DISPLAX

DISPLAX CONNECT

Version 2.2

USER GUIDE

LARGE MULTITOUCH PROJECTED CAPACITIVE

DOCUMENT REVISION HISTORY AND APPROVAL

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PRODUCT COMPLIANCE

DISPLAX is a certified company under the ISO 9001:2015 standard which establishes the requirements for a quality management system, meaning that our R&D, production, support, sales, marketing, finance and human resources processes, are organized around quality management practices to guarantee the effectiveness of our work and the satisfaction of our clients.

Our products are compliant with RoHS - Restriction of Hazardous Substances, meaning that they do not contain substances which might put at peril the product users, they are also compliant with the Electromagnetic Compatibility Directive 2014/30/EU, meaning that they can be integrated with other electronic components without provoking interferences over the regular functionality of other components or parts.

All our products have the CE certification mark, which can be ascribed to our products since they are compliant with RoHS and with the Electromagnetic Compatibility Directive 2014/30/EU, and they are developed, manufactured and supported under a certified quality system.

USER GUIDE

This user guide is intended for users of all levels.

Please note that there are a wide range of videos and support tools, and our support team is available to help you make the best of your product.

For more information consult our support webpage:
https://support.displax.com/

If you need help, please submit a ticket:
https://tickets.displax.com/portal/newticket

Our support team is pleased to help you.

DISPLAX CONNECT DOWNLOAD

Download and install the DISPLAX Connect software:
https://support.displax.com/private-area/downloads/displax-connect/displax-connect-2-2/

DISPLAX CONNECT

OVERVIEW

'DISPLAX Connect' is the control panel software developed for Displax touch products to control touch detection, as well as offering a wide range of setup and configuration options as described below.

Touch detection is obtained by manually or automatically configuring gain, threshold and shield level.

a) Gain adjusts the signal strength injected in the Touch Sensor.
b) Threshold defines the threshold level below which electromagnetic interference in the Touch Sensor must be rejected. Events which are higher than the threshold are then detected as a touch interaction.
c) Shield is a filter of electromagnetic interference, which can be defined when the normal threshold rejection of interference is not sufficient.

'DISPLAX Connect' includes several tools to optimize the touch experience, some of them are:

a) 'Configuration wizard' to automatically configure the touch parameters, namely Gain, Threshold and Shield level. If the configuration wizard fails the touch parameters must be configured manually. Currently the configuration wizard is only recommended for a regular setup, one LCD and one Skin Touch Sensor. Configuration wizard is not available for Skin Dualtouch;
b) 'Palm' to define a rejection area when touching the sensor with a palm or arm (feature not available in Skin Dualtouch);
c) 'Sensor' to enable or disable touch sensor electrodes and to define areas of no touch detection;
d) 'Geometric calibration' to physically match the touch sensor position with the display;
e) 'Advanced calibration' to match the touch sensor position to more than one display or to calibrate a touch sensor area which is smaller than the LCD;
f) 'Optimization' to increase either touch speed or touch precision;
g) 'Number of touches' to define the number of touches to be detected; Can be less than the number supported by the product.
h) 'TUIO' a touch transmission protocol, is embedded in Displax Connect, no external bridge is required, and is used to recognise touches in Mac OS, it is also used for object recognition;
i) 'Object recognition' to recognize objects which can be placed on top of the sensor along with regular touches from fingers (feature only available for Skin Ultra up to 55'');
j) 'Touch test app' a viewing application to analyse touch detection information;
k) 'Security pin' to lock the touch parameters;

l) 'Save and load settings file' to save a file with the touch parameters to be uploaded in identical setups;
m) 'Factory reset' to reset the factory settings;
n) 'Help' shortcuts and information.

OPERATING SYSTEMS

'DISPLAX Connect' runs on Windows (7 or higher), OS X (Yosemite and El Capitan) and Ubuntu (14.04 LTS). The Skin unit must be configured using one of these Operating Systems.

Once the configuration is satisfactory the SKIN can be connected to a PC with a different OS, if it is supported by the Touch Controller. This is possible since the configuration settings are stored in the Touch Controller.

To see the list of all supported OS, please consult the product Spec File.

To configure 'DISPLAX Connect', it is required to have a keyboard and a mouse.

The following instructions refer to the 'DISPLAX Connect' versions 2.0 or higher, for Skin Ultra, Skin Fit and Skin Dualtouch.

MINIMUM REQUIREMENTS

Minimum requirements to run 'DISPLAX Connect' are:

RAM: 2 GB

CPU speed: 1.33 GHz

Graphic card supporting: Open GL 2.0

Minimum free disk space: 300MB

Supported OS: Windows (7 or higher); OS X (Yosemite and El Capitan); Ubuntu (14.04 LTS)

Note:

Avoid using frontal USB ports on desktop PCs. Traditionally these ports do not comply with USB standards and may not provide enough power for the Skin product to run properly.

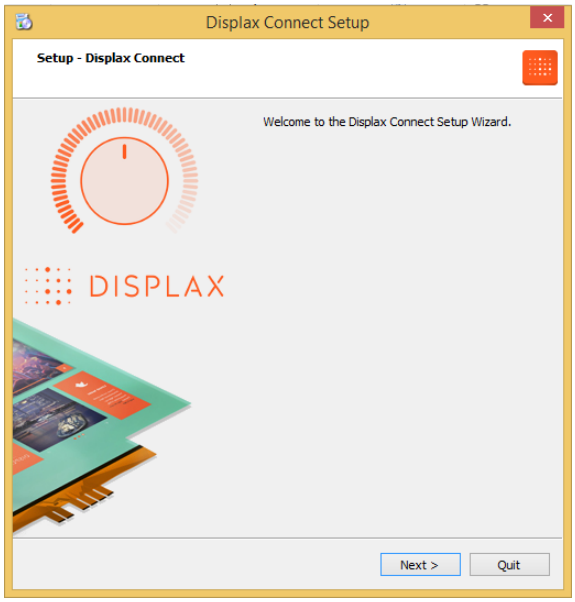
HOW TO INSTALL: WINDOWS 7 OR HIGHER

Note: Run the 'Displax Connect' installation process, after completing the installation, connect the Touch Controller to a PC.

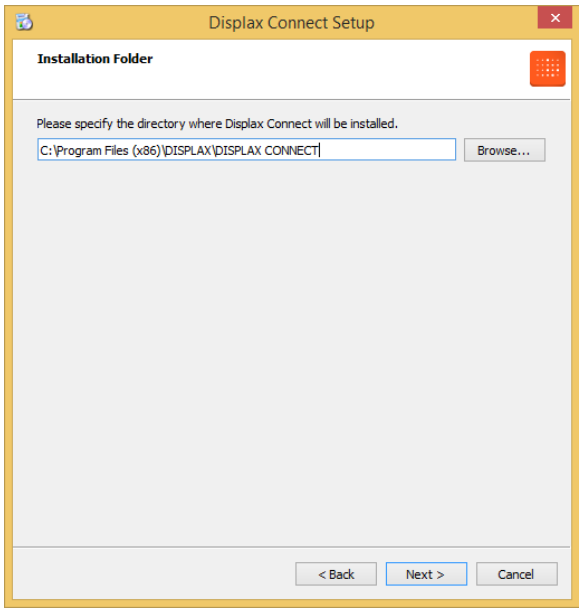
Installation process:

To run 'Displax Connect' double Click the '.exe' file to start the installation process.

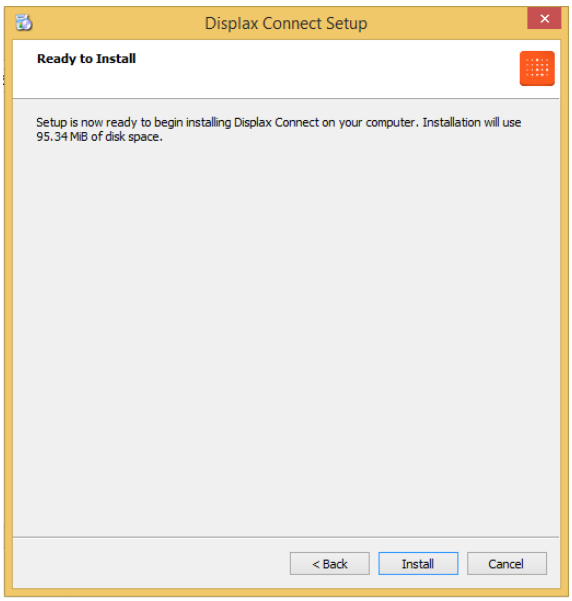
An installation window will be displayed.
Click 'Next' to start the installation process.



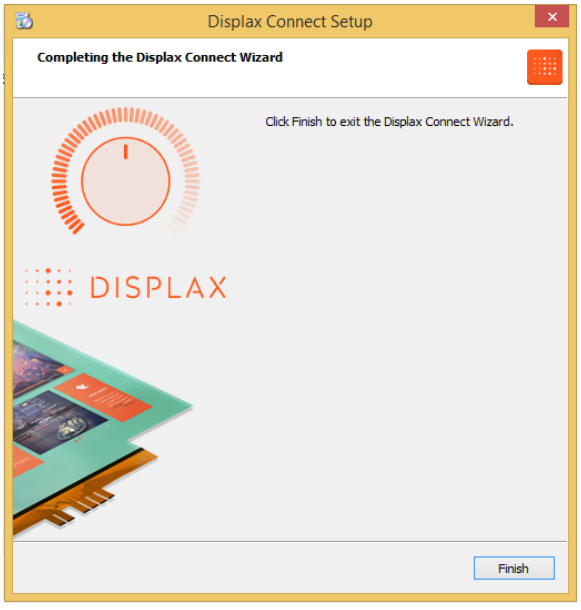
Specify the directory where 'Displax Connect' will be installed, by default, the 64 bits version is installed in the folder 'Program Files (x86)', the 32 bits version is installed on the folder 'Program Files'.



Click 'Install' to begin installing 'Displax Connect'.
The installation will use 95,34 MB of disk space.



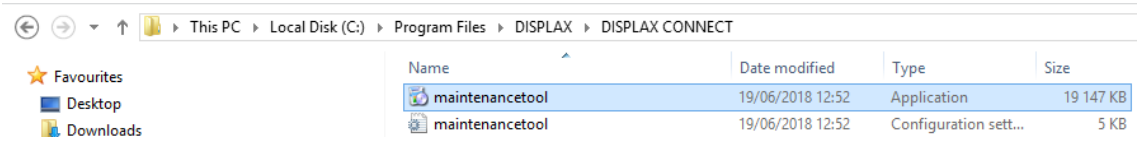
Click 'Finish' to exit the 'Displax Connect' wizard.



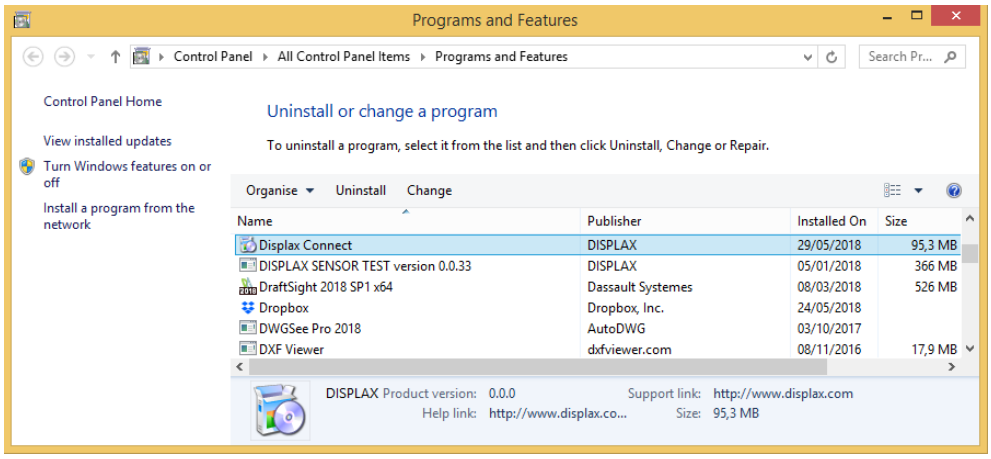
HOW TO UNINSTALL: WINDOWS 7 OR HIGHER

To uninstall 'DISPLAX Connect' you can use one of two processes:

1) You can use the 'Displax Connect' maintenance tool which is in the folder where 'Displax Connect has been installed.

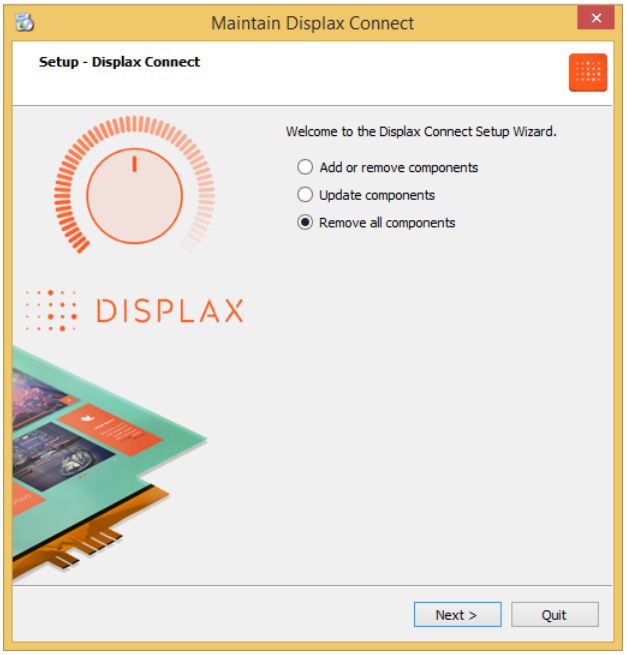


2) You can go to 'Control Panel\All Control Panel Items\Programs and Features', and select the 'DISPLAX Connect' application, then click the icon and select uninstall.



In the follow up of any one of these processes a message box will be displayed to define the change to be done.

Click 'Next' to implement the change.

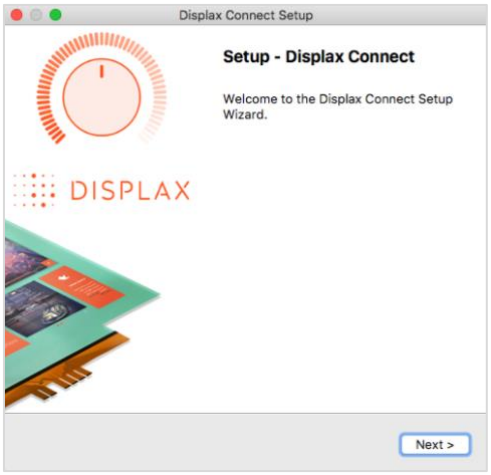


HOW TO INSTALL: MAC OS X

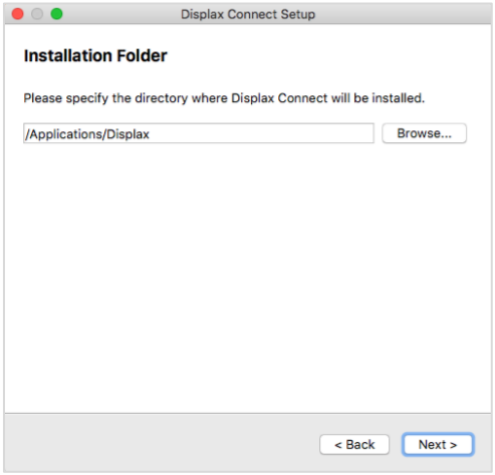
Double click the 'Displax Connect' file to start the installation process.

An installation window will be displayed, double click the 'Installer' icon to start the installation.

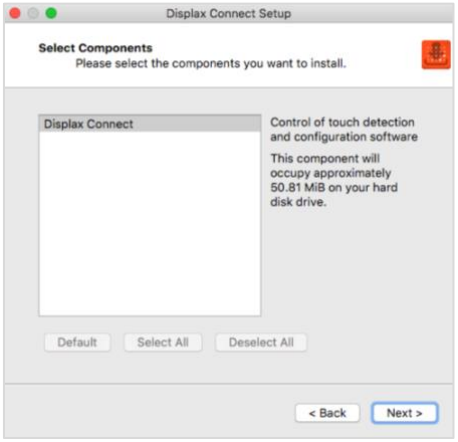
Click 'Next' to initiate the 'Displax Connect' setup wizard.



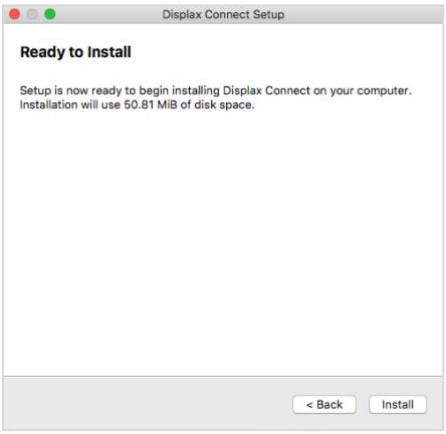
Specify the directory where 'Displax Connect' will be installed.



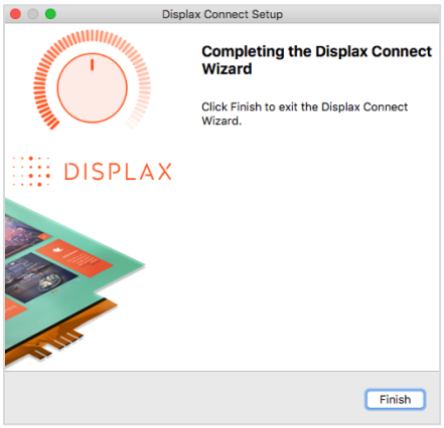
Select the components to be installed.



Click 'Install' to begin installing 'Displax Connect'.
The installation will use 50,81 MB of disk space.



Click 'Finish' to exit the 'Displax Connect' wizard.



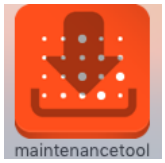
The OS X installation process is concluded.

Your setup is now working with native single touch, since Mac OS Operating System does not support multitouch. To use multitouch on Mac OS applications, you will need to use TUIO based applications. Please refer to the TUIO protocol chapter for more information on how to use TUIO.

Note: If you have a previous version of Control Panel called 'Skin Ultra Connect' it should be manually removed before installing the newest version of 'DISPLAX Connect', as shown in the instructions bellow.

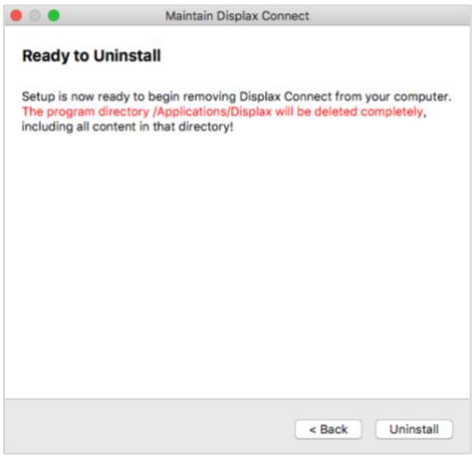
HOW TO UNINSTALL: MAC OS X

To uninstall 'DISPLAX Connect' double click the 'maintenancetool' which is in the folder where you have installed 'Displax Connect', as a default 'Displax Connect' is installed in the applications folder.

