SCT-200
Single/Multiple Cell Tester

User's Guide

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SCT-200 User's Guide, Book Revision 2.1
P/N 4200-027

Printed in the United States of America

Safety Information

Except as explained in this manual, do not attempt to service Albércorp equipment yourself. Opening the equipment may expose you to dangerous voltages. Refer servicing beyond that described in this manual to authorized personnel.

Do not allow liquids or moisture to get into the equipment. If liquid does get into the equipment, unplug it immediately and contact your nearest authorized service center or Albércorp directly.

Ensure equipment is provided adequate ventilation. Do not block equipment ventilation openings.

Do not exceed equipment voltage or power ratings and capabilities.

Make sure that equipment is properly grounded.

Do not let unauthorized persons operate the equipment.

Do not energize the cabinet or any component with 115VAC or battery voltage until after the installation is complete.

Use of this product in a manner not specified could compromise the designed-in safety of this product.

WARNING: High voltage or current may be present in the equipment. Only qualified personnel should perform the operations described in this manual.

WARNING: High voltages exist inside the system components and on the equipment terminals. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing equipment covers, and when connecting leads and making adjustments.

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1. Receiving

Upon receipt, visually inspect the SCT system to verify there is no shipping damage. It is your responsibility to initiate and settle damage claims with the shipper. Albércorp will assist with claims if necessary, but will not be liable for shipping damage not reported to the shipper. You should also verify the items received match the packing slip. Albércorp is not responsible for missing items not reported within ten days after receipt by the customer. The standard SCT-200 includes the following items:

Laptop computer.
SCT-200 charge/discharge module.
Six foot 9-pin RS-232 serial cable.
Two negative and two positive 8 foot 4/0 AWG load cables.
One 8 foot cell voltage sense lead with four clips to test two cells.
AC power cord for the SCT-200.
Program disk.
This instruction manual.

1.1. Contact Information

Proper installation is essential to the correct functioning of your system. If you have any questions about installation, please contact us. Call Albércorp at (561) 997-2299, or fax us at (561) 997-5588. Request SCT installation assistance.

2. System Requirements

A typical SCT-200 system has the following requirements.

2.1. Computer Requirements

The following are the minimum computer requirements for the SCT-200 software and equipment.

Microsoft Windows™ 95, 98, 2000 or NT4.0.
Pentium™ 400MHz or higher microprocessor.
SVGA monitor.
64M of memory.
20M of hard disk space available for software installation.
3.5-inch high-density (1.44MB) disk drive.
CD-ROM drive.
Mouse or compatible pointing device.
RS-232 communication port.

2.2. Documentation

A typical SCT-200 system requires the following documents:

SCT-200 Single/Multiple Cell Tester User's Guide, 4200-027 (this manual).

UPS (uninterruptible power supply) manufacturer's instruction manual (if a UPS is used with the system).

2.3. Wiring

You must make certain that the equipment is properly tied to earth ground as required. The AC line from the equipment must have protective earth connection (three prong). You must not defeat the use of the earth connection prong.

2.4. Disconnect Device

The SCT AC power switch, which connects 115VAC to the SCT, is considered the primary disconnect device.

2.5. Ventilation

You must provide adequate ventilation to prevent equipment overheating. Maintain a minimum of 8" clearance on all sides of the cabinet to allow for proper ventilation. Do not block ventilation ports, and ensure the equipment is operated only within the temperature and humidity ranges described in this manual.

3. SCT General Description

The SCT-200 test system can discharge and charge two separate cells sequentially, one at a time. The test sequence consists of discharging the first cell to a programmed end voltage at a programmed load current, then charging to a programmed charge voltage at a programmed current limit for a time determined by the user. After the first cell has been cycled, the system tests the second cell in the same sequence.

The test system is shown in the following figure. The computer shipped with the system has the Albércorp SCT program installed and controls all but some backup safety circuits. The hardware that controls the charge/discharge cycle is in the SCT-200 charge/discharge module.

Communication between the computer and the SCT is via an RS-232 DB-9 cable. Connection between the SCT and the cells being tested consists of 4/0 AWG current carrying cables and separate voltage sense leads.

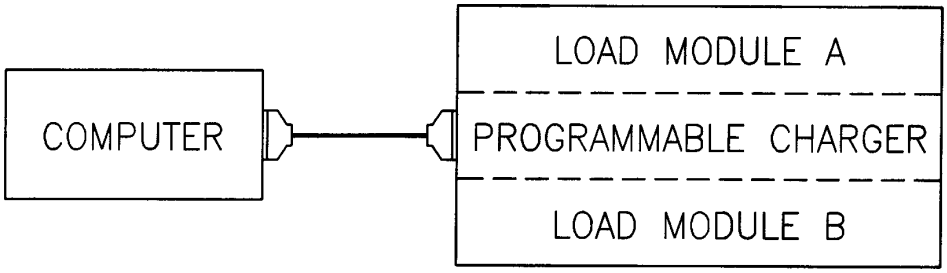


Figure 1. Test System Block Diagram

The test hardware in the SCT-200 consists of :

Data acquisition circuits for reading voltages and currents.
Two separate 300 amp internal resistive load banks.
A 1.80 to 2.60 volt, 0 to120 amp programmable charger.
Communication circuitry to interface to the computer.
Safety circuits to prevent damage to the battery under test.

You can connect the SCT A and B internal load banks to two separate cells in the same string or different battery strings with full isolation up to 500VDC. In this configuration, you can program each cell under test for a discharge current up to 300 amps down to an end voltage of 1.75 volts. For high current testing of 0 to 600 amps on a single cell, you can connect the two load banks to the same cell. The SCT program automatically recognizes the two load banks will operate together when the programmed current exceeds 300 amps.

After the cell discharge is complete, the programmable charger initiates the charge cycle. The maximum programmable charger current is 120 amps. The charger itself is internally current limited to 150 amps.

Cell charge is not a quick process and, even after the charge current approaches minimum level, the electrochemistry of the cell is still not back to normal. It is, therefore, advisable to continue charging at a low current level for up to 24 hours after the discharge; otherwise, the cell will take a long time to reach normal float level after the test set is disconnected. If scheduling does not permit a long charge time using the SCT-200, then connect a separate small charger, such as the Albércorp PSC-10 Programmable Smart Charger (p/n 1000-032), and let it finish the job.

4. SCT Software Notes

This section contains notes you should carefully review. These items, if not properly set, can adversely affect the operation of your computer or the connected equipment.

- **Windows Taskbar**

  On an 800 x 600 screen, the Windows taskbar hides a portion of some SCT screens. Either drag the taskbar to minimize it, or right click on the taskbar, then select **Properties|Auto Hide** to hide the taskbar.

- **Power Management Feature**

  The computer power management feature, which automatically shuts down the computer, hard drive and display after a specified time of inactivity, must either be disabled or set to a time long enough to allow testing without going into the suspend mode. Also check the computer BIOS to determine if power management features have been set.

- **Windows 95 and 98**

  Under Control Panel|System|Performance|File System, in the File System area, confirm that at "Typical role of this machine," Desktop Computer is selected.

- **Windows 2000**

  Under Control Panel|System|Advanced|Performance Options, set the Boost control to Background Services.

  Under Control Panel|System|Hardware|Device Manager|Ports|COM1|Properties| Port Settings| Advanced, set the Receive Buffer and the Transmit Buffer to 1.

- **Windows NT**

  Under Control Panel|System|Performance|Application Performance, set the Boost control to None.

  Under Control Panel|Ports|COM1|Settings|Advanced, uncheck FIFO Disabled.

5. Software Installation

The SCT-200 program is distributed on one CD-ROM. The **.INI** file, which contains the factory-set calibration K factors, is distributed on a 3.5-inch disk. The firmware IC contains the DOS to Windows upgrade program. You will receive one or two of these items as follows:

- With a new SCT module and laptop computer, you will receive the program CD only. The SCT program and the calibration factors are already installed in the laptop.

- With a new SCT module and no laptop, you will receive the program CD and the 3.5-inch disk. You must install both the program and the default calibration factors.

- With no SCT module and no laptop, you will receive the program CD and the firmware IC. This package is for upgrading an existing DOS-based SCT module to Windows. You must install the firmware IC, install the program, and calibrate the module.

Install the SCT program as follows.

1. Read the notes in the *SCT Software Notes* section of this manual and make setting changes to your computer as required.
2. If you are upgrading an SCT module from DOS to Windows based, a qualified person must install the firmware IC. Refer now to the *Updating SCT Software* section before you install the program CD.
3. To install the SCT program, insert the CD into the computer and select Start|Run from the Windows screen. From the Run dialog box, type **d:\setup** (or other appropriate drive letter) to start the installation. Follow the on-screen instructions when installing the software. To start the SCT program, double-click the SCT icon on the desktop.
4. If you must import the **.INI** file, refer now to the *Getting Started* section, especially *Connection and Power Up Sequence*, then refer to *SCT Calibration*. If you must calibrate the SCT module, refer to the same sections.

6. Panel Controls and Indicators

This section contains descriptions of the items on the SCT panels. Additional descriptions of these items may appear elsewhere in this manual or in related manuals. Words in **bold** are stenciled on the SCT panels.

6.1. Indicators

AC Power (red LED) - Lit when the AC power to the SCT is on.

Enable A and **Enable B** (green LEDs) - Lit when the system is functioning normally. If the cell voltage exceeds minimum or maximum limits, the circuitry disconnects and the LED goes out.

6.2. Connectors

A+ A– B+ B– - Connect the load cables from the SCT to the cells.

AC receptacle - Connects the SCT to a 115VAC power source.

Control - A DB-9 connector that connects an RS-232 serial cable from the primary SCT to the computer (PC).

Slave - A DB-9 connector that connects an RS-232 serial cable from the primary SCT to a secondary SCT.

Voltage Sense - Connect the voltage sense leads from the SCT to the cell(s).

Current Sense A and **B** - Connect the current sense leads from the SCT as described in the calibration section of this manual. Used for calibration only.

6.3. Controls

AC power switch - Switches AC power off and on to the SCT.

Reset switch - If the cell voltage exceeds minimum or maximum limits, the SCT circuitry disconnects and the Enable A or B LED goes out. Push the Reset switch to reconnect the circuitry after fixing the problem.

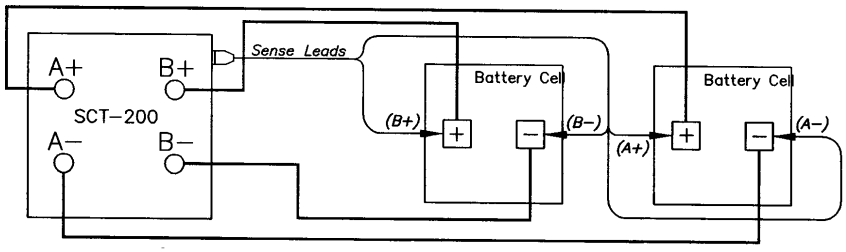
DIP switch - An internal switch on the Controller board that determines if the SCT functions as a primary or secondary module. This switch is factory set and not normally changed by the user.

7. Getting Started

The following sections describe typical wiring configurations and the basic steps for setting up a test and testing a cell. These sections are guides. Read through all these sections before actually connecting the system and setting up a test.

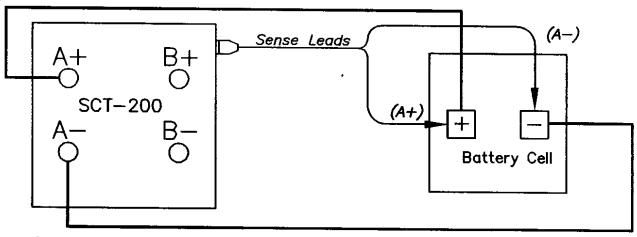
7.1. Typical Configurations

Figure 2 shows the relationship of the SCT and the cell. The subfigures show the connections for testing two separate cells (Figure 2a), for a single cell test of 300 amps or less (Figure 2b), and for a single cell for high current testing (300 to 600 amps) (Figure 2c).



