
IT 1000 PORTABLE APPLIANCE TESTER

OPERATING INSTRUCTIONS

207A910

CONTENTS

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NOTICE

Data may be lost or altered in virtually any electronic memory under certain circumstances. Therefore Seaward Electronic assumes no responsibility for financial losses or claims due to data lost or otherwise rendered unusable whether as a result of abuse, improper use, defects, disregard of operating instructions or procedures, or any other allied causes.

The information in this manual is subject to change without prior notice.

PAT INTERNAL BATTERY

The Portable Appliance Tester contains an internal rechargeable battery to maintain the memory when the unit is switched off. In order to ensure that this battery maintains operability the following procedure should be followed:

1. On receipt of the PAT tester, clear the memory and leave the unit switched on for 16 hours.
2. If the PAT will not be in use for weeks at a time the previous test results should be downloaded onto a printer or computer prior to the unit being stored, otherwise the unit should be switched on for 16 hours to ensure full charge.
3. If the PAT has not been used for some weeks, the battery can become heavily discharged, causing a possible loss of data. If test data is still intact it is advisable to download it. When the PAT is known to be in a discharged state, power it up to charge the battery for at least an hour prior to carrying out testing, or leave to charge for 16 hours.



SAFETY

Read instructions before use.

Due to the potential hazard associated with any electrical circuit it is important that a 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 IT 1000 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.

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

GETTING STARTED

On receiving your tester:-

- 1 Read Instructions
- 2 Plug in tester and leave for 1 hour to charge battery back up
- 3 Clear Memory

INTRODUCTION & DESCRIPTION

The IT 1000 is one of the most advanced portable appliance testers (PATs) available, performing five functions and providing a comprehensive guide to the electrical safety of both Class 1 and Class 2 electrical appliances.

The instrument is micro processor controlled and enables the user to select either test code automatic or manual mode which gives control of the testing sequence to the instruments computer or operator. Alternatively, the IT 1000 can be controlled by a remote IBM compatible PC.

The equipment performs the test selected by the user and records the results in its internal memory which is capable of storing up to 500 sets of test results.

To speed up data entry the Test Item Number, Test Code Number and the User Code can all be entered by a bar wand recorder.


In addition to test results the memory also records the appliance number, the user code and the date of testing. Preset pass/fail limits have been programmed into the IT 1000 and the test result is clearly displayed on the instruments liquid crystal display and any hard copy print out.

The fully charged battery backed memory will store test results for up to six months without being reconnected to the supply for re-charging, however it is recommended that the contents of the memory are printed or downloaded to a PC daily.

Particular features of the specifications are;

Multiple test facility	Allows repetition of earth bond and insulation tests in manual and test code modes.
Repeat test facility	Allows for batch or production testing.
Alpha-numeric facility	Allows the appliance number and user code to be a mixture of alpha-numeric characters.
Bar code reader input	
Remote Control facility	Allows the IT 1000 to be controlled by a remote PC via the serial port.

Symbols used on this equipment:

 -Equipment protected throughout by double or reinforced insulation.

 -Caution - risk of electric shock. (Test voltage of 500V DC may be present).

 -Caution (refer to accompanying documents)

LAYOUT

The IT 1000 is contained in a robust ABS/Polycarbonate injection moulded case which accommodates all the high voltage and power components in the base section and the micro computer and electronic control in the lid/display.

A sturdy zip pouch located at the rear of the instrument enclosure contains all necessary test leads and the mains supply connector. Earth bond sockets are also located in this pouch. These sockets permit the user to perform earth bond testing with two wandering leads as a 4 wire test as some applications may require earth bond testing between two parts of an appliance.

The base control panel of the instrument features a sixteen key keypad for control of the test sequence and for the input of data into the instruments memory. On the right hand section is the mains socket outlet for connection to the test apparatus, an IEC connector for testing of IEC leads, two sockets for the earth bond and a socket for the insulation probe. A second set of earth bonds sockets on the near panel can allow point to point measurements of resistances.

