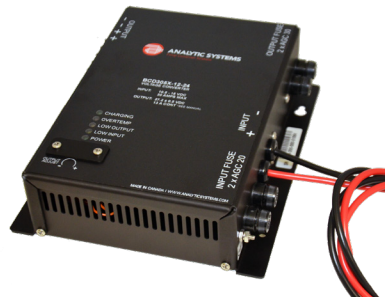


# ANALYTIC SYSTEMS

Power Conversion Solutions

## INSTALLATION & OPERATION MANUAL

### BCD305 SERIES DC SOURCE BATTERY CHARGER



An ISO9001 Registered Company Battery Chargers • Inverters • Power Supplies • Voltage Converters

8128 River Way, Delta B.C. V4G 1K5 Canada T. 604.946.9981 F. 604.946.9983 TF. 800.668.3884 (US/CANADA)

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Revised - June 20, 2019



# DC SOURCE BATTERY CHARGER

## IMPORTANT SAFETY INSTRUCTIONS

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**SAVE THESE INSTRUCTIONS** — This manual contains important safety instructions for operating the battery charger.

### BATTERY CHARGER PRECAUTIONS

1. Do not expose the battery charger to rain or snow unless it is a sealed model.
2. Do not use any attachments with the battery charger unless recommended or sold by the manufacturer, this may result in a risk of fire, electric shock, or injury to persons.
3. Do not disassemble the battery charger; if service or repair is required, return it to the manufacturer or an authorized service center. Incorrect reassembly may result in a risk of fire, electric shock, or injury to persons. Voltages in excess of 350 volts are present inside the charger any time it is plugged into an AC outlet, even if switched off.
4. To reduce risk of electric shock, unplug the battery charger from the AC power before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
5. Do not place battery charger directly above battery; gases generated by battery will corrode and damage battery charger.
6. Do not allow battery acid to drip on the battery charger.

### BATTERY SAFETY

1. WARNING — RISK OF EXPLOSIVE GASES
  - ii. To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery. Review the cautionary marking on these products.
2. PERSONAL PRECAUTIONS
  - iii. When working near a battery there should be another person within range of your voice, who is close enough to come to your aid if needed.
  - iv. Be sure that the area you are working in is well ventilated.
  - v. Clean the battery terminals regularly to keep them free of corrosion.
  - vi. Wear complete eye protection and protective clothing. Avoid touching your eyes while working near a battery.
  - vii. Have plenty of fresh water and soap nearby and ready in case battery acid contacts your clothing, skin or eyes.
  - viii. If battery acid contacts your skin or clothing, immediately wash it off with soap and water. If battery acid enters your eye, immediately flood eye with running cold water for at least 10 minutes and seek medical attention immediately.



- i. Never work on a lead-acid battery in the vicinity of sparks or open flames. Never smoke while working on a battery.
- ii. Never charge a frozen battery.
- iii. Never drop a metal tool onto a battery. This may generate sparks or short-circuit the battery or other electrical part causing to fire or explosion.
- iv. Remove all metallic personal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to melt metal, causing severe burns.
- v. When removing a battery from service, always disconnect the grounded (negative) battery terminal first.
- vi. When connecting a new battery to the battery charger, make sure all accessories connected to the battery are off, to prevent an arc from forming.
- vii. Study all of the battery manufacturer's specific precautions before charging a battery such as removing or not removing cell caps and recommended rates of charge.

### **MEDICAL EQUIPMENT NOTICE**

Analytic Systems does not recommend the use of their products in life support applications where failure or malfunction of this product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Analytic Systems does not recommend the use of any of its products in direct patient care. Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (whether used for anesthesia, pain relief, or other purposes), auto-transfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, neonatal ventilator incubators, ventilators for both adults and infants, anesthesia ventilators, and infusion pumps as well as any other devices designated as "critical" by the U.S. FDA

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## **Introduction**

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The BCD305 DC-DC battery charger provides up to 300 watts of precision charging power to charge a 12 or 24 volt battery system from a 12 or 24 VDC source. For maximum versatility in operation, this unit features two-stage charging capability with adjustable output voltage.

In absence of a battery, the unit can also be used as a DC-DC voltage converter up to its continuous current rating. The unit is Non-Isolated and Common Negative meaning that there is a direct connection between the Input Negative and Output Negative.

