



# **DEEP SEA ELECTRONICS**

## **DSEG8660 Configuration Suite**

### **PC Software Manual**

**Document Number: 057-324**

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**DSEG8660 Configuration Suite PC Software Manual**

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| Amd. No. | Comments        |
|----------|-----------------|
| 1        | Initial Release |
|          |                 |
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|          |                 |
|          |                 |

Typeface: The typeface used in this document is *Arial*. Care must 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.

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# 1 INTRODUCTION

This document details the use of the *DSE Configuration Suite PC Software* with the DSEG8660 module, which is part of the DSE **Genset**® 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*. DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at [www.deepseaelectronics.com](http://www.deepseaelectronics.com)




The *DSE Configuration Suite PC Software* allows the DSEG8660 module to be connected to a PC via USB A to USB B cable (USB printer cable). Once connected, the software allows easy, controlled access to various operating parameters within the module which can then be viewed and edited as required.

The *DSE Configuration Suite PC Software* must only be used by competent, qualified personnel, as changes to the operation of the module may have safety implications on the panel to which it is fitted. Access to critical operational sequences and settings for use by qualified engineers, may be barred by a security code set by the Generator / panel provider.

The information contained in this manual must be read in conjunction with the information contained in the appropriate module documentation. This manual only detail which settings are available and how they may be used. Separate manuals deal with the operation of the individual module and its ancillaries, refer to section 1.3 entitled *Bibliography* in this document for further information.

## 1.1 CLARIFICATION OF NOTATION

Clarification of notation used within this publication.

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

## 1.2 GLOSSARY OF TERMS

| Term  | Description                                                                                                                                                                    |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMSC  | Advanced Multi-Set Communication                                                                                                                                               |
| AVR   | Automatic Voltage Regulator                                                                                                                                                    |
| BMS   | Building Management System. A digital/computer-based control system for a building's infrastructure.                                                                           |
| CAN   | Controller Area Network. Vehicle standard to allow digital devices to communicate to one another.                                                                              |
| CDMA  | Code Division Multiple Access. Cell phone access used in small number of areas including parts of the USA and Australia.                                                       |
| DHCP  | DHCP (Dynamic Host Configuration Protocol) is a protocol that provides quick, automatic, and central management for the distribution of IP addresses within a network.         |
| DNS   | Domain Name System is a collection of databases that translate hostnames to IP addresses.                                                                                      |
| FPE   | Front Panel Editor                                                                                                                                                             |
| FRT   | Fault Ride Through                                                                                                                                                             |
| GSM   | Global System for Mobile communications. Cell phone technology used in most of the World.                                                                                      |
| IDMT  | Inverse Definite Minimum Time                                                                                                                                                  |
| IEEE  | Institute of Electrical and Electronics Engineers                                                                                                                              |
| ISBN  | International Standard Bibliographic Description                                                                                                                               |
| LAN   | Local Area Network                                                                                                                                                             |
| LCD   | Liquid Crystal Display                                                                                                                                                         |
| LED   | Light Emitting Diode                                                                                                                                                           |
| LSB   | Least Significant Bit                                                                                                                                                          |
| MSB   | Most Significant Bit                                                                                                                                                           |
| MSC   | Multi-Set Communication                                                                                                                                                        |
| NAPT  | Network Address and Port Translation                                                                                                                                           |
| NVD   | Neutral Voltage Displacement                                                                                                                                                   |
| PIN   | PIN number                                                                                                                                                                     |
| PLC   | Programmable Logic Controller. A programmable digital device used to create logic for a specific purpose.                                                                      |
| ROCOF | Rate Of Change Of Frequency                                                                                                                                                    |
| RTD   | An RTD (Resistance Temperature Detector) is a sensor whose resistance changes as its temperature changes. The resistance increases as the temperature of the sensor increases. |
| SCADA | Supervisory Control And Data Acquisition. A system that operates with coded signals over communication channels to provide control and monitoring of remote equipment          |
| SNMP  | Simple Network Management Protocol. An international standard protocol for managing devices on IP networks.                                                                    |

*Introduction*

| <b>Term</b> | <b>Description</b>                                                                                                                                                    |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TCP         | TCP (Transmission Control Protocol) is a standard that defines how to establish and maintain a network conversation via which application programs can exchange data. |
| USB         | Universal Serial Bus                                                                                                                                                  |
| WAN         | Wide Area Network                                                                                                                                                     |

## 1.3 BIBLIOGRAPHY

This document refers to, and is referred by the following DSE publications which are obtained from the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com) or by contacting DSE technical support: [support@deepseaelectronics.com](mailto:support@deepseaelectronics.com).

### 1.3.1 INSTALLATION INSTRUCTIONS

Installation instructions are obtained from the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com) or by contacting DSE technical support: [support@deepseaelectronic.com](mailto:support@deepseaelectronic.com) and are intended as a 'quick start' guide only.

| DSE Part | Description                                                        |
|----------|--------------------------------------------------------------------|
| 053-032  | DSE2548 LED Expansion Annunciator Installation Instructions        |
| 053-033  | DSE2130 Input Expansion Installation Instructions                  |
| 053-034  | DSE2157 Output Expansion Installation Instructions                 |
| 053-049  | DSE9xxx Battery Charger 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    |
| 053-147  | DSE9460 & DSE9461 Battery Charger Installation Instructions        |
| 053-253  | DSEG8660 Installation Instructions                                 |
| 053-185  | DSE9473 & DSE9483 Battery Charger Installation Instructions        |

### 1.3.2 MANUALS

Product manuals are obtained from the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com) or by contacting DSE technical support: [support@deepseaelectronics.com](mailto:support@deepseaelectronics.com).

| DSE Part | Description                                                                                                                     |
|----------|---------------------------------------------------------------------------------------------------------------------------------|
| N/A      | DSEGenComm (Modbus protocol for DSE controllers)                                                                                |
| 057-045  | Guide to Synchronising and Load Sharing Part 1 (Usage of DSE Load Share Controllers in synchronisation / load sharing systems.) |
| 057-046  | Guide to Synchronising and Load Sharing Part 2 (Governor & AVR Interfacing)                                                     |
| 057-047  | Load Share System Design and Commissioning Guide                                                                                |
| 057-082  | DSE2130 Input Expansion Operator Manual                                                                                         |
| 057-083  | DSE2157 Output Expansion Operator Manual                                                                                        |
| 057-084  | DSE2548 Annunciator Expansion Operator Manual                                                                                   |
| 057-085  | DSE9xxx Battery Charger Operator Manual                                                                                         |
| 057-139  | DSE2131 Ratio-metric Input Expansion Manual                                                                                     |
| 057-140  | DSE2133 RTD/Thermocouple Expansion Manual                                                                                       |
| 057-141  | DSE2152 Ratio-metric Output Expansion Manual                                                                                    |
| 057-151  | DSE Configuration Suite PC Software Installation & Operator Manual                                                              |
| 057-175  | PLC Programming Guide for DSE Controllers                                                                                       |
| 057-176  | DSE9460 & DSE9461 Battery Charger Operator Manual                                                                               |
| 057-312  | DSEAssistant PC Software Manual                                                                                                 |
| 057-314  | Advanced PLC Software Manual                                                                                                    |
| 057-325  | DSEG8660 Operator Manual                                                                                                        |

### 1.3.3 TRAINING GUIDES

Training guides are provided as 'hand-out' sheets on specific subjects during training sessions and contain specific information regarding to that subject.

| <b>DSE Part</b> | <b>Description</b>                         |
|-----------------|--------------------------------------------|
| 056-001         | Four Steps To Synchronising                |
| 056-005         | Using CTs With DSE Products                |
| 056-006         | Introduction to Comms                      |
| 056-013         | Load Demand Scheme                         |
| 056-021         | Mains Decoupling                           |
| 056-022         | Switchgear Control                         |
| 056-026         | kVA, kW, kvar and Power Factor             |
| 056-030         | Module PIN Codes                           |
| 056-033         | Synchronising Requirements                 |
| 056-036         | Expansion Modules                          |
| 056-043         | Sync Process                               |
| 056-045         | PLC as Load Demand Controller              |
| 056-047         | Out of Sync and Failed To Close            |
| 056-051         | Modbus Control                             |
| 056-069         | Firmware Update                            |
| 056-075         | Adding Language Files                      |
| 056-076         | GenComm Alarms                             |
| 056-079         | GenComm Status                             |
| 056-080         | MODBUS                                     |
| 056-081         | Screen Heaters                             |
| 056-082         | Override Gencomm PLC Example               |
| 056-084         | Synchronising & Loadsharing                |
| 056-091         | Equipotential Earth Bonding                |
| 056-092         | Best Practices for Wiring Restive Sensors  |
| 056-095         | Remote Start Input Functions               |
| 056-097         | USB Earth Loops and Isolation              |
| 056-099         | Digital Output to Digital Input Connection |

### 1.3.4 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.                                                                                                               |

## 1.4 INSTALLATION AND USING THE DSE CONFIGURATION SUITE SOFTWARE

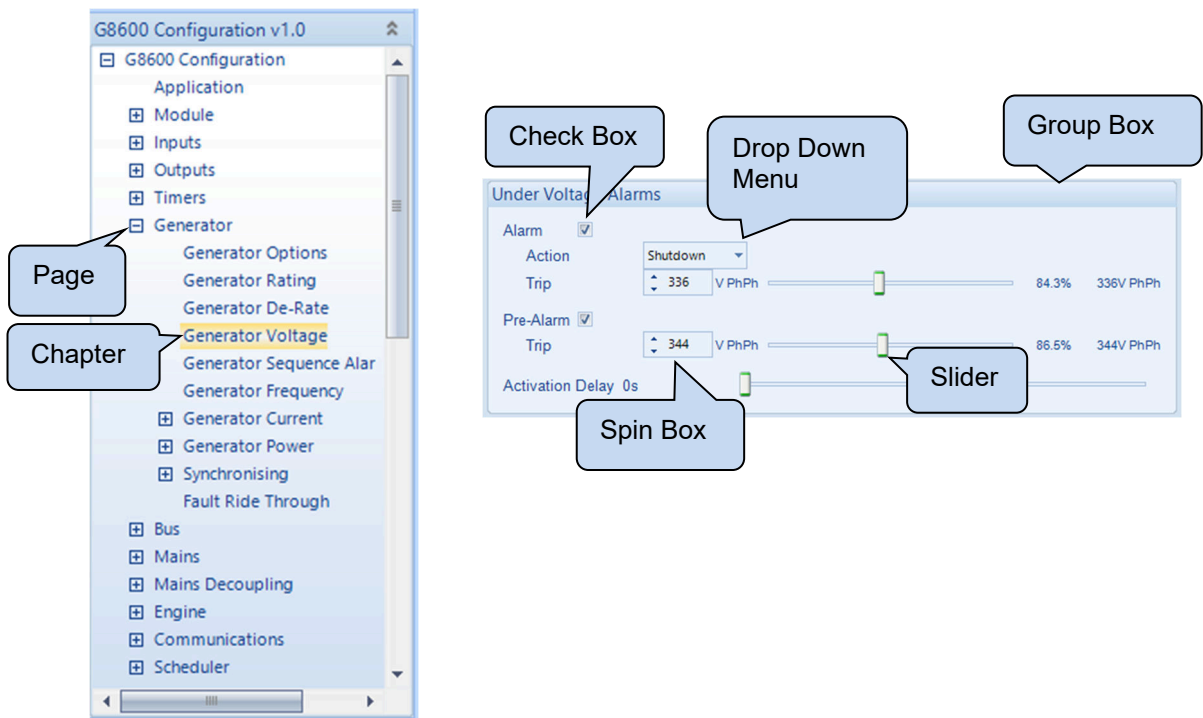
For information regarding installing and using the *DSE Configuration Suite PC Software*, refer to DSE publication: **057-151 DSE Configuration Suite PC Software Installation & Operation Manual** which is found on the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)

## 2 GENERAL CONTROLS

**NOTE:** For information on Menu & Toolbars please refer to DSE Publication: 057-151 *DSE Configuration Suite PC Software Installation & Operation Manual.*

### Overview

The *DSE Configuration Suite PC Software* dialog boxes provide the user with a way to type text, choose options, and initiate actions. Controls in other windows provide a variety of services, such as letting the user choose commands and view and edit text. This section describes the controls provided by the *DSE Configuration Suite* and how to manipulate them. The diagram below shows the general controls of the main configuration screen.



### 2.1 USER CONTROLS

#### Slider

The Slider Control allows the user to change a value using a mouse or arrows found on a standard keyboard.

The slider is highlighted in green in its inactive state and will change to orange (active state) once selected by a mouse pointer.



Inactive state

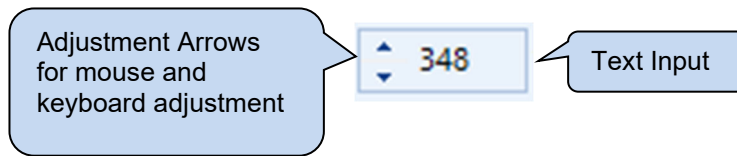


Active state

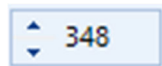
During the active state, the slider is moved with the mouse pointer and the left and right keyboard arrows.

### **Spin Box**

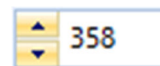
The Spin box displays the current value of the setting in the group box.



Clicking the mouse over the Spin box will change its colour to orange putting it in an active state.



Inactive state



Active state

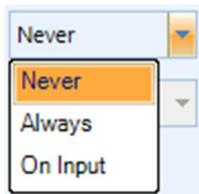
During the active state text is entered using the keyboard, changed using the mouse pointer or the up and down arrows on the keyboard.

### **Check box**



Used to select a parameter.

### **Drop down menu**



Used to select an action.

### 3 EDITING THE CONFIGURATION

The software is broken down into separate sections to provide simple navigation whilst editing the module's configuration to suit a particular application.

#### 3.1 SCREEN LAYOUT

The type of module configuration file being edited

The coloured shading shows the currently selected page/section

Click + or - to expand or collapse the section

Click to move to the *Previous* or *Next* section

Click to close the opened configuration file

This screenshot shows a software interface for editing a configuration file. At the top, there are 'Previous' and 'Next' buttons with arrows. Below them is a title bar 'G8660 Configuration v1.0'. A tree view on the left lists various sections: Application (highlighted in yellow), Module, Digital Inputs, Virtual Inputs, Outputs, Timers, Bus, System, Mains/Bank, Communications, Scheduler, Alternative Configurations, Expansion, and Advanced. Each section has a small square icon with a plus or minus sign next to it.

Click to step *Forward* or *Back* through previously viewed configuration sections

Click to return to the *Home* section shown below

Click to view / edit the section

This screenshot shows a different part of the software interface. At the top, there are 'Back' and 'Forward' buttons with arrows, and a 'Home' button with a house icon. Below these is a list of sections: Application, Module, Digital Inputs, Outputs, Timers, Bus, System, Mains/Bank, Communications, Scheduler, Alternative Configurations, Expansion, and Advanced. Each section is a blue hyperlink. To the right of the list is a photograph of a physical black device with a green screen displaying 'DSE' and several buttons.

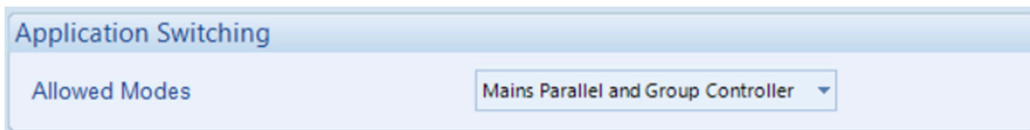
### 3.2 APPLICATION

#### Application Switching

The *Application Switching* page allows the user to configure the module as a *Mains Parallel Controller*, *Group Controller* or set dynamically to switch between each application.

**⚠ CAUTION!: Switching the app to Group Controller forces the mains breaker to be closed without synchronising checks.**

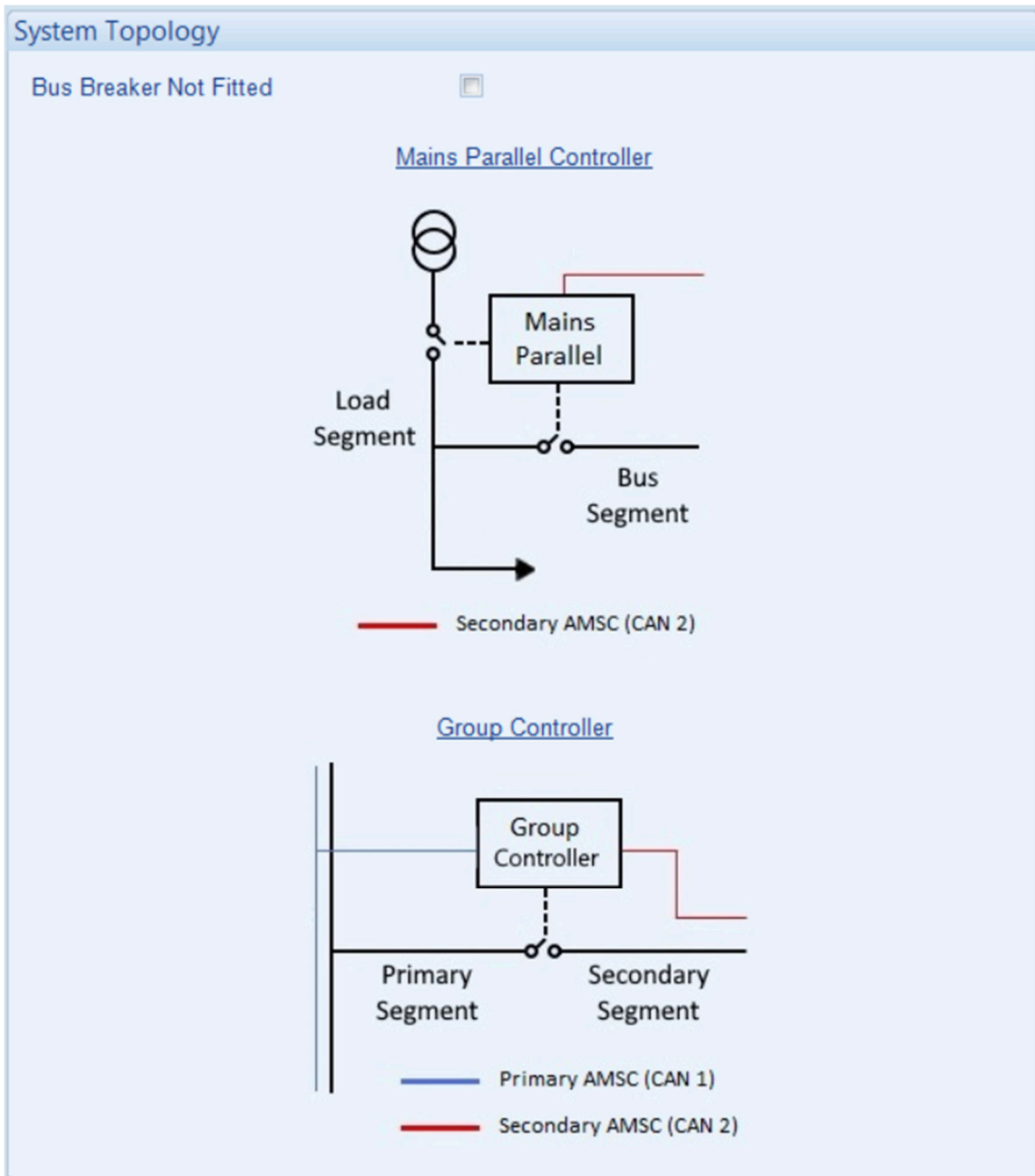
**⚠ NOTE: A *Bus Breaker Failed To Open* alarm will halt application switching.**



| Parameter     | Description                                                                                                                                                                                                                                                                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Allowed Modes | Select the operating application of module:<br><br><b>Group Controller Only:</b> Configuration only allows for it to be a Group Controller.<br><b>Mains and Group Controller:</b> Configuration allows to be dynamically switched between Mains and Group Controller.<br><b>Mains Parallel Only:</b> Configuration only allows for it to be a Mains Parallel Controller. |

**System Topology**

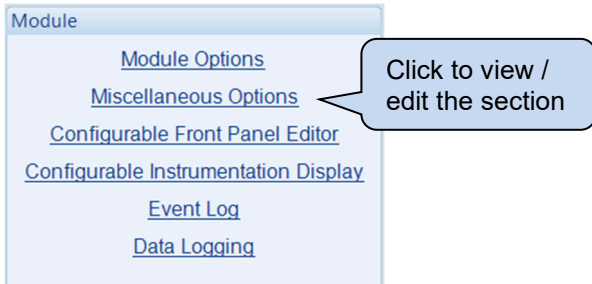
The *System Topology* page shows an overview of each topology and allows configuration of a Bus Breaker.



| Parameter              | Description                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------------------|
| Bus Breaker Not Fitted | <input type="checkbox"/> = Bus Breaker is fitted<br><input checked="" type="checkbox"/> = Bus Breaker is not fitted |

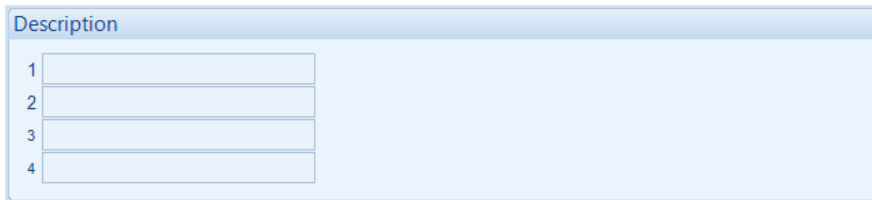
### 3.3 MODULE

The *Module* section allows the user to edit options related to the module itself and is subdivided into smaller sections.



#### 3.3.1 MODULE OPTIONS

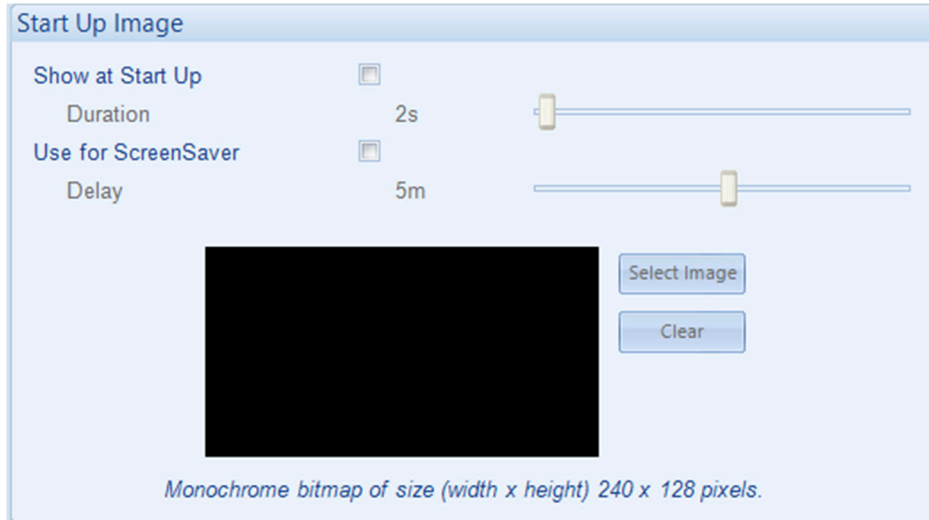
##### Description

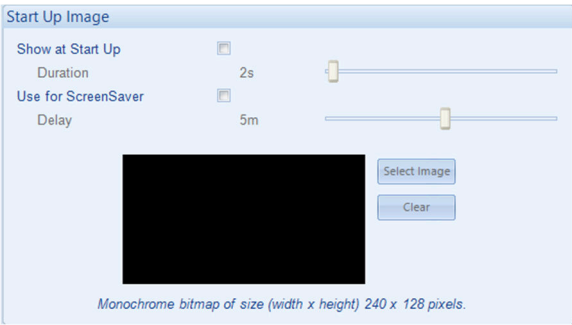


| Parameter   | Description                                                                                                                                                                                                                                                                   |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description | <p>Four free entry boxes to allow the user to give the configuration file a description. Typically used to enter the job number, customer name, engine information etc.</p> <p>This text is not shown on the module's display and is only seen in the configuration file.</p> |

**Start Up Image**

The module is configured to display a *Start UP* image as soon as it is powered up.



| Parameter            | Description                                                                                                                                                                                                                                                                                |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show at Start Up     | <input type="checkbox"/> = Start Up screen is disabled<br><input checked="" type="checkbox"/> = Enable a <i>Start Up Text</i> or <i>Image</i> to be displayed on the module's LCD at power up.<br><br> |
| Duration             | Set the duration for which the <i>Start Up Image</i> is displayed at power up                                                                                                                                                                                                              |
| Use for Screen Saver | <input type="checkbox"/> = Screen Saver is disabled<br><input checked="" type="checkbox"/> = Module activates the Screen Saver to show the selected image after inactivity in any mode for the configured <i>Delay</i> time. Press any button to 'end' the Screen Saver.                   |
| Delay                | Set the duration for which the Start Up Image is displayed as a screensaver                                                                                                                                                                                                                |
| Select Image         | Browse and select the image file to display at power up. The file required must be a monochrome bitmap image of size 240 pixels in width by 128 pixels in height.                                                                                                                          |
| Clear                | Clears the image file selection                                                                                                                                                                                                                                                            |

**Power Saving Options**

The modules backlight is switched off after the timer setting in *Backlight Power Save Mode Delay* in *Module Timers* has expired.

Power Saving Options

Enable Backlight Power Saving Mode

| Parameter                          | Description                                                                                                                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Backlight Power Saving Mode | <input type="checkbox"/> = The <i>Backlight Power Saving Mode</i> is disabled.<br><input checked="" type="checkbox"/> = The <i>Backlight Power Saving Mode</i> is enabled. |

**Breaker Control**

This setting allows manual override of automatic remote load requests in manual mode.

Breaker Control

Enable Manual Breaker Control

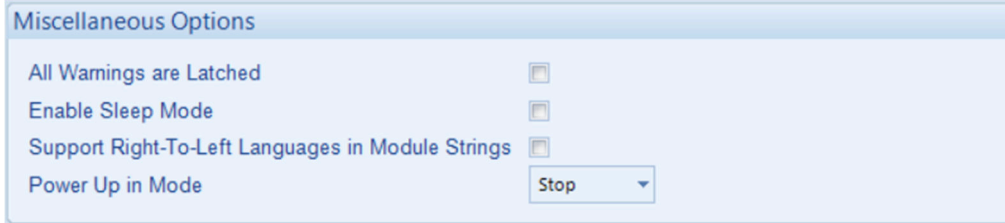
Active Always ▾


| Parameter                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Manual Breaker Control | <input type="checkbox"/> = The <i>Manual Breaker Control</i> is disabled.<br><input checked="" type="checkbox"/> = The <i>Manual Breaker Control</i> is enabled.<br><br>The <i>Manual Breaker Control</i> is activated:<br><b>Always:</b> <i>Manual Breaker Control</i> is always active.<br><b>On Input:</b> <i>Manual Breaker Control</i> is only active when a digital input configured for <i>Manual Breaker Mode</i> is active. |

### 3.3.2 MISCELLANEOUS OPTIONS

#### Miscellaneous Options

Various Module options are configurable on this page.

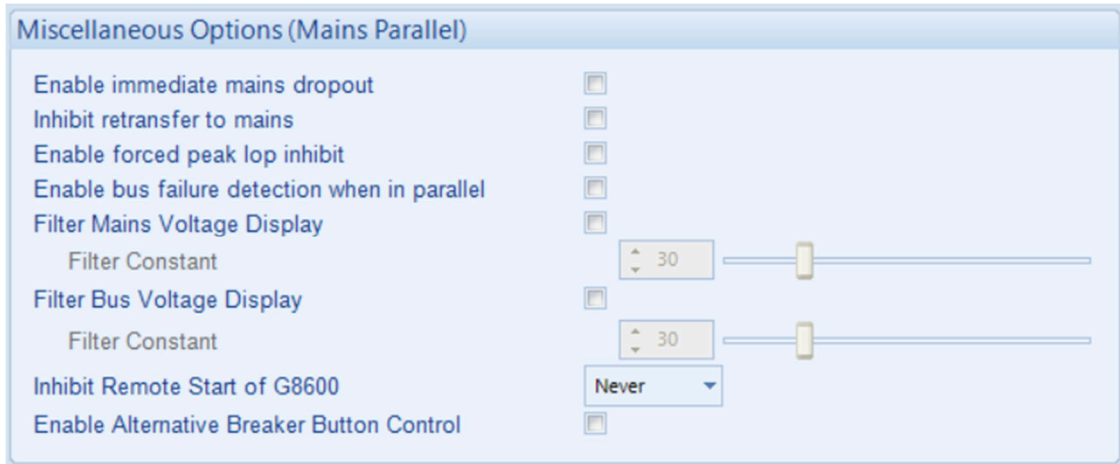


| Parameter                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Warnings Are Latched                          | <p><input type="checkbox"/> = The <i>All Warnings Are Latched</i> is disabled. The module automatically resets the warning and pre-alarms once the triggering condition has been cleared.</p> <p><input checked="" type="checkbox"/> = The <i>All Warnings Are Latched</i> is enabled. The module does not automatically reset the warning and pre-alarms. Resetting the alarm is performed by either activating a digital input configured for <i>Alarm Reset</i> or, pressing the <b>Stop/Reset Mode</b>  button once the triggering condition has been cleared.</p> |
| Enable Sleep Mode                                 | <p><input type="checkbox"/> = Normal operation</p> <p><input checked="" type="checkbox"/> = A configuration option which will allow the module to go into "sleep mode"</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Support Right-To-Left Languages in Module Strings | <p><input type="checkbox"/> = The <i>Support Right-To-Left Languages in Module Strings</i> is disabled. The module displays user configured strings in the order left to right.</p> <p><input checked="" type="checkbox"/> = The <i>Support Right-To-Left Languages in Module Strings</i> is enabled. The module displays user configured strings in the order right to left.</p>                                                                                                                                                                                                                                                                         |
| Power Up in Mode                                  | <p>Select the mode which the module enters once DC power is applied.</p> <p><b>Auto:</b> The module powers up in the <b>Auto Mode</b>.</p> <p><b>Manual:</b> The module powers up in the <b>Manual Mode</b>.</p> <p><b>Stop:</b> The module powers up in the <b>Stop/Reset Mode</b></p> <p><b>Test:</b> The module powers up in <b>Test Mode</b></p>                                                                                                                                                                                                                                                                                                      |




Parameter descriptions are continued overleaf...

**Miscellaneous Options (Mains Parallel)**

Various Module options for the *Mains Parallel* application are configurable on this page.



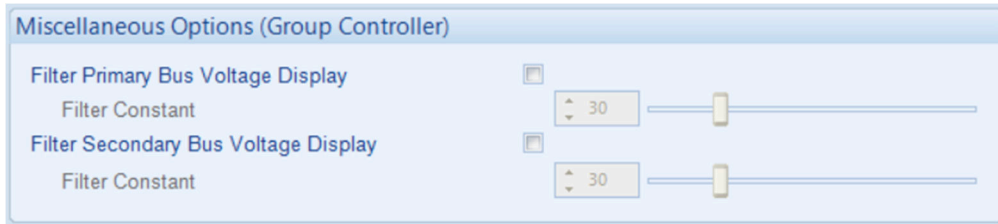
| Parameter                                                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable immediate mains dropout                                                     | <p><input type="checkbox"/> = The <i>Immediate Mains Dropout</i> is disabled. Upon Mains failure, the Mains switchgear is kept closed until the Generator Bus is up to speed and volts.</p> <p><input checked="" type="checkbox"/> = The <i>Immediate Mains Dropout</i> is enabled. Upon Mains failure, the Mains switchgear is opened immediately, subject to the setting of the <i>Mains Transient</i> timer.</p>                                                                                                                                                                                                                                                                                                                                                                  |
| Inhibit retransfer to mains<br><i>IEEE 37.2 - 3 Checking or interlocking relay</i> | <p><input type="checkbox"/> = When the mains supply is reinstated after a failure, the retransfer back to mains takes place.</p> <p><input checked="" type="checkbox"/> = This prevents the load being transferred back to the mains supply, ONLY in the event of the generator failure. This is used in peak lopping systems where the cost of using the mains to supply the load is so prohibitive that the customer does not want to transfer back to the mains supply.</p>                                                                                                                                                                                                                                                                                                       |
| Enable Forced peak lop inhibit                                                     | <p><b>NOTE: If the module is <i>Peak Lopping</i> in <i>Auto Mode</i> and another DSExx60 requests to control the Generator Bus following a Mains failure, the <i>Peak Lopping</i> operation is suspended.</b></p> <p><input type="checkbox"/> = The <i>Forced Peak Lop Inhibit</i> is disabled. The module continues to control the Generator Bus regardless if another DSEG8660 requests control.</p> <p><input checked="" type="checkbox"/> = The <i>Forced Peak Lop Inhibit</i> is enabled. If the DSEG8660 (1) is in <i>Manual Mode</i> controlling the Generator Bus for peak lopping and another DSEG8660 (2) requests the generators to power its load following a Mains failure, the DSEG8660 (1) relinquishes control over the Generator Bus to the other DSEG8660 (2).</p> |
| Enable bus failure detection when in parallel                                      | <p><input type="checkbox"/> = The <i>Bus Failure Detection When in Parallel</i> is disabled. The module does not act upon the Bus being live when in parallel with the Mains with no generators on load.</p> <p><input checked="" type="checkbox"/> = The <i>Bus Failure Detection When in Parallel</i> is enabled. The module trips the bus breaker if there are not generators powering the bus.</p>                                                                                                                                                                                                                                                                                                                                                                               |

| Parameter                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Filter Mains Voltage Display              | <p> <b>NOTE: The mains voltage is only filtered on the module's display and not on the SCADA or any other remote monitoring device.</b></p> <p><input type="checkbox"/> = The <i>Filter Mains Voltage Display</i> is disabled. The rate at which the mains voltage instruments are refreshed to display all voltage fluctuations.</p> <p><input checked="" type="checkbox"/> = The <i>Filter Mains Voltage Display</i> is enabled. The rate at which the mains voltage instruments are refreshed is configurable based on the <i>Filter Constant</i>. A larger <i>Filter Constant</i> leads to a slower refresh rate, filtering out the fluctuations on the mains voltage instruments.</p>                                                  |
| Filter Bus Voltage Display                | <p> <b>NOTE: The Bus voltage is only filtered on the module's display and not on the SCADA or any other remote monitoring device.</b></p> <p><input type="checkbox"/> = The <i>Filter Bus Voltage Display</i> is disabled. The rate at which the Bus voltage instruments are refreshed is fast to display all voltage fluctuations.</p> <p><input checked="" type="checkbox"/> = The <i>Filter Bus Voltage Display</i> is enabled. The rate at which the Bus voltage instruments are refreshed is configurable based on the <i>Filter Constant</i>. A larger <i>Filter Constant</i> leads to a slower refresh rate, filtering out the fluctuations on the Bus voltage instruments.</p>                                                      |
| Inhibit Remote Start of G8600             | <p>Inhibits the module sending any start commands (including Mains failure) being transmitted down the AMSC link to the DSEG8660 units. This enables the user to decide when to start / stop the generators based on other conditions.</p> <p><b>Never:</b> Start commands are always sent down the AMSC link.</p> <p><b>Always:</b> Start commands are never sent down the AMSC link.</p> <p><b>On Input:</b> Start commands are not sent down the AMSC link when a digital input configured for <i>Inhibit Remote Start of G8600</i> is active.</p>                                                                                                                                                                                                                                                                        |
| Enable Alternative Breaker Button Control | <p> <b>NOTE: For more detailed information on the <i>Alternative Breaker Control Button</i> operation, refer to DSE Publication: 057-325 DSEG8660 Operator Manual.</b></p> <p><input type="checkbox"/> = The <i>Alternative Breaker Control Button</i> is disabled. Pressing the <b>Transfer to Mains</b> or <b>Transfer to Bus</b> buttons requests a transfer of load to the respective supply if it is available.</p> <p><input checked="" type="checkbox"/> = The <i>Alternative Breaker Control Button</i> is enabled. Pressing the <b>Transfer to Mains</b> or <b>Transfer to Bus</b> buttons requests the respective switchgear to open or close, causing a transfer of load to occur if required, if the supply is available.</p> |

Parameter descriptions are continued overleaf...

**Miscellaneous Options (Group Controller)**

Various Module options for the *Group Controller* application are configurable on this page.

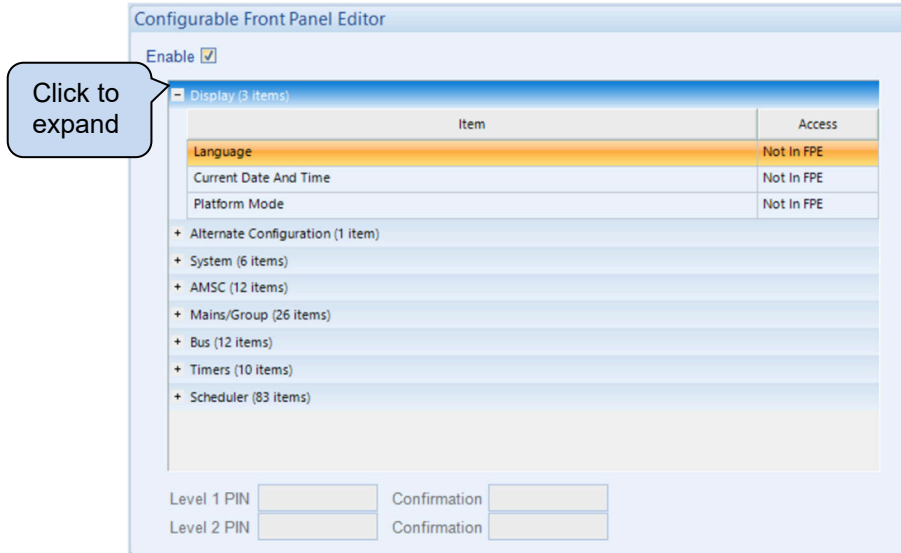


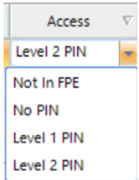
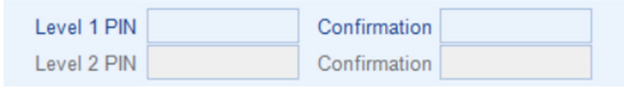
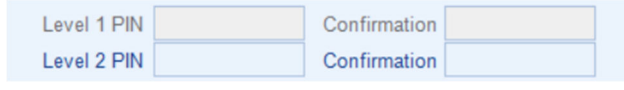
| Parameter                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Filter Primary Bus Voltage Display   | <p><b>▲NOTE: The bus voltage is only filtered on the module's display and not on the SCADA or any other remote monitoring device.</b></p> <p><input type="checkbox"/> = The Primary <i>Filter Bus Voltage Display</i> is disabled. The rate at which the bus voltage instruments are refreshed is fast to display all voltage fluctuations.</p> <p><input checked="" type="checkbox"/> = The Primary <i>Filter Bus Voltage Display</i> is enabled. The rate at which the bus voltage instruments are refreshed is configurable based on the <i>Filter Constant</i>. A larger <i>Filter Constant</i> leads to a slower refresh rate, filtering out the fluctuations on the bus voltage instruments.</p> |
| Filter Secondary Bus Voltage Display | <p><input type="checkbox"/> = The Secondary <i>Filter Bus Voltage Display</i> is disabled. The rate at which the bus voltage instruments are refreshed is fast to display all voltage fluctuations.</p> <p><input checked="" type="checkbox"/> = The Secondary <i>Filter Bus Voltage Display</i> is enabled. The rate at which the bus voltage instruments are refreshed is configurable based on the <i>Filter Constant</i>. A larger <i>Filter Constant</i> leads to a slower refresh rate, filtering out the fluctuations on the bus voltage instruments.</p>                                                                                                                                       |

**▲NOTE: The Primary Bus is the common bus and the Secondary Bus consists of generator segments controlled by the Group controller. See section 7.2 in DSE Publication: 057-325\_G8660\_ops DSEG8660 Operator Manual for further information.**

### 3.3.3 CONFIGURABLE FRONT PANEL EDITOR

The Configurable Front Panel Editor allows generator OEMs to create a PIN protected, customised Front Panel Editor with up to two security access levels. Items may be added or removed as required by the generator supplier.



| Items       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable      | <input type="checkbox"/> = Configuration parameters are all accessible from Front Panel Editor.<br><input checked="" type="checkbox"/> = The Configuration parameters depend on their Access level.                                                                                                                                                                                                                                                                                                                                                                                                              |
| Access      | Permits the relevant item to be edited through the Front Panel Editor of the module.<br> <p><b>Not in FPE:</b> The item cannot be edited through the Front Panel Editor<br/> <b>No PIN:</b> Allowing access to edit the item with no PIN<br/> <b>Level 1 PIN:</b> The Front Panel Editor asks for the configured <i>Level 1 PIN</i> to allow access to the relevant item.<br/> <b>Level 2 PIN:</b> The Front Panel Editor asks for the configured <i>Level 2 PIN</i> to allow access to <i>Level 1</i> and <i>No Pin</i>.</p> |
| Level 1 PIN | Set four-digit PIN number, then repeat the PIN in the <i>Confirmation</i> to configure <i>Level 1 PIN</i> for this access level.<br>                                                                                                                                                                                                                                                                                                                                                                                         |
| Level 2 PIN | Set four-digit PIN number, then repeat the PIN in the <i>Confirmation</i> to configure <i>Level 2 PIN</i> for this access level.<br>                                                                                                                                                                                                                                                                                                                                                                                         |

### 3.3.4 CONFIGURABLE INSTRUMENTATION DISPLAY

#### Displayed information

Allows configuration of the modules display.

**Displayed Instrumentation**

|               |          |   |               |          |   |
|---------------|----------|---|---------------|----------|---|
| Instrument 1  | Not Used | ▼ | Instrument 17 | Not Used | ▼ |
| Instrument 2  | Not Used | ▼ | Instrument 18 | Not Used | ▼ |
| Instrument 3  | Not Used | ▼ | Instrument 19 | Not Used | ▼ |
| Instrument 4  | Not Used | ▼ | Instrument 20 | Not Used | ▼ |
| Instrument 5  | Not Used | ▼ | Instrument 21 | Not Used | ▼ |
| Instrument 6  | Not Used | ▼ | Instrument 22 | Not Used | ▼ |
| Instrument 7  | Not Used | ▼ | Instrument 23 | Not Used | ▼ |
| Instrument 8  | Not Used | ▼ | Instrument 24 | Not Used | ▼ |
| Instrument 9  | Not Used | ▼ | Instrument 25 | Not Used | ▼ |
| Instrument 10 | Not Used | ▼ | Instrument 26 | Not Used | ▼ |
| Instrument 11 | Not Used | ▼ | Instrument 27 | Not Used | ▼ |
| Instrument 12 | Not Used | ▼ | Instrument 28 | Not Used | ▼ |
| Instrument 13 | Not Used | ▼ | Instrument 29 | Not Used | ▼ |
| Instrument 14 | Not Used | ▼ | Instrument 30 | Not Used | ▼ |
| Instrument 15 | Not Used | ▼ | Instrument 31 | Not Used | ▼ |
| Instrument 16 | Not Used | ▼ | Instrument 32 | Not Used | ▼ |

| Parameter          | Description                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| Instrument 1 to 10 | Select the instrumentation parameter that is to be displayed for the specific <i>Configurable Status Screen</i> . |

### 3.3.5 EVENT LOG

#### Logged Events

All events are configured and viewed in the *Event Log*.

**Logged Events**

Log the following events to the event log

|                                                        |                                                  |
|--------------------------------------------------------|--------------------------------------------------|
| Power-Up <input checked="" type="checkbox"/>           | Bus Off Load <input checked="" type="checkbox"/> |
| Latched warnings <input checked="" type="checkbox"/>   | Bus On Load <input checked="" type="checkbox"/>  |
| Unlatched warnings <input checked="" type="checkbox"/> |                                                  |

| Parameter          | Description                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power-Up           | <input type="checkbox"/> = <i>Power-Up</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Power-Up</i> events are logged when the DC Supply is applied to the module.       |
| Latched Warnings   | <input type="checkbox"/> = <i>Latched Warnings Alarms</i> are not logged.<br><input checked="" type="checkbox"/> = <i>Latched Warnings Alarms</i> are logged when the moment they activate.     |
| Unlatched Warnings | <input type="checkbox"/> = <i>Unlatched Warnings Alarms</i> are not logged.<br><input checked="" type="checkbox"/> = <i>Unlatched Warnings Alarms</i> are logged when the moment they activate. |
| Bus Off Load       | <input type="checkbox"/> = <i>Bus Off Load</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Bus Off Load</i> events are logged when the Generator Bus switchgear opens.   |
| Bus On Load        | <input type="checkbox"/> = <i>Bus On Load</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Bus On Load</i> events are logged when the Generator Bus switchgear closes.    |

**Logged Events (Mains Parallel)**

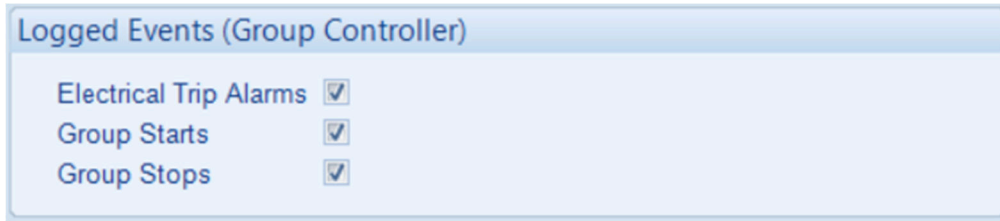
All *Mains Parallel* vents are configured and viewed in the *Event Log*.

| Logged Events (Mains Parallel)                   |                                                    |
|--------------------------------------------------|----------------------------------------------------|
| Mains Fail <input checked="" type="checkbox"/>   | Mains Off Load <input checked="" type="checkbox"/> |
| Mains Return <input checked="" type="checkbox"/> | Mains On Load <input checked="" type="checkbox"/>  |

| Parameter      | Description                                                                                                                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Fail     | <input type="checkbox"/> = <i>Mains Fail</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Mains Fail</i> events are logged when the mains voltage/frequency/phase rotation, above/falls below the configured trip levels for the duration of the <i>Mains Transient Delay</i> timer. |
| Mains Return   | <input type="checkbox"/> = <i>Mains Return</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Mains Return</i> events are logged when the mains voltage/frequency falls below/rise above the configured return levels for the duration of the <i>Mains Transient Delay</i> timer.      |
| Mains Off Load | <input type="checkbox"/> = <i>Mains Off Load (breaker open)</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Mains Off Load (breaker open) events are logged.</i>                                                                                                                    |
| Mains On Load  | <input type="checkbox"/> = <i>Mains On Load events (breaker closed)</i> are not logged.<br><input checked="" type="checkbox"/> = <i>Mains On Load (breaker closed) are logged.</i>                                                                                                                         |

**Logged Events (Group Controller)**

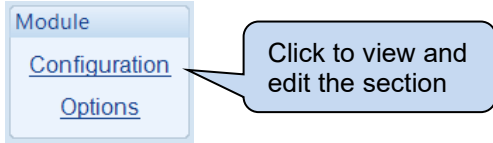
All *Group Controller* events are configured and viewed in the *Event Log*.



| Parameter              | Description                                                                                                                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical Trip Alarms | <input type="checkbox"/> = <i>Electrical Trip Alarms</i> are not logged.<br><input checked="" type="checkbox"/> = <i>Electrical Trip Alarms</i> are logged when the moment they activate.             |
| Group Starts           | <input type="checkbox"/> = <i>Group Start</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Group Start</i> events are logged when the generator successfully crank disconnects. |
| Group Stops            | <input type="checkbox"/> = <i>Group Stop</i> events are not logged.<br><input checked="" type="checkbox"/> = <i>Group Stop</i> events are logged when the generator successfully crank disconnects.   |

### 3.3.6 DATA LOGGING

The *Data Logging* section is subdivided into smaller sections.



The module can record up to twenty parameters and is saved as a *Data Log File* to the module's internal memory or an external USB storage device. If 20 parameters were configured to be logged, each with a *Log Interval* of 1 second, the length of each *Data Log File* would be 6 hours and 21 minutes. This time is extendable as the length of each *Data Log File* varies upon the number of selected parameters and their configured *Log Interval*.

The module can store 128 *Data Log Files* to its internal memory. The number of *Data Log Files* increases when an external USB storage device is connected to the module's USB Host port. The increased number of *Data Log Files* is dependent upon the size of the USB storage device connected. When using the maximum size USB storage device of 16 GB, the number of *Data Log Files* is increased to 8200. This results in a total *Data Log* length of 46 weeks, 2 days, 6 hours, and 24 minutes (assuming 20 parameters were configured to be logged, each with a *Log Interval* of 1 second).

The *Data Logging* is viewed using the *Data Log Viewer* application, which is accessed from the DSE Configuration Suite PC Software under the *Tools* menu.

