User Manual

Surface Analyst™ 3001-HZE

Archer 8.15

IMPORTANT SAFETY NOTE!

Read and understand this entire manual for important information before using the Surface Analyst.

Failure to do so can result in personal injury, property damage or both.

This English language document is the original User Manual.

Document Version #1

Contents

1 Introduction

1.1 Purpose and Scope of this Manual

The purpose of this User Manual is to give operating and basic maintenance instructions for the person who uses the Surface Analyst 3001-HZE on a regular basis. This manual does not include information for special administrative functions.

The images presented in this manual may differ from the actual appearance of your Surface Analyst.

1.2 Safety Messages

Safety messages tell you about important safety information concerning the Surface Analyst. In this manual, safety messages are shown in a safety message block like the following example:

WARNING! This is an example of a safety message.

Always read and understand all safety messages before using the Surface Analyst.

1.3 Important Notes

Important information that is not safety-related is shown in a note message like one of the following:

This note gives information on how to avoid equipment malfunctions or property damage. If you do not follow this note, your warranty may be voided or you may receive incorrect measurements or both.

This note gives other useful, important information.

1.4 Contact Us

Contact us for general inquiries, technical support, and sales:

Brighton Science
4914 Gray Road
Cincinnati, OH 45232
513.469.1800
service@brighton-science.com

Visit us at brighton-science.com

2 Safety Notes and Intended Use

IMPORTANT SAFETY NOTE!

Read and understand all the safety notes in this chapter as well as the safety messages in the rest of the manual. Failure to do so may result in personal injury or property damage or both.

2.1 Intended Use

The intended use of the Surface Analyst is to measure the surface energy properties of a material surface. Do not use the Surface Analyst for any other use.

The Surface Analyst is intended to only be used by properly trained personnel. It is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instructions.

2.2 Safety Labels on the Equipment

Safety labels are attached to the Surface Analyst equipment to warn you about potential hazards.

1	Hazard alert symbol	3	Written description
2	Signal word		

Fig. 1 - Example of a safety label

Safety labels include a hazard alert symbol, a signal word, and a written description (when required). The following table describes these terms.

Term	Definition
Hazard alert symbol	Hazard alert symbols give a visual notification of the hazard. Some examples of hazard alert symbols are the following: • General hazard alert symbol • Electrocution hazard alert symbol

Term	Definition
Signal word	Signal words describe the level of risk of a particular hazard. The definitions are as follows: • DANGER: This signal word indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. • WARNING: This signal word indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. • CAUTION: This signal word indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Written description (as required)	Written special notifications related to the hazard may be included.

Before using the Surface Analyst, read and understand each of the safety labels. The locations of the labels are shown in Fig. 2.

Fig. 2 - Location of safety labels on case

Fig. 3 - Location of safety labels on instrument

To maintain the safety labels, do the following:

- Do not remove or tamper with any labels.
- Keep the labels clear of obstructions so that they are readable.
- Replace any label that is no longer readable. Contact Brighton Science if you need a replacement.

2.3 Particular Safety Notes

The following sections list special safety notes that apply to particular components of the Surface Analyst, activities performed while using the Surface Analyst, and environments in which the Surface Analyst is used.

2.3.1 Explosive Atmospheres

The Surface Analyst 3001-HZE is suitable for use in Pollution Degree 2 environments or better.

Note: Definition of Pollution Degree 2 per IEC 60664-1: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

The Surface Analyst 3001-HZE complies with the following standards:

- EN 60079-0: 2012 + A11: 2013, Explosive atmospheres – Part 0: Equipment – General requirements
- EN 60079-11: 2012, Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"
- EN 1127-1: 2011, Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
- UL 61010-1:2012 Ed.3 +R15JUL2015
- UL 121201:2017 Ed.9

- CSA C22.2#61010-1-12:2012 Ed.3
- CSA C22.2#213:2017 Ed.3

2.3.2 General Operation Safety

- Do not point the inspection head at your face.
- Do not swing the Surface Analyst around by the tether or wrist strap.
- Do not subject the instrument to high charge generating processes.
- Follow proper site and use procedures to limit the build-up of electrostatic charge on the instrument.

2.3.3 Battery, AC Adapter, and Charger Safety

- The battery can expose you to chemicals including nickel, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.
- Use only batteries supplied by Brighton Science.
- Do not attempt to open or tamper with the battery.
- If damaged, the lithium-ion battery can leak substances that can irritate the respiratory tract, eyes, and skin. Make sure your company has a procedure in place for the safe handling of a damaged battery.
- Do not use a battery that is bulging or otherwise damaged or deformed.
- Do not dispose of batteries in the trash or in a single stream recycling program. Take all unneeded, spent, or damaged batteries to a facility that specifically handles lithium-ion battery disposal.
- Do not allow children to play with the battery charger.
- Only use the Brighton Science-supplied battery charger. Only use Brighton Science-supplied batteries in the battery charger. Do not attempt to recharge non-rechargeable batteries in the battery charger.
- Only use the power supply provided by Brighton Science for powering the Surface Analyst.
- Explosion Hazard--Do not install, remove or change the battery in a hazardous environment.
- Do not use, connect or disconnect the AC adapter in a hazardous environment.

2.3.4 USB and Micro USB Connections

Do not use either the USB port or micro USB port in a hazardous environment. The USB and micro USB ports of the Surface Analyst 3001-HZE have been permanently blocked off. Do not remove any of the safety labels on the instrument.

2.3.5 Cartridge Changing

Do not install, remove or change the fluid cartridge in a hazardous environment.

3 Technical Specifications

Item	Specification
Weight (instrument only)	1 lb (.5 kg)
Weight (with case and accessories)	10 lbs (4.5 kg)
Dimensions (instrument only)	4.4 in x 2.4 in x 9.2 in (11.2 cm x 6.1 cm x 23.4 cm)
Case dimensions	14 in x 17 in x 7 in (36 cm x 43 cm x 18 cm)
Power	Battery: Lithium Ion 7.4 VDC, 2600 mAh, 19.24 Wh Power supply (input): 100-240 VAC, 50-60 Hz, 1.2 A Power supply (output): 12 VDC, 2.5 A Mains supply voltage fluctuations up to +/- 10% of the nominal voltage
Battery run time	5 hours
Battery charging station	Input: DC 12 V, 2.5 A Charges 1 Brighton Science battery 2 hour charge time
Operating conditions	Indoor use only Maximum altitude: 6562 ft (2000 m) Temperature: 41° - 104°F (5° - 40°C) Minimum relative humidity:15% Maximum relative humidity: 80% for temperatures up to 31 °C (88 °F), decreasing linearly to 50% relative humidity at 40 °C (104 °F)
Noise emission	Less than 72 dB(A)
Impact resistance	Drop test from 1 m in compliance with IEC 61010-1 (except the pivot inspection head)
Cartridge fluid	HPLC-grade water (standard)
Cartridge capacity	1000 measurements
Inspection time	2 seconds *
Image storage capacity	40,000
Pollution degree rating	Pollution Degree 2 or better **

* Inspection time may be longer with certain options enabled.

** Definition of Pollution Degree 2 per IEC 60664-1: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

4 Overview of the Surface Analyst

The Surface Analyst 3001-HZE is a portable, manually-operated, hand-held inspection device. It determines surface energy by measuring the contact angle of a water drop deposited on your surface.

The Surface Analyst is controlled by Archer, Brighton Science's proprietary software.

4.1 Surface Energy and Contact Angles

The Surface Analyst gives you important information about the surface energy of your product in a fast, easy, non-destructive way.

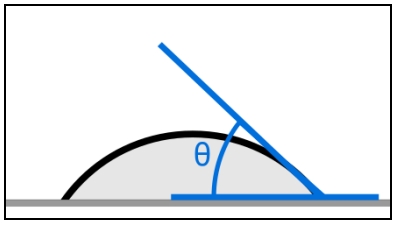
Knowing the surface energy of your product is important for assuring the success of many processes, including the following:

- Adhesion
- Sealing
- Painting and coating
- Printing
- Hydrophobic applications

What contact angles tell you

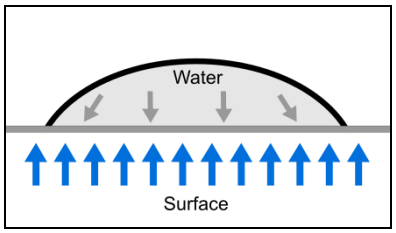
The Surface Analyst deposits a drop of fluid onto a surface and measures the contact angle between the drop and the surface.

The contact angle (θ) tells you how much the surface is able to attract other substances.



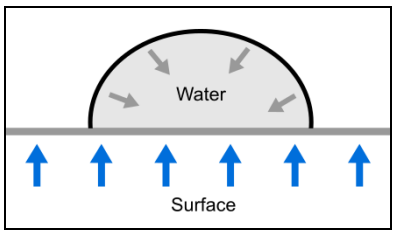
If the fluid spreads out thinly, that means that the fluid is attracted more strongly to the surface than to itself.

- The surface has a high surface energy.
- The contact angle is low.
- This surface is generally good for bonding applications.



If the fluid "beads", then the fluid is attracted more strongly to itself than to the surface.

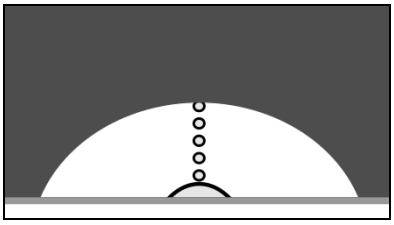
- The surface has a low surface energy.
- The contact angle is high.
- This surface is generally not good for bonding applications, but it is good for anti-stick and hydrophobic applications.



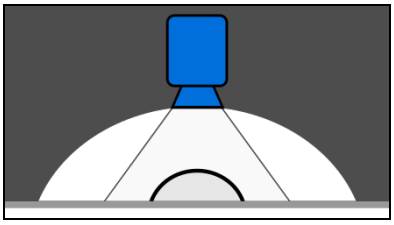
4.2 How the Surface Analyst Works

The Surface Analyst measures the contact angle of a fluid drop on your surface to determine the surface energy.

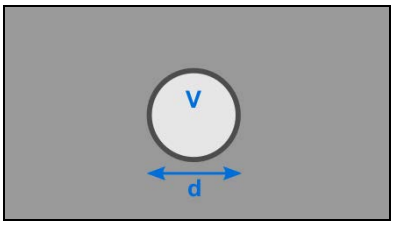
1. The Surface Analyst pulses a stream of several droplets onto the surface. These droplets combine to form one small drop (less than 2 microliters).This process is called Ballistic Deposition.



