COMPLEX SOLUTIONS MADE SIMPLE.

DSE®

DSECONTROL®

DSE7000 Series Control Module

057-074

Author : Anthony Manton

Deep Sea Electronics Plc
Highfield House
Hunmanby
North Yorkshire
YO14 0PH
ENGLAND

Sales Tel: +44 (0) 1723 890099
Sales Fax: +44 (0) 1723 893303

E-mail: sales@deepseaplc.com
Website: www.deepseaplc.com

DSE Model 7000 series Control and Instrumentation System Operators Manual

© Deep Sea Electronics Plc
All rights reserved. No part of this publication may be reproduced in any material form (including photocopying or storing in any medium by electronic means or other) without the written permission of the copyright holder except in accordance with the provisions of the Copyright, Designs and Patents Act 1988.
Applications for the copyright holder's written permission to reproduce any part of this publication should be addressed to Deep Sea Electronics Plc at the address above.

The DSE logo and the names DSEUltra, DSEControl, DSEPower, DSEExtra, DSEMarine and DSENet are UK registered trademarks of Deep Sea Electronics PLC.

Any reference to trademarked product names used within this publication is owned by their respective companies.

Deep Sea Electronics Plc reserves the right to change the contents of this document without prior notice.

Amendments since last publication

Amd. No.	Comments

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.

TABLE OF CONTENTS

Section **Page**

1 BIBLIOGRAPHY 6

2 INTRODUCTION 6

3 SPECIFICATIONS 7
3.1 PART NUMBERING 7
3.1.1 MODEL NAMING 7
3.1.2 SHORT NAMES 7
3.1 POWER SUPPLY REQUIREMENTS 8
3.2 TERMINAL SPECIFICATION 8
3.3 GENERATOR AND MAINS VOLTAGE / FREQUENCY SENSING 9
3.4 GENERATOR CURRENT SENSING 9
3.5 INPUTS 9
3.5.1 DIGITAL INPUTS 9
3.5.2 ANALOGUE INPUTS 10
3.5.3 CHARGE FAIL INPUT 11
3.5.4 MAGNETIC PICKUP 11
3.6 OUTPUTS 11
3.6.1 OUTPUTS A & B 11
3.6.2 OUTPUTS C & D 11
3.6.3 OUTPUTS E,F,G & H 11
3.7 COMMUNICATION PORTS 12
3.8 DSENET® 12
3.9 SOUNDER 13
3.10 ACCUMULATED INSTRUMENTATION 13
3.11 DIMENSIONS AND MOUNTING 14
3.11.1 FIXING CLIPS 15
3.11.2 CABLE TIE FIXING POINTS 16
3.11.3 SILICON SEALING GASKET 16
3.12 APPLICABLE STANDARDS 17

4 INSTALLATION 18
4.1 USER CONNECTIONS 18
4.2 TERMINAL DESCRIPTION 19
4.2.1 DC SUPPLY, FUEL AND START OUTPUTS 19
4.2.2 ANALOGUE SENSOR 19
4.2.3 MAGNETIC PICKUP, CAN AND EXPANSION 20
4.2.4 LOAD SWITCHING AND GENERATOR VOLTAGE SENSING 21
4.2.5 MAINS VOLTAGE SENSING 21
4.2.6 GENERATOR CURRENT TRANSFORMERS 22
4.2.7 CONFIGURABLE DIGITAL INPUTS 23
4.2.8 PC CONFIGURATION INTERFACE CONNECTOR 23
4.2.9 RS485 CONNECTOR 24
4.2.10 RS232 CONNECTOR 24
4.3 TYPICAL WIRING DIAGRAMS 25
4.3.1 7210 AUTOSTART CONTROLLER 25
4.3.2 7220 AMF CONTROLLER 26
4.3.3 7310 AUTOSTART CONTROLLER 27
4.3.4 7320 AMF CONTROLLER 28
4.4 ALTERNATIVE TOPOLOGIES 29
4.4.1 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION 29
4.4.2 SINGLE PHASE WITH RESTRICTED EARTH FAULT 30
4.4.3 SINGLE PHASE WITHOUT EARTH FAULT 31
4.4.4 2 PHASE (L1 & L2) 3 WIRE WITH RESTRICTED EARTH FAULT 32

4.4.5 2 PHASE (L1 & L2) 3 WIRE WITHOUT EARTH FAULT 33
4.4.6 2 PHASE (L1 & L3) 3 WIRE WITH RESTRICTED EARTH FAULT 34
4.4.7 2 PHASE (L1 & L3) 3 WIRE WITHOUT EARTH FAULT MEASURING 35
4.4.8 3 PHASE 4 WIRE WITH UNRESTRICTED EARTH FAULT MEASURING 36
4.5 CT LOCATION 37

5 DESCRIPTION OF CONTROLS 38
5.1 DSE7210 / DSE7310 AUTOSTART CONTROL MODULE 38
5.2 DSE7220 / DSE7320 AMF CONTROL MODULE 40
5.3 QUICKSTART GUIDE 42
5.3.1 STARTING THE ENGINE 42
5.3.2 STOPPING THE ENGINE 42
5.4 VIEWING THE INSTRUMENTS 43
5.4.1 INSTRUMENT PAGE CONTENT 44
5.4.2 CAN ERROR MESSAGES 45
5.5 VIEWING THE EVENT LOG 46
5.6 USER CONFIGURABLE INDICATORS 46
5.7 CONTROLS 47

6 OPERATION (STANDALONE) 49
6.1 AUTOMATIC MODE OF OPERATION 50
6.1.1 WAITING IN AUTO MODE 50
6.1.2 STARTING SEQUENCE 50
6.1.3 ENGINE RUNNING 51
6.1.4 STOPPING SEQUENCE 51
6.2 MANUAL OPERATION 52
6.2.1 WAITING IN MANUAL MODE 52
6.2.2 STARTING SEQUENCE 52
6.2.3 ENGINE RUNNING 53
6.2.4 STOPPING SEQUENCE 53
6.3 TEST MODE OF OPERATION 54
6.3.1 WAITING IN TEST MODE 54
6.3.2 STARTING SEQUENCE 54
6.3.3 ENGINE RUNNING 55

7 OPERATION (DUAL MUTUAL STANDBY) 56

8 PROTECTIONS 57
8.1 WARNINGS 58
8.2 ANALOGUE PRE-ALARMS 59
8.3 HIGH CURRENT WARNING ALARM 59
8.4 SHUTDOWNS 60
8.5 HIGH CURRENT SHUTDOWN ALARM 61
8.6 ELECTRICAL TRIPS 62

9 FRONT PANEL CONFIGURATION 63
9.1 ACCESSING THE MAIN FRONT PANEL CONFIGURATION EDITOR 63
9.1.1 EDITING A PARAMETER 64
9.1.2 ADJUSTABLE PARAMETERS 65
9.2 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR 66
9.2.1 EDITING A PARAMETER 66
9.2.2 ADJUSTABLE PARAMETERS (RUNNING EDITOR) 66

10 COMMISSIONING 67
10.1.1 PRE-COMMISSIONING 67

11 FAULT FINDING 68

12 MAINTENANCE, SPARES, REPAIR AND SERVICING 70
12.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE 70
12.1.1 DSE7200 SERIES 70
12.1.2 DSE7300 SERIES 71
12.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE 71
12.3 PURCHASING ADDITIONAL SEALING GASKET FROM DSE 71

12.4 EXPANSION MODULES 72

13 WARRANTY 73

14 DISPOSAL 73
14.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT) 73
14.2 ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES) 73

15 APPENDIX 74
15.1 IDMT TRIPPING CURVES (TYPICAL) 74
15.2 SENSOR WIRING RECOMMENDATIONS 75
15.2.1 EARTH RETURN SENSORS 75
15.2.2 INSULATED RETURN SENSORS 75
15.3 CAN INTERFACE 75
15.4 COMMUNICATIONS OPTION CONNECTIONS 76
15.4.1 DESCRIPTION 76
15.4.2 PC TO CONTROLLER (DIRECT) CONNECTION 76
15.5 ENCLOSURE CLASSIFICATIONS 77

1 BIBLIOGRAPHY

This document refers to and is referred to by the following DSE publications which can be obtained from the DSE website www.deepseaplc.com

DSE PART	DESCRIPTION
053-026	7210 installation instructions
053-027	7220 installation instructions
053-028	7310 installation instructions
053-029	7320 installation instructions
057-004	Electronic Engines and DSE wiring manual
057-077	DSE7000 Series configuration software manual
057-082	DSE2130 input expansion manual
057-083	DSE2157 output expansion manual
057-084	DSE2548 annunciator expansion manual

2 INTRODUCTION

This document details the installation and operation requirements of the DSE7000 Series modules, part of the DSEControl® range of products.
The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.
This is not a *controlled document.* You will not be automatically informed of updates. Any future updates of this document will be included on the DSE website at www.deepseaplc.com

The **DSE 7000 series** is designed to provide differing levels of functionality across a common platform. This allows the generator OEM greater flexibility in the choice of controller to use for a specific application.

The **DSE 7000 series** module has been designed to allow the operator to start and stop the generator, and if required, transfer the load to the generator either manually (via fascia mounted push-buttons) or automatically. Additionally, the DSE7320 automatically starts and stops the generator set depending upon the status of the mains (utility) supply.
The user also has the facility to view the system operating parameters via the LCD display.

The **DSE 7000** 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 COMMON AUDIBLE ALARM. The LCD display indicates the fault.

The powerful ARM microprocessor contained within the module allows for incorporation of a range of complex features:

- *Text based LCD display (supporting multiple languages).*
- ***True RMS** Voltage, Current and Power monitoring.*
- *Engine parameter monitoring.*
- *Fully configurable inputs for use as alarms or a range of different functions.*
- *Engine ECU interface to **electronic engines**.*

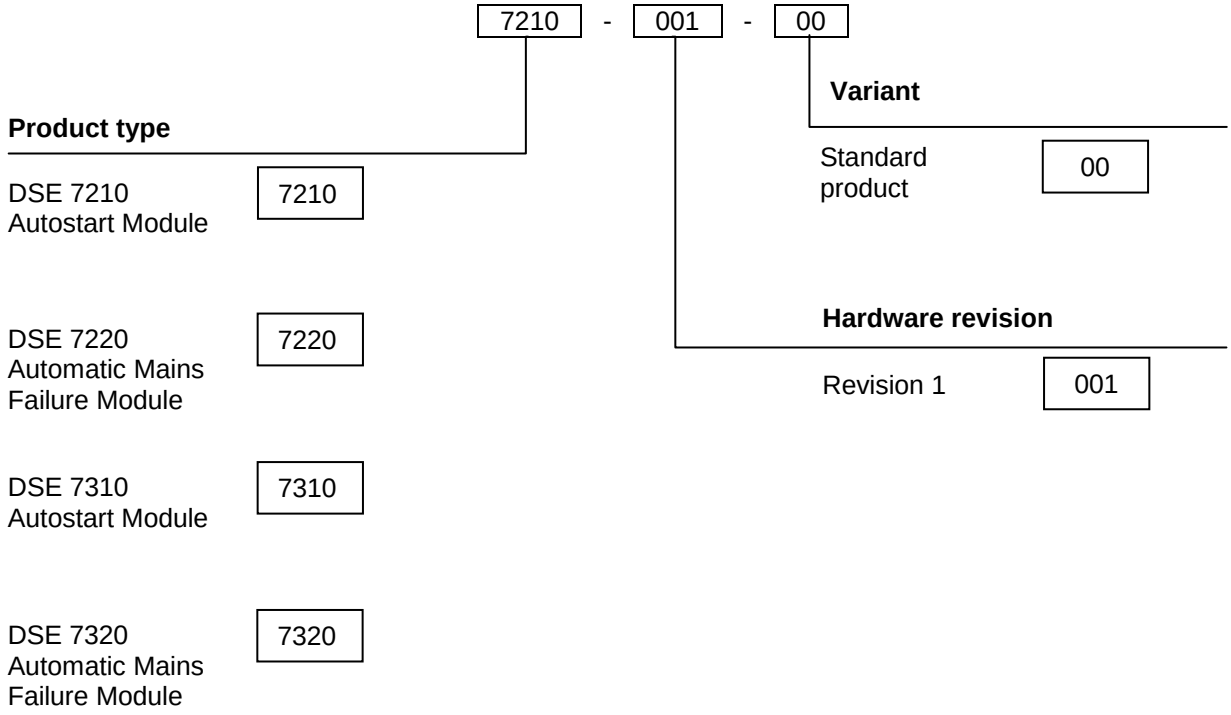
Using a PC and the 7000 series configuration software allows alteration of selected operational sequences, timers and alarm trips.

Additionally, the module's integral fascia configuration editor allows adjustment of a subset of this information.

A robust plastic case designed for front panel mounting houses the module. Connections are via locking plug and sockets.

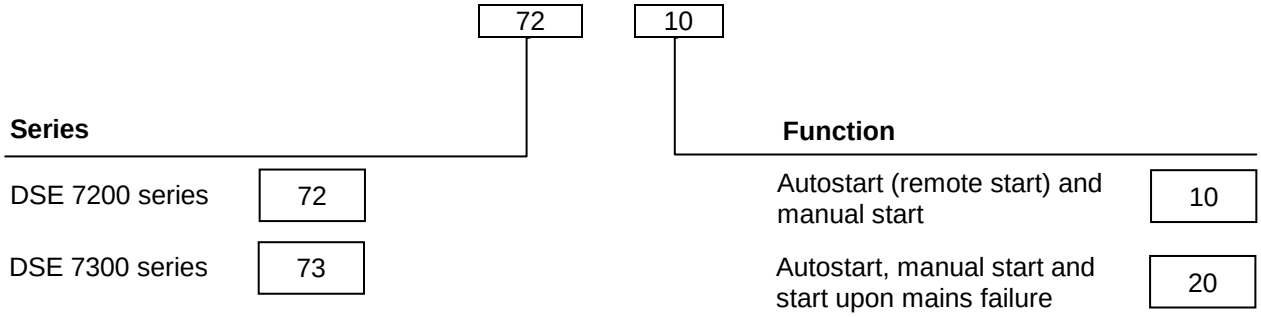
3 SPECIFICATIONS

3.1 PART NUMBERING



At the time of this document production, there are no variants of this product and there have been no revisions of the module hardware.

3.1.1 MODEL NAMING



3.1.2 SHORT NAMES

Short name	Description
DSE7000	All modules in the DSE7000 Series
DSE7x10	All Autostart modules in the DSE7000 Series
DSE7x20	All AMF modules in the DSE7000 Series
DSE72x0	All modules in the DSE7200 series
DSE73x0	All modules in the DSE7300 series

3.1 POWER SUPPLY REQUIREMENTS

Minimum supply voltage	8V continuous	
Cranking dropouts	Able to survive 0V for 50mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards.	
Maximum supply voltage	35V continuous (60V protection)	
Reverse polarity protection	-35V continuous	
Maximum operating current	DSE7200 / DSE7300	160mA at 24V 340mA at 12V
Maximum standby current	DSE7200 / DSE7300	80mA at 24V 160mA at 12V

Plant supply instrumentation display

Range	0V-70V DC (note Maximum continuous operating voltage of 35V DC)
Resolution	0.1V
Accuracy	1% full scale

3.2 TERMINAL SPECIFICATION

Connection type	Screw terminal, rising clamp, no internal spring
Min cable size	0.5mm² (AWG 24)
Max cable size	2.5mm² (AWG 10)

3.3 GENERATOR AND MAINS VOLTAGE / FREQUENCY SENSING

Measurement type	True RMS conversion
Sample Rate	5KHz or better
Harmonics	Up to 10th or better
Input Impedance	300K Ω ph-N
Phase to Neutral	15V to 333V AC (max)
Phase to Phase	25V to 576V AC (max)
Common mode offset from Earth	100V AC (max)
Resolution	1V AC phase to neutral 2V AC phase to phase
Accuracy	±1% of full scale phase to neutral ±2% of full scale phase to phase
Minimum frequency	3.5Hz
Maximum frequency	75.0Hz
Frequency resolution	0.1Hz
Frequency accuracy	±0.2Hz

3.4 GENERATOR CURRENT SENSING

Measurement type	True RMS conversion
Sample Rate	5KHz or better
Harmonics	Up to 10th or better
Nominal CT secondary rating	1A or 5A
Maximum continuous current	5A
Overload Measurement	3 x Nominal Range setting
Absolute maximum overload	50A for 1 second
Burden	0.5VA (0.02Ω current shunts)
common mode offset	±2V peak plant ground to CT common terminal
Resolution	0.5% of 5A
Accuracy	±1% of Nominal (1A or 5A) (excluding CT error)

3.5 INPUTS

3.5.1 DIGITAL INPUTS

Number	DSE72x0	6
	DSE73x0	8
Arrangement	Contact between terminal and ground	
Low level threshold	2.1V minimum	
High level threshold	6.6V maximum	
Maximum input voltage	+50V DC with respect to plant supply negative	
Minimum input voltage	-24V DC with respect to plant supply negative	
Contact wetting current	7mA typical	
Open circuit voltage	12V typical	

3.5.2 ANALOGUE INPUTS

Oil Pressure

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	15mA
Full scale	240Ω
Over range / fail	270Ω
Resolution	1-2 PSI / 0.1 Bar
Accuracy	+/-2% of full scale resistance excluding transducer error
Max common mode voltage	±2V
Display range	0-200 PSI / 13.7 bar subject to limits of the sensor

Coolant Temperature

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	10mA
Full scale	480Ω
Over range / fail	540Ω
Resolution	1°C, 2℉
Accuracy	+/-2% of full scale resistance excluding transducer error
Max common mode voltage	±2V
Display range	0°C -140°C, 32℉ - 284℉ Depending on sensor

Fuel Level

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	10mA
Full scale	480Ω
Over range / fail	540Ω
Resolution	1%
Accuracy	+/-2% of full scale resistance excluding transducer error
Max common mode voltage	±2V
Display range	0-250%

Flexible Sensor

NOTE : Flexible sensor is not available on DSE7200 series controllers

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	10mA
Full scale	480Ω
Over range / fail	540Ω
Resolution	1%
Accuracy	+/-2% of full scale resistance excluding transducer error
Max common mode voltage	±2V
Display range	0-250%

3.5.3 CHARGE FAIL INPUT

Minimum voltage	0V
Maximum voltage	35V (plant supply)
Resolution	0.2V
Accuracy	± 1% of max measured voltage
Excitation	Active circuit constant power output
Output Power	2.5W Nominal @12V and 24V
Current at 12V	210mA
Current at 24V	10mA

3.5.4 MAGNETIC PICKUP

Type	Differential input
Minimum voltage	0.5V RMS
Max common mode voltage	±2V
Maximum voltage	Clamped to ±70V by transient suppressers, dissipation not to exceed 1W.
Maximum frequency	10,000Hz
Resolution	6.25 RPM
Accuracy	±25 RPM
Flywheel teeth	10 to 500

3.6 OUTPUTS

3.6.1 OUTPUTS A & B

Type	Normally used for Fuel / Start outputs. Fully configurable for other purposes if the module is configured to control an electronic engine. Supplied from Emergency Stop terminal 3.
Rating	15A @ 35V

3.6.2 OUTPUTS C & D

Type	Voltage free relays, fully configurable, normally used for generator / mains load switch control.
Rating	8A @ 250 V AC

3.6.3 OUTPUTS E,F,G & H

Type	Fully configurable, supplied from DC supply terminal 2.
Rating	3A @ 35V

3.7 COMMUNICATION PORTS

USB Port	USB2.0 Device for connection to PC running DSE configuration suite only Max distance 6m (20 feet)
Serial Communication (not available on DSE7200 series)	RS232 and RS485 are fitted but do NOT provide independent operation
RS232 Port (not available on DSE7200 series)	Non – Isolated port Max Baud rate 115K baud subject to S/W TX, RX, RTS, CTS, DSR, DTR, DCD Male 9 way D type connector Max distance 15m (50 feet)
RS485 Serial (not available on DSE7200 series)	Isolated Data connection 2 wire + common Half Duplex Data direction control for Transmit (by s/w protocol) Max Baud Rate 19200 External termination required (120R) Max common mode offset 70V (on board protection transorb) Max distance 1.2km (¾ mile)
CAN Port	Engine CAN Port Standard implementation of 'Slow mode', up to 250K bits/s Non Isolated. Internal Termination provided (120Ω) Max distance 40m (133 feet)

3.8 DSENET®

DSENet® is the interconnection cable between the host controller and the expansion module(s) and must not be connect to any device other than DSE equipment designed for connection to the DSENet®

NOTE : DSENet® is not available on DSE7200 series controllers.

Cable type	Two core screened twisted pair
Cable characteristic impedance	120Ω
Recommended cable	Belden 9841 Belden 9271
Maximum cable length	1200m (¾ mile) when using Belden 9841 or direct equivalent. 600m (666 yds) when using Belden 9271 or direct equivalent.
DSENet® topology	Bus with no stubs (spurs)
DSENet® termination	120Ω. Fitted internally to host controller. Must be fitted externally to the 'last' expansion module by the customer .
Maximum expansion modules	Refer to host controller documentation

NOTE : As a termination resistor is internally fitted to the host controller, the host controller must be the 'first' unit on the DSENet®. A termination resistor MUST be fitted to the 'last' unit on the DSENet®. For connection details, you are referred to the section entitled 'typical wiring diagram' elsewhere in this document.

3.9 SOUNDER

DSE7000 Series features an internal sounder to draw attention to warning, shutdown and electrical trip alarms.

Sounder level	84db @ 1m

3.10 ACCUMULATED INSTRUMENTATION

NOTE : When an accumulated instrumentation value exceeds the maximum number as listed below, it will reset and begin counting from zero again.