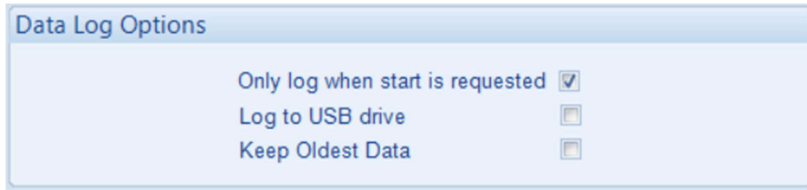
3.3.6.1 CONFIGURATION

The screenshot shows a 'Data Logging' configuration window. It contains a table with 20 rows. The first column is labeled 'Logged data' and the second column is labeled 'Log Interval'. The first row has 'DC Power On' selected in the first column and '1 minute' in the second. The second row has 'Mains/Bank Total Power' selected in the first column and '1 second' in the second. Rows 3 through 20 have '<Not Used>' selected in the first column and either '1 second' or '1 minute' in the second. Two callout boxes are present: one pointing to the first dropdown in the first row with the text 'Click to select data to be logged', and another pointing to the second dropdown in the first row with the text 'Click to select time interval'.

|    | Logged data             | Log Interval |
|----|-------------------------|--------------|
| 1  | DC Power On             | 1 minute     |
| 2  | Mains/Bank Total Power  | 1 second     |
| 3  | Mains/Bank Current L1   | 1 second     |
| 4  | Mains/Bank Volts (L1-N) | 1 second     |
| 5  | <Not Used>              | 1 second     |
| 6  | <Not Used>              | 1 minute     |
| 7  | <Not Used>              | 1 minute     |
| 8  | <Not Used>              | 1 second     |
| 9  | <Not Used>              | 1 second     |
| 10 | <Not Used>              | 1 second     |
| 11 | <Not Used>              | 1 second     |
| 12 | <Not Used>              | 1 second     |
| 13 | <Not Used>              | 1 second     |
| 14 | <Not Used>              | 1 second     |
| 15 | <Not Used>              | 1 second     |
| 16 | <Not Used>              | 1 second     |
| 17 | <Not Used>              | 1 second     |
| 18 | <Not Used>              | 1 second     |
| 19 | <Not Used>              | 1 second     |
| 20 | <Not Used>              | 1 second     |

| Parameter    | Description                                                                                                                                                  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Logged Data  | Select the item required to be logged. See the list of Output Sources in <i>Section 3.6.3</i> for an explanation of selectable items and their descriptions. |
| Log Interval | Select the logging interval of the data: 1 second to 24 hrs                                                                                                  |

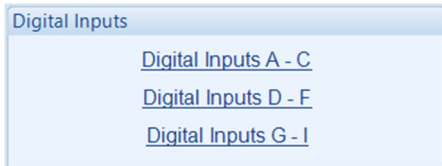
3.3.6.2 OPTIONS



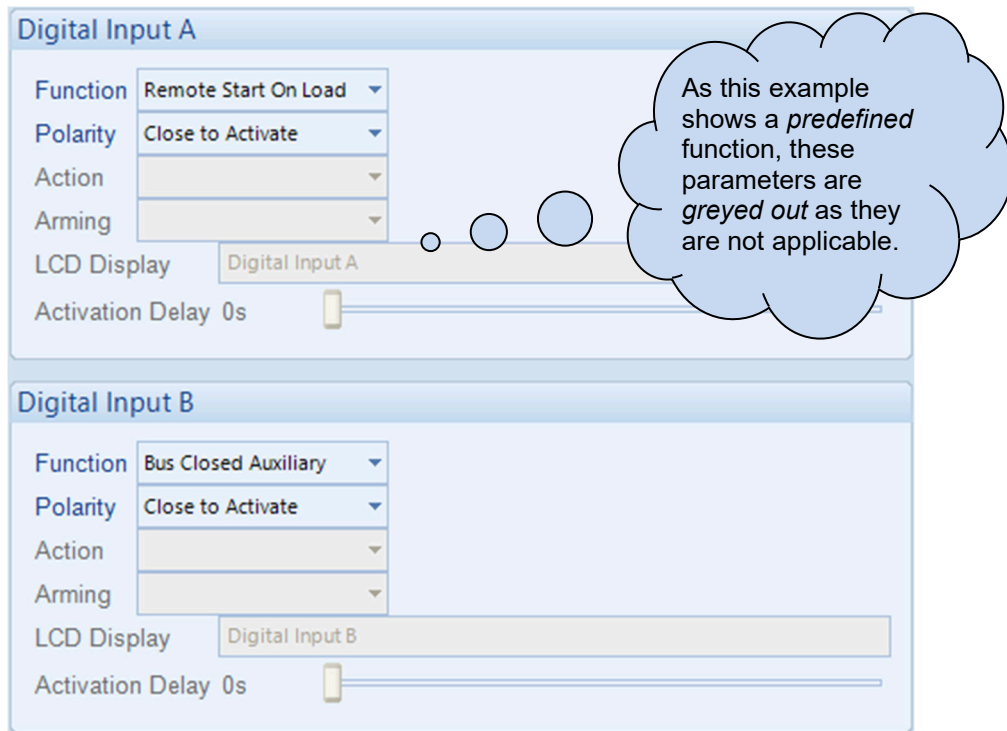
| Parameter                        | Description                                                                                                                                                                                                                               |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Only Log When start is requested | <input type="checkbox"/> = The module logs data regardless.<br><input checked="" type="checkbox"/> = The module only logs data when a start is requested.                                                                                 |
| Log to USB Drive                 | <input type="checkbox"/> = The module logs data to the module's internal memory.<br><input checked="" type="checkbox"/> = The module logs data to an external USB memory device connect to the USB host socket on the module.             |
| Keep Oldest Data                 | <input type="checkbox"/> = When the logging memory is full, the module overwrites the oldest data first with the new data.<br><input checked="" type="checkbox"/> = When the logging memory is full, the module stops recording new data. |

### 3.4 DIGITAL INPUTS

The *Digital Inputs* section is subdivided into smaller sections. Select the required section with the mouse.




#### 3.4.1 DIGITAL INPUTS



| Parameter | Description                                                                                                                                                                                                                                                                                                                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function  | Select the input function to activate when the relevant terminal is energised. See section 3.4.2 entitled <i>Input Functions</i> for details of all available functions                                                                                                                                                      |
| Polarity  | Select the digital input polarity:<br><b>Close to Activate:</b> the input function is activated when the relevant terminal is connected.<br><b>Open to Activate:</b> the input function is activated when the relevant terminal is disconnected.                                                                             |
| Action    | <div style="border: 2px solid black; padding: 5px; margin-bottom: 5px;"> <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> </div> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip</b><br/> <b>Indication</b><br/> <b>Warning</b></p> |

Parameter descriptions are continued overleaf...

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Arming           | <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">  <b>NOTE: For details of these, see the section 6 entitled <i>Alarm Arming</i> for more information.</b> </div> <p>Select when the input becomes active:<br/> <b><i>Active From Mains Parallel</i></b><br/> <b><i>Always</i></b><br/> <b><i>Never</i></b></p> |
| LCD Display      | The text that is displayed on the module's LCD when the input activates and generates an alarm.                                                                                                                                                                                                                                                                                                                         |
| Activation Delay | This is used to give a delay on acceptance of the input. Useful for liquid level switches or to mask short term operations of the external switch device.                                                                                                                                                                                                                                                               |

### 3.4.2 INPUT FUNCTIONS

Where a digital input is NOT configured as “user configured”, a selection is made from a list of predefined functions. The selections are as follows:

Under the scope of IEEE 37.2, function numbers are also used to represent functions in microprocessor devices and software programs. Where the DSE input functions are represented by IEEE 37.2, the function number is listed below.

| Function                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User Configured                                                                       | This input is used to generate a custom alarm using the configured <i>Action</i> , <i>Arming</i> and <i>LCD Display</i> items.                                                                                                                                                                                                                                                           |
| Alarm Mute                                                                            | This input is used to silence the audible alarm from an external source, such as a remote mute switch.                                                                                                                                                                                                                                                                                   |
| Alarm Reset                                                                           | This input is used to reset any latched alarms from a remote location. It is also used to clear any latched warnings which may have occurred (if configured) without having to stop the Generator Bus.                                                                                                                                                                                   |
| Allow Mains Interconnection (Mains Parallel)                                          | If this input is active the system is permitted to take an action that would join two mains supplies, otherwise it is not.                                                                                                                                                                                                                                                               |
| Alt Config 1-5 Select                                                                 | These inputs are used to instruct the module to follow the relevant <i>alternative</i> configuration settings instead of the <i>main</i> configuration settings.                                                                                                                                                                                                                         |
| AMSC Alarms Inhibit (Mains Parallel)                                                  | If this input is active, all AMSC failure related alarms are inhibited from activating even if the fault is active.                                                                                                                                                                                                                                                                      |
| AMSC Alarms Inhibit Group Primary (Group Controller)                                  | If this input is active, then all AMSC related alarms on the Group Controller s Primary AMSC link are inhibited from activating even if the fault is active.                                                                                                                                                                                                                             |
| AMSC Alarms Inhibit Group Secondary (Group Controller)                                | If this input is active, then all AMSC related alarms on the Group Controller s Secondary AMSC link are inhibited from activating even if the fault is active.                                                                                                                                                                                                                           |
| AMSC Keep Holding Token (Mains Parallel)                                              | If this input is active then the module will attempt to keep control of the token regardless of priorities.                                                                                                                                                                                                                                                                              |
| Auto Restore Inhibit (Mains Parallel)<br>IEEE 37.2 - 3 Checking Or Interlocking Relay | In the event of a Mains failure, the Generator Bus is instructed to start and take load. On removal of the Mains return the module continues to run the Generator Bus on load until the <i>Auto Restore Inhibit</i> input is removed. This input allows the controller to be fitted as part of a system where the restoration to Mains is controlled remotely or by an automated system. |

Parameter descriptions are continued overleaf...

| Function                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto Run Inhibit<br>IEEE 37.2 - 3 Checking Or Interlocking Relay     | <p>This input is used to provide an over-ride function to prevent the controller from starting/running the Generator Bus in the event of a scheduled run condition occurring. If this input is active and a scheduled run occurs the module does not give a start command to the Generator Bus or stops the Generator Bus if it is already running. If this input signal is then removed, the controller operates as if a scheduled run has occurred, starting, and loading the Generator Bus. This function is used to give an 'AND' function so that a Generator Bus is only called to start/run if a request and another condition exists which requires the Generator Bus to run. If the 'Auto Run Inhibit' signal becomes active while the Generator Bus is running, a controlled shutdown sequence begins. If the Generator Bus is running in a load demand scheme, this input takes priority and begins the controlled shutdown sequence, causing another Generator Bus to start (if available). This input does not prevent starting of the Generator Bus in MANUAL/TEST mode.</p> |
| Auto Start Inhibit<br>IEEE 37.2 - 3 Checking Or Interlocking Relay   | <p>This input is used to provide an over-ride function to prevent the controller from starting the Generator Bus in the event of a Multi Set Controller /Mains out of limits condition occurring. If this input is active and a Multi Set Controller signal/Mains failure occurs the module does not give a start command to the Generator Bus. If this input signal is then removed, the controller operates as if a Multi Set Controller /Mains failure has occurred, starting, and loading the Generator Bus. This function is used to give an 'AND' function so that a Generator Bus is only called to start if the Mains fails, and another condition exists which requires the Generator Bus to run. If the 'Auto start Inhibit' signal becomes active once more it is ignored until the module has returned the Mains supply on load and shutdown. This input does not prevent starting of the Generator Bus in MANUAL mode.</p>                                                                                                                                                    |
| Auxiliary Mains Fail                                                 | <p>The module monitors the incoming single or three phase supply for Over voltage, Under Voltage, Over Frequency or Under frequency. It may be required to monitor a different Mains supply, or some aspect of the incoming Mains not monitored by the controller (such as a G59 or G99 Mains decoupling relay). If the devices providing this additional monitoring are connected to operate this input, the controller operates as if the incoming Mains supply has fallen outside of limits, the Generator Bus is instructed to start and take the load if not already running. Removal of the input signal causes the module to act if the Mains has returned to within limits providing that the Mains sensing also indicates that the Mains is within limits.</p>                                                                                                                                                                                                                                                                                                                    |
| Bus Closed Auxiliary<br>IEEE 37.2 - 3 Checking or Interlocking Relay | <p>This input is used to provide feedback to allow the module to give true indication of the contactor or circuit breaker switching status. It must be connected to the Bus load switching device auxiliary contact.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                      | <p><b>NOTE: This input is mandatory on synchronising systems.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Bus Load Inhibit<br>IEEE 37.2 - 52 AC Circuit Breaker                | <p><b>NOTE: This input only operates to control the Bus switchgear if the module load switching logic is attempting to load the Bus.</b></p> <p>This input is used to prevent the module from loading the Generator Bus. If the Generator Bus is already on load, activating this input causes the module to unload the Generator Bus without ramping. Removing the input allows the Generator Bus to be loaded again.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Parameter descriptions are continued overleaf...

| Function                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bus Load Inhibit With Ramping                                         | <p>This input is used to prevent the DSEG8660 from loading the generator Bus if it is currently ramping off load. If the bus is loaded, it will cause the load to be ramped off the bus and the switchgear opened.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>▲NOTE: -This input only operates to control the generator bus load switching device if the DSE8660 load switching logic is attempting to load the generator. It will not control the generator switching device when the mains supply is on load.</b></p> </div> |
| Clear Mains Decoupling Alarms                                         | This input is used to reset the module following a Mains Decoupling Alarm (ROCOF, Vector Shift, Mains Voltage Alarm, Mains Frequency Alarm). The input must switch from inactive to active to reset the trip, it is not to be left permanently active.                                                                                                                                                                                                                                                                                             |
| Duty Select (Group Controller)<br>IEEE 37.2 - 10 Unit sequence switch | This input is used to force the appropriate set to become the duty set when using a load demand scheme. Irrespective of the priority number configured in the module, it will be forced to become the priority set. This allows for manual duty selection, overriding the automatic system normally used by the modules.                                                                                                                                                                                                                           |
| EJP1                                                                  | <p>For the French EJP (Effacement Jours de Pointe) tariff system.</p> <p>This input is functionally identical to <i>Remote Start Off Load</i>. When this input is active, operation is like the '<i>Remote Start On Load</i>' function except that the Generator Bus is not instructed to take the load. This function is also used where the Generator Bus only run is required e.g., for exercise.</p>                                                                                                                                           |
| EJP2                                                                  | <p>For the French EJP (Effacement Jours de Pointe) tariff system.</p> <p>This input is functionally identical to <i>Remote Start Off Load</i>. In auto mode, the module performs the start sequence and transfers load to the Generator Bus. In Manual mode, the load is transferred to the Generator Bus if the Generator Bus is already running, however in manual mode, this input does not generate start/stop requests of the generate Bus.</p>                                                                                               |
| Enable Mains/Group Secondary Load Demand                              | <p>If this input is active, the load demand start up and shut down scheme will be activated when two or more generators are running in parallel. On application, all sets will start a race for the bus. This input effectively tells the module that the sets on the bus should be run under a load demand scheme. The group controller always runs its scheme. However, the mains controller may instruct them to run the scheme between the sets or may instruct which set to run depending on the breaker states.</p>                          |
| Enable Power Mode 1 Constant Power (Default)                          | This input is used to instruct the module to switch to <i>Power Mode 1 Constant Power (Default)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Enable Power Mode 2 Frequency-Power                                   | This input is used to instruct the module to switch to <i>Power Mode 2 Frequency-Power</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Enable Power Mode 3 Voltage-Power                                     | This input is used to instruct the module to switch to <i>Power Mode 3 Voltage-Power</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Enable Reactive Mode 1 Constant Power Factor                          | This input is used to instruct the module to switch to <i>Power Mode 1 Constant Power Factor</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Enable Reactive Mode 2 Voltage-Reactive Power                         | This input is used to instruct the module to switch to <i>Reactive Mode 2 Voltage-Reactive Power</i>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Enable Reactive Mode 3 Power-Power Factor                             | This input is used to instruct the module to switch to <i>Reactive Mode 3 Power-Power Factor</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Enable Reactive Mode 4 Constant Reactive Power (Default)              | This input is used to instruct the module to switch to <i>Reactive Mode 4 Constant Reactive Power (Default)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Parameter descriptions are continued overleaf...

| Function                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External Panel Lock                                                                     | <p><b>▲NOTE: External control sources (i.e., Simulate Start Button) are not affected by the external panel lock input and continue to operate normally.</b></p> <p>This input is used to provide security to the installation. When the External Panel lock input is active, the module does not respond to operation of the Mode select or Start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected, and the operator is still able to view the various instrumentation pages etc. (<i>Front panel configuration access is not possible while the system lock is active</i>).</p> |
| Force High Master Priority (Mains Parallel)                                             | This input forces the master priority to the highest level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Force Low Master Priority (Mains Parallel)                                              | This input forces the master priority to the lowest level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inhibit Remote Start of Gens (Mains Parallel)                                           | This input is used to provide a means of disabling all start commands over the AMSC link to the Multi Set Controller module including the event of a mains failure. This input is only active if <i>Inhibit Remote Start of G8600</i> is not selected in <i>Config Suite</i> .                                                                                                                                                                                                                                                                                                                                                                                                 |
| Inhibit Retransfer to Mains (Mains Parallel)                                            | This input is used to prevent the load being transferred back to the Mains supply, only in the event of a Generator Bus failure. This is used in peak lopping systems where the cost of using the Mains to supply the load is so prohibitive that the customer does not want to transfer back to the Mains supply.                                                                                                                                                                                                                                                                                                                                                             |
| Inhibit Scheduled Run<br>IEEE 37.2 – 3 Checking Or Interlocking Relay                   | This input is used to provide a mean of disabling a scheduled run.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Keep Holding Master Token (Mains Parallel)                                              | This input is used to keep control over the Multi Set Controller modules and their generators, preventing other Deep Sea controllers taking control for synchronising and parallel operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Lamp Test                                                                               | This input is used to provide a test facility for the front panel indicators fitted to the module. When the input is activated, all LEDs illuminate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Leave AMSC Link                                                                         | This input causes the module to disconnect from the AMSC link without triggering alarms in other modules. The input will function provided the Bus breaker is open. If there is no bus breaker then it must be configured for no bus breaker.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Main Config Select                                                                      | This input is used to select the <i>Main</i> configuration when <i>Alternative Configurations</i> are enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Mains Closed Auxiliary (Mains Parallel)<br>IEEE 37.2 - 3 Checking or Interlocking Relay | This input is used to provide feedback to allow the module to give true indication of the contactor or circuit breaker switching status. It must be connected to the Mains load switching device auxiliary contact.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                         | <p><b>▲NOTE: This input is mandatory for synchronising.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mains Load Inhibit (Mains Parallel)<br>IEEE 37.2 - 52 AC Circuit Breaker                | <p><b>▲NOTE: This input only operates to control the Mains switchgear if the module load switching logic is attempting to load the mains.</b></p> <p>This input is used to prevent the module from loading the mains. If the Mains is already on load, activating this input causes the module to unload the Mains without ramping. Removing the input allows the Mains to be loaded again.</p>                                                                                                                                                                                                                                                                                |

Parameter descriptions are continued overleaf...

| Function                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Load Inhibit With Ramping (Mains Parallel)                                     | This input is used to prevent the module from loading the mains supply if a generator is currently ramping off load. If the mains supply is already on load activating this input causes the module to unload the mains supply. Removing the input allows the mains to be loaded again.                                                                                                                                                                                                      |
| Manual Breaker Mode                                                                  | When breaker control is set to <i>Active On Input</i> , this input is used to activate the <i>Manual Breaker Control</i> .                                                                                                                                                                                                                                                                                                                                                                   |
| Manual Restore Contact (Mains Parallel)                                              | This input is used to manually allow back-sync to the Mains without removing the Auto-Restore Inhibit input.                                                                                                                                                                                                                                                                                                                                                                                 |
| Paralleling Inhibit (Mains Parallel)<br>IEEE 37.2 - 3 Checking Or Interlocking Relay | This input is used to prevent the Generator Bus from running in parallel with the Mains supply and in turn, forces a break transfer to occur. If the input becomes active while in parallel, the transfer is completed and paralleling ends.                                                                                                                                                                                                                                                 |
| Remote Start Dead Bus Synchronising                                                  | <p><b>▲NOTE: For further details, refer to section 3.15.1 entitled <i>Advanced Options</i> for more information.</b></p> <p>This input is used to enable a Dead Bus Synchronising start and must be used in conjunction with another starting signal such as <i>Remote Start On Load</i>.</p>                                                                                                                                                                                                |
| Remote Start In Island Mode (Mains Parallel)                                         | When in <i>Auto Mode</i> , the module performs the start sequence and transfer the load to the Generator Bus. The Mains switchgear is left open, and the Generator Bus runs in island mode.<br>In <i>Manual Mode</i> , the load is transferred to the Generator Bus if it is already running and available; however, in <i>Manual Mode</i> , this input does not generate start/stop requests to the Generator Bus.                                                                          |
| Remote Start Off Load                                                                | If this input is active, operation is like the 'Remote Start On Load' function except that the Generator Bus is not instructed to take the load. This function is used where the Generator Bus only run is required e.g., for exercise.                                                                                                                                                                                                                                                      |
| Remote Start On Load                                                                 | If this input is active the module performs the start sequence and places the Generator Bus in parallel with the mains.<br>In Manual mode, the Generator Bus is placed in parallel with the Mains if it was already running; however, in manual mode, this input does not generate start/stop requests.                                                                                                                                                                                      |
| Remote Start On Load Demand (Group Controller)                                       | If this input is active, the load demand start up and shut down scheme will be activated when two or more generators are running in parallel.<br>On application, all sets will start a race for the bus. The first available set will close onto the dead bus and the others will synchronise to it. Once the sets are on load they will compare load levels and redundant sets will commence a shutdown sequence and return to standby until the load level is such that they are required. |

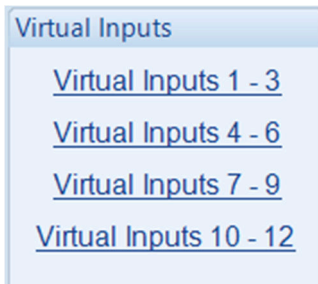
Parameter descriptions are continued overleaf...

| Function                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Simulate Auto Button                   | <p><b>▲NOTE: If a call to start is present when AUTO MODE is entered, the starting sequence begins. Call to Start comes from several sources depending upon module type and configuration and includes (but is not limited to): Multi Set Controller input present, Main's failure, Scheduled run, Auxiliary Mains failure input present, Telemetry start signal from remote locations.</b></p> <p>This input mimics the operation of the 'Auto' button and is used to provide a remotely located Auto mode push button.</p> |
| Simulate Lamp Test / Alarm Mute Button | This input is used to provide a test facility for the front panel indicators fitted to the module. When the input is activated all LED's illuminate. The input also serves a second function, in that it also provides a mute signal to silence the audible alarm. The input is recognised by the module as though it was the Push button on the module itself being operated.                                                                                                                                               |
| Simulate Left Switchgear Button        | Simulates the modules mains close button. See Operation Manual (057-323_G8600_ops) for further details.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Simulate Mains Available.              | This function is provided to override the module's internal monitoring function. If this input is active, the module does not respond to the state of the incoming AC Mains supply.                                                                                                                                                                                                                                                                                                                                          |
| Simulate Manual Button                 | This input mimics the operation of a button and is used to select manual mode.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Simulate Mode Button                   | This input mimics the operation of the 'Mode' button and is used to provide a remotely located Mode push button.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Simulate Right Switchgear Button       | Simulates the modules close bus button. See Operation Manual (057-323_G8600_ops) for further details.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Simulate Start Button                  | This input mimics the operation of the 'Start' button and is used to provide a remotely located start push button.                                                                                                                                                                                                                                                                                                                                                                                                           |
| Simulate Stop Button                   | This input mimics the operation of the 'Stop' button and is used to provide a remotely located stop/reset push button.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Simulate Test On Load Button           | This input mimics the operation of the a'Test' button and is used to select Test Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Stop and Panel Lock                    | Combined function input that instructs the module to enter <i>STOP</i> mode and perform the <i>Panel Lock</i> function. Once the input is active, the module does not respond to operation of the mode select or start buttons. The operator is still able to view the various instrumentation pages etc. ( <i>Front panel configuration access is not possible while the system lock is active</i> ).                                                                                                                       |
| Switch to Group Controller             | Once the input is active the module enables the DSEG8660 to be a Group Controller.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Switch to Mains Parallel               | Once the input is active the module enables the module to switch application mode.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Sync Locking Override                  | Once the input is active it enables sync lock control without a request to close on the load that is active.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Telemetry Panel Lock                   | Once the input is active, the module does not respond to mode changes or breaker control by telemetry. The operator is still able to control and view the various instrumentation pages through the front panel buttons.                                                                                                                                                                                                                                                                                                     |

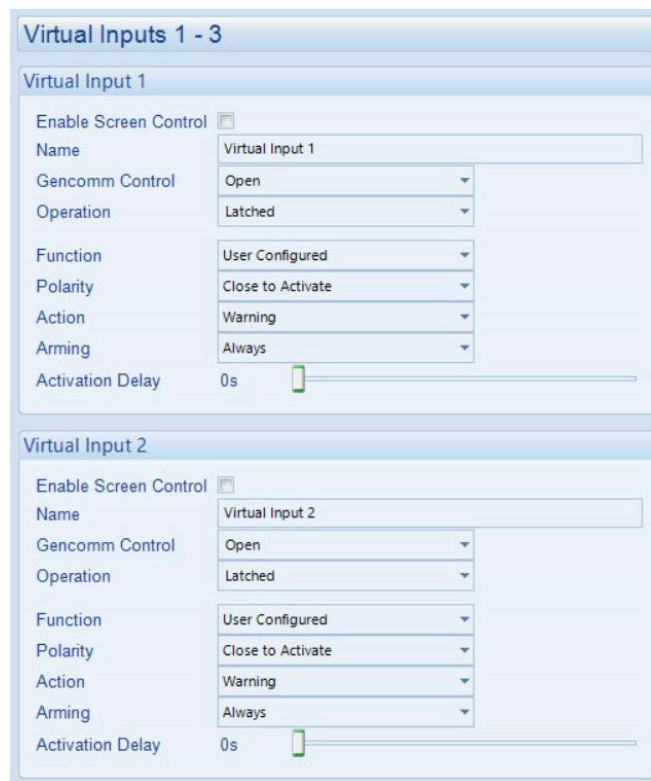
Parameter descriptions are continued overleaf...

### 3.5 VIRTUAL INPUTS

The *Virtual Inputs* section is subdivided into smaller sections. Select the required section with the mouse.






#### 3.5.1.1 VIRTUAL INPUTS



| Parameter             | Description                                                                                                                                                                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Screen Control | <input type="checkbox"/> = Screen Control is disabled.<br><input checked="" type="checkbox"/> = Screen Control is enabled.                                                                                                                        |
| Gencomm Control       | Select the Gencomm control type:<br><b>Disabled:</b> Not controlled by Gencomm<br><b>Open:</b> Available for Gencomm control regardless of Gencomm password status<br><b>Protected:</b> Gencomm config password must have been entered to control |
| Operation             | Select the mode of Operation:<br><b>Latched</b><br><b>Momentary</b>                                                                                                                                                                               |
| Function              | Select the input function to activate. See section 3.4.2                                                                                                                                                                                          |

Parameter descriptions are continued overleaf...

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Polarity         | Select the Virtual Input polarity:<br><b>Close to Activate</b><br><b>Open to Activate</b>                                                                                                                                                                                                                                                                          |
| Action           | <div style="border: 1px solid black; padding: 2px;">  <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b> </div><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Indication</b><br><b>Warning</b>               |
| Arming           | <div style="border: 1px solid black; padding: 2px;">  <b>NOTE: For details of these, see section 6 entitled <i>Alarm Arming</i>.</b> </div><br>Select when the alarm generated by the input becomes active:<br><b>Active from Mains Parallel</b><br><b>Always</b><br><b>Never</b> |
| Activation Delay | This is used to give a delay on acceptance of the input. Useful for liquid level switches or to mask short term operations of the external switch device.                                                                                                                                                                                                          |

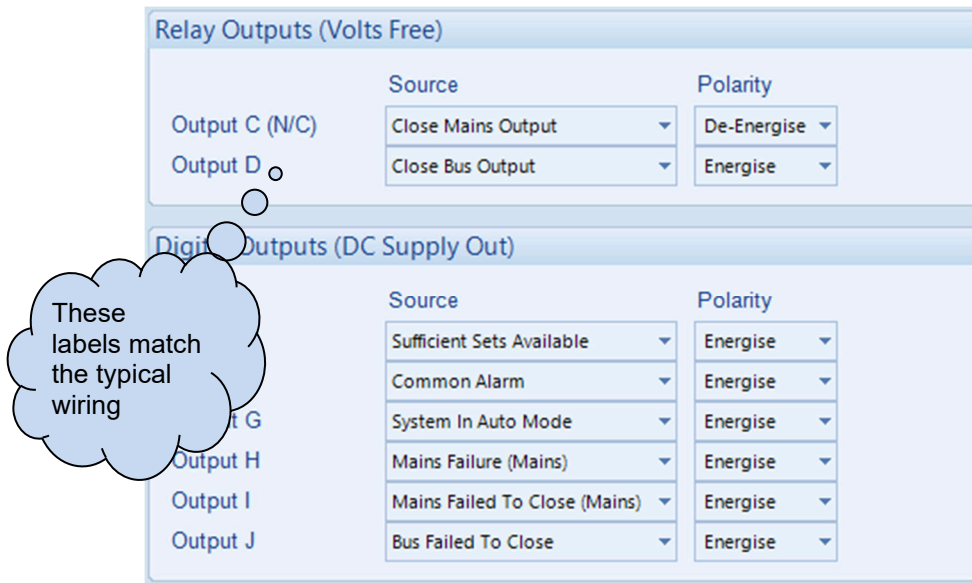
 **NOTE: If the virtual input is configured as momentary, any activation from the front panel will be stretched by 1 second after the button is pressed. It will appear to be continuously active if the button is pressed and held and are used to switch between Mains Parallel and Group Controller. For a Gencomm activation in Scada, the input is triggered when the Scada button is released, the input then remains active for 1 second. If the input is continuously triggered within 1 second of the previous trigger, then the input will appear to be continuously active.**

### 3.6 OUTPUTS

The *Outputs* section is subdivided into smaller sections. Select the required section with the mouse.



#### 3.6.1 DIGITAL OUTPUTS




| Parameter | Description                                                                                                                                                                                  |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source    | Select the output source to control the state of the output<br>See section 3.6.3 entitled <i>Output Sources</i> for details of all available functions                                       |
| Polarity  | Select the digital output polarity:<br><b>De-Energise:</b> When the output source is true, the output deactivates.<br><b>Energise:</b> When the output source is true, the output activates. |

### 3.6.2 VIRTUAL LEDES

The virtual LEDs provide a configuration of 'status' items. There are 10 LED configurations that are available for viewing on the module but and is seen in the SCADA section of the PC software, or read by third party systems (i.e., BMS or PLCs) using the ModBus protocol.

| LED Configuration        |        |          |          |                    |
|--------------------------|--------|----------|----------|--------------------|
| Show On Module           |        | Source   | Polarity | Output Description |
| <input type="checkbox"/> | LED 1  | Not Used | Lit      | LED 1              |
| <input type="checkbox"/> | LED 2  | Not Used | Lit      | LED 2              |
| <input type="checkbox"/> | LED 3  | Not Used | Lit      | LED 3              |
| <input type="checkbox"/> | LED 4  | Not Used | Lit      | LED 4              |
| <input type="checkbox"/> | LED 5  | Not Used | Lit      | LED 5              |
| <input type="checkbox"/> | LED 6  | Not Used | Lit      | LED 6              |
| <input type="checkbox"/> | LED 7  | Not Used | Lit      | LED 7              |
| <input type="checkbox"/> | LED 8  | Not Used | Lit      | LED 8              |
| <input type="checkbox"/> | LED 9  | Not Used | Lit      | LED 9              |
| <input type="checkbox"/> | LED 10 | Not Used | Lit      | LED 10             |
|                          | LED 11 | Not Used | Lit      |                    |
|                          | LED 12 | Not Used | Lit      |                    |
|                          | LED 13 | Not Used | Lit      |                    |
|                          | LED 14 | Not Used | Lit      |                    |
|                          | LED 15 | Not Used | Lit      |                    |
|                          | LED 16 | Not Used | Lit      |                    |
|                          | LED 17 | Not Used | Lit      |                    |
|                          | LED 18 | Not Used | Lit      |                    |
|                          | LED 19 | Not Used | Lit      |                    |
|                          | LED 20 | Not Used | Lit      |                    |

| Parameter          | Description                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show On Module     |  <b>NOTE: 10 virtual outputs are available on the module display.</b><br><input type="checkbox"/> = The LED is disabled on the module<br><input checked="" type="checkbox"/> = <b>The LED is activated on Module</b> |
| Source             | Select the output source to control the state of the output<br>See section 3.6.3 entitled <i>Output Sources</i> for details of all available functions                                                                                                                                                  |
| Polarity           | Select the digital input polarity:<br><b>Lit:</b> When the output source is true, the virtual LED activates<br><b>Unlit:</b> When the output source is true, the virtual LED deactivates.                                                                                                               |
| Output Description | Enter the description of the output that is to be displayed on the module screen.                                                                                                                                                                                                                       |

### 3.6.3 OUTPUT SOURCES

The list of output sources available for configuration of the module digital outputs.

Under the scope of IEEE 37.2, function numbers are also used to represent functions in microprocessor devices and software programs. Where the DSE output functions is represented by IEEE 37.2, the function number is listed below.

| Output Source | Activates...                              | Is Not Active.... |
|---------------|-------------------------------------------|-------------------|
| Not Used      | The output does not change state (Unused) |                   |

#### 3.6.3.1 ALARMS

| Alarms      | Output Source                                                    | Activates...                                                                                            | Is Not Active.... |
|-------------|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------|
|             | Display Heater Fitted and On                                     | Active when the display heater is on.                                                                   |                   |
| Alarms AMSC | AMSC Alarms Inhibited                                            | Active when the <i>AMSC Alarms Inhibit</i> digital input function is active.                            |                   |
| Alarms AMSC | AMSC Alarms Inhibited On Group Primary Bus                       | Active when the <i>AMSC Alarms Inhibit On Group Primary Bus</i> digital input function is active.       |                   |
| Alarms AMSC | AMSC Alarms Inhibited On Group Secondary Bus                     | Active when the <i>AMSC Alarms Inhibit On Group Secondary Bus</i> digital input function is active.     |                   |
| Alarms AMSC | AMSC Data Error (Mains Parallel)                                 | Indicates bad data transfer on the AMSC Comms (AMSC) Link.                                              |                   |
| Alarms AMSC | AMSC Data Error Group Secondary Redundant Bus (Group Controller) | Indicates bad data transfer on the MultiSet Comms (AMSC) Link on the Secondary Redundant Bus.           |                   |
| Alarms AMSC | AMSC Data Error Primary Bus (Group Controller)                   | Indicates bad data transfer on the AMSC Comms (AMSC) Link on the Primary Bus                            |                   |
| Alarms AMSC | AMSC Data Error Primary Redundant Bus (Group Controller)         | Indicates bad data transfer on the MultiSet Comms (AMSC) Link on the Primary Redundant Bus              |                   |
| Alarms AMSC | AMSC Data Error Redundant Bus (Mains Parallel)                   | Indicates bad data transfer on Redundant MultiSet Comms (AMSC) Link.                                    |                   |
| Alarms AMSC | AMSC Data Error Secondary Bus (Group Controller)                 | Indicates bad data transfer on the MultiSet Comms (AMSC) Link on the Secondary Bus.                     |                   |
| Alarms AMSC | AMSC Failure                                                     | Indicates when the <i>AMSC Failure</i> alarm is active on both MultiSet Comms (AMSC) Links.             |                   |
| Alarms AMSC | AMSC Failure - Group Primary Bus                                 | Indicates when the <i>AMSC Failure</i> alarm is active on the Primary Bus.                              |                   |
| Alarms AMSC | AMSC Failure – Group Secondary Bus                               | Indicates when the <i>AMSC Failure</i> alarm is active on the Primary Bus.                              |                   |
| Alarms AMSC | AMSC ID Error -Group                                             | Active when another controller is using the same AMSC ID on either of the MultiSet Comms (AMSC) Links.  |                   |
| Alarms AMSC | AMSC ID Error -Group Primary                                     | Active when another controller is using the same AMSC ID on either of the Primary Group (AMSC) Links.   |                   |
| Alarms AMSC | AMSC ID Error -Group Secondary                                   | Active when another controller is using the same AMSC ID on either of the Secondary Group (AMSC) Links. |                   |
| Alarms AMSC | AMSC Requesting Token (Mains Parallel)                           | Indicates that a 8660/bus tie is requesting the master control token                                    |                   |

Editing the Configuration

| Alarms      | Output Source                                                                                                              | Activates...                                                                                                                                   | Is Not Active... |
|-------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Alarms AMSC | AMSC Requesting Token Highest (Mains Parallel)                                                                             | Indicates that a 8660/bus tie has the highest priority                                                                                         |                  |
| Alarms AMSC | AMSC Requesting Token Not Highest (Mains Parallel)                                                                         | Indicates that a 8660/bus tie does not have the highest priority                                                                               |                  |
| Alarms AMSC | AMSC Too Few Sets                                                                                                          | Indicates that the number of sets connected on the MultiSet Comms (AMSC) Link is lower than the <i>Minimum Sets Required</i> setting.          |                  |
| Alarms AMSC | AMSC Too Few Sets - Group Primary                                                                                          | Indicates that the number of sets connected on the Primary Group Comms (AMSC) Link is lower than the <i>Minimum Sets Required</i> setting.     |                  |
| Alarms AMSC | AMSC Too Few Sets - Group Secondary                                                                                        | Indicates that the number of sets connected on the Secondary Group Comms (AMSC) Link is lower than the <i>Minimum Sets Required</i> setting.   |                  |
| Alarms AMSC | AMSC Unable To Join Mains Segments (Mains Parallel)                                                                        | Indicates that the module was asked to take an action that would have joined two mains supplies and is blocked from doing so.                  |                  |
| Alarms AMSC | Invalid Modules On AMSC (Mains Parallel)                                                                                   | Active when any AMSC versions are incorrect/incompatible on the AMSC in Mains Parallel operation.                                              |                  |
| Alarms AMSC | Invalid Modules On AMSC Group Primary                                                                                      | Active when any AMSC versions are incorrect/incompatible on the AMSC Primary Bus.                                                              |                  |
| Alarms AMSC | Invalid Modules On AMSC Group Secondary                                                                                    | Active when any AMSC versions are incorrect/incompatible on the AMSC Secondary Bus.                                                            |                  |
| Alarms AMSC | Minimum Capacity Not Reached                                                                                               | Indicates that the minimum amount of power that is required by the load has not been reached.                                                  |                  |
| Alarms Bus  | Bus Asymmetry High (Mains Parallel)<br><i>IEEE 37.2 – 59 Overvoltage Relay</i>                                             | Active when the Bus Asymmetry Alarm is active.                                                                                                 |                  |
| Alarms Bus  | Bus Negative Sequence Voltage High (Mains Parallel)<br><i>IEEE 37.2 – 47 Phase-Sequence Or Phase Balance Voltage Relay</i> | Active when the Bus Negative Sequence Voltage Alarm is active.                                                                                 |                  |
| Alarms Bus  | Bus Not Live                                                                                                               | This output indicates that the generator bus remains 'dead' after closing the generator load breaker.                                          |                  |
| Alarms Bus  | Bus Phase Rotation Alarm                                                                                                   | This output indicates that the module has detected a phase sequence error on the bus.                                                          |                  |
| Alarms Bus  | Bus Positive Sequence Voltage Low (Mains Parallel)<br><i>IEEE 37.2 – 47 Phase-Sequence Or Phase Balance Voltage Relay</i>  | Active when the <i>Bus Positive Sequence Alarm</i> is active.                                                                                  |                  |
| Alarms Bus  | Bus Sensing Failure                                                                                                        | The output is active if the AMSC indicates that the generator bus should be live, but the module does not detect the voltage at the ac inputs. |                  |
| Alarms Bus  | Bus Sensing Failure - Group Primary                                                                                        | The output is active if the AMSC indicates that the generator bus should be live on                                                            |                  |

Editing the Configuration

| Alarms        | Output Source                                                                                                   | Activates...                                                                                                                                                                                                                                                                  | Is Not Active...                                   |
|---------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
|               |                                                                                                                 | the Primary Group, but the module does not detect the voltage at the ac inputs.                                                                                                                                                                                               |                                                    |
| Alarms Bus    | Bus Sensing Failure - Group Secondary                                                                           | The output is active if the AMSC indicates that the generator bus should be live on the Secondary Group, but the module does not detect the voltage at the ac inputs.                                                                                                         |                                                    |
| Alarms Bus    | Bus Zero Sequence Voltage High (Mains Parallel)<br>IEEE 37.2 – 47 Phase-Sequence Or Phase Balance Voltage Relay | Active when the Bus Zero Sequence Voltage High Alarm is active.                                                                                                                                                                                                               |                                                    |
| Alarms Bus    | Out Of Sync Bus                                                                                                 | Active when the phase difference between the bus and mains voltages exceeds the config setting and the bus breaker auxiliary has been removed. This is usually caused by the bus breaker tripping from either an external source or self-protections (e.g. short circuit)     |                                                    |
| Alarms Bus    | Spinning Capacity Not Reached - Group Primary                                                                   | Load demand running on the Primary Group managed by the gens has not achieved the spinning capacity.                                                                                                                                                                          |                                                    |
| Alarms Bus    | Spinning Capacity Not Reached - Group Secondary                                                                 | Load demand running on the Secondary Group managed by the gens has not achieved the spinning capacity.                                                                                                                                                                        |                                                    |
| Alarms Bus    | Spinning Reserve Not Reached - Group Primary                                                                    | Load demand running on the Primary Group managed by the gens does not have the spare capacity.                                                                                                                                                                                |                                                    |
| Alarms Bus    | Spinning Reserve Not Reached - Group Secondary                                                                  | Load demand running on the Secondary Group managed by the gens does not have the spare capacity.                                                                                                                                                                              |                                                    |
| Alarms Bus    | Trip Bus In Parallel (Mains Parallel)                                                                           | This output indicates that the module has been forced to remove the generators Bus from its load to pass control of the generators over to another DSExx60 that has detected a Mains failure. This only occurs if the <i>Enable Forced Peak Lop Inhibit</i> has been enabled. |                                                    |
| Alarms Common | Common Alarm                                                                                                    | Active when one or more alarms (of any type) are active.                                                                                                                                                                                                                      | The output is inactive when no alarms are present. |
| Alarms Common | Common Electrical Trip                                                                                          | Active when one or more <i>Electrical Trip</i> alarms are active.                                                                                                                                                                                                             | The output is inactive when no shutdown alarms.    |
| Alarms Common | Common Warning                                                                                                  | Active when one or more <i>Warning</i> alarms are active.                                                                                                                                                                                                                     |                                                    |
| Alarms Common | Mains Decoupling Combined Alarm (Mains Parallel)                                                                | Indicates that during parallel operation, one of the internal mains decoupling functions has been triggered. This output is active when any of utility or grid failure alarms are triggered.                                                                                  |                                                    |
| Alarms Engine | Battery High Voltage<br>IEEE 37.2 – 59 DC Overvoltage Relay                                                     | This output indicates that a Battery Over voltage alarm has occurred.                                                                                                                                                                                                         | Inactive when battery voltage is not High.         |

Editing the Configuration

| Alarms                           | Output Source                                                                                        | Activates...                                                                                                                                                                                  | Is Not Active...                          |
|----------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Alarms Engine                    | Battery Low Voltage<br>IEEE 37.2 – 27 DC Undervoltage Relay                                          | This output indicates that a Battery Under Voltage alarm has occurred.                                                                                                                        | Inactive when battery voltage is not Low. |
| Alarms Generator                 | Fail to Synchronise<br>IEEE 37.2 - 48 Incomplete Sequence Relay                                      | Becomes active if the module fails to synchronise after the fail to sync timer.                                                                                                               |                                           |
| Alarms Generator Current & Power | Generator Reverse Power<br>IEEE 37.2 – 32 Directional Power Relay                                    | Active when the <i>Generator Reverse Power</i> alarm is active.                                                                                                                               |                                           |
| Alarms Generator                 | Insufficient Capacity Available                                                                      | Indicates that during parallel operation, it has been determined that the set(s) is (are) not capable of providing the power that they have been configured to deliver.                       |                                           |
| Alarms Generator Current & Power | kW Overload Warning                                                                                  | Active when the kW level exceeds the <i>Trip</i> setting for longer than the configured <i>Delay</i> time.                                                                                    |                                           |
| Alarms Generator Load Switching  | No Loading Command (Mains Parallel)                                                                  | This output indicates that the module is not calling for the generator load switch to be closed. When the module closes the generator load switch, this output becomes inactive.              |                                           |
| Alarms Generator                 | Out Of Sync                                                                                          | Indicates that the <i>out of sync</i> alarm has been triggered.                                                                                                                               |                                           |
| Alarms Generator                 | Over Current IDMT Alarm (Group Controller)                                                           | Active when the <i>Over Current IDMT</i> alarm is active.                                                                                                                                     |                                           |
| Alarms Generator                 | Over Current Immediate Warning (Group Controller)                                                    | Active when the <i>Over Current Immediate Warning</i> alarm is active.                                                                                                                        |                                           |
| Alarms Group Current & Power     | Earth Fault Trip Alarm (Group Controller)<br>IEEE 37.2 – 51G or 51N Generator IDMT Earth Fault Relay | Active when the <i>Earth Fault Protection Alarm</i> is active.                                                                                                                                |                                           |
| Alarms Group                     | Generator Asymmetry High (Group Controller)<br>IEEE 37.2 – 59                                        | Active when the Generator Asymmetry Alarm is active.                                                                                                                                          |                                           |
| Alarms Group                     | Generator Phase Rotation Alarm (Group Controller)                                                    | Active when the detected generator phase sequence is different than the configured Generator Phase Rotation.                                                                                  |                                           |
| Alarms Group Current & Power     | Generator Unbalanced Current (Group Controller)                                                      | This output is active and when a module has detected an unbalanced load causing negative sequence in the alternator stator.                                                                   |                                           |
| Alarms Group Current & Power     | kW Overload Alarm (Group Controller)                                                                 | Active when the measured kW is above the setting of the <i>kW overload alarm</i> values.<br>Used to give alarms on overload, control a dummy load breaker or for load shedding functionality. |                                           |
| Alarms Group                     | Out Of Sync Generator (Group Controller)                                                             | Indicates that the Generator is not in sync with the Mains after the generator switchgear has closed in parallel with the mains.                                                              |                                           |
| Alarms Group                     | Short Circuit Generator (Group Controller)                                                           | This output indicates that the module has detected a short circuit on the generator output.                                                                                                   |                                           |
| Alarms Load Switching            | Bus Failed To Close                                                                                  | This output source is intended to be used to indicate a failure of the Bus contactor or                                                                                                       |                                           |

Editing the Configuration

| Alarms                      | Output Source                                                                                                                                   | Activates...                                                                                                                                                                         | Is Not Active...                                            |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
|                             | IEEE 37.2 - 48 Incomplete Sequence Relay                                                                                                        | breaker. It is only used if the module is configured to use 'Bus Closed Auxiliary' feedback.                                                                                         |                                                             |
| Alarms Load Switching       | Bus Failed To Open<br>IEEE 37.2 - 48 Incomplete Sequence Relay                                                                                  | This output source is intended to be used to indicate a failure of the Bus contactor or breaker. It is only used if the module is configured to use 'Bus Closed Auxiliary' feedback. |                                                             |
| Alarms Mains                | Combined Mains Failure (Mains Parallel)                                                                                                         | Active when the mains supply is out of limits OR the input for Auxiliary Mains Failure is active.                                                                                    |                                                             |
| Alarms Mains                | Fault Ride Through Event                                                                                                                        | Becomes active during a Fault Ride Through event, the module generates a Warning alarm.                                                                                              | Becomes inactive when there is no Fault Ride Through event. |
| Alarms Mains                | Mains Asymmetry High (Mains Parallel)<br>IEEE 37.2 – 59 Overvoltage Relay                                                                       | Active when the Mains Asymmetry Alarm is active.                                                                                                                                     |                                                             |
| Alarms Mains                | Mains Decoupling High Frequency Stage 1,2 (Mains Parallel)                                                                                      | This output indicates that the relevant Mains decoupling high frequency alarm has been triggered.                                                                                    |                                                             |
| Alarms Mains                | Mains Decoupling High Voltage Stage 1,2 (Mains Parallel)                                                                                        | This output indicates that the relevant Mains decoupling high voltage alarm has been triggered.                                                                                      |                                                             |
| Alarms Mains                | Mains Decoupling Low Frequency Stage 1,2 (Mains Parallel)                                                                                       | This output indicates that the relevant Mains decoupling low frequency alarm has been triggered.                                                                                     |                                                             |
| Alarms Mains                | Mains Decoupling Low Voltage Stage 1,2 (Mains Parallel)                                                                                         | This output indicates that the relevant Mains decoupling low voltage alarm has been triggered.                                                                                       |                                                             |
| Alarms Mains Load Switching | Mains Failed To Close (Mains Parallel)                                                                                                          | This output indicates the mains breaker failed to close.                                                                                                                             |                                                             |
| Alarms Mains Load Switching | Mains Failed To Open (Mains Parallel)                                                                                                           | This output indicates the mains breaker failed to open.                                                                                                                              |                                                             |
| Alarms Mains                | Mains Failure (Mains Parallel)<br>IEEE 37.2 - 81 Frequency Relay<br>IEEE 37.2 – 27 AC Undervoltage Relay<br>IEEE 37.2 – 59 AC Overvoltage Relay | The output indicates that one or more of the module's sources of determining mains failure is active.                                                                                |                                                             |
| Alarms Mains                | Mains High Frequency (Mains Parallel)<br>IEEE 37.2 -81 Frequency Relay                                                                          | Active when the mains frequency exceeds the <i>High Frequency</i> setting.                                                                                                           |                                                             |
| Alarms Mains                | Mains High Voltage (Mains Parallel)<br>IEEE 37.2 – 59 AC Overvoltage Relay                                                                      | Active when the mains voltage exceeds the <i>High Voltage</i> setting.                                                                                                               |                                                             |
| Alarms Mains                | Mains Low Frequency (Mains Parallel)<br>IEEE 37.2 -81 Frequency Relay                                                                           | Active when the mains frequency falls below the <i>Low Frequency</i> setting.                                                                                                        |                                                             |
| Alarms Mains                | Mains Low Voltage (Mains Parallel)<br>IEEE 37.2 – 27 AC Undervoltage Relay                                                                      | Active when the mains voltage falls below the <i>Low Voltage</i> setting.                                                                                                            |                                                             |
| Alarms Mains                | Mains Negative Sequence Voltage High (Mains Parallel)<br>IEEE 37.2 – 47 Phase-Sequence Or Phase Balance Voltage Relay                           | Active when the Mains Negative Sequence Voltage Alarm is active.                                                                                                                     |                                                             |

