BUCKLEYS

MANUFACTURERS OF SPECIALIST TEST EQUIPMENT

WET ROOF PRO2

Flat roof leak detector kit

Instruction manual

Please read this manual before using the equipment

11/24

Contents

General Description

The Wet Roof Pro2 leak detector compliments the Buckleys Dry Roof Pro2 test instrument to provide a complete roof test system for all occasions.

The Wet Roof Pro2 has been designed to assist the user to detect the presence and source of leaks on roofing technologies that incorporate insulating membrane overlays. With large easy to read graphics displays and user-friendly icons enabling fast accurate roof surveys to be undertaken.

The Wet Roof Pro2 leak detector kit comprises two main elements:

A 'Generator unit' provides stabilised low frequency pulses. The positive output is applied to a trace wire bordering the test area and the negative output is connected to a suitable earthed point of the building's substrate. Within the test area - if moisture has penetrated the roofing membrane - electrical current will flow from the trace wire towards the source of the leak via the moisture on the roof.

The "Detector" is worn around the neck and is connected to two survey "ski-poles" which are used to probe the test area. The detector, together with the survey poles comprise an extremely sensitive voltage field measurement device.

By conducting a systematic survey of the roof test area, the operator is guided by the detector unit toward the origin of the leak, or leaks. The leak origin is the fault or point of failure within the roof membrane where moisture has penetrated.

A "Wet Sponge" detector has been incorporated into the Wet Roof Pro2 Generator. This offers significant extra capability as the unit can now be used to test upstands and other areas where water will simply run off. The Wet Sponge capability is also useful for testing painted surfaces.

Both generator and detector units are powered by operator-replaceable batteries, we recommend rechargeable cells which can be charged using the battery charger supplied. The battery charger also has an in-car adaptor to allow charging of batteries whilst travelling between sites, but in time of need any quality disposable alkaline batteries of the appropriate size may be used.

Technical Specification

Generator

Output pulse voltage:	32 V DC Output (Wet Roof Mode)
	90V, 67.5V, 24V, 9V DC Output (Wet Sponge Mode)
Output power:	<10 Watts
Operating temperature:	+ 4˚ to + 40˚C
Dimensions (L x H x D):	169 x 80 x 235 mm
Weight:	2.1 kg – including batteries
Protection:	Sealed to IP65 rating
Relative humidity:	Maximum 80% non-condensing

Detector

Operating temperature:	+ 4˚ to + 40˚C
Dimensions (L x H x D):	189 x 37 x 138 mm
Weight:	580g – including batteries
Protection:	Sealed to IP65 rating

Battery charger

Input voltage (In-car):	12V - 16V DC
Input voltage (Mains):	100V - 240V AC
Output voltage:	4 x 1.45V and 2 x 10.15V

Accessories

Survey pole length:	2 x 3 Section - 1000mm & Handles (Red & Black)
Trace wire:	100m stainless steel
Transit case weight:	13.4Kg (full kit with accessories)
Interconnecting leads:	1 x 10m, red plug - trace wire
	1 x 10m, black plug - substrate
	1 x 1m, red plug - right survey pole
	1 x 1m, black plug - left survey pole

Unpacking

The Buckleys Wet Roof Pro2 leak detector kit and all associated items necessary to conduct a roof survey are supplied in a robust transit case.

Retain all outer packaging to re-use in future should you need to store or return the Wet Roof Pro2 for servicing. Please note any damage to the outer packaging before checking the kit contents.

When first unpacking the Wet Roof Pro2 kit carefully check each item and report any missing or damaged items. The full kit comprises the following items:

- 1 x Generator unit
- 1 x Generator unit carry bag
- 1 x Detector unit
- 1 x Detector unit protective neck pouch
- 1 x Battery charger with mains and in-car adaptors
- 1x 10m earth lead (red plug)
- 1x 10m earth lead (black plug)
- 1 x 100m trace wire on reel
- 1 x Substrate connection lead (red plug)
- 1 x Trace wire connection lead (black plug)
- 1 x Seam probe tool
- 2 x Survey ski-poles (3 sections to each pole)
- Electrode handle - red
- Electrode handle – black
- Wet sponge electrode
- 2 x test probe electrode tip
- 2 x Yellow wax crayon (for marking defects)
- 4 x 'D' cell batteries (Generator)
- 4 x 'AA' cell batteries (Detector)
- 1 x Yellow transit case

Safety Precautions and Symbols

This symbol denotes important information on potential hazards. Please read these sections with particular care.

Attention! Misuse or failure to comply with the guidelines outlined in this manual may impair the safety provided by the equipment.

Controls and Connections

Generator (Wet Roof Mode)

The Wet Roof Pro2 generator unit is housed in a robust waterproof closure with all connections and controls mounted on the front panel. The Generator provides two functions: in addition to the standard generator application, to be used with the matching detector, a wet-sponge test function is included. The wet-sponge test is used without a detector, the generator will display the output current which may be used to determine the presence of a leak. For further details please see page 15 below.

Fig.1 Generator front panel controls and connections

Press the On/Off button to turn the generator on. The screen will illuminate and will display the screen below:

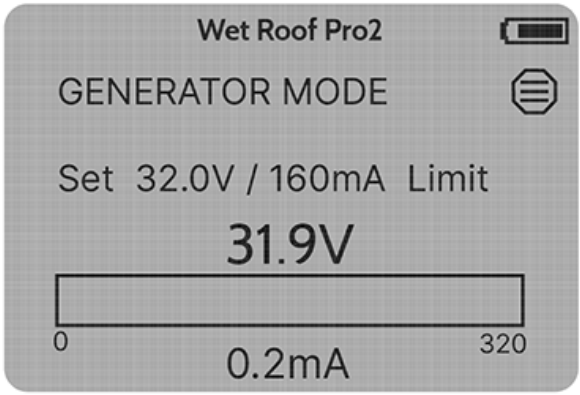


Fig.2 Home screen

The Generator output will be live whenever it is turned on. This is current-limited, and the unit will not be damaged if the output is shorted, although the alarm will sound & the screen backlight will turn red to alert you.

Pressing the "Menu/Yes" button will open the User Menu.

Press and hold the "Menu/Yes" button until the User Menu is displayed.

Fig 3. User menu

The output voltage and alarm current can be adjusted easily by selecting the appropriate menu option and then using the "Increase" and "Decrease" buttons to the left of the screen. Press the "Yes" button to accept the revised value and press the "Back" button to return to the Generator Screen.

It is recommended that the voltage is set to 32V and the alarm current to 300mA in most cases. Where a lower voltage is required or advised (e.g., working in a marina for example), this can easily be set.

Ensure that the Operating Mode is "Wet Roof" before pressing the "Back" button.

The screen will return to the standard Generator mode screen.

The trace wire should be connected to the red terminal and the case should be grounded via the black terminal. Be careful to avoid shorting the case to the trace wire as this will prevent the signal being detected.

