



KMP7030

Loop Impedance Tester

Users Manual



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English

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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, unless local laws require otherwise. 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 STATUTORY - 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

Amprobe Test Tools
Everett, WA 98203
Tel: 877-AMPROBE (267-7623)

In Canada

Amprobe Test Tools
Mississauga, ON L4Z 1X9
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 nominal charge. Please check the "Where to Buy" section on www.amprobe.eu for a list of distributors near you.

European Correspondence Address*

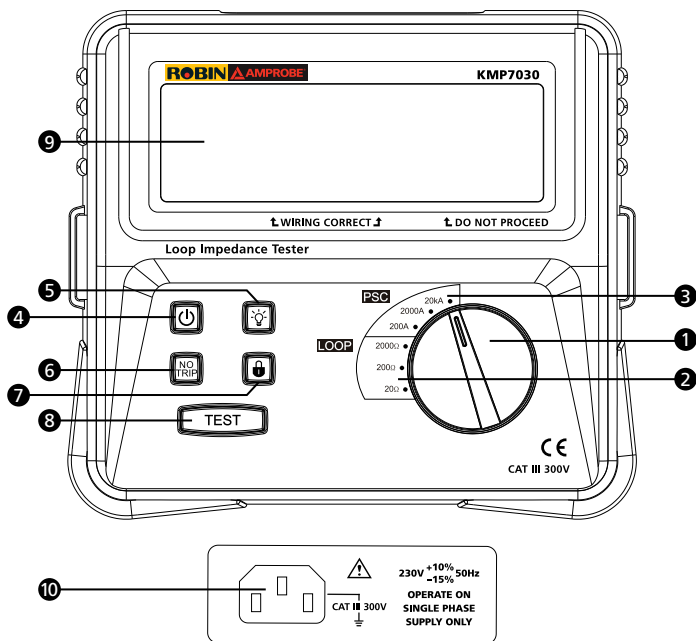
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www.robin-amprobe.co.uk

*(Correspondence only – no repair or replacement available from this address. European customers please contact your distributor.)

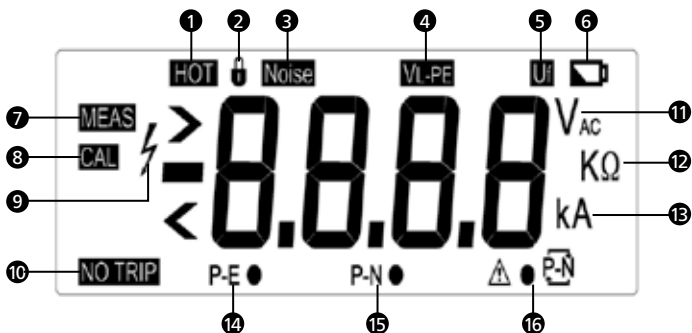
KMP7030

Loop Impedance Tester



- ① Rotary Switch: Select measurement function and range
- ② Loop impedance measurement
- ③ Short-circuit current measurement
- ④ ON / OFF Button
- ⑤ Display Backlight Button
- ⑥ Non Trip test on passive RCDs
- ⑦ Automatic measurement reading lock (except for measurement range LOOP-2000Ω)
- ⑧ TEST Button: Starts the selected test
- ⑨ Display
- ⑩ Measuring terminal

Display



- 1 Over-temperature. Wait while the tester cools down
- 2 Measurement reading lock
- 3 Noise appears between neutral to earth
- 4 Line to earth voltage
- 5 Fault voltage. Protect earth voltage higher than 50V
- 6 Battery status indicator
- 7 Measuring
- 8 Calibration mode
- 9 Hazardous voltage
- 10 Non Trip test on passive RCDs
- 11 Voltage
- 12 Loop impedance
- 13 Prospective short-circuit current
- 14 Correct line and earth wire connection
- 15 Correct neutral and earth wire connection
- 16 Warning! Incorrect connection for line and neutral. Reverse the connection.

