DEEP SEA ELECTRONICS PLC

DSE9474 & DSE9484 OPERATOR MANUAL

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DSE9474 & DSE9484 Operator Manual

Amendments since last publication

Issue. No.	Comments
1	Initial release
2	Addition of DSE9484 information
3	Updated maximum DC voltage rating for DSE9474
4	Updated ambient temperature current derating value
5	Updated for the DSE9474s new features (Soft Start, 5-stage charging, DSEnet…)

Typeface : The typeface used in this document is *Arial*. Care should be taken not to mistake the upper case letter I with the numeral 1. The numeral 1 has a top serif to avoid this confusion.

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Section **Page**

1 INTRODUCTION

This document details the installation requirements of the DSE9474 24 V 30 A battery charger & DSE9484 12 V 30 A battery charger.
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 added to the DSE website at www.deepseaplc.com.

The DSE9474 & DSE9484 battery chargers are intended for mounting within a customer enclosure or panel, fastened by screws / bolts.

The DSE9474 & DSE9484 include protected outputs, intelligent charging and power supply operation with a robust enclosure.

1.1 BIBLIOGRAPHY

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

1.1.1 INSTALLATION INSTRUCTIONS

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

DSE Part	Description
053-175	DSE9474 & DSE9484 Installation Instructions.

1.1.2 MANUALS

DSE Part	Description
057-159	DSE9400 Series Configuration Suite PC Software Manual.

2 SPECIFICATIONS

2.1 ELECTRICAL SPECIFICATIONS

Parameter	Min	Nominal	Max
AC Input Voltage (V)	90 V	110 V to 277 V	305 V
Operating Temperature	-30 °C		80 °C
Input Frequency (Hz)	48 Hz		64 Hz
Output Ripple and Noise		1% Vo	
Load Regulation		1% Vo	
Line Regulation		<0.01% Vo	
Output Voltage Overshoot %		<5%Vo	
Transient Response Peak Deviation (mV) (at 50% to 100% load step)		<4% Vo	
Warm Up Voltage (V)		<1% Vo	
Output Voltage Rise Time (ms)		<200 ms	
Short Circuit Protection		Hiccup	
Switching Frequency (kHz)		42 kHz	
Efficiency % (See section entitled '*output specifications*' elsewhere in this manual)		>90%	
Temperature Sensor Input		PT1000	

2.2 CHARGE FAIL RELAY

Parameter	Specification
Relay Type	Single Pole Change Over Relay. Energises when the battery charger is operational and no alarms are present. De-energises upon any alarm and when the AC power is removed from the charger.
Rating	3 A DC.

2.3 OUTPUT SPECIFICATIONS

NOTE: DSE9474 operates in *Soft Start* when enabled using the DSE Configuration Suite PC Software. For further information on the *Soft Start* feature, refer to *DSE Publication: 057-159 DSE9400 Series Battery Charger Configuration Suite Manual.*

Parameter	Min	Nom	Max	Comments
Output Voltage DSE9474 (24 V DC Battery)	26 V	27 V	31 V	Voltage Drop Compensation is provided when using Voltage Sensing Wires. Battery Temperature Compensation is provided when using PT1000 sensor.
Output Voltage DSE9484 (12 V DC Battery)	13 V	13.5 V	14.75 V	
Output Charging Current (A)	0 A	30 A	31 A	**NOTE: The maximum current output of a DSE9474 derates to 27 A when the output voltage exceeds 29.5 V.**
Current limit threshold (A)	15 A	30 A	31 A	Configurable by DSE Configuration Suite PC Software.
Recovery from current limit (A)	30 A		31 A	
DSE9474 Full load AC input current (A)			4.2 A	At Vin = 230 V, Vo = 29.5 V, Io = 30 A
DSE9474 Full load AC input current (A)			9 A	At Vin = 110 V, Vo = 29.5 V, Io = 30 A
DSE9484 Full load AC input current (A)			2.1 A	At Vin = 230 V, Vo = 14.75 V, Io = 30 A
DSE9484 Full load AC input current (A)			4.4 A	At Vin = 110 V, Vo = 14.75 V, Io = 30 A
AC Input Inrush (10 ms) current (A)		65 A		For 10 ms

2.3.1 VOLTAGE DROP COMPENSATION

The battery voltage is monitored by means of the Sensing Wires. These wires carry only a small sensing current and as such are not affected by the voltage drop experienced by the high current carrying battery connection wires.
This provides for an accurate reading of the battery voltage and enables the battery charger to increase output voltage to maintain the correct charging voltage “at the battery terminals” (Maximum output 29.5 V).

Example:

Float Voltage configuration of the battery charger = 27.4 V
Charger output = 27.4 V
Battery voltage measured by Sensing Wires = 25 V

The battery charger increases the output voltage until the Sensing Wires measure 27.4 V. The voltage drop in the charging cables is eliminated.

