

**INSTALLATION**

**Power Requirements**

**WARNING**  
**LETHAL VOLTAGES. THE SmartPAT 3500 CONTAINS HAZARDOUS VOLTAGES, CORRECT HIGH VOLTAGE HANDLING PRECAUTIONS MUST BE OBSERVED AT ALL TIMES.**

The power requirements of the SmartPAT 3500 are detailed under the Technical Specifications.

The Test set is dispatched from the factory with a mains lead carrying a 230V plug. To power the Test Set from 110V requires the use of an adaptor. The adaptor is available from Robin as:

AD 110V 110V Adaptor.

**Connections**

**WARNING**  
**ELECTRIC SHOCK. TO AVOID ELECTRIC SHOCK, ENSURE THAT ALL POWER IS OFF AND ALL DEVICES ARE UNPLUGGED BEFORE CONNECTING OR REMOVING ANY OF THE TEST CABLES.**

**CAUTIONS**

**EQUIPMENT DAMAGE.** The equipment has been set for 230V/110V operation, it must never be connected to a higher voltage.

**EQUIPMENT DAMAGE.** The mains supply is never to be connected to the IEC lead socket.

The only connection to be made prior to commencing testing is to plug the Test Set into the correct power source.

**Setting Up**

The only requirement to set up the Appliance Tester, is to find a suitable place to conduct the testing, adjacent to the correct power source.

The SmartPAT 3500 has no ON/OFF switch, it is ready for testing equipment as soon as power is applied to it.

When the SmartPAT 3500 is plugged in and power applied, the screen displays:

SPAT 3500 VO.1

The SmartPAT 3500 performs a short test of the mains supply voltage and displays:

230V Operation

A quick self test is then performed to check the functioning of the SmartPAT 3500, on completion of which the following message is displayed:

**Note** If the SmartPAT 3500 is out of calibration the following two messages will be displayed:

Warning-call lost

Ask suppliers

The SmartPAT 3500 will then continue to function as normal displaying the following screen:

Press a function

Followed three seconds later by the second line  
 button to start

After a further three seconds the first line is redisplayed.

The SmartPAT 3500 is now ready to commence testing an appliance.

**OPERATING INSTRUCTIONS**

Prior to performing any test the following information is required.

The class of equipment to be tested, see Table 1:

Class	Test Sequence	Typical Appliances
I (Normal)	Visual check 26A earth bond test Fuse continuity Insulation	Electric heaters, kitchen appliances, fans etc.
I (Business)	Visual check 100mA earth bond test Fuse continuity Insulation	Business machines - Fax machines, printers, personal computers, etc.
II	Visual check Fuse continuity Insulation	Double insulated appliances, Power tools, table lamps, etc.

Business equipment usually contains electronic components and are susceptible to damage from high current and voltage. For this reason the Earth Bond tests are carried out using the 100 mA test current

Fuse Continuity tests are valid for the more common conventional electrical equipment, but certain appliances contain circuitry that is unlikely to give a positive reading eg. High input impedance of solid state devices etc. Examples of the type of equipment which would indicate a failed test, even when the equipment fuse is good are:

- Personal computers
- Monitors (VDU)
- Fax machines
- Photocopiers
- Fluorescent lamps
- Motor driven hand tools with electronic control.

**WARNING**

Before commencing any testing the user is strongly advised to make reference to the Electricity at Work Regulations 1989 and any relevant publications from the Health and Safety Executive. It is important that the user fully understands the various tests required and how they should be performed. The user should also make reference to the Code of Practice for In Service Inspection and Testing of Electrical Equipment, which is available from the Institute of Electrical Engineers. Robin Electronics also produce a useful video guide to PAT testing. (Robin model RV20)

**Results**

The test results are displayed on the display screen, showing the actual resistance, or when necessary the reason for failure. The result may be printed out on a printer if connected. The print out will also contain a space for the user to write in, the site, date and appliance being tested. The results may also be recorded in other mediums; by entering them in a Portable Appliance Test Log Book (Robin Manual IRPI) or downloading the results into a computer with a compatible PAT database management software such as Robin PowerPAT Plus Data Management software. Both the IRPI log book and PowerPAT Plus software are available as optional accessories from Robin Electronics.

