

BC-8000 Field Calibration Procedure 55 AMP

CF1_FIELDCAL_BC8000 Revised 9/8/2012

Charger section can be used on a BC-9000 Version 1.00

INTRODUCTION:

The BC-8000 Battery Capacity Analyzer and Charger will perform capacity testing of 12 and 24 volt lead-acid batteries and charge the batteries. Capacity testing amperage setting resolution is 0.1A for tests in the range of 0.5A to 15A and resolution of 1A for tests from 15A to 55A. The micro processor controlled unit uses quartz crystal timing and will accurately measure the capacity of a fully charged battery with a rating between 0.5 and 55 amp-hours. Amperage selection resolution is 0.1A for a load of 0.5 to 14.9 amps and 1A resolution for 15 to 55 amps. The BC-8000 saves the date, time, test parameters, and test results. It is equipped with a USB interface. With the BC Report software the user can retrieve data from the BC-8000 to create a printable report that includes test settings, test results, time and date of test, and a battery discharge voltage graph. The BC-8000 is line powered and easy to operate. The recommended calibration interval is 1 year.

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 36.2V. 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.

SCOPE:

This document provides instructions on how to perform the annual calibration for the BC-8000. The calibration is broken down into the following categories:

- Verify timing accuracy
- Calibrate Cutoff at 10.00 Volts
- Calibrate Cutoff at 20.00 Volts
- Calibrate 0.5A, 2.0A, 8.5A, 15A, and 55A calibration points
- Calibrate the Seiko clock chip (This is optional. The clock is calibrated at the factory and requires adjustment if the time keeping accuracy is unacceptable. The date and time are set to the current PC time by the BC-8000 report utility every time test results are transferred from the BC-8000 to the report utility)
- Calibrate the charger voltages and currents.

TEST EQUIPMENT REQUIRED:

1. CF1 test device (this is available from Concorde).
2. 12 Volt 55 Amp or greater fully charged battery used for 0.5A, 2.0A, 8.5A, 15A, and 55A calibration.
3. 24 Volt 1 Amp or greater fully charged battery or a 24 Volt 1 Amp regulated power supply used to calibrate voltage and verify timing accuracy.
4. Calibrated Fluke 87 DMM or equivalent. (for 450 Hz measurement)
5. Calibrated 5½ digit DMM Fluke 8840A or equivalent.
6. Calibrated Frequency counter with 1 second period measurement and 7 digit or more readout.
7. PC computer with BC Report utility software installed.
8. Anti-static wrist strap.
9. 24 Volt 25 Amp or greater battery to calibrate charger.

PROCEDURE:

INITIAL SETUP:

1. Photo copy the Calibration Work Sheet on page 8.
2. Attach anti static wrist strap to chrome fan guard and your wrist.
3. Remove the 8 lid screws. Remove the lid.
4. Connect CF1 test device ring terminals to the 24V power source. RED lead to the positive terminal of the power source and the BLACK lead to the negative terminal of the 24V power source.
5. Verify unit is OFF. Connect the BC-8000 to the VOLTAGE OUTPUT CONNECTOR on the CF1 test device. It is the connector that has two #16 AWG smaller wires.
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-8000 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-8000. If the unit fails this test, it is an indication that the crystal time base may have been damaged.
10. Turn OFF the BC-8000 power.

ADJUST 10.00 and 20.00 VOLT CUTOFF:

1. Set DMM to a voltage range of 0-200 Volts.
2. Connect DMM minus - to VOLT minus - test point on the CF1 test device.
3. Connect DMM plus + to VOLT plus + test point on the CF1 test device.
4. Turn ON the BC-8000 power switch.
5. 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.
6. On the CF1 test device, select the 10 Volt range and turn the voltage adjustment knob to obtain a voltage of 10 volts \pm 0.010 volts on your DMM.
7. The unit will display: "CAL VOLTS". Press NEXT. The unit will display "CAL Volts? 10", press NEXT. The unit will display the voltage on the right and the word "ADJUST".
8. Use the UP and DOWN buttons to make the display read "10.00". Press NEXT to save the calibration data. Wait for the word "SAVED" to appear then disappear.
9. Write the DMM Voltage reading into the calibration work sheet. (10 volt cutoff)
10. On the CF1, select the 20 Volt range and turn the voltage adjustment knob to obtain a voltage of 20 volts \pm 0.010 volts on your DMM.
11. The unit will display: "CAL VOLTS". Press NEXT. Press UP. The unit will display "CAL Volts? 20", press NEXT. The unit will display the voltage on the right and the word "ADJUST".
12. Use the UP and DOWN buttons to make the display read "20.00". Press NEXT to save the calibration data. Wait for the word "SAVED" to appear then disappear.
13. Write the DMM Voltage reading into the calibration work sheet. (20 volt cutoff)
14. Turn OFF the BC-8000 power.
15. Unplug the BC-8000 from the CF1 VOLTAGE OUTPUT CONNECTOR.
16. Disconnect the CF1 test device ring terminals from the 24 volt power

source.

