
PAC1000

PORTABLE APPLIANCE CHECKER

OPERATING INSTRUCTIONS

211A910

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SAFETY

Read Instructions Before Use

Due to the potential hazard associated with any electrical circuit it is important that the user is fully familiar with the instructions covering the capabilities, applications and operation of this instrument. The user should ensure that all reasonable safety procedures are followed and if any doubt exists should seek advice before proceeding.

The PAC1000 performs a number of electrical tests which involve high voltages and high currents. Never touch the appliance being tested while the testing procedure is being followed.

The product is designed for use by suitably trained competent personnel.

Before using the PAC1000 ensure that you have read and thoroughly understood the instruction manual.

The PAC1000 has been designed to conform with the general safety requirements of IEC1010. Various terminals on the product are used for working at potentially hazardous voltages and the equipment should therefore be used only after careful study of these instructions.

INTRODUCTION & DESCRIPTION

The PAC1000 is an advanced portable appliance checker which performs tests on Class 1 or Class 2 equipment. These tests are Earth Bond Resistance and Insulation Resistance as required by the Electricity at Work Regulations 1989. The equipment is controlled by solid state electronics and enables the user to easily select and perform the required tests.

Particular features of the specification are;

Tests Class 1 and Class 2 equipment.

Allows Earth Bond measurements to be conducted at low currents (100mA).

Earth Bond currents are electronically controlled for accuracy and safety.

Clear digital display with electronic hold of last reading at end of test.

Layout

The PAC1000 is contained in a robust ABS/Polycarbonate injection moulded case which accommodates all the high voltage, power and control components in the base section and the measurement and display electronics in the lid section. A sturdy zip pouch located at the rear of the instrument contains all the necessary test leads and the mains supply connector. Access is also available to additional test sockets for 4 wire Earth Bond tests and remote Insulation Resistance measurements. The base control panel of the instrument features a rotary switch for test selection and a push button test switch with associated LED indicators.

A number of safety features are included in the instrument design and these include;

1) Fuse protection.

2) Thermal trip on electronic components to prevent failure due to over heating of unit.

3) Fail-safe crowbar system to prevent internal test relays from being continuously powered in the remote possibility of failure of the control electronics.

The use of the PAC1000 is straightforward and involves connecting the checker to a mains supply which powers the electronic circuitry. Plug the appliance under test into the instrument socket outlet on the top plate and connect the test leads appropriate to the insulation class of the appliance.


APPLICATIONS

The PAC1000 is designed to check the electrical safety of portable appliances and its use allows for appliances of Class 1 and Class 2 to be checked.

As a guide BS and IEC standards define these two categories of insulation as follows;

Class 1 Appliances which have a functional insulation throughout and have exposed conductive (typically metal) parts connected to earth. These are often described as earthed appliances.

Class 2 Appliances which have both functional and additional insulation and where any metal parts cannot become 'Live' under fault conditions.

The symbol  represents double insulation and no earth connection is present in this type of appliance.

Different regulations and standards describe a variety of tests for electrical appliances and in general cover approval tests. Such testing involves prolonged sophisticated tests. It is generally recognised that for periodic inspection to ensure

the safety of the appliance is maintained, tests of the type performed by the PAC1000 are realistic and satisfactory.

TEST SEQUENCE

It is important that the PAC1000 is used to test appliances in the following sequence. Failure to follow this sequence may lead to incorrect test results and unsafe equipment being released back into use. Failure of any test must result in the appliance under test being rejected and quarantined until any faults are repaired and the appliance satisfactorily re-tested.

The PAC1000 should be connected to the mains power. There is no power switch and the unit will be ready for use within a few seconds of applying mains power. A green READY indicator will illuminate when the PAC1000 is prepared for tests, the display will not show any readings when the READY indicator is illuminated.

It should be noted that there are two 'safe' positions on the rotary switch. These are; (a) between the 25A Earth Bond Test position and the Insulation Test position and (b) at the fully counter clockwise position of the selector switch. In either of these positions the PAC1000 is inert and will not conduct any tests irrespective of the TEST push-button.

Do not touch the appliance while testing is in progress.

VISUAL INSPECTION

Before commencing testing the user should undertake visual checks on the mains lead, case and fuse of the appliance under test. There should be no evidence of damage of a nature that may impair the electrical safety of the item.

