



CALIBRATION  
PROCESS

AN-FW-008

## DOCUMENT REVISION

Revision	Date	Author	Comments
1.1	Aug\24\2016	John La	Added images to explain parallax effect
1.0	Aug\22\2016	John La	Created the document

## 1.0 INTRODUCTION

ShadowSense is a perimeter based touch technology that when applied to a display, transforms it into an interactive touchscreen. The accuracy offered by ShadowSense is unsurpassed and provides the best touch and writing performance.

To achieve the level of accuracy described, a touch frame must be calibrated when it is first attached to a display. This is necessary due to variations in the manufacturing process. If a frame has not been applied to a display precisely then the touch point registered on the display may not match the touch location shown on the screen.

It may also be desirable to perform a calibration if the active area of the touch frame is larger than the viewing area of the display. This is common with displays using Windows 8/10 that require the use of out of screen swipes to activate the various functions or menus in Windows called Charms. This is also often required for frames applied around a video wall using an array of displays.

## 2.0 CALIBRATION PROCESS

The calibration process allows the user to perfectly align the touchscreen data to the LCD image. Specifically, it will align a users' fingertip or stylus with the middle of a mouse pointer or touch indicator as displayed on the touchscreen.

***The following calibration process requires Dashboard version 2.0.6078.27074 or later. For calibration using an older version of Dashboard, refer to Appendix A at the end of this document.***

Calibration of a ShadowSense touch frame is done through the accompanying configuration and diagnostic application, Dashboard. Using Dashboard, browse to the *Configuration* menu and begin by clicking the *Calibration* button under the *Transformations* setting. This is shown in Figure 1.

