



DRILLING GUIDE

For Both Symmetric & Asymmetric Core Bowling Balls

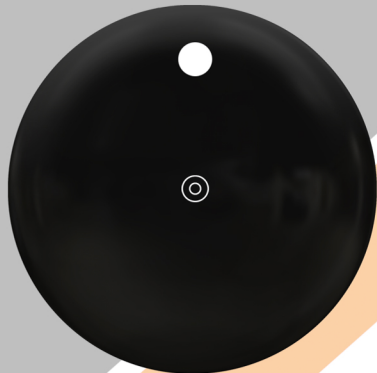
Symbols & Ball Markings

Mass Bias 	Center of Gravity 
Pin 	Positive Axis Point 

Step 1 Does your ball have a Symmetric or Asymmetric Core?



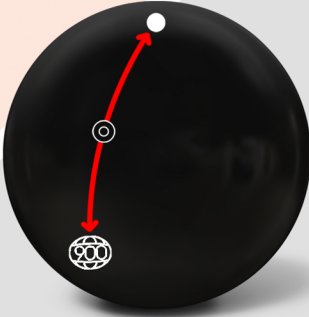
Asymmetric



Symmetric

• If your ball has an Asymmetric Core, proceed to Step 3. Otherwise, continue with Step 2.

• **The following instructions will use a 4x4x2 layout Example. (4" Pin to PAP, 4" MB to PAP, 2" Pin Buffer).**



Step 2

Find the point 6-3/4" from the pin through the CG and mark this as the "Theoretical Mass Bias" for an undrilled symmetric core bowling ball.



Step 3

Draw an arc 4" from the center of the Pin.



Step 4

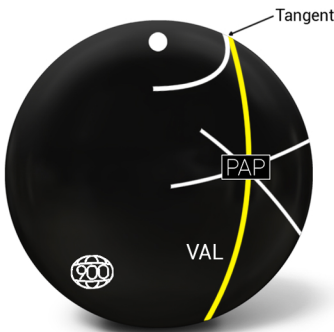
Draw a second arc 4" from the center of the Mass Bias that intersects the first arc from Step 3.

Where these arcs intersect will be the bowler's PAP.

Step 5

Now that you have found the PAP location, you need to draw the Pin Buffer.

Draw another arc 2" from the Pin.



Step 6

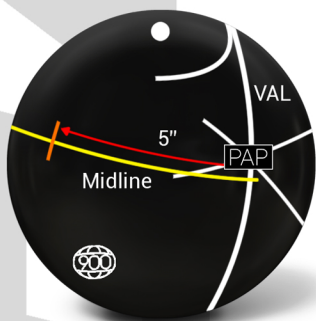
Draw a line through the point where the arcs from Steps 3 & 4 intersect (PAP). This line should be **TANGENT** to the Pin Buffer. This line is the Bowler's Vertical Axis Line (VAL).

TANGENT: Line which only contacts the Pin Buffer arc at one location.

Step 7

Using the VAL from Step 6, measure the bowler's PAP going in reverse.

This example uses a PAP measured as 5" over and 1/4" up. Measure 1/4" down from the PAP along the VAL and make a mark perpendicular to the VAL.



Step 8

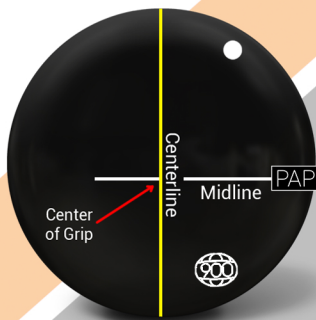
Extend the first perpendicular PAP measurement line across the ball to create the Midline.

Measure 5" backwards on the Midline from the VAL and make another perpendicular mark. This mark will become the Center of Grip for the bowler.