EARTH BOND TEST

General

The objective of this test is to ensure that the connection between the earth or protective conductor of the appliance's mains supply earth pin and the metal casing of the appliance is satisfactory and of low enough value to satisfy accepted safety standards.

The development of business machines (such as computers & VDU's) has necessitated the introduction of a low voltage/low current test range in order to allow tests on these appliances to be conducted without fear of damage being caused by the use of a higher test current.

Type A tests	These are the common form of Earth Continuity tests utilising test currents of 6A, 12A, 20A & 25A at an open circuit voltage of 6V RMS.
Type B tests	This is a form of Earth Continuity test utilising test currents of 100mA at an open circuit voltage of 500mV RMS. The low current prevents damage to the appliance under test, the low voltage will assist the detection of loose connections and is less likely to break down surface corrosion films at defective connections. For this reason when conducting such a test it is vital to ensure that good connection is made between the test leads and the device under test.

It is advisable to consult the manufacturer to obtain the appropriate test current and test point(s) on the accessible conductive parts for each type of equipment.

Connections

The appliance should be connected as per figure 1 ensuring that all connections are firmly made and that the Earth Bond Test Leads are correctly inserted according to the colour coded plugs and sockets.

The PAC1000 should be set to EARTH TEST selecting the appropriate test current for the appliance.

Procedure

The test should be initiated by depressing the TEST push-button. This button must remain pressed throughout the duration of the test. If for any reason the test button is released the test will be aborted.

At the start of the test the READY indicator will extinguish and the TIMEOUT indicator will light showing test signals are being applied to the appliance. The LCD display will show the Earth Bond resistance throughout the test.

At the end of the 6 second test the TIMEOUT indicator will extinguish and the LCD display will continue to hold the last test reading. Test signals are no longer applied to the appliance. The TEST button can be released.

After a further period of 6 seconds the LCD display will switch off and the READY indicator will illuminate showing that the PAC1000 is ready to commence a further test. Until the READY indicator lights further depressions of the TEST button will not initiate tests. The TEST button must be released and depressed to initiate a test. Continual depression of the switch will not result in a continuous sequence of tests.

The test should be repeated for each area of exposed metalwork.

Notes on Results

It may be noted that the earth bond resistance of the appliance may change during the test. Before rejecting the appliance care should be taken to ensure that the following mechanisms are not causing the variance;

1) Bad connection of the test leads, this is particularly critical at low test currents. Ensure that the connections are firmly made onto clean surfaces.

2) Thermal effects. Wire increases in resistance with an increase in temperature. At high current levels the PAC1000 is capable of generating sufficient heat within connection leads which will be detected by the high resolution of the display. Care should be taken to ensure that repeated tests do not damage the appliance.

4 Wire Tests

If the appliance is not fitted with a 13A plug or an Earth Bond test is required between two components of the appliance then the PAC1000 can be used in a 4 wire mode. A second Earth Bond test lead is connected to the green and black sockets within the pouch (at the rear of the instrument) taking care to ensure correct connection as per the colour coding. The two leads can then be connected across the earth bond requiring test and the test carried out in the manner described in the previous section. If this method is used it is important to ensure that the appliance is no longer plugged into the 13A socket on the top plate of the PAC1000.

Technical

The PAC1000 applies a low voltage between the earth pin of the top plate 13A socket and the lead connected to the earth bond test terminal. An electronically controlled current of a value set on the top plate selector switch is allowed to flow for a period of 6 seconds (or until the TEST button is released whichever is the shorter.) The objective of the test current selected is to test the appliance under load conditions (and as such the test current must be selected to reflect these load conditions) and the duration of the test is limited to 6 seconds to prevent damage or over-stressing which may be caused by testing for prolonged periods.

INSULATION

General

The objective of this test is to ensure that the insulation between the phase or neutral conductor of the appliance's mains supply and the metal casing of the appliance is satisfactory and of high enough value to satisfy accepted safety standards.

Connections

The appliance should be connected as per Figure 2 ensuring that all connections are firmly made and that the Insulation Test Lead is correctly inserted according to the colour coded plugs & sockets.

