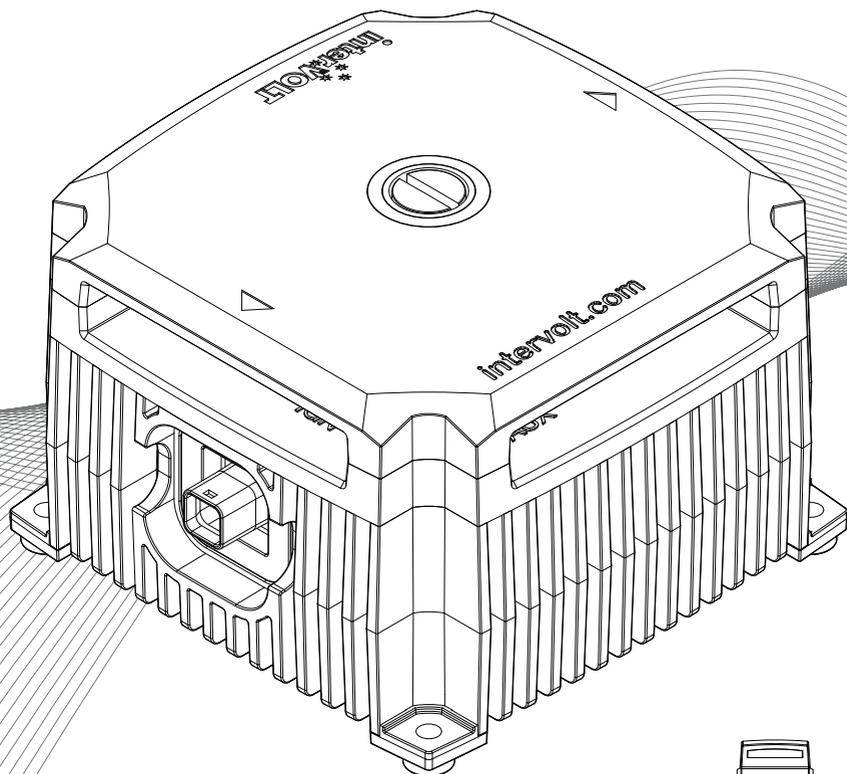
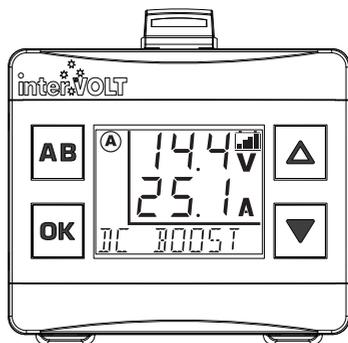


interVOLT



DCC Pro

**In-Vehicle DC-DC
Battery Charger
12VDC 25 AMPS
(VERSION R2.0)**



INSTALLATION & OPERATION MANUAL

Thank you for choosing an interVOLT product...

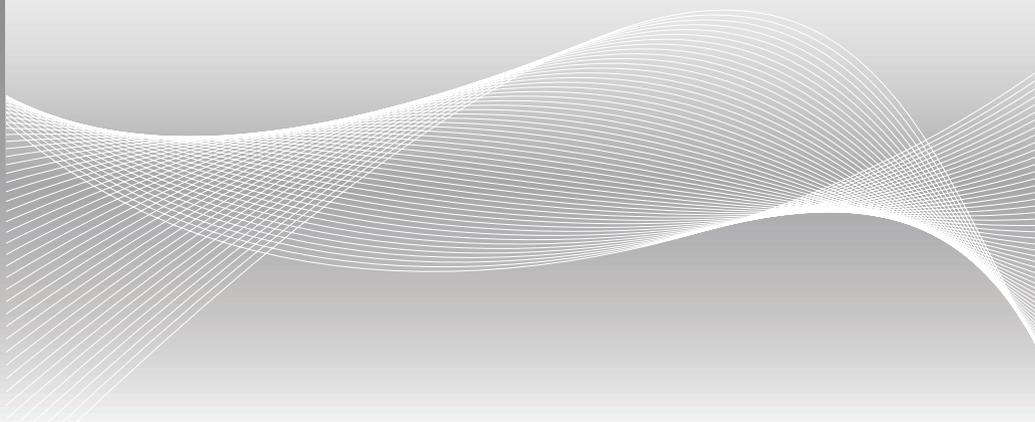
Intervolt Pty Ltd is a wholly Australian owned and operated private company and the proud owner of the **interVOLT** brand, a trademark which is registered in over 20 countries worldwide.

We have been producing specialised power conversion products for over 15 years. All our products are designed, developed and assembled in-house at our premises in Perth, Western Australia from both local and imported components.

Our design ethos is based on quality, performance and value, and we are committed to product development in the DC power, control and conversion field. With roots in the commercial marine, transport, alternate energy and allied industries, we have expanded into the consumer market with dedicated products such as the DCC Pro.

InterVOLT products are designed to cope with the demands of the harshest applications in high temperature and high humidity environments. They are constructed of quality materials and designed to provide many years of continuous service.

Again, thank you for choosing an **interVOLT** product and supporting Australian innovation, technology, intellectual property and of course, jobs.



OVERVIEW	2
Introduction	2
Outline	3
Application	4
Kit Contents	5
FUNDAMENTALS	6
Charging Methods	6
Control Modes	7
Layout - the Charging Device	8
Layout - the Remote Display	9
Standard Wiring Diagram	10
Wiring using two Charging Devices	11
INSTALLATION	12
Planning the Installation	12
Installation Essentials	13
Installing the Charging Device	14
Installing the Data Cable	15
Installing the Remote Display	16
Wiring the Charging Device	17
Connection and Configuration	18
Installation Steps	19
OPERATION	25
Operating Brief	25
Operator Control and Monitoring	27
Operator Convenience Settings	30
System Status	32
TROUBLESHOOTING	33
Alert Conditions	33
Error Conditions	34
Frequently Asked Questions	35
SPECIFICATIONS	36
DIMENSIONS	37
APPENDIX	38
Fundamentals in Detail	38
WARRANTY POLICY	41

Introduction

Following its release in 2015 the DCC Pro has enjoyed outstanding success in the overland vehicle market both in Australia and overseas. We are now pleased to introduce version 2.0 which features a number of functionality and performance upgrades offering even greater 'value for money' than the original.

Just some of the great features on the new DCC Pro 2.0:

- **Designed to charge** an auxiliary battery using the main battery and/or solar power as input sources, quickly and efficiently.
- **Proven three stage** charging methodology in both 'battery to battery' and 'solar to battery' charging processes, including MPPT.
- **Solar charging** is now current limited to 25 Amps so input is no longer restricted to the number of panels connected (total Wattage).
- **Double stacked** printed circuit boards provide a compact footprint allowing for easy location and fixing in an engine bay.
- **All external components** are designed to operate under high ambient/humid conditions and are rated to IP67 for dust and moisture protection.
- **Capable of charging** a wide range of battery chemistry types including a specific curve for LiFePO4 Lithium batteries (with inbuilt battery management system).
- **The flexibility to adapt** to almost any application in any vehicle, old or new, simple or complex with or without an ECU controlled electrical system.
- **A truly universal** 'Plug and Play' system which allows multiple set-up and configuration options for simplified installation and operation.
- **Provides the operator** with the ability to monitor the charging status of the auxiliary battery from the comfort of the cabin.
- **A true stand-alone** charging system which can be implemented without interference or modification to the host vehicle's factory wiring.

Outline

In a standard dual or multiple battery arrangement, the system will consist of a starting (or main) battery and secondary (or auxiliary) batteries. For clarity and conciseness we will refer to these throughout the manual as the main and auxiliary batteries.

Our vision for the DCC Pro was a device which would not only provide an autonomous charging method for any auxiliary battery, but would reliably, accurately and repeatedly provide feedback to the operator on the status of the charging and maintenance process. In order to provide this information we integrated a visual display. The addition of a remote display also provides a level of operator input, allowing some control of the device, such as selection of battery types for example. The development of a true remote user interface enabled the concept to evolve into the product you have purchased today.

The DCC Pro consists of three main components. Together, these form a stand-alone charging system and are all that is necessary, aside from the external wiring, to implement a fully operational charging and maintenance system for **one** auxiliary battery or bank (batteries in parallel). These components are:

- 1. The Charging Device.** This is the power conversion component of the system. It is a high power, yet compact package which is designed to be installed in the engine bay of the vehicle.
- 2. The Remote Display.** This is the separate control and monitoring device which is designed to be installed in the vehicle cabin in easy view and reach of the operator. It has a backlit LCD display and four control buttons.
- 3. The Data Cable.** This is the interconnect harness that enables the Charging Device and Remote Display to communicate with each other.

This manual contains comprehensive information on the installation, set-up and use of the DCC Pro and is applicable to this model only (version R2-0). Whilst every care has been taken in the preparation of this manual, Intervolt Pty Ltd offers no guarantee, express or implied, and accepts no liability for any inaccuracies, errors or omissions in its content. Specifications are subject to change without notice.

Application

The DCC Pro has been designed specifically for use in 4WDs, RVs, buses, coaches, caravans, campers or any vehicle with a 12VDC electrical system where there is a requirement to charge one or more secondary (auxiliary) batteries using the starting (main) battery as the primary source. **It is not designed or warranted for use in marine applications.**

The DCC pro utilises the three step or 'stage' charging principle for maintaining an auxiliary battery by using the main battery as the primary source and solar power as the supplementary source. The three stages combined represent a full charging cycle. Although there are many variants of this concept, the basic three stages, when implemented correctly, are all that is required to ensure proper charging of any auxiliary battery. The stages are categorised as boost, absorption and float, details of which are explained in the appendix of this manual. In boost stage the charger is operating in constant current (CC) mode and in absorption and float stages it is in constant Voltage (CV) mode.

The DCC Pro is pre-programmed with charging regimes for the following battery types which can be selected in the configuration (set-up) process:

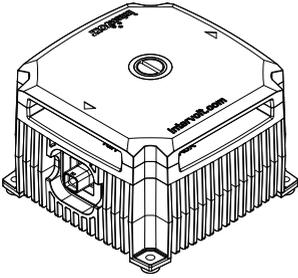
- **Standard Lead Acid – sealed and flooded cell versions**
- **Absorbed Glass Mat – aka AGM**
- **Gelified Electrolyte – aka GEL**
- **Lead Calcium**
- **LiFePO4 – with Battery Management System (BMS) only (not suitable for other Lithium battery types).**

The information on the following pages of this manual detail the functions of the DCC Pro and the settings which are best suited for your application and installation. If you are performing the installation it is important to read this manual in its entirety. If you are the operator it is only necessary to read the 'Operation' section. The appendix section contains specific information on the fundamentals of the DCC Pro and is optional but recommended reading.

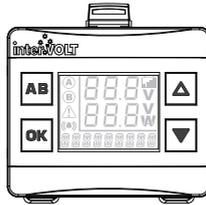
NOTE: It is not essential to use the Remote Display included. The DCC Pro's Charging Device is autonomous and will operate with or without the Remote Display connected. It is necessary to use the Remote Display for programming purposes, however it is not necessary to permanently install the display if it is not desired.

