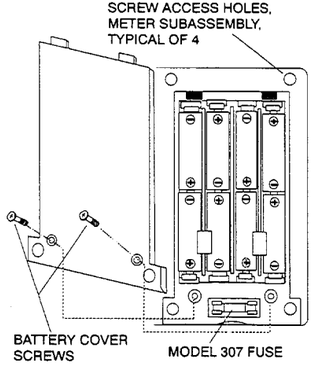
MAINTENANCE

WARNING

Switch FUNCTION to Ω, (low resistance) then disconnect test leads before removing the back cover or performing any maintenance.

BATTERY REPLACEMENT

To check batteries, switch FUNCTION selector to Ω range, low resistance. Next, short test leads and then press TEST. Replace batteries when POWER [model 307] or BATTERY CHECK [model 308] indicator flashes dim, or the indicator remains off.



REAR OF CASE, COVER REMOVED

1. Remove the rear case cover which is held by two Phillips screws; see illustration at the left-side.
2. Push up and pull out at the rear of cover to remove.
3. Note the arrangement of the batteries, two "AA" cells in four rows. All eight cells are in series as shown in illustration at the left side.
4. Remove old cells and replace all eight cells. Never replace only some of the cells; always replace the complete set. Observe polarity as marked. The illustration at the left-side shows this arrangement.
5. Replace cover and securing screw.

WARRANTY INFORMATION

B&K Precision Corp. warrants to the original purchaser that its product and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

Contact B&K Precision to receive a repair Return Authorization tracking number. This number must be clearly written on the exterior of the shipping carton and will assist us with the processing of your return. Return all merchandise to B&K Precision Corp. with pre-paid shipping. The flat-rate repair charge includes return shipping to locations in North America. For overnight shipments and non-North America shipping fees contact B&K Precision Corp.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty card to B&K Precision Corp., 1031 Segovia Circle, Placentia, CA 92870 within fifteen (15) days from proof of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

B&K Precision Corp. shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

Date Purchased: _____

Warranty Service: Please return the product in the original packaging with proof of purchase to the address below. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device.

Non-Warranty Service: Return the product in the original packaging to the address below. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device. Customers not on open account must include payment in the form of a money order or credit card. For the most current repair charges contact the factory before shipping the product.

Return all merchandise to B&K Precision Corp. with pre-paid shipping. The flat-rate repair charge includes return shipping to locations in North America. For overnight shipments and non-North American shipping fees contact B&K Precision Corp.

B&K Precision Corp.
1031 Segovia Circle
Placentia, CA 92870

Phone: 714-237-9220
Facsimile: 714-237-9214
Email: service@bkprecision.com

Include with the instrument your complete return shipping address, contact name, phone number and description of problem.

CUSTOMER SUPPORT

1-800-462-9832

B&K Precision offers courteous, professional technical support before and after the sale of their test instruments. The following services are typical of those available from our toll-free telephone number:

- Technical advice on the use of your instrument.
- Technical advice on special applications of your instrument.
- Technical advice on selecting the best instrument for a given task.
- Information on optional accessories for your instrument.
- Information on instrument repair and recalibration services.
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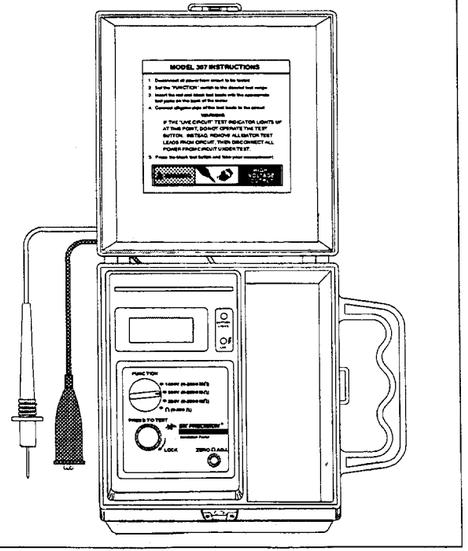
INSTRUCTION MANUAL

