



DEEP SEA ELECTRONICS PLC

4130 AUTOMATIC TRANSFER SWITCH OPERATING MANUAL

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1 INTRODUCTION

The **4130** is a configurable **Automatic Transfer Switch** control module, and is designed to work in conjunction with generator control modules that will accept a remote start input.

It monitors the incoming AC mains supply (1 or 3 phases) for under voltage. If the voltage falls out of limits, the module will issue a start command to the generating set controller. Once the set is available and producing an output within limits, the ATS module will control the transfer devices and switch the load from the mains to the generating set. Should the mains supply return to within limits the module will command a return to the mains supply and shut down the generator after a suitable cooling run. Various timing sequences are used to prevent nuisance starting and supply breaks.

Configuration is via the front panel. No other equipment such as a computer or programming lead is required.

The **DSE 4130** module utilises 4 LEDs to indicate the condition of the mains, generator and which is supplying the load.

The module is housed in a fully enclosed robust plastic case for front panel mounting, offering a high IP rating of 56 with the optional gasket. Connections to the module are via locking plug and sockets.

2 CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.

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

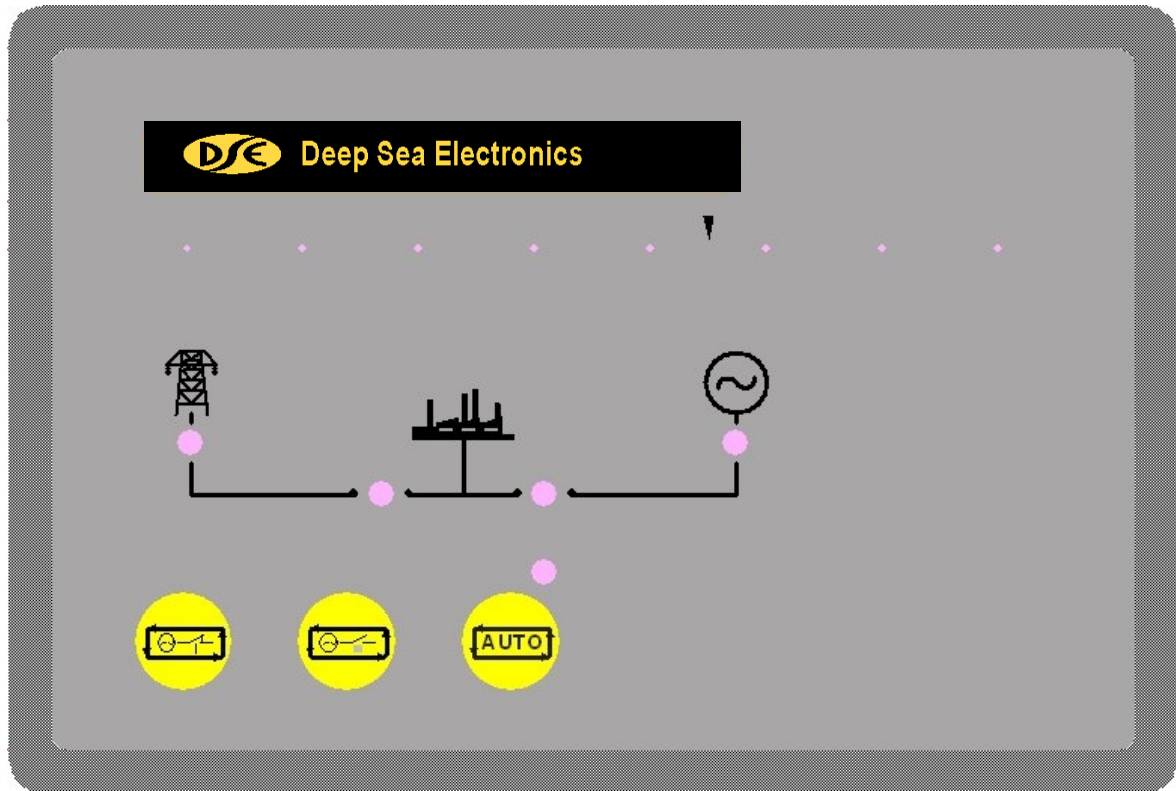


FIG 1

3.1 AUTOMATIC MODE OF OPERATION

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

Upon a mains (utility) failure, scheduled run or if the remote start input is made active, the following sequence is followed:

To allow for short term mains supply transient conditions or false remote start signals, the Mains Fail Delay timer is initiated. After this delay, the Start/Run output is activated.

Once the unit detects the alternator frequency of 45Hz, the **Warm Up** timer is initiated, allowing the engine to stabilise before accepting the load.

If the remote start is being used and has been configured to **Remote start is on load**, or the mains has failed, the load will be transferred to the generator.

On the return of the mains supply, (or removal of the **Remote Start** signal if the set was started by remote signal), the **Mains Return delay** timer is initiated. Once it has timed out, the load is transferred back to the mains (utility). The **Cooling** timer is then initiated, allowing the engine a cooling down period off load before shutting down. Once the **Cooling** timer expires the Start/Run output is de-activated.

If the mains should fail (or a **Remote Start** signal is re-activated) whilst the generator is **Cooling** down, the load will be immediately transferred to the generator.

If the generator should fail, i.e. frequency falls below 20Hz the unit will switch back to the mains, even if the mains is not available.

▲NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

3.2 MANUAL RUN ON LOAD

To initiate a start sequence in **Manual Run On Load**, press the  pushbutton, and the start sequence is initiated.

The Start/Run output is activated.

Once the unit detects the alternator frequency of 45Hz, the **Warm Up** timer is initiated, allowing the engine to stabilise before accepting the load.

The load will be transferred to the generator.

The module will continue to run in this mode until another mode is selected.

If the generator should fail and the mains (utility) are available, the load is transferred back to the mains (utility).

▲NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

3.3 MANUAL RUN OFF LOAD

To initiate a start sequence in **Manual Run Off Load**, press the  pushbutton, and the start sequence is initiated.

The Start/Run output is activated.

The generator will be run off load and no further action is taken.

If during this time the mains (utility) should fail, the load will be transferred to the generator. However, the unit will **NOT** return the load to the mains (utility). The load will stay with the generator until another mode is selected.

▲NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

3.4 EXERCISE SCHEDULER

Available in module versions V1.2 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 3½ seconds, the LED beside the Auto button will extinguish. This sets the “exercise run time” to the correct 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 30 minutes, 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 3½ 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 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 DESCRIPTION OF CONTROLS