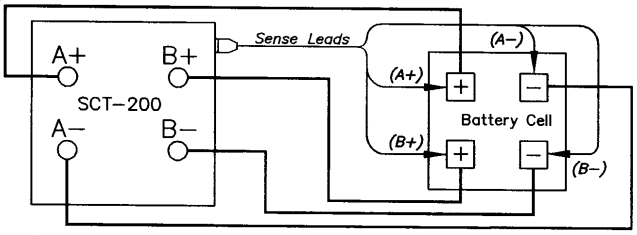
DUAL CELL CONFIGURATION *(300 AMPS MAX.)*

Figure 2a



SINGLE CELL CONFIGURATION *(300 AMPS MAX.)*

Figure 2b



SINGLE CELL CONFIGURATION *(600 AMPS MAX.)*

Figure 2c

Figure 2. Cell Connections

7.2. SCT Primary/Secondary Configuration

The following figure shows the connections for a test of up to 1200 amps, which requires two SCTs. Note that the voltage sense leads connect to the primary SCT. The model number on the serial number tag indicates a primary or secondary module: the primary SCT has a model number SCT-200/P; a secondary module has SCT-200/S. You may use these units individually. A primary unit may be used as a secondary by changing the DIP switch setting to a higher address setting than the primary unit. NOTE: If the DIP switch setting is changed, the unit must be recalibrated. A factory-built secondary SCT does not have a charger installed. Refer to *SCT Unit ID Number* to change a unit from primary to secondary.

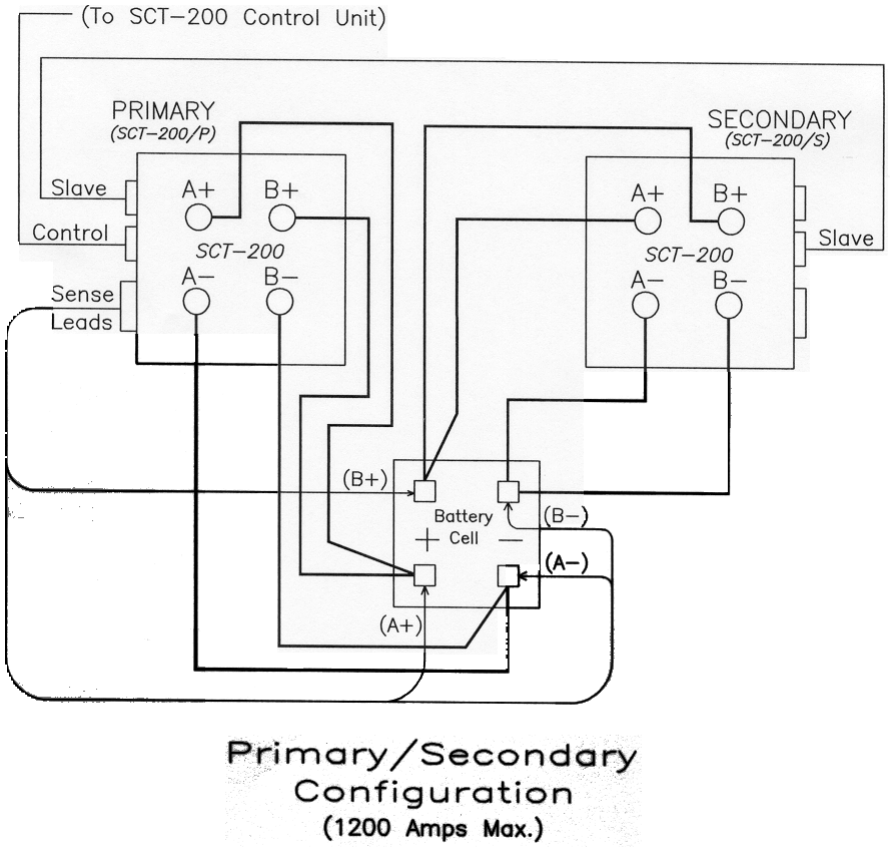


Figure 3. Primary and Secondary Configuration

The following table summarizes the load current available for testing.

Maximum Load Current	Connection Scheme
300 amps, one cell	Connect Cell A or Cell B on the primary SCT to one cell.
300 amps, two cells	Connect Cell A on the primary SCT to the first cell. Connect Cell B on the primary SCT to the second cell.
600 amps, one cell	Connect Cell A and Cell B on the primary SCT in parallel to one cell.
1200 amps, one cell	Connect Cell A and Cell B on the primary SCT and Cell A and Cell B on the secondary SCT in parallel to one cell.
WARNING	Never connect any SCT to a voltage greater than the normal float voltage of a single 2 volt cell.

Figure 4. Maximum Load Current Connection Schemes

7.3. Connection and Power Up Sequence

For safety reasons, after you have programmed test parameters and are ready to connect an SCT system and perform a test, you must use the following connection and power up sequence.

1. Using an RS-232C cable, connect the computer (PC) to the SCT Control DB-9 connector.
2. Connect the computer and the SCT-200 to an appropriate AC power source.
3. Turn power on to the SCT-200.
4. Turn power on to the PC.
5. Select the test setup from the SCT menu, and go to the Start Test menu.
6. Connect the test leads from the SCT-200 to the battery.
7. Press the Reset button on the side of the SCT to enable the connected SCT. A green LED lights if the SCT is connected.

7.4. Programming Test Setup Parameters

You must program test parameters before connecting and powering up the SCT. The system can perform two types of tests: Capacity and Profile. Refer to the setup sections of this manual for test descriptions. The general guidelines for programming a test are as follows:

Power up the computer and start the SCT-200 program. You do not need the SCT module powered on. From the main menu, select Setup, then complete the Setup dialog boxes.

Figure 5. SCT Main Menu

To run a test, from the main menu select Capacity Test or Profile Test. On this screen, select a test you specified under Setup. You must power up the SCT module before clicking the F1 Test Screen button.

7.5. Connecting to the Battery

Proper connection to the cell under test is very important and should be done as follows.

WARNING: Never connect the SCT to a voltage greater than the normal float voltage of a single 2 volt cell.

Current Leads The heavy 4/0 AWG cables are the current leads. Connect them to the positive and negative sides of the cell being tested, noting that the positive lead has a red band identifying it. Connect the clips to the terminal posts or the intercell adjacent to the post, whichever is more convenient and ensures the better connection. The quality of the connection is very important; any extra resistance can limit the test current to less than the amps selected and cause the test to fail.

Voltage Sense Leads Measure the cell voltage directly on the terminal posts. If you connect the voltage clips to the current clips or the adjacent intercells, the voltage reading and the measured capacity of the cell will be incorrect.

8. SCT Files and Backup

This section describes the SCT calibration, setup, and report files. If you are installing the SCT program from a CD onto a new computer, you must import the **.INI** file. Refer to *SCT Calibration*.

8.1. Setup Data

Each time you create a new Capacity or Profile test setup, the settings are appended to the **sctsetup.mdb** file under C:\Program Files\Alber\SCT\Reports\Setup.

When you choose Capacity or Profile test, a Test Selection dialog box lets you select a previously defined test setup. You need only select the Location, Battery, String, and Test names and Cell Number from the drop-down lists to have all the required data appear on the screen. There is no need to save this new screen.

8.2. Calibration Data

SCT calibration data is stored in the **sctsetup.mdb** file under ..\SCT\Reports\Setup. Each time you change calibration K-factors, this file updates.

The SCT is shipped with a disk that has an **.INI** file with the initial factory calibration factors. Copy this file to a location of your choice on the hard drive. If calibration settings are lost, you can import the original settings using the SCT Calibration dialog box. Refer to *SCT Calibration*.

CAUTION: Unless you export an updated **.INI** file, the factory generated **.INI** file become obsolete when the SCT is recalibrated. Only the **sctsetup.mdb** file contains the most up-to-date calibration settings.

8.3. Backing Up Setup and Calibration Data

Back up the **sctsetup.mdb** file under ..\SCT\Reports\Setup upon receipt of the SCT and whenever the unit is calibrated. This file contains the test setup and calibration information. Use Microsoft Explorer™ to back up to a 3.5-inch disk. Also, print the calibration settings from the Calibration dialog box, so you can type them in if required.

8.4. Test Data Files

Test data files have an **.STR** extension and are under ..\SCT\Reports*locationname*. The program assigns a unique file name each time a test is run. This file name indicates test type, battery, string, and cell names and test date. A typical file name would be CT_Battery1String1Cell2 09_28_01.STR. If you perform the same test on the same day, the program requests a different file name so the existing file is not overwritten.

8.5. Backing Up Test Data Files

You should regularly back up the ***filename*.str** files under ..\SCT\Reports*locationname* in case the Windows SCT program must be reinstalled. These files contain data from tests that were run. Use Explorer to back up the files to 3.5-inch disks.

8.6. Archive Files

The Report Generator creates archive files, which have an extension of **.ZRF** and are saved in the folder last opened, unless you select a different folder. Both the Report Generator and the Archive Reader report viewer can open archive files. You cannot change an archive file after you save it. Archive format lets you distribute the report file while ensuring the integrity of the data. Refer to *Report Generator* and to *Archive Reader Program*.

9. SCT Test Setup

To set up test parameters, click the SCT-200 icon to start the program and display the main menu. The computer does not need to be connected to the SCT. On the main menu, click Setup. A dialog box appears with tabs for Location, String(s), Capacity and Profile. Complete each item as described.

9.1. Location

On the Setup box, click Location. Location and battery information is saved with each test report and permanently saved in the SCT Setup file. Complete all text boxes before performing any test, or reports may have incorrect or missing data.

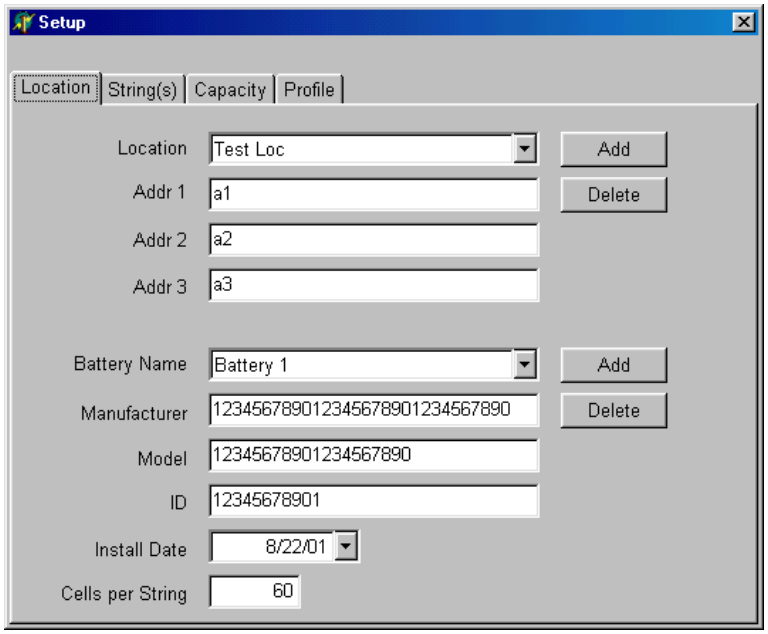


Figure 6. Setup - Location

Location and Address - To add information for the first location, type the location name and address. Do not click Add. Then complete the Battery Name items described below. Information in the Location text box creates a subdirectory in the SCT Reports directory.

Add Location - To add subsequent locations, click Add and type the location information, then complete the Battery Name items described below.

