AMPROBE®

BAT-500

Battery Impedance Tester

Users Manual

- Mode d'emploi
- Bedienungshandbuch
- Manual d'Uso
- Manual de uso

AMPROBE®

BAT-500

Battery Impedance Tester

Users Manual

English

July 2009, Rev.1

Limited Warranty and Limitation of Liability

Your Amprobe product will be free from defects in material and workmanship for 1 year from the date of purchase. This warranty does not cover fuses, disposable batteries or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Amprobe's behalf. To obtain service during the warranty period, return the product with proof of purchase to an authorized Amprobe Test Tools Service Center or to an Amprobe dealer or distributor. See Repair Section for details. THIS WARRANTY IS YOUR ONLY REMEDY. ALL OTHER WARRANTIES - WHETHER EXPRESS, IMPLIED OR STAUTORY - INCLUDING IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, ARE HEREBY DISCLAIMED. MANUFACTURER SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

Repair

All test tools returned for warranty or non-warranty repair or for calibration should be accompanied by the following: your name, company's name, address, telephone number, and proof of purchase. Additionally, please include a brief description of the problem or the service requested and include the test leads with the meter. Non-warranty repair or replacement charges should be remitted in the form of a check, a money order, credit card with expiration date, or a purchase order made payable to Amprobe® Test Tools.

In-Warranty Repairs and Replacement – All Countries

Please read the warranty statement and check your battery before requesting repair. During the warranty period any defective test tool can be returned to your Amprobe® Test Tools distributor for an exchange for the same or like product. Please check the "Where to Buy" section on www.amprobe.com for a list of distributors near you. Additionally, in the United States and Canada In-Warranty repair and replacement units can also be sent to a Amprobe® Test Tools Service Center (see address below).

Non-Warranty Repairs and Replacement – US and Canada

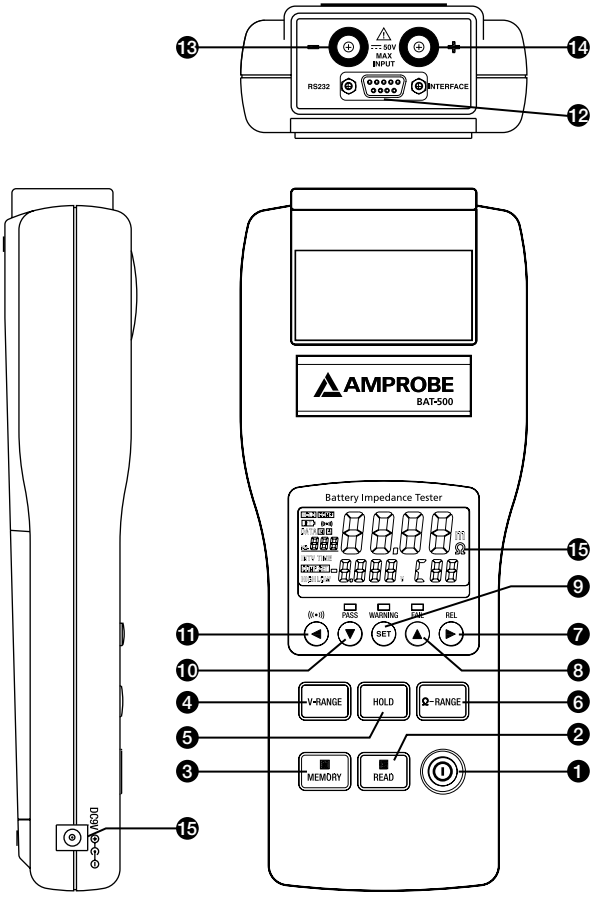
Non-warranty repairs in the United States and Canada should be sent to a Amprobe® Test Tools Service Center. Call Amprobe® Test Tools or inquire at your point of purchase for current repair and replacement rates.

In USA	In Canada
Amprobe Test Tools	Amprobe Test Tools
Everett, WA 98203	Mississauga, ON L4Z 1X9
Tel: 877-AMPROBE (267-7623)	Tel: 905-890-7600

Non-Warranty Repairs and Replacement – Europe

European non-warranty units can be replaced by your Amprobe® Test Tools distributor for a nominalv charge. Please check the "Where to Buy" section on www.amprobe.com for a list of distributors near you.

