DEEP SEA ELECTRONICS

DSE8610 MKII
Configuration Suite PC Software Manual

Document Number: 057-238

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DSE8610 MKII Configuration Suite PC Software Manual

Amendments List

Issue	Comments	Minimum Module Version Required	Minimum Configuration Suite Version Required
1	Initial release	V1.0.0	2015.84 V1.274.3
2	Added information about Reset Electrical Trip	V1.2	2016.41 V1.278.39
3	Added updates to configuring sensor curves, fuel usage alarm, fuel use and efficiency, J1939-75, DTIC/SPN ignore, DEF level alarm and post heat timer.	V1.3	2016.55 V2.10.2
4	Updated to include features added in module firmware v2.0 and v3.0	V3.0	2017.46 v2.51.3

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

The **DSE Configuration Suite PC Software** allows the DSE86xx MKII modules to be connected to a PC via USB A –USB B cable. Once connected the various operating parameters within the module are viewed or edited as required by the engineer. This software allows easy controlled access to these values.

This manual details the configuration of the DSE8610 MKII series controllers.
A separate document covers the older DSE8610 module configuration.
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 / generating set 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 provider.
The information contained in this manual must be read in conjunction with the information contained in the appropriate module documentation. This manual only details which settings are available and how they may be used. A separate manual deals with the operation of the individual module (See section entitled *Bibliography* elsewhere in this document).

1.1 BIBLIOGRAPHY

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

1.1.1 INSTALLATION INSTRUCTIONS

DSE PART	DESCRIPTION
053-182	DSE8610 MKII Installation Instructions Sheet

1.1.2 MANUALS

DSE PART	DESCRIPTION
057-151	DSE Configuration Suite PC Software Installation & Operation Manual
057-004	Electronic Engines and DSE wiring
057-045	DSE Guide to Synchronising and Load Sharing Part1
057-046	DSE Guide to Synchronising and Load Sharing Part2
057-047	DSE Load Share Design and Commissioning Guide
057-254	DSE8610 MKII Operator Manual
057-082	DSE2130 input expansion manual
057-139	DSE2131 input expansion manual
057-140	DSE2133 input expansion manual
057-141	DSE2152 input expansion manual
057-083	DSE2157 input expansion manual
057-084	DSE2548 input expansion manual

1.1.3 OTHER

The following third party documents are also referred to:

ISBN	DESCRIPTION
1-55937-879-4	IEEE Std C37.2-1996 IEEE Standard Electrical Power System Device Function Numbers and Contact Designations. Published by Institute of Electrical and Electronics Engineers Inc

1.1.4 CLARIFICATION OF NOTATION

Clarification of notation used within this publication.

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

1.1.5 GLOSSARY OF TERMS

Term	Description
DSE8xxx MKII	All modules in the DSE8xxx MKII range.
DSE8600 MKII, DSE86xx MKII	All modules in the DSE86xx MKII range.
DSE8610 MKII	DSE8610 MKII module/controller
AVR	Automatic Voltage Regulator
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 world areas including parts of the USA and Australia.
CT	Current Transformer An electrical device that takes a large AC current and scales it down by a fixed ratio to a smaller scale.
BMS	Building Management System A digital/computer based control system for a building's infrastructure.
DEF	Diesel Exhaust Fluid (AdBlue) A liquid used as a consumable in the SCR process to lower nitric oxide and nitrogen dioxide concentration in engine exhaust emissions.
DM1	Diagnostic Message 1 A DTC that is currently active on the engine ECU (ECM).
DM2	Diagnostic Message 2 A DTC that was previously active on the engine ECU (ECM) and has been stored in the ECU's (ECM) internal memory.
DPF	Diesel Particulate Filter A filter fitted to the exhaust of an engine to remove diesel particulate matter or soot from the exhaust gas.
DPTC	Diesel Particulate Temperature Controlled Filter A filter fitted to the exhaust of an engine to remove diesel particulate matter or soot from the exhaust gas which is temperature controlled.
DTC	Diagnostic Trouble Code The name for the entire fault code sent by an engine ECU (ECM).
ECU/ECM	Engine Control Unit/Management An electronic device that monitors engine parameters and regulates the fuelling.
FMI	Failure Mode Indicator A part of DTC that indicates the type of failure, e.g. high, low, open circuit etc.
GSM	Global System for Mobile communications. Cell phone technology used in most of the World.
HEST	High Exhaust System Temperature Initiates when DPF filter is full in conjunction with an extra fuel injector in the exhaust system to burn off accumulated diesel particulate matter or soot.

Continued over page…

Term	Description
HMI	Human Machine Interface A device that provides a control and visualisation interface between a human and a process or machine.
IDMT	Inverse Definite Minimum Time
IEEE	Institute of Electrical and Electronics Engineers
LED	Light Emitting Diode
MSC	Multi-Set Communication
OC	Occurrence Count A part of DTC that indicates the number of times that failure has occurred.
PGN	Parameter Group Number A CANbus address for a set of parameters that relate to the same topic and share the same transmission rate.
PLC	Programmable Logic Controller A programmable digital device used to create logic for a specific purpose.
R.O.C.O.F.	Rate Of Change Of Frequency
SCADA	Supervisory Control And Data Acquisition A system that operates with coded signals over communication channels to provide control and monitoring of remote equipment
SCR	Selective Catalytic Reduction A process that uses DEF with the aid of a catalyst to convert nitric oxide and nitrogen dioxide into nitrogen and water to reduce engine exhaust emission.
SIM	Subscriber Identity Module. The small card supplied by the GSM/CDMA provider that is inserted into the cell phone, GSM modem or DSEGateway device to give GSM/GPRS connection.
SMS	Short Message Service The text messaging service of mobile/cell phones.
SPN	Suspect Parameter Number A part of DTC that indicates what the failure is, e.g. oil pressure, coolant temperature, turbo pressure etc.

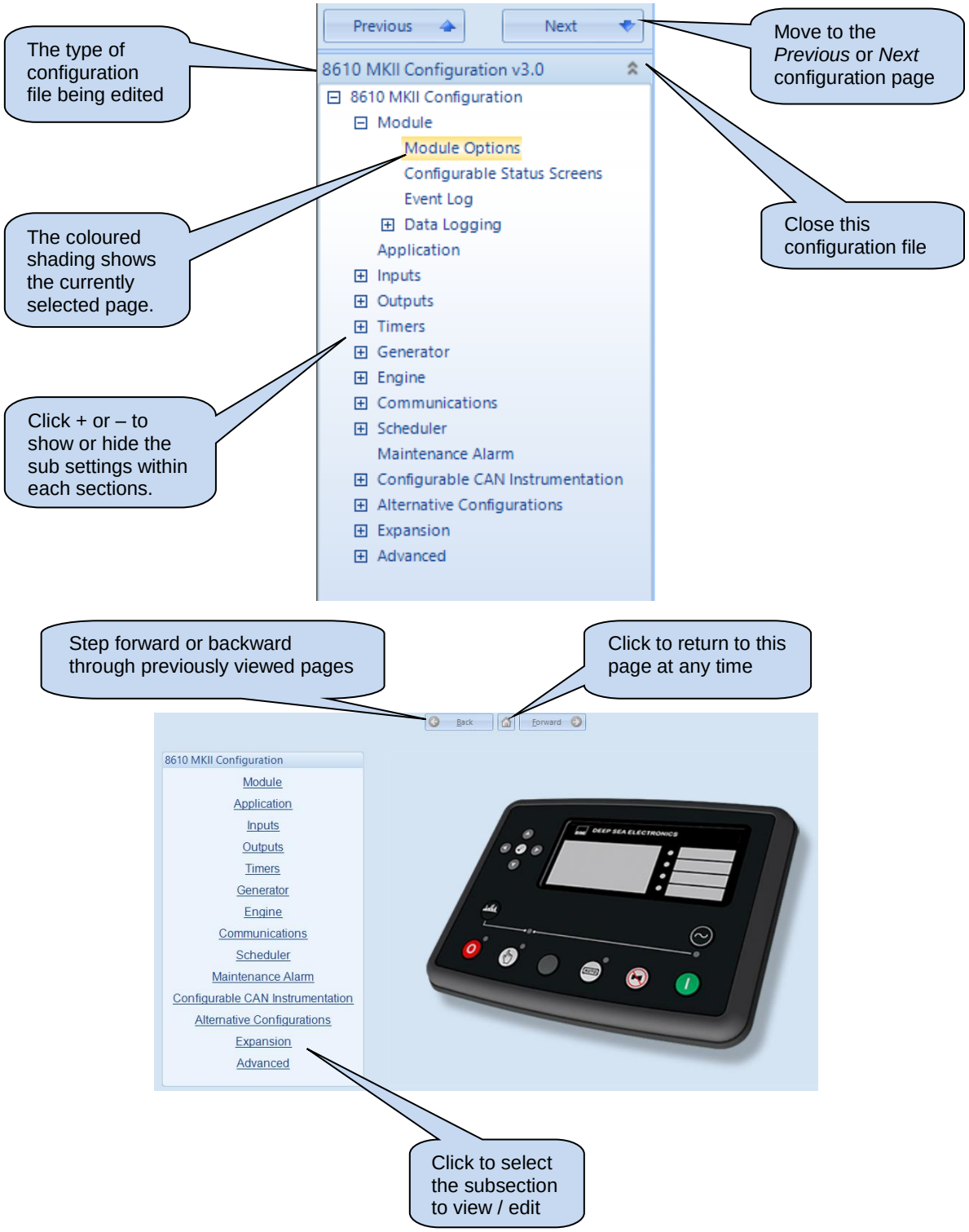
1.2 INSTALLATION AND USING THE DSE CONFIGURATION SUITE SOFTWARE

For information in regards to instating and using the DSE Configuration Suite Software please refer to DSE publication: ***057-151 DSE Configuration Suite PC Software Installation & Operation Manual*** which is found on our website: www.deepseaplc.com

2 EDITING THE CONFIGURATION

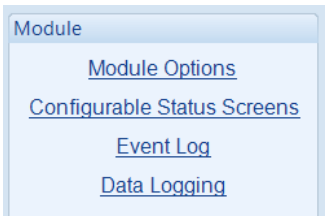
This menu allows module configuration, to change the function of Inputs, Outputs and LED's, system timers and level settings to suit a particular application.

2.1 SCREEN LAYOUT

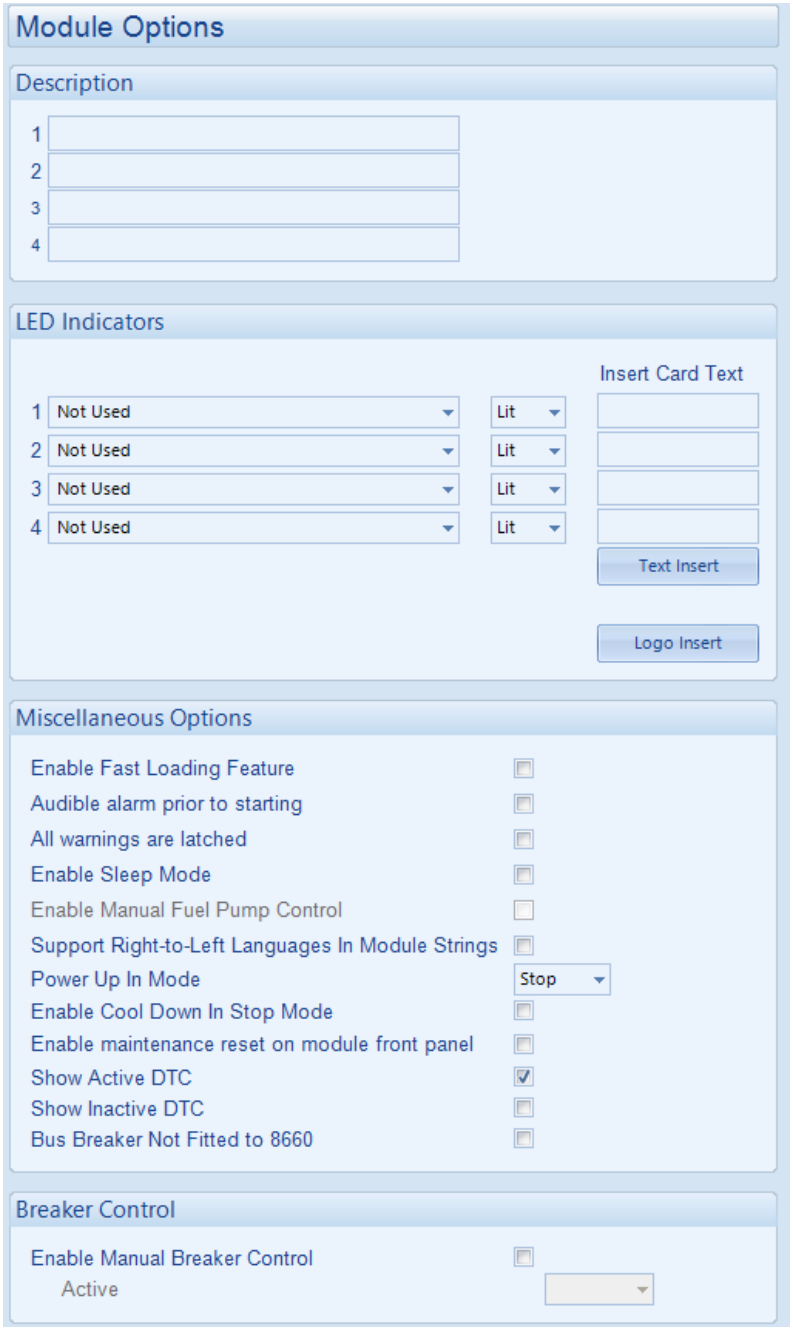


2.2 MODULE

The module section is subdivided into smaller sections.
Select the required section with the mouse.
This section allows the user to change the options related to the module itself.



2.2.1 MODULE OPTIONS



2.2.1.1 DESCRIPTION

Parameter	Description
Description	Free entry boxes to allow the user to give the configuration file a description. Typically used to enter the job number, customer name, engineers name etc. This text is not shown on the module display and is only seen in the configuration file.

2.2.1.2 LED INDICATORS

Parameter	Description
Function	Allows the user to select the function of the modules user configurable LED indicators. For details of possible selections, please see section entitled *Output sources* elsewhere in this document.
Insert Card Text	Enter a custom text to print on the text insert
Text Insert	Allows the user to print the text insert cards
Logo Insert	Allow the user to choose and print an image for the logo insert

2.2.1.3 MISCELLANEOUS OPTIONS

Parameter	Description
Enable Fast Loading	**NOTE: Enabling Fast Loading is only recommended where steps have been taken to ensure rapid start up of the engine is possible. (For example when fitted with engine heaters, electronic governors etc.)** ☐ = Normal Operation, the safety on timer is observed in full. This feature is useful if the module is to be used with some small engines where pre-mature termination of the delay timer leads to overspeed alarms on start up. ☑ = The module terminates the safety on timer once all monitored parameters have reached their normal settings. This feature is useful if the module is to be used as a standby controller as it allows the generator to start and go on load in the shortest possible time.
Audible alarm prior to starting	☐ = The module start the engine with no audible indication ☑ = The module gives an audible warning during the pre-start sequence as an indicator that the set is about to run. This is often a site's specification requirement of AUTO mode operation.
All warnings are latched	☐ = Normal Operation, the warnings and pre-alarms automatically reset once the triggering condition has cleared. ☑ = Warnings and pre-alarms latch when triggered. Resetting the alarm is performed by either an external reset applied to one of the inputs or, the 'Stop/Reset' pushbutton operated (once the triggering condition has been cleared).
Enable Sleep Mode	☐ =Normal operation ☑ = Module goes into sleep (low current) mode after 1m of inactivity in STOP mode. Press any button to 'wake' the module.
Enable Manual Fuel Pump Control	☐ =Normal operation ☑ =Allows manual fuel pump control when the "fuel level" instrument is being viewed.
Support Right-To-Left Languages in Module Strings	Determines the direction of text input where supported (i.e. configurable input text) ☐ =left to right language support ☑ =right to left language support

Parameters are continued overleaf…

Parameter	Description
Power Up In Mode	Select the mode that the module enters when DC power is applied. Available modes to select from: *Auto, Manual, Stop* mode
Enable Cooldown in Stop Mode	☐ =Normal operation. Pressing the Stop button instantly opens the load switch and stops the generator. ☑ =Alternative operation. Pressing the Stop button instantly opens the load switch and puts the generator into a cooling run. Pressing the Stop button again instantly stops the generator.
Enable Maintenance Alarm Reset on Module Front Panel	☐ = The maintenance alarms are only reset through the SCADA section of the DSE Configuration Suite software or digital input if configured. ☑ = The maintenance alarms are also reset by scrolling to the maintenance page on the module. By pressing and holding the *Stop / Reset* button on each alarm, the operator is able to reset each individual alarm.
Show Active DTC	☐ = The module does not show active ECU / ECM fault codes. ☑ = The module shows the active ECU / ECM fault codes on it's display. (Active DTC are also called DM1 in J1939 ECU)
Show Inactive DTC	☐ = The module does not show inactive ECU / ECM fault codes. ☑ = The module shows the in-active ECU (ECM) DTC on it's display. Inactive DTCs are the historical log of the ECU, where previous alarms have been cleared from the active DTC list. (Inactive DTC are called DM2 in J1939).
Bus Breaker Not Fitted to 8660	**NOTE: When no bus breaker is fitted to the DSE8660 controller, this option must be enabled on all DSE load share controllers on the MSC.** **NOTE: This feature is only supported for single mains paralleling applications.** ☐ = Normal operation. When the DSE8660 MKII releases the control over the DSE8610 MKII, the generators continue running in load share mode. ☑ = When the DSE8660 MKII removes the load off the generators and keeps the mains breaker closed, the generators continue running in fixed export mode with both kW and kVAr levels fixed at 0%. Activation of an Electrical Trip alarm on the DSE8660 MKII controller triggers an immediate alarm on the DSE8610 MKII for *Electrical Trip From 8660*.

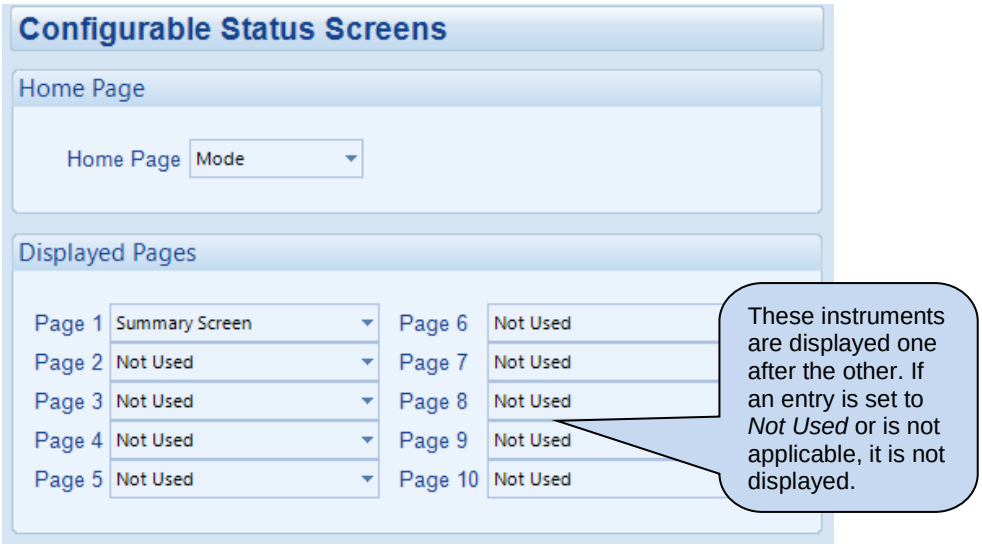
2.2.1.4 BREAKER CONTROL

NOTE: For further information on the module's operation, refer to DSE Publication: *057-254 DSE8610 MKII Operator Manual* which is found on our website: *www.deepseaplc.com*

Parameter	Description
Enable Manual Breaker Control	☐ = Normal operation. When running in Manual mode, activation of any on load request causes the generator breaker to close. ☑ = When running in Manual mode, only the following load requests cause the generator breaker to close: - Pressing the *Close Generator Button* on the module front fascia - Activating a digital input configured for *Close Generator* This also allows opening the generator breaker when running in Manual even if a load request is available.
Active	***Always:*** *Manual Breaker Control* is always active. ***On Input:*** *Manual Breaker Control* is only active when a digital input configured for *Manual Breaker Mode* is active.

2.2.2 CONFIGURABLE STATUS SCREENS

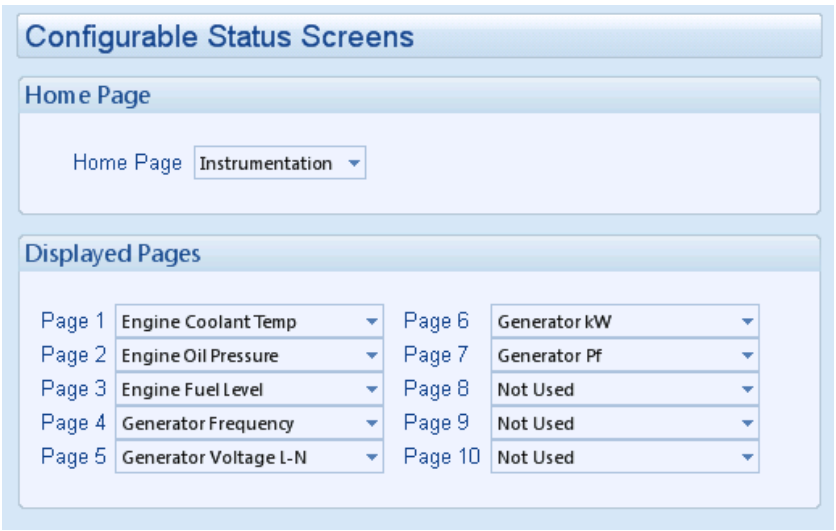
Configurable Status Screens allow the operator to design the default screen to match the requirements of the application.



Setting	Description
Home Page	***Mode:*** When no navigation buttons are pressed for the duration of the *Page* Timer, the module's display reverts back to show the control mode state. ***Instrumentation:*** When no navigation buttons are pressed for the duration of the *Page* Timer, the module's display scrolls through the *Displayed Pages,* the mode page is not displayed automatically but still accessed by manually pressing the navigation buttons.
Displayed Pages	When no navigation buttons are pressed for the duration of the *Page Timer*, the module's display scrolls through the configured *Displayed Pages*. Each of the configured *Displayed Pages* remains on the display for the duration of the *Scroll Timer*. This is useful when a set of parameters is more important for the operator to constantly monitor.

Example

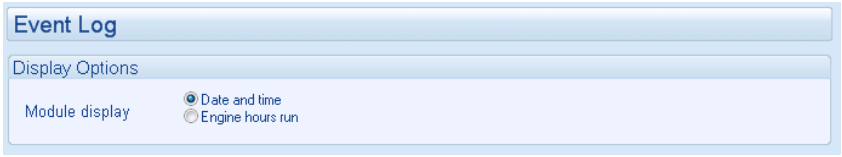
In the example below, the home page is configured to scroll through a preset of parameters. Depending on the application, the system designer selects the instrumentation parameters that are most important to constantly show on the module.



2.2.3 EVENT LOG

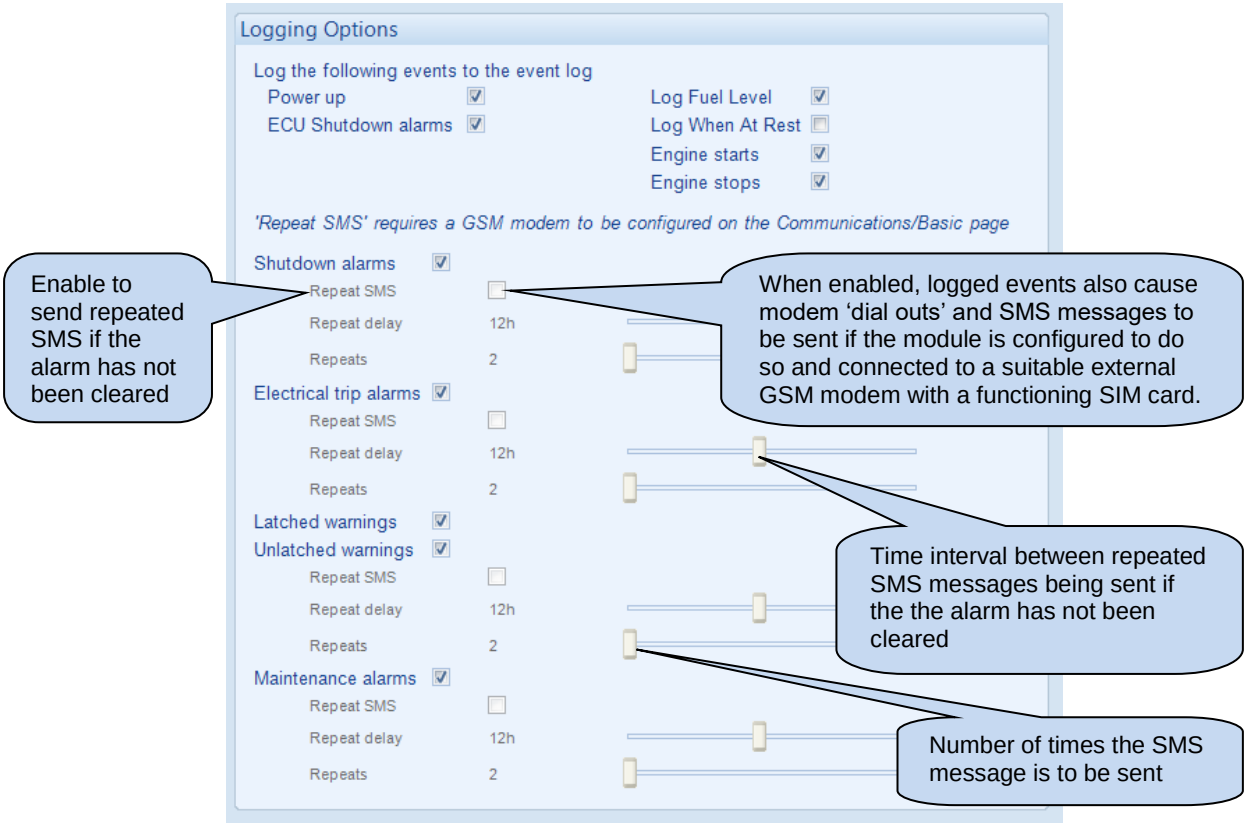
2.2.3.1 DISPLAY OPTIONS

The *Module Display* option allows the operator to choose between `Date and Time` or `Engine Hours` displayed on the screen.



2.2.3.2 LOGGING OPTIONS

The event log is configured to allow users to select which events are stored.

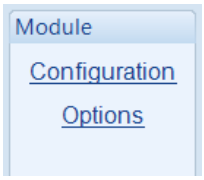


Parameters are detailed overleaf…

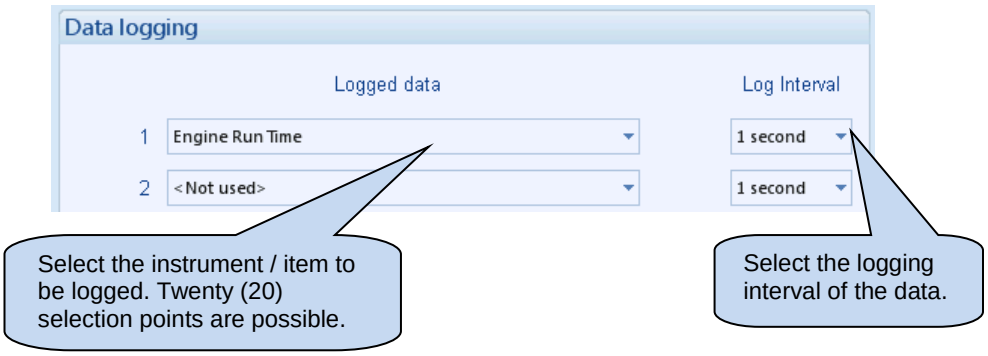
Parameter	Description
Power Up	☐ = Power up events are not logged in the module's event log ☑ = Power up events are logged when the DC Supply is applied to the module or whenever the module is rebooted
ECU Shutdown Alarms	☐ = The ECU (ECM) alarm lamps signals are not logged in the module's event log ☑ = Logs the alarm lamp signals generated by the ECU (ECM)
Log Fuel Level	☐ = The Fuel Level is not logged ☑ = The Fuel Level percentage is logged in the module's event log
Log When At Rest	☐ = The Fuel Level percentage is only logged in the module's event log when the engine is running ☑ = The Fuel Level percentage is logged in the module's event log even when the engine is at rest
Shutdown Alarms	☐ = The Shutdown Alarms are not logged in the module's event log ☑ = Logs the Shutdown alarms
Electrical Trip Alarms	☐ = The Electrical Trip Alarms are not logged in the module's event log ☑ = Logs the Electrical Trip alarms
Warning Alarms	☐ = The Warning Alarms are not logged in the module's event log ☑ = Logs the Warning Alarms
Maintenance Alarms	☐ = The Maintenance Alarms are not logged in the module's event log ☑ = Logs the Maintenance alarms

2.2.4 DATA LOGGING

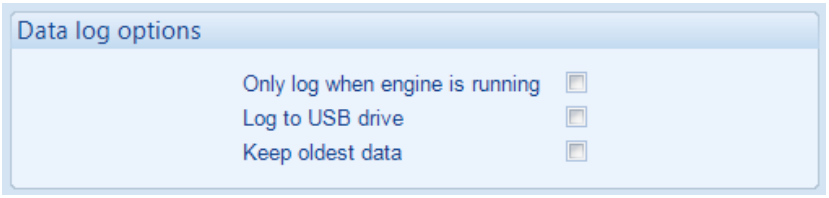
The Data Logging page is subdivided into smaller sections.
Select the required section with the mouse.



2.2.4.1 CONFIGURATION



2.2.4.2 OPTIONS

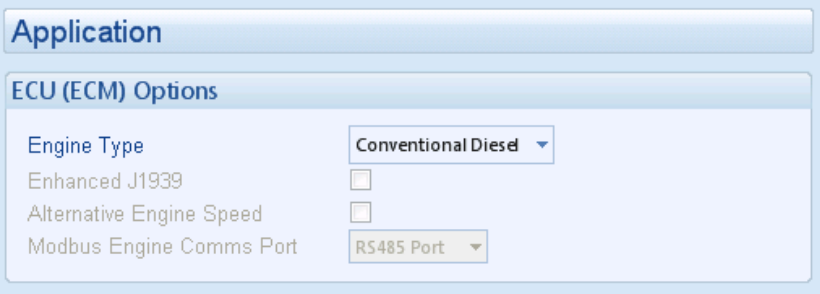


Setting	Description
Only Log When Engine Is Running	☐ = The module logs data regardless of engine running state. ☑ = The module only logs data when the engine is running.
Log to USB drive	☐ = The module logs data to the modules internal memory. ☑ = The module logs data to an external USB device connect to the USB host socket on the module.
Keep Oldest Data	☐ = When the logging memory is full, the module overwrites the oldest data first with the new data. ☑ = When the logging memory is full, the module stops recording new data.

2.3 APPLICATION

2.3.1 ECU (ECM) OPTIONS

NOTE: For further details and instructions on ECU (ECM) options and connections, refer to DSE Publication: *057-004 Electronic Engines and DSE Controllers* which are found on our website: *www.deepseaplc.com*



Parameter	Description
Engine Type	Select the appropriate engine type ***Conventional Engine:*** Select this for a traditional (non-electronic) engine, either Energise to Run or Energise to Stop. ***Conventional Gas Engine:*** Select this for a traditional (non-electronic) engine and require Gas engine functionality. This enables control of configurable outputs for *Gas Choke and Gas Ignition* and instructs the module to follow the gas engine timers. ***Other Engines:*** The list of supported CANbus (or Modbus) engines is constantly updated, check the DSE website at www.deepseaplc.com for the latest version of Configuration Suite software.
Enhanced J1939	☐ = The module reads 'Basic' instrumentation from the engine ECU (ECM) and display (where supported by the engine) : • Engine Speed • Oil Pressure • Engine Coolant Temperature • Hours Run ☑ = The module reads and display an 'Enhanced' instrumentation list (where supported by the engine) : • Engine Speed • Engine Speed Biasing (Subject to *ECM Speed Control* setting) • Oil Pressure • Engine Coolant Temperature • Hours Run • Engine Oil Temperature • Exhaust Temperature • Fuel Pressure • Total Fuel used • Fuel Consumption • Inlet Manifold Temperature • Coolant Pressure • Turbo Pressure Where an instrument is not supported by the engine ECU (ECM), the instrument is not displayed. DSE Reserve the right to change these lists in keeping with our policy of continual development.

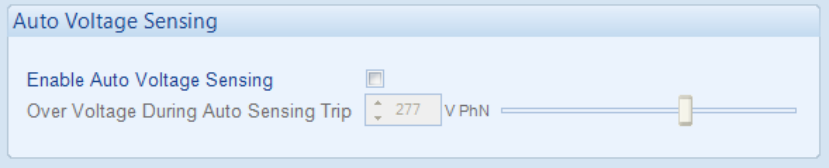
Parameters are continued overleaf…

Parameter	Description
Alternative Engine Speed	☐ = The engine is instructed to run at its *Nominal Speed* as configured by the Engine Manufacturer. ☑ = The engine is instructed to run at its *Alternative Speed* as configured by the Engine Manufacturer.
Modbus Engine Comms Port	***RS485 Port :*** The modules RS485 port is used to communicate to the engine (when a Modbus engine type is selected. ***DSENet Port :*** The modules DSENet port is used to communicate to the engine (when a Modbus engine type is selected. This 'frees' the RS485 port in case connection to BMS or other RS485 compatible equipment is required.

2.3.2 AUTO VOLTAGE SENSING

NOTE: During the safety delay timer, the module factory set status page displays the L–N voltage, based upon the generator being 3 phase, 4 wire. This leads to incorrect status display during the safety timer if Auto Voltage Sensing is enabled and the generator is not 3ph 4w. To prevent this, the status page is customised to display other parameters if required. At the end of the safety timer, the correct voltages are displayed.

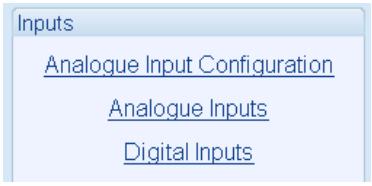
Auto voltage sensing instructs the controller to monitor the generators output during the safety delay timer. During this time, the controller identifies the nominal voltage, frequency and topology of the alternator output and selects the most appropriate 'alternative configuration' to use.
This is particularly useful where a generator is switched from 50Hz/60Hz or 120V/240V for example.



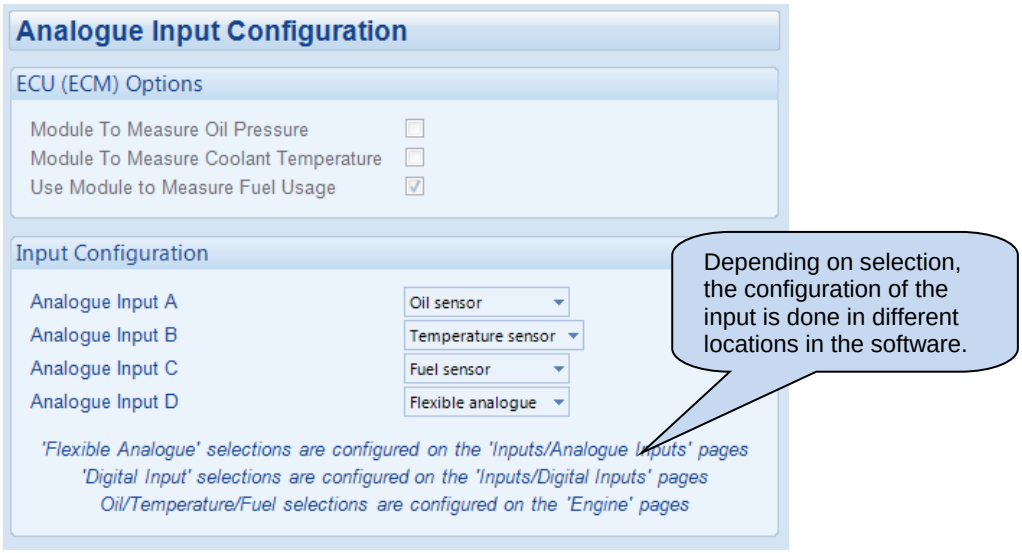
Application Options	Description
Enable Auto Voltage Sensing	☐ = The module operates as normal. ☑ = *Auto voltage sensing* is enabled. During the safety delay timer, the module attempts to measure the system's nominal voltage and frequency and determine the topology of the alternator wiring. At the end of the safety timer, the main and alternative configurations are analysed to see which one is most appropriate to suit the connected system and the module continues to operate, using the most appropriate configuration to provide protection.
Over Voltage During Auto Sensing Trip	During the Auto sensing there is no over voltage trip protection from the main settings until after the safety on timer has elapsed. Therefore the overvoltage trip value is taken from this setting.

2.4 INPUTS

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



2.4.1 ANALOGUE INPUT CONFIGURATION



Parameter	Description
Module To Measure Oil Pressure	(Available only when the module is configured for connection to a CANbus engine.) ☐ = The measurements are taken from the ECU (ECM). ☑ = The module ignores the CANbus measurement and uses the analogue sensor input.
Module To Measure Coolant Temperature	(Available only when the module is configured for connection to a CANbus engine.) ☐ = The measurements are taken from the ECU (ECM). ☑ = The module ignores the CANbus measurement and uses the analogue sensor input.
Use Module to Measure Fuel Usage	(Available only when the module is configured for connection to a CANbus engine.) ☐ = The measurements are taken from the ECU (ECM). ☑ = The module ignores the CANbus measurement and uses the analogue sensor input
Analogue Input A	Select what the analogue input is to be used for: ***Digital Input:*** Configured on the *Inputs/Digital Inputs* pages ***Flexible Analogue:*** Configured on the *Inputs/Analogue Inputs* pages ***Not Used:*** The input is disabled ***Oil Sensor:*** Configured on the *Engine* pages
Analogue Input B	Select what the analogue input is to be used for: ***Digital Input:*** Configured on the *Inputs/Digital Inputs* pages ***Flexible Analogue:*** Configured on the *Inputs/Analogue Inputs* pages ***Not Used:*** The input is disabled ***Temperature Sensor:*** Configured on the *Engine* pages
Analogue Input C	Select what the analogue input is to be used for: ***Digital Input:*** Configured on the *Inputs/Digital Inputs* pages ***Flexible Analogue:*** Configured on the *Inputs/Analogue Inputs* pages ***Fuel Sensor:*** Configured on the *Engine* pages ***Not Used:*** The input is disabled
Analogue Input D	Select what the analogue input is to be used for: ***Digital Input:*** Configured on the *Inputs/Digital Inputs* pages ***Flexible Analogue:*** Configured on the *Inputs/Analogue Inputs* pages ***Not Used:*** The input is disabled

2.4.2 FLEXIBLE SENSOR D

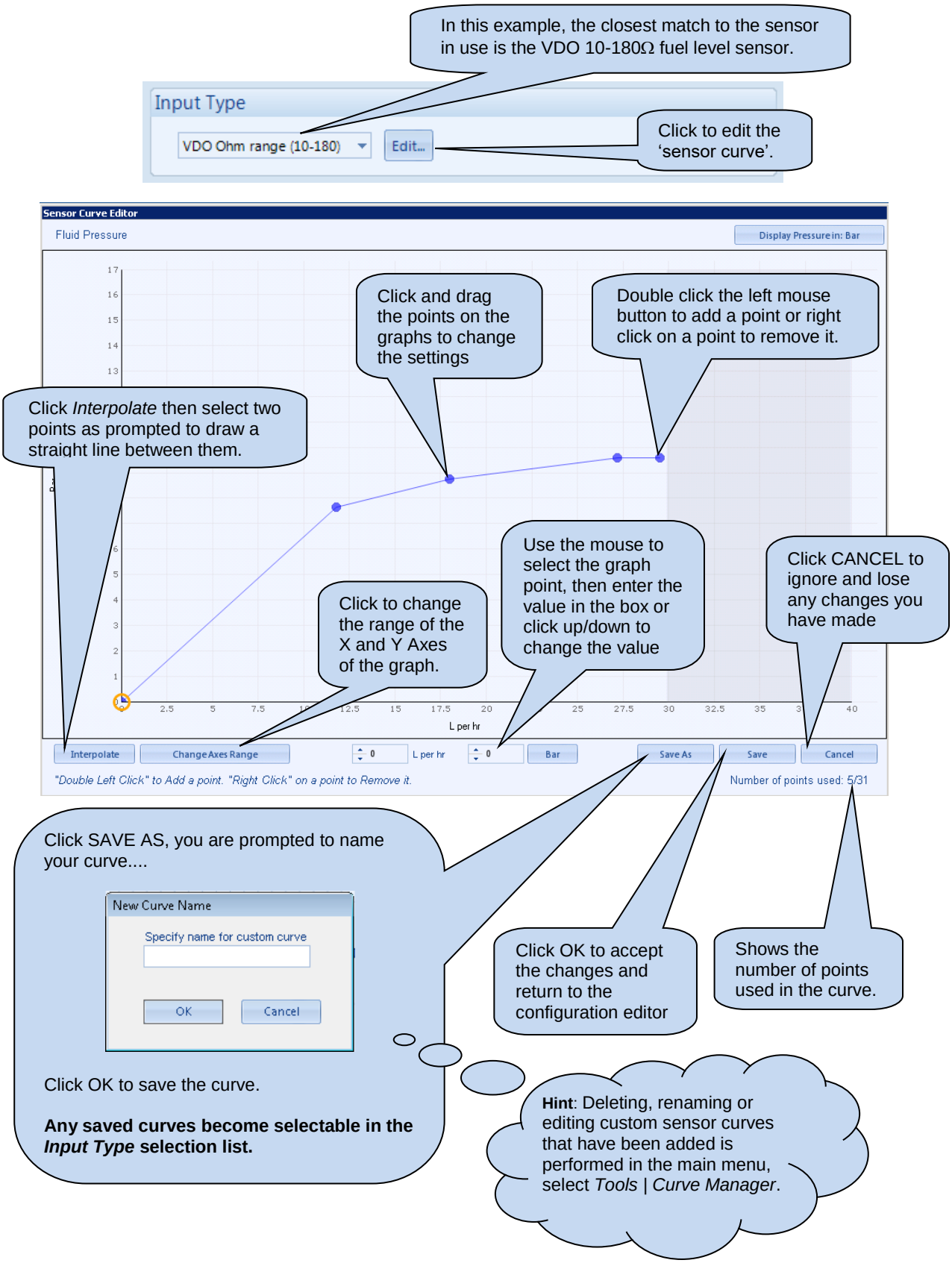
Analogue input D is configured for *Flexible Sensor.*

Parameters are detailed overleaf…

Parameter	Description
Sensor Type	Select the sensor type from a pre-defined list: ***Pressure:*** The input is configured as a pressure sensor ***Percentage:*** The input is configured as a percentage sensor ***Termperature:*** The input is configured as a temperature sensor
Measured Quantity	Select the sensor signal type from a pre-defined list: ***Current:*** for sensors with maximum range of 0 mA to 20 mA ***Resistive:*** for sensors with maximum range of 0 Ω to 480 Ω ***Voltage:*** for sensors with maximum range of 0 V to 10 V
Sensor Name	Enter the *Sensor Name*, this text is shown on the module display when a sensor alarm activates
Input Type	Select the sensor type and curve from a pre-defined list or create a user-defined curve
Alarm Arming	Select when the input becomes active: ***Always:*** The input state is always monitored ***From Safety On:*** The state of the input is monitored from the end of the *Safety On Delay* timer ***From Starting:*** The state of the input is only monitored from engaging the crank
Low Alarm Enable	☐ = The Alarm is disabled. ☑ = The *Low Alarm* is active when the measured quantity drops below the *Low Alarm* setting.
Low Pre-Alarm Enable	☐ = The Pre-Alarm is disabled. ☑ = The *Low Pre-Alarm* is active when the measured quantity drops below the *Low Pre-Alarm* setting. The *Low Pre-Alarm* is automatically reset when the measured quantity rises above the configured *Low Pre-Alarm Return* level.
High Pre-Alarm Enable	☐ = The Pre-Alarm is disabled. ☑ = The *High Pre-Alarm* is active when the measured quantity rises above the *High Pre-Alarm* setting. The *High Pre-Alarm* is automatically reset when the measured quantity falls below the configured *High Pre-Alarm Return* level.
High Alarm Enable	☐ = The Alarm is disabled. ☑ = The *High Alarm* is active when the measured quantity rises above the *High Alarm* setting.

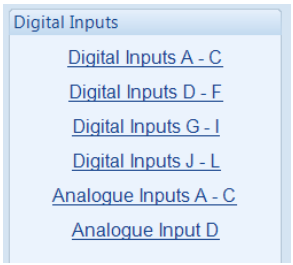
2.4.3 EDITING THE SENSOR CURVE

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

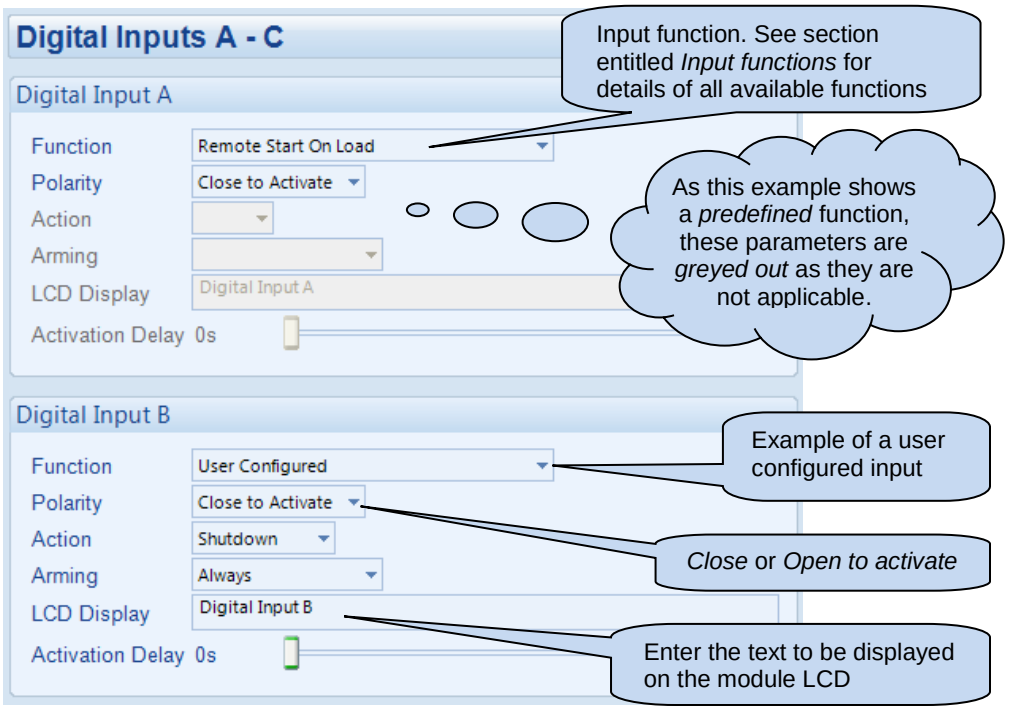


2.4.4 DIGITAL INPUTS

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

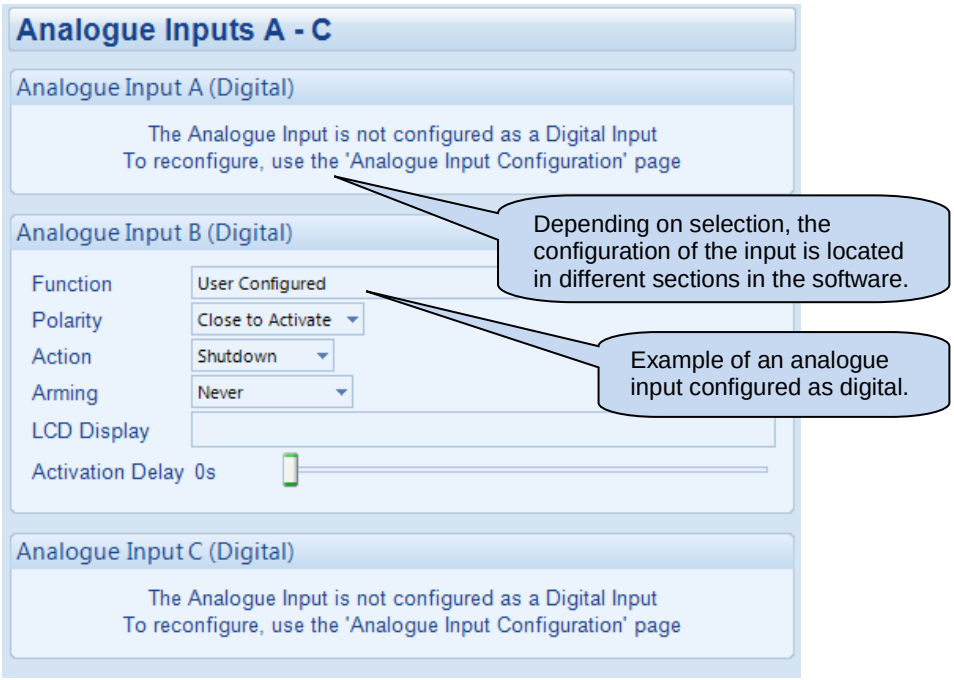


2.4.4.1 DIGITAL INPUTS



Parameter	Description
Funtion	Select the input function to activate when the relevant terminal is energised. See section entitled *Input functions* for details of all available functions
Polarity	Select the digital input polarity: ***Close to Activate:*** the input function is activated when the relevant terminal is connected. ***Open to Activate:*** the input function is activated when the relevant terminal is disconnected.
Action	Select the type of alarm required from the list: ***Electrical Trip*** ***Shutdown*** ***Warning*** For details of these, see the section entitled *Alarm Types* elsewhere in this document.
Arming	Select when the input becomes active: ***Always:*** The input state is always monitored ***Active From Safety On:*** The state of the input is monitored from the end of the *Safety On Delay* timer ***Active From Starting:*** The state of the input is only monitored from engaging the crank ***Never:*** The input is disabled
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.

2.4.5 ANALOGUE INPUTS



2.4.6 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
Air flap closed auxiliary IEEE 37.2 - 3 Checking or Interlocking Relay	This input is used to connect to the Air flap switch contacts. This gives an immediate shutdown in the event of the air-flap being closed. It also prevents the generator from being restarted if the air flap has not been reset following an over-speed shutdown.
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.
Alternative Configuration 1, 2 and 3	These inputs are used to instruct the module to follow the *alternative* configuration settings instead of the *main* configuration settings.
Alternative Language Select	This input is used to instruct the module to display the alternative Language instead of the default module display language.
Auto Run Inhibit IEEE 37.2 - 3 Checking Or Interlocking Relay	This input is used to provide an over-ride function to prevent the controller from starting the generator in the event of a remote start/scheduled run condition occurring. If this input is active and a remote start signal/scheduled run occurs the module does not give a start command to the generator. If this input signal is then removed, the controller operates as if a remote start/scheduled run has occurred, starting and loading the generator. This function is used to give an **‘AND’** function so that a generator is only called to start if a remote start request and another condition exists which requires the generator to run. If the ‘Auto Run Inhibit’ signal becomes active while the generator is running, a controlled shutdown sequence begins. If the generator is running in a load demand scheme, this input takes priority and begins the controlled shutdown sequence, causing another generator to start (if available). This input does not prevent starting of the engine in MANUAL/TEST mode.
Auto Start Inhibit IEEE 37.2 - 3 Checking Or Interlocking Relay	This input is used to provide an over-ride function to prevent the controller from starting the generator in the event of a remote start/mains out of limits condition occurring. If this input is active and a remote start signal/mains failure occurs the module does not give a start command to the generator. If this input signal is then removed, the controller operates as if a remote start/mains failure has occurred, starting and loading the generator. This function is used to give an **‘AND’** function so that a generator is only called to start if the mains fails and another condition exists which requires the generator 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 engine in MANUAL mode.
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.
Close Generator IEEE 37.2 - 52 AC Circuit Breaker	Closes the Generator load switch (synchronising first if required)
Coolant Temperature Switch IEEE 37.2 – 26 Apparatus Thermal Device	This input is used to give a *Coolant Temperature High* shutdown from a digital normally open or closed switch. It allows coolant temperature protection.

Function	Description
Disable Protections	The system designer provides this switch (not DSE) so its location varies depending upon manufacturer, however it normally takes the form of a key operated switch to prevent inadvertent activation. Depending upon configuration, a warning alarm is generated when the switch is operated. When active, and the module is suitably configured (see section entitled 'Advanced') this prevents the engine being stopped upon critical alarm (Sometimes called Battle-Short Mode, War Mode or Run to Destruction)
DPF Auto Regen Inhibit	This input is used to override the ECU (ECM) function and prevent the automatic regeneration of the diesel particulate filter
DPF Force Regeneration	This input is used to override the ECU (ECM) function and activate the regeneration of the diesel particulate filter
DPF Regeneration Interlock	This input is used to stop a manual regeneration from occurring
Droop Enable	This input is used to switch the engine into droop mode on CANbus engines that support this function.
Duty Select 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	For the French EJP (Effacement Jours de Pointe) tarrif system. This input is functionally identical to *Remote Start Off Load.* When this input is active, operation is similar to the 'Remote Start on load' function except that the generator is not instructed to take the load. This function is also used where an engine only run is required e.g. for exercise.
EJP2	For the French EJP (Effacement Jours de Pointe) tarrif system. This input is functionally identical to *Remote Start On Load.* In auto mode, the module performs the start sequence and transfers load to the generator. In Manual mode, the load is transferred to the generator if the engine is already running, however in manual mode, this input does not generate start/stop requests of the engine.
Enable Power Mode 1 Constant Power (Default)	This input is used to instruct the module to switch to *Power Mode 1 Constant Power (Default)*
Enable Power Mode 2 Frequency-Power	This input is used to instruct the module to switch to *Power Mode 2 Frequency-Power*
Enable Power Mode 3 Voltage-Power	This input is used to instruct the module to switch to *Power Mode 3 Voltage-Power*
Enable Power Mode 1 Constant Power Factor	This input is used to instruct the module to switch to *Power Mode 1 Constant Power Factor*
Enable Reactive Mode 2 Voltage-Reactive Power	This input is used to instruct the module to switch to *Reactive Mode 2 Voltage-Reactive Power*
Enable Reactive Mode 3 Power-Power Factor	This input is used to instruct the module to switch to *Reactive Mode 3 Power-Power Factor*
Enable Reactive Mode 4 Constant Reactive Power (Default)	This input is used to instruct the module to switch to *Reactive Mode 4 Constant Reactive Power (Default)*
External Panel Lock	**NOTE: External control sources (i.e. Simulate Start Button) are not affected by the external panel lock input and continue to operate normally.** 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. (*Front panel configuration access is still possible while the system lock is active*).

Function	Description
Fuel Tank Bund Level High	This input is used to provide protection against fuel leakage, where a level switch is fitted to the fuel tank bund. The action for this alarm is configurable under the *Engine Protections* page in the module configuration.
Generator Closed Auxiliary 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 generator load switching device auxiliary contact.
Generator Load Inhibit IEEE 37.2 - 52 AC Circuit Breaker	**NOTE: This input only operates to control the generator-switching device if the module load switching logic is attempting to load the generator. It does not control the generator switching device when the mains supply is on load.** This input is used to prevent the module from loading the generator. If the generator is already on load, activating this input causes the module to unload the generator. Removing the input allows the generator to be loaded again.
Inhibit Scheduled Run IEEE 37.2 - 3 Checking Or Interlocking Relay	This input is used to provide a mean of disabling a scheduled run.
Inhibit SMS Remote Start	This input is used to provide a means of disabling remote starts by SMS
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.
Load Share Inhibit	This input disables the VAr share control when in parallel
Low Fuel Level Switch IEEE 37.2 - 71 Liquid Level Switch	This input is used to allow feedback for low fuel level.
Main Config Select	This input is used to select the *Main* configuration when *Alternative Configurations* are enabled.
Mains Parallel Mode	This input is used to configure the load-sharing module as to how it operates when in parallel. If the input is not active, the module communicates with other controllers to maintain equal share of the load between systems. If the *Mains Parallel Mode* input is active, the controller does not communicate with others, but instead ramps up to the pre-configured level for Base Load or Fixed Export mode with the mains supply.
Manual Breaker Mode	When breaker control is set to *Active On Input,* this input is used to activate the *Manual Breaker Control.*
MSC Alarms Inhibit	**NOTE: For further details on MSC alarms, refer to the DSE Guide to Synchronising and Load Sharing.** This input is used to prevent MSC alarms. It is particularly useful when a set is being removed from duty for maintenance.
Oil Pressure Switch IEEE 37.2 – 63 Pressure Switch	A digital normally open or closed oil pressure switch gives this input. It allows low oil pressure protection.
Open Generator IEEE 37.2 - 52 AC circuit breaker	Opens the generator breaker, ramping off load if part of a parallel system.
Remote Start Dead Bus Synchronising	**NOTE: For further details, refer to the section entitled Dead Bus Synchronising elsewhere in this document.** When Dead Bus Synchronising is configured, this input is used to start the set in Dead Bus Synchronising scheme.
Remote Start Off Load	If this input is active, operation is similar to the 'Remote Start on load' function except that the generator is not instructed to take the load. This function is used where an engine only run is required e.g. for exercise.
Remote Start On Load	When in auto mode, the module performs the start sequence and transfer load to the generator. In Manual mode, the load is transferred to the generator if the engine is already running, however in manual mode, this input does not generate start/stop requests of the engine.

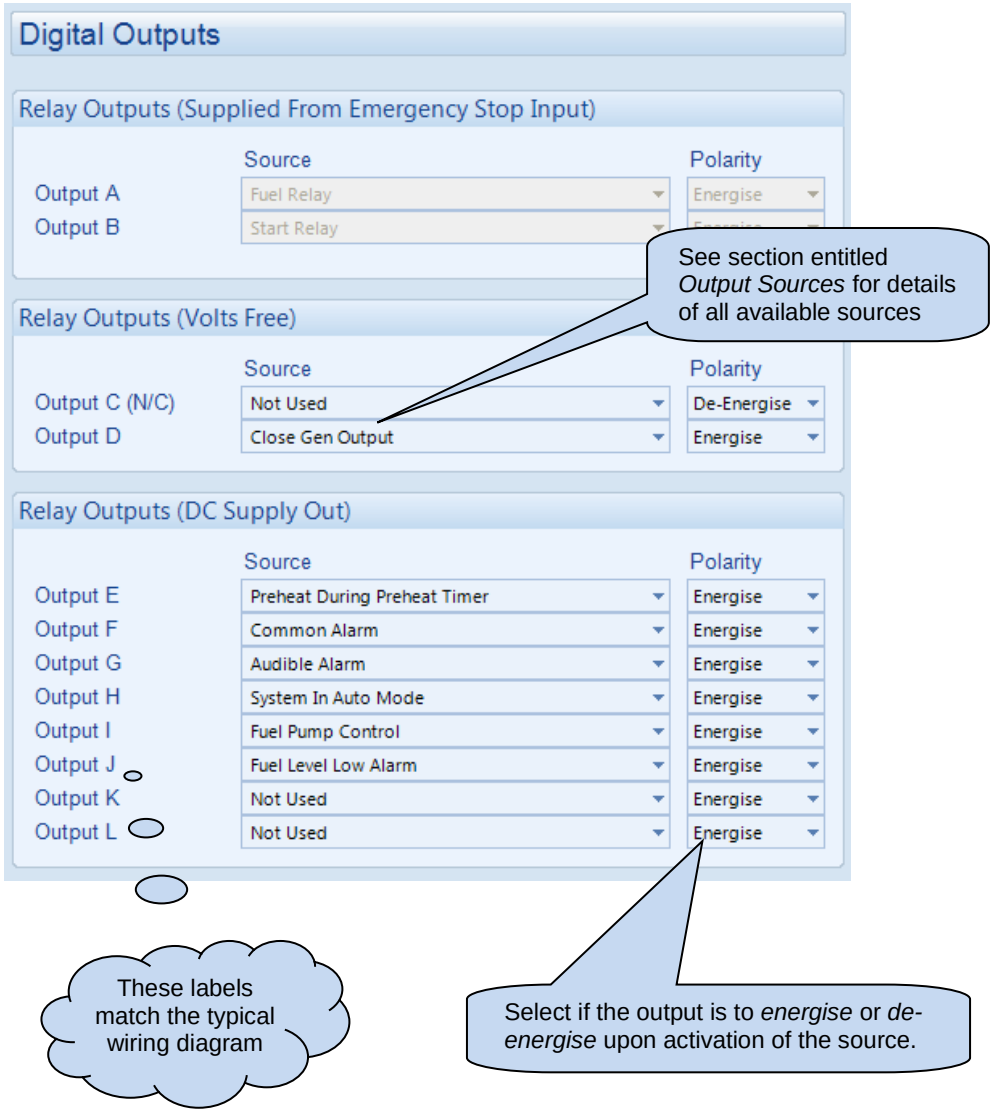
Function	Description
Remote Start On Load Demand	If this input is active, the load demand start up and shut down scheme is active when two or more generators are running in parallel. Upon activation, all sets start a race for the bus. The first available set closes onto the dead bus and the others synchronise to it. Once the sets are on load they compare load levels and redundant sets commence a shutdown sequence and return to standby until the load level is such that they are required.
Reset Electrical Trip	**NOTE: For further details, refer to the section entitled Reset Electrical Trip elsewhere in this document.** Provides an external digital input to reset an electrical trip before the generator has stopped to enable it to go back on load.
Reset Maintenance Alarm 1	Provides an external digital input to reset the maintenance alarm 1
Reset Maintenance Alarm 2	Provides an external digital input to reset the maintenance alarm 2
Reset Maintenance Alarm 3	Provides an external digital input to reset the maintenance alarm 3
Simulate Auto Button	**NOTE: If a call to start is present when AUTO MODE is entered, the starting sequence begins. Call to Start comes from a number of sources depending upon module type and configuration and includes (but is not limited to): Remote start input present, Mains failure, Scheduled run, Auxiliary mains failure input present, Telemetry start signal from remote locations.** This input mimic's the operation of the 'Auto' button and is used to provide a remotely located Auto mode push button.
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 Manual Button	This input mimic's the operation of the 'Manual' button and is used to provide a remotely located Manual mode push button.
Simulate Start Button	This input mimic's the operation of the 'Start' button and is used to provide a remotely located start push button.
Simulate Stop Button	This input mimic's the operation of the 'Stop' button and is used to provide a remotely located stop/reset push button.
Smoke Limiting IEEE 37.2 – 18 Accelerating or Decelerating Device	This input instructs the module to give a *run at idle speed* command to the engine either via an output configured to *smoke limit* or by data commands when used with supported electronic engines.
Speed Lower	**NOTE: This input has no effect when using the internal analogue system to control the governor.** This is operational in Manual Mode only, when the breaker is open. On systems where internal relays are used to control the governor, this input is used to decrease the speed.
Speed Raise	**NOTE: This input has no effect when using the internal analogue to control the governor.** This is operational in Manual Mode only, when the breaker is open. On systems where internal relays are used to control the governor, this input is used to increase the speed.

