



# DEEP SEA ELECTRONICS PLC

5xxx series configuration software for Windows™

For 55xx series controllers.

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DSE 55xx for Windows PC configuration software manual

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## 1 BIBLIOGRAPHY

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2. Diesel generator handbook. L.L.J.Mahon. ISBN 0-7506-1147-2
3. On-Site Power Generation. EGSA Education Committee. ISBN 0-9625949-3-8

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## 2 DESCRIPTION

The DSE **55xx series** configuration software allows the 55xx family of modules to be connected to a PC. Once connected the various operating parameters within the module can be viewed or edited as required by the engineer. This software allows easy controlled access to these values and also has diagnostic monitoring facilities.

The Configuration interface should only be used by competent, qualified personnel, as changes to the operation of the module may have safety implications on the panel / generating set to which it is fitted. Access to critical operational sequences and settings for use by qualified engineers, are barred by a PC software security code. Timers are protected by a separate code allowing operator changes to be made.

The information contained in this manual should be read in conjunction with the information contained in the appropriate module documentation. This manual only details which settings are available and how they may be used. The operation of the module is detailed in its own relevant manual.

The P810 USB interface is housed in a robust plastic case. Connection to the module is via an FCC 68 RJ45 'CAT5E Network' type cable ('straight-through' type), this allows for easy replacement in the field should the connecting lead be damaged or lost.

For legacy support, an RS232 version is also available with an adapter cable to allow connection to the 9 pin D type RS232 connectors as required.

### 2.1 CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.

	<b>NOTE:</b>	Highlights an essential element of a procedure to ensure correctness.
	<b>CAUTION!</b>	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
	<b>WARNING!</b>	Indicates a procedure or practice that could result in injury to personnel or loss of life if not followed correctly.
	<b>CAN</b>	Indicates a function only applicable when the controller is configured for connection to a Can engine controller
		DEEP SEA ELECTRONICS PLC own the copyright to this manual, which cannot be copied, reproduced or disclosed to a third party without prior written permission.

### 2.2 MANUAL STRUCTURE

This manual is designed to assist users of the 55xx series configuration software; this is the common configuration software for all modules of the 55xx range. All software operations such as file handling (loading and saving to disk, reading from and writing to the module) and printing are identical regardless of the module being configured. Some options are only available on the different variants of the 55xx module such as Mains failure detect setting (5520 and 5560 AMF Modules only). A separate manual deals with the operation of the individual modules, and further details on Load sharing and paralleling operations can be found in the 'Guide to Sync and load share' Parts I & II, and also in the 'Load-share system design and Commissioning' Manuals.

**NOTE:** - This Manual does not cover Remote Communication using the P55xx fitted with either RS232 or RS485. For details of these systems, please refer to the Link500Plus Manual.

### 3 PC INTERFACE MODULE 810

The PC interface **810** kit comprises the following:-

- **810** (USB) Interface Module or **810** (RS232) Interface Module
- USB cable, (25 to 9 way adaptor supplied with the RS232 version).
- FCC 68 (8 Pin) Connecting Lead
- 1x CD with configuration software

#### 3.1 810 RS232 INSTALLATION INSTRUCTIONS

The 810 RS232 version does not require special drivers for operation. Connect the 810 interface into the PC serial (COM) port, using the supplied 25 to 9 way adaptor if required. If your PC does not have an RS232 COM port, it is not recommended to use the RS232 810 with USB – serial converters. In this instance, it is recommended to purchase the 810 USB version.



#### 3.2 810 USB INSTALLATION INSTRUCTIONS

The 810 USB version requires drivers to be installed on the PC as shown below. These drivers are included on the DSE softwareCD and are also available to registered users on the DSE website.



- Insert DSE softwareCD into the CD drive or download the drivers from the DSE website (www.deepseapl.com).
- Close any DSE software that may already be running on your PC.
- Connect the P810 USB interface to a PC USB port.
- After a short delay, the computer will detect the device and show two *Found New Hardware* messages, followed by the *Found New Hardware Wizard*.
- The first *Wizard* will ask whether you require *Windows Update* to find software from the internet - Select **No** then **Next** to begin the install :



Select **Install from a list or specific location (Advanced)** then click **Next**.



If you are installing from the SoftwareCD, select **Search removable media (floppy, CD-ROM...)** otherwise, (if you are installing the driver downloaded from the website, select **Include this location in the search**: and **Browse** to the driver location) Click **Next**.



Windows will search for the drivers in the selected location once found it will continue to install the software.



Windows Xp may show the Windows Logo compatibility box before installing.

The software has been extensively tested on Windows Xp, so click "**Continue Anyway**".

Once the USB P180 Port has been installed, the drivers for the USB Serial Port will also be installed from the same location.

Once complete, it is recommended that the PC is shutdown and restarted before the interface is used in conjunction with DSE configuration software.

Windows device manager may be used to determine which virtual port has been allocated, this may then be selected using the DSE software on the setup tab.



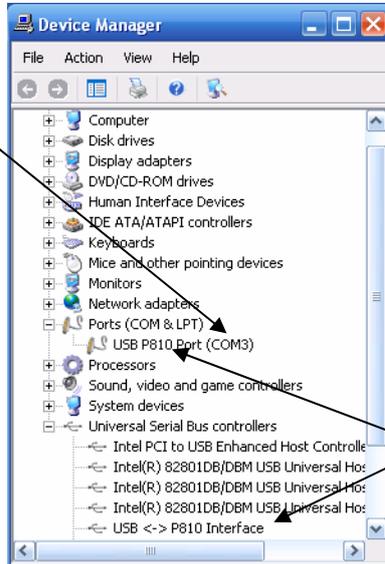
Identify which virtual comport the drivers have been installed onto.



Enter this comport number onto the Setup tab of the communications software.



You are now ready to start using your P810 USB configuration interface. If you haven't already done so, you can now install the configuration software from the SoftwareCD.



When installation is correct and the interface is connected to the PC, the following items appear in the device manager as indicated:  
 USB P810 Port  
 USB <-> P810 Interface

**NOTES:**

1. The installations details refer to Windows XP SP2, other operating systems may differ slightly.
2. For details on module configuration and the setup of the PC configuration software, you are referred to the relevant PC software operators manual.
3. To uninstall the drivers, the P810 USB interface must be connected to the PC otherwise the Windows operating system will "hide" the driver from the System Manager!

**Troubleshooting**

- Occasionally USB devices are disabled by the Windows operating system, the following procedure will re-enable the device in these instances.
  - Disconnect the P810 USB interface. Wait a moment, then reconnect and try again. If you still encounter problems then :
  - Disconnect the P810 USB interface. Shutdown, then restart the PC. Reconnect the interface, then try again.
- For finding the virtual comport allocated to the 810 use Windows control panel *System | Device Manager*. If the virtual comport fails to appear in the COMPORT selection list of the PC configuration software, try reinstalling the drivers :
  - Connect the P810 USB to the PC.
  - Use Windows control panel *System | Device Manager* to uninstall the P810USB Device and USB Serial Port driver.
  - Disconnect the P810 USB interface.

### 3.3 SOFTWARE INSTALLATION INSTRUCTIONS

#### Minimum system requirements

Processor	486 66Mhz
Operating System	Windows XP, NT4, 2000, Me, 98, 95
Ram	32Mb
Monitor	14 inch SVGA (640x480 resolution)
Fixed disk	10Mb free (80Mb minimum)
Disk drive	CD-Rom for software installation (see note below)
Communications	A USB port or an RS232 comms port is needed to communicate with the 810 interface and 5xxx configuration software (see note below)

- NOTE:** - As 55xx series configuration software for Windows™ is a 32-Bit application it will not operate on Windows 2.0, 3.0, 3.1 or 3.11.
- NOTE:** - Exit all other programs before installing the software. It is recommended that any earlier releases of the software are uninstalled prior to installing this version.
- NOTE:** - CD Rom is required on at least one PC in order to operate the software CD.
- NOTE:** - The USB version of the P810 interface is for use on PC's fitted with USB ports. The USB driver must be correctly installed on the machine prior to using the P810 software, installation instructions are available on the Deep Sea Electronics web site at [www.deepseapl.com](http://www.deepseapl.com). The driver will install a 'virtual COM port' for the USB P810 – this should be selected as the COM port in the 'set-up' tab. An RS232 version is also available for legacy PC support.
- NOTE:** - Please register your software online at [www.deepseapl.com](http://www.deepseapl.com) – Once registered you will be notified of any updates to the software to ensure that you always have access to the latest features.

Insert the Software CD into the CD-ROM drive on the PC. The CD will then Auto-run if this feature is enabled on your PC.

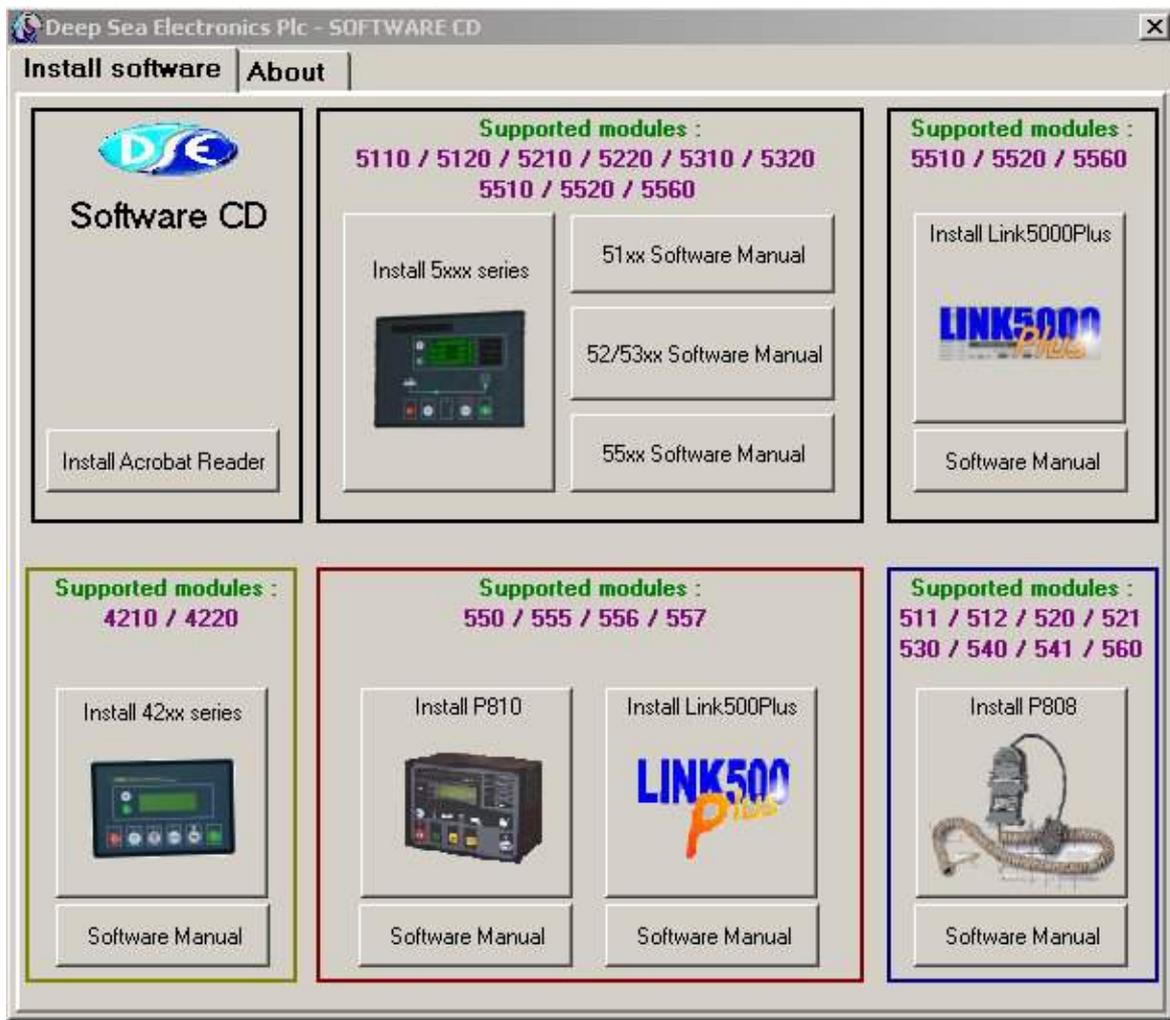
Alternatively, double click on **My Computer**



. Then double click on **CD-ROM Drive**



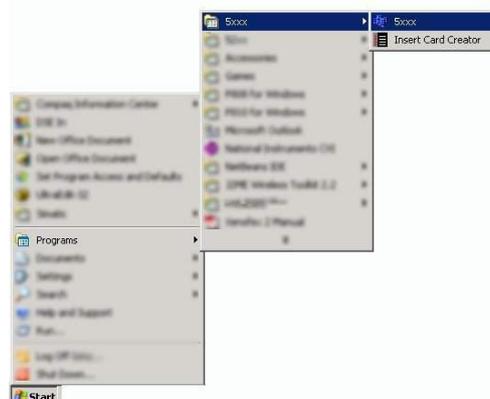
There will be a short delay while the CD-ROM is accessed, then the install program will run



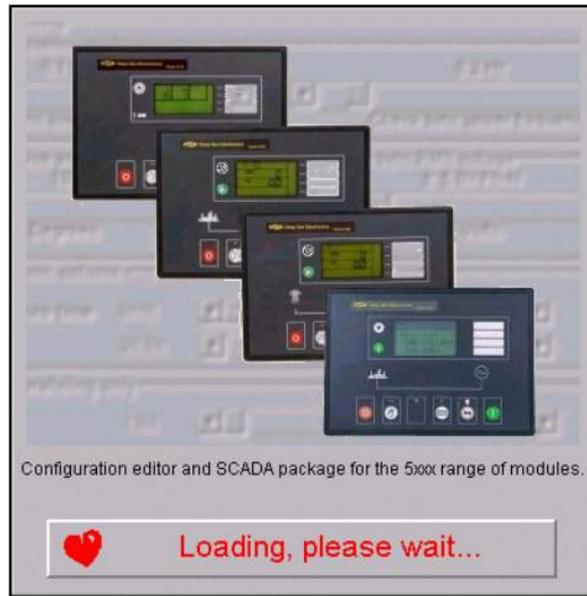
Click on the 'Install 5xxx series' button to install the software onto your PC in its own folder (directory). It will also create 'START MENU' items.

To run 5xxx series configuration software For Windows program Press the Windows start button 

Then select 'Programs' - '5xxx' as shown below: -



The screen will then display: -



The module type selector will appear after a short delay



Click on the button appropriate to the type of module to be configured and the PC will then load the version of P5xxx for Windows suitable for that type of module.

The password page will appear after a short delay.



The software provides four levels of password protection. The first level is the operator level; if the operator password is entered, it will only be possible to edit the Timers not the module configuration. In addition, operator level only allows the creation of new configuration files, existing files cannot be over-written. The second level of password protection is the technician Level; if this password is entered, all of the module functions can be configured.

The third level of password is the Maintenance level, if this password is entered SCADA information can be viewed, Module time, hours run clocks, accumulated values can be adjusted. A software Maintenance reset can also be performed.

The fourth level of password is the Engineer level, if this password is entered all of the module functions can be configured, LOP and HET senders can be calibrated and the Module time, hours run clocks, accumulated values can be adjusted. A software Maintenance reset can also be performed. Password for all levels can also be changed with this level.

It is intended that the technician and engineering passwords be given to qualified engineers who are responsible for initial configuration of the unit, or modification of settings at a later stage.

The operator password is intended to be given to personnel who will not need to be altering the configuration of the module, but may need to visit a controller and modify timer settings, record these changes in a new file and view diagnostic information from the module.

The Maintenance password is intended to be given to personnel who will be attending the generator to perform routine maintenance only.

The final level is the Mimic level; if the password 'MIMIC' is entered the software will display the diagnostic mimic display. None of the module values can be altered and no software settings can be changed. This password is intended for use in situations where the PC is being used for remote monitoring and it is not desirable to allow access to any parameters.

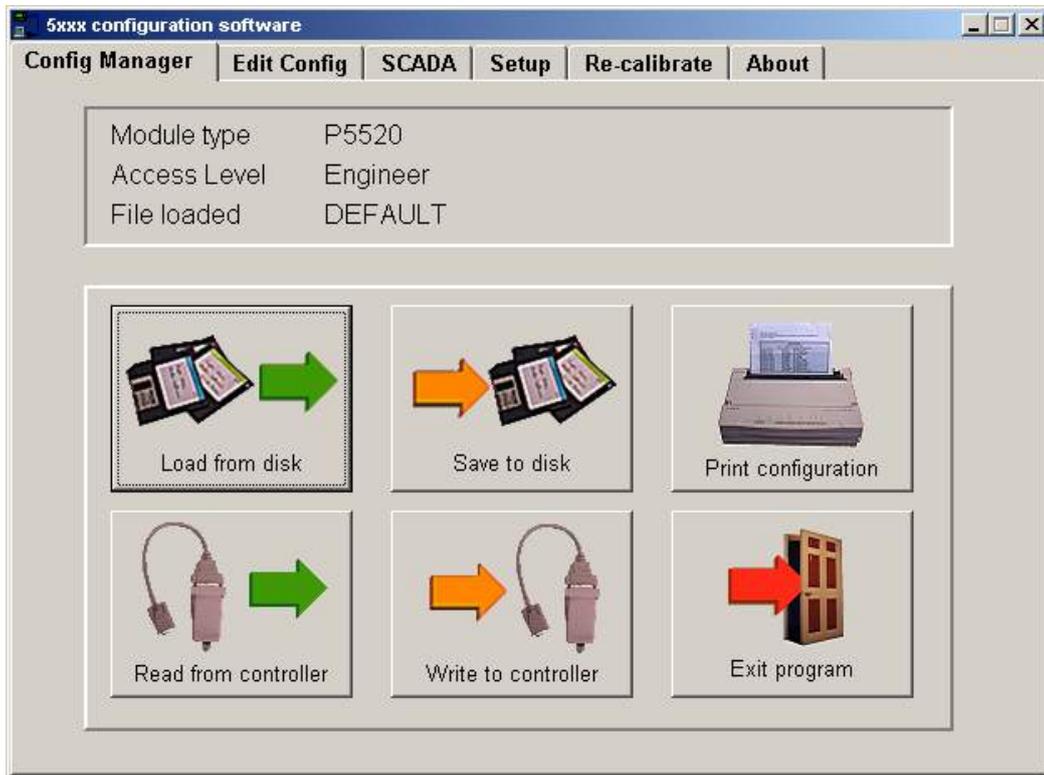
Users without a password will not be able to gain access to the software at all.

Enter the correct password for the required access level then; Click 'OK' or press the ENTER key.

 **NOTE: - The default Engineer password is blank and when a password is requested, Click 'OK' or press the ENTER button.**

## 4 CONFIG MANAGER

Once loaded the **'Main'** Menu is displayed



**Module Type:** - This indicates the type of module for which the 55xx series software is currently configured. This will automatically be selected to the correct module when a configuration file is 'Loaded' from disk or 'Read' from the module. It can also be changed under the *'Misc'* tab in the *'Edit Config'* menu.

**Access Level:** - This indicates the current level of access to the software. Access is gained depending on the password typed to enter to program on start-up. It is the access level that determines what configuration options are available.

**File Loaded:** - This indicates the name of the configuration file currently loaded into the 55xx series software, the *'DEFAULT'* configuration is loaded at start up, If the configuration was 'Read' from the module then *'FROM MODULE'* will be displayed.

**Load from Disk:** - This is used to load an existing configuration from disk into the 55xx series software. The file can then be edited (if required) and then 'Written' to the module. To load a file, simply click this button and enter the name of the file to be loaded in the dialog box. Then click 'OK'. The *'File Loaded'* will then be indicated.

**Save to Disk:** - This is used to save the current configuration file to disk. The required filename for the configuration can be typed in the dialog box. Then click 'OK'.

**Print Configuration:** - This is used to produce a printout of the current configuration. A list of all the settings will then be produced.

**Read from Controller:** - This is used to 'Read' the configuration which exists in the module. The module must be connected to the PC via the 810 interface and have a DC supply feeding it. It is possible to read from the module while the generating set is running. Clicking the 'Read' button will transfer the current configuration to the 55xx series software to allow the setting to be inspected or modified.

**Write to Controller:** - This is used to write a new configuration to the module. To write to the module it must be connected to the PC via the 810 interface and be fed from a suitable DC supply. Additionally the module must be in the correct operating mode in order for re-configuration to be accepted. If a module security PIN number has been set, this will be asked for and must be correctly entered before the configuration file will be sent to the controller.

Should the module not be ready to receive data i.e. generator not at rest and in stop mode, the software senses that the engine is running and a warning message will be displayed. Steps should then be taken to ensure that the engine is at rest and the module is in the 'STOP' mode before attempting to write to the module.

**Exit:** - This is used to exit the 55xx series software and return to windows. If any configuration files are open which have not been saved, the software will query if it is OK to continue or if they need to be saved.

 **NOTES:** - It will not be possible to send a configuration for the wrong module type to a different module. E.g. You cannot send a 5510 configuration to a 5520 module. However, it is possible to base a new configuration on an existing configuration and change the options to suit the new module.

 **NOTE:** - The correct module version must be selected in order to write to the controller. I.e. you can only send version 2 configuration files to version 2 modules.

## 5 EDIT CONFIG

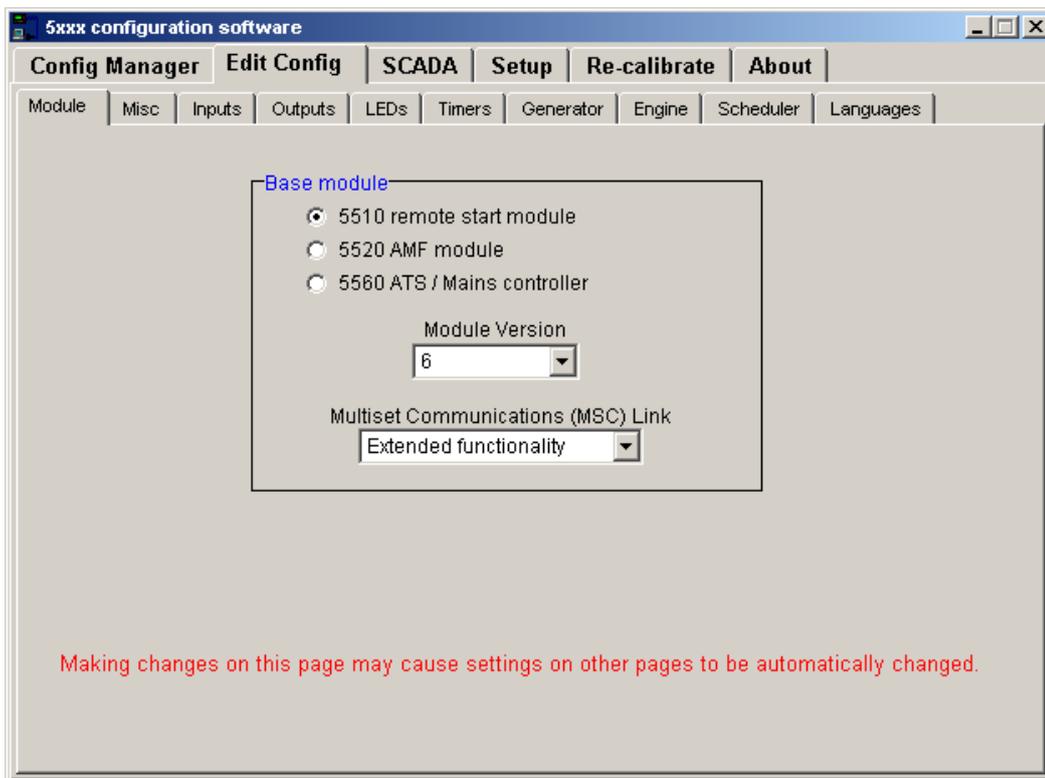
This menu allows the module configuration to be changed, such that the function of Inputs, Outputs and LED's can be altered. System timers and level settings can also be adjusted to suit a particular application.

Access to the various configuration parameters depends on the password entered when the program was started. If the Operator password was entered, then selecting the Edit Configuration option will take the user directly to the Edit Timers page, as this is the only editable section with operator level clearance.

If the Technician or Engineering level password was entered then full access to the settings is possible.

### 5.1 MODULE

This menu allows the user to change the type of module to be configured. This menu is used to determine which options are presented to the user elsewhere in the configuration. The following is displayed:

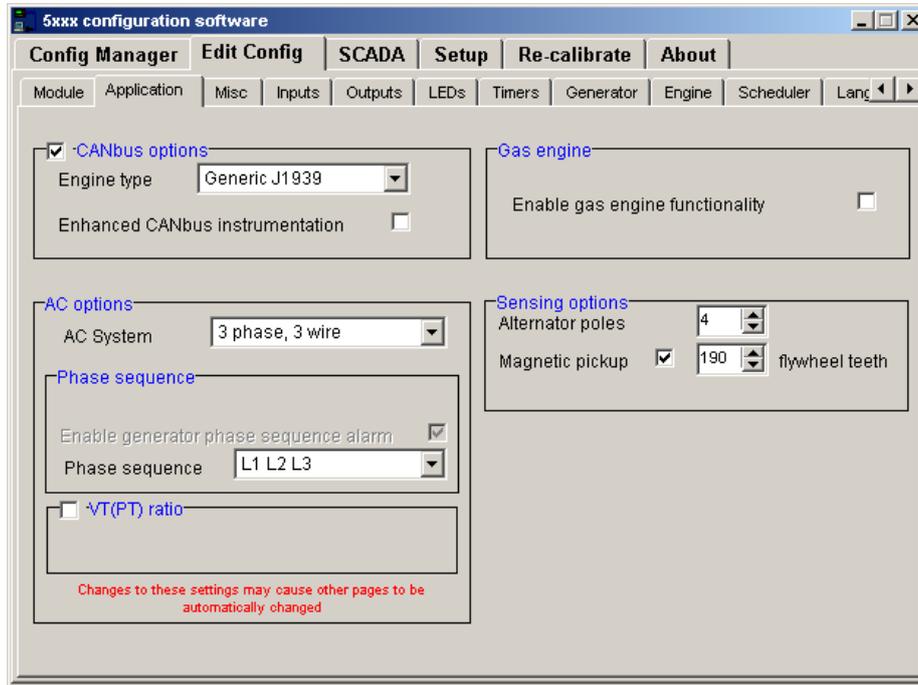


**NOTES:** - It will not be possible to send a configuration for the wrong module type to a different module. E.g., you cannot send a 5510 configuration to a 5520 module. However, it is possible to base a new configuration on an existing configuration and change the options to suit the new module.

Item	Function
Base Module	<p>These settings are used to select the base module on which the configuration is based.</p> <p><b>Module Type -</b>  <input type="radio"/> = 5510 Remote Start Module  <input checked="" type="radio"/> = 5520 Automatic mains failure module  <input type="radio"/> = 5560 ATS / Mains controller</p> <p>This setting determines whether the configuration file is for a <b>5510, 5520</b> or a <b>5560</b> module. If a 5510 module is selected options for the 5520 module will be hidden. The software will not allow the operator to 'Write' the wrong configuration file to the 55xx module.</p>
Module version	<p>Sets the software to allow the user to make a configuration file for an earlier version module.</p> <p>The software will not allow the operator to 'Write' the wrong version configuration file to the 55xx module.</p>
Multiset Communications (MSC) link (5510/5520 only)	<p>Selects how the module's MSC link will operate.</p> <p><b>1) Extended Functionality</b>                      All MSC functionality will be given by the MSC link. This is the recommended setting if all modules are V6 or higher and are all the same version.</p> <p><b>2) Pre V6 compatibility</b>                      MSC functionality will only include functions that are supported by modules from and including versions 1 to 5. This option must be selected if one or more modules on the MSC link are Pre version 6 modules.</p>

## 5.2 APPLICATION

This menu allows the user to select parameters specific to the engine / alternator application. This menu is also used to determine which options are presented to the user elsewhere in the configuration. The following is displayed:



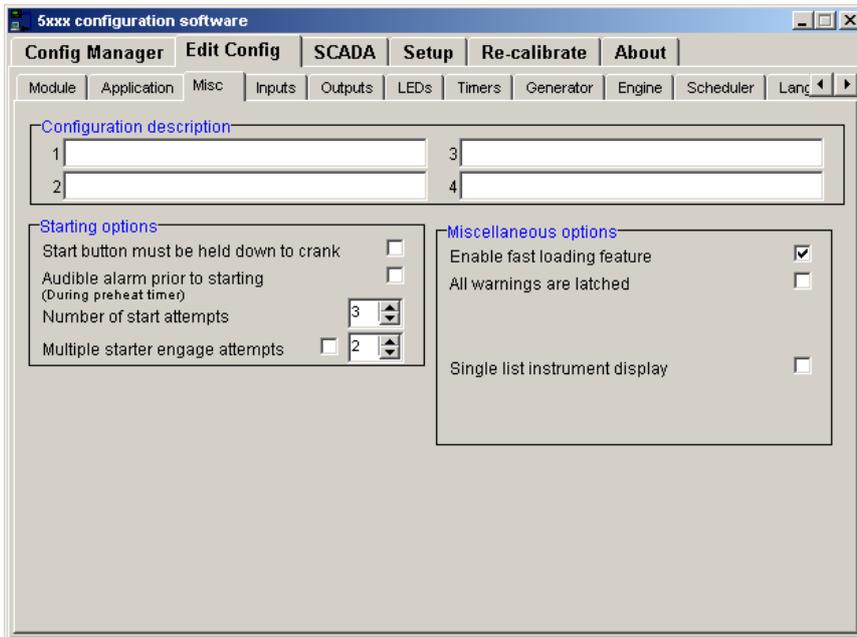
Item	Function
<p>CAN options (Not applicable to 5560)</p>	<p> <b>CAN CanBus</b></p> <p><input type="checkbox"/> = Engine speed sensing is from alternator AC or magnetic pickup as configured below. Additionally other parameters such as oil pressure and coolant temperature are read direct from engine mounted sensors.</p> <p><input checked="" type="checkbox"/> = Configures the module to read engine speed, oil pressure, coolant temperature, hours run information and internal diagnostics information from the engine's ECU via the optional CanBus datalink.</p> <p><b>Engine type (5510/5520 modules only)</b></p> <ul style="list-style-type: none"> <li>• Generic Can – Basic CAN is available when used in conjunction with an CAN enabled engine.</li> <li>• Other engine types allow selection of engine manufacturer specific options such as ECU enable outputs and enhanced CAN instrumentation.</li> </ul> <p><b>Enhanced CAN instrumentation</b></p> <p><input type="checkbox"/> = Enhanced instrumentation disabled.</p> <p><input checked="" type="checkbox"/> = Enhanced instrumentation is shown on the module's display.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE: - These options require a CAN enabled controller connected to a supported CAN engine ECU.</b></p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE:- If CAN is enabled Gas engine functionality cannot be selected.</b></p> </div>

Item	Function
Gas engine options	<p><b>Enable gas engine functionality -</b>  <input type="checkbox"/> = Engine is not gas fuelled.  <input checked="" type="checkbox"/> = Engine is gas fuelled and DSE controller functions for gas engines will be used.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE:- If gas engine functionality is enabled, CAN engine cannot be selected</b></p> </div>
AC Options	<p>These settings are used to detail the type of AC system to which the module is connected: -  <b>AC system -</b>  <i>3 phase 4 wire</i>  <i>1 phase 2 wire</i>  <i>2 phase 3 wire – L1-L3</i>  <i>2 phase 3 wire – L1-L3</i>  <i>3 phase 3 wire</i>  <i>3 phase 4 wire delta</i>                      This setting is used to select the type of AC wiring system used.  <b>Phase Rotation –</b>  <i>Phase Sequence L1 L2 L3</i>  <i>Phase Sequence L3 L2 L1</i>                      This setting is used to select the direction of phase rotation.</p>
IEEE 37.2 - 46 Reverse phase or phase balance current relay	<p><b>Enable Generator Phase Rotation Alarm -</b>  <input type="checkbox"/> = Incorrect Phase rotation will not cause an alarm.  <input checked="" type="checkbox"/> = Phase rotation will be monitored, and if found to be incorrect an alarm will be triggered.  <b>Enable Mains Phase Rotation Alarm -(5520 Modules Only)</b>  <input type="checkbox"/> = Incorrect Phase rotation will not cause an alarm.  <input checked="" type="checkbox"/> = Phase rotation will be monitored, and if found to be incorrect an alarm will be triggered.  <b>Enable Bus Phase Rotation Alarm -(5510 and 5560 Modules Only)</b>  <input type="checkbox"/> = Incorrect Phase rotation will not cause an alarm.  <input checked="" type="checkbox"/> = Phase rotation will be monitored, and if found to be incorrect an alarm will be triggered.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE: - On modules with the Synchronising and/or load sharing fitted Phase rotation alarms are automatically enabled and cannot be disabled.</b></p> </div>
	<p><b>VT Ratio enabled when 3 phase and 3 wire enabled</b>                      These settings enable the controller to be configured to accept connection to the secondary winding of Voltage Transformers (V.T.'s, sometimes called Potential Transformers or P.T.'s)  <input type="checkbox"/> = Voltage transformers are NOT used.  <input checked="" type="checkbox"/> = Voltage transformers are used to step down the generator output to a level that can be accepted by the 55xx controller.  <b>Primary Voltage</b>                      The actual system voltage or output from the generator (i.e. 11,000 V AC ph-ph)  <b>Secondary Voltage</b>                      The output from the voltage transformer secondary winding. I.e. 110 V AC ph-ph.                      This level must be below the VT primary voltage and within the generator and mains/utility (5520/5560) specification of the controller. For further details on this, see section entitled 'Specification'</p>

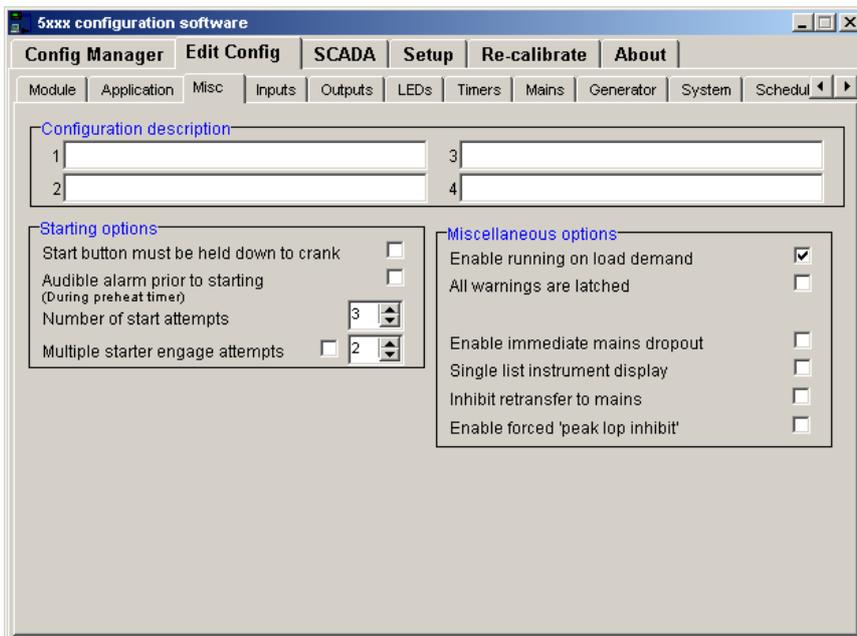
Item	Function
<p>Speed sensing options. (Not applicable to the 5560.)</p>	<p>This setting is used to select which method of speed sensing is used by the module: -</p> <p><b>Generator Frequency -</b>  <input type="checkbox"/> = Speed sensing will not be derived from generator output frequency.  <input checked="" type="checkbox"/> = Speed sensing will be derived from the generator output frequency                      The number of alternator poles then needs to be set to allow the module to determine the engine speed.</p> <p><b>Magnetic Pick-up -</b>  <input type="checkbox"/> = Speed sensing will not be derived from the magnetic pickup.  <input checked="" type="checkbox"/> = Speed sensing will be derived from the magnetic pickup                      The number of flywheel teeth on the engine then needs to be set.</p> <p> <b>NOTE:</b> - Selecting either of the above will enable or disable relevant selections throughout the remainder of the configuration.</p> <p><b>Alt. Freq. Measurement by mag. Pickup (only available if the synchronising option is turned off)</b>  <input type="checkbox"/> = Alternator frequency will be derived from the generator out put frequency  <input checked="" type="checkbox"/> = Alternator frequency will be derived from the engine mag pick up</p>

### 5.3 MISC

This menu allows the user to change the nominal operating parameters and also select the modules special operating modes, according to individual requirements. The following is displayed:



5510/5520



5560

**NOTES:** - It is possible to configure the 55xx module to use either alternator frequency or magnetic pickup speed sensing, both or none (Not 5560). If both sources are used, a shutdown will occur if either speed sensing source gives an over or under-speed (frequency) signal. If a magnetic pickup is not to be used it is important that  is selected for 'Magnetic pickup present'. If the module expects to receive magnetic pickup pulses and none are apparent on starting, it assumes that the pickup is faulty and will shutdown the engine. If connected to an electronically controlled engine which support the J1939 protocol – this can be connected to the modules CAN port this will then give engine speed data and other parameters direct from the engine control unit.

Item	Function
<p>Enable running on load demand (5560 only) IEEE 37.2 - 44 Unit sequence starting</p>	<p>If this input is active, the load demand start up and shut down scheme will be activated when two or more generators are running in parallel.</p>
<p>Configuration description</p>	<p>These four boxes are used to store details about the configuration. This could be used to store details such as Plant/Machine Number, Site location, Customer, and configuration author, etc</p>
<p>Starting Options  (Not applicable to the 5560.)  IEEE 37.2 - 48 Incomplete sequence  IEEE 37.2 - 54 Turning gear engaging device</p>	<p>These settings are used to configure the way the module starts the engine: -</p> <p><b>Start button must be held down to crank -</b>  <input type="checkbox"/> = A single press of the start button when in manual will initiate an automatic start sequence. If the button is released the start sequence will continue.  <input checked="" type="checkbox"/> = The start button must be pressed and held to engage the starter motor. If the start button is released before crank disconnect speed is reached the starter motor will be disengaged.</p> <p><b>Audible Alarm prior to starting -</b>  <input type="checkbox"/> = Normal Operation with-out audible alarm  <input checked="" type="checkbox"/> = The audible alarm will sound before the engine starts. The sounder will become active once the start delay is initialised, it will remain active until either the engine reaches crank disconnect speed or the start delay or pre-heat timers are cancelled.</p> <p><b>Number of Start attempts -</b>  This value is the number of times the module will attempt to start the generator. Should the generator start the module will not attempt further starts. If the generator does not start after the final attempt, the module will give a 'Fail to start' alarm.</p> <p><b>Multiple starter engage attempts - (Only available if using Magnetic pick-up)</b>  <input type="checkbox"/> = Normal Operation, starter engagement with flywheel will not be monitored.  <input checked="" type="checkbox"/> = The module will monitor the flywheel to ensure that the starter motor has engaged. If it detects the starter has not meshed, it will de-energise the start relay and after a short delay it will attempt to re-engage the starter. This will be repeated until either the starter motor engages correctly or the number of engage attempts expires. Each start attempt can have a maximum number of attempts to engage the starter; this value is entered in the box.</p>

Item	Function
Miscellaneous Options	<p>These settings are used to select a range of different functions: -</p> <p><b>Enable Fast Loading feature - (Not applicable to the 5560.)</b>  <input type="checkbox"/> = Normal Operation, the safety on timer will be observed in full. This feature is useful if the module is to be used with some small engines where pre-mature termination of the delay timer can lead to overspeed alarms on start up.  <input checked="" type="checkbox"/> = The module will terminate the safety on timer once all monitored parameters have reached their normal settings. This feature is useful if the module is to be used as a standby controller as it allows the generator to start and go on load in the shortest possible time.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p> <b>NOTE: - It is only recommended to Enable Fast Loading on systems where steps have been taken to ensure rapid start up of the engine is possible. I.e. When fitted with engine heaters, electronic governors etc.</b></p> </div> <p><b>All warnings are latched -</b>  <input type="checkbox"/> = Normal Operation, the warnings and pre-alarms will automatically reset once the triggering condition has cleared.  <input checked="" type="checkbox"/> = Warnings and pre-alarms will latched when triggered. To reset the alarm either an external reset must be applied to one of the inputs or, the 'Stop/Reset' pushbutton operated, once the triggering condition has been cleared.</p> <p><b>Enable Mains Failure Detection - (5520 modules only)</b>  <input type="checkbox"/> = The module will NOT monitor the incoming AC mains supply for failure. The AC mains instrumentation will still be active however.  <input checked="" type="checkbox"/> = The module WILL monitor the incoming AC mains supply. Should the supply go out side of limits the module will initiate its automatic mains failure sequence.</p> <p><b>Enable Immediate Mains Dropout - (5520 modules only)</b>  <input type="checkbox"/> = Normal Operation, in the event of a mains failure the module will attempt to maintain the supply to the load for the incoming AC mains supply until the generator is available to go on load. In the event of a generator failure the module will default back to the incoming AC mains supply. This provides a 'fail-safe' system, ensuring that in the event of a system failure the load will still be fed from the AC mains supply.  <input checked="" type="checkbox"/> = As soon as the module detects a mains failure the mains contactor or breaker relay will be opened to remove the supply from the load. This is to prevent damage to the load in case of a single-phase failure; especially useful if the load is a 3-phase motor or pump. The supply to the load will then be fed from the gen-set once it is available. In the event of a generator failure, the module will open the generator relay and remove the supply to the load until either the mains supply is restored or the generator is restarted.</p> <p><b>Single list instrument display-</b>  <input type="checkbox"/> = The module LCD is comprised of pages. One page covers the engine instruments, one page covers generator instruments, one page covers the mains instruments, etc. This setting is useful for operators familiar with the unit who want to access specific instruments rapidly.  <input checked="" type="checkbox"/> = The module LCD display consists of a single endless list. It has an auto scroll feature so that all instruments can be viewed without operating the button on the front. This setting is recommended for installation where the operator is not familiar with the module, or does not want to operate the module buttons to read instrumentation values.</p> <p><b>Inhibit retransfer to mains-</b>  <input type="checkbox"/> = When the mains supply is reinstated after a failure, the re-transfer back to mains will take place.  <input checked="" type="checkbox"/> = This prevents the load being transferred back to the mains supply, even in the event of the generators failing. This can be used in peak lopping systems where the cost of using the mains to supply the load is so prohibitive that the customer does not want to transfer back to the mains supply.</p>

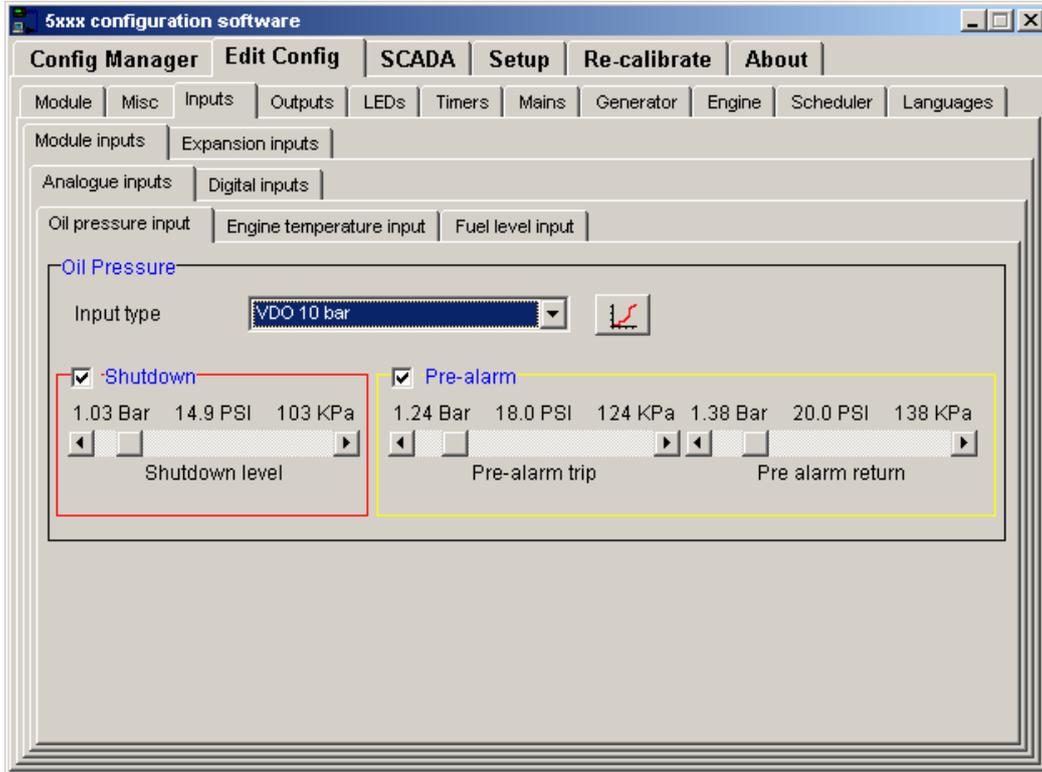
Item	Function
<p>Enable forced peak lop inhibit (5560 only)</p>	<p><input checked="" type="checkbox"/> = If the 5560 (1) is in manual mode using the generator sets to peak lop a mains supply and another 5560 (2) requests the generators to power its load following a mains failure, the 5560 (1) will relinquish the generators to the other 5560 (2)</p> <p><input type="checkbox"/> = The 5560 (1) will continue to use the generator sets regardless of requests by other 5560 controllers for usage of the generators.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>▲ NOTE:- This option only has effect in Manual Mode.</b>  <b>If the 5510 using the generators for Peak Lopping is in Auto Mode, then requests from another 5560 for the generators following a mains failure will always be granted and the peak lopping operation is suspended.</b></p> </div>

## 5.4 INPUTS

### 5.4.1 MODULE INPUTS

#### ANALOGUE INPUTS

#### OIL PRESSURE INPUT



**Custom curve editor**



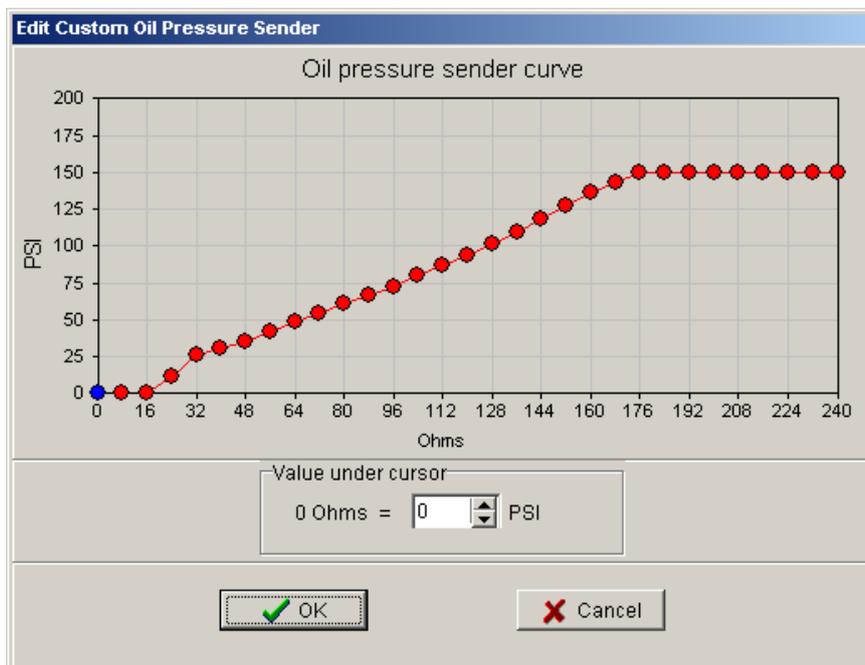
To enter the curve editor select the icon

This allows senders to be used which have not been pre-configured in the 55xx software. Each sender curve has 32 points which map the relationship between sender resistance and reading.

