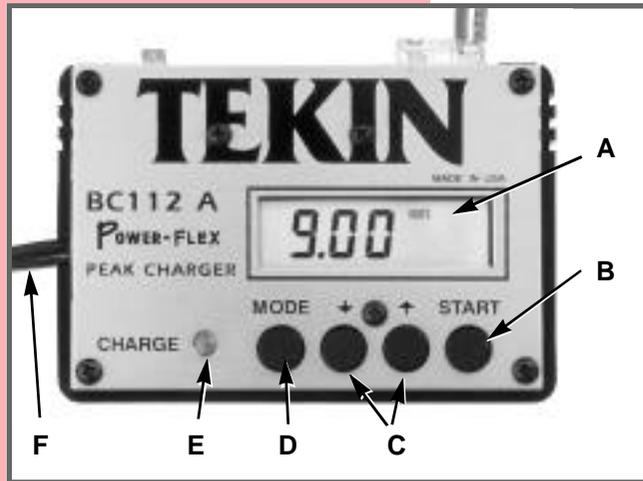


## OWNER'S MANUAL

# BC 112A & 112C

### Professional Digital Charger's with Power Flex™



- A) Digital Display with Annunciators
- B) Charge Start Button
- C) Set Buttons
- D) Mode Select Button
- E) Indicator LED
- F) Output Cable

# TEKIN

ELECTRONICS, INC.

MADE IN THE USA



MICROPROCESSOR  
CONTROLLED

- Accepts 10-24 volts DC (both models) or household AC input (112C only).
- Uses TEKIN's exclusive high-performance Power-Flex™ Negative Pulse battery conditioner circuit.
- Microprocessor controlled optimized charge profiles, and custom multi-function LCD display with annunciators.
- 0 to 10 amp linear charge output with adjustable trickle charge.
- Dual 12 bit high-precision analog to digital converters.
- 33 kHz high-frequency switch mode power supply for cool, efficient operation under all conditions.
- Proprietary Adaptive Sensing peak detection monitors the charge profile and detects the correct optimum shut-off point.
- Compact, dependable, lightweight construction.
- Expandable to a complete charge/discharge-matching and test system.

## POWER SOURCE SELECTION

The BC 112 series charger's can use virtually any power source that puts out between 10 and 24 volts DC, with a current rating of at least the maximum the amperage at which you wish to charge. You can use any regulated supply or lead-acid battery up to a maximum filtering to smooth the pulsating DC. The power supply voltage must be equal to or greater than the peak voltage to which you wish to charge your batteries. 12 volts is a sufficient input to fast charge 7 cells. Up to 12 cells in series can be fast charged with an input of 24 volts. If the power source is not rated for at least 50% of the charge current set on the BC 112, the charge will terminate early.

**Caution:** *If you use a lead-acid (automotive) battery as the power source, make sure you have good ventilation. Lead-acid batteries emit explosive hydrogen gas when they are being charged. Do not charge a lead-acid battery anytime a TEKIN charger is also connected to it.*

The BC 112 has an internal high-frequency, ripple-free buck switch mode power converter which steps down the supply voltage to whatever is needed by the battery pack. This way you can use a 24 volt supply to charge a single 1.2 volt cell without excessive heat buildup in the charger. When the voltage is stepped down, the amperage is stepped up. For this reason, an amp meter on your power supply will not show the true charge current. You may be charging the Ni-Cads at 10 amps, but the BC 112 may only be drawing 1 amp from the power supply. Use the meter on the charger for an accurate reading of the charge current.

**Connection:** Once you have selected a suitable power source, connect the large RED positive(+) clip of the charger to the POS (+) terminal of the power source, and the BLACK negative (-) clip to the NEG (-) terminal of the power source.

## AC POWER SOURCE (Model BC 112C only)

**Warning:** this appliance is not a toy! Improper or unsafe use of this or any other AC powered device can be hazardous. Do not operate or plug in the unit near water or moisture. Not for use outdoors, except under dry, controlled conditions. Always unplug the charger when not in use. If the AC power cord becomes frayed, worn, burned, or damaged in any way, you should immediately shut off the power at the breaker box then unplug the unit from the AC outlet. A damaged charger should not be used until it can be properly serviced. Do not attempt to open or repair the charger yourself. Never insert objects into the cooling vents on the charger.

The BC 112C has a built-in 120 VAC power supply which will charge 1 to 12 Ni-Cad cells to a full peak at up to 10 amps. To use, first unplug the DC power cord from the back of the charger. This will keep the clips from accidentally shorting and blowing the fuse. Plug the AC power cord from the charger into any suitable outlet. Be sure to keep soldering irons and sharp objects away from the power cord.