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

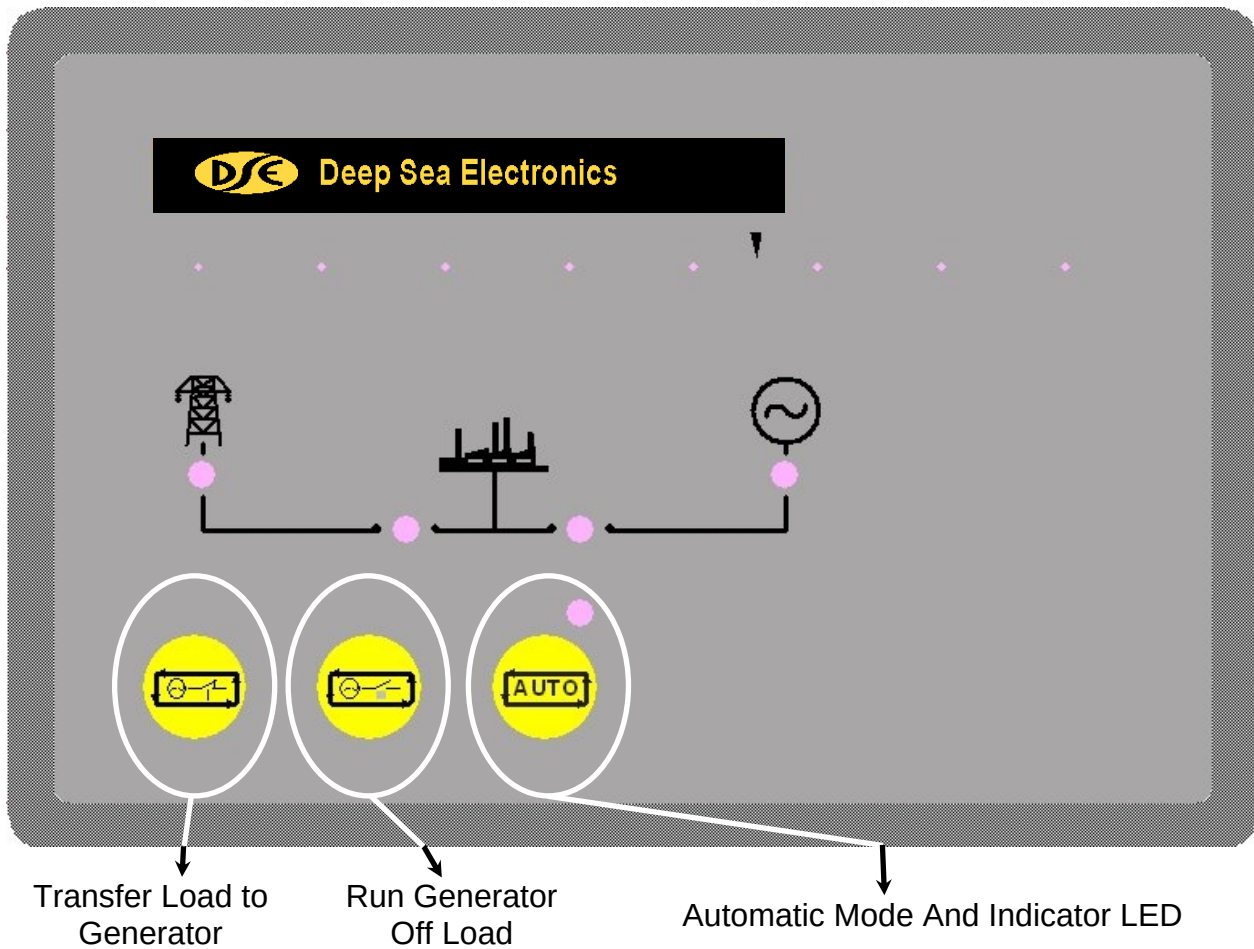


FIG 2A

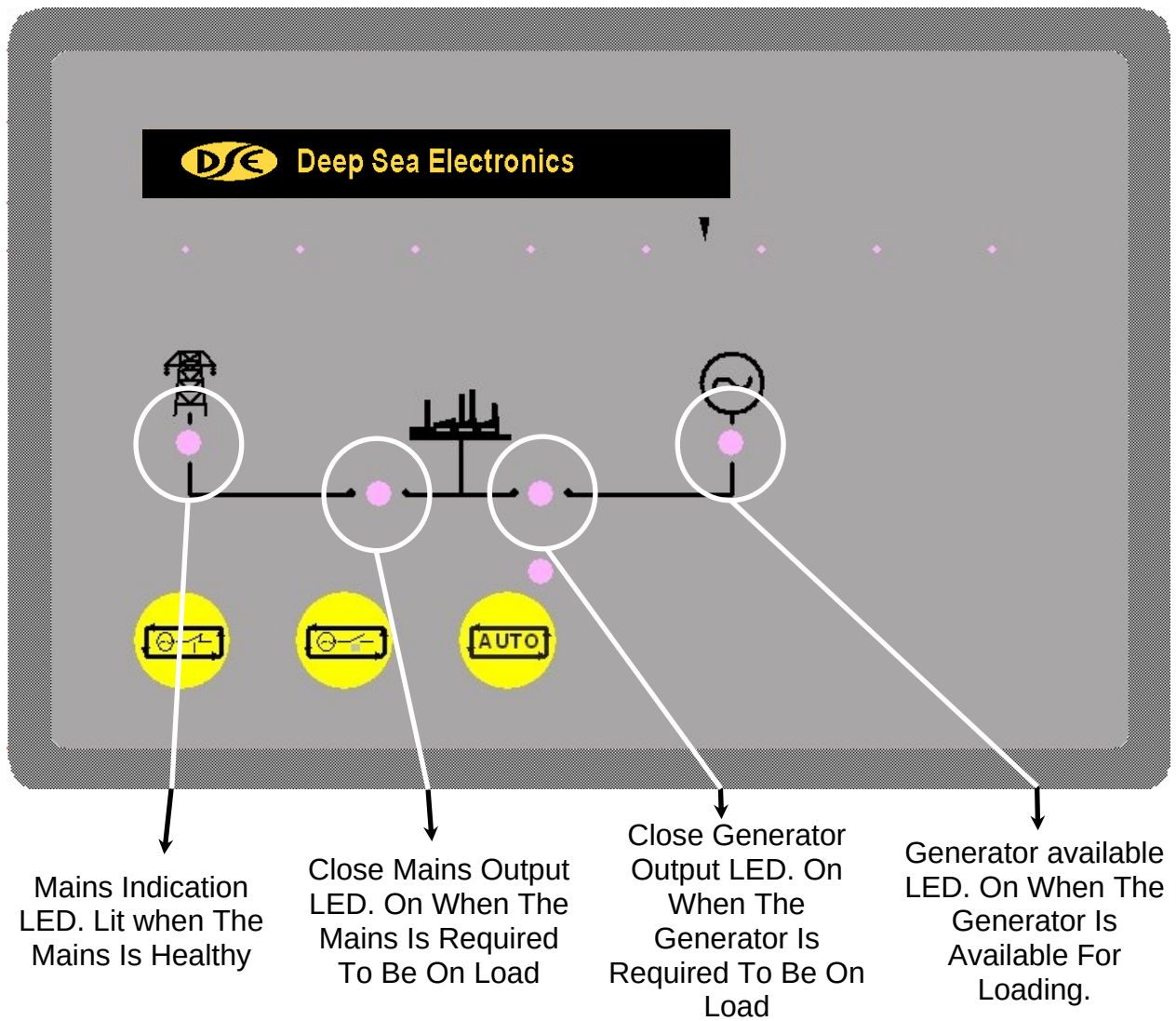


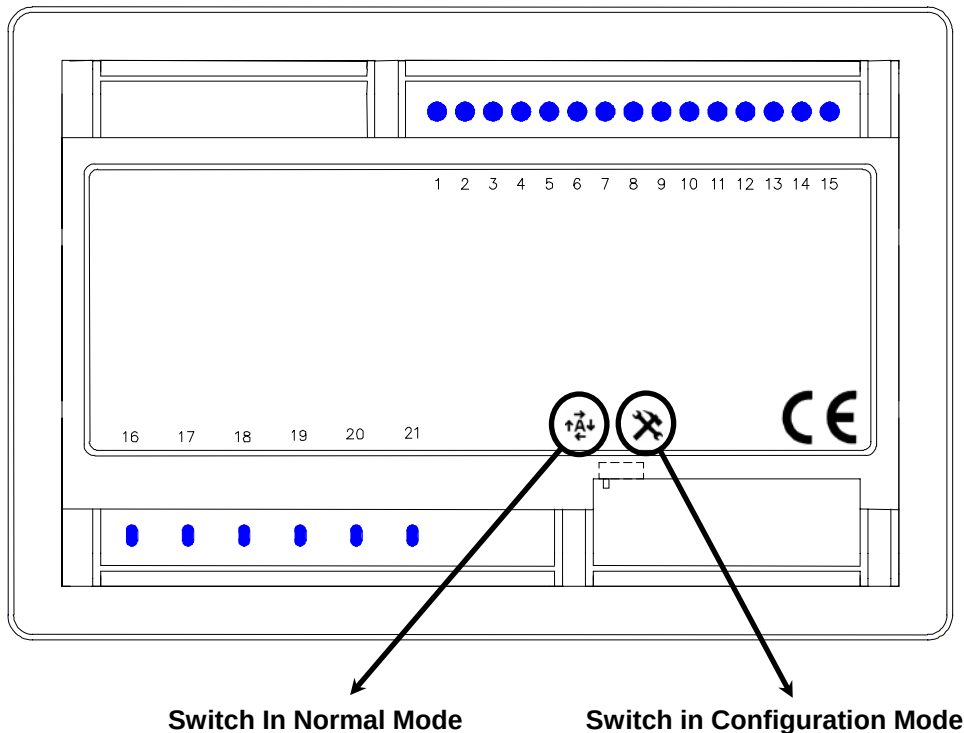
FIG 2B

5 FRONT PANEL CONFIGURATION

The **DSE 4130** module is fully configurable from the front panel. There is no requirement for a PC / Laptop or software.