*Editing the Configuration*

| <b>Alarms</b> | <b>Output Source</b>                                                                                                                | <b>Activates...</b>                                                                                                                                              | <b>Is Not Active...</b> |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Alarms Mains  | Mains Phase Rotation Alarm (Mains Parallel)<br><i>IEEE 37.2 – 47<br/>Phase-Sequence Or Phase Balance<br/>Voltage Relay</i>          | Active when the detected mains phase sequence is different than the configured <i>Mains Phase Rotation</i> .                                                     |                         |
| Alarms Mains  | Mains Positive Sequence Voltage Low (Mains Parallel)<br><i>IEEE 37.2 – 47<br/>Phase-Sequence Or Phase Balance<br/>Voltage Relay</i> | Active when the Mains Positive Sequence Alarm is active.                                                                                                         |                         |
| Alarms Mains  | Mains Reverse Power<br><i>IEEE C37.2 – 32 Directional Power<br/>Relay</i>                                                           | If the module detects that the bus is exporting more than the configured limit, the LCD indicates Mains Reverse Power.                                           |                         |
| Alarms Mains  | Mains ROCOF (Mains Parallel)                                                                                                        | Indicates that the ROCOF protection (when in parallel with mains) has triggered.                                                                                 |                         |
| Alarms Mains  | Mains Vector Shift (Mains Parallel)                                                                                                 | Indicates that the Vector Shift protection (when in parallel with mains) has triggered.                                                                          |                         |
| Alarms Mains  | Mains Zero Sequence Voltage High (Mains Parallel)<br><i>IEEE 37.2 – 47<br/>Phase-Sequence Or Phase<br/>Balance Voltage Relay</i>    | Active when the Mains Zero Sequence Alarm is active.                                                                                                             |                         |
| Alarms Mains  | Out Of Sync Mains                                                                                                                   | Indicates that the Mains is not in sync with the generator bus after the mains switchgear has closed in parallel with the generator.                             |                         |
| Alarms Mains  | Spinning Capacity Not Reached (Mains Parallel)                                                                                      | This output is activated when the load demand system does not have the capacity running as configured.                                                           |                         |
| Alarms Mains  | Spinning Reserve Not Reached (Mains Parallel)                                                                                       | This output is activated when the load demand system does not have the spare capacity (reserve) running as configured.                                           |                         |
| Alarms Mains  | Unable To Obtain Master Token (Mains)                                                                                               | This output is activated when a 8660 / bus tie needs to take control of the gens for synchronizing etc. to close a breaker but is unable to in the time allowed, |                         |

3.6.3.2 CONTROL

| Control                | Output Source                                                                  | Activates...                                                                                                                                                                                                                                    |                                                                          |
|------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Control Generator      | Check Sync<br><i>IEEE 37.2 – 25 Synchronising Or Synchronising Check Relay</i> | Indicates that the internal check synchroscope has determined that the supplies are in sync.                                                                                                                                                    |                                                                          |
| Control Generator      | Remote Start From Digital Input                                                | Active when any configured <i>Remote Start</i> digital input is active.                                                                                                                                                                         |                                                                          |
| Control Generator      | Sync Lock Control Active                                                       | Active when Enable Sync Lock is Active.                                                                                                                                                                                                         |                                                                          |
| Control Group          | Load Share Inhibit (Group Controller)                                          | This output indicates that a digital input that has been configured as ' <i>Load Share Inhibit</i> ' is active. Refer to section 3.4.1 of this manual for details.                                                                              |                                                                          |
| Control Load Switching | Close Bus Output<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>                   | Used to control the Generator Bus load switching device. Whenever the module selects the Generator Bus to be on load this control source is activated.                                                                                          | Inactive whenever the Generator Bus is not required to be on load.       |
| Control Load Switching | Close Bus Output Pulse<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>             | Used to control the Generator Bus load switching device. Whenever the module selects the Generator Bus to be on load this control source is activated for the duration of the Breaker Close Pulse timer, after which it becomes inactive again. |                                                                          |
| Control Load Switching | Close Mains Output<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>                 | Used to control the load switching device. Whenever the module selects the mains to be on load this control source is activated.                                                                                                                | The output is inactive whenever the mains is not required to be on load. |
| Control Load Switching | Close Mains Output Pulse<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>           | Used to control the load switching device. Whenever the module selects the mains to be on load this control source is activated for the duration of the Breaker Close Pulse timer, after which it becomes inactive again.                       |                                                                          |
| Control Load Switching | Interlock Override (Mains Parallel)                                            | Comes on just before and just after both breakers close into parallel enabling an output for a mechanical or electrical interlock.                                                                                                              |                                                                          |
| Control Load Switching | Open Bus Output<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>                    | Used to control the load switching device. Whenever the module selects the generator to be off load this control source is activated.                                                                                                           | Inactive whenever the bus is required to be on load.                     |
| Control Load Switching | Open Bus Output Pulse<br><i>IEEE 37.2 – 52 AC Circuit Breaker</i>              | Used to control the load switching device. Whenever the module selects the bus to be off load this control source is activated for the duration of the Breaker Open Pulse timer, after which it becomes inactive again.                         |                                                                          |

Editing the Configuration

| Control                          | Output Source                                                        | Activates...                                                                                                                                                                                                              |                                                                               |
|----------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Control Load Switching           | Open Mains Output (Group/Mains)<br>IEEE 37.2 – 52 AC Circuit Breaker | Used to control the load switching device. Whenever the module selects the mains or Group to be off load this control source is activated.                                                                                | The output is inactive whenever the mains or Group is required to be on load. |
| Control Load Switching           | Open Mains Output Pulse<br>IEEE 37.2 – 52 AC Circuit Breaker         | Used to control the load switching device. Whenever the module selects the mains to be off load this control source is activated for the duration of the Breaker Open Pulse timer, after which it becomes inactive again. |                                                                               |
| Control Misc                     | Audible Alarm<br>IEEE 37.2 – 74 Alarm Relay                          | Use this output to activate an external sounder or external alarm indicator. Operation of the Mute pushbutton resets this output once activated.                                                                          | Inactive if no alarm condition is active or alarm mute input was pressed.     |
| Control Misc                     | Inhibit Retransfer To Mains (Mains Parallel)                         | Indicates when mains fails, Gens fails and mains not enough capacity to take load inhibit retransfer.                                                                                                                     |                                                                               |
| Control Misc                     | Lamp Test                                                            | Active when the lamp test is activated by a digital input or by pressing the <i>Mute/Lamp Test</i> control button.                                                                                                        |                                                                               |
| Control Power Voltage & Reactive | 1 Constant Power Factor Mode                                         | Active when the <i>Reactive Mode 1 Constant Power Factor</i> is selected.                                                                                                                                                 |                                                                               |
| Control Power Control            | 1 Constant Power Mode (Default)                                      | Active when the <i>Power Mode 1 Constant Power (Default)</i> is selected.                                                                                                                                                 |                                                                               |
| Control Power Control            | 2 Frequency-Power Mode                                               | Active when the <i>Power Mode 2 Frequency Power</i> is selected.                                                                                                                                                          |                                                                               |
| Control Power Voltage & Reactive | 2 Voltage-Reactive Power Mode                                        | Active when the <i>Reactive Mode 2 Voltage Reactive Power</i> is selected.                                                                                                                                                |                                                                               |
| Control Power Voltage & Reactive | 3 Power-Power Factor Mode                                            | Active when the <i>Reactive Mode 3 Power Power Factor</i> is selected.                                                                                                                                                    |                                                                               |
| Control Power Control            | 3 Voltage-Power Mode                                                 | Active when the <i>Power Mode 3 Voltage Power</i> is selected.                                                                                                                                                            |                                                                               |
| Control Power Voltage & Reactive | 4 Constant Reactive Power Mode (Default)                             | Active when the <i>Reactive Mode 4 Constant Reactive Power (Default)</i> is selected.                                                                                                                                     |                                                                               |

3.6.3.3 STATUS

| Status                | Output Source                                 | Activates...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                 |
|-----------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status AMSC           | AMSC Holding Token (Mains Parallel)           | Active when the module is holding the master token.                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 |
| Status AMSC           | AMSC Keep Holding Token (Mains Parallel)      | Active when the IP of the same name is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                 |
| Status AMSC           | AMSC Link Disabled                            | The module has left the AMSC link.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |
| Status AMSC           | AMSC No Module Holding Token (Mains Parallel) | There is no master token in this segment group (The token is only created when needed to control Generators)                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                 |
| Status AMSC           | AMSC Unable To Release Token (Mains Parallel) | Indicates that the module would have released the master token, but the 'Keep Holding Master Token' IP is preventing it.                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |
| Status Bus            | Bus Live                                      | This output indicates that a voltage has been detected on the bus. Once the voltage on the bus is detected above the "Dead bus relay setting", it is no longer considered a 'dead-bus' and the generator needs to synchronise to get onto the bus.                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |
| Status Bus            | Group Primary Bus Live                        | This output indicates that a voltage has been detected on the Primary bus. Once the voltage on the bus is detected above the "Dead bus relay setting", it is no longer considered a 'dead-bus' and the generator needs to synchronise to get onto the bus.                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                 |
| Status Communications | Remote Start Over AMSC (Group Controller)     | Indicates that the controller has received a <i>Remote Start</i> on load signal via the AMSC link.                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |
| Status Generator      | Generator Available (Group Controller)        | Becomes active when the generator is available to take load.                                                                                                                                                                                                                                                                                                                                                                                                                                    | Inactive when <ul style="list-style-type: none"> <li>• <i>Loading voltage and loading frequency</i> have not been reached</li> <li>• After <i>electrical trip</i> alarm</li> <li>• During the starting sequence before the end of the warming timer.</li> </ul> |
| Status Generator      | Panel Locked                                  | This output indicates that the module ' <i>Panel Lock</i> ' is active. If the Panel lock input is active, the module does not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected, and the operator is still able to view the various instrumentation pages etc. ( <i>Front panel configuration access is barred while system lock is active</i> ). |                                                                                                                                                                                                                                                                 |

*Editing the Configuration*

| Status                | Output Source                                                                                | Activates...                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status Group          | All Available Sets Are On The Bus (Group Controller)                                         | This output indicates that all the available sets in the Multiset load sharing system are closed onto the generator bus. This output is used to close an external breaker to allow the generator bus to power the load. 'Available sets' are sets in auto mode with no alarms present. So, sets not in auto mode or sets that have alarms present are not considered to be 'available sets'.                                |
| Status Load Switching | Bus And Mains In Parallel (Mains Parallel)                                                   | This output is active whenever the Bus and Mains are in parallel.                                                                                                                                                                                                                                                                                                                                                           |
| Status Load Switching | Bus Closed Auxiliary                                                                         | Active when the <i>Bus Closed Auxiliary</i> input is active.                                                                                                                                                                                                                                                                                                                                                                |
| Status Load Switching | Mains Closed Aux                                                                             | Active when the <i>Mains Closed Auxiliary</i> input is active.                                                                                                                                                                                                                                                                                                                                                              |
| Status Mains          | Clear Mains Decoupling (Mains Parallel)                                                      | Active when the <i>Clear Mains Decoupling Alarms</i> digital input is active.                                                                                                                                                                                                                                                                                                                                               |
| Status Module Inputs  | Alarm Mute                                                                                   | This output is used to silence the audible alarm from an external source such as a remote mute switch.                                                                                                                                                                                                                                                                                                                      |
| Status Module Inputs  | Alarm Reset                                                                                  | This output is used to reset any latched alarms from a remote location. It is also used to clear any latched warnings which may have occurred (if configured) without having to stop the engine.                                                                                                                                                                                                                            |
| Status Module Inputs  | Auto Restore Inhibit (Mains Parallel)<br><i>IEEE 37.2 - 3 Checking Or Interlocking Relay</i> | In the event of a Multi Set Controller /mains failure, the generator is instructed to start and take load. On removal of the Multi Set Controller signal/mains return the module continues to run the generator on load until the Auto Restore Inhibit input is removed. This input allows the controller to be fitted as part of a system where the restoration to mains is controlled remotely or by an automated system. |
| Status Module Inputs  | Auto Run Inhibited                                                                           | Active when the <i>Auto Run Inhibit</i> function is active.                                                                                                                                                                                                                                                                                                                                                                 |
| Status Module Inputs  | Auto Start Inhibit                                                                           | Active when the <i>Auto-Start Inhibit</i> function is active.                                                                                                                                                                                                                                                                                                                                                               |
| Status Module Inputs  | Auxiliary Mains Failure (Mains Parallel)                                                     | Active when the Auxiliary Mains Fail input function is active.                                                                                                                                                                                                                                                                                                                                                              |
| Status Module Inputs  | Bus Load Inhibit                                                                             | Active when the digital input <i>Bus Load Inhibit</i> is active.                                                                                                                                                                                                                                                                                                                                                            |
| Status Module Inputs  | DC Power On                                                                                  | Active when DC power is supplied to the module.                                                                                                                                                                                                                                                                                                                                                                             |
| Status Module Inputs  | Digital Input A, B, C, D, E, F, G H & I                                                      | Active when the relevant digital input is active.                                                                                                                                                                                                                                                                                                                                                                           |
| Status Module Inputs  | Duty Select (Group Controller)                                                               | Indicates that a digital input configured to <i>Duty Select</i> is active.                                                                                                                                                                                                                                                                                                                                                  |
| Status Module Inputs  | EJP1 / EJP2 (Mains Parallel)                                                                 | Active when an input configured for <i>EJP1</i> or <i>EJP2</i> is active.                                                                                                                                                                                                                                                                                                                                                   |
| Status Module Inputs  | Force High Master Priority                                                                   | Active when the master priority is set to the highest level.                                                                                                                                                                                                                                                                                                                                                                |

*Editing the Configuration*

| Status               | Output Source                                  | Activates...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status Module Inputs | Force Low Master Priority                      | Active when the master priority is set to the lowest level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Status Module Inputs | Inhibit Scheduled Run                          | Active when the Inhibit Scheduled run input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Status Module Inputs | Mains Load Inhibited (Mains Parallel)          | Active when the <i>Mains Load Inhibit</i> digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Status Module Inputs | Mute/Lamp Test Button Pressed                  | This output indicates that the alarm mute / Lamp test push button is being operated. Once the button is released, the output becomes inactive.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Status Module Inputs | Panel Locked By Digital Input                  | This output indicates that a digital input that has been configured as 'Panel Lock' is active. If the Panel lock input is active, the module does not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected, and the operator is still able to view the various instrumentation pages etc. (Front panel configuration access is barred while system lock is active). Refer to the 'Edit Inputs' section of this manual for details. |
| Status Module Inputs | Parallel Inhibit (Mains Parallel)              | Active when the <i>Parallel Inhibit</i> digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Status Module Inputs | Remote Start In Island Mode (Mains Parallel)   | This output indicates that a digital input that has been configured as ' <i>Remote Start in Island Mode</i> ' is active. This output could be used to pass the start signal on to elsewhere in the control system.                                                                                                                                                                                                                                                                                                                                                            |
| Status Module Inputs | Remote Start Off Load                          | Active when the <i>Remote Start Off Load</i> input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Status Module Inputs | Remote Start On Load                           | Active when the <i>Remote Start On Load</i> input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Status Module Inputs | Remote Start On Load Demand (Group Controller) | Indicates that the module's input is active for <i>Remote Start</i> on load demand. Also indicates that the controller has received a Remote Start On Load signal via the AMSC link.                                                                                                                                                                                                                                                                                                                                                                                          |
| Status Module Inputs | Simulate Auto Button                           | Active when the Simulate Auto Button digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Status Module Inputs | Simulate Left Switchgear Button                | Active when the Simulate Left Switchgear Button digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Status Module Inputs | Simulate Manual Button                         | Active when the Simulate Manual Button digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Status Module Inputs | Simulate Mains Available (Mains Parallel)      | Active when the <i>Simulate Mains Available</i> digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Status Module Inputs | Simulate Mode Button                           | Active when the Simulate Mode Button digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Status Module Inputs | Simulate Right Switchgear Button               | Active when the Simulate Right Switchgear Button digital input is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Status Module Inputs | Simulate Start Button                          | Active when a digital input configured to Simulate Start Button is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

*Editing the Configuration*

| Status               | Output Source                                           | Activates...                                                                                                                                                            |                                                                                                                                                                                                                                    |
|----------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status Module Inputs | Simulate Stop Button                                    | Active when the Simulate Stop Button digital input is active.                                                                                                           |                                                                                                                                                                                                                                    |
| Status Module Inputs | Simulate Test On Load Button (Mains Parallel)           | Active when the <i>Simulate Test On Load Button</i> digital input is active.                                                                                            |                                                                                                                                                                                                                                    |
| Status Module Inputs | Stop and Panel Lock                                     | Active when the Stop And Panel Lock digital input is active.                                                                                                            |                                                                                                                                                                                                                                    |
| Status Module Inputs | Stop Button Pressed                                     | This output indicates that the stop pushbutton is being operated. Once the button is released, the output becomes inactive.                                             |                                                                                                                                                                                                                                    |
| Status Module Inputs | Sync Lock Input                                         | Active when Sync Lock is enabled.                                                                                                                                       |                                                                                                                                                                                                                                    |
| Status Module Inputs | Telemetry Panel Lock                                    | Active when the <i>Telemetry Panel Lock</i> digital input is active.                                                                                                    |                                                                                                                                                                                                                                    |
| Status Module Inputs | Transfer to Generator Button Pressed (Group Controller) | Active when the <i>Transfer to Generator Button</i> has been pressed.                                                                                                   |                                                                                                                                                                                                                                    |
| Status Operation     | Alternative Config 1-5 Selected                         | Active when the alternative configuration is selected.                                                                                                                  |                                                                                                                                                                                                                                    |
| Status Operation     | Calling For Scheduled Run                               | Active during a <i>Scheduled Run</i> request from the inbuilt <i>Scheduler</i> .                                                                                        |                                                                                                                                                                                                                                    |
| Status Operation     | Closed To Mains State                                   | Active when the status of the mains breaker is closed.                                                                                                                  |                                                                                                                                                                                                                                    |
| Status Operation     | Data Logging Active                                     | Active when data is being logged.                                                                                                                                       | Inactive when Data logging is disabled. The engine is at rest and the option <i>Only Log When Engine Is Running</i> is enabled. The internal memory of the module becomes full, and the option <i>Keep Oldest Data</i> is enabled. |
| Status Operation     | Dead Bus Synchronise Enabled                            | Active when Dead Bus Synchronising is enabled.                                                                                                                          |                                                                                                                                                                                                                                    |
| Status Operation     | Dead Bus Synchronise In Progress                        | Active when the set is running dead bus synchronising.                                                                                                                  |                                                                                                                                                                                                                                    |
| Status Operation     | Group Controller Application Selected                   | Active when the Group Controller Application is selected.                                                                                                               |                                                                                                                                                                                                                                    |
| Status Operation     | Load Demand Delay Active (Group Controller)             | Indicates that the set has closed onto the bus and that the <i>Load Demand Delay</i> is in progress. When this has expired, the <i>Load Demand Scheme</i> is activated. |                                                                                                                                                                                                                                    |
| Status Operation     | Main Config Selected                                    | Active when the main configuration is active.                                                                                                                           |                                                                                                                                                                                                                                    |
| Status Operation     | Mains Parallel Application Selected                     | Active when the Mains Parallel application has been selected.                                                                                                           |                                                                                                                                                                                                                                    |
| Status Operation     | Protections Disabled (Group Controller)                 | Active when the Protections have been disabled on the module.                                                                                                           |                                                                                                                                                                                                                                    |
| Status Operation     | Return Delay In Progress                                | This output source is active to indicate that the return timer is running.                                                                                              |                                                                                                                                                                                                                                    |
| Status Operation     | Scheduled Auto Start Inhibit                            | Active during a <i>Scheduled Auto Start Inhibit</i> request from the inbuilt <i>Scheduler</i> .                                                                         |                                                                                                                                                                                                                                    |

*Editing the Configuration*

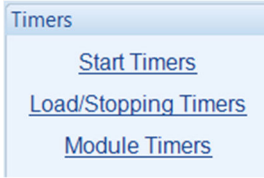
| Status           | Output Source                               | Activates...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status Operation | Start Delay in Progress (Group Controller)  | This output source is active to indicate that the module's internal start delay timer is running. Once this timer expires the module initiates its start sequence.                                                                                                                                                                                                                                                                                                                           |
| Status Operation | Sufficient Capacity Available               | This output indicates that there are sufficient generators available on the Bus.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Status Operation | Synching Enabled                            | This output indicates that the synchronisation feature has been enabled.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Status Operation | System Healthy                              | This output indicates that the module is in Auto mode and there are no alarms present.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Status Operation | System in Auto Mode                         | Active when Auto mode is selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Status Operation | System in Manual Mode                       | Active when Manual mode is selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Status Operation | System in Stop Mode                         | Active when Stop mode is selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Status Operation | System In Test Mode                         | Active when Test On Load mode is selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Status Operation | Waiting For Manual Restore (Mains Parallel) | Becomes active when the generator is on load and the mains supply is healthy, but an input configured to Manual Restore is active.<br>This is used to signal to an operator that action is required before the set transfers back to the mains supply.                                                                                                                                                                                                                                       |
| Status Telemetry | Combined Remote Start Request               | Indicates that a <i>Remote Start Request</i> is active.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Status Telemetry | Panel Locked By Telemetry                   | This output indicates that remote ' <i>Panel Lock</i> ' via telemetry is active. If the Panel lock is active, the module does not respond to operation of the Mode select or start buttons. This allows the module to be controller remotely without local interference. The operation of the module is not affected, and the local operator is still able to view the various instrumentation pages etc. ( <i>Front panel configuration access is barred while system lock is active</i> ). |
| Status Telemetry | Telemetry Active                            | Active when the communication port is live and for a short time after transmission stops.<br>Used as a relay or LED source.                                                                                                                                                                                                                                                                                                                                                                  |
| Status Telemetry | Telemetry Active RS485 1 & 2                | Active when the RS485 communication ports are live and for a short time after transmission stops.<br>Used as a relay or LED source.                                                                                                                                                                                                                                                                                                                                                          |
| Status Telemetry | Telemetry Data Active                       | Active when data is being transmitted. This output changes continuously state (flash) upon data transfer. Normally used as an LED source rather than a relay source as the signal flashes repeatedly.<br>For a similar source more suited to drive a relay, see <i>Telemetry Active</i> .                                                                                                                                                                                                    |
| Status Telemetry | Telemetry Data Active RS485 1 & 2           | Active when data is being transmitted on RS485 ports 1 & 2. This output changes state continuously (flash) upon data                                                                                                                                                                                                                                                                                                                                                                         |

*Editing the Configuration*

| Status               | Output Source                | Activates...                                                                                                                                                                              |
|----------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      |                              | transfer. Normally used as an LED source rather than a relay source as the signal flashes repeatedly.<br>For a similar source more suited to drive a relay, see <i>Telemetry Active</i> . |
| Status Telemetry     | Telemetry Start in Auto Mode | Active when a <i>Multi Set Controller Request</i> is sent over by communication.                                                                                                          |
| Status Virtual Input | Virtual Input 1-12           | Active when the <i>Virtual Input 1 to 12</i> has been activated.                                                                                                                          |

### 3.7 TIMERS

Many timers are associated with alarms. Where this occurs, the timer for the alarm is located on the same page as the alarm setting. Timers not associated with an alarm are located on the timers' page. The *Timers* page is subdivided into smaller sections. Select the required section with the mouse.



#### 3.7.1 START TIMERS

##### Start Delay



| Timer                 | Description                                                                                                                                                                                                                                      |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Start Off Load | The amount of time delay before starting in AUTO mode. This timer is activated upon the <i>Multi Set Controller Off Load</i> command being issued. Typically, this timer is applied to prevent starting upon fleeting start signals.             |
| Remote Start On Load  | The amount of time delay before starting in AUTO mode. This timer is activated upon the <i>Remote Start On Load</i> command being issued. Typically, this timer is applied to prevent starting upon fleeting start signals.                      |
| Telemetry Start       | The amount of time delay before starting in AUTO mode. This timer is activated upon a <i>Multi Set Controller command</i> being received from a Modbus master. Typically, this timer is applied to prevent starting upon fleeting start signals. |

**NOTE:** If more than one start request is active, the shortest timer is used.

**Start Delay Mains Parallel**



| Timer                 | Description                                                                                                                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Fail            | The amount of time delay before starting in AUTO mode. This timer is activated upon a Mains failure detection.                                                                                         |
| Mains Transient Delay | Used to give a delay between sensing Mains failure and acting upon it. This is used to prevent dropouts of the Mains load switch and operation of the system due to Mains supply transient conditions. |

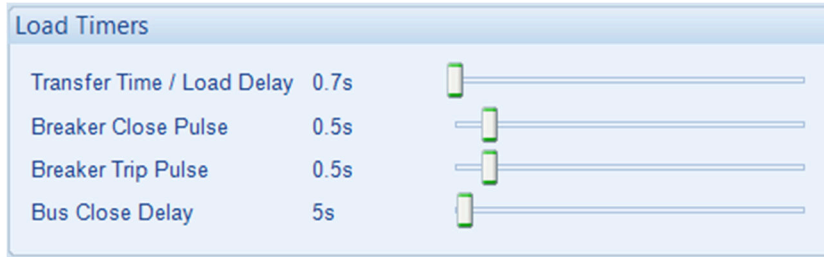
**Start Delay Group Controller**



| Timer                  | Description                                                                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start From AMSC Master | The amount of time delay before starting in AUTO mode. This timer is activated upon a start signal command being transmitted via the AMSC link. Typically, this timer is applied to prevent starting upon fleeting start signals. |

### 3.7.2 LOAD / STOPPING TIMERS

#### Load Timers



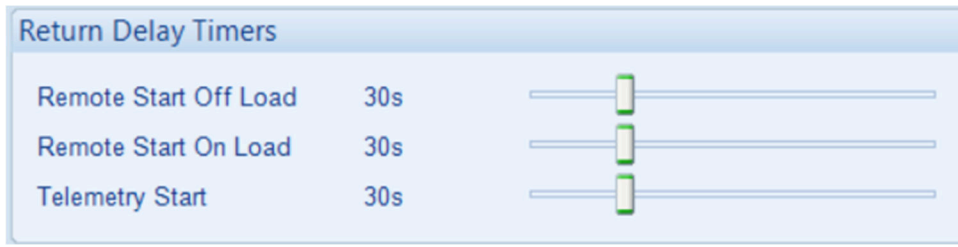
| Timer                      | Description                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transfer Time / Load Delay | The delay time between the Mains switchgear opening to the Bus switchgear closing.                                                                                                       |
| Breaker Close Pulse        | The amount of time that <i>Breaker Close Pulse</i> signal is present when the request to close the load switch is given.                                                                 |
| Breaker Trip Pulse         | The amount of time that <i>Breaker Open Pulse</i> signal is present when the request to open the load switch is given.                                                                   |
| Bus Close Delay            | The time from the Mains breaker becoming open to the Bus Breaker being requested to close.<br>This is used to allow the Generator Bus voltage/frequency to stabilise before taking load. |

#### Load Timers (Mains)



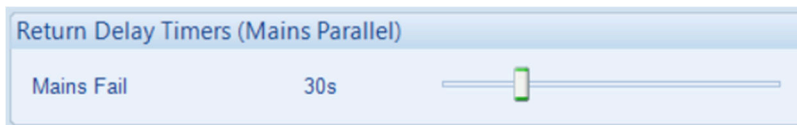
| Timer             | Description                                                                                                            |
|-------------------|------------------------------------------------------------------------------------------------------------------------|
| Parallel Run Time | This timer dictates the minimum time the Generator Bus runs in parallel with the Mains supply without break transfers. |

**Return Delay Timers**



| Timer                 | Description                                                                                                                                                                                                                                      |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Start Off Load | The amount of time delay before starting in AUTO mode. This timer is activated upon the <i>Remote Start Off Load</i> command being issued. Typically, this timer is applied to prevent starting upon fleeting start signals.                     |
| Remote Start On Load  | The amount of time delay before starting in AUTO mode. This timer is activated upon the <i>Remote Start On Load</i> command being issued. Typically, this timer is applied to prevent starting upon fleeting start signals.                      |
| Telemetry Start       | The amount of time delay before starting in AUTO mode. This timer is activated upon a <i>Multi Set Controller command</i> being received from a Modbus master. Typically, this timer is applied to prevent starting upon fleeting start signals. |

**Return Delay Timers (Mains)**



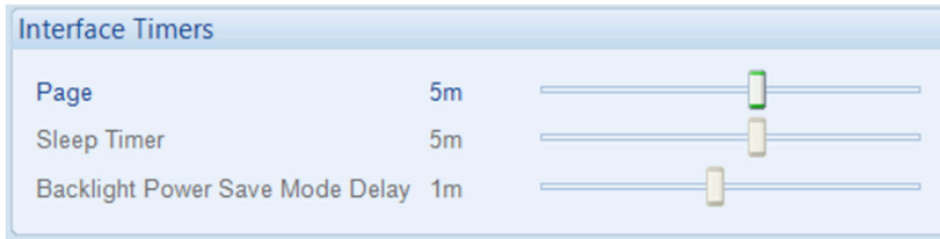
| Timer      | Description                                                                                                          |
|------------|----------------------------------------------------------------------------------------------------------------------|
| Mains Fail | The amount of time delay before the mains breaker is closed. This timer is activated upon a mains failure detection. |

**Return Delay Timers (Group Controller)**



| Timer                  | Description                                                                                                                                                                                                                                            |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start From AMSC Master | A delay, used in auto mode only, that allows for short term removal of the AMSC start request to stop the set before action is taken. This is usually used to ensure the set remains on load before accepting that the start request has been removed. |

### 3.7.3 MODULE TIMERS



| Timer                           | Description                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Page                            | If the module is left unattended for the duration of the <i>LCD Page Timer</i> it reverts to show the <i>Status</i> page. |
| Sleep Timer                     | If the module is left unattended for the duration of the <i>Sleep Timer</i> , it goes into sleep mode to save power.      |
| Backlight Power Save Mode Delay | If the module is left unattended for the duration, then the Backlight will go into Power Save Mode.                       |

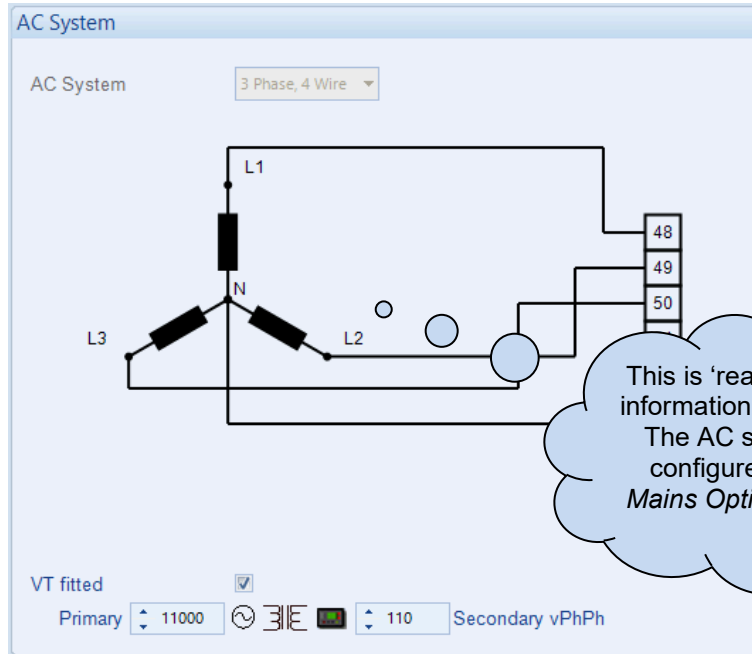
### 3.8 BUS

The *Bus* section is subdivided into smaller sections. Select the required section with the mouse.



### 3.8.1 BUS OPTIONS

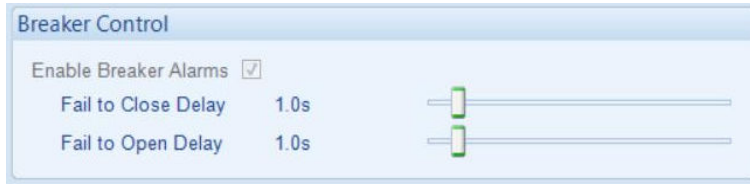
#### AC System



This is 'read only' for information purposes. The AC system is configured in the *Mains Options* page.

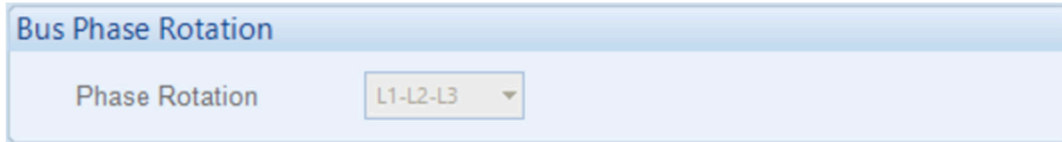
| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC System | <p>The AC System of the Bus is fixed to the same setting as the mains. These settings are used to detail the type of AC system to which the module is connected:</p> <p><b>2 Phase, 3 Wire L1 - L2</b><br/> <b>2 Phase, 3 Wire L1 - L3</b><br/> <b>3 Phase, 3 Wire</b><br/> <b>3 Phase, 3 Wire NVD</b><br/> <b>3 Phase, 4 Wire</b><br/> <b>3 Phase, 4 Wire Delta L1 - N - L2</b><br/> <b>3 Phase, 4 Wire Delta L1 - N - L3</b><br/> <b>3 Phase, 4 Wire Delta L2 - N - L3</b><br/> <b>Single Phase, 2 Wire</b><br/> <b>Single Phase, 3 Wire L1 - L2</b><br/> <b>Single Phase, 3 Wire L1 - L3</b></p>                      |
| VT Fitted | <p><input type="checkbox"/> = The voltage sensing to the controller is direct from the Generator bus<br/> <input checked="" type="checkbox"/> = The voltage sensing to the controller is via Voltage Transformers (VTs or PTs)</p> <p>This is used to step down the generated voltage to be within the controller voltage specifications. By entering the <i>Primary</i> and <i>Secondary</i> voltages of the transformer, the controller displays the <i>Primary</i> voltage rather than the actual measured voltage.</p> <p>This is typically used to interface the DSE module to high voltage systems (i.e. 11kV)</p> |

**Breaker Control**



| Parameter             | Description                                                                                                                                                                                                |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Breaker Alarms | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The <i>Mains Breaker Alarms</i> are enabled.                                                                         |
| Fail To Open Delay    | When the <i>Open Bus</i> output is activated, if the configured <i>Bus Closed Auxiliary</i> digital input does not become inactive within the <i>Bus Fail To Open Delay</i> timer, the alarm is activated. |
| Fail To Close Delay   | When the <i>Close Bus</i> output is activated, if the configured <i>Bus Closed Auxiliary</i> digital input does not become active within the <i>Bus Fail To Close Delay</i> timer, the alarm is activated. |

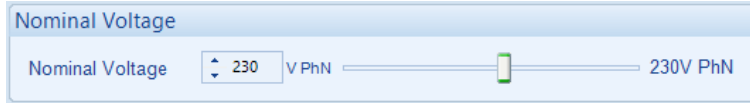
**Bus Phase Rotation**



| Parameter                                                    | Description                                                                                                                                                                             |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phase Rotation<br><i>IEEE 37.2 – 47 Phase Sequence Relay</i> | All the <i>Bus Phase Rotation</i> settings are locked to the same configuration as the <i>Mains Phase Rotation</i> settings. This section is displayed for clarification purposes only. |

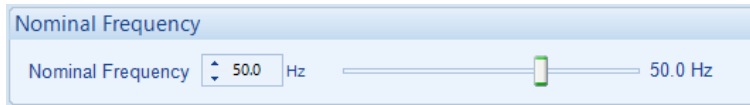
### 3.8.2 BUS NOMINALS

#### Nominal Voltage



| Parameter       | Description                                                                                                                                                                                                            |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Voltage | This is used to instruct the module what voltage to adjust the Generator Bus to whilst running on load. It is also used when the Bus and Mains VTs have different ratios, to synchronise the voltage of both supplies. |

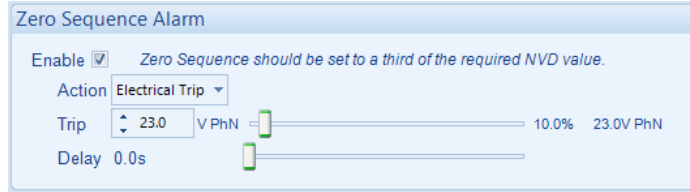
#### Nominal Frequency



| Parameter         | Description                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------|
| Nominal Frequency | This is used to instruct the module what frequency to adjust the Generator Bus to whilst running on load. |

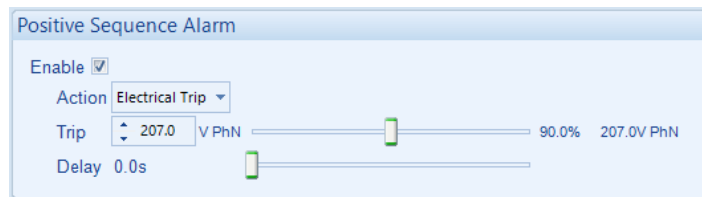
### 3.8.3 BUS SEQUENCE ALARMS

#### Zero Sequence Alarm



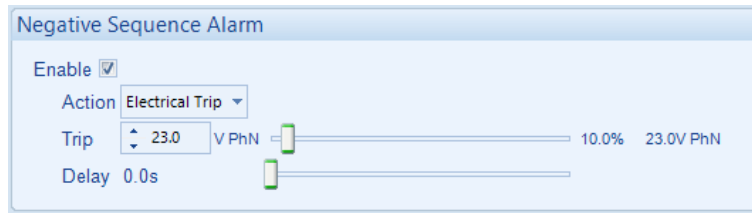
| Parameter                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zero Sequence Alarm<br>IEEE 37.2 – 47H<br>Phase-Sequence Or Phase<br>Balance Voltage Relay | <p><b>NOTE:</b> The Zero Sequence Alarm must be set to a third of the required Neutral Voltage Displacement (NVD) value. This is because the summation of the three Zero Sequence vector components is equal to the NVD value.</p> <p>This is also known as Neutral Voltage Displacement.<br/> <input type="checkbox"/> = Alarm is disabled<br/> <input checked="" type="checkbox"/> = The alarm activates when the difference in potential between the Earth and the calculated Neutral position of a 3-wire delta exceeds the configured <i>Zero Sequence Alarm Trip</i> level for the configured <i>Delay</i> time.</p> |
| Action                                                                                     | Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Warning</b><br>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Trip                                                                                       | Set the percentage of total power at which the <i>Zero Sequence Alarm</i> is activated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Delay                                                                                      | Set the amount of time before the <i>Zero Sequence Alarm</i> activates.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

#### Positive Sequence Alarm



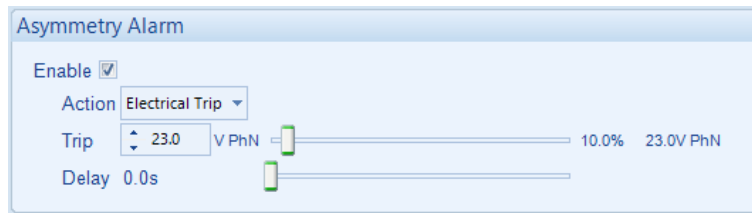
| Parameter                                                                                      | Description                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positive Sequence Alarm<br>IEEE 37.2 – 47L<br>Phase-Sequence Or Phase<br>Balance Voltage Relay | <p><input type="checkbox"/> = Alarm is disabled<br/> <input checked="" type="checkbox"/> = The alarm activates when the <i>Positive Sequence</i> voltage falls below the configured <i>Positive Sequence Alarm Trip</i> level for the configured <i>Delay</i> time.</p> |
| Action                                                                                         | Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Warning</b><br>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.                                                                               |
| Trip                                                                                           | Set the percentage of total power at which the <i>Positive Sequence Alarm</i> is activated.                                                                                                                                                                             |
| Delay                                                                                          | Set the amount of time before the <i>Positive Sequence Alarm</i> activates.                                                                                                                                                                                             |

**Negative Sequence Alarm**



| Parameter                                                                                   | Description                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Negative Sequence Alarm<br>IEEE 37.2 – 47H<br>Phase-Sequence Or Phase Balance Voltage Relay | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The alarm activates when the <i>Negative Sequence</i> voltage exceeds the configured <i>Negative Sequence Alarm</i> level for the configured <i>Delay</i> time. |
| Action                                                                                      | Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Warning</b><br>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.                                                             |
| Trip                                                                                        | Set the percentage of total power at which the <i>Negative Sequence Alarm</i> is activated.                                                                                                                                                           |
| Delay                                                                                       | Set the amount of time before the <i>Negative Sequence Alarm</i> activates.                                                                                                                                                                           |

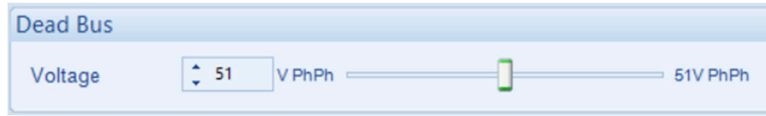
**Asymmetry Alarm**



| Parameter                                              | Description                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asymmetry Alarm<br>IEEE 37.2 – 59<br>Overvoltage Relay | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The alarm activates when the voltage between any two phases exceeds the configured <i>Asymmetry Alarm Trip</i> level for the configured <i>Delay</i> time.<br><b>For example:</b><br>L1 = 230 V, L2 = 235 V, L3 = 226V<br>Asymmetry is <i>largest value – smallest value</i> = 235 V – 226 V = 9 V |
| Action                                                 | Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Warning</b><br>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.                                                                                                                                                                                                |
| Trip                                                   | Set the percentage of total power at which the <i>Asymmetry Alarm</i> is activated.                                                                                                                                                                                                                                                                                                      |
| Delay                                                  | Set the amount of time before the <i>Asymmetry Alarm</i> activates.                                                                                                                                                                                                                                                                                                                      |

### 3.8.4 SYNCHRONISING

#### Dead Bus

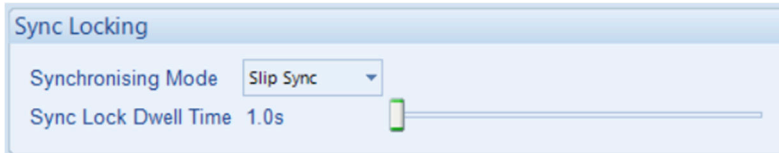


*Dead Bus* detection is used in two scenarios:

- If the bus is dead, controller(s) communicate over the AMSC link to determine which one closes to the dead bus. If the bus is live, synchronisation takes place before the load switch is closed.
- Upon closing the load switch, the bus must be seen to be 'not dead' a short time later.

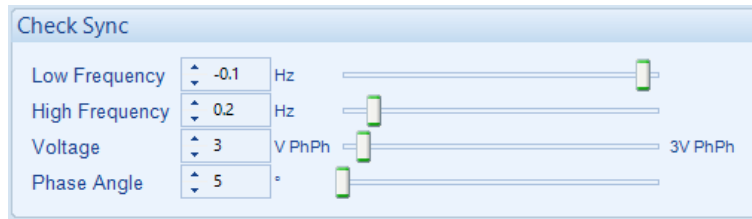
| Parameter | Description                                              |
|-----------|----------------------------------------------------------|
| Voltage   | The voltage below which the bus is assumed to be 'dead'. |

#### Sync Locking



| Parameter            | Description                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------|
| Synchronising Mode   | Select the type of Synchronising Mode required from the list:<br><b>Disabled</b><br><b>Slip Sync</b><br><b>Sync Lock</b> |
| Sync Lock Dwell Time | It is the time the supplies must be in sync when sync locking before the breaker will close.                             |

**Check Sync**

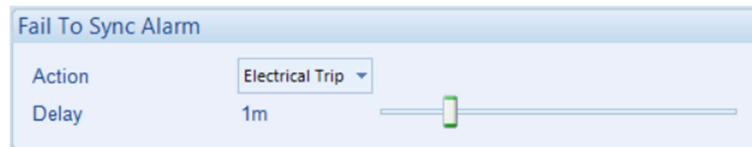


During the synchronising process, the controller adjusts the frequency and voltage of the generator to closely match the existing bus. Typically, the oncoming set is adjusted to be 0.1 Hz faster than the existing supply, this causes the phase of the two supplies to change continuously.

Before the breaker is closed, the following configurable conditions must be met.

| Parameter                       | Description                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Frequency<br>High Frequency | The difference between the two supplies frequencies must be between the <i>Check Sync Low Frequency</i> and <i>Check Sync High Frequency</i> . |
| Voltage                         | The difference between the two supplies voltages must be equal to or below the <i>Check Sync Voltage</i> .                                     |
| Phase Angle                     | The phase of the two supplies must be equal to or below the <i>Check Sync Phase Angle</i> .                                                    |

**Fail to Sync Alarm**



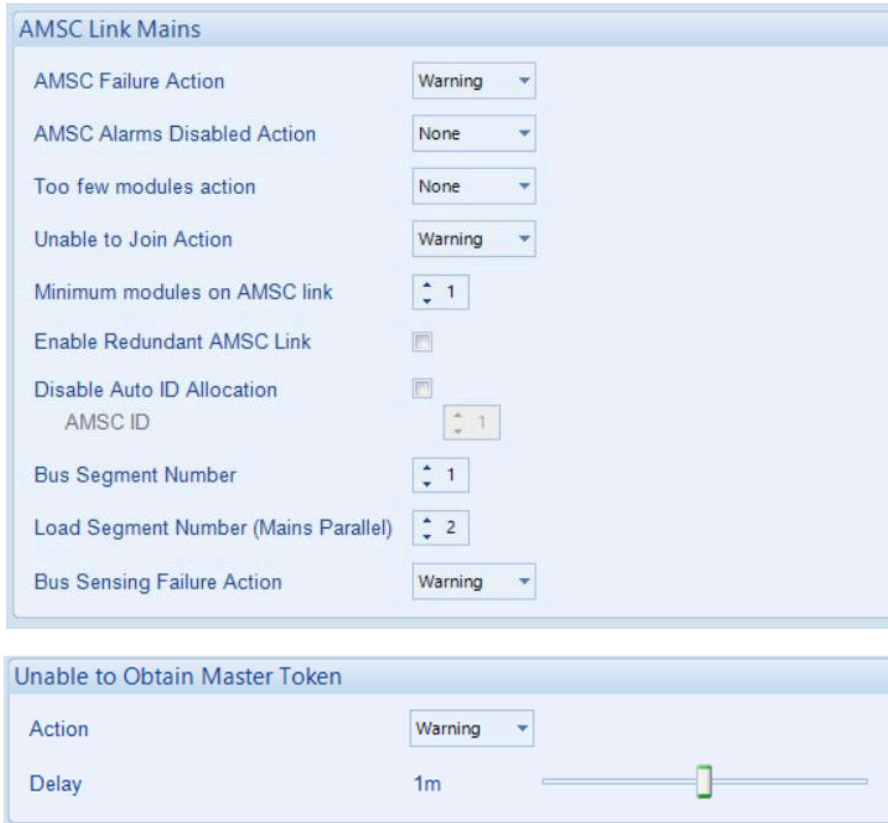
Used to detect that the synchronising process is taking a long time. This occurs when changes in the load are making the set control difficult due to changes in voltage and frequency.

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action    | Determines the action to take upon a <i>Fail to Sync</i> .<br><b>Electrical Trip:</b> The set is stopped. In a <i>Load Demand</i> scheme, other generators start if available.<br><b>Indication:</b> The set continues to synchronise, and no alarm is raised. This is used to set an output source without triggering an alarm message.<br><b>Warning:</b> The set continues to attempt to synchronise. |
| Delay     | The time to allow for successful synchronisation to take place. If the process continues longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                                                                                                    |







### 3.8.5 AMSC LINK



#### 3.8.5.1 AMSC LINK MAINS



| Parameter                   | Description                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMSC Failure Action         | <p>Action upon AMSC Link Failure:</p> <p><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.</p> <p><b>Indication:</b> The set continues to run, and no alarm is raised. This is used to set an output source without triggering an alarm message.</p> <p><b>Warning:</b> The set continues to run, and a warning alarm is activated.</p> |
| AMSC Alarms Disabled Action | <p>Action to take when the AMSC alarm is disabled by a digital input:</p> <p><b>Indication:</b> The set continues to run, and no alarm is raised. This is used to set an output source without triggering an alarm message.</p> <p><b>None:</b> Alarm is disabled.</p> <p><b>Warning:</b> The set continues to run, and a warning alarm is activated.</p>                                                      |


| Parameter                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Too Few Modules Action               | <p>Action to take when the number of modules active on the AMSC link is lower than the <i>Minimum Modules on AMSC link</i> setting.</p> <p><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.</p> <p><b>Indication:</b> The set continues to run, and no alarm is raised. This is used to set an output source without triggering an alarm message.</p> <p><b>None:</b> Alarm is disabled.</p> <p><b>Warning:</b> The set continues to run, and a warning alarm is activated.</p>                                                  |
| Unable to Join Action                | <p>Action to take when a module is unable to join the AMSC Link.</p> <p><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.</p> <p><b>Indication:</b> The set continues to run, and no alarm is raised. This is used to set an output source without triggering an alarm message.</p> <p><b>Warning:</b> The set continues to run, and a warning alarm is activated.</p>                                                                                                                                                            |
| Minimum Modules On AMSC Link         | <p>Set the minimum number of modules on the AMSC before the <i>Too Few Modules</i> alarm is activated. The maximum number of Minimum Modules is 32.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Enable Redundant AMSC Link           | <p> <b>NOTE: When required, this option must be enabled on all DSEG8xxx modules connected on the AMSC Link.</b></p> <p><input type="checkbox"/> = Only one Multi-Set Comms (AMSC) Link is active.<br/> <input checked="" type="checkbox"/> = This activates the second (redundant) Multi-Set Comms (AMSC) Link, allowing for communications redundancy between the controllers.</p>                                                                                                                                     |
| Disable Auto ID Allocation           | <p> <b>NOTE: When required, this option must be enabled on all DSEG8xxx modules connected on the AMSC Link.</b></p> <p><input type="checkbox"/> = The AMSC system assigns the AMSC ID automatically when the DSE module powered over the AMSC network.<br/> <input checked="" type="checkbox"/> = The AMSC system does not assign the AMSC ID automatically when the DSE module is powered up, instead the DSE module uses the <i>AMSC ID</i> number configured in this section up to a maximum of 64.</p>            |
| Bus Segment Number                   | <p> <b>WARNING!: This is critical for safe control!</b></p> <p> <b>NOTE: Load and Bus Segment Numbers must be unique in the system, the same segment number can't be used for both a Load and a Bus AC segment.</b></p> <p>Each section of the ac bus requires a unique identifier, this number. All modules connected to the same section or segment must have the same number. A maximum of 64 Bus Segment Numbers are used.</p> |
| Load Segment Number (Mains Parallel) | <p> <b>WARNING!: This is critical for safe control!</b></p> <p> <b>NOTE: The Load segment Number needs to be set differently to the Bus Segment Number even when the bus breaker is omitted.</b></p> <p>Each section of the load requires a unique identifier, this number. All modules connected to the same section or segment must have the same number. A maximum of 64 Load Segment Numbers are used.</p>                     |

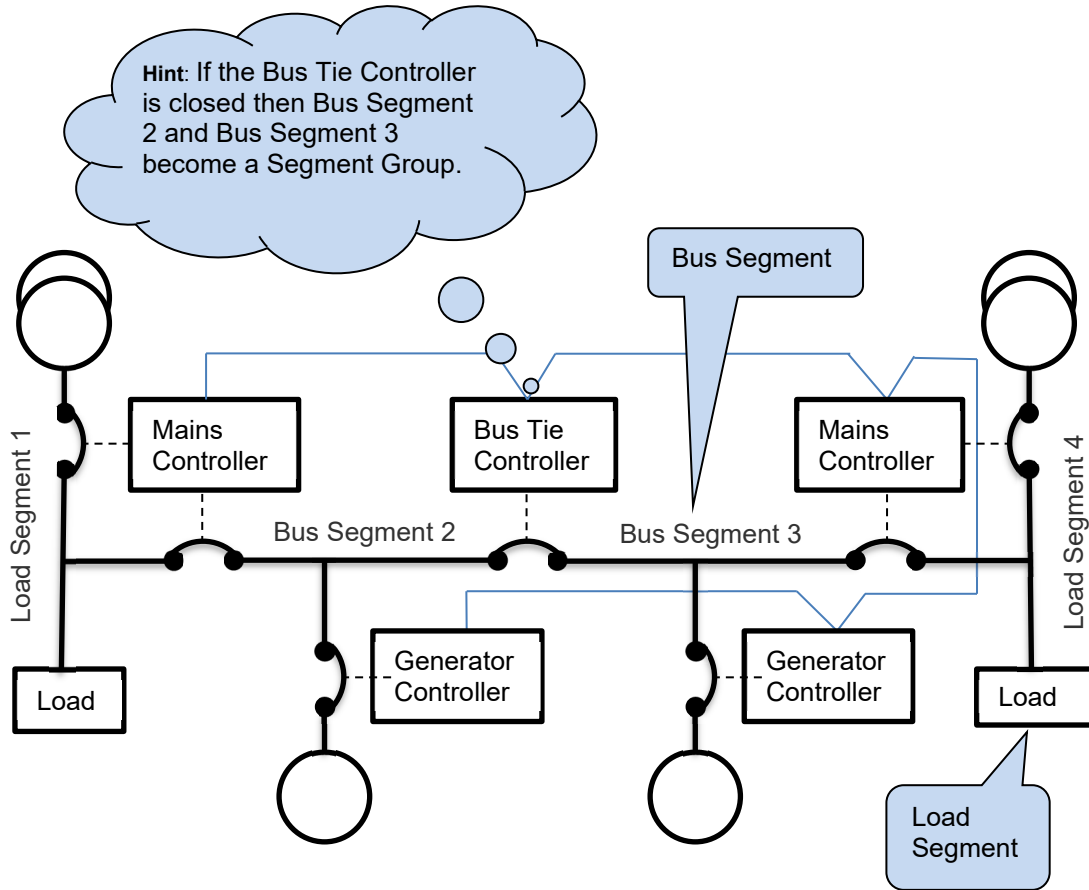
Editing the Configuration

| Parameter                     | Description                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bus Sensing Failure Action    | Action to be taken if failure to sense bus<br><br><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.<br><b>Warning:</b> The set continues to run, and a warning alarm is activated.                                                                                                                                                             |
| Unable to Obtain Master Token | Action to take when Master token cannot be obtained.<br><br><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.<br><b>Indication:</b> The set continues to run, and no alarm is raised. This is used to set an output source without triggering an alarm message.<br><b>Warning:</b> The set continues to run, and a warning alarm is activated. |
| Delay                         | If the process continues longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                                                                                                                                                                                 |

### 3.8.5.2 BUS SEGMENT AND LOAD SEGMENT NUMBERS

The Bus Segment and Load Segment numbers are used to identify Bus and Load segments.