B&K PRECISION

ELECTRONIC INSULATION TESTER
MODELS 307 & 308



SPECIFICATIONS

INSULATION TEST [Model 307 Analog Tester]

Function	Resistance Range	Open Circuit Output Voltage	Center Scale Resistance	Maximum Short Circuit Current
1000 V	0-200 MΩ	1000 V ±10%	4 MΩ	2 mA DC
500 V	0-100 MΩ	500 V ±10%	2 MΩ	2 mA DC
250 V	0-50 MΩ	250 V ±10%	1 MΩ	2 mA DC

LOW RESISTANCE TEST [Model 307 Analog Tester]

Function	Resistance Range	Open Circuit Output Voltage	Center Scale Resistance	Maximum Short Circuit Current
Ω	0 - 50 Ω	600 mV ±10%	2 Ω	170 mA DC

ACCURACY Insulation & Low Resistance Test [Model 307 Analog Tester]:

- Infinity ..... Within 1% of scale length
- Zero ..... Within 1% of scale length
- All Points ..... ± 5% of reading

INSULATION TEST [Model 308 Digital Tester]

Function	Resistance Range	Open Circuit Output Voltage	Maximum Short Circuit Current
1000 V	0-2000 MΩ	950 V ±10%	1.2 mA DC
500 V	0-2000 MΩ	480 V ±10%	1.2 mA DC
250 V	0-2000 MΩ	250 V ±10%	1.2 mA DC

INSULATION TEST ACCURACY [Model 308 Digital Tester]

Ohms Range	250 V	500 V	1000 V
0-100 MΩ	±(1.5% + 3 dgts)	±(1.5% + 2 dgts)	±(1.5% + 2 dgts)
100-200 MΩ	±(2% + 5 dgts)	±(1.5% + 2 dgts)	±(1.5% + 2 dgts)
200-1700 MΩ	±(3% + 7 dgts)	±(3% + 4 dgts)	±(3% + 3 dgts)
1700-2000 MΩ	±(4% + 8 dgts)	±(4% + 6 dgts)	±(4% + 5 dgts)

SPECIFICATIONS

LOW RESISTANCE TEST [Model 308 Digital Tester]

Function	Resistance Range	Open Circuit Output Voltage	Maximum Short Circuit Current
Ω (ohms)	0 - 200 Ω	170 mV ±10%	24 mA DC

Accuracy ..... ±(1.5% + 2 dgts)

LIVE CIRCUIT INDICATOR

Indicator [Model 307] ..... Neon Lamp, turns on at about 75 V AC.

Indicator [Model 308] ..... Neon lamp turns on at about 10 V AC with an audible buzzer.

FEATURES

Press-to-Test [Model 307 & 308] ..... Lock Switch.

Display [Model 307] ..... 2" Analog Graduated Dial.

Display [Model 308] ..... 3-1/2 Digit LCD.

Terminal Voltage Indicator [Model 307].. Flashing "POWER" LED.

Terminal Voltage Indicator [Model 308].. Flashing "BATTERY CHECK" LED.

Zero Adjust [Model 308] ..... Low Resistance Range, Leads Shorted

GENERAL SPECIFICATIONS

Power Requirements ..... Eight "AA" cells (supplied).

Battery Life [Model 307] ..... Typical, 12 hours for Alkaline.

Battery Life [Model 308} ..... Typical, 10 hours for Alkaline.

Operating Temperature ..... 0 to 50 °C, ≤ 70% Relative Humidity.

Storage Temperature ..... -20 to +60 °C, ≤ 80% Relative Humidity With Batteries Removed

Dimensions (H x W x D) ..... 7 " x 8.5" x 3.5" (180 x 220 x 90 mm)

Weight ..... 2.6 Lb. (925 g) With Batteries Installed.