Once the curve direction is started, the curve must continue to follow the set direction – I.e. If resistance increases with rising oil pressure then each point on the graph must follow this. Therefore, each point must show a higher value than the one previous. If any two points on the graph are equal or reverse the initial direction the module will consider this the end of the curve and show 'over-range' for values which are past this point.

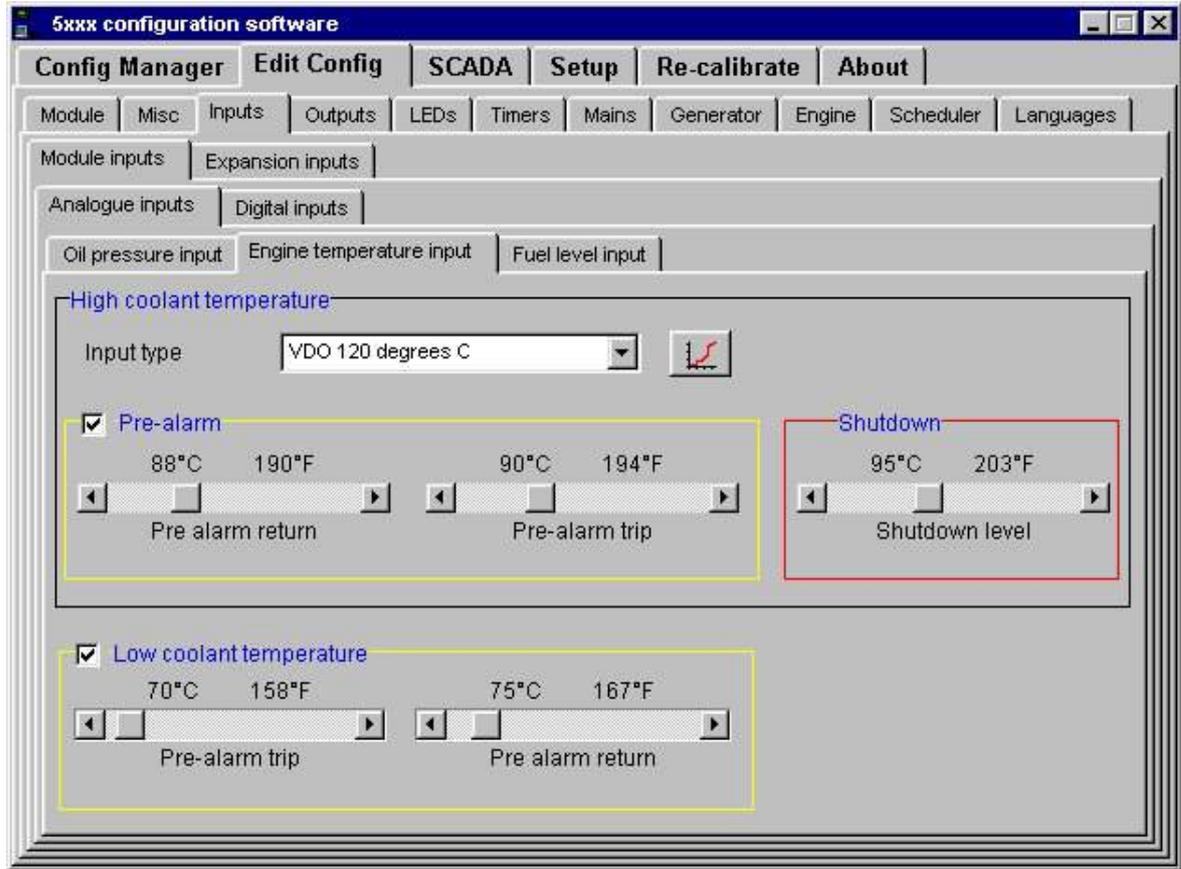
This allows senders to be used which have not been pre-configured in the 5xxx software. Each sender curve has 32 points which map the relationship between sender resistance and reading.

Once the curve direction is started, the curve must continue to follow the set direction – I.e. If resistance increases with rising oil pressure then each point on the graph must follow this. Therefore, each point must show a higher value than the one previous. If any two points on the graph are equal or reverse the initial direction the module will consider this the end of the curve and show 'over-range' for values which are past this point.





### ENGINE TEMPERATURE INPUT



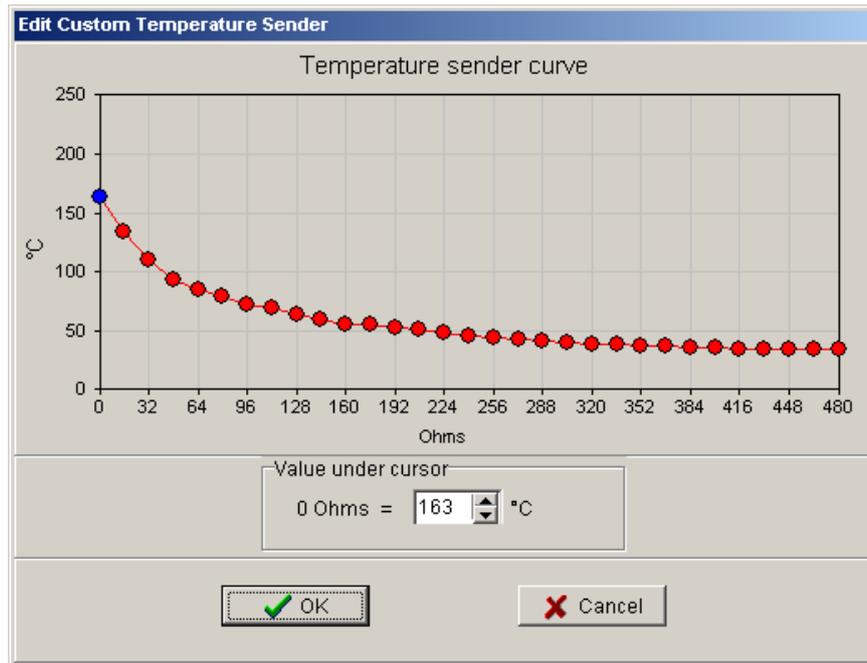
### Custom curve editor



To enter the curve editor select the icon

This allows senders to be used which have not been pre-configured in the 5xxx software. Each sender curve has 32 points which map the relationship between sender resistance and reading.

Once the curve direction is started, the curve must continue to follow the set direction – I.e. If resistance increases with rising oil pressure then each point on the graph must follow this. Therefore, each point must show a higher value than the one previous. If any two points on the graph are equal or reverse the initial direction the module will consider this the end of the curve and show 'over-range' for values which are past this point.



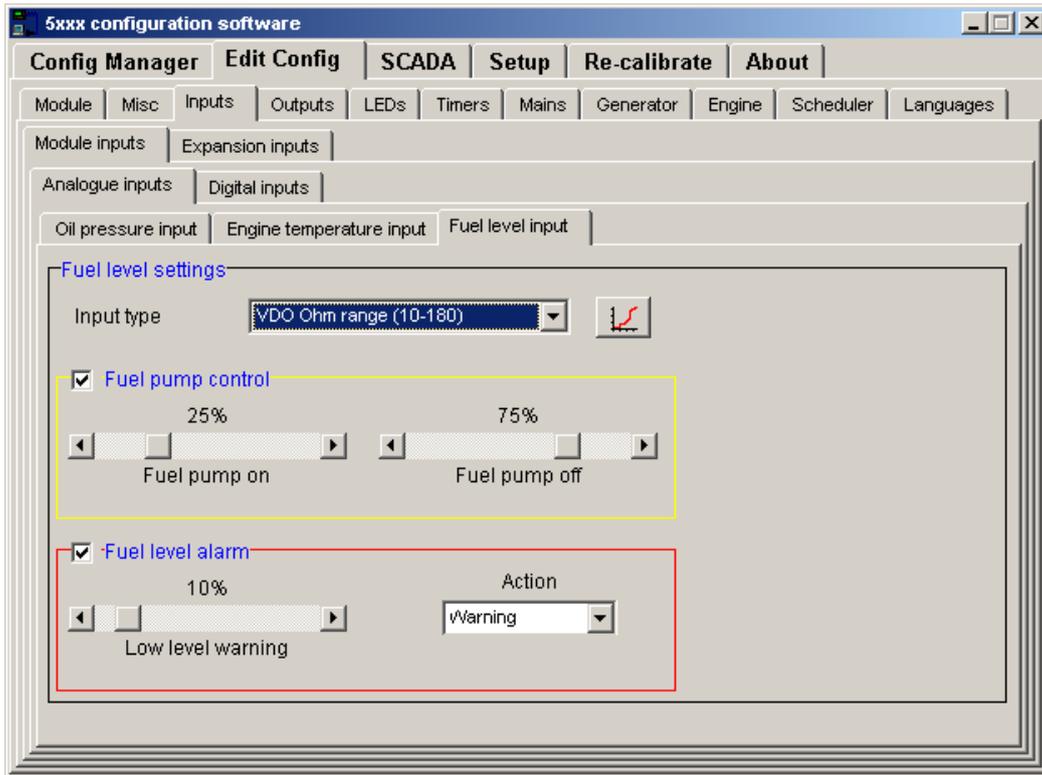
Function	Description
High Coolant Temperature settings	<p>This section is used to configure the Coolant Temperature sender input.</p> <p><b>Input Type: -</b></p> <p> <b>CAN</b></p> <p>If the module is configured for Can, then input type is not configurable; coolant temperature is read from the engine's ECU on the CanBus datalink.</p> <p><i>Disabled</i> - The Coolant Temperature input will not be monitored.</p> <p><i>Digital Switch, Normally Closed</i> - The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns a closed signal during low temperature conditions, should the temperature rise above the switch manufacturers trip point the switch contacts will open.</p> <p><i>Digital Switch, Normally Open</i> - The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns an open signal during low temperature conditions, should the temperature rise above the switch manufacturers trip point the switch contacts will close.</p> <p><i>VDO match, 120°C</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a VDO type sender with an operating range of up to 120°C.</p> <p><i>Datcon HIGH match</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a Datcon HIGH type sender.</p> <p><i>Datcon LOW match</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a Datcon LOW type sender.</p> <p><i>Murphy</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a Murphy type sender.</p> <p><i>Cummins</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a Cummins type sender.</p> <p><i>User Configured</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer is defined by the user by means of the Custom Curve Editor.</p> <p><i>PT100</i> - The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. The output of this transducer matches that of a PT100 type sender however, accuracy is limited to + - 5 °C.</p> <p><b>Pre-Alarm: - (Not available with digital switch inputs)</b></p> <p><input type="checkbox"/> = Engine High Coolant Temperature will NOT give a pre-alarm warning</p> <p><input checked="" type="checkbox"/> = Engine High Coolant Temperature WILL give a pre-alarm warning in the event of the engine coolant temperature rising above the displayed 'Coolant Temperature pre-alarm' value. The 'Coolant temperature pre-alarm' value can be adjusted to suit user requirements.</p> <p>The Coolant temperature must return to below the 'coolant temperature return' setting before the 55xx module will consider that the coolant temperature is back with in limits and cancel the pre-alarm.</p>

Function	Description
High Coolant Temperature settings	<p><b>Shutdown -</b> Coolant temperature will give a shutdown alarm in the event of the engine coolant temperature rising above the displayed '<i>coolant temperature trip</i>' value. The '<i>coolant temperature trip</i>' value can be adjusted to suit user requirements.</p> <p><b>Low Coolant Alarm: - (Not available with digital switch inputs)</b>  <input type="checkbox"/> = Low Coolant Temperature will NOT give an alarm warning  <input checked="" type="checkbox"/> = Low Coolant Temperature WILL give an alarm warning in the event of the engine coolant temperature falling below the '<i>Low Coolant Temperature alarm</i>' value. This value can be adjusted to suit user requirements and is intended to be used to signal engine block heater failure in standby applications (NFPA 110 Specification in particular)</p> <p>The Coolant temperature must return to above the '<i>Low coolant temperature return</i>' setting before the 55xx module will consider that the coolant temperature is back with in limits and cancel the alarm.</p>

 **NOTE: - \*Deep Sea Electronics recommended sender. (Part No: 024-007)**

  **NOTE: - CAN** It is recommended that the engine temperature trip points are set lower or the same as the engine ECU trip points.

## FUEL LEVEL INPUT



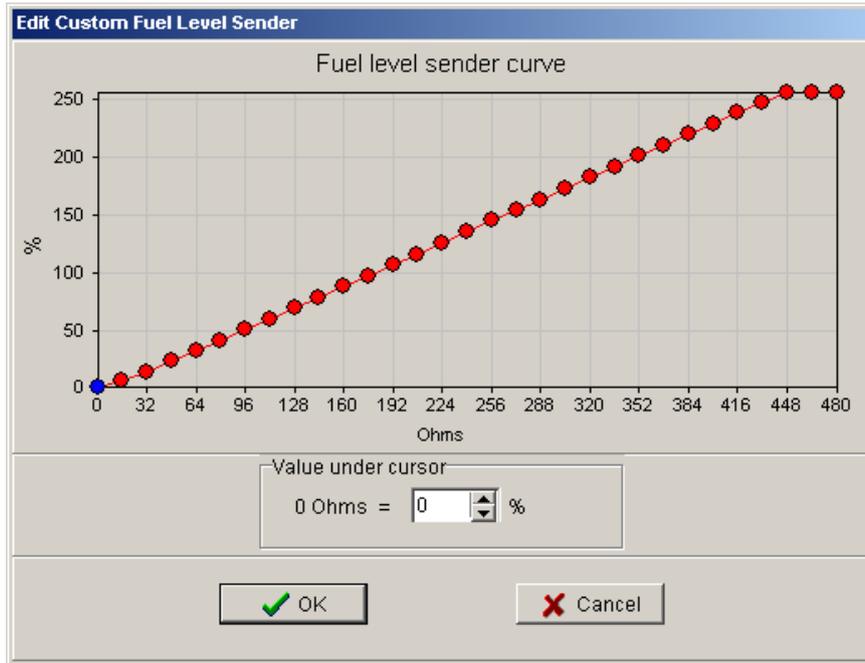
### Custom curve editor



To enter the curve editor select the icon

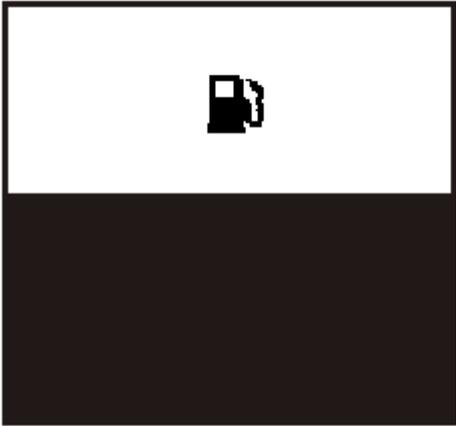
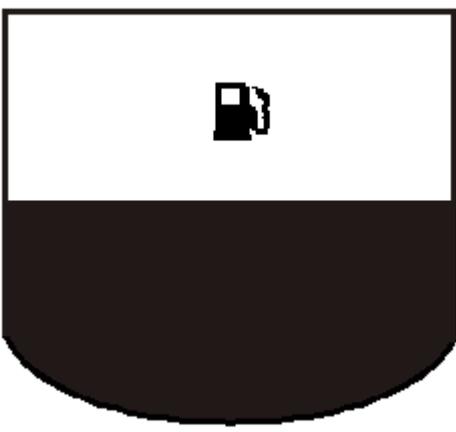
This allows senders to be used which have not been pre-configured in the 5xxx software. Each sender curve has 32 points which map the relationship between sender resistance and reading.

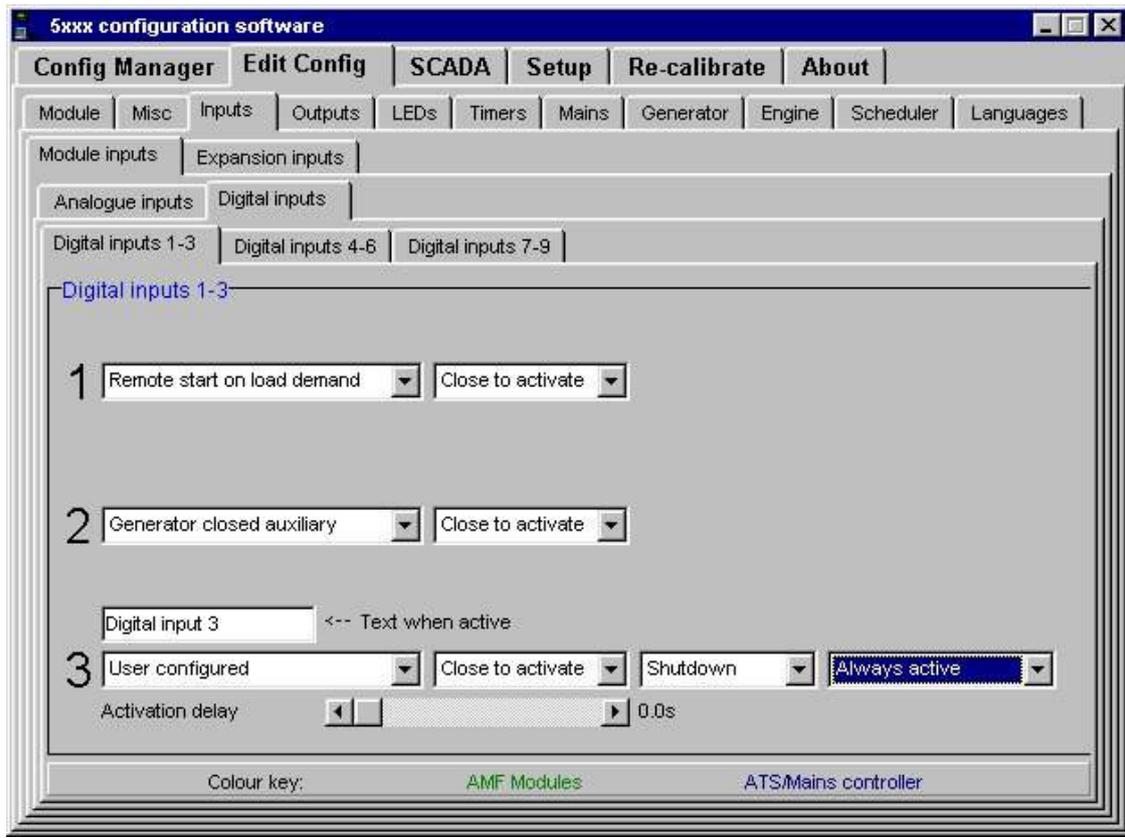
Once the curve direction is started the curve must continue to follow the set direction – i.e. If resistance increases with rising oil pressure then each point on the graph must follow this. So each point must show a higher value than the one previous. If any two points on the graph are equal or reverse the initial direction the module will consider this the end of the curve and show 'over-range' for values which are past this point.



Function	Description
Fuel level sender settings	<p>This section is used to configure the Fuel level sender input.</p> <p><b>Input Type: -</b></p> <p><i>Not Used</i> - The fuel level input will not be monitored.</p> <p><i>Digital Switch, Normally Closed</i> -The fuel level input is fed from a tank mounted switch. This switch returns a closed signal during low fuel level conditions, should the level rise above the switch manufacturers trip point the switch contacts will open.</p> <p><i>Digital Switch, Normally Open</i> - The fuel level input input is fed from a tank mounted switch. This switch returns an open signal during low level conditions, should the level rise above the switch manufacturers trip point the switch contacts will close.</p> <p><i>VDO Ohms type</i> - The Fuel Level input is connected to a resistive type tank mounted fuel level transducer. The output of this transducer matches that of a VDO type sender with an operating range of 10Ω (empty) to 180Ω (full).</p> <p><i>VDO Tube type</i> - The Fuel Level input is connected to a resistive tube type tank mounted fuel level transducer. The output of this transducer matches that of a VDO tube type sender with an operating range of 90Ω (empty) to 0Ω (full).</p> <p><i>US Ohms Range</i> - The Fuel Level input is connected to a resistive type tank mounted fuel level transducer. The output of this transducer matches that of the US Ohms ranged as used by Datcon, Stewart Warner and others. Its operating range is 240Ω (empty) to 33Ω (full).</p> <p><i>GM Ohms Range (high)</i> - The Fuel Level input is connected to a resistive type tank mounted fuel level transducer. The output of this transducer matches that of a GM type sender with an operating range of 0Ω (empty) to 90Ω (full).</p> <p><i>GM Ohms Range (low)</i> - The Fuel Level input is connected to a resistive type tank mounted fuel level transducer. The output of this transducer matches that of a GM type sender with an operating range of 0Ω (empty) to 30Ω (full).</p> <p><i>Ford</i> - The Fuel Level input is connected to a resistive type tank mounted fuel level transducer. The output of this transducer matches that of a Ford type sender with an operating range of 73Ω (empty) to 10Ω (full).</p> <p><i>User Defined</i> - The Fuel Level input is connected to a resistive type fuel level sender. The output of this transducer is defined by the user by means of the Custom Curve Editor.</p>
IEEE 37.2 - 71 Level switch	<p><b>Fuel pump control</b></p> <p><input type="checkbox"/> = Fuel pump control is disabled</p> <p><input checked="" type="checkbox"/> = Fuel pump control is enabled. When the fuel level falls below the 'fuel pump on' threshold, the Fuel Pump Control output (if configured) will energise. This is designed to control the pump to transfer fuel from a bulk tank to the day tank. When the fuel level rises above the 'fuel pump off' threshold, the output is de-energised.</p>
IEEE 37.2 - 71 Level switch	<p><b>Fuel level alarm</b></p> <p><input type="checkbox"/> = Low Fuel level alarm is disabled</p> <p><input checked="" type="checkbox"/> = Low Fuel level alarm is enabled. When the fuel level falls below the 'low level warning' threshold, a warning alarm is generated. Should the level rise above the warning threshold, the alarm is automatically reset.</p> <p><b>Action</b> - when Low Fuel level alarm is enabled</p> <p><b>Warning</b> (Alarm only, No shutdown)</p> <p><b>Shutdown</b> (Alarm and shutdown)</p> <p><b>Electrical Trip</b> (Alarm/off-load generator followed by shutdown after cooling)</p>

The resistive fuel level senders supported by the 5xxx series controllers are devices that translate fuel level into resistance. A change in fuel level translates directly to a change in the resistance of the sender. In the case of a parallel sided fuel tank, an accurate measure of the fuel level can easily be made, however as shown in the example below, this is not the case with non-parallel sided fuel tanks. Therefore, it is recommended that only parallel sided fuel tanks are used to ensure correct fuel level detection.

<p><b>Measured level</b></p> <p>100% —</p> <p>50% —</p> <p>0% —</p>  <p><b>Actual level</b></p> <p>100% —</p> <p>50% —</p> <p>0% —</p>	<p>The fuel sender measures the distance between the top of the tank and the fuel level. Typically, they use a ball float. In this example, the distance between the top of the tank and the level of the fuel is 50% of the height of the tank. The fuel level sender will report the tank correctly as being 50% full.</p> <p>For a parallel-sided tank like this one, 50% distance between the top of the tank and the level of the fuel will occur when the tank is 50% full of fuel.</p>
<p><b>Measured level</b></p> <p>100% —</p> <p>50% —</p> <p>0% —</p>  <p><b>Actual level</b></p> <p>100% —</p> <p>50% —</p> <p>0% —</p>	<p>In this example, the distance between the top of the tank and the level of the fuel is again 50% of the height of the tank; the fuel level sender will report the tank as being 50% full.</p> <p>However, as the bottom of the tank is curved, the actual amount of fuel in the tank is only about 40%. The fuel sender is incorrectly reporting the amount of remaining fuel.</p>

**DIGITAL INPUTS**

**NOTE:** - Each of the auxiliary inputs has the same selection choices, allowing flexibility of selection to be made. However, only one of the fixed input functions can be used at any one time, i.e. only one input can be configured to be 'remote start'. The User Configurable option is the exception to this rule, and allows any number of inputs to be used as Indications (Single or Dual), Warnings, Shutdowns or as an electrical trip Input

**Polarity**

The polarity of the input switching can be configured to be either “Close to Activate”, this is a normally open switch, and closes to negative when activated. Alternatively “Open to Activate”, this is a Normally Closed switch to negative, and opens when activated.

**Activation delay**

User configured inputs can be delayed using the activation delay timer. The input must be active for the duration of the activation delay timer setting before any action is taken. This is particularly useful for use with external float switches etc to prevent nuisance tripping.

Function	Description
<p>User Configured</p>	<p>The input is configured to perform an auxiliary function, this may be any of the following: -</p> <p><b>Indication</b> (<i>annunciation only, no alarm or shutdown</i>)                      To use the 'indication' it is necessary to assign either one of the front panel LED's or a expansion LED/Relay channel to the appropriate input</p> <p><b>Warning</b> (<i>Alarm only, no shutdown</i>)</p> <p><b>Shutdown</b> (<i>Alarm and shutdown</i>)</p> <p><b>Electrical Trip</b> (<i>Alarm/off-load generator followed by shutdown after cooling</i>)</p> <p>The function also has an activation time associated with it chosen from the following list: -</p> <p><b>Never active</b> -This switches off the input if not in use.</p> <p><b>Always active</b> -The input selected to be an indication or alarm even when the module is in the STOP/RESET MODE.</p> <p><b>Active from starting</b> -The Auxiliary input is only active once an attempt to start the generator is made. It will remain active until the generator is at rest again.</p> <p><b>Active from safety on</b> -Auxiliary inputs are only active once the Safety On timer has timed out. This allows a delay on start up for faults, such as Oil Pressure and High Engine Temperature Warnings, or other shutdown conditions which require a delay during start-up, such as Under-voltage.</p> <p>The configuration allows each auxiliary input to have an associated <b>text message</b> displayed on the LCD in addition to the alarm actions detail above.</p> <p>I.e. 'LOW FUEL LEVEL' - could be displayed on the LCD in the event of an Input configured as an; 'Always Active', 'Warning' being activated</p>
<p>Air-flap Closed Auxiliary IEEE 37.2 - 3 Checking or interlocking relay</p>	<p>This input is used to connect to the Air flap switch contacts. This will give an immediate shutdown in the event of the air-flap being closed. It will also prevent the generator from being restarted if the air flap has not been reset following an overspeed shutdown.</p>
<p>Alarm Mute</p>	<p>This input is used to silence the audible alarm from an external source, such as a remote sounder.</p>
<p>Alarm Reset</p>	<p>This input is used to reset any latched alarms from a remote location. It is also used to clear any latched warnings which may have occurred (if configured) without having to stop the generator.</p>
<p>Alternative frequency</p>	<p>This input is used to change the frequency on CAN engines that support dual frequency.</p>
<p>Alternative voltage</p>	<p>This input is used to change the voltage on CAN engines that support dual voltage.</p>
<p>Auto Restore Inhibit</p>	<p>If this input is active the 55xx will operate thus:- To use this function the 55xx should be placed in the <b>AUTO</b> mode. In the event of a remote start/mains failure, the generator will be instructed to start and take load. On removal of the remote start signal/mains return the module will continue to run the generator on load until this <b>AUTO RESTORE INHIBIT</b> input is removed. Once the input is removed, the module will transfer the load back to the mains supply and follow a normal generator stop sequence. This input allows the 55xx to be fitted as part of a system where the manual restoration to mains is controlled remotely or by an automated system.</p>

Function	Description
Auto start Inhibit	This input is used to provide an over-ride function to prevent the <b>55xx</b> from starting the generator in the event of a remote start/mains out of limits condition occurring. If this input is active and a remote start signal/mains failure occurs the <b>55xx</b> will not give a start command to the generator. If this input signal is then removed, the <b>55xx</b> will operate as if a remote start/mains failure has occurred, starting and loading the generator. This function can be used to give an ' <b>AND</b> ' function so that a generator will only be called to start if the mains fails and another condition exists which requires the generator to run. If the 'Auto start Inhibit' signal become active once more it will be ignored until the module has returned the mains supply on load and shutdown.
Auxiliary Mains Fail IEEE 37.2 - 3 Checking or interlocking relay	The <b>5520 and 5560</b> module will monitor the incoming single or three phase supply for Over voltage, Under Voltage, Over Frequency or Under frequency. It may be required to monitor a different mains supply or some aspect of the incoming mains not monitored by the <b>5520 and 5560</b> . If the devices providing this additional monitoring are connected to operate this input, the <b>5520 and 5560</b> will operate as if the incoming mains supply has fallen outside of limits, the generator will be instructed to start and take the load. Removal of the input signal will cause the module to act if the mains has returned to within limits.
Bus closed auxiliary 5560 only IEEE 37.2 - 3 Checking or interlocking relay	This input is used to provide feedback to allow the <b>5560</b> to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator bus load switching device auxiliary contact.  <b>Action:</b> <b>Warning</b> ( <i>Alarm only, No shutdown</i> ) <b>Electrical Trip</b> ( <i>Alarm/off-load generator followed by shutdown after cooling</i> )
 <b>NOTE: - On 5560 modules, an input must be configured to monitor the operation of the generator bus auxiliary contacts.</b>	
Bus load inhibit 5560 only IEEE 37.2 - 52 AC circuit breaker	This input is used to prevent the <b>5560</b> from loading the generator bus. If the bus is already on load, activating this input will cause the <b>5560</b> to unload the generator bus. Removing the input will allow the generator bus to be loaded again.
Clear ROCOF or vector shift	This input is used to reset the module following a ROCOF or vector shift trip. The input must switch from inactive to active to reset the trip, it cannot be left permanently active.
Droop enable	This input is used to switch engine into droop on CAN engines that support this function.
Duty select IEEE 37.2 - 10 Unit sequence switch	This input is used to force the appropriate set to become the duty set when using a load demand scheme. Irrespective of the priority number configured in the module, it will be forced to become the priority set. This allows for manual duty selection, overriding the automatic system normally used by the modules.
Generator Closed Auxiliary IEEE 37.2 - 3 Checking or interlocking relay	This input is used to provide feedback to allow the <b>55xx</b> to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator load switching device auxiliary contact.  <b>Action:</b> <b>Warning</b> ( <i>Alarm only, No shutdown</i> )

Function	Description
Generator Load Inhibit IEEE 37.2 - 52 AC circuit breaker	<p>This input is used to prevent the 55xx from loading the generator. If the generator is already on load, activating this input will cause the 55xx to unload the generator. Removing the input will allow the generator to be loaded again.</p> <p><b>NOTE:</b> -This input only operates to control the generator-switching device if the 55xx load switching logic is attempting to load the generator. It will not control the generator-switching device when the mains supply is on load.</p>
Inhibit retransfer to mains	<p>When active, this input prevents the load being transferred back to the mains supply, even in the event of the generators failing. This can be used in peak lopping systems where the cost of using the mains to supply the load is so prohibitive that the customer does not want to transfer back to the mains supply.</p>
Lamp Test	<p>This input is used to provide a test facility for the front panel indicators fitted to the 55xx module. When the input is activated all LED's should illuminate.</p>
Load Share Inhibit	<p>Used to prevent the AVR/Governor from changing the sets frequency and voltage, disables the load share system but will still perform dead bus and sync checks before closing the load switching device.</p>
Low Oil Pressure Switch	<p>This input is used to give a low oil pressure shutdown from a digital normally open or closed switch. It allows oil pressure protection using the switch and the analogue input can be used in parallel to give protection or configured to be used for oil pressure indication only.</p>
MSC Alarms inhibit	<p>This input is used to prevent MSC alarms. It is particularly useful when a set is being removed from duty for maintenance.</p> <p><b>NOTE:</b> - For further details on MSC alarms, refer to the DSE Guide to Synchronising and Load Sharing.</p>
Mains closed Auxiliary IEEE 37.2 - 3 Checking or interlocking relay	<p>This input is used to provide feedback to allow the 5520 and 5560 to give true indication of the contactor or circuit breaker switching status. It should be connected to the mains load switching device auxiliary contact.</p>
Mains Load Inhibit IEEE 37.2 - 52 AC circuit breaker	<p>This input is used to prevent the 5520 and 5560 from loading the mains supply. If the mains supply is already on load activating this input will cause the 5520 and 5560 to unload the mains supply. Removing the input will allow the mains to be loaded again.</p> <p><b>NOTE:</b> -This input only operates to control the mains switching device if the 5520 and 5560 load switching logic is attempting to load the mains. It will <u>not</u> control the mains switching device when the generator is on load.</p>
Mains parallel mode	<p>This input is used to configure the 5510 load-sharing module as to how it will operate when in parallel.</p> <p>If the input is not active, the 5510 will communicate with other 5510 controllers to maintain equal share of the load between systems.</p> <p>If the mains parallel mode input is active, the controller will not communicate with others, but will instead ramp up to the pre-configured level to "peak lop" with the mains supply.</p>
Panel Lock	<p>This input is used to provide security to the installation. If the Panel lock input is active, the module will not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected and the operator will still be able to view the various instrumentation pages etc. (<i>Front panel configuration access is barred while system lock is active</i>).</p> <p><b>NOTE:</b> - External control sources (i.e. Simulate Start Button) are not affected by the panel lock input and will continue to operate normally.</p>

Function	Description
Paralleling Inhibit IEEE 37.2 - 52 AC circuit breaker	This input is used to prevent the generator from running in parallel with the Bus/Mains supply. This can be used on the <b>5520 and 5560</b> module to prevent the generator and mains from being paralleled and force a clean break transfer. If the input becomes active while in parallel then the transfer will be completed and paralleling ends.
Remote start in island mode	If this input is active, the <b>55xx</b> will operate thus: - To use this function the <b>55xx</b> should be placed in the <b>AUTO</b> mode. The module will perform the start sequence and transfer load fully to the generator and then open the mains load switch device.
Remote Start off load	If this input is active, operation will be similar to the 'Remote Start on load' function except that the generator will not be instructed to take the load. This function can be used where an engine only run is required e.g. for exercise.
Remote Start on load	If this input is active, the <b>55xx</b> will operate thus: - To use this function the <b>55xx</b> should be placed in the <b>AUTO</b> mode. The module will perform the start sequence and transfer load to the generator.
Remote Start on load demand Only applicable to the 5510	If this input is active, the load demand start up and shut down scheme will be activated when two or more generators are running in parallel. On application, all sets will start a race for the bus. The first available set will close onto the dead bus and the others will synchronise to it. Once the sets are on load they will compare load levels and redundant sets will commence a shutdown sequence and return to standby until the load level is such that they are required.
Reset Maintenance Alarm (Not applicable to the 5560.)	This input is used to reset the maintenance alarm. When activated it will reset the maintenance counter to the pre-configured value (i.e. 250 hours). If the maintenance alarm is configured to monitor the monthly service interval this will also be reset to the pre-configured period. (i.e. 6 Months).
Scheduled Runs Inhibited	This input is used to prevent the generator from starting in the event of a programmed scheduled run occurring. While the input is active, no scheduled runs will occur. If the input is active when a schedule run is called for, and is removed during the running period the genset will start and complete any remaining scheduled running time
Simulate Auto Button	This input mimics the operation of the 'Auto' button and is used to provide a remotely located Auto mode push button.
Simulate Lamp test/Mute Pushbutton	This input is used to provide a test facility for the front panel indicators fitted to the <b>55xx</b> module. When the input is activated all LED's should illuminate. The input also serves a second function, in that it also provides a mute signal to silence the audible alarm. The input is recognised by the module as though it was the Pushbutton on the module itself being operated.
Simulate Mains available	This function is provided to over-ride the 5520 module's (AMF module only) internal monitoring function. If this input is active, the module will not respond to the state of the incoming AC mains supply. This can be used to control the operation of the generator during a mains failure by allowing generator operation only if equipment operation requires the genset to run
Simulate Manual Button	This input mimics the operation of the 'Manual' button and is used to provide a remotely located Manual mode push button.
Simulate Start Button	This input mimics the operation of the 'Start' button and is used to provide a remotely located start push button.
Simulate Stop Button	This input mimics the operation of the 'Stop' button and is used to provide a remotely located stop/reset push button.
Simulate Test on load button	On <b>5520 and 5560</b> modules, this input mimics the operation of the 'Test' button and is used to provide a remotely located Test on load mode push button.

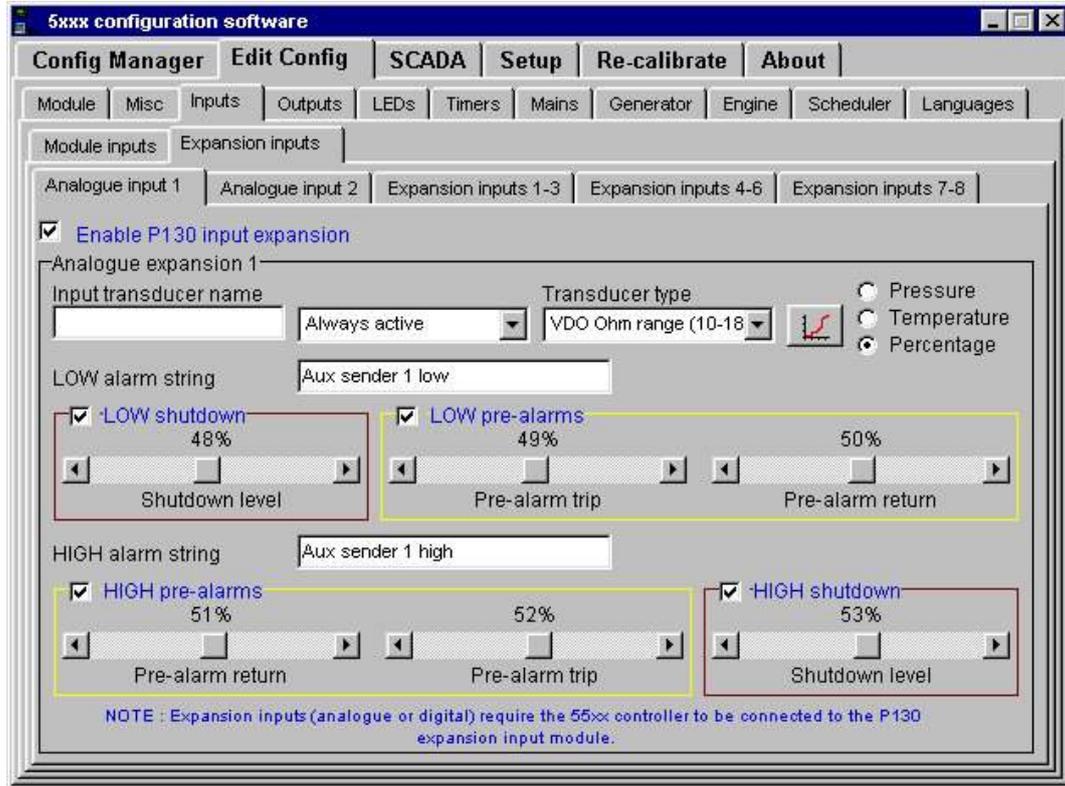
Function	Description
<b>Speed lower</b> IEEE 37.2 - 18 Accelerating or decelerating device  (Not applicable to the 5560.)	On <b>5510/5520</b> systems where internal relays are used to control the governor, this input can be used to decrease the speed.   <b>NOTE: -This input has no effect when utilising the internal analogue system to control the governor.</b>
<b>Speed raise</b> IEEE 37.2 - 18 Accelerating or decelerating device  (Not applicable to the 5560.)	On <b>5510/5520</b> systems where internal relays are used to control the governor, this input can be used to increase the speed.   <b>NOTE: -This input has no effect when utilising the internal analogue to control the governor.</b>
<b>Start Pause</b> IEEE 37.2 - 3 Checking or interlocking relay	This input is intended to be used to allow the generator start sequence to commence, but not to complete. This feature can be used with Air start engines for example to give a controlled start sequence. The function operates such that if the 'Start pause' input is active and an engine start is commanded, the module will perform its start sequence thus: - The pre-heat output (if used) will be activated for the duration of the pre-heat timer. The Fuel output will then be energised and the module will then enter a pause state - 'Awaiting clear to start'. If the 'start pause' signal becomes inactive at this time then the module will continue its normal start sequence. The 'start pause' mode uses the 'manual crank limit' timer and if this expires during the 'Awaiting clear to start' state then a 'Fail to start' alarm will be generated and the set shutdown.
<b>Transfer to bus/open Mains</b> IEEE 37.2 - 52 AC circuit breaker  (5560only)	This input is used to transfer the load to the generator bus when running in <b>MANUAL MODE</b> .  The first button press will cause the module to close the generator contactor once the genset bus and Mains are synchronised.  Once synchronised the genset bus and mains will parallel. The second press of the button will then cause the genset bus to take full load and open the mains contactor.
<b>Transfer to generator/Open Mains</b> IEEE 37.2 - 52 AC circuit breaker  (Not applicable to the 5560.)	This input is used to transfer the load to the generator when running in <b>MANUAL MODE</b> .  If used with autosync enabled on the module – The first button press will cause the module to close the generator contactor once the genset and Bus/Mains are synchronised.  On 5520 module only: Once synchronised the genset and bus/mains will parallel. The second press of the button (or expiry of the parallel run timer) will then cause the genset to take full load and open the mains contactor.
<b>Transfer to Mains/ Open Generator</b> IEEE 37.2 - 52 AC circuit breaker  (Not applicable to the 5560.)	This input is used to transfer the load to the mains supply when running in <b>MANUAL MODE</b> . (Also used to provide an 'Open Generator' signal in the 5510 Module.)  If used with auto sync enabled on the module – The first button press will cause the module to close the mains contactor once the genset and Bus/Mains are synchronised.  On 5520 module only: Once synchronised the genset and bus/mains will parallel. The second press of the button (or expiry of the parallel run timer) will then cause the mains to take full load and open the generator contactor.
<b>Transfer to Mains/ Open bus</b> IEEE 37.2 - 52 AC circuit breaker  (5560 only)	This input is used to transfer the load to the mains supply when running in <b>MANUAL MODE</b> .  The first button press will cause the module to close the mains contactor once the genset bus and mains are synchronised.

	<p>Once synchronised the genset bus bus mains will parallel. The second press of the button (or expiry of the parallel run timer) will then cause the mains to take full load and open the generator bus contactor.</p>
<p>Volts lower (Not applicable to the 5560.)</p>	<p>On 5510/5520 systems where internal relays are used to control the AVR, this input can be used to decrease the volts.</p> <div style="border: 1px solid black; padding: 5px;"> <p> <b>NOTE: -This input has no effect when utilising the internal analogue system to control the AVR</b></p> </div>
<p>Volts raise (Not applicable to the 5560.)</p>	<p>On 5510/5520 systems where internal relays are used to control the AVR, this input can be used to increase the volts.</p> <div style="border: 1px solid black; padding: 5px;"> <p> <b>NOTE: -This input has no effect when utilising the internal analogue system to control the AVR</b></p> </div>

## 5.4.2 EXPANSION INPUTS (P130)

### ANALOGUE INPUT 1 AND 2

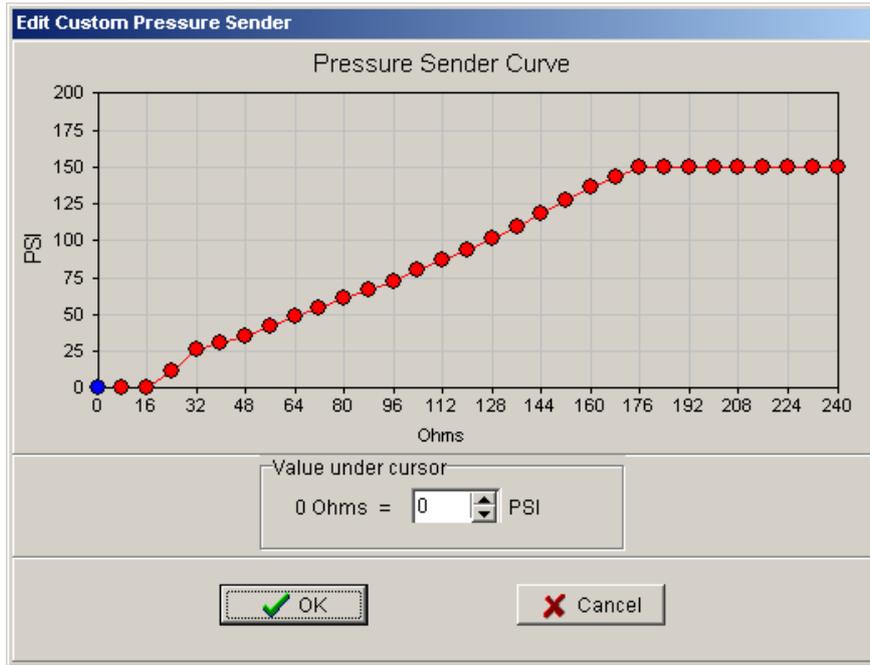
**NOTE:** - Expansion inputs are only available on the 55xx series modules, when used in conjunction with the P130 input expansion module.



