Administrator Manual

Surface Analyst™ 3001-HZE

Archer 8.15

IMPORTANT SAFETY NOTE!

In addition to reading this manual, read and understand the User Manual for important safety 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 Administrator Manual.

Document Version #1

Contents

1 Introduction

1.1 Purpose and Scope of this Manual

The purpose of this Administrator Manual is to give advanced instructions for the person who is an administrator for the Surface Analyst 3001-HZE.

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

1.2 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.

1.3 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 Overview of Functions and Settings

The basic functions available to any user are described in the User Manual. To access the advanced functions and settings and perform most tasks in this manual, you must first log in as an administrator . The password is provided in the Welcome Letter which is shipped with the Surface Analyst.

Pages 1-3 of the Menu screen are available to all users, although only an administrator can manage surface profiles on page 1 (Fig. 1.) There are five additional screens available to administrators only (Fig. 2-Fig. 6). See the chapter references listed in the table "Administrator Functions and Settings" on the next page for more detailed explanations.

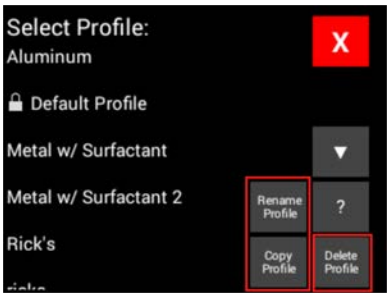


Fig. 1 - Menu screen page 1
Surface profile rename, copy and delete

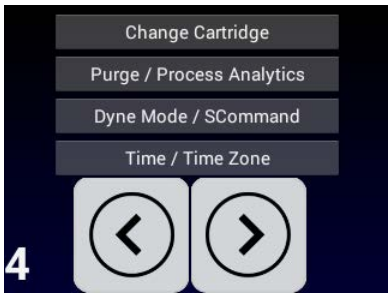


Fig. 2 - Menu screen page 4

Fig. 3 - Menu screen page 5

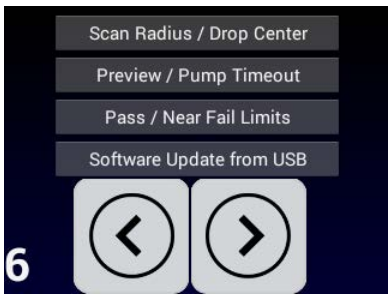


Fig. 4 - Menu screen page 6

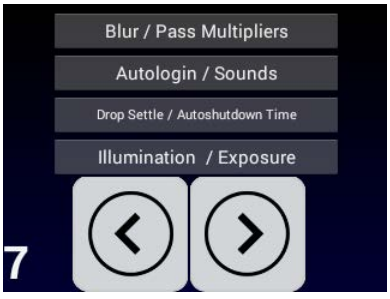


Fig. 5 - Menu screen page 7

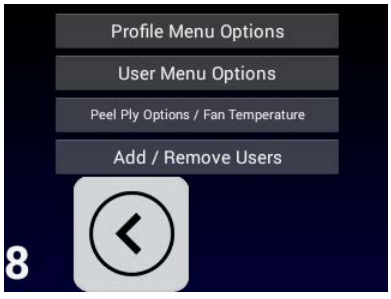


Fig. 6 - Menu screen page 8

Administrator Functions and Settings

Menu Screen Page #	Function / Setting	Chapter Reference
1	Copy, rename or delete a surface profile	"Surface Profile Management" on page 10
4	Change a cartridge	" Cartridge Changing" on page 16
	Purge the system	"Purging" on page 17
	Set up Process Analytics Only available with the Process Analytics option	"Process Analytics" on page 42
	Enable/disable Dyne Mode and set parameters Only available with the Dyne Mode option	"Dyne Mode" on page 41
	Activate new purchasable options (SCommand)	"Activating New Purchasable Options" on page 14
	Change time and time zone	"Changing the Time or Time Zone" on page 13
5	Re-analyze the last measurement	"Re-analyzing the Last Measurement" on page 36
	Set image saving options	"Image Saving" on page 19
	Delete data	"Deleting Data" on page 20
	Set image processing parameters	"Image Processing Parameters" on page 25
	Merge database files provided by Brighton Science	"Database Merging" on page 14
	Enable or disable automatic drop detection (SmartDrop)	"Setting Drop Detection Accept / Reject Options" on page 35
	Enable or disable Wetting Analytics Only available with the Wetting Analytics option	"Wetting Analytics" on page 38
6	Set the initial drop locating parameters	"Scan Radius" on page 30 "Drop Center Settings" on page 28
	Set preview and pump timeouts	"Setting Preview and Pump Timeouts" on page 34
	Set pass and near fail limits	"Setting Pass and Near Fail Limits" on page 35
	Update Archer software	"Updating the Software" on page 14

Menu Screen Page #	Function / Setting	Chapter Reference
7	Enable or disable autologin	"Enabling and Disabling Auto Login" on page 13
	Set the blur parameters	"Blur Passes" on page 27 "Pass Multipliers" on page 31
	Set the drop settle time	"Drop Settle Time" on page 24
	Set the automatic shutdown time	"Setting Auto Shutdown Time" on page 13
	Enable or disable sounds Only available with SA 5001	N/A
	Set the illumination level of the LED lights and the camera exposure	"LED Illumination Level" on page 23 "Camera Exposure" on page 24
8	Profile menu options--Select surface profile upon startup	"Auto Surface Profile Prompting" on page 11
	Profile menu options--Select surface profile with QR code Only available with the Auto Profile Selection via QR Code option	"Auto Profile Selection via QR Code" on page 47
	Profile menu options--Select surface profile for each process Profile menu options--Filter process profiles Profile menu options--Set prefixes for process surface profiles These are only available with the Process Analytics option	"Setting up Process Analytics" on page 43
	Profile menu options--PP designated items	Brighton Science special use
	User menu options--Add/remove user	"Adding and Removing a User" on page 12
	User menu options--Enable/disable passwords	"Enabling and Disabling Passwords" on page 13
	User menu options--Display/hide user list	"Displaying and Hiding User Accounts" on page 12
	Peel Ply Options	Brighton Science special use
	Fan temperature settings Only available with SA 5001	N/A
	Add/remove users	"Adding and Removing a User" on page 12

3 Surface Profile Management

Surface profiles are customized collections of settings that are applicable to a particular surface type or application.

You can create new profiles (by copying an existing profile) to save settings that work best for your situation. You can edit and delete any existing profile, except for the Default Profile and locked profiles.

Contact Brighton Science if you need assistance in creating a new profile for a particular surface application. See "Database Merging" on page 14 for more information.

3.1 Creating a New Surface Profile

Menu screen page 1 ⇨ **Surface Profile**

Create a new surface profile (by copying an existing profile) if you want to save a set of parameter settings.

Touch **Copy Profile**, and follow the directions on the screen.

You are asked if you want to keep the same drop size as the current loaded profile. In most cases, it is recommended to use the same size. If you are measuring a very small surface where the normal drop size is too large, you may choose a smaller number of droplets.

Using very small drop sizes can lead to reduced measurement accuracy. Contact Brighton Science for assistance.

When prompted, you can add a note that is attached to your profile. This note is available to users when they touch the question mark button in the Surface Profiles menu. Touch Edit to add the note.

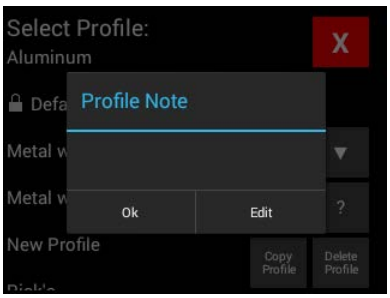


Fig. 7 - Prompt for adding a surface profile note

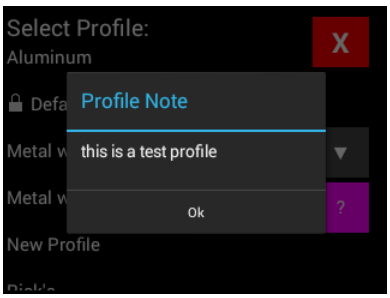


Fig. 8 - Profile note viewed from Surface Profile menu

The newly created profile is automatically loaded after you create it. It inherits the previously loaded profile's parameter settings. You can individually edit the profile-specific parameter settings, and they will be saved to your new profile. See "Changing the Process Parameters" on page 22.

3.2 Renaming a Surface Profile

Menu screen page 1 ⇨ **Surface Profile**

Touch **Rename Profile**, and then select a profile to rename. Enter the new name at the prompt.

You cannot rename the Default profile. You also cannot rename locked profiles that display a lock icon. These are special surface profiles created by Brighton Science.

3.3 Deleting a Surface Profile

Menu screen page 1 ⇨ **Surface Profile**

Touch **Delete Profile**, and follow the directions on the screen.

If you delete the currently loaded profile, the Default profile is loaded automatically.

You cannot delete the Default profile.You also cannot delete locked profiles that display a lock icon  . These are special surface profiles created by Brighton Science.

3.4 Adding or Changing a Profile Note

A profile note is a note attached to a surface profile. The profile note is viewable in the Surface Profile menu .

Menu screen page 1 ⇨ **Surface Profile**

Touch the question mark box and select a profile to which you want to either add a profile note or change an existing note. Enter the new profile note in the dialog box.

.You cannot add or edit profile notes for locked profiles that display a lock icon  . These are special surface profiles created by Brighton Science.

3.5 Auto Surface Profile Prompting

You can set Archer to prompt the user to select a surface profile after login and prior to taking a measurement.

Go to Menu screen page 8 ⇨ **Profile Menu Options**. Set **Select profile on startup** to true. To disable this feature (and allow access to the Measurement screen prior to selecting a surface profile), set to false.

This function only affects user accounts. Admin accounts are not prompted to select a surface profile when this function is enabled.

4 General Administrative Functions

4.1 Adding and Removing a User

You can add multiple user accounts with passwords to control access to the Surface Analyst. User login activity is stored in the system log.

Menu screen page 8 ⇨ **Add / Remove Users**

Touch **Add User** to add a new user. Type in a name for the user and assign a password. You must assign a password to the user, but you can set whether or not the password is required for logging in to a user-level account (see "Enabling and Disabling Passwords" on the next page). Select either "user" or "admin" rights to the new user.

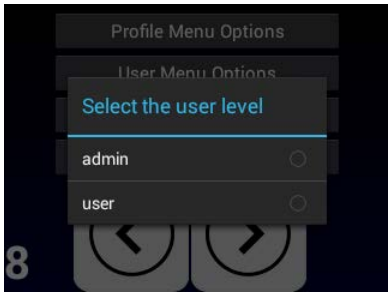


Fig. 9 - Assigning admin or user permissions

"User" permissions are limited to accessing only Menu screen pages 1-3. "Admin" permissions allow access to Menu screen pages 1-8.

Touch **Remove User** to remove any user.

Users cannot remove their own accounts.

4.2 Displaying and Hiding User Accounts

This feature allows you to display or hide a list of all available user accounts in the Users screen.

Menu screen page 8 ⇨ **User Menu Options**. Touch **User List Selection**. Enabling this feature allows selection of a user account from a list at login:

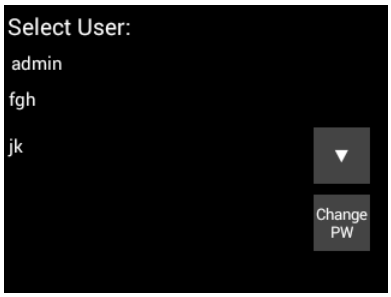


Fig. 10 - Users screen: User List Selection enabled

Disabling this feature hides the list of user accounts when a user logs in:

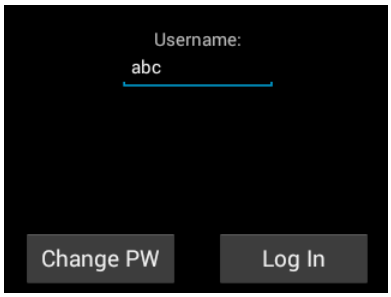


Fig. 11 - Users screen: User List Selection disabled

4.3 Enabling and Disabling Passwords

Menu screen page 8 ⇨ **User Menu Options**

You can set whether or not a password is required for a user to log in. Touch **Passwords for users**. Enable or disable the prompt for a password upon login.

