Megger

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PAT100 Series

Portable Appliance Tester

User Guide

Megger

Thank you for purchasing the Megger portable appliance tester.

For your own safety and to get the maximum benefit from your instrument, please ensure that you read and understand the safety warnings and instructions before attempting to use the instrument.

These instruments are designed and manufactured by:

Megger Instruments Limited
Archcliffe Road
Dover Kent
CT17 9EN
England

Megger Instruments Limited reserves the right to change the specification of these instruments at any time without prior notice.

Unpacking the carton

Unpack the carton contents carefully. There are important documents that you should read and keep for future reference.

Please complete the pre-paid warranty card and return it to Megger Limited as soon as possible to help us reduce any delays in supporting you should you need assistance.

Safety Warnings

The following Safety Warnings and Precautions **must** be read and understood before the instrument is used. They **must** be observed during use.

- Only use test leads and accessories supplied or approved by Megger Instruments Limited
- At any time the ⚠ symbol or ⚠ symbol is displayed, the user guide and warnings documentation must be consulted to identify the nature of the hazard and any actions necessary to avoid the hazard
- Do not use the instrument if there are any signs of damage
- This instrument meets the EMC requirements of Class A applications. Not for use in domestic installations
- All test leads, probes and clips **must** be in good order, clean and with no broken or cracked insulation
- Probes and clips should be held behind the finger guard
- Test leads not used during a measurement should be disconnected from the Appliance tester
- During testing, ensure no hazard will exist as a result of normal running or under fault conditions
- During testing the unit under test (appliance) should not be touched, other than using the appropriate accessories, as faulty appliances can present a shock hazard
- Do not touch the exposed parts of test leads during tests as hazardous voltages may be present
- Do not intentionally connect test leads to live systems or hazardous voltages
- Do not touch the IEC extension lead socket pins especially during a test, as hazardous voltages may be present due to a potentially faulty appliance
- Do not touch the exposed earth pins of the 230 V test socket during a test, as voltages may be present due to a potentially faulty appliance
- Serviceable fuses should only be replaced with those that are suitably rated
- Replacement fuses **must** be of the correct rating and type. **Refer to page 33**
- If this instrument is used in a manner not specified in the supplied documentation, the protection provided by the instrument may be compromised

PAT150

- For safety, only connect the PAT to a supply that is properly earthed. If in doubt, the supply should be checked by a qualified electrician
- Only perform a mains powered leakage test after the Earth bond and insulation tests have been completed, as this test operates at mains voltage
- During mains powered leakage tests the appliance under test will operate. Make sure the appliance is safely secured to ensure no damage or danger is possible
- A yearly calibration is recommended with interim checks on measurement accuracy to ensure no equipment can be left in a hazardous live condition through incorrect readings
- Only use a Megger approved PAT100 charger. Other chargers may present a fire risk
- Do not connect the battery charger to the PAT150R whilst running a test
- During testing make sure that the shutter covers the battery charger port. There is a risk of electrocution from exposed terminals. Do not touch any exposed terminals or probe tips during test
- Always remove the mains plug test lead  from the mains supply AND the instrument when not in use

Product Safety Category

CATII 300 V - MEASUREMENT CATEGORY II Equipment connected between the electrical outlets and the user's equipment.

⚠ **230 V ac powered Leakage testing**: Connecting the PAT150 to a 230 V ac supply will automatically switch the leakage tests from a 40 V ac test to a mains powered 230 V ac test. Any leakage testing performed with 230 V ac connected will operate the equipment under test. Ensure the equipment under test is properly secured and in a safe condition prior to running a 230 V ac leakage test

WEEE DIRECTIVE

The crossed out wheeled bin symbol placed on Megger products is a reminder not to dispose of the product at the end of its life with general waste.
Megger is registered in the UK as a Producer of Electrical and Electronic Equipment. The Registration No is WEE/HE0146QT
For further information about disposal of the product consult your local Megger company or distributer or visit your local Megger website.

Symbols used on the instrument

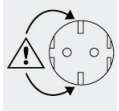
Caution: refer to accompanying notes.

Danger: Mains voltage present during testing

CE

N13117

Equipment complies with 'C tick' requirements



Caution: Earth pins of the 230 V test socket will become hazardous if test lead P1 is in contact with hazardous voltages during continuity test.

Fuse failure

This equipment should be disposed of as electronic waste

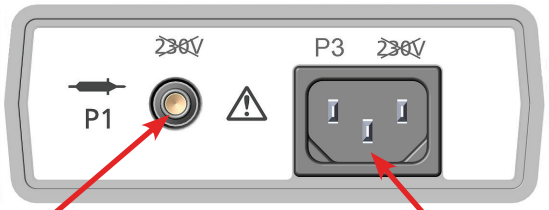
Battery type fitted

Do not connect to 230 V supply

Caution: Earth pin of the 230 V test socket will become hazardous if test lead P1 is in contact with hazardous voltages during continuity test

Symbols used on the connection panel

PAT120 connector panel



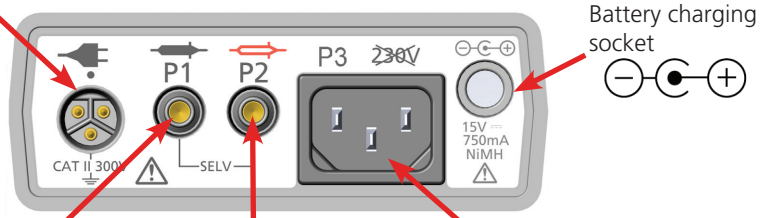
P1
Continuity (Bond), Insulation and Touch leakage probe connection

P3
IEC power cord and extension lead adaptor socket.

⚠ Do NOT connect P1 and P3 sockets to hazardous live voltages

PAT150 connector panel

Mains I/P
Used for testing that require mains power to be applied to the equipment under test, such as:
- PRCD testing
- Mains powered earth leakage tests



Battery charging socket

P1
Continuity (Bond), Insulation and Touch leakage probe connection

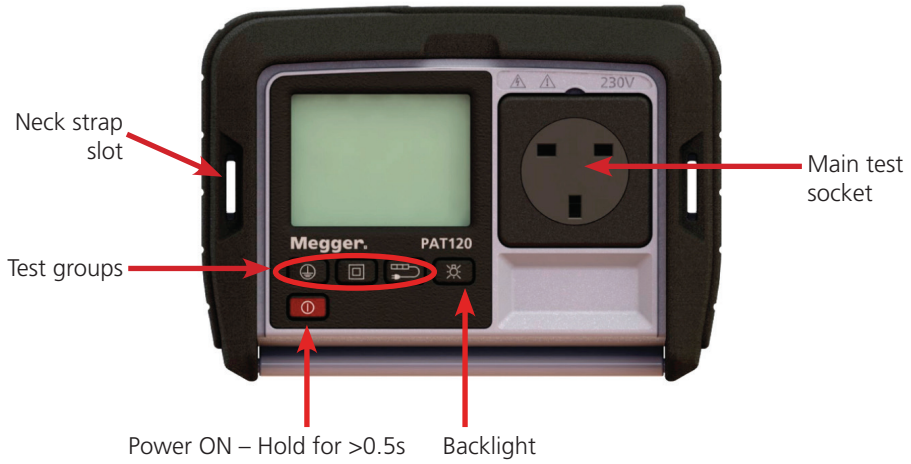
P2
Used with P1 for testing Separated Extra Low Voltages and Mains voltages

P3
IEC power cord and extension lead adaptor socket.

