Cadex Spectro™ CA-12 DC

Deep Cycle Battery Rapid-Tester

User Manual

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Warranty & Service

Cadex Electronics Inc. warrants the Spectro™ CA-12 Deep Cycle Battery Rapid-Tester unit against defective materials and workmanship for two (2) years and the Spectro™ CA-12 Pencil Probes against defective materials and workmanship for ninety (90) days. Warranty starts from the original date of shipment.

The warranty does not cover:

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- Damage caused by an attempted repair not authorized by Cadex.

- Normal wear and tear.

- Cosmetic or similar damage.

- Damage from external causes such as leakage spills, power fluctuations or power failure.

- Damage caused by inadequate packaging during shipping or storage.

- Product without appropriate model number, serial number, or safety markings.

- Product used for rental purposes.

- Changes or modifications to the equipment not expressly approved by Cadex Electronics Inc.

The printer is warranted by its respective party. The printer does not have any serviceable parts.

To obtain service, contact service@cadex.com or (Canada) 1-604-231-7777, (USA Toll Free) 800-565-5228, or (Europe) +49 (0) 911 240 332-0.

Table of Contents

Section 1: Quick Start

Get Started with the Spectro™ CA-12 Deep Cycle Battery Rapid-Tester System

Initial Inspection

When you receive the Spectro™ CA-12 Deep Cycle Battery Rapid-Tester ("**CA-12**"), check that the unit has been supplied with the accessories described in The Spectro™ CA-12 Deep Cycle Package section.

Check the **CA-12** and its accessories for any signs of damage that may have occurred during shipping. Check for cracked or opened cases, exposed wires or any other signs of rough handling. Contact Cadex Electronics Inc. if any damage is discovered.

Initial Charge

When the unit is received it may not be fully charged. Plug in the 12VDC power supply to charge the **CA-12** unit before taking any battery measurements. The **CA-12** will charge when the power supply is plugged in and will automatically stop charging when it is fully charged.

Before Testing a Battery

When testing a battery, the probes must make contact with the lead portion of the battery poles to obtain accurate capacity readings. Connecting to high resistance steel screws or bolts will drastically affect capacity readings.

Test a Battery

1. Charge the **CA-12** unit. Turn the **CA-12** on.

2. Ensure the correct matrix is selected for the battery.

3. Select **Test Vehicle** and press **Enter**.

4. Scroll to an empty record and press **Enter**. Enter a vehicle serial number and select the number of batteries in the set.

5. Select the vehicle parameters and press **Enter**.

6. Select the battery code and press **Enter**.

7. Connect the red probe to the positive terminal and the black probe to the negative terminal on the battery.

8. When the test is complete, view the test results on the **CA-12**′s screen.

9. Repeat the above process for each battery in the set.

> **Note:** If surface charge has been detected and a message displayed, remove the surface charge before repeating the test. Let the batteries rest for about 8 hours, or drive the vehicle for 5 minutes then wait 5 or 10 minutes, or place a 50A load on the batteries for 5 minutes then wait 5 or 10 minutes.
>
> If the battery test is repeated when the surface charge detected message appears, the possibility exists for increased measurement errors or diminished ability to detect shorted or partially shorted cells. This condition may be noticed after recently charging the batteries.

To View Test Results

1. Select **Saved Results** and press **Enter**.

2. Select **View/Print** and press **Enter**.

3. Select the test result to view and press **Enter**.

Understanding Test Results

When all batteries in a vehicle have been tested, the **CA-12** will display for a few seconds:

```
Testing is completed
```
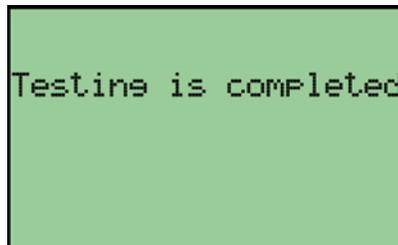
Then the vehicle results will appear:

```
 VEHICLE 000099

CAP = 113 min (98%)
SoC = 97%
OCV = 37.55V

 Good Battery Set
```
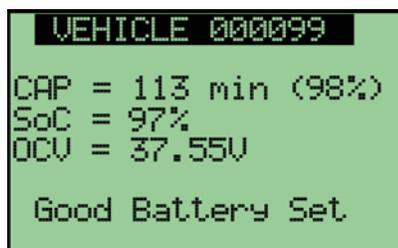
The Capacity is shown in both minutes and percentage. For a vehicle, the Capacity in minutes indicates the battery runtime after a full charge. The percentage capacity is a quick reference that indicates the condition of the batteries compared to the nominal rating of the set.

The State of Charge (SoC) provides a "fuel gauge" result for the amount of charge remaining in an individual battery or vehicle set. When SoC = 100% the battery or vehicle is fully charged, and when SoC = 0% the battery or vehicle has insufficient remaining charge to operate.

The Open Circuit Voltage (OCV) result is the sum of each of the battery voltages that have been tested.

While viewing the vehicle results screen, press the ▶ key to view a graph of individual battery State of Charge (SOC) values.

```
 VEHICLE 000099 SOC
 0%              100%
1
2
3
4
5
6
```

The **State of Charge** screen can help identify a battery that needs recharging or a set of batteries that need an equalization charge to bring the charge levels of all batteries to 100%.

While viewing the vehicle's State of Charge graph, press the ▶ key to view the Vehicle Capacity graph.

The Vehicle Capacity graph can help identify a bad or weak battery at a glance. The capacities shown are the estimated capacities each battery would have after a full charge.

Press **Esc** to return to the **Vehicle Results** screen.

From the **Vehicle Results** screen, press the ▼ key to view the **Battery Results** screen:

Use the arrow keys to select a battery and then press **Enter**.
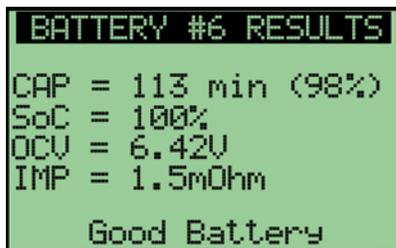
Press **Esc** to return to the previous menu.

To Print Test Results with Infrared Printer

1. Turn the portable infrared printer on.

2. Position the printer and the **CA-12** such that the IR ports on both devices are aligned and within 45cm (18″) distance.

3. Select **Saved Results** and press **Enter**.

4. Select **Print Vehicle** and press **Ente**r.

5. Select the vehicle and press **Enter**.

6. Press **Enter** to send viewed results to the printer.

To Export Test Results to PC Companion™ DC

1. Connect the **CA-12** to the PC using the serial cable.

2. Launch **PC Companion™ DC** on the PC.

3. From the **CA-12** menu, select **Results** and then click **Get Results**.

4. The test results are exported to the PC.

Section 2: The Spectro™ Battery Rapid-Tester

Welcome to Spectro™ CA-12 Deep Cycle Battery Rapid-Tester

The Spectro™ CA-12 Deep Cycle Battery Rapid-Tester ("**CA-12**") is a hand-held battery tester for 6V, 8V and 12V deep cycle lead acid batteries that calculates capacity and state of charge. Typical applications would be to test the deep cycle batteries in golf carts, aerial work platforms, wheelchairs or floor cleaning equipment. It also has the ability to calculate the cold cranking amp (CCA) rating of starter batteries and to perform continuity, temperature, and voltmeter measurements.

The **CA-12** employs multi-model electrochemical impedance spectroscopy (Spectro™) by using matrices that are stored within the unit. A matrix is a set of typical characteristics created by scanning several batteries of a single model with various states of health conditions. It is then used to estimate the capacity of a battery under test by comparison to the selected matrix. For best results a separate matrix is required for each distinct battery model.

Safety Notice

- Read, understand and follow all instructions in this manual before using the **CA-12** unit.

- Refer to the vehicle owners' manual or the battery manufacturer MSDS (Material Safety Data Sheet) for specific handling and safety information.

- Gases produced by a battery are explosive. Test batteries in a well-ventilated area and use extreme caution when working with batteries.

- Always inspect a battery for physical damage before testing a battery.

- Be sure vent caps are tight and level.

- Make certain ignition switches are turned to the OFF position.

- When testing an in-vehicle battery, always wear proper eye protection and never lean over the battery.

Use of Equipment

The **CA-12** is designed with adequate safeguards to protect the user from shock and other hazards when used as specified within this document. However if the equipment is used in a manner not specified by this documentation, the protection provided by this equipment may be impaired. Please read this document and equipment labeling before using the equipment.

Modification of Equipment

CE, FCC, CSA and other approvals apply only to the **CA-12** in the factory-authorized configuration. Changes or modification to the equipment not expressly approved by Cadex will void the approvals and void the user's authority to operate the equipment.

Radio Interference

This equipment generates, uses, and radiates radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference with radio communications. It has been tested and found to comply with the limits for a Class "A" digital device pursuant to Subpart B of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user, at their own expense, is required to take whatever measures needed to correct the interference.

EN55011 Warning: This is a Class A product according to EN55011. In a domestic environment, this product may cause radio interference, in which case the user, at their own expense, may be required to take adequate corrective measures.

The equipment is designed with adequate safeguards to protect the user from shock and other hazards when used as specified within this document. If the equipment is used in a manner not specified by the documentation, the protection provided by the equipment may be impaired. Please read the documentation and equipment labeling before using the equipment.

Disposal of Waste Electrical and Electronic Equipment (WEEE) in the European Union

This symbol on the product and package indicates that this product must not be disposed with unsorted municipal waste. Instead, it is your responsibility to dispose of WEEE by handing it over to a designated collection point for the disposal. The separate collection and recycling of waste equipment will help conserve natural resources and ensure that it is disposed in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for disposal, please contact your local municipal office, waste disposal service or where you purchased the product.

Introduction

The Spectro™ CA-12 Deep Cycle Battery Rapid-Tester ("**CA-12**") is a 6, 8 and 12-volt battery rapid-tester for deep cycle lead acid batteries. It uses sophisticated algorithms to determine reserve capacity and state of charge. It also has Cold Cranking Amp (CCA), continuity, voltmeter, and temperature tests.

The Spectro™ CA-12 Deep Cycle Package

The Spectro™ CA-12 Deep Cycle package contains the following items:

- Spectro™ CA-12 Deep Cycle unit with an internal rechargeable Li-ion battery
- Pencil probes
- Universal AC input power supply and power cord
- PC Companion™ DC software
- RS-232 cable to connect the Spectro™ CA-12 DC to a PC
- User manual

⚠	**CAUTION**

Use only the power supply and power cord supplied with the Spectro™ CA-12 Deep Cycle Battery Rapid-Tester. The power cord is the disconnect device.

Spectro™ CA-12 Deep Cycle Battery Rapid-Tester Features

⏻	ON/OFF	Turns the **CA-12** on and off.
	ENTER	To start tests, confirm settings, and select menu items.
	ESC	To exit menus and result screens.
	Directional keys	To scroll through menus and results.
	Pencil Probes	Connect these probes to the battery terminals. The red probe to the positive (+) terminal and the black probe to the negative (-) terminal.
	Main Display	LCD viewing panel.
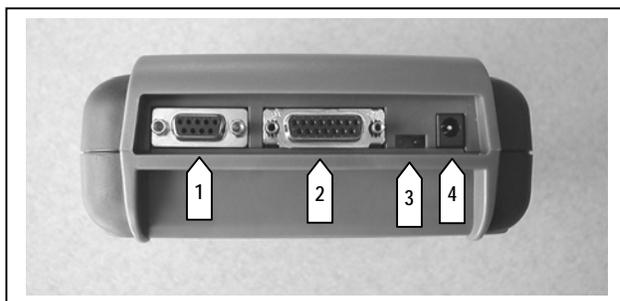
1	Serial port	To connect to a computer.
2	Battery probe port	Connect the battery probe cable to this 15-pin port.
3	Infrared printer port	Place the infrared printer in front of this port.
4	Input Power Port	Connect the external 12VDC power supply here.

Battery Testing

Cautions and Notes

⚠ **CAUTION**

Do NOT attach probes to a battery cable. This may result in inaccurate readings.

While testing batteries, CA-12 probes must be connected to the lead battery posts to obtain accurate, repeatable capacity readings. Connecting to high resistance steel screws or bolts will drastically affect capacity readings.

⚠ **CAUTION**

Do NOT connect the CA-12 across more than one battery or 16V. Short-term connections greater than 16V are acceptable – the LCD will indicate a High Voltage error message and beep. Exceeding 60V may cause the CA-12 internal fuse to blow or may cause permanent damage.

Note: When testing a vehicle that has just come off the charger, it is necessary to drive the vehicle around for 5 minutes or let the batteries rest for 8 hours to remove surface charge.

> **Note:** Before testing batteries within a vehicle, be sure to disconnect the vehicle from the charger.

> **Note:** When moving the unit from one temperature extreme to another (for example, from freezing weather to room temperature), allow the unit to stabilize one hour before testing. The unit can operate from 0° C (32° F) to 40° C (104° F).

Before Testing

Clean the Battery Terminals

Clean the battery terminals with a wire brush. Dirty or corroded battery posts may significantly affect the results.

