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**DEEP SEA ELECTRONICS PLC**

**DSE4110**

**AUTOSTART CONTROL MODULE**

**OPERATING MANUAL**



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DSE Model 4110 Control System Operators Manual

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# 1 INTRODUCTION

The **DSE 4110** automatic start module has been primarily designed to allow the user to start and stop the generator, transferring the load automatically to the generator. If required the generator can be started and stopped manually.








The **DSE 4110** module has a built in LCD hours counter, which displays the number of hours that the generator has run, to the nearest 1/10 hour.

The **DSE 4110** module monitors the engine, utilising 8 LEDs to indicate fault conditions. When a fault is detected the generator is automatically shut down, giving a true first up fault condition.

The customer, using the module's front panel configuration editor, can alter selective operational sequences, timers and alarm trips.

The module is housed in a fully enclosed robust plastic case for front panel mounting, offering a high rating of IP56 with the optional gasket. Connections to the module are via locking plug and sockets.

# 2 CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.

	<b>NOTE:</b>	Highlights an essential element of a procedure to ensure correctness.
	<b>CAUTION!</b>	Indicates a procedure or practice which, if not strictly observed, could result in damage or destruction of equipment.
	<b>WARNING!</b>	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.
		Deep Sea Electronics Plc owns the copyright to this manual, which cannot be copied, reproduced or disclosed to a third party without prior written permission.
		Compliant with BS EN 60950 Low Voltage Directive Compliant with BS EN 50081-2 EMC Directive Compliant with BS EN 50082-2 EMC Directive
		UL Registered Component for USA & Canada
		Year 2000 Compliant

### 3 OPERATION

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

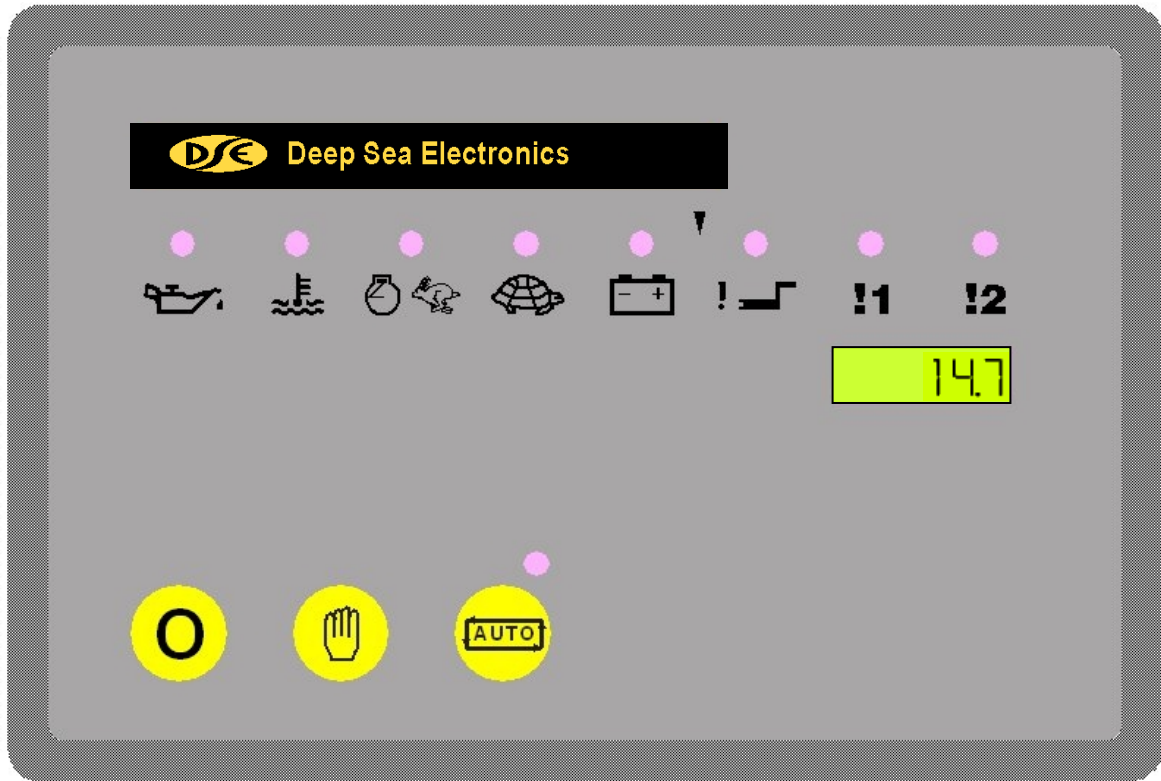


FIG 1

#### 3.1 AUTOMATIC MODE OF OPERATION


This mode is activated by pressing the **Auto**  pushbutton. An LED indicator beside the button confirms this action.

The start sequence is initiated when the remote start input is activated. To allow for false remote start signals, the Start Delay timer is initiated. After this delay, if the pre-heat output option is selected then the pre-heat timer is initiated and the corresponding auxiliary output (if configured) will energise.

**NOTE:-** If the Remote Start signal is removed during the Start Delay timer, the unit will return to a stand-by state.

After the above delays, the **Fuel Solenoid** is energised, then one second later, the **Starter Motor** is engaged.

The engine is cranked for a 10-second period. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for a 10-second rest period. Should this sequence continue beyond the 3 starting attempts, the start sequence will be terminated and

**Fail to Start**  fault will be illuminated.

When the engine fires, the starter motor is disengaged and locked out at 20 Hz measured from the Alternator output. Rising oil pressure can also be used to disconnect the starter motor, however it cannot be used for underspeed or overspeed detection.

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

Once the engine is running, the **Warm Up** timer, if selected, is initiated, allowing the engine to stabilise before it can be loaded.

Once the **Warm Up** timer has expired, the output **Load Transfer** is activated if it has been configured.

On removal of the **Remote Start** signal the **Stop Delay** timer is initiated. After which the **Load Transfer** output (if configured) is deactivated and the **Cool Down Period** is initiated. After the **Cool Down Period** has elapsed, the **Fuel Solenoid** is de-energised, bringing the generator to a stop.

**NOTE:- The safety on time (used for delayed alarms) is pre set to 12 seconds and can not be changed.**

**NOTE:- The exercise scheduler can be used in AUTO mode, see the section entitled “Exercise Scheduler” elsewhere in this manual for details.**


### 3.2 MANUAL OPERATION

To initiate a start sequence in **MANUAL**, press the  pushbutton.

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

If the **pre-heat** output option is selected this timer is then initiated and the auxiliary output selected is energised.

After the above delay the **Fuel Solenoid** is energised, then the **Starter Motor** is engaged.

The engine is cranked for a 10 second period. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the 10 second rest period. Should this sequence continue beyond the 3 cranking attempts, the start sequence will be terminated and **Fail to Start**  fault will be displayed.

When the engine fires, the starter motor is disengaged and locked out at 20 Hz measured from the Alternator output. Rising oil pressure can also be used to disconnect the starter motor, however it cannot be used for underspeed or overspeed detection.

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

**NOTE:- The safety on time (used for delayed alarms) is pre set to 12 seconds and can not be changed.**

Once the engine is running, the **Warm Up** timer, if selected, is initiated, allowing the engine to stabilise before it can be loaded.

The generator will continue to run until the **Auto** mode is selected.

