

DisplayPAT

Battery Powered Portable Appliance Tester With Digital Display

**User Manual
Issue 1.1**



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SAFETY

Thank you for purchasing the DisplayPAT. For safety and full understanding of the product and its benefits, please read this manual carefully before attempting to use it.

1. This manual contains all the information necessary to carry out in-service testing of all electrical appliances. 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 www.firststopsafety.co.uk for details.

2. Before use, please check the unit for cracks or any other damage. Make sure the unit is free dust, grease and moisture. Also check any associated leads and accessories for damage. Do not use if damaged.
3. Do not touch the appliance being tested or the test probe tip when the DisplayPAT is performing a test. Where possible, use the crocodile clip provided to attach the probe to the appliance.
4. **Do not** use the DisplayPAT if the battery cover is not fitted.
5. The unit is powered from 6 x rechargeable 1.2V NiMH batteries with 1800 mAh or greater. Caution – please use only the specified battery type.
6. **Do not** connect the DisplayPAT to the mains supply via the IEC inlet. If mains voltage is inadvertently applied to the DisplayPAT via the IEC socket, an internal buzzer will sound continuously and ‘Err’ message will be displayed on the screen. This is a safety feature only. The DisplayPAT should not be used to determine if a mains socket is live.
7. A battery charger rated at 12V and 330mA is provided with the DisplayPAT.

8. There are no user serviceable parts in this unit other than batteries. Under no circumstances should the user attempt to open the unit, other than the battery compartment. If opened, the warranty will be invalidated.
9. The unit may be cleaned with a soft, dry cloth. Do not use moisture, abrasives, solvents or detergents, which can be conductive. The unit should be kept in warm, dry conditions away from direct sources of heat or light. It is strongly advised not to keep the unit in a tool box where other tools may damage it.
10. The DisplayPAT is guaranteed for one year from the date of purchase. Please keep your invoice as proof of purchase. Should the unit require a service, repair or calibration, please return it to the address at the back of this user manual.
11. 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 DisplayPAT please check that the following items have been included in the shipment:



- DisplayPAT unit
- Mains Charger
- Earth test probe with crocodile clip
- Short IEC lead
- User Manual
- Zip carry case
- Equipment Register form
- Test Record form
- 100 Tested, 5 Failed and 50 Fuse labels.

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

BATTERY CHARGING

New batteries should be charged for at least 12 hours prior to use.

Batteries must always be in position while the DisplayPAT is in use. When the batteries discharge to a predetermined low threshold value, the DisplayPAT will display a 'Connect charger' message. Approximately 10 further tests can be performed, after this message has first been displayed, before Auto Power Down occurs.

The 'Auto Power Down' function will occur after 10 minutes of inactivity, or when the battery is low, to preserve battery life. The message 'Auto Power Down' will be displayed on the screen for 3 seconds before Auto Power Down occurs. Display results will be lost when Auto Power Down occurs. When the DisplayPAT is next powered up, it reverts to the 'select test' screen.

The DisplayPAT will carry out a minimum of 600 tests when fully charged. In the event of discharged batteries, the DisplayPAT will operate fully from the battery charger. Do not remove the batteries. A new unit or new batteries should be charged for at least 12 hours before use with the batteries installed in the unit.

To charge the batteries, plug the charger into a mains socket, then connect the charger jack to the socket on the DisplayPAT. The ~ symbol will flash on the display to show that the charger is connected and the battery symbol will flash while the unit is charging. When the battery is fully charged, the battery symbol will show continuously.

Used batteries should be disposed of in accordance with local directives, and not in standard landfill waste.

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 practice, this means that all electrical appliances at work need to be inspected and tested.

The DisplayPAT is a compact hand-held battery powered Portable Appliance Tester, and can be used to test PCs, monitors, kettles, desk lights, drills, hairdryers etc. If an appliance has a plug it can be tested on DisplayPAT.

