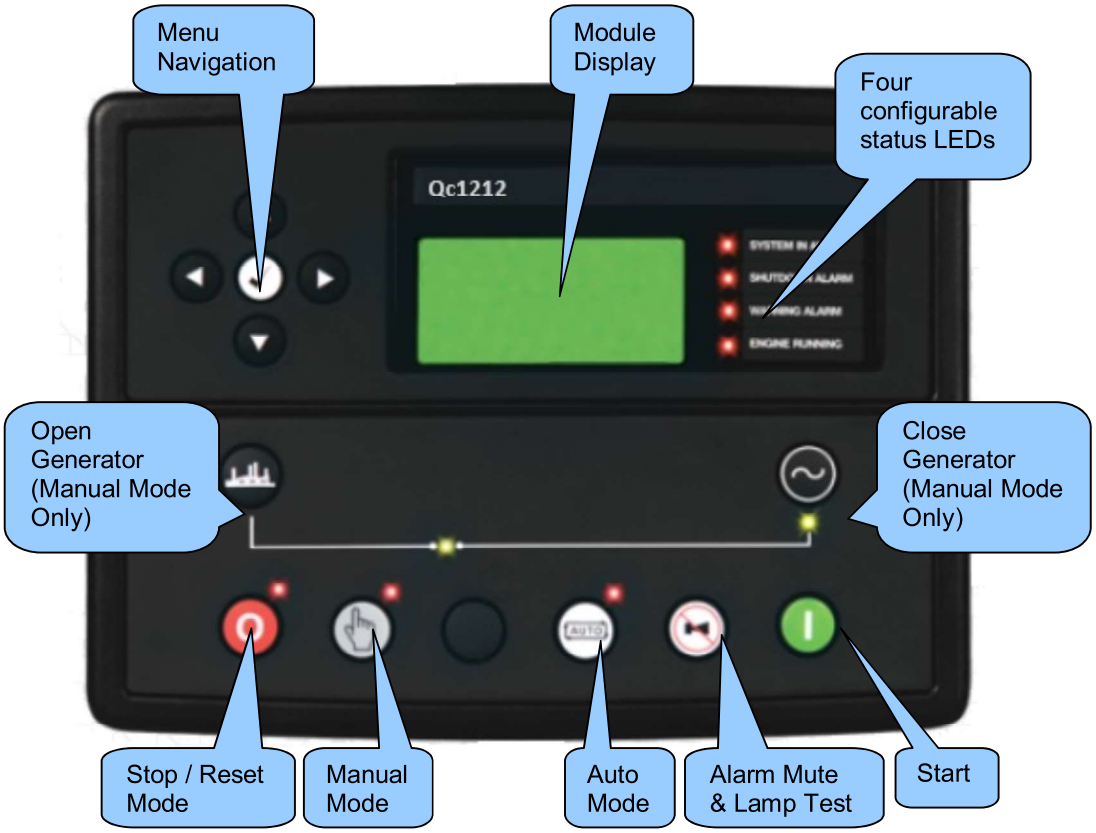
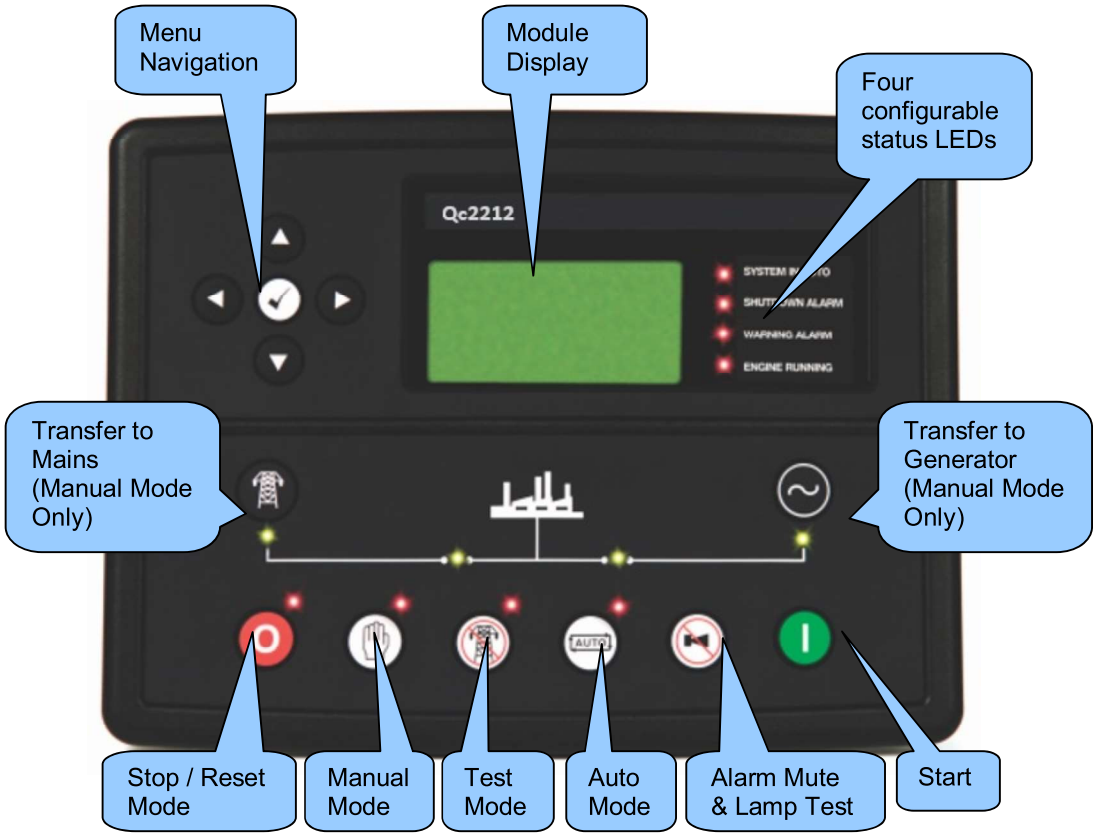
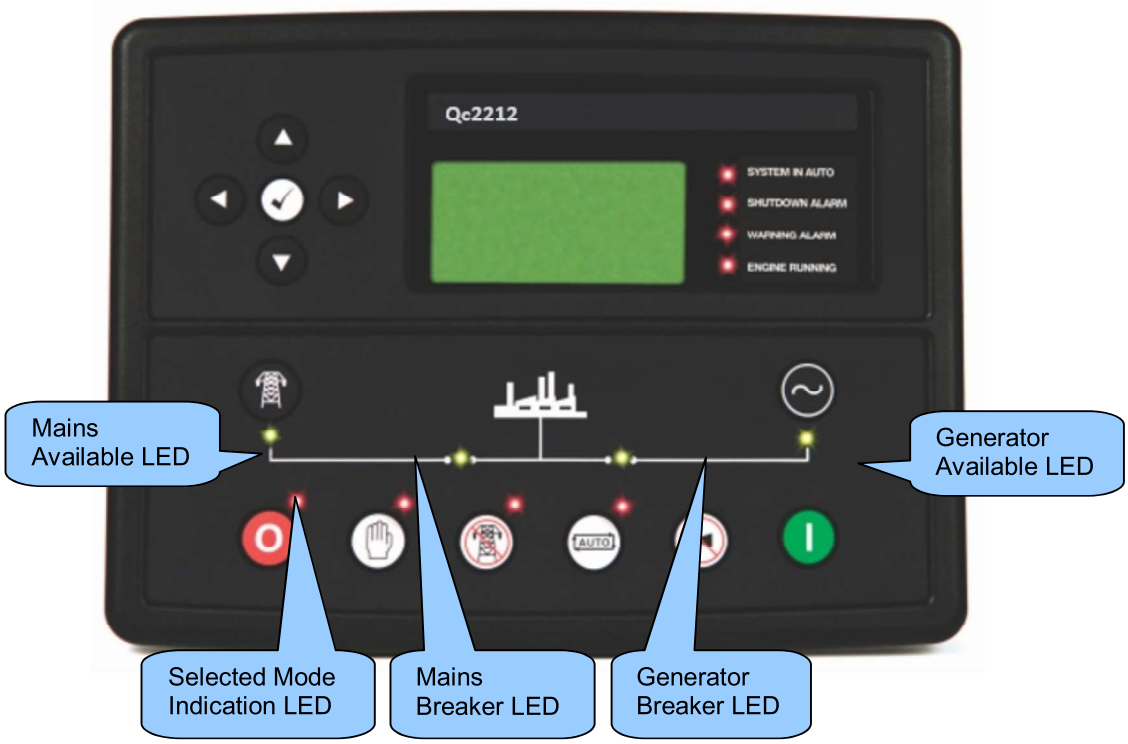
4.1 Qc1212


Menu Navigation
Module Display
Four configurable status LEDs
Qc1212
Open Generator (Manual Mode Only)
Close Generator (Manual Mode Only)
Stop / Reset Mode
Manual Mode
Auto Mode
Alarm Mute & Lamp Test
Start


Qc1212
Generator Available LED
Selected Mode Indication LED
Generator Breaker LED

4.2 Qc2212


Menu Navigation
Module Display
Four configurable status LEDs
Qc2212
SYSTEM IN AUTO
SHUTDOWN ALARM
WARNING ALARM
ENGINE RUNNING
Transfer to Mains (Manual Mode Only)
Transfer to Generator (Manual Mode Only)
AUTO
Stop / Reset Mode
Manual Mode
Test Mode
Auto Mode
Alarm Mute & Lamp Test
Start


Qc2212
SYSTEM IN AUTO
SHUTDOWN ALARM
WARNING ALARM
ENGINE RUNNING
Mains Available LED
Generator Available LED
AUTO
Selected Mode Indication LED
Mains Breaker LED
Generator Breaker LED

4.3 CONTROL PUSH BUTTONS

NOTE: For further details, see section entitled *Operation* elsewhere in this manual.

Icon	Description
	**Stop / Reset Mode** This button places the module into its ***Stop/Reset Mode*** O. This clears any alarm conditions for which the triggering criteria has been removed. If the engine is running and the module is put into ***Stop/Reset Mode*** O, the module automatically instructs the generator off load *('**Close Generator Output'** becomes inactive (if used on))* and place the mains on load *('**Close Mains Output'** becomes active (DSE7320 MKII))*. The fuel supply de-energises and the engine comes to a standstill. Should any form of *start signal* be present when in ***Stop/Reset Mode*** O the generator remains at rest
	**Manual Mode** This button places the module into its ***Manual Mode*** ✋. Once in ***Manual Mode*** ✋, the module responds to the ***Start*** I button to start the generator and run it off load. To place the generator on load, use the ***Transfer to Generator*** ~ button. The module automatically instructs the changeover device to take the mains off load *('**Close Mains Output**' becomes inactive (if used on DSE7320 MKII))* and place the generator on load *('**Close Generator Output**' becomes active (if used))*. To place the generator off load, use the ***Transfer to Mains*** ⚡ or ***Open Generator*** ⚡ buttons. The module automatically instructs the changeover device to take the generator off load *('**Close Generator Output**' becomes inactive (if used on))* and place the mains on load *('**Close Mains Output**' becomes active (DSE7320 MKII))*. Additional digital inputs can be assigned to perform these functions. If the engine is running off-load in ***Manual Mode*** ✋ and on load signal becomes active, the module automatically instructs the changeover device the changeover device to take the mains off load *('**Close Mains Output**' becomes inactive (if used on Qc2212)* and place the generator on load *('**Close Generator Output**' becomes active (if used))*. Upon removal of the on load signal, the generator remains on load until either selection of the ***Stop/Reset Mode*** O or ***Auto Mode*** AUTO.
	**Test Mode (DSE7320 MKII Only)** This button places the module into its ***Test Mode*** ⚡. Once in ***Test Mode*** ⚡, the module responds to the ***Start*** I button to start the generator. Once the set has started and becomes available, it is automatically placed on load (Close Mains Output becomes inactive (if used on Qc2212) and Close Generator Output becomes active (if used)). The generator remains on load until either the ***Stop/Reset Mode*** O or ***Auto Mode*** AUTO is selected.

NOTE: For further details, see section entitled *Operation* elsewhere in this manual.

Icon	Description
	**Auto Mode** This button places the module into its ***Auto Mode*** . This mode allows the module to control the function of the generator automatically. The module monitors numerous start requests and when one has been made, the set is automatically started. Once the generator is available, the mains is taken off load *('**Close Mains Output**' becomes inactive (if used on Qc2212))* and the generator is placed on load *('**Close Generator Output**' becomes active (if used)).* Upon removal of the starting signal, the module starts the *Return Delay Timer* and once expired, takes the generator off load *('**Close Generator Output**' becomes inactive (if used on))* and place the mains on load *('**Close Mains Output**' becomes active (Qc2212)).* The generator then continues to run for the duration of the *Cooling Timer* until it stops. The module then waits for the next start event.
	**Alarm Mute / Lamp Test** This button silences the audible alarm in the controller, de-activates the *Audible Alarm* output (if configured) and illuminates all of the LEDs on the module's facia as a lamp test function.
	**Start** This button is only active in the ***Stop/Reset Mode*** , ***Manual Mode*** and Test Mode . Pressing the ***Start*** button in ***Stop/Reset Mode*** powers up the engine's ECU but does not start the engine. This can be used to check the status of the CAN communication and to prime the fuel system. Pressing the ***Start*** button in ***Manual Mode*** or ***Test Mode*** starts the generator and runs it off load in ***Manual Mode*** or on load in ***Test Mode*** .
	**Menu Navigation** Used for navigating the instrumentation, event log and configuration screens.

NOTE: For further details, see section entitled *Operation* elsewhere in this document.

