

ANALYTIC SYSTEMS

Power Conversion Solutions

INSTALLATION & OPERATION MANUAL

BCA1505 SERIES BATTERY CHARGER





AC SOURCE BATTERY CHARGER

IMPORTANT SAFETY INSTRUCTIONS

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

BATTERY CHARGER PRECAUTIONS

1. Do not expose the battery charger to rain or snow unless it is a sealed model.
2. Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
3. Do not disassemble the battery charger; return it to the manufacturer or an authorized service center when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire. Voltages in excess of 350 volts are present inside the charger anytime it is plugged into an AC outlet, even if it is switched off.
4. To reduce risk of electric shock, unplug the battery charger from the AC outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
5. Never place battery charger directly above battery; gases from battery will corrode and damage battery charger.
6. Never allow battery acid to drip on the battery charger.

BATTERY SAFETY

1. **WARNING — RISK OF EXPLOSIVE GASES**
 - i. **WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE SERVICING EQUIPMENT IN THE VICINITY OF THE BATTERY, YOU READ THIS USER GUIDE AND FOLLOW THE INSTRUCTIONS EXACTLY.**
 - 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**
 - i. Someone should be within range of your voice or close enough to come to your aid when you work near a battery.
 - ii. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
 - iii. Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.
 - iv. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately



- i. NEVER smoke or allow a spark or flame in the vicinity of a battery.
- ii. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit the battery or other electrical part that may cause a fire or explosion.
- iii. Remove personal metal 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 a severe burn.
- iv. NEVER charge a frozen battery.
- v. If it is necessary to remove a battery from service, always remove grounded terminal from battery first. Make sure all accessories connected to the battery are off, to prevent an arc when reconnecting the new battery.
- vi. Be sure area around battery is well ventilated.
- vii. Clean the battery terminals. Be careful to keep corrosion from coming in contact with eyes.
- viii. Study all the battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge

GROUNDING AND AC POWER CORD CONNECTION INSTRUCTIONS

The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER: Never alter the AC power cord or plug provided. If it will not fit the output, use an approved adapter or have the proper AC power cord installed by a qualified electrician. Improper connection can result in the risk of electric shock.

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

The BCA1505 AC source battery charger provides up to 1500 watts of precision charging power to charge your one or two bank battery system from a 110 or 220 VAC source. The batteries must share a common ground.

The recently-updated single board design incorporates time-tested switch-mode technology for unmatched efficiency and ultra-quiet operation. Multiple stages of filtering reduce radiated and conducted noise to MIL461 levels. In the absence of a battery, the BCA1505 can also be used as a power supply up to its continuous current rating.

This unit features output voltage adjustment and user-selectable charging profiles to fine-tune its charging capabilities in order to suit your specific needs. The voltage temperature compensation and equalize cycle functionalities help maintain and protect your expensive battery bank systems, maximizing their lifespan.

Safety features include both charger and battery over-temperature shutdown, current limiting, short circuit protection with automatic recovery, input under voltage shutdown, output over-voltage protection and battery reverse connection protection.

Box Contents

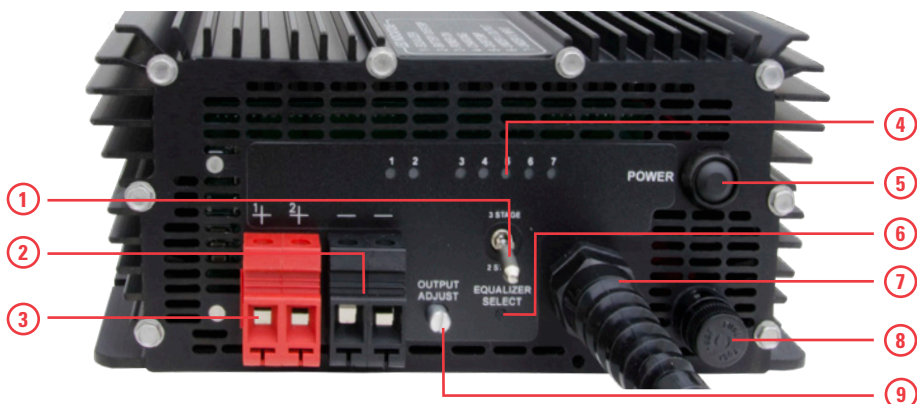
The box you have received should contain the following:

- One BCA1505 battery charger
- This manual
- One Warranty Card

If anything is missing or damaged please contact your dealer or Analytic Systems for a replacement

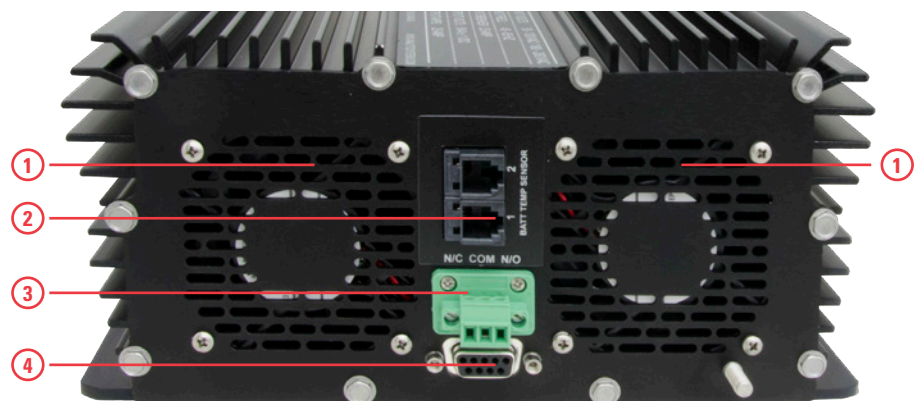


Main Parts



Front Panel

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. 2 Stage / 3 Stage Select Switch (locking toggle switch) 2. Battery Negative Output Connection 3. Battery Positive Output Connection 4. LED Indicators 5. Power Button | <ul style="list-style-type: none"> 6. Equalize Start Push button (recessed) 7. AC Power Cord 8. AC Input Fuse 9. Output Voltage Adjust |
|--|--|



Rear Panel

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Thermostatically-controlled Cooling Fans 2. Battery Temperature Sensor Connection | <ul style="list-style-type: none"> 3. Dry Contact Output Fail Relay Connection 4. Remote Control Connection |
|---|---|



Operation

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. Choose which type of charging profile will be used during charging by moving the Stage Select switch. See *Charging Profiles* for more information.
2. Move the Power Switch to ON. The alarm buzzer will sound and the LOW VOLTAGE OUTPUT LED will glow red briefly, then the POWER LED will glow green. This is normal.
3. 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.
4. 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. Press the Power Button. The alarm buzzer will sound and the LOW VOLTAGE OUTPUT LED will glow red briefly, then the POWER LED will glow green. This is normal.
2. Disconnect the battery temperature sensor(s) from the unit, if connected.
3. Rotate the Output Voltage Adjust potentiometer on the front panel to adjust the output voltage.
4. The charging (float) voltage can be adjusted over a range of ± 1.0 volts. Rotate the potentiometer clockwise to increase the voltage; counterclockwise to decrease the voltage.
5. Using a digital voltmeter, check the charging voltage at the battery terminal. Rotate the potentiometer until you are satisfied with the new voltage reading.
6. Reconnect the battery temperature sensor(s) if necessary.

TO END OPERATION

1. Press the Power Button.
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.

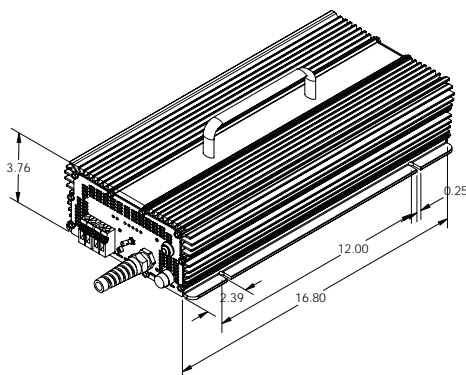


Installation

MOUNTING

Mount the unit in a DRY and WELL VENTILATED location with at least 4 inches of clearance all around it.