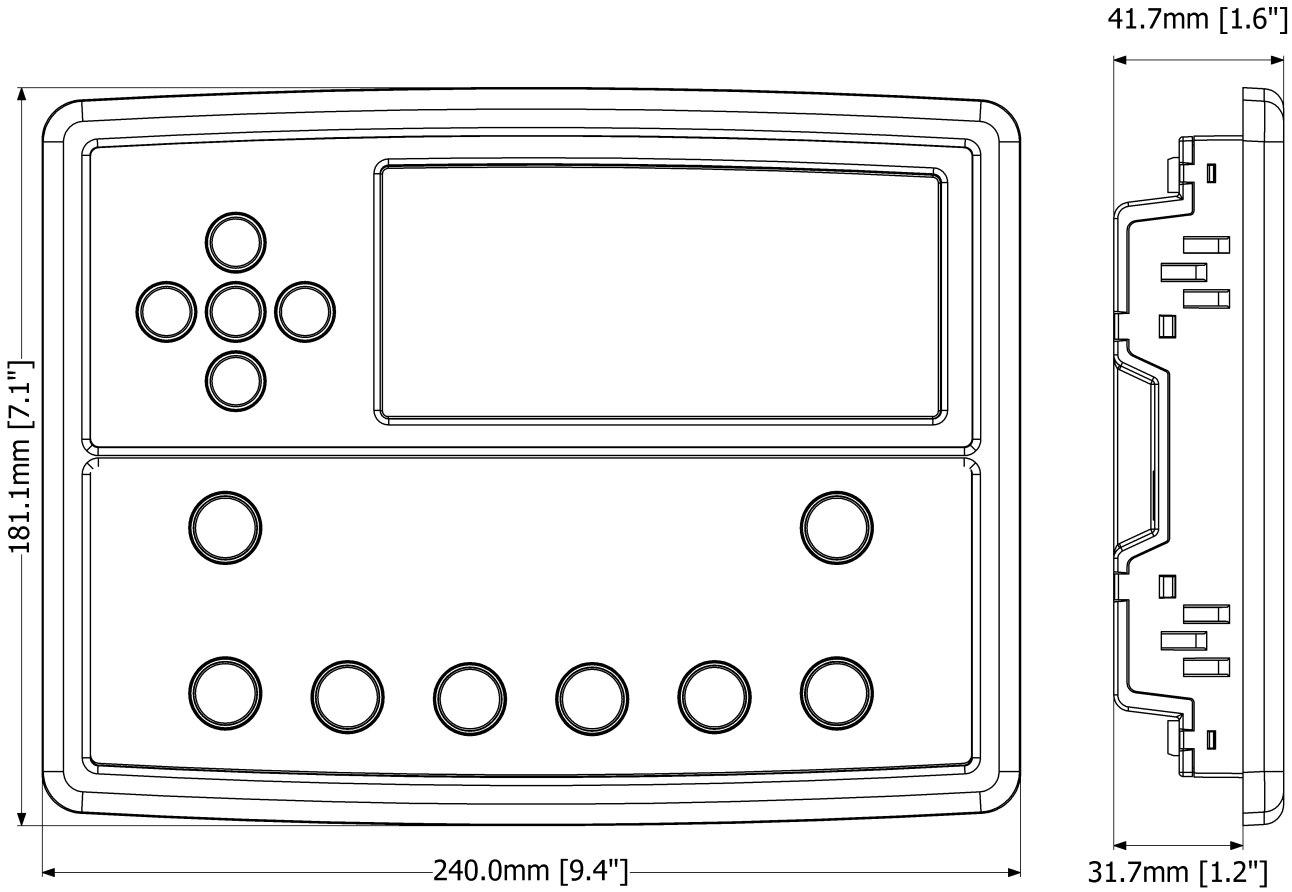
Engine hours run	Maximum 99999 hrs 59 minutes (approximately 11yrs 4months)
Number of starts	1,000,000 (1 million)

3.11 DIMENSIONS AND MOUNTING

DIMENSIONS
240.0mm x 181.1mm x 41.7mm (9.4” x 7.1” x 1.6”)

PANEL CUTOUT
220mm x 160mm (8.7” x 6.3”)

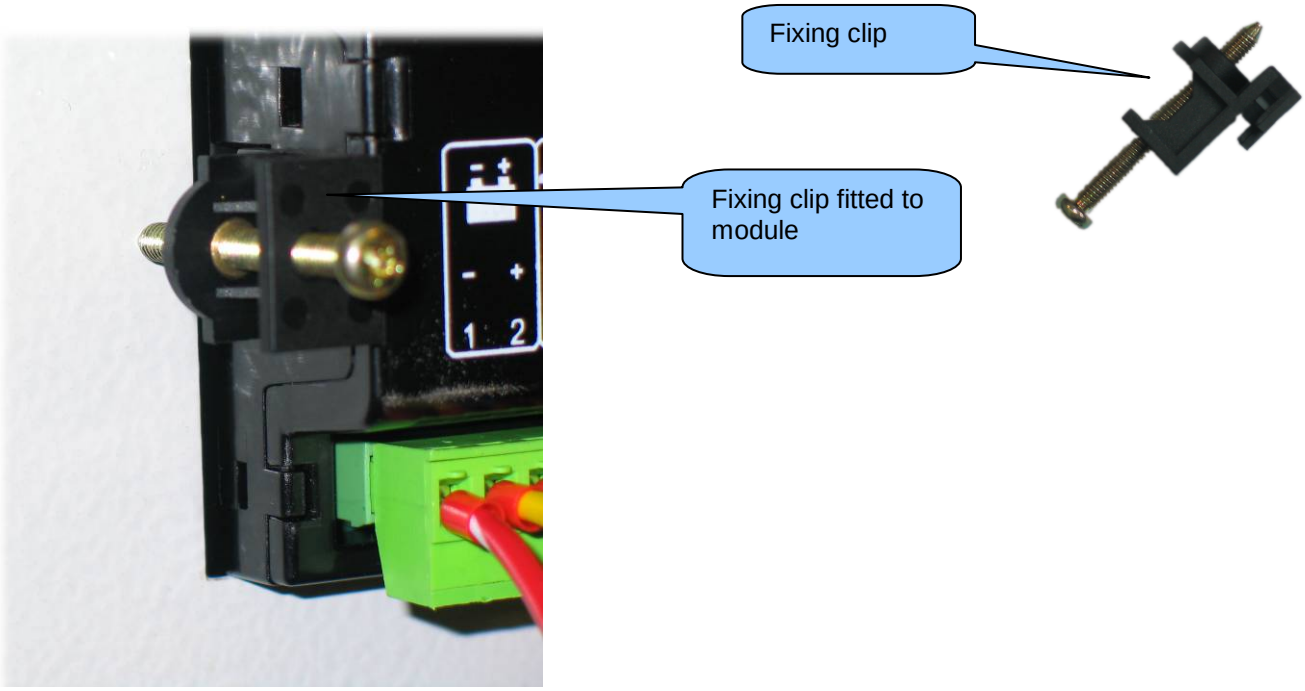
WEIGHT
0.7kg (1.4lb)



3.11.1 FIXING CLIPS

The module is held into the panel fascia using the supplied fixing clips.

- Withdraw the fixing clip screw (turn anticlockwise) until only the pointed end is protruding from the clip.
- Insert the three 'prongs' of the fixing clip into the slots in the side of the 7000 series module case.
- Pull the fixing clip backwards (towards the back of the module) ensuring all three prongs of the clip are inside their allotted slots.
- Turn the fixing clip screws clockwise until they make contact with the panel fascia.
- Turn the screws a little more to secure the module into the panel fascia. Care should be taken not to over tighten the fixing clip screws.



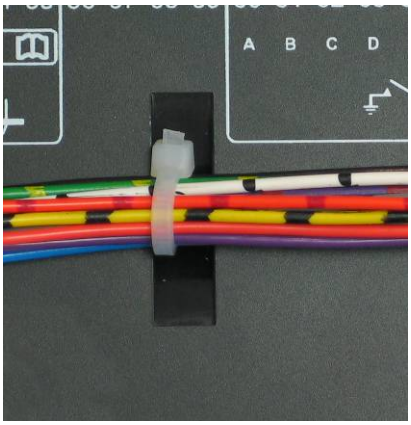
NOTE:- In conditions of excessive vibration, mount the module on suitable anti-vibration mountings.

3.11.2 CABLE TIE FIXING POINTS

Integral cable tie fixing points are included on the rear of the module's case to aid wiring. This additionally provides strain relief to the cable loom by removing the weight of the loom from the screw connectors, thus reducing the chance of future connection failures.
Care should be taken not to overtighten the cable tie (for instance with cable tie tools) to prevent the risk of damage to the module case.



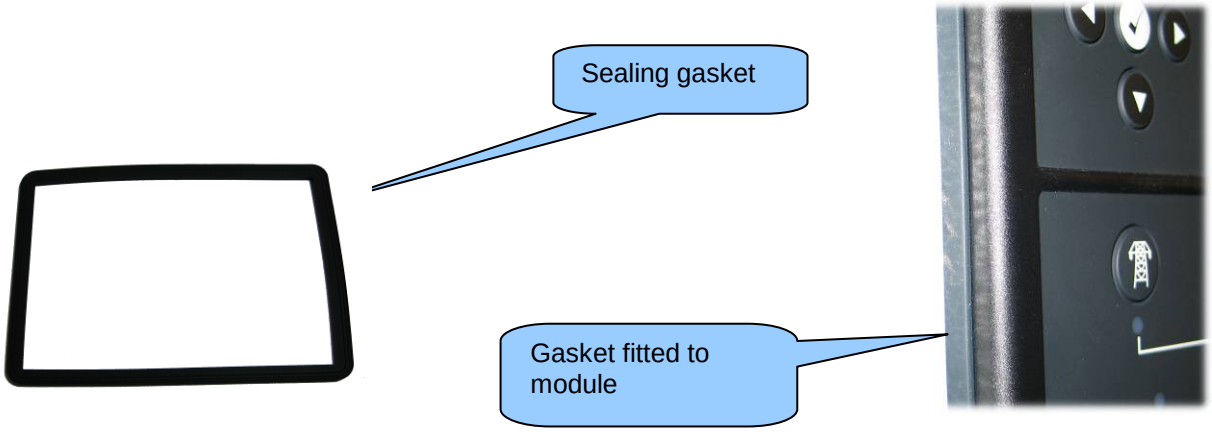
Cable tie fixing point



With cable and tie in place

3.11.3 SILICON SEALING GASKET

The supplied silicon gasket provides improved sealing between the 7000 series module and the panel fascia.
The gasket is fitted to the module before installation into the panel fascia.
Take care to ensure the gasket is correctly fitted to the module to maintain the integrity of the seal.



3.12 APPLICABLE STANDARDS

BS 4884-1	This document conforms to BS4884-1 1992 Specification for presentation of essential information.
BS 4884-2	This document conforms to BS4884-2 1993 Guide to content
BS 4884-3	This document conforms to BS4884-3 1993 Guide to presentation
BS EN 60068-2-1 (Minimum temperature)	-30°C (-22°F)
BS EN 60068-2-2 (Maximum temperature)	+70°C (158°F)
BS EN 60950	Safety of information technology equipment, including electrical business equipment
BS EN 61000-6-2	EMC Generic Immunity Standard (Industrial)
BS EN 61000-6-4	EMC Generic Emission Standard (Industrial)
BS EN 60529 (Degrees of protection provided by enclosures)	IP65 (front of module when installed into the control panel with the supplied sealing gasket) IP42 (front of module when installed into the control panel WITHOUT being sealed to the panel)
UL508 **NEMA rating** (Approximate)	12 (Front of module when installed into the control panel with the supplied sealing gasket). 2 (Front of module when installed into the control panel WITHOUT being sealed to the panel)
IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	Under the scope of IEEE 37.2, *function numbers can also be used to represent functions in microprocessor devices and software programs*. The 7000 series controller is device number 11L-7000 (Multifunction device protecting Line (generator) – 7000 series module). As the module is configurable by the generator OEM, the functions covered by the module will vary. Under the module's factory configuration, the device numbers included within the module are : 2 – Time delay starting or closing relay 6 – Starting circuit breaker 27AC – AC undervoltage relay 27DC – DC undervoltage relay 30 – annunciator relay 42 – Running circuit breaker 50 – instantaneous overcurrent relay 51 – ac time overcurrent relay 52 – ac circuit breaker 53DC – exciter or dc generator relay 54 – turning gear engaging device 59AC – AC overvoltage relay 59DC – DC overvoltage relay 62 – time delay stopping or opening relay 63 – pressure switch 74– alarm relay 81 – frequency relay 86 – lockout relay

In line with our policy of continual development, Deep Sea Electronics, reserve the right to change specification without notice.

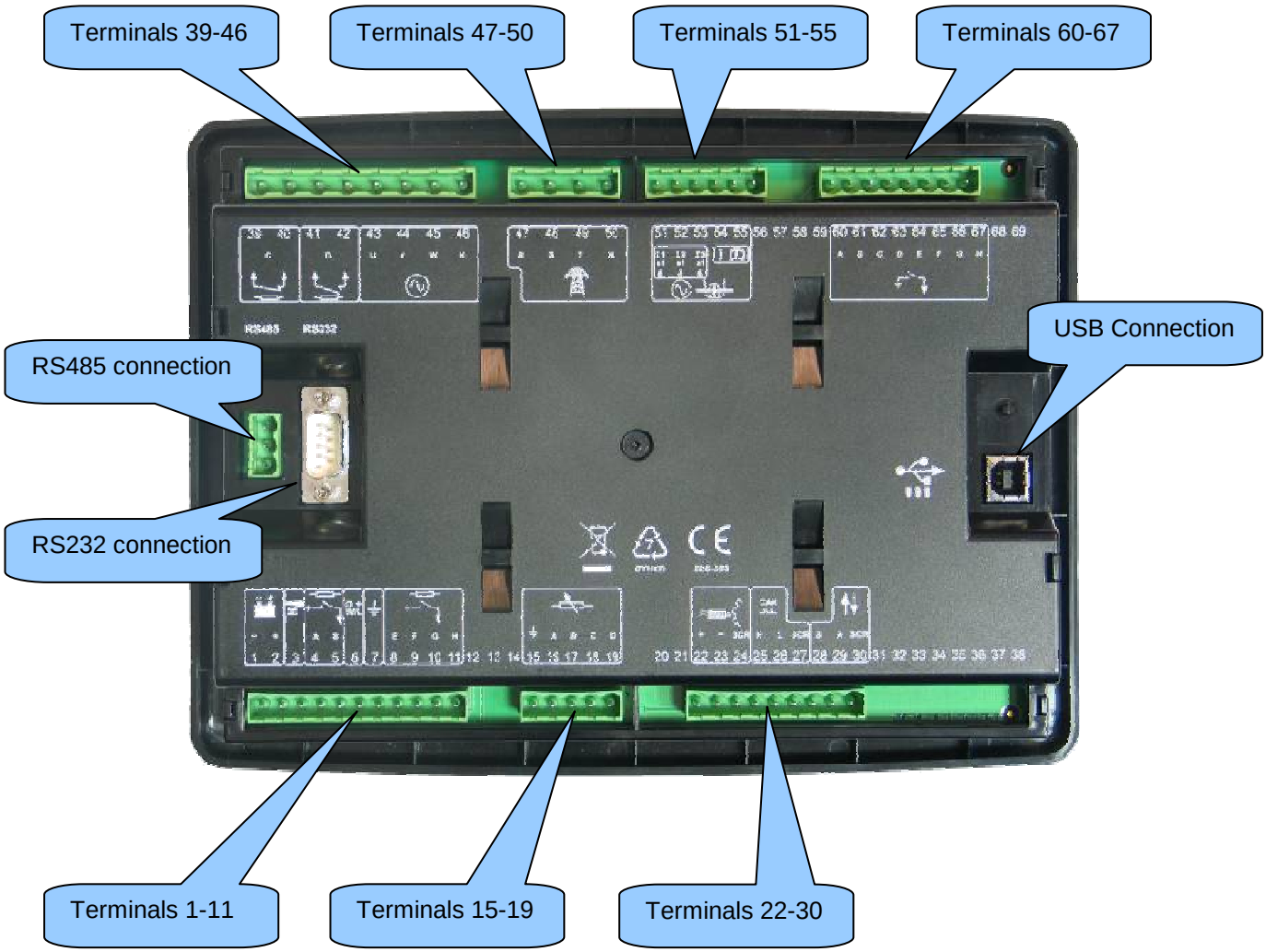
4 INSTALLATION

The DSE7000 Series module is designed to be mounted on the panel fascia. For dimension and mounting details, see the section entitled *Specification, Dimension and mounting* elsewhere in this document.

4.1 USER CONNECTIONS

To aid user connection, icons are used on the rear of the module to help identify terminal functions. An example of this is shown below.

NOTE : Availability of some terminals depends upon module version. Full details are given in the section entitled *Terminal Description* elsewhere in this manual.



4.2 TERMINAL DESCRIPTION

4.2.1 DC SUPPLY, FUEL AND START OUTPUTS

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	1	DC Plant Supply Input (Negative)	2.5mm² AWG 13	
	2	DC Plant Supply Input (Positive)	2.5 mm² AWG 13	(Recommended Maximum Fuse 15A anti-surge) Supplies the module (2A anti-surge requirement) and Output relays E,F,G & H
	3	Emergency Stop Input	2.5mm² AWG 13	Plant Supply Positive. Also supplies outputs 1 & 2. (Recommended Maximum Fuse 20A)
	4	Output relay A (FUEL)	2.5mm² AWG 13	Plant Supply Positive from terminal 3. 15 Amp rated. Fixed as FUEL relay if electronic engine is not configured.
	5	Output relay B (START)	2.5mm² AWG 13	Plant Supply Positive from terminal 3. 15 Amp rated. Fixed as START relay if electronic engine is not configured.
D + W/L	6	Charge fail / excite	2.5mm² AWG 13	Do not connect to ground (battery negative). If charge alternator is not fitted, leave this terminal disconnected.
	7	Functional Earth	2.5mm² AWG 13	Connect to a good clean earth point.
	8	Output relay E	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	9	Output relay F	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	10	Output relay G	1.0mm² AWG 18	Plant Supply Positive. from terminal 2. 3 Amp rated.
	11	Output relay H	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.

NOTE:- Terminals 12 to 14 are not fitted to the DSE7200/DSE7300 series controller.

NOTE:- When the module is configured for operation with an electronic engine, FUEL and START output requirements may be different. Refer to *Electronic Engines and DSE Wiring* for further information. Part No. 057-004.

4.2.2 ANALOGUE SENSOR

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	15	Sensor Common Return	0.5mm² AWG 20	Return feed for sensors*
	16	Oil Pressure Input	0.5mm² AWG 20	Connect to Oil pressure sensor
	17	Coolant Temperature Input	0.5mm² AWG 20	Connect to Coolant Temperature sensor
	18	Fuel Level input	0.5mm² AWG 20	Connect to Fuel Level sensor
	19	Flexible sensor (not available on 7200 series controller)	0.5mm² AWG 20	Connect to additional sensor (user configurable)

NOTE:- Terminals 20 and 21 are not fitted to the 7200/7300 series controller.

NOTE*:- If using single terminal sensors refer to the Appendix section entitled "Sensor wiring recommendations" elsewhere in this manual.

4.2.3 MAGNETIC PICKUP, CAN AND EXPANSION

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	22	Magnetic pickup Positive	0.5mm² AWG 20	Connect to Magnetic Pickup device
	23	Magnetic pickup Negative	0.5mm² AWG 20	Connect to Magnetic Pickup device
	24	Magnetic pickup screen	Shield	Connect to ground at one end only
CAN	25	CAN port H	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	26	CAN port L	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	27	CAN port Common	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	28	+	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	29	-	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	30	SCR	0.5mm² AWG 20	Use only 120Ω RS485 approved cable

NOTE:- Terminals 31 to 38 are not fitted to the 7200 / 7300 controller

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

NOTE:- Screened 120Ω impedance cable specified for use with CAN must be used for the CAN link and the Multiset comms link.
DSE stock and supply Belden cable 9841 which is a high quality 120Ω impedance cable suitable for CAN use (DSE part number 016-030)

NOTE:- When the module is configured for CAN operation, terminals 22, 23 & 24 should be left unconnected. Engine speed is transmitted to the 7000 series controller on the CAN link.
Refer to *Electronic Engines and DSE Wiring* for further information. Part No. 057-004.

4.2.4 LOAD SWITCHING AND GENERATOR VOLTAGE SENSING

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	39	Output relay C	1.0mm AWG 18	Normally configured to control mains contactor coil (Recommend 10A fuse)
	40	Output relay C	1.0mm AWG 18	Normally configured to control mains contactor coil
	41	Output relay D	1.0mm AWG 18	Normally configured to control generator contactor coil (Recommend 10A fuse)
	42	Output relay D	1.0mm AWG 18	Normally configured to control generator contactor coil
	43	Generator L1 (U) voltage monitoring	1.0mm² AWG 18	Connect to generator L1 (U) output (AC) (Recommend 2A fuse)
	44	Generator L2 (V) voltage monitoring input	1.0mm² AWG 18	Connect to generator L2 (V) output (AC) (Recommend 2A fuse)
	45	Generator L3 (W) voltage monitoring input	1.0mm² AWG 18	Connect to generator L3 (W) output (AC) (Recommend 2A fuse)
	46	Generator Neutral (N) input	1.0mm² AWG 18	Connect to generator Neutral terminal (AC)

NOTE:- The above table describes connections to a three phase, four wire alternator. For alternative wiring topologies, please see the ALTERNATIVE AC TOPOLOGIES section of this manual.

4.2.5 MAINS VOLTAGE SENSING

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	47	Mains L1 (R) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (R) incoming supply (AC) (Recommend 2A fuse)
	48	Mains L2 (S) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (S) incoming supply (AC) (Recommend 2A fuse)
	49	Mains L3 (T) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (T) incoming supply (AC) (Recommend 2A fuse)
	50	Mains Neutral (N) input	1.0mm AWG 18	Connect to Mains N incoming supply (AC)

NOTE:- Terminals 47-50 are not fitted to the 7210 / 7310 controller.

