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# **PAT1000X**

## **PORTABLE APPLIANCE TESTER**

### **OPERATING INSTRUCTIONS**

**206A550**

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Bracken Hill, South West Industrial Estate,  
Peterlee, Co. Durham SR8 2SW. England.  
Tel: 0191-586 3511 Fax: 0191-586 0227  
[www.seaward.co.uk](http://www.seaward.co.uk)  
[sales@seaward.co.uk](mailto:sales@seaward.co.uk)  
[calibration@seaward.co.uk](mailto:calibration@seaward.co.uk)

## **NOTICE**

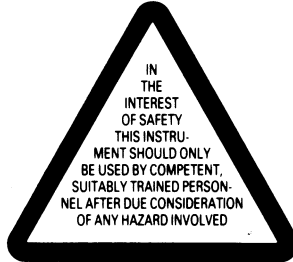
**Data may be lost or altered in virtually any electronic memory under certain circumstances. Therefore Seaward Electronic assumes no responsibility for financial losses or claims due to data lost or otherwise rendered unusable whether as a result of abuse, improper use, defects, disregard of operating 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 PAT1000X 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 PAT1000X is one of the most advanced portable appliance testers 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 the automatic, test code or manual mode which gives control of the testing sequence to the instruments computer or the operator.

The equipment performs the test selected by the user and records the results in its internal memory which is capable of storing over 700 sets of test results.

To speed up data entry, The Appliance 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 test number and the date of testing. Preset pass/fail limits have been programmed into the PAT1000X and the test result is clearly displayed on the instruments liquid crystal display and any hard copy print out.

A fully charged battery backed memory will store test results for up to six months without being reconnected to the supply for re-charging. It is recommended that the contents of the memory is printed or down loaded to a PC daily.

Particular features of the specification are;

Multiple test facility	Allows repetition of earth bond, insulation and flash tests in manual mode.
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

## **LAYOUT**

The PAT1000X 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, the mains supply connector and the 110v output socket. Access is also available to the replaceable protective fuse through this zipped compartment where applicable.

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 a high voltage test socket for the flash test lead and the earth bond socket for 8amps and 25amps.

The standard PAT1000X performs five functions which include:

- 1) Visual Inspection
- 2) Earth Bond
- 3) Insulation
- 4) Flash Test
- 5) Load/Fuse Check

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) A monitor between neutral and earth connection to the PAT1000X which inhibits testing if a potential of greater than nominal 50V exists (as with a reversed polarity connection). The inhibit can be overridden if the user decides it is safe to continue e.g. when using an isolation transformer.
- 3) 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.
- 4) 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 PAT1000X 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 PAT1000X 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 PAT1000X are realistic and satisfactory.

Five different tests are performed by the PAT1000X and these are described as follows:

## **VISUAL INSPECTION**

Before commencing testing, the PAT1000X will remind the user that he has the option to do visual checks on the mains lead, case and fuse of the appliance.

## **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 PAT1000X 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 high current is allowed to flow for a period of 5 seconds which can be either approximately 25 amps at 0.1 ohm or 8Amps depending upon the earth bond output socket selected. The objective of the high current is to test under load conditions and 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**

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 (line 110V) which are connected together for the duration of the test.

PAT1000X displays the resistance and enables the user to confirm sufficient insulation levels exists.

For Class 2 appliances, the flash probe 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

## **FLASH TEST**

A wide variety of tests are specified under different BS and IEC specifications. For this reason test voltages have been selected for the PAT1000X which are realistic for routine testing without overstressing and potentially weakening appliances insulation levels.

A nominal test voltage of 3KV for Class 2 appliances is applied and 1.5KV for Class 1 appliances.

Note:

This particular test may be omitted when testing electronic equipment incorporating interference suppressors. This action may be necessary where the voltage withstand rating of the components fitted to the appliance is insufficient to accommodate the test without damage.

## **LOAD/FUSE CHECK**

This test checks to see if a load/fuse is present by supplying a low voltage to the appliance.