European Correspondence Address*
Amprobe® Test Tools Europe
In den Engematten 14
79286 Glottertal, Germany
Tel.: +49 (0) 7684 8009 - 0
*(Correspondence only – no repair or replacement available from this address. European customers please contact your distributor.)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Keys And Input / Output Terminals

❶ ⏻ **POWER** key : Power on / off

❷ R **READ** key :

1) Press R key to show the manual logged readings.

2) Press R READ key again to stop reading.

❸ M **MEMORY** key :

1) Under the manual logging mode, the tester stores each single set of logged reading to the memory by pressing M **MEMORY** key.

2) Press and hold M MEMORY key for 2 seconds to enter continuous logging mode. Press again to stop logging.

❹ **V-RANGE** key : Select the voltage range. (4V, 40V)

❺ **HOLD** key :

1) Press HOLD key to freeze or unfreeze the displayed reading.

2) Press and hold HOLD key for 2 seconds to enter the interval time setting mode for continuous data logging.

❻ Ω- **RANGE** key : Select the impedance range. (40mΩ, 400mΩ, 4Ω, 40Ω)

❼ ▶ **REL** key :

1) Press ▶ key to move the cursor to the right.

2) Press REL (Relative) key to zero the reading.

❽ ▲ key : Press ▲ key to increase the displayed value.

❾ **SET** key :

1) **Press SET key to switch the comparator mode on or off.**

2) Press and hold the **SET** key for 2 seconds to enter the comparator-setting mode. Press again to store the setting in memory.

❿ ▼ key : Press ▼ key to decrease the displayed value.

⓫ ◀ ıı))) Key :

1) Press ◀ key to move the cursor to the left.

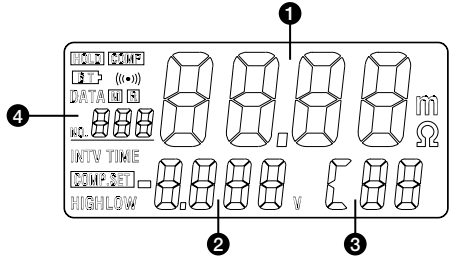
2) Press ıı))) key to turn the beeper on or off.

⓬ **RS-232 connector** : PC interface connector.

⓭ **– Input jack** : For connecting with the black test lead plug.

⓮ **+ Input jack** : For connecting with the red test lead plug.

Display



❶ The reading of the measured impedance (High or Low limit of impedance on the comparator settings)

❷ The reading of the measured voltage (High or Low limit of voltage on the comparator settings)

❸ The assigned number of comparator : 99 sets

❹ The location for the manual logged data

mΩ	The unit of impedance	**V**	The unit of voltage
HOLD	Hold function	**BT**	Low-Battery Mark
((•))	The symbol of beeper	**COMP.SET**	Comparator settings
COMP	The symbol will appear when the comparator function is ON		
DATA R	The symbol will appear when the meter start manual datalogging function or reading the manual logged data		
DATA M	Memory symbol for continuous datalogging function. The symbol will flash when each data is stored to the memory.		
INTV	Interval time settings of continuous datalogging function. (1~255 seconds)		
HIGH	High limit setting of the comparator impedance & voltage		
LOW	Low limit setting of the comparator impedance		

LEDS Display

PASS (Green LED)	To indicate the tested battery complies with the high limit of comparator.
WARNING (Yellow LED)	To indicate that the tested battery is going to deteriorate.
FAIL (Red LED)	To indicate that the tested battery has deteriorated.

These indications will appear when the High and Low comparator limits for internal impedance and the comparator threshold value for voltage are all set.

CONTENTS

RS-232 INTERFACE, SOFTWARE INSTALLATION AND OPERATION

SYMBOLS

⚠	Caution ! Refer to the explanation in this Manual	CE	Complies with European Directives
	Conforms to relevant Australian standards.		Do not dispose of this product as unsorted municipal waste

> ⚠***WARNING!***
> ***Do not operate the meter in explosive gas (material), combustible gas (material) steam or filled with dust.***

UNPACKING AND INSPECTION

Your shipping carton should include:

1 pcs Battery Impedance Tester
6 pcs AA Size 1.5V Batteries
1 set Test Leads
1 pcs Software CD
1 pcs RS-232 Cable
1 pcs Carrying Case
1 pcs Users Manual

If any of the items are damaged or missing, return the complete package to the place of purchase for an exchange.