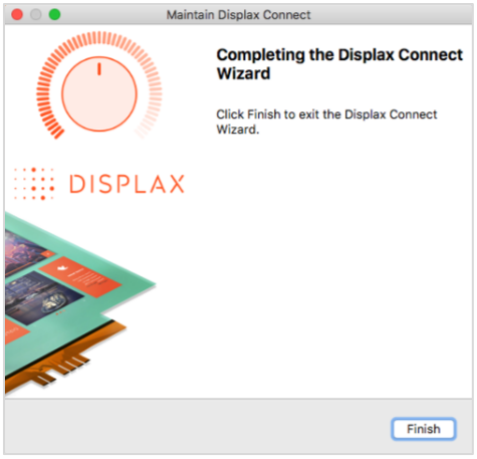


Select 'Remove all components' and click 'Next'.

An uninstallation note will be displayed, click 'Uninstall'.

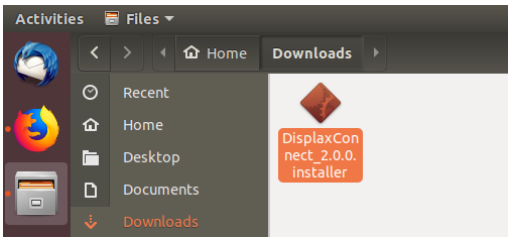


Click 'Finish' to exit the 'Displax Connect' wizard.



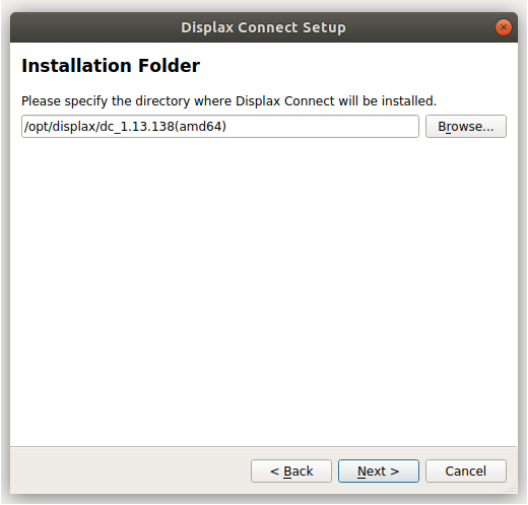
HOW TO INSTALL: UBUNTU

Double click on the 'Displax Connect' file to start the installation process.

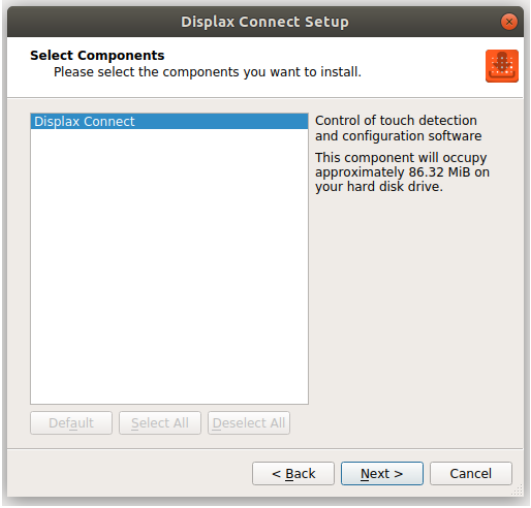


Click 'Next' to initiate the 'Displax Connect' setup wizard.

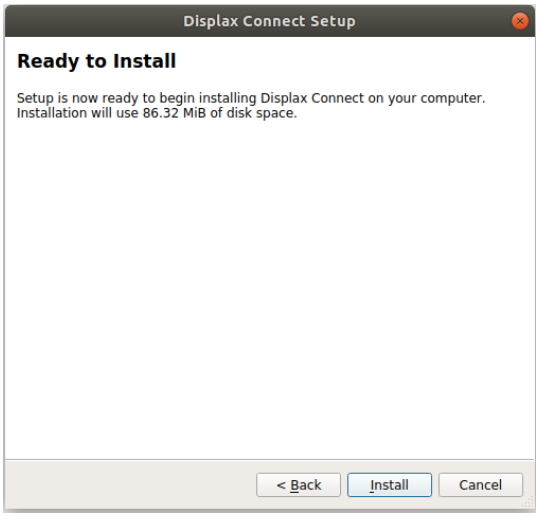
Specify the directory where 'Displax Connect' will be installed.



Select the components to be installed.



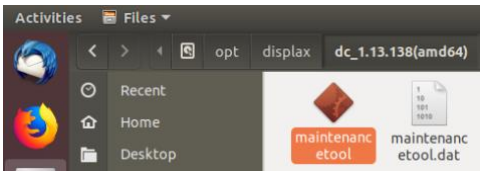
Click 'Install' to begin installing 'Displax Connect'.
The installation will use 86,32 MB of disk space.



Click 'Finish' to exit the 'Displax Connect' wizard.

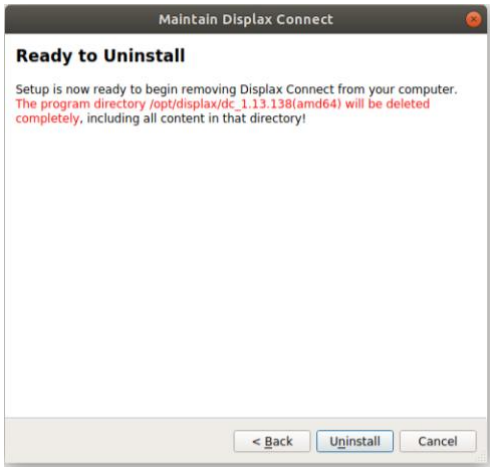
HOW TO UNINSTALL: UBUNTU

To uninstall 'DISPLAX Connect' double click the 'maintenancetool' which is in the folder where you have installed 'Displax Connect'.



Select 'Remove all components' and click 'Next'.

An uninstallation note will be displayed, click 'Uninstall'.



Click 'Finish' to exit the 'Displax Connect' wizard.

HOW TO INSTALL: ANDROID

You can install the Displax Connect app for Android via Google Play or the Displax support website:

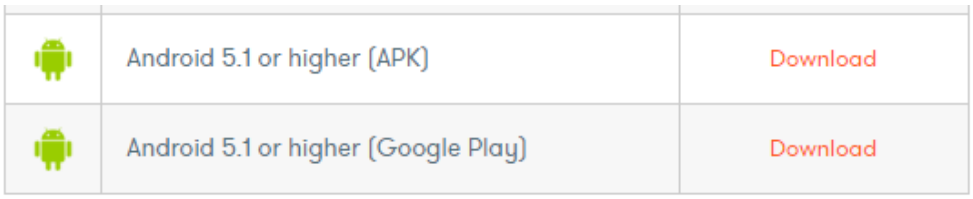
Google play:

https://play.google.com/store/apps/details?id=com.displax.displaxconnect

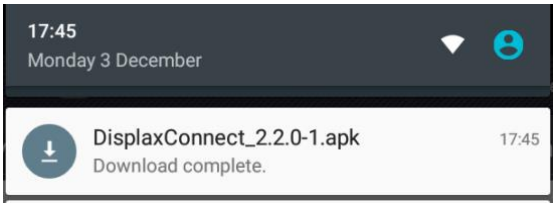
Displax Support website:

https://support.displax.com/private-area/downloads/displax-connect/displax-connect-2-2/

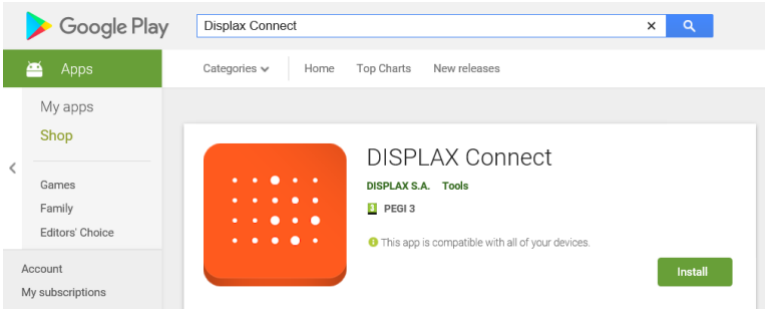
At the Displax Support website, you have two options:



1. Android 5.1. or higher (APK) – the Displax Connect application will be download to your device. Double click the file to install Displax Connect.

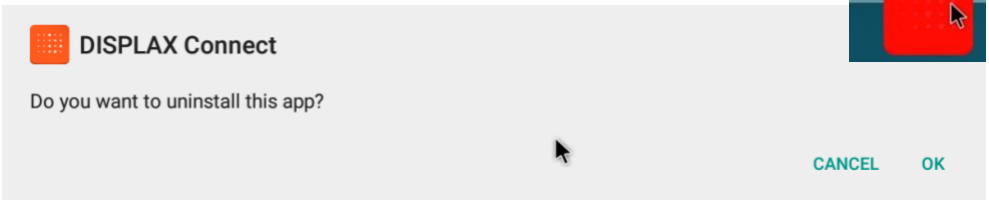


2. Android 5.1. or higher (Google Play) – you will be redirected to the Google Play store to install the Displax Connect application.



HOW TO UNINSTALL: ANDROID

To uninstall drag the Displax Connect icon to the trash box.

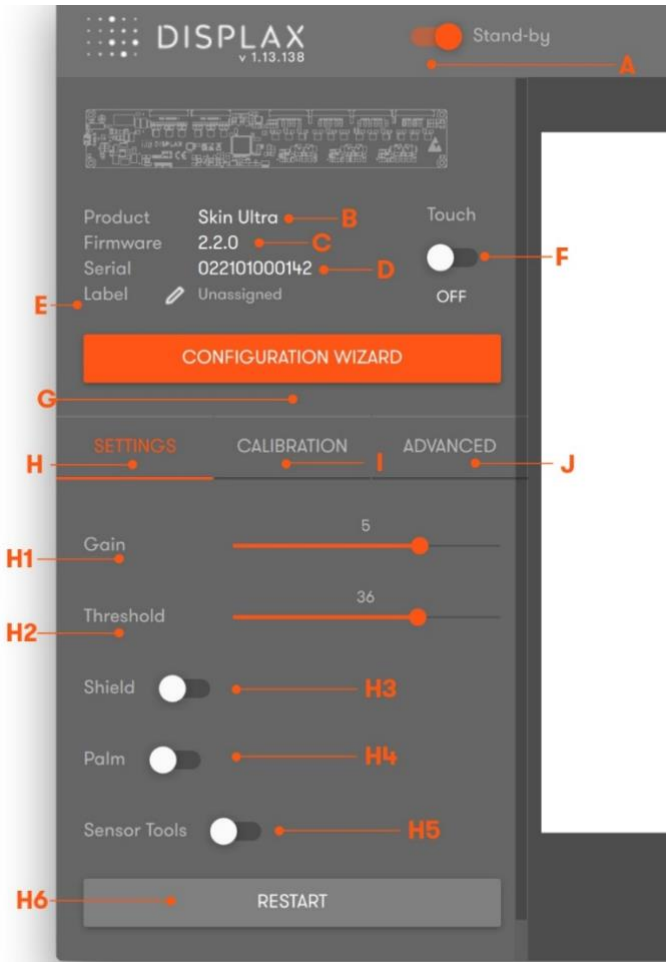


HOW TO USE 'DISPLAX CONNECT'

Displax Connect: index of features

Skin Ultra has all the following features.

If you have Skin Fit or Skin Dualtouch some features may not be available, whenever a feature is not available, a note is provided.



A. Stand by: the touch is temporally disabled when opening the control panel. This way, if you want to adjust a setting you will be able to do it without the touch being active. When you close 'DISPLAX Connect' the touch injection will be automatically re-enabled and the STAND-BY status will change to ON. This stand-by status is only active when 'DISPLAX Connect' is open.

B. Product designation.

C. Firmware version.

D. Product serial number.

E. Label: you can attribute a label to the touch controller.

F. Touch Injection Status: touch injection to the Operating System has 3 modes:

ON: Operating system will receive touch events from the Skin.

OFF: Operating system will not receive touch events from the Skin.

STAND-BY: Operating system will temporarily not receive touch events from the Skin. This way, if you want to adjust some setting you will be able to do it. When you close 'DISPLAX Connect' the touch injection will be automatically re-enabled and the STAND-BY status will change to ON. This stand-by status is only active when 'DISPLAX Connect' is open.

G. Configuration wizard: automatically configures the touch parameters i.e. Gain, Threshold, Shield level. If the configuration wizard fails the touch parameters must be configured manually. Configuration Wizard is not available for Skin Dualtouch.

Settings

H. Settings tab: touch configuration settings.

H1. Gain: adjusts the signal strength injected by the Touch Controller on the Touch Sensor - thicker glasses and bigger Touch Sensors may require a stronger signal (higher GAIN values). Gain values range between 0 and 7.

H2. Threshold: adjusts the threshold level of what is considered a touch. Values vary between 0 and 50 starting on firmware version 1.5.0. (0 to 15 on firmware version equal or previous to 1.4.0). (see graphical representation on page 29).

H3. Shield: electromagnetic shielding reduces noise that may exist between the Skin product and the LCD. Shielding level ranges between 1 and 6, with 6 being the strongest shielding level. The shielding level should be maintained as low as possible.

H4. Palm: allows the rejection of areas with dimensions larger than a finger, such as a hand or an arm. (Feature not available in Skin Dualtouch).

H5. Sensor tools: Allows enabling and disabling horizontal and vertical electrodes and the selection of areas to be activated or deactivated within the touch sensor active area.

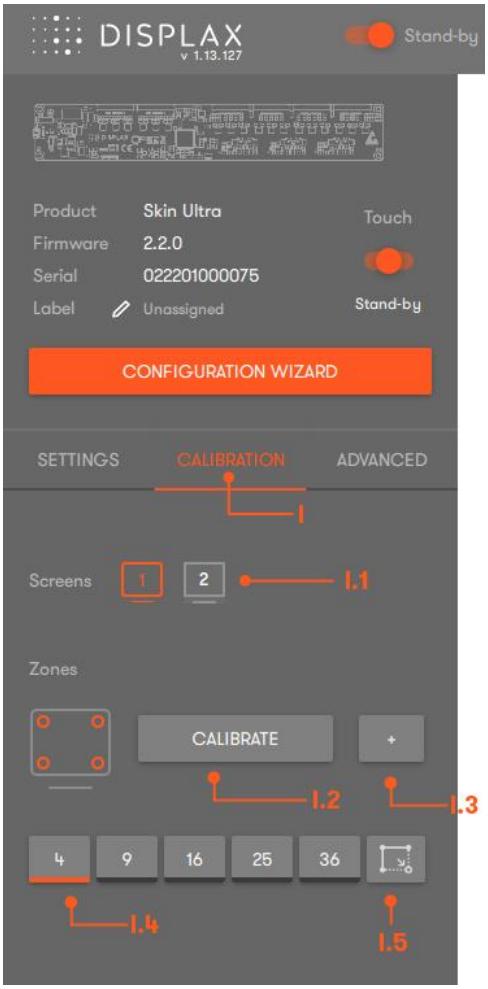
H5.1. Trash: reactivates the electrodes or electrode portions that we have deactivated.

H5.2. Rectangle selection: Enables drawing rectangular areas to be deactivated.

H5.3. Rectangular eraser: Allows the selection of areas to be reactivated.

H5.4. Draw selection: With the draw selection you can select parts of the active area to be disabled.

H5.5. Draw eraser: With the draw eraser you can select parts of the active area to be enabled.



Calibration

I. Calibration: Geometrical calibration process to match the physical touch with the Operating System digital coordinates.

I1. Screens: select the display where you want to perform the geometric calibration.

I2. Calibrate: Click the button to start the geometric calibration. For most scenarios 4 calibration points are more than enough.

I3. + Advanced geometric calibration.

I4. Calibration points: Number of points used to perform the geometric calibration. Please refer to the advanced calibration chapter.

I5. Drag mode: Calibration of a touch sensor smaller than the LCD. Please refer to the advanced calibration chapter.

Advanced

J. Advanced tab: advanced configuration tools.

J1. Optimization: establishes a balance between Touch speed and Touch precision.

J2. Number of touches: limits the number of touches reported by the Touch Controller (Skin Ultra: between 1 to 100 touches; Skin Fit: 1 to 40 touches; Skin Dualtouch: 1 or 2 touches). This feature is available depending on the Touch Controller version and firmware you are using.

J3. Load settings file: allows loading previously saved configuration files. The user must wait 10 seconds after changing settings, before changing to other settings, in order to correctly save them into the controller.

J4. Save current settings to file: Allows saving the current settings to be used in other configurations. This feature should be used with equivalent setups, i.e. same LCD, glass thickness and size, sensor size and air gap. Note that there may be other sources of electromagnetic interferences on each setup, and the settings may have to be adjusted.

J5. Load firmware: allows to load a firmware file to the Touch Controller. This feature can be used when there is no internet access onsite, if you have internet access you do not need to use this feature.

J6. Factory reset: sets the Touch Controller to its default settings.

View options

K. View options:

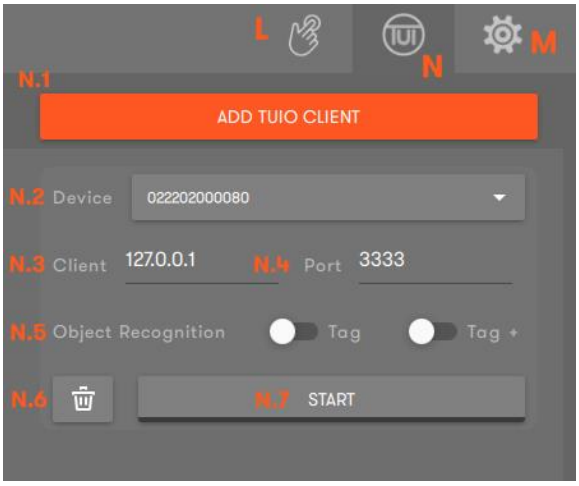
K1. Touches: enables and disables touch recognition.

K2. Frame: represents electromagnetic interferences over the touch sensor.

K3. Frame color: choose between, a white, black or green frame.

K4. Full screen: expand the view of the touch sensor active area.

Additional options



L. Touch test application: application where you can test the touch performance.

M. Security pin and help.

N. TUIO: TUIO is a touch transmission protocol.

N1. Add TUIO client: several TUIO clients can be added.

N2. Device: Touch controller serial number.

N3. Client: introduce the client IP.

N4. Port: introduce the client port number.

