



NLDC-40 **DC-DC/CHARGER**

Dual Battery System & Solar Charger



40A

OWNERS MANUAL

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NLDC-40 Dual Battery Isolator and Charger

The NLDC-40 from National Luna is a DC to DC battery charger and isolator for a dual-battery system. It will charge an auxiliary or service battery from a vehicle alternator or Solar panel up to 40A output current. Traditional 12V and 24V vehicle alternators as well as variable voltage alternators are supported.

The integrated MPPT solar regulator provides a maximum output power of 600W but can support solar panel input wattage higher than this. Solar panel voltages up to 42V can be connected.

In addition to the alternator and solar inputs, the NLDC-40 features a dynamic DC power input that accepts DC voltages from 11V to 32V. An advanced load-response algorithm is used to support DC sources with variable power levels. This allows alternative energy sources such as AC-DC power supplies, wind generators or DC generators to be used.

The NLDC-40 will automatically switch between the input sources based on source availability.

An advanced 6-stage charge algorithm is used that is suitable for Lead-Acid and Lithium batteries. Temperature compensation is used to optimise the charge output, ensuring safe and full battery charging under various conditions.

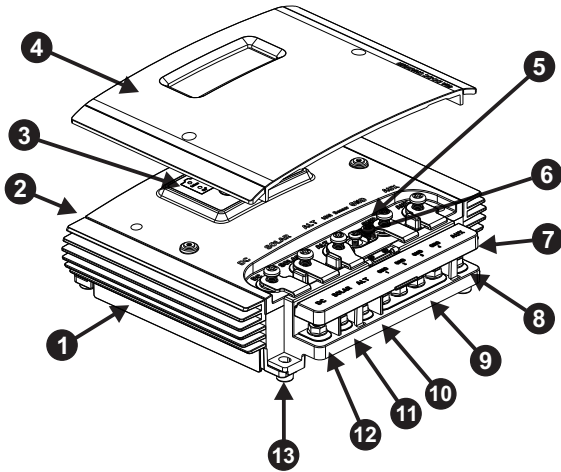
The NLDC-40 supports the connection of a remote monitor that displays information about the system and battery levels to the user on a high-contrast LCD screen.

The NLDC-40 has a IP67 rating for harsh environments and is protected against reverse-polarity, over-voltage, over-temperature and over-current conditions.

SAFETY INFORMATION :

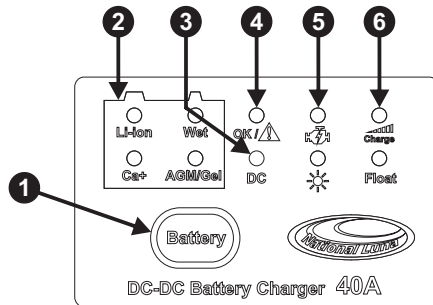
- Before installation, read the instructions carefully.
- Before installation, disconnect any existing batteries.
- The NLDC-40 is used for charging 12V lead-acid and automotive Lithium batteries only.
- Do not use for any purpose other than battery charging.
- Do not attempt to power any devices or instruments directly using the output of the NLDC-40.
- Do not attempt to charge a non-rechargeable or battery other than 12V.
- Never attempt to charge a damaged battery or leaking battery.
- Avoid open flames in the vicinity of the battery.
- Do not alter or disassemble the NLDC-40 under any circumstances.
- Unauthorized disassembly, repairs or modifications will void any warranty.
- Attempts to use the NLDC-40 for purposes other than indicated in this manual will void the warranty.
- Ensure all connections are secure and cables are installed in a safe manner.
- Use the correct cabling size and fuses in accordance with the installation instructions.

NLDC-40 Features



NLDC-40 External features

- 1 - NL-DC40 Metal Base
- 2 - Remote monitor connecting port
- 3 - Status display
- 4 - Removable top cover
- 5 - Temperature compensation input
- 6 - Ignition over-ride input
- 7 - Removable terminal block
- 8 - Terminal block - Auxiliary battery output
- 9 - Terminal block - Common ground connections
- 10 - Terminal block - Alternator input
- 11 - Terminal block - SOLAR panel input
- 12 - Terminal block - DC input
- 13 - Mounting feet



Status Display

- 1 - Battery type selection button
- 2 - Battery type indicator
- 3 - DC Input indicator
- 4 - OK / Fault indicator : Green = OK, Red = Fault
- 5 - Input source indicator (ALT or SOLAR)
- 6 - Charge stage indicator