#### Custom curve editor

This allows senders to be used which have not been pre-configured in the 5xxx software. Each sender curve has 32 points which map the relationship between sender resistance and reading.

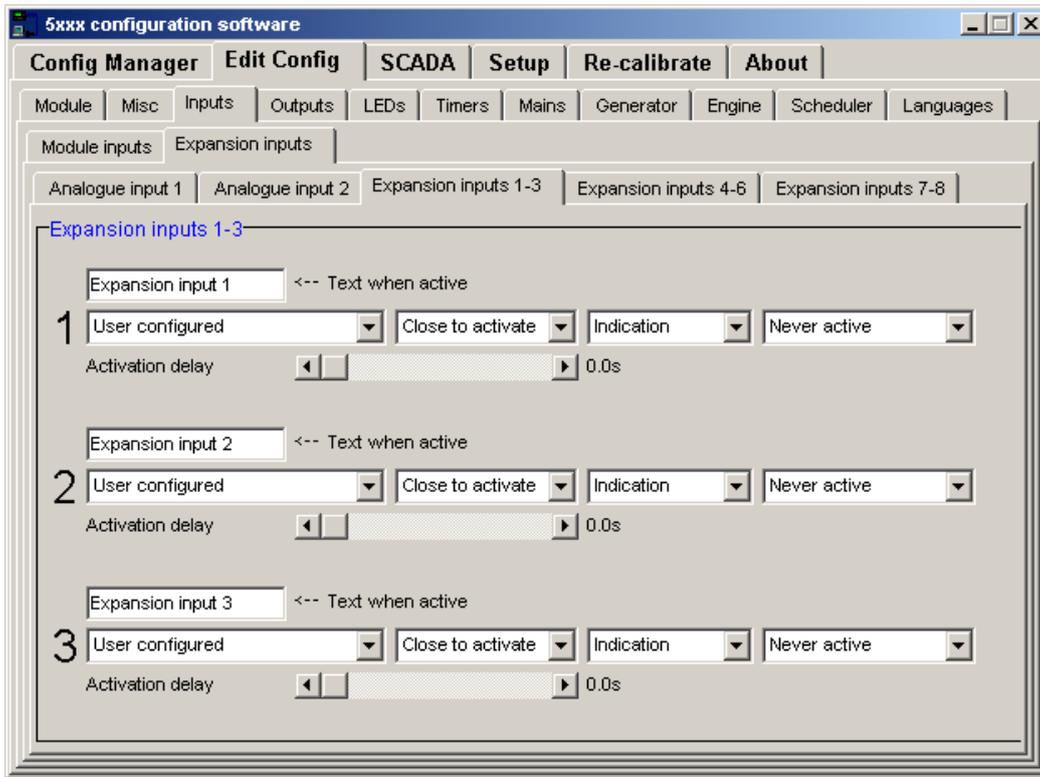
Once the curve direction is started the curve must continue to follow the set direction – i.e. If resistance increases with rising oil pressure then each point on the graph must follow this. So each point must show a higher value than the one previous. If any two points on the graph are equal or reverse the initial direction the module will consider this the end of the curve and show 'over-range' for values which are past this point.



Function	Description
<p>Expansion analogue input selections</p>	<p><b>Enable P130 input expansion:</b></p> <p><input type="checkbox"/> P130 input expansion module is not fitted. Relevant parameters are removed from the tab.</p> <p><input checked="" type="checkbox"/> P130 input expansion module is fitted. The adjustable parameters for input expansion will now be shown.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>⚠ CAUTION! If P130 input expansion is enabled, and the P130 input expansion module is not correctly connected and powered up, the 55xx controller will generate a 'link lost' alarm indicating the failure.</b></p> </div> <p><b>Input Transducer name:</b> The name of your expansion analogue input, for example "Rad water temp"</p> <p><b>Activation:</b> <i>Always active</i> -The input selected to be an indication or alarm even when the module is in the STOP/RESET MODE. <i>Active from starting</i> -The Auxiliary input is only active once an attempt to start the generator is made. It will remain active until the generator is at rest again. <i>Active from safety on</i> - Auxiliary inputs are only active once the Safety On timer has timed out. This allows a delay on start up for faults, such as Oil Pressure and High Engine Temperature Warnings, or other shutdown conditions which require a delay during start-up, such as Under-voltage.</p> <p><b>Input transducer type:</b> <i>Not used</i> - The input will not be monitored. <i>Digital Switch, Normally Closed</i> - The input is fed from an engine mounted switch. The switch returns a closed signal during normal conditions, should the temperature rise above the switch manufacturers trip point the switch contacts will open. <i>Digital Switch, Normally Open</i> - The input is fed from an engine mounted switch. The switch returns a closed signal during fault conditions, should the temperature rise above the switch manufacturers trip point the switch contacts will close.</p> <p>Further options available in this list depend upon the 'Units' selected: <b>Units:</b> ⊙ Pressure = The expansion analogue is configured for a pressure sender. Transducer types available are: <i>VDO match, 0-5bar</i> <i>VDO match, 0-10bar</i> <i>Datcon match, 0-5bar</i> <i>Datcon match, 0-7bar</i> <i>Datcon match, 0-10bar</i> <i>Murphy, 0-7bar</i> <i>User Configured</i></p>

Function	Description
<p>Expansion analogue input selections</p>	<p>☉ Temperature = The expansion analogue is configured for a temperature sender. Transducer types available are:  <i>VDO match, 120°C*</i>  <i>Datcon HIGH match</i>  <i>Datcon LOW match</i>  <i>Murphy</i>  <i>Cummins</i>  <i>PT100</i>  <i>User Configured</i></p> <p>☉ Percentage = The expansion analogue is configured for a percentage reading sender. The sender must be 'linear' in terms of <math>\Omega</math> and the measurement level. This type of input is most suited for fluid level measurement. Transducer types available are:  <i>VDO Ohms type</i> - operating range = 10<math>\Omega</math> (empty) to 180<math>\Omega</math> (full).  <i>VDO Tube type</i> - operating range = 90<math>\Omega</math> (empty) to 0<math>\Omega</math> (full).  <i>US Ohms Range</i> - operating range = 240<math>\Omega</math> (empty) to 33<math>\Omega</math> (full).  <i>GM Ohms Range (high)</i> - operating range = 0<math>\Omega</math> (empty) to 90<math>\Omega</math> (full).  <i>GM Ohms Range (low)</i> - operating range = 0<math>\Omega</math> (empty) to 30<math>\Omega</math> (full).  <i>Ford</i> - operating range = 73<math>\Omega</math> (empty) to 10<math>\Omega</math> (full).  <i>User Defined</i></p>
<p>Expansion analogue settings</p>	<p><b>Low alarm string (only available if <i>LOW shutdown or Low prealarms</i> has been enabled)</b>  This is the text that will appear on the module's display when either of the LOW alarms occur (i.e. LOW rad water temp)</p> <p><b>High alarm string (only available if <i>HIGH shutdown or HIGH prealarms</i> has been enabled)</b>  This is the text that will appear on the module's display when either of the HIGH alarms occur (i.e. HIGH rad water temp)</p> <p><b>LOW / HIGH Shutdowns -</b>  Passing the adjustable trip point will give a shutdown alarm, and the module will display the relevant High or Low alarm string (see above). The '<i>trip</i>' value can be adjusted to suit user requirements</p> <p><b>LOW / HIGH Pre-Alarms: - (Not available with digital switch inputs)</b>  <input type="checkbox"/> = Pre-alarm warnings are disabled.  <input checked="" type="checkbox"/> = Pre-alarm warnings will occur should the measurement pass the specified trip point. The '<i>pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>The measurement must return past the "return" setting before the 55xx module will consider that it is back with in limits and cancel the pre-alarm.</p>

## DIGITAL INPUTS

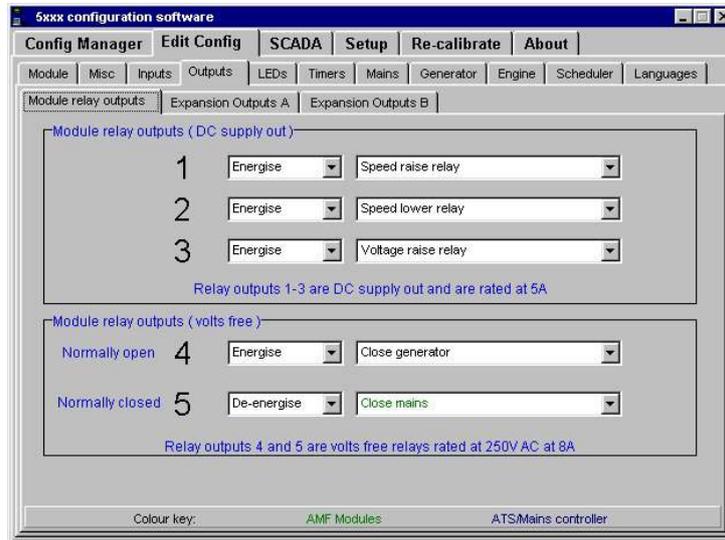


Expansion inputs 1-3, 4-6 and 7-8 use the same drop down list as the module inputs, and are configured in exactly the same way.

## 5.5 OUTPUTS

This menu allows the configurable output to be changed to suit the user's requirements. The following is displayed: -

### 5.5.1 MODULE RELAY OUTPUTS



**NOTE:** - Each Auxiliary output has the same selection choices, allowing a combination of different uses.

Expansion outputs are available for 55xx type modules on a plug in Expansion module type 157, this provides volt free contacts. A maximum of two such expansion modules can be used giving a total of 16 voltage free contacts. The 157 modules are fitted with switch labelled 'A' and 'B'. With the switch in the 'A' position the 157 module will respond to signals for expansion relays 'A' 1 - 8. If the switch is placed in the 'B' position the 157 module will respond to signals for expansion relays 'B' 1-8. Therefore, to use all sixteen possible relays two 157 modules need to be fitted one with the switch set to 'A' the other set to 'B'

If expansion outputs are required to be fitted for indication purposes only, a plug in LED Expansion module type 548 is available. A maximum of two such expansion modules can be used giving a total of 16 configurable LED's (+ Power On and Link Lost indicators). The 548 modules are fitted with switch labelled 'A' and 'B'. With the switch in the 'A' position the 548 module will respond to signals for expansion relays 'A' 1 - 8 and illuminate the appropriate LED's. If the switch is placed in the 'B' position the 548 module will respond to signals for expansion relays 'B' 1-8. And illuminate the appropriate LED's. Therefore to use all sixteen possible configurable LED's two 548 modules need to be fitted one with the switch set to 'A' the other set to 'B' If required it is possible to use a mix of both 157 Relay modules and 548 LED modules on the same 55xx Host.

**CAUTION!** - The 157 relay status is updated a minimum of twice a second. While this makes the response of the relays fast enough for annunciation, remote monitoring and normal system control it is not considered suitable for use in time critical applications such as high speed breaker tripping etc. If this type of function is intended, we would recommend using the 55xx modules own internal relay outputs to control such systems.

**Polarity**

Each of the outputs can be configured as:

**a) Energised**

Normally open relay contact, which closes on activation.

**b) De-energised**

Normally closed relay contact, which opens on activation.

 **NOTE: - If the Expansion relays are actually control sources used for a 548 module then Energised = Lit and De-energised = Unlit.**

Function	Description
Output Not Used	The output is not used.
5560 controls 5510s (5560 only)	Indicates that the 5560 module is currently in control of the generator sets (controlled by the 5510 controller(s))
Activate Synchroniser	This output indicates that the generator is ready to synchronise to the bus. The output can be used to signal an external synchroniser to control the generator and synchronise with the bus.
Air-flap Alarm	This output indicates that the air-flap is closed; to operate it requires an input configured as 'Air-flap closed' connected to the external air-flap switch.
Air flap Relay	The output controls the closing of the air-flaps in an Emergency Stop or Over-speed situation.
Alarm Mute	This output indicates that the module's internal audible alarm has been muted. The output could be used to command a muting of some external sounding device.
Alarm Reset	This output indicates that an alarm reset is being performed. Once the alarm reset has been completed, the output will become inactive again. This output could be used to give a reset signal to external systems such as annunciators or BMS systems to clear any latched alarms.
All available sets on bus	This output indicates that all the available sets in the multiset load sharing system are closed onto the generator bus. This output can be used to close an external breaker to allow the generator bus to power the load. 'Available sets' are sets in auto mode with no alarms present. So sets not in auto mode, or sets that have alarms present are not considered to be 'available sets'.
Alternative Frequency	This output indicates that the module has been configured to the alternate nominal frequency i.e. 60Hz.
Alternative Voltage	This output indicates that the module has been configured to the alternate nominal voltage i.e. 115V AC.
Audible Alarm	This output indicates that the internal sounder is operating. It may be used to feed an external sounder. Operation of the Mute pushbutton will reset this output once activated.
Auto Start Inhibit	This output indicates that a digital input that has been configured as 'Auto Start Inhibit' is active. Refer to the 'Edit Inputs' section of this manual for details.
Auxiliary Mains failure	This output indicates that a digital input that has been configured as 'Auxiliary Mains Failure' is active. Refer to the 'Edit Inputs' section of this manual for details.
Battery High Voltage	This output indicates that a Battery High Voltage alarm has occurred.
Battery Low Voltage	This output indicates that a Battery Low Voltage alarm has occurred.
Bus and mains in parallel (5560 only)	This output indicates that the generator bus and mains supply are in parallel.
Bus closed auxiliary (5560 only)	Indicates that the bus closed auxiliary input is active.
Bus failed to close (5560 only)	This output indicates that the generator bus load switching device failed to close in the time allowed by the "bus failed to close" timer.
Bus failed to open (5560 only)	This output indicates that the generator bus load switching device failed to open in the time allowed by the "bus failed to open" timer.

Function	Description
Bus Live	This output indicates that a voltage has been detected on the bus. Once the voltage on the bus is detected above the "Dead bus relay setting", it will no longer be considered a 'dead-bus' and the generator will need to synchronise in order to get onto the bus.
Bus Phase Sequence Wrong	This output indicates that the module has detected a phase sequence error on the bus.
 CAN CAN ECU error	The engine ECU has indicated that a warning alarm is present.
 CAN CAN ECU fail	The engine ECU has indicated that a shutdown alarm is present.
 CAN CAN data fail	The 55xx module is unable to communicate with the engine ECU.
Calling for Scheduled run	This output indicates that a scheduled run has been called for. The generator will run if the module is in the 'Auto' mode and no shutdown alarms are present. Refer to the Schedule section of this manual for more details.
Charge alternator failure	This output indicates that a failure of the auxiliary charging alternator on the generator has occurred.
Check Sync.	This output indicates that the generator and bus are in sync and that it is safe to close the set onto the bus. This output provides a similar function to that of a sync check relay.
Close Bus (5560 only)	This output source is intended to be used to control the bus load switching device. Whenever the 5560 module selects the generator bus to be on load this control source will be active.
Close Bus Pulse (5560 only)	This output source is intended to be used to control the bus load switching device. Whenever the 5560 module selects the bus to be on load, this control source will be active for the duration of the 'Breaker Close Pulse Timer'. Once this timer has expired, the output source will once again become in-active.
Close Generator	This output source is intended to be used to control the load switching device. Whenever the 55xx module selects the generator to be on load this control source will be active.
Close Generator Pulse	This output source is intended to be used to control the load switching device. Whenever the 55xx module selects the generator to be on load, this control source will be active for the duration of the 'Breaker Close Pulse Timer'. Once this timer has expired, the output source will once again become in-active.
Close Mains	This output source is intended to be used to control the load switching device. Whenever the 5520 / 5560 module selects the mains to be on load this control source will be active.
Close Mains Pulse	This output source is intended to be used to control the load switching device. Whenever the 5520 / 5560 module selects the mains to be on load this control source will be active for the duration of the 'Breaker Close Pulse Timer'. When this timer has expired the output source will once again become in-active.
Combined Mains Decoupling alarm	The output indicates that the mains decoupling function has detected a trip condition (ROCOF, Vector shift, mains under/over voltage/frequency) when in parallel with the mains supply.
Combined under & over Frequency shutdown (Not applicable to 5560.)	The output indicates that either an under frequency or over frequency shutdown has been activated.
Combined under & over Frequency warning (Not applicable to 5560.)	The output indicates that either an under frequency or over frequency warning has been activated.
Combined under & over voltage shutdown (Not applicable to 5560.)	The output indicates that either an under voltage or over voltage shutdown has been activated.
Combined under & over voltage warning (Not applicable to 5560.)	The output indicates that either an under voltage or over voltage warning has been activated.
Common alarm	The output indicates that a warning, electrical trip or shutdown alarm has been activated. Reset depends on whether it is a Warning or a Shutdown fault.

Function	Description
Common Electrical Trip alarm	The output indicates that an electrical trip alarm has been activated. This output can only be reset by removal of the fault and by then pressing the <b>Stop Reset</b> button.
Common Shutdown alarm (Not applicable to 5560.)	The output indicates that a shutdown alarm has been activated. This output can only be reset by removal of the fault and by then pressing the <b>Stop Reset</b> button or by using an external ' <b>Alarm Reset</b> ' Input.
Common Warning alarm	The output indicates that a warning alarm has been activated. This output is normally self-resetting on removal of the fault. However, it is possible to configure the module such that the warning alarms are latching, if so this alarm will need to be reset either by pressing the <b>Stop Reset</b> button or by using an external ' <b>Alarm Reset</b> ' Input.
Coolant temperature high pre-alarm (Not applicable to 5560.)	This output indicates that a high engine coolant temperature warning (pre-alarm) has occurred.
Coolant temperature high shutdown (Not applicable to 5560.)	This output indicates that a high engine coolant temperature shutdown has occurred.
Cooling down timer in progress (Not applicable to 5560.)	This output source will be active when the cooling off-load timer is running.
Delayed alarms armed (Not applicable to 5560.)	The output indicates that the delayed alarms are now enabled. Can be used to control external logic circuitry.
Digital Input 1 active	This output indicates that Digital input 1 is active.
Digital Input 2 active	This output indicates that Digital input 2 is active.
Digital Input 3 active	This output indicates that Digital input 3 is active.
Digital Input 4 active	This output indicates that Digital input 4 is active.
Digital Input 5 active	This output indicates that Digital input 5 is active.
Digital Input 6 active	This output indicates that Digital input 6 is active.
Digital Input 7 active	This output indicates that Digital input 7 is active.
Digital Input 8 active	This output indicates that Digital input 8 is active.
Digital Input 9 active	This output indicates that Digital input 9 is active.
Droop Enable	The output indicates that Droop has been enabled and can be used on Governors with a Droop control input.
Duty select	This output indicates that the module has been selected for duty using the duty select input.
ECU Stop (Not applicable to 5560.)	This output is used to control the 'stop' signal to the CAN engine controller. The action of this output is determined by the 'Engine type' selected on the 'Misc' page.
ECU Power (Not applicable to 5560.)	This output is used to control the 'enable' or power signal to the SAE CAN engine controller. The action of this output is determined by the 'Engine type' selected on the 'Misc' page.
Earth Fault (Not applicable to 5560.)	This output indicates that the module has detected that an earth fault exists on the generator output.
Emergency Stop (Not applicable to 5560.)	This output indicates that an Emergency stop alarm has occurred.
Energise to stop (Not applicable to 5560)	This output controls the fuel solenoid on an ETS type generator, energising for the time period selected in the <b>Edit Timer Menu</b> . The normal fuel output (pin 4) should not be connected to the fuel stop solenoid; however, it can be used for controlling panel instruments and other functions required whilst the engine is running.
Expansion Analogue IP 1 High Pre-alarm (Not applicable to 5560.)	This output indicates that a high pre-alarm has been detected on expansion analogue input 1.
Expansion Analogue IP 1 High Shutdown (Not applicable to 5560.)	This output indicates that a high Shutdown has been detected on expansion analogue input 1.
Expansion Analogue IP 1 Low Pre-alarm (Not applicable to 5560.)	This output indicates that a low pre-alarm has been detected on expansion analogue input 1.

Function	Description
Expansion Analogue IP 1 Low Shutdown (Not applicable to 5560.)	This output indicates that a low Shutdown has been detected on expansion analogue input 1.
Expansion Analogue IP 1 Sender Fault (Not applicable to 5560.)	This output indicates that a sender fault has been detected i.e. open / short circuit on expansion analogue input 1.
Expansion Analogue IP 2 High Pre-alarm (Not applicable to 5560.)	This output indicates that a high pre-alarm has been detected on expansion analogue input 2.
Expansion Analogue IP 2 High Shutdown (Not applicable to 5560.)	This output indicates that a high Shutdown has been detected on expansion analogue input 2.
Expansion Analogue IP 2 Low Pre-alarm (Not applicable to 5560.)	This output indicates that a low pre-alarm has been detected on expansion analogue input 2.
Expansion Analogue IP 2 Low Shutdown (Not applicable to 5560.)	This output indicates that a low Shutdown has been detected on expansion analogue input 2.
Expansion Analogue IP 2 Sender Fault (Not applicable to 5560.)	This output indicates that a sender fault has been detected i.e. open / short circuit on expansion analogue input 2.
Expansion digital Input 1 active	This output indicates that Expansion digital input 1 is active.
Expansion digital Input 2 active	This output indicates that Expansion digital input 2 is active.
Expansion digital Input 3 active	This output indicates that Expansion digital input 3 is active.
Expansion digital Input 4 active	This output indicates that Expansion digital input 4 is active.
Expansion digital Input 5 active	This output indicates that Expansion digital input 5 is active.
Expansion digital Input 6 active	This output indicates that Expansion digital input 6 is active.
Expansion digital Input 7 active	This output indicates that Expansion digital input 7 is active.
Expansion digital Input 8 active	This output indicates that Expansion digital input 8 is active.
Expansion Loss of link	This indicates that the link to the P130 expansion module cannot be detected by the 55xx. Check the connection and configuration.
Fail to start alarm (Not applicable to 5560)	This output indicates that the engine has not started after the specified number of attempts, selected in the <b>Edit Miscellaneous Menu</b> .
Fail to stop alarm (Not applicable to 5560)	This output indicates that the generator has failed to stop within the time period selected in the <b>Edit Timer Menu</b> . The module monitors that the oil pressure has gone low and that the speed-sensing source detects no movement of the generator to establish that the generator has stopped.
Fail to Synchronise Alarm	This output indicates that the generator has not synchronised to the bus within the time allowed. This could indicate a problem with the AVR or governor, or the control link to them from the 55xx module.
Fast Trip Generator	This output source is intended to be used if it is required to trip a generator excitation circuit breaker or operate some other means of tripping alternator off load. This would then be activated under short circuit or earth fault conditions as well as normal electrical trip events. Fast trip generator is the only output source that should be used for this purpose as it is a fast acting output. This output can only be reset by removal of the fault and by then pressing the <b>Stop Reset</b> button or by using an external ' <b>Alarm Reset</b> ' Input.
Fuel Pump Control (Not Applicable to 5560)	This output is used to control a fuel transfer pump. Once the 'fuel pump on' level has been reached, the module will activate the fuel pump control output. This output will remain active until the 'fuel pump off' level is reached.
Fuel relay energised (Not applicable to 5560)	This output mimics the operation of the fuel relay. Can be used to control external logic circuitry.

Function	Description
Gas choke on (Not applicable to 5560)	This output is controls the choke on a gas engine. The choke activates for the period of the gas choke timer, after which the gas ignition activates.
Gas ignition on (Not applicable to 5560)	This output controls the gas ignition system. The output activates when the starter is activated (to assist with gas purging from the engine) and deactivates a time (gas ignition off time) after the fuel (gas) has been de-energised.
Generator & Mains in Parallel	<b>5520 /5560 only:</b> This output indicates that the genset and mains are running in parallel. This will be active whenever the two supplies are on load together.
Generator at Rest (Not applicable to 5560)	This output indicates that the generator is not running.
Generator Available (Not applicable to 5560)	This output indicates when the generator is ready to accept load, i.e. after safety on and warm up timers have timed out. It could be used to connect to an Automatic Transfer System or PLC to give a signal that the set is available.
Generator Closed Auxiliary	This output indicates that a digital input that has been configured, as 'Generator Closed Auxiliary' is active. Refer to the 'Edit Inputs' section of this manual for details.
Generator Failed to Close	This output source is intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the module is configured to use 'Generator Closed Auxiliary' feedback.
Generator Failed to Open	This output source is intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the module is configured to use 'Generator Closed Auxiliary' feedback.
Generator High Frequency Pre-alarm (Not applicable to 5560.)	This output indicates that a Generator High Frequency Warning (pre-alarm) has occurred.
Generator High Frequency Shutdown (Not applicable to 5560.)	This output indicates that a Generator High Frequency Shutdown has occurred.
Generator High Voltage Pre-alarm (Not applicable to 5560.)	This output indicates that a Generator High Voltage Warning (pre-alarm) has occurred.
Generator High Voltage Shutdown (Not applicable to 5560.)	This output indicates that a Generator High Voltage Shutdown has occurred.
Generator Load Inhibit (Not applicable to 5560.)	This output indicates that a digital input that has been configured as 'Generator Load Inhibit' is active. Refer to the 'Edit Inputs' section of this manual for details.
Generator Low Frequency Pre-alarm (Not applicable to 5560.)	This output indicates that a Generator Low Frequency Warning (pre-alarm) has occurred.
Generator Low Frequency Shutdown (Not applicable to 5560.)	This output indicates that a Generator Low Frequency Shutdown has occurred.
Generator Low Voltage Pre-alarm (Not applicable to 5560.)	This output indicates that a Generator Low Voltage Warning (pre-alarm) has occurred.
Generator Low Voltage Shutdown (Not applicable to 5560.)	This output indicates that a Generator Low Voltage Shutdown has occurred.
Generator Phase Sequence Wrong	This output indicates that the module has detected a phase sequence error from the generator output.
Generator Reverse Power (Not applicable to 5560.)	This output indicates that a Generator Reverse Power alarm has occurred.
Generator Stopping (Not applicable to 5560.)	This output source indicates that the engine has been instructed to stop but has not yet come to rest. Once the engine comes to a standstill this output will become in-active.

Function	Description
Inhibit retransfer to mains	This output source indicates that the "inhibit retransfer to mains" function is active.
Insufficient Capacity Available (Not applicable to 5510.)	This output source indicates that there is insufficient Generating capacity. For example, when in Mains control mode the Generators can not supply the required import / export power to the load.
Interlock Override (Not applicable to 5510.)	This output is active from starting to sync until coming out of parallel. It will go active from after 3 seconds delay (or the bus low volts alarm is inactive) and stay until either mains or bus breaker opens.
Lamp test	This output indicates that the module is performing a lamp test. Once the lamp test is completed, the output will become inactive again. The output can be used to feed a lamp test on external modules or panel lamps.
Load share inhibit	Indicates that the Load Share Inhibit input is active
Loss of Magnetic pick-up speed signal  (Not applicable to 5560.)	This output indicates that the magnetic pick up signal is not sufficient to be used by the module for speed monitoring. The alarm can only operate if the speed signal fails to appear during cranking. It is disabled if 'multiple attempts to engage' is selected. If the MPU fails during engine running this would result in an underspeed alarm.
Louvre control (Not applicable to 5560.)	The output controls the opening of the louvres on engine starting and closure when engine has stopped.
Low Coolant temperature (Not applicable to 5560.)	This output indicates that the temperature of the engine coolant has fallen below the low temperature alarm trip point, possibly indicating engine block heater failure.
Low Fuel Level (Not applicable to 5560.)	This output indicates that the level of fuel has fallen below the low fuel alarm trip point.
MSC failure	Indicates a complete failure of the multiset communications data link.
MSC ID Error	Indicates that two or more modules share the same ID number. They must all be unique.
MSC Compatibility Error	Indicates that there are modules on the MSC link of incompatible versions.
MSC Data error	Indicates a data transfer error on the multiset communications link data
MSC too few sets	Indicates that the number of sets on the multiset communications data link is lower than that specified in the module's configuration.
Magnetic Pick-up open circuit (Not applicable to 5560.)	This output indicates that the module has detected an open circuit failure in the Magnetic Pickup transducer circuit.
Mains ROCOF	Indicates that the ROCOF protection (when in parallel with mains) has triggered.
Mains Closed Auxiliary	This output indicates that a digital input that has been configured as ' <i>Mains Closed Auxiliary</i> ' is active. Refer to the ' <i>Edit Inputs</i> ' section of this manual for details.
Mains decoupling high frequency	This output indicates that the mains decoupling high frequency alarm has been triggered.
Mains decoupling high voltage	This output indicates that the mains decoupling high voltage alarm has been triggered.
Mains decoupling low frequency	This output indicates that the mains decoupling low frequency alarm has been triggered.
Mains decoupling low voltage	This output indicates that the mains decoupling low voltage alarm has been triggered.
Mains Failed to Close	This output source is intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the module is configured to use ' <i>Mains Closed Auxiliary</i> ' feedback.
Mains Failed to Open	This output source is intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the module is configured to use ' <i>Mains Closed Auxiliary</i> ' feedback.

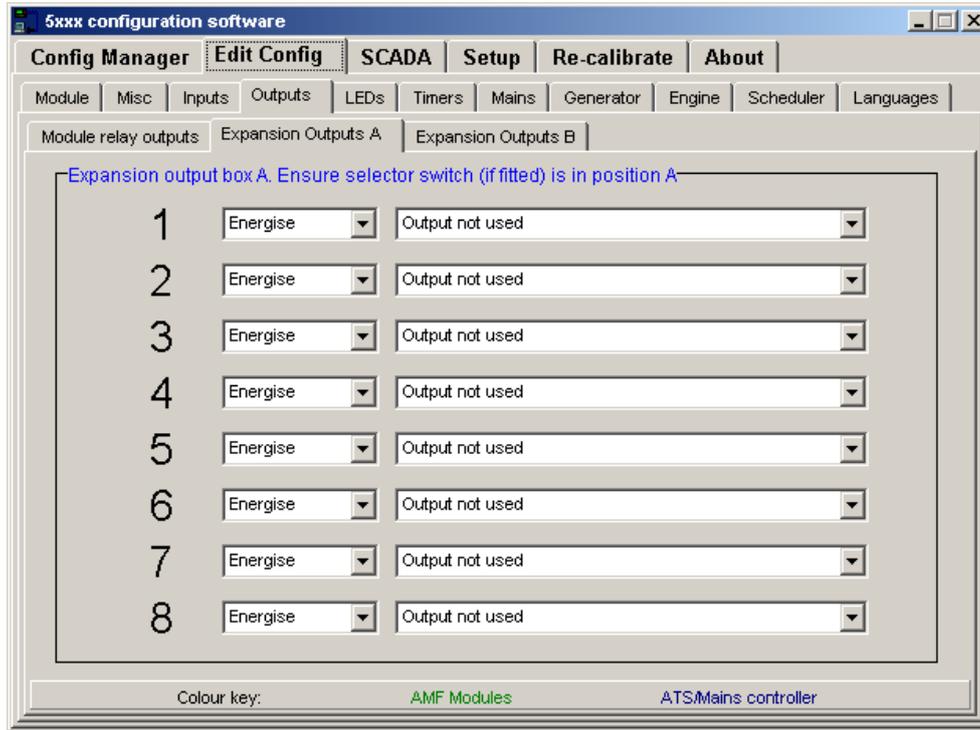
Function	Description
Mains Failure	This output indicates that the module has sensed that a failure of the incoming AC mains supply. This output will become active whenever the mains voltage or frequency goes out of limits, or if the auxiliary mains failure input active (if used) and the mains, transient timer has expired.
Mains High frequency	This output indicates that the module has sensed that the incoming AC mains supply has exceeded the frequency limit setting.
Mains High voltage	This output indicates that the module has sensed that the incoming AC mains supply voltage has exceeded the voltage limit setting.
Mains Load Inhibit	This output indicates that a digital input that has been configured as 'Mains Load Inhibit' is active. Refer to the 'Edit Inputs' section of this manual for details.
Mains Low frequency	This output indicates that the module has sensed that the incoming AC mains supply has fallen below the frequency setting.
Mains Low voltage	This output indicates that the module has sensed that the incoming AC mains supply voltage has fallen below the voltage limit setting.
Mains Phase Sequence Wrong	This output indicates that the module has detected a phase sequence error on the incoming AC mains supply.
Mains vector shift	Indicates that the vector shift protection (when in mains parallel) has triggered.
Maintenance Due Alarm (Not applicable to 5560.)	This output indicates that the generator is now due for maintenance either because it has used all the available running hours or the periodic maintenance time has expired. To clear the output a maintenance reset must be performed. (Refer to the Maintenance alarm section of this manual).
Minimum sets not reached (5560 only)	This output indicates that the minimum number of sets has not been reached prior to closing the generator bus load switching device as dictated by the "minimum number of sets" setting on the 'System' tab.
Mute / Lamp test button pressed	This output indicates that the alarm mute / Lamp test pushbutton is being operated. Once the button is released, the output will become inactive.
No loading command	This output indicates that the module is not calling of the generator (or mains [5520 Modules only]) contactor or breaker to be closed. Should the module close the generator (or mains) contactor this output will become inactive.
Oil pressure low Pre-alarm (Not applicable to 5560.)	This output indicates that a low oil pressure warning (pre-alarm) has occurred.
Oil pressure low shutdown (Not applicable to 5560.)	This output indicates that a low oil pressure shutdown has occurred.
Oil Press sender Open circuit (Not applicable to 5560.)	This output indicates that the module has detected an open circuit failure in the Oil Pressure transducer circuit.
Open bus (5560 only)	This output source is intended to be used to control the bus load switching device. Whenever the 5560 module selects the bus to be on load this control source will be active.
Open bus Pulse (5510 only)	This output source is intended to be used to control the bus load switching device. Whenever the 5560 module selects the bus to be on load, this control source will be active for the duration of the 'Breaker open Pulse Timer'.
Open Generator (Not applicable to 5560.)	This output source is intended to be used to control the load switching device. Whenever the 55xx module selects the mains to be on load this control source will be active.
Open Generator Pulse (Not applicable to 5560.)	This output source is intended to be used to control the load switching device. Whenever the 55xx module selects the mains to be on load, this control source will be active for the duration of the 'Breaker open Pulse Timer'.
Open Mains	This output source is intended to be used to control the load switching device. Whenever the <b>5520 / 5560</b> module selects the generator to be on load this control source will be active.
Open Mains Pulse	This output source is intended to be used to control the load switching device. Whenever the <b>5520 / 5560</b> module selects the generator to be on load this control source will be active for the duration of the 'Breaker open Pulse Timer'. Once this timer has expired the output source will once again become in-active and the <b>5520 / 5560</b> will issue commands to load the generator.

Function	Description
Over current Pre-alarm (Not applicable to 5560.)	This output indicates that the over-current warning (pre-alarm) level has been reached.
Over current trip (Not applicable to 5560.)	This output indicates that the over-current trip level been reached.
Overspeed Pre-alarm (Not applicable to 5560.)	This output indicates that an overspeed warning (pre-alarm) has occurred.
Overspeed Shutdown (Not applicable to 5560.)	This output indicates that an overspeed shutdown has occurred.
Panel locked	This output indicates that the module 'Panel Lock' is active. If the Panel lock input is active, the module will not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected and the operator will still be able to view the various instrumentation pages etc. ( <i>Front panel configuration access is barred while system lock is active</i> ).
Panel lock by digital input	This output indicates that a digital input that has been configured as 'Panel Lock' is active. If the Panel lock input is active, the module will not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected and the operator will still be able to view the various instrumentation pages etc. ( <i>Front panel configuration access is barred while system lock is active</i> ). Refer to the 'Edit Inputs' section of this manual for details.
Panel lock by telemetry	This output indicates that remote 'Panel Lock' via telemetry is active. If the Panel lock is active, the module will not respond to operation of the Mode select or start buttons. This allows the module to be controller remotely without local interference. The operation of the module is not affected and the local operator will still be able to view the various instrumentation pages etc. ( <i>Front panel configuration access is barred while system lock is active</i> ). Refer to the Link500plus manual for details.
Pre-heat (during preheat timer) (Not applicable to 5560.)	This output controls the pre-heater. Pre-heat output is available for the duration of the pre-heat timer, which terminates prior to cranking.
Pre-heat (until end of crank) (Not applicable to 5560.)	This output controls the pre-heater. As 'Pre-heat (during preheat timer)' mode but pre-heat is also available during cranking.
Pre-heat (until end of warming timer) (Not applicable to 5560.)	This output controls the pre-heater. As 'Pre-heat (until safety on)' but pre-heat continues to be available until the warm-up timer has elapsed.
Pre-heat (until safety on) (Not applicable to 5560.)	This output controls the pre-heater. As 'Pre-heat (until end of cranking)' but pre-heat is also available while waiting for the delayed alarms to become active.
Remote start off load	This output indicates that a digital input that has been configured as 'Remote Start off load' is active. This output could be used to pass the remote start signal on to elsewhere in the control system.
Remote start on load	This output indicates that a digital input that has been configured as 'Remote Start on load' is active. This output could be used to pass the remote start signal on to elsewhere in the control system.
Remote start on load demand (5510 / 5560 only)	Indicates that the module's input is active for remote start on load demand. Also indicates that the 5510 has received a remote start on load signal from the 5560 via the MSC link.
Reset to Governor Datum (Not applicable to 5560.)	This output is intended to be used in conjunction with an electronic or motorised potentiometer, which has a 'centre pot' type input. This output is activated whenever the module needs to reset the potentiometer to its centre position.
Reset to AVR Datum (Not applicable to 5560.)	This output is intended to be used in conjunction with an electronic or motorised potentiometer, which has a 'centre pot' type input. This output is activated whenever the module needs to reset the potentiometer to its centre position.

Function	Description
Return delay in progress	This output source will be active to indicate that the return timer is running.
Short Circuit Generator (Not applicable to 5560.)	This output indicates that the module has detected a short circuit on the generator output.
Simulate Mains available	This output indicates that a digital input that has been configured as ' <i>Simulate mains available</i> ' is active.
Smoke Limit  (Not applicable to 5560.)	This is used to supply a smoke-limiting signal to an Electronic Governor to limit smoke emissions on start-up. It is used in conjunction with the Smoke limit timer settings. Once the Timer has expired, the Smoke limit output will cease to operate allowing the engine to accelerate to normal running speed.
Speed Lower Relay (Not applicable to 5560.)	This output will be used to give a speed lower signal to the external governor or electronic pot.
Speed Raise Relay (Not applicable to 5560.)	This output will be used to give a speed raise signal to the external governor or electronic pot.
Start Delay in Progress	This output source will be active to indicate that the 55xx modules internal start delay timer is running. Once this timer expires the module will initiate its start sequence.
Start relay energised	This output mimics the operation of the start relay. Can be used to control external logic circuitry.
Starting Alarm (Not applicable to 5560.)	This output is used to supply an external sounder with a signal that the engine is about to start. The output will be active AFTER the start delay time, during the pre heat delay (if used) and will continue until the set starts.
Starting alarms armed  (Not applicable to 5560.)	This output indicates that the starting alarms are now enabled. It can be used to control external logic circuitry. Starting alarms are armed as soon as the module commences starting of the engine and remain armed until the engine is at rest.
Stop Button Pressed	This output indicates that the stop pushbutton is being operated. Once the button is released, the output will become inactive.
Sufficient sets available (5560 only)	This output indicates that there are sufficient sets available on the bus.
Synching Enabled	This output indicates that the synchronisation feature has been enabled.
System healthy	This output indicates that the module is in <b>Auto</b> mode and there are no alarms present.
System in Test Mode	This output indicates that the module is in the test mode.
System in Auto Mode	This output indicates that the module is in the <b>Auto</b> mode.
System in Manual Mode	This output indicates that the module is in the manual mode.
System in Stop Mode	This output indicates that the module is in the <b>Stop</b> mode.
Telemetry Active (Relay)	This output indicates that the remote telemetry link is active. This output may be used by either an LED or a Relay. It will be active whenever the remote telemetry link is active. Refer to the 'Link5000plus' manual.
Telemetry data Active (LED)	This output indicates that the remote telemetry link is active. This output is intended to be fed to an LED to indicate data activity. It is not suitable for use by the output relays. Refer to the 'Link5000plus' manual.
Trip bus in parallel (5560 only)	This output indicates that the 5560 has been forced to remove the generators from its load to pass control of the generators over to another 5560 that has detected a mains failure. This will only occur if the <i>Enable forced 'peak lop inhibit'</i> has been selected on the 'misc' tab.
Underspeed Warning (Not applicable to 5560.)	This output indicates that an underspeed warning (pre-alarm) has occurred.
Underspeed Shutdown (Not applicable to 5560.)	This output indicates that an underspeed shutdown has occurred.
Voltage Lower Relay  (Not applicable to 5560.)	Auto-sync and load share units only: - This output will be used to give a Voltage lower signal to the external governor or electronic pot.
Voltage Raise Relay  (Not applicable to 5560.)	Auto-sync and load share units only: - This output will be used to give a voltage raise signal to the external governor or electronic pot.

<b>Function</b>	<b>Description</b>
Waiting for generator (Not applicable to 5560.)	This output indicates that the engine has been instructed to start but has not yet become available. Once the generator becomes available this output will become in-active. (Available = Generator Frequency and Voltage levels are above the ' <i>Loading</i> ' levels set in the configuration.)
Waiting for manual restore	The 55xx has detected that the remote start signal is inactive or the mains supply has returned to within limits and is now available to take the load. However, it is receiving a 'Manual Restore' signal. Until this is removed, it will continue to run on the generator.

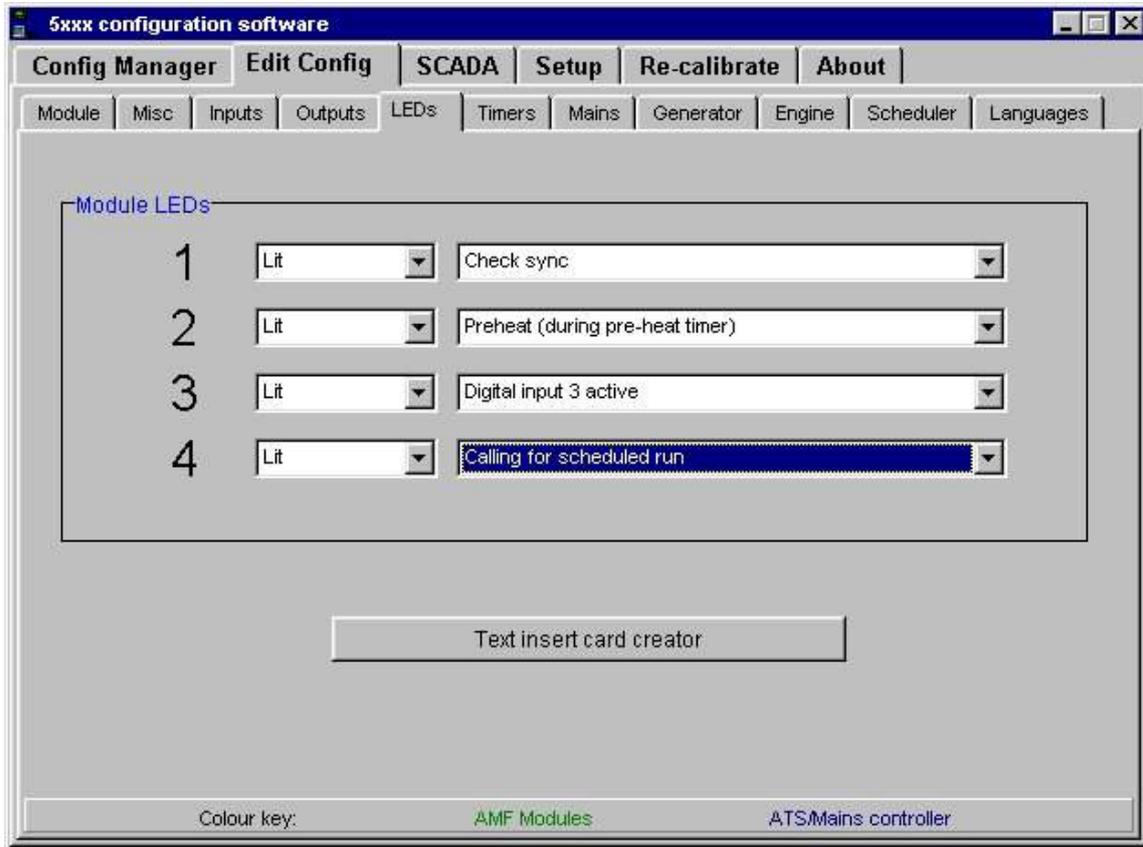
## 5.5.2 EXPANSION OUTPUTS A AND B



Expansion outputs A and B use the same drop down list as the module relay outputs, and are configured in exactly the same way.

## 5.6 LED'S

This menu allows the configurable LED's to be changed to suit the user's requirements. The following is displayed :- ( Typical Settings for information only).