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



CAUTION: *The power switch must be in the OFF position before making connections.*

When connecting the battery to the unit a small arc can form between the connectors. To ensure spark-free connections, make connections only when the power switch is in the OFF position.

AC INPUT CONNECTION

This unit is equipped with a 5-foot (2.5m) power cable terminating in a NEMA 5-20 Connector (for North American models) or a CEE7/7 Connector (for European models) to serve as an AC Input Connection.

If you must extend the power cable be sure to use a 3 conductor grounded type extension cable. For hard wiring to a source of power, cut off the plug, and strip the wires as necessary.

The wire colors are as follows.

North American Plug
Black - AC Hot
White - AC Neutral
Green - Ground

European Plug
Brown - AC Hot / Phase 1
Blue - AC Neutral / Phase 2
Green/Yellow - Ground

All connections should be made inside of an appropriate junction box with appropriately rated circuit breakers used in the circuit panel to feed power to the BCA1505. See *Specifications* for the maximum input current and recommended fuses.



DC OUTPUT CONNECTION

This unit is equipped with two pairs of Phoenix VDFK Through Panel connectors to serve as Output Battery Connections. Use wires of an appropriate gauge for the expected output current to make this connection. #6AWG wiring is the recommended size of wire to use for this connection.

Ensure that the total average load connected to the batteries does not exceed the unit's charging amps. See *Specifications* for this unit's charging amps. See *Specifications* for more details regarding these values.

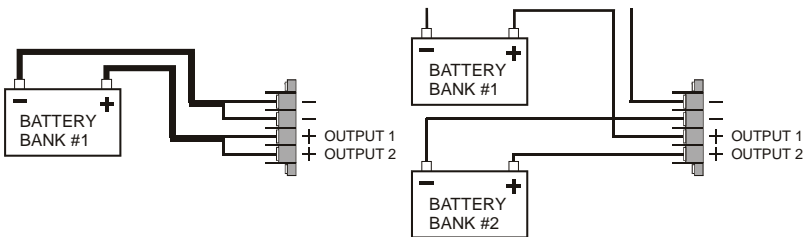
The wiring of this connection can be found on the unit's front panel label and is as follows:

Connector Colour	Wiring
Black	DC Negative
Red	DC Positive

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

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

This connection can support charging up to two battery banks that share a common ground. If you are only charging one battery bank, you may connect both of the BCA1505G's positive outputs in parallel to the battery's positive terminal in order to reduce stress on each individual output connection.



Single Bank Connection

Dual Bank Connection

NOTE: This Single Bank Connection wiring arrangement is mandatory for charging a 12 volt battery bank.



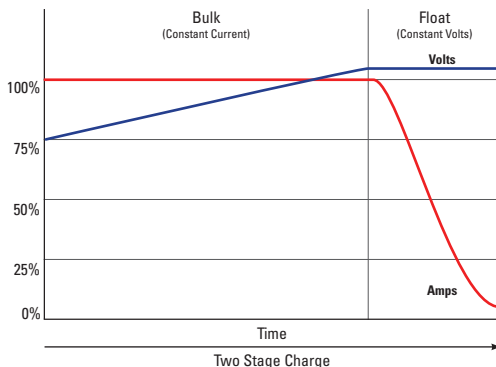
Charging Profiles

This unit has both two-stage and three-stage charging capability. You can choose which charging profile is used during operation by using the Stage Select switch on the front panel.

