

# BC-9000 Field Calibration Procedure

CF1\_FIELDCAL\_BC9000 Revised 03/16/2013

## INTRODUCTION:

The BC-9000 Battery Charger will recharge 12 and 24 volt lead-acid and nickel cadmium batteries. Battery charging amperage resolution is 0.01 amp from 0.050 to 2.50 amps and 0.1 amp from 2.6 to 25 amps. The battery charger voltage range is 3.0V to 36.0V. When operating at 3.0V the maximum amperage is 2 amps. The AC power input is universal 100V to 240V. The charger can charge in 1 or 2 steps, maximum run time limit on each step, and operate in constant voltage or constant current mode. The recommended calibration interval is 1 year.

## SCOPE:

This document provides instructions on how to perform the annual calibration for the BC-9000. The calibration is broken down into the following categories:

- Verify timing accuracy
- Calibrate the BC-9000 charger output voltages.
- Calibrate the BC-9000 charger output current.

## TEST EQUIPMENT REQUIRED:

1. CF1 test device. (Available from Advanced Power Products (626) 969-7227 or Concorde Battery (626) 813-1234). or calibrated 100mv/100A shunt
2. Calibrated Fluke 87 DMM or equivalent. (for 450 Hz measurement)
3. Calibrated 5½ digit DMM Fluke 8840A or equivalent.
4. Two (2) test leads with alligator type clips ends.
5. Anti-static wrist strap.
6. 24 Volt 25 Amp or greater battery to calibrate charger output amps.
7. Battery loading device capable of loading the battery at 25 amps.

## PROCEDURE:

### INITIAL SETUP:

1. Photo copy the Calibration Work Sheet on page 8.
2. Set the BC-9000 on a stable suitable work surface.
3. Set the Power switch to the OFF position. Unplug the BC-9000 from the AC power source.
4. Attach anti static wrist strap to chrome fan guard and your wrist.
5. Remove the 12 lid screws. Remove the lid. *Note: There are lethal AC*

*voltages present when the lid is removed. Follow all high voltage safety precautions.*

6. Locate the display circuit board located on the inside of the front panel and REMOVE the plastic jumper shunt across pins 1 & 3. See Figure 1 for the location of the jumper shunt.

#### **VERIFY TIMING ACCURACY MEASUREMENT:**

1. Set Fluke 87 DMM to measure frequency.
2. Use shielded test probe wires or twist non shielded probe wires together to maximize measurement accuracy.
3. Connect DMM minus - to TP1 on the display circuit board. See figure 1 for the location of TP1 and TP2.
4. Connect DMM plus + to TP2 on the display circuit board.
5. Turn ON the BC-9000 power switch.
6. After the sign on message the unit will display "Code:". The UP and DOWN buttons will increase or decrease the digit's number value. The NEXT button will advance to the next digit. Using the UP, DOWN, and NEXT buttons, enter the code of "1234". Press NEXT.
7. The unit will display "CAL VOLTS". Press UP 2 times. The unit will display "CHK 450Hz". Press NEXT.
8. Verify the Fluke 87 DMM frequency is 449.8 Hz to 450.2 Hz (450 Hz  $\pm$ 0.2 Hz).
9. Write the Frequency measurement reading into the calibration work sheet. (450 Hz) If the frequency is not 449.8 Hz to 450.2 Hz, the unit must be sent in for repair. The crystal oscillator should provide an accurate time base for the entire life of the BC-9000. If the unit fails this test, it is an indication that the crystal time base may have been damaged.
10. Turn OFF the BC-9000 power.

#### **Calibrate Charger:**

1. Attach anti static wrist strap to chrome fan guard and your wrist. You will need a discharged 24V battery that can accept a 25A charge, CF1 current shunt, and a DMM. All Voltage OUT and DISP require the DMM and not connected to a battery. All Amperage OUT and DISP require a battery and a DMM connected to the CF1 current shunt. Note: the current flow is into the battery instead of out of the battery which causes the polarity of the current flow to be reversed.
2. Connect the DMM leads to the grey connector using the two (2) test leads. The DVM V red lead connects to the gray power connectors positive (+) pin. The DVM common black (-) lead connects to the gray negative (-) pin. After the sign on message the unit will display "Code:". The UP and DOWN buttons will increase or decrease the digit's number value. The NEXT button will advance to the next digit.