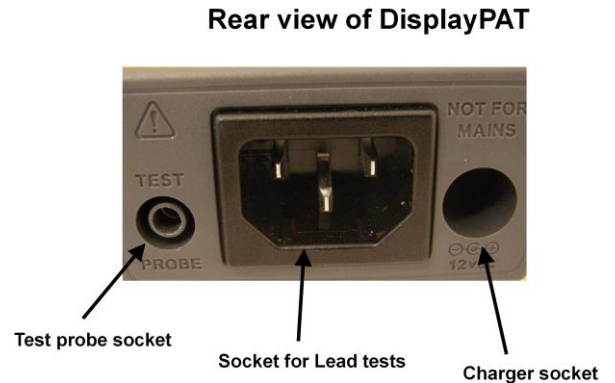
The clear controls and displays make this instrument very easy to use. The instructions, labels and sample records supplied make it very easy for anyone to undertake safety testing on all electrical appliances.

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.

Before any PAT Testing is carried out, it is very important to inspect the appliance. Many faults, e.g. a wrong value fuse or a wrongly wired plug, can only be found by careful inspection. This user manual sets out how this can be carried out.

Also included are master forms that can be used for managing PAT Testing in the workplace. These can be copied as many times as required.

FEATURES



RED POWER BUTTON

Hold for 1 second to power up or power down the DisplayPAT.

CLASS I BUTTON

Selects the Class I automatic test sequence. When this button is pressed, the unit will test Earth Continuity and Insulation Resistance showing the results for each test and an overall PASS or FAIL.

CLASS II TEST

Selects the Class II automatic test sequence. When this button is pressed, the unit will test Insulation Resistance showing the result for the test and an overall PASS or FAIL.

LEAD

Selects the Lead automatic test sequence. When this button is pressed, the unit will carry out an Earth Continuity, Insulation Resistance and a Polarity test showing the results for each test and an overall PASS or FAIL.

CLASS II + ON

Enables contrast adjustment on power up. The **LEAD** or **CLASS I** buttons can then be used to adjust the contrast as indicated on the display. The **CLASS II** button can then be used to accept and exit.

OTHER FUNCTIONS

In addition, buttons are assigned temporary functions at certain points in tests. Temporary functions are indicated in the display for an image of the corresponding button.

SHORT IEC LEAD

This allows mains extension leads to be tested easily.

SAMPLE FORMS

An “Equipment Register” and an “Equipment Test Record” form is included. These can be copied and used as often as required. The user manual refers to this under the relevant sections.

LABELS



100 ‘tested’ labels, 5 ‘failed’ labels and 50 fuse labels are supplied with each unit. Additional labels are available to purchase separately.

PLANNING THE TESTS

Before commencing testing, it is advisable to take a few minutes to plan. First of all work out whether the equipment is Class I or II. Then the type of equipment and the environment it is going to be used in. This will help to determine how often the inspection and testing has to be carried out. The Equipment Register then needs to be prepared. Once this is completed, one is ready to commence Inspection and Testing.

Class of construction

All equipment that uses mains electricity is either Class I or Class II. Knowing the Class of the equipment is important when planning the testing.

If the  symbol is present on the rating plate the equipment is Class II. If the  symbol is missing, assume that the equipment is Class I. Mains extension leads and IEC leads are treated as Class I appliances.

Type of equipment

For the purpose of planning, electrical equipment is categorized into 5 types as shown below. In general, the easier it is to move an appliance, the higher the chances of damage to it and the more frequently it has to be tested.

Stationary equipment: Refrigerators and washing machines are examples.

Information Technology equipment: This includes computers, VDUs, data terminals, telephones, printers, fax machines and photocopiers.

Movable (transportable) equipment: Items that are moved occasionally, like fans and fires would fit in this category.

Portable appliance: These are appliances such as vacuum cleaners, toasters and kettles which can easily be moved whilst connected to the mains.

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

Environment

The location of equipment will have a bearing on the frequency of testing. For example an item that is used in a low-risk environment such as an office will have a much lower risk of damage than an item used on a construction site. Please see below for various examples.

Low risk: Offices, shops, hotels and nursing homes

Medium risk: Schools

High risk: Factories, commercial kitchens and equipment used by the public.