Kit Contents

You have purchased the DCC Pro retail package code number DCC1225ACK-RP. The package contains the components depicted below:



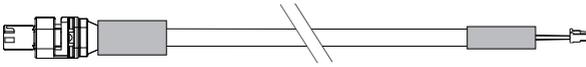
DCC Pro Charging Device
Code: **DCC1225ACD**



DCC Pro Remote Display
Code: **DCC0001ARD**



DCC Pro Printed Manual
Code: **DCCAUTG1 R2-0**



DCC Pro 4mtr Data Cable
Code: **DCC4000CTR**

All components are available to purchase separately. Data Cables are available in a range of optional lengths. In the event you wish to add in a second charger for example, it would not be necessary to purchase another display but simply order another Charging Device and Data Cable of the appropriate length.

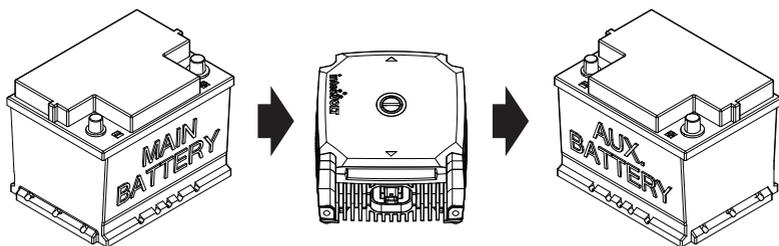
The code numbers for the components are detailed below:

- **DCC1225ACD:** Automotive Charging Device 12 Volts DC 25 Amps
- **DCC0001ARD:** Automotive Remote Display complete with bracket
- **DCC3000CTR:** Data Cable 3 metres Charging Device to Remote Display
- **DCC4000CTR:** Data Cable 4 metres Charging Device to Remote Display
- **DCC6000CTR:** Data Cable 6 metres Charging Device to Remote Display
- **DCC9000CTR:** Data Cable 9 metres Charging Device to Remote Display

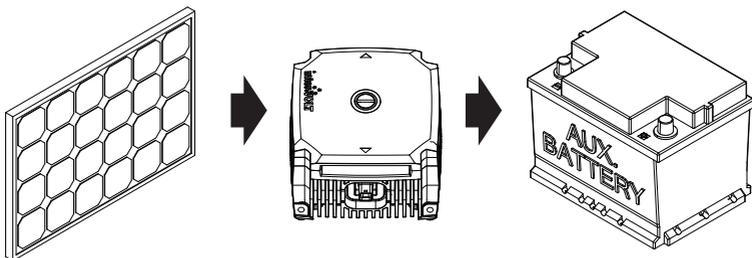
Charging Methods

There are two methods the DCC Pro utilises for charging an auxiliary battery. Although employing the same three stage process for both battery and solar input sources, the methodology is different. Both methods can be utilised at the same time thus providing a complete charging solution for your vehicle's auxiliary battery system.

Charging the auxiliary battery from the main: The battery to battery charging method employs power conversion to step up the source Voltage to a higher level before being regulated at a Voltage determined by the battery type (chemistry) selected. In topology terms, this is defined as a boost/buck conversion process where the input Voltage is stepped up in the boost process and stepped down (regulated) in the buck process. The main battery is the priority charging source if and when available. This is because, by comparison, the vehicle's alternator can generally deliver much higher current when the engine is running than most solar power installations.



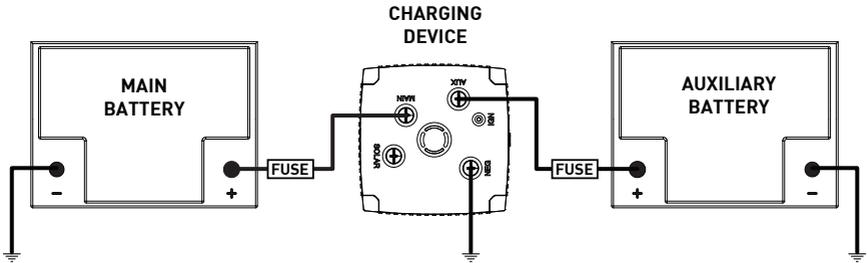
Charging the auxiliary battery from solar power: The solar to battery charging method uses the higher available Voltage (18–28 OCV) to extract the maximum power from a solar source by employing Maximum Power Point Tracking algorithms (MPPT). The MPPT function provides a benefit of up to 30% greater efficiency in performance over a standard (PWM) type regulator. It should be noted at this point that the solar panel is directly connected and should be unregulated. Use of a regulator will not allow the MPPT charging control to operate correctly and as a result will be detrimental to the charging and maintenance of your auxiliary battery.



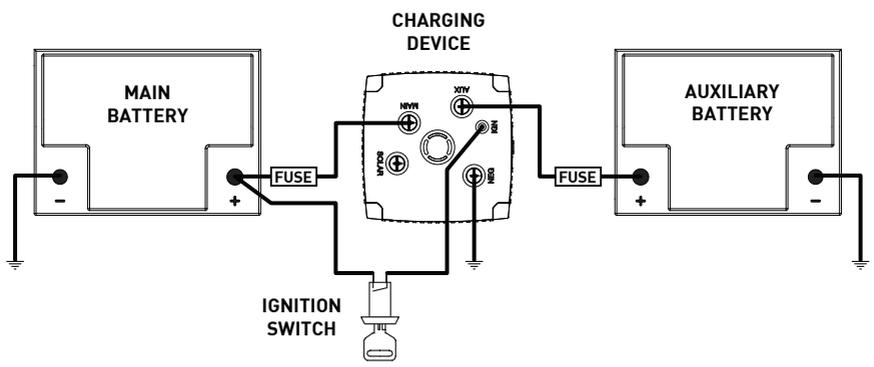
Control Modes

There are two optional modes which control how the charging system operates. These modes are selectable in the initial set-up process when installing the device and control the charging process in different ways. The control modes can always be changed if necessary but the initial set-up and installation steps need to be repeated in order to do so. The control modes are defined and explained as follows:

Voltage Control Mode: Voltage mode is the default (factory) mode and allows the charging process to operate automatically, independent of the host vehicle. This mode is recommended for installations where it is not viable or necessary to use the host vehicle's ignition switch to enable/disable the Charging Device. Voltage mode would primarily be used where the Charging Device is located in a caravan or camper trailer for example, and thus a long way from a switched ignition source.

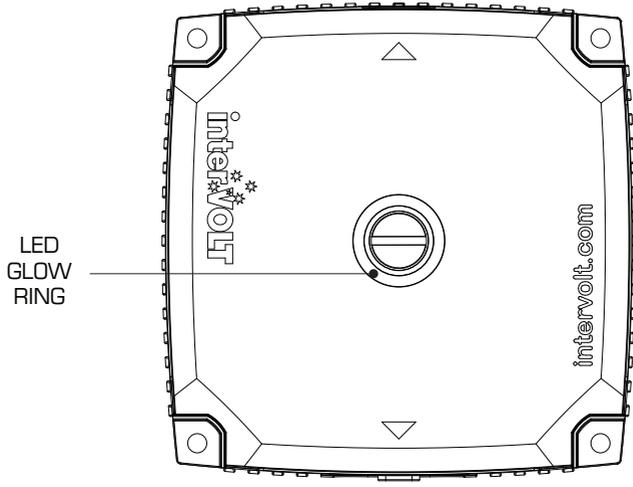


Ignition Control Mode: Ignition mode is selectable at the set-up stage of the installation process and is the alternative to Voltage mode. This mode is recommended for installations where the auxiliary battery is mounted in the host vehicle, in the engine bay or under the tray for example. In Ignition mode a control wire is permanently connected to the Charging Device from the vehicle's electrical system to allow dependent control via the host vehicle's ignition switch. In this mode the Charging Device can be enabled or disabled when the ignition switch is turned on or off respectively.

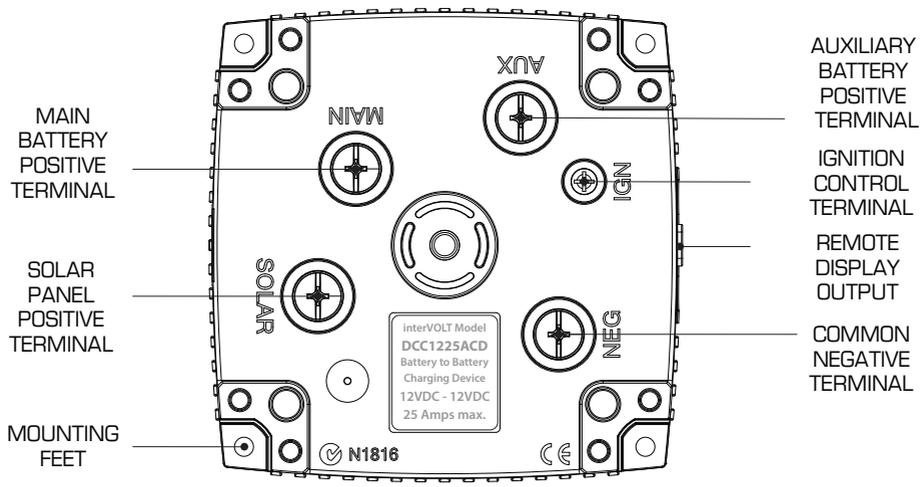


Layout - Charging Device

Top View With Terminal Cover



Top View Without Terminal Cover



Note: Images above shown approximately half actual size.

Layout - Remote Display

Front View

FOR SWITCHING BETWEEN TWO CHARGING DEVICES. ALSO USED AS BACK AND EXIT BUTTON.

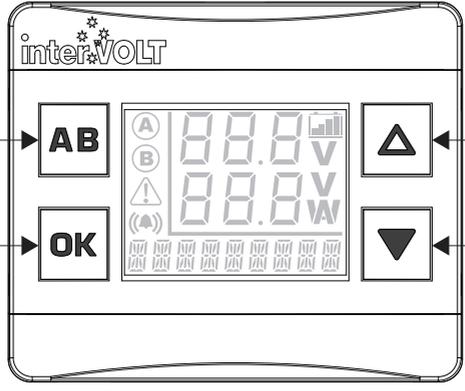


AB

CONFIRMATION SELECTION BUTTON. ALSO USED TO TOGGLE BETWEEN DEFAULT AND ALTERNATE SCREEN. *



OK



'UP' SELECTION OR HIGH BRIGHTNESS CONTROL.



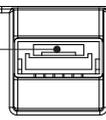
'DOWN' SELECTION OR LOW BRIGHTNESS CONTROL. ALSO USED TO TURN OFF BACKLIGHT.



* See Page 28 for further information.

