

# **Seaward Supernova**

## **Portable Appliance Tester**

### *Instruction Manual*

September 1999

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Issue 6





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***Declaration of Conformity***

for the

Seaward Supernova Portable Appliance Tester

**Manufactured by:**

Seaward Electronic Ltd, Bracken Hill, South West Industrial Estate

Peterlee, County Durham, SR8 2SW, England

**Millennium Statement**

This product is Millennium compliant, and conforms fully to the document BSI DISC PD2000-1.

**Statement of Conformity**

Based on test results using appropriate standards, the product is in conformity with Electromagnetic Compatibility Directive 89/336/EEC and Low Voltage Directive 73/23/EEC


**Standards used:**

EN 61010-1 (1993) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

EN 50081-1 (1992) Electromagnetic Compatibility. Generic Emission Standard: EN55022 Class B

EN 50082-1 (1992) Electromagnetic Compatibility. Generic Immunity Standard: IEC1000-4-2, -4-3, -4-4, -4-5

The tests have been performed in a typical configuration.

This Conformity is indicated by the symbol , i.e. "Conformité Européenne"

## ***Before Starting***

Upon receipt of your Supernova Tester:-

1. Check that all the component parts are present:-
  - Seaward Supernova Tester
  - Earth Bond lead
  - 115V adaptor (UK market only)
  - Instruction Manual
  - Flash Probe
2. Read the operating instructions fully before conducting any tests.
3. Contact Seaward Electronic if you need information on training for Portable Appliance Testing. Courses can be arranged at Seaward, or at customer premises.
4. 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.
5. Seaward Electronic reserve the right to update the software in instruments returned to themselves for repair or otherwise, without notifying the customer previously.

Seaward Electronic Limited can be contacted at:

Bracken Hill  
South West Industrial Estate  
Peterlee  
Co. Durham  
SR8 2SW  
Tel : +44 (0)191 586 3511  
Fax: +44 (0)191 586 0227  
sales@seaward.co.uk

## Safety

### Note

*Please read the following Safety Instructions before use !*




### Safety Precautions

The manual contains specific warning and caution statements where they apply.

**A Warning will identify the conditions and actions that pose hazard(s) to the user.**

**A caution will identify the conditions and actions that may damage the Tester.**

Symbols used within this manual and on the Tester are shown below:

	Risk of electric shock
	Warning of potential hazard
	Conformité Européenne

Use of the instrument in a manner not specified may impair safety.  
Read the following safety information carefully before attempting to operate the instrument.

**Warning**

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

**This product is designed for use by suitably trained competent personnel and should be operated strictly in accordance with the instructions supplied.**

Failure to comply with these instructions may expose the user to electrical hazard

This Tester performs a number of electrical tests which involve high voltages and high currents. Never touch the appliance being tested, or the test leads, whilst a test is in progress.

Always check all test leads for signs of damage prior to use. Never use damaged or defective leads.

Always ensure the mains supply to the Tester provides an adequate earth.

This manual contains information and warnings which must be heeded to ensure user safety during operation. It is essential that this manual is read fully before proceeding with any tests.

Should the Tester behave abnormally do not continue with the testing. Disconnect immediately and contact Seaward Electronic for servicing (see Chapter 5 - Maintaining the Tester).

## **Chapter 1 Introducing the Tester**

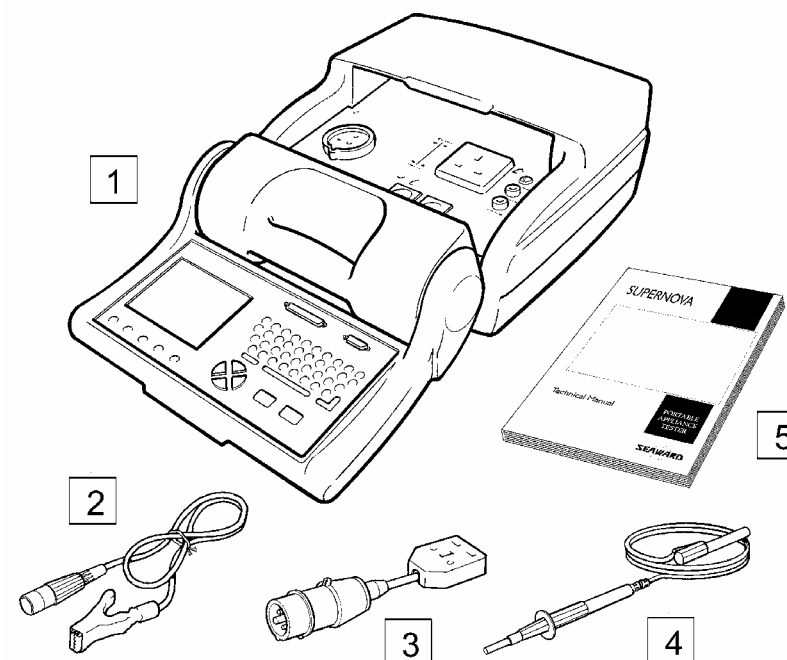
### **Introduction**

The Seaward Supernova Portable Appliance Tester is a powerful tool to assist in the analysis of the safety of portable electrical and electronic equipment. A range of tests are provided, with innovative features to aid difficult test situations, which allow testing of a wide variety of equipment.

The Tester is designed to be easy to use, and also includes the following innovative features:-

- Multi-voltage tester
- Stores up to 2400 results including appliances, location, site, date and time in non-volatile flash memory
- Accurate earth bond and leakage measurement even when multiple earth paths exist
- Qwerty keyboard with fast keys.
- Full graphics display, Real-time clock
- Connects to PC, Barcode reader and printer
- Compatible with Seaward's PATs Plus and other leading software packages (including Seaward's PATSwin software package)
- Software adjusts the user interface to differing levels of expertise
- Auto testcode generation
- Fast Start-up
- Superfast download up to 10 times quicker than existing testers

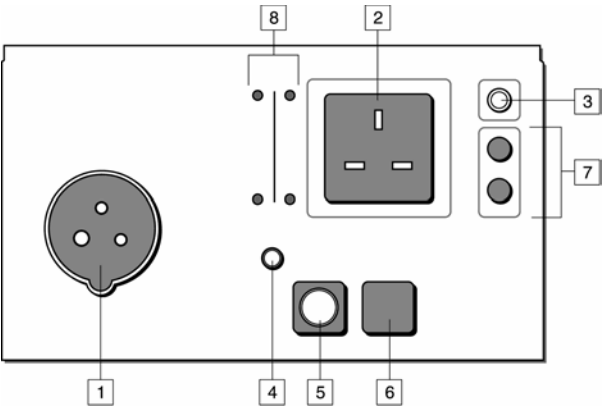
## Your Portable Appliance Tester



Item Number	Part
1	Supernova Appliance Tester
2	Earth Bond Lead
3	115V Adapter (UK market only)
4	Flash Probe and lead
5	Manual

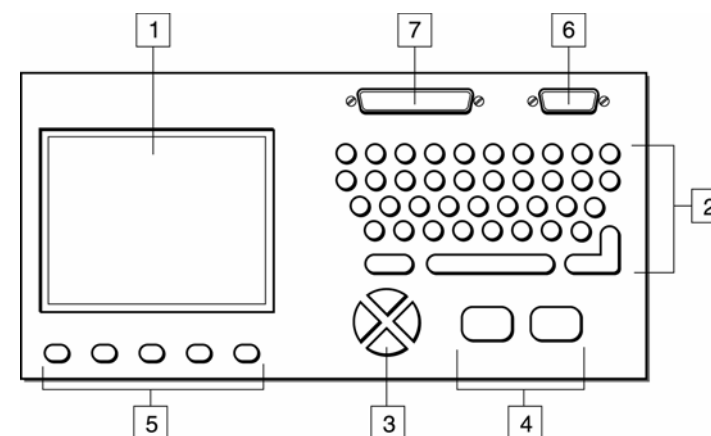


**The Top Panel**



Item Number	Part
1	110V/115V socket
2	230V socket
3	Class 2 Flash Probe connector
4	Remote Probe sense socket
5	Earth Bond lead connector
6	IEC Lead connector
7	Fuses
8	Indicators for selected sockets and mains on.

## The Keyboard



Item Number	Part
1	Graphic LCD
2	'QWERTY' keyboard
3	Cursor Keys
4	Go (Green) and Abort (red) keys
5	'Fast' Keys
6	Serial Port Connector
7	Parallel Port Connector

The user is provided with a 320 x 240 1/4 VGA Graphical Liquid Crystal Display (LCD). The keyboard consists of an alpha-numeric keyboard, together with specific function keys. To the bottom of the keyboard are five function keys which allow the user fast access to options displayed on the Display

There are four cursor keys used to navigate the menus.

To the bottom of the keyboard are the two main function keys which perform execute and cancel function as well as Start and Stop.

The Supernova also has the ability to use non-standard characters which can be displayed by pressing the 'Symbols' key during text

entry. Simply use the cursor keys to highlight the required character and press the Green button. You can also use numeric keys 1-9 to move you to extreme points of the symbol matrix.

The Shift can also be used when editing text

Shift and *	Result
Left key	Go to start of line
Right key	Go to end of line
Up key	Go to start of text
Down key	Go to end of text
Delete key	Delete character under cursor

\* and any alpha key = lower case characters

## Definitions

Equipment Under Test (EUT)	The electrical / electronic apparatus which is the subject of testing.
Powered Tests -	The EUT is supplied with mains voltage, with measurements being taken of power consumption, leakage currents etc.
Fastkeys -	The keys with symbols to the left of the keyboard. These are used to select menu options displayed on the screen.
Tester -	The Seaward Supernova Portable Appliance Tester
Un-powered Tests -	The EUT is the subject of electrical tests using stimuli generated within the Tester. The EUT is not provided with mains power.
User -	The test technician using the Tester to perform tests on an EUT

## Quick Reference

Editing the date in all modes

On delivery of the Supernova it is necessary to ensure that the correct time and a date are stored. Once stored the time/date is retained in memory and does not need to be entered again. To edit the date: from the MAIN MENU select SETUP, select, CHANGE TIME/DATE, use the cursor keys to highlight the digit to be changed. To store the changed time/date setting return to the MAIN MENU. The unit will then display the message STORING SYSTEM DATA.

#### **Entering a User Name**

On delivery of Supernova it is necessary to ensure that a user name(s) is stored. To edit the user list: from the MAIN MENU select SETUP, select EDIT USER LIST / OPTIONS, use the cursor keys and select a name, a screen will appear "EDIT USER SETTINGS", press Green button, use the keyboard to type in the desired name and press GREEN BUTTON to return to the previous menu.