INTRODUCTION

- The Battery Tester is designed for measuring the internal impedance and open-circuit voltage of the secondary battery including Nickel-metal hydride battery (NiMH), Nickel-cadmium battery (NiCd), Lithium-ion battery (Li-ion), Alkaline battery and Lead-Acid battery.
- AC four-terminal method to measure the internal impedance by eliminating lead impedance and contact impedance to get the accurate results.
- Dual display to show the internal impedance and voltage of the battery simultaneously.
- It has 99 sets of composite comparator function, which can be set at impedance and voltage values to get the reliable detection of battery deterioration.
- Pin type leads, which can easily contact the battery electrodes supplied as standard to get more accurate 4-terminal measurement.

OPERATION

Preparation

The following safety information must be observed to ensure maximum personal safety during the operation of this tester.

- To avoid electric shock when replacing the batteries first disconnect the leads from the object to be measured.
- When replacing the batteries, do not install old batteries with new ones and do not mix different types of batteries.
- Check the battery polarity carefully when inserting the batteries.
- Do not short-circuit used batteries, disassemble them, or throw them in a fire. Doing so may cause the batteries to explode.
- Be sure to dispose of used batteries properly.

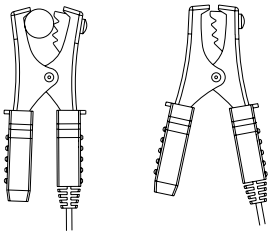
  1. Remove the battery cover.
  2. Insert the batteries into the battery compartment.

Operation

⚠WARNING!

- Do not attempt to measure DC voltage exceeding 50V. Do not attempt to measure AC voltages. This could result in injury or damage to the unit.
- Do not attempt to measure the voltage of a generator. This would result in an AC voltage being applied to the voltage generating output terminals, which is dangerous.
- After measuring a high voltage battery, before continuing to measure a low voltage battery first short the measurement leads together. This will discharge the DC-elimination capacitor which is connected across the leads. Otherwise an excess voltage may be applied to the low voltage battery, which is dangerous.

1. Connect the red test lead to the "+" jack and the black test lead to the "-" jack.
2. Press Power ⏻ key to turn on the tester.
3. Connect the red test probe to the positive battery terminal, and the black test probe to the negative battery terminal.



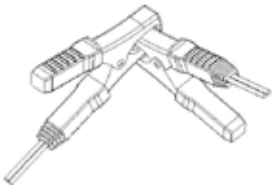
4. Using V-RANGE and Ω-RANGE keys to select desired voltage and impedance ranges.
5. Read the battery internal impedance and DC voltage directly from the display.

   Note : When the measured DC voltage or battery internal impedance value is over range, "OL" is display.
   When the AC test current fault, "- - - -" will be displayed

Zero Adjust (REL)

The zero adjustment function is to zero the range of impedance and voltage. The reading during zero adjustment will be taken as zero and will be used to calibrate subsequent measurements.

1. Short the red and black test leads probe 4 terminals.



2. Press **REL** key. The display shows R, then the impedance and voltage value is zero, connect the test leads probe to the battery to be tested.
3. The zero adjustment is valid only for the currently selected range, as long as the power remains on.

Using Comparator function (99 sets)

The comparator function compares the measured values with preset High and Low limit values for internal impedance and voltage level, and determines the range that the measurement should fall into. Then according to the following conditions to light the corresponding LED, and sounds a beeper under the WARNING and FAIL cases.

Comparator Settings

1. Press and hold down the "**SET**" key for 2 seconds, the display will show **COMP.SET** to enter the comparator setting mode
2. Use the ▼ or ▲ key to change the comparator number, from 01 up to 99.
3. Use the V-RANGE or Ω-RANGE key to the battery voltage and impedance to be measured range.
4. Press ▶ key one time, the low limit impedance of the "two **higher** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)
5. Press ▶ key one time, the low limit impedance of the "two **lower** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)

6. Press ▶ key one time, the high limit impedance of the "two **higher** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)
7. Press ▶ key one time, the high limit impedance of the "two **lower** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)
8. Press ▶ key one time, the throughold voltage of the "tow **higher** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)
9. Press ▶ key one time, the throughold voltage of the "two **lower** digits" will be flashing. (Use the ▲ & ▼ keys to select the desired value.)
10. Repeat step 2 to step 9 to set the next comparator number.
11. Press SET key again to exit from comparator setting mode.