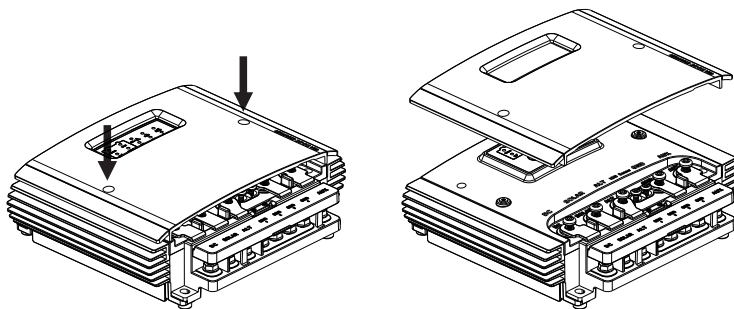
Preparing for Installation

- The NLDC-40 should be located close to the auxiliary battery for best voltage regulation.
- The NLDC-40 can operate in harsh environments but it is best installed in a location that is cooler with adequate ventilation.
- Avoid areas exposed to harsh or corrosive chemicals, excessive dust, extreme heat or mechanical movement.
- The NLDC-40 can be installed vertically or horizontally.
- Do not block or obstruct the cooling fins on the NLDC-40.
- Allow clearance around the NLDC-40 for cables and ventilation.
- It is normal for the NLDC-40 to get hot during operation, keep any objects that are heat-sensitive away from the NLDC-40.
- If the temperature compensation probe is used, it must be able to reach the auxiliary battery.
- It is recommended to use 16mm² cables for connections to the main and auxiliary batteries.
- In-line fuses must be fitted in the positive cables close to the respective main and auxiliary batteries.
- Use the common ground connections on the terminal block for all negative cable connections.
- Use appropriate cable lugs and termination methods for the cable size used.

Removing the top cover

The top cover will need to be removed in order to select the battery type, connect the temperature compensation probe and ignition over-ride wire.

Loosen the two screws as indicated in order to release the cover.



Fitting the NLDC-40

The NLDC-40 has 4 mounting feet, use these to attach the NLDC-40 to a secure, flat surface.

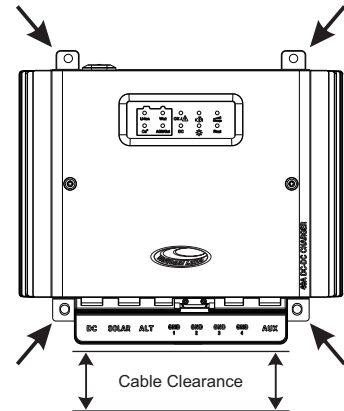
Use appropriate screws or bolts to attach the NLDC-40 securely, M4 machine bolts are recommended.

DO NOT drill into or modify the NLDC-40 housing.

Allow enough clearance for power cables to connect to the terminal block. 50mm or more is recommended.

It is recommended to secure cables together and prevent excessive movement in the final application.

If the remote monitor is fitted, allow clearance for the plug and cable.



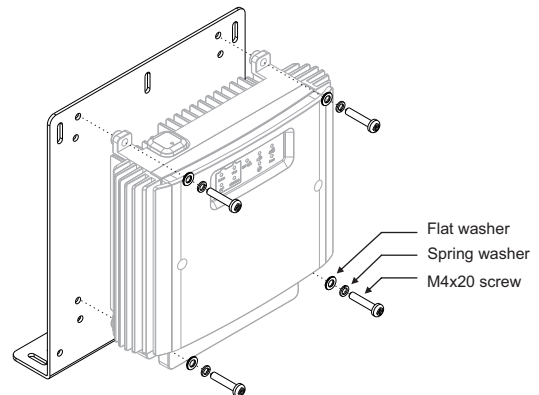
Universal mounting fixture

The NLDC-40 is supplied with a universal mounting fixture and fasteners that can be used to aid installation in a variety of applications.

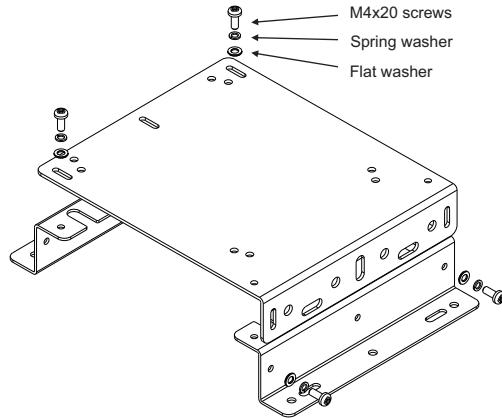
This fixture allows the NLDC-40 to be attached in several ways depending on the application requirements.

Use the supplied screws and washers to secure the NLDC-40 to the plate in the chosen orientation.

Secure the fixture in the final application with appropriate fasteners.



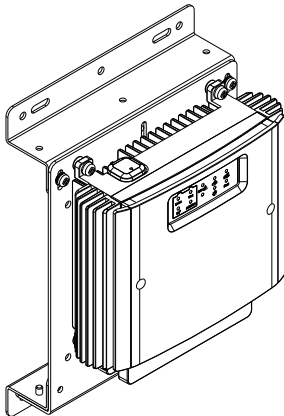
Step plates



The supplied step-plates can be used to raise the NLDC-40 above obstructions such as pipes or cables if necessary.

Use the supplied screws and washers to assemble the fixture as shown in the diagram.

Use appropriate fasteners to secure the assembled plate to the application.



The NLDC-40 can be rotated on the plate by 180° to suit the application.