The standard IT 1000 performs five functions: and can be set to test appliances or IEC leads.

- 1) Visual Inspection
- 2) Earth Bond
- 3) Insulation
- 4) Earth Leakage Test
- 5) IEC Lead Continuity/Polarity Test

The control and use of the instrument is extremely simple with clear explicit prompts on the large liquid crystal display.

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

- 1) Fuse Protection.
- 2) The unit has a preset Pass/Fail level for each test. In addition a preset trip level has also been incorporated for each test which will terminate the test if the measured level exceeds this value. The exact trip level will vary according to test but will normally be approximately 120% of the Pass/Fail level.
- 3) An electronic cutout which provides rapid disconnection of internal relays where test results are detected which are in excess of 5 times the fail limit.

Use of the IT 1000 is straight forward and involves connecting the tester to a suitable mains supply, the electronic circuit is powered from the supply. Plug the appliance under test into the instrument socket outlet and connect the test leads appropriate to the insulation Class of the appliance.

The user is then guided through the testing procedure by the instructions on the liquid crystal display panel.


APPLICATIONS

The IT 1000 is designed to check the electrical safety of portable appliances and its comprehensive testing routine allows for appliances of Safety Class 1 and Class 2 insulation 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 an earth connected case. 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 type approval tests. Such testing involves prolonged sophisticated techniques. It is generally recognised that for periodic inspection to ensure that the safety of the appliance is maintained tests of the type performed by the IT 1000 are realistic and satisfactory.

Before commencing testing, the IT 1000 will remind the user that he has the option to do visual checks on the mains lead, case and fuse of the appliance. Five different tests are performed by the IT 1000 and these are described as follows:

EARTH BOND TEST

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

The IT 1000 applies a low voltage of approximately 6 volts AC RMS between the earth pin of the mains supply plug and the lead connected to the earth bond test terminal, a current is allowed to flow for a period of 5 seconds which can be selectable at 0.1, 4, 6, 12, 20 or 25 Amps. The duration of the test is limited to 5 seconds to prevent damage or over stressing which may be caused by testing for prolonged periods.

INSULATION

The Insulation test applies a nominal 500 volts DC between the earth pin of the portable appliances mains supply plug and the phase (also known as "live") and neutral pin which are connected together for the duration of the test.

The IT 1000 displays the resistance and enables the user to confirm sufficient insulation levels exists.

For Class 2 appliances, insulation can be considered to be connected to earth for the purpose of this test.

Note: Default pass level:- 2 Mohm Class 1
7 Mohm Class 2

LEAKAGE

The test item is energised at normal working voltage through the mains supply plug. The IT 1000 monitors the current flow through the earth lead of the appliance and displays the result on the screen with a pass or fail indication.

Note:

Default pass level 3.5mA class 1
0.75mA class 2

This particular test is of value when an appliance incorporates a number of sequences which may change the electrical characteristics of the product during its operation. These defects would not be apparent under normal passive testing.

Note:

It is important for complete testing that the appliance is switched on for the duration of the test cycle.

IEC LEAD CONTINUITY/POLARITY TEST

The objective of this test is to ensure continuity and correct polarity of live and neutral conductors in an IEC lead.

This test is used with the visual earth bond and insulation tests to fully test an IEC lead.