NOTE: The Strings, Capacity, and Profile tabs at the top of the dialog box do not appear until the battery name and cell information described below is completed.

Delete Location - To delete a location, select the location name from the Location drop-down list, then click Delete. At the Delete Location box, click OK. Deleting a location deletes the battery information for the location.

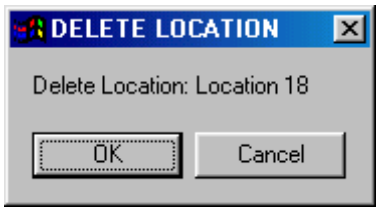


Figure 7. Setup - Delete Location

Change Location Description - To change the information in the Location area, select the location name from the Location drop-down list, then type the new information in the name and address boxes.

Add Battery - To add the first or a subsequent battery, click Add in the battery area of the Location screen. On the New Battery dialog box, type the **Number of Strings** and **Total Cell Number**.

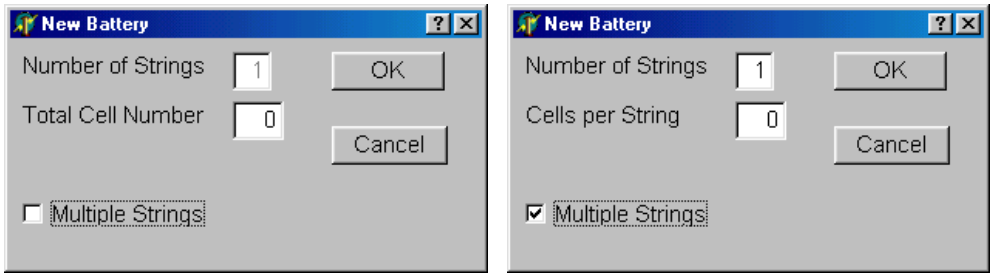


Figure 8. Setup - Battery

If you check the **Multiple Strings** box, Total Cell Number changes to **Cells per String**. Type a value in Cells per String. When using multiple strings, the Cells per String value is the number of cells per string, not the total number of cells.

Click OK on the New Battery dialog box and complete the remaining battery name and date information described below.

Battery Name - The words *Battery Name* do not appear until you add the first battery. (Refer to *Add Battery*.) After adding the battery, type a battery name that readily identifies it, then complete the remaining battery information.

Manufacturer, Model and ID - At Battery ID, note any identification number associated with the battery being tested.

Install Date - Type the battery installation date in mm/dd/yy format.

Delete Battery - To delete a battery, select the battery name from the Battery Name drop-down list, then click Delete. At the Delete Battery box, click OK. Deleting a battery deletes the test information for the battery, but does not delete the Location description.

Change Battery Description - To change the information in the Battery area, select the battery name from the Battery drop-down list, then type the new information in the manufacturer and other boxes. Do not change Cells per String from this screen.

9.2. Strings

On the Setup menu, select a battery name on the Location dialog box, then click the Strings tab. The Strings dialog box lists the battery-specific strings for which the SCT has been configured.

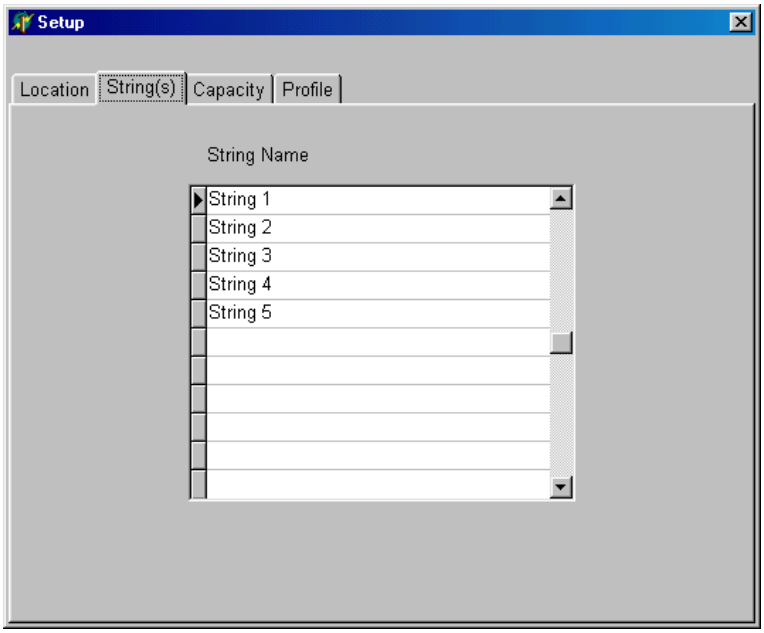


Figure 9. Setup - Strings

You may use the Strings box to change the names of the strings listed.

NOTE: Data displayed on the Strings, Capacity, and Profile dialog boxes are associated with the battery name selected on the Location dialog box.

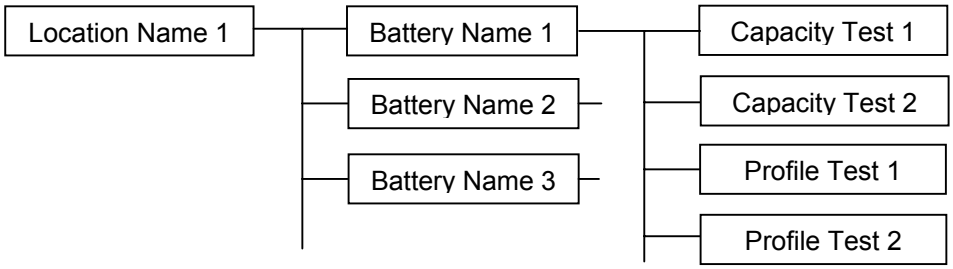


Figure 10. Setup - Hierarchy of Names and Tests (Typical)

For each location name, there may be one or more battery names. For each battery name, there may be one or more capacity and profile tests.

9.3. Test Types

You may configure two test types on the SCT: Capacity and Profile. Each test type saves specific parameters and test steps. The following sections describe the tests and dialog box items; refer to IEEE 450 for more information.

9.4. Capacity Test Setup

A capacity test uses a programmed constant current to project reliability and remaining battery life before replacement is necessary. A standard capacity test has one step and may be used to test any 2 volt (nominal) lead acid cell. The test discharges a cell at a programmed constant current rate to a programmed end voltage and measures the time it takes to reach that end voltage. The cell capacity is then calculated by comparing the actual discharge time to the rated discharge time. (Capacity = actual time/rated time x 100%.) The program calculates the cell capacity if the Rated Time was specified in the test setup.

On the Capacity dialog box, you may open a drop-down list of capacity tests configured for the associated battery. Select a test name to display the test parameters. If this is the first time the system is being used, only Capacity Test 1 is listed.

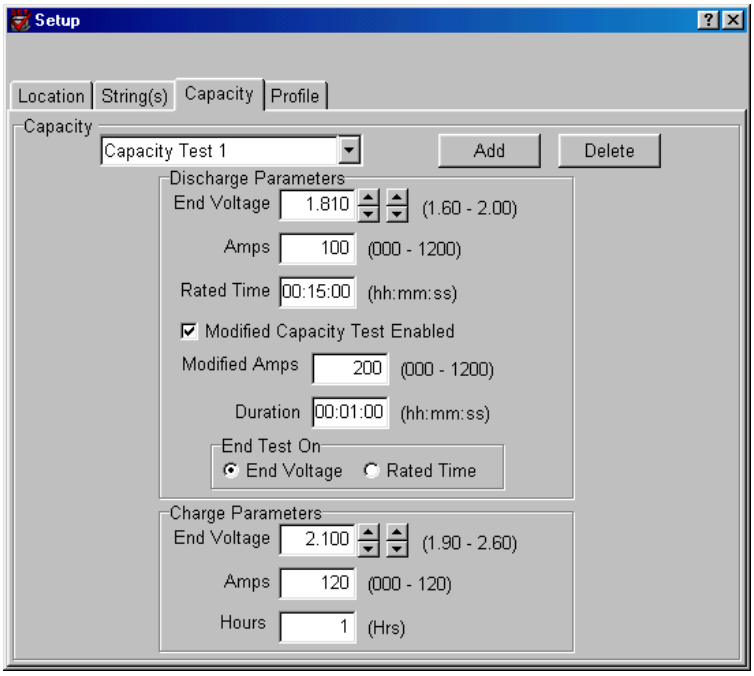


Figure 11. Setup - Capacity

NOTE: Data displayed on the Strings, Capacity, and Profile dialog boxes are associated with the battery name selected on the Location dialog box.

Add / Delete - Click Add to add a new capacity test or click Delete to delete a selected capacity test.

Discharge Parameters Area

End Voltage - Type the voltage of an individual cell to end the test. This is usually the manufacturer's minimum cell voltage. For example, if the battery manufacturer's recommended cut-off voltage for a 500 amp, one hour test is 1.78 volts, type 1.78 in this box. This stops the test if the cell falls below this voltage.

Amps - Type the amps for the load current that will be applied during the test. Depending on the way the system is configured (refer to *Typical Configurations*), the allowable current range is 0 to 300 Amps, 0 to 600 Amps, or 0 to 1200 Amps.

Rated Time - Type the manufacturer's specified rated time in the Rated Time box. This value is important for on-line capacity calculation. The format is hh:mm:ss.

Modified Capacity Test Enabled - Check this box to enable the Modified Amps and Duration settings at the start of the Capacity test. The Duration time is not added to the Rated Time, but is a portion of it. For example, if Rated Time is 15 minutes and Duration is 1 minute, the Capacity test runs at the Modified Amps value for 1 minute and the Amps value for 14 minutes (unless the End Test on End Voltage button is selected).

Rated Time is set to 15 minutes. Amps set to 100. Modified Amps set to 600.	
Duration 1 minute at 600A	Remaining time runs for 14 minutes at 100A

Figure 12. Rated Time vs. Duration

Modified Amps - This is the load amps applied at the start of the test.

Duration - This is the length of time the test runs at the Modified Amps setting.

End Test On: End Voltage, Rated Time - Click the End Voltage button to stop the test when the End Voltage value is reached. Click Rated Time to stop the test when the Rated Time is reached.

Charge Parameters Area

End Voltage - Type the voltage of an individual cell to end the charge cycle. This is usually the manufacturer's float voltage of a cell. For example, if the battery manufacturer's recommended float voltage is 2.20 volts, type 2.20 in this box. This causes the charger to reduce the amps applied until the charge time is reached.

Amps - Type the amps for the charge rate that will be applied during charge.

Hours - This is the length of time charging continues after the programmed End Voltage is reached. The SCT charges the cell at a selected current until the End Voltage is reached and then, for the specified Charge Time, floats that voltage at the required current. Type the Charge time in hours. Float charging stops when this time is reached.

End Voltage setting. Automatically selected charge time to End Voltage at user-selected current.	**Charge Time setting**. User-selected charge time at automatically selected rate to maintain float voltage.

Figure 13. End Voltage and Charge Times

9.5. Profile Test Setup

Profile Test A Profile test evaluates the ability of the battery to provide a high-rate, short-duration load cycle. This test does not calculate battery capacity. The test consists of up to ten programmed constant current steps that simulate the actual load a battery sees during an emergency. The duration of each current step, normally controlled by the programmed time, can be terminated if the voltage drops below the programmed voltage level. You can set up the test to have multiple discharge and charge currents.

On the Profile dialog box, open the drop-down list to display the profile tests configured for the associated battery. Select a test name to display the test parameters. If this is the first time the system is being used, only Profile Test 1 is listed.

