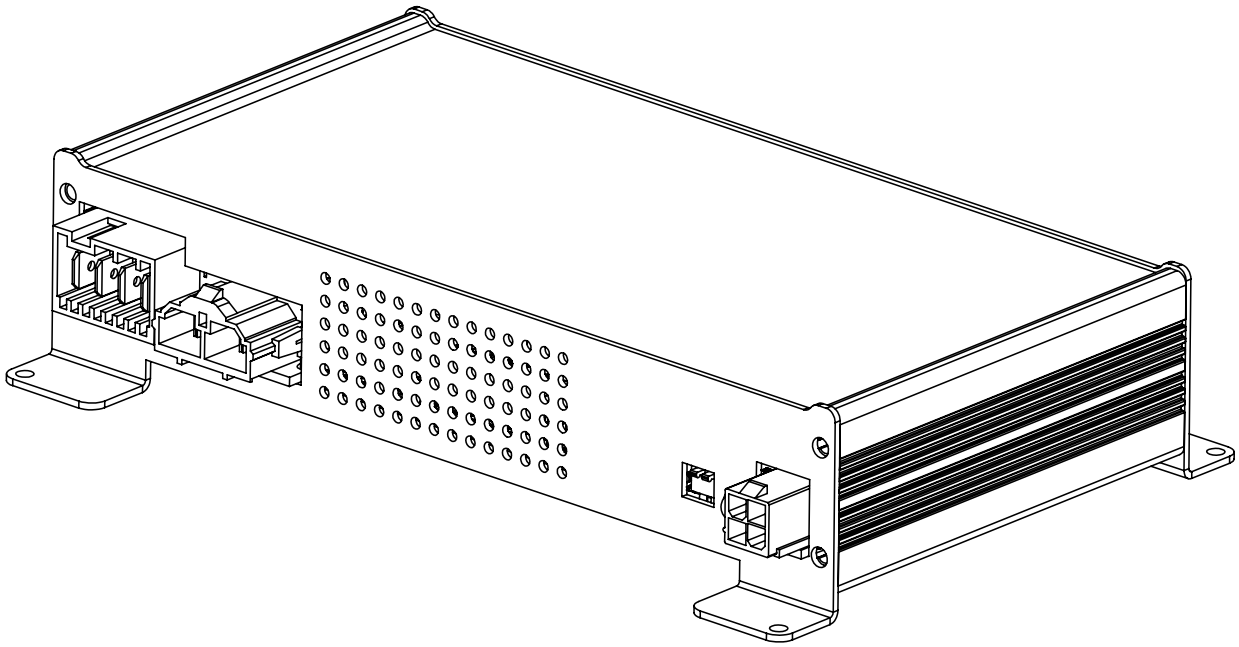
ArSilicii s.r.l.

***ADVANCED ELECTRONIC ENGINEERING FOR AUTOMOTIVE***

# Automotive 3-stage Smart Battery Charger

## DCC-530 and DCC-850



## DCC Family

The DCC family is meant to charge batteries using a user selectable charging cycle in accordance to the type (i.e. chemistry) of the battery and to battery manufacture's specifications.
It is able to reach the optimal charge level and to maintain it. It is designed to be used both with standard alternators and also with new smart and variable output alternators of modern low emission vehicles, including vehicles equipped with START and STOP devices.
An important feature of this family is that the unit works as a standard step-up or step-down power supply for a load **also absence of the battery connected**.

## WARNING & SAFETY INSTRUCTIONS

This manual contains IMPORTANT SAFETY INSTRUCTIONS for the DCC-530 and DCC-850 battery chargers.

**DO NOT OPERATE THE BATTERY CHARGER UNLESS YOU HAVE READ AND UNDERSTOOD THIS MANUAL AND THE CHARGER IS INSTALLED AS PER THESE INSTALLATION INSTRUCTIONS. ARSILICII RECOMMENDS THAT THE CHARGER BE INSTALLED BY A SUITABLY QUALIFIED PERSON.**

**RISK OF EXPLOSIVE GASES:**

**WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT YOU FOLLOW THE INSTRUCTIONS WHEN INSTALLING AND USING THE CHARGER.**