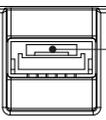
Back View

CHARGING DEVICE INPUT
A

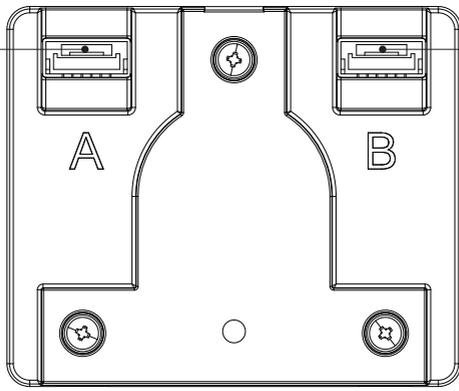


A

CHARGING DEVICE INPUT
B

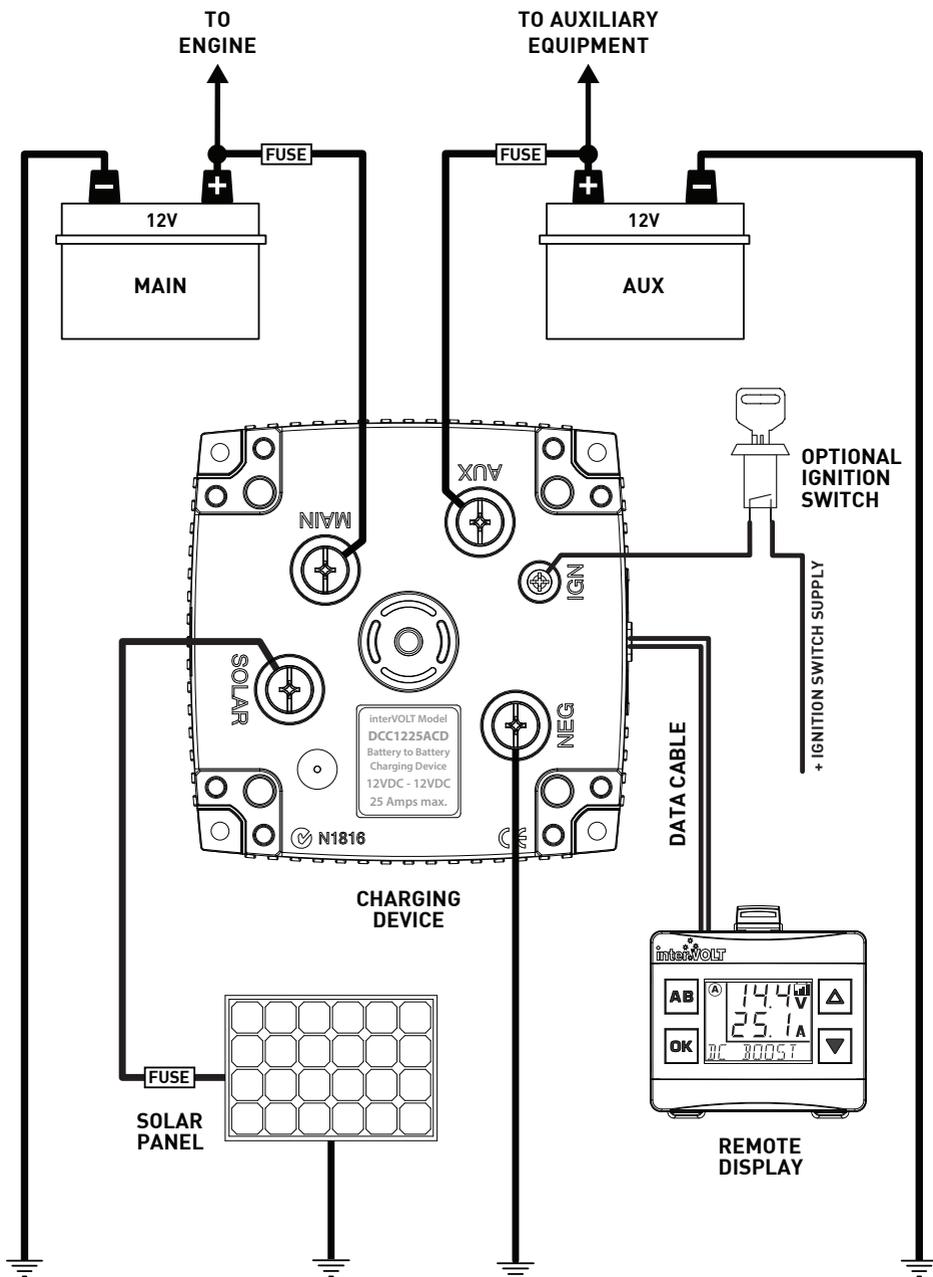


B



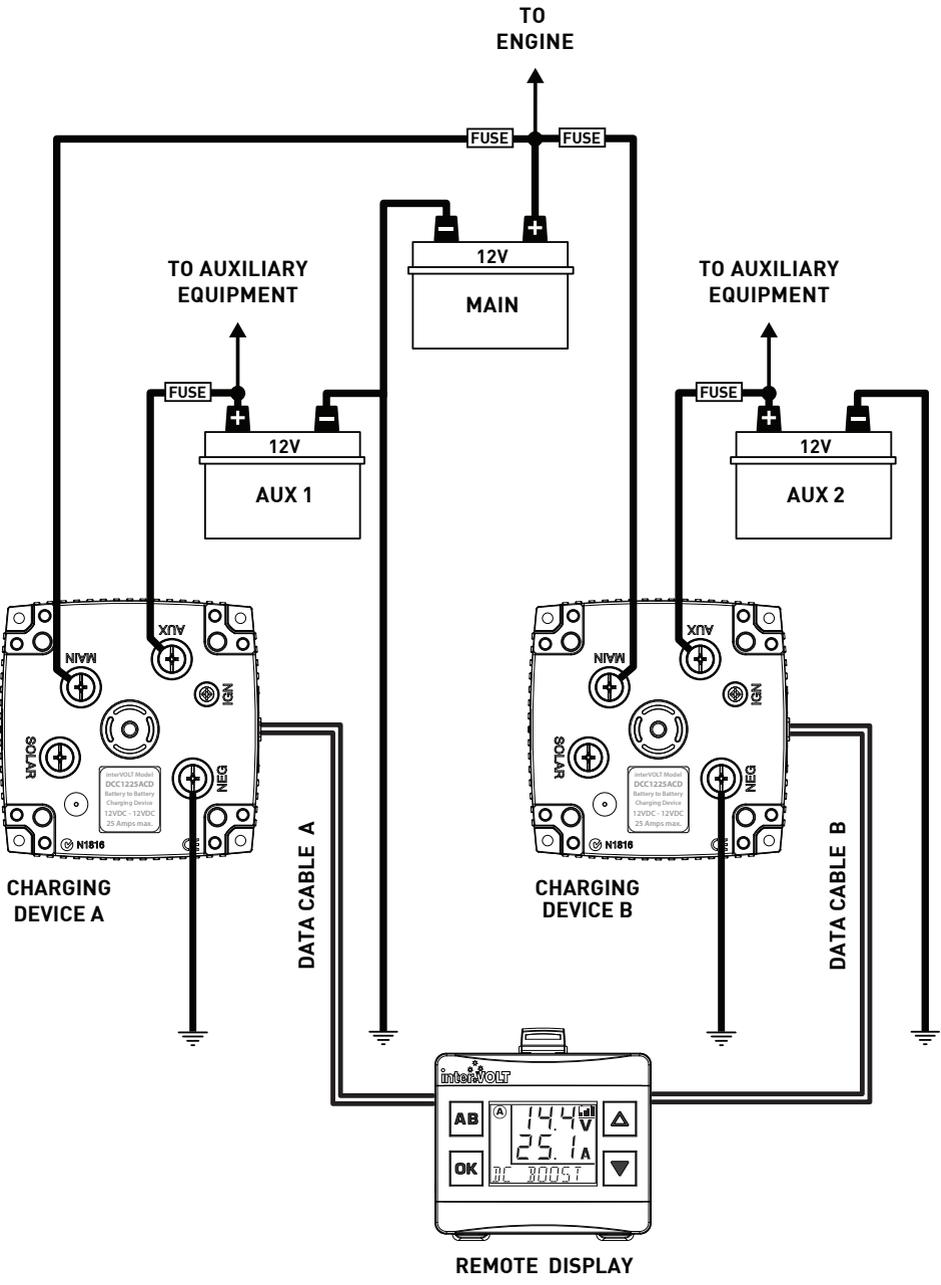
Note: Images above shown approximately actual size.

Standard Wiring Diagram



NOTE: Do not connect auxiliary battery to Charging Device until system has been configured.

Wiring using two Charging Devices



NOTE: Do not connect auxiliary battery to Charging Device until system has been configured.

Planning the installation

IMPORTANT: In order to ensure safety, high performance and long life the DCC Pro should only be installed by a suitably qualified tradesperson.

Plan the installation according to the location of the main and auxiliary batteries. The Charging Device can be situated anywhere in the circuit (subject to using the appropriate cable size) and does not need to be located directly next to either battery. Please consider the number of cables required when planning the install as the location could result in extra wiring. For example if the DCC Pro is required to charge a battery in a caravan it may be better to mount the Charging Device in the caravan itself rather than the vehicle but this may depend on where the Remote Display needs to be located.

Consideration should be given to the wiring layout. The DCC Pro has been designed so that cables can enter the device from any direction, even from one side only, without having to cross over. Crimp terminals are recommended over soldered lugs and should be terminated to automotive quality standards. Incorrect or poor crimping is not only a mechanical issue (wire separating from terminal) but will also cause Voltage drop and potential overheating of the conductor as a result. Using the correct wire size for the application is imperative. The table on page 17 details the minimum conductor size according to the run length.

For complete protection it is necessary to fuse each positive conductor. The fuse should be installed as close as possible to the battery. Fusing is required to protect the vehicle in the event of a short circuit – a cable coming off a terminal and contacting the chassis for example. The DCC Pro itself is fully protected by a range of internal protection devices. The fuse should be no smaller in rating than recommended in the chart on page 17 and no larger than the rating of the cable being used.

NOTE: All wiring should be terminated and routed but not connected to the Charging Device at this time. In order to configure the device the connection must be made in conjunction with the set-up steps depicted on pages 18–24.

Installation Essentials

Common faults often arise as a result of the installation. A poor installation will result in poor performance of the system, placing unnecessary stress (both electrically and physically), on all the components involved. Furthermore, this can result in safety issues such as breakdowns and in worst case scenarios even fire. This is why we state that the DCC Pro should only be installed by a suitably qualified tradesperson.

Please observe the following protocols when undertaking a dual battery installation:

- 1.** To avoid Voltage drop, use correct wire gauge size according to the run length. Using undersized wiring is the most common cause of Voltage drop. Copper is expensive and it is tempting to reduce the cost of an installation by using smaller gauge wire however this is detrimental to both performance and safety. Do not be tempted!
- 2.** Use bolt-down midi style fuses. Do not use blade fuse holders. Many off-the-shelf style blade fuse holders use poor quality materials. The metal contacts cannot handle thermal cycling and quickly become loose, thereby losing conductivity. Manual reset circuit breakers are acceptable but check for de-rating factor under elevated temperatures.
- 3.** Use good quality copper compression lugs for all termination and correct tooling to ensure proper crimping. Sub-standard crimping creates resistance in the circuit which can produce a 'hot spot'. Under heavy current, the heat generated from this point can be enough to melt plastics. The high temperature can also be conducted to other components causing failure.
- 4.** Terminate all negative wiring at a common grounding point. Bad grounding creates resistance in the circuit resulting in Voltage drop and can be difficult to diagnose if the circuit is not under load. Ensure that all grounding points connected to the body/chassis have good electrical conductivity and are protected from corrosion.
- 5.** Many installations use heavy duty connectors fitted in the circuit, often between the DC DC charger and a caravan/camper for example. Ensure any connectors fitted between the Charging Device and batteries are of high quality and correctly rated for the wire size used. If a connector is required, we recommend only Genuine Anderson brand. Poor quality connectors will result in resistance in the circuit and a potential 'hot spot'.