Figure 1: Example of Corrosion on a Battery Post

Connect the Probes to the Battery Post

Proper connection of the probes to the battery post is required for accurate readings. Be sure to connect the probes to the lead battery post and not to the strap, threaded screw, or bolt.

> **Note**: As soon as the **CA-12** detects a valid voltage, it will start a battery test. A battery test may begin when the "Please connect battery leads" message appears or when the battery date code prompt is visible.

Both pins of the probes must contact the battery terminal. Push the probes down so that the pins depress into the handle at least 50%.

Figure 2: Probe is properly connected to the lead post
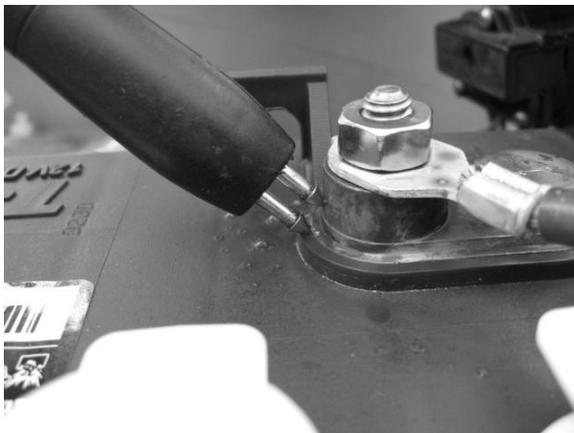
Figure 3: Probe incorrectly connected to the lead post

Battery Testing Order

When testing multiple vehicles, a consistent battery test sequence should be followed from vehicle to vehicle. The **CA-12** will, at times, advise that battery #3 (for example) needs replacing. A consistent testing order will ensure that you will always know which battery is #3.

Start with the battery attached to the positive (*negative*) terminal and then follow the next one in the series. In a 4-battery set, battery #1 would be the most positive (*negative*) battery and battery #4 would be the most negative (*positive*) battery. In a 6-battery set, battery #1 would be the most positive (*negative*) battery and battery #6 would be the most negative (*positive*) battery.
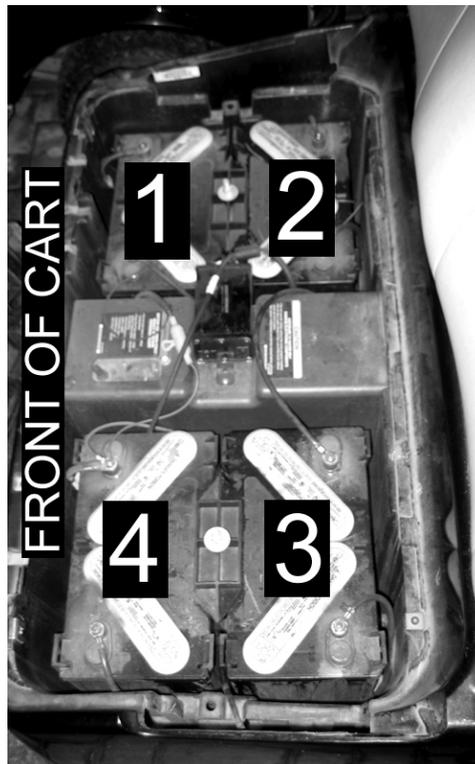
Figure 4: Example of Testing Order for a 4-Battery Set
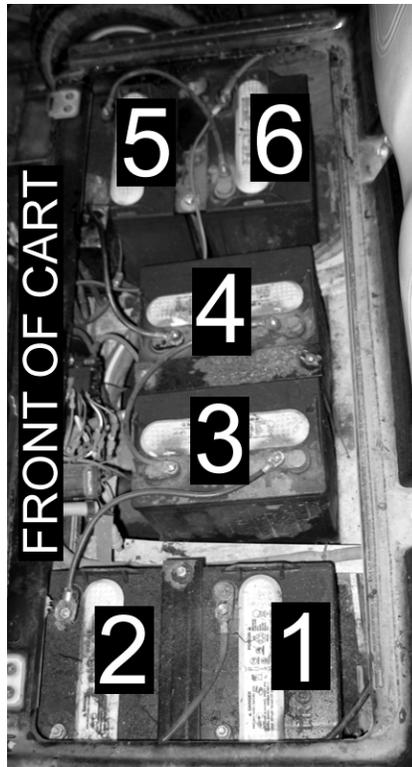
Figure 5: Example Testing Order for a 6-Battery Set

Clean the Probe Contacts

Clean dirty battery probe contacts with isopropyl alcohol and a non-abrasive cloth. Dirty or worn probes may result in false readings.

Clean probes that have been exposed to acid with a neutralizing solution (e.g., baking soda in water) to prevent corrosion.

Connect the Probes to the Battery Terminal

⚠️

CAUTION

Connecting probes to posts of separate batteries may damage the CA-12. Disconnect the probes from both posts before connecting to the posts of the next battery.

The following picture shows the **CORRECT** way to connect the probes to the battery terminal. BOTH probes are connected to posts of the same battery:
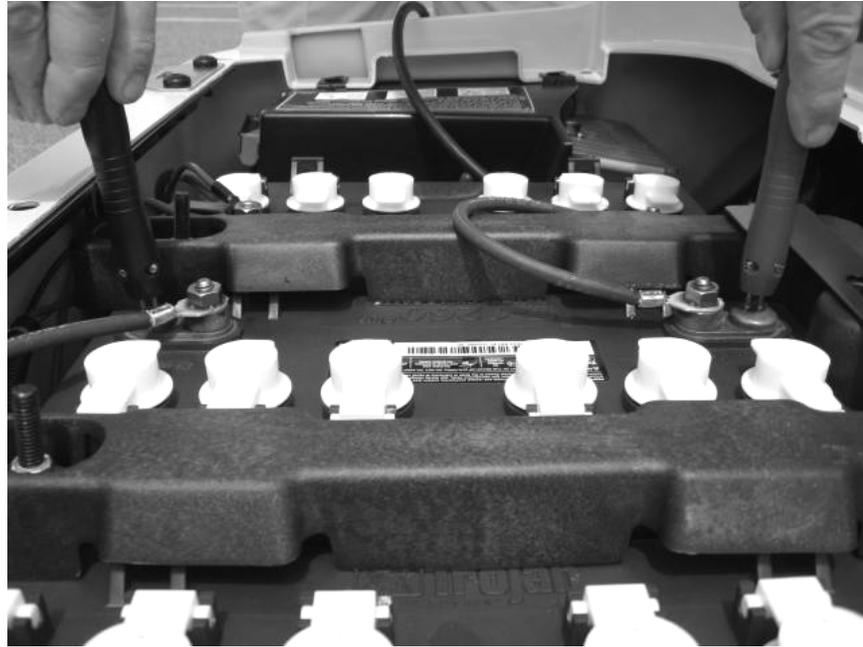
Figure 6: The Correct Way to Connect Probes

The following picture shows an **INCORRECT** way to connect the probes to the battery terminals – NEVER CONNECT PROBES TO POSTS OF SEPARATE BATTERIES:

Figure 7: An Incorrect Way to Connect Probes

Test a Set of Batteries in a Vehicle

When testing a set of batteries in a vehicle using the *Test Vehicle* function, all test results are automatically saved in the **CA-12**. However, when performing the *Test Single* function, only the last *Test Single* test **result** is saved. The *Test Single* function is used primarily as a quick test of a single battery.

> **Note:** If surface charge has been detected and a message is displayed, remove the surface charge before repeating the test. Let the batteries rest for about 8 hours, or drive the vehicle for 5 minutes then wait 5 or 10 minutes, or place a 50A load on the batteries for 5 minutes then wait 5 or 10 minutes.
>
> If the battery test is repeated when the surface charge detected message appears, the possibility exists for increased measurement errors or diminished ability to detect shorted or partially shorted cells. This condition may be noticed after recently charging the batteries.

> **Note**: When running a battery test, there is an Auto Start feature that will start the test when a valid voltage is detected. The **CA-12** will beep once when the test starts and beep three times when the test is completed.

> **Note**: When the internal battery charge falls to its low-battery threshold, the **CA-12** displays a *Low Battery* message on the battery status screen and it beeps twice at one-minute intervals. When the internal battery charge falls to its discharged threshold, and a battery test is attempted, the **CA-12** displays the message "The CA-12 must be recharged before any more tests can be performed".

1. Turn on the **CA-12**.

2. From the **Main** menu, select **Test Vehicle** and press **Enter**. The **Select Vehicle** screen appears.

3. Scroll down to an empty record and press **Enter**.

4. Select a matrix from the active matrix list.

5. In the *Vehicle SN* field, enter the vehicle's serial number and press **Enter**.

6. In the *Batteries* field, enter the number of batteries in the vehicle and press **Enter.**

7. At the *Confirm* prompt, select **Yes** and press **Enter**.

8. If prompted, select the vehicle parameters and press **Enter**. At the Confirm prompt, select **Yes** and press **Enter**.

9. Select the battery code and press **Enter** (if necessary).

10. Connect the battery test probes to the battery to test.

> **Note**: If a valid voltage is present at the battery terminal, you will not need to press **Enter**.

11. When the battery test is complete, the test results for this individual battery appear on the screen. After reviewing the results, press **Enter** to continue.

> **Note:** CAP=Battery Capacity; SoC=Battery State of Charge; OCV=Battery Open Circuit Voltage.
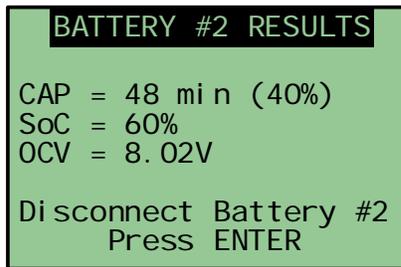
```
 BATTERY #2 RESULTS

CAP = 48 min (40%)
SoC = 60%
OCV = 8.02V

Disconnect Battery #2
     Press ENTER
```

12. Enter the battery code (if necessary).

13. Connect the battery test leads to the next battery to test. When connecting the battery test leads to the next battery, remove BOTH battery test leads from the first battery completely and then connect the battery test leads to the next battery.

14. Repeat this process for each battery in the set.

15. When all batteries in the set have been tested, the *Testing Complete* message appears on the screen. The combined test results of all batteries in this set appear on the screen.

```
┌─────────────────────────┐
│  VEHICLE 000001          │
│                          │
│ CAP = 103 min (86%)      │
│ SoC = 80%                │
│ OCV = 33.20V             │
│                          │
│   Replace Battery(s)     │
│                          │
└─────────────────────────┘
```
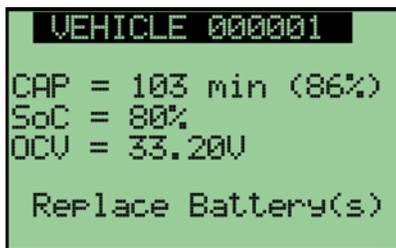
16. To see a graph of the SoC for this set, press the ▶ key.

```
┌─────────────────────────┐
│ VEHICLE 000001  SOC      │
│  10              100%    │
│ 1                        │
│ 2                        │
│ 3                        │
│ 4                        │
│ 5                        │
│ 6                        │
└─────────────────────────┘
```
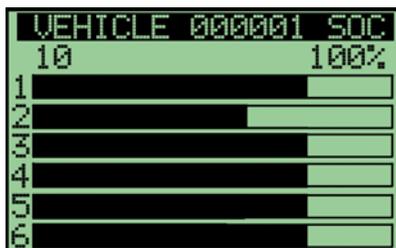
17. To see a graph of the capacity for this set, press the ▶ key.

```
┌─────────────────────────┐
│ VEHICLE 000001  CAP      │
│  10              100%    │
│ 1                        │
│ 2                        │
│ 3                        │
│ 4                        │
│ 5                        │
│ 6                        │
└─────────────────────────┘
```

18. From the **Vehicle** screen, step 11 above, Press the ▼ key to view a list of individual battery results.

```
┌─────────────────────────┐
│  VEHICLE 000001          │
│                          │
│ 1 Good                   │
│ 2 Replace                │
│ 3 Good                   │
│ 4 Good                   │
│                          │
│    Select Battery        │
└─────────────────────────┘
```

19. Use the arrow keys to select a battery and press **Enter**. The individual battery results are shown.

Test Single Batteries

When using the *Test Single* function, only the last *Test Single* test **result** is saved. The *Test Single* function is used primarily as a quick test of a single battery.

1. Turn on the **CA-12**.

2. From the **Main** menu, select **Test Single**. The Active Matrix list appears. Select the correct matrix.

3. Ensure the correct matrix is selected for the battery. The **Testing** screen appears.

4. Connect the battery leads to the battery and press **Enter**. If a valid voltage is present at the battery terminal, you will not need to press **Enter**. The battery test begins.

5. When the battery test is completed, the test results appear on the screen.

```
 BATTERY #1 RESULTS

CAP = 48 min (40%)
SoC = 60%
OCV = 8.02V
IMP = 4.36mOhm

      Bad Battery
```
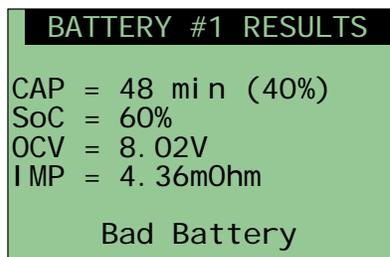
6. If a printout is required, go to the saved results and select **Print Single**.