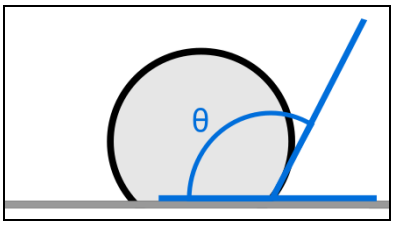
2. A camera views the drop from above and takes a picture.



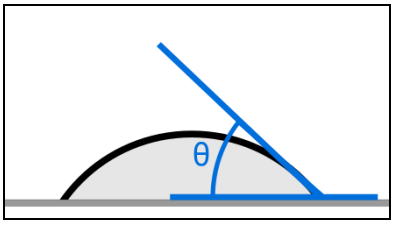
3. The Archer software determines the diameter of the drop. Using the known volume of the drop, Archer calculates the contact angle.



4. A large contact angle shows that the surface has low surface energy.



A small contact angle shows that the surface has high surface energy.



4.3 Equipment Included with the Surface Analyst

The Surface Analyst includes the following equipment packaged in a sturdy carrying case.

1	Storage case	5	Inspection head
2	Surface Analyst	6	Spare cartridge in foil bag
3	AC adapter	7	Battery charger
4	Performance Check Surface (PCS)	8	Battery

Fig. 4 - Surface Analyst3001-HZE in storage case

When you are not using the Surface Analyst, keep all of the equipment in the case.

4.4 Surface Analyst Diagrams and Features

Your Surface Analyst may vary from the images shown, depending upon the options chosen.

1	Tether	6	Reject buttons
2	Touchscreen	7	Foot of inspection head
3	On/Accept buttons	8	Wrist strap anchor
4	Indicator lights	9	Inspection head
5	Wrist strap		

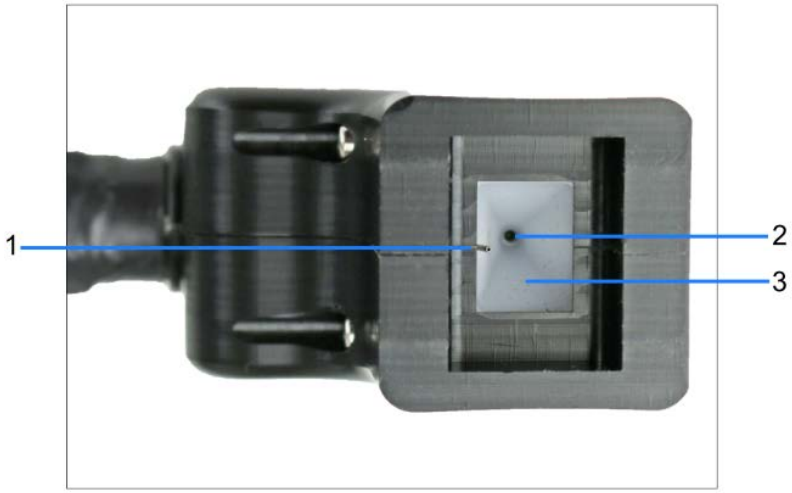
Fig. 5 - Front of Surface Analyst 3001-HZE

1	Surface Analyst serial number	4	Cartridge release lever
2	Cartridge bay	5	Lockout screw
3	Needle	6	Battery

Fig. 6 - Back of Surface Analyst 3001-HZE

1	Battery release button	3	Power jack
2	Tether		

Fig. 7 - Side and top of Surface Analyst 3001-HZE



1	Nozzle or valve orifice (dependent upon equipment purchased)	3	LED light diffuser
2	Camera		

Fig. 8 - Surface Analyst 3001-HZE inspection head

5 Handling and Storage

Proper handling and storage is important for keeping the Surface Analyst operating properly.

5.1 Handling the Surface Analyst

Observe the following handling practices:

- Wrap the wrist strap around your wrist to prevent dropping the Surface Analyst while using it. For the convenience of both right-handed and left-handed users, there is a wrist strap anchor on either side of the Surface Analyst where you can attach the wrist strap.
- For models having a tethered inspection head, use care when moving the head. Rapid or extreme movements can damage the tether.
- Always lift and carry the Surface Analyst by the main body. Do not lift or carry the Surface Analyst by the tether or inspection head.

5.2 Storing the Surface Analyst

Observe the following storage requirements:

- Keep the Surface Analyst and all equipment in the storage case when not in use.
- Store all the equipment within the temperature and humidity range listed in "Technical Specifications" on page 11.
- Keep the fluid cartridges in their mylar pouches until ready to use.
- Do not allow the fluid cartridges to freeze.
- Once you put a cartridge in the Surface Analyst, do not remove it until the cartridge is empty. You may not reuse a cartridge if you remove it from the Surface Analyst.

5.3 Cartridge Shelf Life

Due to fluid evaporation, the cartridges have a limited shelf life. The shelf life is as follows:

- One year, if unopened and stored in the original mylar pouch
- Six months, if inside the Surface Analyst

5.4 PCS Cards Storage and Handling

Keep the PCS cards sealed in their original bags with the desiccant packet. When you need to use a PCS, only grasp it by the gray border at the bottom of the card. The PCS cards have an expiration date that is printed on the back side of the card. The cards expire at the end of the month printed.

6 Operation

Follow the instructions in this chapter for the best operating results. Refer to "General Operation Safety" on page 10 for relevant safety information.

WARNING! Do not use either the USB port or micro USB port in a hazardous environment. The USB and micro USB ports of the Surface Analyst 3001-HZE have been permanently blocked off. Do not remove any of the safety labels on the instrument.

6.1 Powering the Surface Analyst

You may power the Surface Analyst with either the Brighton Science-provided battery or the AC adapter.

IMPORTANT SAFETY NOTE!

Read and understand "Battery, AC Adapter, and Charger Safety" on page 10 for important safety information before using the battery, AC adapter, or the battery charger.

6.1.1 Using the Battery

WARNING! Explosion Hazard--Do not install, remove or change the battery in a hazardous environment.

6.1.1.1 Battery Life

The battery life is as follows:

- Five hours under normal use
- Six hours if the instrument is powered on, but the pump is not active

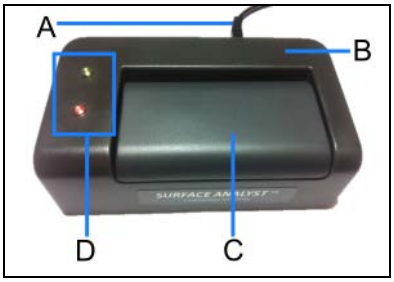
6.1.1.2 Charging the Battery

1. Insert the battery (C) into the charger (B).

   WARNING! Only use the Brighton Science-supplied battery and battery charger as listed in "Spare Parts" on page 54.

2. Push down on the battery to lock it into place.

3. Plug the AC adapter(A) into the battery charger. Plug the AC adapter into a standard wall outlet.



The meanings of the LED indicator lights (D) are as follows:

- Two steady green lights: The battery is fully charged.
- One steady green and one steady red light: Charging is in progress.
- One steady green and one flashing red light: The battery is defective and needs to be replaced. Use only batteries supplied by Brighton Science.To order a new battery, see "Spare Parts" on page 54

The charge time is less than two hours. You can also charge the battery inside the Surface Analyst if you attach the AC adapter. See "Using the AC Adapter" on page 21.

6.1.1.3 Installing the Battery

1. Place the battery into its compartment.

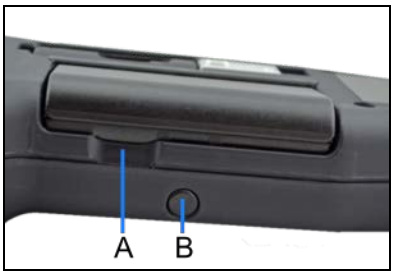
2. Press down on the battery until you hear a click.

3. Squeeze the battery and the Surface Analyst together to make sure the contacts are fully engaged.

Squeeze both ends of the battery to be sure that the contacts are fully engaged.

6.1.1.4 Removing the Battery

1. While holding in the battery release button (B), push your thumb into the indentation below the outer edge of the battery (A).



2. Lift the battery up and out.

6.1.1.5 Disposing of the Battery

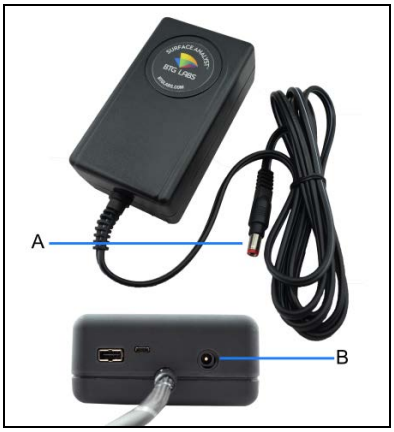
Do not dispose of batteries in the trash or in a single stream recycling program. Take all unneeded, spent, or damaged batteries to a facility that specifically handles lithium-ion battery disposal.

6.1.2 Using the AC Adapter

1. Plug the AC adapter (A) into the power jack (B). You can keep the battery installed inside the Surface Analyst, and it will charge while you use the Surface Analyst.

   WARNING! Do not use, connect or disconnect the AC adapter in a hazardous environment.

2. Plug the AC adapter into a standard wall outlet.



Due to higher available voltage, the pump will sound louder momentarily when switching from battery to AC.

The battery charge time is less than two hours when it charges inside the Surface Analyst. You can also charge the battery using the battery charger. See "Charging the Battery" on page 19.

When the battery is charging inside the Surface Analyst, the battery indicator light changes from red (charging) to green when the battery is charged.

Fig. 9 - Battery indicator light

6.2 Using the Touchscreen

The Surface Analyst has a pressure sensitive touchscreen. Use only one finger to select buttons and navigate the screens. For the best response, you may find it easiest to use your fingernail to gently tap on the touchscreen.

Do not use anything other than your finger on the touchscreen. Using sharp instruments such as a pen or screwdriver may damage the touchscreen.

6.3 Using the Buttons for Screen Selections

Many prompt choices available to a user can be selected from either the touch screen or from the buttons on the Surface Analyst.

When selection by button is available, the text appears in red and green.

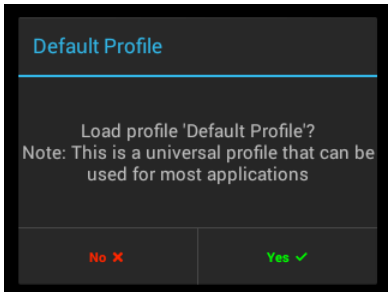


Fig. 10 - Red and green text is selectable with buttons or with the touchscreen

6.4 Understanding the Basic Archer Screens

Archer is the software that controls the Surface Analyst and performs all the calculations. This section gives an introduction to the basic Archer screens most commonly used.