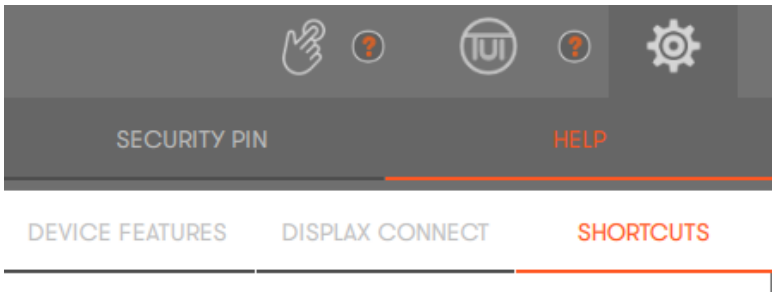
N5. Object recognition: activate or deactivate the object recognition feature. You must choose between Tag or Tag + (Feature not available in Skin FIT and Skin Dualtouch).

N6. Delete TUIO client.

N7. Start and Stop: starts or stops sending TUIO events from the chosen device to the defined client.

KEYBOARD SHORTCUTS

The keyboard shortcuts are presented on the Displax Connect right upper corner on the button containing an arrow.



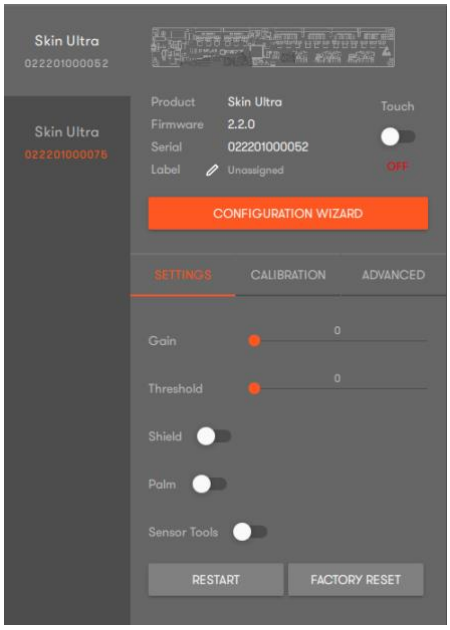
Click on the Help tab.

	SHORTCUT KEY	
ACTION	**WINDOWS**	**OS X**
Help Show/Hide	F1	F1
FullScreen	F11	Alt+F11
Show/Hide Tools	Ctrl+G	Ctrl+G
Toggle STDBY	Alt+S	Alt+S
Change frame view color	Alt+B	Alt+B
Enable/Disable capture frame view	Alt+F	Alt+F
Enable/Disable capture touches view	Alt+T	Alt+T
Next touch controller	Tab	Tab
Enable/Disable touch	E	E
Screen number calibration	Keys [1..n] (screen number)	Keys [1..n] (screen number)
Restart Touch Controller	R	R
Increase Gain	PageUp	PageUp
Decrease Gain	PageDown	PageDown
Increase Threshold	+	+
Decrease Threshold	-	-
Sensor tools	T	T
Enable/Disable Palm	P	P
Increase Palm area	Ctrl+P	Cmd+P
Decrease Palm area	Ctrl+O	Cmd+O
Enable/Disable Shield	X	X
Increase Shield	Ctrl+X	Cmd+X
Decrease Shield	Ctrl+Z	Cmd+Z
Load settings	Ctrl+L	Cmd+L
Save settings	Ctrl+S	Cmd+S
Load Firmware file	W	W
Touch Test	C	C
Show/Hide toolbar Tuio	Alt+O	Alt+O
Show/Hide Security Pin	Alt+P	Alt+P
Quit	Ctrl+Q	Cmd+Q

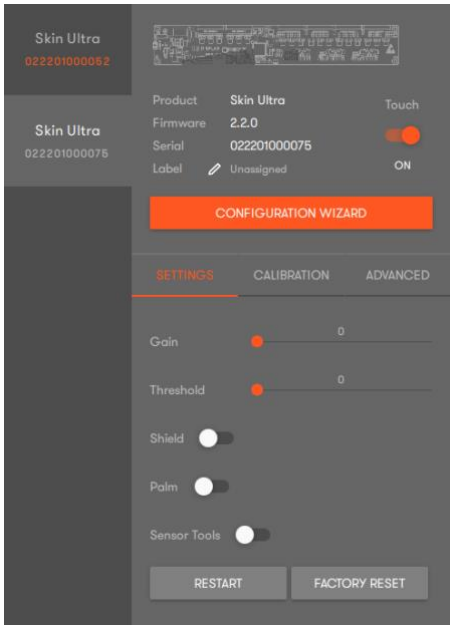
MULTIPLE DEVICES

Two or more units of a specific touch controller can be connected to the same PC. The number of units you can connect is limited by the number of USB connections you have on your PC. Make sure the USB ports used are compliant with USB standards and supply enough energy to power your Skin product.

If you have two units of your Skin connected to the same PC, 'DISPLAX Connect' will display two menus, one for each unit.



Two Skin Ultra connected
Skin Ultra serial number:
022201000052



Two Skin Ultra connected
Skin Ultra serial number:
022201000075

You can identify each unit by its serial number (in the side screen and in the Touch Controller menu). Another identification method is by labeling each controller, in the field 'label' you can assign a specific name to each controller. If physical access to the Touch Controller is not possible, an alternative method to identify it, is by unplugging one of the PC USB cables.

'DISPLAX Connect' will order the devices by order of connection.

WHAT IS CONSIDERED A GOOD TOUCH

Having a continuous touch detection while dragging your finger along the display, i.e. when the drag colour changes, it means that touch detection has been lost. With one finger 90° relative to the display and making minimal finger pressure test across the whole display area, both center and borders. Having continuous drag with 2 or more fingers, i.e. without losing touch detection, with fingers 90° relative to the display and making minimal finger pressure. Test across the whole display area, both center and borders.

Drag with each hand from opposite sides of the display, touching with 4 fingers in each hand, to the other side of the display (left hand drag from left to right; right hand drag from right to left), without losing touch.

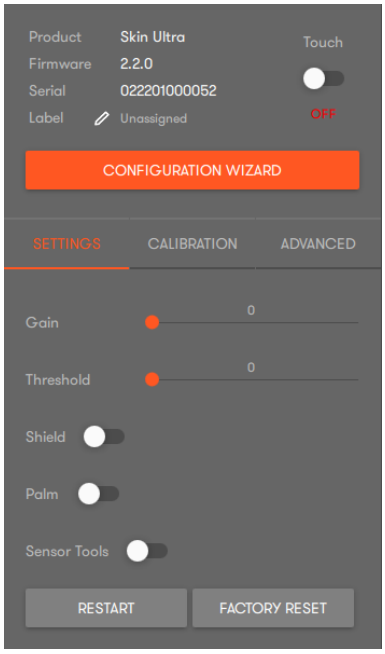
HOW TO CONFIGURE

Skin Ultra and Skin Fit can be configured either using the 'Manual configuration' or the 'Configuration wizard'.

Skin Dualtouch can only be configured manually.

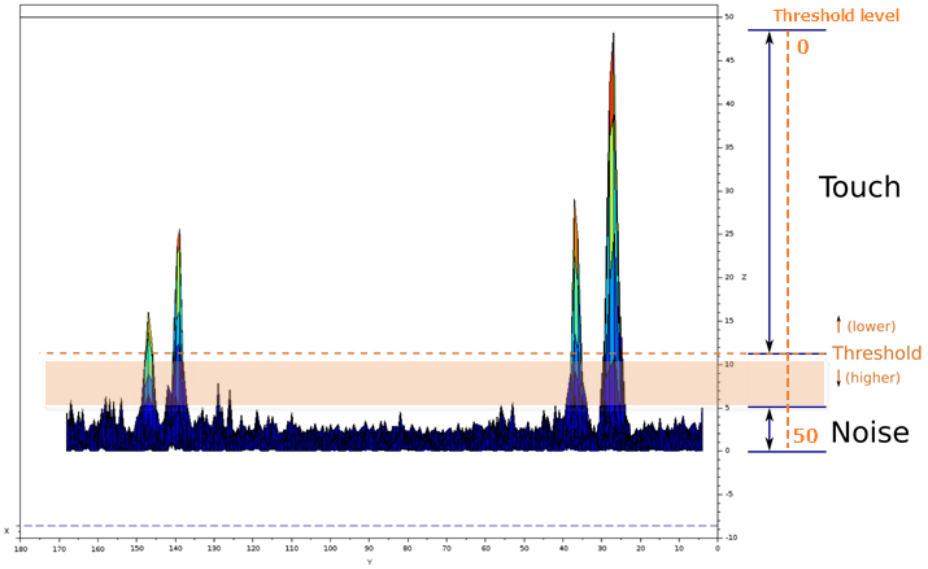
MANUAL CONFIGURATION

The first time you connect your Skin product to a PC you must adjust Gain and Threshold values to have touch recognition. You must also run the geometric calibration to physically match the touch sensor position with the display.



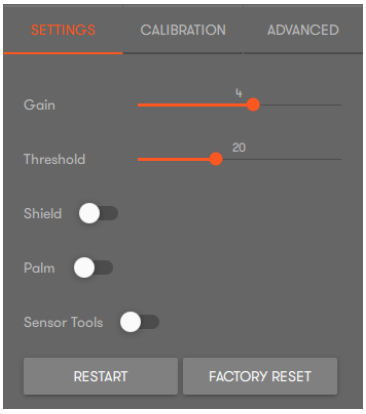
Gain: The Gain adjusts the signal strength injected by the Touch Controller on the Touch Sensor. Thicker glasses and bigger Touch Sensors may require a strong signal (higher Gain values). Gain values range between 0 and 7.

Threshold: When you touch the sensor with a finger or conductive object, an electromagnetic interference is generated which appears as a peak in the graph. The threshold level, which you have set, defines the interference level which is deemed to be considered a touch event. Higher levels of threshold allow the recognition of more sensitive electromagnetic interference, meaning that smaller peaks of interference can generate a touch. If the threshold is set too high (i.e. it is accepting smaller peaks) noise events may be recognized as touch events. The threshold values vary between 0 and 50 starting on firmware version 1.5.0. (firmware versions equal or previous to 1.4.0 the threshold varies between 0 and 15).



Set gain and threshold:

1. The Gain is dependent on the glass thickness, sensor size and energy power, the thicker the glass the higher the gain required. Start by keeping the Gain to a minimum value and then increase the threshold value until you have a good touch experience. If a good touch experience has not been achieved by increasing the threshold you can now increase the Gain.
   Note: Every time the Gain value is changed you need to wait 2 seconds before you can touch the screen (a 'do not touch' message will flash for 2 seconds).
2. Touch while increasing the Threshold until touch is detected.
3. Drag the touch and continue to increase Threshold until the drag is continuous. Make sure the drag is continuous in the whole Sensor, by testing thoroughly both the center of the Sensor and the borders. When the drag colour changes, it means that drag has been lost.
4. If the Threshold reaches its maximum value, and a good touch experience has not been achieved, increase the Gain one point, and set the Threshold to its minimum value, then repeat the process, from step 2. '*Touch the sensor while increasing Threshold until touch is detected*'.
5. Keep repeating the steps 2 and 3 until you achieve a good touch performance.



If you are experiencing difficulties achieving a good touch experience due to high electromagnetic interference levels (seen as visible grey dots along the touch sensor active area, further details in the "Shield section" bellow), you can activate the 'Shield' button or increase the air gap between the LCD and the laminated Touch Sensor to reduce the interference (increasing the airgap should be the first option, if you are about to integrate the Touch Sensor on an LCD).

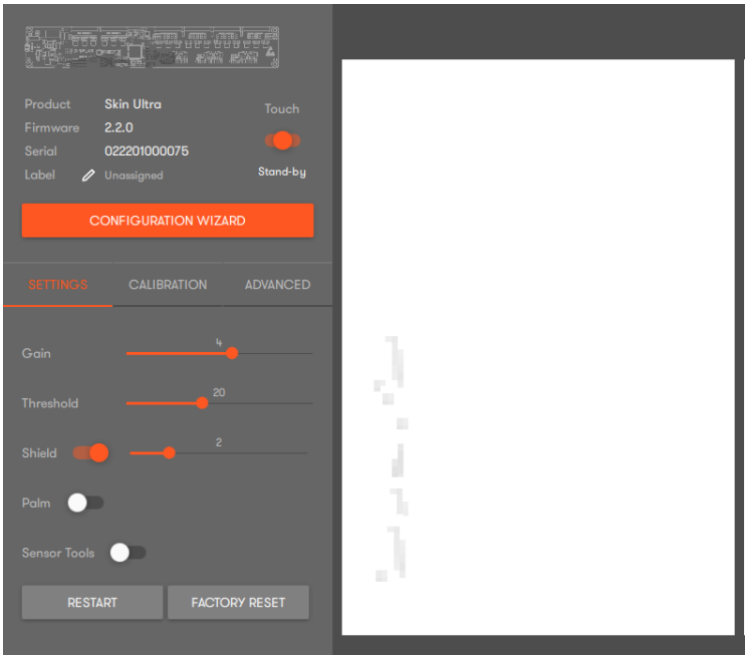
Air gap:

To mount the glass with the Touch Sensor on an LCD a suitable double sided bonding tape should be applied (see the integration guide) around the perimeter of the LCD such as 3MVHB tape.

This mounting procedure creates an air gap between the LCD and the Touch Sensor. This airgap is necessary to reduce electromagnetic interference from the LCD panel, this interference differ depending of the LCD panel characteristics. The air gap may vary between 1 and 10 mm and should be as small as possible once there is no noise visible in the touch signal. We recommend using an air gap of at least 2 mm. In all cases this should be checked before the final integration (i.e. test different airgaps by introducing a temporary object, like a non-adhesive foam or cork spacers along the LCD bezel, to adjust the distance between the LCD and the touch sensor laminated on glass and test the touch performance).

Shield:

Electromagnetic interferences are identified when visible grey dots are seen along the Touch Sensor borders or spread over the Touch Sensor active area.



As you increase the Shielding level, you are reducing the electromagnetic interference. The grey dots tend to disappear as the shielding level is increased. As a consequence, the touch recognition may be less sensitive. However, increasing the Shielding level may be required to avoid false touches. The shielding level should be maintained as low as possible.

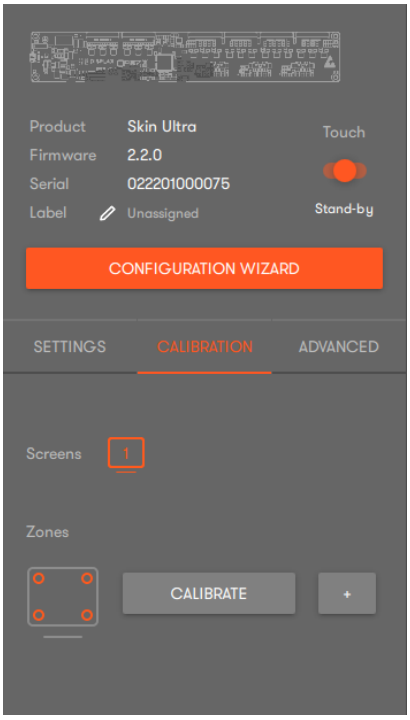
Touch injection:

During the initial configuration process, the touch injection is OFF, and 'DISPLAX Connect' limits the visualization to 20 simultaneous touches, even though your Skin product might support more (see the «Touch Injection Status» section on how to turn the injection ON after configuring the touch parameters).

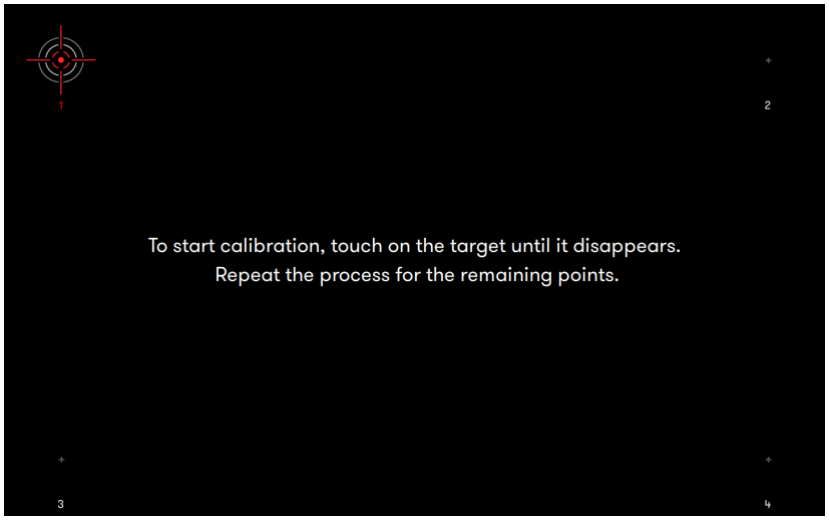
GEOMETRIC CALIBRATION

Once you have a good touch detection, start the Geometric Calibration and make sure you are as accurate as possible during this process.

Click 'Calibrate' if the Touch Sensor is associated with one LCD. If the Touch Sensor is placed over more than one LCD, or the touch sensor is being used in a rear projection setup, please refer to the advanced calibration.



A black screen with four calibration points will be displayed and an instruction will be presented '*To start calibration, touch on the target until it disappears. Repeat the process for the remaining points*'.



ADVANCED GEOMETRIC CALIBRATION

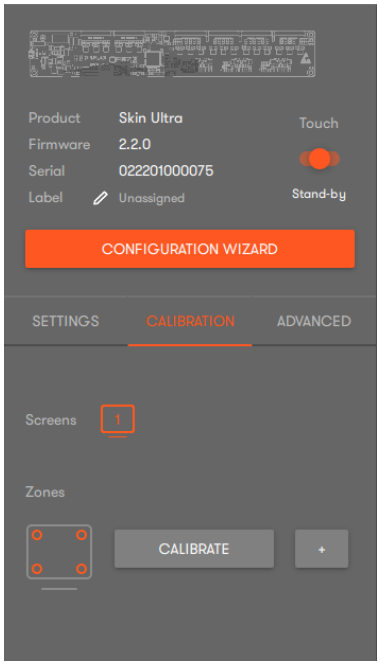
When a single sensor is used on top of two or more LCDs, to overcome the bezel between the LCDs you may have to use more than 4 calibration points.

In applications where we have a rear projection it is also useful to use more than 4 calibration points to improve the calibration precision.

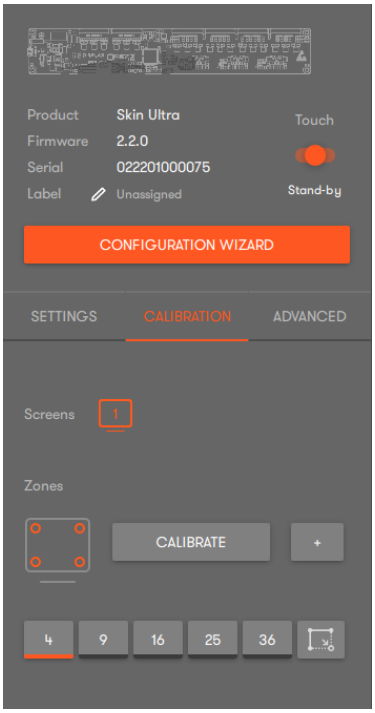
You can use 9, 16, 25 or 36 calibration points.