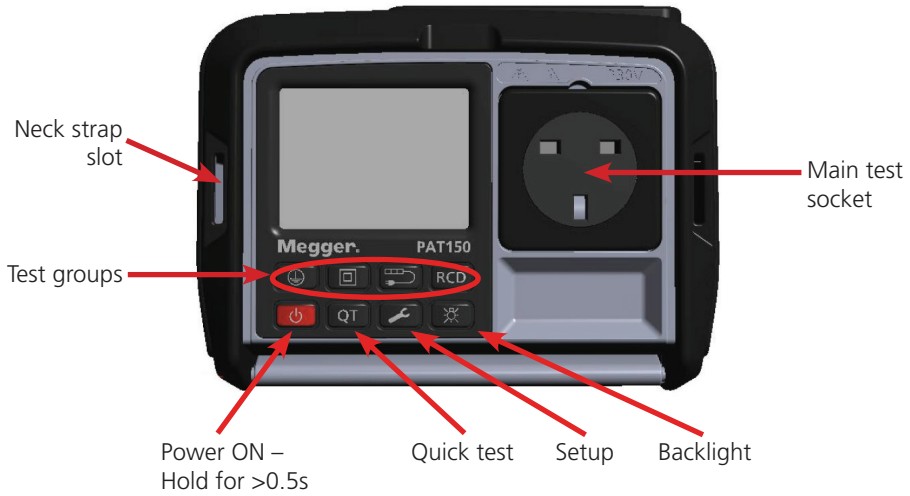
Do NOT connect to 230 Vac

⚠ Do NOT connect P1, P2 and P3 sockets to hazardous live voltages

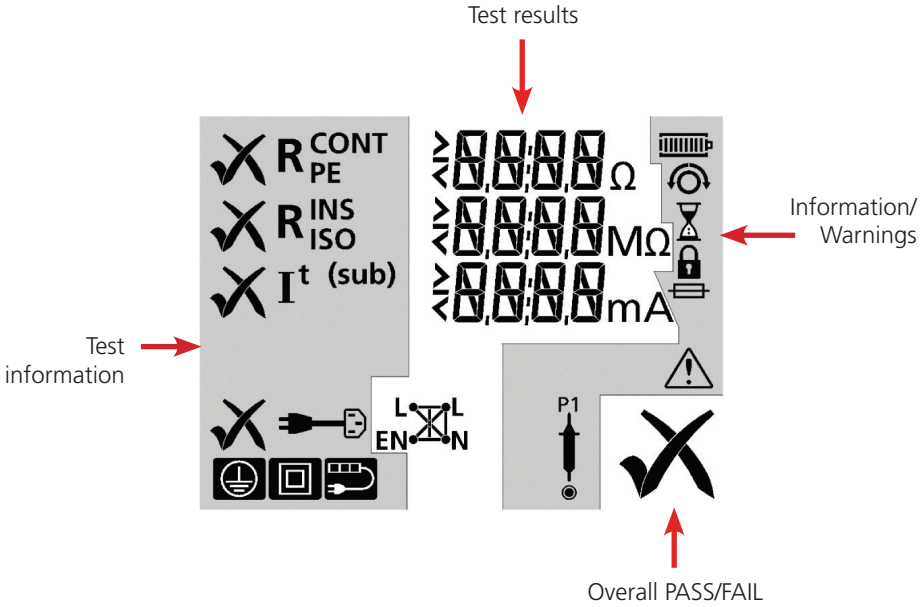
Instrument Layout PAT120



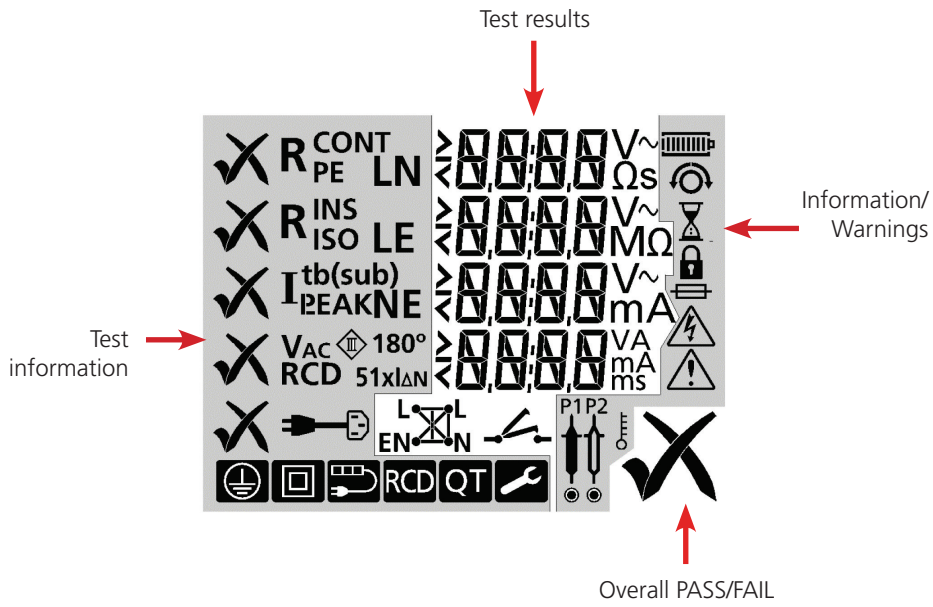
Instrument Layout PAT150



Display information PAT120



Display information PAT150



Measurement (display) symbols

PAT120 & PAT150

R^{CONT}_{PE}	Continuity of the protective earth conductor		Test in progress
R^{INS}_{ISO}	Insulation resistance between the Live/Neutral conductors and earth		Measurement locked ON
I_{EA}	Alternative method:- 40 V ac leakage test for protective conductor current and touch current. Battery powered test		Notice: Refer to user guide
		Ω	Resistance in ohms
$I^{(sub)}_{LEAK}$	(English language models) Alternative method:- 40 V ac leakage test for for protective conductor current. Battery powered test	MΩ	Insulation resistance in Meg Ohms (ohms x $1x10^6$)
		mA	Leakage current in milliamps
I^{t} (sub)	(English language models) Alternative method:- 40 V ac leakage test for for touch current. Battery powered test	L–L N–N	Cable polarity correct
	Power lead or Extension lead polarity test	L–N L–N	Live to Neutral cross polarity
P1	Test probe P1 to be connected	L N	Live to Neutral short circuit detected
✓	Test or overall test group passed	L E	Live to Earth short circuit detected
✗	Test or overall test group failed	L• •L N• •N	Open circuit detected
	Fuse failed		General warning - Appliance open circuit or not switched on

NOTE: The PAT100 instruments perform various pre-checks prior to testing to ensure the asset is not short-circuit and is switched on

PAT150 only

RCD	Residual current device test mode	P2	Test Probe P2 to be connected
0° 180°	0° - Positive edge test current 180 ° - Negative edge test current		Instrument hot, allow to cool
1xIΔN	1 x IΔn = the rated operating current of the RCD		Lead null active
5xIΔN	5 x IΔn = 5 time the rated operating current of the RCD		Warning: Hazardous voltages present
V~	Volts AC		P1 test lead null set
s	Seconds		Extension lead adaptor lead null set
ms	Thousandths of a second	I_{PE} I_{LEAK}	Earth leakage current measured using the differential/residual method
	RCD – Press TEST or RESET	LN	Phase to Neutral voltage
I^{t} I_B	Touch current measured with P1 test probe using the direct method	NE	Neutral to Earth Voltage
LE	Phase to Earth voltage	VAC	Separated Extra-Low Voltage measurement
VAC	Volts AC (measurement function)	R^{CONT}	(English language models) Fixed installation equipment continuity test
	Repeat continuity test	R_{PE}	Fixed installation equipment continuity test

Instrument Buttons

Power button - Hold down for 0.5 second to switch on,
Hold down for 2 seconds to switch off
Abort button - press to stop test or exit a setup mode

Class I button

Class II button

Extension lead button

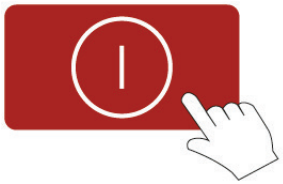
Quick test button

RCD test button

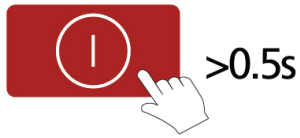
Setup button – allows access to PASS limits, test times and lead null option

Backlight button

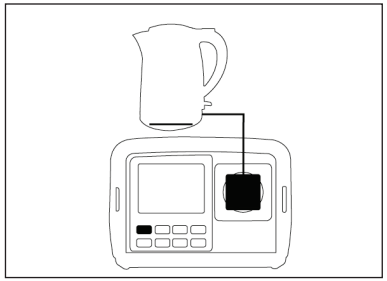
User guide INSTRUCTION symbols



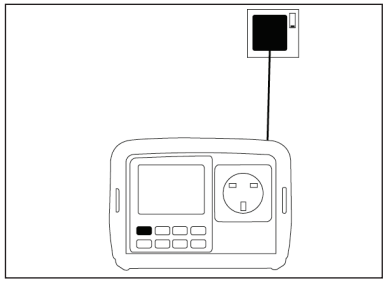
Press the button



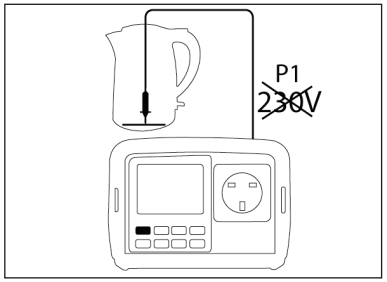
Press and hold for greater than 0.5 seconds



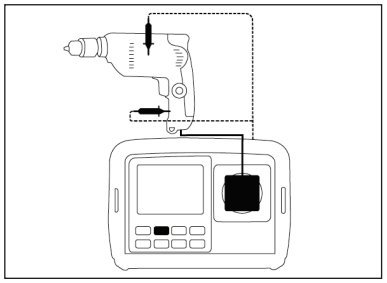
Connect the equipment to be tested to the instrument



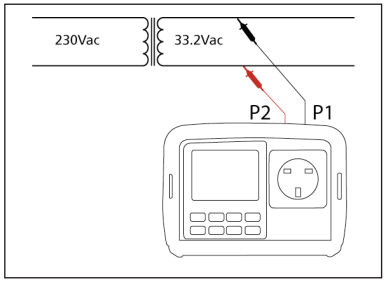
Connect the Instrument to the mains supply using the mains plug test lead (for mains powered leakage and RCD testing)



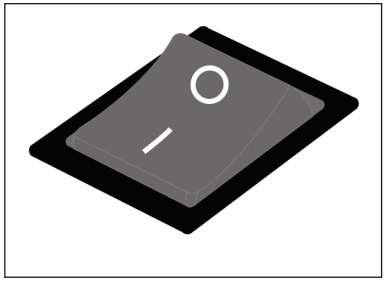
Connect the P1 test lead to socket P1 on the Pat100 and the probe to exposed metalwork Ensure the probe is NOT connected to a 230V source.



Connect the P1 test lead to different conductive points on the equipment under test during the measurement



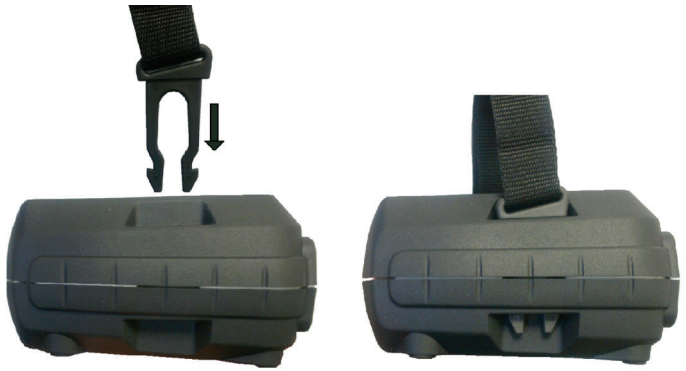
Connect both the P1 and P2 test leads to the circuit to be measured



Ensure equipment under test is switched ON

Carry strap fitting and removal

Fitting the carry strap:



Removing carry strap:

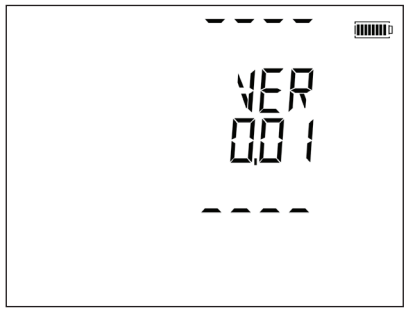
Switching ON / OFF

Switching ON

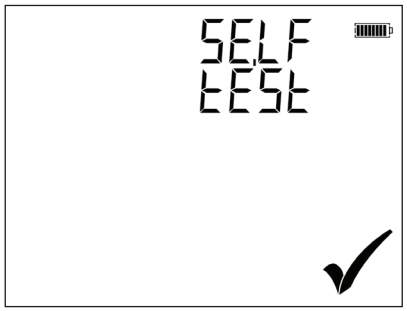
i)

>0.5 s

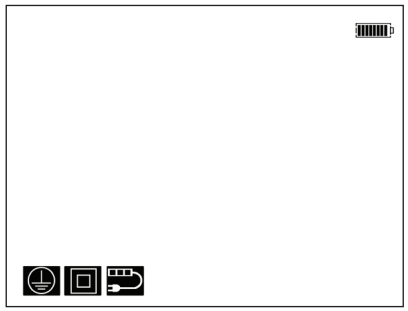
ii)



iii) PAT120



iv)



Switching OFF

i) Manual OFF

>2 s

ii) Auto OFF

Unit switches after 3 minutes of inactivity (not adjustable)

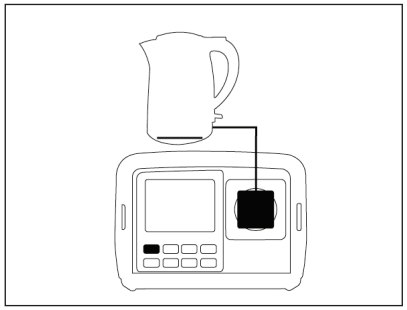
Backlight

Aborting a test

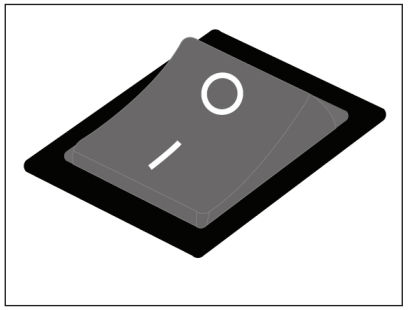
A test can be aborted at any time by pressing the Power (ESC) button

Class I test (PAT120, 150) using substitute leakage @ 40 V ac

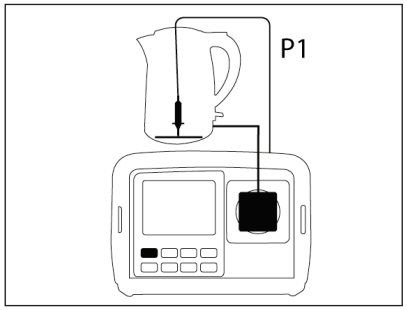
i)



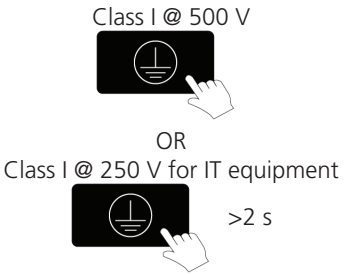
ii)



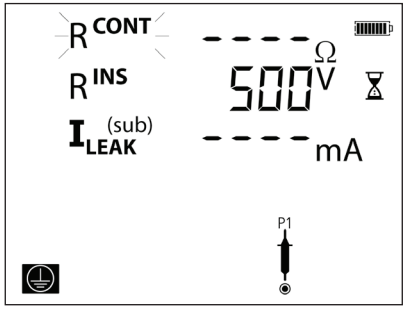
iii) Connect BOND lead P1



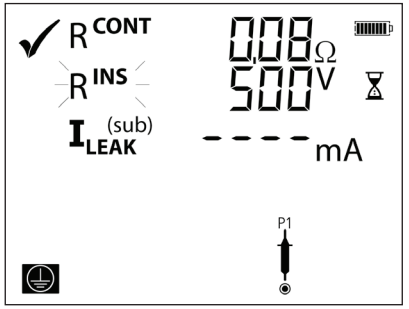
iv)



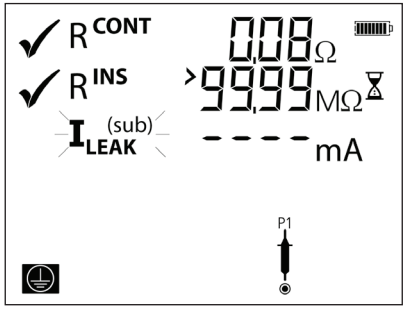
v) Ensure probe (P1) is connected



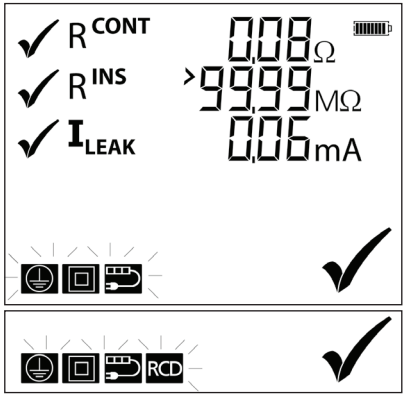
vi) Remove probe (P1)
See note below



vii)



viii) Class I Pass



NOTE: If the contact symbol is displayed during the test, the PAT has detected an open circuit load. Ensure the appliance is switched on then press the Class I icon
NOTE: The PAT100 instruments perform various pre-checks prior to testing to ensure the asset is not short-circuit and is switched on

To repeat a continuity test (PAT150 Class I and Extension lead tests only $R^{CONT}_{\circ}$ or $R_{PE}\circ$):

Press QT key during R^{CONT} (or R_{PE}) test to enable repeat test. The ↻ symbol will be displayed.