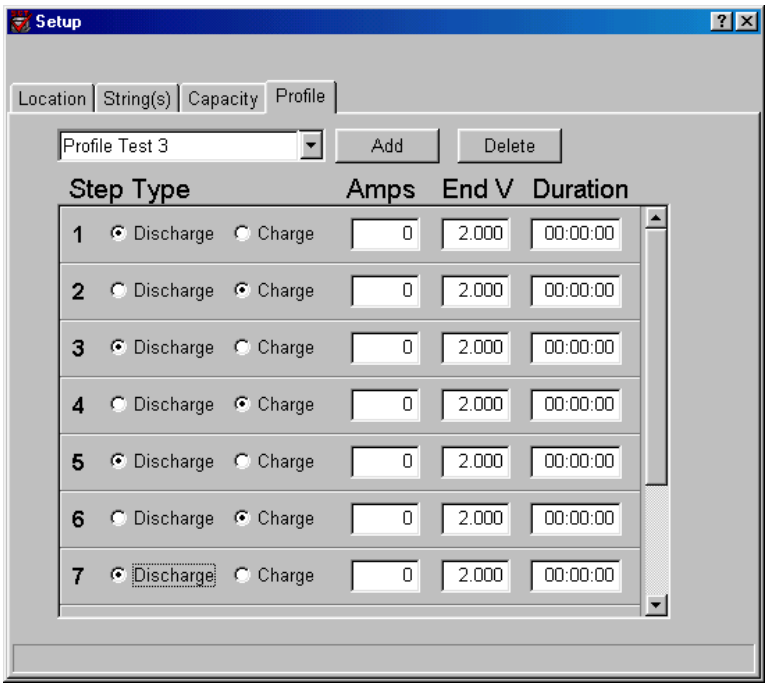


Figure 14. Setup - Profile

NOTE: Data displayed on the Strings, Capacity, and Profile dialog boxes are associated with the battery name selected on the Locations dialog box.

Add / Delete - Click Add to add a new profile test or click Delete to delete a selected profile test.

Start at Test Step 1 to construct a test sequence. Select Discharge or Charge for each step required and complete as described below. You can program up to ten steps for discharge, charge or a combination of both. If a step is not displayed, scroll to the step. You do not have to program all ten steps.

NOTE: For a discharge, the test sequences to the next step if the end voltage or the time is reached.

Discharge - Click the Discharge button to perform a discharge on a step. When Discharge is selected, the voltage you type in End V (End Voltage) is the minimum value.

Charge - Click Charge to perform a Charge on a step. When Charge is selected, the voltage you type in End V is the maximum value.

Load - Type the amps for the load current that will be applied during a discharge or the charge rate that will be applied during a charge. Depending on system configuration (refer to *Typical Configurations*), the allowable current range for Discharge is 0 to 300 Amps, 0 to 600 Amps, or 0 to 1200 Amps.

End V - (Discharge button selected) - Type the end voltage of an individual cell to end the discharge. This is usually the manufacturer's minimum cell voltage. For example, if the battery manufacturer's recommended cut-off voltage for a 500 amp, one hour test is 1.78 volts, type 1.78 in this box. This stops the test if the cell falls below this voltage.

End V - (Charge button selected) - Type the end voltage of an individual cell to end the charge cycle. This is usually the manufacturer's float voltage of a cell. For example, if the battery manufacturer's recommended float voltage is 2.20 volts, type 2.20 in this box. This causes the charger to reduce the amps applied until the charge time is reached.

Duration - Type the length of time the discharge or charge will run. The format is hh:mm:ss. The SCT discharges or charges the cell at a user-selected rate. During a discharge, if the end voltage is reached before the time, the test sequences to the next step. During a charge, if the end voltage is reached before the time, the SCT floats that voltage at the required current.

10. Running a Capacity Test

To open the Capacity Test Selection screen, click Capacity Test on the main menu. Select a Location, Battery Name, String Name, Cell Number, and Test Name from the drop-down lists before running the test. Refer to *Capacity Test Setup* for descriptions of screen items.

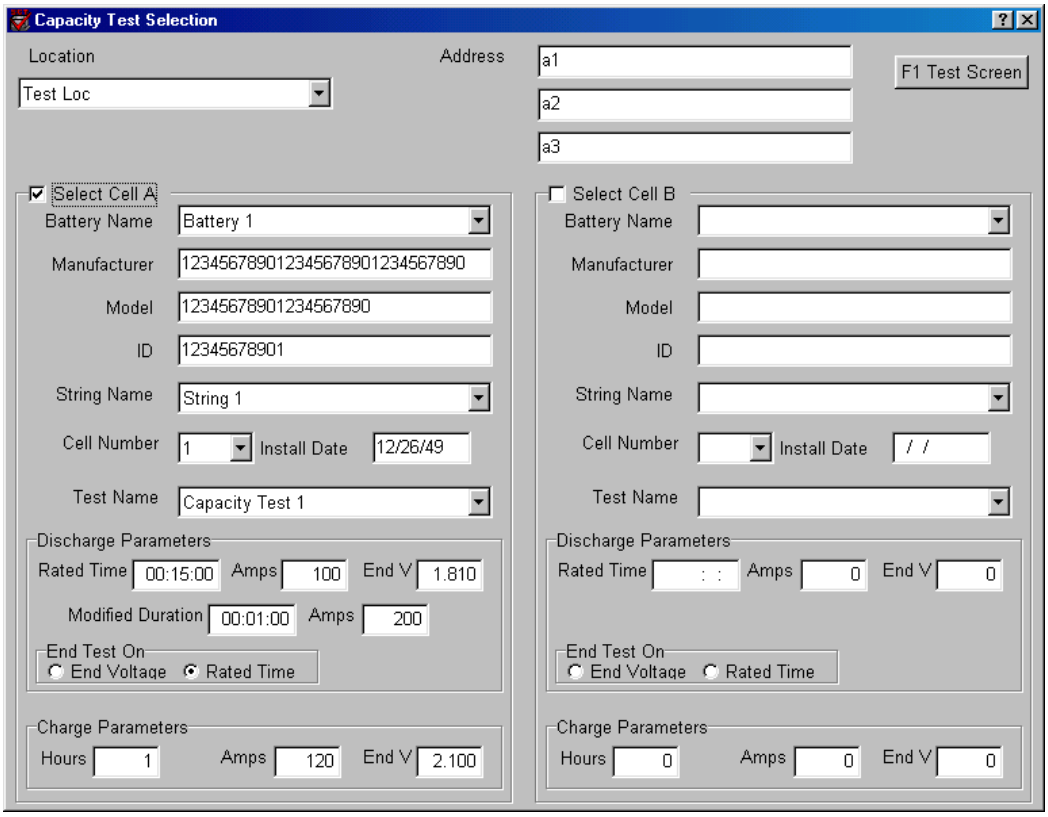


Figure 15. Capacity Test Selection Screen

The **Select Cell A** box is normally enabled. To also test Cell B, click **Select Cell B**. To test Cell B and not Cell A, uncheck the Select Cell A box.

If you change the **End Test On** parameter on this screen, it does not get permanently saved in the setup file.

Verify equipment connections are secure and equipment is in operating mode. Set the SCT AC power switch to On. If no problems are apparent, continue.

F1 Test Screen - To open the Capacity Test screen, on the Capacity Test Selection screen, click F1 Test Screen.

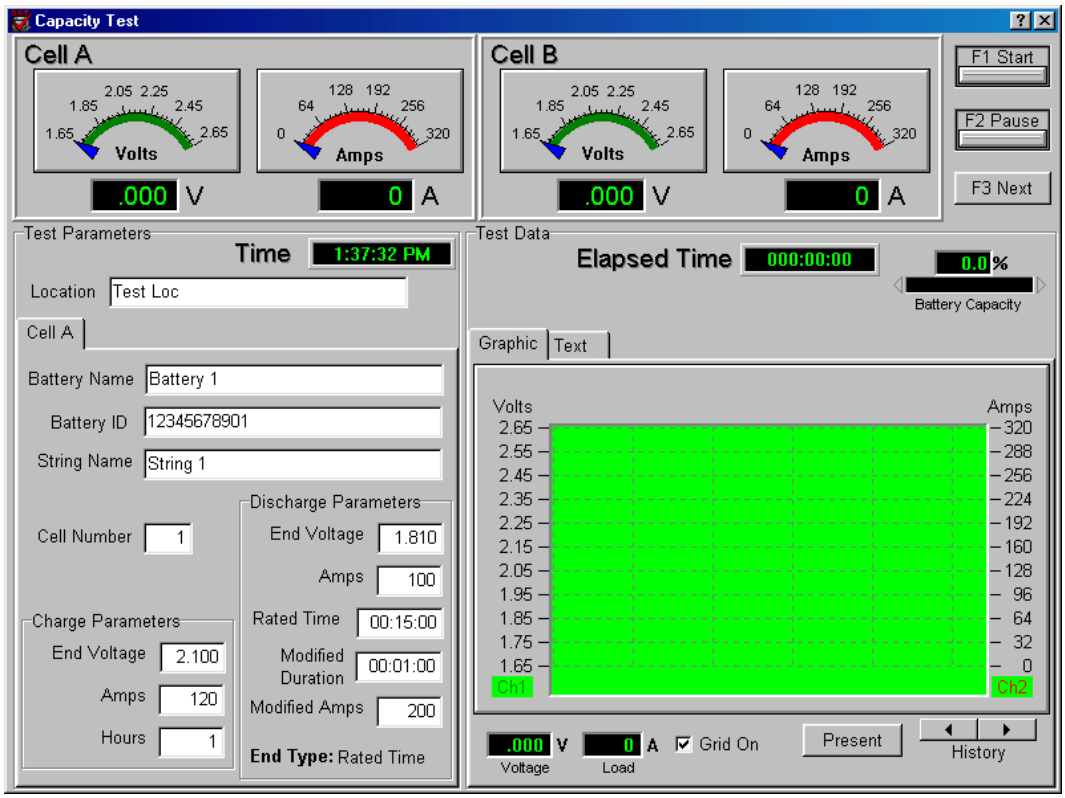


Figure 16. Capacity Test Screen

F1 Start - If no problems are apparent, to start the test, click F1 Start on the Capacity Test screen or press the F1 key.

At the end of the test, a message indicates the test is complete. Power down the SCT, then power down the computer before disconnecting any equipment.

WARNING: When disconnecting equipment, power down the SCT first, then the rest of the system.

While the test is running, several options are available: Stop, Pause, Resume, and Next.

F1 End - To stop the test, click F1 End or press F1. A message appears to confirm the test should be stopped.

F2 Pause and **F2 Resume** - To pause the test, click F2 Pause. Do not pause for extended periods of time during load testing, because the cell recovers during the idle period. When the test is paused, F2 Pause changes to F2 Resume.

F3 Next - The function of this key depends upon when it is clicked. If Cell A Discharge is active, click Next to step to Cell A Charge. If Cell A Charge is active, click to step to Cell B Discharge. If Cell B Discharge is active, click to step to Cell B Charge.

Graphic - Click the Graphic tab for a screen that displays the voltage or current curves while the test is running. The green line displays cell voltage; the red line displays load current in amps.

Grid On - Click this box to display grid lines on the green screen that appears when Graphic is clicked.

History and **Present** - Click the left History arrow to view up to two hours of previous data while the test is running. Click the right arrow to advance through the history. Click Present to reset to display data as it is being read. If the setting is left at History, it reverts to Present after 20 minutes.

Text - Click this tab to display charge and discharge data as text. Three columns of text indicate Load, Voltage, and Time. A new reading appears every 5 minutes or whenever Load changes by 1 Amp or Voltage changes by 5mV.

Cell Discharge / **Cell Charge** - These tabs appear when Text is clicked. Click Cell A (or B) Discharge to view discharge text data. Click Cell A (or B) Charge to view charge text data. Use the slider on the right of the columns to view all readings.

Battery Capacity - This indicator displays test results and is calculated by comparing the elapsed test time to the battery rated time. This value can exceed 100% if the elapsed time to reach the end voltage is more than the rated time.