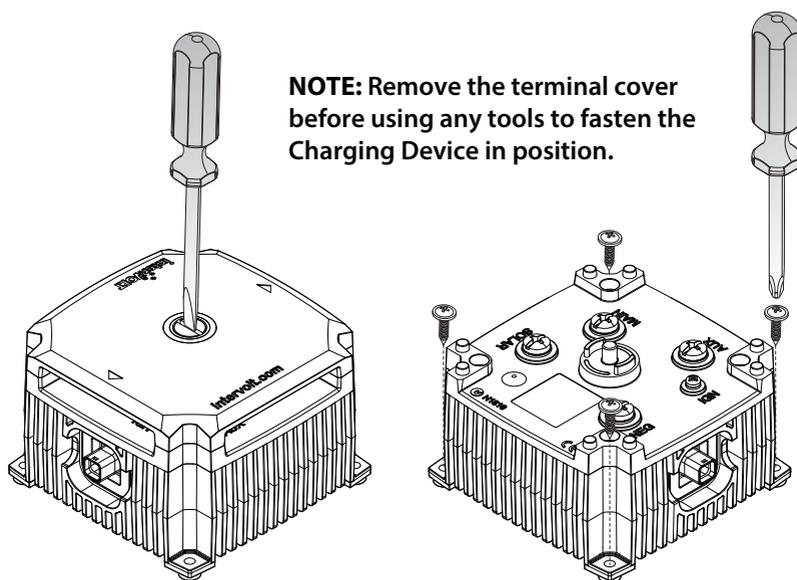
Installing the Charging Device

The DCC Pro Charging Device has been designed to cope with demanding conditions and can be installed in the vehicle's engine compartment. Care must be taken when performing the installation to ensure performance, longevity and of course, safety. Installing the device too close to a turbocharger for example may not only force the device into thermal shut down but could also result in catastrophic failure.

Select a suitable location where the Charging Device can be mounted ensuring adequate ventilation to the heatsink fins, free from excessive vibration and heat. The electronics are enclosed in a sealed housing however the device, where possible, should be installed in a protected environment. The Charging Device is NOT designed to be installed in a location where water can regularly 'short' between the terminals.

As it is of solid state design, the Charging Device can be mounted in any position vertically or horizontally. It should be oriented so that the LED Glow Ring indicator is clearly visible to the installer/operator. It must be installed on a hard flat surface – not an upholstered or insulated surface. Ensure at least 30mm of clearance all around from any other equipment.

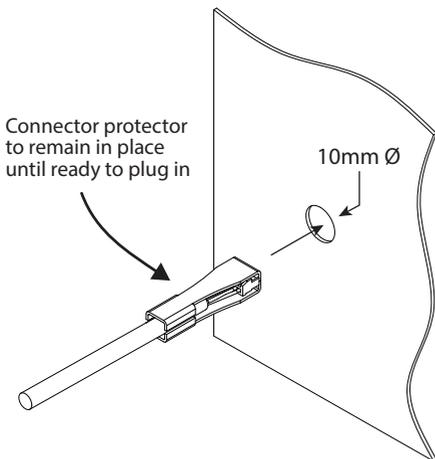
The Charging Device should be fixed with appropriate fasteners ensuring all four anchor holes are utilised. **If mounted on a vertical surface the Data Cable socket should be oriented to the side or downwards.**



Installing the Data Cable

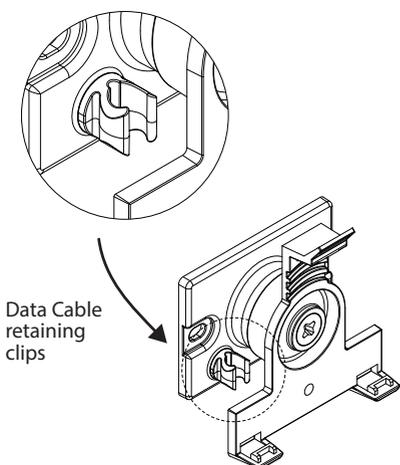
The Data Cable is the communication link between the Charging Device and the Remote Display. It has a sealed connection at the device end and unsealed connector at the display end. If the Charging Device is installed in the engine bay, a 10mm diameter feed-through hole must be drilled in the firewall for the Data Cable.

DO NOT FORCE THE DATA CABLE THROUGH AN EXISTING FACTORY WIRING GROMMET AS THIS COULD RESULT IN DAMAGE TO THE CONNECTOR.



The Data Cable must be fed through the hole from the engine bay side as the sealed connector will not pass through the hole. A rubber grommet is fitted to the cable and must be utilised to prevent damage to the cable sheath from any sharp metal edges.

The Data Cable is fitted with a PVC 'clamshell' protector over the Remote Display connector plug. This is to protect the plug from damage when being routed into the vehicle cabin. The protector should only be removed when you are ready to plug into the Remote Display.



There are two plastic clips located on the Remote Display mounting base. These are used to secure the Data Cable and relieve any strain on the connector. The cable can simply be pushed into the clip after the connector has been plugged in to the socket on the rear of the Remote Display but not until it is mounted (see page 16).

Installing the Remote Display

The DCC Remote Display is designed to be installed in the cabin of the vehicle, on the dash or console. It should be shielded from excessive heat and located away from direct sunlight if possible.

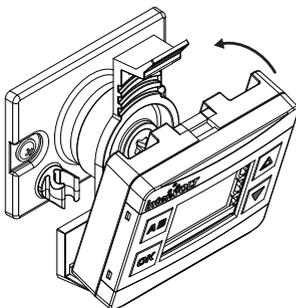
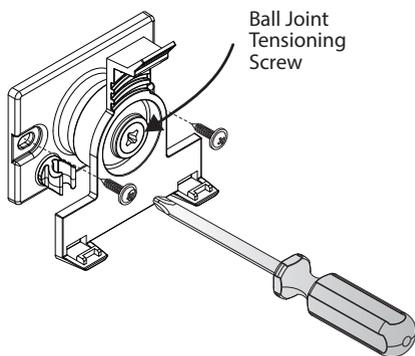
A user adjustable ball joint allows for the housing to swivel through a range of positions to best suit the operator.

A tensioning screw in the centre of the mounting bracket can be utilised to adjust and maintain the Remote Display in the desired position. This screw should not be over-tightened.

There are two methods provided for fixing the mounting base to the surface, details as follows:

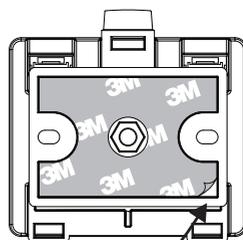
Option A - Screw Fixing:

This method utilises two suitable fasteners (not supplied) to attach the mounting base to the surface as per the diagram below.



Option B – Adhesive Fixing:

This method utilises the self-adhesive foam backing tape to adhere the mounting base to the surface as per the diagram below.



Peel off backing film to apply

The mounting base is designed to hold the Remote Display. Place the display bottom first into the bracket and pinpoint the two location tabs provided. Tilt the display back until the top tab locates in position with an audible 'click'. The display can be removed at any time by pushing the thumb lever gently back and releasing the housing assembly. Do not press on the lens as this may result in it cracking.

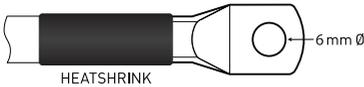
Wiring the Charging Device

Using the correct cable gauge size for the task is paramount to performance and safety. Please refer the table below for the minimum recommended cable size (cross section) required in order to prevent Voltage drop.

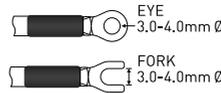
Cable Run Length	Minimum Conductor Size	Recommended SAE Equivalent
1-5 Metres	6 mm ²	8 B&S/AWG (7.91mm ²)
5-9 Metres	10 mm ²	6 B&S/AWG (13.56mm ²)

All cable lugs must be properly terminated using appropriate tooling in order to prevent poor contact which can result in overheating of the stud. An example of the correct method of termination is depicted below.

COPPER LUG FOR POWER TERMINATION



CRIMP LUGS FOR IGNITION TERMINATION



The DCC Pro is fully protected electronically against catastrophic failure. It is mandatory however that inline fuses are fitted to protect the wiring in the event of an external short circuit. The fuse rating should not be less than the continuous current rating of the wiring. The table below details the recommended fuse size for all required wiring.

	Main	Solar	Auxiliary
Fuse rating	40A minimum	To solar panel spec.	30A minimum

There are four large power terminals, one each for the main and auxiliary batteries, one for the solar panel and one for the negative connection. A lug with a 6mm diameter hole should be used for terminating these four cables. There is a single, smaller control terminal which is used when Ignition Control mode is implemented. Spring washers are not required.

DO NOT USE POWER TOOLS TO FASTEN TERMINAL SCREWS

All terminals should be fastened with hand tools and care should be taken not to over-torque the screws. The torque settings are detailed in the table below.

	Main/Auxiliary/Solar/Negative	Ignition
Maximum torque rating	5.0 Nm	1.5 Nm

Connection and Configuration

A step-by-step guide

In some applications, the DCC Pro can be installed and connected straight out of the box without any changes to the configuration. In other situations it is necessary to change these defaults, a different battery type for example, as detailed below (see Charging Methods section on page 6 for explanation). For safety reasons, the battery type and control mode can only be changed during set-up (configuration mode) before the auxiliary battery is connected. Of course, these selections can be changed at any time but the auxiliary battery must be disconnected in order to do so.

In default state the configuration is based on a standard battery to battery charging installation and assumes the following:

1. The auxiliary battery is a standard lead acid type (sealed or unsealed).
2. The system is not controlled by the vehicle's ignition circuit.

The Remote Display is initially used for configuring the Charging Device upon installation. Most importantly the Remote Display allows for selection of different battery types (chemistries) and the control mode, Voltage Sense or Ignition Control (see explanation on page 7).

The following options are available for selection:

- **Standard Lead Acid** – displayed as 1 LEAD ACID on the Remote Display during set-up or SLA in short form.
- **Absorbed Glass Mat** – displayed as 2 AGM on the Remote Display during set-up and in short form.
- **Gelified Electrolyte** – displayed as 3 GEL on the Remote Display during set-up and in short form.
- **Lead Calcium** – displayed as 4 CALCIUM on the Remote Display during set-up or LCA in short form.
- **LiFePO4 Lithium** – displayed as 5 LFP BMS on the Remote Display during set-up and in short form.

The following pages illustrate the step by step configuration process for installing the Charging Device and Remote Display. If there is a need to change the battery type and control mode, this process must be completed in the order depicted for the DCC Pro to operate correctly.

