



# **ANALYTIC SYSTEMS**

Power Conversion Solutions

## **INSTALLATION & OPERATION MANUAL**

### **IBC320** **Intelligent 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)

[www.analiticsystems.com](http://www.analiticsystems.com)



**ANALYTIC SYSTEMS**  
Power Conversion Solutions

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# IMPORTANT & SAFETY INSTRUCTIONS

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**SAVE THESE INSTRUCTIONS** — this manual contains important safety and operating instructions for battery chargers

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 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.
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 battery charger.
7. Output Connection Precautions - Connect and disconnect DC output connections only after setting the Power Switch to the 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 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.
  - v. If acid enters eye, immediately flood eye with running cold water for at least 10



minutes and get medical attention immediately.

- vi. NEVER smoke or allow a spark or flame in vicinity of battery or engine.
- vii. 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.
- viii. 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.
- ix. NEVER charge a frozen battery.
- x. 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, so as not to cause an arc when reconnecting the new battery.
- xi. Be sure area around battery is well ventilated.
- xii. Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.
- xiii. 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 AC cord or plug provided — if it will not fit outlet, have proper cord installed by a qualified electrician. Improper connection can result in a risk of an electric shock.

### **Medical Equipment Notice**

Analytic Systems does not recommend the use of the IBC 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), 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.



# Specifications

Input	
Volts	85 - 265VAC, 1 Phase, 45 - 65 Hz
Current (max) *	4 Amps w/ Inrush Protection
Input Fuse	AGC 5 Amp
Power Factor	>0.99 at Full Load
Efficiency	>90% at Full Load
*	Maximum Input Current Specified at 85 VAC

Output				
Nominal Voltage	12 VDC	24 VDC	36 VDC	48 VDC
Voltage Range **	12.0 - 15.5 VDC	24.0 - 31.0 VDC	36.0 - 46.5 VDC	48.0 - 62.0 VDC
Output Current	20 Amps	10 Amps	6.8 Amps	5 Amps
Recommended Battery Amp-Hours	100	50	37	25
Standard Temperature Compensation	-15mV/C	-30mV/C	-45mV/C	-60mV/C
Charging Stages	2 or 3 stage user selectable			
End of Charge	Float or Rest user selectable			

\*\* Actual Output Voltage determined by User Settings or by Charger Firmware

Mechanical	
Dimensions	9.5"/24.1cm Long x 8.0"/20.3cm Wide x 3.25"/8.3cm High
Clearance	1.0"/2.5cm all around
Weight	6.2 lb / 2.8 kg
Material and Finish	Marine Grade Black Anodized Aluminum with 18-8 Stainless Fasteners
Mounting	Wall or Shelf Mount
Connections	Integrated Color Coded Terminal Blocks

Environmental and Safety	
Operating Temperature Range	-25 to +40 C (-40 to +55 C Optional)
Storage Temperature Range	-55 to +85 C
Humidity	0 - 95% Relative Humidity (non-condensing)
Vibration	Built to meet MIL810g
Emissions	Built to meet MIL461f
Isolation	> 1500 VDC Input-Output, Input-Case, Output-Case
Audible Noise	None
Duty Cycle	Continuous
Warranty	Ten Years Parts and Labor
Safety	Built to meet ABS, CE, UL458 and CSA 22.2.107.1

\* Specifications subjects to change without notice.

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

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# IBC320 Intelligent Battery Charger USER GUIDE

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## Introduction

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The IBC320 Intelligent Battery Charger provides up to 300 watts of output power to charge a 12, 24, 36 or 48 volt, one or two bank battery system (batteries must share a common ground). The charger is preprogrammed for three standard types of Lead Acid batteries; Flooded (traditional Lead Acid), AGM (Absorbed Glass Mat Lead Acid) and Gel or VRLA (Valve Regulated Lead Acid). It also has a 4th custom program where all charging parameters can be adjusted to suit a particular type of battery including bulk charging current, absorption voltage, float voltage, temperature compensation and more.

This charger uses advanced Power Factor Correction circuitry on the AC input so it will work from any standard AC voltage anywhere in the world and use the electricity in the most effective and efficient way. LLC Resonant Converter Technology allows Zero Voltage/Zero Current switching on the Primary or high voltage side of the main power transformer, and Active Rectification on the Secondary or Low Voltage side offers maximum efficiency and lowest Electromagnetic Interference (EMI) to ensure that the IBC320 does not interfere with sensitive voice or data RF communication equipment.