Internally, the recently updated single board design features time-tested switch-mode technology for unmatched efficiency and ultra-quiet operation. Multiple stages of filtering reduce radiated or conducted noise to very low levels.

Safety features include over-temperature shutdown with automatic recovery, current limiting, short circuit protection with automatic recovery, input undervoltage shutdown, output overvoltage protection, and both input and battery reverse connection protection. Additional features include a dry contact alarm relay output, and remote panel monitoring with On/Off control.

## **Box Contents**

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The box you have received should contain the following:

- One BCD305 DC Battery Charger
- This manual
- One Warranty Card

*If there is anything is damaged or missing, please contact your dealer or Analytic Systems for a replacement.*



# Main Parts



## Input Side

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>DC Input Negative Connection:</b><br/>1-ft (0.3m) #12AWG Black Input Lead</li> <li>2. <b>DC Input Positive Connection:</b><br/>1-ft (0.3m) #12AWG Red Input Lead</li> <li>3. <b>Input Fuses:</b> 2x AGC-20</li> </ol> | <ol style="list-style-type: none"> <li>4. Chassis Grounding Stud</li> <li>5. <b>Output Fuses:</b> 2x AGC-30</li> </ol> |
|--|--|



## Output Side

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. <b>Battery Output Connection:</b> Molex 4-pin BEAU Terminal Strip</li> <li>2. Output Voltage Adjust Potentiometer (under Cover Plate)</li> <li>3. Indicator LEDs</li> </ol> | <ol style="list-style-type: none"> <li>4. Remote Control Port</li> <li>5. Power Switch</li> </ol> |
|---|---|



## Operation

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This unit is designed for simple and intuitive operation. Before operating, make sure that this unit is properly installed and connected. See *Installation* for more information.

### TO CHARGE A BATTERY

1. Move the Power Switch to ON. The alarm buzzer will sound and the LOW OUTPUT LED will glow red briefly, then the POWER LED will glow green. This is normal.
2. The CHARGING LED will start glowing green indicating normal operation. The unit will automatically charge the battery until it is fully charged. This may take several hours.
3. Once the battery is fully charged, the CHARGING LED will turn off. The unit will maintain the battery at full charge for as long as it is connected.

### TO ADJUST THE CHARGING (FLOAT) VOLTAGE

1. Move the Power Switch to ON. The alarm buzzer will sound and the LOW OUTPUT LED will glow red briefly, then the POWER LED will glow green. This is normal.
2. Loosen the two screws holding the cover plate to the top panel and remove the plate to access the output voltage adjust potentiometer.
3. Using a small flat-blade screwdriver, rotate the potentiometer.
4. The charging (float) voltage can be adjusted over a range of  $\pm 1.0$  volts. Rotate the potentiometer clockwise to increase the voltage; counterclockwise to decrease the voltage.
5. Using the digital voltmeter/ammeter, monitor the charging voltage.
6. When satisfied with the new voltage, return the cover plate to its original position,

### TO END OPERATION

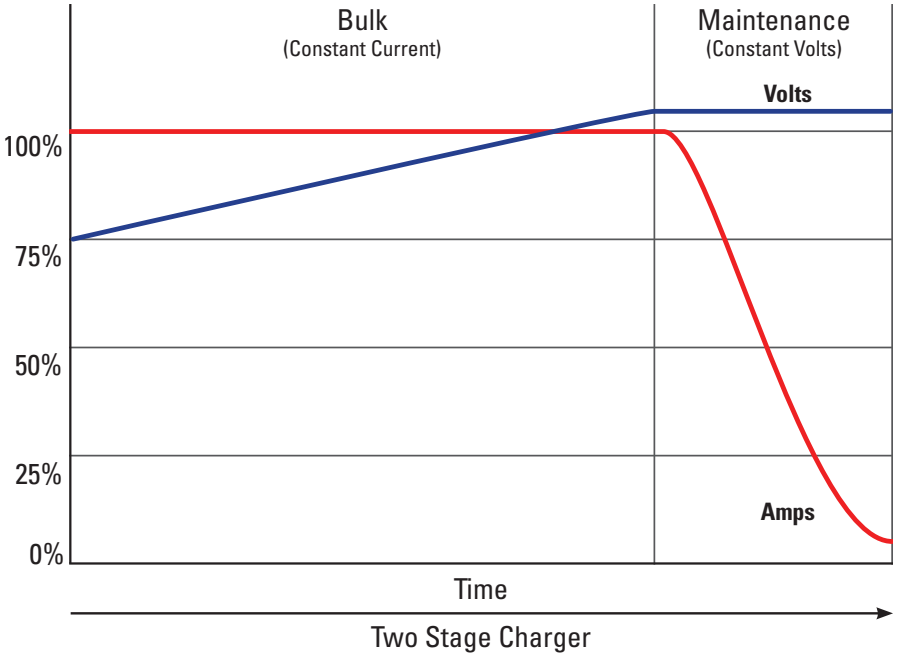
1. Move the Power Switch to OFF.
2. Wait for all the LEDs stop glowing.
3. Once all of the LEDs are off, it is safe to disconnect the unit from the power source and battery. The unit is now ready for storage or service.