11. Running a Profile Test

To open the Profile Test Selection screen, on the main menu, click Profile Test. Select a Location, Battery Name, String Name, Cell Number, and Test Name from the drop-down lists before running the test. Refer to *Profile Test Setup* for descriptions of screen items.

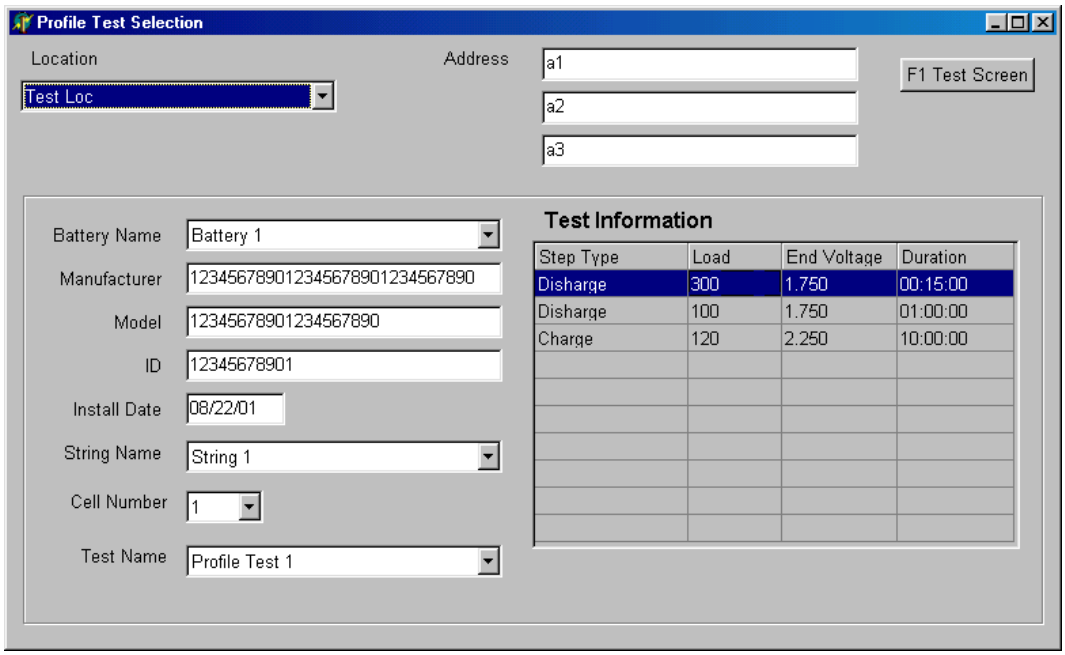


Figure 17. Profile Test Selection Screen

Verify equipment connections are secure and equipment is in operating mode. Set the SCT AC power switch to On. If no problems are apparent, continue.

F1 Test Screen - To open the Profile Test screen, on the Profile Test Selection screen, click F1 Test Screen.

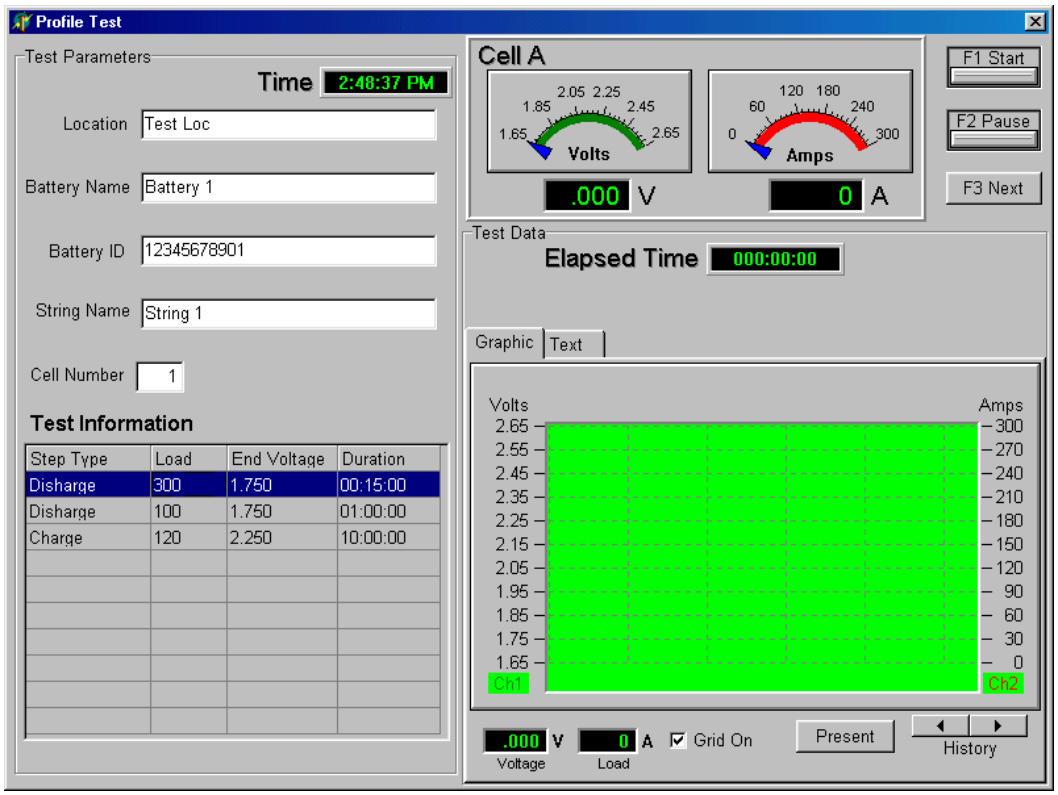


Figure 18. Profile Test Screen

F1 Start - If no problems are apparent, to start the test, click F1 Start Test on the Profile Test screen or press the F1 key.

At the end of the test, a message indicates the test is complete. Power down the SCT, then power down the computer before disconnecting any equipment.

WARNING: When disconnecting equipment, power down the SCT first, then the rest of the system.

While the test is running, several options are available: Stop, Pause, Resume, and Next.

F1 End - To stop the test, click F1 End or press F1. A message appears to confirm the test should be stopped.

F2 Pause and **F2 Resume** - To pause the test, click F2 Pause. Pause lets you change parameters. Do not pause for extended periods of time during load testing, because the cells recover during the idle period. When the test is paused, F2 Pause changes to F2 Resume.

F3 Next - Click this key to advance to the next test step.

Graphic - Click the Graphic tab for a screen that displays the voltage or current curves while the test is running. The green line displays cell voltage; the red line displays load current in amps.

Grid On - Click this box to display grid lines on the green screen that appears when Graphic is clicked.

History and **Present** - Click the left History arrow to view up to two hours of previous data while the test is running. Click the right arrow to advance through the history. Click Present to reset to display data as it is being read. If the setting is left at History, it reverts to Present after 20 minutes.

Text - Click this tab to display charge and discharge data as text. Three columns of text indicate Load, Voltage, and Time. A new reading appears every 5 minutes or whenever Load changes by 1 Amp or Voltage changes by 5mV.

Step *n* - These tabs appear when the Text tab is clicked. Click a Step n tab to view discharge or charge text data. Use the slider on the right of the columns display to view all readings.

12. Report Generator

The Report Generator reads the test data files generated by the SCT software and creates customized reports. After a Capacity or Profile test, the test data is saved as an ASCII text file under C:\program files\alber\sct\reports*locationname*\. It is this data, presented in report format, that battery test personnel rely on to analyze battery system performance. Using the Report Generator, you can display graphs and customize reports.

The Report Generator can save reports in an archive format, which protects the document against changes to ensure the integrity of the information.

12.1. Starting the Report Generator

After the SCT performs a Capacity or Profile test, you may generate a report for battery data analysis. To generate a report from a completed test, click Reports on the main menu.

12.2. Opening a Report

When the Report Generator is started, the Open dialog box appears.

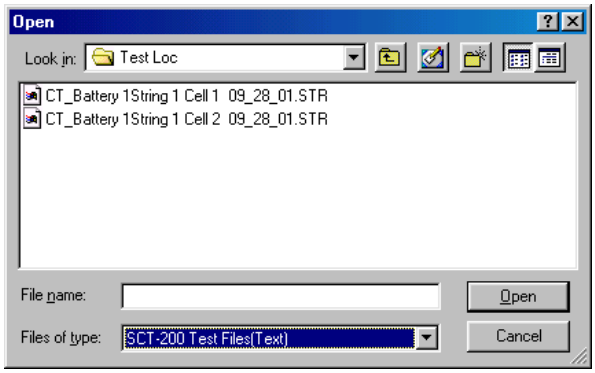


Figure 19. Open

The Files of Type drop-down list lets you select SCT-200 text (**.STR**) or Report Generator archive (**.ZRF**) format files. You must open a file before selecting other options. Select the subdirectory and the file name, then click Open.

12.3. Reports Screen

After you open a file, the Reports dialog box appears. Select items on this screen as follows.

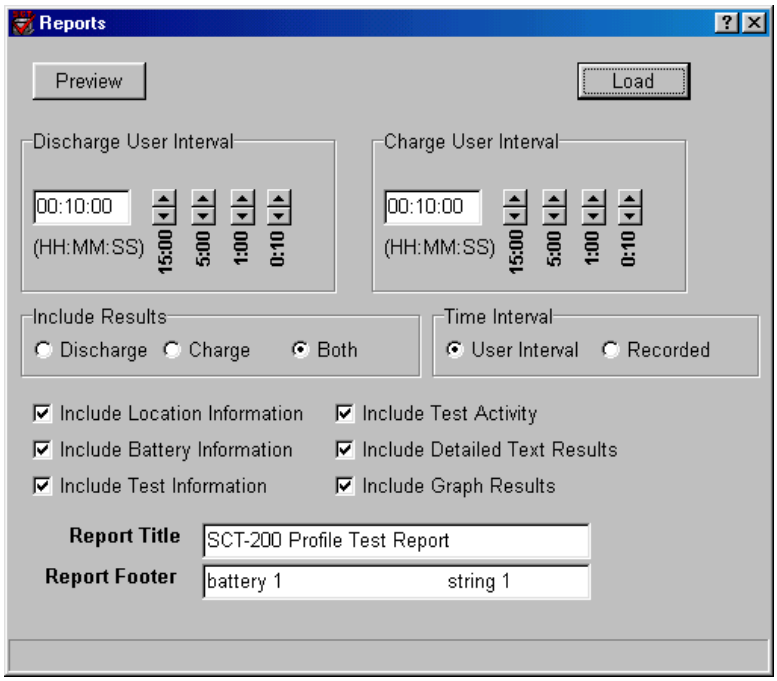


Figure 20. Reports Setup Screen

Load - When some functions are selected and no file is open, a message indicates a file must be opened. To open a file after the Report Generator is started, click Load and select a file. You may also use Load to open a new file with an existing file open. You do not need to close the old file, as only one text file can be open at a time. (Refer to *Opening an Archive File*.)

Discharge User Interval - Type a value or click the time buttons next to the box. The Discharge Interval determines the frequency of report sampling for discharge. Specify time in hours, minutes, and seconds (10 second minimum).

Charge User Interval - Type a value or click the time buttons next to the box. The Charge Interval determines the frequency of report sampling for charge. Specify time in hours, minutes, and seconds (10 second minimum).

Include Results: Charge, Discharge, Both - Click these buttons to include discharge and charge data in the printed report.

Time Interval: User Interval, Recorded - If you select User Interval, the report shows data at intervals selected in the Discharge and Charge User Interval boxes. If you select Recorded, the report shows data at 1 amp or 5mV deviations while it was recorded.

Include check boxes - Select the items to include in the report.

Report Title, Report Footer - You may type text that will appear on each printed page of the report.