The charger can adjust its charging voltage to match the temperature of the batteries, or in the event of a battery getting too hot, will automatically disconnect the batteries for safety. This feature requires the use of the supplied Battery Temperature Sensors. Eight dual color LEDs clearly indicate charging levels and stages as well as indicating faults with either the charger or the batteries. The 'PowerWizard' software that is free to download adds advanced charging algorithm programming and charger monitoring as well as a graphing function through the built in USB port.

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

The charger requires no maintenance other than the occasional wipe down to remove any accumulation of dust or dirt.



# Installation

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## Package Contents

The box should contain:

- One IBC320 Battery Charger,
- One Battery Temperature Sensor (a second sensor is available from Analytic Systems or your dealer at additional cost if required),
- This manual (a pdf copy can be downloaded from [www.analyticsystems.com](http://www.analyticsystems.com)),
- One Warranty Registration Card. Returning this card is not mandatory for warranty coverage, but will assist us to stay in touch with you for updates and other news. Warranty registration can also be completed at [www.analyticsystems.com](http://www.analyticsystems.com),
- PowerWizard software can be downloaded from [www.analyticsystems.com](http://www.analyticsystems.com)

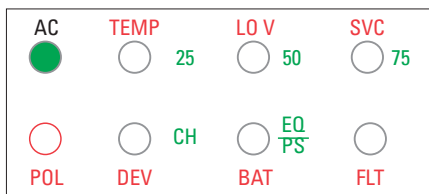
If anything is damaged or missing, please contact us immediately at 1-800-668-3884 for by emailing [sales@analyticsystems.com](mailto:sales@analyticsystems.com)

## Location

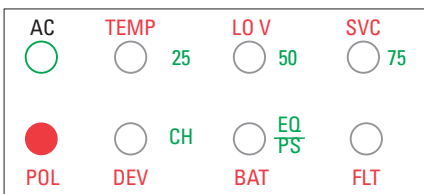
1. Mount the charger so that the indicator LEDs and controls on the front panel are reasonably easy to see and access.
2. Make sure there is at least 2 inches of clearance all around the charger so that air can circulate through the charger to keep it cool.
3. Mount the charger in a location that allows easy connection to the batteries. We recommend using AWG10 wire to connect the charger to the batteries. That is the maximum gauge of wire that the battery connection terminals will accept and provides the best protection against vibration or breakdown of the wires over time.
4. If you are connecting the charger to two banks of batteries, they **MUST** share a common ground. However, it is still a good practice to run a separate ground connection to each battery from the charger.
5. Decide where to attach the battery temperature sensors. If it is practical, embed each sensor into the battery platform so that the battery sits on top of it or if in a battery box, slide it between the battery and the box, or simply use a little silicone to attach the sensor to the top of the battery. Plug each sensor into the charger. It does not matter which port is used, as the charger always sets its charging voltage from the warmer battery. The charger will disconnect from the batteries if either battery reaches 43°C (110°F) and will automatically reconnect when the hottest battery cools to 32°C (90°F). If the temperature sensors are not used, the charger will use the default battery temperature programmed during Setup.
6. Make sure the charger is protected from water. In a marine environment, install the supplied drip shield above the charger if there is any possibility of water dripping onto it.

## Connection

### INSTALLATION INDICATORS



**AC PRESENT**

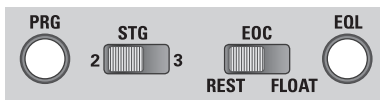


**BATTERY POLARITY REVERSED**

1. Connect the charger to the batteries before connecting to the AC mains.
2. As you complete the connection to each battery, check the 'REV' indicator light on the charger front panel. If it glows RED, the battery is connected in reverse. Stop and reverse the connections to the battery (Red should go to Positive and Black should go to Negative). After all battery banks are connected, double check that the REV indicator light is still OFF.
3. Connect the charger to the AC mains. The AC LED should illuminate. This indicates that the charger is receiving power from the AC mains and that the internal power supply is running. Turn the charger OFF again.