When the timer symbol has disappeared and the repeat symbol is flashing, press QT to run repeat test

Press ⏚ or ⌁ to exit repeat test

To repeat continuity test with 1.0 Ω limit (NOT available on UK models)

At the end of a FAILED continuity test the ↻ symbol will flash for up to 5 seconds.

Press the ⏚ or ⌁ button to repeat the test within the 5 seconds.

The test will be repeated with a 1.0 Ω pass limit.

Lock a test in the ON state:

R^{CONT} (R_{PE}) or R^{INS} (R_{ISO}) can be locked ON (🔒) during a test for up to 3 minutes. To Lock R^{CONT} (R_{PE}) or R^{INS} (R_{ISO}) on:

Press ⏚, ⧈ or ⌁ during the R^{CONT} (R_{PE}) or R^{INS} (R_{ISO}) test

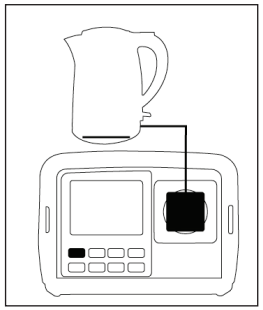
Press key again to unlock test and proceed to next test

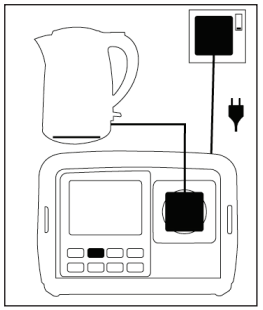
NOTE : This feature is available in group test and QT mode.

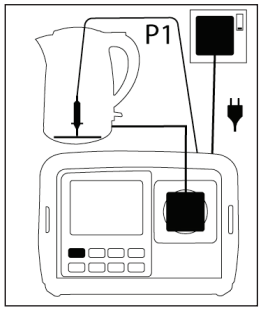
Class I test (PAT150) using mains voltage leakage @ 230 V ac

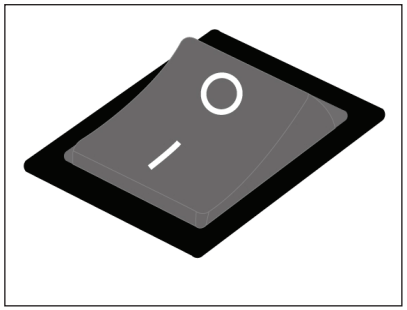
Mains powered testing of equipment with an Earth return conductor

i)

a 

b 

c 

ii) 

iii)

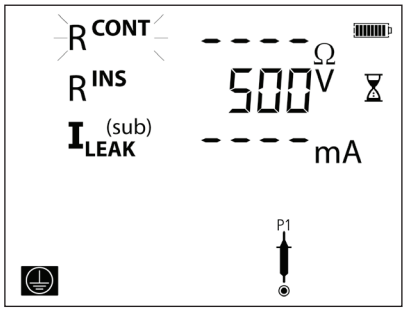
Class 1 @ 500 V

OR

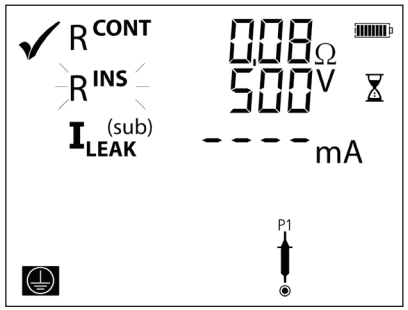
Class 1 @ 250 V

>2 s

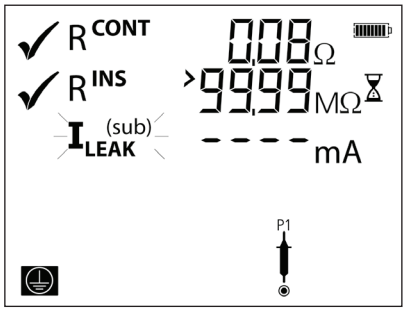
iv) Ensure probe P1 connected



v) See note 1

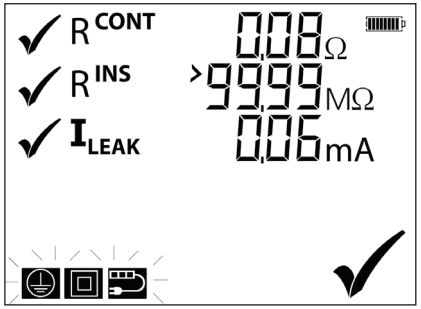


vi) See notes 1, 2 & 3 below



vii) Warning: Appliance will operate

viii) Class 1 Pass



NOTE 1 : If the contact symbol appears, the appliance needs to be switched ON.
NOTE: The PAT100 instruments perform various pre-checks prior to testing to ensure the asset is not short-circuit and is switched on

NOTE 2: If the L-N or L-E symbol is flashing a low resistance has been detected. An L-E fault will stop the test. See Measurement symbols table.
An L-N fault could damage the PAT tester and should be investigated.
To override an L-N warning, press the Class I button.

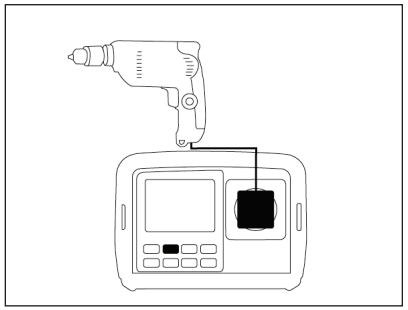
NOTE 3 : Faulty equipment may cause an RCD to trip during a Touch leakage test

Class II test ⧈ (PAT120, 150) using substitute leakage @ 40 V ac

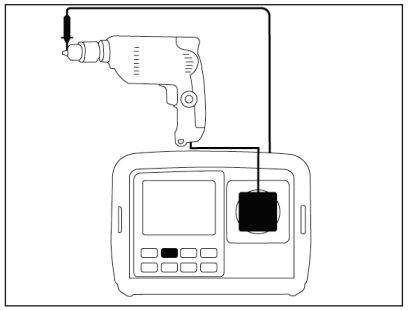
Battery powered testing of equipment without an Earth return conductor

i)

a



b



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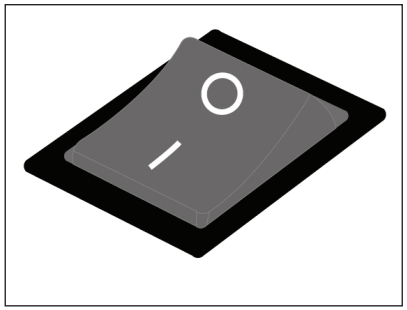
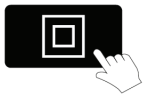


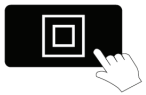
iii)

Insulation test @ 500 V



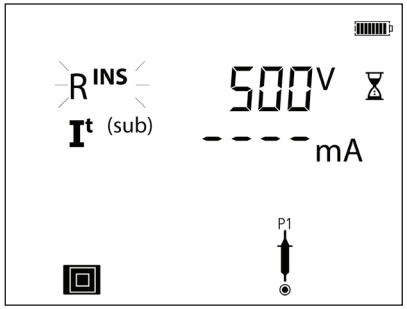
OR

Insulation test @ 250 V

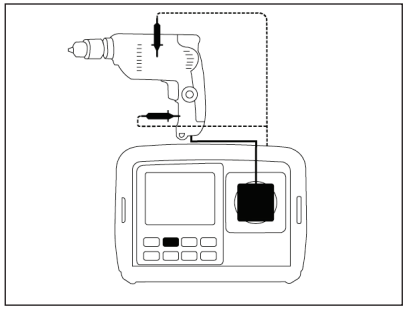


>2 s

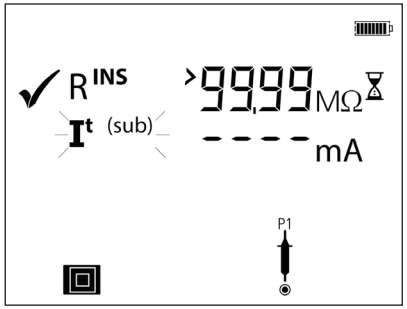
iv) Ensure probe (P1) is connected



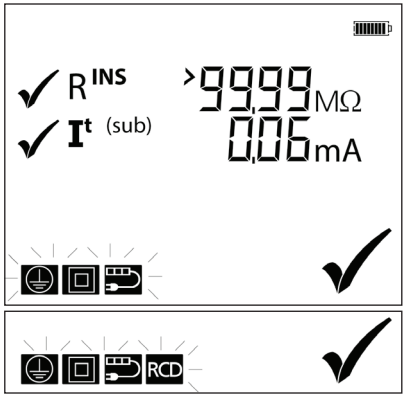
v) Repeat contact on all exposed conductive parts



vi) See note below



vii) Class II Pass



NOTE: If the contact symbol appears, the appliance needs to be switched ON

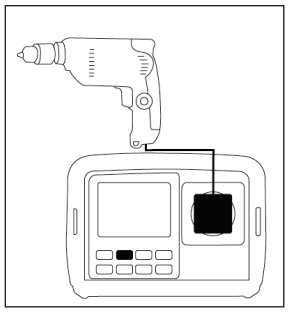
NOTE: The PAT100 instruments perform various pre-checks prior to testing to ensure the asset is not short-circuit and is switched on

Class II test (PAT150) using mains voltage leakage @ 230 V ac

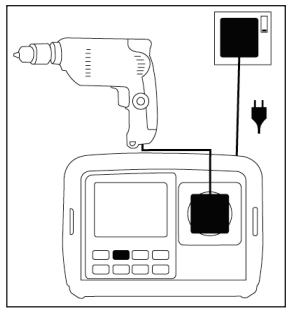
Mains powered testing of equipment without an Earth return conductor

i)

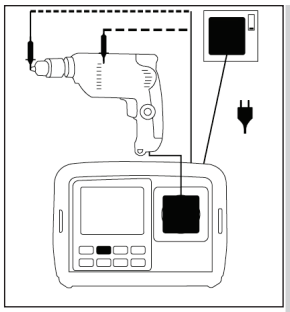
a



b

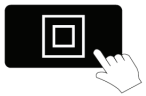


c



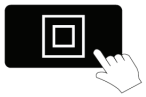
ii)