2.3.2 BATTERY TEMPERATURE COMPENSATION

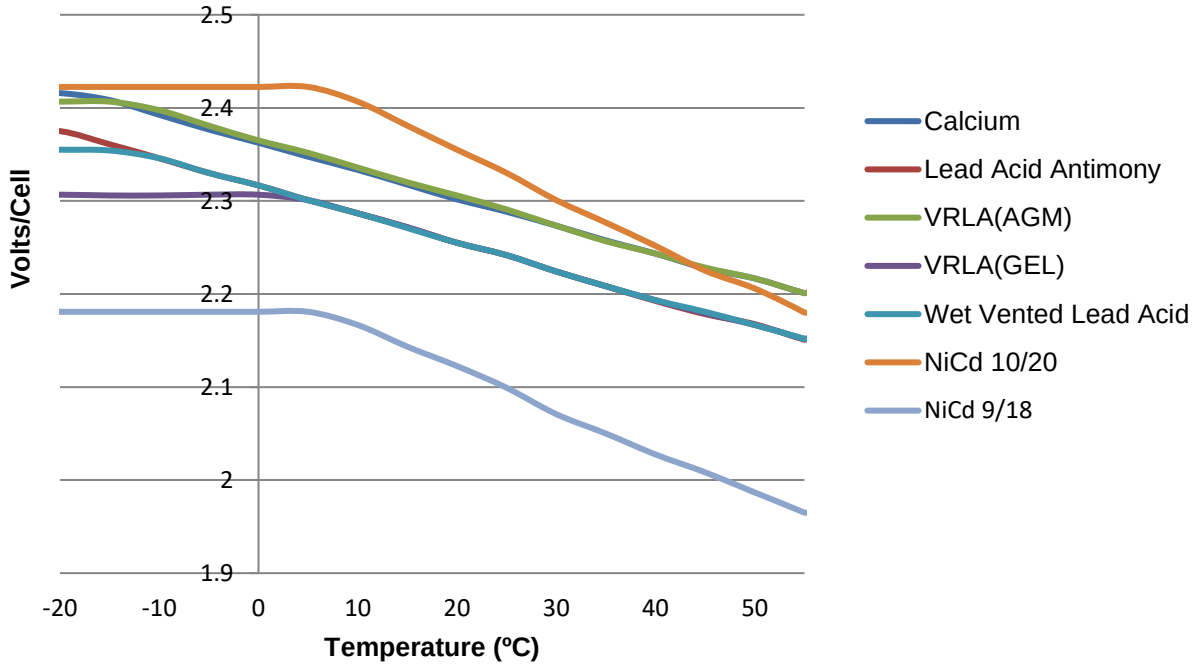
NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Battery Charger Series Configuration Suite PC Software Manual.*

When suitably configured, the external PT1000 temperature sensor is used to monitor battery temperature. As battery temperature increases, the output voltage is lowered as configured to suit the battery requirements.

For example, the following Temperature to Voltage compensation curves are used for the pre-set battery types. For custom battery types, the temperature compensation curve is user configurable.

NOTE: In the below chart, VRLA (Gel), Lead Acid Antimony and Wet Vented are superimposed on each other for most of the curve.
Calcium and VRLA (AGM) are superimposed on each other for most of the curve.

Battery Temperature Float Voltage Compensation



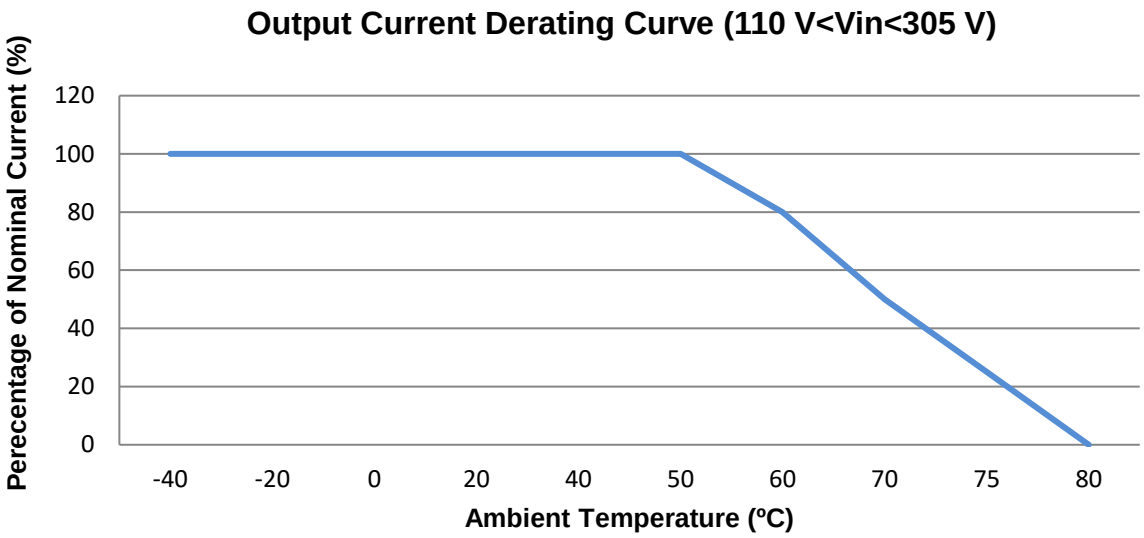
Example:

A Lead Acid battery at 40 ºC is charged at 2.18 V per cell.
The same Lead Acid battery at 0 ºC is charged at 2.30 V per cell.

2.3.3 AMBIENT TEMPERATURE DEPENDENT CURRENT DERATING

The battery charger is rated at full current to 50 ºC. As the temperature increases above 50 ºC, the maximum output current derates to keep the charger within operational parameters and to prevent overheating of the device. An internal temperature sensor is used to determine ambient temperature.

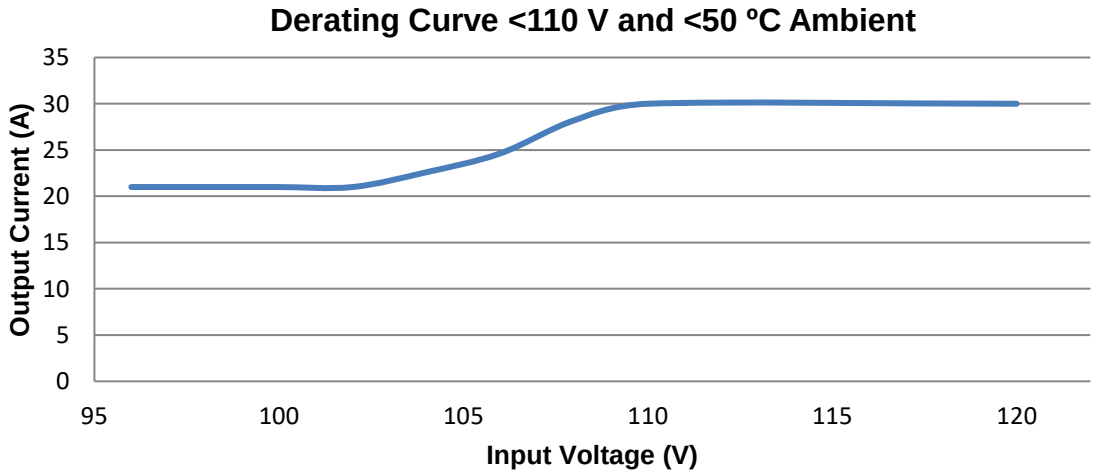
2.3.3.1 TEMPERATURE DERATING (AC VOLTAGE BETWEEN 110 V AND 305 V)



Example:

For AC voltage of between 110 V and 305 V, if the ambient temperature is 73 ºC, the charger is limited to 40% of it's configured current rating.