The BC 112C is available for use with different AC voltages. The standard voltage is 120 volts for the USA. If your charger is intended for use with voltage other than 120, it will have a tag attached to its power cord indicating so. In this case, use only the voltage specified on the tag. The BC 112C is designed, however, to work properly on 220-240 volts when marked 220. -1-

If fully charged your batteries under low AC line voltage conditions, which is often the case in racetracks.

You may use a second Tekin charger plugged in to the extra power plug on the back of the BC112C. Use only a charger rated for 24 volts input, such as a BC112A or 110L. This will allow you to use 2 chargers from the same power supply. When doing so, it is recommended that you set both chargers to a total current of 10 amps or less (5 amps on each charger, for example.) If you operate the charger at over 120 watts total output, its power supply may become too warm and shut down for a few minutes until it cools. This is usually not a problem when charging 7 cells or less. If shutdowns occur, a small fan may be used to help keep the internal power supply cool, or you may reduce the charge amp rate. The power supply will come back on in a few minutes.

## FUSE

If an overload occurs or improper connection is made, the fuse will blow. In this case, disconnect the power and remove the fuse by pulling it straight out. Then replace with a 15-20 amp automotive style plug-in fuse (model 112A uses two fuses). Do not use a fuse rated higher than 20 amps, or the charger could become damaged.

## POWER-FLEX CIRCUIT

Normally a cell will noticeably begin to lose its edge and crispness to throttle response after just a few hard runs. This is caused by a gradual buildup of impurity and crystal formation inside the cell, which is unavoidable. With each run the impurities increase, resulting in increasing internal resistance, and therefore reduced voltage and power output. Discharging the battery fully after each run will help reduce this to a certain extent, but the only way to totally minimize this deterioration, and even actually reverse any previous deterioration, is to use the TEKIN Power-Flex process. Power-Flex makes your batteries perform like no other charge process can, and releases horsepower beyond what even a new fresh cell could deliver.

The Power-Flex circuit is a refined version of the Pro-Flex circuit introduced by Tekin in 1989. Power-Flex works by periodically turning off the charge current, and applying a short-duration, high-amperage discharge pulse of negative current to the battery. This so called "burping" of the battery acts to relieve the pressure buildup which occurs inside a cell during charging, and to restore its chemical balance. The net result is that the cell stays cooler during the charging process, and delivers more voltage and capacity under a load. With the BC112, the amount of Power-Flex conditioning that occurs is computer controlled. There are three user-settable levels.

## CONNECTING THE NI-CAD BATTERY PACK

The BC1112 has a factory installed Tamiya-style JST connector. If this is the type of connector used on your batteries then just unplug the clip leads from the charger and plug the battery pack right in. For other plug types, you may wish to install a mating connector on the charger. If you use the alligator clips, you should solder some stub wires onto the battery pack and clip onto them. The alligator clips should be clipped onto soft, multi-strand wire to insure that a good connection(s) is made. A poor connection can cause the charger to "false peak" and turn off before the charge is completed.

*Important note: Kyosho-style packs use the same JST connectors as Tamiya, but may be wired in reverse from that of the charger. Please be sure the positive (+, red) and the negative (-, black) wires are matched with the red and black wires on the charger.*

## PRECAUTIONS

- a) The heatsink and /or panel may become warm in operation; use caution.
- b) Output adapter cables should be no more than 7 inches longer than the original cables.
- c) The heatsink and panel are electrically live, and should not touch any wires, batteries, or grounded automobile parts. This will cause a short to occur and blow the fuse.
- d) Do not use a fuse rated higher than 20 amps, or the charger can become damaged.
- e) Keep at least 3 feet (1 meter) away from any operating transmitters to avoid erratic operation while charging.
- f) Never connect an electric motor to the battery charger.

**New Battery Warning:** Brand new battery packs may exhibit unusual voltage characteristics the first time they are fast charged. There may be erratic voltage, and no peak causing the charger to overcharge the batteries. For this reason, you should manually monitor the battery for the first charge. If the battery becomes excessively warm, take it off the charger.

## CHARGER SETTINGS and DISPLAY MODES

The BC112 charger settings and display modes are selected by pressing the MODE button. Each time this button is pressed, the LCD display will change to show the current mode and / or setting. A "Display Mode" is one used to monitor a particular parameter while charging. A "Set Mode" is one where a value input setting is required, and is shown by the SET annunciator being lit. To change a setting, press MODE until the display shows both desired parameter and set annunciators, then use the set buttons (arrows) to change the setting.

