

# CB-2000

## Portable Capacitance Meter

User's Guide



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## Assistance

For assistance contact ABB AB. Please see back page for ABB AB's address and contact information.

## Declaration of conformity



ABB AB declares under sole responsibility that the CB-2000 Capacitance meter, to which this declaration relates is in conformity with the following LVD standards: EN 61010-1, according to the terms of directive 2009/95/EC with the addition of 93/68/EEC. This product also is in agreement with the following EMC standards: 61326-1:2006 EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6 and EN 55011 according to the terms of directive 2004/108/EC with the addition of 92/31/EEC and 93/68/EEC.

## Trademark acknowledgements

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## Important safety information

The CB-2000 meter is a hand-held, battery-operated device to measure capacitors. Before using the CB-2000 make sure you read its accompanying User's Guide and warnings carefully. Inappropriate usage of the CB-2000 can cause heat generation, explosion, fire, bodily injury, or death. If you do not fully understand our CB-2000 User's Guide or warnings, please direct your response to ABB AB.

### Key to the symbols



Note symbols alert you to important facts and conditions.



This symbol is a visual notice to help you avoid mistakes that could result in damage of the material and/or no function of the CB-2000 portable capacitance meter.

Read the text carefully and if you do not understand then do not proceed.



Serious material damage, electric shock, severe personal injury and/or death can be the result of not following the information given beside this symbol.

Read the text carefully and if you do not understand then do not proceed.

# Safety guidelines and warnings

## Portable Capacitance Meter



To avoid electric shock, personal injury, or damage to this device and ensure that you use the meter safely, follow the safety guidelines and warnings listed below:

- The CB-2000 shall only be used by qualified and properly trained personnel, with the level of competence required for work in connection with high voltage capacitor banks and/or harmonic filters.
- Avoid working alone.
- Use this device only as specified in this user's guide.
- Do not use this device if it looks damaged.
- Disconnect the capacitor bank from the grid, wait at least 10 minutes and discharge all capacitors before measuring.
- Always use the specified battery.
- Inspect the leads for damaged insulation or exposed metal. Replace damaged leads.
- Follow all regulations and rules stated by international or national safety regulations.



### **WARNING!**

Do not connect the CB-2000 to a capacitor until it is properly discharged. Failure to follow this warning could result in damage to the device, electric shock, or personal injury.



### **WARNING!**

All work on capacitor banks and/or harmonic filters shall only be conducted when the banks/filters are disconnected, discharged, grounded and short-circuited. Otherwise consider the capacitor bank and units as live parts.

**WARNING!**

After disconnection of the capacitor bank, wait at least 10 minutes before grounding and short-circuiting in order to let the capacitor's internal discharge resistors discharge the units (normally it will be less than 75 V, IEC standard). For capacitor banks and capacitor units without discharge resistors (special applications), discharge instructions must be requested from the supplier.

**WARNING!**

Ground the capacitor bank or harmonic filter and discharge all units according to supplier instructions. Failure to follow this warning could result in damage to the device and to the capacitor banks, electric shock, heat generation, explosion, fire, bodily injury, or death. Please refer to the Operating Instructions set forth in Section 3.

**WARNING!**

When working in the vicinity of high voltage, disconnect and ground around the work area. If work must be carried out next to live plant components, the safety distance must comply with applicable safety regulations.

**WARNING!**

When using ladders or platforms, work must be conducted in accordance with applicable safety regulations. Avoid climbing on ladders and platforms in poor weather conditions.

**WARNING!**

Carry out a visual inspection to make sure that no tools are left and remove the groundings (earthings) before energizing the capacitor bank or harmonic filter.

**WARNING!**

Avoid skin contact in event of leakage of impregnation fluid. Refer to the capacitor safety instructions. In case of skin contact, wash off immediately with soap and water. Consult a doctor if skin irritation persists.

## Rechargeable battery pack

To avoid personal injury or product damage, refer to Section 6.3 for handling and charging of the rechargeable battery pack, and follow the safety guidelines and warnings listed below:



**WARNING!**

Do not disassemble, modify or destroy the battery. Doing so can cause fluid leakage, heat generation, or explosion.



**WARNING!**

Do not use the rechargeable battery pack at a site that can get moist or immersed in water. Doing so can cause the batter's terminals to corrode, and/or cause electric shock or fire.



**WARNING!**

Make sure you connect batteries by their proper polarity. Connecting the battery in the wrong polarity can cause fire or damage to the charger.



**WARNING!**

Do not incinerate or apply heat to the battery. Batteries may burst and release hazardous decomposition products when exposed to fire.



**WARNING!**

Prolonged exposure to heat may cause the battery to produce hazardous metal fumes of nickel, cobalt, aluminum and manganese, as well as hydrogen gas, caustic vapors of potassium and sodium hydroxide and other toxic by-products.

## First aid measures

### General advice



The chemicals and metals in this battery are enclosed in a sealed can. Exposure to the contents will not occur unless the battery is exposed to high temperatures or mechanical or electrical abuse. A damaged battery will release concentrated potassium and sodium hydroxides, which are caustic. Anticipated potential leakage of potassium and sodium hydroxides is 1-2 grams per cell.



### Eye contact

If a battery is leaking and material comes in contact with the eyes, flush thoroughly with water for 30 minutes. Seek immediate medical attention.



### Skin contact

If a battery is leaking and material comes in contact with the skin, remove any contaminated clothing and flush exposed skin with water for at least 15 minutes. If irritation, injury or pain persists, seek immediate medical attention.



### Inhalation

If a battery is leaking, the contents may irritate respiratory passages. Move to an area with fresh air. If irritation persists, seek immediate medical attention.



### Swallowing

If battery contents are swallowed, **do NOT induce vomiting**. If the victim is alert, have him/her rinse his/her mouth and the surrounding skin with water for at least 15 minutes. Seek immediate medical attention.



