

Features and benefits of existing eye tracking tools

Features: The eye tracking choices remain the same. People can choose: Blink, Dwell, Blink/Dwell, and External Switch. You can use Zoom, Click and use the Highlight Settings. Also, still available is the choice of choosing to calibrate using just your left eye, your right eye, or both. You have the same choices for the background color (yellow, black and grey), and you can still calibrate with a switch.

Feature: Calibrate with a Switch - It is important to focus on the target, but if you're calibrating with a switch, then you don't have to stay focused for the entire length of time that the target is animated (the period of time the target spins or moves.). The camera will wait indefinitely and will only calibrate when the switch is selected. It's just like taking a picture. Simply plug a switch into Port 1, select Calibrate with Switch in Eye Tracking Settings, and begin the calibration process. The person's attention can wander; each time he or she looks at the target (the EyeLock LEDs are a steady green), hit the switch to register the calibration point.

Feel free to move your eyes away from the screen between targets, as long as you remember to capture the focus of each target by using the switch. It might also help to increase the speed of the time between targets by adjusting the Calibration Time.

Benefit: Sometimes it's hard to stay focused on the calibration target, no matter which image is displayed and it's a great way to help people who aren't fully aware of what's going on during the calibration process. It's easy to get them to look at the target, but tough to keep their attention through the entire calibration process.

Feature: Drain Delay (Highlight Rules) – This clock counts the amount of time you can drift from the targeted button before the *Pause* or *Dwell* clock is set back to zero. When you select your intended button but the cursor drifts before you've met the necessary *Dwell Time* in order to make the selection, this setting is the buffer time, or the wait time you'll have to get the cursor back on the target before the already accumulated *Dwell Time* is erased from your targeted button.

Feature: Drain Time (Highlight Rules) - This is the rate at which you want the clock to start over. So, if you want the remaining clock to drain really fast, set the slider to 1. If you want the remaining clock to drain more slowly, set the slider to 5000.

Benefits: The Drain timers serve as a “cushion” you can use when the target is hard to reach and hold on to for the required Pause or Dwell Time. The Drain tools are there to give you assistance.

Additional Eye Tracking Desktop Settings available when you've selected Extend Selection Method to the Desktop:

Feature: Show Dwell Time Animation is an option which provides visual feedback either in the form of a clock (an animated clock that measures Dwell Time on the target) or contraction (animation that contracts a circle and helps maintain focus on the target while measuring the Dwell Time on the target.). This feature only works when you've selected Extend Your Selection Method to the Desktop option. Although the video animation for this feature can be displayed in the same way as the radar option in desktop scanning, they are not at all the same.

Benefit: It may be very helpful for some people to use the *Show Dwell Time Animation* option because it helps people know how much longer they need to keep their eyes focused on a desktop or web target before it gets selected. It also can serve as the indicator to know when to shift their focus off of the target so it doesn't get selected.

Feature: Dwell Box Size – we've created 3 dwell box sizes (options) and each corresponds to an invisible margin (small, medium or large) that we created to surround the cursor at the point where the cursor is dwelling on an object (link or icon) on the Windows desktop or Internet. This feature only works when you've selected Extend Your Selection Method to the Desktop option.

Benefit: The box is there to allow the small movements that naturally occur while you are trying to maintain contact with the target. It's the wiggle room (or grace) that keeps you in the zone for selection and there to assist accurate targeting. This option is only available if you select with dwell or blink/dwell.

Calibration and Position

Calibration and proper position, together, is the key to optimal eye tracking performance, and can be the difference between when the EyeMax works well and when it does not seem to work as well. There are several possible variables, all within your control, that can influence the performance level of the device.

As lighting conditions and your body position change throughout any given day, so can the performance of the EyeMax. In order to maintain maximum performance after a significant change, be sure the relationship between your head and the device are optimal. This section explains why body position and lighting conditions play a role in successful eye tracking and offers some general advice. The following factors are discussed:

- Distance and angle
- Repositioning
- Environmental light
- Eyewear
- Eyelids
- Eye color
- Losing eye tracking status
- Calibrating with a switch
- Drifting

NOTE:

It's good practice to calibrate without the Internet running in the background. It is important to eliminate the Internet variable in order to establish a baseline performance level between you and the camera. If the Internet is running, it is constantly receiving updated information, and that increased activity draws from the resources of the device's processor, which may cause a delayed response from the mouse cursor. It may also give the impression that there is a device and/or camera failure when the delayed response is really just the Internet being updated. If you have difficulty accessing a Web link or a button while you are using the Internet, the delay may simply be due to the amount of activity on a demanding website. Additional calibration may not be necessary, just a little patience!