## DISPLAY MODES

### **VOLTS:**

Displays voltage from 0 to 19.99 volts. When a Ni-Cad battery is connected to the charger the display shows the Ni-Cad's voltage. If no Ni-Cad is connected, the display shows the input voltage from the power supply. As a battery is charging, the voltage will slowly rise. When the battery voltage reaches its highest value (peak) the fast charge will shut off.

### **AMPS:**

Displays the current (0 to 10.00 amps) that is flowing into the battery. The reading will be 0.00 unless there is a battery connected and charging.

### **TIME:**

Displays the elapsed time of the most recently started fast charge cycle in hours and minutes. When charging is complete, the time reading is stored until the next charge cycle is started.

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### **A/HR:**

Displays the charge capacity in amp-hours (0 - 19.99 AH). This is the energy put into the battery over the duration of the charge, and equals the charging current multiplied by the charging time, or "coulombs". How much energy is put into a battery while charging is a good indication of how much discharge capacity it will deliver. A battery with a discharge capacity rating of 2000mAh needs a least 2.0 A/Hr of energy to fully charge it from a dead state. When charging is complete, the capacity reading is stored until the next charge cycle is started.

### **VOLTS PEAK:**

Displays the voltage at which the battery peaked during the charge. The peak is the highest voltage the battery reaches before the voltage begins to drop and ends the charge cycle. The peak voltage is stored until the next charge is started.

## SET MODES

**Note:** Not all set modes are available while charging.

### **AMPS SET:**

This set mode allows you to adjust the desired charge current from 0 to 10.00 amps. The setting is saved in the charger's memory and is recalled the next time you use the charger, even if all power is removed. See section entitled "Selecting the Charge Amperage" for help on choosing the proper current setting.

### **AMPS SET TRKL:**

This allows you set the trickle (slow charge) current at amperage values from 0 to .5 amp (0 - 500mA). Unless the setting is at 0.0, current will flow into the battery anytime it is connected to the charger. The SET TRKL value is kept in memory for the next time you use the charger. See "Selecting the Charge Amperage" for help on choosing the proper settings.

### **TIME SET:**

This mode is for setting the duration of a Timed Charge, and can be set for up to 1hr 59 minutes. During a timed charge, there is no peak detection; the charge cycle lasts for the time you set, regardless of the battery voltage. You must reset the charge time duration each time you wish to do a timed charge. See the section entitled "Start Button and Charge Profiles" on how to start a Timed Charge.

### **PF1-3 and OFF:**

This is the Power-Flex Mode. In this mode there are 4 available settings; PF1, PF2, PF3, and PF OFF. PF1 is minimum conditioning, mostly used for SCR cells. PF2 is the normal setting, used for SCRC, SCE, P-170, 2000 mAh or for general Ni-Cad charging. PF3 may also be used regularly, but is especially recommended for maximum conditioning of cells in poor condition, or when recharging cells that have not had a chance to rest overnight since their last run. Selection the wrong level of conditioning will not damage to the cells, but they may not attain optimum performance. The Power-Flex setting will remain in memory for the next time you use the charger. The charge light will blink when Power-Flex is active.

## START BUTTON and CHARGE PROFILES

The BC112 is equipped with several charge profiles. Pressing the START button sequences through these settings. Each time the START button is pressed, the next charge profile in the sequence is displayed. The each time you press the button, the charger waits for 2 seconds to see if you will press the start button again to get to the next setting. If START is not pressed again within 2 seconds, the charger will begin charging with the selected charge profile. Multiple presses of the START button will press the charge profiles in order as explained below.

### First Press: "OFF"

Charging current is shut off. Trickle Charge current will still flow if a non-zero value is entered in the SET-TRKL mode.

### Second Press: "P"

Charge Profile "P": This method is for a **normal Peak charge**. Power-Flex is enabled, unless it is turned off in the PF mode setting. Use this method only if one of the other methods does not fit better.

### Third Press: "P2"

Charge Profile "P2": This is the **Re-Peak** profile. Power-Flex is always OFF, and the peak detection is delayed to optimize your battery voltage just before a run. The cells become warmer with this setting.

### Fourth press: "CS"

This is the **Cold Start** profile. Use this method for Ni-Cads that have been fully discharged. The microprocessor will automatically read just the amperage, Power-Flex will follow the voltage curve throughout the charge cycle to attain the best possible results. The first few minutes of the charge will be at a lower amperage than what you had set; this is normal. DO NOT EVER use the CS profile on a battery that is not at least 50% discharged, or it could get damaged by over-charging.