12.4. Report Preview Screen

Preview - After report parameters are selected, to see the report on the View Reports screen, click Preview. Each section of the report is displayed one page at a time. To change the size of the page display, click Page, Width or Full. To view different pages in one section, click the first, previous, next or last page arrows at the top of the screen.

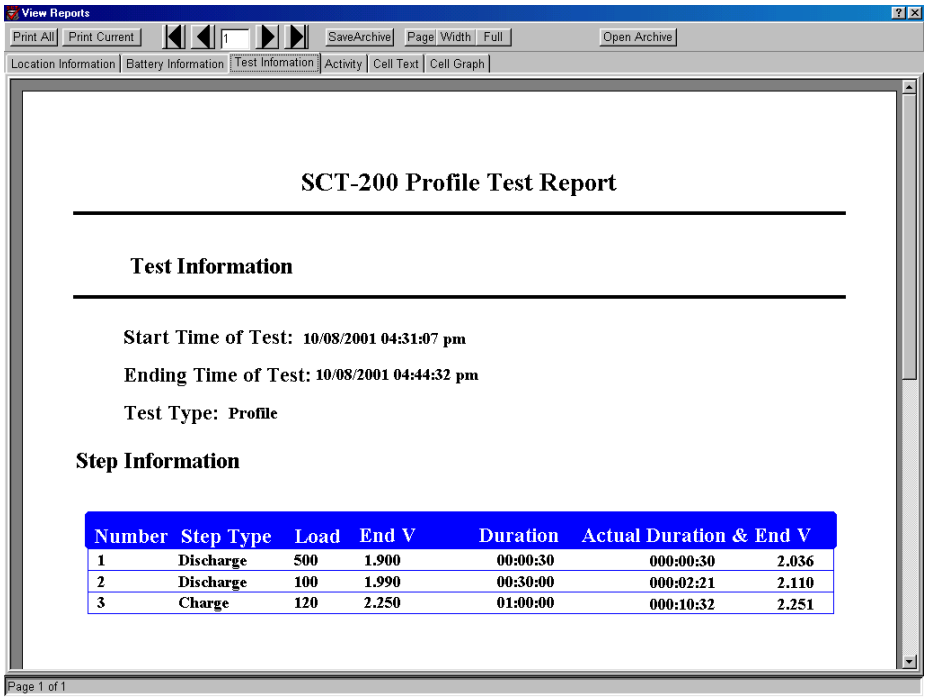


Figure 21. Report Preview Screen

To view different sections of the report, click the tabs along the top of the screen. A tab appears for each item selected on the Reports setup screen.

12.5. Saving a Report

The Report Generator can save a report as an archive file, which you may open later and view or print. Reports are saved in the folder last opened, unless you select a different folder. Both the Report Generator and Archive Reader can open archive files. You cannot change an archive file after you save it. Archive format lets you distribute the report file while ensuring the integrity of the data.

Save Archive - To save a report in **.ZRF** format, click Preview in the Reports box. When the Report Preview screen appears, click Save Archive. In the Save Archive box, select the folder, type the file name, then click Save.

12.6. Printing a Report

Print Current and **Print All** - To print only the pages under the currently-selected tab, click Print Current on the Report Preview screen. To print all the pages under all the tabs, click Print All. When you click Print All, a print dialog box lets you specify print all pages, the current page or specific pages, the number of copies, and the printer setup.

12.7. Opening an Archive File

Load (in Reports) and **Open Archive** (in Report Preview) - You may open an SCT Archive **.ZRF** file while a text file is open. Archive files cannot be changed. To open an archive file, click Load on the Reports dialog box or click Open Archive in the Report Preview dialog box. In the Open box, at Files of Type, select SCT-200 Archive from the drop-down list, select the file name, then click Open.

The archive file opens and is displayed. Use the buttons along the top to change the page size and view different pages. To print the report, click Print at the top left. To close the file, click the Close button.

12.8. Archive Reader Program

The SCT-200 Archive Reader report viewer is a separately distributed freeware program used to view and print archive files when the Report Generator is not available. The Archive Reader is typically distributed with archive files when these files are sent to locations that do not have the Report Generator program. The Archive Reader is packaged with the Report Generator and may be freely copied and distributed with archive files. You may download the Archive Reader from the www.alber.com Web site.

13. SCT Calibration

To perform calibration, the computer must be connected to the SCT module, with power on to both. Refer to *Getting Started.* Only a technically qualified person should perform calibration.

13.1. Calibration Screen

From the main menu, click F5 Calibration to display the SCT-200 Calibration screen.

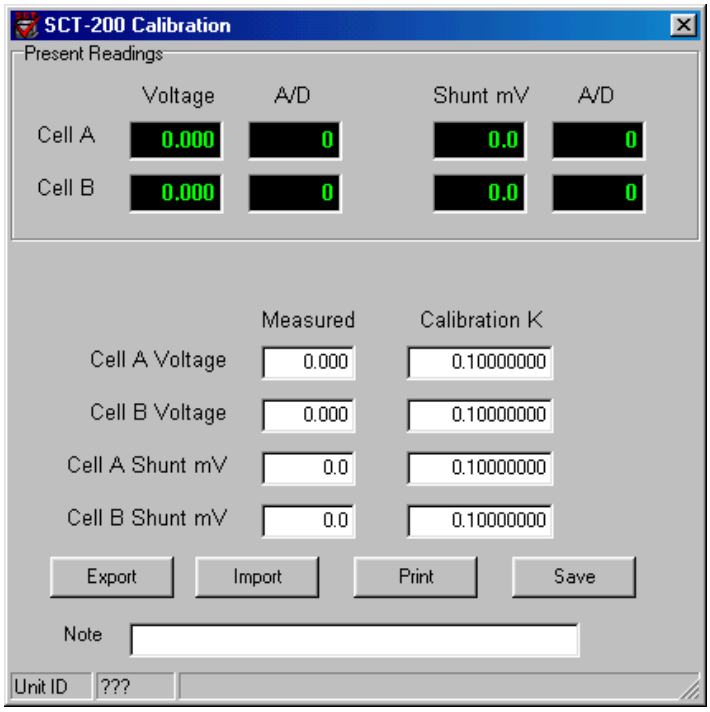


Figure 22. Calibration Screen

The following buttons are on the Calibration screen.

Export - Click Export to create an **.INI** file in which only calibration factors are saved. This file does not contain setup or test data. (See the Save button below.) Save the **.INI** file to a 3.5-inch disk (recommended) or to the hard drive. You should keep an **.INI** file of the most recent calibration factors in case they must be reinstalled into the SCT program.

Import - Click Import to load the calibration factors saved in an **.INI** file into the SCT program.

Print - Click Print to print a report of the calibration factors. You should keep a printout of the calibration factors in case they must be reinstalled into the SCT program. The calibration factors can be manually entered in the Calibration screen if calibration is lost or the program is moved to another computer.

Save - After calibrating the SCT, click Save to save the new Calibration K factors to the SCT database. This saves the setup, test, and calibration data to the **sctsetup.mdb** file.

13.2. Calibrating the SCT-200

The recommended calibration interval of the SCT-200 system is once a year. First, check the system in the as-found (before calibration) condition. If all as-found parameters are within specification, calibration does not have to be performed. Use a photocopy of the SCT-200 Calibration Form in Appendix A to record the before and after readings to keep track of calibration discrepancies.

The following equipment is required for SCT-200 calibration:

Albércorp CS-2000 calibration source (recommended).

A 3½ digit calibrated digital multimeter (DMM), Fluke 87 or equivalent.

If a CS-2000 is not available, use a source capable of delivering 0 to 2VDC for cell calibration and 100mV for current calibration. The SCT cell voltage sense leads must be used.

WARNING: High voltages exist inside the SCT-200 system components and on the CS-2000 terminals. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when connecting leads and making adjustments and when removing and installing the SCT cover.

CAUTION: If your SCT system consists of two SCTs set as Primary and Secondary, calibrate one SCT at a time. The SCT being calibrated must be connected to the computer via the Control DB-9 connector on the SCT.

13.3. SCT Unit ID Number

An SCT module can have a Unit ID number from 0 to 7. Typically, a primary unit is assigned 0 and a secondary unit, if used, is assigned 1. This number appears at the bottom of the Diagnostics and Calibration screens. The calibration K factors are saved by Unit ID number. The number is set using a DIP switch inside the SCT. If you must change the ID number, do the following.

Power off the SCT and remove the load cables, if connected, from Current Out A+ A– B+ and B– terminals on the SCT. With the SCT powered off and all voltage sources removed, open the cover of the SCT.

Locate the DIP switch on the Controller board. The DIP switch block has eight individual switches 1 through 8. Each of these may be set to Off or On. Use switches 1, 2 and 3 to set the ID; switches 4 to 8 are not used. Set the switch to the desired Unit ID number according to the following table.

DIP Switch	1	2	3	4 to 8
Unit ID Number				
0	OFF	OFF	OFF	N/U
1	ON	OFF	OFF	N/U
2	OFF	ON	OFF	N/U
3	ON	ON	OFF	N/U
4	OFF	OFF	ON	N/U
5	ON	OFF	ON	N/U
6	OFF	ON	ON	N/U
7	ON	ON	ON	N/U

Figure 23. Unit ID Code

After setting the Unit ID number, replace the cover on the SCT.

13.4. SCT-200 Calibration Source

When calibrating the SCT-200, use a CS-2000 calibration source. If a CS-2000 is not available, use the original sense lead harness to connect to an alternate voltage source. Not using the original cables may result in inaccurate calibration.

CAUTION: Using a source other than the CS-2000 without the original sense leads may result in inaccurate calibration.

Photocopy the SCT-200 Calibration Form in Appendix A before calibrating the equipment. Retain this form in the event the equipment needs servicing in the future.

13.5. Cell Voltage and Current Calibration

To open the Calibration dialog box, click F5 Calibration on the main menu.

Present Readings - The Present Readings area indicates the cell voltages as measured by the SCT, and the voltages (which correspond to current) across the external
SCT **A B Current Sense** posts. If new voltages are typed in, the readings adjust to match the newly-entered values. The A/D (analog to digital) counts are used for performing equipment diagnostics. Record the Present Readings volts and millivolts in the SCT Reading Before Calibration column on the Calibration Form.

Cell A Voltage Calibration

1. Connect a 2 volt source to the **Voltage Sense A+ and A–** leads from the SCT.
2. Using a DMM, verify the voltage source is **2.000V ±100mV**.
3. Record the voltage reading in the *Actual Input Reading* column on the Calibration Form.
4. Record the existing Present Reading in the *SCT Reading Before Calibration* column.
5. On the Calibration screen, confirm the A/D count for the Cell A Voltage reads from 1900 to 1950 counts.
6. On the Calibration screen, at the Cell A Voltage Measured box, type the measured value and press Enter. Notice the Calibration K-factor changes to compensate for any discrepancy.
7. Record the new Present Reading in the *SCT Reading After Calibration* column.
8. Calibration for Voltage Sense A is now complete.

Cell B Voltage Calibration

1. Connect a 2 volt source to the **Voltage Sense B+ and B–** leads from the SCT.
2. Using a DMM, verify the voltage source is **2V ±100mV**.
3. Record the voltage reading in the *Actual Input Reading* column on the Calibration Form.
4. Record the existing Present Reading in the *SCT Reading Before Calibration* column.
5. On the Calibration screen, confirm the A/D count for the Cell B Voltage reads from 1900 to 1950 counts.
6. On the Calibration screen, at the Cell B Voltage Measured box, type the measured value and press Enter. Notice the Calibration K-factor changes to compensate for any discrepancy.
7. Record the new Present Reading in the *SCT Reading After Calibration* column.
8. Calibration for Voltage Sense B is now complete.