Test Starter Battery

When using the *Test Starter Battery* function, only the last *Test Starter Battery* test **result** is saved. The *Test Starter Battery* function is used primarily as a quick test of a single battery.

1. Turn on the **CA-12**.

2. From the **Main** menu, select **Test Starter Batt**.

3. Enter the CCA (Cold Cranking Amp) Rating for the battery and press **Enter**.

4. Connect the battery leads to the battery to test and press **Enter**. If a valid voltage is present at the battery terminal, you will not need to press **Enter**.
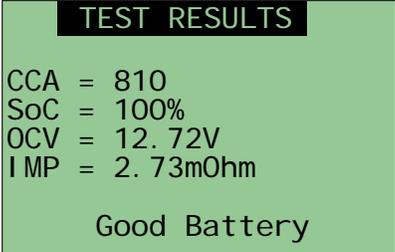
```
    TEST RESULTS

CCA = 810
SoC = 100%
OCV = 12.72V
IMP = 2.73mOhm

      Good Battery
```

5. If a printout is required, go to the saved results and select **Print Single**.

Working with Saved Results

The **CA-12** can store test results up to 125 vehicles.

View Vehicle Results

To view vehicle results:

1. From the **Main** menu, select **Saved Results** and press **Enter**. The **Saved Results** screen appears.

2. Select **View Vehicle** and press **Enter**.

3. Select a vehicle and press **Enter**.

4. The rows show the CAP, SoC and OCV values.

5. To view SoC and Capacity graphs, press the ▶ key. Press the ▼ key to view individual battery results.

Print Vehicle Results

An (optional) portable infrared printer is required to print vehicle results.

To print vehicle results:

1. From the **Main** menu, select **Saved Results** and press **Enter**. The **Saved Results** screen appears.

2. Select **Print Vehicle** and press **Enter**.

3. Select a vehicle and press **Enter**.

4. The rows show the CAP, SoC, and OCV values.

5. Press **Enter** to print the vehicle results.

Print Single Vehicle Results

To print results for the most recent Single Battery or Starter Battery test:

1. From the **Main** menu, select **Saved Results** and press **Enter**. The **Saved Results** screen appears.

2. Select **Print Single** and press **Enter**.

3. The rows shows values for the CAP, SoC, OCV, IMP and State of Health for the Single Battery test and CCA, SoC, OCV, and IMP for the Starter Battery test.

4. Press **Enter** to print the vehicle results.

Clear Test Results for a Specific Vehicle

To clear the test results for a specific vehicle:

1. From the **Main** menu, select **Saved Results** and press **Enter**. The **Saved Results** screen appears.

2. Select **Clear Vehicle**.

3. Select a vehicle and press **Enter**.

4. Select **Yes** to clear the test results for this vehicle.

Clear All Vehicle Test Results

To clear all vehicle test results:

1. From the **Main** menu, select **Saved Results** and press **Enter**. The **Saved Results** screen appears.

2. Select **Clear All** and press **Enter**.

3. Select **Yes** to clear all test results for all vehicles.

Electrical Tests

The **CA-12** provides three electrical tests - the Continuity test, the Voltmeter test, and the Temperature test.

Continuity Test

The Continuity test measures resistance between two points in a vehicle. The Continuity test provides a method to test the condition of your battery cables. To run the Continuity test:

1. From the **Electrical Tests** menu, select **Continuity** and press **Enter**.

2. A 10-second countdown occurs before the test actually begins. The unit will beep once per second during the countdown. **Connect the probes to the two points to test within this 10-second period.** This test takes about **10 seconds.**

3. The result is displayed as resistance as in the following diagram.

```
┌─────────────────────────┐
│   CONTINUITY TEST       │
│                         │
│    Resistance:          │
│                         │
│    0.4 mOhms            │
│                         │
│                         │
│    Press ENTER          │
└─────────────────────────┘
```
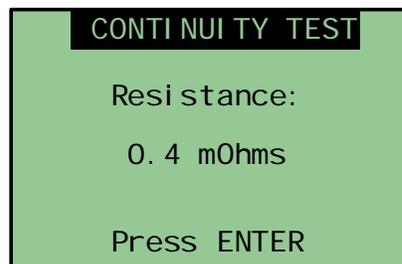
4. Press **Enter** to return to the **Main** menu. Results are not saved.

Voltmeter Test

The Voltmeter test displays the terminal voltage readings if connected to a battery. The voltmeter reads to a maximum 16V.

⚠️ **CAUTION**

Do NOT connect a battery more than 16V to the terminals. This may damage the CA-12 and is not covered by warranty.

To run the Voltmeter test:

1. From the **Main** menu, select **Electrical Tests** and press **Enter**. The **Electrical Tests** screen appears.

2. Select **Voltmeter** and press **Enter** to view the voltage. To determine the minimum or maximum reading, use the ◄ key to select **On**, and then press **Enter**.

3. Connect the probes to the battery.

4. Select **Min** or **Max** to record the lowest or highest voltage respectively and then press **Enter**.

5. Select **Reset** to clear the Min/Max values.

6. Select **Off** to exit Min/Max mode.

7. Press **Esc** to return to the **Main** menu.

Temperature Test

The Temperature test displays the ambient temperature of the black probe.

Note: The temperature sensor is connected to the negative sense contact in the black probe housing. To obtain more accurate readings, allow time for the temperature at the sense contact to stabilize.

To run the Temperature test:

1. From the **Main** menu, select **Electrical Test** and press **Enter**. The **Electrical Tests** screen appears.

2. Select **Temperature** and press **Enter** to view the ambient temperature.

3. Press **Esc** to return to the **Main** menu.

System Settings

Customize the **CA-12** by using the System Settings option. System Settings can select the active matrix, setpoints, user information, device settings, perform a calibration, and export test results with Bluetooth.

To specify system settings:

1. From the **Main** menu, select **System Settings**. The **System Settings** screen appears.

2. Select the option and press **Enter**.

Some of these settings can also be adjusted using the **PC Companion™ DC** application

Active Matrix

The **CA-12** can store up to 37 matrices for different types of batteries.

To select a different active matrix:

1. From the **System Settings** screen, select **Active Matrix**. The **Active Matrix** screen appears.

2. Use the ▼▲ keys to scroll to the required matrix. Press **Enter** to select the matrix.

3. Press **Enter** to save the matrix settings

The battery voltage is shown for each matrix.

Test Parameters

Setpoints

The results of battery tests depend on test setpoints. To view or change the setpoints:

1. From the **Main** menu, select **System Settings** and press **Enter**.

2. From the **System Settings** screen, select **Test Parameters** screen appears.

> **Note**: You may be required to enter a passcode before you view or change the settings.

3. Use the ◄ ► keys to scroll through the setpoint values.

4. Use the ▼ ▲ keys to select a different value for a setpoint.

5. Press **Enter** to confirm the settings. Select **Yes** to save the setpoint settings.

    For Capacity (CAP), the *Good* field determines the capacity result above which the battery is considered good. The *Fair* field determines the threshold below which a battery is considered bad.

    The RC Range setpoint sets the allowable spread in battery capacities in a vehicle before balancing is required. If the setpoint is 50% (the default) then all batteries must be within 50% of the highest rated capacity in the set to be considered balanced. If they are not, then a Regroup message appears advising you to find a battery that more closely matches the capacity of the set.

    The *SOC Full* field sets the limit for the state of charge for a good battery set. If the highest SOC in the battery set is less than the *SOC Full* setpoint, the CA-12 queries the user whether the batteries have been fully charged.

    The *SOC Range* sets the allowable spread in SOC values for a good battery set. If the difference between the highest SOC and an individual SOC is greater than this range, then the battery is marked as Shorted.

Car Parameters

The parameters for a vehicle can be selected for inclusion in the testing process. To include vehicle parameters:

1. From the **Main** menu, select **System Settings** and press **Enter**.

2. From the **System Settings** menu, select **Test Parameters** and press **Enter**.

3. From the **Test Parameters** menu, select **Car Parameters** and press **Enter**.

4. Enter the passcode (if necessary).

5. Select the parameters to include in the testing process. *Battery Code* is a 2-character date code for the battery. *Customer ID* is an 8-digit location ID. *Vehicle ID* is a 3-digit code for the vehicle. *Accessories* is a true/false value that indicates whether accessories are attached to the vehicle. *AHr* is a 5-digit value read from the vehicle controller. *Rounds* is a 4-digit value indicating the number of play rounds.

User Information

Contact information appears on all printer outputs. To enter or change user information:

1. From the **Main** menu, select **System Settings**. The **System Settings** screen appears.

2. From the **System Settings** screen, select **User Information**. The **User Information** screen appears.

3. Press ▼▲ to select a line of text.

4. Press **Enter** to edit the line of text. To select the letter to edit, press ◄ ►. Use ▼▲ to scroll through the letters of the alphabet. Press **Enter** to accept the changes on the line or **Esc** to cancel the edit changes.

5. When all edits are complete, press **Esc**. Select **Yes** to retain the changes or **No** to discard the changes.

Device Settings

The Device Settings option lets you select screen contrast, specify times for backlight and shutoff functions, set the clock, specify the printer port, reset setpoints to factory defaults on the **CA-12**, and view system information.

To select device settings:

1. From the **Main** menu, select **Systems Settings**. The **System Settings** screen appears.

2. Select **Device Settings**.

3. Select the setting to view and press **Enter**.

Screen Contrast

To adjust the screen contrast:

1. From the **Device Settings** screen, select **Screen Contrast**. The **Set Screen Contrast** screen appears.

2. Press the ▼▲ keys to select the screen contrast.

3. Press **Enter** to save the setting.

Shortcut: Press the ◄ or ►key when the **Startup** screen appears to quickly move to the **Set Screen Contrast** screen.

Off Timers

The Off Timers option turns the backlight and the **CA-12** unit off after the specified time.

1. From the **Device Settings** screen, select **Off Timers**. The **Off Timers** screen appears.

2. Select the *Backlight* or *ShutOff* time by pressing ◄ ► keys.

3. Use the ▼▲ keys to select the number of minutes before the backlight turns off or the unit will be shut off. To disable the off timers, specify a value of zero for the minutes.

Set Clock

The Set Clock option sets the time on the **CA-12**. The date and time are set at the factory and may need to be updated to your location.

1. From the **Device Settings** screen, select **Set Clock**. The **Set Clock** screen appears.

2. Use the ◄ ► keys to move from the date and time values. Use the ▼ ▲ keys to adjust the time and date. Press **Enter**.

3. At the **Confirm** prompt, select **Yes** to save the clock setting.

Printer Port

The Printer Port option determines which port will print test data.

1. From the **Device Sett**ings screen, select **Printer Port**. The **Printer Port** screen appears.

2. Use the ▼ ▲ keys to select the *IR Port* or the *Serial Port* device. Press **Enter**.

3. At the **Confirm** prompt, select **Yes** to save the printer port setting.

Factory Defaults

The Factory Defaults option resets all options to factory defaults. Follow the prompts on the screen to reset the unit to factory defaults.

1. From the **Device Settings** screen, select **Factory Defaults**. The **Factory Defaults** screen appears.

2. Enter the passcode (if necessary).

3. At the **Confirm** prompt, select **Yes** to reset the **CA-12** to factory defaults.

When resetting to factory defaults:

• All customized items such as screen contrast and off timers are reset to factory default settings.

- User Information is set to:

  > Cadex Electronics
  > 22000 Fraserwood
  > Richmond, BC
  > Canada
  > (604) 231-7777

The following items are retained during a reset:

- Matrices

- Test results

System Information

The System Info option displays the firmware revision, the loader version, the capacity of the fully charged **CA-12** internal battery, and the date of the last calibration. The *Calibration Count* field shows the current count value at the time of the last calibration. The *Current Count* field shows the total number of tests the cable has performed since first used. This number is not reset during calibration. The *Test Count* field shows the total number of tests that the CA-12 unit has performed. The *Unit#* and *Board #* fields display the unit and board serial numbers loaded at the factory (read-only values). The *Unit #* and *Board #* fields are accessed by pressing the ▼ or ▲ keys.

- From the **Device Settings** screen, select **System Info**. The **System Info** screen appears.

Calibration

Run the calibration routine when the probes are replaced or when instructed to do so by Cadex customer support. The calibration process takes about 90 seconds to complete.

To calibrate the **CA-12**:

1. From the **System Settings** screen, select **Calibration**. The **Calibration** screen appears with the message that calibration will take about 2 minutes.

2. Find a battery with a clean, large, flat lead terminal. Both probes must be placed on the same battery terminal.

Do not place probes here

Place probes on this flat terminal
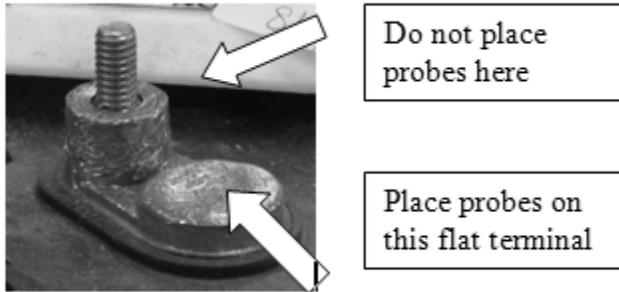
3. Press **Enter** when ready.