Function	Description
Start Pause IEEE 37.2 - 3 Checking or Interlocking Relay	This input is intended to be used to allow the generator start sequence to commence, but not to complete. This feature is used with air start engines for example to give a controlled start sequence. The function operates such that if the 'Start pause' input is active and an engine start is commanded, the module performs its start sequence thus: The pre-heat output (if used) is activated for the duration of the pre-heat timer. The Fuel output then is energised and the module then enters a pause state - 'Awaiting clear to start'. If the 'start pause' signal becomes inactive at this time then the module continues its normal start sequence. The 'start pause' mode uses the 'manual crank limit' timer and if this expires during the 'Awaiting clear to start' state then a 'Fail to start' alarm is generated and the set shutdown.
Stop and Panel Lock	Combined function input that instructs the module to enter *Stop* mode and also perform the *Panel Lock* 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. (*Front panel configuration access is still possible while the system lock 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.
Volts Lower	**NOTE: This input has no effect when using the internal analogue system to control the AVR** This is operational in Manual Mode only, when the breaker is open. On systems where internal relays are used to control the AVR, this input is used to increase the volts.
Volts Raise	**NOTE: This input has no effect when using the internal analogue system to control the AVR** This is operational in Manual Mode only, when the breaker is open. On systems where internal relays are used to control the AVR, this input is used to decrease the volts.
Water in Fuel	This input is used to provide protection against high water content in the fuel, where a switch is fitted to the fuel filter. The action for this alarm is configurable under the *Engine Protections* page in the module configuration.

2.5 OUTPUTS

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

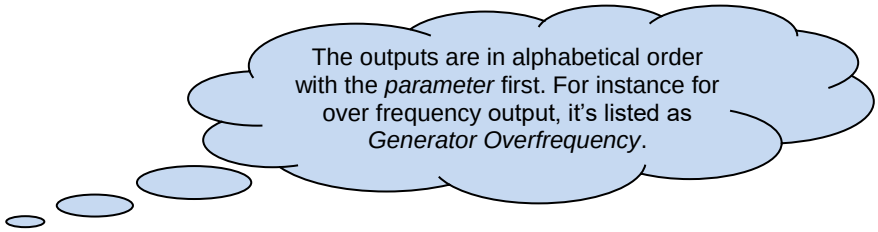
2.5.1 DIGITAL OUTPUTS



2.5.1.1 OUTPUT SOURCES

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

Under the scope of IEEE 37.2, *function numbers is 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)	
1 Constant Power Factor Mode	Active when the *Reactive Mode 1 Constant Power Factor* is selected.	
1 Constant Power Mode (Default)	Active when the *Power Mode 1 Constant Power (Default)* is selected.	
2 Frequency-Power Mode	Active when the *Power Mode 2 Frequency Power* is selected.	
2 Voltage-Reactive Power Mode	Active when the *Reactive Mode 2 Voltage Reactive Power* is selected.	
3 Power-Power Factor Mode	Active when the *Reactive Mode 3 Power Power Factor* is selected.	
3 Voltage-Power Mode	Active when the *Power Mode 3 Voltage Power* is selected.	
4 Constant Reactive Power Mode (Default)	Active when the *Reactive Mode 4 Constant Reactive Power (Default)* is selected.	
Air Flap Alarm	This output indicates that the air-flap is closed; to operate it requires an input configured as 'Air-flap closed' connected to the external air-flap switch.	
Air Flap Relay	Normally used to control an air flap, this output becomes active upon an Emergency Stop or Over-speed situation.	Inactive when the set has come to rest
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 engine.	
All Available Sets Are On The Bus	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'.	
Alternative Config 1, 2 or 3 Selected	Active when the alternative configuration is selected.	
Alternative Language Selected	Active when the configured *Alternative Language Select* digital input is active	
Analogue Input A, B, C & D (Digital)	Active when the relevant analogue input, configured as digital input, is active	
Arm Safety On Alarms	Becomes active at the end of the *safety delay* timer whereupon all alarms configured to 'From Safety On' become active	Inactive when : • When the set is at rest • In the starting sequence before the Safety Delay timer has expired
Audible Alarm 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 if the Mute pushbutton was pressed
Auto Run Inhibited	Active when the *Auto Run Inhibit* function is active	
Auto Start Inhibit	Active when the *Auto-Start Inhibit* function is active	

Output Source	Activates…	Is Not Active….
AVR Maximum Trim Limit Reached	Indicates that the analogue AVR output has reached 100%. This indicates a fault with the control of the AVR (including connection error), incorrect setting of SW2, or that the alternator has reached its maximum capacity.	
Battery High Voltage 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
Battery Low Voltage 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
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 in order to get onto the bus.	
Bus Not Live	This output indicates that the generator bus remains ‘dead’ after closing the generator load breaker.	
Bus Phase Rotation Alarm	This output indicates that the module has detected a phase sequence error on the bus.	
Calling For Scheduled Run	Active during a *Scheduled Run* request from the inbuilt *Scheduler*.	
CAN Link Data Error	Indicates bad data transfer on the second MultiSet Comms (MSC) Link	
CAN Link Failure	Indicates when an *MSC Failure* alarm is active on the second MSC Comms Link	
CAN Link Too Few Sets	Indicates that the number of sets connected on the MultiSet Comms (MSC) Link is lower than the configured *Minimum Sets Required* setting.	
Charge Alternator Failure Shutdown	Active when the charge alternator shutdown alarm is active	
Charge Alternator Failure Warning	Active when the charge alternator warning alarm is active	
Check Sync IEEE 37.2 – 25 Synchronising Or Synchronising Check Relay	Indicates that the internal check synchroscope has determined that the supplies are in sync.	
Clear Mains Decoupling	Active when the *Clear Mains Decoupling Alarms* digital input is active.	
Close Gen Output IEEE 37.2 – 52 AC Circuit Breaker	Used to control the load switching device. Whenever the module selects the generator to be on load this control source is activated.	Inactive whenever the generator is not required to be on load
Close Gen Output Pulse IEEE 37.2 – 52 AC Circuit Breaker	Used to control the load switching device. Whenever the module selects the generator to be on load this control source is activated for the duration of the Breaker Close Pulse timer, after which it becomes inactive again.	
Combined Maintenance Alarm	Active when any of the maintenance alarm is active.	
Combined Remote Start Request	Indicates that a remote start request is active.	
Combined Under and Over Frequency Alarm	Active when an *Under-Frequency* or *Over-Frequency Shutdown* alarm is active	
Combined Under and Over Frequency Warning	Active when an *Under-Frequency* or *Over-Frequency Warning* alarm is active	
Combined Under and Over Voltage Alarm	Active when an *Under-Voltage* or *Over-Voltage Shutdown* alarm is active	
Combined Under and Over Voltage Warning	Active when an *Under-Voltage* or *Over-Voltage Warning* alarm is active	
Common Alarm	Active when one or more alarms (of any type) are active	The output is inactive when no alarms are present
Common Electrical Trip	Active when one or more *Electrical Trip* alarms are active	The output is inactive when no shutdown alarms are present
Common Mains Decoupling Alarm	Indicates 1 or more of the decoupling alarm have activated	
Common Shutdown	Active when one or more *Shutdown* alarms are active	The output is inactive when no shutdown alarms are present
Common Warning	Active when one or more *Warning* alarms are active	The output is inactive when no warning alarms are present

Output Source	Activates…	Is Not Active….
Coolant Cooler Control	Active by the *Coolant Cooler Control* in conjunction with the Coolant Temperature Sensor	
Coolant Heater Control	Active by the *Coolant Heater Control* in conjunction with the Coolant Temperature Sensor	
Cooling Down	Active when the Cooling timer is in progress	
Data Logging Active	Active when data is being logged	Inactive when: • Data logging is disabled • The engine is at rest and the option Only Log When Engine Is Running is enabled • The internal memory of the module becomes full and the option Keep Oldest Data is enabled
DC Power On	Active when DC power is supplied to the module	
Dead Bus Run on Timer Active	Indicates that the set has closed onto the bus and that the Dead Bus Run On Timer is in progress. When this has expired, the *Load Demand Scheme* is activated.	
Dead Bus Synchronise Enabled	Active when Dead Bus Synchronising is enabled.	
Dead Bus Synchronise In Progress	Active when the set is running dead bus synchronising.	
De-Excite Alternator	Active during Dead Bus Synchronising start until the *Excitation Delay* timer expires	
DEF Level Low	Active when *DEF Level Low* CANbus alarm is active.	
Digital Input A, B, C, D, E, F, G H, I, J, K & L	Active when the relevant digital input is active	
Display Heater Fitted and On	Active when the display heater is on	
DPF Forced Regeneration Interlock Active	Active when the *DPF Force Regeneration Interlock* is active	
DPF Forced Regeneration Requested	Active when the *DPF Force Regeneration* is active	
DPF Non Mission State	Active when the *DPF Non-Mission State* is active	
DPF Regeneration In Progress	Active when the *DPF Regeneration* is in progress	
DPTC Filter	Active when the diesel particulate filter CANbus alarm is active	
Droop Enable	Active when an input configured to *Droop Enable* is active or if *Droop Enable* has been activated in the module configuration (CANbus engine only)	
Dummy Load Control (1-5)	Becomes active when the engine kW falls below the Dummy Load Control Trip Setting.	Inactive when the engine kW returns to above the Dummy Load Control Return setting.
Duty Select	Indicates that a digital input configured to *Duty Select* is active.	
Earth Fault Trip Alarm IEEE 37.2 – 51G or 51N Generator IDMT Earth Fault Relay	Active when the *Earth Fault Protection Alarm* is active.	
ECU (ECM) Data Fail	Becomes active when no CANbus data is received from the ECU after the safety delay timer has expired	Inactive when: • CANbus data is being received • The set is at rest • During the starting sequence before the safety delay timer has expired
ECU (ECM) Power	Used to switch an external relay to power the CANbus ECU (ECM). Exact timing of this output is dependent upon the type of the engine ECU (ECM)	
ECU (ECM) Shutdown	The engine ECU (ECM) has indicated that a Shutdown alarm is present.	Inactive when no Shutdown alarm from the ECU (ECM) is present

Output Source	Activates…	Is Not Active….
ECU (ECM) Stop	Active when the DSE controller is requesting that the CANbus ECU (ECM) stops the engine.	
ECU (ECM) Warning	The engine ECU (ECM) has indicated that a Warning alarm is present.	Inactive when no Warning alarm from the ECU (ECM) is present
EJP1 / EJP2	Active when an input configured for *EJP1* or *EJP2* is active	
Electrical Trip From 8660	Becomes active when the DSE8660 records an electrical trip.	Inactive when the electrical trip isn't present on the 8660.
Electrical Trip Reset	Becomes active when the electrical trip has been reset.	Inactive on the next electrical trip alarm or when the generator is at rest.
Electrical Trip Reset Count Exhausted	Becomes active when the maximum number of resets within specified time frame has been reached.	Inactive when the generator is at rest.
Electrical Trip Stop Inhibited	Becomes active when the generator has been on load, there is an active electrical trip alarm and inhibit engine stop has been enabled.	
Emergency Stop IEEE 37.2 – 5 Stopping Device	Active when the *Emergency Stop* input has been activated	
Energise To Stop	Normally used to control an *Energise to Stop* solenoid, this output becomes active when the controller wants the set to stop running.	Becomes inactive a configurable amount of time after the set has stopped. This is the *ETS hold time*.
Fail To Start IEEE 37.2 - 48 Incomplete Sequence Relay	Becomes active if the set is not seen to be running after the configurable number of start attempts	
Fail To Stop IEEE 37.2 - 48 Incomplete Sequence Relay	If the set is still running a configurable amount of time after it has been given the stop command, the output becomes active. This configurable amount of time is the *Fail to Stop Timer*.	
Fail to Synchronise IEEE 37.2 - 48 Incomplete Sequence Relay	Becomes active if the module fails to synchronise after the *fail to sync* timer.	
Fan Control	Energises when the engine becomes available (up to speed and volts). This output is designed to control an external cooling fan. When the engine stops, the cooling fan remains running for the duration of the Fan Overrun Delay.	
Flexible Sensor A, B, C or D Low/High – Alarm/Pre- Alarm	Active when the relevant flexible sensor alarm is active	
Fuel Level High/Low (Pre) Alarm	Active when the respective fuel level (pre) alarm is active.	
Fuel Pump Control IEEE 37.2 – 71 Level Switch	Becomes active when the *Fuel level* falls below the *Fuel Pump Control ON* setting and is normally used to transfer fuel from the bulk tank to the day tank.	If the output is already active it becomes inactive when the *Fuel level* is above the *Fuel Pump Control OFF* settings.
Fuel Relay	Becomes active when the controller requires the governor/fuel system to be active.	Becomes inactive whenever the set is to be stopped, including between crank attempts, upon controlled stops and upon fault shutdowns.
Fuel Tank Bund Level High	Active when the digital input configured for *Fuel Tank Bund Level High* is active.	
Fuel Usage Alarm IEEE 37.2 – 80 Flow Switch	Active when the *Fuel Usage* alarm becomes active	
Gas Choke On	Becomes active during starting for the duration of the Gas Choke timer. Normally used to choke a gas engine.	Inactive at all other times
Gas Ignition	Becomes active during starting.	Becomes inactive a configurable amount of time after the *Fuel Relay* becomes inactive. This is the *Gas Ignition Off* timer.
Generator at Rest	This output indicates that the generator is not running and no alarms are active.	

Output Source	Activates…	Is Not Active….
Generator Available	Becomes active when the generator is available to take load.	Inactive when • *Loading voltage* and *loading frequency* have not been reached • After *electrical trip* alarm • During the starting sequence before the end of the warming timer.
Generator Closed Aux	Active when the *Generator Closed Auxiliary* input is active	
Generator Excite IEEE 37.2 – 31 Separate Excitation Device	Used to control the excitation of the main alternator (AC).	Becomes inactive when the set is stopped.
Generator Failed To Close IEEE 37.2 – 52B AC Circuit Breaker Position (Contact Open When Breaker Closed)	Active when the *Generator Closed Auxiliary* input fails to become active after the *Close Generator Output* or *Close Generator Output Pulse* becomes active	
Generator Failed to Open IEEE 37.2 - 48 Incomplete Sequence Relay	This output source is intended to be used to indicate a failure of the generator contactor or breaker. It is only used if the module is configured to use 'Generator Closed Auxiliary' feedback.	
Generator High Voltage Alarm IEEE 37.2 – 59 AC Overvoltage Relay	Active when the *High Voltage Shutdown* alarm is active	
Generator High Voltage Warning IEEE 37.2 – 59 AC Overvoltage Relay	Active when the *High Voltage Warning* alarm is active	
Generator Load Inhibited	Active when the *Generator Load Inhibit* input is active	
Generator Low Voltage Alarm IEEE 37.2 – 27 AC Undervoltage Relay	Active when the generator voltage falls below the *Low Voltage Alarm Trip* level	Inactive when • The set is stopped • During starting sequence before the safety delay time has expired.
Generator Low Voltage Warning IEEE 37.2 – 27 AC Undervoltage Relay	Active when the generator voltage falls below the *Low Voltage Pre-Alarm Trip* level	Inactive when • The set is stopped • During starting sequence before the safety delay time has expired.
Generator Over Frequency Alarm IEEE 37.2 – 81 Frequency Relay	Active when the generator frequency exceeds the *Over Frequency Shutdown Trip* level.	
Generator Over Frequency Warning IEEE 37.2 – 81 Frequency Relay	Active when the generator frequency exceeds the *Over Frequency Warning Trip* level.	
Generator Over Frequency Delayed Alarm IEEE 37.2 – 81 Frequency Relay	Active when the generator frequency exceeds the configured *Over Frequency Shutdown Trip* level for a duration longer than the set *Overshoot Delay* timer.	
Generator Over Frequency Delayed Warning IEEE 37.2 – 81 Frequency Relay	Active when the generator frequency exceeds the configured *Over Frequency Warning Trip* level for a duration longer than the set *Overshoot Delay* timer.	
Gen Over Frequency Overshoot Alarm IEEE 37.2 – 81 Frequency Relay	Becomes active when the *Over Frequency Overshoot* alarm is active	
Gen Over Frequency Overshoot Warning IEEE 37.2 – 81 Frequency Relay	Becomes active when the *Over Frequency Overshoot Warning* alarm is active	

Output Source	Activates…	Is Not Active….
Generator Phase Rotation Alarm IEEE 37.2 – 47 Phase Sequence Relay	Active when the detected generator phase sequence is different than the configured *Generator Phase Rotation*	
Generator Reverse Power IEEE 37.2 – 32 Directional Power Relay	Active when the *Generator Reverse Power* alarm is active	
Generator Stopping	This output source indicates that the engine has been instructed to stop but has not yet come to rest. Once the engine comes to a standstill this output becomes inactive.	
Under Frequency Shutdown / Electrical Trip	Active when any of the *Generator Under Frequency Shutdown* or *Electrical Trip* alarm are active	
Under Frequency Warning	Active when the *Generator Under Frequency Warning* alarm is active	
HEST Active	Active when the High Exhaust System Temperature CANbus alarm is active	
High Coolant Temperature Electrical Trip IEEE 37.2 – 26 Apparatus Thermal Device	Active when the *Coolant Temperature* exceeds the configured *High Coolant Temperature Electrical Trip* level	
High Coolant Temperature Shutdown IEEE 37.2 – 26 Apparatus Thermal Device	Active when the *Coolant Temperature* exceeds the configured *High Coolant Temperature Shutdown* level	
High Coolant Temperature Warning IEEE 37.2 – 26 Apparatus Thermal Device	Active when the *Coolant Temperature* exceeds the configured *High Coolant Temperature Warning* level	
High Inlet Temperature Alarm	Active when the *Inlet Temperature* exceeds the *High Inlet Temperature Alarm* setting	
High Inlet Temperature Warning	Active when the *Inlet Temperature* exceeds the *High Inlet Temperature Pre-Alarm* setting	
Inhibit Scheduled run	Active when the Inhibit Scheduled run input is active	
Inhibit SMS Start	Active when the input Inhibit SMS Start input is active	
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.	
kW Overload Alarm / Warning	Active when the measured kW are above the setting of the *kW overload alarm / pre-alarm* values. Used to give alarms on overload, control a dummy load breaker or for load shedding functionality.	
Lamp Test	Active when the lamp test is activated by a digital input or by pressing the *Mute/Lamp Test* control button	
Load Share Inhibit	This output indicates that a digital input that has been configured as '*Load Share Inhibit*' is active. Refer to the '*Edit Inputs*' section of this manual for details.	
Load Shedding Control (1-5)	Becomes active when the engine kW exceeds Load Shedding Control Trip Setting.	Inactive when the engine kW returns to below the Load Shedding Control Return setting.
Loading Frequency Not Reached	Active when the generator frequency has not reached the configured *Loading Frequency* during the starting process.	
Loading Voltage Not Reached	Active when the generator voltage has not reached the configured *Loading Voltage* during the starting process.	
Loss of Magnetic Pickup Signal	Active when the controller senses the loss of signal from the magnetic pickup probe	
Louvre Control	Active when the fuel relay becomes active. Normally used to drive ventilation louvres for the generator set	

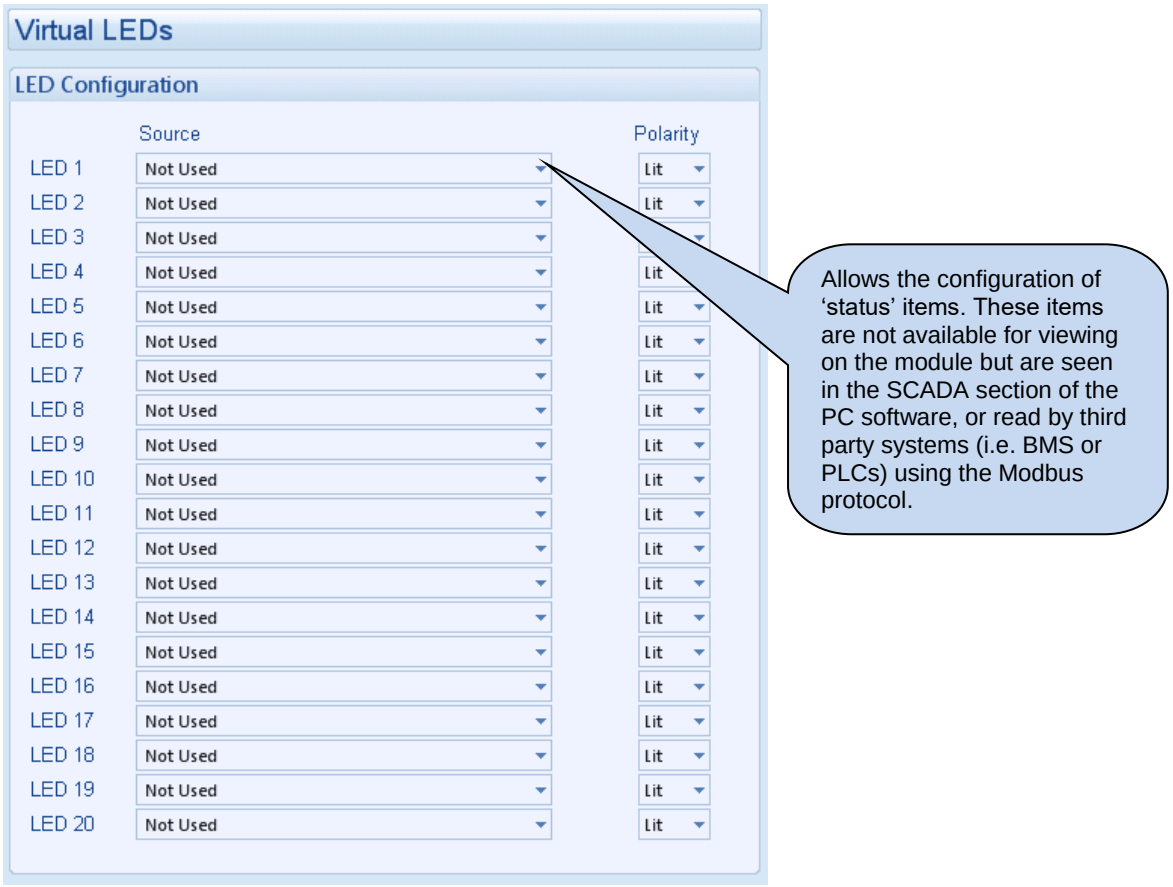
Output Source	Activates…	Is Not Active….
Low Coolant Temperature IEEE 37.2 – 26 Apparatus Thermal Device	Active when the *Coolant Temperature* falls below the *Low Coolant Temperature alarm* setting	
Low kW Load	Active when the kW level falls below configured *Low Load* alarm.	
Low Load	Indicates that the stopping sequence is beginning due to low load levels. (*Load Demand Scheme*)	
Low Oil Pressure Shutdown IEEE 37.2 - 63 Pressure Switch	Active when the *Oil Pressure* falls below the *Low Oil Pressure Shutdown* setting	Inactive when • The set is stopped • During starting sequence before the safety delay time has expired.
Low Oil Pressure Warning IEEE 37.2 - 63 Pressure Switch	Active when the *Oil Pressure* falls below the *Low Oil Pressure Warning* setting	Inactive when • The set is stopped • During starting sequence before the safety delay time has expired.
Main Config Selected	Active when the main configuration is active	
Mains Decoupling High Frequency	This output indicates that the mains decoupling high frequency alarm has been triggered.	
Mains Decoupling High Voltage	This output indicates that the mains decoupling high voltage alarm has been triggered.	
Mains Decoupling Low Frequency	This output indicates that the mains decoupling low frequency alarm has been triggered.	
Mains Decoupling Low Voltage	This output indicates that the mains decoupling low voltage alarm has been triggered.	
Mains Parallel Mode Input	Active when the *Mains Parallel Mode* digital input becomes active.	
Mains ROCOF	Indicates that the ROCOF protection (when in parallel with mains) has triggered.	
Mains Vector Shift	Indicates that the Vector Shift protection (when in parallel with mains) has triggered.	
Maintenance Alarm 1, 2 or 3 Due	Active when the relevant maintenance alarm is due.	
MPU Open Circuit	This output indicates that the module has detected an open circuit failure in the Magnetic Pickup transducer circuit.	
MSC Alarms Disabled	Active when the *MSC Alarms Inhibit* digital input function is active.	
MSC Data Error	Indicates bad data transfer on both of the MultiSet Comms (MSC) Links.	
MSC Electrical Trip	Active when any *MSC Alarm* is active.	
MSC Failure	Indicates when the *MSC Failure* alarm is active on both MultiSet Comms (MSC) Links.	
MSC ID Error	Active when another controller is using the same *MSC ID* on either of the MultiSet Comms (MSC) Links.	
MSC Link Data Error	Indicates bad data transfer on the first MultiSet Comms (MSC) Link.	
MSC Link Failure	Active when the *MSC Failure* alarm is active on the first MultiSet Comms (MSC) Link. Indicates that a genset exists on the second MSC Comms Link but not on the first MultiSet Comms (MSC) Link.	
MSC Link Too Few Sets	Indicates that the number of sets connected on the first MultiSet Comms (MSC) Link is lower than the *Minimum Sets Required* setting.	
MSC Old Units On the Bus	Active when any MSC versions are incorrect/incompatible on either MultiSet Comms (MSC) Links.	
MSC Too Few Sets	Indicates that the number of sets connected on both MultiSet Comms (MSC) Links is lower than the configured *Minimum Sets Required* setting.	
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.	
Negative Phase Sequence Alarm	Active when the *Negative Phase Sequence* alarm is active	
No Loading Command	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.	
Oil Pressure Sender Open Circuit	Active when the *Oil Pressure Sensor* is detected as being open circuit.	

Output Source	Activates…	Is Not Active….
Open Gen Output IEEE 37.2 – 52 AC Circuit Breaker	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 generator is required to be on load
Open Gen Output Pulse IEEE 37.2 – 52 AC Circuit Breaker	Used to control the load switching device. Whenever the module selects the generator to be off load this control source is activated for the duration of the Breaker Open Pulse timer, after which it becomes inactive again.	
Out of Sync	Indicates that the *out of sync* alarm has been triggered.	
Over Current IDMT Alarm	Active when the *Over Current IDMT* alarm is active	
Over Current Immediate Warning	Active when the *Over Current Immediate Warning* alarm is active	
Over Speed Shutdown IEEE 37.2 – 12 Over Speed Device	Active when the *Over Speed Shutdown* alarm is active	
Over Speed Warning IEEE 37.2 – 12 Over Speed Device	Active when the *Over Speed Warning* alarm is active	
Over Speed Overshoot Alarm IEEE 37.2 – 12 Over Speed Device	Active when the *Over Speed Overshoot* alarm is active	
Overspeed Overshoot Warning IEEE 37.2 – 12 Over Speed Device	Active when the *Over Speed Overshoot Warning* alarm is active	
Panel locked	This output indicates that the module '*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*).	
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.	
Panel locked by telemetry	This output indicates that remote '*Panel Lock*' 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. (*Front panel configuration access is barred while system lock is active*).	
PLC Output Flag 1-100	Active when the *PLC Flag* is active	
Preheat During Preheat Timer	Becomes active when the preheat timer begins. Normally used to control the engine preheat glow-plugs.	Inactive when : • The set is stopped • The preheat timer has expired
Preheat Until End Of Cranking	Becomes active when the preheat timer begins. Normally used to control the engine preheat glow-plugs.	Inactive when : • The set is stopped • The set has reached *crank disconnect* conditions
Preheat Until End Of Safety Timer	Becomes active when the preheat timer begins. Normally used to control the engine preheat glow-plugs.	Inactive when : • The set is stopped • The set has reached the end of the *safety delay* timer
Preheat Until End of Warming Timer	Becomes active when the preheat timer begins. Normally used to control the engine preheat glow-plugs.	Inactive when : • The set is stopped • The set has reached the end of the *warming* timer

Output Source	Activates…	Is Not Active….
Protections Disabled	Active when protections are turned off (Unticked) in the configuration.	
Remote Control 1-10	A series of output sources that are controlled by remote control in the SCADA section of the software, used to control external circuits.	
Remote Start From Digital Input	Active when any configured *Remote Start* digital input is active.	
Remote Start Off Load	Active when the *Remote Start Off Load* input is active	
Remote Start On Load	Active when the *Remote Start On Load* input is active	
Remote Start On Load Demand	Indicates that the module's input is active for remote start on load demand. Also indicates that the controller has received a remote start on load signal from the 8860 via the MSC link.	
Remote Start Over MSC	Indicates that the controller has received a remote start on load signal from the 8860 via the MSC link.	
Reset AVR to Datum	This output is intended to be used in conjunction with an electronic or motorised potentiometer, which has a 'centre pot' type input. This output is activated whenever the module needs to reset the potentiometer to its centre position.	
Reset Governor to Datum	This output is intended to be used in conjunction with an electronic or motorised potentiometer, which has a 'centre pot' type input. This output is activated whenever the module needs to reset the potentiometer to its centre position.	
Reset Maintenance 1, 2 or 3	Active when the relevant *Maintenance Alarm Reset* is active	
Return delay in progress	This output source is active to indicate that the return timer is running.	
Scheduled Auto Start Inhibit	Active during a *Scheduled Auto Start Inhibit* request from the inbuilt *Scheduler*.	
SCR Inducement	Active when *SCR Inducement CAN Alarm* is active	
Short Circuit Generator	This output indicates that the module has detected a short circuit on the generator output.	
Shutdown Blocked	Becomes active when protections are disabled and one of the parameters goes out of limits	
Simulate Auto Button	Active when the *Simulate Auto Button* digital input is active	
Simulate Stop Button	Active when the *Simulate Stop Button* digital input is active	
Simulate Start Button	Active when a digital input configured to *Simulate Start Button* is active	
Smoke Limiting	Becomes active when the controller requests that the engine runs at idle speed. As an output, this is used to give a signal to the *Idle Speed Input* on the engine speed governor (if available)	Becomes inactive when the controller requests that the engine runs at rated speed.
SMS Remote Start Off Load	Active when the set receives an SMS message to start and run off load	
SMS Remote Start On Load	Active when the set receives an SMS message to start and run load	
Speed Lower Relay	This output is used to give a speed lower signal to the external governor or electronic pot.	
Speed Raise Relay	This output is used to give a speed raise signal to the external governor or electronic pot.	
Start Delay in Progress	This output source is active to indicate that the module's internal start delay timer is running. Once this timer expires the module with initiate its start sequence.	
Start Paused	Active when the *Start Pause* digital input is active.	
Start Relay IEEE 37.2 – 54 Turning Gear Engaging Device	Active when the controller requires the cranking of the engine.	
Starting Alarm	This output is used to supply an external sounder with a signal that the engine is about to start. The output is active after the start delay time, during the pre heat delay (if used) and continues until the set starts.	
Starting Alarms Armed	This output indicates that the starting alarms are now enabled. It is used to control external logic circuitry. Starting alarms are armed as soon as the module commences starting of the engine and remain armed until the engine is at rest.	

Output Source	Activates…	Is Not Active….
Stop and Panel lock	Active when the *Stop And Panel Lock* digital input is active	
Stop Button Pressed	This output indicates that the stop pushbutton is being operated. Once the button is released, the output becomes inactive.	
Synching Enabled	This output indicates that the synchronisation feature has been enabled.	
System Healthy	This output indicates that the module is in *Auto* mode and there are no alarms present.	
System in Auto Mode	Active when Auto mode is selected	
System in Manual Mode	Active when Manual mode is selected	
System in Stop Mode	Active when Stop mode is selected	
Telemetry Active	Active when the communication port is live and for a short time after transmission stops. Used as a relay or LED source.	
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. For a similar source more suited to drive a relay, see *Telemetry Active*.	
Telemetry Panel Lock	Active when the *Telemetry Panel Lock* digital input is active	
Telemetry Start in Auto Mode	Active when a *Remote Start Request* is sent over by communication	
Under Speed Shutdown	Active when any of the *Underspeed Shutdown* alarm is active	
Under Speed Warning	Active when the *Underspeed Warning* alarm is active.	
Voltage Lower Relay	Used when the *internal relays* scheme of AVR control is used. This output is used to drive a motorised potentiometer or Voltage Lower input of an AVR	
Voltage Raise Relay	Used when the *internal relays* scheme of AVR control is used. This output is used to drive a motorised potentiometer or Voltage Raise input of an AVR	
Waiting for Electrical Trip Reset	Active when an electrical trip alarm is active and waiting for it to be reset.	Inactive when the electrical trip alarm has been reset or when the generator is at rest.
Waiting For Generator	This output indicates that the engine has been instructed to start but has not yet become available. Once the generator becomes available this output becomes in-active. (Available = Generator Frequency and Voltage levels are above the '*Loading*' levels set in the configuration)	
Water In Fuel	Active when the digital input function *Water In Fuel* is active.	
Working Adjusted Nominal Volts	Active when the nominal voltage is different than the configured nominal voltage. Indicates that the nominal voltage was changed through the module FPE and set to a different voltage than the configured nominal voltage.	

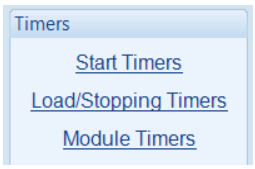
2.5.2 VIRTUAL LEDS



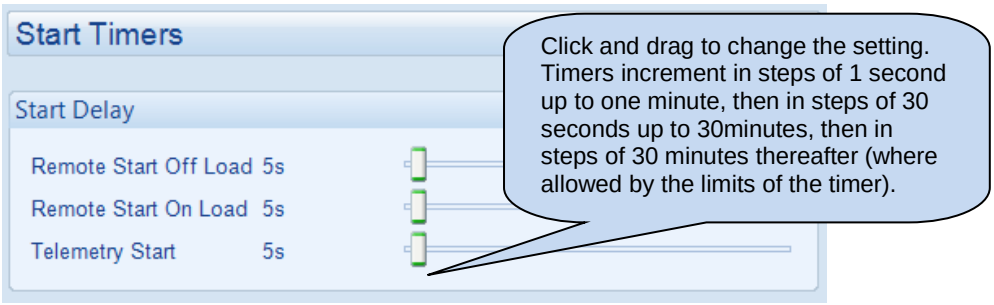
The list of output sources available for configuration of the module Virtual LEDs is listed in the section entitled *Output Sources.*

2.6 TIMERS

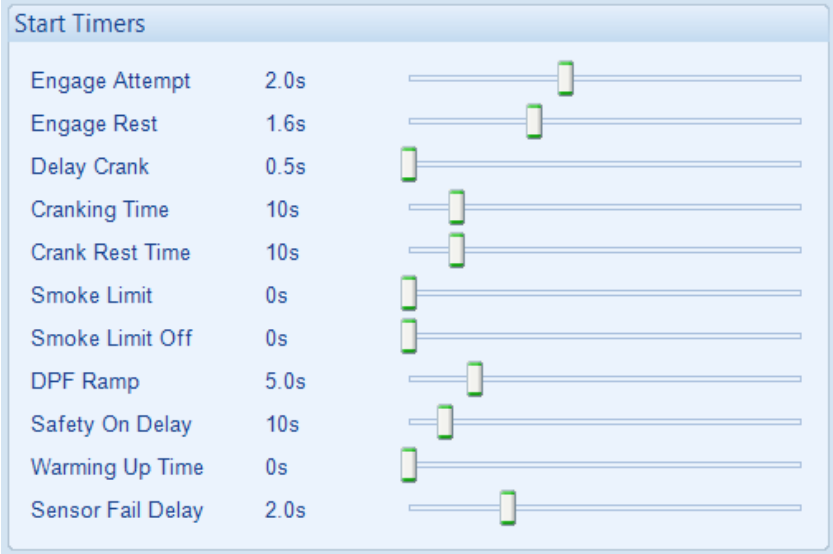
Many timers are associated with alarms. Where this occurs, the timer for the alarm is located on the same page as the alarm setting. Timers not associated with an alarm are located on the timers page.
The *Timers* page is subdivided into smaller sections. Select the required section with the mouse.



2.6.1 START TIMERS

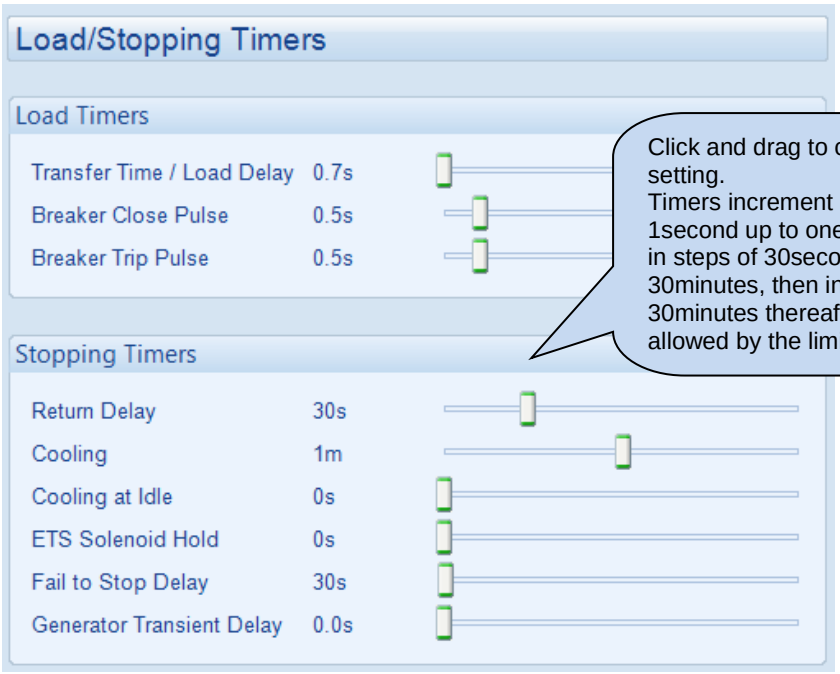


Timer	Description
Remote Start Off Load	The amount of time delay before starting in AUTO mode. This timer is activated upon the *Remote Start Off Load* command being issued. Typically this timer is applied to prevent starting upon fleeting start signals.
Remote Start On Load	The amount of time delay before starting in AUTO mode. This timer is activated upon the *Remote Start On Load* 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 *Remote Start* command being received from a Modbus master. Typically this timer is applied to prevent starting upon fleeting start signals.



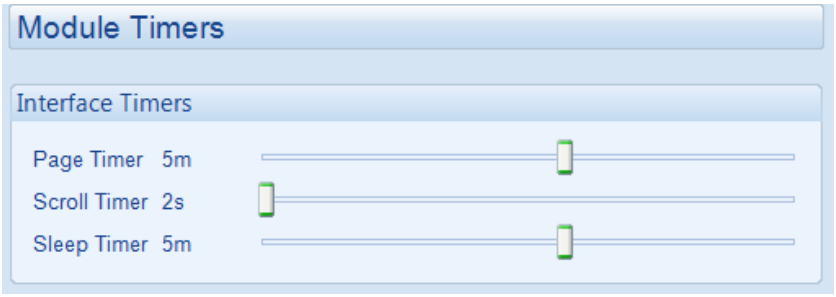
Timer	Description
Engage Attempt	**NOTE: Only available if using magnetic pick-up and multiple engage attempts** The amount of time the module attempts to engage the starter motor during each engage attempt. If the Magnetic Pick-up is not detecting movement of the flywheel when this timer expires, the engage attempt terminates. When the engage fails consecutively for the configured number of *Engage Attempts*, the *Fail to Engage* alarm is activated.
Engage Rest	**NOTE: Only available if using magnetic pick-up and multiple engage attempts** The amount of time the module waits between attempts to engage the starter.
Delay Crank	The amount of time delay between the fuel relay and the crank relay energising. This is typically used to allow fuel systems to prime.
Cranking Time	The amount of time for each crank attempt
Crank Rest Time	The amount of time between multiple crank attempts.
Smoke Limit	The amount of time that the engine is requested to run at idle speed upon starting. This is typically used to limit emissions at startup.
Smoke Limit Off	The amout of time that the engine takes to run up to rated speed after removal of the command to run at idle speed. If this time is too short, the engine is stopped due to an *Underspeed* alarm. If the time is too long, *Underspeed* protection is disabled until the *Smoke Limit Time Off* time has expired.
DPF Ramp	After terminating the DPF stage at idle speed, the amount of time required to disable the speed protections till the engine reaches to its nominal values.
Safety On Delay	The amount of time at startup that the controller ignores oil pressure and engine speed and other delayed alarms. This is used to allow the engine to run up to speed before protections are activated.
Warming Up Time	The amount of time the engine runs before being allowed to take load. This is used to warm the engine to prevent excessive wear.
Sensor Fail Delay	**NOTE: Only available if using Magnetic pick-up** The amount of time during which the module must receive a speed signal once cranking has commenced. If no signal is present, the engine is shutdown and a *Loss of Speed Sensing* alarm given.

2.6.2 LOAD / STOPPING TIMERS



Timer	Description
Transfer Time / Load Delay	The amount of time before closing the breaker when the set becomes available.
Breaker Close Pulse	The amount of time that *Breaker Close Pulse* signal is present when the request to close the load switch is given.
Breaker Trip Pulse	The amount of time that *Breaker Open Pulse* signal is present when the request to open the load switch is given.
Return Delay	A delay, used in auto mode only, that allows for short term removal of the 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.
Cooling	The amount of time that the set is made to run OFF LOAD before being stopped. This is to allow the set to cool down and is particularly important for engines with turbo chargers.
Cooling At Idle	The amount of time that the set is made to run OFF LOAD and at Idle Speed before being stopped.
ETS Solenoid Hold	The amount of time the *Energise to stop* solenoid is kept energised after the engine has come to rest. This is used to ensure the set has fully stopped before removal of the stop solenoid control signal.
Fail To Stop Delay	If the set is called to stop and is still running after the *fail to stop* delay, a *Fail to Stop* alarm is generated.

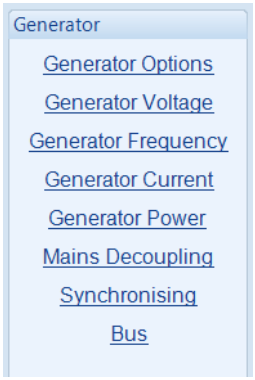
2.6.3 MODULE TIMERS



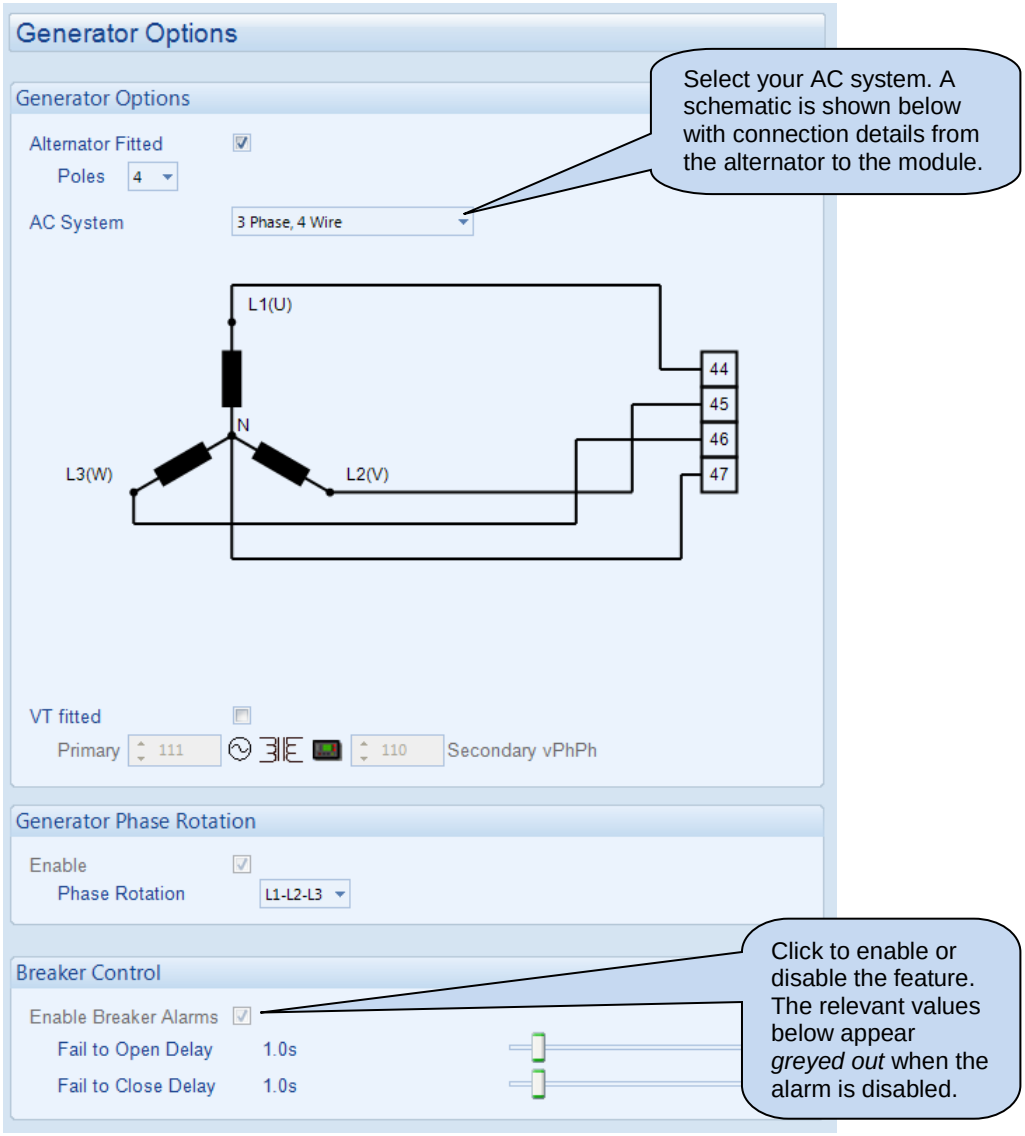
Timer	Description
LCD Page timer	If the module is left unattended for the duration of the *LCD Page Timer* it reverts to show the *Status* page.
LCD Scroll Timer	The scroll time between parameters on a selected page
Backlight Timer	If the module is left unattended for the duration of the *Backlight Timer*, the LCD backlight turns off

2.7 GENERATOR

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



2.7.1 GENERATOR OPTIONS



These parameters are described overleaf...

Parameter	Description
Alternator Fitted	☐ = There is no alternator in the system, it is an *engine only* application ☑ = An alternator is fitted to the engine, it is a generator application.
Poles	The number of poles on the alternator
AC System	**NOTE: For further information on the wiring for the different topologies, please refer to the DSE module operator manual.** Select the AC system topology from the list: ***2 Phase, 3 Wire L1 - L2*** ***2 Phase, 3 Wire L1 – L3*** ***3 Phase, 3 Wire*** ***3 Phase, 4 Wire*** ***3 Phase, 4 Wire Delta L1-N-L2*** ***3 Phase, 4 Wire Delta L1-N-L3*** ***3 Phase, 4 Wire Delta L2-N-L3*** ***Single Phase, 2 Wire*** ***Single Phase, 3 Wire L1 – L2*** ***Single Phase, 3 Wire L1 – L3***
VT Fitted	☐ = The voltage sensing to the controller is direct from the alternator ☑ = The voltage sensing to the controller is via Voltage Transformers (VTs or PTs) This is used to step down the generated voltage to be within the controller voltage specifications. By entering the *Primary* and *Secondary* voltages of the transformer, the controller displays the *Primary* voltage rather than the actual measured voltage. This is typically used to interface the DSE module to high voltage systems (ie 11kV) but also used on systems such as 600V ph-ph.

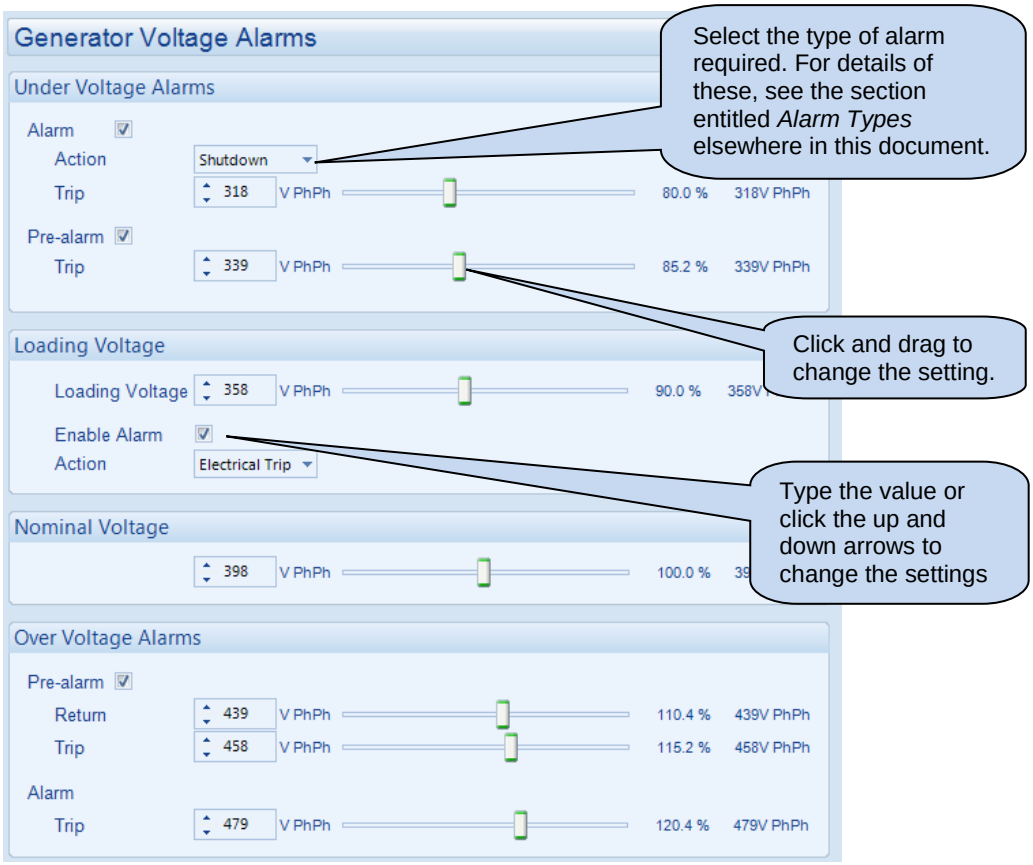
2.7.1.1 GENERATOR PHASE ROTATION

Parameter	Description
Generator Phase Rotation IEEE 37.2 – 47 Phase Sequence Relay	☐ = Generator phase rotation is not checked. ☑ = An electrical trip alarm is generated when the measured phase rotation is not as configured.

2.7.1.2 BREAKER CONTROL

Parameter	Description
Enable Breaker Alarms	☐ = Alarm is disabled ☑ = The *Generator Breaker Alarms* are enabled.
Fail To Open Delay	When the *Open Generator* output is activated, if the configured *Generator Closed Auxiliary* digital input does not become inactive within the *Generator Fail To Open Delay* timer, the alarm is activated
Fail To Close Delay	When the *Close Generator* output is activated, if the configured *Generator Closed Auxiliary* digital input does not become active within the *Generator Fail To Close Delay* timer, the alarm is activated

2.7.2 GENERATOR VOLTAGE



2.7.2.1 UNDER VOLTAGE ALARMS

Parameter	Description
Generator Under Voltage Alarm IEEE 37.2 - 27AC Undervoltage Relay	☐ = Generator Under Volts does NOT give an alarm ☑ = Generator Under Volts gives an alarm in the event of the generator output falling below the configured *Under Volts Alarm Trip* value for longer than the *Generator Transient Delay*. The *Under-volts Alarm Trip* value is adjustable to suit user requirements.
Action	Select the type of alarm required from the list: ***Shutdown*** ***Electrical Trip*** For details of these, see the section entitled *Alarm Types* elsewhere in this document.
Generator Under Voltage Pre-Alarm IEEE 37.2 - 27AC Undervoltage Relay	☐ = Generator Under Volts does NOT give a warning alarm ☑ = Generator Under Volts gives a warning alarm in the event of the generator output falling below the configured *Under Volts Pre-Alarm Trip* value for longer than the *Generator Transient Delay*. The *Under-volts Pre-Alarm Trip* value is adjustable to suit user requirements.

2.7.2.2 LOADING VOLTAGE

Parameter	Description
Loading Voltage	This is the minimum voltage the generator must be operating at before the module considers it available to take the load. It is also the voltage above the under voltage trip that the generator output must return to before the module considers that the supply is back within limits. (i.e. With an undervolts trip of 184.0V and a loading voltage of 207.0V, the output voltage must return to 207.0V following an under voltage event to be considered within limits.)
Enable Alarm	☐ = Alarm is disabled. ☑ = Upon starting and after the *Safety On Delay Timer* expires, if the generator output voltage fails to reach the *Loading Voltage* setpoint, the *Loading Voltage Not Reached* alarm is activated.

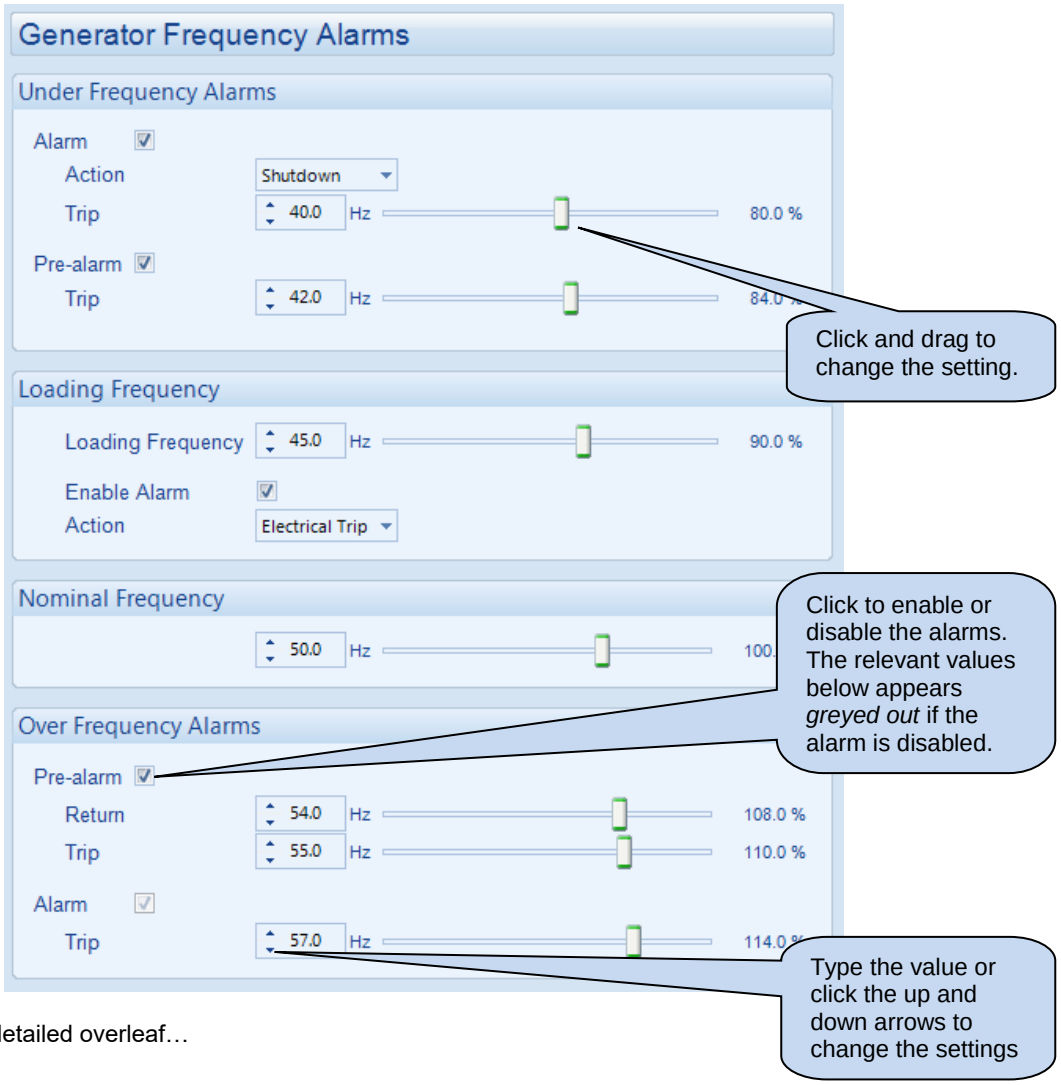
2.7.2.3 NOMINAL VOLTAGE

Parameter	Description
Nominal Voltage	This is used to calculate the percentages of the alarm set points.

2.7.2.4 OVER VOLTAGE ALARMS

Parameter	Description
Generator Over Voltage Pre-Alarm IEEE 37.2 – 59 AC Overvoltage Relay	☐ = Alarm is disabled ☑ = Generator Over Volts gives a warning alarm in the event of the generator output voltage rising above the configured *Over Volts Pre-Alarm Trip* value for longer than the *Generator Transient Delay*. The *Warning* is automatically reset when the generator output voltage falls below the configured *Return* level. The *Over Volts Pre-Alarm Trip* value is adjustable to suit user requirements.
Generator Over Voltage IEEE 37.2 – 59 AC Overvoltage Relay	☐ = Alarm is disabled ☑ = Generator Over Volts gives a *Shutdown* alarm in the event of the generator output rising above the configured *Over Volts Alarm Trip* value for longer than the *Generator Transient Delay*. The *Over-volts Alarm Trip* value is adjustable to suit user requirements.

2.7.3 GENERATOR FREQUENCY



Parameters are detailed overleaf…

2.7.3.1 UNDER FREQUENCY ALARMS

Parameter	Description
Generator Under Frequency Alarm IEEE 37.2 -81 Frequency Relay	☐ = Generator Under Frequency does NOT give an alarm ☑ = Generator Under Frequency gives an alarm in the event of the generator output frequency falling below the configured *Under Frequency Alarm Trip* value for longer than the *Generator Transient Delay*. The *Under-frequency Alarm Trip* value is adjustable to suit user requirements.
Action	Select the type of alarm required from the list: *Shutdown* *Electrical Trip* For details of these, see the section entitled *Alarm Types* elsewhere in this document.
Generator Under Frequency Pre-Alarm IEEE 37.2 -81 Frequency Relay	☐ = Generator Under Frequency does NOT give a warning alarm ☑ = Generator Under Frequency gives a warning alarm in the event of the generator output frequency falling below the configured *Under Frequency Pre-Alarm Trip* value for longer than the *Generator Transient Delay*. The *Under Frequency Pre-Alarm Trip* value is adjustable to suit user requirements.

2.7.3.2 LOADING FREQUENCY

Parameter	Description
Loading Frequency	This is the minimum frequency the generator must be operating at, before the module considers it available to take the load. It is also the frequency above the under frequency trip that the generator output must return to before the module considers that the supply is back within limits. (i.e. With an under-frequency trip of 42.0 Hz and a loading frequency of 45.0 Hz, the output frequency must return to 45.0 Hz following an under frequency event to be considered within limits.)
Enable Alarm	☐ = Alarm is disabled. ☑ = Upon starting and after the *Safety On Delay Timer* expires, if the generator output frequency fails to reach the *Loading Frequency* set point, the *Loading* frequency *Not Reached* alarm is activated.