## Setup

Press the Power button on the front panel to turn the charger ON. The Power button will illuminate once the charger has turned on. Once the startup routine is complete, enter Setup mode by pressing and holding the PRG button for 3 seconds until you hear a one second beep and the Charge LED starts blinking



## Battery Type

Each press of the Equalize (EQU) button will advance the battery selection. The three LED's on the top will indicate Flooded, AGM and Gel when lit. The fourth press will light all three LED's if there is a valid custom configuration.

**Flooded** – The lead–acid battery was invented in 1859 by French physicist Gaston Planté and is the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, make





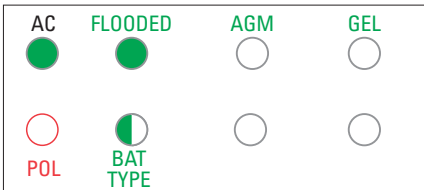
them attractive for use in motor vehicles to provide the high current required by motors. This is the Default setting.

**AGM – AGM** (Absorbed Glass Mat) batteries differ from flooded lead acid batteries in that the electrolyte is held in the glass mats, as opposed to freely flooding the plates. Very thin glass fibers are woven into a mat to increase surface area enough to hold sufficient electrolyte on the cells for their lifetime. The fibers that compose the fine glass mat do not absorb nor are they affected by the acidic electrolyte.

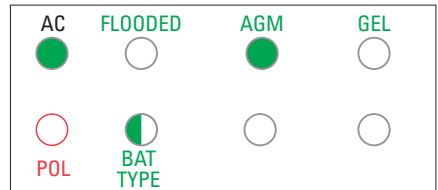
**Gel** – A modern gel battery (also known as a “gel cell”) is a VRLA battery with a gelified electrolyte; the sulfuric acid is mixed with fumed silica, which makes the resulting mass gel-like and immobile. Unlike a flooded wet-cell lead-acid battery, these batteries do not need to be kept upright. Gel batteries reduce the electrolyte evaporation, spillage (and subsequent corrosion problems) common to the wet-cell battery, and boast greater resistance to extreme temperatures, shock and vibration. Chemically they are almost the same as wet (non-sealed) batteries except that the antimony in the lead plates is replaced by calcium, and gas recombination can take place.

**Custom** – This is the mode that can be custom programmed via the USB port using the Power Wizard program on a laptop. From the factory, this profile is not programmed, and is not available unless programmed via the PowerWizard software.

### BATTERY TYPE INDICATORS



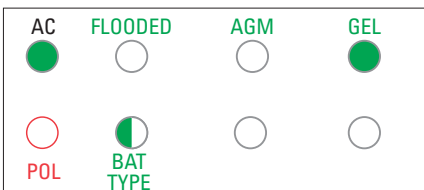
FLOODED LEAD ACID



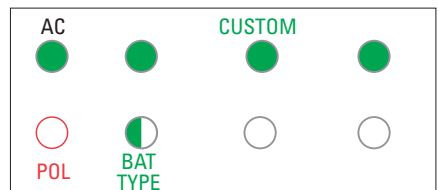
ABSORBED GLASS MAT



BLINKING



GEL

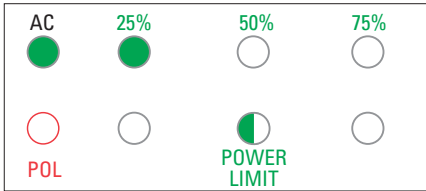


OTHER - DEFAULT L-ION

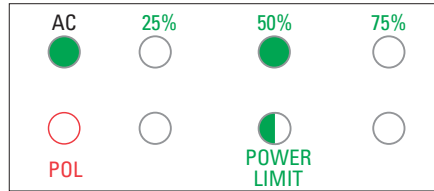
## Power Limit

Depending on the size and type of the battery or batteries connected to the charger, the standard charging current output of the charger may be more than is optimal or recommended. Refer to the documentation from your battery manufacturer to determine the maximum safe charging current. If needed, the maximum charging current can be reduced to 25, 50 or 75 percent of the rated output of the charger. The three LED's on the top will indicate 25%, 50% and 75% respectively. All three LED's will be simultaneously lit to indicate 100% charging current (Default).

