

## LIMITED ONE YEAR WARRANTY – BOWLING BALLS

Congratulations on the purchase of your new Storm Products bowling ball. Storm prides itself on manufacturing the highest quality bowling balls in the industry today and warrants them to be free of defective workmanship and/or materials when used for the purpose intended, under normal conditions and provided they have been cared for properly. All merchandise covered under this warranty must be returned, with a sales slip showing date of purchase, to the dealer from whom it was purchased. This warranty does not cover incidental costs including, but not limited to, freight, measuring, and drilling.

Storm Products agrees to replace this ball if at any time during the warranty period it is found to be defective in material and/or workmanship. Storm Products shall for no reason be responsible for any damage caused by the following:

- ◆ Ball plugging or the installation of inserts for the fingers and/or thumb
- ◆ The width of the bridge being less than 1/4"
- ◆ A bridge that has been weakened by holes that intersect or by insufficient lateral pitches
- ◆ A minimum 3/4" difference in lateral pitches must be used
- ◆ Holes lacking sufficient bevel
- ◆ The distance between any hole and the pin being less than 1"
- ◆ Damage caused by pinsetters, ball return systems, gutter and/or lanes
- ◆ Bowler abuse
- ◆ Exposure to extreme temperatures (above 140°F or below 40°F)

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.



**STORM PRODUCTS, INC.**

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# SYMMETRICAL Drilling Guide

**Drilling Instructions**

**for Balls with a**

**Symmetrical**

**Weight Block / Core**



# SYMMETRICAL DRILLING INSTRUCTIONS

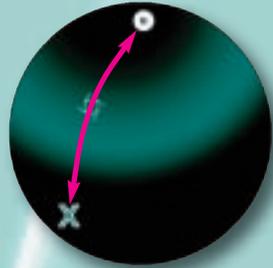
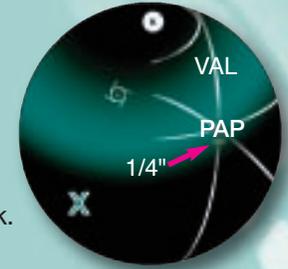
4" x 4" x 2" Example

(4" Pin to PAP x 4" PSA to PAP x 2" Pin Buffer to VAL)

## STEP #6

Using the VAL from Step 5, measure the bowler's PAP backwards.

This example uses a PAP measured as 5" over x 1/4" up. Measure 1/4" down from PAP on the VAL and make a tick mark.

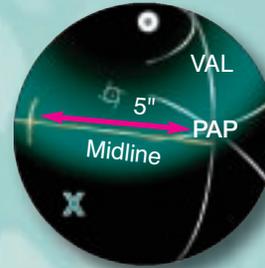
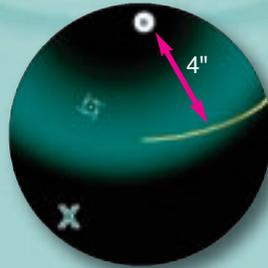


## STEP #1

Find the point 6-3/4" from the Pin through the CG and a mark this with an "X". This indicates the PSA of the undrilled ball.

## STEP #2

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



## STEP #7

Using the bowler's PAP measurements, draw a line perpendicular to the VAL through the first tick mark, creating the Midline. Measure 5" backwards on the Midline and make a second tick mark. This mark will become the Center of Grip.



## STEP #3

Draw a second arc 4" from the center of the Preferred Spin Axis (PSA) that intersects the first arc from Step 2.

Where these arcs intersect is the bowler's Positive Axis Point (PAP).

## STEP #8

Using the tick mark from Step 7, draw a line perpendicular to the Midline. This line is the Centerline.



## STEP #4

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

Draw a second arc 2" from the Pin.



## STEP #9

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

*For full manufacturer's warranty, see back cover.*

\*Tangent



## STEP #5

Draw a line through the point where the arcs from Steps 2 and 3 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 touches the Pin Buffer in one location.*



## STEP #10

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

Drill and scale the ball to determine the need, if any, for a Balance Hole. If one is needed, see instructions on page 7.

# Frequently Asked Questions

## WHAT DOES PSA STAND FOR?

PSA stands for Preferred Spin Axis, and is what most people refer to as the mass bias. However, PSA is a more accurate term. Asymmetrical designs have a stronger PSA than symmetrical shapes, but you can reference the same point for all layout purposes.

## WHAT DOES THE PSA LOOK LIKE?

The PSA is indicated by the "X" drawn in Step #1, on page 2. You can see it in the Legend on page 6. Realize this is the undrilled PSA which changes once holes are drilled in a symmetrical ball.

## CAN I DRILL INTO THE PIN?

Partially drilling into the pin voids the warranty. However, drilling the pin out entirely is perfectly acceptable.

## THE LAYOUT I DREW DOESN'T LOOK LIKE THE ILLUSTRATION!

Because all bowlers have different PAP coordinates, your layouts may not match the illustrations exactly. Also, the layouts in this guide are all for right-handed players, so you need to mirror the layout for left-handed bowlers.

## WHAT ELSE SHOULD I BE AWARE OF?

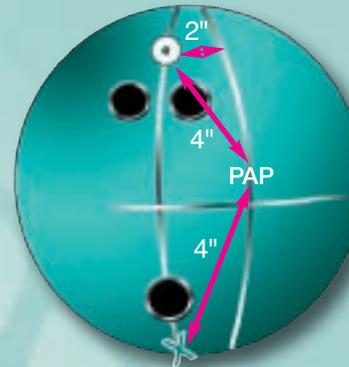
Always keep the PSA at least 2" from the bowler's initial ball track, toward the bowler's PAP. The most popular layouts place the PSA 4" from the bowler's PAP.