6.4.1 The Menu Screen

There are three pages of the Menu screen that are available to those logged in as users. The screen page number appears in the lower left corner. You can access a different page of the Menu screen by touching the arrow icons.

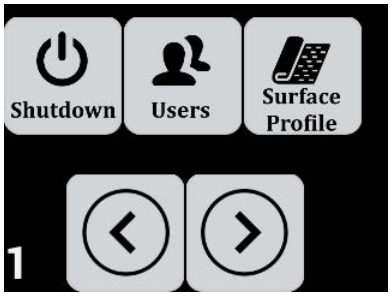


Fig. 11 - Page 1 of the Menu screen

The user functions available from the Menu screens are as follows:

- Turning off the Surface Analyst (See "Turning off the Surface Analyst" on page 47.)
- Logging in as a user/ changing user passwords (See "Select a User" on page 25 and "Changing Your Password" on page 39.)
- Selecting a surface profile (See "Load a Surface Profile" on page 26.)
- Adding a drop note (See "Adding a Drop Note" on page 38.)
- Uploading data from the Archer software (See "Uploading Data Via USB" on page 1.)
- Finding out information about the license and system parameters (See "Viewing the Software License, Settings, and Other Information" on page 44.)

- Doing performance checks (See "Doing Performance Checks" on page 32.)
- Viewing informational videos

There are additional pages of the Menu screen available if you are logged in as an administrator. These functions are described in the Administrator Manual.

To get to the Menu screen while in measuring mode, press the X button or the gear icon .

6.4.2 The Measurement Screen

The Measurement screen is the screen you see while in measurement mode. You can get to the Measurement screen by pressing the check mark button or by touching the back arrow icon on page 1 of the Menu screen.

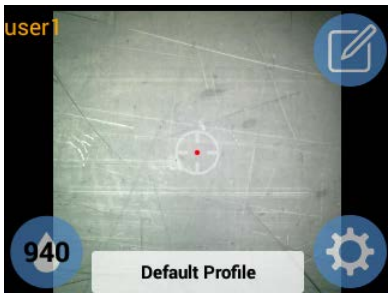


Fig. 12 - Measurement screen

- The current user name is displayed in the top left corner.
- The drop note icon displays the Drop Note menu. See "Adding a Drop Note" on page 38
- The crosshairs help you to position the point of drop impact on your surface.
- The drop icon tells you how many drops you have remaining in the cartridge for taking measurements. This count does not include drops used for purging and performance checks.Touch this icon to view the drop history. See "Viewing Drop History" on page 36 for more information.
- The box in the lower middle of the screen displays the loaded surface profile. Touch this box to go to the Surface Profile menu. See "Load a Surface Profile" on page 26 for more information.
- Touching the gear icon brings you to the first page of the Menu screen.

6.5 Operating the Surface Analyst

The basic steps for operating the Surface Analyst are as follows:

1. Turn on the Surface Analyst.
2. Select a user (if required).
3. Prime the Surface Analyst (if required).
4. Do a performance check (if required). A performance check is recommended at the beginning of each day and as needed to verify that the Surface Analyst is operating at maximum performance.
5. Load a surface profile.
6. Take a measurement.

Detailed instructions for these steps are included in the following sections.

6.5.1 Turn On the Surface Analyst

Press either one of the two check mark buttons on the main body to power on the Surface Analyst.

- The Surface Analyst warms up for up to three minutes, if needed.
- The inspection head reaches thermal equilibrium.
- An on-screen timer counts down the maximum time to wait until the Surface Analyst is ready.
- You may view an instructional video by touching the Videos icon on the Warm Up screen.

Fig. 13 - Warm Up Screen

If your Surface Analyst has temporary features installed, or if you are using a rental instrument, you are notified with a message several days before the trial expires. Contact Brighton Science if you would like to make a purchase. For more information, see " Purchasable Options" on page 48

When the Surface Analyst is turned on, the indicator lights turn on as follows:

- Steady green system indicator: The Surface Analyst is turned on.
- Steady green battery indicator: The Surface Analyst is being powered by a sufficiently charged battery.
- Flashing green and red battery indicator: The Surface Analyst is being powered by the AC adapter, and the battery is not installed.
- Orange battery indicator: The Surface Analyst is being powered by a battery which has minimal charge remaining. A "Low Battery" message is displayed on the screen. Either change batteries or plug the Surface Analyst into a power outlet using the AC adapter.
- Steady red battery indicator: The battery is charging.

Fig. 14 - Indicator lights

When you are taking a measurement, the system light changes from green to red.

By default, the Surface Analyst turns off after 45 minutes of idle time.

6.5.2 Select a User

1. After the Surface Analyst is warmed up, the “Select User” screen appears.

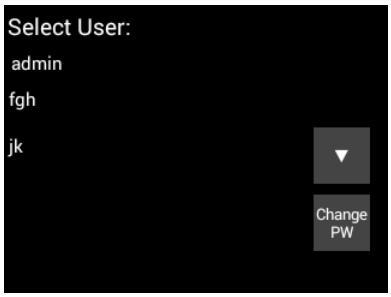


Fig. 15 - User screen

The "Select User" screen does not appear if the auto login feature is enabled. If you have auto login enabled, you are instead prompted to prime the system. See "Prime or Purge the Surface Analyst" below.

2. Select "user1". If your administrator has set up a different user name for you, select that user name. User names are sorted alphabetically, except for the most recently used account which appears first on the list. Use the down arrow to see more user names.

Archer can be set to not show a listing of user names. In this case, you directly type in your user name. See the Administrator Manual for more details.

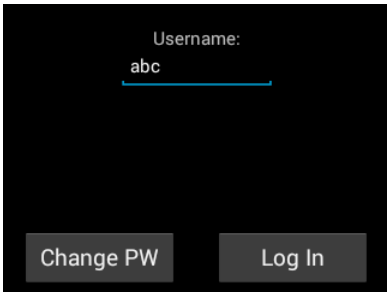


Fig. 16 - User list disabled

3. Enter your password, if prompted.

See."Changing Your Password" on page 39 for how to change your password.

6.5.3 Prime or Purge the Surface Analyst

Priming and purging ensure consistent dispensing.

A prime (also known as a prime shot) is performed upon startup of the Surface Analyst or after ten minutes of inactivity.

A purge is performed upon startup whenever the Surface Analyst has been inactive for over 7 days.

1. A "Prime Needed" or "Purge Needed" message appears on the screen whenever priming or purging is needed.

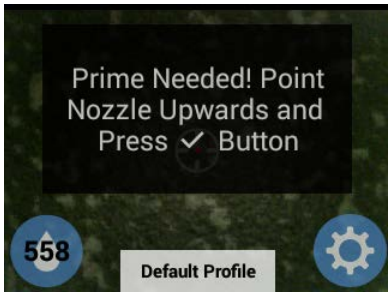


Fig. 17 - Prime Needed message

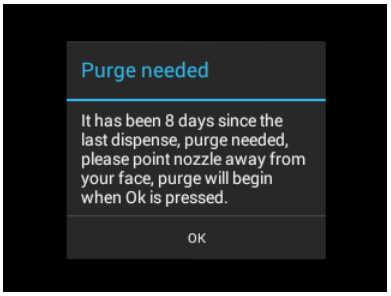


Fig. 18 - Purge Needed message

2. Point the inspection head upward and away from your face, and press the check mark button .
3. After the prime shot (or purge), the Measurement screen is displayed. A short time after that, the screen changes to the Menu screen. The amount of time that the Measurement screen is displayed is called the preview timeout. The default preview timeout is 45 seconds. An administrator can change this time.

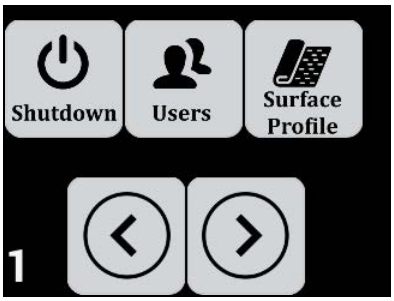
6.5.4 Do a Performance Check if Required

If you are prompted to do a performance check, see "Doing Performance Checks" on page 32.

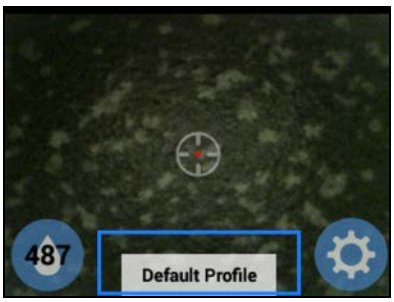
6.5.5 Load a Surface Profile

Before you begin measuring, load a surface profile that is suitable for the surface that you are testing. Depending upon which options are included with your Surface Analyst and how they are configured, you may instead be automatically prompted to choose a surface profile or scan a surface profile QR code. For more information about surface profiles, read the Administrator Manual.

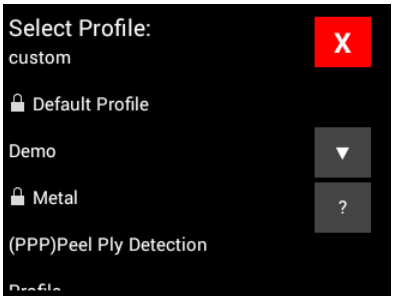
1. On page 1 of the Menu screen, touch **Surface Profile**.



If you are in the Measurement screen, you can also access the surface profiles by touching the box at the bottom of the screen.



2. Choose one of the available surface profiles. Touch **Yes** when prompted to load the selected profile.

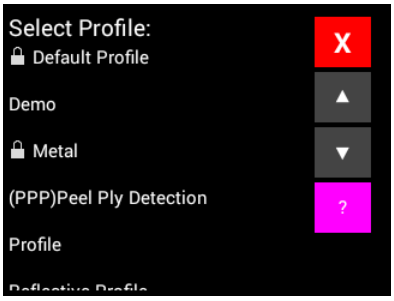


You may touch the square X icon to exit the Surface Profile screen.

If there are more available profiles than fit on the screen, arrows appear to help you navigate to them.

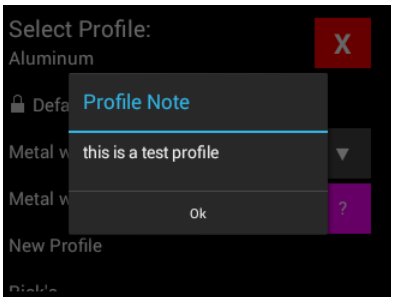
Surface profiles having a lock icon are created by Brighton Science and cannot be modified

If you want to find out information about a surface profile, touch the question mark box and then touch a surface profile.



If information was created for the surface profile, a description appears. See the administrator manual for instructions for adding profile notes.