### CHARGE POWER INDICATORS

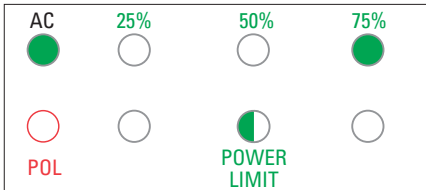


MAX CURRENT 25% OF RATED

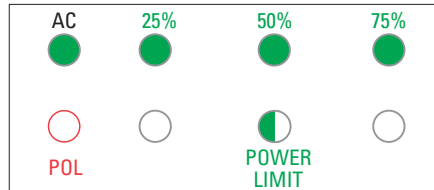


MAX CURRENT 50% OF RATED

 BLINKING



MAX CURRENT 75% OF RATED



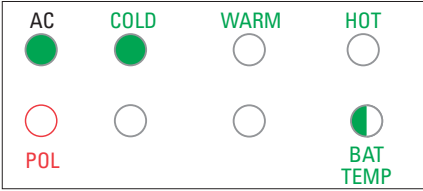
MAX CURRENT 100% OF RATED

## Default Battery Temperature

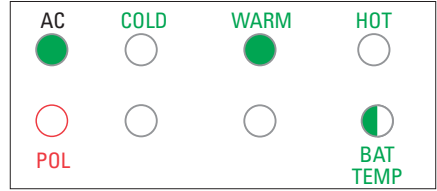
The recommended charging voltage for any type of battery will vary with temperature. The warmer the battery, the lower the charging voltage required. This adjustment will set the battery temperature to use for charge compensation if there are no installed battery temperature sensors. The three top LED's indicate Cold, Warm, Hot and Auto. Cold, Warm and Hot and correspond to battery temperatures of 10, 25 and 35 degrees Celsius respectively. In Auto, the charger measures its own internal temperature during startup, and estimates the batteries to be the same temperature and applies the appropriate compensation (Default). In the event the charger detects one or two battery temperature sensors, their measurements will take precedence.



## DEFAULT BATTERY TEMPERATURE INDICATORS



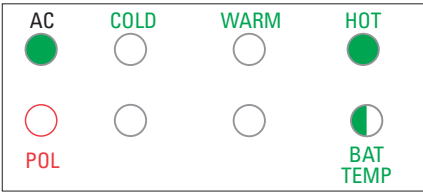
DEFAULT BATTERY TEMP 10C



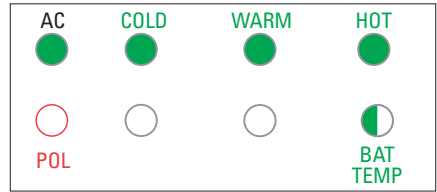
DEFAULT BATTERY TEMP 25C



BLINKING



DEFAULT BATTERY TEMP 35C



AUTO BATTERY TEMP

## Saving

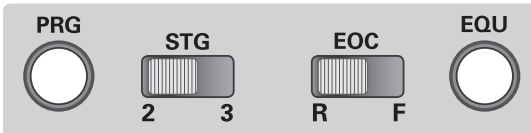
To save the configuration and exit Setup at any point in the process, press and hold the PRG button for 3 seconds until you hear a one second beep.

## Exit without Saving

To exit without saving, either press the On/Off button or do nothing. The charger will exit the configuration mode without changing the stored configuration after 60 seconds elapses without any button being pressed.

## Front Panel Adjustments

Two additional adjustments can be made from the front panel. These are to select the charging profile as well as the behavior of the charger at the conclusion of a recharge cycle.

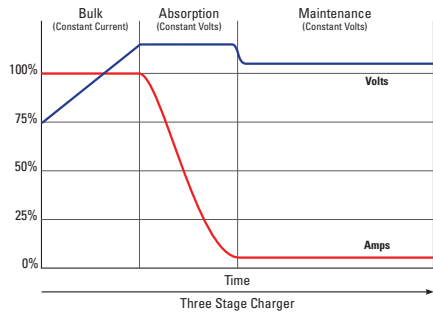
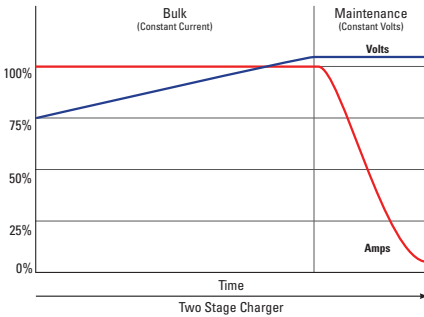


## 2 Stage / 3 Stage (STG) Profile Select

The switch on the left selects a 2 Stage or 3 Stage charging profile.