### Note to physician

The acutely toxic ingredients are concentrated (35%) potassium and sodium hydroxides and nickel. Anticipated potential leakage of potassium and sodium hydroxides is 1-2 grams.

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Section 1  
Introduction

### 1.1 Introduction

The CB-2000 is an advanced measurement unit especially developed for measuring the capacitance of high power capacitors without making any disconnections within the capacitor bank. The ergonomic design makes it easy to handle and with the shoulder strap attached, easy to carry. The capacitance value is clearly displayed on an LCD legible both in daylight and dark environments.

The low voltage (less than 1.4 V) test signal is generated only when a measurement is made, in order to minimize power consumption. The measurement frequency is automatically adjusted according to the measured capacitance for best possible results.

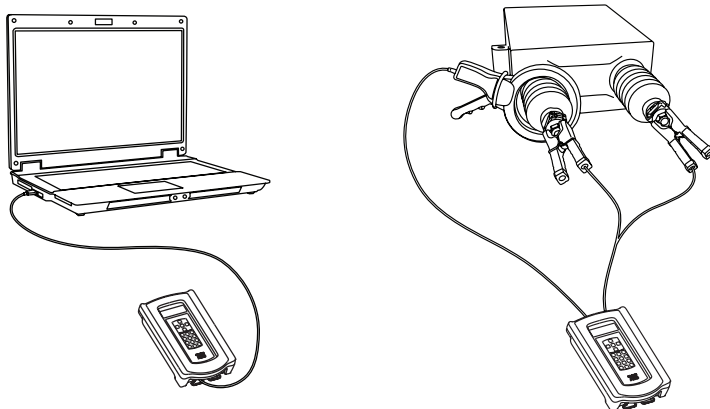
To ensure reproducibility, up to five measurements can be stored and shown for each measurement object. The measurements produced by the CB-2000 are time stamped and the internal temperature at the time of measurement is stored as well. The data can later be downloaded to a PC for storage and analysis using the accompanying software.

The CB-2000 is short-circuit proof and has a measuring range of 0-1000  $\mu\text{F}$ .

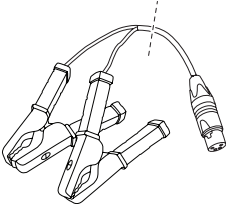
### 1.2 Workflow

The handling and operation of the CB-2000 is quick and easy:

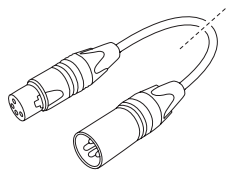
1. Prepare the CB-2000 for a measurement session by uploading the last session data or routine test data (optional).
2. After all safety measures have been taken on the capacitor bank, connect the voltage supply and clip-on transformer and perform a measurement.
3. Download the measurement data to a PC for analysis and storage (optional).



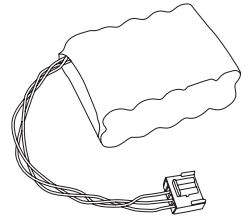
## 1.3 Parts list



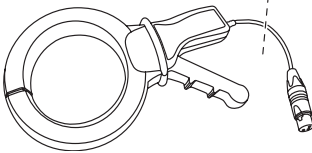
**1HSD100909-725**  
Voltage clips



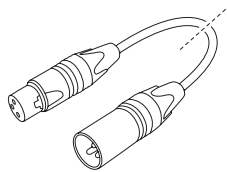
**1HSD100909-726**  
4-pin extension cable  
for voltage clips



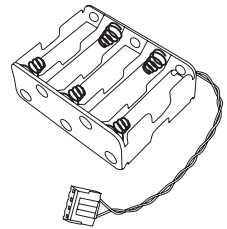
**1HSD100909-729**  
Rechargeable NiMH  
battery pack



**1HSD100909-727**  
Clip-on transformer



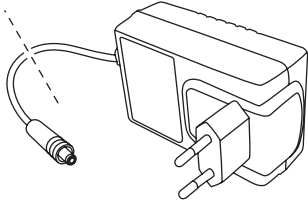
**1HSD100909-728**  
3-pin extension cable  
for clip-on transformer



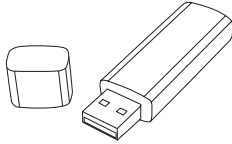
**1HSD100909-730**  
Battery holder

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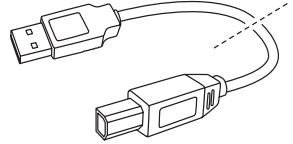
## 1.3 Parts list (continued)



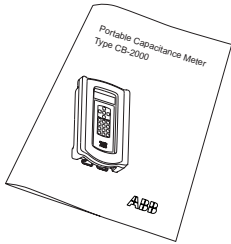
**1HSD100909-731**  
Power adapter  
(AUS, EU, JP, KOR, UK, US)



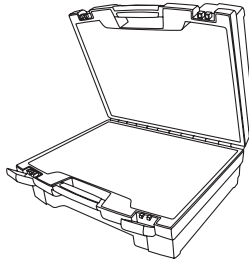
**1HSD101225-139**  
USB stick



**1HSD101225-138**  
USB cable



**1HSD100909-732**  
User's Guide



**1HSD100909-733**  
Product casing

## Parts list - miscellaneous

Set of spare fuses	1HSD101225-140
Calibration of CB-2000	1HSD100909-734
CB-2000 system with casing	1HSD100909-724

Section 2  
CB-2000 software

## 2.1 Installation instructions USB drivers

The CB-2000 is fitted with a USB port that requires installation of special software drivers included on the USB stick or available via Windows Update.

For Windows XP, the installation steps are shown in the paragraphs below. For Windows Vista and Windows 7, when connected to the Internet, the drivers will be installed automatically.



NOTE: Please refer to the installation instructions for Windows Vista or Windows 7 if automatic installation fails. These instructions can be found on the USB stick (if there is no Internet connection) or on the ABB product website.