2.3.3.2 TEMPERATURE DERATING (AC VOLTAGE BELOW 110 V AND AMBIENT TEMP BELOW 50 ºC)



Example:

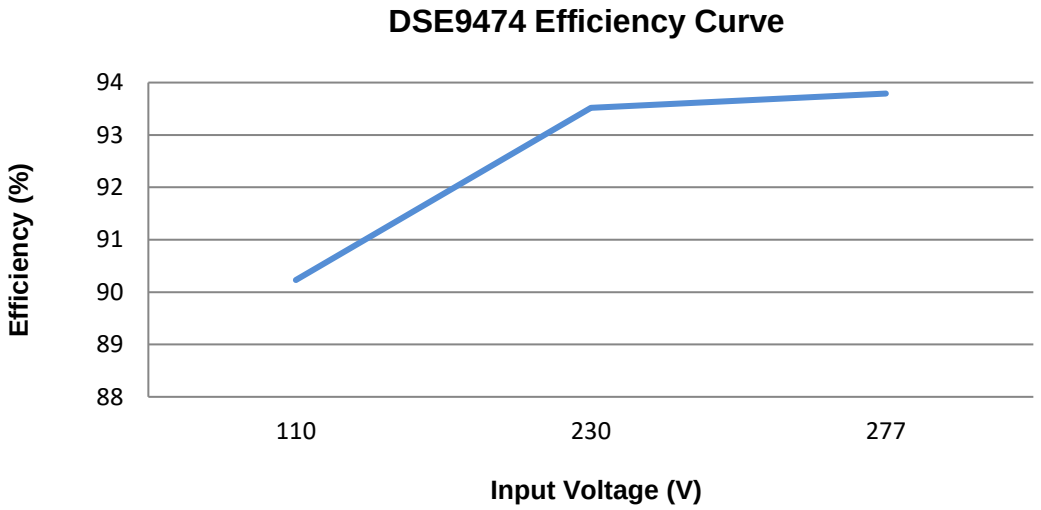
For AC voltage 108 V, if the ambient temperature is below 50 ºC, the charger is limited to 25 A maximum.

2.3.4 INPUT POWER TO OUTPUT POWER EFFICIENCY

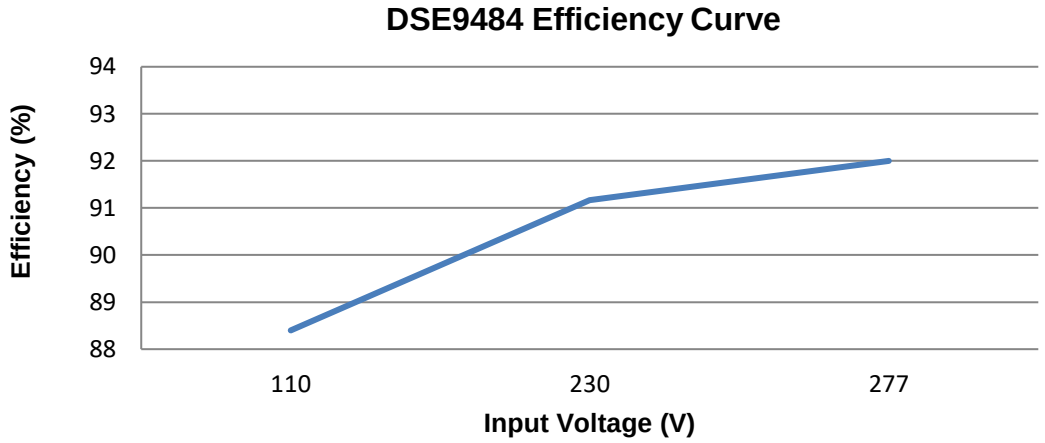
Efficiency of the battery charger is important in terms of minimising power losses in the battery charger and in terms of the heat generated by the battery charger.

The following charts show the high efficiency of the DSE947 & DSE9484

2.3.4.1 INPUT POWER TO OUTPUT POWER EFFICIENCY DSE9474



2.3.4.2 INPUT POWER TO OUTPUT POWER EFFICIENCY DSE9484



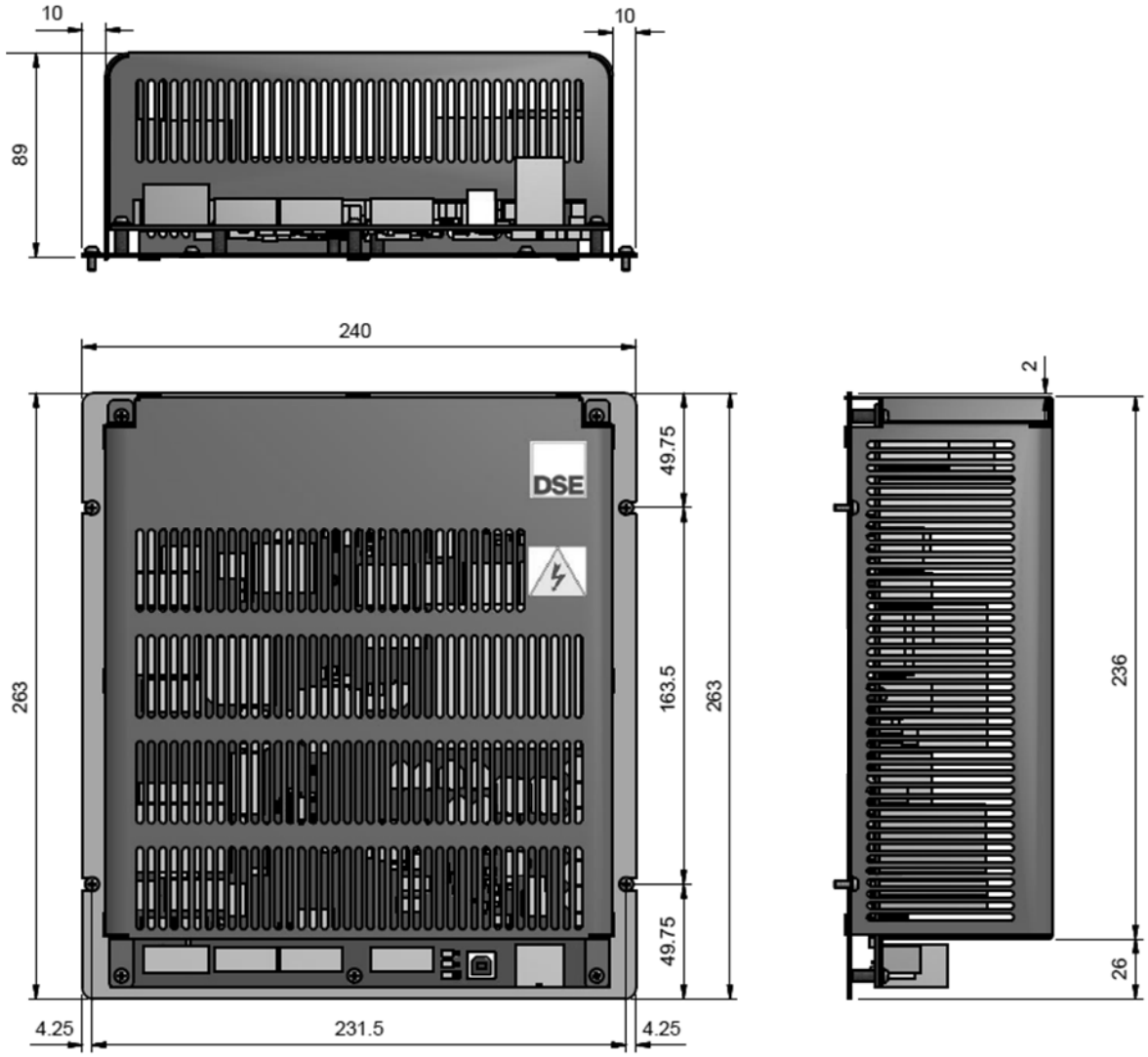
Example:

With an input voltage of 240 V AC, more than 93.5 % of the input power to the battery charger is passed to the battery. resulting in less than 6.5 % of the power being used to supply the battery charger.

2.4 DIMENSIONS AND MOUNTING

NOTE: DSE9474 & DSE9484 are designed to be mounted with the base to a vertical surface with the terminal strips running horizontally.

Parameter	Comment
Weight	2.5 kg
Case Dimensions	240 mm x 269 mm x 89 mm (9.4” x 10.4” x 3.5”)
Mounting Holes Dimensions	Suitable for M5 (3/16” diameter)
Mounting Hole Spacings	231.5 mm x 163.5 mm (9.1” x 6.4”)



All Dimensions shown in mm

2.5 APPLICABLE STANDARDS

Standard	Description
BS EN 60529 (Degrees of protection provided by enclosures)	IP20 Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach. No protection against water
NEMA rating	Enclosure type 1 Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt

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

2.6 COMMUNICATION PORT USAGE

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

Communication	Specification
USB Port	USB 2.0 Device for connection to PC running DSE Configuration Suite Max distance 6 m (20 feet)
RS485 Serial Port	Isolated Data Connection 2 Wire + common Half Duplex Max Baud Rate 19200 External termination required (120 Ω) Max common mode offset 70 V (on board protection transorb) Max distance 1.2 km (¾ mile)
CAN	J1939 at fixed baud rate of 250 kHz. CAN source address is user configurable.

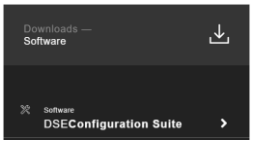
2.6.1 USB CONNECTION

The USB port is provided to give a simple means of connection between a PC and the battery charger. Using the DSE Configuration Suite Software, the operator is able to configure and monitor the state of the battery charger.

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

- DSE9474 24 V 30 A Battery Charger
- DSE9484 12 V 30 A Battery Charger

- DSE Configuration Suite Software
  (Available from www.deepseaplc.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: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Battery Charger Series Configuration Suite PC Software Manual.*

2.6.2 RS485

NOTE: The DSE9484 does not support the DSEnet connection. Currently the DSEnet is only available on the DSE9474 battery charger. Please contact Support@deepseaplc.com for any updates.

The RS485 port on the DSE Intelligent Battery Chargers has three uses.

1) Supporting the DSE2541 remote battery charger display module
2) Support the Modbus RTU protocol for connection to a Modbus RTU Master device.
3) Supporting the DSENet® connection.

2.6.2.1 DSE2541 REMOTE BATTERY CHARGER DISPLAY

DSE2541 remote battery charger display module connects to the DSE9474 or DSE9484 battery charger RS485 terminals.
This provides battery charger operating status, alarm indication, instrumentation and control over the battery charger.

For further information contact sales@deepseaplc.com.

2.6.2.2 MODBUS RTU

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).

Using the DSE Configuration Suite PC Software, Configurable Gencomm is used to map instrumentation to Modbus registers.

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 battery charger and a PC running the DSE Configuration Suite software. The operator is then able to view the various operating parameters.

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

2.6.2.3 DSENET

The DSE9474 Intelligent Battery Charger's RS485 port can be configured as DSENet® using the DSE Configuration Suite PC Software to allow the DSE Intelligent Battery Charger's information (Instruments and Status) to be viewed on the Genset controller's display.

At the time of writing this manual, only the DSE9474 supports the DSENet® communication on its RS485 port.

NOTE: You should contact DSE Technical Support for any updates or additional information at Support@deepseaplc.com.

2.6.2.4 OPTIONS FOR CONNECTION TO PCS

- 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

2.6.3 CAN

The CAN port provides for monitoring of the following parameters.