Icon	Description
	**Transfer To Generator** The ***Transfer to Generator*** button controls the operation of the generator load switch is only active in the ***Manual Mode*** once the generator is available. **'Normal' Breaker Button Control** Pressing the ***Transfer to Generator*** button when the Generator is available and off load, the Mains load switch is opened *('**Close Mains**' becomes inactive)* and the Generator load switch is closed *('**Close Generator**' becomes active)*. Further presses of the ***Transfer to Generator*** button have no effect. **'Alternative' Breaker Button Control** Pressing the ***Transfer to Generator*** button when the Generator is available and off load, the Mains load switch is opened *('**Close Mains**' becomes inactive)* and the Generator load switch is closed *('**Close Generator**' becomes active)*. Further presses of the ***Transfer to Generator*** button opens and closes the Generator load switch *('**Close Generator**' changes state)* and leaves the Mains load switch in the open position *('**Close Mains**' remains inactive)*.
	**Open Generator (Qc2212)** The ***Open Generator*** button is only active in the ***Manual Mode*** and allows the operator to open the generator load switch. Pressing the ***Open Generator*** button when the Generator is on load, the generator load switch is opened *('**Close Generator**' becomes inactive).* Further presses of the ***Open Generator*** button have no effect.
	**Transfer To Mains (Qc2212)** The ***Transfer to Mains*** button controls the operation of the mains load switch and is only active in ***Manual Mode***. **'Normal' Breaker Button Control** Pressing the ***Transfer to Mains*** button when the Mains is available and off load, the generator switch is opened *('**Close Generator**' becomes inactive)* and the mains switch is closed *('**Close Mains**' becomes active)*. Further presses of the ***Transfer to Mains*** button have no effect. **'Alternative' Breaker Button Control** Pressing the ***Transfer to Mains*** button when the Mains is available and off load, the generator load switch is opened *('**Close Generator**' becomes inactive)* and the mains load switch is closed *('**Close Mains**' becomes active)*. Further presses of the ***Transfer to Mains*** button opens and closes the mains load switch *('**Close Mains**' changes state)* and leaves the generator load switch in the open position *('**Close Generator**' remains inactive)*.

4.4 VIEWING THE INSTRUMENT PAGES

NOTE: Depending upon the module's configuration, some display screens may be disabled.

It is possible to scroll to display the different pages of information by repeatedly operating the ***Next & Previous Page*** buttons.

Example

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

Status **Generator** **Mains**

And so on until the desired page is reached. Further presses of the ***Next Page Button*** returns the Status page.

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

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

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

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

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

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

To re-enable 'auto scroll' press the ***Instrumentation Scroll*** buttons to scroll to the 'title' of the instrumentation page (ie Mains). A short time later (the duration of the *LCD Scroll Timer*), the instrumentation display begins to auto scroll.

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

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

4.4.1 STATUS

⚠NOTE: Press the *Instrumentation Scroll*  buttons on the *Status Page* to view other Configurable Status Screens if configured. For further details of module configuration, refer to

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

This page changes with the action of the controller for example when the generator is running and available:

Status	22:31
Generator at Rest	
Stop Mode	

Factory setting of *Status* screen showing engine stopped...

Status	22:31
Generator Available	

...and engine running

4.4.1.1 GENERATOR LOCKED OUT

Status	22:31
Generator Locked Out	

Generator Locked Out indicates that the Generator cannot be started due to an active *Shutdown* or *Electrical Trip Alarm* on the module. Press the ***Next or Previous Page***  button to scroll to the alarms page to investigate. Press the ***Stop/Reset Mode***  button to clear the alarm, if the alarm does not clear the fault is still active.

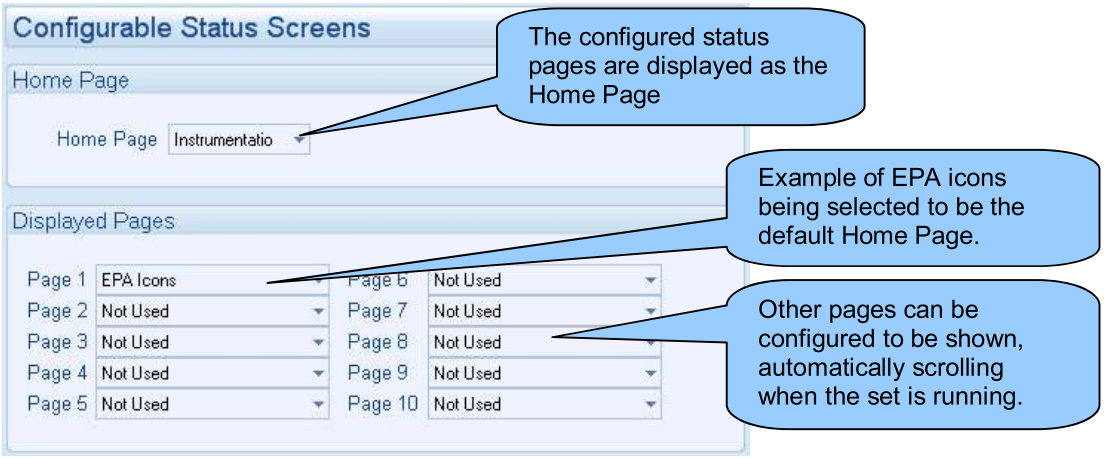
4.4.1.2 WAITING FOR GENERATOR

Status	22:31
Waiting For Generator	

Waiting For Generator indicates that the Generator has started but has not reached the required *Loading Voltage* and or *Loading Frequency* as set in the module's configuration. Press the ***Next or Previous Page***  buttons to scroll to the *Generator* page to check to see if the generator voltage and frequency is higher then the configured *Loading Voltage* and *Loading Frequency*.

4.4.1.3 CONFIGURABLE STATUS SCREENS

The contents of the Home Page may vary depending upon configuration by the generator manufacturer or supplier. Below is an example of the Home Page being changed to show engine CAN related information.

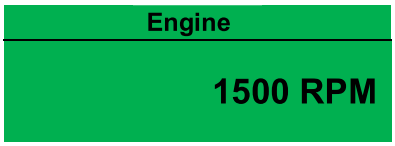


EPA Home Screen Example:

For further information about the icons, refer to *Engine* section elsewhere in this manual.

4.4.2 ENGINE

These pages contain instrumentation gathered about the engine measured or derived from the module's inputs, some of which may be obtained from the engine ECU.

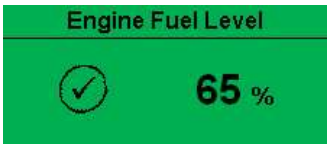


Engine Speed
Oil Pressure
Coolant Temperature
Engine Battery Volts
Engine Run Time
Engine Fuel Level
Oil Temperature*
Coolant Pressure*
Inlet Temperature*
Exhaust Temperature*
Fuel Temperature*
Turbo Pressure*
Fuel Pressure*
Fuel Consumption*
Fuel Used*
Flexible Sensors
Engine Maintenance Alarm 1
Engine Maintenance Alarm 2
Engine Maintenance Alarm 3
After Treatment Fuel Used*
After Treatment Exhaust Gad Temperature*
Engine Oil Level*
Engine Crank Case Pressure*
Engine Coolant Level*
Engine Injector Rail Pressure*
Engine Exhaust Temperature*
Intercooler Temperature*
Turbo Oil Pressure*
Fan Speed*
Water In Fuel*
Air Inlet Pressure*
ECU Regeneration*
ECU Regeneration Icons*
Engine Soot Levels*
DEF Tank Level*
DEF Tank Temperature*
DEF Reagent Cons*
SCR After Treatment Status*
ECU ECR DEF Icons*
DEF Counter Minimum*
DPTC Filter Status*
Engine ECU Link*
Tier 4 Engine Information*

4.4.2.1 MANUAL FUEL PUMP CONTROL

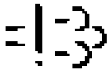
Depending upon module configuration, the *Fuel Level* page may include a ***Tick*** icon. This denotes that *Manual Fuel Pump Control* is available by pressing and holding the ***Tick*** button.

Example:

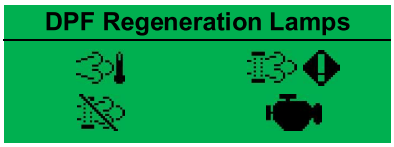


4.4.2.2 DPF REGENERATION LAMPS

Depending upon the *Engine Type* selected in the module's configuration, the *Engine* section may include the *DPF Regeneration Lamps* page. This page contains icons to show the status of various ECU functions, some of which are applicable to Tier 4 engine requirements. The icons flash at different rates to show the status of the ECU function, refer to the engine manufacturer for more information about this.

Icon	Fault	Description
	**ECU Amber Alarm**	The module received an Amber fault condition from the engine ECU.
	**ECU Red Alarm**	The module received a Red fault condition from the engine ECU.
	**DPF Active**	The module received a fault indication from the engine ECU informing that the *Diesel Particulate Filter* is active.
	**DPF Inhibited**	The module received a fault indication from the engine ECU informing that the *Diesel Particulate Filter* has been inhibited.
	**DPF Stop**	The module received a fault indication from the engine ECU informing that the *Diesel Particulate Filter* has been stopped.
	**DPF Warning**	The module received a fault condition from the engine ECU informing that the *Diesel Particulate Filter* has a fault condition.
	**HEST Active**	The module received a fault indication from the engine ECU informing that the *High Exhaust System Temperature* is active.
	**DEF Low Level**	The module received a fault condition from the engine ECU informing that the *Diesel Exhaust Fluid Low Level* is active.
	**SCR Inducement**	The module received a fault indication from the engine ECU informing that the *Selective Catalytic Reduction Inducement* is active.

Example:



4.4.3 GENERATOR

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

Press the ***Instrumentation Scroll***  buttons scroll through the ***Generator*** parameters.

Generator
50.0 Hz

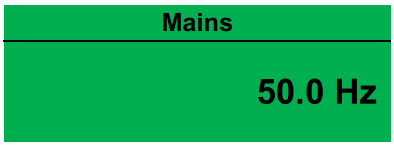
Generator Voltage (ph-N)
Generator Voltage (ph-ph)
Generator Frequency
Generator Current (A)
Generator Load ph-N (kW)
Generator Total Load (kW)
Generator Load ph-N (kVA)
Generator Total Load (kVA)
Generator Single Phase Power Factors
Generator Power Factor Average
Generator Load ph-N (kvar)
Generator Total Load (kvar)
Generator Accumulated Load (kWh, kVAh, kvarh)
Generator Loading Scheme
Generator Phase Rotation
Generator Nominal
Generator Active Configuration

4.4.4 MAINS (Qc2212 ONLY)

NOTE*: Mains current and powering monitoring is only available when the CTs are configured for, and placed in the load.

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

Press the ***Instrumentation Scroll***  buttons scroll through the ***Mains*** parameters.



Mains Voltage (ph-N)
Mains Voltage (ph-ph)
Mains Frequency
Mains Current (A)*
Mains Phase Rotation
Mains Active Configuration
Mains Load ph-N (kW)*
Mains Total Load (kW)*
Mains Load ph-N (kVA)*
Mains Total Load (kVA)*
Mains Single Phase Power Factors*
Mains Average Power Factor*
Mains Load ph-N (kvar)*
Mains Total Load (kvar)*
Mains Accumulated Load (kWh, kVAh, kvarh)*

4.4.5 EXPANSION

NOTE: Depending upon the module's configuration, some display screens may be disabled.

Contains measured values from various input expansion modules that are connected to the AC module.

Press the ***Instrumentation Scroll***  buttons scroll through the ***Expansion*** parameters if configured.

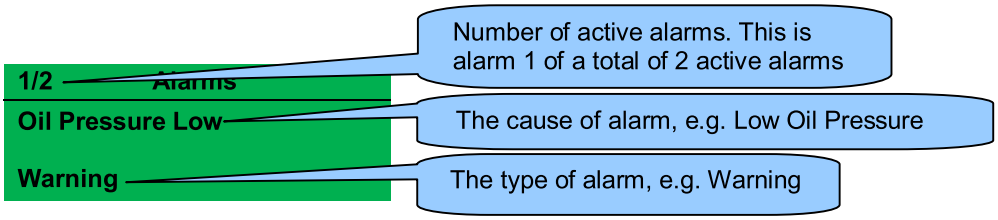
Oil Temperature
80 ℃ 176 ℉

4.4.6 ALARMS

When an alarm is active, the *Internal Audible Alarm* sounds and the Common Alarm LED, if configured, illuminates.

The audible alarm is silenced by pressing the ***Alarm Mute / Lamp Test*** button.

The LCD display jumps from the 'Information page' to display the Alarm Page



The LCD displays multiple alarms such as "*Coolant Temperature High*", "*Emergency Stop*" and "*Low Coolant Warning*". These automatically scroll in the order that they occurred or press the ***Instrumentation Scroll*** buttons scroll through manually.

In the event of an alarm, the LCD displays the appropriate text. If an additional alarm then occurs, the module displays the appropriate text.

Example:

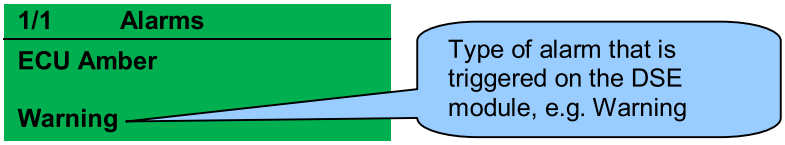
1/2 Alarms
Low Oil Pressure
Warning

2/2 Alarms
Coolant Temp High
Shutdown

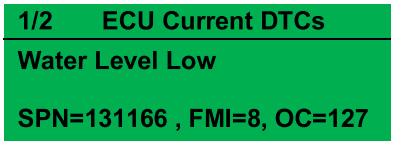
4.4.6.1 ECU ALARMS (CAN FAULT CODES / DTC)

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

When connected to a suitable CAN engine, the controller displays alarm status messages from the ECU in the *Alarms* section of the display.