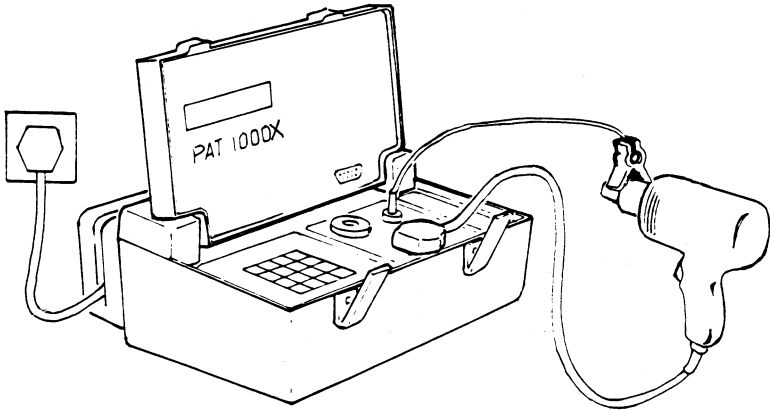
## **WARNING**

- a) Do not touch the appliance while testing is in progress. A high voltage of 1.5KV is applied with respect to earth during the flashtest, and a nominal 500V DC 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) Certain appliances may contain interference suppressors which may be damaged by the flash test if their components are not rated to withstand this type of test. Under these conditions the flash test may be skipped.
- 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 PAT1000X is periodically checked by testing an appliance of known electrical characteristics.
- f) Test should not be carried out while a printer or computer is connected to the instrument's serial port.