## 2.2 Installing via Windows Update (Internet connection)

Connect the CB-2000 to a spare USB port on your PC. The Found New Hardware Wizard will launch.



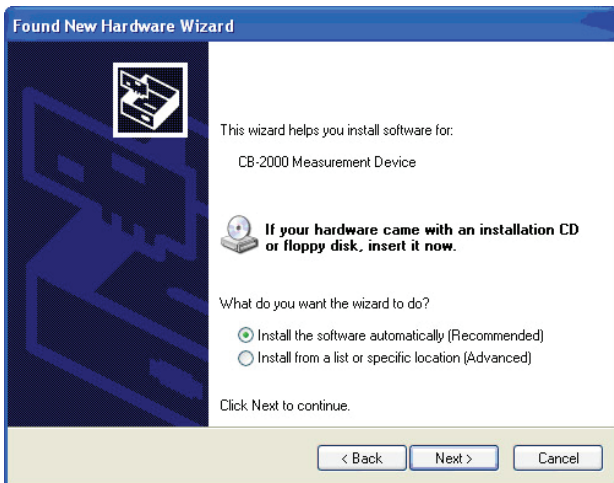
NOTE: If you are running Windows XP or Windows XP SP1, temporarily disconnect your PC from the Internet. This can be done by either removing the network cable from your PC or by disabling your network card by going to “Control Panel\Network and Dial-Up Connections”, right-clicking the appropriate connection and selecting “Disable” from the menu. The connection can be re-enabled after installation is complete. Continue reading in Section 2.3 below for installation of the drivers provided on the memory stick.

This is not necessary with Windows XP SP2 (or later) if configured to ask before connecting to Windows Update. With Windows XP SP2 (or later), the settings for Windows Update can be changed from “Control Panel\System” by selecting the “Hardware” tab and then clicking “Windows Update”.

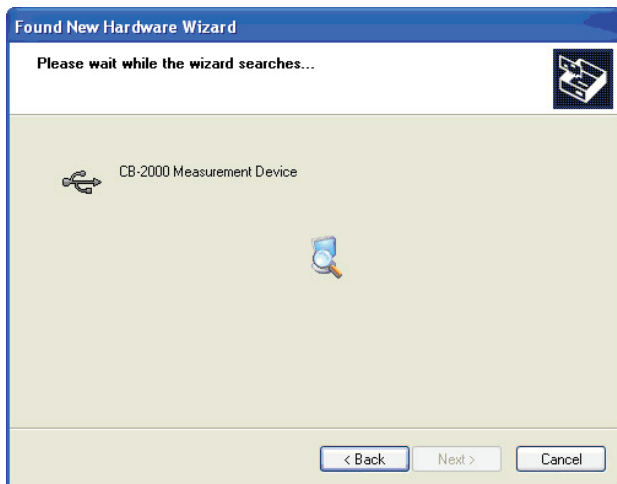
If there is an available Internet connection, select “Yes, this time only” or “Yes, now and every time I connect a device” option and click the next button. If no Internet connection is available, continue with Section 2.3 below.



Select “Install the software automatically (Recommended)” in the next window and click the “Next” button.



The following window appears while Windows is searching for the drivers in the Windows Update database. This can take a few minutes.



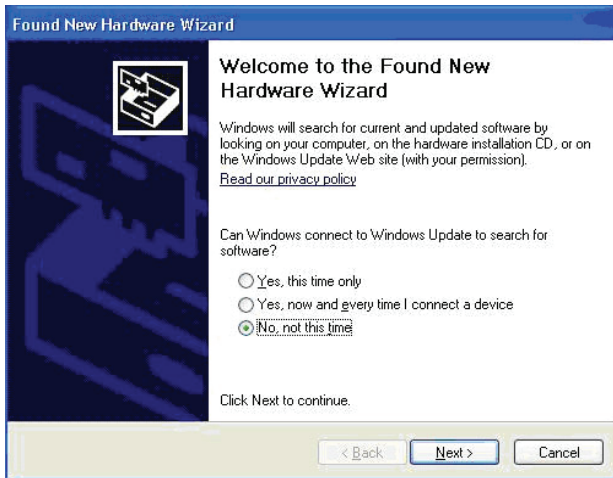
When the wizard has found and installed the CB-2000 drivers, the window below is displayed. Click "Finish" to complete the installation.



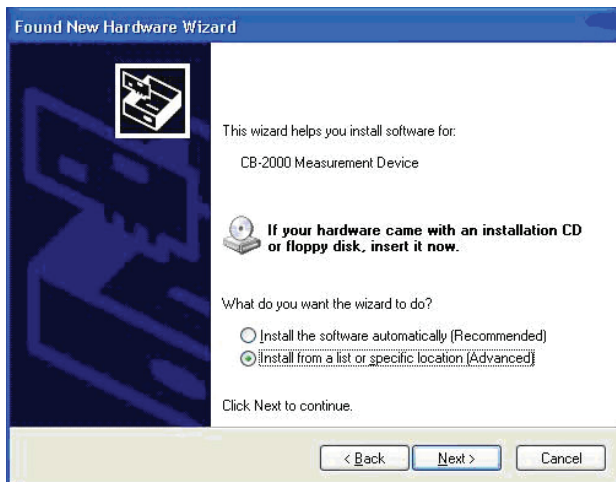


## 2.3 Installation via the drivers on the USB stick

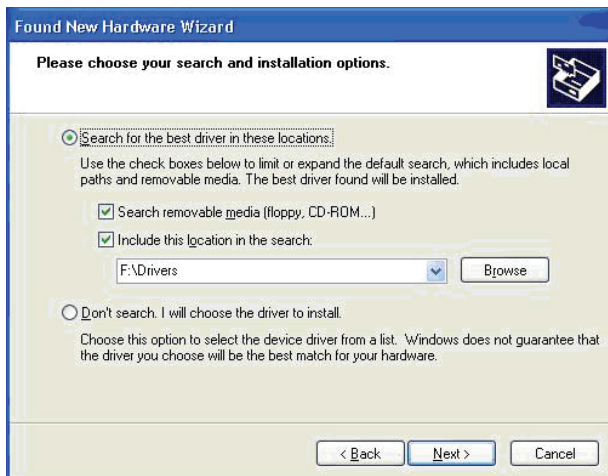
If no Internet connection is available or if Windows XP SP2 (or later) is configured to ask before connecting to Windows Update, the screen shown below is displayed. Select “No, not this time” from the options available and then click “Next” to proceed with the installation. If there is an available Internet connection, Windows XP will silently connect to the Windows Update website and install the latest available driver.