# Charging Profiles

This unit charges connected batteries using a two-stage charging profile. Below is a detailed explanation of how this charging cycle works.



## TWO-STAGE CHARGING

A two-stage charging profile occurs in two stages.

- During the Bulk stage, the unit charges the battery with a *constant current* (13 A) until the battery voltage reaches the unit's pre-programmed float voltage (27.2 VDC). The float voltage is higher than the battery's rated voltage to compensate for the characteristic discharge of idle batteries.
- During the Float stage, the current reduces as necessary to maintain the battery at the float voltage. When the current drops below 2 Amps, the charging cycle is complete. The battery can be left connected to the charger, which will keep it at full charge.

Two-stage charging is recommended in more instances over three-stage since it is more versatile. The battery is subjected to lower voltage and current than in three-stage charging and therefore is less stressed. In addition, the battery can be used to power a load without altering the battery charger's ability to keep the battery at full charge.



# Installation

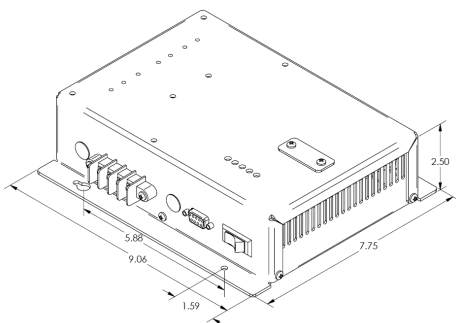
## MOUNTING

Mount the unit in a DRY and WELL VENTILATED location with at least 1 inch of clearance around the unit for adequate cooling.

The best mounting configuration is to mount the unit on a horizontal surface using #10 screws of the appropriate type for the mounting surface to securely mount the unit.

There is 1500 volts of isolation between the input and output, and the input and case. There is 500 volts (1500V for 48V Output) of isolation between the output and case. Therefore, the unit may be mounted on any surface without fear of electrolysis or ground fault.

A ground stud is provided to bond the chassis to local ground to reduce or eliminate EMI.



**IMPORTANT:** *To reduce the risk of high voltage electrical shock, always make the power switch is OFF Before making or breaking any connections.*

## INPUT POWER CONNECTION

The unit is equipped with two 3-foot/1 meter Type D Stranded AWG12 wire leads to serve as a DC Input Connection. Connect these leads to the DC power source in the polarity indicated.

Red Input Lead - Positive DC Terminal

Black Input Lead - Negative DC Terminal

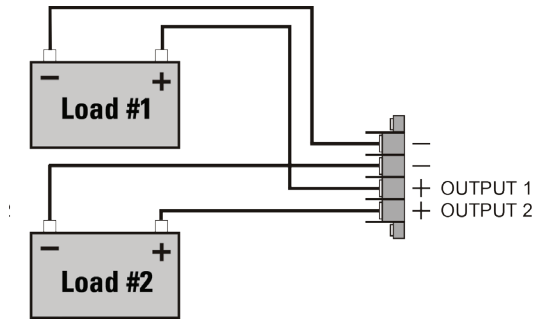
Normally these leads should be adequate to connect to the DC power source, however, if you must extend the leads, be sure to:

- Use the smallest extension length possible.
- Use a good quality (typeTEW) wire
- Use no less than 12 gauge conductors.
- Splice and solder the joints and protect the joints with heat shrink tubing.



## OUTPUT POWER CONNECTION

The unit is equipped with a 4-pin Molex BEAU Terminal strip to serve as a DC Output Connection. This connection can support up to two connected loads, the wiring for this connection can be found on the unit's label.