Notice that the use of more calibration points does not improve the calibration precision, the exception is for applications where you have a rear projection, since the projection Image may not be entirely flat.

To open the 'Advanced geometric calibration' click on the '+' button.



Regular calibration

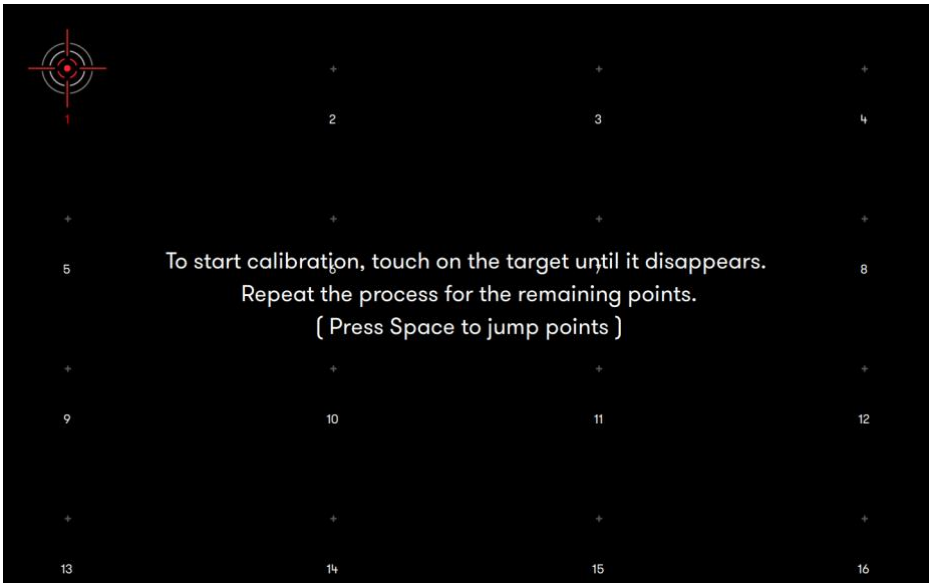


Advanced calibration

You can now select the number of calibration points.

When you select the number of calibration points, they will be shown on all LCDs in use. The optimal calibration is the one in which the points on the different LCDs are positioned almost in the same relative position on the different LCDs. The user should assess which combination of points (9, 16, 25 or 36) offers a closer equidistance of points between the two or more LCDs to obtain an optimal sensor calibration.

After selecting the number of calibration points a black screen with the chosen calibration points will be displayed and an instruction will be presented '*To start calibration, touch on the target until it disappears. Repeat the process for the remaining points*'.



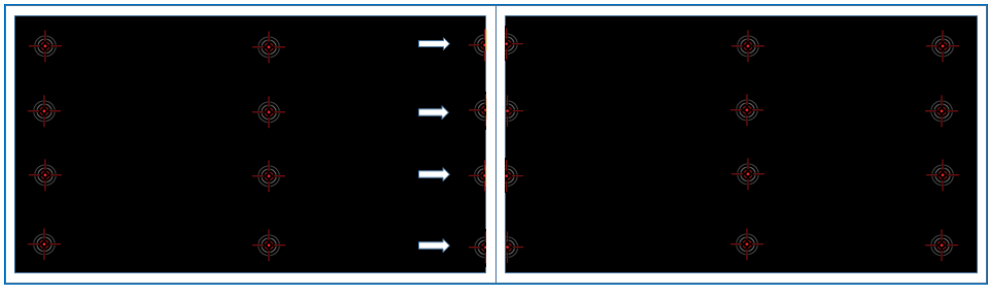
If some calibration targets are shown split between two or more LCDs, those calibration targets must be jumped (see example 1 and 2). Perform calibration point by point as normal, and when you reach to a split calibration point press space to jump it. Perform this action every time a calibration point is split between 2 displays.

Notice that depending on the number of calibration points chosen you must at least successfully complete the calibration of a number of targets which form an area comprising a certain number of squared areas. See the following table and example 3.

Number of calibration points	Required combination of squared areas defined by the targets position
9	2 squares
16	3 squares
25	4 squares
36	5 squares

Example 1 – one Touch Sensor on top of 2 LCDs

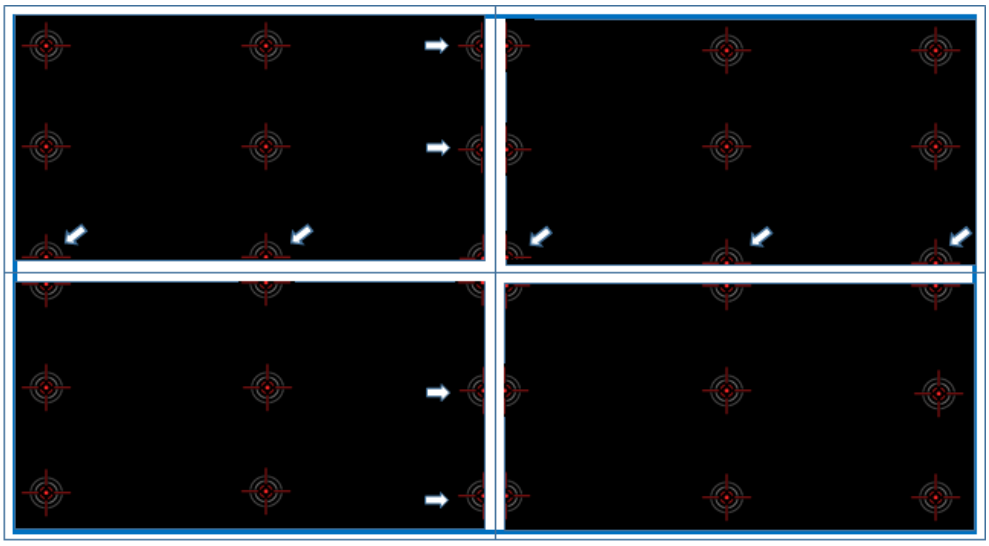
In this scenario, we may have calibration points split between the bezel of two LCDs.



Touch Sensor on top of the LCDs
2 LCDs
Geometric calibration target
Target to be jumped

Example 2 – one Touch Sensor on top of 4 LCDs

In this scenario, we may have calibration points split between four LCDs on a vertical and horizontal axis formed by the LCDs bezel.

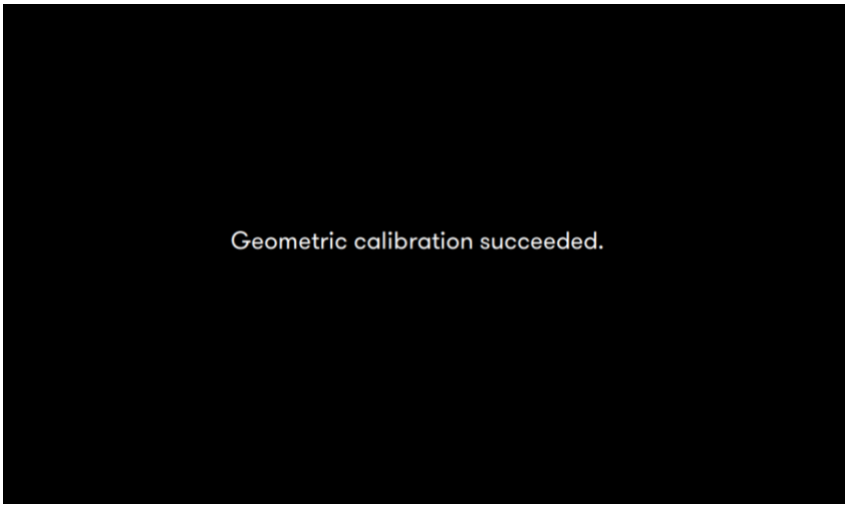


Touch sensor on top of the LCDs (1 unit)
LCD (4 units)
Geometric calibration target
Target to be jumped

Make sure you touch on the target center.

The geometric calibration is successful if all targets have disappeared. If one calibration target fails, after about 2 seconds, it will reappear.

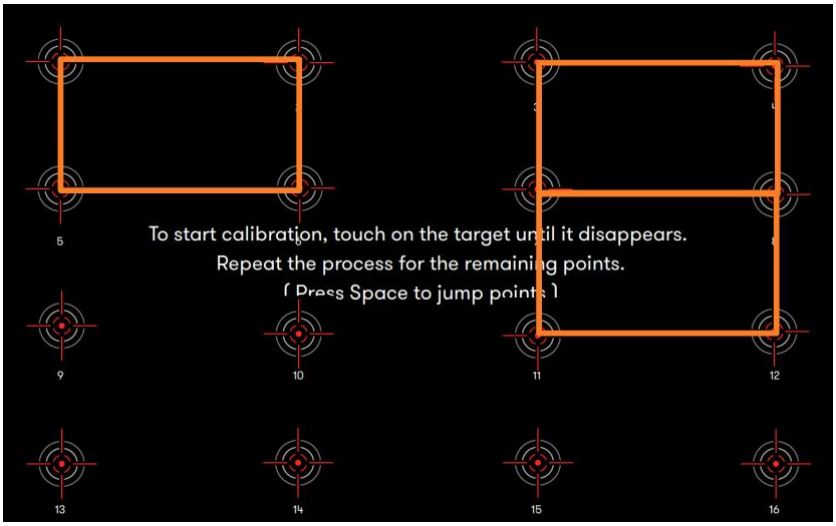
After touching all targets the Touch Sensor will be calibrated.



Example 3 – minimum combination of target forming squared areas

To calibrate the touch sensor you have a minimum number of square targets which are necessary to match the physical touch with the Operating System digital coordinates

A 16 targets calibration requires a combination of at least 3 squared areas formed by the targets position. The targets can be repeated, but at least three combinations of squares must be achieved.



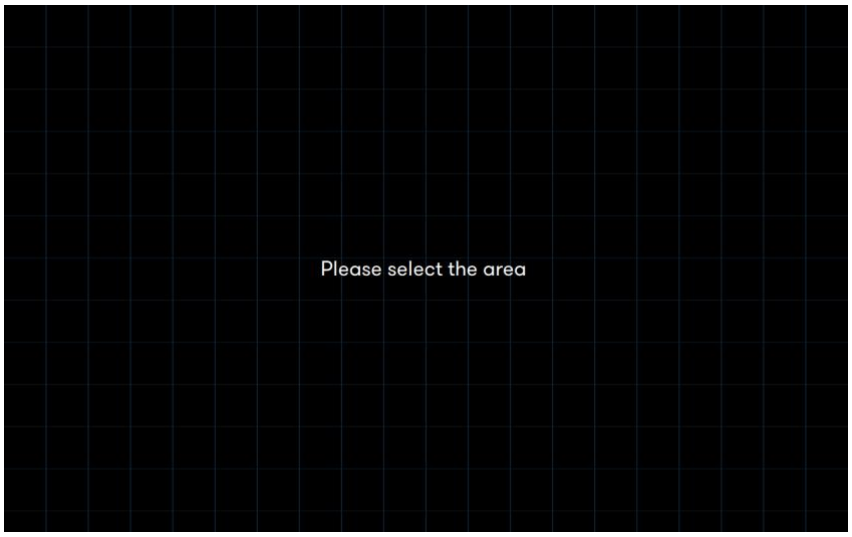
ADVANCED CALIBRATION – DRAG MODE

The 'Advanced calibration' drag mode is used when the active Touch Sensor area is smaller than the LCD.

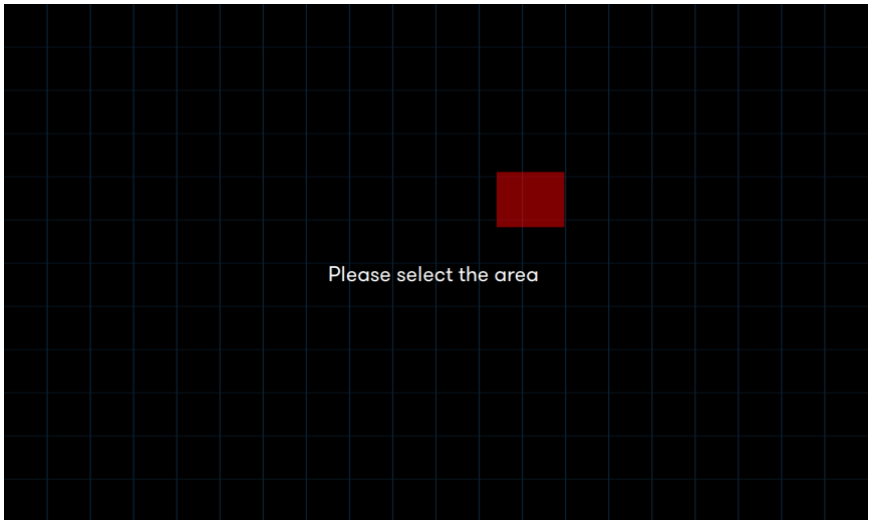
The 'DISPLAX Connect' control panel will be displayed on the entire LCD screen, but since the Touch Sensor is smaller than the LCD you must define the area which is being covered by the Touch Sensor.

To start the calibration process of custom areas, click on the 'Drag mode' button, the one containing a squared drawing and an arrow.

Immediately after clicking on the 'Drag mode' button a message will be displayed '*Please select the area*'.

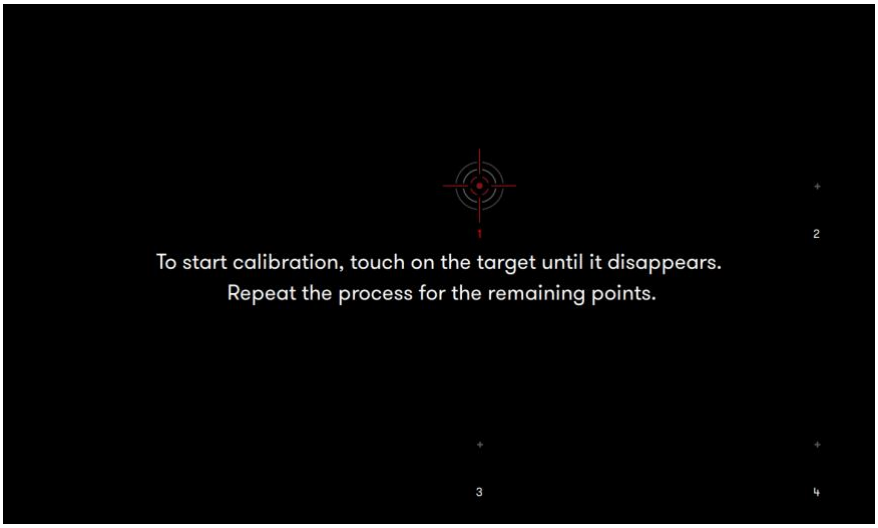


To select the area, click on the left button of the mouse at one of the Touch Sensor active upper corners, and then move the cursor on the diagonal towards the opposite lower corner of the Touch Sensor active grid. When you start selecting the area, you will notice a transition from a red area into a green area. A red area means that the area is too small for calibration.



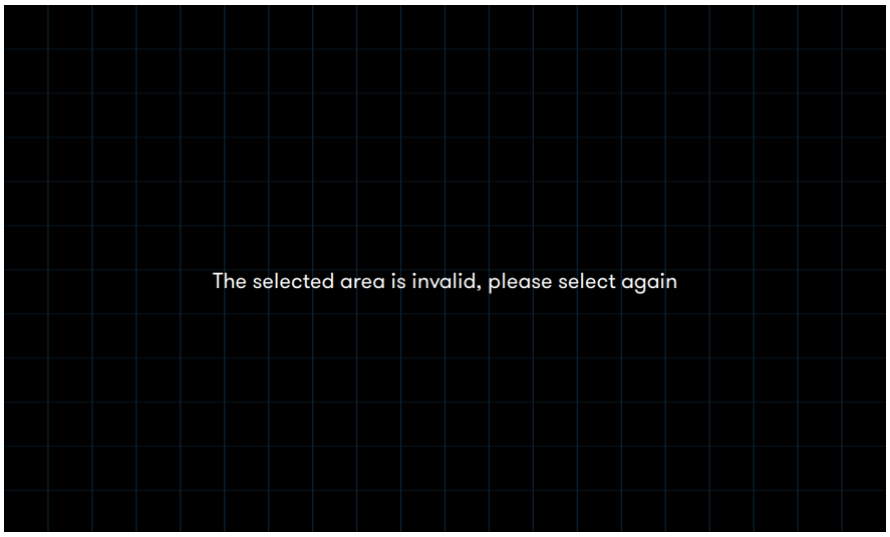
When the selected area is enough to be calibrated, the selected area turns green.

After lifting the finger from the left mouse button, an instruction message and four calibration points will be displayed – '*To start calibration, touch on the target until it disappears. Repeat the process for the remaining points*'.



By touching the displayed targets, you will be defining the Touch Sensor active area.

Note: When selecting a calibration area, an error message may be displayed '*The selected area is invalid, please select again*'.



This message can be displayed if you draw a very small area, in that case a red rectangle will be displayed which will be immediately followed by the above error message.

CONFIGURATION WIZARD

The 'Configuration Wizard' was developed to analyze the Touch module (one skin touch sensor laminated on glass and one LCD) and to configure the Touch Controller settings, namely: Gain, Threshold, Shield and Calibration.

'Configuration wizard' is available for these products:

1. Skin Ultra (Firmware 2.0 or higher)
2. Skin Fit (Firmware 2.0 or higher)

This feature helps you achieve a configuration based on objective data and not on subjective user inputs.

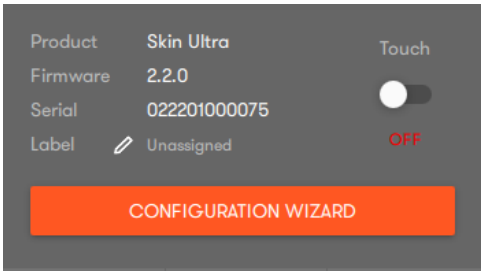
Having run the 'Configuration Wizard', if you want to, you can manually change the defined Gain, Threshold and Shield values.

Currently the 'Configuration Wizard' is only recommended for a regular setup, one LCD and one Skin Touch Sensor.

The 'Configuration wizard' process runs in four steps:

1. Touch Controller: verifies the sensor integrity and checks if the FFCs are properly connected. Make sure that the touch controller is grounded;
2. Touch Sensor: verifies the integrity of the sensor electrodes and displays information regarding any vertical or horizontal electrode which might be defective;
3. Configuration: checks the electromagnetic interference level that may exist between the LCD and the touch sensor active area, and establishes a relation between the analyzed data and the touch contact, to select the best Gain, Threshold and Shielding level;
4. Calibration: geometric calibration process to match the physical touch with the Operating System digital coordinates.

