DEEP SEA ELECTRONICS

DSEG7300

Operator Manual

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DSEG7300 Operator Manual

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1 INTRODUCTION

This document details the installation and operation requirements of the DSEG7300 modules, part of the DSEGenset® 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.* DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at www.deepseaelectronics.com.

The DSEG7300 series is designed to provide differing levels of functionality across a common platform. This allows the generator OEM greater flexibility in the choice of module to use for a specific application.

The DSEG7300 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 or automatically. Additionally, the DSEG7300 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 text LCD display.

The DSEG7300 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 the text LCD display.

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

Text based LCD display
True RMS Voltage
Current and Power monitoring
USB Communications
Engine parameter monitoring.
Fully configurable inputs for use as alarms or a range of different functions.
Engine ECU interface to ***electronic engines****.*
Data Logging

Using a PC and the DSE Configuration Suite software allows alteration of selected operational sequences, timers, alarms and operational sequences. Additionally, the module's integral *Front Panel Configuration Editor* allows adjustment of this information.

Access to critical operational sequences and timers for use by qualified engineers, can be protected by a security code. Module access can also be protected by PIN code. Selected parameters can be changed from the module's front panel.

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

1.1 CLARIFICATION OF NOTATION

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.**

1.2 GLOSSARY OF TERMS

Term	Description
DSEG7300	DSEG7300 module.
ADSL	Asymmetric Digital Subscriber Line A technology for transmitting digital information over standard telephone lines.
AMF	Automatic Mains Failure The ability to start and stop the generator automatically upon changes in mains (utility) supply status.
AVR	Automatic Voltage Regulator A device responsible for maintaining the generators output voltage at a set value.
BMS	Building Management System A digital/computer based control system for a building's infrastructure.
CAN	Controller Area Network Vehicle standard to allow digital devices to communicate to one another.
CDMA	Code Division Multiple Access Cell phone access used in small number of areas including parts of the USA and Australia.
DEF	Diesel Exhaust Fluid (AdBlue) A liquid used as a consumable in the SCR process to lower nitric oxide and nitrogen dioxide concentration in engine exhaust emissions.
DPF	Diesel Particulate Filter A filter fitted to the exhaust of an engine to remove diesel particulate matter or soot from the exhaust gas.
DPTC	Diesel Particulate Temperature Controlled Filter A filter fitted to the exhaust of an engine to remove diesel particulate matter or soot from the exhaust gas which is temperature controlled.
DTC	Diagnostic Trouble Code The name for the entire fault code sent by an engine ECU.
ECM	Engine Control Unit/Management An electronic device that monitors engine parameters and regulates the fuelling.
ECU	Engine Control Unit/Management An electronic device that monitors engine parameters and regulates the fuelling.
EMC	Electromagnetic Compatibility Electromagnetic compatibility is the ability of electrical equipment and systems to function acceptably in their electromagnetic environment.

Parameters continued overleaf…

Term	Description
FMI	Failure Mode Indicator A part of DTC that indicates the type of failure, e.g. high, low, open circuit etc.
FPE	Front Panel Editor A Front Panel Editor is a software tool used to design and customize the user interface of a device or a software application.
GPRS	General Packet Radio Service A packet-oriented mobile data standard within the 2G cellular communication network based on the Global System for Mobile Communications (GSM).
GSM	Global System for Mobile communications Cell phone technology used in most of the World.
HEST	High Exhaust System Temperature Initiates when DPF filter is full in conjunction with an extra fuel injector in the exhaust system to burn off accumulated diesel particulate matter or soot.
HMI	Human Machine Interface A device that provides a control and visualisation interface between a human and a process or machine.
IDMT	Inverse Definite Minimum Time A characteristic of certain types of overcurrent relays used in electrical protection systems.
IEEE	Institute of Electrical and Electronics Engineers A prominent professional association. Its mission is to foster technological innovation and excellence for the benefit of humanity.
ISBN	International Standard Book Number A numeric commercial book identifier that serves as a unique code for books.
LAN	Local Area Network A Local Area Network (LAN) is a group of computers and other devices that are connected together over a network and are all in the same location.
LCD	Liquid Crystal Display A flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers.
LED	Light Emitting Diode A semiconductor device that emits light when an electric current passes through it.
MPU	Magnetic Pickup Unit A Magnetic Pickup Unit (MPU) is a device that senses mechanical motion and converts it into an electrical signal.
MSC	Multi-Set Communication A point to point cable connection of more than one device within a generator system.
NAPT	Network Address and Port Translation A technique in which port numbers and private Internet Protocol (IP) addresses are mapped from multiple internal hosts to one public IP address.
OEM	Original Equipment Manufacturer It refers to a company that produces parts and equipment that may be marketed by another manufacturer, known as a value-added reseller (VAR).
PCI	Peripheral Component Interconnect A local computer bus for attaching hardware devices in a computer and is part of the PCI Local Bus standard.
PDU	Protocol Data Unit A Protocol Data Unit (PDU) is a single unit of information transmitted among peer entities of a computer network. It is composed of protocol-specific control information and user data.

Parameters continued overleaf…

Term	Description
PGN	Parameter Group Number A CANbus address for a set of parameters that relate to the same topic and share the same transmission rate.
PIN	PIN number A four digit number used to access the modules Main Front Panel Configuration Editor.
PLC	Programmable Logic Controller A programmable digital device used to create logic for a specific purpose.
RMS	Root Mean Square A statistical measure of the magnitude of a varying quantity. It's especially useful when quantifying the amplitude of waveforms and alternating current electricity.
ROCOF	Rate Of Change Of Frequency It is the time derivative of the power system frequency (df/dt). In power systems, ROCOF is an important parameter that indicates how quickly the system's frequency is changing.
RPM	Revolutions Per Minute The speed of rotation of a mechanical component.
RTD	Resistance Temperature Detector A sensor whose resistance changes as its temperature changes. The resistance increases as the temperature of the sensor increases.
RTU	Remote Terminal Unit A microprocessor-controlled electronic device that interfaces with objects in the physical world.
RXD	Received Data It refers to the line that transmits received data from one source to another.
SCADA	Supervisory Control And Data Acquisition A system that operates with coded signals over communication channels to provide control and monitoring of remote equipment
SCR	Selective Catalytic Reduction A process that uses DEF with the aid of a catalyst to convert nitric oxide and nitrogen dioxide into nitrogen and water to reduce engine exhaust emission.
SNMP	Simple Network Management Protocol An international standard protocol for managing devices on IP networks.
SPN	Suspect Parameter Number A part of DTC that indicates what the failure is, e.g. oil pressure, coolant temperature, turbo pressure etc.
TCP	TCP (Transmission Control Protocol) A standard that defines how to establish and maintain a network conversation via which application programs can exchange data.
TXD	Transmit Data In communication systems, TXD is responsible for transmitting information or signals.
USB	Universal Serial Bus An industry standard that allows data exchange and delivery of power between many various types of electronics.
WAN	Wide Area Network A Wide Area Network (WAN) is a telecommunications network that extends over a large geographic area.
WEEE	Waste Electrical and Electronic Equipment A European Community Directive, numbered 2012/19/EU, concerned with electrical and electronic equipment waste.

1.3 BIBLIOGRAPHY

This document refers to and is referred by the following DSE publications which are obtained from the DSE website: www.deepseaelectronics.com or by contacting DSE technical support: support@deepseaelectronics.com.

1.3.1 INSTALLATION INSTRUCTIONS

Installation instructions are supplied with the product in the box and are intended as a 'quick start' guide only.

DSE Part	Description
053-032	DSE2548 LED Expansion Annunciator Installation Instructions
053-033	DSE2130 Input Expansion Installation Instructions
053-034	DSE2157 Output Expansion Installation Instructions
053-049	DSE9xxx Battery Charger Installation Instructions
053-125	DSE2131 Ratiometric Input Expansion Installation Instructions
053-126	DSE2133 RTD / Thermocouple Input Expansion Installation Instructions
053-134	DSE2152 Analogue Output Expansion Installation Instructions
053-147	DSE9460/DSE9461 Enclosed Intelligent Battery Charger Installation Instructions
053-251	DSE BC2410Ei Installation Instructions
053-267	DSE BC1205 & DSE BC2405 Installation Instructions
053-268	DSE2160 Input and Output Expansion Module
053-286	DSEG7300 Installation Instructions

1.3.2 TRAINING GUIDES

Training guides are provided as ‘hand-out’ sheets on specific subjects during training sessions and contain specific information regarding to that subject.

DSE Part	Description
056-005	Using CTs With DSE Products
056-006	Introduction to Comms
056-010	Over Current Protection
056-018	Negative Phase Sequence
056-019	Earth Fault Protection
056-022	Breaker Control
056-023	Adding New CAN Files
056-024	GSM Modem
056-026	kW, kvar, kVA and pf.
056-029	Smoke Limiting
056-030	Module PIN Codes
056-051	Sending DSEGencom Control Keys
056-053	Recommended Modems
056-055	Alternate Configurations
056-069	Firmware Update
056-075	Adding Language Files
056-076	Reading DSEGencom Alarms
056-079	Reading DSEGencom Status
056-080	MODBUS
056-091	Equipotential Earth Bonding
056-092	Recommended Practices for Wiring Resistive Sensors
056-095	Remote Start Input Functions
056-096	Engine Speed Control Over CAN for DSEGenset
056-097	USB Earth Loops and Isolation
056-099	Digital Output to Input Connection

1.3.3 MANUALS

Product manuals are obtained from the DSE website: www.deepseaelectronics.com or by contacting DSE technical support: support@deepseaelectronics.com.

DSE Part	Description
057-004	Electronic Engines and DSE Wiring Guide
057-082	DSE2130 Input Expansion Operator Manual
057-083	DSE2157 Output Expansion Operator Manual
057-084	DSE2548 Annunciator Expansion Operator Manual
057-085	DSE94xx Series Battery Charger Operator Manual
057-139	DSE2131 Ratiometric Input Expansion Operator Manual
057-140	DSE2133 RTD / Thermocouple Input Expansion Operator Manual
057-141	DSE2152 Analogue Output Expansion Operator Manual
057-151	DSE Configuration Suite PC Software Installation & Operation Manual
057-175	PLC Programming Guide For DSE Controllers
057-176	DSE9460/DSE9461 Enclosed Intelligent Battery Charger Operators Manual
057-220	Options for Communications with DSE Controllers
057-315	DSE BC2410Ei Configuration Suite PC Software Manual
057-355	DSE BC1205 & BC2405 Operator Manual
057-361	DSE2160 Input and Output Expansion Module
057-388	DSEG7300 Configuration Suite PC Software Manual
N/A	DSEGencom (MODBUS protocol for DSE controllers)

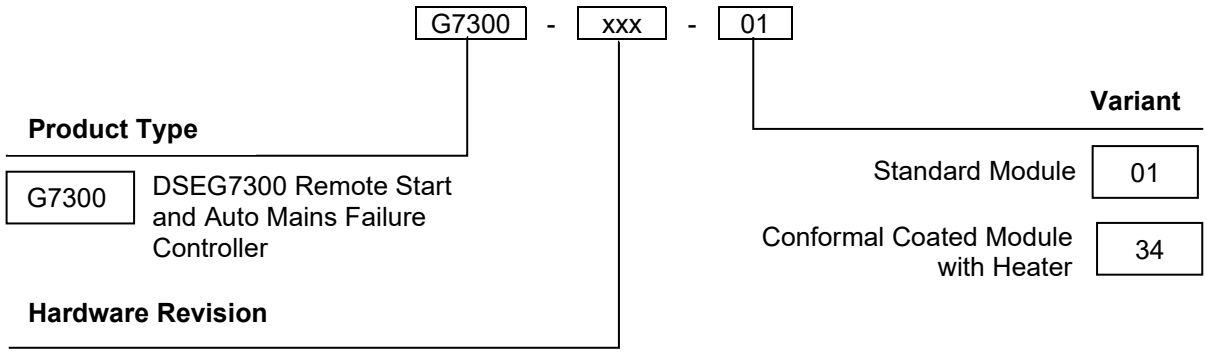
1.3.4 THIRD PARTY DOCUMENTS

The following third party documents are also referred to:

Reference	Description
ISBN 1-55937-879-4	IEEE Std C37.2-1996 IEEE Standard Electrical Power System Device Function Numbers and Contact Designations. Institute of Electrical and Electronics Engineers Inc
ISBN 0-7506-1147-2	Diesel generator handbook. L.L.J. Mahon
ISBN 0-9625949-3-8	On-Site Power Generation. EGSA Education Committee.

2 SPECIFICATION

2.1 PART NUMBERING



2.2 OPERATING TEMPERATURE

Module	Specification
DSEG7300	-30 ºC to +70 ºC (-22 ºF to +158 ºF)
Display Heater Variants	-40 ºC to +70 ºC (-40 ºF to +158 ºF)
Storage Temperature	-40 ºC to +85 ºC (-40 ºF to +185 ºF)

2.3 REQUIREMENTS FOR UL

Description	Specification
Screw Terminal Tightening Torque	4.5 lb-in (0.5 Nm)
Conductors	• Terminals suitable for connection of conductor size AWG 20 to AWG 13 (0.5 mm² to 2.5 mm²). • Conductor protection must be provided in accordance with NFPA 70, Article 240 Low voltage circuits (35 V or less) must be supplied from the engine starting battery or an isolated secondary circuit. • The communication, sensor, and/or battery derived circuit conductors shall be separated and secured to maintain at least ¼" (6 mm) separation from the generator and mains connected circuit conductors unless all conductors are rated 600 V or greater.
Current Inputs	Must be connected through UL Listed or Recognized isolating current transformers with the secondary rating of 5 A max.
Communication Circuits	Must be connected to communication circuits of UL Listed equipment.
Output Pilot Duty	0.5 A.
Mounting	• Suitable for use in type 1 Enclosure Type rating with surrounding air temperature -22 ºF to +158 ºF (-30 ºC to +70 ºC). • Suitable for pollution degree 3 environments when voltage sensing inputs do not exceed 300 V. When used to monitor voltages over 300 V device to be installed in an unventilated or filtered ventilation enclosure to maintain a pollution degree 2 environment.
Maximum Operating Temperature	-22 ºF to +122 ºF (-30 ºC to +50 ºC)

2.4 TERMINAL SPECIFICATION

Description	Specification	
Connection Type	Two part connector. Male part fitted to module Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring.	 Example showing cable entry and screw terminals of a 10 way connector
Minimum Cable Size	0.5 mm² (AWG 20)	
Maximum Cable Size	2.5 mm² (AWG 13)	
Tightening Torque	0.5 Nm (4.5 lb-in)	
Wire Strip Length	7 mm (9/32”)	

2.5 POWER SUPPLY REQUIREMENTS

Description	Specification
Minimum Supply Voltage	8 V continuous, 5 V for up to 1 minute.
Cranking Dropouts	Able to survive 0 V for 50 ms providing the supply was at least 10 V before the dropout and recovers to 5 V afterwards.
Maximum Supply Voltage	35 V continuous (60 V protection)
Reverse Polarity Protection	-35 V continuous
Maximum Operating Current	<640 mA at 12 V <320 mA at 24 V
Maximum Operating Current with Heater	<1.4 A at 12 V <0.7 A at 24 V
Maximum Standby Current	<240 mA at 12V (not including DC and Relay Outputs) <120 mA at 24V (not including DC and Relay Outputs)
Maximum Current When In Sleep Mode	<160 mA at 12 V <80 mA at 24 V
Typical Power (Controller On, Heater Off)	7 W to 7.5 W
Typical Power (Module On, Heater On)	16 W to 17 W

2.5.1 MODULE SUPPLY INSTRUMENTATION DISPLAY

Description	Specification
Range	0 V to 70 V DC (Maximum continuous operating voltage of 35 V DC)
Resolution	0.1 V
Accuracy	±1 % full scale (±0.35 V)

2.5.2 SLEEP MODE OPERATION

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

NOTE: Sleep Mode is disabled when the module's USB, or Modbus RS485 communication port is in use, or when it is Data Logging.

The module incorporates sleep mode when configured using the *Configuration Suite* to reduce current consumption when the engine is stopped, and no active conditions are present.

The module will enter sleep mode after a configurable period with:
- Engine stopped
- No active alarms requiring annunciation
- No user interaction

While in sleep mode:
- The LCD backlight and LEDs are disabled
- Communications remain inactive
- Digital inputs configured as wake-up sources remain monitored

The module will wake from sleep mode upon:
- Activation of configured wake-up digital inputs
- A front panel button press
- Detection of a start request or alarm condition

On wake-up, the module resumes normal operation and restores display and communications functionality.

2.6 VOLTAGE & FREQUENCY SENSING

Description	Specification
Measurement Type	True RMS conversion
Sample Rate	5 kHz or better
Harmonics	Up to 21st or better
Input Impedance	450 kΩ phase to phase
Phase To Neutral	15 V (minimum required for sensing frequency) to 415 V AC (absolute maximum) Suitable for 345 V AC nominal (±20 % for under/overvoltage detection)
Phase To Phase	25 V (minimum required for sensing frequency) to 720 V AC (absolute maximum) Suitable for 600 V AC nominal (±20 % for under/overvoltage detection)
Common Mode Offset From Earth	100 V AC (max)
Resolution	1 V AC phase to neutral 2 V AC phase to phase
Accuracy	±1 % of full scale phase to neutral ±2 % of full scale phase to phase
Minimum Frequency	3.5 Hz
Maximum Frequency	75.0 Hz
Frequency Resolution	0.1 Hz
Frequency Accuracy	±0.05 Hz
Overvoltage category III	Up to 300V L-N up to 2000m
Overvoltage category II	Greater than 300V and less than 415V L-N, up to 2000m
Overvoltage category II	Less than 300V L-N and up to 5000m

2.7 CURRENT SENSING

Description	Specification
Measurement Type	True RMS conversion
Sample Rate	>10 kHz or better
Harmonics	Up to 21st or better
Nominal CT Secondary Rating	1 A and 5 A
Maximum Continuous Current	1 A and 5 A
Overload Measurement	15 A
Absolute Maximum Overload	40 A for 1 second 50 A for 0.2 second
Common Mode Offset	70 V peak plant ground to CT common terminal
Resolution	25 mA
Accuracy	±1 % of Nominal (excluding CT error)

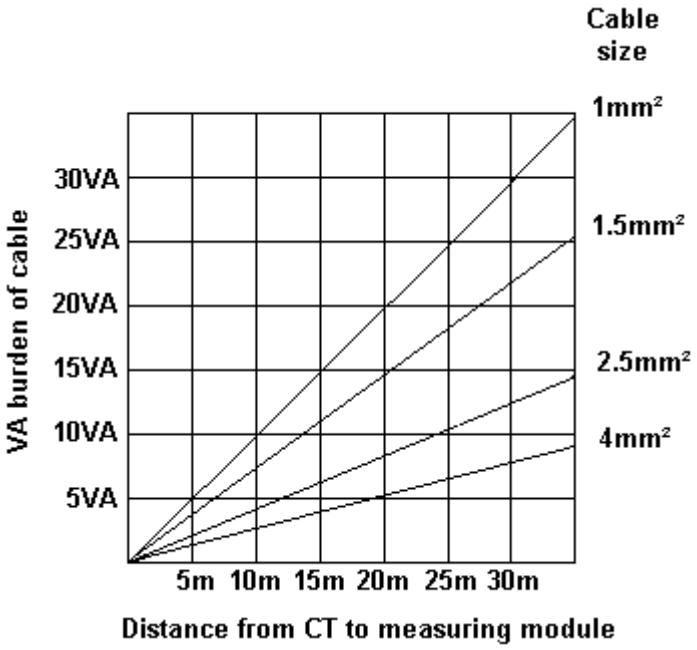
2.7.1 VA RATING OF THE CTS

NOTE: Details for 4 mm² cables are shown for reference only. The connectors on the DSE modules are only suitable for cables up to 2.5 mm².

The VA burden of the module on the CTs is 0.5 VA. However depending upon the type and length of cabling between the CTs and the module, CTs with a greater VA rating than the module are required.

The distance between the CTs and the measuring module should be estimated and cross-referenced against the chart opposite to find the VA burden of the cable itself.

If the CTs are fitted within the alternator top box, the star point (common) of the CTs should be connected to system ground (earth) as close as possible to the CTs. This minimises the length of cable used to connect the CTs to the DSE module.



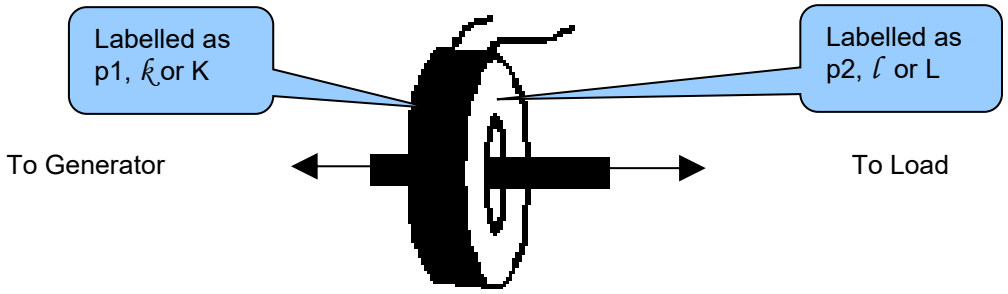
Example:
If 1.5 mm² cable is used and the distance from the CT to the measuring module is 20 m, then the burden of the cable alone is approximately 15 VA. As the burden of the DSE module is 0.25 VA, then a CT with a rating of at least 15 VA + 0.25 VA = 15.25 VA must be used. If 2.5 mm² cables are used over the same distance of 20 m, then the burden of the cable on the CT is approximately 7 VA. CT's required in this instance is at least 7.25 VA (7 + 0.25).

2.7.2 CT POLARITY

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

Take care to ensure the correct polarity of the CTs. Incorrect CT orientation leads to negative kW readings when the set is supplying power. Take note that paper stick-on labels on CTs that show the orientation are often incorrectly placed on the CT. It is more reliable to use the labelling in the case moulding as an indicator to orientation (if available).

To test orientation, run the generator in island mode (not in parallel with any other supply) and load the generator to around 10 % of the set rating. Ensure the DSE module shows positive kW for all three individual phase readings.



Polarity of CT Primary

2.7.3 CT PHASING

Take particular care that the CTs are connected to the correct phases. For instance, ensure that the CT on phase 1 is connected to the terminal on the DSE module intended for connection to the CT for phase 1.

Additionally ensure that the voltage sensing for phase 1 is actually connected to generator phase 1. Incorrect connection of the phases as described above results in incorrect power factor (pf) measurements, which in turn results in incorrect kW measurements.

One way to check for this is to make use of a single-phase load. Place the load on each phase in turn, run the generator and ensure the kW value appears in the correct phase. For instance if the load is connected to phase 3, ensure the kW figure appears in phase 3 display and not in the display for phase 1 or 2.

2.7.4 CT CLASS

Ensure the correct CT type is chosen. For instance if the DSE module is providing over current protection, ensure the CT is capable of measuring the overload level required to protect against, and at the accuracy level required.

For instance, this may mean fitting a protection class CT (P15 type) to maintain high accuracy while the CT is measuring overload currents.

Conversely, if the DSE module is using the CT for instrumentation only (current protection is disabled or not fitted to the module), then measurement class CTs can be used. Again, bear in mind the accuracy required. The DSE module is accurate to better than 1% of the full-scale current reading. To maintain this accuracy, fit a Class 0.5 or Class 1 CT.

Check with the CT manufacturer for further advice on selecting CTs.

2.8 INPUTS

2.8.1 DIGITAL INPUTS

Description	Specification
Number	8 configurable digital inputs (14 when *Analogue Inputs* are configured as digital inputs)
Arrangement	Contact between terminal and ground
Low Level Threshold	3.2 V minimum
High Level Threshold	8.1 V maximum
Maximum Input Voltage	+60 V DC with respect to plant supply negative
Minimum Input Voltage	-24 V DC with respect to plant supply negative
Contact Wetting Current	5 mA typical
Open Circuit Voltage	12 V typical

2.8.2 EMERGENCY STOP

Description	Specification
Arrangement	Contact between terminal and module supply positive
Closed Threshold	3.2 V minimum
Open Threshold	8.1 V maximum
Maximum Input Voltage	+35 V DC with respect to plant supply negative (60 V protection for 1 minute)
Minimum Input Voltage	-24 V DC with respect to plant supply negative
Open Circuit Voltage	0 V

2.8.3 ANALOGUE INPUTS

All of the analogue inputs are flexible within the modules.

2.8.3.1 ANALOGUE INPUT A & F

Description	Specification
Analogue Input A Type	Flexible: Configured for *Oil Sensor* in the DSE default configuration. Flexible Options: Not used, Digital Input, Flexible Analogue, Fuel Sensor, Oil Sensor & Temperature Sensor.
Analogue Input F Type	Flexible: Configured for Flexible Analogue in the DSE default configuration. Flexible Options: Not used, Digital Input and Flexible Analogue
Flexible Input Selection	Pressure Sensor Percentage Sensor Temperature Sensor
Flexible Measured Quantity	Current Restive (Only for Pressure Sensors) Voltage

Resistive Configuration

Description	Specification
Measurement System	Ratio metric
Nominal Output Voltage	12 V
Measurement Current	15 mA ±10 % into Short Circuit
Minimum Value	0 Ω
Full Scale	3 kΩ
Over Range / Fail	3.5 kΩ (SW determined)
Max Common Mode Voltage	±2 V
Resolution	±1% of Value ±1 Count
Accuracy	±2% of Value ±2 Counts excluding sensor error

0 V to 10 V Configuration

Description	Specification
Full Scale	0 V to 10 V
Over Range Value	11 V
Input Impedance	> 100 KΩ
Max Common Mode Voltage	±2 V
Resolution	1% of full scale
Accuracy	±2% of full scale voltage (±0.2 V) excluding sensor error

4 mA to 20 mA Configuration

Description	Specification
Full Scale	0 mA to 20 mA
Over Range Value	22 mA
Resistance	240 Ω ±0.1%
Max Common Mode Voltage	±2 V
Resolution	1% of full scale
Accuracy	±2% of full scale current (±0.4 mA) excluding sensor error

2.8.3.2 ANALOGUE INPUT B, C, D & E

Description	Specification
Analogue Input B Type	Flexible: Configured for *Temperature Sensor* in the DSE default configuration. Flexible Options: Not used, Digital Input and Flexible Analogue
Analogue Input C Type	Flexible: Configured for *Fuel Sensor* in the DSE default configuration. Flexible Options: Not used, Digital Input and Flexible Analogue
Analogue Input D Type	Flexible: Configured for *Flexible Analogue* in the DSE default configuration. Flexible Options: Not used, Digital Input and Flexible Analogue
Analogue Input E Type	Flexible: Configured for *Flexible Analogue* in the DSE default configuration. Flexible Options: Not used, Digital Input and Flexible Analogue
Flexible Input Selection	Pressure Sensor Percentage Sensor Temperature Sensor
Flexible Measured Quantity	Current Restive (Only for Pressure Sensors) Voltage

Resistive Configuration

Description	Specification
Measurement Type	Ratio metric
Nominal Output Voltage	12 V
Measurement Current	10 mA ±10 % into Short Circuit
Minimum Value	0 Ω
Full Scale Value	5 kΩ
Over Range Value	5.5 kΩ (SW Determined)
Max Common Mode Voltage	±2 V
Resolution	±1% of Value ±1 Count
Accuracy	±2% of Value ±2 Counts excluding sensor error

0 V to 10 V Configuration

Description	Specification
Full Scale	0 V to 10 V
Over Range Value	11 V
Input Impedance	> 100 KΩ
Max Common Mode Voltage	±2 V
Resolution	1% of full scale
Accuracy	±2% of full scale voltage (±0.2 V) excluding sensor error

4 mA to 20 mA Configuration

Description	Specification
Full Scale	0 mA to 20 mA
Over Range Value	22 mA
Resistance	240 Ω ±0.1%
Max Common Mode Voltage	±2 V
Resolution	1% of full scale
Accuracy	±2% of full scale current (±0.4 mA) excluding sensor error

2.8.4 CHARGE FAIL INPUT

The charge fail input is actually a combined input and output. Whenever the generator is required to run, the terminal provides excitation current to the charge alternator field winding.

When the charge alternator is correctly charging the battery, the voltage of the terminal is close to the plant battery supply voltage. In a failed charge situation, the voltage of this terminal is pulled down to a low voltage. It is this drop in voltage that triggers the *Charge Failure* alarm. The level at which this operates and whether this triggers a warning or shutdown alarm is configurable using the DSE Configuration Suite Software.

Description	Specification
Minimum Voltage	0 V
Maximum Voltage	35 V
Resolution	0.2 V
Accuracy	±1 % of full scale
Excitation	Active circuit constant power output
Output Power	2.5 W nominal at 12 V and 24 V
Current At 12V	210 mA
Current At 24V	105 mA

2.8.5 MAGNETIC PICK-UP

NOTE: DSE supply a suitable magnetic pickup device, available in two body thread lengths:
DSE Part number 020-012 - Magnetic Pickup probe 5/8 UNF 2 ½" thread length
DSE Part number 020-013 - Magnetic Pickup probe 5/8 UNF 4" thread length

Magnetic Pickup devices can often be 'shared' between two or more devices. For example, one device can often supply the signal to both the DSE module and the engine governor. The possibility of this depends upon the amount of current that the magnetic pickup can supply.

Description	Specification
Type	Differential input
Minimum Voltage	0.5 V Peak
Maximum Voltage	70 V Peak
Max Dissipation	1 W max
Max Common Mode Voltage	±2 V Peak
Minimum Frequency	5 Hz
Maximum Frequency	10 kHz
Resolution	6.25 rpm
Accuracy	±25 rpm
Flywheel Teeth	10 to 500
O/C Threshold	4 V DC (nominal)
O/C Test Current	75 µA (nominal)

2.9 OUTPUTS

2.9.1 DC OUTPUTS A & B (FUEL & START)

Description	Specification
Type	Normally used as Fuel & Start outputs. Fully configurable for other purposes if the module is configured to control an electronic engine.
Rating	15 A resistive at Emergency Stop supply.

2.9.2 CONFIGURABLE VOLT-FREE RELAY OUTPUTS C & D

Description	Specification
Type	Normally used for load switching control Fully configurable volt-free relays. Output C normally closed and Output D normal open.
Rating	8 A resistive at 250 V AC

2.9.3 CONFIGURABLE DC OUTPUTS E, F, G, H, I & J

Description	Specification
Type	Fully configurable, supplied from DC supply terminal 2.
Rating	2 A resistive at plant supply.
Capacity	Maximum Total Current Not to Exceed 15A at DC Plant supply Input (Pin 2)

2.9.4 5 V REFERENCE OUTPUT

Description	Specification
Type	Supplied from DC supply terminal 2.
Voltage	5V
Rating	50 mA resistive at plant supply.
Error	< 1%
Protection	Over Current limit at 75 mA
Short Circuit	< 75 mA
Supply Protection	35 V and –24 V connection
Monitor Range	0 to 10 V DC

2.10 COMMUNICATION PORTS

NOTE: All communication ports can be used at the same time.

Description	Specification
USB Server Port	Type B USB 2.0 For connection to PC running DSE Configuration Suite Max distance 6 m (20 feet)
RS485 Serial Port	Isolated Data connection 2 wire + screen Half Duplex Data direction control for Transmit (by s/w protocol) Current SW limit to 115200 Baud Parity subject to configuration Stop Bits subject to configuration External termination required (120 Ω) Max common mode offset 70 V, 1 kV surge Max distance 1.2 km (¾ mile)
CAN 1 Port	**NOTE: For additional length, the DSE124 CAN Extender is available. For more information, refer to DSE Publication: *057-116 DSE124 Operator Manual*** Data connection 2 wire + screen Standard implementation of 'Slow mode', up to 250 kb/s Isolated. Max common mode offset max 70 V, 1kv surge Internal Termination provided (120 Ω) Max distance 40 m (133 feet)
CAN 2 Port	**NOTE: For additional length, the DSE124 CAN Extender is available. For more information, refer to DSE Publication: 057-116 DSE124 Operator Manual** Configurable baud rate between 10 kbps and 1 Mbps Data connection 2 wire + screen Isolated External termination required (120 Ω) Max common mode offset max 70 V, 1kv surge Typical maximum lengths are approximately 40 m at 1 Mbps and up to 250 m at lower baud rates (e.g. ≤250 kbps) using Belden 9841 cable or equivalent.
DSENet® (Expansion Comms) Port	Non-isolated Data connection 2 wire + screen Half Duplex Data direction control for Transmit (by s/w protocol) Baud Rate of 115 kbaud Internal termination fitted (120 Ω) Max common mode offset ±5 V Max distance 1.2 km (¾ mile)

2.11 COMMUNICATION PORT USAGE

2.11.1 USB SERVER PORT (PC CONFIGURATION)

NOTE: DSE stock 2 m (6.5 feet) USB type A to type B cable, DSE Part Number: 016-125. Alternatively they are purchased from any PC or IT store.

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

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

NOTE: Firmware updates are protected to prevent unauthorised or corrupted software from being installed on the module.
Only authenticated firmware files generated by Deep Sea Electronics may be applied.

The USB port is provided to give a simple means of connection between a PC and the module. Using the DSE Configuration Suite Software, the operator is then able to control the module, starting or stopping the engine, selecting operating modes, etc.

Additionally, the various operating parameters (such as coolant temperature, oil pressure, etc.) of the engine are available to be viewed or changed.

To connect a module to a PC by USB, the following items are required:

DSEG7300 Module



DSE Configuration Suite PC Software
(Available from www.deepseaelectronics.com).



USB cable Type A to Type B.
(This is the same cable as often used between a PC and a USB printer)



2.11.2 RS485 PORT

The RS485 port on the module supports the MODBUS RTU protocol and is for connection to a single MODBUS client device only.

The DSE MODBUS register table for the module is available upon request from the DSE Technical Support Department.

RS485 is used for point-to-point cable connection of more than one device (maximum 32 devices) and allows for connection to PCs, PLCs and Building Management Systems (to name just a few devices).

One advantage of the RS485 interface is the large distance specification (1.2 km when using Belden 9841 (or equivalent) cable. This allows for a large distance between the module and a PC running the DSE Configuration Suite software. The operator is then able to control the module, starting or stopping the engine, selecting operating modes, etc.

The various operating parameters (such as coolant temperature, oil pressure, etc.) of the remote engine are viewed or changed.

NOTE: For a single module to PC connection and distances up to 6 m (20 feet) the USB connection method is more suitable and provides for a lower cost alternative to RS485 (which is more suited to longer distance connections).

Many PCs are not fitted with an internal RS485 serial port. DSE DOES NOT recommend the use of USB to RS485 convertors but can recommend PC add-ons to provide the computer with an RS485port.

2.11.2.1 CABLE SPECIFICATION

NOTE: DSE recommend Belden 9841 (or equivalent) cable for RS485 communication. This is rated to a maximum cable length of 1.2 km. DSE Stock Belden 9841 cable, DSE Part Number: 016-030.

Description	Specification
Cable Type	Two core screened and shielded twisted pair
Cable Characteristics	120 Ω impedance Low capacitance
Recommended Cable	Belden 9841 Belden 9271
Maximum Cable Length	1200 m (¾ mile) when using Belden 9841 or direct equivalent. 600 m (656 yards) when using Belden 9271 or direct equivalent.
RS485 Topology	“Daisy Chain” Bus with no stubs (spurs)
RS485 Termination	120 Ω. Not fitted internally to module. Must be fitted externally to the ‘first’ and ‘last’ device on the RS485 link.

2.11.2.2 RECOMMENDED PC RS485 SERIAL PORT ADD-ONS

NOTE: DSE have no business tie to Brainboxes. Over many years, our own engineers have used these products and are happy to recommend them.

NOTE: For further details of setting up the devices below, refer to the manufacture whose details are below.

Remember to check these parts are suitable for your PC. Consult your PC supplier for further advice.

Brainboxes PM154 PCMCIA RS485 card (for laptops PCs)
Set to ‘Half Duplex, Autogating” with ‘CTS True’ set to ‘enabled’



Brainboxes UC320 PCI Velocity RS485 card (for desktop PCs)
Set to ‘Half Duplex, Autogating” with ‘CTS True’ set to ‘enabled’



Brainboxes PX-324 PCI Express 1 Port RS422/485 (for desktop PCs)



Supplier:
Brainboxes
Tel: +44 (0)151 220 2500
Web: http://www.brainboxes.com
Email: Sales: sales@brainboxes.com

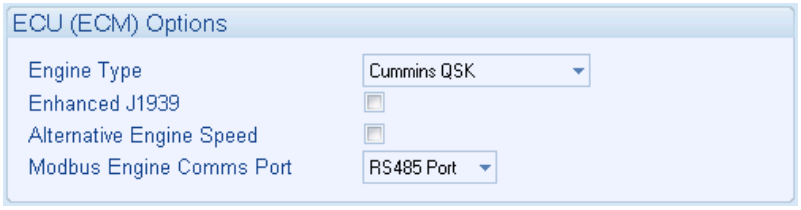
2.11.2.3 RS485 USED FOR MODBUS ENGINE CONNECTION

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

The RS485 port can be configured for connection to Cummins MODBUS engines (Engines fitted with Cummins GCS (G-Drive Control System)).
This leaves the DSENet® interface free for connection to expansion devices.

While this is a very useful feature in some applications, the obvious drawback is that the RS485 interface is no longer available connection or remote monitoring equipment (i.e. Building Management System or PLC) or dual mutual system.

Example of configuring the DSENet® for connection to Cummins QSK GCS using the DSE Configuration Suite Software:

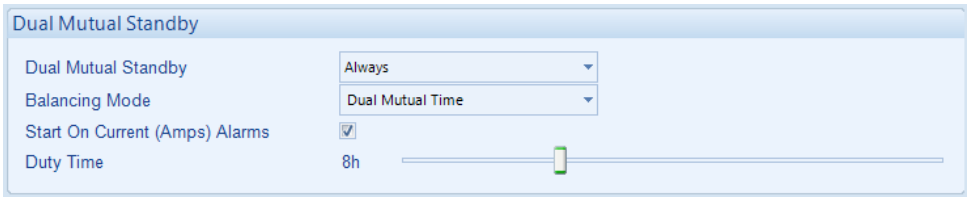


2.11.2.4 RS485 USED FOR DUAL MUTUAL STANDBY CONNECTION

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

The dual mutual system utilises the RS485 hardware interface to allow multiple modules to communicate to one another. The RS485 port can be configured for connection to a MODBUS engine or remote monitoring equipment (i.e. Building Management System, PLC or PC RS485 port).

Example of configuring the dual mutual for connection by RS485 using the DSE Configuration Suite Software:



2.11.3 CAN 2 PORT

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

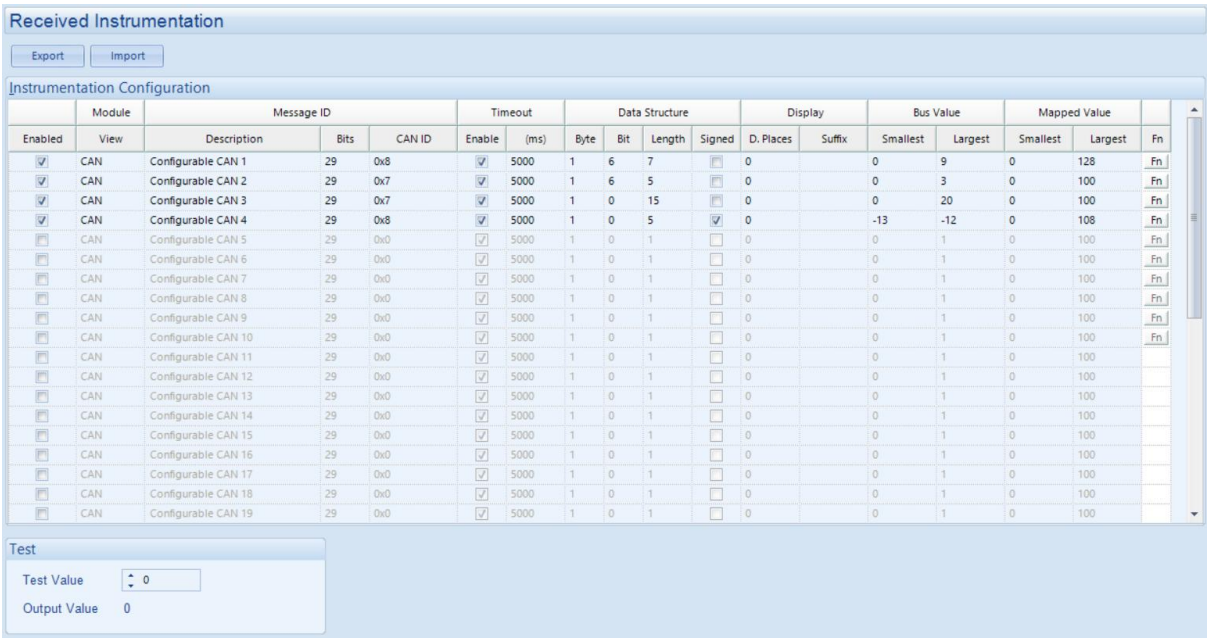
The CAN 2 port provides a configurable CAN interface for connection to supported external devices and systems.
It is intended for use on a multi-drop CAN network and may be configured for applications such as AVR communication, configurable CAN, or other supported CAN functions.
Connection to third-party devices (e.g. AVRs, PLCs, CAN monitoring tools) is dependent on protocol compatibility and system configuration.

2.11.3.1 CONFIGURABLE CAN

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

The module's CAN port is used to connect third-party CAN devices (modules, battery chargers…) and allows the module to read and transmit configurable CAN instruments.

The DSE module supports connection to a CAN device and is able to read up to 30 parameters and transmit up to 10 parameters; these parameters are configurable and the read instrumentation is displayable on the module LCD and/or in SCADA.



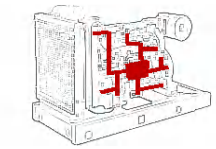
2.11.4 CAN 1 PORT

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

The *CAN 1 Port* is used for connection of more than one device and allows for connection to engine ECU/ECMs, alternator AVRs, CAN Scanner, PLC and CAN modules (to name just a few devices). The operator is then able to view the various operating parameters.

2.11.4.1 CAN SUPPORTED ENGINES

NOTE: For further details on connection to electronic engines, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*.



The modules are fitted with a CAN interface as standard and are capable of receiving engine data from engine ECU/ECMs compliant with the CAN J1939 standard.

ECU/ECMs monitor the engine's operating parameters such as speed, oil pressure, coolant temperature (among others) in order to closely monitor and control the engine. The industry standard communications interface (CAN) transports data gathered by the engine's ECU/ECM using the J1939 protocol. This allows engine modules such as DSE to access these engine parameters with no physical connection to the sensor device.

2.11.4.2 CAN SUPPORTED AVRS

NOTE: For further details on connection to supported CANbus AVRs, contact DSE technical support: support@deepseaelectronics.com.

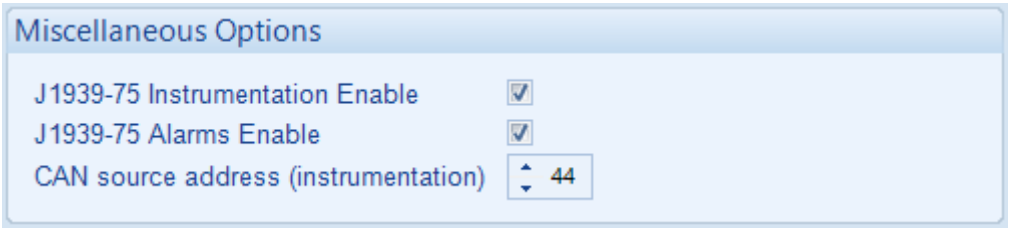
The modules are fitted with a CAN interface as standard and are capable of receiving alternator data from certain AVRs compliant with the CAN J1939 standard.

AVRs are used to maintain the alternators' output voltage by controlling the excitation current in addition to closely monitoring and protecting the alternator. The industry standard communications interface (CAN) transports data gathered by the alternators' AVR using the J1939 protocol. This allows generator modules such as DSE to access these alternator parameters with no physical connection to the sensor device.

2.11.4.3 J1939-75

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

When the J1939-75 is enabled in the module's configuration, the module's AC measurements and alarms are sent onto the CANbus using the *CAN 1 Port* to be received by an external monitoring device. There are two check boxes to enable each of the two parts of the interface as shown below, AC measurement and AC related alarms. The module AC alarms are translated into J1939 DM1 diagnostic messages. There are no additional display screens visible on the module when these options are selected. The default CAN source address for additional J1939-75 messages is 44 however this may be changed by the generator supplier.



2.11.5 DSENET® (EXPANSION MODULES)

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

NOTE: As a termination resistor is internally fitted to the module, the module must be the 'first' unit on the DSENet® link. A termination resistor MUST be fitted to the 'last' unit on the DSENet® link. For connection details, refer to the section entitled *Typical Wiring Diagram* elsewhere in this document.

DSENet® is the interconnection cable designed for linking the host module to the expansion module(s) and should only be connected to DSE equipment that utilises DSENet®.

Description	Specification
Cable Type	Two core screened and shielded twisted pair
Cable Characteristics	120 Ω Low capacitance
Recommended Cable	Belden 9841 Belden 9271
Maximum Cable Length	1200 m (¾ mile) when using Belden 9841 or direct equivalent. 600 m (656 yards) when using Belden 9271 or direct equivalent.
DSENet® Topology	"Daisy Chain" Bus with no stubs (spurs)
DSENet® Termination	120 Ω. Fitted internally to host module. Must be fitted externally to the 'last' expansion module.
Maximum Expansion Modules	**NOTE: Only supported DSE Intelligent Battery Chargers may be connected to the DSENet®. Contact DSE Technical Support for further information.** Total 20 devices made up of DSE2130 (up to 4), DSE2131 (up to 4), DSE2133 (up to 4), DSE2152 (up to 4), DSE2157 (up to 4), DSE2160 (up to 4), DSE2548 (up to 4), DSE Intelligent Battery Chargers (up to 2). This gives the possibility of : Maximum 24 (6 per device x 4) additional analogue outputs 0 V to 10 V or 4 mA to 20 mA (DSE2152) Maximum 32 (8 per device x 4) additional relay outputs (DSE2157) Maximum 32 (8 per device x 4) additional LED indicators(DSE2548) Maximum 16 (4 per device x 4) additional RTD or 32 (8 per device x 4) thermocouple inputs (DSE2133) Maximum 32 (8 per device x 4) additional digital/resistive inputs (DSE2130) Maximum 40 additional flexible inputs digital, resistive, 0 V to 10 V or 4 mA to 20 mA (DSE2131) Maximum 32 additional configurable digital I/O and 8 analogue inputs (resistive or flexible) provided by up to 4 DSE2160 modules, each offering 8 digital I/O, 6 digital inputs, and 2 analogue inputs Maximum 2 DSE Intelligent Battery Chargers

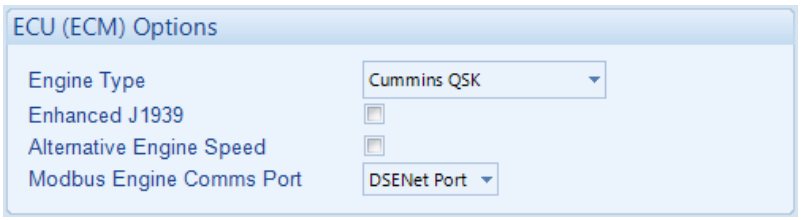
2.11.5.1 DSENET® USED FOR MODBUS ENGINE CONNECTION

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

As DSENet® utilises an RS485 hardware interface, this port can be configured for connection to Cummins MODBUS engines (Engines fitted with Cummins GCS (G-Drive Control System)). This leaves the RS485 interface free for connection to remote monitoring equipment (i.e. Building Management System, PLC or PC RS485 port).

While this is a very useful feature in some applications, the obvious drawback is that the DSENet® interface is no longer available for connection to expansion devices.

Example of configuring the DSENet® for connection to Cummins QSK GCS using the DSE Configuration Suite Software:



2.12 SOUNDER

The module features an internal sounder to draw attention to warning, electrical trip and shutdown alarms.

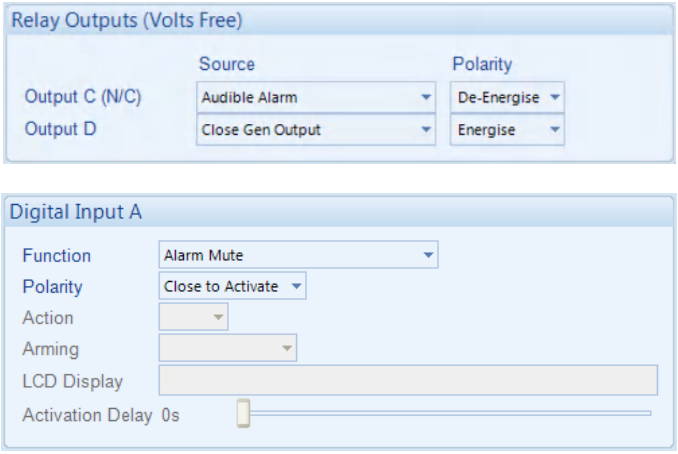
Description	Specification
Sounder Level	75 dB(A) ±10 dB at 1 m

2.12.1 ADDING AN EXTERNAL SOUNDER

Should an external alarm or indicator be required, this can be achieved by using the DSE Configuration Suite PC software to configure an auxiliary output for *Audible Alarm,* and by configuring an auxiliary input for *Alarm Mute* (if required).

The audible alarm output activates and de-activates at the same time as the module's internal sounder. The Alarm mute input and internal ***Lamp Test / Alarm Mute*** button activate 'in parallel' with each other. Either signal mutes both the internal sounder and audible alarm output.

Example of configuration to achieve external sounder with external alarm mute button:



2.13 ACCUMULATED INSTRUMENTATION

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

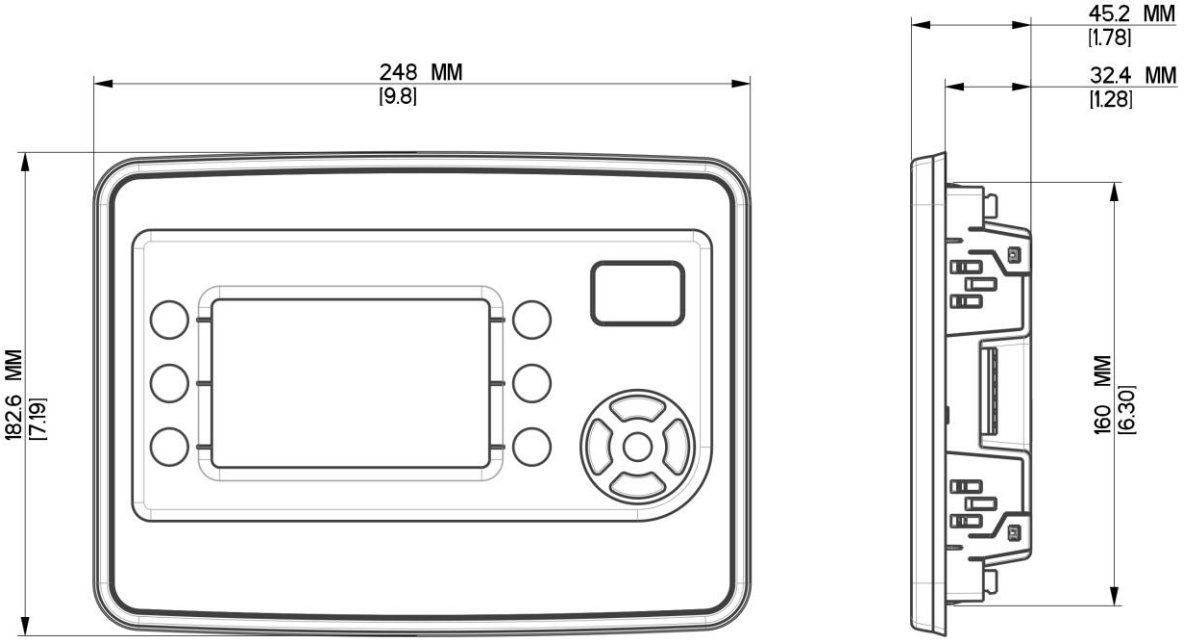
The number of logged *Engine Hours* and *Number of Starts* can be set/reset using the DSE Configuration Suite PC software. Depending upon module configuration, this may have been PIN number locked by the generator supplier.