1

Important! Please read before attempting any connection

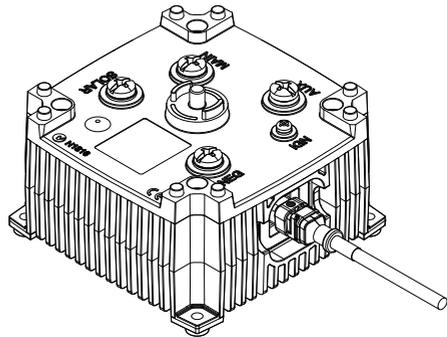
- All steps must be completed in the order indicated. Do not connect the auxiliary battery cable until step 13. For safety reasons there are specific settings that are locked out once the auxiliary battery is connected.
- In step 7 it is important to note that if the **OK** button is not held until the audible 'beep' is heard an error message will be displayed.
- If the battery type selected needs to be changed after step 13 is completed, the auxiliary battery must be disconnected before re-commencing at step 7.

2

Connect the Data Cable to the Charging Device

Remote Display needs only be used for programming

The Charging Device end of the Data Cable is fitted with a sealed 6-way connector plug. The plug is marked with a spot ● of identifying colour indicating the top of the connector. The plug should be gently pushed into the mating connector socket until it 'clicks' into position. To check the latch has engaged gently pull the connector – it should not move. If there is a need to remove the connector, please see page 24 for instructions, do not just pull out.

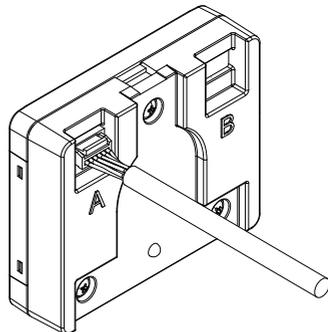


3

Connect the Data Cable to the Remote Display

Remote Display needs only be used for programming

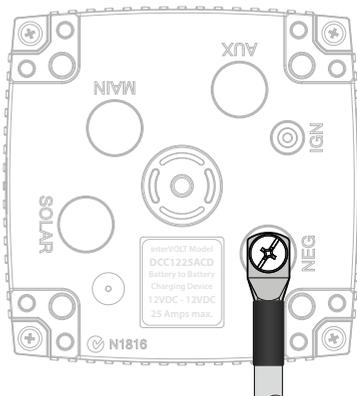
The Remote Display end of the Data Cable is fitted with an unsealed connector plug. The plug is fitted with a plastic 'clamshell' (for protection) which can now be removed for installation. The plug should be gently pushed into the mating connector socket until it 'clicks' into position. To remove the connector press the tab/latch and pull out. When using one Charging Device either socket can be utilised.



4

Connect the negative power cable to the Charging Device

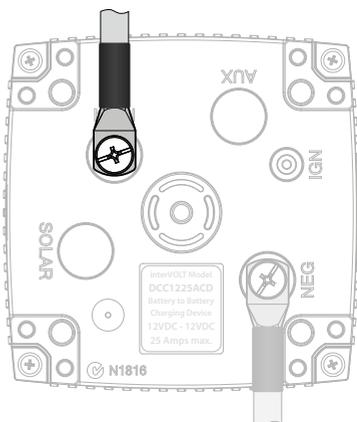
The negative power cable should be connected to the Charging Device first. This should be fastened to the terminal marked **NEG** using the special screw provided. Connect the other end of the negative to the main battery negative (recommended) or directly to the chassis, ensuring the connection has good contact. Ensure the auxiliary battery negative is either connected to the **NEG** terminal of the Charging Device or the chassis.



5

Connect the main battery cable to the Charging Device

The main positive power cable is the next to be connected. Check the in-line fuse is removed prior to connecting the cable. Connect the Charging Device end of the positive cable to the terminal marked **MAIN** using the special screw provided. Connect the other end of the cable to the main battery positive. Insert the fuse into the inline fuse holder. The Charging Device is now powered and the **LED indicators should be flashing white intermittently**.

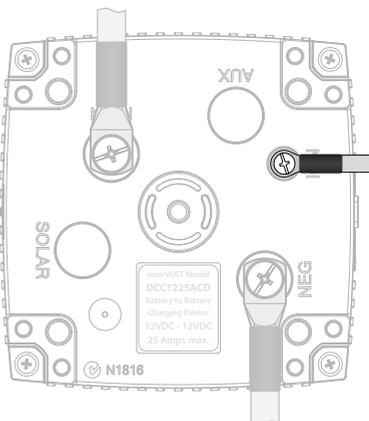


6

Connect the ignition cable to the Charging Device (if utilised)

The ignition cable is the next to be connected, if the intention is to use Ignition Control Mode (see page 7). Keep in mind that the control mode setting is optional and, even if the ignition wire is connected, it does not necessarily need to be implemented in set-up mode.

Important! Do not connect auxiliary battery cable at this time.



7

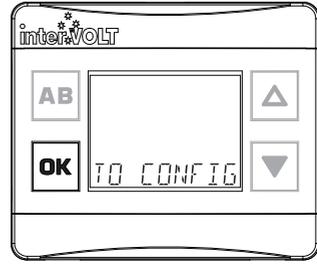
Configure the Charging Device: Initialising set-up mode

This step need only be done if changing the factory default settings

Configuring or 'setting up' the Charging Device is the next step in the sequence. To initiate set-up mode follow the steps below:

- I. Press and hold the **OK** button until an audible 'beep' is heard and a scrolling message reads 'TO CONFIGURE PRESS UP'. The LED Glow Ring will now indicate purple intermittently.
- II. Release the **OK** button.*
- III. Press the **▲** button to initiate the set-up mode and continue to next step.

* If an error message is displayed please see page 34.

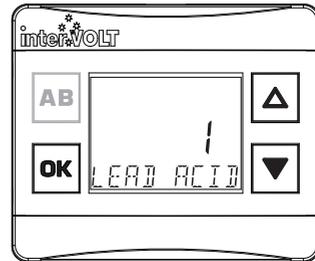


8

Configure the Charging Device: Selecting battery type

Following the last step (7) above, the message 'BATT TYPE' will appear. To select the auxiliary battery type, follow the steps below:

- I. Press the **OK** button to enter the battery type selection menu.
- II. Use the **▲** and **▼** buttons to scroll and view the available options (as outlined on page page 18).
- III. Once the desired battery type is visible, press the **OK** button to confirm and continue to next step.

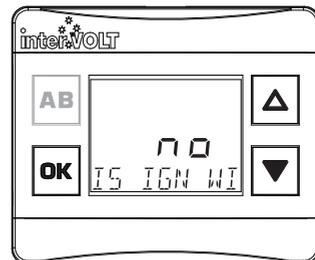


9

Configure the Charging Device: Ignition wire control

Following the last step (8) above, the message 'IS IGN WIRE CONNECTED?' will appear. You will need to answer this question to proceed. Use the **▲** and **▼** scroll buttons to select one of the two following options:

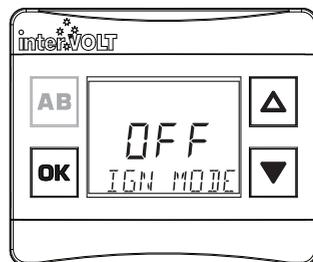
- I. If you **have not** connected the ignition control wire select **NO** and proceed to step 12.
- II. If you **have** connected the ignition control wire to the Charging Device select **YES**.
- III. Press the **OK** button to confirm and continue to next step.



Configure the Charging Device: Ignition control mode

Following the last step (9) confirm if you want to enable ignition control mode. Use the  and  scroll buttons to select one of the two following options:

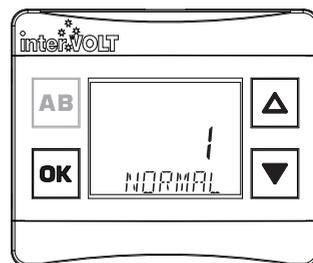
- I. To disable ignition mode select `OFF`
- II. To enable ignition mode select `ON`
- III. Press the  button to confirm and continue to next step.



Configure the Charging Device: Ignition control setting

The next step is to confirm the ignition control setting. Use the  and  buttons to select one of the two following options:

- I. Select `NORMAL` for conventional (non ECU) charging systems.
- II. Select `LOW` for ECU controlled electrical systems.
- III. Press the  button to confirm and continue to next step.

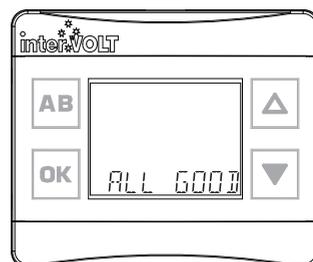


Configure the Charging Device: Confirming configuration

Upon successful completion of the above, the following confirmation message should appear:

`ALL GOOD` - this indicates your selections have been sent to the device and accepted. It does not confirm the integrity of your wiring installation.

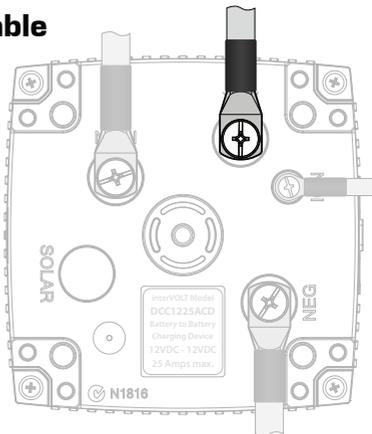
In the event a `SYS` message error is displayed, disconnect, then reconnect the main battery positive cable and re-commence step 7. If the error persists re-check the Data Cable connection. If this does not resolve the problem, please refer to the troubleshooting information on page 34.



13

Connect the auxiliary battery cable to the Charging Device

The auxiliary positive battery cable should now be connected. Check the in-line fuse is removed prior to connecting the cable. Connect the Charging Device end of the positive cable to the terminal marked **AUX** using the special screw provided. Connect the other end of the cable to the auxiliary battery positive. Insert the fuse into the inline fuse holder and continue to next step. **Ensure the auxiliary battery negative cable is connected to complete the circuit.**

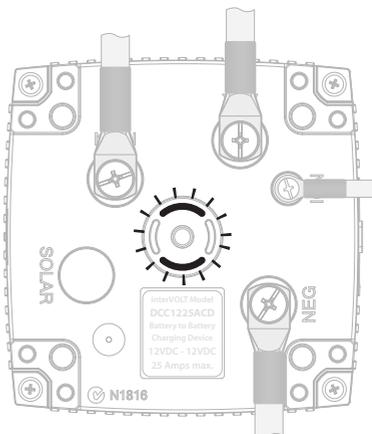


14

Confirming operation

The Charging Device should now be active. Subject to the state of the main and auxiliary batteries, the Charging Device will now enter stand by mode or a charging stage. See pages 39-40 for more information.

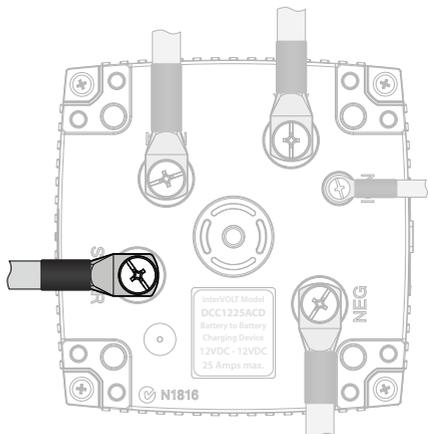
As a result the LED indicators will reflect the current stage, for example if the current stage is 'float' they will illuminate green continuously. If a solar panel is to be connected continue to next step. Otherwise continue to step 16.



