

**Welcome**  
to 21<sup>st</sup> Century Visual Clarity Measurement




**The 21st century method for measuring visual acuity.**

Dyop® is a trademark of Dyop® Vision Associates and is covered under US Patent 8,757,805 and International patent 2011/022428 with additional patents applied for. Copyright©2018 - Dyop® Vision Associates - All Rights Reserved

Copyright©2019 Dyop® Vision Associates LLC 1

**Introduction**

The methodology for the Dyop® test requires that the optotypes be properly calibrated for both the monitor and viewing distance.



[Calibration](#)
[Instructions](#)
[Explanation](#)
[Dyop® Color Matrix](#)

Full Screen  
ON / OFF

**Before using the Dyop® test you must understand that:**

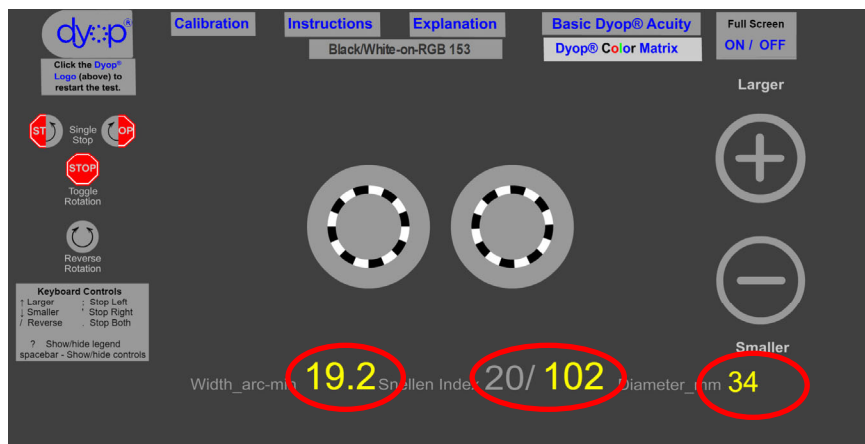
1. A Dyop® is a rotating/moving segmented image used to determine visual clarity. The smallest diameter Dyop® image detected as rotating is an indicator of visual clarity and acuity.
2. To have a precise measure of visual clarity and acuity, you must properly calibrate the Dyop® images and view those images from an appropriate fixed viewing distance.
3. This version of the Dyop® Acuity Test is intended for viewing distances of **10 feet (3.05 meters)** to **30 feet (9.15 meters)** and for monitor sizes from **10 inches (25.4 cm)** to **41 inches (104 cm)** diagonally.
4. Use the [Calibration](#) screen (above) to adjust the test image size to your monitor and viewing distance. The [Instructions](#) and [Explanation](#) have expanded details, and the [ColorMatrix™](#) allows determining acuity in color.
5. To start or return to the test, click the [Dyop® Logo](#) (above).

10.0 % sw - 8 sectors - SWF-3 - 40 rpm - 2016-04-08

Copyright©2019 Dyop® Vision Associates LLC 2

## Snellen and Dyop® Index values

Snellen, Dyop Arc Width, and screen diameter values are automatically presented.



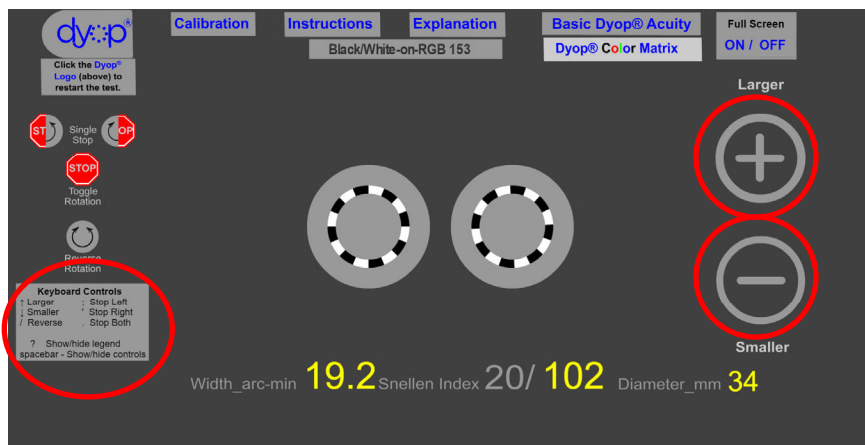
Copyright©2019

Dyop® Vision Associates LLC

3

## Reduce the Dyop® diameter

Use the **Mouse Scroll Wheel** or screen **Up/Down arrows** or **Keyboard Arrows** to reduce the Dyop® image diameters. Use the **; ' . /** Keyboard keys to control the image rotation.



Copyright©2019

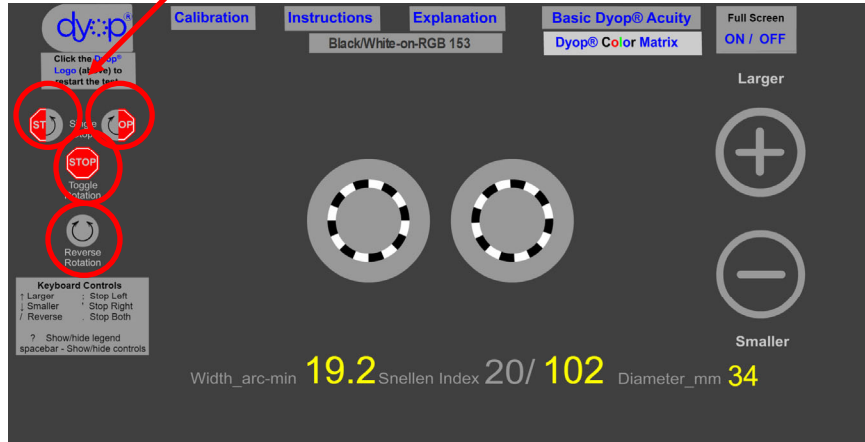
Dyop® Vision Associates LLC

4

## Screen Buttons

Test for "false positives" using the Reverse Rotation, Stop-toggle, and Single Stop buttons.

