



DSE8760 Control Module

FEATURES



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DSE Model 8760 ATS and Mains Controller Operators Manual

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Amendments since last publication

Issue no.	Comments
1	First release

Clarification of notation used within this publication.

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

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1 BIBLIOGRAPHY

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

1.1 INSTALLATION INSTRUCTIONS

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

DSE PART	DESCRIPTION
053-073	DSE8700 Installation Instructions
053-032	DSE2548 LED Expansion Annunciator Installation Instructions
053-033	DSE2130 Input Expansion Installation Instructions
053-034	DSE2157 Output Expansion Installation Instructions

1.2 TRAINING GUIDES

Training Guides are produced to give 'handout' sheets on specific subjects during training sessions.

DSE PART	DESCRIPTION
056-005	Using CTs With DSE Products
056-007	Advantages of Load CT
056-021	Mains Decoupling
056-022	Breaker Control
056-030	Module PIN Codes
056-042	Bus Mode or Mains Mode
056-047	Fail to close and out of sync

1.3 MANUALS

DSE PART	DESCRIPTION
057-082	DSE2130 Input Expansion Manual
057-083	DSE2157 Output Expansion Manual
057-084	DSE2548 Annunciator Expansion Manual
057-124	DSE8710 Operator Manual
057-127	DSE8700 Series Configuration Software Manual

2 INTRODUCTION

This document details the installation and operation requirements of the DSE8760 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*. You will not be automatically informed of updates. Any future updates of this document will be included on the DSE website at www.deepseapl.com

The **DSE8700 series** is designed to provide differing levels of functionality across a common platform. This allows the generator OEM greater flexibility in the choice of controller to use for a specific application.

The **DSE8760** module has been designed to monitor the mains (utility) supply and automatically start/stop one or more generator sets equipped with DSE8710 controllers depending upon the status of the mains (utility) supply.

Synchronising and Load Sharing features are included within the controller, along with the necessary protections for such a system. This provides forward sync, back sync (no break changeover) and start/stop upon changing load levels.

The user also has the facility to view the system operating parameters via the LCD display.

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

- *Text based LCD display (supporting multiple languages).*
- **True RMS** Voltage, Current and Power monitoring.
- *Fully configurable inputs for use as alarms or a range of different functions.*
- *R.O.C.O.F. and Vector shift for detection of mains failure when in parallel with the mains supply.*

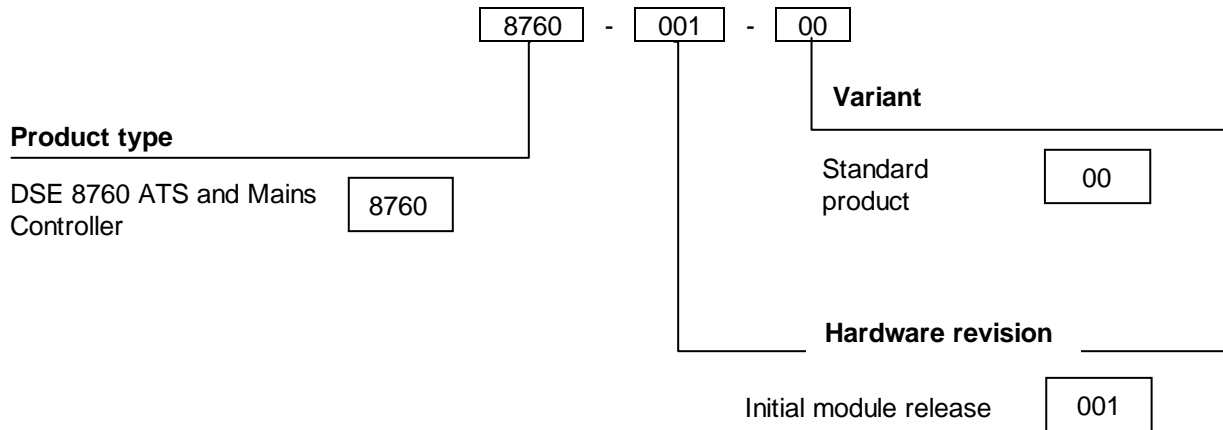
Using a PC and the Configuration Suite software allows alteration of selected operational sequences, timers and alarms.

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

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

3 SPECIFICATIONS

3.1 PART NUMBERING




At the time of this document production, there are no variants of this product.

3.1.1 SHORT NAMES

Short name	Description
DSE8700, DSE87xx	All modules in the DSE8700 Series

3.2 TERMINAL SPECIFICATION

Connection type	Two part connector. <ul style="list-style-type: none"> • Male part fitted to module • Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring. 	 <p>Example showing cable entry and screw terminals of a 10 way connector</p>
Minimum cable size	0.5mm ² (AWG 24)	
Maximum cable size	2.5mm ² (AWG 10)	

NOTE: For purchasing additional connector plugs from DSE, please see the section entitled *Maintenance, Spares, Repair and Servicing* elsewhere in this document.

3.3 POWER SUPPLY REQUIREMENTS

Minimum supply voltage	8V continuous
Cranking dropouts	Able to survive 0V for 50mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards. This is more than sufficient to allow the module to operate during engine cranking where the battery supply falls as low as 4V (on a 12V system!) This is achieved without the need for internal batteries or other external requirements.
Maximum supply voltage	35V continuous (60V protection for surges)
Reverse polarity protection	-35V continuous
Maximum operating current (all inputs and outputs on)	400mA at 24V 200mA at 12V
Maximum standby current (all inputs and outputs off)	110mA at 24V 210mA at 12V

Plant supply instrumentation display

Range	0V-70V DC (Note Maximum continuous operating voltage of 35V DC)
Resolution	0.1V
Accuracy	±1% full scale (±0.7V)

3.4 GENERATOR BUS AND MAINS VOLTAGE / FREQUENCY SENSING

Measurement type	True RMS conversion
Sample Rate	5KHz or better
Harmonics	Up to 10 th or better
Input Impedance	300K Ω ph-N
Phase to Neutral	15V (minimum required for sensing frequency) to 333V AC (absolute maximum) Suitable for 110V to 277V nominal (±20% for under/overvoltage detection)
Phase to Phase	26V (minimum required for sensing frequency) to 576V AC (absolute maximum) Suitable for 190V ph-ph to 479V ph-ph nominal (±20% for under/overvoltage detection)
Common mode offset from Earth	100V AC (max)
Resolution	1V AC phase to neutral 2V AC phase to phase
Accuracy	±1% of full scale phase to neutral (±3.33V ph-N) ±2% of full scale phase to phase (±11.52V ph-ph)
Minimum frequency	3.5Hz
Maximum frequency	75.0Hz
Frequency resolution	0.1Hz