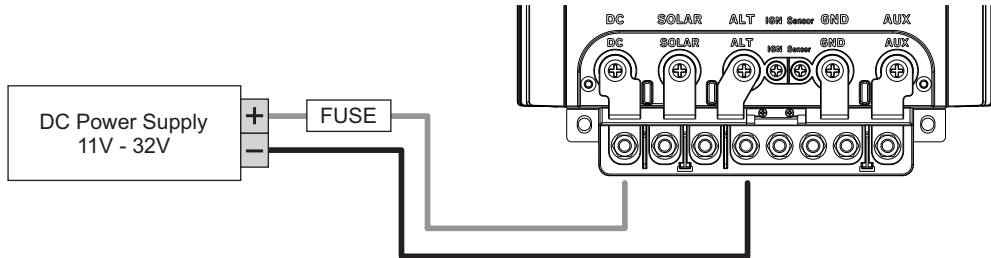
Two sets of threaded holes are provided on the plate to support either orientation.

DC Input

The DC input on the NLDC-40 is designed as an alternative input that can be used with DC power sources such as AC-DC power supplies, wind-generators, hydro-electric and generators with DC output.

To utilise the full 40A output capability of the NLDC-40, the DC source should have a power rating of 600W or more with a voltage between 11V and 32V.

DC, SOLAR and ALT inputs can be connected simultaneously. The NLDC-40 will automatically switch between them based on availability. The ALT input has first priority followed by SOLAR then DC.



It is recommended to install a fuse in-line with the DC power source. The current rating of this fuse should be higher than the DC source maximum current but no more than 50A.

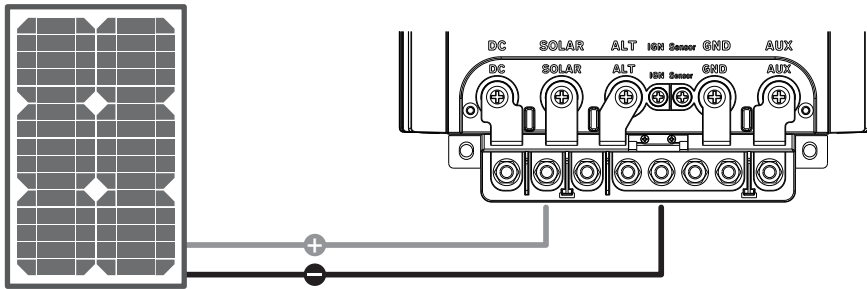
With a suitable power supply, the NLDC-40 will act as a battery charger. Do not use the output from a stand-alone battery charger as the input to the NLDC-40.

Solar Input

The NLDC-40 features a built-in 600W MPPT (maximum power-point tracking) solar regulator with 40A output current and support for panels up to 42V.

The MPPT algorithm ensures that the maximum power available from the connected solar panels is fully utilised under varying conditions and converted into maximum output charge current.

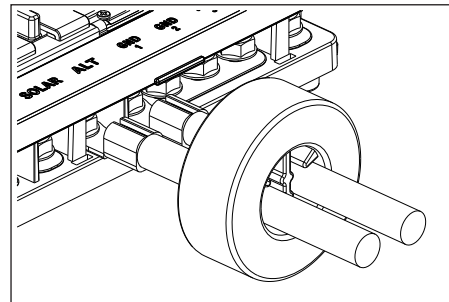
Connect the positive and negative cables from the solar panel(s) to the SOLAR and GND terminals respectively on the NLDC-40.