4.2.6 GENERATOR CURRENT TRANSFORMERS

WARNING!:- Do not disconnect this plug when the CTs are carrying current. Disconnection will open circuit the secondary of the C.T.'s and dangerous voltages may then develop. Always ensure the CTs are not carrying current and the CTs are short circuit connected before making or breaking connections to the module.

NOTE:- The 7000 series module has a burden of 0.5VA on the CT. Ensure the CT is rated for the burden of the 7000 series controller, the cable length being used and any other equipment sharing the CT. If in doubt, consult your CT supplier.

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	51	CT Secondary for Gen L1	2.5mm² AWG 13	Connect to s1 secondary of L1 monitoring CT
	52	CT Secondary for Gen L2	2.5mm² AWG 13	Connect to s1 secondary of L2 monitoring CT
	53	CT Secondary for Gen L3	2.5mm² AWG 13	Connect to s1 secondary of L3 monitoring CT

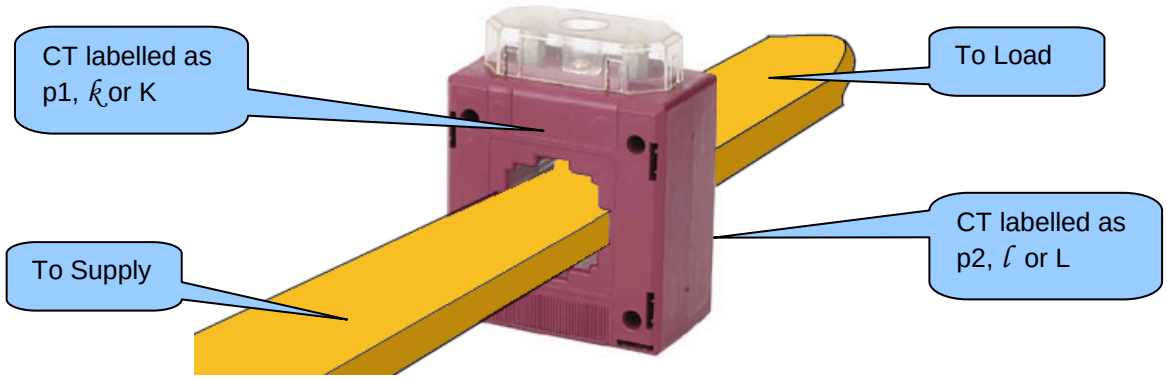
Connection to terminals 54 & 55

The function of terminals 54 and 55 change position depending upon wiring topology as follows :

	Type	Topology	Pin No	Description	CABLE SIZE
	7200 series	All	54	DO NOT CONNECT	
			55	Common for CTs connected to L1,L2,L3	2.5mm² AWG 13
	7300 series	No earth fault measuring	54	DO NOT CONNECT	
			55	Common for CTs connected to L1,L2,L3	2.5mm² AWG 13
		Restricted earth fault measuring	54	Common for CTs connected to L1,L2,L3,N	2.5mm² AWG 13
			55	Connect to CT on the neutral conductor	2.5mm² AWG 13
		Un-restricted earth fault measuring (Earth fault CT is fitted in the neutral to earth link)	54	DO NOT CONNECT	
			55	Common for CTs connected to L1,L2,L3	2.5mm² AWG 13

NOTE:- Terminals 56 to 59 are not fitted to the 7200 / 7300 series controller.

NOTE:- Take care to ensure correct polarity of the CT primary as shown below. If in doubt, check with the CT supplier.



4.2.7 CONFIGURABLE DIGITAL INPUTS

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	60	Configurable digital input A	0.5mm² AWG 20	Switch to negative
	61	Configurable digital input B	0.5mm² AWG 20	Switch to negative
	62	Configurable digital input C	0.5mm² AWG 20	Switch to negative
	63	Configurable digital input D	0.5mm² AWG 20	Switch to negative
	64	Configurable digital input E	0.5mm² AWG 20	Switch to negative
	65	Configurable digital input F	0.5mm² AWG 20	Switch to negative
	66	Configurable digital input G (not available on 7200 series)	0.5mm² AWG 20	Switch to negative
	67	Configurable digital input H (not available on 7200 series)	0.5mm² AWG 20	Switch to negative

NOTE:- Terminals 66 to 69 are not fitted to the 7200 series controller.

NOTE:- Terminals 68 and 69 are not fitted to the 7300 series controller.

4.2.8 PC CONFIGURATION INTERFACE CONNECTOR

This configuration cable is the same as normally used between a PC and a USB printer!

	DESCRIPTION	CABLE SIZE	NOTES
USB	Socket for connection to PC with 7xxx series PC software.	0.5mm² AWG 20	This is a standard USB type A to type B connector. 

NOTE:- The USB connection cable between the PC and the 7000 series module must not be extended beyond 5m (5yds). For distances over 5m, it is possible to use a third party USB extender. Typically, they extend USB up to 50m (yds). The supply and support of this type of equipment is outside the scope of Deep Sea Electronics PLC.

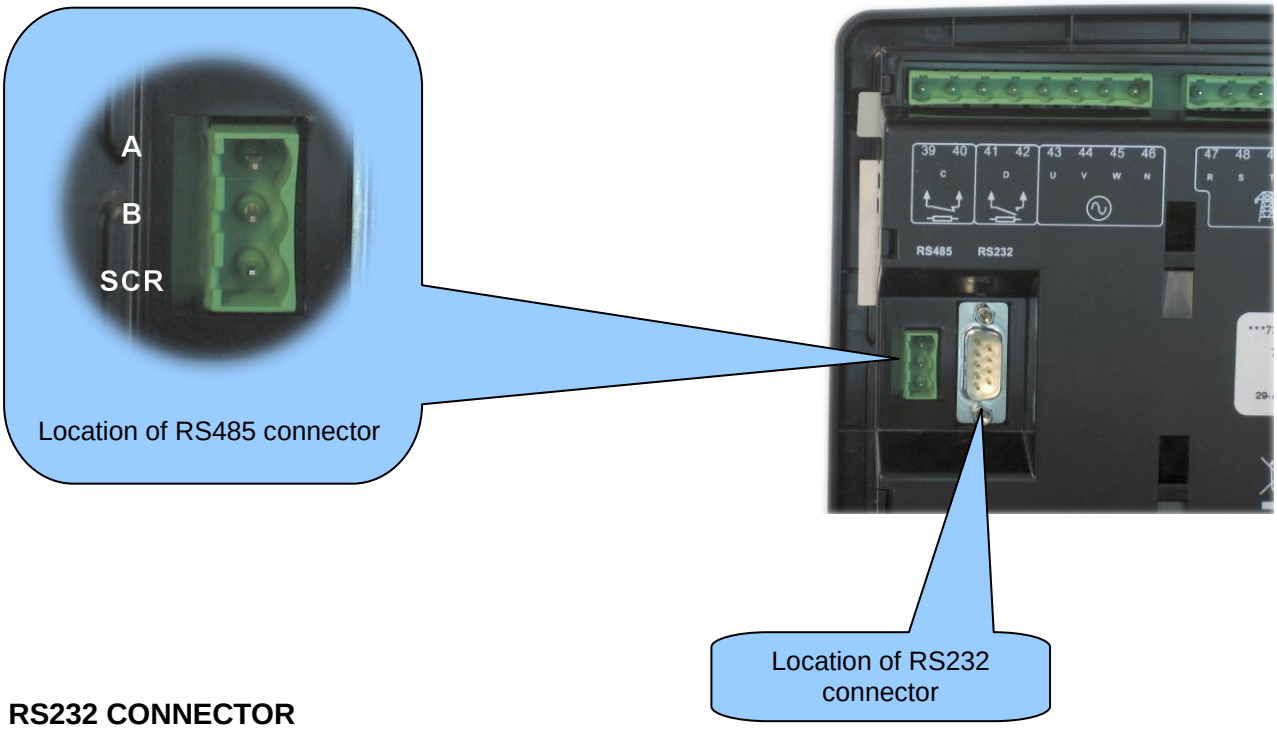
CAUTION!: Care must be taken not to overload the PCs USB system by connecting more than the recommended number of USB devices to the PC. For further information, consult your PC supplier.

CAUTION!: This socket must not be used for any other purpose.

4.2.9 RS485 CONNECTOR

NOTE:- RS485 connector is not fitted to the 7200 series controller.

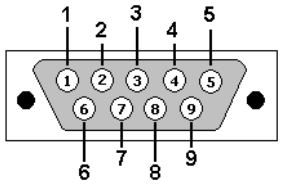
PIN No	NOTES
A	Two core screened twisted pair cable. 120Ω impedance suitable for RS485 use. Recommended cable type - Belden 9841 Max distance 1000m (1km) when using Belden 9841 or direct equivalent.
B	
SCR	



4.2.10 RS232 CONNECTOR

NOTE:- RS232 connector is not fitted to the 7200 series controller.

PIN No	NOTES
1	Received Line Signal Detector (Data Carrier Detect)
2	Received Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request To Send
8	Clear To Send
9	Ring Indicator

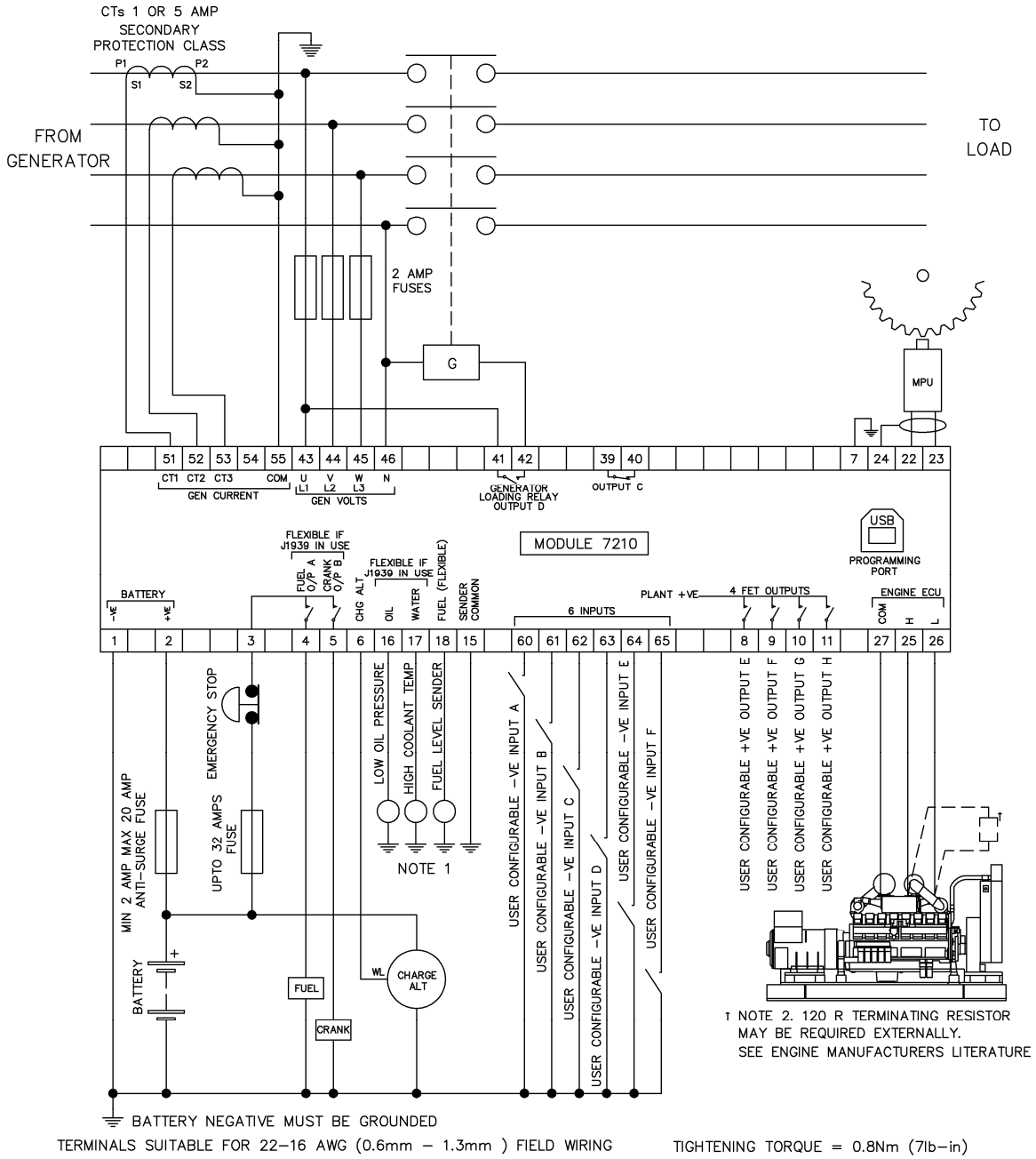


View looking into the male connector on the 7000 series module

4.3 TYPICAL WIRING DIAGRAMS

4.3.1 7210 AUTOSTART CONTROLLER

3 phase, 4 wire



TERMINALS SUITABLE FOR 22–16 AWG (0.6mm – 1.3mm) FIELD WIRING

TIGHTENING TORQUE = 0.8Nm (7lb–in)

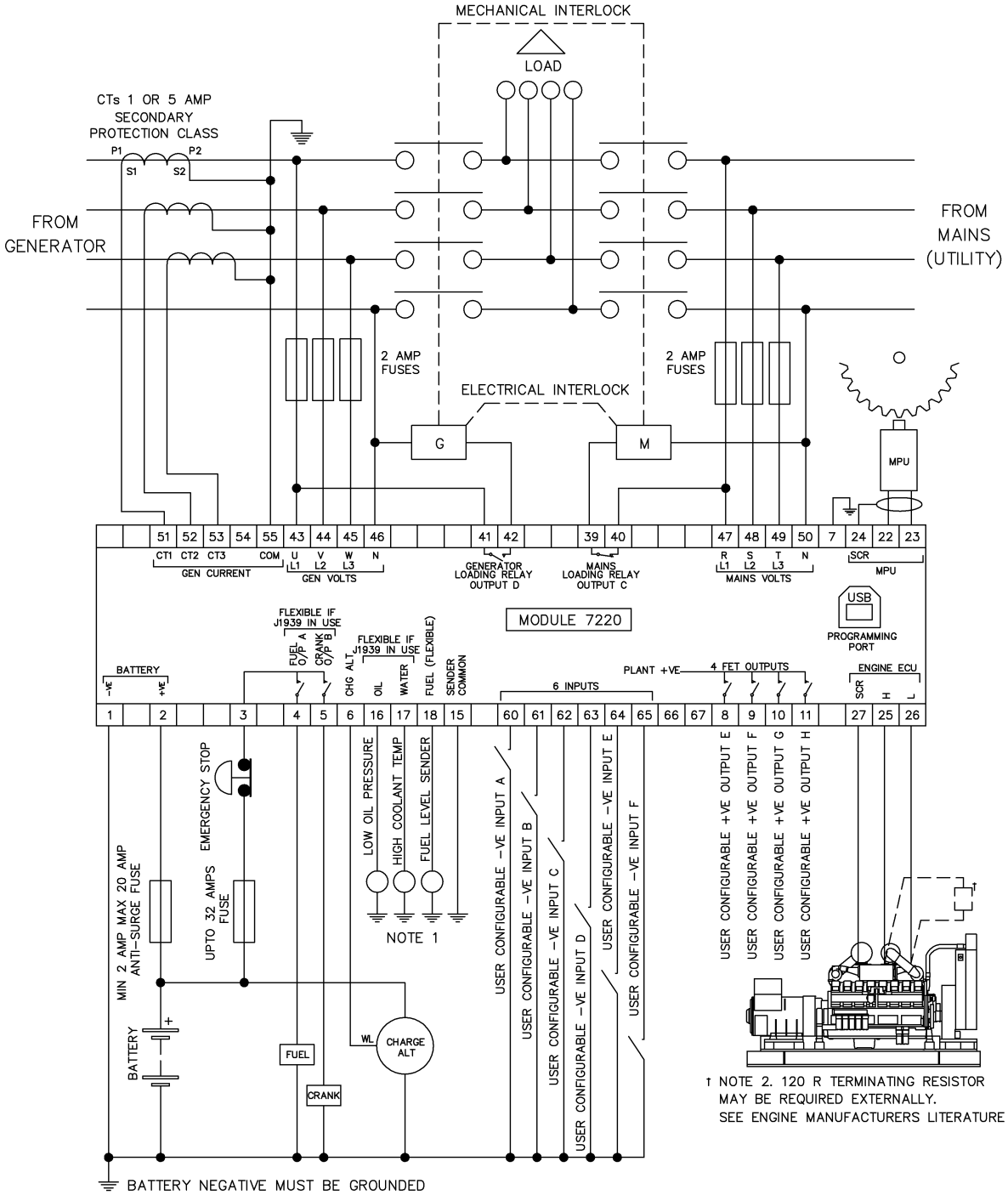
NOTE 1

THESE GROUND CONNECTIONS MUST BE ON THE ENGINE BLOCK, AND MUST BE TO THE SENDER BODIES.

THE GROUND WIRE TO TERMINAL 15 MUST NOT BE USED TO PROVIDE A GROUND CONNECTION TO ANY OTHER DEVICE

4.3.2 7220 AMF CONTROLLER

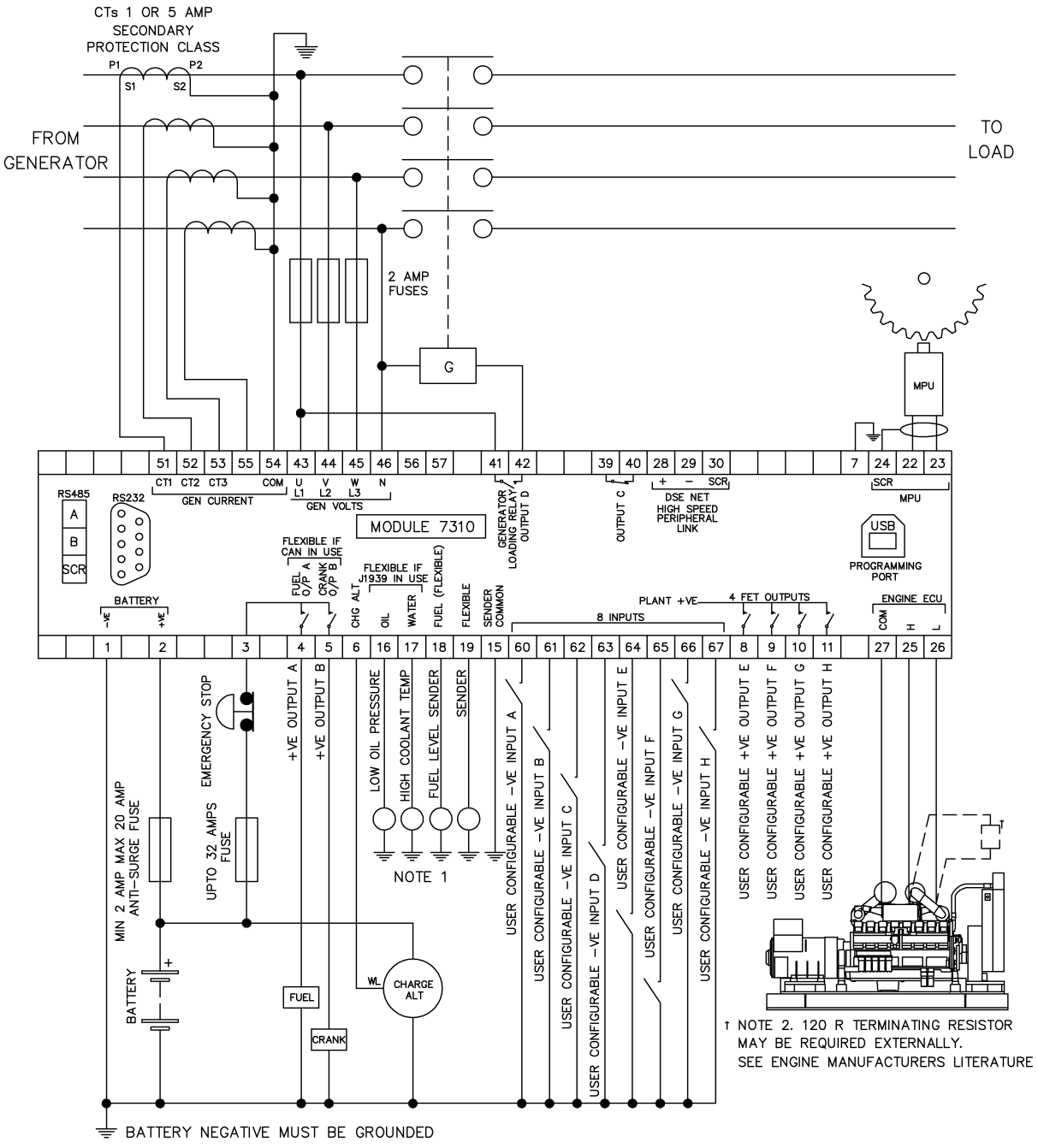
3 phase, 4 wire



4.3.3 7310 AUTOSTART CONTROLLER

3 phase, 4 wire with restricted earth fault protection

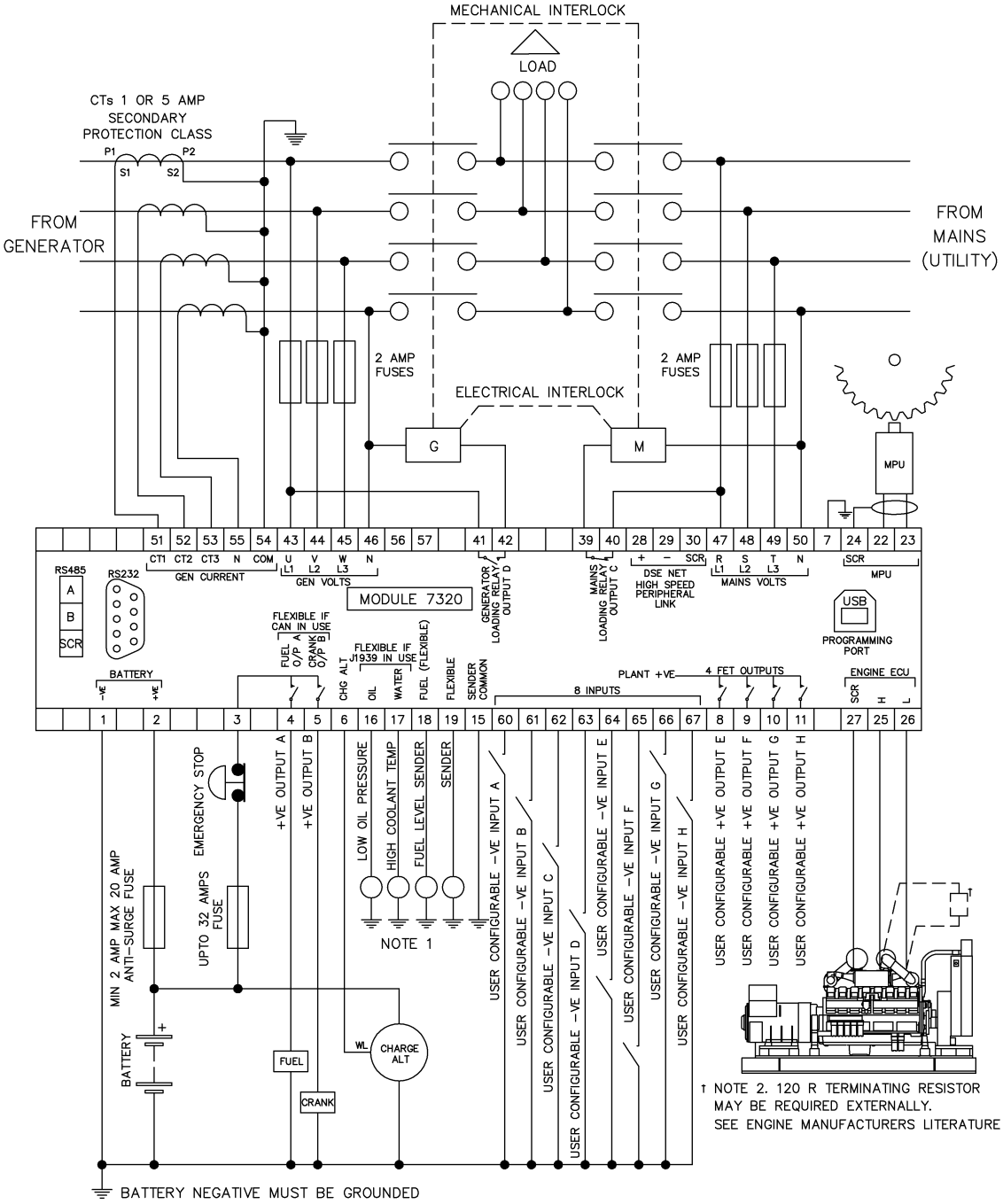
NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)