15

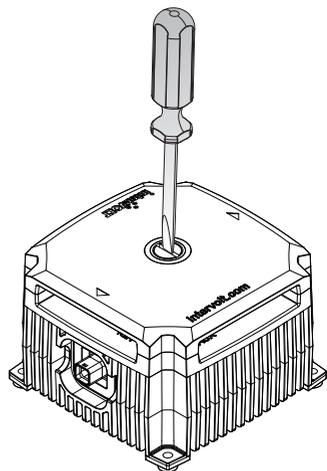
Connect the solar panel power cable (if available)

The solar panel positive power cable can now be connected. Check the in-line fuse is removed prior to connecting the cable. Connect the output positive cable from the solar panel to the terminal marked **SOLAR** using the special screw provided. Reinstall the fuse into the inline fuse holder. Subject to the state of the auxiliary battery, the Charging Device may enter solar mode. See page 6 for more information. Continue to next step.



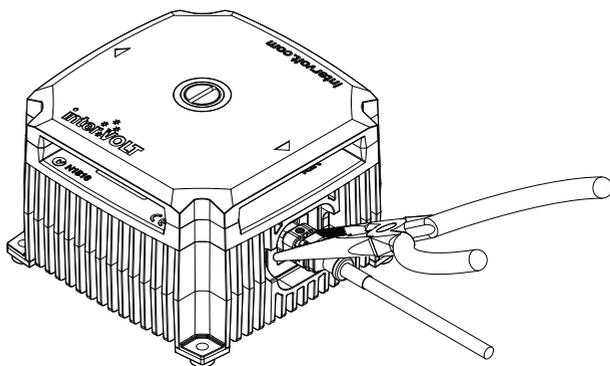
Reinstall the terminal cover

Locate the terminal cover according to the arrows. The cover is indexed and must fit into the locating pins in order for the Glow Ring to operate correctly. The installation is now complete, however if you have a second Charging Device to install please proceed to step 18.



Unplugging the Data Cable from the Charging Device. (if necessary)

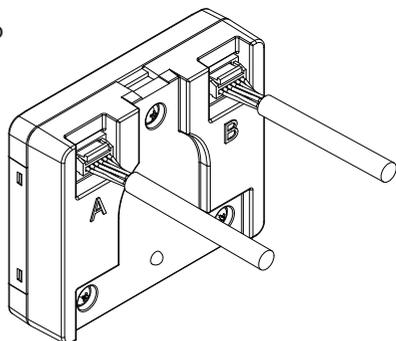
Using a pair of needle nose pliers, apply a little pressure to the sides of the Data Cable plug and gently withdraw the plug assembly. As pressure is applied to the plug the locking tab momentarily deforms and is released from the mating recess.



Connect a second Charging Device (if available)

If a second Charging Device is to be connected to the Remote Display please implement as follows:

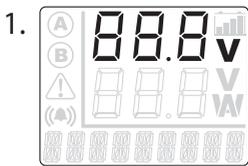
- I. Unplug the data connector of the existing Charging Device for the Remote Display.
- II. To install the second Charging Device repeat steps 2 to 14.
- III. Once successfully installed reconnect the original data connector.
- IV. The two Charging Devices will now be displayed as **A** and **B** on the LCD screen. It is possible to switch between devices by toggling the **AB** button (see operation section).



Operating Brief

The DCC Pro is a fully self-contained Charging Device for in-vehicle battery to battery charging. The kit is supplied complete with the Remote Display and the Data Cable however, aside from initial programming of the operating mode and battery type, it is not essential to use the Remote Display if not required. In fact, for certain applications, the Charging Device is available separately as are all the other components. A fleet of vehicles may be an example where charging is required but monitoring is not. In this example, multiple Charging Devices could be purchased but only one Remote Display is required to program all.

The Remote Display provides valuable feedback to the operator on the charge state of the auxiliary battery and the status of the Charging Device as depicted below:



The upper numeric display

This is the top three digit numeric character set. In conjunction with the **V** icon, this indicates the auxiliary battery Voltage to one decimal place e.g. 144v.



The lower numeric display

This is the bottom three digit numeric character set. This is a multi-function indicator which can be toggled in standard operating mode (not stand by) to switch between auxiliary battery charging current/power and main battery Voltage.



The Voltage icon

This indicates the main battery Voltage e.g. 12.4v; or



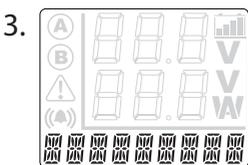
The Amperage icon

This indicates the current in Amps for battery to battery charging e.g. 25.1A; or



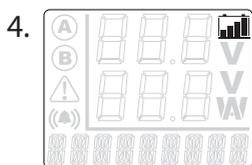
The power icon

This indicates the power in Watts for solar to battery charging e.g. 350w.



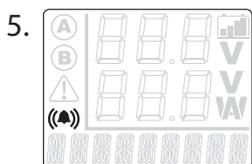
The message display

This is the multi-function nine digit alphanumeric character set which displays the charging source followed by the charging stage status e.g. PV BOOST. In the alternate screen the pre-programmed battery type will be displayed e.g. REM BATT.



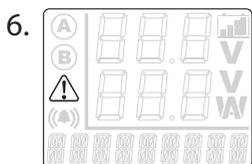
The battery icon

This indicates the auxiliary charging cycle status. Please see page 28 for a detailed description of this function.



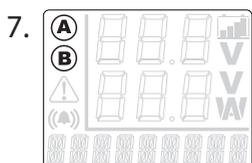
The audible alarm icon

This indicates the audible alarm is enabled. The audible alarm operates in conjunction with the DCC Pro's warning system and is enabled by default. The audible alarm can be disabled at any time. Please see page 30 for directions on configuring the audible alarm.



The alert icon

This indicates an alert condition. Please see page 33 for a detailed description of this function.



The Charging Device icons

These indicate which battery Charging Device is currently being displayed, when there are two Charging Devices in use. Toggling the **[AB]** button changes from one Charging Device to the other, displaying the **(A)** or **(B)** icon accordingly. If there is only one Charging Device connected, these icons will not be displayed.

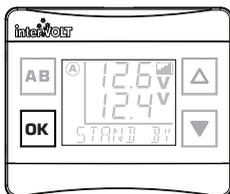


The LED Glow Ring

This indicator is located on the top (terminal cover) of the Charging Device. The LED Glow Ring is an integral part of the DCC Pro's control and monitoring system, changing colour and state according to the status of the Charging Device. Please see page 32 for detailed information on the LED Glow Ring.

Operator Control and Monitoring

Once installed and configured the DCC Pro Remote Display can be used to monitor a range of functions and provide valuable feedback to the operator on the status of the dual battery system.



Display-On-Demand

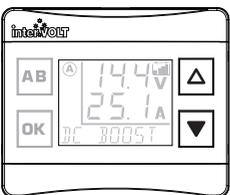
At any time the Charging Device is in stand by mode the Remote Display can be 'woken' by momentarily pressing the **OK** button. This applies in either Ignition or Voltage Control Mode. The following information will be temporarily displayed:

- **Auxiliary Battery Voltage.** This is always displayed as the upper numeric set.
- **Main Battery Voltage.** This will be displayed as the lower numeric set.
- **Charging Device Status.** This is displayed as **STANDBY** on the multi-function character set.



Display On/Off Control

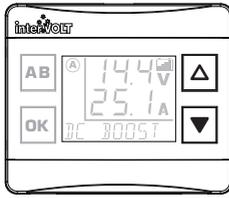
In order to conserve energy, the Remote Display is automatically deactivated when solar charging (**PV**) is under way. At any time, it can be 'woken' by temporarily pressing the **OK** button. Once activated it will temporarily indicate the charging Voltage and power in Watts as described on page 29. If desired, it can be activated to remain 'on' by pressing and holding the **OK** button for 5 seconds until an audible beep is heard. Likewise, it can be deactivated by pressing and holding the **▼** button for 5 seconds until the beep is heard.



Backlight Brightness Control

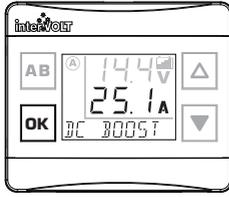
Once the backlight brightness settings have been selected (see page 31), controlling it becomes a convenient one touch process.

Press the **▲** button momentarily and the backlight will assume the highest pre-set brightness
 Press the **▼** button momentarily and the backlight will assume the lowest pre-set brightness



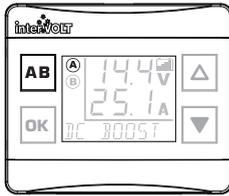
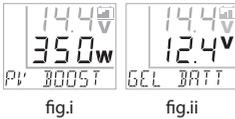
Backlight On/Off Control

By default the backlight is always on when powered but it can be switched off at any time by pressing and holding the button for 2 seconds. It can be switched on again by pushing either the or button momentarily.



Toggle Alternate Screen

By default, the lower three digit character set will display the current in Amps or, if solar power is in use, the charging power in Watts (see fig. i). The multi-function character set will display the charging source and the charge stage. Pressing the button momentarily will toggle an alternate screen to display the main battery voltage on the lower character set and the battery type on the multi-function set (see fig. ii).



Toggle Between Two Charging Devices

If two Charging Devices are installed and connected to a single display it is easy to toggle between both by momentarily pressing the button. The or will indicate the status of the device being monitored. If only one device is connected the or icons will not appear and pressing the button will result in a system error message. The message will clear after a few seconds.

The Battery Icon is a useful quick reference tool used to indicate the charging cycle status, when the Remote Display is in dual Voltage mode for example.



Boost/CC charging – All bars are continuously filling up in a cycle.



Absorption/CV charging – The first three bars are filled and steady and the last one is filling up.



Float/CV charging – All bars are filled and steady.

When battery to battery charging, the Remote Display will indicate the following by default:



- **Auxiliary Charging Voltage.** This is displayed in Volts using the upper character set.
- **Auxiliary Charging Current.** This is displayed in Amps using the lower character set.
- **Charging Cycle Status.** This is indicated using the multi-function character set and displayed as DC (Direct Current) followed by the text BOOST, ABSORB, FLOAT, BMS CC or BMS CV.

When solar to battery charging, the Remote Display will indicate the following when activated with the  button:



- **Auxiliary Charging Voltage.** This is displayed in Volts using the upper character set.
- **Auxiliary Charging Power.** This is displayed in Watts using the lower character set.
- **Charging Cycle Status.** This is indicated using the multi-function character set and displayed as PV (Photovoltaic) followed by the text BOOST, ABSORB, FLOAT, BMS CC or BMS CV.

In addition to the default information detailed above an alternate screen can be accessed by pressing the  button. The Remote Display will now indicate the following:



- **Auxiliary Charging Voltage.** This is displayed in Volts using the upper character set.
- **Main Battery Voltage.** This is displayed in Volts using the lower character set.
- **Selected Battery Type.** This is indicated using the multi-function character set and displayed as SLA BATT, AGM BATT, GEL BATT, LCA BATT or LFP BATT.

Pressing the  button again will return the display to the default screen.

Operator Convenience Settings

The Remote Display also allows certain changes to be made at any time or 'on the fly'. There are three options which can be configured for operator convenience details as follows;

1) Option 1: The keypad beeper.