Insulation test @ 500 V



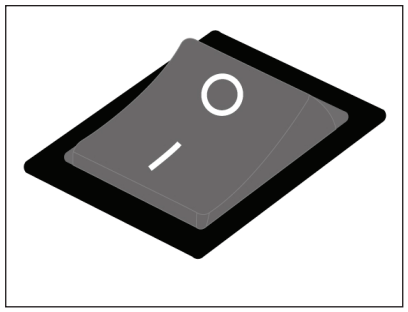
OR

Insulation test @250 V

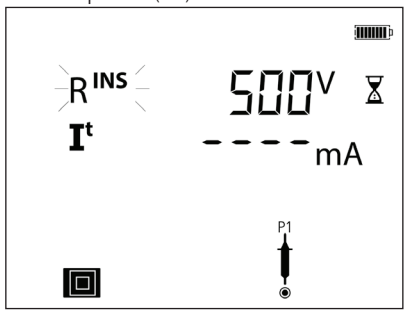


>2 s

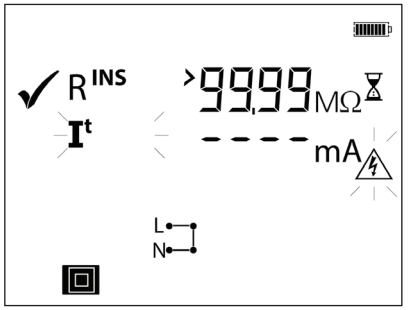
iii)



iv) Ensure probe (P1) is connected



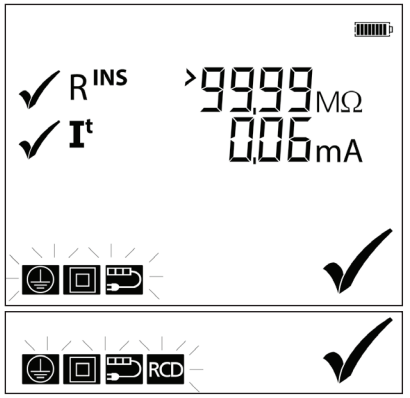
v) See note 1 below



If the L to N short circuit symbol shows, user must check whether there is a true short circuit. Press Class II button to proceed but there is a risk of damage or tripping of protective devices.

vi) Warning: Appliance will operate!

vii) Class II Passed



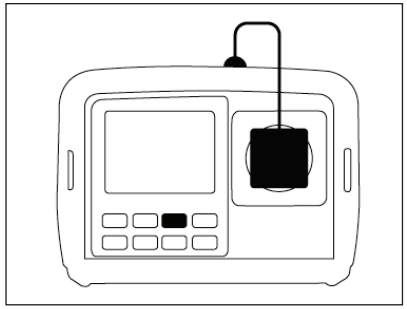
NOTE : High touch leakage measurement on faulty equipment can trip the supply RCD

Warning: High inertia appliances (eg angle grinders) may present a hazard whilst running. It is recommended that where a hazard is likely, the battery powered "Substitute leakage" test is used, which will not operate the appliance.

Power cord test (PAT120, 150)

Testing a standard power cord

i)



ii)

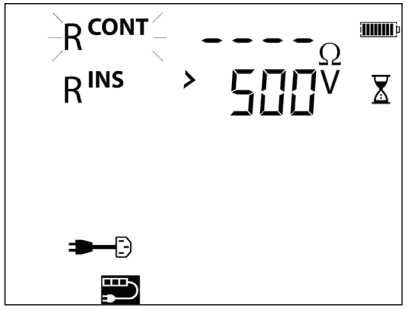
Insulation test @ 500 V

OR

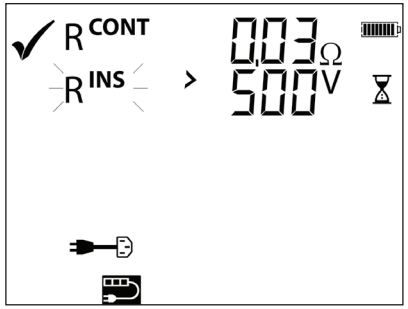
Insulation test @ 250 V

>2 s

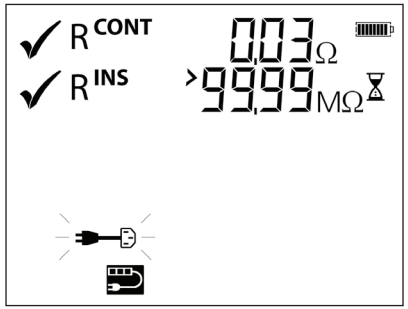
iii)



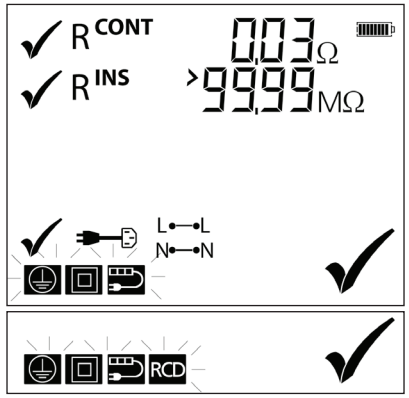
iv)



v)



vi)

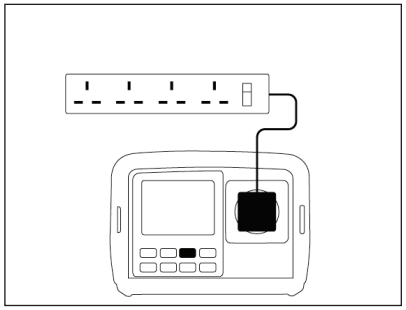


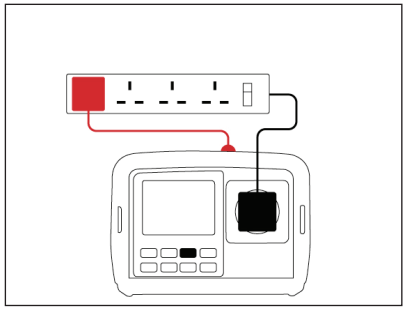
NOTE : For power cords longer than 5m the test can be re-run with a 1.0Ω pass limit by pressing the test button with 5 seconds of the continuity test failing – refer to page 13

Extension lead test (PAT120, 150)

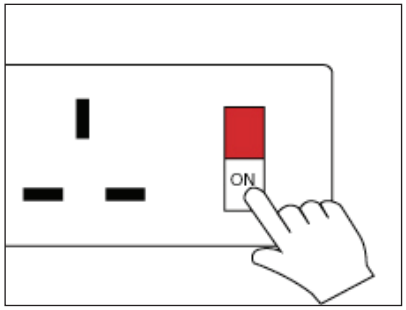
Testing an extension lead or multi-way extension lead

i)

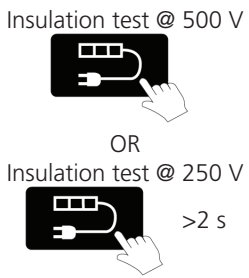




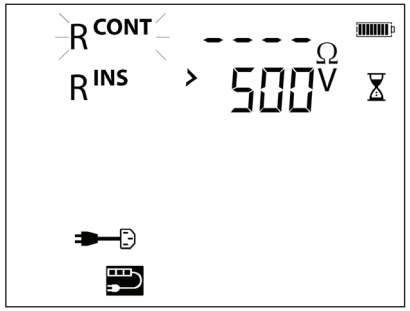
ii)



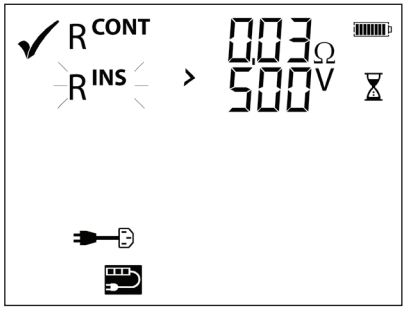
ii)



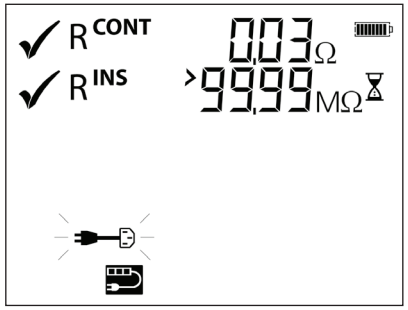
iv)



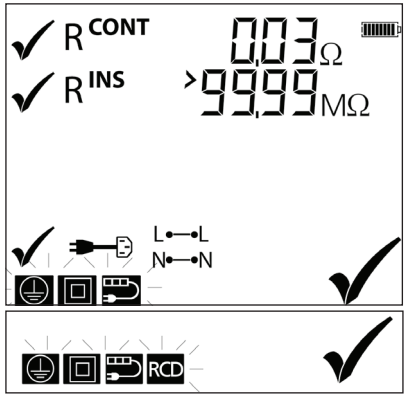
v)



vi)



vii)

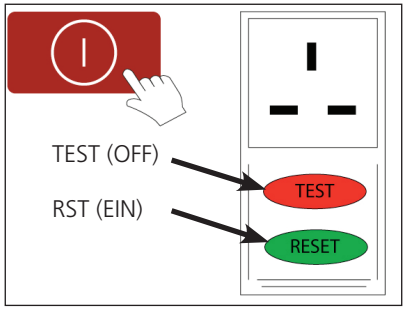


NOTE: Multiple earth continuity tests can be carried out by pressing the QT button during the continuity test, and pressing it again for each new continuity test. See Page 13

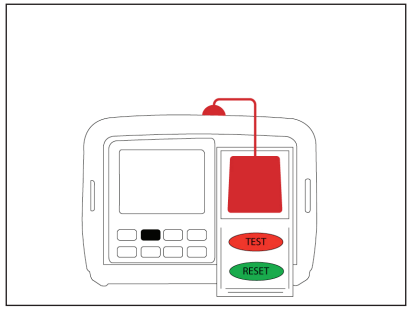
Portable RCD test RCD (PAT150)

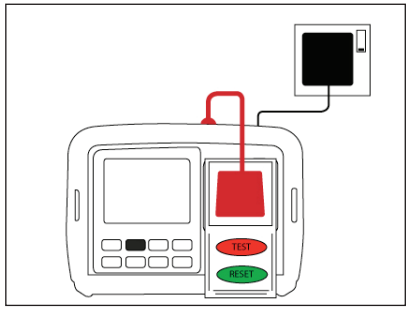
Testing a portable RCD or extension lead with built-in RCD

i)