### Fifth Press: Time Charge

Charges for a set amount of time. There is no peak detection, even if the batteries become overcharged. The display shows a countdown minute time of the charge. The time will count down until it reaches zero, at which point the charger will shut off. Before starting a time charge, you need to enter the desired time in the TIME-SET mode.

**Note:** When using the "P" or "P2" charge profiles, you may set the AMPS SET value to 12 amps (rather than 10). The charger will operate at this higher setting for 3 minutes then automatically adjust back down to 10 amps. This feature is most useful for peaking to the highest voltage.

### Sixth Press: "OFF"

The charger shuts off and returns to the top of the sequence.

### INDICATOR LED:

The Indicator LED will glow brightly while fast charging, and will blink slowly to indicate when trickle current is flowing. If Power-Flex is turned on, the LED will pulse occasionally during the charge cycle.

## TIMED CHARGE

To start a Timed Charge, press the MODE button until TIME SET is displayed, then use the SET (arrow) buttons to enter a time. Next, press the START button (5 times) until the time clock is displayed. The charger will run for this amount of time, which you set in the TIME SET mode.

## SELECTING THE CHARGE AMPERAGE

### FAST CHARGING

Most Ni-Cad batteries can be fast charged at 2 to 3 times their rated hourly capacity without adverse effects. If you have the Power-Flex turned ON, you can safely go to 4 times the rated capacity. Ni-Cad batteries are usually rated for capacity in milliamp hours (Mah). A milliamp is 1/1000th of an AMP. A 2000 Mah battery should be charged at 4000 (2000\*2) TO 6000(2000\*3) milliamps, which is equal to 4.0 to 6.0 amps. A 1200 mAh cell would be charged at 2.4 - 3.6 amps. *Unless you are in a rush, it is usually better to charge at the lower end of the range.*

There are many different cell types on the market. Some cells, such as P-170 (purple), SCRC (black), and 2000mAh (brown) deliver maximum run time but are more sensitive in their charge procedure requirements. If they were just run, always let these cells cool before fast charging. These cells should be discharged fully at least once every 2-3 runs. Never charge them at more than 3 times the rated capacity, except possibly just for a few minutes before running, to get an initial surge of power. Other cell types, such as SCR (red) can withstand charging at higher amperages. You can charge these safely at up to 4 times the rated capacity by using Power-Flex. Your dealer can help you determine the best way to charge the cells you have.

When charging 12 cells, you may need to set the current below 4 amps. Otherwise the peak voltage can exceed 19.99 volts, which will cause the charger to shut off before it reaches a full peak.

### TRICKLE CHARGING

Trickle or slow charging is usually done at 1/10th of the rated capacity. On a 2000 MAH battery this would be 200mA or .20 amps. Trickle is used to "top off" the capacity and equalize a battery that has been fast charged. Trickle can also be used without a previous fast charge. It would take about 12 to 16 hours to completely charge a dead battery with trickle alone.

When trickle charging at very low currents (less than .05A) the indicator LED may not flash. You may check the trickle current by using the AMPS display mode.

## MISCELLANEOUS TIPS & TRICKS

When using the Power-Flex with cells that have not received regular Power-Flex conditioning, it is common for the charger to false peak and trip off several times before charge is complete. This is due to erratic cell voltage as Power-Flex conditions cells reduced impedance. Either turn the Power-Flex off, or leave it on and restart the charge a few times. After Power-Flex has been used on the cells a few times, they will no longer false peak.

When using a DC power supply, try to get one as powerful as possible for best results. A 13 to 14 volt power supply will allow a better, higher peak of 7 cells than a 12 volt power supply or lead-acid battery will. A power supply with good filtering and regulation provide more reliable peaks, especially when using several chargers on one power supply, or when using Power-Flex.

You may disable the key buzzer by pressing both middle buttons simultaneously. The buzzer is reset on by momentarily removing all power from the charger.

### Warming:

Always make sure your cells are cool before beginning a fast charge. If you have just run the car, let the cells cool for about an hour before recharging. This is critical for performance and cell life, as Ni-Cad cells do not accept a full charge at temperatures over about 80 degrees Fahrenheit. After charging the cells let them cool completely. This usually takes at least 20 minutes. You may then re-peak them until they are slightly warm to the touch. They will then be ready to run.

### PRE-CHARGING:

If you wish to get the best possible performance out of your batteries, you will need to first discharge the pack before charging. Fully discharging cells is one of the most effective ways to prevent memory, power loss and capacity loss. With P-170, SCRC and 2000 mAh cells, this should always be done. The pack should first run down in the way of normal use, then do one of the following.

