PAT-IT

Portable Appliance Tester

User Manual

Issue 1.5

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SAFETY

Please read this manual carefully to make yourself familiar with the capabilities and functions of the PAT-IT before attempting to use it. The PAT-IT uses high voltages for some measurements and it is important that due care is taken during its use.

1. The PAT-IT is designed to be used by suitably trained personnel. However, this manual contains all the information necessary to carry out in-service testing of all electrical appliances. Therefore reading this manual, will provide adequate information to be able to carry out these tests. If after reading this manual you are still not confident about carrying out the tests then please consider either
   - attending one of our “Demystifying Portable Appliance Testing” courses held around the UK
   or
   - Studying our Distance Learning Package on Portable Appliance Testing
   See our website for details www.firststopsafety.co.uk

2. The unit is designed to be powered from a 230 V, 50 Hz source. The IEC Power Lead provided is fitted with a 5 Amp fused mains plug.

3. Take great care not to plug the Mains IEC Lead to the IEC Lead Test Socket. However, if this should happen accidentally the unit is protected internally.

4. There is no mains power-on switch. To isolate the unit from the mains, either switch off at the mains socket or disconnect the IEC lead.

5. There are no user serviceable parts in this unit. Under no circumstances should the user attempt to open the unit. If opened, the warranty will be invalidated.

6. The PAT-IT is guaranteed for one year from the date of purchase. Please keep your invoice as proof of purchase.

SAFETY cont.

7. Should the unit require a service, repair or calibration, please return it to:

   First Stop Safety
   11 Glaisdale Road
   Northminster Business Park Upper Poppleton
   York. YO26 6QT
   Tel: 01904 791050

   When returning the unit, please contact the Sales Department to receive a Returns Number. The owner will be advised of any costs prior to work commencing.

GETTING STARTED

Before using the PAT-IT, please check that the following items have been included in the shipment:

- PAT-IT Unit
- IEC Power Lead
- Test Clip
- User Manual
- Sample Equipment Register Form
- Sample Equipment Test Record Form
- 100 Tested Labels
- Other equipment may be included if PAT-IT has been bought as part of a PAT Package.

Check for any damage in transit. If there is any sign of damage, please report it to your supplier and do not attempt to repair the unit.

The unit is factory set to be powered from a 230 V supply. This is indicated on the rating plate. Please ensure that the product is powered from the correct source. The apparatus is constructed to CLASS I construction, and requires a protective mains earth connection.

INTRODUCTION

The Electricity at Work Regulations 1989 (EAW) places certain requirements on employers, designed to control risks that can arise from the use of electricity. In practise, this covers all in-service electrical appliances and includes user checks, formal visual inspection and combined inspection and testing

The PAT-IT is a compact Portable Appliance Tester, aimed specifically at testing IT and office equipment. It can be used to test other portable equipment, such as kettles, desk lights, drills, hairdryers etc. If an appliance has a plug it can be tested on PAT-IT.

The clear controls and displays make this instrument very easy to use. The instructions, labels and sample records supplied make it very easy for anyone to undertake safety testing on all electrical appliances.

The user has only to decide whether the equipment to be tested is built to a Class I or Class II construction. The supplied test clip is connected and the appropriate button pressed.

When testing Class I equipment, the PAT-IT will automatically cycle through the Earth Continuity and Insulation tests. The results of these tests are then displayed with Pass/Fail comments appropriate to Class I equipment.

When Class II equipment is being tested, just the Insulation test is carried out. The result is displayed and assessed against the requirements for Class II equipment.

An IEC lead test facility is also provided. With the lead connected, the IEC test button is pressed to carry out an Earth Continuity and a Polarity test.

Note: The Earth Leakage Current test is optional and is not a requirement for in-service testing.