#### **Storing Appliance Test Results in Automatic mode**

The Appliance Test Results will not be stored until you leave the COMMENTS MENU, upon leaving this menu the unit will display the messages STORING RESULTS then SAVED OK. Your results have now been stored.

#### **Storing Appliance Test Results in Manual mode**

The Appliance Test Results will not be stored until a Manual Appliance Sequence has been completed. To do this firstly press A, this will prompt you for an Appliance number, enter this and press GREEN BUTTON twice. Perform the tests required then press C, this will prompt you to enter comments, select SAVE COMMENTS/RESULTS and press GREEN BUTTON. The unit will then display the messages STORING RESULTS then SAVED OK. Your results have now been stored.

#### **Storing System Data**

System Data consists of everything changed from within the SETUP MENU. To store the System Data return to the MAIN MENU from the

SETUP MENU. The unit will then display the message STORING SYSTEM DATA. This will only be done if changes have been made, if no changes have been made then the system data will not be updated.

### **Waiting for a Yes/No response**

When you are prompted to respond with YES or NO you must use the fastkeys under the display.

### **Using Symbols in Text Fields**

Although there is an option to use non-ascii symbols as Appliance numbers, Site & Location descriptions, User names and comments does not guarantee that your computer software will support them. If you are unsure avoid using symbols.

### **10 Digit Restriction**

When you first receive your Supernova the Appliance and Comments will be set to '10 Digit Restriction'. If you are using compatible software then this option can be set to 'Full Length'. When set to 'Full Length' the maximum Appliance length is extended to 15 characters while the maximum line for the comments is extended to 20 characters per line.

### **Comparing Flash test results with other testers**

To comply with forth coming test standards the Flash output current has been limited. The actual current displayed with differ from previous testers as illustrated in the table below.

<b>Load</b>	<b>Previous Testers</b>	<b>Supernova</b>
3M ohms	0.5mA	0.43mA
1.5M ohms	1mA	0.75mA
750K ohms	2mA	1.2mA
500K ohms	3mA	1.5mA
300K ohms	5mA	1.87mA

The Flash pass/fail limits have been adjusted from 3mA and 5mA to 1,5mA and 2mA respectively.

## Chapter 2 Connecting the Tester

### Connecting the tester

The Tester may be powered by either a 230V or a 110V supply and will test either a 230V appliance or a 110V appliance from either supply voltage, including the power tests.

The supply must include an earth connection (e.g. via a 3 pin plug).

When switched on, the Tester will carry out a short self-test procedure (approximately 2 seconds). During this test, the following screen will appear:-



#### Note

Current revision numbers are shown at the bottom of the screen.

The Tester will then display the Main Menu

## Chapter 3 Using the Tester

### Introduction

Once the start-up procedure of the Tester has been completed, the following screen will appear:-

-----MAIN MENU-----
NEW TEST
VIEW TEST RESULTS
DOWNLOAD RESULTS
SETUP
MEMORY OPTIONS
CHANGE USER
REMOTE MODE
ACCESSORIES

USER : John

Thursday 4 March 1999 09:03

Navigation through the menus is by dedicated keys:-

Key	Function
←	Cursor Left
↑	Cursor Up
→	Cursor Right
↓	Cursor Down
'Red' Button	No / Abort / move back thru menu structure
'Green' Button	Yes/Go
Return	Enter/Execute



There are also the five Fast keys under the LCD whose action will change depending on the function of the Tester at any particular point.

To select an option from the Main Menu, use the cursor keys. The selected option will be highlighted by a light-coloured bar. The highlighted selection is actioned by pressing the Green button.

### ***Fast Key Menus***

To facilitate a fast access to commonly used options on the menus, use the 'fast' keys on the keyboard.

### ***How to....***

The remainder of this chapter has been sub-divided into sections describes the Tester in terms of the essential functions to be performed. A summary is shown below:-

- How to perform Automatic tests
- How to use the Meter display
- How to view test results
- How to perform Manual tests
- How to download test results
- How to use Setup
- How to use the memory
- How to change the user
- How to use Help
- How to use a Barcode Scanner

## How to perform Automatic Tests

To perform automatic tests, use the cursor keys to highlight the New Test option on the Main Menu and press Green button to display the following menus:-

----ENTER APPLIANCE DETAILS----
APPLIANCE :
SITE : SEAWARD
LOCATION : CAD ROOM
OK

Use the keyboard or a compatible Barcode Reader to enter an Appliance Number.

### Note

See Chapter 4 for tips on using barcodes.

If you need to change the current Site use the cursor keys to highlight SITE and press Green button to change the Site Name.

-----SITE LIST-----
SEAWARD
BSX LTD
HSH OFFICES

Use the cursor keys to highlight a site name and press green button to select the desired option.

If you need to change the current Location use the cursor keys to highlight LOCATION and press Enter to change the Site Name



Use the cursor keys to highlight a location name and press green button to select the desired option.

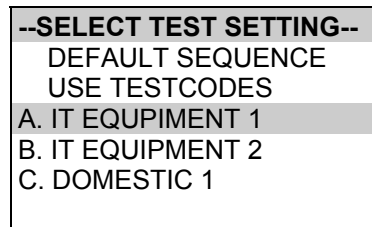
### Note

Default settings for Sites and Test Sequences are pre-loaded into the Tester. See 'How to use Setup' to change these settings.

## Test Settings

The user has the ability to:-

- Set a specific test sequence by selecting DEFAULT SEQUENCE



- Allow testcodes to determine the test to be carried out
- Use preprogrammed sequences for specific EUTS, e.g IT Equipment.

Selecting either of the first two options allows settings to be altered. Selecting any of the remaining options allows the user to commence immediately with that test.

Press the keyboard shortcut or use the cursor keys to highlight a Test Sequence and press Green button to select the desired option.

**Default Sequence**

-----DEFAULT SEQUENCE EDITOR-----				
-				
	OUTPUT	LIMIT	DUR	NUM
SOCKET	230V			
VISUAL		YES		1
EARTH BOND	4A	0.10Ω	5	1
INSULATION	500V	0.50MΩ	5	1
SUB LEAKAGE		SKIP		
FLASH		SKIP		
LEAKAGE		SKIP		
TOUCH LEAKAGE		SKIP		
POLARITY		SKIP		
PERFORM TEST				

When you first enter this menu all of the previous values are displayed and one of the field descriptions is highlighted.

Use the cursor keys to highlight a field to be changed and press Green button to select the desired option.

**Test Parameter Fields**

-----LEAKAGE-----			
OUTPUT	LIMIT	DURATION	NUMBER
230V	SKIP	2s	1
115V	0.25mA	5s	2
	0.50mA	10s	3
	0.75mA	30s	4
	1.50mA	60s	5
	2.25mA	120s	10
	2.50mA	180s	15
	3.00mA	UL	20
	3.50mA		25
	9.90mA		30

By selecting one of the test parameter fields from the Default

Sequence, a list of options for that field will be displayed:-

Use the cursor left and right keys to highlight the description, then use the cursor up and down keys to highlight the required setting. Use the cursor left and right keys to change the highlighted field.

Use the Green button key to save the settings and return to the Default Sequence Editor. Repeat this process for each field as appropriate.

Press the red button to abort changes made to the settings and return to the Default Sequence Editor.

To start the test sequence select PERFORM TEST.

### Use Testcodes

-----ENTER TESTCODES-----				
	OUTPUT	LIMIT	DUR	NUM
SOCKET	230V			
VISUAL		YES		1
EARTH BOND	4A	0.10Ω	5	1
INSULATION	500V	0.50MΩ	5	1
SUB LEAKAGE		SKIP		
FLASH		SKIP		
LEAKAGE		SKIP		
TOUCH LEAKAGE		SKIP		
POLARITY		SKIP		
TESTCODE 1: I2F8008032				
TESTCODE 2: R222111111				
PERFORM TEST				

This option bypasses the need to edit a specific test sequence, allowing direct entry of a Testcode through the keyboard or a barcode scanner.

Use the cursor keys to highlight the Testcode to be changed. Press Green button to select that digit. Use the keyboard to change the value of the digit. Press Green button to confirm the change. Press the Red button to abort changes to the selected Testcode.

Use a barcode scanner to enter a Testcode

Use the cursor keys to highlight the PERFORM TEST option and press Green button to commence the test sequence.

Press the Red button to return to the previous menu.

*Note:*

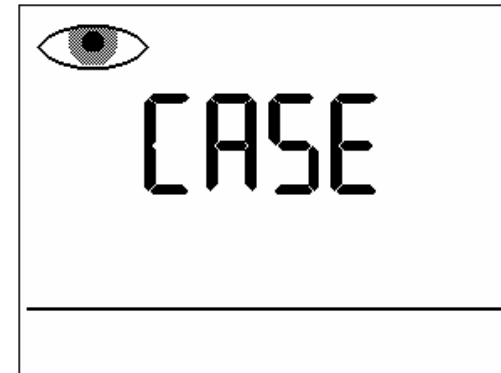
*If you enter the wrong testcode into the wrong field the Supernova will identify this and correctly enter the testcode. If using codes from previous Seaward models you can enter these in either field. These codes will then be automatically translated into Supernova format.*

### Perform Test

Use the cursor keys to highlight the Perform Test option and press Green button to perform the test. Pressing the Red Button will return to the previous menu.

The screen will change to the Meter Display (see separate section - How to use the Meter Display for an explanation).

If a visual test is included as part of the test sequence, the following screen will be displayed:-



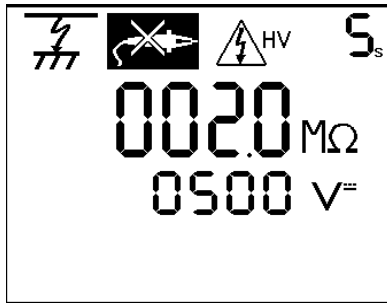
Use the Pass and Fail fast keys to proceed to the next test. Similar screens will be displayed for Lead and Fuse checks.

After the visual tests, the test sequence will continue into the first actual electrical test of the test sequence.

### Note

*Help screens may be displayed depending on the User Level set. It is possible to stop these appearing by altering the User Level. See EDIT USER LIST OPTIONS. Help can be displayed during any test by pressing the appropriately marked fast key.*

If an Insulation test has been selected, then once the test has commenced, a screen similar to the following will be displayed:-



If an external connection e.g. a probe is required, the display will flash the connection icon. The user needs to connect the probe. The test can then proceed when the GREEN BUTTON button is pressed. At the end of each test in the test sequence, the display will indicate the result.