The PAC 1000 should be switched to INSULATION TEST.

The appliance under test must be switched on.

Procedure

The test should be initiated by depressing the TEST push-button. This button must remain pressed throughout the duration of the test. If for any reason the test button is released the test will be aborted.

At the start of the test the READY indicator will extinguish and the TIME OUT indicator will light showing test signals are being applied to the appliance. The LCD display will show the Insulation Resistance throughout the test.

During the test the insulation test lead should be touched on all exposed metalwork of the appliance under test ensuring that at all times the insulation resistance satisfies the accepted safety standards.

At the end of the 6 second test the TIME OUT indicator will extinguish and the LCD display will continue to hold the last test reading. Test signals are no longer applied to the appliance. The TEST button can be released.

240V CONNECTOR

Figure 1
Earth Bond Test
25 Amps - 100m Amps

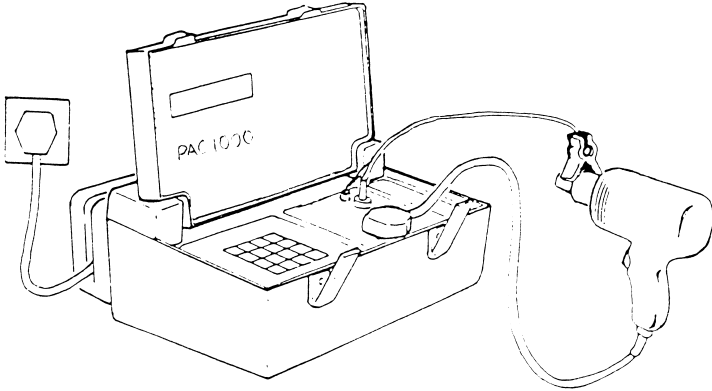
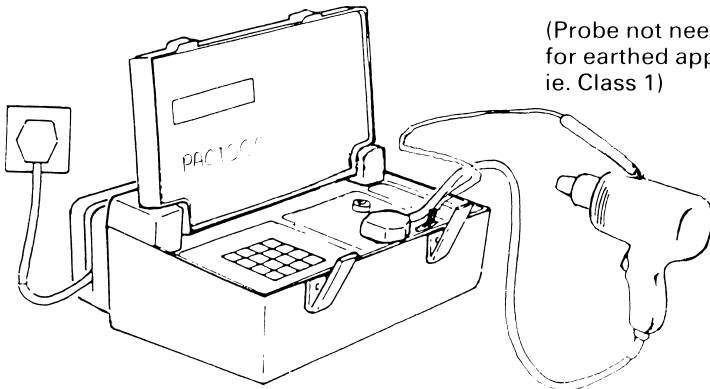


Figure 2
Insulation Test
500V DC



(Probe not needed
for earthed appliances
ie. Class 1)

After a further period of 6 seconds the LCD display will switch off and the READY indicator will illuminate showing that the PAC1000 is ready to commence a further test. Until the READY indicator lights further depressions of the TEST button will not initiate tests. The TEST button must be released and depressed to initiate a test. Continual depression of the switch will not result in a continuous sequence of tests.

Results

The indicated resistance should typically be in excess of; Class 1.....2MΩ
 Class 2.....7MΩ

Technical

The PAC1000 applies a nominal 500V DC between the earth pin of the top plate 13A socket and the Phase & neutral pins which are connected together during the test for a period of 6 seconds (or until the TEST button is released whichever is the shorter). The additional earth connection available on a test lead is to test all exposed metal work on the appliance ensuring that minimum insulation levels are held at all points on the appliance.

TEST RESULTS

Each appliance tested should exhibit the following tests results;

Correct Test Results		
	Class I (Earthed)	Class II (Double Insulated)
Visual	UNDAMAGED	UNDAMAGED
Earth Bond	see equipment manufacturers safety spec.	
Insulation		

Any other test results suggests a defective appliance.