Comparator Tables

Impedance / Voltage	Low limit impedance Lo	Middle	High limit impedance Hi
Voltage Lo / **Comparison** →	WARNING Beeper	WARNING Beeper	FAIL Beeper
Value Hi	Pass	WARNING Beeper	FAIL Beeper

Start / Stop Controls the Comparator

1. Press **SET** key to start comparator function, the **COMP** indication will appear on the display, and the comparator will be operating once the measurements are taken.
2. Press ▲ and ▼ keys to select the desired comparator number. The selected comparator number remains in memory even the power is turned off.
3. Press))) key to set the beeper on, the ((•)) indication will appear on the display, and the beeper will sound when getting the WARNING or FAIL result. Press))) key again to set the beeper off.
4. Press **SET** key again to stop comparator function.

Start / Stop Data Logging

Erasing Memory

When memory is full, "Full" symbol will appear on the display and logging will be stopping.

1. Press ⏻ key to turn off the tester.
2. Press and hold M **MEMORY** key, then press ⏻ key until the display shows **CIr** to delete all logged reading in the memory.

Manual Data Logging (500 sets)

1. Log the reading one by one to the memory by pressing M **MEMORY** key, and "**DATA** M NO XXX" will appear on the LCD for one sec. to indicate the memorized location.
2. Press R **READ** key to review the logged readings. The display will show "**DATA** R NO XXX". Press ▲ and ▼ keys to scroll through the logged readings.
3. Press R **READ** key again to stop viewing logged readings.

Continuous Data Logging

1. Press **HOLD** key for 2 seconds, the display will show INTV. Using ▲ or ▼ key to select desired interval time from 1 second to 255 seconds. Press **SET** key to exit interval time setting.
2. Press M **MEMORY** key for 2 seconds to enter continuous logging mode, the display will show M . Each flashing means the reading is stored to the memory.
3. Press M **MEMORY** key again to exit continuous logging mode.
4. The continuous data logging can't be read from the tester directly. Users can read the data by transferring to PC.

SPECIFICATIONS

General Specifications

Measuring method : Impedance (AC four-terminal method).

A/D conversion : Dual slope method.

Display : Dual display LCD and LEDs (comparator output).

Sampling rate : 1 set (impedance and voltage measurements) / second.
Open-Circuit terminal voltage : 3.5Vpp max.

Input over range : "OL" display.
Low battery detection " " display.
Test current fault detection : "- - - - " display.

Auto power off : Power off automatically after about 30 minutes.

Zero adjustment function : Circuit offset voltage is displayed as 0V.

Hold function : Display is held.

Beeper function : Audible output for warning and fail results (can be turned on and off).

Comparator settings : Impedance High and Low limits and voltage throughold point.

Number of comparator settings : 99 sets.

Comparator output : LEDs for pass (green), warning (yellow) and fail (red) results audible tone for warning and fail results.

Impedance / Voltage	Lo	IN	Hi
Lo	Warning	Warning	Fail
Hi	Pass	Warning	Fail

Manual Data logging : 500 sets.

Continuous Data logging : 9600 sets.

Operating environment : 0°C ~ 40°C (32°F ~ 104°F) 80%RH (no condensation)

Storage environment : -10°C ~ 50°C (14°F ~ 122°F) 80%RH (no condensation)

Power source: 6 AA size 1.5V batteries. (AC adaptor (output 9VDC) is optional)

Maximum power consumption : 1.0VA

Continuous operating time : 7 hours approx.

Maximum altitude value usable: 2000m or less.

Size : 250 (L)mm × 100(W)mm × 45(T)mm (9.8(L)in x 3.9 (L)in x 1.8(L)in)

Weight : 500g / 1.1Lb approx. (including batteries)

Accessories : Test Leads, Instruction Manual, Batteries, Software CD, RS-232 Cable, Carrying Case.

Option : AC adaptor (9V DC output), minimun 1.6 Amp, 15W, DC IN Jack Polarity: Center (-), Outer (+)

CE - **EMC:** Conforms to EN61326-1.

This product complies with requirements of the following European Community Directives: 89/ 336/ EEC (Electromagnetic Compatibility) and 73/ 23/ EEC (Low Voltage) as amended by 93/ 68/ EEC (CE Marking). However, electrical noise or intense electromagnetic fields in the vicinity of the equipment may disturb the measurement circuit. Measuring instruments will also respond to unwanted signals that may be present within the measurement circuit. Users should exercise care and take appropriate precautions to avoid misleading results when making measurements in the presence of electronic interference.