## 240V CONNECTOR

### TEST 1

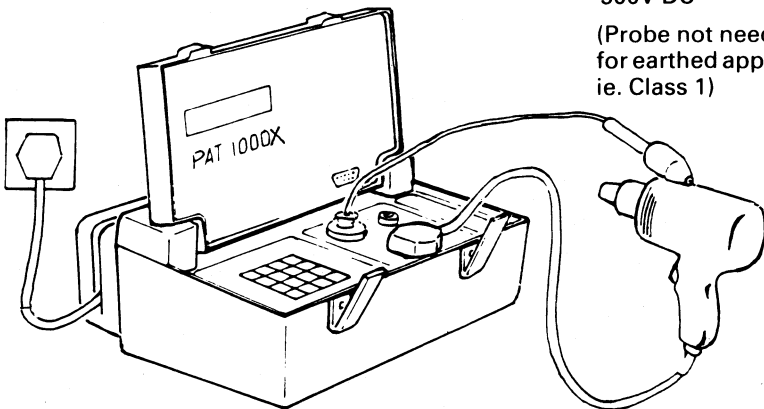
Earth Bond Test  
25 Amps/8Amps



### TEST 2

Insulation Test  
500V DC

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

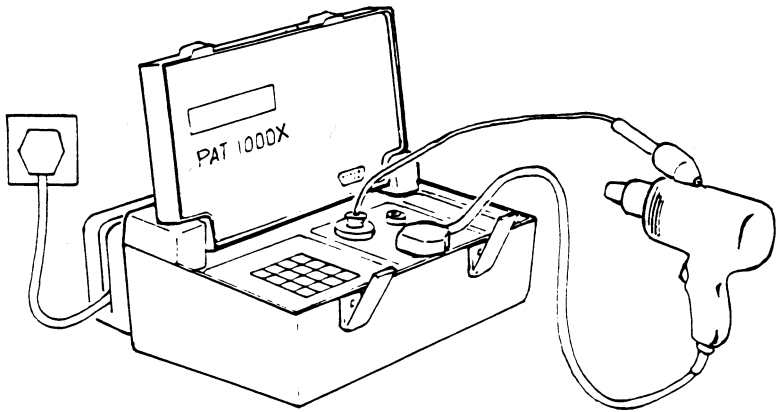


### TEST 3

A.C. Flash Test

1.5KV Class 1

3.0KV Class 2



#### Note:

1. Press # to apply Flash Test Voltage
2. Probe is not required for Class 1 (Earth Appliance)

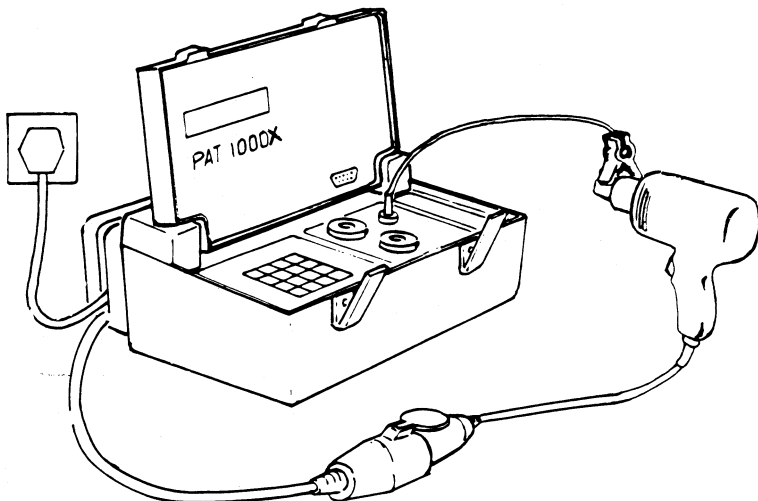
**Warning:** Do not touch probe tip or appliance during test and allow time for any internal capacitors to discharge after test is complete.

### 110V CONNECTOR

#### TEST 1

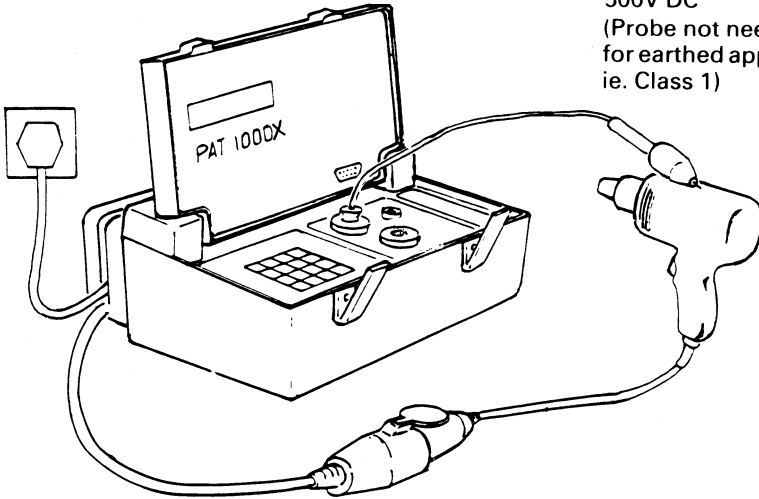
Earth Bond Test

25 Amps

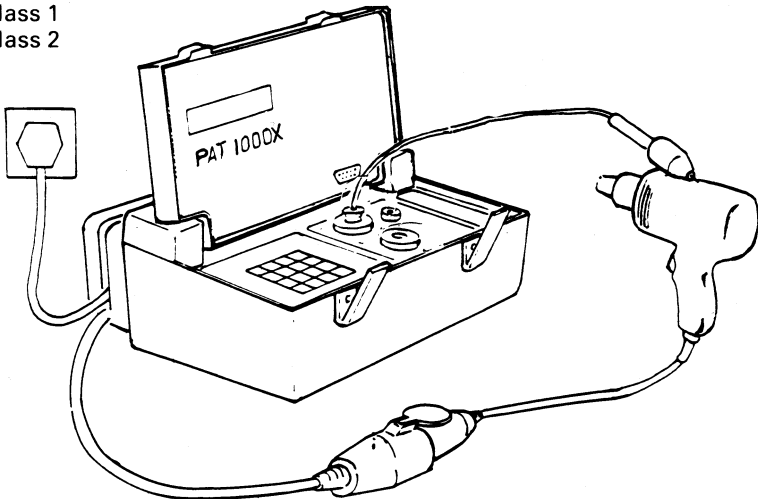




**TEST 2**  
Insulation Test  
500V DC  
(Probe not needed  
for earthed appliances  
ie. Class 1)



**TEST 3**  
A.C. Flash Test  
1.5KV Class 1  
3.0KV Class 2



**Note:**

1. Press # to apply Flash Test Voltage
2. Probe is not required for Class 1 (Earth Appliance)

**Warning:** Do not touch probe tip or appliance during test and allow time for any internal capacitors to discharge after test is complete.

