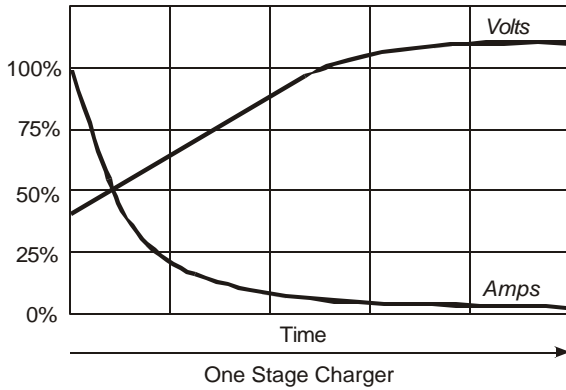


# Battery Chargers

## Which One's For You?

There are many kinds and capacities of battery chargers. However, there are three major types – One-stage, two-stage and three-stage chargers.



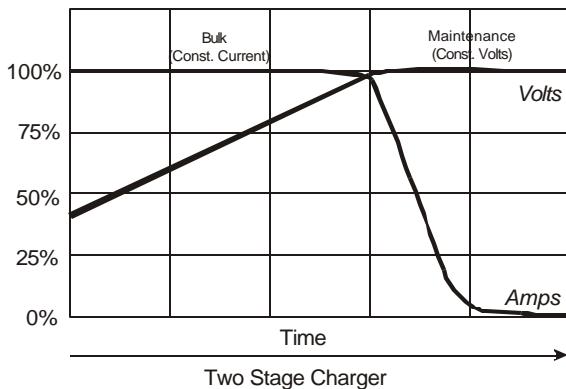
The ordinary one-stage charger you buy from the local auto-parts store is inexpensive, but it charges slowly and cannot completely re-charge a battery to its rated capacity. There are no automatic voltage or current shifts during the charge cycle and without monitoring, overvoltage and water loss can cause premature battery failure.

Analytic Systems does not make nor recommend one-stage chargers because they easily damage the battery by warping its plates or

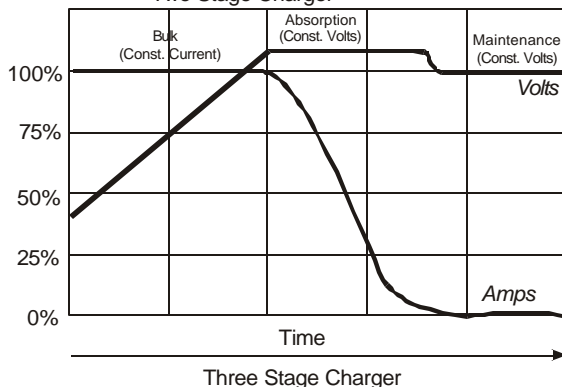
boiling it dry, effectively destroying it. A two or three-stage charger is recommended because both adjust current and voltage according to the battery's requirements.

The choice is between a two or three-stage charger, depending upon its use:

- If there are permanent or transient loads on the battery during charging, a two-stage charger has the advantage because its circuits cannot be “fooled” into pushing a higher “absorption” voltage than required for charging.
- Without loads during charging, the three-stage charger has the advantage because it provides a more complete recharge.



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. 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 most complete 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”

# Battery Chargers

batteries and a three-stage for idle or “unloaded” batteries during recharging. Analytic Systems chargers which offer 3 stage charging can be switched to 2 stage if required by simply moving a slide switch.

**Equalize cycle recharges weak battery cells:** One additional charging cycle is available on certain charger models. This is called the ‘equalize’ cycle. An equalize cycle is manually initiated by pressing a switch on the charger. The charger will wait until it reaches the end of the absorption stage before beginning the equalize. Once equalize begins the charger applies a current of 10% of maximum (ie. 4 amps for a 40 amp charger) for 3 hours or until the battery voltage reaches 30% above nominal (15.6 volts for a 12V battery). The purpose of this cycle is to deliberately overcharge the good cells of a battery while allowing a weak cell to be fully charged. As this deliberate overcharging of the battery causes some water loss, it should only be performed once per month or when battery capacity appears to be diminished. In addition as the battery temperature is elevated by this cycle, a temperature sensor is supplied to monitor battery temperature. It serves to modify the charging voltage of all cycles according to battery temperature, as well as shutting the charger off if the battery temperature exceeds 120 degrees F or 49 degrees C. This cycle is an available option on all BCA610, BCD610, BCA1000 and BCD1000 series chargers.

Analytic Systems makes many different types of chargers to meet your requirements, whether it be recreation vehicle, marine, locomotive, heavy equipment, emergency installations, airplane or helicopter use. They are available as two-stage or two and three-stage chargers capable of charging one or two banks of 6, 12, 16, 24, 32, 36, 48 or other voltage battery banks up to 48 volts and are designed to quickly charge and condition batteries. They will extend a battery's useful life and performance so it is ready to respond when needed.