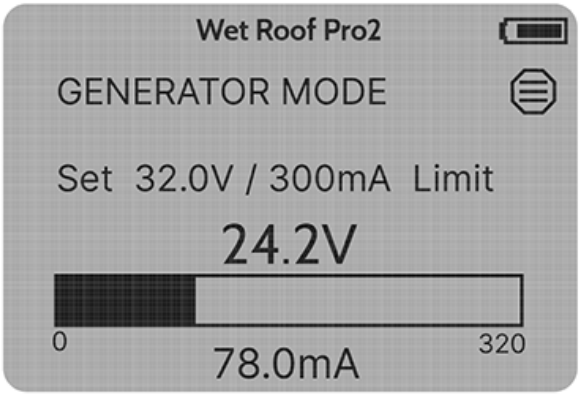


Fig.4 Home screen – current applied

Once the trace and ground wires are correctly connected the generator will display the current that it is supplying.

If this current is greater than the threshold set in the menu (see above) then the screen backlight will be red, and the alarm signal will sound. This is likely to indicate a short circuit between the trace and ground wires, and these should be checked. Alternatively, there may be a significant ground point close to the trace wire, in which case it will be necessary to isolate it or move the ground wire.

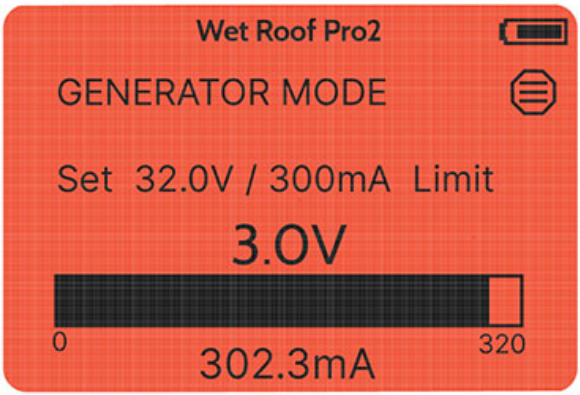


Fig.5 Home screen – current greater than threshold

If the indicated current is very high (e.g., over 150mA) it is likely that the area being surveyed has a significant number of faults, and it may be quicker and more efficient to create a smaller test area with the trace wire. This will allow the

operator to identify and locate faults within each smaller test area, without the confusion that can be caused by many faults over a large area.

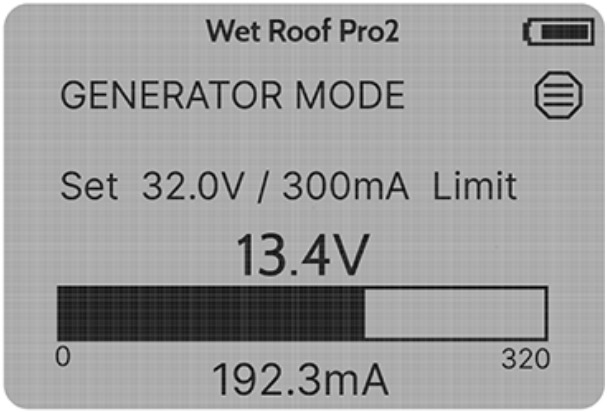


Fig.6 Home screen – high current

You may note that the output voltage varies with the current – this is normal.

Ideally the generator current will be below 100mA, this will give an optimum signal for the detector to work efficiently.

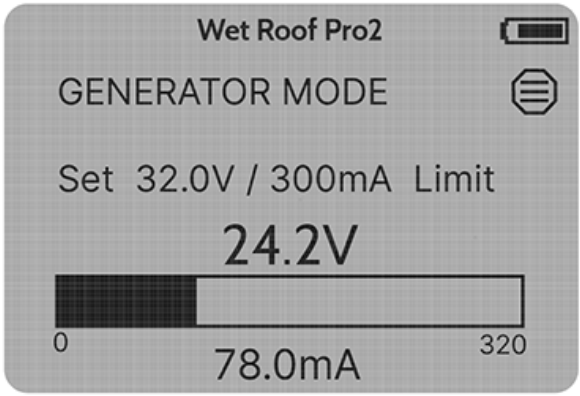


Fig.7 Home screen – optimum current

It is also possible that the generator will register a very low, or zero current.

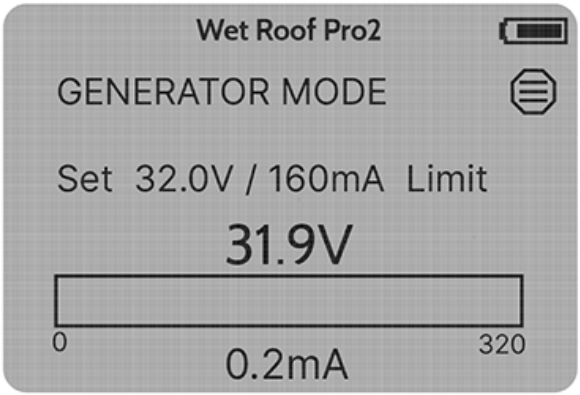


Fig.8 Home screen – very low current

There are four possible reasons for this:

- The area being tested actually does not have a fault – obviously good news but beware of false negatives!
- The test area is not wet enough – aim for an even layer of water on the surface, the depth is not particularly important but do ensure that there are no dry areas.
- There could be a fault in the instrument or the connecting wires, and this can be easily checked by connecting the output terminals of the generator – the red backlight should immediately appear, and the alarm buzzer will sound. It is possible to check all the wires for connectivity by this method.
- Finally, and most likely, there could be a fault or break in the connections, particularly the ground connection. It may be that the ground connection itself is properly grounded, but that the lining of the area being tested is not connected to ground – this is a particular risk with wooden roof structures.

Detector

The **Wet Roof Pro2** detector, housed in a waterproof enclosure has been designed to be worn around the operator's neck thereby leaving both hands free to use the poles to carry out the roof survey.

Detector controls and connections are shown **Fig. 9**.

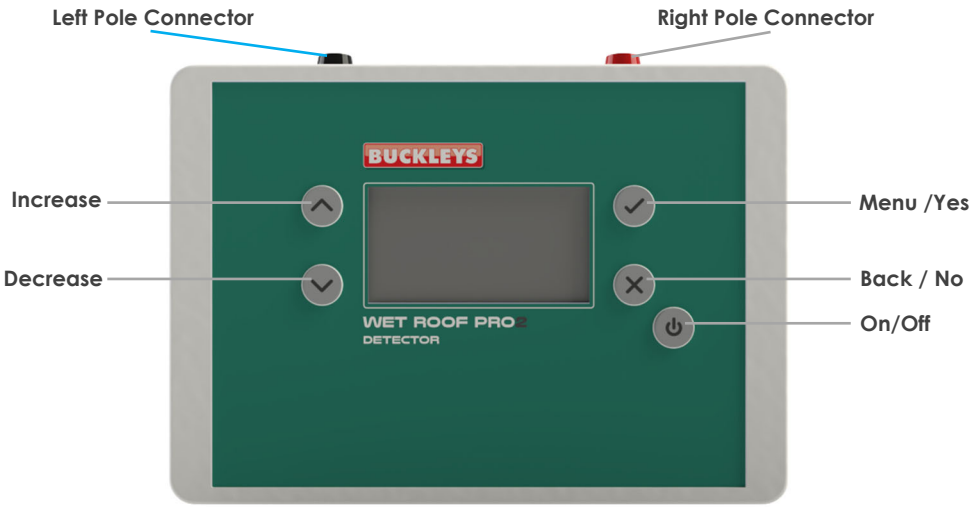


Fig.9 Detector unit

The detector's layout is similar to that of the generator unit. As with the Generator, the options to customise the operation of the instrument are menu-driven, and the button layout is identical.