Administrator accounts always require a password to log in.

4.4 Enabling and Disabling Auto Login

Menu screen page 7 ⇨ **Autologin**

The auto login feature enables a user to begin taking measurements without having to log in upon startup of the Surface Analyst. This setting applies to one active user at a time.

Touch **Enable** and select a user from the list.

Other users may log in, but after the Surface Analyst is re-started, the user originally set will be automatically logged in until auto login is changed to a different user or is disabled.

Touch **Disable** to disable the auto login feature.

4.5 Setting Auto Shutdown Time

Menu screen page 7 ⇨ **Drop Settle / Autoshutdown Time** ⇨ **Autoshutdown Time**

Touch **Autoshutdown Time** to set the time (in minutes) that the Surface Analyst automatically shuts itself off after the set minutes of inactivity.

If you do not want the Surface Analyst to shut down automatically at all, you can disable the feature by entering **0**.

4.6 Changing the Time or Time Zone

Menu screen page 4 ⇨ **Time / Time Zone**

Follow the directions on the screen to change the time or time zone.

4.7 Updating the Software

When a new release of the Archer software is available, you will automatically be contacted by Brighton Science via email. If you are eligible to receive software updates, the email will contain instructions for you to follow.

Since the USB and micro USB ports of the 3001-HZE model are not accessible, this function is not available. Contact Brighton Science for assistance.

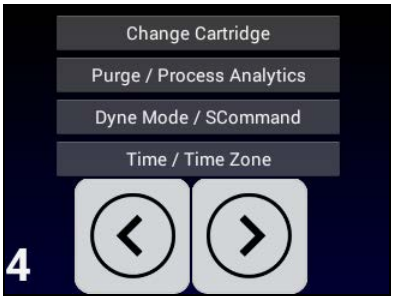
4.8 Database Merging

Since the USB and micro USB ports of the 3001-HZE model are not accessible, this function is not available. Contact Brighton Science for assistance.

4.9 Activating New Purchasable Options

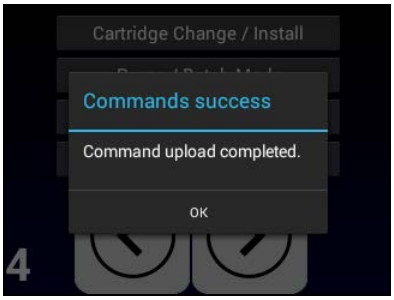
If you purchased additional options, then you will receive a secure command text file (or a series of commands to enter) from Brighton Science. Follow these directions to activate the new features.

1. Menu screen page 4 ⇨ **Dyne Mode / SCommand** ⇨ **SCommand**



To enter the command text manually, select **Type In**. A keyboard appears for you to type in the text.

2. A **Command successful** message appears when the feature is activated.



3. To view the purchasable options that are installed on your Surface Analyst, go to Menu screen page 2 ⇨ **About**. Scroll to page 6.

   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.

The following table describes the purchasable option 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

5 Cartridge Changing

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

Menu screen page 4 ⇨ **Change Cartridge**

In general, a cartridge should only be changed when the fluid is depleted and Archer prompts you to change the cartridge. Any user can change a cartridge when prompted by Archer.

If a cartridge needs to be removed at any other time, only an administrator is permitted to do so. The procedure for changing a cartridge is outlined in the User Manual.

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

6 Purging

Menu screen page 4 ⇨ **Purge / Process Analytics** ⇨ **Purge**

Some purging happens automatically, such as after a cartridge change or when the Surface Analyst has been idle for an extended period. If the dispensing of your Surface Analyst becomes inconsistent, then a manual purge is recommended.

The types of purging operations include the following:

- Quick purge (short duration)
- Extended purge (medium duration)
- Continuous purge (long duration)

The type of purge recommended depends upon how long the Surface Analyst has been idle. Generally, if you are having issues with dispensing, start with the shortest duration purge and increase to the larger duration purges until the issue is resolved.

To perform a purge, touch one of the following: **Quick Purge**, **Extended**, or **Continuous**. Follow the directions on the screen. A message appears when the purge is complete.

Water used for purging and performance checks does not count against the total available drops for measurements listed in the Technical Specifications.

7 Results and Image Management

7.1 Understanding the Images

While in the Measurement screen after taking a measurement, you can view different images of the drop by touching the image on the screen. Each time you touch the image, you see a different image type.

If you choose to save all analyzed images (see "Image Saving" on the next page), then you can also view these images in the Drop History screen.

Result image

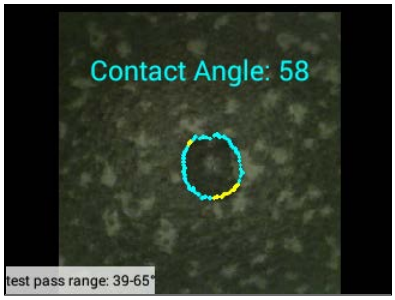


Fig. 12 - Result image

The result image shows the image of the substrate and the drop along with the drop detection and result.

Result analysis image

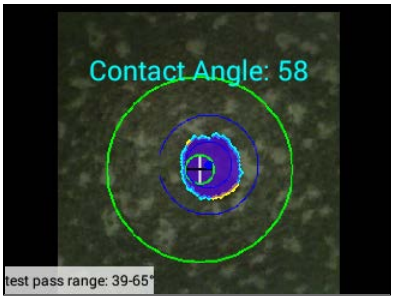


Fig. 13 - Result analysis image

The result analysis image shows the result image with overlay graphics having the following meanings:

- Yellow dots: new location of dots that were moved if Outlier Rejection was enabled
- Red dots: original location of dots that were moved if Outlier Rejection was enabled
- Blue shaded area: actual drop area measured
- Dark blue center dot: found center of drop
- Dark blue circles: Near and Far Multipliers
- Crosshairs: screen crosshairs location or result of Auto Drop Center
- Green circles: Inner and Outer Scan Radius

Subtracted image

Fig. 14 - Subtracted image

The subtracted image shows a subtracted image of only the drop. The picture taken with just the substrate has been subtracted from the picture of the substrate and the drop.

Subtracted analysis image

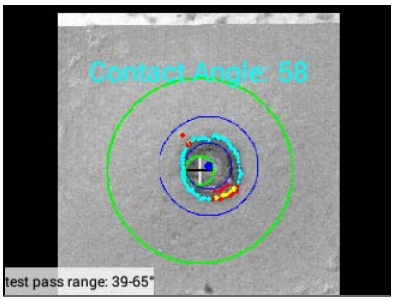


Fig. 15 - Subtracted analysis image

The subtracted analysis image shows the subtracted image with overlay graphics visible.

7.2 Image Saving

Menu screen page 5 ⇨ **Image Saving / Delete Data** ⇨ **Image Saving**

Image saving allows you to save images for each drop measurement so that you can view them later.

Touch the checkbox to place a checkmark for saving all analyzed images or saving raw images or both.

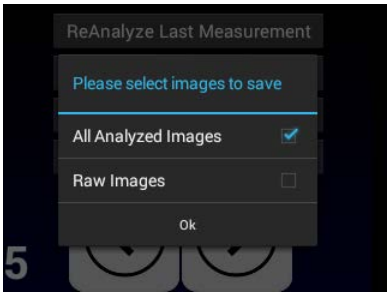


Fig. 16 - Image saving

Selecting **All Analyzed Images** allows you to view the four different types of images (see "Understanding the Images" on the previous page) in the Drop History screen.

It is recommended to keep this feature turned on so that you can review all the analyzed images at a later time. If you do not save analyzed images, you will only be able to review or upload the results images.

Selecting **Raw Images** saves the original raw images of the substrate and the drops.

It is generally not recommended to keep this feature turned on, as it increases the processing time and the file sizes are large. Raw images are generally used by Brighton Science Service.

7.3 Deleting Data

Menu screen page 5 ⇨ **Image Saving / Delete Data** ⇨ **Delete Data**

Touch **Delete Data** to permanently delete all of the results data and images on the Surface Analyst.

7.4 Uploading Data to USB Drive

Menu screen page 2 ⇨ **USB Upload**

Since the USB and micro USB ports of the 3001-HZE model are not accessible, this function is not available. Contact Brighton Science for assistance.

8 The Surface Analyst Process Parameters

Between the time you initiate a measurement with the Surface Analyst and the time you receive your result is a short period of time. However, there is a lot of processing that Archer does in that time.

Fig. 18 and Fig. 19 show the process flow when taking a measurement with a Surface Analyst. The process flow differs, depending upon if the Original image processing is enabled on your Surface Analyst, or if you purchased Dynamic Detection image processing. Fig. 18 shows the process flow with Original image processing, while Fig. 19 shows the process flow if the Dynamic Detection option was purchased.

You can find out if you have Dynamic Detection enabled on your Surface Analyst by going to Page 4 of the About menu.

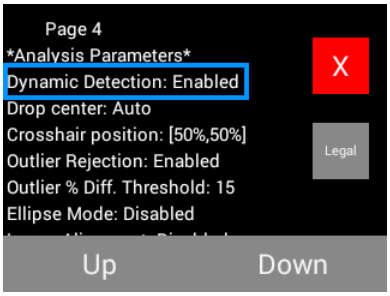


Fig. 17 - Dynamic Detection enabled, shown in the About screen

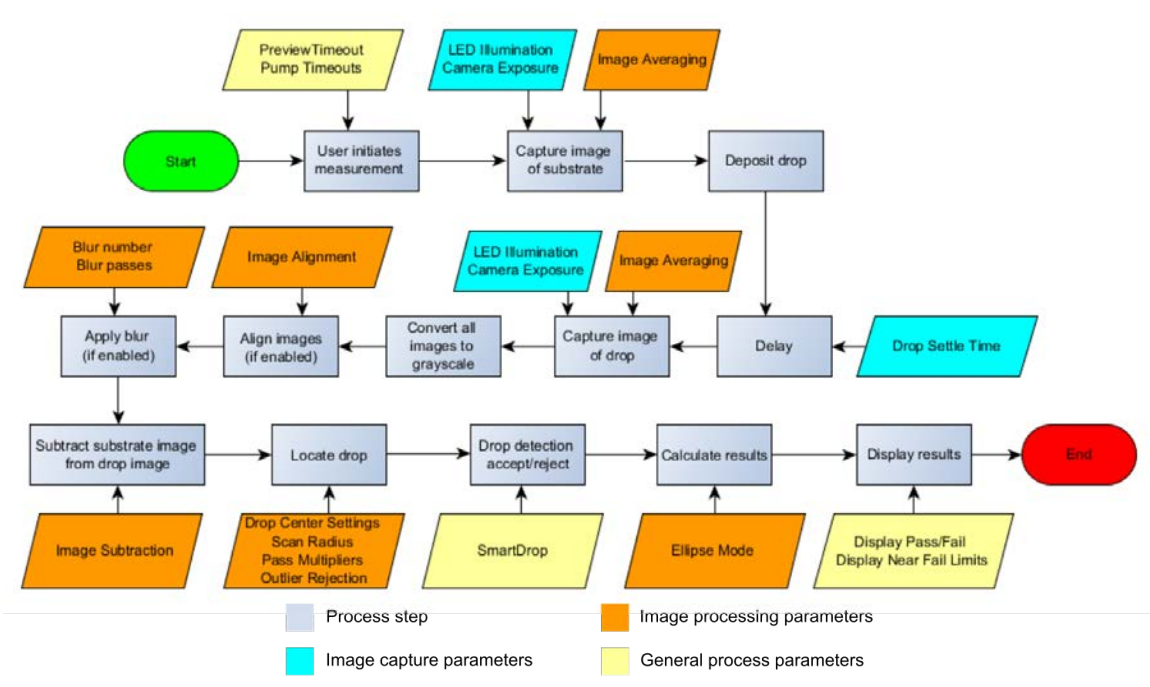


Fig. 18 - Surface Analyst process flow diagram for Original (Purchasable options are excluded from this diagram)