The module incorporates a real-time clock used for event logging, scheduling, and accumulated instrumentation. The real-time clock maintains time during normal operation and ensures accurate timestamping of logged events. Time accuracy and drift characteristics are controlled by the internal clock system. Time and date settings are configurable via the configuration software.

Description	Specification
Engine Hours Run	Maximum 99999 hrs 59 minutes (Approximately 11yrs 4 months)
Number of Starts	1,000,000 (1 Million)
Accumulated Power	999999 kWh / kvarh / kVAh

2.14 DIMENSIONS AND MOUNTING

Parameter	Specification
Panel Cutout	220 mm x 160 mm (8.66 ” x 6.30 ”)
Overall Size	248 mm x 182.6 mm x 45.2 mm (9.8 ” x 7.19 ” x 1.78 ”)
Case Material	Polycarbonate
Keypad Material	Silicone
Protection Category	IP65 panel mounted with integrated gasket.
Weight	0.77 kg (1.69 lb)
Mounting Type	Panel Mounting. Base mounted to a vertical surface with connection terminals to the rear.
Mounting Torque	Mounting Torque 4x 020-294 Clip M4 3 prong, mounting torque 0.2 Nm



2.14.1 INTERNAL MOUNTING

This DSE control module has been designed to be panel mounted in an indoor environment. Examples of indoor use include:

- Panel mounted within an internal control room.
- Panel mounted to the door of a containerised generator behind a weatherproof protective window (Generator can be located externally).
- Mounted to an open frame generator that is permanently located inside.

2.14.2 EXTERNAL MOUNTING

If this module needs to be mounted externally, please note the following:

- The module has an IP65 rating with the integral rubber sealing gasket. The module will withstand some light rain and water spray but cannot be submerged in water.
- The LCD display has no in-built UV protection. Exposure to direct sunlight will impact its lifespan.

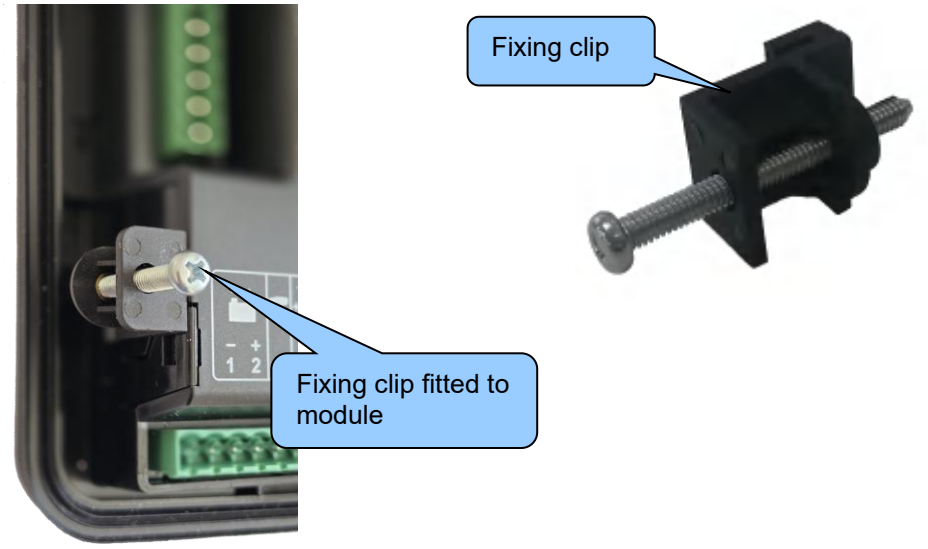
Mounting the product in an external environment, without the proper protections may invalidate the product warranty.

2.14.3 FIXING CLIPS

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

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

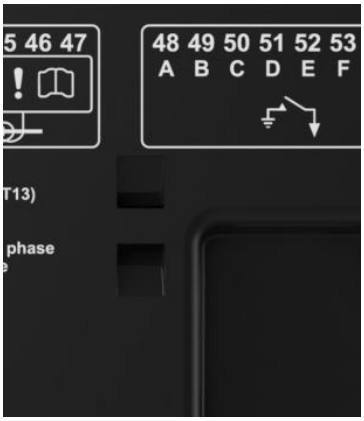
Withdraw the fixing clip screw (turn anticlockwise) until only the pointed end is protruding from the clip.
Insert the three ‘prongs’ of the fixing clip into the slots in the side of the module case.
Pull the fixing clip backwards (towards the back of the module) ensuring all three prongs of the clip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



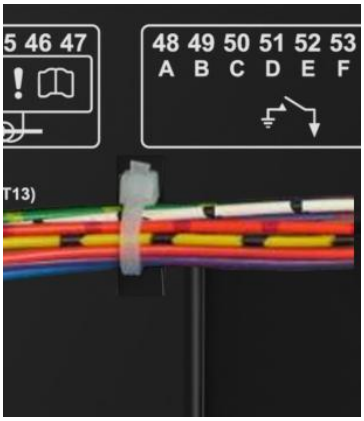
2.14.4 CABLE TIE FIXING POINTS

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, reducing the chance of future connection failures.

Care must be taken not to over tighten the cable tie (for instance with cable tie tools) to prevent the risk of damage to the module case.



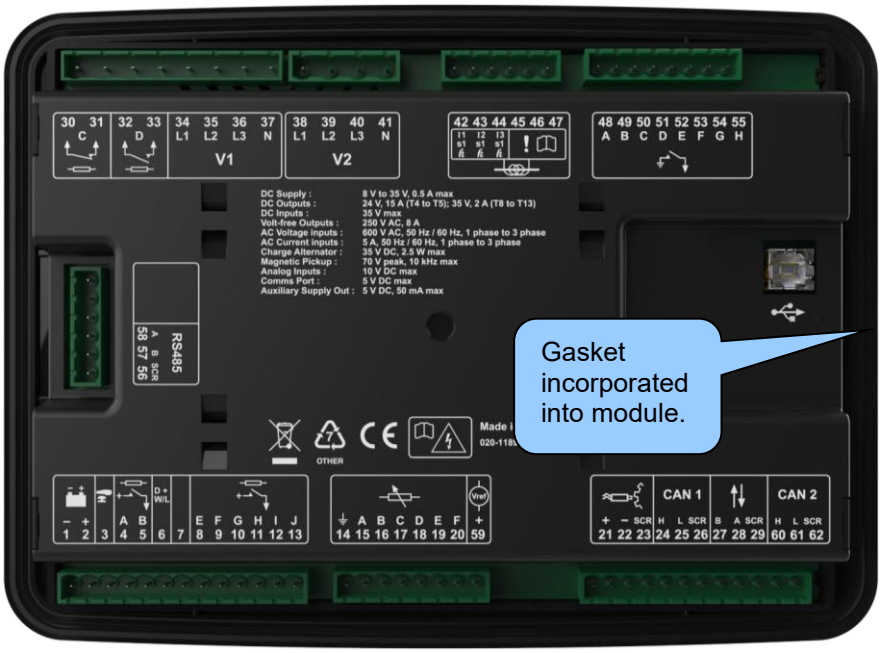
Cable Tie Fixing Point



With Cable And Tie In Place

2.14.5 SILICON SEALING GASKET

The gasket provides improved sealing between module and the panel fascia. The gasket is incorporated into the module as shown below. Ensure correct fitment to the panel facia to maintain the integrity of the seal.



2.15 APPLICABLE STANDARDS

Standard	Description
EN ISO 16750-5 (chemical resistance)	Confirms the enclosure materials can tolerate automotive fluids and cleaning chemicals commonly found in the installation environment.
BS EN 60068-2-1 (Minimum temperature)	-30 °C (-22 °F) -40 °C (-40 °F) with heater.
BS EN 60068-2-2 (Maximum temperature)	+70 °C (158 °F)
BS EN 60068-2-5	Ensures the product resists damage or discoloration from prolonged ultraviolet light exposure.
BS EN 60068-2-6 (Vibration)	Ten sweeps in each of three major axes 5 Hz to 8 Hz at ±7.5 mm 8 Hz to 500 Hz at 2 gn
BS EN 60068-2-27 (Shock)	Three shocks in each of three major axes 15 gn in 11 ms
BS EN 60068-2-30 (Damp heat cyclic)	20˚C to 55 ˚C at 95% relative humidity for 48 hours
BS EN 60068-2-78 (Damp heat static)	40 ˚C at 95% relative humidity for 48 hours
BS EN 61000-6-2 (Electro-magnetic Compatibility)	EMC Generic Immunity Standard (Industrial)
BS EN 61000-6-4 (Electro-magnetic Compatibility)	EMC Generic Emission Standard (Industrial)
BS EN 61010	Defines electrical safety requirements for measurement, control, and laboratory equipment to protect users from shock and fire hazards.
BS EN 60529 (Degrees of protection provided by enclosures)	IP65 (front of module when installed into the control panel with integral sealing gasket).
UL6200 NEMA rating (Approximate)	12 (Front of module when installed into the control panel with integral sealing gasket).
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 module is device number 11L-8000 (Multifunction device protecting Line (generator) –module). As the module is configurable by the generator OEM, the functions covered by the module vary. Depending on module configuration, the device numbers included within the module could be: 2 – Time Delay Starting Or Closing Relay 3 – Checking Or Interlocking Relay 5 – Stopping Device 6 – Starting Circuit Breaker 8 – Control Power Disconnecting Device 10 – Unit Sequence Switch 11 – Multifunction Device 12 – Overspeed Device 14 – Underspeed Device

Continued over the page...

Standard	Description
IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	Continued… 49 – Machine or Transformer Thermal Relay 50 – Instantaneous Overcurrent Relay 51 – AC Time Overcurrent Relay 52 – AC Circuit Breaker 53 – Exciter Or DC Generator Relay 54 – Turning Gear Engaging Device 55 – Power Factor Relay **(USING INTERNAL PLC EDITOR)** 59AC – AC Overvoltage Relay 59DC – DC Overvoltage Relay 62 – Time Delay Stopping Or Opening Relay 63 – Pressure Switch 71 – Level Switch 74 – Alarm Relay 78 – Phase-Angle Measuring Relay 79 – Reclosing Relay **(USING INTERNAL PLC EDITOR)** 81 – Frequency Relay 83 – Automatic Selective Control Or Transfer Relay 86 – Lockout Relay

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

2.15.1 ENCLOSURE CLASSIFICATIONS

2.15.1.1 IP CLASSIFICATIONS

The modules 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 integral sealing gasket).

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 its 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).

2.15.1.2 NEMA CLASSIFICATIONS

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

12 (Front of module when module is installed into the control panel with the integral sealing gasket).

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.

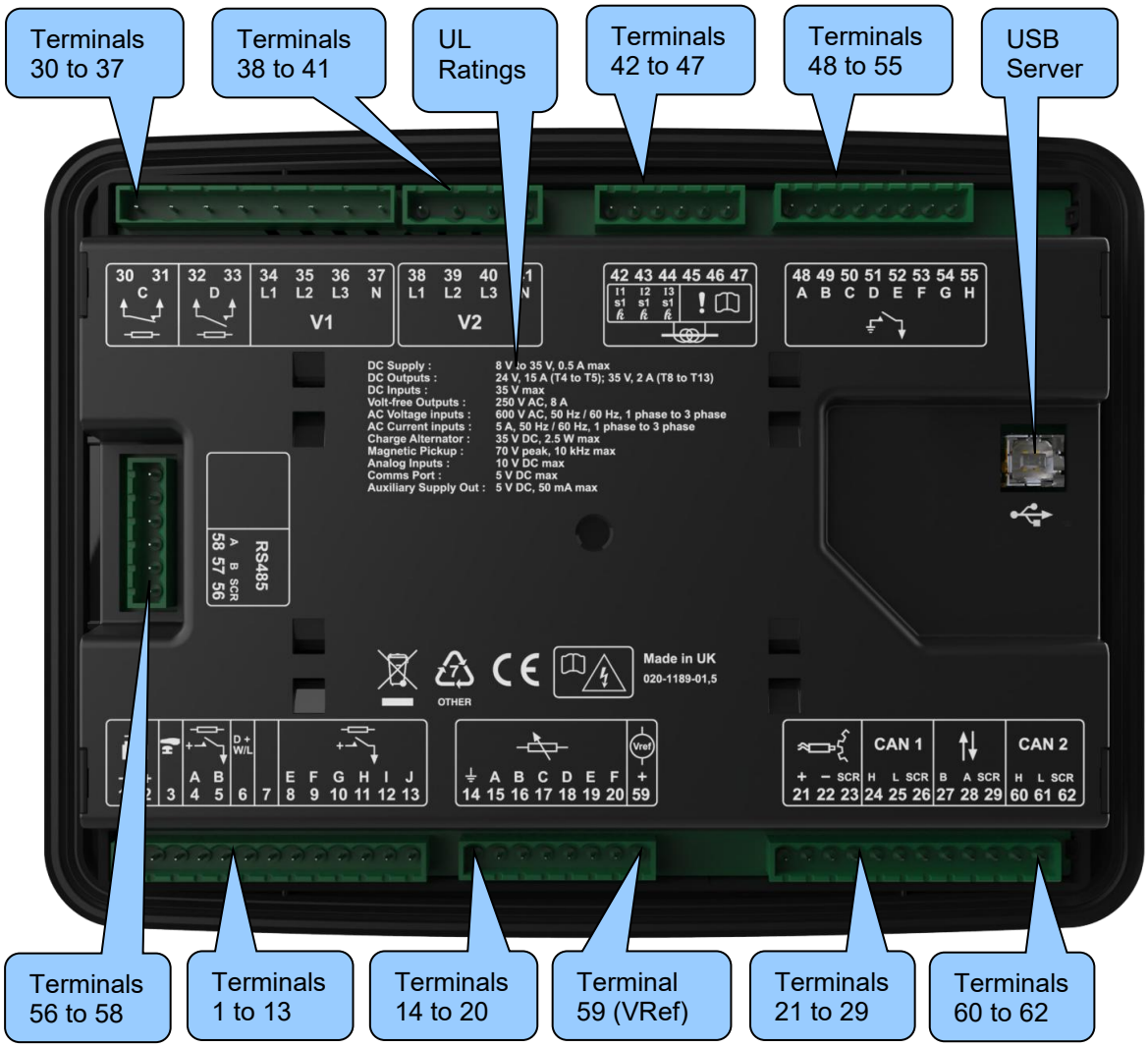
3 INSTALLATION

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

3.1 USER CONNECTIONS

NOTE: Availability of some terminals depends upon module version. Full details are given in the section entitled *Connection Descriptions* elsewhere in this document.

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.



3.2 CONNECTION DESCRIPTIONS

3.2.1 DC SUPPLY, E-STOP INPUT, DC OUTPUTS & CHARGE FAIL INPUT

NOTE: When the module is configured for operation with an electronic engine, *Fuel* and *Start* output requirements may be different. For further details on connection to electronic engines, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual*.

	Pin No	Description	Cable Size	Notes
	1	DC Plant Supply Input (Negative)	2.5 mm² AWG 13	Connect to ground where applicable.
	2	DC Plant Supply Input (Positive)	2.5 mm² AWG 13	Supplies the module and DC Outputs E, F, G, H, I & J
	3	Emergency Stop Input	2.5 mm² AWG 13	Plant Supply Positive. Supplies DC Outputs A & B.
	4	DC Output A (FUEL)	2.5 mm² AWG 13	Plant Supply Positive from terminal 3. 15 A DC rated Fixed as fuel relay if electronic engine is not configured.
	5	DC Output B (START)	2.5 mm² AWG 13	Plant Supply Positive from terminal 3. 15 A DC rated Fixed as start relay if electronic engine is not configured.
D+ W/L	6	Charge Fail / Excite	2.5 mm² AWG 13	Do not connect to ground (battery negative). If charge alternator is not fitted, leave this terminal disconnected.
	7	DO NOT CONNECT		
	8	DC Output E	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.
	9	DC Output F	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.
	10	DC Output G	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.
	11	DC Output H	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.
	12	DC Output I	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.
	13	DC Output J	1.0 mm² AWG 18	Plant Supply Positive from terminal 2. 2 A DC rated.

3.2.2 ANALOGUE SENSOR INPUTS

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

NOTE: It is VERY important that terminal 14 (sensor common) is 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. This connection MUST NOT be used to provide an earth connection for other terminals or devices. The simplest way to achieve this is to run a SEPARATE earth connection from the system earth star point to terminal 14 directly, and not use this earth for other connections.

NOTE: If PTFE insulating tape is used on the sensor thread when using earth return sensors, ensure not to insulate the entire thread, as this prevents the sensor body from being earthed via the engine block.

	Pin No	Description	Cable Size	Notes
	14	Sensor Common Return	0.5 mm² AWG 20	Ground Return Feed For Sensors
	15	Analogue Sensor Input A	0.5 mm² AWG 20	Connect To Oil Pressure Sensor
	16	Analogue Sensor Input B	0.5mm² AWG 20	Connect To Coolant Temperature Sensor
	17	Analogue Sensor Input C	0.5 mm² AWG 20	Connect To Fuel Level Sensor
	18	Analogue Sensor Input D	0.5 mm² AWG 20	Connect To Additional Sensor (User Configurable)
	19	Analogue Sensor Input E	0.5 mm² AWG 20	Connect To Additional Sensor (User Configurable)
	20	Analogue Sensor Input F	0.5 mm² AWG 20	Connect To Additional Sensor (User Configurable)
	59	Vref 5 V Reference Output	0.5 mm² AWG 20	50 mA reference for sensor supply

3.2.3 MPU, CAN 1, DSENET® & CAN 2

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

NOTE: For further details on connection to electronic engines, refer to DSE Publication: *057-004 Electronic Engines and DSE Wiring*.

NOTE: Screened 120 Ω impedance cable specified for use with CAN must be used for the CAN 1 link & CAN 2 link.
DSE stock and supply Belden cable 9841 which is a high quality 120 Ω impedance cable suitable for CAN use (DSE part number 016-030).

NOTE: The CAN 1 port has a 120 Ω termination resistor internally fitted between the H and L terminals.

NOTE: The DSENet® port has a 120 Ω termination resistor internally fitted between the A and B terminals, the module must be the 'first' unit on the DSENet® link. A termination resistor MUST be fitted to the 'last' unit on the DSENet® link.

NOTE: The CAN 2 port requires a 120 Ω termination resistor to be fitted externally across the H and L terminals, when the DSE module is the 'first' unit on the CANBUS link.

	Pin No	Description	Cable Size	Notes
	21	Magnetic Pickup Positive	0.5 mm² AWG 20	Connect To Magnetic Pickup Device
	22	Magnetic Pickup Negative	0.5 mm² AWG 20	Connect To Magnetic Pickup Device
	23	Magnetic Pickup Screen	Shield	Connect To Ground At One End Only
CAN 1	24	CAN 1 Port H	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable Connect To Engine Control Unit
	25	CAN 1 Port L	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable Connect To Engine Control Unit
	26	CAN 1 Port Screen	Shield	Use only 120 Ω CAN or RS485 approved cable
	27	DSENet® Expansion B	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable
	28	DSENet® Expansion A	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable
	29	DSENet® Expansion Screen	Shield	Use only 120 Ω CAN or RS485 approved cable
CAN 2	60	CAN 2 Port H	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable Connect To CAN module or battery charger…
	61	CAN 2 Port L	0.5 mm² AWG 20	Use only 120 Ω CAN or RS485 approved cable Connect To CAN module or battery charger…
	62	CAN 2 Port Screen	Shield	Use only 120 Ω CAN or RS485 approved cable

3.2.4 OUTPUT C & D & V1 (GENERATOR) VOLTAGE & FREQUENCY SENSING

NOTE: The below table describes connections to a three phase, four wire alternator. For alternative wiring topologies, see the section entitled *Alternate Topology Wiring Diagrams elsewhere* in this document.

	Pin No	Description	Cable Size	Notes
	30	Normally Closed Volt-Free Relay Output C	1.0mm² AWG 18	Normally configured to control mains contactor coil
	31		1.0mm² AWG 18	
	32	Normally Open Volt-Free Relay Output D	1.0mm² AWG 18	Normally configured to control generator contactor coil
	33		1.0mm² AWG 18	
V1	34	Generator L1 (U) Voltage Sensing	1.0 mm² AWG 18	Connect to generator L1 (U) output (AC) (Recommend 2 A fuse)
	35	Generator L2 (V) Voltage Sensing	1.0 mm² AWG 18	Connect to generator L2 (V) output (AC) (Recommend 2 A fuse)
	36	Generator L3 (W) Voltage Sensing	1.0 mm² AWG 18	Connect to generator L3 (W) output (AC) (Recommend 2 A fuse)
	37	Generator Neutral (N) Input	1.0 mm² AWG 18	Connect to generator Neutral terminal (AC)

3.2.5 V2 (MAINS) VOLTAGE & FREQUENCY SENSING

NOTE: The below table describes connections to a three phase, four wire mains supply. For alternative wiring topologies, see the section entitled *Alternate Topology Wiring Diagrams* elsewhere in this document.

	Pin No	Description	Cable Size	Notes
V2	38	Mains L1 (R) Voltage Sensing	1.0 mm² AWG 18	Connect to mains L1 (R) output (AC) (Recommend 2 A fuse)
	39	Mains L2 (S) Voltage Sensing	1.0 mm² AWG 18	Connect to mains L2 (S) output (AC) (Recommend 2 A fuse)
	40	Mains L3 (T) Voltage Sensing	1.0 mm² AWG 18	Connect to mains L3 (T) output (AC) (Recommend 2 A fuse)
	41	Mains Neutral (N) Input	1.0 mm² AWG 18	Connect to Mains Neutral terminal (AC)

3.2.6 CURRENT TRANSFORMERS

WARNING!: Do not disconnect this plug when the CTs are carrying current. Disconnection of the plug open circuits 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 module has a burden of 0.25 VA on the CT. Ensure the CT is rated for the burden of the module, the cable length being used and any other equipment sharing the CT. If in doubt, consult with the CT supplier.

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

	Pin No	Description	Cable Size	Notes
	42	CT Secondary for L1	2.5 mm² AWG 13	Connect to s1 secondary of L1 monitoring CT
	43	CT Secondary for L2	2.5 mm² AWG 13	Connect to s1 secondary of L2 monitoring CT
	44	CT Secondary for L3	2.5 mm² AWG 13	Connect to s1 secondary of L3 monitoring CT

NOTE: The function of terminals 45 to 47 changes depending upon what type of earth fault protection (if any) is being used:

	Topology	Pin No	Notes	Cable Size
	No earth fault measuring	45	DO NOT CONNECT	
		46	Connect to s2 of the CTs connected to L1,L2,L3,N	2.5mm² AWG 13
		47	DO NOT CONNECT	
	Restricted earth fault measuring	45	Connect to s2 of the CTs connected to L1,L2,L3,N	2.5mm² AWG 13
		46	Connect to s1 of the CT on the neutral conductor	2.5mm² AWG 13
		47	DO NOT CONNECT	
	Un-restricted earth fault measuring (Earth fault CT is fitted in the neutral to earth link)	45	Connect to s2 of the CT on the neutral to earth link.	2.5mm² AWG 13
		46	Connect to s1 of the CT on the neutral to earth link. Also connect to the s2 of CTs connected to L1, L2, L3.	2.5mm² AWG 13
		47	DO NOT CONNECT	

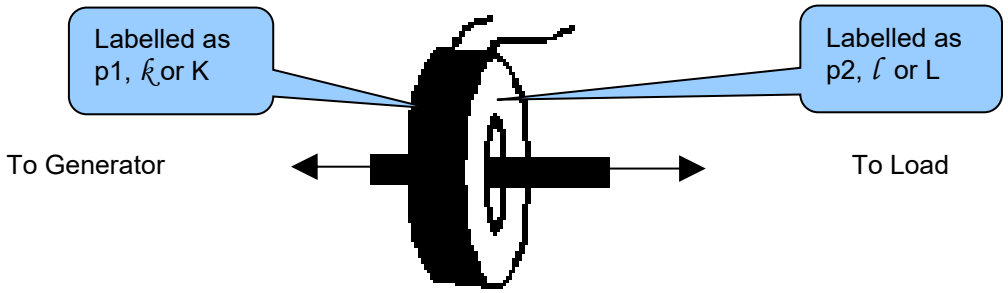
3.2.6.1 CT CONNECTIONS

p1, k or K is the primary of the CT that 'points' towards the Generator

p2, l or L is the primary of the CT that 'points' towards the Load

s1 is the secondary of the CT that connects to the DSE Module's input for the CT measuring

s2 is the secondary of the CT that should be commoned with the s2 connections of all the other CTs and connected to the CT common terminal of the module.



Polarity of CT Primary

3.2.7 DIGITAL INPUTS

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSE7300 Configuration Suite PC Software Manual.*

	Pin No	Description	Cable Size	Notes
	48	Configurable Digital Input A	0.5 mm² AWG 20	Switch To Negative
	49	Configurable Digital Input B	0.5 mm² AWG 20	Switch To Negative
	50	Configurable Digital Input C	0.5 mm² AWG 20	Switch To Negative
	51	Configurable Digital Input D	0.5 mm² AWG 20	Switch To Negative
	52	Configurable Digital Input E	0.5 mm² AWG 20	Switch To Negative
	53	Configurable Digital Input F	0.5 mm² AWG 20	Switch To Negative
	54	Configurable Digital Input G	0.5 mm² AWG 20	Switch To Negative
	55	Configurable Digital Input H	0.5 mm² AWG 20	Switch To Negative

3.2.8 RS485

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

NOTE: A 120 Ω termination resistor must be fitted across terminals A and B if the DSE module is the first or last device on the R485 link.

NOTE: Screened 120 Ω impedance cable specified for use with RS485 must be used for the RS485 link.
DSE stock and supply Belden cable 9841 which is a high quality 120 Ω impedance cable suitable for CAN use (DSE part number 016-030).

	Pin No	Description	Cable Size	Notes
RS485	56	RS485 Port Screen	Shield	Use only 120 Ω CAN or RS485 approved cable
	57	RS485 Port B (+)	0.5 mm² AWG 20	Connect to RXD+ and TXD+ Use only 120 Ω CAN or RS485 approved cable
	56	RS485 Port A (-)	0.5 mm² AWG 20	Connect to RXD- and TXD- Use only 120 Ω CAN or RS485 approved cable

3.2.9 USB SERVER (PC CONFIGURATION) CONNECTOR

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

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.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

	Description	Cable Size	Notes
	Socket for connection to PC with DSE Configuration Suite Software	0.5 mm² AWG 20	This is a standard USB type A to type B connector. 

3.3 TYPICAL WIRING DIAGRAM

As every system has different requirements, these diagrams show only a typical system and do not intend to show a complete system.

Genset manufacturers and panel builders may use these diagrams as a starting point; however always refer to the completed system diagram provided by the system manufacturer for complete wiring detail.

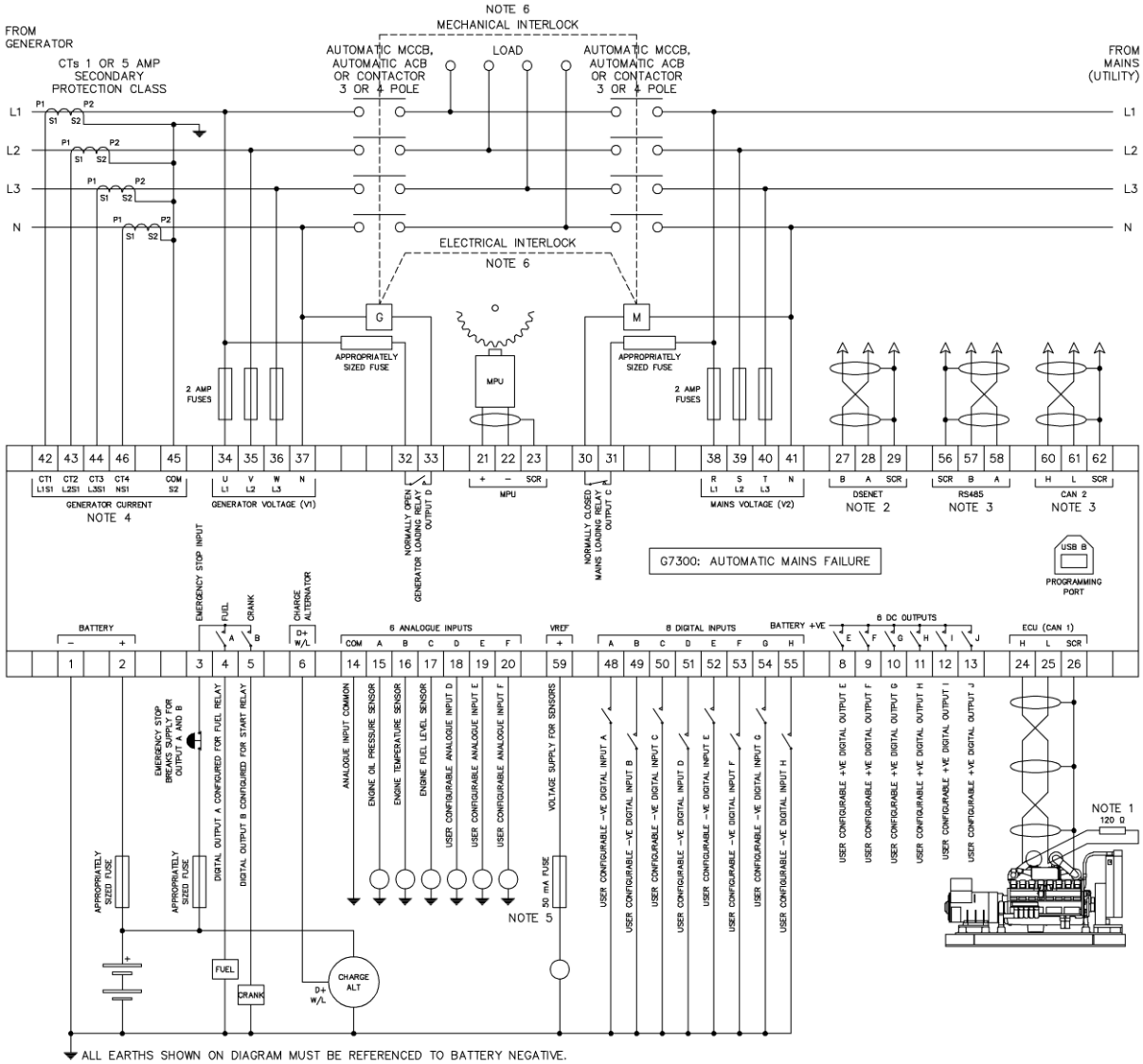
Further wiring suggestions are available in the following DSE publications, available at www.deepseaelectronics.com to website members.

DSE Part	Description
056-005	Using CTs With DSE Products
056-022	Breaker Control
056-091	Equipotential Earth Bonding
056-092	Best Practices for Wiring Resistive Sensors

3.3.1 DSEG7300 AUTO MAINS FAILURE

NOTE: The below diagram applies to a 3-phase 4-wire star system.
Other AC topologies (including 4-wire delta variants) require different wiring. For further details of module configuration to suit these different topologies, refer to DSE Publication: ***057-388 DSEG7300 Configuration Suite PC Software Manual.***

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).



NOTE 1: A 120 Ω TERMINATION RESISTOR MAY BE REQUIRED EXTERNALLY, REFER TO ENGINE MANUFACTURER'S LITERATURE.

NOTE 2. MUST BE FITTED AS FIRST OR LAST UNIT ON DSENET WITH NO TERMINATION RESISTOR. THE SUBSEQUENT FIRST OR LAST UNIT ON DSENET MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE A AND B TERMINALS.

NOTE 3. IF THE MODULE IS FIRST OR LAST UNIT ON THE LINK, IT MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE A AND B, OR H AND L TERMINALS.

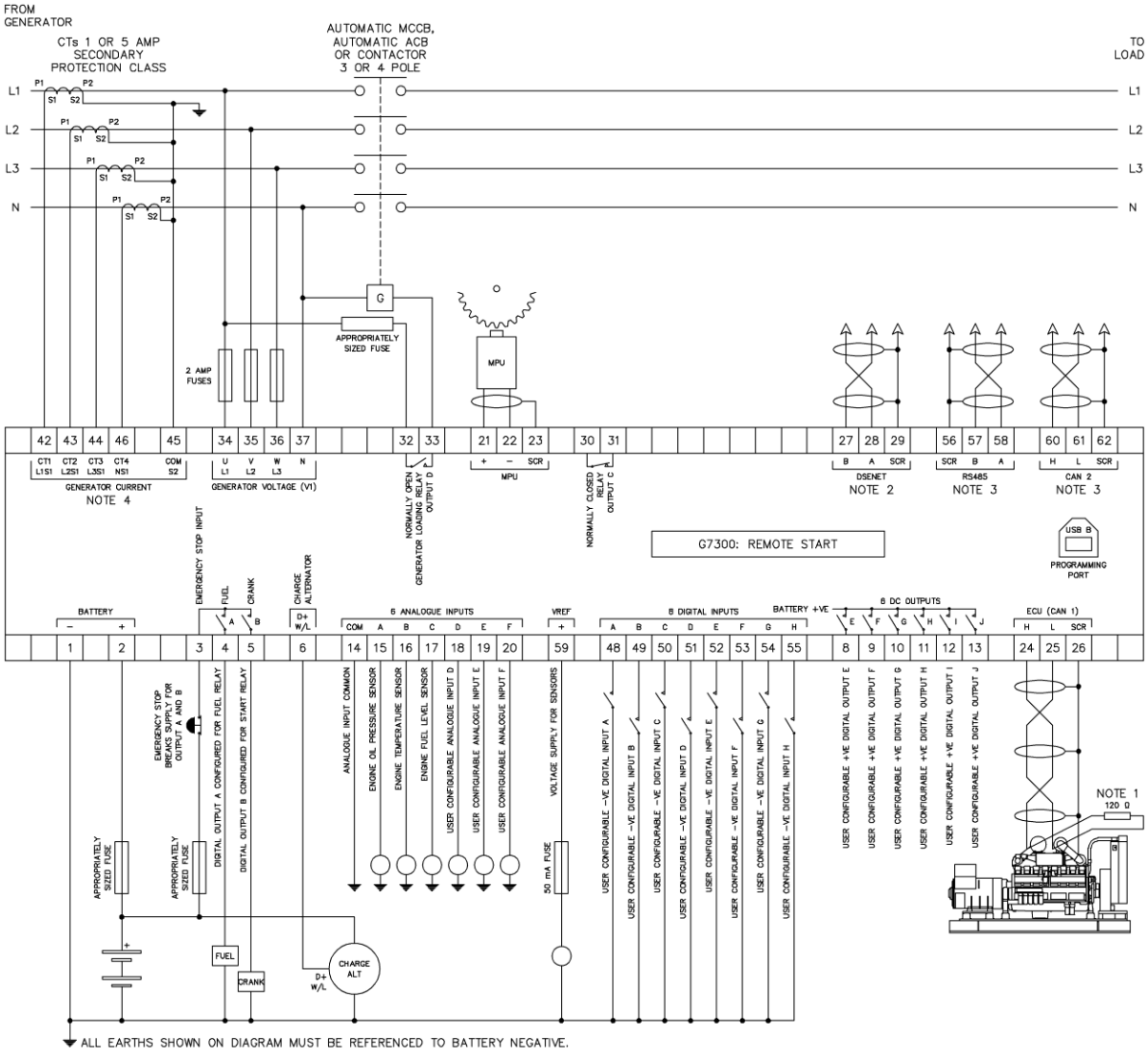
NOTE 4. WHEN THE 4TH CT IS PLACED ON THE NEUTRAL, TERMINAL 48 IS THE CT COMMON. WHEN THE 4TH IS NOT IN USE OR PLACED ON THE EARTH CONNECTION, TERMINAL 49 IS THE CT COMMON

NOTE 5: FUSE AS CLOSE TO THE DSE MODULE'S TERMINAL AS POSSIBLE.

NOTE 6: IT IS RECOMMENDED THAT THE GENERATOR AND MAINS SWITCHGEAR ARE MECHANICALLY AND ELECTRICALLY INTERLOCKED.

3.3.2 DSEG7300 REMOTE START

NOTE: For further details of module configuration to suit these different topologies, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*



NOTE 1: A 120 Ω TERMINATION RESISTOR MAY BE REQUIRED EXTERNALLY, REFER TO ENGINE MANUFACTURER'S LITERATURE.

NOTE 2. MUST BE FITTED AS FIRST OR LAST UNIT ON DSENET WITH NO TERMINATION RESISTOR. THE SUBSEQUENT FIRST OR LAST UNIT ON DSENET MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE A AND B TERMINALS.

NOTE 3. IF THE MODULE IS FIRST OR LAST UNIT ON THE LINK, IT MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE A AND B, OR H AND L TERMINALS.

NOTE 4. WHEN THE 4TH CT IS PLACED ON THE NEUTRAL, TERMINAL 48 IS THE CT COMMON. WHEN THE 4TH IS NOT IN USE OR PLACED ON THE EARTH CONNECTION, TERMINAL 49 IS THE CT COMMON

NOTE 5: FUSE AS CLOSE TO THE DSE MODULE'S TERMINAL AS POSSIBLE.

3.3.3 EARTH SYSTEMS

3.3.3.1 NEGATIVE EARTH

The typical wiring diagrams located within this document show connections for a negative earth system (the battery negative connects to Earth).

3.3.3.2 POSITIVE EARTH

When using a DSE module with a Positive Earth System (the battery positive connects to Earth), the following points must be followed:

Follow the typical wiring diagram as normal for all sections ***except*** the earth points.
All points shown as Earth on the typical wiring diagram should connect to ***battery negative*** (not earth).

3.3.3.3 FLOATING EARTH

Where neither the battery positive nor battery negative terminals are connected to earth the following points must be followed:

Follow the typical wiring diagram as normal for all sections ***except*** the earth points.
All points shown as Earth on the typical wiring diagram should connect to ***battery negative*** (not earth).

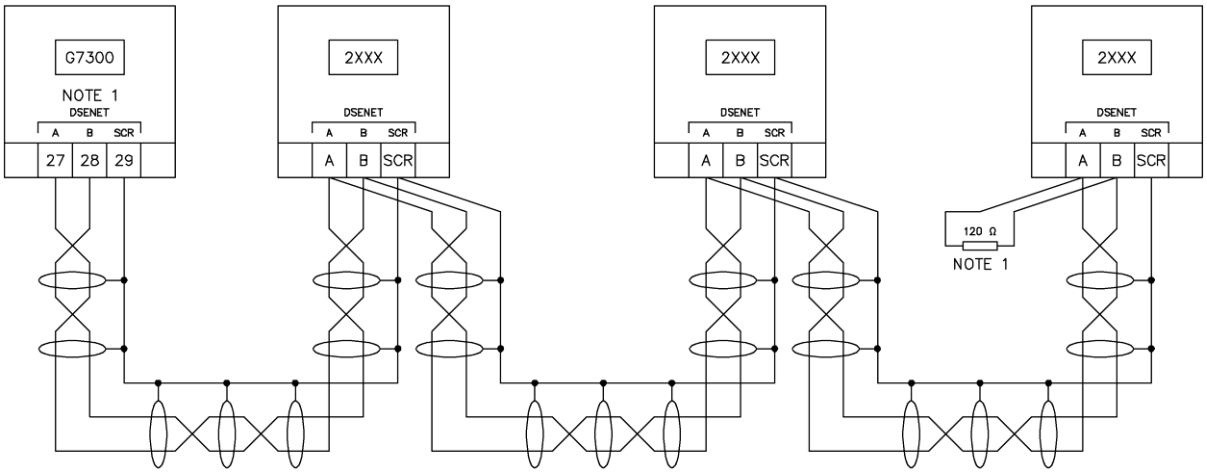
3.3.4 TYPICAL ARRANGEMENT OF DSENET®

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

NOTE: This feature is not available if the module has been configured to use the DSENet® port as the interface to a MODBUS engine ECU/ECM.

NOTE: Screened 120 Ω impedance cable specified for use with CAN must be used for the DSENet® (RS485) connection.
DSE stock and supply Belden cable 9841 which is a high quality 120 Ω impedance cable suitable for DSENet® use (DSE part number 016-030).

Device	Maximum Number Supported
DSE2130 Input Expansion	4
DSE2131 Ratiometric Input Expansion	4
DSE2133 RTD/Thermocouple Input Expansion	4
DSE2152 Analogue Output Expansion	4
DSE2157 Relay Output Expansion	4
DSE2160 Input Expansion	4
DSE2548 LED Expansion	4
DSE Intelligent Battery Chargers	2

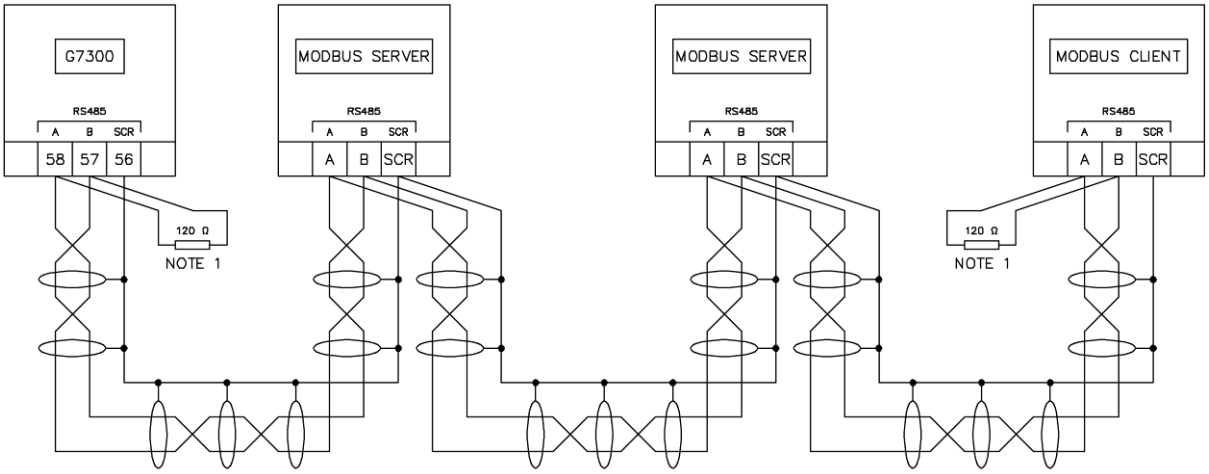


NOTE 1: MUST BE FITTED AS FIRST OR LAST UNIT ON DSENET WITH NO TERMINATION RESISTOR. THE SUBSEQUENT FIRST OR LAST UNIT ON DSENET MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE A AND B TERMINALS.

3.3.5 TYPICAL ARRANGEMENT OF RS485 PORT

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

Typically the RS485 port on the module is used for connection to different external devices via Modbus depending upon module configuration.



NOTE 1: THE FIRST AND LAST MODULE ON THE RS485 LINK MUST HAVE A 120 Ω TERMINATION RESISTOR FITTED ACROSS THE A AND B TERMINALS

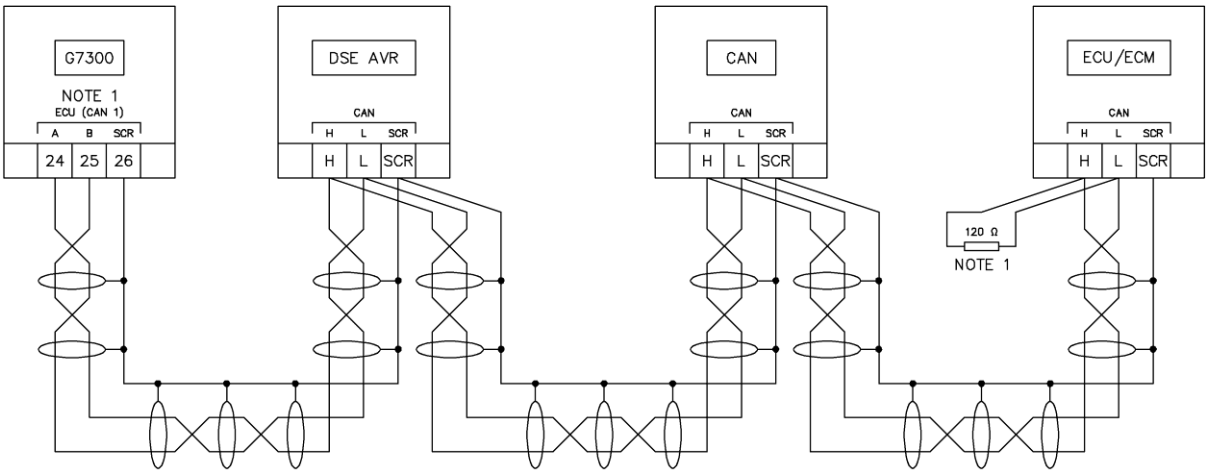
3.3.7 TYPICAL ARRANGEMENT OF CAN

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

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

3.3.7.1 CAN 1 PORT

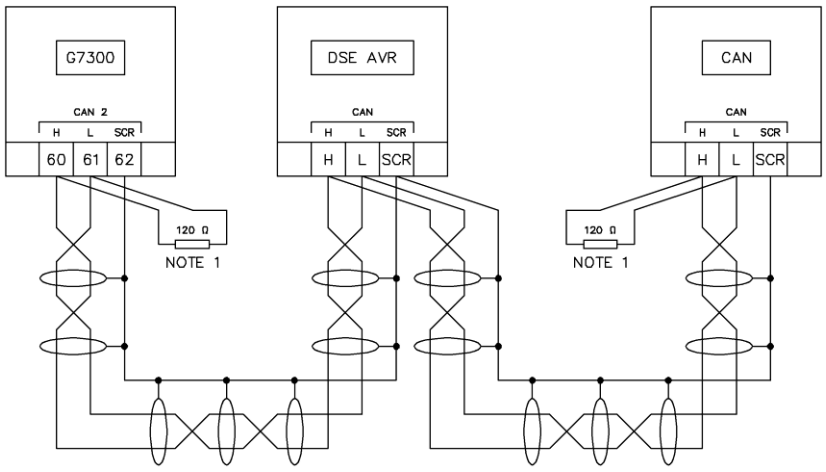
Typically the CAN 1 port on the module is used for connection to an engine ECU/ECM though depending upon module configuration, may be connected to additional CAN devices.



NOTE 1: MUST BE FITTED AS FIRST OR LAST UNIT ON THE CANBUS LINK WITH NO TERMINATION RESISTOR. THE SUBSEQUENT FIRST OR LAST UNIT ON THE CANBUS LINK MUST BE FITTED WITH A 120 Ω TERMINATION RESISTOR ACROSS THE H AND L TERMINALS.

3.3.7.2 CAN 2 PORT

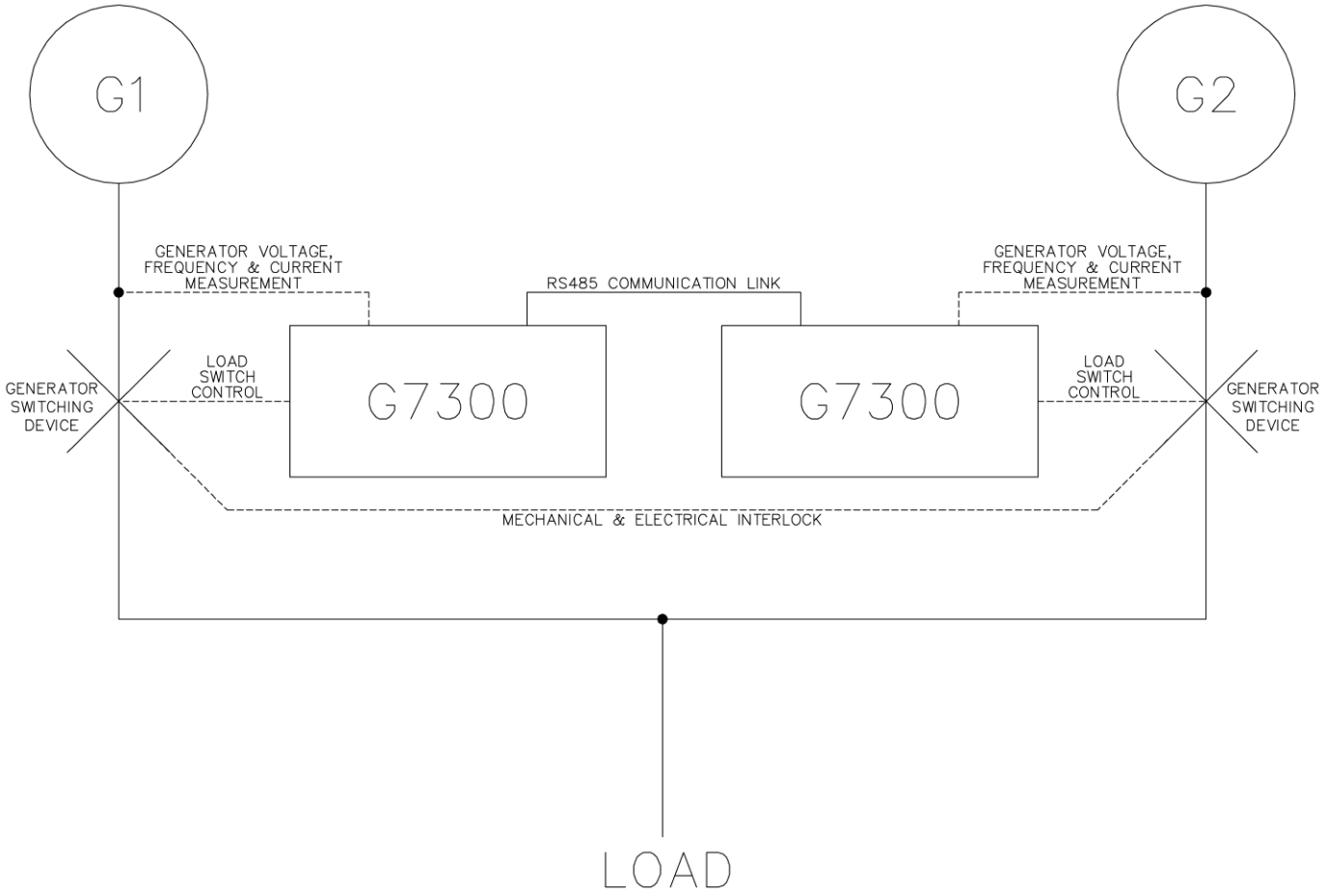
The CAN 2 port provides an additional configurable CAN interface for connection to external CAN devices. Depending on system configuration, supported devices (e.g. AVRs) may be connected to either CAN port.