- Using the UP, DOWN, and NEXT buttons, enter the code of “1234”. Press NEXT. The unit will display “CAL CHARGER”. Press NEXT. Press UP. The unit will display OUT 3.0V. Press NEXT. Press the UP or DOWN button so your DMM reads as close as possible to 3.0V. Note: 2.9V is closer to 3.0V than 3.2V. If the difference is equal choose the higher voltage. Press NEXT to save the calibration.
3. Press UP to select DISP 3.0V. Press UP or DOWN button to get as close as possible to 3.0V on the LCD display. Press NEXT to save the calibration.
  4. Press UP to select OUT 8.9V. Press UP or DOWN button to get as close as possible to 8.9V on the DMM. Press NEXT to save the calibration.
  5. Press UP to select DISP 8.9V. Press UP or DOWN button to get as close as possible to 8.9V on the LCD display. Press NEXT to save the calibration.
  6. Press UP to select OUT 9.0V. Press UP or DOWN button to get as close as possible to 9.0V on the DMM. Press NEXT to save the calibration.
  7. Press UP to select DISP 9.0V. Press UP or DOWN button to get as close as possible to 9.0V on the LCD display. Press NEXT to save the calibration.
  8. Press UP to select OUT 17.9V. Press UP or DOWN button to get as close as possible to 17.9V on the DMM. Press NEXT to save the calibration.
  9. Press UP to select DISP 17.9V. Press UP or DOWN button to get as close as possible to 17.9V on the LCD display. Press NEXT to save the calibration.
  10. Press UP to select OUT 18.0V. Press UP or DOWN button to get as close as possible to 18.0V on the DMM. Press NEXT to save the calibration.
  11. Press UP to select DISP 18.0V. Press UP or DOWN button to get as close as possible to 18.0V on the LCD display. Press NEXT to save the calibration.
  12. Press UP to select OUT 36.0V. Press UP or DOWN button to get as close as possible to 36.0V on the DMM. Press NEXT to save the calibration.
  13. Press UP to select DISP 36.0V. Press UP or DOWN button to get as close as possible to 36.0V on the LCD display. Press NEXT to save the calibration.
  14. The next set of calibration steps require measuring the current flow into a battery. Connect you DMM in series between the battery negative and charger negative. Use the 200mA connections on you DMM to get the maximum resolution. Connect a alligator clip wire between the battery plus and charger plus. Set your DMM to the

- 200mA scale. Press UP to select OUT 0.05A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 50mA on the DMM. Press NEXT to save the calibration.
15. Press UP to select DISP 0.05A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 0.05A on the LCD display. Press NEXT to save the calibration.
  16. Reconnect you DMM to use the 10A measurement. Press UP to select OUT 2.5A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 2.5A on the DMM. Press NEXT to save the calibration.
  17. Press UP to select DISP 2.5A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 2.5A on the LCD display. Press NEXT to save the calibration.
  18. The next steps require the CF1 calibration shunt. Connect the battery to the CF1 calibration shunt. Connect the DMM to the CF1 and select the 200mV scale. 1mV will be 1A. Press UP to select OUT 25.0A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 25.0A. Press NEXT to save the calibration.
  19. Press UP to select DISP 25.0A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 25.0A on the LCD display. Press NEXT to save the calibration.

### **To calibrate charger:**

These are the charger menu items and what you should do at each menu item.

EXIT

OUT	3.0V	connect to volt meter
DISP	3.0V	connect to volt meter
OUT	8.9V	connect to volt meter
DISP	8.9V	connect to volt meter
OUT	9.0V	connect to volt meter
DISP	9.0V	connect to volt meter
OUT	17.9V	connect to volt meter
DISP	17.9V	connect to volt meter
OUT	18.0V	connect to volt meter
DISP	18.0V	connect to volt meter
OUT	36.0V	connect to volt meter
DISP	36.0V	connect to volt meter

OUT	0.05A	connect to a 24V battery
DISP	0.05A	connect to a 24V battery
OUT	2.5A	connect to a 24V battery
DISP	2.5A	connect to a 24V battery
OUT	2.6A	connect to a 24V battery

DISP 2.6A connect to a 24V battery

OUT 25.0A connect to a 24V battery (may require 25A load 24V load)

DISP 25.0A connect to a 24V battery (may require 25A load 24V load)

**FINALIZATION:**

1. Attach anti static wrist strap to chrome fan guard and your wrist.
2. Locate the display circuit board located on the inside of the front panel and REINSTALL the plastic jumper shunt across pins 1 & 3. See Figure 1 for the location of the jumper shunt.
3. Turn ON BC-9000 power. After sign on message, the unit will display "Charge 1? ". The unit is ready for use. Turn OFF BC-9000 power.
4. Disconnect the BC-9000 from the CF1 calibration device.
5. Disconnect the CF1 calibration device from the battery.
6. If this wasn't done already, write the DMM calibration due date in work sheet.
7. Write the BC-9000 serial number in work sheet. The serial number is located on the rear of the case.
8. Sign and date the calibration work sheet.
9. Install the lid and attach it with the 12 screws.