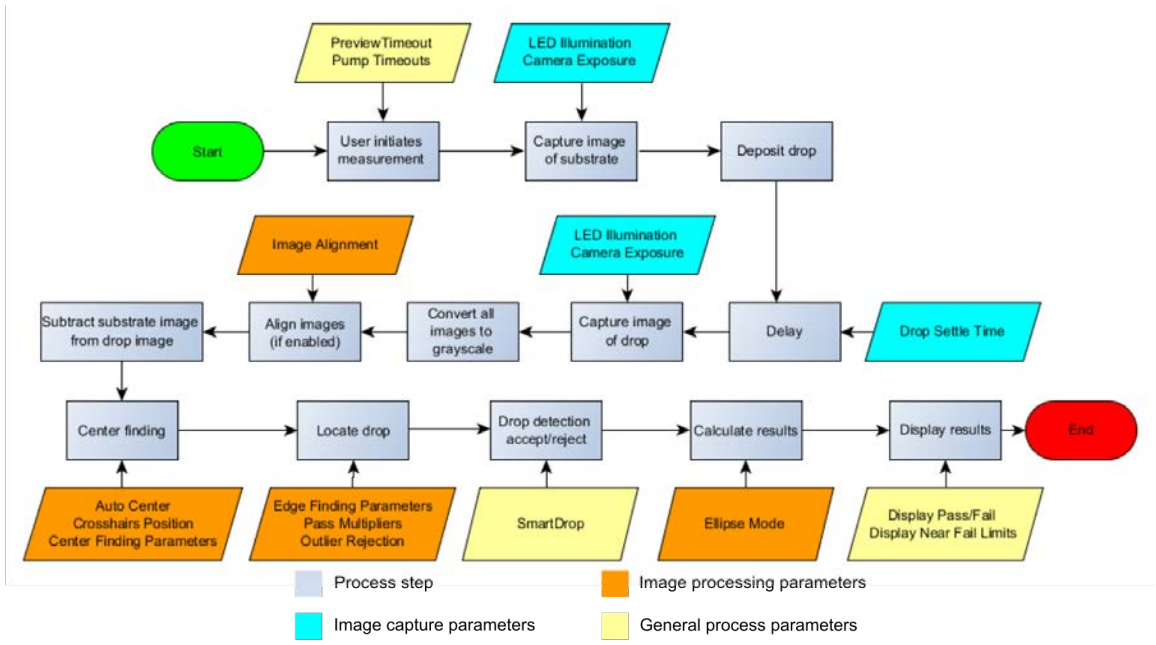


Fig. 19 - Surface Analyst process flow diagram for Dynamic Detection image processing (Purchasable options are excluded from this diagram)

The parameters affecting the process which an administrator can set are described in the following chapters:

- "Image Capture Parameters" on the next page
- "Image Processing Parameters" on page 25
- "General Process Parameters" on page 34

8.1 Changing the Process Parameters

You can change the settings of the process parameters in order to optimize the measurement process for your particular surface conditions.

In order to make adjustments to a locked surface profile, you first need to copy it and create a new surface profile. See "Creating a New Surface Profile" on page 10.

All parameters settings are one of the following:

- Profile specific (apply to the current loaded surface profile only)
- Global (apply to the entire Surface Analyst device)
- Can be applied either to the current loaded profile or to multiple profiles

To find out what the parameters are set at for the currently loaded surface profile, go to Menu screen page 2 ⇨ **About** ⇨ pages 3-5.

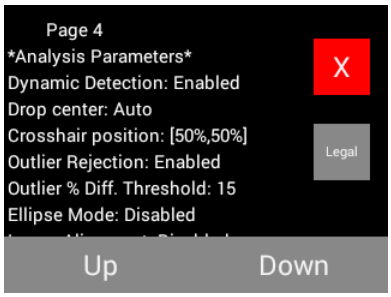


Fig. 20 - About screen

Some of the parameters listed in the About screen are for Brighton Science Service use and are not editable by an Administrator.

Refer to the following sections for information on changing the process parameters:

Topic	Reference
Image capture parameters	"Image Capture Parameters" below
Image processing parameters (Original image processing)	"Image Processing Parameters" on page 25
Image processing parameters (Dynamic Detection)	"Dynamic Detection Image Processing" on page 49
General process parameters such as setting timeouts, SmartDrop, and pass/fail limits	"General Process Parameters" on page 34
Testing the effect of changing parameters using the re-analyze function	"Re-analyzing the Last Measurement" on page 36
Explanation of parameters used in the drop locating algorithms	"Image Processing and Drop Location" on page 33

8.2 Image Capture Parameters

The parameters in this section affect the image capturing process of the Surface Analyst.

8.2.1 LED Illumination Level

Menu screen page 7 ⇨ **Illumination / Exposure** ⇨ **Illumination**

Parameter Scope:	Profile specific
Description:	The LED Illumination Level changes the current supplied to the LED lights to make them brighter or dimmer.
Uses:	The following are situations to increase Illumination:

- Increase contrast
- Decreases the camera exposure which decreases motion blur and noise

Decrease illumination when you need to decrease the heat of the head.

Considerations: Increasing the illumination increases the heat of the inspection head.

Touch **Illumination** to enter a new illumination (as a percentage of maximum allowable illumination).

8.2.2 Camera Exposure

Menu screen page 7 ⇨ **Illumination / Exposure** ⇨ **Exposure**

Parameter Scope:	Profile specific
Description:	Camera Exposure changes the sensitivity of the sensor to light
Uses:	Change the Camera Exposure setting when you need to change the brightness of an image.
Considerations:	Higher exposures have increased noise. Lower exposures have a lower overall brightness, but less noise.

Touch **Exposure** to change the exposure on a scale of 1 to 984. The higher the number, the more sensitive the sensor is to light.

In normal operation, it is recommended to use automatic exposure. To set automatic exposure, enter a value of **0**.

8.2.3 Drop Settle Time

Menu Screen 7 ⇨ **Drop Settle / Autoshutdown Time** ⇨ **Drop Settle**

Parameter Scope:	Can be applied either to the current loaded profile or to multiple profiles
Description:	The Drop Settle Time is a necessary time delay which allows the drop to settle between the end of the drop deposition and the image capture.
Uses:	If a vapor ring is present and is causing detection problems, a longer drop settle time can decrease the vapor ring by giving it time to evaporate.

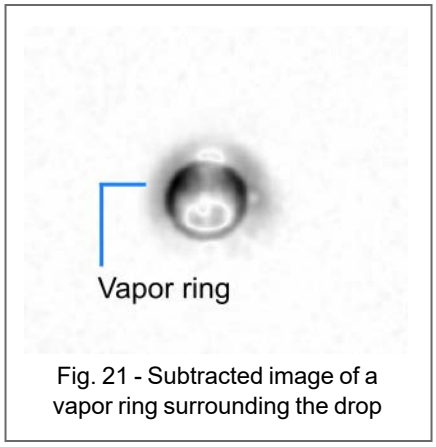


Fig. 21 - Subtracted image of a vapor ring surrounding the drop

Considerations: For longer drop settle times, take extra care to keep the head still during the measurement.

Touch **Drop Settle** to enter the settle time (in seconds).

8.3 Image Processing Parameters

Many of the parameters in this section are applicable only to Original image processing of the Surface Analyst. If you have purchased Dynamic Detection, see "Dynamic Detection Image Processing" on page 49.

You can set many of the image processing parameters by going to Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**.

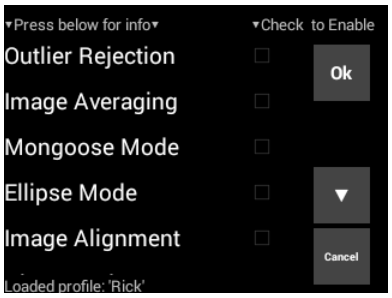


Fig. 22 - Image processing parameters screen

Touching a parameter name displays a description of its function. Use the arrow icons to scroll up and down to see all of the parameters. Touching a checkbox to add a checkmark enables the function.

All image processing settings are profile specific (apply to the current loaded surface profile only).

8.3.1 Image Averaging

This function is only applicable for Original image processing.

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope:	Profile specific
Description:	Image Averaging captures multiple images for each the substrate and the drop. The pixel intensity of the images are averaged together to form one composite image each for the substrate and the drop.
Uses:	Image Averaging reduces noise, particularly in the background of low contrast images. This improves drop detection.

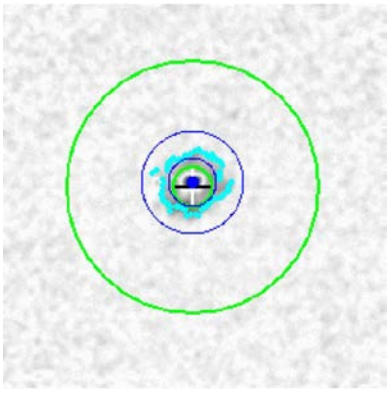


Fig. 23 - No image averaging

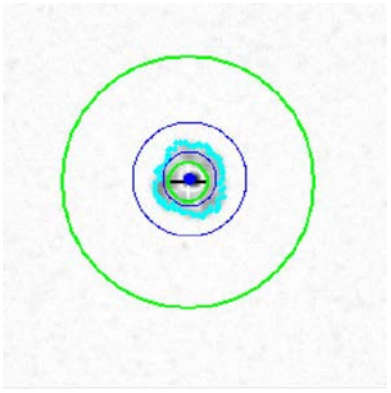


Fig. 24 - Image averaging enabled

Considerations: Image Averaging increases the capture time which can increase the likelihood of motion blur.

Image Averaging cannot be used with surfactant detection.

To enable image averaging, touch the checkbox for **Image Averaging**, and then touch **OK**.

8.3.2 Image Alignment

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope: Profile specific

Description: In situations where there is movement during the measuring process, Image Alignment moves and rotates the grayscale substrate image so that it aligns better with the grayscale drop image. This allows for more complete removal of the backgound and a more accurate contact angle calculation.

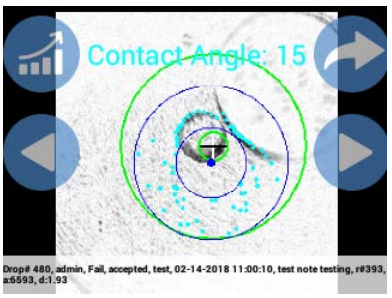


Fig. 25 - No image alignment. Background not properly subtracted.

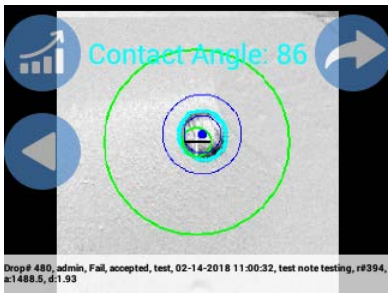


Fig. 26 - Image alignment enabled. Background is properly subtracted.