If Auto mode is selected and the automatic start not active, then the **Remote Stop Delay Timer** begins, after which the **Fuel Solenoid** is de-energised, bringing the generator to a stop.




Selecting **STOP (O)** de-energises the **FUEL SOLENOID**, bringing the generator to a stop.

### 3.3 EXERCISE SCHEDULER

Available in module versions V1.3 and higher.

The exercise scheduler is used to give a 30-minute test run every seven days. The starting time is configurable and repeated every week, but the run duration is fixed at 30 minutes.

The scheduler is configured as follows:

- Press and hold the  button. After 6½ seconds, the LED beside the Auto button will extinguish. This sets the 'exercise run time' to the current time.
- Release the  button, the LED beside the Auto button will illuminate to show that the module is in Auto mode. The exercise period will begin.
- After 30minutes, the set will stop; the same 30 minute exercise period will be repeated on a 7 day cycle so long as the module is in the Auto mode.
- When the exercise timer is set, the Auto LED will blink every 3½ seconds. To cancel the timer, press and hold the  button for 6½ seconds, the Auto LED will extinguish to show the timer has been cancelled and will return to steady operation once the Auto button is released. Removing DC power from the module will also reset the exercise timer.

 **NOTE: - If an output is configured to "load transfer" the exercise run will be ON-LOAD.**


 **NOTE: - If remote start input is active, the set will continue to run beyond the end of the exercise time as the set is then under the control of the remote start input.**

## 4 PROTECTIONS

The module will indicate that an alarm has occurred by illuminating the relevant LED.

### 4.1 WARNINGS

Warnings are used to warn the operator of an impending fault

**BATTERY CHARGE FAILURE**, if the module does not detect a voltage from the warning light terminal on the auxiliary charge alternator, the  icon will illuminate. (Either 8 Volts or 16 Volts depending on the configuration of **Nominal DC Voltage**).


**Inputs 1 and 2** can be configured as warnings or shutdowns. The relevant icon will be illuminated when the input is active

### 4.2 SHUTDOWNS


Shutdowns are latching and stop the generator. The alarm must be cleared and the fault removed to reset the module. In the event of a shutdown the appropriate icon will be illuminated

**NOTE:-** The alarm condition must be rectified before a reset will take place. If the alarm condition remains it will not be possible to reset the unit (The exception to this is the Low Oil Pressure alarm and similar 'delayed alarms', as the oil pressure will be low with the engine at rest). Any subsequent warnings or shutdowns that occur will be displayed steady, therefore only the first-up shutdown will appear flashing.


**NOTE:-** The safety on time (used for delayed alarms) is pre set to 12 seconds and can not be changed.

**FAIL TO START**, if the engine does not fire after the pre-set 3 attempts at starting, a shutdown will be initiated. The  icon will illuminate.


**LOW OIL PRESSURE**, if the module detects that the engine oil pressure has fallen below the low oil pressure switch after the **Safety On** timer has expired, a shutdown will occur.

The  icon will illuminate.

**HIGH ENGINE TEMPERATURE**, if the module detects that the engine coolant temperature has exceeded the high engine temperature switch after the **Safety On** timer has expired, a shutdown will occur.


The  icon will illuminate.

**OVERSPEED**, if the engine speed exceeds the pre-set trip (14% above the nominal frequency) a shutdown is initiated. Overspeed is not delayed, it is an **immediate shutdown**.

The  icon will illuminate.

**NOTE:-** During the start-up sequence the overspeed trip level is extended to 24% above the normal frequency for the duration of the safety timer to allow an extra trip level margin. This is used to prevent nuisance tripping on start-up.

**UNDERSPEED**, if the engine speed falls below the pre-set trip (20% of the nominal frequency) after the **Safety On** timer has expired, a shutdown is initiated.

The  icon will illuminate.

**Inputs 1 and 2** can be configured as warnings or shutdowns. The relevant icon will be illuminated when the input is active



## 5 DESCRIPTION OF CONTROLS

The following section details the function and meaning of the various controls on the module.