NOTE 1: THE FIRST AND LAST MODULE ON THE CANBUS LINK MUST HAVE A 120 Ω TERMINATION RESISTOR FITTED ACROSS THE H AND L TERMINALS

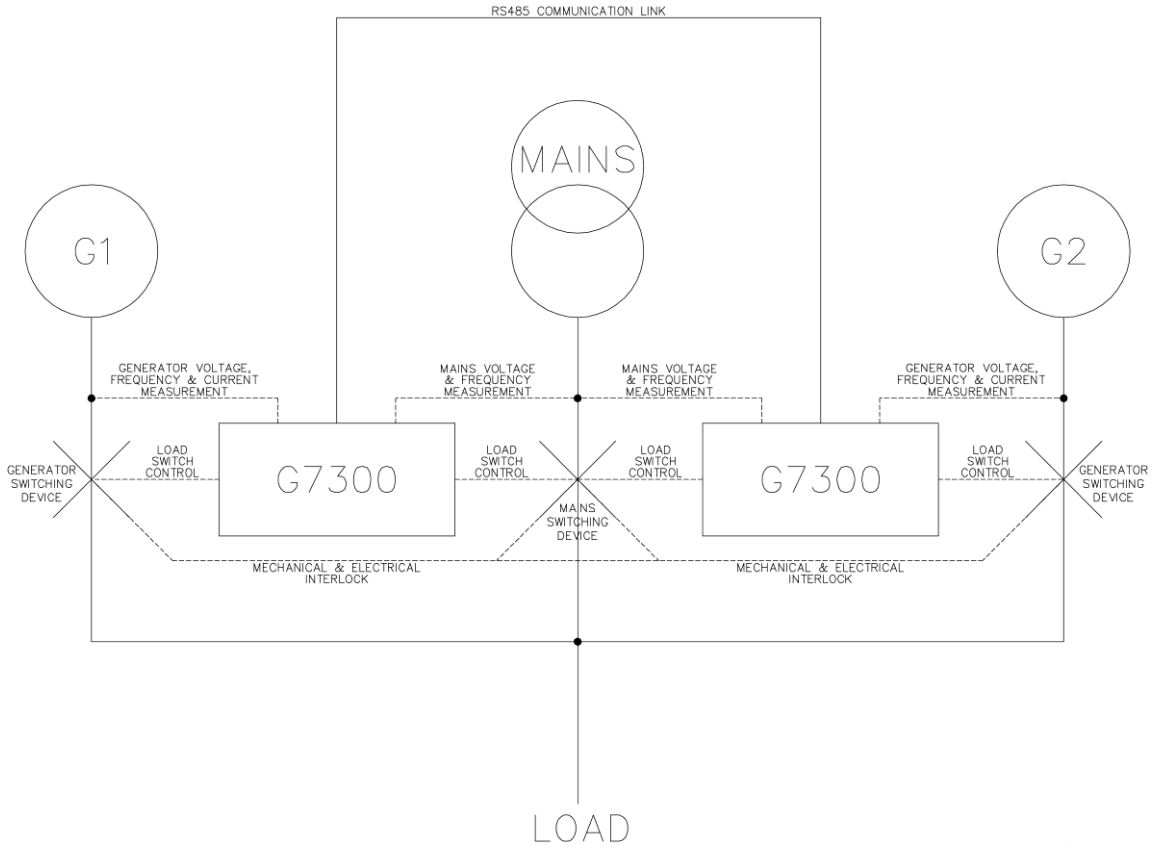
3.3.8 DUAL MUTUAL STANDBY SINGLE LINE DIAGRAMS

3.3.8.1 TWO DSEG7300



3.3.8.2 TWO DSEG7300

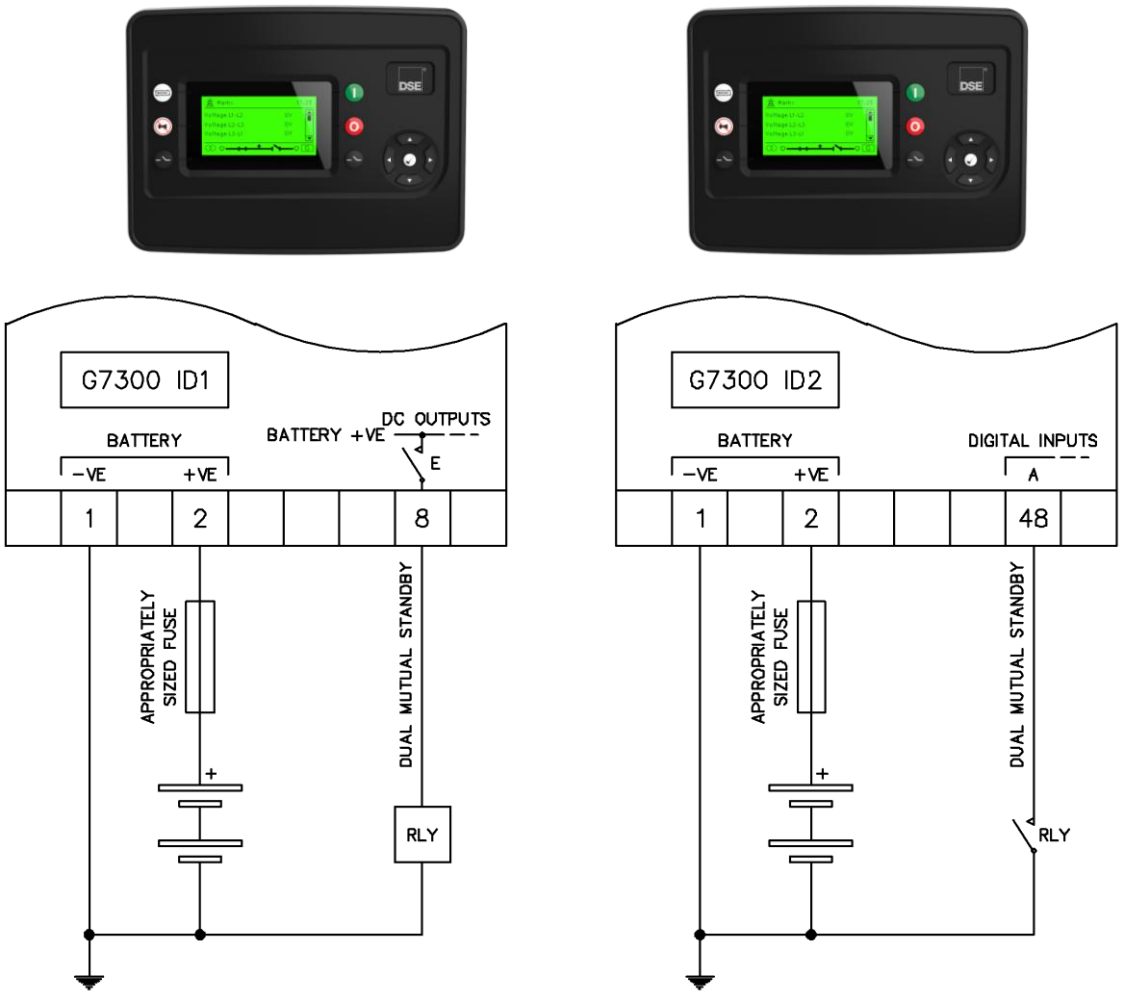
NOTE: Mains load switch control signals are required from both DSEG7300. However, only one DSEG7300 controls the mains load switch at any time to avoid conflicting control signals. For more details refer to the section entitled *Operation (Dual Mutual Standby)* elsewhere in this document.



3.3.8.3 TWO DSEG7300 USING DIGITAL INPUTS AND OUTPUTS

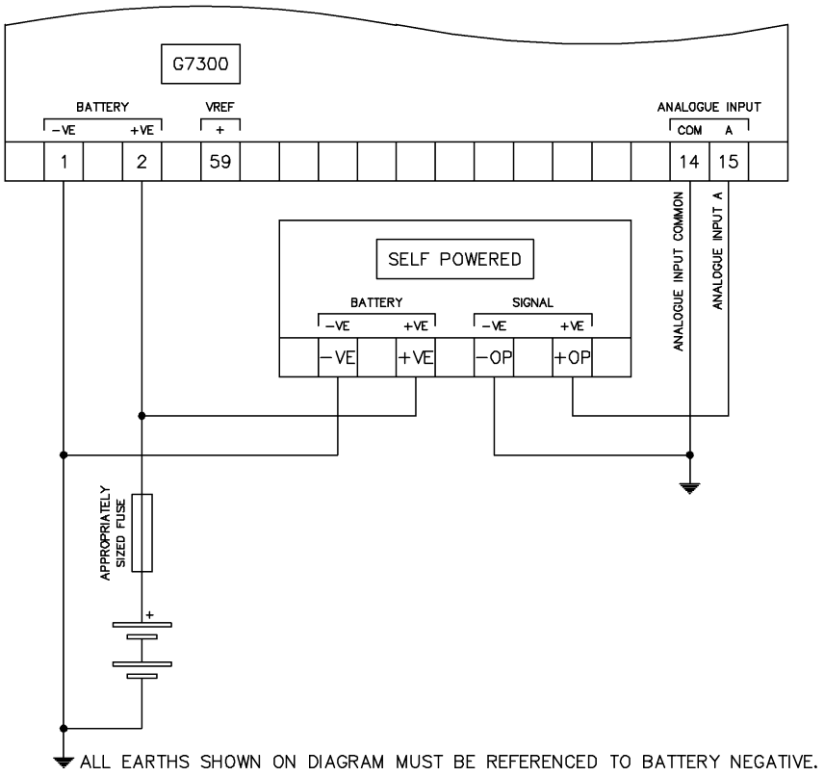
NOTE: The *Dual Mutual Standby* input or output functions are configured on any of the DSEG7300 module's Digital Inputs or Digital Outputs.

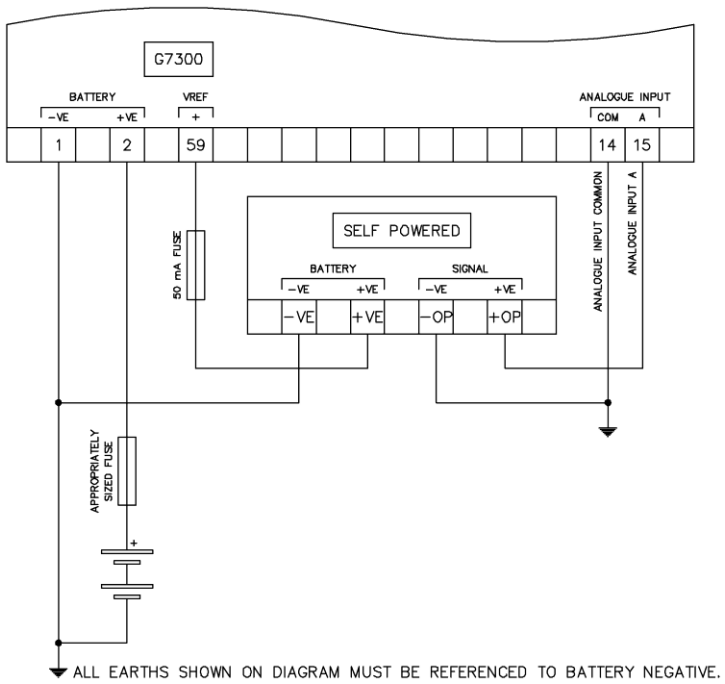
The hardwired input and output signals between the controllers are used to provide a failsafe for the system. In the event of a module being out of service (battery removed), communication failure or generator failure, the output of that controller de-energises, giving the ok to run signal to the other controller.



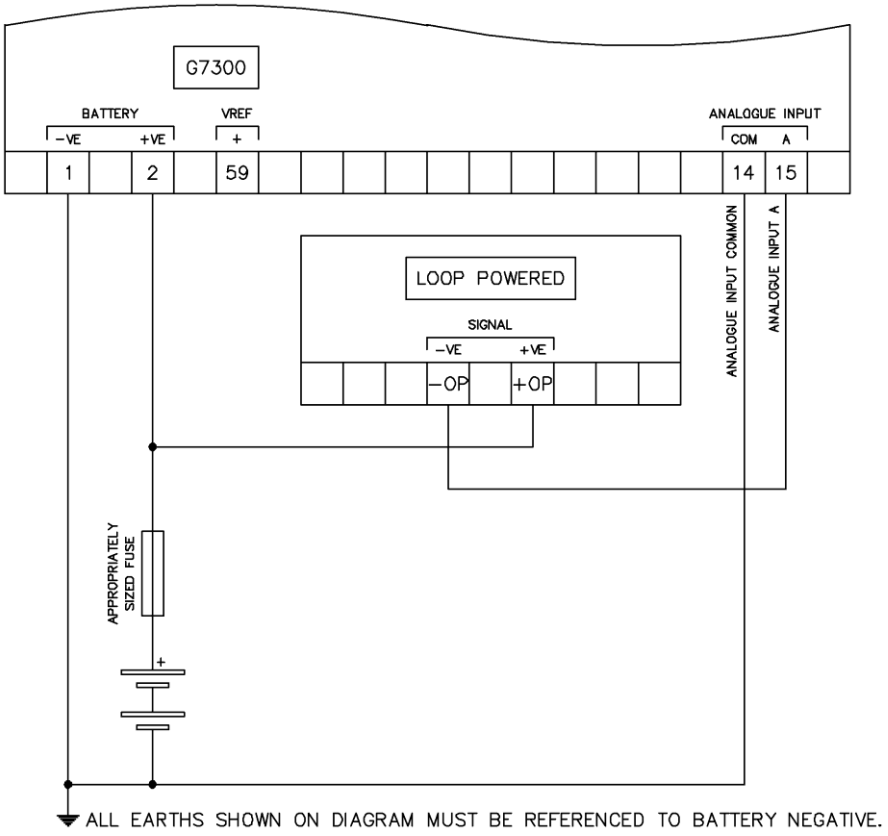
3.4 ALTERNATE TOPOLOGY WIRING DIAGRAMS

3.4.1 SELF POWERED SENSOR





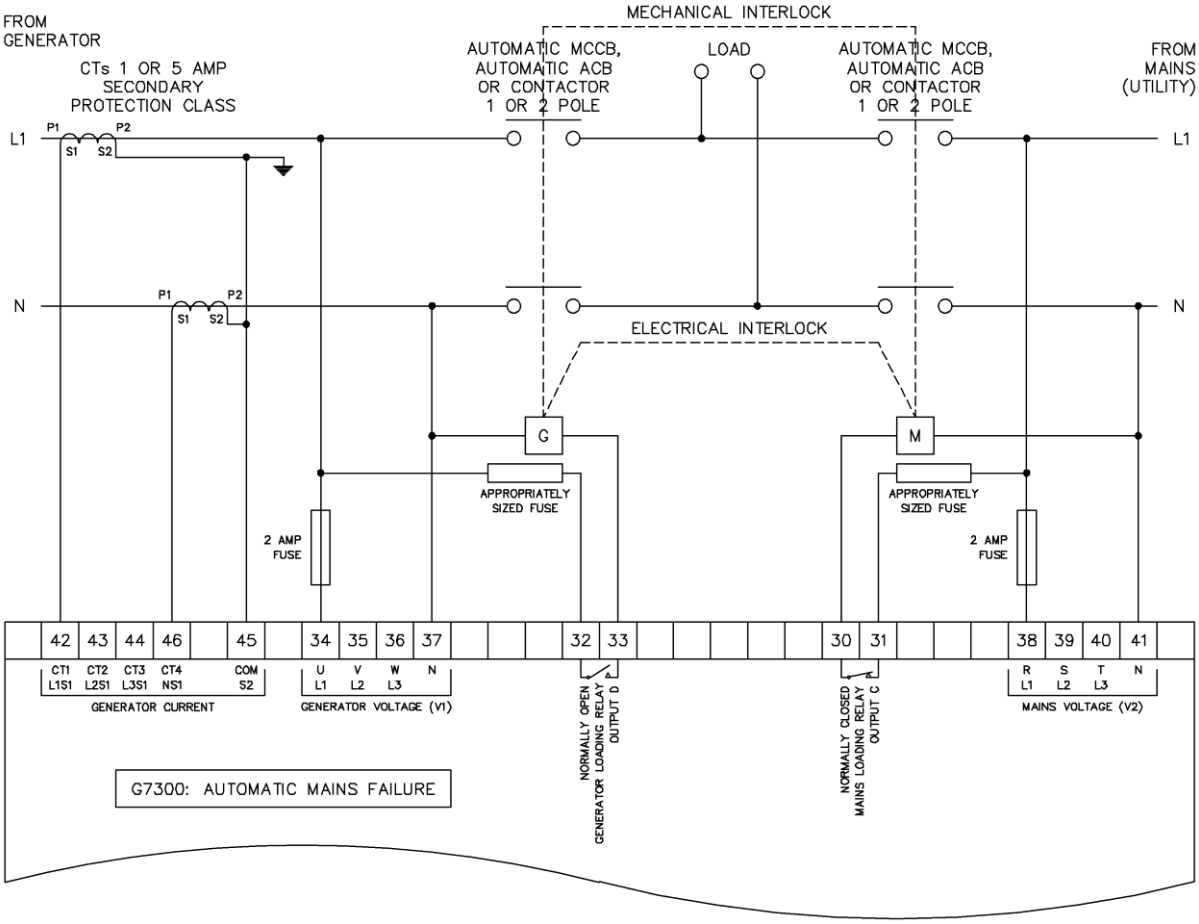
3.4.2 LOOP POWERED 4-20MA SENSOR



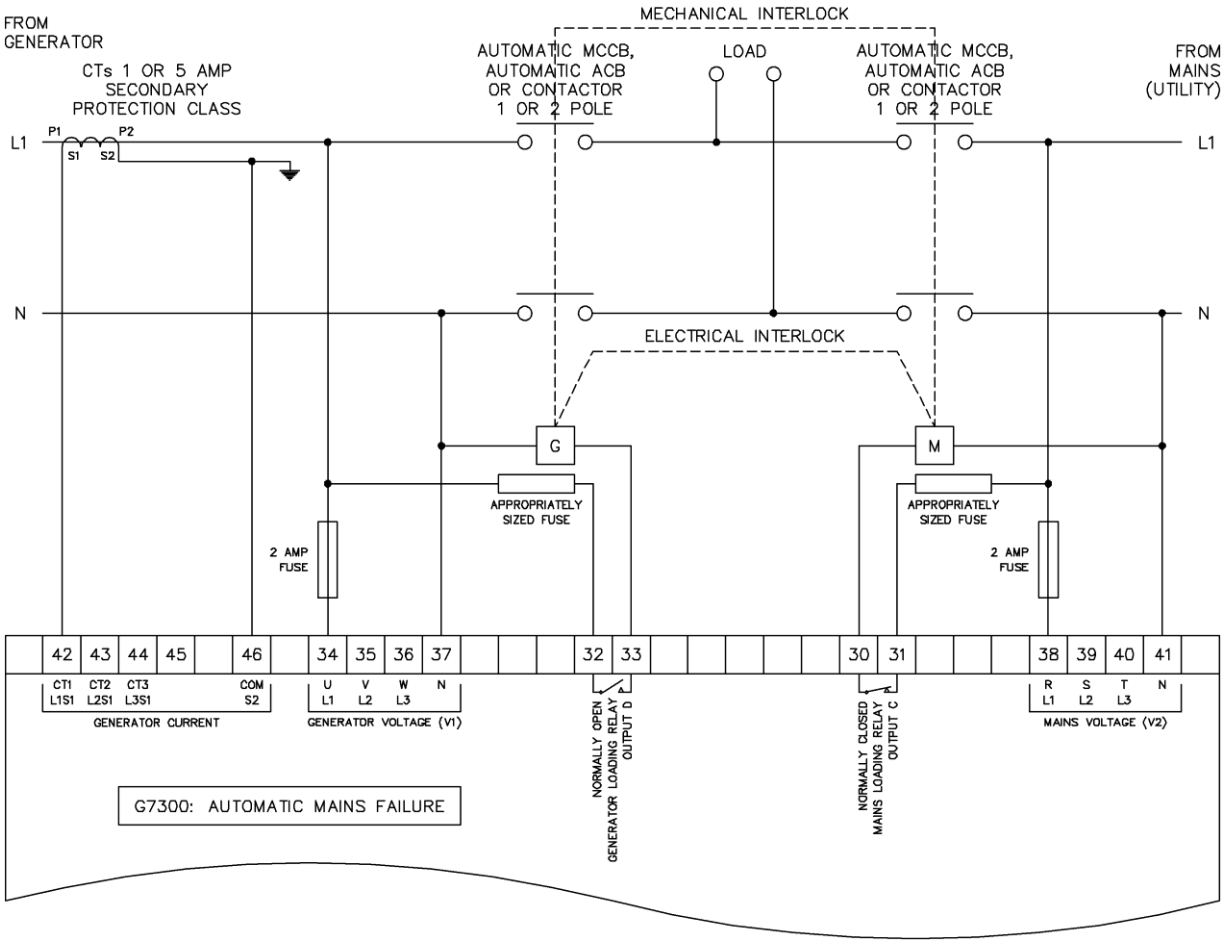
3.4.3 AUTOMATIC MAINS FAILURE

3.4.3.1 SINGLE PHASE 2 WIRE WITH RESTRICTED EARTH FAULT

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).

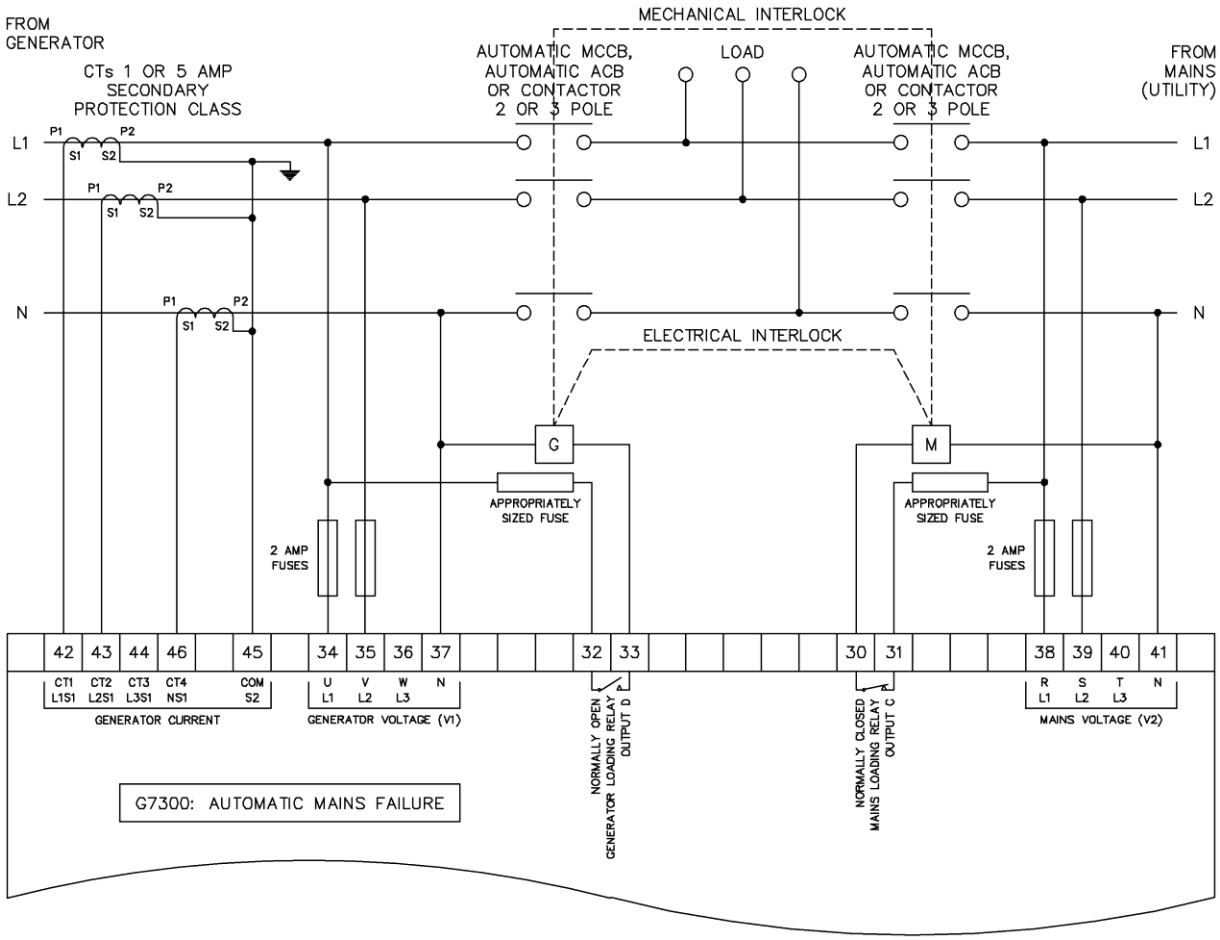


3.4.3.2 SINGLE PHASE 2 WIRE WITHOUT RESTRICTED EARTH FAULT

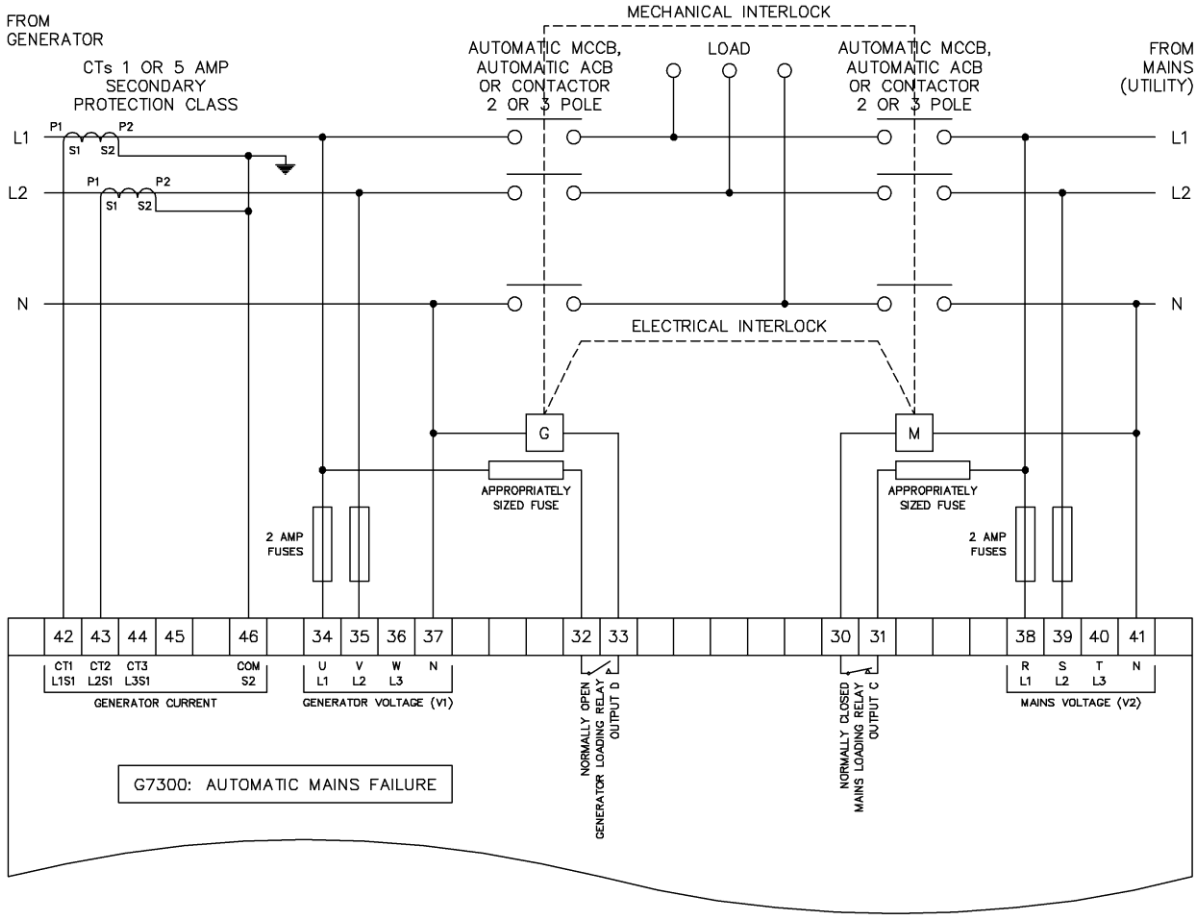


3.4.3.3 SINGLE PHASE (L1 & L2) 3 WIRE WITH RESTRICTED EARTH FAULT

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).

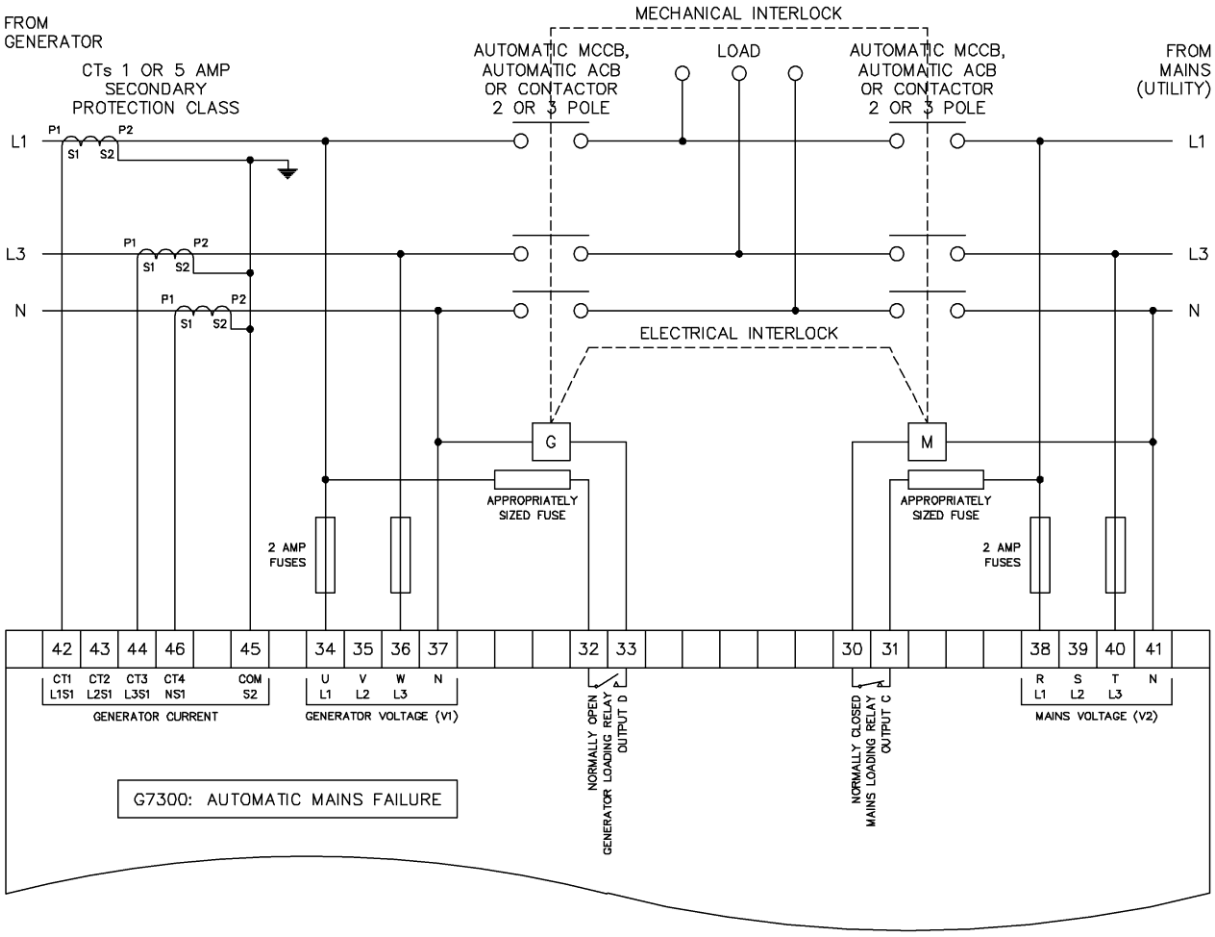


3.4.3.4 SINGLE PHASE (L1 & L2) 3 WIRE WITHOUT RESTRICTED EARTH FAULT

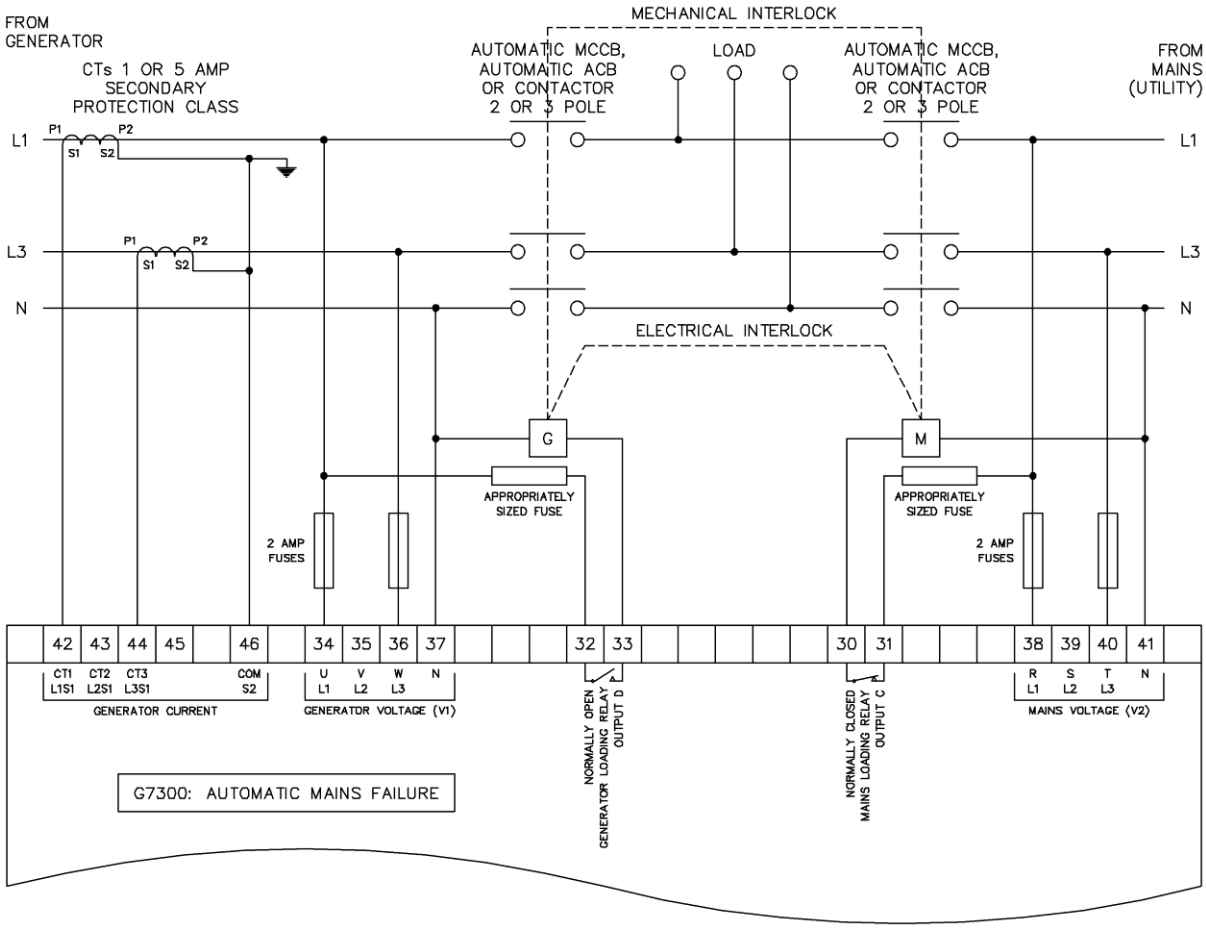


3.4.3.5 SINGLE PHASE (L1 & L3) 3 WIRE WITH RESTRICTED EARTH FAULT

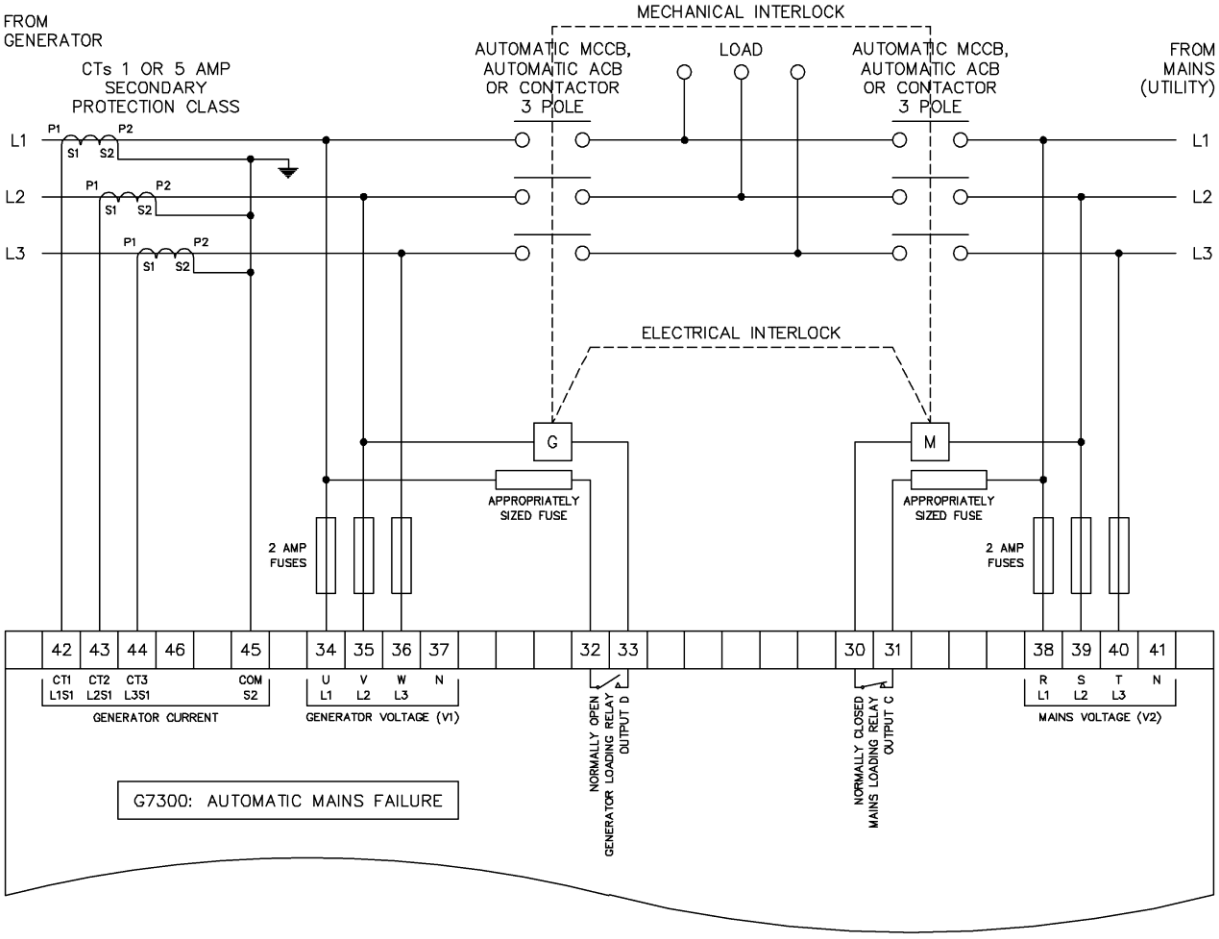
NOTE: Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT).
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator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



3.4.3.6 SINGLE PHASE (L1 & L3) 3 WIRE WITHOUT RESTRICTED EARTH FAULT



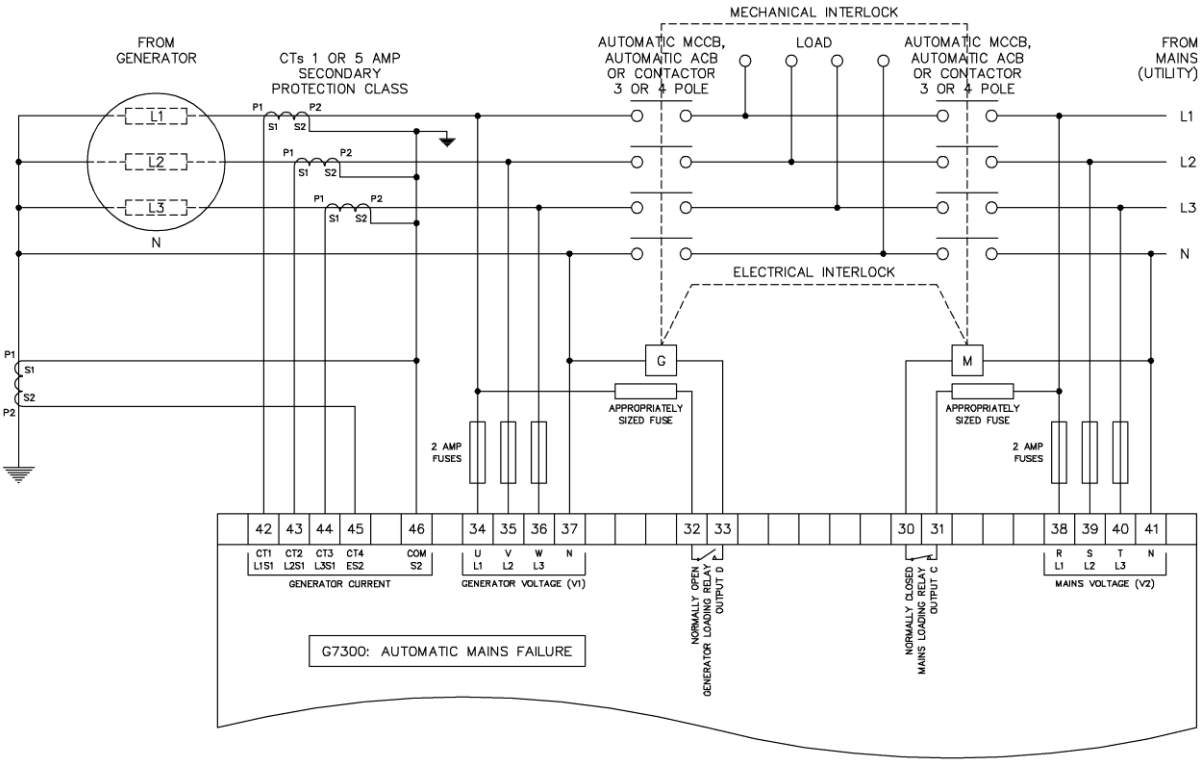
3.4.3.7 3 PHASE (L1, L2 & L3) 3 WIRE DETLA WITHOUT RESTRICTED EARTH FAULT



3.4.3.8 3 PHASE 4 WIRE WITH RESTRICTED EARTH FAULT

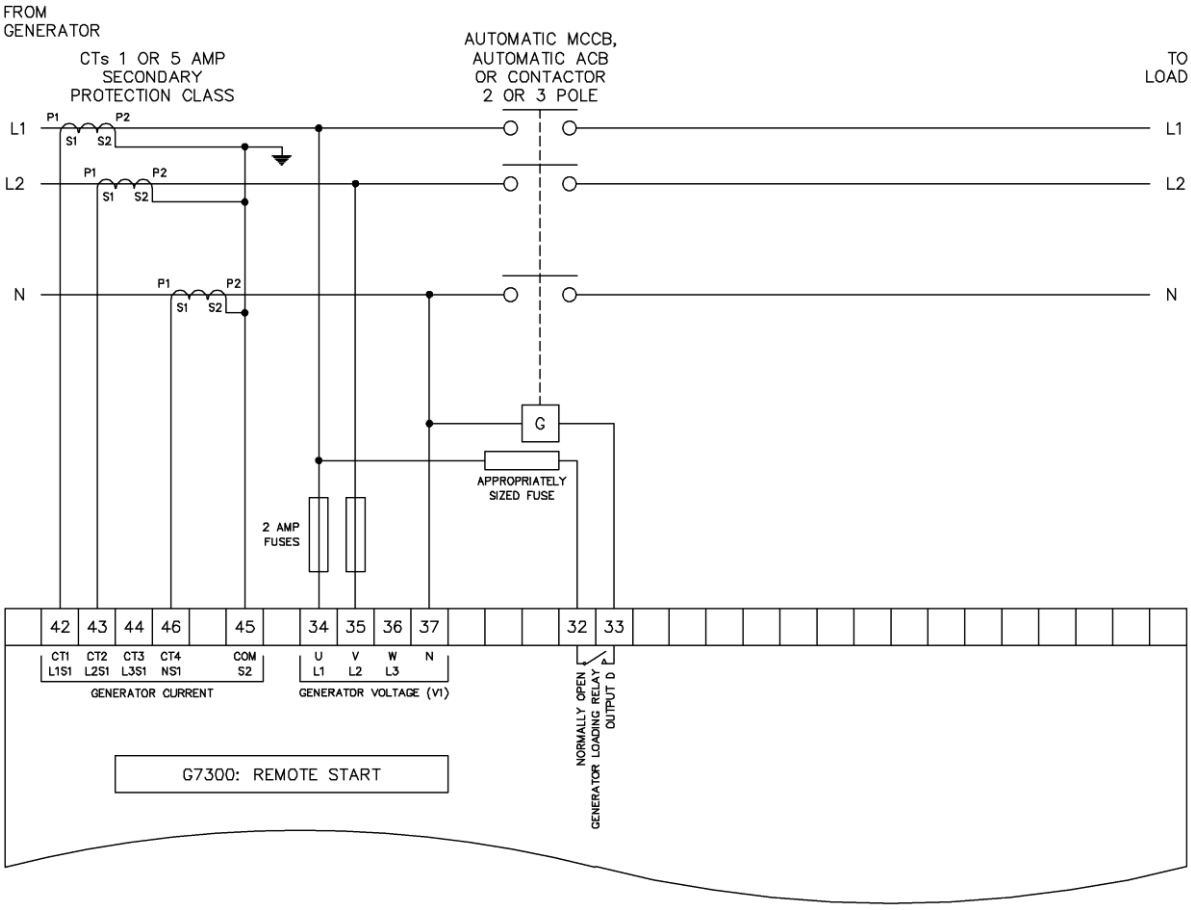
NOTE: The below diagram is applicable for the following AC topologies: 3 Phase 4 Wire Star, 3 Phase 4 Wire Delta L1-N-L2, 3 Phase 4 Wire Delta L1-N-L3 and 3 Phase 4 Wire Delta *L2-N-L3*. For further details of module configuration to suit these different topologies, refer to DSE Publication: *057-388 DSE7300 Configuration Suite PC Software Manual.*

This example shows the CTs in the neutral to earth link for a three phase four wire system to provide unrestricted earth fault protection, but the same philosophy is applicable to the other topologies.