Uses: Image Alignment is used in situations where it is difficult to keep the inspection head still during measuring.

Considerations: This feature is only recommended when there is movement during measurement.
It works best when the background has high contrast features.
Image Alignment increases the processing time.

Touch the checkbox for **Image Alignment** to activate this function.

8.3.3 Blur Settings

This function is only applicable for Original image processing.

Blurring operations can be performed on captured images to reduce the background noise. This is useful in order to better separate the image of the drop from the background.

8.3.3.1 Blur Number

This function is only applicable for Original image processing.

Menu screen page 7 ⇨ **Blur / Pass Multipliers** ⇨ **Blur** ⇨ **Number**

Parameter Scope: Profile specific

Description: The Blur Number determines the number of neighboring pixels to average together in order to determine an individual pixel's intensity.

Uses: Increasing the Blur Number can reduce the amount of background noise.

Considerations:	Increasing the Blur Number can make the drop edge less distinct and more difficult to detect.

Enter a blur number. It is recommended to start with something near 2. Entering a number that is too high can cause a system error.

8.3.3.2 Blur Passes

This function is only applicable for Original image processing.

Menu screen page 7 ⇨ **Blur / Pass Multipliers** ⇨ **Blur** ⇨ **Passes**

Parameter Scope:	Profile specific
Description:	The Blur Passes dictates how many times a blur operation of a given radius is performed.
Uses:	Increasing the Blur Passes can reduce the amount of background noise.
Considerations:	Increasing the Blur Passes can make the drop edge less distinct and more difficult to detect.

Enter a number for blur passes. It is recommended to start with something near 2. Entering a number that is too high can cause a system error.

8.3.4 Image Subtraction

Image subtraction refers to the processing involved in removing the background (substrate image) from the drop image. If you have purchased Dynamic Detection, then your instrument is optimized for image subtraction, and there are no parameters that can be changed.

8.3.4.1 Mongoose Mode

This function is only applicable for Original image processing.

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope:	Profile specific
Description:	Mongoose Mode uses a method of image subtraction where the "white snake" artifact in the center of the drop is reduced so that the contact angle can be more accurately calculated.

Fig. 27 - Standard subtracted image with "white snake"

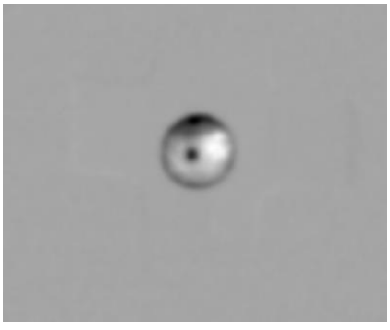


Fig. 28 - Subtracted image using Mongoose mode

Uses:	Mongoose Mode is recommended for highly reflective surfaces. It is an alternative to Glass Mode

Considerations: Mongoose Mode may not work well under difficult lighting scenarios.

Touch the checkbox for **Mongoose Mode** to activate this function.

8.3.4.2 Glass Mode

This function is only applicable for Original image processing.

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope: Profile specific

Description: Glass Mode uses a method of image subtraction where the "white snake" artifact in the center of the drop is reduced so that the contact angle can be more accurately calculated

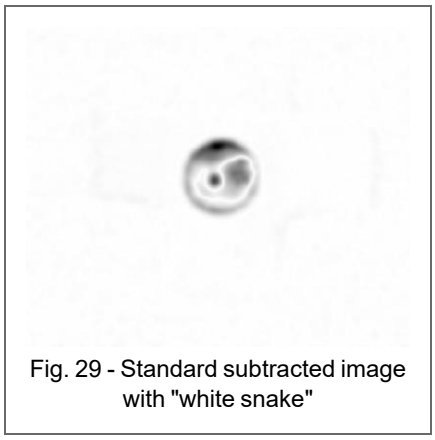


Fig. 29 - Standard subtracted image with "white snake"

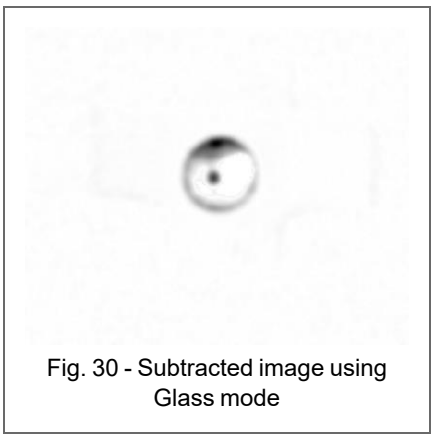


Fig. 30 - Subtracted image using Glass mode

Uses: Glass Mode is used for highly reflective surfaces.
It is an alternative to Mongoose Mode.

Considerations: Sometimes Glass Mode makes the edge of the drop difficult to find.
It can make the drop detection more sensitive to noise or satellites.

Touch the checkbox for **Glass Mode** to activate this function.

8.3.5 Drop Center Settings

The drop center settings allow you to determine whether the initial center of the drop is calculated (Auto Center) or if the initial center is assumed to be at the crosshairs that appear on the Measurement screen. See "Image Processing and Drop Location" on page 33 for more information.

8.3.5.1 Auto Center

Menu screen page 6 ⇨ **Scan Radius / Drop Center** ⇨ **Drop Center**

Parameter Scope: Can be applied either to the current loaded profile or to multiple profiles

Description: The Auto Center function uses a Gaussian fit of the standard deviations of row and column pixel intensities to determine the center of the drop. If you have purchased Dynamic Detection, then the Auto Center function uses object analysis to determine the center and approximate initial size of the drop.

Uses: It is generally recommended for the Auto Center function to always be enabled.

Considerations: Auto Center may be disabled if the Surface Analyst has difficulty finding the drop center.

Touch **Auto Center** to enable or disable the automatic drop center feature. See the following subsections for different settings affecting the behavior of the Auto Center function.

8.3.5.2 Constrain ADC

This function is only applicable for Original image processing.

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope:	Can be applied either to the current loaded profile or to multiple profiles
Description:	Constrain ADC constrains the ADC (Auto Drop Center) algorithm to a square area centered on the crosshairs with sides equal to the Outer Scan Radius. See "Image Processing and Drop Location" on page 33 for more information.
Uses:	Use this function in conjunction with Auto Center and in any of the following situations: • When there is an occlusion at the edge of the view, such as a custom foot or other object, that prohibits finding the drop center properly. • Where the drop is deposited at the same location of the screen very consistently from drop to drop.
Considerations:	The edge of the drop may not be found with low angle drops.

Touch the checkbox for **Constrain ADC** to activate this function.

8.3.5.3 Sum ADC

This function is only applicable for Original image processing.

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope:	Can be applied either to the current loaded profile or to multiple profiles
Description:	Sum ADC changes the ADC (Auto Drop Center) algorithm to a sum-based algorithm.
Uses:	This is the original auto drop center function that is primarily used in legacy applications.
Considerations:	ADC must be enabled. This function is not recommended for most applications.

Touch the checkbox for **Sum ADC** to activate this function.

8.3.5.4 Crosshairs Position

Menu screen page 6 ⇨ **Scan Radius / Drop Center** ⇨ **Drop Center** ⇨ **Crosshairs**

Parameter Scope:	Can be applied either to the current loaded profile or to multiple profiles
Description:	Use this function to set the position of the crosshairs on the Measurement screen.

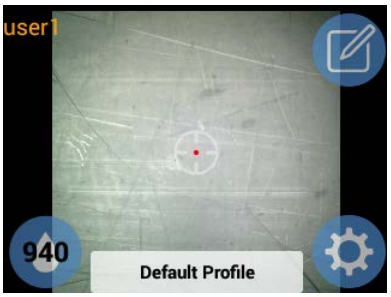


Fig. 31 - Crosshairs on the Measurement screen

Uses: If the drop is consistently not depositing in the center of the screen, you can move the crosshairs to match with where the drop is depositing.

Considerations: If Auto Center is disabled (not generally recommended), the crosshairs are used to determine the center of the drop.

When you touch **Change Crosshairs**, you are asked which direction you want to change.

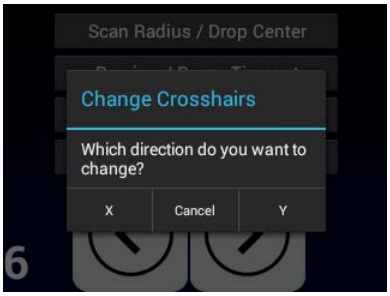


Fig. 32 - Change crosshairs

Enter a number from 0-99 for either the x-direction or y-direction or both. The position (50, 50) is the center of the screen. The position (0,0) is in the upper left-hand region of the screen. (Note that Archer uses a square image that is centered on the rectangular display.)

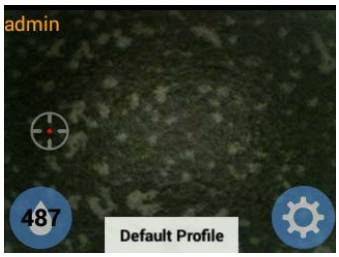


Fig. 33 - Example: X=0; Y=50

Fig. 34 - Example: X=0; Y=0

Fig. 35 - Example: X=99;Y=99

8.3.6 Scan Radius

This function is only applicable for Original image processing.

Menu screen page 6 ⇨ **Scan Radius / Drop Center** ⇨ **Scan Radius**

Parameter Scope: Profile specific

Description: The Scan Radius is the radius of a circle that defines where Archer limits its search to find the edge or center of a drop. See "Image Processing and Drop Location" on page 33 for more information.

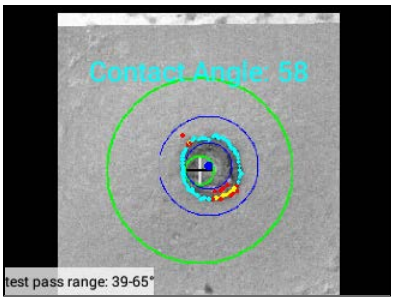


Fig. 36 - Inner and Outer Scan Radii depicted with green circles

Uses: The Outer Scan Radius helps determine the search area in the Constrain ADC function.
The Outer and Inner Scan Radius determines the search area for finding the first pass drop location.

Considerations: A very low contact angle drop may not be properly detected if the Outer Scan Radius is set too small.

Touch **Scan Radius** to change either the Inner Radius or the Outer Radius. The scan radius values are expressed as a percentage of the screen width. The maximum value is 50.

8.3.7 Pass Multipliers

Menu screen page 7 ⇨ **Blur / Pass Multipliers** ⇨ **Pass Multipliers**

Parameter Scope: Profile specific

Description: The pass multipliers limit the area of drop edge detection by defining an area bounded by a minimum and maximum radius. There are two passes of edge detection after the first scan (see "Scan Radius" on the previous page). These passes are denoted by 2 Near,Far and 3 Near,Far Pass Multipliers.

See "Image Processing and Drop Location" on page 33 for more information.

Uses: The Near Pass Multipliers limit the chance of finding an edge inside the drop.

The Far Pass Multipliers limit the chance of finding an edge outside the drop.

Considerations: The drop detection may not work properly if there is significant background noise, especially near the edge of the drop.

Enter values for the near and far pass multipliers. The values are presented as fractions of the drop radius calculated from the previous pass' found dots.

Fig. 37 - Near and Far Pass Multiplier settings

8.3.8 Outlier Rejection

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope: Profile specific

Description: Outlier Rejection replaces dots that are statistically different in position from their neighbors with dots that have a similar distance from the center as the nearest neighbors. The new interpolated dots appear in yellow, while dots that were unchanged remain light blue.