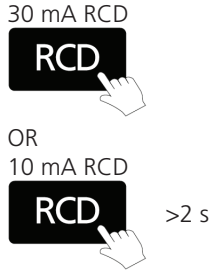


ii) Connect RCD

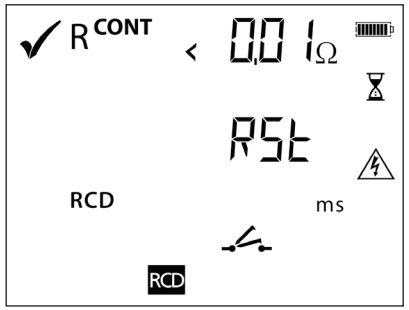




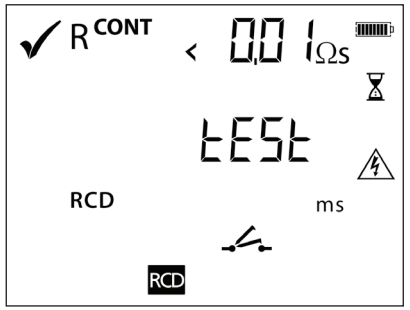
iii) See note below



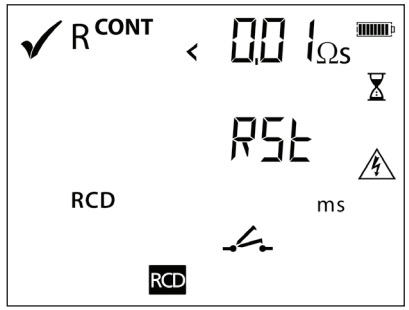
iv) Press RESET on RCD



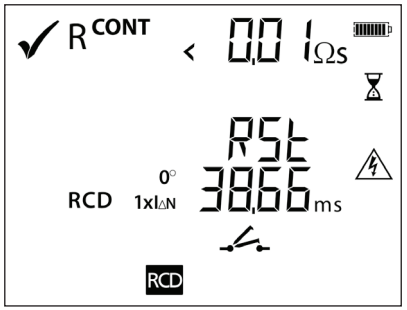
v) Press TEST button on RCD



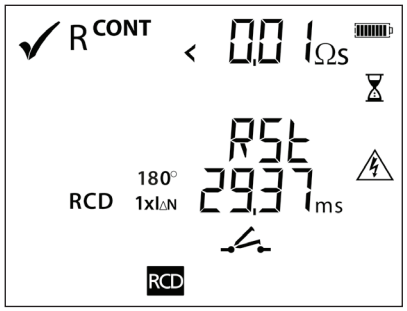
vi) Press RESET on RCD



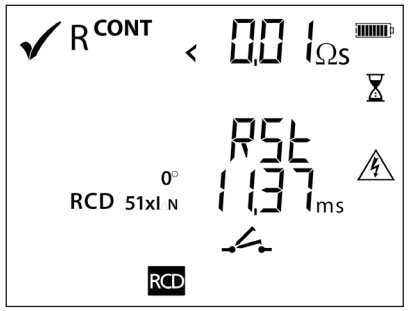
vii) Press RESET on RCD



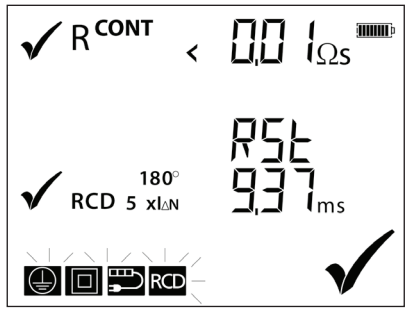
viii) Press RESET on RCD



ix) Press RESET on RCD



x) Test complete

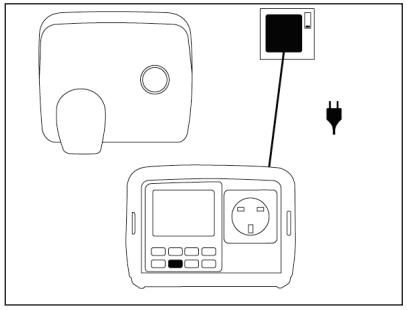


Note : The PAT150 defaults to 30 mA RCD. To change to 10 mA, hold the RCD button down for more than 2 seconds then release.

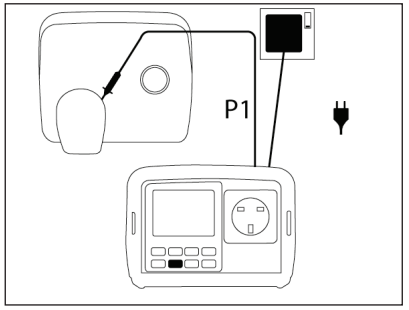
Fixed equipment testing (PAT150, 150R)

Only a continuity test is possible when testing fixed equipment without disconnecting the incoming supply.
Use the Quick Test (QT) button to access the continuity test mode:

i)



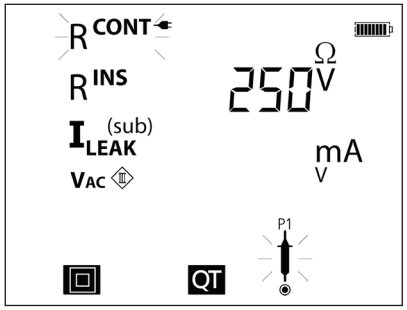
ii) Ensure probe (P1) is connected



iii)

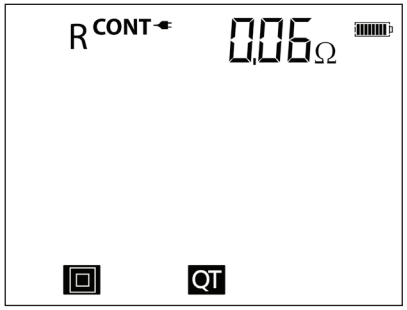
iv) Press 5 times to display R CONT

v) Continuity test



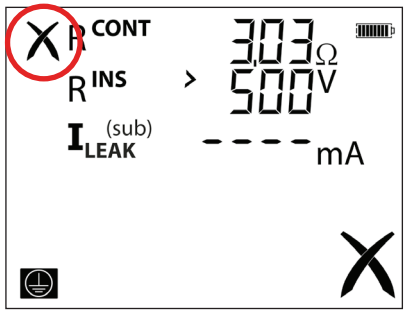
vi)

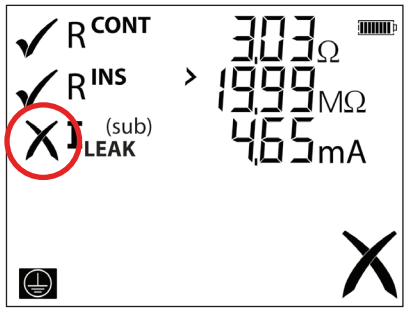
vii) Test complete



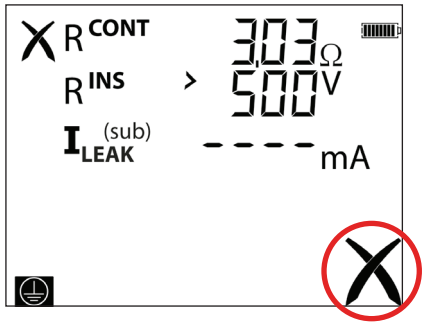
Fail Handling

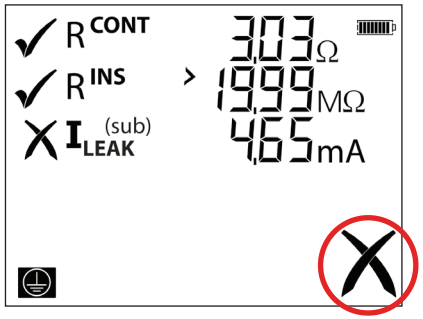
i) Individual test fail indicated by a small cross:





ii) Overall FAIL indicated by a large cross:



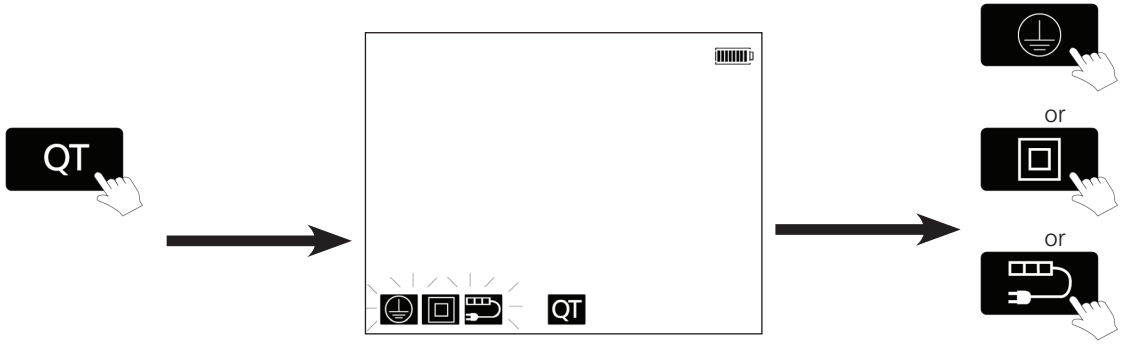


NOTE : Once an appliance has failed a test, further testing of the test group sequence is prevented for safety reasons, except for the extension lead testing

Quick test QT (PAT15, 150R)

QT = Quick test - Access to individual tests within a test group.

To access Quick Test mode:



Connection for individual tests differs depending on the test group selected.

Options:

Class I
- Continuity (Uses P1 probe)
- Insulation 500 V
- Insulation 250 V
- Substitute Leakage
- Mains Leakage (needs mains connection)

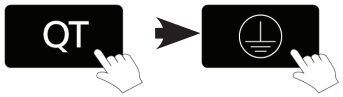
Class II
- Insulation 500 V (uses P1 probe)
- Insulation 250 V (uses P1 probe)
- Substitute leakage (uses P1 probe)
- Mains leakage (uses mains connection and P1 probe)
- SELV measurement (uses P1 and P2 probes)

Extension lead
- Continuity (uses extension lead adaptor)
- Extension Lead, Insulation 500 V
- Extension Lead, Insulation 250 V
- Polarity (uses extension lead adaptor)

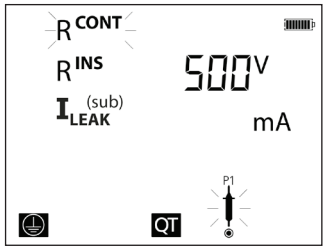
Quick Test (QT) options

Example 1- Class I continuity

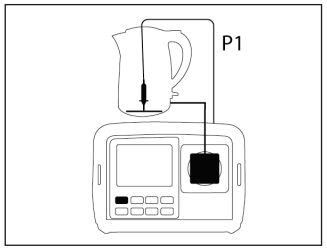
i)



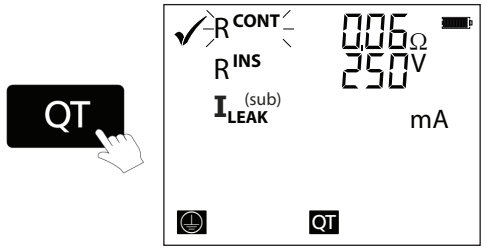
ii)



iii)

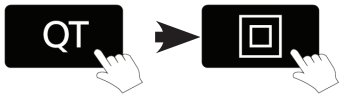


iv)

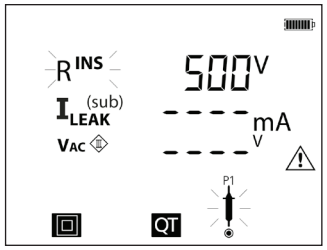


Example 2 – Class II 250 V Insulation test

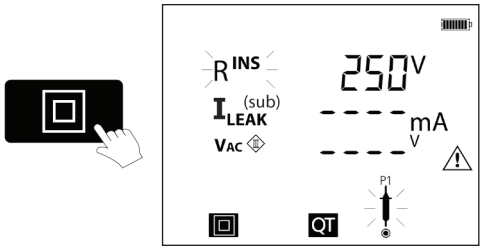
i)



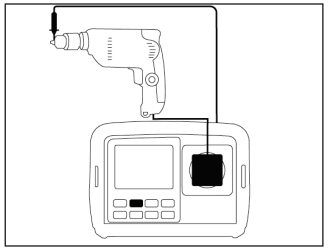
ii)



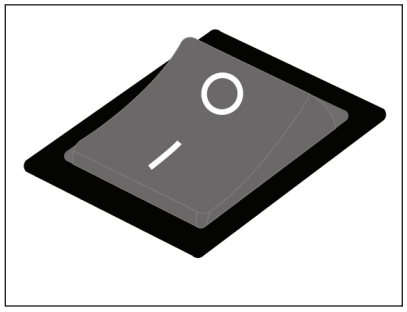
iii)



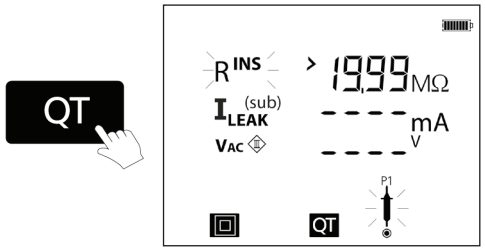
iv)



v)

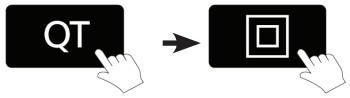


vi)

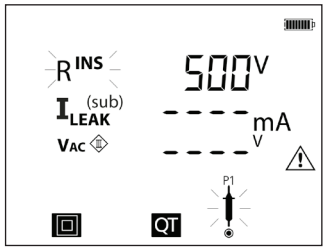


Example 3 – Class II touch leakage test using the Substitute (or alternative) method.