2.6.3.1 J1939-71 VEHICLE APPLICATION LAYER

Message	SPN Suspect Parameter Number	PGN Parameter Group Number	Scaling	Offset	Timing
Battery Charger 1 State	4990	64789	1	0	1 s
Battery Charger 1 Power Line State	4991	64789	1	0	1 s
Battery Charger 1 Output Voltage	4992	64789	20	0	1 s
Battery Charger 1 Output Current	4993	64789	20	-1600	1 s
Battery Potential	168	65271	20	0	1 s
Battery 1 Temperature	1800	65104	1	-40	1 s

2.6.3.2 J1939-75 VEHICLE APPLICATION LAYER – GENERATOR SETS & INDUSTRIAL

Message	SPN Suspect Parameter Number	PGN Parameter Group Number	Scaling	Offset	Timing
Utility Phase A Line-Neutral AC RMS Voltage (AC Supply Voltage)	2479	65014	1	0	100 ms
Utility Phase A Line-Neutral AC RMS Frequency (AC Frequency)	2471	65014	128	0	100 ms

3 INSTALLATION

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

The DSE9474 & DSE9484 Battery Chargers are designed to be mounted within a control panel utilising the mounting holes. For dimension and mounting details, see the section entitled *Specification, Dimensions & Mounting* elsewhere in this document.

The battery charger is *fit-and-forget.* It can be permanently connected to the supply and the load, with no requirement to disable the charger during times of heavy load (such as engine cranking) or when the generator is running (even when a DC charging alternator is fitted).

3.1 BATTERY SUITABILITY

The *standard* DSE9474 & DSE9484 chargers are factory set by DSE to suit Lead Acid batteries but can be altered for other battery types using the DSE Configuration Suite PC software Care should be taken to ensure the batteries connected are of the correct ‘technology’ to suit the setting of the charger.

3.2 USER CONNECTIONS

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

3.2.1 AC SUPPLY CONNECTIONS

The battery charger is protected by an internal fuse. However to protect the A.C. supply cables should a fault arise between the supply and the connection to the battery charger, it is recommended to fit a fuse in the supply line as close to the source of supply as possible.
As the fuse is for cable protection only, the same fuse may be used regardless of the supply voltage.

AC Input Voltage	Recommended Fuse Size
110 V AC	20 A anti-surge
230 V AC	20 A anti-surge

Terminal	Function	Recommended Size	Comments
L	AC Live	4 mm² (AWG 12)	
N	AC Neutral	4 mm² (AWG 12)	
⏚ E	Earth	4 mm² (AWG 12)	

3.2.2 INPUT, OUTPUT, AND RS485 CONNECTIONS

Terminal	Function	Recommended Size	Comments
REMOTE SENSE -	Remote Sensing Wire negative terminal.	1 mm² (AWG 16)	Low current Sensing Wires used to measure the voltage at the battery terminals.
REMOTE SENSE +	Remote Sensing Wire positive terminal.	1 mm² (AWG 16)	
LK1	Configurable Input	1 mm² (AWG 16)	Connect the terminals together to activate the input. The Factory Setting for the digital input provides the Lamp Test function.
LK1	Configurable Input	1 mm² (AWG 16)	Customer configurable using DSE Configuration Suite PC Software.
NC	Normally Closed Contact of the Charge failure relay	0.5 mm² (AWG 22)	Changes State Under Charge Fail Conditions
COM	Charge failure relay Contact Common	0.5 mm² (AWG 22)	
NO	Normally Open Contact of the Charge failure relay	0.5 mm² (AWG 22)	
RS485 A	RS485 A (-) terminal.	0.5 mm² (AWG 22)	Recommended Belden 9841 cable. Ensure correctly fitted 120 Ω termination resistors at the first and last devices on the RS485 link.
RS485 B	RS485 B (+) terminal.	0.5 mm² (AWG 22)	
RS485 SCR	RS485 screen terminal.	0.5 mm² (AWG 22)	

3.2.3 CANBUS AND TEMP SENSOR CONNECTIONS

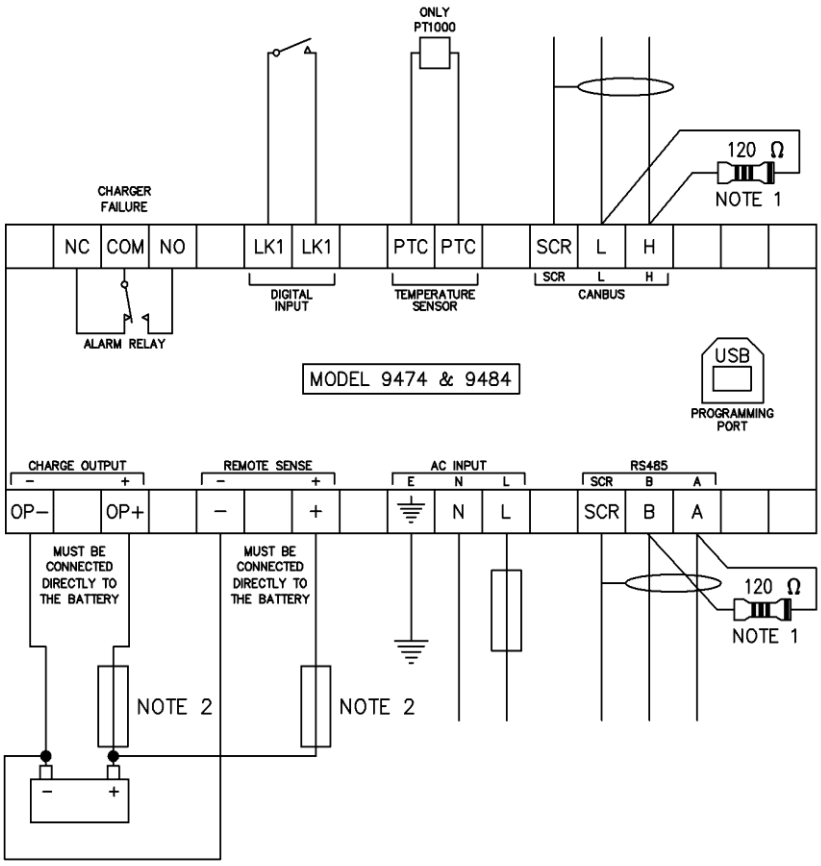
Terminal	Function	Recommended Size	Comments
CANBUS SCR	CAN Screen Terminal.	0.5 mm² (AWG 22)	Recommended Belden 9841 cable. Ensure correctly fitted 120 Ω termination resistors at the first and last devices on the CAN link.
CANBUS L	CAN L Terminal.	0.5 mm² (AWG 22)	
CANBUS H	CAN H Terminal.	0.5 mm² (AWG 22)	
PT1000 TEMP SENSOR	PT1000 Sensor	As fitted to the PT1000 Sensor	Battery Temperature Sensing. Used for Battery Temperature Compensation.
PT1000 TEMP SENSOR	PT1000 Sensor		

3.2.4 BATTERY CONNECTIONS

NOTE: Use correct size cables for the battery connection to ensure minimum voltage drop.