### NOTES

1: - Each LED has the same selection of choices as stated in the edit outputs section of this manual.  
 2: - Each LED can be configured to any function, allowing for flexible configuration.  
 3: - If expansion outputs are required to be fitted for indication purposes only, a plug in LED Expansion module type 548 is available. A maximum of two such expansion modules can be used giving a total of 16 configurable LED's (+ Power On and Link Lost indicators). The 548 modules are fitted with switch labelled 'A' and 'B'. With the switch in the 'A' position the 548 module will respond to signals for expansion relays 1 - 8 and illuminate the appropriate LED's. If the switch is placed in the 'B' position the 548 module will respond to signals for expansion relays 9-16, and illuminate the appropriate LED's. Therefore to use all sixteen possible configurable LED's two 548 modules need to be fitted one with the switch set to 'A' the other set to 'B'.

### Polarity

Each of the LED's can be configured as:

a) **Lit** - Normally extinguished LED, which illuminates on activation.

b) **Un-lit** - Normally illuminated LED, which extinguishes on activation.

[IEEE 37.2 - 30 Annunciator relay](#)

### Control Source

Refer to Output Selection shown in Edit Outputs section of this manual.

### LED identification



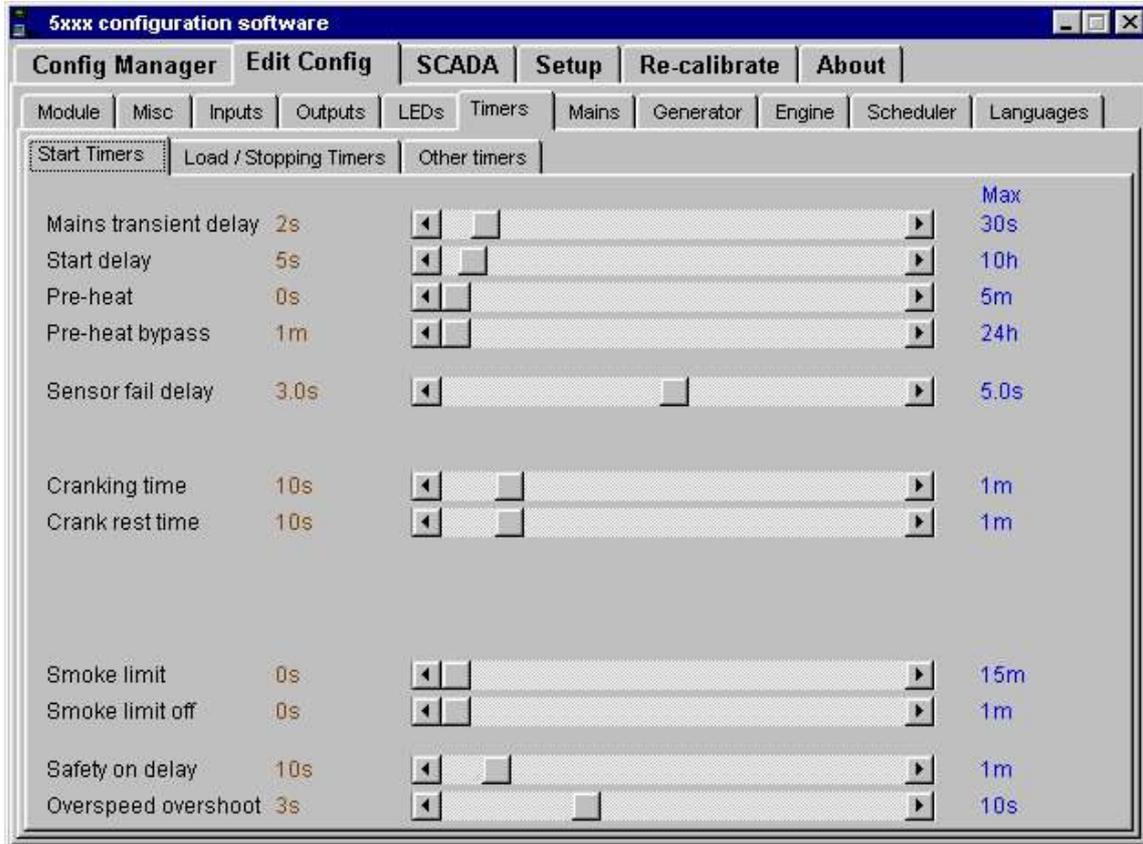
The above diagram indicates which LED number in the configuration corresponds to which LED on the front label.

**NOTE: - LED's are fixed in colour (RED)**

## 5.7 TIMERS

This menu allows the configurable system timers to be changed to suit the users requirements. The following menu is displayed: -

### 5.7.1 START TIMERS

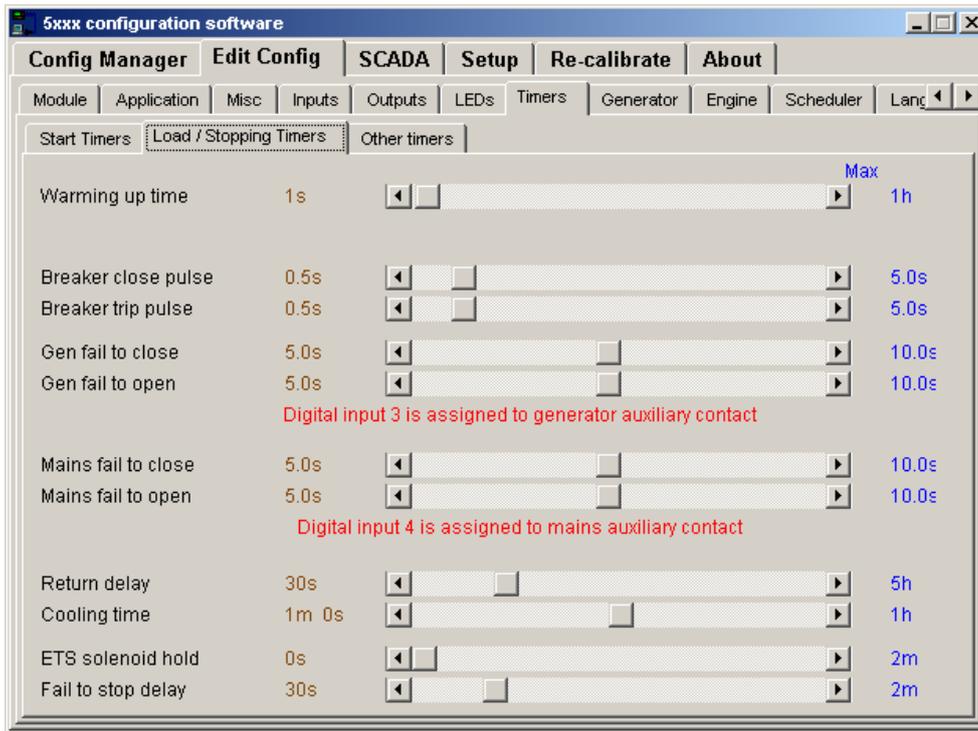


**NOTE:** -Timers can be adjusted by clicking on either the up or down arrow or by clicking on the bar and dragging the bar to the correct time.  
 As the timers can be accurately set to exact times, it is possible to configure the module with the timers reduced to allow rapid testing of the finished generating set. Once the set is ready for a final witness test, it is just a simple matter of entering the specified timer settings and writing them to the module.

Start Timers	Function
Mains Transient Delay	<p><b>(Only available on 5520 / 5560 modules)</b>                      This timer dictates how long a mains anomaly must be present before the module will respond to it. This can be used to prevent nuisance tripping when switching loads etc.</p>
Start delay	<p>This timer dictates how long the module will wait after it has received a remote start signal (or mains failure signal – 5520 / 5560) before it will attempt to start. This prevents un-necessary starting on a fluctuating mains supply, etc.</p>
Pre-heat (Not applicable to 5560.)	<p>This timer dictates the duration that the pre-heat output will be active before an attempt is made to start the engine. Once this timer has expired, cranking will commence.</p>
Pre-heat bypass  (Not applicable to 5560.)	<p>This feature allows the module to start a hot engine without performing an un-necessary pre-heat delay. The generator starting, and actually being loaded, triggers the bypass timer. If the generator is started but does not achieve loading then the timer will not be triggered. The bypass timer is initiated once the engine has come to rest. If any attempts to start are requested within the duration of the bypass timer, the start sequence will bypass the pre-heat timer.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>⚠ NOTE: - If the generator does not start on the first attempt Pre-heat is enabled prior to the second crank attempt.</b></p> </div>
Sensor fail delay  (Not applicable to 5560.)	<p><b>(Only available if using Magnetic pick-up)</b>                      This is only used if magnetic pick speed sensing is selected. Once cranking has commenced the module must receive a speed signal within this time. If no signal is present, the generator will be shutdown and a Loss of Speed Sensing alarm given.</p>
Engage Attempt time  (Not applicable to 5560.)	<p><b>(Only available if using Magnetic pick-up and multiple engage attempts)</b>                      This timer dictates the duration that the module will attempt to engage the starter motor during each engage attempt. If the Magnetic Pick-up is not detecting movement of the flywheel when this timer expires, the engage attempt will terminate. Once all engage attempts have been made, the module will generate a 'Fail to engage' alarm.</p>
Engage Rest Time (Not applicable to 5560.)	<p><b>(Only available if using Magnetic pick-up and multiple engage attempts)</b>                      This timer dictates the duration that the module will wait between attempts to engage to starter.</p>
Cranking time (Not applicable to 5560.)	<p>This is the maximum amount of time that the module will energise the starter motor for during starting attempts once the starter has engaged.</p>
Crank rest time (Not applicable to 5560.)	<p>This is the amount of time the module will wait for between start attempts. This is to allow the starter motor to cool and the starter batteries to recover.</p>
Manual Crank Limit (Not applicable to 5560.)	<p><b>(Only available if using 'Start Button must be held down to crank')</b>                      This is a protective time limit on the duration that the module is allowed to manually crank for. It is used to prevent the operator from holding the 'Start' button depressed for an unacceptable length of time. Once the crank limit timer has expired, the crank relay will be de-energised.</p>
Smoke limiting On (Not applicable to 5560.)	<p>This is the amount of time that the smoke limiting output will remain active for once the engine has started. While the smoke limiting output is active, the engine will be held at a reduced speed to minimise smoke emissions on start-up. (Only if fitted with an appropriate Electronic Fuel Control module). Once the timer has expired, the engine will be allowed to accelerate up to its normal operating speed.</p>
Smoke limiting Off (Not applicable to 5560.)	<p>This is the amount of time that the generator will be given to ramp up to normal running speed after the smoke limit On timer has expired.</p>
Safety on delay  (Not applicable to 5560.)	<p>This timer dictates how long the module will ignore the Low oil pressure, High Engine Temperature, Underspeed, Undervolts and any other inputs configured as active from safety on. It allows the values such as oil pressure to rise to their operating values on starting without triggering an alarm. When the timer has expired, all alarm conditions are monitored again.                      If configured to use 'fast loading', should all the monitored conditions, such as oil pressure, come to the expected state prior to the end of the safety on timer, the timer will be terminated prematurely ensuring maximum protection as soon as possible.</p>

Start Timers	Function
<p>Overspeed Overshoot</p> <p>(Not applicable to 5560.)</p>	<p>This timer is used to prevent nuisance tripping on generators where a slow response governor allows the engine to overspeed slightly during start-up. This setting allows the normal overspeed shutdown level to be exceeded by a percentage (up to a maximum of 10% - see 'Engine', 'Speed settings') for the duration of the timer. Should the engine speed exceed this temporarily elevated level it will be shutdown. Once the overspeed timer has expired the overspeed shutdown value is restored to the normal level.</p> <div style="border: 1px solid black; padding: 5px;"> <p> <b>NOTE: - This is not a delay on overspeed shutdown, only a temporary raising of the overspeed value, therefore overspeed protection is not compromised.</b></p> </div>

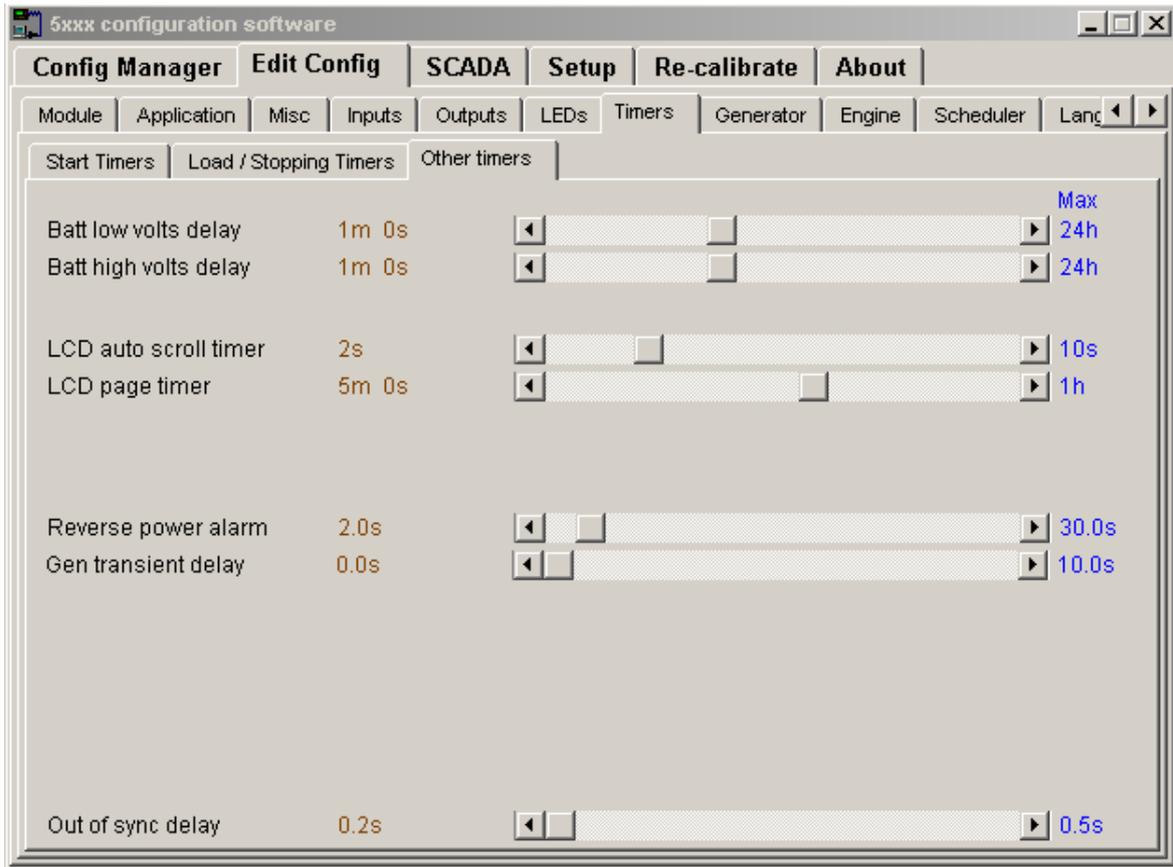
## 5.7.2 LOAD/STOPPING TIMERS



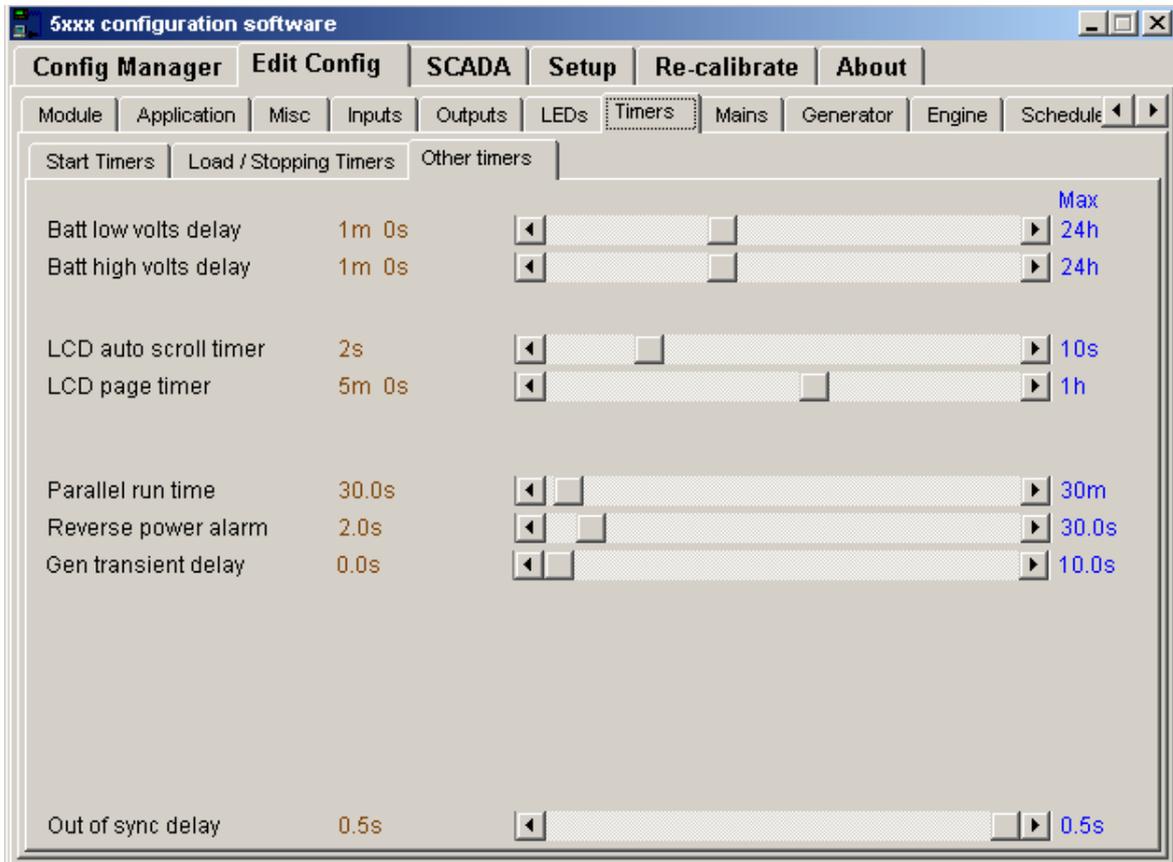
Loading /Stopping	Function
Warm up timer (Not applicable to 5560.)	This timer is initiated once the engine is up and running. It delays loading the generator until it has stabilised. Once this timer has expired, the 'Close generator' signal will be given and the generator is available to be loaded.
Transfer time	This is used to allow for fixed duration transfer breaks when switching from mains to generator and back. It can be used to ensure that the supply is removed from the load for a fixed period of time to allow pumps/motors to come to rest etc.
Bus close delay 5560 only	This is used to delay the synchronising of the bus to the mains once the minimum number of sets has been reached. This is used to allow the bus voltage/frequency to stabilise before taking load.
Breaker Close Pulse Time	This is used to determine the duration of the Mains and Generator close signals. This timer is only used if Pulsed outputs are configured to be used.
Breaker trip Pulse Time	This is used to determine the duration of the Mains and Generator open signals. This timer is only used if Pulsed outputs are configured to be used.
Bus fail to close 5560 only	This is used to monitor the closure of the generator bus contactor or breaker. It will only operate if an auxiliary input is configured as 'Bus closed auxiliary', and connected to the auxiliary on the generator bus contactor or breaker. Once a bus close signal is issued the 'bus fail to close timer' is initiated. Should the 'bus closed auxiliary' input become active, the 'bus fail to close timer' is cancelled. If the timer expires and the 'bus closed auxiliary' has not become active, the module will issue a 'bus failed to close' alarm.

Loading /Stopping	Function
Bus fail to open 5560 only	This is used to monitor the opening of the generator bus contactor or breaker. It will only operate if an auxiliary input is configured as 'Bus closed auxiliary', and connected to the auxiliary on the generator bus contactor or breaker. Once a bus open signal is issued the 'bus fail to open timer' is initiated. Should the 'bus closed auxiliary' input become in-active the timer the 'bus fail to open timer' is cancelled. If the timer expires and the 'bus closed auxiliary' has not become in-active the module will issue a 'bus failed to open' alarm.
Gen fail to close (Not applicable to 5560.)	This is used to monitor the closure of the generator contactor or breaker. It will only operate if an auxiliary input is configured as 'Generator closed auxiliary', and connected to the auxiliary on the generator contactor or breaker. Once a generator close signal is issued, the 'gen close timer' is initiated. Should the 'gen closed auxiliary' input become active, the 'gen close timer' is cancelled. If the timer expires and the 'generator closed auxiliary' has not become active, the module will issue a 'generator failed to close' alarm.
Gen fail to open (Not applicable to 5560.)	This is used to monitor the opening of the generator contactor or breaker. It will only operate if an auxiliary input is configured as 'Generator closed auxiliary', and connected to the auxiliary on the generator contactor or breaker. Once a generator open signal is issued, the 'gen open timer' is initiated. Should the 'gen closed auxiliary' input become in-active the timer the 'gen open timer' is cancelled. If the timer expires and the 'generator closed auxiliary' has not become in-active the module will issue a 'generator failed to open' alarm.
Mains fail to close	This is used to monitor the closure of the mains contactor or breaker. It will only operate if an auxiliary input is configured as 'Mains closed auxiliary', and connected to the auxiliary on the mains contactor or breaker. Once a mains close signal is issued the 'mains close timer' is initiated. Should the 'mains closed auxiliary' input become active the timer the 'mains close timer' is cancelled. If the timer expires and the 'mains closed auxiliary' has not become active the module will issue a 'mains failed to close' alarm.
Mains fail to open	This is used to monitor the opening of the mains contactor or breaker. It will only operate if an auxiliary input is configured as 'Mains closed auxiliary', and connected to the auxiliary on the mains contactor or breaker. Once a mains open signal is issued the 'mains open timer' is initiated. Should the 'mains closed auxiliary' input become in-active the 'mains open timer' is cancelled. If the timer expires and the 'mains closed auxiliary' has not become in-active the module will issue a 'mains failed to open' alarm.
Return delay	This timer dictates how long the module will wait before it will un-load the generator (back to the mains supply if AMF) and initialise its run-on and shutdown cycle. This is to ensure that the mains supply has stabilised before transferring the load back to mains.
Cooling Time (Not applicable to 5560.)	This is the time the generator is to run off-load once the load transfer signal has ceased. This gives the engine time to cool down before shutdown.
ETS Solenoid hold time (Not applicable to 5560.)	This timer is used if the unit is configured to operate an Energise to stop engine. It dictates the duration that the ETS output will remain active after the module has detected the engine has come to rest. If the ETS output is not configured, this timer will still operate, preventing an immediate restart.
Fail to stop delay time (Not applicable to 5560.)	Once the module has given a shutdown signal to the engine it expects the engine to come to rest. It monitors the Oil pressure and speed sensing sources and if they still indicate engine movement when this timer expires, a 'Fail to stop' alarm signal is generated.

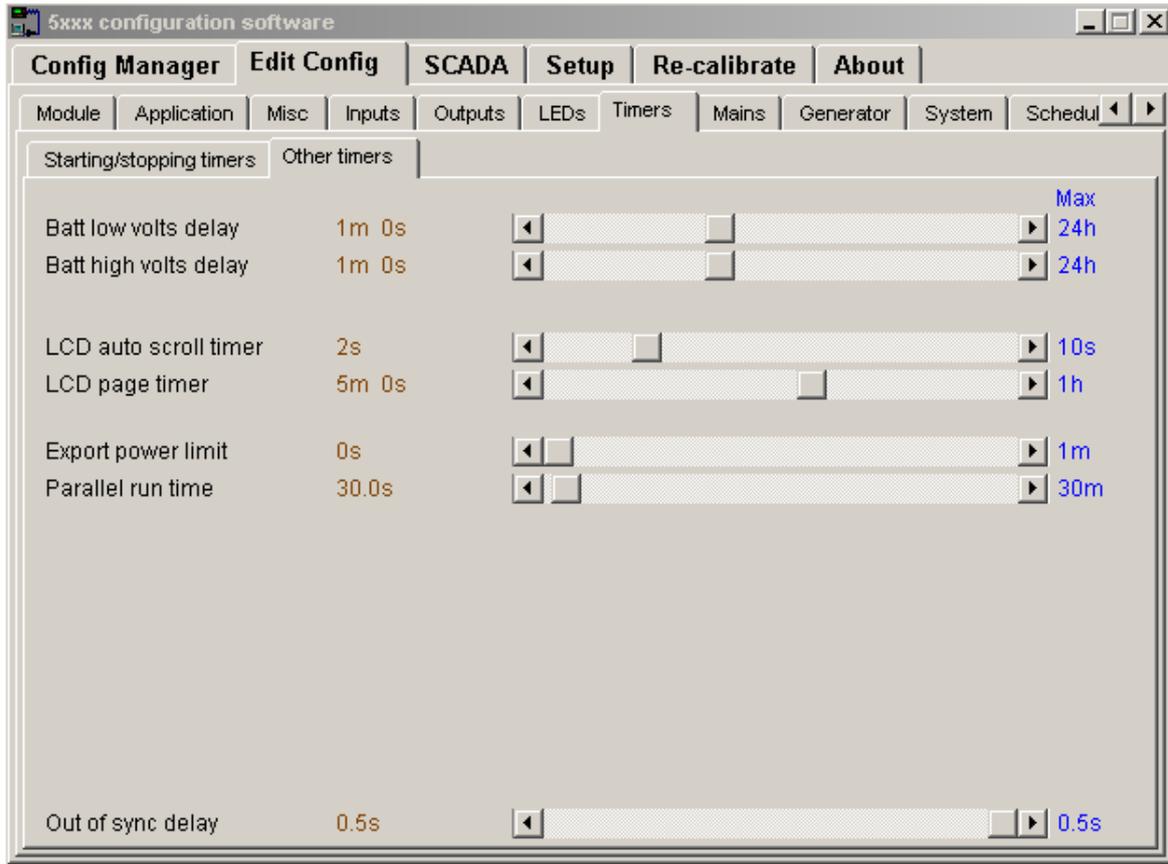
### 5.7.3 OTHER TIMERS



5510



5520



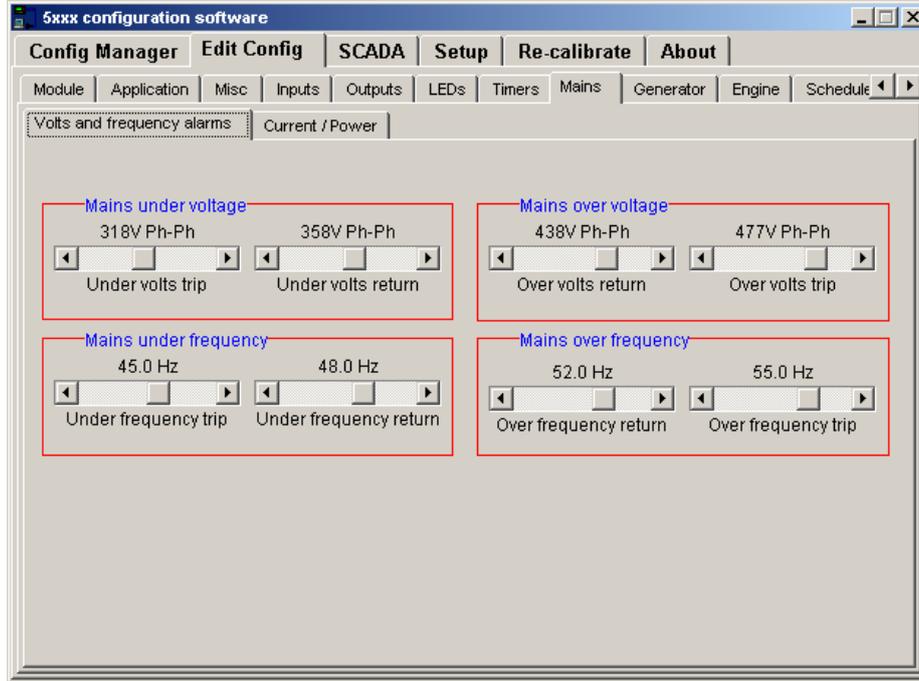
5560

Other/Timers	Function
Battery Low Volts Delay	This timer dictates how long the module will wait before it will give a low DC plant voltage alarm in the event of the plant voltage falling below low voltage trip level. This can be used to prevent nuisance alarms when using poorly regulated power supplies and battery chargers, and during engine cranking.
Battery High Volts Delay	This timer dictates how long the module will wait before it will give a high DC plant voltage alarm in the event of the high voltage trip level being exceeded. This can be used to prevent nuisance alarms when using poorly regulated power supplies and battery chargers.
LCD Auto-scroll Timer	This timer is used to control how long each message or instrument is displayed on the LCD display when automatically scrolling. If the timer is set to 1 second for example, then each instrument would be displayed for 1 second before changing to display the next.
LCD Page Timer	This timer is used to control how long the module will remain on any page other than the 'Information Page'. If for example the module was left on the 'Generator Instruments page' after this timer has expired it will automatically return to the 'Information Page'.
Reverse Power Alarm Timer (Not applicable to 5560.)	This timer dictates how long the module will wait before it will give a Reverse Power alarm in the event of the reverse power trip level being exceeded. This can be used to prevent nuisance alarms when, for example, synchronising with other supplies may normally lead to short periods of reverse power.
Export power limit 5560 Only	This timer dictates how long the module will wait before it will give an alarm when the mains is in reverse power (export power is above the Mains export power limit setting)
Gen Transient Delay (Not applicable to 5560.)	This timer dictates how long a generator anomaly must be present before the module will respond to it. This can be used to prevent nuisance tripping when switching loads by delaying the under/over frequency/voltage/speed alarms.
Parallel run time (not applicable to 5510)	This timer dictates how long the generator will run in parallel with the mains supply.

## 5.8 MAINS

This menu allows the mains sensing configurable trip values to be edited to the users required levels. The following menu is displayed:

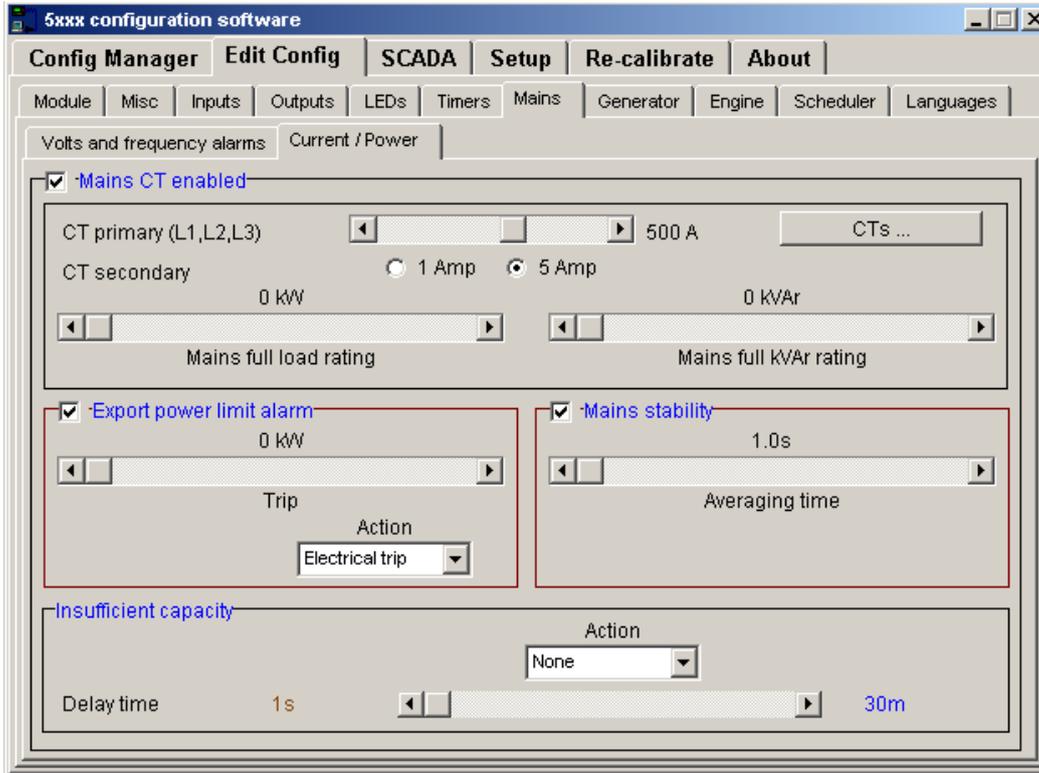
### 5.8.1 VOLTS AND FREQUENCY ALARMS



**NOTES: - Mains sensing is only available on the 5520 / 5560 module**

Level	Function
<p>Mains Under voltage IEEE 37.2 - 27AC Undervoltage relay</p>	<p>These settings are used to configure the mains under voltage alarm: -</p> <p><b>Under Voltage Trip -</b> This is the minimum voltage that the 5520 / 5560 will consider the incoming AC mains supply to be within limits. Should the input fall below this value the module will indicate a mains failure and function accordingly.</p> <p><b>Under Voltage Return -</b> This is the voltage above the under voltage trip that the incoming mains supply must return to before the 5520 / 5560 module will consider that the supply is back with in limits. (i.e. With an undervolts trip of 184.0V and an undervolts return of 207.0V, the mains voltage must return to 207.0V following an under voltage event to be considered within limits.)</p>
<p>Mains Over voltage IEEE 37.2 - 59AC Overvoltage relay</p>	<p>These settings are used to configure the mains Over voltage alarm: -</p> <p><b>Over Voltage Trip -</b> This is the maximum voltage that the 5520 / 5560 will consider the incoming AC mains supply to be within limits. Should this value be exceeded the module will indicate a mains failure and function accordingly.</p> <p><b>Over Voltage Return -</b> This is the voltage that the incoming mains supply must return to before the 5520 / 5560 module will consider that the supply is back with in limits. (i.e. With an overvolts trip of 276.0V and an overvolts return of 253.0V, the mains voltage must return to 253.0V following an over voltage event to be considered within limits.)</p>
<p>Mains Under Frequency IEEE 37.2 -81 Frequency relay</p>	<p>These settings are used to configure the mains under frequency alarm: -</p> <p><b>Under Frequency Trip -</b> This is the minimum frequency that the 5520 / 5560 will consider the incoming AC mains supply to be within limits. Should the input fall below this value the module will indicate a mains failure and function accordingly.</p> <p><b>Under Frequency Return -</b> This is the frequency above the under frequency trip that the incoming mains supply must return to before the 5520 / 5560 module will consider that the supply is back with in limits. (i.e. With an underfrequency trip of 45.0Hz and an underfrequency return of 48.0Hz, the mains frequency must return to 48.0Hz following an under frequency event to be considered within limits.)</p>
<p>Mains Over Frequency IEEE 37.2 -81 Frequency relay</p>	<p>These settings are used to configure the mains Over frequency alarm: -</p> <p><b>Over Frequency Trip -</b> This is the maximum frequency that the 5520 / 5560 will consider the incoming AC mains supply to be within limits. Should this value be exceeded the module will indicate a mains failure and function accordingly.</p> <p><b>Over Frequency Return -</b> This is the frequency below the over frequency trip that the incoming mains supply must return to before the 5520 / 5560 module will consider that the supply is back with in limits. (i.e. With an overfrequency trip of 55.0Hz and a overfrequency return of 52.0Hz, the mains frequency must return to 52.0Hz following an over frequency event to be considered within limits.)</p>

### 5.8.2 CURRENT/POWER (5560/5520 ONLY)

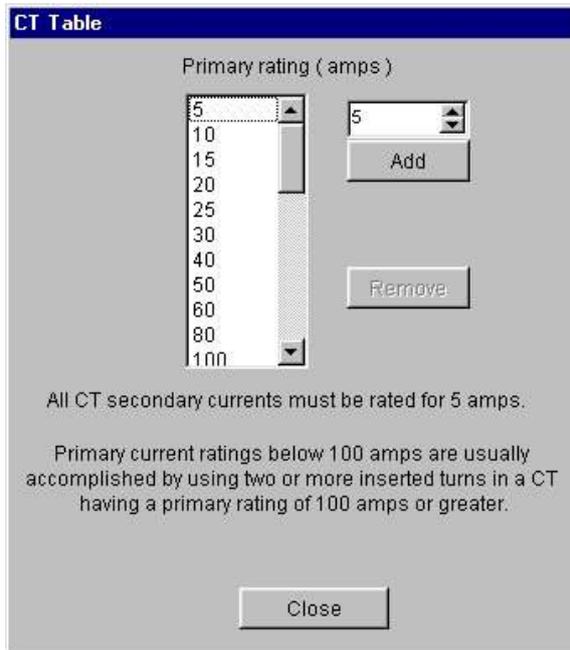


**NOTE: - Mains current/power is only available on the 5560 and 5520 modules**

Level	Function
Mains CT Enabled <i>5560 only</i>	Enables or disables the functions associated with Mains CT. If the mains CT is not fitted, this should not be enabled.
CT Primary (L1,2,3)	This setting is used to set the primary current rating of the three phase monitoring CT's. The secondary of the CT's should be rated at 5 amps. The CT primaries available are stored by the 5xxx for windows program in the form of a table. This table can be modified by the user, to limit or expand the range of CT ratios available. This could be used to ensure that standard stock CT's are always used regardless of the rating of the mains.
CT Secondary	These settings allow the Secondary CT's to be rated at 1 amp or 5 amps output.
Mains Full Load Rating	This setting is used to set the actual full load rating of the mains supply. This setting is used for power control, whilst running in parallel with the mains (utility) and soft transfer of load from bus to mains, and mains to bus. The range of this setting is 0 – 5,000 kW.
Mains Full kVAr Rating	The kVAr rating of the mains supply. If the kVAr rating was 75% of the kW rating the power factor would be 0.8
Export Power Limit Alarm <i>IEEE 37.2 -32 Directional power relay</i>	This setting is used to prevent reverse power of the mains. If mains reverse power exceeds this setting for the amount of time set by the Export power limit timer a reverse power trip will occur. <b>Actions</b> <b>Warning</b> ( <i>Alarm only, No shutdown</i> ) <b>Electrical Trip</b> ( <i>Alarm/off-load the bus followed by shutdown after cooling</i> )

Level	Function
Mains Stability <i>5520 only</i>	This setting is used to average the mains load reading to filter out short term changes in load. This average value is used when maintaining the mains level to a preconfigured value when peak lopping/peak shaving.
Insufficient Capacity <i>5520 only</i>	<p>If, when peak lopping/peak shaving the generating set capacity is not large enough to maintain the mains level to the preconfigured value, then the insufficient capacity timer is started.</p> <p>If the timer expires and insufficient capacity is still not available then the alarm action is taken (warning/electrical trip).</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Electrical Trip</b> (<i>Alarm/off-load the bus followed by shutdown after cooling</i>).</p>

**CT Table**

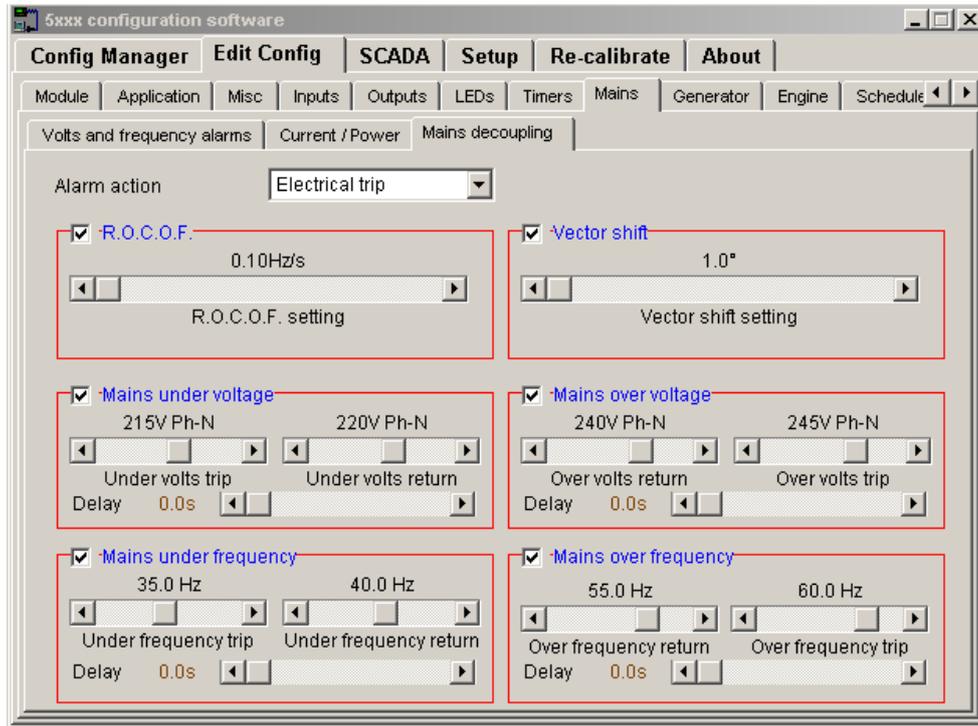


**CT Table Description**

The CT table is used to store a list of different primary rated CT's. This list would normally correspond to commercially available CT ratings, but may be modified by the user to increase or decrease the range of CT ratings.

This allows the list to be tailored to match a standard range of CT's held in stock by the user, ensuring that the switch gear is built from standard stock regardless of the actual ratings.

### 5.8.3 MAINS DECOUPLING



**NOTE:** - Mains decoupling is not available when 5510 module is only used for paralleling with multiple sets. Mains decoupling is only available when paralleling with the mains supply.

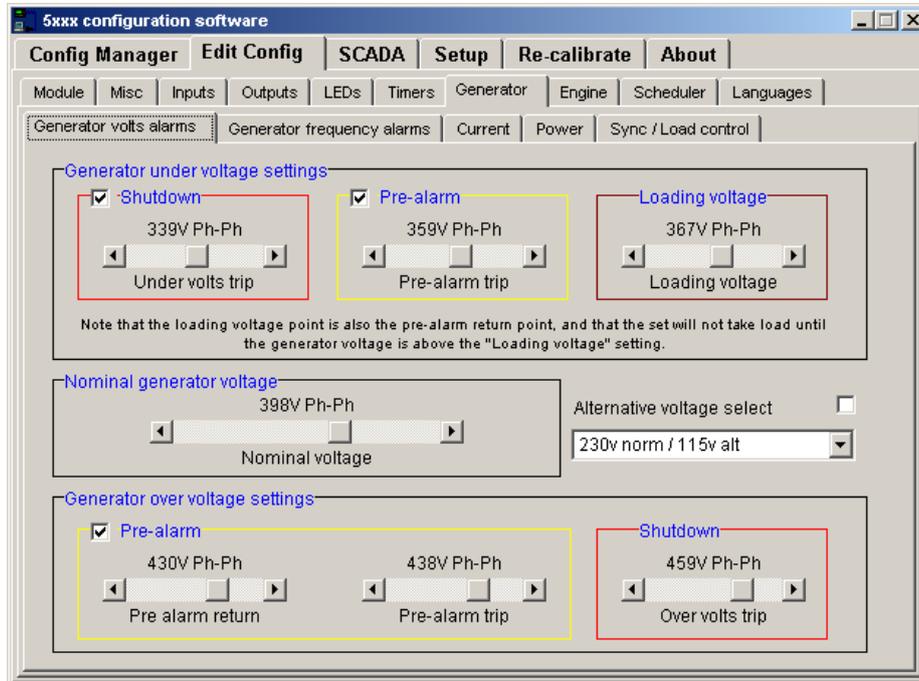
Level	Function
Alarm action	Used to select what happens when a Mains Decoupling trip is detected :  <b>Electrical Trip</b> – The generator load switch is opened and the set allowed to perform a cooling run before being stopped. <b>Auxiliary mains fail</b> – Opens the mains load switch and allows the generator to continue providing power to the load.
R.O.C.O.F. IEEE 37.2 - 81 Frequency relay	<input type="checkbox"/> : ROCOF protection is disabled <input checked="" type="checkbox"/> : ROCOF protection is enabled when the generator is in parallel with the mains supply.
Vector Shift	<input type="checkbox"/> : Vector Shift protection is disabled <input checked="" type="checkbox"/> : Vector Shift protection is enabled when the generator is in parallel with the mains supply.
Mains under voltage IEEE 37.2 - 27 under voltage relay Mains over voltage IEEE 37.2 - 59 Frequency relay Mains under frequency IEEE 37.2 - 81 Frequency relay Mains over frequency IEEE 37.2 - 81 Frequency relay	Used to enable and set the levels at which mains failure is detected when in parallel with the generator set. <b>Delay</b> : Provides a reaction time on the mains level alarms.

## 5.9 GENERATOR

This menu allows the generator configurable trip values to be edited to the users required levels. The following menu is displayed:

### 5.9.1 GENERATOR VOLTS ALARMS

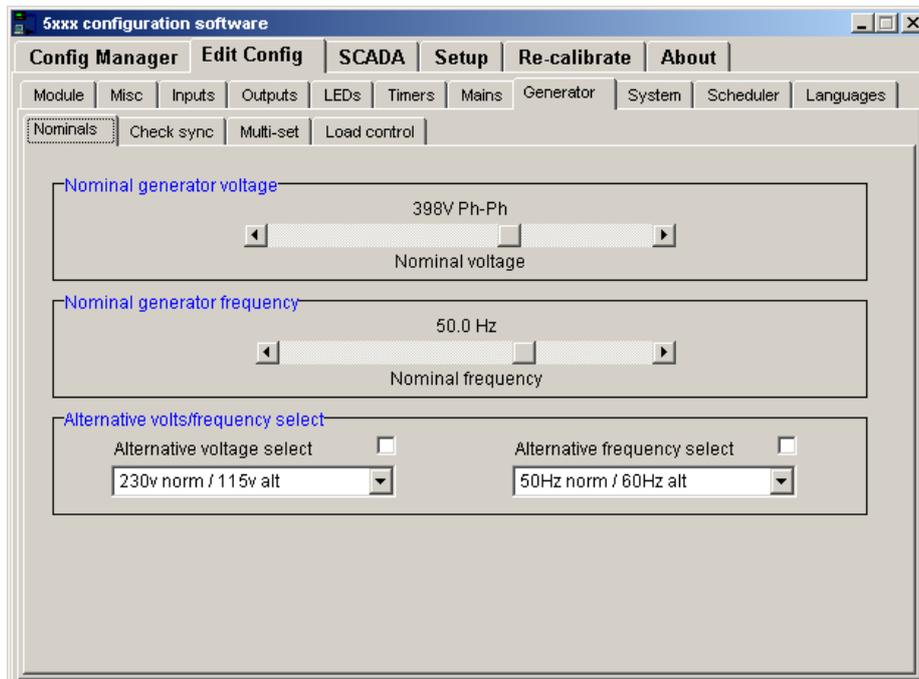
(Not applicable to 5560.)