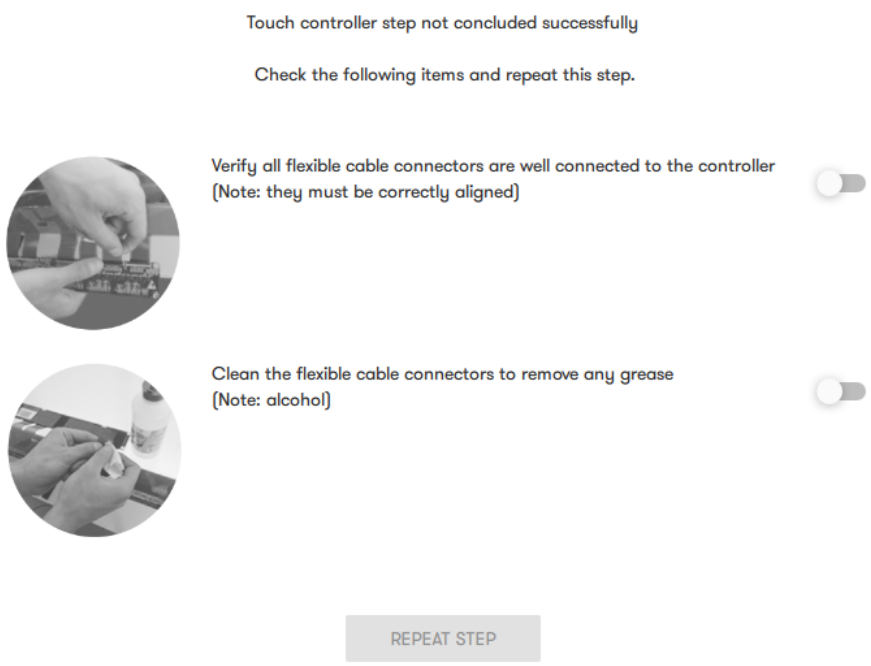
Click on 'Configuration Wizard' to start this process.



1. TOUCH CONTROLLER

Verifies which controller is being used and if the Flexible Flat Cables (FFCs) are properly connected to the Touch Controller.

The Touch Controller step will fail either if the FFCs are not properly connected or if they are not aligned. It can also fail if the Touch Controller is not properly grounded, make sure that it is grounded.

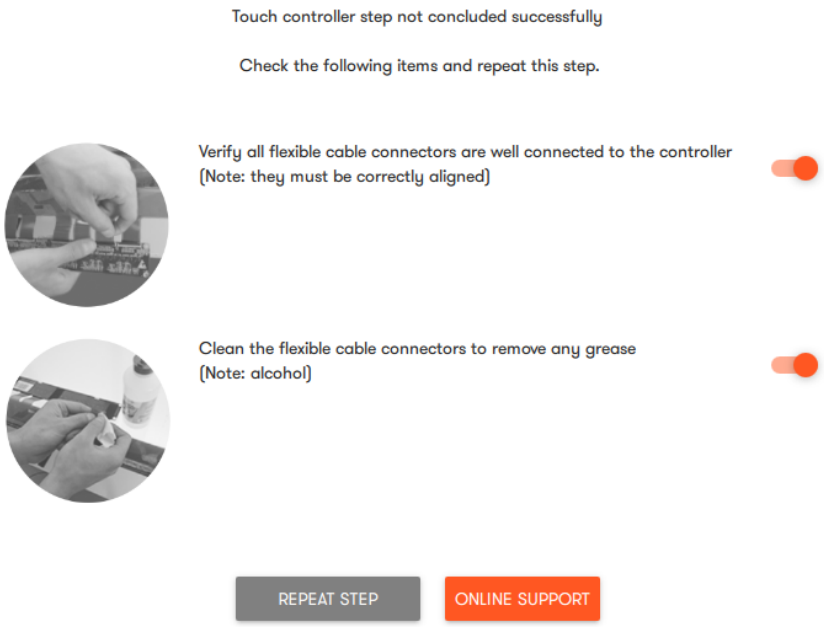


To proceed, you must toggle two items, each one referring to a specific action:

1. Verifying all flexible cable connectors to ensure they are well connected and aligned to the touch controller;
2. Cleaning the flexible cable connectors to remove any grease.

Having toggled the two items, their state will be altered to 'Done' and the 'REPEAT STEP' button will be enabled, allowing to proceed to the next step of the configuration wizard.

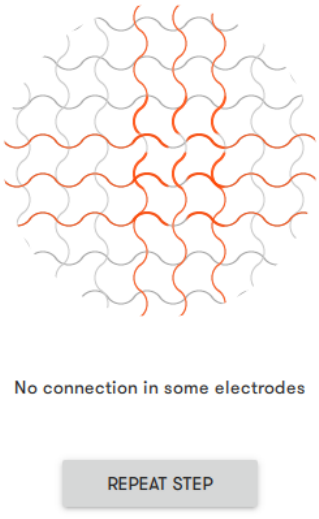
If the process fails for a second time the following screen will be displayed and you can either 'Repeat step', go to 'Online support' or 'Cancel' the configuration process and proceed with the manual configuration.



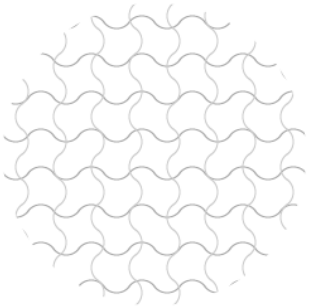
2. TOUCH SENSOR

Tests the integrity of the sensor electrodes.

If any interference is detected you will be required to repeat the test.



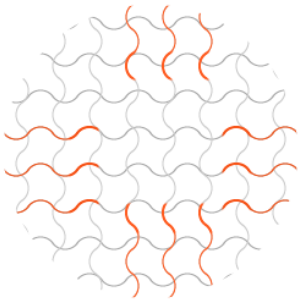
After repeating the step if it does not proceed you can either repeat the step or click in other options.



No connection in some electrodes

REPEAT STEP | OTHER OPTIONS

If you click in other options you can either "Disable unconnected electrodes" or click 'online support'.



No connection in some electrodes

REPEAT STEP | DISABLE UNCONNECTED ELECTRODES | ONLINE SUPPORT

If you click 'Disable unconnected electrodes' the electrodes which are not being properly detected will be disable, after running the configuration wizard you must test the sensor, to check if the touch is being adequately processed throughout the whole horizontal and vertical perimeter of the touch sensor. If you click 'Online Support' you will be redirected to the Displax tickets website, where you can request help to configure your touch sensor.

3. CONFIGURATION

Checks the electromagnetic interference (EMI) level between the LCD and the touch sensor, and establishes an optimum balance between the processed data and the touch event, to configure the touch recognition parameters: Gain, Threshold and Shielding level.

While the process is analysing the EMI level the user should not touch the sensor.

After analysing the EMI level one of two alternatives may be displayed depending on the results obtained in the 'Touch Sensor' step.

The two alternatives are: 'Touch and hold' and 'Touch and drag'.

3.1. TOUCH AND HOLD

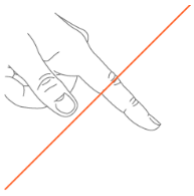
After analysing the sensor EMI level the user will be asked to touch the sensor in order to gather data to configure the touch parameters according to the touch input and EMI level.

An animation, on how to touch the sensor will be presented to instruct the user on how to proceed.

Touch to initiate and hold with 1 finger at the center of the target

After presenting the animation, a target will be displayed on screen, you must touch the target centre and hold for a while.

After a while a 'Stop touching' message will be displayed and you must stop touching the sensor.



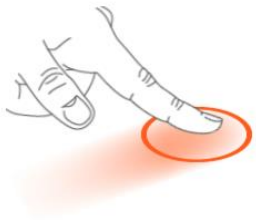
Stop touching

For data comparison, the target to be touched, may be displayed several times – there can be several iterations depending on the EMI levels gathered.

3.2. TOUCH AND DRAG

After analysing the sensor EMI level the user will be asked to touch the sensor in order to gather data to configure the touch parameters according to the touch input and EMI level.

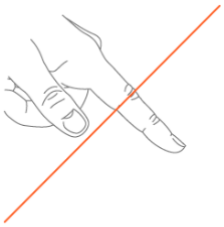
Before the user starts touching and dragging, an animation will be shown to instruct the user on how to proceed.



Touch to initiate and follow the target with your finger

After the animation, a target will be displayed, you must touch the target centre and you must keep your finger inside the circle while it is moving.

After a while a 'Stop touching' message will be displayed, you must stop touching the sensor.

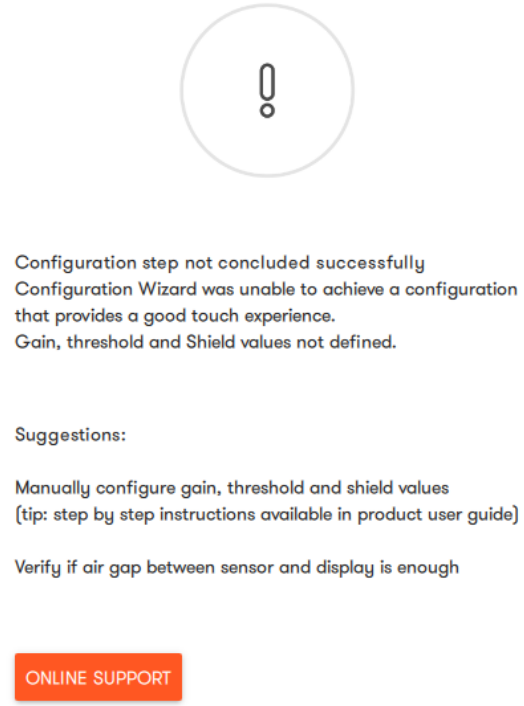


Stop touching

For data comparison, the target to be touched and dragged, may be displayed several times – there can be several iterations depending on the EMI levels gathered.

If the 'Configuration' fails the following screen will be displayed.

This screen lists some suggestions to configure the touch sensor.

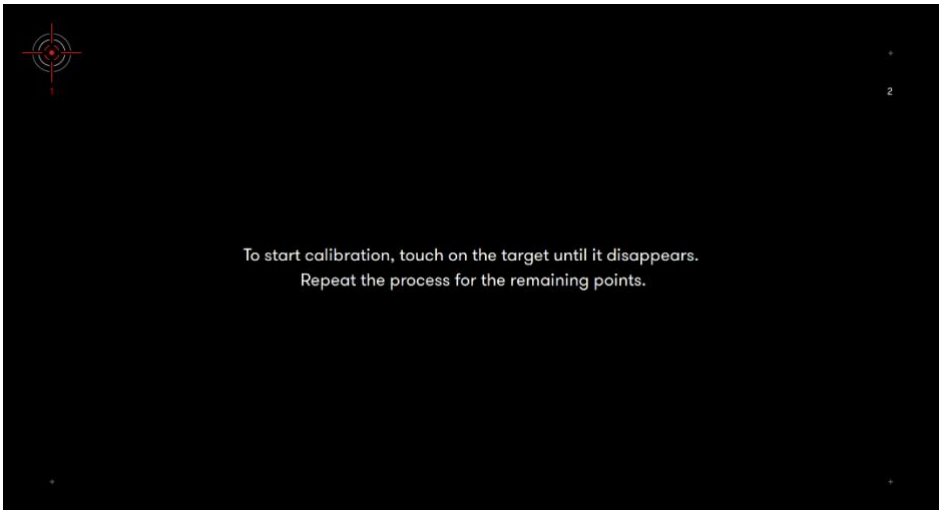


If the 'Configuration' step is successful the 'Calibration' step will be initiated.

4. CALIBRATION

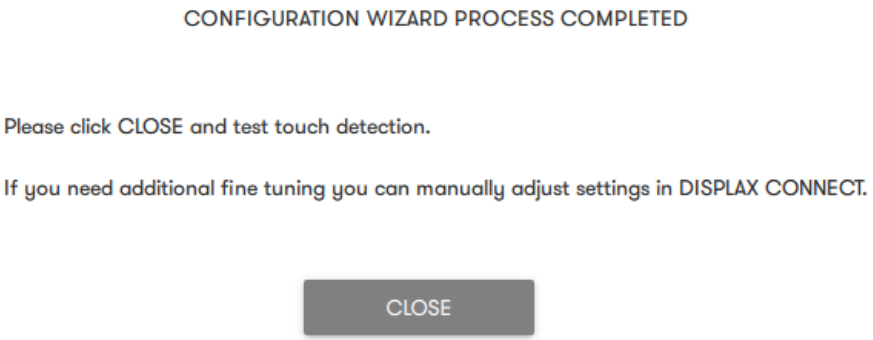
The calibration step matches the physical touch with the Operating System digital coordinates.

To start the calibration, touch on the presented targets until they disappear.



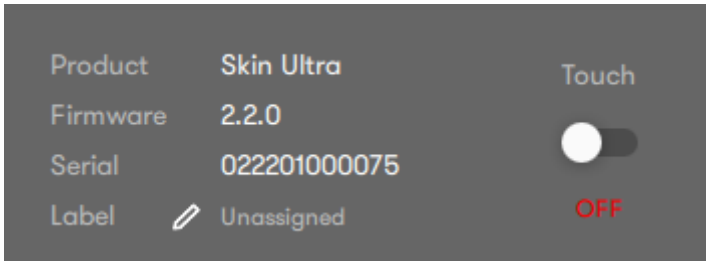
FINAL

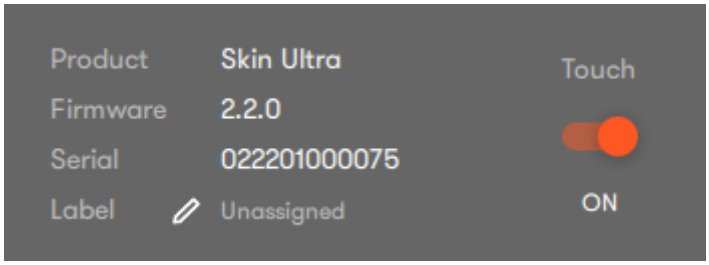
After successfully running the Configuration Wizard the process will be complete, click "Close" to conclude the process, and test the touch detection.



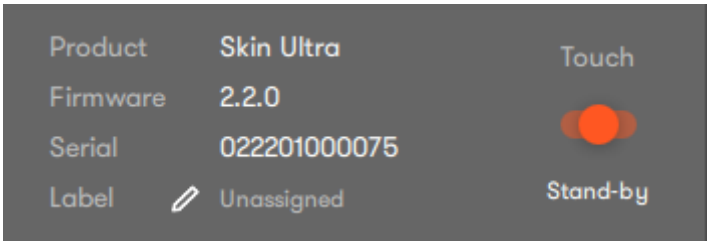
TOUCH INJECTION STATUS

If this is the first time configuring the Touch Controller, before closing 'DISPLAX Connect' make sure that the Touch Injection status is set to ON (as it is set to OFF from factory), otherwise the touch controller won't be processing the touch signals after closing the 'DISPLAX Connect'.





If the touch injection was set into 'ON' in the first configuration before closing the Touch Controller, then when you re-open 'DISPLAX Connect', the Touch injection status will be set into STAND-BY. In this case, you can leave it in that position, as touch injection is automatically enabled (set to ON) when you close 'DISPLAX Connect'.



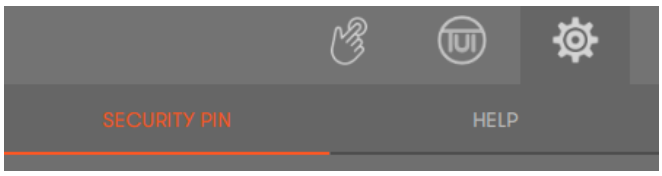
Please note that 'DISPLAX Connect' should only be open when configuration changes are being made. When you conclude the Touch Controller settings adjustment, you must close it. Leaving it open decreases the touch speed.

All settings are stored on the Touch Controller, so once configured for a particular LCD/glass/air gap combination you can change the computer without affecting the touch setup.

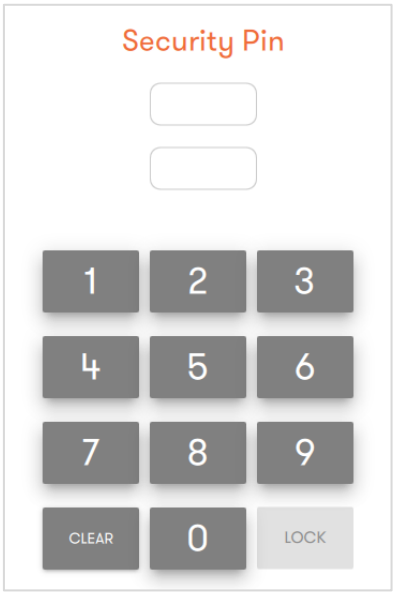
SECURITY PIN

Displax Connect allows you to introduce a pin to protect the configuration settings.

Click on the button containing an arrow, on the top right side of Displax Connect, and then click "Security Pin".



Introduce four digits.



After closing Displax Connect the Security Pin will be saved.

When you reopen Displax Connect the Security Pin will be requested.

You can disable the Security Pin at any time after unlocking Displax Connect by toggling off the 'Security Pin'.

If you forget the Security Pin, it must be reset, using the command line and launching Displax Connect from the folder where it is installed using one of the following arguments:

a) Windows: "displax-connect.exe --resetpin"
b) Ubuntu: "./displaxdc --resetpin"
c) OSx:"./DisplaxConnect --resetpin"

Having reset the security pin, it will be disabled, when you reopen Displax Connect.

TOUCH TEST

This feature provides more data than other mechanisms of test and it is conveniently integrated with the DISPLAX Connect software.