Electrical Specifications

Conditions to guarantee accuracy

Temperature : 23°C ± 5°C (73.4 °F ±41°F)

Humidity : 80%RH or less (no condensation).

Zero adjustment : After zero adjustment for each range.

Impedance measurement

Temperature coefficient : (±0.1% rdg ± 0.5dgs) / °C

Measuring current frequency : 1KHz ± 10%

Measuring burden voltage : 1.5mVAC

Range	Resolution	Measurement current	Accuracy
40mΩ	10μΩ	25mA approx	±(1% reading ± 10 digits)
400mΩ	100μΩ	2.5mA approx	
4Ω	1mΩ	250μA approx	
40Ω	10mΩ	25μA approx	

Voltage Measurement

Temperature coefficient (±0.1%rdg±0.5dgts)/ °C

Range	Resolution	Accuracy
4V	1mV	±(0.1% reading ± 6digits)
40V	10mV	

Maximum Input Voltage : 50VDC maximum, No AC voltage input, Between input terminals and ground, 60VDC and AC maximum.

⚠DANGER!

Do not exceed the maximum permissible input voltage to the measurement terminal. This could result in injury or damage to the unit.

MAINTENANCE AND REPAIR

If there appears to be a malfunction during the operation of the meter, the following steps should be performed in order to isolate the cause of the problem.

1. Check the battery. Replace the battery immediately when the symbol " BT " appears on the LCD.
2. Review the operating instructions for possible mistakes in operating procedure.

   Except for the replacement of the battery, repair of the meter should be performed only by a Factory Authorized Service Center or by other qualified instrument service personnel. The front panel and case can be cleaned with a mild solution of detergent and water. Apply sparingly with a soft cloth and allow to dry completely before using. Do not use aromatic hydrocarbons or chlorinated solvents for cleaning.

Battery Check & Replacement

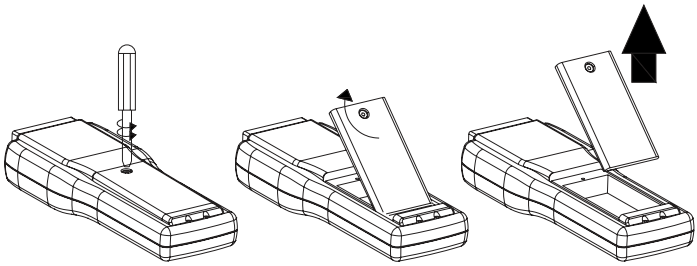
1. As battery power is not sufficient, the BT will be shown on LCD. To replace with six new 1.5V batteries is required.
2. a). Disconnecting test leads.

   b). Turning off the tester.

   c). Open the battery cover with screw driver.

   d). Replace the batteries. (Please note battery polarity)

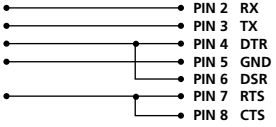
   e). Cover and secure the battery cover.



Step 1. ***Step 2.*** ***Step 3.***

RS-232 Wiring Diagram

Meter Side

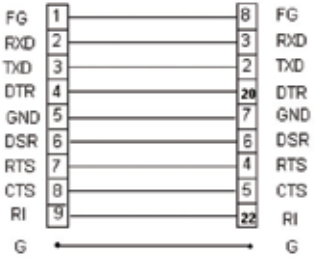


Computer Side(Female)

RS-232 Connector Diagram

9 to 25 pins Wiring Diagram

If 9 pins COM port is occupied, the 9 to 25 pins connector will be needed.



RS-232 Default Settings

When RS-232 communication enabled ,the default RS-232 settings are

Baud Rate: **9600**

Parity: **None**

Data bits: **8**

Stop bit: **1**

RS-232 PROTOCOL

Transmitting Byte Code						
Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
02	Ohm		Voltage		Status	03

Byte1: Starting Byte (02)

Byte2, Byte3 : Ohm Bytes

Byte4, Byte5 : Voltage Bytes

Byte6 : Status Bytes

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
----(Ohm)	- (V)	OL(V)	OL(Ohm)		40 V	00: 40 Ohm ; 01: 4 Ohm;		1
					4 V	10: 400 mOhm 11: 40 mOhm		0

Byte7 : Ending Byte

Commands

"U"---- 02 + Last Address (4300h) + 00 55 AA 00 + Sampling + First Set+...
+ 00 55 AA 00 + Sampling + Second Set +....03