When initially turned on, the screen will display a large "X" to indicate that the detector cannot detect a connection between the poles – this screen will appear whenever the poles are lifted from the surface of the waterproof layer, or if one of the wires between the pole and the detector is broken, or unplugged.

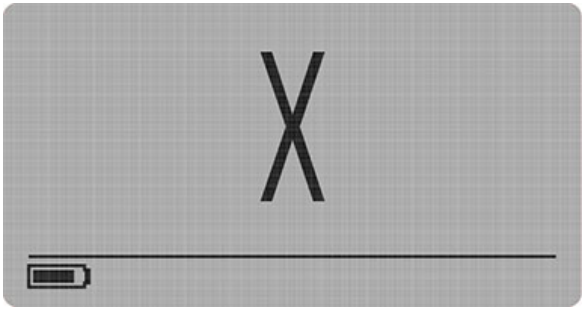


Fig.10 Initial screen

The screen also displays a battery icon at the lower left.

If the poles are shorted together, the screen will change to show a very small signal – this is nominally zero, but the detector is extremely sensitive. The "NOISE" icon is visible, indicating that there is electrical noise present in the location, thus warning the operator to be aware that this may distort the detector readings. This will not normally prevent the successful use of the instrument. The indication may flicker from side to side if the measured values are very small.

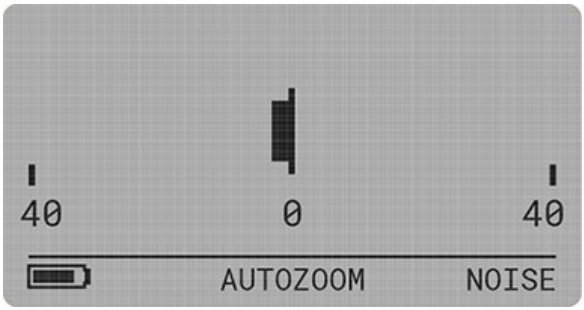


Fig 11. Electrical noise present

The word "AUTOZOOM" will also appear at the bottom of the screen. This indicates that the Wet Roof Pro2 Detector is in AutoZoom mode. The default condition is for Linear display scaling, with AutoZoom.

Whilst the AutoZoom mode is convenient in most situations, it may be easier to use a fixed magnification. The Detector magnification can be conveniently selected by pressing the "Up" or "Down" arrows to the left of the screen. The least sensitive range is range 0, and this can be increased to range 4, which is approximately 10,000 times more sensitive.

To revert to AutoZoom, simply press the "X" button to the right of the screen.

Placing the pole tips on the waterproof layer to be tested, within the area of the trace wire will, assuming there is a leak to be found cause the direction bar to grow, and the instrument will change range to accommodate this. Use the Up and Down arrows to select a suitable range.

The operator should then familiarise him- or herself with the unit, by standing inside the area of the trace wire, taking a reading, then turning approximately 30 degrees (or a smaller angle) clockwise, and checking the reading again.

This is repeated until the operator has turned through a complete circle. It will be observed that the readings will increase to a maximum one way, then decrease to a minimum (or zero) and then increase again to a maximum the other way, and finally decrease once more. The maxima will be approximately 90 degrees from the minima.

The maximum readings are when the pole tips are in line with the fault, and the minimum readings are when the operator is facing directly towards, or away from, the fault.

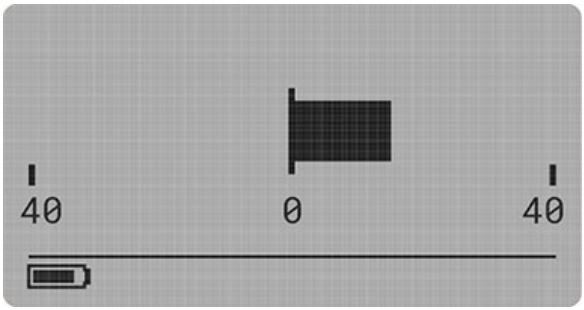


Fig.12 Direction bar

The instrument will default to the "Autozoom" option, but if you would prefer to operate the instrument in manual mode, pressing the Up or Down arrow buttons to the left of the screen will select a manual range.

Range 0 is the least sensitive, and the sensitivity progressively increases by factors of 10 up to Range 4. You can return to Autozoom by pressing the "X" button.

Pressing the menu button allows access to a user menu which allows the user to customise the Detector operation – the contrast and brightness can be adjusted by selecting the menu item using the up/down arrows, pressing the "yes" button and then adjusting with the up/down arrows. The selection is confirmed by pressing the "yes" button.

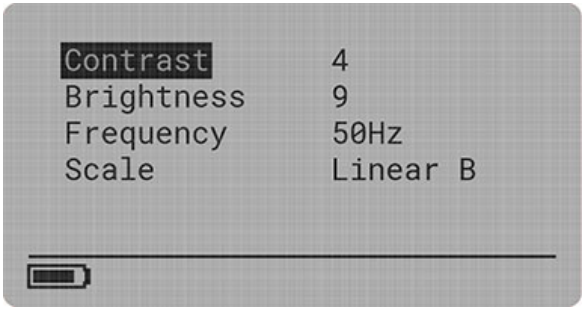


Fig.13 User Menu

The "Frequency" option allows selection of the local mains frequency allowing the instrument to "tune out" mains hum – in much of the world, the frequency is 50Hz however in the Americas, and some of Asia, 60Hz is normal. Some areas, e.g. Japan, use both, and it will be useful to adjust it to obtain the most stable readings in the locality in which the testing is being carried out.

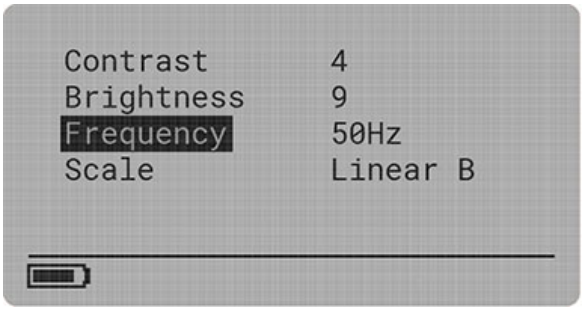


Fig.14 Frequency

The "Scale" menu item allows selection of "Decibels" or "Linear B".

The Linear option provides two scaling options. The user is invited to try each option to establish which is preferred. Please note that the Manual Magnification selection is not available when "Decibels" is selected.

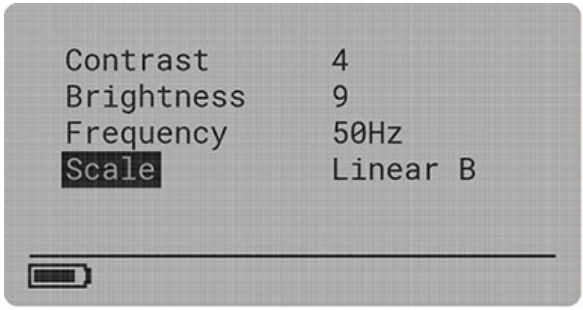


Fig.15 Scale

To return to the home screen, please press the “X” button.