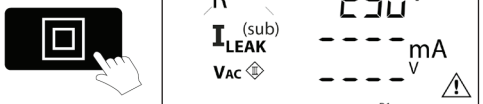
i)



ii)

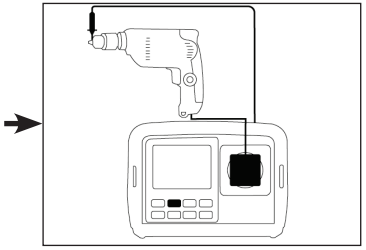


iii)

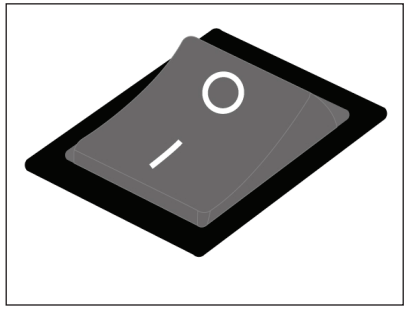


iv)

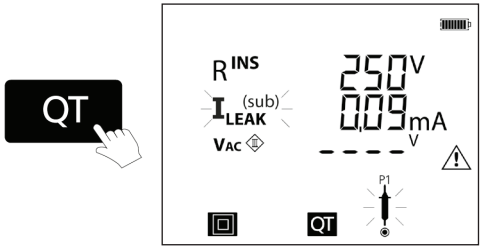
v)



vi)



vii)



To repeat test 

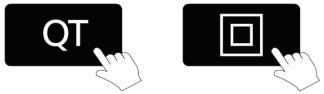
NOTE : To switch between test groups, press the test group buttons.

To exit press the ON/OFF button

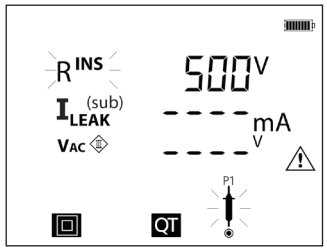
SELV measurement within Quick Test (QT)

Separated Extra Low Voltage (SELV) measurement is performed automatically when the PAT150 is connected to the electrical supply

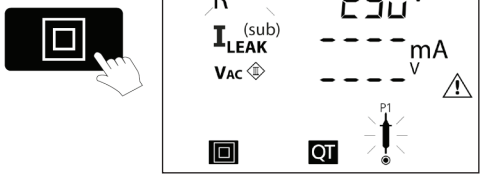
i)



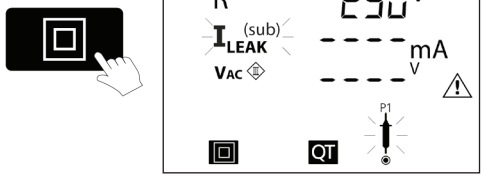
ii)



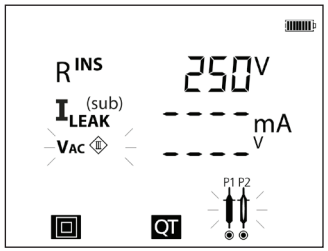
iii)



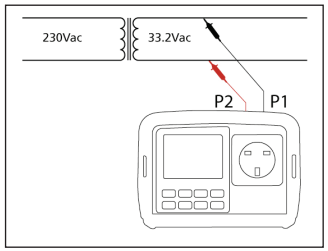
iv)



v)

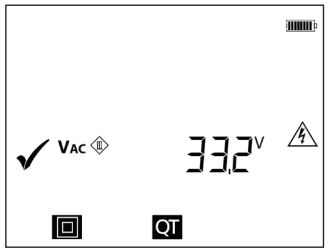


vi)

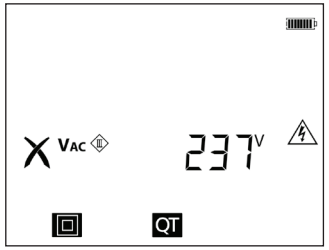


vii)

For voltages <50V ac



For voltages ≥ 50V

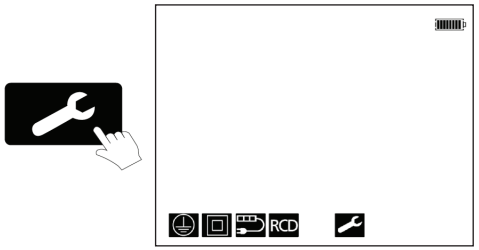


To exit Quick Test (QT) mode

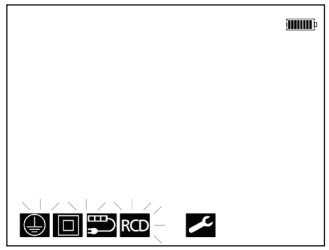
SETUP (PAT150, 150R)

Changing PASS limits and test times

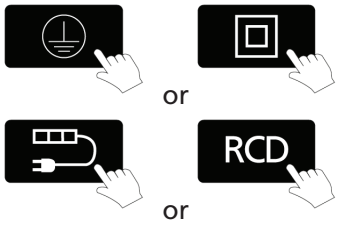
i)



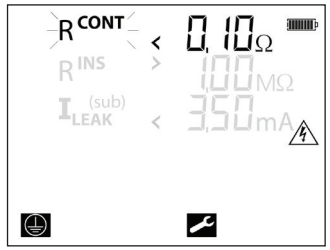
ii)



iii) To select a TEST GROUP to be modified press the relevant button:



iv) Screen displayed



v) Keep pressing the TEST GROUP button to select the test to be changed

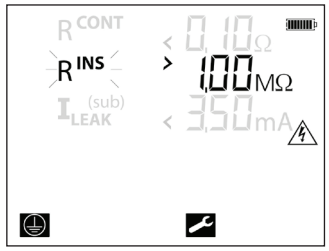
Pass Limit

Default	Rcont	0.01 Ω
1st press	Rins	1.00 MΩ
2nd press	I leak	3.50 mA

Test Time

3rd press	Rcont	5:	S
4th press	Rins	5:	S
5th press	I leak	5:	S

vi) Example changing Insulation pass limit

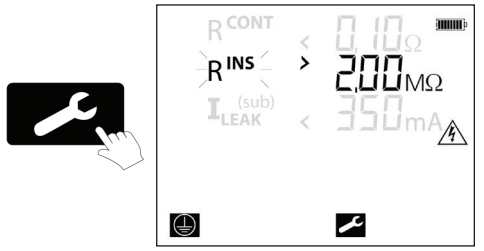


vii) Pressing SETUP button changes the value

Default	1.00 MΩ
1st press	2.00 MΩ
2nd press	0.01 MΩ
3rd press	0.05 MΩ
4th press	0.25 MΩ
5th press	0.30 MΩ
6th press	0.50 MΩ

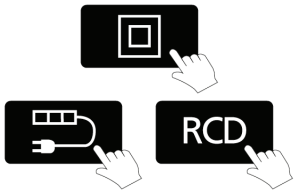
Note : Pressing QT changes the direction

viii) Example: Rins change to 2.00 MΩ



ix) To SAVE changes to setup

x) or, to edit new test groups

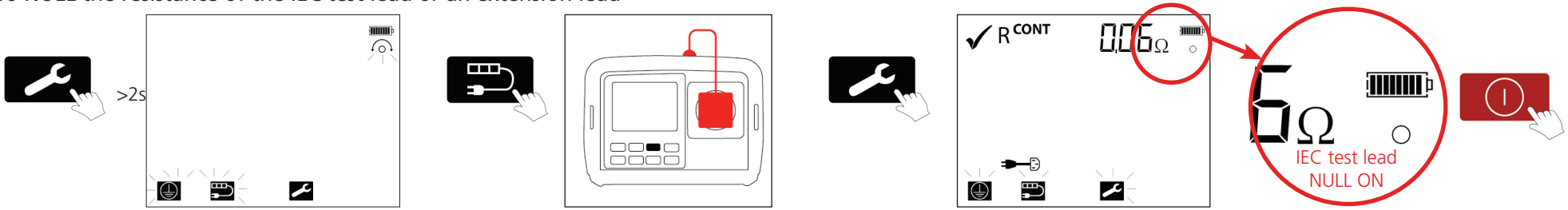


xi) When changes are complete press the Power button

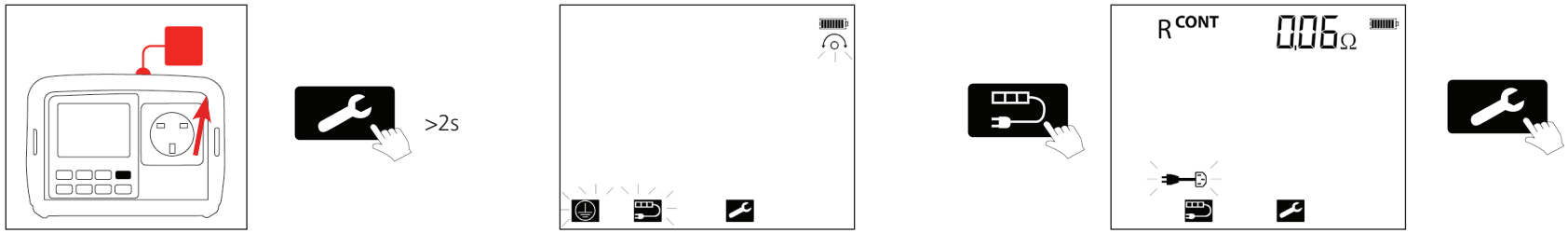
Continuity lead null

Removes the resistance of the CONTINUITY test leads from the measured value

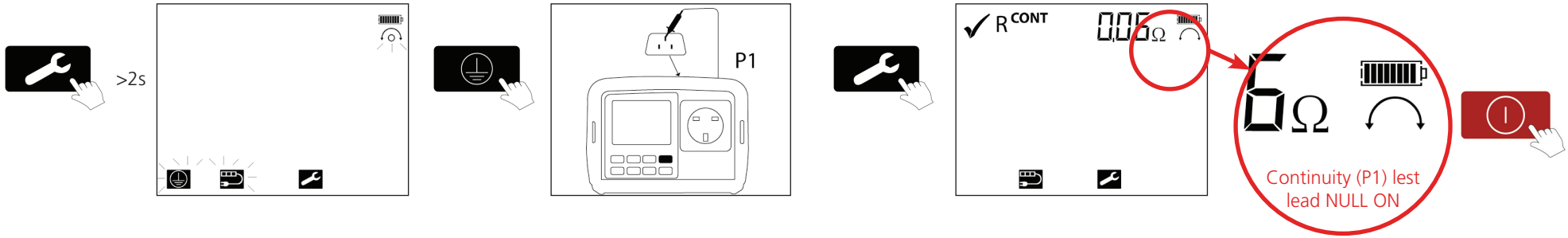
To NULL the resistance of the IEC test lead or an extension lead



To remove the lead null



To NULL the resistance of the P1 continuity test lead



To exit Lead null setup

RCD configuration

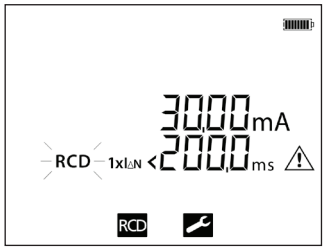
Portable RCD current rating can be changed between 10 mA and 30 mA

Portable RCD trip time for 30 mA can be set at either 200 ms (for BS 7071 conformity) or 300 ms (for IEC 61540 conformity)

Portable RCD trip current selection

i)

ii)

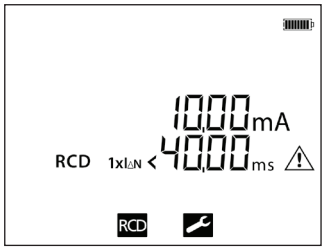


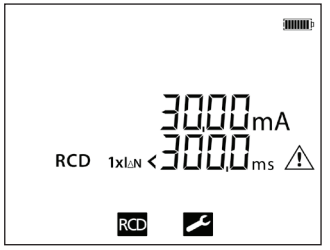
iii) Press RCD button to change from 30 mA to 10 mA

For 10mA RCD

To change trip time

iv)





To exit RCD configuration

Factory reset to Default settings

Factory default settings

SETUP - change test pass limits, test times and test lead resistance. SETUP is "test group based" as the PASS limit for a Class I insulation test is different to a Class II insulation test.

