

CADEX ELECTRONICS INC.

Spectro CA-12 User's Guide

For testing 12-volt automotive batteries

ENGLISH



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Protected by US Patent No. 6,778,913

IMPORTANT NOTICE

This unit is designed to test Flooded Cells, 12V, 500-875 CCA and 50-160 RC

Spectro CA-12 Firmware Version 1

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Service

The Spectro CA-12 is covered under warranty (including parts and labor) for one year. To obtain service, contact service@cadex.com or 1-604-231-7777, USA Toll Free 800-565-5228.

Warranty

Cadex Electronics Inc. warrants your Spectro CA-12 against defective materials and workmanship for one year from the original purchase date. The warranty does not cover:

- Damage caused by abusive operation, negligence, accident or improper installation.
- Damage caused by an attempted repair not authorized by Cadex.
- Cosmetic damage caused by normal wear and tear.
- Damage from external causes such as leakage spills, power fluctuations or failure, inadequate packaging.
- If the product is without the appropriate model number, serial number or safety markings.
- If the product is used for rental purposes.
- Changes or modifications to the equipment not expressly approved by Cadex Electronics Inc.

Part Number: 89-207-5036 (PSMAN0042)

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Safety Notice

- Read, understand and follow all instructions in this manual before using the Spectro 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.
- Keep cords and cables clear from moving engine parts.
- 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 Spectro 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 Spectro 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.

Using This Manual

Conventions

Result	Screen Text
ESC	A button on the Spectro CA-12
▲ ▼ ◀ ▶	Keypad direction keys

Terms

Ahr	Ampere Hour. A European Capacity Standard.
Battery Type	The manufacturer and model number of a particular battery.
CA	Cranking Amps. The current a battery can deliver for 30 seconds at 0° C without dropping below 7.2V.
CCA	Cold Cranking Amps. The current a battery can deliver for 30 seconds at -18°C (0°F) without dropping below 7.2V (12Volt SLI battery standard)
DIN	German Standard
EN	European Norm standard
IEC	International Electrical Commission
MCA	Marine Cranking Amps
RC	Reserve Capacity (expressed in minutes). The amount of time a battery can supply 25 Amps of current without dropping below 10.5V at room temperature
SAE	Society of Automotive Engineers
SoC	State of Charge. The amount of charge in a battery relative to a fully charged battery

Introduction

The Spectro CA-12 is a 12V automotive battery tester for Lead Acid batteries. It uses sophisticated algorithms to determine Cold Cranking Amps, Reserve Capacity and State of Charge. It also has a Starter Test, a Charge System Test, a Continuity Test and a Voltmeter.

The Spectro CA-12 Package

The CA-12 package consists of the following items:

- Main Spectro CA-12 Unit: this unit has an internal rechargeable Li-Ion battery that is ready for use.
- Spectro CA-12 Battery Clamps
- Universal 12V Input Power Supply and Power Cord.
- A copper calibration shunt
- Spectro PC Companion Software
- An RS-232 Cable to connect the CA-12 to a PC
- This Users Guide

IMPORTANT NOTICE

- Use only the power-supply and power cord supplied with the CA-12 analyzer.
- The power cord is the disconnect device.
- The power outlet to which the charger is connected must be accessible at all times.

Spectro CA-12 Features



Figure 1. Spectro CA-12 Features

- | | | |
|---|------------------|--|
| 1 | OFF/ON | Turns the CA-12 ON and OFF. |
| 2 | Enter | To start tests, confirm settings and select menu items. |
| 3 | ESC | To exit menus and result screens. |
| 4 | Directional keys | To scroll through menus and results. |
| 5 | Battery Clamps | Connect these clamps to the battery terminals. The red clamp connects to the positive (+) terminal and the black clamp to the negative (-) terminal. |
| 6 | Main Display | LCD viewing panel |