## INTRODUCTION

PAT1000X 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 autotest? Y/N.

The Y and the N represent YES and NO on the keypad.

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 PAT1000X has been unused for several months it is recommended that it be switched on for 1 hour 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 PAT1000X to the mains supply.

On Power up the PAT1000X may display: Volts on neutral. Press # only if safe. Check for neutral fault, rectify and press # if safe to continue.

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.)

### STEP 2

Display: Input Appliance 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 a ten digit number as follows.

- Digit 1: Must be 1  
Digit 2: 0 = Visual Check omitted.  
1 = Visual Check included.  
Digit 3: 0 = 240v socket.  
1 = 110v socket  
Digit 4: 0 = Class 2 Earth Bond omitted.  
1 = Class 1 Earth Bond pass level 0.1ohm  
2 = Class 1 Earth Bond pass level 0.5ohm  
3 = Class 1 Earth Bond pass level 2.0ohm  
Note: option 3 is for extension leads only.  
4 = Class 1 Earth Bond pass level 0.1ohm up to 3 tests  
5 = Class 1 Earth Bond pass level 0.5ohm up to 3 tests  
Digit 5: 0 = Insulation Test omitted.  
1 = Insulation pass level 7.0 Mohm.  
2 = Insulation pass level 2.0 Mohm.  
3 = Insulation pass level 4.0 Mohm.  
4 = Insulation pass level 7.0 Mohm. Up to 3 tests.  
5 = Insulation pass level 2.0 Mohm. Up to 3 tests.  
6 = Insulation pass level 4.0 Mohm. Up to 3 tests.  
Digit 6: 0 = Flash test omitted.  
1 = 3.0mA pass level.  
2 = 5.0mA pass level.  
3 = 3.0mA pass level. Up to 3 tests.  
4 = 5.0mA pass level. Up to 3 tests.  
Digit 7: 0 = Load present check omitted  
1 = Load present check included.  
Digit 8: Must be 1  
Digit 9: 0 = No repeat test  
1 = Repeat Test Sequence.  
Digit 10: Must be 1

Proceed to Step 7.

### STEP 4

Display: 240v APPLIANCE Y/N  
or  
110v APPLIANCE Y/N

The instrument will default to the last option used. At this stage the operator is asked which output socket is required. Once the operator has selected the appropriate output it needs to be confirmed by pressing the "yes" key.

## STEP 5

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 sequences of each test and will ask for a prompt at the flash test stage.

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 6

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.)

The cyclic option for the selection of Class 1/Class 2 tests is offered on successive pressing of the 'N' key. As each option is offered pressing the 'Y' key will select that option.

If the user selects Class 1 the PAT1000X will prompt for the earth fault fail resistance specified by the external standards which apply to the appliance under test.

The resistance will be  $0.5\Omega$  or  $0.1\Omega$ .

## STEP 7

Display: Visual Check Y/N

The PAT1000X 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

(iii) Is fuse OK Y/N (only on 240v)

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 8

PAT1000X 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.

The flash test probe need only be applied to a Class 2 appliance for insulation and flash tests.

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.

- 1) The display will prompt and the audio sounder operate when the flash test is reached.

The user must depress the hash key to apply the high voltage.

This operation applies even in the automatic test mode.

- 2) When a test fails the PAT1000X will stop and skip all further tests in the automatic or test code 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 9**

The operator will be prompted to enter a user code of up to eight alpha numeric characters (see step 2). If no code is given 00000000 is recorded. This 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.

Note: Only the last 6 characters are processed by the PATS software.