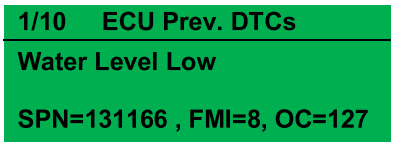


Press the ***Next Page*** button to access the list of *Current Engine DTCs* (Diagnostic Trouble Codes) from the ECU which are DM1 messages.



The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.

Press the ***Next Page*** button to access the list of *ECU Prev. DTCs* (Diagnostic Trouble Codes) from the ECU which are DM2 messages.

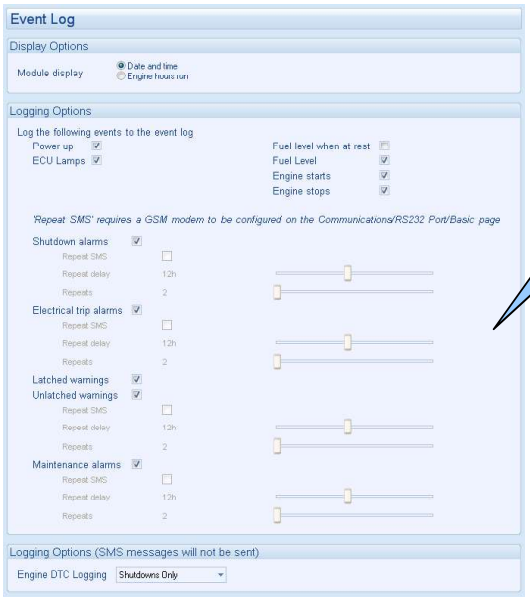


The DM2 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.

4.4.7 EVENT LOG

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

Under default factory settings, the event log is configured to include all possible options; however, this is configurable by the system designer using the DSE Configuration Suite software.

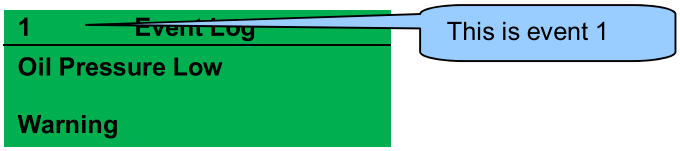


Example showing the possible configuration of the event log (DSE Configuration Suite Software).

This also shows the factory settings of the module.

When the event log is full, any subsequent event overwrites the oldest entry. Hence, the event log always contains the most recent events. The module logs the event type, along with the date and time (or engine running hours if configured to do so).

To view the event log, repeatedly press the ***Next or Previous Page***  buttons until the LCD screen displays the *Event Log* page.



Press the ***Scroll Down***  button to view the next most recent event.

Continuing to press the ***Scroll Down***  button cycles through the past events after which, the display shows the most recent alarm and the cycle begins again.

To exit the event log and return to viewing the instruments, press the ***Next or Previous Page***  buttons to select the next instrumentation page.

4.5 USER CONFIGURABLE INDICATORS

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

Indications - Monitoring of a digital input and indicating associated functioning user's equipment - *Such as Battery Charger On or Louvres Open, etc.*

Warnings, Electrical Trips & Shutdowns Alarms - Specific indication of a particular warning or shutdown condition, backed up by LCD indication - *Such as Low Oil Pressure Shutdown, Low Coolant level, etc.*

Status Indications - Indication of specific functions or sequences derived from the modules operating state - *Such as Safety On, Pre-heating, Panel Locked, etc.*

5 OPERATION

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

5.1 QUICKSTART GUIDE

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

5.1.1 STARTING THE ENGINE

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

5.1.2 STOPPING THE ENGINE

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

5.2 STOP/RESET MODE

NOTE: If a digital input configured to *Panel Lock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

Stop/Reset Mode is activated by pressing the ***Stop/Reset Mode*** button.
The LED above the ***Stop/Reset Mode*** button illuminates to indicate ***Stop/Reset Mode*** operation.

In ***Stop/Reset Mode***, the module removes the generator from load (if necessary) before stopping the generator.

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

- Engine speed is zero as detected by the CAN ECU
- Generator AC Voltage and Frequency must be zero.
- Engine Charge Alternator Voltage must be zero.
- Oil pressure sensor must indicate low oil pressure

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

Any latched alarms that have been cleared are reset when ***Stop/Reset Mode*** is entered.

The engine is not started when in ***Stop/Reset Mode***. If start signals are given, the input is ignored until ***Auto Mode*** is entered.

If *Immediate Mains Dropout* is enabled and the module is in ***Stop/Reset Mode***, the mains load switch is opened and closed as appropriate when the mains fails or becomes available to take load.

When left in ***Stop/Reset Mode*** with no presses of the fascia buttons, no form of communication active and configured for *Power Save Mode,* the module enters *Power Save Mode*. To 'wake' the module, press any fascia control buttons.

Power Save Mode in the DSE Configuration Suite Software

5.2.1 ECU OVERRIDE

Pressing the ***Start*** button in ***Stop/Reset Mode*** powers up the engine's ECU but does not start the engine. This can be used to check the status of the CAN communication and to prime the fuel system.

5.3 MANUAL MODE

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

Manual Mode is activated by pressing the ***Manual Mode*** button.
The LED above the ***Manual Mode*** button illuminates to indicate ***Manual Mode*** operations.

In ***Manual Mode*** the generator does not start automatically
To begin the starting sequence, press the ***Start*** button.

5.3.1 STARTING SEQUENCE

NOTE: There is no *Start Delay* in this mode of operation.

NOTE: If the unit has been configured for CAN, compatible ECU's receives the start command via CAN.

The fuel relay is energised and the engine is cranked.

If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the *Crank Rest Timer* duration after which the next start attempt is made. Should this sequence continue beyond the set *Number Of Attempts*, the start sequence is terminated and the display shows *Fail to Start.*

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency, but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CANbus link to the engine ECU depending on module configuration.

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

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

5.3.2 ENGINE RUNNING

NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

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

- Press the Transfer to Generator button
- Failure of mains supply (Qc2212 only)
- Activation of an auxiliary input that has been configured to *Remote Start On Load or Auxiliary Mains Fail (*Qc2212 Only*).*
- Activation of the inbuilt exercise scheduler if configured for 'on load' runs.
- Activation of *Dual Mutual Standby Balance Mode*, see section entitled *Operation (Dual Mutual Standby)* elsewhere in this document for more information.

Once the generator has been placed on load, it is not automatically removed. To manually remove the load either:

Press the ***Open Generator*** (Qc2212 Only) or ***Transfer to Mains*** (Qc2212 Only) button

- Press the ***Auto Mode*** button to return to automatic mode. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.
- Press the ***Stop/Reset Mode*** button to remove load and stop the generator.
- Activation of an auxiliary input that has been configured to *Generator Load Inhibit.*

5.3.3 STOPPING SEQUENCE

In ***Manual Mode*** the set does not continue to run until either:

- The ***Stop/Reset Mode*** button is pressed – The delayed load outputs are de-activated immediately and the set immediately stops.
- The ***Auto Mode*** button is pressed. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.

5.4 TEST MODE

NOTE: If a digital input configured to *Panel Lock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

Test Mode is activated by pressing the ***Test Mode*** button.
The LED above the ***Test Mode*** button illuminates to indicate ***Test Mode*** operations.

In ***Test Mode***, the set does not start automatically.
To begin the starting sequence, press the ***Start*** button.

5.4.1 STARTING SEQUENCE

NOTE: There is no *Start Delay* in this mode of operation.

NOTE: If the unit has been configured for CAN, compatible ECU's receives the start command via CAN.

The fuel relay is energised and the engine is cranked.

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

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency, but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CANbus link to the engine ECU depending on module configuration.

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

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

5.4.2 ENGINE RUNNING

NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

In ***Test Mode*** , the load is automatically transferred to the generator.

Once the generator has been placed on load, it is not automatically removed. To manually remove the load either:

Press the ***Manual Mode*** button followed by the ***Open Generator*** (Qc2212 Only) or ***Transfer to Mains*** (Qc2212 Only) button.

- Press the ***Auto Mode*** button to return to automatic mode. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.
- Press the ***Stop/Reset Mode*** button to remove load and stop the generator.
- Activation of an auxiliary input that has been configured to *Generator Load Inhibit*.

5.4.3 STOPPING SEQUENCE

In ***Test Mode*** the set continues to run until either:

- The ***Stop/Reset Mode*** button is pressed – The delayed load outputs are de-activated immediately and the set immediately stops.
- The ***Auto Mode*** button is pressed. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.

5.5 AUTOMATIC MODE

NOTE: If a digital input configured to external *Panel Pock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

Auto Mode is activated by pressing the ***Auto Mode*** button.
The LED above the ***Auto Mode*** button illuminates to indicate ***Auto Mode*** operations.

Auto Mode allows the generator to operate fully automatically, starting and stopping as required with no user intervention.

5.5.1 WAITING IN AUTO MODE

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

- Failure of mains supply (Qc2212 only)
- Activation of an auxiliary input that has been configured to *Remote Start*
- Activation of an auxiliary input that has been configured to *Auxiliary Mains Fail* (Qc2212 Only).
- Activation of the inbuilt exercise scheduler.
- Instruction from external remote telemetry devices using the RS232 or RS485 interface.
- Activation of *Dual Mutual Standby Balance Mode*, see section entitled *Operation (Dual Mutual Standby)* elsewhere in this document for more information.

5.5.2 STARTING SEQUENCE

NOTE: If the unit has been configured for CAN, compatible ECU's receive the start command via CAN and transmit the engine speed to the DSE controller.

To allow for 'false' start requests, the *Start Delay* timer begins.

Should all start requests be removed during the *Start Delay* timer, the unit returns to a stand-by state.

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

If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the *Crank Rest* duration after which the next start attempt is made. Should this sequence continue beyond the *Set Number Of Attempts*, the start sequence is terminated and the display shows *Fail to Start.*

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency, but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CAN link to the engine ECU depending on module.

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

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

5.5.3 ENGINE RUNNING

NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

The generator is placed on load if configured to do so.

If all start requests are removed, the *Stopping Sequence* begins.

5.5.4 STOPPING SEQUENCE

The *Return Delay* timer operates to ensure that the starting request has been permanently removed and isn't just a short term removal. Should another start request be made during the cooling down period, the set returns on load.

If there are no starting requests at the end of the *Return Delay* timer, the load is transferred from the generator to the mains supply and the *Cooling Down* timer is initiated.

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

After the *Cooling Down* timer has expired, the set is stopped.

5.6 SCHEDULER

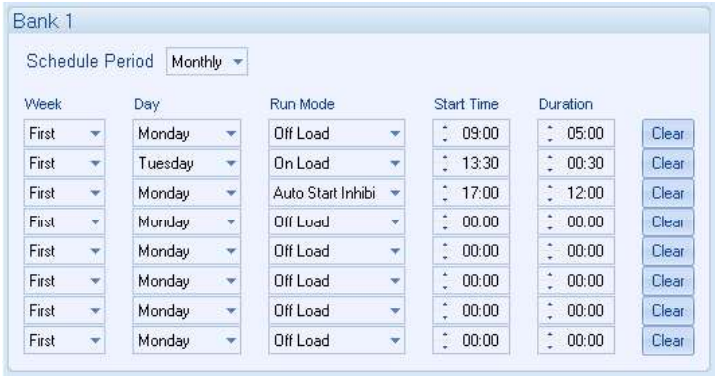
The controller contains an inbuilt exercise run scheduler, capable of automatically starting and stopping the set or inhibiting the set from starting. Up to 16 scheduled (in two banks of 8) start/stop/inhibiting start sequences can be configured to repeat on a 7-day or 28-day cycle.

Scheduled runs may be on load or off load depending upon module configuration.

Example:

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

In this example the set starts at 09:00 on Monday and run for 5 hours off load, then start at 13:30 on Tuesday and run for 30 minutes one load and is inhibited from automatically starting on Monday from 17:00 for 12 hours.



5.6.1 STOP MODE

- Scheduled runs do not occur when the module is in ***Stop/Reset Mode***.

5.6.2 MANUAL MODE

- Scheduled runs do not occur when the module is in ***Manual Mode*** waiting for a start request.
- Activation of a Scheduled Run 'On Load' when the module is operating Off Load in ***Manual Mode*** forces the set to run On Load.

5.6.3 TEST MODE

- Scheduled runs do not occur when the module is in ***Test Mode*** waiting for a start request.

5.6.4 AUTO MODE

- Scheduled runs operate only if the module is in ***Auto Mode*** with no *Shutdown* or *Electrical Trip* alarm active.
- If the module is in ***Stop/Reset Mode*** or ***Manual Mode*** when a scheduled run begins, the engine is not started. However, if the module is moved into ***Auto Mode*** during a scheduled run, the engine is called to start.
- Depending upon configuration by the system designer, an external input can be used to inhibit a scheduled run.
- If the engine is running *Off Load* in ***Auto Mode*** and a scheduled run configured to 'On Load' begins, the set is placed *On Load* for the duration of the Schedule.

5.7 ALTERNATIVE CONFIGURATIONS

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

5.8 DUMMY LOAD / LOAD SHEDDING CONTROL

If the load is low, 'dummy loads' (typically resistive load banks) are introduced to ensure the engine is not too lightly loaded. Conversely, as the load increases towards the maximum rating of the set, non-essential loads are shed to prevent overload of the generator.