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

The BCA610, BCA1000, BCD610 and BCD1000 series chargers are available with up to 2 optional high quality meters. These can be 2 ammeters for monitoring the charging current in each bank of batteries, one ammeter and one voltmeter to monitor overall charging, or 2 voltmeters to monitor the voltage in each bank of batteries.

All models (except portable) are available with an optional remote control. This allows on/off control as well as audible and visual indicators of power on, charging, input undervoltage, output undervoltage and charger over-temperature from any convenient location.

## Charger Sizing

Your battery manufacturer is the best source of information regarding the charging amps to best recharge your battery. If you don't have this information, we recommend you divide the amp-hours of the battery or battery bank by 4 and by 6. This will give you the range of charger sizes which will provide reasonable recharge times without overheating the batteries. For example, a 100 AH 12V battery could be charged by a 16 amp to 25 amp charger. From 110 VAC, you would choose the BCA310-110-12 (20 amp) for this battery.

Analytic Systems makes two stage or two/three-stage chargers with the following features:

- Longest guarantee in the business
- AC or DC sources available
- Portable or fixed installations
- Available in 110 & 220 volt AC source

# Battery Chargers

- Available in 12 to 360 volt DC source
- Reverse polarity protection
- Over-Temperature protection
- Short circuit protection
- Remote controls available
- Robust, reliable construction
- Integrated circuits
- Overload protection
- Advanced, compact designs
- 300, 600 or 1000 watts of charging power
- One or two independent battery banks
- Spark Free connection to the batteries
- Dry Contact 'Charger Fail' Relay standard on all models

## Care, Feeding & Motivation of Your Battery

A stored or unemployed battery will self-discharge. Typically, a lead-acid battery will lose between 0.5 to 1.0% of its charge every day it sits idle, waiting for your attention. In less than 3 months, it will have pined away to half its rated capacity. In just over 5 months it will be dead. The lonely lead-calcium (sealed type) will grieve away at 0.15 to 0.3% per day. So, just from indolence, your brand-new battery will not meet half of your expectations after 7 months of idleness. Don't allow your battery to sulk and learn bad behaviour. Keep it interested and happy in its work. Extend its life. Give it a two or three stage charger for company.

## AC Source Chargers

Analytic Systems' AC Input battery chargers use the latest Current Mode PWM controller IC technology and represent the culmination of years of development effort. Features include precision output voltage control, output short circuit protection, 2 or 3 stage charging topology, visual and audible indicators for input undervoltage, output undervoltage and over-temperature. Extra filtering on the inputs and outputs reduce EMI to the lowest possible levels to reduce or eliminate interference with other devices such as VHF and Sideband transceivers.

## Fixed BCA Series (AC Source) Battery Charger Selection Guide:

Battery Volts	AC Source Volts 45-65 Hz	Charging Amps	Banks	Charger Stages	Model
12	105-125	20	2	2 or 3	BCA310-110-12
12	105-125	40	2	2 or 3	BCA610-110-12
12	105-125	60	1	2 or 3	BCA1000-110-12
12	210-250	20	2	2 or 3	BCA310-220-12
12	210-250	40	2	2 or 3	BCA610-220-12
12	210-250	60	1	2 or 3	BCA1000-220-12
16	105-125	16	2	2 or 3	BCA310-110-16
16	105-125	30	2	2 or 3	BCA610-110-16
16	105-125	60	1	2 or 3	BCA1000-110-16
24	105-125	10	2	2 or 3	BCA310-110-24
24	105-125	20	2	2 or 3	BCA610-110-24
24	105-125	40	2	2 or 3	BCA1000-110-24
24	210-250	10	2	2 or 3	BCA310-220-24
24	210-250	20	2	2 or 3	BCA610-220-24
24	210-250	40	2	2 or 3	BCA1000-220-24
32	105-125	7.5	2	2 or 3	BCA310-110-32

# Battery Chargers

Battery Volts	AC Source Volts 45-65 Hz	Charging Amps	Banks	Charger Stages	Model
32	105-125	16.5	2	2 or 3	BCA610-110-32
32	105-125	30	2	2 or 3	BCA1000-110-32
48	105-125	11	2	2 or 3	BCA610-110-48
48	105-125	20	2	2 or 3	BCA1000-110-48
48	210-250	11	2	2 or 3	BCA610-220-48
48	210-250	20	2	2 or 3	BCA1000-220-48

## DC Source Chargers

Analytic Systems' BCD Series battery chargers operate from a DC source and use a variety of switchmode designs with MosFet or IGBT based circuitry. They offer reliability, efficiency, clean DC power without ripple or "noise" and minimum size for optimum charging. Additional protection features include reverse input protection, current limiting, short circuit protection and reverse battery protection. An output overvoltage crowbar circuit protects any batteries being charged by the unit from excessive voltage in the event of a circuit failure.

