

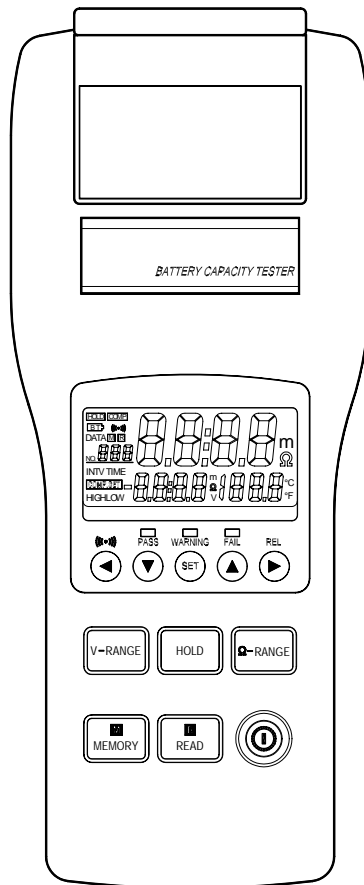


Battery Capacity Tester

TES - 32

INSTRUCTION MANUAL

Enclosed CD : Software & Protocol Inside.



TES ELECTRICAL ELECTRONIC CORP.

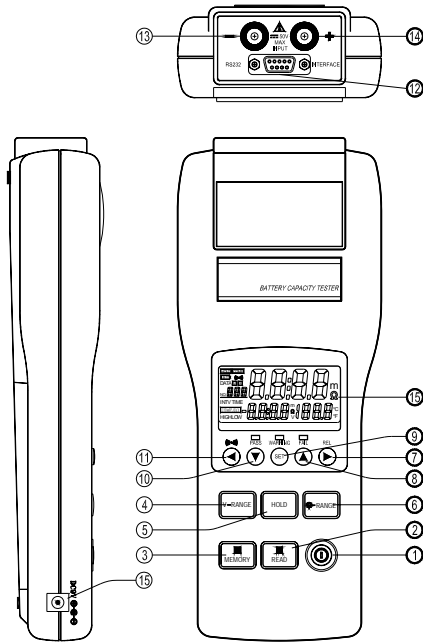
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I. FEATURES

- 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.

II. NAMES AND FUNCTIONS OF PARTS



keys and input / output terminals

1. ① Power key : Power on /off
2. **R** READ key :
 - ① Press **R** key to show the manual logged readings.
 - ② Press **R** READ key again to stop reading.
3. **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.
4. **V-RANGE** key : Select the voltage range. (4V, 40V)
5. **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.
6. **- RANGE** key : Select the impedance range. (40m , 400m , 4 , 40)
7. **▶ REL** key :
 - ① Press ▶ key to move the cursor to the right.
 - ② Press REL (Relative) key to zero the reading.
8. **▲** key : Press ▲ key to increase the displayed value.
9. **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.
10. **▼** key : Press ▼ key to decrease the displayed value.

11. ◀ 🔔 Key :

- ① Press ◀ key to move the cursor to the left.
- ② Press 🔔 key to turn the beeper on or off.

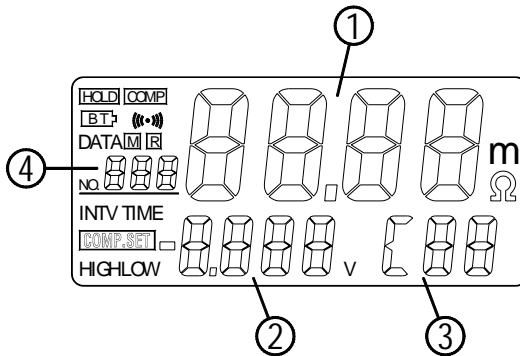
12. **RS-232 connector** : PC interface connector.

13. **- Input jack** : For connecting with the black test lead plug.

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

15. **AC adaptor input socket**  **DC 9V 100mV**

Display



- ① The reading of the measured impedance (High or Low limit of impedance on the comparator settings)
- ② The reading of the measured voltage (High or Low limit of voltage on the comparator settings).
- ③ The assigned number of comparator : 99 sets
- ④ The location for the manual logged data.

m : The unit of impedance.

V : The unit of voltage.

HOLD : Hold function.

COMP : The symbol will appear when the comparator function is on.

BT : Low-Battery Mark

 : The symbol of beeper.

DATA R : The symbol will appear when the meter start manual datalogging function or reading the manual logged 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).

COMP.SET : Comparator settings.

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.

III. SPECIFICATIONS

3-1 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 “ **BT** ” 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 throughhold 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.