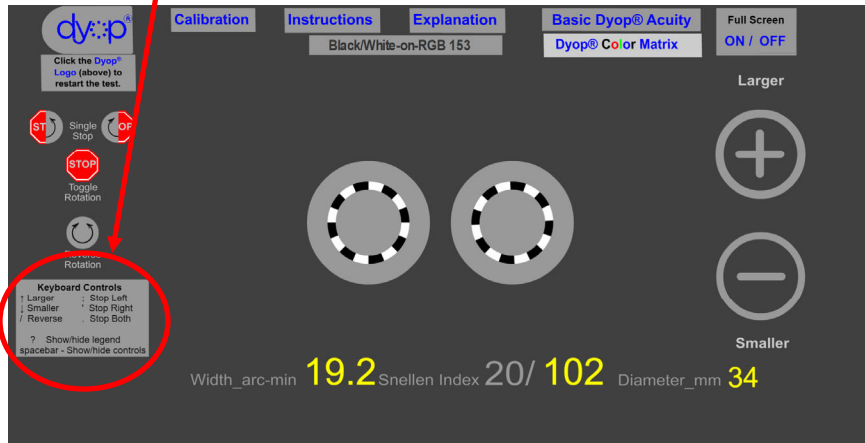
### Screen Control Buttons



## Keyboard Keys

Test for "false positives" using the Reverse Rotation, Stop-toggle, and Single Stop Keys.

### Keyboard Control Guide

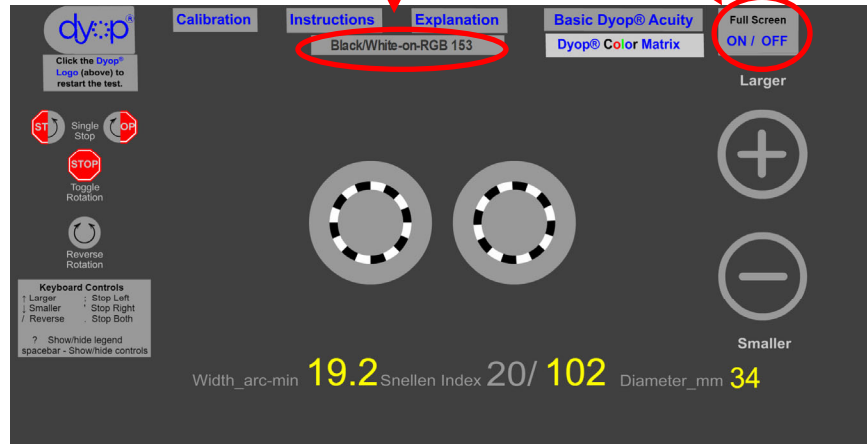


## Color/Contrast and Full Screen

The color/contrast is always displayed. Full Screen is an On/Off toggle.

Color/combination text

Full Screen toggle



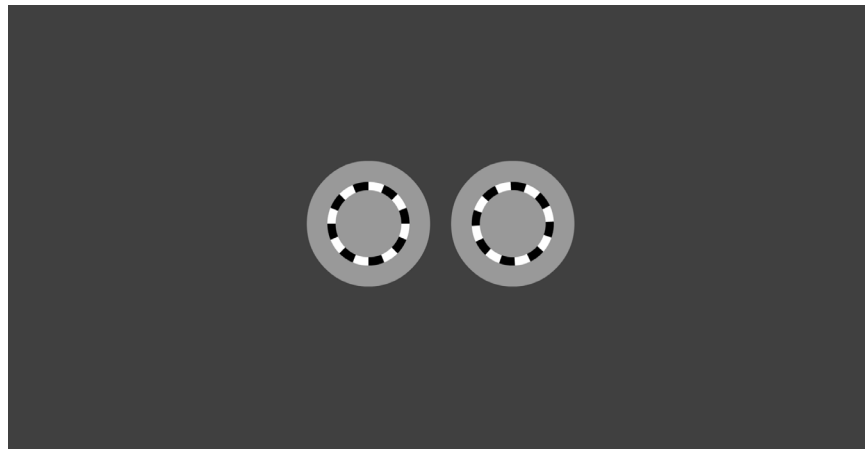
Copyright©2019

Dyop® Vision Associates LLC

7

## Minimalist Display

Pressing the **Space Bar** toggles the display of the screen controls and image size information so that **ONLY** the Dyops are displayed.



Copyright©2019

Dyop® Vision Associates LLC

8

## Instructions Panel

Dyop® accuracy and precision can be calibrated for almost any computer monitor and viewing distance.