Terminal	Function	Recommended Size	Comments
-OP	Load Negative	10 mm² (AWG 6)	Battery negative terminal. This terminal is not internally connected to Earth.
+OP	Load Positive	10 mm² (AWG 6)	Battery positive terminal

3.3 TYPICAL WIRING DIAGRAM



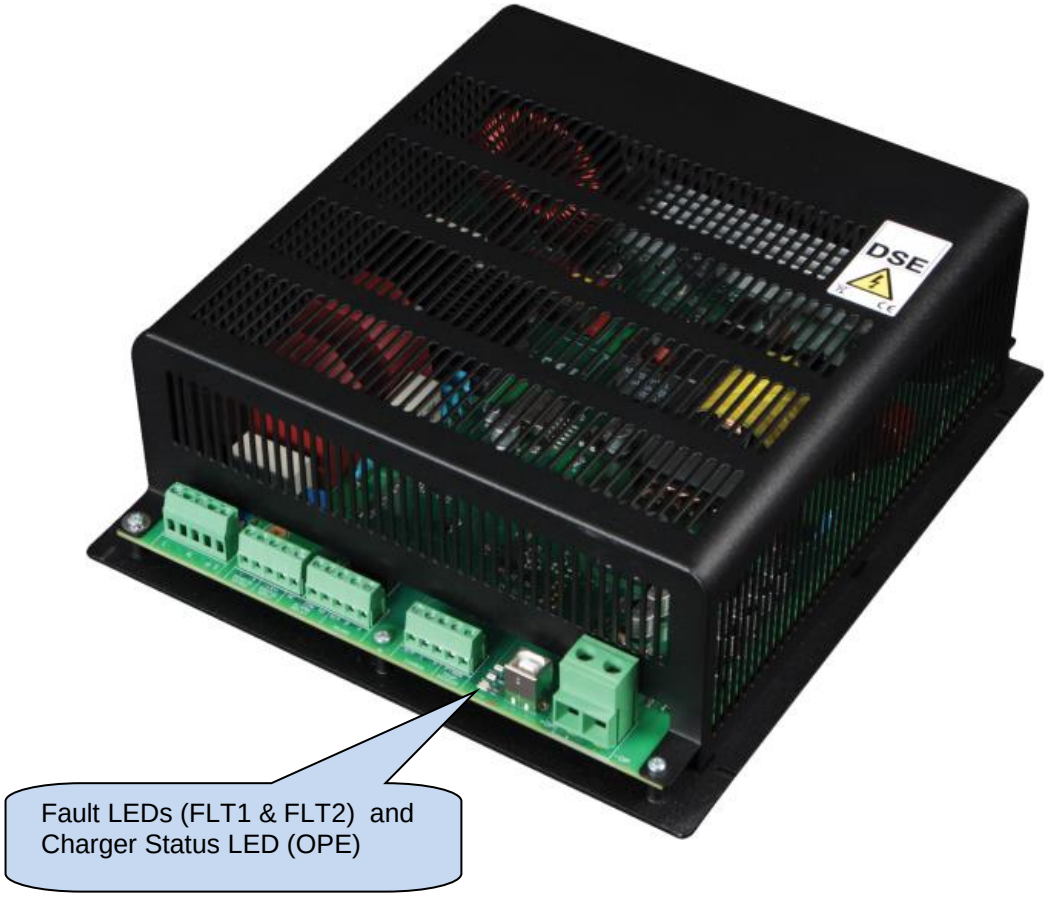
NOTE 1
A 120 OHM TERMINATION RESISTOR MUST BE FITTED IF IT IS THE FIRST OR LAST DEVICE ON THE CANBUS OR RS485 LINK

NOTE 2
FUSE APPROPRIATELY AND AS CLOSE TO THE BATTERY AS POSSIBLE TO PROTECT THE CABLES AND BATTERY

4 INDICATIONS

DANGER OF DEATH: LIVE PARTS exist within the DSE9474 & DSE9484 enclosures. The enclosure cover must not be removed when connected to an AC supply.

Three LEDs are provided to show operating status and fault conditions. These are detailed in the following sections.



4.1 STATUS

Condition	LED Designation		
	OPE	FAULT 1	FAULT 2
Charger Off	Off	Off	Off
Battery not Detected (Battery Detection Mode) Cable Voltage Drop Alarm	Green Constant	Red Flashing	Red Flashing
Battery Connected (Battery Detection Mode)	Green Constant	Red Constant	Red Constant
Bulk (Boost) Charge in progress	Yellow Constant	See Below for Fault Conditions	
Absorption Charge in progress	Yellow Flashing		
Float Charge in Progress	Green Constant		
Storage Charge in Progress	Green Flashing		

4.2 FAULT CONDITIONS

Condition	LED Designation	
	FAULT 1	FAULT 2
DC Over Volts Warning and Trip DC Under Volts Warning Battery Detection Warning DC Over Current Battery Reverse Polarity Short Circuit Protection Battery Detection Warning	Red Constant	Off
Input Fuse Failure AC Under Voltage Warning and Trip AC Over Volts Warning and Trip DC Over Current Warning	Red Flashing	Off
Battery Over Temperature Warning and Trip Battery Temperature Sensor (PT1000) Fail Ambient Over Temperature	Off	Red Constant
Battery Charger Failure	Red Constant	Red Flashing
Battery Detection Mode - Battery not detected Cable Voltage Drop Alarm	Red Flashing	Red Flashing

5 OPERATION

The DSE9474 & DSE9484 are battery chargers, DC power supplies, or both at the same time. For example, one application is to power local control panels and charge panel batteries or generator engine starter batteries at the same time.

With no AC input to the charger, the *Fault* relay is in its inactive state. This volts-free change over relay can be used to provide indication of alarms as detailed in the Protection section below.
When a suitable AC supply is connected, operation of the unit will depend upon the load connected to the unit's output terminals:

5.1 PROTECTION

"Alarms fall into two categories:

- Shutdown Alarms, non-adjustable alarms.
- User Configurable Alarms, adjustable by DSE Configuration Suite PC Software.