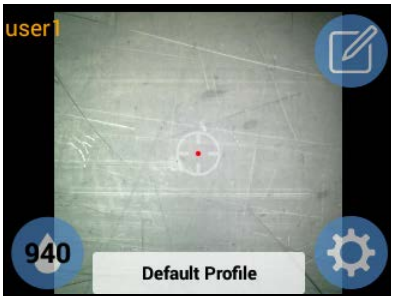
Touch Ok to close the profile note.



6.5.6 Take a Measurement

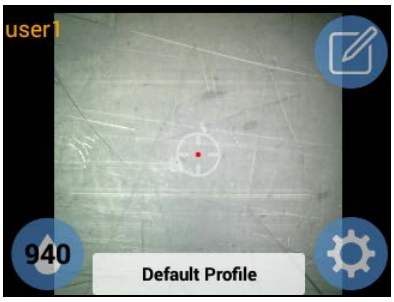
A performance check is recommended at the beginning of each day and as needed to verify that the Surface Analyst is operating at maximum performance. See "Doing Performance Checks" on page 32.

1. To take a measurement, press the check mark button or the back arrow in Menu screen page 1 to put the Surface Analyst in measurement mode.



2. Place the inspection head squarely onto the area to be tested. Make sure the inspection attachment or base of the head makes stable contact with the surface.

3. Align the crosshairs with the area on the surface that you want to test.



4. While holding the head steady against the surface, press the check mark button .

A red banner reading "Hold in place" appears.

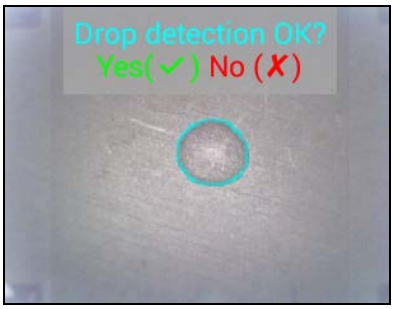
Do not move the head during the drop deposition. Otherwise, you may get a faulty measurement.

5. You may move the head when the green banner reading "Analyzing" appears.

If the camera is not able to take a good picture, a message appears for you to take another measurement.

To exit this screen, either tap the red banner, press the check mark button, or press the X button.

6. You may see the message "Drop detection OK?" appear on the screen together with flashing dots.



This message only appears if SmartDrop is not enabled for the loaded surface profile. See the Administrator Manual for more information.

Press the check mark button to accept the drop detection. Press the X button to reject the drop detection and take a new measurement. To know when to accept or reject a drop detection, see "Accepting or Rejecting the Drop Detection" on page 31 .

If you reject the drop detection, go back to Step 1.

If you have SmartDrop enabled, you are not prompted to accept or reject the drop detection. A message only appears if the drop detection is unacceptable. In this case, you are prompted to re-take the measurement.

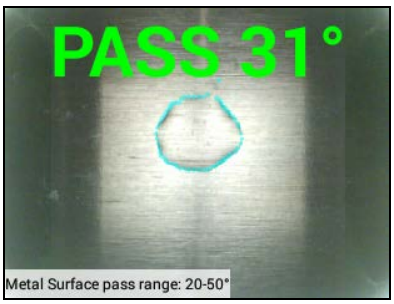
6.5.7 View the Measurement Results

The measurement results are displayed on the screen after you take a measurement.

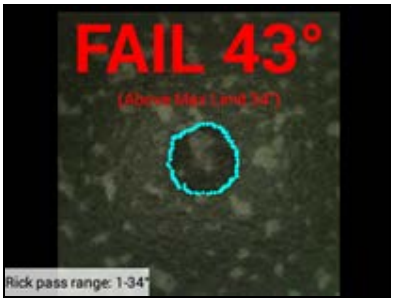
When set up to do so, a "Pass" or "Fail" message appears with a calculated contact angle.

The pass or fail result is determined by the allowable contact angle range of the loaded surface profile.

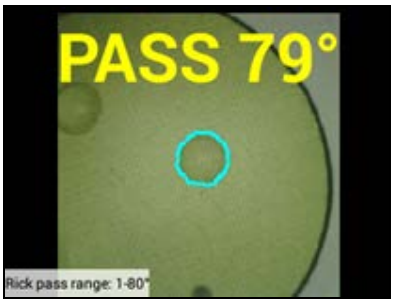
If your device is configured for dynes, you will see results displayed in dynes instead of degrees.



If the measurement fails, the allowable limit is displayed.



When set up to do so, a passing measurement displays in yellow text to warn you if it is close to the allowable limit.



If Wetting Analytics is configured in your device (see "Wetting Analytics" on page 48), then the detection of wettability gives a "Fail" message. A "Fail" is displayed even if the contact angle is within the passing range.

If the "Default" profile is loaded, or if pass/fail limits are disabled, you only see the contact angle result.

6.6 Accepting or Rejecting the Drop Detection

A drop detection is the software's determination of the edge of the deposited drop, represented by a pattern of colored dots. The quality of the drop detection is dependent upon things such as surface irregularities and how steady you hold the head during measuring.

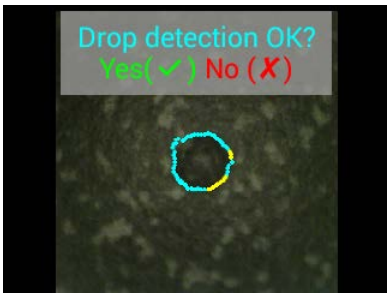
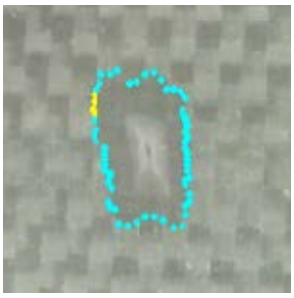


Fig. 19 - Drop detection

If SmartDrop is not enabled in the loaded surface profile, then the message "Drop detection OK?" displays immediately after you take a measurement. The colored dots flash until you accept or reject the drop detection.

Press the check mark button to accept a good drop detection. A drop detection is good if the colored dots closely follow the edge of a satisfactorily-deposited drop.

The following images are examples of good drop detections:



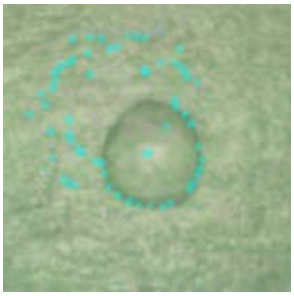
The shape of the blue dots does not need to be a perfect circle as long as the dots follow the edge of the drop, and the drop is not distorted by abnormal features.

Press the X button to reject the drop detection in the following cases:

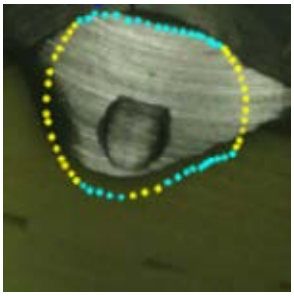
- The colored dots do not follow the edge of the drop.
- No clear image of a drop appears on the screen.
- The drop is distorted due to abnormal features in the surface or due to the drop falling off the surface.

The following images are examples of bad drop detections:

Dots inside of drop



Inspection head moved during measuring



Dots outside of drop

If you have a high number of poorly formed drop detections, contact Brighton Science.

Archer stores all images, regardless of whether or not you reject them. Rejected images are flagged in the database.

6.7 Doing Performance Checks

A performance check is recommended at the beginning of each day and as needed to verify that the Surface Analyst is operating at maximum performance.

A performance check consists of the following:

1. Measurements are performed on each of the five targets on the PCS card.
2. The Surface Analyst automatically analyzes the results from the measurements. If necessary, internal settings are adjusted to ensure proper contact angle readings on the PCS card.

If you have not done a performance check within one week (or for whatever other time period your device has been configured), a message box appears when the device powers up to remind you to do the performance check.

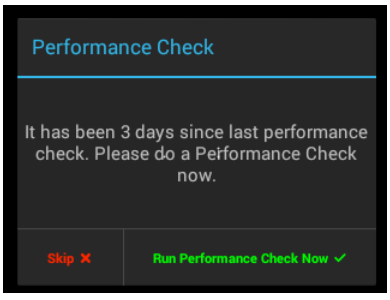


Fig. 20 - Performance check reminder message

You may choose to skip the performance check, but that is not recommended. If you do, the reminder message continues to appear upon start-up and when entering measurement mode until you do the performance check.

6.7.1 Performance Check Surface (PCS)

The Performance Check Surface (PCS) is a special card that you must use when doing a performance check.

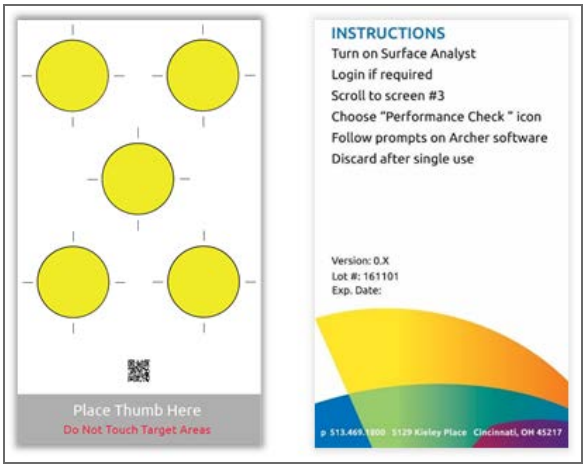


Fig. 21 - PCS (front and back)

The PCS has five circular targets. These targets are printed with a special ink having a controlled and consistent surface energy. There are instructions printed on the back side of the card.To order new cards, see "Spare Parts" on page 54. You can order online at brighton-science.com.

Special information about the PCS:

- Use a PCS for only one performance check. Discard the card after you complete the performance check.
- Keep unused PCS cards in the bag with the desiccant packet.
- PCS cards expire at the end of the month printed on the card.
- Touch the PCS only in the "Place Thumb Here" area.

Do not touch the targets. If you do, the performance check will not work properly.

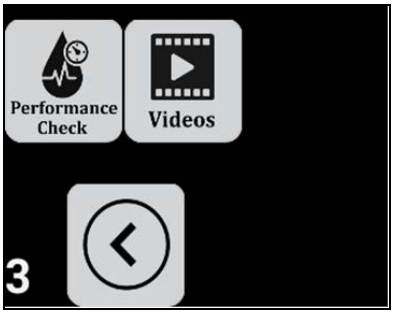
6.7.2 Performance Check Procedure

If you purchased a custom inspection attachment, make sure to do the performance check using the flat inspection attachment that was installed on your Surface Analyst when it was shipped to you.