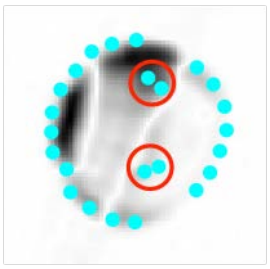


Fig. 38 - Outlier dots to be moved are circled in red

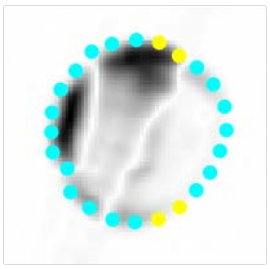


Fig. 39 - Outlier dots that moved appear in yellow

Fig. 40 - Outlier Rejection disabled

Fig. 41 - Outlier Rejection enabled

Uses: Outlier Rejection is used to improve the drop detection so that it more closely follows the edge of the drop.
It is generally recommended to have Outlier Rejection enabled.

Considerations:	There are no meaningful downsides to using Outlier Rejection.

Touch the checkbox for **Outlier Rejection** to enable this feature. You may set the outlier percent difference between the location of an individual point and the points around it. Larger values make outlier rejection less sensitive. Smaller values make it more sensitive. A good starting point is a value of 15.

8.3.9 Ellipse Mode

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope:	Profile specific
Description:	Instead of calculating the area of the drop with the default method using the location of the found dots, Ellipse Mode calculates the area of a best-fit ellipse using the dots of the drop detection.
Uses:	Ellipse Mode filters out dots in the drop detection that do not fit within an elliptical pattern. It can be used with Outlier Rejection.
Considerations:	Ellipse Mode smooths out irregularly-shaped drops which can make the contact angle calculation less accurate. This mode should not be used on rough surfaces such as composites where the expected drop shape is not elliptical.

Touch the checkbox for **Ellipse Mode** to activate this function.

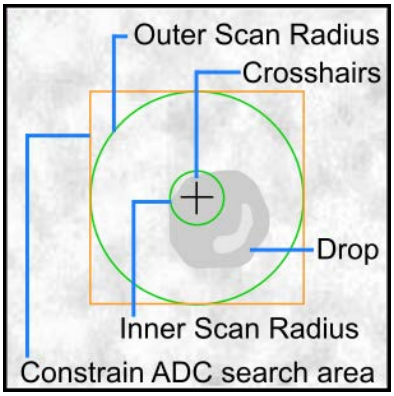
Your Surface Analyst may have Major Axis Ellipse Mode configured. This mode uses the major axis of the best-fit ellipse as the diameter of a circle from which the contact angle is calculated. This method is used in specialized applications where a drop is deposited on a narrow cylindrical object and the contact angle result is affected by the surface curvature. If you think that this method is a good fit for your application, contact Brighton Science for assistance and for special instructions on how to use the Major Axis Ellipse Mode.

8.4 Image Processing and Drop Location

This section gives a brief explanation of how the image processing parameters affect how the drop center and edge are located.

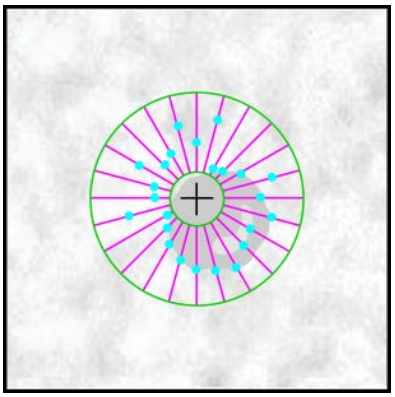
1. a. The initial drop center is found in one of three ways:
   - If Auto Center and Constrain ADC are enabled, then Archer uses a square search area defined by the Outer Scan Radius, centered on the crosshairs, to find an initial drop center.
   - If Auto Center is enabled, but Constrain ADC is disabled, then Archer uses the entire screen to search for the initial center.
   - If Auto Center is disabled, the crosshairs is used as the initial center.

   b. A first pass at finding the drop edge is bounded by the area between the Inner

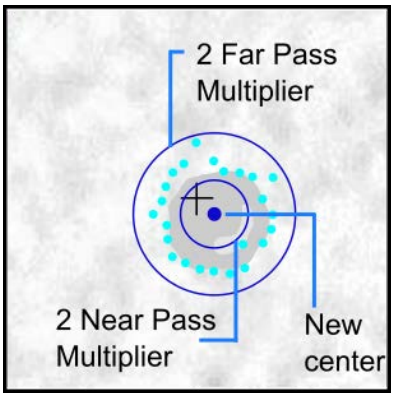


Scan Radius and the Outer Scan Radius, centered on the initial center.

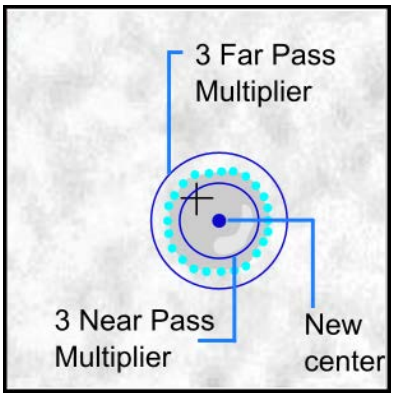
2. Archer works radially (represented by the magenta lines) in the area bounded by the Inner and Outer Scan Radii to find points where there is a change in light-to-dark or dark-to-light pixels. These points (shown as cyan dots) are the first pass detection of the drop edge.



3. Using the found dots from step #2, a new center is determined. Using this new center and the 2 Far Pass and 2 Near Pass Multipliers to create a new bounded working area, Archer then proceeds to find a new set of dots for the second pass detection of the drop edge. In this step, incorrect dots start to get filtered out.



4. The process is repeated once again, using the new center determined from step #3. A third set of dots is found for the third (and last) pass detection of the drop edge. The resulting dots make up the drop detection that undergoes the outlier rejection process (if enabled) to filter out any outlier dots.



8.5 General Process Parameters

The parameters described in this section are general parameters that affect the behavior of the Surface Analyst during operation.

8.5.1 Setting Preview and Pump Timeouts

Menu screen page 6 ⇨ **Preview / Pump Timeout**

Parameter Scope: Global

Preview Timeout

Touch **Preview Timeout** to set the time (in seconds) that a user can be in the Measurement screen before the screen reverts to the Menu screen and the pump shuts off. You can disable the preview timeout by entering **0** so that it will not time out at all.

Pump Timeout

Touch **Pump Timeout** to set the time (in seconds) that the pump will run after a measurement is taken. The screen remains as the Measurement screen after the pump times out.

8.5.2 Setting Drop Detection Accept / Reject Options

Menu screen page 5 ⇨ **SmartDrop / Wetting Analytics** ⇨ **SmartDrop**

Parameter Scope: Can be applied either to the current loaded profile or to multiple profiles

This function sets how the drop detections are accepted or rejected.

The following choices are available:

- **User Accept / Reject**: The user must manually accept or reject the drop detection when prompted by the Surface Analyst. SmartDrop is disabled.
- **SmartDrop**: Enables SmartDrop. The drop detection is accepted or rejected automatically by Archer. If the drop detection is unacceptable, a message is displayed for the user to take another measurement.
- **Accept all**: All drop detections are accepted automatically.

SmartDrop settings

If you choose **SmartDrop**, then there are additional settings available.

Touch **This Profile Only** or **All Profiles**

- Choose **Use Default** if you want to accept the default limits for the automatic accept / reject function.
- Choose **Specify (Advanced)** if you want to set your own limit.
    - Set the accept / reject limit to a value between 0.1 and 1.0.
    - The number you set is the ratio of the perimeter of the drop detected (sum of the polygon sides) to the perimeter of a circle with the same area.
    - The default value is 0.7.

8.5.3 Setting Pass and Near Fail Limits

Menu screen page 6 ⇨ **Pass/Near Fail Limits**

Parameter Scope: Profile specific

Pass Limits

Touch **Pass Limit** to set the maximum and minimum limits. If the Surface Analyst calculates a result that falls inside these limits, it displays a green "Pass" message along with the result. If the result falls outside these limits, it displays a red "Fail" message along with the result.

If you do not want a pass or fail message to display during measurements, then change the minimum angle to 0 and the maximum angle to 180. (For dynes, enter a minimum of 0 and a maximum of 200).

Near Fail Limits

Touch **Near Fail Limit** to warn users that results are passing but are nearing the maximum or minimum allowed value. Enter a value for a distance from your minimum and maximum acceptable values that will

trigger the warning. The Surface Analyst displays a yellow "Pass" message when the result is in the near fail warning range.

The following examples show a pass limit of 0-80° with a near fail limit of 1. Fig. 42 shows how the result appears when the result is within the pass limit and outside of the near fail limit. Fig. 43 shows how the result appears when the result is within the pass limit and within the near fail limit.

Fig. 42 - Passing result outside of the near fail warning range

Fig. 43 - Passing result inside the near fail warning range

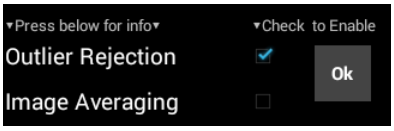
8.6 Re-analyzing the Last Measurement

Menu screen page 5 ⇨ **ReAnalyze Last Measurement**

Use ReAnalyze Last Measurement to test out different processing parameters to see the affect they have on a single measurement.

1. Take a measurement. In this example, Outlier Rejection is disabled.

2. Change one or more processing parameters as desired. In this example, Outlier Rejection is changed to enabled.



3. Go to **ReAnalyze Last Measurement** to see the difference made by changing the parameter.

When images are re-analyzed, the drop number stays the same, but the results number (r#) is incremented. The original drop data as well as the re-analyzed drop data are stored in the database.

9 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 "Activating New Purchasable Options" on page 14.

9.1 Wetting Analytics

Wetting Analytics determines if the contact angle decreases over a period of time from the initial dispense. Wetting Analytics works by taking an additional image of the drop after the normal drop image. The contact angles of the two images are compared. If a surface has high wettability, the drop continues to spread out on the surface after the drop deposition.

9.1.1 Enabling and Disabling Wetting Analytics

Menu screen page 5 ⇨ **SmartDrop / Wetting Analytics** ⇨ **Wetting Analytics**

Touch **Enable / Disable** to turn Wetting Analytics on or off for the current loaded profile.

9.1.2 Setting Wetting Analytics Parameters

The parameters for Wetting Analytics have been pre-set, but you can change them, if desired.

The overall time delay ("t") is the time elapsed (in seconds) between when the first and last images of the drop are taken.

The delta is the contact angle difference between when the drop is first deposited and after it has settled after a "t" second delay. The delta threshold is the value at which the Surface Analyst fails the measurement for wetting.

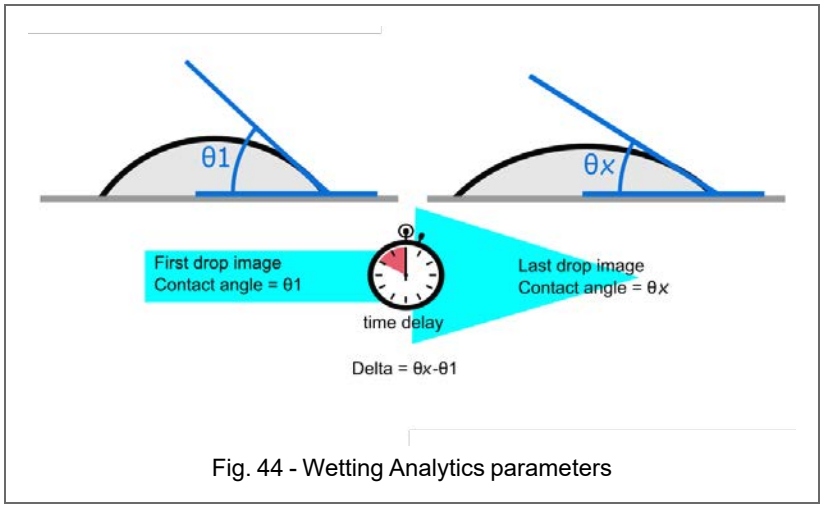


Fig. 44 - Wetting Analytics parameters

Menu screen page 5 ⇨ **SmartDrop / Wetting Analytics** ⇨ **Wetting Analytics**

Parameter Scope: Profile specific

Delta threshold

Touch **Change Delta** to change the delta threshold. Increasing this value decreases the sensitivity of Wetting Analytics.