Step 9

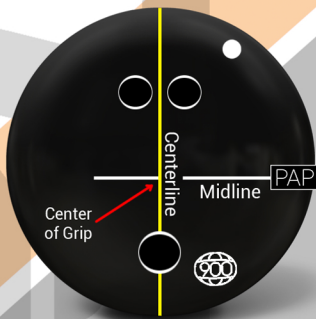
Extend the mark perpendicular to the Midline from Step 8 across the ball in both directions.

This is going to be the Centerline.



Step 10

If the Pin will be within 1" of the nearest hole, it is necessary to shift the Center of Grip to either drill out the Pin entirely or increase the distance beyond 1" in order to meet the manufacturer's warranty requirements.



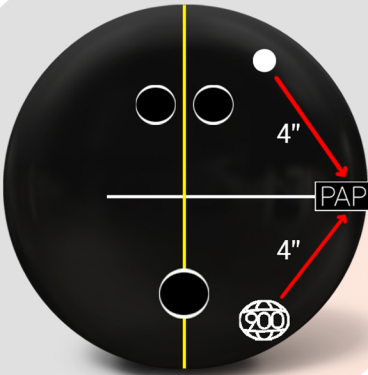
Step 11

Now that you have found the Centerline and Midline, use the bowler's measurements for the final drilling.

Drill and weigh the static weights of the ball to ensure legality. If a balance hole is needed to remove side weight, we recommend keeping 1/2 oz positive side weight if possible.

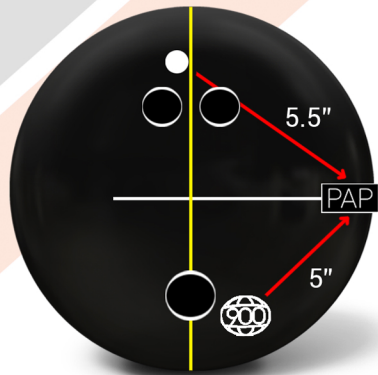
Recommended Ball Layouts

- The layout you draw may not look like the illustration. Bowlers have different PAPs, therefore the same layout for one bowler will look different on a ball than for another.
- These layouts are depicted for right handed bowlers. The layout will be flipped and mirrored for left handed bowlers.
- If the layout places the finger holes within 1/2" of the Pin, it is recommended to slightly modify the layout to either move the fingers away from the Pin to 1" or drill out the pin completely.



4" x 4" x 2"

- High Flaring, strong layout
- Good on multiple patterns
- Strong entry angle



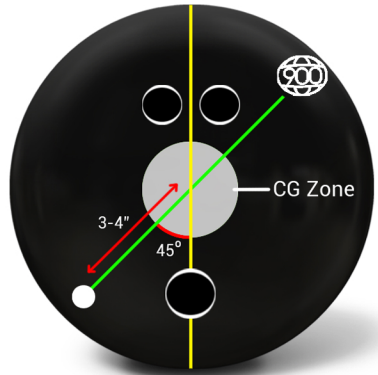
5.5" x 5" x 3"

- Medium flaring, weaker layout
- Best on drier lane conditions
- Good length, angular backend



4.5" x 4" x 4"

- High Flaring, moderate layout
- Best on medium oil
- Smooth backend motion



Full Roller 45°

- Strong arcing motion
- Best with 3-4" Pins
- Go-to Full Roller layout

Important Bowler Characteristics to Consider Before Laying Out a Bowling Ball

Rev Rate: The amount of Revolutions Per Minute (RPMs) that are created by the bowler at the release point

Generally, bowlers with higher rev rates will find more success with layouts that put the Pin position further away from the PAP, such as the 5.5 x 5 x 3 layout

Ball Speed: The average ball speed is between 16-18 mph

Axis Rotation: The horizontal angle of rotation of the bowling ball at release relative to the foul line (0°)

This is usually described as Forward Roll (up the back), 45° (average) and Side Roll (on the side of the ball)

When choosing a ball layout, it is very important to take these factors into consideration because they can heavily influence which layouts may or may not work for the bowler.