## **STEP 10**

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; readings above the upper level are held at the upper value, preceded by >. Readings below the lower level are held at the lower level preceded by <.

e.g. if the upper earth impedance level is set to 5.00

and the lower earth impedance level is set to 0.02

then a measured value of 9.99 is shown as '>5.00'

a measured value of 1.00 is shown as '1.00'

a measured value of 0.01 is shown as '<0.02'

## **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 program is used to call up alpha characters.

## PRINTOUT FORMAT

### Example of Printout

TEST NUMBER	0001	Test number automatic increment
DATE	24 APR 91	Set by operator
APP NO	0000000001	Any 10 character number Input by operator
TEST MODE	MAN	Selectable Auto: Automatic/Test Man: Manual
VISUAL CHECK	P	Visual Check result
E 1	.0.02 OHM P	Measured Value Pass
INS 1	.9.90 MEG P	Insulation Test (P Pass)
FLASH 1	.0.30 mA P	
FLASH 2	. mA	
FLASH 3	. mA S	Flash Test (S Skip)
LOAD	. P	
USRCODE	00000000	

#### NOTE:

P: Test Pass  
S: Skip, Test  
not performed  
F: Fail  
T: Terminate

## MEMORY RECALL

Up to 1000 test results are recorded in the instruments memory. To review the information press the send data key at the beginning of a new test sequence.

The display will prompt with a question asking if the information is to be printed out.

Press Y if a hard copy is required and a printer is connected.

Press N if the data is to be displayed on the LCD.

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 PAT 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

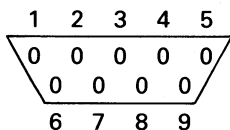
PRESS:-CLEAR

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 +/-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 1200

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

## **MAINTENANCE**

The PAT1000X 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) Maintenance should only be performed by authorised personnel.
- 7) A maintenance manual is available from the manufacturers upon request.

The PAT1000X contains no user replaceable parts with the exception of the internal rechargeable battery which maintains records when the tester is disconnected from the mains supply. In the unlikely event that this battery requires replacement reference should be made to the maintenance manual or the product returned to an authorised dealer. Note: Warranty excluding the internal rechargeable battery.

Should the PAT1000X 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. The product should be returned post paid where, upon receipt, the owner will be advised of any costs prior to work commencing.

## **SPECIFICATION**

- 1) Earth Bond
- 2) Insulation
- 3) Flash Test

### **EARTH BOND TEST**

Measuring Range:	0.02-5.00 ohms
Pass Band selectable at 0.1 ohms, 0.5 ohms and 2.0 ohms (test code only)	
Earth and Circuit voltage:	6V RMS nominal
Output current:	Nominal 25amps or 8amps 240V Version (25amps 110V Version).
Accuracy:	+/- 5% (+/- 2 digits with range 25 mill-ohms to 1 ohm)

**NOTE:** Impedance of earth connector will be significant at low Impedances.



## **INSULATION TEST**

Meter Range: 1 - 9.90M ohms  
Pass band limit: 2M, 4M or 7Mohms selectable  
Output voltage: 500V 2M ohms +/- 10% for input mains voltage variation  
Accuracy of indication: +/-5%

## **FLASH TEST**

Measuring range: 0.3-6mA  
Pass band limit: 3mA or 6mA  
Open circuit voltage:  
Class 1: 1.5KV AC RMS  
Class 2: 3KV AC RMS  
Accuracy: +/-5% +/- 150 microamps in range 0-6mA

## **SUPPLY VOLTAGE**

Rated Voltage +/-6%  
NOTE: Readings are related to supply voltage variation

Dimension: 250mm x 200mm x 150mm (Approx)

Weight: 5 Kilo (Approx)

## **ACCESSORIES**

## **REPLACEMENT PARTS**

High Voltage Probe	161A015
Earth Lead	161A024
Schedule Label	91B037
Pass Safety Test Label	91B038
PATS Software	161A921
PATS + Software	161A922
Printer	194A910
Interface Leads	(Various)
Bar wand recorder	194A300
Bar code labels	194A915

## **FUSES**

Plug Fuse  
13A to BS 1362

P.S. Fuse  
F3A

## **TEMPERATURE RANGE**

0-40°C  
Calibration performed at 20±2°C

Due to a policy of continuous development Seaward Electronic Limited reserves the right to alter the 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 of the equipment unless specially referred to as an inclusion within such contract.