NOTE: The Fail Relay is de-energised when a *Shutdown Alarm* or *User Configurable alarm* is active on the charger.
The Fail Relay is energised when the charger is powered and there is no active alarm.

5.1.1 SHUTDOWN ALARMS

NOTE: The Shutdown alarm are factory set and cannot be changed.

NOTE: When the AC supply source falls outside the hardware voltage limits, the DSE charger is instantly switched off for safety reasons, and the alarm is activated (Fault Relay De-energises).

Under the following conditions, the Fault Relay de-energises to the normally closed state and charging is stopped (DC output is disabled) :

- AC Power removed
- Mains voltage V_{in} > 310 V (rms)
- Mains voltage V_{in} < 85 V (rms)
- Battery temperature > 60 ºC (if temperature compensation is enabled)
- Battery Charger ambient temperature> 80 ºC
- DC output voltage > 110% of Boost Voltage
- Short circuit / reverse polarity of the DC output.

5.1.2 USER CONFIGURABLE ALARMS

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

NOTE: When a *Shutdown Alarm* is active at the same time as a *User Configurable Alarm,* the *Shutdown Alarm* takes priority and switches the charger off.

The following alarms are user configurable using DSE Configuration Suite PC Software. In each case, the Fault relay de-energises.

- DC Overcurrent alarm.
- DC Overvoltage alarm.
- DC Undervoltage alarm.
- Battery Temperature alarm. Activation of this alarm places the charger into Float mode.
- Mains Over Voltage alarm. Activation of this alarm places the charger into Float mode.
- Mains Under Voltage alarm. Activation of this alarm places the charger into Float mode.
- Battery Detection Alarm.
- Cable Voltage Drop Alarm.
- Battery Charger Failure Alarm.

5.2 DIGITAL INPUT

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

The DSE9474 & DSE9484 are fitted with a configurable digital input. Configuration is made using the DSE Configuration Suite PC Software.

The Factory Setting for the digital input provides a *Lamp Test* function.

5.3 PSU MODE

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

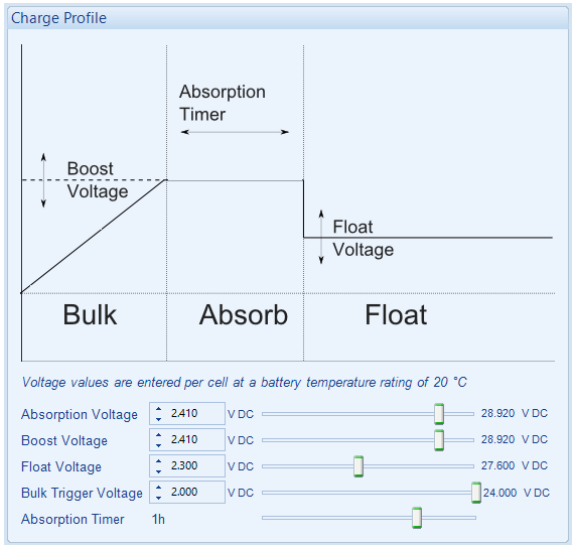
If no battery is connected to the output terminals, the battery charger will operate as a DC power supply only, current limit is factory set to 30 A and is adjustable using the DSE Configuration Suite PC Software. See the section entitled *Specification* elsewhere in this manual for further output specifications.

5.4 CHARGE MODE

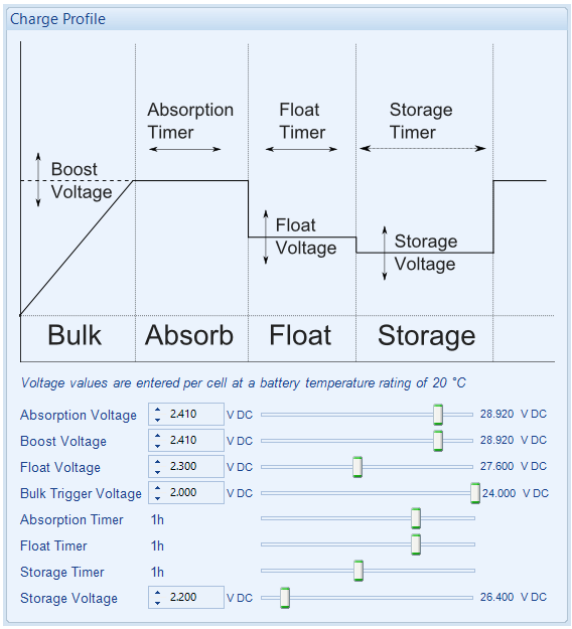
NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

NOTE: Should a 2-Stage charging profile be required, select a 3-Stage profile and configure *Boost Voltage* and *Float Voltage* to the same value.

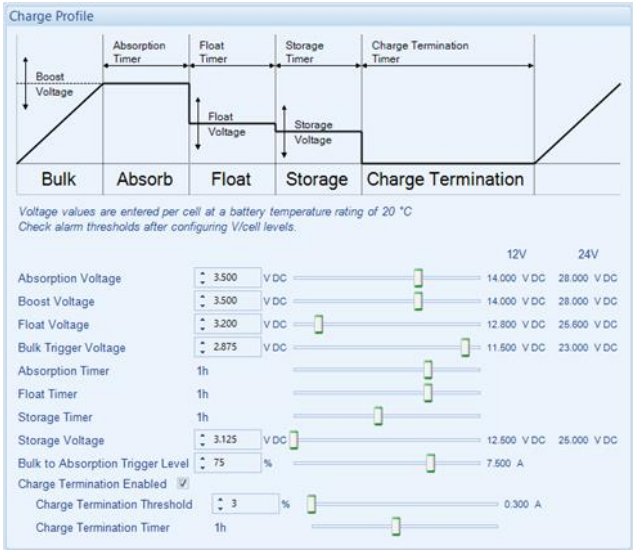
Using DSE Configuration Suite PC Software, the battery charger is configured to use a 3-Stage Charge, or 4-Stage Charge, or 5-Stage Charge profile as shown below. The description of each charge mode is given in the following sections.