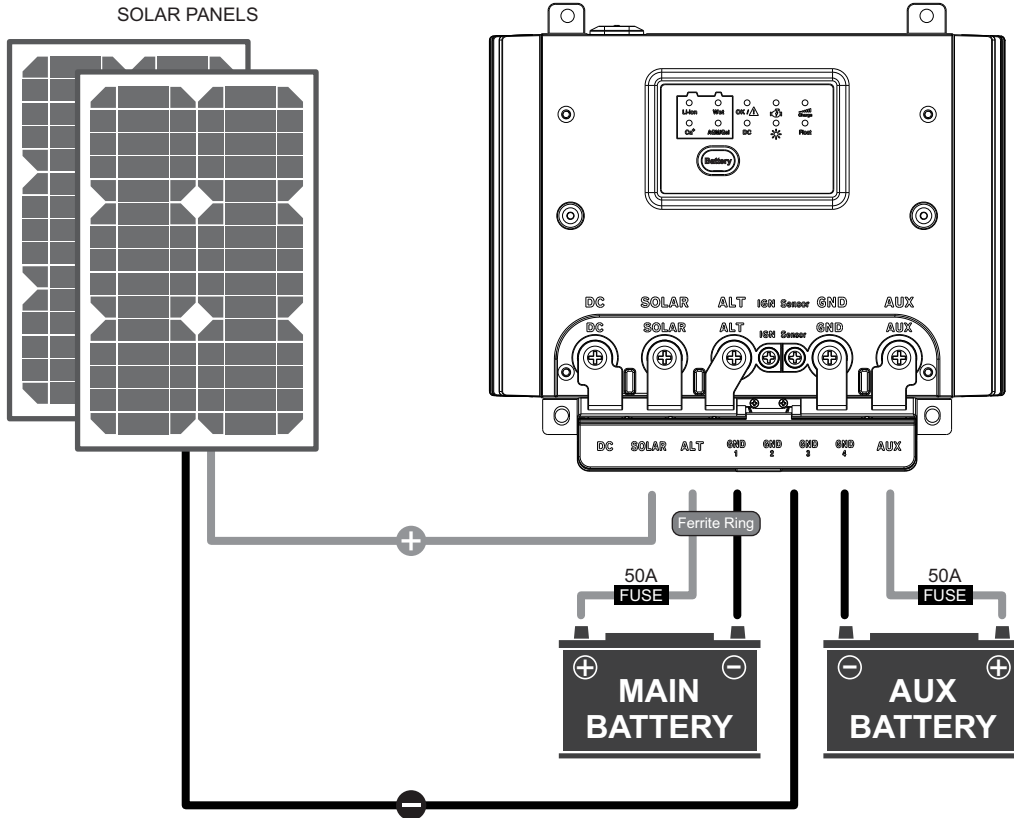
Ferrite Ring

The NLDC-40 is supplied with a ferrite ring. This ring is used to reduce electrical interference in applications that are particularly sensitive to noise, such as with 2-way communication systems.

The ring should be fitted close to the NLDC-40 with the INPUT cables (ALT and GND) passing through the ring.



Typical Installation



Installation Steps

- Disconnect the main battery before starting installation.
- Install the NLDC-40 using the mounting feet. *(Described on page 4).*
- Install positive and negative cables from the Auxiliary battery to the NLDC-40. Connect to the AUX and GND terminals respectively.
- If the ferrite ring is used, pass the positive and negative output cables through the ring *(refer to page 7 for more details).*
- Install one in-line fuse on the positive cable near to the Auxiliary battery. Do not connect the battery yet.
- Install positive and negative cables from the NLDC-40 to the Main battery. Connect to the ALT and GND terminals respectively.
- Install one in-line fuse on the positive cable near to the Main battery.
- If a solar panel is used, connect the positive and negative cables from the solar panel to the SOLAR and GND terminals respectively.
- Connect the temperature compensation probe and IGN over-ride cable if used. *(See page 10).*
- Install the remote monitor (if used) and run its cable to the remote monitor port on the NLDC-40. *(See page 11).*
- Double check all cables and connections for correct installation.
- Re-connect the Main battery. The NLDC-40 should now be powered and will show status on the status display.
- Select the Auxiliary battery type. See “Selecting Battery Type” below.
- Connect the Auxiliary battery.
- If the remote monitor is installed, the voltages of the Main and Auxiliary batteries will now be displayed.
- The system is now ready.

Selecting Battery Type

The NLDC-40 will optimise charge voltage based on the selected battery type.

For safety reasons, the battery type cannot be changed if the AUX battery is already connected.

Remove the NLDC-40 top cover to access the battery select button.

The battery type can be selected by pressing the “Battery” button on the NLDC-40 control panel. The chosen battery type is displayed.

Li-ion	Used for automotive Lithium-ion or LiFe batteries.
Wet	Used for regular automotive starting and flooded high-cycle batteries.
Ca+	Used for flooded deep-cycle, calcium and maintenance-free batteries.
AGM / Gel	Used for all types of AGM and Gel batteries.

IGN over-ride

The ignition (IGN) over-ride input can be used in vehicles that have variable alternator output. This is common with “Smart” alternators.

Connect the IGN terminal using a small gauge wire to a 12V ignition lead or source in the vehicle. This source must be switched to a positive voltage when the vehicle is started and switched off when the vehicle is turned off.

If the IGN feature is used, the Turn-ON and Turn-OFF voltages of the NLDC-40 are adjusted (*See specifications on page 17*).

The IGN feature does not affect Solar or DC input sources.

Temperature compensation

The NLDC-40 is supplied with a temperature compensation probe. For best performance, connect the probe end to the battery casing.

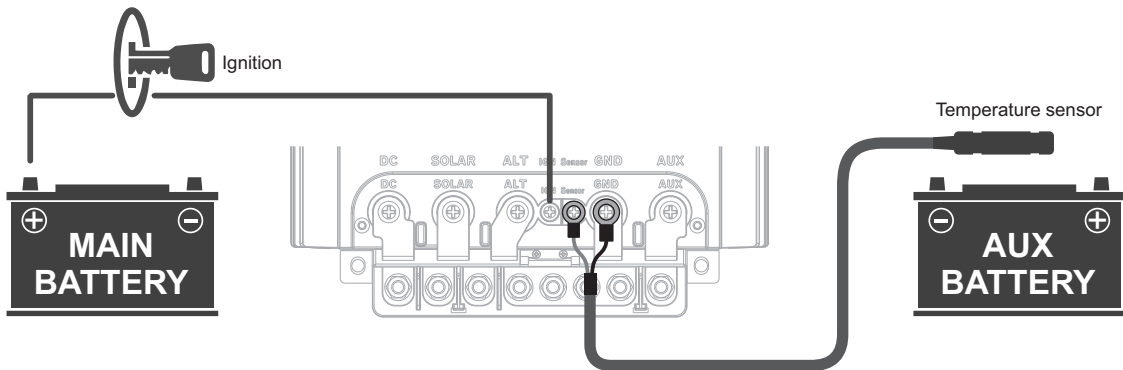
Connect the smaller ring on the sensor cable to the “sensor” terminal on the NLDC-40. Connect the larger ring to one of the GND terminals.