**Instructions**

1. A Dyop® is a spinning segmented ring which uses a strobic stimulus of the photoreceptors to determine visual acuity. The **Visual Acuity Endpoint** is the **smallest diameter Dyop® detected** as spinning. The Dyop® **Visual Acuity Endpoint** also indicates the **Minimum Area of Resolution (MAR)**. Dyops whose gap/segments only "twinkle" are **NOT** "spinning." If using **Full Screen**, adjust the Calibration in that mode. Once **Calibration** is completed, click the **Dyop® Logo** (top left above) to start or return to the test.

2. When the test starts, use the **Keyboard Up/Down Arrows** or the **Mouse Scroll Wheel**, or the "fine tuning" **(+)** and **(-)** **Screen Symbols**, to adjust the Dyop® diameter size. Clicking the screen **Double Arrow Symbol** will reverse the rotation direction to assist in detecting false positives. Clicking **STOP** will toggle Start/Stop rotation. The **SingleStop** buttons will individually **STOP** either the **Left** or **Right** Dyop® images. Keyboard Keys = **(Up)** Larger, **(Down)** Smaller, **(-)** **LeftStop**, **(.)** **RightStop**, **(.)** **AllStop**, **(/)** **Reverse**, **(?)** **HideKeys**. Pressing the **SpaceBar** will toggle hiding the display of screen controls and response data. For dual colors, click the **LeftStop** so that **BOTH** colored Dyops® are spinning.

3. Valued displayed are the Dyop® **arc width**, the **Snellen ratio**, and physical **screen diameter**. The **acuity endpoint** is the smallest diameter arc width Dyop® that can be detected as spinning and may be recorded as the Dyop arc width or the comparable Snellen ratio. **Reducing the Dyop® diameter to where spinning is not detected has the same effect as adding blur with static optotypes.**

4. For a **refraction**, reduce the Dyop® size to the **minimum diameter** detected as spinning. **Subtract 8** from that **minimum arc minute value**, and then **divide by 6** to determine the **initial spherical lens setting**. For example, **14 initial arc minutes** would be one diopter of spherical power ( $14 - 8 = 6$  &  $6/6 = 1$ ). **20 initial arc minutes** would be 2 diopters ( $20 - 8 = 12$  &  $12/6 = 2$ ). **26 initial arc minutes** would be 3 diopters ( $26 - 8 = 18$  &  $18/6 = 3$ ), and **32 initial arc minutes** would be 4 diopters ( $32 - 8 = 24$  &  $24/6 = 4$ ). That value is the initial **+** spherical setting, with **(+)** for a hyperope and **(-)** for a myope. Reduce the Dyop® diameter to the minimum detected rotation setting. Use a **-0.50 diopter cylinder lens** to determine the axis. Once the axis is determined, alternately add increments of **-0.25** or **+0.25** diopters of sphere to determine if the Dyop® becomes clearer and the Dyop® diameter can be reduced. Repeat the addition of increments of **-0.25** diopters or **+0.25** diopters of cylinder to determine if the Dyop® becomes clearer and the Dyop® diameter can be reduced. Repeat the process in increments of **-0.25** diopters or **+0.25** diopters of sphere to determine if the Dyop® becomes clearer and the Dyop® diameter can be reduced. Clicking the **LeftStop** or **RightStop** button to use only **ONE** rotating Dyop® to speed the endpoint determination.

5. The **refraction endpoint** is the setting for sphere, cylinder, and axis for the minimum Dyop® diameter where Dyop® rotation can be detected. The **Best Visual Acuity** may be recorded as the (minimum) Dyop® arc width or the Snellen ratio. Repeat the process for each eye and binocularly. For dual color comparison click the **Left/Stop** icon to have both Dyops rotating.

## Explanation Panel

The technology of Dyop® acuity measurement was not available in 1862. Dyop® testing measures photoreceptor responses in Black/White and in color.

**Explanation**

How well we see (**visual acuity**) is classically defined by the ability to detect the gap separating two points or two lines. That visual gap creates a two dimensional (the optical target height and viewing distance) **Minimum Arc of Resolution (MAR)** **hypothetically defined as 1.0 arc minute of height**. The classic 1962 Snellen test uses culturally derived static letters to create visual targets (optotypes) which have irregular and inconsistent white gaps within black letters as the stimulus for visual acuity measurement.

**However:**

1. The spinning Dyop® empirically derived **Minimum Area of Resolution (MAR)** is a **0.54 arc-min squared stimulus area**, which is about half of the classic **1.0 arc-min squared Snellen/Sloan/Landolt** minimum stimulus area. This smaller uniform stimulus AREA contributes to the increased Dyop® precision versus the irregular and inconsistently shaped Snellen letters, and it measures vision in five variables in terms of height, width, viewing/distance, color, and time.
2. The Dyop® **Acuity Endpoint** is the smallest angular arc width Dyop® diameter whose strobic gap/segments are detected as rotating/moving, when the gap/segment stimulus area "disappears" by becoming smaller than the foveal perception area.
3. The Black/White-on-Gray Dyop® gap/segment stimulus area maximizes contrast sensitivity and minimizes the effect of ambient light by utilizing the strobic stimulus of the photoreceptors and a 0.33 arc-min squared per second photoreceptor refresh rate.
4. The Dyop® circular uniformity, regardless of the image diameter, contributes to the consistency of Dyop® tests versus the lack of uniformity of letters when used for vision testing. Letter-based test irregularity inherently leads to vision test inconsistency.
5. Detection of Dyop® motion maximizes accommodative rest to optimizes acuity measurement. Static letter (image) fixation increases accommodative stress and induces a higher minus refraction response.
6. The use of a computerized image enhances Dyop® accuracy because of the tendency to perceive emitted light with greater precision than we might with scattered light, or fuzzy projected images.
7. Acuity regulation is primarily a learned function based upon the chromatic focal length disparity of the Red and Green cone photoreceptors. The increased accuracy, precision, and flexibility of Dyop® testing facilitates the measurement of acuity in color. Color/contrast acuity endpoints can be used to screen for color perception genetic groups. Chromatic perception color groups will likely have either 50% red & 45% green (Green-Focused Vision) or 75% red and 20% green (Red-Focused Vision).