CALIBRATE AMP SETUP:

1. Connect the CF1 test device ring terminals to a fully charged 12 Volt 55 Amp battery. RED lead to the positive terminal of the battery and the black lead to the negative terminal of the battery.
2. Set DMM to a range of 0-200 mV.
3. Connect 5 ½ digit DMM minus - to the AMP minus - test point on the CF1 test device. Use caution as the DMM meter leads will be connected to a high amperage battery.
4. Connect 5 ½ digit DMM plus + to the AMP plus + test point on the CF1 test device.
5. Verify the BC-8000 is OFF.
6. Connect the BC-8000 to the HIGH AMPERAGE CONNECTOR on the CF1 test device. It is the connector wired with two #6 heavy duty wires.
7. The scale factor is 1 A/mV. Example: when the 5 ½ digit DMM reads 10.000 mV, it is indicating 10.000 Amps. 0.500 mV is indicating 0.500 Amps.

CALIBRATE 0.5A, 2.0A, 8.5A, 15A, and 55A

1. Keep hands, arms, test leads, and clothing away from the FAN BLADE. The FAN BLADE will rotate rapidly during the amp calibration.
2. Turn ON the BC-8000 power switch.
3. 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.
4. The unit will display: "CAL VOLTS". Press the UP button until the LCD screen displays "CAL AMP". Press NEXT, the unit will display "Volts? 12". Press NEXT, the unit will display "Amps: 0.5".
5. Press NEXT to start the process. The FAN will start.
6. Press the UP or DOWN button to obtain a DMM reading of 0.497 to 0.503 mV (0.500 mV \pm 0.003 mV). Allow a few seconds for the reading to settle. Repeat this step to get as close as possible to 0.500 mV. 0.500 mV is 0.5 Amps actual current flow out of the battery.
7. Write the mV reading into the calibration work sheet. (0.5 Amp calibration)
8. Press NEXT to save the calibration data into memory. Wait for the word "SAVED" to appear then disappear.
9. Press the UP button to select "Amps: 2.0".
10. Press NEXT to start the process. The FAN will start.
11. Press the UP or DOWN button to obtain a DMM reading of 1.996 to 2.004 mV (2.000 mV \pm 0.004 mV). Allow a few seconds for the

- reading to settle. Repeat this step to get as close as possible to 2.000 mV. 2.000 mV is 2 Amps actual current flow out of the battery.
12. Write the mV reading into the calibration work sheet. (2 Amp calibration)
 13. Press NEXT to save the calibration data into memory. Wait for the word "SAVED" to appear then disappear.
 14. Press the UP button to select "Amps: 8.5".
 15. Press NEXT to start the process. The FAN will start.
 16. Wait 30 seconds.
 17. Press the UP or DOWN button to obtain a DMM reading of 8.483 to 8.517 mV (8.500 mV \pm 0.017 mV). Allow a few seconds for the reading to settle. Repeat this step to get as close as possible to 8.500mV. 8.500 mV is 8.5 Amps actual current flow out of the battery.
 18. Write the mV reading into the calibration work sheet. (8.5 Amp calibration)
 19. Press NEXT to save the calibration data into memory. Wait for the word "SAVED" to appear then disappear.
 20. Press the UP button to select "Amps: 15.0".
 21. Press NEXT to start the process. The FAN will start.
 22. Wait 30 seconds.
 23. Press the UP or DOWN button to obtain a DMM reading of 14.970 to 15.030 mV (15.000 mV \pm 0.030 mV). Allow a few seconds for the reading to settle. Repeat this step to get as close as possible to 15.000mV. 15.000 mV is 15 Amps actual current flow out of the battery.
 24. Write the mV reading into the calibration work sheet. (15 Amp calibration)
 25. Press NEXT to save the calibration data into memory. Wait for the word "SAVED" to appear then disappear.
 26. Press UP to select "Amps: 55.0".
 27. Press NEXT to start the process. The FAN will start.
 28. Wait 30 seconds. This will allow the current sensor to reach operating temperature.
 29. Press UP or DOWN button to obtain a DMM reading of 54.890 to 55.110 mV (55.00 mV \pm 0.110 mV). Allow a few seconds for the reading to settle. Repeat this step to get as close as possible to 55.00 mV.
 30. Write the mV reading into the calibration work sheet. (55 Amp calibration)
 31. Press NEXT to save the calibration data into memory. Wait for the word "SAVED" to appear then disappear.
 32. Turn OFF the BC-8000 power.