A 2 Stage charging profile consists of charging the battery at a constant current until the battery voltage reaches the Float Voltage. The charger will then maintain the battery at the Float Voltage and the current will gradually taper down. The recharge is considered complete when the charging current drops to 10% of the rated current of the charger.

A 3 Stage charging profile consists of charging the battery at a constant current until the battery voltage reaches an elevated voltage called the 'Absorption Voltage'. The charger will then maintain the battery at the Absorption Voltage until the charging current drops to 10% of the rated current of the charger OR a maximum of 3 hours (adjustable in the custom charging profile).



## End of Charge (EOC) Function Select

The switch on the right tells the Charger what to do when recharging is complete.

Moving the switch to the Left tells the charger to Rest or switch to Standby when the recharge is complete. The charger will remain in Standby until the power is cycled (either by the front panel ON/OFF button, the Power Switch on the rear panel or by cycling the external breaker) OR until the battery voltage drops to 90% of the rated voltage of the battery. Under any of these conditions, the charger will initiate a new recharge cycle. This is the position the switch MUST be in to meet the California Energy Commission regulations.

Moving the switch to the Right tells the charger to maintain the battery at the Float Voltage indefinitely. This will ensure that the battery is always fully recharged and ready for service. A new recharge cycle will be initiated only if the charger is unable to maintain the battery at if the current required to keep the battery at the Float Voltage exceeds 10% of the rated current of the charger OR by cycling the power any one of the three ways as described above.



## Operation

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Operation of the IBC320 charger is very simple. It is intended to operate fully unattended, and will attempt to recover from any fault, such as Charger Over-Temperature, Battery Over-Temperature, Insufficient Input Voltage, Power Failure and more.

In a fixed installation, presumably the charger is already connected to the battery or batteries. In a portable application, connect the charger to the battery before turning it on. Once the battery is connected to the charger, confirm that the 'REV' LED is NOT illuminated and turn on the main power switch on the rear panel. Confirm that the 'AC' LED IS illuminated (Green) and press the Power button on the front panel.

**Note:** The charger has two operating modes – Battery Charger and Power Supply. If you are not sure which mode the IBC320 is in, press and hold the lighted Power button for 3 seconds. If you hear two beeps, it is in Power Supply mode. If you hear one beep, it is in Battery Charger mode. Make sure it is in the correct operating mode for your requirements

The charger will go through a startup sequence that consists of turning the 6 LEDs controlled by the computer all Red, then all Green. Then it will step through the 3 program settings described in Setup so it is easy to see how the charger is programmed. The Power button will illuminate once the charger has completely turned on.

The charger will begin to charge the battery or batteries according to the settings that were selected during the setup. If no battery was detected during the startup of the charger, it will not turn the outputs on and will indicate a failure.

If the AC power fails or is disconnected, the charger will resume charging the batteries when AC is restored.

The IBC320 Charger is so efficient that it does not need a cooling fan to operate at maximum performance. However, in a very hot ambient environment the microprocessor will reduce power output as needed to keep the circuitry operating at a safe and reliable temperature. In extreme cases, the charger may shut off completely until it cools sufficiently to resume operation.

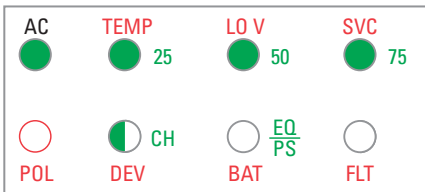
# Equalize Cycle

An equalize cycle is a deliberate overcharge of the battery at a low current to force an undercharged cell to charge up to match the charge of the good cells in the battery. This cycle should only be selected once every 6 months or thereabouts as it is hard on the good cells of the battery and can cause water loss. Initiate an equalize cycle by pressing the Equalize button. It is recessed onto the charger front panel to prevent accidental activation.