2.7.3.3 NOMINAL FREQUENCY

Parameter	Description
Nominal Frequency	This is used to calculate the percentages of the alarm set points.

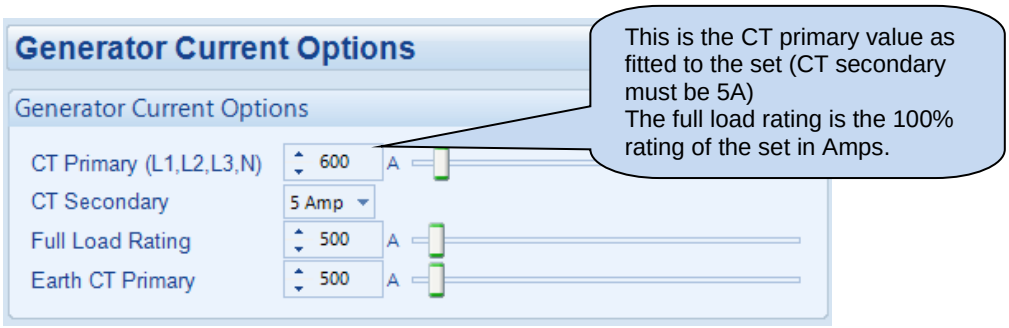
2.7.3.4 OVER FREQUENCY ALARMS

Parameter	Description
Generator Over Frequency Pre-Alarm IEEE 37.2 -81 Frequency Relay	☐ = Alarm is disabled ☑ = Generator Over Frequency gives a warning alarm in the event of the generator output frequency rising above the configured *Over* frequency *Pre-Alarm Trip* value for longer than the *Generator Transient Delay*. The *Warning* is automatically reset when the generator output frequency falls below the configured *Return* level. The *Over Frequency Pre-Alarm Trip* value is adjustable to suit user requirements.
Generator Over Frequency IEEE 37.2 -81 Frequency Relay	☐ = Alarm is disabled ☑ = Generator Over Frequency gives a *Shutdown* alarm in the event of the generator output rising above the configured *Over Frequency Alarm Trip* value for longer than the *Generator Transient Delay*. The *Over Frequency Alarm Trip* value is adjustable to suit user requirements.

2.7.4 GENERATOR CURRENT

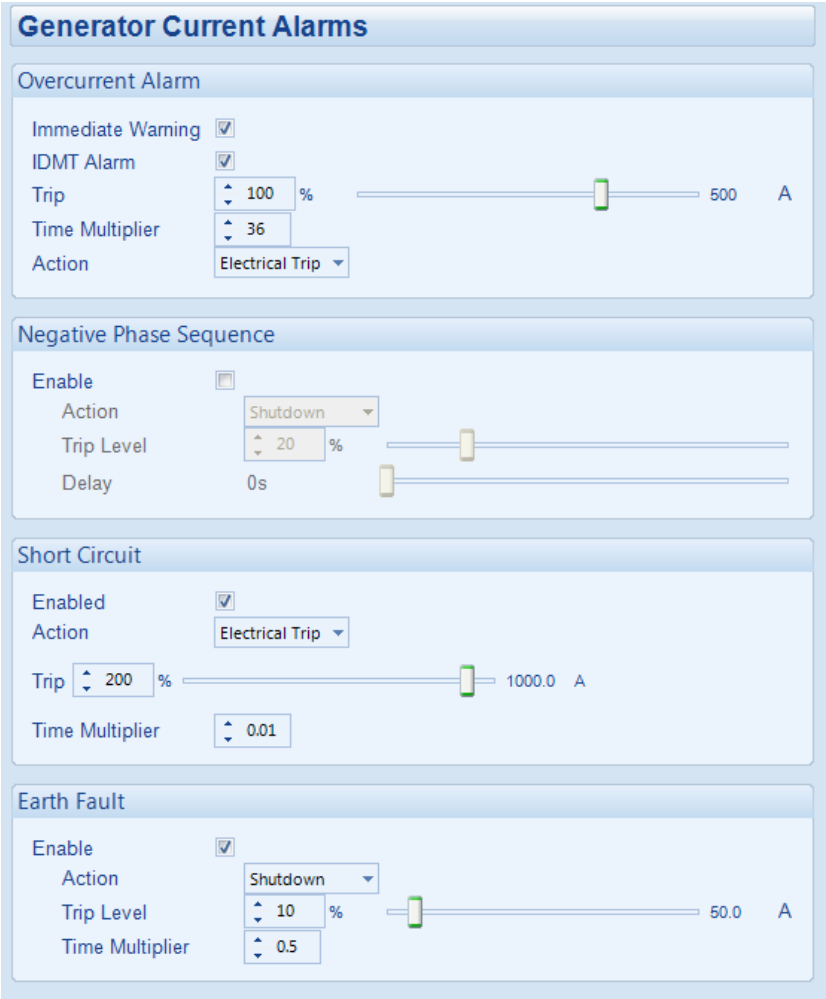
The *generator* section is subdivided into smaller sections.
Select the required section with the mouse.

2.7.4.1 GENERATOR CURRENT OPTIONS



Parameter	Description
CT Primary	Primary rating of the three phase Current Transformers
CT Secondary	Secondary rating of the Current Transformers
Full Load Rating	This is the full load current rating of the alternator
Earth CT Primary	Primary rating of the earth fault Current Transformers

2.7.4.2 GENERATOR CURRENT ALARMS



2.7.4.3 OVERCURRENT ALARM

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

IMMEDIATE WARNING

IEEE 37.2 -50 instantaneous overcurrent relay

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

IDMT ALARM

IEEE 37.2 -51 AC time overcurrent relay (shutdown / electrical trip)

If the *Over Current IDMT Alarm* is enabled, the controller begins following the IDMT 'curve' when the current on any phase passes the *Trip* setting.

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

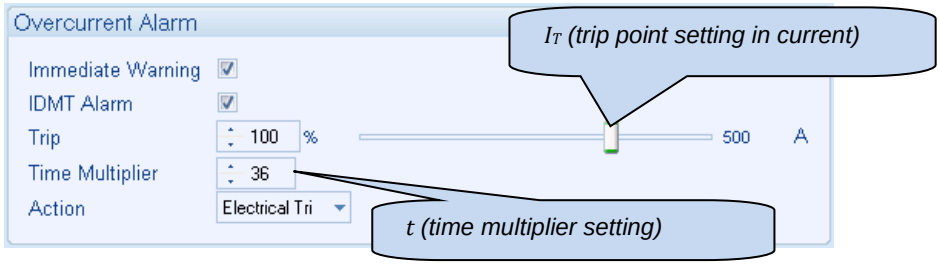
The larger the over circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

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

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

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

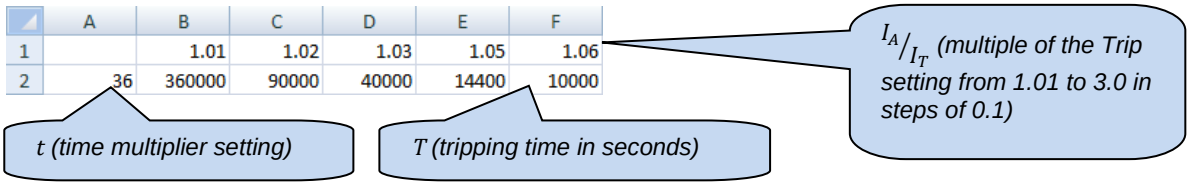
The formula used:

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

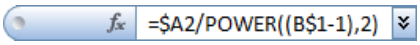
Where:

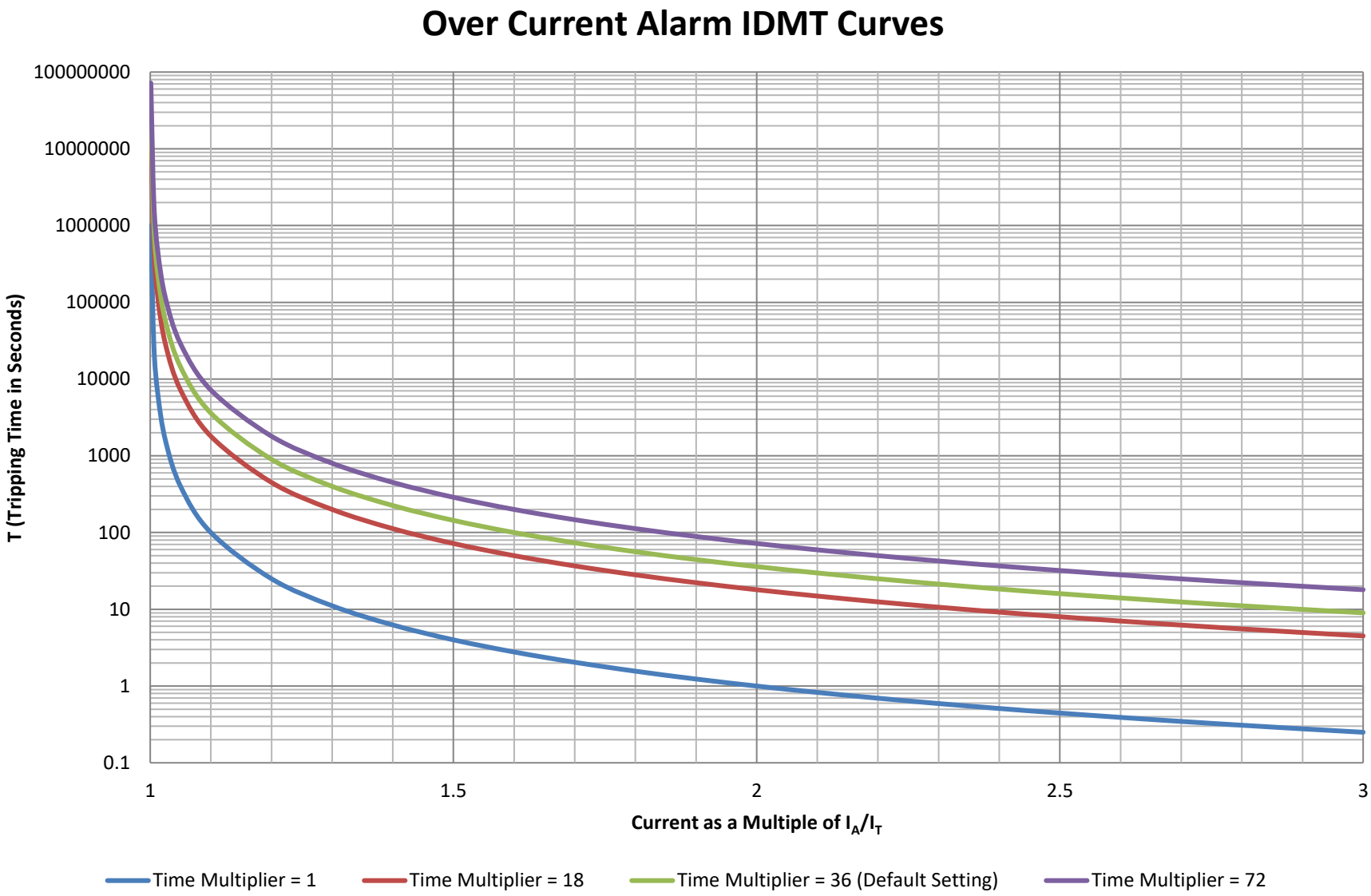
T is the tripping time in seconds
I_A is the actual measured current of the most highly loaded line (L1, L2 or L3)
I_T is the delayed trip point setting in current
t is the time multiplier setting and also represents the tripping time in seconds at twice full load (when $I_A/I_T = 2$).

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 actually testing this on the generator.



The formula for the *Tripping Time* cells is:




Over Current Alarm IDMT Curves
T (Tripping Time in Seconds)
100000000
10000000
1000000
100000
10000
1000
100
10
1
0.1
1
1.5
2
2.5
3
Current as a Multiple of I_A/I_T
Time Multiplier = 1
Time Multiplier = 18
Time Multiplier = 36 (Default Setting)
Time Multiplier = 72

2.7.4.4 SHORT CIRCUIT ALARM

IEEE C37.2 – 51 IDMT Short Circuit Relay

If the *Short Circuit Alarm* is enabled, the controller begins following the IDMT 'curve' when the current on any phase passes the *Trip* setting.

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

The larger the short circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

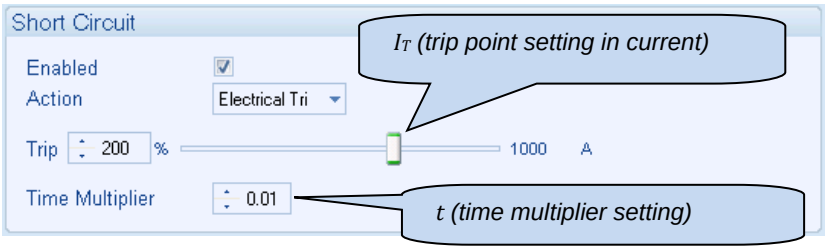
$$T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$$

Where:

T is the tripping time in seconds (accurate to +/- 5% or +/- 50 ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point setting in current
t is the time multiplier setting

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.



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

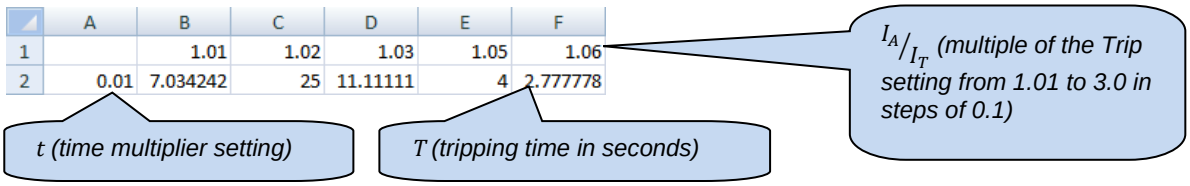
The formula used:

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

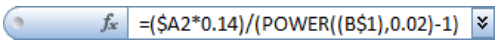
Where:

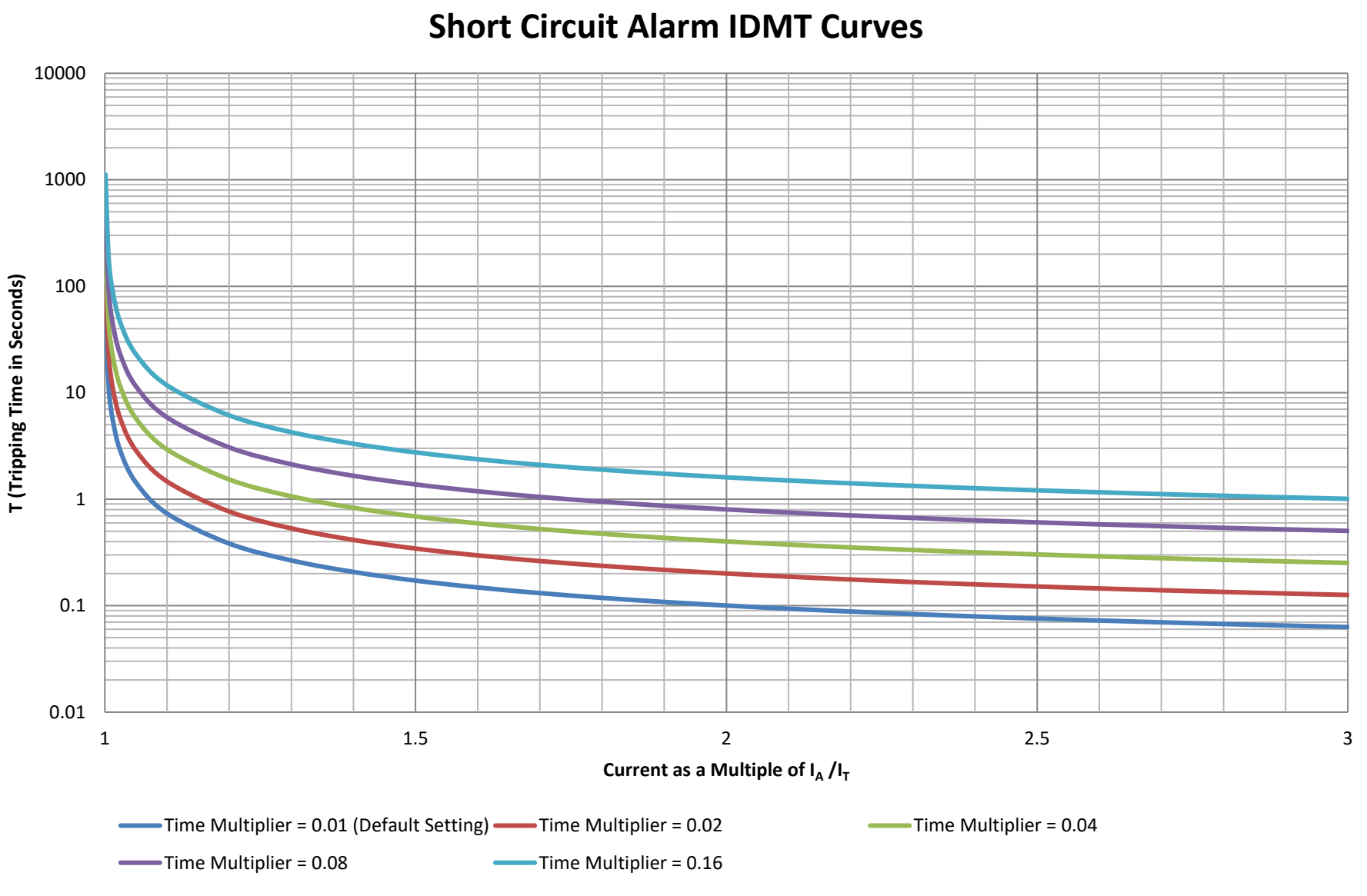
T is the tripping time in seconds (accurate to +/- 5% or +/- 50 ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point setting in current
t is the time multiplier setting

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 actually testing this on the generator.



The formula for the *Tripping Time* cells is:




Short Circuit Alarm IDMT Curves
T (Tripping Time in Seconds)
10000
1000
100
10
1
0.1
0.01
1
1.5
2
2.5
3
Current as a Multiple of I_A /I_T
Time Multiplier = 0.01 (Default Setting)
Time Multiplier = 0.02
Time Multiplier = 0.04
Time Multiplier = 0.08
Time Multiplier = 0.16

2.7.4.5 NEGATIVE PHASE SEQUENCE

IEEE C37.2 - 46 Phase-Balance Current Relay

Unbalanced loads cause negative sequence current in the alternator stator. These currents cause harmonics which eventually leads to overheating and melting of the rotor. An unbalanced-load is, however, permissible within limits.

For recommended settings contact your alternator manufacturer.

2.7.4.6 EARTH FAULT ALARM

When the module is suitably connected using the 'Earth Fault CT'. The module measures Earth Fault and optionally configured to generate an alarm condition (shutdown or electrical trip) when a specified level is surpassed.

If the *Earth Fault Alarm* is enabled, the controller begins following the IDMT 'curve' when the earth fault current passes the *Trip* setting.

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

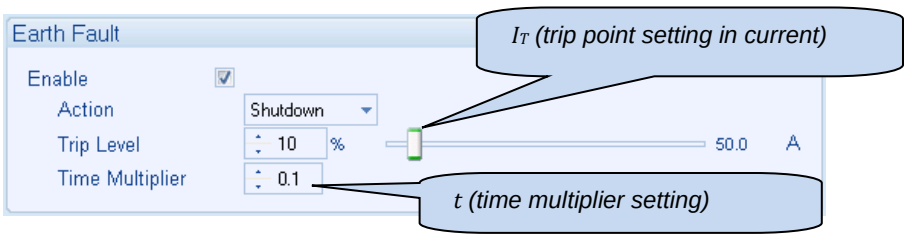
The larger the earth fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

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

Where:

T is the tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point setting in current
t is the time multiplier setting

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



CREATING A SPREADSHEET FOR THE EARTH FAULT 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 +/- 5% or +/- 50 ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point 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 actually testing this on the generator.

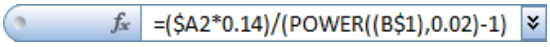
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	0.1	70.34242	250	111.1111	40	27.77778

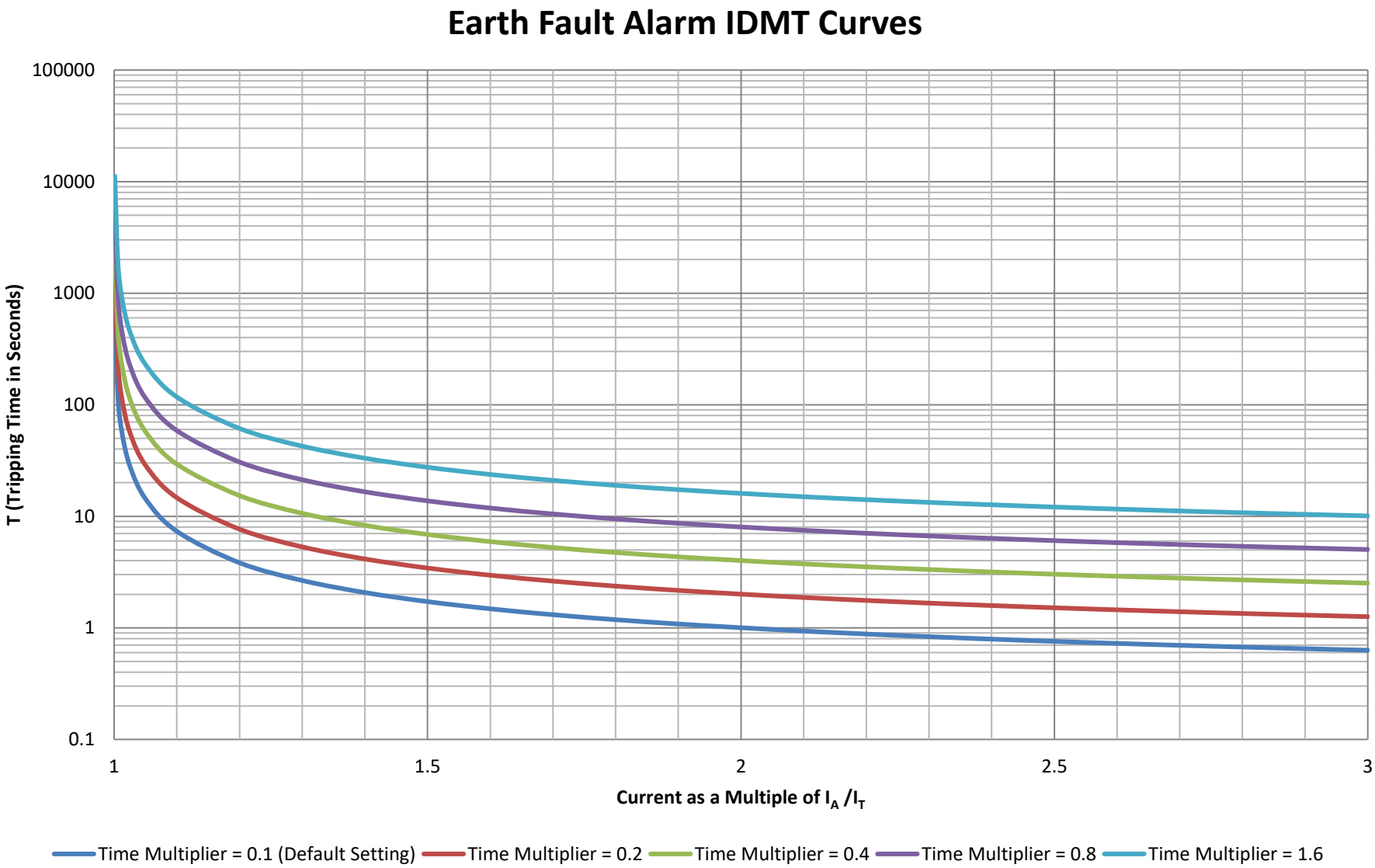
t (time multiplier setting)

T (tripping time in seconds)

I_A/I_T *(multiple of the Trip setting from 1.01 to 3.0 in steps of 0.1)*

The formula for the *Tripping Time* cells is:




Earth Fault Alarm IDMT Curves
100000
10000
1000
100
10
1
0.1
T (Tripping Time in Seconds)
1
1.5
2
2.5
3
Current as a Multiple of I_A / I_T
Time Multiplier = 0.1 (Default Setting)
Time Multiplier = 0.2
Time Multiplier = 0.4
Time Multiplier = 0.8
Time Multiplier = 1.6

2.7.4.7 DEFAULT CURRENT PROTECTION TRIPPING CHARACTERISTICS

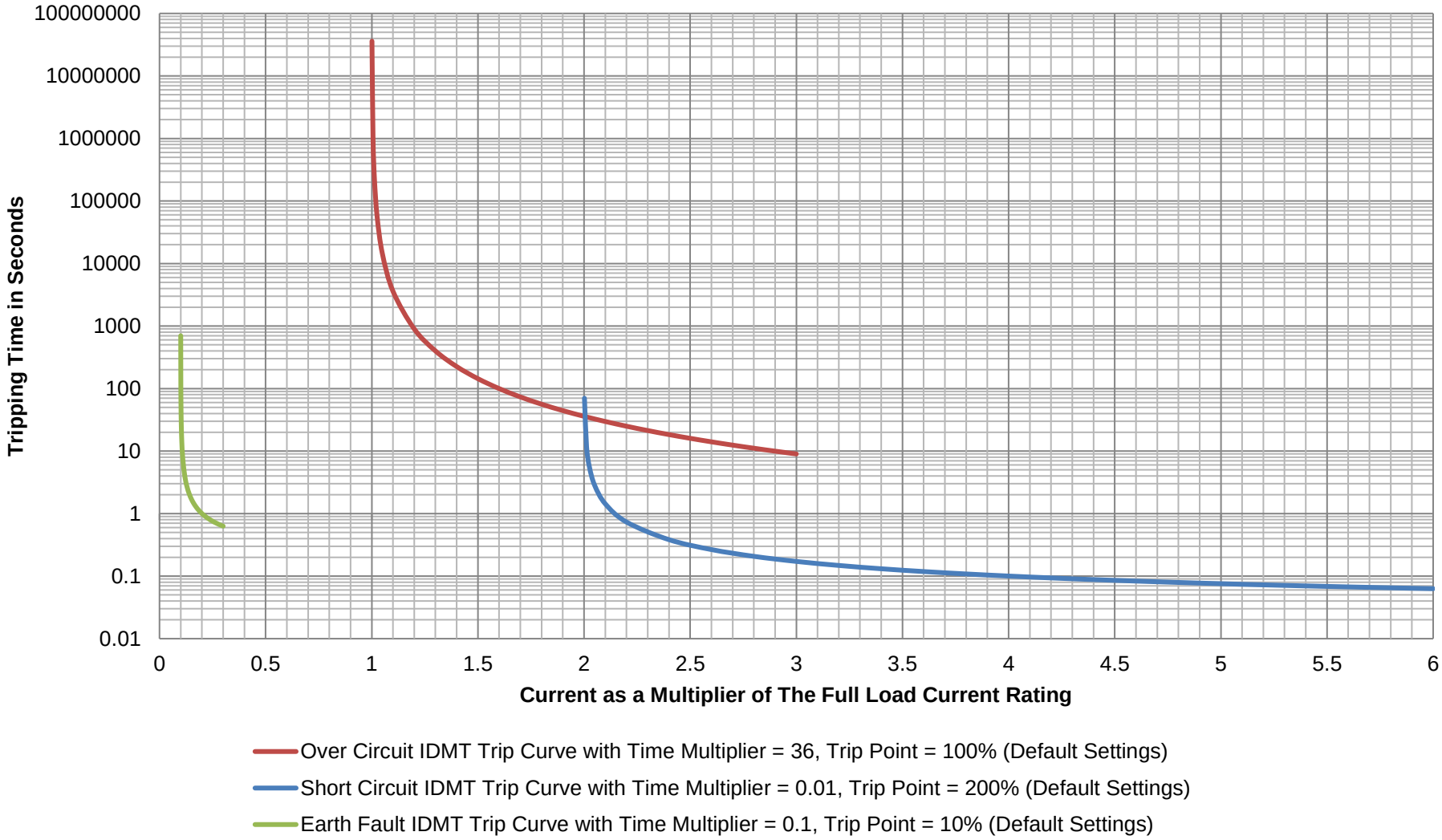
The graph on the following page shows the default settings for the IDMT tripping curves for the *Over Current, Short Circuit* and *Earth Fault* protections.

The default setting for the *Over Current* alarm allows for an overload of an 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. In an over current situation the alternator begins to overheat. The aim of the *Over Current 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 setting for the *Short Circuit* alarm allows for an alternator to supply a high current caused by an genuine short circuit or an in rush current of a motor/transformer. Whereby 300% overload is permitted for 0.17 seconds or 600% overload is permitted for 0.06 seconds. In a short circuit situation the alternator begins to overheat to the point the insulation breaks down, potentially causing a fire. The aim of the *Short Circuit IDMT Alarm* is to prevent the insulation from melting due to excessive heat. The amount of time that the alternator runs safely in a short circuit condition is governed by the alternator's construction.

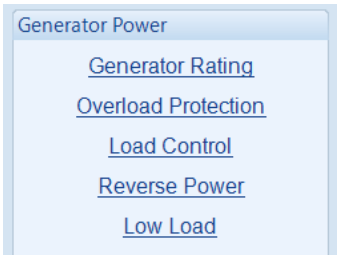
The default setting for the *Earth Fault* alarm allows for an alternator to supply a fault current caused by a high impedance short to earth or motor drives. Whereby 12% fault current is permitted for 3.83 second or 20% fault current is permitted for 1 second.

DSE Default Configratuion of Over Current, Short Circuit & Earth Fault IDMT Alarm Curves



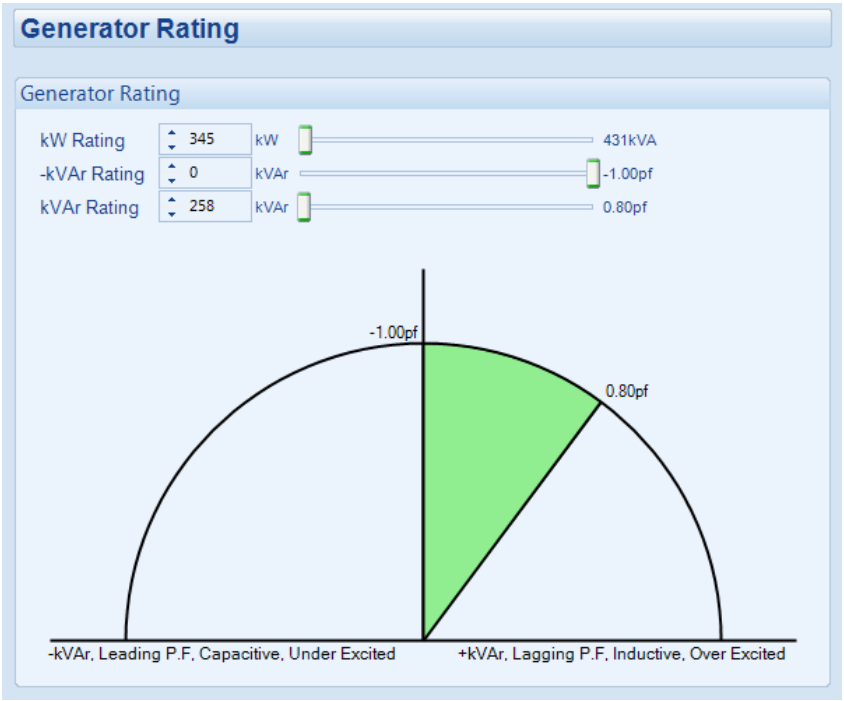
2.7.5 GENERATOR POWER

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



2.7.5.1 GENERATOR RATING

The Generator kW rating must be set in order for the *Generator Power* functions to be correctly utilised.
The Generator kW and kVAr rating must be correctly set.
The values you set here are the kW, kVAr, and Pf, NOT the kVA !



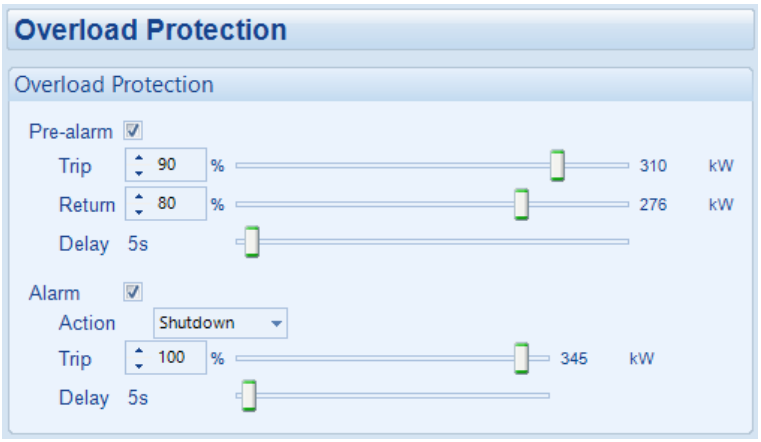
Calculating the VAr rating of a genset

- Most generators are rated for a power factor (W / VA) of 0.8
- From Pythagoras :

  Cos Φ = W / VA
  Cos Φ = 0.8
  Φ = Cos-1 0.8 = 36.87°
- From this we calculate the VAr rating of the typical 0.8 pf rated generator as :

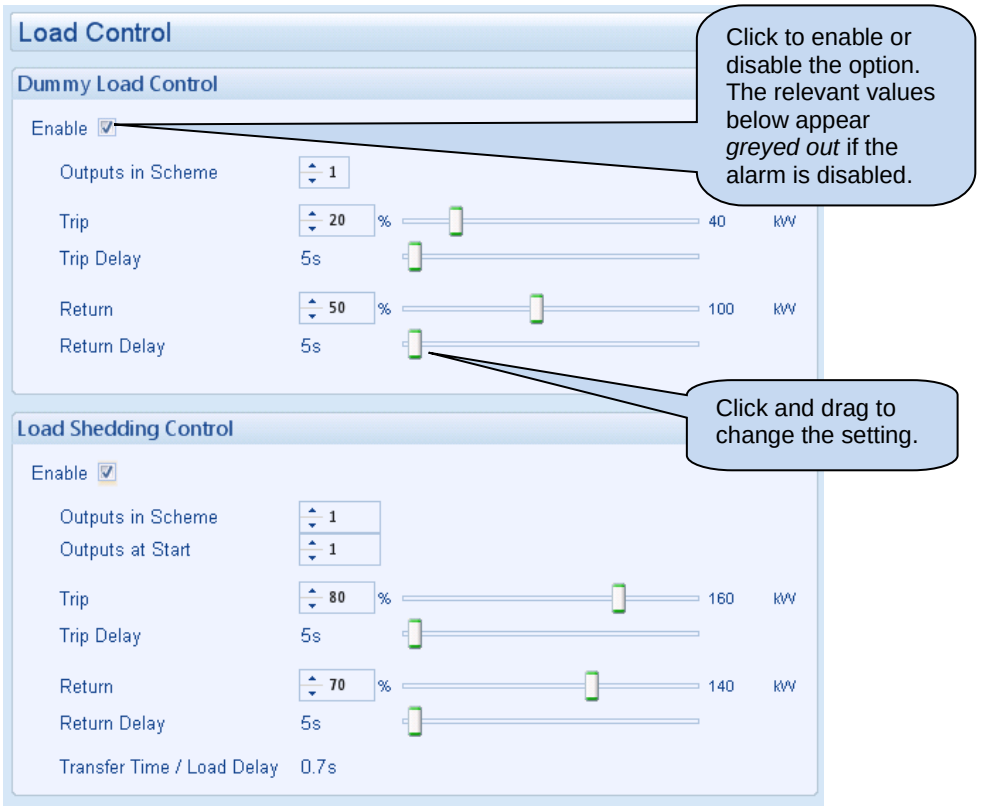
  Tan Φ = VAr / W
  VAr = Tan 36.87 x W
  VAr = 0.75 x W
- Or to simplify this, the VAr rating of a 0.8 pf rated generator is ¾ of the W rating (kVAr rating = 75% of kW rating)

2.7.5.2 OVERLOAD PROTECTION



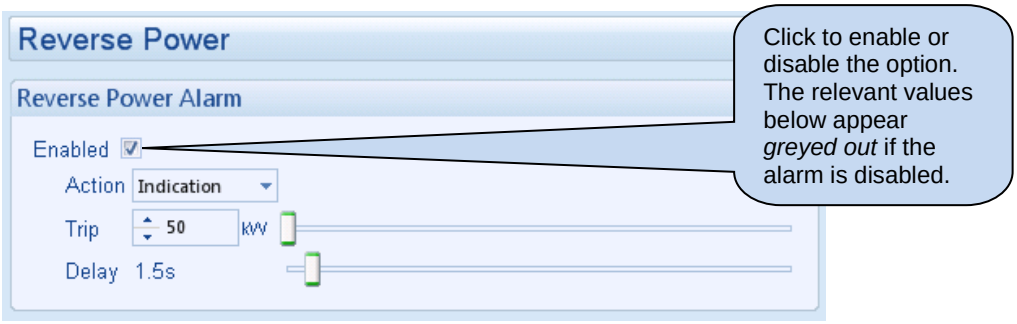
Parameter	Description
Overload Protection Pre-Alarm	☐ = Overload Protection Pre-Alarm is disabled. ☑ = The *kW Overload Warning Alarm* activates when the kW level exceeds the *Trip* setting for longer than the configured *Delay* time. The *kW Overload Warning Alarm* de-activates when the kW level falls below the *Return* setting.
Overload Protection Pre-Alarm	☐ = Overload Protection Alarm is disabled. ☑ = The *kW Overload Warning* activates when the kW level exceeds the *Trip* setting for longer than the configured *Delay* time.
Action	Select the action for the *kW Overload Alarm:* ***Electrical Trip*** ***Shutdown***

2.7.5.3 LOAD CONTROL



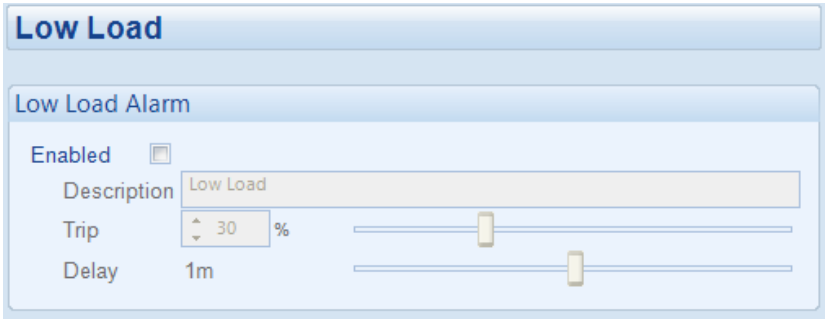
Parameter	Description
Dummy Load Control	Provides control of configurable outputs set to *Dummy Load Control*. ☐ = Dummy Load Control is disabled. ☑ = The module monitors the load and controls outputs configured to *Dummy Load Control (1-5)*
Outputs in Scheme	The amount of Dummy Load Control outputs that are included in the function.
Trip / Trip Delay	When the load level is below the *Trip* setting for the duration of the *Trip Delay*, then the 'next' output configured to *Dummy Load Control* is activated (max 5)
Return / Return Delay	When the load level rises above the *Return* level for the duration of the *Return Delay*, then the 'highest numbered' output configured to *Dummy Load Control* is de-activated and the timer is reset.
Load Shedding Control	Provides control of configurable outputs set to *Load shedding control*. ☐ = Load Shedding Control is disabled. ☑ = The module monitors the load and controls any outputs configured to *Load Shedding Control (1-5)*
Outputs in Scheme	The number of outputs (max 5) that is included in the function.
Outputs at Start	The number of outputs configured to *Load Shedding Control 1-5* that are energised when the set is required to take load. The *Transfer Delay / Load Delay* timer begins. At the end of this timer, the generator load switch is closed – The generator is placed on load.
Trip / Trip Delay	When the load level is above the *Trip* setting for the duration of the *Trip Delay*, then the 'next' output configured to *Load Shedding Control* is activated (max 5)
Return / Return Delay	When the load level is below the *Return* setting for the duration of the *Return Delay*, then the 'highest numbered' output configured to *Load Shedding Control* is de-activated and the timer is reset.
Transfer Time / Load Delay	The time between closing the *Load Shedding Control* outputs (*Outputs at Start)* and closing the generator load switching device.

2.7.5.4 REVERSE POWER



Parameter	Description
Reverse Power IEEE 37.2 – 32 Directional Power Relay	☐= *Generator Reverse Power Alarm* is disabled. ☑= The *Generator Reverse Power* Alarm activates when the reverse power exceeds the *Reverse Power Trip* setting longer than the configured *Delay* time. This is used to protect against back feed from electric motors when mechanically overpowered.
Action	Select the action for the *Reverse Power Alarm:* ***Electrical Trip*** ***Indication*** ***Shutdown*** ***Warning***

2.7.5.5 LOW LOAD



Parameter	Description
Enabled	☐= *Low Load Alarm* is disabled. ☑= The *Low Load Alarm* activates when the generator power drops below the configured *Trip* setting longer than the configured *Delay* time. This is used to prevent the engine from running at very low load levels.
Description	Enter the LCD text that shows up on the display when this alarm activates
Trip	Set the percentage of total power at which the *Low Load Alarm* is activated
Delay	Set the amount of time before the *Low Load Alarm* is activated

2.7.6 MAINS DECOUPLING

NOTE: The *Mains Decoupling* protections only have effect when a digital input is configured for *Mains Parallel Mode* instructing the module to operate in fixed export mode with the utility supply. For more information on this application, refer to DSE Publication: *056-054 DSE7510 in Fixed Export* which is found on our website: *www.deepseaplc.com*

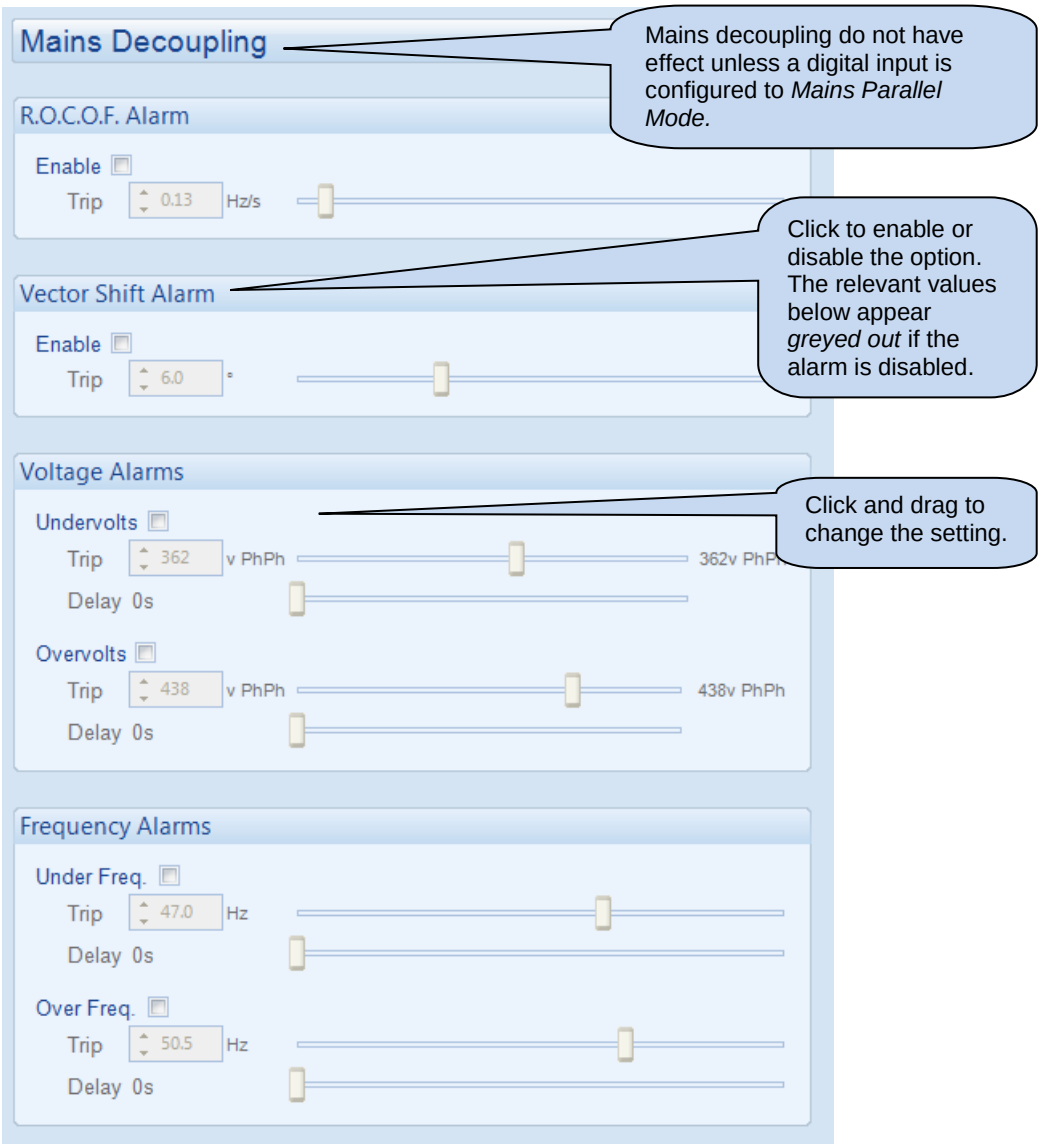
The controller includes “Mains decoupling” detection to be used with generating sets paralleling with the mains (utility) supply.

When the generator set 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 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. In the UK a common regulation requirement is G59. Other countries have different names for these regulations.

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 size and the location of the network fault, this causes problems to the generator in terms of capacity and stability.
- If the generator is able to supply the load, Engineers working on the supposedly dead network would be in fact working on live cables, supplied by the generator set. This is potentially fatal.
- When the mains supply is reconnected and the generator is still connected to the grid, the network would be connected to a generator not synchronised with it, with damaging results (mechanical failure, rotating diode failure, overloaded cables, pole slip etc)

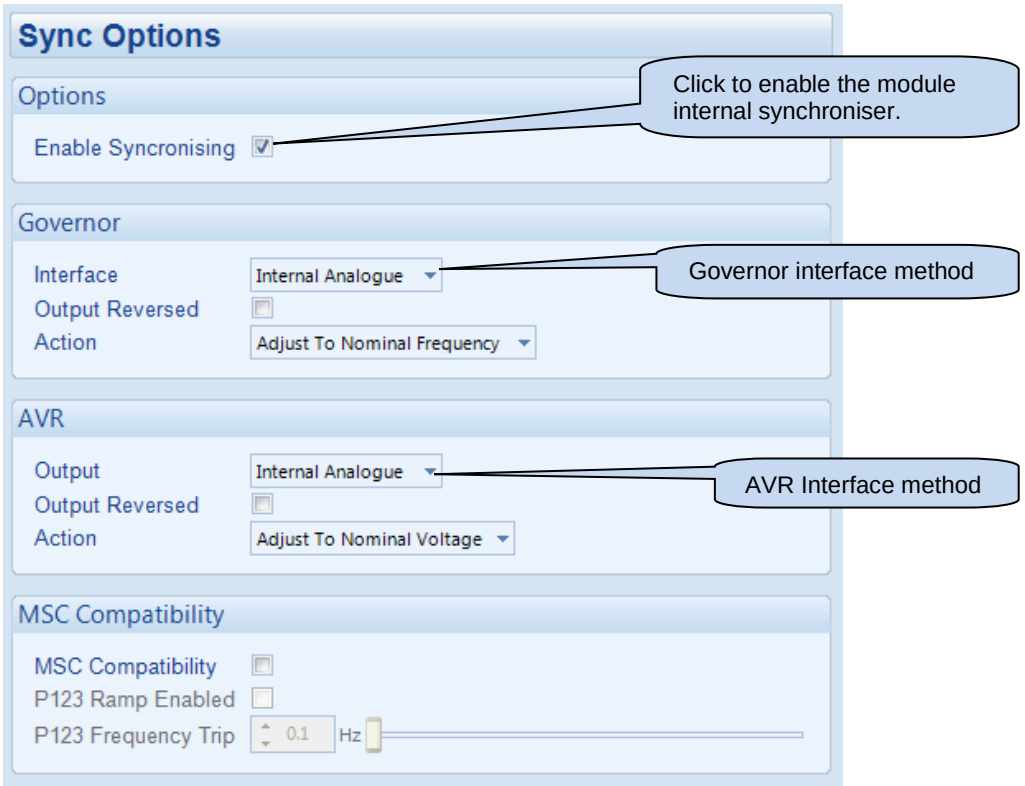


Parameter	Function
R.O.C.O.F. IEEE 37.2 - 81 Frequency relay	☐= R.O.C.O.F. protection is disabled ☑= R.O.C.O.F. protection is enabled when the generator is in parallel with the mains supply. R.O.C.O.F. detection senses sudden, fast changes in the frequency of the waveform. During the failure of the mains supply when in parallel with the generator, the frequency changes faster than is usual by either the on load generator, or by the mains supply.
Vector Shift	☐= Vector Shift protection is disabled ☑= Vector Shift protection is enabled when the generator is in parallel with the mains supply. Vector Shift detection measures the length of each cycle of the voltage wave. When the mains fails in parallel with the generator, the sudden change in load creates a change in the length of the cycle length.
Mains under voltage IEEE 37.2 - 27 under voltage relay Mains over voltage IEEE 37.2 - 59 Frequency relay Mains under frequency IEEE 37.2 - 81 Frequency relay Mains over frequency IEEE 37.2 - 81 Frequency relay	Used to enable and set the levels at which mains failure is detected when in parallel with the generator set. ***Delay*:** Provides a reaction time on the mains level alarms. Under/Over voltage and Under/Over frequency detection relies on the premise that the generator voltage/frequency drifts more when not in parallel, than it does when it is in parallel with the mains supply. This may not be true if the generator is only lightly loaded upon the failure of the mains supply.

2.7.7 SYNCHRONISING

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

2.7.7.1 SYNC OPTIONS



Parameters detailed overleaf...

GOVERNOR

IEEE 37.2 -90 regulating device

These settings configure the method of interface between the DSE controller and the engine speed governor.

Parameter	Description
Governor Interface	**NOTE: When *Internal Relays* is selected, it is necessary to configure two of the module digital outputs to provide the required *Speed Raise* and *Speed Lower* signals.** ***Internal Relays:*** The governor or motorised potentiometer is controlled by the DSE module's own internal relays. ***Internal Analogue:*** This is used to provide a DC voltage output to interface with many engine speed governors remote speed adjust or load sharing controller inputs.
Governor Output Reversed	**NOTE: Only available when internal analogue is selected. This allows the module to interface with a greater diversity of Governors.** ☐ = Lower analogue output voltage equates to lower engine speed. ☑ = Lower analogue output voltage equates to higher engine speed.
Adjust to Nominal Frequency	**NOTE: This option determines the action that is taken by the DSE Controller during the period that the set is running on load and not in parallel.** ***Adjust to Centre Point:*** When the Genset is on load the Frequency is pre-determined by the setting of *SW1* for the governor located in the *Governor / AVR Interface* section within SCADA of the DSE Configuration Suite software. Depending on whether governor droop is enabled or disabled the frequency may vary or remain fixed as the kW load increases/decreases. ***Adjust to Nominal:*** When the Genset is on load the Frequency is pre-determined by the *Nominal Frequency* for the governor located in the *Generator>Generator frequency* section of the DSE Configuration Suite software. Regardless of whether droop is enabled, the nominal frequency is maintained. ***None:*** The DSE module does not attempt to adjust the frequency once the generator breaker has closed. When in parallel with other generators, an external load share controller automatically keeps the system frequency at nominal levels regardless of the selection of this parameter.

AVR

IEEE 37.2 -90 regulating device

These settings configure the method of interface between the DSE controller and the Automatic Voltage Regulator (AVR)

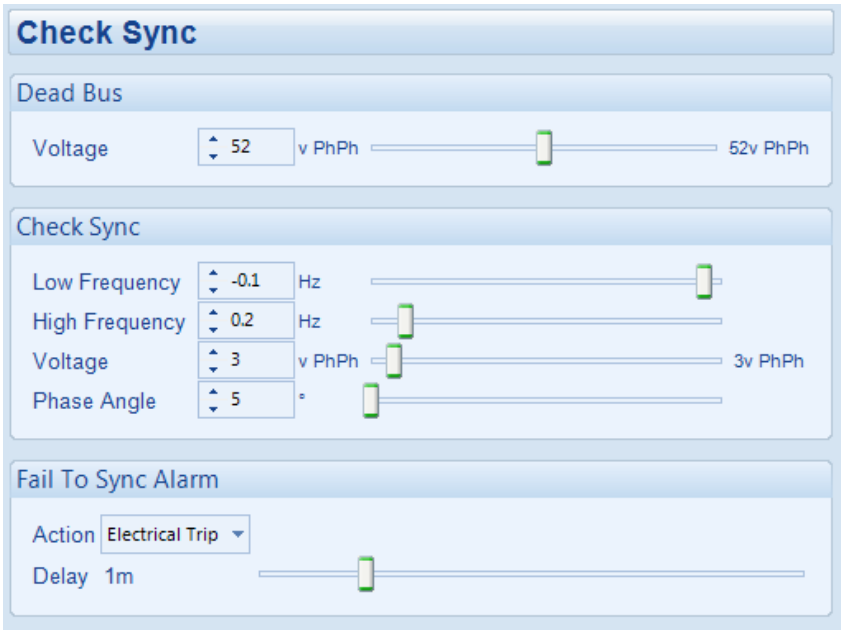
Parameter	Description
AVR Interface	**NOTE: When *Internal Relays* is selected, it is necessary to configure two of the module digital outputs to provide the required 'Voltage raise' and 'Voltage Lower' signals.** ***None:*** No external interface is fitted between the controller and the AVR and no control over voltage matching or VAr sharing is made. ***Internal Relays:*** The AVR or motorised potentiometer is controlled by the DSE module's own internal relays. ***Internal Analogue:*** This external interface is used to provide a DC voltage output to interface with many AVRs remote voltage adjust or load sharing controller inputs.
AVR Output Reversed	**NOTE: Only available when internal analogue is selected. This allows the module to interface with a greater diversity of AVRs.** ☐ = Lower analogue output voltage equates to lower alternator voltage. ☑ = Lower analogue output voltage equates to higher alternator voltage.
Adjust to nominal voltage	**NOTE: This option determines the action that is taken by the DSE Controller during the period that the set is running on load and not in parallel.** ***Adjust to Centre Point:*** When the Genset is on load the Nominal Voltage is pre-determined by the setting of *SW1* for the AVR located in the *Governor / AVR Interface* section within SCADA of the DSE Configuration Suite software. Depending on whether AVR droop is enabled or disabled the voltage may vary or remain fixed as the kvar load increases/decreases. ***Adjust to Nominal:*** When the Genset is on load the Voltage is pre-determined by the *Nominal Voltage* for the AVR located in the *Generator>Generator Voltage* section of the DSE Configuration Suite software. Regardless of whether droop is enabled, the nominal voltage is maintained. ***None:*** The DSE module does not attempt to adjust the voltage once the generator breaker has closed. When in parallel with other generators, an external load share controller automatically keeps the system voltage at nominal levels regardless of the selection of this parameter.

MSC COMPATIBILITY

These settings configure the method of interface between the DSE8610MKII controllers and the DSE5500 and DSE7500 series controllers.

Parameter	Description
MSC Compatibility	☐ = The DSE8610MKII is not able to communicate with the DSE5500 and DSE7500 series modules on the MSC Link ☑ = Communication between DSE8610MKII and DSE5500 / DSE7500 series modules is enabled. The maximum number of generator controllers is reduced to 16 and the maximum number of mains controllers is reduced to 4.
P123 Ramp Enabled	☐ = The MSC link is used for ramping and load sharing. ☑ = The module is connected to a DSE123 to convert the MSC link to interface with Analogue Load Share lines
P123 Frequency Trip	**NOTE: Only Available when P123 Ramp option is enabled** If the frequency changes by this amount when ramping down, the module opens the generator breaker.

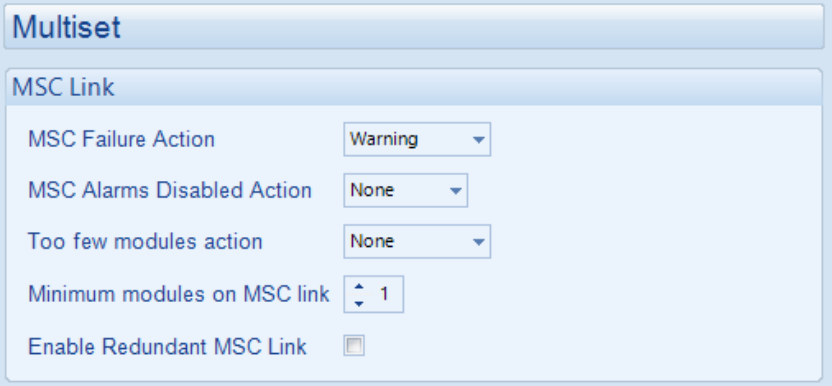
2.7.7.2 CHECK SYNC



Parameter	Description
Dead Bus	The bus is measured when the set is to be loaded. If the bus is measured to be below the *Dead Bus Voltage*, the bus is assumed to be 'dead' and the breaker is closed immediately. If the bus is measured to be above the *Dead Bus Voltage*, the oncoming generator must be synchronised before the breaker can be closed.
Check Sync	During the synchronising process, the controller adjusts the frequency of the generator to closely match the existing bus. Typically the oncoming set is adjusted to be 0.1Hz faster than the existing supply. This causes the phase of the two supplies to change continuously. Before the breaker is closed, the following conditions must be met: • The difference between the two supplies frequencies must be between the *Check Sync Low Frequency* and *Check Sync High Frequency* • The difference between the two supplies voltages must be equal to or below the *Check Sync Voltage* • The phase of the two supplies must be equal to or below the *Check Sync Phase Angle*
Fail to sync Alarm	When the synchronising process continues longer that the *Fail to Sync Alarm Delay*, the alarm is triggered. This occurs when changes in the load are making the set control difficult due to changes in voltage and frequency. ***Electrical Trip**:* The set is stopped. In a *Load Demand* scheme, other generators may start if available. ***Indication:*** The set continues to synchronise and no alarm is raised. This is used for internal use, such as in the *PLC Logic* or *Virtual Leds*. ***Warning**:* The set continues to synchronise.

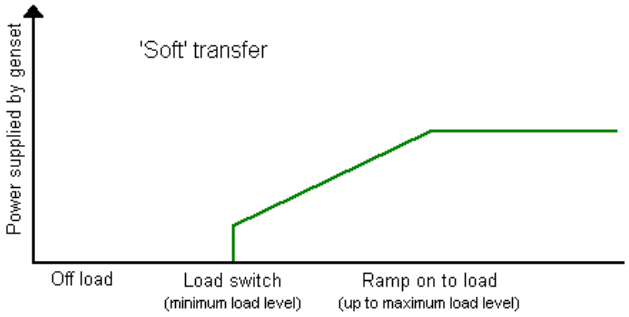
2.7.7.3 MSC LINK

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



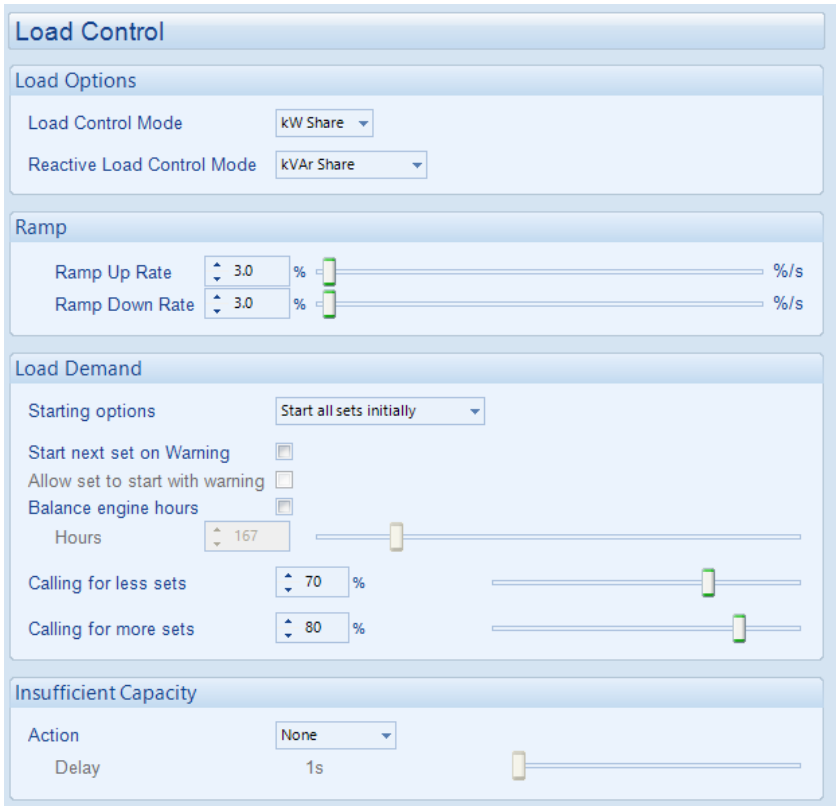
Parameter	Description
MSC Failure Action	Action upon MSC Link Failure: ***Electrical Trip**:* The breaker is opened immediately and the stopping sequence is initiated. ***Indication:*** The set continues to run and no alarm is raised. This is used for internal use, such as in the *PLC Logic* or *Virtual Leds*. ***Warning**:* The set continues to run and a warning alarm is activated.
MSC Alarms Disabled Action	Action to take when the MSC alarm is disabled by a digital input: ***None**:* Alarm is disabled. ***Indication:*** The set continues to run and no alarm is raised. This is used for internal use, such as in the *PLC Logic* or *Virtual Leds*. ***Warning**:* 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 MSC link is lower than the *Minimum Modules on MSC link* setting ***None**:* Alarm is disabled. ***Electrical Trip**:* The breaker is opened immediately and the stopping sequence is initiated. ***Indication:*** The set continues to run and no alarm is raised. This is used for internal use, such as in the *PLC Logic* or *Virtual Leds*. ***Warning**:* The set continues to run and a warning alarm is activated.
Minimum Modules On MSC Link	Set the minimum number of modules on the MSC before the *Too Few Modules* alarm is activated.
Enable Redundant MSC Link	**NOTE: When required, this option must be enabled on all DSE8000 MKII series controllers on the MSC Link.** ☐ = Only one set of Multi-Set Comms (MSC) Link is active. ☑ = This activates the second set of Multi-Set Comms (MSC) Link, allowing for communications redundancy between the contorllers.