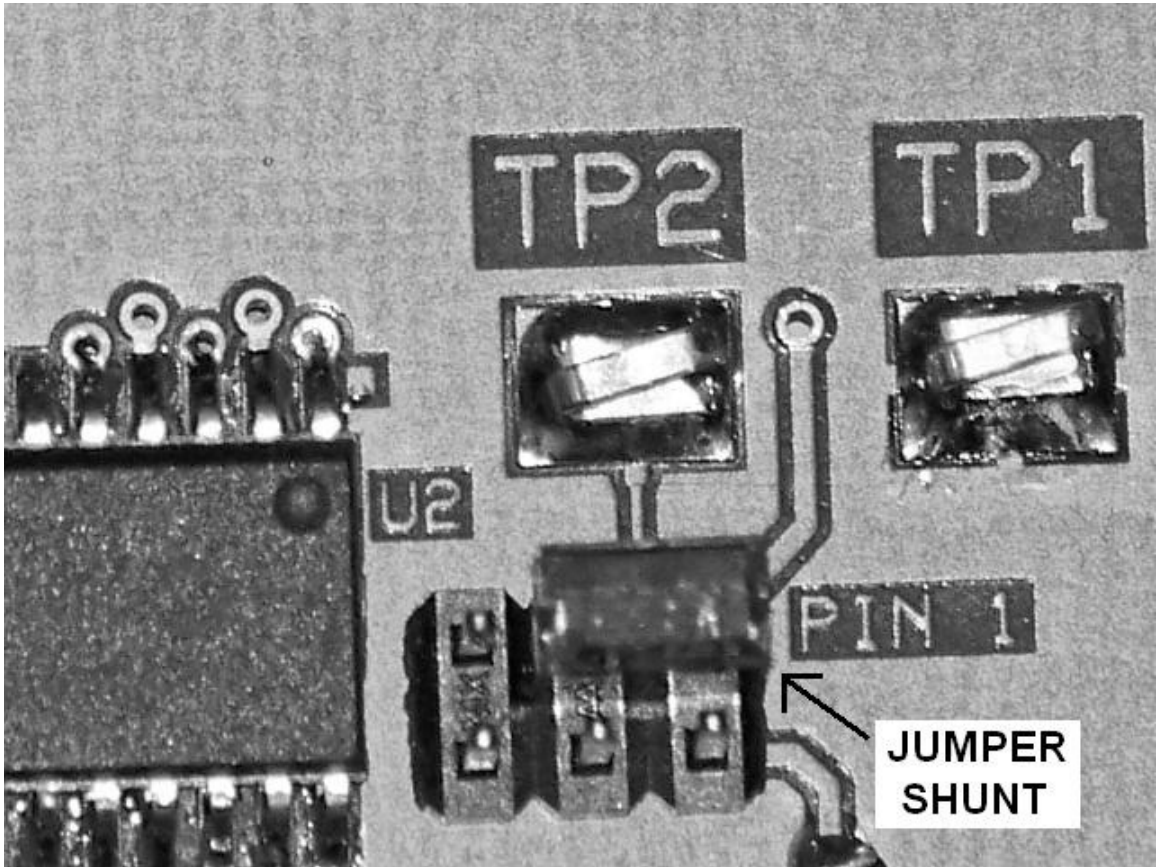


Figure 1

## CALIBRATION WORK SHEET

RECORDS - BC-9000 S/N \_\_\_\_\_

Item name	Measured value	Specification	Pass	Fail
450 Hz		449.8 - 450.2 Hz		
Vout 3.0		Close's value to Vout		
Dsp 3.0				
Vout 8.9				
Dsp 8.9				
Vout 9.0				
Dsp 9.0				
Vout 17.9				
Dsp 17.9				
Vout 18.0				
Dsp 18.0				
Vout 36.0				
Dsp 36.0				
0.05 Amp calibration				
2.5 Amp calibration				
2.6 Amp calibration				
25 Amp calibration				

Digital Multi Meter used to measure 450 Hz calibration expiration date: \_\_\_\_\_

Digital Multi Meter used to calibrate Voltage and Amperage calibration expiration date: \_\_\_\_\_

BC-9000 Calibration performed

as specified by: \_\_\_\_\_ Date: \_\_\_\_\_