Fig. 22 - Stock flat inspection attachment

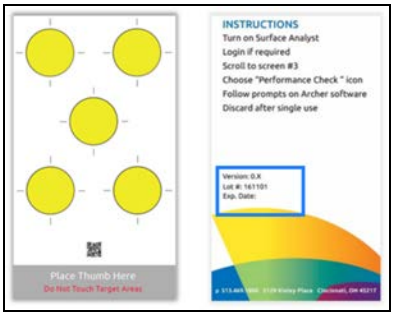
1. To watch a video of the performance check procedure, touch **Videos** on page 3 of the Menu screen.

   To start a performance check, touch the **Performance Check** icon.



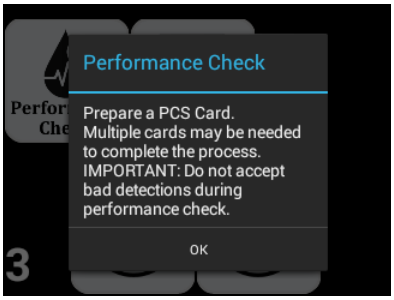
2. Prepare a PCS (Performance Check Surface). Check the expiration date to make sure it has not expired. The card is good through the end of the month printed.

   Be sure not to touch the yellow targets on the card.

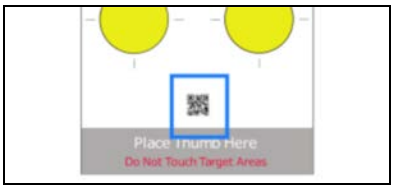


3. Have more than one PCS card on hand, as multiple cards may be necessary to complete the performance check.

   Touch **OK** when you are ready to start the performance check.

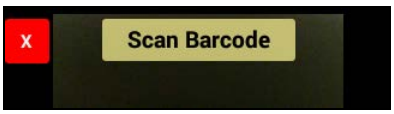


4. Place the Surface Analyst head on the PCS and over the QR code. Make sure that the crosshairs are completely on the code.



   The Surface Analyst scans the code.

   If you need to cancel the scan, touch the red box with the "x".



If your PCS is close to its expiration date, a message reminds you to order replacements soon.

5. Position the crosshairs over a yellow target on the PCS.

Press the check mark button to dispense a drop.

To abort the performance check, touch the gear icon .

6. Press the check mark button if the drop detection is good. (See "Accepting or Rejecting the Drop Detection" on page 31.)

If the drop detection is not good, press the X button and try again at a different location on the same target.

Do not accept bad drop detections!

7. After completing testing on all targets, a message tells you the results of the test:

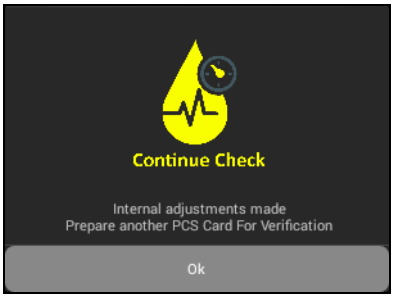
- Check Passed

  You are finished with the performance check. Touch **OK** to return to the Measurement screen.

OR...

- Continue Check

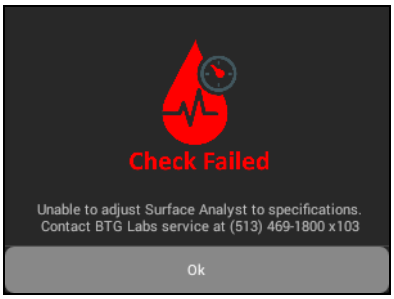
  Internal adjustments were made. You need to continue the performance check to confirm the adjustments. The Surface Analyst may guide you through a purge during this process. Touch **OK** to continue, using a new PCS card of the same lot number.



OR...

- Performance Check Failed

  The Surface Analyst could not be adjusted to specifications. Contact Brighton Science.



6.8 Viewing Drop History

The Surface Analyst can store several thousand images in its log file.

6.8.1 The Drop History Screen

If you want to view a previous drop image, touch the drop icon 

in the Measurement screen to access the Drop History screen.

Fig. 23 - Drop History screen

The Drop History screen has the following functions:

- It displays the following information at the bottom of the screen:
  - Drop number (how many drop depositions have occurred with the current cartridge)
  - Active user (only named users appear)
  - Measurement results
  - Drop detection acceptance status
  - Loaded surface profile
  - Date and time of measurement
  - Drop note, if used (See "Adding a Drop Note" on page 38.)
- The chart icon  allows you to set a range to chart your results in a graph. See "Chart Results" on the next page.
- The back arrow icon  icon sends you back to the Measurement screen.
- The arrows  allow you to view different drop images.

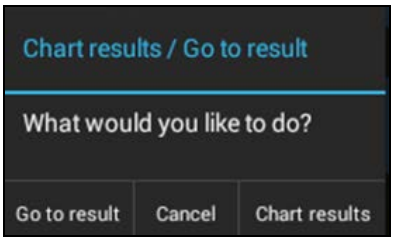
6.8.2 Chart Results

You can review contact angle test results in a graph form for fast and easy trend analysis.

1. Touch the chart icon in the Drop History screen

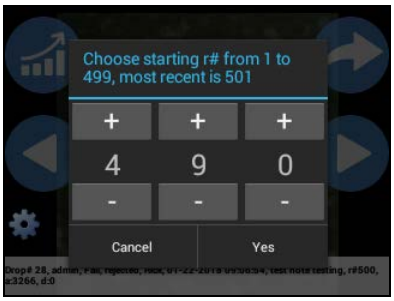
2. Select "Chart results".

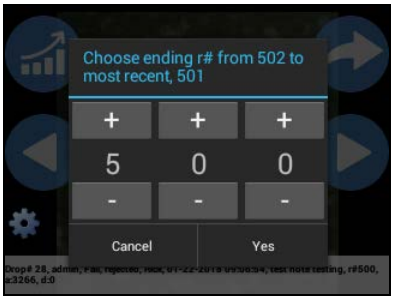
   Selecting "Go to Result" takes you to a single result only.



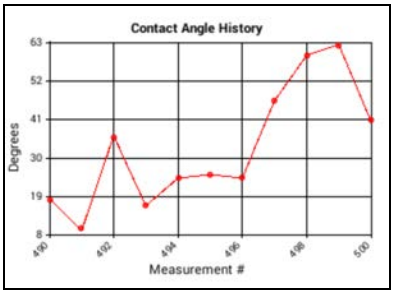
3. Select the starting and ending measurement result numbers (r#) by using the + and -.

   The r# is a counter that keeps track of measurements. It resets when data is deleted, but it does not reset when a cartridge is changed.

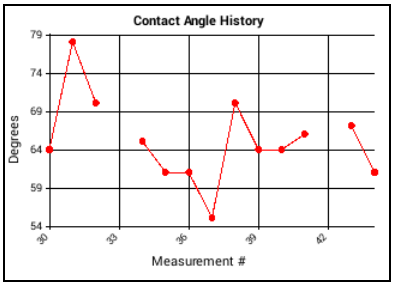




4. The results graph appears showing the contact angle history.



The graph omits points where the drop detection was rejected or where the drop size was too small.

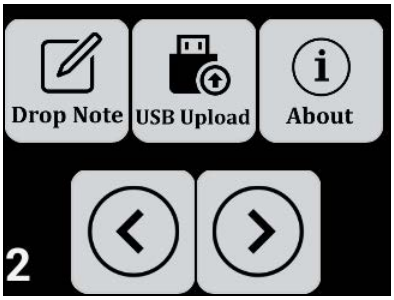


6.9 Adding a Drop Note

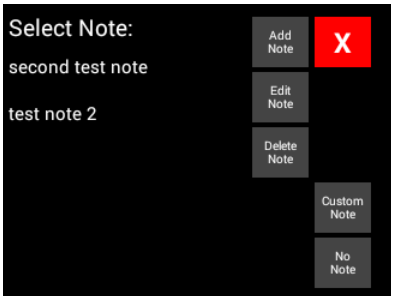
A drop note is a note you add to one measurement or a series of measurements. A drop note is stored with all subsequent measurements until you change or delete the note.

1. Go to page 2 of the Menu screen.

   Touch **Drop Note**.

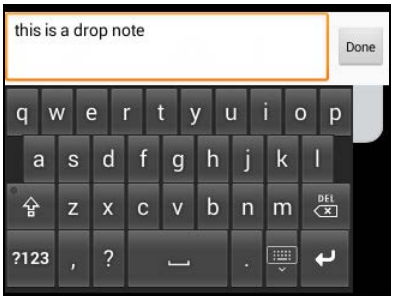


2. You have the choice of selecting an existing note, modifying an existing note, deleting an existing note, or creating a new note.
   - Touch one of the listed notes to make it the active note.
   - Touch **Edit Note** or **Delete Note** to edit or delete an existing note.
   - Touch **Add Note** to create a new note that will be added to the list.
   - Touch **Custom Note** to create a new note that is not saved to the list.



3. Type in your note.

   Touch **Done** to complete your note.

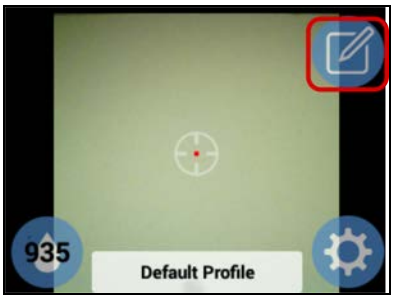


4. Touch **Yes** to accept the note.

The note will be stored with every measurement, beginning with the next measurement.

You can view the current drop note in Menu screen page 2 ⇨ **About** ⇨ page 2.

5. If you have an active drop note, you can access the drop note menu directly from the Measurement screen by touching the drop note icon.



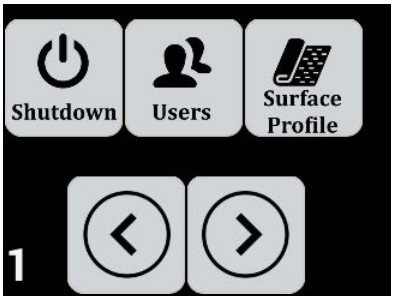
6. To cancel or change the note:
   a. Touch **Drop Note** on Menu Screen page 2.
   b. Touch **No Note** and then **OK**.

6.10 Changing Your Password

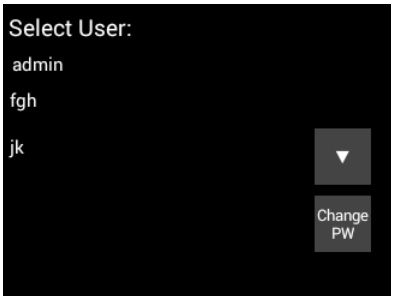
If your administrator has required the use of a password to log in, then you can change your password.