Calibrate Charger (Optional):

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, a CF1 current shunt, and a DMM. All Voltage OUT and DISP menu items require the output of BC-8000 connected to a DMM and can never be connected to a battery as the unit being calibrated will output various voltages. All Amperage OUT and DISP menu items 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 reverse of doing a capacity test.
2. Connect the DMM to the grey connector. 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 NEXT to start. Wait for the relays to sequence. 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 7.9V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 7.9V on the DMM. Press NEXT to save the calibration.
5. Press UP to select DISP 7.9V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 7.9V on the LCD display. Press NEXT to save the calibration.
6. Press UP to select OUT 8.0V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 8.0V on the DMM. Press NEXT to save the calibration.
7. Press UP to select DISP 8.0V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 8.0V on the LCD display. Press NEXT to save the calibration.
8. Press UP to select OUT 16.9V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 16.9V on the DMM. Press NEXT to save the calibration.
9. Press UP to select DISP 16.9V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 16.9V on the LCD display. Press NEXT to save the calibration.

10. Press UP to select OUT 17.0V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 17.0V on the DMM. Press NEXT to save the calibration.
11. Press UP to select DISP 17.0V. Press NEXT to start. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 17.0V on the LCD display. Press NEXT to save the calibration.
12. Press UP to select OUT 36.0V. Press NEXT to start. Wait for the relays to sequence. 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 NEXT to start. Wait for the relays to sequence. 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. Press UP to select OUT 2.6A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 2.6A on the DMM. Press NEXT to save the calibration.
19. Press UP to select DISP 2.6A. Press NEXT. Wait for the relays to sequence. Press UP or DOWN button to get as close as possible to 2.6A on the LCD display. Press NEXT to save the calibration.
20. 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.
21. 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.

Charger menu item and associated BC-8000 output connector hook up.

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

EXIT

- OUT 3.0V connect to volt meter (do not connect to a battery)
- DISP 3.0V connect to volt meter (do not connect to a battery)
- OUT 7.9V connect to volt meter (do not connect to a battery)
- DISP 7.9V connect to volt meter (do not connect to a battery)
- OUT 8.0V connect to volt meter (do not connect to a battery)
- DISP 8.0V connect to volt meter (do not connect to a battery)
- OUT 16.9V connect to volt meter (do not connect to a battery)
- DISP 16.9V connect to volt meter (do not connect to a battery)
- OUT 17.0V connect to volt meter (do not connect to a battery)
- DISP 17.0V connect to volt meter (do not connect to a battery)
- OUT 36.0V connect to volt meter (do not connect to a battery)
- DISP 36.0V connect to volt meter (do not connect to a battery)
- 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 (requires a discharged battery)
- DISP 25.0A connect to a 24V battery (requires a discharged battery)

CALIBRATE SEIKO CLOCK CHIP (OPTIONAL):

1. Turn OFF the BC-8000.
2. Connect the USB cable to the PC computer. Start the BC-8000 report utility. Press the "Set Date and Time" button. The software will search for the BC-8000 and establish a connection. Enter "invalid report" into the battery serial number rectangular box. Click your mouse on the rectangular box. The program will expand.
3. Set frequency counter to measure a 1 second period with 1 micro second resolution. Connect the frequency counter TP3 and TP1 gnd.
4. In the BC-8000 report utility Measure Period rectangular box, enter 1.0 and press the Set Clock Calibration button. This will turn off clock correction and allow you to measure the unadjusted 1 second clock at TP3. Press the Get Clock Calibration button and verify it returned a 00 in the blue box.
5. Read the period on your frequency counter. The acceptable adjustment range is 0.999805 to 1.000192 seconds. Enter the value into the Measured Period rectangular box. The entry requires precision down to 1 micro second. Press the Set Clock Calibration button. Wait 1 second. Press the Get Clock Calibration button and if you entered a correction value other than 1.000000, it should return something other than 00. The only time it will return 00 is if you entered a period of 1.000000 seconds. (Values very close to 1.000000 may return with a correction value of 00).
6. Your clock is now calibrated. Every 20 seconds, the Seiko clock chip will correct its crystal time base by adding or subtracting a few cycles. If you entered a correction value that is between 0.999805 to 1.000192 seconds and is not 1.000000, you will see the period change every 20 seconds. A correction value of 1.000000 causes no correction as it is the perfect value that requires no correction.
7. Remove USB cable.