All test results are automatically stored.

If any test in the test sequence fails, then the test sequence is aborted and an fail message will be displayed. A Failure Menu may be shown if the option is selected (see Test Options.)

-----ENTER COMMENTS-----

### ***Add Comments***

When you have completed a test you can enter comments which will be referenced to the Appliance number.

Use the keyboard to enter comments into the box. Press ENTER button for a new line. To store the comments press the OK fastkey. Your results and comments will now be stored.

### ***Options after Test***

-----OPTIONS-----
NEW TEST
REVIEW TEST RESULTS
DOWNLOAD TEST RESULTS
MAIN MENU

The options menu is displayed when

an Automatic sequence has been completed.

Use the cursor keys to highlight an option after test and press Green button to select the desired option.

### ***New Test***

Perform a new test.



## *Review Test Results*

Display the results from the test in tabular form:-

APPLIANCE	: A1212654673891	<b>PASS</b>		
SITE	: KITCHEN			
USER	: BOB			
TESTCODE1	: 1027353823			
TESTCODE 2	: 312169743A			
TEST	OUTPUT	LIMIT	RESULT	STATUS
EARTH BOND	25A	0.1ohms	0.99	PASS
EARTH BOND	25A	0.1ohms	0.98	PASS
INSULATION	500V	2Mohms	20.67	PASS
SUB LEAKAGE		7.5mA	<0.25	PASS
LOAD			2.00kVa	

A fast key may illuminate to 'view comments'.

Use the Red button to return to the previous menu.

## *Print Pass/Fail Label*

A pass or fail label can be printed using a compatible printer - see Chapter 6. Use the Green button to start the print. The following message will be displayed:-

PRINTING PASS/FAIL LABELS  
PRESS THE RED BUTTON TO  
ABORT

On completion, the Search menu is displayed.

If there are problems downloading e.g. due to interfacing problems, then after a delay, the following error message appears:-

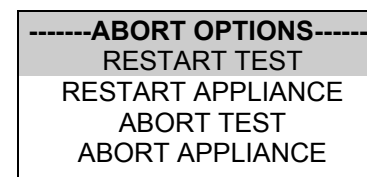
-----WARNING-----  
DOWNLOAD FAILED  
CHECK CONNECTIONS  
AND TRY AGAIN

Press the Red Button to return to the previous menu.

### **Main Menu**

Return to the Main Menu.

### **Abort Actions**



During an Automatic test, pressing the Red Button

immediately stops the test in progress and displays the following menu:-

Use the cursor keys to highlight an action following abort and press Green button to select the desired option.

### **Restart Test**

Restart the current test.

### **Restart Appliance**

Restart the first test in the test sequence for the current appliance.

### **Abort Test**

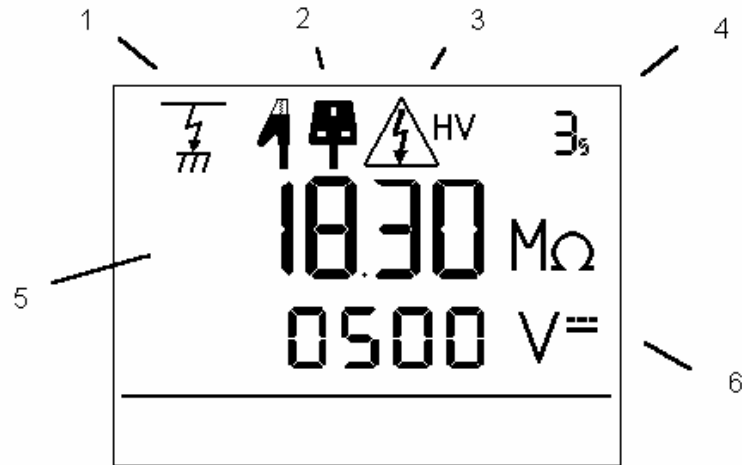
Abort the test without storing a test result and select the next test.

### **Abort Appliance**

Abort the test sequence and select a new appliance.

## ***How to use the Meter Display***

The following screen is displayed prior to tests commencing in both Manual Mode and Automatic Mode:-



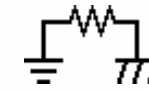
Ref. Number	Function
1	Test Icon
2	Connection Icon
3	Test in Progress Icon
4	Test Duration Counter
5	Primary Display
6	Secondary Display

### Test Icon

Indicates the test selected.



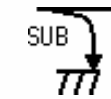
Visual



Earth Bond



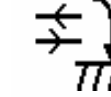
Insulation



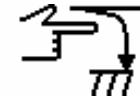
Substitute Leakage



Flash



Leakage & Load



Touch Leakage



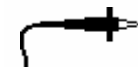
Polarity

### Connection Icon

Indicates connection required for external probes.



Earth Bond & Probe



Probe



No Probe



IEC Lead

### *Test in Progress Icon*

Indicates test in progress with voltage warning.

LV

Low Voltage



High Voltage



Applying Power

### *Test Duration Counter*

Indicates duration of test. This will count down, when the counter reaches zero if the Supernova is still taking a measurement the counter will flash.

### *Primary Display*

Indicates test result or pass/fail limit.

### *Secondary Display*

Indicates test output e.g. voltage or current.

## How to view Test Results

To view test results stored in memory, use the cursor keys to highlight the View Test Results option on the Main Menu and press Green button to display the following menu:-

-----SEARCH FOR RESULTS-----
APPLIANCE: *
SITE: *
LOCATION: *
USER: *
TEST STATUS: *
STORAGE STATUS: NORMAL
DATE FROM: 01/01/1900 00:00
DATE TO: 04/03/1999 13:07
START SEARCH

Use the cursor keys to highlight the required search parameters and press Green button to select the desired option.

## Appliance Number

Enter an Appliance number to search for specific results. If the Appliance number field is left blank then the character '\*' will be inserted, indicating to search for all of the appliances.

## Site Name

-----SITE LIST-----
*
OTHER...
SEAWARD
BSX LTD
HSH OFFICES

Use the cursor keys to highlight a Site name and press Green button to select the desired option. Select '\*' if you wish your search to include all of the sites. Select 'Other' to search for a Site not in the list (this can happen if a Site Name has been modified during testing). If you select 'other' you are prompted to enter a site name

### Location Name

```
---LOCATION LIST--
*
OTHER...
CAD ROOM
KITCHEN
ROOM 123
```

Use the cursor keys to highlight a Location name and press Green button to select the desired option. Select '\*' if you wish your search to include all of the names. Select 'Other' to search for a Location not in the list (this can happen if a Location name has been modified during testing). If you select 'other' you are prompted to enter a Location name

### User Name

```
-----USER LIST-----
*
OTHER...
ANTHONY
JOHN
MALCOLM
```

Use the cursor keys to highlight a User name and press Green button to select the desired option. Select 'All' if you wish your search to include all of the names. Select 'Other' to search for a User not in the list (this can happen if a User name has been modified during testing). If you select 'other' you are prompted to enter a user name.

### **Test Status**

When Test Status is highlighted use the Green button to select the option required, everytime you press the Green button a different option will be displayed. This can be PASS, FAIL or '\*' which indicates both.

### **Storage Status**

When Storage Status is highlighted use the green button to select the option required, everytime you press the Enter button a different option will be displayed. This can be NORMAL, DELETED or '\*' which indicates both.

### **Date From**

This option allows the user to search for test results after the selected date. Use the cursor keys to highlight the digit to be changed. Use

-----DATE FROM-----
01/01/1900 00:00

the (up or down) cursor keys to change the value or enter the digits directly using the keypad. Select OK to store the settings or CANCEL to abort them.

### **Date To**

This option allows the user to search for test results before the selected date. Use the cursor keys to highlight the digit to be

-----DATE TO-----
01/01/1900 00:00

changed. Use the cursor keys to change the value or enter the digits directly using the keypad. Select OK to store the settings or CANCEL





### **Appliance Test Results**

It is possible to view the results obtained for a certain appliance by highlighting the appliance number and pressing the Green button.

APPLIANCE	: A1212654673891	<b>PASS</b>		
SITE	: KITCHEN			
USER	: BOB			
TESTCODE1	: 1027353823			
TESTCODE 2	: 312169743A			
TEST	OUTPUT	LIMIT	RESULT	STATUS
EARTH BOND	25A	0.1ohms	0.99	PASS
EARTH BOND	25A	0.1ohms	0.98	PASS
INSULATION	500V	2Mohms	20.67	PASS
SUB LEAKAGE		7.5mA	<0.25	PASS
LOAD			2.00kVa	

A fast key may illuminate to 'view comments'

Use the Red button to return to the previous menu.

### **How to perform Manual Tests**

Manual mode provides the user with direct access to the tests. In this mode individual tests can be selected and performed. Appliance numbers, sites, users and testcodes can still be assigned to appliances if required, though this is not essential.

### **Entering Manual Mode**

Use the fast key to select Manual Mode from the Main Menu.

The manual tests and other options available are shown in the table below:-

-----MANUAL TEST SELECTION-----
A..CREATE APPLIANCE NO.
S..CHANGE 230V/115V OP SOCKET
1..VISUAL CHECK
2..EARTH BOND TEST
3..INSULATION TEST
4..SUB LEAKAGE TEST
5..LEAKAGE TEST
6..FLASHTEST
7..TOUCH LEKAGE TEST
8..POLARITY TEST
C. ENTER COMMENTS & STORE RESULTS

Press the appropriate key to select a test or option.

### *note*

*To store tests in memory from Manual mode you must first select Create Appliance No., perform the tests required from the EUT. When you have completed the required tests select Enter Comments/Save Results, upon leaving this option the Supernova will now store the results. Note that the Enter Comments option is not displayed until there is something to store. Tests carried out without appliance details being entered will not be stored*

### Create Appliance Number

<b>----ENTER APPLIANCE DETAILS----</b>
APPLIANCE :
<b>SITE : SEAWARD</b>
LOCATION : CAD ROOM
OK

This allows all manual tests performed to be stored against the appliance number until the appliance number is changed.

Use the keyboard or a compatible Barcode Reader to enter an Appliance Number.

#### Note

See Chapter 4 for tips on using barcodes.

If you need to change the current Site use the cursor keys to highlight SITE and press Enter to change the Site Name.

<b>-----SELECT SITE-----</b>
SEAWARD
<b>BSX LTD</b>
HSH OFFICES

Use the cursor keys to highlight a Site name and press Enter to select the desired option.