Installation

Frequency accuracy	±0.2Hz
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3.5 MAINS AND LOAD CURRENT SENSING

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

3.6 INPUTS

3.6.1 DIGITAL INPUTS

Number	11
Arrangement	Contact between terminal and ground
Low level threshold	2.1V minimum
High level threshold	6.6V maximum
Maximum input voltage	+50V DC with respect to plant supply negative
Minimum input voltage	-24V DC with respect to plant supply negative
Contact wetting current	7mA typical
Open circuit voltage	12V typical

3.7 OUTPUTS

3.7.1 OUTPUTS A & B

Outputs A & B are not fitted to the DSE8760 controller.

3.7.2 OUTPUTS C & D

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

3.7.3 OUTPUTS E,F,G,H,I & J

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

3.8 COMMUNICATION PORTS

USB Port	USB2.0 Device for connection to PC running DSE configuration suite only Max distance 6m (20 feet)
Serial Communication	RS232 and RS485 are both fitted for individual or simultaneous operation.
RS232 Serial port	Non – Isolated port Max Baud rate 115200 baud subject to S/W TX, RX, RTS, CTS, DSR, DTR, DCD Male 9 way D type connector Max distance 15m (50 feet)
RS485 Serial port	Isolated Data connection 2 wire + common Half Duplex Data direction control for Transmit (by s/w protocol) Max Baud Rate 115200 External termination required (120Ω) Max common mode offset 70V (on board protection transorb) Max distance 1.2km (¾ mile)
MSC Port	MSC Port for connection to other DSE8760 and DSE8710 controllers Max distance 240m (133 feet). Use DSE124 to extend this if required.

3.8.1 COMMUNICATION PORT USAGE

USB, RS232 and RS485 ports are all fitted as standard to the controller for simultaneous or individual use.

3.8.1.1 USB CONNECTION

The USB port is provided to give a simple means of connection between a PC and the DSE8760 series controller. Using the DSE Configuration Suite Software, the operator is then able to control the module, starting or stopping the generator(s), selecting operating modes, etc.

Additionally, the various operating parameters (such as output volts, oil pressure, etc.) of the remote generator(s) are available to be viewed or changed.

To connect a DSE8700 series module to a PC by USB, the following items are required:

- DSE8700 series module
- DSE 8700 series configuration software
(Supplied on configuration suite software CD or available from www.deepseapl.com).
- USB cable Type A to Type B.
(This is the same cable as often used between a PC and a USB printer)



DSE can supply this cable if required :
PC Configuration interface lead (USB type A – type B) DSE Part No 016-125

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

NOTE: - Refer to DSE8700 series Configuration Suite Manual (DSE part 057-119) for further details on configuring, monitoring and control.

3.8.1.2 RS232

The RS232 port on the DSE8700 series controller supports the Modbus RTU protocol. The Gencomm register table for the controller is available upon request from the DSE Technical Support Department.

RS232 is for short distance communication (max 15m) and is typically used to connect the DSE87xx series controller to a telephone or GSM modem for more remote communications.

Many PCs are not fitted with an internal RS232 serial port. DSE DOES NOT recommends the use of USB to RS232 converters but can recommend PC add-ons to provide the computer with an RS232 port.

Recommended PC Serial Port add-ons (for computers without internal RS232 port):
Remember to check these parts are suitable for your PC. Consult your PC supplier for further advice.

- Brainboxes PM143 PCMCIA RS232 card (for laptop PCs)
- Brainboxes VX-001 Express Card RS232 (for laptops and nettops PCs)
- Brainboxes UC246 PCI RS232 card (for desktop PCs)
- Brainboxes PX-246 PCI Express 1 Port RS232 1 x 9 Pin (for desktop PCs)



Supplier:

Brainboxes

Tel: +44 (0)151 220 2500

Web: <http://www.brainboxes.com>

Email: Sales:sales@brainboxes.com

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

RECOMMENDED EXTERNAL MODEMS:

- Multitech Global Modem – MultiModem ZBA (PSTN)
DSE Part Number 020-252
(Contact DSE Sales for details of localisation kits for these modems)



- Wavcom Fastrak Supreme GSM modem kit (PSU, Antenna and modem)*
DSE Part number 0830-001-01



- Brodersen GSM Industrial Modem*
DSE Part number 020-245



▲ NOTE: *For GSM modems, a SIM card is required, supplied by your GSM network provider:

- For SMS only, a 'normal' voice SIM card is required. This enables the controller to send SMS messages to designated mobile phones upon status and alarm conditions.
- For a data connection to a PC running DSE Configuration Suite Software, a 'special' CSD (Circuit Switched Data) SIM card is required that will enable the modem to answer an incoming data call. Many 'pay as you go' services will not provide a CSD (Circuit Switched Data) SIM card.

3.8.1.3 RS485

The RS485 port on the DSE8700 series controller supports the Modbus RTU protocol. The DSE Gencomm register table for the controller 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 (1.2km when using Belden 9841 (or equivalent) cable). This allows for a large distance between the DSE8700 series module and a PC running the DSE Configuration Suite software. The operator is then able to control the module, starting or stopping the generator(s), selecting operating modes, etc.

The various operating parameters (such as output volts, oil pressure, etc.) of the remote generator(s) can be viewed or changed.

NOTE: - For a single module to PC connection and distances up to 6m (8yds), the USB connection method is more suitable and provides for a lower cost alternative to RS485 (which is more suited to longer distance connections).

Recommended PC Serial Port add-ons (for computers without internal RS485 port). 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 VX-023 ExpressCard 1 Port RS422/485 (for laptops and nettop PCs)
- 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

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

3.8.1.4 ETHERNET

The ethernet port on the DSE8700 series controller supports the Modbus TCP protocol. This can be used by DSE Config Suite, DSE SCADA Suite or by third party products.

The DSE Gencomm register table for the controller is available upon request from the DSE Technical Support Department.