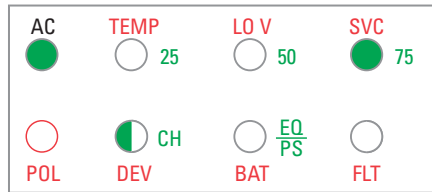
Once pressed, the Equalize light will come on flashing, indicating that an Equalize cycle has been requested. The charger will wait until the current charge cycle is complete (charge LED on solid), and the battery temperature is between 20 and 30 degrees C before the Equalize cycle will start. Once the Equalize cycle starts, the Equalize LED and Charge LED's will come on solid and the charger will charge the battery at 10 percent of its rated current for a period of 3 hours to a maximum voltage of 110% of the float setting. Once complete, the charger will return to the End of Charge mode. The Equalize cycle will also end if either battery temperature reaches 40 degrees C.

The Equalize Function is not available if the charger cannot detect at least one battery temperature sensor.

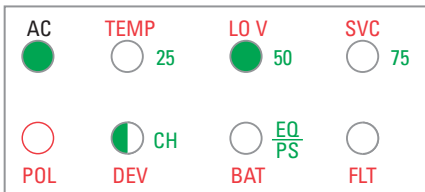
## CHARGING INDICATORS



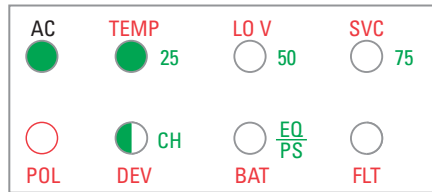
**CHARGING CURRENT > 85%**



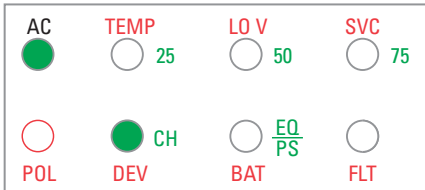
**CHARGING CURRENT 60 - 84%**



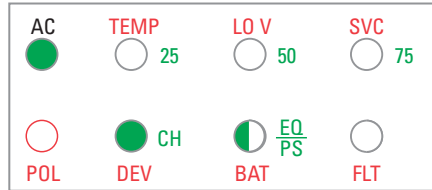
**CHARGING CURRENT > 40 - 59%**



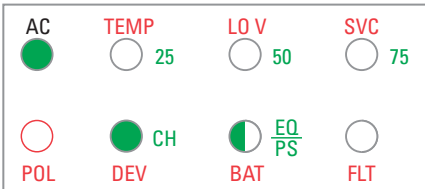
**CHARGING CURRENT 11 - 39%**



**CHARGE COMPLETE**



**EQUALIZE PENDING**



**EQUALIZING**



BLINKING



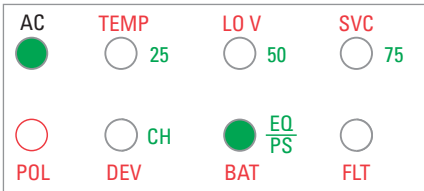
# Power Supply Mode

The IBC320 charger can be switched to Power Supply Mode at any time by pressing and holding the Power button for 3 seconds until you hear 2 beeps. This changes the operation of the charger in the following ways.

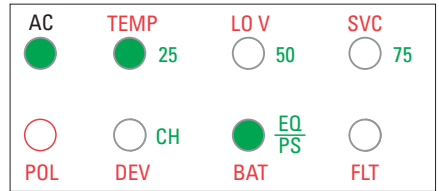
1. The outputs will turn on regardless of whether a battery is detected or not.
2. The Output Power indicator LEDs will all blink any time the output current reaches 100%.
3. The output voltage is fixed at the float voltage for the battery type selected during Setup (in case there is a battery connected).
4. The EOC switch and 2-3 Stage switch have no function.
5. There is no Equalize mode.
6. By use of the Power Wizard PC software, it is possible to customize the output voltage in Power Supply mode within the working range of the unit. To do this, go through the setup routine and select the Custom Battery profile. Then using the Power Wizard software, connect to the charger and program the float voltage for the Custom Profile to any voltage between 12.0 to 15.0 volts (scale appropriately for other charger output voltages).