Current A Calibration

1. Connect a 100mV source to the **Current Sense A+ and A–** terminals on the SCT.
2. Using a DMM, verify the voltage source is **100mV ±0.2mV**.
3. Record the millivolt reading in the *Actual Input Reading* column on the Calibration Form.
4. Record the existing Present Reading in the *SCT Reading Before Calibration* column.
5. On the Calibration screen, confirm the A/D count for the Cell A Shunt mv reads from 1820 to 1860 counts.
6. On the Calibration screen, at the Cell A Shunt mv Measured box, type the measured value and press Enter. Notice the Calibration K-factor changes to compensate for any discrepancy.
7. Record the new Present Reading in the *SCT Reading After Calibration* column.
8. Calibration for Current Sense A is now complete.

Current B Calibration

1. Connect a 100mV source to the Current Sense B+ and B– terminals on the SCT.
2. Using a DMM, verify the voltage source is **100mV ±0.2mV**.
3. Record the millivolt reading in the *Actual Input Reading* column on the Calibration Form.
4. Record the existing Present Reading in the *SCT Reading Before Calibration* column.
9. On the Calibration screen, confirm the A/D count for the Cell B Shunt mv reads from 1820 to 1860 counts.
5. On the Calibration screen, at the Cell B Shunt mv Measured box, type the measured value and press Enter. Notice the Calibration K-factor changes to compensate for any discrepancy.
6. Record the new Present Reading in the *SCT Reading After Calibration* column.
7. Calibration for Current Sense B is now complete.

Record the K Factors

1. Record the four Calibration K factors from the screen in the *Calibration K Factor* area on the Calibration Form.

Save the Calibration

1. Click the Save button after calibrating the SCT to save the new Calibration K factors to the SCT database. This data is saved to the **sctsetup.mdb** file.
   NOTE: The calibration factors are saved by Unit ID number.
2. If you want to create a new or updated **.INI** file, click the Export button.

14. Diagnostics

From the main menu, click F4 Diagnostics to display the SCT-200 Diagnostics screen. This screen lets qualified personnel perform special tests for troubleshooting. If a problem exists, Albércorp may request that certain tests be performed to help diagnose the problem. The following sections explain each utility in detail.

WARNING: High voltages exist inside the SCT-200 system components and on the CS-2000 terminals. Diagnostics must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing the SCT cover, and when connecting leads and making adjustments.

NOTE: If your SCT system consists of two SCTs set as Primary and Secondary, you can only perform diagnostics on one SCT at a time. You must connect the SCT to the computer via the Control DB-9 connector on the SCT. If changing SCTs, exit the Diagnostics screen and open it again to establish communication with the new SCT.

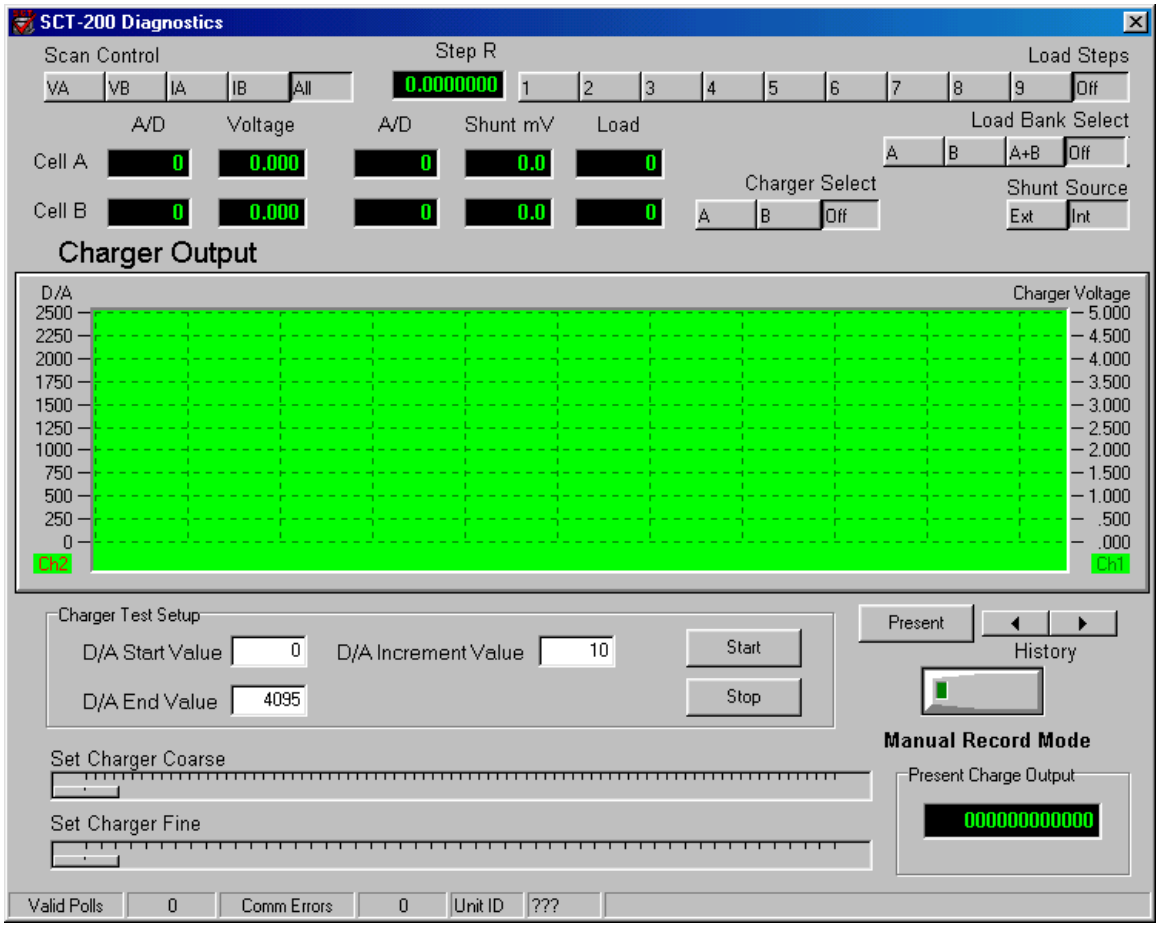


Figure 24. Diagnostics Screen

14.1. Diagnostics Screen Controls

The following items appear on the SCT-200 Diagnostics screen.

Scan Control VA, VB, IA, IB, All buttons - Click a button to scan either Cell A or B voltage channels or Cell A or B current channels. Click All to scan all four channels.

Step R display - Indicates the resistance value in ohms for the selected bank and load step.

Load Steps - Click to test a load step in the SCT. Each load step activates a resistor that provides a load current to the cell. Select Off to turn off all steps. NOTE: You must click a Load Bank Select A, B or A+B switch for Load Steps 1 to 9 buttons to function.

Cell A/D (Voltage) display - Indicates the cell voltage reading as an A/D decimal count.

Cell Voltage display - Indicates the cell voltage in volts.

Cell A/D (Current) display - Indicates the voltage drop across the internal SCT shunt as a decimal A/D count.

Cell Shunt mV display - Indicates the voltage drop in millivolts across the internal SCT shunt. The SCT uses this value to calculate the load applied.

Cell Load display - Displays the calculated load applied by the SCT to the cell.

Load Bank Select buttons - Click a button to apply the Load Step selection to internal SCT Load Bank A or B or both. If you click Off, the Load Steps are not active and the internal load resistors are not tested.

Charger Select buttons - To apply the charger output to cell A or B, click the appropriate button. Click Off to turn off the charger.

Shunt Source buttons - Select Int (internal) to use the SCT internal shunt as a current measuring device. Select Ext (external) to use an external current providing source, such as the Albércorp CS-2000 current source.

Charger Output area - This area plots the output of the D/A in decimal counts into the SCT charger and the charger output voltage.

D/A Start Value field - The starting range for the charger test. The default is 0. Normally not changed by the user.

D/A End Value field - The ending range for the charger test. The default is 4095. Normally not changed by the user.

D/A Increment Value field - Vary this number from 1 to 50 to change the rate at which the charger D/A counts are incremented. The default is 10.

Start and **Stop** buttons - Click Start to automatically run the charger diagnostics test. When the test ends, a message appears. To stop the test before it ends, click Stop.

History arrows and **Present** button - Click the left History arrow to view previous data in the Charger Output area while the test is running. Click the right arrow to advance through the history. Click Present to reset to display data as it is being read.

Manual Record Mode button - When clicked on, the D/A and charger output are plotted according to the manual slide control settings.

Set Charger Coarse and **Set Charger Fine** sliders - These sliders vary the output of the D/A into the charger.

Present Charger Output display - This area displays the D/A output as a binary number.

14.2. Voltage, A/D and Load Diagnostics

You should run this diagnostic test periodically, especially if there is a problem controlling load current. The test verifies no step resistance is too high or low. Each step is approximately half the resistance of the previous step, unless its weight value is not double that of the previous step.

Click Shunt Source Int. The Shunt mV current at Cell A and Cell B monitors the SCT internal shunt if Shunt Source Int is selected. If Shunt Source Ext is selected, you can connect an input to the SCT banana jacks to inject a millivolt signal to simulate a current signal.

Select the VA, VB, IA, IB or All button to have the Cell A and B displays indicate the actual voltages and currents at the SCT inputs.

The A/D counts are from the A/D (analog to digital) circuitry before any processing or calculations are applied.

Verify that Voltage displays cell voltage. If the voltage is not displayed, fix the electrical connections before continuing with the test.

Set Load Bank Select to A, B or A+B. Select Load Steps 1 through 9 and observe the Cell A or B current reading at Shunt mV and the Load value. This lets you test each load resistor in the SCT and verify the resistance or actual load value in amperes.

Compare the values to the following chart for a standard SCT-200.

Step number	Step weight	Value in ohms	Amps at 2 Volts
1	1	0.8	2.5
2	2	0.4	5
3	4	0.2	10
4	8	0.1	20
5	16	0.05	40
6	32	0.025	80
7	64	0.0125	160
8	64	0.0125	160
9	64	0.0125	160
10	N/U	-	-
11	N/U	-	-
12	N/U	-	-

Note: These are approximate values. For exact values, compare the readings to the SCT-200 Load Bank Step Weight log sheet supplied with the unit.

Figure 25. Step Weight Chart

14.3. Ohmmeter Test

You may use an ohmmeter to read each step resistance. This checks the values of the load resistors inside the SCT.

WARNING: There must be no voltage source connected to the SCT A+ A– B+ or B– connectors during this test.

With power off, remove the load cables from the SCT A+ A– B+ B– connectors. Connect the ohmmeter across either the A+ and A– connectors or the B+ and B– connectors, and then power up the SCT program.

On the Diagnostics screen, click the Load Bank Select A or Load Bank Select B button. Energize each step, one at a time, by clicking on a Load Step button. The ohmmeter indicates the resistance value of the resistor activated by the Load Step. The measured resistances can be compared to the values in the Step Weight Chart. Remove the ohmmeter from the connectors after completing the test.

14.4. Charger Output Linearity Test

This test automatically checks the linearity of the A/D circuits and the Charger output. By making the following jumper selections, the safety circuits are disabled and the signals are rerouted appropriately.

CAUTION: Do not perform this diagnostic without the assistance of an Albércorp representative.

WARNING: High voltages exist inside the SCT-200. Observe electrical safety precautions when removing and installing the SCT cover, and when connecting leads and making adjustments.

Power off the SCT and remove the load cables, if connected, from Current Out A+ A– B+ and B– terminals on the SCT.

With the SCT powered off and all voltage sources removed, open the cover of the SCT and install jumpers as follows:

On the Relay Board, install a jumper on the JP4 pins.
On the Relay Board, install a jumper on the JP5 pins.
On the Processor Board, move the jumper from JP5 pins 1 and 2 to JP5 pins 2 and 3 (away from the edge).
On the Processor Board, move the jumper from JP6 pins 1 and 2 to JP6 pins 2 and 3 (away from the edge).

