



# **ANALYTIC SYSTEMS**

Power Conversion Solutions

## **INSTALLATION & OPERATION MANUAL**

### **BCD1015 SERIES Battery Charger**



An ISO9001 and AS9100 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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## **IMPORTANT & SAFETY INSTRUCTIONS**

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1. **SAVE THESE INSTRUCTIONS** — This manual contains important safety and operating instructions for battery charger
2. Do not expose battery charger to rain or snow.
3. 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.
4. Do not disassemble battery charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
5. To reduce risk of electric shock, unplug battery charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
6. Never place battery charger directly above battery; gases from battery will corrode and damage battery charger.
7. Never allow battery acid to drip on battery charger when reading gravity or filling battery.
8. **O/P CONNECTION PRECAUTIONS**  
Connect and disconnect DC output connections only after setting the I/P power switch to off position.

### **ALL BATTERY CHARGERS**

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 MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**
  - ii. To reduce risk of battery explosion, follow these instructions and those published by battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery. Review cautionary marking on these products and on engine.
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 lead-acid 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.



- v. NEVER smoke or allow a spark or flame in vicinity of battery or engine.
- vi. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.
- vii. 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 weld a ring or the like to metal, causing a severe burn.
- viii. NEVER charge a frozen battery.
- ix. If necessary to remove battery from service, always remove grounded terminal from battery first. Make sure all accessories in the vessels are off, so as not to cause an arc.
- x. Be sure area around battery is well ventilated.
- xi. Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.
- xii. Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- xiii. Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. This helps purge excessive gas from cells. Do not overfill. For a battery without cell caps, carefully follow manufacturer's recharging instructions.

Analytic Systems does not recommend the use of the BCD1015 Series Battery Chargers 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), autotransfusion 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.



## Introduction

All new Current Mode switching design offers increased power and reliability in a compact package. Extra input and output filtering reduce EMI to extremely low levels. Reliability features include an input fuse, thermal shutdown, current limiting, reverse battery hookup protection and output short circuit shutdown with automatic recovery. The output voltage is easily adjusted 1.0 volts above or below the standard output voltage. The model BCD 1015 Battery Charger supplies either 12, 24, 32 or 48 VDC from a 24, 48 or 72 VDC power source. High quality digital meters can be added (factory option) to allow monitoring of charging current and charging voltage.

## Specifications

### Input Voltages

Nominal (ip)	24	48	72
Actual (Vdc)	** 20 - 35	** 40 - 60	** 65 - 90
Input Amps (max)	66.7	34	21
Input Fuse (slow blow)	3 x ATC25	2 x ATC20	1 x ATC25

### Output Voltages

Nominal (op)	12	24	32	48
Float (Vdc)	13.6 ± 0.05	27.2 ± 0.05	36.3 ± 0.05	54.4 ± 0.05
Absorption Voltage (Vdc)	14.4	28.8	38.4	57.6
Charging Amps	60	40	30	20
Absorption to Float	9 Amps	6 Amps	4.5 Amps	3 Amps
Battery Size (Amp Hour)*	240 – 360	160 – 240	120 – 180	80 - 120
Output Fuse (ATC)	40 x 2	40 x 2	40 x 2	25 x 2
Battery Banks	1 or 2	1 or 2	1 or 2	1 or 2
Output Adjust	± 1.0 Volts			
Output Crowbar	16.0 ± 0.5 V	32.0 ± 1.0 V	43.7 ± 1.3 V	63.9 ± 2.0 V
Equalize Voltage (Vdc)	15.5	31	41.3	62
Temperature Compensation Coefficient	-30mV / °C	-60mV / °C	-80mV / °C	-120mV / °C



General	
Efficiency	> 80 % @ maximum output
Stages	2 or 3
Temp. Range	-25 to +40o C @ maximum output
Isolation	Input-Output & Input-Case 1500 Vdc (500 Vdc @ 24 V In), Output-Case 500 VDC (1500Vdc @ 48 V Out)
Length	14.5 in / 36.8 cm
Width	9.9 in / 25.1 cm
Height	5.5 in / 14.0 cm
Clearance	1 Inch (2.5 cm) all around
Material	Marine Grade Aluminum
Finish	Black Anodize / Black Powder Epoxy
Fastenings	18-8 Stainless
Weight	12 lb / 5.5 kg

\*\* Actual startup is at 22, 42, or 67Vdc Input, depending on model

\* This is Analytic Systems' suggested range. Please consult your battery manufacturer for their recommendations.