Very high risk: Construction sites

Frequency of visual inspection and testing

It is not essential to carry out inspecting and testing every year. Table I below gives some intervals that are recommended in low risk environments, such as offices, shops, hotels, and nursing homes. (Timescales for other environments can be found in Appendix I)

Type	Class I		Class II	
	Inspection	Insp. & test	Inspection	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
Hand-held	6 months	12 months	6 months	none

Table I: Frequency of inspection and testing in low risk environments

Equipment Register

This form is used to list all the electrical equipment in the business. 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. As new equipment is purchased, this needs to be added to the register.

FORMAL VISUAL INSPECTION

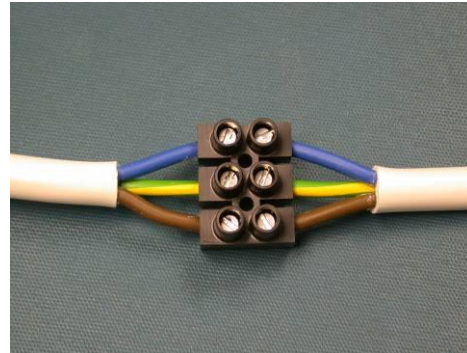
Once the above preparation work has been carried out, the visual inspection is quite straightforward. It is important to prepare a Test Record for each piece of equipment. A sample form is provided that can be photocopied and used as required. This form will be used to record the history of visual inspection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

Formal Visual Inspection is a very important part of making sure that appliances are safe to use. In fact, the majority of faults can only be found by a good visual inspection of the appliance. The following is a list of faults to look for:

Cable



Damage to power cable sheath



Any non-standard joints

Appliance

Signs that the equipment has been subject to conditions for which it is not suitable, e.g. wet or excessively rusty.