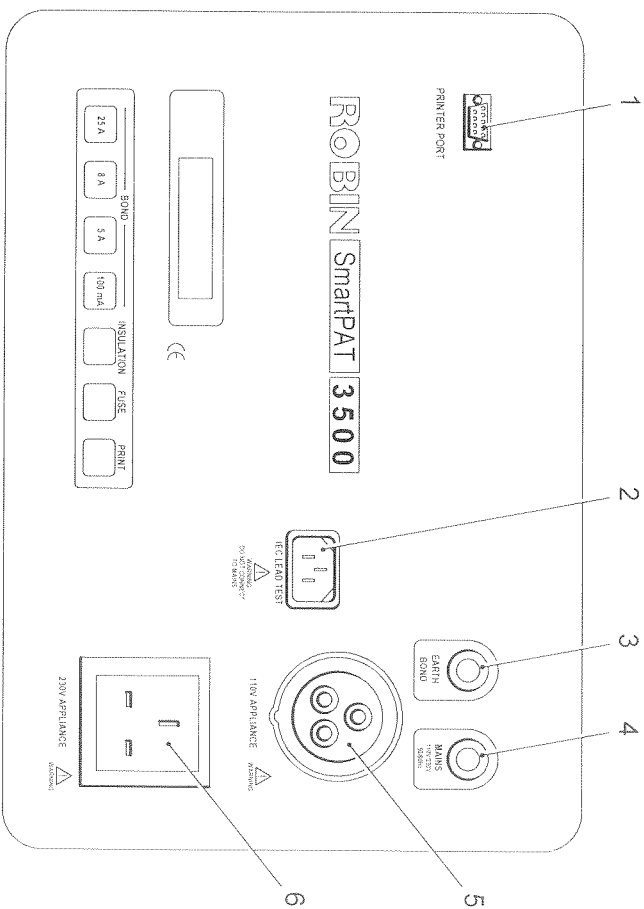


Figure 2 Controls and Accessories

**Controls and Accessories**

The cables, connectors, controls and indicators of the SmartPAT 3500 are shown in Figure 2 and listed below, together with a brief functional description:

**Cables**

- Mains Captive mains cable to connect to the mains supply with either a 13A, 230V or a 16A, 110V plug (via adaptor). (See Figure 2 (4)).
- Earth Bond Captive cable fitted with heavy duty crocodile clip, to connect to appliance under test. (See Figure 2 (3)).

**Connectors**

- 110V Appliance Provides a socket to connect a 110 V appliance to the test set for testing. (See Figure 2 (5)).
- 230V Appliance Provides a socket to connect a 230 V appliance to the test set for testing. (See Figure 2 (6)).
- IEC Lead Test Enables IEC leads to be tested, used in conjunction with the 230 V Appliance Input socket. (See Figure 2 (2)).
- Printer Port Allows an external printer to be connected to the Portable Appliance Tester. (See Figure 2 (1)).

**Controls**

- Bond 25A Green Membrane switch, when pressed initiates a 25A Earth Bond test, on the equipment connected to the test set.
- Bond 8A Green Membrane switch, when pressed initiates a 8A Earth Bond test, on the equipment connected to the test set.
- Bond 5A Green Membrane switch, when pressed initiates a 5A Earth Bond test, on the equipment connected to the test set.
- Bond 100mA Green Membrane switch, when pressed initiates a 100mA Earth Bond test, on the equipment connected to the test set. This test is used for business equipment.
- Insulation Red Membrane switch, when pressed initiates an Insulation test, on the equipment connected to the test set.
- Fuse Yellow Membrane switch, when pressed initiates a Fuse Continuity test, on the equipment connected to the test set.
- Print Yellow Membrane switch, when pressed initiates a print out of the test result, it is inoperative until a test has been completed.