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SYMBOLS

	Caution ! Risk of electric shock		Battery
	Caution ! Refer to the explanation in this Manual		Earth Ground
Ω	Loop Impedance		Complies with EU directives
CAT III	CAT III Testers are designed to protect against transients in fixed equipment installations at the distribution level.		Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler

Safety Information

The Tester complies with:

IEC/EN 61010-1 2nd Edition Pollution Degree 2, Measurement Category III 300V IP40 as per EN 60529

EMC EN 61326-1

EN 61557-1, EN 61557-3

Warning: Read Before Using

- *To avoid possible electric shock or personal injury, follow these guidelines:*
- *Use this product only as specified in this manual or the protection provided by the product might be impaired.*
- *Do not use the product if it is damaged. Before you use the product, inspect the case. Look for cracks or missing plastic.*
- *Make sure the battery door is closed and latched before operating the product.*
- *Remove power cord from the product before opening the battery door.*
- *Inspect the power cord for damaged insulation or exposed metal. Replace damaged power cord before you use the Tester.*
- *Do not apply more than the rated voltage, as marked on the product.*
- *Never operate the product with the cover removed or the case open. Hazardous voltage exposure is possible.*
- *Do not use the product if it operates abnormally. Protection may be impaired. When in doubt, have the product serviced.*

- ***Do not operate the product around explosive gas, vapor, or dust.***
- ***Use only 1.5 V AA batteries, properly installed in the product case, to power the product.***
- ***Use the proper function and range for all measurements.***
- ***Measure a known voltage and loop impedance first to make sure that the product operates correctly.***
- ***Disconnect the power circuit if display shows "HOT" (overheating).***
- ***Comply with local and national safety codes. Use personal protective equipment (approved rubber gloves, face protection, and flame-resistant clothes) to prevent shock and arc blast injury where hazardous live conductors are exposed.***

UNPACKING AND INSPECTION

Your shipping carton should include:

- 1 Loop Impedance Tester
- 1 UK Test Cord set
- 1 Strap
- 1 Users Manual
- 1 Carrying case
- 8 1.5V AA alkaline batteries

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

PRODUCT DESCRIPTION

Loop testing is a quick, convenient, and highly specific method of evaluating an electrical circuit for its ability to engage protective devices (circuit breakers, fuses, RCD's). A "loop" is defined by including unsuspected elements, where current has found parallel paths to ground. Because a ground loop determines the effectiveness of protective devices, it is crucial to be able to measure it, in order to detect and correct problems.

FEATURES

- Non Trip Loop test on passive RCDs
- Instant reading
- 20, 200 & 2000Ω Loop measurement ranges
- PSC measurement up to 20kA
- Displays mains voltage before test
- Instant correct wiring status check
- Backlight display
- Low Battery Indication
- CAT III 300V

This product is intended to be used to measure installations in process plants, industrial installations, and residential applications.

EN 61557-3 Measurement Range:

Function	Display Range	EN 61557 Measurement Range Operating Error	Nominal Values
LOOP EN 61557-3	LOOP (NO TRIP) 0.00Ω - 20.0Ω 0.0Ω - 200Ω	0.50Ω - 19.99Ω ±(3% + 6LSD) 10.0Ω - 199.9Ω ±(3% + 6LSD)	Un=230VAC f = 50Hz Ik=20kA
	LOOP (HI CURRENT) 0.00Ω - 20.0Ω 0.0Ω - 200Ω 0Ω - 2000Ω	0.50Ω - 19.99Ω ±(3% + 4LSD) 10.0Ω - 199.9Ω ±(3% + 4LSD) 100Ω - 1999Ω ±(3% + 4LSD)	
Volts	100 – 300V, 50/60Hz	100 – 300V, 50/60Hz ±(2% + 4LSD)	

Ambient Temperature: 23±2°C

Ambient Humidity: 45 - 75%RH

Additional operating uncertainties from position, supply voltage temperature, system phase angle system frequency, system voltage, harmonics and D.c quantity. The overall operating uncertainty B% is within +/- 30%

Measurement times: approx. 8000 times or more (with new batteries)

MAKING MEASUREMENTS

⚠ When low battery voltage mark "  " shows on LCD screen, replace the batteries before measurement.

Low Battery Voltage Display Symbol	Voltage of Battery
	When 9.2V or lower

Measuring Volts and Frequency

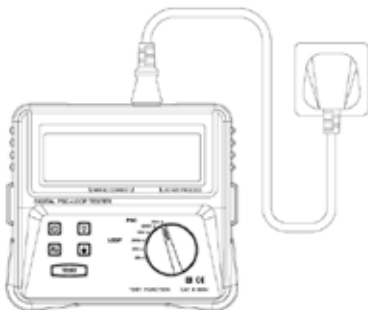


Figure 1: Voltage Measurement Figure of Loop Impedance/Line Impedance/ Power Supply Socket-Outlet.

To measure voltage and frequency:

1. Turn the rotary switch to the Impedance function.
2. Connect the Tester to the mains socket outlet. Check the signs for correct connections of L, N and PE.
3. The display shows the AC voltage and frequency.

Measuring Loop Impedance (See Connection Diagram in Figure 1)

⚠ Warning!

