

Deep Sea Electronics Plc

MODEL 511 MANUAL START ENGINE MANAGEMENT SYSTEM

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TABLE OF CONTENTS

Section	Page
INTRODUCTION.....	3
CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.....	3
1. OPERATION.....	4
1.1 CONTROL.....	4
FIG 1.....	4
1.2 NORMAL MANUAL OPERATION.....	4
1.3 REMOTE FUEL ON OPERATION.....	5
2. PROTECTIONS.....	6
2.1 WARNINGS.....	6
2.2 SHUTDOWNS.....	6
3. INSTALLATION INSTRUCTIONS.....	8
3.1 PANEL CUT-OUT.....	8
FIG 2.....	8
3.2 COOLING.....	8
3.3 UNIT DIMENSIONS.....	8
FIG 3.....	8
3.4 FRONT PANEL LAYOUT.....	9
FIG 4.....	9
3.5 REAR PANEL LAYOUT.....	9
FIG 5.....	9
4. ELECTRICAL CONNECTIONS.....	10
4.1 CONNECTION DETAILS.....	10
PLUG "A" 13 WAY.....	10
PLUG "B" 5 WAY.....	10
4.2 CONNECTOR FUNCTION DETAILS.....	11
PLUG "A" 13 WAY.....	11
PLUG "B" 5 WAY.....	11
CALIBRATION SOCKET.....	12
5. SPECIFICATION.....	12
6. COMMISSIONING.....	13
PRE-COMMISSIONING.....	13
7. FAULT FINDING.....	14
8. TYPICAL WIRING DIAGRAM.....	15
9. CONFIGURATION.....	16
9.1 PC INTERFACE MODULE 808.....	16
10. ICON DESCRIPTIONS.....	16
10.1 ICONS.....	16
11. APPENDIX.....	17
11.1 LED IDENTIFICATION DIAGRAM.....	17
FIG 6.....	17
11.2 FACTORY DEFAULT CONFIGURATION.....	17

INTRODUCTION

The **DSE P511** Manual Start Module, has been designed to allow the OEM to meet most of the industry's complex specifications. It has been primarily designed to allow the user to start and stop the generator.





Once started the **DSE P511** module monitors the engine, indicating the operational status and fault conditions; automatically shutting down the engine and giving a true first up fault condition of an engine failure by a flashing LED and other simultaneous faults by a steady LED. This information is indicated by the LED's on the front panel.

Selective operational sequences, timers and alarm trips can be altered by the customer. Alterations to the system are made by using a PC with the **808** interface.

Access to critical operational sequences and timers for use by qualified engineers, are barred by a security code.

The module is housed in a robust plastic case for the front panel mounting. Connections to the module are via locking plug and sockets.

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.
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1. OPERATION

1.1 CONTROL

Control of the **DSE P511** module is by a two position key-switch , mounted on the front of the module with **OFF** and **RUN** positions. A start push-button is also on the front panel, this is used to initiate the starting sequence.

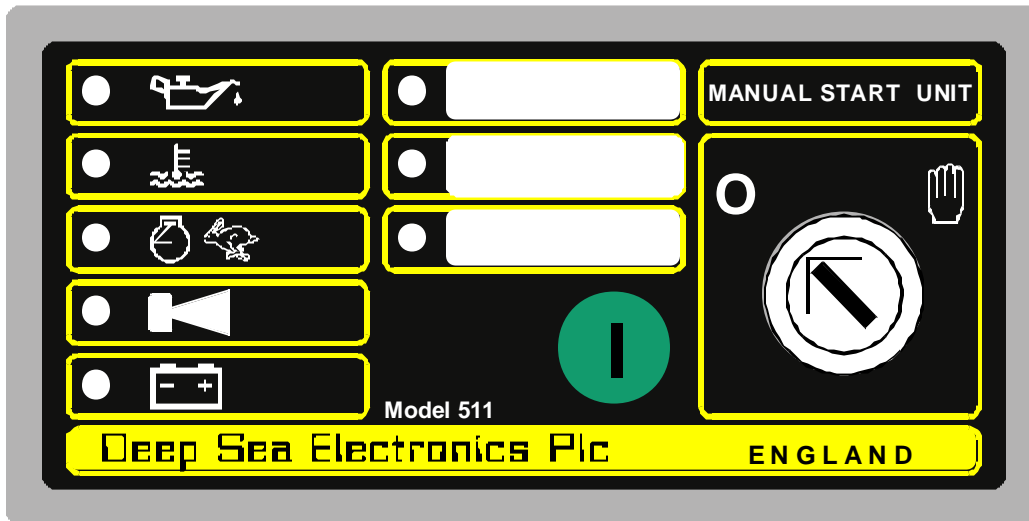


FIG 1

1.2 NORMAL MANUAL OPERATION

To initiate a start sequence turn the key switch to **RUN**.