**Indicators**

- Beeper (internal) Sounds to indicate that a test has been completed.
- Display Dot matrix Liquid Crystal Display, displays up to 16 characters at a time, to show the following:
  - Test type selected
  - Test in progress messages
  - Test results

**TESTING**

**Note** The values indicated in the following tests are typical values for example purposes.

**Note** If the SmartPAT 3500 is out of calibration then before any test is performed, the following message is displayed:

Defaults used

This message is displayed for 3 seconds then the tests continue as detailed.

**Visual Check**

- 1 Check state of flex, ie. No cuts, cracks or any physical damage to the outer insulation layer.
- 2 Check state of the plug, cable securely attached, no signs of overheating and that the correct value of fuse is fitted.
- 3 Check the equipment to be tested for any signs of damage, and that any mains or control switches will physically switch on and off.
- 4 Check any sockets for signs of overheating or physical damage.

**Earth Bond**

The earth bond test requires the selection of a test current. The current rating selected is that which is approximately twice the fuse rating of the equipment to be tested, eg. if a 13A fuse is fitted in the appliance then the earth bond current selected should be 26A.

To perform the earth bond test proceed as follows:

Connect the power cable of the appliance under test (AUT), to the Appliance input (230V or 110V socket).

Clip the crocodile clip on the earth bond lead to a convenient point on the exposed metal parts on the AUT, eg. The exposed element of an electric kettle.

Press the required function button (25A, 8A, 5A or 100mA) on the test set. The following screen will be displayed:

Testing 8A 5

The first number (8A) will be the one selected for the test, 25A, 8A, 5A or 100mA.

The second number, representing seconds will count down to 0.

On completion of the test an internal bleeper will sound to signal the end of the test and the display will change to:

Result 0.13Ω

Record this reading in the equipment log.

**Note** If a printer is connected to the test set, with the screen above displayed, press the print button. The display will change to:

Printing result

**Fuse Continuity**

To perform the Fuse Continuity test proceed as follows:

Connect the power cable of the appliance under test (AUT), to the Appliance input (230V or 110V socket).

Set the power switch of the appliance under test to the ON position.

Press the **FUSE** function button on the test set. The following screen will be displayed:

### Testing Fuse

On completion of the test an internal bleeper will sound to signal the end of the test and the display will change to one of the following two displays:

Check fuse/pol

Fuse/polarity      OK

Record the message displayed in the equipment log.

**Note** If a printer is connected to the test set, with the screen above displayed, press the print button. The display will change to:

Printing result

### Insulation

To perform the insulation test proceed as follows:

Connect the power cable of the appliance under test (AUT), to the Appliance input (230V or 110V socket).

For a Class II appliance, clip the crocodile clip on the earth bond lead to a convenient point on the appliance.

Press the **INSULATION** function button on the test set. The following screen will be displayed:

Testing Insu      5

The number, representing seconds will count down to 0.

On completion of the test an internal bleeper will sound to signal the end of the test and the display will change to:

Result      >300.0M $\Omega$

Record this reading in the equipment log.

**Note** If a printer is connected to the test set, with the screen above displayed, press the print button. The display will change to:

Printing result

### IEC Lead Test

Plug the lead to be tested between the IEC LEAD TEST socket and the APPLIANCE input socket (230V or 110V socket) on the SmartPAT 5500.

The tests that may be performed are as follows:

- Visual Inspection
- Earth Bond
- Fuse Continuity
- Insulation

When performing the Earth Bond test the current selected should ideally be 8A. The actions are the same as those previously detailed for these tests

### Insulation Test

The earth bonding specifications are taken at a nominal mains input supply of 110 V or 235 V rms, unless otherwise stated.