If you need to change the current Location use the cursor keys to

<b>---SELECT LOCATION---</b>
<b>WORKSHOP</b>
CAD ROOM
KITCHEN

highlight LOCATION and press Enter to change the Site Name

Use the cursor keys to highlight a Location name and press Enter to select the desired option.

### *Note*

*Default settings for Sites and Test Sequences are pre-loaded into the Tester. See 'How to use Setup' to change these settings.*

### ***Change Output Socket***

Press the S key to toggle between 230V and 115V output sockets. The LED indicators on the Top Panel indicate which socket is active. You may need to use the adaptor when changing voltages

Use the keyboard to enter comments into the box (4 lines of 20 characters). Press Enter for a new line. To store the comments press the OK fastkey. Use the Red button if you do not want to store the comments.

### ***Select Manual Test***

Use the appropriate number key from the table to select a specific test or use the cursor to highlight the desired option.

### ***Performing a Manual Test***

After selecting the appropriate test the tester displays a screen from which you can set test parameters.

The user can change an individual setting when the icon is shown inverted. Use the left and right cursor keys to highlight a field on the display. Then use the up & down cursor keys to change the variable in the selected field.

When an icon is shown inverted use the left and right cursor keys to highlight a field on the display. Then use the up and down cursor keys to change the variable in the selected field.

When the connection icon is flashing you cannot change any settings.

*note*

*You cannot change the settings for a test if you have performed that test from within an appliance sequence. For example after selecting Create Appliance No you can only change the Earth Bond settings on the first Earth Bond test, all subsequent Earth Bond test will conform to the same settings.*

Press the Green button to start the test.

Press the Red button to abort the test at any time.

*Note*

*In manual mode you will not get Abort Options, the test will simply stop the test and revert to the Meter display. The aborted test will not be stored.*

If an Appliance Number has been created, the test result will be stored under the entered number. To store tests to memory choose Enter Comments / Save Results.

### *Enter Comments/Save Results*

When you have completed a test you can enter comments which will be referenced to the Appliance number.

-----ENTER COMMENTS-----

## How to download Data

To download results stored in memory, use the cursor keys to highlight the Download Data option from the Main Menu and press Enter to display the following menu:-

```
-----DOWNLOAD OPTIONS-----
DESTINATION      : GENERIC PRINTER
OUTPUT CONNECTION : RS232
BAUD RATE        : 9600

DOWNLOAD FORMAT  : CERTIFICATE
OPTION           : ONE PER PAGE
                  OK
```

Use the cursor keys to highlight the required parameters. Use repeated presses of the green button to show the desired options for destination, output connection and baud rate.

## Download Format

This field shows the format choices available depending upon the destination selected.

For downloading to a PC the user has the option of sending data in a PATS+ format, compatible with Seaward PATS+ software, SSS format - Seaward super system, compatible with Seawards PATS Win software, certificate - downloads results in non-ASCII certificate format.

In PATS+ format the user has the option to download by site (send site) or to download by user (send user). This will be truncated to 10 characters.

For downloading to a generic A4 printer the user has the option of sending data as a certificate, or a list, or as pass/fail labels. In the certificate format the user has the option to produce one certificate per page or to produce continuous printouts.

For downloading to a roll printer, including 'till roll' and thermal printers the user has the option of sending data as a continuous list or as pass/fail labels. When using a compatible thermal roll printer the pass/fail labels will produce appliance number and in a number and barcode format. However, the restrictions of paper width means

that appliance numbers representing more than 12 digits cannot be printed and a numbered label will print instead. Testcodes over 12 and upto 15 digits can be accomodated since these are displayed as two lines.

Use repeated presses of the green button to show desired settings for download format. If appropriate the option field will illuminate. Use repeated presses of the green button to show desired settings.

When the download options are as you wish highlight the OK field and press the green button to display the following menu:-

-----SEARCH FOR RESULTS-----
APPLIANCE: *
SITE: *
LOCATION: *
USER: *
TEST STATUS: *
STORAGE STATUS: NORMAL
DATE FROM: 01/01/1900 00:00
DATE TO: 04/03/1999 13:07
START SEARCH

Use the cursor keys to highlight the required search parameters and press Enter to select the desired option.

### ***Appliance Number***

Enter an Appliance number to search for specific results. If the Appliance number field is left blank then the character '\*' will be inserted, indicating to search for all of the appliances.



## Site Name

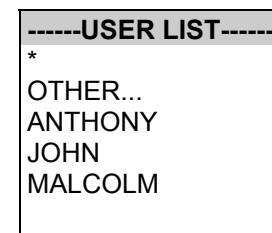
```
-----SITE LIST-----
*
OTHER...
SEAWARD
BSX LTD
HSH OFFICES
```

Use the cursor keys to highlight a Site name and press Enter to select the desired option. Select '\*' if you wish your search to include all of the sites. Select 'Other' to search for a Site not in the list (this can happen if a Site Name has been modified during testing). If you select 'other' you are prompted to enter a site name

## Location Name

```
---LOCATION LIST---
*
OTHER...
CAD ROOM
KITCHEN
ROOM 123
```

Use the cursor keys to highlight a Location name and press Enter to select the desired option. Select '\*' if you wish your search to include all of the names. Select 'Other' to search for a Location not in the list (this can happen if a Location name has been modified during testing).. If you select 'other' you are prompted to enter a location name

**User Name**

Use the cursor keys to highlight a User name and press Enter to select the desired option. Select 'All' if you wish your search to include all of the names. Select 'Other' to search for a User not in the list (this can happen if a User name has been modified during testing). If you select 'other' you are prompted to enter a user name

**Test Status**

When Test Status is highlighted use the Green button to select the option required, everytime you press the Green button a different option will be displayed. This can be PASS, FAIL or '\*' which indicates both.

### **Storage Status**

When Storage Status is highlighted use the Green button to select the option required, everytime you press the Green button a different option will be displayed. This can be NORMAL, DELETED or '\*\*' which indicates both.

### **Date From**

-----DATE FROM-----
01/01/1900 00:00

This option allows the user to search for test results after the selected date. Use the cursor keys to highlight the digit to be changed. Use the (up or down) cursor keys to change the value or enter the digits directly using the keypad. Select OK to store the settings or CANCEL to abort them.

### **Date To**

-----DATE TO-----
01/01/1900 00:00

This option allows the user to search for test results before the selected date. Use the cursor keys to highlight the digit to be changed. Use the cursor keys to change the value or enter the digits directly using the keypad. Select OK to store the settings or CANCEL to abort them.

### **Search**

After all the search parameters have been set, connect the appropriate printer or device. Highlight START SEARCH & press the GREEN BUTTON to search and download process.

If there are problems downloading e.g. due to interfacing problems, then after a short delay, the following error message appears:-



Press the red button to return to the search menu. On completion of successful downloading, the tester returns to the search for results menu. The user can then conduct on other search or press the red button to return to the main menu.

## ***How to print Barcode Labels and Testcodes***

The Supernova is capable of printing barcode labels in conjunction with a compatible thermal printer (see chapter 6).

### ***To print barcode testcodes***

To print barcode test codes select setup from the main menu and select test settings from the setup menu. From the select test settings menu chose the desired test eg HOUSEHOLD CLASS 1. Attach the compatible printer to the port and from the test settings editor highlight the PRINT TESTCODE option and press enter.

### ***To Print Barcode Pass/Fail Labels***

To print barcode pass/fail labels it is necessary to carry out an actual test. (see how to perform automatic tests.) After a test is complete and the results stored in memory it is possible to download results to a thermal printer (see how to download results) and print pass/fail labels.

#### *Note*

*Restrictions of paperwidth means that representing more than 12 digits cannot be printed and a numbered label will print instead.*

*The print format options available are dependant upon the the specific printer chosen.*

## How to use Setup

To set up the Tester, use the cursor keys to highlight the Setup option on the Main Menu and press Enter to display the following menu:-

-----SETUP-----
EDIT TEST SETTINGS
EDIT USER LIST / OPTIONS
EDIT SITE LIST
EDIT LOCATION LIST
CHANGE DATE/TIME
SET LANGUAGE
SYSTEM CONFIGURATION
CHANGE PASSWORD
SET BRIGHTNESS
FACTORY SETTINGS

From this menu you can change the way the Tester will operate and also change user levels and sites. Use the cursor keys to highlight a function and press Enter to select the desired option.

### Edit Test Settings

This allows the user to add, modify, remove or confirm test settings that can then be selected during automatic testing.

Also see Change Password.

SELECT TEST SETTING
A. IT EQUIPMENT
B. DOMESTIC CL1
C. DOMESTIC CL2
D. ?
E. ?

Use the cursor keys to highlight a Test Setting and press Enter to enter the Test Settings Editor:-

## Test Settings Editor

The Test Settings Editor allows the test sequence for the selected test to be examined and changed if required:-.

-----DEFAULT SEQUENCE EDITOR-----				
-				
	OUTPUT	LIMIT	DUR	NUM
SOCKET	230V			
VISUAL		YES		1
EARTH BOND	4A	0.10Ω	5	1
INSULATION	500V	0.50MΩ	5	1
SUB LEAKAGE		SKIP		
FLASH		SKIP		
LEAKAGE		SKIP		
TOUCH LEAKAGE		SKIP		
POLARITY		SKIP		
NAME: IT EQUIPMENT				
TESTCODE 1: I0G2000122				
TESTCODE 2: R222111111				
PRINT TESTCODES				
STORE SETTINGS				

Use the cursor keys to highlight a field to be changed and press Enter to select the desired option.

## Name

Each Sequence is given a name, this is to help the user when selecting Sequences during automatic testing. When Name is highlighted press the Green button, then use the keyboard to enter a new name for the Test Sequence (of up to 15 characters) and press Enter to confirm.

## Test Parameter Fields

By selecting one of the test parameter fields from the Test Settings Editor, a list of options for that field will be displayed:-

---

-----INSULATION-----			
O/P	LIMIT	DUR	REP
250V	0.5MΩ	2s	0
500V	1.0MΩ	5s	1
	2.0MΩ	10s	2
	7.0MΩ	30s	4
	SKIP		5
			10
			15
			20
			25
			30
			UL

When you first enter this menu all of the previous value and one of the field descriptions are highlighted. Use the cursor left and right keys to highlight the description, then use the cursor up and down keys to highlight the required setting. Use this process for each description.

Use the Green button to save the settings and return to the Test Settings Editor. Press the Red button to abort changes made to the settings and return to the Test Settings Editor.