4. A 10-second countdown occurs before the test begins. The unit will beep once per second during the countdown. Connect both probes to the same terminal within this 10-second period.

5. Ensure both probe pins are contacting the terminal and push the probes so that the pins are depressed at least 50% of their length.

6. Hold the probes in place until the *Calibration Completed* message appears (about 75 seconds).

7. Press **Enter** to continue.

8. To check the calibration date, turn the unit off and then on. From the **System Settings** screen, select **Device Settings**, and then select **System Info**. The date of the last calibration is shown at *Cal Date*.

Bluetooth

The **CA-12** includes a Bluetooth interface to export results from the unit to **PC Companion DC** or to a personal digital assistant ("PDA"). The unit has a Class 2 transceiver with a range of up to 10m (33').

Note: The Bluetooth menu item only appears if the CA-12 hardware supports the device.

Export Results to PC Companion™ DC

The Export Results option can send test results to PC Companion™ DC.

1. Set up the Bluetooth interface for **PC Companion DC**. See the section Connect the CA-12 to the PC.

2. From the **Main** menu, select **System Settings** and press **Enter**.

3. From the **System Settings** menu, select **Bluetoot**h and press **Enter**.

4. From the **Bluetooth** menu, select **BT Export Results**. The test results can be retrieved from **PC Companion™ DC** if the Bluetooth connection is enabled.

Export Results to a Personal Digital Assistant (PDA)

The Export Results option sends the test results to the terminal application.

1. Ensure **MobileVT** is installed on the PDA.

2. Configure **MobileVT** as follows (one time setup):

   a) From the main **MobileVT** window, click **Application**.

   b) Click **Settings**.

   c) Click **Display**.

   d) A **Display Settings** window appears. Change **Columns** to **133**.

   e) Click **OK**.

3. From the **Main** menu, select **System Settings** and press **Enter**.

4. From the **System Settings** menu, select **Bluetooth** and press **Enter**.

5. From the **Bluetooth** menu, select **BT Export Results**.

6. Connect the PDA to the **CA-12** via Bluetooth.

7. Start up **MobileVT** on the PDA and connect on the assigned serial port.

8. From the **BT Export Results** screen, press the ▲ key to send test results.

9. Save captured text on **MobileVT** to a file.

Export Results to a Terminal Program on a PC

The Export Results option sends the test results to a terminal application on a PC.

1. Set up the terminal program to communicate via the Bluetooth interface and to capture text.

2. From the **Main** menu, select **System Settings** and press **Enter**.

3. From the **System Settings** menu, select **Bluetooth** and press **Enter**.

4. From the **Bluetooth** menu, select **BT Export Results**. Press the ▲ key to send the test results to the PC.

Reset the Bluetooth Module

The Reset option factory resets the **CA-12** internal Bluetooth module. Use this option to troubleshoot the Bluetooth interface between the CA-12 and the PC. If data is not being transferred correctly, try resetting the Bluetooth module.

1. From the **Main** menu, select **System Settings** and press **Enter**.

2. From the **System Settings** menu, select **Bluetooth** and press **Enter**.

3. From the **Bluetooth** menu, select **BT Reset**. Select *Yes* or *No* and press **Enter**.

Display the Bluetooth Address

The Address option displays the Bluetooth address.

1. From the **Main** menu, select **System Settings** and press **Enter**.

2. From the **System Settings** menu, select **Bluetooth** and press **Enter**.

3. From the **Bluetooth** menu, select **BT Address**.

Infrared Printer

Martel MCP7830B Printer

The Martel MCP7830B is the only printer supported by the **CA-12**. In North America this printer can be purchased from Current Components Incorporated, 8600 Myersvill Road, Middletown, MD 21769 (FAX 301-371-7353; Tel 301-473-5333). In the rest of the world, see the Martel Instruments website at www.martelinstruments.com for contact information.

The printer uses 4x 1.5V alkaline, AA batteries. Batteries should be removed if the printer is to be left unused for long periods.

Use a damp cloth to clean the printer case.

Self-Test

The self-test procedure will check most of the printer functions, except for the serial Interface. The Printer mechanism, Control circuitry, Firmware version and Print quality will be checked. When the printer is off, press and hold the Mode button depressed for approximately 2 seconds. Release the button then the printer will power on and print a self-test report.

Printer Configuration

To check the printer configuration, turn the printer off then press and hold the Mode button depressed for approximately 2 seconds. Release the button. The printer will power on and print a self-test report.

The printer should be configured as follows:

IrDA Protocol	Data Bits: 8 Parity: None
IrDA Baud Rate	9600 baud
RS232 Protocol	Data Bits: 8 Parity: None
RS232 Baud Rate	9600
RS232 Flow Control	No handshaking
Font	Arial 16 (Normal) 24CPL
Character Format	Normal width Normal height
Print Density	Lowest
Printing Current	Highest
Print Format	Standard paper, normal printing
Sleep mode	Never Sleep (Off)

To reprogram the printer configuration, refer to the Martel Instruments MCP7830 Infra-Red Thermal Printer Series Applications Datasheet.

Status LED

LED Indication	Condition	Solution
On	Printer On	-
Off	Printer Off or Asleep	-
* * *	Paper out	Fit new paper
** ** **	Thermal head too hot	Allow head to cool
*** *** ***	Battery cut-out (no charge remaining)	Replace batteries
**** **** ****	Battery low (approx. 20% charge remaining)	Prepare to replace batteries

Messages

Fault Messages

Message	Code	Description
Internal Battery Low, Please Recharge	1	Recharge the **CA-12** battery. A fully charged **CA-12** battery should complete at least 100 tests. See Charge the Internal Battery.
Battery Disconnected	2	Reconnect the battery probes to the battery under test and repeat the test.
Voltage Out-of-Range, Battery cannot be tested	3	Make sure the correct matrix is selected. Recharge the battery and test again. Reattach the probes to the battery. This message may also appear if battery impedance is either high or low.
The battery is bad or the posts/clamps need to be cleaned.	4	Poor connection to the battery. Ensure probes are held steady during the battery test. Clean the probes and posts if necessary. Repeat the test. Check the battery status of the unit. Recharge the unit if it has a low battery.

Message	Code	Description
Over current detected. Test is terminated.	6	Recharge the battery under test and repeat the test.
		Reconnect the probe cables. Battery impedance is too low.
		Check the battery status of the unit. Recharge the unit if it has a low battery.
Loss of voltage signal. Test is terminated	7	Reconnect the battery probes to the battery under test and repeat the test.
		Check the battery status of the unit. Recharge the unit if it has a low battery.
Spectrum Acquisition Error	8	Turn off the **CA-12** and turn it back on. Reconnect the probe cable to the **CA-12** and retest the battery.
		Impdeance of battery under test is more than 20 mOhms.
		Check the fuse. See Change the Fuse for more information.
Cable Disconnected, Test is Terminated	9	Turn off the **CA-12** and reconnect the probe cable**.**
		If this message appears during calibration, restart calibration.
Charge and re-test	10	Battery under test has low charge. Charge the battery and re-test.
Cable is not properly connected to the analyzer	12	See code 9 above.
A new cable was detected and has been initialized	13	Perform a calibration on the cable.
Calibration Error	15	Power cycle the unit. Check the internal battery status and recharge the **CA-12** if it has a low battery. Repeat the battery test.
		Check the fuse. See Change the Fuse for more information.
		Perform a calibration and repeat the test.

Message	Code	Description
Calibration Required		Pencil probe has not been calibrated – perform calibration.
The voltage is too high		The voltage measured on the battery probes exceeds 16V. Ensure only one battery is being tested.
The battery voltage is too high or the active matrix is not correct		The battery voltage exceeds the test range. Check the voltage of the battery. Ensure only one battery is being tested. Check the active matrix matches the battery under test.
Surface charge detected. Continue in 5 seconds.		The battery voltage exceeds the test range. Message appears if testing a freshly charged battery. Allow battery to sit for 8 hours or discharge battery for 5 minutes and retest.

Matrix Error Messages

The selected Active matrix is not valid!	Select another matrix. See [Active Matrix](#) for more information.
You must select or download a new matrix before batteries can be tested!	See above. Contact Cadex Customer Service.
Matrix data is corrupted.	See above.

Battery Messages

Charging…	The **CA-12** unit is attached to the 12VDC power supply and is charging the internal battery.
Battery OK	The internal battery has acceptable charge.
Battery Low	The internal battery has low charge and should be recharged.
The CA-12 must be recharged before any more tests can be performed	The **CA-12** unit has insufficient charge to perform a battery test. Recharge the unit.
No Battery!	The internal battery has been removed.
Ready!	The CA-12 unit has completed charging the internal battery.
Waiting	The internal battery temperature is outside of the allowed temperature limits. This message appears if the battery temperature is less than 32° F (0° C) or greater than 113° F (45° C).

Troubleshooting

The unit does not power up.

Internal battery charge may be low. Plug the unit into a power supply to charge the battery.

Contrast may be low. See Screen Contrast for more information.

The internal battery may need to be replaced. See Charge and Replace the Internal Battery for more information.

Results are inconsistent

Clean the battery terminals and reconnect the probes.

Ensure the probes are held tight to the battery during testing.

Printer does not operate

The printer uses infrared light to communicate. Ensure a clear line of sight.

Keep the printer within 18″ (45cm) of the **CA-12** unit's IR port and approximately ± 20° left/right, up/down angle.

Do not operate the printer in direct sunlight or near high heat sources.

Please refer to the Printer Manual for more instructions.

Check batteries.

Maintenance and Service

To maintain accuracy in test results and long life,
Cadex Electronics Inc. recommends the following steps to
maintain the **CA-12**.

Charge the Internal Battery

The internal battery is charged when the **CA-12** unit is connected
to a power supply. It takes approximately 4 hours to recharge the
battery.

Change the Fuse

The **CA-12** internal fuse provides the unit with over-current and
over-voltage protection.

⚠ **CAUTION**

**Connecting the CA-12 probes to voltages higher than 60V,
even for a short duration, may blow the fuse and/or cause
damage to the unit.**

To replace the fuse:

1. Disconnect the **CA-12** from the battery.

2. Turn off the **CA-12** and disconnect it from the power
   supply.

3. Turn the **CA-12** over and, using a Philips screw driver, remove the screws marked in the following diagram:

4. Remove the cover and locate the fuse adjacent to the battery connector.

5. Remove the fuse with a pair of needle nose pliers and replace it with a spare fuse.

Reset the CA-12

If the **CA-12** does not respond to any input during operation or during a firmware upgrade, do the following:

1. Disconnect the **CA-12** from the battery and power supply.

2. Using a Philips screw driver, remove the screws marked in the following diagram:

3. Remove the cover and locate the reset switch at the bottom of the unit.

4. Use a pen to reset the unit.
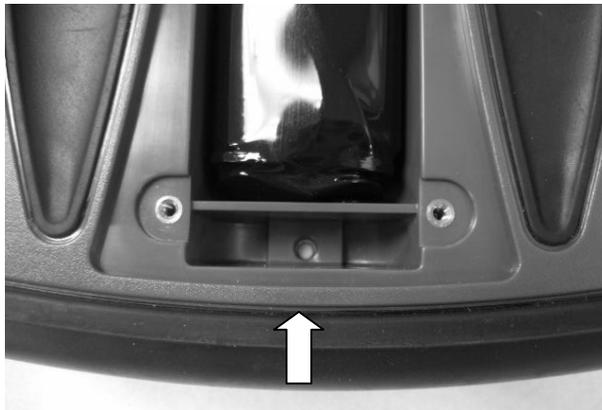
Clean the Probes

⚠️ **CAUTION**

Clean probes that have been exposed to acid with a neutralizing solution (e.g., baking soda in water) to prevent corrosion.

Inspect the probe contacts regularly. Dirty or worn probes may result in false readings.

If the probes are dirty, clean with a non-abrasive cloth and isopropyl alcohol.

Clean the CA-12 Unit

1. Do not use any cleaning solution on the **CA-12** unit.

2. Wipe the unit only with a clean damp cloth.

Upgrade the Firmware

Consult the **PC Companion™ DC** online Help system (section *Update the Firmware on the CA-12*) to upgrade the **CA-12** firmware.

Section 3: PC Companion™ DC

Getting Started with PC Companion™ DC

Welcome to PC Companion™ DC

PC Companion™ DC ("PC Companion") is Windows software for the **Spectro™ CA-12 Deep Cycle Battery Rapid-Tester** ("**CA-12**") and offers the following features:

- Test Result Database
- Matrix Management
- Firmware Update

Test Result Database

The **PC Companion** has the capacity for storing a very large number of test results. After downloading test results from the **CA-12**, you can view information from a previous test and print test reports.

The test results can help augment battery maintenance procedures to extend the life of a set of batteries in various deep cycle battery applications.

Matrix Management

The **CA-12** uses matrices to determine battery condition. As more matrices become available to support different battery models, PC Companion can be used to upload new matrices to the **CA-12**.