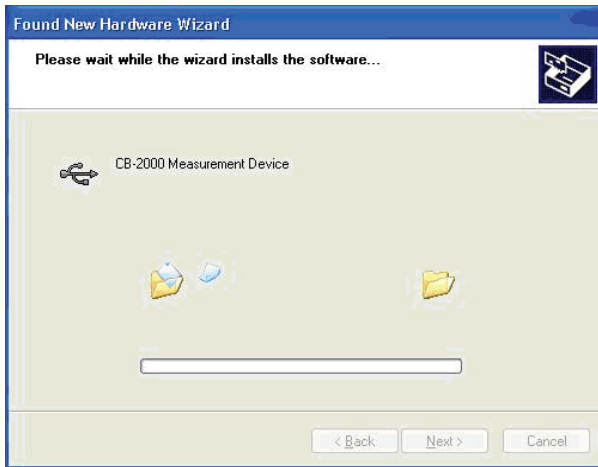
Select “Install from a list or specific location (Advanced)” as shown in figure below and then click “Next”.



Select “Search for the best driver in these locations” and enter the file path in the combo-box or browse to the drivers’ location on the provided memory stick by clicking the “Browse” button. Once the file path has been entered in the box, click “Next” to proceed.



The screen shown in the figure below will be displayed as Windows XP copies the required driver files.



Click "Finish" to complete the installation.





Section 3  
Operating instructions



**WARNING!**

Read the sections entitled “Important Safety Information” and “Safety guidelines and warnings” in their entirety **before** operating the CB-2000.

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**WARNING!**

The CB-2000 shall only be used by qualified and properly trained personnel, with the level of competence required for work in connection with high voltage capacitor banks and/or harmonic filters.

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**WARNING!**

All work on capacitor banks and/or harmonic filters shall only be conducted when the banks/filters are disconnected, discharged, grounded and short-circuited.

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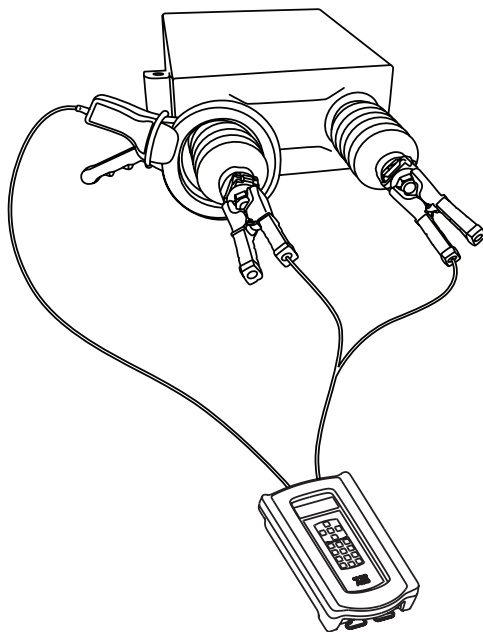
**WARNING!**

Carry out a visual inspection to make sure that no tools are left and remove the groundings (earthings) before energization of the capacitor bank or harmonic filter.

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## 3.1 Operating instructions

1. Prepare the capacitor bank and units for maintenance according to supplier instructions, which should include at least the instructions 1.1 to 1.3 listed below.
  - 1.1 Switch off and disconnect the capacitor bank from the network.
  - 1.2 Wait 10 minutes for the capacitor units to discharge to a maximum of 75 volts.
  - 1.3 Ground and short-circuit the bank.
2. Short-circuit the two bushings of the capacitor unit/parallel group to be measured.
3. Remove the temporary short-circuit.
4. Connect the voltage clips cable to the CB-2000 and connect the voltage clips to the capacitor unit or the parallel group of units to be measured.
5. Connect the clip-on transformer cable to the CB-2000 and hook on the clip-on transformer around one of the bushings of the unit to be measured. Place it as close to the capacitor unit container as possible. The direction of the clip-on transformer is not important for the measurement.
6. Please refer to Section 4, CB-2000 User interface, of this User's Guide for handling of the CB-2000.
7. After finishing the measurements, restore the bank for service according to supplier instructions.