With the probe fitted, the NLDC-40 will optimise final charge voltage based on the measured temperature. This prevents over-charge at higher temperatures and increases charge performance at lower temperatures.

For safety, charge is stopped if the battery temperature increases above 60°C.

CAUTION - DO NOT connect the IGN over-ride permanently to a non-switched positive source. Doing so may result in excessive drain on the Main battery.

Fitting the temperature probe in a location other than on the AUX battery can increase the risk of battery over or under-charging.



Remote monitor - (Optional accessory)

The Remote Monitor for the NLDC-40 provides status information about the system and batteries on a high-contrast LCD screen.

Information such as Main and Auxiliary battery voltages, charge mode, charge current, battery type, battery temperature and error conditions are displayed on a choice of 3 user-selectable display modes.

In addition to the selectable screen modes, the user is able to increase or decrease the screen brightness and choose to turn the display on or off.

The screen will turn off automatically when the system is idle. It will turn on automatically when the next charge cycle starts. It is normal for the display to remain on during solar charge.

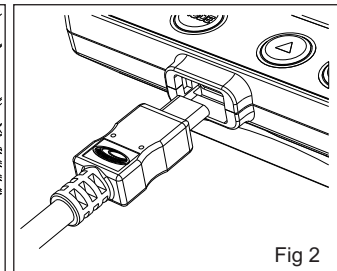
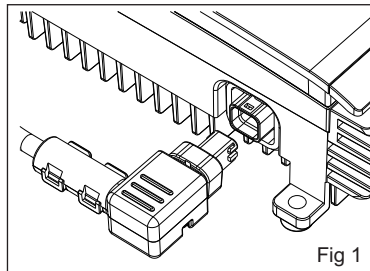
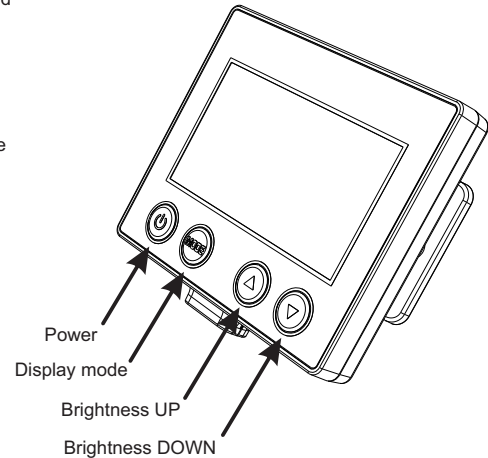
Connecting the Remote monitor

The Remote Monitor is supplied with a mounting bracket that allows the viewing angle to be adjusted.

Attach the bracket to a flat surface using appropriate screws or adhesive. Slide the Remote Monitor onto the mounting bracket until it clicks securely.

Connect the square end of the supplied data cable to the NLDC-40 remote port, it can fit in one direction only (*fig 1*). Press the plug until it clicks securely and forms a waterproof seal.

Connect the flat end of the data cable to the Remote Monitor. (*fig 2*). This connector can fit both ways.



Remote Monitor operation

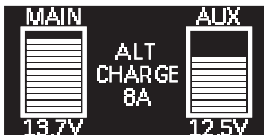
The remote monitor can be turned ON or OFF by pressing the **POWER** button.
The display will turn off automatically after a short delay if there is no active charge cycle.
The display brightness can be increased or decreased by pressing the **UP** or **DOWN** buttons.

The remote monitor has 3 display modes that represent the status of the charging system in different ways.
Press the **MODE** button to cycle through the different display options.



Display mode 1 - This mode focuses on the auxiliary battery with the majority of the screen used to show the auxiliary battery voltage and temperature (if probe is installed).

The input source (ALT, SOLAR or DC) as well as charge current is displayed during a charge cycle. If SOLAR is the active charge source, the solar panel voltage is displayed. If DC input is the active charge source, the input voltage is displayed. If there are no active charge cycles, "STBY" is displayed.



Display mode 2 - In this mode, the status of the main and auxiliary batteries are represented as graphical bar-graphs. The actual voltages are shown below each graph.

During a charge cycle, the input source (ALT, SOLAR or DC) is displayed with the actual charge current. If there is no active charge cycle, "STANDBY" is displayed. The AUX graph is animated during charge and represents the battery state of charge.



Display mode 3 - This mode shows voltages of the respective main and auxiliary batteries as well as charger mode, charge current, battery type and battery temperature (if probe is installed).

If there are no active charge cycles, "STBY" is displayed.

Charge Status

The remote monitor will show the charge status during an active charge cycle.