FEATURES

- Aimed at testing IT and other electrical equipment
- 100mA Earth Continuity test current
- Insulation test at 500 V
- Class I, Class II test button. Automatic test cycle
- IEC cable test facility as standard
- Test results displayed on a 2-line display
- Supplied with test clip
- Supplied with sample test records
- Supplied with test result labels

PLANNING THE TESTS

Before commencing testing, it is advisable to take a few minutes to plan. One needs to assess whether the equipment is Class I or II, the type of equipment, the type of environment and then the frequency of inspection and testing required. The Equipment Register then needs to be prepared. Once this is completed, one is ready to commence Inspection and Testing. Please note that all mains extension leads are also to be included in the list. IT equipment with detachable IEC leads can be tested together, there is no need to test the lead separately. However, if there is a batch of IEC leads, that can be used with any appliance, it is important to test these as individual items.

Determining the Class of construction

All equipment that uses mains electricity are categorised into two Classes. Below are some guidelines on how to identify which Class an appliance belongs to:

	Class I	Class II
Has ⧈ symbol		✔
Uses 2-core mains cable		✔
Uses an earth connection	✔	

Knowing the Class of the equipment is important when planning the testing. In general, if the ⧈ symbol is present, the equipment is Class II and is built to a high standard of insulation. If the ⧈ symbol is missing, assume that the equipment is Class I and the safety is dependent on having a good earth connection. Mains extension leads and IEC leads are treated as Class 1 appliances.

1. Type of equipment

For the purpose of planning an in-service test regime, electrical equipment is categorised into 5 types. These are explained below:

2. **Stationary equipment**: This is defined as heavier than 18 kg and not provided with a carrying handle. Refrigerators and washing machines are examples.

3. **Information Technology equipment** (business equipment): This includes electrical business equipment, such as computers, mains powered equipment and other equipment for general business use, such as mail processing machines, electrical plotters, trimmers, VDUs, data terminals, telephones, printers, fax machines and photocopiers.

4. **Movable (transportable) equipment**: This is defined as equipment less than 18 kg and not fixed, like an electric fire or equipment with wheels or castors to facilitate movement by the operator as required to perform its intended use.

5. **Portable appliance**: This is defined as an appliance that is intended to be moved whilst in operation, or an appliance that can easily be moved whilst connected to the mains. Vacuum cleaners, toasters and kettles are examples of these. Mains extension leads and IEC leads are classified as Portable appliances in their own right.

   Handheld appliance: This is portable equipment intended to be held in the hand during normal use like a hair dryer, drill or soldering iron.

Type of environment

The location of equipment will finally determine the frequency of testing. An item that is used in a low-risk environment such as an office will not be subject to the same rigours as an item used on a construction site. The different environments are:

- Offices, shops, hotels, nursing homes
- Schools
- Equipment used by the public
- Industrial including commercial kitchens
- Construction sites

Frequency of visual inspection and testing

It is not essential to carry out testing every year. The guidelines allow for formal visual inspections to be carried out at planned intervals and combined visual inspection and testing to be carried out at longer intervals, depending on the type of equipment being tested, and the environment it is in. Table 1 below gives some intervals that are recommended for offices, shops, hotels, and nursing homes.

	Class I		Class II	
Type	**Formal Visual insp.**	**Combined Insp. & test**	**Formal Visual insp.**	**Combined Insp. & test**
Stationary	24 months	48 months	24 months	none
IT	24 months	48 months	24 months	none
Movable	12 months	24 months	24 months	none
Portable	12 months	24 months	24 months	none
Handheld	6 months	12 months	6 months	none

Table 1

Exceptions to these time periods are:

- Items brought in by third parties
- Items repaired
- Items rented

and test more frequently if items are:

- Moved regularly
- Regularly failing inspection and testing

Timescales for other environments can be found in Appendix III.

Equipment Register

This form is used to list all the electrical equipment in the premises. Information, such as Class I or II, type of equipment and frequency of test is recorded. A blank form is supplied, and this can be photocopied and used if additional sheets are required. The layout of this is shown below:

Reg.	Date Added	Location	Description	Class	Type	Environ.	Frequency	
							Formal Visual Insp	Comb Insp + test
1	01/01/01	Kitchen	Kettle	1	Portable	Office	12m	24m
2	01/01/01	Sales	PC	1	IT	Office	24m	48m
3	01/01/01	Sales	Copier	1	IT	Office	24m	48m

As new equipment is purchased, this needs to be added to the register.