This option simply turns the keypad beeper, also known as 'button clicks', on or off. In default mode the keypad beeper is enabled and can be disabled at any time.



- i. Press and hold the **OK** button until an audible beep is heard and the text **KEY BEEP** appears.
- ii. Press the **OK** button again and the word **On** will appear above the text line.
- iii. Press **▲** or **▼** to toggle between **On** or **OFF**.
- iv. Press the **OK** button to confirm your choice.
- v. Press the **AB** button to exit (or wait 5 minutes for timer to automatically exit).

2) Option 2: The audible alarm.



This option allows the operator to enable or disable the audible alarm which operates in conjunction with the warning system. By default the audible alarm is enabled and the (▲) icon will be displayed on the main screen. The icon will disappear when the audible alarm is disabled. In the event of a warning condition the audible alarm can still be muted even if it is enabled. In any warning condition, pressing the **OK** button serves as acknowledgment of the problem and automatically mutes the audible alarm at the same time.



- i. Press and hold the **OK** button until an audible beep is heard and the text **KEY BEEP** appears.
- ii. Press the **▲** or **▼** to toggle the selection until the text **AUD ALARM** appears.
- iii. Press the **OK** button again and the word **On** will appear above the text line.
- iv. Press **▲** or **▼** to toggle between **On** or **OFF**.
- v. Press the **OK** button to confirm your choice.
- vi. Press the **AB** button to exit.

3) Option 3: The backlight brightness.



Hi
SETTING

This option allows the operator to adjust the backlight brightness for both high (Hi) and low (Lo) settings to enable the 'one touch' operation of both. Each setting allows the brightness to be adjusted over 5 increments. In Hi setting, the range is 0 through 5 with 5 being the maximum and in Lo, 0 through -5 with -5 being the minimum.



5
SET HIGH

To select the maximum backlight brightness:

- i. Press and hold the **OK** button until an audible beep is heard and the text **KEY BEEP** appears.
- ii. Press the **▲** or **▼** to toggle the selection until the text **BACKLIGHT** appears.
- iii. Press the **OK** button again and the word **Hi** will appear above the text line **SETTING**.
- iv. Press **OK** again and the text **SET HIGH** will appear.
- v. Press **▲** or **▼** to increase or decrease the backlight brightness.
- vi. Press the **OK** button to confirm your choice.
- vii. Press the **AB** button to exit.



Lo
SETTING

To select the minimum backlight brightness:



-5
SET LOW

- i. Press and hold the **OK** button until an audible beep is heard and the text **KEY BEEP** appears.
- ii. Press the **▲** or **▼** to toggle the selection until the text **BACKLIGHT** appears.
- iii. Press the **OK** button again and the word **Lo** will appear above the text line **SETTING**. Use the **▲** or **▼** to toggle to text **Lo**.
- iv. Press the **OK** button and the text **SET LOW** will appear.
- v. Press **▲** or **▼** to increase or decrease the backlight brightness.
- vi. Press the **OK** button to confirm your choice.
- vii. Press the **AB** button to exit.

System Status

The DCC Pro has a number of protection and monitoring mechanisms built in to protect the product from application and installation issues as well as faults that may occur in exceptional circumstances. To assist with troubleshooting any problems that arise, the DCC Pro can indicate these issues in one of two ways, via the Charging Device itself or on the Remote Display (if connected).

The Charging Device incorporates the LED Glow Ring, a multi-colour, multi-function indicator which is illuminated according to the status of the device. The Glow Ring will reflect a range of conditions as a visual indication to the operator/installer.

The Remote Display can visually and audibly alert the operator to the same conditions as indicated by the LED Glow Ring with the advantage, as the name indicates, of being located away from the Charging Device. These conditions are detailed in the table below.

	Glow Ring Colour	Glow Ring Frequency	Status	Remote Display Indication	Condition	Charger State
	White	Intermittent (8 seconds)	Stand by	STAND BY*	Normal	Off
	Purple	Intermittent	Set-up	TO CONFIG...	Normal	Off
	Blue	Continuous	Boost/CC	DC or PV BOOST DC or PV BMS CC	Normal	On
	Blue/Green	Alternate	Absorption/CV	DC or PV ABSORB	Normal	On
	Green	Continuous	Float/CV	DC or PV FLOAT DC or PV BMS CV	Normal	On
	Yellow	Intermittent	High Voltage	HIGH MAIN HIGH AUX HIGH SOLR	Alert ¹	Off
	Orange	Intermittent	Over Temperature	OVER TEMP	Alert ²	Off
	Red	Continuous	Device Issue	CHECK DVC	Alert ³	Off
	Red	Intermittent S.O.S.	Reverse Polarity	N/A	Alert ⁴	Off

*Use the **OK** button to 'awaken' the display for temporary viewing.

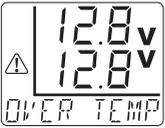
NOTE: For further information on alert conditions (1- 4) please refer to troubleshooting guide on the following page.

Alert Conditions

There are certain conditions that may arise in operation that could result in an alert condition. In an alert condition the output of the Charging Device will be automatically disabled and the alert symbol will be displayed (if the Remote Display is on). A message indicating the cause of the condition will be displayed on the multi-function character set.



If high Voltage is detected on Main, Auxiliary or Solar input terminals, over Voltage protection will be enabled and will be displayed as **HIGH MAIN**, **HIGH AUX** or **HIGH SOLR**. Please see Alert¹ condition in the table below for further information.



In a situation where the Charging Device is subjected to extreme temperatures for a prolonged period, thermal protection will be activated and displayed as **OVER TEMP**. Please see Alert² condition in the table below for further information.



In the event an internal input fuse 'blows' in the Charging Device itself, the system is shut down and displayed as **CHECK FUSE**. Internal fuses protect the Charging Device from catastrophic failure. Please see Alert³ condition in the table below for further information."

Alert	Displayed	Possible Reason	Potential Solution
1	HIGH MAIN HIGH AUX HIGH SOLR	The vehicle's charging system regulator or ECU is faulty. A battery charger of too high a Voltage has been connected to the auxiliary battery. A solar panel with too high a Voltage has been connected.	Check the vehicle's charging system Voltage. Connect a battery charger that meets the Voltage input specifications. Connect a solar panel that meets the Voltage input specifications.
2	OVER TEMP	The Charging Device has overheated due to high environmental temperature. The Charging Device cooling fins are obstructed.	Relocate the Charging Device to a more suitable location. Check the Charging Device cooling fins for obstructions.
3	CHECK FUSE	The Charging Device has no output.	Return to vendor for testing.
4	N/A	The wiring has been reverse polarity connected on all/any of the Charging Device input or output terminals.	Check and correct the polarity immediately or irreversable damage may occur to the Charging Device.

Error Conditions

In addition there are certain conditions which may result as a communication issue between the Charging Device and Remote Display. These will be displayed in the form of a System Error on the Remote Display in one of four ways, details as follows:



SYS 1 – In the event an input error is made when configuring the Charging Device (set-up) or if two Charging Devices are connected and the user attempts to program both simultaneously, a sequence error is detected and the Remote Display will indicate **SEQ ERR**.



SYS 2 – If only one Charging Device is connected and the **[AB]** button is pressed (to toggle between Charging Devices) a connectivity error is detected and the Remote Display will indicate **NO DEVICE**. See note 1.



SYS 3 – If there is a data exchange issue between the Charging Device and the Remote Display, a damaged Data Cable for example, a communications error is detected and the Remote Display will indicate **COMM ERR**. See note 1 & 2.



SYS 4 – In the event there is a transmission issue during the configuration procedure and the Charging Device cannot be programmed a corruption error is detected and the Remote Display will indicate **SEND ERR**. A transmission error is often caused by a fault with the Data Cable or the connections. See note 2.

1. Please note that this error may also display when the Charging Device is in the process of changing states/cycles at the precise moment the button is pressed. Simply waiting a few seconds and trying the button again should result in a successful reading.

2. If SYS 3 or 4 errors persist it is most likely the result of an issue with the Data Cable. Disconnect and inspect both the Charging Device and Remote Display plugs and sockets. Check there are no bent or broken pins in the Charging Device socket. Check there are no broken wires at the Remote Display end.

If the above checks are confirmed as OK please contact your vendor for further assistance.

Frequently Asked Questions

Why am I unable to programme my DCC Pro after having installed it?

For safety reasons the DCC Pro cannot be programmed while the auxiliary battery is connected. Disconnect the auxiliary battery, programme the DCC Pro and re-connect. Please refer to step by step installation instructions on pages 19–24 for clarification.

Why can't I enter the programming mode after pressing the Remote Display button?

Press and hold the  button until you hear the audible beep. If you release the button before, you will initiate a system error. Wait 1 minute before pressing the  button again.

Why do I get a system error when I try to re-programme the DCC Pro?

Disconnect both batteries then re-connect the main battery only. Press and hold the  button until you hear the audible beep. Follow installation steps 7 through 12 in the manual. Leave for 1 minute. Start engine and the display will show auxiliary battery Voltage and current.

Should I programme the DCC Pro to operate in ignition or Voltage mode?

This primarily depends on where the Charging Device itself will be installed. If it is located in the vehicle then ignition mode is recommended. If it is located in a caravan/camper it may not be viable to run a control wire and therefore Voltage mode is the best option. See page 7 for comprehensive details.

When programming for ignition mode should I choose normal or low setting?

For vehicles with an ECU controlled charging system you should select the 'low' setting. For vehicles with a conventional charging system you should select 'normal'. If you are unsure you will need to contact your vehicle dealership to confirm your charging system specifics.

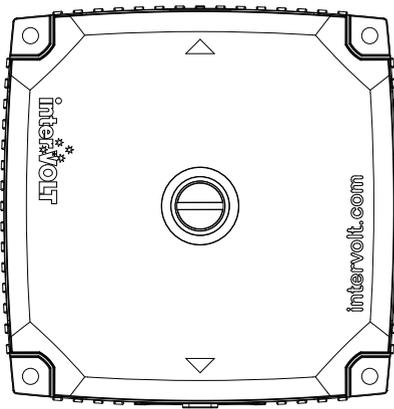
Why do I get a system error when I press the Remote Display button?

Once the unit is programmed (after installation step 12) you need to connect the auxiliary battery to commence normal operation.

Why does my Remote Display stay on after I turn the engine off?

In voltage control mode the device is activated and de-activated based on the main (starting) battery Voltage. If the Remote Display is still on, it is because the main battery Voltage has not yet dropped below 12.6V for a given time.