## WHAT ARE THE PAP EXAMPLES USED IN THIS GUIDE FOR BOTH THE LOW TRACK AND HIGH TRACK PLAYERS?

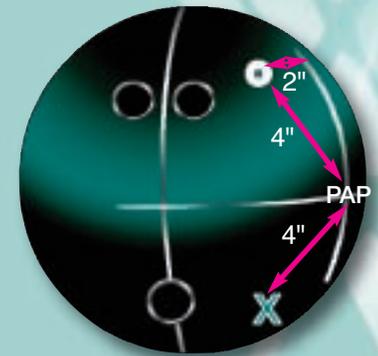
Low Track = 3-1/2" by 3/4" up

High Track = 5" by 1/4" up

### 4" x 4" x 2"



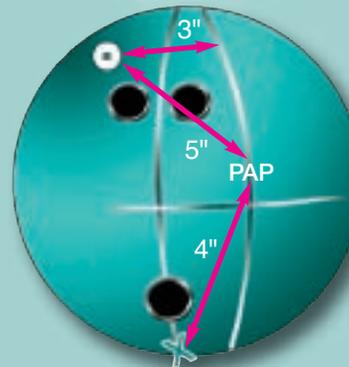
**LOW TRACK EXAMPLE**



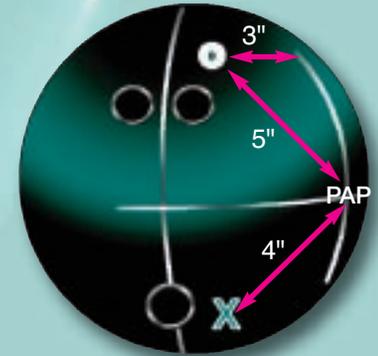
**HIGH TRACK EXAMPLE**

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

### 5" x 4" x 3"



**LOW TRACK EXAMPLE**



**HIGH TRACK EXAMPLE**

- ◆ Good combination of length and backend
- ◆ Great for drier heads and/or a deep inside line
- ◆ Late break point

NOTE: Some layouts may require Balance Holes (see page 7).

## STORM LEGEND

● = Major Pin



= Center of Gravity

PAP = Initial Positive Axis Point



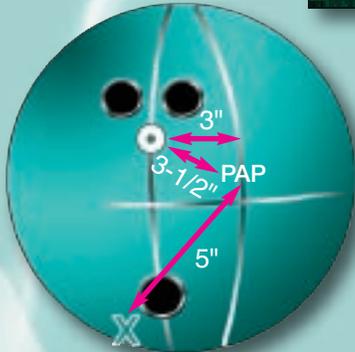
= PSA (preferred spin axis)

## Full Roller 45°

- ◆ Strongest layout for full roller ◆
- ◆ Strong arcing motion ◆
- ◆ Works best with 3" - 4" pins ◆
- ◆ For more reaction, drill fingers deep ◆
- ◆ For less reaction, drill thumb deep ◆

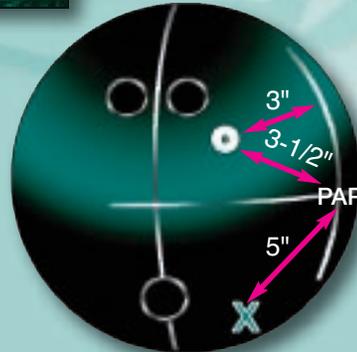


## 3-1/2" x 5" x 3"



### LOW TRACK EXAMPLE

- ◆ Very strong layout ◆ Great for long patterns ◆
- ◆ Not recommended for crankers or extremely high track players ◆



### HIGH TRACK EXAMPLE

## BALANCE HOLE PLACEMENT



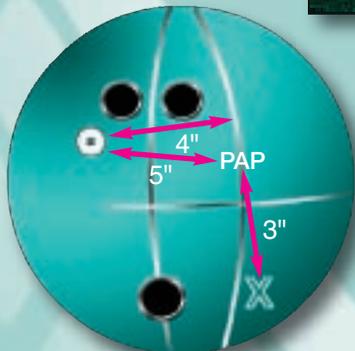
EXAMPLE: 5" x 1/4" Up

- ◆ Balance holes in dark blue decrease flare potential ◆
- ◆ Balance holes in yellow may have little effect on performance ◆
- ◆ Balance holes in white increase flare potential ◆

A balance hole outside these zones will have the highest chance of tracking over the balance hole during use, or pulling the track over the fingers or thumb.

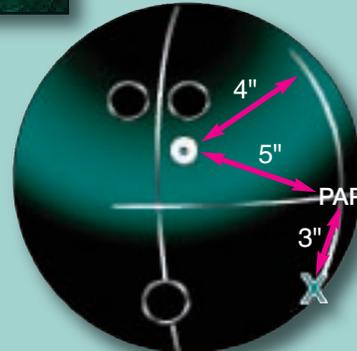
In general, crankers or high track players should keep balance holes within 4" of the center of grip. Low track or low rev players are normally safe with balance holes within 6" of their center of grip.

## 5" x 3" x 4"



### LOW TRACK EXAMPLE

- ◆ Good length ◆ Late midlane ◆
- ◆ Control type of layout ◆ Low volume or wet/dry ◆



### HIGH TRACK EXAMPLE

**DISCLAIMER:** Unique PAP distances or releases may make balance hole placement difficult. If balance hole placement is questionable, have the bowler throw the ball first. Make sure the intended balance hole is no closer than 2" to the nearest flare ring, otherwise tracking issues may result.