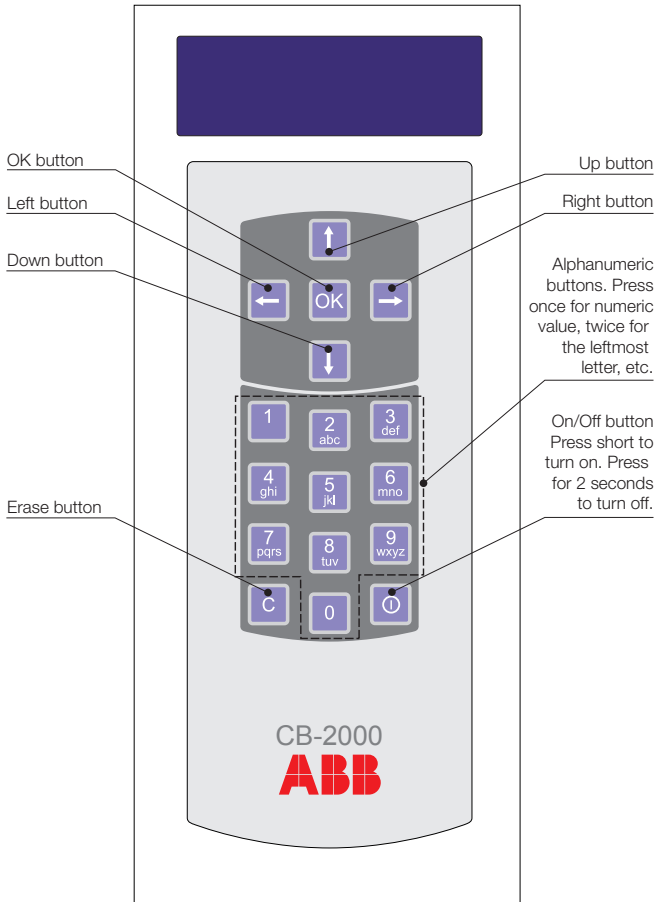


Section 4

# User interface



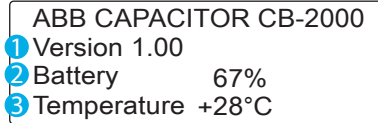
## 4.1 Overview



The LCD backlight is automatically switched off after five minutes of inactivity; after 30 minutes the system is shut down.

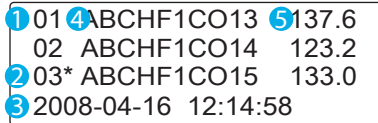
## 4.2 Start-up window

When the CB-2000 is switched on, a start-up window appears for 5 seconds before the CB-2000 enters the **Main menu**.







1. Version of software.
2. Battery status in percent or "External power" if external power supply is used.
3. Current temperature in CB-2000.



## 4.3 Main menu



1. Index number.
2. Latest measurement or measurement made today is marked with a (\*).
3. System date and time.
4. Order and serial number combined.
5. Latest capacitance measured or blank if no measurements have been made.

Scroll the list with the arrow keys  and .  
Hold down the  /  keys for faster scrolling.

Move through the combined Order and Serial no. field with the arrow keys  /  and enter new letters/digits with the **alphanumeric**  –  keys.

Erase the current position with the  key. Press the  key for 3 seconds to delete all information for that index.

Press the **0** key for more than 3 seconds to enter the **Clock and date adjust menu**.

Press the **OK** key to enter the **Measurement menu** for the specific capacitor. A maximum of 1000 capacitor units can be stored in the CB-2000. An "OUT OF MEMORY" message is displayed if further capacitor units are added. If this occurs, download measurements to a PC for safe keeping and/or erase outdated measurements.

## 4.4 Measurement menu

1	ABCHF1C 015	4	123.2
2	133.0	135.8	137.8
	5	22°C	
3	2008-04-16	12:14:58	

1. Order and serial number combined.
2. Latest measurement followed by previous ones; maximum of five.
3. Time stamp of latest measurement.
4. Reference capacitance, if one exists.
5. Internal temperature for the latest measurement.

Press **any** key **but** **OK** to return to the main menu.

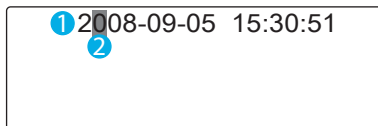
Press the **OK** key to make and add a new measurement to the list. The measurement takes about 5 seconds and "... " is displayed in the lower-right corner while the data is processed. When the measurement is finished, the window will be updated with new data. If 5 measurements have already been made, the oldest is replaced according to the FIFO (First In First Out) principle.

Reference capacitance can be uploaded to the CB-2000; see sections 5.1 and 5.3 for details. If no values have been uploaded, it is set to 0 by default.

Measurements with results higher than 1000  $\mu\text{F}$  are displayed as ">1000".






## 4.5 Clock and date adjust menu

To adjust the system time and date, press the  key for more than 3 seconds.



.....  
1. Date and time in the CB-2000  
.....

.....  
2. Position of the cursor is marked with gray.  
.....

Use the arrow keys  /  to adjust the date and time. Use the arrow keys  /  to move the cursor. To save a new date and time and return to main menu press .

Section 5  
PC application

## 5.1 PC application upload

The CB-2000 can be prepared for a measurement session by uploading the most recent session data or routine test data.

Connect the CB-2000 to a PC and switch it on.

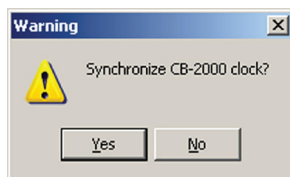
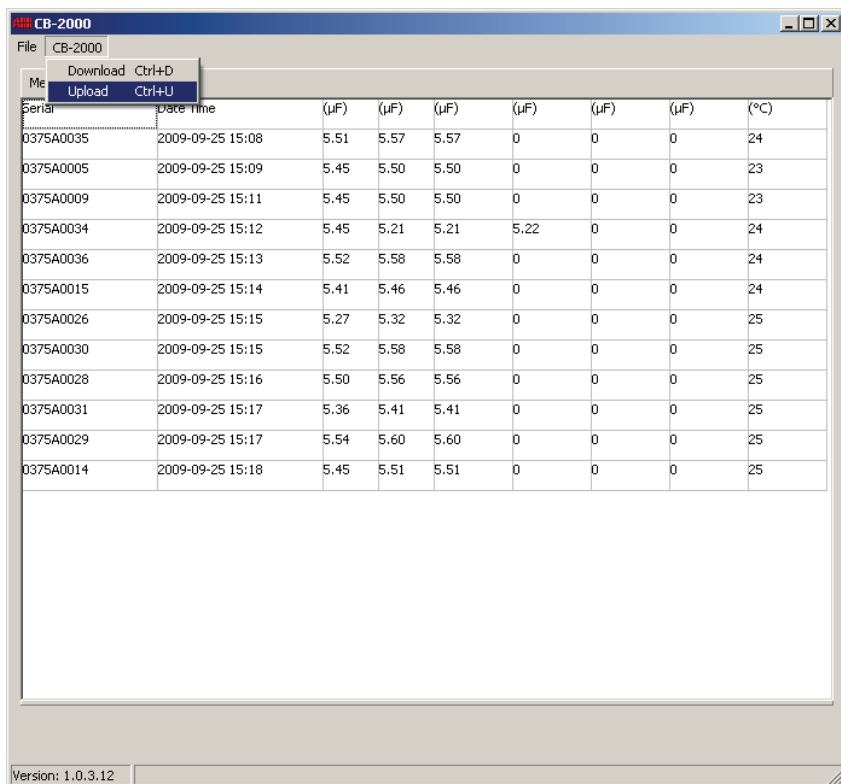
Routine test or session data can be accessed from the Open command on the File menu.