2018-08-30 Green=00FF00

# Adjust for the viewing distance

Enter the **viewing distance** as either feet or meters.  
Once determined, the distance adjustment will be maintained by the browser.

Click the Dyop® Logo (above) to restart the test.

Enter the actual viewing distance: **20 ft** **6.09 m** Default is 20 feet (6.09 meters).

**Width** 100% Smaller Larger

If using Full Screen mode, adjust the Calibration for FULL SCREEN ON prior to using the test.

The Credit Card Template (below) should be 3-3/8 inches by 2-1/8 inches OR 86 mm by 54 mm.

3-3/8 inches 86 mm  
2-1/8 inches 54 mm  
Credit Card Calibration Template

Height 100% Smaller Larger

A Dyop® is a segmented spinning/rotating ring which uses strobic photoreceptor stimulus to determine visual acuity and the refraction endpoint.

The Calibration screen adjusts the size of the test images to your monitor and viewing distance. The Instructions and Explanation provide expanded details. The ColorMatrix™ allows determining acuity in color.

To have the proper Dyop® image Calibration for your monitor, enter the actual viewing distance (above), and then use the Gray Arrows to adjust the size of the Credit Card Template to 3-3/8 inches (86 mm) wide and 2-1/8 inches (54 mm) high. (Minimum 50%; maximum 140%.)

Once Dyop® calibration is determined, it will remain the same each time the test is used.

This test is for a viewing distance of 5 feet (1.52 m) to 30 feet (9.15 m) and monitor diagonal sizes of 10 inches (25.4 mm) to 41 inches (104 mm).

2018-08-31 Green=00FF00

Dyop® is a trademark of Dyop® Vision Associates and is covered under US Patent 8,757,805 and International patent 2011022428 with additional patents applied for. Copyright©2017 - Dyop® Vision Associates - All Rights Reserved

# Adjust for the Monitor Size

Use the **Gray Arrows** to adjust the size of the **Credit Card Template** to **3-3/8 inches (86 mm) wide** and **2-1/8 inches (54 mm) high** to have the proper Dyop® image sizes for your monitor..

Click the Dyop® Logo (above) to restart the test.

Enter the actual viewing distance: **20 ft** **6.09 m** Default is 20 feet (6.09 meters).

**Width** 100% Smaller Larger

If using Full Screen mode, adjust the Calibration for FULL SCREEN ON prior to using the test.

The Credit Card Template (below) should be 3-3/8 inches by 2-1/8 inches OR 86 mm by 54 mm.

3-3/8 inches 86 mm  
2-1/8 inches 54 mm  
Credit Card Calibration Template

Height 100% Smaller Larger

A Dyop® is a segmented spinning/rotating ring which uses strobic photoreceptor stimulus to determine visual acuity and the refraction endpoint.

The Calibration screen adjusts the size of the test images to your monitor and viewing distance. The Instructions and Explanation provide expanded details. The ColorMatrix™ allows determining acuity in color.

To have the proper Dyop® image Calibration for your monitor, enter the actual viewing distance (above), and then use the Gray Arrows to adjust the size of the Credit Card Template to 3-3/8 inches (86 mm) wide and 2-1/8 inches (54 mm) high. (Minimum 50%; maximum 140%.)

Once Dyop® calibration is determined, it will remain the same each time the test is used.

This test is for a viewing distance of 5 feet (1.52 m) to 30 feet (9.15 m) and monitor diagonal sizes of 10 inches (25.4 mm) to 41 inches (104 mm).

2018-08-31 Green=00FF00

Dyop® is a trademark of Dyop® Vision Associates and is covered under US Patent 8,757,805 and International patent 2011022428 with additional patents applied for. Copyright©2017 - Dyop® Vision Associates - All Rights Reserved

### Adjust for the Monitor Size

Once determined, the precise monitor percent adjustment image size will be maintained by the browser.

Click the Dyop® Logo (above) to restart the test.

Enter the actual viewing distance:  ft  m Default is 20 feet (6.09 meters).

**Width** 100%

Smaller ← → Larger

If using Full Screen mode, adjust the Calibration for FULL SCREEN ON prior to using the test.

The Credit Card Template (below) should be 3-3/8 inches by 2-1/8 inches OR 86 mm by 54 mm.

3-3/8 inches 86 mm

2-1/8 inches 54 mm

Credit Card Calibration Template

Height 100%

Smaller ↑ ↓ Larger

Dyop® is a trademark of Dyop® Vision Associates and is covered under US Patent 8,757,805 and International patent 2011022428 with additional patents applied for. Copyright©2017 - Dyop® Vision Associates - All Rights Reserved.