4.3.4 7320 AMF CONTROLLER

3 phase, 4 wire with restricted earth fault protection

NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)



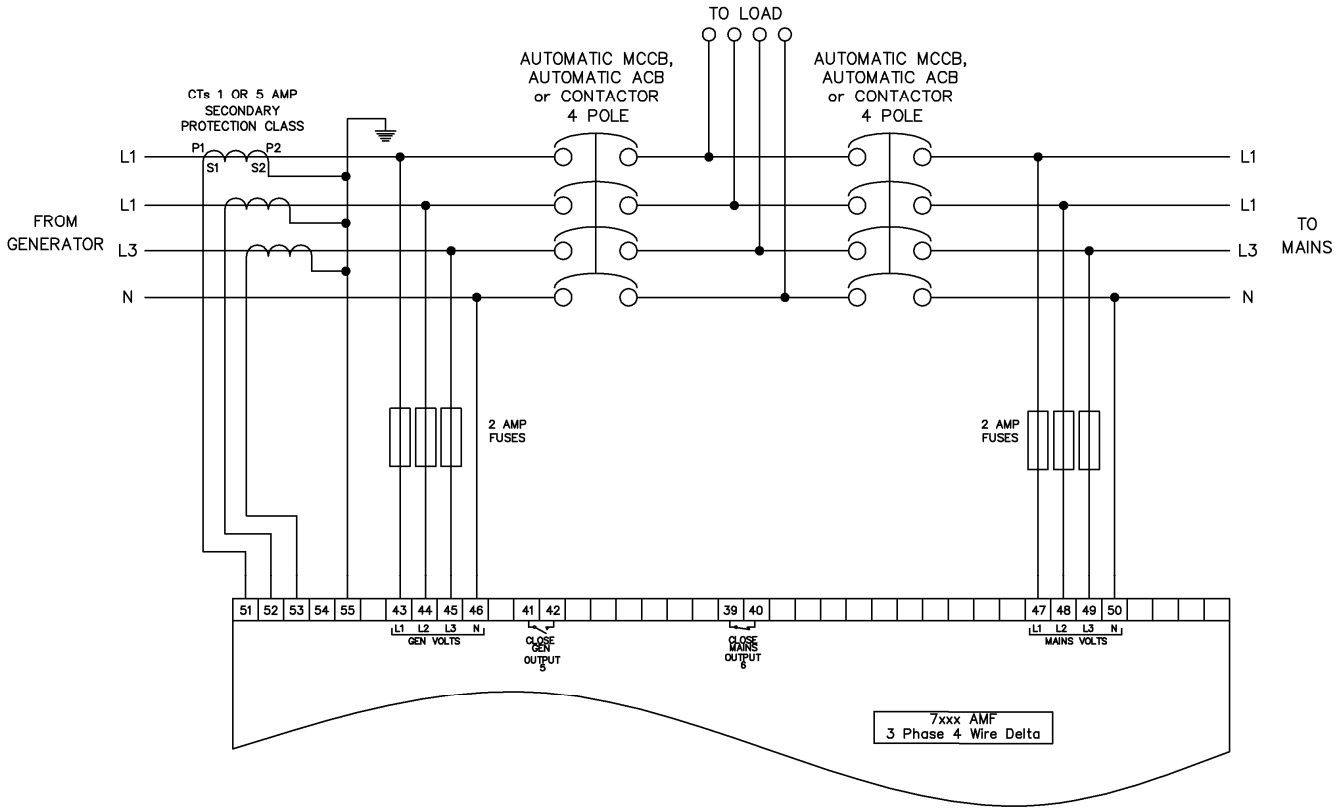
4.4 ALTERNATIVE TOPOLOGIES

The 7000 controller is factory configured to connect to a 3 phase, 4 wire Star connected alternator. This section details connections for alternative AC topologies. Ensure to configure the 7000 series controller to suit the required topology.

NOTE:- Further details of module configuration are contained within the DSE7000 Series configuration software manual (DSE part number 057-077)

4.4.1 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.



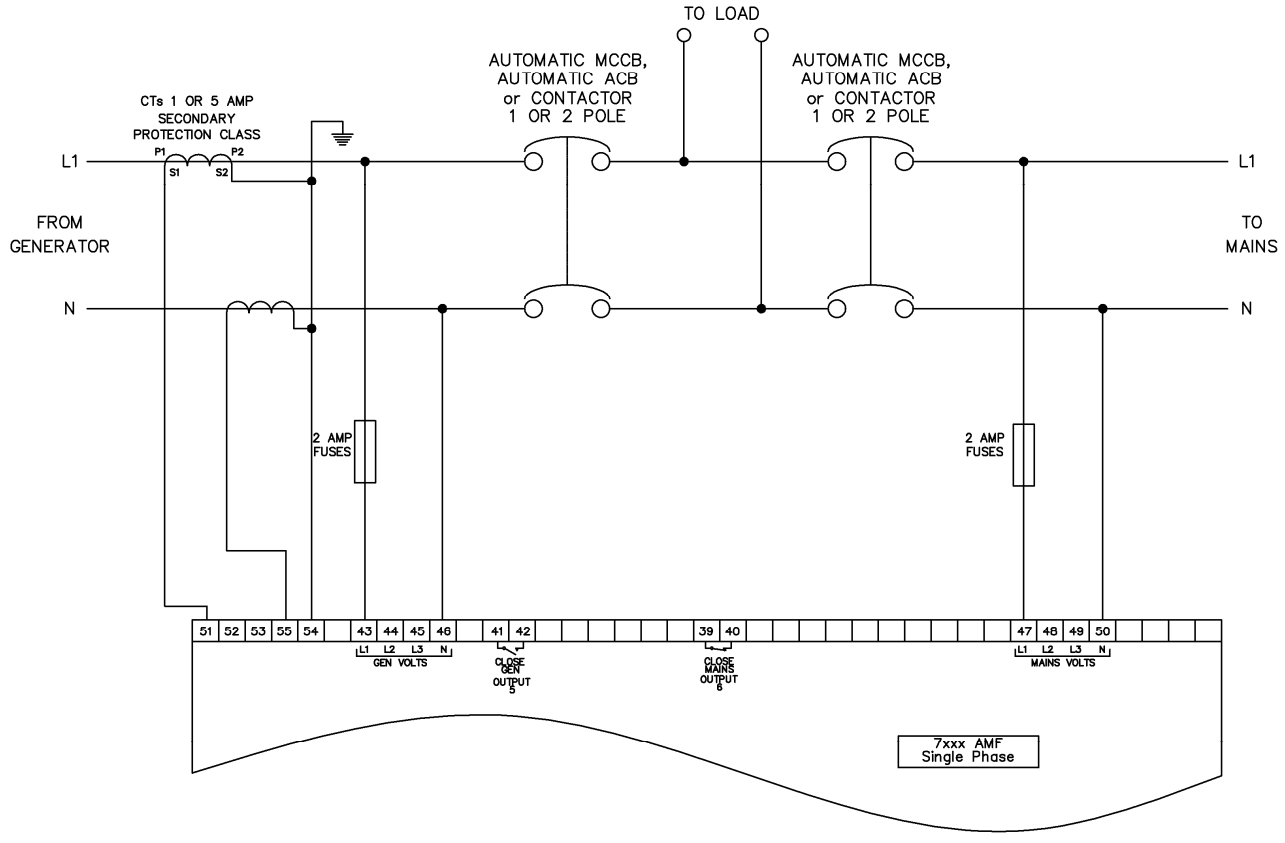
4.4.2 SINGLE PHASE WITH RESTRICTED EARTH FAULT

NOTE:- Earth fault measuring not available on 7200 series controllers.

NOTE:- Earth fault protection alarm only available on 7300 series V2.0.0 and above controllers. 7300 series V1.x.x modules have Earth fault measuring only (no protection alarms).

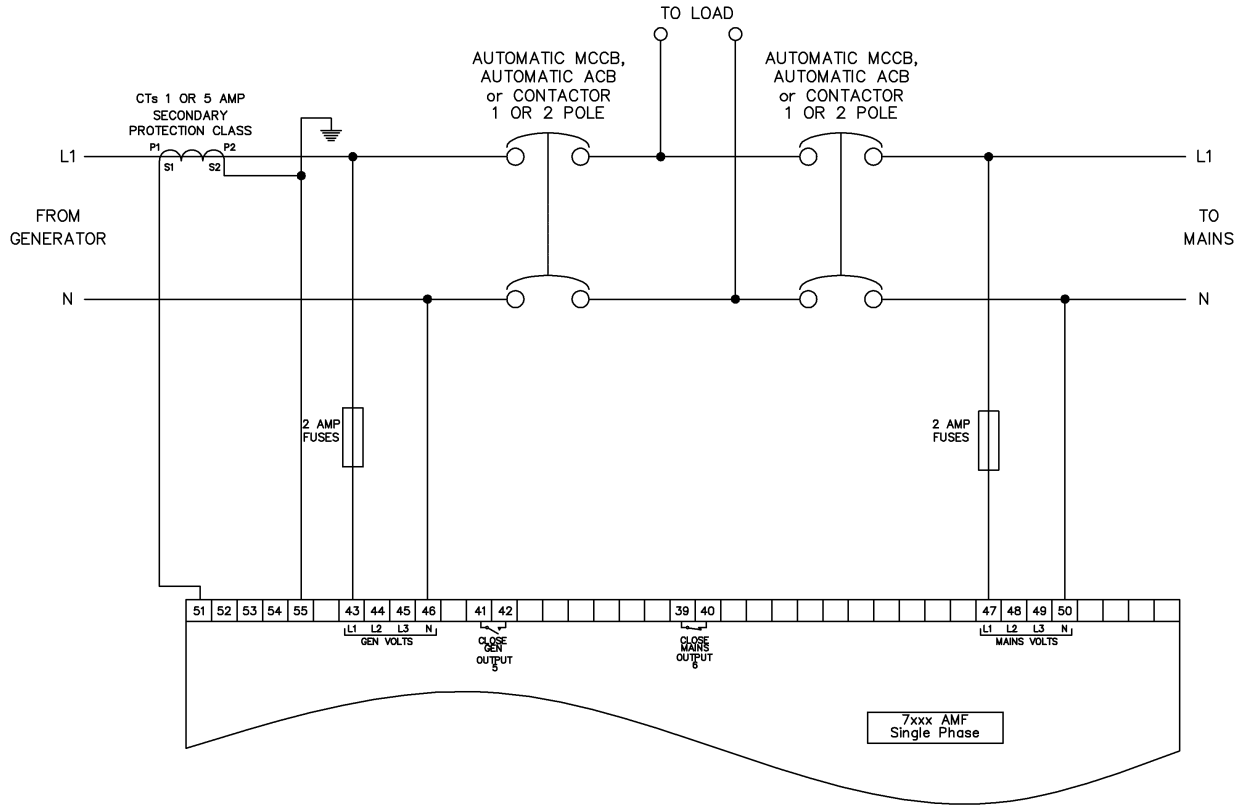
NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)



4.4.3 SINGLE PHASE WITHOUT EARTH FAULT

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

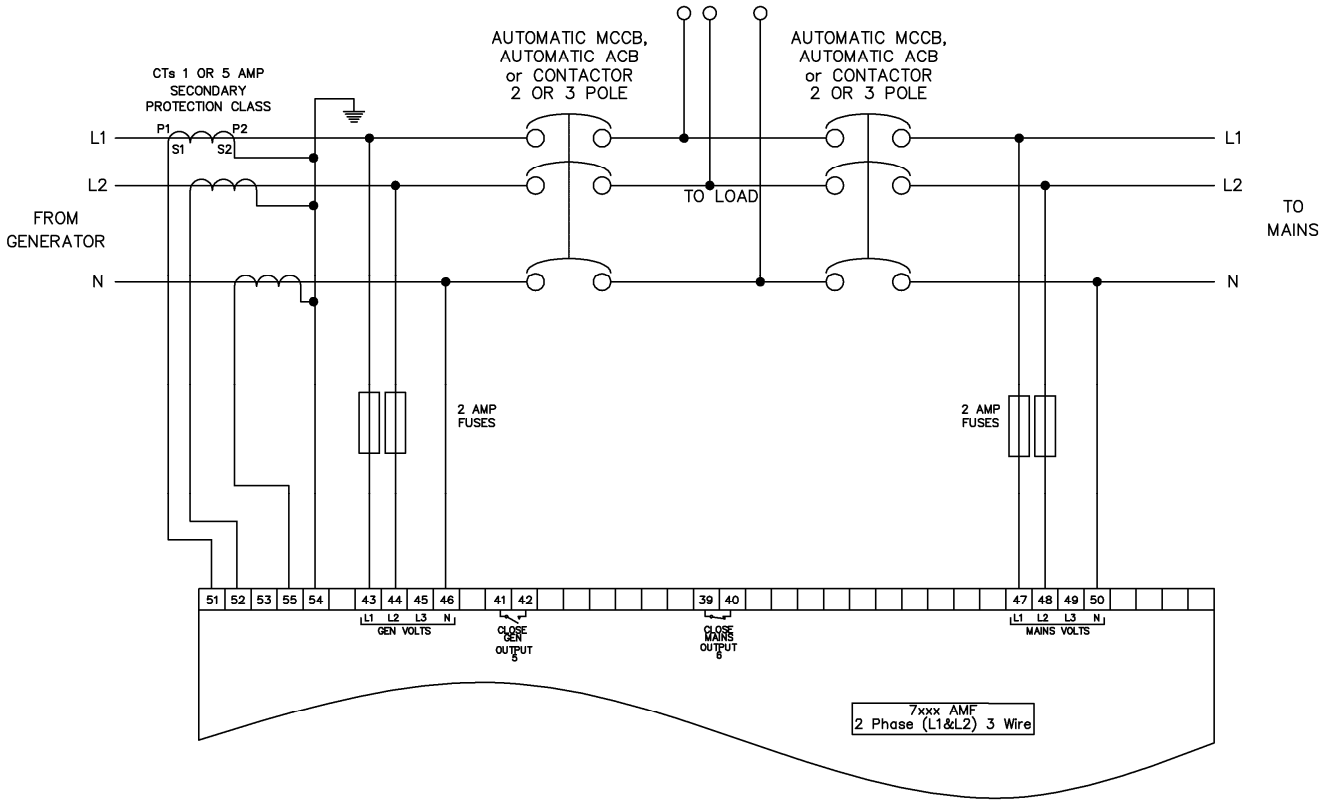


4.4.4 2 PHASE (L1 & L2) 3 WIRE WITH RESTRICTED EARTH FAULT

NOTE:- Earth fault protection alarm only available on 7300 series V2.0.0 and above controllers. 7300 series V1.x.x modules have Earth fault measuring only (no protection alarms).

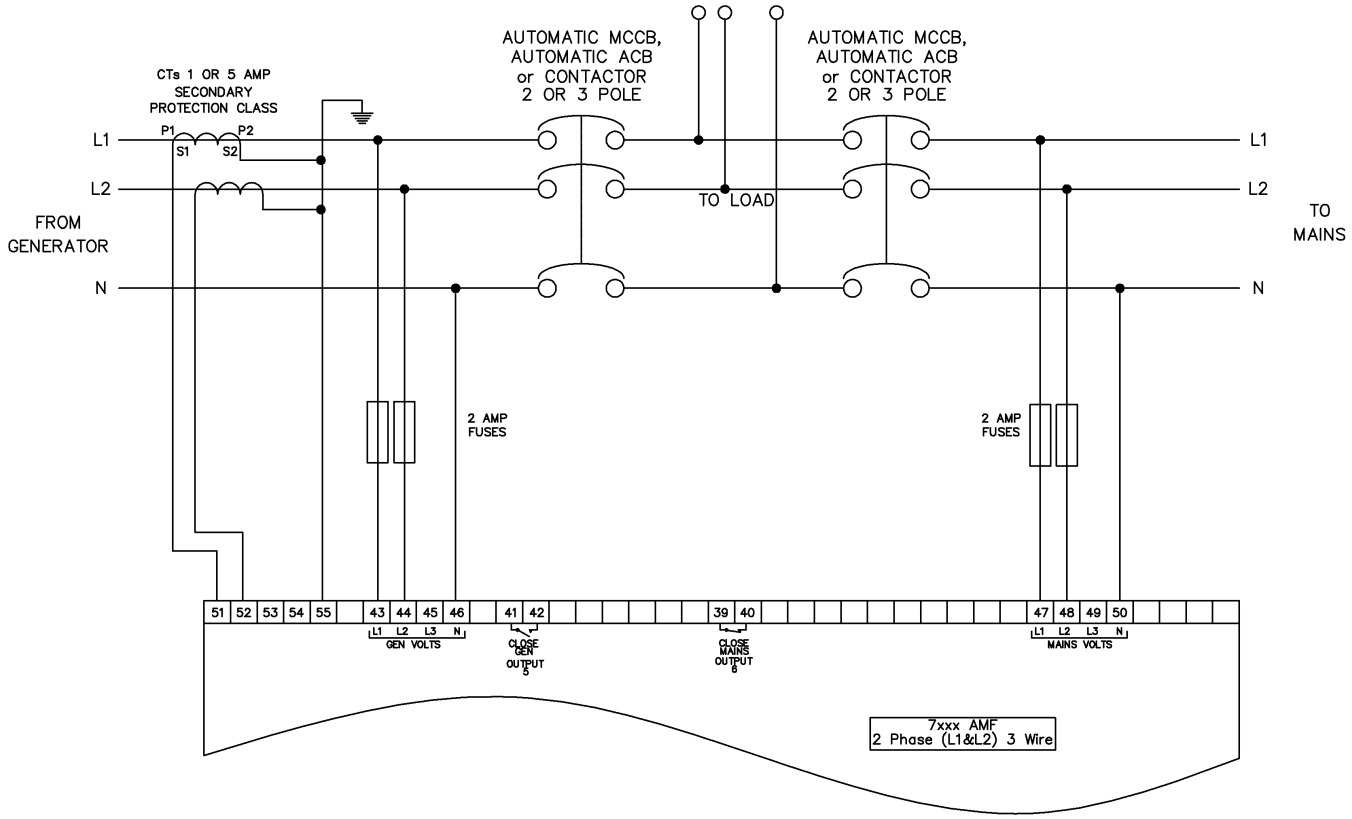
NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)



4.4.5 2 PHASE (L1 & L2) 3 WIRE WITHOUT EARTH FAULT

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

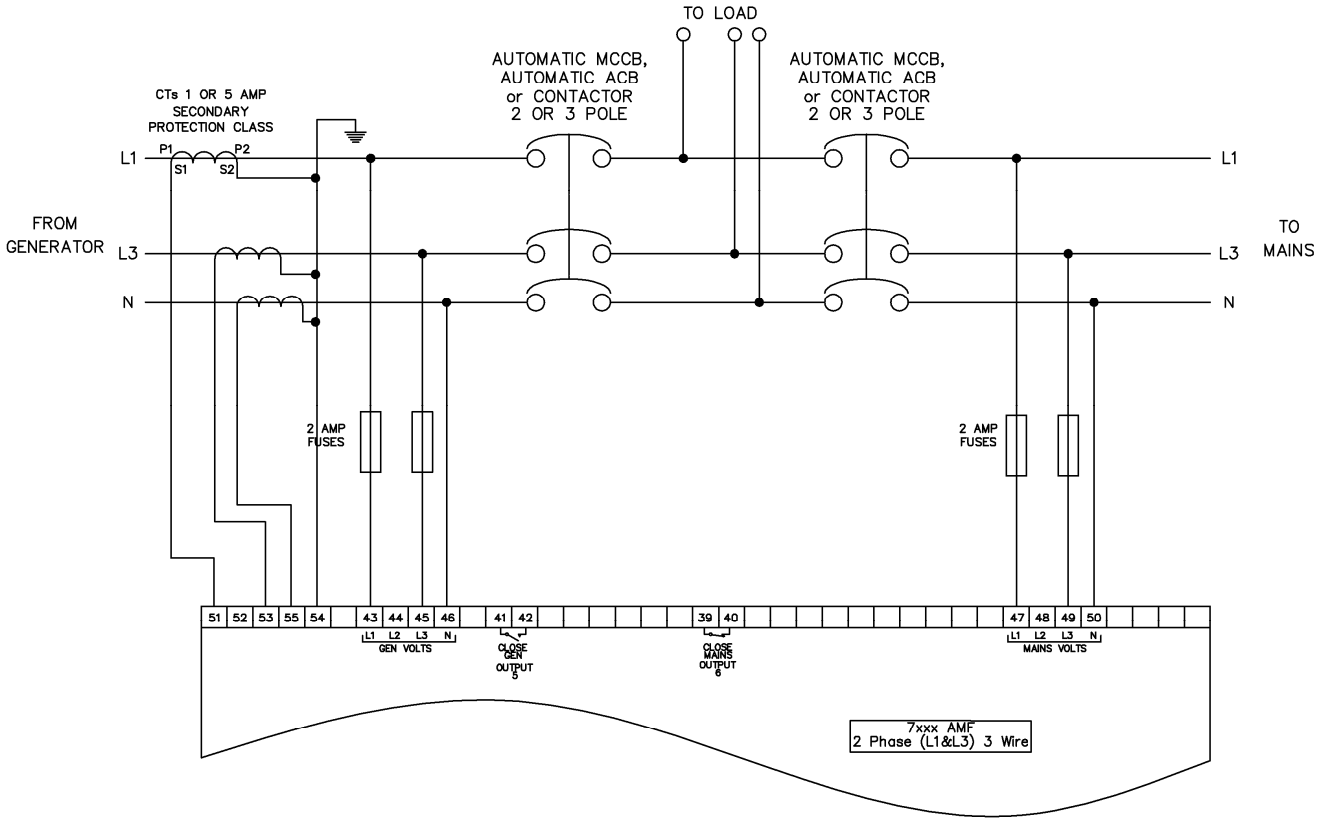


4.4.6 2 PHASE (L1 & L3) 3 WIRE WITH RESTRICTED EARTH FAULT

NOTE:- Earth fault protection alarm only available on 7300 series V2.0.0 and above controllers. 7300 series V1.x.x modules have Earth fault measuring only (no protection alarms).