### *Testcodes*

Use the cursor keys and Enter to select one of the Testcode fields.

A Testcode can be entered manually or through a compatible barcode scanner, reader or wand (see How to use a Barcode Scanner).

The Supernova has two testcodes, when entering a Seaward PAT testcode they will automatically translated into Supernova testcodes.

### *Store Settings*

Use the cursor keys to highlight the Store Settings option and press Enter to save the settings and return to the previous menu. Pressing the Red Button will abort all of the changes made and return to the previous menu.

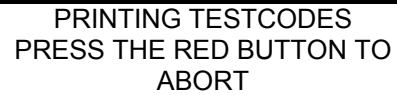


---

### *Print Testcodes*

The testcodes can be printed (using a compatible printer - see Chapter 6).

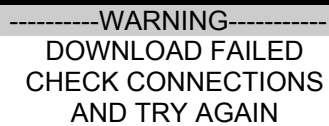
Use the Green button to start the print. The following message will be displayed:-



PRINTING TESTCODES  
PRESS THE RED BUTTON TO  
ABORT

On completion of downloading, the Test Settings Editor menu is displayed.

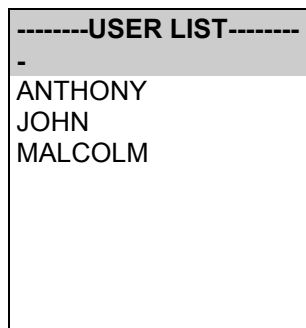
If there are problems downloading e.g. due to interfacing problems, then after a delay, the following error message appears:-



-----WARNING-----  
DOWNLOAD FAILED  
CHECK CONNECTIONS  
AND TRY AGAIN

Press the Red Button to return to the Test Settings Editor menu.

### *Edit User List / Options*



-----USER LIST-----  
-  
ANTHONY  
JOHN  
MALCOLM

---

Use the cursor keys to highlight a User name and press Enter to select the desired option:-

----- <b>EDIT USER SETTINGS</b> -----
NAME: JOHN
<b>USER LEVEL: ADVANCED</b>
STARTUP MODE: AUTO
BEEP ON KEYPRESS: YES
BEEP ON TESTS: YES
BEEP ON BARCODES: YES
OK

*Note*

*If you change the name of the user during testing all of the previous tests will still be referenced to the old user name, this gives unlimited amounts of users within memory.*

To change the user name highlight Name and press the Green button.

Use the cursor keys to highlight options that can be customised for each user and press Enter to select the desired option.

### *User Level*

Use the cursor keys to highlight a user level and press Enter to select the desired option.

#### Novice User

Selects the user level as a regular user. This provides an average level of help information and additional warnings and prompts

#### Advanced User

Selects the user level as an advanced user. This provides a minimum level of help information and additional warnings and prompts

### *Startup Mode*

Use the cursor keys to highlight a test mode on startup and press

---

Enter to select the desired option.

#### Automatic Mode

The Tester will start up in Automatic Mode, with the Tester displaying the Main Menu.

#### Manual Mode

The Tester will start up in Manual Mode, with the Tester displaying the Manual Test Selection Menu.

#### *Beep on Key Press*

Use the cursor keys to highlight a buzzer option and press Enter to select the desired option. This option will beep everytime a key is pressed.

#### *Beep on Tests*

Use the cursor keys to highlight a buzzer option and press Enter to select the desired option. This option will beep whenever the High Voltage Test in Progress icon is displayed or a test has failed.

#### *Beep on Barcodes*

Use the cursor keys to highlight a buzzer option and press Enter to select the desired option. This option will beep whenever a barcode has been received.

#### *Saving User Settings*

In the Edit user settings menu, highlight OK and press the Green button. The user settings will then be saved.

#### *Edit Site List*

-----EDIT SITE LIST-----
WORKSHOP
KITCHEN
CAD ROOM
OFFICE
LAB

---

Use the cursor keys to highlight a Site name and press Enter to select the desired option.

--EDIT SITE NAME--
OFFICE

*Note*

*If you change the name of the site during testing all of the previous tests will still be referenced to the old site name, this gives unlimited amounts of sites within memory.*

If you chose to edit an existing site the name of the site will be shown in the box. If you chose to edit an empty box (signified by a ?), the box will be empty. Use the keyboard to enter the name of the site and press Enter to return to the previous menu.

**Edit Location List**

-----EDIT LOCATION LIST-----
WORKSHOP
KITCHEN
CAD ROOM
OFFICE
LAB

Use the cursor keys to highlight a Location name and press Enter to select the desired option.

--EDIT SITE NAME--
OFFICE

*Note*

*If you change the name of the site during testing all of the previous tests will still be referenced to the old site name, this gives unlimited amounts of sites within memory.*

If you chose to edit an existing site the name of the site will be shown in the box. If you chose to edit an empty box (signified by a ?), the box will be empty. Use the keyboard to enter the name of the site and press Enter to return to the previous menu.

---

## Change Time/Date

-----SET DATE AND TIME-----
01/01/1900 00:00

This option allows the user to change the Date and Time. Use the left and right cursor keys to highlight the digit to be changed. Use the up and down cursor keys to change the value or enter the digits directly using the keypad. Select OK to store the settings or CANCEL to abort them. To store the new setting you must return to the MAIN MENU.

## Set Language

-----SET LANGUAGE-----
ENGLISH
FRANCAIS
DEUTSCH
ITALIANO
NEDERLANDS

Use the cursor keys to highlight a language and press Enter to select the desired option.

### Note

*If the selected language is unavailable, a message will be displayed.*

## System Configuration

The Test Settings are included to cover the wide range of options which may be country or company specific.

---

-----SYSTEM CONFIGURATION-----	
SUB LEAKAGE	0%
POWER POLARITY	INPUT & REVERSED
ON TEST FAILURE	END APPLIANCE
ROLL PRINTER	A-P860B
DATE AND TIME	UNPROTECTED
USER LIST	UNPROTECTED
APLNCE & CMNTS	FULL LENGTH
OK	

#### Sub Leakage

This option allows you to set the Sub Leakage value indicated 10%, 6% or 0% high, depending upon national legislation or best practice.

#### Power Polarity

The Power Polarity option will allow the tester to perform the power tests in one of three ways.

Input Polarity:- perform the power tests with the same mains polarity as the Supernova is powered.

Auto-corrected:- perform the power tests with the mains correct polarity even if the Supernova is powered from a socket which has the mains polarity reversed.

Input & reversed:- this option will perform two power tests for every one selected, one with the correct mains polarity and one with the reverse mains polarity.

#### On Test Failure

This gives you the option of having a menu for a failure within an automatic sequence. This menu will give you the option of retrying a failed test or appliance.

#### Roll Printer

This allows the user to define the thermal printer to be used with the Supernova. Seawards recommended option is "SEAWARD (283A954)"

#### Date & Time

This allows the user to password protect the date and time. An existing password must be setup before this option can be used.

### User List

This allows the user to password protect the User List. An existing password must be setup before the option can be used.

### Aplnce & Cmnts

This allows the user to limit the Appliance number and Comment lines to 10 digits. When limited to 10 digits the Supernova can be downloaded to a wider range of software.

### ***Change Password***

It is possible to Password protect the Test Sequence Editor and the Country Settings.

If you currently do not have password protection you will be asked to enter a new password twice, once for confirmation.

If you currently do have password protection then you will be asked for the old password before entering a new one, again you will be asked for the new password twice.

To clear the password protection simply press Enter when asked for the new password. A warning will show that no password is in place.

### ***Set Brightness***

You can now set the Brightness of the display. Use the cursor keys to change the Brightness, once the Brightness is set press the Green button to accept the changes. Press the Red button to abort any changes made.

### ***Factory Settings***

It is possible to reset the Supernova to the settings which were configured from new. This option will first ask you if you are sure, select Yes to reset or No to abort.

### ***How to use the Memory***

To use the memory tests and functions, use the cursor keys to highlight the Memory Options option on the Main Menu and press Enter to display the following menu:-

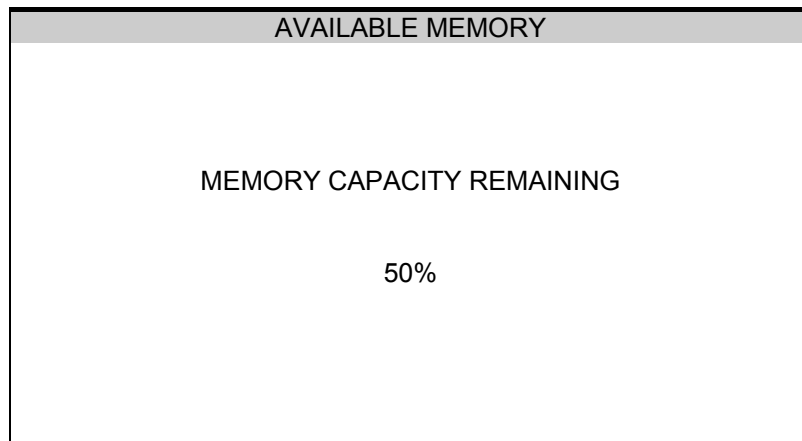
-----MEMORY OPTIONS-----
VIEW MEMORY USED
PERFORM MEMORY TEST
DELETE SINGLE APPLIANCE
CLEAR RESULTS MEMORY
CLEAR TESTFILE MEMORY

Use the cursor keys to highlight a test or function and press Enter to select the desired option.

### ***View Memory Used***

The Tester allows the user to see how much of the results memory is being used. The following bargraph of the memory remaining is displayed:-





### **Perform Memory Test**

Once the perform memory test option is highlighted press the green button.

The memory test checks all of the appliance results against their checksums. If the test result is a pass then no action is taken. If any tests fail then the Memory checksum requires updating. Use the cursor keys and press Enter to choose an action if corrupted tests are found.

#### *Note*

*The memory checksum is the sum of all of the memory excluding display data, registers and deleted tests.*

### **Delete Single Appliance**

-----DELETE APPLIANCE-----
APPLIANCE NUMBER

Enter the Appliance number to delete a single appliance and press Enter .

A warning 'Are You Sure ?' prompt will appear. Press the No fast key

to return to the previous menu or press the Yes fast key to perform the delete operation and return to the previous menu.