5.8.1 DUMMY LOAD CONTROL

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

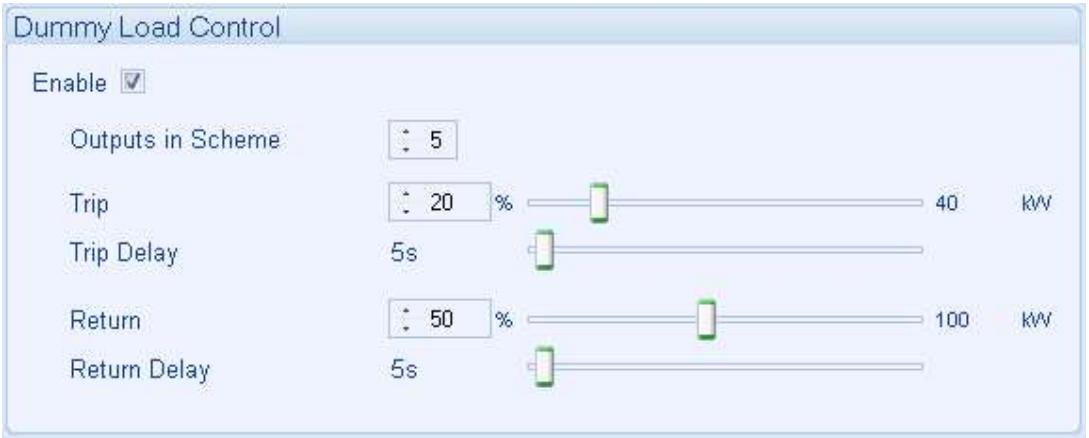
If the generator loading falls below the *Dummy Load Control Trip* setting (kW), the *Dummy Load Control Trip Delay* begins. If the generator loading remains at this low level for the duration of the timer, the first *Dummy Load Control* output is energised. This is used to energise external circuits to switch in a resistive load bank.

The first dummy load has increased the generator loading. Again, the generator loading is monitored. This continues until all configured *Dummy Load Control* outputs are energised.

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

When the generator enters a stopping sequence for any reason, all the *Dummy Load Control* outputs de-energise at the same time as the generator load switch is signalled to open.

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



5.8.2 LOAD SHEDDING CONTROL

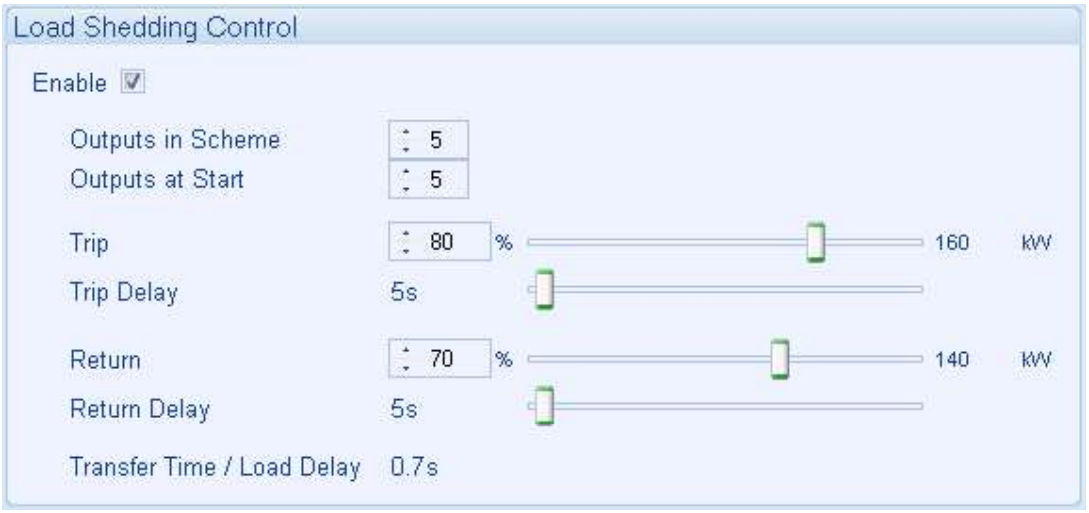
The *Load Shedding Control* feature (if enabled) allows for a maximum of five load shedding steps. When the generator is about to take load, the configured number of *Load Shedding Control Outputs at Start* will energise. This allows certain none-essential loads to be removed prior to the generator's load switch being closed. This is used to ensure the initial loading of the generator is kept to a minimum, below the *Load Acceptance* specification of the generator.

The generator is then placed on load. The *Load Shedding Control* scheme begins.
When the generator loading exceeds the *Load Shedding Trip* level the *Trip Delay* timer will start. If the generator loading is still high when the timer expires, the first *Load shedding Control* output energises. When the generator loading been above the trip level for the duration of the timer the 'next' *Load Shedding Control* output energises and so on until all *Load Shedding Control* outputs are energised.

When the generator loading falls below the *Load Shedding Return* level, the *Return Delay Time* starts. If the generator load remains below the *Load Shedding Return* level when the timer has expired, the 'highest' *Load Shedding Control* output de-energises. This process continues until all outputs have been de-energised.

When the generator enters a stopping sequence for any reason, all the *Load Shedding Control* outputs de-energise at the same time as the generator load switch is signalled to open.

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



6 OPERATION (DUAL MUTUAL STANDBY)

The following description details the sequences followed by a module containing the default factory settings modified to allow two controllers to operate in *Dual Mutual Standby*. The operating modes are as per the standard operation documented in the section *Operation* elsewhere in the manual with the addition of the *Dual Mutual Standby* functions detailed below.

If the completed generator set or control panel has been purchased from a third party supplier, the module's configuration would have been changed by them to suit their particular requirements. Always refer to the module's configuration source for the exact sequences and timers observed by any particular module in the field.

6.1 USING TWO Qc1212

NOTE: In all operating modes, only one Qc1212 is permitted to close its Generator load switching device at any time.

NOTE: Mechanical and/or electrical interlocks between the load switches is required.

When using the two Qc1212 modules, one on each generator, the *Dual Mutual Standby* feature allows a priority generator to be backed up. The generators starting and stopping to achieve this occurs automatically with no user intervention. Depending upon module configuration, the priority changes between the generators based on engine hours or an internal dual mutual timer.

6.1.1 BALANCING MODE: SET PRIORITY

Highest Priority

Next Highest Priority

If a starting request is made, the starting sequence begins.
Starting requests are made from the following sources:

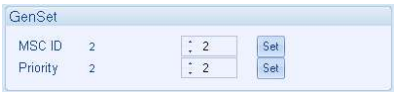
- Activation of a digital input that has been configured to *Remote Start On Load:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) controls the starting/stopping of both modules when they are in ***Auto Mode*** (AUTO). In this instance, the *Highest Priority* starts its generator. If the *Highest Priority* fails, it instructs the *Next Highest Priority* to start and take the load using the digital communications link.
  - If the *Highest Priority* is running and the *Remote Start Signal On Load* signal is given to the *Next Highest Priority*, the *Next Highest Priority* does not start its generator until the *Highest Priority* generator fails.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Priority* scheme. Both generators could start, but only the *Highest Priority* is allowed to close its load switch to power the load.

6.1.2 BALANCING MODE: ENGINE HOURS/DUAL MUTUAL TIME

Highest Priority

Next Highest Priority



If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- Activation of a digital input that has been configured to *Remote Start On Load:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) controls the starting/stopping of both modules when they are in ***Auto Mode*** (AUTO). In this instance, the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* starts. If all generators have the same number of *Engine Hours* or *Dual Mutual Time*, the highest *Priority* starts. If the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* fails, it instructs the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* to start and take the load using the digital communications link.
  - If a generator is running and the *Remote Start Signal On Load* signal is given to another generator with a lower number *Engine Hours* or *Dual Mutual Time*, it does not start until the generator fails. If the running generator's *Engine Hours* or *Dual Mutual Time* is greater than another generator's by the configured *Duty Time*, it instructs the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* to start and take the load using the digital communications link.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Engine Hours* or *Dual Mutual Time* scheme. Both generators could start, but only the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* is allowed to close its load switch to power the load.

6.2 USING TWO Qc2212

NOTE: In all operating modes, only one Qc2212 is permitted to close a generator load switching device at any time.

NOTE: In all operating modes, only one Qc2212 is permitted to operate the mains load switching device at any time.

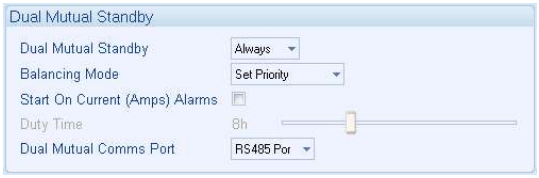
NOTE: Mechanical and/or electrical interlocks between all the load switches is required.

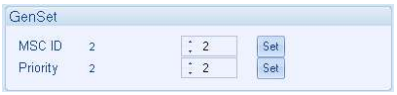
When using the two Qc2212 modules, one on each generator, the *Dual Mutual Standby* feature allows a priority generator to be backed up whilst also backing up a mains supply. The generators starting and stopping to achieve this occurs automatically with no user intervention. The priority can be configured change between the generators based on engine hours or an internal dual mutual timer. The Qc2212 which controls the mains load switch is the one which has the highest priority in that instant or whose generator is running on load.

6.2.1 BALANCING MODE: SET PRIORITY

Highest Priority

Next Highest Priority





If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- No activation of a digital input configured to *Remote Start On Load* or no *Mains Failure Detection:*
  - If the *Highest Priority* module is not in the ***Stop/Reset Mode*** or does not have an *Electrical Trip Alarm* or *Shutdown Alarm* active, it controls the mains load switch by activating the required close or open signal. The other module ensures its close and open signals are turned off so no conflicting control signals are sent to the mains load switch.
  - If the *Highest Priority* module is in the ***Stop/Reset Mode*** or has an *Electrical Trip Alarm* or *Shutdown Alarm* active, it passes control of the mains load switch to *Next Highest Priority*. The *Next Highest Priority* activates the required close or open signal prior to the *Highest Priority* de-activating its control signal. This is done to ensure that the mains load switch is maintained in the required position whilst changing over control between the modules.

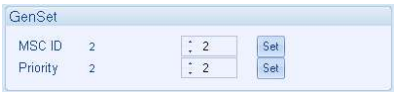
- Activation of a digital input configured to *Remote Start On Load or Mains Failure Detection:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) or *Mains Failure* detection (loss of mains sensing on both modules) controls the starting/stopping of both modules when they are in ***Auto Mode***. In this instance, the *Highest Priority* starts its generator. If the *Highest Priority* generator fails to start, control is passed to the *Next Highest Priority* using the digital communications link. The *Next Highest Priority* takes control of the mains load switch and starts its generator. Once the generator is available, the load is then transferred.
  - If the *Highest Priority* is running and the *Remote Start Signal On Load* signal or *Mains Failure* detection occurs on the *Next Highest Priority*, the *Next Highest Priority* does not attain control nor start its generator until the *Highest Priority* generator fails.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Priority* scheme. Both generators could start, but only the *Highest Priority* is allowed to control the mains load switch and transfer the load to its generator.

6.2.2 BALANCING MODE: ENGINE HOURS/DUAL MUTUAL TIME

Highest Priority

Next Highest Priority



If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- No activation of a digital input configured to *Remote Start On Load* or no *Mains Failure Detection:*
  - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* is not in the ***Stop/Reset Mode*** or, does not have an *Electrical Trip / Shutdown Alarm* active, it controls the mains load switch by activating the required close or open signal. The other module ensures its close and open signals are turned off so no conflicting control signals are sent to the mains load switch.
  - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* is in the ***Stop/Reset Mode*** or, has an *Electrical Trip* / *Shutdown Alarm* active, it passes control of the mains load switch to the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time*. The next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* activates the required close or open signal prior to generator with the lowest number of *Engine Hours* or *Dual Mutual Time* de-activating its control signal. This is done to ensure that the mains load switch is maintained in the required position whilst changing over control between the modules.

- Activation of a digital input configured to *Remote Start On Load or Mains Failure Detection:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) or *Mains Failure* detection (loss of mains sensing on both modules) controls the starting/stopping of both modules when they are in ***Auto Mode***  . In this instance, the module with the lowest number of *Engine Hours* or *Dual Mutual Time* starts its generator. If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* generator fails to start, control is passed to the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* using the digital communications link. The next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* takes control of the mains load switch and starts its generator. Once the generator is available, the load is then transferred.
  - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* generator is running and the *Remote Start Signal On Load* signal or *Mains Failure* detection occurs on the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time*, it does not attain control or start its generator until module with the running generator fails.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Engine Hours* or *Dual Mutual Time* scheme. Both generators could start, but only the with the lowest number of *Engine Hours* or *Dual Mutual Time* is allowed to control the mains load switch and transfer the load to its generator.

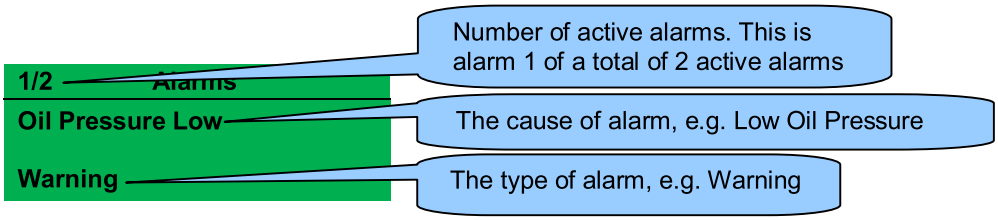
7 PROTECTIONS

7.1 ALARMS

When an alarm is active, the *Internal Audible Alarm* sounds and the *Common Alarm* output if configured, activates.

The audible alarm is silenced by pressing the ***Alarm Mute / Lamp Test*** button.

The LCD display jumps from the 'Information page' to display the Alarm Page



The LCD displays multiple alarms such as "*Coolant Temperature High*", "*Emergency Stop*" and "*Low Coolant Warning*". These automatically scroll in the order that they occurred or press the ***Instrumentation Scroll*** buttons to scroll through manually.

In the event of an alarm, the LCD displays the appropriate text. If an additional alarm then occurs, the module displays the appropriate text.