3.9 DSENET® FOR EXPANSION MODULES

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

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

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

▲ NOTE: DSE8700 series do not support the 2510/2520 display modules.

3.10 SOUNDER

DSE8700 Series features an internal sounder to draw attention to warning, shutdown and electrical trip alarms.

Sounder level	64db @ 1m
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3.10.1 ADDING AN EXTERNAL SOUNDER TO THE APPLICATION

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 alarm mute button activate 'in parallel' with each other. Either signal will mute both the internal sounder and audible alarm output.

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

Relay Outputs (DC Supply Out)		
Output E	Source Audible Alarm	Polarity Energise

Digital Input A	
Function	Alarm Mute

3.11 DIMENSIONS AND MOUNTING

3.11.1.1 DIMENSIONS

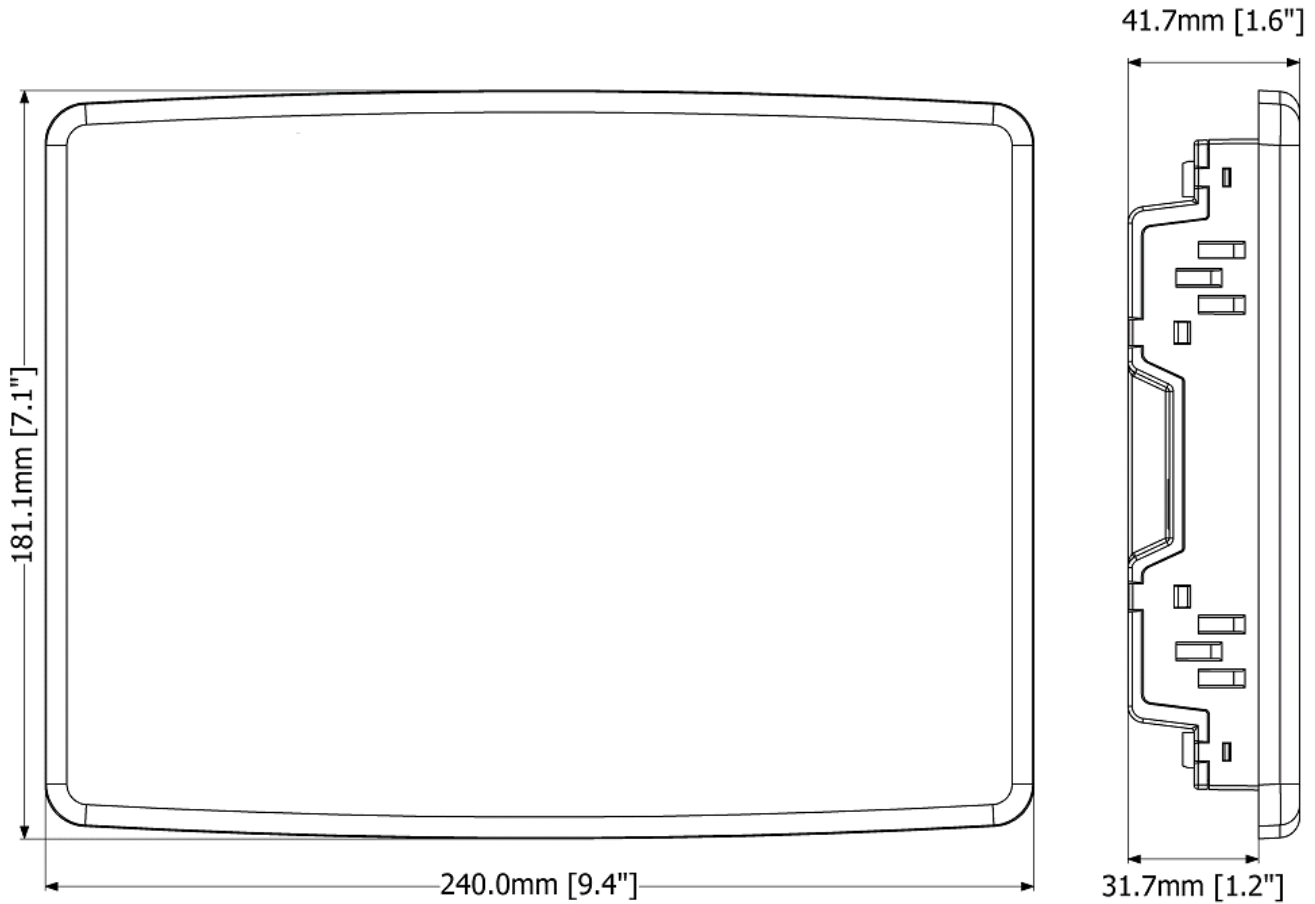
240.0mm x 181.1mm x 41.7mm (9.4" x 7.1" x 1.6")

PANEL CUTOUT

220mm x 160mm (8.7" x 6.3")

WEIGHT

0.7kg (1.4lb)



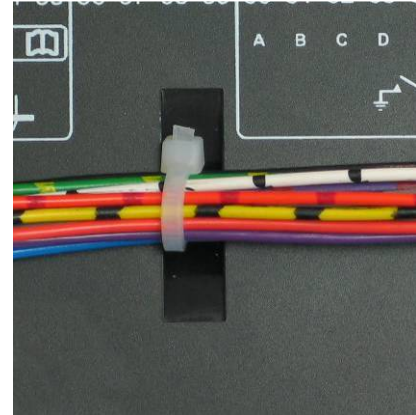
3.11.2 CABLE TIE FIXING POINTS

Integral cable tie fixing points are included on the rear of the module's case to aid wiring. This additionally provides strain relief to the cable loom by removing the weight of the loom from the screw connectors, thus reducing the chance of future connection failures.