2018-08-31 Green=00FF00

### Click the Dyop® logo to Start

After determining the proper calibration, click the [Dyop® Logo](#) to start the test. The monitor calibration and viewing distance will be remembered by your browser.

Click the Dyop® Logo (above) to restart the test.

Enter the actual viewing distance:  ft  m Default is 20 feet (6.09 meters).

**Width** 100%

Smaller ← → Larger

If using Full Screen mode, adjust the Calibration for FULL SCREEN ON prior to using the test.

The Credit Card Template (below) should be 3-3/8 inches by 2-1/8 inches OR 86 mm by 54 mm.

3-3/8 inches 86 mm

2-1/8 inches 54 mm

Credit Card Calibration Template

Height 100%

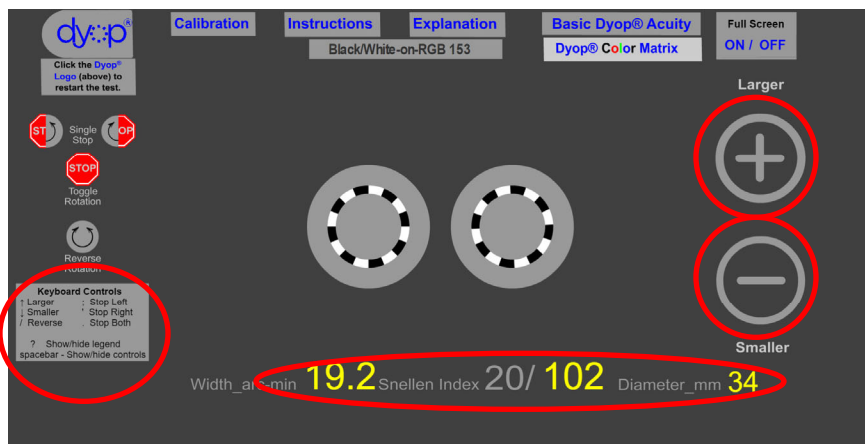
Smaller ↑ ↓ Larger

Dyop® is a trademark of Dyop® Vision Associates and is covered under US Patent 8,757,805 and International patent 2011022428 with additional patents applied for. Copyright©2017 - Dyop® Vision Associates - All Rights Reserved.

2018-08-31 Green=00FF00

## Use the Mouse Scroll Wheel

The screen **Plus/Minus Icons** change the Dyop® image diameter angular arc width. You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



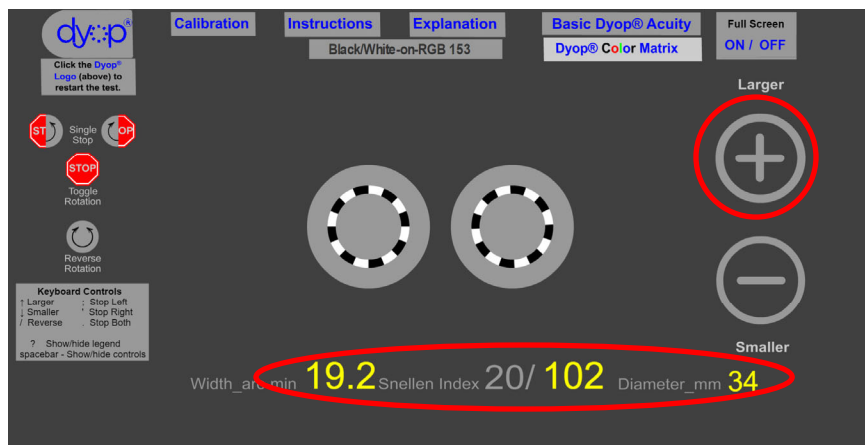
Copyright©2019

Dyop® Vision Associates LLC

15

## Use the Mouse Scroll Wheel

The **Plus Icon** increases the Dyop® image diameter angular arc width. You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