WARNING

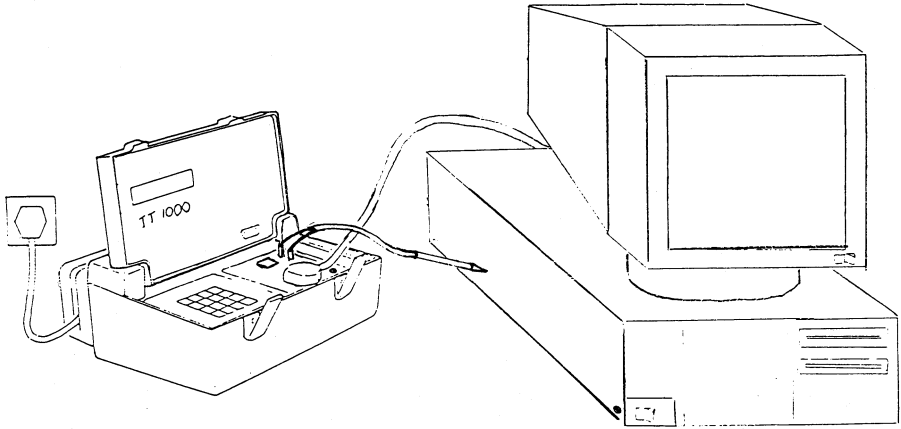
- a) Do not touch the appliance while testing is in progress. A high voltage of 500V DC is produced during the insulation test.
- b) Ensure that the earth clip of the bonded earth test cable is securely attached to this appliance. A poor connection may introduce arcing of the contact.
- c) The appliance will be automatically energised during the earth leakage test. Care should be taken that no ill effects can occur when the appliance commences operation.
- d) Where it is unclear which Class of insulation applies to the appliance being tested it is recommended that the manufacturers operating instructions be consulted.
- e) It is recommended that the operation of the IT 1000 is periodically checked by testing an appliance of known electrical characteristics.
- f) Tests should not be carried out while a printer or computer is connected to the instrument. In remote mode a Seaward isolating cable should be used.
- g) Only specialist users require fault levels below 1M Ω . Check with equipment supplier before using these settings.
- h) During earth bond tests it is recommended that any earth conductor should be moved during the tests and if the display reads greater the selected pass level this may indicate a faulty conductor.

VERSIONS WITH FRONT PANEL MAINS CONNECTOR.