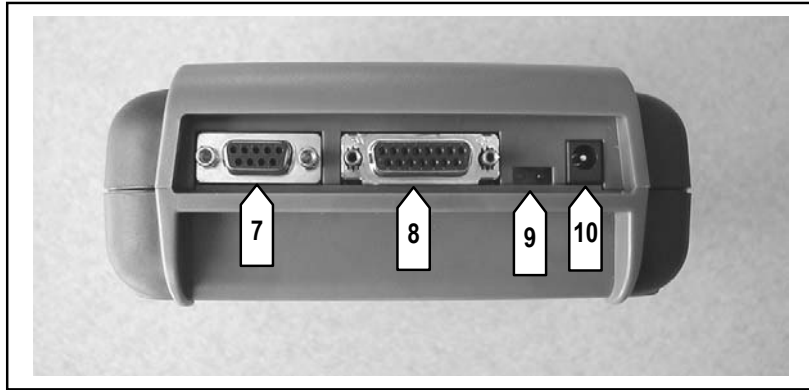


Figure 2. Spectro CA-12 Rear

- | | | |
|----|-----------------------|---|
| 7 | Serial port | To connect to a computer. |
| 8 | Battery clamp port | Connect the battery cable to this 15-pin port. |
| 9 | Infrared printer port | Place the infrared printer in front of this port. |
| 10 | Input Power Port | Connect the external power supply here. |

Battery Testing

Before Testing

1. Look on the battery label or the battery specification sheet for the CCA (Cold Cranking Amps). Note down the Reserve Capacity (in minutes) if it is available. An inaccurate entry will result in inaccurate measurements.
2. Make sure that the battery has at least 70% SoC (approximately 12.45V or see page 23). Charge the battery if necessary.
3. If testing the battery in-vehicle, turn off any vehicle loads such as heaters, lights, audio or video equipment and ensure that the vehicle ignition is in the OFF position.
4. Clean the battery terminals with a wire brush. Dirty or worn contacts may result in false readings.
5. For best results, connect the clamps directly to the battery terminals.

Do NOT attach clamps to a battery bus bar. This may result in inaccurate readings.

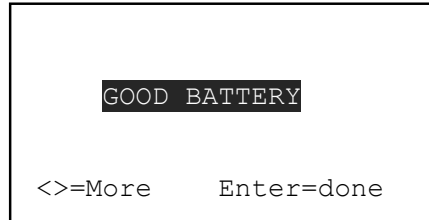
Temperature Compensation: When moving the unit from one temperature extreme to another (for example from freezing weather to room temperature), allow the unit to stabilize five minutes before testing. This unit can operate from 0°C (32F) to 40°C (104F).

Testing the Battery

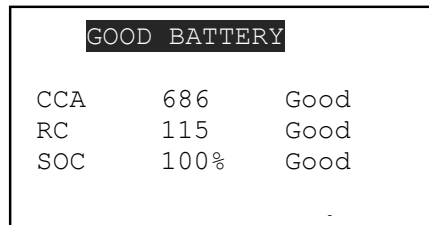
1. Turn on the CA-12
2. Use ▲ ▼ to select Test Battery. Press Enter.
3. Firmly connect the red clamp to the positive terminal (+) of the battery.
4. Firmly connect the black clamp to the negative terminal (-) of the battery.
5. Use ▲ ▼ to select the CCA Rating for the battery. Press Enter. If the CCA rating is not available on the CA-12, use the closest setting. For example, if the CCA on the battery is 638, choose 650.
6. Use ▲ ▼ to select the Reserve Capacity for the battery. Select 0 if the Reserve Capacity is not available.
7. Press Enter to start the battery test.
8. A battery test takes 30 seconds.