 **WARNING! : The Bus Segment number and Load Segment number cannot be the same!**  
This is critical for safe control!



### 3.8.5.3 SEGMENT OPERATION

The segments are used to allow the controllers to determine their position within the system. They use this information to determine which other modules they need to interact with. Where more than 2 mains or bus tie controllers are connected, they will use the mains tokens to determine which should be in control. Where no control is required neither controller will request control.

### 3.8.5.4 AMSC LINK GROUP PRIMARY/SECONDARY

**NOTE:** The AMSC Link Alarms are disabled by a digital input configured to *AMSC Alarms Inhibit* if required.

**NOTE:** When the Redundant AMSC link (AMSC 2) is enabled but AMSC1 is not wired then a warning alarm will be triggered.

**AMSC Link Group Primary**

AMSC Failure Action: Warning

AMSC Alarms Disabled Action: None

Too few modules action: None

Minimum modules on AMSC link: 1

Enable Redundant AMSC Link:

Disable Auto ID Allocation:





AMSC ID: 1

Bus Segment Number: 1

Bus Sensing Failure Action: Warning

| Parameter                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMSC Failure Action         | Action upon AMSC Link Failure:<br><br><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.<br><b>Indication:</b> The set continues to run, and no alarm is raised. This is used for internal use, such as in the <i>PLC Logic</i> or <i>Virtual LEDs</i> .<br><b>Warning:</b> The set continues to run, and a warning alarm is activated.                                                                                                                                      |
| AMSC Alarms Disabled Action | Action to take when the AMSC alarm is disabled by a digital input:<br><br><b>Indication:</b> The set continues to run, and no alarm is raised. This is used for internal use, such as in the <i>PLC Logic</i> or <i>Virtual LEDs</i> .<br><b>None:</b> Alarm is disabled.<br><b>Warning:</b> The set continues to run, and a warning alarm is activated.                                                                                                                                                                                           |
| Too Few Modules Action      | Action to take when the number of modules active on the AMSC link is lower than the <i>Minimum Modules on AMSC link</i> setting.<br><br><b>Electrical Trip:</b> The breaker is opened immediately, and the cooling timer begins, after which the set is stopped.<br><b>Indication:</b> The set continues to run, and no alarm is raised. This is used for internal use, such as in the <i>PLC Logic</i> or <i>Virtual LEDs</i> .<br><b>None:</b> Alarm is disabled.<br><b>Warning:</b> The set continues to run, and a warning alarm is activated. |

Parameters continued overleaf...

| Parameter                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Minimum Modules On AMSC Link | Set the minimum number of modules on the AMSC before the <i>Too Few Modules</i> alarm is activated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Enable Redundant AMSC Link   | <p> <b>NOTE: When required, this option must be enabled on all DSEG8xxx modules connected on the AMSC Link.</b></p> <p><input type="checkbox"/> = Only one Multi-Set Comms (AMSC) Link is active.<br/> <input checked="" type="checkbox"/> = This activates the second (redundant) Multi-Set Comms (AMSC) Link, allowing for communications redundancy between the controllers.</p>                                                                                                                        |
| Disable Auto ID Allocation   | <p> <b>NOTE: When required, this option must be enabled on all DSEG8xxx modules connected on the AMSC Link.</b></p> <p><input type="checkbox"/> = The AMSC system assigns the AMSC ID automatically when the DSE module powered over the AMSC network.<br/> <input checked="" type="checkbox"/> = The AMSC system does not assign the AMSC ID automatically when the DSE module is powered up, instead the DSE module uses the <i>AMSC ID</i> number configured in this section up to a maximum of 64.</p> |
| Bus Segment Number           | <p> <b>WARNING!: This is critical for safe control!</b></p> <p>Each section of the ac bus requires a unique identifier, this number. All module connected to the same section or segment must have the same number.</p>                                                                                                                                                                                                                                                                                    |
| Bus Sensing Failure Action   | <p> <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> <p><b>Electrical Trip:</b><br/> <b>Shutdown:</b><br/> <b>Warning:</b> The set continues to run, and a warning alarm is activated.</p>                                                                                                                                                                                                                                                                          |

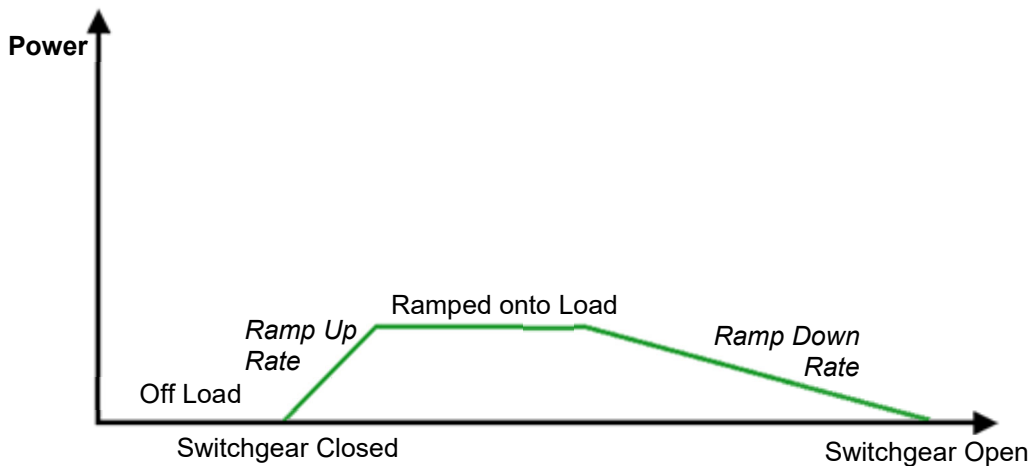
### 3.8.6 LOAD CONTROL

**NOTE:** The *Maximum Load Level* are configured within the SCADA section. For further details, refer to section 4.7.5 entitled *Load Levels* contained within the SCADA section within this document.

The module performs a 'soft' load transfer when taking or removing load from the Generator Bus.

Upon the generator bus's switchgear closing, the module controls the Generator Bus's power production starting from the zero. Load is then applied to the Generator Bus at the configured *Ramp Up Rate*. The generator bus is ramped up so that the mains load level is at the configured maximum load level. The bus generation requirement is varied so that the mains is held stable at the maximum power level.

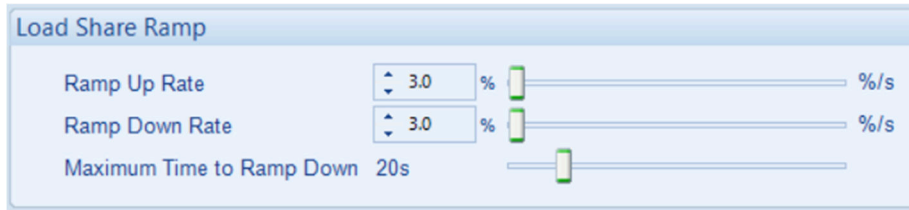
Before the Generator Bus is disconnected, the load is ramped down to the zero at the configured *Ramp Down Rate*. The Generator Bus's switchgear is opened once zero power has been attained, removing the Generator Bus from the load.



'Soft' load transfers of this type have many benefits, the most obvious are:

- When the Generator Bus is removed, the generators in the system are not suddenly unloaded with the load that was being supplied. Instead, the load is slowly ramped, allowing time for the Mains to take up the load.
- Opening of the switchgear occurs at a low load level, helping to reduce arcing of the contacts.

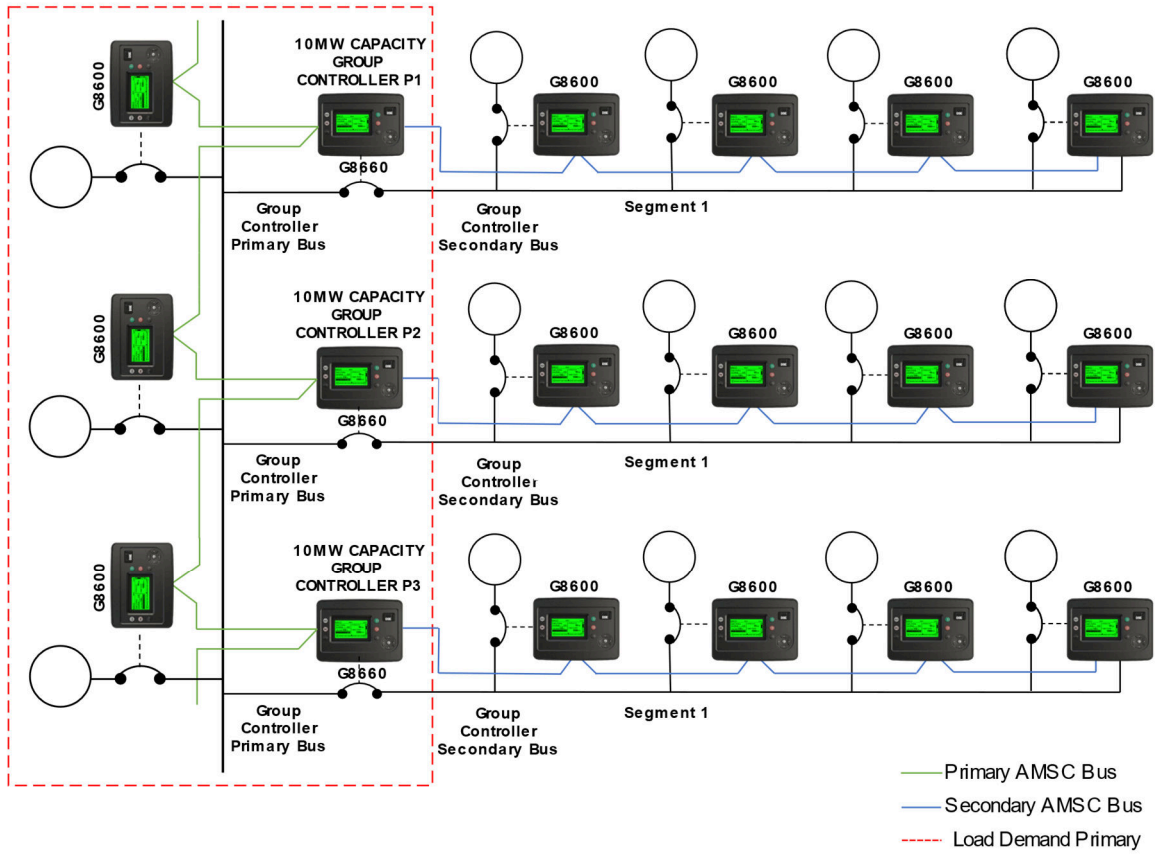
**Load Share Ramp**



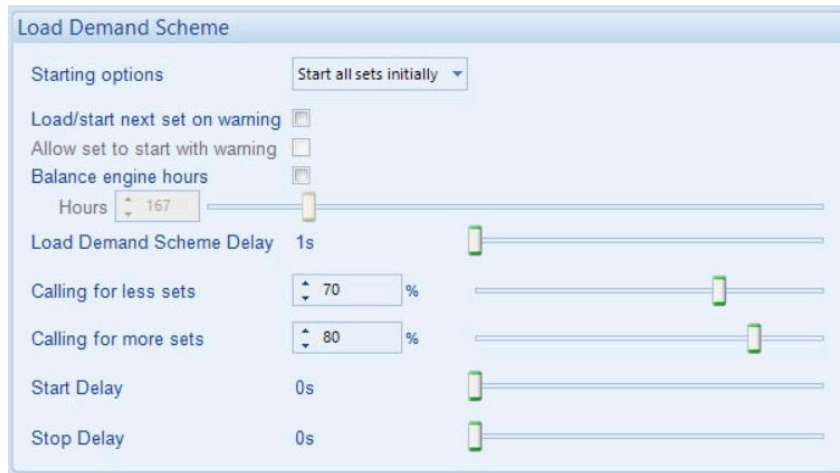
| Parameter                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ramp Up Rate              | The rate at which the Generator Bus is ramped onto the load.                                                                                                                                                                                                                                                                                                                                                                                                  |
| Ramp Down Rate            | The rate at which the Generator Bus is ramped off the load.                                                                                                                                                                                                                                                                                                                                                                                                   |
| Maximum Time to Ramp Down | This is to set a time limit to the ramp down process, and it is useful when the engines responses are slow or are not capable to ramp off the load.<br>The <i>Maximum Time to Ramp Down</i> starts when the Generator Bus begins to ramp down. When this timer is expired the Bus breaker opens regardless of the actual power on the Bus.<br>It is possible to set the ramp rate slower than this time, so the bus breaker opens prior to the ramp finishes. |

### 3.8.7 LOAD DEMAND/PRIMARY (GROUP CONTROLLER)

From a load share perspective, a Group Controller appears as a single Generator. The diagram shows a typical layout.



**Load Demand Scheme**




| Parameter                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Starting Options               | <p>Determines how the load demand scheme operates upon start-up.</p> <p><b>Continuous Running, Load all Initially:</b> Upon activation of the load demand scheme, all sets in the system start up and parallel onto the generator bus. As load demands, sets go off load / on load. The set continues to run regardless of load levels until requested to stop.</p> <p><b>Continuous Running, Load as Required:</b> Upon activation of the load demand scheme, all sets start initially, but only enough required to satisfy spinning capacity (if configured) go on load. Other sets in the system are only started according to demand. As load demands, sets become off load / on load. The set continues to run regardless of load levels until requested to stop.</p> <p><b>Disabled:</b> Starting options are disabled. The load demand scheme itself is disabled so a set won't start.</p> <p><b>NOTE:</b> If there is a <b>Start On Load Demand</b> request the set will not run.</p> <p><b>Start all sets initially:</b> Upon activation of the load demand scheme, all sets in the system start up (for the load demand scheme delay) and parallel onto the generator bus. As load demands sets start or stop. This option is particularly recommended in Multiset Mains standby applications where the load is likely to be greater than the capacity of a single set.</p> <p><b>Start sets as load requires:</b> Upon activation of the load demand scheme, only one set will start initially. Other sets in the system are only started according to demand. This option is recommended for mutual standby systems where the load is likely to be less than the capacity of a single set.</p> |
| Load/Start Next Set on Warning | <p><b>NOTE:</b> Enabling <b>Start Next Set on Warning</b> results in the <b>All Warnings are Latched</b> option being forced on.</p> <p>Whenever a warning occurs, a start/load command is issued over the AMSC link to start the next highest priority set. The set with the warning stops once enough additional sets have taken load to allow the set to stop.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Parameter descriptions are continued overleaf...

| Parameter                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Allow Set to Start with Warning | <p><input type="checkbox"/> = If the AMSC calls to start another set, generators which display a warning status alarm remain at rest, only generators with no warning alarm are started according to their priority number.</p> <p><input checked="" type="checkbox"/> = Allows a stationary generator with a warning alarm to start if requested.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE: A stationary set with a warning alarm active will be considered part of the load demand scheme and may be called on to start if the load requires it. If more than one set has a warning active, all the sets with warnings will start.</b></p> </div>                                                                                                                                                                                                                                                                                                                                        |
| Balance Engine Hours            | <p>Used in a Multi Set system so that the engine's priority changes according to the amount of usage of the set.</p> <p>For instance, in a two-set system.</p> <p>Set 1 has logged 100 running hours<br/>Set 2 has logged 20 running hours<br/>Balance engine hours are configured to 75 hours.</p> <p>As Set 2 has logged 80 hours less than Set 1. As this is greater than the configured 75 hours, Set 2 is the highest priority set.</p> <p>If all sets are within the configured Balance Engine Hours value, then the set Priority Number (See SCADA/Bus/AMSC Link) is followed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Load Demand Scheme Delay        | <p>If <i>Start all sets initially</i> is set then the <i>Load Demand Scheme Delay</i> is the time each set is required to run after initially starting before it may stop.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Calling For Less Sets           | <p>The kW load level at which the module decides that generator (Group Controller) is disconnected from the generator bus. The generator does not disconnect from the bus when its percentage of kW is below the <i>Calling For Less Sets</i> value. Instead, the generator disconnects from the bus when it ensures that the remaining generators' kW percentage is at the <i>Calling For Less Sets</i> value when it disconnects. This prevents the system from reaching a point where the load is such that the generator starts and stops repeatedly.</p> <p>Once the load is below this level, the lowest priority generator in the sequence (determined using the <i>Genset Priority</i>) begins its <i>Return Delay</i> timer. Once this has expired, the generator ramps off and stops.</p> <p>If the load level rises above this set point during the <i>Return Delay</i> timer, the timer is cancelled, and the generator continues to supply power to the load. This caters for short term reductions in kW load demand.</p> |
| Calling For More Sets           | <p>The kW load level at which the module calls for additional generators (Group Controller) to join the generator bus.</p> <p>Once the load is above this level, the highest priority generator that is not running in the sequence (determined using the <i>Genset Priority</i>) begins its <i>Start Delay</i> timer. Once this has expired, the generator joins the bus and ramps up.</p> <p>If the load level reduces below this set point during the <i>Start Delay</i> timer, the timer is cancelled, and the generator enters its stops cycle. This caters for short term kW load demand.</p> <p>If the set fails to become available, it communicates this using the AMSC Link which signals the next generator in the sequence to take its place.</p>                                                                                                                                                                                                                                                                           |

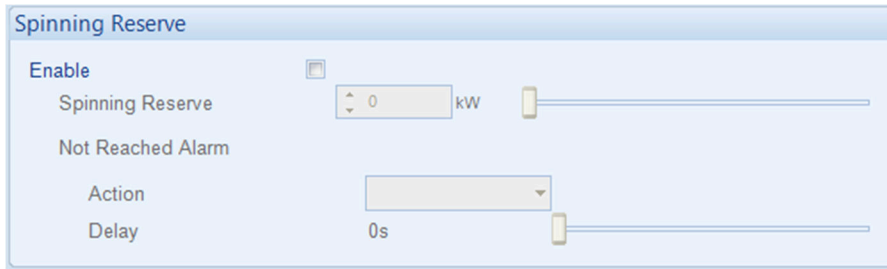
*Editing the Configuration*

| <b>Parameter</b> | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start Delay      | <p>Time delay used at start up to ensure the start request is not simply a fleeting request.</p> <div style="border: 1px solid black; padding: 5px;"><p> <b>NOTE: The start and return delay timers should be greater than the time that it takes for a set to ramp on or off as the load fluctuation can cause the sets to start and stop.</b></p></div> |
| Return Delay     | <p>Time delay used to before a stop cycle is initiated.</p>                                                                                                                                                                                                                                                                                                                                                                                |

**Spinning Capacity**

| Parameter          | Description                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable             | <input type="checkbox"/> = <i>Spinning capacity</i> is disabled.<br><input checked="" type="checkbox"/> = <i>Spinning capacity</i> is enabled.                                                                                                                          |
| Spinning Capacity  | The minimum power that will be available on the bus.                                                                                                                                                                                                                    |
| Not Reached Alarms | An alarm is generated when the spinning capacity cannot be achieved.                                                                                                                                                                                                    |
| Action             | <div style="border: 2px solid black; padding: 5px;"> <p><b>⚠ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> </div> <p>Select the action for the <i>Not Reached Alarm</i>:</p> <p><b>Electrical Trip:</b></p> <p><b>Warning:</b></p> |
| Delay              | Set the amount of time before the <i>Spinning Capacity Alarm</i> activates.                                                                                                                                                                                             |

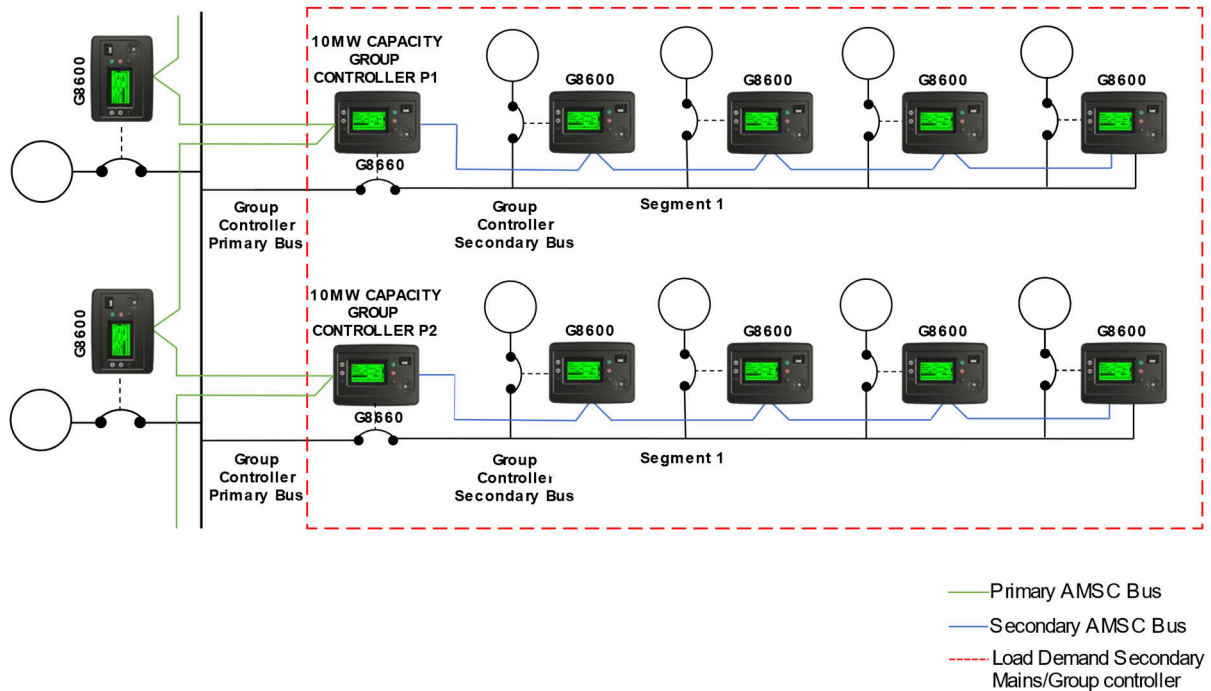
**Spinning Reserve**



| Parameter          | Description                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable             | <input type="checkbox"/> = <i>Spinning reserve</i> is disabled.<br><input checked="" type="checkbox"/> = <i>Spinning reserve</i> is enabled.                                                                                                                             |
| Spinning Reserve   | The power available over and above the load requirements on the bus. The load demand scheme will start further sets to ensure that this margin is maintained.                                                                                                            |
| Not Reached Alarms | An alarm is generated when the spinning reserve cannot be achieved.                                                                                                                                                                                                      |
| Action             | <div style="border: 3px double black; padding: 5px;"> <p><b>⚠ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> </div> <p>Select the action for the <i>Not Reached Alarm</i>:</p> <p><b>Electrical Trip:</b></p> <p><b>Warning:</b></p> |
| Delay              | Set the amount of time before the <i>Spinning Reserve Alarm</i> activates.                                                                                                                                                                                               |

### 3.8.8 LOAD DEMAND SECONDARY (MAINS/GROUP)

**NOTE:** The Load Demand Scheme operates when the starting Maximum Load Level % for Bus and Mains Mode criteria in Scada is satisfied. See section 4.7.5 entitled Load Levels for further information. If generators go into Island mode then the load demand scheme used is set in the Generator G8600 controllers not the G8660 load demand scheme.



The group scheme will only run if the primary bus is sharing (i.e. not in parallel with the mains) and not under control of a G8x60 load demand scheme

The group runs independently of the primary, although the two schemes are not connected.

When the group is running its secondary scheme it appears as a large generator to the primary scheme with a capacity which is the sum of all the generators available in the secondary scheme

The secondary scheme will run independently of the primary scheme

Where the start stop settings are the same on both schemes, the Group controllers will start each of their generators before the next set on the primary bus.

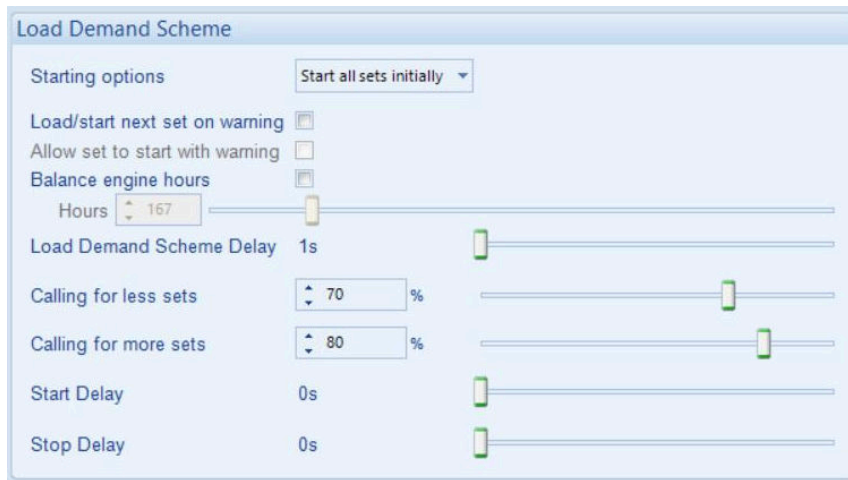
Where the start stop thresholds are significantly less on the primary bus, the Group controllers will start the first few sets in turn and gradually increase the number of sets running.

The Group controllers are started by either the number of hours run or by priority. Where the number of hours run is used, the Group controller keeps a timer which is incremented when any of the generator are run in its group, this is then used to balance hours.

Where groups are used it is important that the start and return timers are set appropriately to prevent flip flopping of sets, they should be set to exceed the time taken for a set to ramp on/off plus the time length of any load transients.

**NOTE:** If the Secondary AMSC from one Group controller is connected to another Group controller (e.g. P1 to P2) an arbitration fail alarm will be flagged as the two modules would have the same control token at the same time. In the event of this happening the Group Controller would not give up the Master Token and nothing will start.

**Load Demand Scheme**

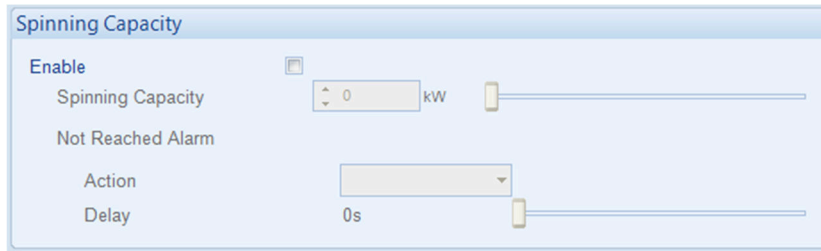


| Parameter                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Starting Options               | <p>Determines how the load demand scheme operates upon start-up.</p> <p><b>Continuous Running, Load all Initially:</b> Upon activation of the load demand scheme, all sets in the system start up and parallel onto the generator bus. As load demands, sets go off load / on load. The set continues to run regardless of load levels until requested to stop.</p> <p><b>Continuous Running, Load as Required:</b> Upon activation of the load demand scheme, all sets start initially, but only enough required to satisfy spinning capacity (if configured) go on load. Other sets in the system are only started according to demand. As load demands, sets become off load / on load. The set continues to run regardless of load levels until requested to stop.</p> <p><b>Start all sets initially:</b> Upon activation of the load demand scheme, all sets in the system start up (for the load demand scheme delay) and parallel onto the generator bus. As load demands sets start or stop. This option is particularly recommended in Multiset Mains standby applications where the load is likely to be greater than the capacity of a single set.</p> <p><b>Start sets as load requires:</b> Upon activation of the load demand scheme, only one set will start initially. Other sets in the system are only started according to demand. This option is recommended for mutual standby systems where the load is likely to be less than the capacity of a single set.</p> |
| Enable                         | <p>Select when load demand scheme becomes active:</p> <p><b>Always</b><br/> <b>Never</b><br/> <b>On Input</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Load/Start Next Set on Warning | <p><b>NOTE: Enabling Start Next Set on Warning results in the All Warnings are Latched option being forced on.</b></p> <p>Whenever a warning occurs, a start/load command is issued over the AMSC link to start the next highest priority set. The set with the warning stops once the next highest priority set has joined the bus.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Parameter descriptions are continued overleaf...

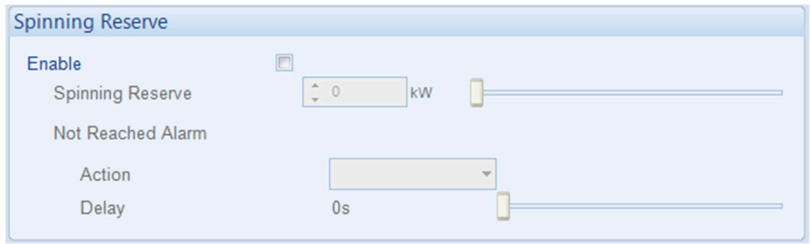
| Parameter                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Allow Set to Start with Warning | <p><input type="checkbox"/> = A stationary set with a warning alarm active will not be considered part of the load demand scheme and so will not be called on to start.</p> <p><input checked="" type="checkbox"/> = A stationary set with a warning alarm active will be considered part of the load demand scheme and may be called on to start if the load requires it.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Balance Engine Hours            | <p>Used in a Multiset system so that the engine's priority changes according to the amount of usage of the set.</p> <p>For instance, in a two-set system.</p> <p>Set 1 has logged 100 running hours<br/>Set 2 has logged 20 running hours<br/>Balance engine hours are configured to 75 hours.</p> <p>As Set 2 has logged 80 hours less than Set 1. As this is greater than the configured 75 hours, Set 2 is the highest priority set.</p> <p>If all sets are within the configured Balance Engine Hours value, then the set Priority Number (See SCADA   Maintenance page) is followed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Load Demand Scheme Delay        | Time delay used before Load Demand Scheme is initiated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Calling For Less Sets           | <p>The kW load level at which the module decides that generator is disconnected from the generator bus. The generator does not disconnect from the bus when its percentage of kW is below the <i>Calling For Less Sets</i> value. Instead, the generator disconnects from the bus when it ensures that the remaining generators' kW percentage is at the <i>Calling For Less Sets</i> value when it disconnects. This prevents the system from reaching a point where the load is such that the generator starts and stops repeatedly.</p> <p>Once the load is below this level, the lowest priority generator in the sequence (determined using the <i>Genset Priority</i>) begins its <i>Return Delay</i> timer. Once this has expired, the generator ramps off and stops.</p> <p>If the load level rises above this set point during the <i>Return Delay</i> timer, the timer is cancelled, and the generator continues to supply power to the load. This caters for short term reductions in kW load demand.</p> |
| Calling For More Sets           | <p>The kW load level at which the module calls for additional generators to join the generator bus.</p> <p>Once the load is above this level, the highest priority generator that is not running in the sequence (determined using the <i>Genset Priority</i>) begins its <i>Start Delay</i> timer. Once this has expired, the generator joins the bus and ramps up.</p> <p>If the load level reduces below this set point during the <i>Start Delay</i> timer, the timer is cancelled, and the generator enters its stops cycle. This caters for short term kW load demand.</p> <p>If the set fails to become available, it communicates this using the AMSC Link which signals the next generator in the sequence to take its place.</p>                                                                                                                                                                                                                                                                           |
| Start Delay                     | Time delay used at start up to ensure the start request is not simply a fleeting request.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Stop Delay                      | Time delay used to before a stop cycle is initiated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Spinning Capacity**



| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable             | <input type="checkbox"/> = <i>Spinning capacity</i> is disabled.<br><input checked="" type="checkbox"/> = <i>Spinning capacity</i> is enabled.                                                                                                                                                                                                                                                                               |
| Spinning Capacity  | The minimum power that will be available on the bus (this setting normally exceeds spinning reserve).                                                                                                                                                                                                                                                                                                                        |
| Not Reached Alarms | This is to set a time limit to the ramp down process, and it is useful when the engine response is slow or is not capable to ramp off the load.<br>The <i>Ramp Off Load</i> timer starts when the generator begins to ramp down. When this timer is expired the breaker opens regardless of the actual power.<br>It is possible to set the ramp rate slower than this time, so the breaker opens prior to the ramp finishes. |
| Action             | Select the action for the <i>Not Reached Alarm</i> :<br><b>Electrical Trip:</b><br><b>Warning:</b>                                                                                                                                                                                                                                                                                                                           |
| Delay              | Set the amount of time before the <i>Spinning Capacity Alarm</i> activates.                                                                                                                                                                                                                                                                                                                                                  |

**Spinning Reserve**



| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable             | <input type="checkbox"/> = <i>Spinning reserve</i> is disabled.<br><input checked="" type="checkbox"/> = <i>Spinning reserve</i> is enabled.                                                                                                                                                                                                                                                                                 |
| Spinning Reserve   | The power available over and above the load requirements on the bus. The load demand scheme will start further sets to ensure that this margin is maintained.                                                                                                                                                                                                                                                                |
| Not Reached Alarms | This is to set a time limit to the ramp down process, and it is useful when the engine response is slow or is not capable to ramp off the load.<br>The <i>Ramp Off Load</i> timer starts when the generator begins to ramp down. When this timer is expired the breaker opens regardless of the actual power.<br>It is possible to set the ramp rate slower than this time, so the breaker opens prior to the ramp finishes. |
| Action             | <div style="border: 3px double black; padding: 5px;"> <p><b>⚠ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> </div> <p>Select the action for the <i>Not Reached Alarm</i>:</p> <p><b>Electrical Trip:</b></p> <p><b>Warning:</b></p>                                                                                                                                                     |
| Delay              | Set the amount of time before the <i>Spinning Reserve Alarm</i> activates.                                                                                                                                                                                                                                                                                                                                                   |

### 3.8.9 POWER CONTROL

**NOTE:** The *Power Control* modes and *Voltage and Reactive Power Control* modes are to be used in conjunction with the following documents:  
Engineering Recommendation G99 Issue 1 – Amendment 8 and subsequent versions.  
- COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators  
- P1547 - IEEE Draft Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

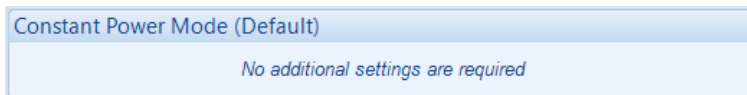
**NOTE:** The *Simulation Injection Testing* tool of the DSE Configuration Suite PC Software allows testing the generator's frequency response and check its performance for the *Power Control* curves. For details on how to test the *Simulation Injection* on the DSEG8600 module refer to DSE Publication: 056-123 Simulation Injection Testing document.

**NOTE:** The *Power Control* parameters only have effect when the module is configured for *Bus Mode* which instructs the module to operate in fixed export mode when in parallel with the Mains supply. For more information on this application, refer to section 4.7.5 entitled *Load Levels* within this document.

**NOTE:** Activation of the different *Power Control* modes is done through digital inputs, PLC functions, Front Panel Editor or Modbus; with digital inputs having higher priority over PLC functions, and PLC functions have higher priority over Front Panel Editor and ModBus commands.

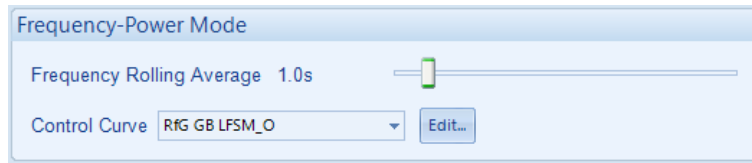
**NOTE:** Simultaneously activating different *Power Control* modes, results in the lowest number taking priority.

#### Constant Power Mode (Default)



This is the default mode of exporting power to the Mains (utility); where the module holds the amount of power produced by the Generator Bus at a constant level. The amount of power produced by the Generator Bus is irrespective of the load level or any other parameter. The amount of power produced is defined as *Maximum kW Level* and is set in SCADA/Generator/Load Levels section, through the Front Panel Running Editor, in PLC Functions, or via ModBus messages.

**Frequency-Power Mode**

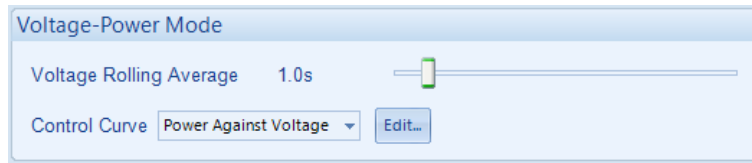


In this mode of exporting power to the Mains (utility); the module varies the amount of power produced by the Generator Bus with regards to the Control Curve depending on the measured frequency.

This mode allows the Generator Bus to support the Mains (utility) frequency stability by monitoring the frequency and changing the amount of power produced.

| Parameter                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Rolling Average | The measured frequency is averaged over the period of the <i>Frequency Rolling Average</i> . The average frequency is used in the <i>Control Curve</i> to determine the required level of power production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Control Curve             | <p>The <i>Control Curve</i> determines, based on the average frequency, the amount of power the Generator produces. This amount of power is a percentage of the <i>kW Maximum Load Level</i> set within the SCADA section.</p> <p>Select the <i>Control Curve</i> from a pre-defined list or create a user-defined curve.</p> <p><b>RfG GB LFSM_O</b>: Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Over frequency<br/> <b>RfG GB LFSM_U</b>: Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Under frequency<br/> <b>RfG GB LFSM_U and LFSM_O</b>: Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Under frequency and Over frequency<br/> <b>RfG GB FSM 5%</b>: Requirements for Generators Network Code in Great Britain, Frequency Sensitive Mode at 5%<br/> <b>P1547 60Hz 50%</b>: Requirements for Generators in United States, Frequency Sensitive Mode at 50%<br/> <b>P1547 60Hz 75%</b>: Requirements for Generators in United States, Frequency Sensitive Mode at 75%<br/> <b>P1547 60Hz 90%</b>: Requirements for Generators in United States, Frequency Sensitive Mode at 90%</p> |

**Voltage-Power Mode**

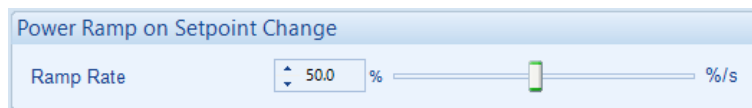


In this mode of exporting power to the Mains (utility); the module varies the amount of power produced by the Generator Bus with regards to the Control Curve depending on the measured voltage.

This mode allows the Generator Bus to support the Mains (utility) voltage stability by monitoring the voltage and changing the amount of power produced.

| Parameter               | Description                                                                                                                                                                                                                                                                                                                         |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Rolling Average | The measured voltage is averaged over the period of the <i>Voltage Rolling Average</i> . The average voltage is used in the <i>Control Curve</i> to determine the required level of power production.                                                                                                                               |
| Control Curve           | The <i>Control Curve</i> determines, based on the average voltage, the amount of power the Generator Bus produces. This amount of power is a percentage of the <i>kW Maximum Load Level</i> .<br><br>Select the <i>Control Curve</i> from a pre-defined list or create a user-defined curve.<br><b><i>Power Against Voltage</i></b> |

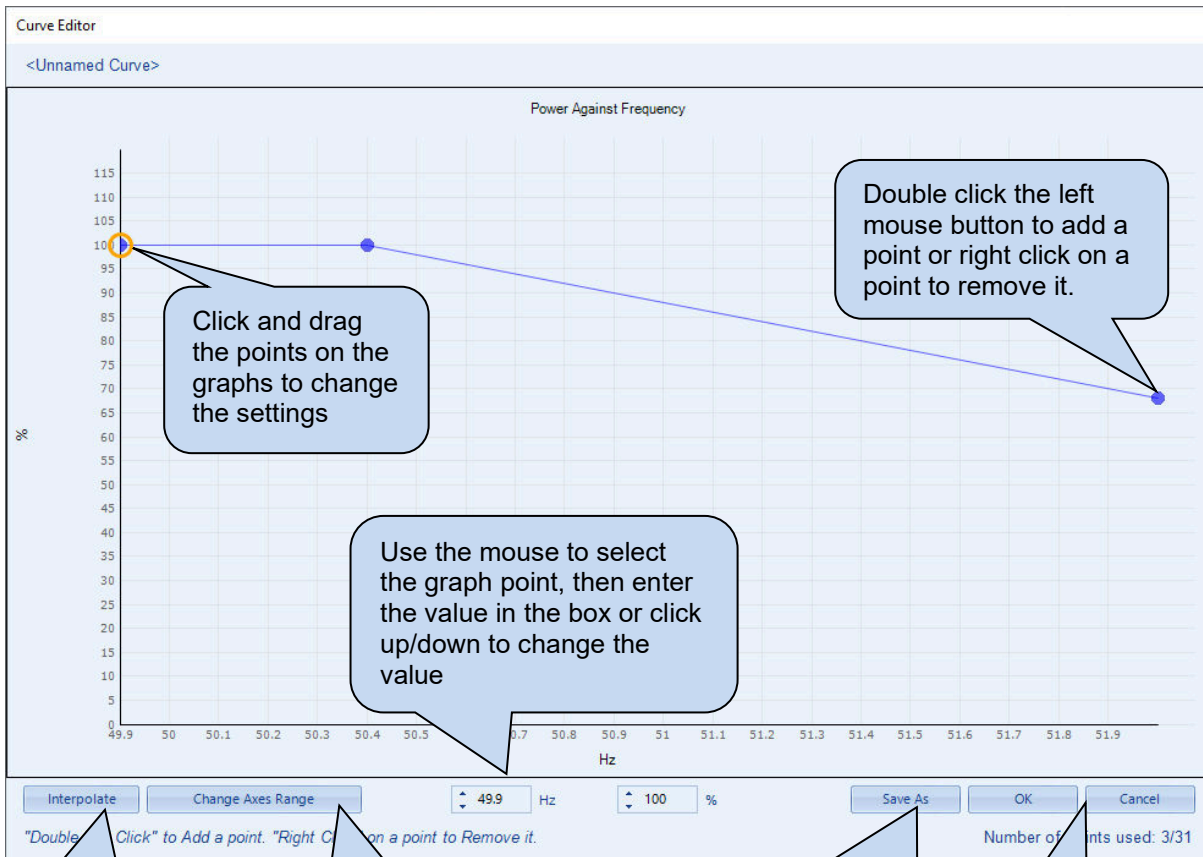
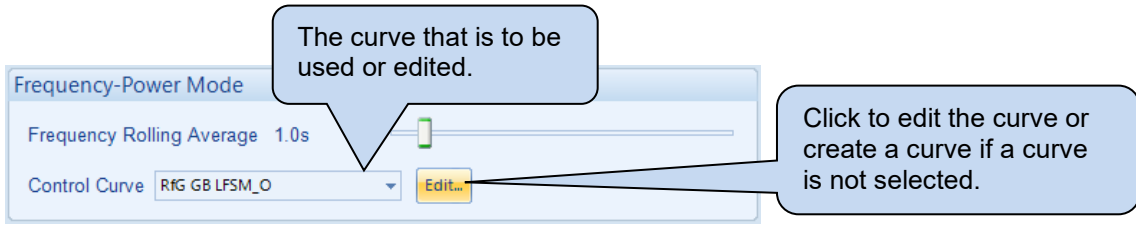
**Power Ramp on Setpoint Change**



| Parameter | Description                                                                                                                                                                 |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ramp Rate | When changing between <i>Power Control</i> modes or changing the set point, the <i>Ramp Rate</i> defines how fast the output power changes in percentage points per second. |

### 3.8.9.1 CREATING / EDITING THE POWER MODE CURVE

While the *DSE Configuration Suite* holds most used droop curves, occasionally it is required that the module's droop function be configured for a specification application not listed by the *DSE Configuration Suite*. To aid this process, a droop curve editor is provided.



Click *Interpolate* then select two points as prompted to draw a straight line between

Click to change the range of the X and Y Axes of the graph and the level of open circuit

Click *Save As*, a prompt to name the curve...

New Curve Name

Enter a name for the new curve

OK Cancel

Click OK to save the curve.

**Any saved curves become selectable in the *Input Type* selection list.**

Click OK to accept the changes or CANCEL to ignore and lose the changes.

**Hint:** Deleting, renaming, or editing custom sensor curves that have been added is performed in the main menu, select *Tools | Curve Manager*.

### 3.8.10 VOLTAGE AND REACTIVE POWER CONTROL

**NOTE:** The *Power Control* modes and *Voltage and Reactive Power Control* modes are to be used in conjunction with the following documents:  
 Engineering Recommendation G99 Issue 1 – Amendment 8 and subsequent versions.  
 - COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators  
 - P1547 - IEEE Draft Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

**NOTE:** The *Simulation Injection Testing* tool of the DSE Configuration Suite PC Software allows testing the generator’s voltage response and check its performance for the *Voltage & Reactive Power Control* curves. For details on how to test the *Simulation Injection* on the DSE8x10 module refer to DSE Publication: 056-123 Simulation Injection Testing document.

**NOTE:** The *Voltage and Reactive Power Control* parameters only have effect when the module is configured for *Bus Mode* which instructs the module to operate in fixed export mode when in parallel with the Mains supply. For more information on this application, refer to section 4.7.5 entitled *Load Levels* within this document.

**NOTE:** Activation of the different *Voltage and Reactive Power Control* modes is done through digital inputs, PLC functions, Front Panel Editor or Modbus; with digital inputs having higher priority over PLC functions, and PLC functions have higher priority over Front Panel Editor and ModBus commands.

**NOTE:** Simultaneously activating different *Voltage and Reactive Power Control* modes, results in the lowest number taking priority.

#### Constant Power Factor Mode

The screenshot displays the configuration for Constant Power Factor Mode. On the left, there are three control elements: a checked checkbox for 'Limit Power Factor', a 'Leading Power Factor Limit' slider set to -0.95 pf, and a 'Lagging Power Factor Limit' slider set to 0.85 pf. Below these is a 'Power Rolling Average' slider set to 1.0s. On the right, a diagram shows a semi-circle with a vertical line at the center. A green shaded area is bounded by -0.95pf on the left and 0.85pf on the right. The area to the left of -0.95pf is labeled 'Leading P.F' and the area to the right of 0.85pf is labeled 'Lagging P.F'.

In this mode of exporting power to the Mains (utility); the module varies the amount of reactive power produced by the Generator Bus with regards to maintaining the required power factor. This mode allows the Generator Bus to maintain a constant export power factor if so required. The required power factor is set in SCADA/Generator/Load Levels section, through the Front Panel Running Editor, PLC Functions, or ModBus messages.

Parameters described overleaf...

| Parameter                  | Description                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Limit Power Factor         | <input type="checkbox"/> = The Generator Bus produces reactive power beyond the power factor limits. Regardless of this setting, the generators do not produce more than their rated kvar.<br><input checked="" type="checkbox"/> = The Generator Bus produces reactive power within its specified power factor limits |
| Leading Power Factor Limit | The limit for Generator bus's leading power factor.                                                                                                                                                                                                                                                                    |
| Lagging Power Factor Limit | The limit for Generator bus's lagging power factor.                                                                                                                                                                                                                                                                    |
| Power Rolling Average      | The exported power is averaged over the period of the <i>Power Rolling Average</i> . The average power is then used to determine the required reactive power production to achieve the set power factor.                                                                                                               |

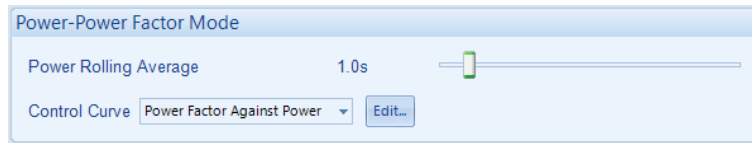
**Voltage-Reactive Power Mode**

In this mode of exporting power to the Mains (utility); the module varies the amount of reactive power produced by the Generator Bus with regards to the Control Curve depending on the measured voltage.