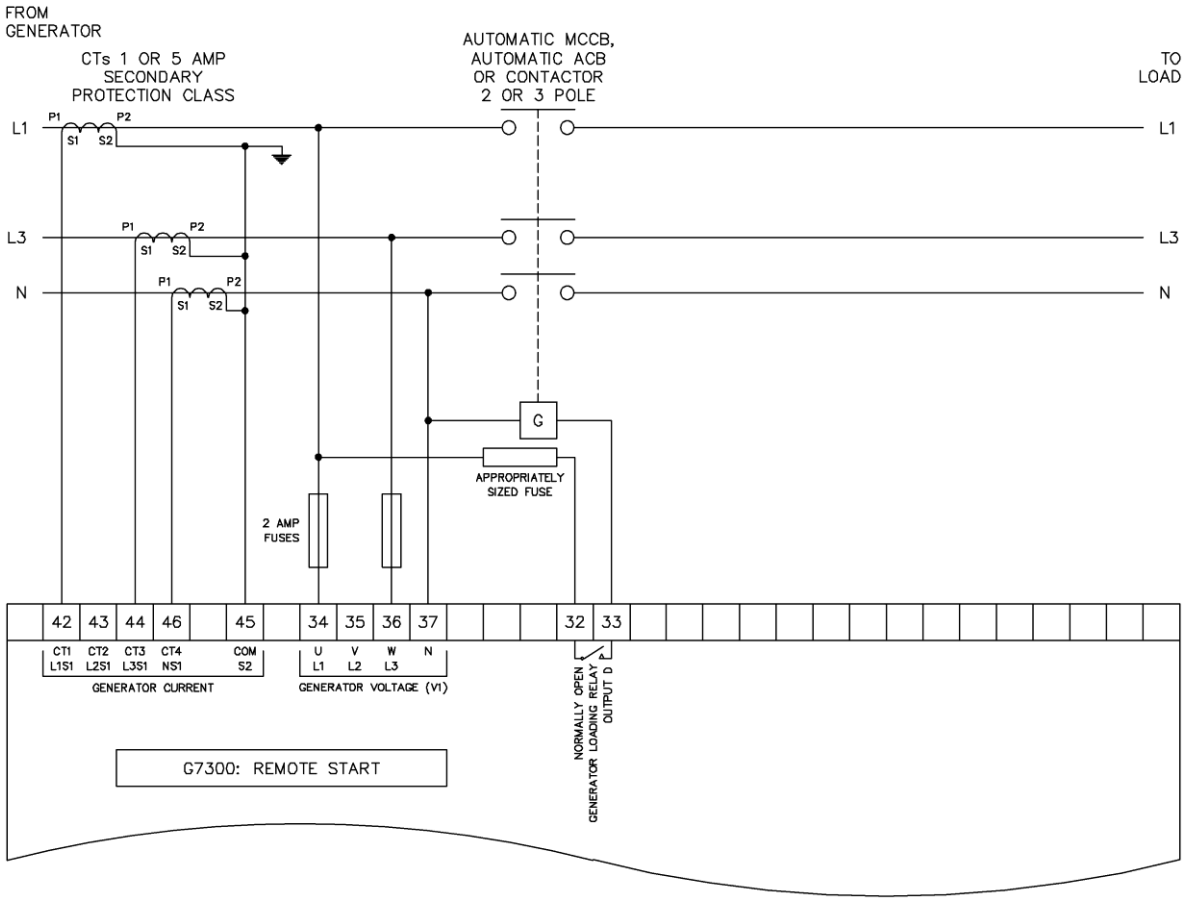


3.4.4 REMOTE START

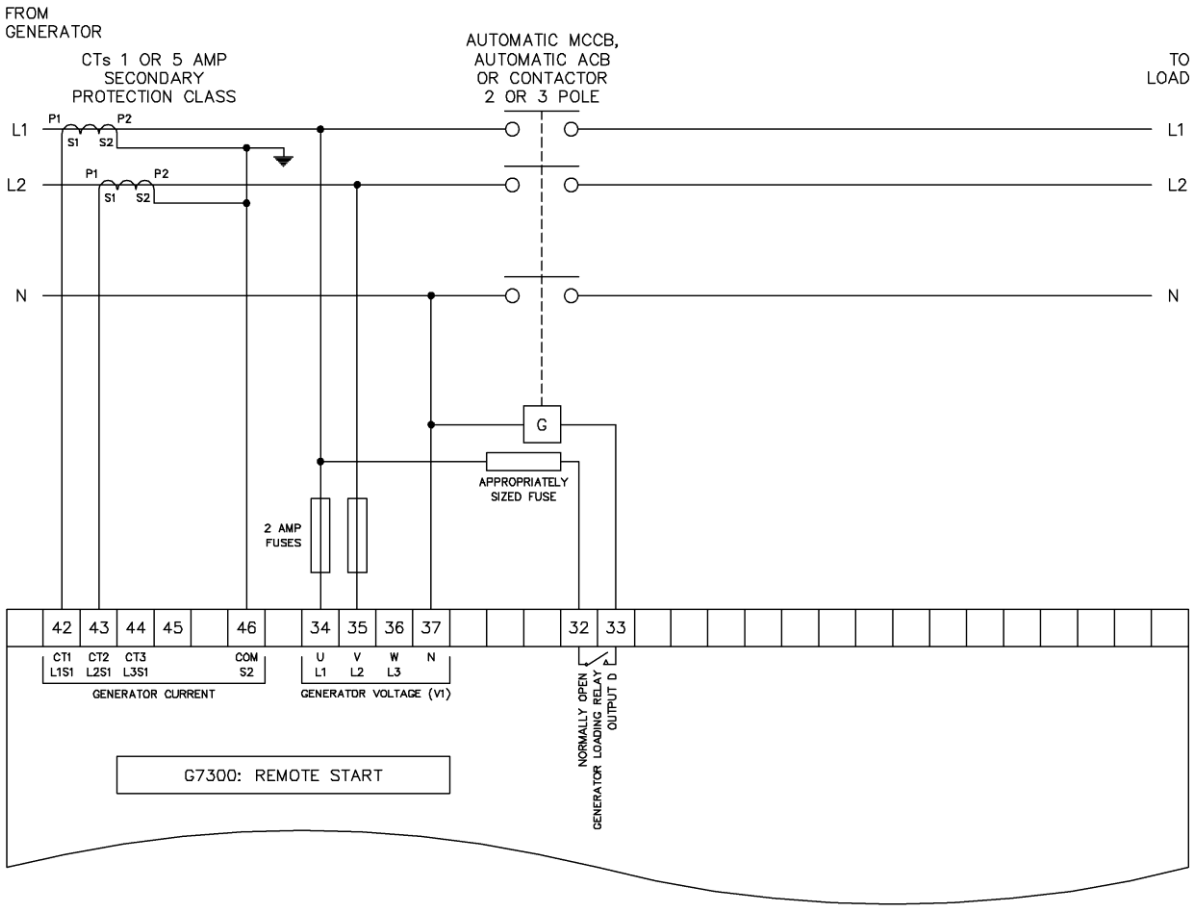
3.4.4.1 SINGLE PHASE (L1 & L2) WITH RESTRICTED EARTH FAULT



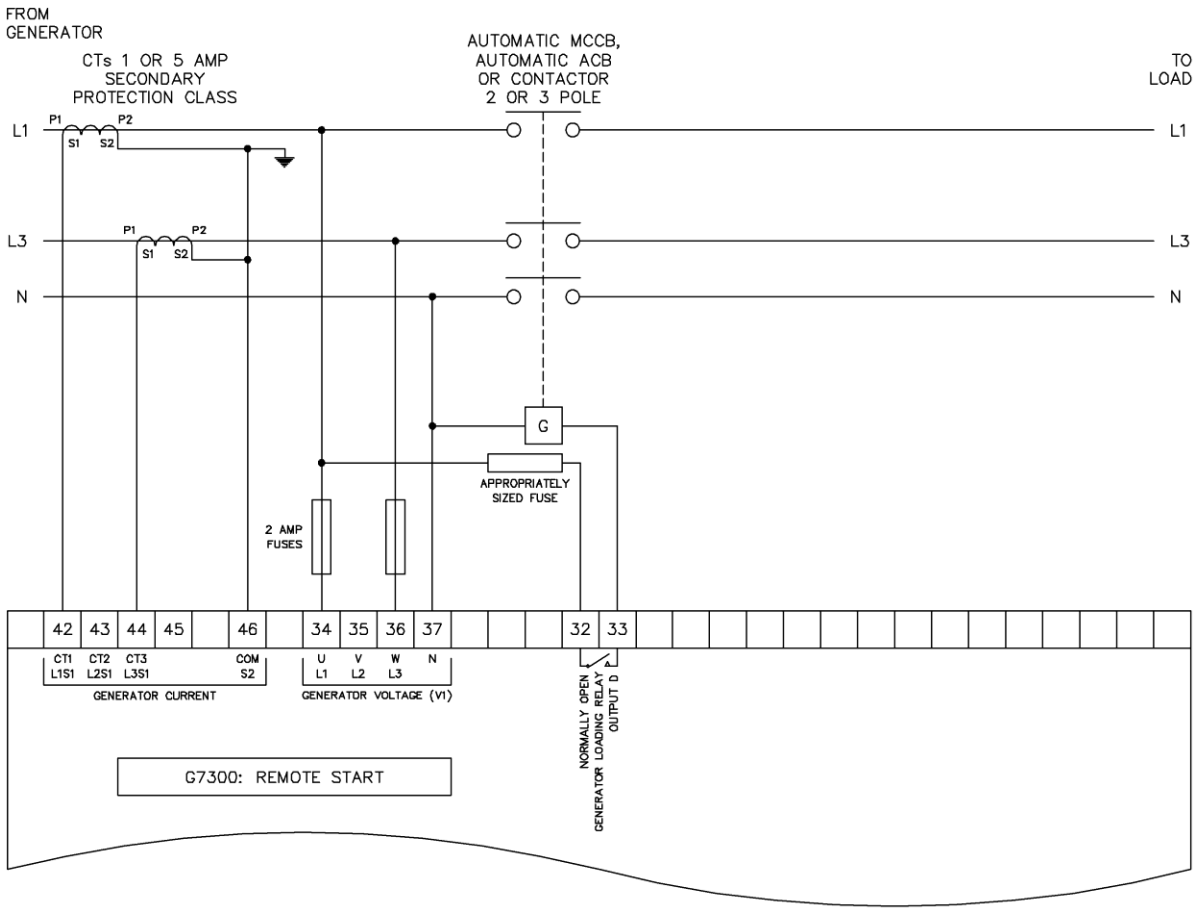
3.4.4.2 SINGLE PHASE (L1, L3) WITH RESTRICTED EARTH FAULT



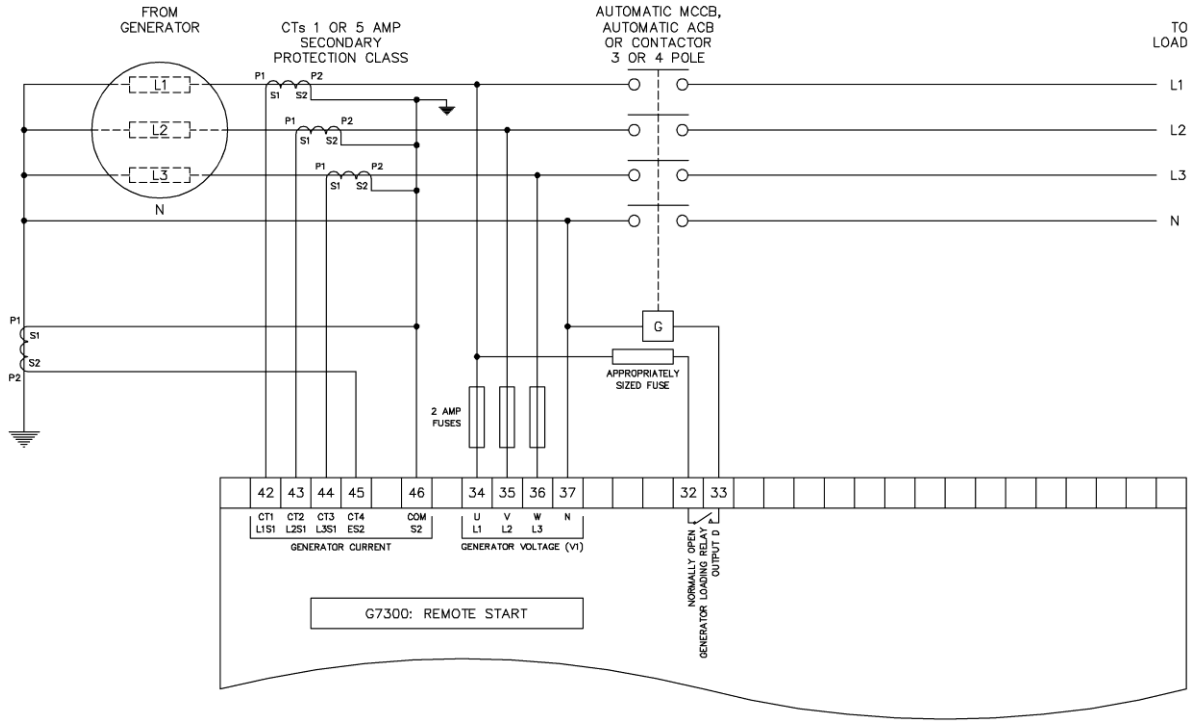
3.4.4.3 SINGLE PHASE (L1, L2) WITHOUT RESTRICTED EARTH FAULT



3.4.4.4 SINGLE PHASE (L1, L3) WITHOUT RESTRICTED EARTH FAULT

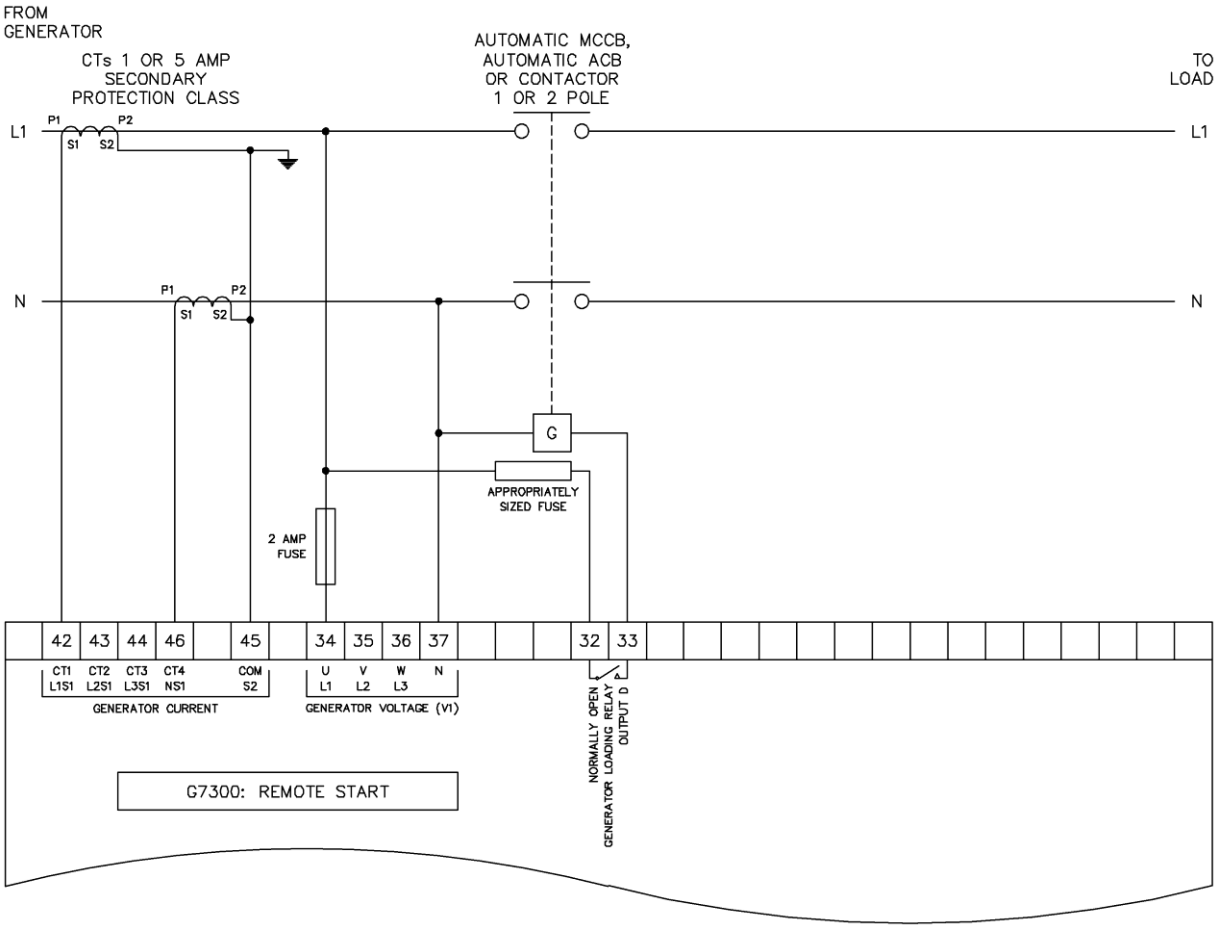


3.4.4.5 3 PHASE 4 WIRE WITH RESTRICTED EARTH FAULT

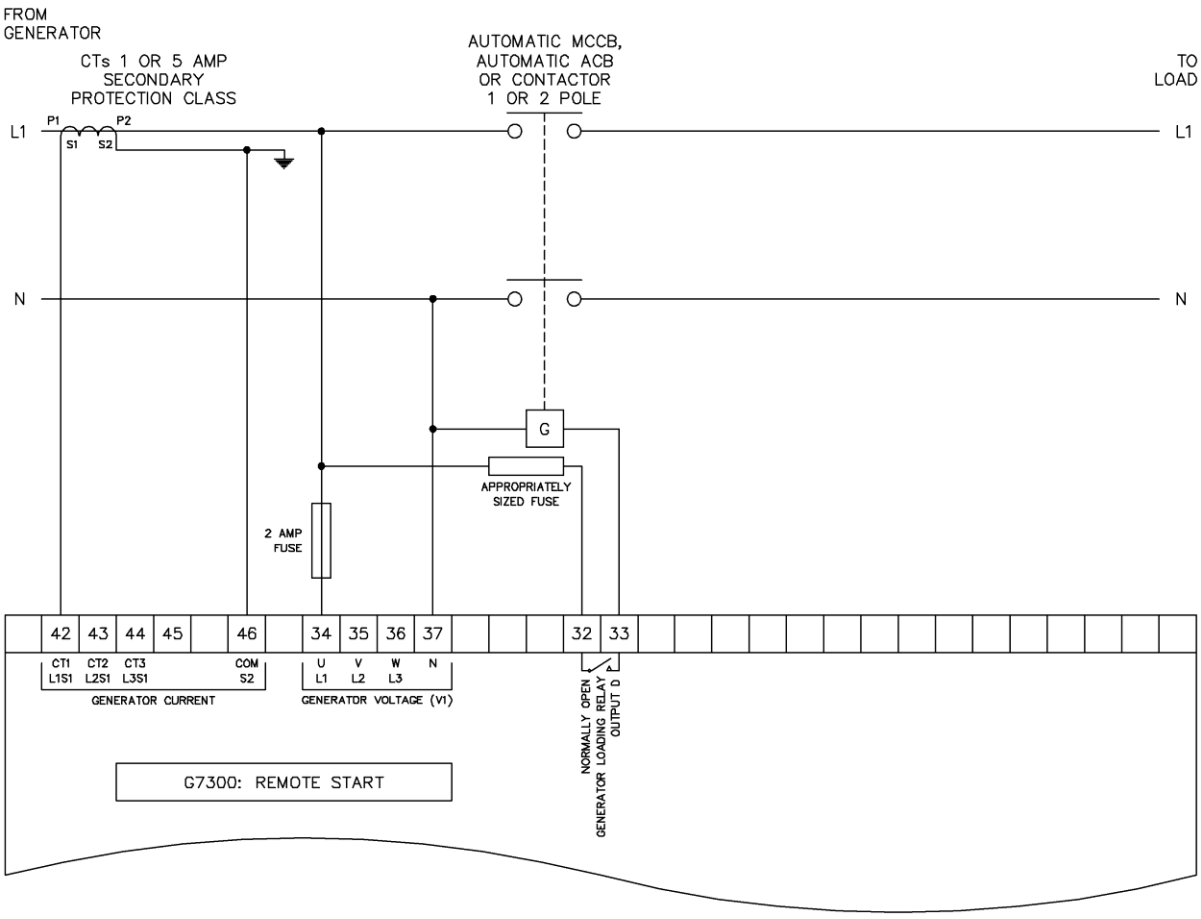


3.4.4.6 SINGLE PHASE WITH RESTRICTED EARTH FAULT

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).

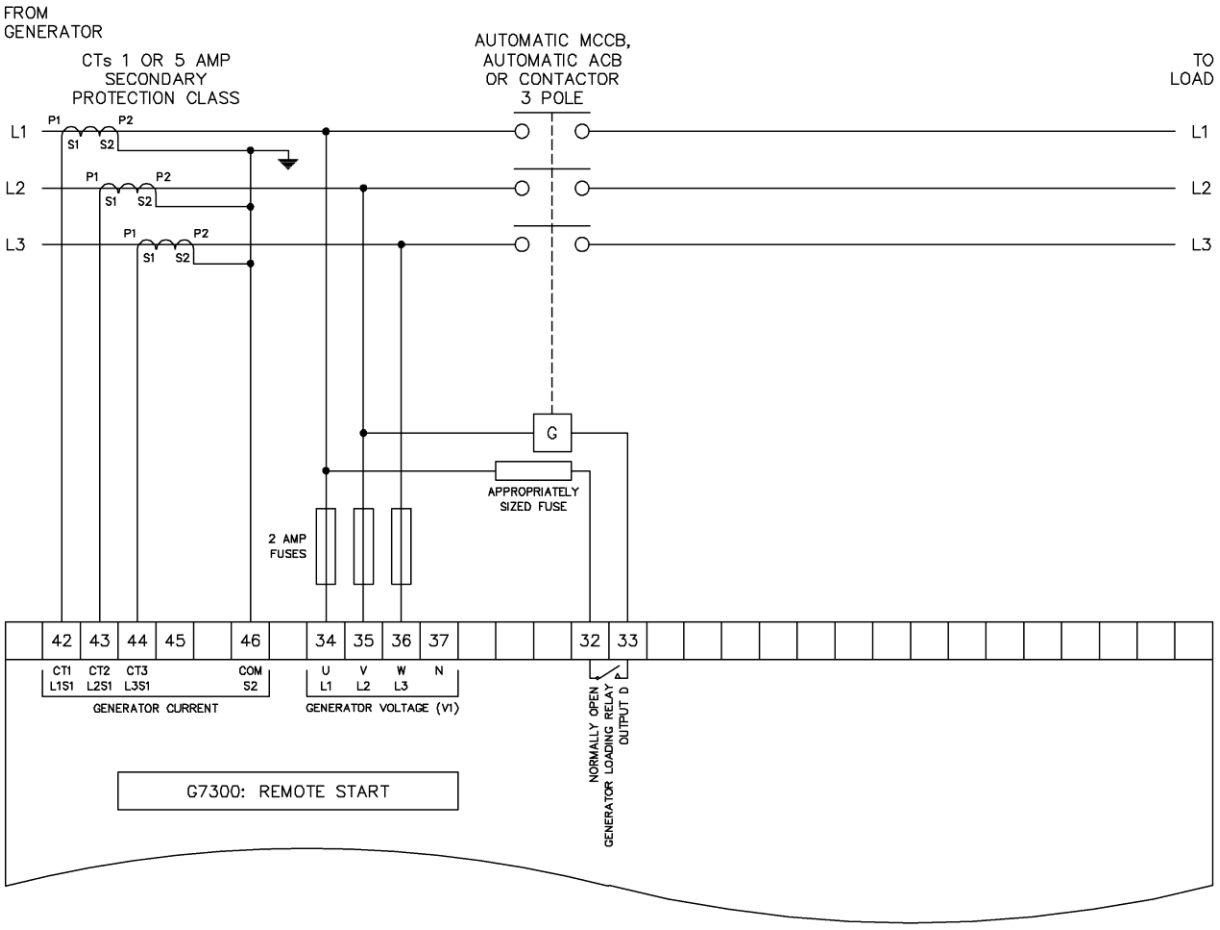


3.4.4.7 SINGLE PHASE WITHOUT RESTRICTED EARTH FAULT

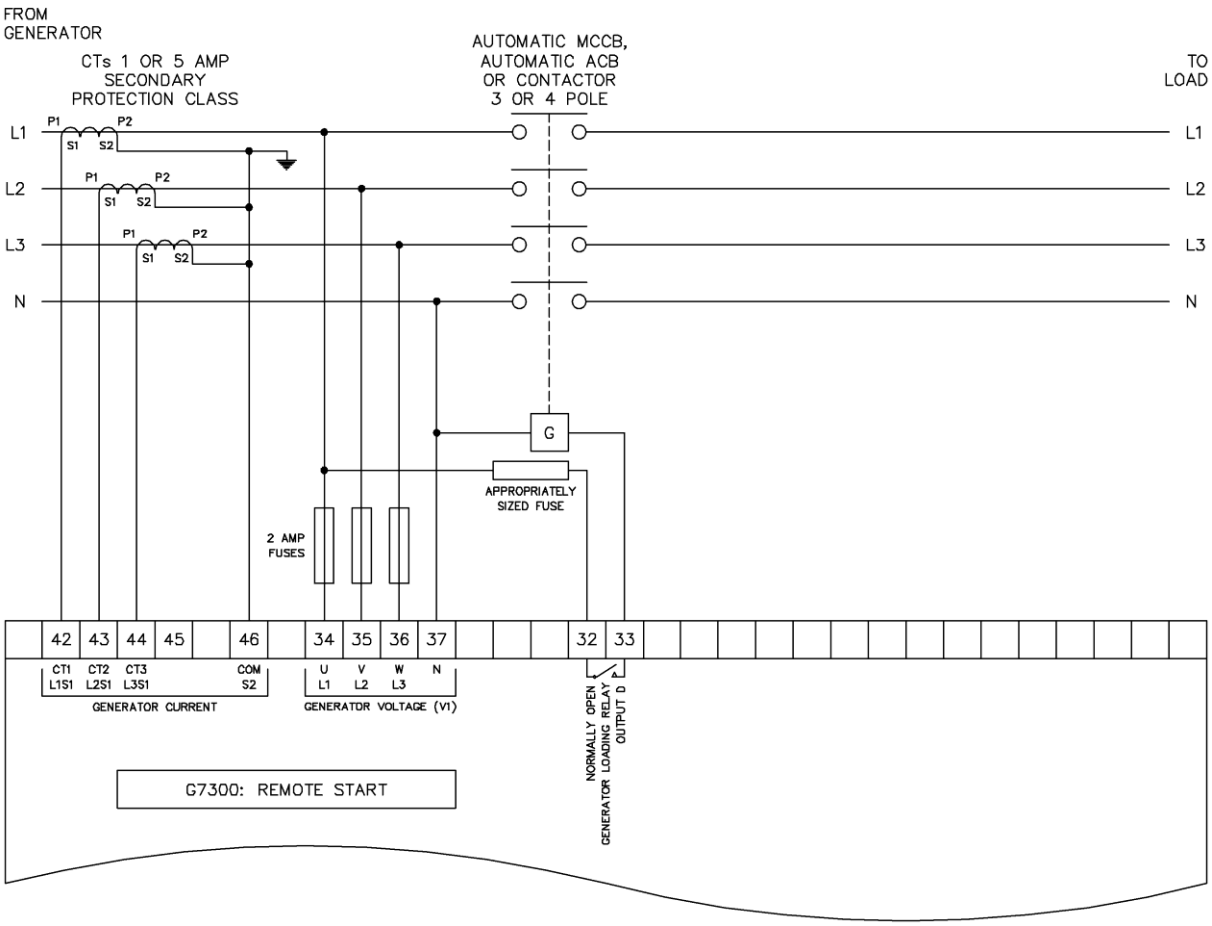


3.4.4.8 3 PHASE (L1, L2 & L3) 3 WIRE WITHOUT RESTRICTED EARTH FAULT

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).

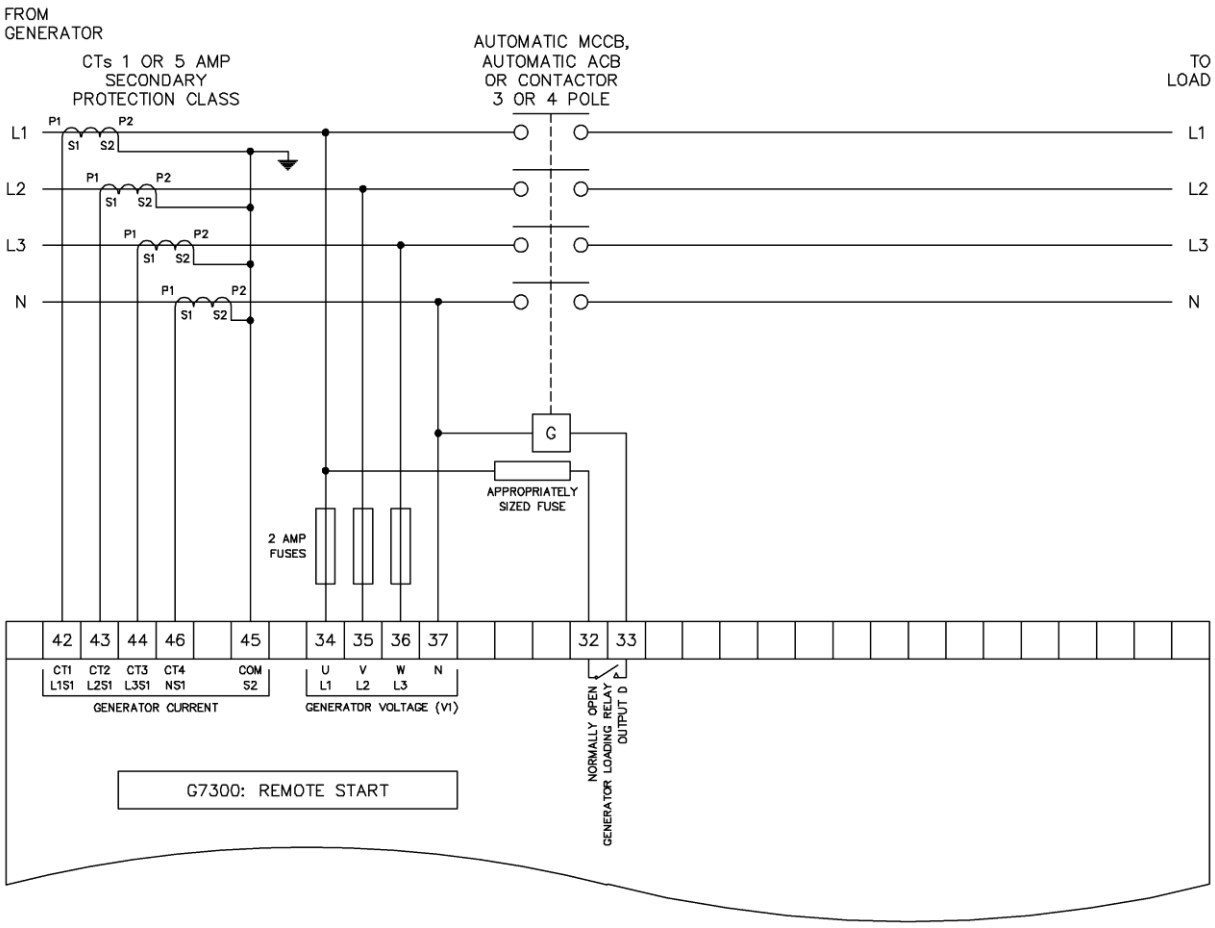


3.4.4.9 3 PHASE (L1, L2 & L3) 4 WIRE WITHOUT RESTRICTED EARTH FAULT



3.4.4.10 3 PHASE (L1, L2 & L3) 4 WIRE WITH RESTRICTED EARTH FAULT

NOTE: The below diagram is applicable for the following AC topologies: 3 Phase 4 Wire Star, 3 Phase 4 Wire Delta L1-N-L2, 3 Phase 4 Wire Delta L1-N-L3 and 3 Phase 4 Wire Delta *L2-N-L3*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*



3.4.5 CT LOCATION

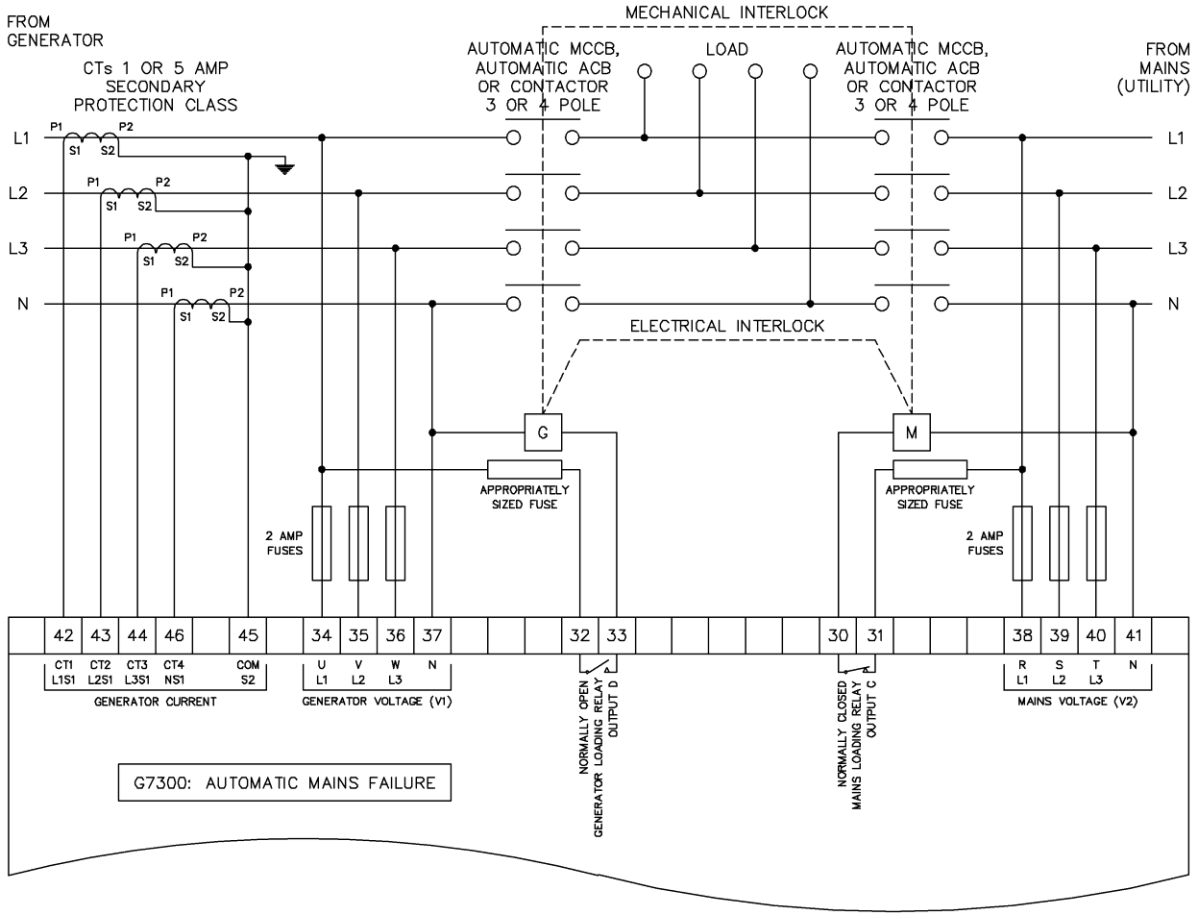
There are two possible locations for the current transformers to be installed in the system:

3.4.5.1 GENERATOR

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).

NOTE: The below diagram is applicable for the following AC topologies: 3 Phase 4 Wire Star, 3 Phase 4 Wire Delta L1-N-L2, 3 Phase 4 Wire Delta L1-N-L3 and 3 Phase 4 Wire Delta *L2-N-L3*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The CTs are used to measure and display generator current and power only. This example shows the CTs in the generator for a three phase four wire system with restricted earth fault protection, but the same philosophy is applicable to the other topologies.

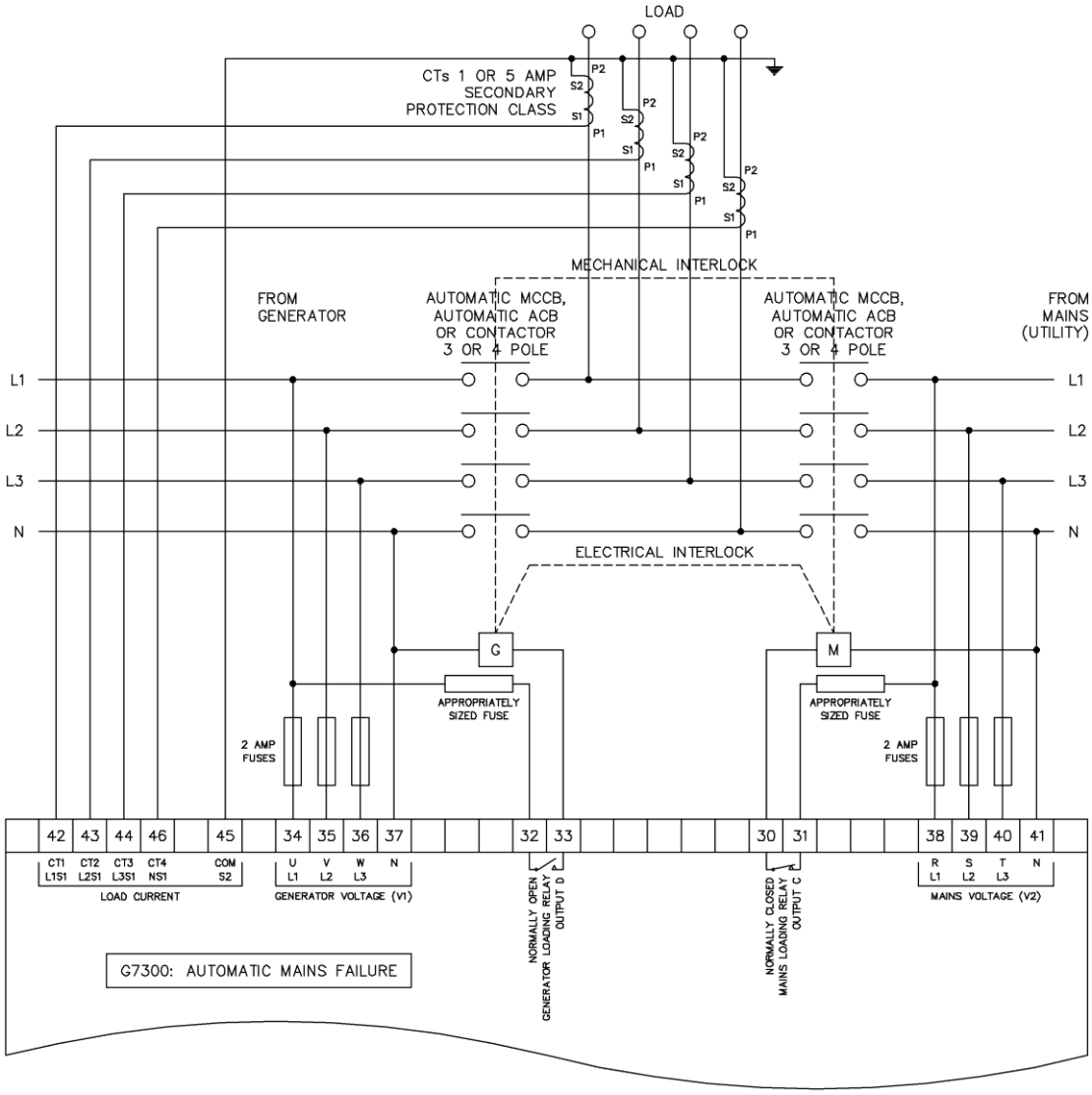


3.4.5.2 LOAD

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 / mains / upstream of the CT).

NOTE: The below diagram is applicable for the following AC topologies: 3 Phase 4 Wire Star, 3 Phase 4 Wire Delta L1-N-L2, 3 Phase 4 Wire Delta L1-N-L3 and 3 Phase 4 Wire Delta *L2-N-L3*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The CTs are used to measure and display generator current and power when the generator is on load and mains current and power when the mains is on load. The module display automatically changes to display the current and power in the relevant instrumentation page. This example shows the CTs in the 'load' for a three phase four wire system with restricted earth fault protection, but the same philosophy is applicable to the other topologies.

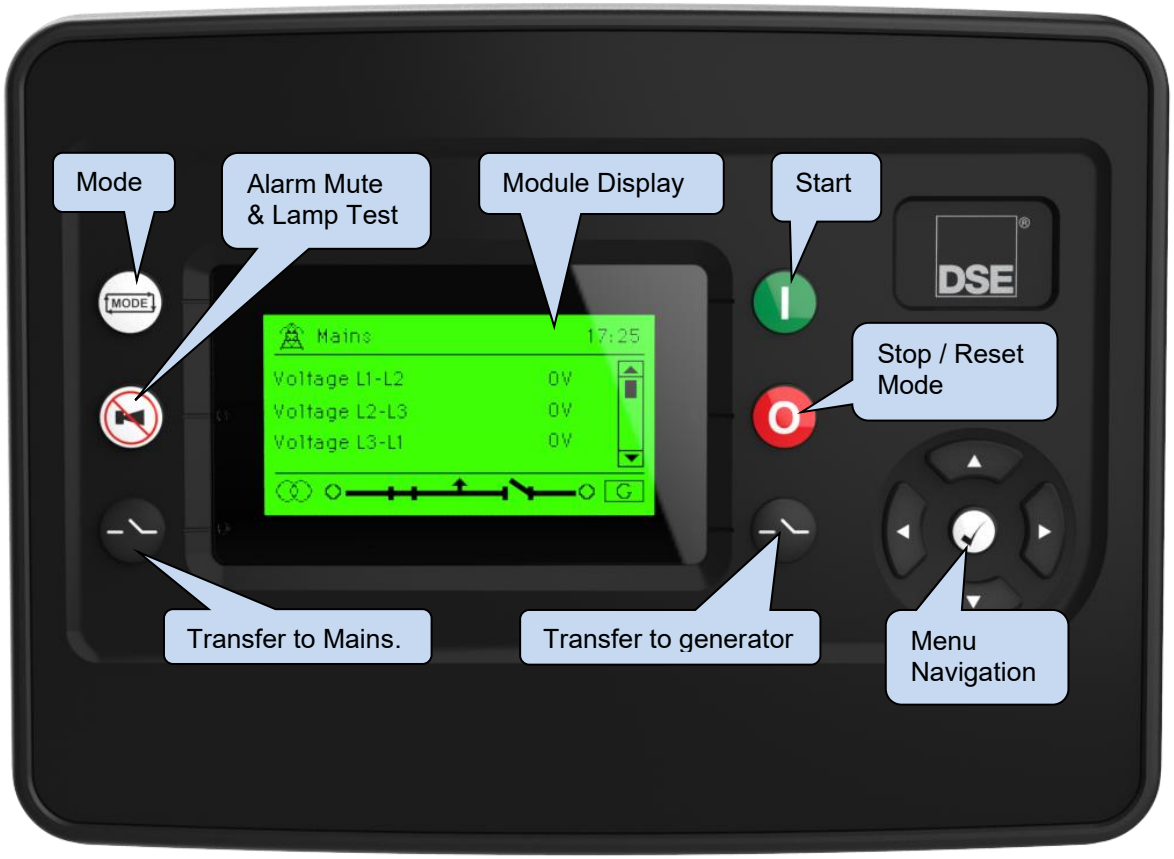


4 DESCRIPTION OF CONTROLS

CAUTION: The module may instruct an engine start event due to external influences. Therefore, it is possible for the engine to start at any time without warning. Prior to performing any maintenance on the system, it is recommended that steps are taken to remove the battery and isolate supplies.

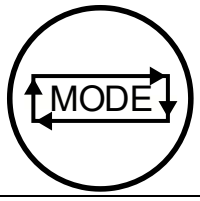
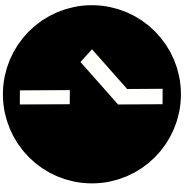
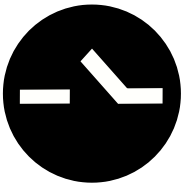
NOTE: The following descriptions are based on the standard factory configuration. For exact sequences and timing, refer to the active configuration of the module in service.

Control of the module is via push buttons mounted on the front of the module with ***Stop/Reset Mode***, **Start/*Manual Mode***, ***Auto Mode, Test Mode, Manual Mode***, ***Alarm Mute/Lamp Test***, ***Transfer to Mains*** and ***Transfer to Generator*** functions. For normal operation, these are the only controls which need to be operated. Details of their operation are provided later in this document.



4.1 CONTROL PUSH BUTTONS

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

Icon	Description
	**Mode Button** In the G7300 the mode button is used to select ***Auto Mode, Test Mode,*** or ***Manual Mode***. Pressing the button cycles through ***Auto mode > Test mode > Manual mode >***
	**Alarm Mute / Lamp Test** This button silences the audible alarm in the module, de-activates the *Audible Alarm* output (if configured) and illuminates all the LEDs on the module's facia as a lamp test function.
	**Right Hand Side Breaker Button** The breaker button provides the following function: Transfer to generator / electrical trip reset.
	**Left Hand Side Breaker Button** The breaker button provides the following function: Transfer to mains (utility) / open generator.
	**Start** Pressing the ***Start*** (I) button in ***Stop/Reset Mode*** (O) powers up the engine's ECU but does not start the engine and places the module in ***Manual Mode*** (MANUAL). This is used to check the status of the CAN communication and to prime the fuel system. Pressing the ***Start*** (I) button in ***Manual Mode*** (MANUAL) starts the generator and runs it off load in ***Manual Mode*** (MANUAL).
	**Stop / Reset Mode** This button places the module into its ***Stop/Reset Mode*** (O). This clears any alarm conditions for which the triggering criteria has been removed. If the engine is running and the module is put into ***Stop/Reset Mode*** (O), the module automatically instructs the generator off load *('**Close Generator Output**' becomes inactive)* and place the mains (utility) on load *('**Close Mains Output**' becomes active).* The fuel supply de-energises and the engine comes to a standstill. The generator remains at rest if any form of *start signal* is present when in ***Stop/Reset Mode*** (O).

Parameter descriptions are continued overleaf…

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

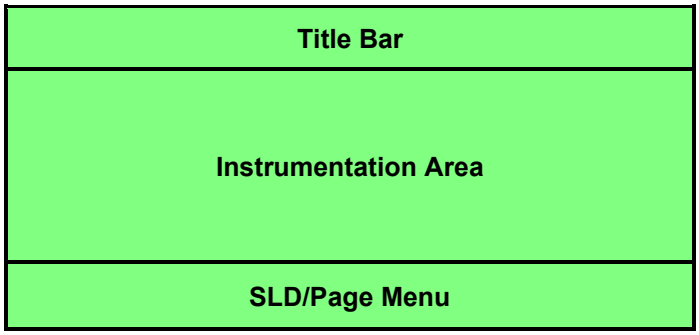
Icon	Description
	**Menu Navigation** Used for navigating the instrumentation, event log and configuration screens.

4.2 MODULE DISPLAY

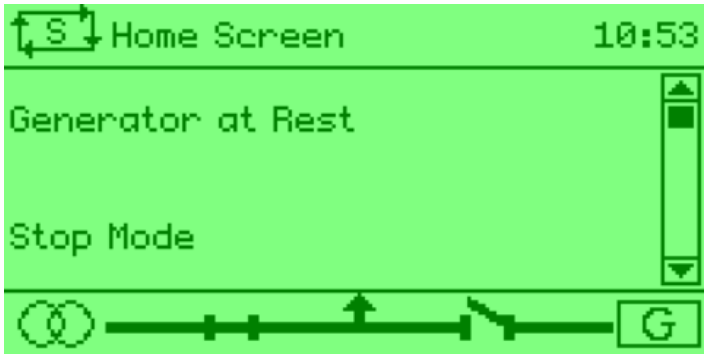
The module's display contains the following sections. Description of each section can be viewed in the sub sections.

NOTE: Depending upon the module's configuration, some display screens may be disabled. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

Home Screen Layout



Example Home Screen Layout



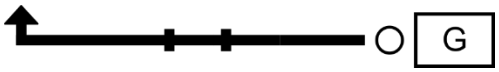
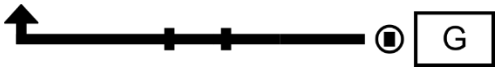
4.2.1 SINGLE LINE DIAGRAM (SLD)

NOTE: There are two types of SLD: one for the *Remote Start* module platform and another for the *Auto Mains Failure* platform, based on the module type configuration. Additionally, each of these SLD types is available in two sizes: a standard size screen in the Standard screen format and a reduced size for the home page in the Home screen format when the engine icon section is utilised.

The system summary, or single line diagram (SLD), is displayed at the bottom of the screen on all pages, with the exception of the FPE. It may, however, be obscured by the page menu while navigating between different sections. Virtual LED indicators located next to the generator and mains symbols (AMF only) indicate the availability of the generator and mains power.

Arrow indication:

Arrows within the SLD indicate the state of the power path rather than physical power flow direction.
A left-pointing arrow indicates that the circuit path is open or inactive (no power transfer).
An upward-pointing arrow indicates that the circuit path is closed or active, meaning power transfer is possible or occurring.
In fault conditions (e.g. breaker fail-to-open), the arrow will also indicate an active path.

Icon	Module Type	Details
	Remote Start	Appears when the generator is at rest or not available and when the generator breaker is open.
	Remote Start	Appears when the generator is at rest or not available and the generator breaker has failed to open.
	Remote Start	Appears when the generator is available, and the generator breaker is open.
	Remote Start	Appears when the generator is available, and the generator breaker is closed.
	AMF	Appears when the mains supply is not available, and the mains breaker is open.
	AMF	Appears when the mains supply is not available, and the mains breaker is closed.
	AMF	Appears when the mains supply is available, and the mains breaker is open.
	AMF	Appears when the mains supply is available, and the mains breaker is closed.

4.2.2 BACKLIGHT

NOTE: It is possible to turn of the LCD backlight after a period of inactivity. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The LCD backlight is on if the unit has sufficient voltage while the unit is turned on unless the unit is starting for which the backlight is turned off.

The unit supports an option for turning the LCD backlight off after a period without user interaction. The backlight may turn off during a time of inactivity when no facia control button is pressed. The backlight turns on again when a button is pressed, or an alarm is activated. The unit supports an option for turning the LCD backlight off whilst there is an active alarm.

Example of configuration to enable the LCD backlight to turn off after 1 minute of inactivity on the module's facia buttons whilst there is an active alarm:



4.3 VIEWING THE INSTRUMENT PAGES

NOTE: Depending upon the module's configuration, some display screens, or specific instrumentation may be disabled. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

It is possible to scroll to display the different pages of information by repeatedly operating the ***Next & Previous Page*** buttons.

Example

If you want to view one of the instrument pages towards the end of the list, it may be quicker to scroll left through the pages rather than right!

Status **Generator** **Mains**

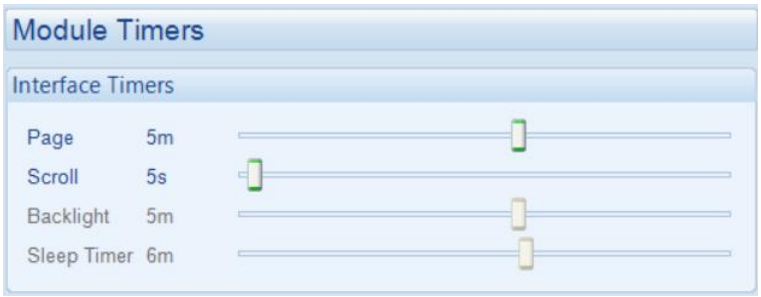
And so on until the desired page is reached. Further presses of the ***Next Page Button*** returns the Status page.

The complete order and contents of each information page are given in the following sections

Once selected, the page remains on the LCD display until the user selects a different page, or after an extended period of inactivity (*LCD Page Timer*), the module reverts to the status display.

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

The *LCD Page* and *LCD Scroll* timers are configurable using the DSE Configuration Suite Software or by using the Front Panel Editor.



The screenshot shows the factory settings for the timers, taken from the DSE Configuration Suite PC Software.

Alternatively, to scroll manually through all instruments on the currently selected page, press the ***Instrumentation Scroll*** buttons. The 'auto scroll' is disabled.

To re-enable 'auto scroll' press the ***Instrumentation Scroll*** buttons to scroll to the 'title' of the instrumentation page (i.e. Mains). A short time later (the duration of the *LCD Scroll Timer*), the instrumentation display begins to auto scroll.

When scrolling manually, the display automatically returns 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.

4.3.1 PAGE MENU ICONS

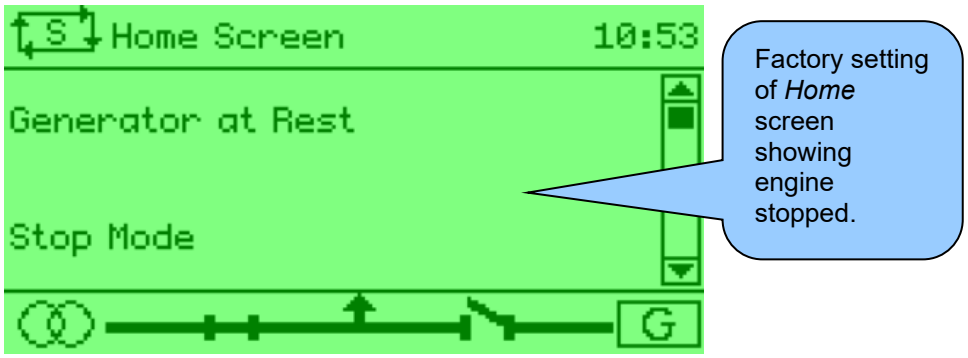
Icon	Description
	Home page (either engine tier 4 or generator and voltage instrumentation, depending upon module configuration)
	Engine
	Generator instrumentation
	Mains instrumentation
	Alarms
	ECU Current DTC’s (Diagnostic Trouble Codes) if active
	ECU Previous DTCs
	Event Log
	Scheduler
	Configurable CAN
	Maintenance
	RS485 Port
	User Defined Strings
	Expansion
	AVR Current DTCs
	AVR Instruments
	Battery
	About
	Editor
	PLC
	Synchroscope

4.3.2 HOME

NOTE: Press the *Instrumentation Scroll* buttons on the *Status Page* to view other Configurable Status Screens if configured. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

This is the *Home* page, the page that is displayed when no other page has been selected, and the page that is automatically displayed after a period of inactivity (*LCD Page Timer)* of the module control buttons.

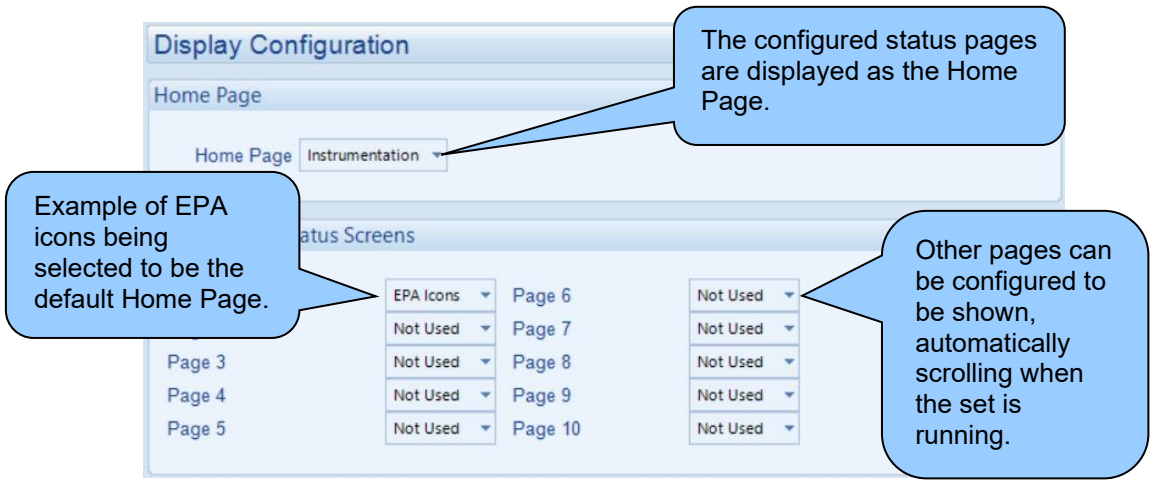
This page changes with the action of the module for example when the generator is running and available:



4.3.2.1 CONFIGURABLE STATUS SCREENS

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The contents of the Home Page may vary depending upon configuration by the generator manufacturer or supplier. Below is an example of the Home Page being changed to show engine CAN related information.