Place an approximately 30 ohm, 10 watt resistor across the battery pack. The resistor will cool off when the cells discharge in about 30 minutes. It can then be removed and the pack allowed to rest for preferably at least 24 hours before charging.

Place a single 1 ohm 5 watt resistor across each individual cell. This method is slightly better, as each cell then gets discharged independently of the other, thereby ensuring a fully matched discharge. These resistors are available as accessories at most hobby shops.

### Optional Add-On Discharger/Cycler:

A precision electronic discharger is available from Tekin as an add-on module for BC112 series. This unit, model number DIS-350, will test, cycle, and match your batteries for absolutely maximum performance. It discharges at up to 30 amps, (45 amp peak) and will train your cells to run stronger, longer. The DIS-350 can be used by itself, connected to the input-output connectors and expansion wire on the side of the charger for automatic cycling.

## TROUBLESHOOTING

Almost all problems are caused poor or loose connections that trip the peak detector when the wires are bumped or moved. Make certain the charger wires are tightly connected to the battery pack. Any connectors should be clean (use motor spray) and tight. Alligator clips are best clipped to piece of multi-strand flexible wire so the teeth can sink in.

**A)** When using a 12 volt automotive charger or external AC power supply, line surges or dropouts will occasionally cause problems.

**B)** If the unit slow charges, but will not fast charge when you press the start button, the output wires may be shorted or hooked up in reverse.

**C)** Be careful not to hook up the charger backwards as the fuse may blow. You can replace the fuse yourself with a 20 amp unit.

**D)** If the power supply, battery, fuse, and all connections all check out okay and the charger either stays on or off all the time, or blow fuses, then the MOSFET transistor inside the charger may have been damaged. This can happen if the unit is shorted, overheated or connected to an improper power supply.

**E)** If it should ever be necessary to return unit to factory for repair, be sure to enclose a note stating the nature of the problem, the return address, shipping instructions and any special instructions. Most repairs are shipped back out within 3 days, C.O.D. Please allow up to 2 weeks for shipping.

## ERROR CODES

If something abnormal occurs while charging, the display may show one of the following error codes:

### **ECO:**

Internal reset has occurred. This is usually caused by static. Charge must be restarted.

### **EC2:**

Indicates a problem with the power supply. The charge current has dropped below the selected amperage value. The power supply may not be strong enough to maintain the selected charge current. Try charging at a lower amperage setting by changing the value in *AMPS SET* mode. If this does not work, the problem may be from power supply disturbances or line transients.

### **EC5:**

Indicated excessive current flow. Check to see if the battery is connected backwards or shorted.

### **EC6:**

This error code is caused by the Ni-Cad being connected to the charger backwards (reverse polarity). Reconnect the battery correctly, and restart.

**ECF:** A high amp surge over 25 amps occurred due to a line voltage surge, and the charger shut down to avoid blowing a fuse. Try charging again.

## ABOUT TEKIN

TEKIN's products are designed with racers in mind, and are suitable for use by anyone. Our standard off-the-shelf items have won World Championships without any additional enhancements. Many of our products use exclusive, or patented circuits to deliver the performance you need. With TEKIN, you always get the right features and accessories to do the job.



Ultra-precise, high-density, computer controlled, automated assembly machines ensure that you get consistent high quality.



TEKIN maintains a staff of highly knowledgeable and skilled technicians. Most repairs are completed in 2 to 3 working days. All TEKIN products carry a limited warranty which guarantees new units to be free of factory defects for 120 days from the date of original purchase.

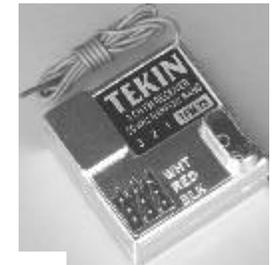
## LIMITED WARRANTY

TEKIN ELECTRONICS, INC. guarantees this battery charger to be free from factory defects in materials and workmanship for a period of 120 days from date of purchase, verified by sales receipt. This warranty does not cover; suitability for specific application, components worn by use, application of reverse or improper voltage (fuse provides protection in most cases), tampering, misuse, or shipping. Our warranty liability shall be limited to repairing units to our original specifications. In no case shall our liability exceed the original cost of the product. By the act of using this battery charger, the user accepts all resulting liability. Batteries and other equipment damaged in connection with the use of this device are NOT covered by this warranty.

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### *Race all of TEKIN's expert gear...*

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FM Chrome Micro Receiver



Digital Motor Dyno



AM Ultra Micro Receiver

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**TEKIN Electronics, Inc.** • 940 Calle Negocio • San Clemente, CA 92673  
Phone: (714) 498-9518 • Fax: (714) 498-6339