This mode allows the Generator Bus to support the Mains (utility) voltage stability by monitoring the voltage and changing the amount of reactive power produced.

| Parameter                  | Description                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Limit Power Factor         | <input type="checkbox"/> = The Generator Bus produces reactive power beyond the power factor limits. Regardless of this setting, the generators do not produce more than their rated kvar.<br><input checked="" type="checkbox"/> = The Generator Bus produces reactive power within its specified power factor limits.                             |
| Leading Power Factor Limit | The limit for Generator bus's leading power factor.                                                                                                                                                                                                                                                                                                 |
| Lagging Power Factor Limit | The limit for Generator bus's lagging power factor.                                                                                                                                                                                                                                                                                                 |
| Power Rolling Average      | The exported power is averaged over the period of the <i>Power Rolling Average</i> . The average power is used to calculate the power factor if the option <i>Limit Power Factor</i> is enabled.                                                                                                                                                    |
| Voltage Rolling Average    | The measured voltage is averaged over the period of the <i>Voltage Rolling Average</i> . The average voltage is used in the <i>Control Curve</i> to determine the required level of reactive power production.                                                                                                                                      |
| Control Curve              | The <i>Control Curve</i> determines, based on the average voltage, the amount of reactive power the Generator Bus produces. This amount of power is a percentage of the <i>kvar Maximum Load Level</i> .<br><br>Select the <i>Control Curve</i> from a pre-defined list or create a user-defined curve <b><i>Reactive Power Against Voltage</i></b> |

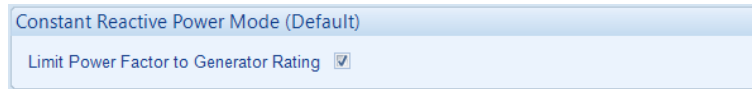
**Power-Power Factor Mode**



In this mode of exporting power to the Mains (utility); the module varies the amount of reactive power produced by the Generator Bus with regards to maintaining the required power factor. This power factor is derived from the averaged power using the *Control Curve*. This mode allows the Generator Bus to support the Mains (utility) stability by varying the power factor depending on the export power.

| Parameter             | Description                                                                                                                                                                                                                            |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Rolling Average | The exported power is averaged over the period of the <i>Power Rolling Average</i> . The average is then used in the <i>Control Curve</i> to determine the required power factor.                                                      |
| Control Curve         | The <i>Control Curve</i> determines, based on the average power, the power factor that is required.<br><br>Select the <i>Control Curve</i> from a pre-defined list or create a user-defined curve<br><b>Power Factor Against Power</b> |

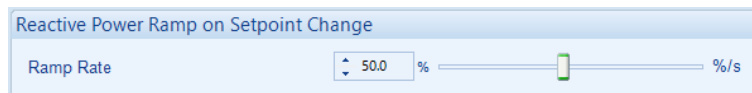
**Constant Reactive Power Mode (Default)**



This is the default mode of exporting power to the Mains (utility); where the module holds the amount of reactive power produced by the Generator Bus at a constant level. The amount of reactive power produced by the Generator Bus is irrespective of the load level or any other parameter. The amount of reactive power produced is defined as *Maximum kvar Level* and is set in SCADA/Generator/Load Levels section, through the Front Panel Running Editor, in PLC Functions, or via ModBus messages.

| Parameter                              | Description                                                                                                                                                                                                                                                                                                             |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Limit Power Factor to Generator Rating | <input type="checkbox"/> = The Generator Bus produces reactive power beyond the power factor limits. Regardless of this setting, the generators do not produce more than their rated kvar.<br><input checked="" type="checkbox"/> = The Generator Bus produces reactive power within its specified power factor limits. |

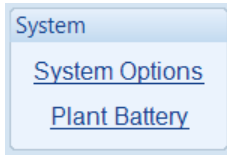
**Reactive Power Ramp on Setpoint Change**



| Parameter | Description                                                                                                                                                                                               |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ramp Rate | When changing between <i>Voltage and Reactive Power Control</i> modes or changing the set point, the <i>Ramp Rate</i> defines how fast the output reactive power changes in percentage points per second. |

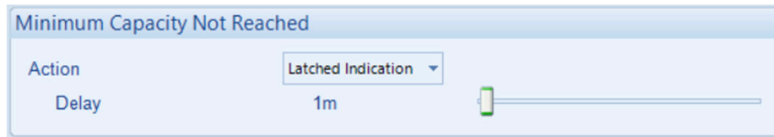
### 3.9 SYSTEM

The *System* section is subdivided into smaller sections. Select the required section with the mouse.



#### 3.9.1 SYSTEM OPTIONS

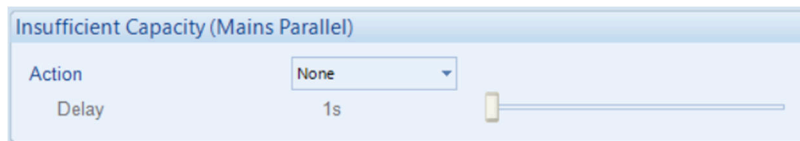
##### Minimum Capacity Not Reached



| Parameter | Description                                                                                                                                                                                                                                                                                                                                       |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action    | <p><b>▲ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip</b><br/> <b>Latched Indication</b><br/> <b>Warning Always Latched</b></p> <p>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> |
| Delay     | The time for enough generation capacity (generators) to close onto the bus before alarm is raised.                                                                                                                                                                                                                                                |

**▲ NOTE: The minimum capacity threshold is set in Scada/Load levels (*Load Capacity Required*)**

##### Insufficient Capacity



| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action    | <p>Activates when the module is operating in <i>Mains Mode</i> (Peak Lopping/Shaving) and the Generator Bus is producing 100 % of its rated kW for the configured <i>Delay</i> timer.</p> <p>The alarm action list is as follows, see section 5 entitled <i>Alarm Types</i> for more information:</p> <p><b>▲ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> <p><b>Electrical Trip</b><br/> <b>Indication</b><br/> <b>None</b><br/> <b>Warning</b></p> |

**Load CT**

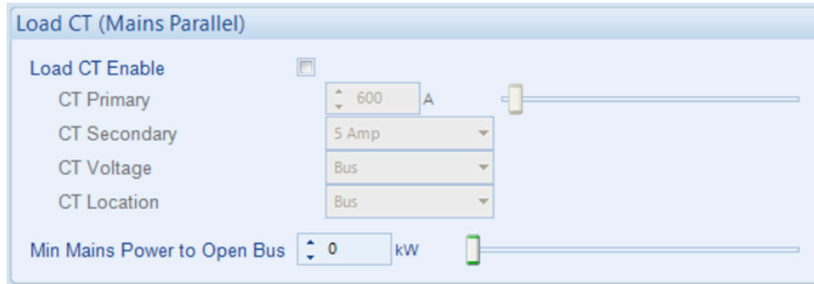
**NOTE:** For more information on the Load CT, refer to DSE Publication: *056-007 Advantages of Load CT* which is found on our website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)

The load CT is only required when there is more than one DSEGxx60 module connected on the AMSC link.

With the load CT fitted, the module transfers the right amount of load back to the Mains (so that is no power flowing through the bus breaker when it is opened) before disconnecting the Generator Bus. This prevents the Generator Bus being 'shock loaded'.

Without the load C.T., the module does not know how much load to transfer to the Mains when other DSExx60 modules are also running in island mode. This results in the module transferring a pre-determined amount of load before disconnecting the Generator Bus from the mains. This amount is configured by the *Min Mains Power to Open Bus* setting.

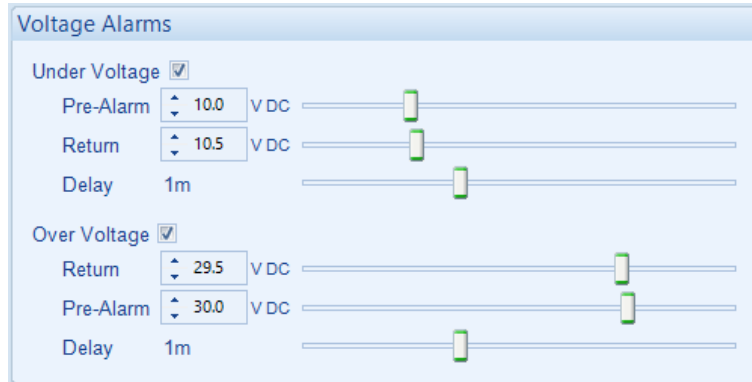
Hence, there is either too much load, or not enough load transferred, and the Generator Bus is 'shock loaded' as it is disconnected from the mains.



| Parameter                   | Description                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Load CT Enable              | <input type="checkbox"/> = The Load CT is disabled and the <i>Min Mains Power to Open Bus</i> is enabled.<br><input checked="" type="checkbox"/> = The Load CT enabled and the <i>Min Mains Power to Open Bus</i> is disable. There is only one CT for measuring/calculating load current, and it must be fitted on L1. The system assumes a balanced kw & kvar load on all phases, mirroring the values seen on L1. |
| CT Primary                  | Primary rating of the Current Transformer.                                                                                                                                                                                                                                                                                                                                                                           |
| CT Secondary                | Secondary rating of the Current Transformer.                                                                                                                                                                                                                                                                                                                                                                         |
| CT Voltage                  | The supply voltage used to multiply with the load current to calculate the load kW and kvar. This is useful when the system has different voltages for the Bus and Mains sensing.<br><b>Bus:</b> The Load CT is at the same potential as the Bus sensing.<br><b>Mains:</b> The Load CT is at the same potential as the Mains sensing.                                                                                |
| CT Location                 | The location where the L1 'Load CT' is situated:<br><b>Bus:</b> The 'Load CT' is situated on the L1 feed from the Generator Bus. The load current and power is calculated.<br><b>Load:</b> The 'Load CT' is situated on the common L1 feed to the load. The load current and power is measured.                                                                                                                      |
| Min Mains Power to Open Bus | <div style="border: 1px solid black; padding: 2px;"> <p><b>NOTE:</b> This parameter is only available when the Load CT is not enabled.</p> </div> The amount of Mains power at which the Generator Bus breaker opens when the Generator Bus is ramping down.                                                                                                                                                         |

### 3.9.2 PLANT BATTERY

#### Voltage Alarms



| Parameter                                                             | Description                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plant Battery Under Voltage<br>IEEE 37.2 -27 DC<br>Undervoltage Relay | <input type="checkbox"/> = The alarm is disabled.<br><input checked="" type="checkbox"/> = The alarm activates when the battery voltage drops below the configured <i>Pre-Alarm</i> level for the configured <i>Delay</i> time. When the battery voltage rises above the configured <i>Return</i> level, the alarm is de-activated. |
| Plant Battery Over Voltage<br>IEEE 37.2 -59 DC<br>Overvoltage Relay   | <input type="checkbox"/> = The alarm is disabled.<br><input checked="" type="checkbox"/> = The alarm activates when the battery voltage rises above the configured <i>Pre-Alarm</i> level for the configured <i>Delay</i> time. When the battery voltage drops below the configured <i>Return</i> level, the alarm is de-activated. |

### 3.10 MAINS/GROUP

The *Mains* section is subdivided into smaller sections.  
Select the required section with the mouse



 **NOTE: Some of the settings are also used for Group control.**

### 3.10.1 MAINS OPTIONS

#### AC System

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC System | <p>Select the AC topology of the Mains from the following list:</p> <ul style="list-style-type: none"> <li><b>2 Phase, 3 Wire L1 - L2</b></li> <li><b>2 Phase, 3 Wire L1 - L3</b></li> <li><b>3 Phase, 3 Wire</b></li> <li><b>3 Phase, 3 Wire NVD</b></li> <li><b>3 Phase, 4 Wire</b></li> <li><b>3 Phase, 4 Wire Delta L1 - N - L2</b></li> <li><b>3 Phase, 4 Wire Delta L1 - N - L3</b></li> <li><b>3 Phase, 4 Wire Delta L2 - N - L3</b></li> <li><b>Single Phase, 2 Wire</b></li> <li><b>Single Phase, 3 Wire L1 - L2</b></li> <li><b>Single Phase, 3 Wire L1 - L3</b></li> </ul>                                                          |
| VT Fitted | <p><input type="checkbox"/> = The voltage sensing to the controller is direct from the alternator<br/> <input checked="" type="checkbox"/> = The voltage sensing to the controller is via Voltage Transformers (VTs or PTs)</p> <p>This is used to step down the generated voltage to be within the controller voltage specifications.<br/>                     By entering the <i>Primary</i> and <i>Secondary</i> voltages of the transformer, the controller displays the <i>Primary</i> voltage rather than the actual measured voltage.</p> <p>This is typically used to interface the DSE module to high voltage systems (i.e. 11kV)</p> |

**Phase Rotation**

| Parameter                                             | Description                                                                                                |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Phase Rotation<br>IEEE 37.2 – 47 Phase Sequence Relay | An electrical trip or mains fail alarm is generated when the measured phase rotation is not as configured. |

**Breaker Control**

| Parameter             | Description                                                                                                                                                                                                      |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Breaker Alarms | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The <i>Mains Breaker Alarms</i> are enabled.                                                                               |
| Fail To Open Delay    | When the <i>Open Mains</i> output is activated, if the configured <i>Mains Closed Auxiliary</i> digital input does not become inactive within the <i>Mains Fail To Open Delay</i> timer, the alarm is activated. |
| Fail To Close Delay   | When the <i>Close Mains</i> output is activated, if the configured <i>Mains Closed Auxiliary</i> digital input does not become active within the <i>Mains Fail To Close Delay</i> timer, the alarm is activated. |

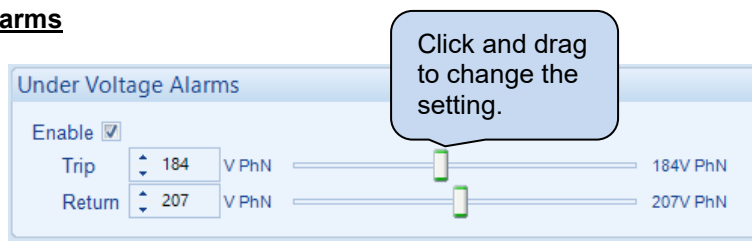
**Phase Offset**

| Parameter     | Description                                                                                                                                                                  |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Allow Editing | <input type="checkbox"/> = <i>Phase Offset</i> for the Mains VTs is disabled.<br><input checked="" type="checkbox"/> = The <i>Phase Offset</i> for the Mains VTs is enabled. |
| Phase Offset  | Set the phase angle between the main's VT primary and secondary.                                                                                                             |

**! CAUTION!** Editing the phase offset is only allowed when the checkbox is ticked. This setting is only required if a phase offset is available and should not be altered otherwise. If the setting is adjusted and no phase offset is required, then crash synchronisation may occur. This option is only available on the Mains Controller.

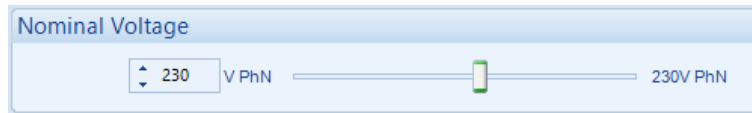
### 3.10.2 MAINS VOLTAGE ALARMS

#### Under Voltage Alarms



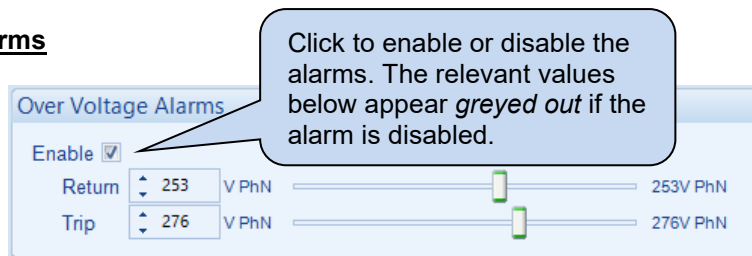
| Alarm                                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Under Voltage<br>IEEE 37.2 – 27 AC<br>Undervoltage Relay | <input type="checkbox"/> = Mains Under Voltage detection is disabled<br><input checked="" type="checkbox"/> = Mains Under Voltage gives an alarm in the event of the Mains voltage falling below the configured <i>Under Voltage Trip</i> value. The <i>Under Voltage Trip</i> value is adjustable to suit the application. The alarm is reset, and the Mains is considered within limits when the Mains voltage rises above the configured <i>Under Voltage Return</i> level. |

#### Nominal Voltage



| Parameter       | Description                                                                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Voltage | This is used to calculate the percentages of the alarm set points. It is also used when the Bus and Mains VTs have different ratios, to synchronise the voltage of both supplies. |

#### Over Voltage Alarms



| Parameter                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Over Voltage<br>IEEE 37.2 – 59 AC<br>Overvoltage Relay | <input type="checkbox"/> = Mains Over Voltage detection is disabled<br><input checked="" type="checkbox"/> = Mains Over Voltage gives an alarm in the event of the Mains voltage rising above the configured <i>Over Voltage Trip</i> value. The <i>Over Voltage Trip</i> value is adjustable to suit the application. The alarm is reset, and the Mains is considered within limits when the Mains voltage falls below the configured <i>Over Voltage Return</i> level. |

### 3.10.3 MAINS SEQUENCE ALARMS

#### Zero Sequence Alarm

| Parameter                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zero Sequence Alarm<br>IEEE 37.2 – 47H<br>Phase-Sequence Or Phase<br>Balance Voltage Relay | <p><b>NOTE:</b> The Zero Sequence Alarm must be set to a third of the required Neutral Voltage Displacement (NVD) value. This is because the summation of the three Zero Sequence vector components is equal to the NVD value.</p> <p>This is also known as Neutral Voltage Displacement.</p> <p><input type="checkbox"/> = Alarm is disabled.<br/> <input checked="" type="checkbox"/> = The alarm activates when the difference in potential between the Earth and the calculated Neutral position of a 3-wire delta exceeds the configured <i>Zero Sequence Alarm Trip</i> level for the configured <i>Delay</i> time.</p> |
| Action                                                                                     | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p> <p>Select the type of alarm required from the list:<br/> <b>Auxiliary Mains Fail</b><br/> <b>Electrical Trip</b><br/> <b>Warning</b></p> <p>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p>                                                                                                                                                                                                                                                                                            |
| Delay                                                                                      | The time to allow for successful action selected to take place. Should the process continue longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**NOTE:** These settings are also used for Group control.

#### Positive Sequence Alarm

| Parameter                                                                                      | Description                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positive Sequence Alarm<br>IEEE 37.2 – 47L<br>Phase-Sequence Or Phase<br>Balance Voltage Relay | <p><input type="checkbox"/> = Alarm is disabled.<br/> <input checked="" type="checkbox"/> = The alarm activates when the <i>Positive Sequence</i> voltage falls below the configured <i>Positive Sequence Alarm Trip</i> level for the configured <i>Delay</i> time.</p> |
| Action                                                                                         | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p>                                                                                                                                                                                 |

*Editing the Configuration*

|       |                                                                                                                                                                                                                                                          |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | <p>Select the type of alarm required from the list:<br/><b><i>Auxiliary Mains Fail</i></b><br/><b><i>Electrical Trip</i></b><br/><b><i>Warning</i></b><br/>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> |
| Delay | <p>The time to allow for successful action selected to take place. Should the process continue longer than <i>Delay</i>, the <i>Action</i> above is taken.</p>                                                                                           |

**Negative Sequence Alarm**

| Parameter                                                                                   | Description                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Negative Sequence Alarm<br>IEEE 37.2 – 47H<br>Phase-Sequence Or Phase Balance Voltage Relay | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The alarm activates when the <i>Negative Sequence</i> voltage exceeds the configured <i>Negative Sequence Alarm</i> level for the configured <i>Delay</i> time.                                                                              |
| Action                                                                                      | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p> <p>Select the type of alarm required from the list:<br/> <b>Auxiliary Mains Fail</b><br/> <b>Electrical Trip</b><br/> <b>Warning</b></p> <p>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> |
| Delay                                                                                       | The time to allow for successful action selected to take place. Should the process continue longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                           |

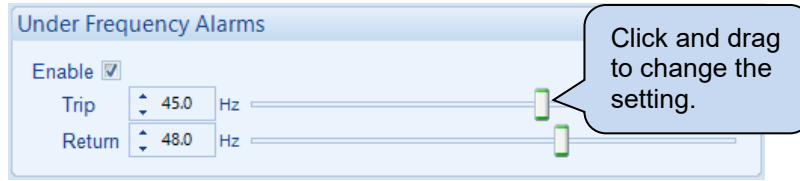
**Asymmetry Alarm**

| Parameter                                              | Description                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asymmetry Alarm<br>IEEE 37.2 – 59<br>Overvoltage Relay | <input type="checkbox"/> = Alarm is disabled<br><input checked="" type="checkbox"/> = The alarm activates when the voltage between any two phases exceeds the configured <i>Asymmetry Alarm Trip</i> level for the configured <i>Delay</i> time.<br><b>For example:</b><br>L1 = 230 V, L2 = 235 V, L3 = 226V<br>Asymmetry is <i>largest value – smallest value</i> = 235 V – 226 V = 9 V |
| Action                                                 | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p> <p>Select the type of alarm required from the list:<br/> <b>Auxiliary Mains Fail</b><br/> <b>Electrical Trip</b><br/> <b>Warning</b></p> <p>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p>                                                       |
| Delay                                                  | The time to allow for successful action selected to take place. Should the process continue longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                                                                                 |

*Editing the Configuration*

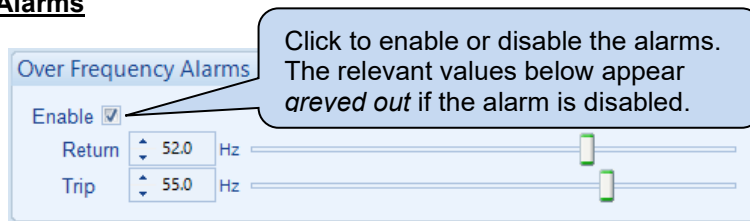
### 3.10.4 MAINS FREQUENCY ALARMS

#### Under Frequency Alarms



| Parameter                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Under Frequency<br>IEEE 37.2 – 81 Frequency<br>Relay | <input type="checkbox"/> = Mains Under Frequency detection is disabled<br><input checked="" type="checkbox"/> = Mains Under Frequency gives an alarm in the event of the Mains frequency falling below the configured <i>Under Frequency Trip</i> value. The <i>Under Frequency Trip</i> value is adjustable to suit the application. The alarm is reset, and the mains is considered within limits, when the mains frequency rises above the configured <i>Under Frequency Return</i> level. |

#### Over Frequency Alarms



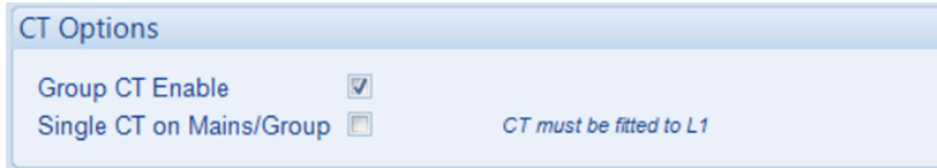
| Parameter                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Over Frequency<br>IEEE 37.2 – 81 Frequency<br>Relay | <input type="checkbox"/> = Mains Over Frequency detection is disabled<br><input checked="" type="checkbox"/> = Mains Over Frequency gives an alarm in the event of the Mains frequency rising above the configured <i>Over Frequency Trip</i> value. The <i>Over Frequency Trip</i> value is adjustable to suit the application. The alarm is reset, and the mains is considered within limits, when the mains frequency falls below the configured <i>Over Frequency Return</i> level. |

### 3.10.5 CURRENT



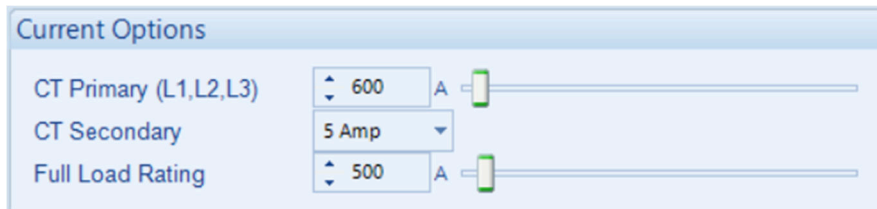
#### 3.10.5.1 CURRENT OPTIONS

##### CT Options



| Parameter                | Description                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group CT Enable          | <input type="checkbox"/> = Group CT is disabled<br><input checked="" type="checkbox"/> =Group CT is enabled.                                                                                                                                                                                                                                               |
| Single CT on Mains/Group | <input type="checkbox"/> = <i>Single CT on Mains</i> disabled. A CTs is required on each phase for measuring mains current,<br><input checked="" type="checkbox"/> = <i>Single CT on Mains</i> enabled. Only one CT for measuring mains current is required. The system assumes a balanced kw & kvar load and all phases, mirroring the values seen on L1. |

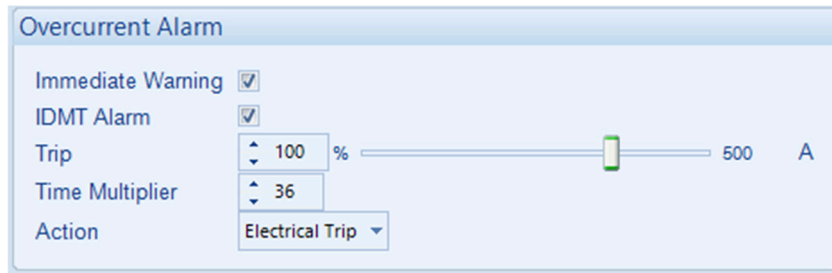
##### Current Options



| Parameter        | Description                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CT Primary       | Primary rating of the three phase current transformers.                                                                                                                                |
| CT Secondary     | Secondary rating of all the current transformers, options are:<br><b>1 Amp</b> - Select for 1 amp secondary winding rating.<br><b>5 Amp</b> Select for 5 amp secondary winding rating. |
| Full Load Rating | The kW rating of the mains incoming supply. This is used for calculating the power control when the Generator Bus is in long term parallel with the mains                              |


### 3.10.5.2 CURRENT ALARMS (GROUP CONTROLLER)

#### Overcurrent Alarm



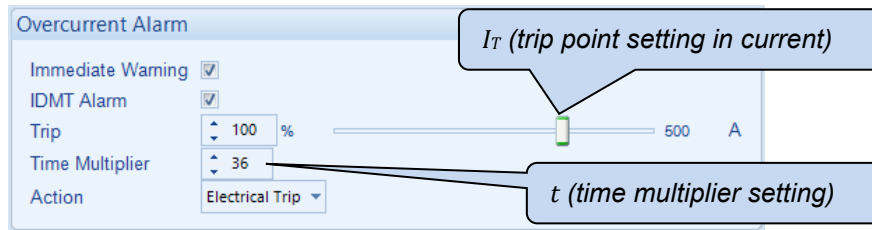
The overcurrent alarm combines a simple warning trip level combined with a fully functioning IDMT curve for thermal protection.

| Parameter                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Immediate Warning<br>IEEE 37.2 -50<br>instantaneous overcurrent<br>relay                 | If the <i>Immediate Warning</i> is enabled, the controller generates a <i>warning alarm</i> as soon as the <i>Trip</i> level is reached. The alarm automatically resets once the generator loading current falls below the <i>Trip</i> level (unless <i>All Warnings are latched</i> is enabled). For further advice, consult the generator supplier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| IDMT Alarm<br>IEEE 37.2 -51 AC time<br>overcurrent relay<br>(shutdown / electrical trip) | If the <i>Over Current IDMT Alarm</i> is enabled, the controller begins following the IDMT 'curve' when the current on any phase passes the <i>Trip</i> setting.<br><br>If the <i>Trip</i> is surpassed for an excess amount of time, the <i>IDMT Alarm</i> triggers ( <i>Shutdown</i> or <i>Electrical Trip</i> as selected in <i>Action</i> ).<br><br>The larger the over circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:<br><br>$T = \frac{t}{\left(\frac{I_A}{I_T} - 1\right)^2}$<br><br><b>Where:</b><br>T is the tripping time in seconds<br>I <sub>A</sub> is the actual measured current of the most highly loaded line (L1, L2 or L3)<br>I <sub>T</sub> is the <i>Trip</i> setting in amps<br>t is the <i>Time Multiplier</i> setting and represents the tripping time in seconds at twice full load (when $I_A/I_T = 2$ ). |
| Trip                                                                                     | The percentage of alternator full load current at which the IDMT Alarm curve starts to operate from.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Time Multiplier                                                                          | The time multiplier constant throughout the IDMT curve. It also represents the tripping time in seconds at 200% alternator full load current.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Action                                                                                   | <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p> </div> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip</b><br/> <b>Indication</b><br/> <b>Warning</b><br/>                     For details of these, see the section 5 entitled <i>Alarm Types</i> for further information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

 **NOTE: If a breaker is not fitted an Electrical Trip action will trip the breakers on the connected generators. Any generators in the same segment will trip their breakers and on the other side of a Bus Tie unless the Bus Tie is open.**

### Overcurrent Protection Explanation

The settings shown in the example below are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite PC Software for a brushless alternator.



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, and 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 alternator is safely overloaded is governed by how high the overload condition is.

The default settings as shown above allow for an overload of the alternator to the limits of the *Typical Brushless Alternator* whereby 110% overload is permitted for 1 hour or 200% overload is permitted for 36 seconds.

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

For further details on the *Thermal Damage Curve* of your alternator, refer to the alternator manufacturer and generator supplier.

### Creating A Spreadsheet For the Over Current IDMT Curve

The formula used:

$$T = \frac{t}{\left(\frac{I_A}{I_T} - 1\right)^2}$$

#### Where:

- $T$  is the tripping time in seconds
- $I_A$  is the actual measured current of the most highly loaded line (L1, L2 or L3)
- $I_T$  is the *Trip* setting in amps
- $t$  is the *Time Multiplier* setting and represents the tripping time in seconds at twice full load (when  $I_A/I_T = 2$ ).

The equation is simplified for addition into a spreadsheet. This is useful for 'trying out' different values of  $t$  (*Time Multiplier* setting) and viewing the results, without testing this on the generator.

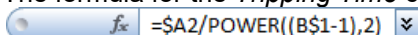
|   | A  | B      | C     | D     | E     | F     |
|---|----|--------|-------|-------|-------|-------|
| 1 |    | 1.01   | 1.02  | 1.03  | 1.05  | 1.06  |
| 2 | 36 | 360000 | 90000 | 40000 | 14400 | 10000 |

$t$  (*time multiplier setting*)

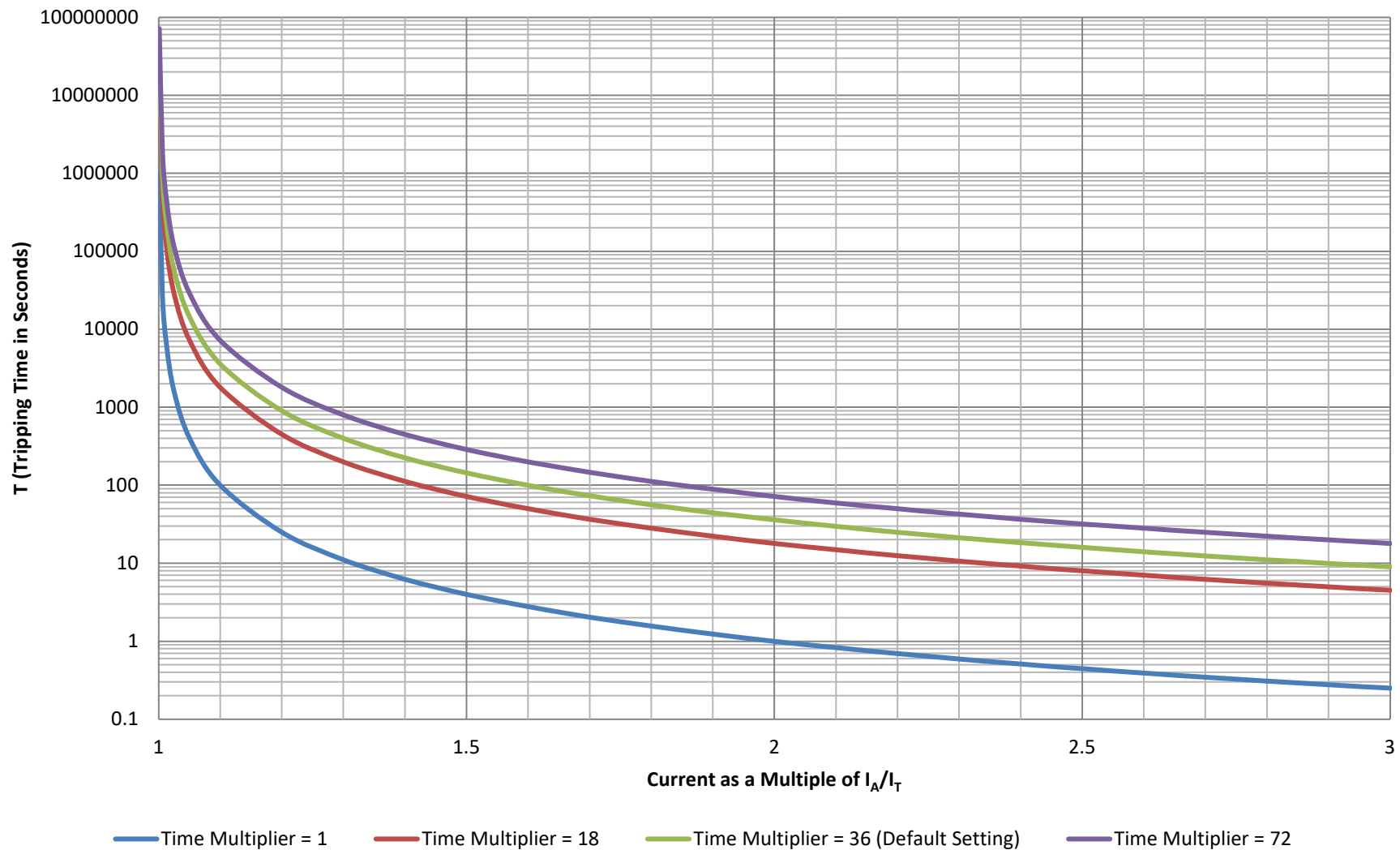
$T$  (*tripping time in seconds*)

$I_A/I_T$  (*multiple of the Trip setting from 1.01 to 3.0 in steps of 0.01*)

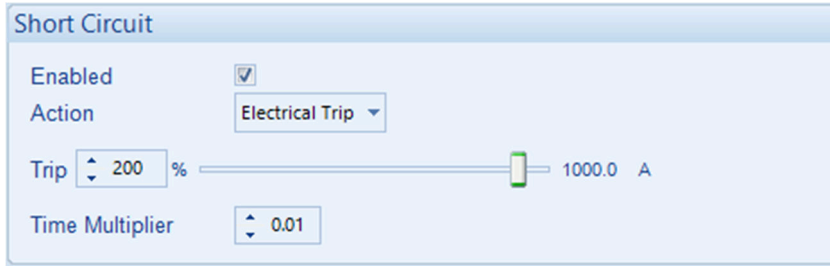
The formula for the *Tripping Time* cells is:



### Over Current Alarm IDMT Curves



**Short Circuit**

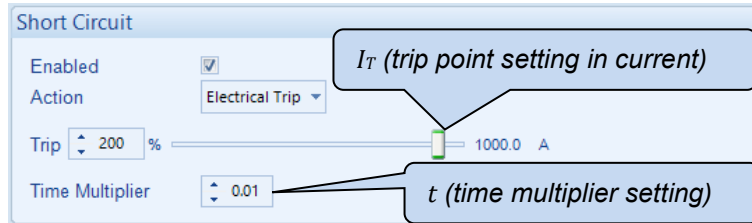


| Parameter                                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Short Circuit Enable<br>IEEE C37.2 – 51 IDMT<br>Short Circuit Relay | <p>If the <i>Short Circuit Alarm</i> is enabled, the controller begins following the IDMT 'curve' when the current on any phase passes the <i>Trip</i> setting.</p> <p>If the <i>Trip</i> is surpassed for an excess amount of time, the <i>IDMT Alarm</i> triggers (<i>Shutdown</i> or <i>Electrical trip</i> as selected in <i>Action</i>).</p> <p>The larger the short circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:</p> $T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$ <p>Where:<br/> <i>T</i> is the tripping time in seconds (accurate to ±5 % or ±50 ms (whichever is greater))<br/> <i>I<sub>A</sub></i> is the actual measured current<br/> <i>I<sub>T</sub></i> is the <i>Trip</i> setting in current<br/> <i>t</i> is the <i>Time Multiplier</i> setting</p> |
| Action                                                              | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i>.</p> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip Indication</b><br/> <b>Warning</b><br/>                     For details of these, see the section 5 entitled <i>Alarm Types</i> for further information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Trip                                                                | The percentage of alternator full load current at which the IDMT Alarm curve starts to operate from.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Time Multiplier                                                     | The time multiplier constant throughout the IDMT curve.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### Short Circuit Protection Explanation

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

**NOTE:** Due to large inrush currents from certain loads, such as motors or transformers, the default settings for the Short Circuit alarm may need adjusting to compensate for normal operating conditions.



The effect of a short circuit on the generator is that the alternator stator and rotor begin to overheat; the aim of the *IDMT alarm* is to prevent the stator and rotor being overload (heated) too much. The amount of time that the alternator is safely overloaded is governed by how high the short circuit condition is.

For further details on the *Thermal & Magnetic Damage Curve* of your alternator, refer to the alternator manufacturer and generator supplier.

### Creating a Spreadsheet For the Short Circuit IDMT Curve

The formula used:

$$T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$$

Where:

- $T$  is the tripping time in seconds (accurate to  $\pm 5\%$  or  $\pm 50$  ms (whichever is greater))
- $I_A$  is the actual measured current
- $I_T$  is the *Trip* setting in current
- $t$  is the *Time Multiplier* setting

The equation is simplified for addition into a spreadsheet. This is useful for 'trying out' different values of  $t$  (*time multiplier setting*) and viewing the results, without testing this on the generator.

|   | A    | B        | C    | D        | E    | F        |
|---|------|----------|------|----------|------|----------|
| 1 |      | 1.01     | 1.02 | 1.03     | 1.05 | 1.06     |
| 2 | 0.01 | 7.034242 | 25   | 11.11111 | 4    | 2.777778 |

$t$  (*time multiplier setting*)

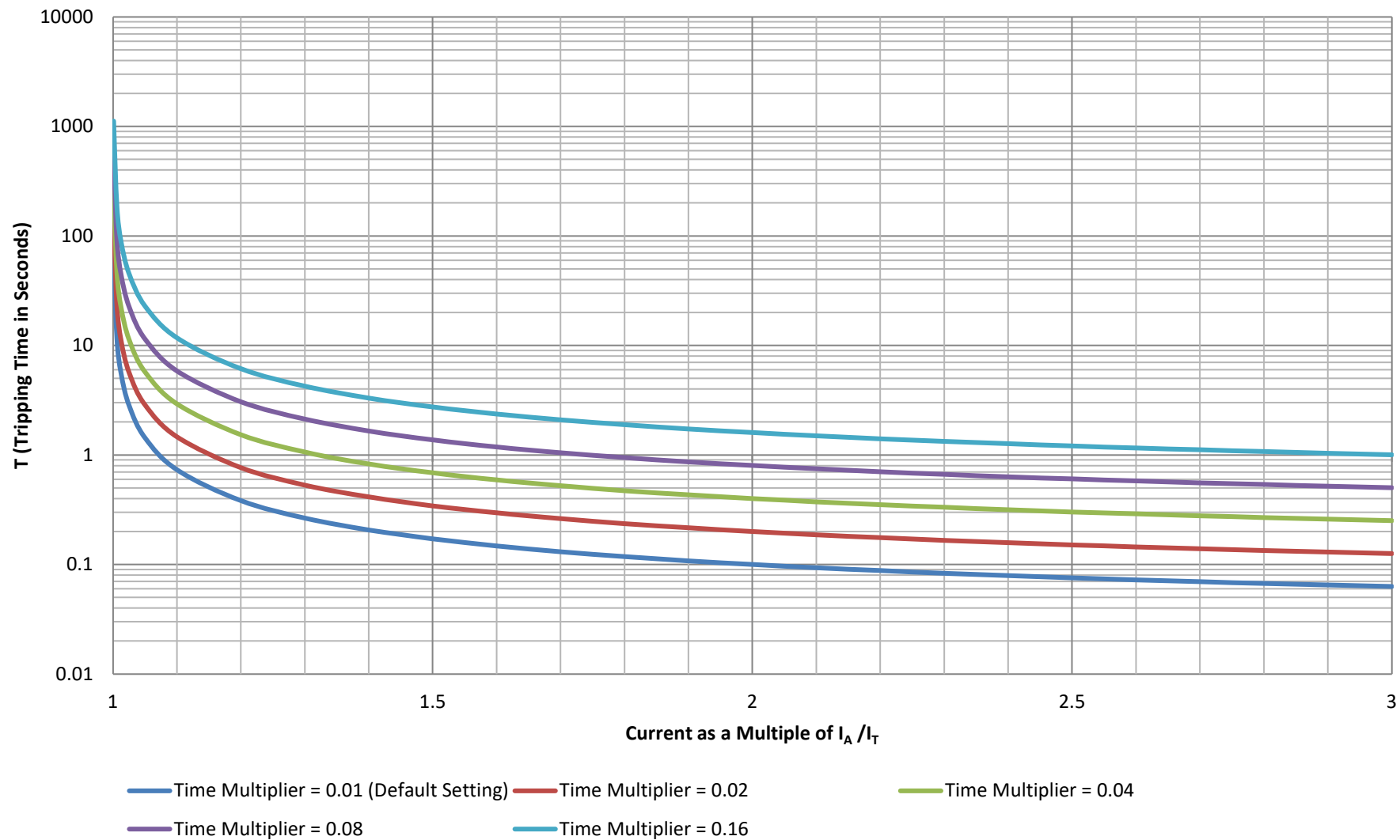
$T$  (*tripping time in seconds*)

$I_A/I_T$  (*multiple of the Trip setting from 1.01 to 3.0 in steps of 0.01*)

The formula for the *Tripping Time* cells is:

$f_x$  `=(A2*0.14)/(POWER((B$1),0.02)-1)`

### Short Circuit Alarm IDMT Curves



### 3.10.6 POWER

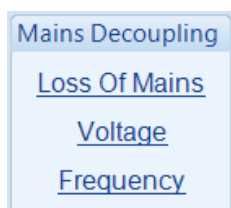
#### Mains Rating

| Parameter                            | Description                                                                                                                                                                                                                                                                                         |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Full Load Rating<br>Full kVAr Rating | <p>Full load rating (100% rating) of the mains supply<br/>The kW and kvar rating must be correctly set.<br/>The values set here are the kW and kvar, NOT the kVA or Power Factor!</p> <p>These values are used for many functions including <i>Mains Power</i> and <i>Load Share</i> functions.</p> |

#### Mains Reverse Power (Mains Export Limit)

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Export Power | <input type="checkbox"/> = The DSE module does not monitor the export kilowatt.<br><input checked="" type="checkbox"/> = the DSE module measures power exported to the mains supply and provides an alarm condition if the <i>Export Power</i> value is exceeded by the <i>Trip</i> value for the configured <i>Delay</i> time.                                                                       |
| Action       | <div style="border: 2px solid black; padding: 5px;"> <p><b>⚠ NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i>.</b></p> </div> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip</b><br/> <b>None</b><br/> <b>Warning</b><br/>                     For details of these, see the section 5 entitled <i>Alarm Types</i> for further information.</p> |
| Delay        | The time to allow for successful action selected to take place. Should the process continue longer than <i>Delay</i> , the <i>Action</i> above is taken.                                                                                                                                                                                                                                              |

### 3.10.7 MAINS DECOUPLING



The *Mains Decoupling* section is subdivided into smaller sections. Select the required section with the mouse.

The controller includes “Main’s decoupling” detection to be used with generators paralleling with the Mains (utility) supply.

When the Generator Bus is in parallel with the Mains supply it is important that failure of the Mains is detected as soon as possible otherwise problems arise. It is not possible to simply monitor the Mains voltage and frequency as the sensing of this is now being fed by the Generator Bus itself!

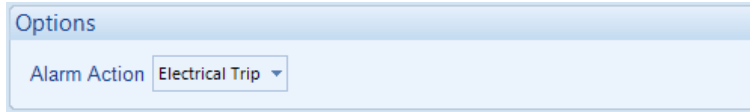
Because of this and other possible dangerous situations, the power supply companies impose regulations when generators are in parallel. This is to detect mains failure during parallel operation and to remove the Generator from the grid in this situation.

Failure to detect and act upon loss of Mains supply when in parallel leads to the following effects:

- The Generator feeds the site load and attempts to feed the load of the grid. Depending upon the Generator Bus size and the location of the network fault, this causes problems to the Generator Bus in terms of capacity and stability.
- If the Generator Bus can supply the load, Engineers working on the supposedly dead network would be in fact working on live cables, supplied by the Generator Bus. This is potentially fatal.
- When the Mains supply is reconnected and the Generator Bus is still connected to the grid, the network would be connected to the Generator Bus but not synchronised with it, with damaging results (mechanical failure, rotating diode failure, overloaded cables, pole slip etc).

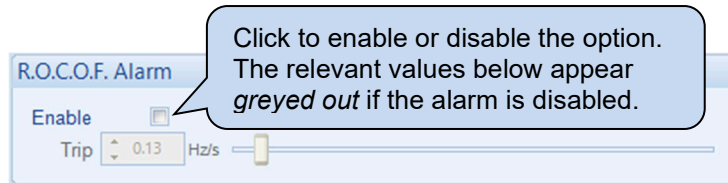
### 3.10.7.1 LOSS OF MAINS

#### Options



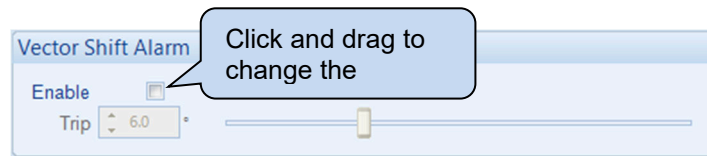
| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action    | <p>Select the required action when the module detects a Mains decoupling event:</p> <p><b>Auxiliary Mains Fail:</b> Opens the Mains switchgear and allows the Generator Bus to continue providing power to the load.</p> <p><b>Electrical Trip:</b> The Generator Bus switchgear is opened, and the generators are allowed to perform a cooling run before being stopped. If the Mains is within limits after the decoupling event, it continues to supply the load.</p> <p><b>Warning:</b> Audible alarm is generated but the switchgear is not opened.</p> <p>For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> |

#### R.O.C.O.F. Alarm



| Parameter                                    | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R.O.C.O.F.<br>IEEE 37.2 - 81 Frequency relay | <p><input type="checkbox"/> = R.O.C.O.F. protection is disabled</p> <p><input checked="" type="checkbox"/> = R.O.C.O.F. protection is enabled when the Generator Bus is in parallel with the Mains supply.</p> <p>R.O.C.O.F. detection senses sudden, fast changes in the frequency of the waveform. During the failure of the Mains supply when in parallel with the Generator bus, the frequency changes faster than is usual by either the on-load Generator bus, or by the Mains supply.</p> |

#### Vector Shift Alarm



| Parameter    | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vector Shift | <p><input type="checkbox"/> = Vector Shift protection is disabled.</p> <p><input checked="" type="checkbox"/> = Vector Shift protection is enabled. The <i>Vector Shift Alarm</i> activates when the generator/Mains voltage vector changes by more than the <i>Trip</i> setting. The <i>Vector Shift Alarm</i> is only enabled when the generator is in parallel with the Mains supply.</p> <p>Vector Shift detection measures the length of each cycle of the voltage wave. When the Mains fails in parallel with the Generator bus, the sudden change in load creates a change in the length of the cycle length.</p> |

### 3.10.7.2 VOLTAGE ALARMS

#### Options

| Parameter    | Description                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Action | The <i>Alarm Action</i> is locked to the same configuration as in the <i>Loss Of Mains</i> . This section is displayed for clarification purposes only. |

#### Limits

| Parameter               | Description                                                                                                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Impose IEEE 1547 Limits | <p><b>NOTE: Category Limits are only applicable for 60Hz nominal frequency.</b></p> <p>Limit the Mains Decoupling Alarms as imposed by IEEE rules, options are:</p> <p><b>No Limits</b><br/> <b>Category I Limit</b><br/> <b>Category II Limit</b><br/> <b>Category III Limit</b></p> |

#### Under Voltage Alarms

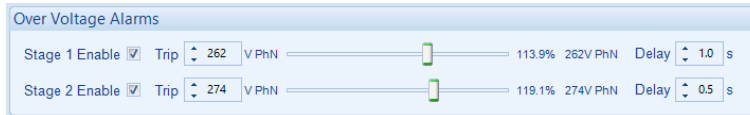
| Parameter                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Under Voltage, Stage 1 to Stage 2<br>IEEE 37.2 - 27AC<br>Undervoltage Relay | <p>These are '2 stage' alarms.</p> <p>Stage 1 allows for a delayed operation should the voltage stray by a small amount.</p> <p>Stage 2 allows for a faster trip should the voltage change by a larger amount.</p> <p><input type="checkbox"/> = Mains Under Voltage does NOT give an alarm<br/> <input checked="" type="checkbox"/> = Mains Under Voltage protection is enabled when the Generator Bus is in parallel with the Mains supply. The alarm activates when the Mains voltage falls below the configured <i>Under Voltage Alarm Trip</i> value for longer than the <i>Delay</i>. The <i>Under Voltage Alarm Trip</i> value is adjustable to suit user requirements.</p> |

**Nominal Voltage**



| Parameter             | Description                                                                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Nominal Voltage | The <i>Mains Nominal Voltage</i> is locked to the same configuration as the <i>Bus Nominal Voltage</i> . This section is displayed for clarification purposes only. |

**Over Voltage Alarms**



| Parameter                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Over Voltage, Stage 1 to Stage 2<br>IEEE 37.2 - 59AC<br>Overvoltage Relay | <p>These are '2 stage' alarms.</p> <p>Stage 1 allows for a delayed operation should the voltage stray by a small amount.</p> <p>Stage 2 allows for a faster trip should the voltage change by a larger amount.</p> <p><input type="checkbox"/> = Mains Over Voltage does NOT give an alarm</p> <p><input checked="" type="checkbox"/> = Mains Over Voltage protection is enabled when the Generator Bus is in parallel with the Mains supply. The alarm activates when the Mains voltage rises above the configured <i>Over Voltage Alarm Trip</i> value for longer than the <i>Delay</i>. The <i>Over Voltage Alarm Trip</i> value is adjustable to suit user requirements.</p> |

### 3.10.7.3 FREQUENCY

#### Options

Options

Alarm Action Electrical Trip ▼

| Parameter    | Description                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Action | The <i>Alarm Action</i> is locked to the same configuration as in the <i>Loss Of Mains</i> . This section is displayed for clarification purposes only. |

#### Limits

Limits

Impose IEEE 1547 Limits No Limits ▼

| Parameter               | Description                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Impose IEEE 1547 Limits | <div style="border: 3px double black; padding: 5px;"> <p><b>NOTE: Category Limits are only applicable for 60Hz nominal frequency.</b></p> </div> <p>The <i>Limits</i> is locked to the same configuration as in the <i>Mains Decoupling Voltage</i> Section's <i>Limits</i>. This section is displayed for clarification purposes only.</p> |

#### Under Frequency Alarms

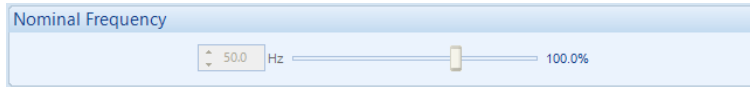
Under Frequency Alarms

Stage 2 Enable  Trip 47.00 Hz  94.0% Delay 0.50 s

Stage 1 Enable  Trip 47.50 Hz  95.0% Delay 20.00 s

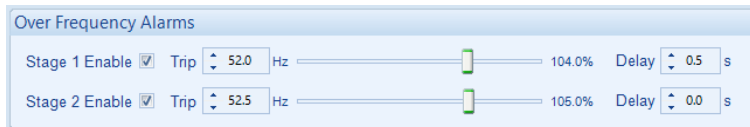
| Parameter                                                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Under Frequency, Stage 1 to Stage 2<br><span style="color: orange;">IEEE 37.2 – 81L Frequency Relay</span> | <p>These are '2 stage' alarms.</p> <p>Stage 1 allows for a delayed operation should the frequency stray by a small amount.</p> <p>Stage 2 allows for a faster trip should the frequency change by a larger amount.</p> <p><input type="checkbox"/> = Mains Under Frequency does NOT give an alarm<br/> <input checked="" type="checkbox"/> = Mains Under Frequency protection is enabled when the Generator Bus is in parallel with the Mains supply. The alarm activates when the Mains voltage falls below the configured <i>Under Frequency Alarm Trip</i> value for longer than the <i>Delay</i>. The <i>Under Frequency Alarm Trip</i> value is adjustable to suit user requirements.</p> |

**Nominal Frequency**



| Parameter               | Description                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Nominal Frequency | The <i>Mains Nominal Frequency</i> is locked to the same configuration as the <i>Bus Nominal Frequency</i> . This section is displayed for clarification purposes only. |


**Over Frequency Alarms**



| Parameter                                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Over Frequency, Stage 1 to Stage 5<br>IEEE 37.2 – 81H Frequency Relay | <p>These are '2 stage' alarms.</p> <p>Stage 1 allows for a delayed operation should the frequency stray by a small amount.</p> <p>Stage 2 allows for a faster trip should the frequency change by a larger amount.</p> <p><input type="checkbox"/> = Mains Over Frequency does NOT give an alarm.</p> <p><input checked="" type="checkbox"/> = Mains Over Frequency protection is enabled when the Generator Bus is in parallel with the Mains supply. The alarm activates when the Mains voltage rises above the configured <i>Over Frequency Alarm Trip</i> value for longer than the <i>Delay</i>. The <i>Over Frequency Alarm Trip</i> value is adjustable to suit user requirements.</p> |

### 3.10.8 FAULT RIDE THROUGH

 **NOTE:** To configure these settings refer to the appropriate grid standards for paralleling with the mains.

 **NOTE:** The *Fault Ride Through* feature is used to prevent the generator being disconnected from the Mains when in parallel during a momentary Mains Failure. Care **MUST** be taken when configuring the *Fault Ride Through* feature as a prolonged time in parallel with a failed mains might cause a damage to the generator.