During the normal bulk and absorption charge stage, the charge current will be shown as well as the input source. During the Analysis stage, "TEST" will be shown. This stage helps to detect a defective battery. During the Float stage, "FLOAT" is shown.

Warning Messages

The remote monitor will respond and indicate various error conditions that may occur under normal operation. These warnings should be investigated to prevent damage to the batteries or the NLDC-40 system.

The following symbols or messages may appear on any of the 3 display modes :



LOW BATTERY or NO BATTERY - This symbol is displayed when either the Main or Auxiliary battery voltage is lower than 11.4V or there is no connection to one of the batteries. Check fuses and connections to both batteries.
If this symbol and voltage display are flashing, the battery is not holding charge and should be tested.

OVP - OVER VOLTAGE PROTECTION - The voltage applied to the DC, SOLAR, ALT or AUX terminals is too high. Ensure the applied voltages are within specification. *Refer to specifications on page 17.*

OTP - OVER TEMPERATURE PROTECTION - The detected auxiliary battery temperature is above 60°C. Charging is stopped to prevent damage to the battery. It is possible that the battery is damaged or is located in an area that is too hot. This error will also be displayed if the NLDC-40 temperature is above 115°C. Charge will stop until the system temperature drops to a safe level.

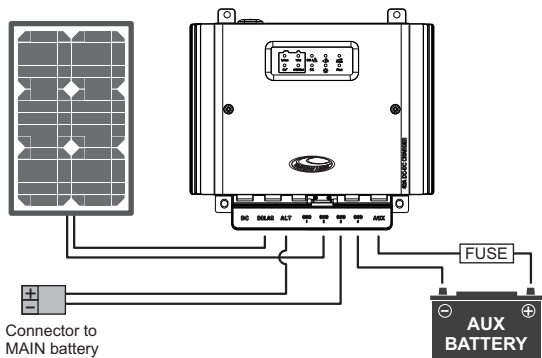
OCP - OVER CURRENT PROTECTION - The detected charge current is higher than specification. Inspect the installation for cable faults or short-circuits.

REV - REVERSE POLARITY - The connections to the auxiliary battery have been reversed. Check the battery connections.

BAD - BAD BATTERY - The NLDC-40 has detected that the AUX battery is not able to be charged safely. Test the battery and replace if necessary.

Please check cable The plug to the remote monitor may not be inserted correctly. Ensure it is fully inserted.

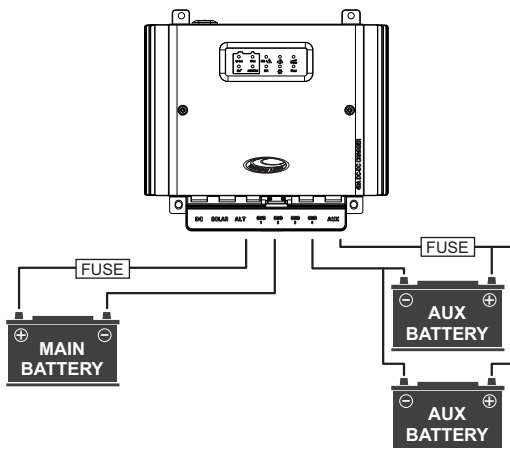
Application examples



Installation in a Trailer or Caravan

The NLDC-40 can be installed in a Trailer or Caravan that is equipped with batteries. In this application, the NLDC-40 supports a stand-alone application with solar input as well as a removable connection to the charging system of the towing vehicle.

More than one solar panel can be connected provided the maximum voltage is below 42V.
(See specifications on page 17).

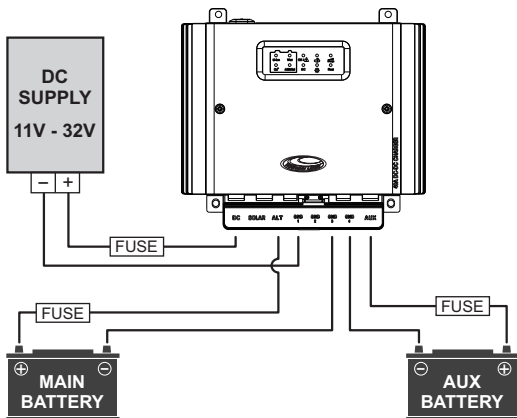


Multiple Auxiliary batteries

The NLDC-40 will support multiple auxiliary batteries connected in parallel to form a large 12V bank. This is a common configuration in trailers or caravans with large service battery banks.

Care should be taken to ensure that the parallel batteries are matched in type, capacity and age.

Application examples



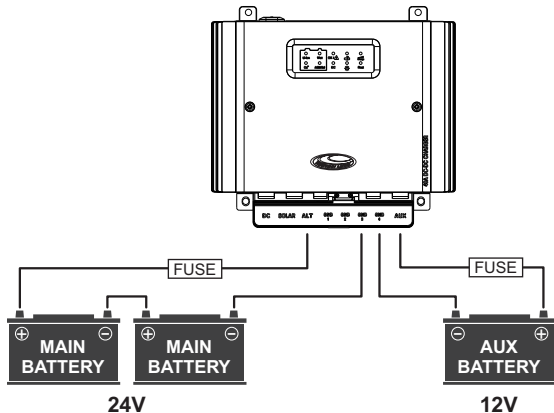
Connecting an external DC Supply

In cases where a DC supply is available such as from a DC generator or AC-DC power supply, the NLDC-40 can be used to regulate charge to the battery.