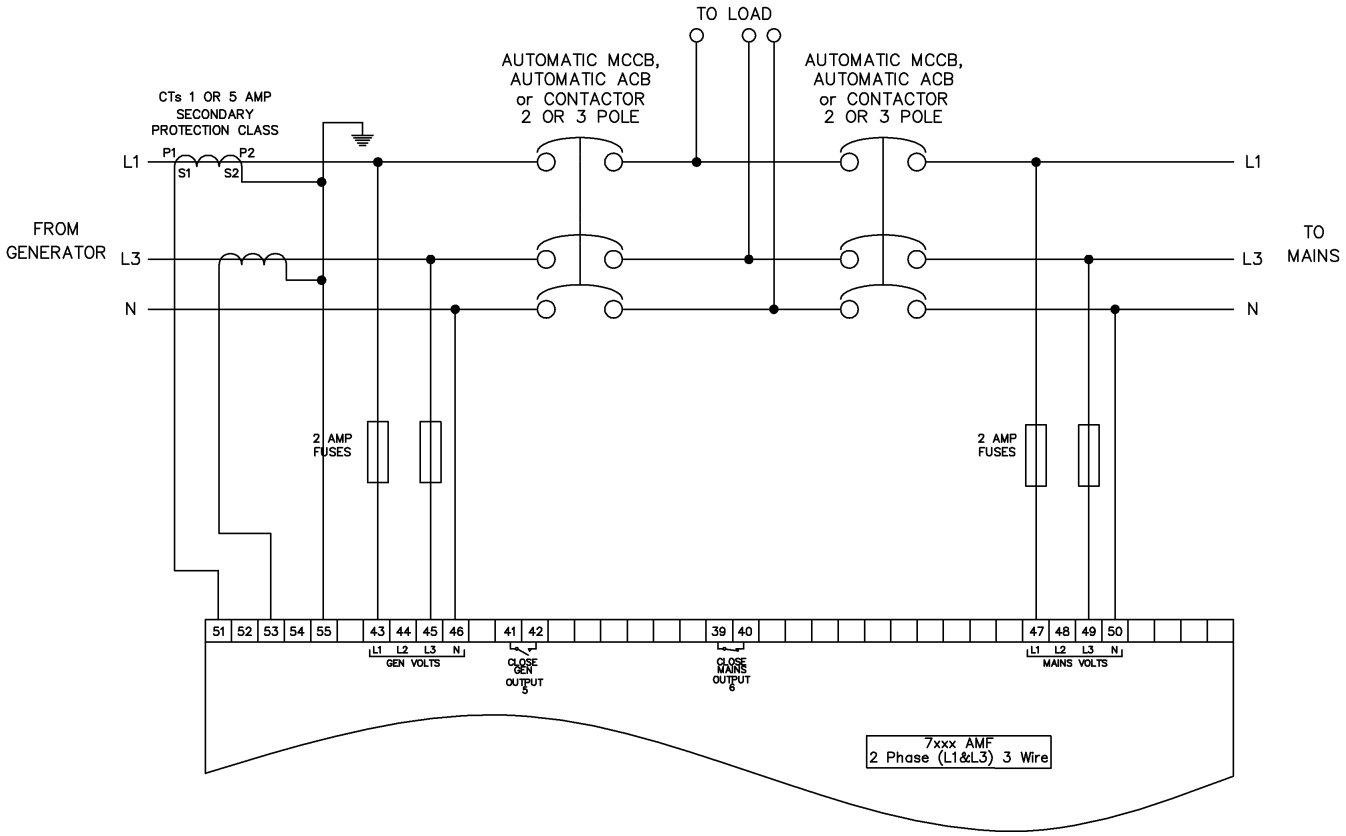
NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)



4.4.7 2 PHASE (L1 & L3) 3 WIRE WITHOUT EARTH FAULT MEASURING

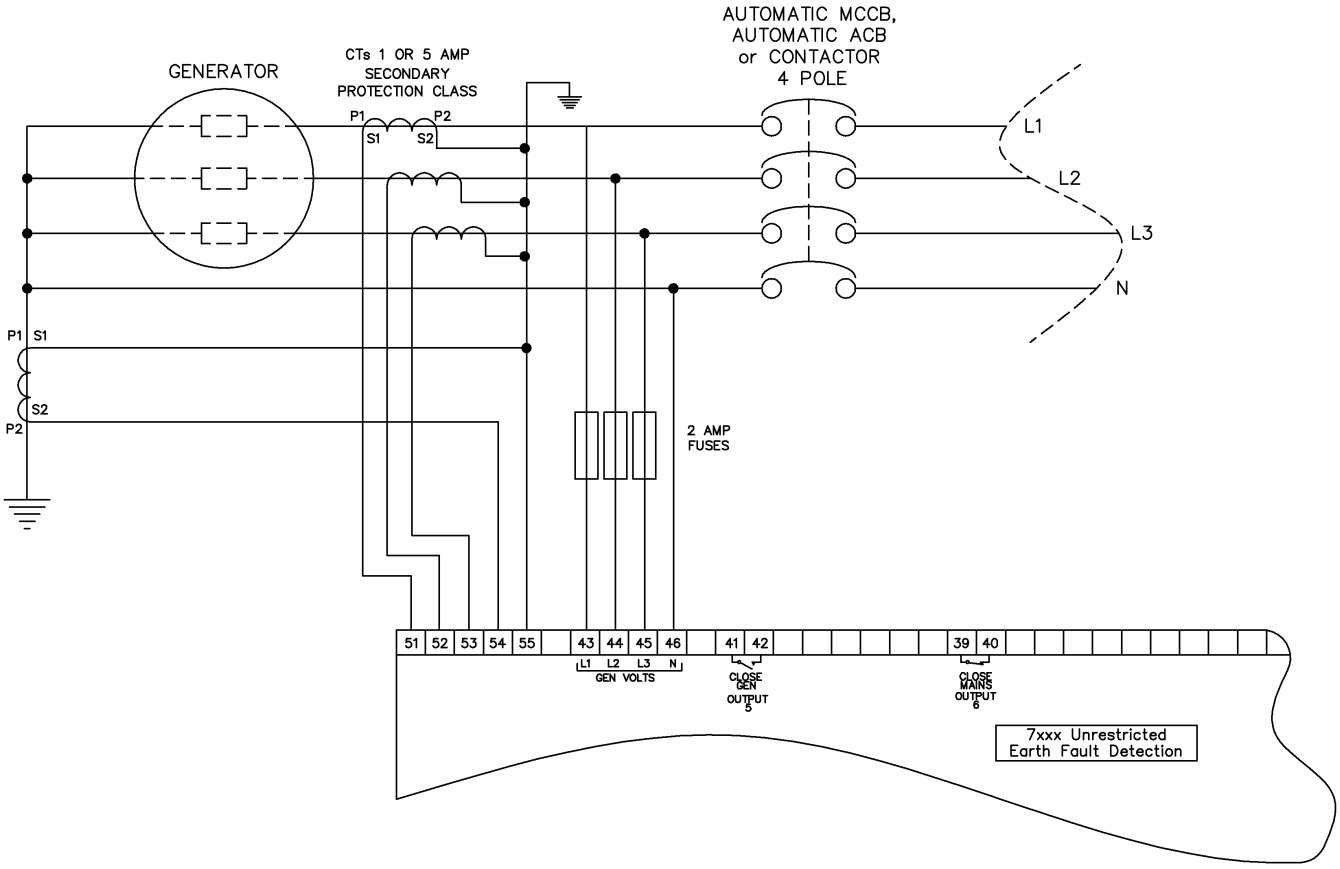
NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.



4.4.8 3 PHASE 4 WIRE WITH UNRESTRICTED EARTH FAULT MEASURING

NOTE:- Earth fault protection alarm only available on 7300 series V2.0.0 and above controllers. 7300 series V1.x.x modules have Earth fault measuring only (no protection alarms).

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.

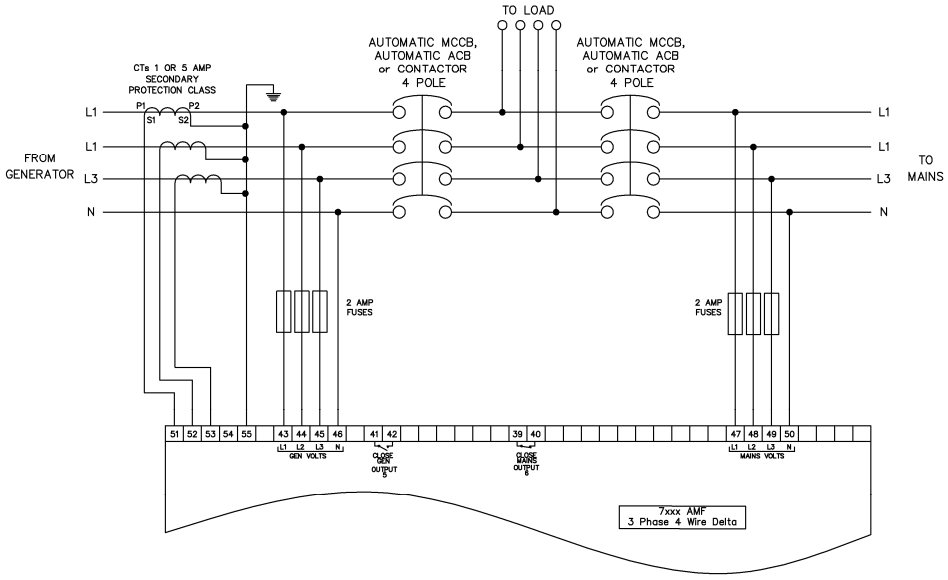


4.5 CT LOCATION

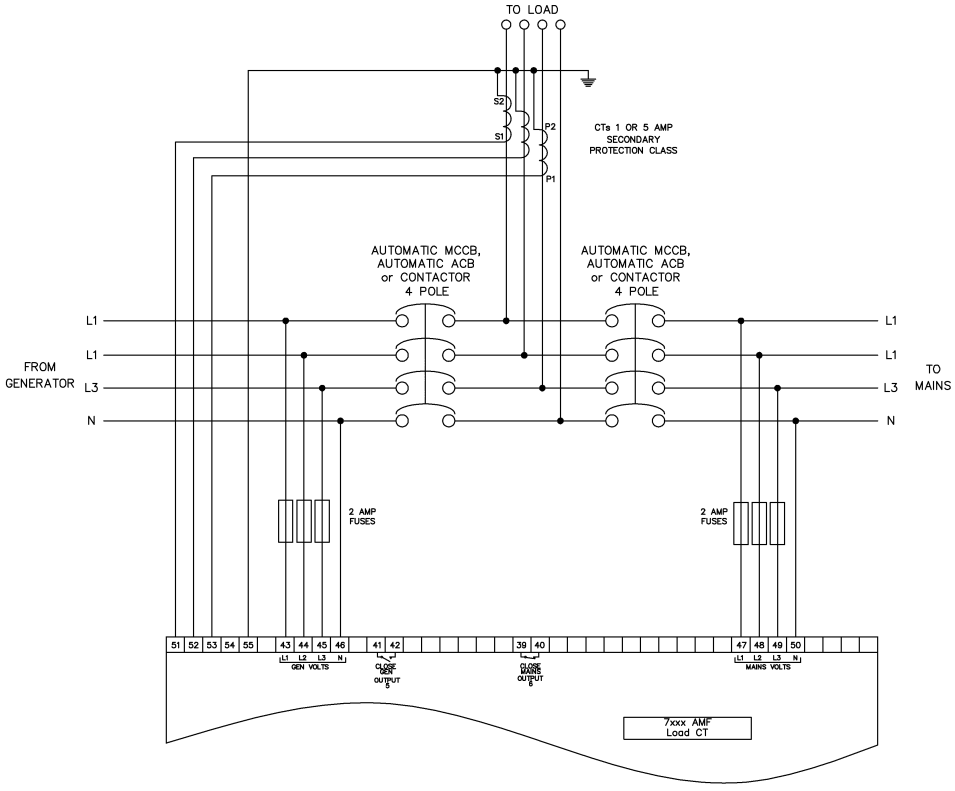
NOTE:- CT Location is not applicable to the DSE7210 / DSE7310 autostart controllers.

There are two possible locations for the current transformers in the system:

1) **Generator** : The CTs are used to measure and display generator current only. The typical wiring diagrams in the preceding section all show the CT measuring the generator load. For clarity, an example is shown below.



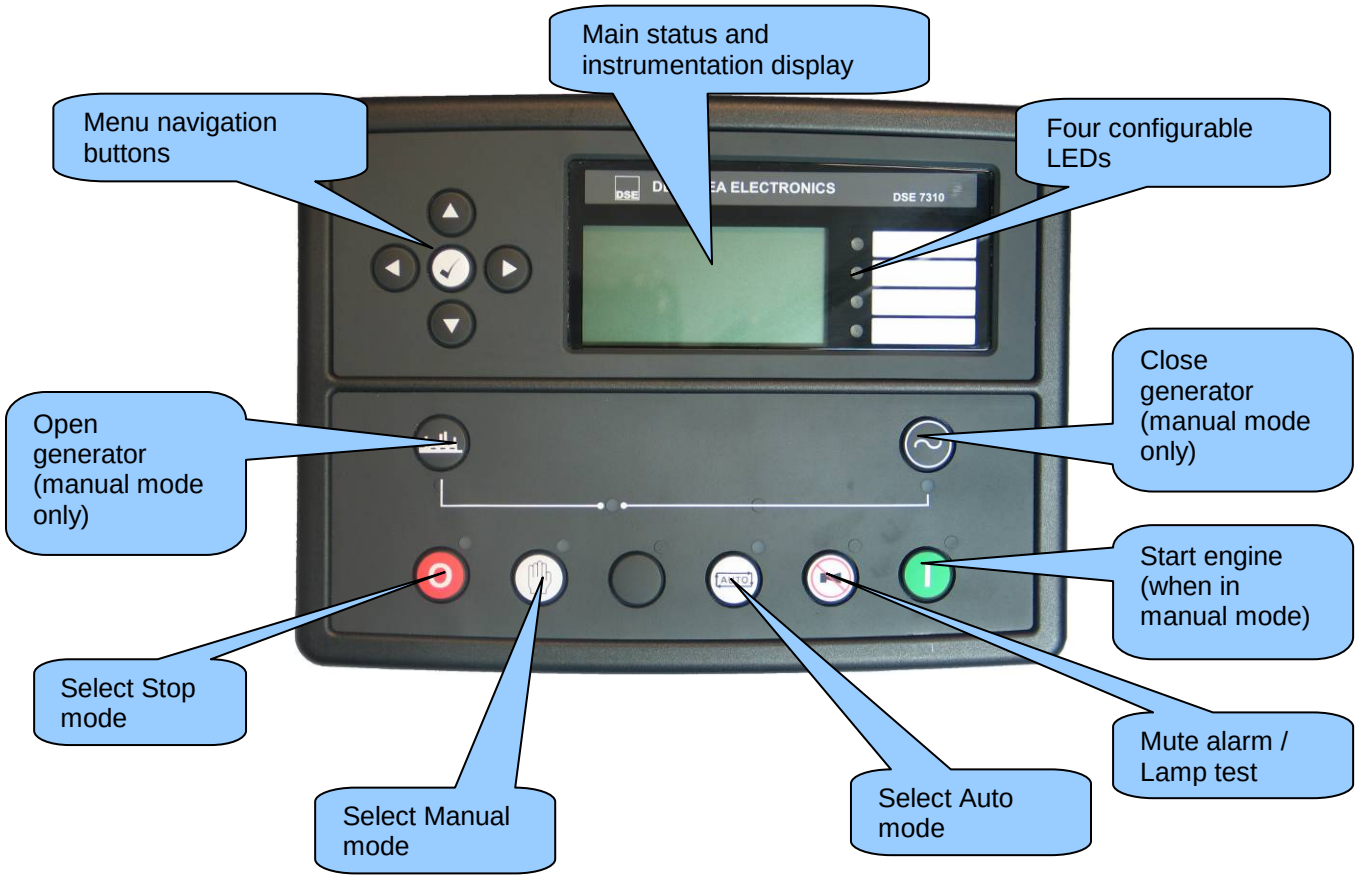
2) **Load** : The CTs are used to measure and display generator current when the generator is on load and mains current when the mains is on load. The module display automatically changes to display the current in the relevant instrumentation page. This example shows the CTs in the 'load' for a three phase delta system but the same philosophy is applicable to the other topologies.