Test Results

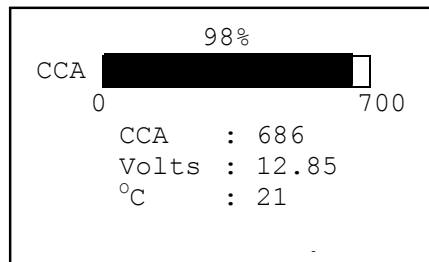
After the battery test completes, a screen displays the battery condition (see page 14 for detailed messages):



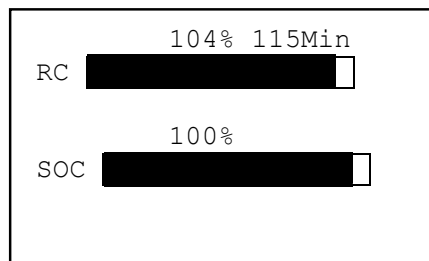
1. Press **▶** to view the CCA, SoC (State of Charge) and the RC (Reserve Capacity) if it was entered:



2. Press **▶** to display the CCA in graphics with the Voltage and Temperature readings:



3. Press **▶** to display the SoC (State of Charge) and RC (Reserve Capacity) and in graphics mode. The RC will not be displayed if it was not entered.



4. Press **Enter** to save the results. The data is automatically sent to the IR port when the data is saved. Press **ESC** to return to the main menu without saving the results.

Working with Saved Results

The CA-12 can store 25 results.

View/Print Results

To view or print results, follow this procedure:

1. From the main screen, use ▲▼ to select `Saved Results`. Press **Enter**.
2. Use ▲▼ to select `View/Print`. Press **Enter**.
3. The columns show the test number, date, time and CCA. Use ▲▼ to select the result.
4. Use ◀▶ to select `Print` or Press **Enter** to view the result. When viewing the result, use ◀▶ to view the RC and SoC screen.

Exporting Saved Results

To export data using the Spectro CA-12 PC Companion Software, refer to PC Companion software for details.

The Export feature sends data to a PC Terminal program through the serial port. Use the following procedure.

1. Connect the CA-12 to the PC using a serial cable and start the PC terminal program.
2. From the main screen, use ▲▼ to select `Saved Results`. Press **Enter**.
3. Use ▲▼ to select `Export`. Press **Enter**.
4. Press **Enter** to begin exporting or use ◀▶ to select `No` to exit the screen.

Deleting Saved Results

To clear all data, follow this procedure:

1. From the main screen, use ▲▼ to select `Saved Results`. Press **Enter**.
2. Use ▲▼ to select `Clear`. Press **Enter**.
3. Press **Enter** to begin clear all data or use ◀▶ to select `No` and then press **Enter** to exit the screen.

Electrical Tests

There are three electrical tests and a voltmeter available on the CA-12. The electrical tests are a Starter Test, Charge System Test and Continuity Test.

Starter Test

To run the Starter Test, follow this procedure:

1. From the main screen, use ▲ ▼ to select `Electrical Tests`. Press **Enter**.
2. Use ▲ ▼ to select `Starter Test`. Press **Enter**.
3. Firmly connect the red clamp to the positive terminal (+) of the battery.
4. Firmly connect the black clamp to the negative terminal (-) of the battery.
5. Press **Enter** and start the vehicle immediately.
6. A Starter Test takes **30 seconds**.
7. The result displays the float voltage, the crank voltage and idle voltage as in the following diagram. This information cannot be saved.
8. Press **ESC** to return to the Main Menu.

<p>CRANK TEST</p> <p>Float Voltage: 12.73V Crank Voltage: 9.54V Idle Voltage: 14.49V</p>

Charge System Test

The Charge System Test contains four other tests that are about 10 seconds each. To perform this test, follow this procedure:

1. Turn off all electrical loads in the vehicle such as the radio, windshield wipers and lights.
2. From the main screen, use ▲ ▼ to select `Electrical Tests`. Press **Enter**.
3. Use ▲ ▼ to select `Charge System`. Press **Enter**.
4. Firmly connect the red clamp to the positive terminal (+) of the battery.