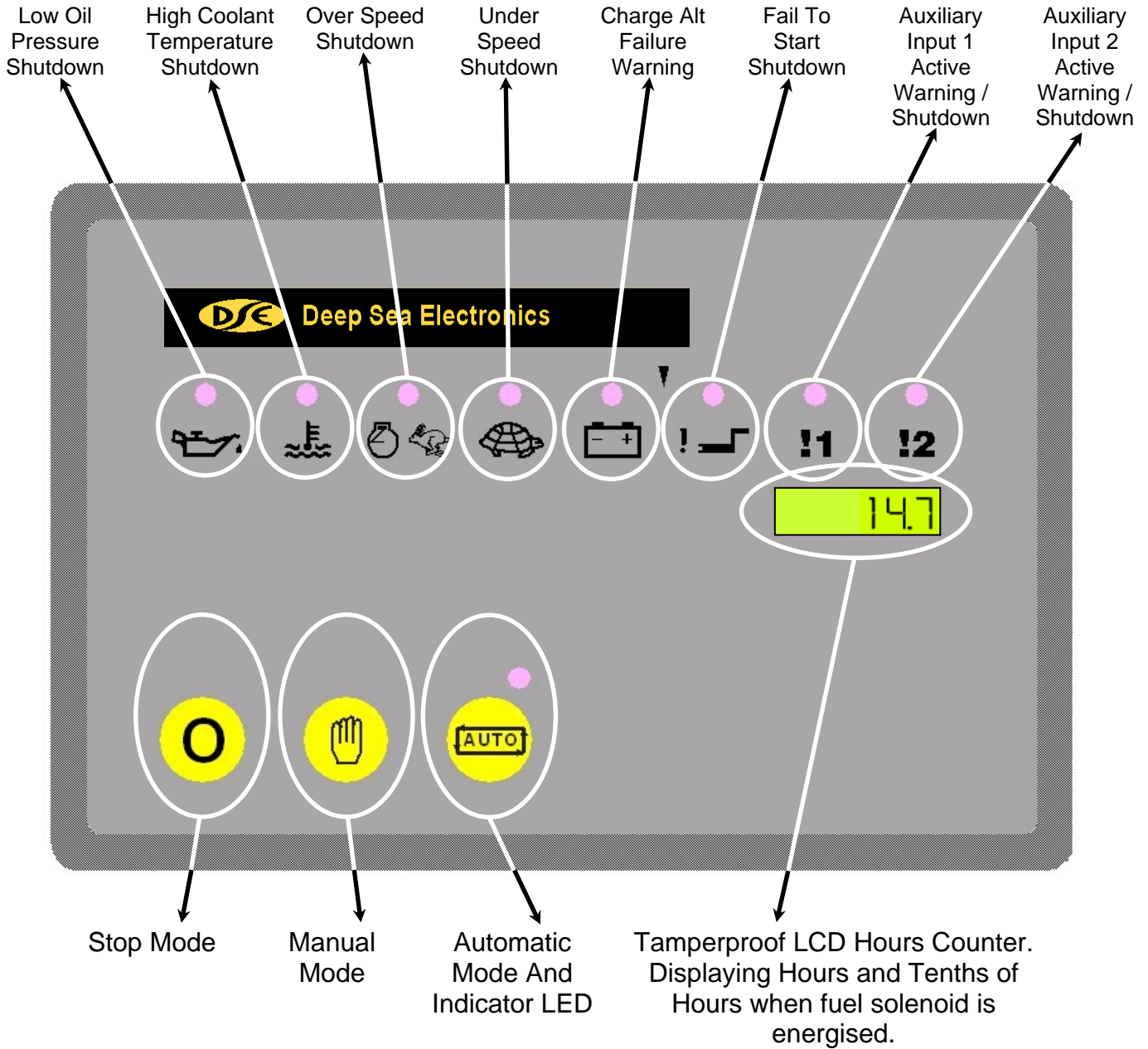



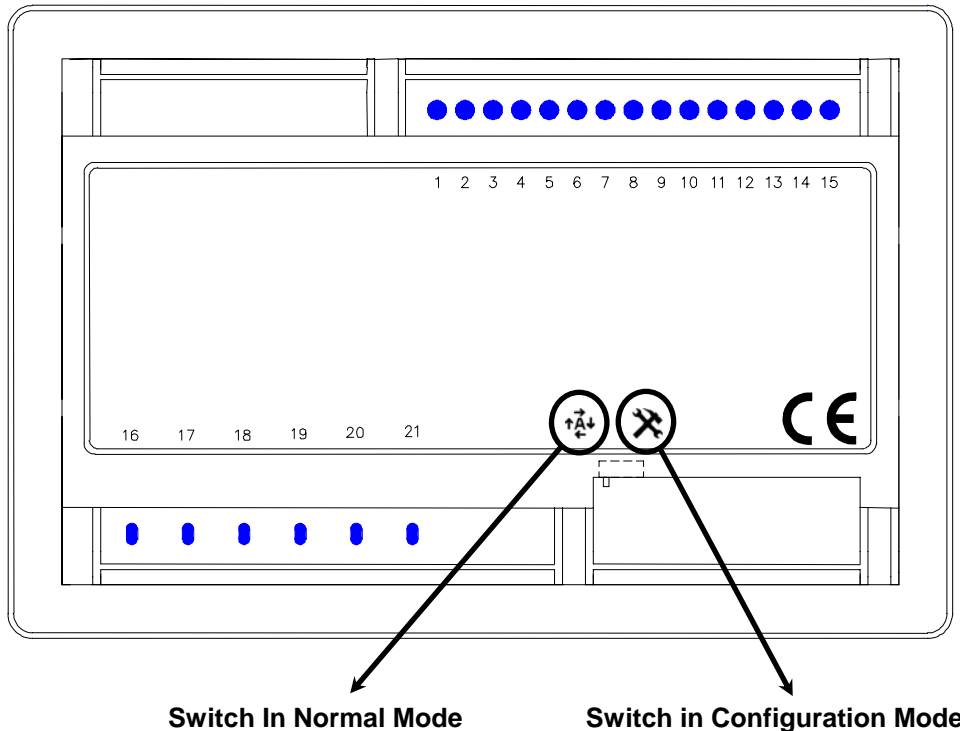
FIG 2

## 6 FRONT PANEL CONFIGURATION

The **DSE 4110** module is fully configurable from the front panel. There is no requirement for a PC / Laptop or software.




### 6.1 ACCESSING THE FRONT PANEL CONFIGURATION EDITOR

- ◆ With the unit is in **Stop**  mode, **Configuration Mode** is selected by operation of a small switch on the rear, bottom edge of the PCB. This is partially hidden to prevent accidental operation.



- ◆ Once **Configuration Mode** is selected, the 'Auto' LED will commence rapid flashing and all normal operation is suspended.

### 6.2 EDITING THE CONFIGURATION

- ◆ The **Stop**  pushbutton can be used to select the LED 'code' that corresponds to the required function. The 5 left-hand LED's will form the code. See configuration table overleaf.
- ◆ The **Manual**  pushbutton will allow the user to change the associated value. The 3 right-hand LED's inform the user of the current setting for the chosen function. See configuration table overleaf.
- ◆ When the required parameters are displayed, pressing the **Auto**  button will save the new setting and the process is repeated for each function change.
- ◆ When configuration is complete, the **Configuration Mode** Selector Switch should be returned to the 'Normal' position.

## 7 CONFIGURATION TABLES

Function						!	I 1	I 2	Value (Default in Bold)
Pre-heat Timer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>0 Seconds</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	5 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	30 Seconds
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Used to pre-heat the engine prior to cranking. The output is active for the duration of the setting, prior to cranking.

Start Delay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<b>5 Seconds</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	30 Seconds
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Used to give a delay between activating the remote start input, or a mains failure and actually starting the engine.

Stop Delay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	5 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<b>30 Seconds</b>
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Used to give a delay between deactivating the remote start input and actually stopping the engine.

Energise to Stop Hold Timer	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>0 Seconds</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	5 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	30 Seconds
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Used for the control of the engine stop solenoid. When the engine is to be stopped, the Energise To Stop output becomes active, closing the stop solenoid (fuel valve). When the engine comes to rest, the stop solenoid will remain energised for the period of the Energise To Stop Timer, to ensure the engine has come to a complete stop.

Warm-up Timer	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>0 Seconds</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	5 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	30 Seconds
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Delay between the engine being available for use and the closure of the generator load-switching device to allow time for the engine to warm before being loaded. This occurs after the 12 second safety on timer.

Cooling Timer	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>0 Seconds</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	5 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	10 Seconds
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	15 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20 Seconds
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	30 Seconds
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	60 Seconds
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	180 Seconds	

Delay between opening the generator load-switching device and stopping the engine to allow time for the engine to cool down before being stopped. This is particularly useful when used in conjunction with turbo-charged engines.

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Function							I 1	I 2	Value (Default in Bold)
Nominal Frequency	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>50 Hz (O/S +14% / Overshoot +24%)</b>
							<input type="radio"/>	<input type="radio"/>	60 Hz (O/S +14% / Overshoot +24%)
The systems nominal frequency. Either 50 Hz or 60 Hz									
Nominal DC Voltage	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>12V DC (CF 8V)</b>
							<input type="radio"/>	<input checked="" type="radio"/>	24V DC (CF 16V)
The generator battery voltage. Either 12 Volts or 24 Volts. It is used for the charge alternator failure level.									
LOP Switch Contact	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>Close on Fault</b>
							<input type="radio"/>	<input checked="" type="radio"/>	Open on Fault
Configuration for the oil pressure switch. Either to close to battery negative on a fault, or open on a fault.									
HET Switch Contact	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>Close on Fault</b>
							<input type="radio"/>	<input checked="" type="radio"/>	Open on Fault
Configuration for the coolant temperature switch. Either to close to battery negative on a fault, or open on a fault.									
Crank disconnect on Oil Pressure	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>Disabled</b>
							<input type="radio"/>	<input checked="" type="radio"/>	Enabled (2 Second Delay)
If this is enabled, the starter motor will disconnect 2 seconds after the oil pressure switch detects oil pressure. <b>NOTE:-</b> Not suitable for all generators, due to the different monitoring points on lubrication systems.									
Underspeed Detection	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Disabled
							<input type="radio"/>	<input checked="" type="radio"/>	<b>Enabled (U/S -20%)</b>
If this is enabled, the unit will shut down the generator if the frequency falls below 20% of the nominal frequency.									