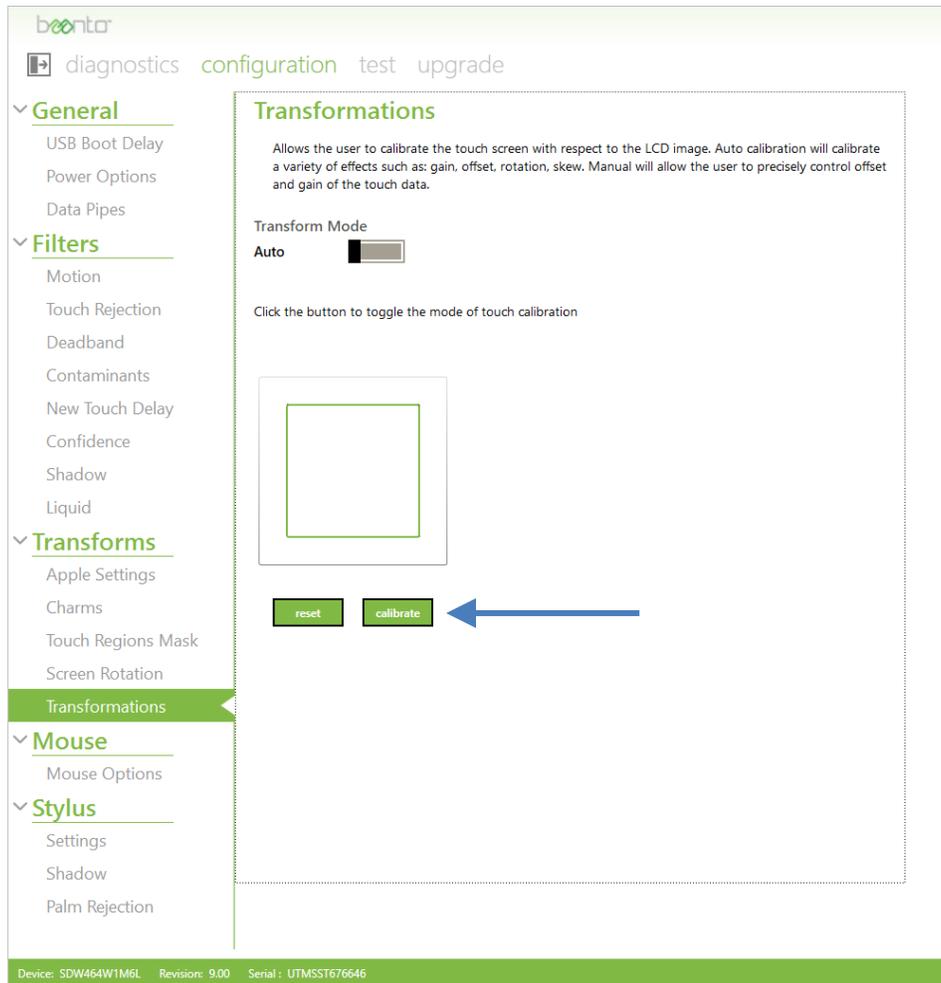
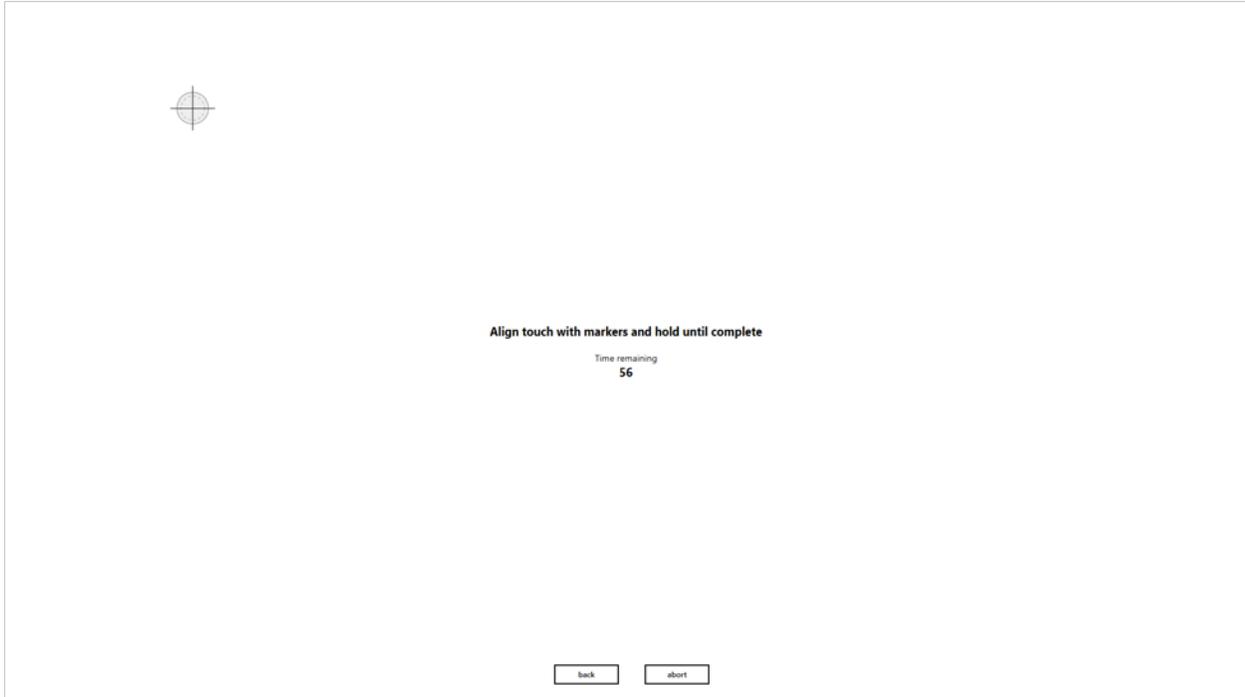


Figure 1: Calibration with Dashboard

Once the calibration process has started, a user has 60 seconds to complete it. If calibration is not completed in this time then it can simply be restarted. The process can be aborted at any time by clicking the *abort* button at the bottom of the screen, and the user can also click the *back* button at any time to repeat the most recent change.

The calibration process will require the user to touch and hold four registration points shown on the screen. Each registration point will appear as a light grey circle with a crosshair in the middle. The accuracy of the calibration process is determined by how close a user touches the center of each registration point. The initial registration point will appear in the top left corner of the screen as shown in Figure 2.



*Figure 2: First Registration Point at Start of Calibration Process*

The user is required to touch and hold their finger at the intersection of the crosshair until the touch is registered and stored in memory. A green crosshair will appear at the point where the user first touches the screen as shown in Figure 3. This is the current location of the registered touch and should not be confused with the target. **Do not try to drag this green crosshair onto the registration point.**

The user should then move their finger so that it is directly over the registration point and hold it in place for about 4 seconds. The duration in which the point is held is shown as a sweeping grey circle in Figure 4. When the entire circle goes from dark grey to light grey, the initial target will be replaced by a green crosshair showing that the new touch point has been registered. This is shown in Figure 5. If a user removes their finger before this occurs then they must restart the process for that particular registration point.

