

Patch

Portable Appliance Tester and Checker

Testing Computers with the Patch

It is possible to use the Patch to test computers.

Please read the following carefully, and ensure that you fully understand before starting computer testing.

Normally a PAT test of computer or other IT equipment uses a low current (100mA) test. Whilst this will give an indication of Earth Bond fitness, it is not particularly good as it does not stress the connection with a sufficiently high current to show a fault.

Any PAT tester (including the Patch) can be used to test a computer, but you have to be careful where you connect the Earth Bond test lead.

The computer may have a plastic or metal casing, but the electronics are built on a metal chassis. It is to this chassis that you must connect the test lead. Most computers have a series of serial and parallel ports and printer ports on the back panel. **DO NOT CONNECT TO THESE.** Look for the case securing screws and use one of these to make the connection.

The problem is that computers use two kinds of earth - one which is bonded to the mains earth and the other that is connected via printed circuit board tracks to the ports (the signal earth). If this connection is made, the pat tester puts approximately 15A through this circuitry and the computer will never work again!

MAKE SURE THAT THE EARTH CONNECTION YOU USE IS THE CASE SECURING SCREW - NOTHING ELSE WILL DO!

The simplest way to test is to leave the computer and monitor linked and switched on and to test the whole system together. Select Class 1 test and use the 10A Earth Bond test socket.

If you have any doubts, do not test, do a visual inspection only and mark your paperwork accordingly.

Introduction

The **PATCH** (Portable Appliance Tester and Checker) is a versatile Portable Appliance Tester which enables the user to easily test appliances, fitted with a 13A plug, for electrical safety. The **PATCH** allows testing of both Class 1 (earthed case) and Class 2 (double insulated case) appliances and offers the facility to test moulded IEC mains leads.

The **PATCH** is supplied with test leads, 50 results labels for marking a tested appliance, 5 'faulty' labels and a sample Certificate of Inspection which may be freely photocopied.

What should be tested?

Any appliance that is fitted with a 13A plug should be tested. This includes photocopiers, refrigerators, electric kettles etc. Any items brought from home by a member of staff etc., should also be tested.

There have recently been some concerns expressed about testing of IT equipment such as computers, monitors etc. If in doubt, the advice of the manufacturer should be sought. Similarly, some appliances are fitted with input filter capacitors on the mains input (e.g. some televisions). The insulation test applies up to 600V d.c. between earth and live and neutral. In some circumstances, this could stress the filter capacitors - once again the manufacturer's advice should be sought (see page 8).

How often should I test?

The Electricity at Work (1989) regulations requires portable appliances to be tested 'regularly'. The time interval for testing has not been defined. It is generally accepted that for most items, annual testing is sensible. However, items that are subjected to excessive movement of the power cord (e.g. kettles, electric drills, etc.) should be tested more frequently.

Beginning the tests

Before electrically testing an appliance, the appliance should be visually inspected to ensure that it is safe to perform the electrical tests. A suggested order of testing is shown on the Certificate of Inspection. Should a fault become apparent, this **MUST** be rectified, by a qualified person, before proceeding to the electrical test.

The tests to be performed using the Portable Appliance Tester are designated numbers 8 and 9 on the Certificate of Inspection. Having made an assessment of the insulation class of the equipment, the appropriate tests should be performed as detailed below. If the appliance has a mains switch, this must be switched **ON** whilst the electrical tests are performed.

The **PATCH** should be connected to a suitable mains supply. The **PATCH** is switched on using the rocker switch on the front panel which will illuminate. Periodically, upon switching on, the **PATCH** performs a self test which illuminates one or both of the indicator leds for approximately 5 seconds. This does not indicate a fault. The **PATCH** is ready for use at the end of the 5 second test period.

Class 1 Appliance Testing

- * Plug the appliance into the 13A socket on the **PATCH**.
- * Select 'Class 1' with the slide switch.
- * Plug the test lead into the appropriate 4mm socket - generally appliances with a power consumption of 1KW or less should be tested using the 10A socket. All others should be tested using the 25A socket.
- * Connect the test clip to a part of the metal case that is bare metal - often fixing screws are a convenient point. If there is nothing on which to fasten the clip, it may be pressed firmly against the base metal ensuring that **YOU** are not touching bare metal. If the case has several sections, a separate test should be performed on each section (e.g. base and lid).
- * If the appliance has an on/off switch, switch it **ON**.