### ***Note:***

*Deleting Appliances in this way will delete all of the matched appliances across all of the Sites and Locations.*

*When a single appliance is deleted it is not removed from memory but hidden from the user. This test is still resident in memory and is taking up memory space, this test can be reviewed / downloaded at a later date. Since the test is still resident in memory the View Memory Capacity figure may seem false. i.e whilst you may think you have no results stored and the View Memory Capacity indicates there are results stored, previously deleted appliances are resident in memory. In this situation to remove all resident tests select clear results memory.*

## ***How to upload test details to your Supernova***

To upload test details to the Supernova memory first connect the serial port of the Supernova to the appropriate port on your PC using a serial-download lead (9-9way or 9-25 Way). Please see the optional accessories section of this manual for part numbers.

From the main menu on the tester use the cursor keys to select REMOTE MODE, the tester is now ready to accept download data. Follow the instructions supplied with your results recording software to communicate with the tester. Once the communication is in process the tester will show a count of tests being transferred. The software and Supernova will display a message to say that the transfer is complete. Once complete press the ABORT key and return to the MAIN MENU. Disconnect the serial download lead and the Supernova can be used as normal.

### ***Clear Results Memory***

This option will delete all of the appliances currently stored in memory and should be used carefully!

A warning 'Are You Sure ?' prompt will appear. Press the No fast key to return to the previous menu or press the Yes fast key to perform the delete operation and return to the previous menu.

### **Clear Upload Memory**

This option will delete all of the appliance codes that have been uploaded from an external computer and should be used carefully!

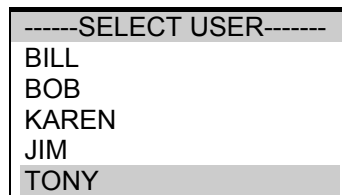
#### *Note*

*Users will be asked whether they are sure about performing this action.*

A warning 'Are You Sure ?' prompt will appear. Press the No fast key to return to the previous menu or press the Yes fast key to perform the delete operation and return to the previous menu.

### **How to change the User**

To change the User, use the cursor keys to highlight the Change User option on the Main Menu and press Green button to display the following menu:-



Use the cursor keys to highlight the User and press Green button to select the desired option.

## ***How to use Help***

The Tester is provided with an on-line help function which can be called up at during the test screens by pressing the Help fast key.

Each test will have three or four help pages depending on connection information.

## ***Help Provided to the User***

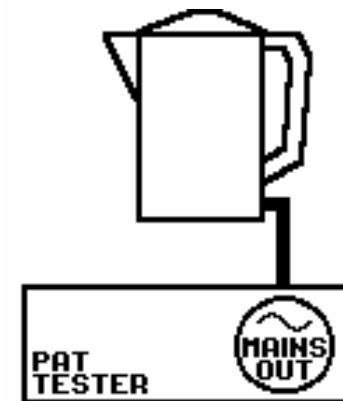
The Help function provides the following information:-

### ***Description of Test***

The first help page shown contains information on the particular test, including its icon and a description of the purpose of the test.

### ***How to Perform Tests***

The second page of information describes how the Tester performs the test. A diagram showing how to connect the Tester to the EUT is included. An example for the Insulation test is shown below:-



A description of how to connect the test leads and perform the test is provided in a step-by-step format.

### *Note:*

*This topic will cover one or two pages depending on the connection options available (Insulation and Flash can be Class 1 or Class 2). Each connection option will have a new page of information.*

### ***Why tests fail***

The final page of information provides guidance on why a test may fail e.g. connection problems. This includes a step by step check list to ensure all of the connections are correct and secure.

### ***The effect of User Levels during Test Sequences***

There are two possible user levels: Novice, and Advanced.

### *Note*

*The user level for a new user is set to Novice.*

### **Novice User Level**

When the user level is set to Novice Level, the help information is displayed before every new test

Press the Green button key to continue the sequence.

### **Advanced User Level**

When the user level is set to Advanced Level, no help information will be shown before a test. Use the Help/Information key for help information if required at any time.

## Chapter 4 Tips & Troubleshooting

### **Power -On Self tests:**

When the tester is powered on, a number of messages can possibly appear as the tester performs safety tests on itself and the mains power supply.

If a voltage greater than 30V is detected on the neutral input line or the earth is missing then the following message will be displayed.

#### **LIVE & NEUTRAL INPUT REVERSED REVERSING INTERNALLY**

Check for incorrect wiring on supply.

The next test will check for an earth connection. If there is no Earth connection, the following message will appear.

**EARTH CHECK FAILED !!  
PRESS THE ENTER  
BUTTON IF SAFE**

Check for incorrect wiring on supply.

The Tester will fail the earth check if it is being supplied with a balanced supply (e.g. 55V - 0 - 55V ) since it will detect phase voltage on both L and N supply connections. Only continue if certain that the supply is balanced and the earth on the Tester connection is secure.

If all the above is checked the Supernova maybe faulty contact Seaward for repair

The unit then completes an internal check. If any faults are found then the following message will be displayed:-

**1INTERNAL RELAY FAULT  
CANNOT PROCEED !!**

The Supernova is faulty and should be returned to Seaward for Repair

### ***Sequence Warning Faults***

If you enter a testcode which involves tests the Supernova cannot perform then you may see one of the following warnings.

```
-----WARNING-----  
THE SELECTED TESTCODE SPECIFY  
THAT A 200mA (DC) EARTH BOND  
TEST SHOULD BE PERFORMED  
THIS IS NOT POSSIBLE ON THE  
SUPERNOVA  
A 100mA (AC) TEST WILL BE  
PERFORMED. PRESS START KEY TO  
CONTINUE
```

### ***Safety Tests during operation***

The Tester performs self-tests during normal operation. An internal earth bond test and a low voltage test are performed prior to applying mains power to any EUT (including Load/Leakage and Touch Leakage tests). If the internal earth bond test is failed, the following message will be displayed:-

**INTERNAL RELAY FAULT  
CANNOT PROCEED !!**

If this message appears, the Supernova is faulty and requires repair.

If the low voltage test fails, then either of the following warnings will be displayed:-

```
-----WARNING-----  
APPLIANCE MAY BE SHORT CIRCUIT  
PRESS THE ENTER BUTTON IF SAFE  
PRESS THE RED BUTTON TO ABORT
```

-----WARNING-----  
FUSE MAY BE OPEN CIRCUIT OR  
PRESS THE ENTER BUTTON IF SAFE  
PRESS THE RED BUTTON TO ABORT

These messages mean that the appliance under test is switched off or the fuse may be open circuit, or it maybe possible that the appliance under test will draw more than 18A and could damage the Supernova. User discretion is required. If in doubt do not test and seek advice.

### ***Temperature monitoring***

The tester is provided with temperature monitoring facilities to ensure that prolonged tests do not overheat sensitive components. If , during testing a 'Hot' warning is displayed, switch off any EUT, and allow the tester to cool. This is provided to allow the EUT to be switched off in a controlled way. If the tester determines that damage will occur if the test is allowed to continue, the test will be switched off and the following message will be displayed:-

#### **WARNING**

**THE TEST HAS BEEN ABORTED BECAUSE THE APPLIANCE  
TESTER BECAME TOO HOT. ALLOW THE UNIT TO COOL  
BEFORE STARTING PRESS GREEN BUTTON TO CONTINUE**

### ***Multiple Earth connections:***

In general, multiple earth connections to an EUT (e.g. water pipe connections to a water heater) can cause difficulties in measurement. This has previously needed the additional earth connections to be isolated.

The Supernova tester is capable of testing earth connections in the presence of additional earth paths. This is done automatically by performing a point to point measurement of the earth connection, and measurement of the differential leakage current, rather than the earth



lead current. Measurements are thus assured without special precautions.

## **Barcodes**

### *Barcode Scanner Specification*

The Supernova Tester can be used with barcodes and barcode scanners, readers or wands compatible with the Seaward PAT2000i. These connect to the serial (RS232) connector. The required configuration is as follows:-

Baud Rate:	9600
Start Bits:	2
Data Bits	8
Stop Bits:	2
Parity:	None
Inter-character Delay:	20ms

### *When to use a Barcode Scanner*

Barcodes can be scanned at the following points:-

- Entering a Testcode as part of an Automatic Test
  - Test Setting Editor
  - Use Testcodes
- Entering an Appliance number

## **Interfacing**

The Tester provides two interfacing ports:-

Serial Port - for connection to a PC, printer or Barcode Reader

To avoid any problems during download, ensure that leads are undamaged and correctly wired.

The Connector pinouts for Serial port are shown below:-

Parallel - The Supernova features a serial port. However a serial to parallel adaptor is available to allow interface with parallel ports. See accessories in Chapter 6.

## **Downloading to Computer Software**

The Europa can be setup to be backward compatible with various software packages. The APLNCE & CMNTS option can be found in SYSTEM CONFIGURATION in the SETUP menu.

### **Note for PATS/PATS+ for DOS Users**

Please note that if the version you are using is earlier than 5.4 then it is not millenium compatible and therefore requires upgrading. Contact on 0191 586 3511.

If you are using version 5.4f or later then you can set APLNCE & CMNTS to FULL LENGTH to obtain the 15 digit Appliance Number and 20 digit comments lines.

If you are using an earlier version than 5.4f the leave APLNCE & CMNTS set to 10-DIGIT RESTRICTION.

### **Note for PATS+ for Windows Users**

Please note that you should be using version 1.03.15 or higher. This version allows you to set the APLNCE & CMNTS to FULL LENGTH to obtain the 15 digit Appliance Number and 20 digit comments lines.

If you are not using the latest version please contact your supplier for a free update.

### **Note for PATSwin Users**

Please note that you should be using version 1.05 or higher. This version allows you to set the APLNCE & CMNTS to FULL LENGTH to obtain the 15 digit Appliance Number and 20 digit comments lines.

If you are not using the latest version please contact Seaward on 0191 586 3511 for a free update.

Please note that when using PATSwin it only accepts the first 3 results of any test type. This may lead to a FAILED appliance being indicated as a PASS. For example if the fourth Earth Bond is a fail, PATSwin will only record the three results, these may all be passes.

### **Note for PATSwin Users**

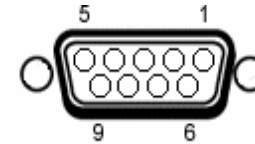
The Europa has only been tested with Powersuite version 1.4. If you are using Powersuite then leave the APLNCE & CMNTS set to 10-DIGIT RESTRICTION.

When downloading use the Download Wizard and select PAT 2000iee as the tester to download.

Please note that when using PATSwin it only accepts the first 3 results of any test type. This may lead to a FAILED appliance being indicated as a PASS. For example if the fourth Earth Bond is a fail, PATSwin will only record the three results, these may all be passes.