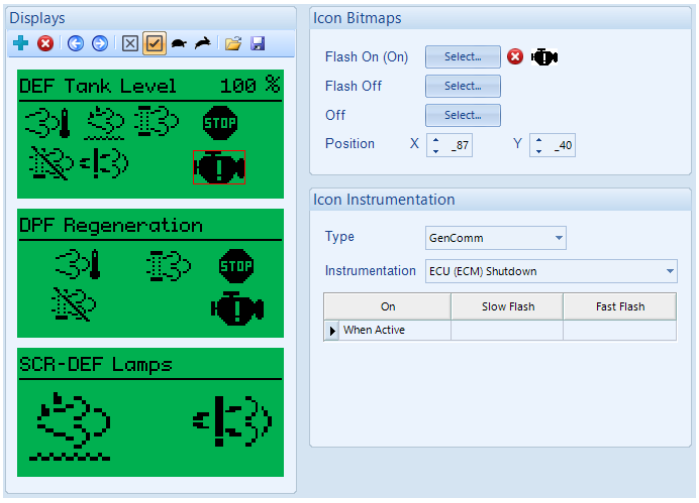


EPA Home Screen Example:

NOTE: The EPA Icons is only available as a *Configurable Status Screen*.



For further information about the default icons, refer to *the* section entitled *Engine* elsewhere in this document.
Depending upon module configuration, the icons displayed and their functions may differ from the default. An example of icon configuration is shown:

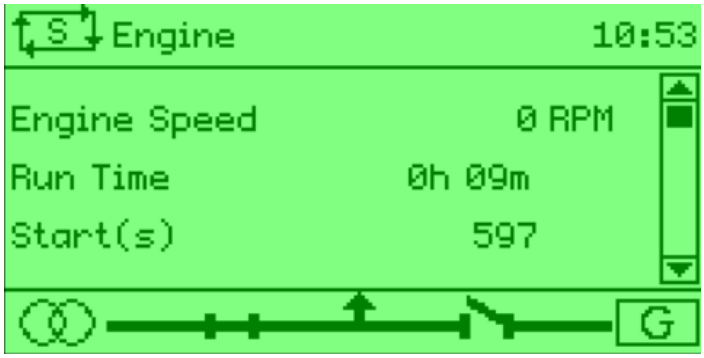


4.3.3 ENGINE

NOTE: For further details of supported engines, refer to DSE Publication: *057-004 Electronic Engines and DSE Wiring Guide.*

NOTE: Instruments with an * are dependent upon the type of ECU selected within the module's configuration, for further details of supported engines parameters refer to the manufacturers documentation.

These pages contain instrumentation gathered about the engine measured or derived from the module's inputs, some of which may be obtained from the engine ECU.

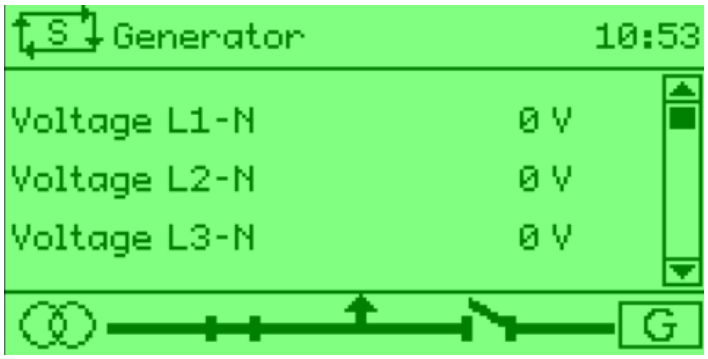


Engine Speed
Engine Run Time
Engine Start (s)
Engine Battery Voltage
Engine Charge Alternator Voltage
Engine Oil Pressure
Engine Oil Temperature
Pre Filter Oil Pressure*
Engine Crank Case Pressure*
Coolant Temp
Engine Coolant Level*
Coolant Pressure*
Fuel Pressure*
Fuel Temperature*
Atmospheric Pressure*
Turbo Pressure*
Engine Injector Rail Pressure*
DEF Level Status
Battery Electrical Potential
Percent Torque
Demand Torque
Instant Brake Power
Engine ECU Link

4.3.4 GENERATOR

Contains electrical values of the mains (utility), measured or derived from the module's voltage and current inputs.

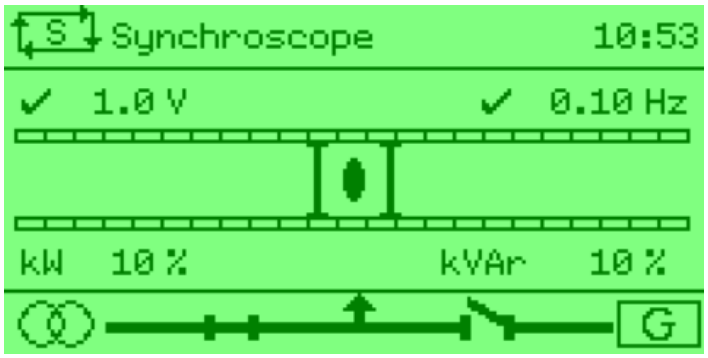
Press the ***Instrumentation Scroll***  buttons scroll through the ***Generator*** parameters.



Generator Voltage (ph-N)
Generator Voltage (ph-ph)
Generator Frequency
Generator ph Current (A)
Generator Earth Current (A)
Generator Phase Sequence
Generator Load ph-N (kW)
Generator Total Load (kW)
Generator Load ph-N (kVA)
Generator Total Load (kVA)
Generator Load ph-N (kVAr)
Generator Total Load (kVAr)
Generator Single Phase Power Factors
Generator Power Factor Average
Generator Accumulated Load (kWh, kVAh, kvarh)
Generator Nominal Voltage
Generator Nominal Frequency

4.3.5 SYNCHROSCOPE

Initially the synchroscope display shows the difference between the mains (utility) and generator supplies. When both the frequency and the voltage differences are within acceptable limits, the phase matching begins. Then the moving bar shows the phase difference between the two supplies. The engine speed is automatically adjusted, altering the phase, until the moving bar enters the centre of the scope.
Once the mains (utility) and generator supplies are in sync, the module initiates a breaker close signal to the generator load switch closing the generator onto the mains (utility). The moving bar passes out of the synchronising window if the synchronism is broken and activates the Out of Sync alarm.

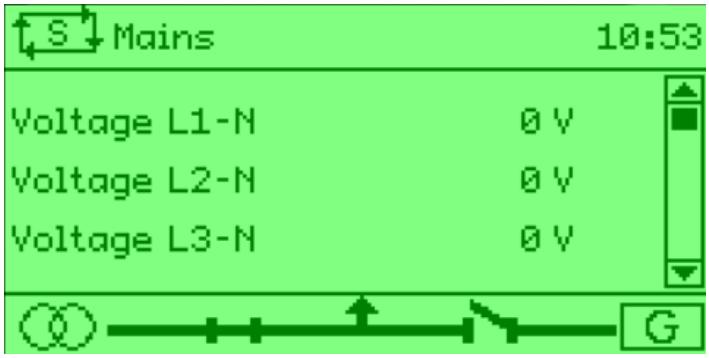


4.3.6 MAINS

NOTE: Mains current and power monitoring is only available when the CTs are configured for and placed in the load. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

Contains electrical values of the mains (utility), measured or derived from the module's voltage and current inputs.

Press the ***Instrumentation Scroll***  buttons scroll through the ***Mains*** parameters.



Mains Voltage (ph-N)
Mains Voltage (ph-ph)
Mains Frequency
Mains Phase Sequence
Nominal Voltage
Nominal Frequency
Mains Current (A)*
Mains Phase Rotation
Mains Active Configuration
Mains Load ph-N (kW)*
Mains Total Load (kW)*
Mains Load ph-N (kVA)*
Mains Total Load (kVA)*
Mains Single Phase Power Factors*
Mains Average Power Factor*
Mains Load ph-N (kvar)*
Mains Total Load (kvar)*
Mains Accumulated Load (kWh, kVAh, kvarh)*

4.3.7 ALARMS

When an alarm is active, the *Internal Audible Alarm* sounds and the Common Alarm LED, if configured, illuminates.

The audible alarm is silenced by pressing the ***Alarm Mute / Lamp Test*** button.

The LCD display jumps from the 'Information page' to display the Alarm Page.



The LCD displays multiple alarms such as "*Coolant Temperature High*", "*Emergency Stop*" and "*Low Coolant Warning*". These automatically scroll in the order that they occurred or press the ***Instrumentation Scroll*** buttons scroll through manually.

In the event of an alarm, the LCD displays the appropriate text. If an additional alarm then occurs, the module displays the appropriate text.

Example:



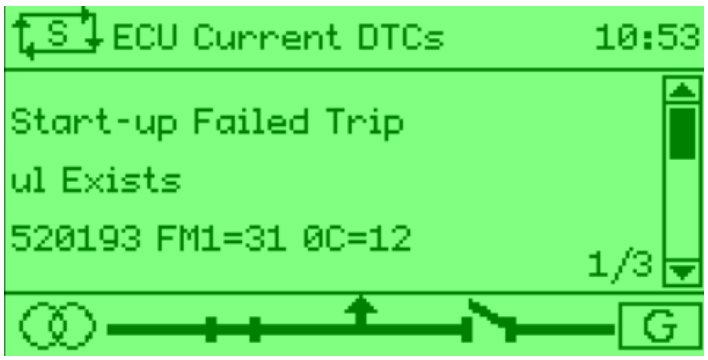
4.3.8 ECU CURRENT DTCS

NOTE: For details on these code/graphic 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, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*

Press the ***Next Page***  button to access the list of *Current Engine DTCs* (Diagnostic Trouble Codes) from the ECU which are DM1 messages.

The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



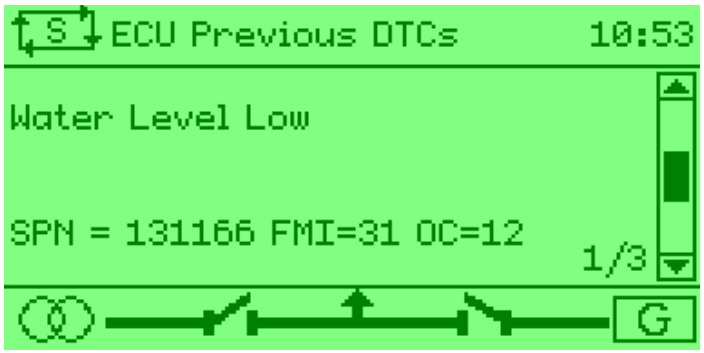
4.3.9 ECU PREVIOUS DTCS

NOTE: For details on these code/graphic 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, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*

Press the ***Next Page***  button to access the list of *Previous Engine DTCs* (Diagnostic Trouble Codes) from the ECU which are DM2 messages.

This page shows inactive Diagnostic Trouble Codes (DTCs) that were previously active but have cleared. It provides a historical record of engine faults for improved troubleshooting. The page is only available for CAN engines and must be enabled in the configuration settings. It appears similar to the ECU Current DTCs page but is titled “ECU Previous DTCs” and uses a unique icon for identification.

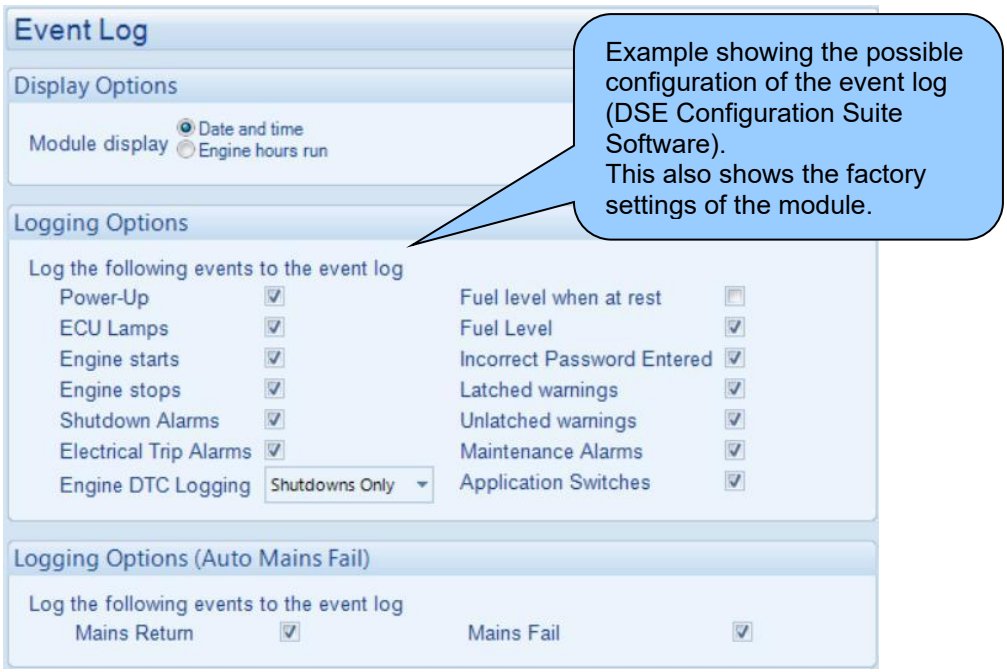


4.3.10 EVENT LOG

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

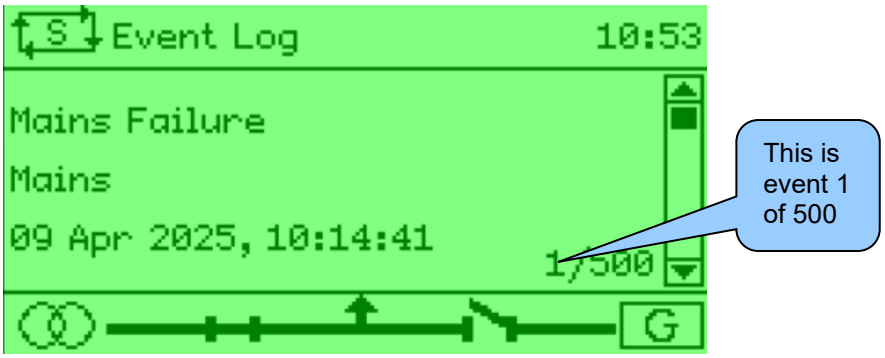
The module maintains a log of past alarms and/or selected status changes.
At the time of writing, the modules log is capable of storing the last 500 log entries.

Under default factory settings, the event log is configured to include all possible options; however, this is configurable by the system designer using the DSE Configuration Suite software.



When the event log is full, any subsequent event overwrites the oldest entry. Hence, the event log always contains the most recent events. The module logs the event type, along with the date and time (or engine running hours if configured to do so).

To view the event log, repeatedly press the ***Next or Previous Page*** buttons until the LCD screen displays the *Event Log* page.



Press the ***Scroll Down***  button to view the next most recent event.

Continuing to press the ***Scroll Down***  button cycles through the past events 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 or Previous Page***  buttons to select the next instrumentation page.

4.3.11 COMMUNICATIONS

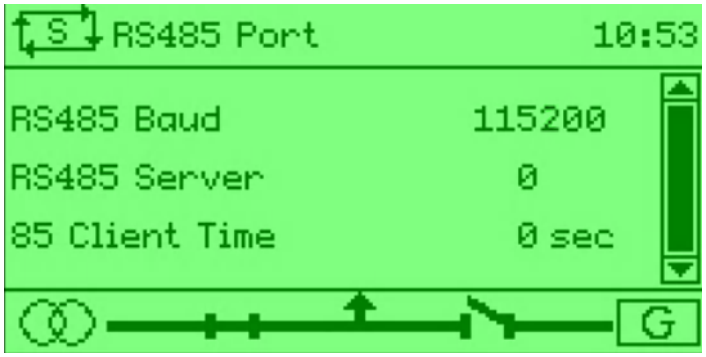
4.3.11.1 RS485 SERIAL PORT

This section is included to give information about the currently selected serial port.

The items displayed on this page change depending upon configuration of the module. Refer to the system supplier for further details.

NOTE: Factory Default settings are for the RS485 port to operate at 19200 baud, MODBUS server address 10.

Connected to an R485 MODBUS Client

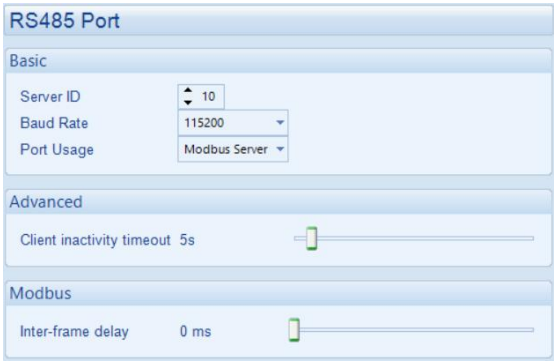


The modules operate as a MODBUS RTU server device.
In a MODBUS system, there is only one Client, typically a PLC, HMI system or PC SCADA system.

This client requests for information from the MODBUS server (The module) and may (in control systems) also send request to change operating modes etc. Unless the Client makes a request, the server is 'quiet' on the data link.

The factory settings are for the module to communicate at 115200 baud, MODBUS server address 10.

'Client inactivity timeout' should be set to at least twice the value of the system scan time. For example if a MODBUS client PLC requests data from the module once per second, the timeout should be set to at least 2 seconds.



The DSE MODBUS document containing register mappings inside the DSE module is available upon request from support@deepseaelectronics.com. Email the request along with the serial number of the DSE module to ensure the correct information is sent.

Typical Requests (Using Pseudo Code)

`BatteryVoltage=ReadRegister(10,0405,1)`: reads register (hex) 0405 as a single register (battery volts) from server address 10.

`WriteRegister(10,1008,2,35701, 65535-35701)`: Puts the module into AUTO mode by writing to (hex) register 1008, the values 35701 (auto mode) and register 1009 the value 65535-35701 (the bitwise opposite of auto mode)

`Warning=(ReadRegister(10,0306,1) >> 11) & 1)`: reads (hex) 0306 and looks at bit 12 (Warning alarm present)

`ElectricalTrip=(ReadRegister(10,0306,1) >> 10) & 1)`: reads (hex) 0306 and looks at bit 11 (Electrical Trip alarm present)

`ControlMode=ReadRegister(10,0304,2)`: reads (hex) register 0304 (control mode).

4.3.12 USER DEFINED STRINGS

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The user define strings are intended to contain generic important information about the generator such as oil service internal information. The contents of these screens vary depending upon configuration by the engine manufacturer or supplier.

Under default factory settings the support strings are not viewable. They are configurable by the system designer using the DSE Configuration Suite software.

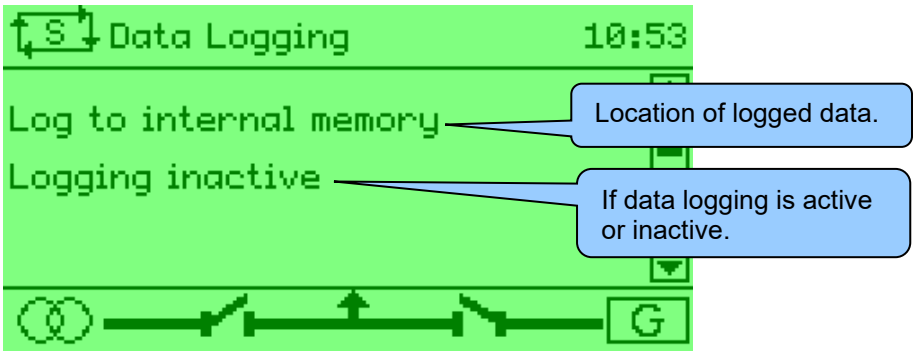
The display below example screen is achieved using the settings shown in the below screen shot of the DSE Configuration Suite Software:



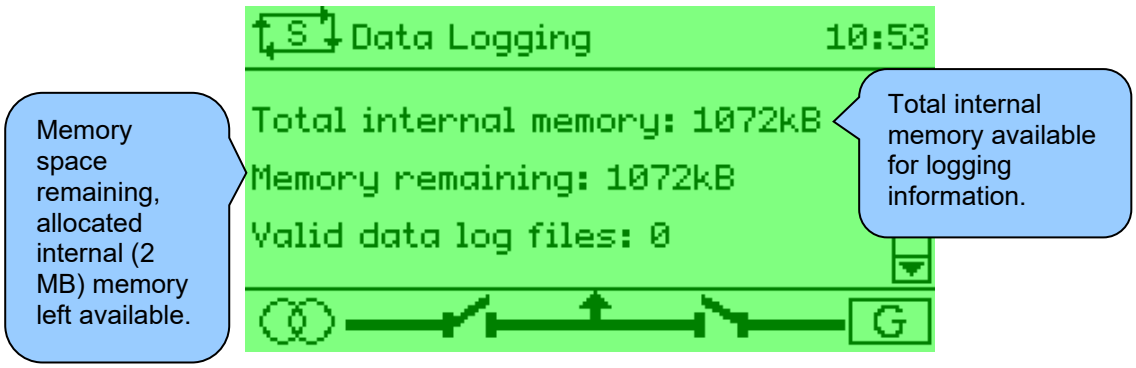


4.3.13 DATA LOGGING

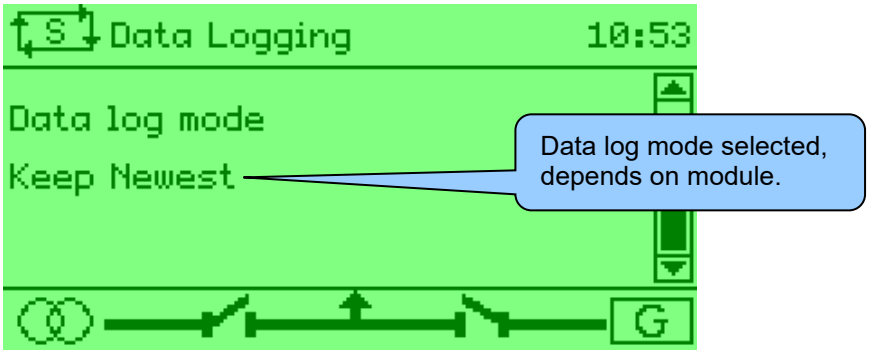
Whilst in the *About* section, press ***Scroll Down*** button to access more information about the Data Logging.



Press ***Scroll Down*** button to view the next page.



Press ***Scroll Down*** button to view the next page.



4.3.14 SCHEDULE

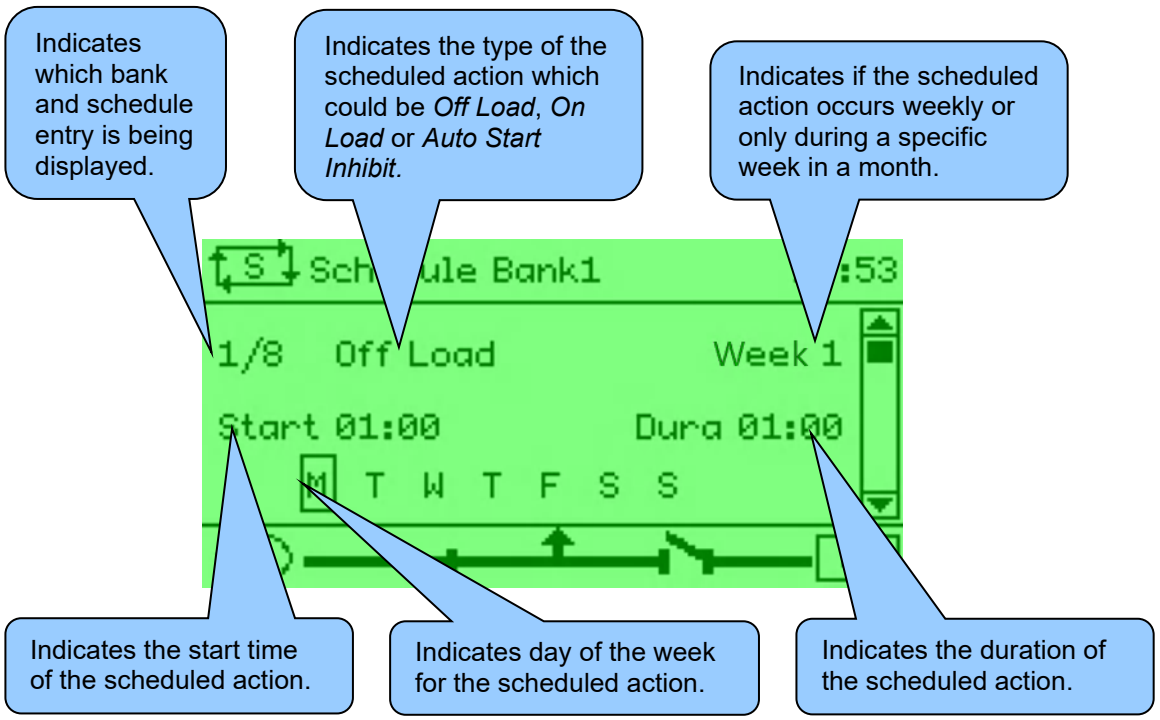
NOTE: For further details on the operation of the inbuilt scheduler feature, refer to the section entitled *Scheduler* in the *Operation* section elsewhere in this document.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The module contains an inbuilt exercise run scheduler, capable of automatically starting and stopping the set or inhibiting the set from starting. Up to 16 scheduled (in two banks of 8) start/stop/inhibiting start sequences can be configured to repeat on a 7-day or 28-day cycle.

Scheduled runs may be on load or off load depending upon module configuration.

This section of the module's display shows how exactly the scheduler (if enabled) is configured. Under default factory settings the Schedule is not viewable. It is enabled by the system designer using the DSE Configuration Suite software.

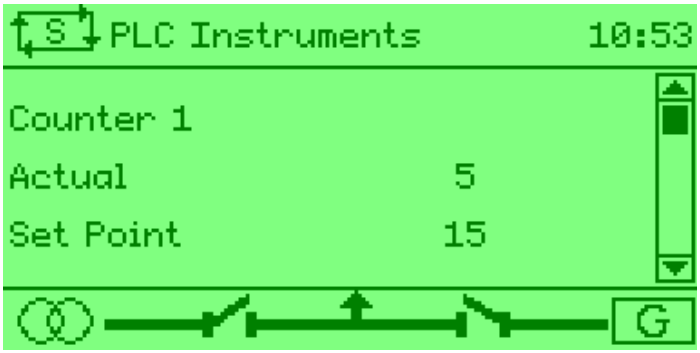


4.3.15 PLC INSTRUMENTS

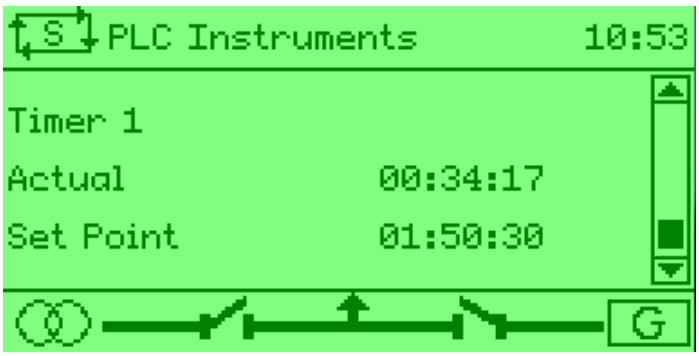
NOTE: Depending upon the module's configuration, some display screens may be disabled. The PLC Instrument screen is visible once watched variables have been written to the module using the PLC Editor. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

Contains values from various elements from the module's internal PLC editor to enable the user to view them from the module's facia.

Press the ***Instrumentation Scroll***  buttons scroll through the PLC instruments.

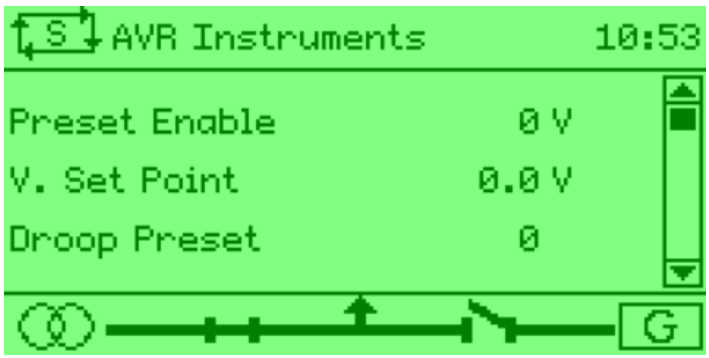


Timer Example



4.3.16 AVR CAN INSTRUMENTS

AVR Instruments provide a real-time display of the Automatic Voltage Regulator parameters received from the generator's AVR system. These instruments allow the operator to view key values such as Preset Enable status, Voltage Set Point, and Droop Preset, giving clear visibility of the active AVR control conditions during operation. The parameters shown are read-only and are intended for monitoring purposes, helping the user confirm that the AVR is responding correctly to system demands while the generator is running.



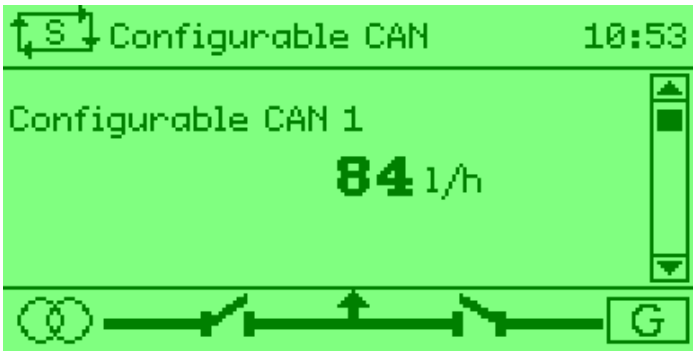
4.3.17 CONFIGURABLE CAN

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The configurable CAN instruments are intended to display CAN information from external third party CAN devices such as fuel flow meters. The contents of these screens vary depending upon configuration by the engine manufacturer or supplier.

Under default factory settings the configurable CAN instruments are not viewable. They are configurable by the system designer using the DSE Configuration Suite software.

Example:



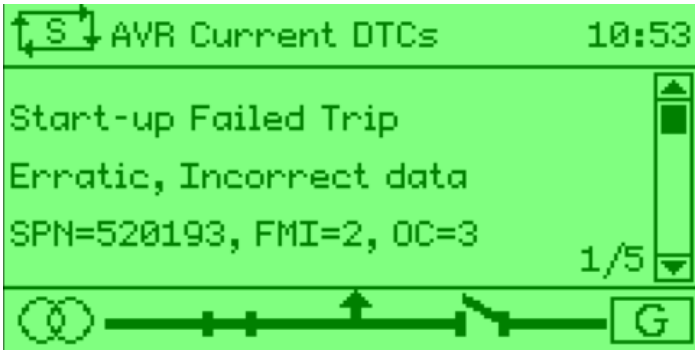
- Configurable CAN Instrument 1 to 30

4.3.18 AVR CURRENT DTCS

NOTE: For details on these code/graphic meanings, refer to the AVR instructions provided by the manufacturer, or contact the manufacturer for further assistance.

Press the ***Next Page***  button until the *AVR Current DTCs* (Diagnostic Trouble Codes) page is displayed to access the list of DTCs from the AVR which are DM1 messages.

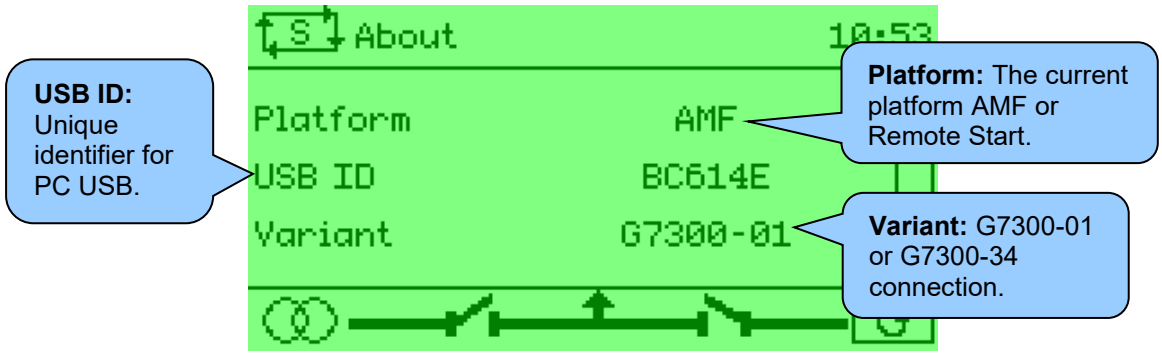
The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



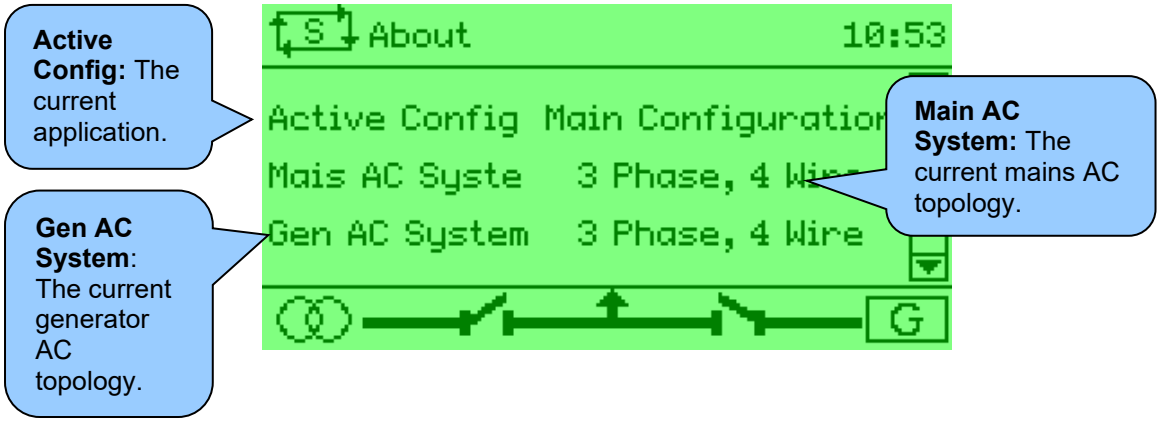
4.3.19 ABOUT

4.3.19.1 MODULE INFORMATION

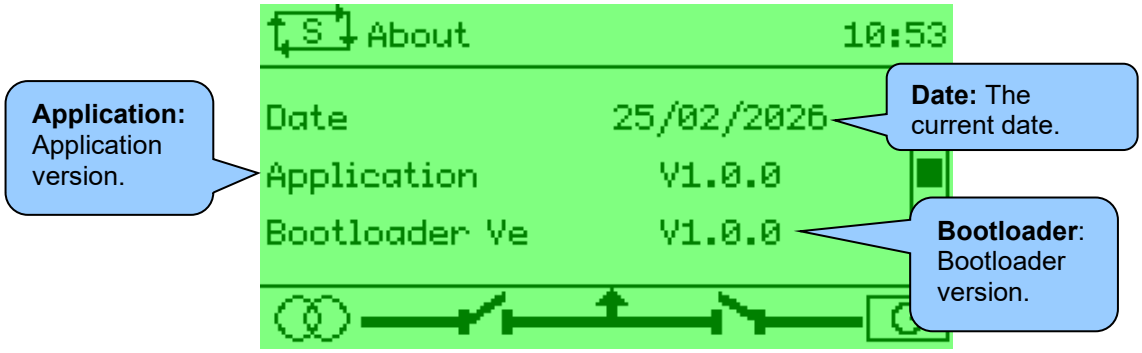
Contains important information about the module and the firmware versions. This information may be asked for when contacting DSE Technical Support Department for advice.

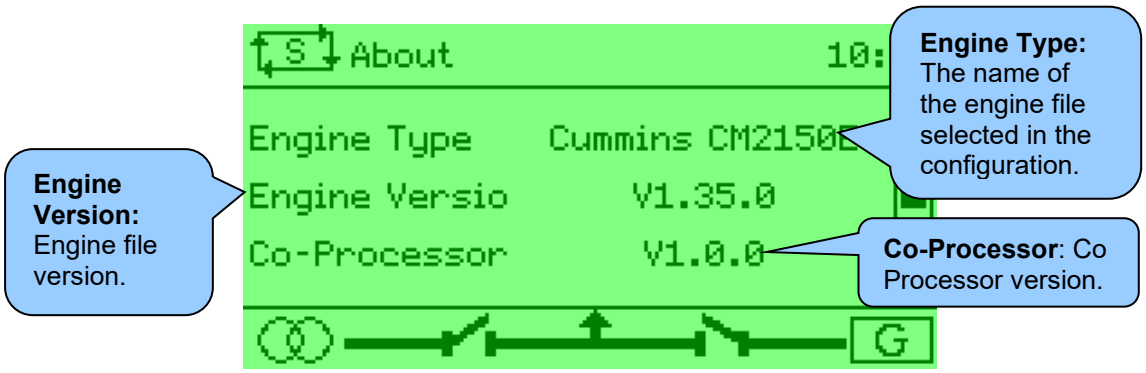


Press the ***Scroll Down*** button to access more information about the module.

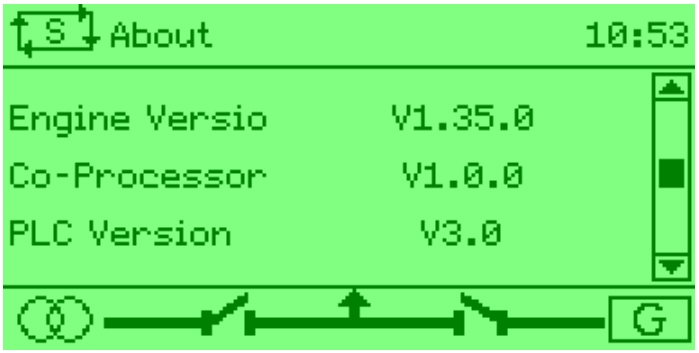


Press the ***Scroll Down*** button to access more information about the module.





Press the ***Scroll Down*** button to access more information about the module.



5 OPERATION

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

5.1 QUICKSTART GUIDE

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

5.1.1 STARTING THE ENGINE

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

To manually start the generator, press the start button once to put the module into manual mode, and then a second time to start the generator.



5.1.2 STOPPING THE ENGINE

NOTE: For further details, see the section entitled *Operation* elsewhere in this document.

The engine is stopped by pressing the *Stop* button.



5.2 STOP/RESET MODE

NOTE: If a digital input configured to *Panel Lock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

Stop/Reset Mode is activated by pressing the ***Stop/Reset Mode*** button.
The LED next to the ***Stop/Reset Mode*** button illuminates to indicate ***Stop/Reset Mode*** operation.

In ***Stop/Reset Mode***, the module removes the generator from load (if necessary) before stopping the generator.

If the generator does not stop when requested, the *Fail To Stop* alarm is activated (subject to the setting of the *Fail to Stop* timer). To detect the engine at rest the following must occur:

- Engine speed is zero as detected by the CAN ECU or MPU.
- Generator AC Voltage and Frequency must be zero.
- Engine Charge Alternator Voltage must be zero.
- Oil pressure is detected as low by the sensor.

When the engine has stopped and the module is in the ***Stop/Reset Mode***, it is possible to send configuration files to the module from DSE Configuration Suite PC software and to enter the Front Panel Editor to change parameters.

Any latched alarms that are no longer active are cleared when the ***Stop/Reset Mode*** is pressed.

The engine is not started when in ***Stop/Reset Mode***. If start signals are given, the input is ignored until ***Auto Mode*** is entered.

If *Immediate Mains Dropout* is enabled and the module is in ***Stop/Reset Mode***, the mains load switch is opened and closed as appropriate when the mains fails or becomes available to take load.

5.2.1 ECU OVERRIDE

Pressing the ***Start*** button in ***Stop/Reset Mode*** powers up the engine's ECU but does not start the engine. This can be used to check the status of the CAN communication and to prime the fuel system.

5.3 MANUAL MODE

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

Manual Mode is activated by pressing the ***Mode*** button.

The LCD display shows an “M” in the *Title Bar* to indicate ***Manual Mode*** operations.

In ***Manual Mode*** the generator does not start automatically
To begin the starting sequence, press the ***Start*** button.

5.3.1 STARTING SEQUENCE

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

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

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The fuel relay is energised and the engine is cranked.

If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the *Crank Rest Timer* duration after which the next start attempt is made. Should this sequence continue beyond the set *Number Of Attempts*, the start sequence is terminated, and the display shows *Fail to Start.*

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CANbus link to the engine ECU depending on module configuration.

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

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

5.3.2 ENGINE RUNNING

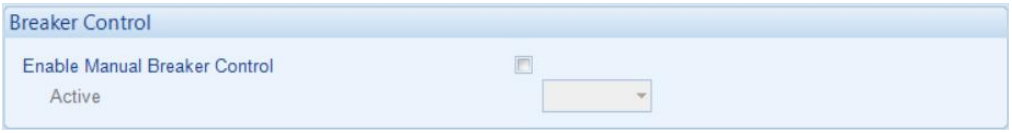
NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Suite PC Software Manual.*

NOTE: For further detailed information on the operation of changing from one supply to another, refer to section entitled *Changeover Functionality* elsewhere in this document.

When in ***Manual Mode*** the load is transferred to the generator whenever a 'loading request' is made. The possible sources for 'loading requests' are limited dependant on the state of the *Manual Breaker Control* function.

5.3.2.1 MANUAL BREAKER CONTROL DISABLED



A loading request may come from any of the following sources:

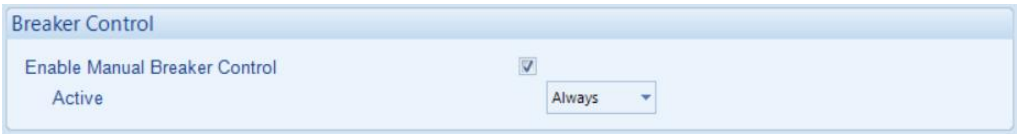
- Press the Transfer to Generator button.
- Failure of mains supply.
- Activation of an auxiliary input that has been configured to *Remote Start On Load, Transfer To Generator / Open Mains* or *Auxiliary Mains Fail.*
- Activation of the inbuilt exercise scheduler if configured for 'on load' runs.
- Activation of *Dual Mutual Standby Balance Mode*, see section 6 entitled *Operation* (*Dual Mutual Standby*) in this document for more information.
- Instruction from external remote telemetry devices using an RS485 interface.

Once the generator is placed on load, it is not automatically removed. Depending on loading request state, one of the following methods is used to manually open the load switch:

- If the loading request has been removed:
  - Press the ***Open Generator*** or ***Transfer to Mains*** button
  - Activation of an auxiliary input that has been configured to *Transfer To Mains / Open Generator.*
  - Press the ***Mode*** button to return to automatic mode. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.

- If the loading request remains active:
  - Press the ***Stop/Reset Mode*** button to remove load and stop the generator.
  - Activation of an auxiliary input that has been configured to *Generator Load Inhibit.*

5.3.2.2 MANUAL BREAKER CONTROL ENABLED



Loading request sources are limited to:

- Press the Transfer to Generator button.
- Activation of an auxiliary input that has been configured to *Transfer To Generator / Open Mains.*

Once the generator is placed on load, it will not automatically be removed. Any one of the following methods are used to manually open the load switch:

- Press the ***Open Generator*** or ***Transfer to Mains*** button
- Activation of an auxiliary input that has been configured to *Transfer To Mains / Open Generator.*
- Press the ***Mode*** button to return to automatic mode. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.
- Press the ***Stop/Reset Mode*** button to remove load and stop the generator.
- Activation of an auxiliary input that has been configured to *Generator Load Inhibit.*

5.3.3 STOPPING SEQUENCE

In ***Manual Mode*** the set continues to run until either:

- The ***Stop/Reset Mode*** button is pressed – The delayed load outputs are de-activated immediately and the set immediately stops.
- ***Auto Mode*** is selected. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.

5.4 TEST MODE

NOTE: If a digital input configured to *Panel Lock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

Test Mode is activated by pressing the ***Mode*** button.

The LCD display shows an “T” in the *Title Bar* to indicate ***Test Mode*** operations.

In ***Test Mode*** the set does not start automatically.
To begin the starting sequence, press the ***Start*** button.

5.4.1 STARTING SEQUENCE

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

NOTE: If the unit has been configured for CAN, compatible ECU’s receives the start command via CAN.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

The fuel relay is energised and the engine is cranked.

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 is terminated, and the display shows *Fail to Start.*

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CANbus link to the engine ECU depending on module configuration.

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

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

5.4.2 ENGINE RUNNING

NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

NOTE: For further detailed information on the operation of changing from one supply to another, refer to the section entitled *Changeover Functionality* elsewhere in this document.

In ***Test Mode*** the load is automatically transferred to the generator.

Once the generator has been placed on load, it is not automatically removed. To manually remove the load either:

Enter ***Manual Mode*** *by pressing the* button followed by the ***Open Generator*** or ***Transfer to Mains*** button.

- Press the ***Mode*** button to select automatic mode. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.
- Press the ***Stop/Reset Mode*** button to remove load and stop the generator.
- Activation of an auxiliary input that has been configured to *Generator Load Inhibit.*

5.4.3 STOPPING SEQUENCE

In ***Test Mode*** the set continues to run until either:

- The ***Stop/Reset Mode*** button is pressed – The delayed load outputs are de-activated immediately and the set immediately stops.
- The ***Mode*** button is pressed. The set observes all ***Auto Mode*** start requests and stopping timers before beginning the *Auto Mode Stopping Sequence*.

5.5 AUTOMATIC MODE

NOTE: If a digital input configured to external *Panel Pock* is active, changing module modes is not possible. Viewing the instruments and event logs is NOT affected by *Panel Lock*.

Auto Mode is activated by pressing the ***Mode*** button.

The LCD display shows an “A” in the *Title Bar* to indicate ***Auto Mode*** operations.

Auto Mode allows the generator to operate fully automatically, starting and stopping as required with no user intervention.

5.5.1 WAITING IN AUTO MODE

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

- Failure of mains supply.
- Activation of an auxiliary input that has been configured to *Remote Start.*
- Activation of an auxiliary input that has been configured to *Auxiliary Mains Fail.*
- Activation of the inbuilt exercise scheduler.
- Instruction from external remote telemetry devices using the RS485 interface.
- Activation of *Dual Mutual Standby Balance Mode*, see the section entitled *Operation (Dual Mutual Standby)* elsewhere in this document.

5.5.2 STARTING SEQUENCE

NOTE: If the unit has been configured for CAN, compatible ECU's receive the start command via CAN and transmit the engine speed to the DSE module.

NOTE: For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

To allow for 'false' start requests, the *Start Delay* timer begins.

Should all start requests be removed during the *Start Delay* timer, the unit returns 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 is cranked.

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 is terminated, and the display shows *Fail to Start.*

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the AC alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel or from the CAN link to the engine ECU depending on module.

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

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

5.5.3 ENGINE RUNNING

NOTE: The load transfer signal remains inactive until the generator is available. This prevents excessive wear on the engine and alternator.

NOTE: For further detailed information on the operation of changing from one supply to another, refer to section entitled *Changeover Functionality* elsewhere in this document.

The generator is placed on load if configured to do so.

If all start requests are removed, the *Stopping Sequence* begins.

5.5.4 STOPPING SEQUENCE

The *Return Delay Timer* ensures that the start request has been fully removed and not just momentarily interrupted.

- While the *Return Delay Timer* is active, the generating set remains running and on load.
- If a new start request is received during the *Return Delay* period, the timer is reset and the generating set continues normal operation without any change in load state.

If no start requests are present when the *Return Delay Timer* expires, the load is transferred from the generator to the mains supply, and the *Cooling Timer* is started.

5.6 SCHEDULER

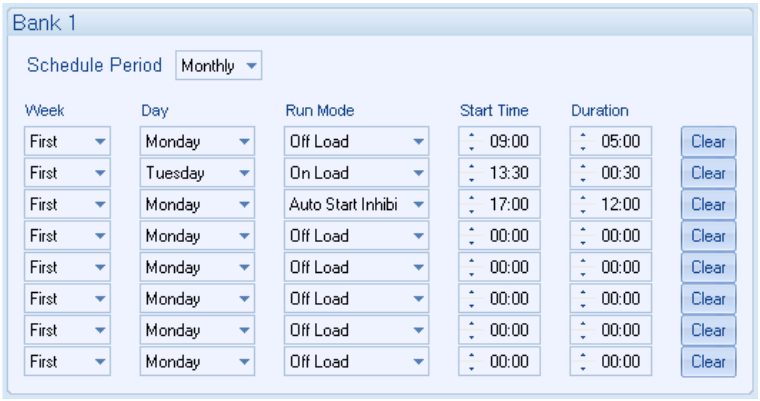
The module contains an inbuilt exercise run scheduler, capable of automatically starting and stopping the set or inhibiting the set from starting. Up to 16 scheduled (in two banks of 8) start/stop/inhibiting start sequences can be configured to repeat on a 7-day or 28-day cycle.

Scheduled runs may be on load or off load depending upon module configuration.

Example:

Screen capture from DSE Configuration Suite Software showing the configuration of the Exercise Scheduler.

In this example the set starts at 09:00 on Monday and run for 5 hours off load, then start at 13:30 on Tuesday and run for 30 minutes one load and is inhibited from automatically starting on Monday from 17:00 for 12 hours.



5.6.1 STOP MODE

- Scheduled runs do not occur when the module is in ***Stop/Reset Mode*** .

5.6.2 MANUAL MODE

- Scheduled runs do not occur when the module is in ***Manual Mode*** waiting for a start request.
- Activation of a Scheduled Run 'On Load' when the module is operating Off Load in ***Manual Mode*** forces the set to run On Load.

5.6.3 TEST MODE

- Scheduled runs do not occur when the module is in ***Test Mode*** waiting for a start request.

5.6.4 AUTO MODE

- Scheduled runs operate only if the module is in ***Auto Mode*** with no *Shutdown* or *Electrical Trip* alarm active.
- If the module is in ***Stop/Reset Mode*** or ***Manual Mode*** when a scheduled run begins, the engine is not started. However, if the module is moved into ***Auto Mode*** during a scheduled run, the engine is called to start.
- Depending upon configuration by the system designer, an external input can be used to inhibit a scheduled run.
- If the engine is running *Off Load* in ***Auto Mode*** and a scheduled run configured to 'On Load' begins, the set is placed *On Load* for the duration of the Schedule.

5.7 ALTERNATIVE CONFIGURATIONS

Depending upon the configuration of the system by the generator supplier, the system may have selectable configurations (for example to select between 50 Hz and 60 Hz). If this has been enabled the generator supplier will advise how this selection can be made (usually by operating an external selector switch or by selecting the required configuration file in the module's front panel configuration editor).

5.8 DUMMY LOAD / LOAD SHEDDING CONTROL

If the load is low, 'dummy loads' (typically resistive load banks) are introduced to ensure the engine is not too lightly loaded. Conversely, as the load increases towards the maximum rating of the set, non-essential loads are shed to prevent overload of the generator.

5.8.1 DUMMY LOAD CONTROL

The *Dummy Load Control* feature (if enabled) allows for a maximum of five dummy load steps. When the set is first started, all configured *Dummy Load Control* outputs are de-energised. Once the generator is placed onto load, the generator loading is monitored by the *Dummy Load Control* scheme.