Make sure the power supply socket-outlet's wiring is correct and the ground wire is reliably connected earth. The tester displays the existing voltage in the

socket-outlet and displays symbols of "P-E●" and "P-N●" to indicate the wiring connections.

The Tester displays the symbol of "LO V" when the voltage is lower than 100Vac .

Make sure the grounding of the socket-outlet is connected to Earth. The symbol of "P-N●" and "△●" on the display means grounding wire is not connected to earth or not well-connected to earth.

When measuring the loop impedance/prospective short-circuit current, make sure line and neutral wires are connected correctly. Otherwise, Tester will display "230V", "P-E●", "P-N●", ● 

Loop Impedance (Line to Protective Earth L-PE)

To measure loop impedance:

1. Turn the rotary switch to the impedance function (select range for display resolution).
2. Connect the Tester to the mains socket outlet. The voltage of the circuit will appear on display. Check the signs for correct connections of L, N and PE.
3. Press TEST button (the measurement would take few seconds to 60 seconds)
4. The display shows the measured loop impedance

Measuring loop impedance NO TRIP mode:

To prevent tripping RCDs in the circuit:

- Use the NO TRIP function for loop measurements.
- An RCD with a nominal fault current of 15mA or above will trip.

To measure loop impedance NO TRIP mode:

1. Press NO TRIP button. NO TRIP sign will appear on display.
2. Turn the rotary switch to the impedance function (select range for display resolution).
3. Connect the Tester to the mains socket outlet. The voltage of the circuit will appear on display. Check the signs for correct connections of L, N and PE.

4. Press TEST button (the measurement would take few seconds to 60 seconds)
5. The display shows the measured loop impedance

Measuring for Line Resistance and Prospective Short-circuit Current

The line resistance is the resistance measured between the phase line L and the neutral line N in single-phase power system. The measurement principle is same as fault circuit impedance measurement. However, the measurement is done between L and N.

⚠Warning!

The capacity of the overload current protection shall be higher than the calculated prospective short-circuit current.

To measure Line Resistance and Prospective Short-circuit Current (PSC):

1. Turn the rotary switch to the PSC function (or LOOP) (select range for display resolution).
2. Connect the Tester to the mains socket outlet. The voltage of the circuit will appear on display. Check the signs for correct connections of L, N and PE.
3. Press TEST button (the measurement would take few seconds to 60 seconds)
4. The display shows the PSC (or line resistance)

Example of measurement for line resistance and prospective short-circuit current:

The following figure is for the principle of the line impedance measurement between Neutral N and Phase Line L1:

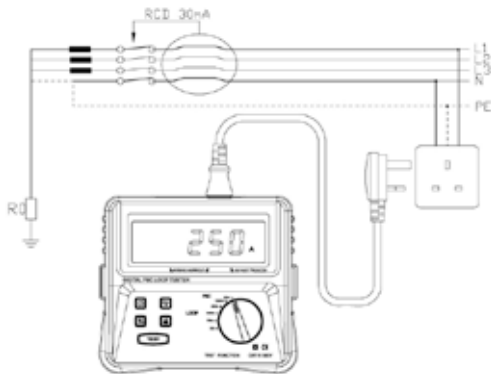


Figure 2

⚠ WARNING!

- *The Tester can only connect the mains AC230V+10%/-15% phase to ground or OLD-TT system's neutral line.*
- *Disconnect between the Tester and the circuit when overheating symbol "HOT" shows on the display. Wait while the tester cools down*

Fault Loop Impedance and Fault Prospective Short-Circuit Current

In case there is overflow protective device or fuse in the electrical circuit, its fault impedance shall be measured. Fault loop resistance shall be small, so that overflow protective device or fuse can automatically cut off the circuit within specified time in the case of fault.

⚠ Inspect circuit's fault impedance in order to determine protective device's specified value in circuit is not exceeded.

TT system's fault impedance consists of the following parts:

- Power transformer's secondary winding resistance;
- Phase line from power transformer to fault location;
- Protective conductor resistance from fault location to grounding electrode;
- Grounding resistance R_g ;
- Power transformer grounding system's resistance R_0 .

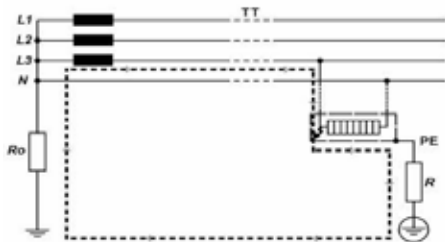


Figure 3: TT System

Circuits in TT system shall meet the following conditions in accordance to the international standard IEC 60364: $RA \leq 50/I_a$

Here:

- **RA** is the sum of the ground connecting resistance **R** and the conductor resistance.
- **50** is the maximum contact voltage.
- **Ia** is the current that can enable the protective device to automatically trip within five seconds.