Last Address: 2 Bytes

Sampling: 1 Byte

Each Record: 5 Bytes

HARDWARE REQUIREMENTS AND SETUP

PC HardWare Requirements :

HDD, CD Rom, 486 PC or above, with available COM port

EGA or higher monitor

4M bytes or more memory size

PC HardWare Setup :

1) Switch off all power related to the PC

2) Connect the socket (female) of RS-232 cable to available COM port

3) Switch on all related power

4) Connect the socket of RS-232 cable to Battery Impedance Tester

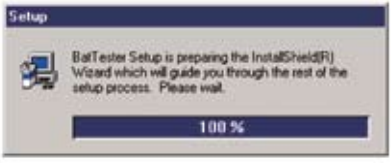
SOFTWARE REQUIREMENTS AND SETUP

1) Start up windows 98 / 2000 / XP operating system
2) Close all other applications
3) Insert disk in CD drive

   Wait for "Autorun" to start and follow on-scree instructions

   (If "autorun" does not sart, click on "Start" then "Run". Type the drive letter and ": \Disk1\Setup.exe" and click "OK" .)

1).

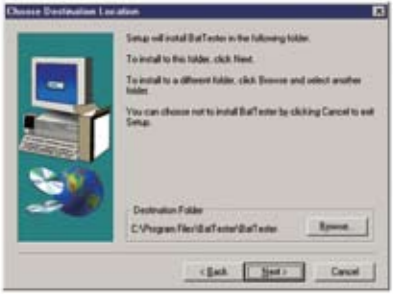


Setup program will run automatically.

2).

Click Next> button

3).



a. Click Next> button to setup on the default folder or

b. Click Browse…button to setup on a different folder

4).

Click Next> button

Setup is completed.

COMMUNICATING OPERATION

Run the software

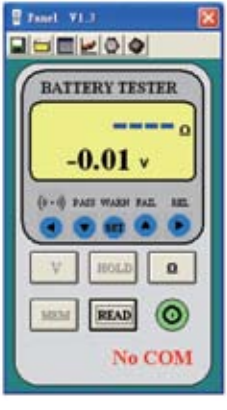
1. Click “Start” form Start menu and then move to “Programs” then “BatTester” and then click the “BatTester” icon.

2. Click an available COM port

3. Main software screen

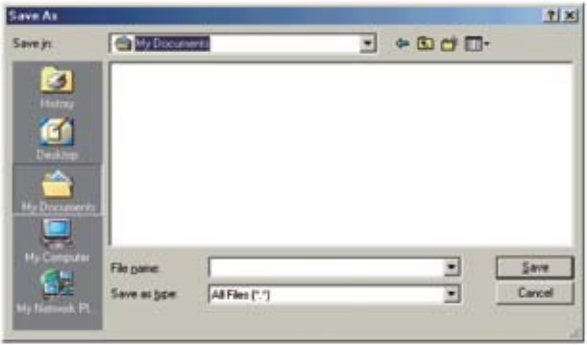
If no connection, then shows below

The right bottom side shows “No COM”

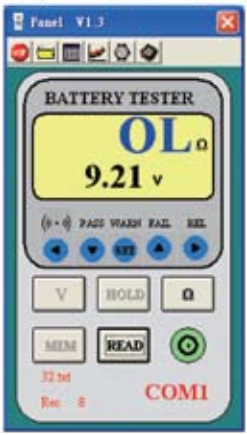


RECORD (SAVE TO HDD)

Click button. The dialog box shown below will appear.



Input a file name and then click "Save" to begin saving data to the file just named.

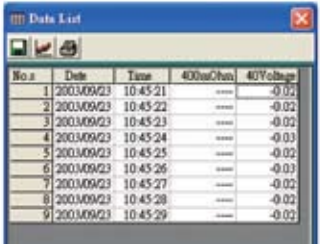


Click button to stop recording.

DOWNLOAD DATA

1.Download Data from EEP ROM (to read automatically recorded data)

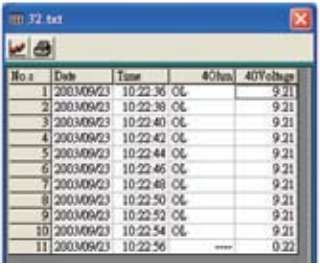
Click button. The Data Logger window, shown below, will open.



Click on a SET number to view the set's details. For example, in the window above, there are 2 sets from which to choose. The list below is an example of an opened set.