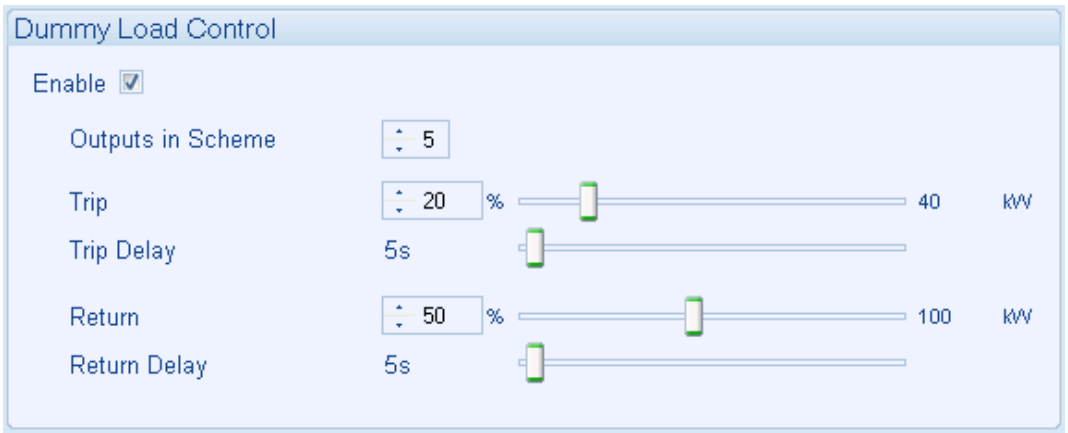
If the generator loading falls below the *Dummy Load Control Trip* setting (kW), the *Dummy Load Control Trip Delay* begins. If the generator loading remains at this low level for the duration of the timer, the first *Dummy Load Control* output is energised. This is used to energise external circuits to switch in a resistive load bank.

The first dummy load has increased the generator loading. Again, the generator loading is monitored. This continues until all configured *Dummy Load Control* outputs are energised.

When the generator loading rises above the *Dummy Load Return* level, the *Dummy Load Return Delay* begins. If the generator loading remains at these levels after the completion of the timer, the 'highest' active *Dummy Load Control* output is de-energised. This continues until all *Dummy Load Control* outputs have been de-energised.

When the generator enters a stopping sequence for any reason, all the *Dummy Load Control* outputs de-energise at the same time as the generator load switch is signalled to open.

Example screen shot of *Dummy Load Control* setup in the DSE Configuration Suite.



5.8.2 LOAD SHEDDING CONTROL

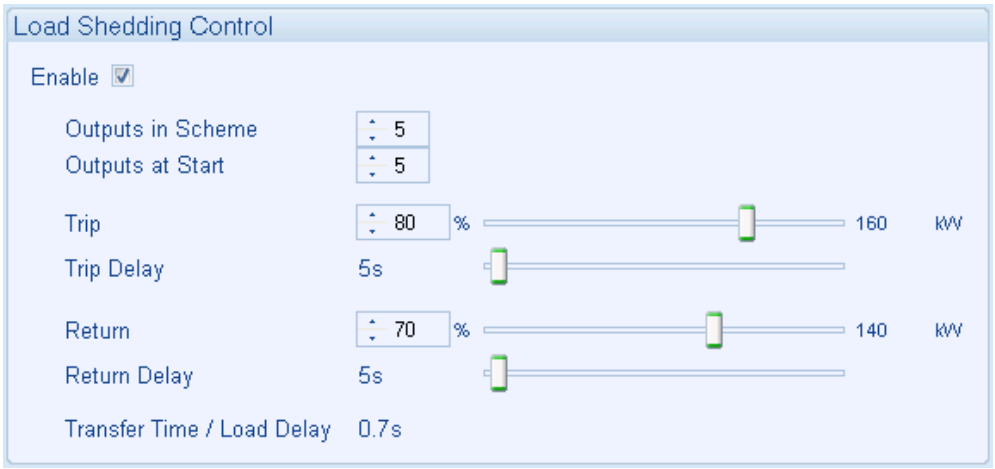
The *Load Shedding Control* feature (if enabled) allows for a maximum of five load shedding steps. When the generator is about to take load, the configured number of *Load Shedding Control Outputs at Start* will energise. This allows certain none-essential loads to be removed prior to the generator's load switch being closed. This is used to ensure the initial loading of the generator is kept to a minimum, below the *Load Acceptance* specification of the generator.

The generator is then placed on load. The *Load Shedding Control* scheme begins.
When the generator loading exceeds the *Load Shedding Trip* level the *Trip Delay* timer will start. If the generator loading is still high when the timer expires, the first *Load shedding Control* output energises. When the generator loading been above the trip level for the duration of the timer the 'next' *Load Shedding Control* output energises and so on until all *Load Shedding Control* outputs are energised.

When the generator loading falls below the *Load Shedding Return* level, the *Return Delay Time* starts. If the generator load remains below the *Load Shedding Return* level when the timer has expired, the 'highest' *Load Shedding Control* output de-energises. This process continues until all outputs have been de-energised.

When the generator enters a stopping sequence for any reason, all the *Load Shedding Control* outputs de-energise at the same time as the generator load switch is signalled to open.

Example screen shot of *Load Shedding Control* setup in the DSE Configuration Suite:



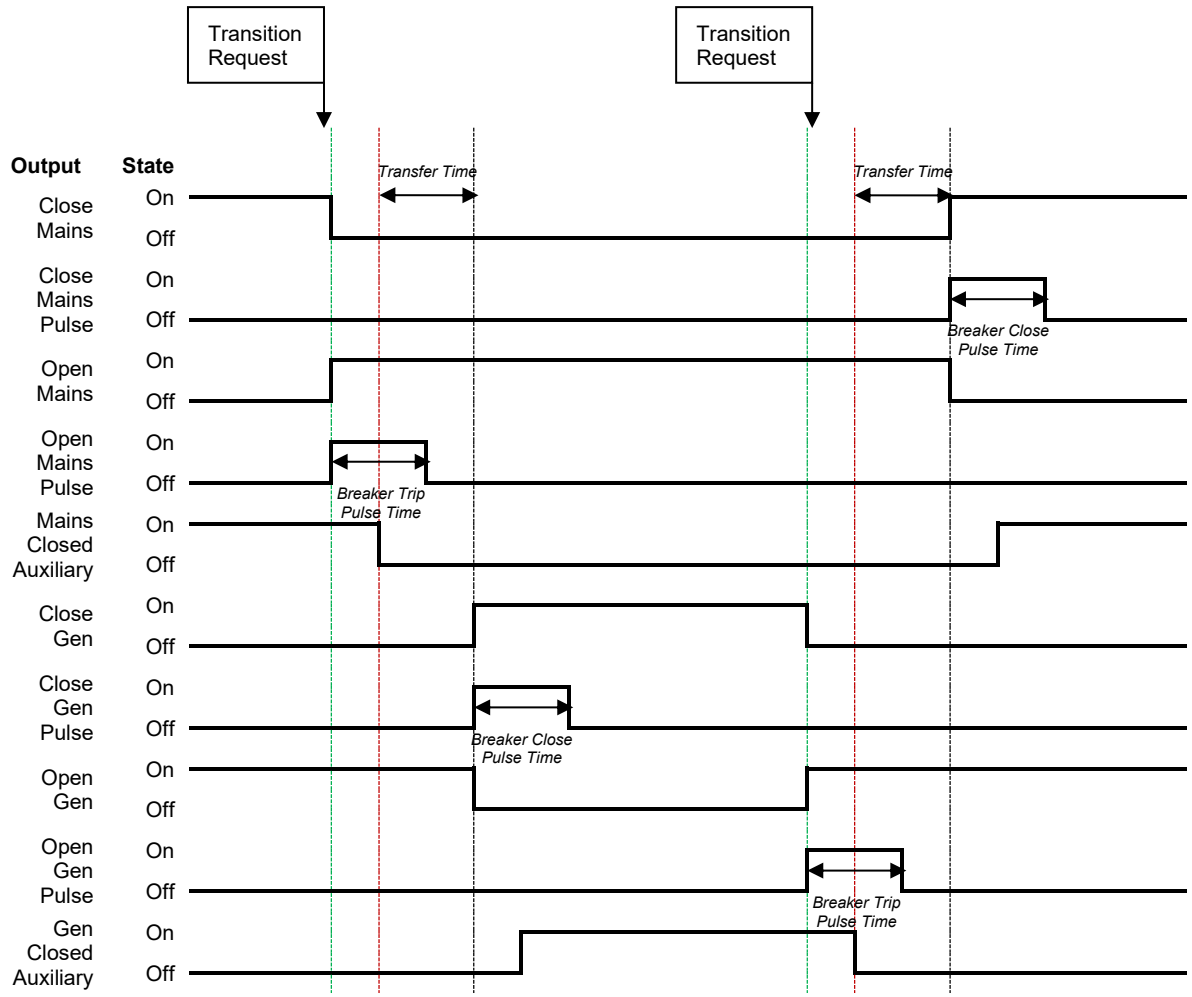
5.9 CHANGEOVER FUNCTIONALITY

The change over functionality between mains and generator is dependent on how the DSE module is configured. A brief description of the operation of each scheme is detailed in the following sections.

5.9.1 OPEN TRANSITION WITHOUT CHECK SYNC

NOTE: When using *Open Transition*, it is recommended that digital inputs are configured for *Generator Closed Auxiliary* and *Mains Closed Auxiliary* to provide additional interlock protection.

By default the DSE module performs an open transition without check sync, with a pre-configured transfer delay between opening one load switch and closing the other. When changing over from mains to generator, the module requests that the mains load switch opens. Once the *Mains Closed Auxiliary* indicates the mains load switch has opened, the *Transfer Time* begins. After the *Transfer Time* expires, the module attempts to close the generator load switch. The operating philosophy is the same when going from generator to mains and the complete transition is shown below in the timing diagram.



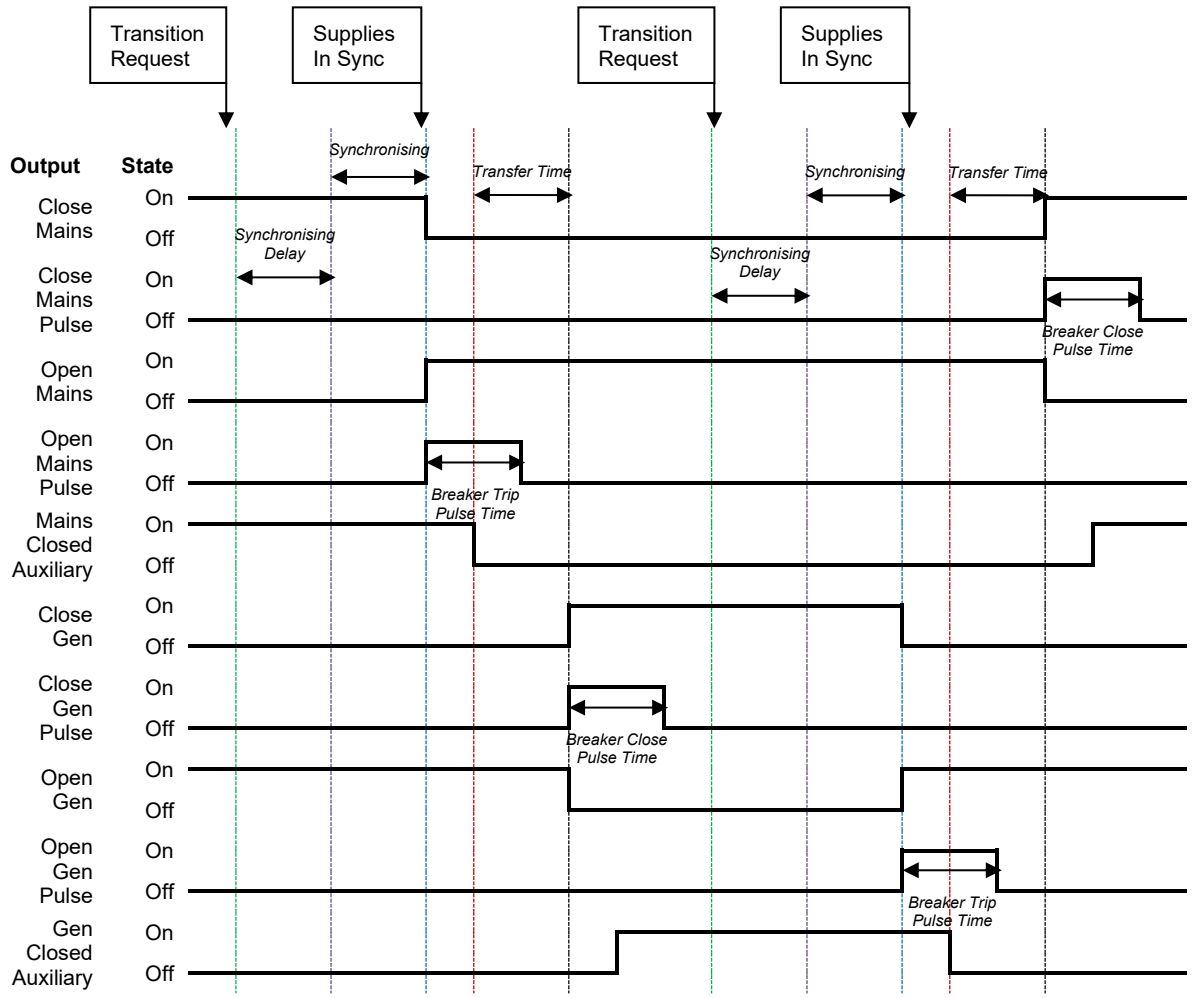
5.9.2 OPEN TRANSITION WITH CHECK SYNC

NOTE: When using *Open Transition*, it is recommended that digital inputs are configured for *Generator Closed Auxiliary* and *Mains Closed Auxiliary* to provide additional interlock protection.

NOTE: *Check Sync* is not available when using the *Dual Mutual Standby* feature.

NOTE: When using *Open Transition With Check Sync* without enabling the *Check Sync Assist* to actively control the synchronising, it is advised that the *Return to Open Transition* is enabled. If *Return to Open Transition* is enabled, the module performs an open transition without check sync if the supplies fail to synchronise within the configured time. For further details of module configuration, refer to DSE Publication: *057-388 DSE7300 Configuration Software Manual.*

It is possible to configure the DSE module to perform an open transition with check sync, with a pre-configured transfer delay between opening one load switch and closing the other. When changing over from mains to generator, the module waits for the two supplies to become in sync (by passive or actively synchronising depending on configuration). After the supplies become in sync, the module requests that the mains load switch opens. Once the *Mains Closed Auxiliary* indicates the mains load switch has opened, the *Transfer Time* begins. After the *Transfer Time* expires, the module attempts to close the generator load switch. The operating philosophy is the same when going from generator to mains and the complete transition is shown below in the timing diagram.



5.9.3 CLOSED TRANSITION WITH CHECK SYNC

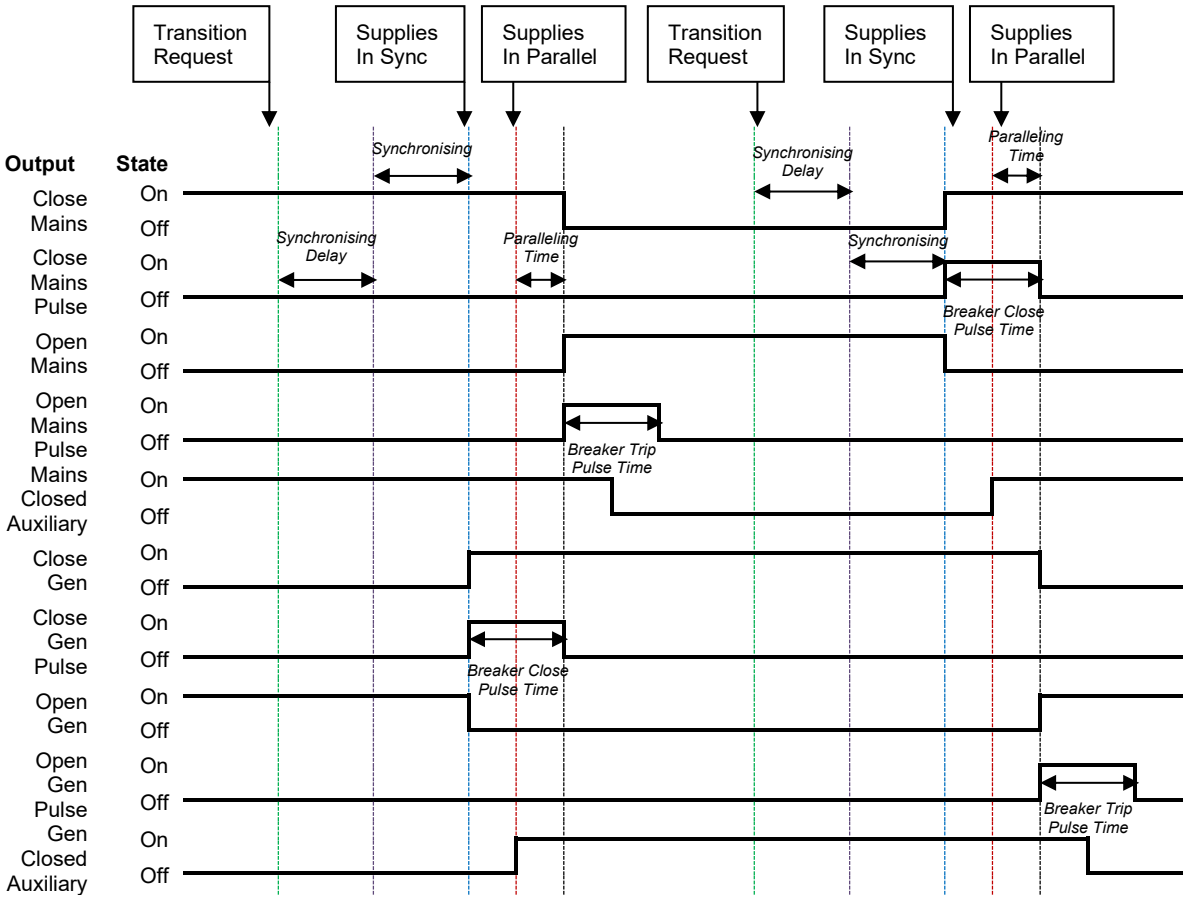
NOTE: *Closed Transition With Check Sync* is not available when using the *Dual Mutual Standby* feature.

NOTE: When using *Closed Transition With Check Sync*, digital inputs must be configured for *Generator Closed Auxiliary* and *Mains Closed Auxiliary*.

NOTE: When using *Closed Transition With Check Sync*, mechanical interlock must not be fitted. It is recommended that external electrical interlock provided but overridden using and output configured as *Interlock Override.*

NOTE: When using *Closed Transition With Check Sync* without enabling the *Check Sync Assist* to actively control the synchronising, it is advised that the *Return to Open Transition* is enabled. If *Return to Open Transition* is enabled, the module performs an open transition without check sync if the supplies fail to synchronise within the configured time. For further details of module configuration, refer to DSE Publication: *057-388 DSE7300 Configuration Software Manual.*

It is possible to configure the DSE module to perform a closed transition with check sync, with a pre-configured parallel time when both load switches are closed. When changing over from mains to generator, the module waits for the two supplies to become in sync (by passive or actively synchronising depending on configuration). After the supplies become in sync, the module requests that the generator load switch closes. Once the *Generator Closed Auxiliary* indicates the generator load switch has closed, the *Paralleling Time* begins. After the *Paralleling Time* expires, the module attempts to open the mains load switch. The operating philosophy is the same when going from generator to mains and the complete transition is shown in the timing diagram overleaf.


Transition Request
Supplies In Sync
Supplies In Parallel
Transition Request
Supplies In Sync
Supplies In Parallel
Output
State
Close Mains
Close Mains Pulse
Open Mains
Open Mains Pulse
Mains Closed Auxiliary
Close Gen
Close Gen Pulse
Open Gen
Open Gen Pulse
Gen Closed Auxiliary
On
Off
Synchronising
Synchronising Delay
Paralleling Time
Synchronising Delay
Synchronising
Paralleling Time
Breaker Close Pulse Time
Breaker Trip Pulse Time
Breaker Close Pulse Time
Breaker Trip Pulse Time

6 OPERATION (DUAL MUTUAL STANDBY)

The following description details the sequences followed by a module containing the default factory settings modified to allow two modules to operate in *Dual Mutual Standby*. The operating modes are as per the standard operation documented in the section entitled *Operation* with the addition of the *Dual Mutual Standby* functions detailed below.

If the completed generator set or control panel has been purchased from a third party supplier, the module's configuration would have been changed by them to suit their particular requirements. Always refer to the module's configuration source for the exact sequences and timers observed by any particular module in the field.

6.1 REMOTE START

NOTE: In all operating modes, only one DSEG7300 is permitted to close its Generator load switching device at any time.

NOTE: Mechanical and/or electrical interlocks between the generators' switchgear is required.

When using the two DSEG7300 modules, one on each generator, the *Dual Mutual Standby* feature allows a priority generator to be backed up. The generators starting and stopping to achieve this occurs automatically with no user intervention. Depending upon module configuration, the priority changes between the generators based on engine hours or an internal dual mutual timer.

6.1.1 BALANCING MODE: SET PRIORITY

Highest Priority



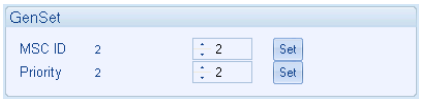




Next Highest Priority







If a starting request is made, the starting sequence begins.
Starting requests are made from the following sources:

- Activation of a digital input that has been configured to *Remote Start On Load:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) controls the starting/stopping of both modules when they are in *Auto Mode***.** In this instance, the *Highest Priority* starts its generator. If the *Highest Priority* fails, it instructs the *Next Highest Priority* to start and take the load using the digital communications link.
  - If the *Highest Priority* is running and the *Remote Start Signal On Load* signal is given to the *Next Highest Priority*, the *Next Highest Priority* does not start its generator until the *Highest Priority* generator fails.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Priority* scheme. Both generators could start, but only the *Highest Priority* is allowed to close its load switch to power the load.

6.1.2 BALANCING MODE: ENGINE HOURS/DUAL MUTUAL TIME

Highest Priority







Next Highest Priority







If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- Activation of a digital input that has been configured to *Remote Start On Load:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) controls the starting/stopping of both modules when they are in *Auto Mode*. In this instance, the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* starts. If all generators have the same number of *Engine Hours* or *Dual Mutual Time*, the highest *Priority* starts. If the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* fails, it instructs the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* to start and take the load using the digital communications link.
  - If a generator is running and the *Remote Start Signal On Load* signal is given to another generator with a lower number *Engine Hours* or *Dual Mutual Time*, it does not start until the generator fails. If the running generator's *Engine Hours* or *Dual Mutual Time* is greater than another generator's by the configured *Duty Time*, it instructs the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* to start and take the load using the digital communications link.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Engine Hours* or *Dual Mutual Time* scheme. Both generators could start, but only the generator with the lowest number of *Engine Hours* or *Dual Mutual Time* is allowed to close its load switch to power the load.

6.2 AUTO MAINS FAIL

NOTE: In all operating modes, only one DSEG7300 is permitted to close a generator load switching device at any time.

NOTE: In all operating modes, only one DSEG7300 is permitted to operate the mains load switching device at any time.

NOTE: Mechanical and/or electrical interlocks between all the load switches is required.

When using the two DSEG7300 modules, one on each generator, the *Dual Mutual Standby* feature allows a priority generator to be backed up whilst also backing up a mains supply. The generators starting and stopping to achieve this occurs automatically with no user intervention. The priority can be configured change between the generators based on engine hours or an internal dual mutual timer. The DSEG7300 which controls the mains load switch is the one which has the highest priority in that instant or whose generator is running on load.

6.2.1 BALANCING MODE: SET PRIORITY

Highest Priority







Next Highest Priority







If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- No activation of a digital input configured to *Remote Start On Load* or no *Mains Failure Detection:*
  - If the *Highest Priority* module is not in the ***Stop/Reset Mode*** or does not have an *Electrical Trip Alarm* or *Shutdown Alarm* active, it controls the mains load switch by activating the required close or open signal. The other module ensures its close and open signals are turned off so no conflicting control signals are sent to the mains load switch.
  - If the *Highest Priority* module is in the ***Stop/Reset Mode*** or has an *Electrical Trip Alarm* or *Shutdown Alarm* active, it passes control of the mains load switch to *Next Highest Priority*. The *Next Highest Priority* activates the required close or open signal prior to the *Highest Priority* de-activating its control signal. This is done to ensure that the mains load switch is maintained in the required position whilst changing over control between the modules.

- Activation of a digital input configured to *Remote Start On Load or Mains Failure Detection:*
  - The *Remote Start On Load* signal (connected to a digital input on both modules) or *Mains Failure* detection (loss of mains sensing on both modules) controls the starting/stopping of both modules when they are in *Auto Mode*. In this instance, the *Highest Priority* starts its generator. If the *Highest Priority* generator fails to start, control is passed to the *Next Highest Priority* using the digital communications link. The *Next Highest Priority* takes control of the mains load switch and starts its generator. Once the generator is available, the load is then transferred.
  - If the *Highest Priority* is running and the *Remote Start Signal On Load* signal or *Mains Failure* detection occurs on the *Next Highest Priority*, the *Next Highest Priority* does not attain control nor start its generator until the *Highest Priority* generator fails.

- Activation of the inbuilt scheduler:
  - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Priority* scheme. Both generators could start, but only the *Highest Priority* is allowed to control the mains load switch and transfer the load to its generator.

6.2.2 BALANCING MODE: ENGINE HOURS/DUAL MUTUAL TIME

Highest Priority







Next Highest Priority







If a starting request is made, the starting sequence begins. Starting requests are made from the following sources:

- No activation of a digital input configured to *Remote Start On Load* or no *Mains Failure Detection:*
  - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* is not in the ***Stop/Reset Mode*** or, does not have an *Electrical Trip / Shutdown Alarm* active, it controls the mains load switch by activating the required close or open signal. The other module ensures its close and open signals are turned off so no conflicting control signals are sent to the mains load switch.
  - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* is in the ***Stop/Reset Mode*** or, has an *Electrical Trip* / *Shutdown Alarm* active, it passes control of the mains load switch to the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time*. The next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* activates the required close or open signal prior to generator with the lowest number of *Engine Hours* or *Dual Mutual Time* de-activating its control signal. This is done to ensure that the mains load switch is maintained in the required position whilst changing over control between the modules.

- Activation of a digital input configured to *Remote Start On Load or Mains Failure Detection:*
    - The *Remote Start On Load* signal (connected to a digital input on both modules) or *Mains Failure* detection (loss of mains sensing on both modules) controls the starting/stopping of both modules when they are in *Auto Mode*. In this instance, the module with the lowest number of *Engine Hours* or *Dual Mutual Time* starts its generator. If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* generator fails to start, control is passed to the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* using the digital communications link. The next generator with the lowest number of *Engine Hours* or *Dual Mutual Time* takes control of the mains load switch and starts its generator. Once the generator is available, the load is then transferred.
    - If the module with the lowest number of *Engine Hours* or *Dual Mutual Time* generator is running and the *Remote Start Signal On Load* signal or *Mains Failure* detection occurs on the next generator with the lowest number of *Engine Hours* or *Dual Mutual Time*, it does not attain control or start its generator until module with the running generator fails.

- Activation of the inbuilt scheduler:
    - In the *Dual Mutual Standby* operation, the inbuilt scheduler operates totally independently to the *Engine Hours* or *Dual Mutual Time* scheme. Both generators could start, but only the with the lowest number of *Engine Hours* or *Dual Mutual Time* is allowed to control the mains load switch and transfer the load to its generator.

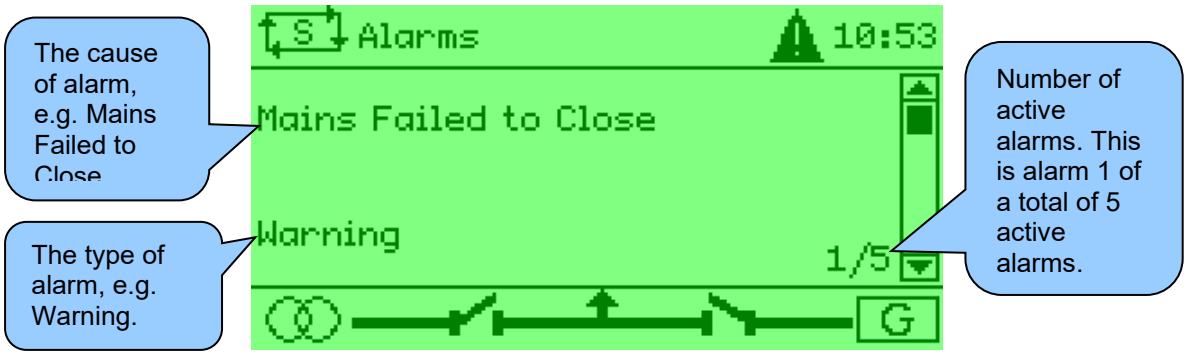
7 PROTECTIONS

7.1 ALARMS

When an alarm is active, the *Internal Audible Alarm* sounds and the *Common Alarm* output if configured, activates.

The audible alarm is silenced by pressing the ***Alarm Mute / Lamp Test*** button.

The LCD display jumps from the 'Information page' to display the Alarm Page.



If one or more alarms are active, the LCD displays the current alarm message, including:

- The alarm description (e.g. Mains Failed to Close)
- The alarm type (e.g. Warning)
- The position of the displayed alarm within the total number of active alarms (e.g. 1/5)

If multiple alarms are present, they can be viewed by scrolling through the list using the ***Instrumentation Scroll*** buttons.

When a new alarm occurs, it is added to the list of active alarms and displayed accordingly.

Example:



7.1.1 PROTECTIONS DISABLED

Protections Disabled indicates that one or more protective shutdown functions have been temporarily inhibited by configuration or by operator action. This state prevents the controller from automatically initiating a shutdown in response to specific alarm conditions.
When protections are disabled and no alarm condition is present, the home screen displays *Protections Disabled*. Shutdown and Electrical Trip type alarms remain active and continue to be detected by the system; however, their associated shutdown actions are inhibited while protections are disabled.

If an alarm condition that would normally cause a shutdown occurs while protections are disabled:

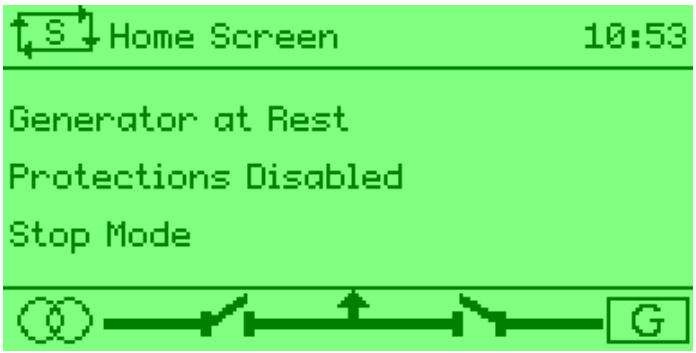
- The module prevents the shutdown from occurring.
- A *Shutdown Blocked* warning is raised.
- The home screen indicates that the shutdown has been blocked.

The alarm and event logs continue to record the original alarm action (for example, Shutdown), even though the shutdown has been inhibited. This behaviour is normal and allows accurate logging of alarm severity while clearly indicating that the shutdown action was blocked.

Below are examples of screens that might appear when these conditions arise.

Protections Disabled (no active alarm)

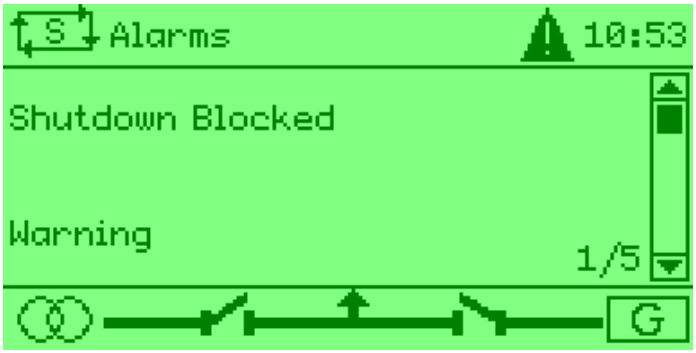
The home screen indicates that protections are disabled.



Protections Disabled with alarm present

The following functions occur:

- The alarm is raised normally.
- A Shutdown blocked warning is displayed.
- The shutdown does not occur.
- The home screen indicates that the shutdown has been blocked.



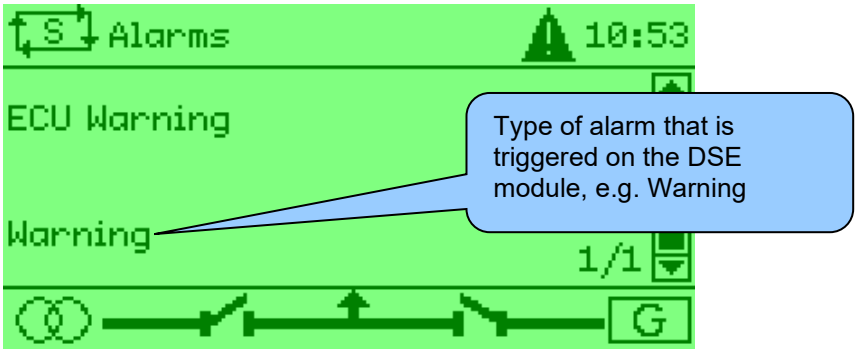
Protections can be disabled through configuration or operator action, depending on system design. Typical use cases include commissioning, testing, or fault-finding activities where automatic shutdowns must be temporarily prevented.
It is the system designer’s responsibility to ensure that the use of disabled protections complies with site safety and operational requirements.

7.1.2 ECU ALARMS (CAN FAULT CODES / DTC)

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.

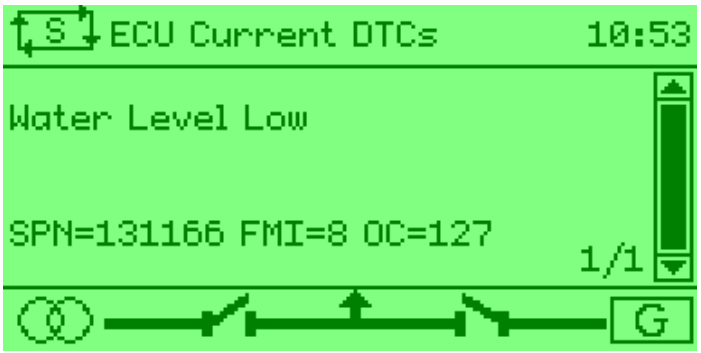
NOTE: For further details on connection to electronic engines, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*.

When connected to a suitable CAN engine, the module displays alarm status messages from the ECU in the *Alarms* section of the display.



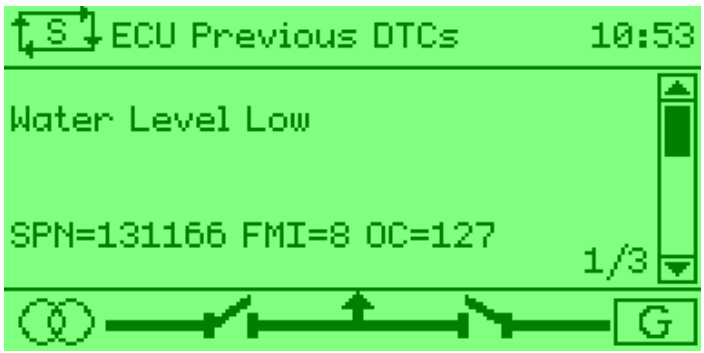
Press the ***Next Page***  button to access the list of *ECU Current DTCs* (Diagnostic Trouble Codes) from the ECU which are DM1 messages.

The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



Press the ***Next Page***  button to access the list of *ECU Previous DTCs* (Diagnostic Trouble Codes) from the ECU which are DM2 messages.

The DM2 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



7.2 INDICATIONS

NOTE: There is no Configuration Suite option to create, modify, or assign LED indications.

NOTE: LEDs are intended to provide at-a-glance information only. For detailed system status, alarm information, and diagnostics, refer to the LCD display and event logs.

Indications are non-critical, status-only conditions intended to provide immediate visual feedback to the operator. Indications do not generate alarms and do not appear as text messages on the LCD Status, Event Log, or Alarms pages.
On the G7300 series module, indications are presented using the front-panel LEDs located adjacent to the control buttons.

The front-panel LEDs are fixed-function indicators. They are controlled automatically by the module firmware and cannot be configured or reassigned in Configuration Suite.



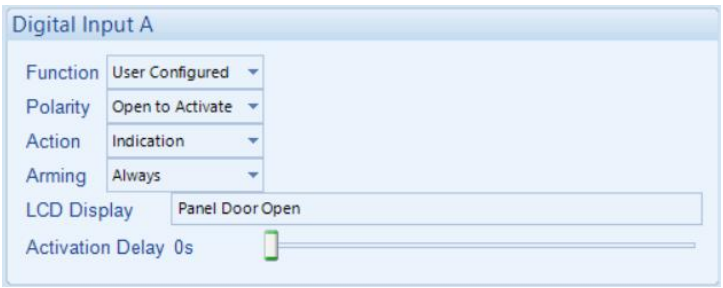
Each front-panel LED is associated with a specific control button and indicates the operating state of the module, engine, or system function related to that button. Depending on the condition being indicated, an LED may be:

- Off-Illuminated continuously
- Flashing at a predefined rate

When the Alarm Mute button is pressed, all front-panel LEDs illuminate simultaneously. This provides a lamp test function allowing the operator to confirm correct LED operation.

Example (Indication without alarm):

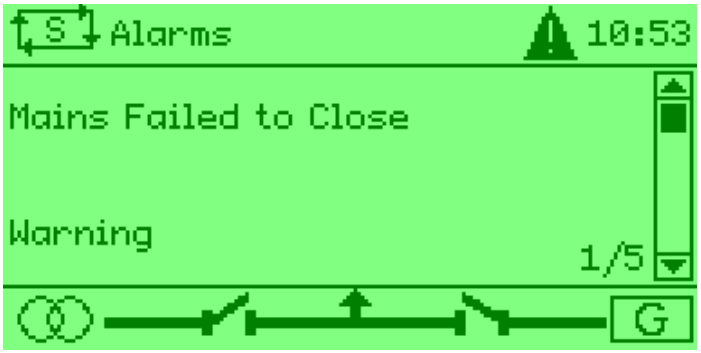
- Input configured for indication.
- The LCD text does not appear on the module display but can be added in the configuration to remind the system designer what the input is used for.
- As the input is configured to *Indication* there is no alarm generated.



7.3 WARNING ALARMS

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

Example:



In the event of an alarm the LCD jumps to the alarms page and scroll through all active alarms.

By default, warning alarms are self-resetting when the fault condition is removed. However enabling *All Warnings Are Latched* causes warning alarms to latch until reset manually. This is enabled using the DSE Configuration Suite in conjunction with a compatible PC.

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

Fault	Description
2130 ID 0 to 3 Analogue Input E to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had risen above the *Flexible Sensor High Pre-Alarm Trip* level.
2130 ID 0 to 3 Analogue Input E to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had fallen below the *Flexible Sensor Low Pre-Alarm Trip* level.
2130 ID 0 to 3 Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2130 expansion module became active and the appropriate LCD message displayed.

Continued over page…

Fault	Description
DSE2131 ID 0 to 3 Analogue Input A to J High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had risen above the *Flexible Sensor High Pre-Alarm Trip* level.
DSE2131 ID 0 to 3 Analogue Input A to J Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had fallen below the *Flexible Sensor Low Pre-Alarm Trip* level.
DSE2131 ID 0 to 3 Digital Input A to J	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2131 expansion module became active and the appropriate LCD message displayed.
DSE2133 ID 0 to 3 Analogue Input A to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had risen above the *Temperature Sensor High Pre-Alarm Trip* level.
DSE2133 ID 0 to 3 Analogue Input A to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had fallen below the *Temperature Sensor Low Pre-Alarm Trip* level.

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Fault	Description
Charger ID 0 to 1 Common Warning	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a battery charger connected by DSENet® had issued a *Common Warning Alarm*.
Analogue Input A to F (Digital)	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input configured as a digital input to create a fault condition became active and the appropriate LCD message is displayed.
AVR Data Fail	The module is configured to communicate to the generator's AVR by CAN but has not detected data being sent from the generator's AVR.
AVR Fault	The module received a red fault condition from the alternators AVR.
Battery Detect Failure	The module detected that a battery charger connected by DSENet® had issued a *Battery Detect Failure* alarm.
Battery Failure Detection Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery Failure Detection* alarm on its Output 1.
Battery Failure Detection Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery Failure Detection* alarm on its Output 2.
Battery High Current Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery High Current* alarm on its Output 1.
Battery High Current Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery High Current* alarm on its Output 2.
Battery High Temperature Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery High Temperature* alarm on its Output 1.
Battery High Temperature Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery High Temperature* alarm on its Output 2.
Battery High Voltage Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery High Voltage* alarm on its Output 1.
Battery High Voltage Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery High Voltage* alarm on its Output 2.
Battery Low Voltage Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery Low Voltage* alarm on its Output 1.
Battery Low Voltage Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery Low Voltage* alarm on its Output 2.
Battery Temperature Sensor Fail Output 1	The module detected that a battery charger connected by DSENet® had issued a *Battery Temperature Fail* alarm on its Output 1.

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Fault	Description
Battery Temperature Sensor Fail Output 2	The module detected that a battery charger connected by DSENet® had issued a *Battery Temperature Fail* alarm on its Output 2.
Calibration Fault	The module detected that its internal calibration has failed. The unit must be sent back to DSE to be investigated and repaired. Contact DSE Technical Support for more details.
Charge Alt Failure IEEE 37.2 – 27 DC Undervoltage Relay	The module detected that the output voltage of the charge alternator had fallen below the *Charge Alternator Warning Trip* level for the configured delay timer.
Charger Fan Locked	The module detected that a battery charger connected by DSENet® had a *Failure* alarm.
Charger High Temperature	The module detected that a battery charger connected by DSENet® had a *High Temperature* alarm.
Charger Mains High Current	The module detected that a battery charger connected by DSENet® had a *Mains High Current* alarm.
Charger Mains High Voltage	The module detected that a battery charger connected by DSENet® had a *Mains High Voltage* alarm.
Charger Mains Low Voltage	The module detected that a battery charger connected by DSENet® had a *Mains Low Voltage* alarm.
Charger Voltage Drop Charging Cable Output 1	The module detected that a battery charger connected by DSENet® had issued a *Voltage Drop Charging Cable* alarm on its Output 1.
Charger Voltage Drop Charging Cable Output 2	The module detected that a battery charger connected by DSENet® had issued a *Voltage Drop Charging Cable* alarm on its Output 2.
Coolant Temp High IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the engine coolant temperature had risen above the *High Coolant Temperature Pre-Alarm Trip* level after the *Safety On Delay* timer had expired.
DC Battery High Voltage IEEE 37.2 – 59 DC Overvoltage Relay	The module detected that its DC supply voltage had risen above the *Plant Battery Overvolts Warning Trip* level for the configured delay timer.
DC Battery Low Voltage IEEE 37.2 – 27 DC Undervoltage Relay	The module detected that its DC supply voltage had fallen below the *Plant Battery Undervolts Warning Trip* level for the configured delay timer.
DEF Level Low	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Pre-Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.

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Fault	Description
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.
Engine Over Speed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Pre-Alarm Trip* level for the configured delay timer.
Engine Over Speed Delayed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Trip* level but was below the *Over Speed Overshoot Trip* for the configured *Overshoot Delay* timer during starting.
Engine Under Speed IEEE C37.2 - 14 Underspeed Device	The module detected that the engine speed had fallen below the *Under Speed Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Escape Mode	The module detected that an *Escape Mode* request has been sent to the engine ECU.
Exp. Unit Failure	The module detected that communications to one of the DSENet® expansion modules had been lost.
Fail to Synchronise	The module failed to synchronise the generator to the mains before the *Fail to Sync Delay* timer had expired. The generator continues to run until it has successfully synchronised to the mains.
Flexible Sensor A to F High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had risen above the *Flexible Sensor High Pre-Alarm Trip* level.
Flexible Sensor A to F Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had fallen below the *Flexible Sensor Low Pre-Alarm Trip* level.
Fuel Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level rose above the *High Fuel Level Trip* level.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.

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Fault	Description
Fuel Tank Bund Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the fuel tank bund level switch had activated.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more than the configured *Running Rate* or *Stopped Rate*.
Gen Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the generator load switch had failed to close as the Generator Closed Auxiliary input did not activate within the Generator Fail to Close Delay time after the Close Gen Output activated.
Gen Failed to Open IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the generator load switch had failed to open as the Generator Closed Auxiliary input did not deactivate within the Generator Fail to Open Delay time after the Close Gen Output deactivated.
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the *Generator Loading Voltage* setting after the *Warming Up* timer had expired.
Gen Over Current IEEE C37.2 – 50 Instantaneous Overcurrent Relay IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the *Generator Over Current Trip*.
Gen Over Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Pre-Alarm Trip* level for the configured delay timer.
Gen Over Frequency Delayed IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Trip* level but was below the *Over Frequency Overshoot Trip* for the configured *Overshoot Delay* timer during starting.
Gen Over Voltage IEEE C37.2 – 59 AC Overvoltage Relay	The module detected that the generator output voltage had risen above the *Over Voltage Pre-Alarm Trip* level for the configured delay timer.
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Gen Under Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had fallen below the *Under Frequency Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Gen Under Voltage IEEE C37.2 – 27 AC Undervoltage Relay	The module detected that the generator output voltage had fallen below the *Under Voltage Pre-Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
HEST Active	The module received a fault condition from the engine ECU alerting that the HEST had activated.
Inlet Temperature	The module detected that the engine's ECU measurement of inlet temperature had risen above the *Inlet Temperature Alarm Pre-Alarm Trip* level.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the *Overload Protection Trip* for the configured delay timer.
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required *Crank Disconnect* criteria had been met.

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Fault	Description
Low Coolant Warning	The module detected that the engine coolant temperature had fallen below the *Low Coolant Temperature Pre-Alarm Trip* level.
Low Load IEEE C37.2 – 37 Undercurrent or Underpower relay	The module detected that the load had fallen below the *Low Load Alarm Trip* level.
Mains Earth Fault IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the mains load switch had failed to close as the Mains Closed Auxiliary input did not activate within the Mains Fail to Close Delay time after the Close Mains Output activated.
Mains Failed to Open IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the mains load switch had failed to open as the Mains Closed Auxiliary input did not deactivate within the Mains Fail to Open Delay time after the Close Mains Output deactivated.
Mains Over Current IEEE C37.2 – 50 Instantaneous Overcurrent Relay IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled *Over Current Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Mains Over Current Trip*.
Mains Phase Seq Wrong	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.

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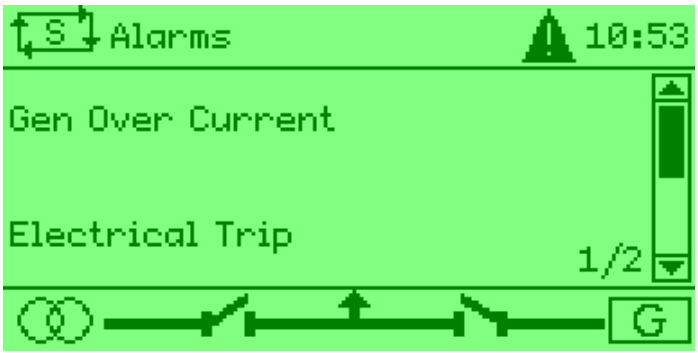
Fault	Description
Maintenance Due	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.
MSC Failure	The module detected that *Dual Mutual Standby* communication link had failed.
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative kvar Pre-Alarm Trip* for the configured delay timer.
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Oil Pressure Low IEEE C37.2 - 63 Pressure Switch	The module detected that the engine oil pressure had fallen below the *Low Oil Pressure Pre-Alarm Trip* level after the *Safety On Delay* timer had expired.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the Positive kvar Pre-Alarm Trip for the configured delay timer.
Protections Disabled	The module detected that an input configured for Protections Disable became active.
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.4 ELECTRICAL TRIP ALARMS

NOTE: The fault condition must be resolved before the alarm can be reset. If the fault condition remains, it is not possible to reset the alarm (the exception to this is the *Coolant Temp High* alarm and similar *Active From Safety On* alarms, as the coolant temperature could be high with the engine at rest).

Electrical Trip Alarms are latching and stop the Generator but in a controlled manner. On initiation of the electrical trip condition the module de-activates the ***Close Gen Output*** outputs to remove the load from the generator. Once this has occurred the module starts the *Cooling Timer* and allows the engine to cool off-load before shutting down the engine. To restart the generator the fault must be cleared and the alarm reset.

Example:



In the event of an alarm the LCD jumps to the alarms page and scrolls through all active alarms.

Electrical Trip Alarms are latching alarms and to remove the fault, press the ***Stop/Reset Mode*** button on the module.

Fault	Description
2130 ID 0 to 3 Analogue Input E to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had risen above the *Flexible Sensor High Alarm Trip* level.
2130 ID 0 to 3 Analogue Input E to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had fallen below the *Flexible Sensor Low Alarm Trip* level.

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Fault	Description
2130 ID 0 to 3 Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2130 expansion module became active and the appropriate LCD message displayed.
DSE2131 ID 0 to 3 Analogue Input A to J High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had risen above the *Flexible Sensor High Alarm Trip* level.
DSE2131 ID 0 to 3 Analogue Input A to J Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had fallen below the *Flexible Sensor Low Alarm Trip* level.
DSE2131 ID 0 to 3 Digital Input A to J	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2131 expansion module became active and the appropriate LCD message displayed.
DSE2133 ID 0 to 3 Analogue Input A to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had risen above the *Temperature Sensor High Alarm Trip* level.
DSE2133 ID 0 to 3 Analogue Input A to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had fallen below the *Temperature Sensor Low Alarm Trip* level.

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Fault	Description
Charger ID 0 to 1 Common Electrical Trip	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a battery charger connected by DSENet® had issued a *Common Electrical Trip Alarm*.
Analogue Input A to F (Digital)	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input configured as a digital input to create a fault condition became active and the appropriate LCD message is displayed.
Auto Sense Fail	The module detected that the output voltage of the generator had risen above the *Over Voltage During Auto Sensing Trip* level during starting whilst attempting to detect which alternative configuration to use.
AVR Data Fail	The module is configured to communicate to the generator's AVR by CAN but has not detected data being sent from the generator's AVR.
AVR Fault	The module received a red fault condition from the alternators AVR.
Calibration Fault	The module detected that its internal calibration has failed. The unit must be sent back to DSE to be investigated and repaired. Contact DSE Technical Support for more details.
Coolant Temp High IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the engine coolant temperature had risen above the *High Coolant Temperature Electrical Trip* level after the *Safety On Delay* timer had expired.
DEF Level Low	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see the section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.

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Fault	Description
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.
Exp. Unit Failure	The module detected that communications to one of the DSENet® expansion modules had been lost.
Fail to Synchronise	The module failed to synchronise the generator to the mains before the *Fail to Sync Delay* timer had expired. A break changeover occurs and the generator goes into a cooling run.
Flexible Sensor A to F High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had risen above the *Flexible Sensor High Alarm Trip* level.
Flexible Sensor A to F Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had fallen below the *Flexible Sensor Low Alarm Trip* level.
Fuel Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level rose above the *High Fuel Level Trip* level.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.
Fuel Tank Bund Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the fuel tank bund level switch had activated.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more than the configured Running Rate or Stopped Rate.
Gen Loading Frequency	The module detected that the generator output frequency had not risen above the Generator Loading Frequency setting after the Warming Up timer had expired.
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the Generator Loading Voltage setting after the Warming Up timer had expired.
Gen Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the Generator Over Current Trip for the duration of the IDMT function.
Gen Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the generator was different to the configured Generator Phase Rotation Alarm setting.