Distance and Angle

For effective EyeMax use, always follow a few simple positioning guidelines:

1. Your forehead should be lined up (as closely as possible) to the power button on the Vmax+.
2. Your eyes should be approximately 20 to 24 inches away from the Vmax+ touch screen. This is the optimum distance for proper focus.
3. If you lean to the side, it is important to tilt both the Vmax+ and the EyeMax to the side as well. Rotating the Vmax+ and the EyeMax to match your head angle will greatly increase the allowable head movement.
4. Whenever you move significantly or rotate the device, be sure to that the relationship between your head and the device are optimal.

Repositioning

Apart from necessary and deliberate extreme repositioning (and even the slightest passive range-of-motion [PROM] exercises), gradual repositioning frequently happens because of gravity and the lack of muscle control. Whenever you move enough that your eyes are no longer displayed in the blue box, you need to reposition your head or the device so that your eyes are in the box.

NOTES:

Clinical recommendations for repositioning range from every 10 minutes to every two hours. Gravitational repositioning, “drifting” or “sliding” occurs less frequently and is less obvious but can be just as compromising as moving from place to place. As your position shifts, your eyes naturally shift and if you’re using the Show Calibration Hint it will help you know when it’s time to add to your calibration data (Improve Calibration) and improve accurate targeting.

Environmental Light

Even when your eyes are squarely in the blue box, lighting can be an important influence. The EyeMax accessory contains light-emitting diodes (LEDs). These infrared transmitters are located on each side of the EyeMax. They help the camera track the movement of your eyes. The amount of light in a room, either natural (sunlight) or artificial (lamplight), can interfere with the transmission of the LEDs. When the light source appears as a “point source” to the camera, it may be mistaken as an LED reflection. In other words, in some instances, intense light can affect the LED transmission that tracks your eye, but it’s usually easily correctable. To minimize this problem, close blinds or curtains, and either dim or reposition lamps. A simple experiment can determine if environmental light is causing a problem. When the sun is down or the lights are low, recalibrate and then use the device for normal communication. If accuracy is significantly improved, take steps to minimize light interference.

NOTE:

If you are getting unwanted glare from the reflection of the LEDs in your eyes, you can angle the Vmax+ up a bit (keeping your eyes in the blue box) until the glare disappears. Simply adjust the bottom up a bit.

Eyewear

The lenses, frames, rims or arms of your glasses can sometimes create enough reflection that the LED transmission fails to localize on the specific light that is reflecting from your eye. This can interfere with camera performance. In other words, at times light can either reflect or refract the light from the LEDs, causing the camera to track the light from your glasses and not your eye. This is usually easily correctable.

As your position shifts, your eyes naturally shift. Consequently, the reflection of your glasses might change the light points, and might even increase the number or position of light points reflected from your eye surface. Because the camera tracks the reflection from the surface of your eye, your new position might cause the critical reflections (the ones used from calibration) to be partially occluded by the lens (bifocal/trifocal/progression lens), frame, rim or arm of your glasses, making repositioning necessary.

To see if your glasses are affecting performance, wear your everyday glasses and compare the performance of the EyeMax during the day to its performance at night. If the performance is better at night, then the natural light reflecting from your glasses onto your eye surface may be compromising the camera performance. Try the same test with over-the-counter reading glasses and evaluate the performance level.

To minimize eyewear interference, try calibrating without your glasses. If that is successful, but you need glasses to support vision while using the Vmax+, try inexpensive, over-the-counter reading glasses. Avoid bright metal rims. Additionally, glasses with anti-glare coatings can reduce reflection.

Eyelids

The camera relies on the reflections from the surface of your eye (the pupil, iris and retina). Therefore, the position of your eyelid (droopiness) can compromise eye tracking performance. For some people, tilting the EyeMax up will naturally force the eyelids up.

Eye Color

Occasionally, eye tracking just doesn't work for people who have very light-colored eyes. This happens because the infrared light transmitter actually inverts the color of the iris. Therefore, the lighter the iris (light blue or green), the darker it appears to the camera. This creates less contrast between the pupil and the iris, and compromises the eye tracking response from the camera. The darker the iris is (brown), the lighter it appears to the camera, creating greater contrast between the pupil and iris. This leads to a better eye tracking response from the camera.