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

After the pre-heat timer has expired the module will de-energise the pre-heat output and wait for a start command to be received. The pre-heat timer can be prematurely terminated at any time by pressing the Start push-button.

When the start push-button is pressed the following sequence occurs. The **Fuel Solenoid** is energised, then the **Starter Motor** is engaged.

The engine is cranked for as long as the start push-button is operated or when the engine fires, the starter motor is disengaged and locked out at a pre-set frequency from the Alternator output. Alternatively a Magnetic Pickup mounted on the flywheel housing can be used for speed detection. (This is specified on ordering.) The warning lamp output of the charge alternator can also be used to disconnect the starter motor, however it cannot be used for underspeed or overspeed. This is explained in the calibration manual.

NOTE:- Operation of the start button initiates a crank limit timer, this is used to prevent potentially damaging long duration cranks from being made by in-experienced operators. Once this timer has expired the starter motor is automatically dis-engaged and locked out. For further attempts to start the switch must be turned to the 'OFF' position and the above sequence repeated.

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

Once the engine is running and the safety on timer has expired, full fault protection is made available.

Turning the switch to the '**OFF**' position will de-energise the **Fuel Solenoid** and bring the engine to rest.

1.3 REMOTE FUEL ON OPERATION

The module is activated by turning the key switch to the **RUN** position.

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

After the pre-heat timer has expired the module will de-energise the pre-heat output and wait for a start command to be received. The pre-heat timer can be prematurely terminated at any time by pressing the Start push-button.

When a **Remote Fuel On** signal is applied to the remote fuel on input, the following sequence is initiated:-


The **Fuel Solenoid** is energised, and the **Safety On Timer** is initiated.

 **NOTE:- If the Remote Fuel On signal is removed before the engine has started the unit will return to a standby state and the Fuel Solenoid will be de-energised.**

The operator must then crank the engine and reach normal running conditions before the safety on timer expires. If the engine does not reach normal running conditions on timer termination. The module will generate an alarm and stop the engine (Fuel Solenoid de-energises). If normal running conditions are met the module will enter it's Remote Running state.

Should a fault condition occur the module will shutdown the engine and the fault will be indicated by a flashing LED.


If the Remote Fuel On signal is removed the module will shutdown the engine and return to a standby state.


 **CAUTION!:- The Remote Fuel On facility is intended for use where a dual engine start position is required. The module will turn on the fuel supply and provide all normal protections to the engine. However engine cranking must be performed externally to the module if via a key switch or push-button connected in parallel with the module crank relay. Crank disconnect in this instance will be entirely manual and is the responsibility of the operator.**

If the key-switch on the module is turned to the '**OFF**' position during Remote Running the fuel solenoid will be de-energised and the engine stopped.

2. PROTECTIONS

The **LED's** will indicate the fault condition and one of the auxiliary outputs if selected to be a common alarm output, will activate. First up fault is indicated by a flashing **LED**, subsequent faults which happen simultaneously are indicated by a steady **LED**. Warnings are also indicated by a steady **LED**. Indications are fed directly from the appropriate input and are indicated by a steady **LED** which will be present for as long as the input is active, this feature can be used to allow the module to operate as an Annunciator.

 **NOTE 1:-An auxiliary output may be configured as one of three alarm options, Shutdown, Warning or Common Alarm (Shutdown and Warnings). This is in addition to the list of other control sources from which it may be driven.**

 **NOTE 2:-The Common alarm indicates all Shutdown and Warning faults, this is mainly used to indicate fault conditions such as Emergency Stop, Fail to Stop, Underspeed, Sensor Fail and Oil Pressure Switch which do not have their own individual LED to indicate the fault. To prevent un-indicated faults from occurring it is recommended that this is brought out to an LED on the front panel. A warning indication is illuminated steady, while shutdown indications flash.**

 **NOTE 3:- A corrupt configuration is indicated by all the LED's flashing. The module must then be re-configured.**

2.1 WARNINGS

Warnings are self resetting, once the fault has been removed the input is reset.

CHARGE FAIL, If charge alternator voltage falls below the pre-set trip voltage after the end of the **Safety On** timer. The **Charge Fail LED** is illuminated.

AUXILIARY INPUTS, if an auxiliary input has been configured as a warning the appropriate **LED** will illuminate.

OIL PRESSURE SWITCH, the **DSE P511** will only attempt to crank the engine if the Oil Pressure is initially low, (engine at rest, not running), this feature is used to prevent accidental crank engage on a running engine. (It is also possible that the Oil Pressure switch is faulty if engine not running but the crank will not engage). The **Common Alarm LED** will illuminate.

2.2 SHUTDOWNS

Shutdowns are latching and stop the Generator. The selector switch must be turned to **OFF** and the fault removed to reset the module.