Cable not being gripped



Damage to external casing

Plug external



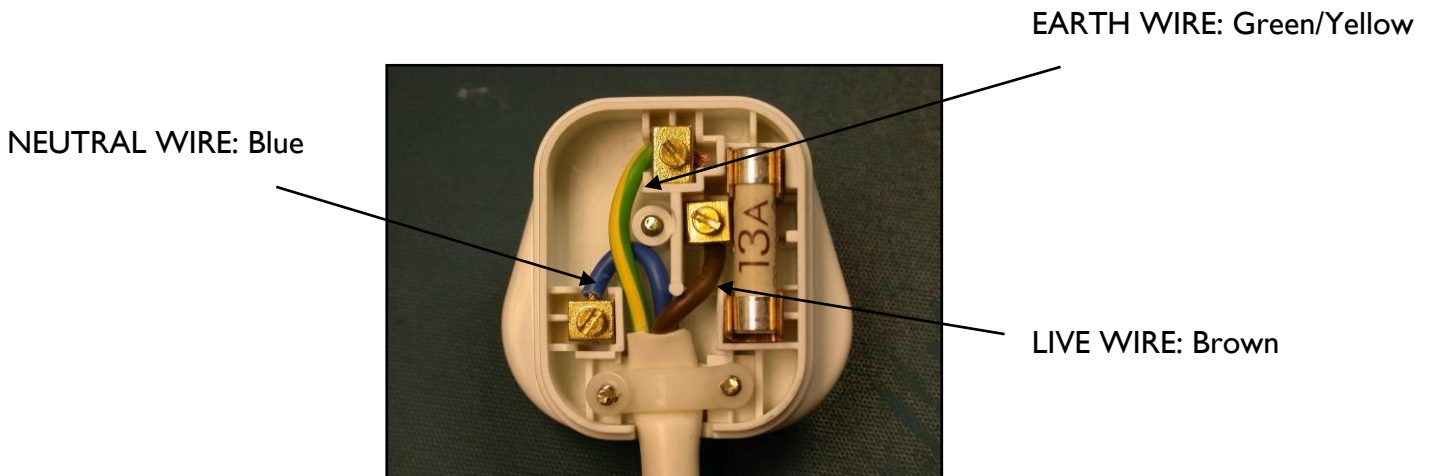
Cable not being gripped



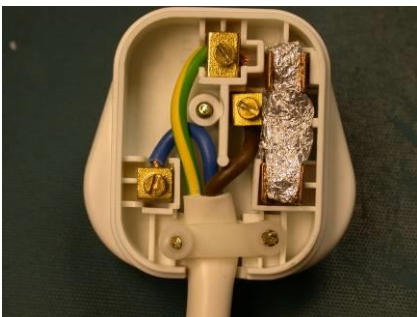
Damage to mains plug

Plug internal

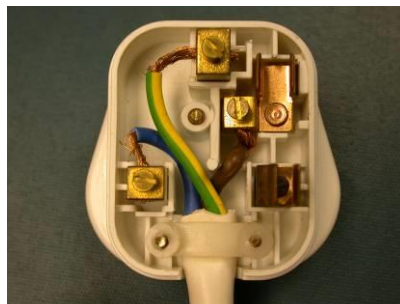
In addition to the above, the plug cover (if it is not molded) needs to be taken off and check that the cable terminations are correct.



Examples of faults:



Fuse not being used



Bare wires visible

Fuse rating

Check fuse rating. If possible, refer to manufacturer's user guide. Otherwise follow guidelines below:

3A or 5A fuse fitted: NO action.

13A fuse fitted: Then check power rating.

If power is less than 700 W then fit 3 Amp Fuse.

If power is more than 700 W then NO action.

Examples:



40W rating, requires 3A fuse.



1200W rating, requires 13A fuse.

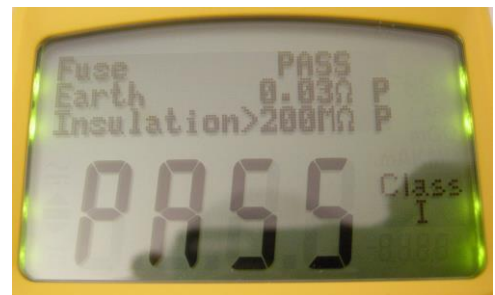
If the equipment fails on any of the above points, then it must be taken out of service, a "DO NOT USE" label applied and not used again until it has been properly repaired and tested.

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

OPERATION

Testing Class I equipment

The equipment to be tested is plugged into the mains socket on the DisplayPAT. The test clip is connected to any exposed metal on the equipment. For example on a kettle this will be the element. On a PC it will be the metal case. Please ensure the appliance is switched on, if applicable.



Press the Class I button. The tests will be run and the individual measurements for Earth Continuity and Insulation Resistance will be displayed with a 'P' or 'F' alongside each to indicate a Pass or Fail.

When testing Class I appliances, it is important to put the on/off button/switch to the "On" position. If **SWITCH ON** is displayed after the fuse check, please check that the appliance is switched on and is correctly connected to the DisplayPAT. Please also refer to notes on page 19 for more detail.

Sometimes "**NOTE x.xx Ω PASS**" is displayed after the Class I Earth Continuity test. If the power cord is more than 1 metre, then this appliance can be passed. If it is less than 1 metre, then it has to be failed.

Note 1: When the tests are performed, it is important to 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.

Note 2: On some appliances, paint, rust or scale will prevent a good earth. It is important to persevere and try and get a good earth connection when carrying out this test,

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

Class I Earth Connection

Finding a good earth on Class I appliances comes with experience. To help you identify where to connect the test lead, we have provided a few examples below.



PC: Case or connector



Toaster: Metalwork



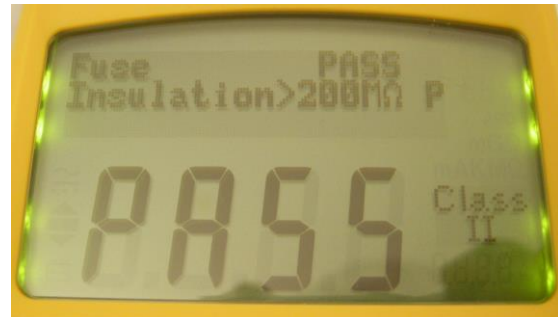
Hot melt gun: nozzle



Iron: Behind plate

Testing Class II equipment

The equipment to be tested is plugged into the mains socket on the DisplayPAT.



Press the Class II button. The tests will be run and the individual measurements for the fuse check and Insulation Resistance will be displayed with a 'P' or 'F' alongside each to indicate a Pass or Fail.