3-Stage Charge Profile Configuration



4-Stage Charge Profile Configuration



5-Stage Charge Profile Configuration

5.4.1 BULK CHARGE

The battery charger operates in *Constant voltage current limited* mode.
The charger output voltage is maintained at a constant level (*boost voltage)* to allow the battery to charge while the load does not exceed the maximum rating of the charger.
If the load on the battery charger (*battery charge demand + standing load*) exceeds the maximum current rating of the charger, the charging current is limited to the maximum rating of the charger and the voltage is reduced.
The voltage will rise to the rated voltage again once the load drops below the maximum rating of the charger. This may occur naturally as the battery charges.
As the battery charges and the charge current drops below 75% of the current rating, *Absorption* mode is entered.

5.4.2 ABSORPTION

NOTE: When the DSE9474 is configured to *Lithium Phosphate* Battery Type, the DSE9474 does a Weekly Battery Refresh by entering into a repeated Absorption mode for one hour every week, to refresh or fully charge the *Lithium Phosphate* battery.

This mode is active for the duration of the *Absorption Timer*. This is adjustable using the DSE Configuration Suite PC Software.
Absorption mode is used to complete the charging process, bringing the battery to 100% charged status.
After the *Absorption timer*, *float charge* mode is entered.

5.4.3 FLOAT CHARGE

The battery charger DC voltage is lowered to the configured f*loat voltage*.
Float Charge is used to provide a small amount of current to the battery, to overcome internal losses and keep the battery at it's 100% charged state. The battery can be left in this mode indefinitely.

5.4.4 STORAGE

When configured to use a four stage charging profile, a time limited storage charge is periodically entered (*storage timer*) to maintain the battery charge at optimum levels. This occurs at the level of the *storage voltage*. This is adjustable using the DSE Configuration Suite PC Software.
When the *storage timer* expires, the charger re-enters the *Absorption* mode.

Additionally, this is used as an 'Automatic Boost' facility, to periodically attempt to remove sulfation from the battery plates.

5.4.5 CHARGE TERMINATION

NOTE: *Charge Termination* stage is available on the DSE9474. Currently the DSE9484 does not support this profile.

When *Charge Termination* is enabled, the charger terminates the charging when the output current level decreases below the *Charge Termination Threshold* % level, and the charger remains off for the *Charge Termination Timer* time before exiting this stage. The *Charge Termination Threshold* and the *Charge Termination Timer* are configured using the DSE Configuration Suite PC Software.
The charger transfers back to the Bulk Stage when the *Charge Termination Timer* expires, or the output voltage drops below the *Bulk Trigger Voltage* level.

5.4.6 CHARGING TIME

Charge time is often of little consequence when the battery is used in a *standby* operation. An example of this is when the battery is used to supply the starting system of a diesel generator. During normal operation, the battery is at full capacity and the battery charger is used to maintain the float voltage of the battery. The battery is only drained when the generator is called to start. As the generator has a DC charging alternator fitted, the battery is quickly recharged when the generator is running. Should the generator stop before the battery is fully recharged, the DSE9474 & DSE9484 Battery Chargers will continue to recharge the battery until it is fully charged.

Typically, a battery will charge from flat to 80% capacity in 16 hrs when charged at C/10.
For example, charging a 50 Ah battery for 16 hrs at 5 A will charge the battery to 80% of its full capacity.
Remember to consider any other standing load such as control panel requirements when calculating how much power is 'left' to charge the battery.

5.4.7 MANUAL BOOST

NOTE: The Digital Input must be configured to *Manual* Boost to provide this function. For further details, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

Manual boost will place the charger into *Bulk* Charge mode, charging at the level of the *boost voltage*. A typical use of manual boost is with Lead Acid type batteries. When the battery is fully charged, placing the charger into boost mode will raise the output voltage. This has the effect of *gassing* the battery, helping to remove sulfation from the battery plates and helping the cells to *equalise* in voltage.

5.4.8 TEMPERATURE COMPENSATION

NOTE: For further details of PC Configuration, refer to DSE Publication: *057-159 DSE9400 Configuration Suite PC Software Manual.*

If temperature compensation is enabled through configuration, and remote temperature sensor is connected, the output voltage automatically varies by a configurable voltage per cell for each 1 °C deviation from 20 °C, within the range of -20 °C to 60 °C. Increasing temperature gives decreasing output voltage and decreasing temperature gives increasing output voltage.
The battery temperature is measured by a 2 wire PT1000 sensor placed on the battery itself.

6 FAULT DIAGNOSIS

Nature of Problem	Suggestion
The charger is not operating.	Check that the incoming AC supply is correctly connected and within limits and check the integrity of any external fuse that may be fitted. Disable the AC supply and check the integrity of the internal AC supply fuse. Replace where necessary. For details, see the section entitled *Maintenance, Spares, Repair, and Servicing* elsewhere in this manual. Ensure the charger is not being operated above the maximum temperature specification. Check the LED indications against the LED descriptions listed elsewhere in this document.
Charge fail relay continuously operated.	Check the connected load of the charger is not reverse connected or short circuit. Check the LED indications against the LED descriptions listed elsewhere in this document.
Batteries fail to charge.	Check the batteries using the battery manufacturers recommendations.
Charge time is too long.	Typically, a battery will charge from flat to 80% capacity in 16 hrs when charged at C/10. For example, charging a 50 Ah battery for 16 hrs at 5 A will charge the battery to 80% of its full capacity. Remember to take into account any other standing load such as control panel requirements when calculating how much power is 'left' to charge the battery. Check the batteries using the battery manufacturers recommendations.
Internal AC fuse repeatedly fails.	Return the device to Deep Sea Electronics for investigation. Contact the repairs department at warranty@deepseaplc.com

7 MAINTENANCE, SPARES, REPAIR, AND SERVICING

DANGER OF DEATH: LIVE PARTS exist within the DSE9474 & DSE9484 enclosures. The enclosure cover must not be removed when connected to an AC supply.

The DSE battery chargers are designed to be *Fit and Forget*. As such, there is only one user serviceable part, listed below. In the case of malfunction, contact your original equipment supplier (OEM).

Description	DSE Part Number
Internal AC Fuse 15A	011-106

8 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).

9 DISPOSAL

9.1 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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