Accessories Supplied
Batteries
Integral Carrying Case With Strap
Test Leads
Instruction Manual

TEST INSTRUMENT SAFETY

WARNING

An electrical shock causing 10 milliamps of current to pass through the heart will stop most human heartbeats. Voltage as low as 35 volts dc or ac rms should be considered dangerous and hazardous since it can produce a lethal current under certain conditions. Higher currents are even more dangerous. Observe the following safety precautions:

1. Open circuit voltage in the 1000 V, 500 V and 250 V ranges corresponds to the voltage range selected. Current may be as high as 2 mA which can produce a "very strong" electrical shock.
2. When the case is removed for servicing, 1,000 V, 500 V or 250 V are present at several points on the circuit board. Some points can supply a higher current than the output probe and produce a "severe" electrical shock. Take precautions to avoid contact.
3. Only use these meters to check circuits that are electrically "cold". Before taking insulation checks, make sure equipment under test is turned off and disconnected from input power source.
4. Use the time proven "one hand in pocket" technique while handling an instrument probe. Be particularly careful to avoid contacting a nearby metal object that could provide a good ground return path.
5. Avoid touching a high voltage point. Remember that ac line voltage may be present in equipment under test (for example, at an on-off switch, fuses, transformer, etc.), any time the equipment is connected to an ac outlet, even if it is turned off. If possible, familiarize yourself with the equipment being tested and the location of its high voltage points. However, remember that high voltage may appear at unexpected points in defective equipment.
6. When using a probe, only touch the insulated portion; keep your fingers in back of the finger guard. Never touch the exposed tip.
9. Never work alone. Someone should be nearby to render aid if necessary. Training in CPR (cardio-pulmonary resuscitation) first aid is highly recommended.

INTRODUCTION

The models 307 and 308 meters are compact insulation testers, sometimes called a megohmeters or meggers. They are rugged self-contained instruments housed in integral cases. Model 307 has four analog scales ranging from high to low resistance readings; Model 308 provides a digital readout of the reading.

These meters serve a wide range of uses where high resistance measurements are needed. They are typically used to locate insulatıcn breakdown, intermittent shorts and defective electrical connections. Insulation breakdown may be caused by temperature, contaminated insulating oil, moisture, abrasion, corrosion or other environmental conditions.

Power is supplied by eight internal, standard AA batteries; use of Alkaline batteries for longer life. In the low resistance range, the meter operates directly from these batteries. In the higher test voltage ranges, the battery voltage is stepped up by an electronic regulated voltage regulator.

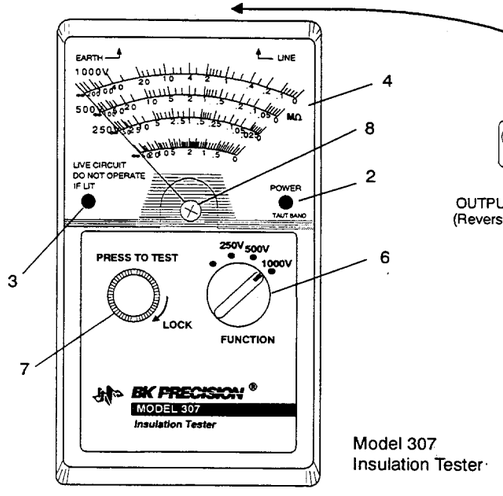
INSULATION TEST CONSIDERATIONS

These insulation testers are typically used to measure insulation leakage in industrial transformers, motors, generators, hermetic compressors, cables, etc. However, they can also be used to measure leakage in TV sets, appliances and other similar devices.

When used as an insulation tester, an ideal reading is infinity (∞), meaning no leakage at the applied voltage. Applied test voltage depends on the range selected, 1000, 500 or 250 volts. A high reading is desirable, 2,000 MΩ is very good in most cases. Readings can be affected by external conduction paths; for example, moisture, high humidity, and dirt or contamination on the surface of the device under test.

Always try to determine the normal resistance before taking a measurement. Select a range that gives a reading at about 75% of full scale. When using this instrument to check leakage in chassis type circuits, examine the schematic of the circuit to get an estimate of the expected resistance. The arrangement of the circuit, isolated or one side earth ground, in addition to other factors, affects the readings obtained.