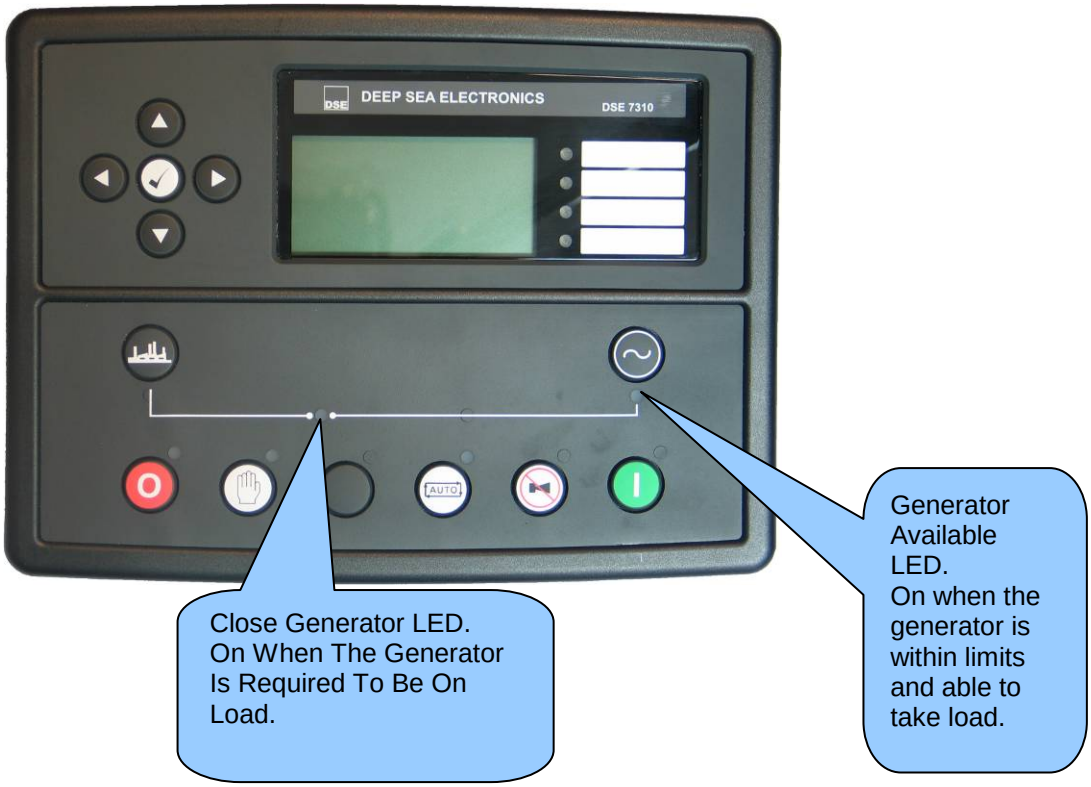


5 DESCRIPTION OF CONTROLS

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

5.1 DSE7210 / DSE7310 AUTOSTART CONTROL MODULE

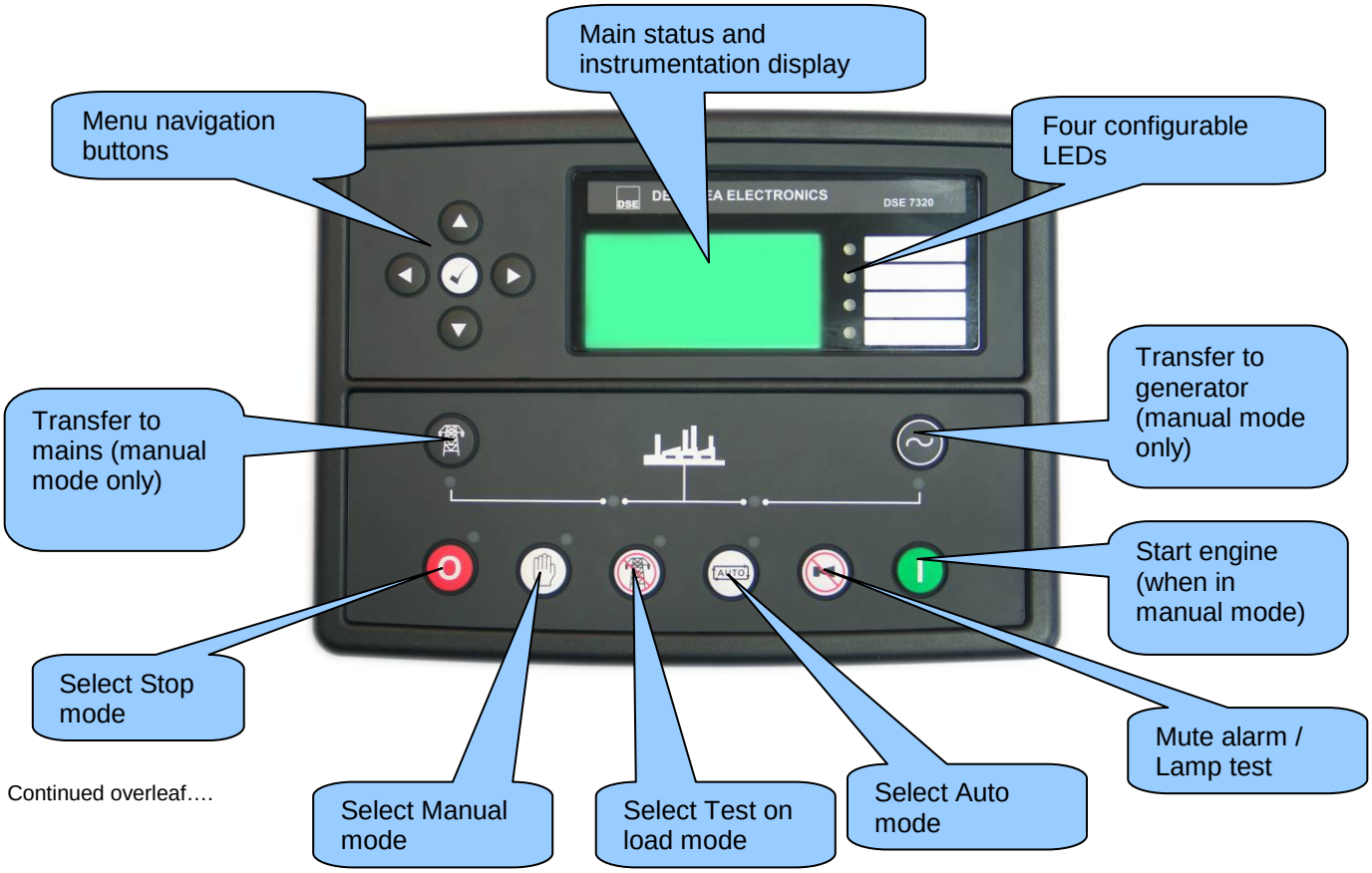




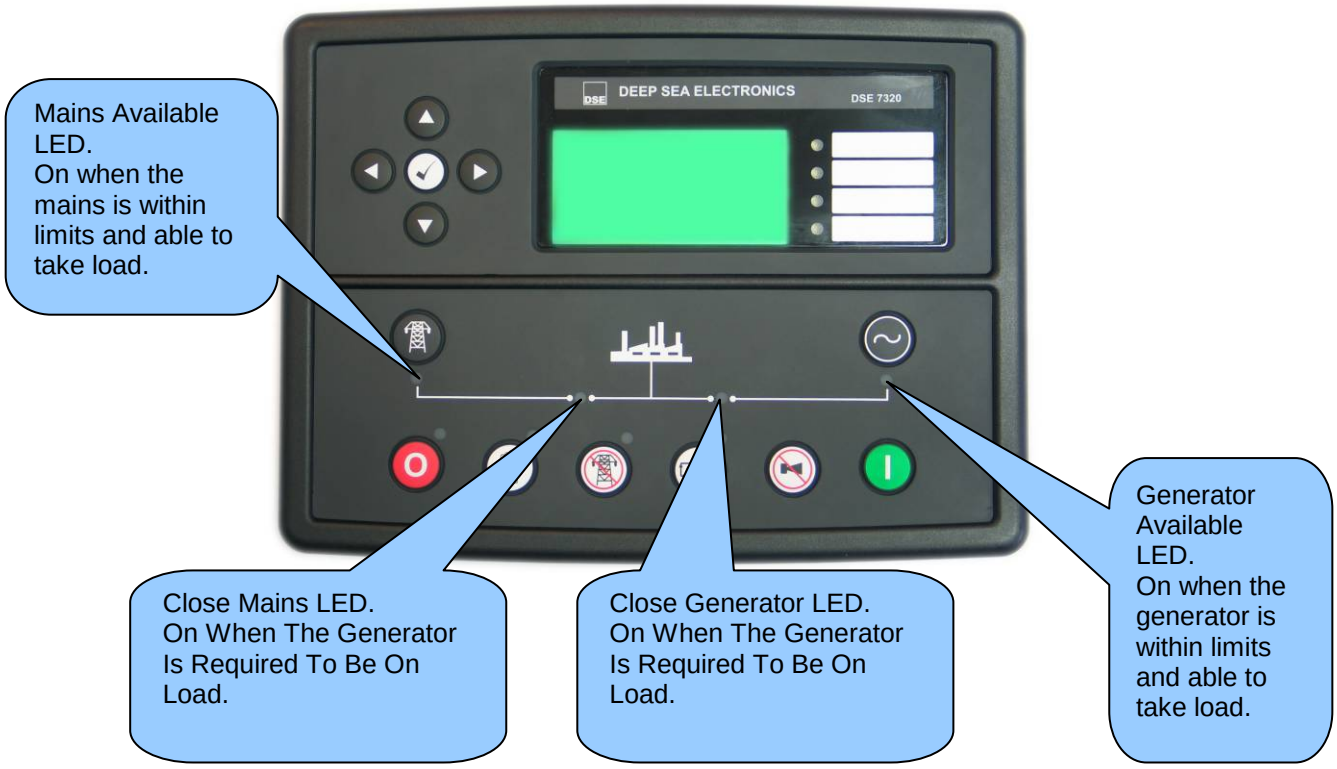
NOTE:- "Generator on load" LED has two modes of operation depending upon the configuration of the controllers digital inputs.

1) **Digital input configured for "Generator closed auxiliary" – The LED illuminates when the generator closed auxiliary input is active – The LED shows the state of the auxiliary contact.**
2) **There is NO input configured for "Generator closed auxiliary" (factory default setting) – The LED illuminates when the 7x20 gives the loading signal to the generator – The LED shows the state of the 7x20's loading request.**

5.2 DSE7220 / DSE7320 AMF CONTROL MODULE



Continued overleaf….



NOTE:- "Generator on load" LED has two modes of operation depending upon the configuration of the controllers digital inputs.

3) **Digital input configured for "Generator closed auxiliary" – The LED illuminates when the generator closed auxiliary input is active – The LED shows the state of the auxiliary contact.**
4) **There is NO input configured for "Generator closed auxiliary" (factory default setting) – The LED illuminates when the 7x20 gives the loading signal to the generator – The LED shows the state of the 7x20's loading request.**

NOTE:- "Mains on load" LED has two modes of operation depending upon the configuration of the controllers digital inputs.

5) **Digital input configured for "Mains closed auxiliary" – The LED illuminates when the mains closed auxiliary input is active – The LED shows the state of the auxiliary contact.**
6) **There is NO input configured for "Mains closed auxiliary" (factory default setting) – The LED illuminates when the 7x20 gives the loading signal to the mains – The LED shows the state of the 7x20's loading request.**

5.3 QUICKSTART GUIDE

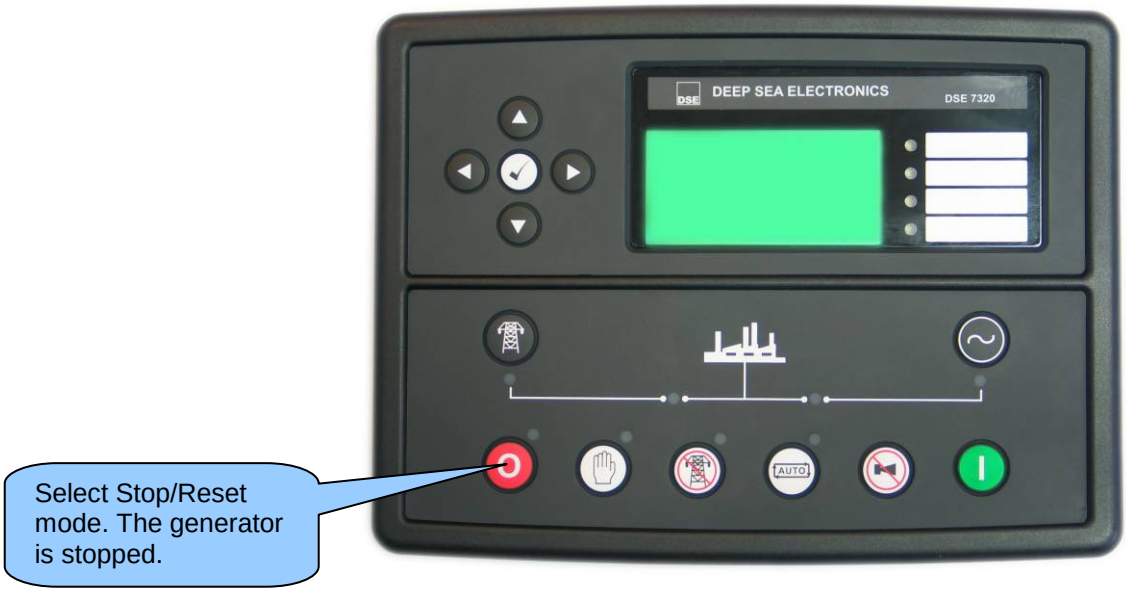
This section provides a quick start guide to the module's operation.

5.3.1 STARTING THE ENGINE



NOTE:- For further details, see the section entitled 'OPERATION' elsewhere in this manual.

5.3.2 STOPPING THE ENGINE



NOTE:- For further details, see the section entitled 'OPERATION' elsewhere in this manual.

5.4 VIEWING THE INSTRUMENTS

It is possible to scroll to display the different pages of information by repeatedly operating the next page button.

Once selected the page will remain on the LCD display until the user selects a different page or after an extended period of inactivity, the module will revert to the status display.

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

Alternatively, to scroll manually through all instruments on the currently selected page, press the scroll or buttons. The 'autoscroll' is disabled.

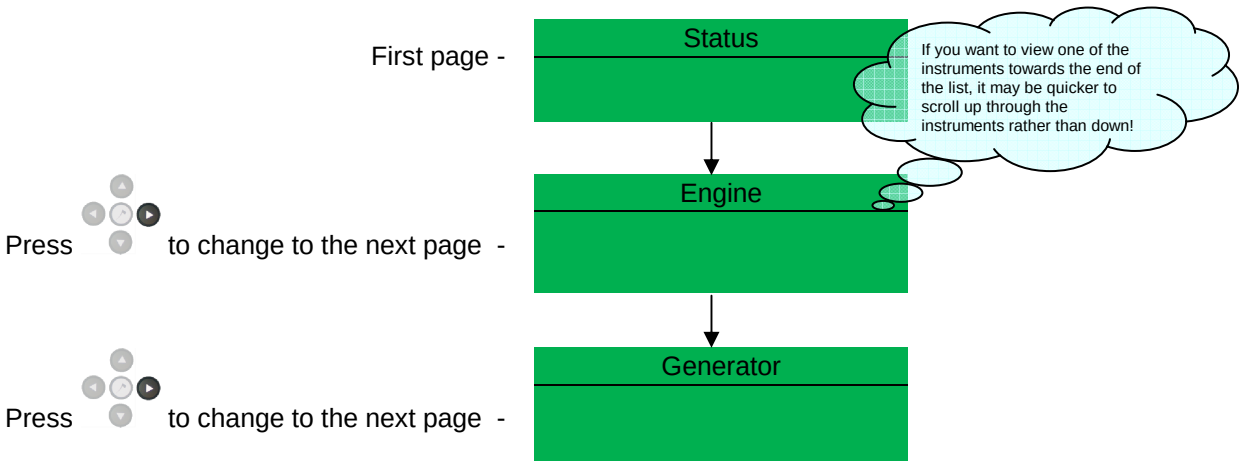
To re-enable 'autoscroll' press the or buttons to scroll to the 'title' of the instrumentation page (ie Engine).

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

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

Page order:-

Status, Engine, Generator, Mains, Alarms, ECU DTCs (electronic engines only), Event log, Scheduler (if enabled), About.



5.4.1 INSTRUMENT PAGE CONTENT

Engine

- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Run Time
- Oil Temperature*
- Coolant Pressure*
- Inlet Temperature*
- Exhaust Temperature*
- Fuel Temperature*
- Turbo Pressure
- Fuel Pressure*
- Fuel Consumption*
- Fuel Used*
- Fuel Level*
- Auxiliary Sensors (If fitted and configured)
- Engine Maintenance Due (If configured)
- Engine ECU Link*

*When connected to suitably configured and compatible engine ECU. For details of supported engines see 'Electronic Engines and DSE wiring' (DSE Part number 057-004)

Generator

- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Frequency
- Generator Current
- Generator Earth Current
- Generator Load (kW)
- Generator Load (kVA)
- Generator Power Factor
- Generator Load (kVAr)
- Generator Load (kWh, kVAh, kVArh)
- Generator Phase Sequence

Mains (DSE7220/DSE7320 only)

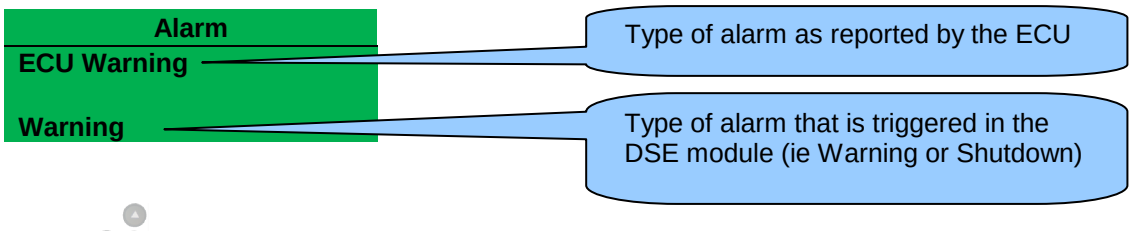
- Mains Voltage (ph-N)
- Mains Voltage (ph-ph)
- Mains Frequency

About

- Module Type
- Application Version
- USB ID – unique identifier for PC USB connection
- Analogue Measurements Version
- Firmware Update Bootloader Version

5.4.2 CAN ERROR MESSAGES

When connected to a suitable CAN engine the 7000 series controller displays alarm status messages from the ECU.



Press  to access the list of current active Engine DTCs (Diagnostic Trouble Codes).

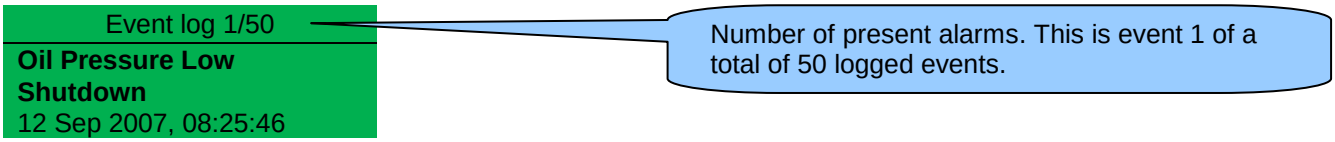


The code interpreted by the module shows on the display as a text message. Additionally, the manufactures code is shown.

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

NOTE:- For further details on connection to electronic engines please refer to *Electronic engines and DSE wiring.* Part No. 057-004

5.5 VIEWING THE EVENT LOG



The 7000 series modules maintains a log of the last 50 shutdown alarms (7200 series logs 30 shutdown alarms) to enable the operator or engineer to view the past alarms history.
The event log only includes shutdown and electrical trip alarms logged; **The event log does not contain Warning alarms.**

If *All warnings are latched* is configured, the event log will capture warning alarms. For more details consult the 7xxx series configuration software manual.

Once the log is full, any subsequent shutdown alarms will overwrite the oldest entry in the log.
Hence, the log will always contain the most recent shutdown alarms.
The module logs the alarm, along with the date and time of the event in the format shown in this example.

To view the event log, repeatedly press the next page button  until the LCD screen displays the Event log.

Press down  to view the next most recent shutdown alarm:

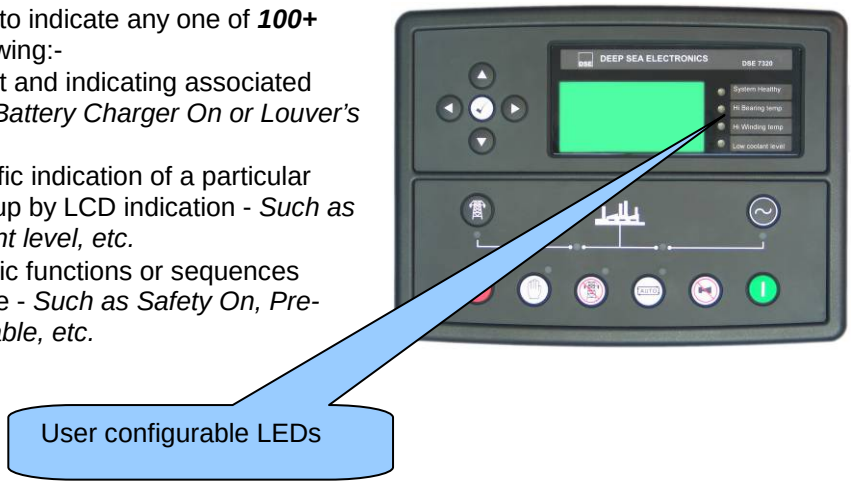
Continuing to press down  cycles through the past alarms after which the display shows the most recent alarm and the cycle begins again.

To exit the event log and return to viewing the instruments, press the next page  button.

5.6 USER CONFIGURABLE INDICATORS

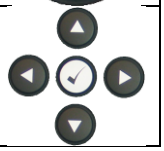
These LEDs can be configured by the user to indicate any one of ***100+ different functions*** based around the following:-

- **Indications** - Monitoring of a digital input and indicating associated functioning user's equipment - *Such as Battery Charger On or Louver's Open, etc*.
- **WARNINGS a**nd **SHUTDOWNS** - Specific indication of a particular warning or shutdown condition, backed up by LCD indication - *Such as Low Oil Pressure Shutdown, Low Coolant level, etc.*
- **Status Indications** - Indication of specific functions or sequences derived from the modules operating state - *Such as Safety On, Pre-heating, Panel Locked, Generator Available, etc.*



5.7 CONTROLS

Stop / Reset This button places the module into its **Stop/Reset** mode. This will clear any alarm conditions for which the triggering criteria have been removed. If the engine is running and the module is in Stop mode, the module will automatically instruct the changeover device to unload the generator *('**Close Generator**' becomes inactive (if used))*. The fuel supply de-energises and the engine comes to a standstill. Should a **remote start signal** be present while operating in this mode, a remote start will not occur.	
Manual This mode allows manual control of the generator functions. Once in **Manual mode** the module will respond to the start button, start the engine, and run off load. If the engine is running off-load in the **Manual mode** and a **remote start signal** becomes present, the module will automatically instruct the changeover device to place the generator on load *('**Close Generator**' becomes active (if used))*. Upon removal of the **remote start signal**, the generator remains on load until either selection of the **'STOP/RESET'** or **'AUTO'** modes. *For further details, please see the more detailed description of 'Manual operation' elsewhere in this manual.*	
Auto This button places the module into its **'Automatic'** mode. This mode allows the module to control the function of the generator automatically. The module will monitor the *remote start* input and mains supply status and once a start request is made, the set will be automatically started and placed on load. Upon removal of the starting signal, the module will automatically transfer the load from the generator and shut the set down observing the *stop delay* timer and *cooling* timer as necessary. The module will then await the next start event. *For further details, please see the more detailed description of 'Auto operation' elsewhere in this manual.*	
Test (DSE7220/DSE7320 only) This button places the module into its **'Test'** mode. This allows an on load test of the generator. Once in **Test mode** the module will respond to the start button, start the engine, and run on load. *For further details, please see the more detailed description of 'Test operation' elsewhere in this manual.*	
Start This button is only active in STOP/RESET or MANUAL mode. Pressing this button in manual or test mode will start the engine and run off load (manual) or on load (test). Pressing this button in STOP/RESET mode will turn on the CAN engine ECU (when correctly configured and fitted to a compatible engine ECU)	
Mute / Lamp Test This button silences the audible alarm if it is sounding and illuminates all of the LEDs as a lamp test feature/ When correctly configured and fitted to a compatible engine ECU, pressing this button in STOP/RESET mode after pressing the START button (to power the ECU) will cancel any "passive" alarms on the engine ECU.	