Voltage \ Impedance	Lo	IN	Hi
Lo	Warning	Warning	Fail
Hi	PASS	Warning	Fail

- Manual Data logging : 500 sets.
- Continuous Data logging : 9600 sets.
- Operating environment : 0 to 40 80%RH (no condensation)
- Storage environment : -10 to 50 80%RH (no condensation)
- Power source: Six 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
- Weight : 500g approx. (including batteries)
- Accessories : Test Leads, Instruction Manual, Batteries, Software CD, RS-232 Cable, Carrying Case.
- Option : AC adaptor (9V DC output).

3-2 Electrical Specifications

Conditions to guarantee accuracy :

- Temperature : 23 ± 5
- Humidity : 80%RH or less (no condensation).
- Zero adjustment : After zero adjustment for each range.
- Impedance measurement
 Temperature coefficient : ($\pm 0.1\%$ rdg ± 0.5 dgs)/
 Measuring current frequency : 1KHz $\pm 10\%$
 Measuring burden voltage : 1.5mVAC

Range	Resolution	Measurement current	Accuracy
40m	10 μ	25mA approx.	$\pm(1\%$ reading ± 10 digits)
400m	100 μ	2.5mA approx.	
4	1m	250 μ A approx.	
40	10m	25 μ A approx.	

● Voltage Measurement

Temperature coefficient ($\pm 0.1\%$ rdg ± 0.5 dgs)/

Range	Resolution	Accuracy
4V	1mV	$\pm(0.1\%$ reading ± 6 digits)
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.

IV. OPERATION

4-1 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.

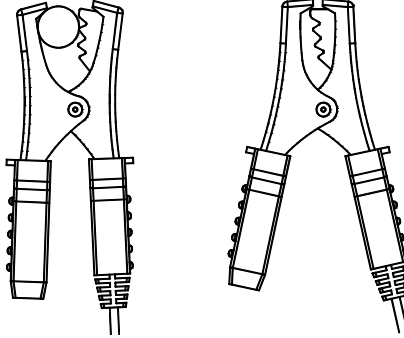
4-2 Operation



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.

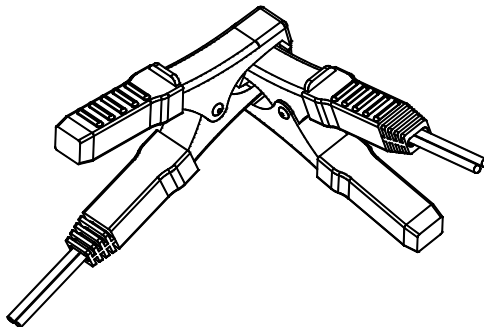
Note : When the measured DC voltage or battery internal impedance value is over range, “OL” is display.

When the AC test current fault, “- - -” will be displayed.

4-3 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.

V. USING COMPARATOR FUNCTION (99 SETS)

5-1 Comparator

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.

5-2 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 -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 ▲ and ▼ 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 ▲ and ▼ keys to select the desired value.)

7. Press \blacktriangleright key one time, the high limit impedance of the “two lower digits” will be flashing. (Use the \blacktriangle and \blacktriangledown keys to select the desired value.)
8. Press \blacktriangleright key one time, the throughhold voltage of the “two higher digits” will be flashing. (Use the \blacktriangle and \blacktriangledown keys to select the desired value.)
9. Press \blacktriangleright key one time, the throughhold voltage of the “two lower digits” will be flashing. (Using the \blacktriangle and \blacktriangledown 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.

5-3 Comparator Tables

Impedance Voltage		Low limit impedance		High limit impedance	
		Lo	Middle	Hi	Hi
Voltage Comparison	Lo	WARNING Beeper	WARNING Beeper	FAIL Beeper	FAIL Beeper
	Hi	Pass	WARNING Beeper	FAIL Beeper	FAIL Beeper

5-4 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 \blacktriangle and \blacktriangledown keys to select the desired comparator number. The selected comparator number remains in memory even the power is turned off.
3. Press $\bullet\bullet\bullet$ key to set the beeper on, the $\bullet\bullet\bullet$ indication will appear on the display, and the beeper will sound when getting the WARNING or FAIL result. Press $\bullet\bullet\bullet$ key again to set the beeper off.
4. Press SET key again to stop comparator function.

VI. START / STOP DATA LOGGING

6-1 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 Clr to delete all logged reading in the memory.

6-2 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.

6-3 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.

VII. MAINTENANCE

7-1 Cleaning :

1. Repairs or servicing not covered in this manual should only be performed by qualified personnel.
2. Periodically wipe the case with a dry cloth. Do not use abrasives or solvents on this instrument.

Do not use abrasives or solvents on this instrument.

7-2 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
e). Cover and secure the battery cover.

VIII. RS-232 INTERFACE, SOFTWARE INSTALLATION and OPERATION

- For the detailed instruction, please refer to the content of attached CD-ROM, which has the complete instruction of RS-232 interface, software operation and relevant information.
- RS-232 protocol : are enclosed within the content of CD-ROM, please open the CD-ROM for details.



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