1. The Battery Charger should not be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are supervised or have been instructed on how to use the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the Battery Charger.
2. Do **NOT** alter or disassemble the Battery Charger under any circumstances. All faulty units must be returned to ARSILICII or repair. Incorrect handling or reassembly may result in a risk of electric shock or fire and may void the unit warranty.
3. Only use the Battery Charger for charging Standard Automotive Lead Acid, Calcium Content, Gel, AGM or Deep Cycle type 12V batteries. Check the manufacturers data for your battery and ensure that the 'Maximum' voltage of the profile you select does not exceed the manufacturers recommended maximum charging voltage. If the 'Maximum' voltage for your battery type is too high, please select another charging profile.
4. **NEVER** smoke or allow a spark or flame in vicinity of battery or engine. This may cause the battery to explode.
5. **PERSONAL SAFETY PRECAUTIONS**

To assist with the safe operation and use of the Battery Charger:

a) Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.

b) If battery acid contacts your skin or clothing, remove the affected clothing and wash the affected area of your skin immediately with soap and water. If battery acid enters your eye, immediately flood the eye with running cold water for at least 10 minutes and seek medical assistance immediately.

## CONTENTS



## SPECIFICATIONS

| Part Number | **DCC-530** | **DCC-850** |
|---|---|---|
| Continuous Current Rating | 30A | 50A |
| Cooling Fan | No | Yes |
| Output SC Protecting | Yes (Electronic resettable) | |
| Output Peak Power | 500W | 800W |
| DC Input Voltage Range*1 | 9-32V | 9-32V |
| Default Charging Profile | Standard Lead Acid, Calcium content, Gel & AGM | |
| -Maximum Voltage | 14.3-15.6V | |
| -Float Voltage | 13.3-13.8V | |
| No Load Current | <100mA (available special version < 2 mA ) | |
| Standby Current | <200uA | |
| Ambient Temperature | -20°C to +80°C | |
| Weight | 450g | |
| Dimensions | 100x120x37mm | |
| Warranty | 2 years | |
| Standards | CE | |

## GENERAL DESCRIPTION

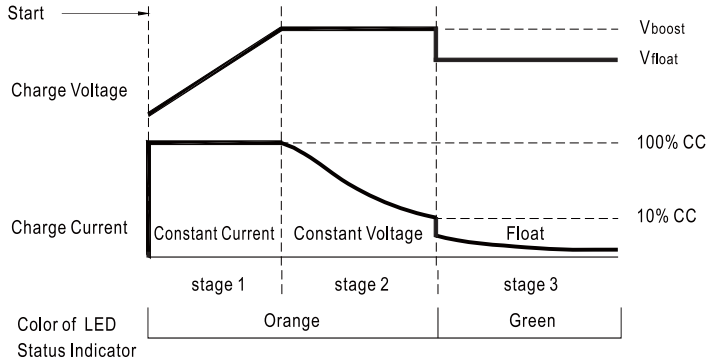
The DCC family is family of multi stage, 12V DC-DC battery chargers that operates from an input voltage starting from 9 volts to 32 volts and it adjust dynamically the output to follow the charging cycle selected by the user using a 3-stage charging strategy.

It is designed to work in accordance with modern environmental compliant engines, therefore accepts control signals from most of main vehicles manufacturers. In order to save quiescent current when not in use, the unit may be powered only when the ignition is on. A special version is available on request, with a very low quiescent current (<2mA), for always ON operations, where current drain is critical.

## SYSTEM LOGIC

When the DCC is turned on, it analyses the load connected at its output (connector C). This phase lasts about 20 seconds, in order to determine if a battery is connected or just a simple load. If battery is detected, it switches to **CHARGER** mode, otherwise, if only a standard load is detected, it switches to **STABILIZER** mode in which deliver all the possible power at a steady output of 13.5.
As a charger, when the engine is running, according to operational status, the DCC optimize the charge of the battery, trying not to overload the alternator, if not expressly commanded by the vehicle's ECU. If no special behaviours are requested (i.e. start and stop) Connector B (check in the following) might be left not connected , and the enable signal, typically the ignition key turned, can be connected to a pin on the E connector.