The charger will remain in Power Supply mode until switched back to Charger mode by pressing and holding the Power button for 3 seconds again until you hear 1 beep

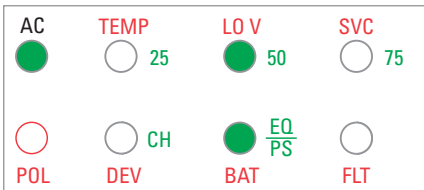
## POWER SUPPLY INDICATORS



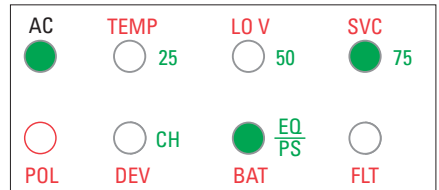
CURRENT < 10%



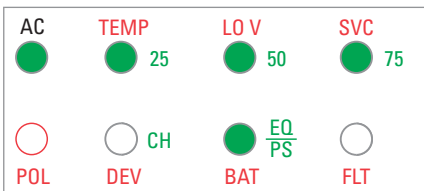
CURRENT 11 - 39%



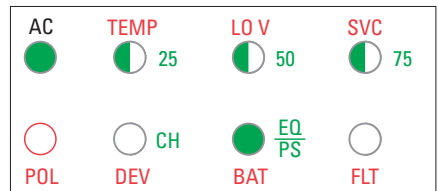
CURRENT > 40 - 59%



CURRENT 60 - 84%



CURRENT > 85%



CURRENT = 100%



BLINKING



## **Maintenance**

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The charger requires no maintenance other than the occasional wipe down to remove dust that could reduce its ability to dissipate heat, and carefully blow air through the cooling vent to remove any dust buildup on it or inside the unit.

## **Dry Contact Relay (option)**

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The charger is equipped with a 1 amp dry contact relay that can be used to indicate charger status to a monitoring system. It has both a normally open and normally closed contact which changes state depending on the presence of absence or charging voltage on the output of the charger. It is independent of the microprocessor. If the charger is producing voltage on the output, the normally closed contact will be closed and there will be an electrical connection between NC and COM. If the voltage on the output of the charger goes to zero, the contact will change state. The Normally Open contact operates exactly in the reverse of the Normally Closed contact.





## Troubleshooting

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The IBC320 charger is designed to provide years of reliable service. However in the event that it does not seem to be operating correctly, here are some things you can check.

### **AC Present LED does not come on.**

First make sure any external circuit breaker is ON. Unplug or turn off the external power to the charger. Plug any other device into the AC receptacle or use a multimeter to make sure AC is present. Remove the fuse and check for continuity with a multimeter. If the fuse is open, replace it with the recommended fuse listed on the label and reconnect or turn the power back on. The AC Present LED should come on. If it does not, then there is an internal failure and the charger will have to be returned for service.

### **Battery Overtemp Indication**

The sensor connected to the battery indicates that the battery temperature has exceeded the safe maximum limit. The charger will turn off its outputs until the battery temperature returns to a safe level, at which time the charger will resume normal operation.

### **Battery Low Voltage Indication**

If the battery is seriously discharged, and the charger voltage drops below 85% of nominal (ie. 10V for a 12V charger), the charger will alternate between its normal display and the Low Battery Voltage display until the battery voltage exceeds 85% of nominal.

### **Battery Fail Indication**

If the charger determines that the battery is defective and will not accept a charge, the charger will stop attempting to charge the battery. This condition requires action on the part of the user to replace the battery before the charger will resume normal operation. Cycling the power switch to Off and back On again in any way will reset this condition and the charger will attempt to recharge the battery again.

### **Charger Overtemp**

If the charger gets too hot, it will switch to Standby until it cools sufficiently to resume normal operation.

### **Low Input Volts**

If the input voltage drops below the minimum voltage necessary for normal operation, the charger will show display. The charger will switch to Standby and wait for the voltage to recover.

### **Charger Failed**

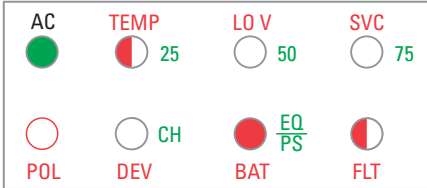
If the processor detects a condition that prevents the charger from operating, it will show this display. Try cycling the power a couple of times to see if that clears the problem. If it does not clear the display the charger will have to be returned for repair. More information on the nature of the fault can be determined by connecting to the charger using a laptop and using the Power Wizard program to see if a more detail error message is there.