The screenshot shows the CB-2000 software interface. The title bar reads "CB-2000". The menu bar includes "File" and "CB-2000". The "File" menu is open, showing options: "Open" (Ctrl+O), "Save As" (Ctrl+S), "Close", and "Exit". The main window displays a table of measurement data.

	Date Time	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $^{\circ}\text{C}$ )
	2009-09-25 15:08	5.51	5.57	5.57	0	0	0	24
0375A0005	2009-09-25 15:09	5.45	5.50	5.50	0	0	0	23
0375A0009	2009-09-25 15:11	5.45	5.50	5.50	0	0	0	23
0375A0034	2009-09-25 15:12	5.45	5.21	5.21	5.22	0	0	24
0375A0036	2009-09-25 15:13	5.52	5.58	5.58	0	0	0	24
0375A0015	2009-09-25 15:14	5.41	5.46	5.46	0	0	0	24
0375A0026	2009-09-25 15:15	5.27	5.32	5.32	0	0	0	25
0375A0030	2009-09-25 15:15	5.52	5.58	5.58	0	0	0	25
0375A0028	2009-09-25 15:16	5.50	5.56	5.56	0	0	0	25
0375A0031	2009-09-25 15:17	5.36	5.41	5.41	0	0	0	25
0375A0029	2009-09-25 15:17	5.54	5.60	5.60	0	0	0	25
0375A0014	2009-09-25 15:18	5.45	5.51	5.51	0	0	0	25

Version: 1.0.3.12

Data is uploaded with the “Upload” command on the CB-2000 menu.



Before the upload begins the user is given the opportunity to synchronize the CB-2000 clock with the PC. If “Yes” the clock is set according to the PC’s system time.

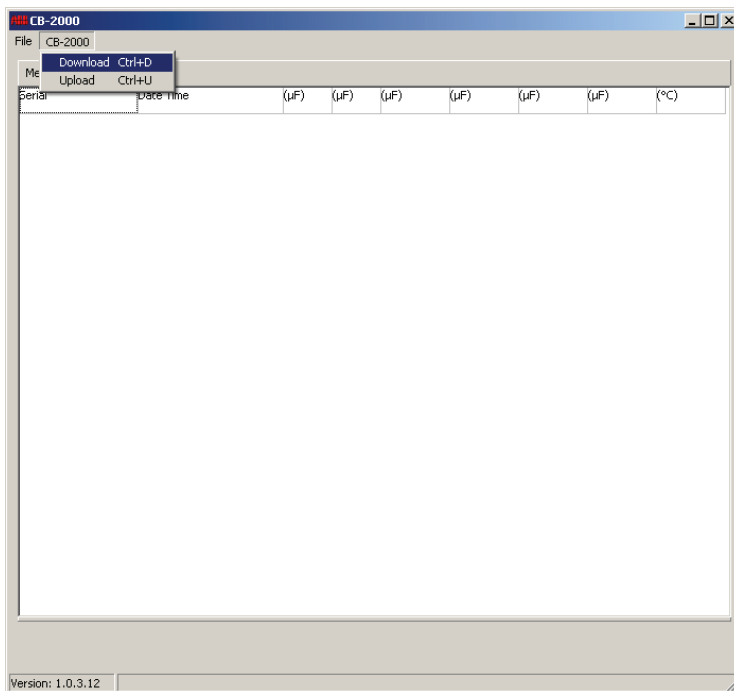
During upload, a progress bar is shown in the CB-2000 program.

## 5.2 PC application download

Measurement data can be downloaded to your PC for analysis and storage.

Connect the CB-2000 to a PC and switch it on.

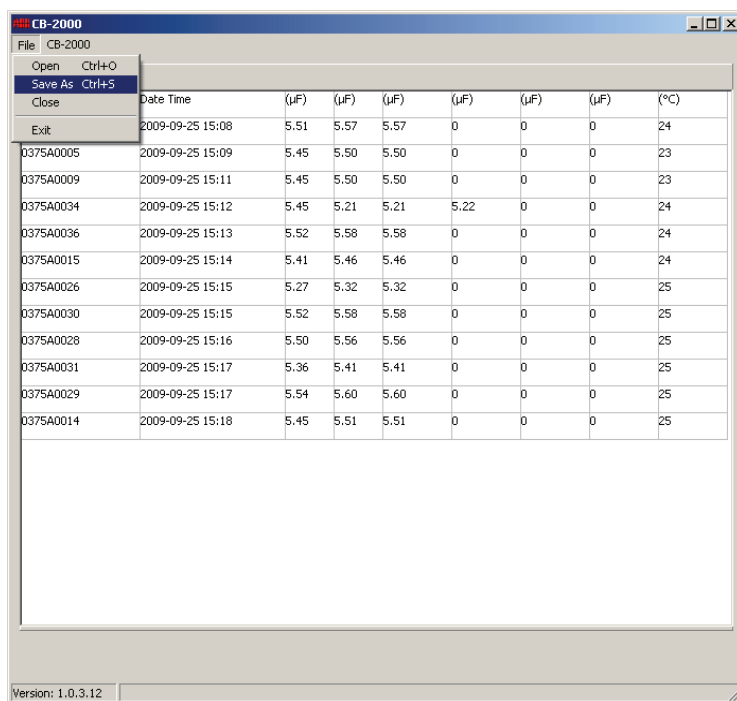
Data is downloaded with the “Download” command on the CB-2000 menu.