Open Circuit Voltage	560 V dc $\pm$ 8%
Short Circuit Current	1.5 mA $\pm$ 10%
Display Resolution	0.1 to 99.9 Mohm, then 1 to 299 Mohm, >300 Mohm
Display Accuracy	$\pm$ (5% + 4 digits)
Test Duration	10 s to 1 minute, dependent on time test button held down

### Fuse Continuity

Voltage      4.5 V dc nominal

### Test Summary

The following statements provide a brief summary of the tests performed by the SmartPat 3500.

#### Earth bond

Checks the resistance between the Earth pin of the appliance under test and any exposed metalwork on the appliance.

#### Insulation

Checks the resistance of the insulation between the Earth pin (class I) of the appliance under test cable plug or the earth bond crocodile clip (class II), to the Live and Neutral pins of the appliance (pins are connected together within the SmartPAT 3500 for this test).

#### Continuity

Tests the continuity of the fuse in the appliance under test, by checking the resistance between the Live and Neutral pins of the appliance cable plug.

**Technical Specifications**

The technical specifications of the SmartPAT 3500 are as follows:

<b>Mains input supply</b>	Voltage	100V to 120V rms at 50/60 Hz $\pm$ 10% 207V to 255V rms at 50/60 Hz $\pm$ 10%
	Power Consumption	20W maximum (quiescent)
	Earth Leakage Current	3 mA maximum
<b>Display</b>	Type	Liquid Crystal Display (LCD)
	Character Height	5.5 mm
	Character Width	3 mm
	Viewing Angle	'6 o'clock'
	Contrast Adjustment	Fixed
<b>Environmental</b>	Storage Temperature	-10 to +50°C
	Operating Temperature	0 to 40°C (results within calibrated limits)
		-10 to 60°C (results may be outside calibrated limits)
	Humidity	0 to 90% R-H non condensing
	Pollution Level	II
	IP Rating	IP51 case closed, IP30 case open

The Technical Specifications of the Tests performed by the SmartPAT 3500 Portable Appliance Tester are as follows:

**Earth Bond**

The earth bonding specifications are taken at a nominal mains input supply of 110V or 235V rms, unless otherwise stated.

**High Current**

Open Circuit Voltage Test Current	3 Vrms $\pm$ 10% 5 A, 8 A or 26 A $\pm$ 15% into 0.1 ohm load. (user selectable)
Display Resolution	0.01 ohm to 19.99 ohm, then shows >20 ohm.
Display Accuracy	$\pm$ (3% + 4 digits)
Test Duration	10 s to 1 minute, dependent on time test button held down

**Business Equipment**

Open Circuit Voltage Test Current	3 Vrms $\pm$ 10% 100 mA +20% -0% at 230 Vrms into 0.1 ohm load. (user selectable)
Display Resolution	0.01 ohm to 19.99 ohm, then shows >20 ohm.
Display Accuracy	$\pm$ (3% + 4 digits)
Test Duration	10 s to 1 minute, dependent on time test button held down

**FAULT FINDING AND REPAIR**

Should any faults develop on the SmartPAT 3500, the equipment is to be returned to ROBIN. There are no user facilities to repair the test set, due to the technical nature of the equipment. In the event of a fault developing return the equipment to the Service Department at the following address:

**ROBIN Electronics Limited,  
Precision Centre,  
Dwight Road  
Watford,  
Hertfordshire,  
England.  
WD1 8HG**

**Calibration**

To ensure the accuracy of the equipment is maintained at a high level, it is recommended that the Portable Appliance Tester be returned to the above address for calibration at least once every 12 months. If the results at any time give rise to doubt the equipment should be returned straight away for safety reasons. Always state clearly what the reason for return is.

**Basic Maintenance**

The SmartPAT 3500 test set has a fused moulded mains plug fitted. The only user maintenance on this is the changing of the fuse. However if the plug is damaged then the moulded plug must be cut off and a new 3 pin fused plug fitted by a qualified electrician.