Administrators can set standard user-level accounts to require a password or not. However, administrator-level accounts always require a password. See the Administrator Manual for more information.

1. Go to Menu screen page 1 ⇨ **Users**.

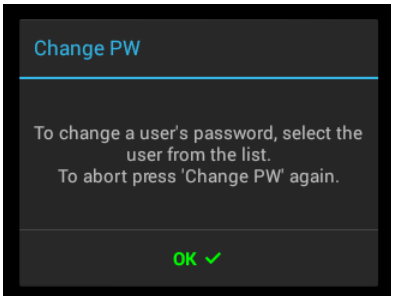


2. Touch **Change PW**.



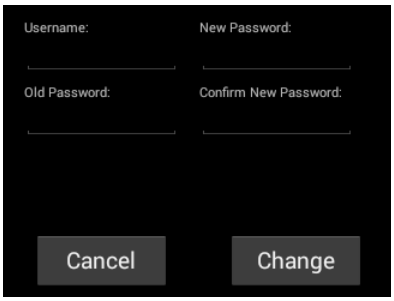
3. Touch **OK** at the **Change PW** prompt, and then select your user account.

   To cancel, touch **Change PW** again.

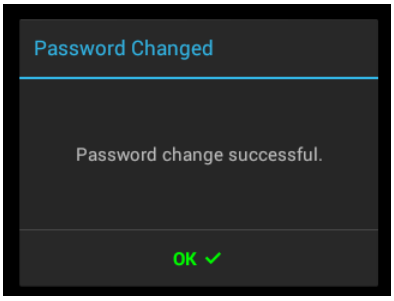


4. Enter your old password and new password. Enter the new password again in the **Confirm New Password** field.

   Touch **Change**.



5. Touch **OK**.



6.11 Changing the Cartridge

The Surface Analyst comes with a cartridge installed. You need to replace the cartridge after the drop limit has been reached. See the "Technical Specifications" on page 11 for the cartridge fluid capacity. To order new cartridges, see "Spare Parts" on page 54. You can order online at brighton-science.com.

WARNING! Do not install, remove or change the fluid cartridge in a hazardous environment.

Do not remove a cartridge from the Surface Analyst unless a message to change the cartridge appears.

Only use a replacement cartridge supplied by Brighton Science. Do not attempt to refill an empty cartridge.

Whenever you remove a cartridge from the Surface Analyst, you cannot reuse the cartridge. You must reinstall a new cartridge.

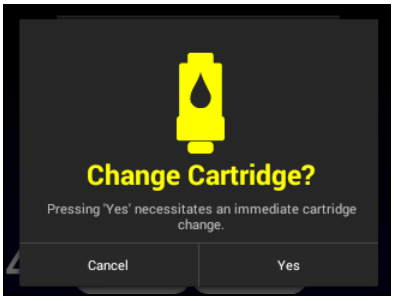
To view a demonstration video showing how to change a cartridge, go to Menu screen page 3 ⇨ **Videos**.

1. When a cartridge has reached its limit of drops, the "Change Cartridge" screen appears.

   Touch **Yes** to be prompted to begin the cartridge change procedure.

   If you choose **Cancel**, you will not be able to do any measurements until the cartridge is changed.

   Be sure to have a new cartridge ready before beginning the cartridge change.



2. A message prompts you to check the replacement cartridge for air bubbles.

   Hold the cartridge up to a light source to see if there are air bubbles present.

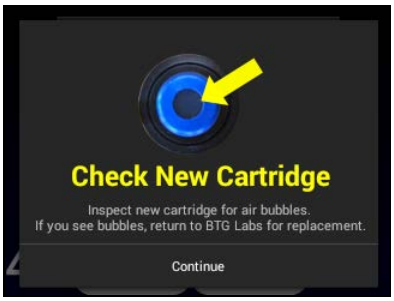


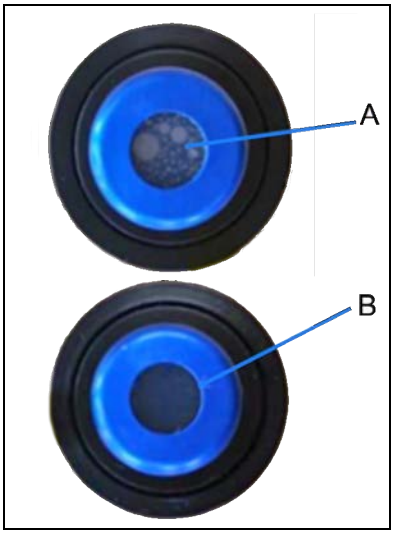
   Image A shows air bubbles in the cartridge.

   Image B shows a cartridge with no air bubbles.

   If no bubbles are present, touch **Continue** on the screen prompt.

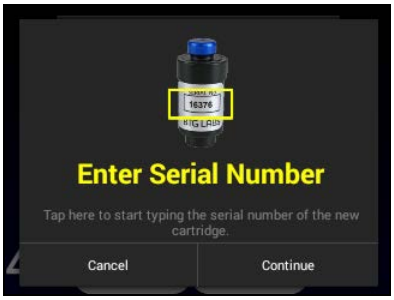
   If you see air bubbles, return the cartridge to Brighton Science for replacement.

   Do not use a cartridge that has air bubbles.

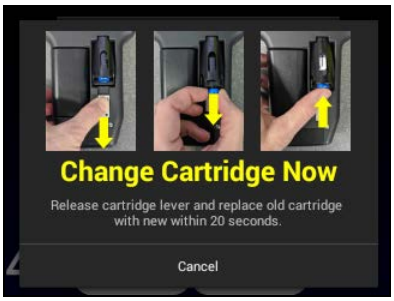


3. When prompted, enter the serial number printed on the new cartridge.

   Touch **Continue** on the screen prompt.

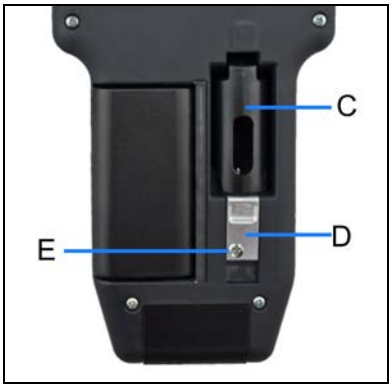


4. The message "Change Cartridge Now" appears.



5. Remove the lockout screw (E) using the supplied screwdriver.

   Pull the cartridge release lever (D) down to open the cartridge bay (C).



6. Pull out the old cartridge.

7. Align the new cartridge so that arrow points upward.

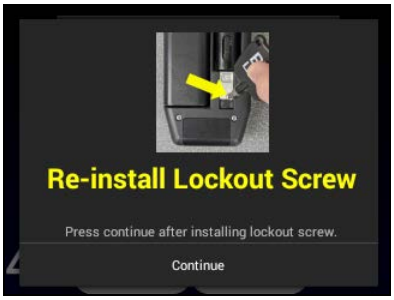
   Insert the cartridge into the bay all the way.

8. Firmly close the cartridge bay. The release lever returns to its original position.

   Make sure that the release lever has returned to its original position before proceeding.

9. Re-install the lockout screw.

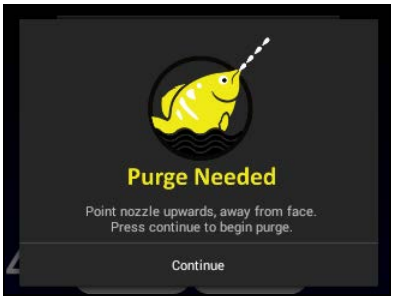
   Touch **Continue** after you install the lockout screw.



10. A "Purge" message appears.

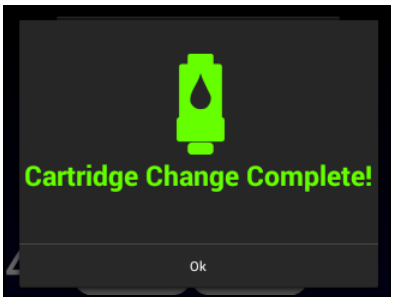
    Point the inspection head upwards, and touch **Continue**.

    A stream of fluid dispenses.



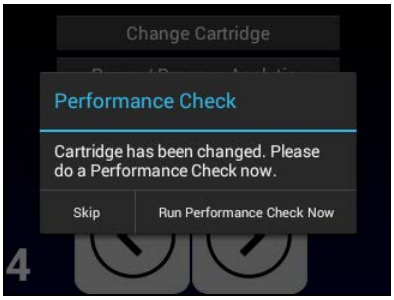
11. The cartridge change is complete.

    Touch **OK** to begin measurements.



12. A performance check is required after a cartridge change. (See "Doing Performance Checks" on page 32).

    Touch **Run Performance Check Now** to begin the performance check. Make sure you have a PCS card ready.



6.12 Viewing the Software License, Settings, and Other Information

To view the software license, settings, and other information, go to page 2 of the Menu screen, and touch **About**.

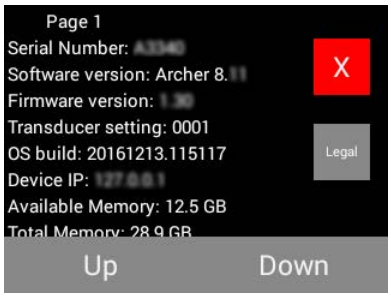


Fig. 24 - About screen page 1

For license information and the End User License Agreement (EULA), touch the square **Legal** icon.

Touch **Up** or **Down** to scroll through the different pages on the About screen. The following information is contained on each of the pages:

Page 1

- Serial number of the Surface Analyst
- Archer software version
- Firmware version
- Head firmware version
- Transducer setting
- Fan settings
- Valve use counter
- OS build
- Device IP
- Memory information
- Battery type

Page 2

- Active user
- Loaded surface profile
- Drops remaining/used (Drops used for measurements and purging are counted separately.)
- Auto login status
- Current drop note
- Minimum and maximum pass angles
- Near Fail limit
- Drop detection accept setting
- SmartDrop limit
- Settings for outlier detection
- Current time and time zone
- Cartridge serial number
- Calibration due date
- Number of days since last performance check

Page 3

- Drop dispense settings
- Internal purge settings

Page 4

- General and image process settings (Read the Administrator Manual for more information.)
- Settings for installed purchasable options

Page 5

- Image capture settings (Read the Administrator Manual for more information.)

Page 6

- Purchasable options which are installed on the Surface Analyst

  See "Viewing Installed Options" on the next page for explanations of the codes.

Touch the square **X** icon to exit the About screen.

6.13 Viewing Installed Options

To view which options are installed on your Surface Analyst, go to page 2 of the Menu screen, and touch **About**. Go to page 6 of the About screen.