## Serial Port

The serial port uses a standard 9-way D-type connector



Pin	Description
1.	N.C.
2.	RX
3.	TX
4.	DTR
5.	0V
6.	N.C.
7.	0V
8.	N.C.
9.	+5V

Baud Rate: 9600, 19200, 28800 (selectable)

Start Bits: 2

Data Bits: 8

Stop Bits: 2

Parity: None

Inter-character Delay: 20ms

## **Quick Reference**

### **Editing the date in all modes**

On delivery of the Supernova it is necessary to ensure that the correct time and a date are stored. Once stored the time/date is retained in memory and does not need to be entered again. To edit the date: from the MAIN MENU select SETUP, select, CHANGE TIME/DATE, use the cursor keys to highlight the digit to be changed. Press GREEN BUTTON to confirm the change. To store the changed time/date setting return to the MAIN MENU. The unit will then display the message STORING SYSTEM DATA.

### **Entering a User Name**

On delivery of Supernova it is necessary to ensure that a user name(s) is stored. To edit the user list: from the MAIN MENU select SETUP, select EDIT USER LIST, use the cursor keys and select USER 1, a screen will appear "EDIT USER NAME" use the keyboard to type in the desired name and press GREEN BUTTON to return to the previous menu.

### **Editing User Level and Novice Mode**

The Supernova is delivered with a default setting of novice user level. To change this setting: from the MAIN MENU select SETUP, select USER OPTIONS, select USER LEVEL, select the desired level by selecting either REGULAR or ADVANCED. To store the changed user level setting return to the MAIN MENU. The unit will then display the message STORING SYSTEM DATA.

### **Storing Appliance Test Results in Automatic mode**

The Appliance Test Results will not be stored until you leave the OPTIONS MENU, upon leaving this menu the unit will display the messages STORING RESULTS then SAVED OK. Your results have now been stored.

### **Storing Appliance Test Results in Manual mode**

The Appliance Test Results will not be stored until a Manual Appliance Sequence has been completed. To do this firstly press A, this will prompt you for an Appliance number, enter this and press GREEN BUTTON twice. Perform the tests required then press C, this will prompt you to enter comments, select SAVE COMMENTS/RESULTS and press GREEN BUTTON. The unit will then display the messages STORING RESULTS then SAVED OK. Your results have now been stored.

### **Storing System Data**

System Data consists of everything changed from within the SETUP MENU. To store the System Data return to the MAIN MENU from the SETUP MENU. The unit will then display the message STORING SYSTEM DATA. This will only be done if changes have been made, if no changes have been made then the system data will not be updated.

### **Waiting for a Yes/No response**

When you are prompted to respond with YES or NO you must use the fastkeys under the display.

### **Using Symbols in Text Fields**

Although there is an option to use non-ascii symbols as Appliance numbers, Site & Location descriptions, User names and comments does not guarantee that your computer software will support them. If you are unsure avoid using symbols.

### **10 Digit Restriction**

When you first receive your Supernova the Appliance and Comments will be set to '10 Digit Restriction'. If you are using compatible software then this option can be set to 'Full Length'. When set to 'Full Length' the maximum Appliance length is extended to 15 characters while the maximum line for the comments is extended to 20 characters per line.

### **Comparing Flash test results with other testers**

To comply with forth coming test standards the Flash output current has been limited. The actual current displayed with differ from previous testers as illustrated in the table below.

<b>Load</b>	<b>Previous Testers</b>	<b>Supernova</b>
3M ohms	0.5mA	0.43mA
1.5M ohms	1mA	0.75mA
750K ohms	2mA	1.2mA
500K ohms	3mA	1.5mA
300K ohms	5mA	1.87mA

The Flash pass/fail limits have been adjusted from 3mA and 5mA to 1,5mA and 2mA respectively.

## **Chapter 5 Maintaining the Tester**

### ***Cleaning the Tester***

The Tester case can be cleaned with a damp cloth, with if necessary, a small amount of mild detergent. Prevent excessive moisture around the socket panel or in the lead storage area.

Do not allow liquid inside the Tester, or near the sockets panel. Do not use abrasives, solvents, or alcohol.

If any liquid is spilt into the Tester case, the Tester should be returned for repair, stating the cause of the defect.

### ***User Maintenance***

The Tester is a rugged quality instrument. However, care should always be taken when using, transporting and storing this type of equipment. Failure to treat the product with care will reduce both the life of the instrument its reliability.

If the Tester is subject to condensation, allow the Tester to completely dry before use.

- Always check the Tester and all test leads for signs of damage and wear before use.
- Do not open the Tester under any circumstances.
- Keep the instrument clean and dry.
- Avoid testing in conditions of high electrostatic or electromagnetic fields.
- Maintenance should only be performed by authorised personnel.
- There are no user replaceable parts in the Tester.
- The unit should be regularly calibrated (at least annually).
- For repair or calibration return the instrument to:-



Seaward Electronic Limited.  
Bracken Hill  
South West Industrial Estate  
Peterlee  
Co. Durham  
SR8 2SW  
Tel : +44 (0)191 586 3511  
Fax: +44 (0)191 586 0227  
sales@seaward.co.uk

## Chapter 6 Accessories

### Standard Accessories

Accessory	Part Number
Earth Bond Test Lead	249A908
Flash Probe	44B101
115V Adaptor Lead	281A075
Manual	283A560

### Optional Accessories

Calibration Checkbox	283A951
Barcode Scanner	283A922
Thermal Label Printer	283A954
Thermal Printer Labels	283A304
Appliance Number Labels (250)	194A307
Test Code Labels (240)	194A308
Serial Printer Lead	283A955
Serial to Parallel adaptor	270A954
Serial-PC Download Lead (9-9 way)	194A919
Serial-PC Download Lead (9-25way)	194A920
Pass Labels (500)	91B038
PATS Software (DOS)	161A221
PATS Plus Software (DOS)	161A922
PATS Plus for Windows™	161A947
PATSwin	161A951

## Chapter 7 Specifications

### Earth Bond Test

Test Voltage \* .....6V nominal (no load)  
Test Current \* .....4A, 10A, 25A selectable (into s/c load)  
Range ..... 40m $\Omega$  - 19.99 $\Omega$   
Resolution.....0.01 $\Omega$   
Accuracy..... +/- 5% of reading, +/- 2 digits  
Pass  
Levels.....selectable  
Misc.....4-wire measurement, floating earth

### Earth Screen Test

Test Voltage \* ..... 100mV nominal (no load)  
Test Current \* .....100mA (into s/c load)  
Range..... 40m $\Omega$  - 19.99 $\Omega$   
Resolution.....0.01 $\Omega$   
Accuracy..... +/- 5% of reading, +/- 2 digits upto 5.00 $\Omega$   
Pass  
Levels.....selectable  
Misc.....4-wire measurement, floating earth

### ***Insulation Test***

**Test Voltage \*** ..... 500V d.c. or 250V d.c. nominal (0.5MΩ load)  
**Short Circuit Current** ..... 2mA d.c. maximum  
**Range** ..... 100kΩ - 100 MΩ  
**Resolution** ..... 0.01 MΩ (<100 MΩ)  
**Accuracy** ..... +/- 5% of reading, +/- 2 digits (100kΩ - 20MΩ)  
**Pass Levels** ..... 0.5MΩ, 1.0MΩ, 2.0MΩ, 4.0MΩ, 7.0MΩ

### ***Substitute Leakage Test***

**Test Voltage \*** ..... 40V a.c. o/c  
**Display Range** ..... 0.1 - 20.0 mA a.c.  
**Resolution** ..... 0.01mA  
**Accuracy** ..... +/- 10% of reading, +/- 2 digits 1.00 - 20mA  
**Pass Levels** ..... 0.25mA, 0.5mA, 0.75mA, 2.5mA,  
 3.5mA, 7.0mA, 9.9mA, 15.0mA

### ***Flash Test***

**Test Voltage** ..... 1.5kV a.c. (Class I), 3.0kV a.c. (Class II)  
**Display Range** ..... 0.1 - 2.5 mA a.c.  
**Resolution** ..... 0.01mA  
**Accuracy** ..... +/- 5% of reading, +/- 2 digits  
**Pass Levels** ..... 1.0mA, 1.5mA, 2.0mA, 2.25mA

## ***Leakage***

**Range**.....0.1mA - 10.0mA

**Resolution**.....0.01mA

**Accuracy**..... +/- 5% of reading, +/- 2 digits

**Pass Levels**.....0.25mA, 0.5mA, 0.75mA, 1.5mA, 2.25mA,  
2.5mA, 3.0mA, 3.5mA, 9.9mA

## ***Touch Leakage***

**Range**.....0.1mA - 2.0mA

**Resolution**.....0.01mA

**Accuracy**..... +/- 10% of reading, +/- 2 digits

**Pass Levels**.....0.25mA, 0.5mA, 1.0mA

## ***Power Tests***

**Socket**.....Selectable 115V BS4343, BS546 / 230V BS 1363 socket.

**Measured Voltage**..... 90 - 300V

Indication only.

**Measured Load** ..... 0 - 4kVA

Indication only.

## ***IEC Lead Test***

**Test Voltage** \*...40Vac or 250Vdc depending on hardware revision

**Detects**..... Open, Short, Good, Reverse

\* - Test stimulus based on mains supply of 230V, varies with supply voltage.

***Mechanical***

Size..... 450mm x 410mm x 155mm

Weight..... 9.5kg

***Environmental***

Operating..... 0°C to 40°C (non condensing)

Storage ..... -10°C to 50°C (non condensing)

Maximum R.H ..... 90%

Supply Ratin..... 110V/230V 50/60Hz

Max Output Curre..... 16A(F) HRC

## ***Appendix A Purpose of Tests***

### ***Earth Bond Test***

This test is to ensure that the connection between the earth pin in the mains plug of the appliance and the metal casing of the appliance is satisfactory and of sufficiently low resistance.

A selectable test current is applied between the earth pin of the mains supply plug and the earth bond test lead clip.

A high current is normally used to stress the connection under fault conditions. The length of the test should be limited to prevent damage due to overheating.

### ***Earth Screen Test***

This test is to check the earth screen connection using a current which will prevent damage that may be caused by testing using high currents. This is often required by sensitive electronics such as computers and other Information Technology (IT) equipment.

A low voltage of approximately 100mV AC RMS is applied between the earth pin of the mains supply plug and the Earth Bond test lead clip. A current of 100mA is allowed to flow for the duration of the test.