5. Firmly connect the black clamp to the negative terminal (-) of the battery.
6. Start the vehicle and let it idle.
7. On the CA-12, Press **Enter** to start the *Curb Idle No Load* test.
8. After the above test is complete, turn on the high beams and Press **Enter** to start the *Curb Idle High Beams* test.
9. After the above test is complete, turn OFF the high beams and Rev to 2000 RPM Press **Enter** to start the *2000 RPM No Load* test.
10. After the above test is complete, turn on the high beams and Rev to 2000 RPM Press **Enter** to start the *2000 RPM high beam* test.
11. After the above test is complete, the *Idle Test* results display with the float voltage and ripple, the load voltage and ripple as in the following diagram. The ripple voltages are peak to peak:

Idle Test	
Float Voltage:	14.52V
Float Ripple:	180mV
Load Voltage:	14.47V
Load Ripple:	194mV

12. Press ► to display the *Rev Test* results as in the following diagram. The ripple voltages are peak-peak:

Rev Test	
Float Voltage:	14.52V
Float Ripple:	124mV
Load Voltage:	14.48V
Load Ripple:	139mV

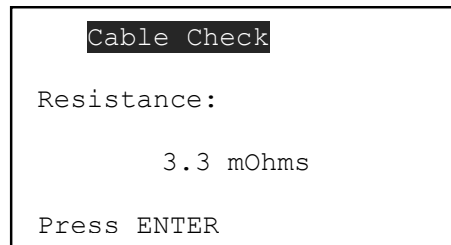
13. Press **ESC** or **Enter** to return to the Main Menu. Results are not saved.

Continuity Test

The continuity test measures resistance between two points in a vehicle. To run the Continuity Test, follow this procedure:

1. From the main screen, use ▲ ▼ to select `Electrical Tests`. Press **Enter**.

2. Use ▲ ▼ to select `Continuity`. Press **Enter**.
3. Firmly connect the red clamp to the first test point in the vehicle.
4. Firmly connect the black clamp to second test point.
5. Press **Enter** to start the test. This test takes about **10 seconds**.
6. The result is the resistance as in the following diagram.



7. Press **Enter** to return to the Main Menu. Results are not saved.

Voltmeter

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

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

To use the Voltmeter, follow this procedure:

1. From the main screen, use ▲ ▼ to select `Electrical Tests`. Press **Enter**.
2. Use ▲ ▼ to select `Voltmeter`. Press **Enter** to display the voltage
3. To determine the minimum or maximum reading, use ◀ to select `On` and then press **Enter**.
4. Use ◀▶ to select `Min` or `Max` to record the lowest or highest voltage respectively and then press **Enter**.
5. Use ◀▶ to select `Reset` or `OFF` to resume readings.
6. Press **ESC** to return to the Main Menu.

System Settings

The `System Settings` customizes the CA-12 for your use. The system settings are to select the active matrix, result options, user information, device settings, calibration and counters. To access the System Settings, in the main menu, use ▼▲ to scroll to `System Settings`. Press **Enter**.

These settings can be adjusted easily through the Spectro CA-12 PC Companion Software. See the Spectro CA-12 PC Companion Software help file for more details.

Active Matrix

The CA-12 can store five matrices for different types of batteries. The default matrix that is provided in the CA-12 is for applications with the SAE CCA: 500-875A and SAE RC: 50-160. Cadex can create specific matrices for specialized applications or vehicles. Please contact your local representative to learn about this process.

To select a different Active Matrix, do the following:

1. In the main menu, use ▼▲ to scroll to `System Settings`. Press **Enter**.
2. Use ▼▲ to scroll to `Active Matrix`. Press **Enter**.
3. Use ▼▲ to scroll to the required matrix. Press **Enter** to select the matrix.
4. Press **Enter** to save the settings or use ► to select `No` to exit without saving.

Result Options

The result options allow the user to select different crank units and temperature. Using the setpoints, pass/fail criteria can be set for the CCA, RC and SoC.