Generator (Wet Sponge Mode)

Press the On/Off button to turn the generator on. The screen will illuminate and will display the screen shown below:

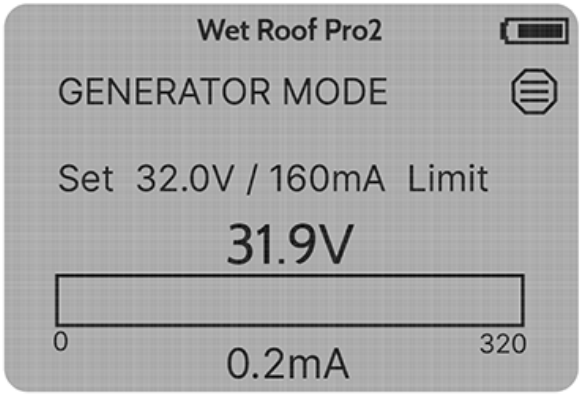


Fig.16 Home screen

Press and hold the “Menu/Yes” button until the user menu opens.

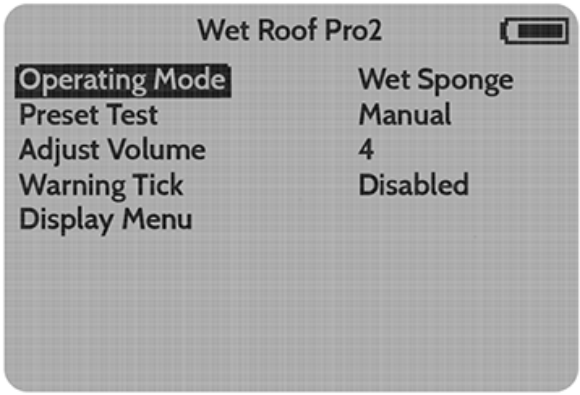


Fig 17. Wet Sponge User menu

A range of preset tests are available which may be selected by using the "Increase" and "Decrease" buttons to the left of the screen. Press the "Yes" button to accept the revised value and press the "Back" button to return to the Generator Screen.

Alternatively, the user can set a custom voltage between 9 and 90V and an alarm threshold current between 100 and 1200 uA.

Ensure that the Operating Mode is "Wet Sponge" before pressing the "Back" button.

The screen will return to the Sponge Mode Generator screen.

The Sponge Handle should be connected to the red terminal and the case should be grounded via the black terminal.

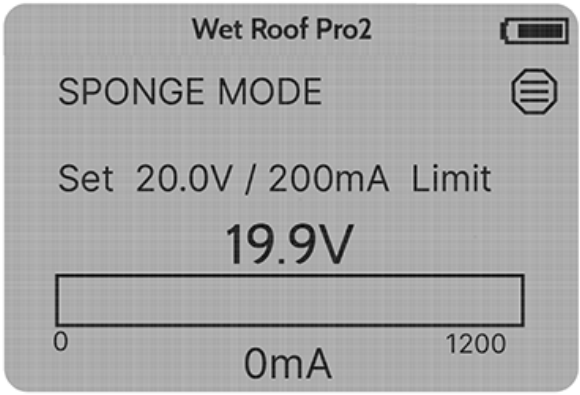


Fig.18 Home screen – Sponge Mode

Ensure that the sponge is wet, and check that the connections are correct by touching the sponge to a known earth point. The screen will go red, and the alarm will sound.

You will notice the bar graph will extend across the screen.

Now start testing. The voltage should remain close to the set point, and the current should remain very low, assuming the surface being tested is undamaged.

Where there is damage to the surface coating, the current will increase. If the current is greater than the threshold set in the menu (see above) then the screen backlight will be red, and the alarm signal will sound.

Please note that the Detector is not used in Wet Sponge Mode.

Wet Roof Leak Detection Operation Principle

Imagine standing on a hillside, holding a survey ski-pole in each hand. You could turn around a little on the spot, placing the poles on the ground each time, and even with your eyes closed, you could work out which way the hill sloped by the difference in heights of your two hands. If you were facing straight up, or down, the hill, the poles would be the same height. It's also clear that if you put your poles closer together, there will be a smaller difference, and further apart there will be a bigger one – so it would be helpful to keep the distance between the poles as consistent as possible.

Fig.19 Skier on hillside

The Wet Roof Generator creates an electric field, in which the highest potential is where there are faults in the waterproof layer, and lowest is at the trace wire, which is laid around the outside of the area being tested.

The Wet Roof Detector contains a very sensitive voltmeter which displays which hand is "higher" and therefore nearer to the "top of the hill", i.e. where the fault is.

Wet roof leak detection relies on the roof's surface moisture forming an electrically conductive path to earth via the building substrate. This method is also known as voltage gradient mapping or vector mapping.

Fig. 20 shows a representation of how lines of equal voltage, "Equipotential" lines, which are similar to contour lines on a map, rather like ripples on a pond would appear in a test area with a single fault.

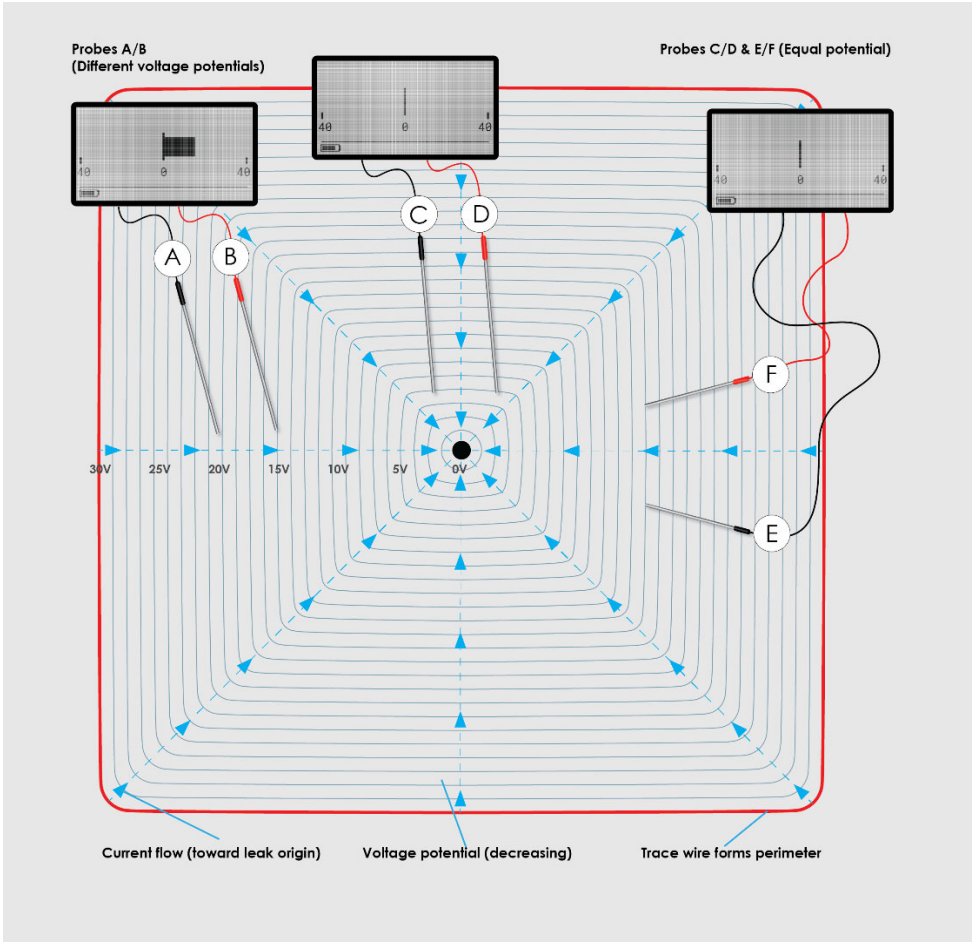


Fig.20 Principle of operation

The Wet Roof Pro2 detector unit detects the tiny difference in voltage between the two probes, and this allows the operator to detect and locate the fault, or faults, within the test area.