Making sure that you are clear of the appliance, press and hold the test button and observe the blue led above it. Should the led not illuminate then check the fuses and the mains switch. When testing certain items e.g. SMPSUs and electronically controlled drills, the blue led will simply flash rather than stay on. This constitutes a **PASS**. Releasing the button starts an automatic 5 second test sequence.

- * The results should be interpreted as follows:



Earth Bond Led	Result
Green	PASS 25A test < 0.1Ω
	PASS 10A test < 0.45Ω
Red	FAIL

Insulation Led	Result
Green	PASS >2MΩ
Red	FAIL <2MΩ

Example

Patch Portable Appliance Certificate of Inspection

Inspector
 Appliance Date
 Location Serial Number

TEST	PASS REQUIREMENT	PASS	FAIL	NOTES
1. Inspection of Cable	No insulation damage BS colour	.....	.....
2. Inspection of plug	No damage Correct fuse	.....	.....
3. Inspection of Male connector	BS type or equivalent	.....	.....
4. Open socket without tool	Unopenable	.....	.....
5. Pull cable from female connector	No movement	.....	.....
6. Cable grommet or clamp	Cable insulation protected Cable pull - no movement Cable twist - no movement	.....	.....
7. Inspection of mains switch	Correct operation No damage	.....	.....
8a. Case Earth connection (Class 1)	No damage	.....	.....
8b. Fuse/mains switch test	Flash/continuous blue led	.....	.....
8c. Earth Bond (Class 1)	<0.1Ω (25A test) <0.45Ω (10A test)	.....	.....	Earthed case 
9a. Insulation Test (Class 1)	>2MΩ	.....	.....
9b. Insulation Test (Class 2)	>7MΩ	.....	.....	Double insulated 
10. Remove accessible fuse	No damage No access to live parts >50V	.....	.....
ASSESSMENT		.....	.....
Recommended date for next test/...../.....				
Signed				

SPECIFICATION

Mains Input	240V 50Hz 5A fused mains plug. Rear panel fuse - 2A quick blow.
Earth Bond Test	Test voltage - 6V a.c. nominal Short circuit current = 36A Two shrouded test sockets: 25A - pass limit = <0.1Ω 10A - pass limit = <0.45Ω
Insulation Test	Test voltage 500-600V d.c. load dependent Short circuit current <0.5mA Class 1 - pass limit = >2MΩ Class 2 - pass limit = >7MΩ
IEC and Kettle Lead Tests	25A Earth Bond and 2/7MΩ insulation tests
Extension Lead Test	10/25A Earth Bond and 2/7MΩ insulation tests
Case	18swg steel 250 x 155 x 135mm powder coated in black with carry handle and rubber feet
Supplied with:	Test lead - 4mm plug to insulated crocodile clip Test lead - 4mm plug to 13A mains plug 50 test result labels, 5 'Faulty' labels Copyright free sample test certificate Instruction booklet

**We recommend that the Patch should be recalibrated every year.
Please telephone 01376 340506 for details of prices.**

Class 2 Appliance Testing

- * Plug the appliance into the 13A socket on the **PATCH**.
- * Select 'Class 2' with the slide switch.
- * Plug the test lead into either 4mm socket.
- * Connect the test clip to a part of the insulated case. If there is nothing on which to fasten the clip, it may be pressed firmly against the case ensuring that **YOU** are not touching the metal of the clip. Several tests should be applied to different parts of the case. If there are metal parts (e.g. the chuck of an electric drill), these should also be tested.
- * If the appliance has an on/off switch, this should be switched **ON**.
- * Press and hold the test button and observe the blue led above it. Should the led not illuminate then check the fuses and the mains switch. When testing certain items e.g. SMPSUs and electronically controlled drills, the blue led will simply flash rather than stay on. This constitutes a **PASS**. Releasing the button starts an automatic 5 second test sequence
- * Observe the result led for Insulation during the 5 second test. The Earth Bond led is disabled during Class 2 testing.

The results should be interpreted as follows:

Insulation Led	Result
Green	PASS = >7MΩ
Red	FAIL = <7MΩ

IEC Lead Testing

IEC and high temperature IEC (kettle) leads may be tested independently of the appliance required. This may be done by connecting the lead between the 13A and IEC connectors on the front panel of the **PATCH**. The Earth Bond test lead is not used. Class 1 test should be selected and the test button pressed. The results should be interpreted as for Class 1 testing above. Any lead that does not give an unambiguous **GREEN** result on both Earth Bond and Insulation leds should be carefully checked.