After the first touch point has been registered, the process repeats itself with a registration point appearing in the top right corner, then the bottom right corner, and finally the bottom left corner. When the entire process is complete, the screen should look similar to the screenshot shown in Figure 6.

If the calibration process has been performed correctly then the touchscreen should now be ready for use. Users should not see a significant difference between the location of their finger or stylus, and the pointer that is shown on the screen. If the gap is more than a few millimeters apart then repeat the calibration process.



Figure 3: Green Crosshair Showing Initial Touch Point

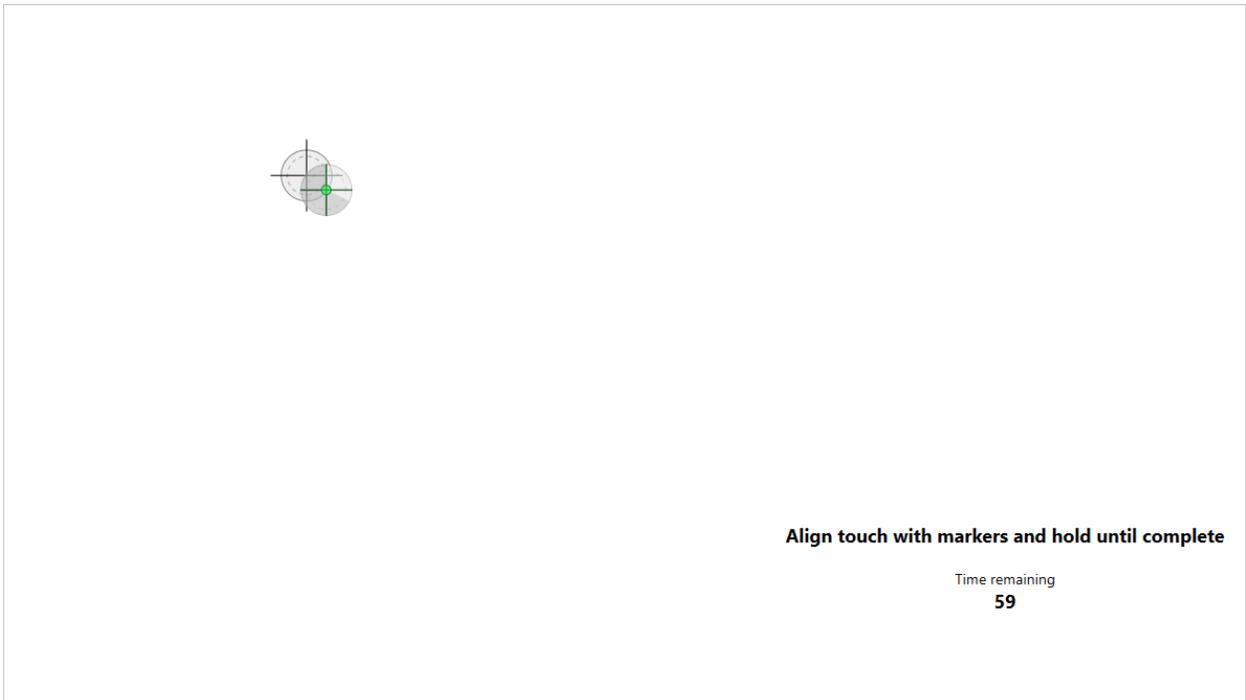


Figure 4: Sweeping Grey Circle Showing Duration of Hold (Light Grey = Time Held, Dark Grey = Time Remaining)