Copyright©2019

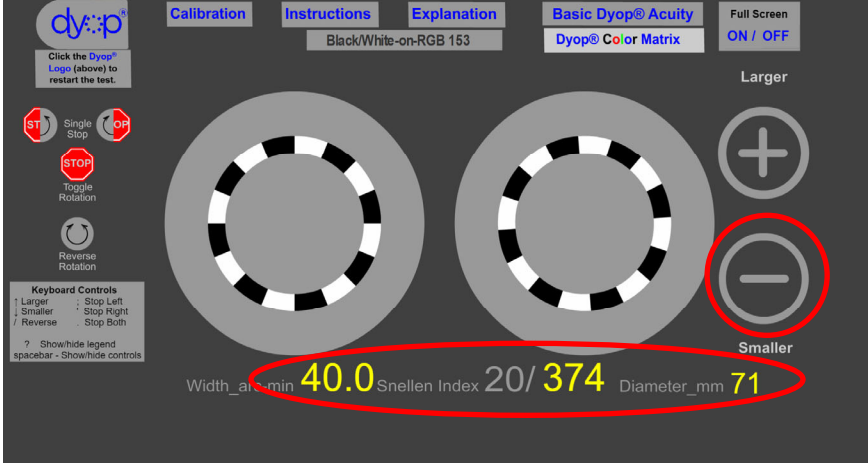
Dyop® Vision Associates LLC

16



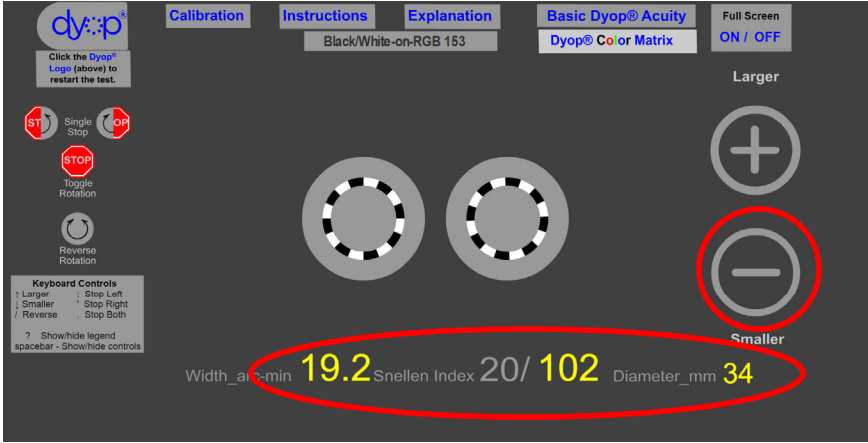
### Use the Mouse Scroll Wheel

The **MINUS Icon** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



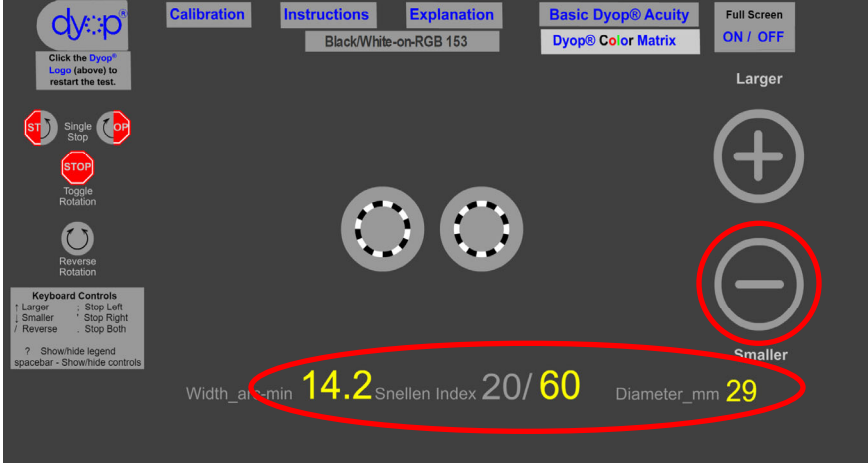
### Use the Mouse Scroll Wheel

The **DOWN Arrow** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



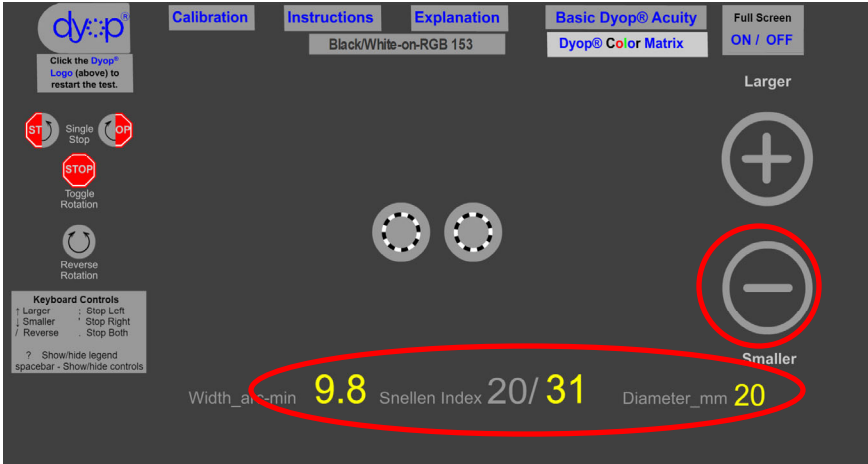
### Use the Mouse Scroll Wheel

The **DOWN Arrow** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



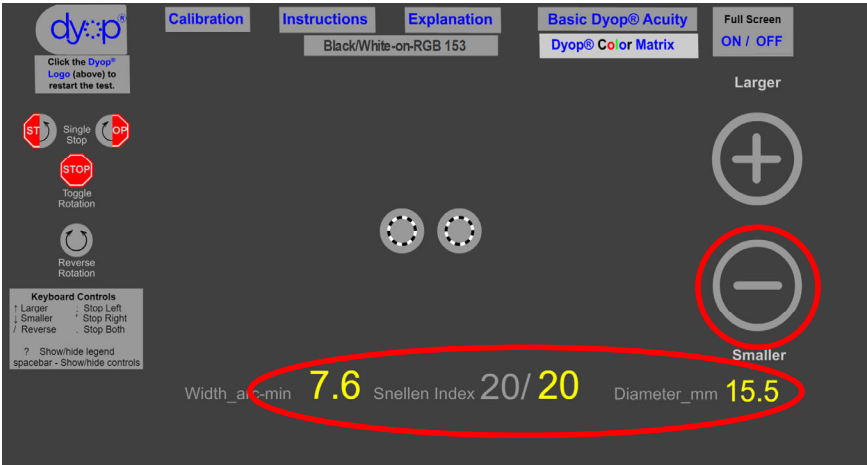
### Use the Mouse Scroll Wheel

The **DOWN Arrow** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and ; ' / keys to control the image size and rotation.