5.1 ACCESSING THE FRONT PANEL CONFIGURATION EDITOR

- ◆ With the unit in **Auto**  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.

5.2 EDITING THE CONFIGURATION

- ◆ Once **Configuration Mode** is selected, the 'Auto' LED will commence rapid flashing, and all normal operation is suspended.
- ◆ The **Run On Load**  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 over leaf.
- ◆ The **Run Off Load**  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 over leaf.
- ◆ 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.

6 CONFIGURATION TABLES

Function	☐	☐	☐	☐	☐	☐	☐	☐	Value (Default in Bold)
Start Delay	☐	☐	☐	☒	☐	☐	☐	☐	0 Seconds
	☐	☐	☐	☐	☐	☐	☐	☒	5 Seconds
	☐	☐	☐	☐	☐	☐	☒	☐	10 Seconds
	☐	☐	☐	☐	☐	☒	☒	☐	15 Seconds
	☐	☐	☐	☐	☒	☐	☐	☐	20 Seconds
	☐	☐	☐	☐	☒	☐	☒	☐	30 Seconds
	☐	☐	☐	☐	☒	☒	☐	☐	60 Seconds
	☐	☐	☐	☐	☒	☒	☒	☐	180 Seconds
Used to give a delay between mains failure and starting the engine. Used to prevent the generating from starting on brown outs (dips) or short mains outages.									

Mains Return Delay	☐	☐	☐	☒	☒	☐	☐	☐	0 Seconds
	☐	☐	☐	☐	☐	☐	☐	☒	5 Seconds
	☐	☐	☐	☐	☐	☐	☒	☐	10 Seconds
	☐	☐	☐	☐	☐	☒	☒	☐	15 Seconds
	☐	☐	☐	☐	☒	☐	☐	☐	20 Seconds
	☐	☐	☐	☐	☒	☐	☒	☐	30 Seconds
	☐	☐	☐	☐	☒	☒	☐	☐	60 Seconds
	☐	☐	☐	☐	☒	☒	☒	☐	180 Seconds
Used to give a delay between the mains returning and the system switching the load back to the mains. Used to ensure that the mains (utility) is steady before this action is executed.									

Warm Up Timer	☐	☐	☒	☐	☒	☐	☐	☐	0 Seconds
	☐	☐	☐	☐	☐	☐	☐	☒	5 Seconds
	☐	☐	☐	☐	☐	☐	☒	☐	10 Seconds
	☐	☐	☐	☐	☐	☒	☒	☐	15 Seconds
	☐	☐	☐	☐	☒	☐	☐	☐	20 Seconds
	☐	☐	☐	☐	☒	☐	☒	☐	30 Seconds
	☐	☐	☐	☐	☒	☒	☐	☐	60 Seconds
	☐	☐	☐	☐	☒	☒	☒	☐	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.									

Cooling Timer	☐	☐	☒	☒	☐	☐	☐	☐	0 Seconds
	☐	☐	☐	☐	☐	☐	☐	☒	5 Seconds
	☐	☐	☐	☐	☐	☐	☒	☐	10 Seconds
	☐	☐	☐	☐	☐	☒	☒	☐	15 Seconds
	☐	☐	☐	☐	☒	☐	☐	☐	20 Seconds
	☐	☐	☐	☐	☒	☐	☒	☐	30 Seconds
	☐	☐	☐	☐	☒	☒	☐	☐	60 Seconds
	☐	☐	☐	☐	☒	☒	☒	☐	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.									

Remote Start Input Type	☐	☒	☒	☒	☐	☐	☐	☐	Remote Start
	☐	☐	☐	☐	☐	☐	☐	☒	Simulate Mains
Programmable input can be configured to one of the following. ◆ Remote start – If the input is active the generator will be started, and stopped if the input is deactive. Mains fail is allways active. ◆ Simulated mains (utility) – If the input is active the generator will not start in the event of a mains failure. E.G. if the generator is supporting a non 24 hour operation, a 24 hour timer can be used to prevent a mains failure from starting the generator and taking load.									

Function	☐	☐	☐	☐	☐	☐	☐	☐	Value (Default in Bold)
Remote Start Function	☐	☒	☒	☒	☒	☐	☐	☐	Remote Start Is Off load
	☐	☐	☐	☐	☐	☐	☐	☒	Remote Start Is On Load

The remote start input can be configured to one of the following.

- ♦ Remote start is off load – The generator will start and run off load when the remote start input is active.
- ♦ Remote start is on load – The generator will start, and the load transferred to the generator when the remote start is active.

Auxiliary Output 1 Function	☒	☐	☐	☒	☐	☐	☐	☐	Not used
	☐	☐	☐	☐	☐	☐	☐	☒	Mains Failure
	☐	☐	☐	☐	☐	☐	☐	☒	Generator Available
	☐	☐	☐	☐	☐	☐	☐	☒	Generator On Load
	☐	☐	☐	☐	☐	☐	☐	☒	Mains On Load
	☐	☐	☐	☐	☐	☐	☐	☒	System in Auto
	☐	☐	☐	☐	☐	☐	☐	☒	Close to neutral Position

Programmable output can be configured to one of the following.

- ♦ Mains Failure. - The output is energised after the delay mains fail timer has elapsed and stays energised until the delay mains return timer has elapsed.
- ♦ Generator Available. - The output is energised after the warm up timer has elapsed and generator voltage is sensed.
- ♦ Generator On Load. - The output is energised when the unit has switched over to generator supply.
- ♦ Mains On Load. - The output is energised when the unit has switched over to mains supply.
- ♦ System in auto. - The output is energised when the unit is in automatic mode.
- ♦ Close to Neutral Position. - The output is energised when the close to neutral position input is active.

Auxiliary Output 2 Function	☒	☐	☐	☒	☒	☐	☐	☐	Not used
	☐	☐	☐	☐	☐	☐	☐	☒	Mains Failure
	☐	☐	☐	☐	☐	☐	☐	☒	Generator Available
	☐	☐	☐	☐	☐	☐	☐	☒	Generator On Load
	☐	☐	☐	☐	☐	☐	☐	☒	Mains On Load
	☐	☐	☐	☐	☐	☐	☐	☒	System in Auto
	☐	☐	☐	☐	☐	☐	☐	☒	Close to neutral Position

Programmable output can be configured to one of the following.

- ♦ Mains Failure. - The output is energised after the delay mains fail timer has elapsed and stays energised until the delay mains return timer has elapsed.
- ♦ Generator Available. - The output is energised after the warm up timer has elapsed and generator voltage is sensed.
- ♦ Generator On Load. - The output is energised when the unit has switched over to generator supply.
- ♦ Mains On Load. - The output is energised when the unit has switched over to mains supply.
- ♦ System in auto. - The output is energised when the unit is in automatic mode.
- ♦ Close to Neutral Position. - The output is energised when the close to neutral position input is active.