2.7.7.4 LOAD CONTROL

Soft transfer	Description
	When either of the load sharing modes are selected (see below), the controller performs a 'soft' load transfer when taking up or shedding load. Upon activation of the load-switching device, the load sharing module controls the generating set to share the load over the bus. Load is then ramped up to either the set's share of the *load (Load Share* mode); or to the *Maximum Load Level* when running in *Mains Parallel Mode*. When a paralleled set is to go off the bus, first the load is ramped down to the minimum load level, and then the load switch is deactivated, removing the generator from the bus.

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

- When the generator is removed from the bus, other sets in the system are not suddenly loaded with the load that was being supplied by the generator being removed. Instead, the load is slowly ramped, allowing time for the remaining sets to take up their share of the load.
- Opening of the load switch occurs at a much lower load level, helping to reduce arcing of the contacts.



Parameters detailed overleaf...

LOAD OPTIONS

Item	Function
Load Control Mode IEEE 37.2 -90 Regulating device	**NOTE: The module automatically switches from *kW Share* mode to kW fixed export mode when an input configured for *Mains Parallel Mode* is active.** ***None:*** No load sharing takes place. ***kW Share:*** The load is shared between all the sets in the system.
Reactive load control mode IEEE 37.2 -90 Regulating device	**NOTE: Not available when Active (kW) load share mode is set to *None*.** **NOTE: The module automatically switches from *kVAr Share* mode to *VAr Fixed Export* mode when an input configured for *Mains Parallel Mode* is active.** ***None:*** No reactive power (VAr/pf) sharing takes place. ***kVAr Share:*** Reactive power (VAr) is shared between all the sets in the system. ***kVAr fixed export:*** The generator produces a fixed amount of reactive power (VAr) for use when in parallel with the mains supply.

RAMP

Item	Function
Ramp Up Rate	**NOTE: The set initially takes load at the level set by the *Minimum Load Level* and then increases its load share at this rate until either:** • **All the sets have an equal share of the load** • **The generated power is equal to the setting for *Load Parallel Power*** The rate at which the generator is ramped onto the load.
Ramp Down Rate	**NOTE: When the set is unloaded, it ramps down at this rate from the current load level to the level set by the *Minimum Load Level* before being removed from the bus.** The rate at which the generator is ramped off the load.

LOAD DEMAND

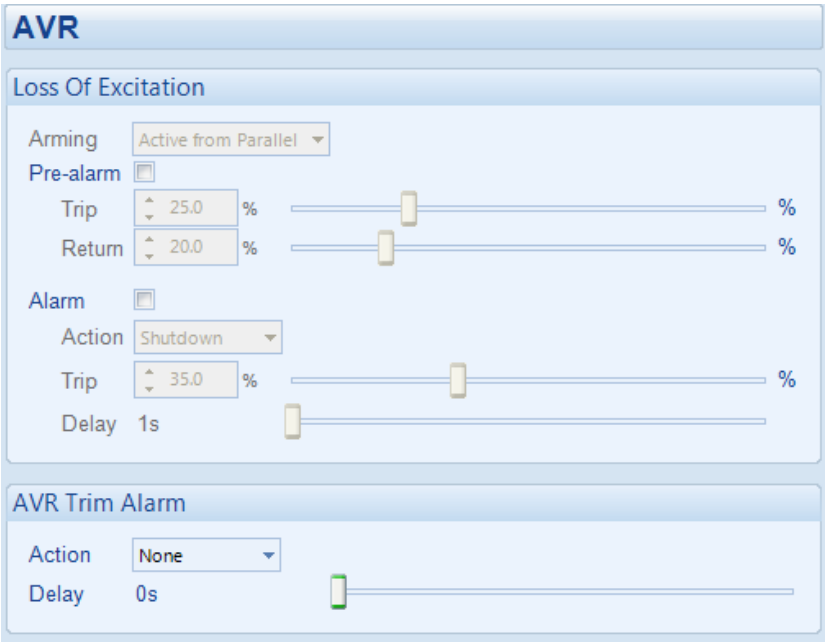
Item	Function
Starting Options	Used to configure how the load demand scheme operates upon start-up. ***Start all sets initially:*** Upon activation of the load demand scheme, all sets in the system start up and parallel onto the generator bus. Then they stop / start according to load demands. This option is particularly recommended in Multiset mains standby applications where the load is likely to be greater than the capacity of a single set. ***Start sets as load requires:*** 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.
Start Next Set on Warning	Whenever a warning occurs, a start command is issued over the MSC link to start the next highest priority set.
Allow Set to Start with Warning	☐ = If the MSC calls to start another set, generators which display a warning status alarm remain at rest, only generators with no warning alarm can be started according to their priority number. ☑ = Allows a stationary generator with a warning alarm to start if requested.
Balance Engine Hours	Used in a Multiset system so that the engine's priority changes according to the amount of usage of the set. For instance in a two set system. Set 1 has logged 100 running hours Set 2 has logged 20 running hours Balance engine hours are configured to 75 hours. 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. If all sets are within the configured Balance Engine Hours value, then the set Priority Number (See SCADA | Maintenance page) is followed.
Calling For Less Sets	**NOTE: The generator does not disconnect from the bus when its percentage of kW is below the *Calling For Less Sets* value. Instead, the generator disconnects from the bus when it can ensure that the remaining generators' kW percentage is at the *Calling For Less Sets* value. This prevents the system from reaching a point where the load is such that the generator starts and stops repeatedly.** **NOTE: The *Calling For Less/More* sets value is based on a load demand scheme whereby all Generators are of equal size. Care should be taken must be taken when using dissimilar size sets.** **NOTE: The module opens the generator breaker when it assumes the ramping down of kW has been completed.** The load level at which the DSE controller decides that generating set capacity can be reduced by dropping sets off the bus. Once the load is below this level, the lowest priority set in the sequence (determined using the *Genset Priority*) begins its *Return Delay* timer. Once this has expired, the generator ramps off the load and stops. If the load level rises above this set point during the *Return Delay* 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.

Item	Function
Calling For More Sets	**NOTE: The *Calling For Less/More* sets value is based on a load demand scheme whereby all Generators are of equal size. Care should be taken must be taken when using dissimilar size sets.** The load level at which the DSE controller decides that the generating set capacity should increased by increasing the sets on the bus. Once the load is above this level, the lowest priority set in the sequence (determined using the *Genset Priority*) begins its *Start Delay* timer. Once this has expired, the generator ramps up and joins the bus. If the load level reduces below this set point during the *Start Delay* timer, the timer is cancelled and the generator enters its stops cycle. This caters for short term kW load demand. If the set fails to become available, it communicates this using the MSC Link which signals the next generating set in the sequence to take its place.

INSUFFICIENT CAPACITY

Item	Function
Action	Activates when the internal governor output reaches maximum to indicate that the set does not have enough capacity to perform as configured. ***Warning:*** Alarm only, No shutdown ***Shutdown:*** Alarm and shutdown ***Electrical Trip:*** Alarm/off-load generator followed by shutdown after cooling
Delay	Set the activation delay timer

2.7.7.5 AVR



Item	Function
Loss Of Excitation IEEE 37.2 -90 Regulating device	**NOTE: The kvar trip level is taken as a percentage of the full load kVA rating. Graphs are obtained from the alternator suppliers to assist in these settings.** ***Pre-Alarm*** ☐ = Loss of excitation does NOT give a pre-alarm warning ☑ = Loss of excitation gives a pre-alarm warning in the event of negative VAr rising above the configured *Loss Of Excitation Trip* level The *Loss Of Excitation Trip* level is adjusted to suit user requirements. Negative VAr must return to below the 'Loss of excitation *return*' setting before the DSE module considers the negative VAr level is back within limits. ***Shutdown*** ☐ = Loss of excitation does NOT give a Shutdown alarm ☑ = Loss of excitation gives a shutdown alarm in the event of negative VAr rising above the configured *Loss Of Excitation Trip* level. The *Loss Of Excitation Trip* level is adjusted to suit user requirements.
AVR Maximum Trim Limit Alarm	When configured, provides an alarm to indicate that the analogue AVR output is being driven to its maximum level longer than the configured *Delay* time. Alarm actions available are: ***Electrical Trip*** ***Indication*** ***None*** ***Shutdown*** ***Warning***

2.7.7.6 POWER CONTROL

NOTE: The *Power Control* modes and *Voltage and Reactive Power Control* modes are to be used in conjunction with the following documents:
- 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

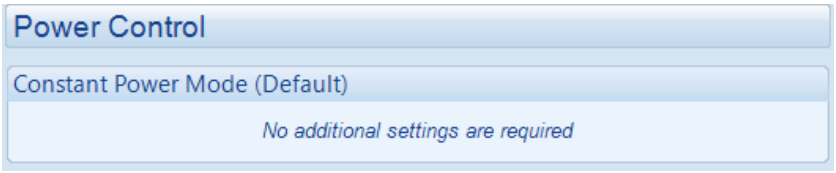
NOTE: The *Power Control* parameters only have effect when a digital input is configured for *Mains Parallel Mode* instructing the module to operate in fixed export mode with the utility supply. For more information on this application, refer to DSE Publication: *056-054 DSE7510 in Fixed Export* which is found on our website: *www.deepseaplc.com*

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.

When changing between *Power Control* modes or changing the set point, the *Ramp Rate* defines how fast the output power changes in percentage points per second.

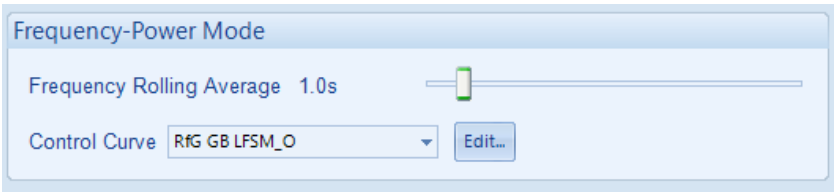
CONSTANT POWER MODE (DEFAULT)



This is the default mode of exporting power to the mains (utility); where the DSE load share controller holds the amount of power produced at a constant level. The amount of power produced by the generator 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

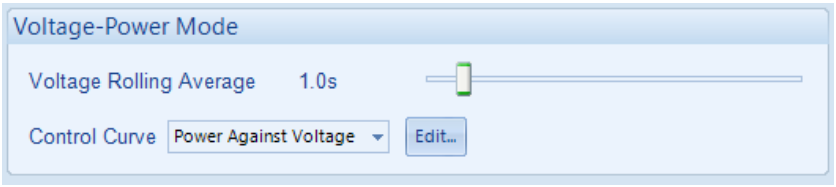
In this mode of exporting power to the mains (utility); the DSE load share controller varies the amount of power produced with regards to the Control Curve depending on the measured frequency.
This mode allows the generator to support the mains (utility) frequency stability by monitoring the frequency and changing the amount of power produced.



Item	Function
Frequency Rolling Average	The measured frequency is averaged over the period of the *Frequency Rolling Average.* The average frequency is used in the *Control Curve* to determine the required level of power production.
Control Curve	The *Control Curve* determines, based on the average frequency, the amount of power the generator produces. This amount of power is a percentage of the *kW Maximum Load Level.*
Edit	Allows creating a control curve for power against frequency, or editing existing curves. The configuration is pre-loaded with default curves that are available to select or edit: ***RfG GB LFSM_O:*** Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Overfrequency ***RfG GB LFSM_U:*** Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Underfrequency ***RfG GB LFSM_U and LFSM_O:*** Requirements for Generators Network Code in Great Britain, Limited Frequency Sensitive Mode Underfrequency and Overfrequency ***RfG GB FSM 5%:*** Requirements for Generators Network Code in Great Britain, Frequency Sensitive Mode at 50% ***P1547 60Hz 50%:*** Requirements for Generators in United States, Frequency Sensitive Mode at 50% ***P1547 60Hz 75%:*** Requirements for Generators in United States, Frequency Sensitive Mode at 75% ***P1547 60Hz 90%:*** Requirements for Generators in United States, Frequency Sensitive Mode at 90%

VOLTAGE-POWER MODE

In this mode of exporting power to the mains (utility); the DSE load share controller varies the amount of power produced with regards to the Control Curve depending on the measured voltage.
This mode allows the generator to support the mains (utility) voltage stability by monitoring the voltage and changing the amount of power produced.



Item	Function
Voltage Rolling Average	The measured voltage is averaged over the period of the *Voltage Rolling Average.* The average voltage is used in the *Control Curve* to determine the required level of power production.
Control Curve	The *Control Curve* determines, based on the average voltage, the amount of power the generator produces. This amount of power is a percentage of the *kW Maximum Load Level.*
Edit	Allows creating a control curve for power against voltage, or editing existing curves. The configuration is pre-loaded with a default curve available to select or edit: ***Power Against Voltage***

2.7.7.7 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:
- 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

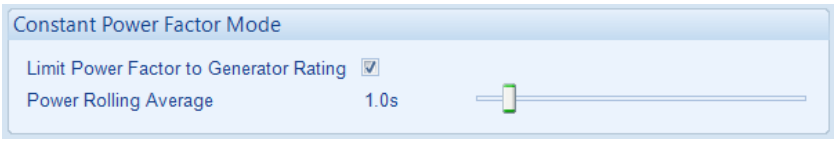
NOTE: The *Voltage and Reactive Power Control* parameters only have effect when a digital input is configured for *Mains Parallel Mode* instructing the module to operate in fixed export mode with the utility supply. For more information on this application, refer to DSE Publication: *056-054 DSE7510 in Fixed Export* which is found on our website: *www.deepseaplc.com*

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.

When changing between *Voltage and Reactive Power Control* modes or changing the set point, the *Ramp Rate* defines how fast the output reactive power changes in percentage points per second.

CONSTANT POWER FACTOR MODE

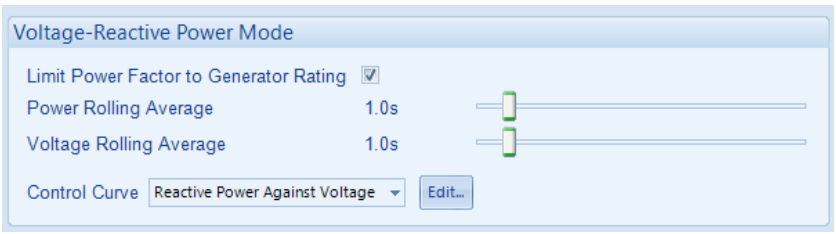


In this mode of exporting power to the mains (utility); the DSE load share controller varies the amount of reactive power produced with regards to maintaining the required power factor.
This mode allows the generator to maintain a constant export power factor if so required.
The required power factor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

Item	Function
Limit Power Factor to Generator Rating	☐ = The generator produces power beyond it's specified power factor rating configured within the *Generator Rating* section. This may lead to the generator producing excessive positive or negative kvar. ☑ = The generator produces power within its specified power factor rating configured within the *Generator Rating* section
Power Rolling Average	The exported power is averaged over the period of the *Power Rolling Average.* The average power is then used to determine the required reactive power production to achieve the set power factor.

VOLTAGE-REACTIVE POWER MODE

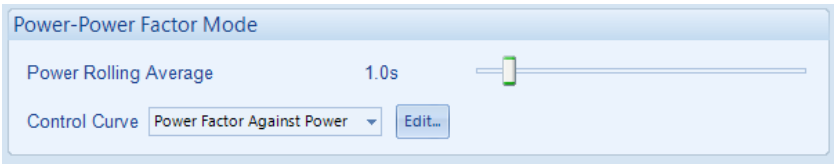
In this mode of exporting power to the mains (utility); the DSE load share controller varies the amount of reactive power produced with regards to the Control Curve depending on the measured voltage.
This mode allows the generator(s) to support the mains (utility) voltage stability by monitoring the voltage and changing the amount of reactive power produced.



Item	Function
Limit Power Factor to Generator Rating	☐ = The generator produces power beyond it's specified power factor rating configured within the *Generator Rating* section. This may lead to the generator producing excessive positive or negative kvar. ☑ = The generator produces power within its specified power factor rating configured within the *Generator Rating* section
Power Rolling Average	The exported power is averaged over the period of the *Power Rolling Average.* The average power is used to calculate the power factor if the option *Limit Power Factor To Generator Rating* is enabled.
Voltage Rolling Average	The measured voltage is averaged over the period of the *Voltage Rolling Average.* The average voltage is used in the *Control Curve* to determine the required level of reactive power production.
Control Curve	The *Control Curve* determines, based on the average voltage, the amount of reactive power the generator produces. This amount of power is a percentage of the *kVAr Maximum Load Level.*
Edit	Allows creating a control curve for reactive power against voltage, or editing existing curves. The configuration is pre-loaded with default curve available to select or edit: ***Reactive Power Against Voltage***

POWER-POWER FACTOR MODE

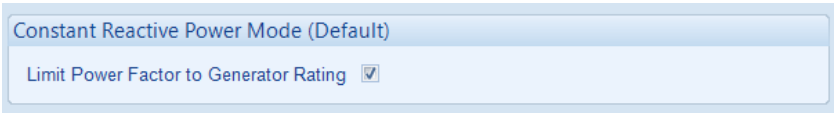
In this mode of exporting power to the mains (utility); the DSE load share controller varies the amount of reactive power produced with regards to maintaining the required power factor. This power factor is derived from the averaged power using the *Control Curve.*
This mode allows the generator to support the mains (utility) stability by varying the power factor depending on the export power.



Item	Function
Power Rolling Average	The exported power is averaged over the period of the *Power Rolling Average.* The average is then used in the *Control Curve* to determine the required power factor.
Control Curve	The *Control Curve* determines, based on the average power, the power factor that is required.
Edit	Allows creating a control curve for power factor against power, or editing existing curves. The configuration is pre-loaded with a default curve available to select or edit: ***Power Factor Against Power***

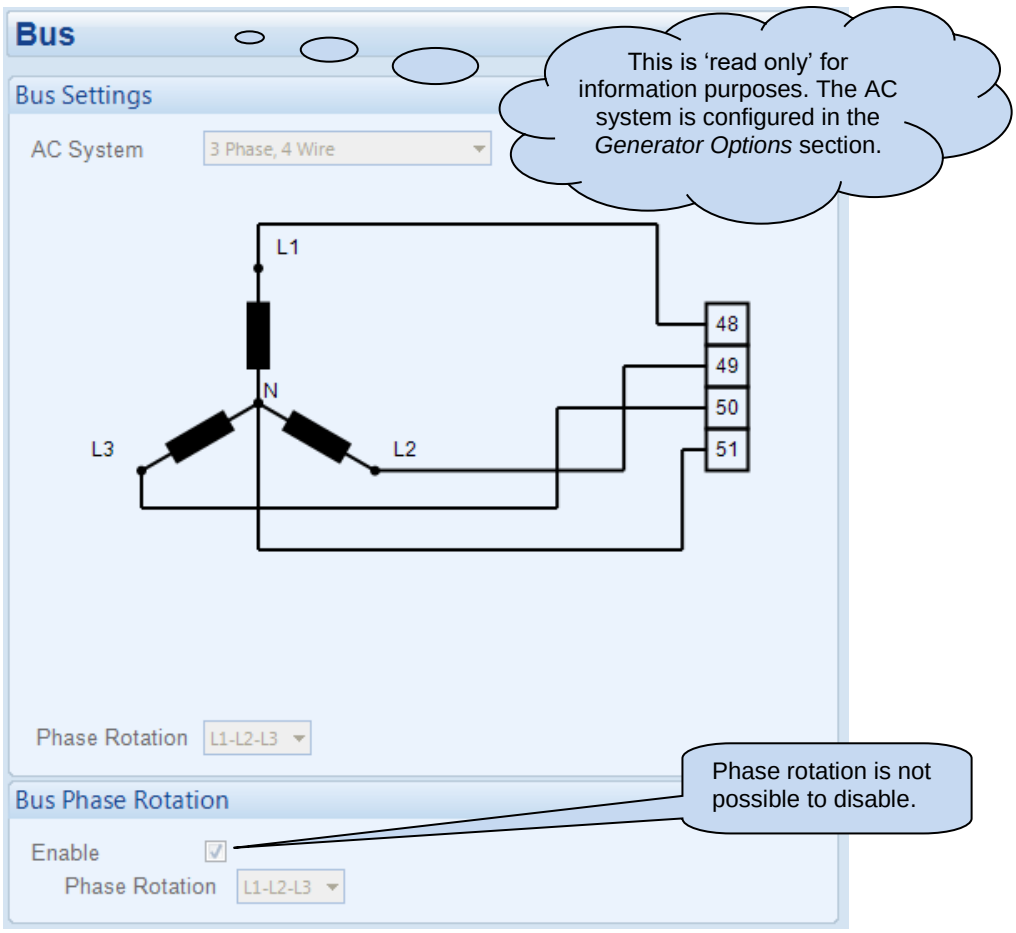
CONSTANT REACTIVE POWER MODE (DEFAULT)

This is the default mode of exporting power to the mains (utility); where the DSE load share controller holds the amount of reactive power produced at a constant level. The amount of reactive power produced by the generator 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.



Item	Function
Limit Power Factor to Generator Rating	☐ = The generator produces power beyond it's specified power factor rating configured within the *Generator Rating* section. This may lead to the generator producing excessive positive or negative kvar. ☑ = The generator produces power within its specified power factor rating configured within the *Generator Rating* section

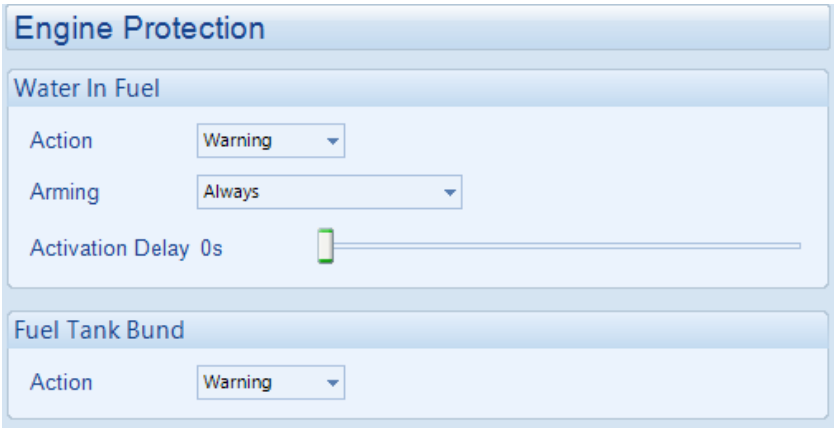
2.7.8 BUS


Bus
This is 'read only' for information purposes. The AC system is configured in the *Generator Options* section.
Bus Settings
AC System
3 Phase, 4 Wire
L1
N
L3
L2
48
49
50
51
Phase Rotation
L1-L2-L3
Phase rotation is not possible to disable.
Bus Phase Rotation
Enable
Phase Rotation
L1-L2-L3

2.8 ENGINE

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

2.8.1 ENGINE PROTECTION



2.8.1.1 WATER IN FUEL

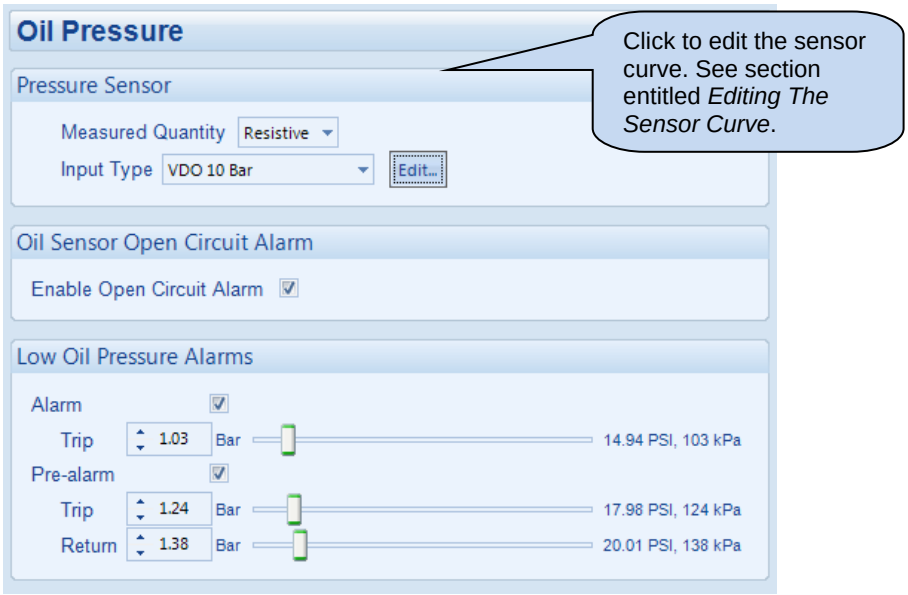
Parameter	Description
Action	The alarm goes active when a *Water in Fuel* alarm is received over a CAN message when the DSE module is connected to an ECU, or if a digital input configured for *Water in Fuel* becomes active. Select the action for the alarm: ***None*** ***Electrical Trip*** ***Shutdown*** ***Warning***
Arming	Select when the alarm is active. Options are as follows: ***Active From Breaker Closed:*** Active only when the breaker is closed ***Active From Parallel:*** Active only when running in parallel ***Always:*** The alarm is active at anytime the CANbus Link is lost ***From Loading:*** Active only after the set is on load ***From Safety On:*** Active only after the *Safety On* delay timer ***From Starting:*** Active only after the *Crank Relay* is energised ***Never****:* Alarm is disabled ***When Stationary:*** Active only when the engine is not running
Activation Delay	The amount of time before the module activates the *CAN ECU (ECM) Data Fail* after a failure.

2.8.1.2 FUEL TANK BUND

Parameter	Description
Action	The alarm goes active when a digital input configured for *Fuel Tank Bund* becomes active. Select the action for the alarm: ***Electrical Trip*** ***Shutdown*** ***Warning***

2.8.2 OIL PRESSURE

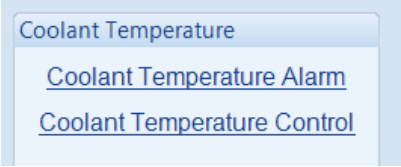
If a CAN Engine File is selected – Most engines give oil pressure over CANbus link. In these cases, Analogue Input A is configured as Flexible Analogue or Digital Input. Configuration of Flexible Analogue Inputs and Digital Inputs is detailed elsewhere in this document.
Where the CANbus engine does not support oil pressure over the CANbus link, Analogue input A is selectable as either digital input, analogue flexible input, or as analogue oil pressure sensor.



Parameter	Description
Measured Quantity	Select the sensor signal: ***Current:*** for sensors with maximum range of 0 mA to 20 mA ***Resistive:*** for sensors with maximum range of 0 Ω to 480 Ω ***Voltage:*** for sensors with maximum range of 0 V to 10 V
Input Type	Select the sensor curve from a pre-defined list or create a user-defined curve.
Enable Open Circuit Alarm	☐ = Alarm is disabled. ☑ = The *Low Oil Pressure Open Circuit Alarm* is active when the module detects an open circuit when the sender is disconnected
Low Oil Pressure Alarm	☐ = Alarm is disabled. ☑ = The *Low Oil Pressure Shutdown Alarm* is active when the measured oil pressure drops below the configured *Trip* level.
Low Oil Pressure Pre-Alarm	☐ = Alarm is disabled. ☑ = The *Low Oil Pressure Warning Alarm* is active when the measured oil pressure drops below the configured *Trip* level. The warning is automatically reset when the oil pressure increases above the configured *Return* level.

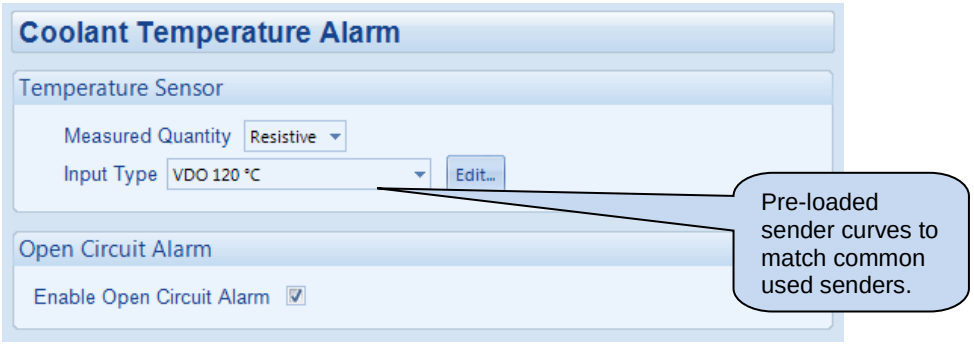
2.8.3 COOLANT TEMPERATURE

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

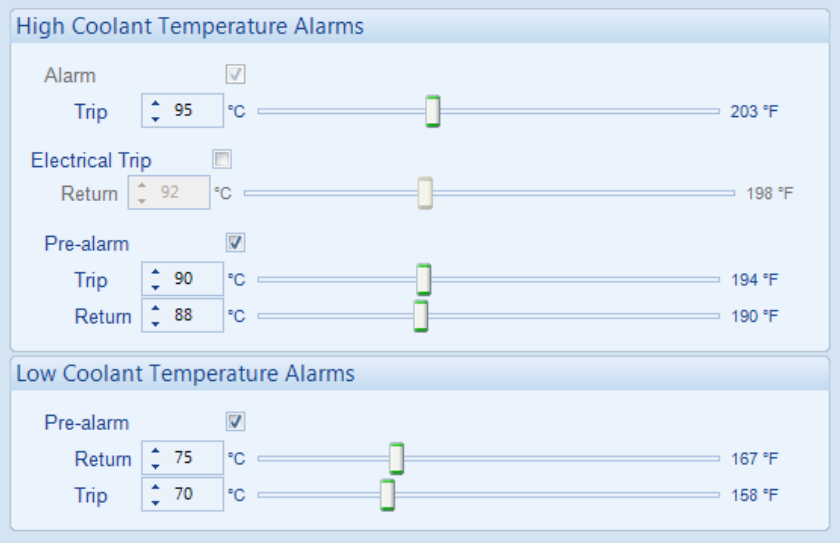


2.8.4 COOLANT TEMPERATURE ALARM

If a CAN Engine File is selected – Engines give temperature measurements from the CANs link. Analogue Input B is configured as Digital Input. Configuration is the same as for Digital Inputs, detailed elsewhere in this document.

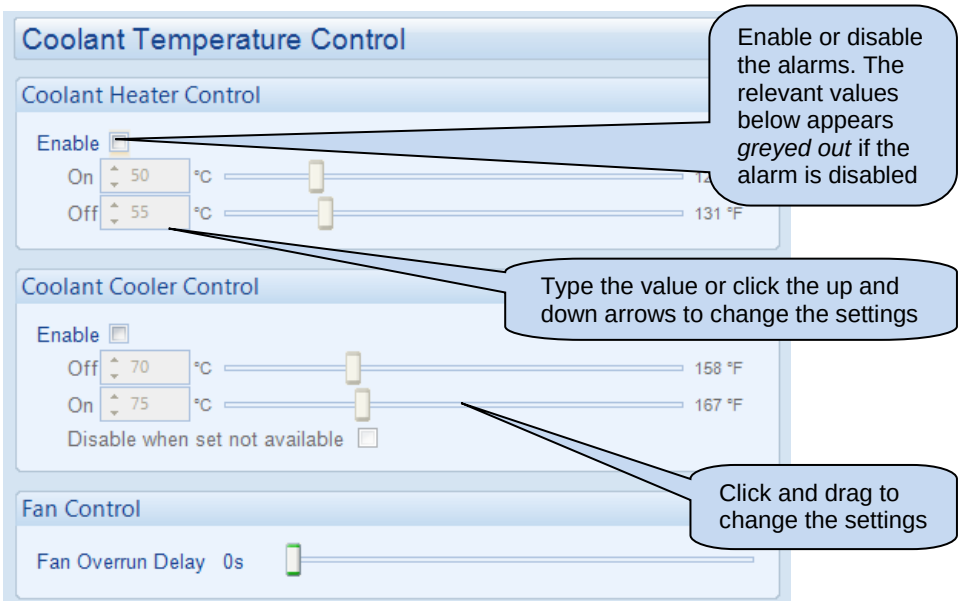


Parameter	Description
Measured Quantity	Select the sensor signal: ***Current:*** for sensors with maximum range of 0 mA to 20 mA ***Resistive:*** for sensors with maximum range of 0 Ω to 480 Ω ***Voltage:*** for sensors with maximum range of 0 V to 10 V
Input Type	Select the sender curve from a pre-defined list or create a user-defined curve.
Enable Open Circuit Alarm	☐ = Alarm is disabled. ☑ = The *Coolant Temperature Open Circuit* Alarm is active when the module detects an open circuit when the sensor is disconnected



Parameter	Description
High Coolant Temperature Pre-Alarm	☐ = Alarm is disabled. ☑ = The *High Coolant Temperature Warning Alarm* is active when the measured coolant temperature rises above the configured *Trip* level. The *Warning* is automatically reset when the coolant temperature falls below the configured *Return* level.
Electrical Trip	☐ = Alarm is disabled. ☑ = The *High Coolant Temperature Controlled Shutdown Alarm* is active when the measured coolant temperature rises above the configured *Trip* level.
High Coolant Temperature Alarm	The *High Coolant Temperature Shutdown Alarm* is active when the measured coolant temperature rises above the configured *Trip* level.
Low Coolant Temperature Pre-Alarm	☐ = Alarm is disabled. ☑ = The *Low Coolant Temperature Warning Alarm* is active when the measured coolant temperature falls below the configured *Trip* level. The *Warning* is automatically reset when the coolant temperature rises above the configured *Return* level.

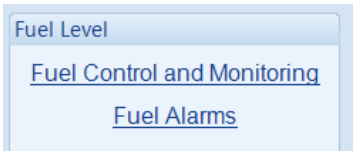
2.8.5 COOLANT TEMPERATURE CONTROL



Parameter	Description
Coolant Heater Control	☐ = Coolant Heater Control function is disabled ☑ = The digital output configured to *Coolant Heater Control* is energised when the engine coolant temperature falls below the configured *On* level. This is designed to control an external engine heater. When the coolant temperature rises above the configured *Off* level, the digital output is de-energised.
Coolant Cooler Control	☐ = Coolant Cooler Control function is disabled ☑ = The digital output configured to *Coolant Cooler Control* is energised when the engine coolant temperature exceeds the configured *On* level. This is designed to control an external engine cooling system, for instance an additional cooling fan. When the coolant temperature falls below the configured *Off* level, the digital output is then de-energised.
Fan Control	An output configured to *Fan Control* energises when the engine becomes available (up to speed). This output is designed to control an external cooling fan. When the engine stops, the cooling fan remains running for the duration of the *Fan Overrun Delay.*

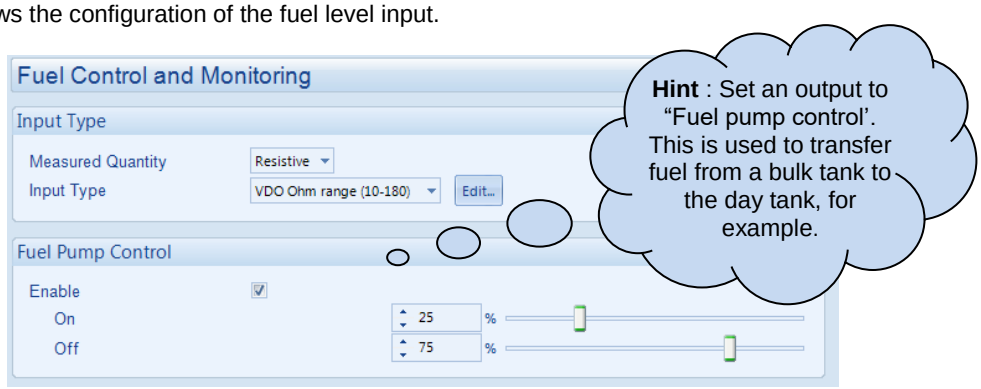
2.8.6 FUEL LEVEL

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

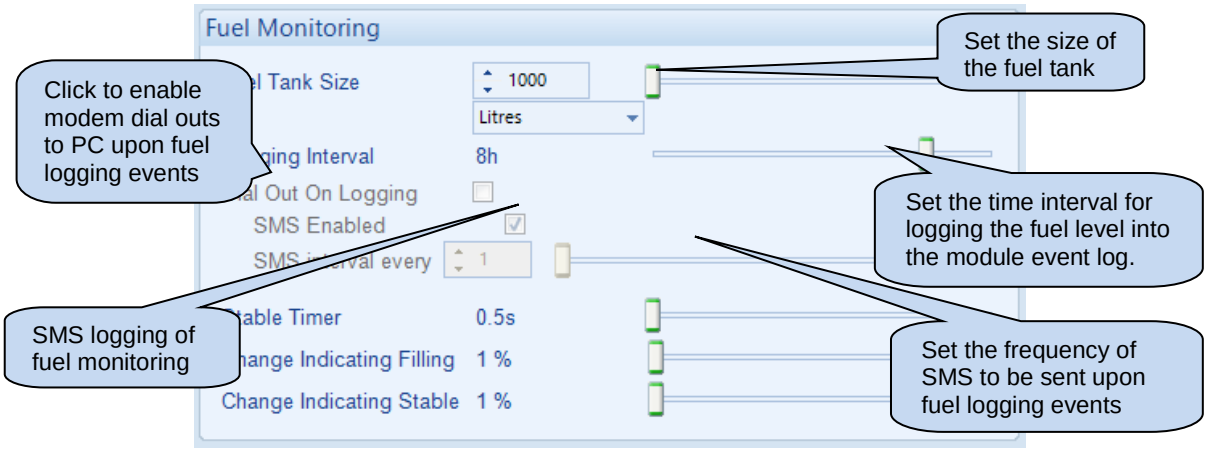


2.8.6.1 FUEL CONTROL AND MONITORING

This section allows the configuration of the fuel level input.



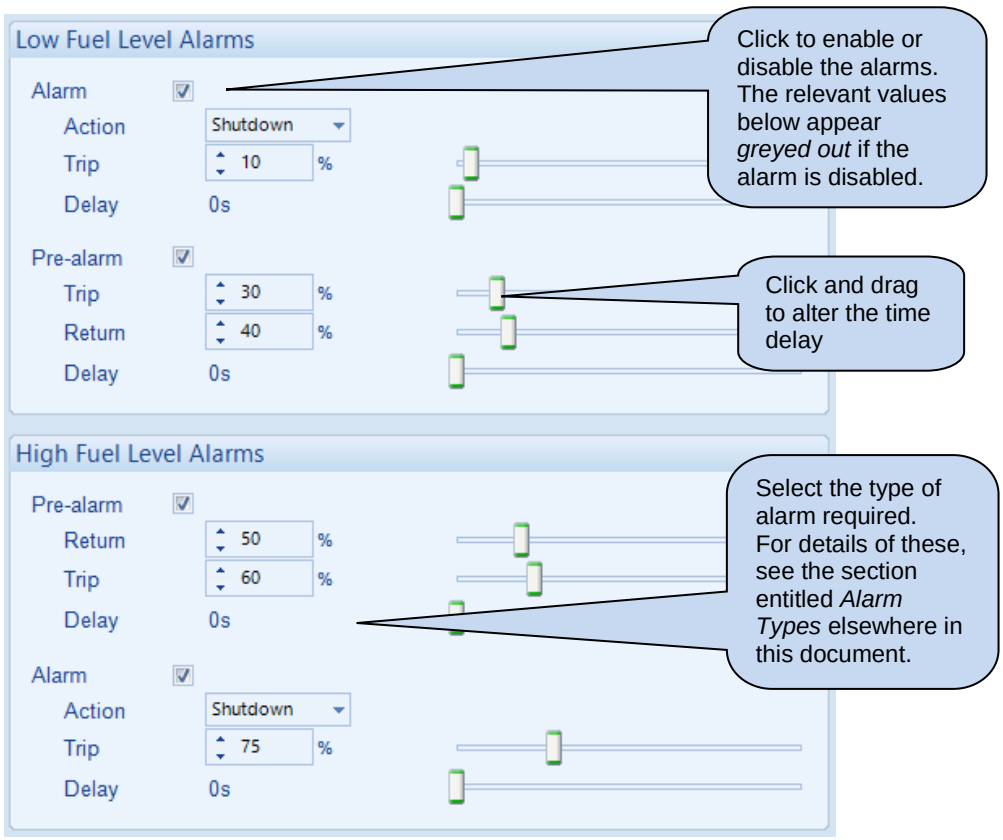
Parameter	Description
Measured Quantity	Select the sensor signal: ***Current:*** for sensors with maximum range of 0 mA to 20 mA ***Resistive:*** for sensors with maximum range of 0 Ω to 480 Ω ***Voltage:*** for sensors with maximum range of 0 V to 10 V
Input Type	Select the sender curve from a pre-defined list or create a user-defined curve.
Low Fuel Level Alarm	☐ = Alarm is disabled. ☑ = The *Low Fuel Level Alarm* is active when the measured fuel level drops below the *Trip* setting for the configured *Delay* time.
Fuel Pump Control	☐ = Fuel Pump Control is disabled. ☑ = Allows the module to control an external fuel pump to transfer fuel from a bulk tank to the day tank. A digital output configured for *Fuel Pump Control* energises when the fuel level falls below the configured *On* setting and de-energises when the fuel level exceeds the configured *Off* setting.



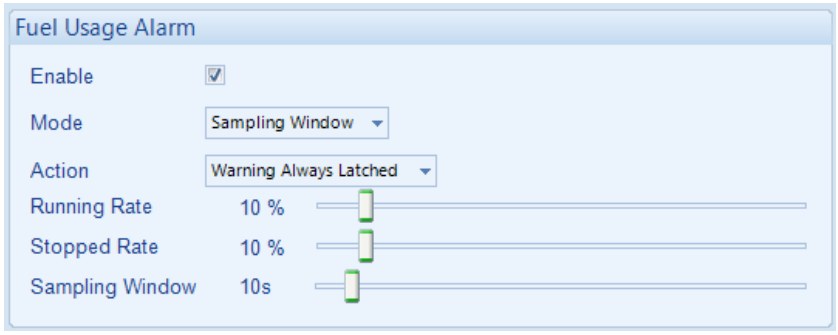
Parameter	Description
Stable Timer	The controller maintains a rolling record of the fuel level percentage for the duration of the *Stable Timer*. When the rolling record of the fuel level percentage indicates that the fuel level has increased more than the *Change Indicating Filling* during the *Stable Timer*, the controller records a *Fuel Filling Start* event in its event log. When the rolling record of the fuel level indicates that the fuel level has not changed more than the *Change Indicating Stable* during the *Stable Timer*, the controller records a *Fuel Filling Stop* event in its event log.
Change Indicating Filling	When the fuel level increases at a rate higher than $\frac{\textit{Change Indicating Filling}}{\textit{Stable Timer}}$ then a fuel fill start event is recorded into the event log. Depending on configuration this generates a dial out or SMS message. **Example:** *Stable Timer* = 1 minute *Change Indicating Filling* = 3 % When the fuel level increases by more than 3% in 1 minute, a fuel fill event is recorded.
Change Indicating Stable	During filling, if the fuel level increases at a rate less than $\frac{\textit{Change Indicating Stable}}{\textit{Stable Timer}}$ then a fuel fill end event is recorded into the event log. Depending on configuration this generates a dial out or SMS message. **Example:** *Stable Timer* = 1 minute *Change Indicating Stable* = 2 % When the fuel level increases by less than 2% in 1 minute, a fuel fill end event is recorded.
Estimate Run Time to Empty	☐ = Normal operation ☑ = This feature estimates the time remaining to empty the fuel tank. The estimated time is shown on the Engine's Fuel page of the controller display.
Fuel Tank Run Time	The amount of time required to empty the fuel tank during the generator's operation.
Fuel Tank Run Time Load Level Percentage	It is the load percentage of the generator's total capacity to empty the fuel tank at the *Fuel Tank Run Time*.

2.8.6.2 FUEL ALARMS

FUEL LEVEL ALARMS

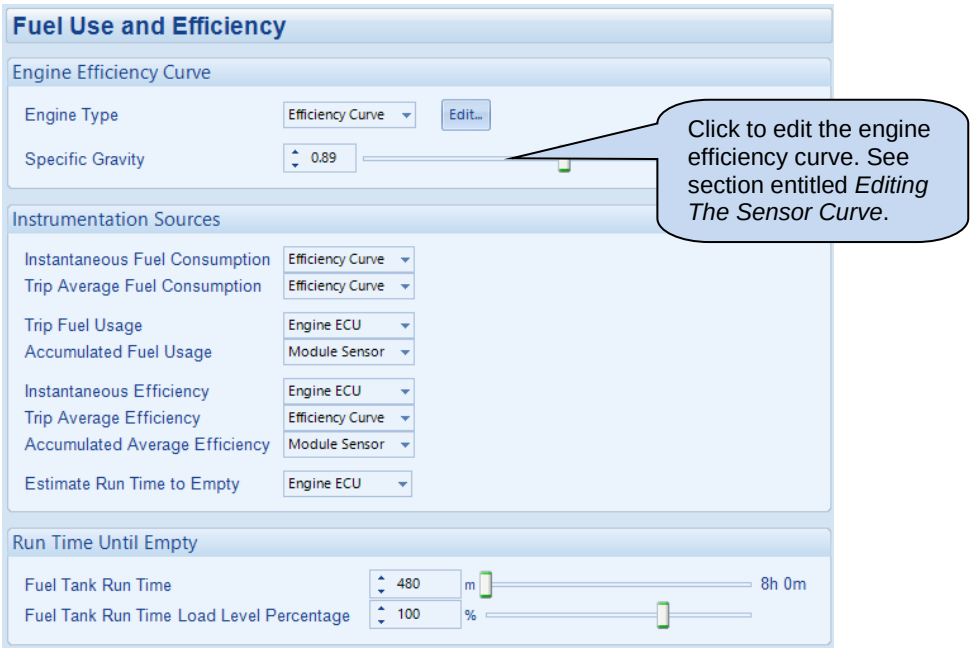


FUEL USAGE ALARMS



Parameter	Description
Mode	**Standard Mode:** The fuel usage alarm activates when the fuel level decreases at a higher rate per hour than the configured *Running Rate* while the engine is running, or *Stopped Rate* while the engine is stopped. **Sampling Window:** The fuel usage alarm activates when the fuel level decreases at a higher rate per *Sampling Window* than the configured *Running Rate* while the engine is running, or *Stopped Rate* while the engine is stopped.

2.8.7 FUEL USE AND EFFICIENCY



2.8.7.1 ENGINE EFFICIENCY CURVE

Parameter	Description
Engine Type	Select the engine type from a pre-defined list or create a user-defined curve.
Specific Gravity	The relative fuel density of the fuel (usually given as kg/m^3) being consumed by the generator.

2.8.7.2 INSTRUMENTATION SOURCES

Parameter	Description
Instantaneous Fuel Consumption	**Not Used:** *Instantaneous Fuel Consumption* is not displayed **Efficiency Curve:** The DSE module calculates the *Instantaneous Fuel Consumption* as Litre/hour from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Instantaneous Fuel Consumption* as Litre/hour from the engine ECU.
Trip Average Fuel Consumption	**Not Used:** *Trip Average Fuel Consumption* is not displayed **Efficiency Curve:** The DSE module calculates the *Trip Average Fuel Consumption* as litre/hour over the current or last run from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Trip Average Fuel Consumption* as litre/hour over the current or last run from the engine ECU. **Module Sensor:** The DSE module calculates the *Trip Average Fuel Consumption* as litre/hour over the current or last run from the change in fuel tank level using the *Fuel Tank Size*.
Trip Fuel Usage	**Not Used:** *Trip Fuel Usage* is not displayed **Efficiency Curve:** The DSE module calculates the *Trip Fuel Usage* as litres over the current or last run from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Trip Fuel Usage* as litres over the current or last run from the engine ECU. **Module Sensor:** The DSE module calculates the *Trip Fuel Usage* as litres over the current or last run from the change in fuel tank level using the *Fuel Tank Size*.
Accumulated Fuel Usage	**Not Used:** Accu*mulated Fuel Usage* is not displayed **Efficiency Curve:** The DSE module calculates the *Accumulated Fuel Usage* as litres over the entire run time from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Accumulated Fuel Usage* as litres over the entire run time from the engine ECU. **Module Sensor:** The DSE module calculates the *Accumulated Fuel Usage* as litres over the entire run time from the change in fuel tank level using the *Fuel Tank Size*.
Instantaneous Efficiency	**Not Used:** *Instantaneous Efficiency* is not displayed **Efficiency Curve:** The DSE module calculates the *Instantaneous Efficiency* as kWh/litre from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Instantaneous Fuel Consumption* as Litre/hour from the engine ECU and calculates the *Instantaneous Efficiency* as kWh/litre using the *Generator Total kW Percentage*.
Trip Average Efficiency	**Not Used:** *Trip Average Efficiency* is not displayed **Efficiency Curve:** The DSE module calculates the *Trip Average Efficiency* as kWh/litre over the current or last run from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Trip Average Fuel Consumption* as Litre/hour from the engine ECU over the current or last run and calculates the *Trip Average Efficiency* as kWh/litre using the *Generator Total kW Percentage*. **Module Sensor:** The DSE module calculates the *Trip Average Efficiency* as kWh/litre over the current or last run from the change in fuel tank level using the *Fuel Tank Size* and *Generator Total kW Percentage*.
Accumulated Average Efficiency	**Not Used:** *Accumulated Average Efficiency* is not displayed **Efficiency Curve:** The DSE module calculates the *Accumulated Average Efficiency* as kWh/litre over the entire run time from *Generator Total kW Percentage* using the *Efficiency Curve* and *Specific Gravity.* **Engine ECU:** The DSE module reads the *Accumulated Fuel Usage* as litres over the entire run time from the engine ECU and calculates *the Accumulated Average Efficiency* as kWh/litre using the *Generator Total kW Percentage*. **Module Sensor:** The DSE module calculates the *Accumulated Average Efficiency* as kWh/litre over the entire run time from the change in fuel tank level using the *Fuel Tank Size* and *Generator Total kW Percentage*.
Estimate Run Time to Empty	**Not Used:** *Estimate Run Time to Empty* is not displayed **Engine ECU:** The DSE module reads the *Instantaneous Fuel Consumption* as Litre/hour from the engine ECU and *Estimates Run Time to Empty* using the *Fuel Tank Size*. **Module Sensor:** The DSE module *Estimates Run Time to Empty* using the *Run Time Until Empty* parameters.

2.8.7.3 RUN TIME UNTIL EMPTY

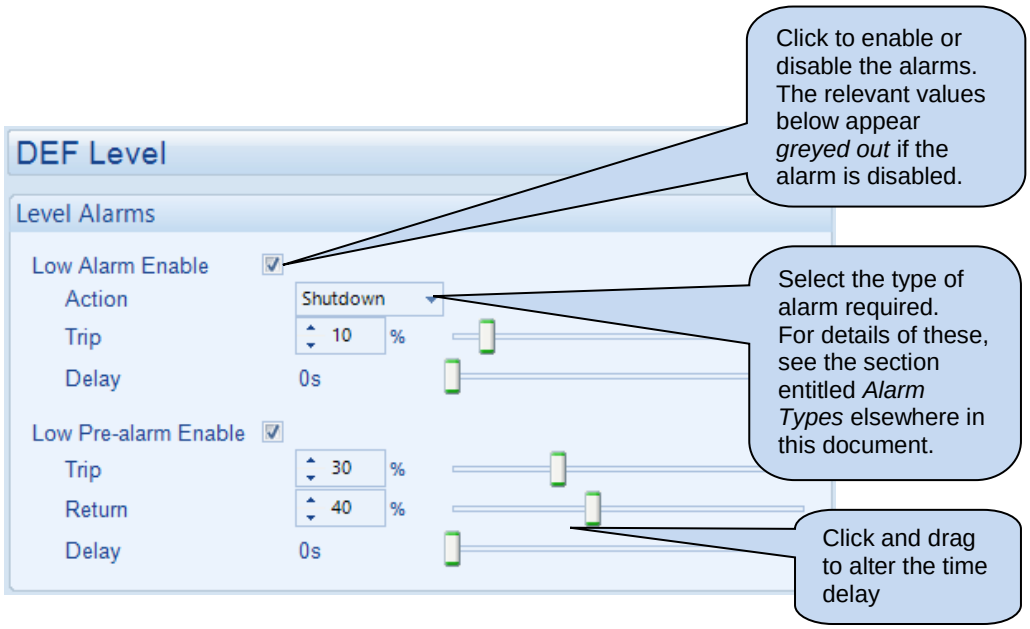
Parameter	Description
Fuel Tank Run Time	The time in minutes how long the generator's fuel tank last when running at the *Fuel Tank Run Time Load Level Percentage*
Fuel Tank Run Time Load Level Percentage	The percentage of full load kW the generator which is used to calculate how long the fuel in the tank lasts.

2.8.8 DEF LEVEL

NOTE: Configuration of alarms in this section only has effect when the ECU (ECM) supports DEF Level.

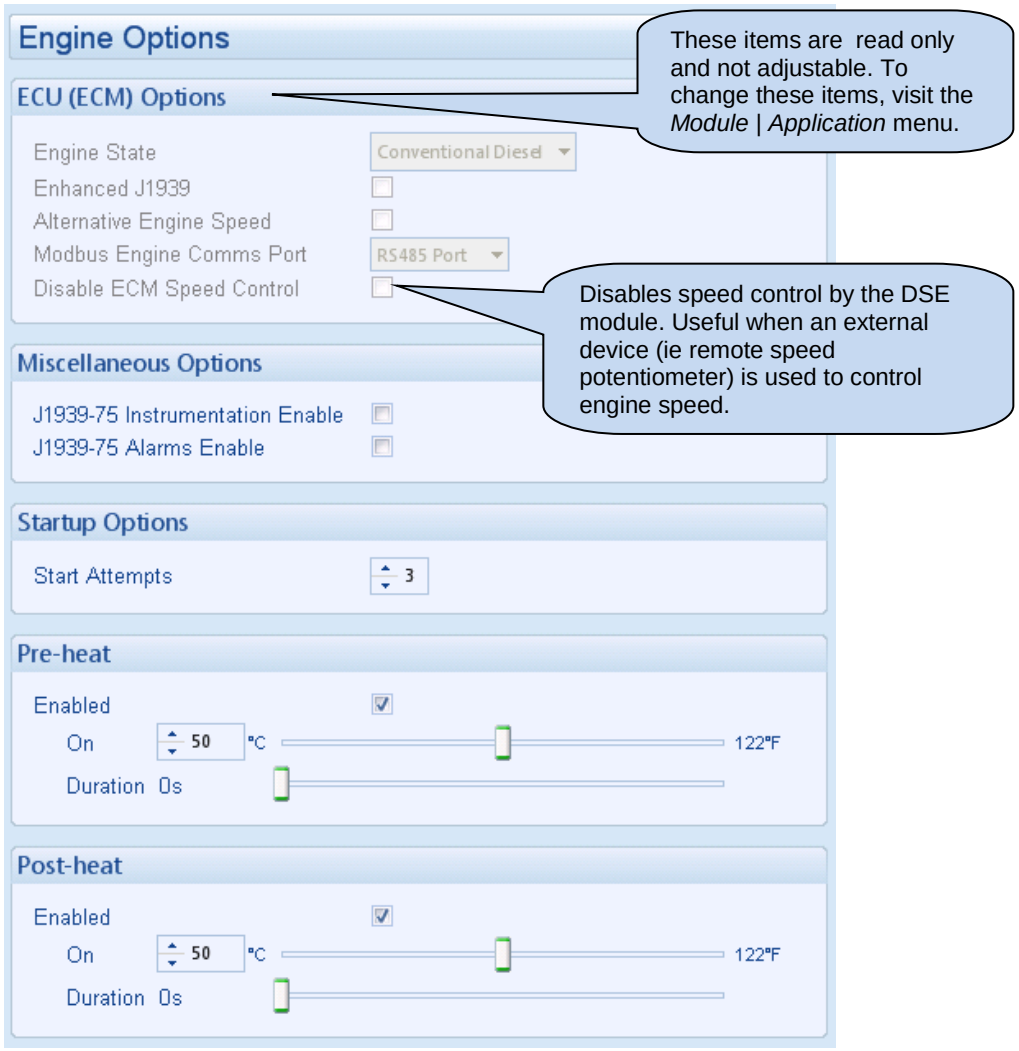
NOTE: Configuration of the *Alarm Action* in this section defines the DSE module response to the CANbus message; however, the ECU (ECM) still shuts down the engine depending on the alarm severity.

DEF Level is a CANbus message from the ECU (ECM). The following parameters allow configuration of how the DSE module responds to the DEF Level.



Parameter	Description
DEF Level Low Alarm	☐ = Disable the alarm ☑ = *DEF Low Alarm* will be activated when the *DEF Level* sent from the ECU is below the configured *Trip* level for longer than the configured *Delay* time.
Action	Select the type of alarm required from the list: ***Shutdown*** ***Electrical Trip*** For details of these, see the section entitled *Alarm Types* elsewhere in this document.
DEF Level Low Pre-Alarm	☐ = The Pre-alarm is disabled. ☑ = *DEF Low Pre-Alarm* will be activated when the *DEF Level* sent from the ECU is below the configured *Trip* level for longer than the configured *Delay* time. The Pre-Alarm is deactivated when the *DEF Level* rises above the *Return* level.

2.8.9 ENGINE OPTIONS



2.8.9.1 MISCELLANEOUS OPTIONS

NOTE: For a full list of the J1939-75 alarms and instrumentation, refer to DSE Publication: *057-254 DSE8610 MKII Operator Manual* which is found on our website: *www.deepseaplc.com*

Parameter	Description
J1939-75 Instrumentation Enable	Allows the DSE module to be interrogated by another CAN device and transfer the generator set instrumentation over J1939 link.
J1939-75 Alarms Enable	Allows the DSE module to be interrogated by another CAN device and transfer the alarms over J1939 link.

2.8.9.2 STARTUP OPTIONS

Parameter	Description
Start Attempts	The number of starting attempts the module makes. If the module does not detect that the engine has fired before the end of the *Cranking Time*, then the current start attempt is cancelled and the *Crank Rest* time takes place before the next crank attempt begins. If, after all configured *start attempts,* the engine is not detected as running, the *Fail to Start* shutdown alarm is generated. The engine is detected as running by checking all methods of *Crank Disconnect.* For further details, see the section entitled *Crank Disconnect* elsewhere in this document.

2.8.9.3 PRE-HEAT

NOTE: For this feature to have effect, configure a digital output for *Pre-Heat.*

NOTE: Depending on *Engine Type* configuration, this is controlled direct by the ECU (ECM).

Parameter	Description
Enabled	☐ = Pre-heat is disabled. ☑ = When the *Coolant Temperature* is below the configured *On* level, the *Pre-Heat* digital output is activated for the set *Duration* of time before cranking.
On	Set the coolant temperature below which the pre-heat is activated.
Duration	Set the time delay during which the *Pre-Heat* digital output remains active before cranking

2.8.9.4 POST-HEAT

NOTE: For this feature to have effect, configure a digital output for *Pre-Heat.*

NOTE: Depending on *Engine Type* configuration, this is controlled direct by the ECU (ECM).

Parameter	Description
Enabled	☐ = Post-heat is disabled. ☑ = When the *Coolant Temperature* is below the configured *On* level, the *Pre-Heat* digital output is activated for the set *Duration* of time after cranking and before the set is considered available.
On	Set the coolant temperature below which the pre-heat is activated.
Duration	Set the time delay during which the *Pre-Heat* digital output remains active after cranking and before the engine is considered available.