When testing Class II appliances, it is important to put the on/off button/switch to the "On" position. If **SWITCH ON** is displayed after the fuse check, please check that the appliance is switched on and is correctly connected to the DisplayPAT. Please also refer to notes on page 19 for more detail.

Where the appliance being tested has more than one area of possible insulation breakdown, such as cooling slots or cover joints, it is advisable to connect the test probe to this and then repeat the test.

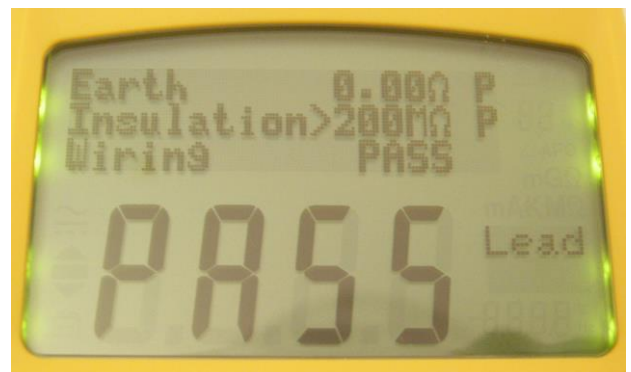
Once the testing is complete, record the results on the Test Record.

Testing IEC leads

When testing IT equipment with detachable IEC leads, it is important to test these leads as individual items.

Plug both ends of the IEC lead into the DisplayPAT. One end into the mains socket and the other end into the IEC socket. Press the Lead button. The tests will be run and the individual measurements for Earth Continuity, Insulation Resistance and Polarity will be displayed with a 'P' or 'F' alongside each to indicate a Pass or Fail.

Sometimes “**NOTE x.xx Ω PASS**” is displayed after the Lead Earth Continuity test. If the power cord is more than 1 metre, then this appliance can be passed. If it is less than 1 metre, then it has to be failed.

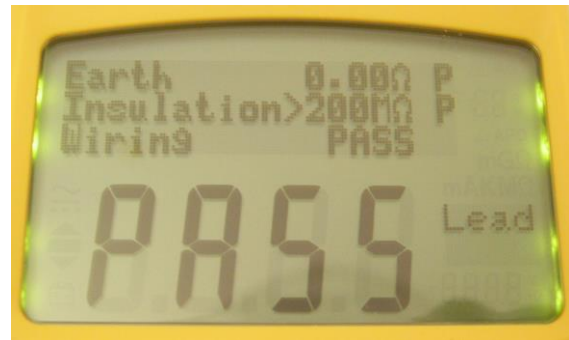


Once the testing is complete, it is important to label the leads.

Testing mains extension leads

The short IEC lead allows the testing of mains extension leads. Plug the extension lead into the DisplayPAT. Plug the short IEC lead into one of the sockets of the extension lead and also into the IEC testing socket on the DisplayPAT. Press the Lead button. The tests will be run and the individual measurements for Earth Continuity, Insulation Resistance and Polarity will be displayed with a 'P' or 'F' alongside each to indicate a Pass or Fail.

Sometimes “**NOTE x.xx Ω PASS**” is displayed after the Lead Earth Continuity test. If the power cord is more than 1 metre, then this appliance can be passed. If it is less than 1 metre, then it has to be failed.



Note 1: On a multi-way mains extension lead, make sure that you check all the socket outlets.

Note 2: The Insulation Resistance test is carried out at 500V.

Note 3: If the extension lead has a switch, it must be switched on.

Once the testing is complete, it is important to label the leads.

Testing long extension leads

When testing extension leads longer than 5 metres, the DisplayPAT will show FAIL for the Earth Continuity test. This is because of the additional resistance due the extra length of the lead. In this case the user can refer to the following table to see if the extension lead has a resistance that falls below the limits shown for that length.

Lead length	PASS limit
Up to 10 m	less than 0.3 ohms
Up to 15 m	less than 0.4 ohms
Up to 20 m	less than 0.5 ohms
Up to 25 m	less than 0.6 ohms
Up to 30 m	less than 0.7 ohms
Up to 35 m	less than 0.8 ohms
Up to 40 m	less than 0.9 ohms
Up to 45 m	less than 1.0 ohms
Up to 50 m	less than 1.1 ohms

Note: If the Earth Continuity is a FAIL, the tester will not carry on with the Insulation Resistance and Wiring tests.