This is particularly useful if the DC source voltage is not regulated or appropriate for battery charging. This feature can be used to replace an ordinary AC-DC battery charger.

The NLDC-40 will regulate the output current based on the limitations of the DC supply. This prevents over-loading of the supply.

In order to benefit from the full 40A capability of the NLDC-40, a 600W DC source is recommended with a voltage in the range of 11V - 32V.



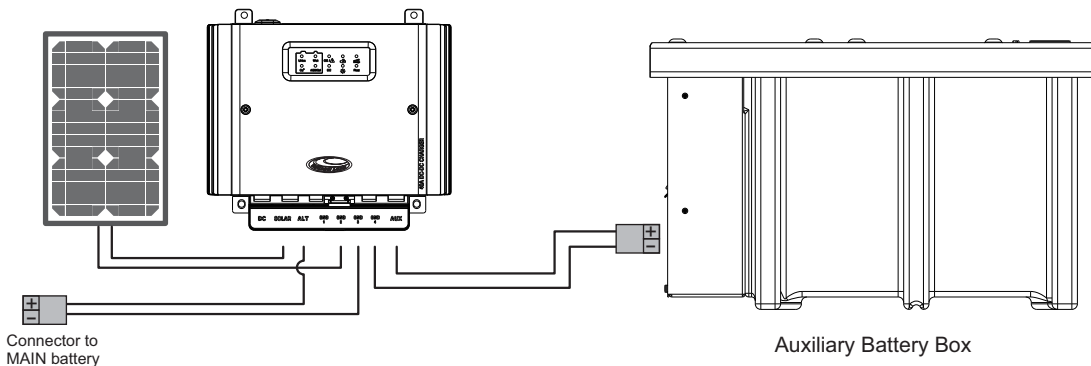
24V vehicles

The NLDC-40 directly supports vehicles with 24V alternators. Usually these vehicles have two 12V main batteries connected in series.

The output of the NLDC-40 will charge a 12V battery or battery bank.

This is useful when 12V accessories are used in a vehicle with a 24V electrical system.

Application examples



Connecting an external battery pack

The NLDC-40 can be directly connected to the input of a National Luna Auxiliary Battery Box or other 12V battery pack. Any loads connected to the battery will be powered by the NLDC-40 when a charge cycle is active.

If the Auxiliary Battery Box is disconnected, the NLDC-40 will automatically revert to a safe mode. An error will appear on the remote monitor, if installed (*see page 13*).

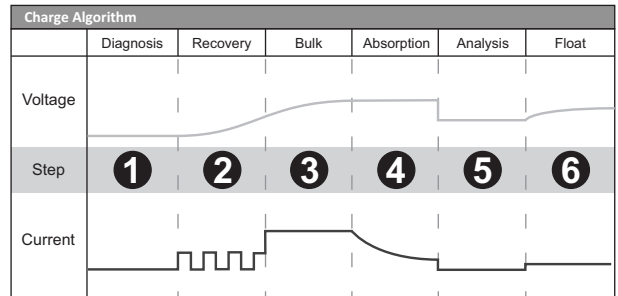
Technical Specifications

Input Voltage Range		
Alternator / DC	11V - 32V	
Solar	9V - 42V	
Input priority	ALT - SOLAR - DC	
Solar Regulator		
Type	MPPT	
Output Current	40A	
Output Power	600W	
DC Input		
Voltage range	11V - 32V	
Turn OFF	< 11V	
Over-Voltage	32V	
12V Alternator Input		
Turn ON	13.2V	
Turn OFF	12.6V	
Over-Voltage	14.8V - 16V	
24V Alternator Input		
Turn ON	26.4V	
Turn OFF	23.2V	
Over-Voltage	29.6V - 31V	
Ignition Over-ride (12V / 24V)		
Turn ON	12.0V	24V
Turn OFF	11.5V	23V
Over-Voltage	15.5V - 16V	31V - 32V
Output		
Voltage	3V -14.8V	
Current	40A	
Power	600W	
Ambient Operating Temperature	-20°C to 85°C	
Standby Current	< 10mA	
Ingress Protection	IP67	
Standards	EN55011, AS/NZS CISPR11	
Dimensions	178mm x 160mm x 59mm	
Remote Display	Optional	