Function									Value (Default in Bold)
Auxiliary Input 1 Function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>Immediate Warning Close on Fault</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Immediate Warning Open on Fault
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Immediate Shutdown Close on Fault
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Immediate Shutdown Open on Fault
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delayed Warning Close on Fault
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Delayed Warning Open on Fault
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delayed Shutdown Close on Fault
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Delayed Shutdown Open on Fault

Programmable input, can be configured to one of the following

- ◆ Immediate warning close on fault – If the input is activated at any time the unit will alarm and energise the common warning and common alarm output.
- ◆ Immediate warning open on fault – If the input is deactivated at any time the unit will alarm and energise the common warning and common alarm output.
- ◆ Immediate shutdown close on fault – If the input is activated at any time the generator will be shutdown and energise the common warning and common shutdown output. The generator can not be started.
- ◆ Immediate shutdown open on fault – If the input is deactivated at any time the generator will be shutdown and energise the common warning and common shutdown output. The generator can not be started.
- ◆ Delayed warning close on fault – If the input is activated and the safety time has elapsed the unit will alarm and energise the common warning and common alarm output.
- ◆ Delayed warning open on fault – If the input is deactivated and the safety time has elapsed the unit will alarm and energise the common warning and common alarm output.
- ◆ Delayed shutdown close on fault – If the input is activated and the safety time has elapsed the generator will be shutdown and energise the common warning and common shutdown output.
- ◆ Delayed shutdown open on fault – If the input is deactivated and the safety time has elapsed the generator will be shutdown and energise the common warning and common shutdown output.

Auxiliary Input 2 Function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<b>Immediate Warning Close on Fault</b>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Immediate Warning Open on Fault
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Immediate Shutdown Close on Fault
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Immediate Shutdown Open on Fault
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delayed Warning Close on Fault
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Delayed Warning Open on Fault
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delayed Shutdown Close on Fault
	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Delayed Shutdown Open on Fault

Programmable input, can be configured to one of the following

- ◆ Immediate warning close on fault – If the input is activated at any time the unit will alarm and energise the common warning and common alarm output.
- ◆ Immediate warning open on fault – If the input is deactivated at any time the unit will alarm and energise the common warning and common alarm output.
- ◆ Immediate shutdown close on fault – If the input is activated at any time the generator will be shutdown and energise the common warning and common shutdown output. The generator can not be started.
- ◆ Immediate shutdown open on fault – If the input is deactivated at any time the generator will be shutdown and energise the common warning and common shutdown output. The generator can not be started.
- ◆ Delayed warning close on fault – If the input is activated and the safety time has elapsed the unit will alarm and energise the common warning and common alarm output.
- ◆ Delayed warning open on fault – If the input is deactivated and the safety time has elapsed the unit will alarm and energise the common warning and common alarm output.
- ◆ Delayed shutdown close on fault – If the input is activated and the safety time has elapsed the generator will be shutdown and energise the common warning and common shutdown output.
- ◆ Delayed shutdown open on fault – If the input is deactivated and the safety time has elapsed the generator will be shutdown and energise the common warning and common shutdown output.

Function						! I 1	I 2	Value (Default in Bold)
Auxiliary Output 1 Function						<input type="radio"/>	<input type="radio"/>	Not used
						<input type="radio"/>	<input type="radio"/>	Pre-heat
						<input type="radio"/>	<input checked="" type="radio"/>	Load Transfer
						<input type="radio"/>	<input checked="" type="radio"/>	Common Warning
						<input checked="" type="radio"/>	<input type="radio"/>	Common Shutdown
						<input checked="" type="radio"/>	<input type="radio"/>	System in Auto
						<input checked="" type="radio"/>	<input type="radio"/>	<b>Common Alarm</b>
						<input checked="" type="radio"/>	<input checked="" type="radio"/>	Energise to Stop

Programmable output can be configured to one of the following.

- ◆ Pre-heat. - The output is energised for the period of pre-heat time prior to cranking and between the cranking attempts.
- ◆ Load Transfer. - The output is active after the safety timer and warmup timer have elapsed.
- ◆ Common warning. - The output is active if there are any warning alarm active.
- ◆ Common shutdown - The output is active if there are any shutdown alarms active.
- ◆ System in auto. - The output is active when the system is in automatic mode.
- ◆ Common Alarm. - The output is active if there is any alarm condition.
- ◆ Energise to stop. - The output is energised when the engine is required to stop (normal or fault conditions) and will remain energised for the period of the Energise To Stop Timer, to ensure the engine has come to a complete stop.

Auxiliary Output 2 Function	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Not used
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<b>Pre-heat</b>
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Load Transfer
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Common Warning
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Common Shutdown
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	System in Auto
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Common Alarm
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Energise to Stop

Programmable output can be configured to one of the following.

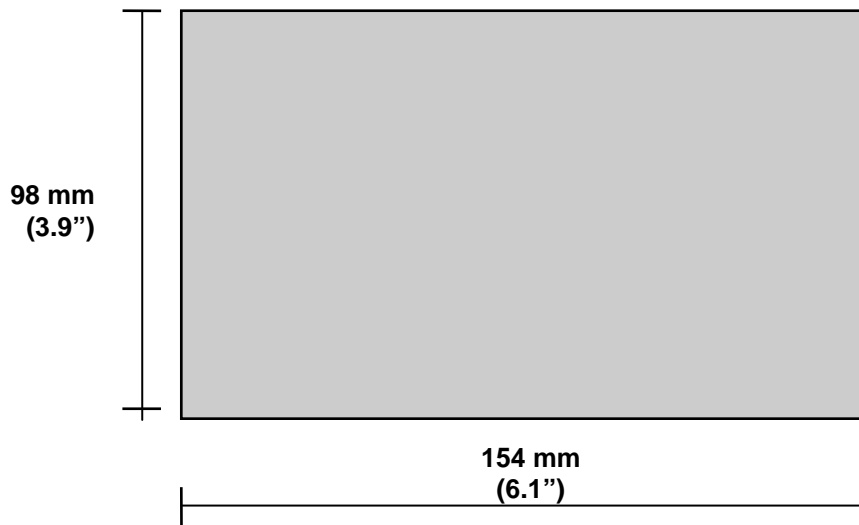
- ◆ Pre-heat. - The output is energised for the period of pre-heat time prior to cranking and between the cranking attempts.
- ◆ Load Transfer. - The output is active after the safety timer and warmup timer have elapsed.
- ◆ Common warning. - The output is active if there are any warning alarm active.
- ◆ Common shutdown - The output is active if there are any shutdown alarms active.
- ◆ System in auto. - The output is active when the system is in automatic mode.
- ◆ Common Alarm. - The output is active if there is any alarm condition.
- ◆ Energise to stop. - The output is energised when the engine is required to stop (normal or fault conditions) and will remain energised for the period of the Energise To Stop Timer, to ensure the engine has come to a complete stop.

**NOTE: - All the outputs are solid state, rated at 1.2 Amps and switch to battery negative when active.**

## 8 INSTALLATION INSTRUCTIONS

The model DSE 4110 Module has been designed for front panel mounting. Fixing is by 2 clips for easy assembly.

### 8.1 PANEL CUT-OUT



**FIG 3**

Maximum panel thickness – 8mm (0.3")

In conditions of excessive vibration the module should be mounted on suitable anti-vibration mountings.