Below are explanations of the two profiles:

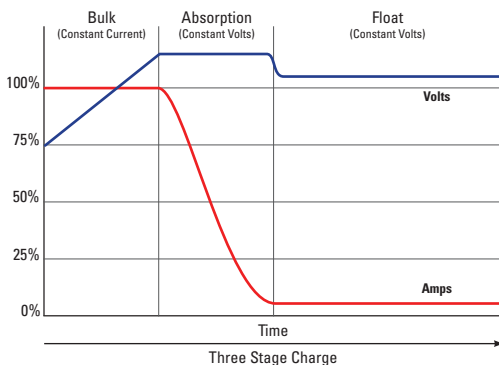
TWO-STAGE CHARGING

- The battery is charged at a constant current until the battery's voltage reaches the float voltage.
- Then the charging current diminishes as necessary to maintain the battery at that voltage.
- Once the current drops to 10%, the charging cycle is complete. The unit will maintain the battery at full charge until needed.
- Two-stage charging is gentler on the battery since the battery is subjected to lower voltages and currents than in three-stage. In addition, a reasonable load can be connected to the battery without affecting the charger's ability to keep the battery at full charge.



THREE-STAGE CHARGING

- The battery is charged at a constant current (higher than in two-stage) until the battery's voltage reaches the absorption voltage.
- Then the charging current diminishes as necessary to maintain the battery at that voltage.
- Once the current drops to 10%, the charging cycle is complete. The unit switches to keeping the battery at the float voltage and will maintain the battery at full charge until needed.
- Three-stage charging is faster than two-stage, however the battery is subjected to higher voltages and currents. Three-stage charging is not recommended for charging loaded batteries because the unit cannot differentiate between current going to a load connected to the battery and current being absorbed by the battery; this can cause overcharging.





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 inverter 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 when the low output LED and buzzer come on. Both normally open and normally closed contacts are available on the connector. If your system detects an alarm condition when the charger is operating normally, simply move the wire connected to Pin 1 of the dry contact terminal block to Pin 3, or vice versa as needed.



Battery Temperature Sensor

This unit is supplied with one battery temperature sensor. This sensor communicates the temperature of the battery to the charger and is required to access the charger’s voltage temperature compensation, battery over temperature alarm and equalize cycle functionality.



Pictured: An *Analytic Systems* Waterproof Battery Temperature Sensor (B-TEMPW)

BATTERY TEMPERATURE SENSOR CONNECTION

This unit is equipped with an Amphenol MIL-Spec PT02A8-4S connector to connect to up to two *Analytic Systems* waterproof battery temperature sensor(s). This connection’s wiring is shown on the unit’s label.

There are multiple ways to install the sensor at the battery. Regardless of which method you use, the sensor must be firmly secured to the battery. The sensor should not lose physical contact with the battery at any point in the charging cycle.

TO INSTALL THE SENSOR AT THE BATTERY, YOU MAY:

- Slide the sensor between the side of the battery and wall of the battery platform so it sits flush.
- Place the battery so it is sitting on top of the sensor to hold it in place.
- Apply a small amount of silicone RTV sealant to the sensor and stick it to the top of the battery.

VOLTAGE TEMPERATURE COMPENSATION

Heat is a normal by-product of the charging cycle. However, excessive heat can cause overcharging, damaging the battery. With a battery temperature sensor installed, your battery charger will automatically reduce the charging voltage to compensate for rising temperature.

The ambient battery temperature is set to 77°F (25°C). For each degree above 77°F (25°C), the charger will reduce the charging voltage by a small amount. See *Specifications* for the temperature compensation coefficient specific to your unit. You can adjust the voltage temperature compensation and the temperature compensation range using Analytic System’s free-to-download software PowerWizard.



Equalize Cycle

If a battery is left discharged for too long, sulfate crystals can form on its internal electrode plates. This interferes with their conductance reducing battery's capacity and charging speed.

Your battery charger can perform an Equalize Cycle to correct this condition. An Equalize Cycle ensures all the cells of the battery are fully charged; deliberately overcharging the battery at a low current (approximately 10% of its normal output) until it reaches the unit's programmed Equalize Voltage. The charger maintains the battery at that voltage for three hours after which time the Equalize Cycle ends and the battery charger resumes normal operation; maintaining the battery at the float voltage.

DANGER: An Equalize Cycle can only be performed in a well ventilated area!