WARNING

- a) Do not touch the appliance while testing is in progress. A high voltage of 500V is applied with respect to earth during the Insulation Test.
- b) Ensure that the earth clip of the bonded earth test cable is securely attached to the appliance. A poor connection may result in arcing of the contact.
- c) If it is unclear which Class of insulation applies to the appliance being tested it is recommended that the manufacturers operating instructions be consulted.
- d) It is recommended that the PAC1000 is periodically checked by testing an appliance of known electrical characteristics.
- e) If the PAC1000 is used to conduct a series of Earth Bond tests the internal circuitry will heat up. It is recommended that the PAC1000 is allowed to recover for a short period between close sequences of tests.
- f) If the PAC1000 does overheat a thermal trip will trigger removing the supply from the unit. In this case the PAC1000 should be allowed to recover for a reasonable period to allow the internal circuitry to cool. The thermal trip is only likely to trigger in the event of an extended sequence of Earth Bond tests.
- g) The PAC1000 contains a safety device which will trigger if the internal circuitry fails causing the unit to power either the Insulation test or Earth Bond test circuitry continuously. This can be reset by removing the power from the PAC1000 for a few seconds and then reconnecting it. In normal use this should not arise thus in the event of this occurrence the unit should be returned for service.

MAINTENANCE

The PAC1000 is a rugged, quality instrument. However care should be taken in its use, failure to do so will reduce the instruments life and hinder its reliability.

- 1) Always check all test leads for signs of damage prior to use.
- 2) Always check the PAC1000 for signs of damage prior to use.
- 3) Keep the PAC1000 clean and dry.
- 4) Avoid testing in conditions of high electrostatic or electromagnetic fields.
- 5) No attempt should be made to gain access to the instrument whilst under test conditions.
- 6) Maintenance should only be performed by authorised personnel.

The PAC1000 contains no user serviceable parts.

Should the PAC1000 require service, repair or calibration return the equipment to a recognised dealer or to;

Seaward Electronics Ltd.
Bracken Hill,
South West Industrial Estate.
Peterlee,
County Durham,
SR8 2SW,
England.

Telephone....0191 586 3511. Telefax....0191 586 0227

The PAC1000 should be returned, post paid, where upon receipt, the owner will be advised of any costs prior to work commencing (unless the unit is still within warranty).

Overseas

If the instrument owner resides outside the UK, he may either return the instrument directly to Seaward Electronic Ltd at the address above or to his local sales agent, a list of whom may be obtained from Seaward Electronic Ltd. It is important that if the unit is returned to Seaward Electronic Ltd a copy of the invoice and packing note are sent via airmail in order to clear the unit through customs.

SPECIFICATION

Earth Bond Test

AC Test Currents.....	6A, 12A, 20A, 25A (@ 6V RMS (nominal)). Corresponds to Type A earth continuity tester as defined in Electricity at Work Regulations 1989.
.....	100mA (@ 500mV RMS (nominal)). Corresponds to Type B earth continuity tester as defined in Electricity at Work Regulations 1989.
.....	Electronically controlled constant current to $\pm 20\%$ accuracy.

Note:- the current will only be controlled within an acceptable test load impedance.

Display Range.....0,1.999 Ω .

Accuracy..... $\pm 10\%$ or 1m Ω whichever is the greater. ± 2 counts.

NOTE: Impedance of the earth connector will be significant at low impedances.

Resolution..... 1m Ω .

Test Duration..... 6 seconds nominal.

Insulation Test

DC Test Voltage..... 480V min, 600V max off load

Display Range..... 10k Ω to 19.99M Ω

Accuracy $\pm 3\%$ or 10k Ω (whichever is the greater) up to 15.00M Ω

Resolution..... 10k Ω .

Test Duration..... 6 seconds nominal.

Supply Voltage

AC Supply..... 240V $\pm 10\%$ (@ 50Hz).

NOTE:- Some readings and specification figures are related to supply voltage variation.

Physical Data

Dimensions..... 250mm x 200mm x 150mm (approx).

Weight..... 4 kilo (approx).

Temperature Range..... 0° to 40°C (operating), - 10° to 70°C (Storage).

..... Thermal cut-out will operate when internal components attain 70°C in order to prevent damage.

REPLACEMENT PARTS

Earth Lead..... 207A916

Insulation probe..... 207A918

FUSES

Plug Fuse..... 5A to BS 1362

There are no user serviceable parts within the unit.

Due to a policy of continuous development Seaward Electronic Limited reserves the right to alter equipment specification and description outlined in this publication without prior notice and no part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

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