5510/5520

### 5.9.2 GENERATOR NOMINALS

(5560 only)

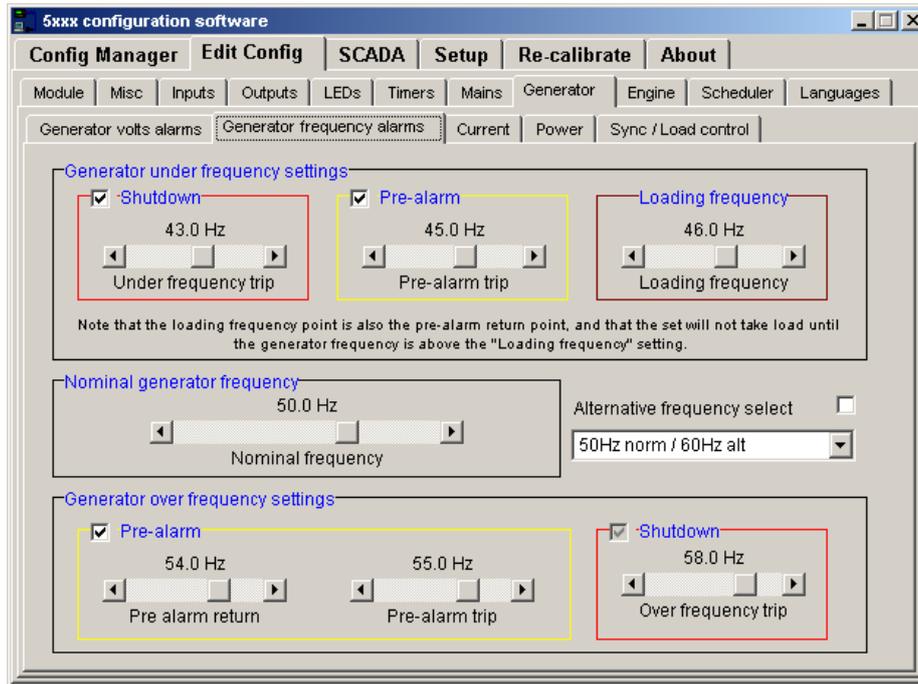


5560

Generator Volts Alarms	Function
<p>Generator Under voltage IEEE 37.2 - 27AC Undervoltage relay</p> <p>(Not applicable to 5560.)</p>	<p>These settings are used to configure the generator under voltage alarm: -</p> <p><b>Shutdown -</b>  <input type="checkbox"/> = Generator Under Volts will NOT give a Shutdown alarm  <input checked="" type="checkbox"/> = Generator Under Volts WILL give a shutdown alarm in the event of the generator output falling below the displayed '<i>under volts trip</i>' value. The '<i>under volts trip</i>' value can be adjusted to suit user requirements.</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Under Volts will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Under Volts WILL give a pre-alarm warning in the event of the generator output falling below the displayed '<i>under volts pre-alarm</i>' value. The '<i>under volts pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p><b>Loading Voltage -</b>                      This is the minimum voltage the generator must be operating at before the 55xx module will consider it available to take the load. It is also the voltage above the under voltage trip that the generator output must return to before the 55xx module will consider that the supply is back with in limits. (i.e. With an undervolts trip of 184.0V and an undervolts return of 207.0V, the output voltage must return to 207.0V following an under voltage event to be considered within limits.)</p>
<p>Generator Nominal voltage</p>	<p>This setting is used to configure the generator nominal voltage. This is also used if the 'Return to Nominal' function is selected when using automatic synchronising. The Voltage of a common bus is maintained at this figure when VAR sharing.</p>
<p>Generator Over voltage IEEE 37.2 - 59AC Overvoltage relay</p> <p>(Not applicable to 5560.)</p>	<p>These settings are used to configure the generator over voltage alarm: -</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Over Volts will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Over Volts WILL give a pre-alarm warning in the event of the generator output rising above the displayed '<i>over volts pre-alarm</i>' value. The '<i>over volts pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>The voltage must return to below the '<i>Over volts return</i>' setting before the 55xx module will consider that the supply is back with in limits. (i.e. With an overvolts trip of 276.0V and an overvolts return of 253.0V, the mains voltage must return to 253.0V following an over voltage event to be considered within limits.)</p> <p><b>Shutdown -</b>                      This is the setting at which a Generator Over Volts will give a shutdown alarm in the event of the generator output rising above the displayed '<i>over volts trip</i>' value. The '<i>over volts trip</i>' value can be adjusted to suit user requirements.  <input type="checkbox"/> = The generator will run at its normal voltage  <input checked="" type="checkbox"/> = The generator will run at its alternative voltage</p>
 <b>NOTE:- Only applies to CAN engines that support this function</b>	

### 5.9.3 GENERATOR FREQUENCY ALARMS

(Not applicable to 5560.)

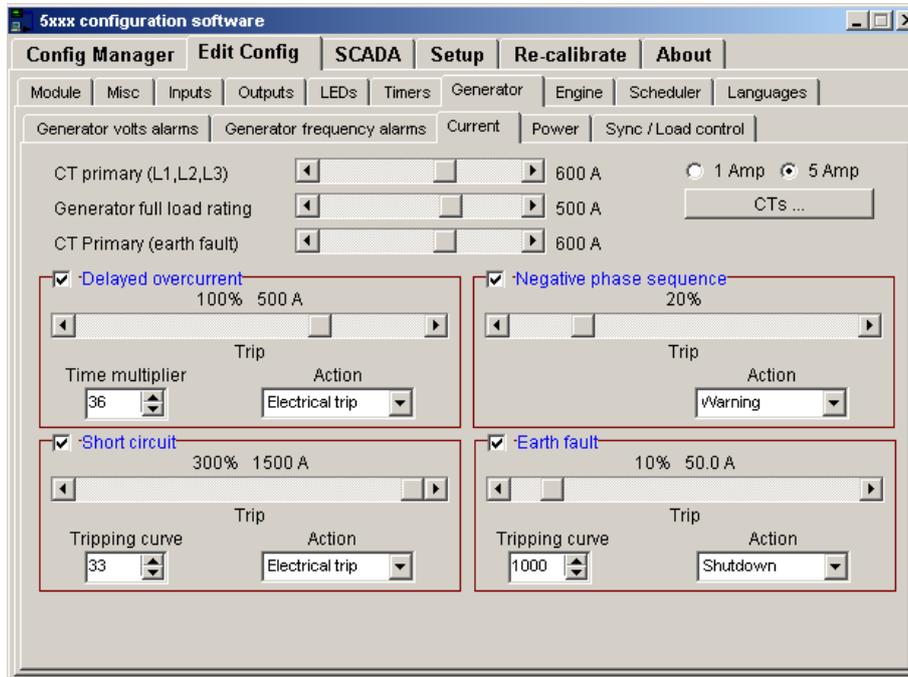


Generator Freq. Alarms	Function
<p><b>Generator Under frequency</b>                      IEEE 37.2 -81 Frequency relay                      (Not applicable to 5560.)</p>	<p>These settings are used to configure the generator under frequency alarm: -</p> <p><b>Shutdown -</b>  <input type="checkbox"/> = Generator Under Frequency will NOT give a Shutdown alarm  <input checked="" type="checkbox"/> = Generator Under Frequency WILL give a shutdown alarm in the event of the generator output falling below the displayed '<i>under frequency trip</i>' value. The '<i>under frequency trip</i>' value can be adjusted to suit user requirements.</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Under frequency will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Under frequency WILL give a pre-alarm warning in the event of the generator output falling below the displayed '<i>under frequency pre-alarm</i>' value. The '<i>under frequency pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p><b>Loading Frequency -</b>                      This is the minimum frequency the generator must be operating at before the 55xx module will consider it available to take the load. It is also the frequency above the under frequency trip that the generator output must return to before the 55xx module will consider that the supply is back with in limits. (i.e. With a UF trip of 45.0Hz and a UF return of 48.0Hz, the mains frequency must return to 48.0Hz following an under frequency event to be considered within limits.)</p>

Generator Freq. Alarms	Function
<p>Generator Nominal Frequency</p>	<p>This setting is used to configure the generator nominal frequency. This is also used if the 'Return to Nominal' function is selected when using automatic synchronising. The frequency of a common bus is maintained at this figure when load sharing.</p>
<p>Generator Over frequency IEEE 37.2 -81 Frequency relay  (Not applicable to 5560.)</p>	<p>These settings are used to configure the generator over frequency alarm:</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Over frequency will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Over frequency WILL give a pre-alarm warning in the event of the generator output rising above the displayed '<i>over frequency pre-alarm</i>' value. The '<i>over frequency pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>The frequency must return to below the '<i>Over frequency return</i>' setting before the 55xx module will consider that the supply is back within limits. (i.e. With a OF trip of 55.0Hz and a OF return of 52.0Hz, the mains frequency must return to 52.0Hz following an over frequency event to be considered within limits.)</p> <p><b>Shutdown -</b>  <input type="checkbox"/> = Generator Over Frequency will NOT give a Shutdown alarm  <input checked="" type="checkbox"/> = Generator Over Frequency WILL give a shutdown alarm in the event of the generator output rising above the displayed '<i>over frequency trip</i>' value. The '<i>over frequency trip</i>' value can be adjusted to suit user requirements.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>⚠ NOTE:- If Generating output frequency is selected as the only source of speed sensing (i.e. no Mag-pickup fitted), then the generator over frequency trip can not be disabled as it provides an overspeed protection function. If a Mag-pickup is fitted and selected as the speed sensing source it is possible to disable the over frequency trip if required.</b></p> </div>
<p>Alternative Frequency Select CAN Only</p>	<p><input type="checkbox"/> = The generator will run at its normal speed  <input checked="" type="checkbox"/> = The generator will run at its alternative frequency</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>⚠ NOTE:- Only applies to CAN engines that support this function</b></p> </div>

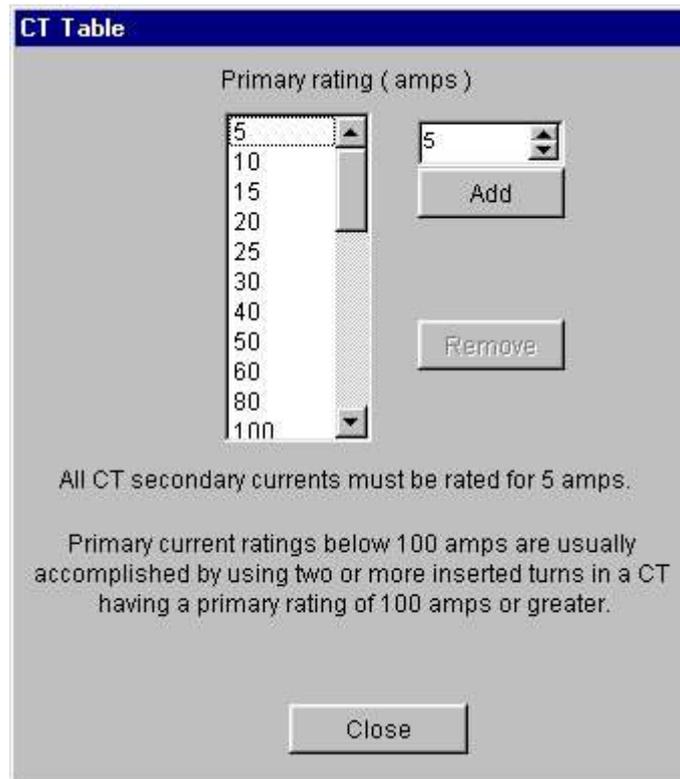
### 5.9.4 CURRENT

(Not applicable to 5560)



Generator Current Transformer Settings	Function
CT Primary (L1,2,3) – (Not applicable to 5560.)	This setting is used to set the primary current rating of the three phase monitoring CT's. The CT ratios available are stored by the 5xxx for windows program in the form of a table. This table can be modified by the user to limit or expand the range of CT ratios available. This could be used to ensure that standard stock CT's are always used regardless of the rating of the generating set (within the rules stated below for Generator full load current).
1 Amp or 5 Amp CT Secondary (Not applicable to 5560.)	These settings allow the Secondary CT's to be rated at 1 amp or 5 amps output.
Generator Full Load Rating – (Not applicable to 5560.)	This setting is used to set the actual full load current the generator is rated to give. This setting is used to give over-current protection and may be adjusted to 'de-rate' the generator, for example, for temperature or altitude. This setting must be within the range of 50% - 100% of the actual CT primary ratio fitted to the generating set.
CT Primary (Earth Fault) (Not applicable to 5560.)	This setting is used to set the primary current rating of the neutral phase monitoring CT. This is the CT associated with monitoring of Earth Faults and therefore the monitored current will be substantially smaller than the main phase CT's allowing a lower rated CT to be used. The secondary of the CT should be rated at 5 amps output.

CT Table



CT Table Description

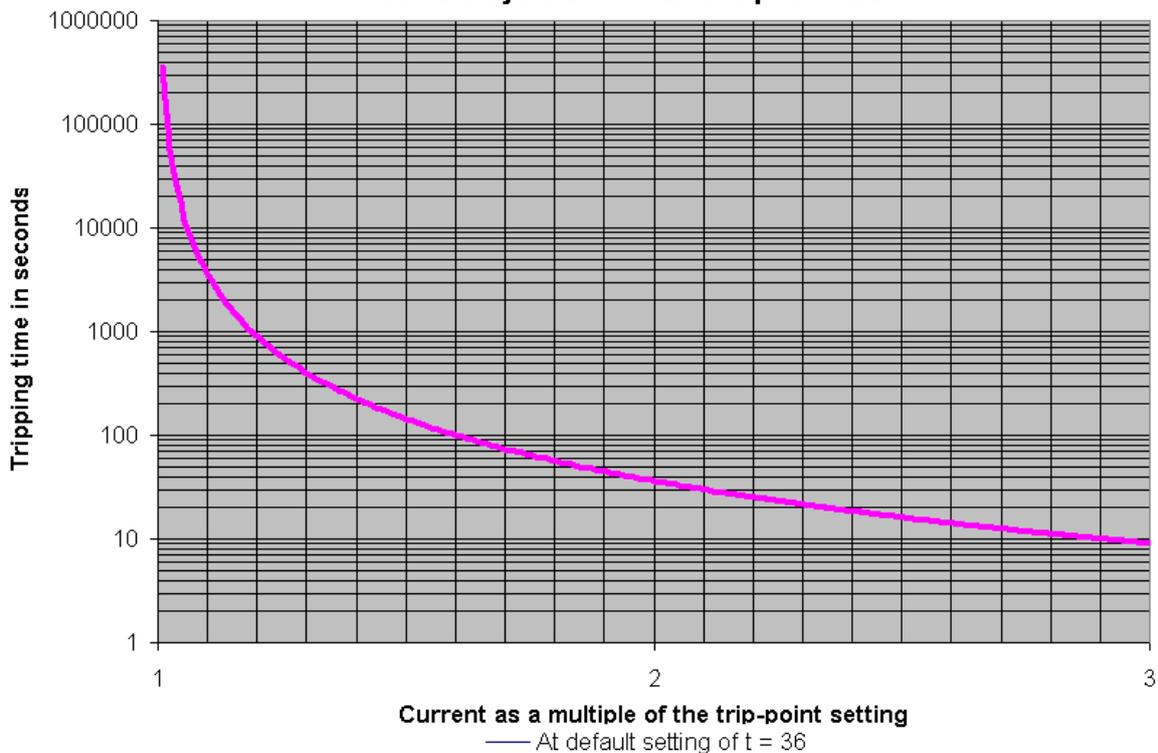
The CT table is used to store a list of different primary rated CT's. This list would normally correspond to commercially available CT ratings, but may be modified by the user to increase or decrease the range of CT ratings.

This allows the list to be tailored to match a standard range of CT's held in stock by the user, ensuring that the Generating set is built from standard stock regardless of the actual rating (see note for generator full load rating)

**NOTE:** - Adjustments to the Generator Current Transformer settings may cause some of the Current/Power alarms to flash red. This is to draw attention to the fact that adjusting one or more of the Generator Current transformer settings has affected the actual trip level of that particular alarm. Please ensure that the actual trip values are correct before sending the configuration to the module.

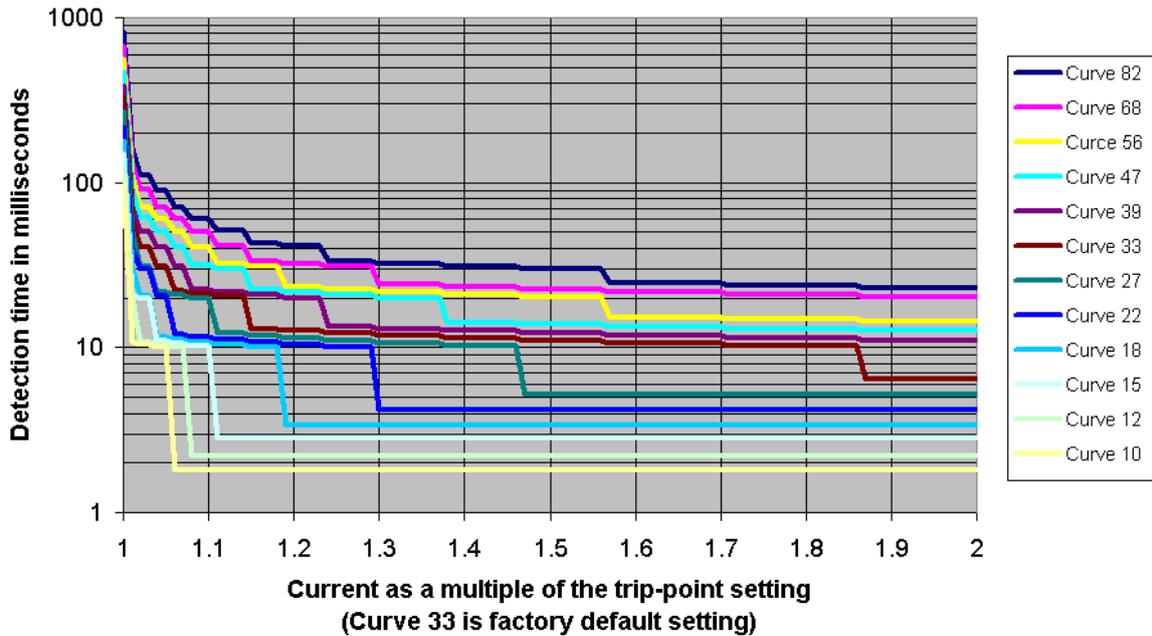
Generator Current Alarms	Function
<p><b>Delay Over current</b>                      IEEE 37.2 -51 AC time overcurrent relay (shutdown / electrical trip)                      IEEE 37.2 -81 frequency relay (warning)                      (Not applicable to 5560.)</p>	<p>This setting is used to configure the generator over current alarm:</p> <p><input type="checkbox"/> = Generator over current will NOT give an electrical trip alarm.  <input checked="" type="checkbox"/> = Generator over current WILL give an electrical trip alarm in the event of the load current exceeding the displayed 'over current trip' values. The 'over current trip' values can be adjusted to suit user requirements as detailed below.</p> <p>The following configurable settings are provided:                      Delayed over current setting (<math>I_T/I</math>) (range 0.80 to 1.20 in steps of 0.01) (default 1.00)                      Time multiplier (t) (range 1 to 36 in steps of 1) (default 36)</p> <p>Where: <math>I_T</math> is the delayed over-current trip point  <math>I</math> is the Generator full load current rating</p> <p>The delayed over-current tripping time is given by the formula: <math>T = t / ((I_a/I_T)-1)^2</math>                      Where: <math>T</math> is the tripping time in seconds  <math>I_a</math> is the actual current of the most highly loaded line (L1 or L2 or L3)  <math>I_T</math> is the delayed over-current trip point  <math>t</math> is the time multiplier setting and also represents the tripping time in seconds at twice full load                      when <math>I_a/I_T = 2</math></p> <p>If <math>I_a</math> exceeds <math>I_T</math>, then the Delayed Over Current warning will occur immediately and the protection will trip after T seconds.</p> <p>This curve matches the thermal damage curve of a typical brush-less alternator but it can be modified if necessary by changing the configurable settings.</p> <p><b>Actions</b>  <b>Warning</b> (Alarm only, No shutdown)  <b>Shutdown</b> (Alarm and shutdown)  <b>Electrical Trip</b> (Alarm/off-load generator followed by shutdown after cooling)</p>

**55x Delayed over-current protection**



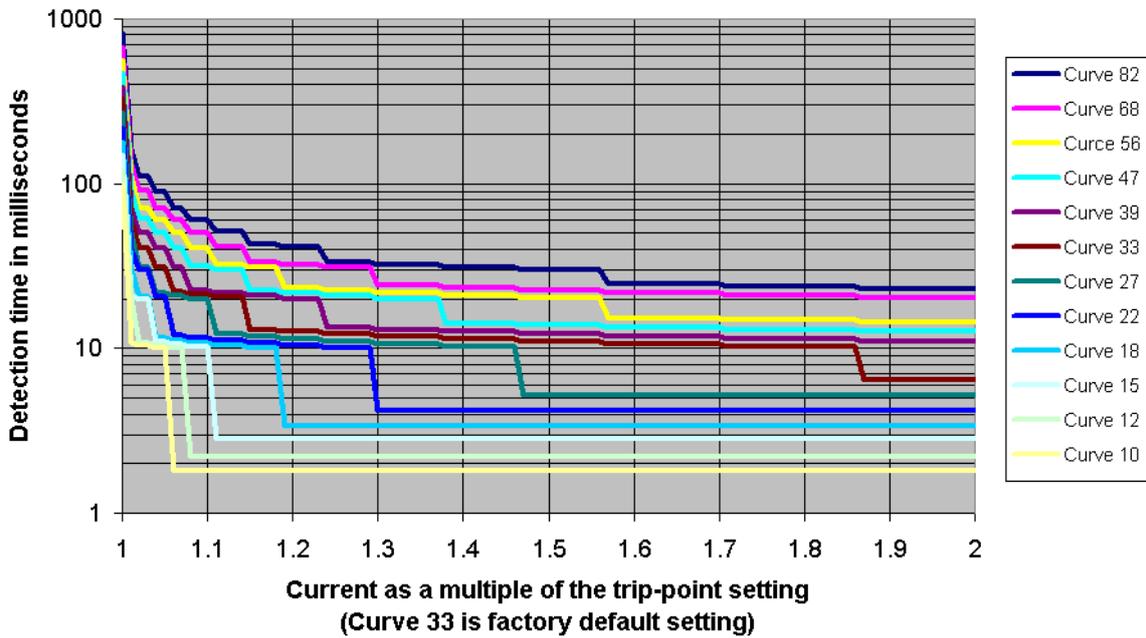
Generator Current Alarms	Function
<p><b>Short Circuit</b>                      IEEE 37.2 -50 Instantaneous overcurrent relay (warning)                      (Not applicable to 5560.)</p>	<p>This settings is used to configure the generator short circuit alarm: -  <input type="checkbox"/> = Generator short circuit will NOT give an electrical trip alarm.  <input checked="" type="checkbox"/> = Generator short circuit WILL give an electrical trip alarm in the event of the load current exceeding the displayed 'short circuit trip' values. The 'short circuit trip' values can be adjusted to suit user requirements as detailed below.                      The following configurable settings are provided:                          Short circuit current setting (IT/I) (range 1.0 to 3.0 in steps of 0.1) (default 3.0)                          Short circuit tripping curve (1 to 8200 in steps of 1) (default 33)                      Where: IT is the short circuit current trip point                      I is the Generator full load current rating</p> <p><b>Actions</b>  <b>Warning</b> (Alarm only, No shutdown)  <b>Shutdown</b> (Alarm and shutdown)  <b>Electrical Trip</b> (Alarm/off-load generator followed by shutdown after cooling)</p>

Model 55x Short circuit & Earth fault curves for a Single phase fault @ 50 Hz



Generator Current Alarms	Function
<p>Negative Phase Sequence</p> <p>IEEE 37.2 -46 Phase balance current relay</p> <p>(Not applicable to 5560.)</p>	<p>This setting is used to configure the generator negative phase sequence (unbalanced load current) alarm.</p> <p><input type="checkbox"/> = Negative phase sequence will NOT give an alarm.  <input checked="" type="checkbox"/> = Negative phase sequence WILL give an alarm in the event of the load being unbalanced by the amount set.</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Shutdown</b> (<i>Alarm and shutdown</i>)  <b>Electrical Trip</b> (<i>Alarm/off-load generator followed by shutdown after cooling</i>)</p>
<p>Earth Fault</p> <p>(Not applicable to 5560.)</p>	<p>This setting is used to configure the generator earth fault alarm: -</p> <p><input type="checkbox"/> = Generator Earth Fault will NOT give an electrical trip alarm.  <input checked="" type="checkbox"/> = Generator Earth Fault WILL give an electrical trip alarm in the event of the load current exceeding the displayed 'earth fault trip' values. The 'earth fault trip' values can be adjusted to suit user requirements.</p> <p>The following configurable settings are provided:  Earth fault current setting (IT/I) (range 0.01 to 1.00 in steps of 0.01) (default 0.10)  Earth fault tripping curve (1 to 8200 in steps of 1) (default 1000)</p> <p>Where: IT is the earth fault current trip point  I is the Generator full load current rating</p> <p>The earth fault current setting assumes that the CT ratio for earth current is the same as that for the main line current and for the normal arrangement of one neutral CT and a CT for each line this will be the case. But if a dedicated CT is used for earth current detection then this may have a different ratio to those used for the main lines. This is a means of increasing the sensitivity of the earth fault protection since the earth fault current setting will be multiplied by the ratio of the two CT primary currents.</p> <p>As an example let us assume that:</p> <ol style="list-style-type: none"> <li>(1) The earth CT has a ratio of 100/5. This would have to be a dedicated CT either on the cable that connects the neutral conductor to the station earth (unrestricted protection) or it could be a core-balance CT fitted over the neutral and line conductors (restricted protection)</li> <li>(2) The main line CT(s) have a ratio of 1000/5.</li> <li>(3) The above earth fault current setting is 0.01 pu</li> <li>(4) The generator full load rating is 900 amps</li> </ol> <p>Then if all the CT ratios had been the same, the earth fault current trip-point would have been <math>900 \times 0.01 = 9.0</math> amps. However, in the case of this example it would be <math>900 \times 0.01 \times 100 / 1000 = 0.9</math> amps.</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Shutdown</b> (<i>Alarm and shutdown</i>)  <b>Electrical Trip</b> (<i>Alarm/off-load generator followed by shutdown after cooling</i>)</p>

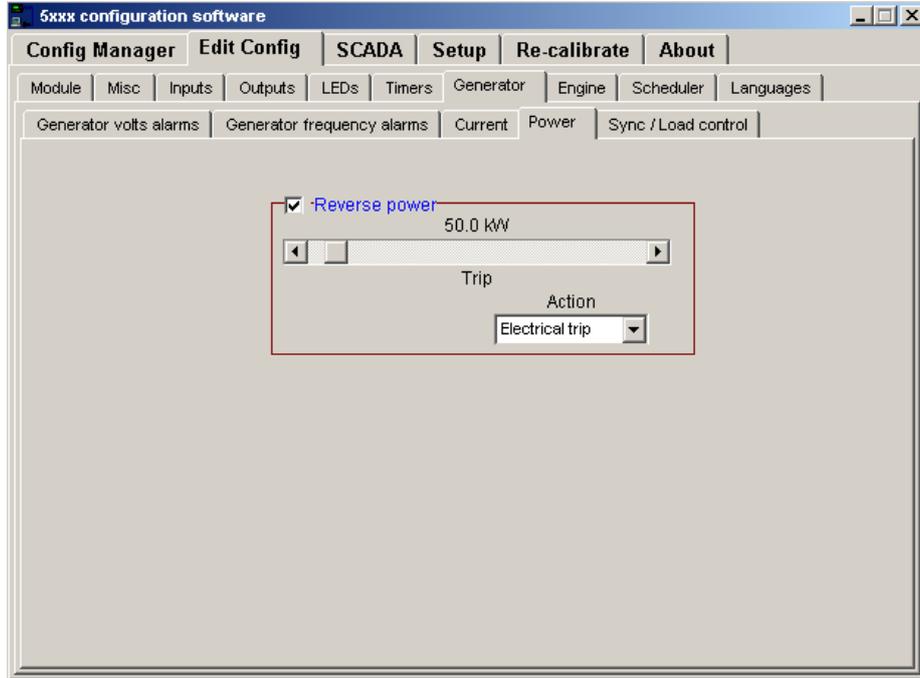
**Model 55x Short circuit & Earth fault curves for a Single phase fault @ 50 Hz**



Generator Current Alarms	Function
Droop Enable (Not applicable to 5560.)	<input type="checkbox"/> = A compatible CAN engine will run in isochronous. <input checked="" type="checkbox"/> = A compatible CAN engine will run in Droop and the percentage droop can be adjusted.

## 5.9.5 POWER

(Not applicable to 5560)



Generator Power Alarm	Function
<p>Reverse Power IEEE 37.2 -32 Directional power relay  (Not applicable to 5560.)</p>	<p>This setting is used to configure the generator reverse power alarm: -  <input type="checkbox"/> = Generator reverse power will NOT give an electrical trip alarm.  <input checked="" type="checkbox"/> = Generator reverse power WILL give an electrical trip alarm in the event of the reverse power exceeding the displayed 'reverse power trip' values. The 'reverse power trip' values can be adjusted to suit user requirements.</p> <p><b>Actions</b>  <b>Warning</b> (Alarm only, No shutdown)  <b>Shutdown</b> (Alarm and shutdown)  <b>Electrical Trip</b> (Alarm/off-load generator followed by shutdown after cooling)</p>

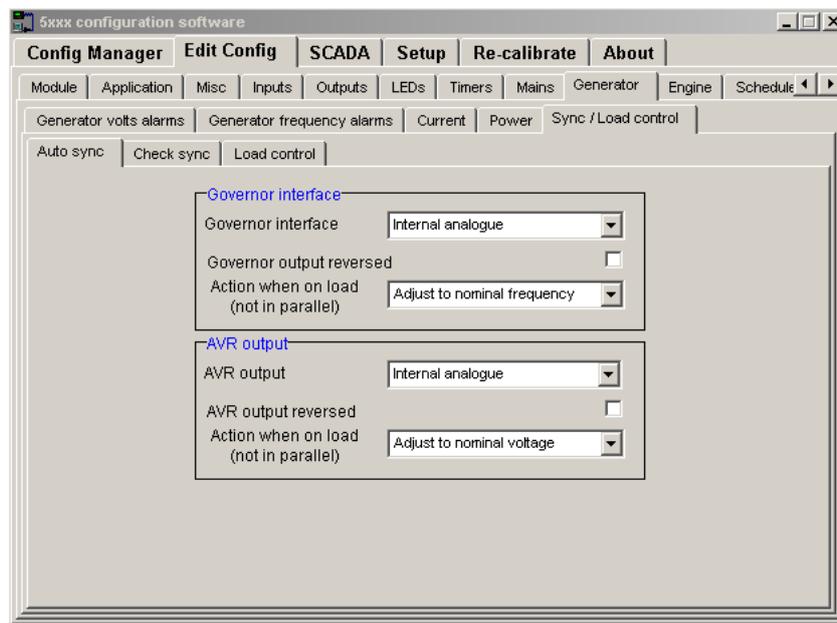
## 5.9.6 SYNC / LOAD CONTROL

This section details the configuration of the module for synchronising and load sharing. For connection details and assistance in the design of such a system, you are referred to the following DSE publications :

- 057-004 CAN and DSE wiring (when using CAN option with compatible engine ECU).
- 057-045 Guide to Synchronising and Load Sharing Part 1.
- 057-046 Guide to Synchronising and Load Sharing Part 2.
- 057-047 Load Share Design and Commissioning.

### AUTO SYNC

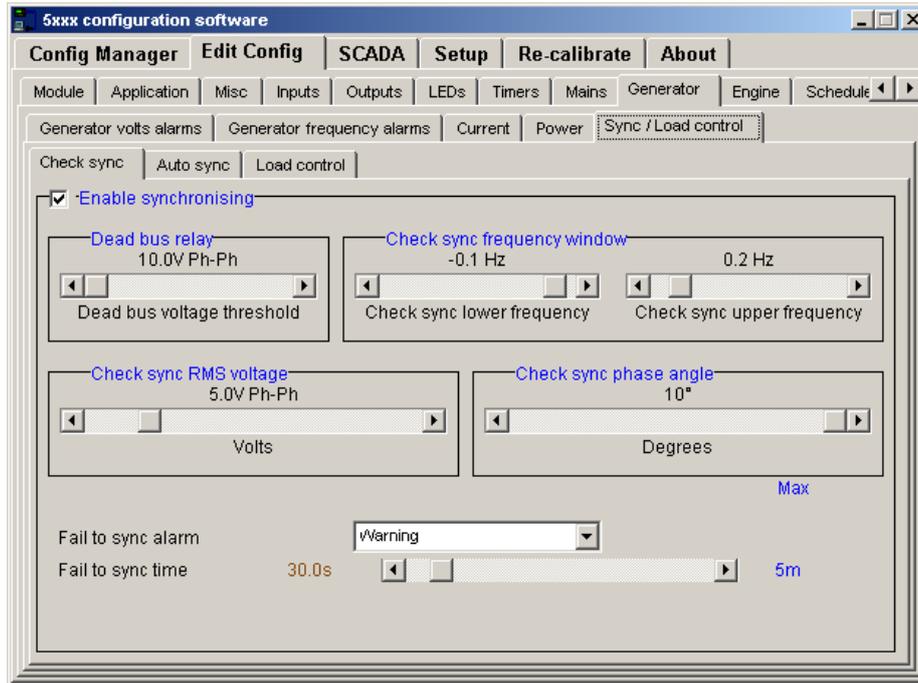
(Not applicable to 5560.)



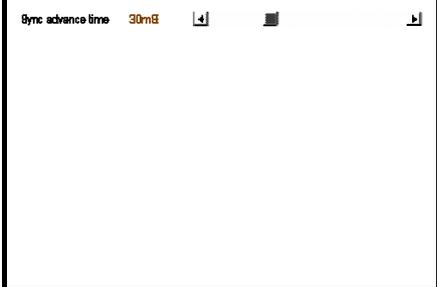
Generator Auto Synchronising Settings	Function
<p><b>Interface Options</b></p> <p>(Not applicable to 5560.)</p>	<p>These settings are used to configure the auto synchronising mode of interfacing to the engine governor and AVR.</p> <p>For details of connections and interface options with governors and AVRs, please refer to the sections headed <i>Interfacing to Governors</i> and <i>Interfacing to AVRs</i></p>
<p><b>Governor interface</b> <input type="text" value="Internal relays"/></p> <p>IEEE 37.2 -90 Regulating device</p> <p>(Not applicable to 5560.)</p>	<p><b>Internal Relays</b> –The governor or motorised potentiometer is controlled by the 55xx modules’ own internal relays.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE: - It will be necessary to configure two of the module relays to provide the required ‘Speed raise’ and ‘Speed Lower’ signals.</b></p> </div> <p><b>Internal Analogue module</b> – This is used to provide a DC voltage output to interface with many engine speed governors remote speed adjust or load sharing controller inputs. For further information regarding this interface, refer to the ‘Re-calibrate’ section.</p>
<p>AVR interface <input type="text" value="Internal Analogue"/></p> <p>IEEE 37.2 -90 Regulating device</p> <p>(Not applicable to 5560.)</p>	<p><b>None</b> – No external interface is fitted between 55xx controller and the AVR and no control over voltage matching or VAr sharing will be made.</p> <p><b>Internal Relays</b> – The AVR or motorised potentiometer is controlled by the 55xx modules own internal relays.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE: - It will be necessary to configure two of the module relays to provide the required ‘Voltage raise’ and ‘Voltage Lower’ signals.</b></p> </div> <p><b>Internal Analogue module</b> - This external interface is used to provide a DC voltage output to interface with many AVRs remote voltage adjust or load sharing controller inputs. For further information regarding this interface, refer to the ‘Re-calibrate’ section</p>
<p><b>Governor output reversed</b> <input type="checkbox"/></p> <p><b>AVR output reversed</b> <input type="checkbox"/></p> <p>(Not applicable to 5560.)</p>	<p><b>Only available in conjunction with internal analogue selected</b></p> <p>This allows the module to interface with a greater diversity of AVRs and governors.</p> <p><input type="checkbox"/> = Lower voltage equates to lower speed / voltage.</p> <p><input checked="" type="checkbox"/> = Lower voltage equates to higher speed / voltage.</p>

Generator Auto Synchronising Settings	Function
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">                     Action when on load (not in parallel) <span style="float: right;">Adjust to nominal frequency ▾</span> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">                     Action when on load (not in parallel) <span style="float: right;">Adjust to nominal voltage ▾</span> </div> <p style="color: #e67e22;">IEEE 37.2 -90 Regulating device</p> <p style="color: #3498db;">(Not applicable to 5560.)</p>	<p><b>This option determines the action that will be taken by the 55xx synchroniser during the period that the set is running on load.</b></p> <p><b>Disabled</b> – No reset will take place; the speed and voltage will remain at current levels.</p> <p><b>Reset to Datum</b> – Whenever generators are required to run in parallel, then active load sharing is recommended. However, this may not be essential when the accuracy of the load sharing is not critical and is only required for short periods. In this case ‘droop’ governors must be used in conjunction with the ‘synchronising reset option – reset to datum on load’ feature. This works on the principal that the governed frequency of each generator for any given load will be the same when at its datum setting. This approach is generally unsuitable for mains connected systems but will provide rudimentary load sharing between two or more generators.</p> <p><b>Adjust to Nominal (5510/5520 load share only)</b> – When on load as a single set (but not in parallel) the 5510 load sharing module will effect changes to the governor and/or AVR to keep the system voltage and frequency at nominal levels. These levels are user adjustable on the ‘generator’ tab accessible via 5xxx for Windows™ configuration software.</p> <p>This is used to ensure the nominal voltage/frequency of the system is maintained even if droop is configured.</p> <p>When in parallel with other sets, the 5510 load share controller will automatically keep the system voltage and frequency at nominal levels regardless of the selection of this parameter.</p>

**CHECK SYNC**



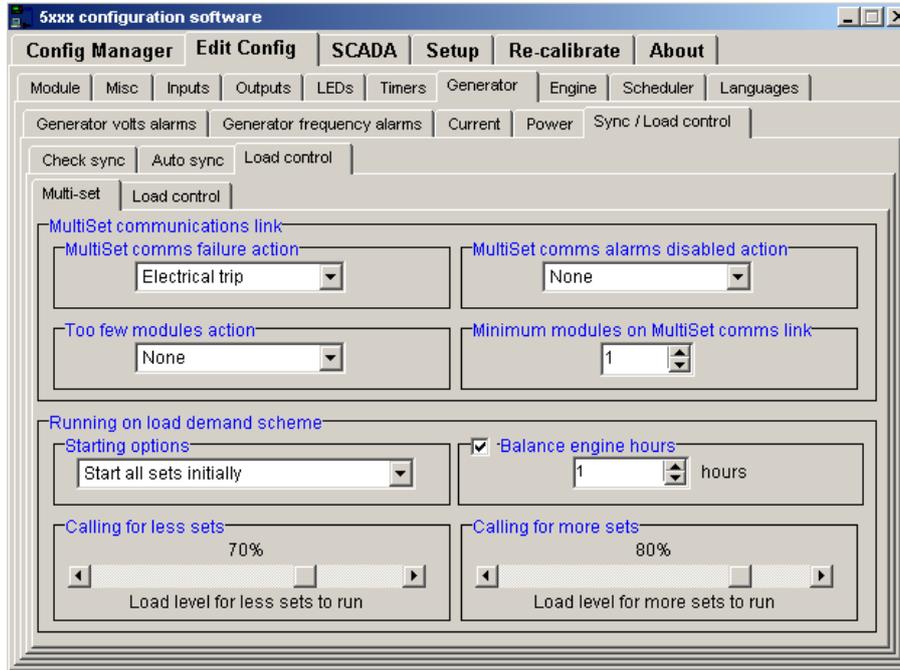
Generator Check Synchronising Settings	Function
<p><input checked="" type="checkbox"/> <b>Enable synchronising</b></p>	<p>This setting is used to configure the synchronising mode: -  <input type="checkbox"/> = The module will not synchronise when operating the generator (or mains) contactors.  <input checked="" type="checkbox"/> = The module will not operate the generator (or mains) contactors until both supplies (generator and Bus/or mains) are synchronised. This function will also show or hide the Synchroscope display on the module LCD.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>⚠ CAUTION! Synchronising must not be disabled in a system which is not fitted with load-switching device interlocks.</b></p> </div>
<p><b>Dead bus relay</b> 10V</p> <p>Dead bus voltage threshold</p>	<p>This setting is used to set the voltage at which the 55xx controller's dead bus relay will operate. When the bus voltage is above this setting, the controller will synchronise with the bus before closing its load-switching device.</p>
<p>0.0 Hz</p> <p>Check sync lower frequency</p>	<p>This setting is used to set the maximum frequency the generator is allowed to be slower than the bus for synchronising to take place. Only when the frequency is greater than this setting will the module try to close the contactors.                      If the setting is set to 0.0Hz then the generator will only be allowed onto the bus when coming in faster than the bus frequency. This can be used to ensure that the set will take load when closed in parallel with the bus, and will not cause a reverse power alarm generated by the bus "driving" the set.</p>
<p>0.2 Hz</p> <p>Check sync upper frequency</p>	<p>This setting is used to set the maximum frequency the generator is allowed to be faster than the bus for synchronising to take place. Only when the frequency difference is less than this setting will the module try to close the contactors.</p>
<p>Check sync RMS voltage</p> <p>5.0V PT-N</p> <p>Volts</p>	<p>This setting is used to set the maximum voltage difference allowed between the generator and the bus/mains supply. Only when the voltage difference is less than this setting will the module try to close the contactors.</p>
<p>Check sync phase angle</p> <p>10°</p> <p>Degrees</p> <p>IEEE 37.2 -78 phase-angle measuring relay</p>	<p>This setting is used to set the maximum phase angle difference allowed between the generator and the bus/mains supply. Only when the phase angle difference is less than this setting will the module try to close the contactors.</p>

Generator Auto Synchronising Settings	Function
<p><b>Sync Advance Time</b> Not available in version 7.0+</p> 	<p>This setting is used to determine how much the module will 'forward forecast' the event of synchronization. The module will use the advance time to predict when the generator and bus/mains supply will be synchronised and issue the close command in advance. This allows the module to ensure that the closing delays in the contactors or breakers are minimised.</p> <p>This value should be set to the typical closing time of the load-switching device in use.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE:- This should be set 0mS (zero mS) in applications with a 'fast changing' load.</b></p> </div>
<p><b>Fail to sync time</b> IEEE 37.2 -48 Incomplete sequence relay (Electrical trip)</p> 	<p>This setting is used to determine how long the module will allow for the generator and bus/mains supplies to synchronise. If this timer expires and the generator and bus/mains have not synchronised then a 'Fail to Sync' action will be issued.</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Electrical Trip</b> (<i>Alarm/off-load generator followed by shutdown after cooling</i>)</p>

**LOAD CONTROL**

**MULTI-SET**

The multi-set settings page is used to configure the automatic starting and stopping of generators based upon load level demands.