Mains Under Voltage (Trip / Return)	☒	☐	☒	☐	☐	☐	☐	☐	60V / 70V
	☐	☐	☐	☐	☐	☐	☐	☒	70V / 80V
	☐	☐	☐	☐	☐	☐	☐	☒	80V / 90V
	☐	☐	☐	☐	☐	☐	☐	☒	90V / 100V
	☐	☐	☐	☐	☐	☐	☐	☒	120V / 140V
	☐	☐	☐	☐	☐	☐	☐	☒	140V / 160V
	☐	☐	☐	☐	☐	☐	☐	☒	160V / 180V
	☐	☐	☐	☐	☐	☐	☐	☒	180V / 200V

If for example 180V/200V is selected the generator will be started and the load transferred if any phase falls below 180V with respect to the neutral for the duration of the delay start timer. The load will be transferred back to mains when the mains voltage returns to 200V or higher for the duration of the mains return timer. (The system must be in Auto)

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

7 INSTALLATION INSTRUCTIONS

The model **DSE 4130** Module has been designed for front panel mounting. Fixing is by 2 clips for easy assembly.

7.1 PANEL CUT-OUT

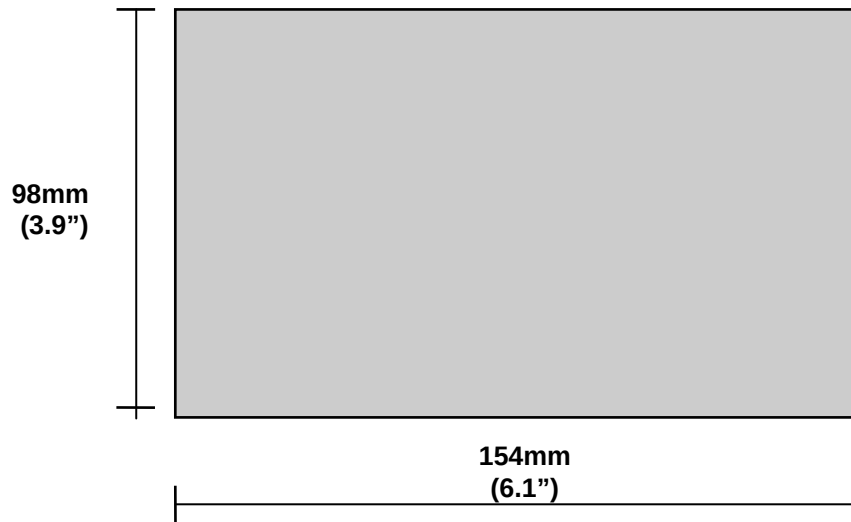


FIG 3

Maximum panel thickness – 8mm (0.3")

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

7.2 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%**.