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Fault	Description
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Inlet Temperature	The module detected that the engine's ECU measurement of inlet temperature had risen above the *Inlet Temperature Alarm Trip* level.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the Overload Protection Trip for the configured delay timer.
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required Crank Disconnect criteria had been met.
Low Load IEEE C37.2 – 37 Undercurrent or Underpower relay	The module detected that the load had fallen below the *Low Load Alarm Trip* level.
Mains Earth Fault IEEE C37.2 – 51G or 51N IDMT Earth Fault Relay	**NOTE: For more details, see the section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Over Current Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Mains Over Current Trip* for the duration of the IDMT function.
Mains Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.

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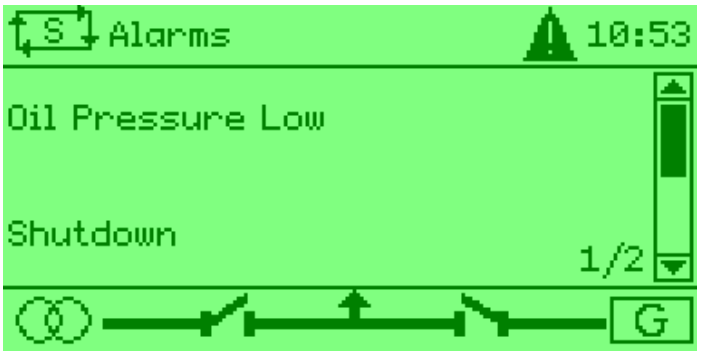
Fault	Description
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Maintenance Due	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.
MSC ID Error	The module detected that another module on the *Dual Mutual Standby* communication link had the same *GenSet MSC ID* configured.
MSC Old Version Unit	The module detected that another module on the *Dual Mutual Standby* communication link had an incompatible *Dual Mutual Standby* version to its own
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative var Alarm Trip* for the configured delay timer.
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the *Positive var Alarm Trip* for the configured delay timer.
Priority Selection Error	The module detected that another module on the *Dual Mutual Standby* communication link had the same *GenSet Priority* configured.
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.5 SHUTDOWN ALARMS

NOTE: The fault condition must be resolved before the alarm can be reset. If the fault condition remains, it is not possible to reset the alarm (the exception to this is the *Oil Pressure Low* alarm and similar *Active From Safety On* alarms, as the oil pressure is low with the engine at rest).

Shutdown Alarms are latching and immediately stop the Generator. On initiation of the shutdown condition the module de-activates the ***Close Gen Output*** outputs to remove the load from the generator. Once this has occurred, the module shuts the generator set down immediately to prevent further damage. To restart the generator the fault must be cleared and the alarm reset.

Example:



In the event of an alarm the LCD jumps to the alarms page and scrolls through all active alarms.

Shutdown Alarms are latching alarms and to remove the fault, press the ***Stop/Reset Mode*** button on the module.

Fault	Description
2130 ID 0 to 3 Analogue Input E to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had risen above the *Flexible Sensor High Alarm Trip* level.
2130 ID 0 to 3 Analogue Input E to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2130 had fallen below the *Flexible Sensor Low Alarm Trip* level.

Continued over page…

Fault	Description
2130 ID 0 to 3 Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2130 expansion module became active and the appropriate LCD message displayed.
DSE2131 ID 0 to 3 Analogue Input A to J High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had risen above the *Flexible Sensor High Alarm Trip* level.
DSE2131 ID 0 to 3 Analogue Input A to J Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2131 had fallen below the *Flexible Sensor Low Alarm Trip* level.
DSE2131 ID 0 to 3 Digital Input A to J	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition on a DSE2131 expansion module became active and the appropriate LCD message displayed.
DSE2133 ID 0 to 3 Analogue Input A to H High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had risen above the *Temperature Sensor High Alarm Trip* level.
DSE2133 ID 0 to 3 Analogue Input A to H Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value of a DSE2133 had fallen below the *Temperature Sensor Low Alarm Trip* level.

Continued over page…

Fault	Description
Charger ID 0 to 1 Common Shutdown	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a battery charger connected by DSENet® had issued a *Common Shutdown Alarm*.
Analogue Input A to F (Digital)	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input configured as a digital input to create a fault condition became active and the appropriate LCD message is displayed.
Auto Sense Fail	The module detected that the output voltage of the generator had risen above the *Over Voltage During Auto Sensing Trip* level during starting whilst attempting to detect which alternative configuration to use.
AVR Data Fail	The module is configured to communicate to the generator's AVR by CAN but has not detected data being sent from the generator's AVR.
AVR Fault	The module received a red fault condition from the alternators AVR.
Battery Temp	The module detected that a battery charger connected by DSENet® had issued a *Battery Temperature* alarm.
Calibration Fault	The module detected that its internal calibration has failed. The unit must be sent back to DSE to be investigated and repaired. Contact DSE Technical Support for more details.
Charge Alt Failure IEEE C37.2 – 27DC Undervoltage Relay	The module detected that the output voltage of the charge alternator had risen above the *Charge Alternator Shutdown Trip* level for the configured delay timer.
Charger Failure	The module detected that a battery charger connected by DSENet® had a *Failure* alarm.
Charger Fan Locked	The module detected that a battery charger connected by DSENet® had a *Failure* alarm.
Charger High Temperature	The module detected that a battery charger connected by DSENet® had a *High Temperature* alarm.
Charger Input Fuse Fail	The module detected that a battery charger connected by DSENet® had an *Input Fuse Fail* alarm.
Charger Mains High Current	The module detected that a battery charger connected by DSENet® had a *Mains High Current* alarm.
Charger Mains High Voltage	The module detected that a battery charger connected by DSENet® had a *Mains High Voltage* alarm.
Charger Mains Low Voltage	The module detected that a battery charger connected by DSENet® had a *Mains Low Voltage* alarm.
Charger Reverse Polarity	The module detected that a battery charger connected by DSENet® had a *Reverse Polarity* alarm.
Charger Short Circuit	The module detected that a battery charger connected by DSENet® had a *Short Circuit* alarm.
Charger Short Circuit / Reverse Polarity	The module detected that a battery charger connected by DSENet® had a combined *Short Circuit* and *Reverse Polarity* alarm.

Continued over page…

Fault	Description
Coolant Sensor O/C	The module detected that circuit to the engine coolant temperature sensor had become open circuit.
Coolant Temp High IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the engine coolant temperature had risen above the *High Coolant Temperature Shutdown Trip* level after the *Safety On Delay* timer had expired.
Coolant Temp High Switch IEEE C37.2 – 26 Apparatus Thermal Device	The module detected that the high engine coolant temperature switch had activated after the *Safety On Delay* timer had expired.
DEF Level	The module received a fault condition from the engine ECU alerting about the DEF level or the module detected that the *DEF Level* had fallen below the *DEF Level Low Alarm Trip* level for the configured delay timer.
Digital Input A to H	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that a digital input configured to create a fault condition became active and the appropriate LCD message is displayed.
DPTC Filter	The module received a fault condition from the engine ECU alerting that the DPF/DPTC had activated.
Earth Fault IEEE C37.2 – 51G or 51N Generator IDMT Earth Fault Relay	**NOTE: For more details, see the section entitled Earth Fault IDMT Alarm elsewhere in this document.** The module detected that the generator earth fault current had risen above the *Generator Earth Fault Trip Level* for the duration of the IDMT function.
ECU Amber	The module received an amber fault condition from the engine ECU.
ECU Data Fail	The module is configured for CAN operation but has not detected data being sent from the engine's ECU.
ECU Malfunc.	The module received a malfunction fault condition from the engine ECU.
ECU Protect	The module received a protect fault condition from the engine ECU.
ECU Red	The module received a red fault condition from the engine ECU.
Emergency Stop IEEE C37.2 - 5 Stopping Device	The module detected that emergency stop button had been pressed removing a positive voltage supply from the emergency stop input terminal. This input is failsafe (normally closed to emergency stop) and immediately stops the generator when the signal is removed.
Engine Over Speed IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Alarm Trip* level for the configured delay timer.
Engine Over Speed Overshoot IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Over Speed Overshoot Trip* during the configured *Overshoot Delay* timer whilst starting.
Engine Under Speed IEEE C37.2 - 14 Underspeed Device	The module detected that the engine speed had fallen below the *Under Speed Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Exp. Unit Failure	The module detected that communications to one of the DSENet® expansion modules had been lost.
Fail to Synchronise	The module failed to synchronise the generator to the mains before the Fail to Sync Delay timer had expired.

Continued over page…

Fault	Description
Failed to Start IEEE C37.2 - 48 Incomplete Sequence Relay	The module detected that the generator had failed to start as it did not meet the required Crank Disconnect criteria during the configured number of Crank Attempts.
Failed to Stop IEEE C37.2 - 48 Incomplete Sequence Relay	**NOTE: *Fail to Stop* could indicate a faulty oil pressure sensor. If engine is at rest, check the oil pressure sensor wiring and configuration.** The module detects a condition that indicates the generator is running when the DSE module has instructed it to stop.
Flexible Sensor A to F Fault	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that circuit to the flexible sensor had become open circuit.
Flexible Sensor A to F High	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had risen above the *Flexible Sensor High Alarm Trip* level.
Flexible Sensor A to F Low	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that an analogue input value had fallen below the *Flexible Sensor Low Alarm Trip* level.
Flexible Sensor A to F Open Circuit	The module detected that circuit to the flexible sensor had become open circuit.
Fuel Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level rose above the *High Fuel Level Trip* level.
Fuel Level Low IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine fuel level had fallen below the *Low Fuel Level Trip* level.
Fuel Level Low Switch IEEE C37.2 - 71 Liquid Level Switch	The module detected that the engine low fuel level switch had activated.
Fuel Sensor Fault	The module detected that circuit to the engine fuel level sensor had become open circuit.
Fuel Tank Bund Level High IEEE C37.2 - 71 Liquid Level Switch	The module detected that the fuel tank bund level switch had activated.
Fuel Usage IEEE C37.2 – 80 Flow Switch	The module detected that the fuel consumption was more than the configured Running Rate or Stopped Rate.
Gen Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the generator load switch had failed to close as the Generator Closed Auxiliary input did not activate within the Generator Fail to Close Delay time after the Close Gen Output activated.
Gen Loading Frequency	The module detected that the generator output frequency had not risen above the Generator Loading Frequency setting after the Warming Up timer had expired.

Continued over page…

Fault	Description
Gen Loading Voltage	The module detected that the generator output voltage had not risen above the Generator Loading Voltage setting after the Warming Up timer had expired.
Gen Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Over Current Alarm elsewhere in this document.** The module detected that the generator output current had risen above the *Generator Over Current Trip* for the duration of the IDMT function.
Gen Over Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Alarm Trip* level for the configured delay timer.
Gen Over Frequency Overshoot IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Over Frequency Overshoot Trip* during the configured *Overshoot Delay* timer whilst starting.
Gen Over Voltage IEEE C37.2 – 59 AC Overvoltage Relay	The module detected that the generator output voltage had risen above the *Over Voltage Alarm Trip* level for the configured delay timer.
Gen Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the generator was different to the configured *Generator Phase Rotation Alarm* setting.
Gen Reverse Power IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had fallen below the *Reverse Power Trip* for the configured delay timer.
Gen Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** The module detected that the generator output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Gen Under Frequency IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had fallen below the *Under Frequency Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Gen Under Voltage IEEE C37.2 – 27 AC Undervoltage Relay	The module detected that the generator output voltage had fallen below the *Under Voltage Alarm Trip* level for the configured delay timer after the *Safety On Delay* timer had expired.
Inlet Temperature	The module detected that the engine's ECU measurement of inlet temperature had risen above the *Inlet Temperature Alarm Trip* level.
kW Overload IEEE C37.2 – 32 Directional Power Relay	The module detected that the generator output kW had risen above the Overload Protection Trip for the configured delay timer.
Loss of Mag-PU	The module detected that the magnetic pick up was not producing a pulse output after the required Crank Disconnect criteria had been met.
Low Load IEEE C37.2 – 37 Undercurrent or Underpower relay	The module detected that the load had fallen below the *Low Load Alarm Trip* level.
Mag-PU Fault	The module detected that circuit to the magnetic pick up sensor had become open circuit.

Continued over page…

Fault	Description
Mains Earth Fault IEEE C37.2 – 51G or 51N IDMT Earth Fault Relay	**NOTE: For more details, see the section entitled Earth Fault IDMT Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the generator earth fault current had risen above the *Mains Earth Fault Trip Level* for the duration of the IDMT function.
Mains Failed to Close IEEE C37.2 – 52b AC Circuit Breaker Position (Contact Open when Breaker Closed)	The module detected that the mains load switch had failed to close as the Mains Closed Auxiliary input did not activate within the Mains Fail to Close Delay time after the Close Mains Output activated.
Mains Over Current IEEE C37.2 – 51 IDMT Overcurrent Relay	**NOTE: For more details, see the section entitled Over Current Alarm elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Mains Over Current Trip* for the duration of the IDMT function.
Mains Phase Seq Wrong IEEE C37.2 – 47 Phase Sequence Relay	The module detected that the phase rotation of the mains was different to the configured *Mains Phase Rotation Alarm* setting.
Mains Short Circuit IEEE C37.2 – 51 IDMT Short Circuit Relay	**NOTE: For more details, see the section entitled *Short Circuit IDMT Alarm* elsewhere in this document.** **NOTE: Mains current protection is only available when the CT location is set for *Load*. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that the mains output current had risen above the *Short Circuit Trip* for the duration of the IDMT function.
Maintenance Due	**NOTE: Due to module configuration the alarm message that appears on the display may be different. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*** The module detected that one of the configured maintenance alarms is due as its configured maintenance interval has expired.

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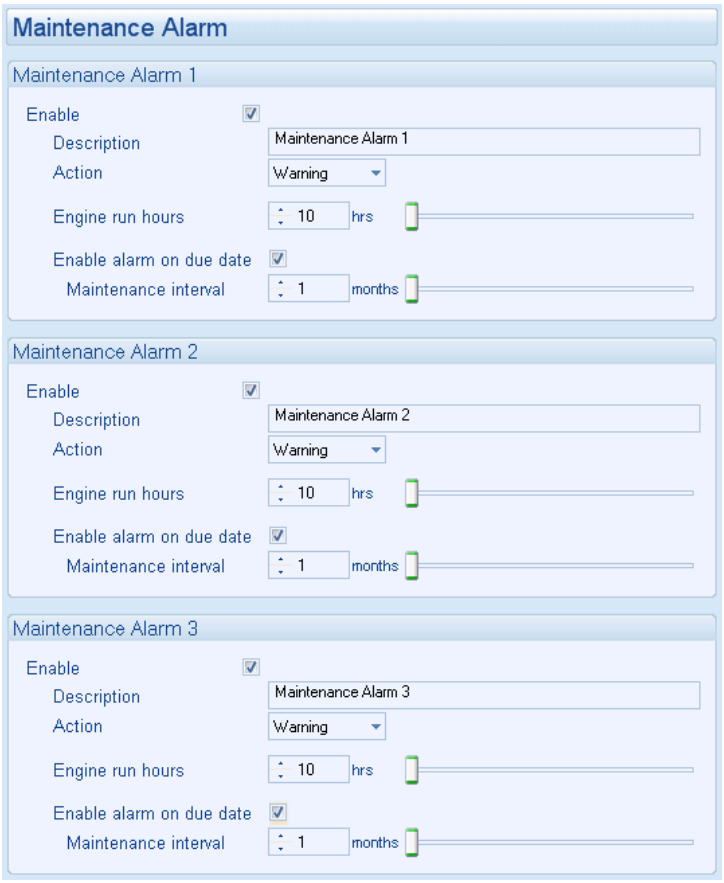
Fault	Description
Negative kvar IEEE C37.2 – 40 Field Under Excitation Relay	The module detected that the generator output kvar had fallen below the *Negative var Alarm Trip* for the configured delay timer.
Negative Phase Sequence IEEE C37.2 - 46 Phase-Balance Current Relay	The module detected that there was an imbalance of current across the generator phases greater than the *Negative Phase Sequence Trip Level* percentage setting.
Oil Press Sender Fault	The module detected that circuit to the engine oil pressure sensor had become open circuit.
Oil Pressure Low IEEE C37.2 - 63 Pressure Switch	The module detected that the engine oil pressure had fallen below the *Low Oil Pressure Shutdown Trip* level after the *Safety On Delay* timer had expired.
Oil Pressure Low Switch IEEE C37.2 - 63 Pressure Switch	The module detected that the low oil pressure switch had activated after the *Safety On Delay* timer had expired.
Over Frequency Runaway IEEE C37.2 – 81 Frequency Relay	The module detected that the generator output frequency had risen above the *Run Away Trip* level.
Over Speed Runaway IEEE C37.2 - 12 Overspeed Device	The module detected that the engine speed had risen above the *Run Away Trip* level.
Positive kvar IEEE C37.2 – 40 Field Over Excitation Relay	The module detected that the generator output kvar had risen above the *Positive var Alarm Trip* for the configured delay timer.
Priority Selection Error	The module detected that another module on the *Dual Mutual Standby* communication link.
SCR Inducement	The module received a fault condition from the engine ECU alerting about the SCR Inducement.
Water in Fuel	The module received a fault condition from the engine ECU alerting that water in the fuel had been detected.

7.6 MAINTENANCE ALARMS

Depending upon module configuration one or more levels of engine maintenance alarm may occur based upon a configurable schedule.

Example 1:

Screen capture from DSE Configuration Suite Software showing the configuration of the Maintenance Alarm for 1, 2 and 3.



When activated, the maintenance alarm can be either a **warning** (set continues to run) or **shutdown** (running the set is not possible).

Resetting the maintenance alarm is normally actioned by the site service engineer after performing the required maintenance.
The method of reset is either by:

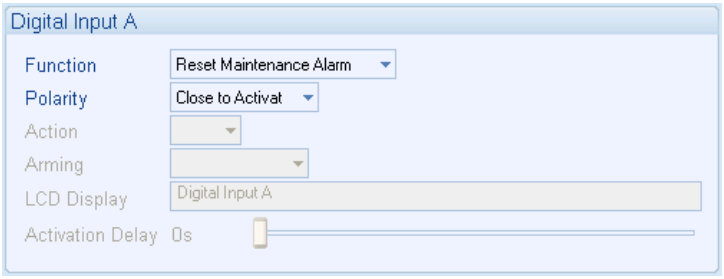
Activating an input that has been configured to Maintenance Reset Alarm 1, 2 or 3.

Pressing the maintenance reset button in the DSE Configuration Suite, Maintenance section.

Pressing and holding the ***Stop/Reset Mode*** button for 10 seconds on the desired Maintenance Alarm status page. This may be protected by a PIN number.

Example 2:

Screen capture from DSE Configuration Suite Software showing the configuration of a digital input for Reset Maintenance Alarm.



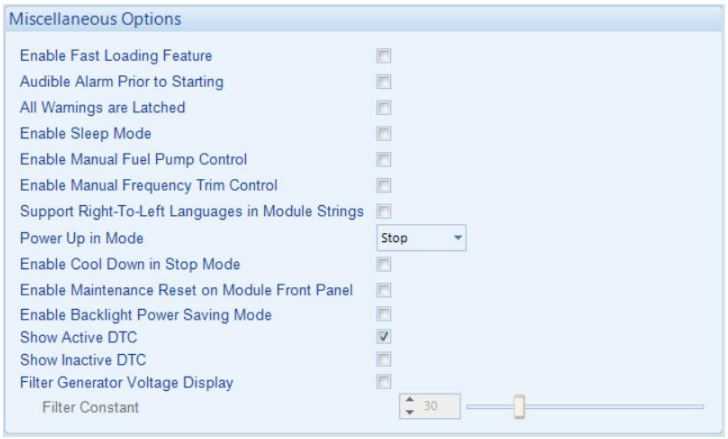
Example 3:

Screen capture from DSE Configuration Suite Software showing the Maintenance Alarm Reset ‘button’ in the DSE Configuration Suite SCADA | MAINTENANCE section.



Example 4:

Screen capture from DSE Configuration Suite Software showing the configuration holding stop button to reset the maintenance alarm.



7.7 OVER CURRENT ALARM

The *Over Current Alarm* combines a simple warning trip level with a fully functioning IDMT curve for thermal protection.

7.7.1 IMMEDIATE WARNING

If the *Immediate Warning* is enabled, the module generates a *warning alarm* as soon as the *Trip* level is reached. The alarm automatically resets once the generator loading current falls below the *Trip* level (unless *All Warnings are latched* is enabled). For further advice, consult the generator supplier.

7.7.2 INVERSE DEFINITE MINIMUM TIME (IDMT) ALARM

If the *Over Current IDMT Alarm* is enabled, the module begins following the IDMT 'curve' when the current on any phase passes the *Trip* setting.

If the *Trip* is surpassed for an excess amount of time, the *IDMT Alarm* triggers (*Shutdown* or *Electrical Trip* as selected in *Action*).

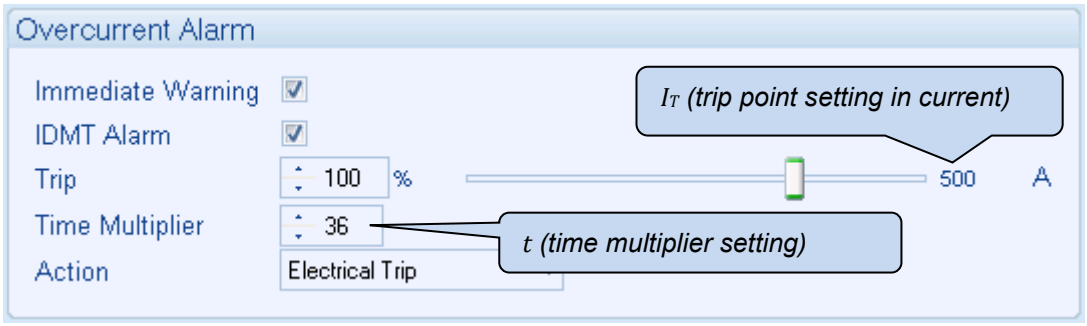
The larger the over circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

$$T = \frac{t}{\left(\frac{I_A}{I_T} - 1\right)^2}$$

Where:

T is the tripping time in seconds
I_A is the actual measured current of the most highly loaded line (L1, L2 or L3)
I_T is the delayed trip point setting in current
t is the time multiplier setting and also represents the tripping time in seconds at twice full load (when $^{I_A}/_{I_T} = 2$).

The settings shown in the example below are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite PC Software for a brushless alternator.



These settings provide for normal running of the generator up to 100% full load. If full load is surpassed, the *Immediate Warning* alarm is triggered, and the set continues to run.

The effect of an overload on the generator is that the alternator windings begin to overheat; the aim of the *IDMT Alarm* is to prevent the windings being overload (heated) too much. The amount of time that the alternator can be safely overloaded is governed by how high the overload condition is.

The default settings as shown above allow for an overload of the alternator to the limits of the *Typical Brushless Alternator* whereby 110% overload is permitted for 1 hour or 200% overload is permitted for 36 seconds.

If the alternator load reduces, the module then follows a cooling curve. This means that a second overload condition may trip soon after the first as the module knows if the windings have not cooled sufficiently.

For further details on the *Thermal Damage Curve* of your alternator, refer to the alternator manufacturer and generator supplier.

7.7.2.1 CREATING A SPREADSHEET FOR THE OVER CURRENT IDMT CURVE

The formula used:

$$T = \frac{t}{\left(\frac{I_A}{I_T} - 1\right)^2}$$

Where:

T is the tripping time in seconds
I_A is the actual measured current of the most highly loaded line (L1, L2 or L3)
I_T is the delayed trip point setting in current
t is the time multiplier setting and also represents the tripping time in seconds at twice full load (when $^{I_A}/_{I_T} = 2$).

The equation can be simplified for addition into a spreadsheet. This is useful for 'trying out' different values of t *(time multiplier setting)* and viewing the results, without actually testing this on the generator.

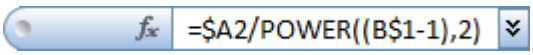
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	36	360000	90000	40000	14400	10000

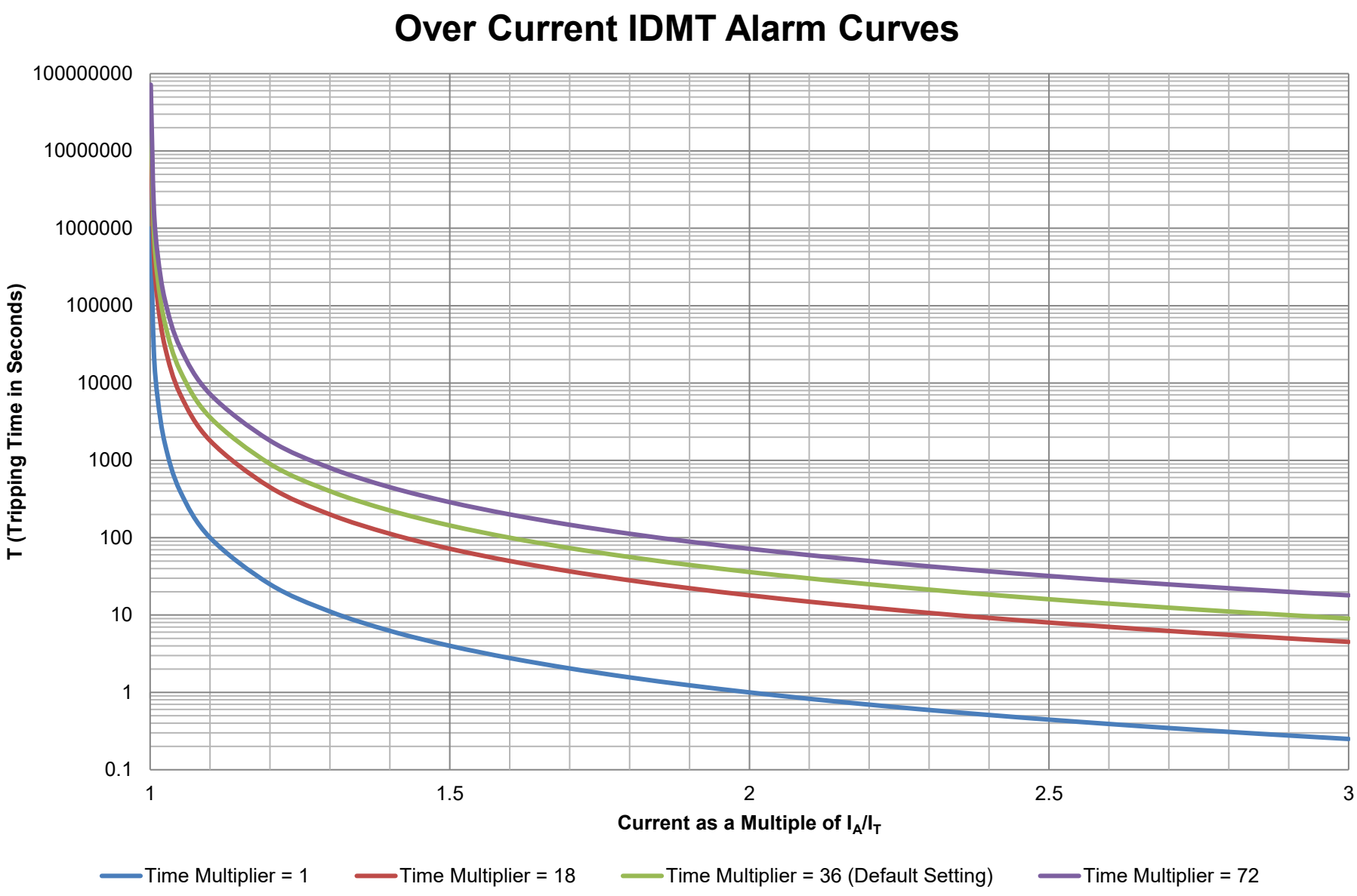
$^{I_A}/_{I_T}$ *(multiple of the Trip setting from 1.01 to 3.0 in steps of 0.1)*

t *(time multiplier setting)*

T *(tripping time in seconds)*

The formula for the *Tripping Time* cells is:




Over Current IDMT Alarm Curves
T (Tripping Time in Seconds)
100000000
10000000
1000000
100000
10000
1000
100
10
1
0.1
1
1.5
2
2.5
3
Current as a Multiple of I_A/I_T
Time Multiplier = 1
Time Multiplier = 18
Time Multiplier = 36 (Default Setting)
Time Multiplier = 72

7.8 SHORT CIRCUIT IDMT ALARM

If the *Short Circuit Alarm* is enabled, the module begins following the IDMT 'curve' when the current on any phase passes the *Trip* setting.

If the *Trip* is surpassed for an excess amount of time, the *IDMT Alarm* triggers (*Shutdown* or *Electrical trip* as selected in *Action*).

The larger the short circuit fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

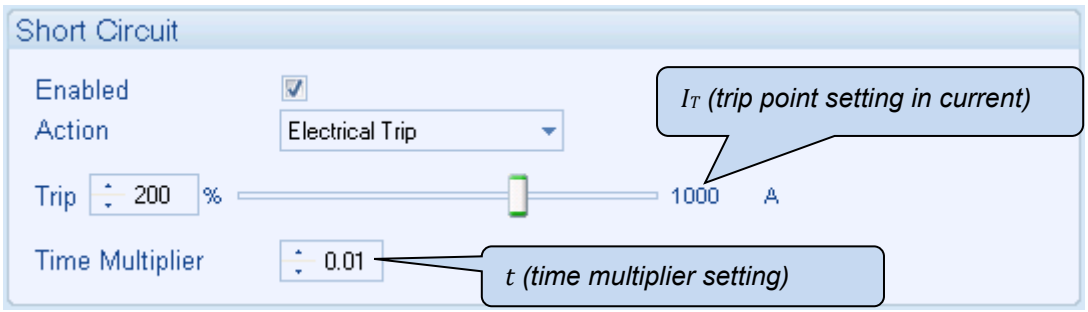
$$T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$$

Where:

T is the tripping time in seconds (accurate to +/- 5% or +/- 50 ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point setting in current
t is the time multiplier setting

The settings shown in the example below are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite software.

NOTE: Due to large inrush currents from certain loads, such as motors or transformers, the default settings for the *Short Circuit* alarm may need adjusting to compensate.



The effect of a short circuit on the generator is that the alternator stator and rotor begin to overheat; the aim of the *IDMT alarm* is to prevent the stator and rotor being overload (heated) too much. The amount of time that the alternator can be safely overloaded is governed by how high the short circuit condition is.

For further details on the *Thermal & Magnetic Damage Curve* of your alternator, refer to the alternator manufacturer and generator supplier.

7.8.1 CREATING A SPREADSHEET FOR THE SHORT CIRCUIT IDMT CURVE

The formula used:

$$T = \frac{t \times 0.14}{\left(\left(\frac{I_A}{I_T}\right)^{0.02} - 1\right)}$$

Where:

T is the tripping time in seconds (accurate to +/- 5% or +/- 50 ms (whichever is the greater))
I_A is the actual measured current
I_T is the trip point setting in current
t is the time multiplier setting

The equation can be simplified for addition into a spreadsheet. This is useful for 'trying out' different values of t *(time multiplier setting)* and viewing the results, without actually testing this on the generator.

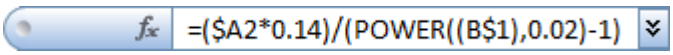
	A	B	C	D	E	F
1		1.01	1.02	1.03	1.05	1.06
2	0.01	7.034242	25	11.11111	4	2.777778

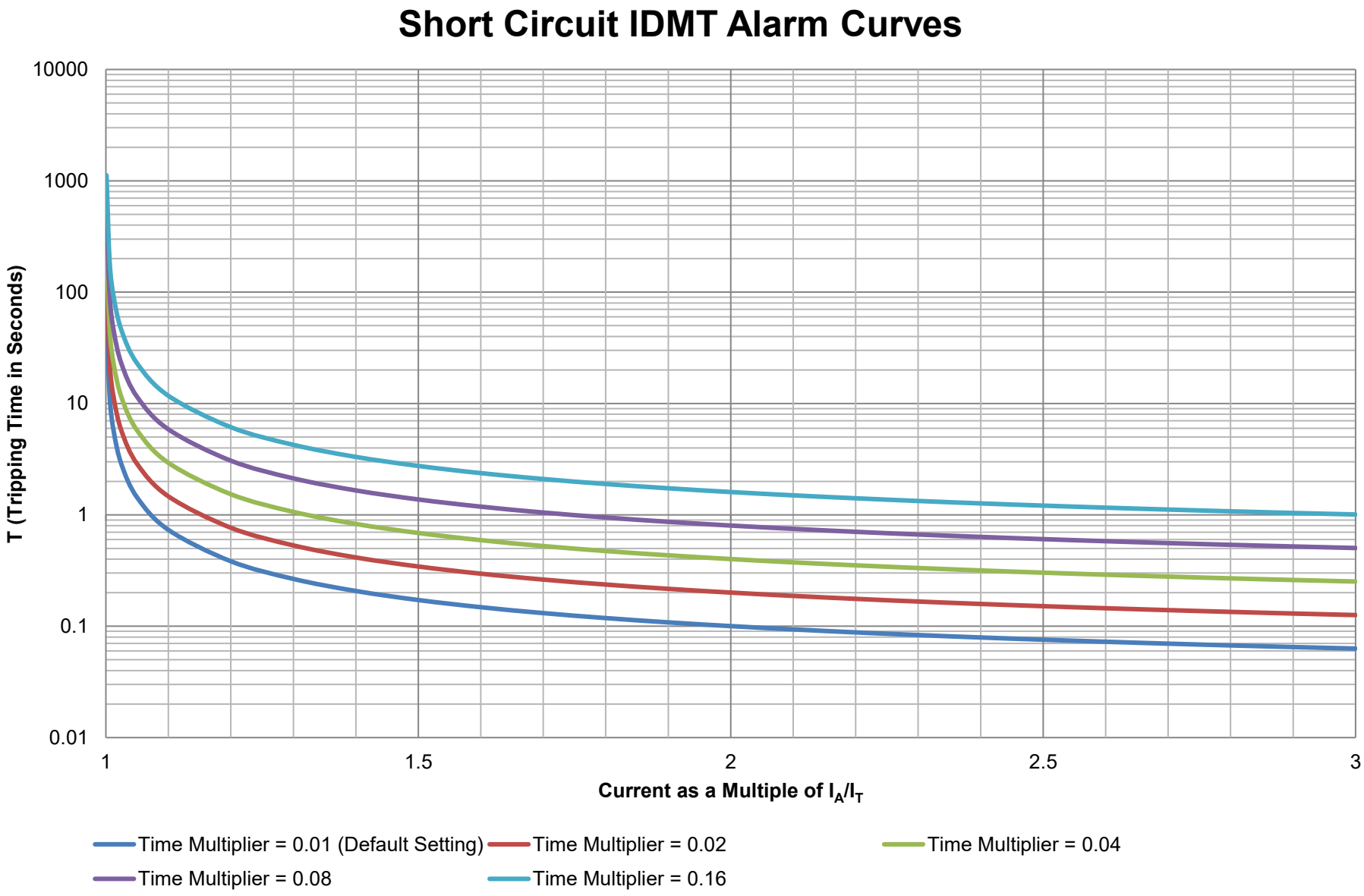
I_A/I_T (multiple of the Trip setting from 1.01 to 3.0 in steps of 0.1)

t (time multiplier setting)

T (tripping time in seconds)

The formula for the *Tripping Time* cells is:




Short Circuit IDMT Alarm Curves
10000
1000
100
10
1
0.1
0.01
T (Tripping Time in Seconds)
1
1.5
2
2.5
3
Current as a Multiple of I_A/I_T
Time Multiplier = 0.01 (Default Setting)
Time Multiplier = 0.02
Time Multiplier = 0.04
Time Multiplier = 0.08
Time Multiplier = 0.16

7.9 EARTH FAULT IDMT ALARM

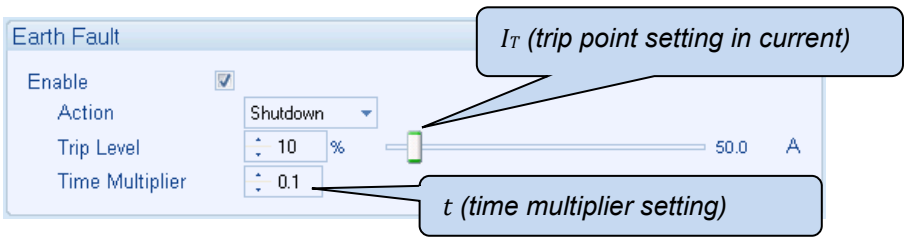
When the module is suitably connected using the 'Earth Fault CT'. The module measures Earth Fault and optionally configured to generate an alarm condition (shutdown or electrical trip) when a specified level is surpassed.

If the *Earth Fault Alarm* is enabled, the module begins following the IDMT 'curve' when the earth fault current passes the *Trip* setting.

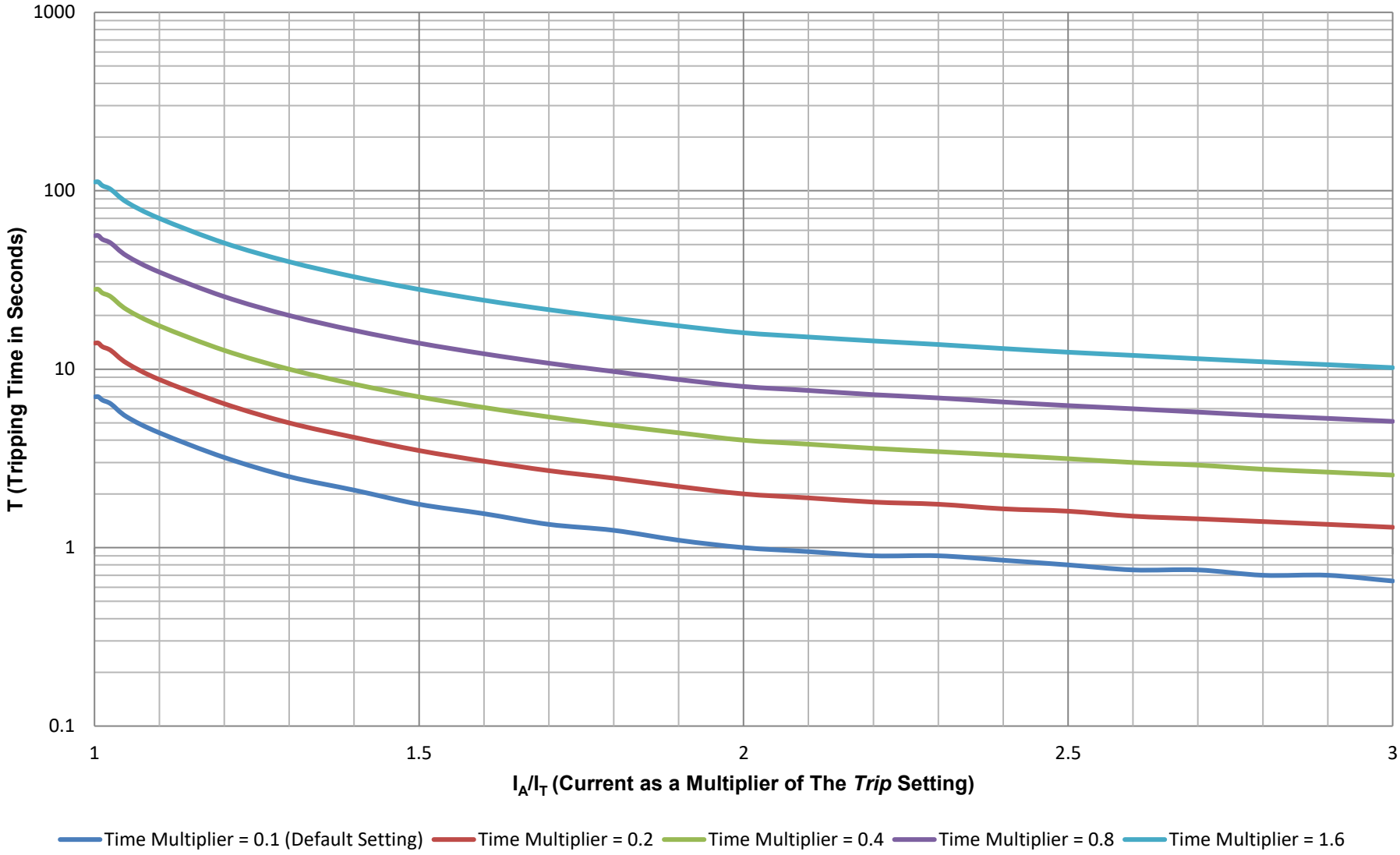
If the *Trip* is surpassed for an excess amount of time, the *IDMT Alarm* triggers (*Shutdown* or *Electrical Trip* as selected in *Action*).

The larger the earth fault, the faster the trip.

The settings shown in the example below are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite software.



Earth Fault Alarm IDMT Curves



7.10 DEFAULT CURRENT PROTECTION TRIPPING CHARACTERISTICS

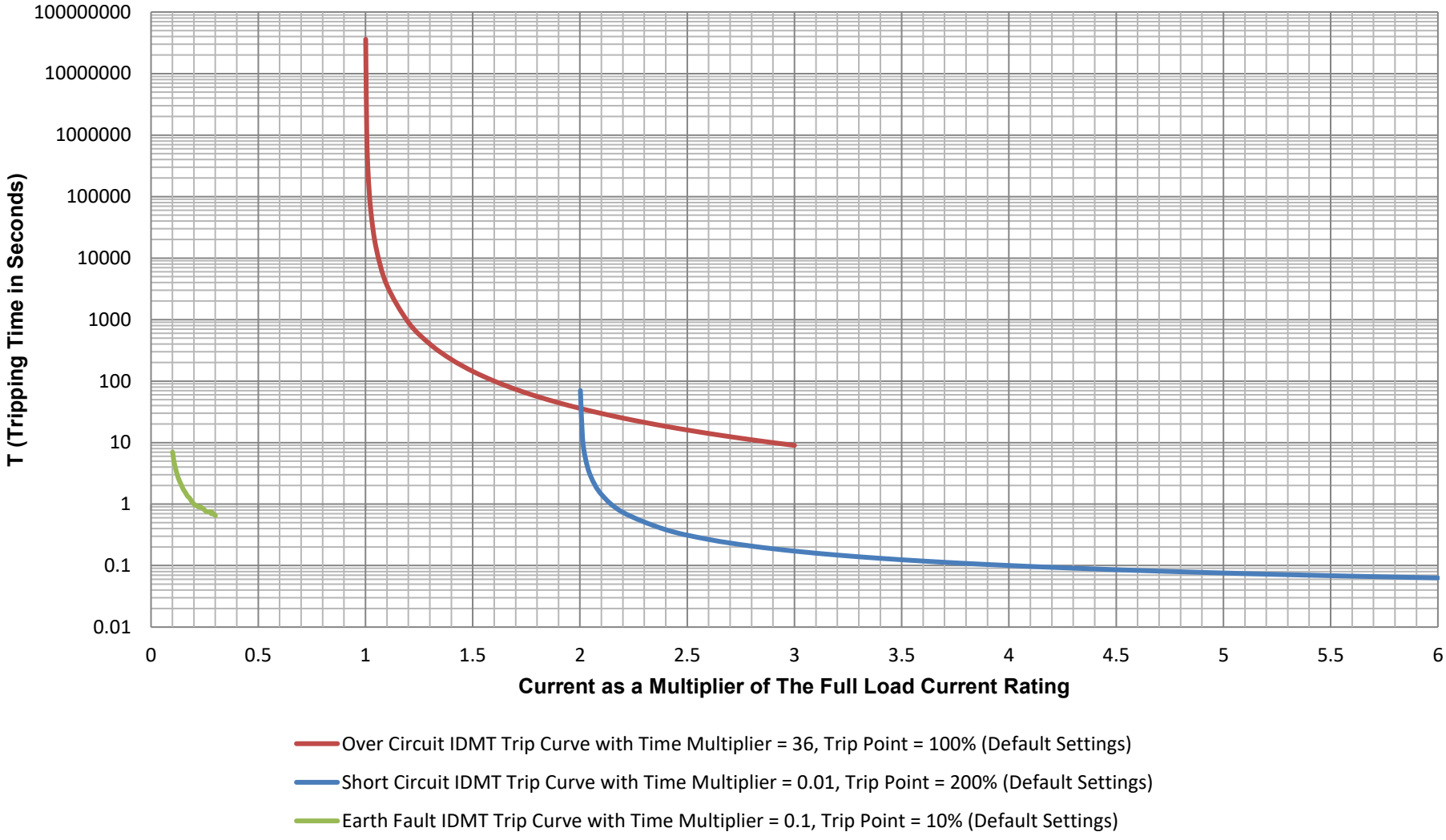
The graph on the following page shows the default settings for the IDMT tripping curves for the *Over Current, Short Circuit* and *Earth Fault* protections.

The default setting for the *Over Current* alarm allows for an overload of an alternator to the limits of the *Typical Brushless Alternator* whereby 110% overload is permitted for 1 hour or 200% overload is permitted for 36 seconds. In an over current situation, the alternator begins to overheat. The aim of the *Over Current IDMT Alarm* is to prevent the windings being overload (heated) too much. The amount of time that the alternator can be safely overloaded is governed by how high the overload condition is.

The default setting for the *Short Circuit* alarm allows for an alternator to supply a high current caused by a genuine short circuit or an inrush current of a motor/transformer. Whereby 300% overload is permitted for 0.17 seconds or 600% overload is permitted for 0.06 seconds. In a short circuit situation the alternator begins to overheat to the point the insulation breaks down, potentially causing a fire. The aim of the *Short Circuit IDMT Alarm* is to prevent the insulation from melting due to excessive heat. The amount of time that the alternator can be safely in a short circuit condition is governed by the alternator's construction.

The default setting for the *Earth Fault* alarm allows for an alternator to supply a fault current caused by a high impedance short to earth or motor drives. Whereby 15% fault current is permitted for 1.75 second or 20% fault current is permitted for 1 second.

DSE Default Configratuion of Over Current, Short Circuit & Earth Fault Alarm IDMT Curves

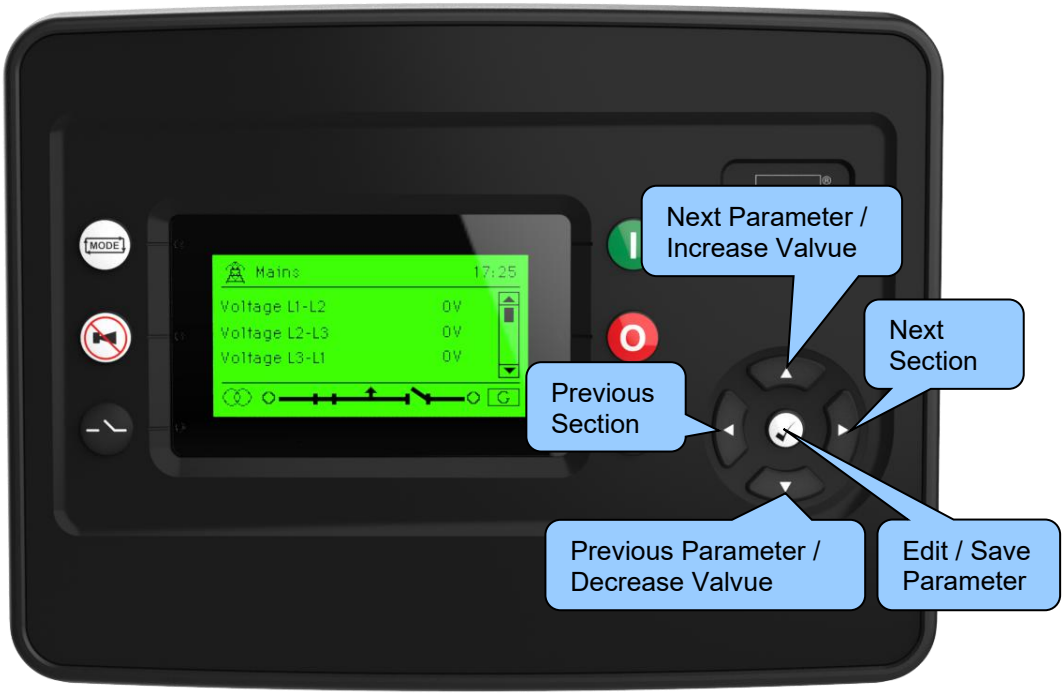


8 FRONT PANEL CONFIGURATION

NOTE: Depending upon module configuration, some values in the *Mains & Running Configuration Editors* may not be available. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

This configuration mode allows the operator to partially configure the module through its display without the use of the DSE Configuration Suite PC Software.

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



8.1 MAIN CONFIGURATION EDTIOR

8.1.1 ACESSING THE MAIN CONFIGURATION EDTIOR

NOTE: More comprehensive module configuration is possible via PC configuration software. For further details of module configuration, refer to DSE Publication: *057-388 DSEG7300 Configuration Software Manual.*

- Ensure the engine is at rest and the module by pressing the ***Stop/Reset Mode*** button.
- Press the ***Stop/Reset Mode*** and ***Tick*** buttons together to enter the main configuration editor.

8.1.2 ENTERING PIN

NOTE: The PIN is not set by DSE when the module leaves the factory. If the module has a PIN code set, the generator supplier has entered this. Contact the generator supplier if the code is required. If the code has been 'lost' or 'forgotten', the module must be returned to the DSE factory to have the PIN removed. A charge is made for this procedure. This procedure cannot be performed away from the DSE factory.

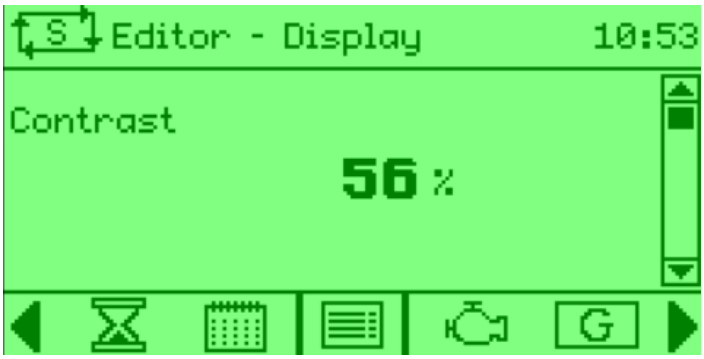
NOTE: The PIN is automatically reset when the editor is exited (manually or automatically) to ensure security.

- If a module security PIN has been set, the PIN request is then shown.
- The first '#' changes to '0'. Press the ***Up*** or ***Down*** buttons to adjust it to the correct value.
- Press the ***Right*** button when the first digit is correctly entered. The digit previously entered now shows as '#' for security.
- Repeat this process for the other digits of the PIN number. Press the ***Left*** button to move back to adjust one of the previous digits.
- When the ***Tick*** button is pressed after editing the final PIN digit, the PIN is checked for validity. If the number is not correct, the PIN must be re-entered.
- If the PIN has been successfully entered (or the module PIN has not been enabled), the editor is displayed.

8.1.3 EDITING A PARAMETER

NOTE: Pressing and holding the *Menu Navigation* buttons provides the auto-repeat functionality. Values can be changed quickly by holding the navigation buttons for a prolonged period of time.

- Select the configuration that is required to be edit by pressing the ***Up*** or ***Down*** buttons.