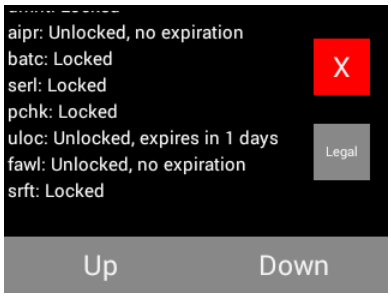


Fig. 25 - About screen page 6

The following table defines the codes:

Purchasable Options Codes

Code	Feature
adac	SmartDrop
aipr	Enhanced Image Processing
batc	Process Analytics
data	Data Collection
dnot	Drop Note
dynd	Dynamic Detection
dyne	Dyne Mode
fawl	Pass/Fail Mode
mpro	Surface Profiles
pbcr	Auto Profile Selection via QR Code
pchk	Brighton Science internal use
ppdt	Brighton Science internal use
serl	RS232 Output
shnd	Single-Hand Operation Only available with the Surface Analyst 5001
srft	Wetting Analytics
uloc	Brighton Science internal use
umnt	User Management
vids	Live Videoscope
port	Detatchable Portable Option

Options installed on your Surface Analyst are indicated by the word **Unlocked**. Option codes followed by the word **Locked** are not installed. Unlocked options may have an expiration date. Archer alerts you to expiring options ahead of time with a pop-up message.

To purchase Surface Analyst features that may be useful for your application, contact Brighton Science.

6.14 Turning off the Surface Analyst

There are two ways to turn off the Surface Analyst:

- Hold the check mark button or X button down for three seconds.

  OR

- Touch the "Shutdown" icon on page 1 of the Menu screen.

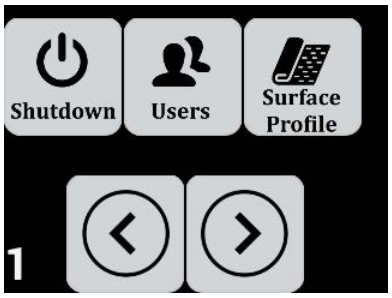


Fig. 26 - Menu screen page 1

Always store the Surface Analyst in its case when you are not using it.

7 Purchasable Options

The features described in this chapter are available with the Surface Analyst 3001-HZE if you purchased them. If you have not purchased these features, but are interested in having them installed on your Surface Analyst, contact Brighton Science.

For a listing of all the purchasable options currently installed on your Surface Analyst, see "Viewing Installed Options" on page 46.

7.1 Wetting Analytics

Wetting Analytics determines if the contact angle decreases over a period of time from the initial dispense.

When Wetting Analytics is turned on, more than one image is captured per measurement taken. The first image is compared with subsequent images to determine if the drop spreads out beyond the allowed limit (Δ). If a drop spreads out beyond the assigned Δ, then the inspection fails.

Fig. 27 shows the results screens when using Surface Analyst.

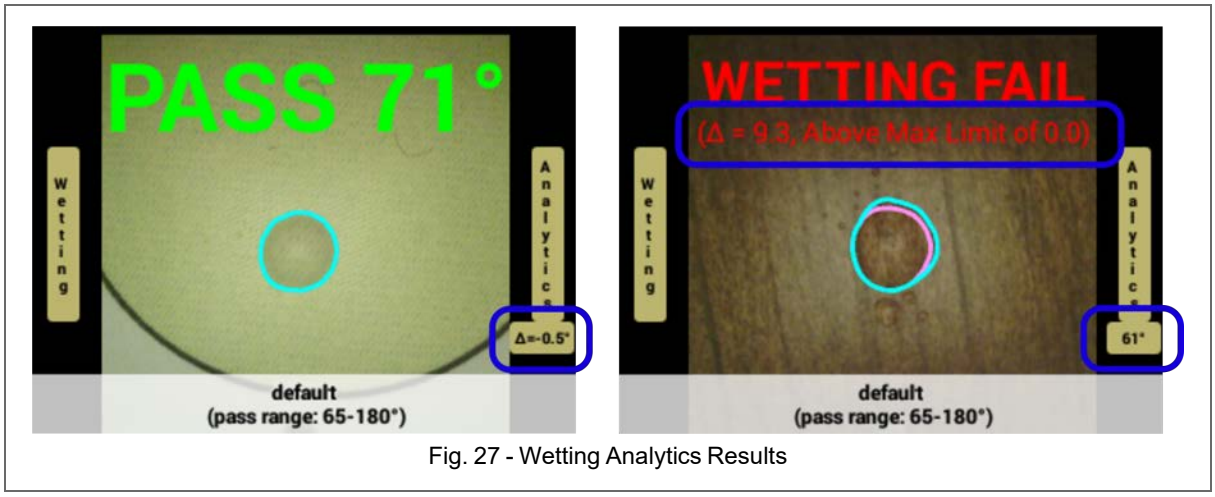


Fig. 27 - Wetting Analytics Results

When a measurement passes, the delta angle is displayed for reference.

When a measurement fails due to wetting, the delta angle and maximum limit (threshold) are displayed. The initial drop is shown in pink, while the larger blue outline represents the drop after it spreads out after the time delay. The contact angle of the initial drop (before spreading) is also displayed, for reference.

An administrator can enable and disable Wetting Analytics and set parameters. See the Administrator Manual for more information.

7.2 Dyne Mode

Dyne Mode changes the displayed result from contact angle to dynes.

Fig. 28 - Dyne Mode

An administrator can enable and disable Dyne Mode. See the Administrator Manual for more information.

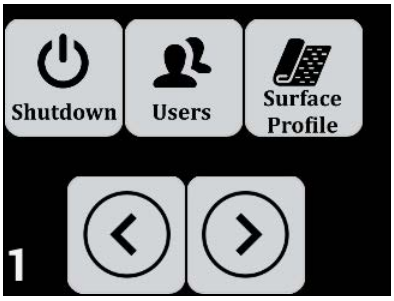
7.3 Process Analytics

Process Analytics allows you to set up a workflow ("process") to take a particular number of measurements at several locations on several products. Within this set of measurements, the average value of the measurements and the standard deviation are calculated to determine if the process passes or fails.

An administrator needs to enable and set up Process Analytics within a surface profile. See the Administrator Manual for instructions.

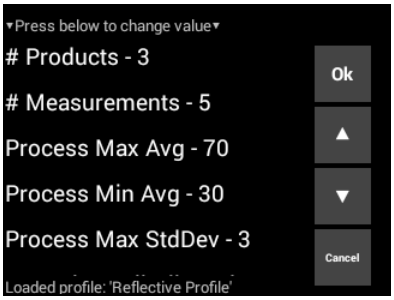
7.3.1 Using Process Analytics

1. Load a surface profile that is configured for Process Analytics. (Menu screen page 1 ⇨ **Surface Profile**)

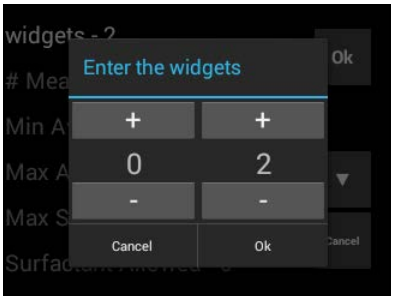


   If your administrator has configured your Surface Analyst to automatically load the proper surface profile, then you do not have to do this.

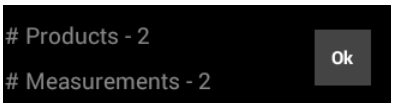
2. Press the check mark button to go into measurement mode. Depending on how the process has been configured, you may see a settings page for the process (such as the one pictured at right), or you may be prompted to enter information.



Fields that appear in bold can be edited by touching them and entering data as prompted. (The ability to enter or edit data is set up by an administrator.)



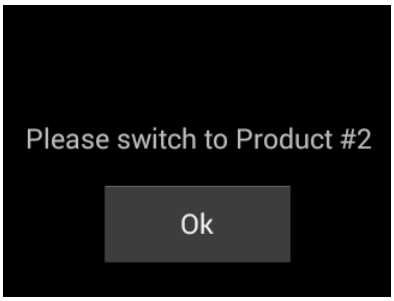
Touch **Ok** to start the process.



3. While the process is running, the product and measurement numbers are displayed.

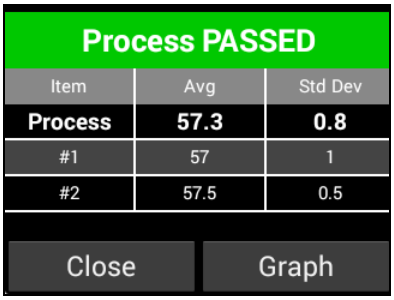
4. You are prompted to switch to the next product when the set of measurements for the first product is complete.

After switching to the new product, either touch **Ok** or press the check mark button to continue.



If at any time you need to cancel the process, touch the gear icon . A message appears, asking if you want to end or continue the process.

5. When the process is finished, a summary displays the results of the process and informs if the process passed or failed. The calculated average contact angle and standard deviation for each product are also displayed.

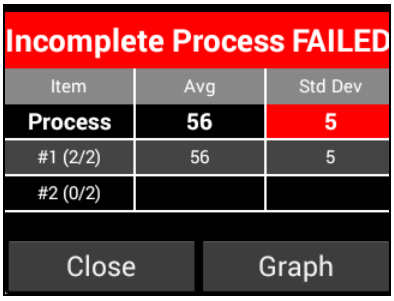


A process passes if the calculated average measurement and standard deviation for the entire set of measurements are within the acceptable range.

Drag your finger on the screen to scroll through the data.

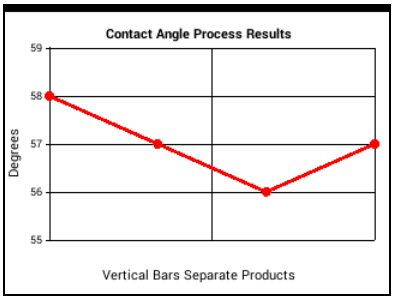
If your Surface Analyst is set up to measure in dynes, then your results are displayed in dynes.

If a process is interrupted, it is labeled as incomplete. The results for the completed portion of the process are displayed, as well as how many measurements were completed.



An incomplete process can pass or fail. If a process (complete or incomplete) fails, then the values that made the process fail are highlighted in red.

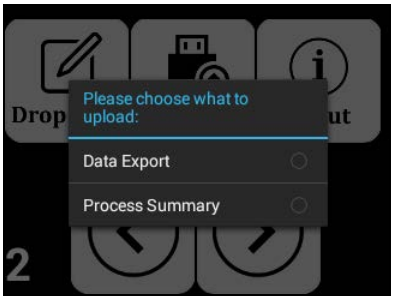
6. Touch **Graph** to view a graph of the data. The graph shows you all the contact angle measurements. Vertical bars separate the measurements by product.