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



Cable tie fixing point



With cable and tie in place

3.12 APPLICABLE STANDARDS

BS 4884-1	This document conforms to BS4884-1 1992 Specification for presentation of essential information.
BS 4884-2	This document conforms to BS4884-2 1993 Guide to content
BS 4884-3	This document conforms to BS4884-3 1993 Guide to presentation
BS EN 60068-2-1 (Minimum temperature)	-30°C (-22°F)
BS EN 60068-2-2 (Maximum temperature)	+70°C (158°F)
BS EN 60950	Safety of information technology equipment, including electrical business equipment
BS EN 61000-6-2	EMC Generic Immunity Standard (Industrial)
BS EN 61000-6-4	EMC Generic Emission Standard (Industrial)
BS EN 60529 (Degrees of protection provided by enclosures) (see overleaf)	IP65 (front of module when installed into the control panel with the supplied sealing gasket) IP42 (front of module when installed into the control panel WITHOUT being sealed to the panel)
UL508 NEMA rating (Approximate) (see overleaf)	12 (Front of module when installed into the control panel with the supplied sealing gasket). 2 (Front of module when installed into the control panel WITHOUT being sealed to the panel)
IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	Under the scope of IEEE 37.2, <i>function numbers can also be used to represent functions in microprocessor devices and software programs.</i> The 8700 series controller is device number 11L-8700 (Multifunction device protecting Line (mains) – 8700 series module). As the module is configurable by the generator OEM, the functions covered by the module will vary. Under the module's factory configuration, the device numbers included within the module are : 2 – Time delay starting or closing relay 27AC – AC undervoltage relay 27DC – DC undervoltage relay 30 – annunciator relay 42 – Running circuit breaker 52 – AC circuit breaker 59AC – AC overvoltage relay 59DC – DC overvoltage relay 62 – Time delay stopping or opening relay 74– Alarm relay 81 – Frequency relay 86 – Lockout relay







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

4 INSTALLATION

The DSE8700 Series module is designed to be mounted on the panel fascia. For dimension and mounting details, see the section entitled *Specification, Dimension and mounting* elsewhere in this document.




4.1 TERMINAL DESCRIPTION


4.1.1 DC SUPPLY, FUEL AND START OUTPUTS

Icon	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	1	DC Plant Supply Input (Negative)	2.5mm ² AWG 13	
	2	DC Plant Supply Input (Positive)	2.5 mm ² AWG 13	(Recommended Maximum Fuse 15A anti-surge) Supplies the module (2A anti-surge requirement) and Output relays E,F,G & H
	3	Not Connected		
	4	Not Connected		
	5	Not Connected		
	6	Not Connected		
	7	Functional Earth	2.5mm ² AWG 13	Connect to a good clean earth point.
	8	Output relay E	1.0mm ² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	9	Output relay F	1.0mm ² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	10	Output relay G	1.0mm ² AWG 18	Plant Supply Positive. from terminal 2. 3 Amp rated.
	11	Output relay H	1.0mm ² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	12	Output relay I	1.0mm ² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	13	Output relay J	1.0mm ² AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.



 **NOTE:- Terminal 14 is not fitted to the DSE8700 series controller.**

4.1.2 MAGNETIC PICKUP, CAN AND EXPANSION

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	22	Not Connected		
	23	Not Connected		
	24	Not Connected		
CAN 	25	Not Connected		
	26	Not Connected		
	27	Not Connected		
	28	DSENet expansion +	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
	29	DSENet expansion -	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
	30	DSENet expansion SCR	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
MSC	31	MultiSet Comms (MSC) Link H	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
	32	MultiSet Comms (MSC) Link L	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
	33	MultiSet Comms (MSC) Link SCR	0.5mm ² AWG 20	Use only 120Ω RS485 approved cable
GOV	34	Not Connected		
	35	Not Connected		
AVR	37	Not Connected		
	38	Not Connected		

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


4.1.3 LOAD SWITCHING AND MAINS VOLTAGE SENSING (V1)

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	39	Output relay C	1.0mm AWG 18	Normally configured to control load switching device (Recommend 10A fuse)
	40	Output relay C	1.0mm AWG 18	Normally configured to control load switching device
	41	Output relay D	1.0mm AWG 18	Normally configured to control load switching device (Recommend 10A fuse)
	42	Output relay D	1.0mm AWG 18	Normally configured to control load switching device
V1	43	Mains L1 (R) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (R) incoming supply (AC) (Recommend 2A fuse)
	44	Mains L2 (S) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (S) incoming supply (AC) (Recommend 2A fuse)
	45	Mains L3 (T) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (T) incoming supply (AC) (Recommend 2A fuse)
	46	Mains Neutral (N) input	1.0mm AWG 18	Connect to Mains N incoming supply (AC)

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

4.1.4 GENERATOR BUS VOLTAGE SENSING (V2)

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
V2	47	Generator Bus L1 (U) voltage monitoring	1.0mm ² AWG 18	Connect to Generator Bus L1 (U) output (AC) (Recommend 2A fuse)
	48	Generator Bus L2 (V) voltage monitoring input	1.0mm ² AWG 18	Connect to Generator Bus L2 (V) output (AC) (Recommend 2A fuse)
	49	Generator Bus L3 (W) voltage monitoring input	1.0mm ² AWG 18	Connect to Generator Bus L3 (W) output (AC) (Recommend 2A fuse)
	50	Generator Bus Neutral (N) input	1.0mm ² AWG 18	Connect to Generator Bus Neutral terminal (AC)

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

4.1.5 MAINS CURRENT TRANSFORMERS

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

NOTE: - The 8700 series module has a burden of 0.5VA on the CT. Ensure the CT is rated for the burden of the 8700 series controller, the cable length being used and any other equipment sharing the CT. If in doubt, consult your CT supplier.

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

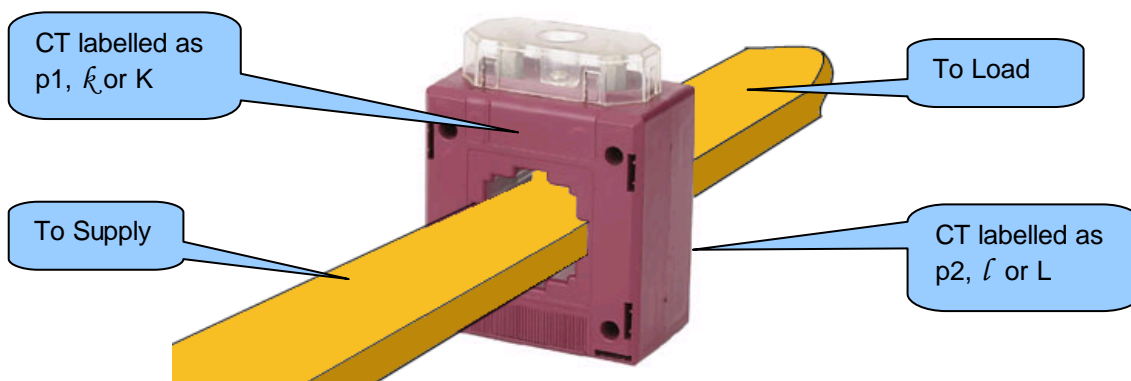
CT LABELLING

p1, κ or K is the primary of the CT that 'points' towards the MAINS

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 (I1,I2,I3)


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 DSE8700 series modules.