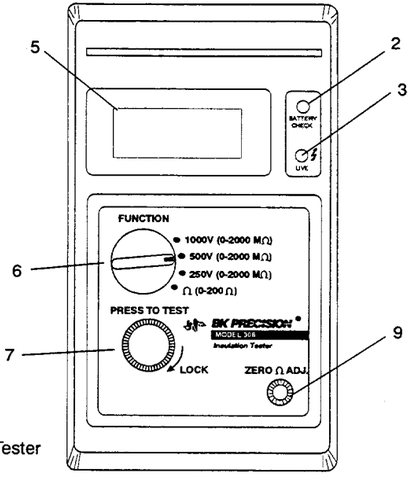
CONTROLS AND INDICATORS



Model 307
Insulation Tester

OUTPUT JACKS, REAR VIEW
(Reversed From Front View)

CONTROLS AND INDICATORS



Model 308
Insulation Tester

1. **Output Jacks** [Model 307 & 308]
   Output jacks for all checks. Plug-in black test lead into the (-) jack and red high voltage probe lead into the (+) jack.
2. **POWER** [Model 307] or **BATTERY CHECK** [Model 308]
   Flashes while reading is being taken. Replace batteries if flash is dim, or indicator remains off when TEST is pressed.
3. **LIVE CIRCUIT** [Model 307] or **LIVE** ϟ [Model 308]
   WARNING indicator showing connections to a "live" circuit, power is on. DO NOT operate TEST button if this light is lit.
4. **Meter Scales** [Model 307]
   - Upper 1000 V scale, read measurements from 0 to 200 MΩ.
   - Second (from upper) 500 V scale, read measurements from 0 to 100 MΩ.
   - Third (from upper) 250 V scale, read measurements from 0 to 50 MΩ.
   - Fourth (from upper) Ω scale, read measurements from 0 to 50 Ω.
5. **DISPLAY** [Model 308]
   Indicates measured resistance value. Displays 3-1/2 digits (1999 maximum) with automatic decimal point. Overrange shown by displaying a "1" in most significant digit location with all other digits blank.
6. **FUNCTION** [Model 307 & 308]
   Rotary selector to choose operating range. See OPERATING INSTRUCTIONS, INSULATION TEST MEASUREMENTS, for more details.

CONTROLS AND INDICATORS

7. **PRESS TO TEST** [Model 307 & 308]
   Press this button to take a momentary reading. Press and twist clockwise to lock for longer duration readings; turn counterclockwise to release.
8. **Mechanical Zero Adjust** [Model 307]
   Mechanical adjustment for setting pointer to zero.
9. **Zero Adjust** [Model 308]
   Electrical adjustment for setting low resistance (Ω) measuring circuit to zero, leads shorted.

OPERATING INSTRUCTIONS

PREMEASUREMENT CHECKS

1. Before taking measurements, perform a battery check. To check, press **TEST** switch; POWER LED [Model 307], or BATTERY CHECK [Model 308] should flash brightly. If LED does not flash, or is dim, replace batteries as indicated in MAINTENANCE instructions. Measurements made with low batteries will not meet stated accuracy specifications.
2. Check that the meter is correctly "zeroed" as follows:
   - [Model 307]. Test leads open, pointer should rest on (∞) infinity on the high resistance scales. If necessary adjust the mechanical pointer adjustment so the meter pointer sets exactly at the (∞) infinity mark. Test leads shorted, switch **FUNCTION** to Ω, then press **TEST**. Pointer should rest on exact zero. If meter is not on zero, use an internal adjustment to adjust for electrical zero with the leads shorted. If the meter reads infinity at this time, the fuse may be blown. Replace with a 1 A, 250 V fuse; see illustration in MAINTENANCE, BATTERY REPLACEMENT.
   - [Model 308]. Switch **FUNCTION** to Ω, short test leads, press **TEST**. Display should read 0.0. If neded, adjust **ZERO** Ω **ADJUST** to zero reading.
3. Verify that device or circuit about to be tested is disconnected from power source (off) and is discharged. If device has a power cord, pull it out from receptacle. If the wiring is faulty, the chassis could be "hot" if the plug remains connected.
4. Obtain records of previous tests. Take tests under the same conditions as previous tests. If external conditions change, apply appropriate correction factor to compensate for temperature, humidity, etc.