## GENERAL ENQUIRES

Robin Electronics operate a technical helpline to assist customers in the use of Robin products. A selection of the most common enquiries received regarding portable appliance testing together with the answers are given below:

### My PN fuse test fails?

The objective of this test is to check to see if the appliance fuse is fitted. An appliance will fail the fuse test if the fuse is not fitted or has failed. Some appliances are electronically controlled, i.e. they may have semi-conductor devices in the supply path. This will give a high input resistance to the appliance and may cause the equipment to fail the test.

### How do I test my extension lead for the Earth, Insulation and Load tests?

Earth tests and insulation tests on extension leads can easily be undertaken using a special ROBIN Extension lead test adaptor (catalogue code EL 100). A load test is not applicable to an extension lead and is therefore not required.

### What tests should I do?

For a comprehensive overview of portable appliance testing and specific tests that should be performed, it is suggested that reference is made to the Code of Practice for In Service Inspection and Testing of Electrical Equipment. This document has been prepared by the Institution of Electrical Engineers and is available direct from them. The IEE can be contacted on 01438 313311.

### What is meant by class I, II and III?

There are a number of basic equipment constructions that are referred to in all standards for electrical equipment. They are important because they determine how the user is protected against electric shock and what tests are appropriate when assessing safety.

Class I equipment is where protection against electric shock is achieved by using basic insulation and providing a means of connecting to the protective earthing conductor in the fixed installation wiring any conductive parts (eg. metal) that could otherwise assume hazardous voltages if the basic insulation failed. Consequently Class I equipment relies for its safety upon a satisfactory earth in the fixed wiring installation and an adequate connection usually via a flexible cable to it.

Class II equipment is where the protection against electric shock is provided by a basic insulation and a secondary level of insulation, such as a double insulation or reinforced insulation. There is no provision for protective earthing or reliance upon installation earthing. Class II equipment should be identified with the Class II construction mark, which is essentially a square within a square.

Class III equipment relies for protection against electric shock from an SELV source (separated extra low voltage). The Class III construction mark should be found on such appliances and is Roman numeral III inside a rhombus. SELV voltages will not exceed 50V. Class III equipment must be supplied from a safety isolating transformer to BS5535.

### How do I find the class of an appliance?

It can be difficult to actually define the class of a piece of equipment. It is suggested that reference be made to the appliance rating plate or look for specific construction marks for Class II and Class III appliance which may be found adjacent to the manufacturers details on the appliance.

### Can my SmartPAT test business equipment?

For the specific test requirements on typical office equipment reference should be made to the code of practice as defined earlier. Two basic tests are required, insulation and earthing, however, earthing tests must be done at low current.

## WARNINGS AND CAUTIONS

Although the equipment has been built to meet the requirements of the IEC publication 1010, Safety Requirements for Electronic Measuring Apparatus, the following warnings and cautions must be adhered to:

### WARNINGS

**LETHAL VOLTAGES. THE SmartPAT 3500 CONTAINS HAZARDOUS VOLTAGES, CORRECT HIGH VOLTAGE HANDLING PRECAUTIONS, AS LAID DOWN IN THE ELECTRICITY AT WORKS REGULATIONS 1989, MUST BE OBSERVED AT ALL TIMES.**

### CAUTIONS

**EQUIPMENT DAMAGE.** The equipment has been set for 230V/110V operation, it must never be connected to a higher voltage.

**EQUIPMENT DAMAGE.** The mains supply is never to be connected to the IEC lead test connector.

**ABRASIVE MATERIALS.** Routine Maintenance. Do not use abrasive materials, metal polish or furniture polish during cleaning procedures.

**TEMPERATURE CONTROL.** Operating and Storage. Temperatures below -10°C may cause permanent damage to the equipment.

# Portable Appliance Tester

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## INTRODUCTION

Thank you for purchasing a Robin Portable Appliance Tester. Please ensure you read and understand these instructions fully before starting any testing.

The SmartPAT 3500 is a manually operated Portable Appliance Tester (PAT). It is capable of performing preset earth bonding, insulation and fuse continuity tests. The equipment is contained in a high impact carrying case, see Figure 1. When opened access is provided to the operating panel, secured into the base of the case, this panel carries all the operating switches, connectors and the results display. The lid of the case provides a storage space for the cables associated with the appliance tester.