Example:

1/2 Alarms
Oil Pressure Low
Warning

2/2 Alarms
Coolant Temp High
Shutdown

7.1.1 PROTECTIONS DISABLED

User configuration is possible to prevent *Shutdown* and *Electrical Trip* alarms from stopping the generator. Under such conditions, *Protections Disabled* appears on the module display to inform the operator. *Shutdown* and *Electrical Trip* alarms still appear however, the operator is informed the alarms are blocked.

Example:

1/1	Alarms
Oil Pressure Low	
Shutdown Blocked	

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

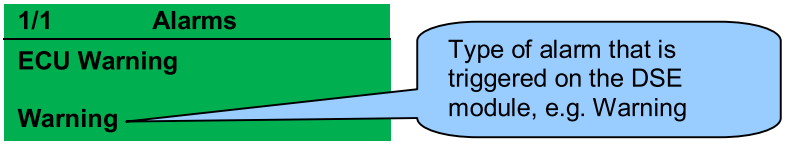
When configuring this feature in the PC software, the system designer chooses to make the feature permanently active or only active upon operation of an external switch. The system designer provides this switch so its location varies depending upon manufacturer, however it normally takes the form of a key operated switch to prevent inadvertent activation. Depending upon configuration, a warning alarm may be generated when the switch is operated.

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

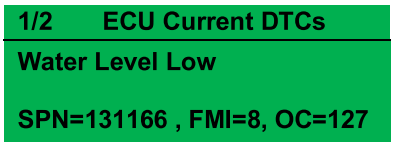
7.1.2 ECU ALARMS (CAN FAULT CODES / DTC)

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

When connected to a suitable CAN engine, the controller displays alarm status messages from the ECU in the *Alarms* section of the display.

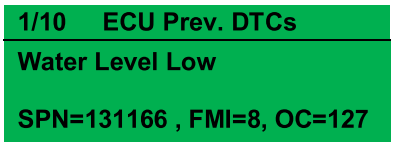


Press the ***Next Page***  button to access the list of *ECU Current DTCs* (Diagnostic Trouble Codes) from the ECU which are DM1 messages.



The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.

Press the ***Next Page***  button to access the list of *ECU Prev. DTCs* (Diagnostic Trouble Codes) from the ECU which are DM2 messages.



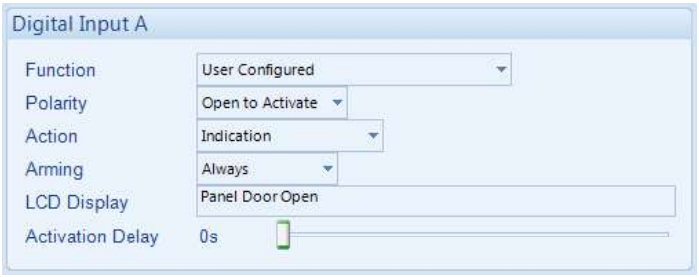
The DM2 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.

7.2 INDICATIONS

Indications are non-critical and often status conditions. They do not appear on the LCD display of the module as a text message in the *Status, Event Log* or *Alarms* pages. However, an output or LED indicator is configured to draw the operator's attention to the event.

Example:

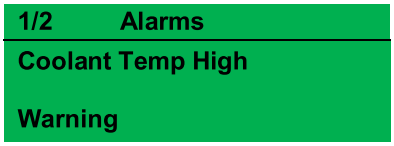
- Input configured for indication.
- The LCD text does not appear on the module display but can be added in the configuration to remind the system designer what the input is used for.
- As the input is configured to *Indication* there is no alarm generated.
- LED Indicator 1 illuminates when Digital Input A is active.
- The Insert Card Text allows the system designer to print an insert card detailing the LED function.
- Example showing operation of the LED.



7.3 WARNING ALARMS

Warnings are non-critical alarm conditions and do not affect the operation of the engine system, they serve to draw the operators attention to an undesirable condition.

Example:



In the event of an alarm the LCD jumps to the alarms page, and scroll through all active alarms.

By default, warning alarms are self-resetting when the fault condition is removed. However enabling *All Warnings Are Latched* causes warning alarms to latch until reset manually. This is enabled using the DSE Configuration Suite in conjunction with a compatible PC.

If the module is configured for **CAN** and receives an “error” message from the ECU, ‘ECU Warning” is shown on the module’s display as a warning alarm.

Fault	Description
Coolant Temp High IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the engine coolant temperature had risen above the *High Coolant Temperature Pre-Alarm Trip* level after the *Safety On Delay* timer had expired.
DC Battery High Voltage IEEE 37.2 – 59 DC Overvoltage Relay	The module detected that its DC supply voltage had risen above the *Plant Battery Overvolts Warning Trip* level for the configured delay timer.
DC Battery Low Voltage IEEE 37.2 – 27 DC Undervoltage Relay	The module detected that its DC supply voltage had fallen below the *Plant Battery Undervolts Warning Trip* level for the configured delay timer.
DEF Level Low	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Pre-Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.
Engine Over Speed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Pre-Alarm Trip* level for the configured delay timer.

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Fault	Description
Engine Over Speed Delayed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Trip* level but was below the *Over Speed Overshoot Trip* for the configured *Overshoot Delay* timer during starting.
Engine Under Speed IEEE C37.2 - 14 Underspeed Device	The module detected that the engine speed had fallen below the *Under Speed Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
	®
	NOTE: Due to module configuration the alarm message that appears on the display may be different. The module detected that an analogue input value had risen above the *Flexible Sensor High Pre-Alarm Trip* level.
	NOTE: Due to module configuration the alarm message that appears on the display may be different. The module detected that an analogue input value had fallen below the *Flexible Sensor Low Pre-Alarm Trip* level.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more then the configured *Running Rate* or *Stopped Rate*.
Gen Loading Frequency	The module detected that the generator output frequency had not risen above the *Generator Loading Frequency* setting after the *Warming Up* timer had expired.
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the *Generator Loading Voltage* setting after the *Warming Up* timer had expired.
Gen Over Current IEEE C37.2 – 50 Instantaneous Overcurrent Relay IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the *Generator Over Current Trip*.
Gen Over Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Pre-Alarm Trip* level for the configured delay timer.
Gen Over Frequency Delayed IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Trip* level but was below the *Over Frequency Overshoot Trip* for the configured *Overshoot Delay* timer during starting.
Gen Over Voltage IEEE C37.2 – 59 AC Overvoltage Relay	The module detected that the generator output voltage had risen above the *Over Voltage Pre-Alarm Trip* level for the configured delay timer.
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.

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Fault	Description
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Gen Under Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had fallen below the *Under Frequency Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Gen Under Voltage IEEE C37.2 – 27 AC Undervoltage Relay	The module detected that the generator output voltage had fallen below the *Under Voltage Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
HEST Active	The module received a fault condition from the engine ECU alerting that the HEST had activated.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the *Overload Protection Trip* for the configured delay timer
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required *Crank Disconnect* criteria had been met.
Low Coolant Warning	The module detected that the engine coolant temperature had fallen below the *Low Coolant Temperature Pre-Alarm Trip* level.
Mains Earth Fault	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Over Current IEEE C37.2 – 50 Instantaneous Overcurrent Relay	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Mains Over Current Trip*.
Mains Phase Seq Wrong	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.

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Fault	Description
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
	NOTE: Due to module configuration the alarm message that appears on the display may be different. The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.
MSC Failure	The module detected that *Dual Mutual Standby* communication link had failed.
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative var Pre-Alarm Trip* for the configured delay timer.
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Oil Pressure Low IEEE C37.2 - 63 Pressure Switch	The module detected that the engine oil pressure had fallen below the *Low Oil Pressure Pre-Alarm Trip* level after the *Safety On Delay* timer had expired.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the Positive var Pre-Alarm Trip for the configured delay timer.
Protections Disabled	The module detected that an input configured for Protections Disable became active.
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.4 ELECTRICAL TRIP ALARMS

NOTE: The fault condition must be resolved before the alarm can be reset. If the fault condition remains, it is not possible to reset the alarm (the exception to this is the *Coolant Temp High* alarm and similar *Active From Safety On* alarms, as the coolant temperature could be high with the engine at rest).

Electrical Trip Alarms are latching and stop the Generator but in a controlled manner. On initiation of the electrical trip condition the module de-activates the ***Close Gen Output*** outputs to remove the load from the generator. Once this has occurred the module starts the *Cooling Timer* and allows the engine to cool off-load before shutting down the engine. To restart the generator the fault must be cleared and the alarm reset.

Example:

1/2 Alarms
Gen Over Current
Electrical Trip

In the event of an alarm the LCD jumps to the alarms page and scrolls through all active alarms.

Electrical Trip Alarms are latching alarms and to remove the fault, press the ***Stop/Reset Mode*** button on the module.

Fault	Description
Analogue Input A to F (Digital)	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that an analogue input configured as a digital input to create a fault condition became active and the appropriate LCD message is displayed.
Auto Sense Fail	The module detected that the output voltage of the generator had risen above the *Over Voltage During Auto Sensing Trip* level during starting whilst attempting to detect which alternative configuration to use.
Calibration Fault	The module detected that its internal calibration has failed. The unit must be sent back to DSE to be investigated and repaired. Contact DSE Technical Support for more details.
Coolant Temp High IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the engine coolant temperature had risen above the *High Coolant Temperature Electrical Trip* level after the *Safety On Delay* timer had expired.
DEF Level Low	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.

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Fault	Description
Flexible Sensor A to F High	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that an analogue input value had risen above the *Flexible Sensor High Alarm Trip* level.
Flexible Sensor A to F Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that an analogue input value had fallen below the *Flexible Sensor Low Alarm Trip* level.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more then the configured Running Rate or Stopped Rate.
Gen Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the generator load switch had failed to close as the Generator Closed Auxiliary input did not activate within the Generator Fail to Close Delay time after the Close Gen Output activated.
Gen Loading Frequency	The module detected that the generator output frequency had not risen above the Generator Loading Frequency setting after the Warming Up timer had expired.
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the Generator Loading Voltage setting after the Warming Up timer had expired.
Gen Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the Generator Over Current Trip for the duration of the IDMT function.
Gen Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the generator was different to the configured Generator Phase Rotation Alarm setting.
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the Overload Protection Trip for the configured delay timer.
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required Crank Disconnect criteria had been met.

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Fault	Description
Mains Earth Fault	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the mains load switch had failed to close as the Mains Closed Auxiliary input did not activate within the Mains Fail to Close Delay time after the Close Mains Output activated.
Mains Over Current IEEE C37.2 – 51 IDMT Overcurrent	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Mains Over Current Trip* for the duration of the IDMT function.
Mains Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
	NOTE: Due to module configuration the alarm message that appears on the display may be different.. The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.
MSC ID Error	The module detected that another module on the *Dual Mutual Standby* communication link had the same *GenSet MSC ID* configured.

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Fault	Description
MSC Old Version Unit	The module detected that another module on the *Dual Mutual Standby* communication link had an incompatible *Dual Mutual Standby* version to its own.
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative var Alarm Trip* for the configured delay timer.
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the *Positive var Alarm Trip* for the configured delay timer.
Priority Selection Error	The module detected that another module on the *Dual Mutual Standby* communication link had the same *GenSet Priority* configured.
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.5 SHUTDOWN ALARMS

NOTE: The fault condition must be resolved before the alarm can be reset. If the fault condition remains, it is not possible to reset the alarm (the exception to this is the *Oil Pressure Low* alarm and similar *Active From Safety On* alarms, as the oil pressure is low with the engine at rest).

Shutdown Alarms are latching and immediately stop the Generator. On initiation of the shutdown condition the module de-activates the ***Close Gen Output*** outputs to remove the load from the generator. Once this has occurred, the module shuts the generator set down immediately to prevent further damage. To restart the generator the fault must be cleared and the alarm reset.

Example:

1/2 Alarm
Oil Pressure Low
Shutdown

In the event of an alarm the LCD jumps to the alarms page and scrolls through all active alarms.

Shutdown Alarms are latching alarms and to remove the fault, press the ***Stop/Reset Mode*** button on the module.

Fault	Description
DEF Level	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Generator Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.
Emergency Stop IEEE C37.2 - 5 Stopping Device	The module detected that emergency stop button had been pressed removing a positive voltage supply from the emergency stop input terminal. This input is failsafe (normally closed to emergency stop) and immediately stops the generator when the signal is removed.
Engine Over Speed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Alarm Trip* level for the configured delay timer.
Engine Over Speed Overshoot IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Overshoot Trip* during the configured *Overshoot Delay* timer whilst starting.
Engine Under Speed IEEE C37.2 - 14 Underspeed Device	The module detected that the engine speed had fallen below the *Under Speed Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.

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Fault	Description
Failed to Start IEEE C37.2 - 48 Incomplete Sequence Relay	The module detected that the generator had failed to start as it did not meet the required Crank Disconnect criteria during the configured number of Crank Attempts.
Failed to Stop IEEE C37.2 - 48 Incomplete Sequence Relay	**NOTE: *Fail to Stop* could indicate a faulty oil pressure sensor. If engine is at rest, check the oil pressure sensor wiring and configuration.** The module detects a condition that indicates the generator is running when the DSE module has instructed it to stop.
Flexible Sensor A to F Fault	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that circuit to the flexible sensor had become open circuit.
Flexible Sensor A to F High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-243 DSE7310 MKII & DSE7320 MKII Configuration Software Manual.*** The module detected that an analogue input value had risen above the *Flexible Sensor High Alarm Trip* level.
Flexible Sensor A to F Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that an analogue input value had fallen below the *Flexible Sensor Low Alarm Trip* level.
Flexible Sensor A to F Open Circuit	The module detected that circuit to the flexible sensor had become open circuit.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.