OPERATING INSTRUCTIONS

INSULATION TEST MEASUREMENTS

WARNING

Make sure that the circuit under test is turned OFF and disconnected from the input power source. Observe high voltage precautions when taking high resistance (insulation) measurements. Open circuit voltage depends on the range selected, 1000 V, 500 V or 250 V.

1. Plug black reference (alligator) test lead into (-) jack and red high voltage probe into (+) jack.
2. Switch **FUNCTION** selector to desired **MΩ** range, **1000 V**, **500 V**, **250 V** or to Ω. As a guide, use the ranges as follows:
   - **1000 V**: Highest resistance measurements of about 200 MΩ, or more. Typically used for preventive measurements on electrical equipment.
   - **500 V**: Measurements of about 100 MΩ, or more. Primarily to test insulation that has started to degrade.
   - **250 V**: Measurements of about 25 MΩ, or more.
   - **Ω**: Low resistance continuity type measurements; midscale reading is 2 ohms. Could be used to test resistance or relay contacts or motor-run and start windings.
3. Connect black alligator test lead to common or earth ground side of circuit to be tested.
3. Make good contact with point of red high voltage probe to (+) test point in circuit. Be sure to keep your fingers in back of the guard on the probe.
4. Press **TEST** button, take your reading, then release this button for a momentary reading. To take a longer duration reading, press then turn **TEST** button clockwise to lock. Turn button counterclockwise to release it after reading is taken. Be sure to release **TEST** button soon after reading is taken to conserve battery power. Voltage generated during test is automatically discharged when button is released.

WARNING

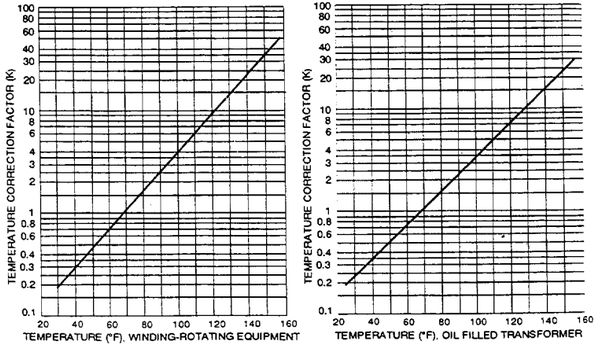
If the "live circuit" test indicator lights up at this point, do not operate the **TEST** button. Instead, remove alligator test leads from circuit, then disconnect all power from circuit under test.

INSULATION TEST NOTES

When taking insulation resistance tests for preventive maintenance, start by taking the first measuerment when the equipment or circuit is in good condition. Record your results and and the conditions under which these results were taken. Next, setup a schedule to repeat these tests at regular intervals under the same conditions as the initial test. In addition to the condition of the insulation, the readings taken are also affected by these external factors: temperature, relative humidity and time duration of the measurement.

Temperature

Most electrical insulation materials have a negative temperature coefficient. That is, insulation resistance decreases as insulation temperature increases. For example, the insulation resistance of a transformer taken at 68 °F may be three times higher than a similar measurement taken at 100 °F. If readings are taken at different temperatures, a corrrection factor must be applied to the results; typically using 68 °F as the reference base.. Request information for the temperature correction factor from the manufacturer of your equipment. The following charts can be used for reference when testing insulation windings in rotating equipment (class A) and oil filled transformers.



INSULATION TEST NOTES (continued)

Temperature (continued)

The formula for temperature correction is as follows: Rc = K • Rm. Where Rc is corrected resistance value; K is temperature correction factor from chart; and Rm is measured resistance value in MΩ. For example, insulation windings in rotating equipment, 100 MΩ at a temperature of 110 °F: Rc = 6 • 100 M = 600 MΩ.

Relative Humidity

Measurements taken in a humid environment will be lower than similar measurements taken in a dry environment. The physical characteristics of the equipment also affects measurements. For example, rotating machines have more leakage paths; commutators and armatures can trap more moisture than a sealed transformer or shielded cable.

Time Duration of Measurements

This factor affecting insulation resistance is often overlooked. Typically, if the insulation is good, the measured value of resistance holds steady.