During download, a progress bar is shown.



Measurement data is saved with the “Save As” command on the File menu.



## 5.3 Measurement data opened with Microsoft Excel

CB-2000 measurement data is saved as tab-delimited text, which can be opened with Microsoft Excel or any other spreadsheet program.

Example of downloaded file, when opened with Microsoft Excel.

The time stamp and temperature reading belong to the latest measurement.

	A	B	C	D	E	F	G	H	I
1	Serial	Date Time	ref( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $\mu\text{F}$ )	( $^{\circ}\text{C}$ )
2	0375A0035	2009-09-25 15:08	5.51	5.57	5.57	0	0	0	24
3	0375A0005	2009-09-25 15:09	5.45	5.5	5.5	0	0	0	23
4	0375A0009	2009-09-25 15:11	5.45	5.5	5.5	0	0	0	23
5	0375A0034	2009-09-25 15:12	5.45	5.21	5.21	5.22	0	0	24
6	0375A0036	2009-09-25 15:13	5.52	5.58	5.58	0	0	0	24
7	0375A0015	2009-09-25 15:14	5.41	5.46	5.46	0	0	0	24
8	0375A0026	2009-09-25 15:15	5.27	5.32	5.32	0	0	0	25
9	0375A0030	2009-09-25 15:15	5.52	5.58	5.58	0	0	0	25
10	0375A0028	2009-09-25 15:16	5.5	5.56	5.56	0	0	0	25
11	0375A0031	2009-09-25 15:17	5.36	5.41	5.41	0	0	0	25
12	0375A0029	2009-09-25 15:17	5.54	5.6	5.6	0	0	0	25
13	0375A0014	2009-09-25 15:18	5.45	5.51	5.51	0	0	0	25

Column	Description	Input
A.	Serial no.	Maximum 10 characters
B.	Time stamp of latest measurement	YYYY-MM-DD hh:mm:ss
C.	Reference measurement	Digits and decimal separator
D.	Latest measurement	Digits and decimal separator
E-H.	Previous measurements	Digits and decimal separator
I.	Temperature of latest measurement	Digits only

The same file can be uploaded to a CB-2000 unit, with the serial no. column and reference column being especially important. The reference column can contain values from the routine test or the latest measurement. The file must be saved in tab-delimited text format to be read by the CB-2000 PC application.

# Maintenance

Only the specified replacement parts should be used for maintenance purposes. The manufacturer will not be held responsible for any accident occurring following any repairs made other than by its After Sales Service or an approved repair shop.

## 6.1 Maintenance

Regularly check the cables and potential leads, as well as their contacts.

The contact surfaces of the clip-on transformer must be kept clean to maintain accuracy. The surfaces must be regularly checked, especially if the meter is used in polluted areas.

The clamp must be kept away from any conductor and disconnected from the measuring instrument.

### Cleaning the clip-on transformer

1. Clean the clamp's casing, arms and output cable with a sponge dampened with soapy water.
2. Rinse these parts with a sponge dampened with clean water.
3. Never run water over the clamp. Dry with a cloth or pulsed air (at a maximum temperature of 80°C).

## 6.2 Calibration

The meter is calibrated with the clip-on transformer when manufactured; see the included quality document. To ensure that the meter is working properly and with optimal accuracy, calibration is recommended once a year.



Any clip-on transformer other than the one specified on the back of the CB-2000 should NOT be used. Usage with a non-specified clip-on transformer may result in inaccurate measurement readings.

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## 6.3 Power supply

The CB-2000 can be powered with the accompanied power adapter, which can be connected to a 100 to 240 V 50/60Hz AC power supply.

The CB-2000 unit is delivered with a pre-installed rechargeable battery pack, which can be replaced with the included battery holder. The battery holder can hold both rechargeable and Alkaline LR6 AA batteries.

When about 25% of the battery power is remaining, a “LOW BATTERY” message appear on the LCD.



The battery status indication may be inaccurate when not using the rechargeable battery pack.

### Charging the battery pack

The rechargeable battery pack is charged when the power adapter is plugged in. A discharged battery pack is completely recharged after 3 hours. The integrated charger protects the battery from over-charging if the power adapter is connected for longer periods. Use of power adapters other than the one supplied may lead to increased safety risks.

The rechargeable battery pack can retain power for up to one year when not in use. For maximum performance, it is advisable to recharge it every 6 months.

The batteries may only be charged at room temperature (15-35 °C).



Batteries placed in the battery holder are not charged by the integrated charger.

If battery replacement takes longer than ten minutes or if the batteries are completely drained, the system clock may require resetting.

### Replacement of the battery pack

The rechargeable battery pack can be replaced by the included battery holder as per below:

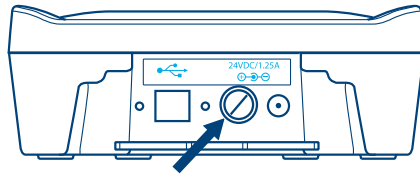
1. Disconnect and turn off the CB-2000.
2. Loosen the 4 screws that secure the battery cover on the back of the CB-2000.
3. Open the battery cover.
4. Carefully lift the rechargeable battery pack.
5. Disconnect the connector by carefully pressing the interlock clip.
6. Connect the battery pack connector to the CB-2000.
7. Place the battery pack inside the CB-2000.
8. Secure the battery cover by tightening the 4 screws.



While replacing the battery cover, make sure that the connection wires are not placed between the CB-2000 and battery cover.

### 6.4 Replacement of the internal fuse

1. Disconnect and turn off the CB-2000.
2. Open the fuse holder on the bottom of the CB-2000; see the figure below.
3. Replace the fuse with the recommended model; see Section 7.
4. Close the fuse holder.