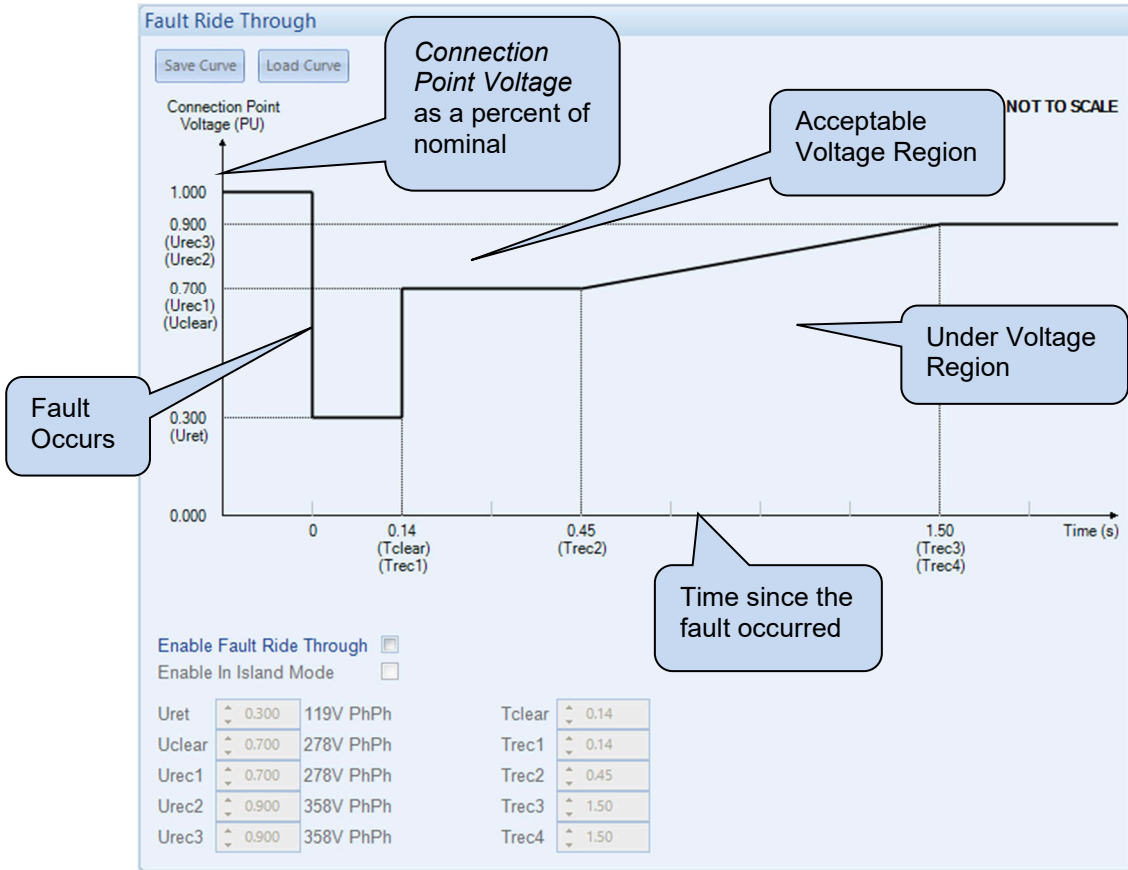
The *Fault Ride Through* feature is useful to prevent Electrical Trips on voltage dips caused by the grid when the generator is running in *Multi Set* mode. This feature is also applicable on generators paralleling. The feature is to ignore the following *Electrical Trip* and *Shutdown* alarms:

- *Reverse Power*
- *Short Circuit*
- *Unbalanced Load*
- *Overcurrent*
- *Under Voltage*
- *Over Voltage*
- *Under Frequency*
- *Over Frequency*
- *Under Speed*
- *Over Speed*
- *Mains Decoupling Voltage & Frequency Stage Alarms*
- *Over Load*
- *Low Load*
- *Phase Rotation*
- *Earth Fault*

The *Fault Ride Through* curve must be configured which is formed of a sequence of *Connection Point Voltages* which increase after consecutive time intervals. The *Fault Ride Through* curve allows the generator to ignore the above list of alarms if the voltage remains above the specified curve during the transmission grid fault and recovery.

The curve starts when the voltage on one or more of the generator phases falls below the Urec3 level. The curve ends on the expiry of Trec4, after which all alarms will trip as usual.

The *Connection Point Voltages* are configured in *PU (Per Unit)* which represent the percentages of the *Generator Nominal Voltage*; (i.e. 0.30PU = 30%). All the timers are configured in hundredths of a second.



| Parameter                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Fault Ride Through | <input type="checkbox"/> = <i>Fault Ride Through</i> is disabled when in <i>Mains Parallel Mode</i> .<br><input checked="" type="checkbox"/> = <i>Fault Ride Through</i> is enabled when in <i>Mains Parallel Mode</i> .                                                                                                                                                                                                                                            |
| Enable In Island Mode     | <input type="checkbox"/> = <i>Fault Ride Through</i> is disabled when load sharing with generators only.<br><input checked="" type="checkbox"/> = <i>Fault Ride Through</i> is enabled when load sharing with generators only.                                                                                                                                                                                                                                      |
| Uret                      | When the <i>Fault Ride Through</i> event starts, the voltage must remain above this level to ignore the <i>Gen Low Voltage Electrical Trip</i> or <i>Shutdown</i> alarm. This is the voltage that must be retained. If it falls below this then the list of alarms is enabled.                                                                                                                                                                                      |
| Tclear                    | During the normal operation when the voltage drops below the <i>Urec3</i> level this timer is started and the <i>Fault Ride Through</i> event is activated. After this time, the DSE module monitors the voltage to ensure it remains above the FRT curve to ignore the alarms. This timer ends at the next <i>Connection Point Voltage</i> ( <i>Uclear</i> ) of the curve. This is set longer than the clearance time of the transmission grid's circuit breakers. |
| Uclear                    | The next <i>Connection Point Voltage</i> level at the <i>Tclear</i> time, above which the voltage must be to ignore the <i>Gen Low Voltage Alarm</i> . The voltage must recover above this level after the transmission grid's circuit breaker clears, if not then the list of alarms is enabled.                                                                                                                                                                   |
| Trec1                     | The time in seconds that the <i>FRT event</i> is active for. The voltage must be raised above the <i>Urec1</i> level at this time.                                                                                                                                                                                                                                                                                                                                  |
| Urec1                     | The next <i>Connection Point Voltage</i> level after the <i>Trec1</i> time, above which the dipped voltage must be to ignore the <i>Gen Low Voltage Alarm</i> .                                                                                                                                                                                                                                                                                                     |
| Trec2                     | The time in seconds that the <i>FRT event</i> is active for. After this time, the voltage must be raised above the <i>Urec1</i> level to ignore the <i>Gen Low Voltage Alarm</i> .                                                                                                                                                                                                                                                                                  |

## Editing the Configuration

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                               |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Urec2     | The next <i>Connection Point Voltage</i> level after the <i>Trec3</i> time, above which the voltage must be to ignore the <i>Gen Low Voltage Alarm</i> .                                                                                                                                                                                                                  |
| Trec3     | The time in seconds that the <i>FRT event</i> is active.<br>At this time, the voltage must be raised above the <i>Urec2</i> level, but if the voltage is still below the <i>Urec2</i> , then the <i>Fault Ride Through</i> event terminates and the alarms are no longer ignored.                                                                                         |
| Urec3     | The next <i>Connection Point Voltage</i> level after the <i>Trec4</i> time, above which the voltage must be to terminate the <i>Fault Ride Through</i> event and activate the alarms.                                                                                                                                                                                     |
| Trec4     | The time in seconds after which the DSE module monitors the voltage level to be raised above the <i>Urec3</i> to clear the <i>Fault Ride Through</i> event.<br>The voltage must rise above <i>Urec3</i> for a new event to be started. The alarms are enabled at that time. If the voltage fails to stay over this part of the curve, then the list of alarms is enabled. |

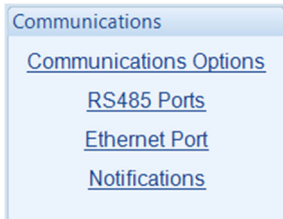
### Save / Load Curve

This feature is used to import the *Fault Ride Through* settings into another DSE module.

| Parameter  | Description                                                                                                 |
|------------|-------------------------------------------------------------------------------------------------------------|
| Save Curve | This allows saving the current configured settings of the <i>Fault Ride Through</i> into an FRT file.       |
| Load Curve | This allows loading of previously configured settings of the <i>Fault Ride Through</i> saved in FRT format. |

### 3.11 COMMUNICATIONS

The *Communications* page is subdivided into smaller sections. Select the required section with the mouse.



#### 3.11.1 COMMUNICATIONS OPTIONS

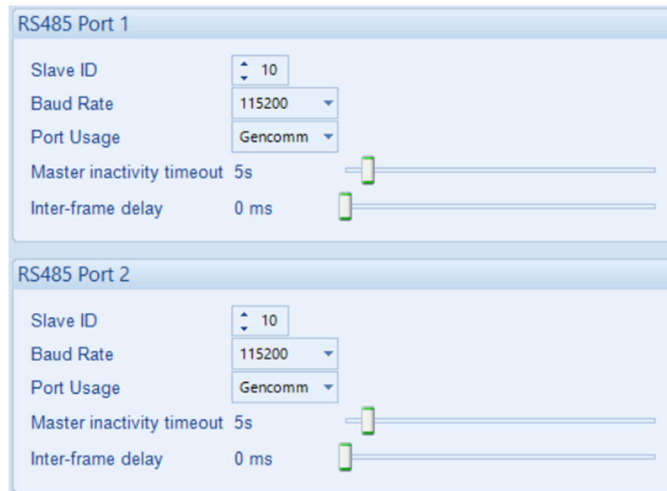
Provides a means of giving the controller an identity. This is used in the SCADA section to allow the operator to see the site name and site identity that it is currently connected to.



| Parameter       | Description                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site Identity   | A free entry box to allow the user to give the DSE module a description of where the site is located.<br>This text is not shown on the module's display and is only seen when performing remote communication. This aids the user in knowing where the site is located.                                                  |
| Genset Identity | A free entry box to allow the user to give the DSE module a description of which transfer switch it is connected to.<br>This text is not shown on the module's display and is only seen when performing remote communication. This aids the user in knowing which transfer switch on a specific site is being monitored. |

### 3.11.2 RS485 PORTS

**NOTE:** When the *RS485 Port Usage* is configured to “*PLC Comms*”, all other modules’ *Port Usage* must be configured to “*Gencomm*”. This allows the module configured as “*PLC Comms*” to act as a master and read from the module(s) configured to “*Gencomm*”. For details on how to configure the *PLC Editor* to read via its RS485, refer to DSE Publication: *057-314 Advanced PLC Software Manual* which is found on our website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)



| Parameter  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slave ID   | Select the Slave ID of the DSE module’s RS485 port. Every device on the RS485 link must have an individual Slave ID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Baud Rate  | Select the Baud Rate (speed of communication) of the DSE module’s RS485 port. Every device on the RS485 link must have the same Baud Rate.<br><b>1200</b><br><b>2400</b><br><b>4800</b><br><b>9600</b><br><b>14400</b><br><b>19200</b><br><b>28800</b><br><b>38400</b><br><b>57600</b><br><b>115200</b>                                                                                                                                                                                                                                                                                                                                                                                    |
| Port Usage | <p><b>NOTE:</b> In a system for a <i>PLC Comms</i> application, only one DSE module must be configured to act as the PLC master. A maximum of 64 devices are allowed on each port. For further details and instructions on using <i>the PLC Comms</i>, refer to DSE Publication: <i>057-314 Advanced PLC Software Manual</i> which is found on our website: <a href="http://www.deepseaelectronics.com">www.deepseaelectronics.com</a></p> <p>Select the RS485 Port1 usage.<br/><b>GenComm:</b> Modbus RTU RS485 communication<br/><b>PLC Comms:</b> The RS485 Port 1 is used to read the other controllers’ registers over the RS485 link which are defined in the <i>PLC Editor</i>.</p> |

## Editing the Configuration

| Parameter                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master Inactivity Timeout | <p>Set the time delay between a Modbus RTU request and the receipt of a response.</p> <p>The module monitors by default the USB port for communications. When activity is detected on the RS485 port, the module monitors the port for further data. If no data activity is detected on the port for the duration of the <i>Master Inactivity Timer</i>, it reverts to looking at the USB port.</p> <p>This needs to be set longer than the time between Modbus polls from the master.</p> |
| Inter-frame Delay         | <p>Set the time delay between the DSE module receiving a Modbus RTU request and the DSE module's response.</p>                                                                                                                                                                                                                                                                                                                                                                             |

### 3.11.3 ETHERNET PORT

**NOTE:** Consult the network administrator of the host network before changing these settings. Incorrect settings cause network errors in the existing local area network. These settings must only be changed by qualified network administrators.

#### Dynamic Host Configuration Protocol

Dynamic Host Configuration Protocol

Obtain IP Address Automatically

| Parameter                       | Description                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Obtain IP Address Automatically | <input type="checkbox"/> = The Dynamic Host Configuration Protocol (DHCP) is disabled and the unit has a fixed IP address as configured in the <i>IP Address</i> section.<br><input checked="" type="checkbox"/> = The Dynamic Host Configuration Protocol (DHCP) is enabled, and the unit automatically attains an IP address from the network it is connected to if it has DHCP enabled. |

#### Names

Names

|             |                      |
|-------------|----------------------|
| Domain Name | DSE Module           |
| Host Name   | Company              |
| Vendor Name | Deep Sea Electronics |

| Parameter   | Description                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Domain Name | The hostname of the device which is used for DHCP requests and acknowledgements. Consult the network IT manager for suitable naming. |
| Host Name   | Additional description string for DHCP                                                                                               |
| Vendor Name | Additional description string for DHCP                                                                                               |

**IP Address**

| IP Addresses                 |     |     |     |     |
|------------------------------|-----|-----|-----|-----|
| IP address                   | 192 | 168 | 1   | 100 |
| Subnet Mask                  | 255 | 255 | 255 | 0   |
| Gateway Address              | 0   | 0   | 0   | 0   |
| DNS Address                  | 0   | 0   | 0   | 0   |
| Preferred Connection Address | 0   | 0   | 0   | 0   |

| Parameter                    | Description                                                                                                                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IP Address                   | The static IP address of the module.                                                                                                                                                                                                                       |
| Subnet Mask                  | The subnet mask is to determine whether the module is on the local subnet or on a remote network.                                                                                                                                                          |
| Gateway Address              | IP address of the internet router that module is connected to.                                                                                                                                                                                             |
| DNS Address                  | IP address of the Domain Name Service (DNS). Usually this is the same as the module's IP address.                                                                                                                                                          |
| Preferred Connection Address | The module allows up to five MODBUS masters to connect to it. The <i>Preferred Connection Address</i> enables the unit to reserve one of the five connections for a specific IP address, such as for a remote display module to ensure it always connects. |

**MODBUS**

| Modbus             |     |
|--------------------|-----|
| Modbus Port Number | 502 |

| Parameter          | Description                                                |
|--------------------|------------------------------------------------------------|
| Modbus Port Number | The port number which the module serves MODBUS traffic on. |

### 3.11.3.1 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 DSE 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 DSE module makes its data available to a configurable TCP port number. 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.

### 3.11.3.2 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 DSE module 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 requests reach the modem/router, we want this passed to a 'virtual server' for handling, in our case this is the DSE module.

#### Example:

| Virtual Servers |             |                           |
|-----------------|-------------|---------------------------|
| Filter Name     | Source Port | Destination (LAN) Address |
| DSEG8660        | 1003        | 192.168.1.45              |

User provided name for the Port Forwarding rule.

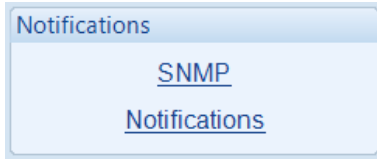
Port number of the communications (must match the configuration of the DSE controller).

IP Address of the DSE controller connected to the LAN.

**Result:** Traffic arriving from the WAN (internet) on port 1003 is automatically sent to IP address 192.168.1.45 on the LAN (DSE module) for handling.

### 3.11.4 NOTIFICATIONS

The *Notifications* page is subdivided into smaller sections. Select the required section with the mouse.

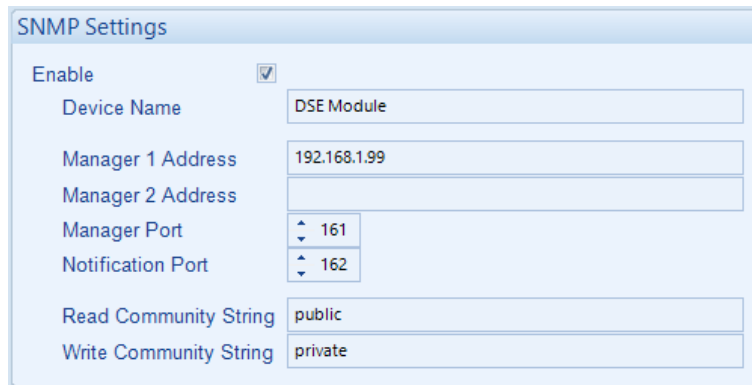


#### 3.11.4.1 SNMP

**NOTE:** The SNMP V2c MIB file for the module is available to download from the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com).

The module supports SNMP v2c with GetRequest, SetRequest, GetNextRequest, GetBulkRequest and Response. The module also allows communication up to two different SNMP managers at the same time on different IP addresses.

A fixed MIB file is available for the module for use by external SNMP managers. The MIB file is a file used by the SNMP manager to give context to the information held within the module.



| Parameter              | Description                                                                                                                                                                                             |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable                 | <input type="checkbox"/> = The SNMP function is disabled.<br><input checked="" type="checkbox"/> = The SNMP function is enabled. The module communicates with the SNMP manager using its ethernet port. |
| Device Name            | The name of the module which is attainable by SNMP requests using sysName OID contained within the standard RFC1213 MIB file.                                                                           |
| Manager 1 Address      | The static IP address of the first SNMP manager.                                                                                                                                                        |
| Manager 2 Address      | The static IP address of the second SNMP manager.                                                                                                                                                       |
| Manager Port           | The port number which the module serves SNMP GET, GET Next, Get Bulk, Get Subtree, Walk and SET messages.                                                                                               |
| Notification Port      | The port number which the module sends SNMP TRAP messages via.                                                                                                                                          |
| Read Community String  | The SNMP <i>Read Community String</i> (Factory setting <i>public</i> ).                                                                                                                                 |
| Write Community String | The SNMP <i>Write Community String</i> (Factory setting <i>private</i> ).                                                                                                                               |

### 3.11.4.2 NOTIFICATIONS

The user can select the types of events which are sent to the SNMP managers as SNMP TRAP messages.

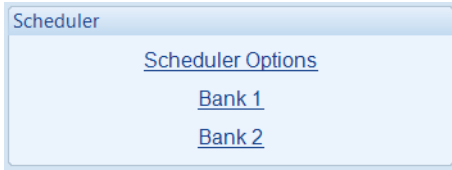
**Notifications**

|                            | SNMP Trap                |
|----------------------------|--------------------------|
| Named Alarms               | <input type="checkbox"/> |
| Unnamed Alarms             | <input type="checkbox"/> |
| Mode Change                | <input type="checkbox"/> |
| Power Up                   | <input type="checkbox"/> |
| Bus Off Load               | <input type="checkbox"/> |
| Bus On Load                | <input type="checkbox"/> |
| Application Switched Mains | <input type="checkbox"/> |
| Application Switched Group | <input type="checkbox"/> |
| Mains Breaker Opened       | <input type="checkbox"/> |
| Mains Breaker Closed       | <input type="checkbox"/> |
| Group Starts               | <input type="checkbox"/> |
| Group Stops                | <input type="checkbox"/> |

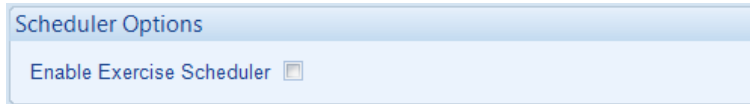
| Parameter                  | Description                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Named Alarms               | <input type="checkbox"/> = No SNMP TRAPs are sent when a <i>Named Alarm</i> activates.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when a <i>Named Alarm</i> activates. A <i>Named Alarm</i> is a protection with a pre-set name, e.g. <i>Fail to Synchronise</i> .                                             |
| Unnamed Alarms             | <input type="checkbox"/> = No SNMP TRAPs are sent when an <i>Unnamed Alarm</i> activates.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when an <i>Unnamed Alarm</i> activates. An <i>Unnamed Alarm</i> is a protection with a user configured name, e.g. a digital input configured for <i>User Configured</i> . |
| Mode Change                | <input type="checkbox"/> = No SNMP TRAPs are sent when the module changes operating mode.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent to indicate the operating mode has changed and what it has changed to.                                                                                                    |
| Power Up                   | <input type="checkbox"/> = No SNMP TRAPs are sent when the module powers up.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the module powers up.                                                                                                                                                             |
| Bus Off Load               | <input type="checkbox"/> = No SNMP TRAPs are sent when the Generator Bus switchgear opens.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Generator Bus switchgear opens.                                                                                                                                 |
| Bus On Load                | <input type="checkbox"/> = No SNMP TRAPs are sent when the Generator Bus switchgear closes.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Generator Bus switchgear closes.                                                                                                                               |
| Application Switched Mains | <input type="checkbox"/> = No SNMP TRAPs are sent when the Application is switched to Mains Mode.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Application is switched to Mains Mode.                                                                                                                   |
| Application Switched Group | <input type="checkbox"/> = No SNMP TRAPs are sent when the Application is switched to Group Mode.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Application is switched to Group Mode.                                                                                                                   |
| Mains Breaker Open         | <input type="checkbox"/> = No SNMP TRAPs are sent when the Mains Breaker is Open.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Mains Breaker is Open.                                                                                                                                                   |
| Mains Breaker Closed       | <input type="checkbox"/> = No SNMP TRAPs are sent when the Mains Breaker is Closed.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when the Mains Breaker is Closed.                                                                                                                                               |
| Group Starts               | <input type="checkbox"/> = No SNMP TRAPs are sent when there are Group Starts.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when there are Group Starts.                                                                                                                                                         |
| Group Stops                | <input type="checkbox"/> = No SNMP TRAPs are sent when there are Group Stops.<br><input checked="" type="checkbox"/> = An SNMP TRAP is sent when there are Group Stops.                                                                                                                                                           |

### 3.12 SCHEDULER

The section is subdivided into smaller sections.



#### 3.12.1 SCHEDULER OPTIONS




| Function                  | Description                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------------------|
| Enable Exercise Scheduler | <input type="checkbox"/> = The scheduler is disabled.                                              |
|                           | <input checked="" type="checkbox"/> = The scheduler is enabled, Bank 1 and Bank 2 become editable. |

### 3.12.2 BANK 1 / BANK 2

Each Bank of the Exercise Scheduler is used to give up to 8 scheduled runs per bank, 16 in total. This run schedule is configurable to repeat every 7 days (weekly) or every 28 days (monthly). The run is *On Load*, *Off Load* or *Auto Start Inhibit*.

Each scheduler bank configured differently either to weekly or monthly based exercises.

| Function        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Schedule Period | Determines the repeat interval for the scheduled run. Options available are:<br><b>Weekly:</b> The schedule events occur every week.<br><b>Monthly:</b> The schedule events occur every month on the week selected.                                                                                                                                                                                                                                                                                                                                                               |
| Week            | Specifies the week of the month, on which the scheduled run takes place.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Day             | Specifies the day of week, on which the scheduled run takes place.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Run Mode        | Determines the loading state mode of the Generator Bus when running on schedule<br><br><b>Auto Start Inhibit:</b> The Generator Bus is prevented from starting in <i>Auto</i> mode.<br><b>Island:</b> The module runs the Generator Bus in long term parallel operation for the duration of the schedule.<br><b>Off Load:</b> The module runs the Generator Bus on schedule with the Bus switchgear open.<br><b>Parallel:</b> The module runs the Generator Bus in island operation on schedule, transferring all the load to the Generator Bus and opening the Mains switchgear. |
| Start Time      | Determines at what time of day the scheduled run starts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Duration        | Determines the time duration in hours for the scheduled run.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Clear           | Resets the values for the Day, Start Time, and Duration to defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

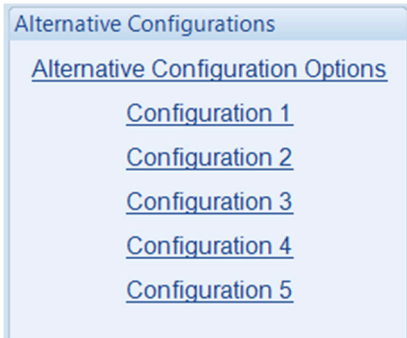
 **Note:** If Run Mode is set for Mains Parallel and the module is in Group Control Mode then it will run on schedule and close the Group Controller Bus Breaker. Island Mode and Mains Parallel have the same function on a group.

### 3.13 ALTERNATIVE CONFIGURATIONS

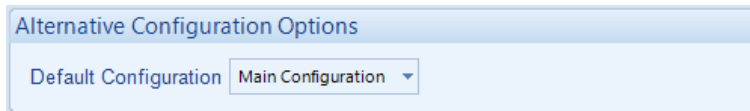
An Alternative Configurations are provided to allow the system designer to cater for different AC requirements utilising the same generator system. Typically, this feature is used by Rental Set Manufacturers where the set is capable of being operated at (for instance) 120 V 50 Hz and 240V 50 Hz using a selector switch.

The Alternative Configuration is selected using either:

- Configuration Suite Software (Selection for 'Default Configuration').
- Module Front Panel Editor.
- Via external signal to the module input configured to "Alternative Configuration" select.



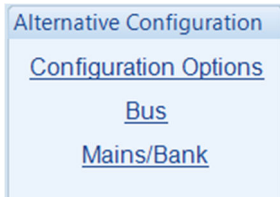
#### 3.13.1 ALTERNATIVE CONFIGURATION OPTIONS



| Parameter             | Description                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------|
| Default Configuration | Select the 'default' configuration that is used when there is no instruction to use an 'alternative configuration'. |

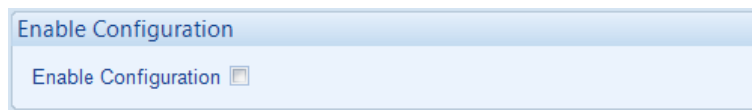
### 3.13.2 ALTERNATIVE CONFIGURATION 1 TO 5

The Alternative Configurations Editor allows for editing of the parameters that are to be changed when an Alternative Configuration is selected.



#### 3.13.2.1 CONFIGURATION OPTIONS

##### Enable Alternative Configuration

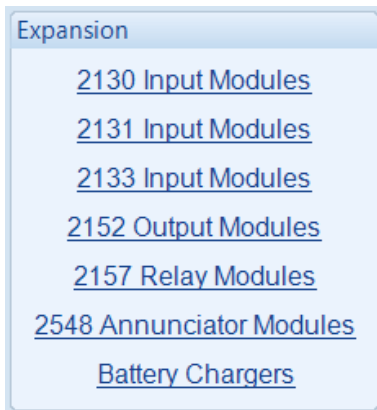


| Parameter            | Description                                                                                                                                                                                                                                                                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable Configuration | <p><input type="checkbox"/> = <i>Alternative Configuration</i> is disabled.</p> <p><input checked="" type="checkbox"/> = <i>Alternative Configuration</i> is enabled. The configuration is enabled by changing the <i>Default Configuration</i>, activating a digital input or through the module's <i>Front Panel Editor</i>.</p> |

### 3.14 EXPANSION

**NOTE:** In the event of a comms failure to an expansion module the controller will no longer react. If a digital input is critical then the alarm on the expansion module should be set to *Electrical Trip* or *Shutdown*. If the link is lost to an expansion unit, then it behaves as if it is powered down.

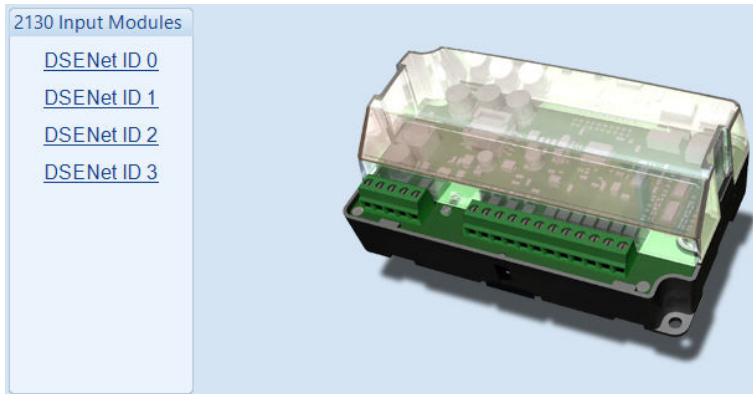
The *Expansion* page is subdivided into smaller sections. Select the required section with the mouse.



See overleaf for description of the different expansion modules.

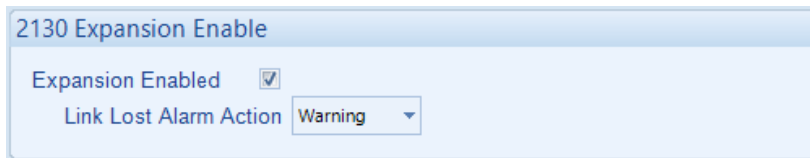
### 3.14.1 DSE2130 INPUT MODULES

Select the DSENet ID of the input expansion to be configured. The ID of the expansion module is set by rotary decimal switch accessible under the removable cover of the device.



The following options are then shown:

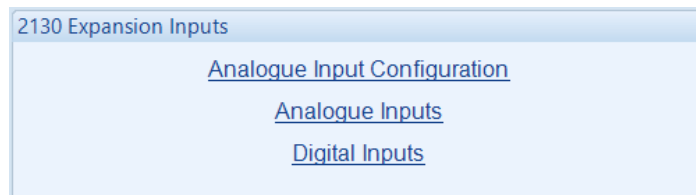
#### **2130 Expansion Enable**



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <p><input type="checkbox"/> = The expansion module with the selected ID is not enabled.</p> <p><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity.</p> <p><b>Warning:</b><br/><b>Electrical Trip:</b></p> |

#### **2130 Expansion Inputs**

The *Expansion Unit* page is then subdivided into smaller sections. Select the required section with the mouse.




### 3.14.1.1 ANALOGUE INPUT CONFIGURATION

#### Input Configuration

| Parameter             | Description                                                                                                                                                                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analogue Input E to H | Select what the analogue input is to be used for:<br><b>Not Used:</b> The analogue input is disabled<br><b>Digital Input:</b> Configured on the 2130/Digital Inputs pages<br><b>Flexible Analogue:</b> Configured on the 2130/Analogue Inputs pages |

### 3.14.1.2 ANALOGUE INPUTS

 **NOTE:** An analogue input is only configurable as a flexible sensor if it has been configured as Flexible Analogue.

#### Sensor Description

| Parameter   | Description                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------|
| Sensor Name | Enter the <i>Sensor Name</i> , this text is shown on the module display when viewing the instrument. |

#### Input Type

| Parameter  | Description                                                                                                                                                                                                                                                                                          |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Type | Select the sensor type and curve from a pre-defined list or create a user-defined curve<br><b>Pressure:</b> The input is configured as a pressure sensor<br><b>Percentage:</b> The input is configured as a percentage sensor<br><b>Temperature:</b> The input is configured as a temperature sensor |

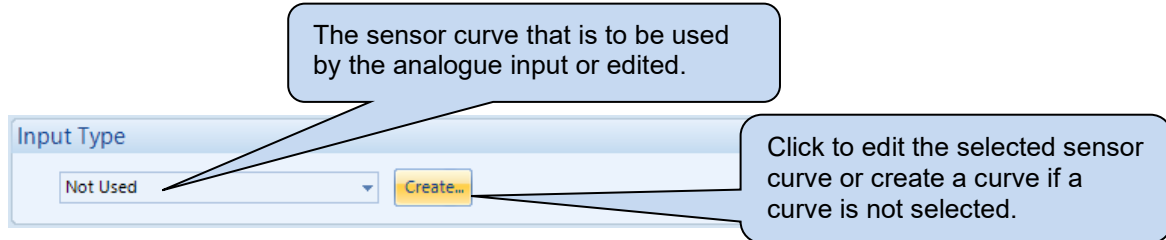
Parameter descriptions are continued overleaf...

**Sensor Alarms**

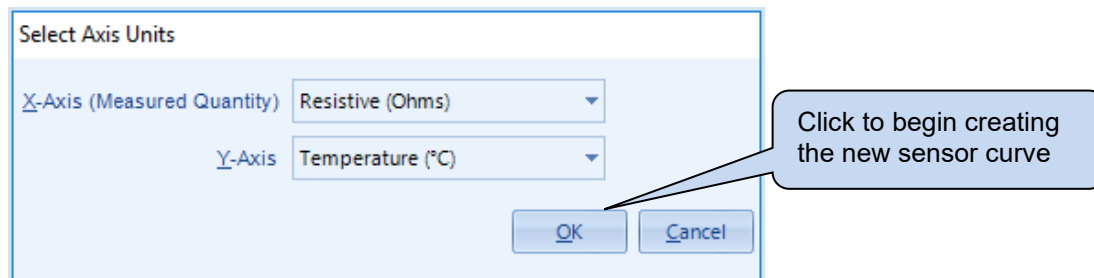
| Parameter             | Description                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Arming          | Select when the alarm becomes active:<br><b>Always</b><br><b>Active From Mains Parallel</b><br><b>Never</b>                                                                                                                                                                                                                                                  |
| Low Alarm Enable      | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Alarm</i> activates when the measured quantity drops below the <i>Low Alarm</i> setting.                                                                                                                                                               |
| Low Alarm Action      | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| Low Pre-Alarm Enable  | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Pre-Alarm</i> is active when the measured quantity drops below the <i>Low Pre-Alarm Trip</i> setting. The <i>Low Pre-Alarm</i> is automatically reset when the measured quantity rises above the configured <i>Low Pre-Alarm Return</i> level.     |
| Low Alarm String      | The text that is displayed on the module's LCD when the <i>Low Alarm</i> or <i>Low Pre-Alarm</i> activates.                                                                                                                                                                                                                                                  |
| High Pre-Alarm Enable | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Pre-Alarm</i> is active when the measured quantity rises above the <i>High Pre-Alarm Trip</i> setting. The <i>High Pre-Alarm</i> is automatically reset when the measured quantity falls below the configured <i>High Pre-Alarm Return</i> level. |
| High Alarm Enable     | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Alarm</i> is active when the measured quantity rises above the <i>High Alarm</i> setting.                                                                                                                                                             |
| High Alarm Action     | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| High Alarm String     | The text that is displayed on the module's LCD when the <i>High Alarm</i> or <i>High Pre-Alarm</i> activates.                                                                                                                                                                                                                                                |

### 3.14.1.2.1 CREATING / EDITING THE SENSOR CURVE

While the *DSE Configuration Suite* holds sensor specifications for the most used resistive sensors, occasionally it is required that the module be connected to a sensor not listed by the *DSE Configuration Suite*. To aid this process, a sensor curve editor is provided.



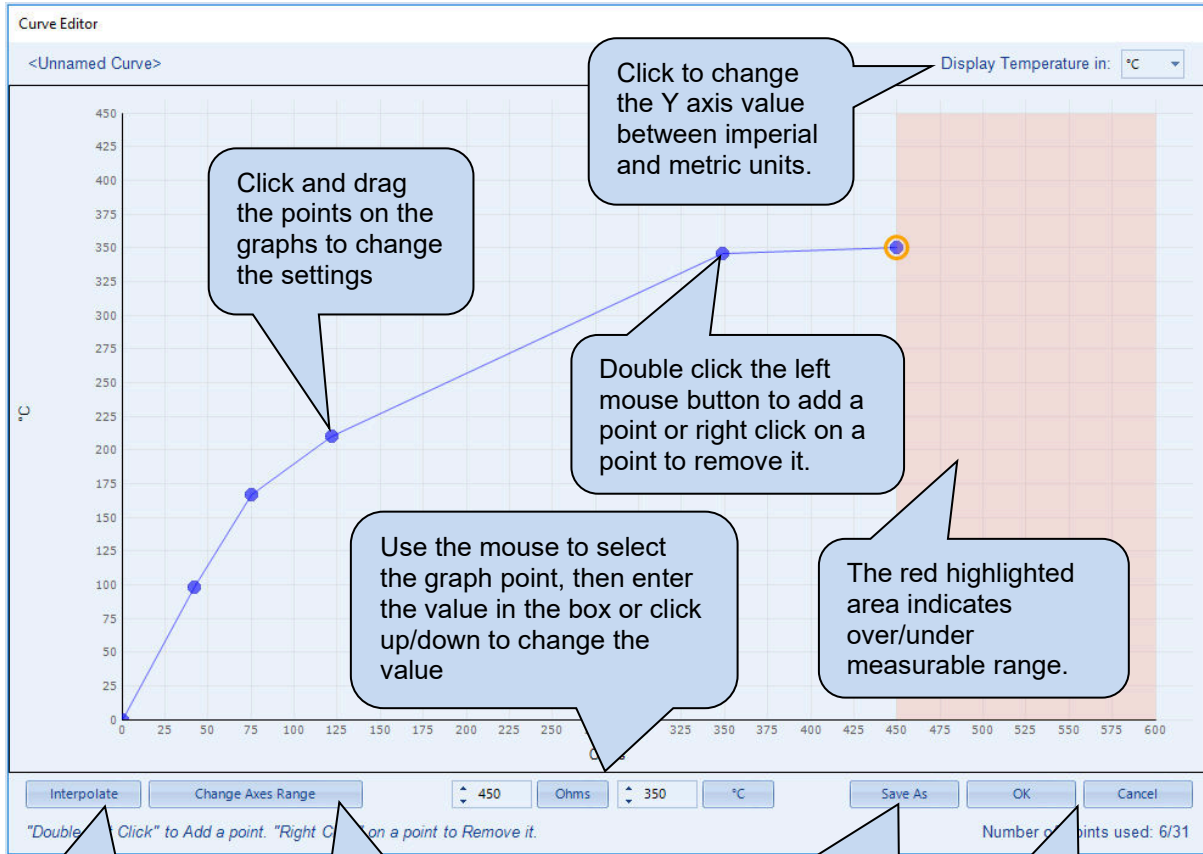
When creating a new sensor curve the measurement quantity and measured parameter are required.



| Parameter                  | Description                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| X-Axis (Measured Quantity) | Select the electrical quantity that the sensor outputs.<br><b>Resistive (Ohms)</b> : For sensors that output a resistance within a range 0 Ω to 480 Ω<br><b>Current (mA)</b> : For sensors that output current within a range 0 mA to 20 mA<br><b>Voltage (Volt)</b> : For sensors that output voltage within a range of 0 V to 10 V |
| Y-Axis                     | Select the parameter that is being monitored by the sensor<br><b>Temperature (°C)</b> : For sensors that measure temperature.<br><b>Pressure (Bar)</b> : For sensors that measure pressure.<br><b>Percentage (%)</b> : For sensors that measure percentage.                                                                          |

Sensor curve creation / editor descriptions are continued overleaf...

## Editing the Configuration



Click *Interpolate* then select two points as prompted to draw a straight line between

Click to change the range of the X and Y Axes of the graph and the level of open circuit

Click *Save As*, a prompt to name the curve...

New Curve Name

Enter a name for the new curve

Click OK to save the curve.

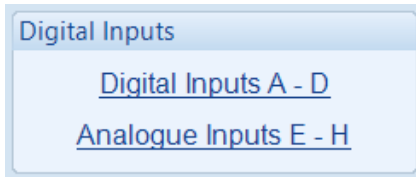
**Any saved curves become selectable in the *Input Type* selection list.**

Click OK to accept the changes or CANCEL to ignore and lose the

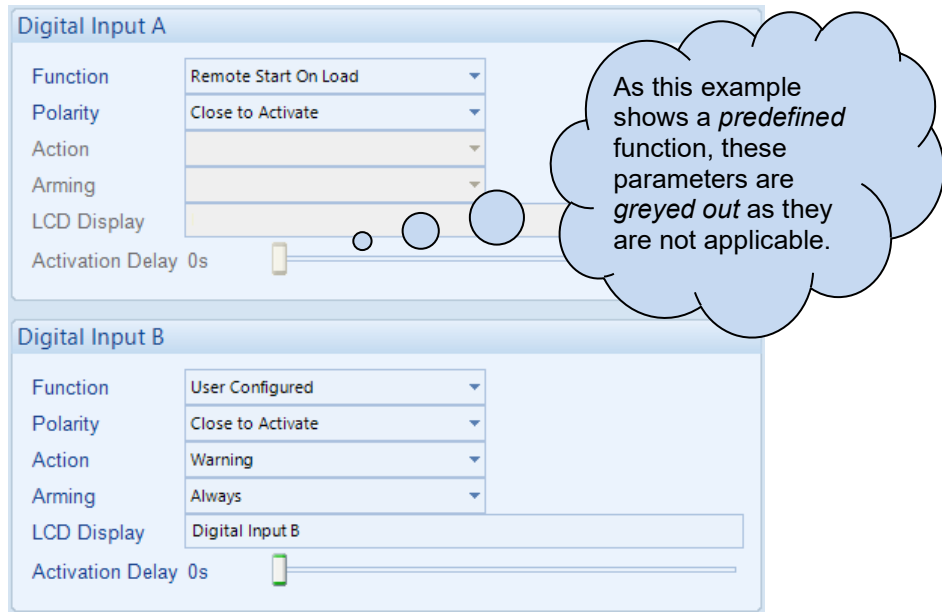
**Hint:** Deleting, renaming, or editing custom sensor curves that have been added is performed in the main menu, select *Tools | Curve Manager*.

### 3.14.1.3 DIGITAL INPUTS

The *Digital Inputs* section is subdivided into smaller sections. Select the required section with the mouse.



3.14.1.3.1 DIGITAL INPUTS



| Parameter        | Description                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function         | Select the input function to activate when the relevant terminal is energised. See section entitled <i>Input Functions</i> for details of all available functions                                                                                |
| Polarity         | Select the digital input polarity:<br><b>Close to Activate:</b> the input function is activated when the relevant terminal is connected.<br><b>Open to Activate:</b> the input function is activated when the relevant terminal is disconnected. |
| Action           | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> <p>Select the type of alarm required from the list:<br/> <b>Electrical Trip</b><br/> <b>Indication</b><br/> <b>Warning</b></p>     |
| Arming           | <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Arming</i> for more information.</p> <p>Select when the input becomes active:<br/> <b>Active From Mains Parallel</b><br/> <b>Always</b><br/> <b>Never</b></p>          |
| LCD Display      | The text that is displayed on the module's LCD when the input activates and generates an alarm.                                                                                                                                                  |
| Activation Delay | This is used to give a delay on acceptance of the input. Useful for liquid level switches or to mask short term operations of the external switch device.                                                                                        |

3.14.1.3.2 ANALOGUE INPUTS

**NOTE:** An analogue input is only configurable as a digital input if it has been configured as Digital Input, refer to section 3.14.1.1 entitled *Analogue Input Configuration* in this document for further details.

### Analogue Inputs E - H

**Analogue Input E (Digital)**

|                     |                               |
|---------------------|-------------------------------|
| Function            | User Configured               |
| Polarity            | Close to Activate             |
| Action              | Warning                       |
| Arming              | Always                        |
| LCD Display         | 2130 ID0 Analogue E (Digital) |
| Activation Delay 0s | <input type="range"/>         |

**Analogue Input F (Digital)**

The Analogue Input is not configured as a Digital Input  
To reconfigure, use the 'Analogue Input Configuration' page

| Parameter        | Description                                                                                                                                                                                                                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function         | Select the input function to activate when the relevant terminal is energised. See section entitled <i>Input Functions</i> for details of all available functions                                                                                                                                                         |
| Polarity         | Select the digital input polarity:<br><b>Close to Activate:</b> the input function is activated when the relevant terminal is connected.<br><b>Open to Activate:</b> the input function is activated when the relevant terminal is disconnected.                                                                          |
| Action           | <div style="border: 2px solid black; padding: 5px; margin-bottom: 5px;"> <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</p> </div> <p>Select the type of alarm required from the list:<br/><b>Electrical Trip</b><br/><b>Indication</b><br/><b>Warning</b></p> |
| Arming           | <div style="border: 2px solid black; padding: 5px; margin-bottom: 5px;"> <p><b>NOTE:</b> For details of these, see the section 5 entitled <i>Alarm Arming</i> for more information.</p> </div> <p>Select when the input becomes active:<br/><b>Active From Mains Parallel</b><br/><b>Always</b><br/><b>Never</b></p>      |
| LCD Display      | The text that is displayed on the module's LCD when the input activates and generates an alarm.                                                                                                                                                                                                                           |
| Activation Delay | This is used to give a delay on acceptance of the input. Useful for liquid level switches or to mask short term operations of the external switch device.                                                                                                                                                                 |

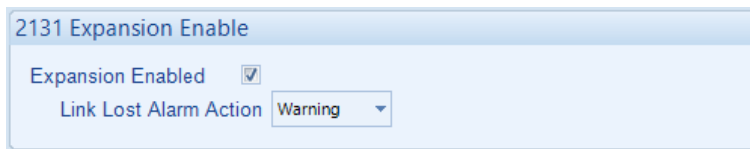
### 3.14.2 DSE2131 INPUT MODULES

Select the DSENet ID of the input expansion to be configured. The ID of the expansion module is set by rotary decimal switch accessible under the removable cover of the device.



The following options are then shown:

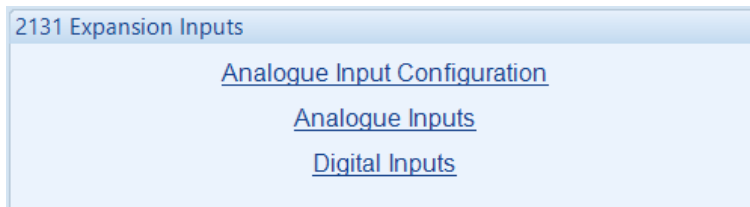
#### 2131 Expansion Enable



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <input type="checkbox"/> = The expansion module with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity.<br><b>Warning:</b><br><b>Electrical Trip:</b> |

#### 2131 Expansion Inputs

The *Expansion Unit* page is then subdivided into smaller sections. Select the required section with the mouse.