The stainless-steel trace wire is laid out to form a conductive perimeter around the area of roof to be tested and is connected to the positive output of the Wet Roof Pro2 generator unit. We advise that you "start small" until you have gained some experience with the instrument – a suitable test area may be 5-10 metres square.

The negative output of the Wet Roof Pro2 generator is connected to a suitable earthed point of the building substrate. The Wet Roof Generator applies a voltage to the trace wire, and provided everything is correctly connected, an electrical current flows from the trace wire toward the origin of the leak (denoted by the blue lines).

The flowing current can be detected as a voltage difference, a potential, which the Wet Roof Pro2 Detector displays.

The measured potential on the Detector is equivalent to the "difference in height" of the hands holding the survey ski-poles. The poles should be manipulated, by turning around on the spot, to detect the greatest reading – an imaginary line drawn through the pole tips and extended, will lead the operator in the direction of the leak.

This technique can be used in two or three locations, to find the point where the imaginary lines cross. This approach can then be repeated over a much smaller area to find the exact position of the fault(s) in the waterproof layer.

In **Fig.20** the difference between measured voltage potentials at probes **A** & **B** is approximately 6.0 volts, the detector unit will therefore display the direction bar to the right as the voltage at B is higher than at A.

Probes at points **C** & **D** will show no direction because both probes are on equipotential lines as are probes at points **E** & **F**.

Operators should be careful to keep the poles a consistent distance apart, as the further the survey probe are set apart, the greater the signal that will be displayed. This is due to there being a larger voltage difference between the two poles. This can be initially confusing, so we recommend keeping the poles approximately a shoulder-width apart.

The operator should be guided mostly by the direction, and relative magnitude of the signal. The absolute value of the measured voltage is not generally useful as it will vary as the overall voltage field on the roof will, due to a number of factors, including the presences of solutes in the water, the pole separation, and the electrical resistance between the fault in the waterproof layer to the building earth point. Typically, the greater the moisture penetration between roof membrane and building structure the greater the current flow will be, and the easier it will be to find the fault(s).

Using the Wet Roof Pro2

Overview

Preparation

- Fit batteries to both Detector and Generator
- Lay trace wire around area to be tested and connect to Generator
- Ensure good earth connection for Generator
- Assemble poles & connect to Detector
- Ensure roof is thoroughly wet.

Verification

- Turn on Generator, verify the current is below about 100mA.
  - If the alarm is sounding, check for shorts in the generator connections.
  - If the current is over 150mA, consider reducing the area being tested.
  - If the current is zero, check that the wires are properly connected, the batteries are properly charged, and that the generator is working correctly – short the output connectors and ensure the screen backlight is red and the alarm sounds. Then check that the roof structure is properly grounded.
- Turn on Detector, place one detector pole inside the area to be tested, and one outside. The detector should strongly indicate towards the pole that is within the area.

Testing

- Keep poles about shoulder width apart – try to keep this constant.
- Work methodically – there are various techniques, choose the best for you.
- When you find leaks/faults, isolate them with the trace wire, and you may detect other damage close by.
- If you are not fixing damage immediately, mark clearly with the crayon, and take photographs showing features to ensure the fault can be found easily for the repair.

Finished

- Turn off the instruments and put the interconnecting leads in the bag with them.
- Reel up the trace wire

Preparation

Before conducting a survey, the roof must be wet, and the trace wire needs to have been laid down to form a perimeter bordering the area to be tested. Use the 10m lead (clip to black plug) to connect the ends of the trace wire to form a closed loop.

It is also important to ensure that there is good contact between the trace wire and roof surface to ensure an efficient survey can be conducted. If necessary, the trace wire may be weighted down or fixed in position with adhesive tape if possible.

Metallic structures protruding through the roof such as ventilation shafts and drainpipes must be screened off by either looping around them with the trace wire or an additional loop of wire which must be connected to the main trace wire. Otherwise, these will appear as "faults" and the detector will lead you to them!

Defects and faults located in a membrane during test can also be isolated in this way in order to continue testing for further leaks (see **Fig.21**).

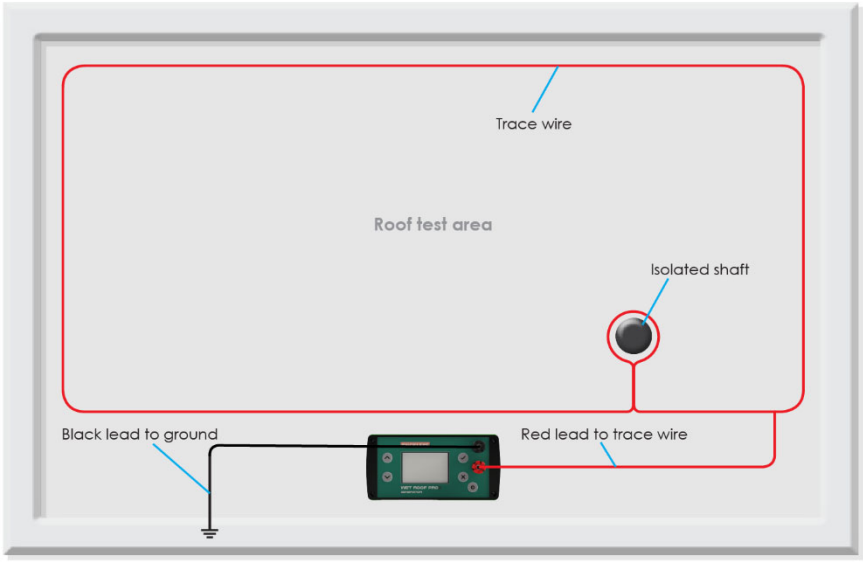


Fig21. Wet Roof Pro2 Generator connections

Prior to using the Wet Roof Pro2 for the first time the batteries will need to be installed, once inserted the batteries can remain in the units until charging is required.

To fit the generator unit batteries (4 x 'D' cell) remove the twist-grip cap from each battery tube located on the rear of the unit and slide two batteries into each battery tube (positive to cap) as shown in **Fig. 22A** and refit the caps.

To fit the detector batteries, firstly remove the detector unit from its protective neck pouch and open the battery compartment cover located on the rear of the case. Next, observing the correct polarity, insert an 'AA' cell into each of the four battery slots.

NOTE: Although the battery compartment has five positions only four batteries are fitted to the detector unit (see **Fig 22B**).