OPERATION

Once the above preparation work has been carried out, the visual inspection and testing is quite straightforward. It is important to prepare a Test Record for each piece of equipment. A sample form is provided that can be photocopied and used as required.

This form will be used to record the history of visual inspection and testing. On some equipment, where the test result is marginal, recording the actual reading will allow trends to be monitored, and potential problems caught in time.

Formal Visual Inspection

This can form an important part of in-service testing. The following is a list of faults to look for:

1 CABLE

(a) Damage to power cable sheath.
(b) Any taped joints to the cable.

2 APPLIANCE

(a) Signs that the equipment has been subject to conditions for which it is not suitable, e.g. wet or excessively rusty.
(b) Damage to external casing of the equipment, or loose parts or screws.
(c) Evidence of overheating.
(d) Cable covering not being gripped.

3 PLUG EXTERNAL

(a) Damage to mains plug, e.g. cracking to the casing, or bent pins.
(b) Inadequate strain relief. This is when the outer sheath of the cable is not effectively secured where it enters the plug. Obvious evidence of this would be if the coloured insulation of the internal cable were showing.

4 PLUG INTERNAL

In addition to the above, the plug cover (if it is not moulded) needs to be taken off and the following checked:

(a) That a fuse is being used
(b) That cable terminations are correct (see Appendix 1)
(c) The terminal screws are tight
(d) No excessive bare wires are visible
(e) That there are no signs of internal damage, overheating or ingress of foreign matter
(f) Check fuse rating. If possible, refer to manufacturer's user guide. Otherwise follow guidelines below:

< 700W	3 Amp Fuse
700-1200W	5 Amp Fuse
>1200W	13 Amp Fuse

If the equipment fails on any of the above points, then it must be taken out of service, a "Failed" label applied and not used again until it has been properly repaired and tested.

Examples of some of these failures are given in Appendix II.

Under no circumstances must one proceed with the testing stage, if a failure is found during the Formal Visual Inspection stage.

Testing Class I equipment

The equipment to be tested is plugged into the mains socket on PAT-IT. The test clip is connected to any exposed metal on the equipment. (Note: Some Class I equipment may have exposed metal that is painted or enamelled and will not provide a good earth connection). Some may in fact have no external earth connection at all, like a vacuum cleaner. If no external earth can be found, then the Earth Continuity test will fail with the message “CONNECTION? FAIL”. Just make a note of this on the Test Record.

Operate the Class I button. The test will now run and the display will show the results for the Earth Continuity and Insulation tests. The results are displayed for a few seconds, before the display returns to its default state.

When the tests are performed, it is important to put the on/off button/ switch to the "On" position and flex the power lead to make sure that any loose connections are stressed and are picked up by the test. The Earth Continuity test is repeated automatically to look for this.

PAT-IT automatically assesses the test result for a pass or a fail.

Once the testing is complete, record the results on the Test Record.

Testing Class II equipment

The equipment to be tested is plugged into the mains socket on PAT-IT. The test clip is connected to any exposed metal on the equipment, if present.

Operate the Class II button. The test will now run, and the display will show the results for the Insulation test. The result is displayed for a few seconds, before the display returns to its default state.

PAT-IT automatically assesses the test result for a pass or a fail.

Once the testing is complete, record the results on the Test Record.

Testing IEC leads

When testing IT equipment with detachable IEC leads, they can be tested together, and there is no need to test the lead separately. However, if there is a batch of IEC leads, that can be used with any appliance it is important to test these as individual items.

Plug the IEC lead into the top PAT-IT mains and IEC sockets. Operate the IEC button. PAT-IT will now test for Earth Continuity and correct Polarity and display the results.

Use of Optional Accessories (ask Sales for details)

Testing mains extension leads - Short IEC lead

This adaptor allows the testing of extension leads. Plug the extension lead into the PAT-IT. Plug the adaptor into one of the sockets of the extension lead and also into the IEC testing socket on the PAT-IT. Press the IEC button to test Polarity and Earth Continuity. Check all other sockets in the same manner.

Testing 110 V appliances - 110 V adaptor

This adaptor allows appliances with 110 V plugs to be tested. Just plug the adaptor into the PAT-IT and connect the appliance to be tested into the yellow 110 V socket. Then use the PAT-IT as normal.