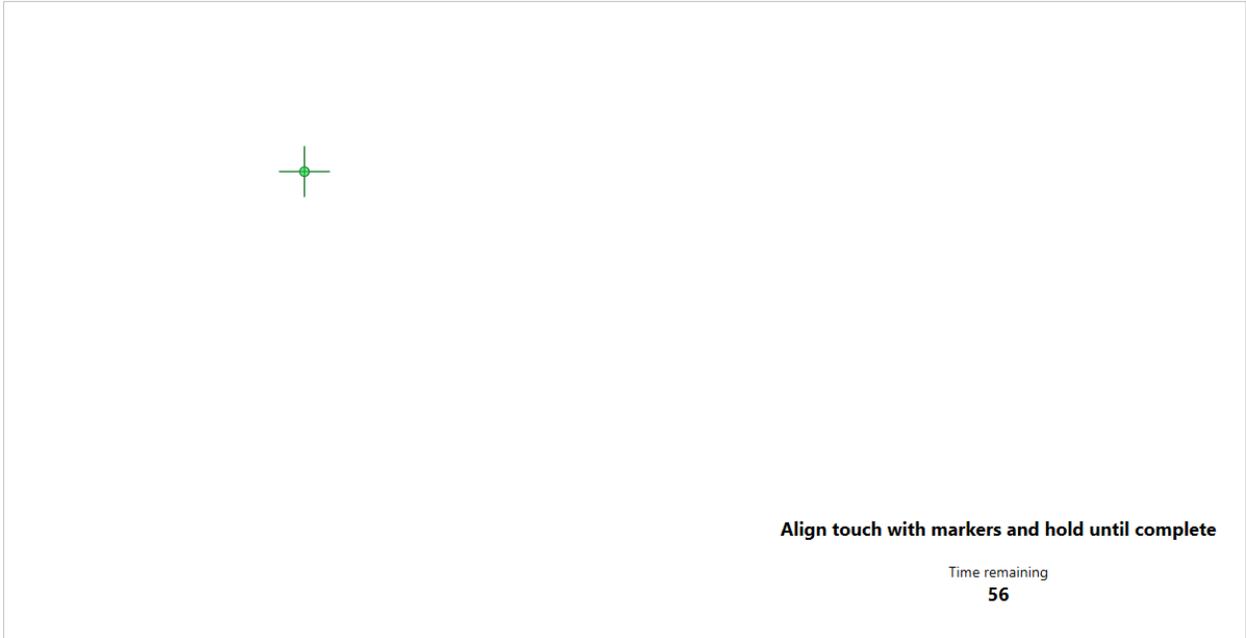


Figure 5: Green Crosshair Showing New Registered Touch Point

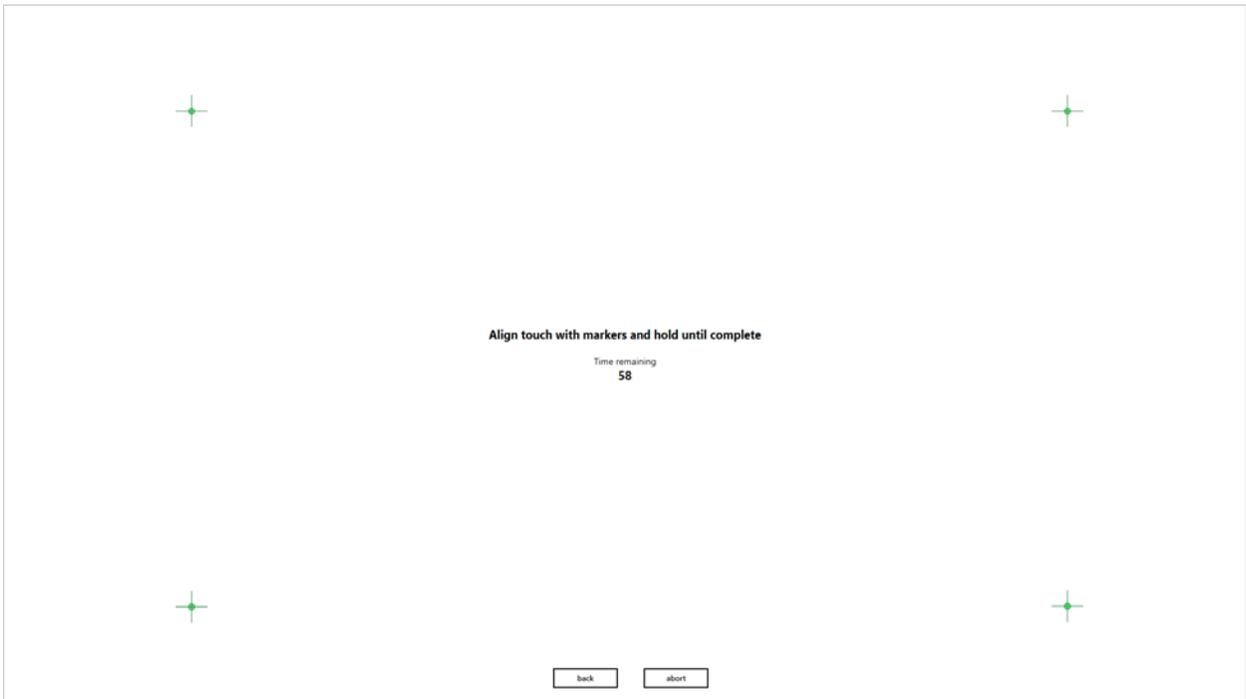
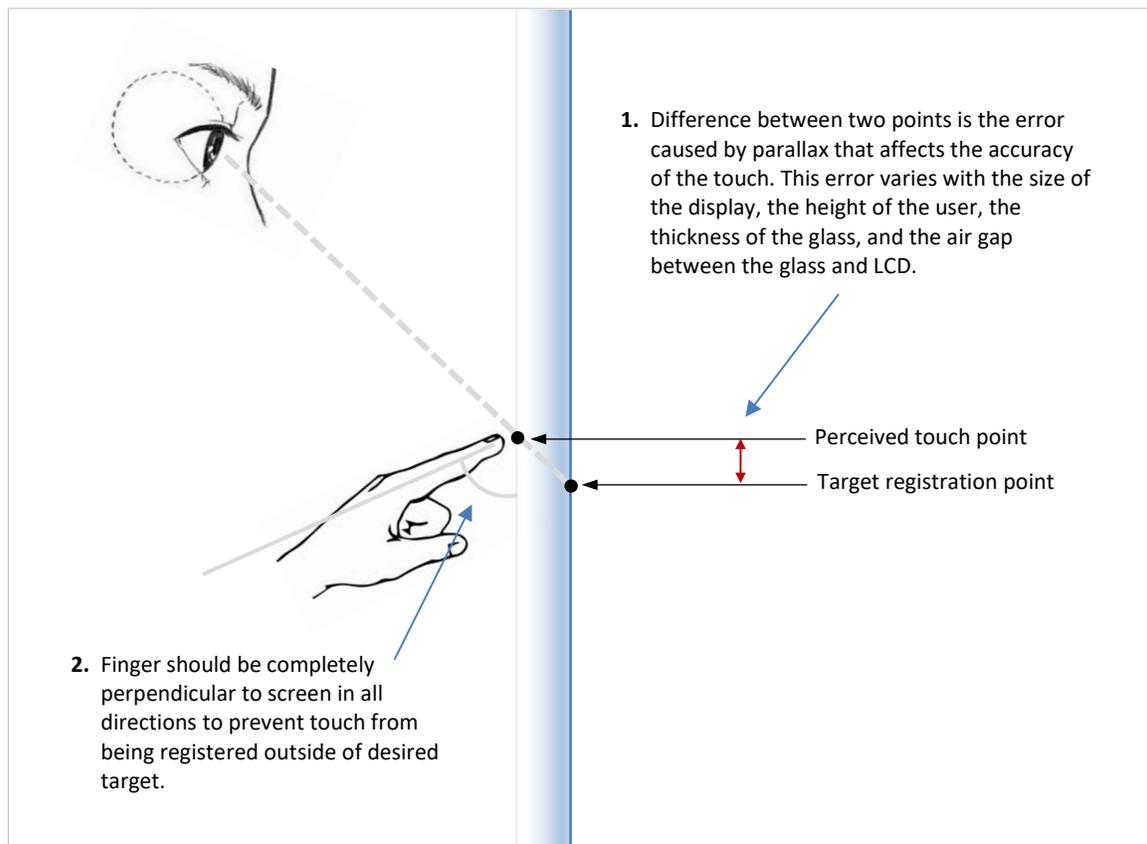


Figure 6: Calibration Screen Once All Points are Registered

### 3.0 ADVANCED CALIBRATION PROCESS

Using the calibration method outlined in the previous section can yield very favorable results, however, the accuracy of the touch registration can be improved even further with some assistance. When calibrating a screen using a user's finger, factors such as parallax can cause the touch registration to be slightly off, especially on the lower half of the screen, furthest from the user's line of sight. Accuracy is further compromised when using a finger to touch the registration points since the shape of the fingertip varies depending on the angle and pressure that is applied, and touch is detected outside the desired target. Both of these issues are illustrated in Figure 7.