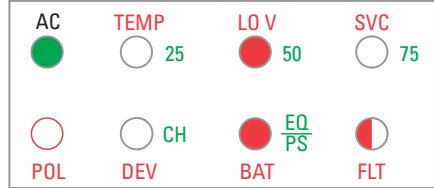
### Charger in wrong mode

The charger may be in Power Supply mode instead of Battery Charger mode. Make sure the charger is in the Battery Charging mode by pressing the Power button for 3 seconds until you hear 1 beep. If you hear 2 beeps, repeat until you hear 1 beep.

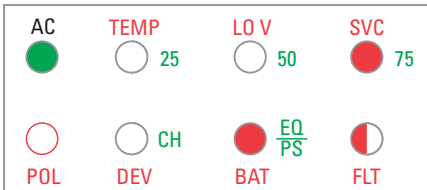
## FAULT INDICATORS



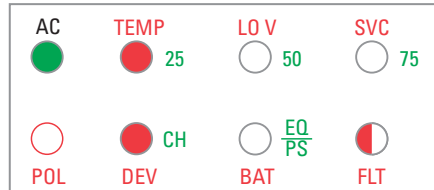
BATTERY OVERTEMP



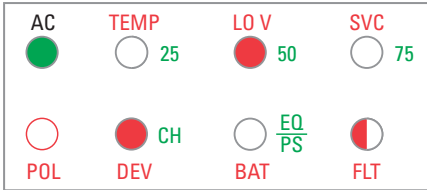
BATTERY LO VOLTAGE



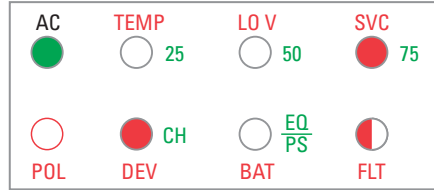
BATTERY FAILED



CHARGER OVERTEMP



CHARGER LO INPUT VOLTS



CHARGER FAILED



## Abbreviations and definitions

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We use a number of abbreviations on the labels to save space. Here are the full words corresponding to each abbreviation along with common battery charger terms and their definitions:

### **ABBREVIATIONS**

**POL** – Polarity. Refers to the correct connection of the Positive and Negative terminals of the battery to the charger.

**DEV** – Device. Refers to the charger. Used together with the Fault LED to indicate a problem with the Device.

**BAT** – Battery. Refers to the battery. Used together with the Fault LED to indicate a problem with the Battery.

**FLT** – Fault. Used to indicate a problem with the battery (BAT) or the device (DEV)

**AC** – Alternating Current

**TEMP** – Temperature. Used to indicate that either the Battery or the Device is too hot.

**LO V** – Low Voltage. Used to indicate that either the Input Voltage or the Battery Voltage is too low.

**SVC** – Service. Used to indicate that either the battery or the device needs repair or replacement.

**CH** – Charging

**EQ** – Equalize

**PS** – Power Supply

### **DEFINITIONS**

**CC** – Constant Current. Typically the first phase of a recharge cycle where a constant current is delivered to the battery until the voltage reaches a specific level.

**CV** – Constant Voltage. Typically the 2nd or 3rd phases of a recharge cycle where the battery voltage is maintained at a constant level.

**Absorption** – The first Constant Voltage stage in a 3 stage charging algorithm, where the battery is maintained at an elevated voltage for a period of time to ensure full and equal recharging of all cells.

**Equalize** – A deliberate overcharge at low current to bring a weak cell up to the same charge level as the good cells in a weak battery. Typically only performed once every few months, and only if battery exhibits reduced capacity.



Float – The second and final Constant Voltage stage in a 3 stage charging algorithm, or the only Constant Voltage stage in a 2 stage algorithm where the battery is held at safe voltage indefinitely.

Amp-Hour Capacity – The energy capacity of a battery expressed in the number of hours the battery can last a specific output current. For example, 100 Amp-Hours means that a battery can supply 100 amps for 1 hour, or 10 amps for 10 hours, etc..

C/20 Rate – The number of amps that a battery can supply for 20 hours. For example a 100 amp hour battery should be able to supply 5 amps continuously for 20 hours. Battery capacity varies with the discharge rate. The higher the discharge rate, the lower the capacity of the battery.

Deep Discharge Battery – a battery designed to have a lower maximum current capability, but can be repeatedly deeply discharged without damaging it or seriously affecting its lifespan.

Engine Starting Battery – a battery designed to produce a very high amperage for engine starting, but typically does not tolerate repeated deep discharging.



## 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.







# **ANALYTIC SYSTEMS**

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