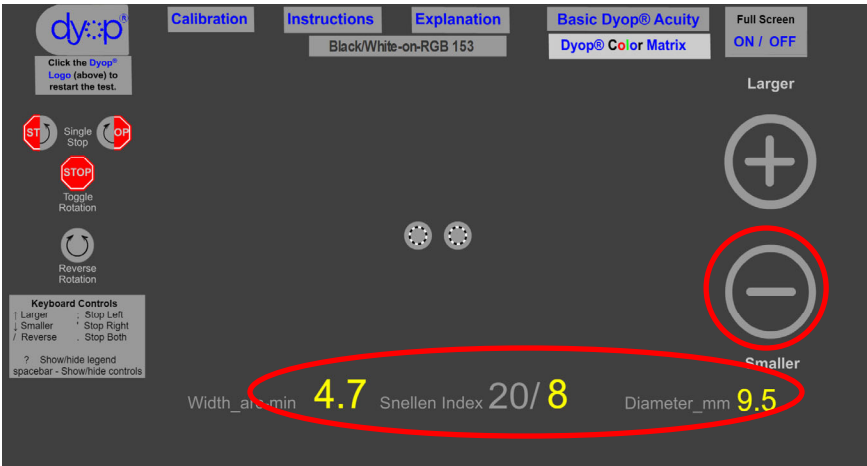
### Use the Mouse Scroll Wheel

The **DOWN Arrow** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and  **; . /**  keys to control the image size and rotation.



### Use the Mouse Scroll Wheel

The **DOWN Arrow** decreases the Dyop® image diameter angular arc width  
You can also use the **Keyboard Arrows** and  **; . /**  keys to control the image size and rotation.



## Basic Dyop® Acuity

Select the color for basic acuity testing

Acuity (accommodation) is typically regulated by the relative focal depth of red and green light. Select a Dyop® color combination (below) to begin the test.

The smallest Dyop® arc width detected as spinning for each color/contrast combination is the Acuity Endpoint. Acuity is normally regulated by the relative focal depth of the color response of the red and green photoreceptors.

\*\* Context Focused Vision is indicated by detecting the smallest spinning Green-on-White Dyop® versus the spinning Blue-on-Black Dyop®.  
 \*\* Image Focused Vision is indicated by detecting the smallest spinning Blue-on-Black Dyop® versus the spinning Green-on-White Dyop®.

Vision distribution	% Red (L)	% Green (M)	% Blue (S)
Context Focused Vision	50	45	5
Image Focused Vision	75	20	5

2018-08-31 Green=00FF00

Copyright©2019

Dyop® Vision Associates LLC

23

## ColorMatrix™ Menu

Select the color/combination for additional testing.

Select a Dyop® color combination (below) to begin the test. The smallest arc width Dyop® diameter where spinning is detected is the color acuity endpoint. Benchmark Dyops® are circled in yellow.

Chromatic Screening \*\*

Dual colors need dual rotation

Photoreceptor type	% Red (L)	% Green (M)	% Blue (S)
Chromatic Screening **	50	45	5

Copyright©2019

Dyop® Vision Associates LLC

24

### Color Focus Group Screening

Green-on-White versus Blue-on-Black color group screening.

Copyright©2019                      Dyop® Vision Associates LLC                      25

### Black/White-on-Gray contrast sensitivity

Compares to classic Snellen/Sloan/Landolt acuity.

Copyright©2019                      Dyop® Vision Associates LLC                      26

## Black-on-White contrast sensitivity

Compares to classic Snellen/Sloan/Landolt acuity.

Width\_arc-min **19.1** Snellen Index **20/ 101** Diameter\_mm **39**

Copyright©2019 Dyop® Vision Associates LLC 27

## Red-on-White contrast sensitivity

Select the color/combination for additional testing.

Width\_arc-min **19.1** Snellen Index **20/ 101** Diameter\_mm **39**

Copyright©2019 Dyop® Vision Associates LLC 28

# Amber-on-White contrast sensitivity

Select the color/combination for additional testing.

Width\_arc-min **20.6** Snellen Index **20/ 116** Diameter\_mm **42**

Copyright©2019

Dyop® Vision Associates LLC

29

# Green-on-White contrast sensitivity

Select the color/combination for additional testing.

Width\_arc-min **19.1** Snellen Index **20/ 101** Diameter\_mm **39**

Copyright©2019

Dyop® Vision Associates LLC

30

### Blue-on-White contrast sensitivity

Select the color/combination for additional testing.

Copyright©2019

Dyop® Vision Associates LLC

31

### Red-on-Gray contrast sensitivity

Select the color/combination for additional testing.

Copyright©2019

Dyop® Vision Associates LLC

32



# Green-on-Gray contrast sensitivity

Select the color/combination for additional testing.

Copyright©2019

Dyop® Vision Associates LLC

33

# Blue-on-Gray contrast sensitivity

Select the color/combination for additional testing.