\* Specifications subjects to change without notice.

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

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# Installation

## MOUNTING

Mount the unit in a DRY location. Allow at least 4 inches of clearance around the heat sink fins for adequate cooling.

## POWER CONNECTION

The unit is supplied with power leads about 3 feet long. This should normally be adequate to connect to a source of power. If you must extend the power leads, be sure to use at least a good quality (typeTEW) AWG 8 gauge wire. The wire colours are:

- Red - Positive
- Black - Negative

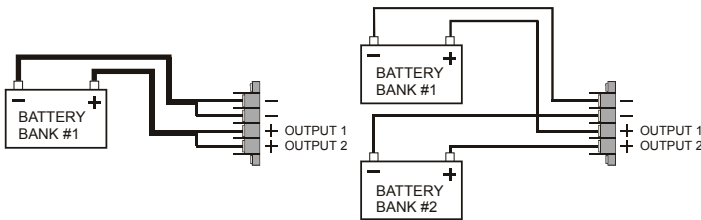
All connections should be made inside an appropriate junction box. Refer to the specifications table for the correct sizing of the circuit breaker in the distribution panel.

## OUTPUT CONNECTIONS

Two Positive output terminals and two Negative output terminals are provided. Connect only one wire to each terminal. Ensure that the total average load connected does not exceed the continuous current rating of the unit.

To ensure spark free connections the power switch must be in the OFF position prior to making the connections to the battery bank(s).

The unit may be hooked to 1 or 2 battery banks. Hook up the battery bank(s) as shown below. If you are hooking up 2 battery banks keep in mind that they **MUST** share a common ground! If you are going to hook up one battery to a 12Vdc charger, you must hook up the outputs in parallel as shown below in the left hand drawing!



## Meters

High quality digital meters can be added to the charger (factory installed only). Both outputs can be monitored for current and voltage.



## Operation

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Prior to turning on the unit, you must decide on which charging profile, 2 or 3 stage charging, to use. To help you decide, please see the following section entitled 2 or 3 Stage Charging to determine the charging profile.

Once you have decided on the charging profile you must set the switch to the correct position. To access the switch remove the cover plate (secured by 2 screws). Set the switch to the correct position as shown on the label. When you are done, replace the cover plate and securely tighten the screws.

To turn the unit on, simply move the power switch to the ON position. The alarm buzzer will sound and the Low Output LED will come on briefly, and then the green OUTPUT ON LED will illuminate.

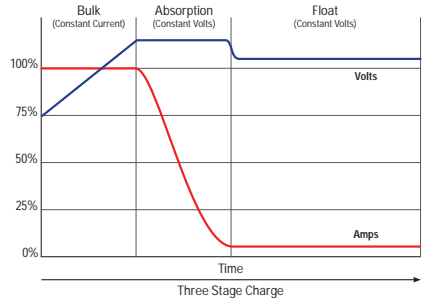
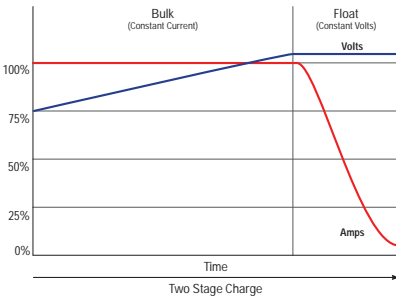
When the unit is first turned on, it will charge the batteries at a constant current and the charging light will be on. After a period of time, which may be minutes to hours, the batteries will reach the float voltage at which time the charging light will go off, and the charging current will reduce as necessary to maintain the batteries at that voltage. You may check this voltage at the output terminals of the unit with a good digital voltmeter. As shipped from the factory, the unit is preset to 13.6, 27.2, 36.3 or 54.4 VDC, which is generally recommended for lead-acid batteries. If you wish to adjust the charging voltage, remove the cover plate (secured by 2 screws) to expose the output adjust potentiometer. Reach in with a very small flat blade screwdriver to rotate the potentiometer. Please note that this adjusts both the float and absorption voltages at the same time. Clockwise increases the output voltage, and counter clockwise decreases it. When you are done, replace the cover plate and securely tighten the screws. It is advisable to check with the battery manufacturer before changing the float voltage.