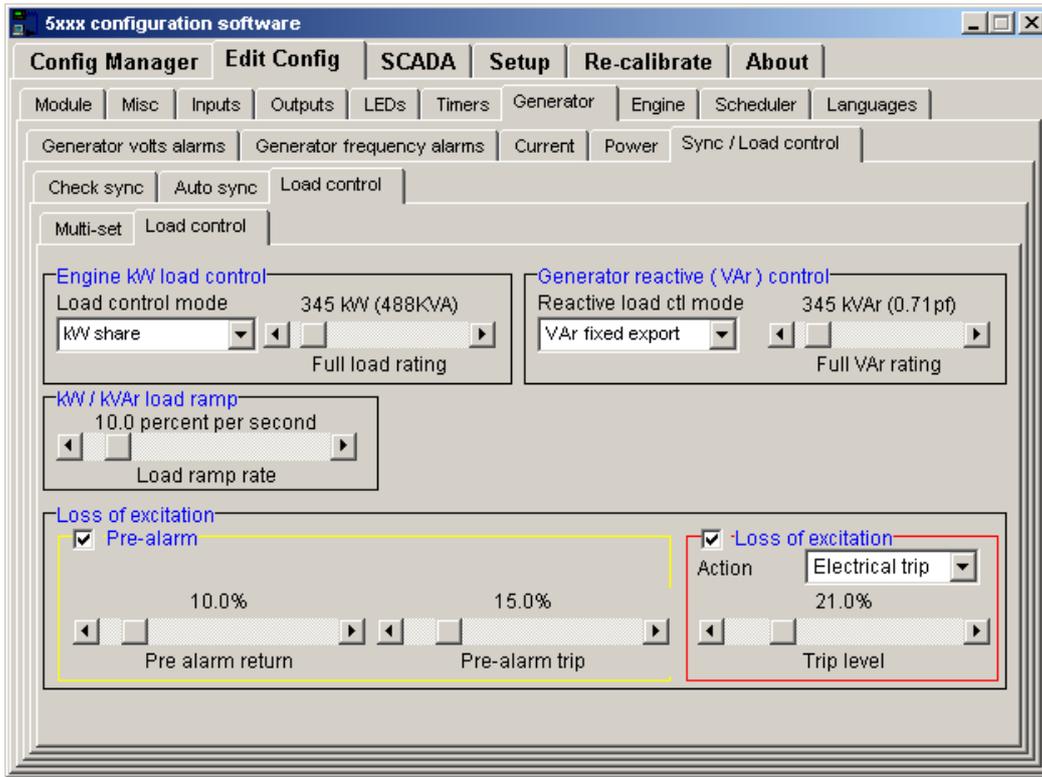


Running on load demand	Description
	<p>This system is enabled by activating digital inputs on the controllers that have been configured to <i>Remote Start on load demand</i>. Every controller in the multiset system must have a digital input configured and connected in this way. This enables generating set(s) to be taken out of service for maintenance, while still allowing the remainder of the system to operate.</p> <p>Upon activation of the <i>Remote Start on load demand</i> input, all the sets in the system will start up. The first one to become available will close onto the dead bus, communicating with the other sets to instruct them to synchronise onto the now live bus, before closing the load switch in parallel with it.</p> <p>If too much generating set capacity is available to supply the current load, the sets that are not required will begin their stop delay timers, after which they will drop off the bus and stop.</p> <p>Occasionally while one or more sets are already available in 'running on load demand' mode, it may be required to make all generating capacity in the system available to provide power to the load. For instance, this may be necessary prior to switching in a large load that the currently available generating sets may not be able to supply. To provide this function, a digital input on each controller in the system must be configured to <i>Remote start on load</i>. Activating this input will cause each controller to start its generating set, synchronise with the bus and close its supply in parallel with it.</p> <p>The sets will continue to provide power until removal of the <i>Remote start on load</i> input, when, providing the <i>Remote start on load Demand</i> input is present, the system will drop sets off the bus depending upon the total load levels.</p>

Multi-set settings	Function
Multiset comms failure action	<p>The action that will be taken if one or more modules 'drop off' the multiset communications link.</p> <p><b>Warning:</b> An alarm condition will be given, but the sets will still be able to run and take load.</p> <p><b>Electrical trip:</b> An alarm condition will be given; the set will be removed from the bus and shutdown after the cooling timer.</p>
Too few modules action	<p>The action that will be taken if the number of modules communication on the MSC link is less than the "minimum modules on Multiset comms link" setting.</p> <p><b>None:</b> Too few modules on the MSC link will not generate an alarm condition.</p> <p><b>Warning:</b> An alarm condition will be given, but the sets will still be able to run and take load.</p> <p><b>Electrical trip:</b> An alarm condition will be given; the set will be removed from the bus and shutdown after the cooling timer.</p>
Multiset comms alarms disabled action	<p>The action that will be taken if the Multiset comms alarms are disabled via configurable input or external communications control.</p> <p><b>None:</b> Disabling the MSC link alarms will not generate an alarm condition.</p> <p><b>Indication:</b> Disabling the MSC link alarms will generate an 'indication', but no alarm condition is generated.</p> <p><b>Warning:</b> An alarm condition will be given to remind the user/operator that the MSC alarms have been disabled.</p>
Minimum number of Modules action	<p>The minimum number of modules allowed on the MSC link before an alarm is generated. The type of alarm can be configured using "Too few modules action" detailed above.</p>
Starting options	<p>Used to configure how the load demand scheme will operate upon startup.</p> <p><b>Start all sets initially:</b> Upon activation of the load demand scheme, all sets in the system will start up and parallel onto the generator bus. Then they will stop / start according to load demands. This option is particularly recommended in multiset mains standby applications where the load is likely to be greater than the capacity of a single set.</p> <p><b>Start sets as load requires:</b> Upon activation of the load demand scheme, only one set will start initially. Other sets in the system will only be started according to demand. This option is recommended for mutual standby systems where the load is likely to be less than the capacity of a single set.</p>
Balance engine hours	<p>Used in a multiset system so that the engine's priority changes according to the amount of useage of the set.</p> <p>For instance in a two set system.</p> <p>Set 1 has logged 100 running hours Set 2 has logged 20 running hours Balance engine hours is configured to 75 hours.</p> <p>As Set 2 has logged 80 hours less than Set 1. As this is greater than the configured 75 hours, Set 2 will be the highest priority set.</p> <p>If all sets are within the configured Balance Engine Hours value, then the set Priority Number (See Recal page) is followed.</p>

Multi-set settings	Function
<p>Load level for more sets to run</p> <p>(Not applicable to 5560.)</p>	<p><b>Load level for more sets to run:</b> The load level at which the 5510 controller decides that additional generating set capacity is required to supply power to the load.</p> <p>Once this load level is exceeded, the next highest priority set in the sequence (determined using the Genset Run Priority) will begin its start delay timer. Once this has expired, the set will run up, synchronise and take load. Should the set fail to become available, it will communicate this using the MultiSet Communications Link which will signal the next generating set in the sequence to take its place.</p> <p>The starting sequence will be terminated should the load level drop below the <i>Load level for more sets to run</i> while the start delay timer is in progress. This allows for short term increases in load.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - It is recommended that each set in the system has the same value configured for this parameter.</p> </div>
<p>Load level for less sets to run</p> <p>(Not applicable to 5560.)</p>	<p><b>Load level for less sets to run:</b> The load level at which the 5510 controller decides that generating set capacity can be reduced by dropping sets off the bus.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - The module will calculate the load levels left on the remaining sets if it should remove a set. This prevents the system from reaching a point where the load is such that one sets starts and stops repeatedly. As a result, the system will not take action when the % on each generator is slightly below the setting for less sets, but instead the level will need to fall much lower until the excess set is call to stop.</p> </div> <p>Once the load is below this level, the lowest priority set in the sequence (determined using the Genset Run Priority) will begin its stop delay timer. Once this has expired, the set will ramp off load and stop. Should the load level rise above this set point during the stop delay timer, then the timer is cancelled and the set will continue to supply power to the load. This allows for short term drops in load, without decreasing supply capacity, only for it to be increased again a short while later.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - It is recommended that each set in the system have the same value configured for this parameter.</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - When the module assumes that the load is at the bottom of the ramp the breaker will open.</p> </div>

**LOAD CONTROL**



Soft transfer	Description
	<p>When either of the load sharing modes are selected (see below), the 55xx controller will perform a 'soft' load transfer when taking up or shedding load.</p> <p>Upon activation of the load-switching device, the 55xx load sharing system controls the generating set to take up the minimum load. Load is then ramped up to either the set's share of the <i>load</i> (<i>Load share mode</i>) or to the maximum load level (<i>Load level control mode</i>).</p> <p>When a paralleled set is to shed its load, first the load is ramped down to the minimum load level, and then the load switch is deactivated, removing the generator from the bus.</p>

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

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

Item	Function
<p>Load Control Mode IEEE 37.2 -90 Regulating device</p> <p>(Not applicable to 5560.)</p>	<p><b>Disabled:</b> No load sharing will take place.  <b>Load Share (5510 only):</b> The load will be shared between all the sets in the system.  <b>KW fixed export:</b> The generator will export a fixed amount of active (kW) power.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - (5510 and 5520 only) KW fixed export is only used in conjunction with generating sets in parallel with the mains supply.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE:</b> - The 5510 will automatically switch from load share mode to kW fixed export mode when an input configured for Mains parallel mode is active.</p> </div>
<p>Generator full load rating</p> <p>(Not applicable to 5560.)</p>	<p><b>Generator full load rating:</b> The full load rating (in kW) of the set.</p>
<p>Reactive load control mode IEEE 37.2 -90 Regulating device</p> <p>(Not applicable to 5560. 5520 is set at fixed export)</p>	<p>Not available when Active (kW) load share mode is set to <i>Disabled</i>.</p> <p>Options:  <b>Disabled:</b> No reactive power (VAr/pf) sharing will take place.  <b>VAr Share:</b> Reactive power (VAr) will be shared between all the sets in the system.  <b>VAr fixed export:</b> The generator will produce a fixed amount of reactive power (VAr) for use when in parallel with the mains supply.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - The 5510 will automatically switch from VAr share mode to VAr fixed export mode when an input configured for Mains parallel mode is active.</p> </div>
<p>Generator full VAr rating</p> <p>(Not applicable to 5560.)</p>	<p>The full load rating (in VAr) of the set. This setting is used in conjunction with the full load rating (VAr) of the other sets in the system to determine the load share that this set will take.</p>
<p>Load Ramp Rate</p>	<p>The rate at which the generator will be ramped onto and off the load.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> - The set will initially take load at the level set by load ramp minimum and will then increase it's load share at this rate until either</p> <ul style="list-style-type: none"> <li>• All the sets have an equal share of the load (5510 module only)</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• The generated power is equal to the setting for 'load parallel power'</li> </ul> <p>When the set is unloaded it will ramp down at this rate from the current load level to the level set by load parallel ramp minimum before being removed from the bus (or mains supply).</p> </div>

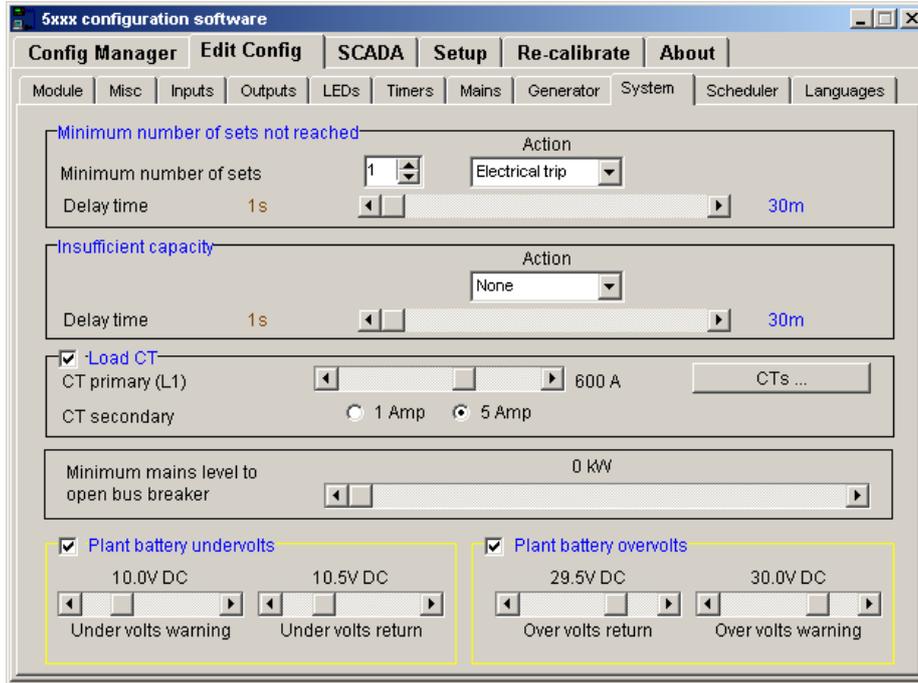
Item	Function
<p>Loss Of Excitation                      IEEE 37.2 -90 Regulating device                      (Not applicable to 5560.)</p>	<p><b>Pre-alarm -</b>  <input type="checkbox"/> = Loss of excitation will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Loss of excitation WILL give a pre-alarm warning in the event of negative VAR rising above the displayed 'Loss of excitation <i>pre-alarm</i>' value. The 'Loss of excitation <i>pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>Negative VAR must return to below the 'Loss of excitation <i>return</i>' setting before the 55xx module will consider that negative VAR is back with in limits</p> <p><b>Shutdown -</b>  <input type="checkbox"/> = Loss of excitation will NOT give a Shutdown alarm  <input checked="" type="checkbox"/> = Loss of excitation WILL give a shutdown alarm in the event of negative VAR rising above the displayed 'Loss of excitation <i>trip</i>' value. The 'displayed 'Loss of excitation <i>trip</i>' value can be adjusted to suit user requirements.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE:- Graphs can be obtained from the alternator suppliers to assist in these settings.</b></p> </div>

**Connections to governor controller and AVR.**

For comprehensive details on how to connect your 5510 and 5520 controllers to a wide variety of electronic governor controllers and AVRs, see the DSE Guide to Synchronising and Load sharing.

### 5.10 SYSTEM

Only applicable to 5560.



System	Function
<p><a href="#">Minimum number of sets</a></p> <p>Only applicable to 5560.</p>	<p>The action that will be taken, if the minimum number of sets available on the common bus, prior to the bus closing is not reached before the delay time has expired.</p> <p><b>None:</b> No action will be taken.</p> <p><b>Warning:</b> An alarm condition will be given, but the sets will still be able to run and take load.</p> <p><b>Electrical trip:</b> An alarm condition will be given; the sets will be removed from the bus and shutdown after the cooling timer.</p>
<p><a href="#">Insufficient capacity</a></p> <p>Only applicable to 5560.</p>	<p>The action that will be taken, if the generating system is not large enough to ramp the mains to the desired level. The action is delayed by the delay time.</p> <p><b>None:</b> No action will be taken.</p> <p><b>Warning:</b> An alarm condition will be given, but the sets will remain on load.</p>
<p><a href="#">Load CT</a></p>	<p>When used in a multimains system, it is recommended that a CT is placed on phase 1 of the feed to the site load. This will allow the 5560 to ramp down the generators until they are no longer feeding the load before opening the bus breaker for that particular load. The generators will continue to feed the other loads in the system (if any).</p>
<p><a href="#">CT Primary</a></p> <p><a href="#">CT Secondary</a></p>	<p>The ratio of the CT fitted in the feed to the load.</p>
<p><a href="#">Minimum level to open bus breaker</a></p>	<p>Used only when <b>Load CT</b> (see above) is not fitted. When ramping off generator load in a multimains system, this is the level of mains power at which the generators will be ramped down to.</p>

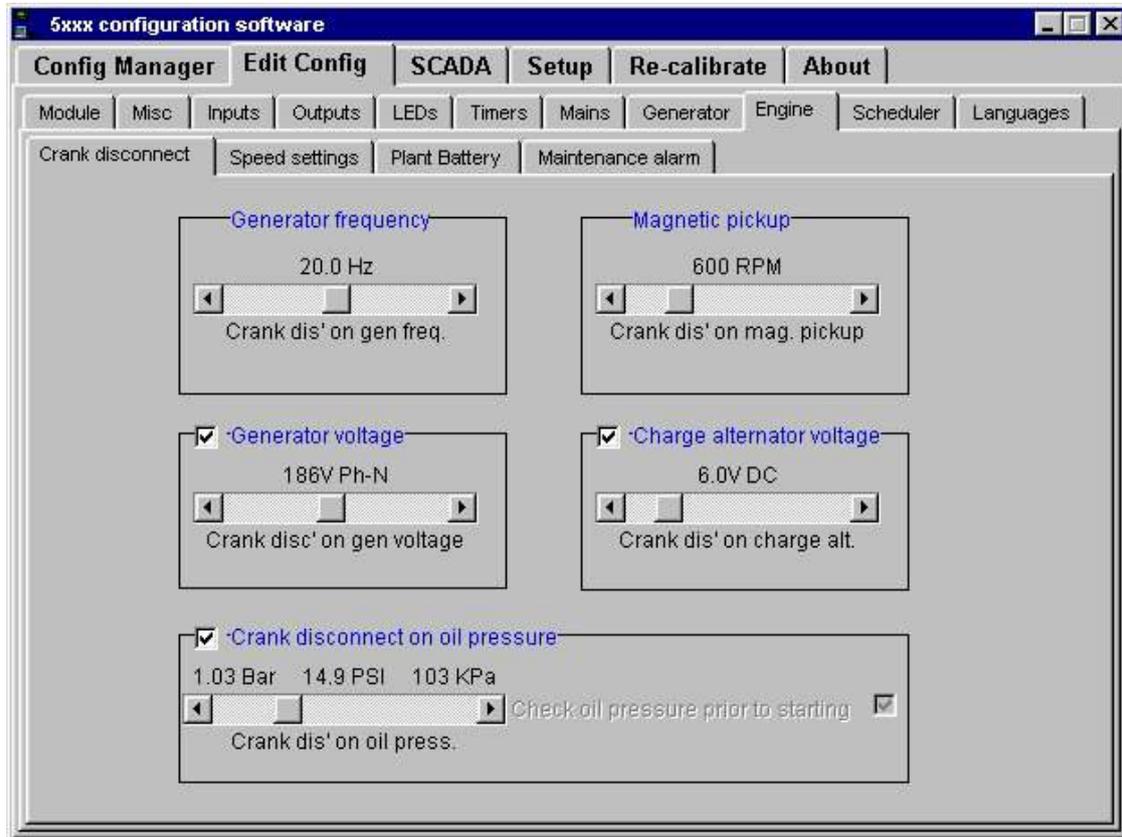
System	Function
<p>Plant Battery Undervolts                      IEEE 37.2 -27DC                      Undervoltage relay</p> <p>Only applicable to 5560.</p>	<p><b>Plant Battery Undervolts -</b>  <input type="checkbox"/> = Low Plant voltage trip will NOT give a warning alarm  <input checked="" type="checkbox"/> = Low Plant voltage WILL give a warning alarm in the event of the generator plant battery voltage falling below the displayed '<i>low voltage alarm</i>' value. The '<i>low voltage alarm</i>' value can be adjusted to suit user requirements.                      Should the input fall below this value the module will initiate the low voltage delay timer, if the voltage remains low and the timer expires, a low voltage warning will be given.</p> <p>The voltage must return to above the '<i>low voltage return</i>' setting before the 55xx module will consider that it is back with in limits.                      (i.e. With a low voltage trip of 10.0V and a low voltage return of 12.0V, the plant voltage must return to 12.0V following a low voltage event to be considered within limits.)</p>
<p>Plant Battery Overvolts                      IEEE 37.2 -59DC Overvoltage relay</p> <p>Only applicable to 5560.</p>	<p><b>Plant Battery Overvolts -</b>  <input type="checkbox"/> = High Plant voltage trip will NOT give a warning alarm  <input checked="" type="checkbox"/> = High Plant voltage WILL give a warning alarm in the event of the generator plant battery voltage rising above the displayed '<i>High voltage alarm</i>' value. The '<i>high voltage alarm</i>' value can be adjusted to suit user requirements.                      Should the input rise above this value the module will initiate the high voltage delay timer, if the voltage remains high and the timer expires, a high voltage warning will be given.</p> <p>The voltage must return to below the '<i>high voltage return</i>' setting before the 55xx module will consider that it is back with in limits.                      (i.e. With a high voltage trip of 27.0V and a high voltage return of 25.0V, the plant voltage must return to 25.0V following a high voltage event to be considered within limits.)</p>

## 5.11 ENGINE

(Not applicable to 5560)

This menu allows the engine configurable trip values to be edited to the users required levels. The following menu is displayed:

### CRANK DISCONNECT



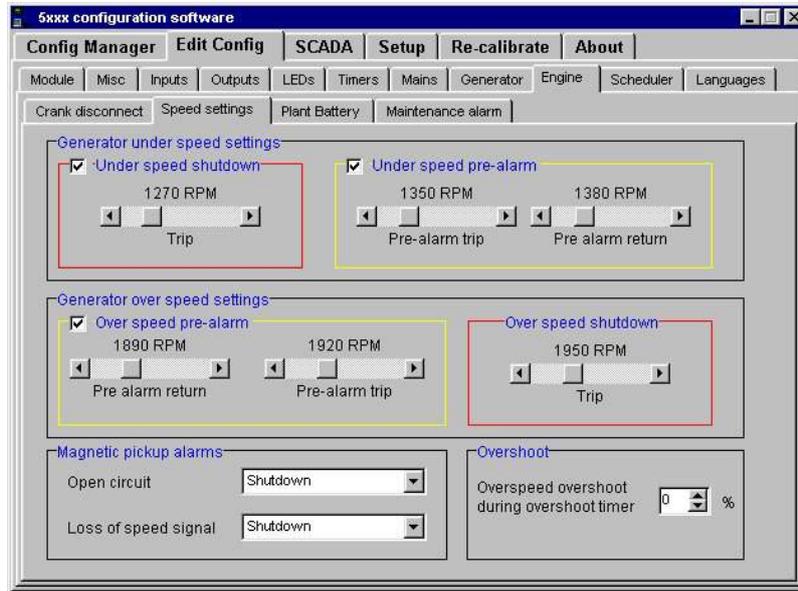
### **NOTES**

**1: - The 55xx module has five possible sources of crank disconnect, namely magnetic pickup (or CAN equivalent), alternator frequency or voltage, engine oil pressure or engine charge alternator voltage. Any of these sources may be used individually, but it is also possible to use multiple sources or even all five. If this is the case, the source which reaches its crank disconnect level first will cause the starter motor to disengage regardless of the state of the remaining monitored sources. This feature allows for a much faster crank disconnect response leading to less wear on the engine and starter components, and provides added safety in case one source is lost, by a broken fan belt or tripped fuses for example.**

Crank Disconnect	Function
<p>Crank disconnect on generator frequency IEEE 37.2 -81 Frequency relay (Not applicable to 5560.)</p>	<p>This level dictates the value that has to appear on the alternator frequency input (if used) before the starter motor will be instructed to disengage.</p>
<p>Crank disconnect on magnetic pickup  (Not applicable to 5560.)</p>	<p><b>(Only available if using Magnetic Pick-up Sensing)</b> This level dictates the value that has to be given by the magnetic pickup sensor (if used) before the starter motor will be instructed to disengage.</p>
<p>Crank disconnect on generator voltage IEEE 37.2 -59AC Overvoltage relay  (Not applicable to 5560.)</p>	<p><input type="checkbox"/> = Generator voltage will NOT be used for crank disconnect. <input checked="" type="checkbox"/> =Generator voltage WILL be used for crank disconnect in the event of the charge voltage exceeding the displayed 'crank disconnect on gen voltage' value. The 'crank disconnect on gen voltage' values can be adjusted to suit user requirements as detailed below. This level dictates the value that has to be generated by the generator before the starter motor will be instructed to disengage.</p>
<p>Crank disconnect on charge alternator voltage IEEE 37.2 -59DC Overvoltage relay  (Not applicable to 5560.)</p>	<p><input type="checkbox"/> = Charge alternator voltage will NOT be used for crank disconnect. <input checked="" type="checkbox"/> =Charge alternator voltage WILL be used for crank disconnect in the event of the charge voltage exceeding the displayed 'crank disconnect on chg alt' value. The 'crank disconnect on chg alt' values can be adjusted to suit user requirements as detailed below. This level dictates the value that has to be generated by the engine charge alternator before the starter motor will be instructed to disengage. This setting can be used to obtain a crank disconnect much earlier than if alternator speed sensing is used, particularly if using alternators fitted with digital voltage regulators as these can take some time to produce an output. Alternatively the charge alternator could be used alone to provide crank disconnect on such as pump sets where no alternative speed sensing source is available.</p>
<p><b>⚠ CAUTION! - If this feature is not to be used ensure that this setting is OFF to prevent premature crank disconnect.</b></p>	
<p>Crank disconnect on oil pressure IEEE 37.2 -63 Pressure switch  (Not applicable to 5560.)</p>	<p><input type="checkbox"/> = Engine oil pressure will NOT be used for crank disconnect. <input checked="" type="checkbox"/> =Engine oil pressure WILL be used for crank disconnect in the event of the oil pressure exceeding the displayed 'crank disconnect on oil pressure' value. The 'crank disconnect on oil pressure' values can be adjusted to suit user requirements as detailed below. This level dictates the value that has to be reached by the engine oil pressure sender reading before the starter motor will be instructed to disengage. This setting can be used to obtain a crank disconnect much earlier than if alternator speed sensing is used, particularly if using alternators fitted with digital voltage regulators as these can take some time to produce an output. Alternatively the charge alternator could be used alone to provide crank disconnect on such as pump sets where no alternative speed sensing source is available.</p>
<p><b>⚠ CAUTION! - If this feature is not to be used ensure that this setting is OFF to prevent premature crank disconnect.</b></p>	
<p><b>Check oil pressure prior to starting -</b> If oil pressure is required to be monitored to provide a crank disconnect and the feature is set to OFF; The software will query if oil pressure should be monitored as a indication of engine at rest: <input type="checkbox"/> = Engine oil pressure will NOT be monitored to check if the engine is at rest. This would be used if an oil prime or pre-lubrication system was fitted, and would ensure that the engine would be allowed to start if oil prime was operating. <input checked="" type="checkbox"/> =Engine oil pressure WILL be used to ensure that the engine is at rest. This is a back up to prevent the start motor from being engaged onto a running engine in the event of all other speed sensing forms being unavailable.</p>	
<p><b>⚠ CAUTION! - This is a safety feature and should only be set to OFF if it is strictly necessary to disable oil pressure monitoring at rest.</b></p>	

**SPEED SETTINGS**

(Not applicable to 5560.)

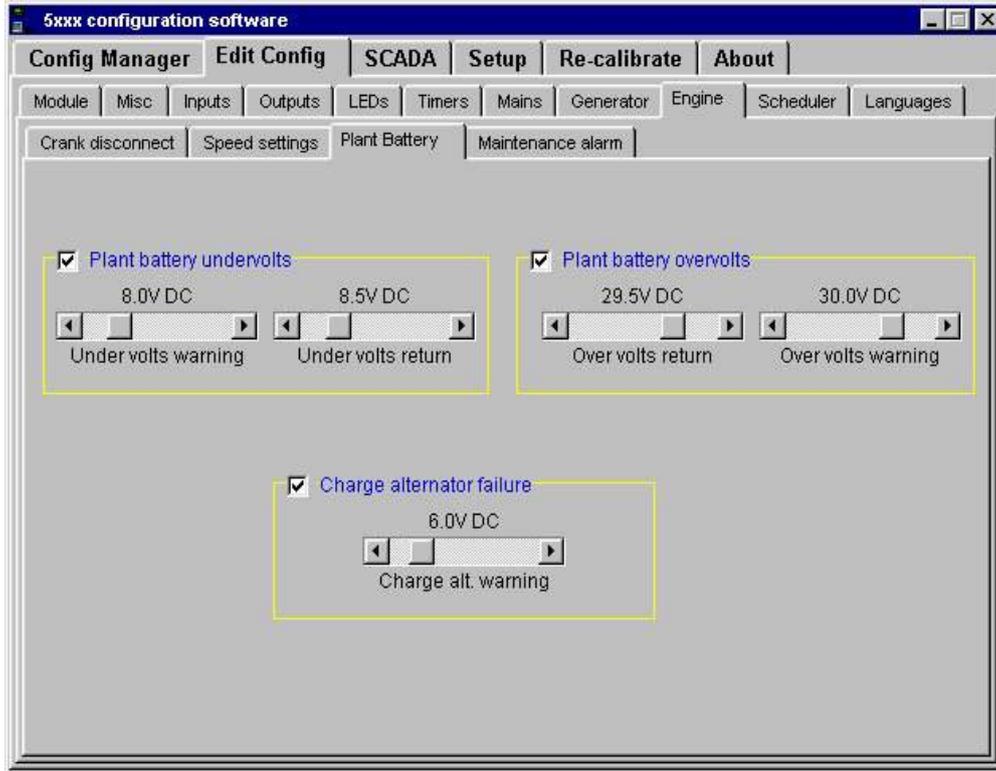


Speed Settings	Function
<p>Generator Under Speed (Not applicable to 5560.)</p>	<p>These settings are used to configure the generator under speed alarm: -</p> <p><b>Shutdown -</b>  <input type="checkbox"/> = Generator Under speed will NOT give a Shutdown alarm  <input checked="" type="checkbox"/> = Generator Under speed WILL give a shutdown alarm in the event of the generator speed falling below the displayed '<i>underspeed trip</i>' value. The '<i>underspeed trip</i>' value can be adjusted to suit user requirements.</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Under speed will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Under speed WILL give a pre-alarm warning in the event of the generator speed falling below the displayed '<i>under speed pre-alarm</i>' value. The '<i>under speed pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>The speed must return above the '<i>Underspeed return</i>' setting before the 55xx module will consider that it is back within limits.</p>
<p>Generator Overpeeed (Not applicable to 5560.)</p>	<p>These settings are used to configure the generator over speed alarm: -</p> <p><b>Pre-alarm -</b>  <input type="checkbox"/> = Generator Overspeed will NOT give a pre-alarm warning  <input checked="" type="checkbox"/> = Generator Overspeed WILL give a pre-alarm warning in the event of the generator speed rising above the displayed '<i>over speed pre-alarm</i>' value. The '<i>over speed pre-alarm</i>' value can be adjusted to suit user requirements.</p> <p>The speed must return below the '<i>Overspeed return</i>' setting before the 55xx module will consider that it is back with in limits.</p> <p><b>Shutdown -</b>                      This is the setting at which a Generator Overspeed will give a shutdown alarm in the event of the generator speed rising above the displayed '<i>overspeed trip</i>' value. The '<i>overspeed trip</i>' value can be adjusted to suit user requirements.</p>

Speed Settings	Function
<p>Overshoot</p> <p>(Not applicable to 5560.)</p>	<p><b>Over-speed Overshoot during Overshoot timer-</b></p> <p>This value is used to prevent nuisance tripping on generators where a slow response governor allows the engine to overspeed slightly during start-up. This setting allows the normal overspeed shutdown level to be exceeded by a percentage (up to a maximum of 10%) for the duration of the overspeed overshoot timer. Should the engine speed exceed the temporarily elevated level it will be shutdown. Once the overspeed overshoot timer has expired the overspeed shutdown value is restored to the normal level.</p> <p> <b>NOTE: - This is not a delay on overspeed shutdown, only a temporary raising of the overspeed value, therefore overspeed protection is not compromised.</b></p>
<p>Magnetic Pickup alarms</p> <p>(Not applicable to 5560)</p>	<p><b>Open Circuit</b></p> <p>The P55xx module will monitor the Magnetic pick-up input to ensure that the MPU device is actually connected (if configured to use Magnetic Pickup). If it detects that the magnetic pickup circuit is high resistance an 'Open Circuit' alarm will be triggered. The user can configure the module to either; Alarm but continue to operate the generator (only to be used if other speed sensing sources are available), or to shutdown the generator until the fault is rectified.</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Shutdown</b> (<i>Alarm and shutdown</i>)</p> <p> <b>NOTE: - This alarm will be active as soon as the P55xx module is powered up. Therefore if the module is powered up without a magnetic pickup fitted, but is configured to be used, an alarm will be triggered.</b></p> <p><b>Loss of Speed Signal</b></p> <p>The P55xx module will monitor the Magnetic pick-up input to ensure that a value signal is received once cranking commences. If it does not detect a magnetic pickup signal, a 'Loss of speed signal' alarm will be triggered. The user can configure the module to either; Alarm but continue to operate the generator (only to be used if other speed sensing sources are available), or to shutdown the generator until the fault is rectified.</p> <p><b>Actions</b>  <b>Warning</b> (<i>Alarm only, No shutdown</i>)  <b>Shutdown</b> (<i>Alarm and shutdown</i>)</p> <p> <b>CAUTION! - These alarms are set to SHUTDOWN as default. They should only be set to WARNING if it really is necessary and ONLY if alternative speed sensing sources are available to the P55xx module to use. Failure to observe this may result in damage to the engine and/or starting equipment.</b></p>

**PLANT BATTERY**

(Not applicable to 5560.)

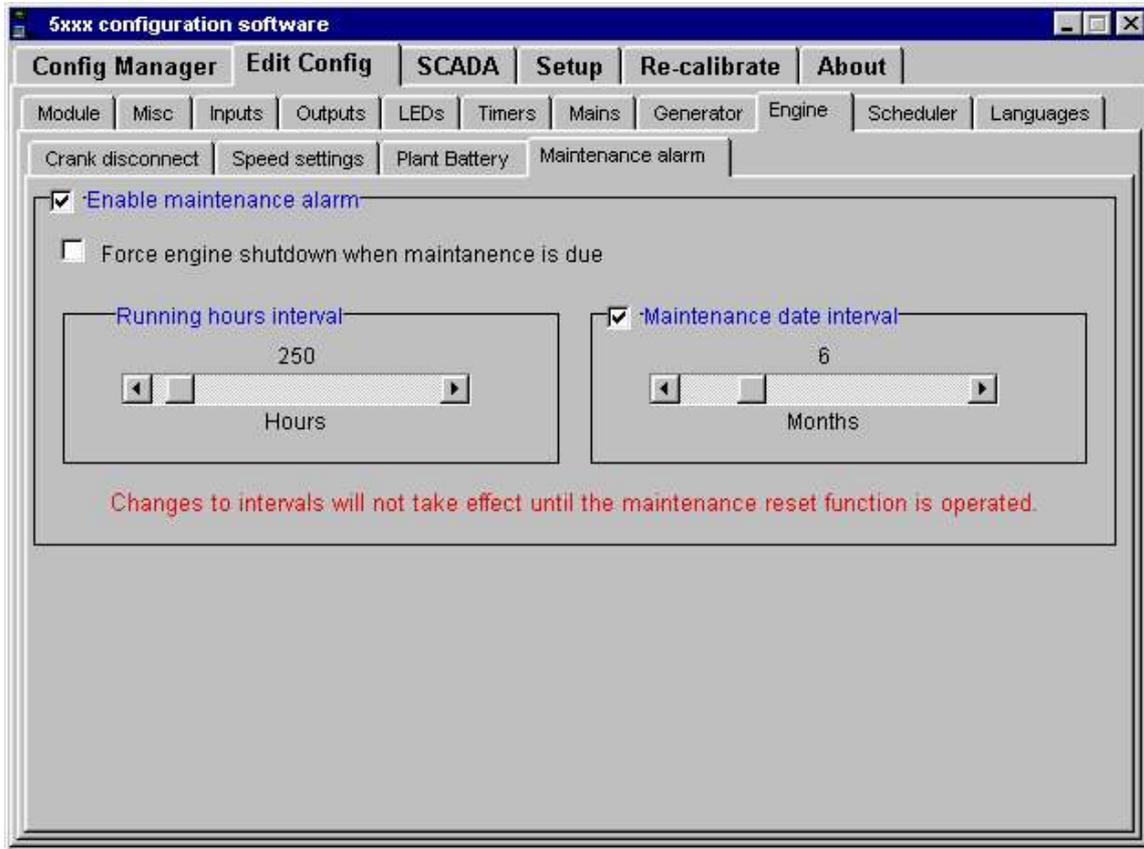


Plant Battery	Function
<p>Plant Battery Undervolts                      IEEE 37.2 -27DC                      Undervoltage relay                      (Not applicable to 5560.)</p>	<p><b>Plant Battery Undervolts -</b>  <input type="checkbox"/> = Low Plant voltage trip will NOT give a warning alarm  <input checked="" type="checkbox"/> = Low Plant voltage WILL give a warning alarm in the event of the generator plant battery voltage falling below the displayed '<i>low voltage alarm</i>' value. The '<i>low voltage alarm</i>' value can be adjusted to suit user requirements. Should the input fall below the value the module will initiate the low voltage delay timer, if the voltage remains low and the timer expires, a low voltage warning will be given.</p> <p>The voltage must return above the '<i>low voltage return</i>' setting before the 55xx module will consider that it is back with in limits.                      (i.e. With a low voltage trip of 10.0V and a low voltage return of 12.0V, the plant voltage must return to 12.0V following a low voltage event to be considered within limits.)</p>

Plant Battery	Function
<p>Plant Battery Overvolts IEEE 37.2 -59DC Overvoltage relay  (Not applicable to 5560.)</p>	<p><b>Plant Battery Overvolts -</b>  <input type="checkbox"/> = High Plant voltage trip will NOT give a warning alarm  <input checked="" type="checkbox"/> = High Plant voltage WILL give a warning alarm in the event of the generator plant battery voltage rising above the displayed '<i>High voltage alarm</i>' value. The '<i>high voltage alarm</i>' value can be adjusted to suit user requirements.                      Should the input rise above this value the module will initiate the high voltage delay timer, if the voltage remains high and the timer expires, a high voltage warning will be given.                       The voltage must return below the '<i>high voltage return</i>' setting before the 55xx module will consider that it is back with in limits.                      (i.e. With a high voltage trip of 27.0V and a high voltage return of 25.0V, the plant voltage must return to 25.0V following a high voltage event to be considered within limits.)</p>
<p>Charge Alternator Failure IEEE 37.2 -27DC Undervoltage relay  (Not applicable to 5560.)</p>	<p><b>Charge Alternator Failure -</b>  <input type="checkbox"/> = Charge alternator low voltage will NOT give a warning alarm  <input checked="" type="checkbox"/> = Charge alternator low voltage WILL give a warning alarm in the event of the charge alternator voltage falling below the displayed '<i>Charge fail alarm</i>' value. The '<i>Charge Fail alarm</i>' value can be adjusted to suit user requirements.                      As the input is a true analogue value, total failure of the charge alternator is not the only failure that the module will provide protection for. Faults which cause the output voltage to fall, such as worn brushes etc., will cause the alarm to operate.                       The voltage must return above the '<i>Charge Fail return</i>' setting before the 55xx module will consider that it is back with in limits.</p> <div style="border: 1px solid black; padding: 5px;"> <p> <b>NOTE: - If this input is not used, ensure that this setting is <input type="checkbox"/> to prevent the possibility of a spurious Charge Fail Alarm occurring.</b></p> </div>

**MAINTENANCE ALARM**

(Not applicable to 5560.)

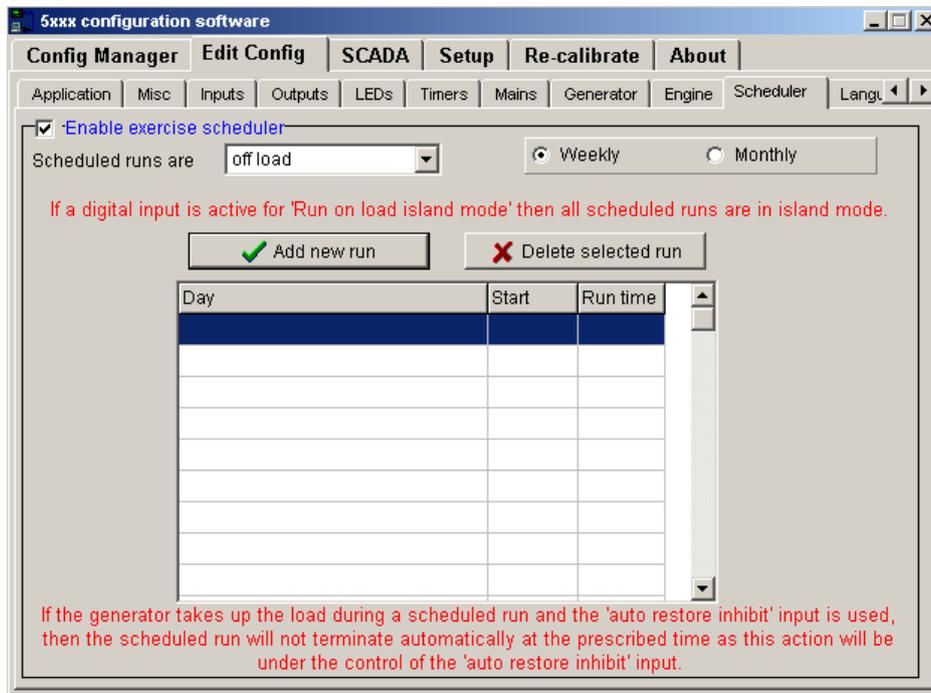


Maintenance Alarm Settings	Function
<p>Enable Maintenance Alarm (Not applicable to 5560.)</p>	<p><b>Enable Maintenance Alarm -</b>  <input type="checkbox"/> = The module will not monitor the engine maintenance intervals.  <input checked="" type="checkbox"/> = The module will monitor the engine maintenance intervals and issue an alarm once maintenance becomes due.</p>
<p>Force engine shutdown when maintenance is due (Not applicable to 5560.)</p>	<p><b>Force engine shutdown when maintenance is due -</b>  <input type="checkbox"/> = In the event of a Maintenance alarm being activated, the module will only issue a warning alarm. The engine will be allowed to continue running. The alarm will remain present until the maintenance reset is operated.  <input checked="" type="checkbox"/> = In the event of the Maintenance alarm being activated, the module will issue an alarm and will SHUTDOWN the engine. Further operation of the engine will not be possible until the maintenance reset is operated.</p>
<p><b>⚠ CAUTION! - This option will prevent any operation of the engine once triggered; it is recommended that the function be used in conjunction with the external maintenance reset to prevent loss of genset availability.</b></p>	
<p>Running Hours Interval (Not applicable to 5560.)</p>	<p><b>Running Hours Interval-</b>                      This setting is used to select the amount of running hours between maintenance alarms. This should be in accordance with the engine manufacturer's recommendations. Once the number of hours running before maintenance has reached zero, maintenance due alarm will be issued. This will remain present until a maintenance reset command is sent to the module (either from the P810 software or from a digital input), the running hours interval counter will then be reset to the value selected.</p>
<p>Maintenance Date Interval (Not applicable to 5560.)</p>	<p><b>Maintenance Date Interval -</b>  <input type="checkbox"/> = The module will only monitor engine running hours between maintenance intervals. This is the normal mode of operation for engines, which will accumulate a large number of running hours in the maintenance period. E.g. Prime Power applications.  <input checked="" type="checkbox"/> = The module will monitor both the engine running hour and calendar months between maintenance intervals. Whichever expires first will trigger a maintenance alarm. This mode is used for engines, which may not accumulate many running hours in the maintenance period. E.g. Standby power applications</p> <p>When enabled the module will monitor the passage of calendar months in addition to the engine running hours. Whichever setting expires first will trigger a maintenance due alarm, ensuring that the engine still receives regular attention.</p>

**⚠ CAUTION! - The Maintenance alarm can only be reset either via the 5xxx software 'Re-Calibrate' tab or from a digital input configured as 'Maintenance Reset'. Ensure that suitable arrangements are made to ensure that at least one of these methods is made available to reset the maintenance alarm on site.**  
**When the 'Maintenance Reset' is performed, the maintenance interval values will be re-loaded into the module and will start to countdown again.**  
**E.g. If the maintenance interval is set to 250 hours when the reset is issued then 250 hours running will be re-loaded into the maintenance interval timer.**

## 5.12 SCHEDULER

This menu allows the scheduled run events to be configured. These events will automatically start and run the generator at a given time for a given duration. This function can be used to provide a regular generator exercise feature, or a pre-configured run for peak lopping purposes, etc.



### NOTES

- 1: - The 55xx Module will only respond to scheduled run events if in the 'auto' mode. The engine will only be started if there are no shutdown alarms present.
- 2: - Should the module not be able to run when a scheduled event is called the event will not be cancelled but will remain active for the duration configured. Therefore should the module be restored to a condition where it can run, it will act in accordance with the scheduled run settings.
- 3: - If the 'Auto restore inhibit' input is active and an on-load scheduled run is requested the generator will start and take load. However, at the end of the scheduled run the generator will remain running on-load until the 'Auto restore inhibit' input is de-activated.
- 4: - It is recommended that an LED is configured to indicate 'Calling for Scheduled Run' to avoid operator confusion as to why the generating set may be running for no apparent reason.

Scheduler Settings	Function
Enable Exercise Scheduler	<b>Enable Exercise Scheduler -</b> <input type="checkbox"/> = The module will not respond to the scheduled run commands from the exercise scheduler. <input checked="" type="checkbox"/> = The module will respond to the scheduled run commands from the exercise scheduler.
Scheduled runs are :	<b>Off load</b> - In the event of a scheduled run command the module will start the generator and run off-load for the duration of the scheduled run. E.g. To exercise a standby generator without interrupting the load. Should a remote start/mains failure occur during the off-load run the genset will take load as normal. <b>On load</b> - In the event of a scheduled run command, the module will start the generator and will take load for the duration of the run. E.g. For a timed peak lopping application. <b>Island mode</b> - In the event of a scheduled run command, the module will start the generator and will take load for the duration of the parallel run time, after which the load is ramped fully onto the generator(s) and the mains load switch is opened. At the end of the scheduled run, this operation is repeated in reverse.
Scheduled Runs are Weekly / Monthly	<b>Weekly</b> = The scheduler works on a 7 day cycle allowing for different start and stop times throughout the week. <b>Monthly</b> = The scheduler works on a 28 day cycle allowing for monthly exercise.
Exercise Scheduler	<b>Exercise Scheduler -</b> Day - <i>Day of the week/month that the event will occur.</i> Start - <i>The Time of Day that the scheduled run command will be issued.</i> Run Time - <i>The duration that the scheduled run command will be present for, therefore the amount of time the generator will run for.</i>

**CAUTION!** - Should the generator take load during a scheduled run, either because the run was configured to be 'on load', or a remote start/mains failure occurred during the run; if the 'Auto restore inhibit' input is active the genset will not stop at the end of the scheduled run, until the 'Auto restore inhibit' input becomes in-active.