Firmware Update

Periodically, Cadex releases new firmware for the **CA-12**. PC Companion can be used to upgrade the **CA-12** with new firmware on-site.

Computer Requirements

PC Companion requires the following minimum computer configuration:

- Windows XP Professional SP2 (32-bit)

- 1.2 GHz or better CPU

- 512 MB RAM

- UPS device recommended during Firmware or Matrix Update operations

- One serial communications port.

> **Note:** Systems without a serial port will require a USB-to-Serial converter.

- SVGA color monitor 1024 x 768 or better, 16-bit color minimum, mouse and keyboard.

- Suggested optional RS232-USB converter Dynex DXUBDB9 (not included)

- Suggested optional Bluetooth 2.0 EDR USB adapter RocketFish RF-FLBTAD (not included)

Install PC Companion™ DC

To install **PC Companion**:

1. Insert the installation CD into the CD drive.

2. Browse to your CD drive in *Windows Explorer* and double-click SETUP.EXE to install **PC Companion** as a user with *Administrative* privileges. The **Welcome** window appears.

3. Follow the steps through the installation wizard.

4. Administrators should review the instructions in [Running with User-Level Privileges in Windows XP](#).

Uninstall PC Companion™ DC

> **Note:** Uninstalling **PC Companion** removes all **PC Companion** information, including the test results database.

1. In Control Panel, double-click **Add or Remove Programs**.

2. Select *Cadex PC Companion DC* and click **Remove**.

3. You can select either *Automatic* or *Custom*. If you select *Custom*, select *All* followed by *Next* on each successive

dialog box until the software uninstall is complete. If you choose *Automatic*, the uninstall process will retain shared system components that were installed by the installer during setup.

4. Follow the steps through the uninstall wizard.

Software Updates

Software Version

To see what version of **PC Companion** is installed on the computer, select **About** from the **Help** menu. The version number and build number appears in the **About** window.
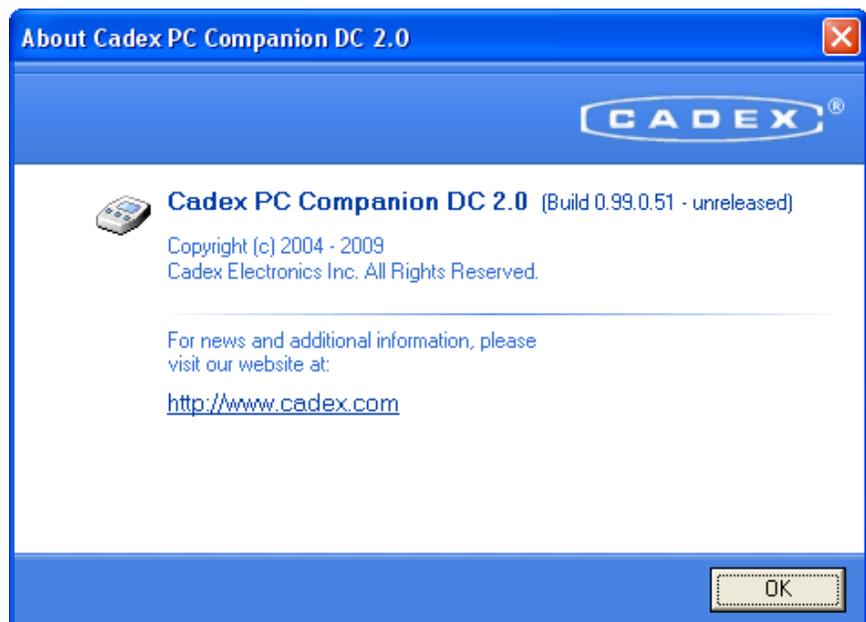
Update PC Companion™ DC Software

To receive a new version of **PC Companion DC** when available, registered users can contact Cadex Customer Service at (Canada) 1-604-231-7777, (USA Toll Free) 800-565-5228, or (Europe) +49 (0) 911 240 332-0, or service@cadex.com.

Run the executable to either run **Setup** and install a new version of the software, or extract files to a specified directory. In the latter case, follow instructions in the *ReadMe.Txt* file that accompanies the software update before running the executable file that installs the upgrade.

Connect the CA-12 to the PC

Communications between **PC Companion** and the **CA-12** is available via serial cable or Bluetooth port.

Note: If the PC does not have a serial port, use a Serial-to-USB converter (not supplied).

**Note:** The **CA-12** Bluetooth interface supports only Test Result transfer to **PC Companion.** Matrix transfer and Firmware upgrade are not supported via Bluetooth.

To connect the **CA-12** to the PC:

1. Connect the female-end of the supplied DB9 serial cable to COM Port 1 on your PC.

2. Connect the other female-end of the supplied DB9 serial cable to the 9-Pin serial port on the top front side of the **CA-12**.

To specify the communications port to use on the **PC Companion** software:

1. Launch **PC Companion** by double-clicking the **PC Companion DC** icon on the Windows desktop or by selecting **Star**t **> Programs > Spectro DC > PC Companion DC**.

2. From the **Configuration** menu, select *Communication Port*. The **Communication Port** window appears.
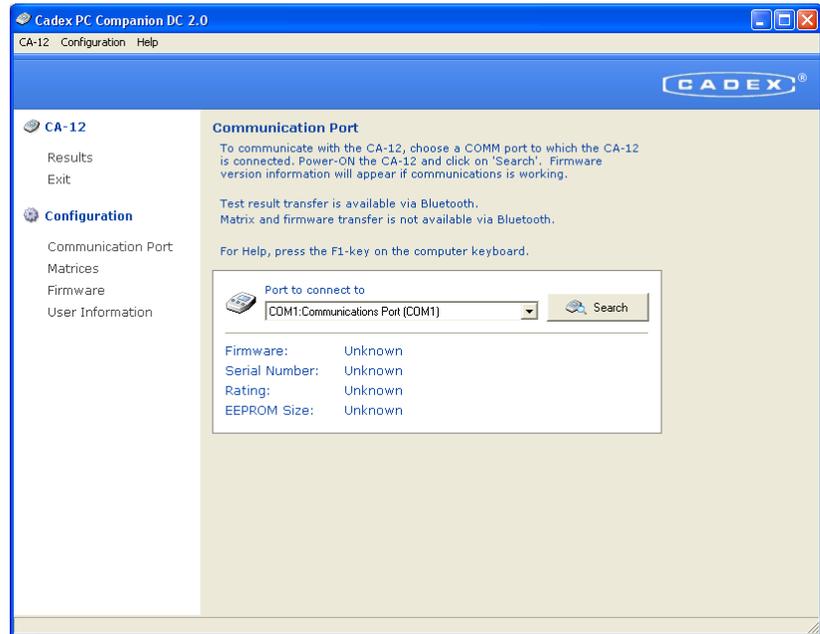
3. In the *Port to connect to* field, select the serial port. The default port is COM1. If using Bluetooth, select a *Standard Serial over Bluetooth link* COM Port.

To confirm a working connection between the **CA-12** and the PC:

1. In **PC Companion**, select the port, power-on the **CA-12**, and choose **Search**. If using Bluetooth, configure the **CA-12** into Bluetooth (select BT Export Results from the Bluetooth menu) and click **Search**.

2. If the connection succeeded, values will appear in the *Firmware*, *Serial Number*, and *Rating* fields. If the connection failed, *unknown* will appear in these fields. In this case, select a different communications port and click **Search** again.

Bluetooth Setup

> **Note**: The **CA-12** Bluetooth interface supports only Test Result transfer to **PC Companion**. Matrix transfer and Firmware upgrade are not supported via Bluetooth.

Follow the driver installation instructions that came with the **Bluetooth 2.0 EDR USB Adapter** (not included).

To add a **Bluetooth Serial Port Device** to the list of available Bluetooth devices:

1. Right-click the **Bluetooth** icon on the **System Tray** and select **Show Bluetooth Devices**.

If the **Bluetooth** icon is not visible even though the **Bluetooth 2.0 EDR USB Adapter** is inserted in a USB 2.0 port on the PC, refer to the Display the Bluetooth Icon on the System Tray instructions to display the **Bluetooth** icon on the **System Tray**.

2. Next, right-click the **Bluetooth** icon on the **System Tray** and select **Show Bluetooth Devices**.

3. Click **Add** to add a Bluetooth device. The **Add Bluetooth Device Wizard** window appears.

Consult the **CA-12** Manual to configure Bluetooth feature into **Waiting to connect** mode. Select the *My device is set up an ready to be found* option and click **Next**.

4. The **Bluetooth Wizard** will search for and display the available Bluetooth devices. Select the name of the Bluetooth device to install and click **Next**.

5. Select the *Let me choose my own passkey* option and enter the passkey as "0000".
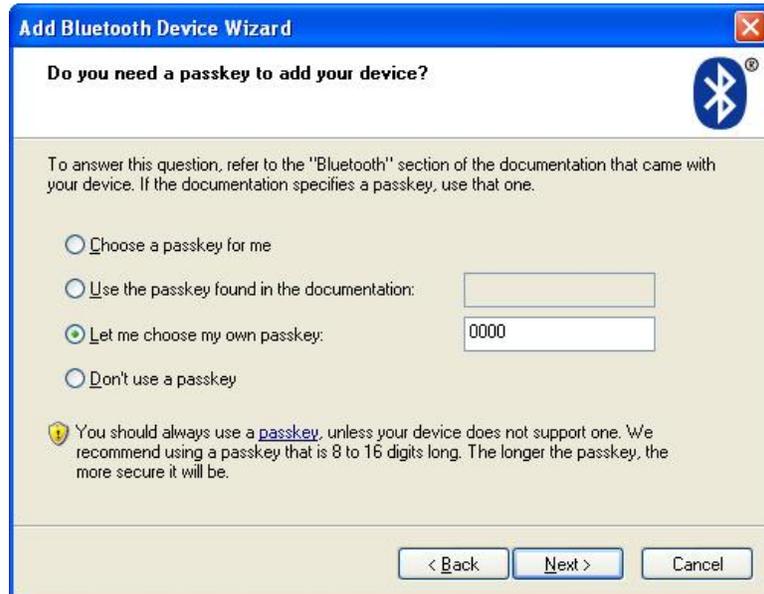
6. Click **Next** to let the **Bluetooth Wizard** exchange passkeys.
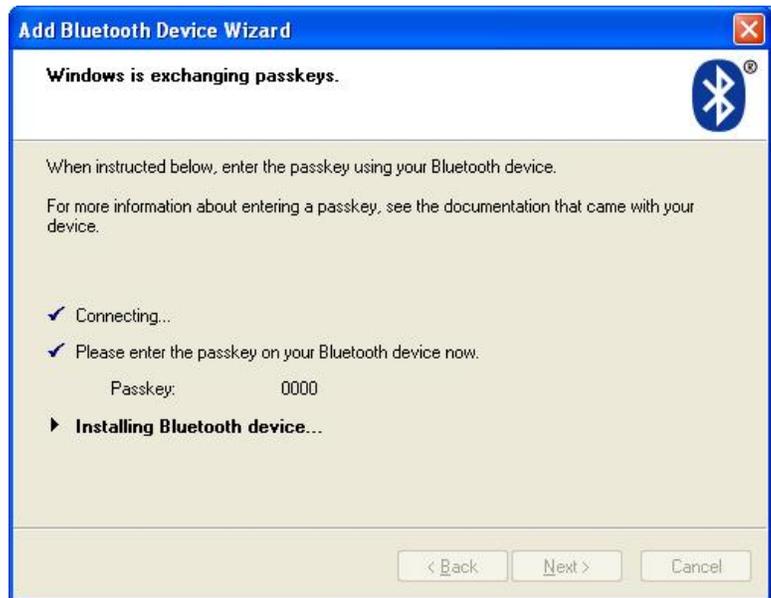
7. Make note of the **Outgoing Bluetooth COM Port** as the COM Port that will be used for transferring Test Results from the **CA-12** to **PC Companion** over Bluetooth.

8. Click **Finish**. The Bluetooth **Serial Port Device** with passkey enabled appears in the **Bluetooth Devices** window. Click **OK**.

Set User Information on the CA-12

Five lines of user information, such as business name, address, telephone number and contact person, can be uploaded to the **CA-12**. Each line can be up to 17 characters in length.

To upload user information to the **CA-12**:

1. Launch **PC Companion** by double-clicking the **PC Companion DC** icon on the Windows desktop or by selecting **Start > Programs > Spectro DC > PC Companion DC**.