Ia is the rated residual current $I_{\Delta n}$ when the protective device is the residual current equipment (RCD).

For instance, RCD protective device exists in TT system and its maximum **RA** value is:

$I_{\Delta n}$ Rated Residual Current $I_{\Delta n}$	10	30	100	300	500	1000	mA
RA (50V)	5000	1667	500	167	100	50	Ω
RA (25V)	2500	833	250	83	50	25	Ω

Δ The fault impedance is measured by KMP7030 is slightly higher than **RA** value, However, if the circuit impedance value is considered when the circuit is protected, follow **RA** value.

The following is the example to test TT system protection in accordance to the international standard IEC 60364:

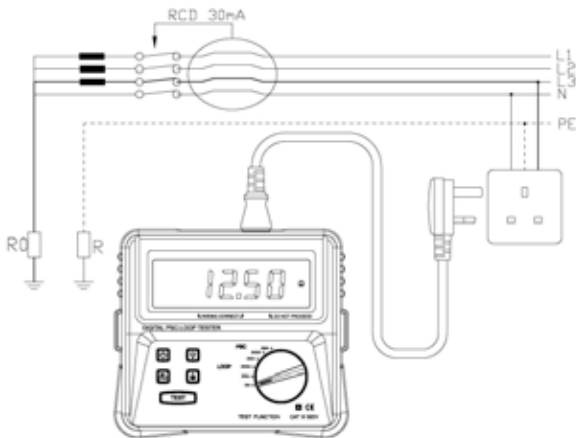


Figure 4

This example's maximum value is 1667Ω and Tester's reading is 12.50Ω conforming to $RA \leq 50/I_a$.

RCD test shall also be carried out in order to determine that using RCD protective device effective and meet the safety requirements.

TN system's fault impedance consists of the following parts:

- Power transformer's secondary winding resistance
- Phase line from power transformer to fault location
- Protective conductor resistance from fault location to power transformer
- Grounding resistance R
- Power transformer grounding system's resistance R_0 .

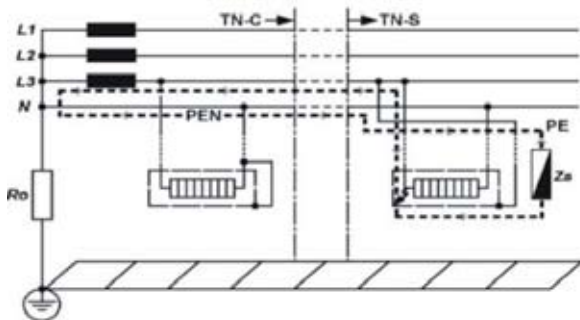


Figure 5: TN System

Circuits in TN system shall meet the following conditions in accordance to the international standard IEC 60364: $Z_s \leq U_o / I_a$

Where:

Z_s is fault circuit resistance.

U_o is the rated voltage between phase and grounding.

I_a is the current that can enable the protective device to act within the time in the following table.

$U_o(V)$	$T(S)$
120	0.8
230	0.4
400	0.2
>400	0.1

- For the distribution line, no the tripping time exceeding five seconds is allowed.
- I_a is the rated residual current $I_{\Delta n}$ when the protective device is the residual current device (RCD).

For instance, in TN system, rated power $U_0=230V$, the protective device, I_a value and maximum Z_s value may be as follows:

Rated(A)	5s of Tripping Time		0.4s of Tripping Time	
	I_a (A)	Z_s (Ω)	I_a (A)	Z_s (Ω)
6	28	8.2	47	4.9
10	46	5	82	2.8
16	65	3.6	110	2.1
20	85	2.7	147	1.56
25	110	2.1	183	1.25
32	150	1.53	275	0.83
40	190	1.21	320	0.72
50	250	0.92	470	0.49
63	320	0.71	550	0.42
80	425	0.54	840	0.27
100	580	0.39	1020	0.22

The prospective fault current can also be measured by KMP7030 PSC function. The prospective fault current must be higher than I_a .