Testing surge protected appliances

Surge protected appliances can fail the Insulation Resistance test as this is carried out at a high voltage (500V DC) and cause the protection devices to activate. Expect to get an Insulation Resistance FAIL on an appliance that is surge protected.

Note: If the Insulation Resistance is a FAIL, the tester will not carry out the Wiring test.

FUSE CHECK FAILURE

If the display indicates **‘SWITCH ON?’**, then there are the following possible reasons for failure:

- The appliance’s main switch may not be set to the ‘On’ position. Rectify this and restart the test.
- The appliance may not be correctly connected to the DisplayPAT. Rectify this and restart the test.
- Ruptured fuse: Remove any fuse/s and check the fuse continuity by an alternative means. Ensure that the appliance is disconnected from any mains power whilst the fuses are being examined, then reassemble any fuse/s, reconnect the appliance to the DisplayPAT, ensure the appliance switch is set to the ‘On’ position and restart the appropriate test.
- Appliance Internal Circuitry: If the fuse/s are undamaged, the ‘SWITCH ON?’ display may be due to a switching device inside the appliance which only operates when the appliance is engaged at mains voltage. A ‘fail’ in such circumstances does not necessarily mean a fuse is ruptured or the appliance is faulty.

When the ‘SWITCH ON?’ message is displayed, the DisplayPAT automatic testing can be allowed to continue by selecting ‘SKIP’.

If it is decided that the appliance is faulty, when the ‘SWITCH ON?’ message is displayed, the test should be terminated by selecting ‘EXIT’ and unplugging the appliance from the DisplayPAT.

SPECIFICATION

EARTH CONTINUITY TEST

TEST VOLTAGE	500 V DC
CURRENT	200 mA DC (into short circuit)
OC VOLTAGE	4V DC (into open circuit)
TOLERANCE	+/- (5% + 2 digits)
FIXED PASS LEVEL – LEAD	$\leq 0.10\Omega$ = PASS $\leq 0.20\Omega$ = Note x.xx PASS
FIXED PASS LEVEL – CLASS I	$\leq 0.10\Omega$ = PASS $\leq 0.20\Omega$ = Note x.xx PASS

INSULATION TEST

TEST VOLTAGE	500 V DC at 1 mA ($< 600V$ DC into open circuit)
TEST CURRENT	1.5 mA (into short circuit)
TOLERANCE	$< 100M\Omega$ +/- (5% + 2 digits)
FIXED PASS LEVEL – LEAD	$\geq 1.0 M\Omega$
FIXED PASS LEVEL – CLASS I	$\geq 1.0 M\Omega$
FIXED PASS LEVEL - CLASS II	$\geq 2.0 M\Omega$

POLARITY TEST

TEST VOLTAGE	5 V
SC CURRENT	0.5 mA
WORKING LOAD	$> 30 k\Omega$

FUSE TEST

TEST VOLTAGE	4V DC (into open circuit)
TEST CURRENT	200mA DC (into short circuit)
PASS LEVEL	$> 2mA$

BATTERY & CHARGING

BATTERY	1.2V, NiMH x 6
LIFE	600 operations
INPUT	230V 50Hz
OUTPUT	12VDC @300mA, 5.5 jack x 2.5 bore centre

DIMENSIONS and GENERAL SPECIFICATION

HEIGHT	210 mm
WIDTH	90 mm
DEPTH	54 mm
WEIGHT	700g (including leads and batteries)
OVERLOAD PROTECTION	300V AC/DC
PROTECTION CLASS	IP20
SAFETY	Complies with BS EN 61010-1:2001
OPERATING TEMPERATURE RANGE	-10 to 40°C, non-condensing
RANGE	0 – 19.99Ω
RESOLUTION	0.01Ω
FIXED PASS LIMIT – LEAD	≤0.10Ω = PASS ≤0.20Ω = NOTE x.xx PASS
FIXED PASS LIMIT – CLASS I	≤0.10Ω = PASS ≤0.20Ω = NOTE x.xx PASS

If “NOTE x.xx Ω” is displayed, the instrument has granted a PASS for the appliance under test, where Earth Continuity is higher than the lower pass level of 0.10Ω but within the higher pass level of 0.20Ω.