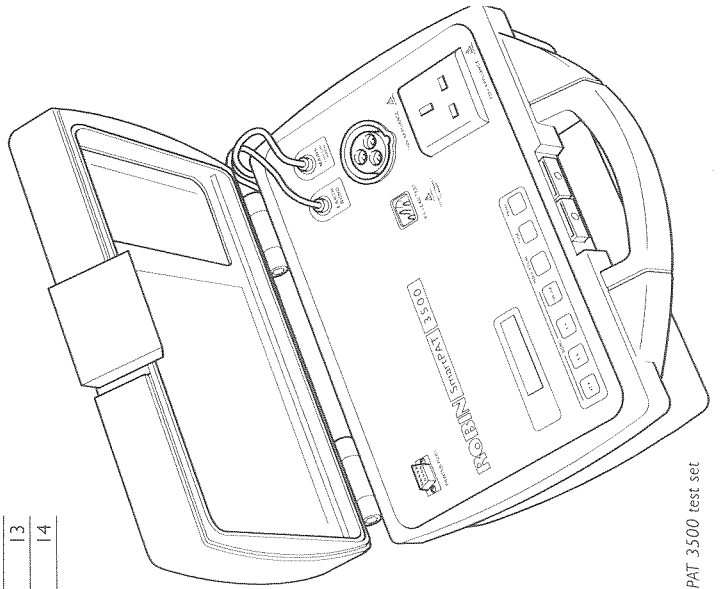


Figure 1 SmartPAT 3500 test set

### How do I test three phase equipment ?

Three phase equipment can only be tested one phase at a time. It is not possible to test all three phases simultaneously.

### How often should I calibrate my PAT tester?

Under normal operating conditions it is recommended that your PAT tester is calibrated annually. Your PAT tester should be returned to ROBIN for all calibration requirements as ROBIN have purpose built facilities and the equipment necessary to undertake the correct calibration procedures.

### What rules/regulations does the law require?

Legislation that has specific relevance to electrical portable appliance testing and maintenance is the Health & Safety at Work Act, the Management of Health & Safety at Work Regulations, the Electricity at Work Regulations, and the Provision and Use of Work Equipment Regulations.

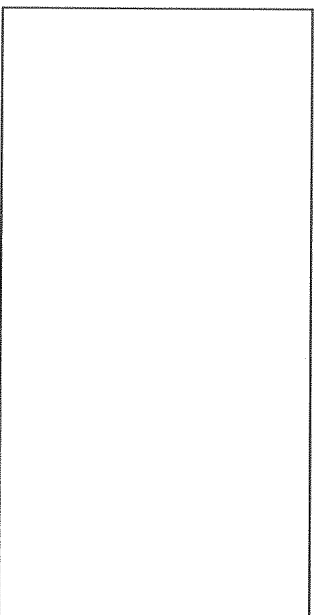
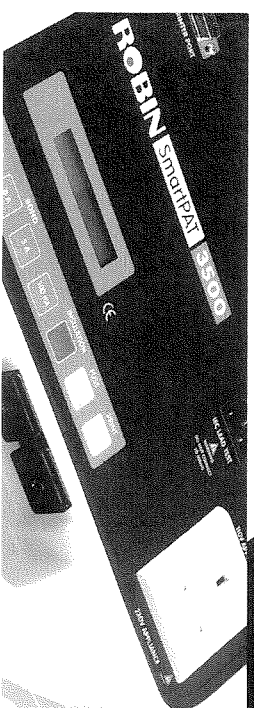
### My PAT tester display has gone blank?

If this occurs you should check the incoming electricity supply to the PAT tester, and check the fuse has not blown, if these are both correct, then there may be a problem with the PAT unit and it should be returned immediately to ROBIN Electronics for investigation.

# ROBIN

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## User Manual