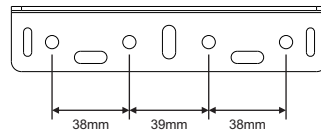
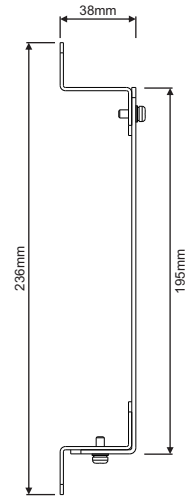
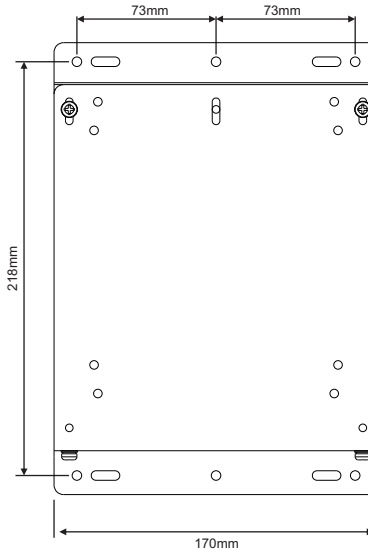
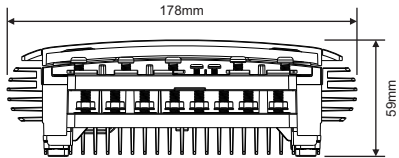
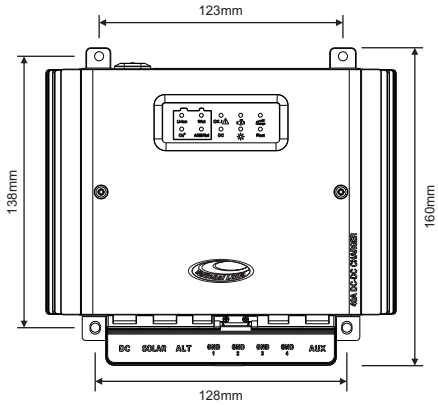
Battery Types	Bulk Voltage	Float Voltage
AGM / Gel	14.4V	13.6V
Standard Wet	14.6V	13.6V
Calcium	14.8V	13.6V
Lithium Ion	14.4V	13.6V

Battery Temperature Compensation	
High temperature	-17mV per °C above 30°C
Low temperature	+17mV per °C below 21°C
Battery over-temperature protection	60°C

Device Protection	
	Reverse Polarity
	Over Voltage
	Over Current
	Over Temperature
	Bad Battery Detect



Technical Specifications - continued





National Luna Limited Warranty - South Africa Only

This National Luna Warranty supersedes any other advertised Guarantee or Warranty provided with this appliance by any wholesaler or retailer.

National Luna warrants this product to be free from defects in materials and / or workmanship under normal use and service to the original purchaser subject to the following :

1. At any time within FIVE YEARS from the date of purchase by the original purchaser, National Luna will at its discretion replace or repair without cost to the owner, through an authorised service agent, any part found to be defective by National Luna.
2. Where parts are replaced by an authorised service agent, the labour account for the work done will be for the owner's account.
3. This warranty does not apply to accessories or items where the length of life depends on the amount of use and care given.
4. This warranty is valid in South Africa only.
5. National Luna may consider a warranty void if modifications have been made to this product which may cause undesirable or hazardous operation or may be the cause of the malfunction of this product.
6. National Luna shall not be responsible for any damages of any kind resulting from incorrect voltages or faults with regards to power supply which fall outside of the appliance operating specifications.
7. National Luna shall not be responsible for damage to the product caused by negligent use, storage of hazardous chemicals, use of corrosive substances, fire, flood, civil-disturbances, lightning or any other natural phenomenon.
8. Warranty returns to the factory for repairs - in the event where the unit has been shipped to the factory for repairs, transport costs will be for the owners account.
9. National Luna will not accept any responsibility for the consequential loss or damage caused by, or due to the malfunctioning of this appliance.
10. National Luna shall not be held responsible for any injuries to persons caused by the incorrect or negligent usage of this appliance.
11. Repair work to be done in terms of this warranty must be referred to National Luna for written authorisation before any work is carried out.
12. National Luna reserves the right to refuse repair or service under warranty if the original proof of purchase cannot be produced.
13. Proof of purchase and purchase date must be presented with submission of a warranty claim. All units have a unique serial number. (Removal of the serial number on the appliance will render this warranty void).

National Luna Limited Warranty - International

The standard National Luna Warranty in South Africa cannot be applied outside the South African borders for practical reasons.

1. National Luna has a world wide distributor network. These distributors import products and carry the warranty (at their cost) in line with the various countries' conditions of sale.
2. Cross border customs and duties apply. A National Luna manufactured product that is returned to the factory in South Africa will have the South African warranty applied. However, all transport costs incurred will be for the purchaser's account.
3. It is important to note that a private purchase of this product in South Africa and exported will not carry a warranty. Any labour repairs and parts required would incur costs in foreign currency and be for the owner's account.
4. In the event of a National Luna product being fitted as standard equipment in caravans and trailers and subsequently being exported from South Africa, the warranty must be carried by the persons responsible for the importing into a country other than South Africa.
5. It is recommended that National Luna products be purchased from the authorised importer of that particular country who would carry the applicable warranty and back-up service.

For tracking and warranty purposes, please fill in the information below :

Serial Number : _____

Date of purchase : _____

Place of purchase : _____

Invoice number : _____

National Luna sales and support :
www.nationalluna.com