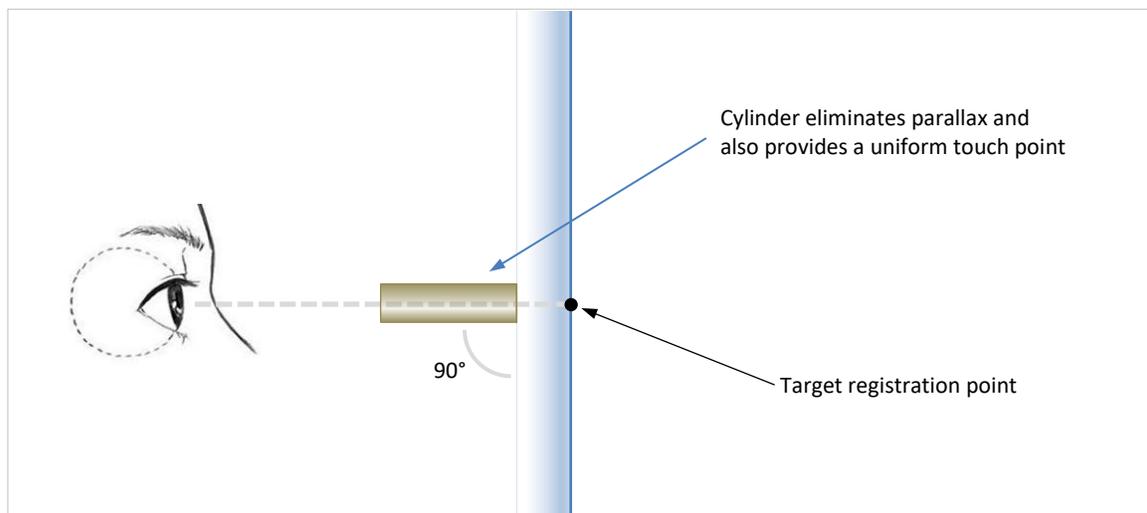
*Figure 7: The Effect of Parallax on Accuracy of Calibration*

To eliminate issues of parallax, a small hollow cylinder can be used to assist in the calibration process. An example of such an object is shown in Figure 8. This particular object is simply a hollow copper tube with a cap on one end. The object has an outer diameter of 18 mm, a length of 67 mm, and the cap has a 5.7 mm hole drilled into it.



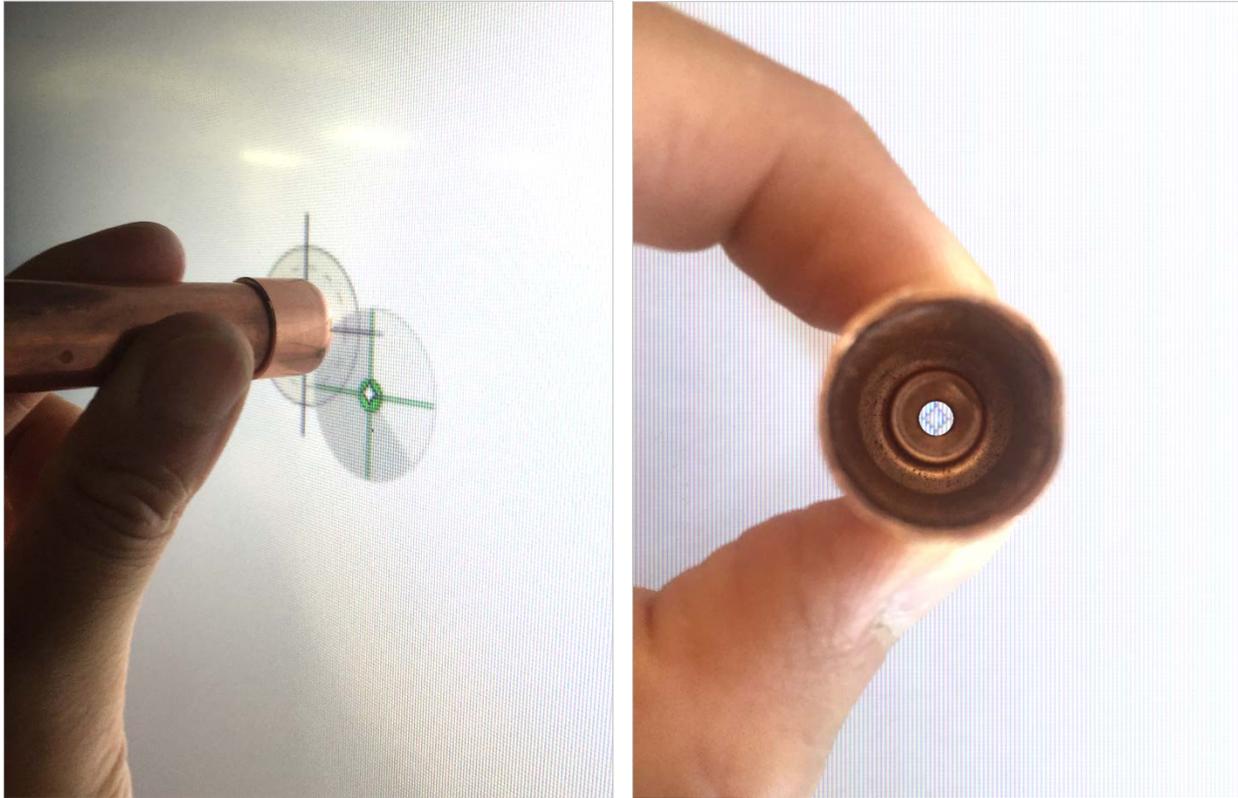
*Figure 8: Example Object for Use with Calibration*