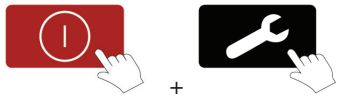
Factory Default Test Limits

Variant Model	R_{PE}, R_{CONT} (Ω)	R_{PE}, R_{CONT} (Ω) for Ext lead	R_{PE}, R_{CONT} (Ω) for RCD	Class 1 R_{ISO}, R_{INS} (MΩ)	Class 2 R_{ISO}, R_{INS} (MΩ)	Ext lead R_{ISO}, R_{INS} (MΩ)	Class 1 I_{EA}, I_{LEAK}(sub), I_{PE}, I_{LEAK} (mA)	It, I^B Class 2 I_{EA}, It(sub) (mA)	1xIΔN30 (ms)	5xIΔN30 (ms)	1xIΔN10 (ms)	5xIΔN10 (ms)
PAT120-UK	0.2	0.2	0.2	1	2	1	3.5	0.25	NA	NA	NA	NA
PAT150-UK	0.2	0.2	0.2	1	2	1	3.5	0.25	200	40	200	40
PAT120-DE, PAT120-CH, PAT120-EU	0.3	0.3	0.3	1	2	1	3.5	0.5	NA	NA	NA	NA
PAT150-DE, PAT150-CH, PAT150-EU	0.3	0.3	0.3	1	2	1	3.5	0.5	300	NA	300	NA
PAT150-AU	1	1	1	1	1	1	5	1	300	NA	40	NA

Region selection

i) To return an instrument to Factory Default settings:

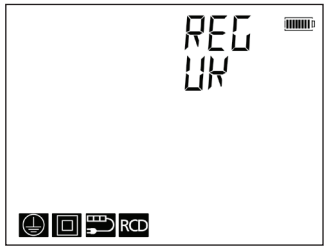
Press



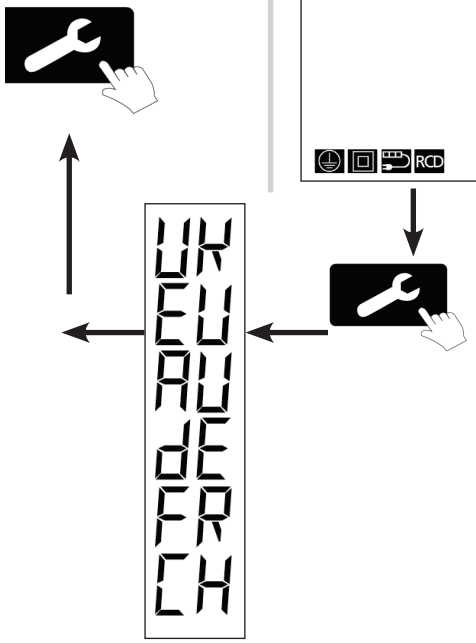
+

together for 2 seconds

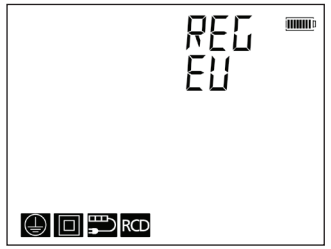
ii)



iii)



iv)



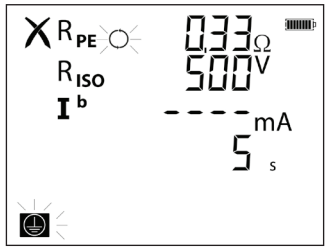
v)

International model variations:

Continuity retest after fail (PAT120, PAT150 DE, & CH models only)

When a continuity test fails to meet the pre-set continuity resistance pass limit of 0.3 Ω, the test can be run again within 5 seconds at the higher 1.0 Ω limit.

Example Class I continuity FAIL. Display shows:



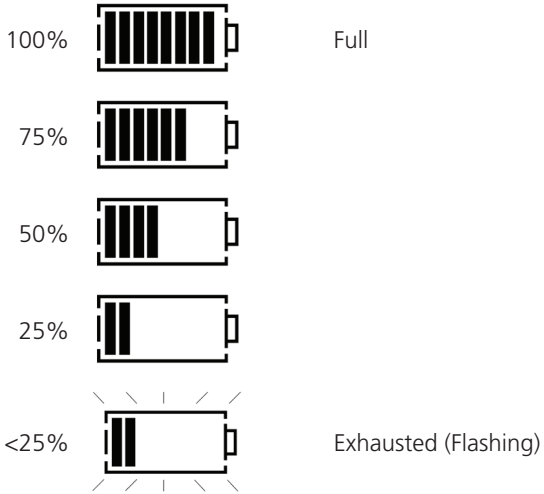
to retest at 1.0 Ω limit or

to FAIL test

Battery and Fuse replacement (PAT120, 150)

Battery type: 8 x 1.5 V Alkaline LR6 (AA) or NiMH HR6 rechargeable

Battery condition is shown by the following display symbols:



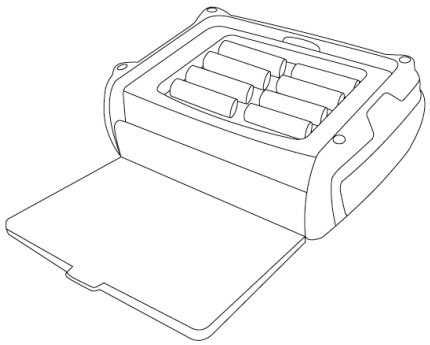
To replace batteries or fuse:

Switch off the instrument.

Disconnect the instrument from all electrical circuits.

Battery replacement

Remove the battery cover from the base by using a cross head screwdriver to un screw the battery cover fixing screw.



Spent Alkaline and NiMH batteries are classified as portable batteries and should be disposed of in the UK in accordance with Local Authority requirements. For disposal of batteries in other parts of the EU contact your local distributor.

Megger is registered in the UK as a producer of batteries.
The Registration number is BPRN 00142

For battery replacement:

a) Remove old cells and refit new batteries following correct polarity as marked on the battery holder.

Either: 8 x 1.5 V AA / LR6 Alkaline
8 x 1.2 V AA / LR6 NiMH

c) Replace the battery cover.

Warning: Incorrect battery cell polarity can cause electrolyte leakage, resulting in damage to the instrument.

Warning: Do not mix battery technologies

Warning: Do not use batteries with different charge state.

⚠ Rechargeable batteries and battery charging

All PAT100 series accept alkaline or rechargeable NiMH cells. Only the PAT150R can be recharged as below:

PAT150R – Use supplied battery charger

To charge the batteries:

Ensure fitted batteries are of the rechargeable NiMH type.
Connect the 15 V DC plug of the charger to the socket on the connection panel of the PAT marked ⊖-(•)-⊕

Warning: The instrument should be fully disconnected and not used during the charging process.

Warning: Do not attempt to recharge non-rechargeable (Primary) cells. Doing so may result in instrument damage and may cause personal injury.

Warning: Only use a Megger approved PAT100 charger. Other chargers may present a fire risk.

Ensure ambient temperatures are between 4 °C and 40 °C while charging the PAT.

Battery Disposal

The crossed out wheeled bin symbol placed on the batteries is a reminder not to dispose of them with general waste at the end of their life.

This product contains the following batteries:
8 x AA Alkaline (LR6) 1.5V primary cells or
Nickel Metal Hydride NiMH (HR6) 1.2V secondary cells
They are located in the battery compartment on the rear of the instrument
They can be safely removed by ensuring all test leads have been disconnected from the instrument prior to removing the battery cover with a suitable screwdriver.

Spent PAT100 batteries are classified as Portable Batteries and should be disposed of in the UK in accordance with Local Authority requirements

For disposal of batteries in other parts of the EU contact your local Megger company or distributor.

Megger is registered in the UK as a producer of batteries.
The Registration number is BPRN00142

For Further information see www.megger.com

Fuse replacement

Possible fuse failure is indicated by the symbol.

For fuse replacement

Remove battery cover as above.

Withdraw fuse and check for failure.

Replace with a fuse type:
1 x 100 mA (F) 250 V 1.5 KA HBC 4 x 20 mm

Preventive maintenance

Test leads should be checked before use to ensure there is no damage.
Ensure batteries are removed if the instrument is left unused for an extended period.
When necessary, the instrument can be cleaned with a damp cloth.
Do not use alcohol based cleaners as these may leave a residue.

Specification

ENVIRONMENTAL CONDITION:

Operating ambient	20°C
Humidity	Nominal humidity

CONTINUITY TEST

Test voltage	Compliance Voltage: +4 V dc –0% / +10% (open circuit)
Test current	Bi-directional +200 mA -0% + 50 mA (into 2 Ω load)
Continuity accuracy	Resistance: ± 5% ± 3 digits (0 to 19.99 Ω)
Resistance resolution	10 mΩ
Display range	0.01 to 19.99Ω
Continuity test nulling	up to 9.99 Ω
Test time	User selectable from 2 sec to 20 sec or selected during test to 180 sec

INSULATION TEST

Insulation test	250 V dc –0 % /+25 % open circuit 500 V dc –0 % /+25 % open circuit ≥ 500V –0% dc across 0.5 MΩ load
Short circuit/charge current	< 2 mA dc
Insulation accuracy	±3% ±10 digits (0 to 19.99 MΩ)
Resolution	0.01 MΩ
Display range	0.10 MΩ to 99.99 MΩ
Test duration	User selectable from 2 sec to 20 sec or selected during test to 180sec

SUBSTITUTE LEAKAGE TEST

Leakage current Accuracy	± 5% ± 3 digits
Test frequency	Nominal mains frequency 50Hz
Test voltage	< 50 V ac
Leakage Current Resolution	0.01 mA
Display range	0.10 to 19.99 mA
Test duration	User selectable from 2 sec to 5 seconds Reading corrected to 230V ac.

DIFFERENTIAL LEAKAGE CURRENT

Test voltage	Nominal supply voltage 230 V ac
Test frequency	Nominal mains frequency 50 Hz
Test accuracy	±5% ±3d ±3uA/A
Resolution	0.01 mA
Display range	0.10 to 19.99 mA
Test duration	User selectable from 2 sec to 5 seconds

TOUCH CURRENT TEST

Test voltage	Nominal mains 230 V ac
Test frequency	Nominal mains 50 Hz
Test accuracy	± 5% ± 3 digits
Resolution	0.01 mA
Display range	0.10 to 3.99 mA
Test duration	User selectable from 2 sec to 5 sec

SELV DEVICE TEST

Test voltage	0 to 300 V ac
Measurement accuracy	± 3% ± 3 digits
Resolution	0.1 V ac
Display range	0.1 to 300 V ac

EXTENSION LEAD TEST

Test includes Insulation and Bond tests.

Test voltage	5 V
Polarity	Lead OK Live neutral shorted Live neutral reversed Live/neutral open circuit

PORTABLE RCD TEST

Test voltage	Nominal mains 230 V
Test frequency	50 Hz
Test current accuracy	+2% to +8% (1 x I, 5 x I)
Trip time accuracy	±1% ± 1 ms
Trip time resolution	0.01 ms
Display range	0 to 200 ms (1 x I) 0 to 40 ms (5 x I)

MAINS SUPPLY TEST

Specification

Frequency measurement range	50 Hz
Test voltage	40 to 300 V ac
Accuracy	± 3% ± 3 digits
Resolution	0.1 V ac
Display range	40 to 300 V ac

CIRCUIT TEST
(Carried out automatically, not available to user)

Test voltage	5 V
Test frequency	Nominal Mains 50 Hz
Test current	< 100 mA short circuit

SAFETY
Instrument designed to IEC 61010-1: 2010
Test leads designed to IEC 61010-031: 2008
300 volts to Earth Category II
Mains fuse protection to 250 volts rms ac

EMC
Design to meet IEC 61326-1: 2012 and IEC 61326-2-2: 2005.

FUSE
(user replaceable)
UK variants has mains plug fuse
One F 100 mA 250 V 5 x 20 mm HBC fuse.