**ADD NEW RUN**

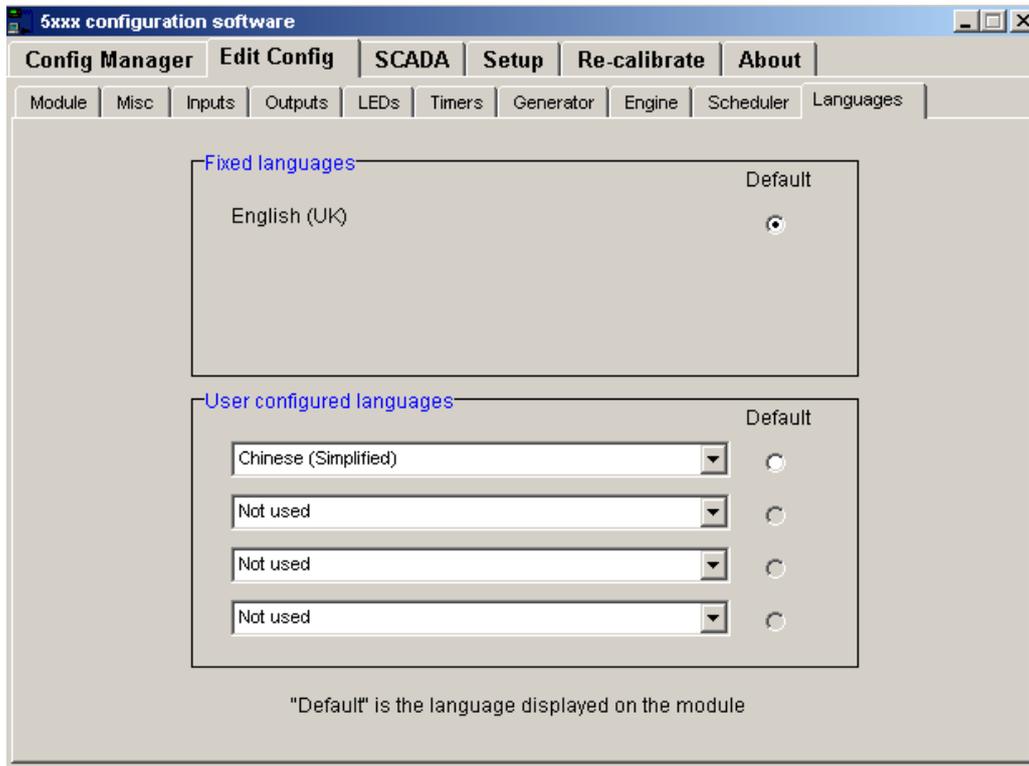
To add a new scheduled run event simply, Select the day of the Week the run is required (i.e. Tuesday), select the time of day the run is to start (i.e. 13:00) and select the duration of the run (i.e. 1 hour) and Click 'Add'.

**NOTE:** - Should a conflict arise between existing scheduled runs and the additional one, the software will reject the new run and highlight the conflicting event in RED. Please check the conflict, correct, and retry.

## 5.13 LANGUAGES

This menu is used to configure which languages are available in the module. Each module is capable of displaying one of five different stored languages. English is factory installed and cannot be removed. A further four languages can be selected during configuration. DSE pre-load Chinese (Simplified), French and Spanish (International) into these slots for your convenience. These can be added to or changed using the 5xxx software as below.

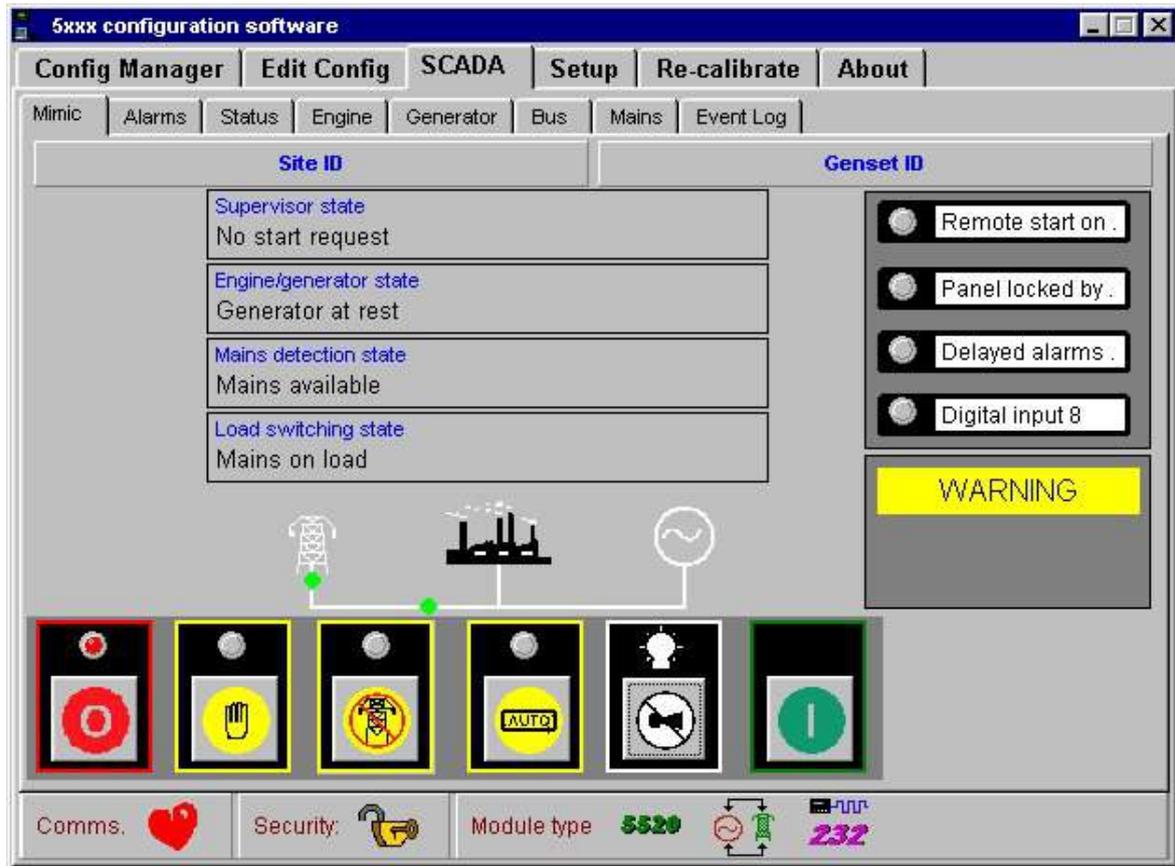
Language selection can then be made from the front panel keys of the module - refer to the appropriate 55xx module operators manual for further details.



### NOTES

- 1: - It is only possible to send languages to the module which exist on the PC that is sending the configuration. It is not possible to read the language files from a module, only the information regarding which languages are actually set. Therefore care must be exercised when 'cloning' modules which have been configured on different PC's. Always ensure that the PC has the correct languages files available.
- 2: - When configuring a module and selecting extra languages, the configuration Write time will be increased for each additional language requested by the module. The module will request the language files for the new configuration first and then will request the new configuration.
- 3: - When configuring a module which already has all four user configurable languages set, if a different language is selected from those already in the module, all language files will be removed and the new selection written to the module.
- 4: - It is not actually possible to remove any languages once written to the module. However, unused languages (except English) can be over-written with new ones.
- 5: - If the language required is not on the list please contact Deep Sea Electronics PLC regarding possible translation and software update to include it.

## 6 SCADA MENU



### Diagnostics

A particularly useful feature of the module is its ability to provide real-time diagnostic information to the PC. This can be used to give on-screen details of the operation of the module and generating set performance.

**NOTE:** - The display screen is updated by information sent from the module; if the communications link to the module is lost the information displayed could be incorrect and is therefore 'greyed out'. A small icon in the bottom right of each display indicates that the link to the module is healthy.

	Communication Link is OK when 'beating Heart' is displayed.
	Communication Link is OK when 'beating Heart' is displayed.
	Communication Link is not functioning, no data is being received. Check 'Set-up' and ensure module is connected. You may need to click on 'Dial' or 'Connect via 810/RS485' to establish the link.

**Communications State Indication**

**Comms:** - A small icon in the bottom right of the screen indicates that the link to the module is healthy.

	Communication Link is OK when 'beating Heart' is displayed.
	Communication Link is OK when 'beating Heart' is displayed.
	Communication Link is not functioning, no data is being received. Check 'Set-up' and ensure module is connected. You may need to click on 'Dial' or 'Connect via 810/RS485' to establish the link.

**SECURITY:** - A small icon indicates the security state of the link to the module.

	No valid PIN has been entered for the currently connected module. Read only access – Operator can view module parameters but can not change operating mode or reset alarms, etc.
	Valid PIN entered, full read/write access – Operator can view module parameters and control the module, resetting alarms etc.

**MODULE TYPE:** - A small icon in the bottom left of the screen indicates the type of module and any options fitted.

	Module type unknown (prior to comms link being made or when link is lost)
	Currently connected module is 5510 Automatic Start Module
	Currently connected module is 5520 Automatic Mains Failure Module
	Currently connected module is 5560 multi set ATS / mains controller module
	Currently connected module is a multiset load share controller
	Currently connected module is a load control module for single set parallel with the mains (utility) supply
	Currently connected module has RS232 communications card fitted
	Currently connected module has RS485 communications card fitted
	Currently connected module has Can option fitted

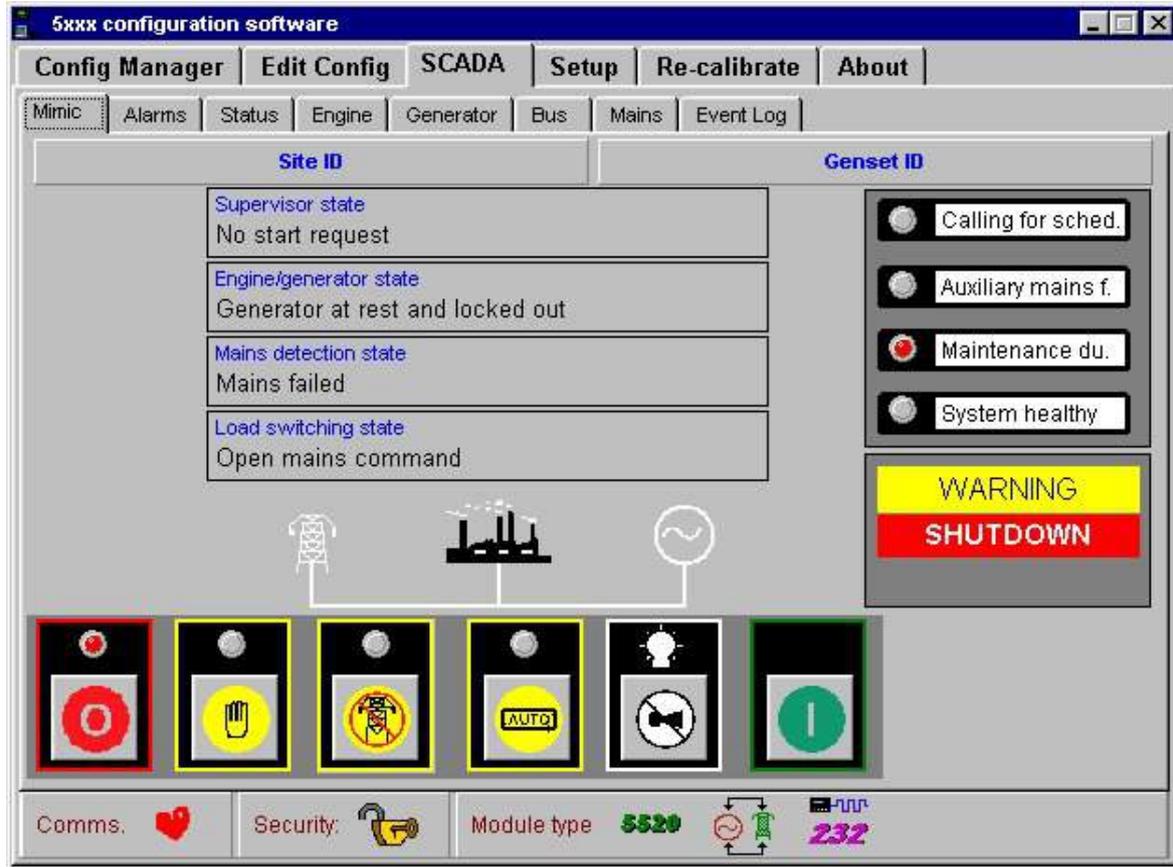
**Requesting module settings for SCADA display (Automatic)**

Once connected, the software will ask the module to send details of its internal configuration. This is then used by the SCADA display to provide more detailed information about the operation of the module and the remote site. While this information is being received the SCADA screen will gradually add this information as it is received.

 **NOTE:** - The additional information is used to identify the function of inputs, outputs and LED's etc.

## 6.1 MIMIC

If the Mimic Display option is selected the display will show:



**NOTE:** - Using the Mouse to 'click' on the buttons will allow the module to be operated from the PC screen. This function can be used to provide remote control of the 55xx module via the 810 interface. The 810 interface cable can be extended up to 100 meters (from the module to the 810).

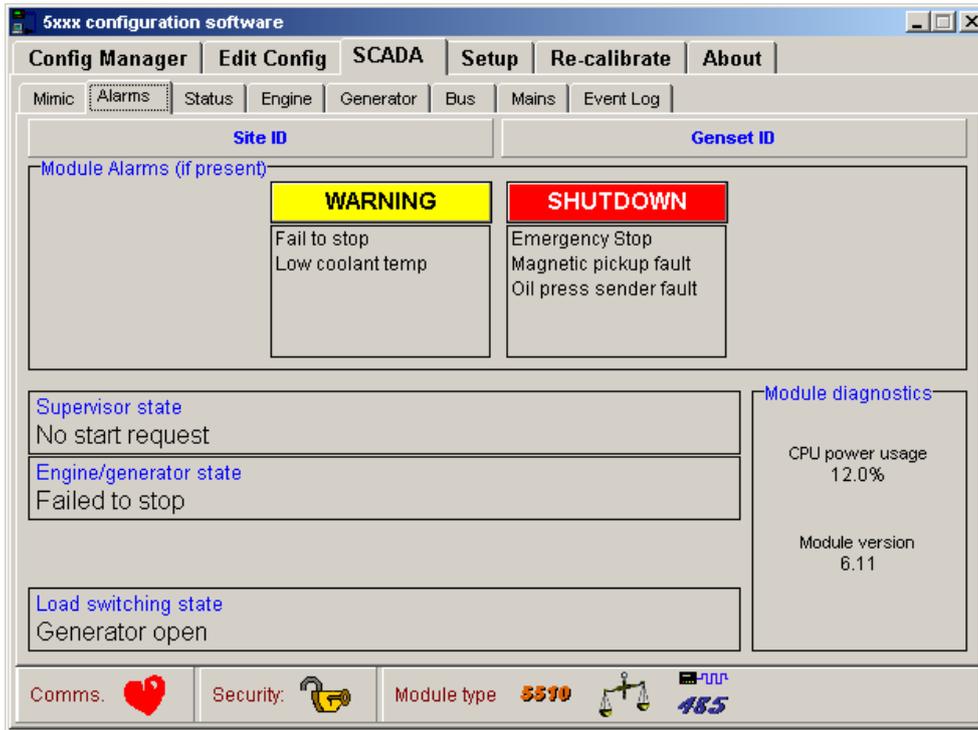
The remote control facility can be disabled from the 'Set-up' tab if remote monitoring only is required.

Modules also have load transfer pushbutton control available on the mimic display. This facility can be disabled from the 'Set-up' tab if remote monitoring only is required.

**CAUTION!** - If the module has a PIN security number set, then it will not be possible to send remote control commands to the module, unless the correct Security Access is given.

## 6.2 ALARMS

If the Status Display option is selected the display will show:

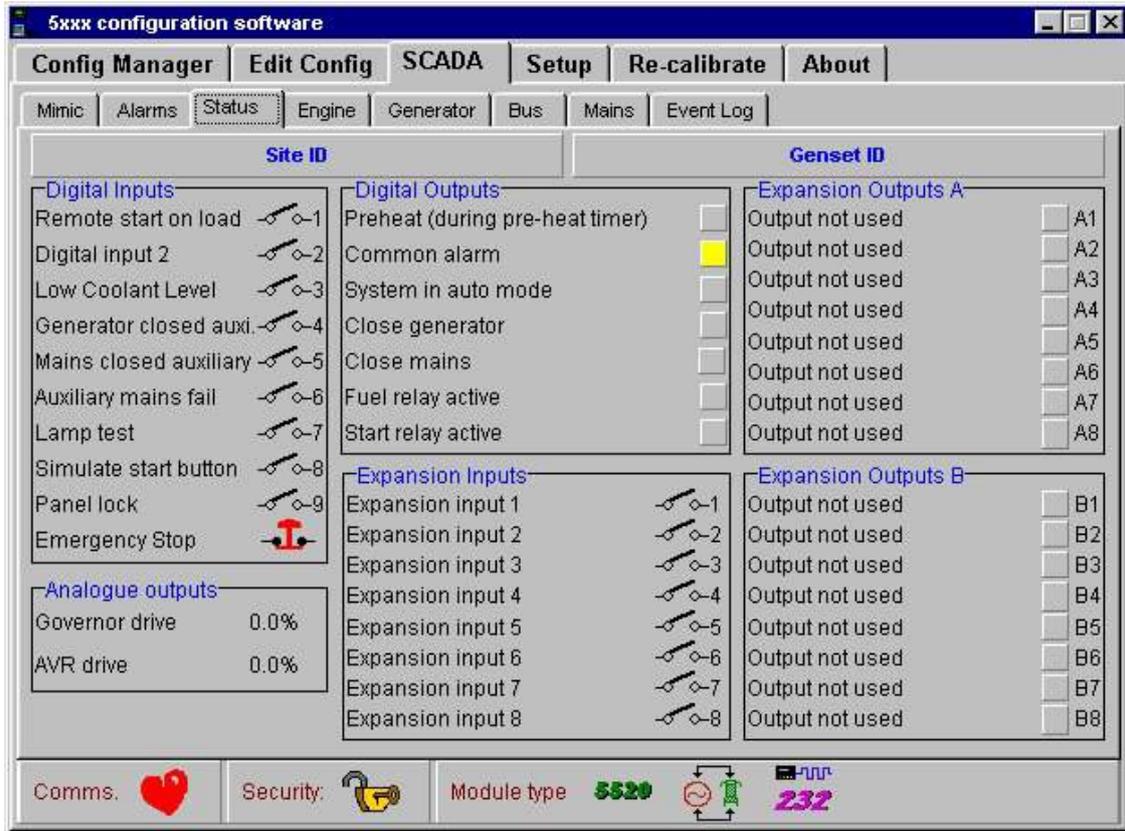


<p> <b>CAN</b> ECU error messages (when available) are displayed on the alarms page above.</p>	<p>Examples of SPN / FMI numbers, taken from the Volvo Penta TAD12 manual are:</p> <p><b>SPN 110 – Engine coolant temperature</b>                      FMI 0 – Out of range                      FMI 3 – Above normal                      FMI 4 – Below normal</p>
---	---

**NOTE:** - 'Hovering' the mouse cursor over the SPN/FMI numbers will display the CAN messages where appropriate. For further details on these code meanings, refer to the ECU instructions provided by the engine manufacturer.

### 6.3 STATUS

If the Status Display option is selected the display will show:



## 6.4 ENGINE

If the Engine Instruments Display option is selected the display will show:

### Engine Instrumentation – Standard input configuration

5xxx configuration software

Config Manager | Edit Config | SCADA | Setup | Re-calibrate | About

Mimic | Alarms | Status | Engine | Generator | Bus | Mains | Event Log

Engine | J1939

Cellular BTR Transmitter ~12-453 | Back-up genset #234-6875

**Engine Instruments**

Coolant Temp 58°C 136°F	Oil Pressure 4.68 Bar 67.9 PSI 468 KPa
Engine Speed 1503 RPM	Fuel level 94%
Plant Battery 10.7V DC	Charge Alt 9.5V DC

**Time and Date**

Module current date 16/02/05	Hours run 57:09
Module current time 12:27:03	Number of starts 235

**Maintenance alarm**

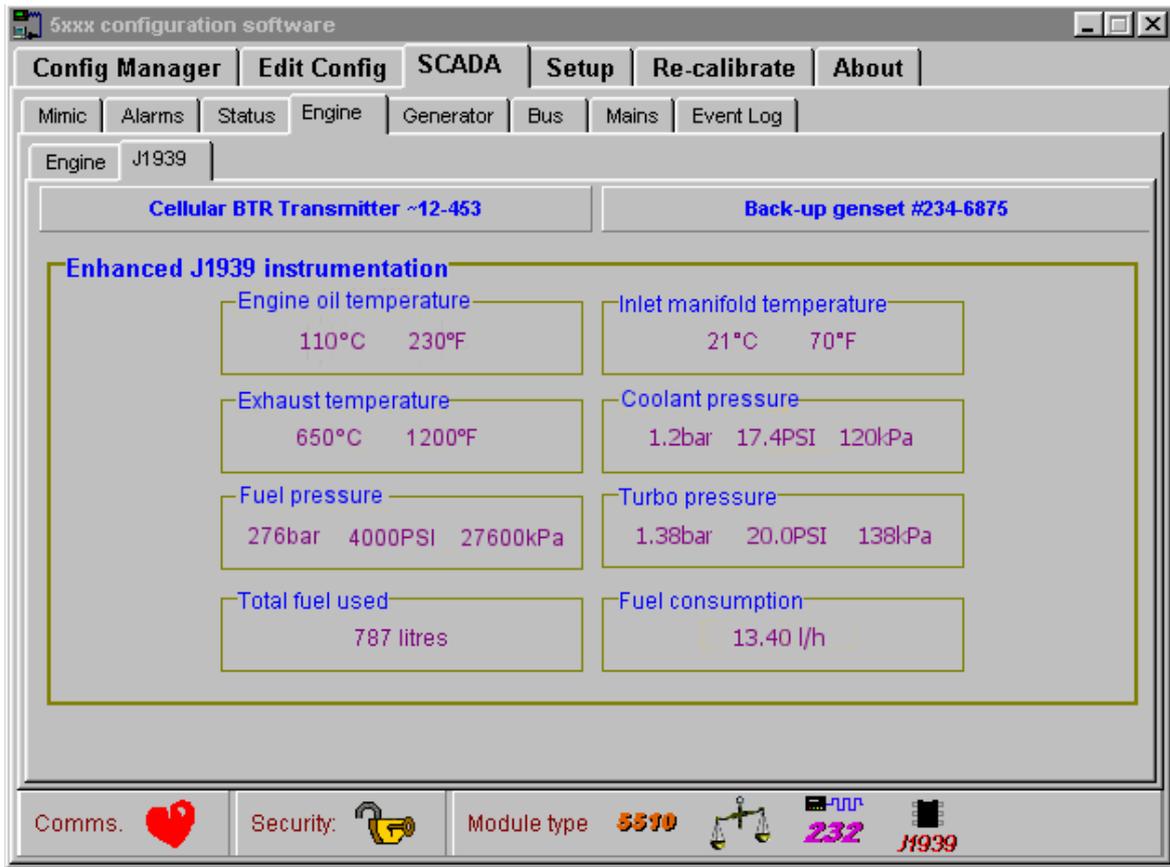
Running time until next maintenance  
249 Hours

Date of next maintenance  
17/08/05

(whichever occurs soonest)

Comms. Security: Module type 5510 232

6.4.1 ENGINE INSTRUMENTATION – WITH CAN OPTION SELECTED.



## 6.5 GENERATOR

**Cellular BTR Transmitter ~12-453**      **Back-up genset #234-6875**

**Generator Instruments**

**Generator phase-neutral voltage**

L1-N	L2-N	L3-N
198V	196V	197V

**Generator phase-phase voltage**

L1-L2	L2-L3	L3-L1
326V	357V	339V

**Generator Load Current**

L1	L2	L3
534A	602A	582A

**Generator frequency**

50.0 Hz

**Generator sequence**

Phase sequence  
L1 L2 L3

**Generator Earth Current**

0.00A

**Generator lag / lead**

Lag

**Generator power**

L1	L2	L3	Total
106 KVA	118 KVA	115 KVA	339 KVA
49.5 kW	59.7 kW	56.7 kW	166 kW
93.9 KVAh	10 KVAh	99.3 KVAh	295 KVAh

**Generator accumulated power**

Negative KWh	Positive KWh
0.0 KWh	32.9 KWh
KVAh	KVAh
39.3 KVAh	9.1 KVAh

**Power factor**

L1	L2	L3	Average
0.46	0.50	0.49	0.48

Comms. Security: Module type **5510** **232**

## 6.6 BUS

**5xxx configuration software**

Config Manager | Edit Config | SCADA | Setup | Re-calibrate | About

Mimic | Alarms | Status | Engine | Generator | **Bus** | Mains | Event Log

Test | DSE

**Bus instruments**

**Bus phase-neutral voltage**

L1-N	L2-N	L3-N
226V	226V	226V

**Bus phase-phase voltage**

L1-L2	L2-L3	L3-L1
398V	398V	398V

**Bus frequency**

50.0 Hz

**Bus sequence**

L1-L2-L3

**Time and Date**

Module current date  
24/11/2005

Module current time  
17:03:41

Comms. Security: Module type **5590** **232**

## 6.7 MAINS

**5xxx configuration software**

Config Manager | Edit Config | SCADA | Setup | Re-calibrate | About

Mimic | Alarms | Status | Engine | Generator | Bus | **Mains** | Event Log

Deep Sea Electronics | 5560 Mains Controller

**Mains Supply Instruments**

**Mains phase-neutral voltage**

L1-N	L2-N	L3-N
233V	234V	234V

**Mains phase-phase voltage**

L1-L2	L2-L3	L3-L1
403V	405V	405V

**Mains current**

L1	L2	L3
169A	164A	154A

**Mains power**

L1	L2	L3	Total
39.2 KVA	38.2 KVA	36.0 KVA	113 KVA
36.2 kW	35.5 kW	32.2 kW	104 kW
16.8 KVAh	16.5 KVAh	15.5 KVAh	48.8 KVAh

**Mains power factor**

L1	L2	L3	Average
0.92	0.92	0.89	0.91

**Mains frequency**

50.0 Hz

**Mains sequence**

Phase sequence  
L1 L2 L3

**Mains Earth Current**

Lag

**Mains accumulated energy**

Negative kWh	Positive kWh
65.7 kWh	1332780.6 kWh
KVAh	KVAh
1448497.5 KVAh	542244.3 KVAh

Comms. Security: Module type **5560** **465**

## 6.8 EVENT LOG

If the Event Log option is selected the display will show:



### READ EVENT LOG

To interrogate the module's onboard event log the 'Read Event log' button must be operated. The module will then send the contents of its Event log to the PC.

### PRINT LOG

This button will generate a print-out of the displayed event log.

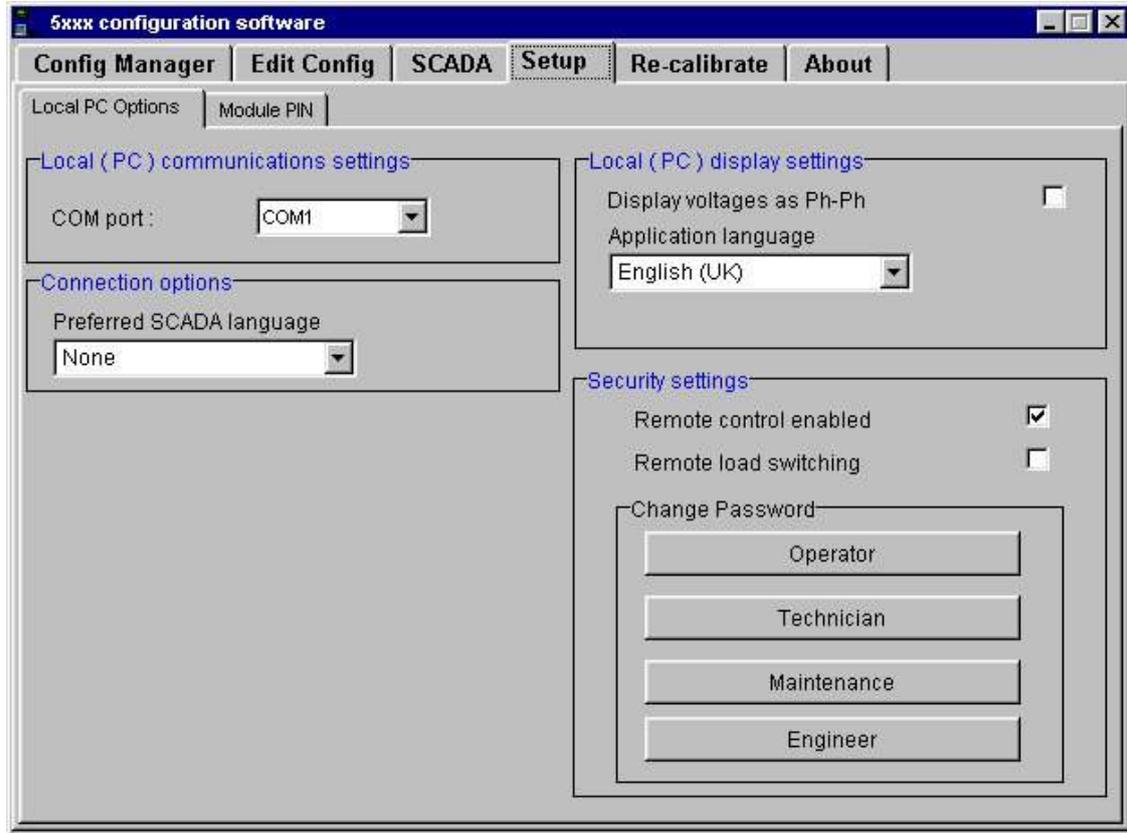
**NOTE:** - The event log display is only updated when the 'Read Event Log' button is operated. Any subsequent events stored in the module will not appear on the PC unless an update is requested. To prevent possible user confusion the event log display is cleared whenever a different Tab in 5xxx is selected, or if the link to the module is lost

**NOTE:**- It is not possible to 'Clear' the module event log.

## 7 SETUP MENU OPTIONS

### 7.1 LOCAL PC OPTIONS

This menu is used to access the software configuration file, to customise the way the software operates with the PC system. When selected the following is displayed:



Set-up This Software	Function
<p><a href="#">Communications Settings</a></p>	<p>Communications settings configure how the software is to communicate with the module.</p> <p><b>Change COM Port (COM2) -</b>                      This menu option is used to configure the software to use the appropriate COM port on the PC. Possible ports are COM1, COM2, COM3 or COM4. The COM ports are the RS232 interface terminals normally located on the rear of the PC, the module configuration software can use any one of these ports. A check should be made to ensure that the ports are not already in use by other sources such as mouse drivers or modems.</p> <p>Normally COM2 is the spare port with COM1 being used by a mouse. This can vary from PC to PC, so it is recommended that you check your configuration by referring to the documentation supplied with your PC or by contacting your PC support personnel. Should you still experience problems contact DEEP SEA ELECTRONICS for assistance.</p> <p>When using the USB version of P810 interface, the USB driver will create a 'virtual COM port' (i.e. COM6). This must be selected in the set up tab for the USB P810 to operate. The 'virtual COM port' may only be visible when the USB P810 is connected to the PC.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> <b>NOTE: - A quick check of correct communication with the module can be made by selecting the SCADA diagnostics mode, if no 'Heartbeat' is displayed this indicates that a communications link has not been established. Check the COM port setting as described above.</b></p> </div>
<p><a href="#">Security Settings</a></p>	<p>These options are used to set up certain security features, which will affect users with lower level passwords.</p> <p><b>Remote Control Enabled-</b>  <input type="checkbox"/> = If the remote control facility is disabled then the facility is removed from the 'Mimic' diagnostic SCADA display in all password levels.  <input checked="" type="checkbox"/> = If the remote control facility is enabled then a set of control buttons will be displayed in the 'Mimic' diagnostic SCADA display in all password levels. If these are operated, <i>(by using the mouse and clicking on them)</i> then the appropriate command is sent via the P810 interface to the <b>55xx</b> module.</p> <p><b>Remote Load Switching-</b>  <input type="checkbox"/> = If the remote load switching is disabled then the facility is removed from the 'Mimic' diagnostic SCADA display in all password levels.  <input checked="" type="checkbox"/> = If the remote load switching is enabled then a set of control buttons will be displayed in the 'Mimic' diagnostic SCADA display in all password levels. If these are operated, <i>(by using the mouse and clicking on them)</i> then the appropriate command is sent via the P810 interface to the <b>55xx</b> module.</p>

## SECURITY SETTINGS

### Operator Password

This option is used to change the operator level password used to access the software. In operator only limited changes can be made to the module configuration (Timer settings only), existing config files cannot be overwritten only new ones created.

The operator level password can only be changed if the Engineering level password is known; this is to prevent unauthorised password changes being made.

**NOTE: - The passwords are only to give access to the software for configuring the module, not for access to the module itself.**

When the option is selected the following will be displayed:

Type in the NEW password, this password is limited to 20 characters maximum; any combination of numbers and letters can be used. The software IS case sensitive.

Re-enter the NEW password, press the 'OK' button. The passwords will be verified and if they do not match the screen will display:

### MAINTENANCE Password

This option is used to change the MAINTENANCE level password used to access the software. In MAINTENANCE level access is limited to adjusting the internal clock and hour run counters, the accumulated instrumentation and performing software maintenance reset.

The Maintenance level password can only be changed if the Engineering level password is known; this is to prevent unauthorised password changes being made.

**NOTE: - The passwords are only to give access to the software for configuring the module, not for access to the module itself.**

### TECHNICIAN Password

This option is used to change the TECHNICIAN level password used to access the software. In Technician level access is limited to the module configuration only, the module sender calibration, internal clock and hour run counter cannot be adjusted.

The technician level password can only be changed if the Engineering level password is known; this is to prevent unauthorised password changes being made.

### Engineering Password

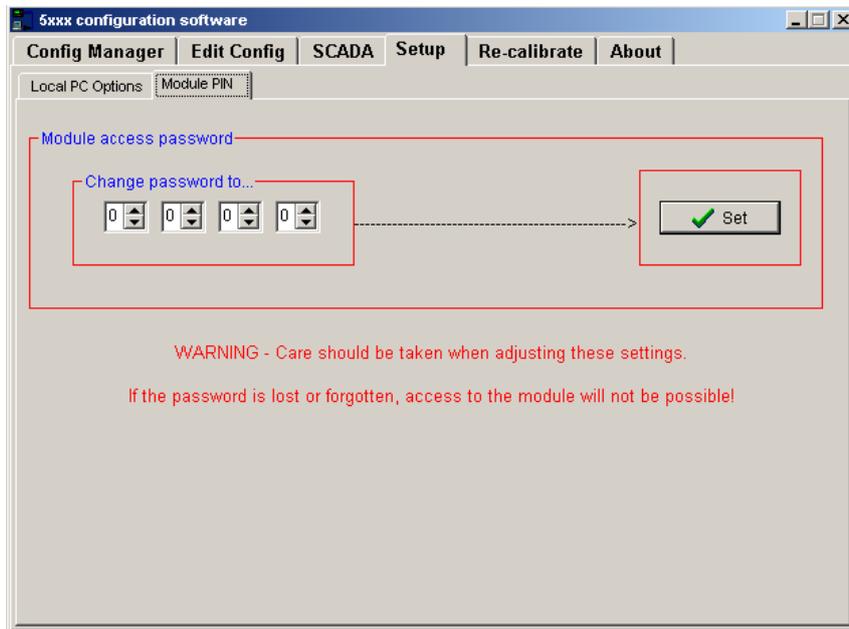
This option is used to change the engineering level password used to access the software.

If the software is accessed using the engineering password, all values are available for modification including the complete module configuration and sender calibration, internal clock and hours run counter.

**NOTE: - A fourth password level exists for use where the module is being used to provide a remote monitoring display on a PC. If the password 'MIMIC' is entered on start-up the software will enter the diagnostic Mimic display. No changes to any of the module settings or software configuration can be made without the correct operator or engineering password being entered. Refer to the 'Diagnostics' section of this manual.**

## 7.2 MODULE PIN

Permission to adjust the module's configuration settings is controlled by module PIN number. This is a four digit numeric code to protect both writing of a configuration file using the PC software, and access to the configuration using the front panel editor.



Enter the required security PIN number and click the SET button. The controller must be correctly connected to a DC Supply and to the PC via the P810 interface lead.

If a current module PIN is already set, the following will appear:



Using the selector the correct PIN should be selected and then the OK button selected. The PIN entered will be compared against the module PIN and if a match is found access will be granted. This access will remain active for as long as the connection is maintained by the 5xxx software. If the user selects to close the communication link the module will be instructed to secure itself again, and if the link is re-established the password will be requested again before control of the module is possible. Should the link to the PC be broken due to a comms error the module will wait a short period of time and if the comms link is not re-established it will secure itself again and request a correct PIN.

When the link is re-established the 55xx software will try to use the last PIN number entered during that session and if this fails it will try the default PIN number, if this also fails it will then prompt the user to enter the module PIN.

If an incorrect password is sent to the module the following screen is displayed:-



The module will allow three attempts to enter the PIN number – If this is exceeded it will stop responding to attempts for a period of 60 seconds. The following message will be displayed: -



After this period the module will start checking the PIN numbers again a further two attempts will be granted. If these are both incorrect, the module will again stop responding for double the previous period. This will continue to a maximum wait period between retries of 64 minutes. This is to prevent a more determined attack on the security of the module via a remote link.

**! CAUTION! - Ensure that you make a note of the PIN number when you allocate it to a module. With out the correct PIN number it will be impossible to gain configuration access to the module. If the PIN number is lost, the module will need to be returned to DSE to be re-initialised – All module setting will however be lost in this operation.**

**! CAUTION! - Setting a PIN number in the module will stop all access to the module via the 5xxx software in addition to the RS232 and RS485 ports. Therefore, it is important to ensure that any field service personnel who are likely to need access to the module configuration as advised of the PIN number prior to visiting site. Without the correct PIN number, the module will not allow changes to its configuration.**

## 8 RE-CALIBRATE

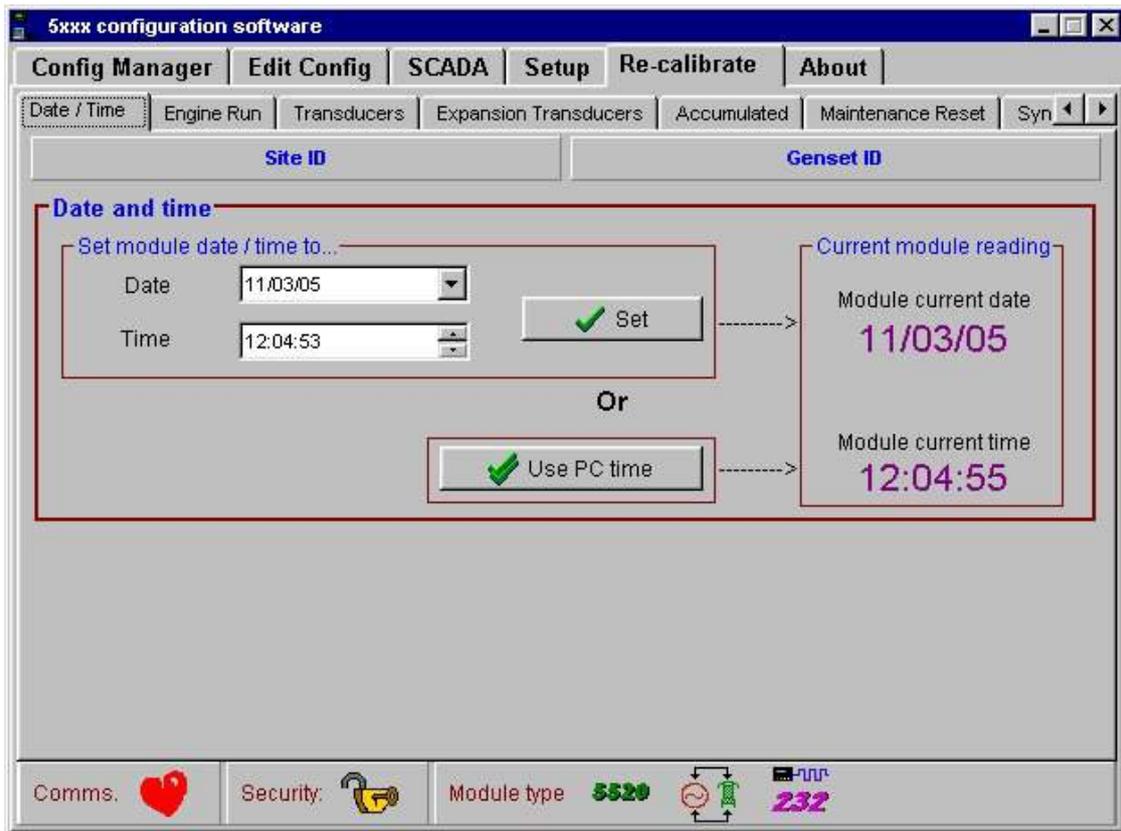
This menu is used for four purposes; the first is to configure the module to read the Oil pressure and coolant temperature senders correctly. The second function is to allow the engineer to set the module's internal clock, hours run counter, KW Hour meter, etc, etc. The Third is to allow the operator to perform a software maintenance reset in the event of the module maintenance alarm being active. The fourth is while commissioning to allow the engineer to set up the module synchronising and load sharing features.

**NOTE:** - The re-calibration display screens are updated by information sent from the module; if the link to the module is lost the information displayed could be incorrect and is therefore 'greyed out'. A small icon in the bottom right of each diagnostic display indicates that the link to the module is healthy.



When selected the following is displayed:

### 8.1 DATE / TIME



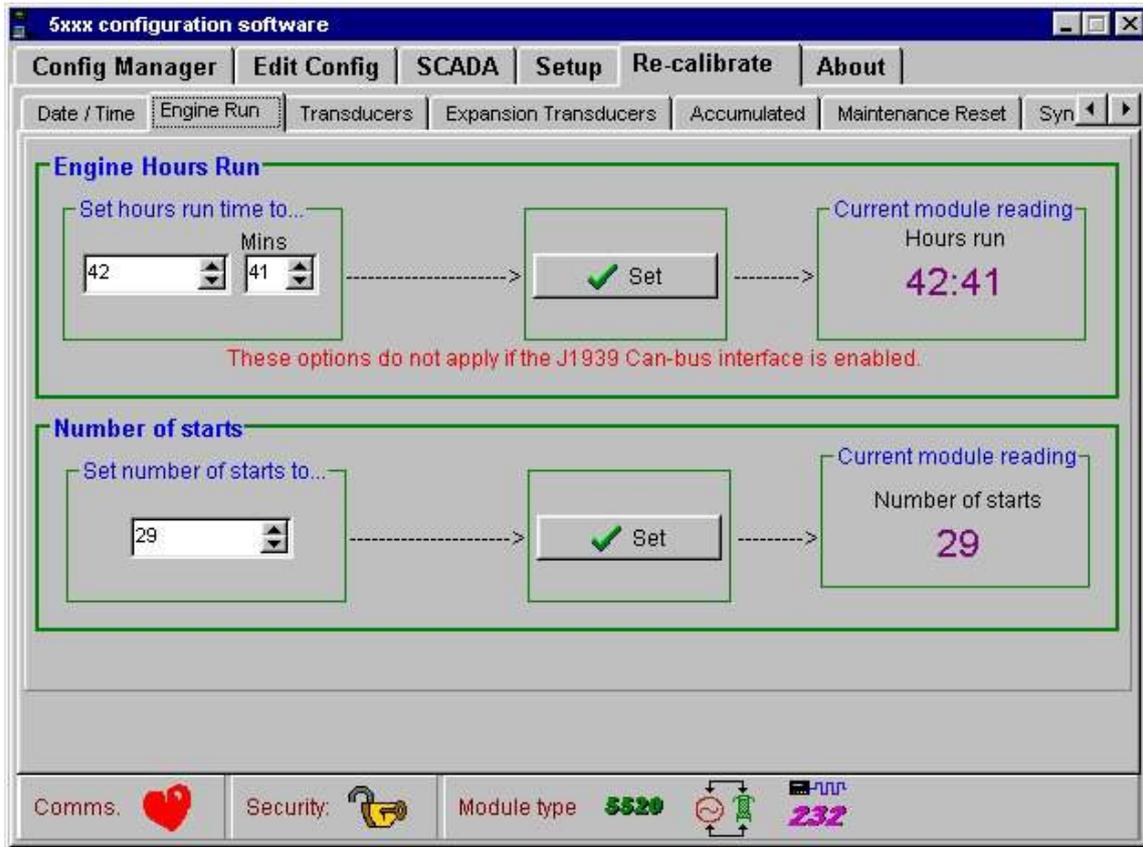
This option will allow the engineer to re-calibrate the modules' internal clock

There are two possible ways to set the module time and date: -

- 1) Using the 'Date' and 'Time' tools on the screen set the required module time and date and then press the 'SET' button. The time and date set will then be transferred to the module and the 'Current module setting' display will change to reflect this.
- 2) If you wish to match the module time and date to the same settings as used by your PC simple press the 'Use PC time' button. The current time and date will be taken from your PC clock and sent to the module. Again, the 'Current module setting' display will change to reflect this.

## 8.2 ENGINE RUN

(Not applicable to 5560.)



This option will allow the engineer to re-calibrate the modules' hours run and number of starts counter.

### ENGINE HOURS RUN

(Not applicable to 5560.)

It is possible to set the module engine hours run counter to the required value, for instance if the control system is to be used with an existing generating set, the hours run reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the hours run counter on a new generator could be reset to zero following testing.

To set the hours run simply set the accumulated time in the tool provided and press the 'SET' button. The hours run value entered will be sent to the module. The 'Current module reading' display will change to reflect this.

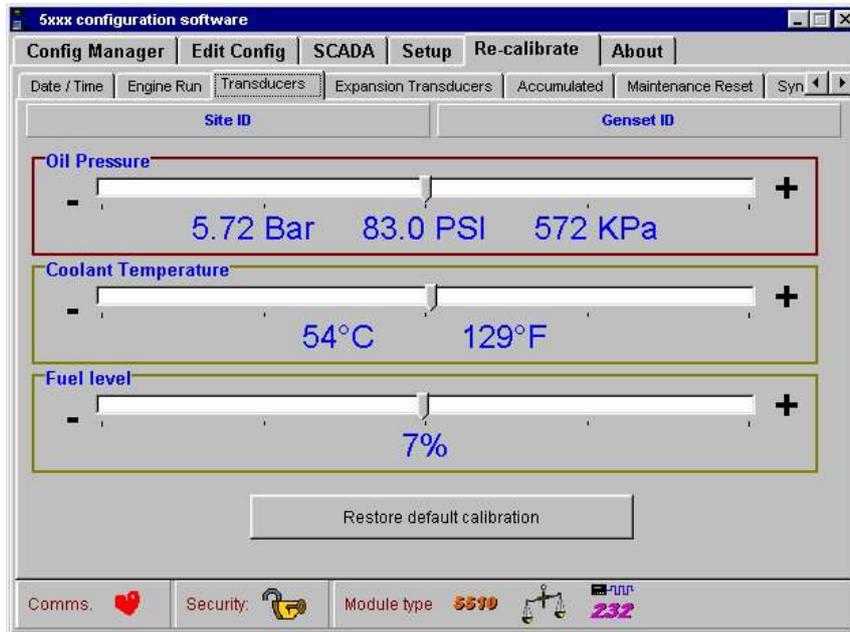
### NUMBER OF STARTS

(Not applicable to 5560.)