	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	51	CT Secondary for Mains L1	2.5mm ² AWG 13	Connect to s1 secondary of L1 monitoring CT
	52	CT Secondary for Mains L2	2.5mm ² AWG 13	Connect to s1 secondary of L2 monitoring CT
	53	CT Secondary for Mains L3	2.5mm ² AWG 13	Connect to s1 secondary of L3 monitoring CT
	54	DO NOT CONNECT		
	55	Common for CTs connected to L1,L2,L3 (s2)	2.5mm ² AWG 13	Connect to s2 secondary of L1,L2,L3 monitoring CTs

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


4.1.1 LOAD CURRENT TRANSFORMER


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

 **NOTE:** - Load CT is NOT REQUIRED in a system including only one mains supply (with one 8760 controller). See section below detailing advantages of the load CT in a multiple mains (multiple 8760) system.

 **NOTE:** - The 8700 series module has a burden of 0.5VA on the CT. Ensure the CT is rated for the burden of the 8700 series controller, the cable length used and any other equipment sharing the CT. If in doubt, consult your CT supplier.

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

	Pin No	Description	CABLE SIZE	NOTES
	56	CT Secondary for Load CT	2.5mm ² AWG 13	Connect to s1 secondary of Load CT
	57	CT Secondary for Load CT	2.5mm ² AWG 13	Connect to s2 secondary of Load CT

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


4.1.1.1 ADVANTAGES OF LOAD CT

The load CT is only required when there is **more than one** DSE8760 on the same system.




When the load CT is fitted the 8760 transfers the right amount of load to the mains before disconnecting the generator(s), preventing them from being shock loaded.

Without the load CT, the 8760 does not know how much load to transfer to the mains when other 8760's are still in island mode. The 8760 would transfer a pre-determined amount of load before disconnecting the generator(s) from the mains. This would lead to there being too much load or not enough load transferred, and the generator(s) would be shock loaded as the generator(s) disconnect from the mains.

4.1.2 CONFIGURABLE DIGITAL INPUTS

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	60	Configurable digital input A	0.5mm ² AWG 20	Switch to negative
	61	Configurable digital input B	0.5mm ² AWG 20	Switch to negative
	62	Configurable digital input C	0.5mm ² AWG 20	Switch to negative
	63	Configurable digital input D	0.5mm ² AWG 20	Switch to negative
	64	Configurable digital input E	0.5mm ² AWG 20	Switch to negative
	65	Configurable digital input F	0.5mm ² AWG 20	Switch to negative
	66	Configurable digital input G	0.5mm ² AWG 20	Switch to negative
	67	Configurable digital input H	0.5mm ² AWG 20	Switch to negative
	68	Configurable digital input I	0.5mm ² AWG 20	Switch to negative
	69	Configurable digital input J	0.5mm ² AWG 20	Switch to negative
	70	Configurable digital input K	0.5mm ² AWG 20	Switch to negative

4.1.3 PC CONFIGURATION INTERFACE CONNECTOR

	DESCRIPTION	CABLE SIZE	NOTES
 	Socket for connection to PC with 87xx series PC software.	0.5mm ² AWG 20	This is a standard USB type A to type B connector. 

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

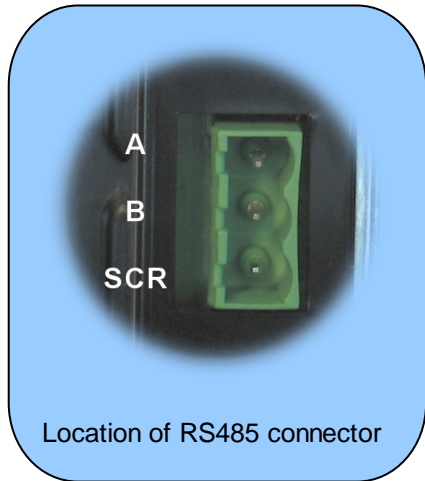
NOTE: - The USB connection cable between the PC and the DSE8700 series module must not extend beyond 5m (5yds). For distances over 5m, it is possible to use a third party USB extender. Typically, they extend USB up to 50m (yds). The supply and support of this type of equipment is outside the scope of Deep Sea Electronics PLC.

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

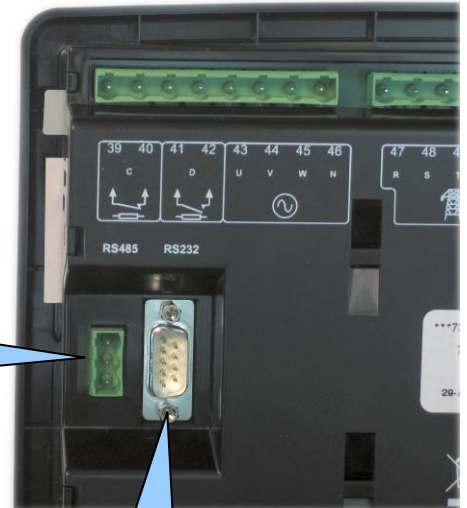
CAUTION! This socket must not be used for any other purpose.

4.1.4 RS485 CONNECTOR

PIN No	NOTES
A	Two core screened twisted pair cable. 120Ω impedance suitable for RS485 use.
B	Recommended cable type - Belden 9841
SCR	Max distance 1200m (1.2km) when using Belden 9841 or direct equivalent.