2. From the **Configuration** menu, select *User Information*. The **User Information** window appears.
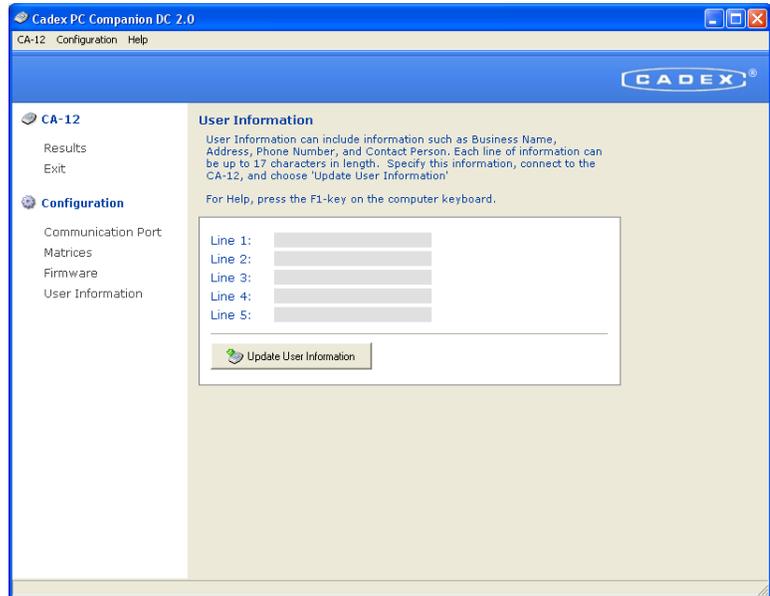
3. Ensure the **CA-12** is connected to the PC. For instructions, refer to <u>Connect the CA-12 to the PC</u>.

4. In the *Line1* through *Line 5* fields, enter details such as business name, address, telephone number and contact person's name.

5. Click **Update User Information**.

6. Confirm the user information was transferred to the **CA-12** (**Main menu > System Settings > User Information**).

The Menu Bar

The **PC Companion** main window displays three menus: *CA-12*, *Configuration*, and *Help*. Clicking any of these menus displays a list of menu commands.
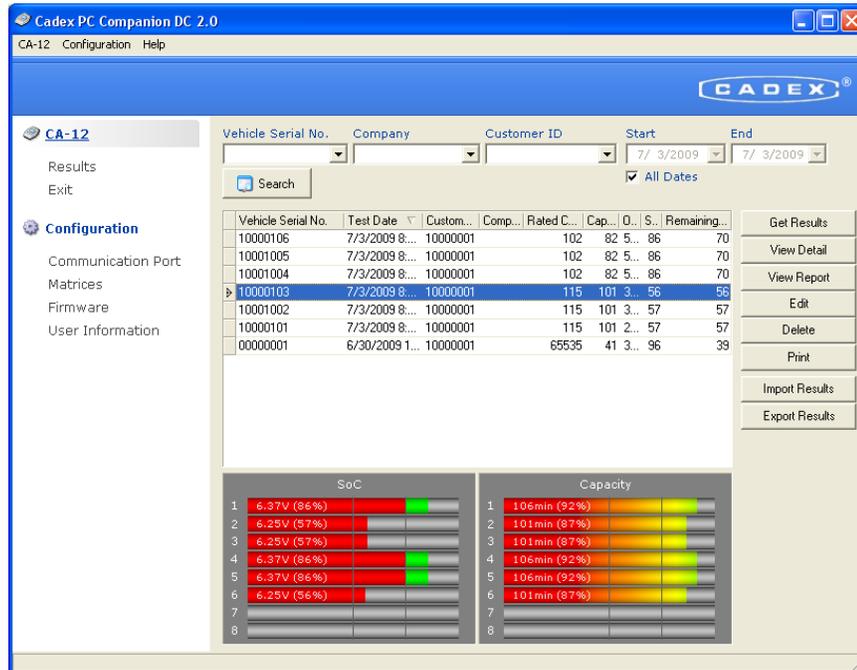
The CA-12 Menu

Click the *CA-12* menu item to see the **CA-12** menu. The **CA-12** menu contains two menu items, as follows:

> *Results*: Select the *Results* menu item to view test results.

> *Exit*: Select the *Exit* menu item to close the **PC Companion** application.

The Configuration Menu

Click the *Configuration* menu item to see the **Configuration** menu. The **Configuration** menu contains four menu items, as follows:

> *Communication Port*: Displays the **Communication Port** window.

> *Matrices*: Displays the **Matrices** window.

> *Firmware*: Displays the **Firmware** window.

> *User Information*: Displays the **User Information** window.

The Help Menu

Click the *Help* menu item to see the **Help** menu. The **Help** menu contains two menu items, as follows:

Contents F1: Displays the **Help** window.

About: Displays the **About** window, which shows details about the **PC Companion** application.

Search for Test Results

When **PC Companion** is run, the **Results** page displays the one hundred most recent test records.

Clicking **Search** without specifying search parameters retrieves all test results from the database with the most current test results appearing at the top of the result list.

Results may be filtered by Vehicle Serial#, Company, or Date Range.

1. To filter results by **Vehicle Serial#**, specify the Vehicle Serial# and click **Search**.

2. To filter results by **Company**, enter the company name or select a company from the dropdown list and click **Search**.

3. To filter results by **Date Range**, specify the Date Range and click **Search**. The *All Dates* check box is checked by default to return results for all dates. Deselect the *All Dates* check box and specify the *Start* and *End* dates to filter Test Result searches.

Get Test Results from the CA-12

The **CA-12** can store a limited number of test results. However, **PC Companion** has a large database capacity to store CA-12 Test Results.

To get Test Results from the **CA-12** to **PC Companion**:

1. Ensure the **CA-12** is connected to the PC. See the <u>Connect the CA-12 to the PC</u> section for instructions.

2. Launch **PC Companion** (**Start > Programs > Spectro DC > PC Companion DC**).

3. From the **Configuration** menu, select **Communication Port**. The **Communication Port** window appears. Select the serial port to connect to the **CA-12**. The default port is COM1. If using Bluetooth, select a **Standard Serial over Bluetooth link** COM Port.

Choose the **Results** option under the **Summary** menu to display the **Results** page. Click **Get Results**.

View Test Result Detail

To view details about a test result record:

1. From the **CA-12** menu, select **Results**. The **Results** window appears.

2. Select a test result record.
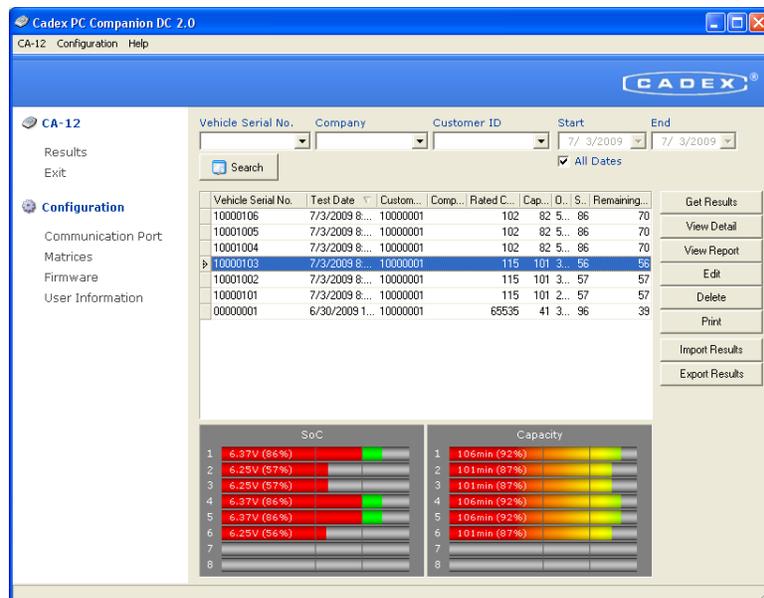
3. Click **View Details**. The **Details** window appears.

View a Test Result Report

To preview a report for a Test Result:

1. Select a record in the **Results** window.

2. Click **View Report**. The report appears.

Edit Test Information

Test Results taken from a **CA-12** may not contain the following information:

1. Company

2. Customer ID

3. Tested By

4. Vehicle Model

To associate this information with a Test Result received from the **CA-12**, select one or more test results in the **Results** window and click **Edit.**

Enter the required values for the respective fields and click **OK** to associate this information with the selected test results.

Delete Selected Test Results

To delete test results from the database:

1. Select the test result row(s) in the **Results** window to delete. Select multiple rows by holding the Ctrl key down.
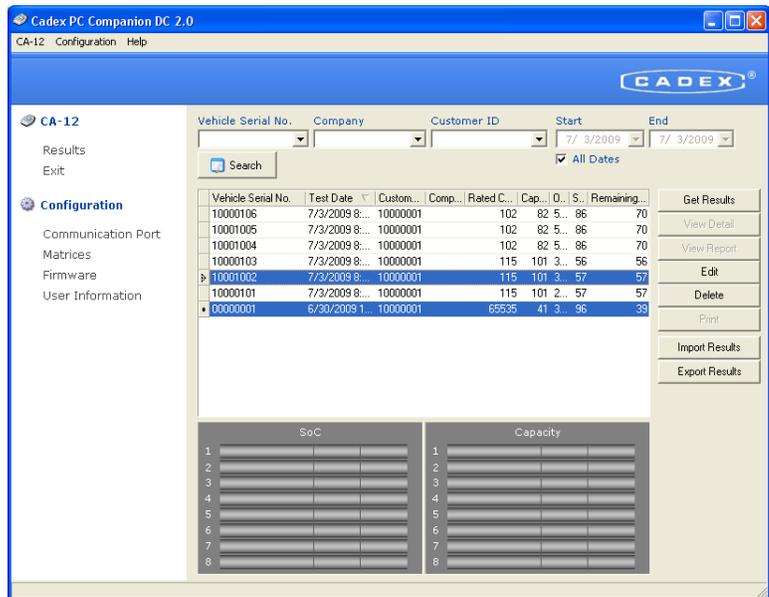

2. Click **Delete** and then click **Yes** to confirm the delete request.
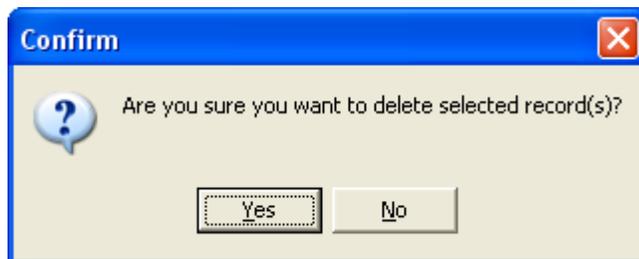
Print Report

To print a report:

1. Select a record in the **Results** window. Click **Print**.
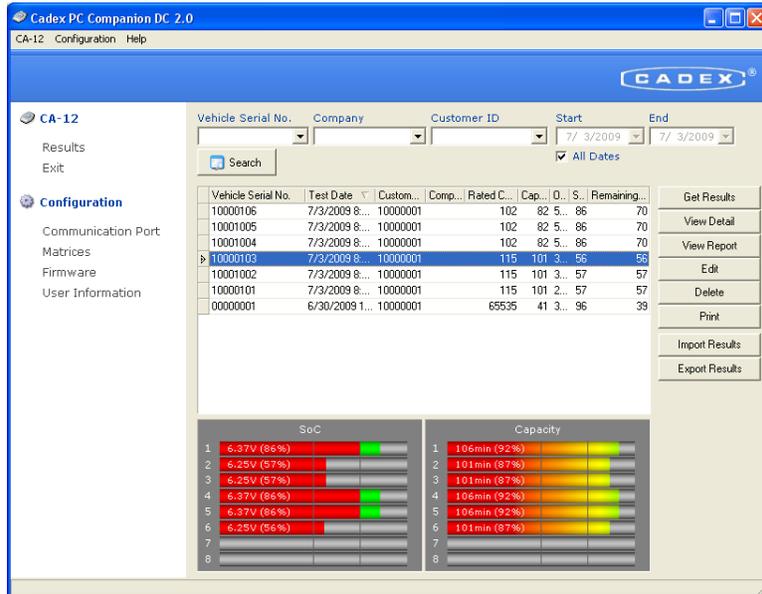
2. The **Print Setup** window appears. Select the printer to print to and click **OK**.
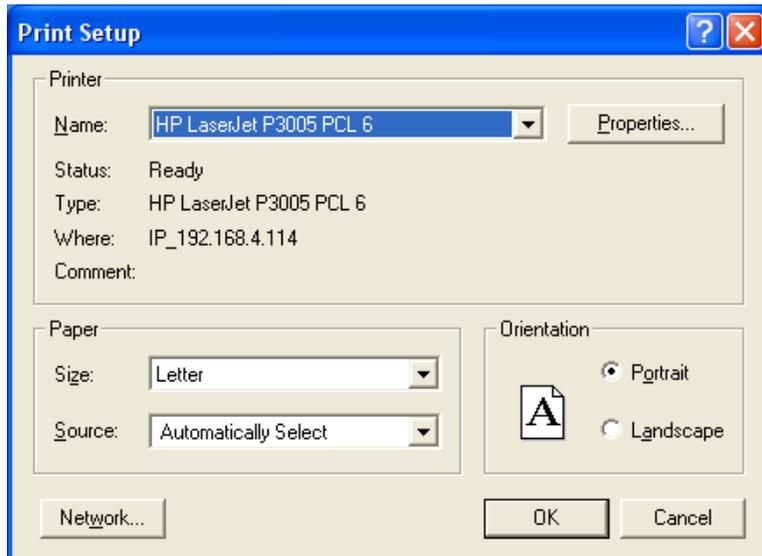
Edit Free-Form Text on Reports

Before printing a report, free-form text can be entered on the report.