EMERGENCY STOP, removal of the **+ve DC** Supply from the Emergency Stop input initiates the following sequence, firstly it will initiate a controlled shutdown of the Generator and prevent any attempt to restart the Generator until the Emergency Stop push-button has been reset. Secondly it removes the **+ve DC** supply from both the Fuel Solenoid and Starter Solenoid. This input is always active when **RUN** is selected.

 **NOTE:- The Emergency Stop signal must be present otherwise the unit will shutdown.**

LOW OIL PRESSURE, activation of the Low Oil Pressure input after the **Safety On** timer has expired, initiates a shutdown. The **Low Oil Pressure LED** will flash.

HIGH ENGINE TEMPERATURE, activation of the High Engine Temperature input after the **Safety On** timer has expired, initiates a shutdown. The **High Engine Temperature LED** will flash.

OVERSPEED, if the engine speed exceeds the pre-set trip a shutdown is initiated. The **Overspeed LED** will flash. Overspeed is not delayed, it is an **immediate shutdown**.


FAIL TO STOP, if the generator fails to stop after the pre-set time, the **Common Alarm LED** will flash. Two conditions must be met to signal that the generator has stopped, Oil Pressure has gone low, and that no speed is sensed from either Magnetic Pickup or Alternator speed sensing sources.

UNDERSPEED, if the engine speed falls below the pre-set trip after the **Safety On** timer has expired a shutdown is initiated. The **Common Alarm LED** will flash.

SENSOR FAIL, if the speed sensing signal is lost during cranking, the Generator will shutdown and the **Common Alarm LED** will flash.

 **NOTE:- This will only occur if the speed sensing signal is lost during cranking or during the safety on timer. If the signal is lost during normal operation the Generator will shutdown with an Underspeed alarm.**

AUXILIARY INPUTS, if an auxiliary input has been configured as a Shutdown the appropriate **LED** will illuminate.

 **NOTE:- It is possible for the LED's to be configured to indicate any of the 32 different control sources in addition to the shutdowns and warnings detail above. Please refer to the 808 Software Manual for detail on how to achieve this.**

3. INSTALLATION INSTRUCTIONS

The model **DSE P511** Manual Start Module has been designed for front panel mounting. Fixing is by 2 spring loaded clips for easy assembly.

3.1 PANEL CUT-OUT

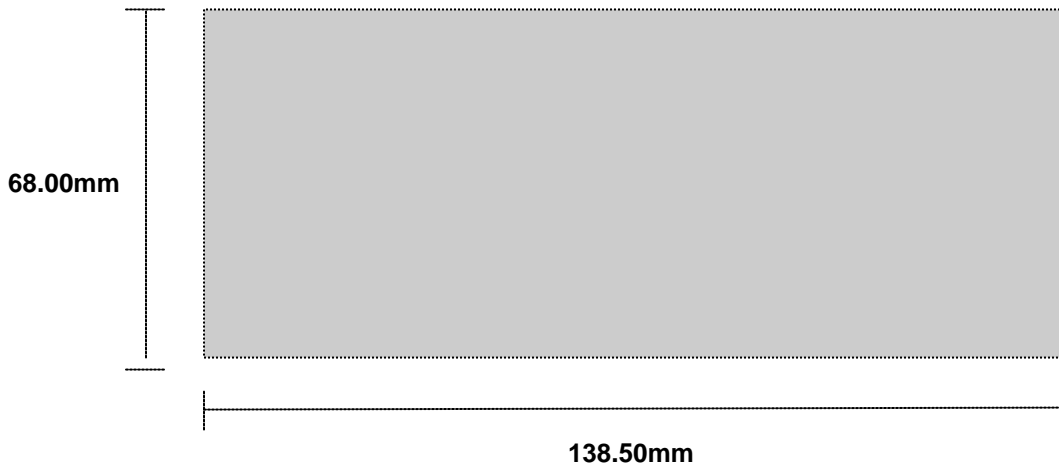


FIG 2

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

3.2 COOLING

The module has been designed to operate over a wide temperature range **-30 to +55° C**. However 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 **85%**.

3.3 UNIT DIMENSIONS

All dimensions in mm.