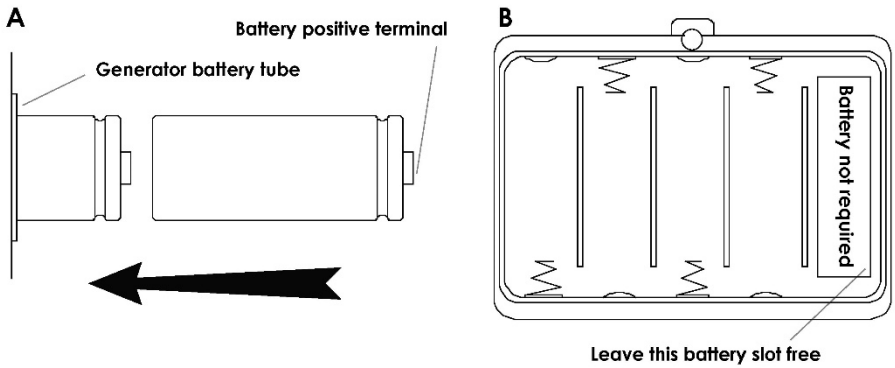


Fig.22. Fit batteries A - Detector Unit, B - Generator Unit

Connect the 10m lead (red plug) from the trace wire to the positive output socket of the Wet Roof Pro2 generator unit with the negative output of the generator connected to a good building earth (substrate) point this time using the 10m black 4mm plug to crocodile-clip lead.

Attention! Avoid submersing the generator units output sockets in standing water as this could cause a short-circuit across the output sockets.

The generator unit should ideally be raised above any standing water on the roof surface. If it is not possible to position the generator in a dry place, then the trace wire reel can act as a stand to raise the unit away from the water.

The left- and right-hand survey poles comprise three sections, an upper handle, a middle section and the lower probe-tip section. To assemble the survey poles, simply screw the sections together.

Connect each survey pole to the detector unit using the respective 1m red and black test leads (stored in a small pocket on the rear of the detector's protective neck pouch).

Surveying

When all preparations as detailed above on have been completed, switch both generator and detector units on. Select the required generator pulse frequency, duration voltage, maximum current and alarm. Enable the warning tick if required.

Once inside the test area, position the poles at a comfortable distance apart on the roof surface and begin the survey at one corner of the trace wire perimeter.

Interference may cause a slight offset to be noticed on the detector, but not in a pulsed manner. The direction of the observed pulse indicates the direction of the leak. Note that it is the direction and not strength of the pulse that is important.

One possible method for conducting a survey is to follow a course similar to that of mowing a lawn, continuing along the roof to the opposite corner of the trace wire then turn through 180° and return. As you turn, the direction response will switch sides. See **Fig.23**.

Alternatively, continue in the direction of the pulse until the detector reading swings in the opposite direction, indicating that you have passed the leak origin. Now turn through 90˚, measure in a direction perpendicular to this line, see **Fig.20** for detail.

During testing if a momentary weak pulse is detected which always leads to the centre of the test area, this indicates that no leaks are present. This may be verified by shifting the position of the trace wire, which will shift the apparent origin of the weak pulse respectively.

Walk along one edge of the test area. The detector indicator will increase as you get closer to a fault and decrease as you move away. At the peak, turn 90 degrees and continue testing. When you reach the new peak, turn 90 degrees once more and continue testing until the exact location of the fault is identified.

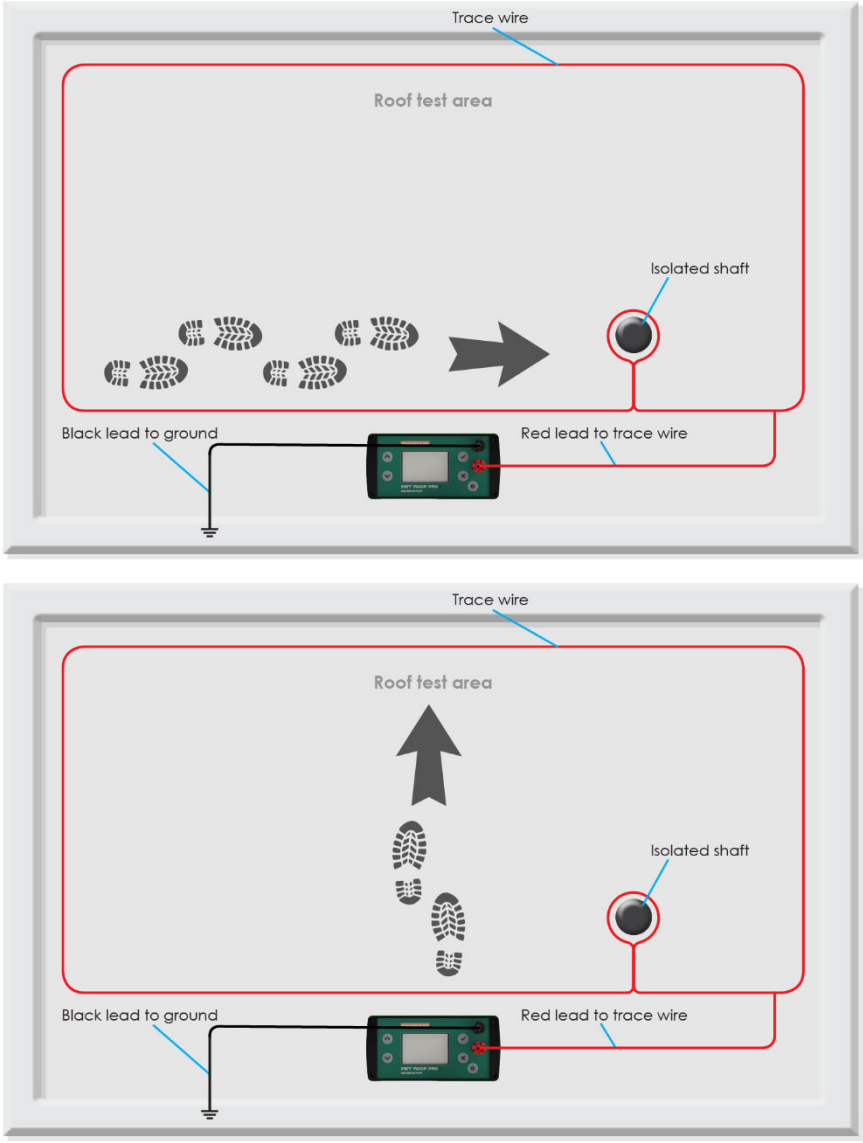


Fig.23 Roof survey

Battery charger

Safety

- Please read these operating instructions carefully before using the charger.
- Do not use the device if there are any signs of damage to the housing, plug or cable. If you do find any damage to the unit, please contact an authorised dealer.
- Use only with NiMH cells. Other battery types may explode.
- Please make sure batteries have been inserted with the correct polarity (+/-) prior to use.
- Please note that due to the high charging current, only high-quality brand rechargeable batteries should be charged with this device. Low quality cells may leak and damage the charger and invalidate the warranty.
- Keep the charger in a dry place away from direct sunlight.
- To avoid the risk of fire and/or electric shock, the charger must be protected against high humidity and water.
- To clean the unit, disconnect the power supply and only use a dry cloth.
- Never attempt to open the charger.
- Keep out of the reach of children. Children should be supervised to ensure that they do not play with the charger.
- The device is not to be used by children or people with reduced physical, sensory or mental capabilities. In addition, novice users who have not fully read these instructions should be supervised or given instruction before use.
- If the safety instructions are not followed, it may lead to damage to the device or battery and could cause injury to the user.
- We recommend the use of ANSMANN rechargeable batteries with this product.