To edit a report:

1. From the **CA-12** menu, select **Results**. The **Results** window appears.

2. Select a data record.
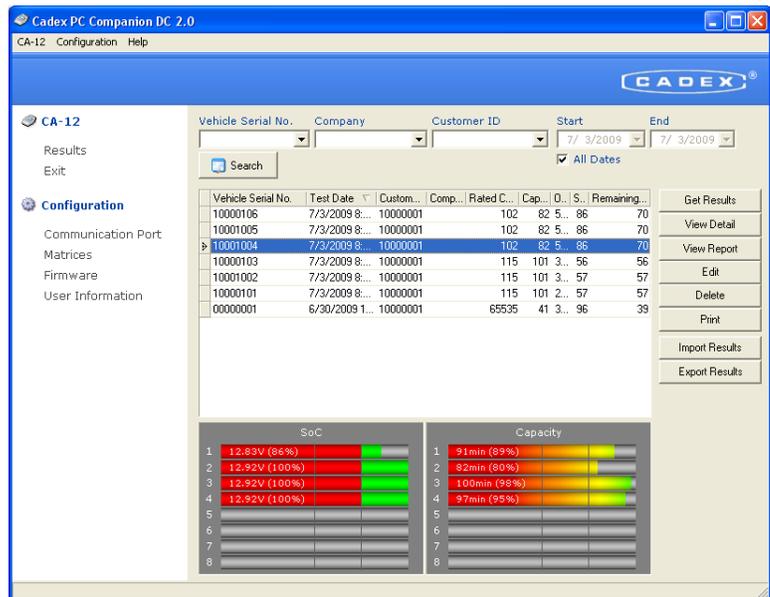
3. Click **View Report**. The **Test Report** window appears showing a preview of the report. Gray areas on the report show the free-form text elements that can be edited.

The five-line, free-text area at the top of the report is persistent. Any data entered in this field will appear in ALL reports in **PC Companion**.

4. Click the gray field and type the text for that field. When finished editing the text elements, click **Apply** to save the information in the report. Click **Print** to print the report.

Import Test Results

PC Companion can import Test Result files that were exported from a **CA-12** that are stored on a computer or network.

1. Click **Import Results**. The **Open File** window appears.

2. Navigate to the folder containing the CA-12 Test Result files and select one of those files.

3. Click **Open** to import the file into the **PC Companion** database.

Export Results

Test results can be exported to an XLS file for further analysis using a spreadsheet application.

To export test results to an XLS file:

1. Select one or more results in the **Results** window and click **Export Results**. The **Save As** window appears.

2. Type a file name for the XLS file and click **Save**.

> **Note:** If using Windows Vista and the file is saved to the default *Export* folder, the exported file may not be visible to a user with user-level permissions. In this case, consult the section <u>Running with User-Level Privileges in Windows XP</u> to set permissions on the *Export* folder to make the exported file visible.

Matrix Updates

Update Matrices on the CA-12

The **CA-12** employs matrices to determine a battery's condition. Each matrix is optimized for a specific battery model in order to provide accurate readings. It is important to use the correct matrix to test a battery.

New matrices may be downloaded from the Cadex website as they become available.

> **Note**: Matrix updates can only be completed using the RS232 cable.

> **Note:** Retrieve matrices from the **CA-12** to **PC Companion** prior to updating matrices to the **CA-12**. Matrix retrieval is important because **PC Companion** will erase all matrices on the **CA-12** during the Matrix Update process.

To update the set of matrices on the **CA-12**:

1. From the **Configuration** menu, select *Matrices*. The **Matrices** window appears.

2. If the matrices are not available, import new matrices as required into the database. (See Import a Matrix from a File for information.)

3. **Retrieve from CA-12** the existing matrices from the **CA-12** to get the matrices from the unit.

4. Select the check box adjacent to each matrix to upload to the **CA-12**. The **CA-12** has a limit to the number of matrices that it can store. **PC Companion** will display a

message if that limit is exceeded when you click **Update**. In this case, you must un-check some of the matrices to upload to the **CA-12** before clicking **Update** a second time.

5. You must select all the matrices that are needed (up to the **CA-12** limit) to conduct battery tests. The Starter Battery CCA matrix is automatically transferred to the **CA-12** and does not require selection.

6. Make sure the **CA-12** is connected to the PC. (See Connect the CA-12 to the PC for information.)

7. Click **Update**. **PC Companion** will copy the selected matrices to the **CA-12** only if the selected matrices are firmware-compatible with the firmware version currently on the **CA-12**.

Export a Matrix to a PC File

Use the *Export* function to export a matrix for use at another site. To export matrices to a file:

1. Select one matrix file in the **Matrices** window.
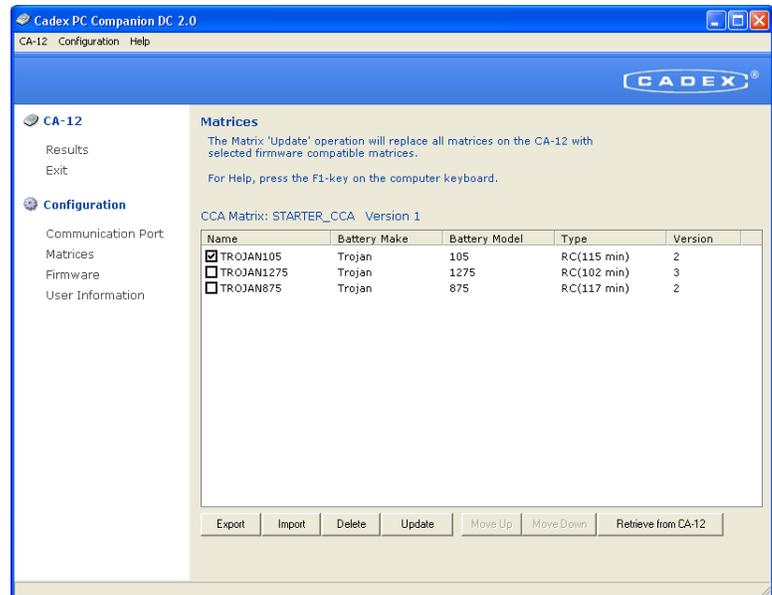
2. Click **Export**. The **Save As** window appears.

3. Specify the directory and filename for the export file and click **OK**.
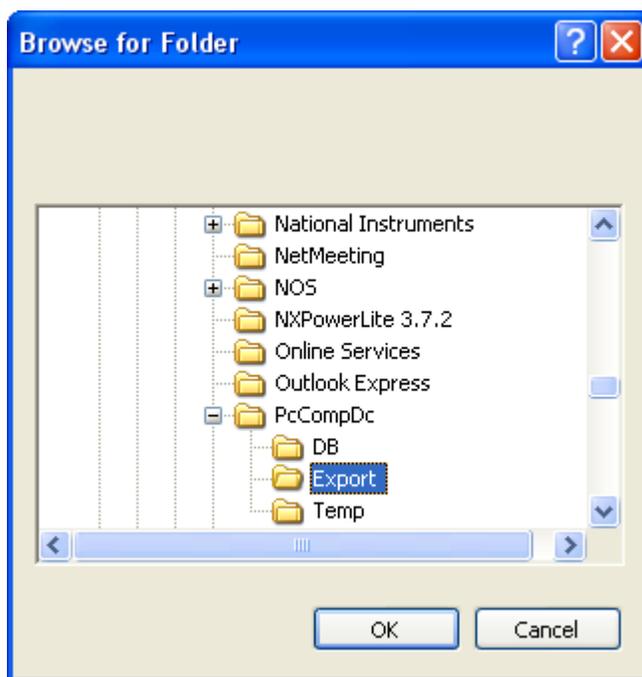

4. The file will be saved to the specified location.

Import a Matrix from a File

As new matrices become available, it is necessary to import the matrices into **PC Companion DC** for transfer to the **CA-12**.

To import a matrix from a file:

1. In the **Matrices** window, click **Import**. The **Open File** window appears. Navigate to the folder that contains the **CA-12** matrix files. These files have a **"smb"** file extension.
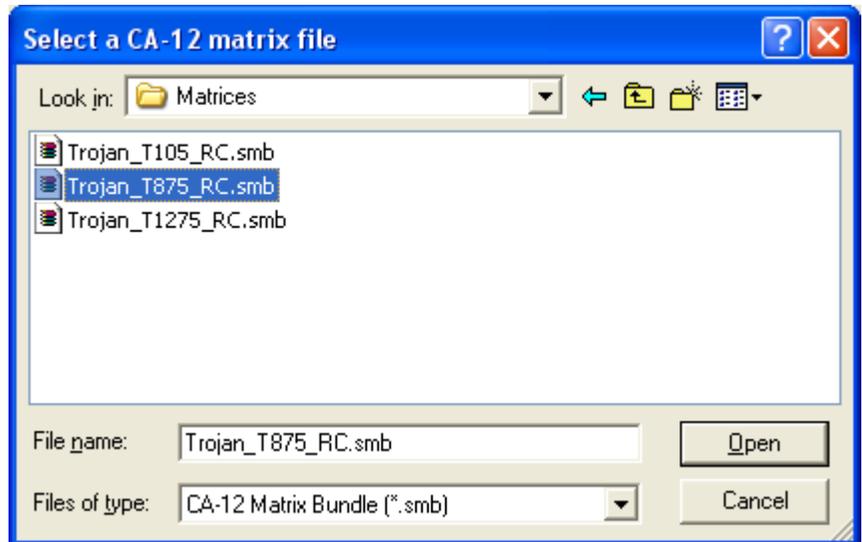

2. Select the matrix file to import into the database and click **Open**. If the selected matrix is not present in the database, the matrix will be imported. If the selected matrix is already present in the database, a prompt appears to replace the matrix in the database. Click **Yes** to overwrite the existing matrix in the database or click **No** to cancel the matrix import operation.

   Note: To select multiple matrix files all at once, hold the Shift key down while selecting the matrix files.
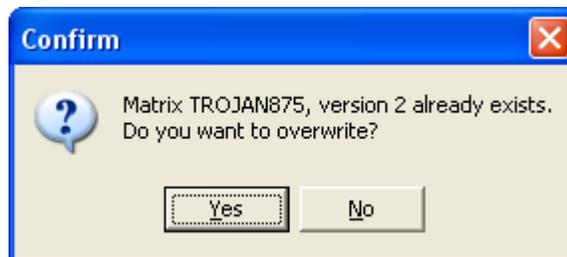
3. An **Information** window appears telling you the matrix was imported successfully.

Delete a Matrix

To delete a matrix in the database:

1. Select the **matrices** to delete in the **Matrices** window.
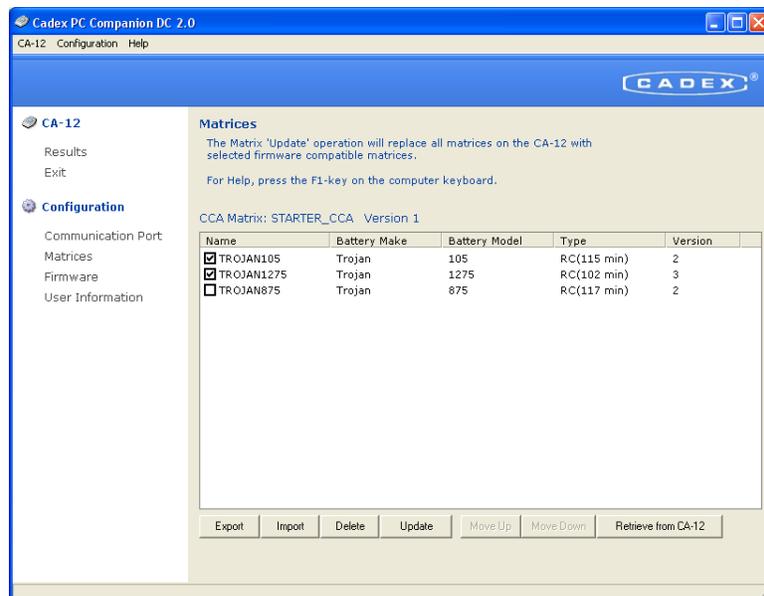
2. Click **Delete**. Click **OK** to proceed with the delete operation or click **Cancel** to abort the delete operation.
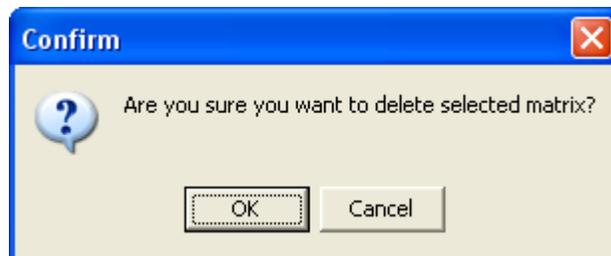
Retrieve Matrices from the CA-12

To retrieve matrices from the **CA-12**:

1. From the **Configuration** menu, select **Matrices**. The **Matrices** window appears.

2. Make sure the **CA-12** is connected to the PC. (See Connect the CA-12 to the PC for information.)

3. Click **Retrieve from CA-12**. All matrices in the **CA-12** are copied to the **PC Companion DC** database. If a dialog appears prompting to overwrite existing matrices, click **Yes** to retrieve the matrices from the **CA-12**.