**IMPORTANT:** *If multiple batteries are connected to the output, they must share a common ground!*

**CAUTION:** *Do not connect the battery in the reverse polarity!*

This will activate the reverse connection protection which will blow the output fuses in order to protect the device. The unit will be inoperable until these fuses have been replaced.

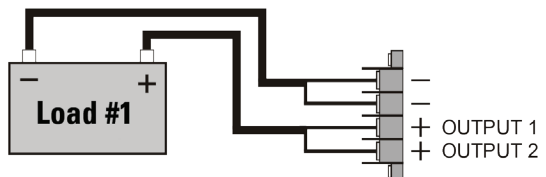
Connect the load to the terminals using an appropriate gauge of wire for the Output Current. See *Specifications* for the unit's Output Current and the table below for the necessary gauge of wire.

Max. Output Current	24.00 A	15.00 A	9.30 A	5.90 A	3.70 A
American Wire Gauge	#8AWG	#10AWG	#12AWG	#14AWG	#16AWG

Max. Output Current	2.30 A	1.50 A	0.92 A	0.58 A	0.23 A
American Wire Gauge	#18AWG	#20AWG	#22AWG	#24AWG	#28AWG

**TIP:** *If you are only powering a single load, connect it to the unit in the configuration shown.*

By connecting the load to both of the battery charger's positive output terminals, you reduce the strain on each individual connection.





# Remote Control Accessory



**IMPORTANT:** This remote is to be used only on Battery Chargers manufactured by Analytic Systems.

The remote control panel and 9-pin D-connector are an optional feature for this product line. The remote control panel allows the unit to be operated remotely and duplicates all the diagnostic LED indicators with audible alarm. A built-in dimmer switch allows you to control the brightness of the remote control LEDs.

**CAUTION:** Do not turn on the battery charger until the remote is connected!

To prevent the possibility of high voltage electrical shock, the charger must be OFF while connecting the remote control. Do not remove the dust-cover on the remote control connector if it is not being used.

**CAUTION:** Do not connect this port to a computer!

This will cause serious damage to the battery charger and computer. This damage is not covered under warranty.

Pin Number	Function
1	Dry Contact Relay (Closed for fault)
6	Dry Contact Relay (Closed for fault)
2	Remote Off (Short to 5 to turn unit OFF)
7	OverTemp (Low for fault)
3	UnderVolt In (Low for fault)
8	OverLoad (Low for fault)
4	UnderVolt Out (Low for fault)
9	+12 Volts
5	Common

## DRY CONTACT RELAY

The relay is factory preset to fail in the closed position when the LOW OUTPUT LED and buzzer come on. If you wish to have the relay fail in the open position, you must take the cover off the unit and move the jumper to the other position on J11 on the circuit board. J11 is located next to the relay.





# Troubleshooting

This unit features several LED indicators and an alarm buzzer to help diagnose any malfunctions. The voltage converter will sound the buzzer to alert you prior to shutting down. You should immediately check which LEDs are glowing to determine the cause of the shutdown.

<b>Issue</b>	<b>Meaning</b>
<b>LOW INPUT LED is ON Alarm buzzer sounds</b>	The input voltage is too low for normal operation or there may be an internal component failure.
<b>Fix:</b>	Check that the DC power source is rated for the application. Check that the input wiring and connections are not corroded or damaged.  If everything is normal, the unit is defective and must be returned to the factory or an authorized service centre for repair.
<b>OVER TEMP LED is ON Alarm buzzer sounds</b>	The unit has overheated, its internal temperature is too hot for normal operation.
<b>Fix:</b>	Remount the unit for improved ventilation and cooling or disconnect some devices from the output to reduce heat generation.  Check that the unit's cooling fans are functioning. If they are NOT, the unit is defective and must be returned to the factory or an authorized service centre for repair.
<b>Unit will not turn ON</b>	The input fuse may have blown or there may be an internal component failure.
<b>Fix:</b>	Turn the battery charger OFF and disconnect it from the power source and load. Then remove the input fuse and check if it has blown using an ohmmeter. Replace the fuse if blown.  If the new fuse blows when the unit is turned ON or the unit still doesn't turn ON, the unit is defective and must be returned to the factory or an authorized service centre for repair.
<b>LOW OUTPUT LED is ON OUTPUT ON LED is OFF</b>	The output voltage is too low for normal operation. The battery may be defective, overloaded or there is an internal failure.
<b>Fix:</b>	The battery being charged may be defective, or too much load is connected causing the battery to become severely discharged. Replace the battery or reduce the load on the system. Check that the output connection and wires have not been damaged or corroded.  If the condition persists, then the unit is defective and must be returned to the factory or an authorized service centre for repair.