TEST 1

Earth Bond Test

0.1 - 25 Amps

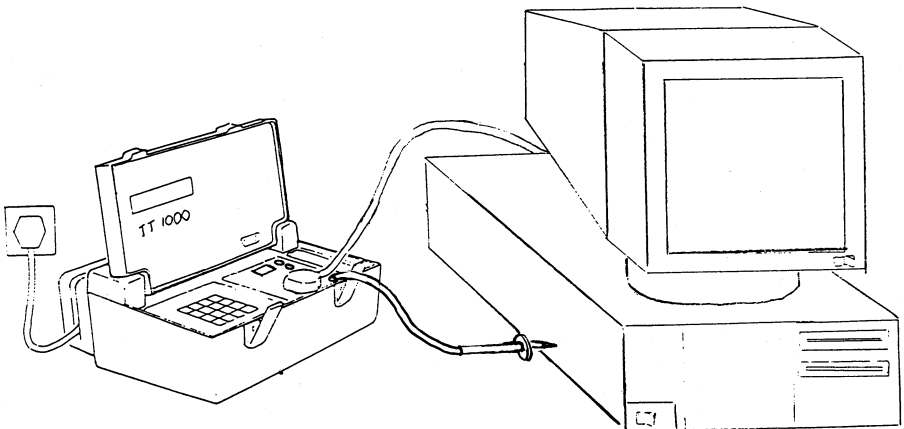


TEST 2

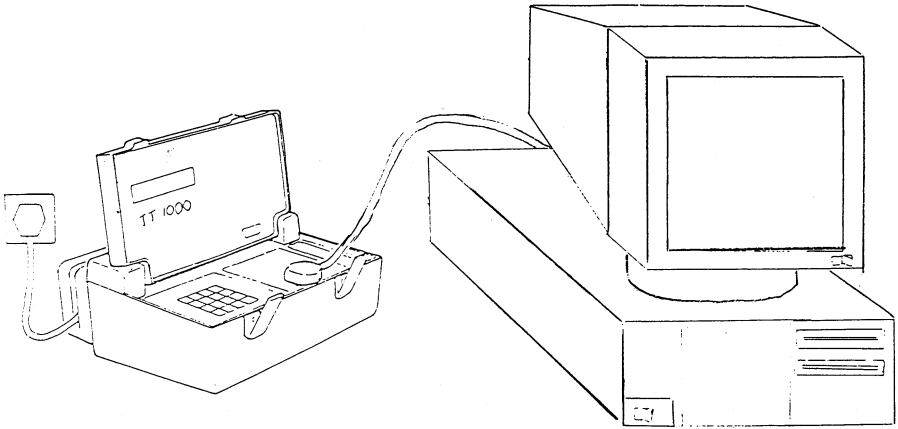
Insulation Test

500V DC

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



TEST 3
Earth Leakage Test

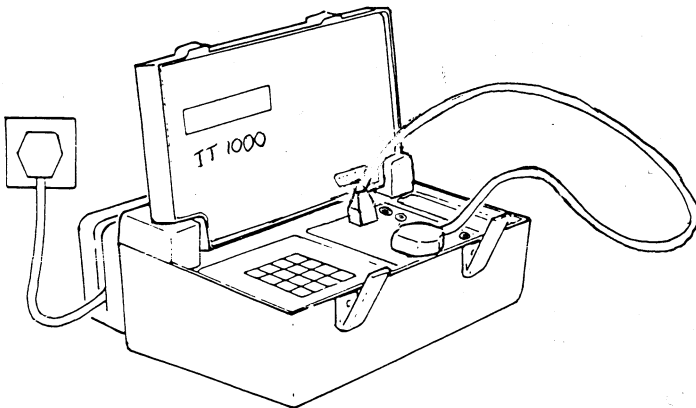


Note:

1. Switch appliance on.
2. Press # to apply power to appliance.

Warning: Ensure that no hazard will occur when the appliance operates.

TEST 4
IEC Polarity/Continuity test.



INTRODUCTION

The IT 1000 is micro processor controlled and designed to be extremely user friendly and guide the operator through the testing sequence.

The instrument will make clear statements concerning the test or condition of the equipment and ask the operator to confirm or deny the status. e.g. in the case of setting the test mode the display prompts automatic test? Y/N.

If the operator wishes to use the automatic test sequence he presses the Y and the instrument records the choice and proceeds to the next step.

If the operator wishes to use the manual mode he presses N.

In this case the display will present the message manual test mode? Y/N. The operator then will press the Y to confirm that he wishes to use the manual test sequence. Should the operator wish to change his mind he should press N and go back to the beginning of the sequence.

If the IT 1000 has been unused for several months it is recommended that it be switched on for several hours before use to ensure the memory backup battery is in a healthy state of charge. Check memory for corruption and if in doubt clear before use.

(The hash sign represents the enter command and advises the micro processor that a selection has been made and it should action the request. NOTE: No action will follow unless the hash sign has been depressed.)

STEP 1

Connect the IT 1000 to the mains supply.

Display: Pass Data Check Sum

Display: is this right Y/N

16 May 90 (16:05:90)

If the date is correct depress the Y key and the programme will sequence to the next instruction.

If the date is not correct press the N key and the instrument will then lead the user through a sequence of setting day, month and year.

At the end of this sequence the new date will be displayed and the user asked to confirm whether it is correct or not. (Should the user make an error during the set up procedure of the date he will now have the opportunity to correct this.)

DIRECT USER CONTROL MODE

- 1 At the prompt 'PRESS #FOR NEW TEST', simultaneously depress the 1 and 7 keys on the keypad.
- 2 The following screen will appear;
1=SET I(12A); 2=EARTH
3=INS;4=LKGE; 5=CONT
- 3 By using the keypad numbers as directed the user may set the earth current and perform just an individual test.
- 4 The D.U.C. mode does not require appliance identification as the tests performed in this mode are not logged in memory.

STEP 2

Display: Input Test Item Number, Press # or use wand.

(Each appliance may be allocated an alpha/numeric code of up to 10 digits).

The ALPHA characters are obtained by pressing the CLR/∞ key and then scrolling up or down through the alphabet using ↑ or ↓. Having selected an ALPHA character press # to enter it into the code.

The numerical characters are obtained direct from the keypad.

When the desired code is completed press # ONCE only to enter code into memory.