2.8.10 ECU (ECM) OPTIONS

Parameter	Description
Module to Record Engine Hours	When enabled, DSE module counts Engine Run Hours. When disabled, Engine ECU (ECM) provides Run Hours.
DPF Regeneration Control	Available for ECUs (ECM) which require the engine speed to drop during a manual regeneration cycle. During this time, the generator is not available to supply power and the under speed and under frequency alarms are not active.
Speed Switch	Defines the method of speed control over CANbus when supported by the ECU (ECM). Selection needs to match the ECU (ECM) calibration for the speed control method. Available speed control methods to choose from: ***CAN Open Increase Decrease*** ***CAN Open Speed Demand*** ***Default Dataset ECU*** ***ECU Analogue Absolute*** ***ECU Analogue Relative*** ***ECU CAN Open Analogue*** ***ECU Frequency Input*** ***ECU Increase Decrease Input***
ECU Wakeup	☐ = Option is disabled. ☑ = When the engine is stopped, the DSE module sends a wakeup signal to the ECU (ECM) and keeps it powered up for 2 minutes to read the ECU (ECM) parameters. This is periodically repeated depending on the configured *Periodic Wakeup Time.*

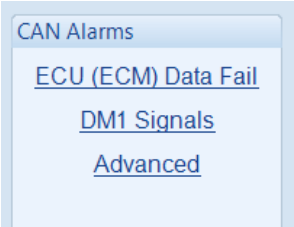
Parameters continued overleaf…

Parameter	Description
Engine CAN Termination	☐ = The engine CAN port has no 120 Ω termination resistor across the H and L terminals. ☑ = The engine CAN port has a 120 Ω termination resistor fitted across the H and L terminals.
Coolant Measurement Persistence	**NOTE: Available only when *ECU Wakeup* is enabled.** ☐ = Option is disabled. ☑ = The *Coolant Temperature* measurement is used for the *Coolant Temperature Control.*
Droop	**NOTE: Droop options are only available where supported by the Engine ECU (ECM) over the CAN or MODBUS datalink. Contact the engine manufacturer for further details.** ☐ = Engine droop is not enabled. ☑ = Where supported by the electronic engine ECU (ECM), the DSE enable droop in the engine ECU (ECM) governor at the %age configured.
SPN Ignore List	Choose the specific SPN for the module to ignore. The module allows the engine to keep running when the ignored SPN occurs; however, depending on the severity, the engine shuts down based on the ECU (ECM) calibration. This is used to mask certain indications or warnings on the ECU (ECM) and not display them on the DSE module.
CAN Source Address (Engine Messages)	**NOTE: For a full list of the J1939-75 engine message and instrumentation, refer to DSE Publication: *057-254 DSE8610 MKII Operator Manual* which is found on our website: *www.deepseaplc.com*** Set the *CAN Source Address* for the DSE module over which other CANbus devices read the alarms.
CAN Source Address (Instrumentation)	**NOTE: For a full list of the J1939-75 engine message and instrumentation, refer to DSE Publication: *057-254 DSE8610 MKII Operator Manual* which is found on our website: *www.deepseaplc.com*** Set the *CAN Source Address* for the DSE module over which other CANbus devices read the generator set instrumentation.

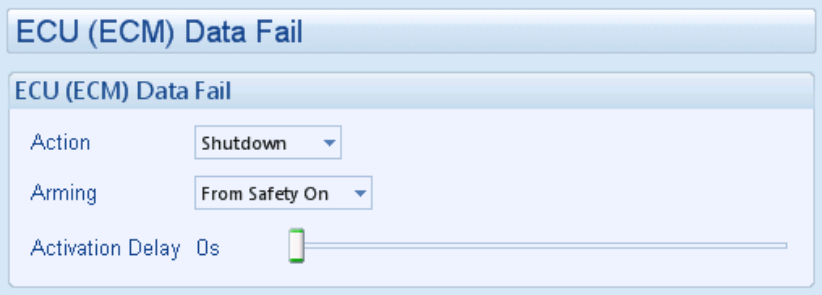
2.8.11 ECU (ECM) ALARMS

NOTE: This section is only available when the module is connected to an ECU.

The *ECU (ECM) Alarms* section is subdivided into smaller sections.
Select the required section with the mouse.



2.8.11.1 ECU (ECM) DATA FAIL



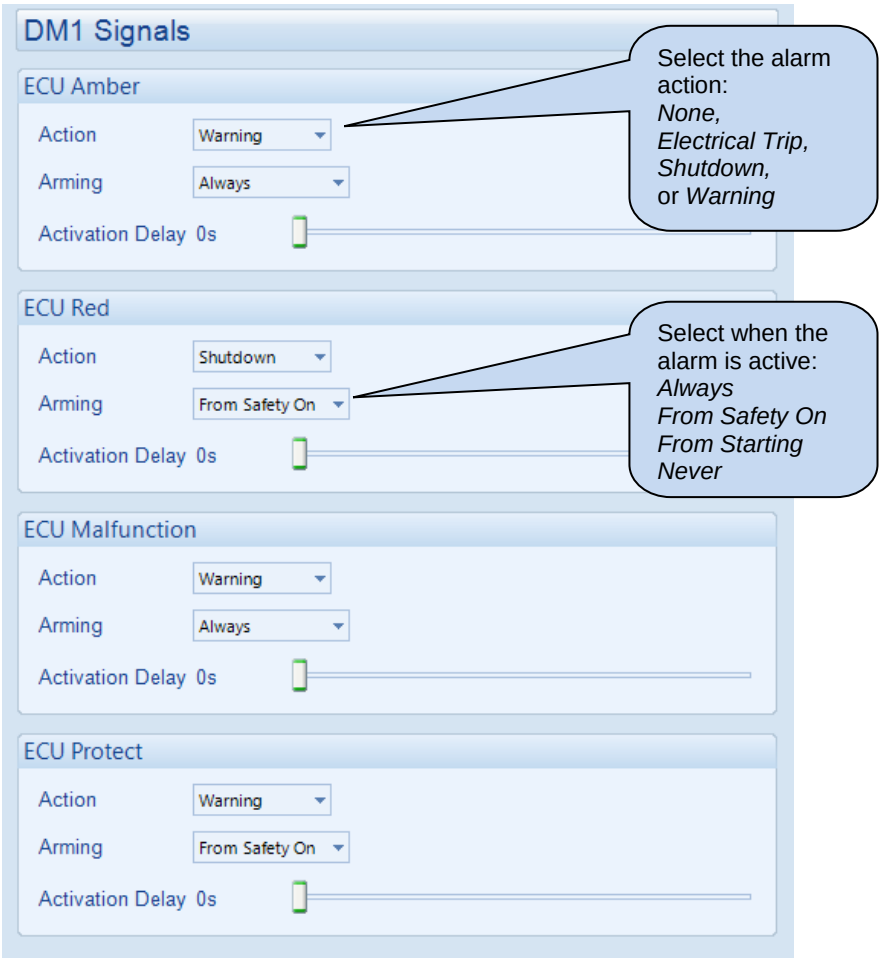
Parameter	Description
CAN Data Fail	Provides protection against failure of the ECU (ECM) CANbus data link. The alarm action list is as follows, see section entitled *Alarm Types* for more information: ***None*** ***Electrical Trip*** ***Shutdown*** ***Warning***
Arming	Select when the *CAN ECU (ECM) Data Fail* alarm is active. Options are as follows: ***Active From Breaker Closed:*** Active only when the breaker is closed ***Active From Parallel:*** Active only when running in parallel ***Always:*** The alarm is active at anytime the CANbus Link is lost ***Engine Protection Activation:*** Active when the engine protection alarms are armed ***From Safety On:*** Active only after the *Safety On* delay timer ***From Starting:*** Active only after the *Crank Relay* is energised ***Never****:* Alarm is disabled ***When Stationary:*** Active only when the engine is not running
Activation Delay	The amount of time before the module activates the *CAN ECU (ECM) Data Fail* after a failure.

2.8.11.2 DM1 SIGNALS

NOTE: Configuration of parameters in this section only has effect when the ECU (ECM) supports these features.

NOTE: Configuration of the *Alarm Action* in this section defines the DSE module response to the CANbus message; however, the ECU (ECM) still shuts down the engine depending on the alarm severity.

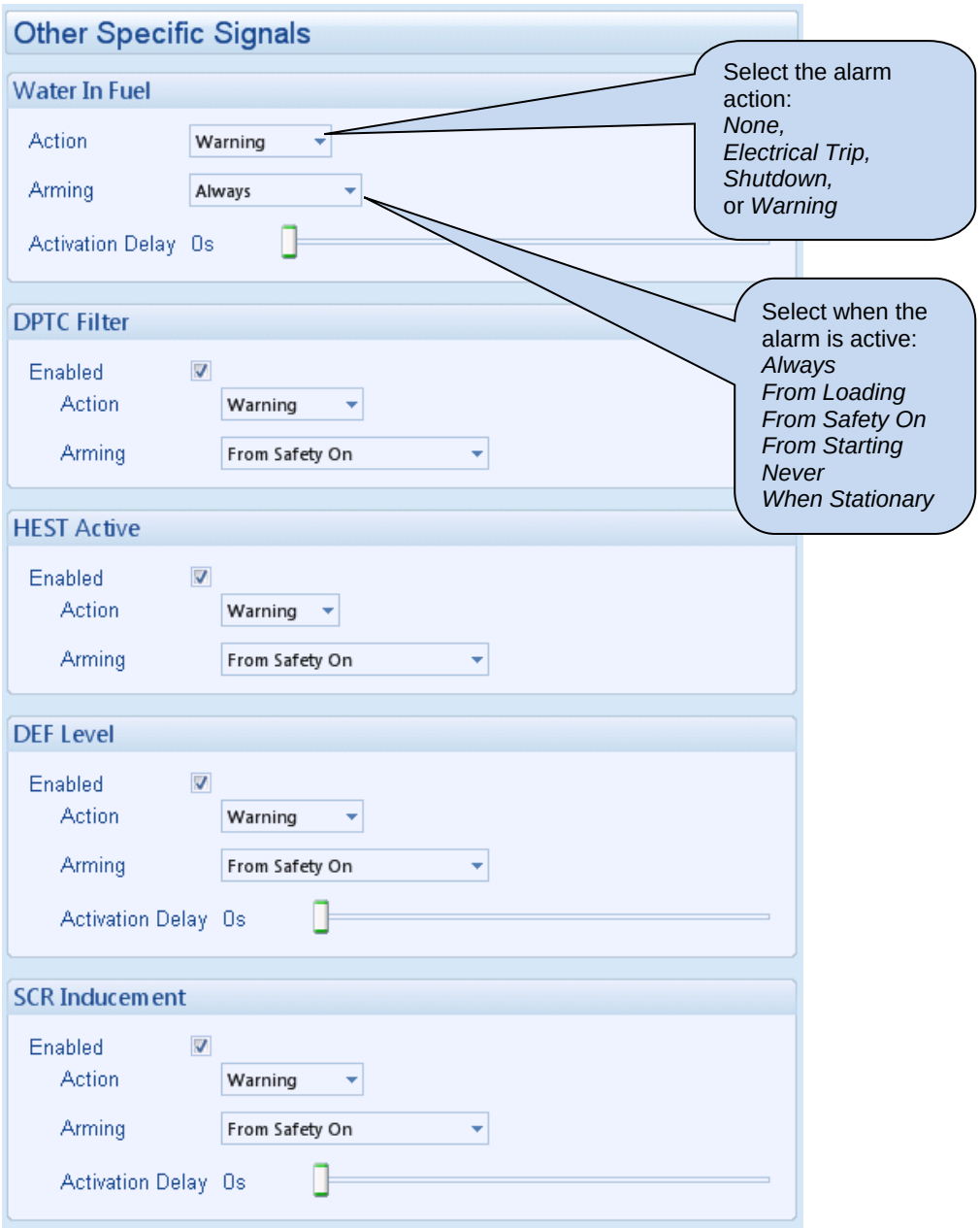
DM1 signals are messages from the CANbus (ECM) ECU. The following parameters allows configuration of how the DSE module responds to these messages.



2.8.11.3 ADVANCED

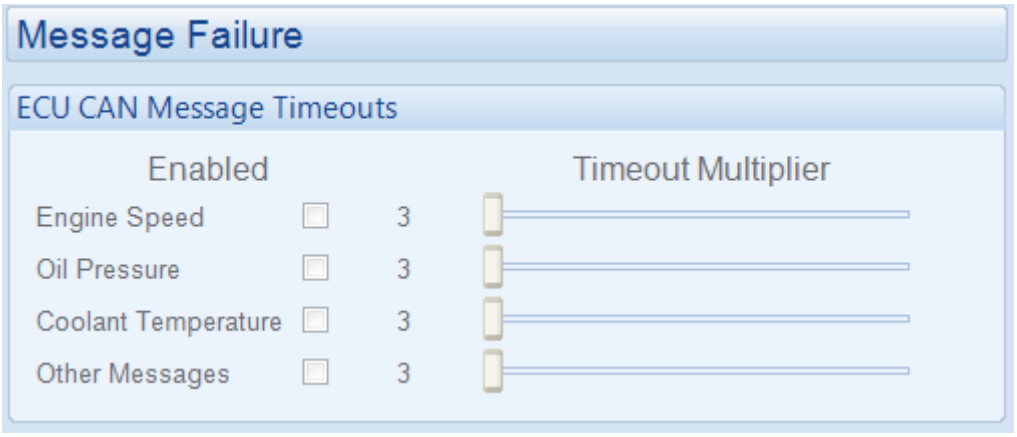
NOTE: Configuration of parameters in this section only has effect when the ECU (ECM) supports the features.

Allows configuration of selected additional CANbus messages from the engine ECU (ECM).



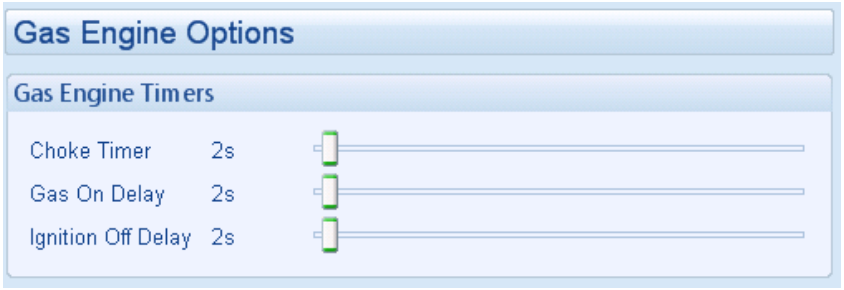
2.8.11.4 MESSAGE FAILURE

Allows adjustment of the CAN message failure rate for instrumentation parameters received from the ECU (ECM). This is to allow for spurious CAN data loss error message caused by longer than usual timeouts.



Parameter	Description
Message Failure	☐ = The message failure monitoring works on the default setting as specified by the manufacturer. ☑ = When enabled, this option overrides the standard message timeout with a longer timeout to avoid spurious failures. Set the *Timeout Multiplier* to adjust the timeout value for the parameter by between three and ten times the standard value.

2.8.12 GAS ENGINE OPTIONS

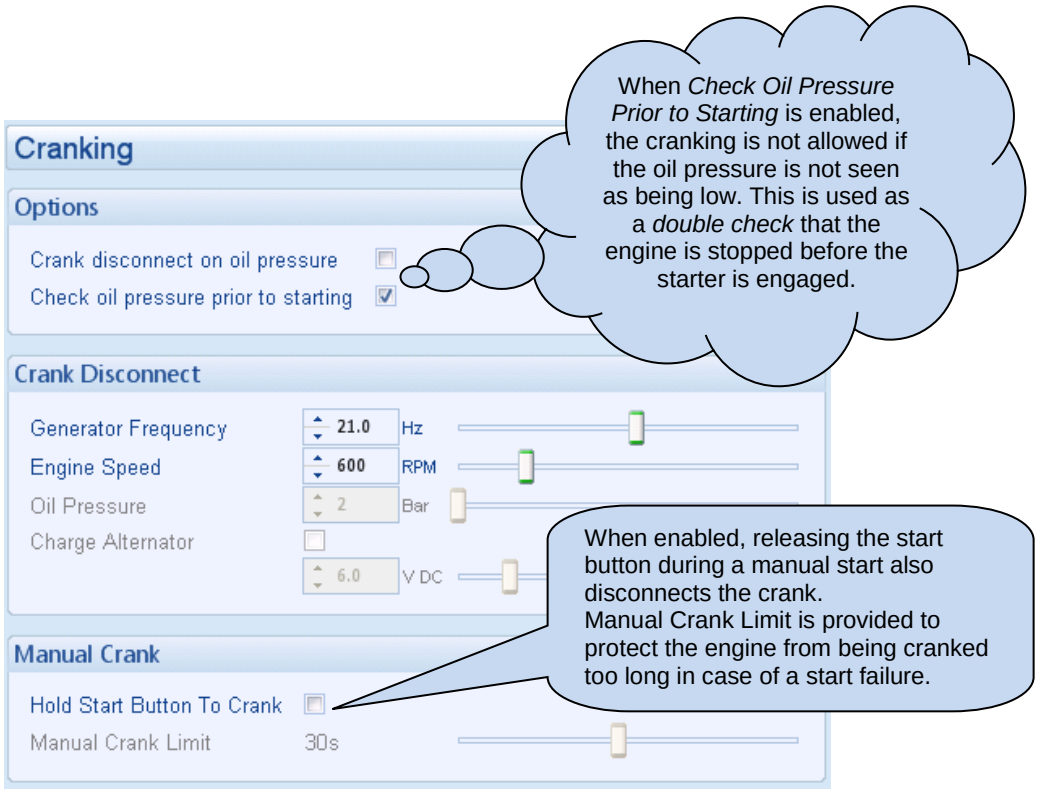


Parameter	Description
Choke Timer	Controls the amount of time that the Gas Choke output is active during the starting sequence.
Gas On Delay	Controls the amount of time between energising the Gas Ignition and energising the Fuel output. Used in the starting sequence to purge old gas from the engine.
Ignition Off Delay	Controls the amount of time between de-energising the Fuel output and de-energising the Gas Ignition output. Used in the stopping sequence to purge unburnt gas from the engine before it is stopped.

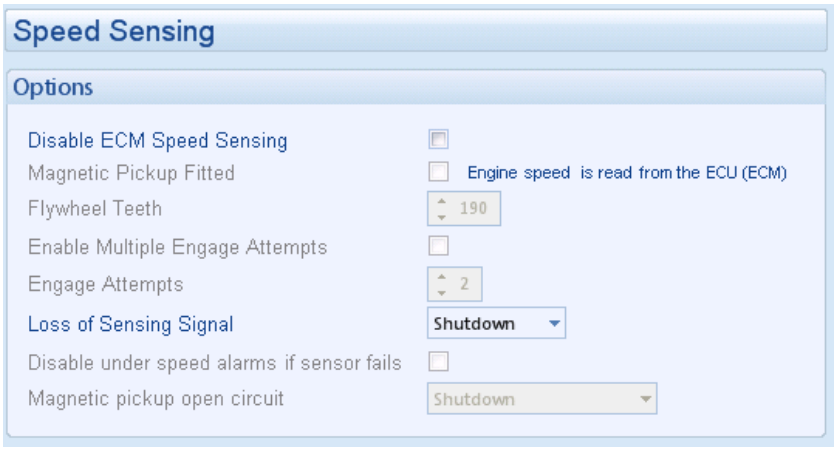
2.8.13 CRANKING

Crank disconnect settings are used to detect when the set fires during the starting sequence.
As the set is cranked, the first parameter that passes it's *crank disconnect* setting results in the cessation of the cranking signal.

Having more than one *crank disconnect* source allows for a much faster crank disconnect response leading to less wear on the engine and starter components, and provides added safety in case one source is lost, by a blown or tripped fuse for example.

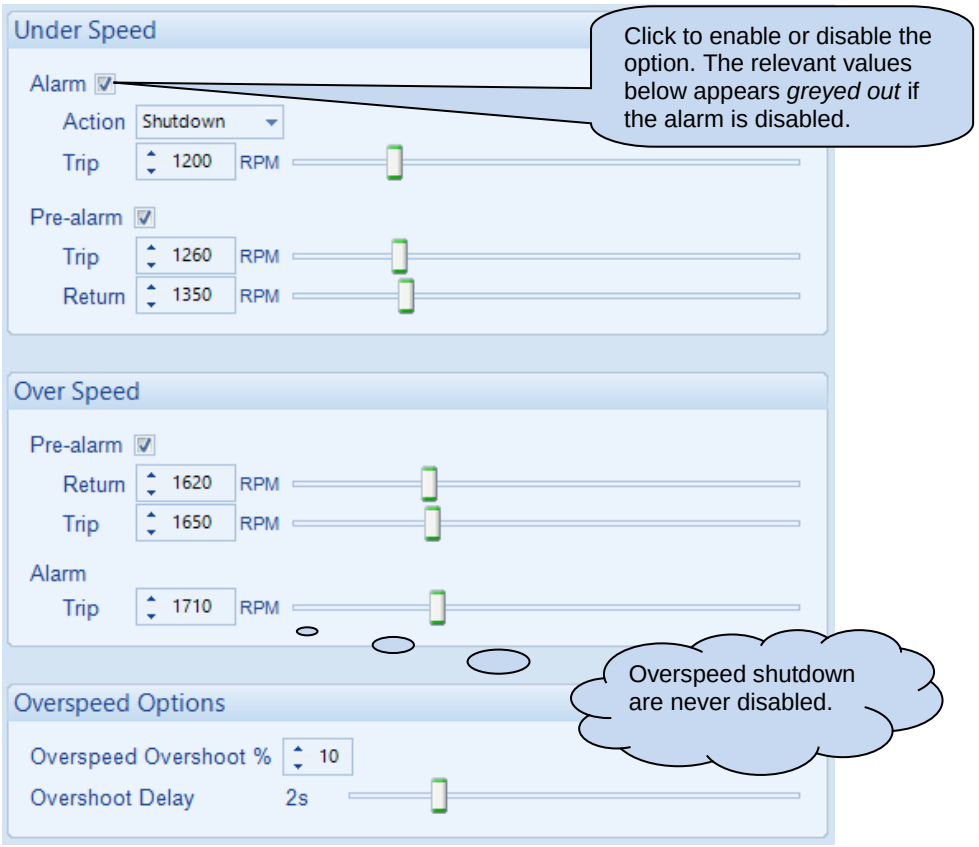


2.8.14 SPEED SENSING



Parameter	Description
Disable ECM Speed Sensing	☐ = An ECM is connected to the DSE module and being used for speed sensing. ☑ = An ECM is connected to the DSE module but another form of speed sensing fitted to the DSE module is being used.
Magnetic Pickup Fitted	**NOTE: For specifications of the magnetic pickup input, refer to DSE Publication: *057-254 DSE8610 MKII Operator Manual* which is found on our website: *www.deepseaplc.com*** ☐ = Magnetic pickup device is not connected to the DSE module. ☑ = A low impedance magnetic pickup device is connected to the DSE module to measure engine speed.
Flywheel Teeth	Define the number of pulses which are counted by the speed sensing device in each engine revolution.
Enable Multiple Engage Attempts	☐ = No engage attempt is given. If no speed sensing is detected during cranking, the *Fail To Start* alarm is active. ☑ = If no magnetic pickup pulses are detected during cranking, it is assumed that the starter has not engaged to turn the engine. The starter is withdrawn and re-energised for the configured number of *Engage Attempts.*
Loss of Sensing Signal	If the speed sensing signal is lost during engine running (or not present during cranking when *Multiple Engage Attempts* is enabled), an alarm is generated: *Shutdown:* The engine is removed from load and is immediately stopped. *Warning:* The engine continues to run, however a warning alarm is raised.
Disable Under Speed Alarms If Sensor Fails	☐ = Under speed alarms activate even if speed sensor has failed. ☑ = Under speed alarms are disabled when the speed sensor fails.
Magnetic Pickup Open Circuit	If the magnetic pickup device is not detected, an alarm is generated: *Shutdown:* The engine is removed from load and is immediately stopped. *Warning Always Latched:* The engine continues to run, however a latched warning alarm is raised even if the magnetic pickup signal returns to normal.

2.8.15 SPEED SETTINGS



2.8.15.1 UNDER SPEED

Parameter	Description
Under Speed Alarm	☐ = *Under Speed* alarm is disabled ☑ = Under Speed gives an alarm in the event of the engine speed falling below the configured *Under Speed Alarm Trip* value for longer than the *Activation Delay*. The *Underspeed Alarm Trip* value is adjustable to suit user requirements.
Action	Select the type of alarm required from the list: ***Shutdown*** ***Electrical Trip*** For details of these, see the section entitled *Alarm Types* elsewhere in this document.
Under Speed Pre-Alarm	☐ = *Under Speed Warning* alarm is disabled ☑ = Under Speed gives a warning alarm in the event of the engine speed falling below the configured *Under Speed Pre-Alarm Trip* value for longer than the *Activation Delay*. The *Under Speed Pre-Alarm Trip* value is adjustable to suit user requirements.

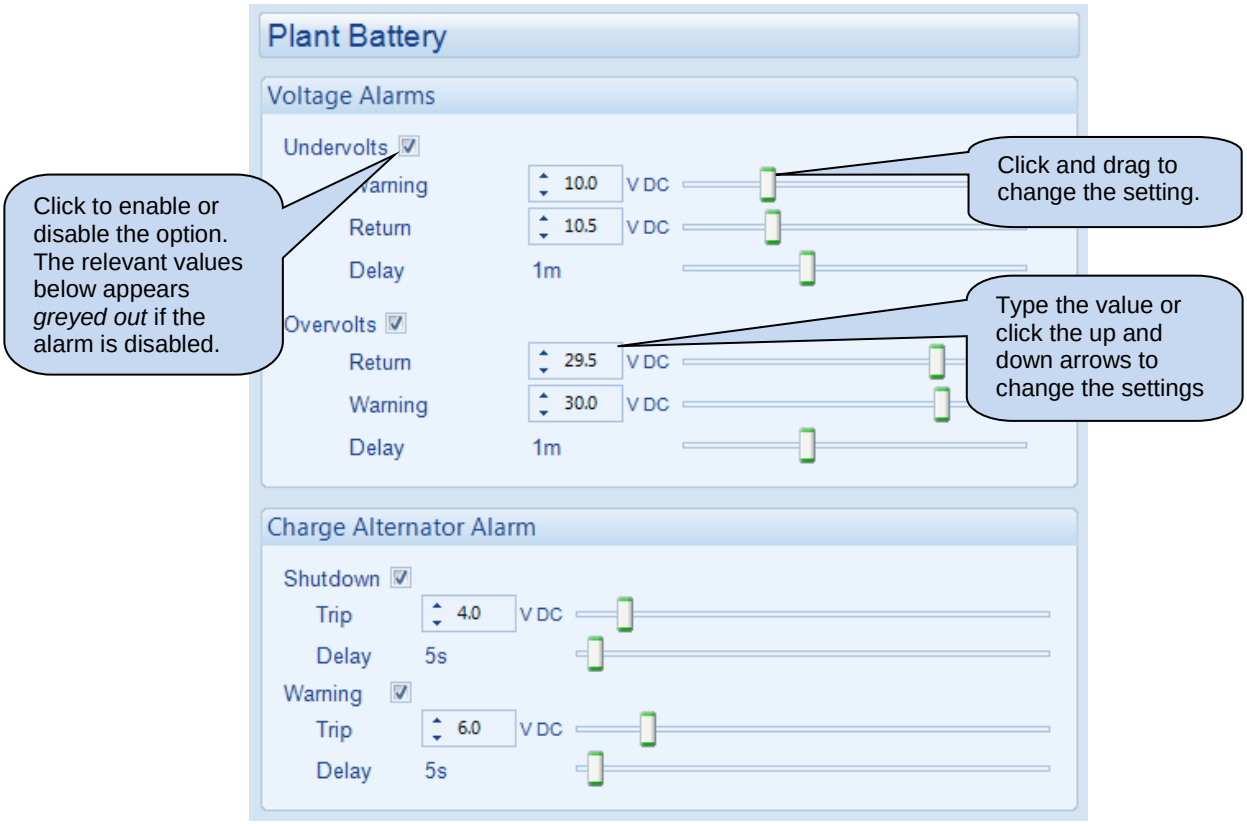
2.8.15.2 OVER SPEED

Parameter	Description
Over Speed Pre-Alarm	☐ = Alarm is disabled ☑ = Over Speed gives a warning alarm in the event of the engine speed rising above the configured *Over Speed Pre-Alarm Trip* value for longer than the *Activation Delay*. The *Warning* is automatically reset when the engine speed falls below the configured *Return* level. The *Over Speed Pre-Alarm Trip* value is adjustable to suit user requirements.
Over Speed Alarm	☐ = Alarm is disabled ☑ = Over Speed gives a *Shutdown* alarm in the event of the engine speed rising above the configured *Over Speed Alarm Trip* value for longer than the *Activation Delay*. The *Over Speed Alarm Trip* value is adjustable to suit user requirements.

2.8.15.3 OVERSPEED OPTIONS

Parameter	Description
Overspeed Overshoot %	To prevent spurious overspeed alarms at engine start up, the module includes configurable *Overspeed Overshoot* protection. This allows the engine speed to 'overshoot' the Overspeed setting during the starting process for a short time.
Overshoot Delay	Rather than 'inhibiting' the Overspeed alarms, the levels are temporarily raised by the *Overspeed Overshoot %* for the duration of the *Overspeed Overshoot* delay from starting.

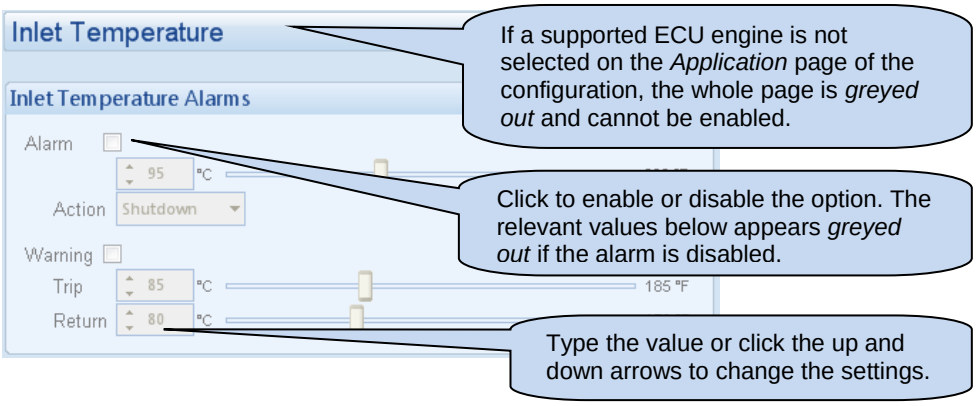
2.8.16 PLANT BATTERY



Parameter	Description
Plant Battery Undervolts IEEE 37.2 -27 DC Undervoltage Relay	The alarm activates when the battery voltage drops below the configured *Pre-Alarm* level for the configured *Delay* time. When the battery voltage rises above the configured *Return* level, the alarm is de-activated.
Plant Battery Overvolts IEEE 37.2 -59 DC Overvoltage Relay	The alarm activates when the battery voltage rises above the configured *Pre-Alarm* level for the configured *Delay* time. When the battery voltage drops below the configured *Return* level, the alarm is de-activated.
Charge Alternator Alarm	The alarm activates when the charge alternator voltage falls below the configured *Trip* level for the configured *Delay* time.
Charge Alternator Pre-Alarm	The alarm activates when the charge alternator voltage falls below the configured *Trip* level for the configured *Delay* time.

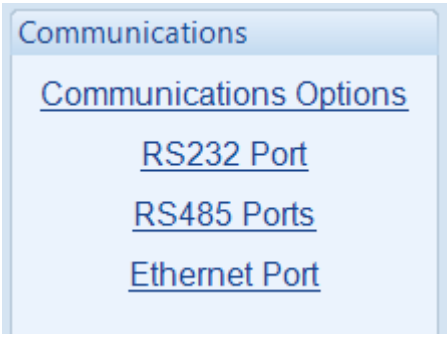
2.8.17 INLET TEMPERATURE

Provides inlet temperature alarms when the module is used in conjunction with electronic (ECU) engines that support the reading of inlet temperature.



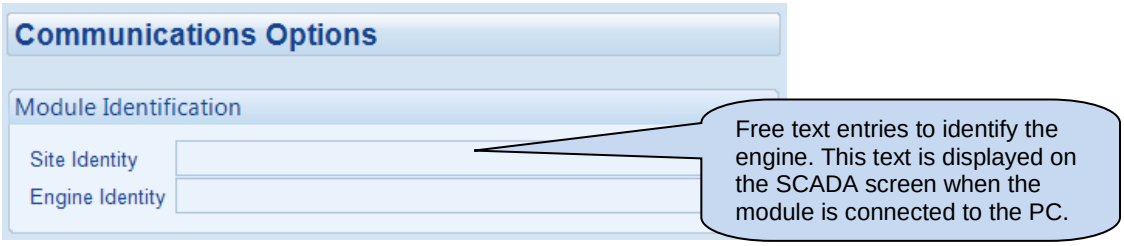
2.9 COMMUNICATIONS

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



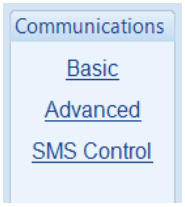
2.9.1 COMMUNICATION OPTIONS

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 engine identity that it is currently connected to. This feature is used when a remote module is connected over modem or Ethernet.

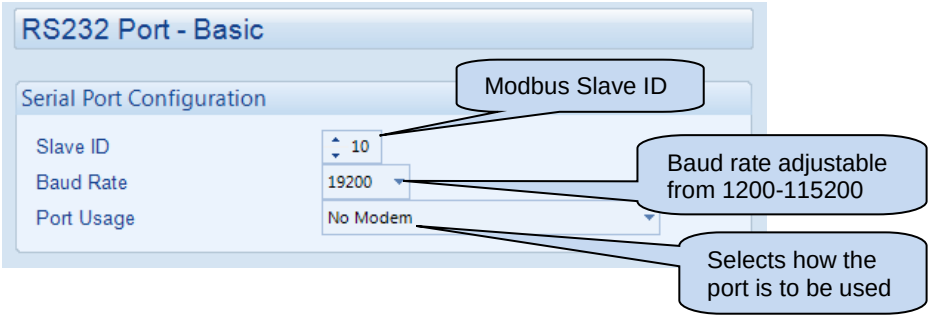


2.9.2 RS232 PORT

The *RS232 Port* section is subdivided into smaller sections.
Select the required section with the mouse.



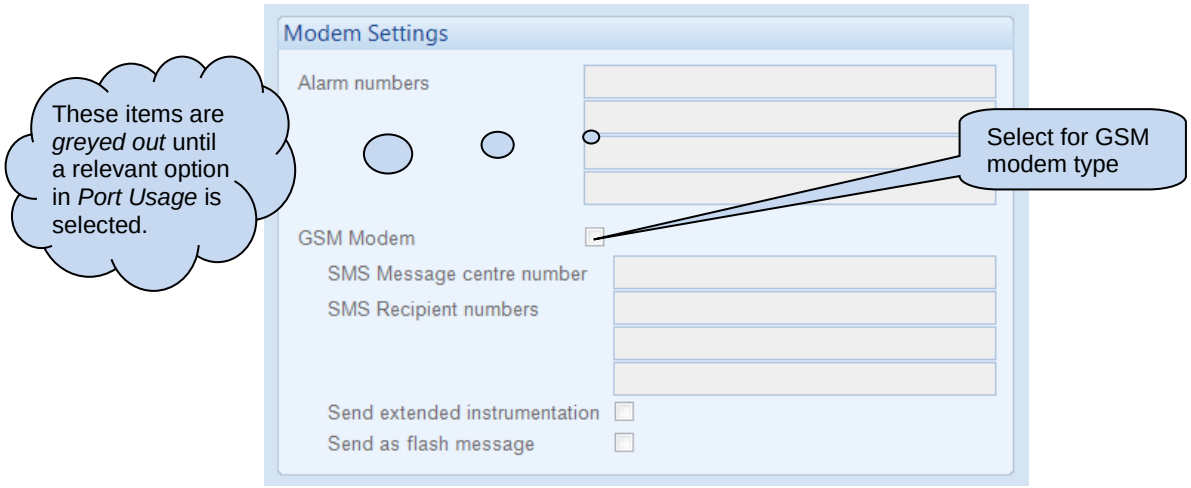
2.9.2.1 BASIC



SERIAL PORT CONFIGURATION

Parameter	Description
Port usage	The options are : ***No Modem:*** RS232 ports is used for direct RS232 connection to PLC, BMS etc ***Incoming Modem Calls:*** RS232 port connected to modem, used to accept incoming calls from a PC only. ***Incoming And Outgoing Modem:*** RS232 port connected to modem used to accept incoming calls from a PC and also make calls upon events. ***Outgoing Modem Alarms:*** RS232 port connected to modem, used to make calls upon events.
Cyclic	When multiple *Alarm Numbers* are configured, the module attempts to dial each number. When the dial out call fails to one of the configured numbers, the module completes the cycle and re-attempts to call those numbers for the configured number of *Retries*.
Sequence	When multiple *Alarm Numbers* are configured, the module attempts to dial each number. When the dial out call fails to one of the configured numbers, the module attempts to call that number for the configured number of *Retries*, before it carries on to the next number.

MODEM SETTINGS



Parameter	Description
Alarm Number	The phone number that the module dials upon an event. This number must be connected to a PC modem on a PC running the DSE Configuration Suite Software. Leave this field empty when dial-out to a PC is not required.
GSM Modem	☐ = The connected modem is a fixed line telephone modem ☑ = The connected modem is a GSM (cellular) modem. The GSM signal strength meter and GSM operator are shown on the module display.
SMS Message Centre Number	The Message centre used to send SMS messages. This number is obtained from the GSM operator.
SMS Recipient Numbers	Numbers of the cell phones to send SMS messages to. Leave blank if SMS function is not required.

RECOMMENDED MODEMS

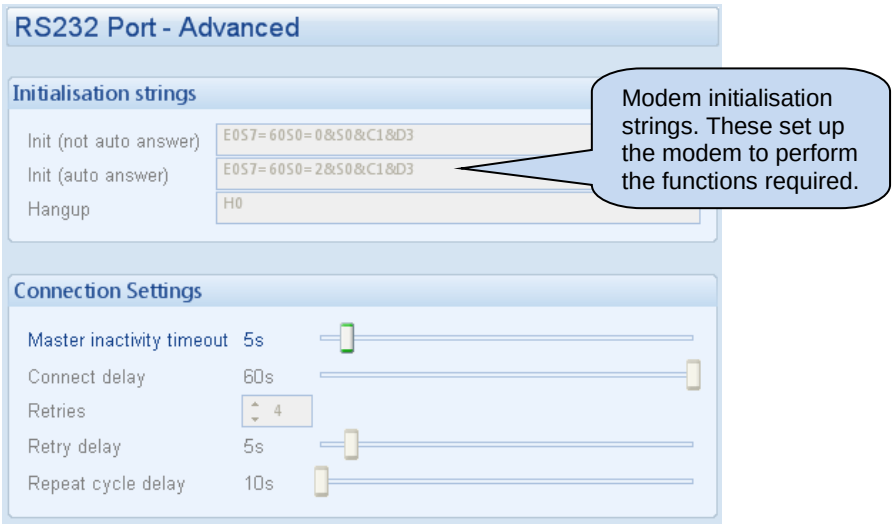
DSE stock and supply the following recommended modems:

GSM modem

DSE do not stock or supply CSD SIM cards for the modem, these must be obtained from your local GSM provider.

Description	DSE Part Number
The GSM Modem is supplied with power supply cable, RS232 connection cable and GSM antenna. Suitable for GSM operating on 900/1800 MHz bands.	0830-001-01
NOTE : This modem is supplied ready configured to operate with the DSE module. When purchasing from a third party, the modem is not configured to communicate with the DSE module.	

2.9.2.2 ADVANCED



INITIALISATION STRINGS

The initialisation strings are commands that are sent to the modem upon powering up the DSE module and additionally at regular intervals subsequently, whenever the DSE module *initialises* (resets) the modem.

Factory set initialisation strings

Parameter	Description
E0	Echo off
S7=60	Wait for carrier time 60s
S0=0 (not auto answer) S0=2 (auto answer)	Do not answer Answer after two rings
&S0	DSR always on
&C1	DCD is active if modem is online
&D3	Reset (ATZ) on DTR-drop
H0	Hang up (disconnect)

Silent operation

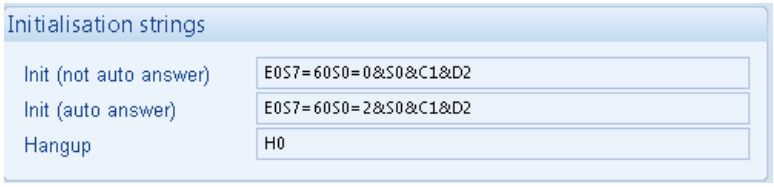
The modem connected to the DSE controller usually makes dialling noises and ‘squeal’ in the initial stages of making a data call. To control this noise, add the following command to the end of the initialisation string:

Parameter	Description
M0	Silent operation
M1	Sounds during the initial stages of making a data call
M2	Sounds always when connected (not recommended for normal use but is of use for troubleshooting)

Sierra/Wavecom Fastrak Supreme GSM Modem initialisation strings

When connected to the Wavecom Fastrak Supreme GSM modem, the initialisation strings must be altered by changing the factory set &D3 to &D2.

Parameter	Description
&D2 (required for Sierra/Wavecom Fastrak Supreme)	Hang up on DTR-drop
&D3 (DSE module factory settings)	Reset on DTR-drop



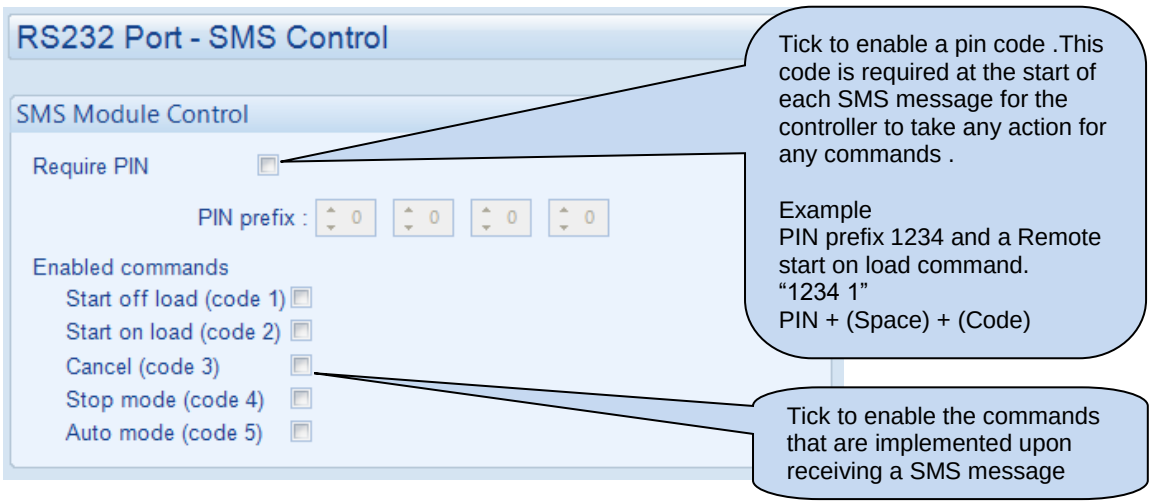
OTHER MODEMS

When using modems not recommended by DSE first try either of the options shown above. If problems are still encountered, contact your modem supplier for further advice.

CONNECTION SETTINGS

Parameter	Description
Master Inactivity Timeout	The module monitors by default the USB port for communications. When activity is detected on the RS232 port, the module monitors the port for further data. If no data activity is detected on the port for the duration of the *Master Inactivity Timer*, it reverts to looking at the USB port. This needs to be set longer than the time between Modbus polls from the master.
Connect Delay	The amount of time that is allowed to elapse between the alarm being registered and the controller dialling out with the fault.
Retries	The number of times the module attempts to contact the remote PC by modem.
Retry Delay	The amount of time between retries
Repeat Cycle Delay	The amount of time between the cycle repeats when dialling out calls to multiple *Alarm Numbers* fails.

2.9.2.3 SMS MODULE CONTROL



The SMS commands listed below.

Parameter	Code	Description
Start Off Load	1	When in Auto mode, the module performs the start sequence but the engine is not instructed to take the load. This function is used where an engine only run is required e.g. for exercise.
Start On Load	2	When in auto mode, the module performs the start sequence and transfer load to the engine.
Cancel	3	This cancels the SMS Start Off load or SMS Start On Load.
Stop Mode	4	This mimics the operation of the ‘Stop’ button and is used to provide a remote SMS stop command.
Auto Mode	5	This input mimics the operation of the “AUTO” button

2.9.2.4 TROUBLESHOOTING MODEM COMMUNICATIONS

MODEM COMMUNICATION SPEED SETTING

First ensure the modem is set to communication with the DSE module at 9600 baud – Modems supplied by DSE are factory adjusted to operate with the DSE module. Only modems purchased from a third party may require adjustment.

To change the modems RS232 baud rate you need a command line terminal program (Hyperterminal by Microsoft is a good solution). Operation of this terminal program is not supported by DSE; contact your terminal program supplier.

Connect the modem RS232 port to your PCs RS232 port. You may need an additional card in your PC to provide this facility.

Use Hyperterminal (or similar) to connect to the modem at its current baud rate. You may need to contact your modem supplier to obtain this detail. If this is not possible, use 'trial and error' methods. Select a baud rate, attempt connection, press <ENTER> a few times. If the modem responds with **OK>** then you are connected at the correct baud rate. Any other response (including nothing) means you are not connected so select another baud rate.

When connected, enter the following command:

AT+IPR=9600 and press <ENTER>
This sets the modem to 9600 baud.

Close the Hyperterminal connection (**do not** remove power from the modem) then open a new connection to the modem at 9600 baud.

Enter the following command:

AT&W and press <ENTER>

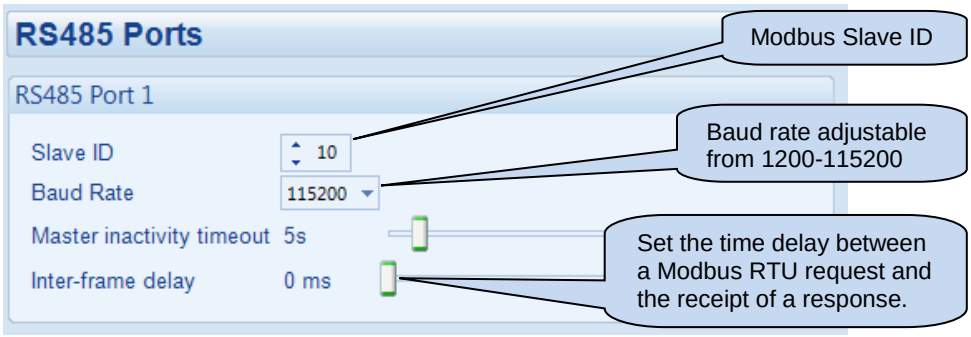
This saves the new setting in the modem. Power is now removed. The next time power is applied, the modem starts with the new settings (Baud rate = 9600), suitable to communicate with the DSE module.

GSM MODEM CONNECTION

Most GSM modems have a *Status* LED. The Wavecom Fastrack Supreme as recommended and supplied by DSE has a RED Status LED, operating as follows.

LED STATE	Description
Off	Modem is not powered
On Continuous	Not connected to GSM network
Flashing Slow (approx once every two seconds)	Connected to GSM network
Flashing Fast (approx twice per second)	Connected to GSM network data transmission in progress.

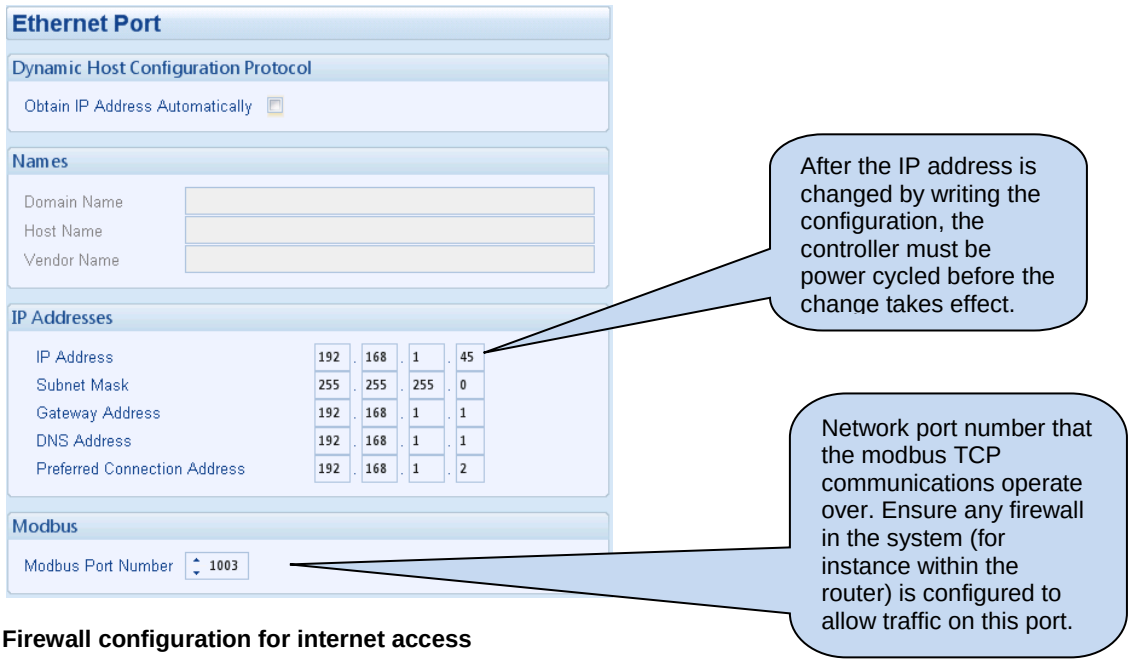
2.9.3 RS485 PORT



Timer	Description
Master Inactivity Timeout	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 *Master Inactivity Timer*, it reverts to looking at the USB port. This needs to be set longer than the time between modbus polls from the master.

2.9.4 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.



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.

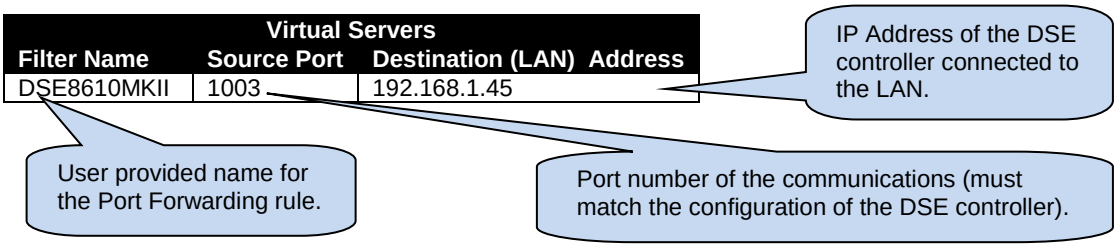
Incoming traffic (virtual server)

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.

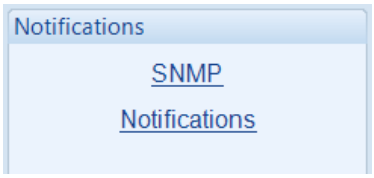
Example:



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.

2.9.5 NOTIFICATIONS

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



2.9.5.1 SNMP

The DSE86xx MKII supports SNMPv2c with GetRequest, SetRequest, GetNextRequest, GetBulkRequest and Response. The DSE86xx MKII allows two SNMP managers at a time on different addresses.

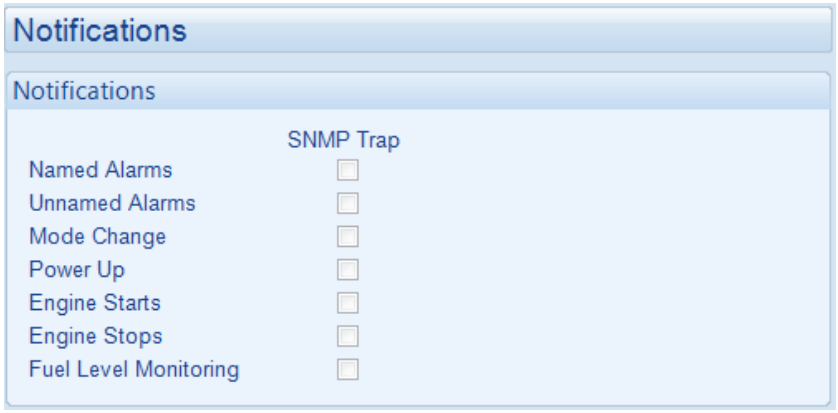
A fixed **MIB file** is available for the module for use by external SNMP managers.
The MIB file is a file used by the SNMP manager to give context to the information held within the SNMP agent (DSE86xx MKII).

NOTE: The MIB file is available to download from the DSE Website. This generic MIB file is conformed to SNMPV2c standards.

Parameter	Description
SNMP Enable	☐ = SNMP is disabled ☑ = SNMP is enabled and the 86xxMKII module communicates with the SMTP server through its Ethernet port.
Device Name	The device name of the module (for SNMP only).
Manager 1 Address	The IPV4 Network location of the SNMP manager 1.
Manager 2 Address	The IPV4 Network location of the SNMP manager 2.
Manager Port	The SNMP port used for GET, GET Next, Get Bulk, Get Subtree, Walk and SET messages.
Notification Port	Port Number that SNMP TRAP messages are sent to.
Read Community String	The SNMP *Read Community* String. (Factory setting *public*)
Write Community String	The SNMP *Write Community* String. (Factory setting *private*)

2.9.5.2 NOTIFICATIONS

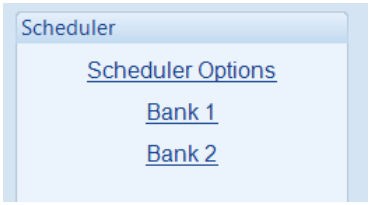
The user is able to enable Module and Instrumentation Events to be transmitted to SNMP Trap devices.



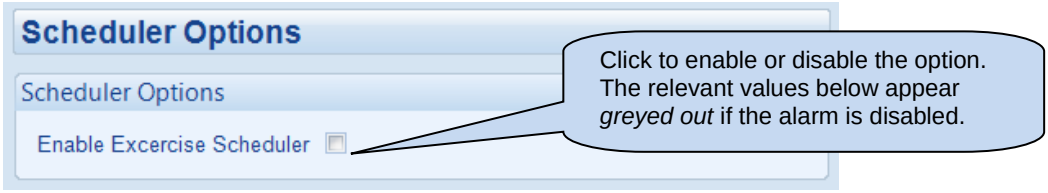
Parameter	Description
Notification	Refer to the *Logging Options* section elsewhere in this document for the different *Module Events*.
SNMP Trap	☐ = This event does not generate an SNMP trap. ☑ = The DSE86xx MKII generates an SNMP TRAP message upon activation of this event.

2.10 SCHEDULER

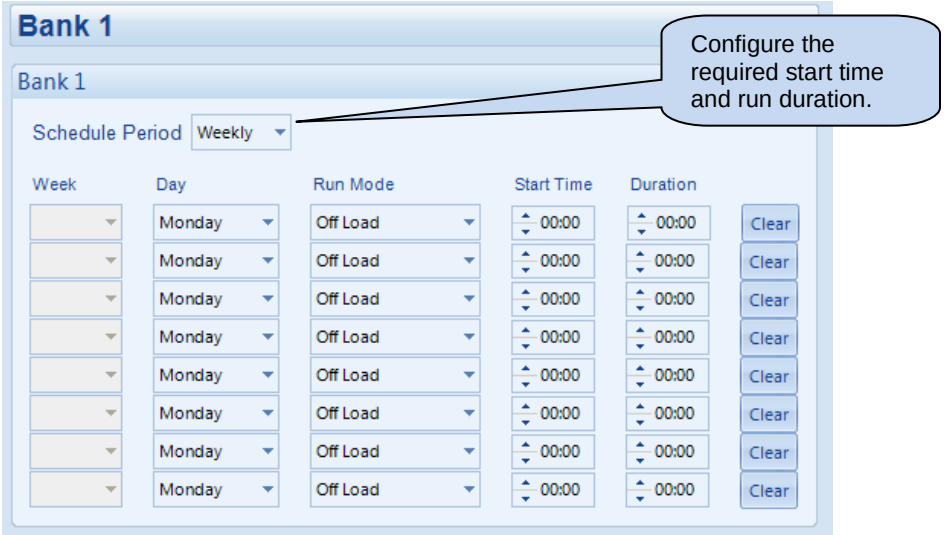
The section is subdivided into smaller sections.
Each Bank of the Exercise Scheduler is used to give up to 8 scheduled runs per bank, 16 in total. This run schedule is configurable to repeat every 7 days (weekly) or every 28 days (monthly). The run is *on load* or *off load.*
Each scheduler bank configured differently either to weekly or monthly based exercises.



2.10.1 SCHEDULER OPTIONS

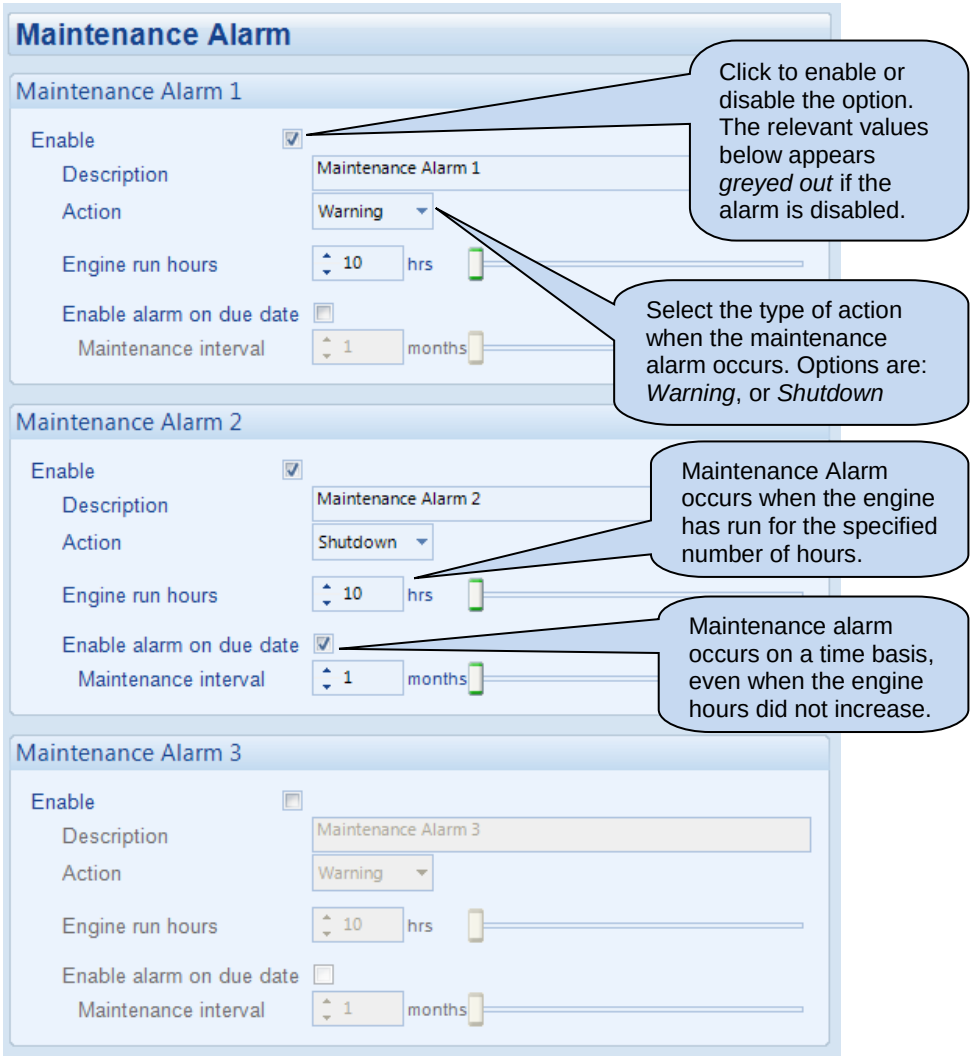


2.10.2 BANK 1 / BANK 2



Function	Description
Schedule Period	Determines the repeat interval for the scheduled run. Options available are: Weekly, Monthly
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 when running on schedule ***Auto Start Inhibit:*** the generator is prevented from running in *Auto* mode. ***Off Load:*** The module runs the generator on schedule with the load switch open ***On Load:*** The module runs the generator on schedule and closes the load switch
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

2.11 MAINTENANCE ALARM

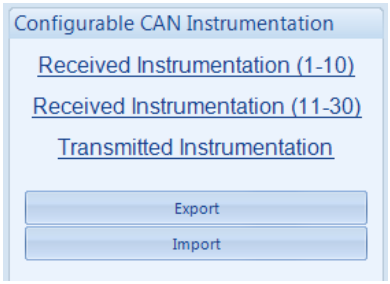


There are two ways to reset the maintenance alarm:

1) Activate a digital input configured to “Maintenance Reset Alarm”.
2) Use the SCADA | Maintenance | Maintenance Alarm section of this PC Software.
3) Through the Front Panel Editor of the module

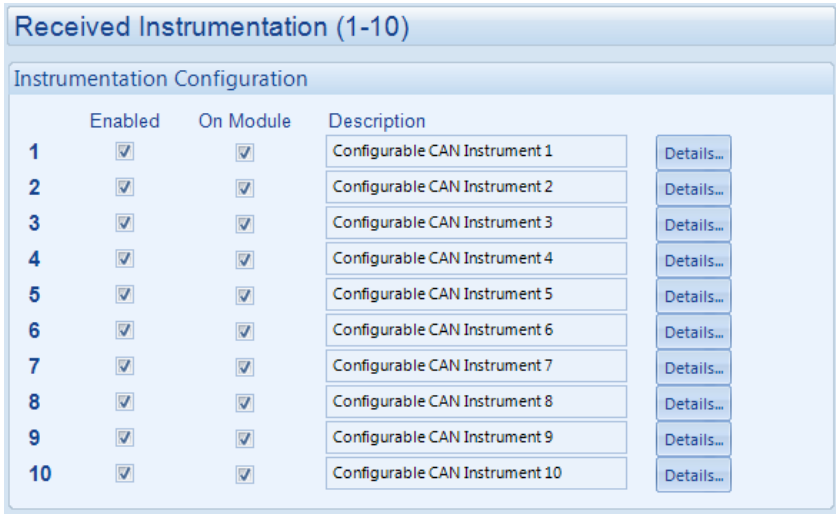
2.12 CONFIGURABLE CAN INTRUMENTATION

The *Configurable CAN Instrumentation* section is subdivided into smaller sections.
Select the required section with the mouse.