7.3 UNIT DIMENSIONS

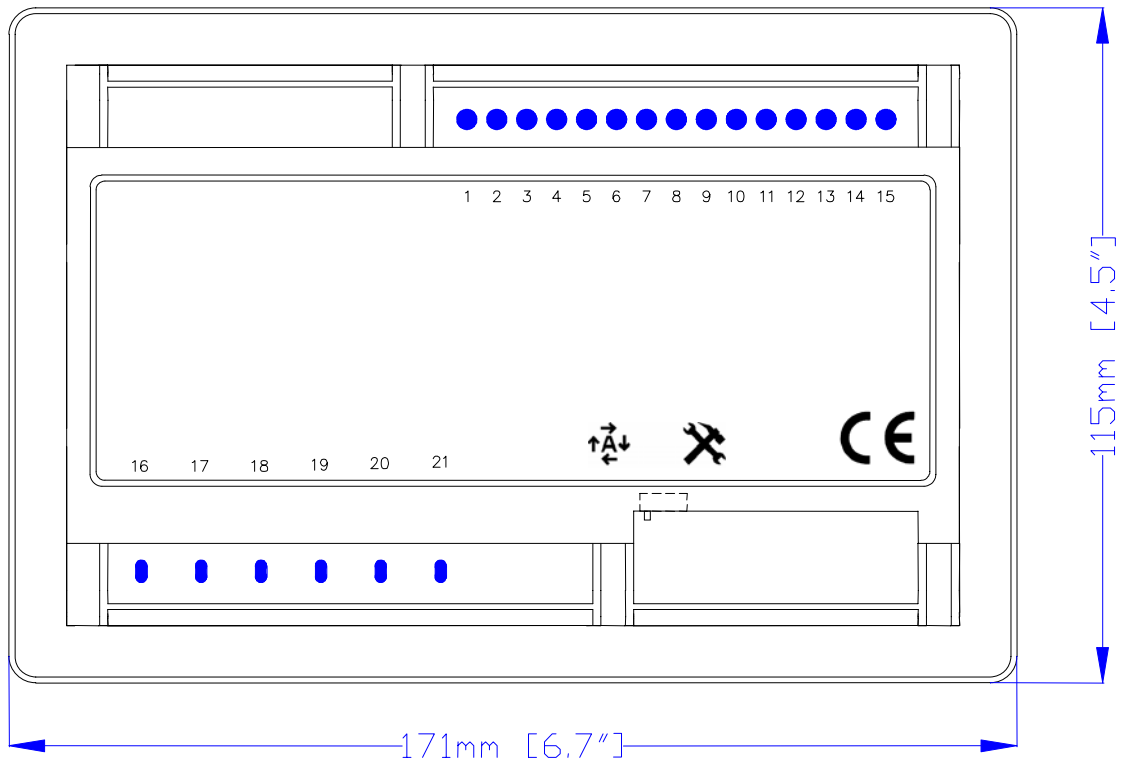


FIG 4A

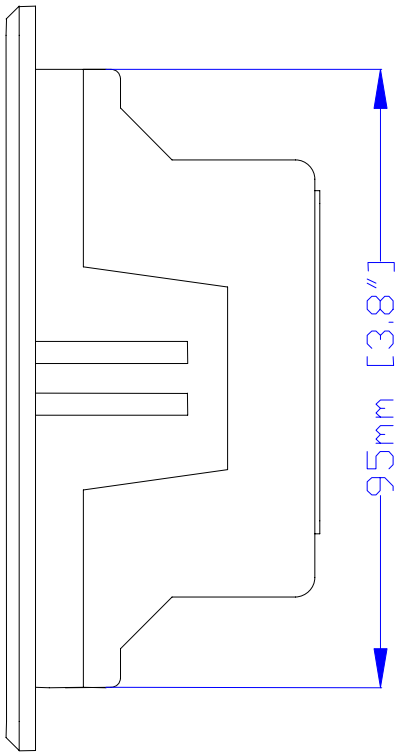


FIG 4B

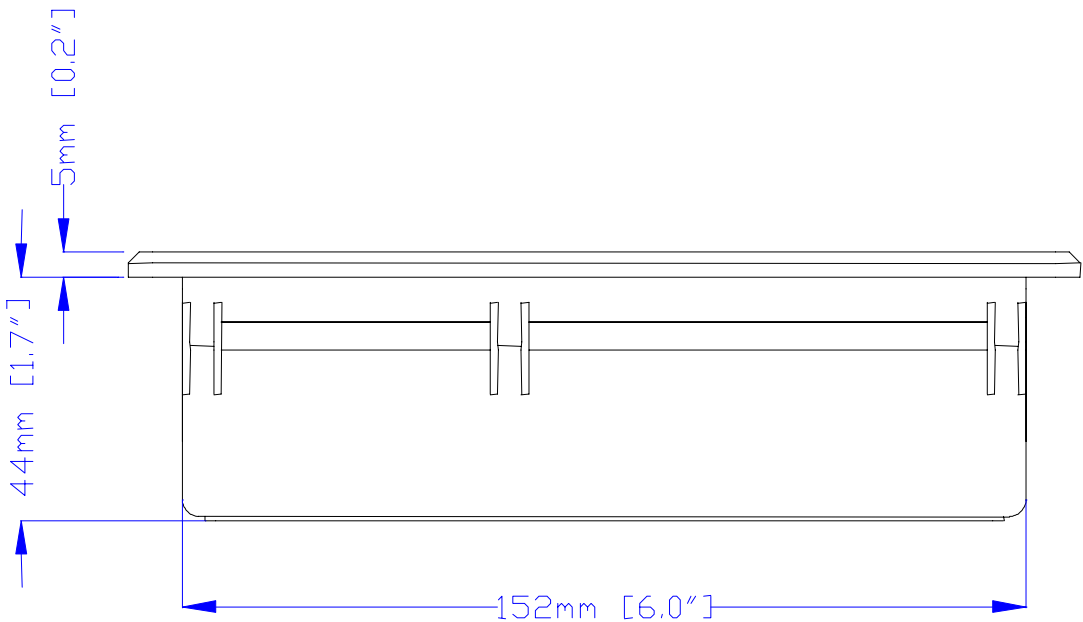


FIG 4C

7.4 FRONT PANEL LAYOUT

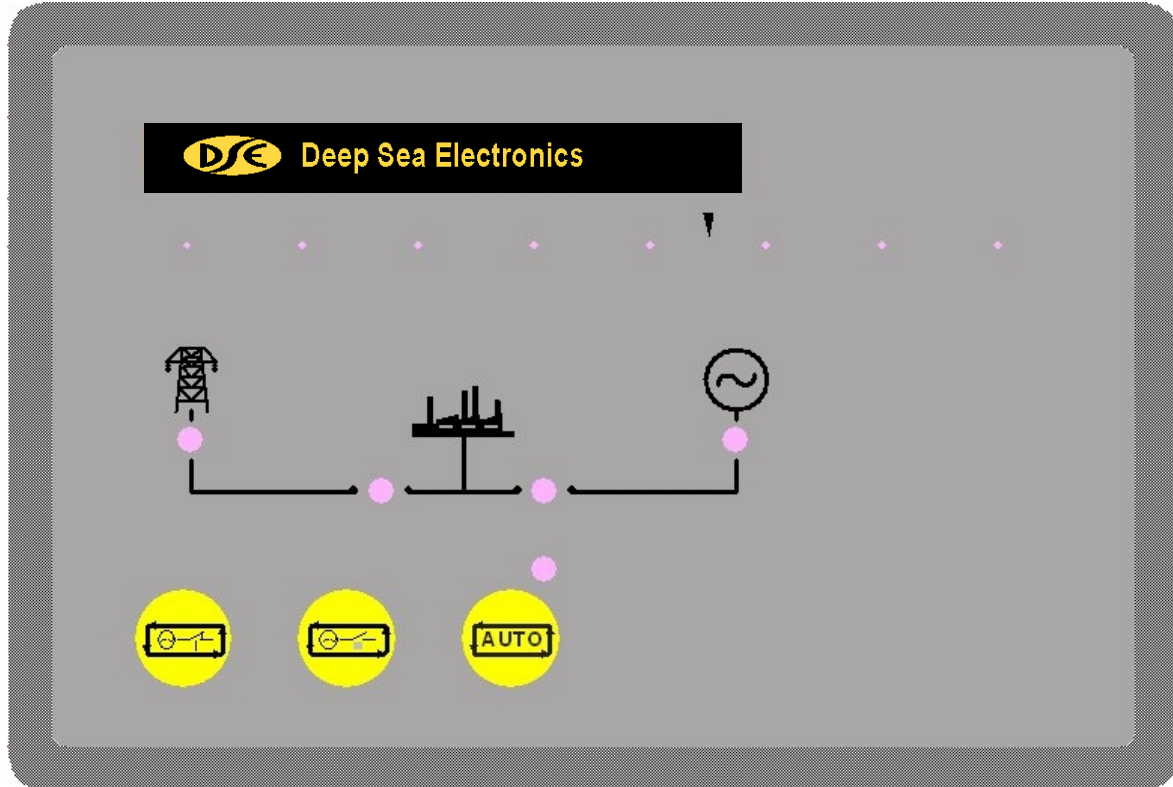


FIG 5

7.5 REAR PANEL LAYOUT

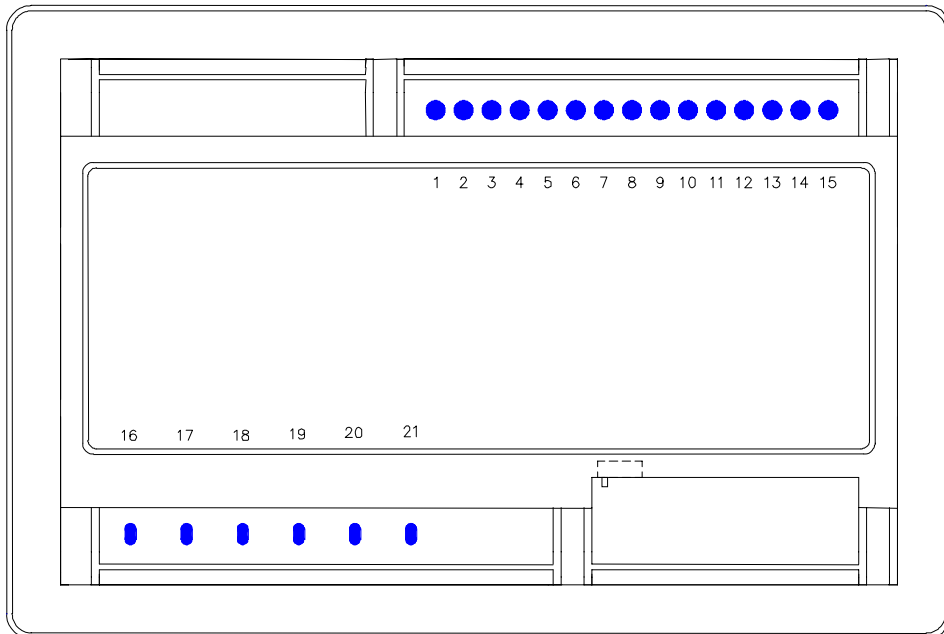


FIG 6

8 ELECTRICAL CONNECTIONS

Connections to the Module are via plug and sockets.

8.1 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	Remote Start Output	1.0mm	Remote Start Input to all DSE remote start modules.
4	Auxiliary Output relay 1	1.0mm	Configurable output.
5	Auxiliary Output relay 2	1.0mm	Configurable output.
6	NOT USED		DO NOT CONNECT
7	NOT USED		DO NOT CONNECT
8	NOT USED		DO NOT CONNECT
9	NOT USED		DO NOT CONNECT
10	NOT USED		DO NOT CONNECT
11	Close To Neutral. (Mains & Generator Off Load)	0.5mm	Switch to negative.
12	Remote Start Input	0.5mm	Switch to negative.
13	Mains loading Relay Normally Open contact	1.0mm	Used to close the mains contactor / breaker
14	Generator loading Relay Normally Open contact	1.0mm	Used to close the generator contactor / breaker
15	Functional Earth	1.0mm	Connect to a good clean earth point
16	Mains L1 Voltage Monitoring Input	1.0mm	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
17	Mains L2 Voltage Monitoring Input	1.0mm	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
18	Mains L3 Voltage Monitoring Input	1.0mm	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
19	Mains N Voltage Monitoring Input	1.0mm	Connect to Mains N supply (AC)
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: - For single-phase mains monitoring the neutral should be connected to terminal 19, L1 should be connected to terminals 16,17 and 18.

NOTE: - For two phase mains monitoring the L2 should be connected to terminal 19, L1 should be connected to terminals 16,17 and 18. The voltage between the two phases must not exceed 305 Volts.