The instrument will ask "Is this right? Y/N". The user may then re-check and respond accordingly.

STEP 3

Display: Input Test Code? Y/N

At this stage the operator is being asked to select either the test code or normal operation. If normal operation is required then answer 'N' and proceed to step 4. The test code can be entered by the keypad or by the bar wand. The test code has been added to save time by avoiding the requirement for repeated input of information and takes the form of:

Digit 1:	Must be a 1
Digit 2:	0 = No Visual Check, appliance mode 1 = Visual Check, appliance mode 2 = No Visual Check, lead mode 3 = Visual Check, lead mode
Digit 3:	0 = Class 2 1-9 = earth fault limit (m Ohm)
Digit 4:	earth fault multiplier 0 = x1 1 = x10 2 = x100 3 = x1000 Example: To select 0.4(Ohm) earth fault Digit 3 must be a 4 Digit 4 must be a 2 $0.004 \times 100 = 0.4\Omega$
Digit 5:	earth test current 0,1 = 0.1A 2 = 4A 3 = 6A 4 = 12A 5 = 20A 6 = 25A
Digit 6:	0 = skip insulation test 1-9 = insulation fault limit (x0.01M Ohm)
Digit 7:	insulation fault multiplier 0 = x1 1 = x10 2 = x100 3 = x1000
Digit 8:	0 = skip mains leakage test 1 = 0.25mA limit 2 = 0.75mA limit 3 = 1.25mA limit 4 = 2.00mA limit 5 = 3.00mA limit

	6 = 3.50mA limit	
	7 = 4.00mA limit	
	8 = 5.00mA limit	
	9 = 7.50mA limit	
Digit 9:	0 = No repeat test	
	1 = Repeat test	
Digit 10:	0 = No earth repeat, no insulation repeat	} including continuity check
	1 = repeat earth, no insulation repeat	
	2 = no earth repeat, repeat insulation	}
	3 = Repeat earth, repeat insulation	
	4 = No earth bond repeat. No insulation repeat	
	5 = Repeat bond earth. No insulation repeat	
	6 = No earth bond repeat. Repeat insulation	
	7 = Repeat earth bond. Repeat insulation	

STEP 4

Display: Automatic Test Y/N or Manual Test Y/N

Instrument will default to last used option.

At this stage the operator is being asked to select either the automatic sequencing of tests or the manual sequence.

An automatic sequence will allow the tester to apply 5 second test at each stage prompting a response at leakage test in Class 1 and also at each stage for repeat test option in Class 2.

Manual mode requires the operator to depress the hash key in between each test in order to sequence to the next test.

It should be noted that for safety reasons tests are only performed in the sequence detailed under the section headed application.

STEP 5

Display: Class 1 Test Y/N or Class 2 Test Y/N

Instrument will default to last used option.

(The tester is now asking the operator to advise it which Class of insulation appliance is being tested.)

By pressing the Y key he will confirm a Class 1 appliance is being tested. (Pressing the N key will result in the display prompting the question "Class 2 Test Y/N.") The user then presses Y key and will be prompted for the earth test current which is selectable at 0.1, 4, 6, 12, 20 or 25 Amps. The user then presses Y key and will be prompted for the earth fault fail resistance specified by the external standards which apply to the instrument under test. This resistance will be 0.5Ω or 0.1Ω.

STEP 6

Display: Visual Check Y/N

The IT is now asking the operator if a visual inspection is to be carried out. By pressing the Y key, 3 questions are then posed:-

(i) Is lead OK Y/N

(ii) Is case OK Y/N (This question is omitted for IEC lead test)

(iii) Is fuse OK Y/N

In automatic mode tests will be terminated if any of the questions are answered with a 'NO'.

Memory will record visual check as a pass/fail or skip.

STEP 7

IT 1000 is now ready to commence testing.

Display: Connect Appliance

Press # to start

The tester will now perform each test for a five second period. Before depressing the hash button the operator should ensure that the connections are correct, the appliance is switched on and that the earth bond lead is attached to the Class 1 appliance.