## 8.2 COOLING

The module has been designed to operate over a wide temperature range **-30 to +70° C**. Allowances should be made for the temperature rise within the control panel enclosure. Care should be taken **NOT** to mount possible heat sources near the module unless adequate ventilation is provided. The relative humidity inside the control panel enclosure should not exceed **95%**.

## 8.3 UNIT DIMENSIONS

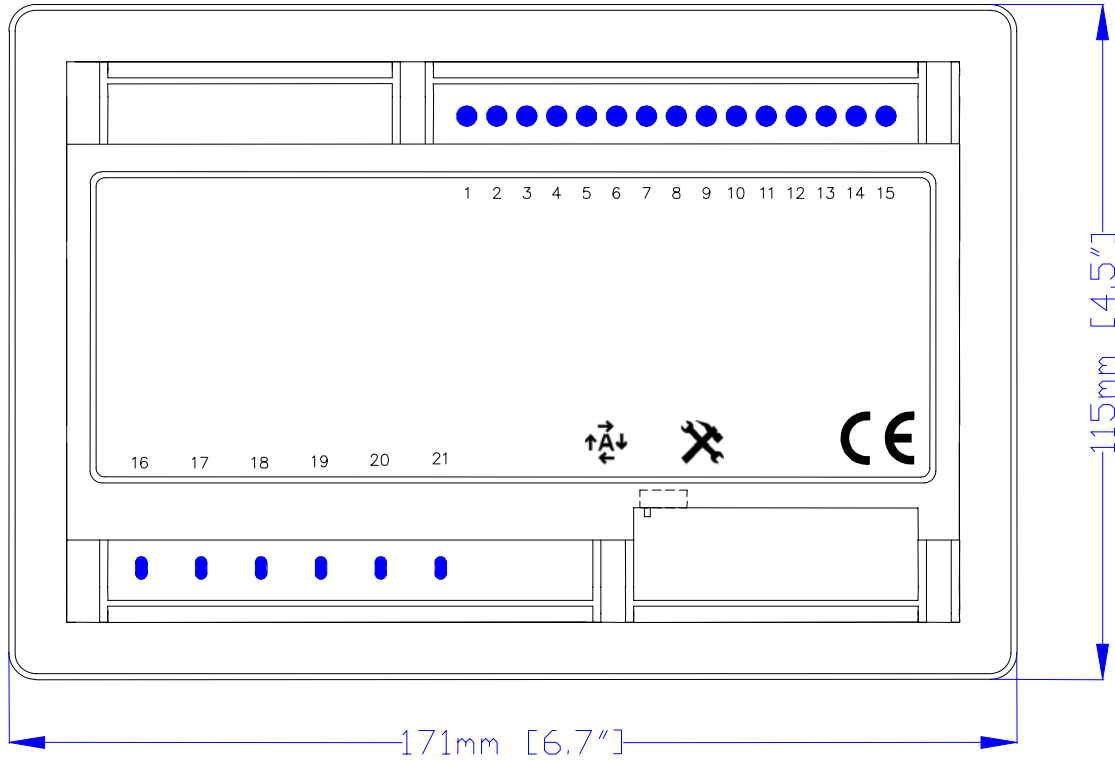
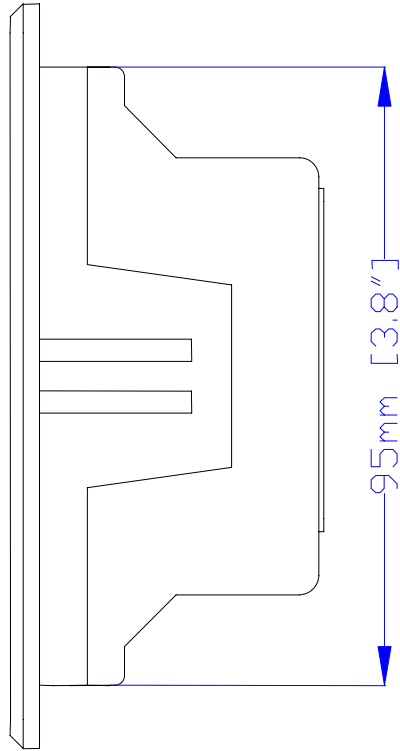
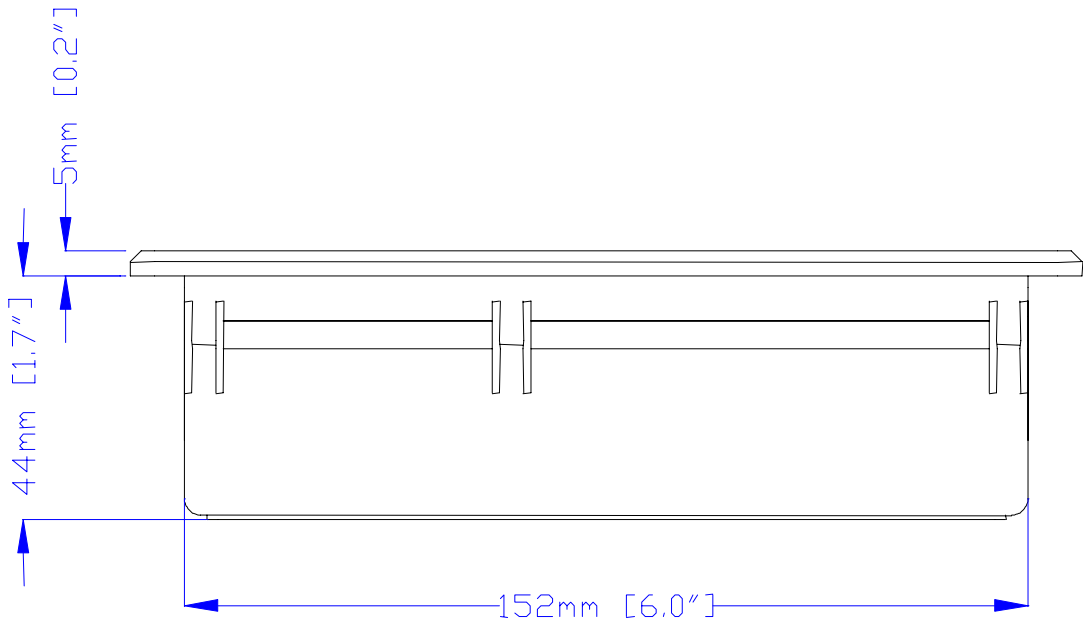