Extension Leads - Select Class 1 Testing

The **PATCH** is supplied with a facility for testing extension leads. Plug the test lead that is terminated in a mains plug into the 25A socket and plug its mains plug into the extension lead. Plug the extension lead into the 13A socket on the **PATCH**. Press and release the test button. Should the lead 'fail', plug the test lead into the 10A socket and retest. Extension leads sometimes fail because the resistance of the cable, due to the length, exceeds the cut-off resistance of the **PATCH**. Under these circumstances, the advice of a qualified electrician should be sought.

As a guide, a 6A cable has a resistance of 28mΩ/m, and a 13A cable has a resistance of 17.5mΩ/m. This means that 6A extensions over 9m and 13A extensions over 5m may fail the test. Similar problems may occur with items having very long leads.

Logging the Results

If the appliance **PASSES**: The results of the test should be logged onto a Certificate of Inspection and noted on a label affixed to the appliance.

If the appliance **FAILS**: The results of the test should be logged onto a Certificate of Inspection and noted on a label affixed to the appliance.

The appliance should be clearly marked as being unsafe, taken out of circulation and should be checked and repaired by a qualified electrician prior to retest.

Problems?

* ***The green switch neon does not illuminate when the unit is switched on.***

Check the mains plug fuse (3A) and the rear panel fuse (2A).

* ***An appliance with a long lead fails the Earth Bond test but appears to be OK.***

The resistance of long cables, particularly if they are of a low current rating, is such that the cable will cause a failure. In this case the advice of a qualified electrician should be sought.

* ***When performing the tests, an indicator glows red and then turns to green within the timed test period.***

This does not indicate a fault; the status of the indicator near the end of the test period should be noted. Once the test period is over, the green 'Test' led will extinguish. As the circuitry powers down, the indicators may momentarily flash red - this should be disregarded.

Patch Testing Notes Please read carefully before use

1. The testing of portable appliances includes a visual inspection as indicated on the sample Certificate of Inspection. The inspection and tests should only be performed by a competent person.

Further details on inspection standards are available from HSE. Of particular interest is Guidance Note HS(G)107, 2001. Two free leaflets are also available: Maintaining Portable Electric Equipment in Offices and other Low Risk Environments and Maintaining Portable Electric Equipment in Hotels and Tourist Environments.

2. When testing appliances, the term 'portable' applies to anything fitted with a mains plug including photocopiers, offset litho machines, etc.
3. When performing an insulation test on Class 2 (double insulated) appliances, the test lead crocodile clip should be pressed against various parts of the insulated case e.g. near where the mains supply enters etc. Either of the test sockets may be used for this test. Care should be taken to hold the crocodile clip via the insulating shroud. If the metal of the clip is touched during the test, a mild tingling may be felt - this is unpleasant but not dangerous.

Some double insulated appliances may have an insulating case but metal screws etc. may be visible; these do not necessarily mean that it is Class 1! Provided the screws are driven into enclosed insulating material, Class 2 integrity is maintained.

4. The insulation test applies 500-600V d.c. between the live and neutral conductors and earth. If the appliance is fitted with mains input filter capacitors, this can stress these components. The fitting of filter capacitors may also give misleading results - under these circumstances the manufacturer's advice should be sought.
5. When testing electric kettles, the test lead should be clipped to the kettle element. In hard water areas, this will require you to scrape away scale until the bare metal can be seen.
6. When testing computers, ensure that the earth bond test point is a genuine mains earth and not a signal earth point. If there is any doubt, simply complete a visual inspection and skip the PATCH tests. A note should be made on the Certificate of Inspection.
7. When assessing Class 1 and Class 2 appliances and plug fuse values, the following information may be helpful:

Items fitted with 2 core cable are Class 2 (double insulated). Some Class 2 appliances may be fitted with a 3 core cable, but Class 1 appliances are never fitted with 2 core cable.

Plastic electric kettles are Class 1 (see 5 above).

Generally speaking, the only appliances which will require 13A fuses are kettles, water heaters, irons and electric heaters. Colour televisions require a 5A fuse. Most other appliances require a 3A fuse - if in doubt fit a 3A fuse. If this 'blows' try a 5A. If this 'blows', fit a 13A.