Hydrogen gas is a normal by-product of the Equalize Cycle and is explosive at concentrations greater than 4% of the local atmosphere.

CAUTION: A battery temperature sensor must be installed and used!

Heat is a normal by-product of the Equalize Cycle and excessive heat will damage the battery bank. The battery temperature sensor must be connected and installed to allow the unit to monitor the temperature and ensure it is within safe operating limits.

TO PERFORM AN EQUALIZE CYCLE:

1. Connect and install the supplied Analytic Systems Battery Temperature Sensor. See *Installation* for more information.
2. Push the Equalize Button on the front panel. On some units, this button is recessed to prevent accidental operation; a ballpoint pen can be used to access it.
3. If the unit is not currently charging a battery, the EQUALIZE LED will glow red and the Equalize Cycle will begin.
4. If the unit is currently charging a battery, the EQUALIZE LED will blink red. Once the charging cycle ends, the CHARGING LED will shut off and the EQUALIZE LED will glow red and the Equalize Cycle will begin.
5. Three hours later, the Equalize Cycle will end. The battery charger will automatically resume normal operation maintaining the battery at the float voltage.



Specifications

Input Voltages					
Input Volts Nominal	110 and 220 VAC (auto switching)				
Input Volts Actual	90 - 140 and 180 - 260 VAC				
Input Amps	16 maximum (at 90 VAC in)				
Input Fuse	25 A Slow Blow Part # MDA25A				
Input Frequency	45 - 405 Hz				
Noise on Input	< 50 mV				
Output Voltages					
Output Volts Nominal	12 VDC	24 VDC	32 VDC	48 VDC	72(rail) VDC
Absorption Voltage	14.4 VDC	28.8 VDC	38.4 VDC	57.6 VDC	76.8 VDC
Float Voltage	13.6 ± 0.05	27.2 ± 0.05	36.3 ± 0.15	54.4 ± 0.2	72.5 ± 0.3
Output Voltage Adjust	+/- 0.5 V	+/- 1.0 V	+/- 1.5 V	+/- 2.0 V	+/- 3.0 V
Charging Amps	100 A	60 A	45 A	30 A	20 A
Battery Banks	1	1 or 2	1 or 2	1 or 2	1 or 2
Recommended Battery Capacity (Amp Hrs.)	200 - 600	100 - 300	75 - 200	50 - 150	40 - 120
Output Overvoltage Protection Crowbar	17.0 ± 0.05 V	34.0 ± 1.0 V	45.0 ± 0.5 V	68.0 ± 2.0 V	90.0 ± 0.3 V
Temp. Compensation Coefficient	-30 mV / °C	-60 mV / °C	-80 mV / °C	-120 mV / °C	-160 mV / °C
Duty Cycle	Continuous				
Efficiency	> 80% @ Maximum Output				
Stages	2 or 3				
Mechanical					
Dimensions	17.4 in / 44.2 cm Long x 8.35 in / 21.2 cm Wide x 4.0 in / 10.2 cm High				
Clearance	1.0 in / 2.5 cm all around				
Weight	18.0 lb / 8.2 kg				
Material and Finish	Marine Grade Black Anodized Aluminum with 18-8 Stainless Fasteners				
Connections	AC Input - NEMA 5-20 plug with 2.5 m AWG14 cable (approx. length) (North America) or CEE 7/7 2.5 m cable (Europe) DC Output - Color coded Phoenix VDFK6 terminal blocks, 60 Amp rated				
Environmental and Safety					
Operating Temperature Range	-25°C to +40°C @ maximum output. Derate Linearly 2.5% per °C from 40°C (Optional -40°C extra wide temperature operation available)				
Humidity	0 - 95% Relative Humidity (non-condensing) with standard conformal coating				
Isolation	Input-Case, Input-Output and Output-Case 1500 VDC				
Audible Noise	40 dB when fans operating				
Typical Service Life	> 10 years (87,600 hrs)				
Warranty	Three years parts and labor				
Safety	Built to meet CSA 22.2.107.1 & UL458				