Transfer to generator Allows the operator to transfer the load to the generator (when in Manual mode only)	
Open generator (DSE7210/DSE7310 only) Allows the operator to open the generator (when in Manual mode only)	
Transfer to mains (DSE7220/DSE7320 only) Allows the operator to transfer the load to the mains (when in Manual mode only)	
Menu navigation Used for navigating the instrumentation, event log and configuration screens. For further details, please see the more detailed description of these items elsewhere in this manual.	

6 OPERATION (STANDALONE)

The following description details the sequences followed by a module containing the standard '*factory configuration*'.

Remember that if you have purchased a completed generator set or control panel from your supplier, the module's configuration will probably have been changed by them to suit their particular requirements.

Always refer to your configuration source for the exact sequences and timers observed by any particular module in the field.



6.1 AUTOMATIC MODE OF OPERATION

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

Activate auto mode be pressing the AUTO pushbutton. An LED indicator beside the button confirms this action.

Auto mode will allow the generator to operate fully automatically, starting and stopping as required with no user intervention.

6.1.1 WAITING IN AUTO MODE

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

- Mains supply out of limits (DSE7220/7320 only)
- Activation of an auxiliary input that has been configured to *remote start*
- Activation of the inbuilt exercise scheduler.

6.1.2 STARTING SEQUENCE

To allow for 'false' start requests such as mains brownouts, the *start delay* timer begins.

Should all start requests be removed during the *start delay* timer, the unit will return to a stand-by state.

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

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

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

When the engine fires, the starter motor is disengaged. Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel (Selected by PC using the 7000 series configuration software).

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

NOTE:- If the unit has been configured for CAN, speed sensing is via CAN.

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

6.1.3 ENGINE RUNNING

Once the engine is running, the *Warm Up* timer, if selected, begins, allowing the engine to stabilise before accepting the load.

DSE7210/DSE7310 - The generator will be placed on load.
DSE7220/DSE7320 - Load will be transferred from the mains supply to the generator

NOTE:-The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.

If all start requests are removed, the *stopping sequence* will begin.

6.1.4 STOPPING SEQUENCE

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

If there are no starting requests at the end of the *return delay* timer, the load is transferred back from the generator to the mains supply and the *cooling* timer is initiated.

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

After the *cooling* timer has expired, the set is stopped.

6.2 MANUAL OPERATION

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

Activate Manual mode be pressing the pushbutton. An LED indicator beside the button confirms this action.

Manual mode allows the operator to start and stop the set manually, and if required change the state of the load switching devices.

6.2.1 WAITING IN MANUAL MODE

When in manual mode, the set will not start automatically.

To begin the starting sequence, press the button.

6.2.2 STARTING SEQUENCE

NOTE:- There is no *start delay* in this mode of operation.

The fuel relay is energised and the engine is cranked.

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

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

When the engine fires, the starter motor is disengaged. Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel (Selected by PC using the 7000 series configuration software).

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

NOTE:- If the unit has been configured for CAN, speed sensing is via CAN.

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

6.2.3 ENGINE RUNNING

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

- Pressing the *transfer to generator* button
- Mains supply out of limits (DSE7220/DSE7320 only)
- Activation of an auxiliary input that has been configured to *remote start on load*
- Activation of the inbuilt exercise scheduler if configured for 'on load' runs.

NOTE:-The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.

Once the load has been transferred to the generator, it will not be automatically transferred back to the mains supply. To manually transfer the load back to the mains either:

- Press the *transfer to mains* button (DSE7220/DSE7320 only)
- Press the *Open Generator* button (DSE7210/DSE7310 only)
- Press the *auto mode* button to return to automatic mode.

6.2.4 STOPPING SEQUENCE

In manual mode the set will continue to run until either :

- The *stop button* is pressed – The set will immediately stop
- The *auto button* is pressed. The set will observe all auto mode start requests and stopping timers before beginning the *Auto mode stopping sequence*.

6.3 TEST MODE OF OPERATION

NOTE:- Test Mode is only applicable to DSE7220/DSE7320 controllers.

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

Activate test mode be pressing the pushbutton. An LED indicator beside the button confirms this action.

Test mode will start the set and transfer the load to the generator to provide a ***Test on load*** function.

6.3.1 WAITING IN TEST MODE

When in test mode, the set will not start automatically.

To begin the starting sequence, press the button.

6.3.2 STARTING SEQUENCE

The set begins to crank.

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

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

When the engine fires, the starter motor is disengaged. Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel (Selected by PC using the 7000 series configuration software).

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

NOTE:- If the unit has been configured for CAN, speed sensing is via CAN.

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

6.3.3 ENGINE RUNNING

Once the engine is running, the *Warm Up* timer, if selected, begins, allowing the engine to stabilise before accepting the load.

Load will be automatically transferred from the mains supply to the generator.

NOTE:-The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.

In test mode, the set will continue to run *on load* until either:

- The *stop button* is pressed – The set will immediately stop
- The *auto button* is pressed. The set will observe all auto mode start requests and stopping timers before beginning the *Auto mode stopping sequence*.

7 OPERATION (DUAL MUTUAL STANDBY)

NOTE:- Dual Mutual Standby is only available in DSE7000 series V2.0.0 or above.

The following description details the sequences followed by a module containing the standard '*factory configuration*' modified to allow two controllers to operate in Dual Mutual Standby.

The operating modes are as per *Standalone* operation with the dual mutual functions detailed below.

Remember that if you have purchased a completed generator set or control panel from your supplier, the module's configuration will probably have been changed by them to suit their particular requirements.

Always refer to your configuration source for the exact sequences and timers observed by any particular module in the field.



Dual Mutual Standby will allow the generators to operate fully automatically, starting and stopping as required with no user intervention, with the *master* backed up by the *slave*.

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

- Mains supply out of limits (DSE7220/7320 only)
  - When the mains supply fails, the *Master* will start its generator. Should the *Master* fail, the *Slave* will be instructed to start and take the load.
- Activation of an auxiliary input that has been configured to *remote start*
  - It is usual that both modules are controlled by the same remote start signal. In this instance, the *Master* will start its generator. Should the *Master* fail, the *Slave* will be instructed to start and take the load.
  - If the *Master* running and the *Slave* is given a remote start signal, the *Slave* will not start its generator until the *Master* generator fails.
- Activation of the inbuilt exercise scheduler.
  - In dual mutual standby operation the scheduler operates totally independently to the *Master/Slave* scheme. Both generators could start, but only one will be allowed to close its load switch to power the load.

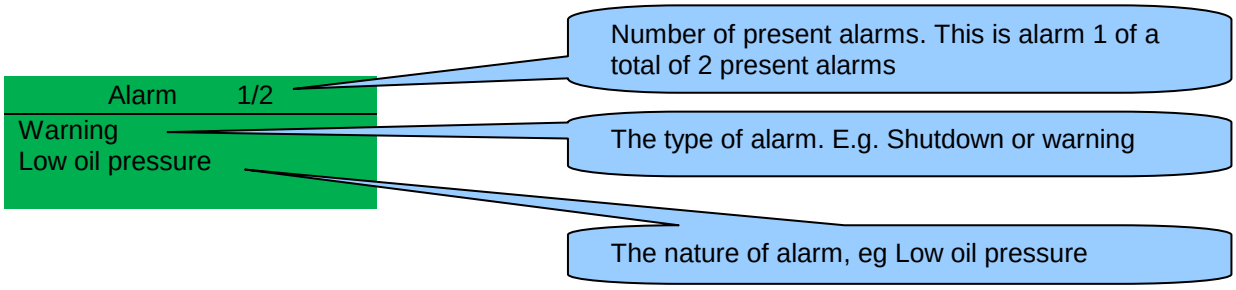
NOTE:- In all operating modes, only one module will be permitted to close its load switching device. The controller inhibited from closing, will continue to run off load.

8 PROTECTIONS

When an alarm is present, the Audible Alarm will sound and the Common alarm LED if configured will illuminate.

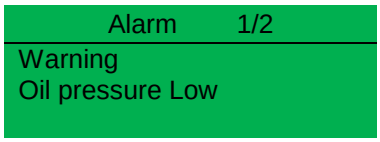
The audible alarm can be silenced by pressing the *Mute button*

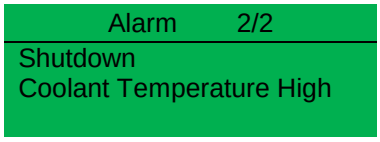
The LCD display will jump from the 'Information page' to display the Alarm Page



The LCD will display multiple alarms E.g. "High Engine Temperature shutdown", "Emergency Stop" and "Low Coolant Warning". These will automatically scroll round in the order that they occurred;

In the event of a warning alarm, the LCD will display the appropriate text. If a shutdown then occurs, the module will again display the appropriate text.
Example:-

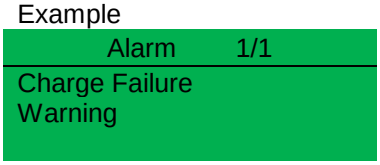




8.1 WARNINGS

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

Example



In the event of an alarm the LCD will jump to the alarms page, and scroll through all active warnings and shutdowns.

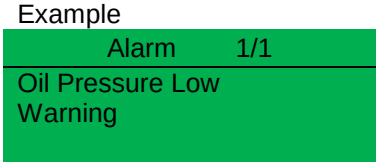
By default, warning alarms are self-resetting when the fault condition is removed. However enabling 'all warnings are latched' will cause warning alarms to latch until reset manually. This is enabled using the 7000 series configuration suite in conjunction with a compatible PC.

Display	Reason
CHARGE FAILURE	The auxiliary charge alternator voltage is low as measured from the W/L terminal.
BATTERY UNDER VOLTAGE	The DC supply has fallen below the low volts setting level for the duration of the low battery volts timer
BATTERY OVER VOLTAGE	The DC supply has risen above the high volts setting level for the duration of the high battery volts timer
FAIL TO STOP	The module has detected a condition that indicates that the engine is running when it has been instructed to stop. **NOTE:- 'Fail to Stop' could indicate a faulty oil pressure sensor - If engine is at rest check oil sensor wiring and configuration.**
AUXILIARY INPUTS	Auxiliary inputs can be user configured and will display the message as written by the user.
LOW FUEL LEVEL	The level detected by the fuel level sensor is below the low fuel level setting.
CAN ECU ERROR	The engine ECU has detected a warning alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.
kW OVERLOAD	The measured Total kW is above the setting of the kW overload warning alarm
EARTH FAULT (DSE7300 series V2.0.0 or above only)	The measured Earth Fault Current has been in excess of the earth fault trip and has surpassed the IDMT curve of the Earth Fault alarm.
NEGATIVE PHASE SEQUENCE (DSE7000 series V2.0.0 or above only)	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault

8.2 ANALOGUE PRE-ALARMS

The following alarms are termed ‘pre-alarms’ as they pre-warn the operator of a potentially more serious alarm condition. For instance, if the engine temperature rises past the pre alarm level, a warning condition will occur to notify the operator. If the temperature falls below this level, then the alarm ceases, and the set will continue to run as normal. However if the temperature continues to rise until the coolant temperature trip point is reached, the warning is escalated and a high coolant temperature shutdown is initiated.

Example



By default, analogue pre alarms are self-resetting when the fault condition is removed. However enabling ‘all warnings are latched’ will cause warning alarms to latch until reset manually. This is enabled using the 7000 series configuration suite in conjunction with a compatible PC.

Display	Reason
LOW OIL PRESSURE	The module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level after the *Safety On* timer has expired.
ENGINE HIGH TEMPERATURE	The module detects that the engine coolant temperature has exceeded the high engine temperature pre-alarm setting level after the *Safety On* timer has expired.
ENGINE LOW TEMPERATURE	The module detects that the engine coolant temperature has fallen below the high engine temperature pre-alarm setting level.
OVERSPEED	The engine speed has risen above the overspeed pre alarm setting
UNDERSPEED	The engine speed has fallen below the underspeed pre alarm setting
GENERATOR OVER FREQUENCY	The generator output frequency has risen above the pre-set pre-alarm setting.
GENERATOR UNDER FREQUENCY	The generator output frequency has fallen below the pre-set pre-alarm setting after the *Safety On* timer has expired.
GENERATOR OVER VOLTAGE	The generator output voltage has risen above the pre-set pre-alarm setting.
GENERATOR UNDER VOLTAGE	The generator output voltage has fallen below the pre-set pre-alarm setting after the *Safety On* timer has expired.
ECU WARNING	The engine ECU has detected a warning alarm and has informed the DSE module of this situation. The exact error is also indicated on the module’s display.

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

8.3 HIGH CURRENT WARNING ALARM

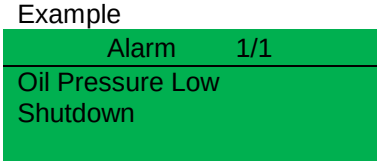
GENERATOR HIGH CURRENT, if the module detects a generator output current in excess of the pre-set trip a warning alarm initiates. The module shows Alarm Warning High Current. If this high current condition continues for an excess period, then the alarm escalates to a shutdown condition. For further details of the high current alarm, please see High Current Shutdown Alarm.

By default, High Current Warning Alarm is self-resetting when the overcurrent condition is removed. However enabling ‘all warnings are latched’ will cause the alarm to latch until reset manually. This is enabled using the 7000 series configuration suite in conjunction with a compatible PC.

8.4 SHUTDOWNS

Shutdowns are latching alarms and stop the Generator. Clear the alarm and remove the fault then press Stop/Reset to reset the module.

Example



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).

Display	Reason
EARTH FAULT (DSE7300 series V2.0.0 or above only)	The measured Earth Fault Current has been in excess of the earth fault trip and has surpassed the IDMT curve of the Earth Fault alarm.
FAIL TO START	The engine has not fired after the preset number of start attempts
EMERGENCY STOP	The emergency stop button has been depressed. This a failsafe (normally closed to battery positive) input and will immediately stop the set should the signal be removed. Removal of the battery positive supply from the emergency stop input will also remove DC supply from the Fuel and Start outputs of the controller. **NOTE:- The Emergency Stop Positive signal must be present otherwise the unit will shutdown.**
LOW OIL PRESSURE	The engine oil pressure has fallen below the low oil pressure trip setting level after the *Safety On* timer has expired.
ENGINE HIGH TEMPERATURE	The engine coolant temperature has exceeded the high engine temperature trip setting level after the *Safety On* timer has expired.
PHASE ROTATION (DSE7000 series V2.0.0 or above only)	The phase rotation is measured as being different to the configured direction.
OVERSPEED	The engine speed has exceeded the pre-set trip **NOTE:-During the start-up sequence, the overspeed trip logic can be configured to allow an extra trip level margin. This is used to prevent nuisance tripping on start-up - Refer to the 7000 series configuration software manual under heading 'Overspeed Overshoot' for details.**
UNDERSPEED	The engine speed has fallen below the pre-set trip after the ***Safety On*** timer has expired.
GENERATOR OVER FREQUENCY	The generator output frequency has risen above the preset level
GENERATOR UNDER FREQUENCY	The generator output frequency has fallen below the preset level
GENERATOR OVER VOLTAGE	The generator output voltage has risen above the preset level
GENERATOR UNDER VOLTAGE	The generator output voltage has fallen below the preset level

Display	Reason
OIL PRESSURE SENSOR OPEN CIRCUIT	The oil pressure sensor is detected as not being present (open circuit)
AUXILIARY INPUTS	An active auxiliary input configured as a shutdown will cause the engine to shut down. The display shows the text as configured by the user.
LOSS OF SPEED SIGNAL	The speed signal from the magnetic pickup is not being received by the DSE controller.
ECU DATA FAIL	The module is configured for CAN operation and does not detect data on the engine Can datalink, the engine shuts down.
ECU SHUTDOWN	The engine ECU has detected a shutdown alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.
kW OVERLOAD	The measured Total kW is above the setting of the kW overload shutdown alarm
NEGATIVE PHASE SEQUENCE (DSE7000 series V2.0.0 or above only)	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault

8.5 HIGH CURRENT SHUTDOWN ALARM

GENERATOR HIGH CURRENT, if the module detects a generator output current in excess of the adjustable trip a warning alarm occurs. This warning will continue for a period depending upon the level of overload placed on the generator, and the configuration setting for Generator High Current in the 7000 series configuration software.

For instance, the factory default settings for Generator High Current allow for a loading of the generator to 110% for one hour. That is to say if the generator load level exceeds the trip point by 10%, a warning alarm will occur while the overload condition exists. If the load level does not drop to normal levels within one hour, the set stops, with the 7000 series module displaying either a shutdown or electrical trip alarm depending upon module configuration.

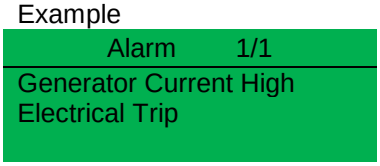
High current shutdown is a latching alarm and stops the Generator. Remove the fault then press Stop/Reset to reset the module.

NOTE:- Higher overload levels will result in a faster acting shutdown condition. For instance with the factory default configuration, an overload level twice that of the trip level (typically 200%) will result in a Generator High Current shutdown condition after 36 seconds.
For details of the relationship between the overload and the shutdown time, please see the Appendix section of this manual.

8.6 ELECTRICAL TRIPS

Electrical trips are latching and stop the Generator but in a controlled manner. On initiation of the electrical trip condition the module will de-energise the **'Close Generator'** Output to remove the load from the generator. Once this has occurred the module will start the Cooling timer and allow the engine to cool off-load before shutting down the engine. The alarm must be accepted and cleared, and the fault removed to reset the module.

Example



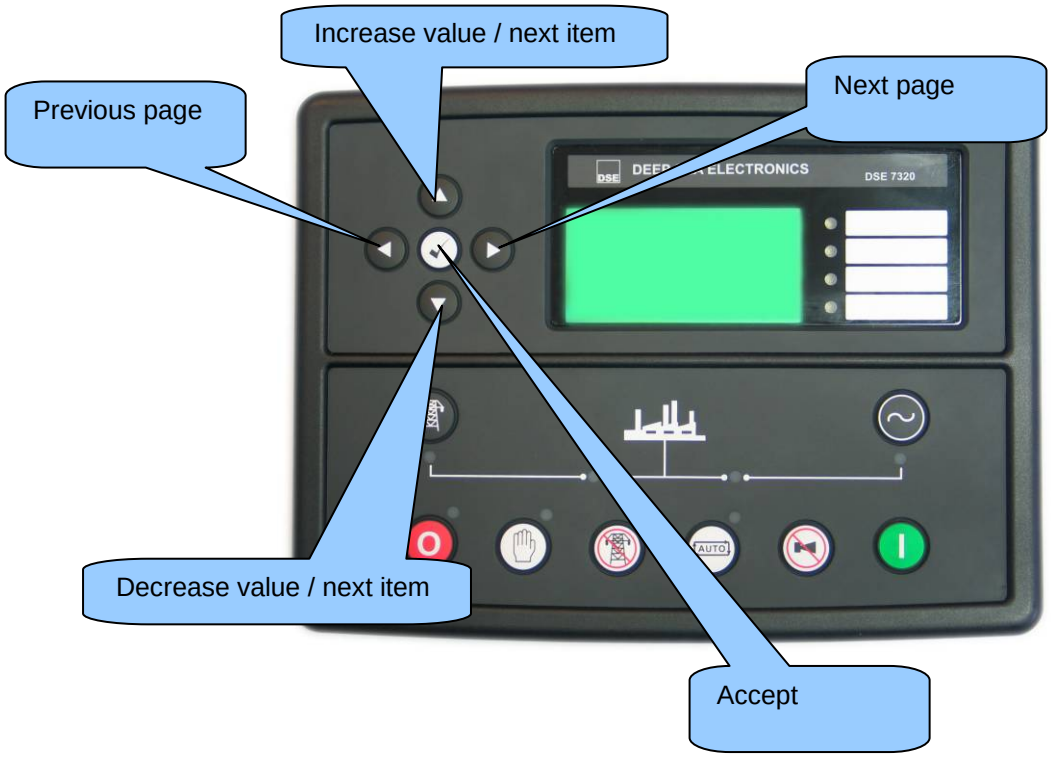
Electrical trips are latching alarms and stop the Generator. Remove the fault then press Stop/Reset to reset the module.

Display	Reason
GENERATOR OVER CURRENT	If a generator output in excess of the high current alarm point, a warning alarm occurs. If this high current condition continues for an excess period, then the alarm escalates to either a shutdown or electrical trip condition (depending upon module configuration). For further details of the high current alarm, please see High Current Shutdown Alarm.
AUXILIARY INPUTS	If an auxiliary input configured as an electrical trip is active, the appropriate message will be displayed as configured by the user.
kW OVERLOAD	The measured Total kW is above the setting of the kW overload Electrical Trip alarm
EARTH FAULT (DSE7300 series V2.0.0 or above only)	The measured Earth Current is above the setting of the Earth fault alarm.
NEGATIVE PHASE SEQUENCE (DSE7000 series V2.0.0 or above only)	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault

9 FRONT PANEL CONFIGURATION

This configuration mode allows the operator limited customising of the way the module operates.

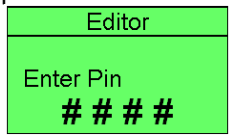
Use the module's navigation buttons to traverse the menu and make value changes to the parameters:



9.1 ACCESSING THE MAIN FRONT PANEL CONFIGURATION EDITOR

Ensure the engine is at rest and the module is in STOP mode by pressing the Stop/Reset button.