### ***Insulation Test***



**Warning**

**500 V / 250 V d.c. test voltage**

This test is used to verify that adequate insulation exists between the mains supply pins and earth.

During the insulation test, a 500V DC voltage is applied between the earth pin and both the live and neutral pins of the appliance mains

supply plug. The Tester displays the resistance measured and allows the user to confirm sufficient insulation exists.

For Class 2 appliances, the Earth Bond Test clip can be used for an earth return lead.

For appliances which incorporate over-voltage protection, a 250V DC test voltage is provided to allow a reading to be taken without the protection devices generating a false failure.

### ***Substitute Leakage Test***

The substitute leakage test applies a nominal voltage of 40V AC RMS to the appliance and is applied between the earth pin and both the live and neutral pins of the supply plug. For Class II appliances, connect the Earth Bond test clip to the appliance as a substitute for the Earth.

The Tester measures the current that flows and scales the result to display a guide to the current that would flow if the test voltage had been the nominal mains supply voltage, scaled for the applicable socket.

Please note that values for Substitute Leakage may differ substantially from that of conventional Earth Leakage tests because of the way that the test is performed (e.g. it will be affected by the presence of Neutral-to-Earth suppression capacitors).

This test can prove useful in situations where neither conventional Insulation nor Flash tests are acceptable methods of testing the insulation of the appliance.

### ***Flash Test***



**Warning**

**1500V/3000V a.c. test voltage**

This test is used to determine that the insulation is of sufficient strength to prevent breakdown, particularly where high transient



voltages are likely. This test can be omitted when testing equipment with component whose voltage withstand rating is insufficient to accommodate the test without damage. This is especially true of IT equipment.

For Class I appliances, a nominal test voltage of 1.5kV AC RMS is applied between the earth pin, and both the live and neutral pins of the appliance mains supply plug

For Class II appliances, a nominal voltage of 3kV AC RMS is applied between the flash probe tip and the live and neutral pins of the appliance mains supply plug.

### ***IEC Lead Test***



**Warning**

**250Vd.c. test voltage applied to lead depending on hardware revision**

If you are using hardware revision 1.23 or earlier then the IEC lead test will be performed at 250Vdc. If you are using hardware revision 1.24 or later then the test will be performed at 40Vac.

This test confirms the electrical safety of 230V and 115V IEC leads.

The IEC test performs a continuity and polarity check on the Live and Neutral conductors and confirming that there are no breaks or cross wiring in these conductors.

### ***Powered Tests***



**Warning**

**Mains voltage applied to appliance**

The following powered tests differ from the previous tests in that they apply mains supply voltage to the appliance to perform their functions:-

- Leakage Test

- Touch Leakage Test
- Operation Test

The Tester performs an initial low voltage test to establish that the appliance can be safely powered.



### Warning

**It is important that the user verifies that an appliance with moving parts (e.g. an electric drill) is safely mounted to allow movement without causing damage to equipment or personnel.**

If the potential load current is too high, a warning message appears, allowing the user to continue. If a Live to Neutral short exists, this message will appear, and if tests are continued the fuses will blow. If the potential load current is low, a warning message appears to allow the user to check that the appliance is switched on, and all fuses are intact. The Tester also performs a safety test to verify that internal relays are properly set before applying full mains supply to the appliance.

Power to the appliance will remain until the Red Button is pressed. This allows the user to switch between the three powered tests without removing power from the appliance.

## Leakage Test



### Warning

#### Mains voltage applied to appliance

The Leakage Test shows the current being lost through Leakage as the difference in the currents flowing in the Live and the Neutral conductors. This difference is the total leakage away from the

## *Touch Leakage Test*

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appliance, and is generally equivalent to the current flow through the earth lead of the appliance, and displays the result in milliamps (mA).

This differential method of determining leakage will show the full leakage of an appliance in-situ, so if the appliance has an extra earth point, i.e. water pipe, then the Tester will show the full and true appliance leakage. This is also known as Enclosure or Differential Leakage.

### ***Touch Leakage Test***



**Warning**

#### **Mains voltage applied to appliance**

The Touch Test displays the current that would flow if the appliance was touched by a person. This is based on a 'body model' of  $2k\Omega$ .

The Tester detects any current flowing in the Earth Bond Lead (attached to an appropriate point on the appliance) and indicates the potential leakage through a metal panel. The Tester displays the result in milliamps (mA).

### ***Operation Test***



**Warning**

#### **Mains voltage applied to appliance**

The Power test supplies the equipment under test (appliance), connected to 115V/230V test sockets, with the rated voltage of that socket.

The Tester measures the power used by the appliance and displays the reading in kVA. There is no test duration limit on the Power tests. Once supplied with power, the appliance will be supplied until the operation is cancelled. This will allow appliances with slow start-up speeds the time to ramp up to their working state.



## Appendix B Reference

### Information Factory-set Test Sequences

Name	Earth Bond	Insulation	Leakage	Touch Leakage	Flash
230V Household 1	0.1Ω	0.5MΩ	0.75mA	0.5 mA	SKIP
230V Household 2	SKIP	1.0MΩ	0.25mA	SKIP	SKIP
IT Equip. 1	0.1Ω	0.5MΩ	SKIP	SKIP	SKIP
IT Equip. 2	SKIP	1.0MΩ	SKIP	SKIP	SKIP
Hand-held 230V Power Tools 1	0.1Ω	0.5MΩ	0.75mA	0.5 mA	1.5mA
Hand-held 230V Power Tools 2	SKIP	1.0MΩ	0.25Ma	SKIP	1.5mA
Lead (3m) 230V	0.08Ω	0.5MΩ	SKIP	SKIP	SKIP
Lead (6m) 230v	0.2Ω	0.5MΩ	SKIP	SKIP	SKIP
Lead (12m) 230v	0.3Ω	0.5MΩ	SKIP	SKIP	SKIP
110V H H Powertools 1	0.1Ω	0.5	0.5	0.5	1.5mA
110 V H H PowerTools 2	SKIP	1.0	0.25	SKIP	1.5mA

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110V Lead 6 M	0.2Ω	0.5	SKIP	SKIP	SKIP
110V Lead 12 M	0.3Ω	0.5	SKIP	SKIP	SKIP
110V Household 1	0.1Ω	0.5	0.5	0.5	SKIP
110V Luminaires 1	0.5	0.5	SKIP	0.75	0.5
110V Luminaires 2	SKIP	1	SKIP	0.75	SKIP

All tests have visual test included

Extension lead tests include a Polarity check

## Testcode Tables

The test sequence code is split into two 10-digit testcodes, this Appendix describes how the two testcodes are broken down.

### First Testcode:

Digit 1	Visual Inspection/Polarity	Voltage
H	No Visual Inspection No Polarity Test	230V
I	Visual Inspection No Polarity Test	230V
J	No Visual Inspection Polarity Test	230V
K	Visual Inspection Polarity Test	230V
L	No Visual Inspection No Polarity Test	115V
M	Visual Inspection No Polarity Test	115V
N	No Visual Inspection Polarity Test	115V
O	Visual Inspection Polarity Test	115V

Digit 2	Earth Bond
0	Skip Earth Bond
1-9	Earth Bond Fault Limit (mΩ)

Digit 3	Earth Bond Multiplier	Current
1	x1	4A
2	x10	4A
3	x100	4A
4	x1000	4A
5	x1	10A
6	x10	10A
7	x100	10A
8	x1000	10A
A	x1	25A
B	x10	25A
C	x100	25A
D	x1000	25A
E	x1	100mA a.c.
F	x10	100mA a.c.
G	x100	100mA a.c.
H	x1000	100mA a.c.
I	Reserved	
J	Reserved	
K	Reserved	
L	Reserved	
M	Reserved	
N	Reserved	
O	Reserved	
P	Reserved	
Q	Reserved	
R	Reserved	
S	Reserved	
T	Reserved	
U	Reserved	
V	Reserved	
W	Reserved	
X	Reserved	



Digit 4	Insulation	Voltage
0	Skip	
1	0.5M $\Omega$	250V d.c.
2	1.0M $\Omega$	250V d.c.
3	2.0M $\Omega$	250V d.c.
4	4.0M $\Omega$	250V d.c.
5	7.0M $\Omega$	250V d.c.
6	0.5M $\Omega$	500V d.c.
7	1.0M $\Omega$	500V d.c.
8	2.0M $\Omega$	500V d.c.
9	4.0M $\Omega$	500V d.c.
A	7.0M $\Omega$	500V d.c.

Digit 5	Sub-Leakage
0	Skip
1	0.25mA
2	0.50mA
3	0.75mA
4	2.50mA
5	3.50mA
6	7.00mA
7	9.90mA
8	15.0mA

Digit 6	Flash
0	Skip
1	1mA
2	1.5mA
3	2.00mA
4	2.25mA

Digit 7	Leakage
0	Skip
1	0.25mA
2	0.50mA
3	0.75mA
4	1.50mA
5	2.25mA
6	2.50mA
7	3.00mA
8	3.50mA
9	9.90mA

Digit 8	Touch Leakage
0	Skip
1	0.25mA
2	0.50mA
3	1.00mA

Digit 9	Earth Bond Test Duration
1	2s
2	5s
3	10s
4	30s

### *Testcode Tables*

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Digit 10	Insulation Test Duration
1	2s
2	5s
3	10s
4	30s

### *Second Testcode*

Digit 1	Sub-Leakage Test Duration
Q	2s
R	5s
S	10s
T	30s

Digit 2	Flash Test Duration
1	2s
2	5s
3	10s
4	30s

Digit 3	Leakage/Load Test Duration
1	2s
2	5s
3	10s
4	30s
5	60s
6	120s
7	180s
8	Unlimited

<b>Digit 4</b>	<b>Touch Leakage Test Duration</b>
1	2s
2	5s
3	10s
4	30s
5	60s
6	120s
7	180s
8	Unlimited

<b>Digit 5</b>	<b>Number of Earth Bond Tests</b>
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30
B	Unlimited

*Testcode Tables*

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<b>Digit 6</b>	<b>Number of Insulation Tests</b>
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30
B	Unlimited

<b>Digit 7</b>	<b>Number of Substitute Leakage Tests</b>
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30
B	Unlimited

Digit 8	Number of Flash Tests
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30
B	Unlimited

Digit 9	Number of Load/Leakage Tests
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30

*Testcode Tables*

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Digit 10	Number of Touch Leakage Tests
0	1
1	1
2	2
3	3
4	4
5	5
6	10
7	15
8	20
9	25
A	30