The advisory NOTE alerts the end user of the DisplayPAT, who should take note of the Earth Continuity resistance value and reach a pass/fail decision for the appliance.

This is normally due to longer power cords. If the Power cord on the appliance is longer than 1 metre and less than 5 metres, then the display may show “NOTE x.xx Ω”. In this case the user can pass the appliance.

APPENDIX I

Suggested Frequency of Inspection & Testing of Equipment

SCHOOLS

Type	Class I		Class II	
	Inspection	Insp. & test	Inspection	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
Hand-held	4 months	12 months	4 months	48 months

EQUIPMENT USED BY THE PUBLIC

Type	Class I		Class II	
	Inspection	Insp. & test	Inspection	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
Hand-held	weekly	6 months	1 month	12 months

FACTORIES, COMMERCIAL KITCHENS

Type	Class I		Class II	
	Inspection	Insp. & test	Inspection	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
Hand-held	1 month	6 months	3 months	6 months

CONSTRUCTION SITES

Type	Class I		Class II	
	Inspection	Insp. & test	Inspection	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
Hand-held	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.

Note: The above are suggested initial periods. If during inspection and testing items are always passing, then it is acceptable to reduce the frequency of testing. Conversely, if many items are found to fail, then it is important to test more frequently till any particular problems are identified and corrected.

CARING FOR YOUR DISPLAYPAT

Annual calibration

Your DisplayPAT tester is an accurate instrument and it is important to make sure that it continues to measure correctly. A faulty tester could fail to pick up any faults with electrical appliances and results in passing them. To prevent this and ensure the accuracy of your DisplayPAT, we recommend that calibration is carried out annually. We will send you an annual reminder by e-mail or letter.

When you return the DisplayPAT to us we check it out thoroughly and:

Calibrate it with traceability back to National Standards.

Refurbish the unit and upgrade it if required.

Carry out a PAT test on the tester.

Issue a Calibration Certificate.

Collection & Delivery Service

We can arrange for the DisplayPAT to be collected for calibration and delivered back to you within 5 working days. All you have to do is to send us a completed order form.

Warranty

As long as your DisplayPAT is calibrated annually by First Stop Safety we provide a Lifetime Warranty. Should the DisplayPAT fail for any reason between annual calibrations please give us a call. We will repair it and ship it back to you free of charge. By calibrating your tester annually your Lifetime Warranty will cover your DisplayPAT for many years.

Booking a calibration

This couldn't be easier. You can request your calibration in a number of ways.

Download a booking form from our website www.firststopsafety.co.uk

Send us an e-mail to calibrations@firststopsafety.co.uk

Ring us on 01904 529054

***Remember: All you have to do is to send us the order.
We will do everything else.***



Warranty Conditions

First Stop Safety has complete confidence in our DisplayPAT testers enabling us to provide a Lifetime Warranty free of charge.

To retain the validity of the Lifetime Warranty the unit must be returned to First Stop Safety annually for a calibration.

Note: If the calibration is allowed to expire, the Lifetime Warranty is invalidated.

You have a one month grace period with regards to your calibration date. This means that you have one calendar month after the calibration expiry date in which to book your tester in for calibration.

The Lifetime Warranty covers the DisplayPAT unit only, not accessories.

If your unit develops a fault we repair it free of charge as long as your unit's Lifetime Warranty has been maintained.

What is not covered by the Lifetime Warranty

- If the unit has been water damaged. For example soaked in water or submerged in water or any other fluid.
- If the unit has been physically damaged beyond fair wear and tear. e.g. where the unit has had mains power applied to the white testing socket or the IEC socket on the upper face of the PAT tester.
- Repairs if the unit has not been returned for annual calibration.
- Repairs to accessories. For example repairs to adaptor leads such as the 110V adaptors.
- The cost of the annual calibration.

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First Stop Safety

11 Glaisdale Road

Northminster Business Park

York YO26 6QT

t: 01904 791050

f: 01904 352225

e: info@firststopsafety.co.uk

w: www.firststopsafety.co.uk