Connect the voltage sense leads from the SCT Voltage Sense connector to the A+ and A– terminals on the SCT, then power up the SCT.

Click the Start button in the Charger Test Setup area. Two lines plot across the green screen as the charger A/D signal and voltage output increase. The charger voltage appears as a green line, and the A/D count appears as a red line. The test ends when the A/D End Value is reached.

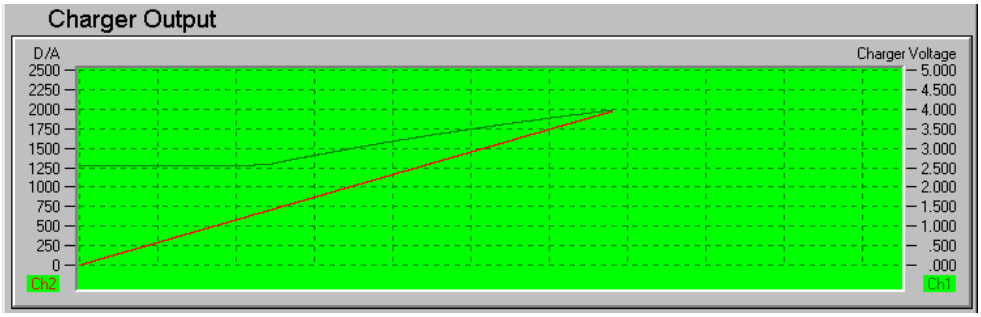


Figure 26. Typical Charger Linearity Plot

NOTE: You may manually run the charger test by clicking the Manual Record Mode button on and setting the Set Charger Coarse and Set Charger Fine sliders to the desired values. Do not click Start. Clicking Start turns the Manual Record Mode off.

After the test, power down the SCT and replace the jumpers to their original positions as follows:

Remove the voltage sense leads from the A+ and A– terminals on the SCT.

On the Relay Board, remove the jumpers from the JP4 and JP5 pins.
On the Processor Board, move the jumper from JP5 pins 2 and 3 to JP5 pins 1 and 2.
On the Processor Board, move the jumper from JP6 pins 2 and 3 to JP6 pins 1 and 2.

Replace the cover on the SCT.

15. Preventive Maintenance

Visual Inspection - Visually inspect SCT system components for damaged or frayed power cords and cables, and damaged panels, controls, and connectors. If you detect any damage, remove the equipment from service until the damage is repaired.

WARNING: Before cleaning any equipment, ensure the system is disconnected and power to the SCTs is shut off. You must disconnect the SCT system components from any DC voltage sources and from any AC power sources.

Cleaning System Components - The SCT system should provide years of service if properly maintained. Clean the computer screen and system components using a soft cloth, *slightly* moistened with water. Do not use commercial or industrial cleaners that may attack the computer display and housing. Never expose the computer or any system component to water, high humidity, or dampness.

Fans and Vents - If applicable, remove dust from fans and vents using a small brush or hand held vacuum cleaner. If fans or vents have dust filters, clean the filters according to the manufacturer's instructions.

Sense Leads - Clean the sense leads as required. The acid to which the sense lead clips are exposed during testing should be neutralized often, using a water and baking soda mixture. Brush this mixture onto the sense lead clip, then rinse well with clean, cool tap water. Whenever you are cleaning the sense lead clips, ensure the system is disconnected and power to the system is shut off. Dry with a clean, soft cloth.

Internal Components - The SCT system is microprocessor based and has no user-replaceable components. Because high voltage exists in several areas in the unit, only knowledgeable users should remove the covers or cowling from system components (the PC, SCT, UPS, etc.) when required. Failure to comply with this restriction could pose a safety hazard and/or void the system warranty.

WARNING: High voltages exist inside the SCT system components and on the terminals. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing the equipment covers, and when connecting leads and making adjustments.

UPS (Uninterruptible Power Supply) - If you are using an optional UPS with the SCT system, be certain the UPS internal battery is fully functional. Follow the instructions in the manual provided by the UPS manufacturer.

Shipping - Protect the SCT system from bumps and bangs during normal use or storage, and provide protection during shipment between test sites.

16. Updating SCT Software

The following sections describe replacing the firmware IC, updating from DOS to Windows-based SCT software, and reinstalling Windows-based SCT software. Read all of the sections before beginning the update process. If assistance is required, obtain technical support by contacting Albércorp directly. Read the following key points before replacing the firmware or connecting the computer to the SCT and starting the update.

16.1. Key Points When Updating

The following are key points that you must observe when updating the SCT hardware and software from DOS to Windows.

- A firmware upgrade (new memory IC) is required for updating from the DOS to Windows SCT program. If you do not have this IC, with installation instructions, do not proceed.

- The SCT system (computer and SCT module) must be connected and operating before updating the software or entering calibration data.

- You must manually enter calibration settings after updating from the DOS version. Be sure you have a print-out of calibration settings (K-factors) before starting the update.

- Calibration K-factors must be entered with the computer connected to the SCT via the SCT Control DB-9 connector.

- The test data created under DOS cannot be imported into the new Windows SCT software. You will configure new capacity or profile tests in the program after start-up and create new test data files that will be stored under programfiles\alber\SCT200\reports\locationname\.

- If you have a primary and a secondary SCT, you must enter calibration K-factors for each SCT, one at a time. Connect either the primary or secondary SCT to the computer via the SCT Control DB-9 connector.

16.2. Replacing the Firmware IC

Before the Windows software can communicate with an existing DOS SCT-200 system, you must change a firmware IC inside the SCT.

1. Power down the SCT and disconnect it from AC power.
2. Disconnect all voltage sources and connections from the SCT.
3. Remove the SCT cover.
4. The PROM firmware IC is located in socket U9 on the top Controller board inside the SCT.
5. At this point, the technician should be connected to ground with a ground strap, or should discharge any static electricity by touching a grounded object.

   WARNING: Observe that the PROM IC has a notch on one end. The new PROM must be inserted with the notch and Pin 1 on the same end. Failure to properly orient the notch and Pin 1 will result in severe damage to the SCT.
6. Using a chip puller, carefully remove U9 from its socket.
   CAUTION: The socket can easily be broken if care is not exercised during removal and installation of the chips.
7. Grasp the replacement U9 PROM IC and install it in the socket, making certain that the notch on the IC and Pin 1 are oriented the same as the original IC.
8. Replace the cover on the SCT.
9. Reconnect the SCT to power and continue with the software update.

16.3. Updating from DOS to Windows SCT Software

This section describes how to install the SCT-200 Windows software on a computer that has the DOS version installed.

To update from the DOS to the Windows version, insert the SCT CD program disk into the computer and select **Start|Run** from the Windows desktop. At the Run dialog box, type **d:\setup** (or other appropriate drive letter), then follow the on-screen instructions.

After software installation, you must enter the calibration data. Start the newly-installed SCT Windows program by double-clicking the SCT icon on the desktop, then open the Calibration dialog box. Type the calibration settings (K-factors) from the calibration print-out into the Calibration boxes for Cell Voltage A and B, and Cell A and B Shunt mV. Close the Calibration dialog box. If you have a secondary SCT, repeat this process: Power down the system, connect the secondary SCT, power up, and enter the calibration K-factors.

This completes the update process. Either exit the program and power down the system or leave the system powered up to create test setups.

16.4. Reinstalling Windows SCT Software

The SCT-200 Windows-based software is loaded onto the laptop computer at the factory. If the program or data becomes corrupted, follow the steps in this section to reinstall the SCT program. Connect the computer to the SCT and power up the system before starting the reinstall.

The Windows SCT program does not overwrite an existing **sctsetup.mdb** calibration file during reinstallation. However, Albércorp suggests you have a backup copy of the **sctsetup.mdb** file on disk before proceeding. It is also advisable to have a print-out of the calibration settings.

Test data created using the Windows SCT program can be imported into the reinstalled SCT software. The test data files are stored under C:\program files\alber\sct\reports*locationname*\

To reinstall the Windows SCT program, insert the SCT CD program disk into the computer and select **Start|Run** from the Windows desktop. At the Run dialog box, type **d:\setup** (or other appropriate drive letter), then follow the on-screen instructions.

The calibration data file is not overwritten during reinstallation. After starting the SCT program, check the calibration settings. If the correct values are not indicated, copy the backup **sctsetup.mdb** file from your 3.5-inch backup disk over the existing file on the hard drive.

If no **sctsetup.mdb** file is present, the program creates one. At this point, either recalibrate the SCT system (refer to *SCT Calibration*) or re-enter the calibration constants (K-factors) from the calibration report as follows before using the SCT system for testing.

NOTE: Calibration K-factors must be entered with the computer connected to the SCT via the SCT Control DB-9 connector.

NOTE: If you have a primary and a secondary SCT, you must enter calibration K-factors for each SCT, one at a time. Connect either the primary or secondary SCT to the computer via the SCT Control DB-9 connector.

To enter the calibration data, start the newly-installed SCT Windows program by double-clicking the SCT icon on the desktop, then open the Calibration dialog box. Type the calibration settings (K-factors) from the calibration print-out into the Calibration boxes for Cell Voltage A and B, and Cell A and B Shunt mV. Close the Calibration dialog box. If you have a secondary SCT, repeat this process. Power down the system, connect the secondary SCT, power up, and enter the calibration K-factors.

This completes the reinstall process. Either exit the program and power down the system or leave the system powered up if required.

17. Appendix A: SCT-200 Calibration Log

SCT-200 Calibration Form

General Information

Customer: _____

Calibration Date: _____

Serial Number: _____

Data

	Approximate Input Voltage	**Actual Input Reading** (DMM Reading)	**SCT Reading Before Calibration**	**SCT Reading After Calibration**
Cell A Voltage	2 volts			
Cell B Voltage	2 volts			
Current A (Shunt mV)	100mV			
Current B (Shunt mV)	100mV			

	Calibration K Factor (after calibration)
Cell A	
Cell B	
Current A	
Current B	

Calibrated By:_____

Date: _____

18. System Specifications

Power
115VAC ±10% 60Hz 12A / 230VAC ±10% 50Hz 6A factory optional

Fuses
AC Input fuses 15A 115VAC / 7A 230VAC

Inputs

Voltage Sense	Two channels for monitoring cell voltage(s) during operation.
Current Sense A and B	Two channels for use during calibration only.

Inputs/Outputs (function dependent)
A+ A– B+ B– Load/charge cable connectors.

Indicators

AC Power	Red LED
Enable A and Enable B	Green LEDs indicating normal operation.

Communication

Control	RS-232 DB-9 connector to the computer.
Slave	RS-232 DB-9 connector from primary to secondary module.

System

	Reading Range	Control Accuracy
Discharge Current	(0 to 600A one cell / 0 to 300 A two cells)	±1% (±2 Amps)
Discharge Voltage	2.08VDC to 1.75VDC	±0.01 volt
Charging Voltage	Maximum 2.60VDC	±0.01 volt
Charging Current Limit	0 to 120 Amps	(±1 Amp)

Control Switches

AC Power	Rocker switch for main power.
Reset	Push button for minimum or maximum limits.
DIP switch	Internal on Controller board for primary or secondary configuration.

Maximum Dimensions
Width: 13" Depth: 23.5" Height: 14" Weight: 55 pounds

Operating Environment

- Temperature range: 5°C to 40°C (41°F to 104°F)
- Humidity range: 0% to 80% RH (non condensing) at 5°C to 31°C
  0% to 50% RH (non condensing) at 32°C to 40°C
- Indoor use only.
- Altitude 0 to 2000 meters above sea level.

Packaging
- Floor mount horizontally or vertically.

Specifications subject to change without notice.

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