The CA-12 can display the Crank Units in the following formats:

CCA	Cold Cranking Amps. This is the default setting.
CA	Cranking Amps
EN	European Norm

IEC	International Electrical Commission
DIN	German Standard
BCI	Battery Council International Standard
MCA	Marine Cranking Amps

The CA-12 can display the Temperature in the following formats:

°C	Centigrade. This is the default setting.
°F	Fahrenheit

To change the result options, do the following:

1. In the main menu, use ▼▲ to scroll to `System Settings`. Press **Enter**.
2. Use ▼▲ to scroll to `Result Options`. Press **Enter**.
3. Use ▼▲ to select between `Units` or `Setpoints`. Press **Enter**.
4. If `Units` has been selected, use ◀▶ to move between the `Crank Units` and `Temperature`. Use ▼▲ to select the values in each field.
5. If `Setpoints` has been selected, use ◀▶ to move between `GOOD` and `MARG` (Marginal) columns. Use ▼▲ to select the values in each field. The `LOW` column cannot be selected.
6. Use ▼▲ to scroll to select the appropriate settings.
7. Press **Enter** to confirm the settings.
8. Press **Enter** to save the settings or use ▶ to select `NO` to exit without saving.

User Information

Enter the contact information in this area. The information on this screen will appear on printer outputs. To change the User Information, do the following:

1. In the main menu, use **▼▲** to scroll to `System Settings`. Press **Enter**.
2. Use **▼▲** to scroll to `User Information`. Press **Enter**.
3. Use **▼▲** to select a line and press **Enter** to edit the line.
4. Use **◀▶** to select the letter to edit. Use **▼▲** to scroll through letters.
5. Press **ESC** or **Enter** to accept the changes on each line.
6. After accepting the changes on each line, use **▼▲** to scroll through the various lines.
7. Press **Enter** to confirm the settings. Press **Enter** again to save the settings or use **▶** to select `No` to exit without saving.

Device Settings

The device settings setup other features of the CA-12. To access the device settings, do the following:

1. In the main menu, use **▼▲** to scroll to `System Settings`. Press **Enter**.
2. Use **▼▲** to scroll to `Device Settings`. Press **Enter**.
3. Use **▼▲** to the various device settings. Press **Enter**. The details for each device settings are described below:

Screen Contrast

Adjust the screen contrast using the **▼▲** keys.

Shortcut: Press the **◀▶** key when the startup screen is displayed to jump to the contrast adjustment screen. Then use the **▼▲** keys to set the screen contrast.

Off Timers

This feature will turn off the backlight or the unit after a programmed time. Move between the `BackLight` and `Power Off` time using **◀▶**. Adjust the off-timers using the **▼▲** keys.

Set Clock

This feature sets the time. By default, the clock is set to PST (GMT-8). Move through the data and time using ◀▶. Adjust the time using the ▼▲ keys.

Printer Port

This feature determines which port will print test data. Select the IR PORT or Serial Port device using the ▼▲ keys. Press **Enter** to save the settings or use ▶ to select **NO** to exit without saving.

Factory Defaults

This option will reset all options in the Menu and Matrix to factory defaults. Follow the prompts on the screen to reset the unit to factory defaults.

When resetting to factory defaults:

- a. All results are deleted.
- b. All customized items such as screen contrast and off timers are reset to factory default settings.

The following items are retained during a reset:

- a. Matrices are not deleted.
- b. User Information is not deleted.

System Info

The system info displays the firmware revision, the number of tests performed and the last date of calibration.

A 'Recalibration Needed' message will appear if the date is more than 6 months old or it has been 2000 tests since the last calibration. Refer to page 18 for the calibration procedure.

The `Current Count` is the total number of tests the cable has performed since first used. This number is not reset during calibration.

The `Calibration Count` is the total number of tests the cable has performed since the last calibration. This number is reset during calibration.