Only in manual and test code mode are 3 Earth bond and 3 Insulation tests available.

The results of each test will be displayed with either a pass or fail indication depending upon whether the measurement is within or outside the preset test limits.

When a test fails the IT 1000 will stop and skip all further tests in the automatic mode or prompt to proceed in the manual mode. This action is taken on the grounds of safety and the operator should consider whether it is wise to proceed.

STEP 8

The operator will be prompted to enter a user code of up to ten alpha numeric characters (see step 2). If no code is given 0000000000 is recorded. The code can be used to identify retest dates, departments, users etc. If more than eight characters are inserted then the last eight will be recorded as the code.

STEP 9

After the tests have been completed the display will prompt the user to remove the test leads and then ask for the next appliance number to be entered.

If no further tests are to be performed the instrument may be switched off from the mains supply.

NOTE: Always switch the appliance tester off when not in use.

RANGE LIMITS

Upper and lower limits have been set for each range; reading above the upper level are held at the upper value preceded by >. Reading below the lower level are held at the lower value preceded by <.

e.g. Upper earth impedance level is set to >20.00 Ω

Upper insulation level is set to >300 M Ω

Lower earth leakage level (class 1) is set to < 0.4mA

OTHER COMMANDS

Abort: Depressing this key at any time will result in the test sequence being interrupted and the program being reset.

Data: Using this key the operator will be put in command of recalling the test results contained within the memory.

The program will lead the user through the steps which allows for recall on the display or onto a printer (See Printer Options.)

Clear/ ∞ : Clears the display and depending upon sequence in program may reset the program to the start sequence.

At other stages in the program it is used to call up alpha characters.

PRINTOUT FORMAT

Example of Printout

TEST NUMBER	0001	Test number auto increment
DATE	31 MAR 92	Set by operator
APP NO	0000000001	Any 10 character No.
TEST MODE	MAN	Selectable
VISUAL CHECK	P	Visual Check result
EARTH CURRENT	12A	Test current
EARTH	00.033 OHM P	Measured Value
EARTH	00.032 OHM P	Measured Value
EARTH	S	Skipped Test
INS	300.00 MEG P	Measured Value
INS	S	Skipped Test
INS	S	
LEAKAGE	0.00 mA P	Measured Value
LEAD CONTINUITY	P	IEC lead result
USER	1234567890	User Code

NOTE:

P: Test Pass
S: Test Skipped
F: Test Failed
T: Test terminated
MAN: Manual Mode
AUTO: Automatic Mode
TEST: Test Code Mode
A: Aborted

MEMORY RECALL

Up to 500 test results are recorded in the instruments memory. To review the information press the send data key at the beginning of the new test sequence.

The display will prompt with a question confirming the send data procedure. Press 'Y' to proceed or 'N' to return to the test sequence.

The display will then prompt with a question asking if the information is to be sent to the serial port.

Press Y to confirm.

Press N if the data is to be displayed on the L.C.D. The user is then asked if the data is to be sent from the start. Press Y to confirm. Pressing N will result in a prompt for the test item number. Once entered, press # and data will be sent from this test item number.

By depressing the # button the display will move through each line of the test results, holding the button down will cause the display to move rapidly through the test results.

The data will continue until all results have been displayed.

To exit this stage depress and hold down the Abort button.

Note: When multiple tests have been performed the IT will automatically output the worst case.

MEMORY CLEAR

Should the memory be required to be cleared of its contents the following sequence should be followed:

PRESS:-ABORT

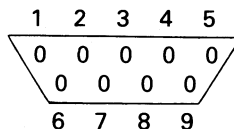
PRESS:-CLEAR

The display will ask for confirmation of the desire to clear memory. The unit will check its memory.

DATA INPUT/OUTPUT

A 9 pin D type connector is located at the lower right corner of the lid panel.