Sort the Order of Matrices

To sort the matrices:

1. From the **Configuration** menu, click **Matrices**. The **Matrices** window appears.
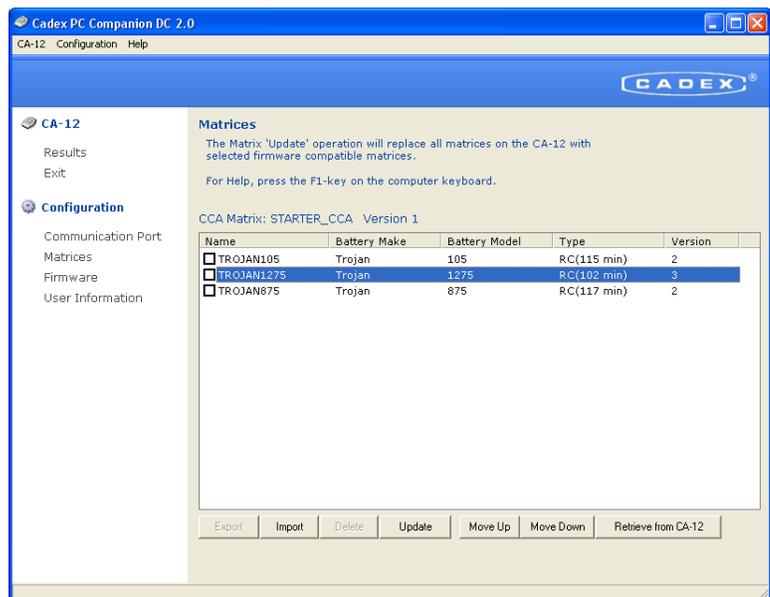
2. Highlight the matrix to move. To move the matrix up one position in the list, click **Move Up**. To move the matrix down one position in the list, click **Move Down**.

Firmware Updates

Update the Firmware on the CA-12

PC Companion can update the **CA-12**'s firmware. Contact Cadex Customer Service at (Canada) 1-604-231-7777, (USA Toll Free) 800-565-5228, or (Europe) +49 (0) 911 240 332-0, or service@cadex.com.

> **Note**: Firmware updates can only be completed using the RS232 cable.

To update the firmware on the **CA-12**:

1. Obtain the new firmware, if available, from Cadex Customer Service. The contents of the ZIP file may need to be extracted from the ZIP file to a new folder.

2. From the **Configuration** menu, select **Firmware**. The **Firmware** window appears.
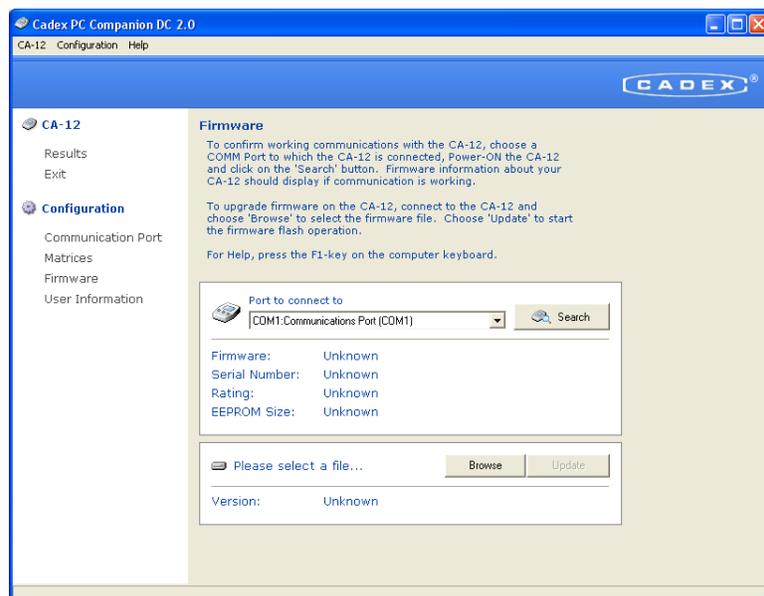
3. Connect the **CA-12** to the PC. Ensure there is a working connection by clicking **Search** on the **Firmware** window. For more information, see [Connect the CA-12 to the PC](#).

4. Click **Browse.** The **Open File** window appears. Navigate to the folder that contains the new firmware files. Select the new file and click **Open**.

    > **Note:** Follow the instructions in the *ReadMe.txt* file that accompanies the firmware file(s) to choose the file to flash to the **CA-12**. In some cases there may be two files to flash to the **CA-12** in a specific order.

5. Click **Update** to start the firmware update function. Do not disturb the firmware update process until complete. You may have to repeat Step 3 if two files need to be flashed to the **CA-12**. Follow the instructions in the *ReadMe.txt* file that accompany the firmware file(s).

View the CA-12 Serial Number and Firmware Version

To view the **CA-12** serial number and firmware version:

1. Connect the **CA-12** to the PC

2. From the **Configuration** menu, select **Firmware**. The **Firmware** window appears.

3. Click **Search**. The firmware version, **CA-12** serial number, and battery rating appear in the **Firmware** window.
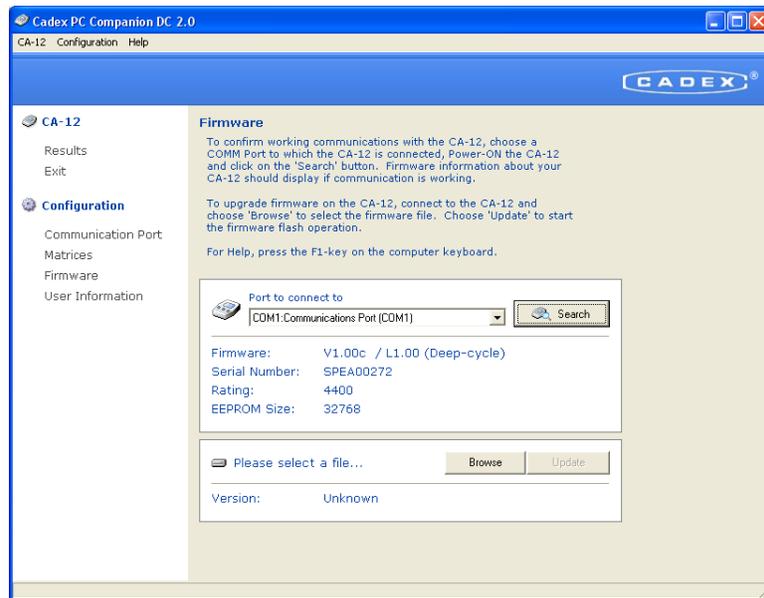
Appendix

Running with User-Level Privileges in Windows XP

The **Setup** installer sets permissions on the database folder to allow software usage by a user with user-level privileges in Windows XP.

However, after running a Windows Service Pack for Windows XP, folder permissions may be reset to their default settings preventing user-level access to the database.

To rectify this situation, follow these steps:

1. Log-on as a user with *Administrative* rights.

2. Navigate (using **Windows Explorer** or **My Computer**) to the **\PcCompDc** folder where the database folder (**DB**) is located. The default install location is **C:\Program Files\PcCompDc**.

3. Right-click the **DB** folder and select **Properties**.

4. Click the **Security** tab. (If there is no **Security** tab, skip to the steps below).

5. Choose the **User** group and select the **Full Control** checkbox.

6. Deselect the *Allow inheritable permissions from parent to propagate this object* option.

7. Click **Copy**.

8. Click **OK** to save the changes.

If the **Security** tab is not displayed, use the following method:

1. Double-Click *My Documents* on the **Desktop**.

2. Choose **Folder Options**… from the **Tools** menu.

3. Choose the **View** page.

4. Deselect the *Use simple file sharing (recommended)* option and click **OK**.

5. Type **C:\Program Files\PcCompDc** for **My Documents** address and press **Enter**.

6. Right-click the **DB** folder and select **Properties**.

7. Click the **Security** tab.

8. Choose **Users** in the group or user names list.

9. Select the *Full control Allow* check box.

10. Click **Advanced**.

11. Deselect the *Inherit from parent* check box and click **Copy**.

12. Click **OK** to close the dialog box.

13. Double-click **My Documents** on the **Desktop**.

14. Select *Folder Options…* from the **Tools** menu.

15. Choose the **View** page.

16. Select the *Use simple file sharing (Recommended)* option and click **OK**.

Display the Bluetooth Icon on the System Tray

If the Bluetooth icon is not visible even though the **Bluetooth 2.0 EDR USB Adapter** (not included) is inserted into a USB 2.0 port on the PC, follow instructions to display the Bluetooth icon on the System Tray.

1. Right-click **My Computer** and select **Properties**. Click the **Hardware** tab and select **Device Manager**. The **Device Manager** window appears.
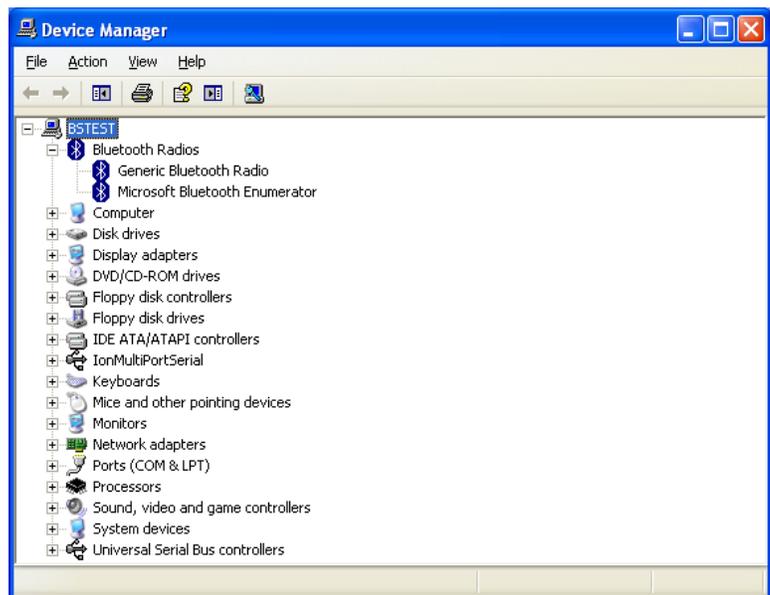
2. Right-click the *Generic Bluetooth Radio* option and select *Disable*.

3. Right-click the *Generic Bluetooth Radio* option and select *Enable* to see the **Bluetooth** icon reappear on the **System Tray**.
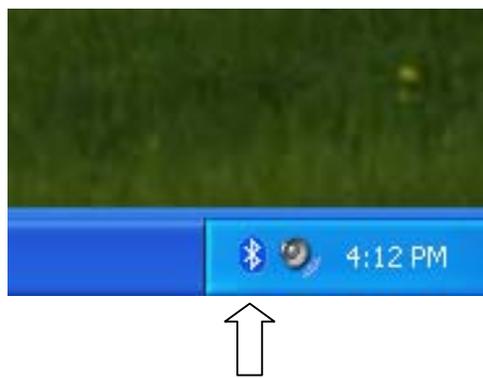
Specifications

CA-12 DEEP CYCLE BATTERY RAPID-TESTER

Application: Non-invasive hand-held rapid-tester for deep cycle lead acid batteries. Based on multi-model electrochemical impedance spectroscopy, excitation frequency 20-2000 Hertz. Patented algorithm.

Battery Types: Deep Cycle lead acid, 6, 8, 12V. Maximum test voltage 16V. Fuse protected.

Test Conditions: Measures batteries individually. 40-100% state-of-charge. Reverse polarity protected. Each battery model requires a specific matrix, stores a minimum of 10 matrices, additional matrices can be stored in the **PC Companion™ DC** software.

Tests :
- Reserve capacity, in minutes and percentage of battery model rated capacity
- State-of-charge, in percent
- Impedance, in milliohms
- Cold cranking amps (CCA), in amps
- Continuity, in milliohms
- Voltage (up to 19V), in volts

Test Time: Approximately 15 seconds

Power Source: 2200mAh internal Li-ion battery provides at least 100 tests per charge; state of charge (SOC) indication; 4-hour charge via external DC power supply and internal charge control.

Physical:

- ABS housing with rubber over-molds

- Dimensions: 172 x 248 x 60.5mm (6.75″ x 9.76″ x 2.38″)

- Weight: 1.4 kg (3 lbs) without cables

Ports: RS232. Infrared port for printer. Bluetooth Class 2 (10m/33′) for wireless data transfer.

Environmental: Operating temp: 0 to 40ºC (32 to 104ºF); Storage temp: -20ºC to +70ºC (-4° to +158º F)

External AC Power Supply: 100-240VAC, 50-60 Hz, 12VDC/1.5A(min) output

Safety: UL61010-1, CSA 22.2 No. 61010-1, EN61010-1, EMI/EMC: FCC part 15 Class A, EN55011 Level A, EN61326 for EMC

Warranty: Two (2) years for the Spectro™ CA-12 Deep Cycle Battery Rapid-Tester and (90) days for the Pencil Probes from the date of shipment.

PC-SUPPORT SOFTWARE

PC Software: PC Companion™ DC on CD-ROM, provides PC interface to update firmware, download test results, print data, store and review historical data.

Operates on Windows XP operating system

OPTIONAL ACCESSORIES

Infrared thermal printer
4400mAh extended capacity Li-ion battery
Small clamp probes