Insulation Resistance Test

Resistance Values	Condition Note
High, holds steady	Good to very good.
High, then slopes down	Questionable, possible start of breakdown.
Moderately low but steady	May be good, depends on past records. Try to find cause of low reading.
Low, then slopes down	Possible failure soon, repair or replace.

Hermetic Compressors

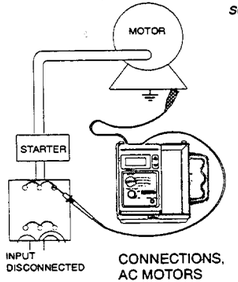
Resistance Values	Condition Note
100 megohms and greater	Good to very good.
50 to 100 megohms	Moisture in refrigerant slightly high, check drier.
25 to 50 megohms	Moisture in refrigerant too high, check system.
Below 20 megohms	System failure likely, repair or replace.

OPERATING INSTRUCTIONS

TEST CONNECTIONS

WARNING

Before connecting this tester to a circuit or equipment, make sure input power is removed - disconnected. Only carry out tests with the power off and circuit discharged to avoid the possibiltiy of serious personal injury from electrical shock.



CONNECTIONS, AC MOTORS

AC Motors & Generators: To carry out a basic insulation test on an ac motor or generator, connect the black alligator test lead to the frame or housing and contact the red high voltage probe to one of the motor terminals, or wire.

To test the start and run windings, switch the FUNCTION selector to Ω, low resistance. Next, connect the black alligator test lead to the common terminal and contact the red high voltage probe to the start or run terminal.

DC Motors & Generators

DC motors or generators can be checked with an overall insulation test, or the electrical sections can be tested separately. When making an overall test, the brushes remain in contact with the commutator for a complete path between all electrical sections. For this test, connect the insulation tester between the frame and one of the windings. When making a check of the separate sections, isolate the brushes from the commutator. Test individual electrical sections using procedures similar to those indicated for the start-run windings of ac motors.

Hermetic Compressors:

Many compressors use a three terminal block labeled C, S and M. To verify your electrical arrangement, see the literature provided by your manufacturer.

To measure insulation resistance at an S, M and C type terminal block, connect the black alligator clip lead to the frame or ground. Contact the red high voltage probe to the C terminal before taking a measurement. To check the start and run windings, switch FUNCTION to Ω, low resistance and check between the C and S or M terminals.

TEST CONNECTIONS

Cables

Disconnect cable from line and also from its related equipment. As an added safety precaution, discharge it by shorting the individual leads to the sheath. This procedure is especially important when testing coaxial cables.

Several measurements can be made, lead-to-lead(s), lead-to-sheath, lead-to-ground, etc. To test an individual lead in a multiconductor cable, leave this lead free and short all other leads to the shield. Connect the alligator clip lead to the shield and contact red high voltage probe to the free lead before taking a measurement. Check all remaining leads using this procedure.

Circuit Breakers, Starters and Switches

In addition to verifying that your device is disconnected from the input line, make sure it's switched to an OFF or open position. Next, examine the condition of your device. If you see signs of carbon arcing, pitted contacts, leakage paths across the insulator blocks, etc., replace the device. Leakage paths cause low resistance insulation readings. To test these devices, connect one lead of your tester to one of the poles and the other lead to the remaining pole or pole pairs.

MAINTENANCE

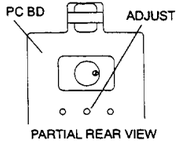
ELECTRICAL ZERO ADJUSTMENT [Model 307]

WARNING

Do not touch PC board to avoid a severe shock.

Only follow these procedures if your pointer was not on zero when you made the PREMEASUREMENT CHECKS for the Model 307 meter.

1. Remove the four corner Phillips screws from the back of the meter.



PARTIAL REAR VIEW OF PC BOARD

2. Rock meter subassembly (front) gently as you pull out to remove from main carrying case. Take care to avoid breaking the leads by pulling out subassembly too far.
3. Note the three access holes below the meter cutout opening in the PC board. Insert a small blade screwdriver into the middle hole to adjust the pointer to zero with the test leads shorted.
4. Reverse steps (3) through (1) to reinstall subassembly.

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