FIG 4A





**FIG 4B**



**FIG 4C**

### 8.4 FRONT PANEL LAYOUT

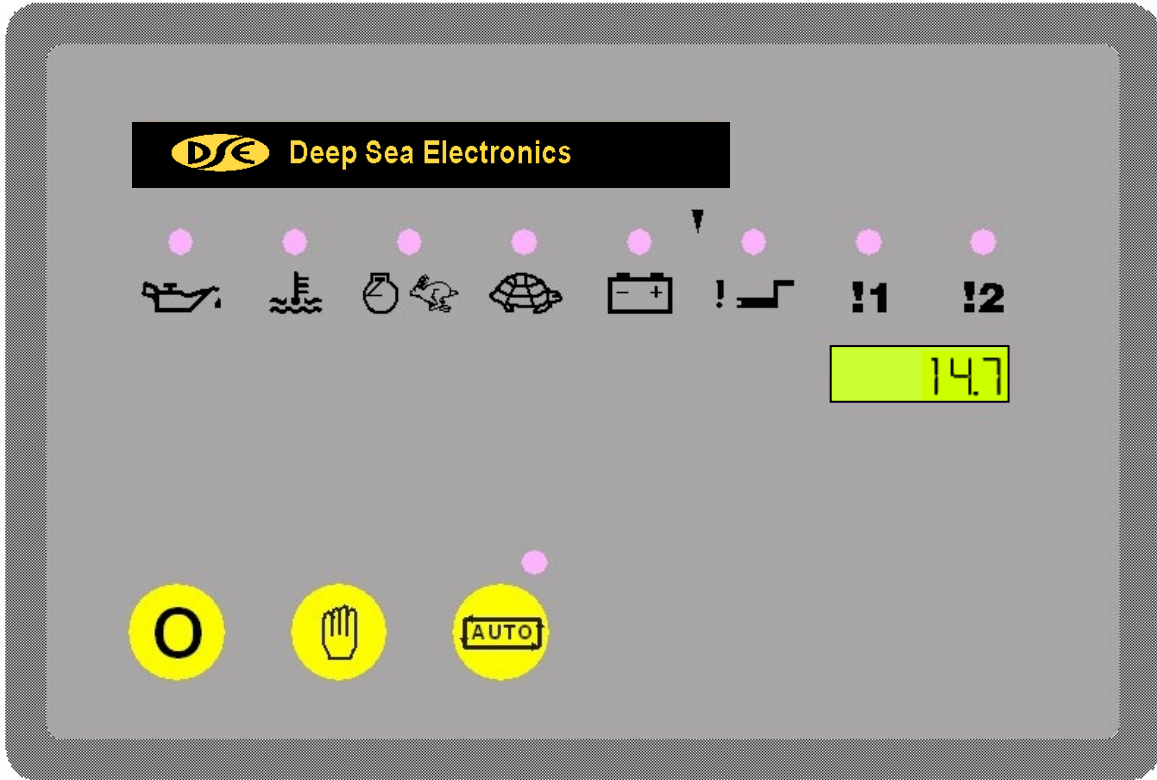


FIG 5

### 8.5 REAR PANEL LAYOUT

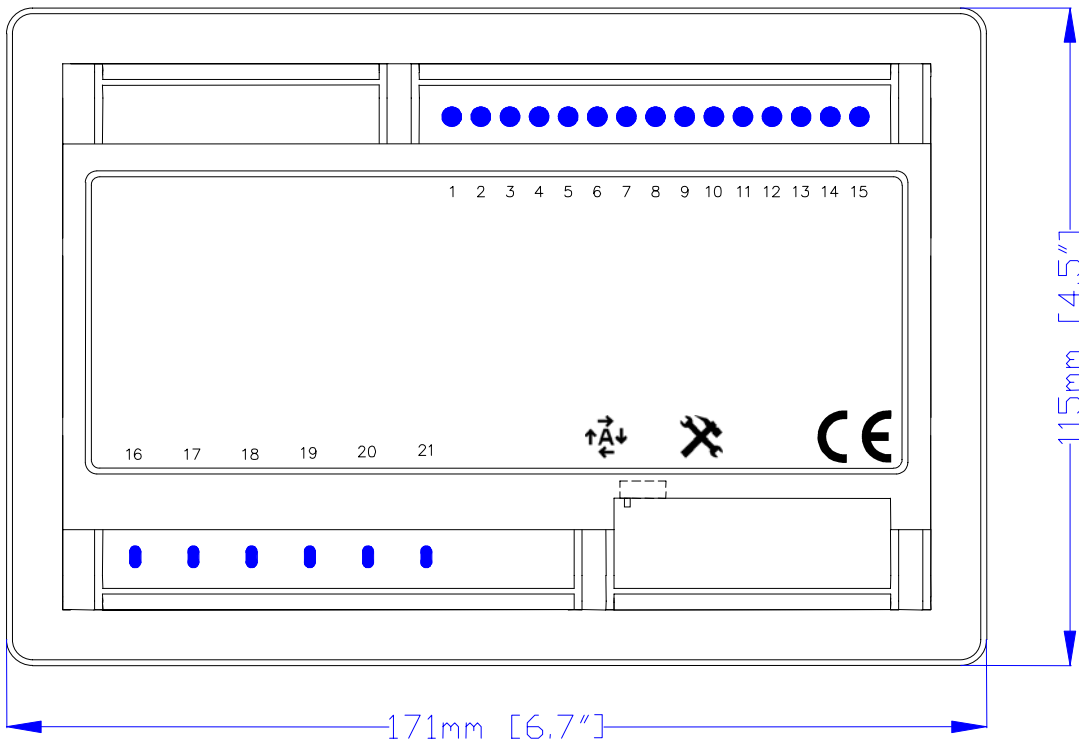


FIG 6


## 9 ELECTRICAL CONNECTIONS

Connections to the Module are via plug and sockets.

### 9.1 CONNECTION DETAILS

The following describes the connections and recommended cable sizes to the 2 plugs and sockets on the rear of the Module. See rear panel layout **FIG 6**.

PIN No	DESCRIPTION	CABLE SIZE	NOTES
1	DC Plant Supply Input (-ve)	1.0mm	Connected to plant battery negative
2	DC Plant Supply Input (+ve)	1.0mm	Connected to plant battery positive (Recommended Fuse 2A)
3	Fuel Solid State Output	1.0mm	Used to operate the fuel relay.
4	Start Solid State Output	1.0mm	Used to operate the cranking relay.
5	Auxiliary Solid State Output 1	1.0mm	Configurable output.
6	Auxiliary Solid State Output 2	1.0mm	Configurable output.
7	Charge Fail Input/ Excitation Output	1.0mm	Must NOT be connected to plant supply negative if not used.
8	Low Oil Pressure Input	0.5mm	Switch to negative.
9	High Engine Temp Input	0.5mm	Switch to negative.
10	Auxiliary Input 1	0.5mm	Switch to negative.
11	Auxiliary Input 2	0.5mm	Switch to negative.
12	Automatic start Input	0.5mm	Switch to negative.
13	Not used		
14	Not used		
15	Functional Earth	1.0mm	Connect to a good clean earth point
16	Not used		
17	Not used		
18	Not used		
19	Not used		
20	Alternator Input L1	1.0mm	Do not connect if not used. (2A Fuse)
21	Alternator Input N	1.0mm	Do not connect if not used.

 **NOTE:- All the outputs are solid state, rated at 1.2 Amps and switch to battery negative when active.**

## 9.2 CONNECTOR FUNCTION DETAILS

The following describes the functions of the 3 connectors on the rear of the module. See rear panel layout **FIG 5**.