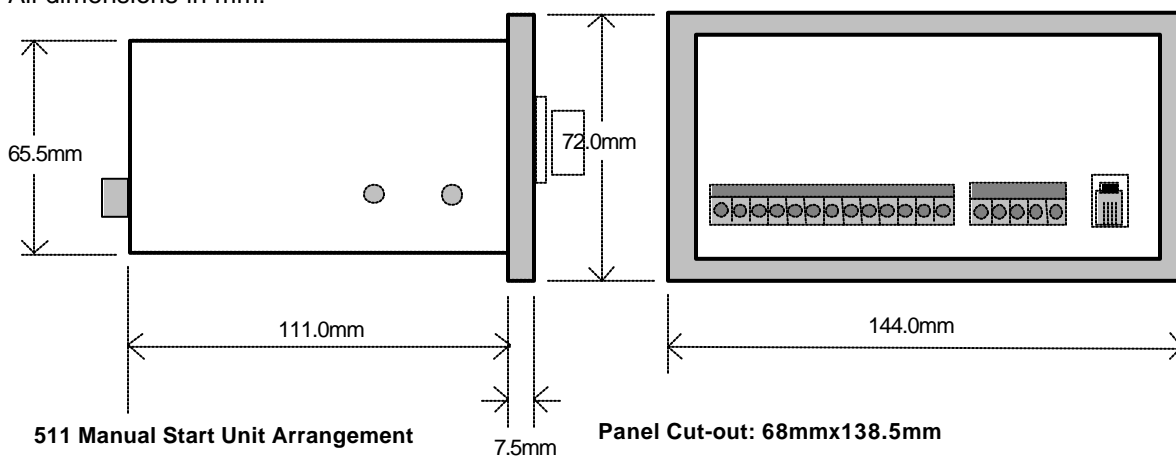


FIG 3

3.4 FRONT PANEL LAYOUT

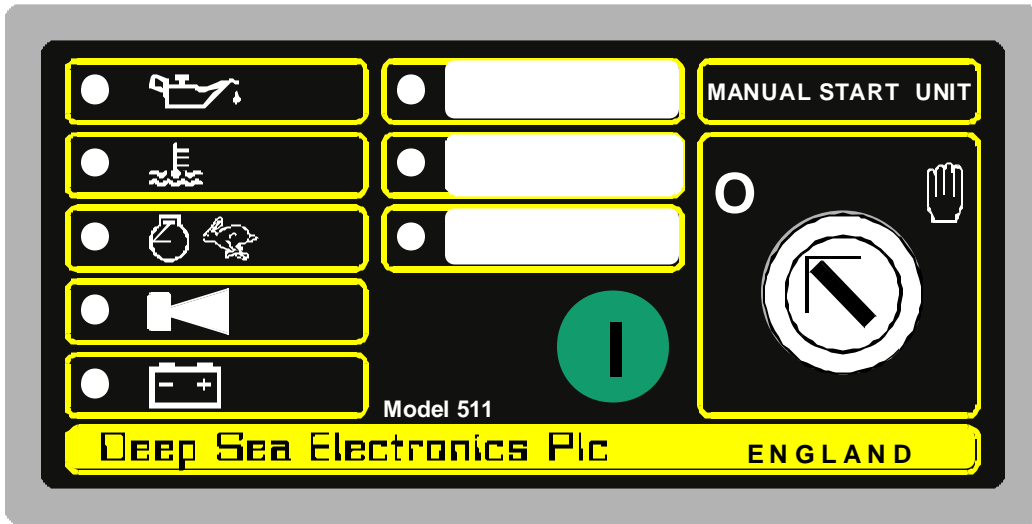


FIG 4

3.5 REAR PANEL LAYOUT

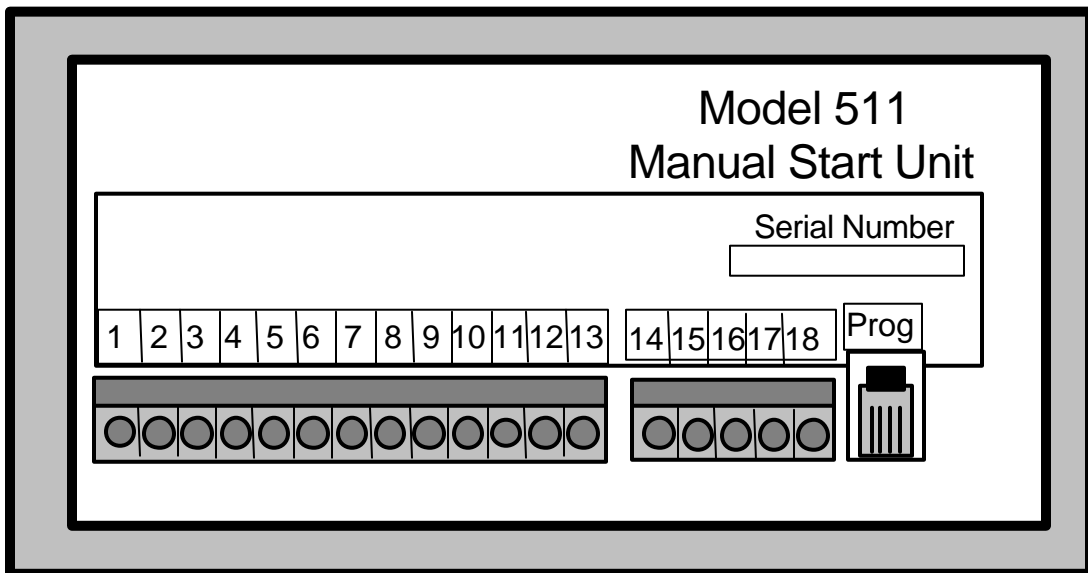


FIG 5

4. ELECTRICAL CONNECTIONS

Connections to the **DSE P511** Module are via plug and sockets.