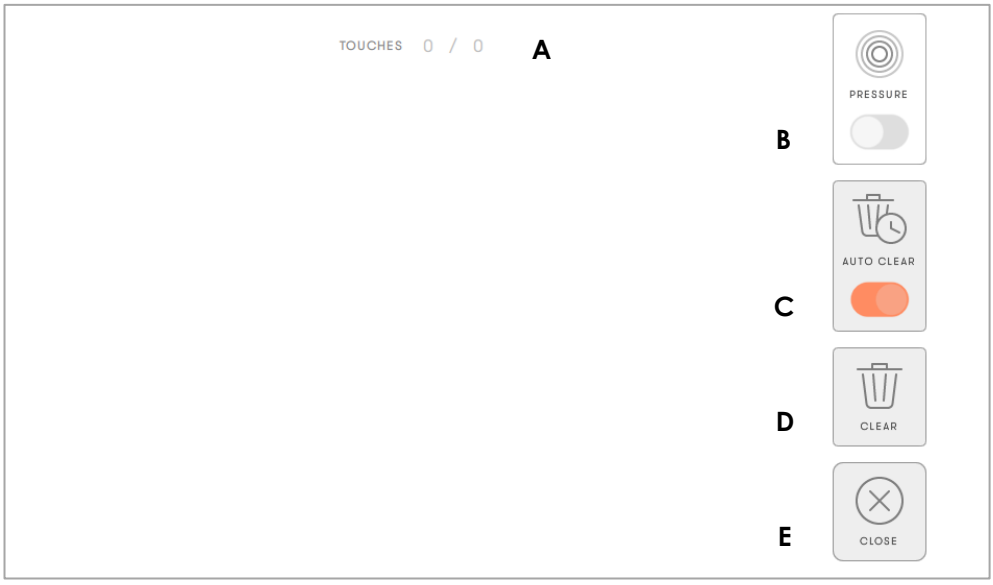
Depending on the PC specifications and the Skin product that you have, there are some features that may not be presented, namely:

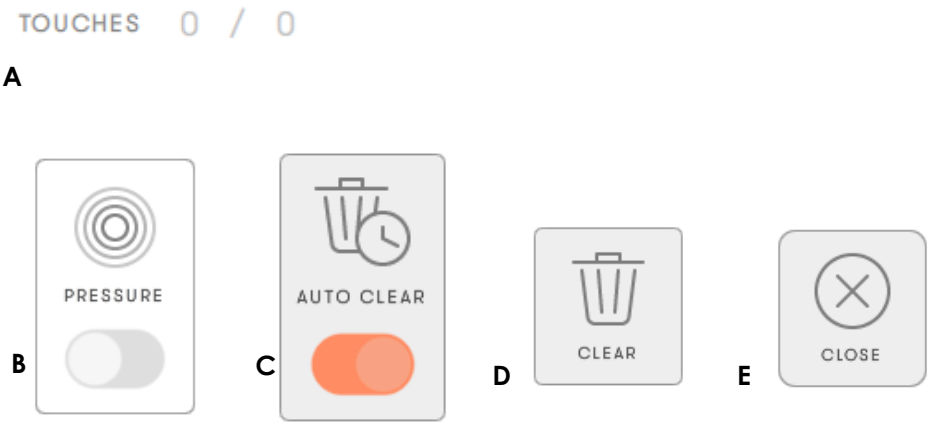
- Pressure report (Feature not available in Skin Fit and Skin Dualtouch);
- Touch coordinates;
- Number of touches (Skin Ultra: up to 100 touches; Skin Fit: up to 40 touches; Skin Dualtouch: up to two touches);
- Multiple devices input.

Notice that OS X will only work with a single touch due to OS limitation.

To access this feature, click on the 'Touch test' button, or hit the keyboard key 'C'.

Touch test app representation:





B — Activate/deactivate pressure report

C — Activate/deactivate auto clear – clears the drawn touches

D — Erases the drawn touches

E — Closes Touch Test

A. Touches: number of touches being reported, i.e. "Touches 2 / 24", means that 2 touches are currently being recognized, from a total of 24 touches already reported since the last "Auto clear";

B. Pressure (only available in Skin Ultra): activates or deactivates the touch pressure representation. Pressure units are dependent on the OS:

- 'Windows' represents pressure between 0~1024;
- 'Linux' represents pressure 0~1;
- 'Mac OS' pressure is not represented.

C. Auto-clear: if activated the drawn touches will be cleared in about 5 seconds since the last touch recognition, making the Touch Test screen clear of all previous touches and the touch counter is reset. If deactivated, the drawn touches will remain on the displayed screen until you touch the button 'Clear';

D. Clear: clears the screen by deleting all the drawn lines and resets the touch counter;

E. Close: closes the Touch Test application.

When touching the Touch Sensor area, the first five touches will be represented with their respective identification, coordinates and pressure if enabled (Pressure is only reported in Skin Ultra).

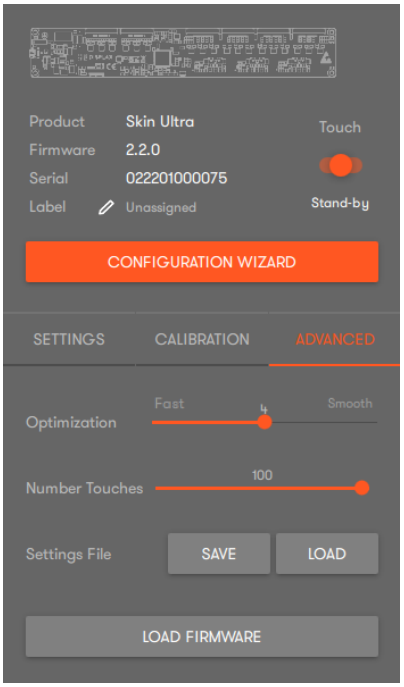
In the touch test application pressure is graphically represented with a thinner or thicker line depending on the pressure applied over the touch sensor.

Touch test version 1.13 onwards accepts multiple devices input, distinguishing device inputs with the ID first two digits, the remaining digits refer to the touch ID identification number. The number of devices input is conditioned by the type of product. Skin Dualtouch can only report two devices, since it is limited to report two touches.

Note:
1 – MAC OS pressure is not supported and only the mouse is recognised.
2 – If the touch injection is disabled, when using multiple devices at the same time one of the devices will not have touch, the touch should be enabled in all devices first and then you can enter in touch test.
3 – When opening the Touch Test application if multiple touches have been detected, possibly due to high levels of electromagnetic interferences, a warning message will be displayed. (This does not apply to Skin Dualtouch which only reports two simultaneous touches).

NUMBER OF TOUCHES

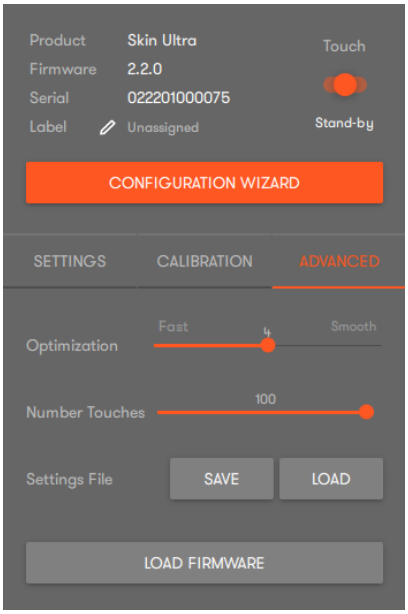
Limits the number of touches reported by the Touch Controller to a specified number (Skin Ultra: up to 100 touches; Skin Fit: up to 40 touches; Skin Dualtouch: up to 2 touches). This feature is available depending on the version of the Touch Controller and firmware you are using.



Note: some operating systems may still incorrectly report the maximum number of touch points supported by the Skin product, when in fact a lower number of touches has been defined in this feature.

OPTIMIZATION

The 'Optimization' is a parameter allowing a balance between Touch speed and Touch smoothness. As a factory default the optimization in Skin Ultra and Skin Fit is halfway between Touch speed and Touch smoothness. In Skin Dualtouch the factory default slightly favours touch speed.



If you want more Touch smoothness, you can slide the orange bar to the right. This may be useful for drawing or writing.

If you want more Touch speed, you can decrease smoothness to gain speed by sliding the orange bar to the right. This may be useful for non-precision activities, like touching and manipulating buttons and images.

You should always try to establish an adequate compromise between precision and speed in accordance to the application content and user experience you want to provide.

PALM AND ARM REJECTION

(Feature not available in Skin Dualtouch)

Allows the rejection of areas with dimensions larger than a finger, such as a hand or an arm. The rejection area can be configured and is conditioned by the Touch Sensor size.

For the same hand, a smaller Touch Sensor should have a greater palm rejection area since the touch is going to cover more Touch Sensor cells. On a bigger Touch Sensor, the hand touch will cover less cells. In this case, the rejection area should be smaller.

To support the user when configuring the palm rejection area, here is a table with suggested values to configure the Skin product to reject an adult palm for Touch Sensors with different dimensions.

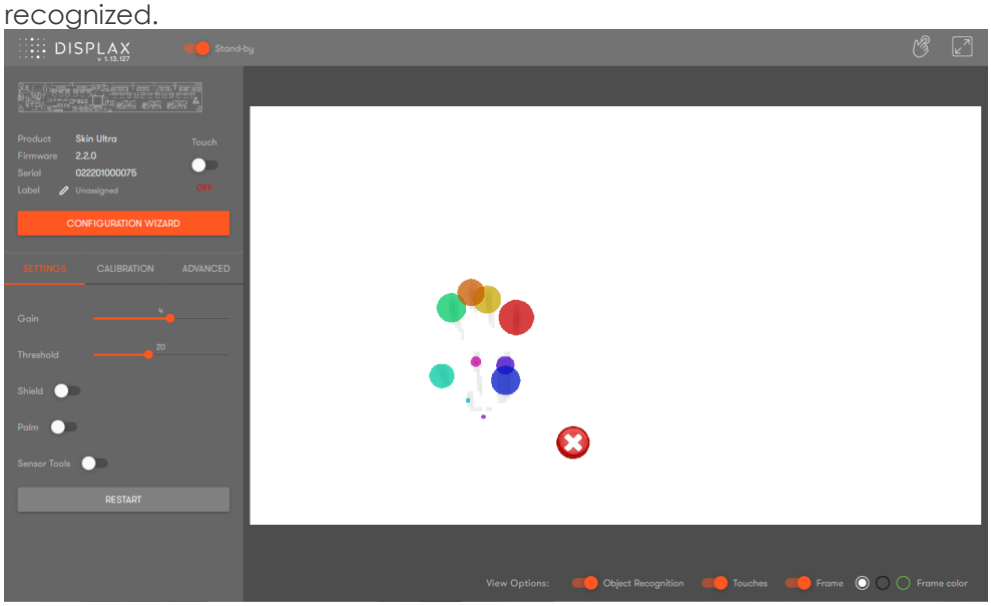
Touch sensor dimension	Rejection area reference
30'' to 41''	8
42'' to 49''	7
50'' to 64''	6
65'' to 75''	5
>75''	4

A sequence of images is presented to illustrate palm and arm rejection examples.

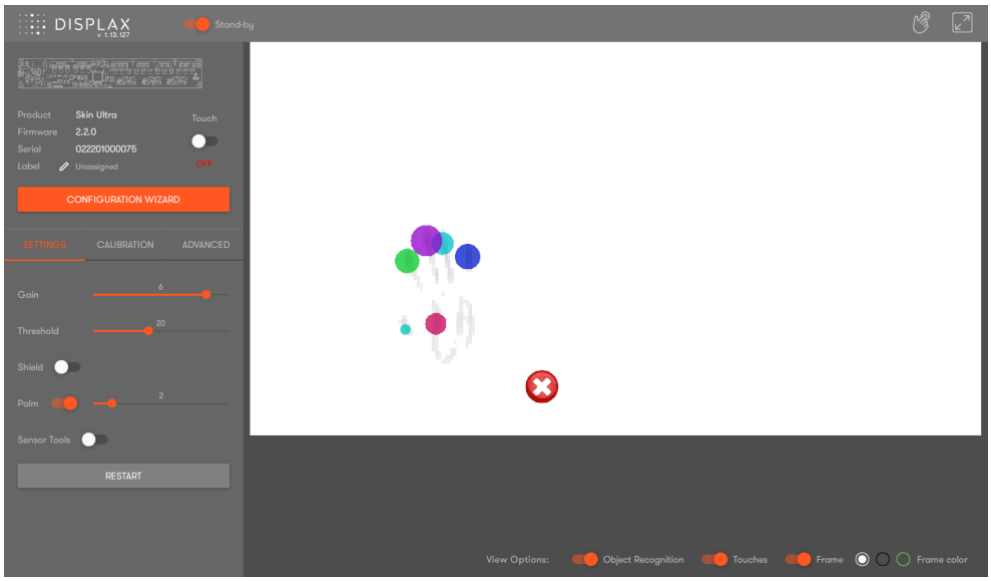
Note: touch representation, in palm and arm rejection, may differ slightly depending on the product you have purchased.

PALM

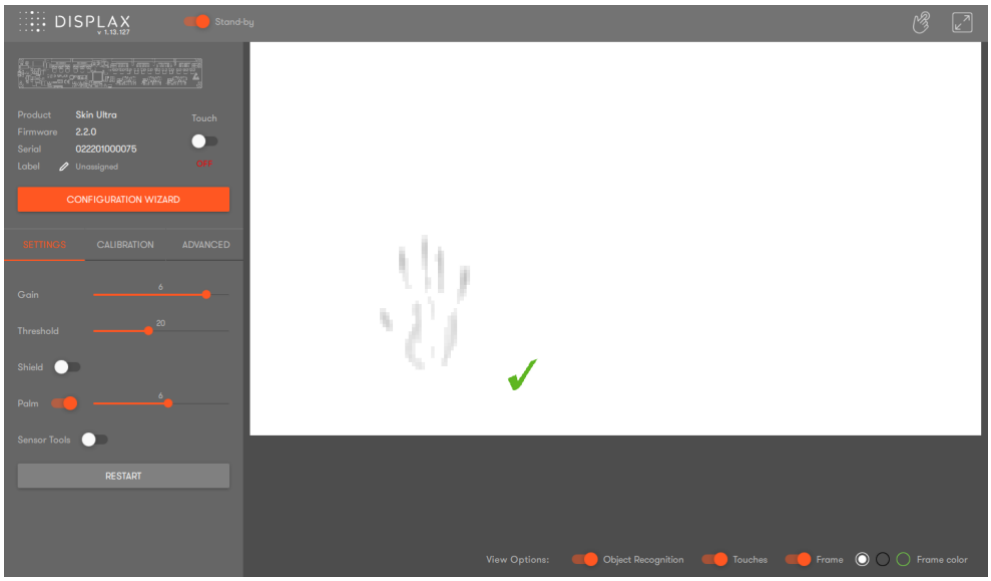
Palm rejection is not activated, as a result multiple touches are being recognized.



Palm rejection is activated, however, touches are still being recognized since the rejection area is not properly adjusted to the Touch Sensor size. An increase or decrease of the palm rejection area is required.



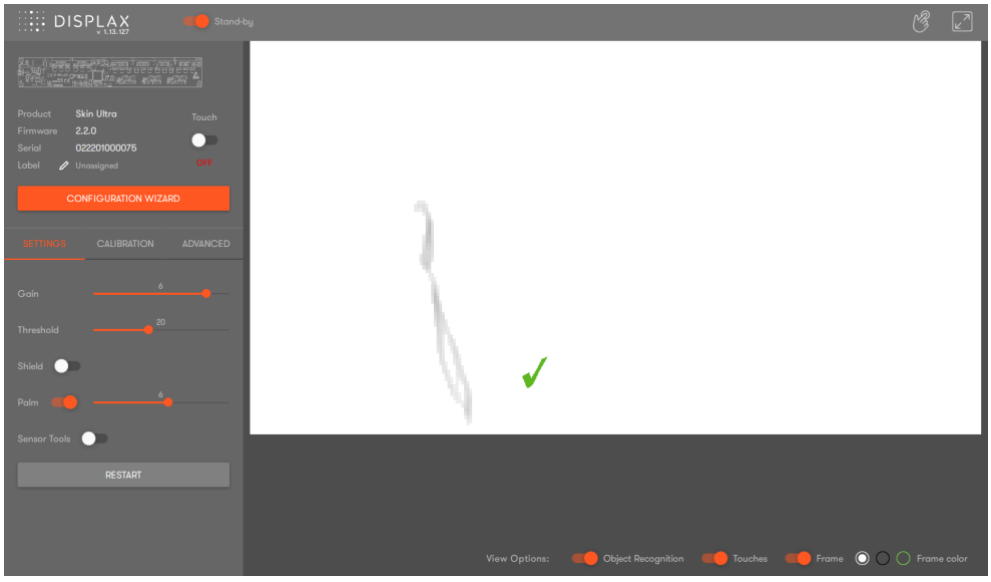
Palm rejection is activated with an adequate value for the Touch Sensor dimension. In the following image, you can see the contours of a hand but no touch is being recognized.



ARM

Palm rejection is not active: an arm is placed on top of the Touch Sensor and the display is reporting multiple touches.

If Palm rejection is activated, with a certain rejection area adequate to the touch sensor dimension, we can see the contours of an arm but no touch is being recognized.

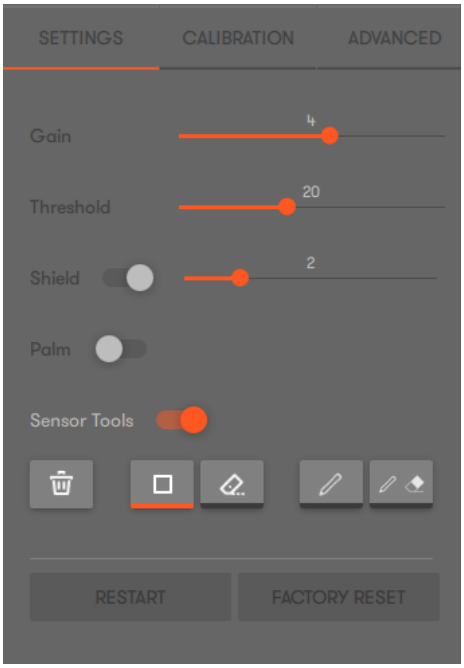


SENSOR

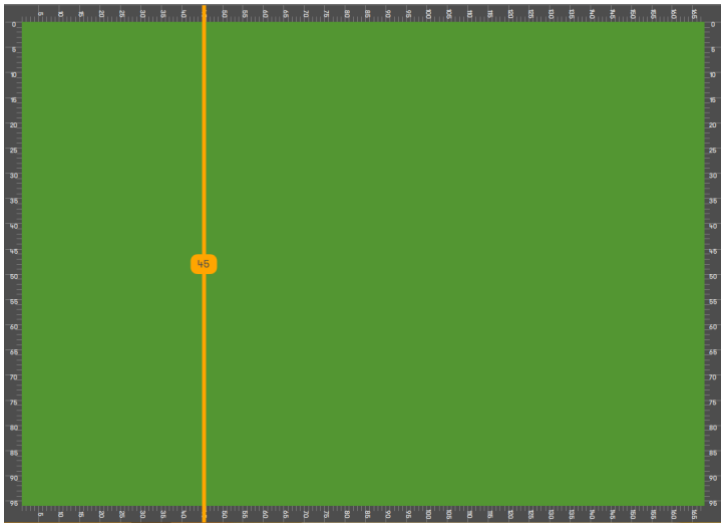
The sensor tools options allow enabling and disabling horizontal and vertical electrodes and the selection of areas to be activated or deactivated within the touch sensor active area.

1. ENABLE AND DISABLE HORIZONTAL AND VERTICAL ELECTRODES

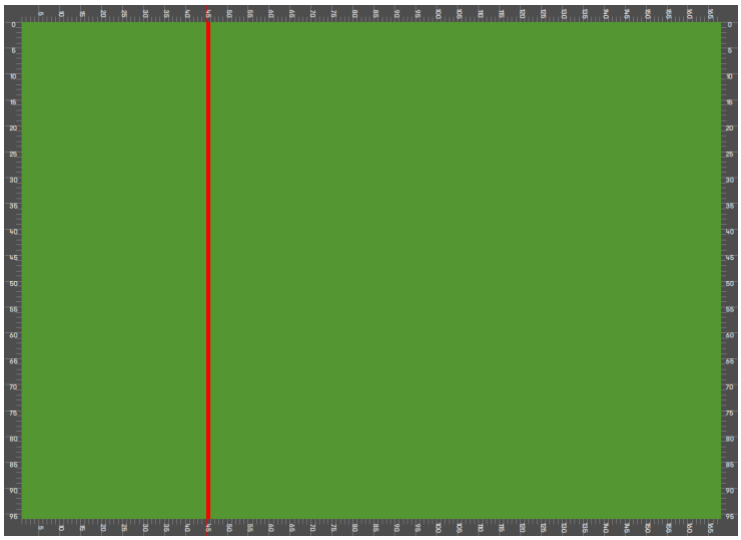
Activate sensor tools by toggle its button.