## Fixed BCD Series (DC Source) Battery Charger Selection Guide:

Battery Volts	DC Source Volts	Charging Amps	Banks	Charger Stages	Model
12	10 - 14	◆ 26	1	2	BCD305-12-12
12	10 - 14	◆ 42	1	2	BCD605-12-12
12	20 - 45	25	2	2	BCD300-32-12
12	20 - 45	50	1	2	BCD600-32-12
12	100 - 140	20	2	2 or 3	BCD310-110-12
12	100 - 140	40	2	2 or 3	BCD610-110-12
12	100 - 140	60	1	2 or 3	BCD1000-110-12
12	230 - 280	20	2	2 or 3	BCD310-250-12
12	230 - 280	40	2	2 or 3	BCD610-250-12
12	230 - 280	60	1	2 or 3	BCD1000-250-12
12	280 - 360	20	2	2 or 3	BCD310-300-12
12	280 - 360	40	2	2 or 3	BCD610-300-12
12	280 - 360	60	1	2 or 3	BCD1000-300-12
16	10 - 14	◆ 20	1	2	BCD305-12-16
16	10 - 14	◆ 40	1	2	BCD605-12-16
16	20 - 45	20	2	2	BCD300-32-16
16	20 - 45	40	1	2	BCD600-32-16
24	10 - 28	◆ 13	1	2	BCD305-12-24
24	10 - 28	◆ 21	1	2	BCD605-12-24
24	30 - 45	20	2	2	BCD300-32-24
24	30 - 45	38	1	2	BCD600-32-24
24	100 - 140	10	2	2 or 3	BCD310-110-24
24	100 - 140	20	2	2 or 3	BCD610-110-24
24	100 - 140	40	2	2 or 3	BCD1000-110-24
24	230 - 280	10	2	2 or 3	BCD310-250-24

# Battery Chargers

Battery Volts	DC Source Volts	Charging Amps	Banks	Charger Stages	Model
24	230 - 280	20	2	2 or 3	BCD610-250-24
24	230 - 280	40	2	2 or 3	BCD1000-250-24
24	280 - 360	10	2	2 or 3	BCD310-300-24
24	280 - 360	20	2	2 or 3	BCD610-300-24
24	280 - 360	40	2	2 or 3	BCD1000-300-24
32	100 - 140	7.5	2	2 or 3	BCD310-110-32
32	100 - 140	15	2	2 or 3	BCD610-110-32
32	100 - 140	30	2	2 or 3	BCD1000-110-32

◆ Actual charging rate depends upon input voltage, specifically the input/output voltage ratio.

*Now, why would you want to charge one 12 volt battery from another 12-volt battery?*  
**It is great in an emergency as Jim Hargrove, Analytic's president, found out. The morning of race-day, his race car had a dead battery - and no AC available for a quick charge. Ordinary replacement batteries would not fit in the tight space. In the nick of time, his mechanic hooked a BCD605 between the tow vehicle's battery and the race car battery. At race time, it was ready to go!**

## Portable Chargers

Any Analytic Systems charger can be prepared as a Portable Charger with generous leads and oversize alligator clips, rubber feet, a carrying handle, and all the features of the comparable fixed model. We offer standard part numbers for some of the more common models.



# Battery Chargers

Portable BCA Series (AC Source) Battery Charger Selection Guide:

Battery Volts	AC Source Volts 45-65 Hz	Charging Amps	Charger Stages	Model
12	105-125	20	2	BCA310P-110-12
12	105-125	40	2	BCA610P-110-12
12	105-125	60	2	BCA1000P-110-12
16	105-125	15	2	BCA310P-110-16
16	105-125	30	2	BCA610P-110-16
16	105-125	60	2	BCA1000P-110-16

Portable BCD Series (DC Source) Battery Charger Selection Guide:

Battery Volts	DC Source Volts	Charging Amps	Charger Stages	Model
12	10-14	◆ 26	2	BCD305P-12-12
12	10-14	◆ 42	2	BCD605P-12-12
12	20-45	25	2	BCD300P-32-12
12	20-45	50	2	BCD600P-32-12
16	10-14	◆ 20	2	BCD305P-12-16
16	10-14	◆ 32	2	BCD605P-12-16
16	20-45	20	2	BCD300P-32-16
16	20-45	38	2	BCD600P-32-16

◆ Actual charging rate depends upon input voltage, specifically the input/output voltage ratio.

## Battery Charger Options

Option	Available For
Remote Control Panel	All chargers except portable models
Single or Dual Output Meters	All 610 and 1000 series Chargers
Custom Battery Voltage	All chargers, from 6 to 48 volts
Custom Input Voltage	Input voltages from 12 to 360 volts DC