4.1 CONNECTION DETAILS


The following describes the connections and recommended cable sizes to the 2 plugs and sockets on the rear of the **DSE P511** Module. See rear panel layout **FIG 5**.

PLUG "A" 13 WAY

PIN No	DESCRIPTION	CABLE SIZE	NOTES
1	DC Plant Supply Input (-ve)	2.5mm	
2	DC Plant Supply Input (+ve)	2.5mm	(Recommended Fuse 12A)
3	Emergency Stop Input	2.5mm	Plant Supply +ve. Also supplies fuel & start outputs. (Recommended Fuse 32A.)
4	Fuel relay Output	2.5mm	Plant Supply +ve from pin 3. 16 Amp rated.
5	Start relay Output	2.5mm	Plant Supply +ve from pin 3. 16 Amp rated.
6	Auxiliary Output relay 1	1.0mm	Plant Supply +ve. 5 Amp rated.
7	Auxiliary Output relay 2	1.0mm	Plant Supply +ve. 5 Amp rated.
8	Charge Fail Input/ Excitation Output	1.0mm	Must NOT be connected to plant supply -ve if not used.
9	Low Oil Pressure Input	0.5mm	Switch to -ve
10	High Engine Temp Input	0.5mm	Switch to -ve
11	Auxiliary Input 1	0.5mm	Switch to -ve
12	Auxiliary Input 2	0.5mm	Switch to -ve
13	Remote Fuel On Input	0.5mm	Switch to -ve

PLUG "B" 5 WAY

PIN No	DESCRIPTION	CABLE SIZE	NOTES
14	Alternator Input L1 or Magnetic Pickup Input (+ve)	1.0mm	Only connect Alternator L1 input if module is a Frequency sensing model. Only connect magnetic pickup input if module is a Magnetic Pickup sensing model. (Recommended Fuse 2A)
15	Alternator Input N or Magnetic Pickup Input (-ve)	1.0mm	Only connect Alternator N input if module is a Frequency sensing model. Only connect magnetic pickup input if module is a Magnetic pickup sensing model.
16	DO NOT USE		Ensure no connection is made to this pin.
17	Tachometer Output (+ve)	0.5mm	Tachometer must be completely isolated.
18	Tachometer Output (-ve)	0.5mm	Tachometer must be completely isolated.

 **CAUTION!:-** The module is available with two speed sensing sources, Alternator frequency (F) or Magnetic Pickup (M). These are factory build options and cannot be changed by the customer. Only connect the correct speed sensing input to the appropriate model. Failure to observe this will result in damage to the module.

 **NOTE:-** Screened cable must be used for connecting the Magnetic Pickup, ensuring that the screen is earthed at one end ONLY.

4.2 CONNECTOR FUNCTION DETAILS

The following describes the functions of the 2 connectors on the rear of the module. See rear panel layout FIG 5.

PLUG "A" 13 WAY

PIN No	DESCRIPTION
1	DC Supply -ve. System DC negative input. (Battery Negative).
2	DC Supply +ve. System DC positive input. (Battery Positive).
3	Emergency Stop input. Internally linked to Starter and Fuel outputs. If this input is not connected to positive the module will be locked out, and if the engine is running will shutdown immediately. Positive Supply is also removed from Starter and Fuel therefore only a single pole Emergency Shutdown button is required.
4	Fuel Relay output. Plant Supply +ve from pin 3. Used to control the fuel solenoid.
5	Starter Relay output. Plant Supply +ve from pin 3. Used to control the Starter Motor.
6	Auxiliary Relay output 1. Plant Supply +ve. Configurable output, see Calibration Manual for options available.
7	Auxiliary Relay output 2. Plant Supply +ve. Configurable output, see Calibration Manual for options available.
8	Charge Fail input / Excitation output. Supplies excitation to the Plant Battery Charging Alternator, also an input for the Charge Fail detection circuitry.
9	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.
10	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.
11	Auxiliary input 1. This is a negative switched configurable input, see Calibration Manual for options available. It is possible to configure the input to be a normally closed signal or a normally open signal.
12	Auxiliary input 2. As for Auxiliary input 1 (Pin 11).
13	Remote Fuel On input. This is a negative switched input which will energise the fuel solenoid on the generator when Run is selected. It is possible to configure the input to be a normally open signal or a normally closed signal. Refer to the description of Remote Fuel On Operation earlier in this manual for full details of how to use this input.