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

8.2 CONNECTOR FUNCTION DETAILS

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

PIN No	DESCRIPTION
1	DC Supply -ve. System DC negative input. (Battery Negative).
2	DC Supply +ve. System DC positive input. (Battery Positive).
3	Remote start output. Plant Supply negative from pin 1. Used to start DSE autostart modules via a slave relay.
4	Auxiliary Relay output 1. Plant Supply negative from pin 1. Configurable output, see configuration tables for options available.
5	Auxiliary Relay output 2. Plant Supply negative from pin 1. Configurable output, see configuration tables for options available.
6	Not used
7	Not used
8	Not used
9	Not used
10	Not used
11	Close to neutral. Will open both the mains and generating switching devices if active.
12	Remote start input. This is a negative switched input, which will start the generator when Auto is selected. If this input is configured for Remote start is on load the load will be switched from the mains to generator as soon as the generator is available.
13	Mains loading relay. Plant Supply negative from pin 1. Normally open. This output closes when the mains (utility) has failed, energising a slave relay which should open the mains (utility) switching device.
14	Generator loading relay. Plant Supply negative from pin 1. Normally open. This output closes when the generator is available for loading, energising a slave relay, which should close the generator switching device.
15	Functional Earth - Ensure connection to a good clean earth point.
16	Mains L1 voltage monitoring input. Connect to mains L1 supply
17	Mains L2 voltage monitoring input. Connect to mains L2 supply
18	Mains L3 voltage monitoring input. Connect to mains L3 supply
19	Mains Neutral input. Connect to mains N supply.
20	Generator L1 sensing input. Connect to alternator L1 output.
21	Generator N sensing input. Connect to alternator N output.

9 SPECIFICATION

DC Supply	8.0 to 35 V Continuous.
Cranking Dropouts	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>
Typical Standby Current	TBA. mA at 12 V. TBA. mA at 24 V.
Max. Operating Current	TBA. mA at 12 V. TBA. mA at 24V
Alternator / Mains (Utility) Input Range	
Single phase 2 wire system	15V AC - 277 V AC (ph-N) (+20%)
3Phase 4Wire System	15V AC - 277 V AC (ph-N) 3 Phase 4wire (+20%)
Alternator / Mains (Utility) Input Frequency	50Hz - 60 Hz at rated engine speed
Start Relay Output	1.2 Amp DC at supply voltage.
Fuel Relay Output	1.2 Amp DC at supply voltage.
Auxiliary Relay Outputs	1.2 Amp DC at supply voltage.
Dimensions	
Panel cutout	154mm x 98mm (6.1" x 3.9") Maximum panel thickness 8mm (0.3")
Charge Fail / Excitation Range	12 Volts = 8 Volts CF 24 Volts = 16 Volts CF
Operating Temperature Range	-30 to +70°C
Electromagnetic Compatibility	BS EN 50081-2 EMC Generic Emission Standard (Industrial) BS EN 50082-2 EMC Generic Immunity Standard (Industrial)
Electrical Safety	BS EN 60950 Safety of I.T. equipment, including electrical business equipment.
Cold Temperature	BS EN 60068-2-1 to -30 °C
Hot Temperature	BS EN 60068-2-2 to +70°C
Humidity	BS2011-2-1 to 93% RH @ 40°C for 48 Hours
Vibration	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
Shock	BS EN 60068-2-27 3 Half sine shocks in each of 3 major axes 15gn amplitude, 11mS duration
Applicable Standards	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  Compliance to European Legislation  Registered Component for USA & Canada

10 COMMISSIONING

10.1 PRE-COMMISSIONING

Before the system is started, it is recommended that the following checks are made:, and that the automatic start module on the generator is fully commissioned first.

- 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, connect the battery supply. Select , the unit start sequence will commence.
- 4) The automatic start module on the generator should receive a start signal and attempt to start the generator. The generator will continue to run with no further action.
- 5) Make sure that the mains is healthy and the mains healthy LED is illuminated. Select “**AUTO**” on the front panel, after the stop delay has expired, the remote start to the automatic start module should be removed. The generator should stop.
- 6) Select  on the front panel, the unit start sequence will commence and the generator will be started (via the automatic start module). Once the **4130** detects that the generator is available, the load will be transferred to the generator.
- 7) Make sure that the mains is healthy and the mains healthy LED is illuminated. Select “**AUTO**” on the front panel, after the stop delay has expired, the load will be transferred back to the mains (utility). After the cooling time has expired the remote start to the automatic start module should be removed. The generator should stop.
- 8) Initiate an automatic start by supplying the automatic start signal. The start sequence will commence and the generator will be started (via the automatic start module). If the remote start has been configured as a **Remote start on load** the **4130** will transfer the load to generator once it has detected that the generator is available.
- 9) Remove the automatic start signal the stop sequence will be initiated. After the pre-set time period, the load will be transferred back to the mains (utility) and after the cooling time has expired the remote start to the automatic start module should be removed. The generator should stop.
- 10) Simulate a mains (utility) failure, The start sequence will commence and the generator will be started (via the automatic start module). The **4130** will transfer the load to generator once it has detected that the generator is available.
- 11) Reinststate the mains (utility), the stop sequence will be initiated. After the pre-set time period, the load will be transferred back to the mains (utility) and after the cooling time has expired the remote start to the automatic start module should be removed. The generator should stop.
- 12) If despite repeated checking of the connections between the **4130** 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