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Fault	Description
Fuel Sensor Fault	The module detected that circuit to the engine fuel level sensor had become open circuit.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more then the configured Running Rate or Stopped Rate.
Gen Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the generator load switch had failed to close as the Generator Closed Auxiliary input did not activate within the Generator Fail to Close Delay time after the Close Gen Output activated.
Gen Loading Frequency	The module detected that the generator output frequency had not risen above the Generator Loading Frequency setting after the Warming Up timer had expired.
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the Generator Loading Voltage setting after the Warming Up timer had expired.
Gen Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the *Generator Over Current Trip* for the duration of the IDMT function.
Gen Over Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Alarm Trip* level for the configured delay timer.
Gen Over Frequency Overshoot IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Overshoot Trip* during the configured *Overshoot Delay* timer whilst starting.
Gen Over Voltage IEEE C37.2 – 59 AC Overvoltage Relay	The module detected that the generator output voltage had risen above the *Over Voltage Alarm Trip* level for the configured delay timer.
Gen Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the generator was different to the configured *Generator Phase Rotation Alarm* setting.
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Gen Under Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had fallen below the *Under Frequency Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Gen Under Voltage IEEE C37.2 – 27 AC Undervoltage Relay	The module detected that the generator output voltage had fallen below the *Under Voltage Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the Overload Protection Trip for the configured delay timer.
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required Crank Disconnect criteria had been met.
Mag-PU Fault	The module detected that circuit to the magnetic pick up sensor had become open circuit.

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Fault	Description
Mains Earth Fault IEEE C37.2 – 51G or 51N IDMT Earth	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the mains load switch had failed to close as the Mains Closed Auxiliary input did not activate within the Mains Fail to Close Delay time after the Close Mains Output activated.
Mains Over Current IEEE C37.2 – 51 IDMT Overcurrent	**NOTE: For more details, see section entitled Over Current Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Mains Over Current Trip* for the duration of the IDMT function.
Mains Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit	**NOTE: For more details, see section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*.** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Maintenance Due	**NOTE: Due to module configuration the alarm message that appears on the display may be different.** The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative var Alarm Trip* for the configured delay timer.

Continued over page…

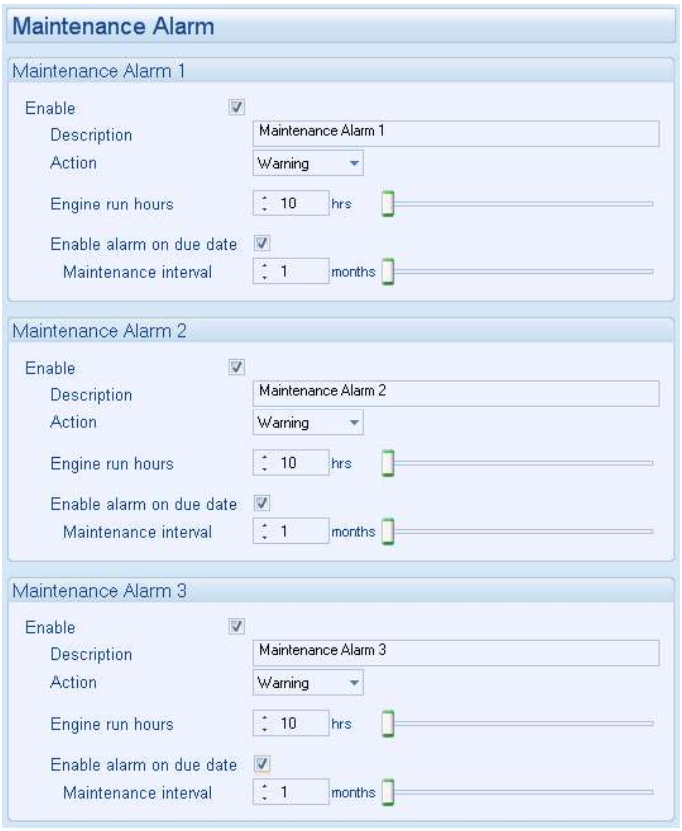
Fault	Description
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Oil Press Sender Fault	The module detected that circuit to the engine oil pressure sensor had become open circuit.
Oil Pressure Low IEEE C37.2 - 63 Pressure Switch	The module detected that the engine oil pressure had fallen below the *Low Oil Pressure Shutdown Trip* level after the *Safety On Delay* timer had expired.
Oil Pressure Low Switch IEEE C37.2 - 63 Pressure Switch	The module detected that the low oil pressure switch had activated after the *Safety On Delay* timer had expired.
Over Frequency Runaway IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Run Away Trip* level.
Over Speed Runaway IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Run Away Trip* level.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the *Positive var Alarm Trip* for the configured delay timer.
Priority Selection Error	The module detected that another module on the *Dual Mutual Standby* communication link
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.6 MAINTENANCE ALARMS

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

Example 1:

Screen capture from DSE Configuration Suite Software showing the configuration of the Maintenance Alarm for 1, 2 and 3.



When activated, the maintenance alarm can be either a **warning** (set continues to run) or **shutdown** (running the set is not possible).

Resetting the maintenance alarm is normally actioned by the site service engineer after performing the required maintenance.
The method of reset is either by:

Activating an input that has been configured to Maintenance Reset Alarm 1, 2 or 3.

Pressing the maintenance reset button in the DSE Configuration Suite, Maintenance section.

Pressing and holding the ***Stop/Reset Mode*** button for 10 seconds on the desired Maintenance Alarm status page. This may be protected by a PIN number.

Example 2:

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

Example 3:

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

Example 4:

Screen capture from DSE Configuration Suite Software showing the configuration holding stop button to reset the maintenance alarm.

7.7 OVER CURRENT ALARM

The *Over Current Alarm* combines a simple warning trip level with a fully functioning IDMT curve for thermal protection.

7.7.1 IMMEDIATE WARNING

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

7.7.2 INVERSE DEFINITE MINIMUM TIME (IDMT) ALARM

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*).

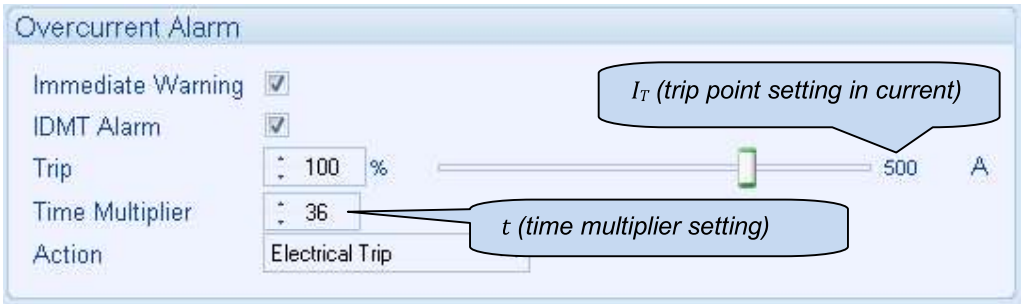
The larger the over circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

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

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 can be 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.

7.7.2.1 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 can be 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.

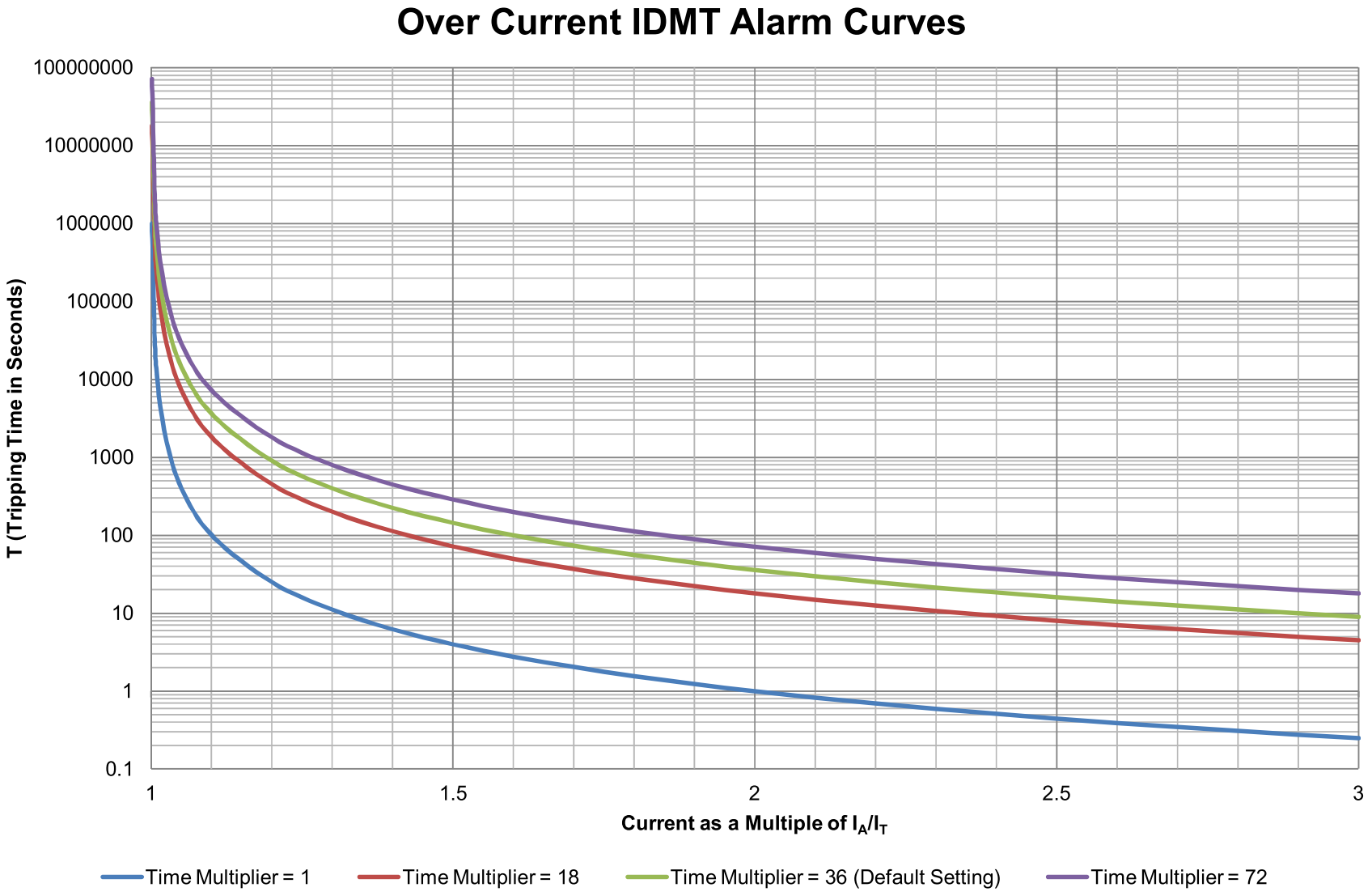
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	36	360000	90000	40000	14400	10000

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

t *(time multiplier setting)*

T *(tripping time in seconds)*

The formula for the *Tripping Time* cells is:


Over Current IDMT Alarm 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

7.8 SHORT CIRCUIT IDMT ALARM

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:

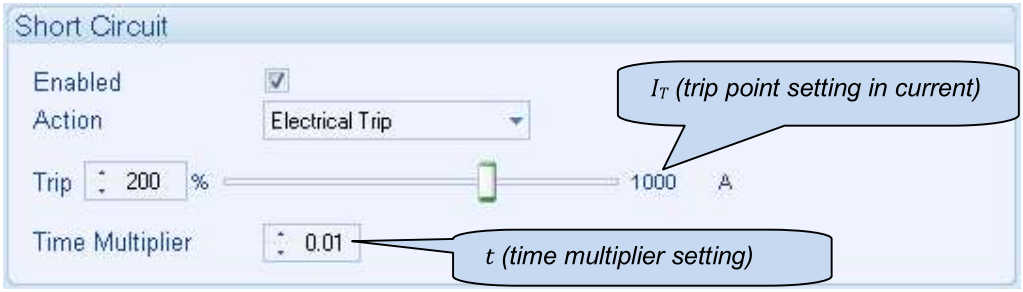
$$T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$$

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 can be 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.

7.8.1 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 can be 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.