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-8000 power. After sign on message, if the user menu item is showing the unit is ready for use. Turn OFF BC-8000 power.
4. Disconnect the BC-8000 from the CF1 calibration device.
5. Disconnect the CF1 calibration device from the battery.
6. If this wasn't done already, write the calibration due dates of all equipment used in work sheet. Attach a photo copy of the calibration certificates of all of the equipment used in this procedure to the work sheet.
7. Write the BC-8000 serial number in work sheet. The serial number is located on the inside rear panel.
8. Sign and date the calibration work sheet.
9. Install the lid and attach it with the 8 screws.

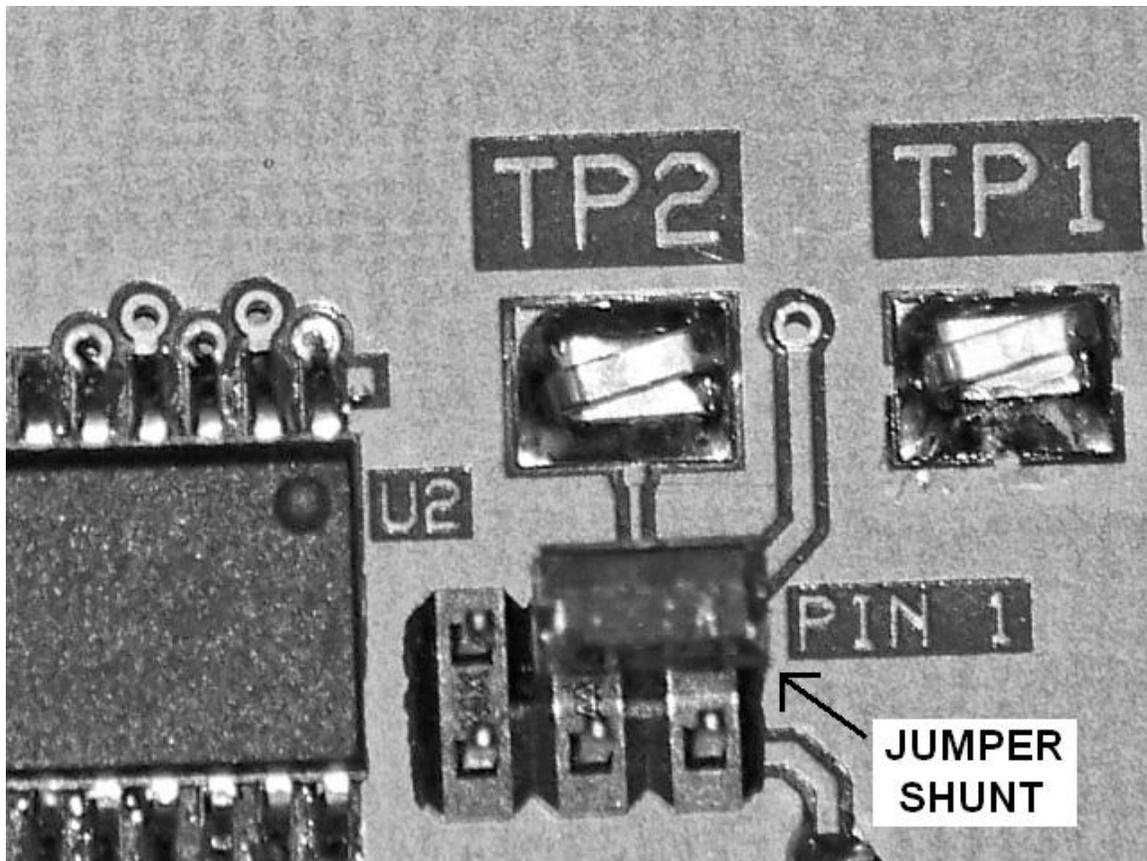


Figure 1 (BC-8000 will not have the IC chip U2 shown on the left)

CALIBRATION WORK SHEET

RECORDS - BC-8000 S/N _____

| Item name | Measured value | Specification | Pass | Fail |
|---------------------|----------------|---------------------|------|------|
| 450 Hz | | 449.8 - 450.2 Hz | | |
| 10.00 Volt cutoff | | 9.90 - 10.10 Volts | | |
| 20.00 Volt cutoff | | 19.80 - 20.20 Volts | | |
| 0.5 Amp calibration | | 0.497 to 0.503 mV | | |
| 2.0 Amp calibration | | 1.996 to 2.004 mV | | |
| 8.5 Amp calibration | | 8.483 to 8.517 mV | | |
| 15 Amp calibration | | 14.970 to 15.030 mV | | |
| 55 Amp calibration | | 54.890 to 55.110 mV | | |
| | | | | |
| | | | | |
| | | | | |

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

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

If Seiko Clock chip was calibrated: Frequency counter calibration expiration date: _____

Attach a photo copy of the calibration certificates of all of the equipment used to in this procedure to this work sheet.

BC-8000 Calibration performed

as specified by: _____ Date: _____