Technical overview

- Charger for 1 to 4 x AAA, AA, C or D and 1 x 9V E-block.
- Suitable for NiMH batteries
- Reverse polarity protection
- Trickle charging
- For worldwide use (100V-240V AC / 50-60Hz) and car use -12V DC only.

Please do not connect to 24V systems as this will damage the charger.

Only use nickel-metal hydride (NiMH) cells. Non rechargeable batteries or other types could cause an explosion. Do not attempt to charge zinc/alkaline batteries or other types of non-rechargeable, primary batteries.

For charging round cells

- Multifunction clear LCD display with backlight
- Adjustable charging current for each charging slot 400mA, 600mA, 800mA for 1-4 rechargeable batteries 400mA, 600mA, 800mA, 1500mA, 1800mA for 1-2 rechargeable batteries
- Individual charging programs for each charging slot:
  - **CHARGE**
  - **DISCHARGE** (discharges battery before charging to minimize the 'memory effect' of batteries)
  - **REFRESH** (cycle of charging and discharging to refresh old batteries)
  - **TEST** (fully charges battery - discharge battery and measures capacity, recharges battery)
- Capacity measurement in mAh/Ah
- The selected charging program can be easily read on the LCD display
- Microprocessor controlled charging and supervision of each battery
- Individual monitoring of the current parameters:
  - **VOLTAGE** (V)
  - **CAPACITY** (mAh/Ah)
  - **TIME** (hh:mm)
  - **CURRENT** (mA)
- Multiple over charging protection per bay and auto cut-off function
- Faulty cell detection/accidental alkaline battery insertion detection

For 9V rechargeable batteries

- LED charging indication
- Charging current 15mA
- Automatic termination of the charging process by 24-hour timer

Operation

Using the charger in a mains power outlet

Insert the input plug included on the two power contacts, located on the power supply, and push the plug until it clicks into place.

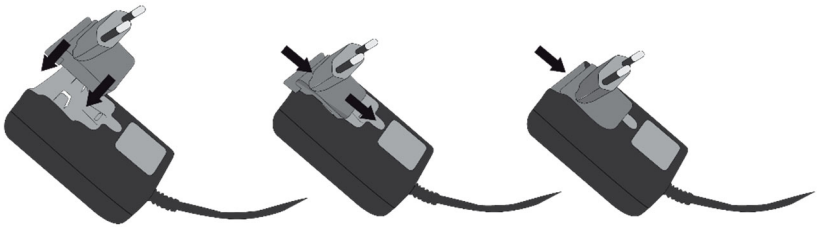


Fig.25 Input plug

Please ensure that the input plug 'clicks' into the power supply to ensure the unit is safe to use. Connect the power supply to the charger. Finally, connect the power supply to the mains (100-240V AC 50-60Hz).

To change the input plug, push the locking lug below the plug (e.g. using a pen) until the plug can be moved slightly upwards. Then remove the plug.

Using the charger in a vehicle

Connect the DC charging cable to the charger. Connect the DC charging cable to the 12V DC car socket of your vehicle **(do not use in 24V DC truck sockets)**. Please make sure that the power of the socket is switched on. Some cars require the ignition to be switched on.

The charger is now ready for use. You can insert one 9V E-block and up to 4 AA/AAA/C/0 (in any combination) NiMH rechargeable batteries. Insert all batteries with correct polarity, corresponding to the symbols in the charging slot.

Charging of round cells

The charger has 3 function buttons; '**CURRENT'**, '**DISPLAY'** and '**MODE'** (see 'A' in illustration on page 16). Use these buttons to select the following settings:

- **MODE** button
  Push the '**MODE**' button within 8 seconds of inserting 1-4 rechargeable batteries, to access one of the following charging programs:

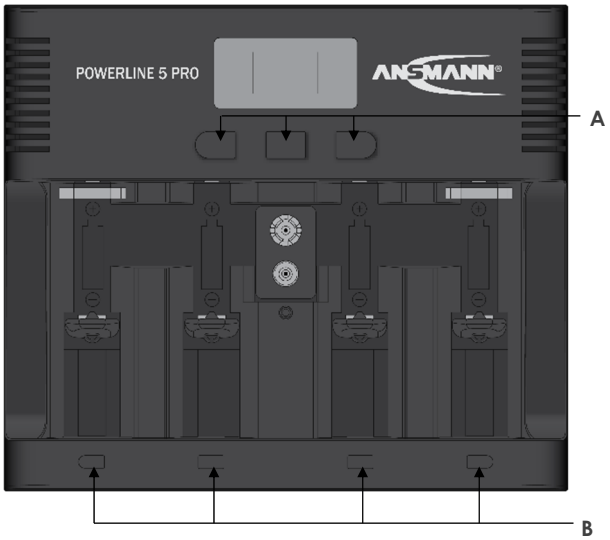
  A **CHARGE**: Charges battery. After charging is complete, charger will automatically switch to trickle charging (trickle charge will commence after all modes)
  B **DISCHARGE**: Discharges battery before charging to minimize the 'memory effect' of batteries
  C **REFRESH**: 'DISCHARGE REFRESH' or 'CHARGE REFRESH' status is shown on the LCD display when charger cycles between discharging and charging. This process will refresh old batteries and bring them back to the maximum capacity. Refresh will be repeated (max. 10x) until the charger can no longer register a rise in capacity.
  D **TEST**: Fully charges battery. LCD display shows 'CHARGE TEST' Discharges battery and measures capacity. The LCD shows 'DISCHARGE TEST'. Recharges battery, ready for use. LCD shows 'CHARGE TEST'.

- **CURRENT** button

  Push the 'CURRENT' button within 8 seconds of selecting a charging program or after inserting batteries to select the charging current for the program 'CHARGE' or 'TEST'. Alternatively, choose the discharging current for the program 'DISCHARGE' or 'REFRESH'.

- **DISPLAY** button

  Push the 'DISPLAY' button whilst charging or discharging to display the charging/discharging current (mA), the voltage of the rechargeable battery (V), the charging/discharging capacity (mAh or Ah) or the remaining charging/discharging time (hh:mm).



Once the settings have been selected, the charger automatically starts with the selected parameters after 8 seconds. If no settings are chosen, the LCD display will flash after inserting rechargeable batteries. First the voltage of the rechargeable batteries as well as the pre-set charging program 'CHARGE' is shown. Next, the pre-set charging current of 600mA is shown. After 8 seconds the charging process starts automatically using the pre-set parameters.

Fig.26 Battery charger

By using the 4 charging slot buttons (see 'B' in illustration above) you can make individual settings for each rechargeable battery. To change a function for a single rechargeable battery, press the corresponding button below the charging slot for the chosen battery. The display will flash for this battery, and you can now change settings, as described above, for the single charging slot using the function buttons 'MODE' and/or 'CURRENT'.