The touch sensor view will display the horizontal and vertical electrodes number. You can now enable or disable electrodes by moving the cursor along the touch sensor view borders.



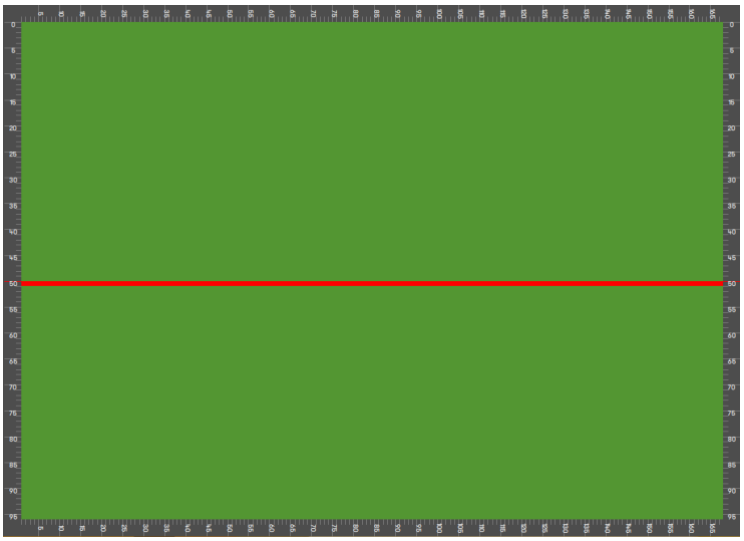
As you move the cursor along the sensor view borders, the horizontal and vertical electrodes number are zoomed in to allow clicking on them to enable or disable a specific horizontal or vertical electrode.



On the previous image, the vertical electrode '45' is disabled.

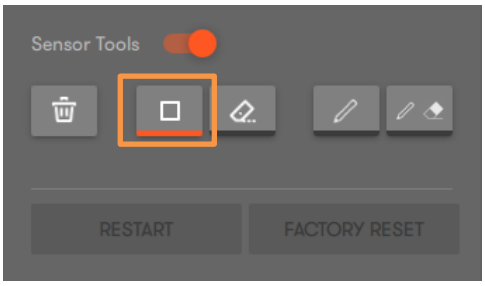
When an electrode is disabled it turns red.

The same procedure is used to disable horizontal electrodes.



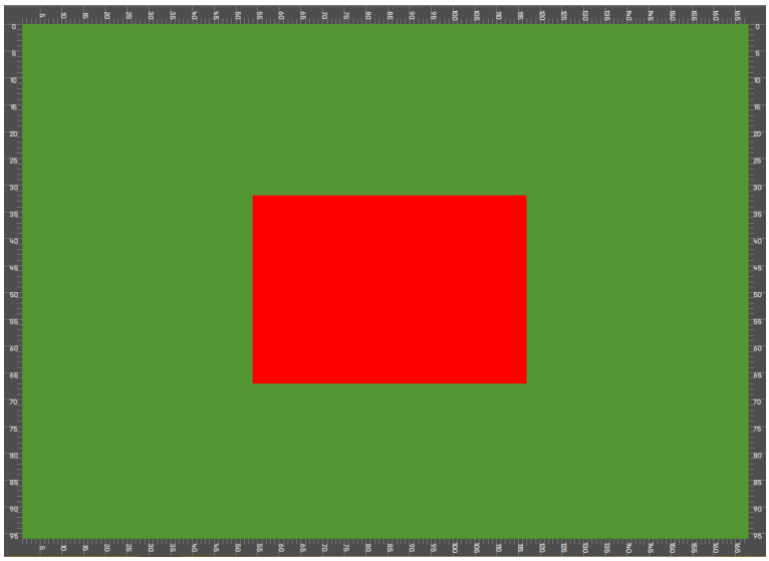
2. RECTANGLE SELECTION

The rectangle selection is intended to disable touch on specific Touch sensor areas.

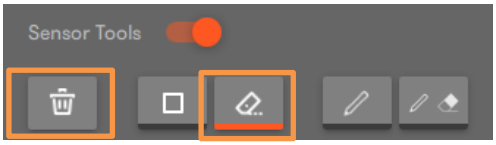


To disable parts of the Touch Sensor active area, make a left click and keep it pressed while moving the cursor to select the area to be disabled.

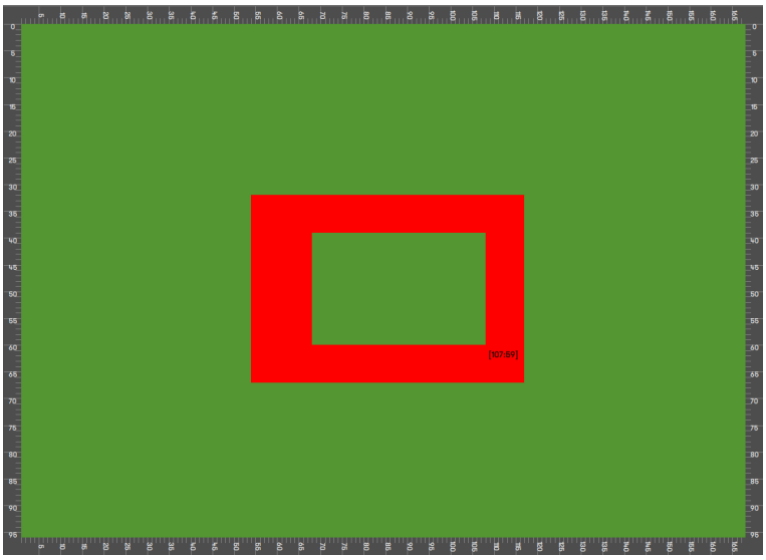
When you stop pressing the left click a disabled area will be defined.



To reactivate areas you can either use the rectangle eraser to enable parts of the sensor, or you can use the trash button, to enable the whole sensor.

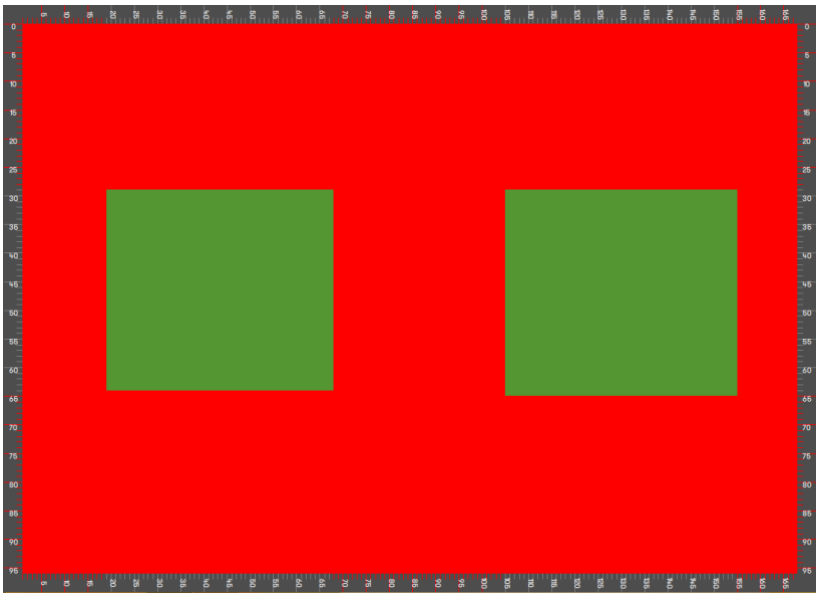


If for example you want to insert an active area inside an inactive area you can do it by clicking on the rectangular erase button and by selecting the area to be reactivated.



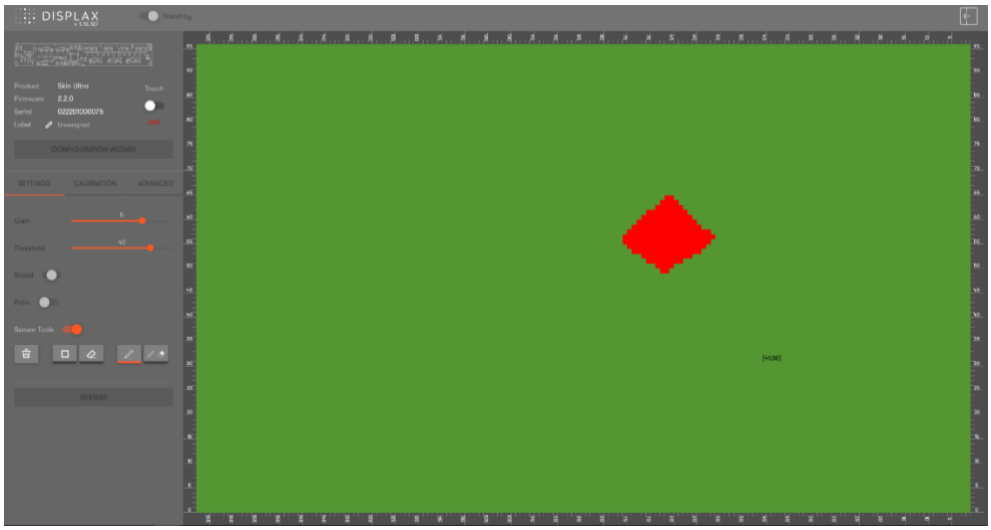
If you click on the trash button the areas you have disabled will be enabled.

If, for example, you want to have touch in two central areas, you can disable the whole active area using the rectangle selection and then you can activate the areas where you want to have touch using the rectangle eraser.



It is also possible to draw areas to be deactivated, by using the 'Draw selection'.

With the draw selection you can select small parts of the active area to be disabled, with the draw erased you can enable the disabled areas.



LOAD & SAVE TOUCH CONTROLLER SETTINGS

When you have multiple units of an identical setup it is useful to save the touch controller settings to upload them in other setups. It can also be useful to save the touch controller settings, in case someone changes the configuration parameters, if this happens you can upload the saved settings to restore the configuration.

When you save the touch controller parameters, from your current setup, the following settings will be saved:

- Touch status (enabled/disabled);
- Gain (values 0 - 7);
- Threshold (Values vary between 0 and 50 starting on firmware version 1.5.0, and between 0 and 15 on firmware versions equal or previous to 1.4.0);
- Shield level;
- Palm detection status and palm rejection area values (Feature not available in Skin Dualtouch);
- Disabled columns, rows or cells;
- Number of touches;
- Geometric Calibration.

When you LOAD the file into a new setup (PC + display + Skin product, either Skin Ultra, Skin Fit or Skin Dualtouch), 'DISPLAX Connect' will assume the values of the previous setup. It is recommended reviewing the touch performance of every setup to verify if additional configuration adjustments are required.

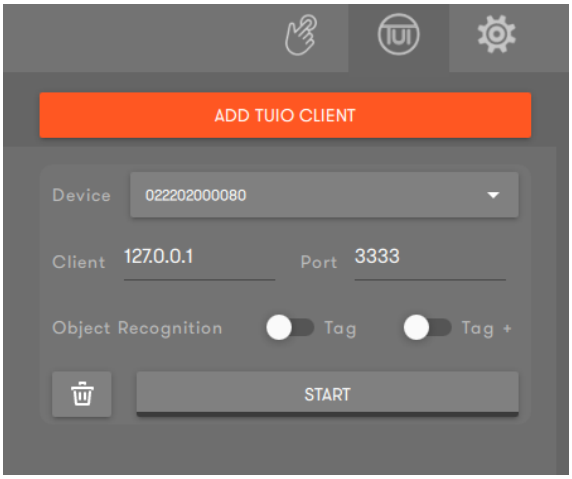
Bear in mind that this feature should be used with equivalent setups, i.e. same LCD, glass thickness and size, sensor size and air gap.

It is recommended, shortly after loading the settings file, to restart the Touch Controller.

TUIO

TUIO should be configured after configuring the touch settings.

Having configured the touch settings go to the TUIO Tab.



In 'Client' define the IP of the PC which is going to receive TUIO events. Next, define the port that will be receiving these events.

Click 'Start' and test if the host PC is receiving the TUIO events. If not, check if the firewall is blocking them.

If TUIO events are being received in the Client PC, you can now close 'DISPLAX Connect', TUIO is now a Daemon (for windows)/Agent (OS X) process (it runs on the background).

To stop TUIO, go to the TUIO tab and click 'Stop'. TUIO should now be stopped.

It is recommended to stop sending TUIO events before uninstalling 'DISPLAX Connect'.

NOTES:

OS X: From 'Displax Connect' 1.9.0 version onwards, if touch injection is ON, 100 touches for the Skin Ultra and 40 touches for Skin Fit will be recognized through TUIO. If touch injection is OFF, only 20 touches will be recognized. Skin Dualtouch either way recognizes two touches.

OSX Touch injection	Ultra	Fit	DT
ON	100	40	2
OFF	20	20	2

Windows and Linux: Does not matter the touch injection status, only 20 touches will be recognized through TUIO, either in Skin Ultra or Skin Fit. Skin Dualtouch either way recognizes two touches.

Windows and Linux Touch injection	Ultra	Fit	DT
ON	20	20	2
OFF	20	20	2

Windows: Once the Board is reset or unplugged, you should restart TUIO, otherwise TUIO events will stop being sent to the host. But if you shut down or restart the computer, TUIO will automatically restart and there is no need to perform this step.

OBJECT RECOGNITION

Feature only available for Skin Ultra.

1. General description

Skin Ultra supports the use and detection of objects which can be placed on top of the sensor along with regular touches from fingers.

Object recognition is supported for Skin Ultra sensor sizes up to 55 inches. For larger sizes it is also possible to process object recognition events but the size of the predefined objects must be redefined accordingly.

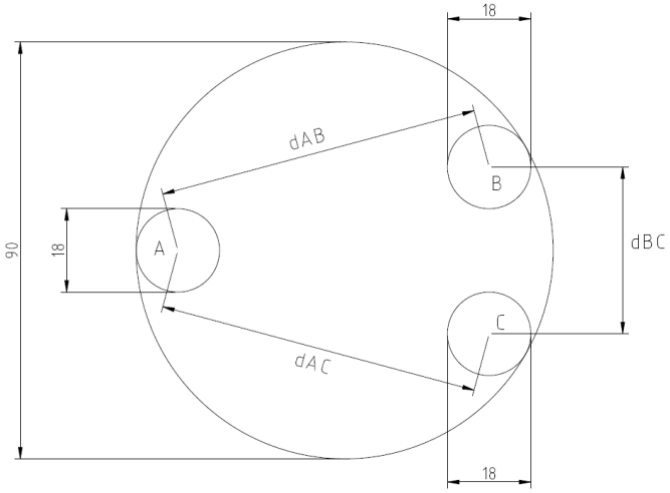
Currently there are two available specifications, which support a different number of tags.

- Tag: Up to 6 different object types;
- Tag+: Up to 16 different object types;

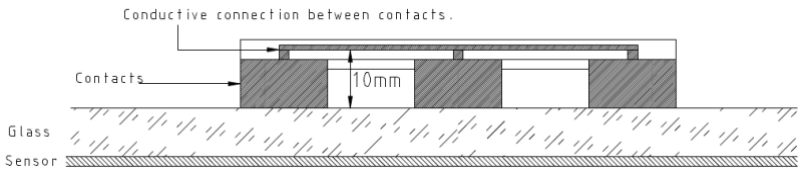
The tags are objects with conductive contacts arranged in pre-determined configurations. The tags have a circular shape, but it is possible to have different tag designs and shapes, but the relations between the contact points must be maintained.

The tags designed for Skin Ultra are guaranteed to work in all sensor sizes, for the Skin Ultra product up to 55 inches. For larger sensors the tag dimensions must be scaled up accordingly.

The following representation presents the top view of an object tag, displaying contacts as points A, B and C.



The object tag conductive contacts touch the glass which has underneath a laminated Touch Sensor, the following representation illustrates this setup, where the tag conductive contacts are touching the glass and those touches are being processed by the Skin Ultra Touch Sensor and Touch Controller.



2. Specification: Tag

The "Tag" specification supports up to 6 different object types. The minimum diameter for the tags built for this version of specification must be at least 90 mm.

There are two types of tags, 3 point tags and 4 point tags, 4 of them have 3 conductive contacts, and 2 of them have 4 conductive contacts.

When all the 6 tags are placed over the Skin sensor, 20 touch points will be recognized.

3. Specification: Tag +

The "Tag" specification supports up to 16 different object types. The minimum diameter for the tags built for this version of specification must be at least 120 mm.

There are two types of tags, 3 point tags and 4 point tags, 8 of them have 3 conductive contacts, and another 8 of them have 4 conductive contacts.

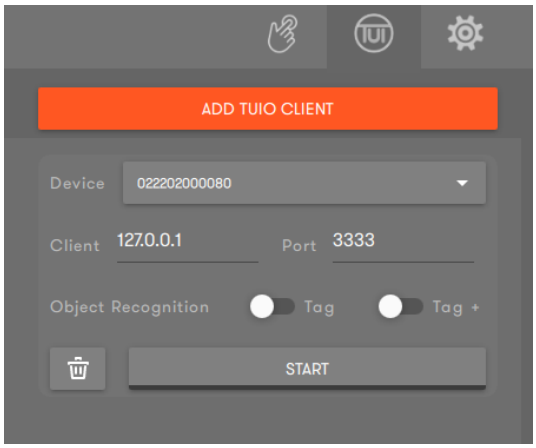
Due to Tuio limitation only 20 touches are recognized, this means, that you cannot use all tags simultaneously.

4. Usage

The object recognition is performed by the application used to interface with the touch sensor.

The data generated by the recognition of touches and objects is available through a TUIO client which implements the specification v1.1 or v2.0 (for further details on the protocol see https://www.tuio.org/ and http://www.tuio.org/?tuio20).

To start TUIO go to the TUIO tab, and in 'Client' define the IP address of the PC that will receive TUIO events. Next, define the port that will be receiving these events. Then click 'Start' and test if the host PC is receiving TUIO events. If not, check if the firewall is blocking them.



Description of the parameters passed to 'skin' executable:

- Client and Port: specify IP address and port of client, if necessary, multiple addresses can be specified;
- Object recognition: enable Tag or Tag +, you cannot enable them simultaneously i.e. there is a specific set of tags for each specification and you can only use either one or the other set of tags. In the command line If the parameter is specified as '1' it enables Tag, if the parameter is specified as '2' it enables Tag+, if the parameter is not specified or set as '0', all touch events will be reported as finger touches.

You have two options:

1. HID and TUIO combined to support touches and object recognition;
2. TUIO to support both touches and object recognition.