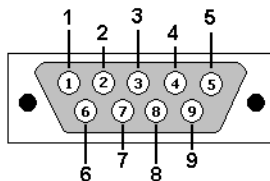
Location of RS485 connector



Location of RS232 connector

4.1.5 RS232 CONNECTOR

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



View looking into the male connector on the 8700 series module

4.2 TYPICAL WIRING DIAGRAMS

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

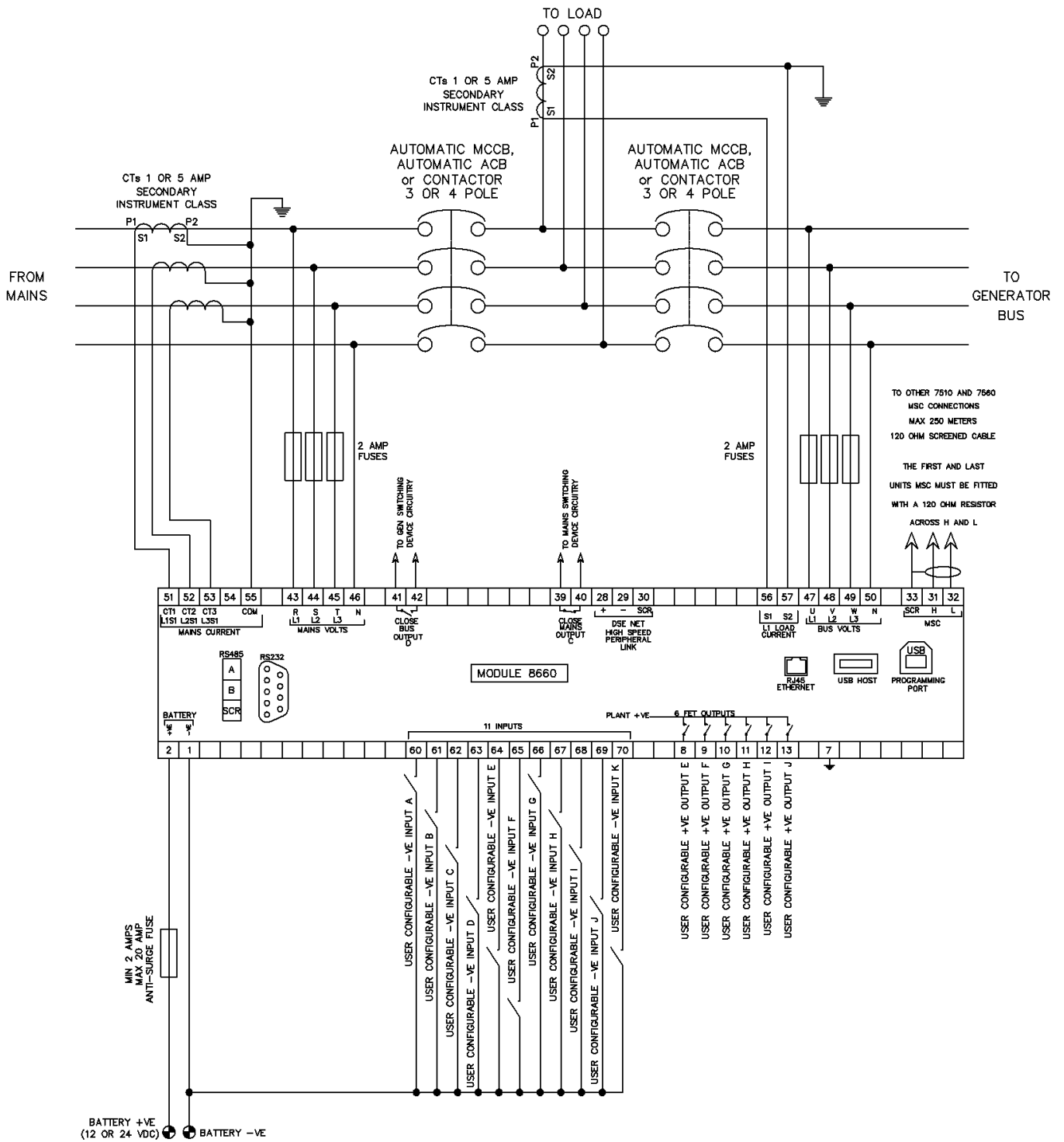
Genset manufacturers and panel builders may use these diagrams as a starting point; however, you are referred to the completed system diagram provided by your system manufacturer for complete wiring detail.

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

DSE PART	DESCRIPTION
056-022	Breaker Control (Training guide)

Installation

4.2.1 3 PHASE, 4 WIRE

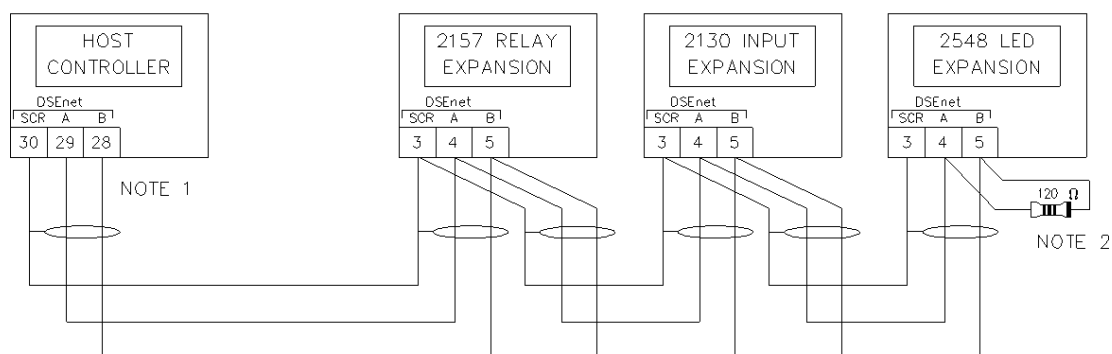


4.2.2 DSENET®

DSENet® is the communication port between the host controller (DSE87xx series) and the expansion device as shown below. Further details are contained within the *Specification* section of this document and within the operator manual for the specific expansion module you are connecting to.

NOTE: - Screened 120Ω 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 120Ω impedance cable suitable for DSENet® use (DSE part number 016-030)



NOTE 1
AS A TERMINATING RESISTOR IS INTERNALLY FITTED TO THE HOST CONTROLLER, THE HOST CONTROLLER MUST BE THE FIRST UNIT ON THE DSEnet

NOTE 2
A 120 OHM TERMINATION RESISTOR MUST BE FITTED TO THE LAST UNIT ON THE DSEnet

4.2.3 EARTH SYSTEMS

4.2.3.1 NEGATIVE EARTH

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

4.2.3.2 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).