It is possible to set the module number of starts counter to the required value, for instance if the control system is to be used with an existing generating set, the starts reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the starts counter on a new generator could be reset to zero following testing.

## 8.3 TRANSDUCERS

(Not applicable to 5560.)



This option will allow the engineer to re-calibrate the module transducers such that it will read correctly the oil pressure and coolant temperature values. This action may be necessary as the senders used for sensing the pressure and temperature are electro/mechanical devices and as such suffer from a degree of inaccuracy. The ability to re-calibrate the senders is akin to turning the adjustment screw on a conventional engine gauge.

**CAUTION! - To re-calibrate the senders a known good, accurate sensing device must be used and the module reading adjusted to match.**

### OIL PRESSURE

(Not applicable to 5560.)

The reading shown below the adjustable slider is the current module reading. Read the actual Oil pressure off the accurate sensing device and then by moving the slider up or down adjust the value displayed to match that of the accurate sensing device. Once matched release the slider, the new value will be stored in the module.

### COOLANT TEMPERATURE

(Not applicable to 5560.)

The reading shown below the adjustable slider is the current module reading. Read the actual coolant temperature off the accurate sensing device and then by moving the slider up or down adjust the value displayed to match that of the accurate sensing device. Once matched release the slider, the new value will be stored in the module.

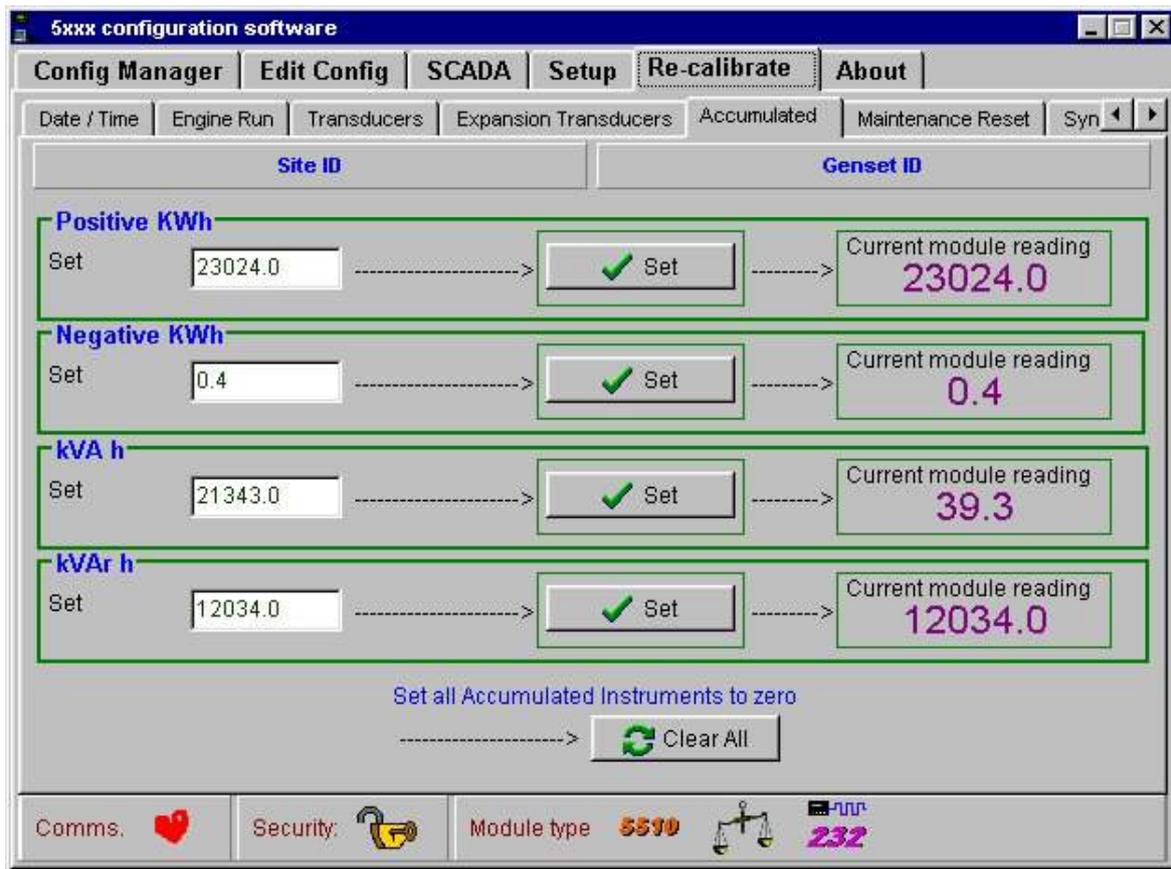
### FUEL LEVEL

(Not applicable to 5560.)

The reading shown below the adjustable slider is the current module reading. Read the actual fuel level off the accurate sensing device and then by moving the slider up or down adjust the value displayed to match that of the accurate sensing device. Once matched release the slider, the new value will be stored in the module.

If at any time you wish to return the settings to standard and remove the re-calibration applied to the senders, simply press the 'Restore default calibration' button. This could be used for example if the sender calibration appeared inaccurate and was modified, then a panel wiring fault was traced as being the cause of the inaccuracy.

## 8.4 ACCUMULATED



This option will allow the engineer to calibrate the modules' accumulated memory

### Pos KWh

It is possible to set the module's KWh counter to the required value, for instance if the control system is to be used with an existing generating set, the hours run reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the KWh counter on a generator could be reset to zero following return from rental.

To set the KWh simply set the accumulated value in the tool provided and press the 'SET' button. The hours run value entered will be sent to the module. The '*Current module reading*' display will change to reflect this.

### Neg KWh

It is possible to set the module's KWh counter to the required value, for instance if the control system is to be used with an existing generating set, the hours run reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the KWh counter on a generator could be reset to zero following return from rental.

To set the KWh simply set the accumulated value in the tool provided and press the 'SET' button. The hours run value entered will be sent to the module. The '*Current module reading*' display will change to reflect this.

### **KVAh**

It is possible to set the module's KVAh counter to the required value, for instance if the control system is to be used with an existing generating set, the hours run reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the KVAh counter on a generator could be reset to zero following return from rental.

To set the KVAh simply set the accumulated value in the tool provided and press the 'SET' button. The hours run value entered will be sent to the module. The '*Current module reading*' display will change to reflect this.

### **KVArh**

It is possible to set the module KVArh counter to the required value, for instance if the control system is to be used with an existing generating set, the hours run reading can be transferred to the new control system, thereby maintaining the history of the generating set. Alternatively, the KVArh counter on a generator could be reset to zero following return from rental.

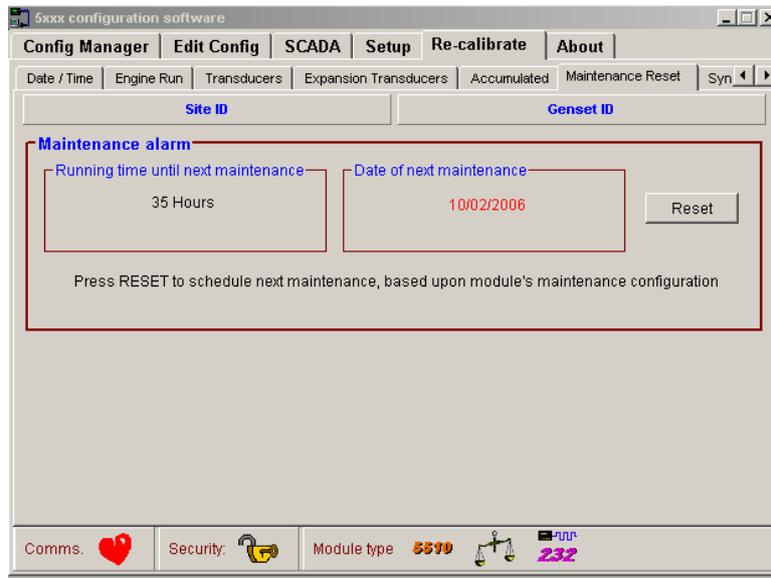
To set the KVArh simply set the accumulated value in the tool provided and press the 'SET' button. The hours run value entered will be sent to the module. The '*Current module reading*' display will change to reflect this.

### **Clear All**

If at any time, you wish to zero all the settings simply press the '*Clear All*' button.

## 8.5 MAINTENANCE RESET

(Not applicable to 5560.)



### RESET

It is possible to reset the maintenance due alarm back to the pre-configured interval. When operated the 'Reset' button will restore the Running Hours until Maintenance due and the date of the next maintenance to the intervals stored in the module configuration.

If the maintenance alarm is active, it can only be reset after the 'Reset' has been sent.

**NOTE:** - The maintenance reset function does not allow the operator to change the maintenance interval, **ONLY** reinstate the allowed maintenance intervals from values stored in the module configuration.

## 8.6 SYNC & LOAD CONTROL



**WARNING:** - Until all synchronising adjustments have been satisfactorily completed, ensure the generator contactor/breaker is disabled. You can do this by either disabling the controller's contactor/breaker output using the 5xxx configuration software, or by simply removing the connections to the contactor/breaker. Ensure any disconnected wires are suitably insulated.

The method of setting up the 55xx synchroniser depends upon the interface method between the 55xx controller and the AVR/Governor.

If your interface method uses the internal 55xx raise/lower relays then you will use the 'pulse' scheme.

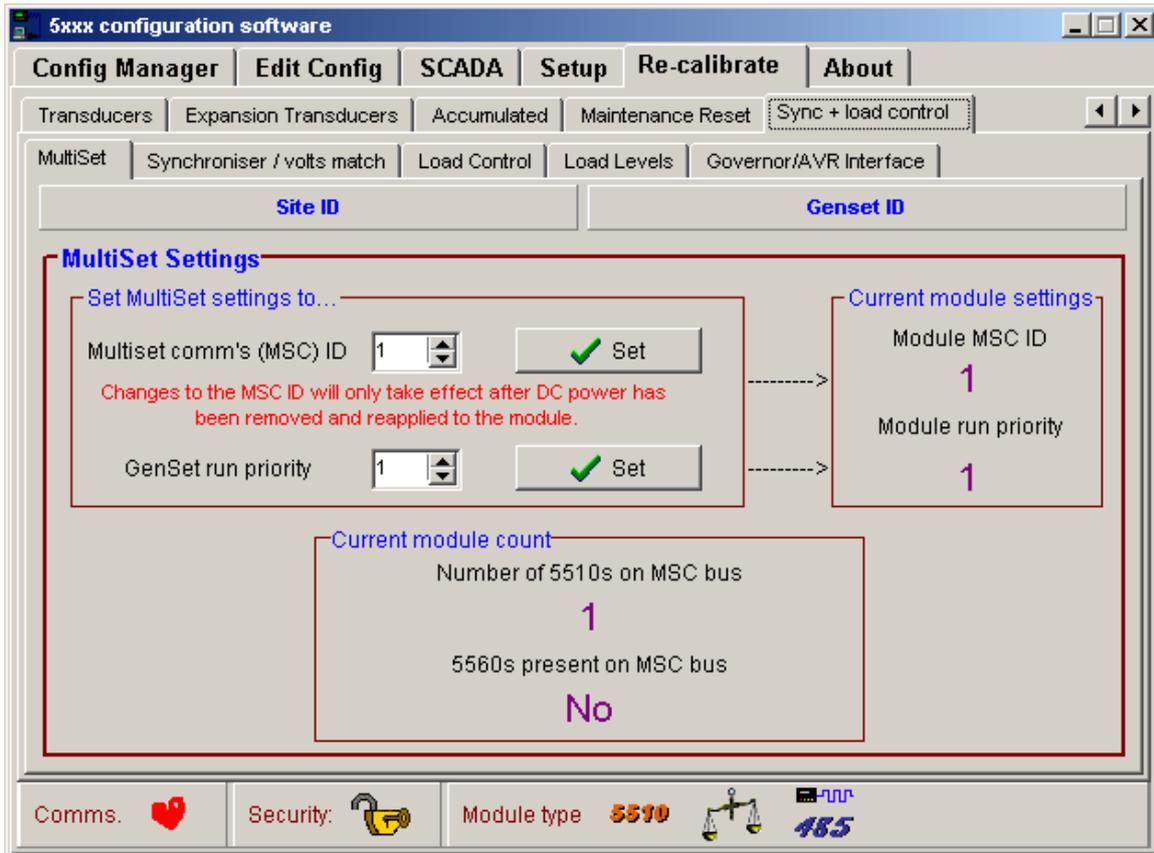
If your interface method uses the internal analogue interface module, then you will use the 'analogue' scheme.

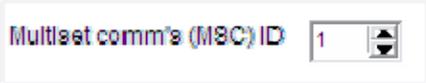


**NOTE:** - There are multiple combinations of interface method:

- 1) Internal raise/lower relays to interface to governor and AVR using the 'pulse scheme'
- 2) Internal raise/lower speed relays to interface to governor ('pulse' scheme) and internal analogue interface to AVR ('analogue' scheme).
- 3) Internal analogue interface to governor ('analogue' scheme) and Internal raise/lower voltage relays to interface to AVR.
- 4) Internal analogue interface to governor and internal analogue interface to AVR (both using the 'analogue scheme')
- 5) CAN control of supported engine types such as VOLVO TAD9/TAD16 and other compatible engines.

### 8.6.1 MULTI SET

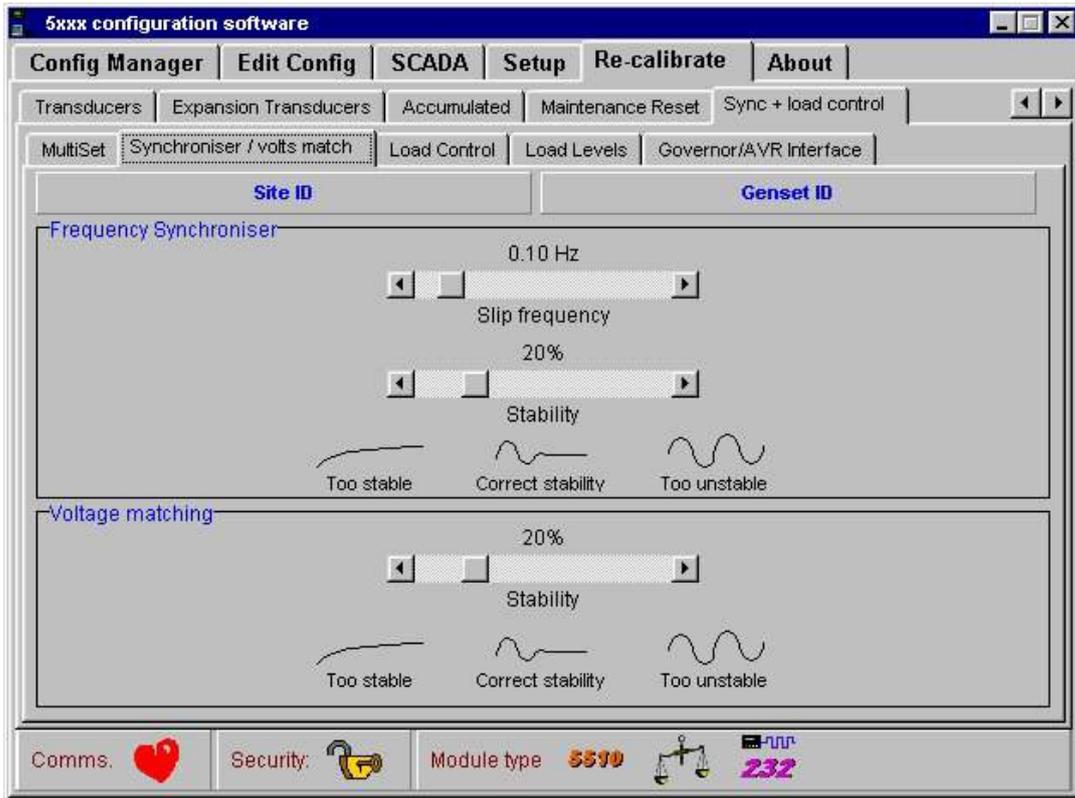


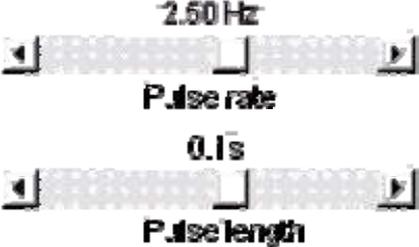
Item	Function
	This setting is used to give the module a unique ID addresses with the modules on the MSC link.
 IEEE 37.2 -10 Unit sequence switch	This is used to set the run priority when using the load demand scheme.
Current module count	<b>5510 controller</b> : Shows the number of 5510 controllers connected on the Multiset comms link and whether one or more 5560 mains controllers are connected.  <b>5560 controller</b> : Shows the number of 5510 and 5560 controllers connected on the Multiset comms link.

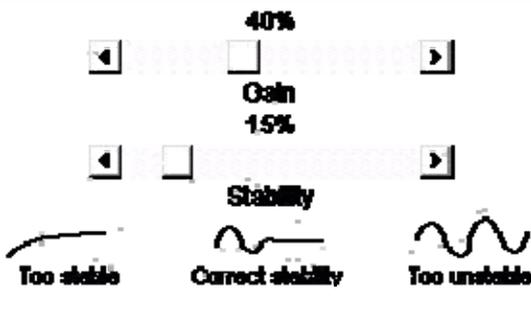
**NOTE:** - The module's DC power must be cycled before the module will respond to a change in the MSC ID.

**NOTE:** - 5510 module versions 5.10 and later have 'auto MSC ID' negotiation. If the MSC ID is the same as another module's ID, the module will automatically adjust its ID to a unique number after the power is cycled.

### 8.6.2 SYNCHRONISER / VOLTS MATCH

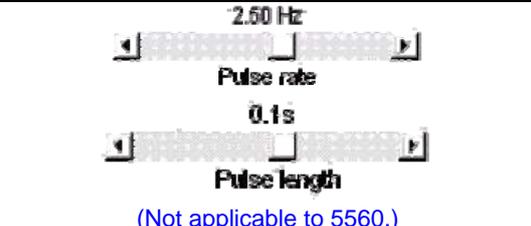


Item	Function
 <p style="text-align: center;"><b>0.20 Hz</b> <b>Slip frequency</b></p>	<p><b>Slip frequency:</b> The difference between generator frequency and the bus/mains frequency. The 55xx controller will adjust engine speed until the frequency difference matches the slip frequency. The phase of the supplies will then drift in and out of synchronism at a rate of 1/slip-frequency times per second. I.e. for Slip frequency of 0.2Hz, the supplies will be in phase once every five seconds.</p>
 <p style="text-align: center;"><b>2.50 Hz</b> <b>Pulse rate</b></p> <p style="text-align: center;"><b>0.1s</b> <b>Pulse length</b></p> <p style="text-align: center;">(Not applicable to 5560.)</p>	<p><b>Pulse rate</b> (Not applicable when using internal analogue system)</p> <p>The number of raise/lower changes per second of the raise / lower relay outputs.</p> <p><b>Pulse length</b> (Not applicable when using Internal analogue system)</p> <p>The lengths of raise/lower pulses of the raise / lower relay outputs.</p>

Item	Function
	<p><b>Gain / Stability:</b> In general, lower setting results in a slow frequency matching process, but too high a setting may cause instability (hunting). If this occurs, lower the stability setting. If this has no effect, lower the gain setting.</p> <p><b>NOTE:</b> - Stability setting only applicable when using internal analogue system or CAN control.</p>

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

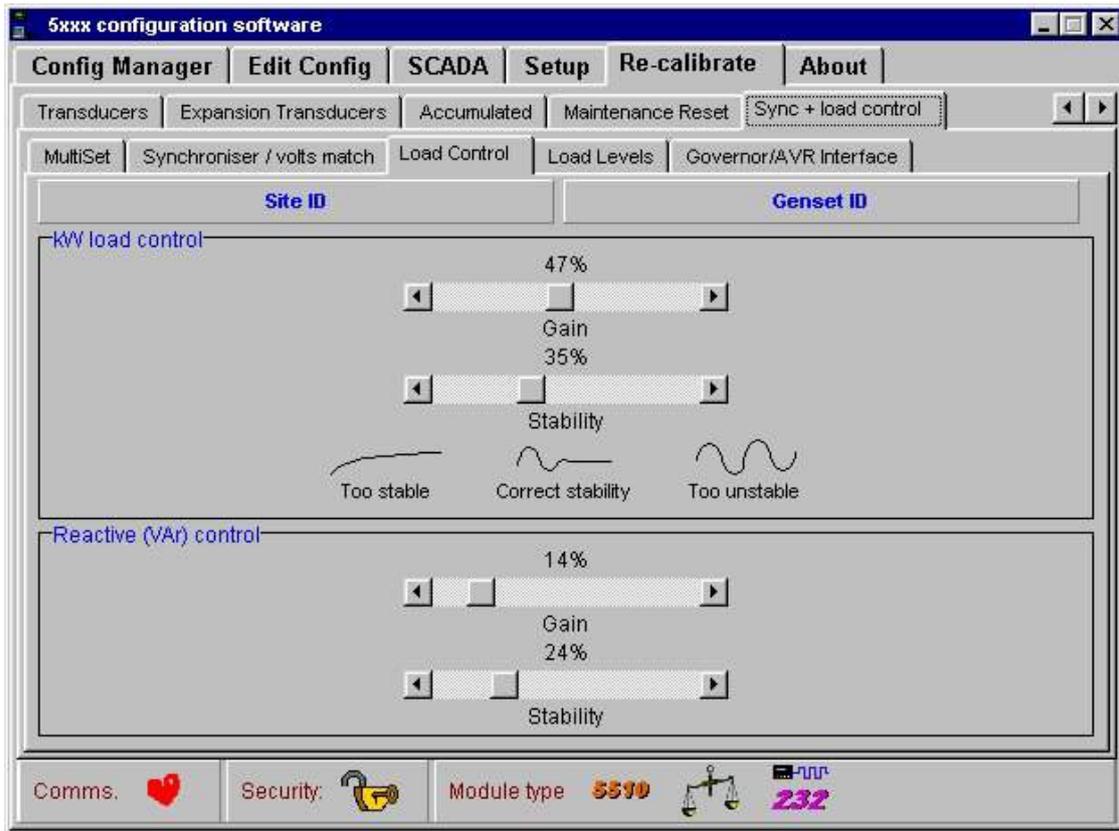
**NOTE:** - As shown in the 'graph' images above, correct setting of gain/stability is achieved when the engine speed 'overshoots' it's target two or three times before settling. Less overshoot will result in a slower synchronising process. More overshoots will lead to an unstable engine speed.

Item	Function
	<p><b>Pulse rate</b> (Not applicable when using internal analogue system) The number of raise/lower changes per second of the raise / lower relay outputs.</p> <p><b>Pulse length</b> (Not applicable when using internal analogue system) The lengths of raise/lower pulses of the raise / lower relay outputs.</p>
	<p><b>Gain / Stability:</b> In general, lower setting results in a slow voltage matching process, but too high a setting may cause instability (hunting). If this occurs, lower the stability setting. If this has no effect, lower the gain setting.</p>
<p><b>NOTE:</b> - Stability setting only applicable when using internal analogue system or CAN control</p>	

**NOTE:** - Start with gain and stability at the minimum settings. Increase gain until the generator voltage becomes unstable, then half the gain setting. Now increase the stability setting until the voltage again becomes unstable, then lower a little. You may need to perform the voltage-matching process a number of times to see the effect of your changes.

**NOTE:** - As shown in the 'graph' images above, correct setting of gain/stability is achieved when the voltage 'overshoots' it's target two or three times before settling. Less overshoot will result in a slower voltage-matching process. More overshoots will lead to an unstable voltage.

### 8.6.3 LOAD CONTROL



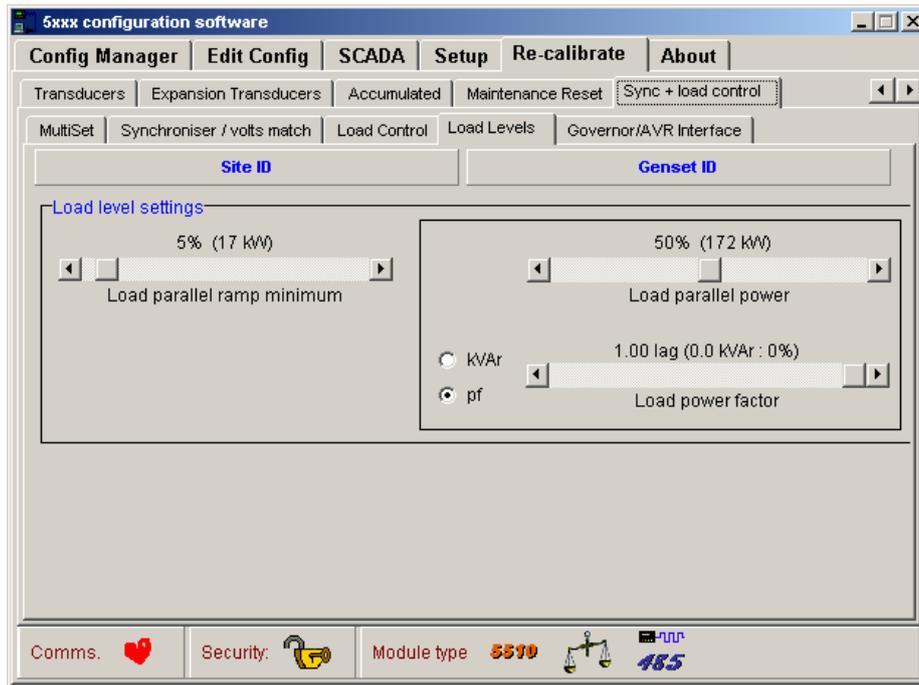
Item	Function
	<p><b>Gain and stability:</b> In general, a lower setting results in slower changes to the load control. Too high a setting may cause instability in changes to the load control. If this occurs, lower the settings.</p>

**NOTE:** - Start with gain and stability at the minimum settings. Increase gain until the engine speed becomes unstable, then half the gain setting. Now increase the stability setting until the engine speed again becomes unstable, then lower a little. You may need to change load levels a number of times to see the effect of your changes. You can change the 'load parallel power' setting (5520) to disturb the load-share process and 'force' the controller into making further changes.

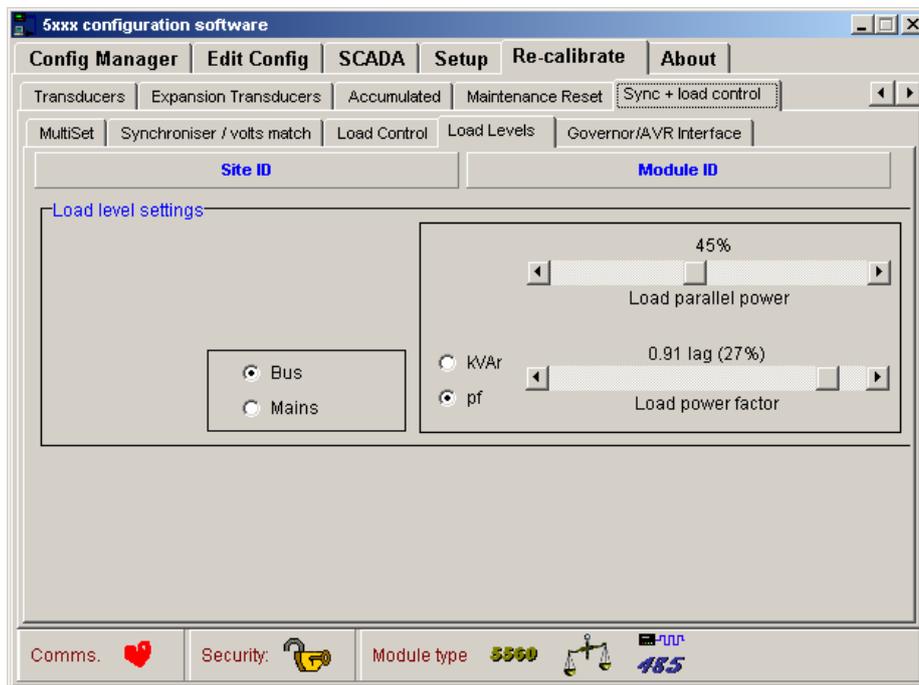
**NOTE:** - As shown in the 'graph' images above, correct setting of gain/stability is achieved when the %age load share passes its target two or three times before settling. When using multiple 5510 controllers, stability is considered to once the %age share of all controllers in the system are less than 2% apart while no load changes take place, this is considered to be stable. If the %age load share passes its target twice or less before achieving stability, this is considered to be too slow. If it passes its target more than 2 or three times, this will lead to an unstable load share between controllers. This could ultimately lead to the set being reverse powered by the bus (or utility supply on 5520) and in the case of multiple generators being on the bus, may result in the set reverse powering (motoring) one or more of the other generators on the bus.

Item	Function
<p><b>Load level settings</b></p> <p><b>5% (2 kW)</b></p> <p>◀ ◻ ▶</p> <p><b>Load parallel ramp minimum</b></p>	<p><b>Load parallel ramp minimum:</b> The level to which the generator will ramp down to before being removed from the bus and the level the generator will ramp up from when being applied to the bus. i.e. This level sets the “bottom” of the load ramp.</p>
<p><b>100% (48 kW)</b></p> <p>◻ ▶</p> <p><b>Load parallel power</b></p>	<p><b>Load parallel power:</b> The amount of power that the set will produce when used in ‘Load level control’, whilst running in parallel with the mains (utility).</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>⚠ NOTE: - If the load level is below this setting, then the generator will export power to the mains grid. If no export agreement with the Electricity Supply Company exists, a reverse power unit on the incoming mains supply should be utilised to prevent this situation occurring.</b></p> </div>

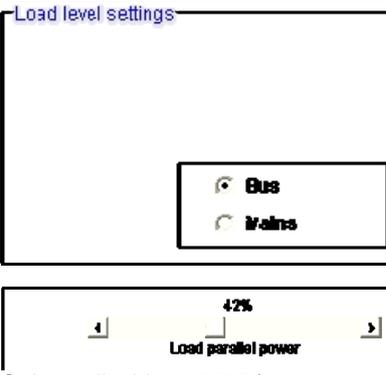
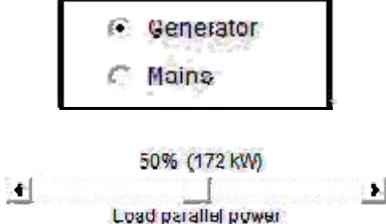
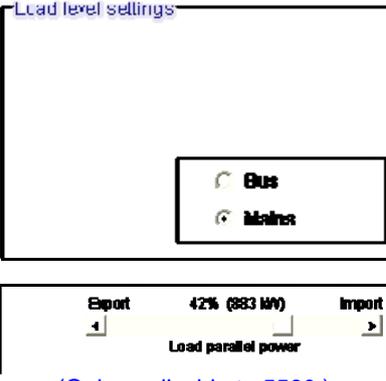
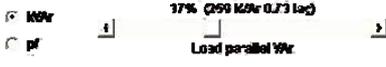
### 8.6.4 LOAD LEVELS

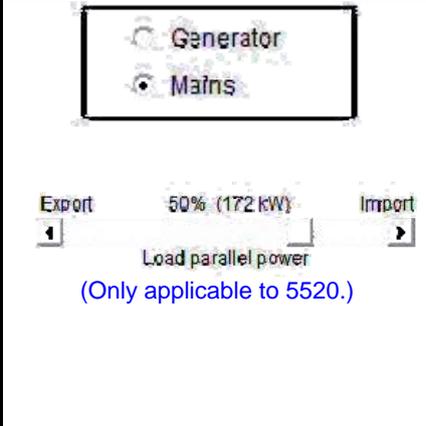
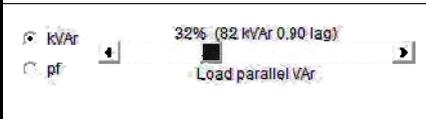
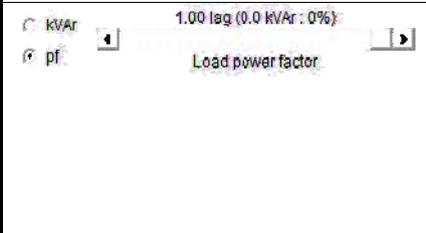


5510



5520 / 5560

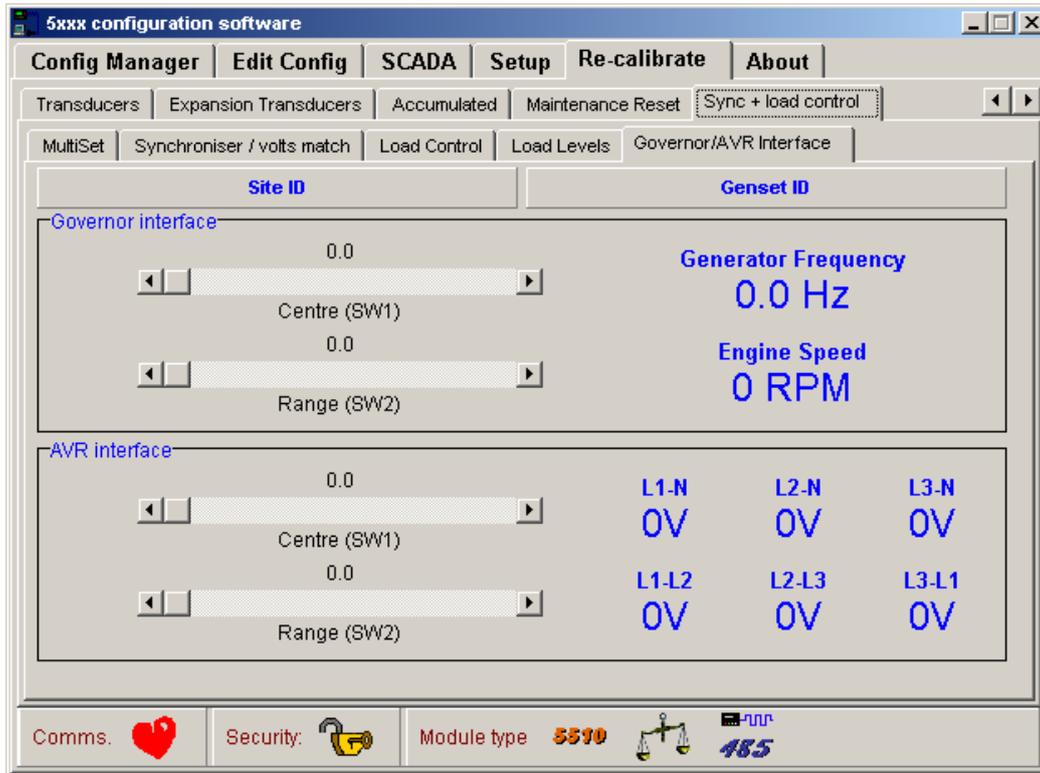
Item	Function
 <p>(Only applicable to 5560.)</p>	<p><b>Bus Control: (5560 Only).</b> The amount of power that the sets will produce when in parallel with the mains. This figure is a percentage of each generators capacity that is connected to the bus. Therefore, the actual kW will vary depending on how many sets are on the bus. The 'load demand start up and shut down scheme' is <b>disabled</b> whilst running in parallel with the mains (utility). E.g. on a multi set system where each generator is rated at 500 kW and the bus power was set to 50%, each set running would produce 250 kW of power.</p> <p><b>NOTE:</b> - If the load level is below this setting, then the generator will export power to the mains grid. The 5560 internal mains power protection can be configured to decouple the generators from the mains.</p>
 <p>(Only applicable to 5520.)</p>	<p><b>Generator Control: (5520 Only).</b> The amount of power that the set will produce when in parallel with the mains. This figure is a percentage of the generators capacity.</p> <p><b>NOTE:</b> - If the load level is below this setting, then the generator will export power to the mains grid. The 5520 internal mains power protection can be configured to decouple the generators from the mains.</p>
 <p>(Only applicable to 5560.)</p>	<p><b>Mains Control: (5560 Only).</b> The amount of power that the sets produce will vary to ensure that the mains will always supply the desired level. This level can either be an amount of imported power or exported power.</p> <p>E.g. If the mains load level was set to 250 kW the generators would supply the difference between this figure and total connected load. If the load was lower than this figure then the generators come off load and perform a controlled stop. Therefore, this setting is also a start level when remote start on load is active.</p> <p><b>NOTE:</b> - The generators will never be driven to more than 100% of their full load capability.</p>
	<p><b>KVAR control:</b> The amount of reactive power that the set will produce when used in 'load level control' mode, when Reactive Load Control Mode is set to Load Level Control</p>
	<p><b>Pf control:</b> The power factor that the set will maintain when used in 'load level control' mode, when Reactive Load Control Mode is set to Load Level Control)</p> <p><b>NOTE:</b> - At low load levels, it may not be possible to maintain the power factor.</p>

Item	Function
	<p><b>Mains Control: (5520 Only).</b> The amount of power that the set will produce will vary to ensure that the mains will always supply the desired level. This level can either be an amount of imported power or exported power, and requires the mains CT to being fitted.</p> <p>E.g. If the mains load level was set to 172 kW the generator would supply the difference between this figure and total connected load. If the load was lower than this figure then the generator will come off load and perform a controlled stop. Therefore, this setting is also a start level when remote start on load is active.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE: - The generator will never be driven to more than 100% of its full load capability.</b></p> </div>
	<p><b>KVAR control:</b> The amount of reactive power that the set will produce when used in 'load level control' mode, when <i>Reactive Load Control Mode</i> is set to <i>Load Level Control</i></p>
	<p><b>Pf control:</b> The power factor that the set will maintain when used in 'load level control' mode, when <i>Reactive Load Control Mode</i> is set to <i>Load Level Control</i></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE: - At low load levels it may not be possible to maintain the power factor.</b></p> </div>

## 8.6.5 GOVERNOR / AVR INTERFACE

(Not applicable to 5560.)

Only applicable if using internal analogue system or CAN control.



### CENTRE and RANGE setting

These settings are used to match the output from the internal analogue control system to the requirements of the governor and AVR. Please refer to the guide to sync and load share part II for listings of the settings for most commonly used governors and AVR's.

**NOTE:** - These settings must be made before attempting any load share or synchronising operations.

**NOTE:-** Where CAN is being used to control the engine speed, SW1 should be set to 5.0. The 'analogue' output is still active, although this will not be used. This allows checking of the speed control system by measuring the analogue output with a voltmeter thereby verifying the control system.

## 9 ACCESSORIES

### 9.1 OUTPUT EXPANSION

There are several methods of output expansion available for the 55xx range of modules: -

#### 9.1.1 RELAY OUTPUT EXPANSION (157)

An expansion module is available, which connects to the configuration socket, and enables the 55xx to use eight additional relays, providing Volt-free contacts for customer connection. A maximum of two of these units can be used give 16 independent volt-free contacts.

The 157's need to be identified as module 'A' and module 'B'

Refer to technical data sheet on the 157 relay module for further details.

#### 9.1.2 LED OUTPUT EXPANSION (548)

An expansion module is available, which connects to the configuration socket, and enables the 55xx to use the eight additional LED's on the 548 module, providing remote LED's indication. A maximum of two of these units can be used give 16 independent remote LED's.

The 548's need to be identified as module 'A' and module 'B'

Refer to technical data sheet on the 548 LED modules for further details.

It is possible to use a mix of 157 and 548 modules to give both relay and LED expansion if required.

### 9.2 INPUT EXPANSION (P130/P540/P541)

It is possible to increase the number of monitored inputs available by utilising either:

- DSE P130 input expansion.
- 540 / 541 Protection Expansion/Annunciator.

Please refer to the relevant product documentation for further details.

### 9.3 COMMUNICATIONS EXPANSION

The 55xx Modules have an integral communications board fitted. This can be either RS232 or RS485 output (specify on ordering).

The RS232 port is designed to be connected to DSE Link5000Plus P.S.T.N. (fixed line telephone) modem or to a GSM cellular network modem.

The RS485 port provides a modbus RTU interface to allow connections to DSE Link5000Plus monitoring/control software or connection to DSE P820 or to a third party modbus enabled P.L.C or building management system.

*Refer to the Link5000plus Manual for further details on communications expansion.*

 <b>NOTE:- 5560 controller only available with RS485 communications.</b>
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## 10 FUNCTION NUMBERS AND CONTACT DESIGNATIONS IEEE STD C37.2-1996

**Excerpt taken from IEEE Std C37.2-1996 IEEE Standard Electrical Power System Device Function Numbers and Contact Designations.**

Institute of Electrical and Electronics Engineers Inc. ISBN 1-55937-879-4

**Device number 2**—time-delay starting or closing relay

A device that functions to give a desired amount of time delay before or after any point of operation in a switching sequence or protective relay system, except as specifically provided by device functions 48, 62, 79, and 82.

**Device number 3**—checking or interlocking relay

A device that operates in response to the position of one or more other devices or predetermined conditions in a piece of equipment or circuit, to allow an operating sequence to proceed, or to stop, or to provide a check of the position of these devices or conditions for any purpose.

**Device number 10**—unit sequence switch

A device that is used to change the sequence in which units may be placed in and out of service in multiple-unit equipment.

**Device number 11**—multifunction device

A device that performs three or more comparatively important functions that could only be designated by combining several device function numbers. All of the functions performed by device 11 shall be defined in the drawing legend, device function definition list or relay setting record. See Annex B for further discussion and examples.

**Device number 12**—overspeed device

A device, usually direct connected, that operates on machine overspeed.

**Device number 14**—underspeed device

A device that functions when the speed of a machine falls below a predetermined value.

**Device number 15**—speed or frequency matching device

A device that functions to match and hold the speed or frequency of a machine or a system equal to, or approximately equal to, that of another machine, source, or system.

**Device number 18**—accelerating or decelerating device

A device that is used to close or cause the closing of circuits that are used to increase or decrease the speed of a machine.

**Device number 25**—synchronizing or synchronism-check relay

A synchronizing device produces an output that causes closure at zero-phase angle difference between two circuits. It may or may not include voltage and speed control. A synchronism-check relay permits the paralleling of two circuits that are within prescribed limits of voltage magnitude, phase angle, and frequency.

**Device number 27**—undervoltage relay

A device that operates when its input voltage is less than a predetermined value.

**Device number 30**—annunciator relay

A nonautomatically reset device that gives a number of separate visual indications upon the functioning of protective devices and that may also be arranged to perform a lockout function.

**Device number 32**—directional power relay

A device that operates on a predetermined value of power flow in a given direction such as reverse power flow resulting from the motoring of a generator upon loss of its prime mover.

**Device number 44**—unit sequence starting relay

A device that functions to start the next available unit in multiple-unit equipment upon the failure or non-availability of the normally preceding unit.

**Device number 46**—reverse-phase or phase-balance current relay

A device in a polyphase circuit that operates when the polyphase currents are of reverse-phase sequence or when the polyphase currents are unbalanced or when the negative phase-sequence current exceeds a preset value.

**Device number 48**—incomplete sequence relay

A device that generally returns the equipment to the normal or off position and locks it out if the normal starting, operating, or stopping sequence is not properly completed within a predetermined time.

**Device number 50**—instantaneous overcurrent relay

A device that operates with no intentional time delay when the current exceeds a preset value.

**Device number 51**—ac time overcurrent relay

A device that functions when the ac input current exceeds a predetermined value, and in which the input current and operating time are inversely related through a substantial portion of the performance range.

**Device number 52**—ac circuit breaker

A device that is used to close and interrupt an ac power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.

**Device number 54**—turning gear engaging device

A device either electrically operated, controlled, or monitored that functions to cause the turning gear to engage (or disengage) the machine shaft.

**Device number 55**—power factor relay

A device that operates when the power factor in an ac circuit rises above or falls below a predetermined value.

**Device number 59**—overvoltage relay

A device that operates when its input voltage exceeds a predetermined value.

**Device number 60**—voltage or current balance relay

A device that operates on a given difference in voltage, or current input or output, of two circuits.

**Device number 62**—time-delay stopping or opening relay

A device that imposes a time delay in conjunction with the device that initiates the shutdown, stopping, or opening operation in an automatic sequence or protective relay system.

**Device number 63**—pressure switch

A device that operates at a given pressure value or at a given rate of change of pressure.

**Device number 65**—governor

A device consisting of an assembly of fluid, electrical, or mechanical control equipment used for regulating the flow of water, steam, or other media to the prime mover for such purposes as starting, holding speed or load, or stopping.

**Device number 67**—ac directional overcurrent relay

A device that functions at a desired value of ac overcurrent flowing in a predetermined direction.

**Device number 71**—level switch

A device that operates at a given level value, or on a given rate of change of level.

**Device number 74**—alarm relay

A device other than an annunciator, as covered under device function 30, that is used to operate, or that operates in connection with, a visual or audible alarm.

**Device number 78**—phase-angle measuring relay

A device that functions at a predetermined phase angle between two voltages, between two currents, or between voltage and current.

**Device number 81**—frequency relay

A device that responds to the frequency of an electrical quantity, operating when the frequency or rate of change of frequency exceeds or is less than a predetermined value.

**Device number 90**—regulating device

A device that functions to regulate a quantity or quantities, such as voltage, current, power, speed, frequency, temperature, and load, at a certain value or between certain (generally close) limits for machines, tie lines, or other apparatus.