If only one or two rechargeable batteries are inserted into the charger using the two outer charging slots, in the mode 'CHARGE' and 'TEST' the charging current can be increased up to 1500mA or 1800mA with the 'CURRENT' button. In this case the inner charging slots are disabled and cannot be used. When charging three or four rechargeable batteries at the same time, the charging current can be set to 400mA, 600mA or 800mA. Using the programs 'DISCHARGE' and 'REFRESH' discharging currents of 200mA, 300mA or 400mA can be selected. The charging current is generally twice as high as the chosen discharging current.

A few minutes before the rechargeable batteries are completely charged, the charger reduces the charge current to ca. 200mA, regardless of the previously selected charge current. This gentle full charging extends the service life of your rechargeable batteries.

After every charge/discharge procedure is complete, the charger adds a short pause for the benefit of the rechargeable batteries before continuing with the selected charging/discharging program.

ATTENTION: Please ensure that the rechargeable batteries are designed for the respective charging current. For example, AAA rechargeable batteries should not be charged with a 1500mA or 1800mA charging current. We recommend choosing the maximum charging current (mA) so that it does not exceed the capacity value (mAh) of the inserted rechargeable battery.

It is normal that batteries may become warm during charging. After charging is complete, the charger switches automatically to trickle charge. The trickle charge prevents self-discharge of the batteries when left in the charger.

LCD Display

'- --' is shown when there is no rechargeable battery inserted but the charger is connected to mains.

'- -- mAh' is shown during the first charging cycle when in 'TEST' mode.

'Full' is shown when the charging process is finished and the charger switches to trickle charging, after finishing the charging program 'TEST' or 'REFRESH', the display switches between 'Full' and the measured discharging capacity in mAh/Ah.

'ERR' and 'Lo' are displayed alternately if the rechargeable battery inserted has an internal short-circuit and so is defective.

'ERR' and 'Hi' are displayed alternately if the rechargeable battery inserted exhibits a very high resistance or a non-rechargeable battery is inserted. In such

cases, no charging occurs. Please remove the defective batteries and dispose of these in an environmentally friendly manner.

During the charging process, the pre-set parameters are displayed as mentioned under point 3 (DISPLAY). In addition, the chosen charging program and the current process (CHARGE or DISCHARGE) are shown. In the illustration above you can see an example of the LCD display. This example shows 4 different display modes and 4 different charging programs.

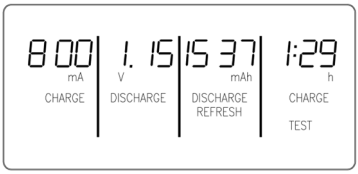


Fig.27 LCD display

Charging 9V rechargeable batteries

One 9V battery can be charged, if no D-cells are inserted in the inner round cell charging slots. When inserting the 9V battery, pay attention to the correct polarity referring to the symbol in the charging slot. The LED charging indicator illuminates red when the battery is inserted correctly. 9V batteries are charged with a gentle current of c.15mA. After approx. 24 hours, the charge process ends automatically and the LED illuminates green. The rechargeable battery is charged and will be supplied with the trickle charge current so long as it remains in the device. If the indicator flashes red, the battery has an internal short circuit and should be disposed of.

Technical data

Input voltage external power supply:	100-240V AC / 50-60Hz
Input voltage car adapter:	12V DC (Do NOT use with 24V sockets)
Input voltage charger:	12V DC
Charging current for round cells:	400mA - 1800mA
Charging current for 9V batteries:	15mA
Maximum charging capacity:	11000mAh for round cells
	300mAh for 9V block-style batteries

Maintenance

We strongly recommend the Wet Roof Pro2 is serviced annually by Buckleys (UVRAL) Ltd. or one of our approved service & repair agents in order to ensure it works at optimum performance, accuracy and safety.

By registering your Wet Roof Pro2's warranty at the time of first purchase, we will send annual reminders for scheduled maintenance as well as extending the warranty. For more information, see the flyer enclosed with this manual.

Remove batteries from both units if they are not going to be used for a prolonged period of time.

Regularly inspect all items and accessories within the Wet Roof Pro2 kit, checking for damage. Check the integrity of the survey poles (fully assembled) and all leads, replacing any that are damaged or broken.

The exterior of both units should be cleaned regularly using a moistened cloth. A mild detergent mixture can be used for more stubborn stains (99% water +1% mild detergent).

Do not use abrasive cleaners as this could damage the display lens. Under no circumstances should cleaning fluids be allowed to enter the input/ output sockets of the units.

Disposal Information

Producer registration number: WEE/HJ0051TQ

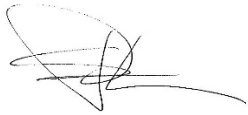
This Product must be disposed of in accordance with UK WEEE Producer Responsibility Regulations, or in accordance with your local WEEE guidance.

For further information on UK WEEE Producer Responsibility regulations click on: http://www.gov.uk/government/collections/producer-responsibility-regulations

EC Declaration of conformity

We, Buckleys (UVRAL) Ltd., as manufacturer of the apparatus listed, declare that the product **Wet Roof Pro2** is manufactured in conformity with the following directives: **2014/30/EU**, **2014/35/EU**, **2015/863/EU** and **2011/65/EU (RoHS)**.

Authorised by:



S B Dobson

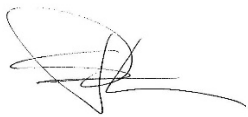
Managing Director, Buckleys (UVRAL) Ltd.

CE

UKCA Declaration of conformity

We, Buckleys (UVRAL) Ltd., as manufacturer of the apparatus listed, declare that the product **Wet Roof Pro2** is manufactured in conformity with the following UK legislation: **Electronic Compatibility Regulations 2016** and **The Electrical Equipment (Safety) Regulations 2016**.

Authorised by:



S B Dobson

Managing Director, Buckleys (UVRAL) Ltd.

UK CA

Contact details

Manufacturer: Buckleys (UVRAL) Ltd

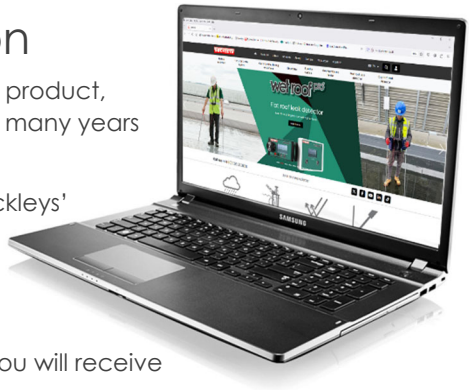
Address: Buckleys House
Unit G, Concept Court
Shearway Business Park
Shearway Road
Folkestone
Kent CT19 4RG, UK

Tel: +44 (0)1303 278888

Website: www.buckleysinternational.com

Distributor details

Product registration



Thank you for choosing a Buckleys product, we are sure it will provide you with many years of reliable service.

Please register this product via Buckleys' website and download the Warranty Registration Certificate.

Register your product in 5 minutes

Once your product is registered, you will receive the following benefits:

- **FREE** annual service & calibration reminders by email
- **Latest** industry news relating to your product
- Be the **first** to hear about our new products

We strive to improve the quality of our products and service.

Registering your product helps us monitor overall quality of our products, service and dealer network. Additionally, if we ever need to contact you regarding your product, we are able to do so immediately.

We will also send you annual service/calibration reminders by email to help ensure your product is always in perfect working order.

To register your product, simply visit:

www.buckleysinternational.com/registration

... Complete the online form and click on SUBMIT.