- Press the ***Right*** or ***Left*** buttons to cycle to the section to view/change.
- Press the ***Up*** or ***Down*** buttons to select the parameter to view/change within the currently selected section.
- To edit the parameter, press the ***Tick*** button to enter edit mode. The parameter begins to flash to indicate editing.
- Press the ***Up*** or ***Down*** buttons to change the parameter to the required value.
- Press the ***Tick*** button to save the value. The parameter ceases flashing to indicate that it has been saved.

8.1.4 EXITING THE MAIN CONFIGURATION EDITOR

NOTE: The editor automatically exits after 5 minutes of inactivity to ensure security.

- Press and hold the ***Stop/Reset Mode*** button to exit the editor without saving changes.
- Press and hold the ***Tick*** button to exit the editor and save the changes.

8.1.5 ADJUSTABLE PARAMETERS

Section	Parameter As Shown On Display	Value
Display	Contrast	0 %
	Brightness	0 %
	Language	English
	Current Date and Time	dd:mm:yyyy hh:mm:ss
	Dual Mutual Mode	Set Priority / Run Time / Engine Hours
	Dual Mutual Priority	0
	Dual Mutual Duty Time	0 h 0 m
	Platform Mode	Remote Start / Auto Mains Fail / Remote Start and Auto Mains Fail
Alt Config	Config to Edit	Main Configuration / Alt Config 1, 2, 3, 4 or 5
	Default Configuration	Main Configuration / Alt Config 1, 2, 3, 4 or 5
Engine	Oil Pressure Low Shutdown	0.00 bar 0 psi 0 kPa
	Oil Pressure Low Pre Alarm	0.00 bar 0 psi 0 kPa
	Coolant Temperature Low Warning	0 ºC 0 ºF
	Coolant Temperature High Pre Alarm	0 ºC 0 ºF
	Coolant Temperature High Electrical Trip	0 ºC 0 ºF
	Coolant Temperature High Shutdown	0 ºC 0 ºF
	Fuel Usage Alarm Running	0 %
	Fuel Usage Alarm Stopped	0 %
	Fuel Specific Gravity	0.00
	Pre Heat Temp	0 ºC 0 ºF
	Pre Heat Timer	0 h 0 m 0 s
	Post Heat Temp	0 ºC 0 ºF
	Post Heat Timer	0 h 0 m 0 s
	Droop Control Enable	Active / Inactive
	Droop Control	0.0 %
	Crank Disconnect Delay on Oil Pressure	0.0 s
	Crank Disconnect on Generator Voltage	0 V
	Under Speed Shutdown Enable	Active / Inactive
	Under Speed Shutdown	0 RPM
	Under Speed Warning Enable	Active / Inactive
	Under Speed Warning	0 RPM
	Under Speed Delay	0.0 s
	Over Speed Warning Enable	Active / Inactive
	Over Speed Warning	0 RPM
	Over Speed Shutdown	0 RPM
	Over Speed Delay	0.0 s
	Overspeed Overshoot	0 %
	Overspeed Overshoot Delay	0.0 s
	Battery Under Voltage Warning Enable	Active / Inactive
	Battery Under Voltage Warning	0 V
	Battery Under voltage Warning Delay	0 h 0 m 0 s
	Battery Over Voltage Warning Enable	Active / Inactive
	Battery Over Voltage Warning	0 V
	Battery Over Voltage Warning Delay	0 h 0 m 0 s
	Charge Alternator Failure Warning Enable	Active / Inactive
	Charge Alternator Failure Warning	0 V
	Charge Alternator Warning Delay	0 h 0 m 0 s
	Charge Alternator Failure Shutdown Enable	Active / Inactive

Section	Parameter As Shown On Display	Value
	Charge Alternator Failure Shutdown	0.0 V
	Charge Alternator Shutdown Delay	0 h 0 m 0 s
	Inlet Temperature Alarm	0 ºC 0 ºF
	Inlet Temperature Pre-Alarm	0 ºC 0 ºF
Generator	AC System	3 Phase, 4 Wire
	Under Voltage Shutdown	0 V
	Under Voltage Pre Alarm	0 V
	Under Voltage Delay	0.0 s
	Nominal Voltage	0 V
	Over Voltage Pre Alarm	0 V
	Over Voltage Shutdown	0 V
	Over Voltage Delay	0.0 s
	Under Frequency Shutdown	0.0 Hz
	Under Frequency Pre Alarm	0.0 Hz
	Under Frequency Delay	0.0 s
	Nominal Frequency	0.0 Hz
	Over Frequency Pre Alarm	0.0 Hz
	Over Frequency Shutdown	0.0 Hz
	Over Frequency Delay	0.0 s
	Frequency Overshoot	0 %
	Frequency Overshoot Delay	0 m 0.0 s
	CT Primary	0 A
	CT Secondary	0 A
	Earth CT Primary	0 A
	Full Load Rating	0 A
	Delayed Over Current Enable	Active / Inactive
	Delayed Over Current	0 %
	Earth Fault Trip	Active / Inactive
	Earth Fault Trip	0 %
	kW Overload Trip	0 %
	Phase Rotation Enable	Active / Inactive
	Phase Rotation	0
Mains	AC System	3 Phase, 4 Wire
	Under Voltage Trip	0 V
	Over Voltage Trip	0 V
	Under Frequency Trip	0.0 Hz
	Over Frequency Trip	0.0 Hz
	Phase Rotation	0
Timers	Start Delay Off Load	0 h 0 m 0 s
	Start Delay On Load	0 h 0 m 0 s
	Start Delay Mains Fail	0 h 0 m 0 s
	Start Delay Telemetry	0 h 0 m 0 s
	Mains Transient Delay	0 m 0 s
	Engine Cranking	0 m 0 s
	Engine Cranking Rest	0 m 0 s
	Engine Smoke Limiting	0 m 0 s
	Engine Smoke Limiting Off	0 m 0 s
	Engine Safety On Delay	0 m 0 s
	Engine Warming	0 h 0 m 0 s
	ECU Override	0 m 0 s
	MPU Fail Delay	0 s
	(Mains) Transfer Time	0 m 0.0 s
	Return Delay	0 h 0 m 0 s
	Engine Cooling	0 h 0 m 0 s
	Engine Fail To Stop Delay	0 m 0 s

Section	Parameter As Shown On Display	Value
	LCD Page Delay	0 h 0 m 0 s
	LCD Scroll Delay	0 h 0 m 0 s
	Sleep Timer	0 h 0 m 0 s
	Backlight Timer	0 h 0 m 0 s
Schedule	Schedule	Active / Inactive
	Schedule Period Bank 1	Weekly / Monthly
	On Load / Off Load / Auto Start Inhibit, Week, On, Run Time and Day Selection (1 to 8)	Press ***Tick***  to begin editing then up or down when selecting the different parameters in the scheduler.
	Schedule Period Bank 2	Weekly / Monthly
	On Load / Off Load / Auto Start Inhibit, Week, On, Run Time and Day Selection (1 to 8)	Press ***Tick***  to begin editing then up or down when selecting the different parameters in the scheduler.

8.2 ‘RUNNING’ CONFIGURATION EDITOR

8.2.1 ACCESSING THE ‘RUNNING’ CONFIGURATION EDITOR

- The *Running Editor* is enterable whilst the generator is running. All protections remain active when the generator is running while the *Running Editor* is entered.

- Press and hold the ***Tick***  button to access the *Running Editor.*

8.2.2 ENTERING PIN

NOTE: The PIN is not set by DSE when the module leaves the factory. If the module has a PIN code set, this has been affected by your engine supplier who should be contacted if you require the code. If the code has been ‘lost’ or ‘forgotten’, the module must be returned to the DSE factory to have the module’s code removed. A charge is made for this procedure.
NB - This procedure cannot be performed away from the DSE factory.

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

Even if a module security PIN has been set, the PIN is not requested whilst entering the *Running Editor*.

8.2.3 EDITING A PARAMETER

NOTE: Pressing and holding the *Menu Navigation*  **buttons provides the auto-repeat functionality. Values can be changed quickly by holding the navigation buttons for a prolonged period of time.**

- Press the ***Right*** or ***Left***  buttons to cycle to the section to view/change.
- Press the ***Up*** or ***Down***  buttons to select the parameter to view/change within the currently selected section.
- To edit the parameter, press the ***Tick***  button to enter edit mode. The parameter begins to flash to indicate editing.
- Press the ***Up*** or ***Down***  buttons to change the parameter to the required value.
- Press the ***Tick***  button to save the value. The parameter ceases flashing to indicate that it has been saved.

8.2.4 EXITING THE 'RUNNING' CONFIGURATION EDITOR

NOTE: The editor automatically exits after 5 minutes of inactivity to ensure security.

- Press and hold the ***Tick***  button to exit the editor and save the changes.

8.2.5 RUNNING EDITOR PARAMETERS

Section	Parameter As Shown On Display	Value
Display	Contrast	0%
	Brightness	0 %
	Language	English
	Pressure Units	0 kPa
	Temperature Units	0 ºC
	Volume Units	0 Litre

9 COMMISIONING

9.1 BASIC CHECKS

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

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

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.

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

The Emergency Stop input is wired to an external normally closed switch connected to DC positive.

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. Press the ***Mode*** button to select ***Manual Mode*** followed by the ***Start*** button the unit start sequence commences.

The starter engages and operates 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 displays *Failed to Start*. Press the ***Stop/Reset Mode*** button to reset the unit.

Restore the engine to operational status (reconnect the fuel solenoid). Press the ***Mode*** button to select ***Manual Mode*** followed by the ***Start*** button. 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 is possible at this time to view the engine and alternator parameters - refer to the 'Description of Controls' section of this manual.

Press the ***Mode*** button to select ***Auto Mode***, the engine runs for the pre-set cooling down period, then stop. The generator should stay in the standby mode. If it does not, check that the *Remote Start* input is not active.

Initiate an automatic start by supplying the remote start signal (if configured). The start sequence commences and the engine runs up to operational speed. Once the generator is available the delayed load outputs activate, the Generator accepts the load. If not, check the wiring to the delayed load output contactors. Check the Warming timer has timed out.

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

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*.

If, despite repeated checking of the connections between the module and the customer's system, satisfactory operation cannot be achieved, then contact DSE Technical Support Department:

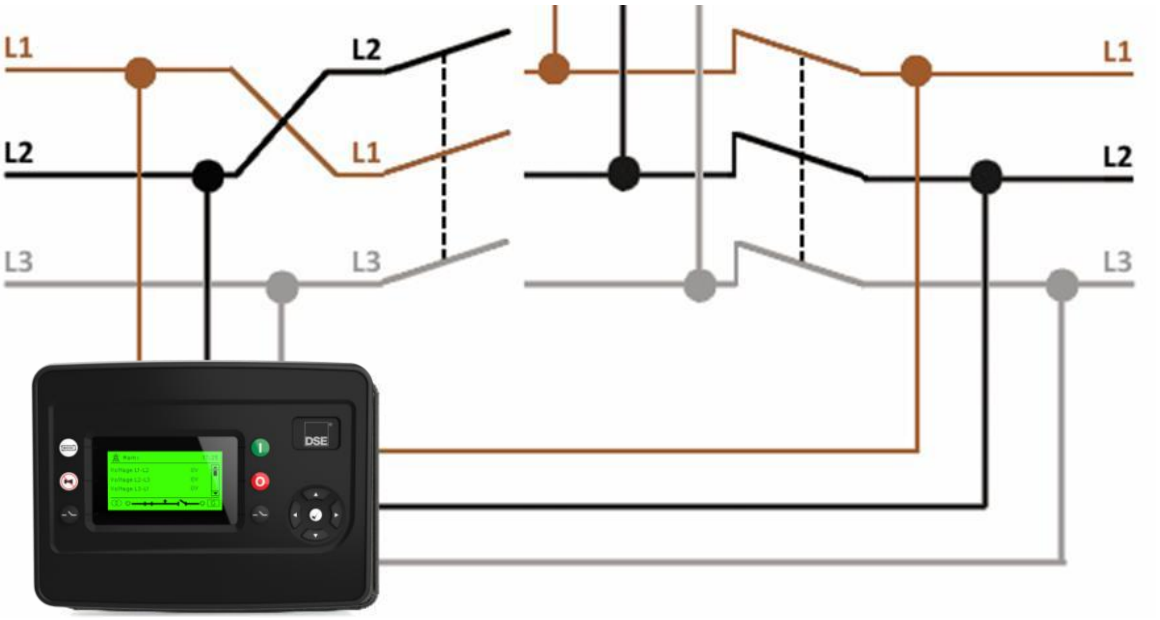
Tel: +44 (0) 1723 890099
Fax: +44 (0) 1723 893303
E-mail: support@deepseaelectronics.com
Website: www.deepseaelectronics.com

9.2 CLOSED TRANSITION

9.2.1 SYNC CHECKS

⚠ CAUTION!: Failure to perform the Sync Check results in in serious damage to the system (breakers, bus bars, alternators, engines etc) caused by out of sync closures.

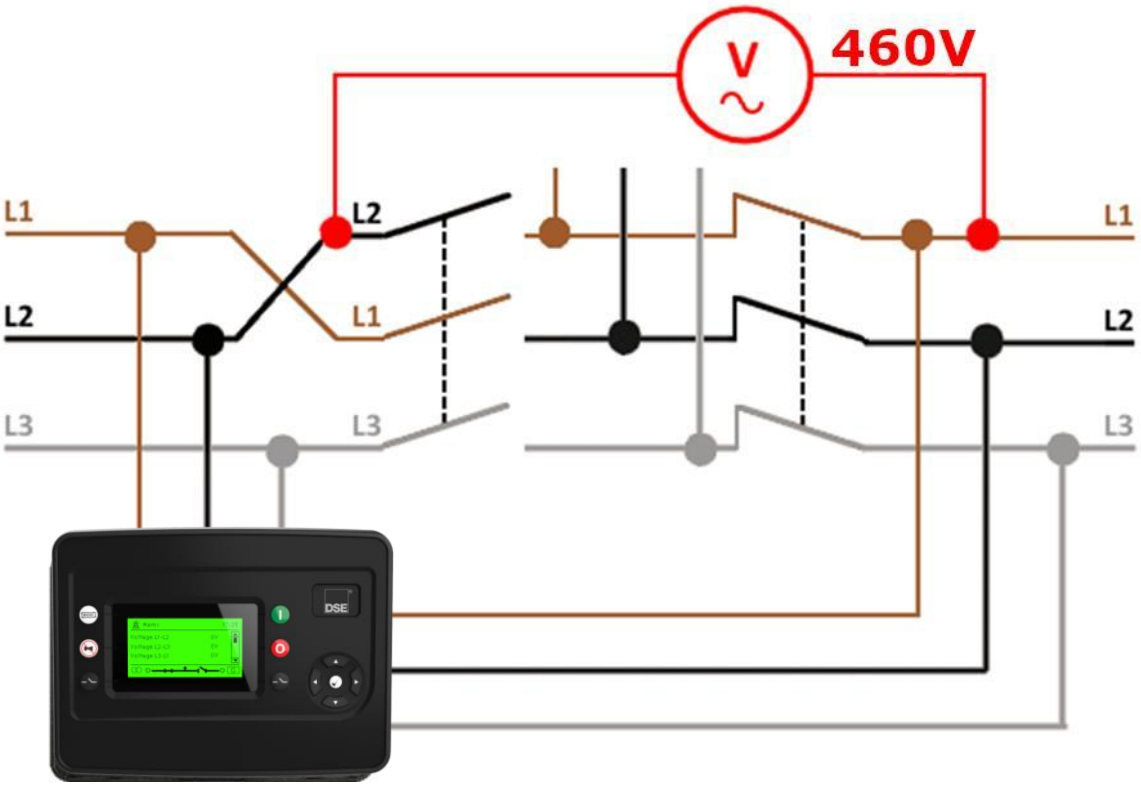
Check to ensure that all the module's sensing cables have been connected to the correct phases and that the generator and mains switchgear has been correctly connected. Failing to perform such tests may lead to the DSE module sensing both sides of the switchgear as in sync.



This is tested by starting the generator with the DSE module and ensuring the generator switchgear is left open (activate an input configured for *Generator Load Inhibit*). Then the load bus is to be made live, this is achieved by ensuring the mains switchgear is closed. Across the switchgear, connect a voltage meter to measure the AC voltage when the DSE module shows the two supplies in sync.

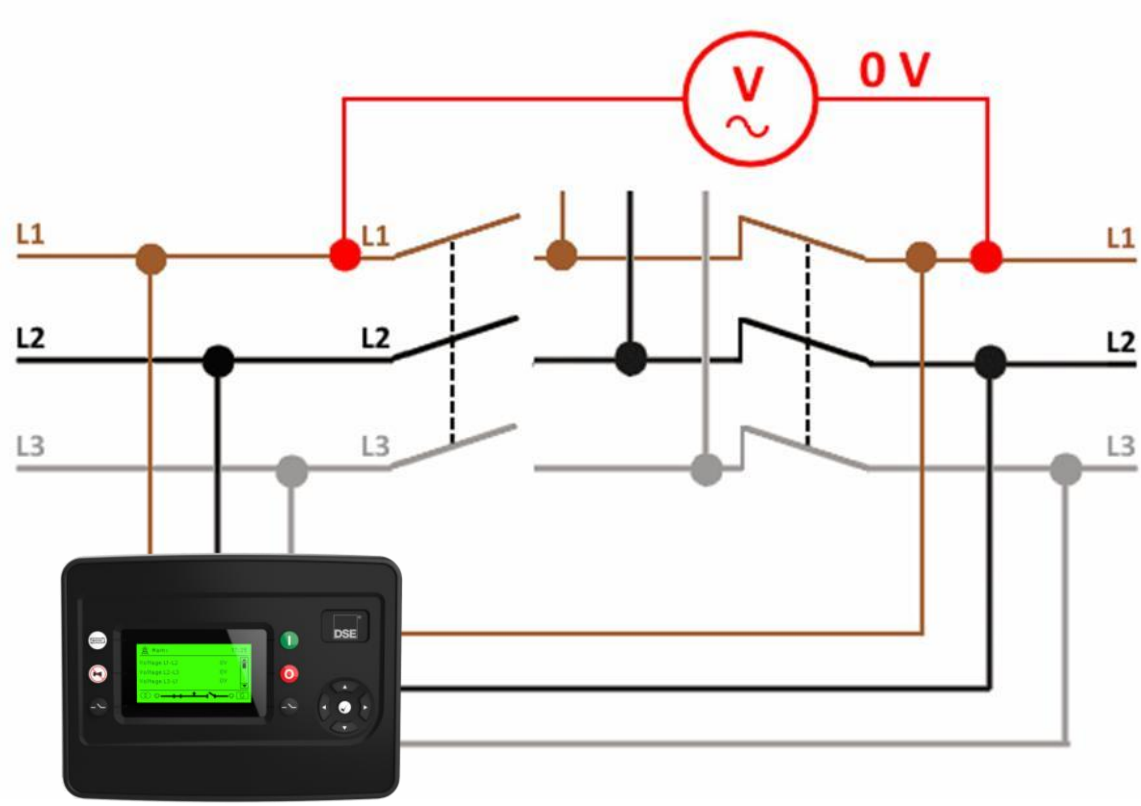
9.2.1.1 INCORRECTLY WIRED BREAKER

When the DSE module's synchroscope shows the two supplies in sync, if the voltage meter shows a voltage difference the switchgear is wired incorrectly. This is shown in the example below.



9.2.1.2 CORRECTLY WIRED BREAKER

When the DSE module's synchroscope shows the two supplies in sync, if the voltage meter shows no voltage difference the switchgear is wired correctly. This is shown in the example below.



10 FAULT FINDING

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

10.1 STARTING

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 8 Volts Check the operating temperature is not above 70°C or below -30 ºC or -40 ºC (heater variant). Check the DC fuse.
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 module's inputs. Refer to engine manual.
Continuous starting of generator when in ***Auto Mode.***	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
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 module. Depending upon configuration, the set does 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 oil pressure switch or sensor is indicating the "low oil pressure" state to the module.

10.2 LOADING

Symptom	Possible Remedy
Engine runs but generator does 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 does not take load in *Manual Mode* unless there is an active load signal.
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

10.3 ALARMS

Symptom	Possible Remedy
Oil pressure low 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 module and is correctly configured.
Coolant temp high 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 module.
Shutdown fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Electrical Trip 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.
ECU Amber ECU Red	This indicates a fault condition detected by the engine ECU and transmitted to the DSE module.
ECU Data Fail	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required).
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 14. Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

10.4 COMMUNICATIONS

Symptom	Possible Remedy
ECU Data Fail	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required).

10.5 INSTRUMENTS

Symptom	Possible Remedy
Inaccurate generator measurements on module 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 occur if CT1 is connected to phase 2). Remember to consider the power factor (kW = kVA x power factor). The module is true RMS measuring so gives more accurate display when compared with an ‘averaging’ meter such as an analogue panel meter or some lower specified digital multimeters. Accuracy of the module is better than 1% of full scale. Generator voltage full scale is 415 V ph-N, accuracy is ±4.15 V (1 % of 415 V).

10.6 MISCELLANEOUS

Symptom	Possible Remedy
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 module before editing it. This edited configuration must then be "written" back to the module for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the ***Tick*** ⊘ button to save the change before moving to another item or exiting the fascia editor.

11 CAN INTERFACE SPECIFICATION (J1939-75)

The CAN 1 port is used for live operational communications between the DSE module and other CAN enabled devices. The specification below details all broadcast messages which are transmitted when the J1939-75 is enabled, and the relevant engine file is selected.

Parameter	Description
Protocol	S.A.E. J1939 with PGNs as listed in the following subsections.
Bit Rate	250 kb/s
Isolation	Withstand 3000 Vrms, Working 450 Vrms
Termination	120 Ω termination resistor internally fitted.

11.1 DSE BROADCAST MESSAGES

NOTE: All instrumentation is transmitted from the DSE module using a default source address of 44 (0x2C), however this is configurable. Refer to the module's configuration for further clarification of the configured source address.

NOTE: Availability of instrumentation changes depending on module type and configuration. For SPNs that are not applicable/configured within a PGN, the module transmits have all bits set to '1'. For PGNs where all SPNs that are not applicable/configured, the module no longer transmits the PGN.

NOTE: All message ID information is shown in a Hexadecimal format.

NOTE: Values larger than 8 bits utilise *Little-Endian* format. For example, a 16 bit value, occupying two Bytes has Byte2 as the most significant Byte and Byte1 as the least significant Byte.

Parameter Groups below are broadcast by the module and are detailed in the following subsections.

11.2 INSTRUMENTATION

11.2.1 ENGINE

NOTE: When the *Conventional Diesel Plus* engine file is selected (no engine ECU), all the *Engine* instruments are transmitted from the DSE module.

When any other engine file is selected, the *Engine* instruments are not transmitted by the DSE module unless the DSE module is configured to ignore the engine ECU's transmission for that specific instrument.

The *Engine* instrumentation listed in this section is what the DSE module transmits on the CANbus link when *J1939-75 Instrumentation* is enabled in the configuration.

11.2.1.1 DD1 - DASH DISPLAY 1

PGN 65276

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xFC	0x2C (44)	0x18FEFC2C	1000 ms
0x18							
	0x0FEFC (65276)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
96	Engine Fuel Level	Byte 2	0 to 100 %	0.4 %	0

11.2.1.2 EC2 - ENGINE CONFIGURATION 2

PGN 64895

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x7F	0x2C (44)	0x18FD7F2C	Request
0x18							
	0x0FD7F (64895)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
3670	Maximum Crank Attempts per Start Attempt	Byte 1	0 to 250	1	0

Request Message

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Source Address of Requesting Device	Default Message ID
0x6	0x0	0x0	0xEA	0xFF	0x##	0x18FEE5##
0x18						

Byte	Data
1	0x7F (PDU Specific of requested message ID)
2	0xFD (PDU Format of requested message ID)
3	0x00 (Ext Data Page & Data Page of requested message ID)

11.2.1.3 EEC1- ELECTRONIC ENGINE MODULE 1

PGN 61444

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x3	0x0	0x0	0xF0	0x04	0x2C (44)	0x0CF0042C	100 ms
0x0C							
	0x0F004 (61444)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
190	Engine Speed	Byte 4 to 5	0 to 8031.875 RPM	0.125 RPM	0

11.2.1.4 EEC4 - ELECTRONIC ENGINE MODULE 4

PGN 65214

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x7	0x0	0x0	0xFE	0xBE	0x2C (44)	0x1CFEBE2C	Request
0x1C							
	0x0FEBE (65214)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
3671	Crank Attempt Count on Present Start Attempt	Byte 6	0 to 250	1	0

Request Message

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Source Address of Requesting Device	Default Message ID
0x6	0x0	0x0	0xEA	0xFF	0x##	0x18FEE5##
0x18						

Byte	Data
1	0xBE (PDU Specific of requested message ID)
2	0xFE (PDU Format of requested message ID)
3	0x00 (Ext Data Page & Data Page of requested message ID)

11.2.1.5 EFL/P1 – ENGINE FLUID LEVEL/PRESSURE 1

PGN 65263

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xEF	0x2C (44)	0x18FEEF2C	500 ms
0x18							
	0x0FEEF (65263)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
100	Engine Oil Pressure	Byte 4	0 to 1000 kPa	1 kPa	0

11.2.1.6 EOI - ENGINE OPERATING INFORMATION

PGN 64914

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x3	0x0	0x0	0xFD	0x92	0x2C (44)	0x0CFD922C	250 ms
0x0C							
	0x0FD92 (64914)						

SPN	Instrument	Byte / Bit	State
3543	Engine Operating State	Byte 1 Bits 1 to 4	***0000:*** Stopped (*At Rest, Power on Before Start,* or *Failed to Start* are active). ***0001:*** Pre-Start (*Fuel* or *Pre-Heat Timer* are active). ***0010:*** Starting (*Cranking Timer* or *Crank Rest Timer* is active). ***0100:*** Running (*Idle Speed, Rated Speed, Running* or *Fail to Stop Timer* are active). ***0101:*** Stopping (*Stopping Timer* is active).
3607	Emergency Stop	Byte 6 Bit 5 to 6	***00:*** Off (No Shutdown Requested) ***01:*** On (Shutdown Requested) ***10:*** Reserved ***11:*** Don't care / take no action

11.2.1.7 ET1 - ENGINE TEMPERATURE 1

PGN 65262

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xEE	0x2C (44)	0x18FEEE2C	1000 ms
0x18							
	0x0FEEE (65262)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
110	Engine Coolant Temperature	Byte 1	-40 to 210 °C	1 °C	-40

11.2.1.8 HOURS - ENGINE HOURS, REVOLUTIONS

PGN 65253

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xE5	0x2C (44)	0x18FEE52C	Request
0x18							
	0x0FEE5 (65253)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
247	Engine Total Hours of Operation	Byte 1 to 4	0 to 210554060.75 hr	0.05 hr	0

Request Message

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Source Address of Requesting Device	Default Message ID
0x6	0x0	0x0	0xEA	0xFF	0x##	0x18FEE5##
0x18						

Byte	Data
1	0xE5 (PDU Specific of requested message ID)
2	0xFE (PDU Format of requested message ID)
3	0x00 (Ext Data Page & Data Page of requested message ID)

11.2.1.9 SOFT - SOFTWARE INDENTIFICATION (ENGINE FILE)

PGN 65242

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xDA	0x2C (44)	0x18FEDA2C	Request
0x18							
	0x0FEDA (65242)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
965	Number of software identification fields	Byte 1	0 to 250	1	0
234	Major Version Number	Byte 2	N/A	1	0
234	Minor Version Number	Byte 3	N/A	1	0
234	Build Version Number	Byte 4	N/A	1	0
234	De-limiter	Byte 5	N/A	1	0

Request Message

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Source Address of Requesting Device	Default Message ID
0x6	0x0	0x0	0xEA	0xFF	0x##	0x18FEE5##
0x18						

Byte	Data
1	0xDA (PDU Specific of requested message ID)
2	0xFE (PDU Format of requested message ID)
3	0x00 (Ext Data Page & Data Page of requested message ID)

11.2.1.10 VEP1 - VEHICLE ELECTRICAL POWER 1

PGN 65271

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0xF&	0x2C (44)	0x18FEF72C	1000 ms
0x18	0x0FEF7 (65271)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
167	Charge Alternator Voltage	Byte 3 to 4	0 to 3212.75 V	0.05 V	0
168	Plant Battery Voltage	Byte 5 to 6	0 to 3212.75 V	0.05 V	0

11.2.1.11 PROPB_00 - REMOTE START STATUS

PGN 65280

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFF	0x00	0x2C (44)	0x18FF002C	250 ms
0x18	0x0FF00 (65280)						

SPN	Instrument	Byte / Bit	State
Proprietary	Remote Start Status	Byte 1	***No Bits Active:*** No Remote Start Signal Active ***Bit 1 Active:*** Remote Start Off Load is Active ***Bit 2 Active:*** Remote Start On Load is Active ***Bit 3 Active:*** Remote Start On Load Demand is Active ***Bit 4 Active:*** Remote Start in Island Mode is Active ***Bit 5 to 8:*** Reserved

11.2.2 GENERATOR

NOTE: The *Generator* instrumentation does not change depending on the engine file selected.

The *Generator* instrumentation listed in this section is what the DSE module transmits on the CANbus link when *J1939-75 Instrumentation* is enabled in the configuration.

11.2.2.1 ACS - AC SWITCHING DEVICE STATUS

PGN 64913

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x91	0x2C (44)	0x18FD912C	250 ms
0x18	0x0FD91 (64913)						

SPN	Instrument	Byte / Bit	State
3545	Generator Breaker Status	Byte 1 Bits 1 to 3	***000:*** Open ***001:*** Closed ***010:*** Locked Out ***011-101:*** Available for SAE assignment ***110:*** Error ***111:*** Not available

11.2.2.2 GC1 - GENERATOR CONTROL 1

PGN 64915

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x93	0x2C (44)	0x18FD932C	100 ms
0x18	0x0FD93 (64915)						

SPN	Instrument	Byte / Bit	State
3567	Generator Control Not In Automatic Start State	Byte 1 Bits 5 to 6	***00:*** Inactive (ready to start automatically) ***01:*** Active (not ready to start automatically) ***10:*** Error ***11:*** Not available

11.2.2.3 GAAC - GENERATOR AVERAGE BASIC AC QUANTITIES

PGN 65030

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x06	0x2C (44)	0x18FE062C	100 ms
0x18	0x0FE06 (65030)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2440	Generator Avg. L-L AC Voltage	Byte 1 to 2	0 to 64255 V	1 A	0
2444	Generator Avg. L-N AC Voltage	Byte 3 to 4	0 to 64255 V	1 A	0
2436	Generator Avg. AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2448	Generator Avg. AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.2.4 GPAAC - GENERATOR PHASE A BASIC AC QUANTITIES

PGN 65027

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x03	0x2C (44)	0x18FE032C	100 ms
0x18	0x0FE03 (65027)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2441	Generator Phase A Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2445	Generator Phase A Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2437	Generator Phase A AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2449	Generator Phase A AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.2.5 GPAACP - GENERATOR PHASE A AC POWER

PGN 65026

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x02	0x2C (44)	0x18FE022C	100 ms
0x18	0x0FE02 (65026)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2453	Generator Phase A Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2461	Generator Phase A Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.2.6 GPAACR - GENERATOR PHASE A AC REACTIVE POWER

PGN 65025

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x01	0x2C (44)	0x18FE012C	100 ms
0x18	0x0FE01 (65025)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2457	Generator Phase A Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^9$
2465	Generator Phase A Power Factor	Byte 5 to 6	-1.00000 to 2.921814	$6.103515625*10^{-5}$	-1
2519	Generator Phase A Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.2.7 GPBAC - GENERATOR PHASE B BASIC AC QUANTITIES

PGN 65024

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x00	0x2C (44)	0x18FE002C	100 ms
0x18	0x0FE00 (65024)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2442	Generator Phase B Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2446	Generator Phase B Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2438	Generator Phase B AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2450	Generator Phase B AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

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11.2.2.8 GPBACP - GENERATOR PHASE B AC POWER

PGN 65023

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFF	0x2C (44)	0x18FEFF2C	100 ms
0x18	0x0FDFF (65023)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2454	Generator Phase B Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2462	Generator Phase B Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.2.9 GPBACR - GENERATOR PHASE B AC REACTIVE POWER

PGN 65022

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFE	0x2C (44)	0x18FEFE2C	100 ms
0x18	0x0FDFE (65022)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2458	Generator Phase B Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^{9}$
2466	Generator Phase B Power Factor	Byte 5 to 6	-1.00000 to 2.921814 PF	$6.103515625*10^{-5}$ PF	-1
2520	Generator Phase B Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.2.10 GPCAC - GENERATOR PHASE C BASIC AC QUANTITIES

PGN 65021

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFD	0x2C (44)	0x18FEFD2C	100 ms
0x18	0x0FDFD (65021)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2443	Generator Phase C Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2447	Generator Phase C Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2439	Generator Phase C AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2451	Generator Phase C AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.2.11 GPCACP - GENERATOR PHASE C AC POWER

PGN 65020

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFC	0x2C (44)	0x18FDFC2C	100 ms
0x18	0x0FDFC (65020)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2455	Generator Phase C Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^{9}$
2463	Generator Phase C Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^{9}$

11.2.2.12 GPCACR - GENERATOR PHASE C AC REACTIVE POWER

PGN 65019

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFB	0x2C (44)	0x18FDFB2C	100 ms
0x18	0x0FDFB (65019)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2459	Generator Phase C Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^9$
2467	Generator Phase C Power Factor	Byte 5 to 6	-1.00000 to 2.921814 PF	$6.103515625*10^{-5}$ PF	-1
2521	Generator Phase C Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.2.13 GTACE - GENERATOR TOTAL KW HOURS EXPORT

PGN 65018

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xFA	0x2C (44)	0x18FDFA2C	100 ms
0x18	0x0FDFA (65018)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2468	Generator Total kW Hours Export	Byte 1 to 4	0 to 4211081215 kWh	1 kWh	0

11.2.2.14 GTACER - GENERATOR TOTAL AC REACTIVE ENERGY

PGN 64910

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x8E	0x2C (44)	0x18FD8E2C	250 ms
0x18	0x0FD8E (64910)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
3593	Generator Total kvar Hours Export	Byte 1 to 4	0 to 4211081215 kvarh	1 kvarh	0

11.2.2.15 GTACP - GENERATOR TOTAL AC POWER

PGN 65029

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x05	0x2C (44)	0x18FE052C	100 ms
0x18	0x0FE05 (65029)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2452	Generator Total Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2460	Generator Total Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.2.16 GTACPP - GENERATOR TOTAL AC PERCENT POWER

PGN 64911

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x8F	0x2C (44)	0x18FD8F2C	250 ms
0x18	0x0FD8F (64911)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
3590	Generator Total Percent kW	Byte 1 to 2	-251 to 250.99 %	$7.8125*10^{-3}$ %	-251
3591	Generator Total Percent kVA	Byte 3 to 4	-251 to 250.99 %	$7.8125*10^{-3}$ %	-251
3592	Generator Total Percent kVAr	Byte 5 to 6	-251 to 250.99 %	$7.8125*10^{-3}$ %	-251

11.2.2.17 GTACR - GENERATOR TOTAL AC REACTIVE POWER

PGN65028

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFE	0x04	0x2C (44)	0x18FE042C	100 ms
0x18	0x0FE04 (65028)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2456	Generator Total Reactive Power	Byte 1 to 4	-2,000,000,000 to 2,211,081,215 var	1 var	$-2*10^9$
2464	Generator Overall Power Factor	Byte 5 to 6	-1.00000 to 2.921814 PF	$6.103515625*10^{-5}$ PF	-1
2518	Generator Overall Power Factor Lagging	Byte 7 to 8	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.3 MAINS

NOTE: The *Mains* instrumentation does not change depending on the engine file selected.

The *Utility* instrumentation listed in this section is what the DSE module transmits on the CANbus link when *J1939-75 Instrumentation* is enabled in the configuration.

11.2.3.1 ACS - AC SWITCHING DEVICE STATUS

PGN 64913

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x91	0x2C (44)	0x18FD912C	250 ms
0x18	0x0FD91 (64913)						

SPN	Instrument	Byte / Bit	State
3546	Utility Circuit Breaker Status	Byte 1 Bits 4 to 6	***000:*** Open ***001:*** Closed ***010:*** Locked Out ***011-101:*** Available for SAE assignment ***110:*** Error ***111:*** Not available

11.2.3.2 UAAC - UTILITY AVERAGE BASIC AC QUANTITIES

PGN 65017

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF9	0x2C (44)	0x18FDF92C	100 ms
0x18	0x0FDF9 (65017)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2474	Utility Avg. L-L AC Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2478	Utility Avg. L-N AC Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2470	Utility Avg. AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2482	Utility Avg. AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.3.3 UPAAC - UTILITY PHASE A BASIC AC QUANTITIES

PGN 65014

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF6	0x2C (44)	0x18FDF62C	100 ms
0x18	0x0FDF6 (65014)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2475	Utility Phase A Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2479	Utility Phase A Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2471	Utility Phase A AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2483	Utility Phase A AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.3.4 UPAACP - UTILITY PHASE A AC POWER

PGN 65013

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF5	0x2C (44)	0x18FDF52C	100 ms
0x18	0x0FDF5 (65013)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2487	Utility Phase A Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2495	Utility Phase A Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.3.5 UPAACR - UTILITY PHASE A AC REACTIVE POWER

PGN 65012

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF4	0x2C (44)	0x18FDF42C	100 ms
0x18	0x0FDF4 (65012)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2491	Utility Phase A Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^9$
2499	Utility Phase A Power Factor	Byte 5 to 6	-1.00000 to 2.921814	$6.103515625*10^{-5}$	-1
2523	Utility Phase A Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.3.6 UPBAC - UTILITY PHASE B BASIC AC QUANTITIES

PGN 65011

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF3	0x2C (44)	0x18FDF32C	100 ms
0x18	0x0FDF3 (65012)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2476	Utility Phase B Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2480	Utility Phase B Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2472	Utility Phase B AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2484	Utility Phase B AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.3.7 UPBACP - UTILITY PHASE B AC POWER

PGN 65010

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF2	0x2C (44)	0x18FDF22C	100 ms
0x18	0x0FDF2 (65010)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2488	Utility Phase B Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^{9}$
2496	Utility Phase B Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^{9}$

11.2.3.8 UPBACR - UTILITY PHASE B AC REACTIVE POWER

PGN 65009

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF1	0x2C (44)	0x18FDF12C	100 ms
0x18	0x0FDF1 (65009)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2492	Utility Phase B Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^{9}$
2500	Utility Phase B Power Factor	Byte 5 to 6	-1.00000 to 2.921814	$6.103515625*10^{-5}$	-1
2524	Utility Phase B Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.3.9 UPCAC - UTILITY PHASE C BASIC AC QUANTITIES

PGN 65008

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF0	0x2C (44)	0x18FDF02C	100 ms
0x18	0x0FDF0 (65008)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2477	Utility Phase C Line Line AC RMS Voltage	Byte 1 to 2	0 to 64255 V	1 V	0
2481	Utility Phase C Line Neutral AC RMS Voltage	Byte 3 to 4	0 to 64255 V	1 V	0
2473	Utility Phase C AC Frequency	Byte 5 to 6	0 to 501.9921875 Hz	$7.8125*10^{-3}$ Hz	0
2485	Utility Phase C AC RMS Current	Byte 7 to 8	0 to 64255 A	1 A	0

11.2.3.10 UPCACP - UTILITY PHASE C AC POWER

PGN65007

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xEF	0x2C (44)	0x18FDEF2C	100 ms
0x18	0x0FDEF (65007)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2489	Utility Phase C Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2497	Utility Phase C Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.3.11 UPCACR - UTILITY PHASE C AC REACTIVE POWER

PGN 65006

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xEE	0x2C (44)	0x18FDEE2C	100 ms
0x18	0x0FDEE (65006)						

SPN	Instrument	Byte / Bit	Scaling	Scaling	Offset
2493	Utility Phase C Reactive Power	Byte 1 to 4	-2000000000 to 2211081215 var	1 var	$-2*10^9$
2501	Utility Phase C Power Factor	Byte 5 to 6	-1.00000 to 2.921814	$6.103515625*10^{-5}$	-1
2525	Utility Phase C Power Factor Lagging	Byte 7 Bits 1 to 2	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.2.3.12 UTACE - UTILITY TOTAL KW HOURS EXPORT

PGN 65005

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xED	0x2C (44)	0x18FDED2C	100 ms
0x18							
	0x0FDED (65005)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2502	Utility Total kW Hours Export	Byte 1 to 4	0 to 4211081215 kWh	1 kWh	0

11.2.3.13 UTACER - UTILITY TOTAL AC REACTIVE ENERGY

PGN64909

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0x8D	0x2C (44)	0x18FD8D2C	250 ms
0x18							
	0x0FD8D (64909)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
3595	Utility Total kvar Hours Export	Byte 1 to 4	0 to 4211081215 kvarh	1 kvarh	0

11.2.3.14 UTACP - UTILITY TOTAL AC POWER

PGN65016

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF8	0x2C (44)	0x18FDF82C	100 ms
0x18							
	0x0FDF8 (65016)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2486	Utility Total Real Power	Byte 1 to 4	-2000000000 to 2211081215 W	1 W	$-2*10^9$
2494	Utility Total Apparent Power	Byte 5 to 8	-2000000000 to 2211081215 VA	1 VA	$-2*10^9$

11.2.3.15 UTACR - UTILITY TOTAL AC REACTIVE POWER

PGN65015

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message ID	Transmit Rate
0x6	0x0	0x0	0xFD	0xF7	0x2C (44)	0x18FDF72C	100 ms
0x18							
	0x0FDF8 (65015)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
2490	Utility Total Reactive Power	Byte 1 to 4	-2,000,000,000 to 2,211,081,215 var	1 var	$-2*10^{9}$
2498	Utility Overall Power Factor	Byte 5 to 6	-1.00000 to 2.921814 PF	$6.103515625*10^{-5}$ PF	-1
2522	Utility Overall Power Factor Lagging	Byte 7 to 8	***00:*** Leading ***01:*** Lagging / Unity ***10:*** Error ***11:*** Not Available		

11.3 DM1 - CONDITIONS ACTIVE DIAGNOSTIC TROUBLE CODES

NOTE: All DM1s are transmitted from the DSE module using a default source address of 44 (0x2C), however this is configurable. Refer to the module's configuration for further clarification of the configured source address.

NOTE: If only one DM1 alarm is active the DM1 priority of the message is 6. If two or more DM1 alarms are active the priority of the message changes to 7.

NOTE: SPN 1216 Occurrence Count is not supported and is fixed to a value of at 127 (i.e. not available).

NOTE: Once a fault condition is cleared, the corresponding DTCs continues to transmit via DM01 PGN for 10 seconds.

PGN 65226

The Amber Warning and Red Stop lamps are enabled for the DM01 message such that:

- SPN 623 Red Stop Lamp is 01 (Lamp On) if any of the supported alarms are active as a Shutdown or Electrical Trip alarm.
- SPN 624 Amber Warning Lamp is 01 (Lamp On) if any of the supported alarms are active as a Warning alarm.

Priority	Ext Data Page	Data Page	PDU Format	PDU Specific	Default Source Address	Default Message IDs	Transmit Rate
0x6/0x7	0x0	0x0	0xFE	0xCA	0x2C (44)	0x18FECA2C 0x1CFECA2C	1000 ms
0x18/0x1C							
	0x0FECA (65226)						

SPN	Instrument	Byte / Bit	Range	Scaling	Offset
624	Amber Warning Lamp	Byte 1 Bits 3 to 4	***00:*** Lamp Off ***01:*** Lamp On ***10:*** Reserved ***11:*** Not available		
623	Red Stop Lamp	Byte 1 Bits 5 to 6	***00:*** Lamp Off ***01:*** Lamp On ***10:*** Reserved ***11:*** Not available		
1214	Suspect Parameter Number	Byte 3 Bits 1 to 19	0 to 524,287	1	0
1215	Failure Mode Identifier	Byte 5 Bits 1 to 5	0 to 31	1	0
1706	SPN Conversion Method	Byte 6 Bit 8	**0:** Convert SPNs per the J1939-73 Version 4 definition **1:** Convert SPNs per the J1939-73 Version 1, 2 or 3 definitions.		

Diagnostic Trouble Code FMI Conditions

Value	Condition
0	High Fault - Most Severe
1	Low Fault - Most Severe
2	Data Erratic, Intermittent or Incorrect
7	Mechanical System Not Responding
9	Abnormal Update Rate
11	Other Failure Mode
12	Failure
13	Out of Calibration
14	Special Instruction
15	High Fault - Least Severe
17	Low Fault - Least Severe
19	Data Error
31	Condition Exists

Diagnostic Trouble Codes Conditions

Named Alarm	SPN	FMI	
		Warning	Electrical Trip / Shutdown
Auto Voltage Sense Fail	5006	11	31
AVR Data Fail	520230	9	19
AVR Fault (Red Lamp)	520221	11	31
Battery Over Voltage	168	15	0
Battery Under Voltage	168	17	1
Calibration Fault	630	13	31
Charge Alternator Failure	167	17	1
Coolant Temperature High	110	15	0
Coolant Temperature High Switch	110	15	0
DEF Level Low	1761	17	1
Digital Input A	520305	11	31
Digital Input B	520306	11	31
Digital Input C	520307	11	31
Digital Input D	520308	11	31
Digital Input E	520309	11	31
Digital Input F	520310	11	31
Digital Input G	520311	11	31
Digital Input H	520312	11	31
DPTC Filter	3701	11	31
ECU Amber	624	11	31
ECU Data Fail	639	9	19
ECU Malfunction	1213	11	31
ECU Protect	987	11	31
ECU Red	623	11	31
Emergency Stop	3607	11	31
Engine Over Speed	190	15	0
Engine Under Speed	190	17	1
Escape Mode	520231	11	31
Expansion Unit Failure	520200	9	19
Fail to Synchronise	2529	11	31

Continued overleaf…

Named Alarm	SPN	FMI Warning	FMI Electrical Trip / Shutdown
Failed to Start	1664	11	31
Failed to Stop	520193	11	31
Fuel Level High	96	15	0
Fuel Level Low	96	17	1
Fuel Level Low Switch	96	17	1
Fuel Sensor Fault	96	2	12
Fuel Tank Bund Level High	7785	15	0
Fuel Usage Running	183	11	31
Fuel Usage Stopped	183	11	31
Generator Failed To Open	3571	7	31
Generator Earth Fault Trip	3569	11	31
Generator Failed To Close	3572	7	31
Fail To Reach Loading Frequency	2436	17	1
Fail To Reach Loading Voltage	2444	17	1
Generator Negative var	520319	15	0
Generator Over Frequency	2436	15	0
Generator Over Current	2448	15	0
Generator Over Voltage	2444	15	0
Generator Phase Sequence Wrong	3579	11	31
Generator Positive var	2456	15	0
Generator Reverse Power	520214	15	0
Generator Short Circuit	520222	15	0
Generator Under Frequency	2436	17	1
Generator Under Voltage	2444	17	1
HEST Active	3698	15	0
Inlet Temperature	105	15	0
kW Overload	2452	15	0
Loss of Magnetic Pick Up	4201	11	31
Low Coolant Temperature Warning	110	17	1
Magnetic Pick-Up Fault	4201	2	12
Mains Failed to Open	3573	7	31
Mains Earth Fault	520224	15	0
Mains Failed To Close	3574	7	31
Mains Over Current	2482	15	0
Mains Short Circuit	520225	15	0
Maintenance Due	2648	11	31
MSC Failure	520216	9	19
MSC ID Error	520216	11	31
MSC Old Version Units	520215	11	31
Negative Phase Sequence Current	520202	15	0
Oil Pressure Low	100	17	1
Oil Pressure Low Switch	100	17	1
Oil Pressure Sensor Fault	100	2	12
Over Frequency Run Away	2436	15	0
Over Speed Runaway	190	15	0
Priority Selection Error	520239	11	31
Protections Disabled	640	14	31
Remote Display Link Lost	520229	9	19
SCR Inducement	5246	11	31
Shutdown Blocked	1237	11	31
Temperature Sensor Fault	110	2	12
Water In Fuel	97	11	31

12 MAINTENANCE, SPARES, REPAIR AND SERVICING

The module is *Fit and Forget*. As such, there are no user serviceable parts within the module.
In the case of malfunction, you should contact your original equipment manufacturer (OEM).

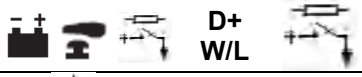
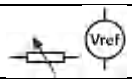
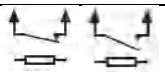
12.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

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

12.1.1 PACK OF PLUGS

Module Type	Plug Pack Part Number
G7 Connector Pack	007-1208

12.1.2 INDIVIDUAL PLUGS

Module Terminal Designation		Plug Description	Part No.
1 to 13	 **D+ W/L**	13 way 5.08 mm	007-166
14 to 59		8 way 5.08 mm	007-164
21 to 62	 **CAN 1** **CAN 2**	12 way 5.08 mm	007-109
30 to 37	 **V1**	8 way 7.62 mm	007-454
38 to 41	**V2**	4 way 7.62 mm	007-171
42 to 47		6 way 5.08 mm	007-446
48 to 55		8 way 5.08 mm	007-164
56 to 58	**RS485**	6 way 5.08 mm	007-446
		PC Configuration interface lead (USB type A – USB type B)	016-125

12.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

Item	Description	Part No.
	Module Fixing Clips (Packet of 4)	020-294

12.3 DSENET® EXPANSION MODULES

NOTE: A maximum of twenty (20) expansion modules and DSE Intelligent Battery Chargers can be connected to the DSEG7300 DSENet® Port.

NOTE: The DSENet® port is also used to connect to the Battery Chargers. This document does not cover the Battery Chargers ranges. For more information about the Battery Chargers refer to the relevant Chargers Operators and Software manuals.

NOTE: DSENet® utilises an RS485 connection. Using Belden 9841 (or equivalent) cable allows for the expansion cable to be extended to a maximum of 1.2 km.
DSE Stock and supply Belden 9841 cable. DSE Part Number 016-030.

Item	Max No. Supported	Description	DSE Part Numbers		
			Model Order Number	Operator Manual	Installation Instructions
	4	Model DSE2130 input module provides additional analogue and digital inputs for use with the module.	2130-00	057-082	053-033
	4	Model DSE2131 Ratio-metric input expansion module provides additional resistive, digital, 0 V to 10 V and 4 mA to 20mA inputs for use with the module.	2131-01	057-139	053-125
	4	Model DSE2133 RTD/Thermocouple input expansion module provides additional RTD and thermocouple inputs for use with the module.	2133-01	057-140	053-126
	4	Model DSE2152 Ratio-metric output expansion module provides additional 0 V to 10 V and 4 mA to 20mA outputs for use with the module.	2152-01	057-141	053-134

Expansion modules continued overleaf…

Item	Max No. Supported	Description	DSE Part Numbers		
			Model Order Number	Operator Manual	Installation Instructions
	4	Model DSE2157 expansion relay module provides eight additional voltage free relays for use with the module	2157-01	057-083	053-034
	4	Model DSE2548 expansion LED module provides additional LED indications, internal sounder and remote lamp test/alarm mute for use with the module.	2548-01	057-084	053-032
	4	Model DSE2160 Input and Output Expansion Module provides 8 Digital Input/Outputs, 6 Digital Inputs and 2 Analogue inputs.	2160-01	057-361	053-268
	2	Intelligent Battery Charger monitored over the DSENet® Port.	Various DSE Intelligent Battery Chargers are supported, contact DSE Technical Support; support@deepseaelectronics.com for further details.		

13 WARRANTY

DSE Provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, refer to the original equipment supplier (OEM).

14 DISPOSAL

14.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

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



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