Time and interval

Touch **Change Capture** to access parameters that control the time delay between the first image and last image taken. You can set a time delay that captures images at the beginning and end of the time span, or you can set a time delay that captures several images within the time span.

Touch **Overall Time** to change the time from the first image taken to the last image taken. This is the amount of time used for the overall wetting pass/fail determination. Increasing the overall time increases the sensitivity of Wetting Analytics.

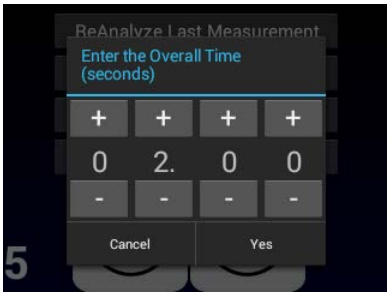
Touch **Image Interval** to set the length of time between individual captured images in the overall time span. This parameter is useful if you want to gain more granular information about how the drop wets the surface over time. This information is stored in the Surface Analyst database and can be exported.

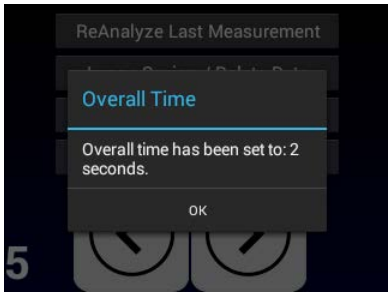
- Due to camera frame rate limitations, intervals are available in 66.7 ms increments.
- Setting the interval to 0 disables the capture of any additional images between the initial and final images. This is the recommended setting for most applications.
- The number of images is calculated from the overall time and the interval selected.

Example:

Set an overall time of 2 seconds, with intervals having a time of 200 ms each.

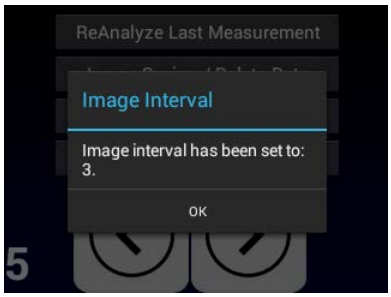
1. Set the **Overall Time** to 2 seconds



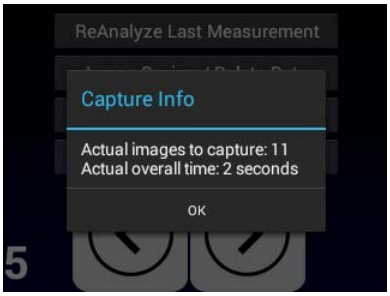


2. Set the **Image Interval** to 3

   (200 ms ÷ 66.7 ms/increment = 3 increments)



3. The capture information is displayed.



For a total time of 2 seconds, and intervals of 200 ms, the number of actual images that will be captured is 11, as illustrated in .Fig. 45.

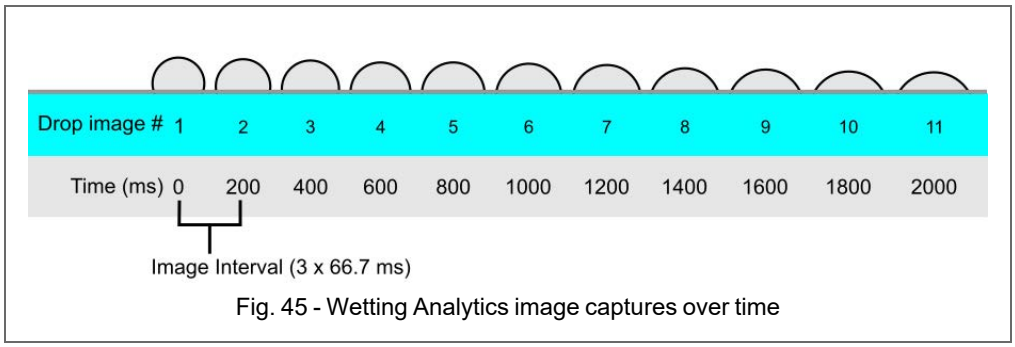


Fig. 45 - Wetting Analytics image captures over time

The maximum number of image captures per measurement is 200.

9.1.3 Wetting Analytics Results

Fig. 46 shows the results screens when using Surface Analyst.

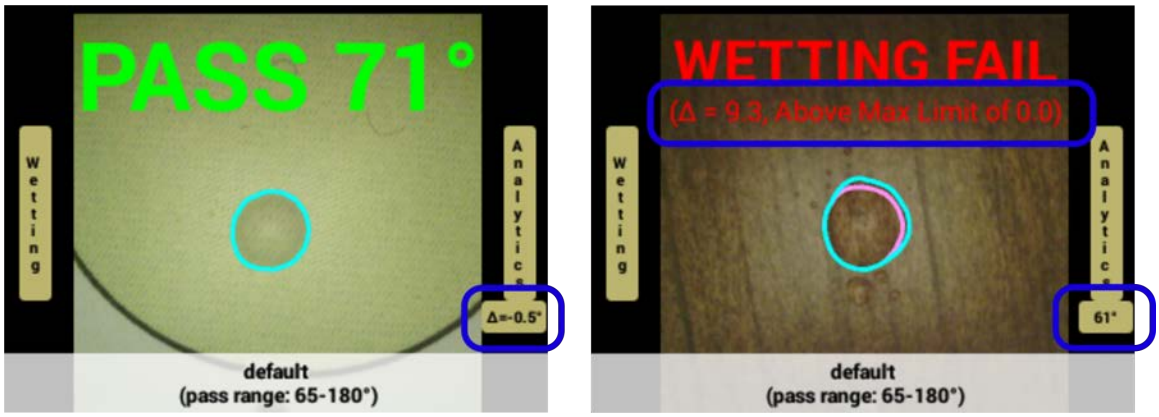


Fig. 46 - Wetting Analytics Results

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.

Archer stores results information for the measurements using Wetting Analytics. Fig. 47 shows the database results for a single measurement having a 3-second overall time, and an image interval of 667 ms (image interval set to 10). See "Uploading Data to USB Drive" on page 20 for how to upload the results from the Surface Analyst.

CD	CE	CF	CG	CH	CI
WettingImagesTotal	WettingImageNumber	WettingMsSinceFirst	WettingDelta	WettingPassOrFail	WettingDeltaAngleTolerance
6	1	0	0		10
6	2	667	3.5		10
6	3	1333	4.9		10
6	4	2000	5.8		10
6	5	2667	6.3		10
6	6	3000	6.6	Pass	10

Fig. 47 - Wetting Analytics results

9.2 Dyne Mode

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

9.2.1 Enabling and Disabling Dyne Mode

Menu screen page 4 ⇨ **Dyne Mode / SCommand** ⇨ **Dyne Mode**

Touch **Enable/Disable** to turn Dyne Mode on or off . Touch **Only Current Profile** to affect the current loaded profile only. Touch **ALL profiles** to have the change affect all profiles.

9.2.2 Setting Dyne Parameters

Menu screen page 4 ⇨ **Dyne Mode / SCommand** ⇨ **Dyne Mode** ⇨ **Parameters**

Parameter Scope: Can be applied either to the current loaded profile or to multiple profiles

You can change parameters that alter the dynes calculation based upon your specific surface application.

The dynes parameters (A,B,C,D) are derived by lab testing of a particular surface with differing surface treatments applied. For each surface condition, a dynes measurement is plotted against the contact angle result in an Excel spreadsheet. A best fit polynomial is derived in the form:

Dynes = $Ax^3 + Bx^2 + Cx + D$.

An example graph of dynes and contact angle for a particular glass surface is shown below:

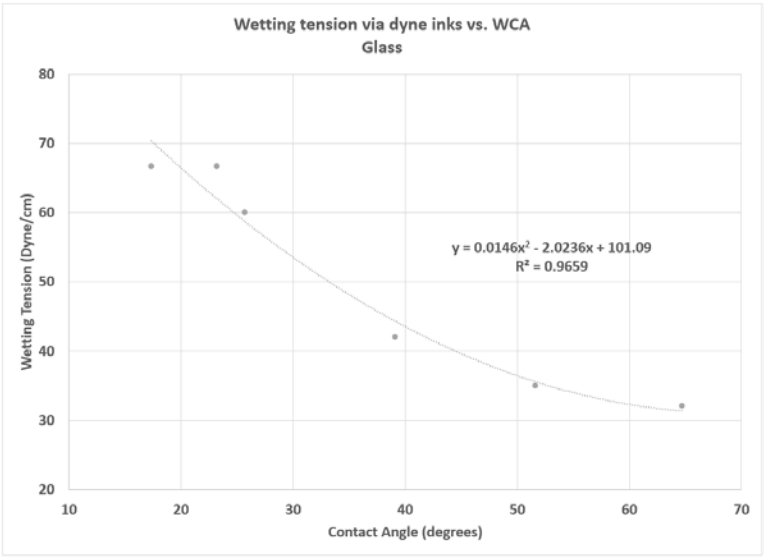


Fig. 48 - Dynes and contact angle best fit polynomial

Since the best fit polynomial in this example is $y = 0.0146x^2 - 2.0236x + 101.09$, the parameters for this particular surface profile are entered as follows:

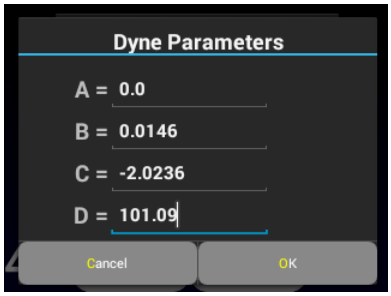


Fig. 49 - Dynes parameters

Only use the correct parameters that are based upon verified lab testing. Otherwise, your results will be innacurate.

9.3 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.

Fig. 50 and Fig. 51 show the results of an example set of six measurements, where two measurements were taken on each of two separate products.

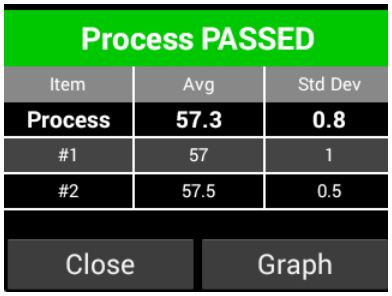


Fig. 50 - Process results

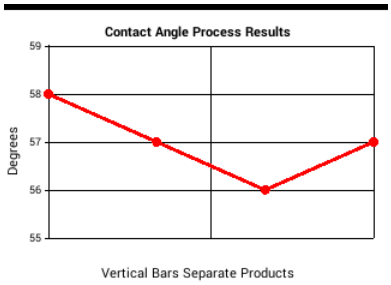


Fig. 51 - Process measurements

Archer supports up to 99 products and 99 measurements per product.

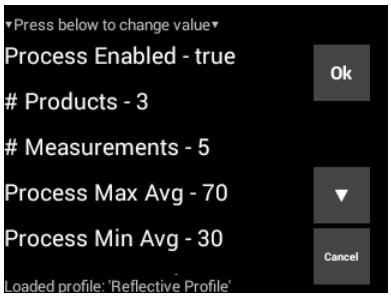
See the User Manual for detailed instructions on how to use Process Analytics.