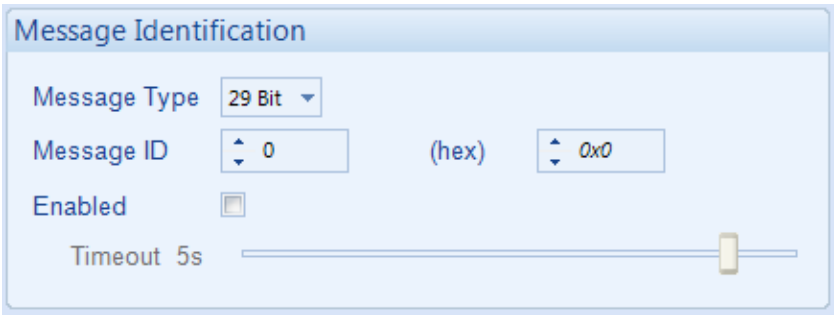
2.12.1 RECEIVED INTRUMENTATION (1-10)

This feature allows for up to ten custom engine CAN instrumentation items to be decoded from CAN messages on the connected ECU port.



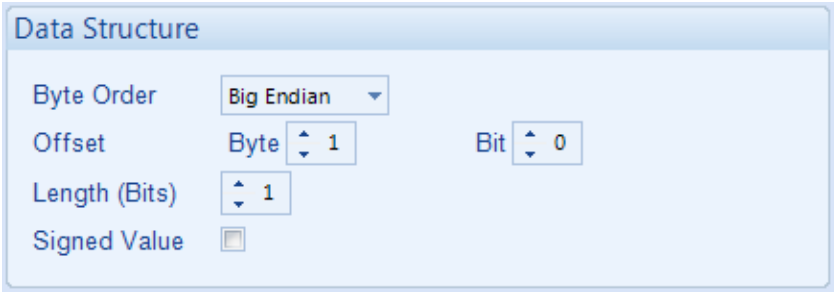
Parameter	Description
Enabled	**NOTE: The CAN instrumentation must already be available on the CAN bus. There is no request for a non-standard instrumentation.** ☐ = The CAN instrumentation is disabled. ☑ = The CAN instrumentation is enabled. Reading depends upon the message availability on the bus.
On Module	**NOTE: The CAN instrumentation is always available on the Scada, Data Logging, PLC as long as at least one CAN instrumentation is enabled. The CAN instrumentation is shown on the DSE module's display when the *On Module* is enabled.** ☐ = The CAN instrumentation is not displayed on the DSE module. ☑ = The CAN instrumentation is displayed on the DSE module.
Description	Provide a description for the CAN instrumentation. This description is only shown in SCADA.
Details	Click on Details to set the *Message Decoding* CAN options.

2.12.1.1 MESSAGE IDENTIFICATION



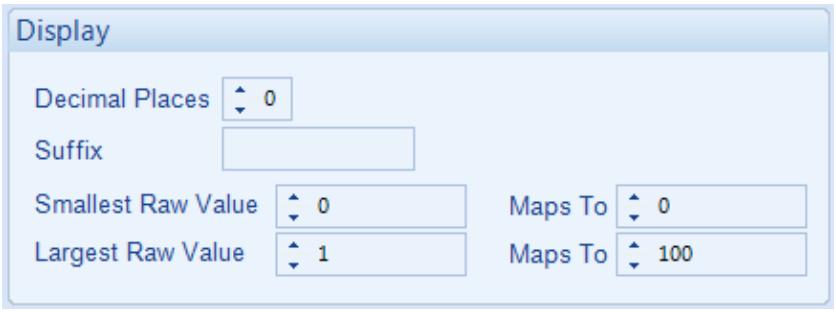
Parameter	Description
Message Type	Select the required message type: ***11 Bit*** message identifier for standard CAN ***29 Bit*** message identifier for extended CAN
Message ID	CAN message ID
Enabled	☐ = Timeout is disabled ☑ = Timeout is enabled
Timeout	It indicates how often the messages are expected to be seen on the CAN bus. If no new instrumentation is seen beyond the timeout period, the calculated instrumentation value changes to a 'bad data' sentinel value.

2.12.1.2 DATA STRUCTURE



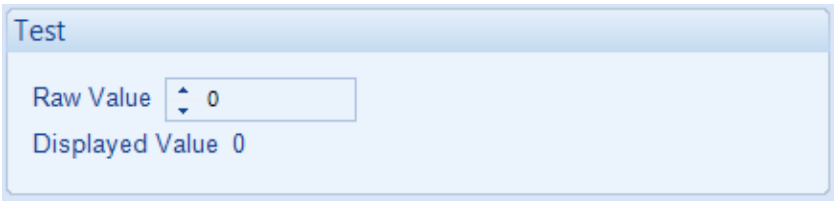
Parameter	Description
Byte Order	Select the *Byte Order* ***Big Endian*** the bytes on the bus are sent from the Most Significant Byte to the Least Significant Byte. ***Little Endian*** the bytes on the bus are sent from the Least Significant Byte to the Most Significant Byte.
Offset Byte	Set the start position Byte
Offset Bit	Set the start position Bit
Length (Bits)	Data length 1-32 bits
Signed Value	☐ = Unsigned value ☑ = Signed value

2.12.1.3 DISPLAY



Parameter	Description
Decimal Places	Display the decimal point, where 0 represents 0 scaling factor, 1 represents 0.1 scaling factor and -1 represents 10 multiplier.
Suffix	Unit display (example: m³/hr)
Smallest Raw Value	The smallest data sent over the CAN bus before the transformations (decimal places).
Maps To	The output format after all transformations including decimal point shift) as to be shown on the module screen, or SCADA, in data log file, etc.
Largest Raw Value	The largest data sent over the CAN bus before the transformations (decimal places).
Maps To	The output format after all transformations including decimal point shift) as to be shown on the module screen, or SCADA, in data log file, etc.

2.12.1.4 TEST



Parameter	Description
Test Raw Value	**NOTE: The Test Raw Value is not saved in the configuration, this is only to check the displayed value.** This is a test case to check the representation of the *Raw Value* when it is complicated. *Test Raw Value* is the value read from the CAN bus before the conversion.
Displayed Value	The *Displayed Value* is a represented value as to be shown on the DSE module's LCD screen, or in SCADA.

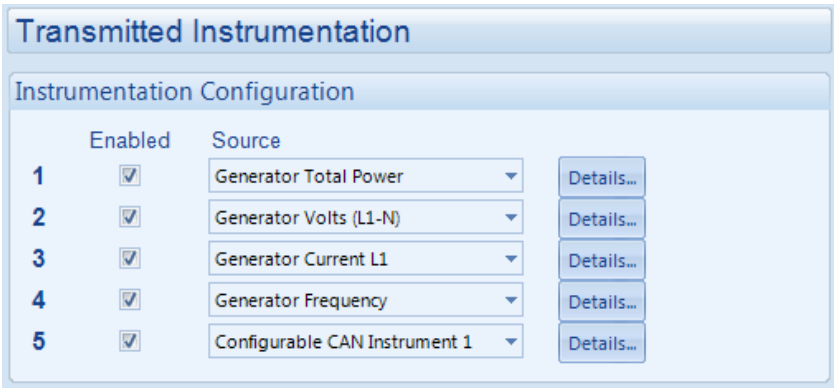
2.12.2 RECEIVED INTRUMENTATION (11-30)

NOTE: The *Received Instrumentation (11-30)* only have the default Description string. Description cannot be configured to the *Received Instrumentation (11-30).*

NOTE: The *Message Decoding Details* parameters of the *Received Instrumentation (11-30)* are exactly the same as the Received *Instrumentation (1-10).* Please refer to the previous subsection for the *Message Decoding Details*.

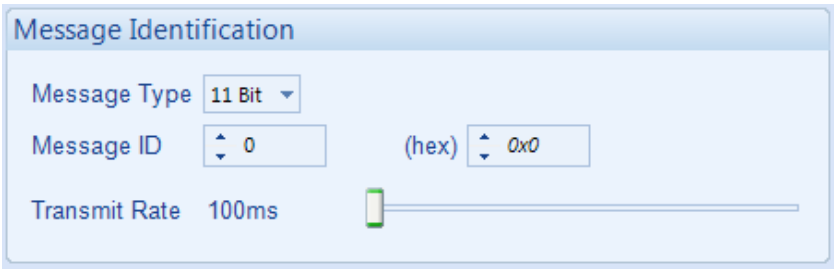
2.12.3 TRANSMITTED INSTRUMENTATION

The DSE module allows transmitting up to five instruments over the CANbus on the ECU port by specifying the source address (message ID) of the selected Instrument.



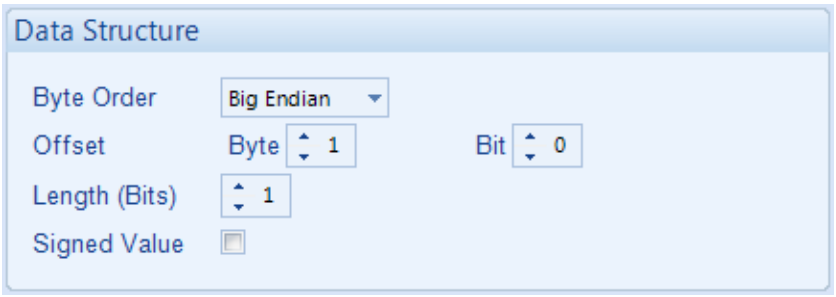
Parameter	Description
Enabled	☐ = The Transmit CAN instrumentation is disabled. ☑ = The Transmit CAN instrumentation is enabled.
Source	Select the instrument to be created over the CAN.
Details	Click on Details to set the *Message Encoding* CAN options.

2.12.3.1 MESSAGE IDENTIFICATION



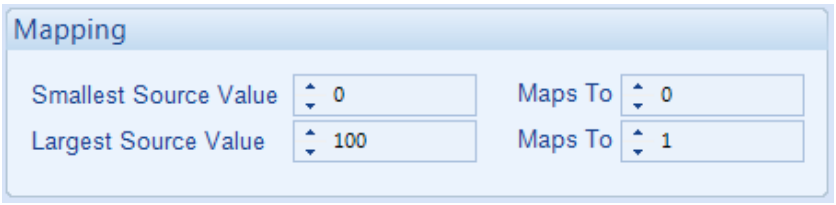
Parameter	Description
Message Type	Select the required message type to transmit: ***11 Bit*** message identifier for standard CAN ***29 Bit*** message identifier for extended CAN
Message ID	CAN message ID
Transmit Rate	The rate at which the *CAN Instrument* is transmitted over the CANbus.

2.12.3.2 DATA STRUCTURE



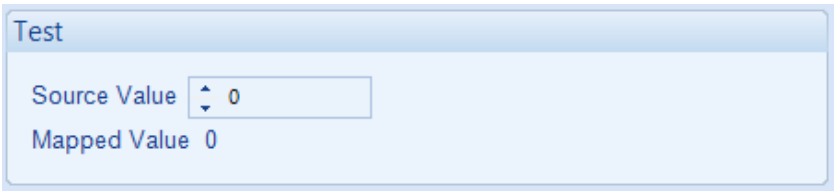
Parameter	Description
Byte Order	Select the *Byte Order* ***Big Endian*** the bytes on the bus are sent from the Most Significant Byte to the Least Significant Byte. ***Little Endian*** the bytes on the bus are sent from the Least Significant Byte to the Most Significant Byte.
Offset Byte	Set the start position Byte
Offset Bit	Set the start position Bit
Length (Bits)	Data length 1-32 bits
Signed Value	☐ = Transmit unsigned value ☑ = Transmit signed value

2.12.3.3 MAPPING



Parameter	Description
Smallest Source Value	The smallest instrument value before being sent over the CAN bus.
Maps To	The transmitted format for the *Smallest Source Value*.
Largest Source Value	The largest instrument value before being sent over the CAN bus.
Maps To	The transmitted format for the *Largest Source Value*.

2.12.3.4 TEST



Parameter	Description
Source Value	⚠**NOTE: The *Source Value* is not transmitted over the CANbus, this is only to check the encoded value.** This is a test case to check the representation of the *Source Value* when they are complicated. *Source Value* is the instrument value before being encoded.
Mapped Value	The *Mapped Value* represents the transmitted *Source value*.

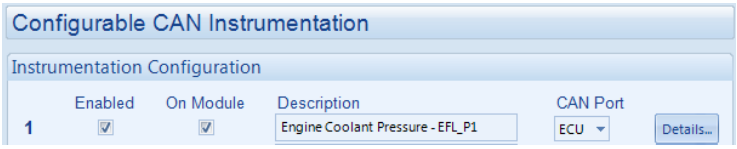
2.12.4 CONFIGURABLE CAN INSTRUMENTATION EXPORT/IMPORT

This feature is used to import the *Configurable CAN Instrumentation* settings in another DSE61xx MKII module.

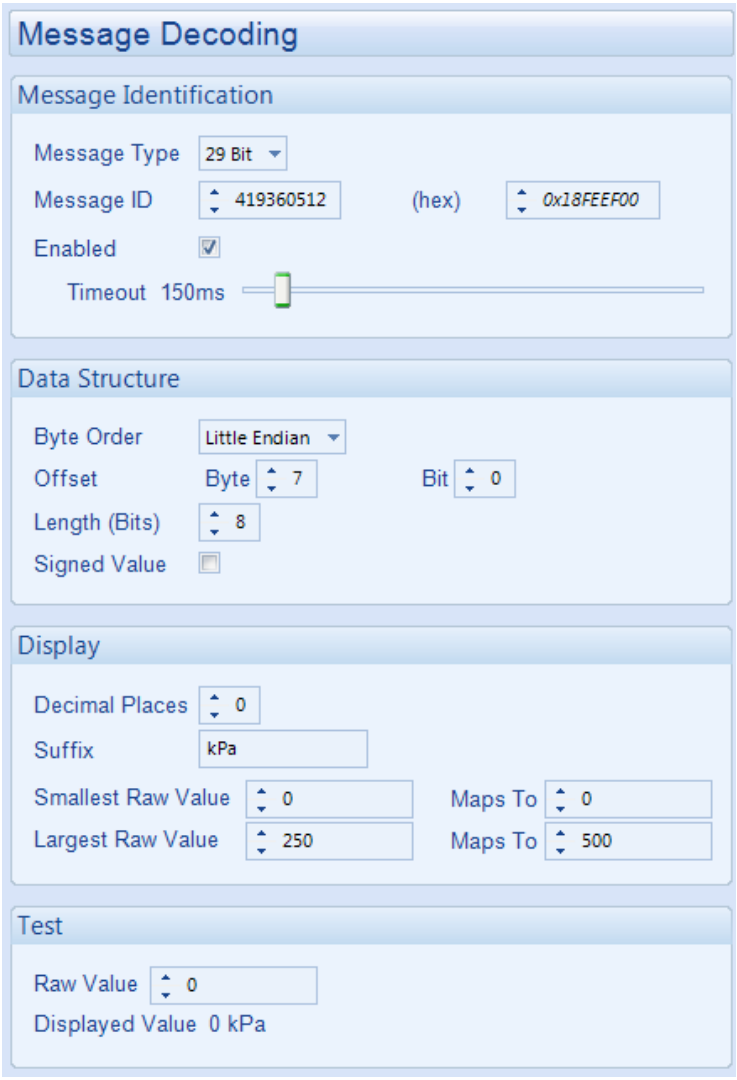
Parameter	Description
Export	This allows the configuration settings of all Configurable CAN Instrumentation (Received & Transmitted) into one XML file.
Import	This allows to import an existing configuration settings of all Configurable CAN Instrumentation saved in XML format.

EXAMPLE

Below is an example for the *Configurable CAN Instrumentation*.



Click on the *Details* next to the instrument to configure its *Message Decoding*.
An example is shown below for the *Message Decoding* of the *Configurable CAN Instrumentation*.



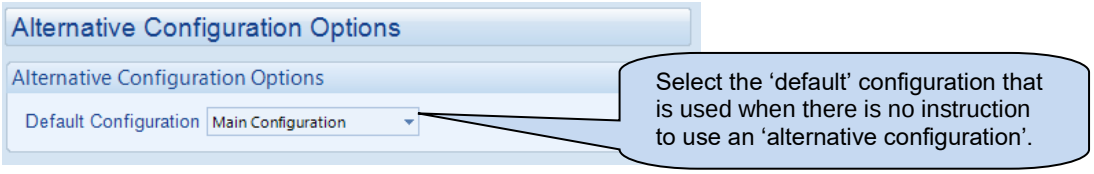
2.13 ALTERNATIVE CONFIGURATIONS

An Alternative Configuration is 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) 120V 50Hz and 240V 50Hz using a selector switch.

The Alternative Configuration is selected using either:

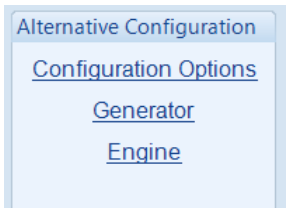
- Configuration Suite Software (Selection for 'Default Configuration')
- Module Front Panel Editor
- Via external signal to the module input configured to "Alternative Configuration" select.

2.13.1 ALTERNATIVE CONFIGURATION OPTIONS

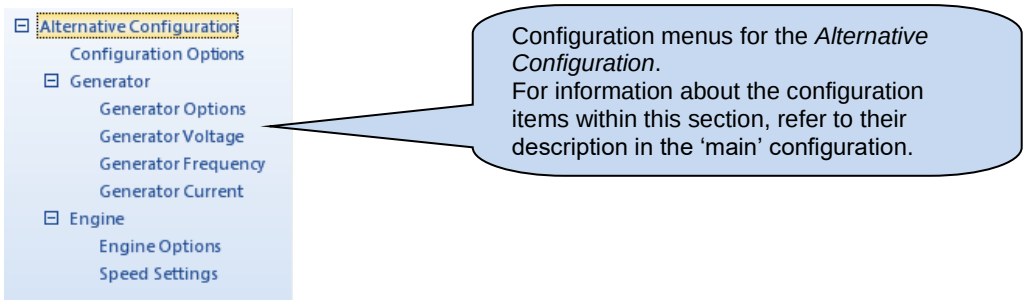


2.13.2 ALTERNATIVE CONFIGURATION

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

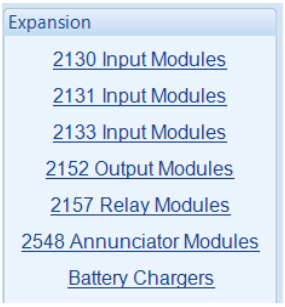


Alternative configuration options contain a subset of the main configuration. The adjustable parameters are not discussed here as they are identical to the main configuration options :



2.14 EXPANSION

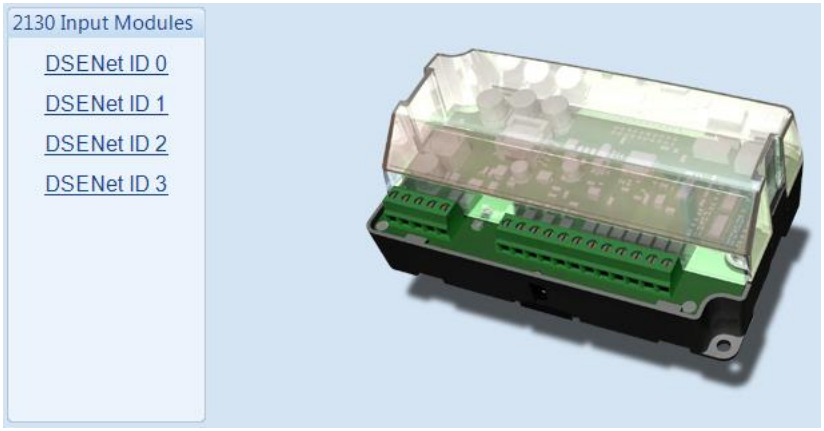
The *Expansion* page is subdivided into smaller sections.
Select the required section with the mouse.



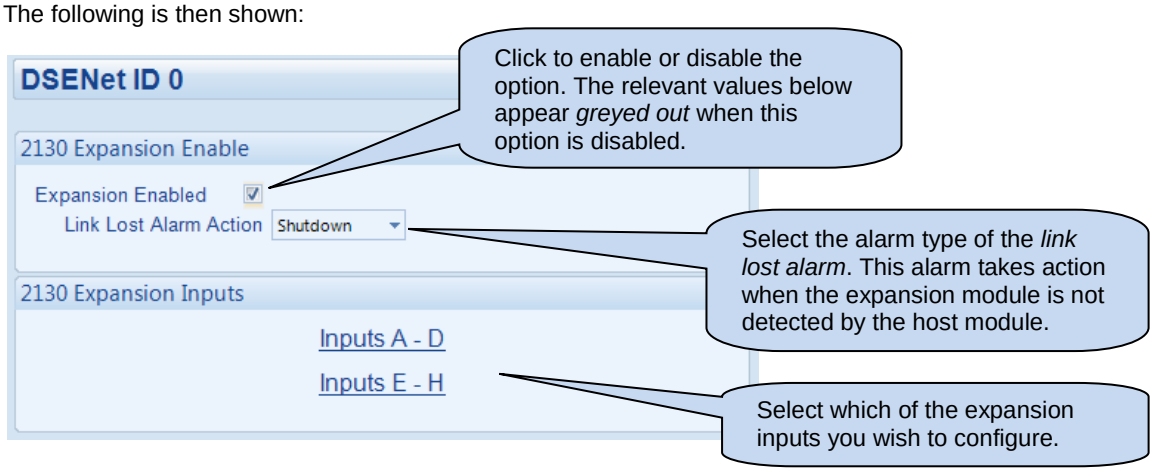
See overleaf for description of the different expansion modules.

2.14.1 2130 INPUT MODULES

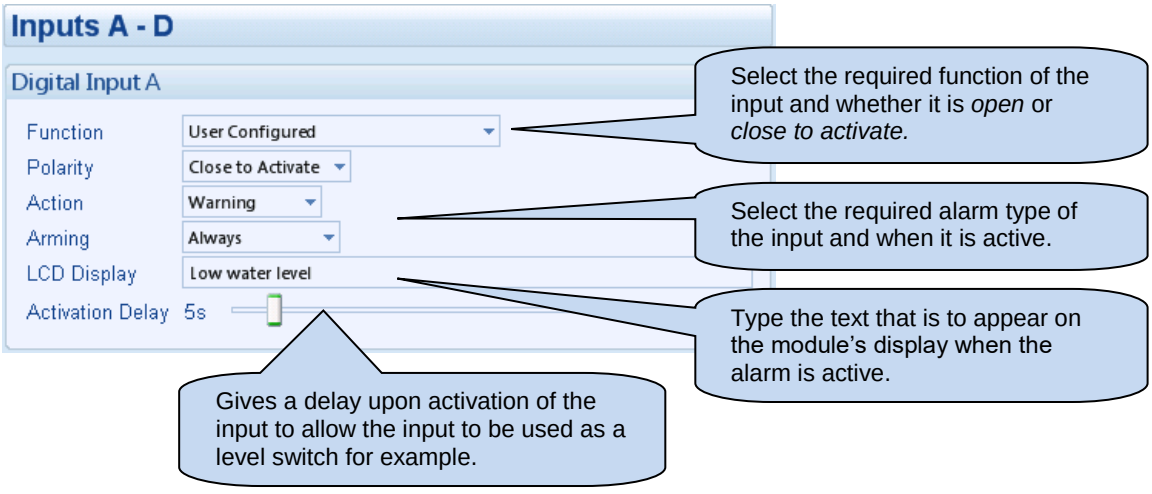
Select the DSENet ID of the input expansion you wish to configure.



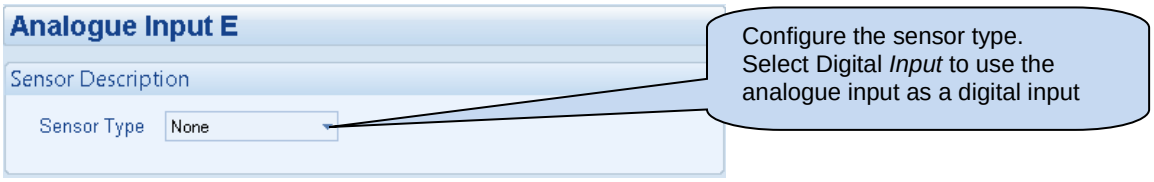
The following is then shown:



2.14.1.1 DIGITAL INPUTS (A-D)

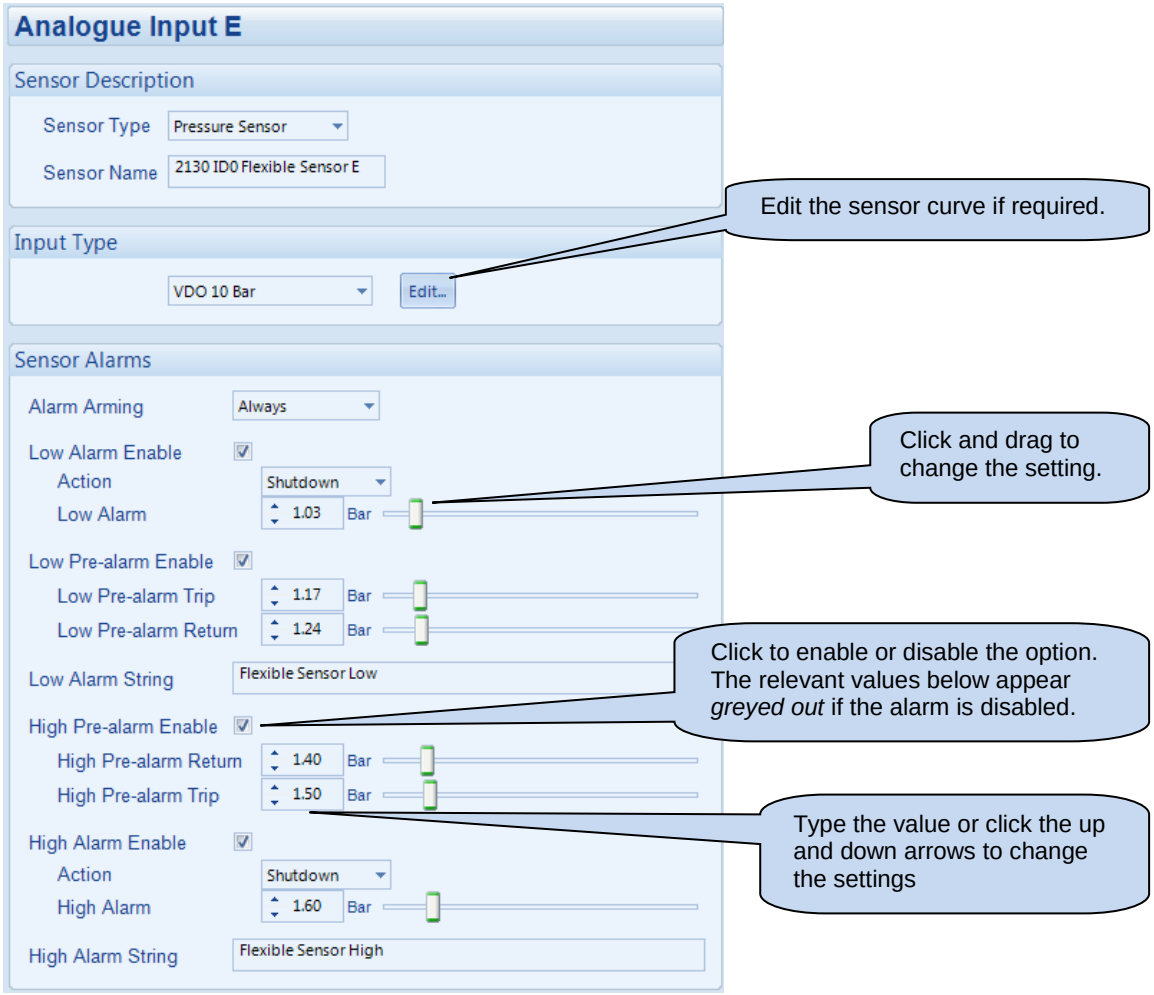


2.14.1.2 ANALOGUE INPUTS (E-H)

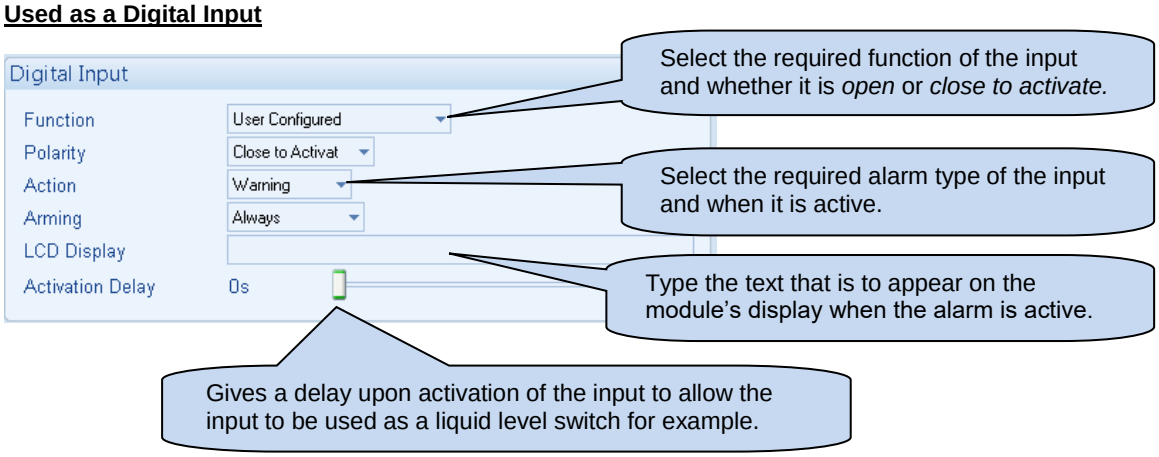


Depending upon your selection above, either the *Analogue Input* or *Digital Input* configuration screen is shown

Used as an Analogue Input

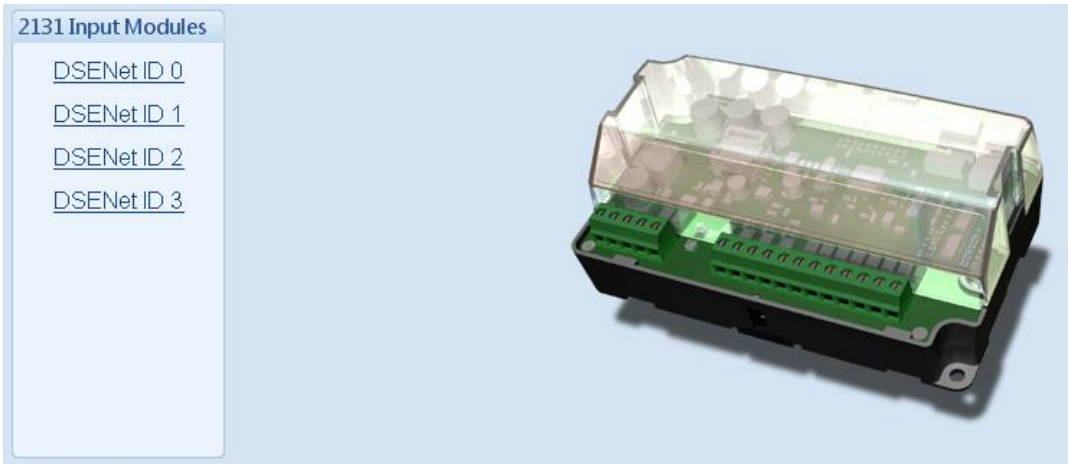


Used as a Digital Input

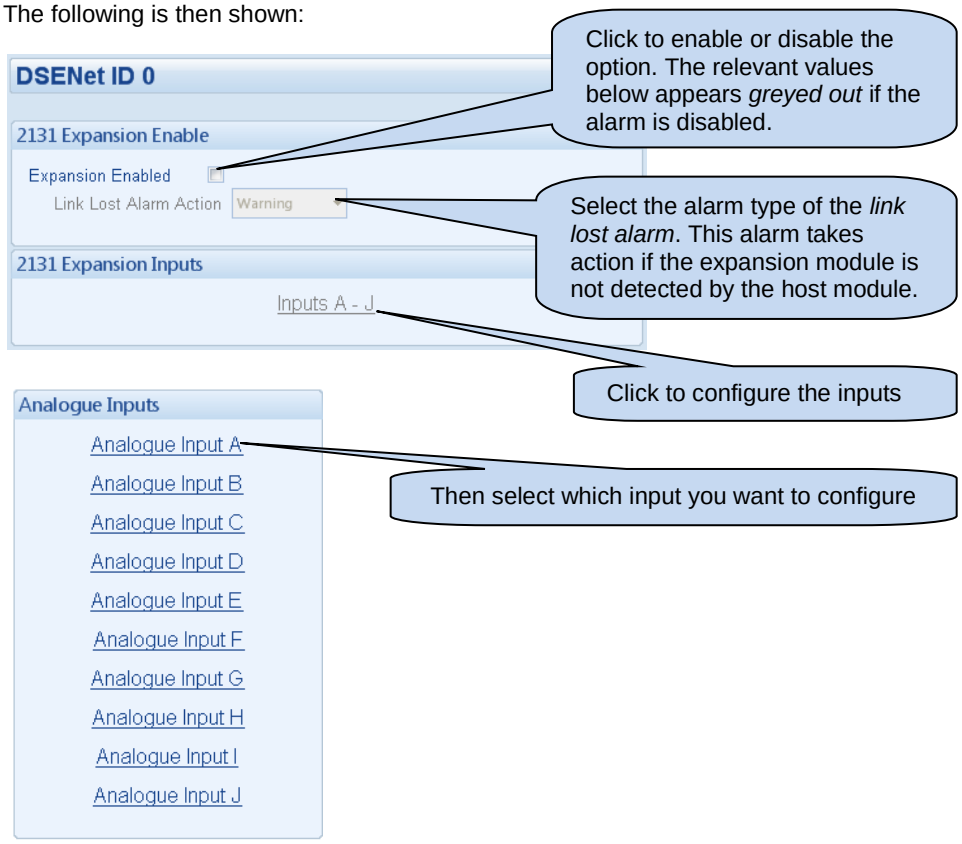


2.14.2 DSE2131 RATIOMETRIC EXPANSION INPUT MODULE

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

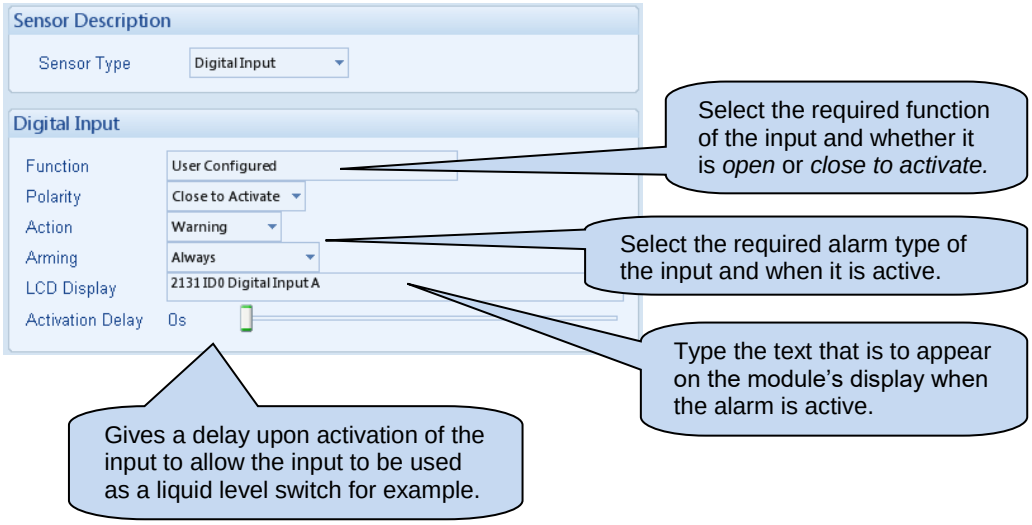


The following is then shown:

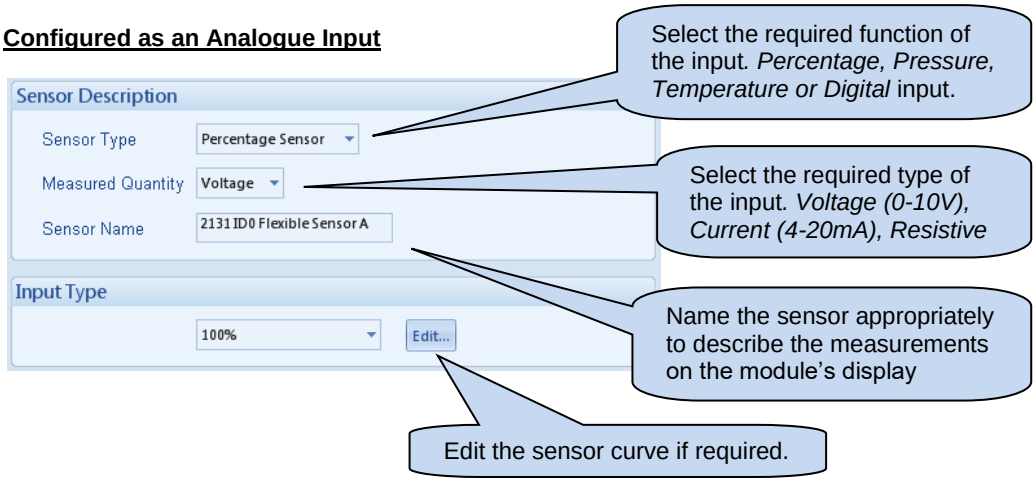


Depending upon your selection of *Sensor Type*, one of the following configuration screens are shown :

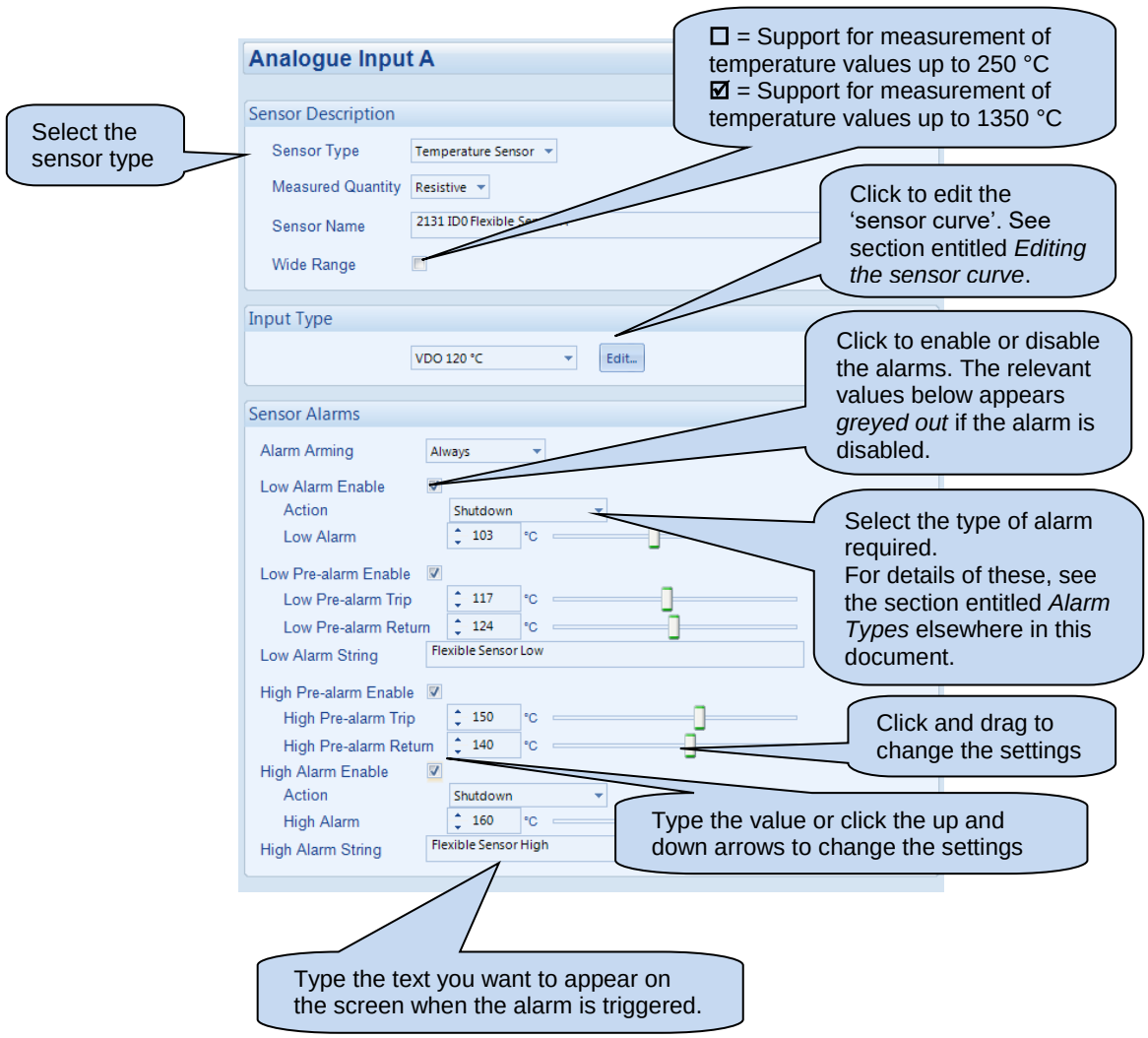
Configured as a Digital Input



Configured as an Analogue Input

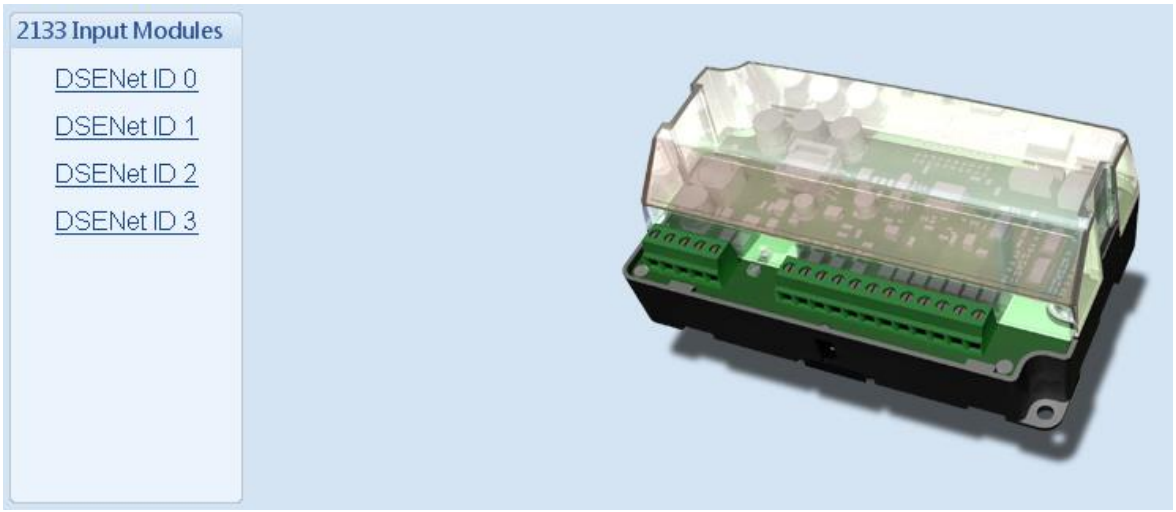


The following screen shot shows the configuration when set for *Temperature Sensor.* When set to other Sensor Type, consult the relevant manual section for details (Digital inputs, Oil Pressure input etc)

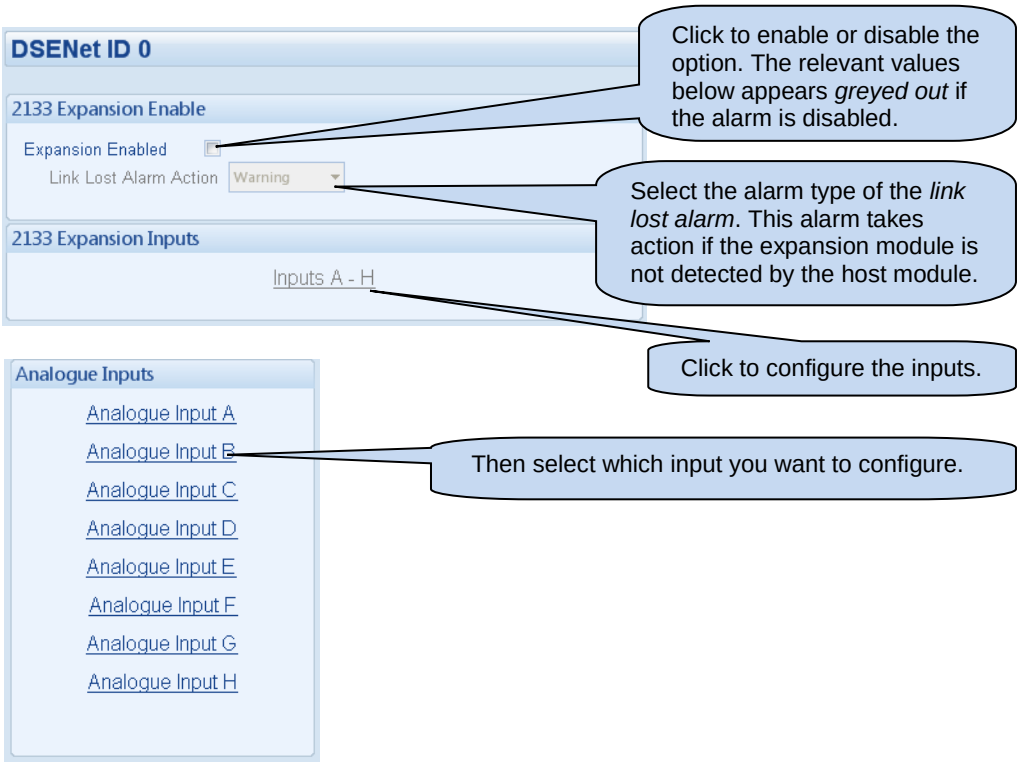


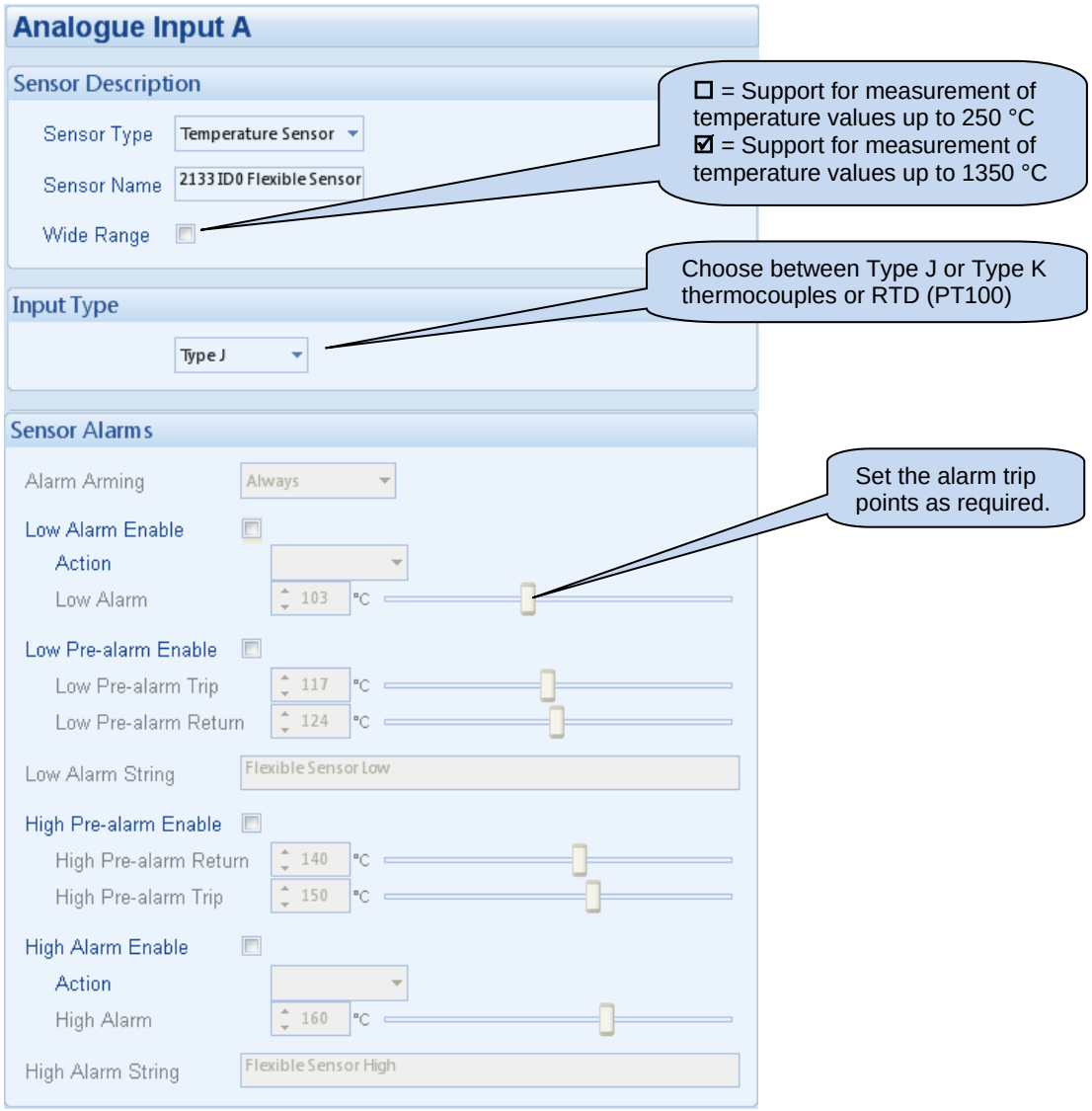
2.14.3 DSE2133 RTD / THERMOCOUPLE INPUT MODULE

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



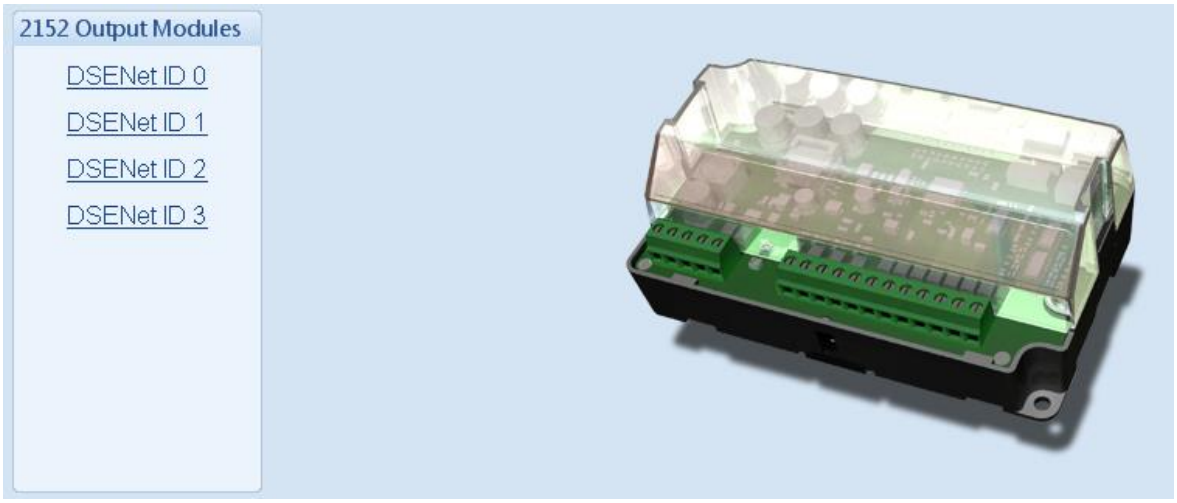
The following is then shown:



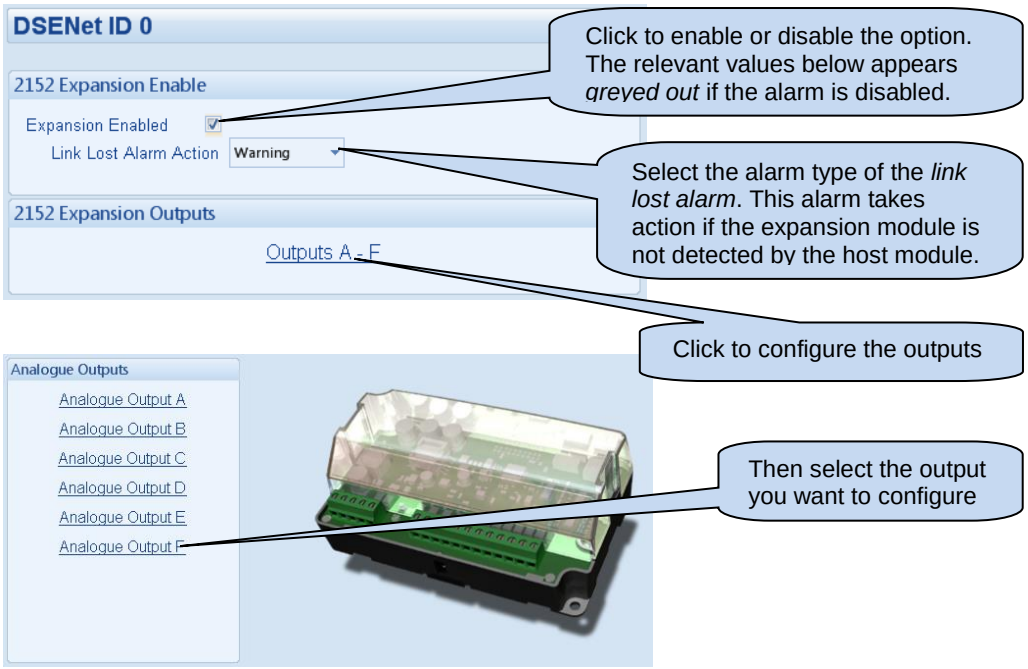

Analogue Input A
Sensor Description
Sensor Type
Temperature Sensor
Sensor Name
2133ID0 Flexible Sensor
Wide Range
☐ = Support for measurement of temperature values up to 250 °C
☑ = Support for measurement of temperature values up to 1350 °C
Input Type
Type J
Choose between Type J or Type K thermocouples or RTD (PT100)
Sensor Alarms
Alarm Arming
Always
Low Alarm Enable
Action
Low Alarm
103
°C
Set the alarm trip points as required.
Low Pre-alarm Enable
Low Pre-alarm Trip
117
°C
Low Pre-alarm Return
124
°C
Low Alarm String
Flexible Sensor Low
High Pre-alarm Enable
High Pre-alarm Return
140
°C
High Pre-alarm Trip
150
°C
High Alarm Enable
Action
High Alarm
160
°C
High Alarm String
Flexible Sensor High

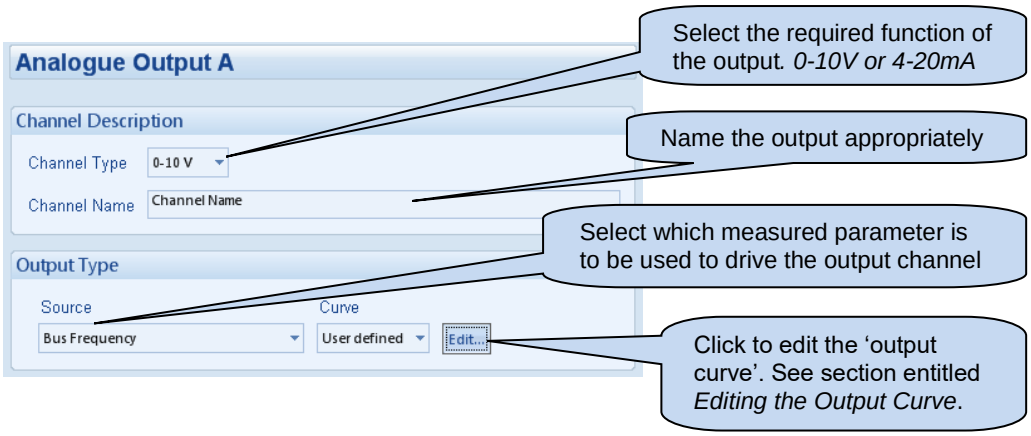
2.14.4 DSE2152 ANALOGUE OUTPUT MODULE

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

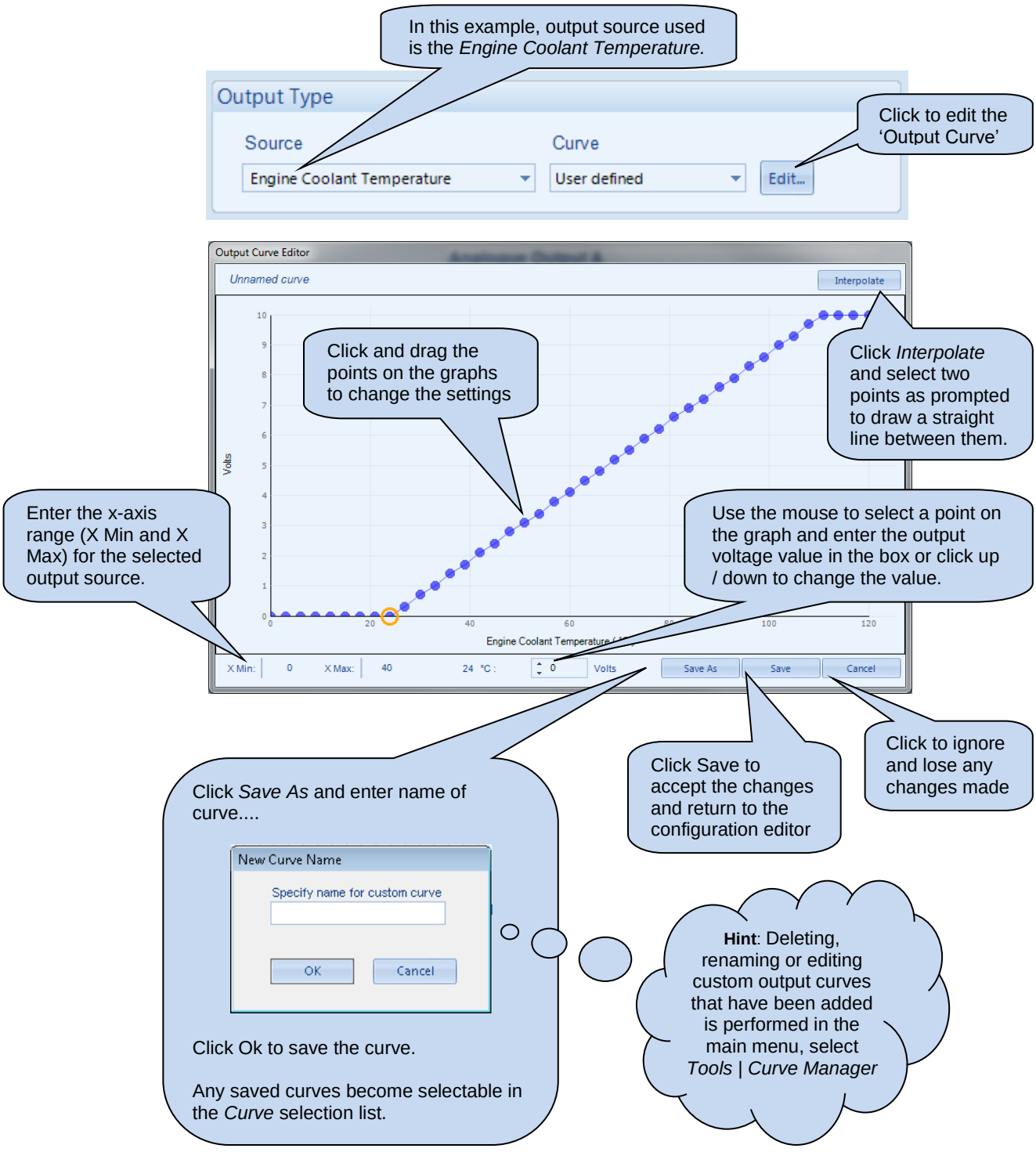


The following is then shown:



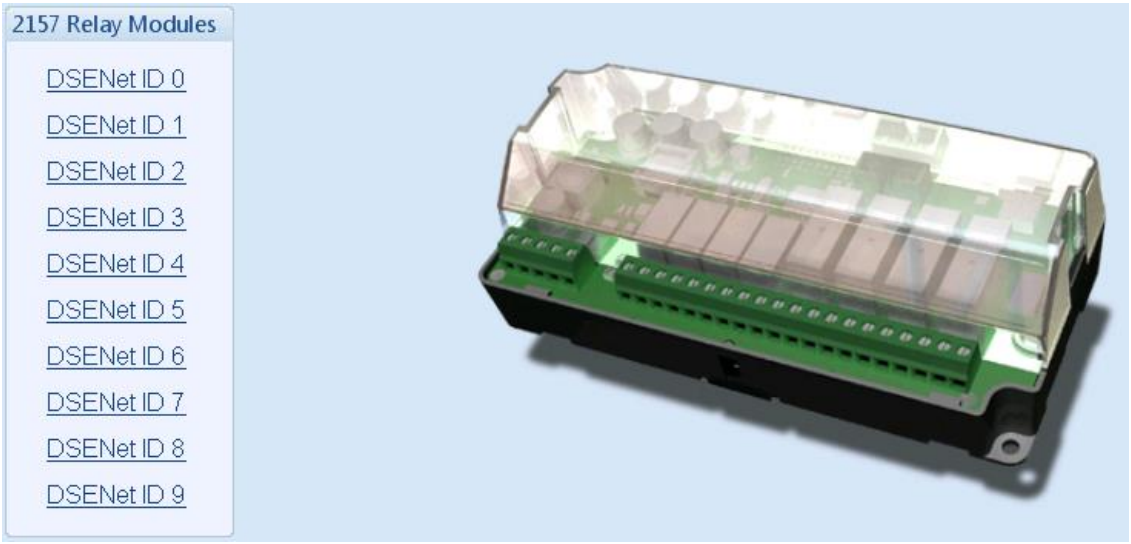


2.14.4.1 EDITING THE OUTPUT CURVE

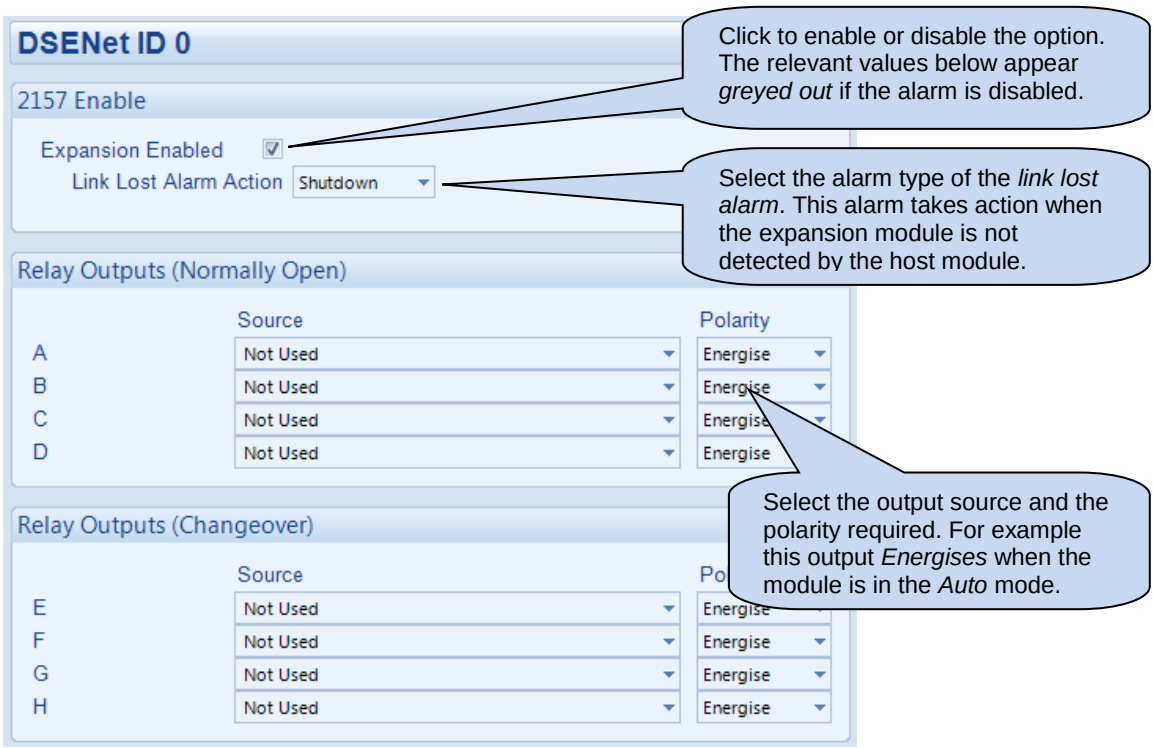


2.14.5 2157 RELAY MODULES

Select the DSENet ID of the relay expansion you wish to configure.