## CHARGING CYCLE WHEN IN CHARGER MODE




When the DCC is turned on in charging mode, it will maintain a constant current until the battery voltage reaches the Absorption Voltage. The current during this stage may vary throughout operation in order to maintain a safe operating temperature, or to limit the difference between input and output voltages.
The charger will then maintain a constant voltage level for a predetermined period of time after which the charger will enter Float stage. In order to have a more precise temperature reading, instead of an estimate, an external probe might be installed on the battery itself and connected to the unit.
Float stage maintains 13.5V on the output battery, keeping the battery topped up. This counteracts the battery's self-discharging or loads applied to the battery. When the battery loses charge, the charger will move back into the first stage.
Mount the unit to a flat surface close to the auxiliary battery and away from any heat sources. The DCC has several connectors and should be installed as described over the following pages.

NOTE: The pre-sets charging cycle is compatible with load connected in parallel to the battery to be charged. In this case the, obviously, the charging is sub-optimal, in particular, the second stage (absorption).

NOTE: The unit will operate optimally below 55°C with good airflow. At higher temperatures, the unit will de-rate output current.
NOTE: Appropriate connections must be made to the wires with a continuous current rating of at least 50A. Failure to do so may cause damage to the unit and vehicle.

Pre-sets charging cycles can be selected using the dip switches located in the front panel.

| DIP switch S | SW 1 | SW 2 | Description of the State | Vboost | Vfloat |
|---|---|---|---|---|---|
|  | OFF | - | Lead Acid Battery Cycle | 14.2 | 13.5 |
| | ON | - | AGM Battery Cycle | 14.5 | 13.5 |
| | - | OFF | Auto (Basic Logic) | | |
| | - | ON | User logic. Default to “Start and Stop Logic” (signal on B-6 must be present). | | |

### Custom Charge Cycle

Charge Cycle can be customized for special needs by the user, through a serial communication connection using a proprietary software that can be requested directly to ArSilicii s.r.l.

### Custom System Logic

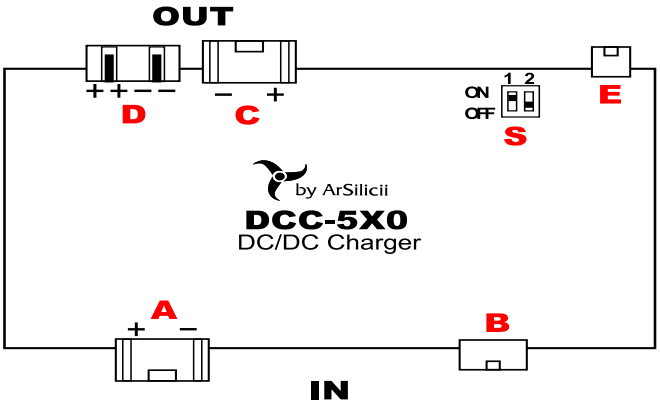
System Logic can be customized for special needs by the user, through a serial communication programmer. For information ask directly to ArSilicii s.r.l. Examples of custom system logic:
Manage batteries with different chemistry (ex. LiPo), 24V-12V Voltage system converter, Power Filtering and Stabilizing, Solar power Converter/Charger, Fridge bypass through connector D, special logic by handling signal and/or analogic measure through connector B.

## FRONT LED

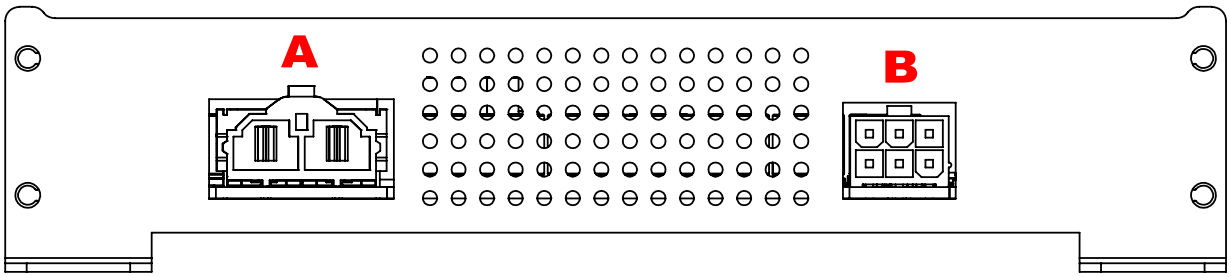
These units are provided with a LED to signal the state.