By placing the cylinder directly on the screen and looking through the hole, a user can eliminate any parallax issues. This is because the cylinder forces the user to look directly at the registration points on the screen at an angle that is perpendicular to the display. This allows the user to touch the registration points more accurately. This is illustrated in Figure 9.



*Figure 9: Using Cylinder to Eliminate Errors*

Additionally, since the end of the cylinder is perfectly round and flat, the centroid that is used to approximate the size and location of the touch point will be exactly in the middle. This accuracy is shown in Figure 10.



*Figure 10: Accuracy of Calibration*

Using a similar object to replace a user's finger in the process described in Section 2.0 will yield the most accurate and repeatable calibration results.

## APPENDIX A: CALIBRATION PROCESS - PRIOR VERSIONS OF DASHBOARD

The following calibration process is used on versions of Dashboard prior to 2.0.6078.27074. This process is done by tapping the center of four purple circles that appear on the screen, all within one minute.

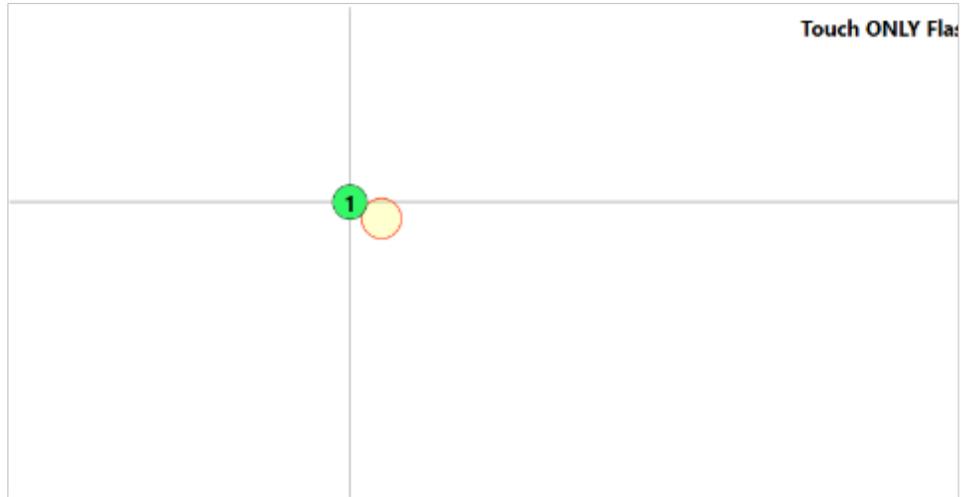
It should be noted that the user must try to touch as close to the middle of the purple circle as physically possible. Every time the user touches a purple circle Dashboard draws a red circle representing the error between the LCD image and the touch location. Once the calibration process is completed the touch screen automatically compensates for the detected error and the LCD image will register very accurately with the touch location.

The calibration screen is shown in Figure 9.



Figure 11: Calibration Screen (Old)

Once the circle has been touched, a red circle is shown that signifies the error between the LCD image and the touch location. This is shown in Figure 10.



*Figure 12: Touch Registration Point (Old)*

Repeating the process for all four circles will calibrate the touch frame.