### 3.14.2.1 ANALOGUE INPUT CONFIGURATION

| Input Configuration |                     |
|---------------------|---------------------|
| Analogue Input A    | Flexible Analogue ▾ |
| Analogue Input B    | Flexible Analogue ▾ |
| Analogue Input C    | Not Used ▾          |
| Analogue Input D    | Flexible Analogue ▾ |
| Analogue Input E    | Digital Input ▾     |
| Analogue Input F    | Digital Input ▾     |
| Analogue Input G    | Digital Input ▾     |
| Analogue Input H    | Flexible Analogue ▾ |
| Analogue Input I    | Digital Input ▾     |
| Analogue Input J    | Not Used ▾          |

#### Input Configuration

| Parameter             | Description                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analogue Input A to J | Select what the analogue input is to be used for:<br><b>Not Used:</b> The analogue input is disabled<br><b>Digital Input:</b> Configured on the <i>2131/Digital Inputs</i> pages<br><b>Flexible Analogue:</b> Configured on the <i>2131/Analogue Inputs</i> pages |

### 3.14.2.2 ANALOGUE INPUTS

**NOTE:** An analogue input is only configurable as a flexible sensor if it has been configured as Flexible Analogue, refer to section 3.14.2.1 entitled *Analogue Input Configuration* in this document for further details.

#### Sensor Description

Sensor Description

Sensor Name

| Parameter   | Description                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------|
| Sensor Name | Enter the <i>Sensor Name</i> , this text is shown on the module display when viewing the instrument. |

#### Input Type

Input Type

VDO Ohm range (10-180)

| Parameter  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Type | Select the sensor type and curve from a pre-defined list or create a user-defined curve<br><b>Resistive:</b> for sensors with maximum range of 0 $\Omega$ to 1920 $\Omega$<br><b>Current:</b> for sensors with maximum range of 0 mA to 20 mA<br><b>Voltage:</b> for sensors with maximum range of 0 V to 10 V<br><b>Percentage:</b> The input is configured as a percentage sensor<br><b>Pressure:</b> The input is configured as a pressure sensor<br><b>Temperature:</b> The input is configured as a temperature sensor |

Parameter descriptions are continued overleaf...

**Sensor Alarms**

| Parameter             | Description                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Arming          | Select when the alarm becomes active:<br><b>Always</b><br><b>Active From Mains Parallel</b><br><b>Never</b>                                                                                                                                                                                                                                                  |
| Low Alarm Enable      | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Alarm</i> activates when the measured quantity drops below the <i>Low Alarm</i> setting.                                                                                                                                                               |
| Low Alarm Action      | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| Low Pre-Alarm Enable  | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Pre-Alarm</i> is active when the measured quantity drops below the <i>Low Pre-Alarm Trip</i> setting. The <i>Low Pre-Alarm</i> is automatically reset when the measured quantity rises above the configured <i>Low Pre-Alarm Return</i> level.     |
| Low Alarm String      | The text that is displayed on the module's LCD when the <i>Low Alarm</i> or <i>Low Pre-Alarm</i> activates.                                                                                                                                                                                                                                                  |
| High Pre-Alarm Enable | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Pre-Alarm</i> is active when the measured quantity rises above the <i>High Pre-Alarm Trip</i> setting. The <i>High Pre-Alarm</i> is automatically reset when the measured quantity falls below the configured <i>High Pre-Alarm Return</i> level. |
| High Alarm Enable     | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Alarm</i> is active when the measured quantity rises above the <i>High Alarm</i> setting.                                                                                                                                                             |
| High Alarm Action     | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| High Alarm String     | The text that is displayed on the module's LCD when the <i>High Alarm</i> or <i>High Pre-Alarm</i> activates.                                                                                                                                                                                                                                                |

### 3.14.2.3 DIGITAL INPUTS



**NOTE:** An analogue input is only configurable as a digital input if it has been configured as Digital Input, refer to section 3.14.2.1 entitled *Analogue Input Configuration* in this document for further details.

The screenshot shows a configuration page titled "Analogue Inputs A - C". It is divided into three sections:

- Analogue Input A (Digital):** This section shows a configuration for a digital input. The "Function" is set to "Alarm Mute". The "Polarity" is "Close to Activate". The "Action" and "Arming" options are greyed out. The "LCD Display" is "2131 ID0 Flexible Sensor A". The "Activation Delay" is 0s.
- Analogue Input B (Digital):** This section shows a configuration for a digital input. The "Function" is "User Configured". The "Polarity" is "Close to Activate". The "Action" is "Warning". The "Arming" is "Always". The "LCD Display" is "2131 ID0 Flexible Sensor B". The "Activation Delay" is 0s.
- Analogue Input C (Digital):** This section contains a message: "The Analogue Input is not configured as a Digital Input. To reconfigure, use the 'Analogue Input Configuration' page".

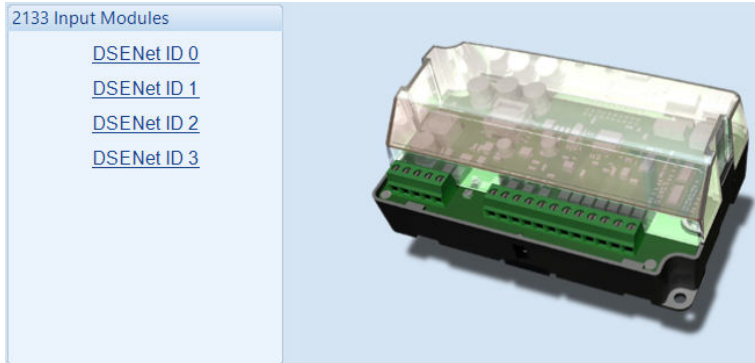
As this example shows a predefined function, these parameters are greyed out as they are not applicable.

Parameter descriptions are overleaf...

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function         | Select the input function to activate when the relevant terminal is energised.<br>See section entitled <i>Input Functions</i> for details of all available functions                                                                                                                                                                                                      |
| Polarity         | Select the digital input polarity:<br><b>Close to Activate:</b> The input function is activated when the relevant terminal is connected.<br><b>Open to Activate:</b> The input function is activated when the relevant terminal is disconnected.                                                                                                                          |
| Action           | <div style="border: 1px solid black; padding: 5px;">  <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b> </div><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b><br><b>Indication</b><br><b>Warning</b> |
| Arming           | <div style="border: 1px solid black; padding: 5px;">  <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Arming</i> for more information.</b> </div><br>Select when the input becomes active:<br><b>Active From Mains Parallel</b><br><b>Always</b><br><b>Never</b>      |
| LCD Display      | The text that is displayed on the module's LCD when the input activates and generates an alarm.                                                                                                                                                                                                                                                                           |
| Activation Delay | This is used to give a delay on acceptance of the input. Useful for liquid level switches or to mask short term operations of the external switch device.                                                                                                                                                                                                                 |

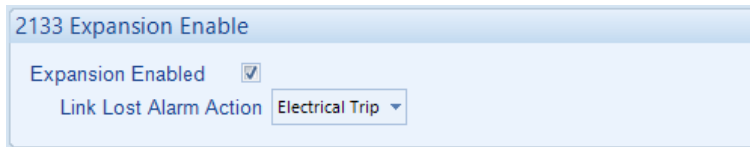
### 3.14.3 DSE2133 INPUT MODULES

Select the DSENet ID of the input expansion to be configured. The ID of the expansion module is set by rotary decimal switch accessible under the removable cover of the device.



The following options are then shown:

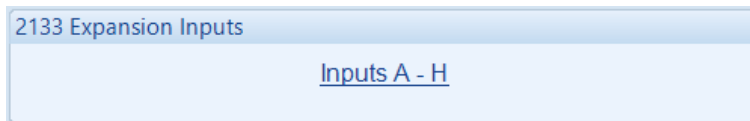
#### **2133 Expansion Enable**



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <input type="checkbox"/> = The expansion module with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity. |

#### **2133 Expansion Inputs**

The *Expansion Unit* page is then subdivided into smaller sections. Select the required section with the mouse.



### 3.14.3.1 ANALOGUE INPUTS

**NOTE:** An analogue input is only configurable as a flexible sensor if it has been configured as Flexible Analogue, refer to section 3.14.2.1 entitled *Analogue Input Configuration* in this document for further details.

#### Sensor Description

Sensor Description

Sensor Name

| Parameter   | Description                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------|
| Sensor Name | Enter the <i>Sensor Name</i> , this text is shown on the module display when viewing the instrument. |

#### Input Type

Input Type

| Parameter  | Description                                                                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Type | Select the sensor type from the pre-defined list:<br><b>2 Wire PT100</b><br><b>3 Wire PT100</b><br><i>Type J (Thermocouple)</i><br><i>Type K (Thermocouple)</i> |

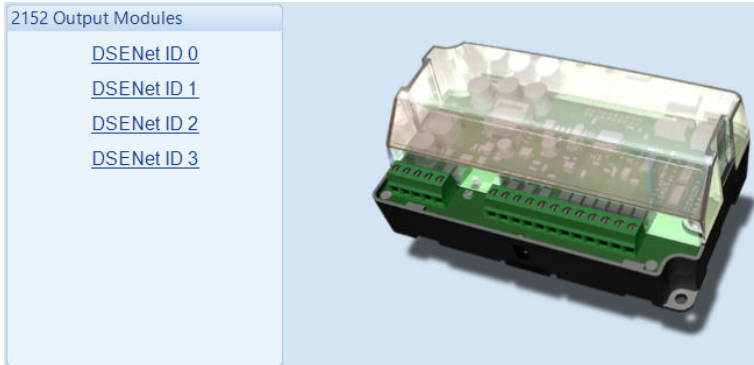
Parameter descriptions are continued overleaf...

**Sensor Alarms**

| Parameter             | Description                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Arming          | Select when the alarm becomes active:<br><b>Always</b><br><b>Active From Mains Parallel</b><br><b>Never</b>                                                                                                                                                                                                                                                  |
| Low Alarm Enable      | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Alarm</i> activates when the measured quantity drops below the <i>Low Alarm</i> setting.                                                                                                                                                               |
| Low Alarm Action      | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| Low Pre-Alarm Enable  | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>Low Pre-Alarm</i> is active when the measured quantity drops below the <i>Low Pre-Alarm Trip</i> setting. The <i>Low Pre-Alarm</i> is automatically reset when the measured quantity rises above the configured <i>Low Pre-Alarm Return</i> level.     |
| Low Alarm String      | The text that is displayed on the module's LCD when the <i>Low Alarm</i> or <i>Low Pre-Alarm</i> activates.                                                                                                                                                                                                                                                  |
| High Pre-Alarm Enable | <input type="checkbox"/> = The Pre-Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Pre-Alarm</i> is active when the measured quantity rises above the <i>High Pre-Alarm Trip</i> setting. The <i>High Pre-Alarm</i> is automatically reset when the measured quantity falls below the configured <i>High Pre-Alarm Return</i> level. |
| High Alarm Enable     | <input type="checkbox"/> = The Alarm is disabled.<br><input checked="" type="checkbox"/> = The <i>High Alarm</i> is active when the measured quantity rises above the <i>High Alarm</i> setting.                                                                                                                                                             |
| High Alarm Action     | <b>NOTE: For details of these, see the section 5 entitled <i>Alarm Types</i> for more information.</b><br><br>Select the type of alarm required from the list:<br><b>Electrical Trip</b>                                                                                                                                                                     |
| High Alarm String     | The text that is displayed on the module's LCD when the <i>High Alarm</i> or <i>High Pre-Alarm</i> activates.                                                                                                                                                                                                                                                |

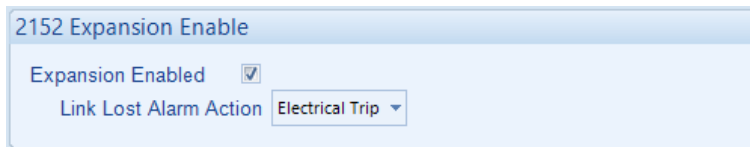
### 3.14.4 DSE2152 OUTPUT MODULES

Select the DSENet ID of the output expansion to be configured. The ID of the expansion input module is set by rotary decimal switch accessible under the removable cover of the device.



The following options are then shown:

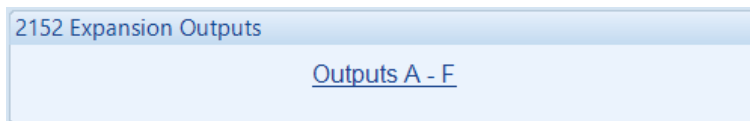
#### **2152 Expansion Enable**



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <input type="checkbox"/> = The expansion module with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity. |

#### **2152 Expansion Outputs**

The *Expansion Unit* page is then subdivided into smaller sections. Select the required section with the mouse.



### 3.14.4.1 ANALOGUE OUTPUTS

#### Output Configuration

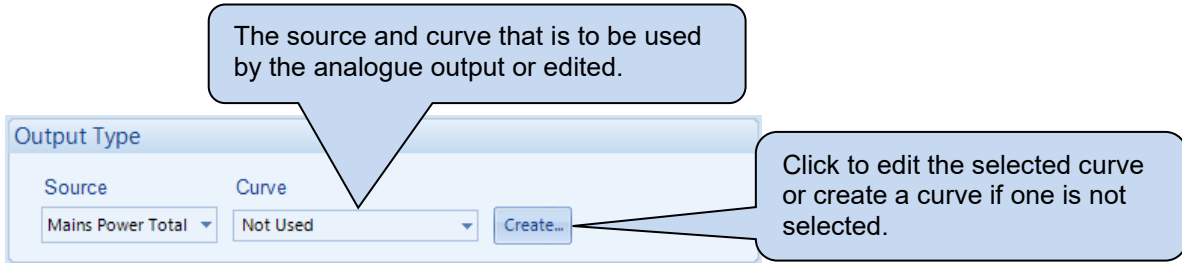
| Parameter   | Description                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------|
| Output Name | Enter the <i>Output Name</i> , this text is shown on in the SCADA section when viewing the output. |

#### Output Type

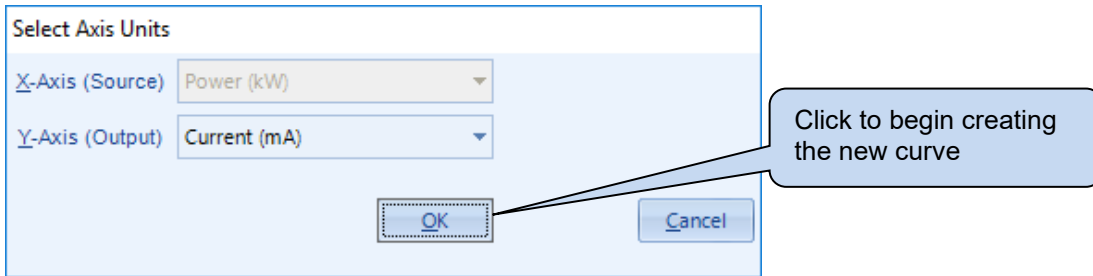
| Parameter | Description                                                                                                                                                                                                                 |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source    | Select the parameter that is to be mapped to the analogue output.                                                                                                                                                           |
| Curve     | Select the output type and curve from a pre-defined list or create a user-defined curve<br><b>Current:</b> for sensors with maximum range of 0 mA to 20 mA<br><b>Voltage:</b> for sensors with maximum range of 0 V to 10 V |

### 3.14.4.2 CREATING / EDITING THE OUTPUT CURVE

While the *DSE Configuration Suite* holds specifications for the most used output ranges, occasionally it is required that the expansion module's output be connected to a nonstandard device. To aid this process, a curve editor is provided.



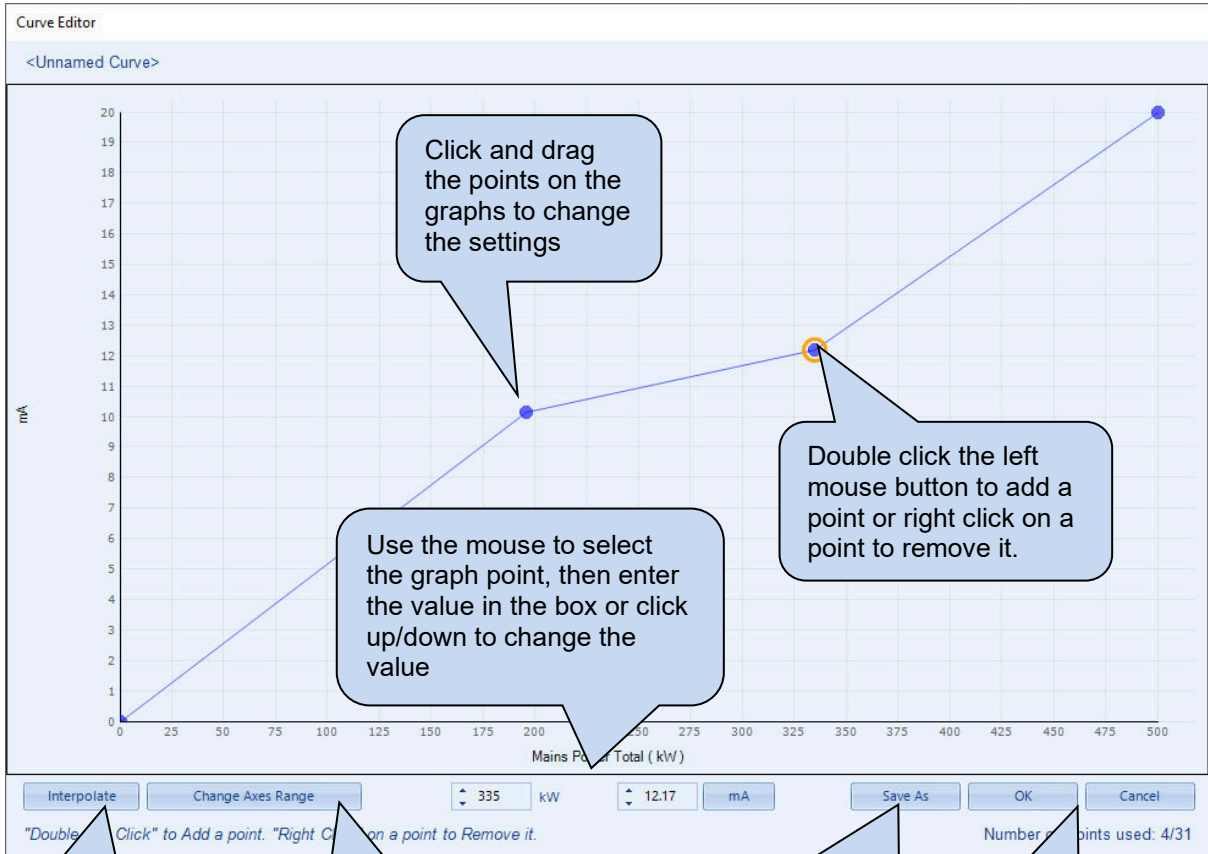
When creating a new sensor curve the measurement quantity and measured parameter are required.



| Parameter       | Description                                                                                                                                                                                                      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y-Axis (Source) | The parameter measured by the DSE module that is to be mapped to the output.                                                                                                                                     |
| X-Axis (Output) | Select the electrical quantity that the sensor outputs.<br><b>Current (mA):</b> For an output current within a range 0 mA to 20 mA<br><b>Voltage (Volt):</b> For an output voltage within a range of 0 V to 10 V |

Curve creation / editor descriptions are continued overleaf...

## Editing the Configuration



Click *Interpolate* then select two points as prompted to draw a straight line between

Click to change the range of the X and Y Axes of the graph and the level of open circuit

Click *Save As*, a prompt to name the curve...

New Curve Name

Enter a name for the new curve

OK Cancel

Click OK to accept the changes or CANCEL to ignore and lose the

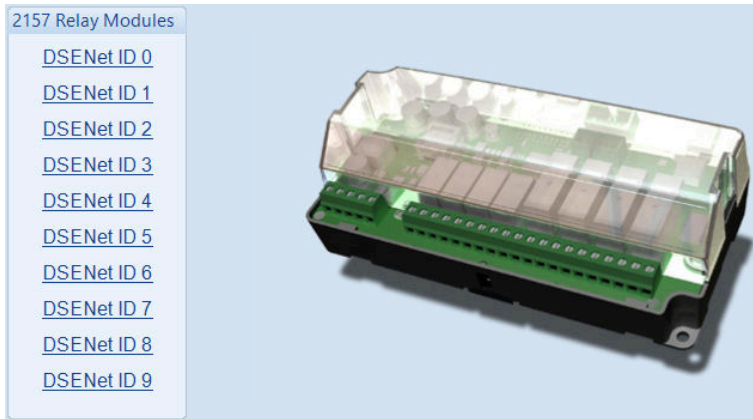
Click OK to save the curve.

**Any saved curves become selectable in the *Output Type* selection list.**

**Hint:** Deleting, renaming, or editing custom curves that have been added is performed in the main menu, select *Tools | Curve Manager*.

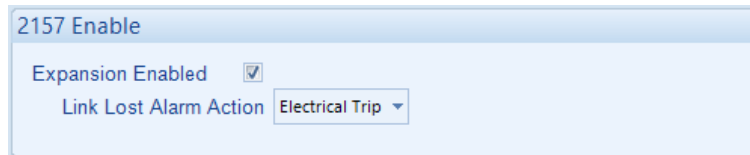
### 3.14.5 DSE2157 RELAY MODULES

Select the DSENet ID of the output expansion to be configured. The ID of the expansion module is set by rotary decimal switch accessible under the removable cover of the device.



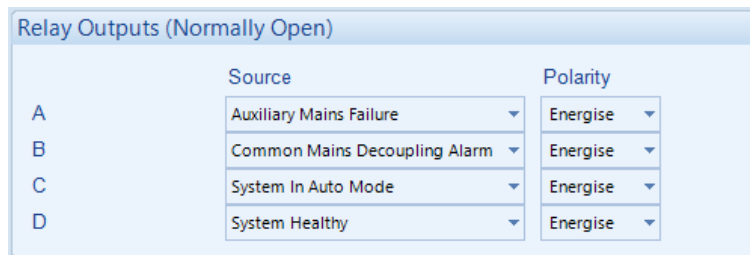
The following options are then shown:

#### 2157 Expansion Enable



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <input type="checkbox"/> = The expansion module with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity. |

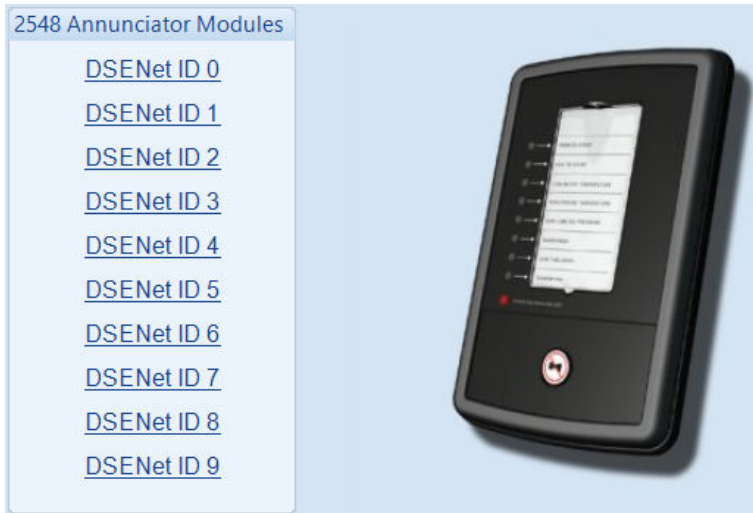
#### Relay Outputs (Normally Open / Changeover)



| Parameter | Description                                                                                                                                                                                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source    | Select the output source to control the state of the output<br>See section entitled <i>Output Sources</i> for details of all available functions                                            |
| Polarity  | Select the digital input polarity:<br><b>Energise:</b> When the output source is true, the output activates.<br><b>De-Energise:</b> When the output source is true, the output deactivates. |

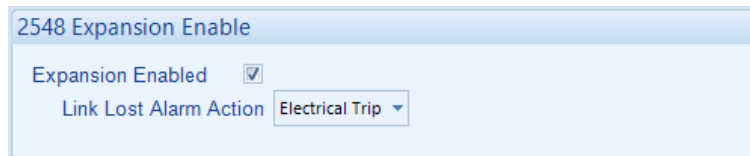
### 3.14.6 DSE2548 ANNUNCIATOR MODULES

Select the DSENet ID of the LED expansion to be configured. The ID of the expansion input module is set by rotary decimal switch accessible on the rear of the device.



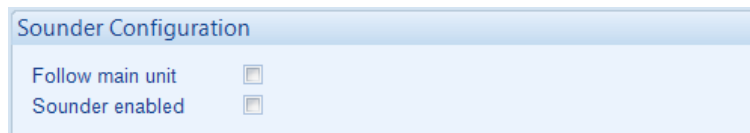
The following options are then shown:

#### **2548 Expansion Enable**



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Enabled | <input type="checkbox"/> = The expansion module with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The expansion module with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity. |

#### **Sounder Configuration**



| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Follow Main Unit | <input type="checkbox"/> = If the <i>mute / lamp test</i> button is pressed, other DSE2548 modules and the host module does not respond to this.<br><input checked="" type="checkbox"/> = If the <i>mute / lamp test</i> button is pressed, other DSE2548 modules configured to <i>Follow main unit</i> and the host module also lamp test / mute their alarm and vice-versa. |
| Sounder Enabled  | <input type="checkbox"/> = The DSE2548 internal sounder does not annunciate on a fault condition becoming active.<br><input checked="" type="checkbox"/> = The DSE2548 internal sounder annunciates on a fault condition becoming active.                                                                                                                                     |

Parameter descriptions are continued overleaf...

**LED Indicators**

| Indicator | Source                        | Polarity |
|-----------|-------------------------------|----------|
| A         | System In Auto Mode           | Lit      |
| B         | Mains Load Inhibited          | Lit      |
| C         | Combined Remote Start Request | Lit      |
| D         | Common Alarm                  | Lit      |
| E         | Not Used                      | Lit      |
| F         | Not Used                      | Lit      |
| G         | Not Used                      | Lit      |
| H         | Not Used                      | Lit      |

Annunciator Insert Card

| Parameter               | Description                                                                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source                  | Select the output source to control the state of the output<br>See section entitled <i>Output Sources</i> for details of all available functions                                            |
| Polarity                | Select the digital input polarity:<br><b>Energise:</b> When the output source is true, the output activates.<br><b>De-Energise:</b> When the output source is true, the output deactivates. |
| Annunciator Insert Card | Allows the user to create and print the custom text insert cards for the LEDs.                                                                                                              |

### 3.14.7 BATTERY CHARGERS

Select the DSENet ID of the battery charger to be configured. The ID of the expansion module is set by configuration of the device.



The following options are then shown:

#### DSENet ID

DSENet ID 0

Enable

Link Lost Alarm Action

Modbus Slave ID

Display Instrumentation

Charger Name

| Parameter               | Description                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable                  | <input type="checkbox"/> = The battery charger with the selected ID is not enabled.<br><input checked="" type="checkbox"/> = The battery charger with the selected ID is enabled. If the expansion module is not connected / detected by the module, the module generates an <i>Exp. Unit Failure</i> alarm with the configured <i>Link Lost Alarm Action</i> severity. |
| Modbus Slave ID         | The Slave ID used to address the battery charger via the host module's RS485 when using the host module as a MODBUS RTU pass through.                                                                                                                                                                                                                                   |
| Display Instrumentation | <input type="checkbox"/> = The battery chargers' information is not shown on the host module's display.<br><input checked="" type="checkbox"/> = The battery charger information is shown on the host module's display.                                                                                                                                                 |
| Charger Name            | Enter the <i>Charger Name</i> , this text is shown on the module display when viewing the battery charger instrumentation                                                                                                                                                                                                                                               |

**Charger Shutdown Alarms**

The battery charger has 2 alarm types a Warning and a Shutdown. A warning alarm such as high battery temperature will allow the system to continue to operate safely, so this is appropriate on both modules.

If we now take for example a shutdown alarm on the charger, e.g., mains failure. The battery charger can no longer continue to operate as there is no power available, so it will shut down (correct operation). From the generator perspective a mains failure would normally require the set to run to restore power, if the charger alarm also has a shutdown action on the generator then the site is blacked out and the generator is effectively useless. So, the alarm action is a warning to the generator to allow the set to start on a blackout. A warning is still required as there may be other reasons for the charger mains failing, e.g. a fuse, so the system operator must be warned.

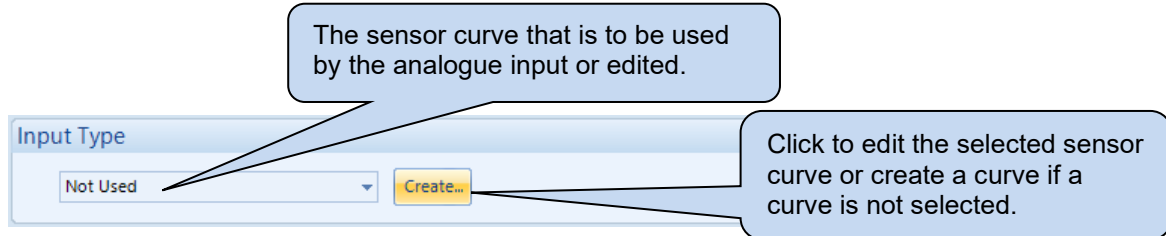
| Parameter    | Description                                                                                                                                                                                                                                    |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable       | <input type="checkbox"/> = The DSE module does not display any shutdown alarms from the battery charger.<br><input checked="" type="checkbox"/> = The DSE module displays shutdown alarms from the battery charger with the configured action. |
| Alarm String | The text that is displayed on the module's LCD when the DSE module detects a shutdown fault from the battery charger.                                                                                                                          |

**Charger Warning Alarms**

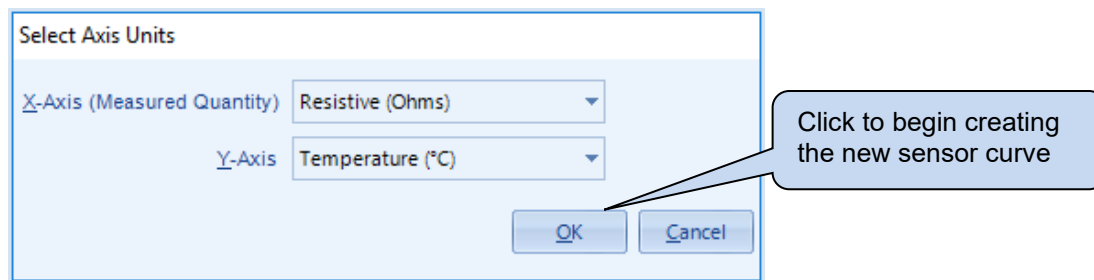
| Parameter    | Description                                                                                                                                                                                                                                   |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable       | <input type="checkbox"/> = The DSE module does not display any warning alarms from the battery charger.<br><input checked="" type="checkbox"/> = The DSE module displays warnings alarms from the battery charger with the configured action. |
| Alarm String | The text that is displayed on the module's LCD when the DSE module detects a warning fault from the battery charger.                                                                                                                          |

### 3.14.8 CREATING / EDITING THE SENSOR CURVES

While the *DSE Configuration Suite* holds sensor specifications for the most used resistive sensors, occasionally it is required that the module be connected to a sensor not listed by the *DSE Configuration Suite*. To aid this process, a sensor curve editor is provided.



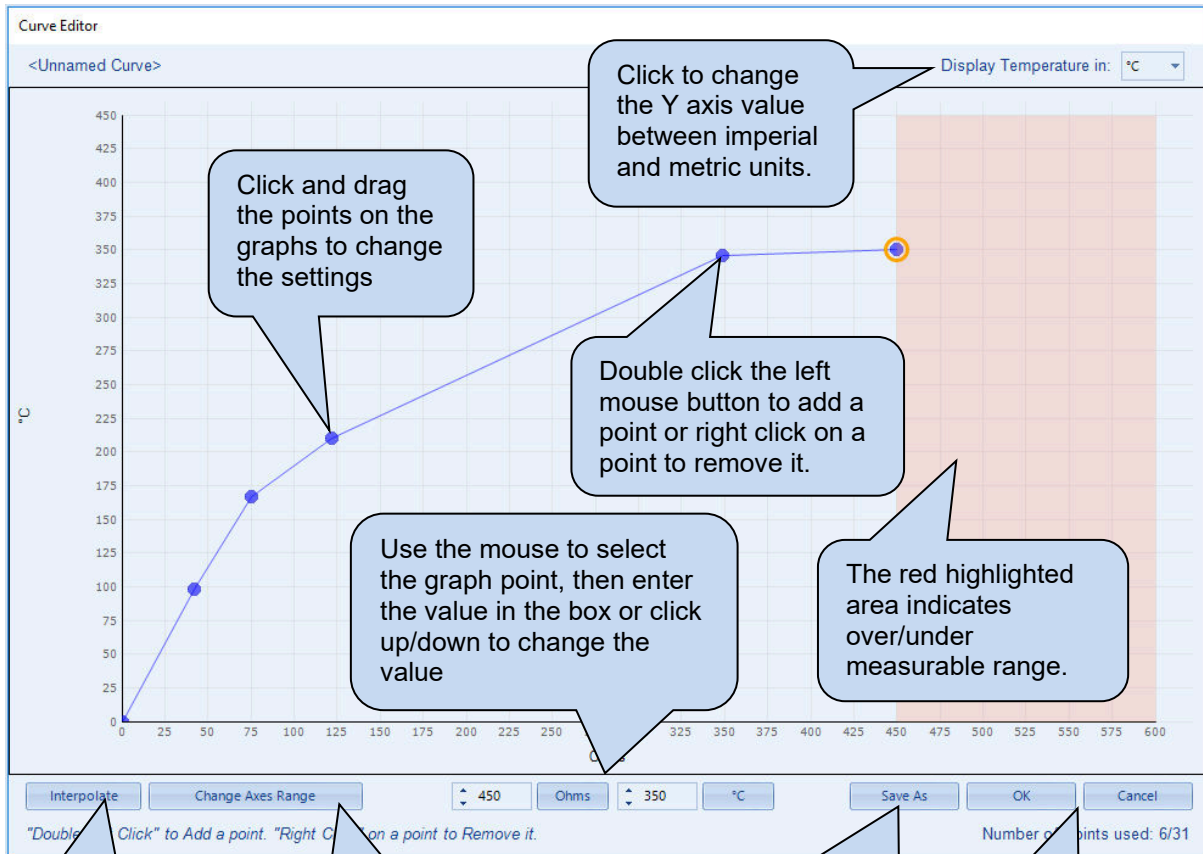
When creating a new sensor curve the measurement quantity and measured parameter are required.



| Parameter                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| X-Axis<br>(Measured Quantity) | Select the electrical quantity that the sensor outputs.<br><b>Current (mA)</b> : For sensors that output current within a range 0 mA to 20 mA<br><b>Voltage (0-10 Volts)</b> : For sensors that output voltage within a range of 0 V to 10 V<br><b>Voltage (0-32 Volts)</b> : For sensors that output voltage within a range of 0 V to 32 V<br><b>Resistive (Ohms)</b> : For sensors that output a resistance within a range 0 Ω to 3K Ω on Analogue Input A and 0 to 5K Ω on Analogue Inputs B to G |
| Y-Axis                        | Select the parameter that is being monitored by the sensor.<br><b>Temperature (°C)</b> : For sensors that measure temperature.<br><b>Pressure (Bar)</b> : For sensors that measure pressure.<br><b>Percentage (%)</b> : For sensors that measure percentage.                                                                                                                                                                                                                                         |

Sensor curve creation and editor descriptions are continued overleaf...

## Editing the Configuration



Click *Interpolate* then select two points as prompted to draw a straight line between them.

Click to change the range of the X and Y Axes of the graph and the level of open circuit

Click Save As prompt to name the curve...

New Curve Name

Enter a name for the new curve

OK Cancel

Click OK to save the curve.

**Any saved curves become selectable in the *Input Type* selection list.**

Click OK to accept the changes or CANCEL to ignore and lose the

**Hint:** Deleting, renaming, or editing custom sensor curves that have been added is performed in the main menu, select *Tools | Curve & Unit Manager*.

**Change Axis Range Example**

The X Axis will display the sensor unit depending on what type of input is selected.

The Y Axis will display the sensor unit depending on what type of input is selected.

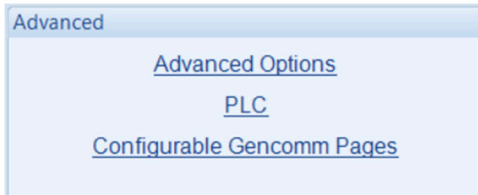
The maximum X Axis Fault Threshold limit.

| Parameter                | Minimum | Maximum |
|--------------------------|---------|---------|
| X-Axis(Ohms)             | 0       | 480     |
| Y-Axis(%)                | 0       | 260     |
| X Axis - Fault Threshold | 0       | 5000    |

**NOTE:** The difference between the Minimum and Maximum values on the X and Y axis must exceed the noted limits.

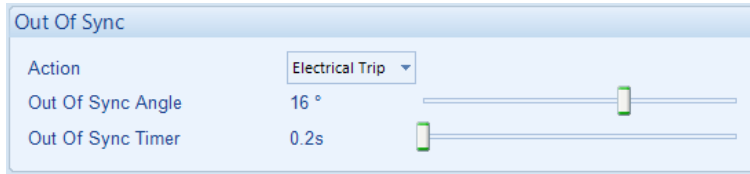
### 3.15 ADVANCED

The *Advanced* page is subdivided into smaller sections. Select the required section with the mouse.



### 3.15.1 ADVANCED OPTIONS

#### Out of Sync



| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Out of Sync Angle | <p>During parallel operation, the phase of both supplies is monitored. Being in parallel means that the phase difference is zero degrees (0 °) between the two supplies.</p> <p>If the angle exceeds the <i>Out of Sync Angle</i> for longer than the duration of the <i>Out of Sync Timer</i>, an alarm is generated with the configured <i>Action</i>.</p> <p>Select the type of alarm required from the list:<br/> <b>Auxiliary Mains Failure</b><br/> <b>Electrical Trip</b><br/> <b>Warning</b></p> |

#### Troubleshooting Out of Sync

This section describes the most common causes for an *Out of Sync* alarm:

- The switchgear does not close quickly enough. Ensure the switchgear closes within 100 ms of receiving the close signal.
- The *Out of Sync* timer is set too low. If this timer is raised away from the factory setting of 200 ms (0.2 s), ensure the consequences are fully understood.
- Something external has caused the switchgear to open or has prevented it from closing. Typical examples are mains decoupling and other equipment operating directly on the switchgear to open it.
- The switchgear wiring 'logic' is not correct, causing the switchgear to 'fire through', where it triggers the close mechanism, but the switchgear does not actually mechanically close, it re-opens again.

#### Other Timers



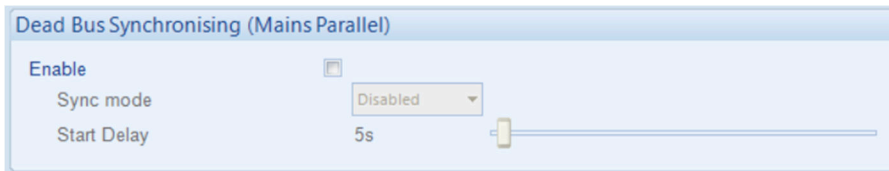
| Parameter             | Description                                                                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Synchronisation Delay | Delays the synchronising process to allow the Generator Bus to stabilise and power parasitic loads or transformers (for instance) before the synchronising process begins. |

**Other Timers (Mains Parallel)**



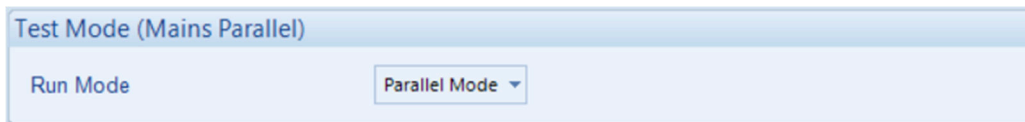
| Parameter                    | Description                                                                                                                                                                                                                                             |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mains Decoupling Supervision | Delays the activation of the inbuilt Mains Decoupling detection when Bus switchgear closes in parallel with the mains. Upon closing into parallel, the timer is activated. After the timer has expired, the Mains decoupling protection becomes active. |
| Interlock Override Off       | Timer to delay the <i>Interlock Override</i> de-energising once a breaker has opened.                                                                                                                                                                   |


**Dead Bus Synchronising (Mains Parallel)**



| Parameter   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable      | <input type="checkbox"/> = All synchronising is performed ‘the traditional’ way by achieving a slip frequency and waiting for the voltage, frequency, and phase to be within configured windows<br><input checked="" type="checkbox"/> = The Dead Bus Synchronising feature is activated as configured below.                                                                                                                                                                                                                |
| Sync Mode   | <p><b>Always:</b> Dead Bus sync is always used when the generators are required to be online and in the <i>Auto</i> mode (Dead Bus sync does not operate in <i>Manual</i> mode under any circumstance).</p> <p><b>Disabled:</b> The feature is not active</p> <p><b>On Input:</b> Dead Bus sync is used when a digital input configured for <i>Multi Set Controller Dead Bus Synchronising</i> is active.</p> <p><b>On Mains Failure:</b> The generators are started in dead Bus sync whenever the Mains failure occurs.</p> |
| Start Delay | Time delay used at start up to ensure the start request is not simply a fleeting request.                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Test Mode**



| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Run Mode  | Configures the operation of the Mode  button as:<br><p><b>Island Mode:</b> The module performs the start sequence and transfers all the load to the Generator Bus. The Mains switchgear is left open, and the Generator Bus runs in island mode.</p> <p><b>Parallel Mode:</b> The module performs the start sequence and synchronises the generators Bus to the Mains to allow long term parallel operation; peak lopping when set to <i>Mains Mode</i>, or fixed export / base load when in <i>Bus Mode</i>.</p> |

**Manual Island Mode Bus Limits (Mains Parallel)**

**NOTE:** The *Manual Island Mode Bus Limits* feature is only applicable on the DSEG8660 when it is in *Island* mode or in *Manual* mode and generators running in island.

**NOTE:** The DSE module does not use the *Manual Island Mode Bus Limits* settings for the normal synchronisation and load share operation.

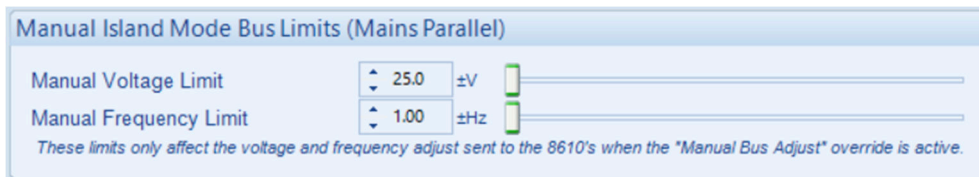
In certain applications it is required to ‘manually’ synchronise the generators bus to an external source ‘mains’ then to manually control the mains switchgear to parallel the generators bus with the mains. In this instance the DSEG8660 *Bus Voltage Adjust* and the *Bus Frequency Adjust* functions must be used to control the bus voltage and bus frequency levels when the generators are running in island. The *Bus Voltage Adjust* and the *Bus Frequency Adjust* levels are configured from the PLC Editor or through Modbus communication by writing to the *Bus Voltage Adjust* and the *Bus Frequency Adjust* GenComm registers.

The *Manual Island Mode Bus Limits* feature, applicable when generators running in island mode only, is to set limits to the bus voltage bias and the bus frequency bias that the DSEG8660 must control the Multi Set generators over the AMSC. The configuration of these settings depends on the generators’ control ranges capabilities. For example, if in a system one or more of the generators is only able to be controlled by +/-30 volts, then the *Manual Voltage Limit* must be configured to 30.0 Volt. In this way the DSEG8660 does not request more than what that generator is able to accept.

To control the bus voltage and the bus frequency through the *Bus Voltage Adjust* and the *Bus Frequency Adjust* functions, it is first required to enable the *Manual Bus Adjust* from the PLC Editor’s *Override Gencomm* functionality. It is also possible to enable the *Manual Bus Adjust* through GenComm.

The DSEG8660 uses the *Manual Island Mode Bus Limits* only when all the following conditions are satisfied:

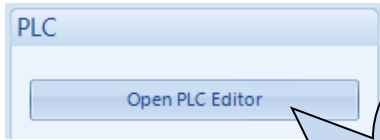
- The DSEG8660 must be in *Island Mode* or in *Manual Mode* and not in parallel with the mains.
- The DSEG8660 must have the Control over Multi Set modules.
- The *Manual Bus Adjust* must be set to active. Refer to the section 3.15.2 entitled PLC in this document for details on how to use the *PLC Editor*.



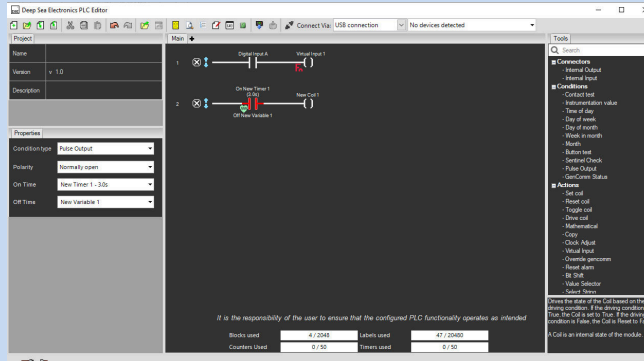
| Parameter              | Description                                                                                                                                                                                                                 |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manual Voltage Limit   | This is the maximum voltage that the DSEG8660 increases or decreases around the <i>Bus Nominal Voltage</i> when requested to control the Multi Set generators’ bus voltage through the AMSC whilst running in island mode.  |
| Manual Frequency Limit | This is the maximum frequency that the DSEG8660 increases or decreases around the <i>Bus Nominal Frequency</i> when requested to control the Multi Set generators’ bus frequency through the AMSC whilst running in island. |

3.15.2 PLC

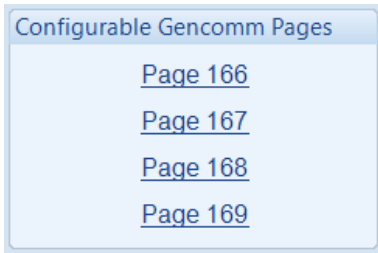
**NOTE:** For further details and instructions on the *PLC Editor*, refer to DSE Publication: *057-314 Advanced PLC Software Manual* which is found on our website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)



Click to open the *PLC Editor*, then the *PLC Editor* opens as shown below.



### 3.15.3 CONFIGURABLE GENCOMM PAGES 166 TO 169



For advanced MODBUS users of the controller, configurable Gencomm pages are available. The intention is to allow the user to create personal collections of data in subsequent registers to minimise the number of MODBUS reads required by the master, and hence speed up data collection.

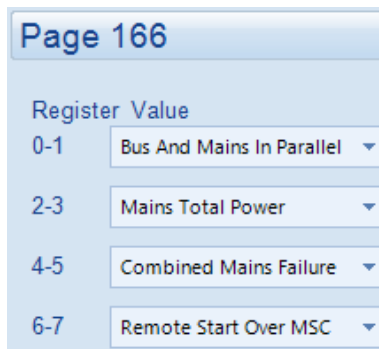
All configurable Gencomm registers are 32-bit unsigned format.

| Gencomm Page 166 |            |          |            |          |            |          |            |
|------------------|------------|----------|------------|----------|------------|----------|------------|
| Register         | Value      | Register | Value      | Register | Value      | Register | Value      |
| 0-1              | <Not Used> | 64-65    | <Not Used> | 128-129  | <Not Used> | 192-193  | <Not Used> |
| 2-3              | <Not Used> | 66-67    | <Not Used> | 130-131  | <Not Used> | 194-195  | <Not Used> |
| 4-5              | <Not Used> | 68-69    | <Not Used> | 132-133  | <Not Used> | 196-197  | <Not Used> |
| 6-7              | <Not Used> | 70-71    | <Not Used> | 134-135  | <Not Used> | 198-199  | <Not Used> |
| 8-9              | <Not Used> | 72-73    | <Not Used> | 136-137  | <Not Used> | 200-201  | <Not Used> |
| 10-11            | <Not Used> | 74-75    | <Not Used> | 138-139  | <Not Used> | 202-203  | <Not Used> |
| 12-13            | <Not Used> | 76-77    | <Not Used> | 140-141  | <Not Used> | 204-205  | <Not Used> |
| 14-15            | <Not Used> | 78-79    | <Not Used> | 142-143  | <Not Used> | 206-207  | <Not Used> |
| 16-17            | <Not Used> | 80-81    | <Not Used> | 144-145  | <Not Used> | 208-209  | <Not Used> |
| 18-19            | <Not Used> | 82-83    | <Not Used> | 146-147  | <Not Used> | 210-211  | <Not Used> |
| 20-21            | <Not Used> | 84-85    | <Not Used> | 148-149  | <Not Used> | 212-213  | <Not Used> |
| 22-23            | <Not Used> | 86-87    | <Not Used> | 150-151  | <Not Used> | 214-215  | <Not Used> |
| 24-25            | <Not Used> | 88-89    | <Not Used> | 152-153  | <Not Used> | 216-217  | <Not Used> |
| 26-27            | <Not Used> | 90-91    | <Not Used> | 154-155  | <Not Used> | 218-219  | <Not Used> |
| 28-29            | <Not Used> | 92-93    | <Not Used> | 156-157  | <Not Used> | 220-221  | <Not Used> |
| 30-31            | <Not Used> | 94-95    | <Not Used> | 158-159  | <Not Used> | 222-223  | <Not Used> |
| 32-33            | <Not Used> | 96-97    | <Not Used> | 160-161  | <Not Used> | 224-225  | <Not Used> |
| 34-35            | <Not Used> | 98-99    | <Not Used> | 162-163  | <Not Used> | 226-227  | <Not Used> |
| 36-37            | <Not Used> | 100-101  | <Not Used> | 164-165  | <Not Used> | 228-229  | <Not Used> |
| 38-39            | <Not Used> | 102-103  | <Not Used> | 166-167  | <Not Used> | 230-231  | <Not Used> |
| 40-41            | <Not Used> | 104-105  | <Not Used> | 168-169  | <Not Used> | 232-233  | <Not Used> |
| 42-43            | <Not Used> | 106-107  | <Not Used> | 170-171  | <Not Used> | 234-235  | <Not Used> |
| 44-45            | <Not Used> | 108-109  | <Not Used> | 172-173  | <Not Used> | 236-237  | <Not Used> |
| 46-47            | <Not Used> | 110-111  | <Not Used> | 174-175  | <Not Used> | 238-239  | <Not Used> |

The configurable MODBUS pages are:

| Page | Hex Address | Decimal Address |
|------|-------------|-----------------|
| 166  | A600        | 42496           |
| 167  | A700        | 42752           |
| 168  | A800        | 43008           |
| 169  | A900        | 43264           |

**Example of Gencomm Page Configuration:**



| Page 166       |                           |
|----------------|---------------------------|
| Register Value |                           |
| 0-1            | Bus And Mains In Parallel |
| 2-3            | Mains Total Power         |
| 4-5            | Combined Mains Failure    |
| 6-7            | Remote Start Over MSC     |

The register address is obtained from the formula:

$\text{register\_address} = \text{page\_number} * 256 + \text{register\_offset}$ .