This adaptor is designed to be used only with the PAT-IT for testing purposes, under no circumstances is it to be connected to a mains outlet.

Testing 3-phase appliances - 3-phase adaptor (Various models available)

This adaptor allows appliances with 3-phase plugs to be tested. Just plug the adaptor into the PAT-IT and connect the appliance to be tested into the 3-phase socket. Then use the PAT-IT as normal.

This adaptor is designed to be used only with the PAT-IT for testing purposes, under no circumstances is it to be connected to a mains outlet.

A hard carry case and additional labels are available. See our website (www.firststopsafety.co.uk) or contact Sales for details.

SPECIFICATION

EARTH CONTINUITY TEST

Measuring range	20-2000 m:
Resolution	1 MΩ
Measuring Current	80 mA
OC Voltage	5 V
Tolerance	5% + 20mΩ
Fail Threshold	>300 mΩ

INSULATION TEST

Measuring range	0.5-20 mΩ
Resolution	1 mΩ
Test Voltage	500 V
SC current	< 5 mA
Tolerance	5% + 0.1
Fail Threshold Class I	< 2 MΩ
Fail Threshold Class II	< 4 MΩ

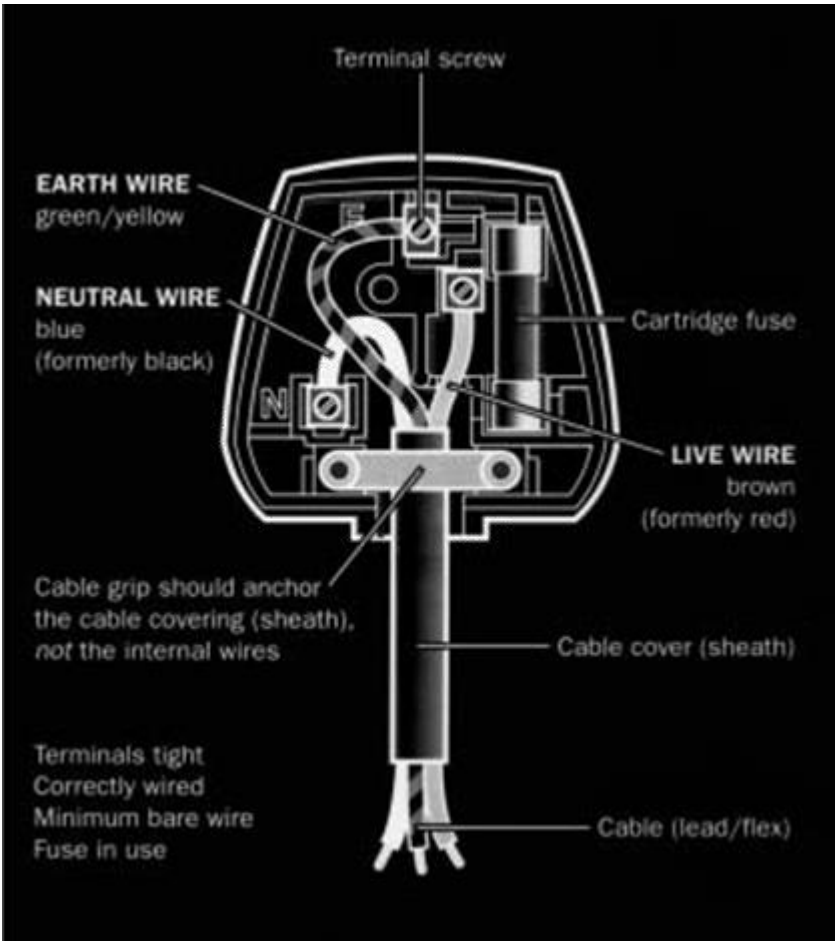
LEAKAGE CURRENT

Measuring range	0.1 to 5mA
Resolution	0.1mA
Measuring voltage	40 V rms
Tolerance	10% +0.1 (Mainly capacitive load R>2mΩ)
Fail Threshold Class I	>5 mA
Fail Threshold Class II	>0.5 mA

DIMENSIONS

Height	65 mm
Width	195 mm
Depth	130 mm
Weight	1.5 kg

APPENDIX I - Wiring of Mains Plug



APPENDIX II - Examples of Visual Inspection failures.