9.3.1 Setting up Process Analytics

1. You may set up one process per surface profile. Before setting up a process, load the desired surface profile.

2. Go to Menu screen page 4 ⇨ **Purge / Process Analytics** and touch**Process Analytics** to set up a process for your desired application. Set the **Process Enabled** parameter to **true** in order to enable Process Analytics for the loaded surface profile.

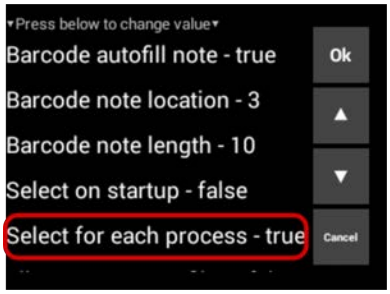
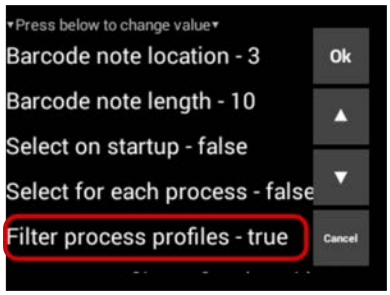
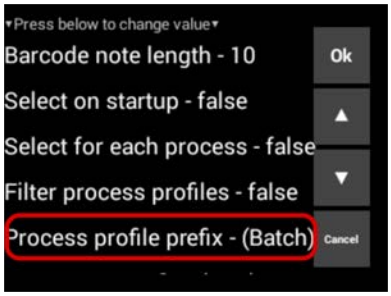
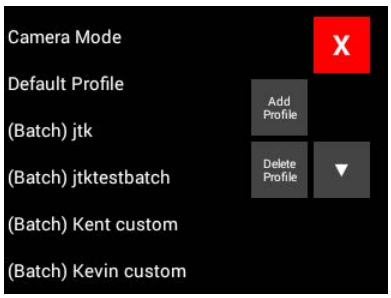
3. Touch each parameter to change its setting. Each of these parameters is customizable (see "Understanding the Process Analytics Parameters" on page 45 for more details). Use the arrow button to scroll all the way to the end.



4. Touch **Ok** when you are finished.

Process Analytics optional settings

The following table lists the optional settings for Process Analytics. All of these settings can be found in Menu screen page 8 ⇨ **Profile Menu Options**.

Task	Instructions	
Prompt selection of a surface profile for each process.	Set **Select profile each process** to **true**. Whenever a new process is loaded, the user is prompted to select a surface profile.	
Allow a user to only see surface profiles that are enabled for Process Analytics.	Set **Filter process profiles** to **true**. This setting does not affect what a user with admin permissions can see. Admin accounts are always able to view all available surface profiles.	
Add a prefix to label all surface profiles set up for Process Analytics.	Touch **process profile prefix**, and type in your desired prefix. In this example, the prefix is "Batch". In the Surface Profiles menu (Menu screen page 1), all of the profiles that are set up for Process Analytics show the prefix.	 

9.3.2 Understanding the Process Analytics Parameters

There are several parameters that control how a process is performed and what metadata is included with the process. These may be set in Menu screen page 4 ⇨ **Purge / Process Mode** ⇨ **Process Analytics** (see "Setting up Process Analytics" on page 43).

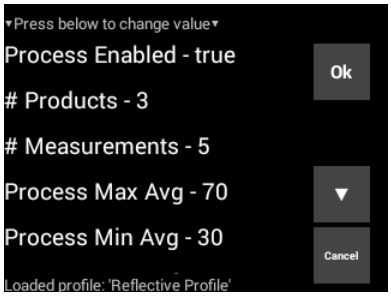


Fig. 52 - Process Analytics parameters

A complete listing of these parameters is shown in the following table :

Process Analytics Parameters

Parameter	Meaning
Process Enabled	Set this value to **true** to enable the Process Analytics function for the loaded surface profile. Set this value to **false** to disable Process Analytics for the loaded surface profile.
# Products	The total number of different products on which measurements will be taken in each process
# Measurements	The number of measurements to take on each product
Process Max Avg	The maximum allowable average result
Process Min Avg	The minimum allowable average result
Process Max StdDev	The maximum allowable standard deviation for all measurements
# Wetting Fail Allowed	The maximum number of allowable wetting failures. (To be used with the Wetting Analytics purchasable option)
Fields 1-5	Customizable fields that allow you to enter a descriptor and a value

Options within the parameters

By touching each parameter, you can access additional options that control how the parameter information is entered and displayed.

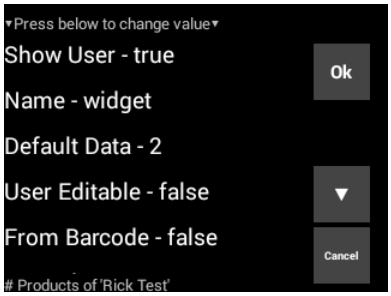


Fig. 53 - Process Analytics parameter options

The following table lists the available options for each parameter. Setting an option to **true** enables that option. Setting an option to **false** disables it.

Process Analytics Parameter Options

Option	Meaning
Show user (set to **true** or **false**)	Determines whether or not this parameter is visible to the user Note: This setting is recommended to be set to **true** when a user enters parameter values.
Name	Label that describes the parameter
Default data	Sets the default value of the parameter
User Editable (set to **true** or **false**)	Determines whether or not a user can edit the parameter set values
From Barcode (set to **true** or **false**)	Uses a QR code scan to fill in the parameter values See "Notes about using QR codes" below
Barcode Separator	What character (if any) is used to separate information in the QR code (only used when **From Barcode** is set to true)
Barcode Location	Designates the location in the QR code where the parameter value can be found (only used when **From Barcode** is set to true)
Barcode Length	If no QR code separator is used, designates the character length of the parameter value within the QR code (only used when **From Barcode** is set to true)

Notes about using QR codes

The following recommendations apply if you use a QR code to enter data:

- Data within the barcode must be ordered consistently and should have separators (such as a commas) between them. If separators are not used, then the field length (number of characters) for

each type of data must be consistent.
- The recommended size of a QR code is 7 mm square.

When using the QR code scan functionality during a process run, the scan can be overided by touching the red **X** during the barcode scan. The user is then prompted to enter the data manually.

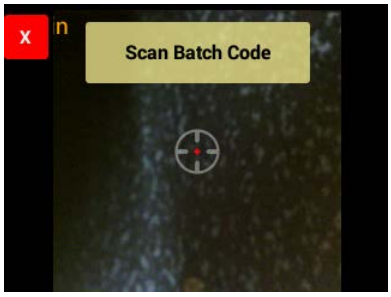


Fig. 54 - Cancel code scan

9.4 Auto Profile Selection via QR Code

This option allows an automatic selection of a surface profile via a QR code scan.

9.4.1 Enabling and Disabling Auto Profile Selection via QR Code

If Auto Profile Selection via QR Code is already set-up to read a QR code, go to Menu screen page 8 ⇨ **Profile Menu Options**.

Set **Barcode read for profile** to **true** to enable QR code scanning for surface profile selection. To disable this feature, set **Barcode read for profile** to **false**.

9.4.2 Setting up Auto Profile Selection via QR Code

In most cases, Auto Profile Selection via QR Code is already set up for you in the Surface Analyst. Follow these instructions if you want to set-up this feature on your own.

Supply a QR code for each surface profile

Create a QR code that contains at least the name of the surface profile you desire to scan. You can optionally include a note that will be saved by Archer as a drop note. (See the User Manual for information about using drop notes.) Other information can also be included in the code, but it will be ignored by Archer.

QR code requirements

- Each QR code must contain the exact name (case sensitive) of one of the available surface profiles loaded on the Surface Analyst as listed in Menu screen page 1 ⇨ **Surface Profiles**.
- Each QR code may contain an optional drop note. If one QR code includes a drop note, then all QR codes include a drop note.
- Data within the barcode must be ordered consistently and should have separators (such as a commas) between them. If separators are not used, then the field length (number of characters) for each type of data must be consistent.
- The recommended size of a QR code is 7 mm square.

Example

Fig. 55 shows a sample QR code generated using a free on-line application. In this example, the name of the surface profile is "Test Surface Profile", and the drop note text is "Drop note example". A comma

separates the drop note from the surface profile name.

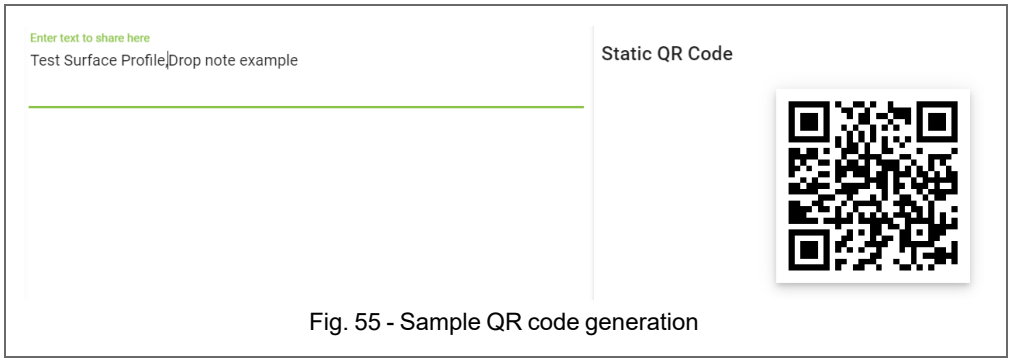


Fig. 55 - Sample QR code generation

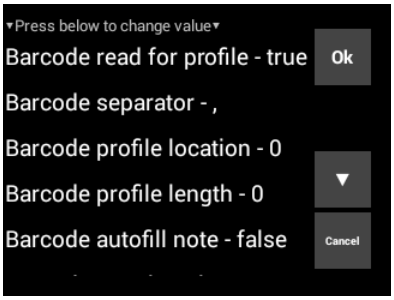
Surface Analyst Setup

The setup instructions refer to the example in Fig. 55 .

1. Go to Menu screen page 8 ⇨ **Profile Menu Options**.

   Set **Barcode read for profile** to **true** in order to enable the Auto Profile Selection via QR Code function.

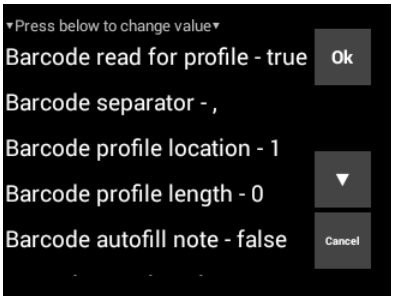
   Set the **Barcode separator** if a character is used to separate data within the QR code. In this example, the data is separated by a comma. If a separator is not used, leave this field blank.



2. Set the location of the surface profile within the QR code in the **Barcode profile location** field.

   In this example, the profile name begins in the first place of the QR code, so it has location of 1.

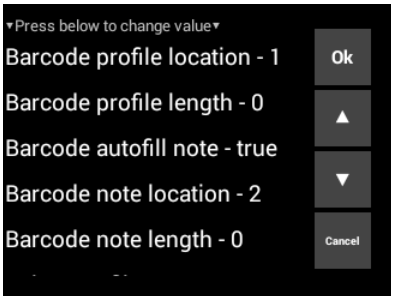
   If a separator is not used, then the length of the surface profile name is entered in **Barcode profile length**. Since a separator is used in this example, this field is left at zero.



3. If a drop note is included in the QR code, set **Barcode autofill note** to **true**. If no drop note is included, set this parameter to **false**.

   Set the location (and length if appropriate) of the drop note text in the **Barcode note location** and **Barcode note length** fields.

   In this example, the drop note is in the second location, since a comma is used as a separator. The length is left at zero.