Touch any part of the screen to return to the process summary.

Touch **Close** to close the summary.

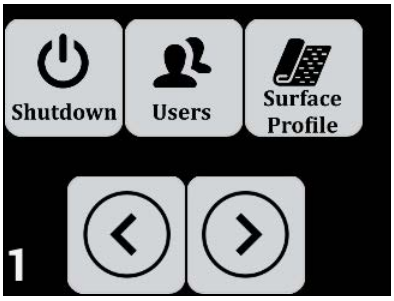
Once the summary screen is closed, you can not view it again. If you want to view the results after closing the summary, upload the data onto a USB drive and choose **Process Summary**. The process data is found in the **completed_ process.csv** file. See "Uploading Data Via USB" on page 1 for more information.



7.4 Auto Profile Selection via QR Code

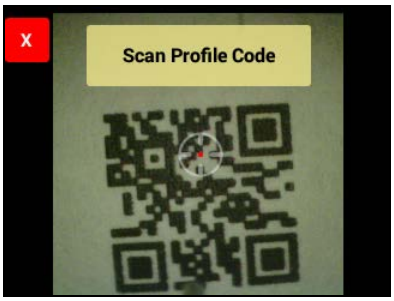
The Auto Profile Selection via QR Code uses a scan of a QR code to automatically select a surface profile. This feature can be enabled or disabled by an administrator. (See the Administrator Manual for more information.)

1. Go to Menu screen page 1 ⇨ **Surface Profile**.

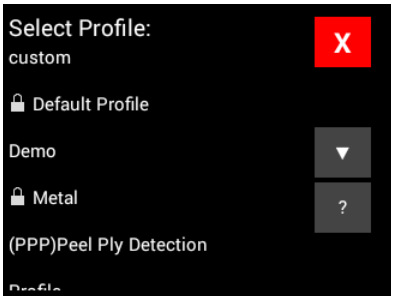


2. Scan the appropriate QR code for the desired surface profile with the Surface Analyst inspection head. If the code is valid and properly read, the surface profile is automatically loaded. You can begin taking measurements.

   If you wish to cancel the scan, touch the red **X** button.



3. If there is an error reading or the scan was cancelled, a list of available surface profiles appears. You may manually select a surface profile to load.



8 Cleaning and Maintenance

Proper cleaning and maintenance is important to keeping the Surface Analyst functioning at peak performance.

8.1 Keeping the Surface Analyst Clean

Do the following to keep the Surface Analyst clean:

- Use LCD display wipes to clean the touchscreen.
- Wipe the body of the Surface Analyst with a slightly damp cloth.
- Isopropyl alcohol (IPA) may be used to clean the bottom of the inspection attachment.
- Never immerse the Surface Analyst in water or any other liquid.

  Never use cleaners that contain ammonia. Never use any abrasive chemicals, solvents or soaps.

8.2 Maintaining the Surface Analyst

Do the following maintenance to keep the Surface Analyst functioning properly:

- It is recommended to have the Surface Analyst calibrated every year. A message appears on the screen when you log in if the unit is due for calibration. Send in your Surface Analyst to Brighton Science for calibration when prompted.

  Failure to have your Surface Analyst calibrated may result in unreliable contact angle measurements.

- Always keep the Surface Analyst in its case when you are not using it.
- Send the Surface Analyst to Brighton Science for service if any parts malfunction.
- Handle the inspection head with care.

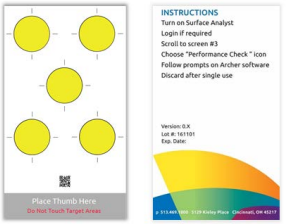
  Do not try to remove the camera, lights, or any other part.

  Never insert anything into the nozzle or valve orifice, as you may damage it. If the valve becomes clogged, send the Surface Analyst to Brighton Science.

9 Spare Parts

The following items are available for purchase. Contact Brighton Science Sales Department at (513) 469-1800, or orders@brighton-science.com. You can order online at brighton-science.com.

Item		Part Number
Fluid Cartridge (Water)		11118
USB Drive		11234
AC Adapter		11166
Battery Charger		11222
Battery Pack		11438

Item		Part Number
Performance Check Surface (PCS cards) Pack of 25 Visit brighton-science.com for other quantity options.		11693
Proposition 65 Warning Label		11502
Haz Loc Battery Warning Label		11537
CE Battery Fire Warning Label		11538
Haz Loc AC Adapter Warning Label		11539

10 Warranty

The following warranty and disclaimers apply to US purchasers:

This Limited Warranty provides the following assurance to the Purchaser of the Surface Analyst™ (Equipment).

(1) Should the Equipment fail to function within normal tolerances due to a defect in materials or workmanship within a period of one (1) year, from the date of delivery of the Equipment to the purchase, BTG Labs will at its sole option: (a) repair or replace any part or parts of the Equipment; (b) provide a functionally comparable replacement Equipment at no charge to Purchaser.

B. BTG's Limited Warranty set forth in Section A (1), is expressly contingent upon the following conditions:

(1) Purchaser must give BTG written notice of the defect within twenty-four (24) hours of discovery.

(2) The Equipment must be returned to BTG, within thirty (30) days after discovery of the defect. BTG may, at its sole option, choose to repair the Equipment on site.

(3) Any attempt by the Purchaser to repair or replace the Equipment, or any part thereof, will render this Limited Warranty null and void, and of no effect whatsoever. Further, and abuse or misuse of the Equipment, whether accidental, reckless or intentional will render this Limited Warranty null and void, and of no effect whatsoever.

C. This Limited Warranty is limited to its express terms. In particular:

(1) Except as expressly provided by this Limited Warranty, BTG IS NOT RESPONSIBLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES BASED ON ANY DEFECT, FAILURE OR MALFUNCTION OF THE EQUIPMENT, WHETHER THE CLAIM IS BASED ON WARRANTY, CONTRACT, TORT OR OTHERWISE.

Specifications and Warranty

(1) THE WARRANTIES CONTAINED HEREIN ARE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHETHER ARISING FROM STATUTE, COMMON LAW, CUSTOM OR OTHERWISE. NO EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO PATENTS OR ANY OTHER INTELLECTUAL PROPERTY SHALL EXTEND BEYOND THE PERIOD SPECIFIED IN A (1) ABOVE. THIS LIMITED WARRANTY SHALL BE THE EXCLUSIVE REMEDY AVAILABLE TO ANY PERSON.

(2) This Limited Warranty is made only to the Purchaser of the Equipment, and in no way can be assigned, transferred or in any other way conveyed to any other party. Any conveyance or attempted conveyance of this Limited Warranty will render this Limited Warranty null and void, and of no effect whatsoever.

(3) The exclusions and limitations set out above are not intended to, and should not be construed so as to contravene mandatory provisions of applicable law. If any part or term of this Limited Warranty is held to be illegal, unenforceable or in conflict with applicable law by a court of competent jurisdiction, the validity of the remaining portions of the Limited Warranty shall not be affected, and all rights and obligations shall be construed and enforced as if this Limited Warranty did not contain the particular part or term held to be invalid. This Limited Warranty gives the purchaser specific legal rights. The purchaser may also have other rights which vary from state to state.

(4) No person has any authority to bind BTG, as to any representation, condition or warranty except this Limited Warranty.

(5) INDEMNIFICATION: Except for damages, claims or losses solely due to BTG's acts or omissions, Purchaser, to the extent permitted by law, will indemnify and hold BTG, free and harmless from and any costs, claims or liabilities (including Attorneys' Fees), arising from or relating to losses, claims, injury to or

death of any person, including buyer, or for damage to property arising from Purchaser's use and possession of the Equipment or from the acts or omissions of any person or persons, including Purchaser, using or possessing the Equipment.

(6) This Limited Warranty and all terms thereof will be governed by the laws of the State of Ohio, with jurisdiction in the State and Federal Courts located in Hamilton County, Ohio.

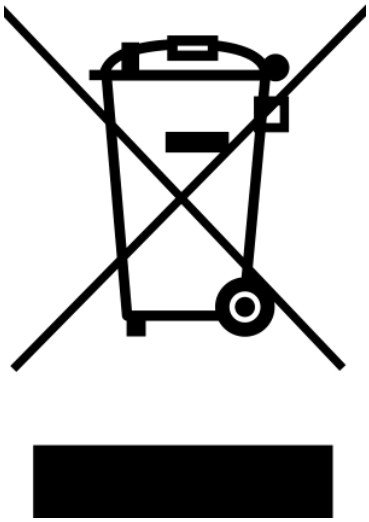
(3) The exclusions and limitations set out above are not intended to, and should not be construed so as to contravene mandatory provisions of applicable law. If any part or term of this Limited Warranty is held to be illegal, unenforceable or in conflict with applicable law by a court of competent jurisdiction, the validity of the remaining portions of the Limited Warranty shall not be affected, and all rights and obligations shall be construed and enforced as if this Limited Warranty did not contain the particular part or term held to be invalid. This Limited Warranty gives the purchaser specific legal rights. The purchaser may also have other rights which vary from state to state.

(4) No person has any authority to bind BTG, as to any representation, condition or warranty except this Limited Warranty.

(5) INDEMNIFICATION: Except for damages, claims or losses solely due to BTG's acts or omissions, Purchaser, to the extent permitted by law, will indemnify and hold BTG, free and harmless from and any costs, claims or liabilities (including Attorneys' Fees), arising from or relating to losses, claims, injury to or death of any person, including buyer, or for damage to property arising from Purchaser's use and possession of the Equipment or from the acts or omissions of any person or persons, including Purchaser, using or possessing the Equipment.

(6) This Limited Warranty and all terms thereof will be governed by the laws of the State of Ohio, with jurisdiction in the State and Federal Courts located in Hamilton County, Ohio.

11 Disposing and Recycling



This symbol on the product(s) and / or accompanying documents means that used electrical and electronic products should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product(s) to designated collection points where it will be accepted free of charge.

Alternatively, in some countries you may be able to return your products to your local retailer upon purchase of an equivalent new product.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

Please contact your local authority for further details of your nearest designated collection point.

Penalties may be applicable for incorrect disposal of this waste, in accordance with you national legislation.

For business users in the European Union:

If you wish to discard electrical and electronic equipment, please contact your dealer or supplier for further information.

Information on Disposal in other Countries outside the European Union:

This symbol is only valid in the European Union. If you wish to discard this product, please contact your local authorities or dealer and ask for the correct method of disposal.

Do not dispose of batteries in the trash or in a single stream recycling program. Take all unneeded, spent, or damaged batteries to a facility that specifically handles lithium-ion battery disposal.

brighton-science.com