Messages

Battery Results

Message	CCA	RC
Good Battery	Good	Good
Marginal Battery, CCA Marginal	Marginal	Good
Marginal Battery, RC Marginal	Good	Marginal
Replace Battery, CCA Low	Low	Good or Marginal
Replace Battery, RC Low	Good or Marginal	Low
Replace Battery, CCA and RC Low	Low	Low
Replace Battery Shorted cell suspected	Any	Any
Charge and Retest	Good, Marginal, or Low	Good, Marginal or Low

Fault Messages

Internal Battery Low, Please Recharge

Recharge the CA-12 battery. A fully charged CA-12 battery exceeds 100 tests. If the battery is not recharging, replace it. See *Charging and Replacing the Internal Battery* on page 19.

Battery Disconnected

Reconnect the battery clamps to the battery under test and repeat the test. If the battery under test is connected, move the clamps back and forth to ensure a tight connection.

Cable Disconnected, Test is Terminated

Reconnect the cable clamp to the CA-12 and recalibrate the unit (see page 18).

If this occurs during calibration, restart calibration.

Cable EEPROM failure

See above.

Data Acquisition Error, Test is terminated

Turn off the CA-12 and turn it back on. Retest the battery.

Reconnect the cable clamp to the CA-12 and recalibrate the unit (see page 18).

Battery under test impedance is more than 20 mOhms.

Loss of voltage signal, Test is terminated

Reconnect the battery clamps to the battery under test and repeat the test. If the battery under test is connected, move the clamps back and forth to ensure a tight connection.

Over current detected, Test is terminated

Confirm that the CCA and RC match the battery.

Recharge the battery under test and test it again.

Reconnect the cable clamps. Battery impedance is too low.

Re-calibration Needed

Perform the calibration to clear the message. This message appears if the unit has performed more than 2000 tests since the last calibration or was last calibrated more than 6 months ago.

Spectrum Acquisition Error

See **Data Acquisition Error, Test is terminated**

The state-of-charge is too low. Please charge the battery and re-test.

Battery charge level is low (below 12.3V) to provide an accurate CCA/RC reading. Charge the battery and re-test.

Voltage Out-of-Range, Battery cannot be tested

Confirm that the battery under test is 12V.

Recharge the battery and test again.

Reinsert the clamps onto the battery.

This message may also appear if battery impedance is either high or low.

Matrix Error Messages

The selected Active matrix is not valid!

Select another matrix. See Active Matrix on page 10.

You must select or download a new matrix before batteries can be tested!

See above

Matrix data is corrupted.

See above.

Memory Messages

Memory is now full!

Clear all results. See *Deleting Saved Results* on page 6.

Result data could not be saved.

See above.

Troubleshooting

- The unit does not power up.** Battery charge may be low. Plug the unit into a power supply to charge the battery.
- Contrast may be low. See *Screen Contrast* on page 12.
- The internal battery may need to be replaced. See *Charging and Replacing the Internal Battery* on page 19.
- Results are inconsistent** Calibrate the unit. See *Calibration* on page 18.
- Clean the battery terminals and reconnect the clamps. Make sure clamps are tight on the battery.
- Printer does not operate** The printer uses infra red light to communicate. Ensure a clear line of sight.
- Keep the printer less than 1m from the Spectro unit IR port and approximately +/- 20 deg 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.
- If the above items do not work, refer to ***Resetting the Printer*** on page 22 for further details.

Maintenance and Service

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

WARNING: DO NOT ATTEMPT TO REPLACE THE INTERNAL BATTERY. APART FROM REPLACING THE FUSE OR RESETTING THE UNIT, DO NOT OPEN THE CA-12 OR ATTEMPT TO REPAIR THE UNIT.

Calibration

The CA-12 requires calibration to maximize the accuracy of test results. It is necessary to recalibrate the unit:

- Every six months or after 2000 tests. The CA-12 will indicate when this limit has been reached.
- After a firmware update.
- Whenever the battery clamps are replaced or removed.

The calibration procedure is as follows:

1. In the main menu, use ▼▲ to scroll to `System Settings`. Press **Enter**.
2. Use ▼▲ to scroll to `Calibration`. Press **Enter**.
3. At the prompt `Connect Leads`, clamp the jaws of the battery probes onto the calibration shunt, as shown in the figure below.