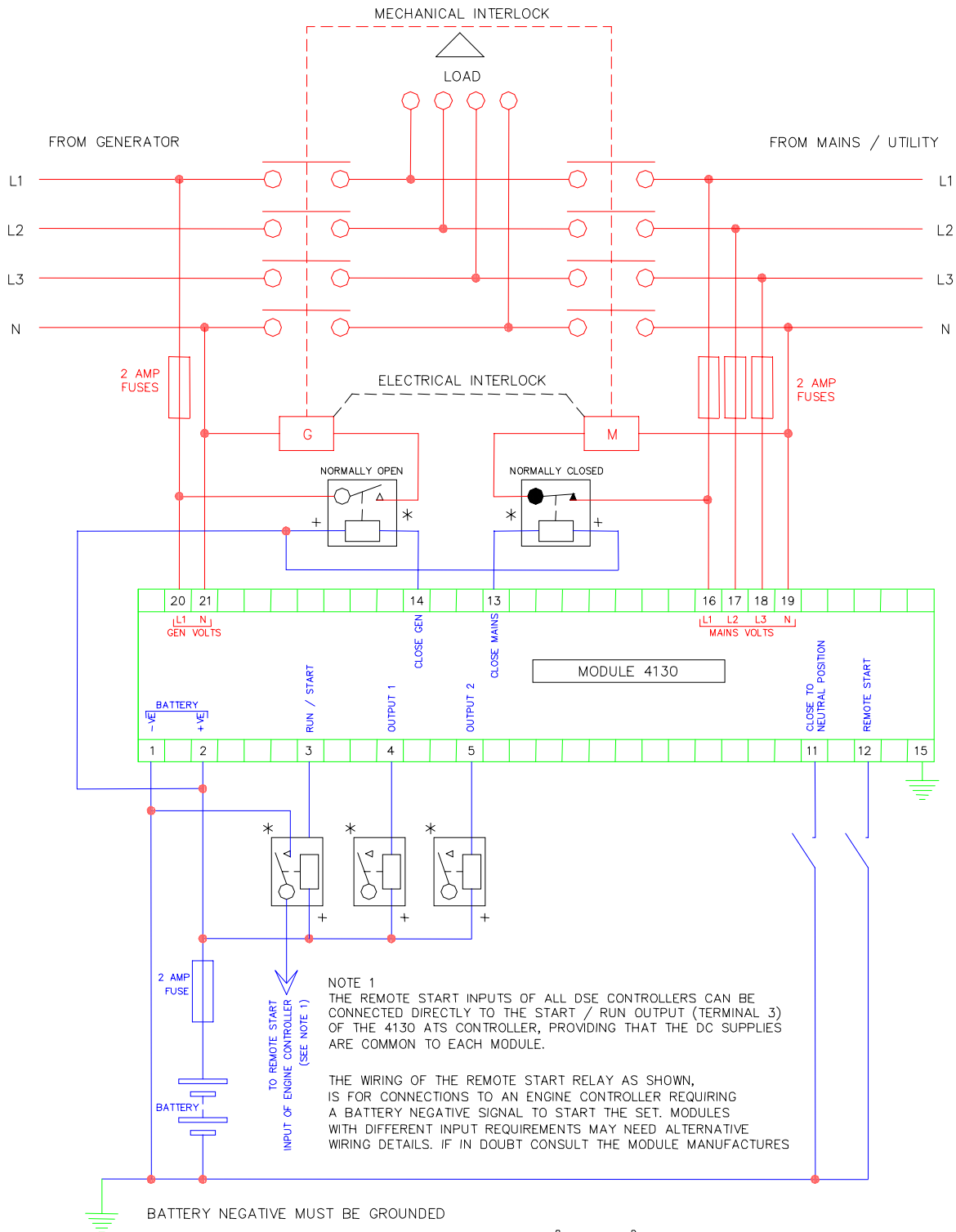
Website : www.deepseapl.com

11 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.
The generator switching device fails to close	Check wiring to switching device. Check battery supply. Check battery supply is present on the fuel output of module. NB all the outputs are negative switching.
The mains (utility) switching device fails to close	Check wiring to switching device. Check battery supply. Check battery supply is present on the fuel output of module. NB all the outputs are negative switching.
Generator start will not activate	Check wiring to automatic start module. Check battery supply. Check battery supply is present on the generator start output of module. NB all the outputs are negative switching.
Continuous starting of generator when in AUTO	Check that there is no signal present on the "Automatic start" input, and that the mains (utility) is healthy.

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.