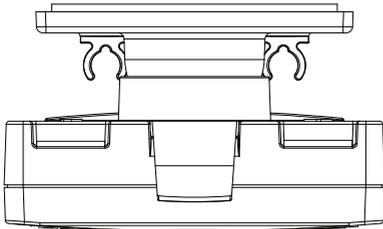
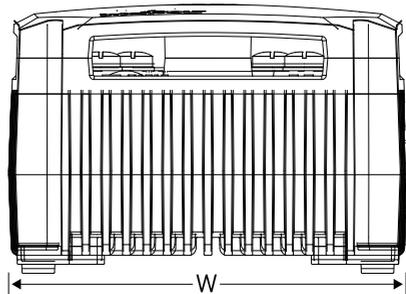
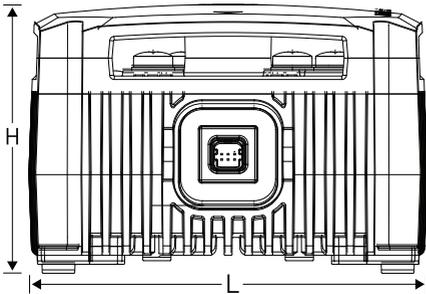
Input Voltage			
Main	9 – 16 VDC		
Solar	18 – 28 VOC (open circuit Voltage – no load)		
Solar Power	Unrestricted (system limited to 25 Amps)		
Continuous Rating	25 Amps@50°C (de-rate from 50°C to 85°C)		
Current Draw			
Charging Device	In stand by: Including LED indicator <10mA At full load: Up to 35 Amps		
Remote Display	With backlight off: 10mA max With backlight on: 45mA max		
Output Voltage	Boost/CC	Absorption/CV	Float/CV
Standard Lead Acid	14.5 VDC	14.4 VDC	13.4 VDC
Absorbed Glass Mat	14.7 VDC	14.6 VDC	13.6 VDC
Gellified Electrolyte	14.3 VDC	14.2 VDC	13.5 VDC
Lead Calcium	14.9 VDC	14.8 VDC	13.8 VDC
LiFePO4 BMS	14.6 VDC	—	14.4 VDC
	Voltage values subject to tolerance $\pm 0.1V$		
Electrical Protection	Over temperature disconnect – auto re-connect Under Voltage shutdown – auto re-start High Voltage disconnect – auto re-connect Reverse polarity protection on all terminals		
Environmental Protection			
Charging Device	IP67 (internal components only)		
Remote Display	IP40 (not dust or water resistant)		
Operating Temperature	-20°C to +85°C		
Operating Humidity	Up to 100% (non-condensing)		
Charging Device Materials			
Heatsink	E-Coated ADC-3 die cast aluminium		
Blue Plastics	10% glass reinforced PC/ABS alloy		
Black Plastics	15% glass reinforced PBT		
Transparent Plastics	Temperature resistant PMMA		
Remote Display Materials			
Dark Grey Plastics	Temperature resistant PC/ABS alloy		
Transparent Plastics	Temperature resistant PMMA		
Termination	Tin plated brass terminals, 304SS fasteners		
Conformity	AS/NZS CISPR 11:2004 for EMC		
Dimensions			
Charging Device	112 x 112 x 75mm (including terminal cover)		
Remote Display	60 x 36 x 59mm (including mounting bracket)		
Weight			
Charging Device	690 grams		
Remote Display	55 grams		



DCC Pro Charging Device

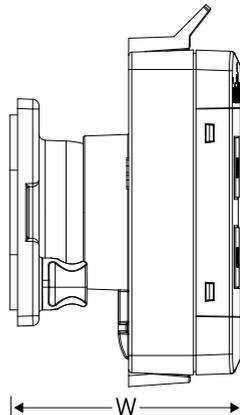
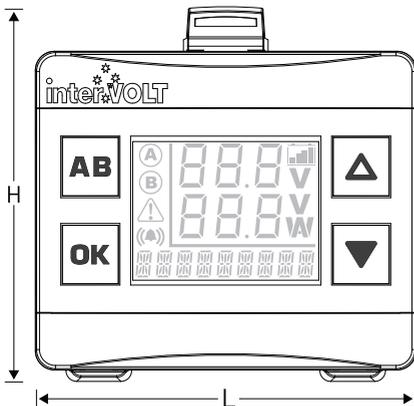
Length	Width	Height
112mm	112mm	75mm

Footprint Mounting Centres
95mm x 95mm



DCC Pro Remote Display

Length	Width	Height
60mm	36mm	59mm



Fundamentals in Detail

CHARGING FUNCTIONS

Soft start: This function is the initial phase of the boost/CC stage cycle. In soft start the current is allowed to build gradually, effectively controlling the high inrush current normally experienced at 'switch on'. Controlling the inrush current reduces the risk of further damage if the battery is unserviceable and prevents potential issues with any equipment that may be powered from the battery at the time. Many manufacturers refer to a soft starting feature as an additional stage. In reality however it is simply another process used for controlling the boost/CC cycle to properly manage the auxiliary battery.

Thermal control: This function is enabled when the temperature of the Charging Device rises above a pre-set limit. When the environmental temperature exceeds 50°C and the Charging Device is under full load (25 Amps), thermal control is initiated. When thermal control is activated it enters a pre-programmed control mode allowing current output to continue subject to temperature rise. As the temperature increases the current is reduced proportionally over time so that the charging process can still be maximised for the hottest of conditions.

Input Voltage control: This function is incorporated to compensate for Voltage drop caused by undersize cable, poor connections, improper termination, etc. by comparing the input Voltage at the main battery terminal with the Voltage at the Charging Device itself. It does this by momentarily disconnecting the auxiliary battery, thereby removing the load. At this time it measures the Voltage without load to determine the true Voltage. It will then establish if the true Voltage is high enough to continue charging or to implement low Voltage shut down.

Override Timer Control: This function utilises an inbuilt timer which allows the system to re-instate the last charging stage if the main charging source is interrupted for any reason within a 30 minute period. For example, if the system was in boost/CC and a fuel stop was required within 15 minutes of setting out, upon re-starting the vehicle, the system will remember and re-instate the boost/CC stage of the charging cycle. If the system was in float/CV stage at the time and the voltage drops over the 30 minute period, the boost/CC stage may be initiated.

CONTROL MODES

Voltage control mode: In Voltage control mode the charging control process is automatic and is based on Voltage sensed at the input and output terminals of the Charging Device. When the main battery Voltage rises above 13.0V the system will commence operation. The charging cycle is determined by the auxiliary battery Voltage and may enter boost/CC or float/CV stage depending on this Voltage. Conversely, if the Voltage of the main battery drops below 12.6V the system will revert to stand by. If solar power is actively available, PV stage may be initiated.

Ignition control mode: In ignition control mode the system is controlled differently because the operator is effectively directing the function of the device when they turn the key on or off. In this mode the DCC Pro has two optional settings. These settings allow the DCC Pro to be used in traditional vehicles with conventional charging methods or the new ECU controlled systems used in modern design. The NORMAL setting is provided for the former and the LOW for the latter. In ignition mode the start-up Voltage is the same value in both NORMAL and LOW settings and is set to 12.8V (remember this is the Voltage level of the main battery). In order to conserve power, the DCC Pro will NOT commence charging, even with the ignition ON if the main battery has a Voltage level below 12.8V. The difference between the settings is the low Voltage cut-out limit. These limits are set as follows:

1. NORMAL: 12.0VDC
2. LOW: 11.5VDC

If the main battery falls below these levels the DCC Pro will stop charging immediately in order to protect it from further discharge.

CHARGING METHODS

Boost/CC: The boost/CC stage (also known as bulk charge) is the stage when the Charging Device is operating in constant current mode. In CC mode is producing the heavy current required to re-charge a depleted battery as quickly as possible. The boost/CC Voltage is determined by the battery type selected in the initial set-up phase. The boost/CC stage is controlled by an algorithm of time vs Voltage to ensure that the battery is charged optimally under the given conditions. In boost/CC stage the charger will produce up to 25 Amps (maximum) subject to the aforementioned conditions. When the Charging Device is powered up and the auxiliary battery measures 12.6V or below the boost/CC stage is then initialised. At this point the 'soft start' function is also enabled (see page 38 for detailed information) and current flows. The boost/CC stage is completed or terminated under the following conditions:

- when the auxiliary battery reaches terminal Voltage (pre-determined by the battery type selected) ; or
- the maximum boost/CC time has expired before the battery has reached terminal Voltage.

In the instance where the boost/CC time has expired before reaching terminal Voltage, the charging process will skip the next (absorption/CV stage) and progress directly to the final (float) stage. Generally this occurs when the auxiliary battery is damaged or no longer serviceable.

Continued...

In order to prevent further damage due to overcharging, the DCC Pro is programmed for the safest option which is to reduce the Voltage by switching out of constant current mode into float stage. There is also the possibility that a heavy load permanently connected to the auxiliary battery is responsible for the charging cycle to time out in boost/CC stage before terminal Voltage is achieved. If this is the case the DCC will continue to monitor the Voltage and if the Voltage drops below 12.0V again (during the two minute check period), the boost/CC stage will re-initiate and the whole process will start over.

Absorption/CV: The absorption/CV stage, the next step in the charging cycle, is initialised when the boost/CC stage is completed. In absorption/CV stage the charger is operating in Constant Voltage (CV) mode and is also time limited. The time is calculated from the boost/CC cycle and is based on a maximum of four times the actual boost/CC time (subject to the battery type selected). As with the boost/CC stage the current is limited to 25 Amps. The absorption/CV stage is completed or terminated under the following conditions:

- the programmed time cycle has finished (pre-determined by the battery type selected) ; or
- the charge current is reduced below 4 Amps (approximately 15% of maximum charge current).

Float/CV: The final process in the charging cycle is the float stage. In float stage the charger is operating in Constant Voltage (CV) mode. The float Voltage is determined by the battery type selected in the initial set-up phase. The float stage is programmed to maintain and monitor the battery indefinitely and as such, allows the auxiliary battery to be connected permanently without any risk of overcharging. As with the boost/CC and absorption/CV stage the current is limited to 25 Amps.

It is important to note that solar power can only be utilised if it is required. In other words, if the batteries are fully charged and there is no load on the auxiliary battery, the power is therefore unusable. Accordingly the charging power displayed on the Remote Display may read zero Watts so do not be alarmed to see this result under these conditions. The solar charging method operates in two different ways depending on the control mode selected - Voltage or ignition. These charging control modes are explained on page 7.

interVOLT products are warranted for a period of 24 months against faulty materials and/or workmanship from date of purchase by the end user subject to proof of purchase. In the event proof of purchase is not provided, and at the discretion of the manufacturer, the warranty shall be 24 months from manufacturer's date of sale to the merchant from whom the product was purchased. Intervolt's 24 month warranty is subject to the following terms and conditions:

The goods must be installed and operated in accordance with the manufacturer's recommendations and instructions set out within this booklet.

In the event of a claim the goods are to be returned to the original point of purchase with a copy of the merchant invoice or the relevant merchant invoice number.

In the event of a claim any associated expenses including diagnosis, removal, and/or installation of the goods is the responsibility of the client including any freight costs.

The warranty shall be void where the goods have been used for a purpose for which they are not intended, or altered in any way that is detrimental, or opened or tampered with by an unauthorised party, or damaged by mechanical abuse, or contaminated by water or other substances (other than IP rated products), or damaged by incorrect application.

Save and except for the express warranty set out above and to the maximum extent permitted by law, all conditions and warranties which may at any time be implied by the common law, Trade Practices Act, Fair Trading Act or any other State or Federal Act are excluded. To the extent that these cannot be excluded and where the law permits, the manufacturer in respect of any such condition or warranty shall be limited at their option to the repair or the replacement of the goods or the supply of equivalent goods or refunding the cost of the goods.



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