PLUG "B" 5 WAY

PIN No	DESCRIPTION
14	Speed sensing input
15	Speed sensing input
16	DO NOT USE
17	Tachometer output +ve. 0.5 or 1.0 mA Tachometer can be used.
18	Tachometer output -ve. ----- " -----

CALIBRATION SOCKET

PIN No	DESCRIPTION
1	Ground
2	Transmit Data
3	Receive Data
4	+5 Supply

⚠ CAUTION!:- THIS SOCKET IS FOR THE CONNECTION OF APPROPRIATE PRODUCTS ONLY, CONNECTION OF ANY OTHER DEVICE MAY CAUSE DAMAGE AND WILL INVALIDATE THE WARRANTY.

5. SPECIFICATION

DC Supply	8.0 to 35 V Continuous.
Cranking Dropouts	Able to survive 0 V for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5V
Max. Operating Current	150 mA at 12 V. 180 mA at 24 V.
Max. Standby Current	15 mA at 12 V. 21 mA at 24 V. (In stop position consumption is zero.)
Alternator Input Range (if fitted)	15 - 300 V ac RMS
Alternator Input Frequency	50 - 60 Hz at rated engine speed.
Magnetic Input Range (if fitted)	0.5 V to +/- 70 V (Clamped by transient suppressors)
Magnetic Input Frequency	10Hz to 10,000 Hz at rated engine speed.
Start Relay Output	16 Amp DC at supply voltage.
Fuel Relay Output	16 Amp DC at supply voltage.
Auxiliary Relay Outputs	5 Amp DC at supply voltage.
Dimensions	72 X 144 X 118.5 (Excluding Key-switch)
Charge Fail / Excitation Range	0 V to 35 V
Operating Temperature Range	-30 to +55°C

6. COMMISSIONING

PRE-COMMISSIONING

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

- 6.1. The unit is adequately cooled and all the wiring to the module is of a standard and rating compatible with the system.
- 6.2. The unit **DC** supply is fused and connected direct to the battery and of correct polarity.
- 6.3. The Emergency Stop input is wired to an external normally closed switch connected to **DC** positive.


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

- 6.1. To check the start cycle 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. Turn the key switch to **“RUN”**. The unit starts to pre-heat if selected.
- 6.2. Press and hold the **‘START’** push-button for a short time, starter will engage and operate for the duration that the button is operated for. After the safety on timer has expired the module will generate an alarm and the **“COMMON ALARM” LED** will be illuminated (if fitted). Turn to **OFF** to reset the unit.
- 6.3. Restore the engine to operational status (reconnect the fuel solenoid), again select **“RUN”** and operate the **“START”** push-button and 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.
- 6.4. Select **OFF** on the front panel, the engine will then shutdown.
- 6.5. All internal timers and selections should now be adjusted to the customers specifications or to the engine and alternator manufacturers recommendations.
- 6.6. If despite repeated checking of the connections between the **DSE P511** and the customers system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice.

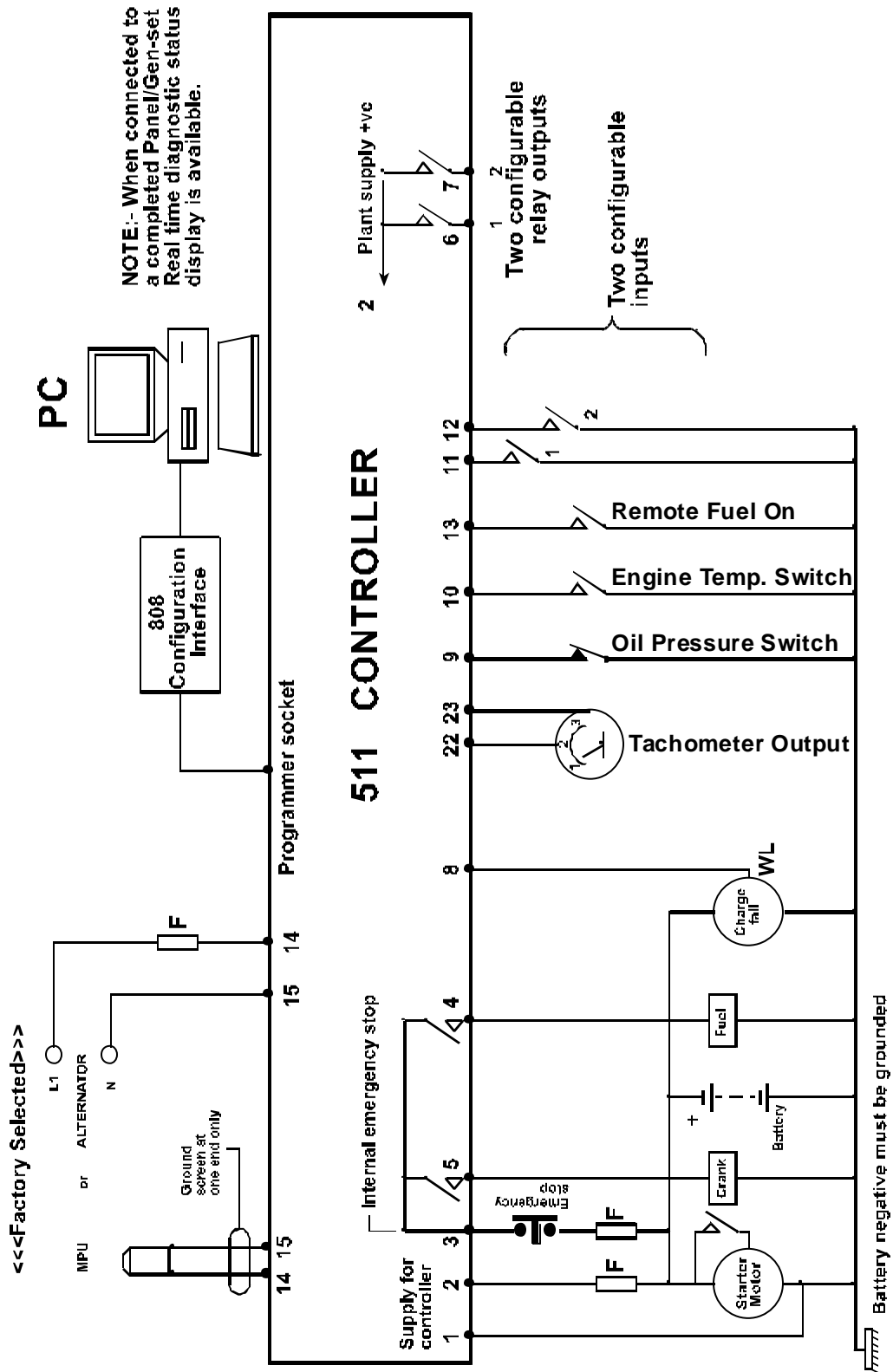
INTERNATIONAL TEL: 44 (0) 1723 377566
INTERNATIONAL FAX: 44 (0) 1723 354453
E-mail: Support@Deepseapl.com

7. FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative	Select RUN on the front panel and operate the START push-button. 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 8 Volts Check the operating temperature is not above 55 °C. Check the DC fuse.
Unit locks out on Emergency Stop	If an Emergency Stop Switch is not fitted, ensure that a positive is connected to the Emergency Stop input. Check emergency stop switch is functioning correctly. Check Wiring is not open circuit.
Intermittent sensor fault (if fitted)	Ensure that Magnetic pick-up screen is only connected at one end, if connected at both ends this enables the screen to act as an aerial and will pick up random voltages.
Low oil Pressure fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch and wiring.
High engine temperature fault operates after engine has fired.	Check engine temperature. Check switch and wiring. Check configuration of input i.e. Normally Open or Normally Closed.
Shutdown fault operates	Check relevant switch and wiring of illuminated fault LED. Check configuration of input. If only common alarm LED illuminated, please refer to section 2, note 2.
Warning fault operates	Check relevant switch and wiring of illuminated fault LED. Check configuration of input. If only common alarm LED illuminated, please refer to section 2, note 2.
Engine fails to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed sensing signal is present on the DSE P511 inputs. Refer to engine manual.
Fuel solenoid energises when in RUN	Check that there is no signal present on the Remote Fuel ON input. Check configured polarity of input is correct.
Fuel solenoid does not energise on receipt of Remote Fuel On signal	Check Pre-heat timer has timed out. Check signal is on Remote Start input.
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 the configuration menu.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure that the Emergency Stop input is at +Ve.

 **NOTE:-** Fault finding can be assisted greatly by utilising the Diagnostic feature available from the PC Interface. This will display the module state, any alarm conditions present and the state of all inputs and outputs. It is recommended that diagnostics are used to aid fault finding where-ever possible.

8. TYPICAL WIRING DIAGRAM



9. CONFIGURATION

The **DSE P511** module can be calibrated by using either a PC with Interface Module **808**.

9.1 PC INTERFACE MODULE 808









The PC interface **808** kit comprises the following:-

- **808** Interface Module
- 25 to 9 way adapter
- FCC 68 (4 Pin) Connecting Lead
- Floppy disc with configuration software

10. ICON DESCRIPTIONS

The **DSE P511** module is available with graphical icons instead of text. This is for use where text in the English language may cause problems and also allows for a standard module for all world markets to be used.