<b>PIN No</b>	<b>DESCRIPTION</b>
1	DC Supply -ve. System DC negative input. (Battery Negative).
2	DC Supply +ve. System DC positive input. (Battery Positive).
3	Fuel solid state output. Plant Supply negative from pin 1. Used to control the fuel solenoid or engine fuel control system.
4	Starter solid state output. Plant Supply negative from pin 1. Used to control the Starter Motor.
5	Auxiliary solid state output 1. Plant Supply negative from pin 1. Configurable output, see configuration tables for options available.
6	Auxiliary solid state output 2. Plant Supply negative from pin 1. Configurable output, see configuration tables for options available.
7	Charge Fail input / Excitation output. Supplies excitation to the Plant Battery Charging Alternator, also an input for the Charge Fail detection circuitry.
8	Low Oil Pressure input. This is a negative switched input, it is possible to calibrate the input to be a normally closed signal or a normally open signal. This input is used to signal to the module that the oil pressure is low.
9	High Engine Temperature input. This is a negative switched input, it is possible to calibrate the input to be a normally closed signal or a normally open signal. This input is used to signal to the module that the engine temperature is high.
10	Auxiliary input 1. This is a negative switched configurable input, see configuration tables for options available. It is possible to configure the input to be a normally closed signal or a normally open signal.
11	Auxiliary input 2. This is a negative switched configurable input, see configuration tables for options available. It is possible to configure the input to be a normally closed signal or a normally open signal.
12	Automatic start input. This is a negative switched input, which will start the generator when Auto is selected.
13	Not used
14	Not used
15	Functional Earth - Ensure connection to a good clean earth point.
16	Not used
17	Not used
18	Not used
19	Not used
20	Generator L1 sensing input. Connect to alternator L1 output.
21	Generator N sensing input. Connect to alternator N output.


## 10 SPECIFICATION

<b>DC Supply</b>	8.0 to 35 V Continuous.
<b>Cranking Dropouts</b>	Able to survive 0 V for 50mS, providing supply was at least 10 V before dropout and supply recovers to 5V. <i>This is achieved without the need for internal batteries.</i>
<b>Typical Standby Current</b>	20A at 12 V. 20A at 24 V.
<b>Max. Operating Current</b>	150A at 12 V. 250A at 24V
<b>Alternator Input Range</b>	
<b>Single phase 2 wire system</b>	15V AC - 277 V AC (ph-N) (+20%)
<b>3Phase 4Wire System</b>	15V AC - 277 V AC (ph-N) 3 Phase 4wire (+20%)
<b>Alternator Input Frequency</b>	50Hz - 60 Hz at rated engine speed
<b>Start solid state Output</b>	1.2 Amp DC at supply voltage. Switched to negative
<b>Fuel solid state Output</b>	1.2 Amp DC at supply voltage. Switched to negative
<b>Auxiliary solid state Outputs</b>	1.2 Amp DC at supply voltage. Switched to negative
<b>Dimensions</b>	
<b>Panel cutout</b>	154mm x 98mm ( 6.1" x 3.9") Maximum panel thickness 8mm (0.3")
<b>Charge Fail / Excitation Range</b>	12 Volts = 8 Volts CF 24 Volts = 16 Volts CF
<b>Operating Temperature Range</b>	-30 to +70°C
<b>Electromagnetic Compatibility</b>	BS EN 50081-2 EMC Generic Emission Standard (Industrial) BS EN 50082-2 EMC Generic Immunity Standard (Industrial)
<b>Electrical Safety</b>	BS EN 60950 Safety of I.T. equipment, including electrical business equipment.
<b>Cold Temperature</b>	BS EN 60068-2-1 to -30 °C
<b>Hot Temperature</b>	BS EN 60068-2-2 to +70°C
<b>Humidity</b>	BS2011-2-1 to 93% RH @ 40°C for 48 Hours
<b>Vibration</b>	BS EN60068-2-6 10 sweeps at 1 octave/minute in each of 3 major axes. 5Hz to 8Hz @ +/-7.5mm constant displacement 8Hz to 500Hz @ 2gn constant acceleration
<b>Shock</b>	BS EN 60068-2-27 3 Half sine shocks in each of 3 major axes 15gn amplitude, 11mS duration
<b>Applicable Standards</b>	Compliant with BS EN 60950 Low Voltage Directive Compliant with BS EN 50081-2: 1992 EMC Directive Compliant with BS EN 61000-6-4: 2000 EMC Directive <b>CE</b> Compliance to European Legislation

## 11 COMMISSIONING

### 11.1 PRE-COMMISSIONING

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

- 1) The unit is adequately cooled and all the wiring to the module is of a standard and rating compatible with the system.
- 2) The unit DC supply is fused and connected to the battery and that it is of the correct polarity.
- 3) To check the start cycle operation take appropriate measures to prevent the engine from starting (disable the operation of the fuel solenoid). After a visual inspection to ensure it is safe to proceed, connect the battery supply. Select “**MANUAL**”, the unit start sequence will commence.
- 4) The starter will engage and operate for the pre-set crank period. After the starter motor has attempted to start the engine for the pre-set number of attempts the LCD will display its icon indicating; ‘Failed to start’ . Select the **STOP/RESET** position to reset the unit.
- 5) Restore the engine to operational status (reconnect the fuel solenoid), again select “**MANUAL**”, this time the engine should start and the starter motor should disengage automatically. If not then check that the engine is fully operational (fuel available, etc.) and that the fuel solenoid is operating. The engine should now run up to operating speed. If not and an alarm is present, check the alarm condition for validity, then check input wiring. The engine should continue to run for an indefinite period.
- 6) Select “**AUTO**” on the front panel, the engine will run for the pre-set stop delay, then stop. The generator should stay in the standby mode. If not check that there is not a signal present on the **Automatic start** input.
- 7) Initiate an automatic start by supplying the automatic start signal. The start sequence will commence and the engine will run up to operational speed. Once the generator is available the output **Load Transfer** is activated if it has been configured.
- 8) Remove the automatic start signal the stop sequence will be initiated. After the pre-set time period, the generator will shutdown into it’s standby mode.
- 9) If despite repeated checking of the connections between the **4110** and the customer’s system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice on:-