Fuse holder



#### WARNING!

To avoid electric shock, product damage or personal injury, do not replace the fuse while the CB-2000 is connected to a capacitor.

Section 7  
Technical data

## 7. Technical data

### Measurement

Measurement range	0 – 1000 $\mu$ F
Accuracy	$\pm 1.0$ %
Resolution	0.01 $\mu$ F
Maximum load	2000 $\mu$ F
Test voltage	1.1 – 1.4 VAC pk-pk, 40 – 160 Hz
Internal temperature accuracy	$\pm 2.0$ °C from -10 °C to +50 °C (maximum)

### Dimensions and weights

Complete enclosure dimensions	500 x 420 x 230 mm
Total weight	7.9 kg
CB-2000 dimensions	270 x 190 x 60 mm
Weight, cables and clip-on transformer excluded	2.4 kg
Clip-on transformer opening ( $\varnothing$ )	100 mm
Clip-on transformer cable length	2.0 m
Clip-on transformer extension cable length	4.0 m
Voltage supply cable length	2.0 m
Voltage supply extension cable length	4.0 m

### Environment data

Operating temperature	-10 °C to +50 °C
Storage temperature	-30 °C to +70 °C
Climatic conditions	IP 51

### Electrical data

Rechargeable battery pack voltage	12 V
Rechargeable battery pack capacity	2000 mAh
Operating time	> 8 hours with fully charged battery pack
Power adapter input	100 – 240 VAC 50/60 Hz
Power adapter output	24 VDC, 1.25 A
Battery pack charging time	3 hours with fully discharged batteries
Test voltage output, fuse protection	3 A, 250 V fast fuse



Section 8  
Disposal

### 8.1 Disposal of old electrical and electronic equipment

Electronic equipment and batteries should not be disposed of as household waste but should instead be left at an appropriate collection point for recycling. This helps prevent potential negative consequences for the environment and human health. Check local regulations.

### 8.2 Disposing of the battery

Check local regulations. Never use municipal waste.



Section 9  
Trouble-shooting

## 9. Trouble-shooting

Refer to the troubleshooting tables when the CB-2000 does not function properly. If the problem experienced is not listed or if the instructions below do not help, disconnect the CB-2000 and contact your sales support representative.

## Program

Problem	Cause	Remedy	Section
<b>The CB-2000 not detected by computer</b>			
<b>Message “No CB-2000 present” is displayed.</b>	Drivers for CB-2000 are not installed.	Install drivers.	2.1
	USB cable is not connected.	Connect USB cable and switch on CB-2000.	5
	CB-2000 is not switched on.	Switch on CB-2000.	5
<b>Error messages appear while trying to upload data to the CB-2000.</b>			
<b>“Illegal date and time stamp detected”</b>	Date and time format should be: YYYY-MM-DD hh:mm:ss	Correct date and time stamp to the required format or leave input blank.	5.3
<b>“Illegal capacitance value detected”</b>	Only digits and a decimal separator are accepted.	Correct the capacitance values to the required format or leave input blank.	5.3
<b>“Illegal temperature value detected”</b>	Only digits are accepted.	Correct temperature value to the required format or leave input blank.	5.3
<b>The first capacitor is missing in the CB-2000 program.</b>	The first line is expected to be a header line and is ignored while opening a data file.	Add an extra line at the beginning of the data file.	5.3
<b>Warning message appears while trying to upload data to the CB-2000.</b>			
<b>“Upload is limited to 1000 rows, upload is cancelled”</b>	A maximum of 1000 capacitor units can be stored in the CB-2000.	Reduce the number of rows to 1000 or less.	4.3

## CB-2000

Problem	Cause	Remedy	Section
CB-2000 switches off automatically.	CB-2000 switches off automatically after 30 minutes.		4.1
	Battery pack is discharged.	Connect power adapter.	6.3
		Replace the battery pack with the battery holder with new batteries.	6.3
CB-2000 fails to turn on.	No power supply connected or battery pack discharged.	Charge the battery and try again.	6.3
		Connect power adapter.	6.3
		Replace the battery pack with the battery holder with new batteries.	6.3
CB-2000 fails to charge the battery pack.	The CB-2000 is too warm.	Charge the battery and try again.	6.3
		Place the CB-2000 in a cooler environment and try again.	6.3
		Send the CB-2000 in for service.	6.3
Odd measuring values.	Defective battery pack.	Send the CB-2000 in for service.	n/a
	Defective power adapter.		n/a
	Blown fuse.	Change fuse.	6.4
Odd measuring values.	Dirty current transformer.	Clean current transformer.	6.1
	Current transformer not connected.	Connect current transformer.	6.1
	Voltage clips not connected or incorrectly connected.	Connect voltage clips.	6.1
	Total capacitance is higher than 2000 uF.	Connect voltage clips across the capacitor to be measured. Disconnect parallel units.	7
	Defective cable to current transformer.	Send the CB-2000 in for service.	n/a
	Defective cable to voltage clips.	Send the CB-2000 in for service.	n/a
	Wrong current transformer.	Check whether the serial numbers of the current transformer and the CB-2000 match.	6.2

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## CB-2000

<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>	<b>Section</b>
<b>No backlight.</b>	The backlight automatically turns off after 5 minutes.	Press any button to activate the backlight.	4.1
	The backlight is defective.	Send the CB-2000 in for service.	
<b>The internal clock shows wrong date and time.</b>	The CB-2000 has been without power supply for more than 10 minutes.	Connect a power supply and set the date and time.	6.3
<b>The CB-2000 hangs.</b>	System error.	Disconnect and connect battery pack.	n/a
<b>Battery status seems to show wrong value.</b>	The battery status is shown for the rechargeable battery pack. If batteries in the battery holder are used, the algorithm might not be able to accurately calculate the remaining battery power.		6.3

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