The data output uses RS232 levels using $\pm 5VDC$



Pin 5 Ground, Earth

Pin 3 Data out

Pin 2 Busy/Data in

Pin 4,6-9 No connection

For a printer/computer the set up data is as follows:-

Baud Rate 9600 (computer) 1200 (printer)

Start Bits 1

Stop Bits 2

Data Bits 8

No Parity

For a bar wand recorder the set up data is as follows:-

Baud rate 9600

Stop bits 2

Data bits 8

intercharacter Delay 20ms

INTEGRAL BARCODE READER CONFIGURATION

- 1) At the prompt 'PRESS # FOR NEW TEST', plug the barcode reader into the I/O part on the IT 1000.
- 2) Simultaneously depress the 3 and 9 keys on the keypad.
- 3) The IT 1000 will now automatically send the required codes for barcode reader set up and the barcode reader will be configured.
- 4) Test the barcode reader on a suitable barcode for verification of configuration.

MAINTENANCE

The IT 1000 is a rugged quality instrument, however care should be taken, 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) Keep the appliance tester clean and dry.
- 3) Avoid testing in conditions of high electrostatic or electromagnetic fields.
- 4) Check memory for corruption prior to each period of operation. If in doubt clear memory.
- 5) No attempt should be made to gain access to the instrument while under test conditions.
- 6) Inspect the condition of the IEC320 socket at regular intervals for signs of wear.
- 7) Maintenance should only be performed by authorised personnel.

The IT 1000 contains no user replaceable parts. In the unlikely event of a fault the product should be returned to an authorised dealer.

Note: In order to maintain reliability of stored data, it is necessary that the battery is kept in a healthy state of charge. A fully discharged battery will take 16 hours to recharge fully.

Should the IT 1000 require service, repair or calibration return the equipment to a recognised dealer or to Seaward Electronic Limited, Bracken Hill, South West Industrial Estate, Peterlee, County Durham, SR8 2JJ, England stating the full description of the fault. The product should be returned post paid where, upon receipt, the owner will be advised of any costs prior to work commencing.

IT 1000 SPECIFICATION

- 1) Earth Bond
- 2) Insulation
- 3) Leakage Test
- 4) IEC Lead Continuity/Polarity Test

EARTH BOND TEST Typically 4.5V rms

Test Current	.1, 4, 6, 12, 20, 25A nominal into Short Circuit.
Pass Limit	0.1 or 0.5 ohms (manual or automatic) 1m ohms to 20 ohms selectable in decade steps (test code)
Readout Range	0 to 20 ohms
Accuracy	At 0.1A test current $\pm 5\%$ (50m Ohms to 5 Ohms) ± 4 digits At other tests currents $\pm 5\%$ (50m Ohms to 20 Ohms) ± 4 digits

Note: Contact resistance between instrument and appliance under test may vary by up to 5m Ω .

INSULATION TEST

Test Voltage	500V nominal
Pass Range	2, 7M ohms (manual or automatic) 0.1 to 300M Ohms in decade steps (test code)
Readout Range	0.1 to 300M Ohms
Accuracy	$\pm 8\%$ 1 - 50M Ohms

EARTH LEAKAGE TEST

Pass Limit	0.75mA, 3.5mA
Readout Range	0.5mA to 8.9mA
Test Voltage	Mains supply
Accuracy	$\pm 10\%$ ± 60 Micro amps

POLARITY CHECK

L - L	
N - N	at 0.5A, 6V nominal
Pass Range	Pass or Fail

GENERAL

Size and Weight
W250, D212, H140, Wt 5Kg

SUPPLY VOLTAGE

240V +/- 10%, 50Hz

Note: Readings are related to supply voltage variation.

The minimum range of environmental conditions for which the equipment is designed is as follows:

- indoor use
- altitude up to 2000M
- installation category II
- pollution degree 2

ACCESSORIES

REPLACEMENT PARTS

Earth Lead	207A915
Schedule Label	91B037
Pass Safety Test Label	91B038
Printer	194A910
Interface Leads	(Various)
Bar wand recorder	194A300
Bar code Labels	194A915
Seaward Isolating Cable	207A917

FUSES - 240V Versions

Plug Fuse
13A to BS 1362

P.S. Fuse
F1A

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