The following is the example to test TN system's protection in accordance to the international standard IEC 60364:

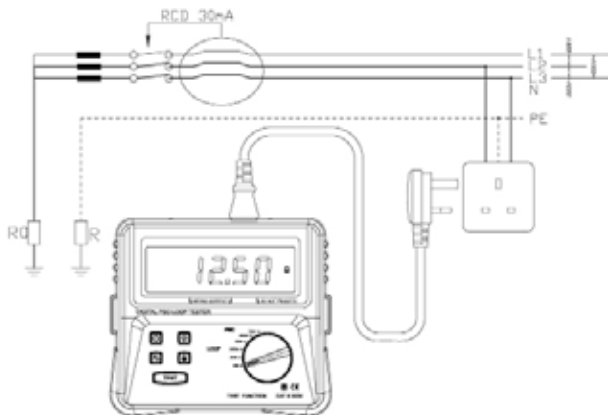


Figure 6

SPECIFICATION

Ambient Temperature: 23±5°C

Ambient Humidity: 45 - 75%RH

Error Limit: ±(% Reading + dgt Count)

Loop Impedance:

Range	Display Range	Rated Test Current and Time	Accuracy
20Ω	0.00 - 19.99Ω	25A/10ms	±(3%rdg+4LSD)
200Ω	0.0 - 199.9Ω	2.3A/20ms	
2000Ω	0 - 1999Ω	15mA/360ms	
20Ω NO TRIP	0.00 - 19.99Ω L-N<20Ω*1	P-N: 25A/30ms N-E: 15mA/approx. 2s	±(3%rdg+6LSD)
20Ω NO TRIP	0.00 - 199.9Ω L-N<20Ω*1		

*1: If the impedance between L-N is 20Ω or more, "no" is displayed on the display and no measurement can be made. In this case, disables NO TRIP function and make measurement.

Prospective Short-Circuit Current:

Range	Display Range	Rated Test Current and Time	Accuracy
200A	0.00 - 199.9A	2.3A/20ms	±(3%rdg+4LSD)
2000A	0.0 - 1999A	25A/10ms	
20kA	0.00 - 19.9kA	25A/10ms	
200A NO TRIP	0.00 - 199.9A L-N<20Ω*1	P-N: 25A/30ms N-E: 15mA/approx. 2s	±(3%rdg+6LSD)
2000A NO TRIP	0.00 - 1999A L-N<20Ω*1		
20kA NO TRIP	0.0 - 19.9kA L-N<20Ω*1		

*1: If the impedance between L-N is 20Ω or more, "no" is displayed on the display and no measurement can be made. In this case, disables NO TRIP function and make measurement.

Voltage Measurement:

	AC Voltage
Measuring Range	100 - 300V(50/60Hz)
Resolution	1V
Accuracy	$\pm(2\%+4\text{LSD})$

Display: maximum reading is 9999.

Low Battery warning indication: ""

Over-range indication: "OL"

Operating Condition: 0°C - 40°C, <85% Relative Humidity

Storage Condition: -20°C - 60°C, <90% Relative Humidity

Dimension (L x W x D): 189 x 167 x 85mm (7.43 x 6.65 x 3.35in)

Weight: 1kg (2.2lb) (including battery)

Power Supply: Alkaline Battery 1.5V (AA Battery) x 8pcs

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 "" appears on the display.
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 an Authorized Service Center or by other qualified instrument service personnel.

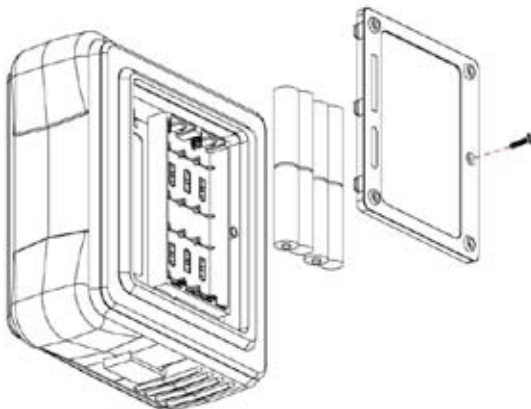
The front panel and case can be cleaned with a mild solution of detergent and water.

Apply sparingly with a soft cloth and allow to dry completely before using. Do not use aromatic hydrocarbons, Gasoline or chlorinated solvents for cleaning.

Battery Replacement

Replace the batteries immediately after the low battery indicator appears on the screen. Follow the steps below to replace the batteries:

1. Disconnect the power cord from mains socket-outlet.
2. Turn the OFF the Tester
3. Remove the screws from the battery cover and open the battery cover
4. Remove the batteries and replace with 8 new 1.5V Alkaline Batteries (AA). Pay attention to the polarity signs.
5. Put the battery cover back and re-fasten the screw.



Visit www.Amprobe.com for

- Catalog
- Application notes
- Product specifications
- User manuals



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