10.1 ICONS

Symbol	Meaning	Description
	Stop/Reset	Stop the generator and reset any alarm conditions. Refer to Section 1 of this Manual.
	Start	Start the generator if operating state allows. Refer to Section 1 of this Manual.
	Manual	The controller will start the generator under manual control. Refer to section 1.3 of this Manual.
	Low Oil Pressure	A low oil pressure shutdown has occurred. Refer to section 2.2 of this Manual.
	High Engine Temperature	A High Engine Temperature shutdown has occurred. Refer to section 2.2 of the Manual.
	Overspeed	An overspeed shutdown has occurred. Refer to section 2.2 of this Manual.
	Charge Fail	The charge alternator on the engine is not giving sufficient output. Refer to section 2.1 of this Manual.
	Common Alarm	An alarm condition has been detected. Refer to section 2 of this Manual. (Warning = Steady, Shutdown = Flashing)

11. APPENDIX

11.1 LED IDENTIFICATION DIAGRAM

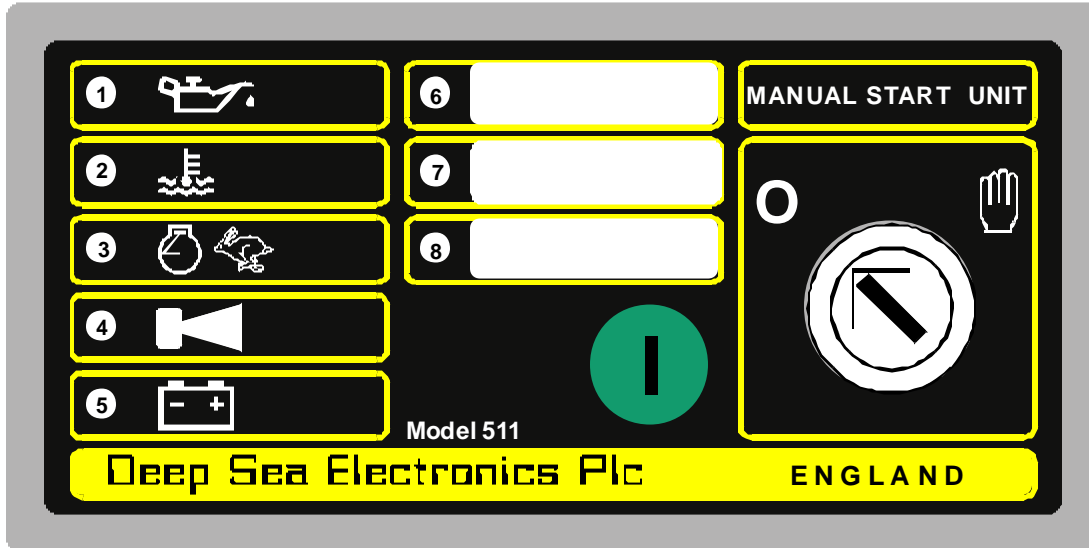


FIG 6

Note:- The Software disk supplied with the Calibration Interface (808) contains a Microsoft Word document for the automatic creation of suitable label inserts for the Auxiliary LED's.

11.2 FACTORY DEFAULT CONFIGURATION

The 511 module when shipped contains the following configuration, allowing it to be used as a standard module if no configuration interface is available.

P51x Configuration

Title: Standard default settings factory set
 Created by: Miles Revell
 Date: 25 March 1997
 Filename: P511B

MISCELLANEOUS ITEMS

Item	Value
Alternator frequency input present	Yes
Nominal frequency	50Hz
Alternator poles	4
Magnetic pickup input present	No
Flywheel teeth	118
Nominal RPM	1500
Lamp test enabled	No
Pre-heat mode	Normal
Tachometer full scale current	0.5mA
Tachometer full scale RPM	2500

CONFIGURABLE INPUTS

Input channel	Polarity	Type	Activation time
Remote Fuel On	Close to activate		
Low oil pressure	Close to activate	Shutdown	Active from safety on
High engine temp.	Close to activate	Shutdown	Active from safety on
Auxiliary input 1	Close to activate	Warning	Active from safety on

Auxiliary input 2	Close to activate	Shutdown	Active from safety on
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RELAY OUTPUTS

Output channel	Polarity	Control source
Auxiliary output 1	Energize	1 Pre-heat
Auxiliary output 2	Energize	18 Common alarm

FRONT PANEL LED'S

LED	Polarity	Control source
LED 1	Lit	27 Low oil pressure alarm
LED 2	Lit	28 High engine temp. alarm
LED 3	Lit	20 Overspeed
LED 4	Lit	18 Common alarm
LED 5	Lit	21 Charge fail alarm
LED 6	Lit	29 Auxiliary IP1 active
LED 7	Lit	30 Auxiliary IP2 active
LED 8	Lit	1 Pre-heat

SYSTEM TIMERS

Timer	Mins:secs
Safety on delay time	0:10
Fail to stop time	0:30
Pre-heat time	0:00
Sensor fail delay time	0:02
Crank limit time	0:30

ANALOGUE LEVELS

Level	Value
Overspeed on alternator frequency	57.0 Hz
Overspeed on magnetic pickup	1750 RPM
Overspeed overshoot during safety on delay	0 %
Underspeed on alternator frequency	30.0 Hz
Underspeed on magnetic pickup	1250 RPM
Crank disconnect on alternator frequency	21.0 Hz
Crank disconnect on magnetic pickup	600 RPM
Crank disconnect charge alternator voltage	30.0 V
Charge fail voltage	8.0 V