| LED state | Description of the State |
|---|---|
| Off (Not lit) | Unit is not powered |
| Green Blinking | System check/idle |
| Green Flash | System Analysis |
| Red Steady/Yellow Flash | Boost |
| Yellow Steady/Red Flash | Absorption |
| Green Steady | Float or Stabilizer (Low Current) |
| Yellow Steady | Float or Stabilizer (Middle Current) |
| Red Steady | Float or Stabilizer (High Current) |
| Yellow Blinking | Charger cycle in pause |
| Red Flashing | System alarm (Reached one of max limits). |

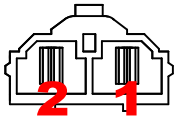
## CONNECTORS



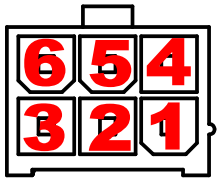

The drawing above show a schematic diagram of the connectors numbered in red. Below follow the tables with the details of each connector the description and the ratings.

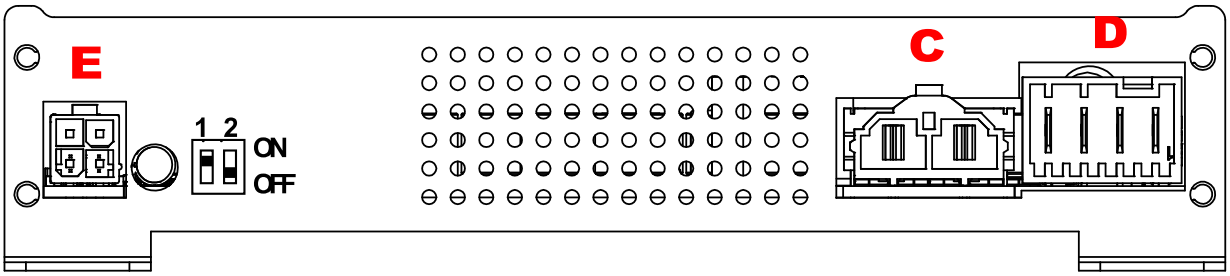



Connector A is the input of the power line from the alternator.

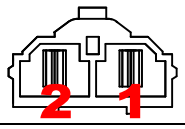
| **Connector A** Front View | Pin | Description |
|---|---|---|
|   | 1 | **Negative** pole powerline from the alternator |
| | 2 | **Positive** pole powerline from the alternator |
| Model: MOLEX 42820-2212 Mate with: Molex: 42816-0212 | | |

The B connector groups all the signal coming from the car.

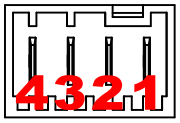
| **Connector B** Front View | Pin | Name | Dir | Description | Function in default logic |
|---|---|---|---|---|---|
|   | 1 | **EGND** | - | Signal Ground | Signal negative pole |
| | 2 | **EDP** | **IN** | Activation signal | Ignition Key Turned signal: Active High (12v) |
| | 3 | **ENG0** | **IN** | Universal Analog Digital | - |
| | 4 | **ENG1** | **IN** | Universal Analog Digital | Load Shedding: Active Low |
| | 5 | **ENG2** | **IN** | Universal Analog Digital | - |
| | 6 | **ENG3** | **IN** | Universal Analog Digital | Engine Running: Active Low |
| Model: Molex 35318-0620 Mate with: Molex 39012060 | | | | | |



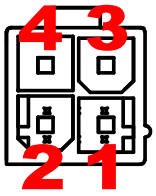

Connector C is the output of the battery to be charged.

| **Connector C** Front View | **Pin** | **Dir** | **Description** |
|---|---|---|---|
|   | 1 | **OUT** | **Negative** pole powerline to the battery to charge |
| | 2 | **OUT** | **Positive** pole powerline to the battery to charge |
| Model: MOLEX 42820-2212 Mate with: Molex: 42816-0212 | | | |

Connector D is a current limited, protected bypass from the alternator output.