## 2 or 3 Stage Charging

This charger features user selectable 2 or 3 stage charging. The charging profile is selected by moving the slide switch on the front panel left to 3 stage or right for 2 stage charging.



A two-stage charger provides a constant current until the battery reaches its rated capacity and then switches to a “float” voltage. The current then reduces as necessary to maintain the battery at the float voltage. The charger can be connected to the battery indefinitely and will provide the appropriate profile. A two-stage charger is recommended in most instances since it is the most versatile and can be permanently connected to attenuate the characteristic discharge of unused batteries. A load can be put on the battery or batteries without altering its ability to keep the battery at optimal charge.

A three-stage charger is the fastest charger. It charges the battery at a constant current until the battery voltage reaches a slightly elevated level. The battery is maintained at this voltage while the charging current diminishes to a low value, and then the battery is switched to the float voltage where it can be maintained indefinitely. However, the charger cannot differentiate between a current going to a load on the battery, or being absorbed by the battery, so it can overcharge a battery supplying current to a load. A two-stage charger is preferred for “loaded” batteries and a three-stage for idle or unloaded batteries during recharging.

All of Analytic Systems’ chargers include adjustable output voltage for charging standard or deep cycle lead-acid, VLRAs or gel type batteries.



## Troubleshooting

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This unit provides LED indicators and a buzzer to help diagnose any problems. The unit should sound the buzzer to alert you prior to shutting itself down. You should immediately check the indicators to determine the cause of the shutdown.

<b>CHARGING</b>	Indicates that the battery charger is charging the batteries: If the LED is not on, the batteries may be fully charged and the charger is supplying a float voltage to the batteries to keep them fully charged.
<b>LOW OUTPUT</b>	Indicates that the output voltage is below normal because: The current demanded by the devices connected to the unit exceeds the maximum output current rating, causing the output voltage to drop to maintain the current at the maximum level, The input voltage is not high enough for unit to operate,
<b>LOW INPUT</b>	Indicates that the input voltage is below normal because: The input voltage is not in the correct range for proper operation of the unit.
<b>OVERHEAT</b>	Indicates that the Battery Charger is running too hot because: Too much power is being drawn, turn off or unplug some devices. The Battery Charger is located in a poorly ventilated area.

If the load exceeds the continuous rating for too long a period, the temperature sensor inside the unit will turn off the outputs. After the unit cools sufficiently, it will automatically come back on. If this happens frequently, remount the unit for increased airflow so it cools better.



## Dry Contact Relay

To use your dry contact output fail relay you must connect a 9-pin D connector to the unit. You must use pins one and six as is indicated on page 10 in the remote connector diagram.

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 when the low output LED and buzzer come on, you must take the cover off the unit and move the jumper to the other position on J22. J22 is located next to the relay.

To change the position of the jumper, first turn the unit off and disconnect the unit from both the power and batteries. Next, turn the unit on for 30 seconds to discharge the capacitors, then turn it off again. Remove the eight screws holding on the cover. Turn the unit upside



To use your dry contact output fail relay you must connect a 9-pin D connector to the unit. You must use pins one and six as is indicated on page 10 in the remote connector diagram.

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To change the position of the jumper, first turn the unit off and disconnect the unit from both the power and batteries. Next, turn the unit on for 30 seconds to discharge the capacitors, then turn it off again. Remove the eight screws holding on the cover. Turn the unit upside down, remove the cover and locate J22. It will be next to the relay as is shown in the above diagram. Simply move the jumper to the desired position as is shown in the above diagram. Replace the cover and re-install the eight screws. Reconnect the unit to the power and batteries.

## BATTERY TEMPERATURE SENSORS

Up to 2 battery temperature sensors can be connected to the charger to allow temperature compensation of the battery charging voltage (1 is supplied with the unit). If only the 1 sensor is used, it MUST be plugged into the 'BATT 1' connection on the side of the unit. If no sensor is used, the charger will default to standard output voltage.

For installation instructions of the temperature sensor, please see the section entitled Remote Battery Temperature Sensor Installation.



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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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