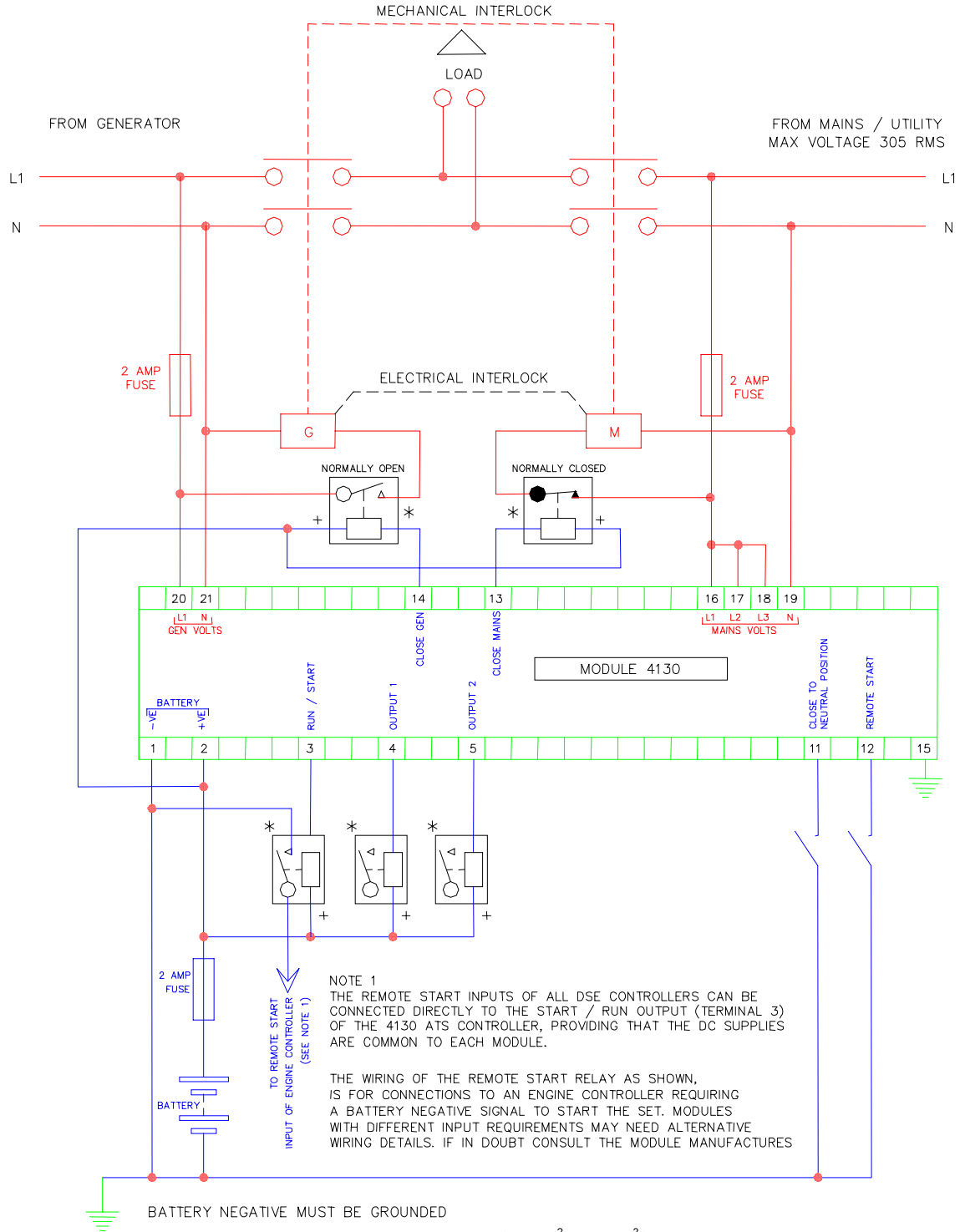
12 TYPICAL WIRING DIAGRAM



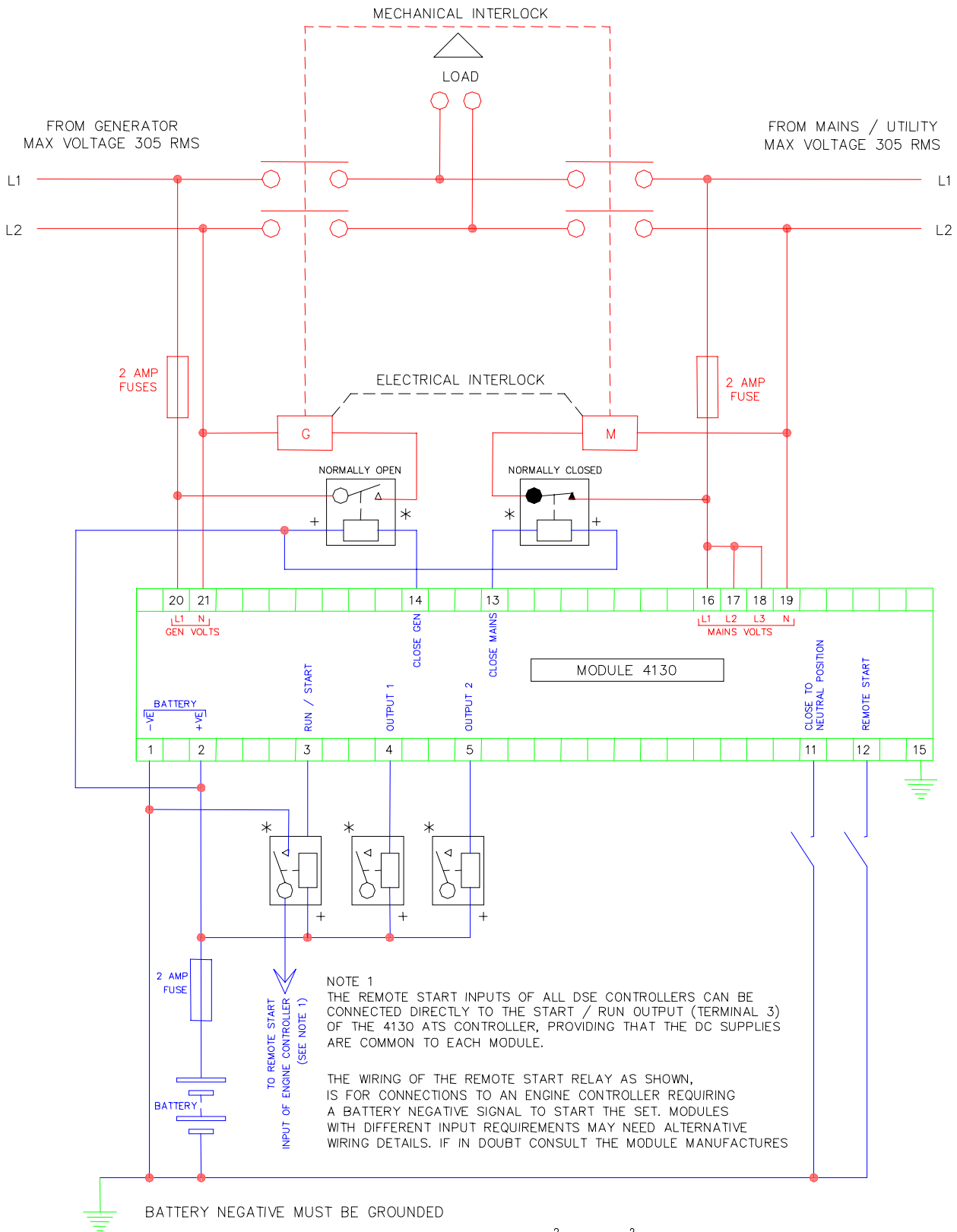
13 APPENDIX

13.1 ALTERNATIVE WIRING TOPOLOGIES

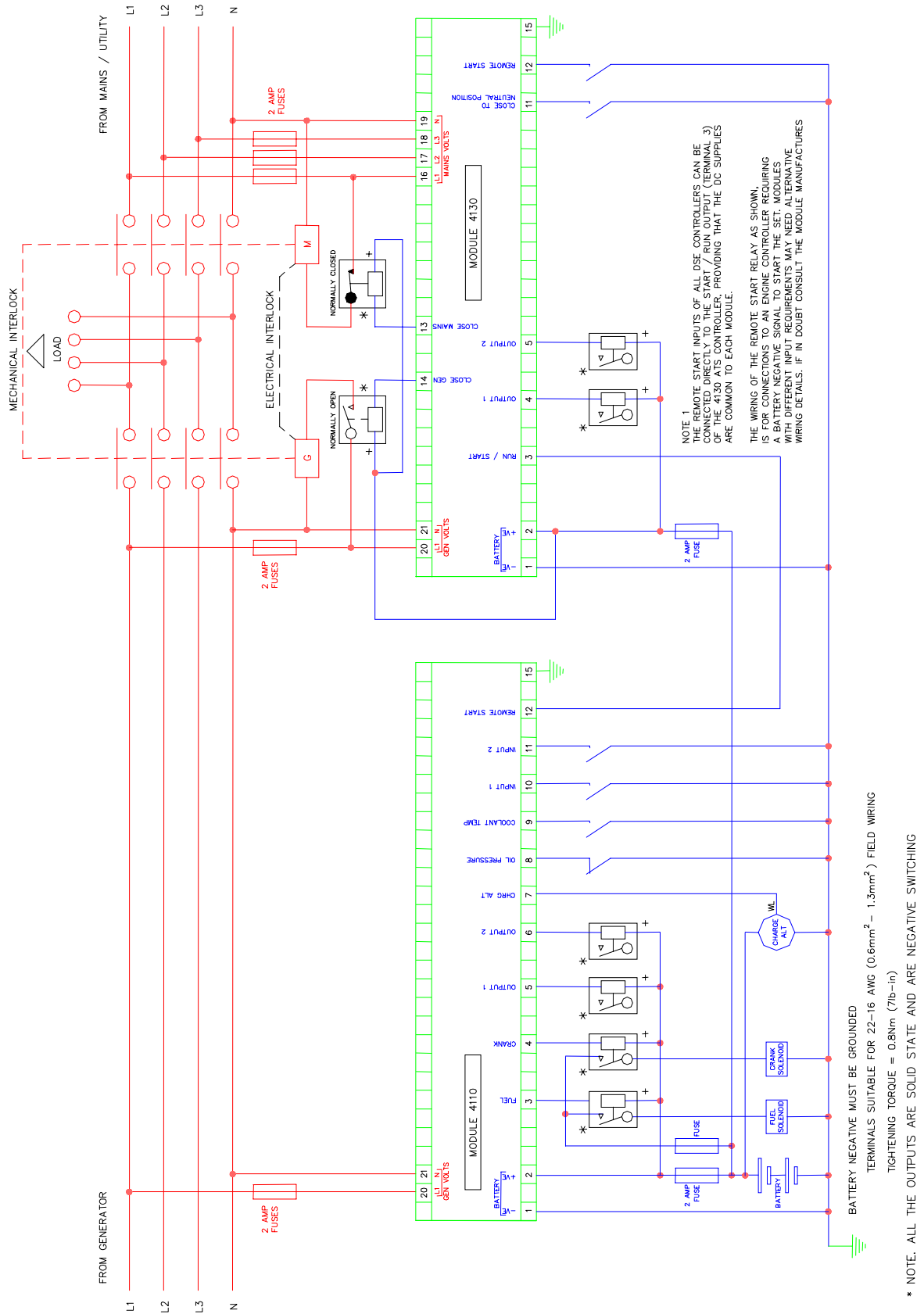
13.1.1 SINGLE PHASE TWO WIRE



13.1.2 TWO PHASE 2 WIRE



13.1.3 4130 CONNECTED TO A 4110



13.2 SOLID STATE OUTPUTS

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

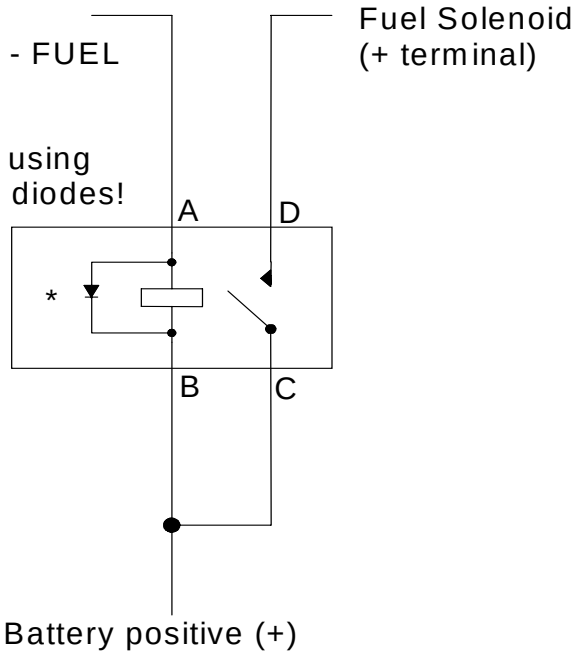
- ◆ No Moving Parts
- ◆ Fully Overload / Short Circuit Protected.
- ◆ Smaller dimensions hence lighter, thinner and cheaper than conventional relays.
- ◆ Less power required making them far more reliable.

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 overleaf for overall typical wiring diagram

13.3 PUSH BUTTONS

Display	Description
	Run generator off load
	Run generator on load
	Auto mode

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