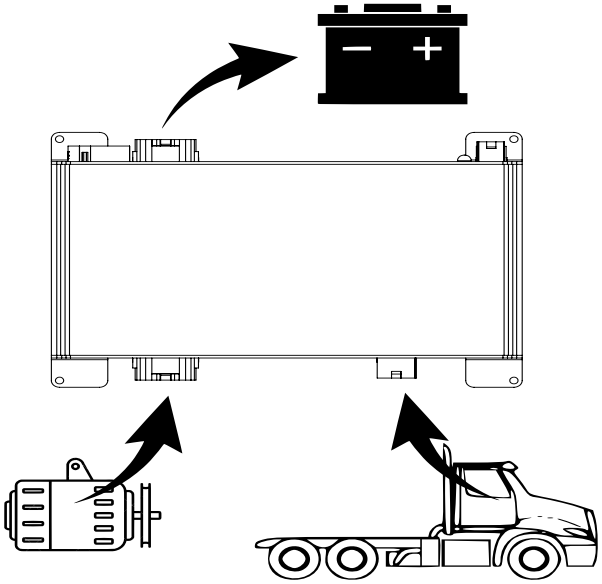
| **Connector D** Front View | **Pin** | **Dir** | **Description** |
|---|---|---|---|
|   | 1 | **OUT** | **Positive** pole power output |
| | 2 | **OUT** | **Positive** pole power output |
| | 3 | **OUT** | **Negative** pole power output |
| | 4 | **OUT** | **Negative** pole power output |
| Model: Lumberg 3642 04K01 Mate with: Molex 94550-4004 | | | |

Connector E is the connector for basic signal and serial port to program the DCC.

| **Connector E** Front View | **Pin** | **Name** | **Dir** | **Description** |
|---|---|---|---|---|
|   | 1 | **RTH/RX** | **IN** | Battery Temperature Sensor / Serial RX |
| | 2 | **EGND** | - | Signal ground |
| | 3 | **TX** | **OUT** | Serial TX /Lin BUS |
| | 4 | **EDP** | **IN** | Activation signal |
| Model: Molex 87727 Mate with: Molex 39012040 | | | | |

## INSTALLATION DIAGRAM

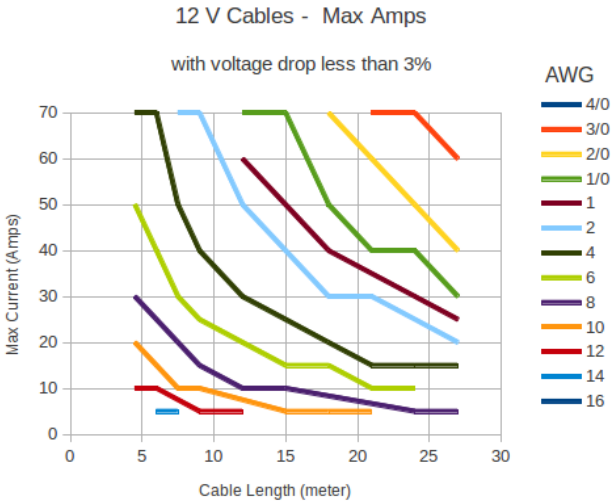
The DCC has the power flow from front to back.
The basic connection is the one depicted in the diagram below.
Regarding signals from the vehicle only one connection is strictly necessary, the activation signal EDP, in this case the pin 4 on connector E may be preferable over the pin 2 on connector B.
The EDP signal power up the unit, it is normally connected to the ignition key signal of the vehicles, so that the unit is OFF when the key is not turned, to avoid abnormal current consumption.



The pin 6 and 4 on connector B is normally connected to the Start and stop and Load Shedding signalling of modern ECU vehicles, in order to prevent the unit from sinking unauthorized power or shutting down its power output when the car stops for short amount of time (i.e. traffic lights).
All the other signal on connector B can be omitted without big impact on charger behaviour, since these signals are used only for special custom behaviours.

## CABLE SIZING

Below is a table outlining the required cable size for a given cable install length. Always choose a wire diameter equal to or greater than what is specified below.




## WIRING

The wires on the DCC unit carry peak high currents of many Amps and it is important to make a good, low resistance, electrical connection that will not degrade over time. Failure to make a good, reliable contact may result in breakdown of the wire insulation and cause a short circuit, or worst case a fire. We recommend that this activity be undertaken by an appropriately trained person.
Crimping provides good mechanical connection; soldering provides a long lasting electrical connection and forming of the heatshrink will prevent any shorting/ contact with your vehicle chassis. Avoid blade contacts of any size or color.