# Specifications

Model	BCD305-12-24
Input Voltage Range	10.5 - 15 VDC
Input Amps (Max)	30 A
Output Voltage	27.2 ± 0.5 V
Charging Amps	*13 A
Overvoltage Crowbar Protection	Output Volts x (1.3 ± 1%)
Input Fuses	AGC-20 x 2
Output Fuses	AGC-30 x 2
Low Input Alarm Threshold	10.5 VDC
Low Output Alarm Threshold	Output Voltage minus 2.5 VDC
No. Supported Battery Banks	1 or 2 Battery Banks
Charging Profile	2-Stage
Battery Size	52 - 78 Amp-Hours
Transient Response	< 1 V for 15 A Surge
Efficiency	> 85% @ Maximum Output
Operating Temp. Range	-25 °C to +40 °C @ Maximum Output
Humidity	0 - 95% Relative Humidity (non-condensing) with standard conformal coating
Isolation	Any Input or Output to Case: 500 VDC Input to Output: Common Negative
Length	9.1 in / 23.1 cm
Width	7.8 in / 19.8 cm
Height	2.5 in / 6.4 cm
Clearance	1.0 in (2.5 cm) all around
Material and Finish	Black Anodized Marine Grade Aluminum
Fastenings	18-8 Stainless
Connections	DC Input: 2x 1-ft (0.3m) #12AWG Input Leads (Red: Positive, Black: Negative) Battery Output: 4-pin Molex BEAU Terminal Strip
Weight	4.0 lb / 1.8 kg
Safety	Built to meet CSA 22.2.107.1 & UL458
Warranty	5 Years Parts and Labor

\*The actual charging amps depends upon the Input/Output voltage ratio. To obtain the charging amps at any given Input Voltage value, use the following formula: **Charging Amps = Input Voltage/Output Voltage x 26**

For example, at 10.5VDC in and 27.2VDC out, the charging amps = 10.5 VDC/27.2 VDC x 26 = 10.0 A.

Designed and manufactured by: **ANALYTIC SYSTEMS WARE (1993) LTD.**

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## Limited Warranty

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1. The equipment manufactured by Analytic Systems Ware (1993) Ltd. (the “Warrantor”) is warranted to be free from defects in workmanship and materials under normal use and service.
2. This warranty is in effect for:
  - a. 3 Years from date of purchase by the end user for standard products offered in our catalog.
  - b. 2 Years from date of manufacture for non-standard or OEM products
  - c. 1 Year from date of manufacture for encapsulated products.
3. Analytic Systems will determine eligibility for warranty from the date of purchase shown on the warranty card when returned within 30 days, or
  - a. The date of shipment by Analytic Systems, or
  - b. The date of manufacture coded in the serial number, or
  - c. From a copy of the original purchase receipt showing the date of purchase by the user.
4. In case any part of the equipment proves to be defective, the Purchaser should do the following:
  - a. Prepare a written statement of the nature of the defect to the best of the Purchasers knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
  - b. Call Analytic Systems at 800-668-3884 or 604-946-9981 and request a return material authorization number (RMA).
  - c. Return the defective part or unit along with the statement at the Purchasers expense to the Warrantor; Analytic Systems Ware (1993) Ltd., 8128 River Way, Delta, B.C., V4G 1K5, Canada.
5. If upon the Warrantor’s examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor’s option without charge, and returned to the Purchaser at the Warrantor’s expense by the most economical means. Requests for a different method of return or special handling will incur additional charges and are the responsibility of the Purchaser.
6. Analytic Systems reserves the right to void the warranty if:
  - a. Labels, identification marks or serial numbers are removed or altered in any way.
  - b. Our invoice is unpaid.
  - c. The defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.
7. No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.
8. Only the Warrantor shall perform warranty service. Any attempt to remedy the defect by anyone else shall render this warranty void.
9. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically stated to be waterproof.
10. No other express warranty is hereby given and there are no warranties that extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.
11. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.
12. The Warrantor assumes no liability for incidental or consequential damages of any kind




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Battery Chargers • Inverters • Power Supplies • Voltage Converters

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