1a Damage to power cable sheath

3a Damage to mains plug

1b Taped joint of cable

3b Inadequate strain relief

2c Evidence of overheating

APPENDIX III - Suggested Frequency of Inspection and Testing of Equipment

OFFICES, SHOPS, HOTELS, NURSING HOMES

	Class I		Class II	
Type	Formal Visual insp.	Combined Insp. & test	Formal Visual insp.	Combined Insp. & test
Stationary	24 months	48 months	24 months	none
IT	24 months	48 months	24 months	none
Movable	12 months	24 months	24 months	none
Portable	12 months	24 months	24 months	none
Handheld	6 months	12 months	6 months	none

SCHOOLS

	Class I		Class II	
Type	Formal Visual insp.	Combined Insp. & test	Formal Visual insp.	Combined Insp. & test
Stationary	12 months	12 months	12 months	48 months
IT	12 months	12 months	12 months	48 months
Movable	4 months	12 months	4 months	48 months
Portable	4 months	12 months	4 months	48 months
Handheld	4 months	12 months	4 months	48 months

EQUIPMENT USED BY THE PUBLIC

	Class I		Class II	
Type	Formal Visual insp.	Combined Insp. & test	Formal Visual insp.	Combined Insp. & test
Stationary	monthly	12 months	3 months	12 months
IT	monthly	12 months	3 months	12 months
Movable	weekly	6 months	1 month	12 months
Portable	weekly	6 months	1 month	12 months
Handheld	weekly	6 months	1 month	12 months

INDUSTRIAL, COMMERCIAL KITCHENS

	Class I		Class II	
Type	Formal Visual insp.	Combined Insp. & test	Formal Visual insp.	Combined Insp. & test
Stationary	12 months	12 months	12 months	12 months
IT	12 months	12 months	12 months	12 months
Movable	1 month	12 months	3 months	12 months
Portable	1 month	6 months	3 months	6 months
Handheld	1 month	6 months	3 months	6 months

CONSTRUCTION SITES

	Class I		Class II	
Type	Formal Visual insp.	Combined Insp. & test	Formal Visual insp.	Combined Insp. & test
Stationary	1 month	3 months	1 month	3 months
IT	1 month	3 months	1 month	3 months
Movable	1 month	3 months	1 month	3 months
Portable	1 month	3 months	1 month	3 months
Handheld	1 month	3 months	1 month	3 months

Source - The Institute of Electrical Engineers Code of Practice for In-service Inspection and Testing of Electrical Equipment.

Additional notes on PAT-IT use

1. Testing long mains extension cables (longer than 15m)

The PASS/FAIL limits of the PAT-IT are set to suit most appliances and mains extension leads found in the workplace. However, when testing extension leads greater than 15m, you may get a FAIL indication during the Earth Continuity part of the IEC test.

For long extension leads, you can ignore the FAIL for Earth Continuity and apply your own limits as set out below:

15 to 25 metres	less than 0.50 ohms is a pass
25 to 40 metres	less than 0.80 ohms is a pass
40 to 50 metres	less than 0.90 ohms is a pass

2. Earth Leakage test results

For the maintenance of in-house electrical appliances, it is really only necessary to check Earth Continuity and Insulation Resistance. (If the appliance is Class II, only the Insulation Resistance is required).

3. ERROR 4 message

If equipment is still plugged into the PAT-IT when the PAT-IT is powered up, "ERROR 4" is displayed on the LCD. Unplug all equipment before powering up the PAT-IT.

4. Testing IEC leads or mains extension leads

When these type of leads are being tested and both ends are plugged into the PAT-IT, then it is important to press the IEC button. If you press the Class 1 button then a false reading will result.

5. Appliances with built-in surge protection

These appliances have protection devices that may cause an Insulation test result failure. In this case, the appliance must NOT be used until the manufacturer of the appliance is contacted and comes up with a satisfactory explanation.