Please note, the calibration shunt must be used when calibrating; DO NOT directly connect the probe jaws together or inaccurate battery measurements will result.

4. Press **Enter** to begin calibration. Calibration will take approximately two minutes.



Ensure good contact between probe jaws and calibration bar.

Correct Method for Attaching Battery Probes to Calibration Shunt During Calibration.

Charging and Replacing 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.

WARNING: DO NOT ATTEMPT TO REPLACE THE INTERNAL BATTERY YOURSELF. THE INTERNAL BATTERY CAN ONLY BE REPAVED BY A CADEX AUTHORIZED SERVICE CENTER.

The internal battery is designed to operate for several years. In order to replace the Internal Battery, please contact service@cadex.com to obtain the contact information of the nearest service center. Contact the service center on how to return the unit to replace the battery.

Changing the Fuse

The CA-12 internal fuse provides the unit with over-current and over-voltage protection. Do the following to replace the fuse:

- a. Disconnect the CA-12 from the automotive battery.
- b. Turn off the CA-12 and disconnect it from the power supply.
- c. Turn over the CA-12 and use a Philips screw driver and remove the screws marked in the following diagram:



Figure 4. Removing the CA-12 Rear Cover

- d. Remove the top cover and locate the fuse at the topside of the unit.
- e. Remove the fuse with a pair of needle nose pliers and replace it with the spare fuse.



Figure 5. Location of CA-12 Fuse

Resetting the CA-12

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

- a. Disconnect the CA-12 from the automotive battery and power supply.
- b. Turn OFF the CA-12.
- c. Use a Philips screw driver and remove the screws marked in the following diagram:



Figure 6. Removing the CA-12 Rear Cover

- d. Remove the top cover and locate the reset switch at the bottom of the unit.
- e. Use a pen to reset the unit.

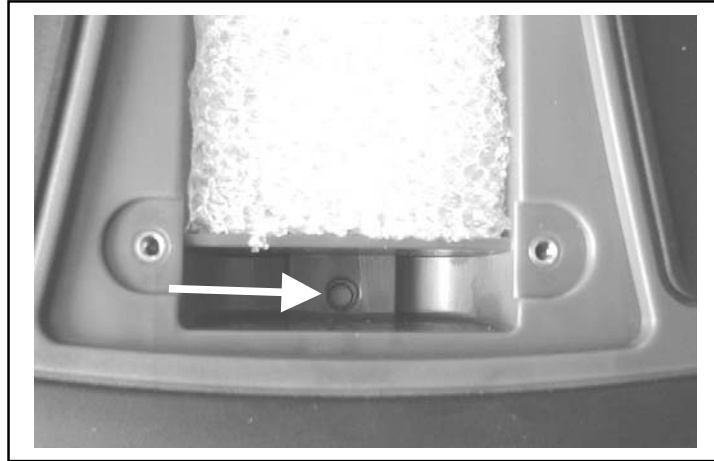


Figure 7. Location of CA-12 Reset Switch

Cleaning the clamps

Clean the battery clamps every **three months** with a wire brush. This will ensure that the readings are accurate.

Cleaning the unit

1. Do not use any cleaning solution on the CA-12 unit.
2. Wipe the unit with a clean damp cloth.

Upgrading the firmware

Please refer to the help section in the PC Companion software to upgrade the Spectro CA-12 firmware.

Resetting the Printer

The Cadex supplied printer (Martel MCP8830B) has been configured in the factory for IR operation. Only this printer is supported by the CA-12.

If the printer is not printing, the printer may need to be reprogrammed. To reprogram the printer, please refer to *Configuration Options* in the Printer Users Manual. Program the Communications Protocol (Option Number 1) to setting number 2: IrDA Physical Layer (9600baud).

Spare Components

The following replacement parts may be purchased from Cadex Electronics Inc. Please contact service@cadex.com for pricing and delivery.