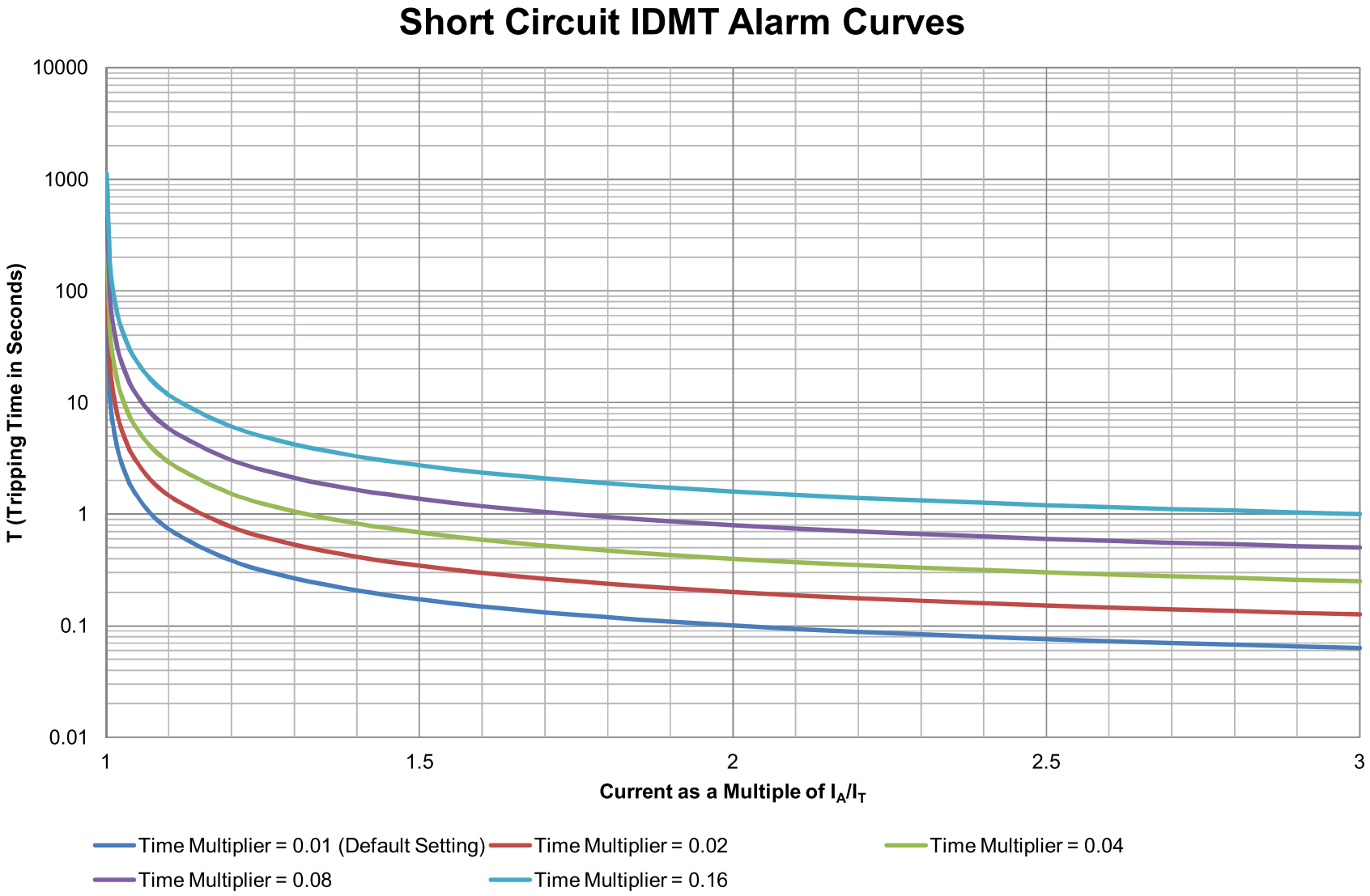
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	0.01	7.034242	25	11.11111	4	2.777778

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

t (time multiplier setting)

T (tripping time in seconds)

The formula for the *Tripping Time* cells is:


Short Circuit IDMT Alarm 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

7.9 EARTH FAULT IDMT ALARM

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

If the *Earth Fault Alarm* is enabled, the controller begins following the IDMT 'curve' 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*).

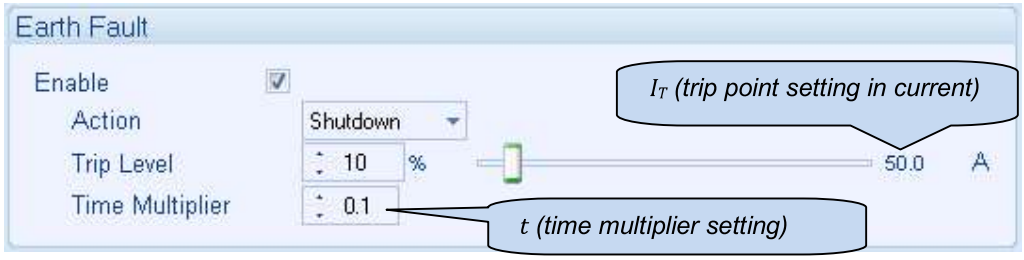
The larger the earth fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

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

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.



7.9.1 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 can be 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.

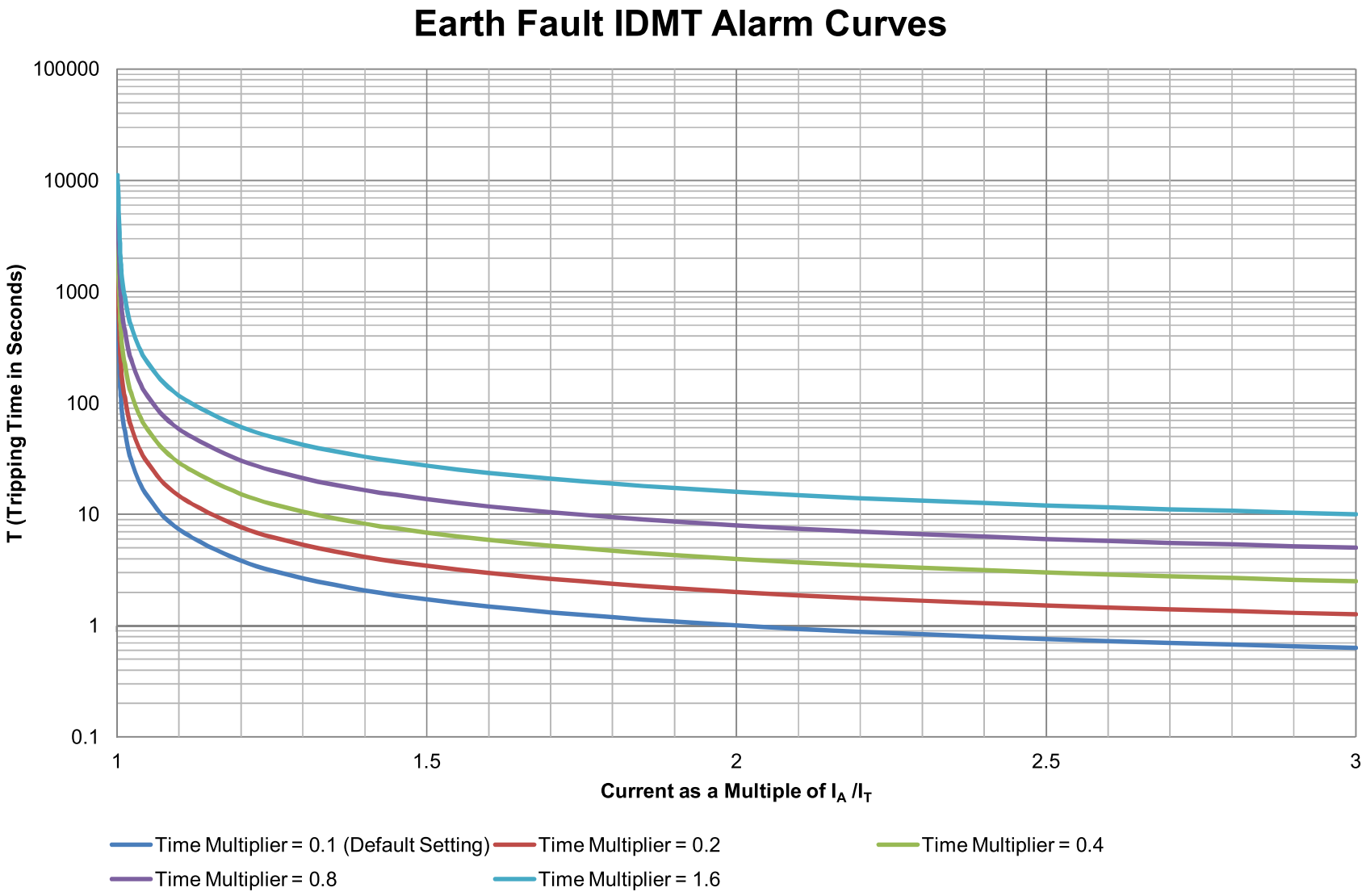
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	0.1	70.34242	250	111.1111	40	27.77778

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

t (time multiplier setting)

T (tripping time in seconds)

The formula for the *Tripping Time* cells is:


Earth Fault IDMT Alarm Curves
T (Tripping Time in Seconds)
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 = 0.1 (Default Setting)
Time Multiplier = 0.2
Time Multiplier = 0.4
Time Multiplier = 0.8
Time Multiplier = 1.6

7.10 DEFAULT CURRENT PROTECTION TRIPPING CHARACTERISTICS

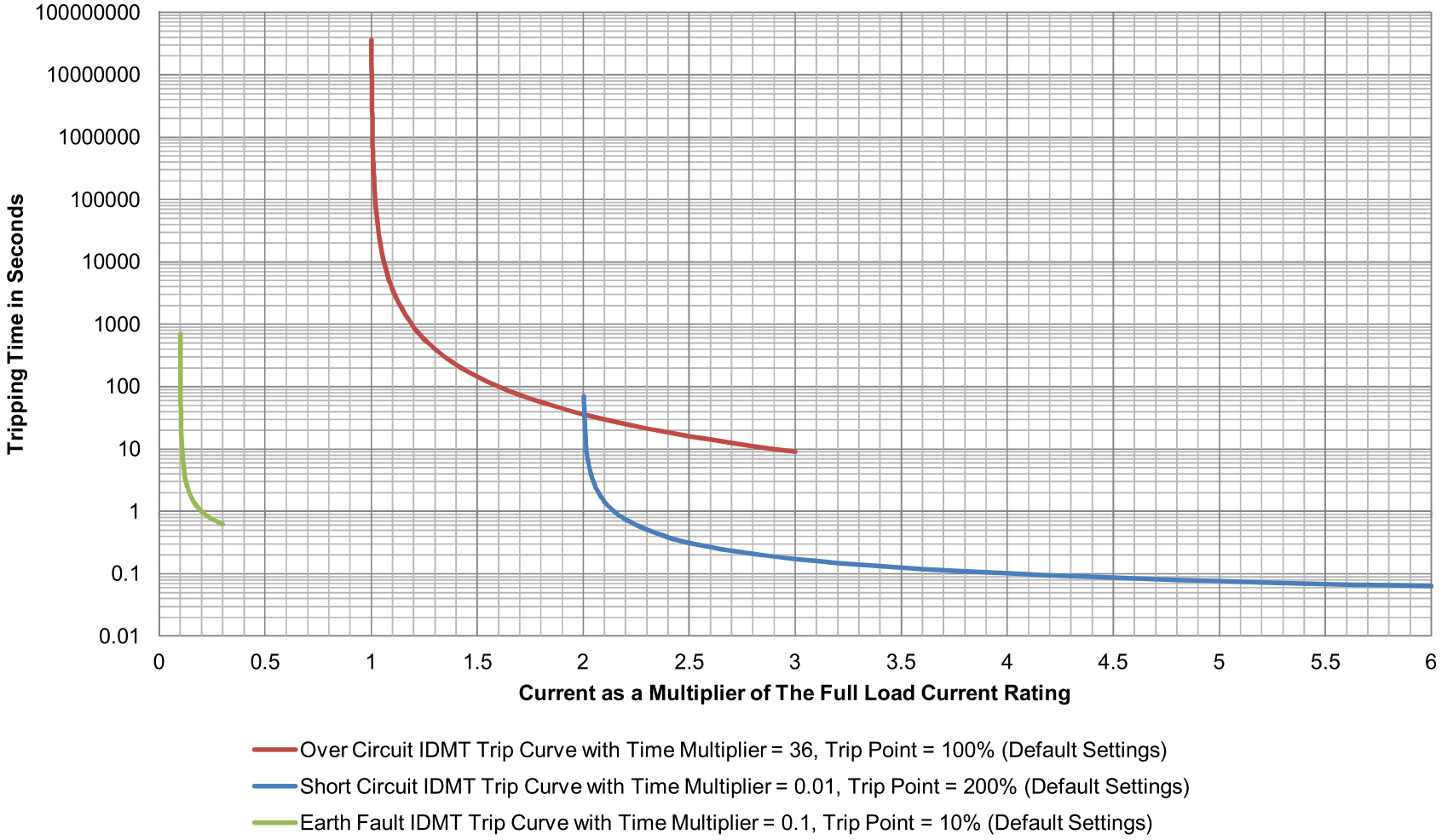
The graph on the following page shows the default settings for the IDMT tripping curves for the *Over Current, Short Circuit* and *Earth Fault* protections.

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 can be 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 a genuine short circuit or an inrush 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 can be 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.

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

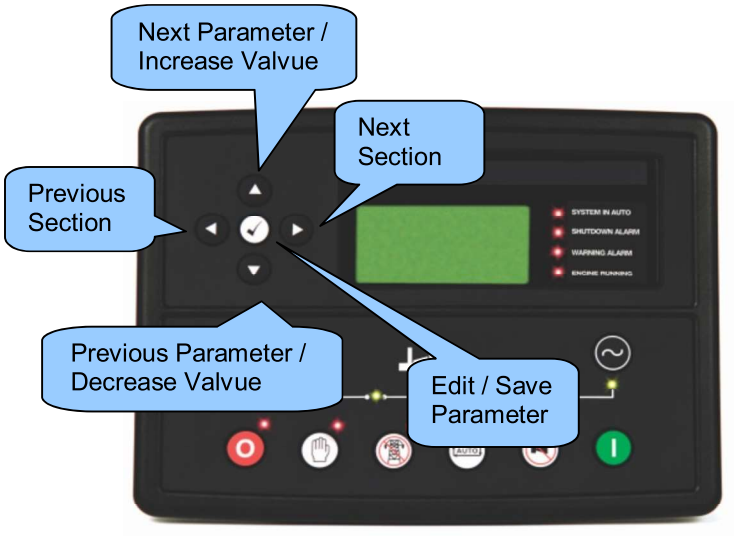


8 FRONT PANEL CONFIGURATION

NOTE: Depending upon module configuration, some values in the *Mains & Running Configuration Editors* may not be available.

This configuration mode allows the operator to partially configure the module through its display without the use of the DSE Configuration Suite PC Software.

Use the module's facia buttons to traverse the menu and make value changes to the parameters:



8.1 MAIN CONFIGURATION EDTIOR

8.1.1 ACESSING THE MAIN CONFIGURATION EDTIOR

NOTE: More comprehensive module configuration is possible via PC configuration software.