Press the Stop/Reset and Info buttons simultaneously.
If a module security PIN has been set, the PIN number request is then shown :



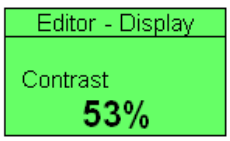
Press , the first '#' changes to '0'. Press (up) or (down) to adjust it to the correct value.

Press (right) when the first digit is correctly entered. The digit you have just entered will now show '#' for security.

Repeat this process for the other digits of the PIN number. You can press (left) if you need to move back to adjust one of the previous digits.

When is pressed after editing the final PIN digit, the PIN is checked for validity. If the number is not correct, you must re-enter the PIN.

If the PIN has been successfully entered (or the module PIN has not been enabled), the editor is displayed :



9.1.1 EDITING A PARAMETER

Enter the editor as described above.

Press the  (left) or  (right) buttons to cycle to the section you wish to view/change.

Press the  (up) or  (down) buttons to select the parameter you wish to view/change within the currently selected section.

To edit the parameter, press ✓ to enter edit mode. The parameter begins to flash to indicate that you are editing the value.

Press the  (up) or  (down) buttons to change the parameter to the required value.

Press ✓ to save the value. The parameter ceases flashing to indicate that it has been saved.

To exit the editor at any time, press and hold the ✓ button.

⚠NOTE: - When the editor is visible, it is automatically exited after 5 minutes of inactivity to ensure security.

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

⚠ NOTE: - More comprehensive module configuration is possible using the 7xxx series PC configuration software. Please contact us for further details.

9.1.2 ADJUSTABLE PARAMETERS

Front Panel Configuration Editor

Section	Parameter as shown on display	Factory Settings
DISPLAY	Contrast	53%
	Language	English
	LCD Page Timer	5m
	Auto Scroll Delay	2s
	Current Date and time	hh:mm
EDITOR **Module versions V2.0.0+**	Alt Config	Default Config
ENGINE	Oil Pressure Low Shutdown	1.03bar
	Oil Pressure Low Pre Alarm	1.17bar
	Coolant Temperature Low Warning	70ºC
	Coolant Temperature High Pre Alarm	90ºC
	Coolant Temperature High Shutdown	95ºC
	Start Delay Timer	5s
	Pre Heat Timer	0s
	Crank Duration Timer	10s
	Crank Rest Timer	10s
	Safety On Delay	10s
	Smoke Limiting	0s
	Smoke Limiting Off	0s
	Warm Up Timer	0s
	Cool Down Timer	1m
	Engine Under Speed Shutdown	Inactive
	Engine Under Speed Shutdown	1260RPM
	Engine Under Speed Warning	Inactive
	Engine Under Speed Warning	1350RPM
	Engine Over Speed Warning	Inactive
	Engine Over Speed Warning	1650RPM
	Engine Over Speed Shutdown	1710RPM
	Engine Speed Overshoot Delay	2s
	Engine Speed Overshoot	0s
	Fail To Stop Delay	30s
	Battery Under Voltage Warning	Active
	Battery Under voltage Warning Delay	1m
	Battery Under Voltage	10V
	Charge Alternator Failure Warning	Active
	Battery Over Voltage Warning Delay	1m
	Battery Over Voltage Warning	30V
	Charge Alternator Failure Warning	Active
	Charge Alternator Failure Warning	6V
	Droop control	Disable (Compatible engine ECUs only)
	Droop control	4% (Compatible engine ECUs only)
GENERATOR	Generator Under Voltage Shutdown	184V
	Generator Under Voltage Pre Alarm	196V
	Generator Over Voltage Pre Alarm	265V
	Generator Over Voltage Shutdown	276V
	Generator Under Frequency Shutdown	40Hz
	Generator Under Frequency Pre Alarm	42Hz
	Generator Over Frequency Pre Alarm	55Hz
	Generator Over Frequency Shutdown	57Hz
	Full Load Rating	500A
Module versions V2.0.0+	kW Overload Trip	500kW
	Delayed Over Current	Active
	Delayed Over Current	100%
	AC System	3 Phase, 4 Wire
	CT Primary	600A
	CT Secondary	5A
	Generator Transient Delay	0s
MAINS **Mains settings only applicable to DSE7220 and DSE7320 controllers.**	Mains Under Voltage Trip	184V
	Mains Over Voltage Trip	276V
	Mains Under Frequency Trip	45Hz
	Mains Over Frequency Trip	55Hz
	Mains Transient Delay	2s
	Return Delay	30s
	Mains Transfer Time	0.7s
TIMERS	LCD Page Timer	5m
	Auto Scroll Delay	2s
	Start Delay Timer	5s
	Pre Heat Timer	0s
	Crank Duration Timer	10s
	Crank Rest Timer	10s
	Safety On Delay	10s
	Smoke Limiting	0s
	Smoke Limiting Off	0s
	Warm Up Timer	0s
	Cool Down Timer	1m
	Speed Overshoot Delay	2s
	Fail To Stop Delay	30s
	Battery voltage Low Warning Delay	1m
	Battery Voltage High Warning Delay	1m
	Generator Transient Delay	0s
DSE7220 / DSE7320 only	Mains Transient Delay	2s
	Return Delay	30s
DSE7220 / DSE7320 only	Mains Transfer Time	0.7s

9.2 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR

The 'running' editor can be entered while the engine is running. All protections remain active if the engine is running while the running editor is entered.

Press and hold the ✓ button to enter the running editor.

9.2.1 EDITING A PARAMETER

Enter the editor as described above.

Press the  (left) or  (right) buttons to cycle to the section you wish to view/change.

Press the  (up) or  (down) buttons to select the parameter you wish to view/change within the currently selected section.

To edit the parameter, press ✓ to enter edit mode. The parameter begins to flash to indicate that you are editing the value.

Press the  (up) or  (down) buttons to change the parameter to the required value.

Press ✓ to save the value. The parameter ceases flashing to indicate that it has been saved.

To exit the editor at any time, press and hold the ✓ button.

9.2.2 ADJUSTABLE PARAMETERS (RUNNING EDITOR)

Running Editor (Factory default settings are shown in bold italicised text)

Section	Parameter as shown on display	Factory Setting
DISPLAY	Contrast	50%
	Language	English

10 COMMISSIONING

10.1.1 PRE-COMMISSIONING

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

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

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

10.3. 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. The module will not operate unless either the Emergency Stop is fitted correctly OR terminal 3 is connected to DC positive.

10.4. 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"** and then press **"START"** the unit start sequence will commence.

10.5. 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 'Failed *to start*. Select the **STOP/RESET** position to reset the unit.

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

10.7. Select **"AUTO"** on the front panel, the engine will run for the pre-set cooling down period, then stop. The generator should stay in the standby mode. If not check that there is not a signal present on the **Remote start** input.

10.8. Initiate an automatic start by supplying the remote start signal (if configured). The start sequence will commence and the engine will run up to operational speed. Once the generator is available a load transfer will take place (if configured), the Generator will accept the load. If not, check the wiring to the Generator Contactor Coil *(if used)*. Check the Warming timer has timed out.

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

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

10.11. If, despite repeated checking of the connections between the **7000** series controller 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@Deepseaplc.com
Website : www.deepseaplc.com

11 FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative Read/Write configuration does not operate	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70°C. Check the DC fuse.
Unit locks out on Emergency Stop	If no Emergency Stop Switch is fitted, ensure that a DC positive signal is connected to the Emergency Stop input. Check emergency stop switch is functioning correctly. Check Wiring is not open circuit.
Intermittent Magnetic Pick-up sensor fault	Ensure that Magnetic pick-up screen only connects to earth at one end, if connected at both ends, this enables the screen to act as an aerial and will pick up random voltages. Check pickup is correct distance from the flywheel teeth.
Low oil Pressure fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 73x0 Module and is correctly configured.
High engine temperature fault operates after engine has fired.	Check engine temperature. Check switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 7000 series module.
Shutdown fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Warning fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Fail to Start is activated after pre-set number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed-sensing signal is present on the 7000 series module's inputs. Refer to engine manual.
Continuous starting of generator when in **AUTO**	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct. Check the mains supply is available and within configured limits (DSE7220/DSE7320 only)
Generator fails to start on receipt of Remote Start signal.	Check Start Delay timer has timed out. Check signal is on "Remote Start" input. Confirm correct configuration of input is configured to be used as "Remote Start". Check that the oil pressure switch or sensor is indicating low oil pressure to the controller. Depending upon configuration, then set will not start if oil pressure is not low.
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module. Check pre-heat configuration is correct.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure that the Emergency Stop input is at Positive. Ensure oil pressure switch or sensor is indicating the "low oil pressure" state to the 7300 series controller.
Engine runs but generator will not take load	Check Warm up timer has timed out. Ensure generator load inhibit signal is not present on the module inputs. Check connections to the switching device. Note that the set will not take load in manual mode unless there is an active remote start on load signal.

SYMPTOM	POSSIBLE REMEDY
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix). Check that sensor is compatible with the 7000 series module and that the module configuration is suited to the sensor.
Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the Accept button to save the change before moving to another item or exiting the fascia editor
Set will not take load	Ensure the generator available LED is lit Check that the output configuration is correct to drive the load switch device and that all connections are correct. Remember that the set will not take load in manual mode unless a remote start on load input is present or the close generator button is pressed.
Inaccurate generator measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow (p1,p2 and s1,s2) and additionally ensure that CTs are connected to the correct phase (errors will occur if CT1 is connected to phase 2). Remember to consider the power factor. Ie (kW = kVA x powerfactor) The 7000 series controller is true RMS measuring so gives more accurate display when compared with an 'average' meter such as an analogue panel meter or some lower specified digital multimeters. Accuracy of the controller is better than 1% of full scale. Ie Gen volts full scale is 333V ph-n so accuracy is ±3.33V (1% of 333V).

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

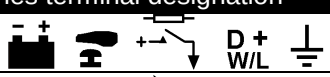
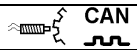
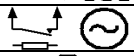
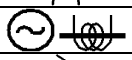
12 MAINTENANCE, SPARES, REPAIR AND SERVICING

The DSE7000 Series controller is designed to be *Fit and Forget*. As such, there are no user serviceable parts within the controller.
In the case of malfunction, you should contact your original equipment supplier (OEM).

12.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

12.1.1 DSE7200 SERIES

If you require additional plugs from DSE, please contact our Sales department using the part numbers below.

7000 series terminal designation	Plug description	Part No.
1-11 	11 way 5.08mm	007-451
15-18 	4 way 5.08mm (DSE7200 series only)	007-100
22-30 	9 way 5.08mm	007-167
39-46 	8 way 7.62mm	007-454
47-50 	4 way 7.62mm (Not fitted to DSE7210)	007-171
51-56 	6 way 5.08mm	007-446
60-65 	6 way 5.08mm (DSE7200 series only)	007-379
60-67 	8 way 5.08mm (DSE7300 series only)	007-164
	PC Configuration interface lead (USB type A – type B)	016-125

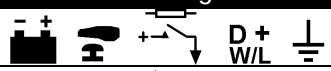
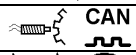
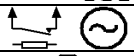
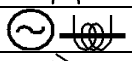
NOTE:- Terminal 19 is not fitted to DSE72000 series controllers.

NOTE:- Mains sensing (Terminals 47-50) is not fitted on DSE7210 autostart controller.

NOTE:- RS485 connector is not fitted to the 7200 series controller.

12.1.2 DSE7300 SERIES

If you require additional plugs from DSE, please contact our Sales department using the part numbers below.

7000 series terminal designation	Plug description	Part No.
1-11 	11 way 5.08mm	007-451
15-19 	5 way 5.08mm	007-445
22-30 	9 way 5.08mm	007-167
39-46 	8 way 7.62mm	007-454
47-50 	4 way 7.62mm (Not fitted to DSE7310)	007-171
51-56 	6 way 5.08mm	007-446
60-67 	8 way 5.08mm (DSE7300 series only)	007-164
RS485	3 way 5.08mm	007-174
	PC Configuration interface lead (USB type A – type B)	016-125

NOTE:- Mains sensing (Terminals 47-50) is not fitted on DSE7310 autostart controller.

12.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

Item	Description	Part No.
	7000 series fixing clips (packet of 4)	020-294

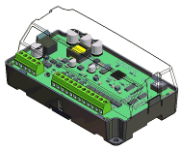
12.3 PURCHASING ADDITIONAL SEALING GASKET FROM DSE

Item	Description	Part No.
	7000 series silicon sealing gasket	020-507

12.4 EXPANSION MODULES

NOTE:- Expansion modules are not compatible with the DSE7200 series controllers.

NOTE:- A maximum of twenty (20) expansion modules can be connected to the DSENet.

Item	Description	DSE Part numbers	
		Sales literature	Operator manual
	Model DSE2130 expansion input module provides additional analogue and digital inputs for use with the 7320 controller. Up to 4 DSE2130s can be fitted to the 73x0 module at one time.	055-060	057-082
	Model DSE2157 expansion relay module provides eight additional voltage free relays for use with the 73x0 controller Up to 10 DSE2157s can be fitted to the 73x0 module at one time.	055-061	057-083
	Model DSE2548 expansion LED module provides additional LED indications for use with the 73x0 controller. Up to 10 DSE2548s can be fitted to the 73x0 module at one time.	055-062	057-084

13 WARRANTY

DSE provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, you are referred to your original equipment supplier (OEM).

14 DISPOSAL

14.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

Directive 2002/96/EC
If you use electrical and electronic equipment you must store, collect, treat, recycle and dispose of WEEE separately from your other waste.



14.2 ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES)

Directive 2002/95/EC:2006
To remove specified hazardous substances (Lead, Mercury, Hexavalent Chromium, Cadmium, PBB & PBDE´s)

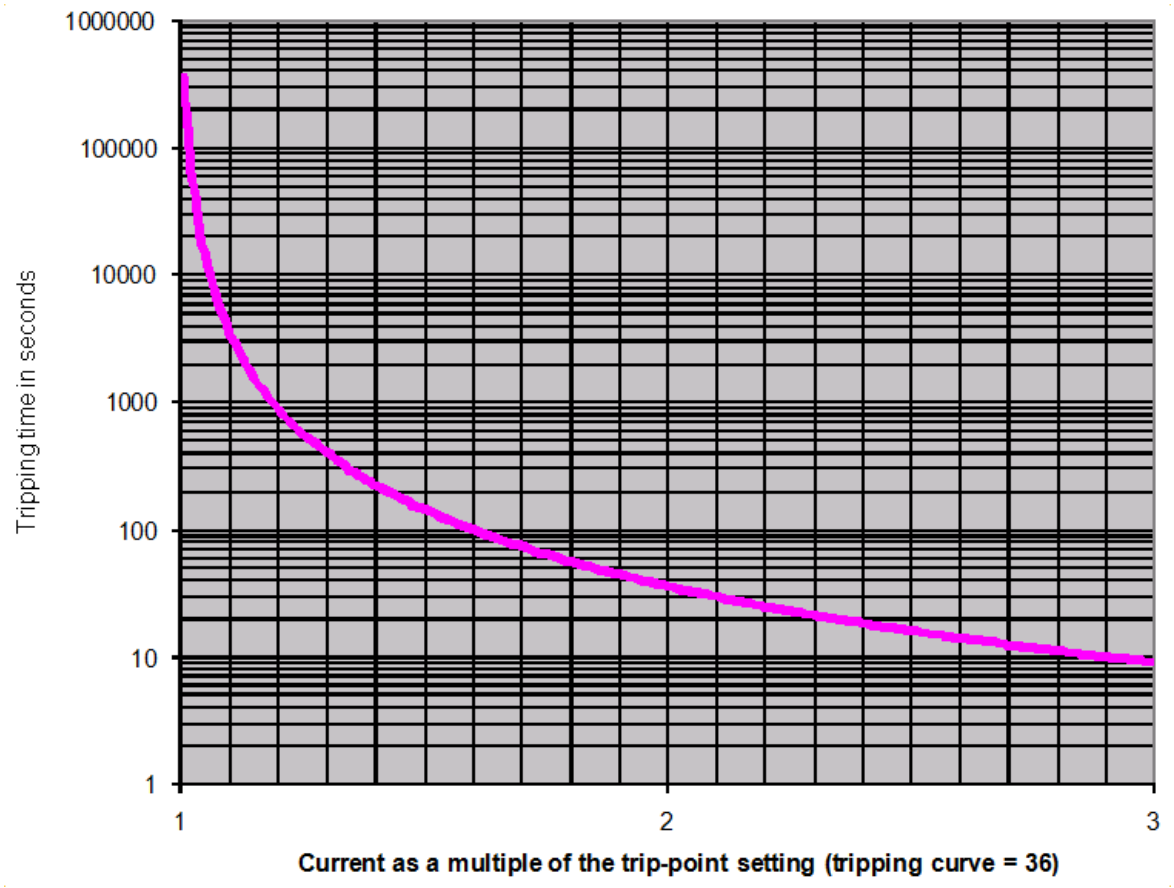
Exemption Note: Category 9. (Monitoring & Control Instruments) as defined in Annex 1B of the WEEE directive will be exempt from the RoHS legislation. This was confirmed in the August 2005 UK´s Department of Trade and Industry RoHS REGULATIONS Guide (Para 11).

Despite this exemption DSE has been carefully removing all non RoHS compliant components from our supply chain and products.
When this is completed a Lead Free & RoHS compatible manufacturing process will be phased into DSE production.

This is a process that is almost complete and is being phased through different product groups.

15 APPENDIX

15.1 IDMT TRIPPING CURVES (TYPICAL)



NOTE:- The factory default settings of *tripping curve 36* and *trip level of 100%* of full load allows for the set to run at 110% of full load for one hour.

15.2 SENSOR WIRING RECOMMENDATIONS

15.2.1 EARTH RETURN SENSORS

Connection Name	Terminal Number
Sensor common	15
Oil pressure Sensor	16
Coolant temperature sensor	17
Fuel level sensor	18
Flexible Sensor (Not fitted to 7200 series)	19

NOTE:- . It is important that terminal 15 (sensor common) is soundly connected to an earth point on the ENGINE BLOCK, not within the control panel, and must be a sound electrical connection to the sensor bodies.

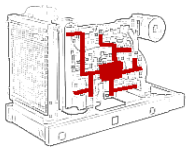
NOTE:- . If you use PTFE insulating tape on the sensor thread when using earth return sensors, ensure you do not insulate the entire thread, as this will prevent the sensor body from being earthed via the engine block.

15.2.2 INSULATED RETURN SENSORS

Connection Name	Terminal Number
Sensor common	15
Oil pressure Sensor	16
Coolant temperature sensor	17
Fuel level sensor	18
Flexible Sensor (Not fitted to 7200 series)	19

NOTE:- . It is important that terminal 15 (sensor common) is soundly connected to an earth point on the ENGINE BLOCK, not within the control panel.

15.3 CAN INTERFACE



Modules are fitted with the CAN interface as standard and are capable of receiving engine data from engine CAN controllers compliant with the CAN standard.
CAN enabled engine controllers monitor the engines operating parameters such as engine speed, oil pressure, engine temperature (among others) in order to closely monitor and control the engine. The industry standard communications interface (CAN) transports data gathered by the engine controller interface (CAN). This allows generator controllers such as the DSE 73x0 range to access these engine parameters with no physical connection to the sensor device.

NOTE:- For further details for connections to CAN enabled engines and the functions available with each engine type, refer to the manual *Electronic Engines and DSE Wiring.* Part No. 057-004

15.4 COMMUNICATIONS OPTION CONNECTIONS

15.4.1 DESCRIPTION

The 7000 series configuration software allows the controller to communicate with a PC. The computer connects to the module as shown below. The operator is then able to control the module, starting or stopping the generator, selecting operating modes, etc.
The various operating parameters (such as output volts, oil pressure, etc.) of the remote generator can be viewed.

15.4.2 PC TO CONTROLLER (DIRECT) CONNECTION

To connect a 7000 series module to a PC the following items are required: -

- 7000 series module



- 7000 series configuration software (Supplied on configuration suite software CD).



- USB cable Type A to Type B.





NOTE:- The DC supply must be connected to the module for configuration by PC.

NOTE:- Refer to 7xxx software Manual for further details on configuring, monitoring and control.

15.5 ENCLOSURE CLASSIFICATIONS

IP CLASSIFICATIONS

7000 series specification under BS EN 60529 Degrees of protection provided by enclosures

IP65 (Front of module when module is installed into the control panel with the optional sealing gasket).
IP42 (front of module when module is installed into the control panel WITHOUT being sealed to the panel)

First Digit Protection against contact and ingress of solid objects	Second Digit Protection against ingress of water
0 No protection	0 No protection
1 Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.	1 Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).
2 Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.	2 Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from it s normal position (drops falling at an angle).
3 Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.	3 Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).
4 Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.	4 Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).
5 Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interface with satisfactory operation of the equipment. Complete protection against contact.	5 Protection against water projected from a nozzle against the equipment (enclosure) from any direction. There must be no harmful effect (water jet).
6 Protection against ingress of dust (dust tight). Complete protection against contact.	6 Protection against heavy seas or powerful water jets. Water must not enter the equipment (enclosure) in harmful quantities (splashing over).

NEMA CLASSIFICATIONS

7000 series NEMA Rating (Approximate)
12 (Front of module when module is installed into the control panel with the optional sealing gasket).
2 (front of module when module is installed into the control panel WITHOUT being sealed to the panel)

NOTE: - There is no direct equivalence between IP / NEMA ratings. IP figures shown are approximate only.

1 **IP30**	Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt.
2 **IP31**	Provides a degree of protection against limited amounts of falling water and dirt.
3 **IP64**	Provides a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.
3R **IP32**	Provides a degree of protection against rain and sleet:; undamaged by the formation of ice on the enclosure.
4 (X) **IP66**	Provides a degree of protection against splashing water, windblown dust and rain, hose directed water; undamaged by the formation of ice on the enclosure. (Resist corrosion).
12/12K **IP65**	Provides a degree of protection against dust, falling dirt and dripping non corrosive liquids.
13 **IP65**	Provides a degree of protection against dust and spraying of water, oil and non corrosive coolants.