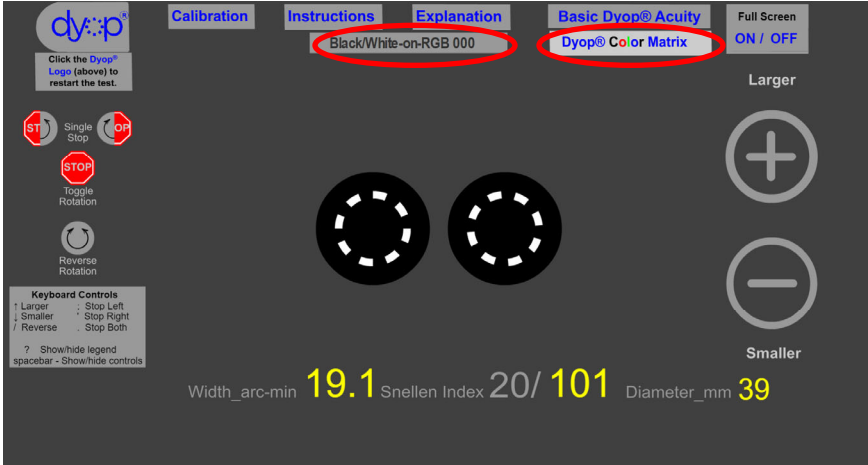
Copyright©2019

Dyop® Vision Associates LLC

34

# White-on-Black contrast sensitivity

Select the color/combination for additional testing.



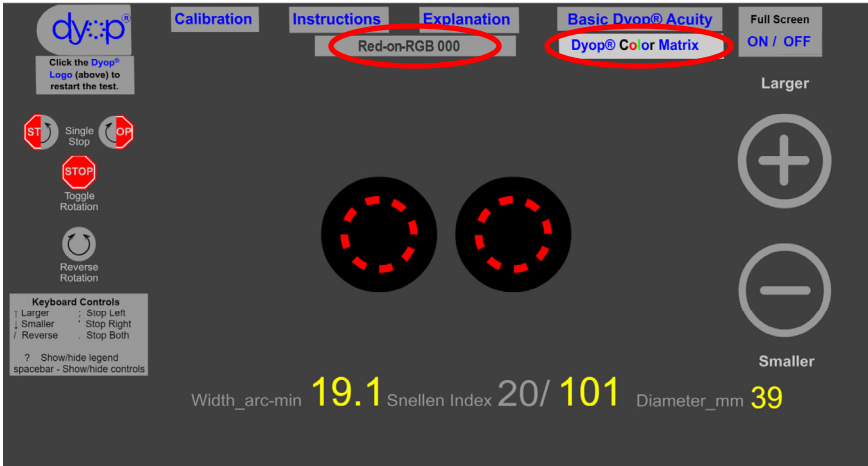
Copyright©2019

Dyop® Vision Associates LLC

35

# Red-on-Black contrast sensitivity

Select the color/combination for additional testing.



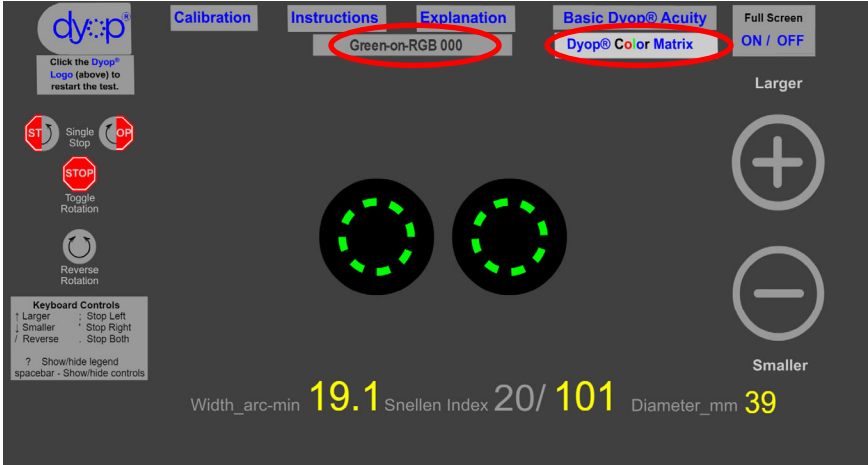
Copyright©2019

Dyop® Vision Associates LLC

36

# Green-on-Black contrast sensitivity

Select the color/combination for additional testing.



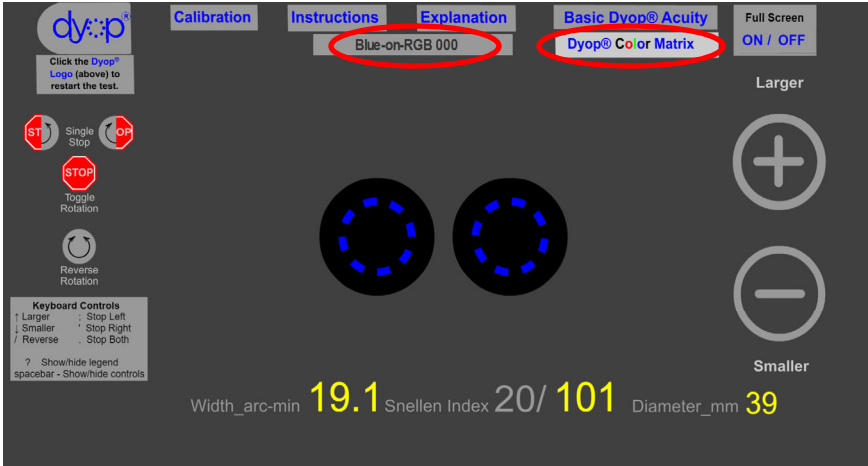
Copyright©2019

Dyop® Vision Associates LLC

37

# Blue-on-Black contrast sensitivity

Select the color/combination for additional testing.



Copyright©2019

Dyop® Vision Associates LLC

38