2.Download Data from Hard Disk

Click button. The Open window, shown below, appears

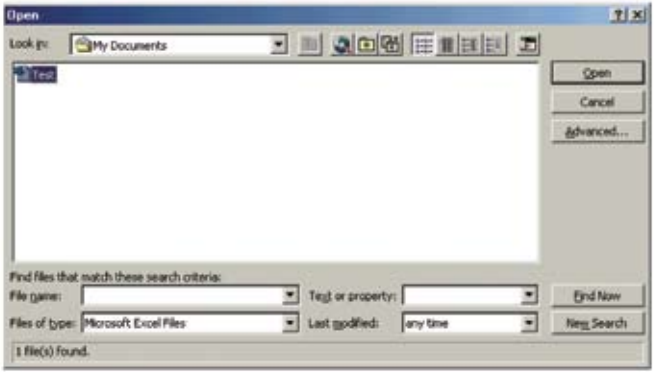


Input the file that was selected earlier and then click the Open button.

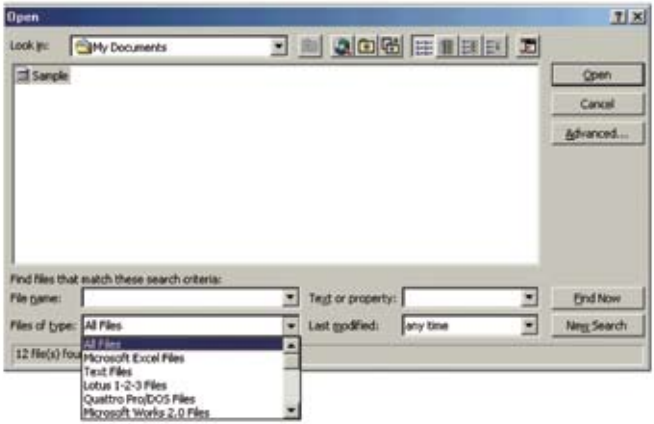
Apply for Excel

Open Microsoft Excel, find the file saved in Excel type, for example, test.xls.

EMBED PBrush



or find any file already saved in HDD, for example, sample.dat.(see below)

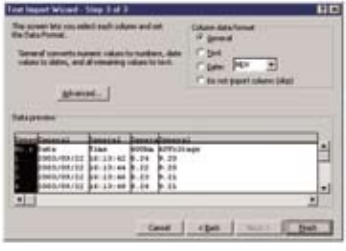


EMBED PBrush

The “Text Import Wizard” then appears. Follow the steps 1 to 3 to complete.

Click Next> button

Click “Next”

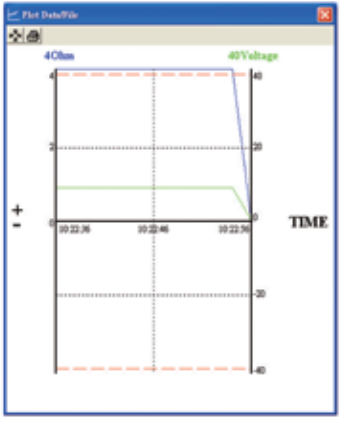


Click Finish to complete.

	A	B	C	D	E
1	No.s	Date	Time	40Ohm	40Voltage
2	1	9/22/2003	16:13:42	8.24	9.2
3	2	9/22/2003	16:13:44	8.22	9.2
4	3	9/22/2003	16:13:46	8.23	9.21
5	4	9/22/2003	16:13:48	8.24	9.21
6	5	9/22/2003	16:13:50	8.25	9.2
7	6	9/22/2003	16:13:52	8.23	9.2
8	7	9/22/2003	16:13:54	8.24	9.2
9	8	9/22/2003	16:13:56	8.24	9.21
10	9	9/22/2003	16:13:58	8.24	9.2
11	10	9/22/2003	16:14:00	8.24	9.21
12	11	9/22/2003	16:14:02	8.22	9.2
13	12	9/22/2003	16:14:04	8.24	9.21
14	13	9/22/2003	16:14:06	8.23	9.21
15	14	9/22/2003	16:14:08	8.23	9.2

Apply for Graph

Open a saved data in HDD or EEP ROM, click button to complete.



SAMPLING TIME

PC Sampling Rate:

Click button on the Menu Bar.

In the **Input Sampling Time** dialog box, input the willing sampling time and then click**"OK"** button to complete.

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