**INTERNATIONAL TEL: +44 (0) 1723 890099**

**INTERNATIONAL FAX: +44 (0) 1723 893303**

**E-mail: [Support@Deepseapl.com](mailto:Support@Deepseapl.com)**

**Website : [www.deepseapl.com](http://www.deepseapl.com)**

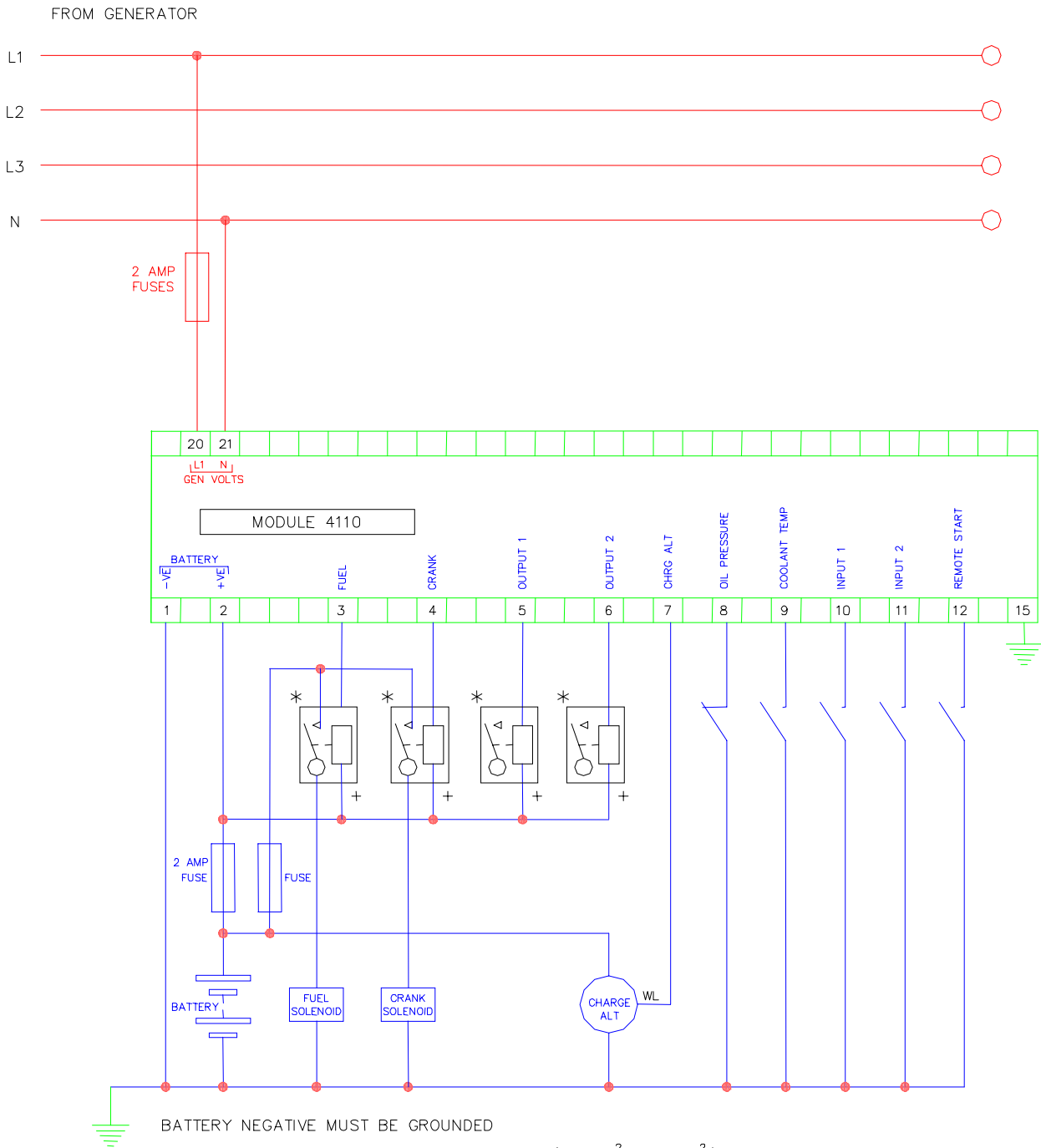
## 12 FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70 °C. Check the DC fuse.
Low oil Pressure fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch and wiring. Check switch polarity is correct (i.e. Normally Open or Normally Closed).
High engine temperature fault operates after engine has fired.	Check engine temperature. Check switch and wiring. Check switch polarity is correct (i.e. Normally Open or Normally Closed).
Shutdown fault operates	Check relevant switch and wiring of fault indicated by the illuminated LED. Check configuration of input.
Warning fault operates	Check relevant switch and wiring of fault indicated by the illuminated LED. Check configuration of input.
Fail to Start is activated after pre-set number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Refer to engine manual.
Continuous starting of generator when in <b>AUTO</b>	Check that there is no signal present on the "Automatic start" input.
Generator fails to start on receipt of Automatic start signal	Check that there is a signal on the "Automatic start" input. Confirm that the input is configured to be used as "Automatic start".
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module. Check pre-heat has been selected in your configuration. NB all the outputs are negative switching.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. NB all the outputs are negative switching.
Fuel solenoid inoperative	Check wiring to fuel solenoid. Check battery supply. Check battery supply is present on the fuel output of module. NB all the outputs are negative switching.

**NOTE:-** The above fault finding is provided as a guide check-list only. As it is possible for the module to be configured to provide a wide range of different features always refer to the source of your module configuration if in doubt.

**NOTE:** - All the outputs are solid state, rated at 1.2 Amps and switch to battery negative when active.

# 13 TYPICAL WIRING DIAGRAM



TERMINALS SUITABLE FOR 22-16 AWG (0.6mm<sup>2</sup> - 1.3mm<sup>2</sup>) FIELD WIRING

TIGHTENING TORQUE = 0.8Nm (7lb-in)

\* NOTE. ALL THE OUTPUTS ARE SOLID STATE AND ARE NEGATIVE SWITCHING



## 14 APPENDIX

### 14.1 SOLID STATE OUTPUTS

DSE's utilisation of Solid State Outputs gives many advantages, the main points being:

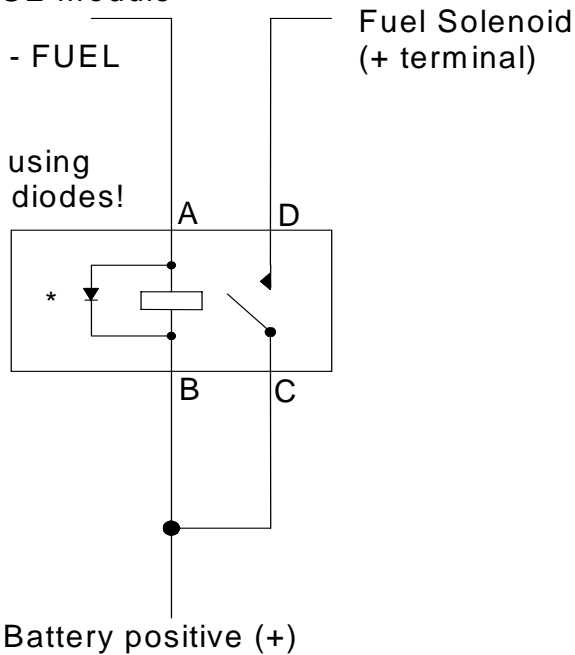
- ◆ No Moving Parts
- ◆ Fully Overload / Short Circuit Protected.
- ◆ Smaller dimensions hence lighter, thinner and more cost effective than conventional relays.
- ◆ Lower power consumption hence increased reliability.

The main difference from conventional outputs is that solid state outputs switch to negative (-ve) when active. This type of output is normally used with an automotive or plug in relay.

Solid state output from DSE module

eg. Terminal 3 of 4110 - FUEL




\* Observe polarity when using relays fitted with integral diodes!









	Solid State Output from DSE Module Pin	Automotive relay Pin	8 Pin Plugin relay	Function
A	3	86	7	Fuel Output
B		85	2	To Positive supply via fuse
C		30	1	To Positive supply via fuse
D		87	3	To Fuel Solenoid

Example of relay pins connected to DSE solid state output to drive a fuel solenoid.  
See section on **Typical Connections** else where in this manual for overall typical wiring diagram

## 14.2 PUSH BUTTONS

Display	Description
	Stop/Reset
	Manual mode
	Auto mode

## 14.3 ALARM / SHUTDOWN INDICATIONS

Display	Description
	<i>Low Oil Pressure</i>
	<i>High Coolant Temperature</i>
	<i>Overspeed</i>
	<i>Underspeed</i>
	<i>Fail to start (Over-crank)</i>
	Charge Fail
!1	<i>Auxiliary Alarm input 1 (Warning or Shutdown)</i>
!2	<i>Auxiliary Alarm input 2 (Warning or Shutdown)</i>