- Ensure the engine is at rest and the module by pressing the ***Stop/Reset Mode*** button.
- Press the ***Stop/Reset Mode*** and ***Tick*** buttons together to enter the main configuration editor.

8.1.2 ENTERING PIN

NOTE: The PIN is not set by DSE when the module leaves the factory. If the module has a PIN code set, the generator supplier has entered this. Contact the generator supplier if the code is required.

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

- If a module security PIN has been set, the PIN request is then shown.
- The first '#' changes to '0'. Press the ***Up*** or ***Down*** buttons to adjust it to the correct value.
- Press the ***Right*** button when the first digit is correctly entered. The digit previously entered now shows as '#' for security.
- Repeat this process for the other digits of the PIN number. Press the ***Left*** button to move back to adjust one of the previous digits.
- When the ***Tick*** button is pressed after editing the final PIN digit, the PIN is checked for validity. If the number is not correct, the PIN must be re-entered.
- If the PIN has been successfully entered (or the module PIN has not been enabled), the editor is displayed.

8.1.3 EDITING A PARAMETER

NOTE: Pressing and holding the *Menu Navigation* buttons provides the auto-repeat functionality. Values can be changed quickly by holding the navigation buttons for a prolonged period of time.

- Select the configuration that is required to be edit by pressing the ***Up*** or ***Down*** buttons.

Editor

Config to Edit

Main Configuration

- Press the ***Right*** or ***Left*** buttons to cycle to the section to view/change.
- Press the ***Up*** or ***Down*** buttons to select the parameter to view/change within the currently selected section.
- To edit the parameter, press the ***Tick*** button to enter edit mode. The parameter begins to flash to indicate editing.
- Press the ***Up*** or ***Down*** buttons to change the parameter to the required value.
- Press the ***Tick*** button to save the value. The parameter ceases flashing to indicate that it has been saved.

8.1.4 EXITING THE MAIN CONFIGURATION EDITOR

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

- Press and hold the ***Stop/Reset Mode*** button to exit the editor without saving changes.
- Press and hold the ***Tick*** button to exit the editor and save the changes.

8.1.5 ADJUSTABLE PARAMETERS

Section	Parameter As Shown On Display	Value
Display	Contrast	0 %
	Language	English
	LCD Page Timer	0 h 0 m 0 s
	Auto Scroll Delay	0 h 0 m 0 s
	Current Date and Time	Month, Year, hh:mm
	Dual Mutual Mode	Engine Hours / Dual Mutual Hours / Priority
	Dual Mutual Priority	0
	Dual Mutual Duty Time	0 h 0 m
Editor	Config to Edit	Main Configuration / Alternative Configuration 1,2,3,4, or 5
	Default Configuration	Main Configuration / Alternative Configuration 1,2,3,4, or5
Engine	Oil Pressure Low Shutdown	0.00 bar
	Oil Pressure Low Pre Alarm	0.00 bar
	Coolant Temperature Low Warning	0 ºC
	Coolant Temperature High Pre Alarm	0 ºC
	Coolant Temperature High Electrical Trip	0 ºC
	Coolant Temperature High Shutdown	0 ºC
	Fuel Usage Running Rate	0 %
	Fuel Usage Stopped Rate	0 %
	Specific Gravity	0.89
	Pre Heat Temeprature	0 ºC
	Pre Heat Timer	0 h 0 m 0 s
	Post Heat Timer	0 h 0 m 0 s
	Post Heat Temperature	0 ºC
	Droop Control	Active / Inactive
	Droop Control	0 %
	Engine Under Speed Shutdown	Active / Inactive
	Engine Under Speed Shutdown	0 RPM
	Engine Under Speed Warning	Active / Inactive
	Engine Under Speed Warning	0 RPM
	Engine Under Speed Delay	0.0 s
	Engine Over Speed Warning	Active / Inactive
	Engine Over Speed Warning	0 RPM
	Engine Over Speed Shutdown	0 RPM
	Engine Over Speed Delay	0.0 s
	Engine Speed Overshoot	0 %
	Engine Speed Overshoot Delay	0.0 s
	Battery Under Voltage Warning	Active / Inactive
	Battery Under Voltage Warning	0 V
	Battery Under voltage Warning Delay	0 h 0 m 0 s
	Battery Over Voltage Warning	Active / Inactive
	Battery Over Voltage Warning	0 V
	Battery Over Voltage Warning Delay	0 h 0 m 0 s
	Charge Alternator Failure Warning	Active / Inactive
	Charge Alternator Failure Warning	0 V
	Charge Alternator Warning Delay	0 h 0 m 0 s
	Charge Alternator Failure Shutdown	Active / Inactive
	Charge Alternator Failure Shutdown	0.0 V
	Charge Alternator Shutdown Delay	0 h 0 m 0 s

Continued over page...

Section	Parameter As Shown On Display	Value
Generator	AC System	3 Phase, 4 Wire
	Generator Under Voltage Shutdown	0 V
	Generator Under Voltage Pre Alarm	0 V
	Generator Under Voltage Delay	0.0 s
	Generator Nominal Voltage	0 V
	Generator Over Voltage Pre Alarm	0 V
	Generator Over Voltage Shutdown	0 V
	Generator Over Voltage Delay	0.0 s
	Generator Under Frequency Shutdown	0.0 Hz
	Generator Under Frequency Pre Alarm	0.0 Hz
	Generator Under Frequency Delay	0.0 s
	Generator Nominal Frequency	0.0 Hz
	Generator Over Frequency Pre Alarm	0.0 Hz
	Generator Over Frequency Shutdown	0.0 Hz
	Generator Under Frequency Delay	0.0 s
	Generator Over Frequency Overshoot	0 %
	Generator Over Frequency Overshoot Delay	0.0 s
	Generator CT Primary Current	0 A
	Generator Secondary Current	1 A / 5 A
	Generator CT Primary Earth Current	0 A
	Full Load Rating	0 A
	Delayed Over Current	Active / Inactive
	Delayed Over Current	0%
	Generator Earth Fault Trip	Active / Inactive
	Generator Earth Fault Trip	0 %
	kW Overload Trip	0 %
Mains Qc2212 Only	Mains Under Voltage Trip	0 V
	Mains Over Voltage Trip	0 V
	Mains Under Frequency Trip	0.0 Hz
	Mains Over Frequency Trip	0.0 Hz
Timers	Start Delay Off Load	0 h 0 m 0 s
	Start Delay On Load	0 h 0 m 0 s
	Start Delay Mains Fail	0 h 0 m 0 s
	Start Delay Telemetry	0 h 0 m 0 s
	Mains Transient Delay	0 m 0 s
	Crank Duration Timer	0 m 0 s
	Crank Rest Timer	0 m 0 s
	Smoke Limiting	0 m 0 s
	Smoke Limiting Off	0 m 0 s
	Safety On Delay	0 m 0 s
	Warm Up Timer	0 h 0 m 0 s
	ECU Override	0 m 0 s
	Transfer Time	0m 0.0s
	Return Delay	0 h 0 m 0 s
	Cool Down Timer	0 h 0 m 0 s
	Fail To Stop Delay	0 m 0 s
	LCD Page Timer	0 h 0 m 0 s
	Auto Scroll Delay	0 h 0 m 0 s
	Sleep Timer	0 h 0 m 0 s
	Backlight Power Save	0 h 0 m 0 s

Continued over page...

Section	Parameter As Shown On Display	Value
Schedule	Schedule	Active / Inactive
	Schedule Bank 1 Period	Weekly / Monthly,
	On Load / Off Load / Auto Start Inhibit, Week, Start Time, Run Time and Day Selection (1-8)	Press ✓ to begin editing then up or down when selecting the different parameters in the scheduler.
	Schedule Bank 2 Period	Weekly / Monthly,
	On Load / Off Load / Auto Start Inhibit, Week, Start Time, Run Time and Day Selection (1-8)	Press ✓ to begin editing then up or down when selecting the different parameters in the scheduler.

8.2 'RUNNING' CONFIGURATION EDITOR

8.2.1 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR

- The *Running Editor* is enterable whilst the generator is running. All protections remain active when the generator is running while the *Running Editor* is entered
- Press and hold the ***Tick***  button to access the *Running Editor.*

8.2.2 ENTERING PIN

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

Even if a module security PIN has been set, the PIN is not requested whilst entering the *Running Editor*.

8.2.3 EDITING A PARAMETER

⚠NOTE: Pressing and holding the *Menu Navigation*  **buttons provides the auto-repeat functionality. Values can be changed quickly by holding the navigation buttons for a prolonged period of time.**

- Press the ***Right*** or ***Left***  buttons to cycle to the section to view/change.
- Press the ***Up*** or ***Down***  buttons to select the parameter to view/change within the currently selected section.
- To edit the parameter, press the ***Tick***  button to enter edit mode. The parameter begins to flash to indicate editing.
- Press the ***Up*** or ***Down***  buttons to change the parameter to the required value.
- Press the ***Tick***  button to save the value. The parameter ceases flashing to indicate that it has been saved.

8.2.4 EXITING THE 'RUNNING' CONFIGURATION EDITOR

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

- Press and hold the ***Tick***  button to exit the editor and save the changes.

8.2.5 RUNNING EDITOR PARAMETERS

Section	Parameter As Shown On Display	Values
Display	Contrast	0%
	Language	English
	Dual Mutual Priority	0
Engine	Speed Adjust	0 %
	Speed Bias	0 %
	Governor Gain	0
	Frequency Adjust	0 %
	DPF Auto Regeneration Inhibit	Active / Inactive
	DPF Manual Regeneration Request	Active / Inactive
	ECU Service Mode	Active / Inactive

9 COMMISIONING

NOTE: If Emergency Stop feature is not required, link the input to the DC Positive.

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

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

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

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

To check the start cycle operation, take appropriate measures to prevent the engine from starting (disable the operation of the fuel solenoid). After a visual inspection to ensure it is safe to proceed, connect the battery supply. Press the ***Manual Mode*** button followed by the ***Start*** button the unit start sequence commences.

The starter engages and operates for the pre-set crank period. After the starter motor has attempted to start the engine for the pre-set number of attempts, the LCD displays *Failed to Start*. Press the ***Stop/Reset Mode*** button to reset the unit.

Restore the engine to operational status (reconnect the fuel solenoid). Press the ***Manual Mode*** button followed by the ***Start*** button. This time the engine should start and the starter motor should disengage automatically. If not then check that the engine is fully operational (fuel available, etc.) and that the fuel solenoid is operating. The engine should now run up to operating speed. If not, and an alarm is present, check the alarm condition for validity, then check input wiring. The engine should continue to run for an indefinite period. It is possible at this time to view the engine and alternator parameters - refer to the 'Description of Controls' section of this manual.

Press the ***Auto Mode*** button, the engine runs for the pre-set cooling down period, then stop. The generator should stay in the standby mode. If it does not, check that the *Remote Start* input is not active.

Initiate an automatic start by supplying the remote start signal (if configured). The start sequence commences and the engine runs up to operational speed. Once the generator is available the delayed load outputs activate, the Generator accepts the load. If not, check the wiring to the delayed load output contactors. Check the Warming timer has timed out.

Remove the remote start signal. The return sequence begins. After the pre-set time, the generator is unloaded. The generator then runs for the pre-set cooling down period, then shutdown into its standby mode.

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

10 FAULT FINDING

NOTE: The below fault finding is provided as a guide check-list only. As the module can be configured to provide a wide range of different features, always refer to the source of the module configuration if in doubt.

10.1 STARTING

Symptom	Possible Remedy
Unit is inoperative Read/Write configuration does not operate	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70℃. Check the DC fuse.
Fail to Start is activated after pre-set number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed-sensing signal is present on the module's inputs. Refer to engine manual.
Continuous starting of generator when in the ***Auto Mode***	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct. Check the mains supply is available and within configured limits
Generator fails to start on receipt of Remote Start signal.	Check Start Delay timer has timed out. Check signal is on "Remote Start" input. Confirm correct configuration of input is configured to be used as "Remote Start". Check that the oil pressure switch or sensor is indicating low oil pressure to the controller. Depending upon configuration, the set does not start if oil pressure is not low.
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module. Check pre-heat configuration is correct.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure oil pressure switch or sensor is indicating the "low oil pressure" state to the controller.

10.2 LOADING

Symptom	Possible Remedy
Engine runs but generator does not take load	Check Warm up timer has timed out. Ensure generator load inhibit signal is not present on the module inputs. Check connections to the switching device. Note that the set does not take load in ***Manual Mode*** unless there is an active load signal.
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

10.3 ALARMS

Symptom	Possible Remedy
Oil pressure low fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the module and is correctly configured.
Coolant temp high fault operates after engine has fired.	Check engine temperature. Check switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the module.
Shutdown fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Electrical Trip fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Warning fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
ECU Amber ECU Red	This indicates a fault condition detected by the engine ECU and transmitted to the controller.
ECU Data Fail	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required).
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 14. Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

10.4 COMMUNICATIONS

Symptom	Possible Remedy
ECU Data Fail	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required).

10.5 INSTRUMENTS

Symptom	Possible Remedy
Inaccurate generator measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow (p1,p2 and s1,s2) and additionally ensure that CTs are connected to the correct phase (errors occur if CT1 is connected to phase 2). Remember to consider the power factor (kW = kVA x powerfactor). The controller is true RMS measuring so gives more accurate display when compared with an 'averaging' meter such as an analogue panel meter or some lower specified digital multimeters. Accuracy of the controller is better than 1% of full scale. Generator voltage full scale is 415 V ph-N, accuracy is ±4.15 V (1 % of 415 V).

10.6 MISCELLANEOUS

Symptom	Possible Remedy
Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the ***Tick*** button to save the change before moving to another item or exiting the fascia editor