4.2.3.3 FLOATING EARTH

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

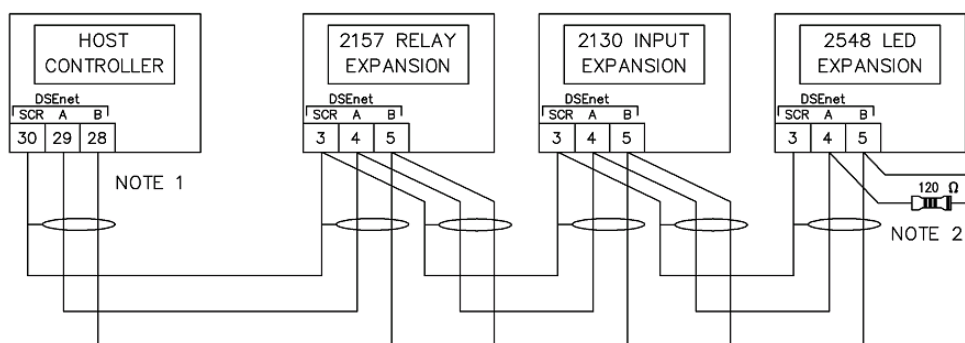
- Follow the typical wiring diagram as normal for all sections EXCEPT the earth points
- All points shown as Earth on the typical wiring diagram should connect to BATTERY NEGATIVE (not earth).

4.3 TYPICAL ARRANGEMENT OF DSENET®

Twenty (20) devices can be connected to the DSENet®, made up of the following devices :

Device	Max number supported
DSE2130 Input Expansion	4
DSE2157 Output Expansion	10
DSE2548 LED Expansion	10

NOTE : DSE8700 series does not support the 2510/2520 display modules.



NOTE 1
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NOTE 2
 A 120 OHM TERMINATION RESISTOR MUST BE FITTED TO THE LAST UNIT ON THE DSEnet

5 PROTECTIONS

Indication of activated protections is shown on the connected remote display. For example DSE8716 or DSE8721.

5.1 INDICATIONS

Indications are non-critical and often status conditions. They do not appear on the remote display. However, an output or LED indicator can be configured to draw the operator's attention to the event.

Example

- Input configured for indication.
- The LCD text will 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.
- LED Indicator to make LED1 illuminate when Digital Input A is active.
- The Insert Card Text allows the system designer to print an insert card detailing the LED function.
- Sample showing operation of the LED on a connected 8716 remote display.

Digital Input A

Function: User Configured

Polarity: Close to Activate

Action: Indication

Arming: Always

LCD Display: Battery Charger On

Activation Delay: 0s

LED Indicators

1 Digital Input A Lit Battery Charger On

Insert Card Text



5.2 WARNINGS


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

By default, warning alarms are self-resetting when the fault condition is removed. However enabling 'all warnings are latched' will cause warning alarms to latch until reset manually. This is enabled using the 8700 series configuration suite in conjunction with a compatible PC.

Display	Reason
BATTERY UNDER VOLTAGE	The DC supply has fallen below the low volts setting level for the duration of the low battery volts timer
BATTERY OVER VOLTAGE	The DC supply has risen above the high volts setting level for the duration of the high battery volts timer
AUXILIARY INPUTS	Auxiliary inputs can be user configured and will display the message as written by the user.
kW OVERLOAD	The measured Total kW is above the setting of the kW overload warning alarm

5.3 ELECTRICAL TRIPS

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

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




Display	Reason
AUXILIARY INPUTS	If an auxiliary input configured as an electrical trip is active, the appropriate message will be displayed as configured by the user.
KW OVERLOAD	The measured Total kW is above the setting of the kW overload Electrical Trip alarm

5.4 ROCOF / VECTOR SHIFT

When configured to run in parallel with the mains (utility) supply, the module monitors for ROCOF / Vector shift trips according to the module's configuration settings. This is included within the module and will detect failure of the mains supply during parallel operation with the generator.

 NOTE:- This protection operates only when in parallel with the mains supply and is disabled at all other times.

Should either of these alarms operate, the module will perform a controlled shutdown (electrical trip) of the generator. This operation must be manually reset. Using the remote display :

- 1) Press  button. The engine will stop if it is still running and the alarm is cleared.
- 2) Activate digital input configured to "Clear ROCOF/Vector shift" if this has been provided.
- 3) Press  and  button together and hold for 5 seconds. The ROCOF/Vector shift instrument is displayed and all 'peak hold' values are reset, clearing the ROCOF/Vector shift alarm.

For details on activating and configuring the ROCOF/Vector shift protection, you are referred to the 8700 configuration software manual.

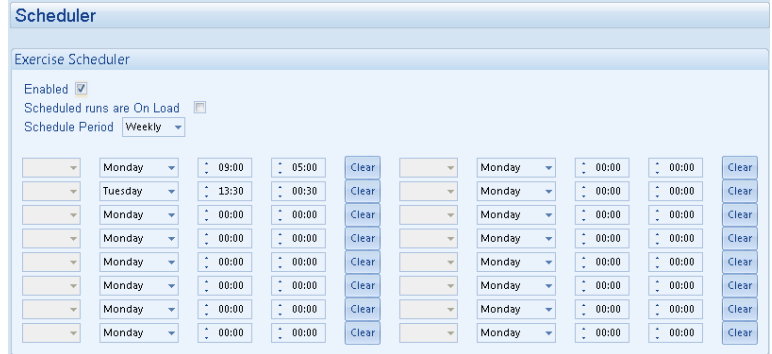
6 SCHEDULER

DSE8700 Series contains an inbuilt exercise run scheduler, capable of automatically starting and stopping the set. Up to 16 scheduled start/stop 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 will start at 09:00 on Monday and run for 5 hours, then start at 13:30 on Tuesday and run for 30 minutes.



6.1.1 STOP MODE

- Scheduled runs will not occur when the module is in STOP/RESET mode.

6.1.2 MANUAL MODE

- Scheduled runs will not occur when the module is in MANUAL mode.
- Activation of a Scheduled Run 'On Load' when the module is operating OFF LOAD in Manual mode will have no effect, the set continues to run OFF LOAD

6.1.3 AUTO MODE

- Scheduled runs will operate ONLY if the module is in AUTO mode with no Shutdown or Electrical Trip alarm present.
- If the module is in STOP or MANUAL mode when a scheduled run begins, the engine will not be started. However, if the module is moved into AUTO mode during a scheduled run, the engine will be 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.