Description	Part Number
Battery Clamp and Cable Assembly	17-797-0052
Calibration Shunt	17-797-0061
Fuse (7A, 125V)	52-813-0700
Internal Battery	01-000-0005
PC to Spectro Unit RS-232 Cable	68-940-0006
Printer, Martel Instruments MCP8830B (IR & Thermal)	00-004-3060
Spectro PC Software	84-100-0120
Universal Input Power Supply (Input 90-264VAC, Output 12V, 1.6A). Only this power supply is approved for use with the Spectro CA-12.	17-600-0006
IEC320 6' Power Cord	68-723-1810

State of Charge and Open Circuit Voltage

The following table compares a 12V battery state of charge with the open circuit voltage.

State of Charge (SoC Level)	Voltage
100%	12.65
75%	12.45
50%	12.24
25%	12.06
Discharged	11.89

Source: Battery Council International (BCI), *Battery Service Manual*, 12th Edition; Chicago, 2002: page 7

Specifications

Application Services 12V lead acid batteries for SLI (Starting, Ignition and Lighting).

Battery Types The generic matrix accommodates the Flooded lead-acid (maintenance free version)

Operating Range 12V, 500-875 CCA; 50-160 min RC

Test Results - Reserve capacity in minutes or Ah; Cranking in CCA, CA, EN, IEC, DIN, BCI and MCA; State-of-charge in percentage of full charge; Voltage, 0 – 16V, +/- 50mV

Test Conditions Battery must have 70-100% state-of-charge at 0 to 40°C (32 to 104°F)

Test Time Approximately 30 seconds

Internal Power Source Internal lithium-ion battery provides 100 full tests per charge; on-screen charge indicator; auto shut-off; 3-hour charge time.

Internal Power Source AC adapter with 6' power cord and IEC320 socket: 90-264VAC input, 50-60Hz, 12V/1.6A output. A 6' IEC 320 power cord is also included.

Battery Excitation 24 excitation frequencies range from 20-2000 Hertz.

Languages Set to English. Contact your representative for other language options.

Display Graphic LCD 128 x 64, backlit

Physical Drop-resistant ABS housing with rubber over-molds to absorb shocks.

Dimensions 172 mm (6.75") x 248 mm (9.76") x 60.5 mm (2.38") Weight: 1.10 kg (2.45 lbs)

Cable 1.8 m (72"), removable, four-wire measurement, temperature sensor in clamp adjusts instrument to adverse temperature conditions, factory calibrated, provision for field calibration.

Printing Infrared port for printer

Ports RS232 port, allows field updates through PC

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

Approvals UL3101, CSA 1010, EN61010 EMI/EMC: FCC part 15 Class A, EN55011 Level A, EN61326 for EMC

Warranty Cadex warrants the instrument against defective materials and workmanship for a period of one (1) year from the original purchase date.

PC-SUPPORT SOFTWARE

PC-Companion On CD-ROM, provides PC-interface to update firmware, download test results, print data, store and review historical data, and examine Nyquist and Bode charts. Software also allows collecting battery data to create battery-specific matrices through Cadex engineering labs.

Using the SpectroCA-12 PC Companion Software

Cadex Spectro is the Windows PC companion software for the Cadex Spectro CA-12. Please refer to the PC companion software help section for more details. It offers the following functions:

Test Result Database

The Spectro PC Companion software has unlimited capacity for storing test results. After downloading test results from the CA-12, the end-user can display information from a previous test, print Nyquist or Bode plots and export results to a file for further analysis.

Matrix Management

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

Firmware Update

Periodically, Cadex will release new firmware for the Cadex Spectro CA-12. The PC companion software can be used by the end-user to upgrade their CA-12 unit with the new firmware on-site.

Setup & Installation

On the PC, run Setup on the CD to install Cadex Spectro PC Companion. After the installation is complete. Double Click on the Cadex Spectro icon to start the program. Click on Help for instructions to connect the CA-12 to the PC and to log data.