ENVIRONMENTAL

Operating temperature range	0°C to +40°C
Storage temperature range	-20°C to +60°C
Humidity	90%RH @ +10°C +30°C 75%RH @ +30°C to +40°C
Maximum altitude	2,000m to full safety spec.
IP rating	IP40 (with front cover closed)

MECHANICAL

BATTERIES

Battery life	> 30 hrs 20sec:2min Test:Standby ratio
Battery type	Supply voltage 12 Vdc (Alkaline AA LR6) 9.6 Vdc (NiMH AA LR6)

WEIGHT

PAT120 (instrument only):	1150 g	(40.4 oz)
Shipping weight:	2370g	(83.6 oz)
PAT150 (instrument only):	1300 g	(45.8 oz)
Shipping weight:	2795g	(98.6 oz)
PAT150R (instrument only):	1300 g	(45.8 oz)
Shipping weight:	2975g	(104.9 oz)

DIMENSIONS

Dimensions (instrument and case)	203 mm (L) x 148 mm (W) x 78 mm (H) (8 x 5.7 x 3.2 inches)
Dimensions (instrument and packaging)	456 mm (L) x 178 mm (W) x 89 mm (H) (18 x 7.1 x 3.5 inches)

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This instrument is manufactured in the United Kingdom.
The company reserves the right to change the specification or design without prior notice.

Part No. PAT100_UG_EN_V03

www.megger.com

PAT100 SERIES
Handheld portable appliance testers

- **Simple tick or cross, pass or fail indication plus measurement**
- **Battery powered with rechargeable options**
- **Includes 250 V insulation and leakage testing for safe IT testing and surge protected devices**
- **Testing portable and fixed electrical equipment**
- **10 mA and 30 mA portable RCD lead testing (PAT150)**
- **Adjustable PASS test limits (PAT150)**
- **Substitute and mains powered leakage testing (PAT150)**
- **Tough, rubber armoured with built-in front cover, hardened, scratch proof display window**

DESCRIPTION

The PAT100 series of hand-held portable appliance testers enable simple, fast safety testing in all environments including offices, shops and business units. It is ideally suited to training organisations with a very short learning curve and tough, reliable functionality.

With rubber armoured cases and fitted with hardened, scratch proof glass, the PAT100s are exceptionally tough instruments.

Battery powered operation makes the PAT100s perfect for those locations where an electrical supply is not available, inconvenient or unsafe, especially building sites and warehouses. The PAT100 series conforms to all UK and European requirements for electrical safety testing.

Test groups

Test groups enable the correct sequence of tests to be performed automatically with minimum intervention by the user. This keeps testing simple, reduces test times to a minimum and helps to prevent testing errors.

PAT120:

- The PAT120 model has test groups available for Class I, Class II and Extension/Power leads.
- Fixed PASS limits.
- Insulation testing at 500 V (default) or 250 V can be selected at the start of the test.
- Leakage testing uses a "Substitute Leakage" also known as the "Alternative" method to remove the need for a mains supply during test.

The PAT150:

- The PAT150 has additional tests available for testing portable RCDs (PRCDs) of 10 mA and 30 mA.
- Separate tests for continuity, insulation, mains powered leakage testing and SELV measurements can be made using the Quick Test (QT) button.
- Test group pass limits and test duration can be configured by the user.
- Bond lead resistance can be nulled to reduce measurement errors.
- Live circuit measurement is available for testing the mains supply and socket polarity or electrical circuit voltage to 300 V ac.
- Can be used for testing fixed appliances.

Continuity test

Used for measuring the proper bonding of all metal parts of a class I device to the protective conductor.

Tests are performed at 200 mA dc in both polarities to be compliant with international and UK regulation or recommendations. This test is safe to perform on equipment where higher test currents could cause damage.

Insulation testing

Used for measuring the separation of conductive parts or conductors from earth. This test is usually performed at 500 V dc. The PAT100 series maintain the necessary test voltage down to 0.5 Mohms.

An additional 250 V dc insulation test is available on all models for use on IT equipment, on devices or extension leads that are fitted with surge protection, or simply where it may be considered undesirable to use a 500 V test.

Substitute leakage testing

Substitute leakage testing enables the measurements of AC leakage currents, which could differ significantly from the DC Insulation test results.

Substitute leakage testing is performed at less than 40 V ac. and does not require a mains supply.

Substitute leakage testing is used for measuring protective conductor current and touch current, in addition to an insulation test, or where it is considered an insulation test may damage equipment.

The Substitute leakage test will not operate equipment and so can be used where the operation of the equipment under test is undesirable.

Portable RCD testing (PRCD)

Portable RCDs can be tested using the PAT150. There is no need to find a non-RCD protected supply as the PAT150 will not trip external RCDs.

Both 10 mA and 30 mA RCDs can be tested both for disconnection times and the manual test button function.

Separated Extra Low Voltage (SELV) supplies

SELV supplies should be tested to ensure the output voltage does not exceed maximum limits as defined in the international regulations for Extra Low voltage systems. The PAT150 permits up to 50 V ac measurement, with a PASS or fail indication for SELV.

Differential Leakage (Protective Conductor Current), Touch Current & operational test

The PAT150 includes the facility for mains powered leakage test. This test has the benefit that equipment under test will function during the test sequence.

Battery life

The PAT120 & PAT150 operates from AA Alkaline or NiMH cells. Battery life is typically 4 days, based on 120 assets per day.

The PAT150R can be re-charged with NiMH batteries fitted.

Product selection table:	UK		
	PAT120	**PAT150**	**PAT150R**
Connector Interfaces			
Mains test socket	BS1363		
Power supply			
AA alkaline/NiMH	■	■	■
Rechargeable (PAT150R)*			■
Testing			
Protective Earth Resistance	■	■	■
250 V insulation	■	■	■
500 V insulation		■	■
Cable test	■	■	■
Live protective conductor current		■	■
Live touch current		■	■
Substitute leakage	■	■	■
Functional test (part of Live leakage test)		■	■
10 mA PRCD		■	■
30 mA PRCD		■	■
SELV voltage		■	■
Lead resistance nulling		■	■
Function keys			
Class 1	■	■	■
Class 2	■	■	■
Lead/cord	■	■	■
PRCD		■	■
Single test		■	■
LCD Backlight	■	■	■
Setup		■	■
On/Off	■	■	■
Standard accessories			
4mm plug lead probe + croc clip	1	2	2
Extension lead adaptor	BS1363		
AC Charger Adaptor			■
Mains Supply Cord		■	■
Carry case	■	■	■

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SPECIFICATIONS

ENVIRONMENTAL CONDITION:

Operating ambient	20°C
Humidity	Nominal humidity

CONTINUITY TEST

Test voltage	Compliance Voltage: +4V dc –0 % /+10 % (open circuit)
Test current	Bi-directional +200mA -0% + 50mA (into 2Ω load)
Continuity accuracy	Resistance: ± 5% ± 3 digits (0 to 19.99 Ω)
Resistance resolution	10 mΩ
Display range	0.01 to 19.99Ω
Continuity test nulling	up to 9.99 Ω
Test time	User selectable from 2 sec to 20 sec or selected during test to 180sec

INSULATION TEST

Insulation test	250V dc –0 % /+25 % open circuit 500V dc –0 % /+25 % open circuit ≥ 500V 0% dc across 0.5 MΩ load
Short circuit/charge current	< 2mA dc
Insulation accuracy	±3% ±10 digits (0 to 19.99 MΩ)
Resolution	0.01 MΩ
Display range	0.10 MΩ to 99.99 MΩ
Test duration	User selectable from 2 sec to 20 sec or selected during test to 180sec

SUBSTITUTE LEAKAGE TEST

Leakage current	Accuracy ± 5% ± 3 digits
Test frequency	Nominal mains frequency 50Hz
Test voltage	< 50V ac
Resolution	0.01mA
Display range	0.10 to 19.99mA
Test duration	User selectable from 2 sec to 5 seconds

Reading corrected to 230V ac.

DIFFERENTIAL LEAKAGE CURRENT

Test voltage	Nominal supply voltage 230 V ac
Test frequency	Nominal mains frequency 50 Hz
Test accuracy	±5% ±3d ±3uA/A
Resolution	0.01 mA
Display range	0.10 to 19.99 mA
Test duration	User selectable from 2 sec to 5 seconds

TOUCH CURRENT TEST

Test voltage	Nominal mains 230 V ac
Test frequency	Nominal mains 50 Hz
Test accuracy	± 5% ± 3 digits
Resolution	0.01 mA
Display range	0.10 to 3.99 mA
Test duration	User selectable from 2 sec to 5 sec

SELV DEVICE TEST

Test voltage	0 to 300 V ac
Measurement accuracy	± 3% ± 3 digits
Resolution	0.1 V ac
Display range	0.1 to 300 V ac

EXTENSION LEAD TEST

Test includes Insulation and Bond tests.

Test voltage	5V
Polarity	Lead OK Live/neutral shorted Live/neutral reversed Live/neutral open circuit

PORTABLE RCD TEST

Test voltage	Nominal mains 230 V
Test frequency	50Hz
Test current accuracy	+2% to +8% (1 x I, 5 x I)
Trip time accuracy	±1% ± 1ms
Trip time resolution	0.01ms
Display range	0 to 200ms (1 x I) 0 to 40ms (5 x I)

MAINS SUPPLY TEST

Frequency measurement range	50 Hz
Test voltage	40 to 300V ac
Accuracy	± 3% ± 3 digits
Resolution	0.1Vac
Display range	40 to 300V ac

CIRCUIT TEST
(Carried out automatically, not available to user)

Test voltage	5V
Test frequency	Nominal Mains 50 Hz
Test current	< 100mA short circuit

Safety

Instrument designed to IEC 61010-1: 2012
Test leads designed to IEC 61010-031: 2005
300 volts to Earth Category II
Mains fuse protection to 250 volts rms ac

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EMC

Design to meet IEC 61326-1: 2006 and IEC 61326-2-2: 2005.

Fuse

(user replaceable)
UK variants has mains plug fuse
One F 100 mA 250 V 5 x 20 mm HBC fuse.

ENVIRONMENTAL

Operating temperature range	0°C to +40°C
Storage temperature range	-20°C to +60°C
Humidity	90%RH @ +10°C +30°C 75%RH @ +30°C to +40°C
Maximum altitude	2,000m to full safety spec.
IP rating	IP40 (with front cover closed)

MECHANICAL

BATTERIES

Battery life	3 days based on 120 tests/ day using 2000 mAh Alkaline batteries
Battery type	Supply voltage 12 Vdc (Alkaline AA LR6) 9.6 Vdc (NiMH AA LR6)

WEIGHT

PAT120 (instrument only): 1150 g
Shipping weight: 2370g

PAT150 (instrument only): 1300 g
Shipping weight: 2795g

PAT150R (instrument only): 1300 g
Shipping weight: 2975

DIMENSIONS

Dimensions (instrument and case)	203mm (L) x 148mm (W) x 78mm (H)
Dimensions (instrument and packaging)	456mm(L) x 178mm (W) x 89mm (H)

ORDERING INFORMATION

Description	Order Code
PAT120-UK PORTABLE APPLIANCE TESTER	1003-062
PAT150-UK PORTABLE APPLIANCE TESTER	1003-064
PAT150R-UK PORTABLE APPLIANCE TESTER	1003-428
Included accessories for PAT120	
Extension lead adaptor BS1363	1001-234
Continuity/earth bond lead	1001-233
Carry case	1005-075
Included accessories for PAT150	
Continuity/earth bond lead	1001-233
SELV/mains voltage test lead Red x1	1005-077
Extension lead adaptor BS1363	1001-234
Mains plug test lead	6231-601
Carry case	1005-075
Included accessories for PAT150R	
AC Mains charger – multi-country	1003-436
Optional accessories	
Plug adaptor IEC C6 - C13	2000-551
Roll of 1000 PASS test labels	1000-971
PAT test certificate book	1001-299
PTDVD - DVD covering Portable Appliance Testing	1002-384

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