7 COMMISSIONING

7.1.1 PRE-COMMISSIONING

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

1. The unit is adequately cooled and all the wiring to the module is of a standard and rating compatible with the system.
2. 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.
3. Check the operation of the MSC datalink. Use the DSE Config Suite to check this on the SCADA | BUS | MSC LINK page. Verify the number of sets on the bus.
4. Ensure all 8710 controllers in the system have been fully commissioned using the DSE "Four Steps to Successful Synchronising".
5. Place the 8760 module into STOP mode. Place the 8710(s) into AUTO mode. Initiate a start by pressing the START button of the 8760. All 8710's start upon receipt of the MSC start command.
6. The bus will remain off load so long as the mains supply is healthy and on load.
7. Press the 8710 STOP button to remove the start request and stop the set(s).
8. Set the modules internal clock/calendar to ensure correct operation of the scheduler and event logging functions. For details of this procedure see section entitled *Front Panel Configuration – Editing the date and time*.
9. If, despite repeated checking of the connections between the **8700** series controller and the customer's system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice on:-


INTERNATIONAL TEL: +44 (0) 1723 890099

INTERNATIONAL FAX: +44 (0) 1723 893303

E-mail: Support@Deepseapl.com

Website : www.deepseapl.com

8 FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative Read/Write configuration does not operate	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70°C. Check the DC fuse.
Continuous starting of generator when in AUTO	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct. Check the mains supply is available and within configured limits.
Generators fail 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 MSC link operation Check 8760 ATS and 8710 engine controllers are in AUTO mode.
Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the Accept  button to save the change before moving to another item or exiting the fascia editor
Bus will not take load	Ensure the generator available LED is lit Check that the output configuration is correct to drive the load switch device and that all connections are correct. Remember that the set will not take load in manual mode unless the mains supply fails, a remote start on load input is present or the close generator button is pressed.
Inaccurate measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow (p1,p2 and s1,s2) and additionally ensure that CTs are connected to the correct phase (errors will occur if CT1 is connected to phase 2). Remember to consider the power factor. $I_e (kW = kVA \times \text{powerfactor})$ The 8700 series controller 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 controller is better than 1% of full scale. I.e Gen volts full scale is 333V ph-n so accuracy is $\pm 3.33V$ (1% of 333V).

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

Protections

9 MAINTENANCE, SPARES, REPAIR AND SERVICING

The DSE8700 Series controller is designed to be *Fit and Forget*. As such, there are no user serviceable parts within the controller.

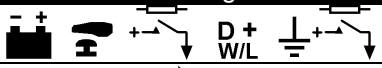
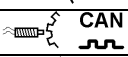





In the case of malfunction, you should contact your original equipment supplier (OEM).

9.1.1.1 PACK OF PLUGS

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

Module type	Plug Pack Part Number
DSE8710	057-513
DSE8760	007-514

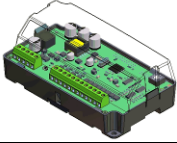
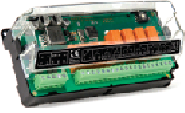

9.1.1.2 INDIVIDUAL PLUGS

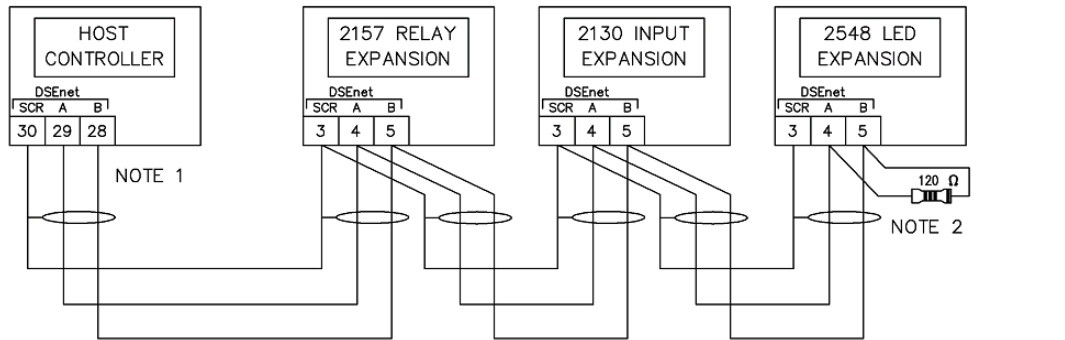
8700 series terminal designation	Plug description	Part No.
1-11 	11 way 5.08mm	007-451
15-19	Not fitted to DSE8760	
22-30 	9 way 5.08mm	007-167
39-46 	8 way 7.62mm	007-454
47-50 	4 way 7.62mm	007-171
51-56 	6 way 5.08mm	007-446
60-67 	8 way 5.08mm	007-164
RS485	3 way 5.08mm	007-174
	PC Configuration interface lead (USB type A – type B)	016-125

9.2 EXPANSION MODULES

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

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

Item	Max No. supported	Description	Model order number	DSE Part numbers		
				Sales literature	Operator manual	Installation Instructions
	4	Model DSE2130 expansion input module provides additional analogue and digital inputs for use with the 73x0 controller	2130-001-00	055-060	057-082	053-033
	10	Model DSE2157 expansion relay module provides eight additional voltage free relays for use with the 73x0 controller	2157-001-00	055-061	057-083	053-034
	10	Model DSE2548 expansion LED module provides additional LED indications, internal sounder and remote lamp test/alarm mute for use with the 73x0 controller.	2548-001-00	055-062	057-084	053-032



NOTE 1
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NOTE 2
A 120 OHM TERMINATION RESISTOR MUST BE FITTED TO THE LAST UNIT ON THE DSEnet

10 WARRANTY

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

11 DISPOSAL

11.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

Directive 2002/96/EC

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



11.2 ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES)

Directive 2002/95/EC:2006

To remove specified hazardous substances (Lead, Mercury, Hexavalent Chromium, Cadmium, PBB & PBDE's)

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

Despite this exemption, DSE has been carefully removing all non RoHS compliant components from our supply chain and products.

When this is completed a Lead Free & RoHS compatible manufacturing process will be phased into DSE production.

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