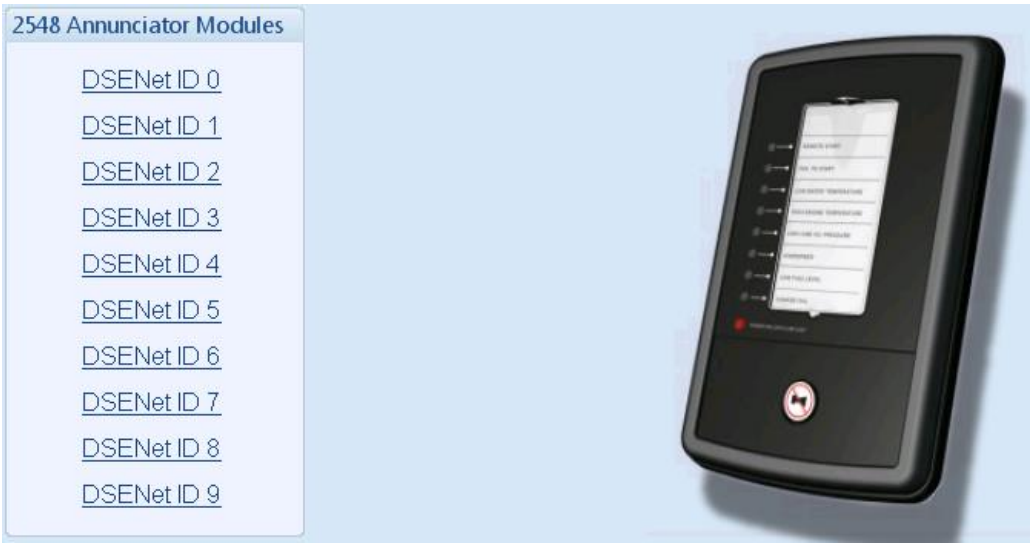


The following is then shown:

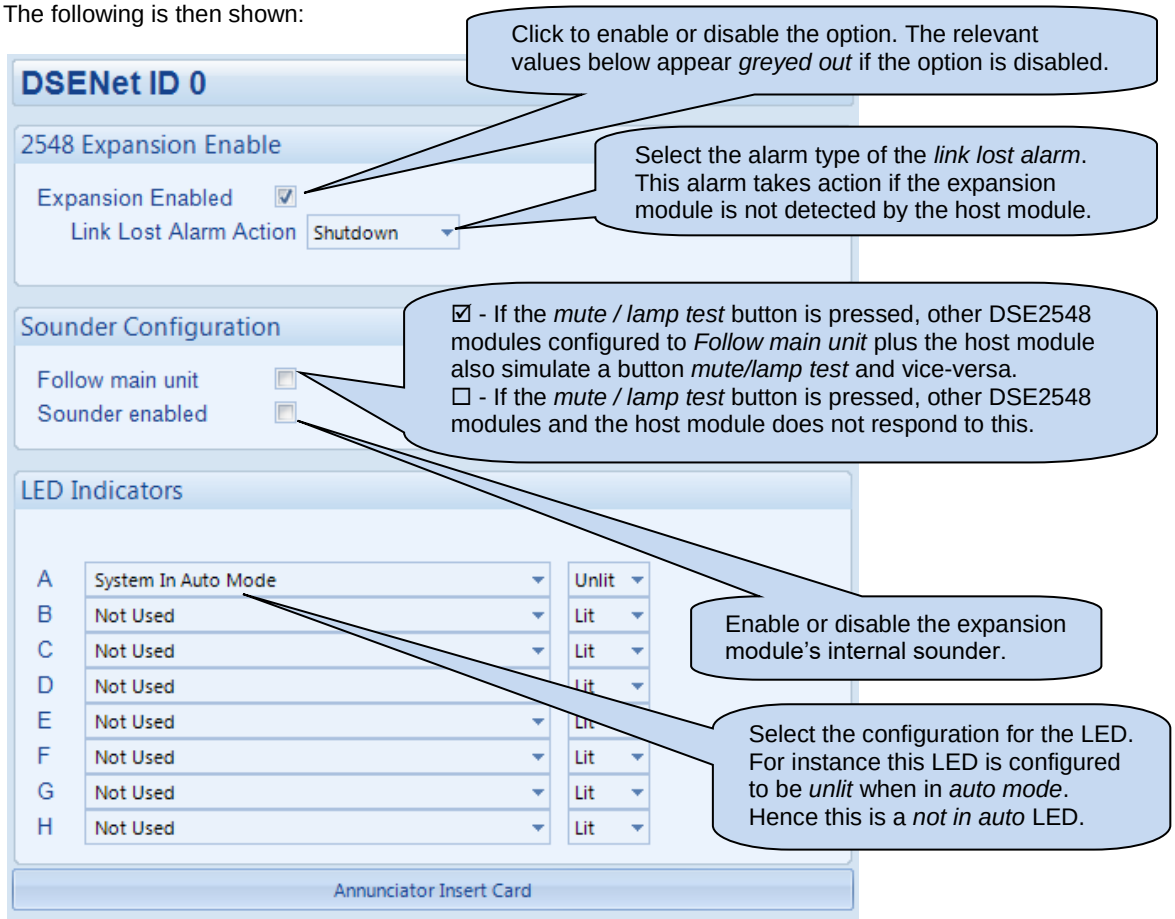


2.14.6 2548 LED EXPANSION

Select the DSENet ID of the LED expansion you wish to configure.



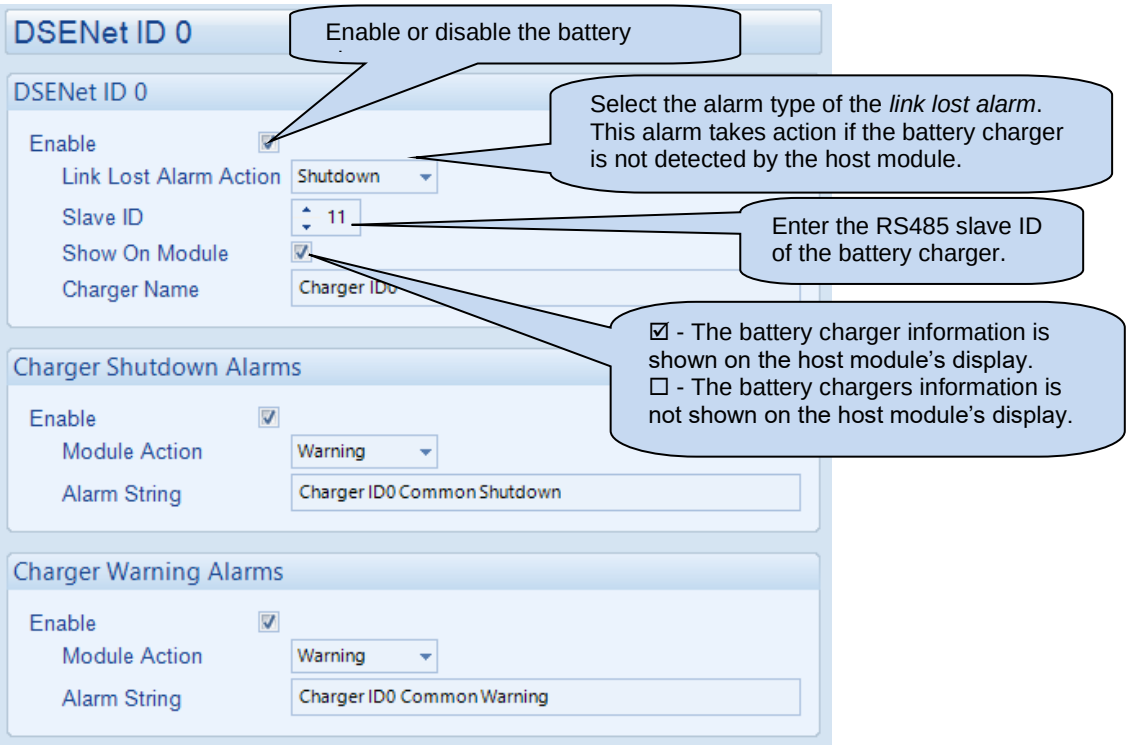
The following is then shown:



2.14.7 BATTERY CHARGERS

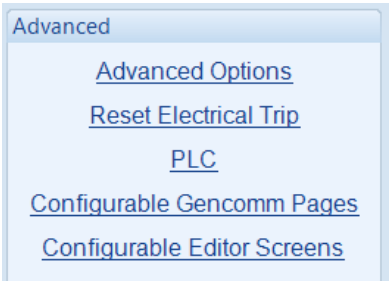
Select the DSENet ID of the Battery Charger you wish the DSE host controller to communicate too. This enables the DSE host controller to display battery charger parameters and alarms.

The following is then shown:



2.15 ADVANCED

These settings are provided for *advanced* users only. Take care when changing these options and ensure you fully understand the consequences of any change made.



2.15.1 ADVANCED OPTIONS

Parameters are detailed overleaf…

2.15.1.1 PROTECTIONS

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

WARNING! - Enabling this feature prevents the set being stopped upon critical alarm conditions. All shutdown alarms are disabled with the exception of EMERGENCY STOP which continues to operate.

Options	Description
Disable	**NOTE: Writing a configuration to the controller that has “Protections Disabled” configured, results in a warning message appearing on the PC screen for the user to acknowledge before the controller’s configuration is changed. This prevents inadvertent activation of the feature.** ☐ = The module operates as normal and provide engine shutdown if required. ☑ = *Protections disabled* function is activated. Operation depends upon the following configuration.
Protections are disabled	***Never*** : The protections are not disabled ***Always***: Protections are always overridden by the DSE controller. ***On Input*** : Protections are disabled whenever a configurable input set to *Protections Disabled* is activated
Protections Disabled Alarm Action	If *Disable All Protections* is set to *On Input*, this selection allows configuration of an alarm to highlight that the protections have been disabled on the engine. ***Indication****:* Any output or LCD display indicator configured to *Protections Disabled* is made active; however the internal alarm sound does not operate. ***Warning****:* Any output or LCD display indicator configured to *Protections Disabled* is made active, and the internal alarm sound operates. When protections are disabled, *Protections Disabled* appears on the module display to inform the operator of this status.

2.15.1.2 OUT OF SYNC

During parallel operation, the phase of both supplies is monitored. Being in parallel means that this phase angle is zero degrees (0º).

If the angle exceeds the *Out of Sync Angle* for longer than the duration of the *Out of Sync Timer*, an electrical trip alarm is generated taking the set off load and into the cooling timer, after which the set is stopped.

TROUBLESHOOTING

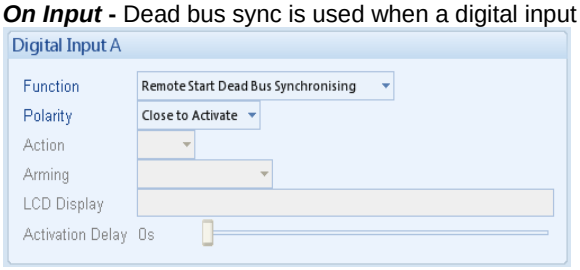
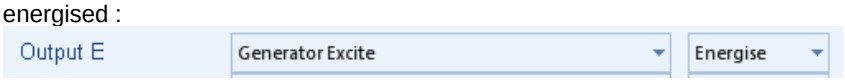
This sections describes the most common causes for an *Out of Sync* alarm:

- The *Bus Sensing* connections have not been made between the common generator bus and the DSE module, or the bus sensing fuses have blown or have been removed.
- The load switching device does not close quickly enough. Ensure the breaker closes within 100mS of receiving the close signal.
- The *Out of Sync* timer is set too low. If you raise this timer away from the factory setting of 200mS (0.2s), ensure you understand why you are raising it!
- Something external has caused the breaker to open, or has prevented it from closing. Typical examples are external G59 relays and other equipment operating directly on the breaker to open it.
- The breaker wiring ‘logic’ may not be correct, causing the breaker to ‘fire through’, where it triggers the close mechanism, but the breaker doesn’t actually mechanically close, it re-opens again.

2.15.1.3 OTHER TIMERS

Options	Description
Synchronisation Delay	Delays the synchronising process to allow the set to stabilise and power parasitic loads or transformers (for instance) before the synchronising process begins.
Dead Bus Run On	Delays the *Load Demand Scheme* becoming active upon closing the breaker.
Mains Decoupling Supervision	Delays the activation of the inbuilt 8600 Mains Decoupling detection when generator and mains are in parallel. Upon closing into parallel, the timer is activated. After the timer has expired, the mains decoupling protection becomes live.
Interlock override off	Timer to delay the re-assertion of the interlock override.

2.15.1.4 DEAD BUS SYNCHRONISING

Options	Description
Enable	☐ = 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 ☑ = The Dead Bus Synchronising feature is activated as configured below.
Sync mode	***Always*** - Dead bus sync is always used when the generators are required to be on line and in the *Auto* mode (Dead bus sync does not operate in *Manual* mode in any circumstance. ***Disabled*** – The feature is not active ***On Input*** **-** Dead bus sync is used when a digital input is active :  ***On Request From xx60*** – The feature is only used when a start request is received from a DSExx60 module
Excitation Speed	The speed at which the engine is deemed to be running fast enough for the excitation to be energised :  Any sets not reaching this speed by the end of the *excitation delay* open their breakers and are removed from the Dead Bus Sync System.
Start Delay	Time delay used at start up to ensure the start request is not simply a fleeting request.
Excitation Delay	During engine run up, if the *Excitation Speed* is not achieved by the end of the *Excitation Delay*, the set is removed from the Dead Bus Sync system and attempts to synchronise in the 'traditional' way.
Excitation Ramp Time	The time allowed for the excitation field to build after being energised. At the end of this time, all frequency and voltage alarms are active.

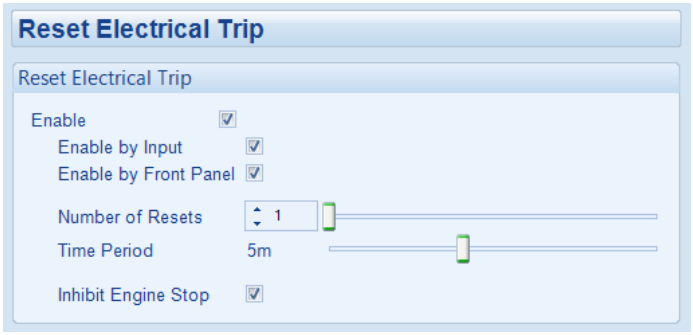
2.15.1.5 AVR

NOTE: Ensure the generator is adequately designed to cater for voltage adjustment.

Options	Description
Allow Live Nominal Voltage Adjust	☐ = Adjustment of nominal voltage is disabled. ☑ = The nominal voltage is adjusted through the running editor on the module display.

2.15.2 RESET ELECTRICAL TRIP ALARM

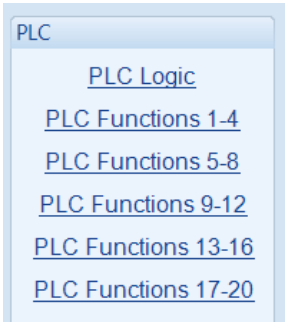
This feature is provided to assist the system designer in meeting specifications requirements to ensure the generator (if running) is able to take load again after the *Electrical Trip* alarm has been reset. Depending upon configuration, the generator may go into a cooling run or be inhibited from stopping after the *Electrical Trip* alarm activates.



Options	Description
Enable	**NOTE: Writing a configuration to the controller that has "Reset Electrical Trip" enabled, results in a warning message appearing on the PC screen for the user to acknowledge before the controller's configuration is changed. This prevents inadvertent activation of the feature.** ☐ = If an Electrical Trip alarm is reset, the generator must continue to cooldown before it becomes available again. ☑ = If an Electrical Trip alarm is reset, the generator is placed back on load if requested.
Enable by Input	**NOTE: Can only be enabled if an input is configured to *Reset Electrical Trip.*** ☐ = *Reset Electrical Trip* only by pressing the ***Close Generator*** button (if enabled). ☑ = *Reset Electrical Trip* by an input configured for *Reset Electrical Trip* and/or by pressing the ***Close Generator*** button (if enabled).
Enable by Front Panel	☐ = *Reset Electrical Trip* only by activating an input configured for *Reset Electrical Trip* (if enabled). ☑ = *Reset Electrical Trip* by pressing the ***Close Generator*** button and/or activating an input configured for *Reset Electrical Trip* (if enabled).
Number of Resets	The number of times any electrical trips can be reset whilst the generator is running to enable it to go back on load. The counter goes to zero upon the generator stopping.
Time Period	The time interval for the *Number of Resets*. If the *Number of Resets* is reached within configured *Time Period*, no more resets can occur until the generator has stopped.
Inhibit Engine Stop	**NOTE: Writing a configuration to the controller that has "Inhibit Engine Stop" enabled, results in a warning message appearing on the PC screen for the user to acknowledge before the controller's configuration is changed. This prevents inadvertent activation of the feature.** ☐ = When an Electrical Trip alarm activates, the generator's load switch opens and the generator goes into a cooling run before shutting down. ☑ = When an Electrical Trip alarm activates, the generator's load switch opens and the generator continues to run with the *Electrical Trip Stop Inhibited Warning* alarm active.

2.15.3 PLC

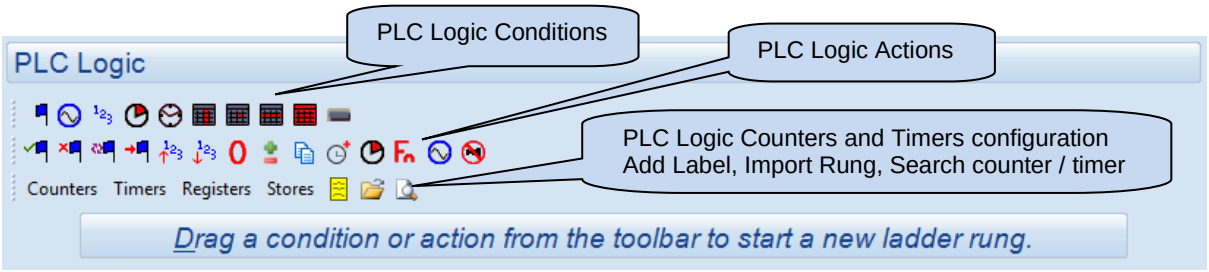
The *PLC* section is subdivided into smaller sub-sections.



2.15.3.1 PLC LOGIC

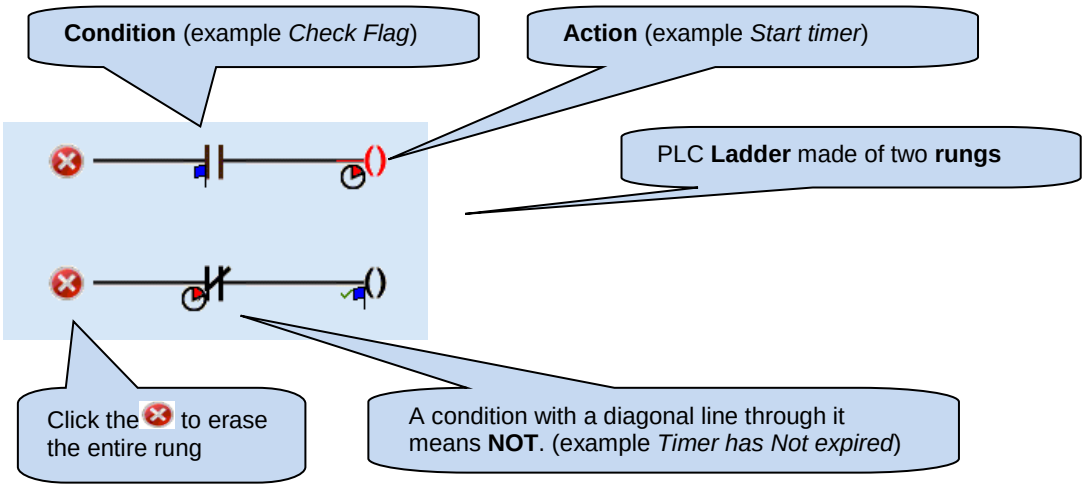
NOTE: For further details and instructions on PLC Logic and PLC Functions, refer to DSE Publication: *057-175 PLC Programming Guide* which is found on our website: *www.deepseaplc.com*

The PLC Logic adds comprehensive PLC functionality to the DSE controller.
This is an advanced section, used entirely at your own risk.



In PLC logic, the *ladder* of logic is made up of a series of *rungs*.
The ladder is the complete PLC *program*. This program may perform a single task, or multiple tasks.
Each rung contains a number of *conditions* and *actions*.

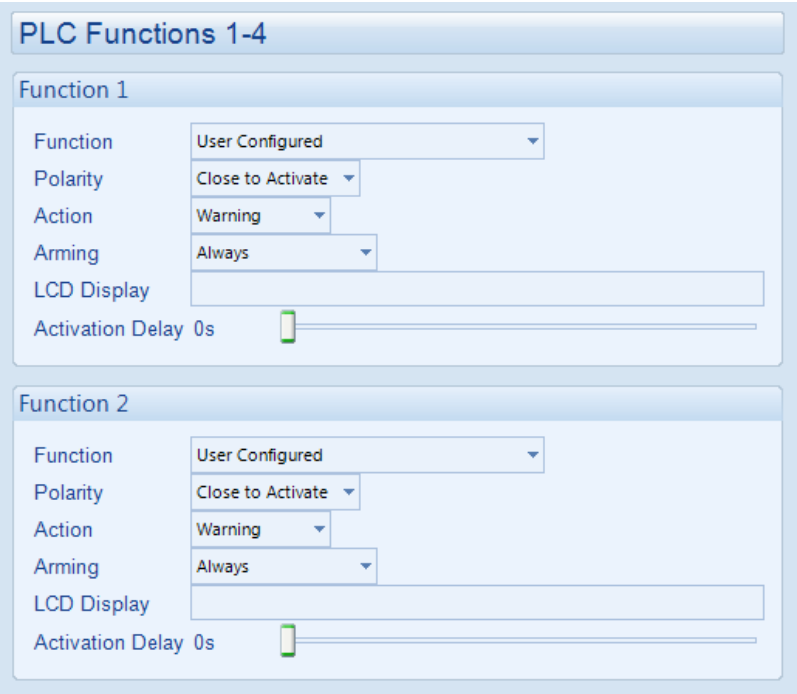
For instance if the conditions in the rung are met, the action takes place.



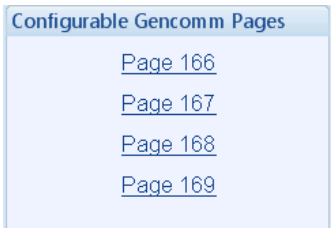
2.15.3.2 PLC FUNCTIONS

NOTE: For further details and instructions on PLC Logic and PLC Functions, refer to DSE Publication: *057-175 PLC Programming Guide* which is found on our website: *www.deepseaplc.com*

PLC Functions allow the PLC logic to create alarm conditions or drive 'virtual inputs' on the controller.
A PLC function is configured in the same way as a module digital input.

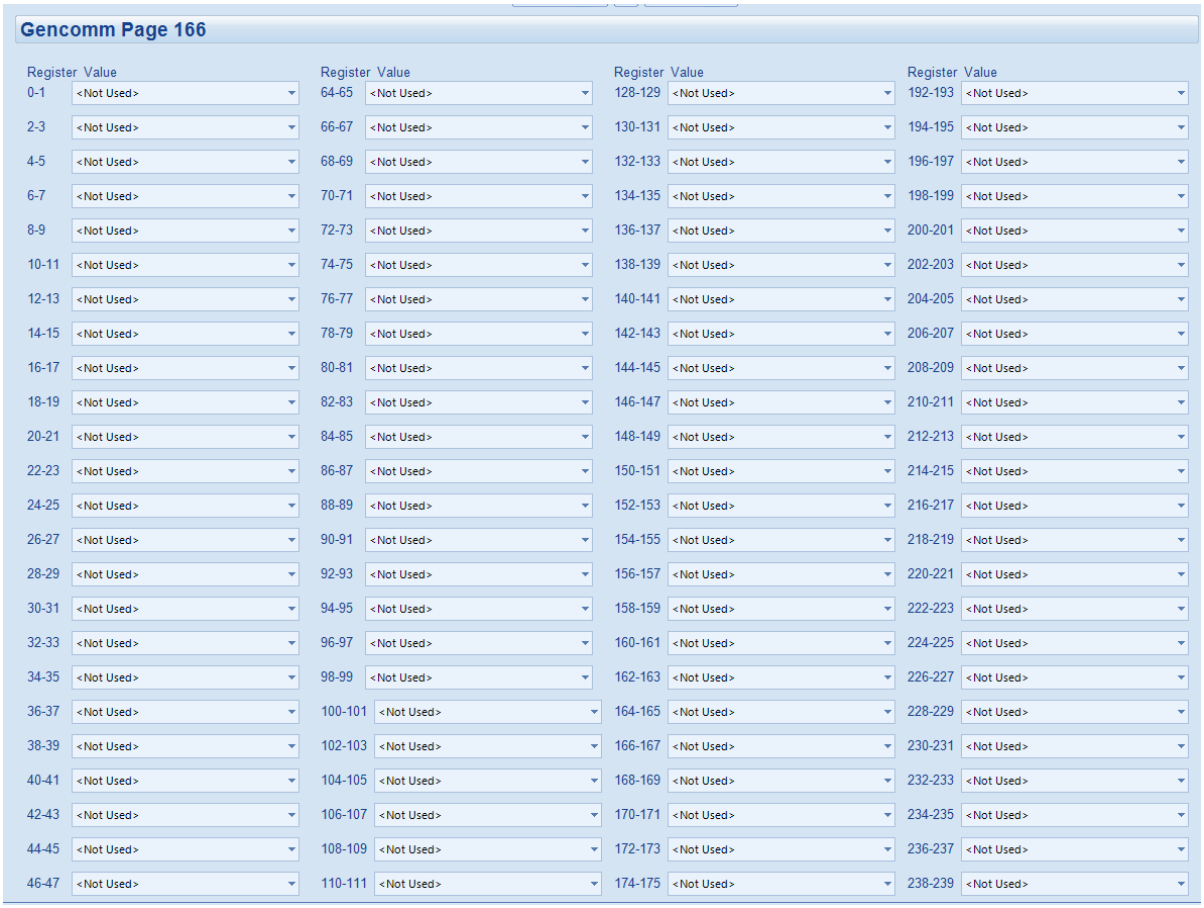


2.15.4 CONFIGURABLE GENCOMM PAGES



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.

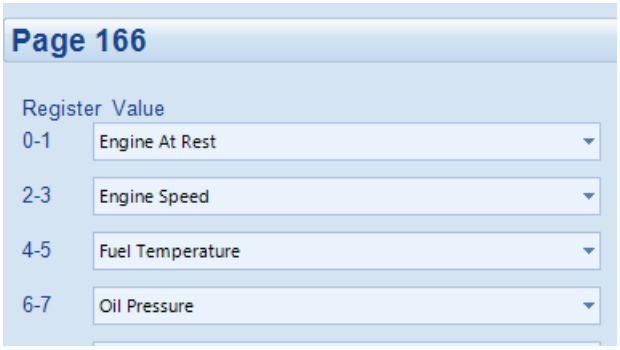
All configurable Gencomm registers are 32-bit unsigned format.



The configurable modbus pages are:

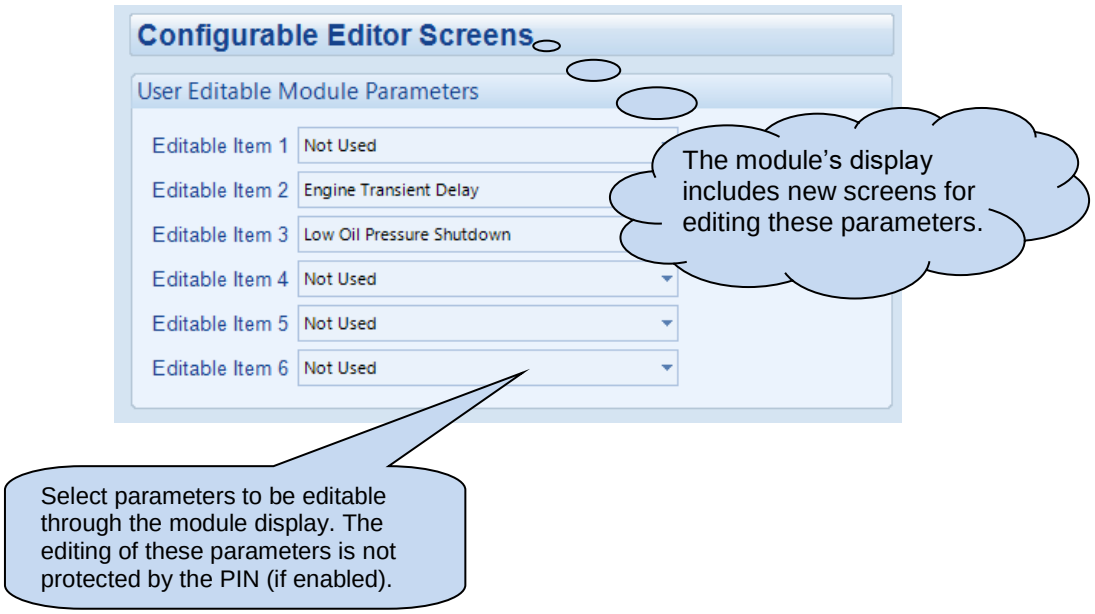
Page	Hex address	Decimal address
166	A600	42496
167	A700	42752
168	A800	43008
169	A900	43264

Example of Gencomm page configuration:



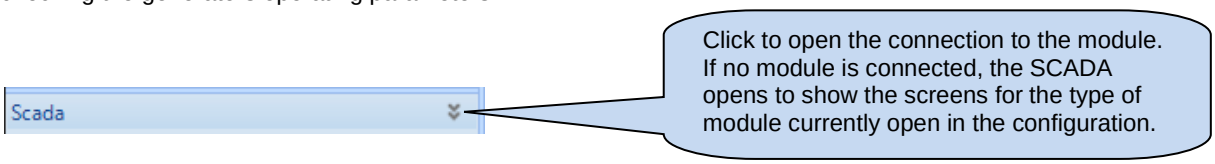
The register address is obtained from the formula: register_address=page_number*256+register_offset.
To read the *Engine Speed* from the above register, the Modbus master device needs to read the data in two registers and then combine the data from the Most Signficant Bit and the Least Significant Bit.
MSB address in Decimal = (166 * 256) + 2 = 42498
LSB address in Decimal = (166 * 256) + 3 = 42499

2.15.5 CONFIGURABLE EDITOR SCREENS

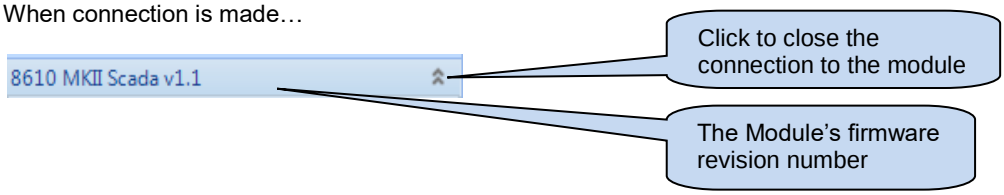


3 SCADA

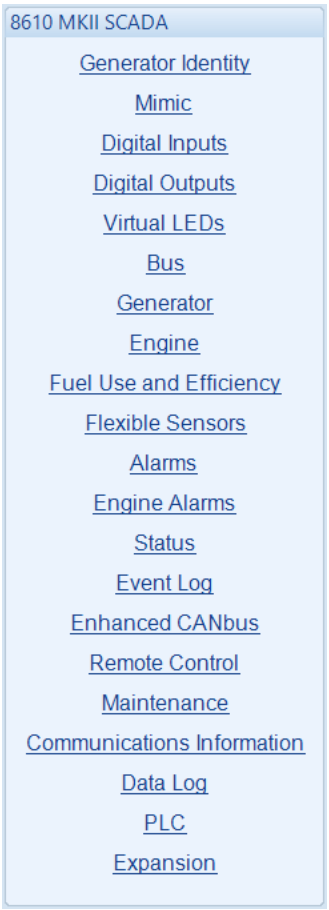
SCADA stands for **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition and is provided both as a service tool and also as a means of monitoring / controlling the generator set.
As a service tool, the SCADA pages are to check the operation of the controller's inputs and outputs as well as checking the generators operating parameters.



When connection is made…

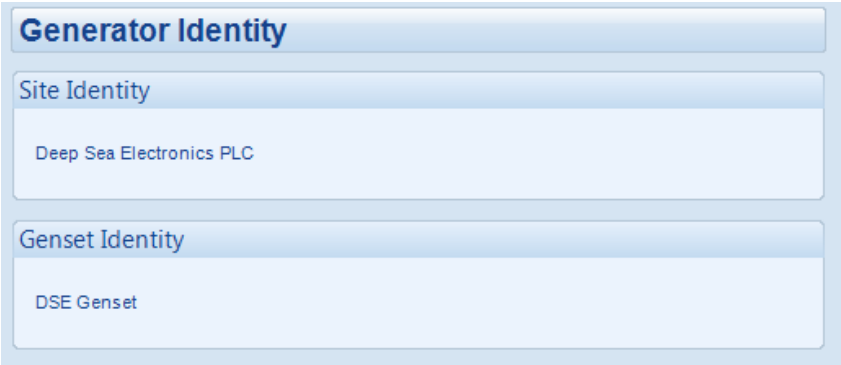


The *SCADA* page is subdivided into smaller sections.
Select the required section with the mouse.



3.1 GENERATOR IDENTITY

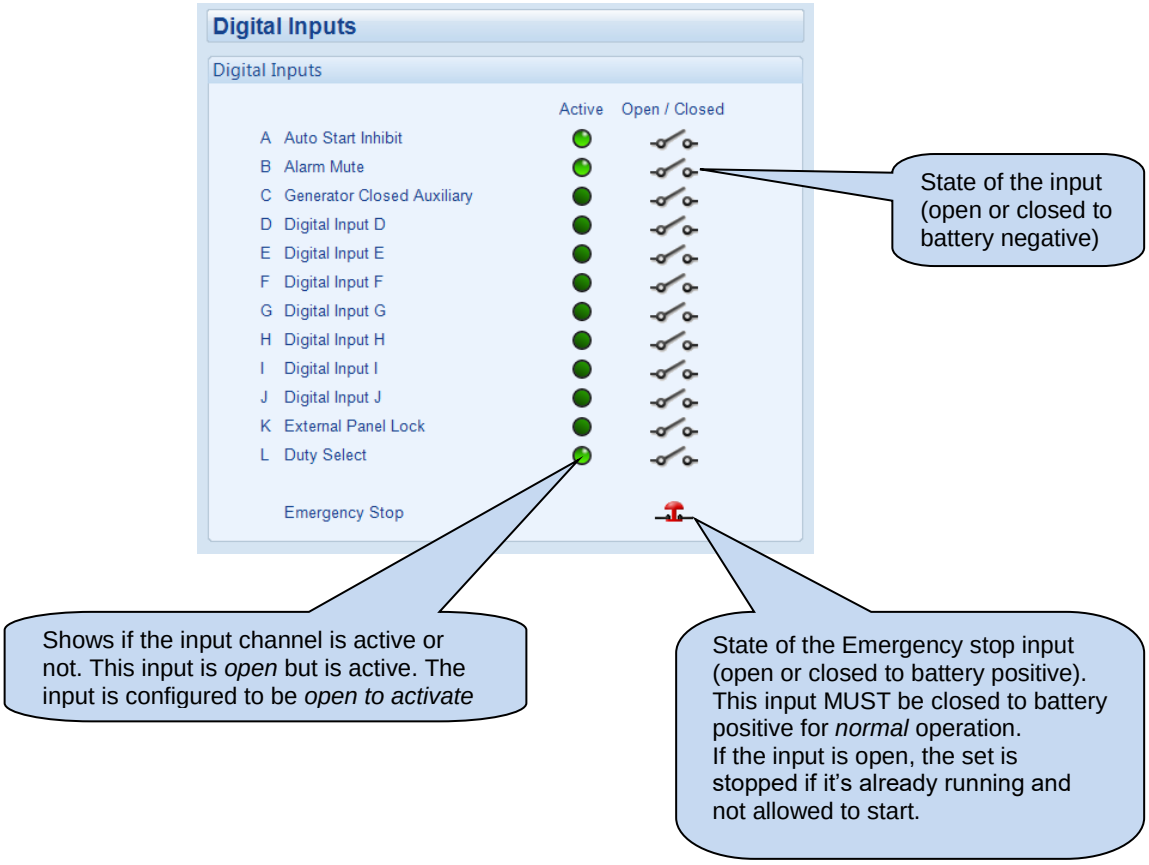
Shows the module's current settings for *Site ID* and *Genset ID*



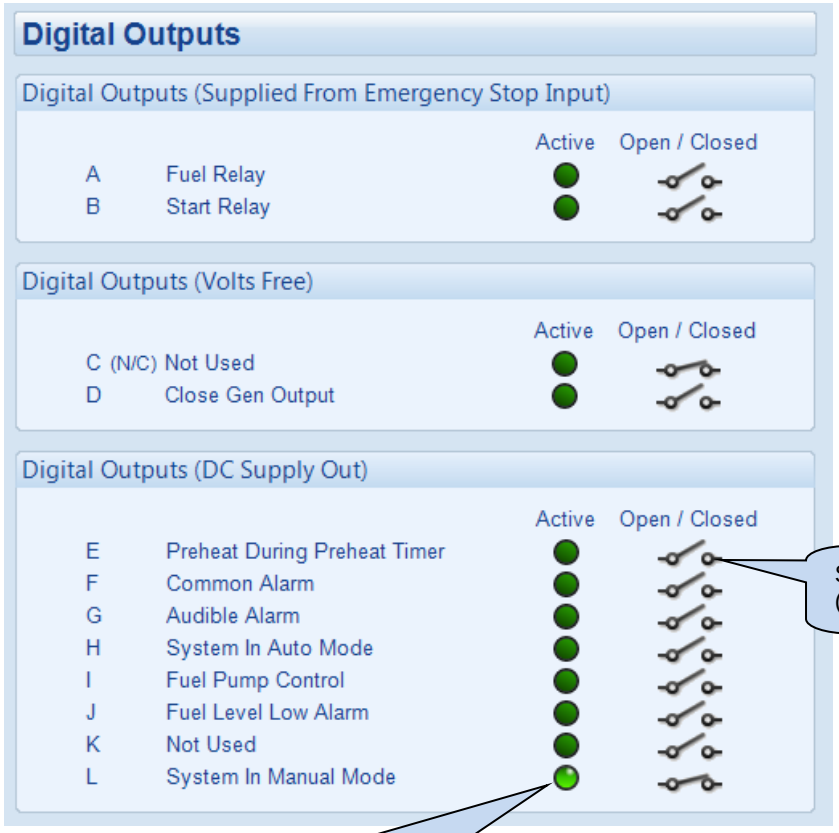
3.2 MIMIC

This screen provides a mimic of the control module and allows the operator to change the control mode of the module.

3.3 DIGITAL INPUTS

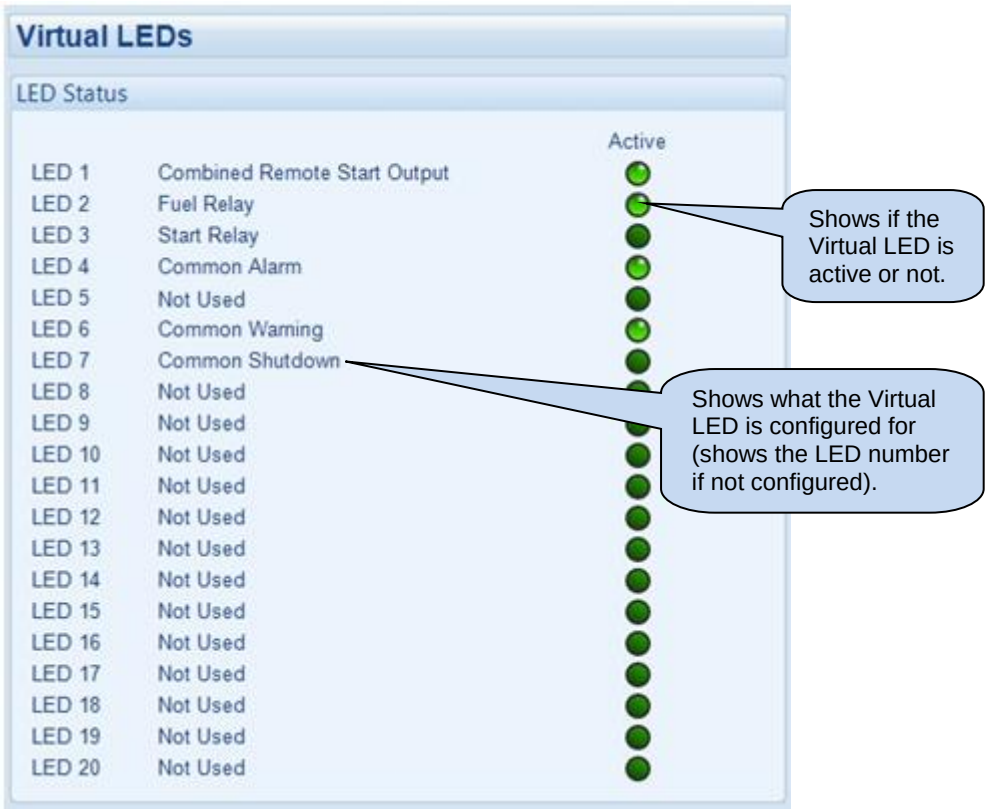


3.4 DIGITAL OUTPUTS



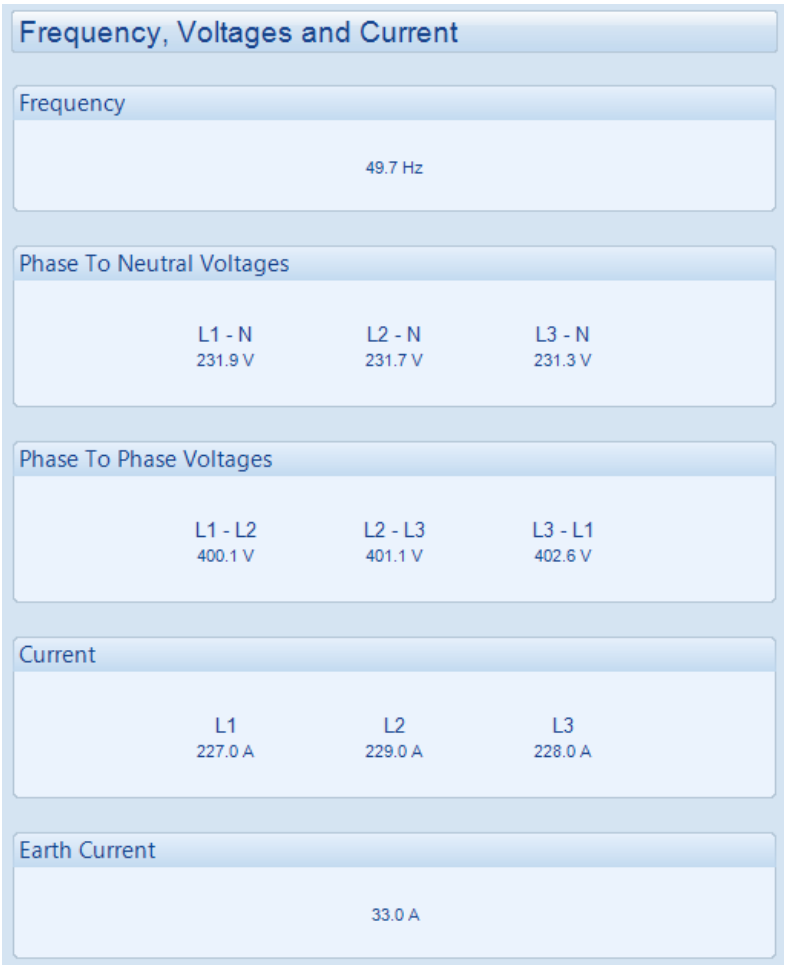
3.5 VIRTUAL LEDS

Shows the state of the *Virtual LEDs*. 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 configuration suite, or read by third party PLC or Building Management Systems (for example) using the modbus RTU protocol.



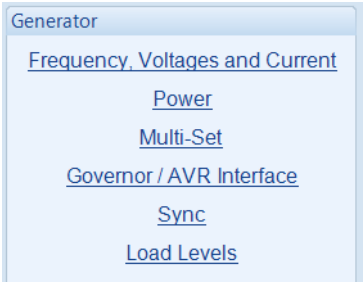
3.6 BUS

Shows the modules measurements of the Bus supply.



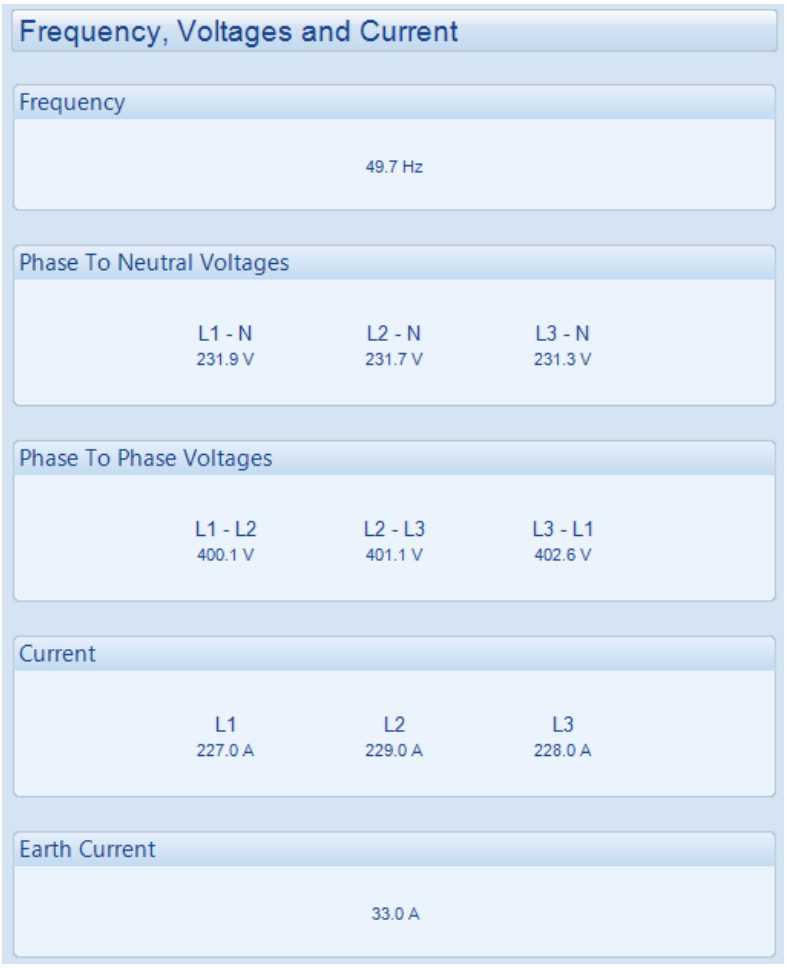
3.7 GENERATOR

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



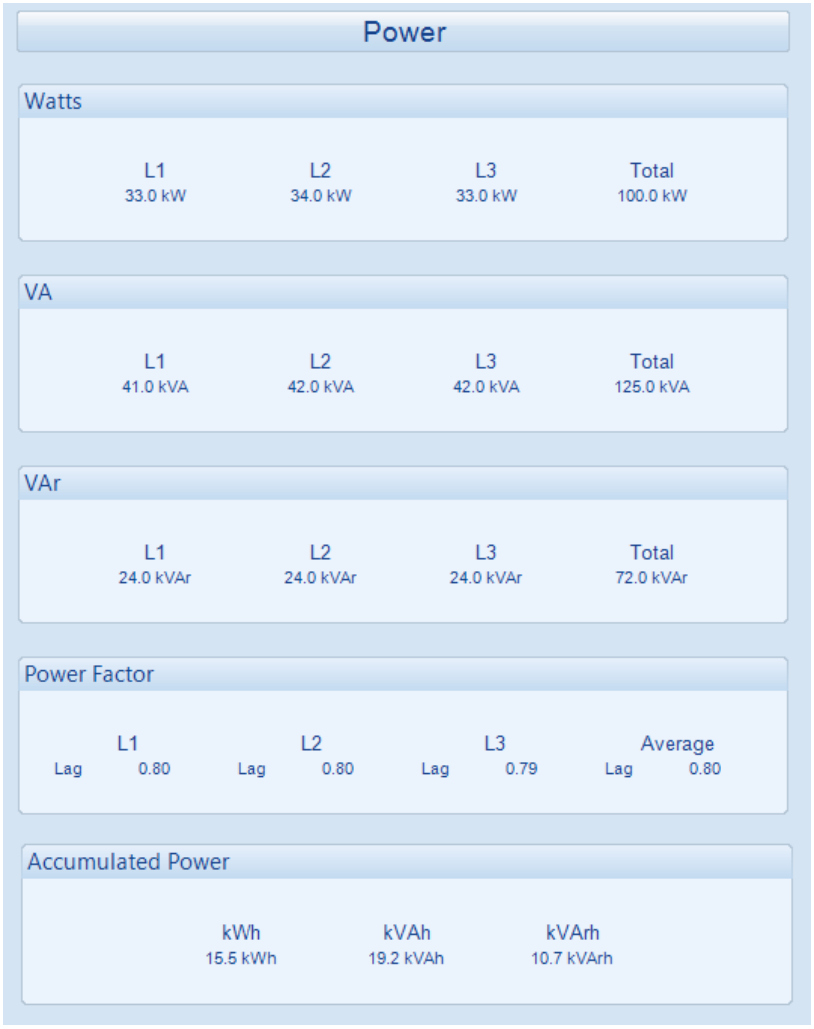
3.7.1 FREQUENCY, VOLTAGES AND CURRENT

Shows the modules measurements of the generator supply.



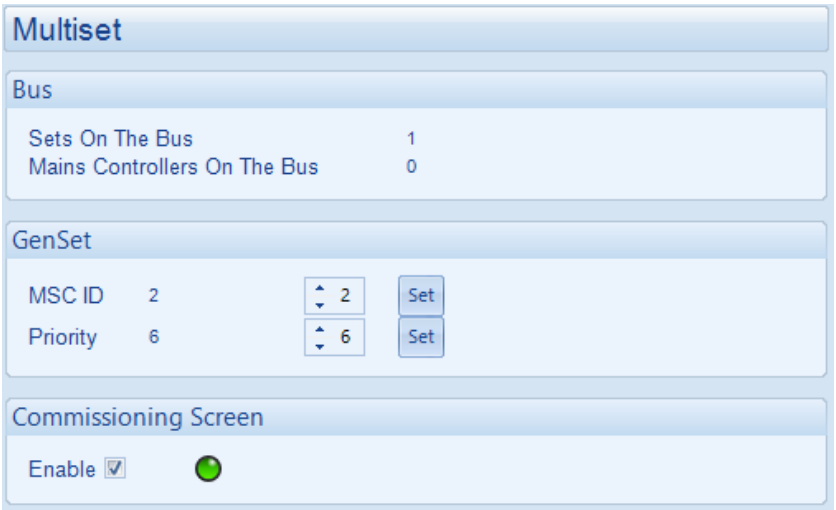
3.7.2 POWER

Shows the module's measurements of the generator supply power.



3.7.3 MULTISET

NOTE: These settings are not stored in the module configuration. They are stored in a different memory area and not transferred with the configuration. The *Backup Module* feature transfers both the configuration AND the settings of the Multiset, Governor/AVR interface and the Sync page.



3.7.3.1 BUS

Parameter	Description
Sets On The Bus	Shows the number of modules currently connected to the MSC link.
Mains Controller Present	Shows if there is a DSExx60 controller on the MSC Link.

3.7.3.2 GENSET

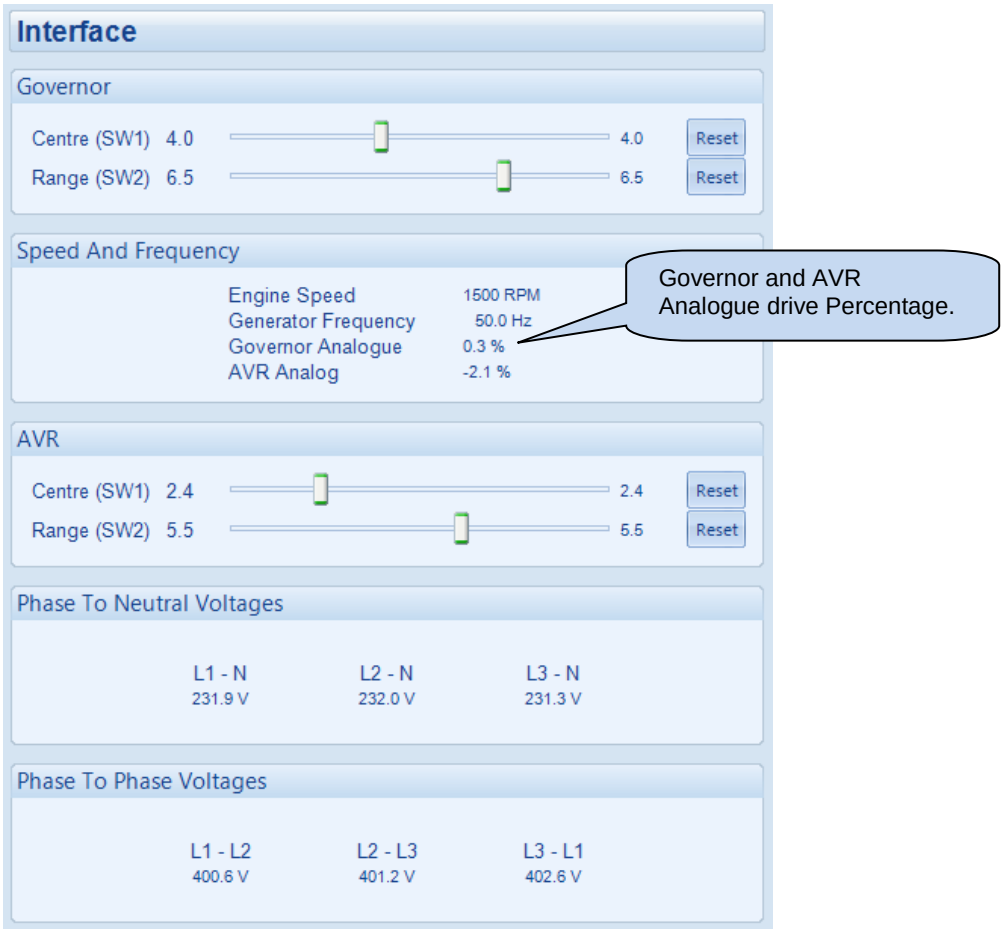
Parameter	Description
MSC ID	Set the MSC ID of the module over the MSC link. Each controller connected to the MSC link must have a unique ID. If all the controllers are powered up “one at a time”, this Device ID is automatically set. Powering them up together may result in “ID alarm”. Manually setting the DeviceID here prevents this.
Priority	Set Priority used when the *Load Demand Scheme* is in operation.

3.7.3.3 COMMISSIONING SCREEN

Parameter	Description
Enable	☐ = Commissioning screens are not shown on the module display ☑ = The commissioning screens are shown at the bottom of the *Generator* section on the module display. These pages are useful for the commissioning and troubleshooting of a load share system.

3.7.4 GOVERNOR/AVR INTERFACE

NOTE: These settings are not stored in the module configuration. They are stored in a different memory area and not transferred with the configuration. The *Backup Module* feature transfers both the configuration AND the settings of the Multiset, Governor/AVR interface and the Sync page.



SW1 and SW2 are the configurable settings for the *analogue governor output* and *analogue AVR output* included on the DSE8610/DSE8620 controller.

As the input requirements of governors and AVRs vary from manufacturer to manufacturer, and even from model to model, the DSE module is configurable to allow connection to many devices.