4. Touch **Ok** to save the settings.

9.5 Dynamic Detection Image Processing

The Dynamic Detection feature offers upgraded and more powerful image processing tools, as compared with the Original image processing. The following advantages are realized with Dynamic Detection:

- Increased accuracy (especially for smaller drop sizes)
- Higher measuring speed
- Increased accommodation for movement during measurement-taking
- Greater flexibility with different surface types

The following table shows the differences between Original and the Dynamic Detection image processing.

Parameter	Original	Dynamic Detection	Dynamic Detection Chapter Reference
Image Averaging	x		N/A for Dynamic Detection
Image Alignment	x	x	"Image Alignment" on page 26
Blur Settings	x		N/A for Dynamic Detection
Image Subtraction-Mongoose Mode	x		N/A for Dynamic Detection
Image Subtraction-Glass Mode	x		N/A for Dynamic Detection
Auto Center	x	x	"Auto Center " on page 28
Constrain ADC	x		N/A for Dynamic Detection
Sum ADC	x		N/A for Dynamic Detection
Crosshairs position	x	x	"Crosshairs Position" on page 29
Dynamic Detection Center Finding Parameters		x	"Dynamic Detection Center Finding Parameters" on the next page
Dynamic Detection Edge Finding Parameters		x	"Dynamic Detection Edge Finding Parameters" on page 51
Scan Radius	x		N/A for Dynamic Detection
Pass Multipliers 1 Near, 1 Far		x	"Dynamic Detection Pass Multipliers" on page 52
Pass Multipliers 2 Near, 2 Far, 3 Near, 3 Far	x	x	"Pass Multipliers" on page 31
Outlier Rejection	x	x	"Outlier Rejection" on page 32
Ellipse Mode	x	x	"Ellipse Mode" on page 33

The following sub-sections describe the image processing parameters that are unique to Dynamic Detection. Refer to the above chapter references for information regarding the image processing parameters that are common to both the original image processing and Dynamic Detection.

9.5.1 Dynamic Detection Center Finding Parameters

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope: Profile specific
Description: The set of parameters listed in the following table control the behavior of the center finding algorithms.

Parameter	Application	
Center Minimum Diameter	Settings:	Min: 0, Max: 999 Expressed in pixels of diameter (image is 480 x 480 pixels). Default: 15
	Description:	Found objects which have smaller diameters in pixels (width or height) than this parameter will be removed during the non-relevant object removal process.
	Uses:	Filter out noise and satellites (small droplets).
	Considerations:	This parameter is useful when the main drop is off center and there are satellites (small droplets) which occur in the center.
Center Maximum Diameter	Settings:	Min: 0, Max: 999 Expressed in pixels of diameter (image is 480 x 480 pixels). Default: 370
	Description:	Found objects which have larger diameter in pixels (width or height) than this parameter will be removed during the non-relevant object removal process.
	Uses:	Filter out artifacts from movement or uneven lighting.
	Considerations:	This setting may need to be increased when working with extremely low contact angle inspections.
Center Merge All	Settings:	True, False Boolean value representing the merge method. Default: False
	Description:	Treat all remaining objects as a single object for the purpose of center location and drop size estimates. This takes the minimum and maximum dimensions of the individual object bounding boxes and makes a new bounding box which holds all the objects then uses that resulting larger box as the drop center and size.
	Uses:	When movement, lighting artifacts, or satellites are not expected to be present then this can be an easy way to merge objects which form a single drop (due to low contrast or lighting issues).

Parameter	Application	
Center Merge Distance	Settings:	Min: 0, Max: 500 Expressed in integer pixels of growth (image is 480 x 480 pixels). Default: 7
	Description:	Objects are grown by this amount and then whatever objects are left over after the growth cycle are then shrunk by this amount. Nearby objects are often merged into an unrecognizable mass which then shrinks back to the original size with a connection between the original found objects.
	Uses:	This is useful when there is expected that there might be clutter or movement artifacts which should be ignored, but the central drop is broken into pieces which need to be merged.

9.5.2 Dynamic Detection Edge Finding Parameters

Menu screen page 5 ⇨ **Image Processing / Profile Merge** ⇨ **Image Processing**

Parameter Scope: Profile specific

Description: The set of parameters listed in the following table control the behavior of the drop edge finding algorithms.

Parameter	Application	
Invert Finding	Settings:	Enable, Disable Default: Disable
	Description:	This changes the edge finding so it looks for the opposite intensity edges from normal finding.
	Uses:	This might be useful if the drop is always lighter than the background and so a white ring is always present at the edge of the drop.
	Considerations:	This parameter is rarely used.
Edge Width Filter	Settings:	Min: 1, Max: 99 – MUST BE AN ODD NUMBER Number of pixels to be averaged together across the width of the edge Default: 5
	Description:	This parameter provides filtering along the perimeter of the drop edge and will provide smoothing to the location of the found dots.
	Uses:	This provides the ability for bridging small gaps in the drop edge.

Parameter	Application	
Edge Length Filter	Settings:	Min: 3, Max: 99 – MUST BE AN ODD NUMBER Number of pixels to be averaged together across the length of the edge Default: 9
	Description:	This parameter is the kernel size used in the initial derivative calculation to find edges. This functionally works as a filter along the length of the edge.
	Uses:	This parameter makes the edge less sensitive to noise and "white snake" type edges parallel to the drop perimeter.

9.5.3 Dynamic Detection Pass Multipliers

Menu screen page 7 ⇨ **Blur/Pass Multipliers** ⇨ **Pass Multipliers**

Parameter Scope: Profile specific

Description: The pass multipliers limit the area of drop edge detection by defining an area bounded by a minimum and maximum radius.

Parameter	Application	
1 Near, 1 Far	Settings:	Near Min: 0, Max: 1 Far Min: 0, Max: 2 Multiplier based upon the center locator size estimation. Default: Near .25, Far 1.5
	Description:	The 1 Near, 1 Far parameters use the center finding estimated size . The edge tools will only return results in between the two circles generated by these parameters.
	Uses:	The Near Pass Multipliers limit the chance of finding an edge inside the drop. The Far Pass Multipliers limit the chance of finding an edge outside the drop.
	Considerations:	Normally the near parameter will be a number < 1 so it is inside the estimated drop size. Normally the far parameter will be a number > 1 so it is outside the estimated drop size.

Parameter	Application	
2 Near, 2 Far 3 Near, 3 Far	Settings:	Near Min: 0, Max: 1 Far Min: 0, Max: 2 Multiplier based upon the last edge finding pass. Default: 2nd Near 0.5, 2nd Far 1.4 Default: 3rd Near 0.8, 3rd Far 1.3
	Description:	These parameters use the last finding pass.The edge tools will only return results in between the two ellipses generated by these parameters.
	Uses:	The Near Pass Multipliers limit the chance of finding an edge inside the drop. The Far Pass Multipliers limit the chance of finding an edge outside the drop.
	Considerations:	The third pass near and far parameter is also used when more than three passes are required for the drop edge to become stable. Normally the near parameter will be a number < 1 so it is inside the estimated drop size. Normally the far parameter will be a number > 1 so it is outside the estimated drop size.

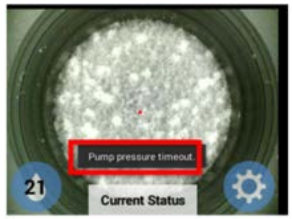
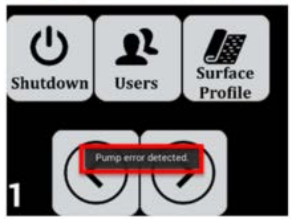
10 Troubleshooting

If you have difficulties in the functioning of the Surface Analyst, consult this troubleshooting guide to help solve the problem.

This guide is separated into sections by problem type to help you find the information you need easily.

If you do not find your problem here or you continue to experience difficulties, contact Brighton Science at 513.469.1800.

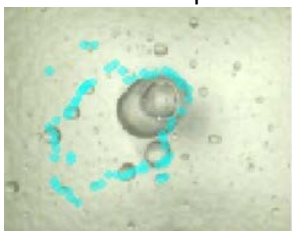
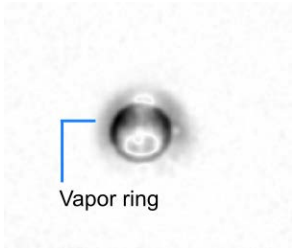
10.1 General Operation

Problem	Cause	Solution
Loss of power	Battery is not fully engaged.	Press the both ends of the battery into the Surface Analyst to make sure it is fully engaged.
	Battery is discharged.	Charge the battery.
	AC adapter is not fully connected.	Check the connection of the AC adapter to the Surface Analyst. Check to make sure the AC adapter is plugged into a functioning outlet.
Pump pressure error   	The pumping system is malfunctioning.	Do a hard reset.  If the problem persists, contact Brighton Science.

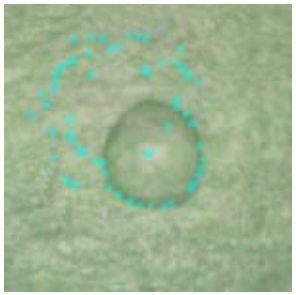
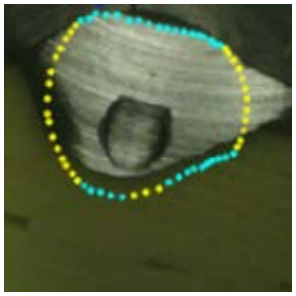
Problem	Cause	Solution
Surface Analyst does not respond.	System needs re-setting.	Do a hard reset.  If the problem persists, contact Brighton Science.
Power is on, but Surface Analyst does not boot up	Micro USB cable is connected with a computer.	Disconnect the Surface Analyst from the computer and turn off the Surface Analyst before restarting.

10.2 Drop Dispensing

Problem	Cause	Solution
Intermittent drop dispensing or drop splattering	Cartridge is nearly empty or is dried out due to non-use.	Change the cartridge. If the problem persists, contact Brighton Science.
	Air is in the line.	Perform an extended purge. If necessary, perform a continuous purge next.
Excessive, large satellites (small droplets surrounding the main drop)  Small satellites usually do not affect contact angle results.	Air is in the line.	Perform an extended purge. If necessary, perform a continuous purge next.
	Valve period needs adjusting.	Contact Brighton Science for assistance.

Problem	Cause	Solution
Air bubble in drop  Air bubbles usually only affect contact angle results for contact angles above 50 degrees.	Air is in the line.	Perform an extended purge. If necessary, perform a continuous purge next.
Vapor ring is present and is causing bad drop detections. 	Drop settle time is too short.	Increase the drop settle time by .05 seconds.
Fluid does not dispense, and there is a droplet that forms at the nozzle. 	There is a failure of the equipment.	Perform a continuous purge. If the problem persists, contact Brighton Science.

10.3 Drop Detections

Problem	Cause	Solution
Drop detection does not match up with the drop outline 	The feet or base of the inspection head was not in firm contact with the surface during measurement.	Make sure to hold the inspection head squarely against the surface. Do not move the head during the measuring process.
	Auto Drop Center is disabled	Enable Auto Drop Center (ADC)
Drop detection is inside the edge of the droplet. 	If this happens regularly, the Near Pass Multiplier setting needs to be adjusted.	Increase the Near Pass Multiplier (3 Near)
Drop detection is outside the edge of the droplet. 	If this happens regularly, the Far Pass Multiplier setting needs to be adjusted.	Decrease the Far Pass Multiplier (3 Far).

10.4 Results

Problem	Cause	Solution
The Surface Analyst is not reporting the expected results. Contact angles are consistently too high or too low.	Over time, the Surface Analyst needs to be fine tuned for optimal performance.	Do a performance verification check with a new PCS card.

brighton-science.com