3. Limitations

The implementation of the TUIO client protocol, has a limitation in the number of reported touches. No matter what operating system is being used, only 20 touches will be recognized and reported via TUIO, no matter the status of touch injection in the operating system. Since the object recognition works with the TUIO protocol, the number of tags used is limited to the number of available touches. See https://support.displax.com/private-area/displax-connect/tuio/ for more information.
The use of palm rejection with object recognition can in some cases affect the recognition and tracking of objects. Palm rejection by itself disables agglomerates of touches not reporting them to the operating system, if more than two tags are close enough to each other, some of their touch points will be disabled by the palm rejection feature. For this reason, if the user needs close interaction of more than two tags, disabling palm rejection is advisable.

4. TUIO message structure

The communication protocol is implemented using TUIO specification v1.1. and v2.0. (for further details on the global operation and message structure see https://www.tuio.org/ and http://www.tuio.org/?tuio20).

This section specifies how data about the objects is encoded and transmitted.

4.1. Object ID

There are object Tags with 3 points and with 4 points. To each object Tag is assigned a unique object identifier composed of 3 fields (Type, Subtype and ID), which is used in TUIO messages.

The object ID is formed as a 32bit integer with the following format:

XX YY ZZZ

where:

- **XX**: Type of touch:
  - 00: None/Invalid;
  - 01: Finger touch;
  - 02: Object (Tag 3 points);
  - 03: Object (Tag 4 points);
  - 04: Object (Tag+ 3/4 points)
- **YY**: Sub type, for each type of touch there is an associated sub type.
  - Finger touch – 00: None/Invalid; 01: Finger;
  - Object (Tag 3 points) – 00: None/Invalid; [01..04]: Tag number;
  - Object (Tag 4 points) – 00: None/Invalid; [01..02]: Tag number;
  - Object (Tag+ 3/4 points) – 00 None/invalid; [01..16]: Tag number.
- **ZZZ**: ID, incremental value that identifies the object/touch [001..999]. Some examples:

Supported pairs of type and subtype of touches/objects	
Description	**Object ID (XXYY)**
Finger touch	101
Tag 3 points	201, 202, 203, 204
Tag 4 points	301, 302
Tag + 3 points	401, 402, 403, 404, 405, 406, 407, 408
Tag + 4 points	409, 410, 411, 412, 413, 414, 415, 416

4.2. TUIO Version 1.1

See http://www.tuio.org/?tuio11 for details on global operation and message structures.

Information about touches and objects is packed together but with different message types,

'2Dcur' for touches and '2Dobj' for objects.

Touches

Touch points are transmitted using a '2Dcur' message formatted as:

/tuio/2Dcur set s x y X Y m

Message components:

- s [int32]: Session ID, unique identifier of touch, see details in section 4.1 Object ID;
- x [float]: Point coordinate X axis;
- y [float]: Point coordinate Y axis;
- X [float]: Velocity vector X axis (not used, sent as 0);
- Y [float]: Velocity vector Y axis (not used, sent as 0);
- m [float]: Motion acceleration (not used, sent as 0).

Objects

Objects are transmitted using a '2Dobj' message formatted as:

/tuio/2Dobj set s i x y a X Y A m r

Message components:

- s [int32]: Session ID, unique identifier, see details in section 4.1. Object ID;
- i [int32]: Class ID (e.g. marker ID), type (XXYY - Type Subtype), see details in section 4.1 Object ID;
- x [float]: Point coordinate X axis;
- y [float]: Point coordinate Y axis;
- a [float]: Rotation angle relative to the horizontal surface plane ($0 - 2\pi$);
- X [float]: Velocity vector X axis (not used, sent as 0);
- Y [float]: Velocity vector Y axis (not used, sent as 0);
- A [float]: Rotation velocity vector (not used, sent as 0);
- m [float]: Motion acceleration (not used, sent as 0);
- r [float]: Rotation acceleration (not used, sent as 0).

Some examples:

Type of object	Session ID	Class ID
Object (Tag 3 points)	204561	204
Object (Tag 4 points)	301127	301
Object (Tag + 3 points)	403365	403
Object (Tag + 4 points)	410156	410

Table 1: Some examples of 'Object ID' according to the type of object being detected in the sensor.

4.3. TUIO Version 2.0

See http://www.tuio.org/?tuio20 for details on global operation and message structures.

The data specifically concerning the objects and touches uses a 'PTR' component message formatted as:

/tuio2/ptr s_id tu_id c_id x_pos y_pos angle shear radius press

Message components:

- **s_id** [int32]: Session ID, identification of touch, see details in section 4.1 'Object ID';
- **tu_id** [int32]: Type/User ID (Follows specification of pointer types, see bellow for more information);
- **c_id** [int32]: Component ID (Not used: sent as '0');
- **x_pos** [float]: Point coordinate X axis;
- **y_pos** [float]: Point coordinate Y axis;
- **angle** [float]: Rotation angle relative to the horizontal surface plane (0 – 2π);
- **shear** [float]: Shear angle (Not used: value sent '0');
- **radius** [float]: Radius of influence, normalized relatively to the frame height and encoded in the range [0..1]. If the touch is a finger touch, radius is '0';
- **press** [float]: Pressure of touch, normalized in the range [0..1].

Type/User ID This field encodes user id and type id, the user id component is not being used in our implementation and is sent as '0', the type id is encoded according to the specification. TUIO2 specifies types of pointers, the default ID for an unknown finger is the right index finger ID 1, other types are encoded accordingly if supported. Objects are encoded following the current scheme XXYY (Type Subtype), see details in section 4.1 'Object ID';

Some examples:

Type of object	**Object ID** (Session ID in TUIO)
Finger touch	0101264
Object (Tag 3 points)	204561
Object (Tag 4 points)	301127
Object (Tag + 3 points)	403365
Object (Tag + 4 points)	410156

Table 2: Some examples of 'Object ID' according to the type of object being detected in the sensor.

5. Software development for object recognition

When developing software for object recognition, take into account the above information regarding the TUIO message structure and the Object ID, knowing that the communication protocol is implemented using either TUIO v1.1 or v2.0.

6. Notes

a) Object recognition should be enabled before starting TUIO;
b) Things that can affect OR: Glass thickness; sensor cell area; electromagnetic interferences; contacts or tags close to each other; signal Strength.

TOUCH CONTROLLER FIRMWARE UPDATE

If your computer is connected to the internet when a new firmware version is available you will receive a notification.

This notification will be presented in the right side of the control panel, just follow the steps to update your firmware.

This feature is available for Windows 8 (or higher), OS X (Yosemite), and Ubuntu (14.04 LTS or higher).

LOAD TOUCH CONTROLLER FIRMWARE

This feature was provided to be used when there is no internet access onsite. If you have internet access you do not need to use this feature.

This feature can only be used with an available Touch Controller Firmware file either using OS X (Yosemite), Ubuntu (14.04. LTS) or Windows 8 (or higher version).

Use only files provided by DISPLAX otherwise you will lose warranty and you may damage the Touch Controller.

While performing the upload, assure that you do not remove the USB cable and do not perform any other action while the firmware is being uploaded into the Touch Controller.

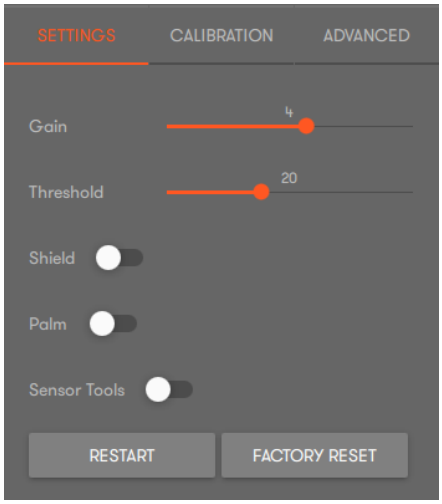
Click 'Load firmware' to upload the Touch Controller firmware file.

Browse for the folder where the Firmware file is stored and select the file to be loaded and follow the required steps.

DISPLAX CONNECT UPDATE

If your computer is connected to the internet, when you open 'DISPLAX Connect' it will always verify whether there is a new version available (feature also present in SUC versions 1.4.0 or higher). If there is a new version of 'DISPLAX Connect', a notification will appear on the upper right corner of the Control Panel. Download the update and install.

FACTORY RESET



Sets the Touch Controller to its default settings.

To re-establish the factory default settings, select the 'Advanced' tab. In this tab, click 'Factory reset'.

A warning message will be displayed '*You are about to set the factory default settings*'.

Click 'Yes' to reestablish the factory default settings.

PRESSURE DETECTION

Feature only available in Skin Ultra.

Skin Ultra is an HID Multitouch compliant product. This means that Skin Ultra follows the USB Multitouch standard when sending touch events information to the Operating System. Information about pressure is one of the parameters that Skin Ultra sends to the Operating System, and that is why you can detect pressure when using Skin Ultra.

Therefore, to use the touch pressure information in your software application, you should develop the application following the instructions of the Operating System where the application will run.

The Operating System must have native multitouch support.

For more information about each Operating System, please visit:

Windows:

https://msdn.microsoft.com/en-us/library/windows/desktop/dd371581(v=vs.85).aspx

Linux:

https://www.kernel.org/doc/Documentation/input/multi-touch-protocol.txt

Mac OS X:

It is possible to develop software applications with pressure detection on Mac OS X, but it requires the use of IOKit. This is a low-level programming that requires a high level of expertise.

https://developer.apple.com/library/mac/documentation/DeviceDrivers/Conceptual/IOKitFundamentals/Introduction/Introduction.html

Chrome OS:

Chrome OS is a Linux running a Chrome browser.

To develop native Linux applications, follow the Linux link. Chrome OS applications follow the W3C standard, that currently does not support pressure.

https://dvcs.w3.org/hg/webevents/raw-file/tip/touchevents.html

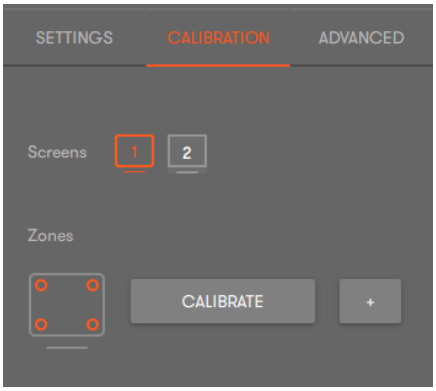
Android:

http://developer.android.com/reference/android/view/MotionEvent.html

MULTI MONITOR CALIBRATION

Two or more units of Skin product can be connected to the same PC. The number of units that can be connected is limited by the number of USB connections you have on the PC in use. Make sure that the USB ports used are compliant with the USB standards and supply enough energy to power the Skin product units.

In the 'Calibration' tab, 'Screens' section, select the number of Skin product units connected to the PC.



During the geometric calibration, all monitors should have the same orientation. Afterwards, you may use monitors in a different orientation, for example, on a vertical orientation.

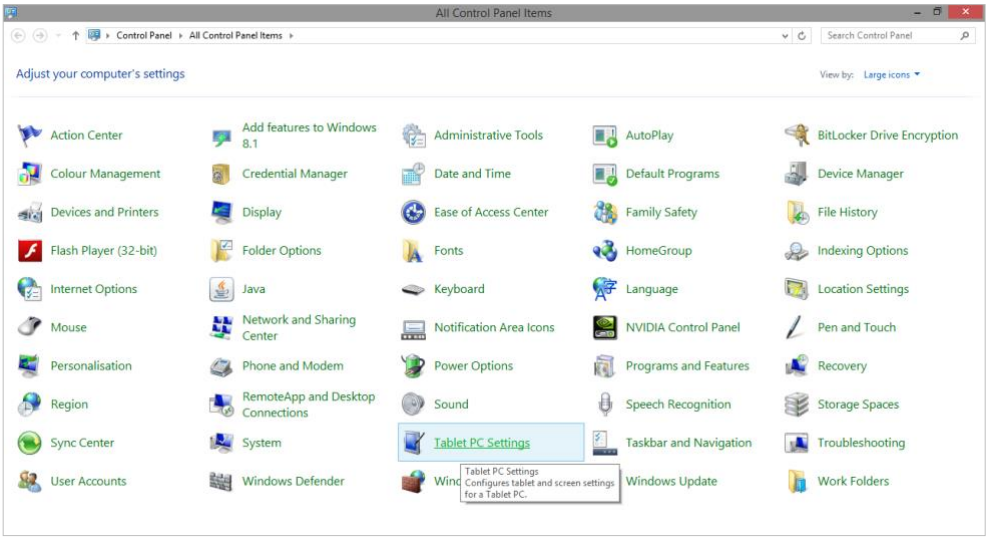
Number of displays connected	Display Mode (Mirrored or	Number of Sensors	Native support in OS (OS X Yosemite,

	Extended	connected	Windows >=7, Ubuntu 14.04)
1	N/A	1	All
2	Mirrored	1	All
2	Mirrored	2	All
2	Extended	1	Windows (>=7)
2	Extended	2	Windows (>=7)

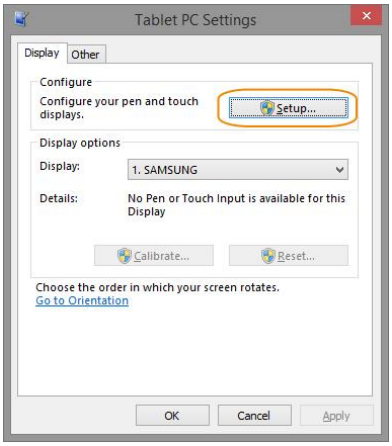
The calibration process of setups with multiple displays can differ depending on a number of factors, such as the display mode, graphics card, operating system, amongst others. If you have a setup with multiple displays and you are experiencing difficulties with the calibration process, please contact us for detailed information.

Windows natively supports the use of multiple displays with touch, and the assignment of touch inputs to each of them.

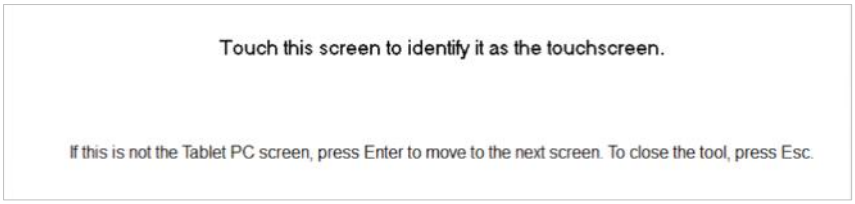
Go to the Windows Control Panel and open 'Tablet Settings'.



In 'Configure your pen and touch displays' click 'Setup'.



In one of the displays, the following message will be presented.



Follow the instructions.

Now Windows knows which display has touch (in case only one does) or which display is controlled by which touch device (in case all displays have either one of the following products Skin Ultra, Skin Fit or Skin Dualtouch).

Open 'DISPLAX Connect' and calibrate – to perform the geometric calibration refer to the section 'How to configure Displax Connect'.

If all displays have touch, calibrate all. If only one display has touch, there is no way of knowing if it is display number 1 or number 2, and so on. You must click on each of them to detect which ones are the displays without touch, cancel the calibration on those displays without touch and click on the one with touch.

Bear in mind that the number assigned by Windows to each display (1, 2, 3 and so on) does not necessarily match the numbers assigned by 'DISPLAX Connect' to each display.

This feature is currently available for Windows 7 and higher versions.

HOW TO USE WITH OTHER OPERATING SYSTEMS

GENERIC LINUX

Skin products work in Linux if all the following requirements are met:

- Kernel version 3.8 or higher
- Xorg version 1.8 or higher
- Kernel is compiled with HID multitouch support

You need to configure your setup running 'DISPLAX Connect' on a Windows (7 or higher), OS X (Yosemite), and Ubuntu (14.04 LTS). Once you are satisfied with the configuration, switch to a PC with Linux. The configuration settings are stored in the Touch Controller so there is no need to re-configure the Skin product in the Linux PC.

CHROME OS

Skin products run in Chrome OS 38.0.2125.119 (64 bit) or higher. You need to configure your setup running 'DISPLAX Connect' on a Windows (7 or higher), OS X (Yosemite), and Ubuntu (14.04 LTS). Once you are satisfied with the configuration, switch to a PC with Chrome OS. The configuration settings are stored in the Touch Controller, so there is no need to re-configure your Skin product in the Chrome OS PC.

ANDROID

Your Skin product will work out of the box in Android, if all the following requirements are met:

- Kernel version greater or equal to 3.10
- Kernel compiled with HID multitouch support

You need to configure your setup running 'DISPLAX Connect' on a Windows (7 or higher), OS X (Yosemite), and Ubuntu (14.04 LTS). Once you are satisfied with the configuration, switch to an Android PC. The configuration settings are stored in the Touch Controller so there is no need to re-configure your Skin product in an Android PC.

Note: if you are using a Display orientation different from landscape, the geometric calibration should be performed in a Windows Operating System.

MOUSE EMULATION

Some Operating Systems do not support multitouch. Skin products emulate a mouse, letting you operate the touchscreen as if it was a single touch device. You need to configure your setup running 'DISPLAX Connect' on a Windows (7 or higher), OS X (Yosemite and El Capitan), and Ubuntu (14.04 LTS). Once you are satisfied with the configuration, switch to the PC or Media Player of your choice. The configuration settings are stored in the Touch Controller, so there is no need to re-configure your Skin product in the new PC / Media Player.

WARRANTY

DISPLAX provides quality products. DISPLAX warrants to the original end user and customer of its products that they are free from defects in material and workmanship. In the event of experiencing problems with any of our product, please follow these guidelines.

DISPLAX Skin products, since January, 2017, have a two years warranty under normal use, which starts counting from the product's invoice date. During the warranty period, DISPLAX will repair or replace defective parts that are returned to our head-quarters, in Braga, Portugal, Europe.

Replacement parts are warranted for the remainder of the warranty period. All parts that are exchanged under this warranty become the property of DISPLAX.

This limited warranty does not cover any damage to this product that results from:

- Improper installation
- Accident
- Abuse
- Misuse
- Natural disaster
- Insufficient or excessive electrical supply
- Abnormal mechanical or environmental conditions

This limited warranty also does not apply to any product on which the original configuration has been:

- Altered
- Obliterated or removed
- Incorrect handling
- Non-Cautions Packaging (difficult to understand)
- Damage caused using the product outside the permitted or intended usage described in the product specifications

Damage caused by service (including upgrades and expansions) performed by anyone who is not a representative of DISPLAX or by anyone unauthorized by DISPLAX is not covered.

For any warranty claim, the Buyer must provide DISPLAX with:

- Applicable model and serial numbers, the date of purchase, and the nature of the problem.

DISPLAX, in its discretion, may also require that the Buyer return the product being covered under warranty.

The warranty covers only the returned items to the base, and it does not include:

- On-site repair charges such as labor
- Travel
- Shipping
- Other expenses associated with the repair or installation of replacement parts.

Shipping Charges: When applicable, DISPLAX will pay all shipping charges to send the repaired, replaced or exchanged product to the original shipment point.