The analogue governor and AVR outputs are both isolated from ground and battery negative, allowing compatibility with devices with inputs that are not referenced to ground or battery negative.

3.7.4.1 SW1

SW1 is also known as Centre. SW1 sets the voltage produced by the DSE module's output for 'nominal'. For example SW1 = 0 for the governor output, means that the analogue governor output is 0V DC when the engine is required to run at it's nominal speed.

3.7.4.2 SW2

SW2 is also known as Range. SW2 sets the range of the 'swing' around the Centre (SW1) voltage produced by the DSE module's output for change. For example SW2 = 1 for the governor output, means that the analogue governor output is made to change by up to 1V DC either side of the Centre (SW1) voltage to make the engine run at lower or higher speeds or to increase/decrease load share.

3.7.4.3 SETTINGS

SW1 setting	'centre' voltage of analogue output
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range of analogue output
0	±0.5V
1	±1.0V
2	±1.5V
3	±2.0V
4	±2.5V
5	±3.0V
6	±3.5V
7	±4.0V
8	±4.5V
9	±5.0V

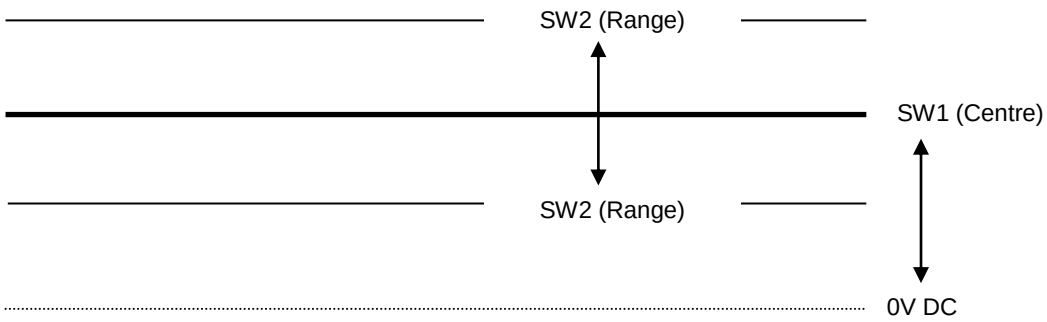
Typical wiring diagrams and SW1/SW2 selector settings for many of the most popular governors are included within the DSE guide to synchronising and Load Sharing (Part2).

3.7.4.4 SUMMARY

Consider the settings as Analogue output voltage is SW1 ± SW2

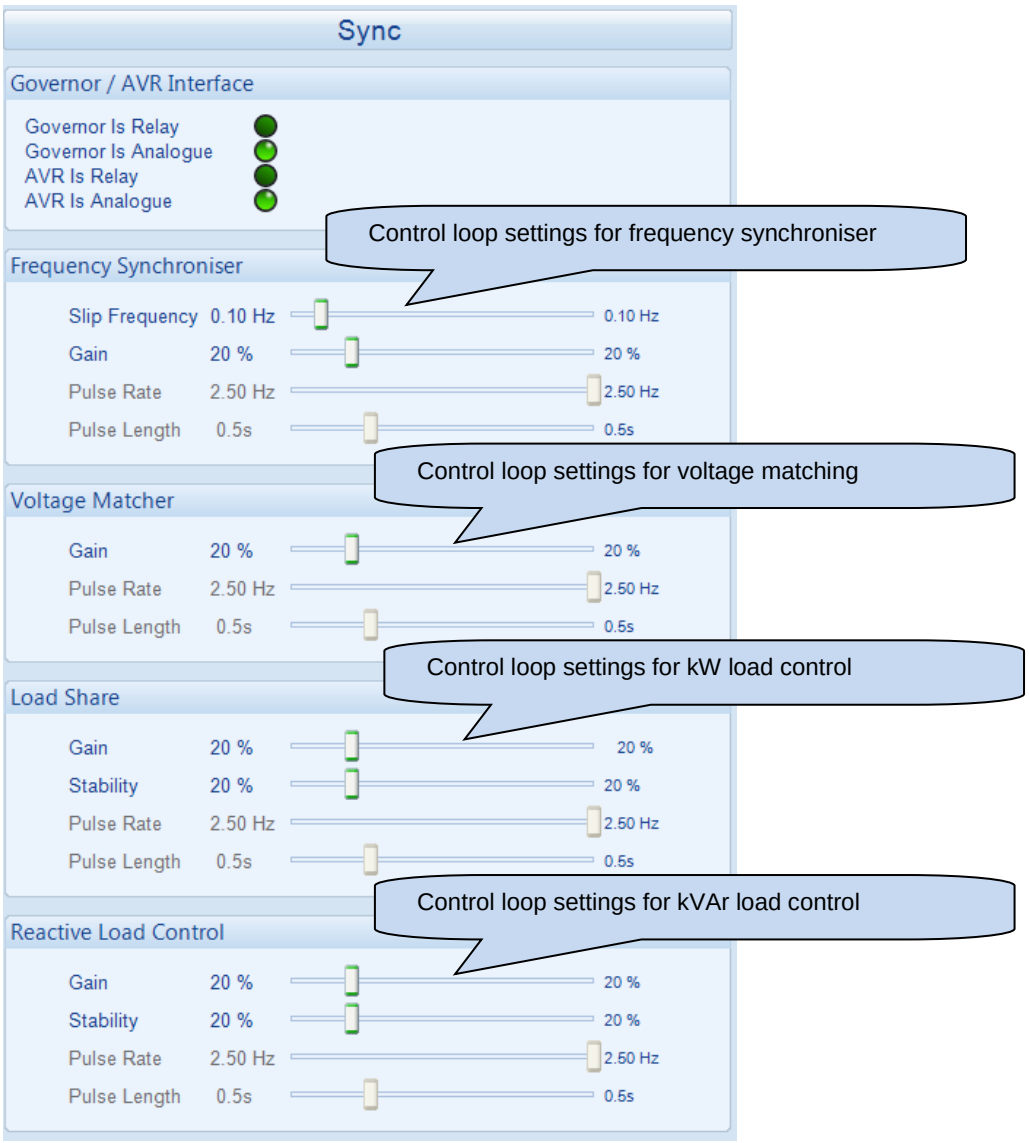
In the example above this means the analogue output is 1.0V ± 1.5V (based upon the settings of SW1=2 and SW2=2

SW1 is the voltage above (or below) 0V that the analogue output produces to instruct 'no change' to the voltage/frequency of the genset.
SW2 is the maximum voltage above (and below) SW1 that the analogue output produces to instruct the voltage/frequency of the genset to change.



3.7.5 SYNC

NOTE: These settings are not stored in the module configuration. They are stored in a different memory area and not transferred with the configuration. The *Backup Module* feature transfers both the configuration AND the settings of the Multiset, Governor/AVR interface and the Sync page.



Parameters are detailed overleaf…

Item	Function
Slip frequency	The difference between generator frequency and the bus/mains frequency. The controller adjusts engine speed until the frequency difference matches the slip frequency. The phase of the supplies then drift in and out of synchronism at a rate of 1/slip-frequency times per second. I.e. for Slip frequency of 0.2Hz, the supplies are in phase once every five seconds.
Pulse rate	**NOTE: Not applicable when using internal analogue control system.**
	The number of raise/lower changes per second of the raise / lower relay outputs.
Pulse length	**NOTE: Not applicable when using Internal analogue control system.**
	The lengths of raise/lower pulses of the raise / lower relay outputs.
Gain / Stability	**NOTE: Not applicable when using external relays control system.**
	In general, lower setting results in a slow frequency matching process, but too high a setting may cause instability (hunting). If this occurs, lower the stability setting. If this has no effect, lower the gain setting.

3.7.5.1 ADJUSTING GAIN AND STABILITY

NOTE: An over damped response results in a slower control process. An under damped response (overshooting the target) leads to an unstable control process.

Either case leads to undesirable consequences such as overcurrent or reverse power, resulting in generator shutdown, and loss of supply to the load.

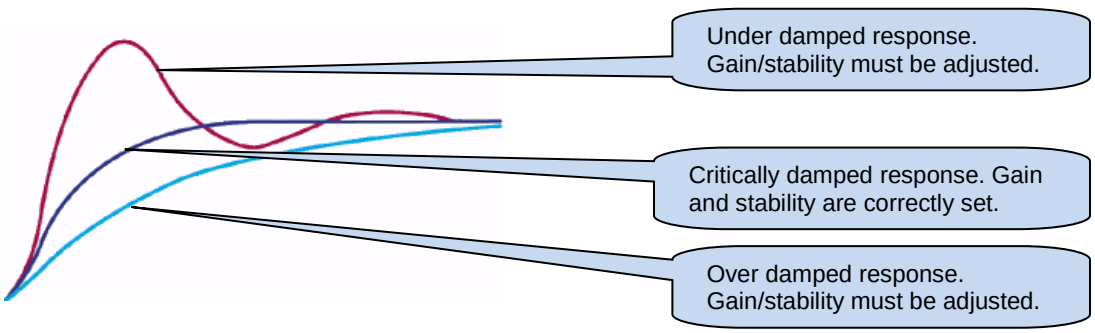
Initial Setup

Typically the DSE factory settings are suitable for most systems. However occasionally it may be necessary to adjust them, but only after checking the gain and stability settings of the speed governor/AVR.

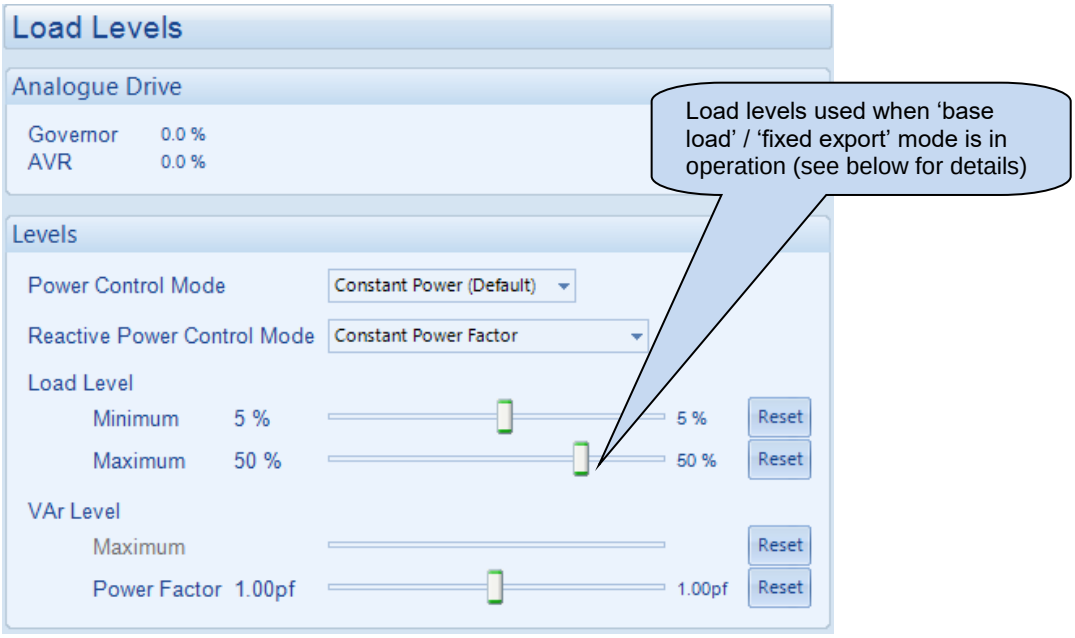
Start with gain and stability at the minimum settings. Increase gain until the engine speed becomes unstable, then half the gain setting.
Now increase the stability setting until the engine speed again becomes unstable, and then lower a little.
You may need to perform the synchronising process a number of times to see the effect of your changes. Also attempt to 'knock' the governor actuator, or change the 'slip frequency' setting to disturb the engine speed and force the controller into making further changes.

Troubleshooting

Generally a problem with the gain (too high or too low) results in a fast oscillation of the parameter being controlled. A slow rolling oscillation usually indicates that the stability is too high or too low.
Remember that the DSE module is not the only device with gain/stability. The engine governor and AVR also have these settings. An incorrectly set governor/AVR cannot be corrected by the DSE controller. You must ensure correct settings for these devices before changing the DSE module settings.
In general, engine governors need lower gain when in parallel with the mains supply than they do for single set operation or paralleling with other generators.



3.7.6 LOAD LEVELS



3.7.6.1 ANALOGUE DRIVE

Parameter	Description
Governor	Shows the drive percentage of the module's *Governor Analogue Output*
AVR	Shows the drive percentage of the module's *AVR Analogue Output*

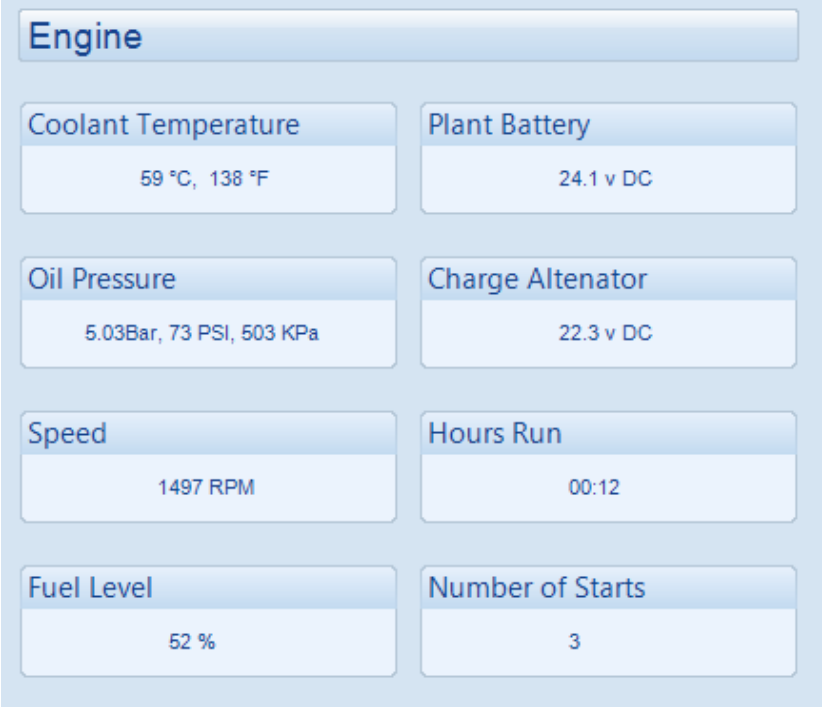
3.7.6.2 LEVELS

NOTE: These settings only have effect when activating a digital input configured for *Mains Parallel Mode* instructing the module to operate in fixed export mode with the utility supply. For more information on this application, refer to DSE Publication: *056-054 DSE7510 in Fixed Export* which is found on our website: *www.deepseaplc.com*

Parameter	Description
Power Control Mode	Allows selection of the *Power Control Mode*. This can also be selected by activation of a configured digital input or via the *Running Editor*.
Reactive Power Control Mode	Allows selection of the *Reactive Power Control Mode*. This can also be selected by activation of a configured digital input or via the *Running Editor*.
Load Level Minimum	Set the minimum load level at which the load switching device is opened when ramping down and going off load.
Load Level Maximum	Set the maximum kW load level to be produced when running in *Mains Parallel Mode*
VAR Level Maximum	Set the maximum kVAr load level to be produced when running in *Mains Parallel Mode*
Power Factor	Set the power factor to maintain when running in *Mains Parallel Mode*

3.8 ENGINE

Shows the modules measurements of the engine parameters.



3.9 FUEL USE AND EFFICIENCY

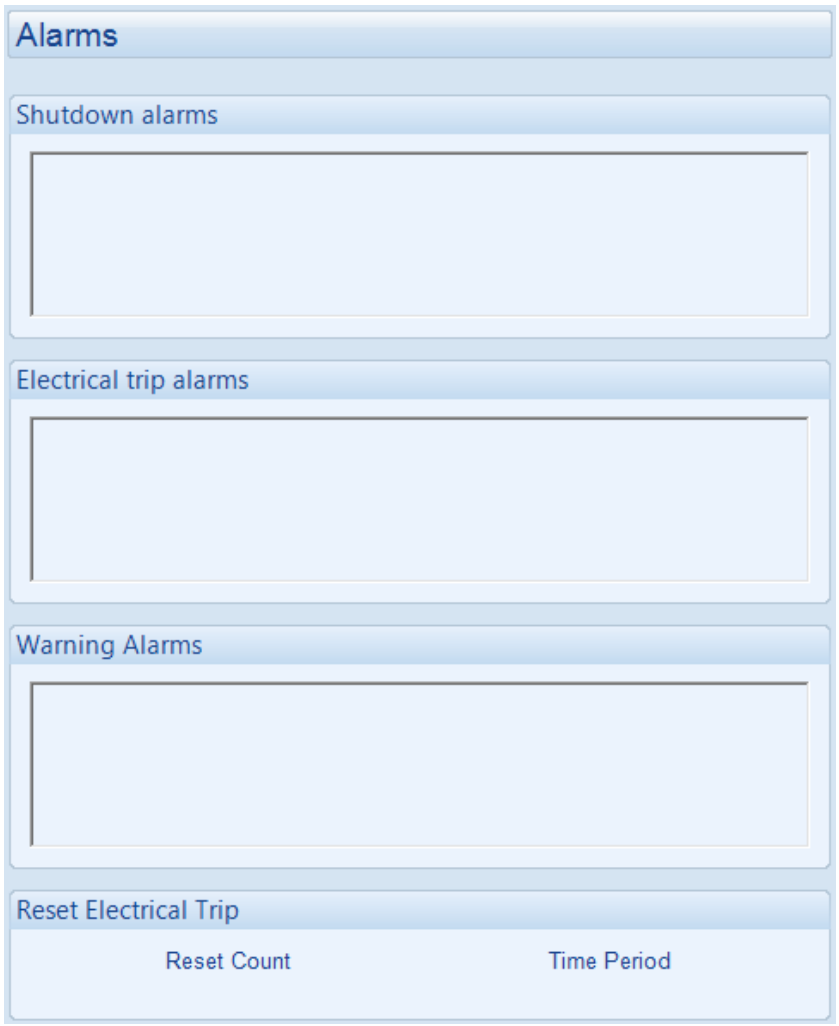
Shows the measurement of the fuel use and efficiency (If configured)

3.10 FLEXIBLE SENSOR

Shows the measurement of the Flexible Sensor (If configured)

3.11 ALARMS

Shows any present alarm conditions.
For a description of the different alarm types, see the section entitled *Alarm Types* elsewhere in this manual.

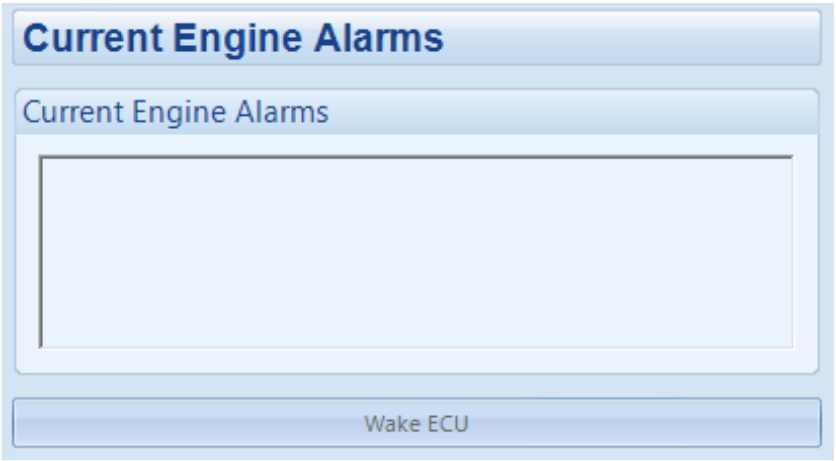


3.12 ENGINE ALARMS

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

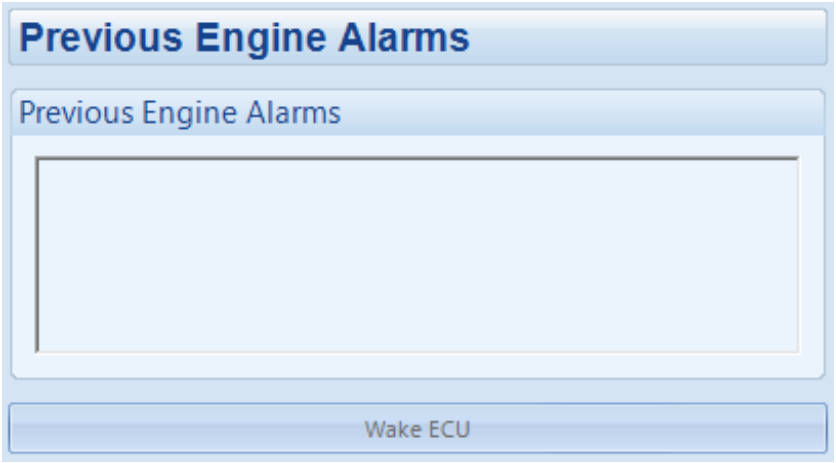
3.12.1 CURRENT ENGINE ALARMS

Shows the current engine alarms.



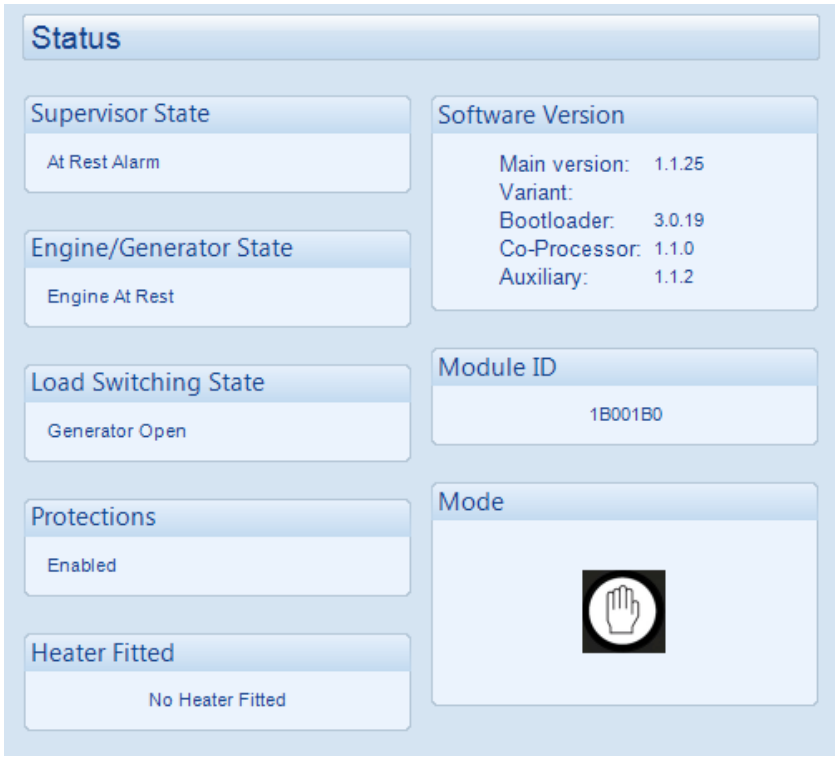
3.12.2 PREVIOUS ENGINE ALARMS

Shows the previous engine alarms.



3.13 STATUS

Shows the module's current status.

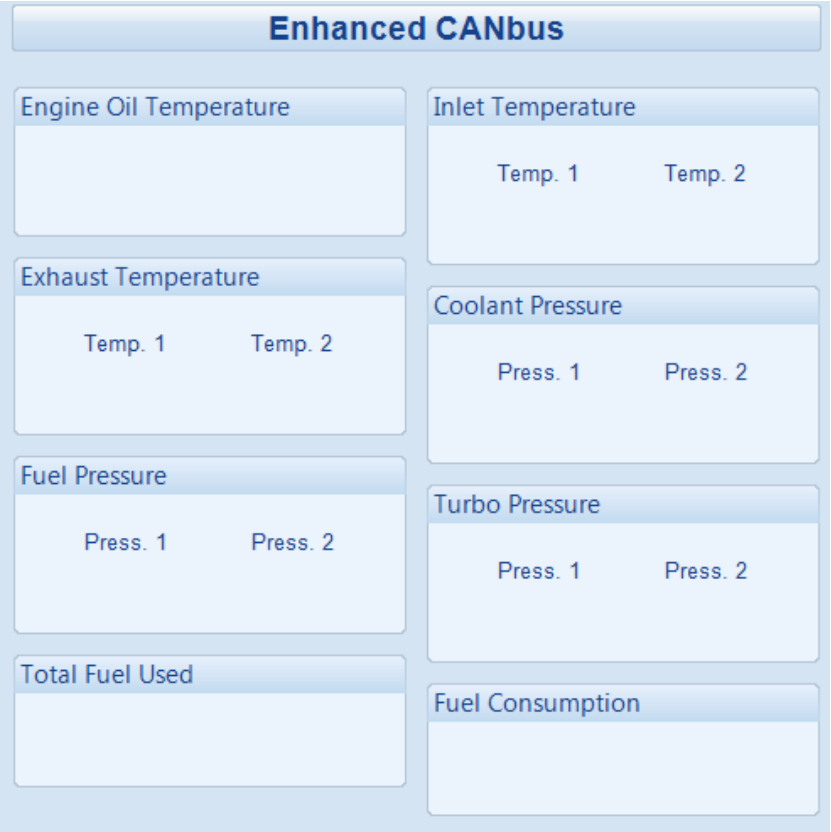


3.14 EVENT LOG

Shows the contents of the module's event log.

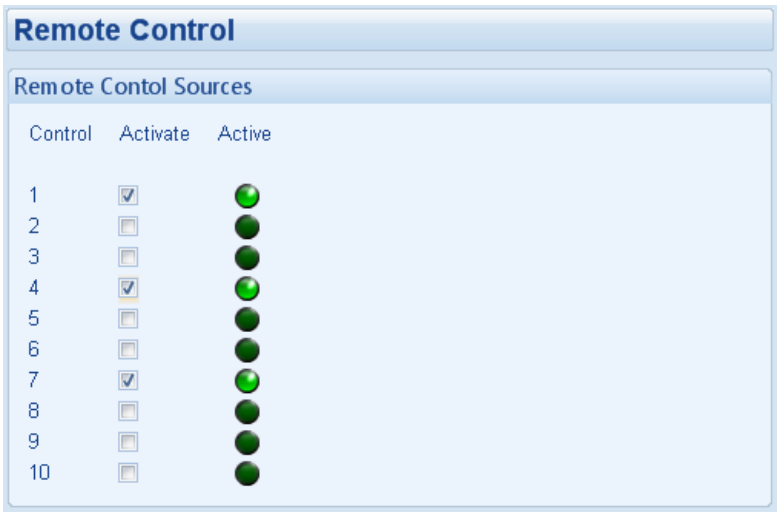
3.15 ENHANCED CANBUS

Shows the module's readings of enhanced Canbus parameters. This is only available if the module is configured for CANbus communication and the *Enhanced Canbus* option is enabled.



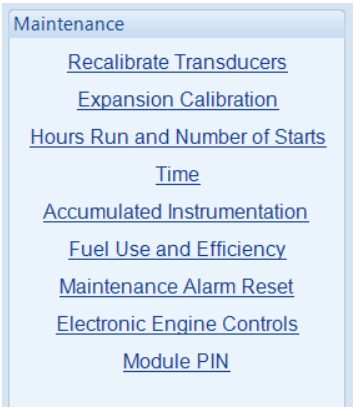
3.16 REMOTE CONTROL

The remote control section of the SCADA section is used for monitoring and control of module ‘remote control’ sources.
Any of the module outputs, expansion outputs, LED indicators, or remote Annunciator LEDs are to be configured to *Remote Control 1-10*. This output source is energised/de-energised by click the respective check box as shown below in the *Activate* column below.



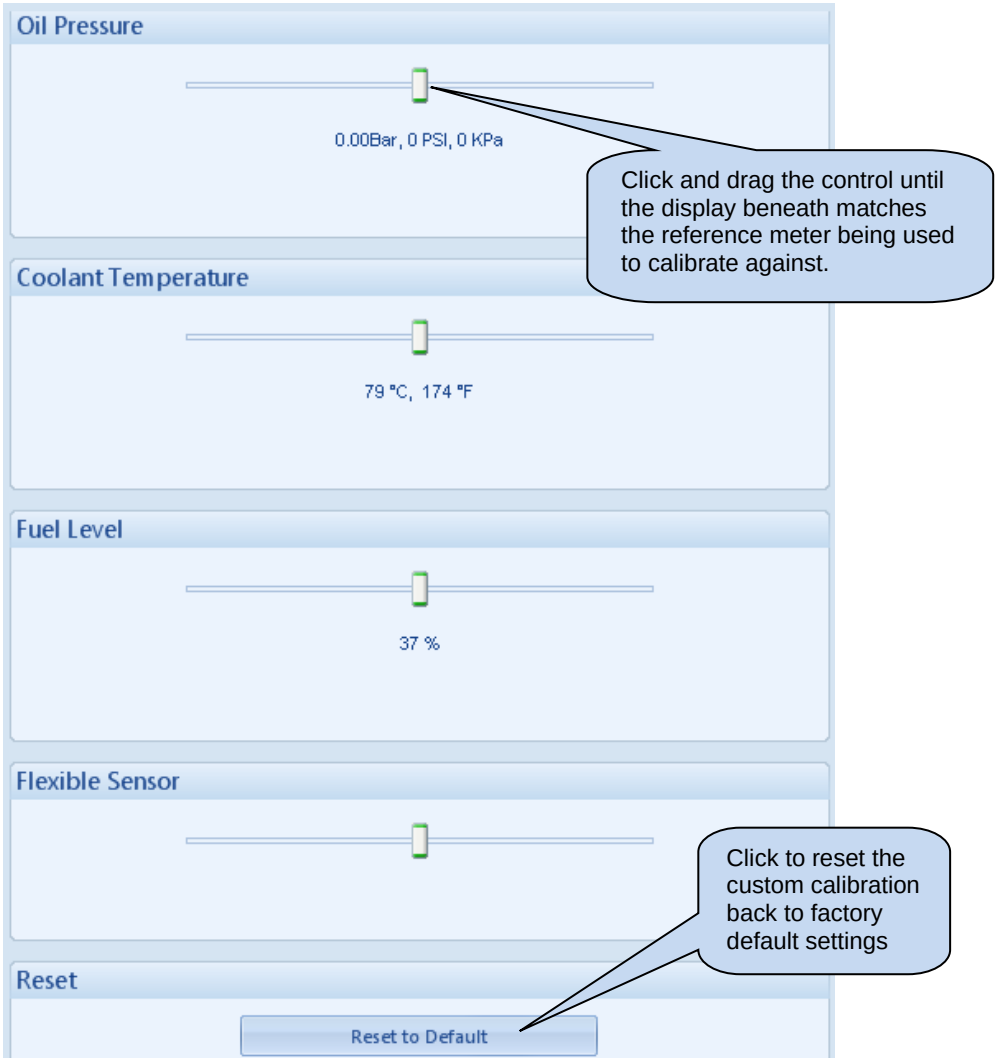
3.17 MAINTENANCE

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



3.17.1 RECALIBRATE TRANSDUCERS

Allows the recalibration of the analogue sensors.

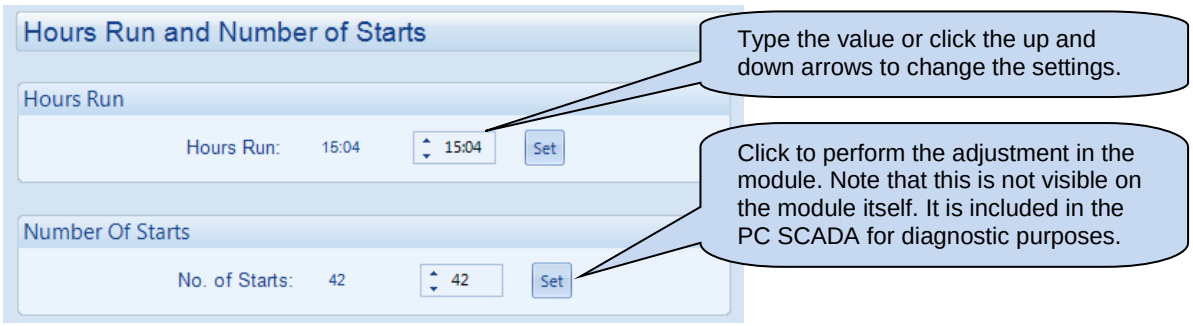


3.17.2 EXPANSION CALIBRATION

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

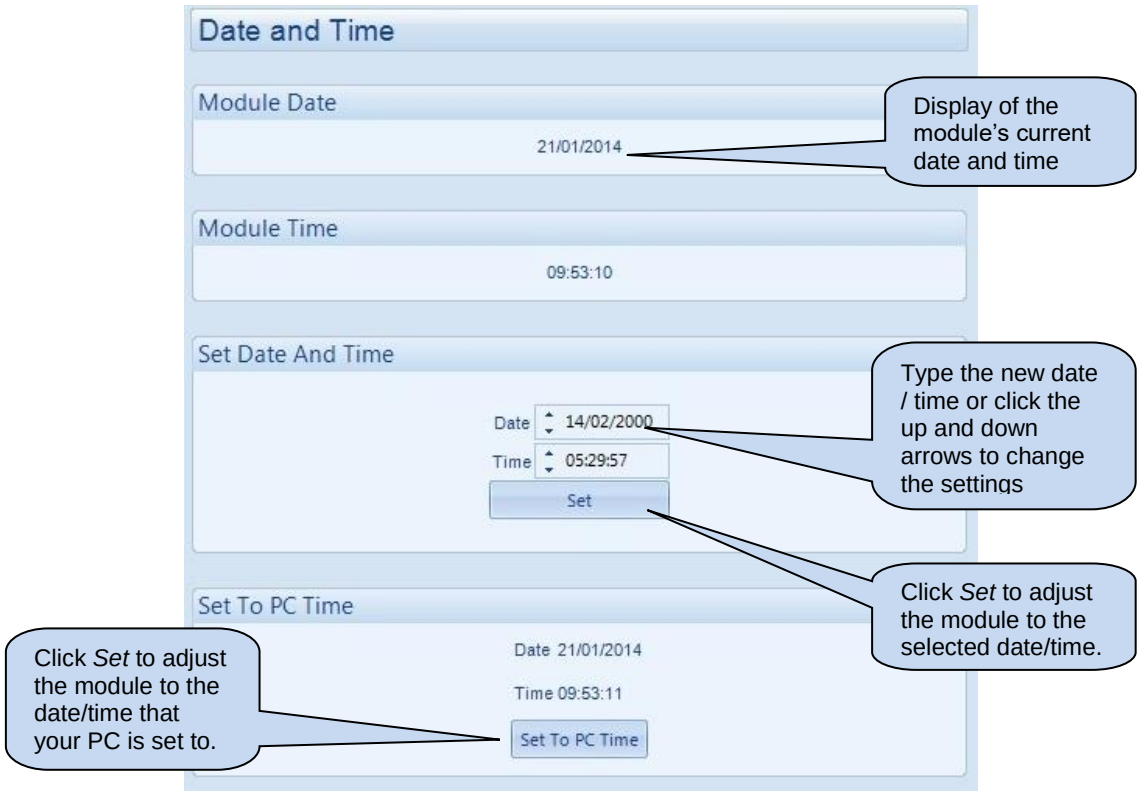
3.17.3 HOURS RUN AND NUMBER OF STARTS

This section allows the Hours Run and Number of Starts to be customised on the controller.
Typically, this is used when fitting a new controller to an older engine so that the controller display matches the amount of work previously done by the system.



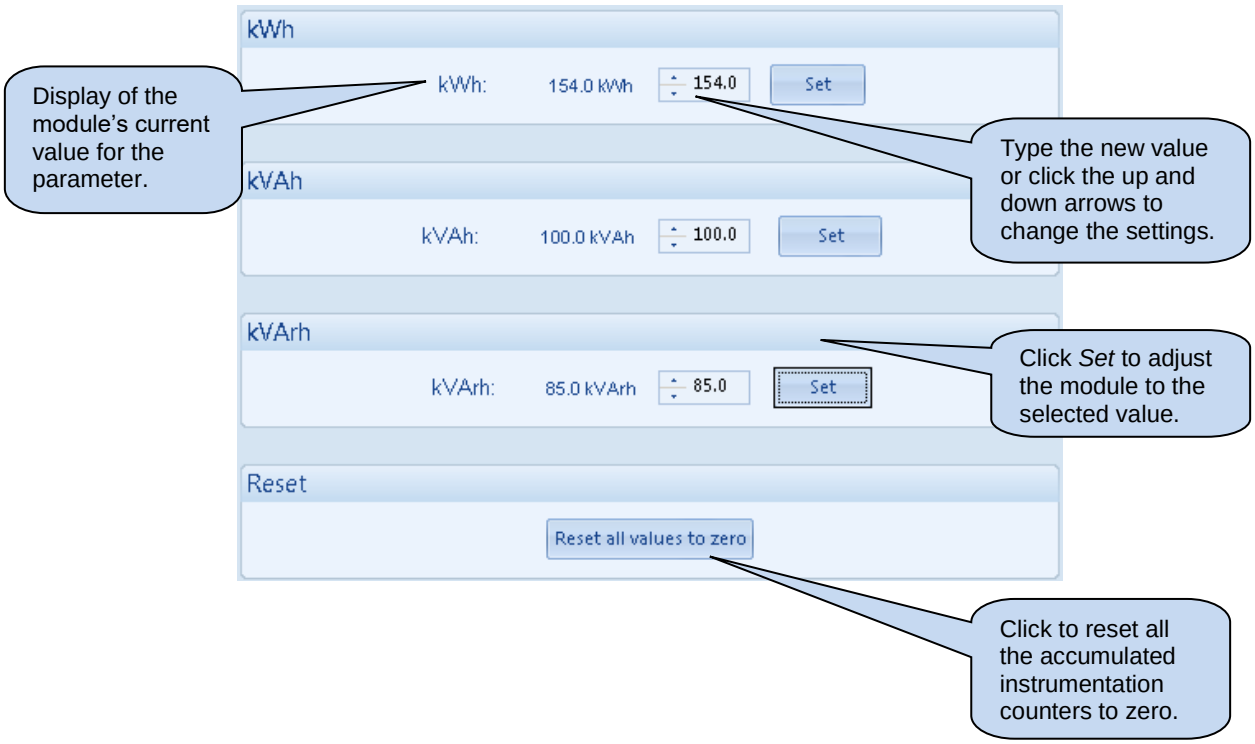
3.17.4 TIME

This section allows the day and time to be set and changed on the controller.

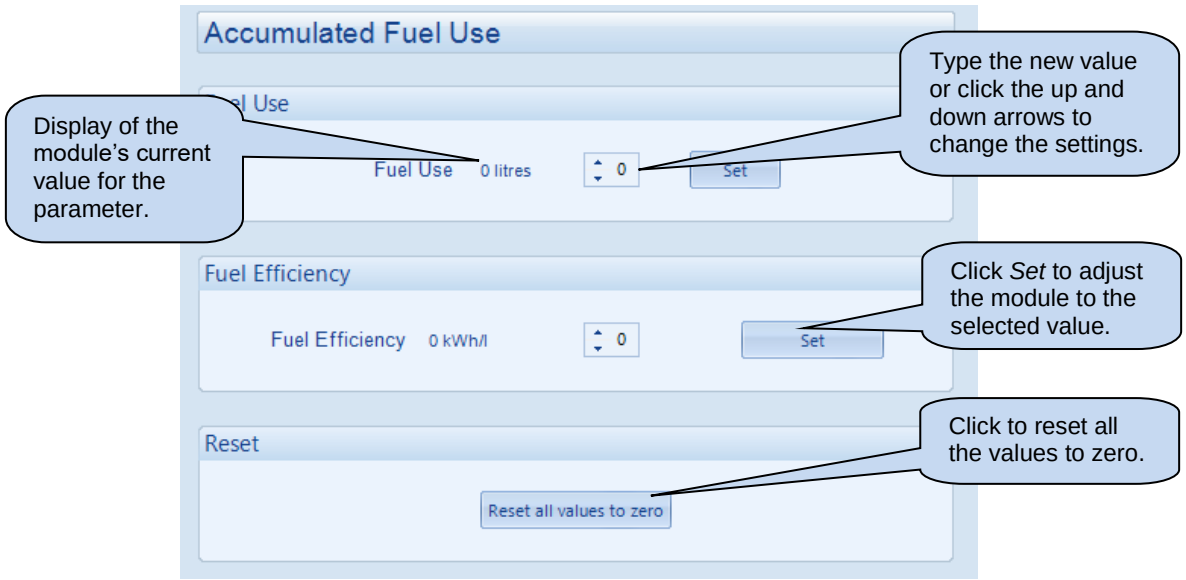


3.17.5 ACCUMULATED INSTRUMENTATION

Allows the user to view or change the module's accumulated instrumentation.



3.17.6 FUEL USE AND EFFICIENCY



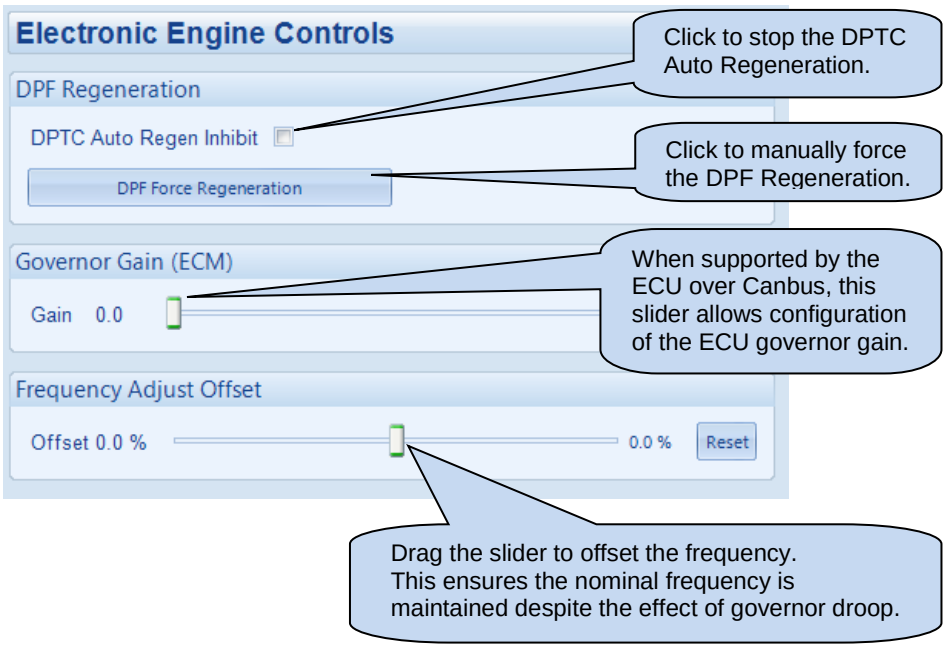
3.17.7 MAINTENANCE ALARM RESET

Three maintenance alarms active in the control module. Each is reset individually;

3.17.8 ELECTRONIC ENGINE CONTROLS

The DPF Forced Regeneration is controlled when the Electronic Engine supports the Non-mission DPF Regeneration.

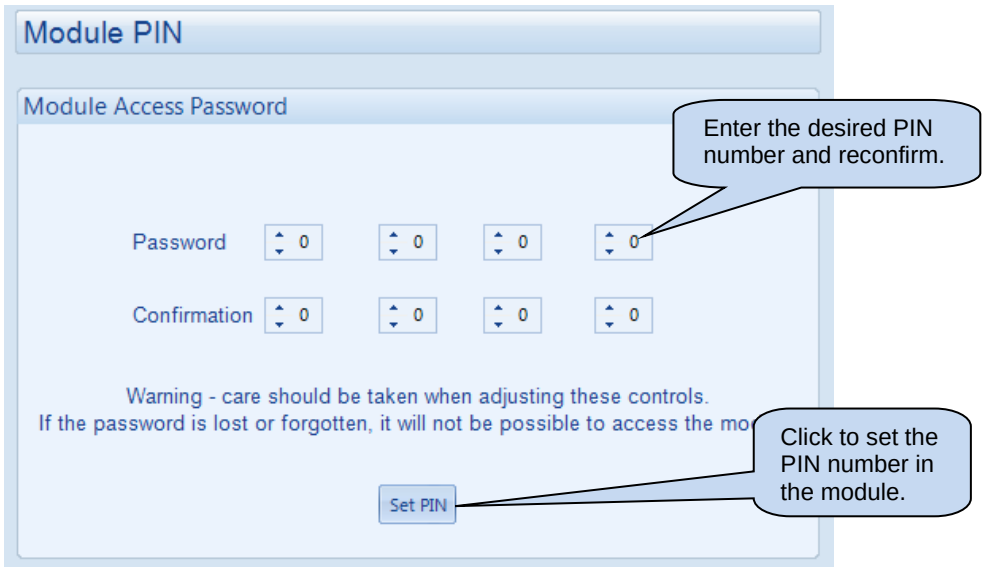
NOTE: Electronic Engine Controls parameters are only available when the DSE module is connected and configured for operation on an electronic engines.



3.17.9 MODULE PIN

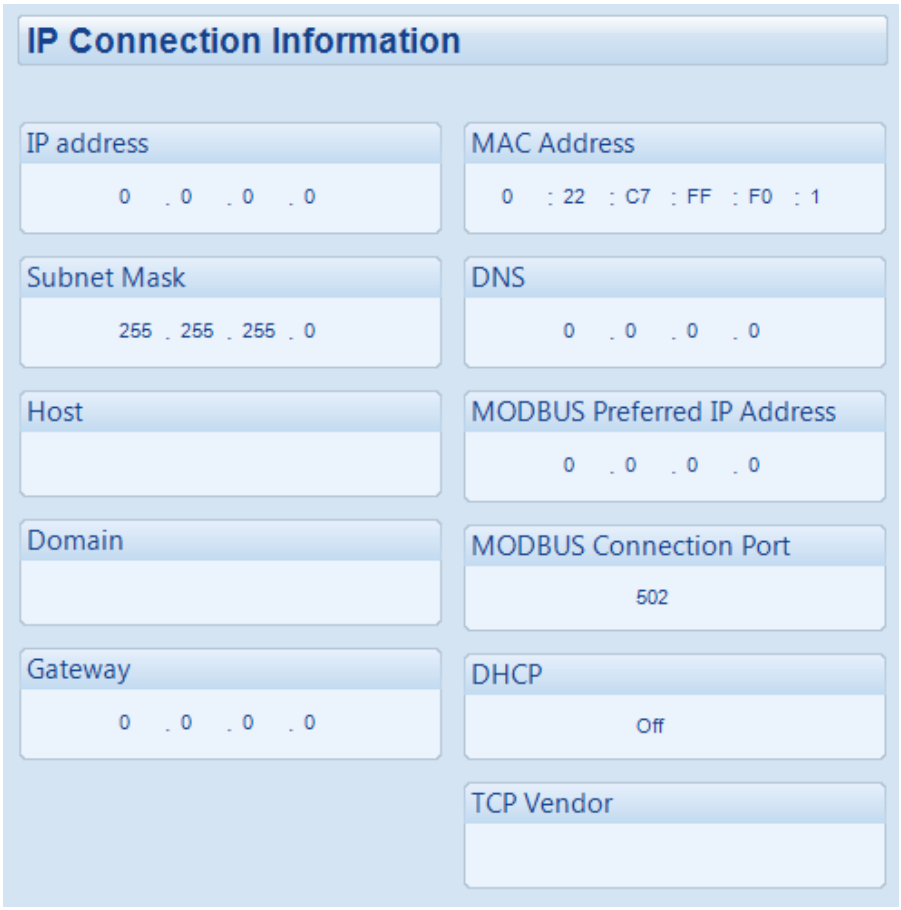
NOTE : If the PIN is lost or forgotten, it is no more possible to access the module!

Allows a PIN (Personal Identification Number) to be set in the controller. This PIN must be entered to either access the front panel configuration editor or before a configuration file is sent to the controller from the PC software.



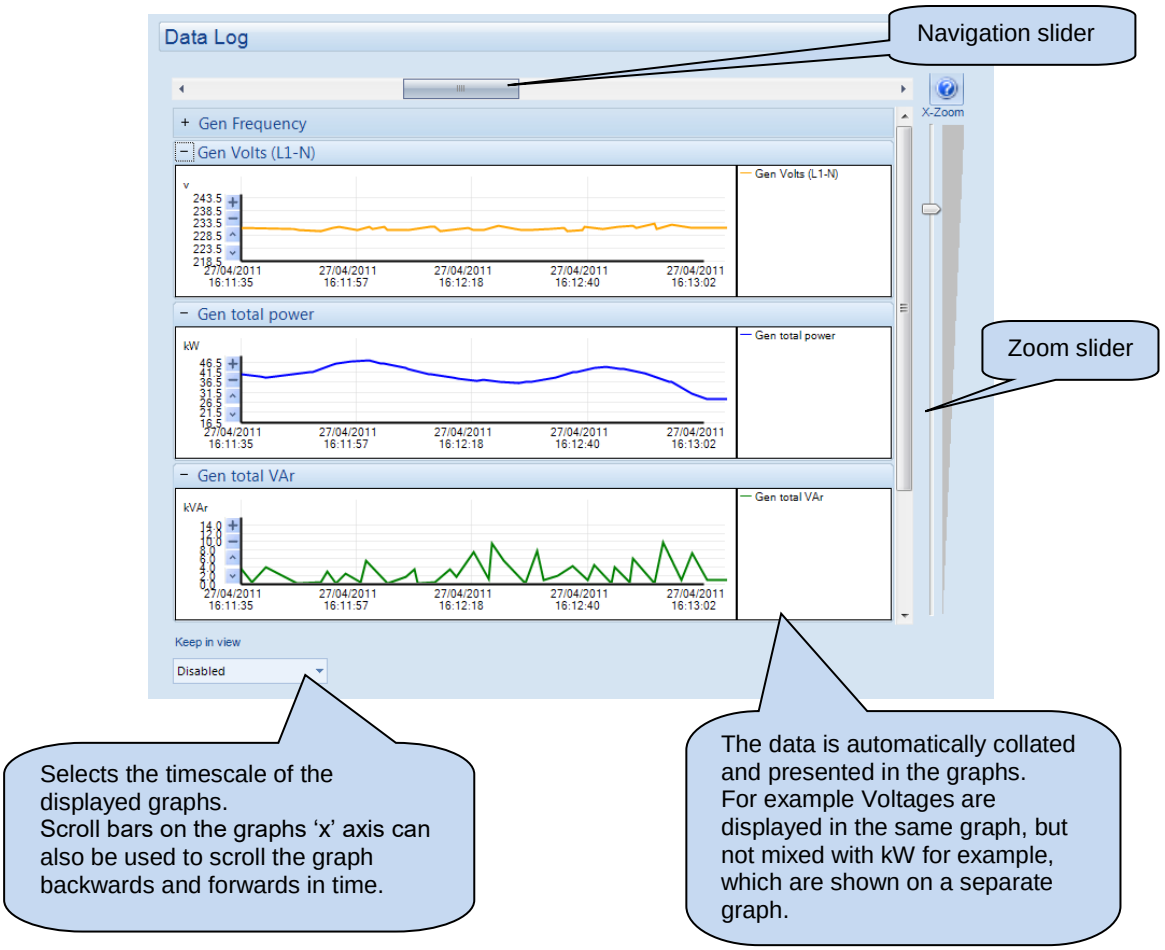
3.18 COMMUNICATIONS INFORMATION

Shows the module's communication ports settings.



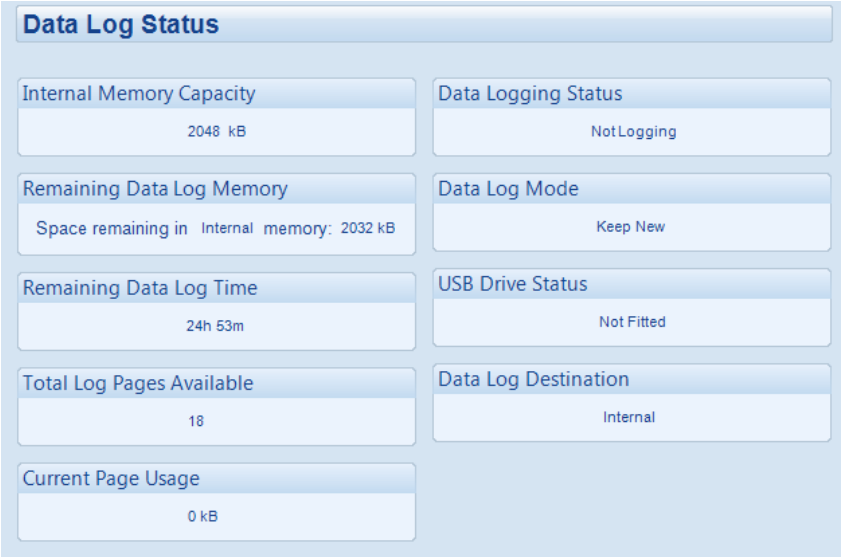
3.19 DATALOG

Allows viewing of the module datalog (if configured).



3.19.1 DATA LOG STATUS

Shows the memory status of the data log allocated space.



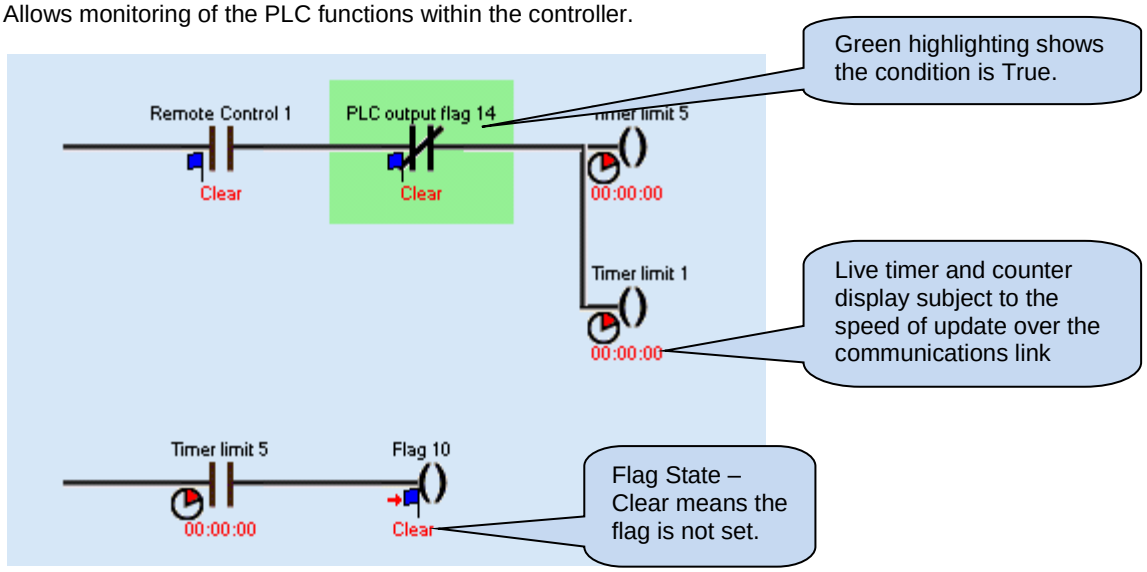
3.20 PLC

NOTE: For further details and instructions on PLC Logic and PLC Functions, refer to the DSE PLC PROGRAMMING GUIDE, document part number 057-175.

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

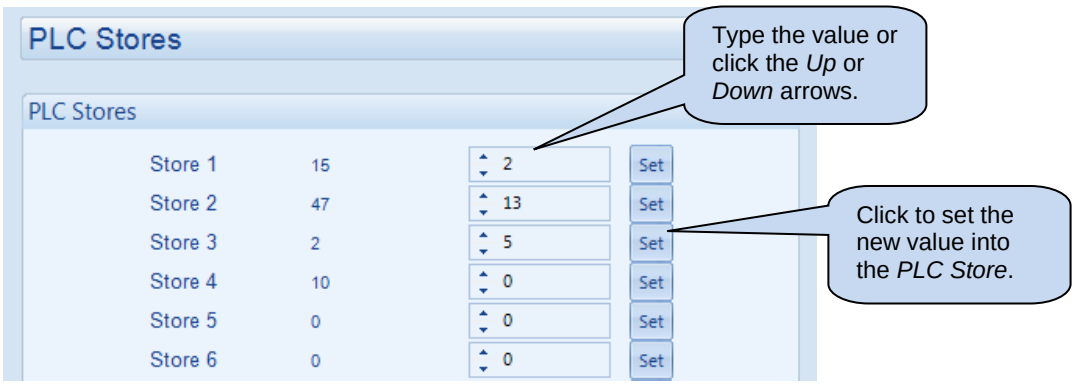
3.20.1 PLC LOGIC

Allows monitoring of the PLC functions within the controller.

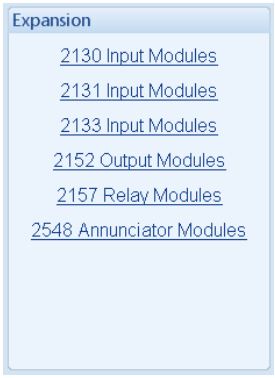


3.20.2 PLC SOTRES

Allows the editing and setting of PLC Stores values.

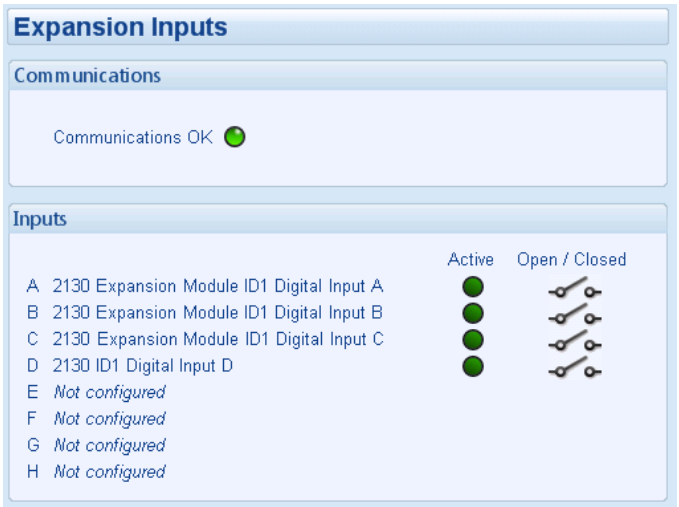


3.21 EXPANSION



Allows monitoring of the controller's expansion modules (when fitted)

For example:



4 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. *Indication* alarms are only used to illuminate indicators or to activate outputs.
Warning	Audible alarm and common alarm signal is generated. The set continues to run. *Warning alarms* are used to draw the operator's attention to a minor issue or to a problem that may escalate to an Electrical Trip or Shutdown Alarm if left untreated.
Electrical Trip	Audible alarm and common alarm signal is generated. The set is taken off load and the cooling timer begins, after which the set is stopped. *Electrical Trip alarms* are series issues that require the set to be taken off load. As the name implies, this is often electrical faults that occur 'after' the load switch. The set is allowed to cool before stopping.
Shutdown	Audible alarm and common alarm signal is generated. The set is taken off load and immediately stopped. *Shutdown alarms* are serious issues that demand immediate stopping of the generator. For instance Emergency Stop or Over-speed alarms require immediate shutdown.

5 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 the generator status.

Timing Segment	Stopped	Start Delay	Preheat	Cranking	Safety Delay	Smoke Limiting	Smoke Limiting Off	Warming Up	Gen Available/ Gen On Load	Cooling	Cooling in Idle
Always											
From Starting											
From Safety On											
Engine Protection											
Overfrequency / Overspeed Overshoot											

5.1 ALWAYS

The protection is always active on the controller. This is used to constantly monitor statuses such as a fuel level switch irrespective of the engine running state.

5.2 FROM STARTING

The protection is active from the beginning of engine cranking, until the engine stops.

5.3 FROM SAFETY ON

The protection is active when the set is running at nominal speed, until the engine stops.

5.4 ENGINE PROTECTION

The protection is active when the engine is running and all engine protection (for example oil pressure and coolant temperature) are in a 'healthy' state.
Oil Pressure Warning
Oil Pressure Shutdown
Oil Pressure Open Circuit (CANbus engine)
High Coolant Temperature Warning
High Coolant Temperature Shutdown
High Coolant Temperature Electrical Trip
High Coolant Temperature Open circuit (CANbus engine)
CAN ECU Warning
CAN ECU Shutdown
Generator Phase Rotation Shutdown

5.5 OVERSHOOT

Active during the *Safety Delay* timer, this allows for a temporary raise of the overspeed/overfrequency trip points during start-up.

Protection Level	Over Frequency Trip Level	Over Speed Trip Level
Immediate Shutdown	Over Frequency + Overshoot %	Over Speed + Overshoot %
Delayed Shutdown (Overspeed Overshoot Delay)	Over Frequency	Over Speed

Example

57 Hz *Over Frequency* setting, 10% *Overspeed Overshoot*
During *Safety Delay* a generator frequency above (57 Hz x 1.1) = 62.7 Hz results in an immediate shutdown without delay.
After *Safety delay*, a generator frequency above 57 Hz for the period of the *Generator Transient Delay* results in a shutdown.

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