To read the *Mains Total Power* from the above register, the MODBUS master device needs to read the data in two registers and then combine the data from the Most Significant Bit and the Least Significant Bit.

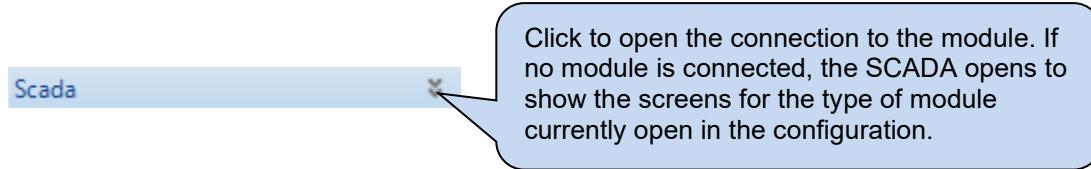
MSB address in Decimal =  $(166 * 256) + 2 = 42498$

LSB address in Decimal =  $(166 * 256) + 3 = 42499$

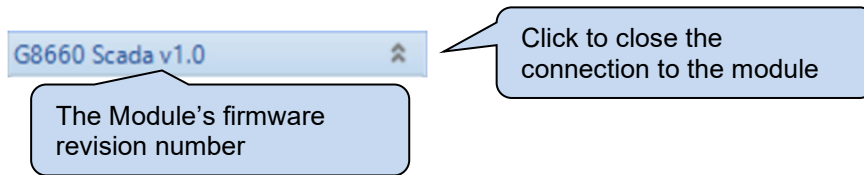
## 4 SCADA

SCADA stands for Supervisory Control And Data Acquisition and is provided both as a service tool and as a means of monitoring / controlling the Generator Bus.

As a service tool, the SCADA pages are to check the operation of the controller's inputs and outputs as well as checking the Mains operating parameters.

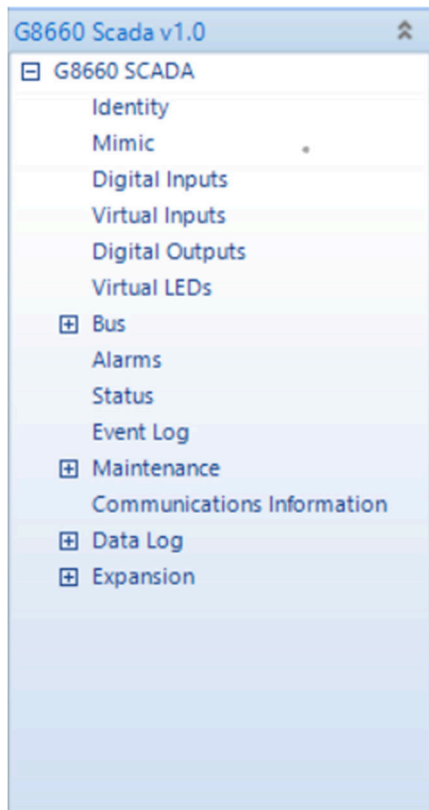


When connection is made...



The SCADA page is subdivided into smaller sections. Select the required section with the mouse.

**NOTE: The SCADA sections will appear depending on how the module is configured.**



## 4.1 IDENTITY

This section displays the module's configuration settings for *Site ID* and *Genset ID*. For further details on how to configure these items, refer to section 3.11.1 entitled *Communications Options* within this document.

|                           |
|---------------------------|
| <b>Identity</b>           |
| <b>Site Identity</b>      |
| Deep Sea Electronics Ltd. |
| <b>Module Identity</b>    |
| G8660 Module              |

## 4.2 MIMIC

This section provides a mimic of the module's fascia and allows the operator to change the control mode of the module. For information regarding operating the DSE module, refer to DSE publication: **057-259 DSEG8660 Operator Manual** which is found on the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)



### 4.3 DIGITAL INPUTS

This section displays the status of the module's digital inputs and their configured functions. For further details on how to configure these items, refer to section 3.4 entitled *Digital Inputs* within this document.

The screenshot shows a window titled "Digital Inputs" with a table of digital input channels. Each channel has a label, an "Active" status indicator (a green circle), and an "Open / Closed" state indicator (a switch icon). A callout points to the "Active" indicator for the first channel, and another callout points to the "Open / Closed" indicator for the same channel.

| Label                                  | Active | Open / Closed |
|----------------------------------------|--------|---------------|
| A Remote Start On Load                 | ●      | ⏏             |
| B Bus Closed Auxiliary                 | ●      | ⏏             |
| C Mains Closed Auxiliary               | ●      | ⏏             |
| D Auxiliary Mains Fail                 | ●      | ⏏             |
| E Paralleling Inhibit (Mains Parallel) | ●      | ⏏             |
| F Mains Load Inhibit (Mains Parallel)  | ●      | ⏏             |
| G Bus Load Inhibit                     | ●      | ⏏             |
| H Clear Mains Decoupling Alarms        | ●      | ⏏             |
| I External Panel Lock                  | ●      | ⏏             |

Shows if the input channel is active or not. This input is open and not active. The input is configured to be *Remote Start On Load*

State of the input (open or closed to battery negative)

## 4.4 VIRTUAL INPUTS

This section displays and controls the status of the module's *Virtual Input Control Sources*. Any of the module's outputs, expansion outputs, expansion LEDs indicators or PLC Flag Tests are to be configured to *Virtual Inputs 1 to 12*. They are provided to enable control using the SCADA section of the DSE Configuration Suite or by third party PLC or Building Management Systems (for example) using the Modbus protocol.

The screenshot shows a software interface titled "Virtual Inputs" with a sub-section "Virtual Input Control Sources". It lists 12 virtual inputs, each with a "Control" checkbox, an "Open / Closed" indicator (a switch), and an "Active" indicator (a green circle). Input 2 is the only one with its control checkbox checked. A callout bubble explains that for Gencomm activation, the input is triggered when the Scada button is released. Another callout points to the green circles, stating they represent the state of the virtual input (on or off). A legend at the bottom right explains that an unchecked checkbox means the function name is de-activated, and a checked checkbox means it is activated.

| Control                             | Open / Closed | Active |
|-------------------------------------|---------------|--------|
| <input type="checkbox"/>            | Open          | Off    |
| <input checked="" type="checkbox"/> | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |
| <input type="checkbox"/>            | Open          | On     |

For a Gencomm activation in Scada, the input is triggered when the Scada button is released.

State of the Virtual Input (on or off)

= Virtual Input function name is de-activated.  
 = Virtual Input function name is activated.

## 4.5 DIGITAL OUTPUTS

This section displays the status of the module's digital outputs and their configured functions. For further details on how to configure these items, refer to section 3.6.1 entitled *Digital Outputs* within this document.

| Digital Outputs (Volts Free) |                    | Active | Open / Closed |
|------------------------------|--------------------|--------|---------------|
| C (N/C)                      | Close Mains Output | ●      | ⏏             |
| D                            | Close Bus Output   | ●      | ⏏             |

| Digital Outputs (DC Supply Out) |                                        | Active | Open / Closed |
|---------------------------------|----------------------------------------|--------|---------------|
| E                               | Sufficient Capacity Available          | ●      | ⏏             |
| F                               | Common Alarm                           | ●      | ⏏             |
| G                               | System In Auto Mode                    | ●      | ⏏             |
| H                               | Mains Failure (Mains Parallel)         | ●      | ⏏             |
| I                               | Mains Failed To Close (Mains Parallel) | ●      | ⏏             |
| J                               | Bus Failed To Close                    | ●      | ⏏             |

State of the output (open or closed)

Shows if the output channel is active or not. This output is open and not active.

## 4.6 VIRTUAL LEDS

This section displays the status of the module's *Virtual LEDs* and the functions they are configured for. These LEDs are not fitted to the module or expansion modules, they are not physical LEDs. They are provided to show status and appear only in the SCADA section of the DSE Configuration Suite or from the module screen or read by third party PLC or Building Management Systems (for example) using the Modbus protocol. For further details on how to configure these items, refer to section 3.6.1 entitled *Digital Outputs* within this document.

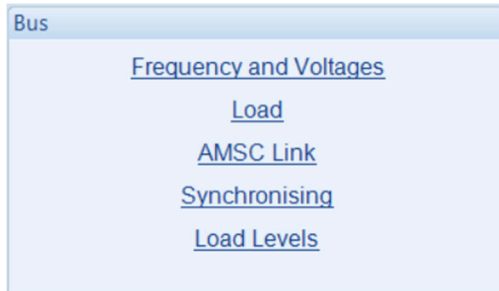
| LED Status |                     | Active |
|------------|---------------------|--------|
| LED 1      | System In Auto Mode | ●      |
| LED 2      | Fuel Relay          | ●      |
| LED 3      | Start Relay         | ●      |
| LED 4      | Not Used            | ●      |
| LED 5      | Common Alarm        | ●      |
| LED 6      | Common Shutdown     | ●      |
| LED 7      | Not Used            | ●      |
| LED 8      | Not Used            | ●      |
| LED 9      | Not Used            | ●      |
| LED 10     | Not Used            | ●      |
| LED 11     | Not Used            | ●      |
| LED 12     | Not Used            | ●      |
| LED 13     | Not Used            | ●      |
| LED 14     | Not Used            | ●      |
| LED 15     | Not Used            | ●      |
| LED 16     | Not Used            | ●      |
| LED 17     | Not Used            | ●      |
| LED 18     | Not Used            | ●      |
| LED 19     | Not Used            | ●      |
| LED 20     | Not Used            | ●      |

Shows what the virtual LED is configured to indicate.

State of the LED (on or off)

## 4.7 BUS

The *Bus* section is subdivided into smaller sections. Select the required section with the mouse.



### 4.7.1 FREQUENCY AND VOLTAGES

This section displays the module's measurement of the *Bus* supply.

| Frequency                 |                    |                    |
|---------------------------|--------------------|--------------------|
| 49.98 Hz                  |                    |                    |
| Phase Rotation            |                    |                    |
| L1-L2-L3                  |                    |                    |
| Phase To Neutral Voltages |                    |                    |
| L1 - N<br>240.3 V         | L2 - N<br>240.2 V  | L3 - N<br>239.8 V  |
| Phase To Phase Voltages   |                    |                    |
| L1 - L2<br>416.2 V        | L2 - L3<br>414.5 V | L3 - L1<br>415.4 V |

### 4.7.2 LOAD

This section displays the module's measurement of the *Load* derived from the *Load CT*.

| Current                     |                 |                 |
|-----------------------------|-----------------|-----------------|
| 279.0 A                     |                 |                 |
| Power                       |                 |                 |
| Watts<br>183.98 kW          | VA<br>192.9 kVA | VAr<br>8.5 kVAr |
| Power factor                |                 |                 |
| 0.99                        |                 |                 |
| Bus Derived Instrumentation |                 |                 |
| Watts<br>0.00 kW            | VAr<br>0.0 kVAr |                 |

4.7.3 AMSC LINK

**NOTE:** These settings are not saved within the module’s configuration file. They are stored in a different memory area and not transferred with the configuration file. The *Backup Module* feature transfers both the configuration file AND the settings of the *AMSC Link, Sync and Load Levels* page. The settings may also change when configured for a Group Controller.

Shows if the *Commissioning Screen* is active or not.

**Bus**

| Parameter                            | Description                                                                                                                                                                                           |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set On The Bus                       | The number of DSExx10 controllers that are connected on the AMSC link.                                                                                                                                |
| Sets On Load                         | The number of DSExx10 controllers that are connected on the AMSC link and closed onto the Generator Bus.                                                                                              |
| Mains Controllers On The Bus         | The number of Mains Controllers and Bus Tie controllers that are connected on the AMSC link.                                                                                                          |
| Bus Ties On The Bus                  | The number of Bus Ties On The Bus                                                                                                                                                                     |
| Group Controllers On The Bus         | The number of DSEG8660 group controllers that are connected on the AMSC link.                                                                                                                         |
| Group Controllers On Load            | The number of DSEG8660 group controllers that are connected on the AMSC link and closed onto the Generator Bus.                                                                                       |
| AMSC ID Group (Primary)              | The AMSC ID of the Primary Group                                                                                                                                                                      |
| Group Primary Segment Number         | The segment number of the Primary Group.                                                                                                                                                              |
| Load Demand Priority (Group Primary) | Set the priority number for the <i>The Load Demand Priority (Group Primary)</i> to give the Primary Group Sets priority over all other sets in other Groups when the load demand scheme is activated. |

**Mains/Group**

| Parameter                      | Description                                   |
|--------------------------------|-----------------------------------------------|
| AMSC ID Group (Secondary)      | The AMSC ID of the Secondary Group            |
| Group Secondary Segment Number | The segment number of the Secondary Group.    |
| Sets on the AMSC Group         | The number of sets on the AMSC group.         |
| Sets on Load on the AMSC Group | The number of sets on load on the AMSC group. |

**Commissioning Screen**

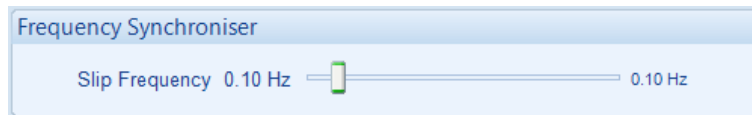
| Parameter | Description                                                                                                                                                                                                                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable    | <input type="checkbox"/> = Commissioning screens are not shown on the module display<br><input checked="" type="checkbox"/> = The commissioning screens are shown in the <i>Generator</i> section on the module display. These pages are useful for the commissioning and troubleshooting of a load share system. |

**▲ NOTE:** Every module connected on the AMSC link must have a unique AMSC ID. The AMSC ID is automatically set when all the modules are powered up “one at a time”. If all the modules are powered up together, this may result in the AMSC ID Error alarm activating. Manually setting the AMSC ID allows this alarm to be reset and prevents this from occurring.

#### 4.7.4 SYNCHRONISING

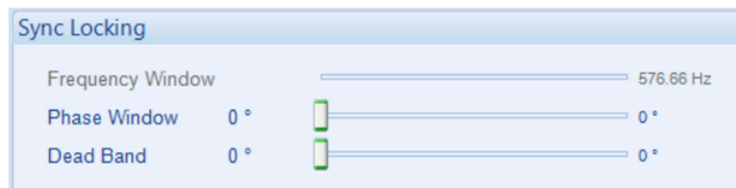
**NOTE:** These settings are not saved within the module's configuration file. They are stored in a different memory area and not transferred with the configuration file. The *Backup Module* feature transfers both the configuration file AND the settings of the *AMSC Link, Sync and Load Levels* page.

##### Frequency Synchroniser



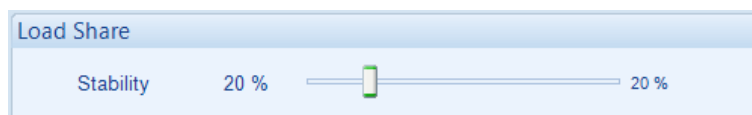
| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slip Frequency | This is the frequency difference between the Generator Bus and the Mains which the module adjusts to during synchronising. This is done to match the phase of the Generator Bus supply to Mains supply.<br>The phase of the supplies then drifts in and out of synchronism at a rate of $1/Slip\ Frequency$ times per second. e.g. with a <i>Slip Frequency</i> of 0.2 Hz, the supplies are in phase once every five seconds. |

##### Sync Locking



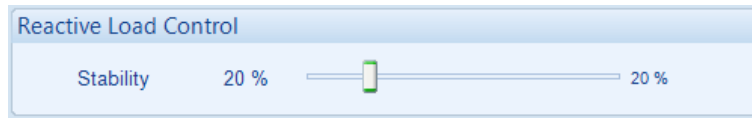
| Parameter        | Description                                                                                                                  |
|------------------|------------------------------------------------------------------------------------------------------------------------------|
| Frequency Window | The setting for adjusting the allowed frequency range. When the slip is within this window, phase locking will be attempted. |
| Phase Window     | The phase offset around which the phase locking is active, otherwise it is pushed round again.                               |
| Dead Band        | The setting for adjusting the total governor non-response zone.                                                              |

##### Load Share



| Parameter     | Description                                                                                                                                                                                                                                                                  |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stability (I) | The setting for the Stability (I) of the control loop used for control the DSEG8600's kW power production.<br><br>In general, lower setting results in slow kW control, but too high a setting may cause instability (hunting). If this occurs, lower the stability setting. |

**Reactive Load Control**



| Parameter     | Description                                                                                                                                                                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stability (I) | <p>The setting for the Stability (I) of the control loop used for control the DSEG8600's kvar power production.</p> <p>In general, lower setting results in slow kvar control, but too high a setting may cause instability (hunting). If this occurs, lower the stability setting.</p> |

### 4.7.5 LOAD LEVELS

#### Levels

**NOTE:** The *Load Level* settings only have effect when the Generator Bus is in parallel with the mains.

For further details on how to configure the different power modes and their operation, refer to sections 0 & 3.8.10 entitled *Power Control* and *Voltage and Reactive Power Control* within this document.

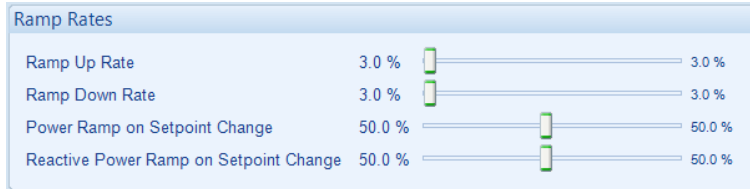
| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode: Bus | <p><b>NOTE:</b> In Bus Mode the Generators provide up to the Load Level Maximum setting (%) and the Utility Mains supplies the rest of the power. All generators are started in Auto and on the same segment number. The G8660 then requests the generators to produce the power as per the Load Level setting and share the power (in equal %) between them all. No Load demand scheme is in operation.</p> <p>Using the <i>Remote Start on Load</i> input to the module, the Generator Bus is instructed to go into continuous parallel operation with the mains. This may be required to only occur during specified times of the day.</p> <p>When the module is set to <i>Bus Mode</i>, this causes the Generator Bus to produce a fixed (base) level of <i>Active Power</i> (kW) and <i>Reactive Power</i> (kvar) against the Mains when in continuous parallel operation.</p> <div style="text-align: center;"> </div> |

| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <p>With <i>Bus Mode</i>, care must be taken if exporting power to the Mains supply is not allowed. For instance, if the <i>Maximum kW Level</i> is set to 100 kW and the site load is 75 kW, the Generator Bus exports 25 kW into the Mains supply.</p> <p>The <i>Maximum kW Level</i> and <i>Maximum kvar Level</i> are a percentage of each generators capacity that is connected to the Bus. E.g. on a multi set system where each Generator is rated at 500 kW and the <i>Maximum kW Level</i> was set to 50%, each Generator running produces 250 kW.</p> <p>Therefore, the actual kW and kvar produced varies depending on how many generators are closed onto the Bus.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Mode: Mains        | <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> When operating in <i>Mains Mode</i>, the generators are never driven to more than 100% of their full load rating. When the generators reach 100% of their full load rating, the <i>Insufficient Capacity</i> alarm activates (if configured).</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE:</b> The Load Demand Scheme is active when the power is above the <i>Maximum Load Level %</i> (Utility Mains provides up to this level) which in turn will start generators. If the load increases or decreases the calling for more sets will commence using the Load Demand Scheme.</p> </div> <p>Using the <i>Remote Start on Load</i> input to the module, the Generator Bus is instructed to go into continuous parallel operation with the Mains once the Mains power exceeds the <i>Maximum kW Level</i> setting. This may be required to only occur during specified times of the day.</p> <p>When the module is set to <i>Mains Mode</i>, this enables the Generator Bus to provide <i>Peaking Lopping/Shaving Parallel</i> operation when in continuous parallel with the mains.</p> <div style="text-align: center; margin: 10px 0;"> </div> <p>With <i>Mains Mode</i>, the Generator Bus is used to provide a variable amount of <i>Active Power (kW)</i> to maintain the Mains import/export levels to the configured <i>Maximum kW Level</i>.</p> <p>The <i>Maximum kW Level</i> and <i>Maximum kvar Level</i> are a percentage the Mains rating. E.g. If the Mains rating was configured as 250 kW, the Generator Bus would supply the difference between 250 kW and total connected load. If the load was lower than 250 kW, Generator Bus comes off load performs a controlled stop.</p> |
| Power Control Mode | <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> For further information on these operating modes, refer to section 0 entitled <i>Power Control</i> within this document.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Parameter                          | Description                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | <p>Allows selection of the <i>Power Control Mode</i> when running in <i>Bus Mode</i>. This is also selectable by activation of a configured digital input or via the <i>Running Editor</i>.</p>                                                                                                                                                                                             |
| <p>Reactive Power Control Mode</p> | <p><b>▲ NOTE: For further information on these operating modes, refer to section 3.8.10 entitled <i>Voltage and Reactive Power Control</i> within this document.</b></p> <p>Allows selection of the <i>Reactive Power Control Mode</i> when running in <i>Bus Mode</i>. This is also selectable by activation of a configured digital input or via the <i>Running Editor</i>.</p>           |
| <p>Load Capacity Required</p>      | <p>The maximum amount of power that is required by the load.</p>                                                                                                                                                                                                                                                                                                                            |
| <p>Spinning Reserve</p>            | <p>The power available over and above the load requirements on the bus. The load demand scheme will start further sets to ensure that this margin is maintained.</p>                                                                                                                                                                                                                        |
| <p>Spinning Capacity</p>           | <p>The minimum power that will be available on the bus (this setting normally exceeds spinning reserve).</p>                                                                                                                                                                                                                                                                                |
| <p>Load Level</p>                  | <p><b>▲ NOTE: When in <i>Bus Mode</i> if <i>Maximum kW Level</i> is greater than the load, power is exported to the mains. If required, enable the module's <i>Mains Export Power</i> alarm to protect against undesired power export.</b></p> <p>The operation of this setting depends on the parallel mode selected:</p> <p><b>Minimum:</b><br/><b>Maximum:</b></p>                       |
| <p>VAr Level</p>                   | <p><b>▲ NOTE: When in <i>Bus Mode</i> if <i>Maximum kvar Level</i> is greater than the load, power is exported to the mains.</b></p> <p><b>Maximum:</b> The percentage of total kvar the Generator Bus to produce whilst in continuous parallel with the mains.<br/><b>Power Factor:</b> The power factor the Generator Bus is to produce whilst in continuous parallel with the mains.</p> |

**Ramp Rates**

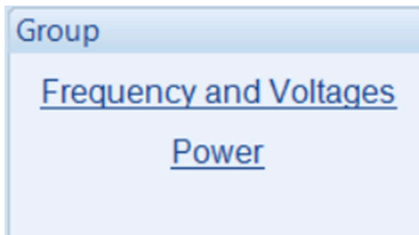
**NOTE:** These adjustable parameters do not change the module’s configuration settings. These settings enable the user to change the values dynamically via SCADA or the module’s internal PLC based on operating requirements. The settings are reset on an alternate config change or when a new config is written.



| Parameter                              | Description                                                                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ramp Up Rate                           | The rate at which the Generator Bus is ramped onto the load.                                                                                                                                |
| Ramp Down Rate                         | The rate at which the Generator Bus is ramped off the load.                                                                                                                                 |
| Power Ramp on Setpoint Change          | When changing between <i>Power Control</i> modes or changing the set point, the <i>Ramp Rate</i> defines how fast the Generator Bus power changes in percentage points per second.          |
| Reactive Power Ramp on Setpoint Change | When changing between <i>Reactive Power Control</i> modes or changing the set point, the <i>Ramp Rate</i> defines how fast the Generator Bus power changes in percentage points per second. |

## 4.8 GROUP

The Group section is subdivided into smaller sections. Select the required section with the mouse.



### 4.8.1 FREQUENCY AND VOLTAGES

This section displays the modules measurement of the Group frequency, voltage, and current supply

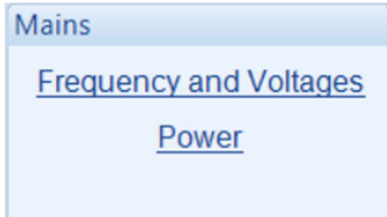
| Frequency and Voltages    |         |         |  |
|---------------------------|---------|---------|--|
| Frequency                 |         |         |  |
| 0.00 Hz                   |         |         |  |
| Phase Rotation            |         |         |  |
| Indeterminate             |         |         |  |
| Phase To Neutral Voltages |         |         |  |
| L1 - N                    | L2 - N  | L3 - N  |  |
| 0.0V                      | 0.0V    | 0.0V    |  |
| Phase To Phase Voltages   |         |         |  |
| L1 - L2                   | L2 - L3 | L3 - L1 |  |
| 0.0V                      | 0.0V    | 0.0V    |  |
| Group Current             |         |         |  |
| L1                        | L2      | L3      |  |
| 0 A                       | 0 A     | 0 A     |  |

### 4.8.2 POWER

This section displays the module's measurement of the power the Group is supplying.

| Power             |          |           |          |
|-------------------|----------|-----------|----------|
| Watts             |          |           |          |
| L1                | L2       | L3        | Total    |
| 0.00 kW           | 0.00 kW  | 0.00 kW   | 0.00 kW  |
| 0.0 %             | 0.0 %    | 0.0 %     | 0.0 %    |
| VA                |          |           |          |
| L1                | L2       | L3        | Total    |
| 0.0 kVA           | 0.0 kVA  | 0.0 kVA   | 0.0 kVA  |
| VAr               |          |           |          |
| L1                | L2       | L3        | Total    |
| 0.0 kVAr          | 0.0 kVAr | 0.0 kVAr  | 0.0 kVAr |
| Power factor      |          |           |          |
| L1                | L2       | L3        | Average  |
| 0.00              | 0.00     | 0.00      | ---      |
| Accumulated Power |          |           |          |
| kWh               | kVAh     | kVArh     |          |
| 0.0 kWh           | 0.2 kVAh | 0.2 kVArh |          |

## 4.9 MAINS



### 4.9.1 FREQUENCY AND VOLTAGES

This section displays the modules measurement of the Mains frequency, voltage, and current supply

|                                  |                  |                  |
|----------------------------------|------------------|------------------|
| <b>Frequency</b>                 |                  |                  |
| 0.00 Hz                          |                  |                  |
| <b>Phase Rotation</b>            |                  |                  |
| Indeterminate                    |                  |                  |
| <b>Phase To Neutral Voltages</b> |                  |                  |
| L1 - N<br>0.0 V                  | L2 - N<br>0.0 V  | L3 - N<br>0.0 V  |
| <b>Phase To Phase Voltages</b>   |                  |                  |
| L1 - L2<br>0.0 V                 | L2 - L3<br>0.0 V | L3 - L1<br>0.0 V |
| <b>Mains Current</b>             |                  |                  |
| L1<br>0.0 A                      | L2<br>0.0 A      | L3<br>0.0 A      |
| <b>Fault Ride Through</b>        |                  |                  |
| 0 Events                         |                  |                  |

### 4.9.2 POWER

This section displays the module's measurement of the power the *Mains is supplying*.

| Watts   |         |         |         |
|---------|---------|---------|---------|
| L1      | L2      | L3      | Total   |
| 0.00 kW | 0.00 kW | 0.00 kW | 0.00 kW |
|         |         |         | 0.0 %   |

| VA      |         |         |         |
|---------|---------|---------|---------|
| L1      | L2      | L3      | Total   |
| 0.0 kVA | 0.0 kVA | 0.0 kVA | 0.0 kVA |

| VAr      |          |          |          |
|----------|----------|----------|----------|
| L1       | L2       | L3       | Total    |
| 0.0 kVAr | 0.0 kVAr | 0.0 kVAr | 0.0 kVAr |

| Power factor |      |      |         |
|--------------|------|------|---------|
| L1           | L2   | L3   | Average |
| 1.00         | 1.00 | 1.00 | 1.00    |

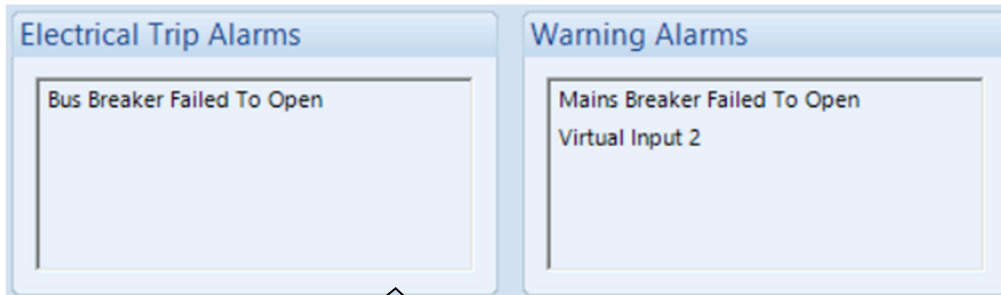
| Accumulated Power |          |           |
|-------------------|----------|-----------|
| kWh               | kVAh     | kVArh     |
| 0.1 kWh           | 0.1 kVAh | 0.1 kVArh |

## 4.10 ALARMS

This section displays the alarms that are currently active on the module. For information regarding alarm descriptions, refer to DSE publication: **057-259 DSEG8660 Operation Manual** which is found on the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com).

For information regarding alarm severity, refer to section 5 entitled *Alarm Types* within this document.


### Alarms



Alarms that are active on the unit are grouped based on their type. For example, the *Bus Breaker Failed To Open* alarm appears in the *Electrical Trip Alarms* list because it has generated a *Electrical Trip* alarm type.

## 4.11 STATUS

This section displays the status information about the module.

|                                                  |                                                                                                                |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Supervisor State</b><br>At Rest               | <b>Application</b><br>Mains Parallel Mode                                                                      |
| <b>Mains Detection State</b><br>Mains Failed     | <b>Software Version</b><br>Main version: 1.0.255<br>Bootloader: 0.3.255<br>Co-Processor: 1.0.255<br>Bootstrap: |
| <b>Load Switching State</b><br>Generator On Load | <b>Module ID</b><br>1BAD1DEA                                                                                   |
| <b>Protections</b><br>Enabled                    | <b>Mode</b><br>              |
| <b>Heater Fitted</b><br>Heater Fitted            |                                                                                                                |

### 4.12 EVENT LOG

This section displays the events which are recorded with the module's event log along with the time, date in which they occurred. For further details on how what events are recorded, refer to section entitled 3.3.5 *Event Log* within this document.

For information regarding alarm descriptions, refer to DSE publication: *057-259 DSEG8660 Operation Manual* which is found on the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com).

| #  | Date       | Time     | Hours Run | Event   | Details                       |
|----|------------|----------|-----------|---------|-------------------------------|
| 1  | 23/04/2019 | 14:15:17 | 0:00      | Mains   | Mains fail                    |
| 2  | 23/04/2019 | 14:15:16 | 0:00      | Warning | Mains Failed To Close         |
| 3  | 23/04/2019 | 14:15:14 | 0:00      | Restart | Power Up                      |
| 4  | 23/04/2019 | 14:12:16 | 0:00      | Mains   | Mains fail                    |
| 5  | 23/04/2019 | 14:12:15 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 6  | 23/04/2019 | 14:12:15 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 7  | 23/04/2019 | 14:12:15 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 8  | 23/04/2019 | 14:12:15 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 9  | 23/04/2019 | 14:12:13 | 0:00      | Restart | Power Up                      |
| 10 | 13/04/2018 | 08:45:43 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 11 | 13/04/2018 | 08:45:43 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 12 | 13/04/2018 | 08:45:43 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 13 | 13/04/2018 | 08:45:43 | 0:00      | ETrip   | Expansion Unit Watchdog Alarm |
| 14 | 13/04/2018 | 08:44:38 | 0:00      | Mains   | Mains fail                    |
| 15 | 13/04/2018 | 08:44:36 | 0:00      | Warning | Mains Failed To Close         |
| 16 | 13/04/2018 | 08:44:35 | 0:00      | Restart | Power Up                      |
| 17 | 13/04/2018 | 08:43:33 | 0:00      | Mains   | Mains fail                    |
| 18 | 13/04/2018 | 08:43:31 | 0:00      | Warning | Mains Failed To Close         |
| 19 | 13/04/2018 | 08:43:30 | 0:00      | Restart | Power Up                      |
| 20 | 13/04/2018 | 08:38:19 | 0:00      | Mains   | Mains fail                    |
| 21 | 13/04/2018 | 08:38:17 | 0:00      | Warning | Mains Failed To Close         |
| 22 | 13/04/2018 | 08:38:16 | 0:00      | Restart | Power Up                      |
| 23 | 13/04/2018 | 08:35:40 | 0:00      | Mains   | Mains fail                    |
| 24 | 13/04/2018 | 08:35:38 | 0:00      | Warning | Mains Failed To Close         |
| 25 | 13/04/2018 | 08:35:37 | 0:00      | Restart | Power Up                      |
| 26 | 13/04/2018 | 08:31:11 | 0:00      | Mains   | Mains fail                    |

Export to Excel
Export to CSV
Export to PDF
Print event log

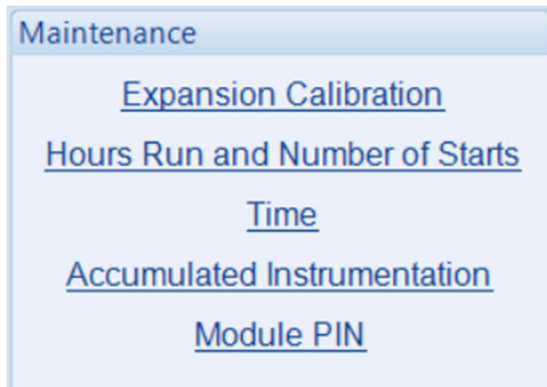
Click to save the log to an Excel or csv file for use in an external spreadsheet

Click to save the log to a pdf (Adobe Acrobat) file.

Click to print the log

## 4.13 MAINTENANCE

The *Maintenance* section is subdivided into smaller sections. Select the required section with the mouse.



### 4.13.1 EXPANSION CALIBRATION

This section allows the analogue sensor inputs of the DSE2130 and DSE2131 expansion modules to be calibrated to remove inaccuracies caused by the tolerance of the sensor devices. While the Generator Bus is running, the instruments are calibrated, and reference needs to be made to a third-party accurate sensing device to ensure accurate recalibration.

- Expansion Calibration
- [2130 DSENet ID 0](#)
  - [2130 DSENet ID 1](#)
  - [2130 DSENet ID 2](#)
  - [2130 DSENet ID 3](#)
  - [2131 DSENet ID 0](#)
  - [2131 DSENet ID 1](#)
  - [2131 DSENet ID 2](#)
  - [2131 DSENet ID 3](#)

The screenshot displays the 'Expansion Calibration' interface with the following components and callouts:

- Analogue Input A:** A slider set to '0 Bar'. Callout: "The value for the sensor as displayed on the module's display".
- Analogue Input B:** A slider set to 'Not configured'. Callout: "Adjust the slider to alter the module's calibration for the sensor".
- Analogue Input C:** A slider set to 'Fault'.
- Analogue Input D:** A slider set to '20 %'.
- Reset:** A 'Reset to Default' button. Callout: "Click to reset all the recalibration settings back to default."

### 4.13.2 HOURS RUN AND NUMBER OF STARTS

This section shows the number of Hours Run and the number of Starts.

The screenshot displays a software interface for monitoring 'Hours Run and Number of Starts'. It features a main title bar and a sub-section titled 'Load Demand Run Hours'. Within this sub-section, there is a label 'Hours Run:' followed by the value '27:12'. To the right of the value is a small control box with up and down arrows and the text '27:12', and further right is a 'Set' button.

### 4.13.3 TIME

This section allows the date and time to be adjusted on the controller.

The screenshot displays a SCADA interface with four main sections for time management:

- Module Date:** Shows the current date as 14/07/2021. A callout bubble states: "Display of the module's current date and time".
- Module Time:** Shows the current time as 14:07:16.
- Set Date And Time:** Contains two dropdown menus for "Date" (14/07/2021) and "Time" (14:06:52), and a "Set" button. A callout bubble says: "Type the new date / time or click the up and down arrows to change the settings". Another callout bubble points to the "Set" button: "Click Set to adjust the module to the selected date/time."
- Set To PC Time:** Shows the PC's current date (14/07/2021) and time (14:10:51), with a "Set To PC Time" button. A callout bubble says: "Click Set to adjust the module to the date/time that the PC is set to."

### 4.13.4 ACCUMULATED INSTRUMENTATION

This section allows the Mains accumulated instrumentation to be adjusted on the controller.

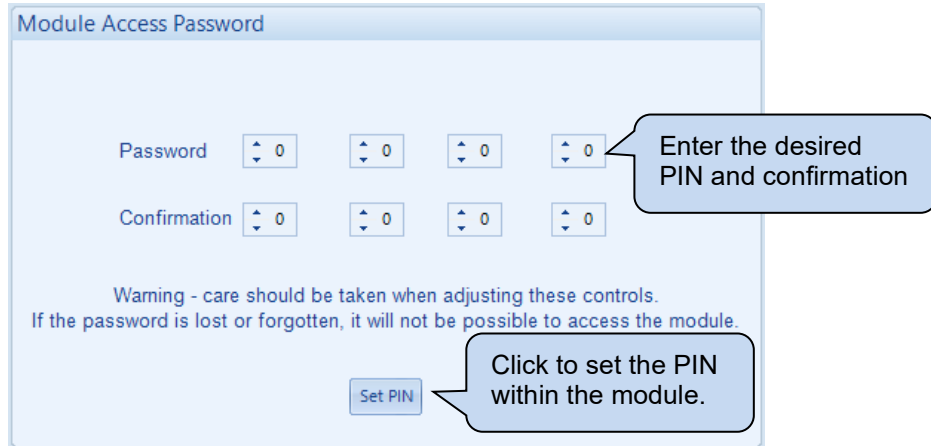
The screenshot displays a SCADA interface for adjusting accumulated instrumentation. It features five main sections: kWh, kVAh, kVArh, Fault Ride Through, and a Reset button. Each section contains a label, a current value, a numeric input field with up/down arrows, and a 'Set' button. Callout boxes provide instructions: 'Display of the module's current value for the parameter.' points to the kWh value; 'Type the new value or click the up and down arrows to change the settings.' points to the kVAh input field; 'Click Set to adjust the module to the selected value.' points to the Set button in the kVArh section; and 'Click to reset all the accumulated instrumentation counters to zero.' points to the 'Reset all values to zero' button.

| Parameter          | Current Value | Target Value |
|--------------------|---------------|--------------|
| kWh                | 30.6 kWh      | 30.6         |
| kVAh               | 38.2 kVAh     | 38.2         |
| kVArh              | 22.7 kVArh    | 22.7         |
| Fault Ride Through | 19 Events     | 19           |

### 4.13.5 MODULE PIN

**! CAUTION!: If the module PIN is lost or forgotten, it is no longer possible to access or make changes to the module!**

This section allows the user to configure a PIN (Personal Identification Number) within the module. This PIN must be entered to access the modules *Main Front Panel Configuration Editor* or, when writing a configuration / changing a value in SCADA using the DSE Configuration Suite PC Software.



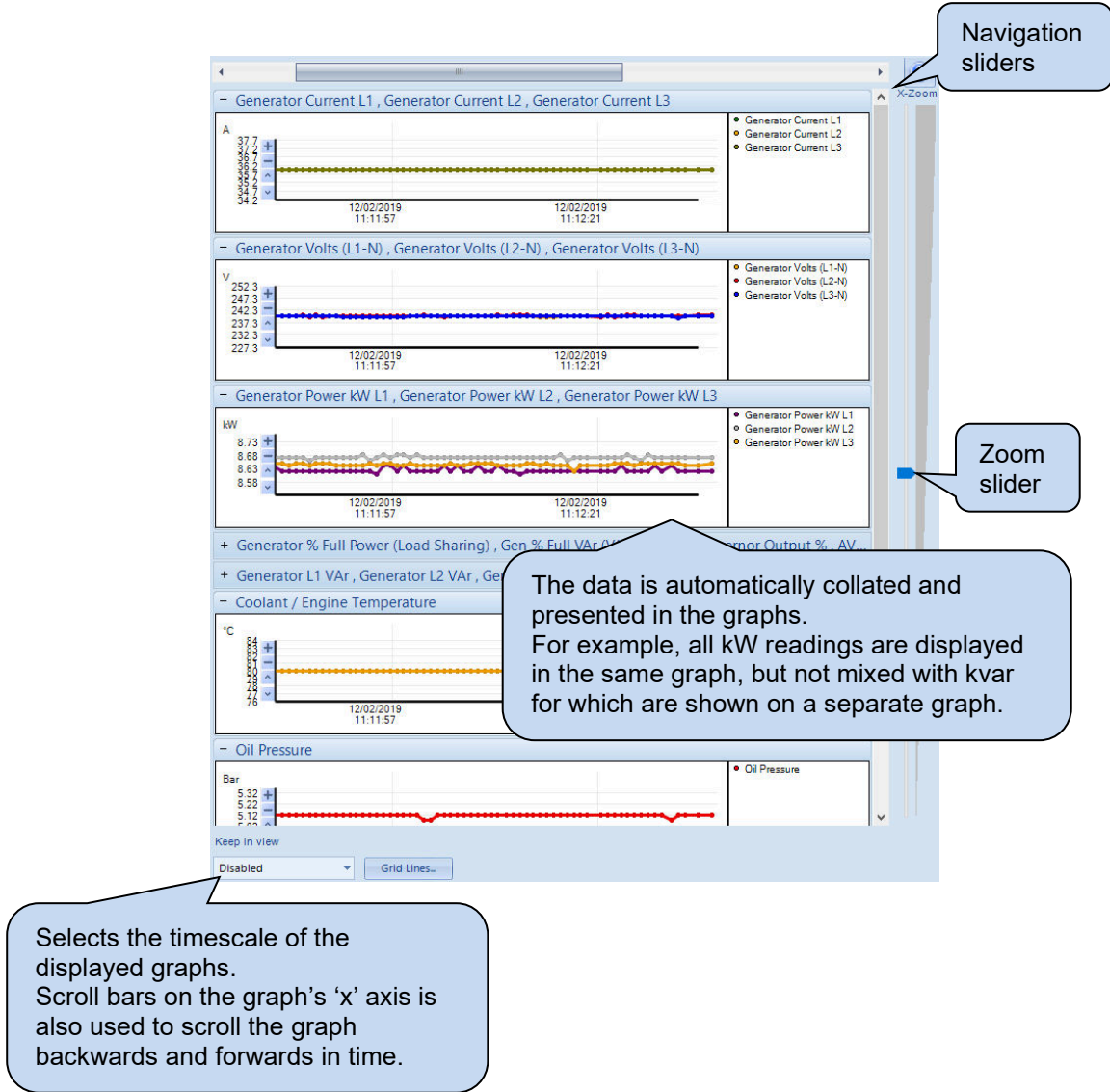
## 4.14 COMMUNICATIONS INFORMATION

This section displays the information about the configuration of the module's ethernet port. For further details on how to configure the module's ethernet port, refer to section 3.11.3 entitled *Ethernet Port* within this document.

|                                           |                                                          |
|-------------------------------------------|----------------------------------------------------------|
| <b>IP address</b><br>192 . 168 . 1 . 100  | <b>MAC Address</b><br>E8 : A4 : C1 : 2 : 8D : 7          |
| <b>Subnet Mask</b><br>255 . 255 . 255 . 0 | <b>DNS</b><br>8 . 8 . 8 . 8                              |
| <b>Host</b><br>DSE Host                   | <b>MODBUS Preferred IP Address</b><br>192 . 168 . 1 . 99 |
| <b>Domain</b><br>DSE Module               | <b>MODBUS Connection Port</b><br>502                     |
| <b>Gateway</b><br>192 . 168 . 1 . 1       | <b>DHCP</b><br>Off                                       |
|                                           | <b>TCP Vendor</b><br>DSE Vender                          |

### 4.15 DATA LOG

This section displays and temporarily records the instruments configured within the module's *Data Logging* facility to the PC. The data which is temporarily recorded is only for the duration in which the *Data Log* section is viewed. For further details on how to configure these items, refer to section 3.3.6 entitled *Data Logging* within this document.



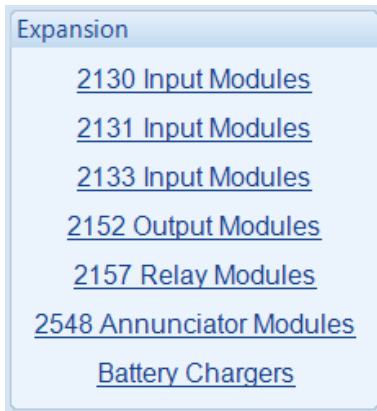
### 4.15.1 DATA LOG STATUS

This section displays the status of the data log configured within the module's *Data Logging* facility to the PC

|                                                                                 |                                           |
|---------------------------------------------------------------------------------|-------------------------------------------|
| <b>Internal Memory Capacity</b><br>2048 kB                                      | <b>Data Logging Status</b><br>Not Logging |
| <b>Remaining Data Log Memory</b><br>Space remaining in Internal memory: 2032 kB | <b>Data Log Mode</b><br>Keep New          |
| <b>Remaining Data Log Time</b><br>24h 53m                                       | <b>USB Drive Status</b><br>Not Fitted     |
| <b>Total Log Pages Available</b><br>42                                          | <b>Data Log Destination</b><br>Internal   |
| <b>Current Page Usage</b><br>0.000 kB                                           |                                           |

## 4.16 EXPANSION

The *Expansion* section is subdivided into smaller sections. Select the required section with the mouse.



The selected section displays the status of the expansion module's inputs/outputs/LEDs etc and the functions they are configured for. For further details on how to configure these items, refer to section 3.14 entitled *Expansion* within this document. An example status of a DSE2157 Output Expansion is shown below.

**Communications**

Communications OK ● State of communication to the expansion module

---

**Relay Outputs (Normally Open)**

|                          | Active | Open / Closed |
|--------------------------|--------|---------------|
| A Combined Mains Failure | ●      | ⏏             |
| B Bus Closed Auxiliary   | ●      | ⏏             |
| C PLC Output Flag 4      | ●      | ⏏             |
| D Not Used               | ●      | ⏏             |

State of the output (open or closed)

---

**Relay Outputs (Changeover)**

|                     | Active | Open / Closed |
|---------------------|--------|---------------|
| E PLC Output Flag 5 | ●      | ⏏             |
| F Not Used          | ●      | ⏏             |
| G PLC Output Flag 6 | ●      | ⏏             |
| H Not Used          | ●      | ⏏             |

Shows if the output channel is active or not. This output is open and is active. The output is configured to be *PLC Output Flag 6 De- Energise*.

## 5 ALARM TYPES

The protection included with the DSE control modules provides increasing levels of notification, depending upon the severity of the situation:

| Alarm Type              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Indication              | No audible alarm or common warning signal occurs.<br><i>Indication</i> alarms are only used to illuminate indicators, activate outputs, or checked by the module's internal PLC.                                                                                                                                                                                                                                                                           |
| Latched Indication      | Latched indication alarm will stay active until manually disabled. The module does not automatically reset the indication alarm. Resetting the indication alarm is performed by either activating a digital input configured for <i>Alarm Reset, individual alarms using PLC</i> , or pressing the <i>Stop/Reset Mode</i> button once the triggering condition has been cleared.                                                                           |
| Warning                 | Audible alarm and common alarm signal are generated. The Generator Bus continues to run.<br><i>Warning alarms</i> are used to draw the operator's attention to a minor issue or to a problem that may escalate to an Electrical Trip if left untreated.                                                                                                                                                                                                    |
| Warning Always Latched  | <i>Warning Always Latched</i> alarms will stay active until manually disabled. The module does not automatically reset the warning alarm. Resetting the alarm is performed by either activating a digital input configured for <i>Alarm Reset, individual alarms using PLC</i> , or pressing the <i>Stop/Reset Mode</i> button once the triggering condition has been cleared.                                                                             |
| Electrical Trip         | Audible alarm and common alarm signal are generated. The Generator Bus is taken off load and the cooling timer begins, after which the set is stopped.<br><i>Electrical Trip alarms</i> are series issues that require the Generator Bus to be taken off load. As the name implies, this is often electrical faults that occur 'after' the load switch. The Generator Bus is allowed to cool before stopping.                                              |
| Shutdown                | Audible alarm and common alarm signal is generated. The set is taken off load and immediately stopped.<br><i>Shutdown alarms</i> are serious issues that demand immediate stopping of the generator. For instance, Emergency Stop or Overspeed alarms require immediate shutdown.                                                                                                                                                                          |
| Auxiliary Mains Failure | The module operates as if the incoming mains supply has fallen outside of limits, the Generator Bus is instructed to start and take the load. The alarm is recorded in the event log / alarms section as a warning.<br>Deactivation of this alarm causes the module to act as the mains has returned to within limits, providing that the Mains sensing also indicates that the mains is within limits. This usually requires a manual reset of the alarm. |

## 6 ALARM ARMING

The protections on the DSE module are active during their configured *Alarm Arming* setting. The table below shows the timing segment for the different *Alarm Arming* options with regards to the Generator Bus status.

| Timing Segment             | Bus and Mains Open | Bus Available / Bus on Load | Mains Available / Mains on Load | Bus and Mains in Parallel |
|----------------------------|--------------------|-----------------------------|---------------------------------|---------------------------|
| Active from Mains Parallel |                    |                             |                                 |                           |
| Always                     |                    |                             |                                 |                           |
| Never                      |                    |                             |                                 |                           |

### 6.1 NEVER

The protection is never active on the controller. This is used to disable the protection.

### 6.2 ALWAYS

The protection is always active on the controller. This is used to constantly monitor statuses such as an external Mains protection device regardless of the state of the Generator Bus.

### 6.3 ACTIVE FROM MAINS PARALLEL

The protection is active when the Generator Bus is running in parallel with the mains.

## *Alarm Arming*