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- **Axis Leverage** : A drilling layout where the pin is 3 3/8" from the PAP and in a 10:30 direction from the CG. The CG is 0" to 1-1/2" from the PAP (depending on pin out distance). The balance hole is 0" to 2" from the PAP on a line running thru the pin and CG.

- **Axis of Rotation** : (Side Roll) this is a measure of the direction of the initial rotation on the ball with respect to the lane. Measurement of the angle between the initial spin axis and the foul line running across the line. A zero degree axis of rotation is all forward roll. A 90-degree axis of rotation is most likely all side roll. The only way axis rotation can be measured is by the use of a camera. There is no way to measure axis rotation by the ball track. At any point in the path of the ball on the lane, the axis rotation must be greater than or equal to the axis tilt.

- **Axis Tilt** : The distance the PAP is above the middle of the ball measured in degrees. A full roller or high track style would have little or no axis tilt. The initial spin axis (bowler's release axis) would be parallel or close to parallel with the lane surface. One rotation of the ball would cover the major diameter of the ball. A spinner would have an initial spin axis (bowler's release axis) tilted up from the lane. The ball track would be far away from the thumb and finger holes. One rotation of the ball would cover a much smaller diameter than other bowlers. The spinner style tends to get the ball further down the lane before it hooks.
- **Axis Weight** - Axis weight is a drilling pattern designed to produce little or no track flare and get the ball into a early roll with little backend reaction. Axis weight has the pin located on or near the bowlers PAP. The core is positioned along the initial spin axis (bowler's release axis). This places the core in a stable position. The ball will be initially rotating about the minimum RG axis, which is a stable core position. Therefore, it will continue to rotate about this axis creating no track flare. This reduces the backend reaction.
- **Balance Hole** : (or weight hole or XHole) an extra hole in a ball, which was originally used to bring the ball within ABC specifications for imbalance (static balance). X-holes are now used also to adjust the amount of track flare and the position of the narrow and wide points of the track to change performance. The maximum allowance diameter for a balance hole is 1-1/4" for ABC and 1-3/8" for the PBA.
- **Backend** : Area of the lane closest to the pin deck (last 20-25 feet). It is the area of the lane that is not oiled. The oil moves to the area of the backend due to bowling activity, which is referred to as "no backends" or "carrydown." "Strong backends" are lanes in which the ball hooks a lot the last 20 feet. For our measuring purposes, back end only measures the amount of hook from the breakpoint to the point of hookout. It does not matter where on the lane this happens or how many feet it takes the ball to make it through the hook cycle.
- **Coefficient of Friction** : The coefficient of friction (also called COF, or friction) is a measurement of the force it takes to slide an object across another surface divided by object's weight. In bowling, the coefficient of friction refers to how well the bowling ball grabs a dry lane surface. If lane oil is present the ball slides on the lane surface very easily and there is a low COF. If there is no oil on the lane, the ball does not slide as easily and the coefficient of friction is high.
- **Center of gravity (CG)** : The center of gravity is the "point of application" used in scientific calculations when applying gravitational forces to an object. This point is the object's center of

static balance, like the mid-point of a pencil where it can be balanced on the end of a finger. In bowling balls this position is inside the ball and is no more than 0.050" from the geometric center of the sphere. Drawing a line from the center of the bowling ball, through the center of gravity, and extending it to the surface of the ball is located what in bowling we call the "Center of Gravity", a point on which the bowling ball could be balanced on a very small rod. (See diagram)

- Centerline or Span line : A vertical line that passes between the finger holes and through the center of the thumb hole

- Core Density : For our reviews, this refers to the number of different pieces or sections involved in the design of the interior of the ball.

- Core Torque : This refers to the smoothness or flippiness of the ball at the breakpoint. A high torque ball will flip the most; a low torque ball will have the most even break. Players who generate more torque through their release generally like balls with less torque. Bowlers who are "roll" bowlers generally have more success with higher torque balls.

- Differential RG : This is the difference between the minimum and maximum RG axis on the ball. This property determines the track flare potential. The maximum allowable differential RG is 0.080 inches. The more the differential RG the more potential for track flare. The flare increases the friction between the ball and the lane.

- Durometer : This is a gage for measuring the hardness of a ball. ABC and PBA require a minimum hardness of 72 .

- Flare : Flare is created when a bowling ball moves from its release axis toward its preferred spin axis. This is caused by the ball's differential, RG, and the position of the core relative to the bowlers release axis.

- Full Roller : This is a bowling style where the ball will track between the finger and thumbhole and roll across the full circumference of the ball.

- Grip Center : The intersection of the midline and the centerline of the grip.

- Heads : This is the front part of the lane. Also called the maple area of the lane because of the material from which it is made (on wood lanes).

- High RG drilling : This is a drilling pattern where the pin is located at approximately 90 degrees (or 6 to 6-3/4") to the PAP. It is called this because the core is initially rotating around its highest RG axis off the bowler's hand. This results in the ball skidding further down the lane before hooking. The pin may be positioned close to or in the bowler's track.

- Hook out : This is when the ball has completed hooking and begins to travel in a straight line. The stages of the ball path are described as skid, hook, and roll. After the ball skids in the oil and hooks on the dry backends, it will eventually start to just roll. This is hook out, or commonly known as roll out.

- Hook Potential (Total Hook) : A scale used to compare how much different balls will hook when an equal force is applied. Generally, in our tests it equates to two boards per point.

- Label Leverage : A ball-drilling layout where the pin is 3-3/8" from the PAP and in a 1:30 direction from the CG. The CG is roughly contained within the grip and 4" to 5-1/2" from the PAP. No balance hole is needed.

- Length : Expresses the ability of a ball to grip the lane in the presence of oil. Since the amount of oil on the lane usually decreases from front to back, balls that can grip the lane through heavier amounts of oil will change direction earlier, balls that can grip the lane only

through lighter amounts of oil will change direction later.

- Length - (BTM Ball Reviews) This is a guesstimate of the distance that you can expect AFTER THE BALL ENCOUNTERS FRICTION. All balls tend to skid in oil. That distance is not figured into our length equation.
- Leverage Drilling : This is a drilling pattern that produces the maximum amount of track flare. The pin and CG are located at 3-3/8" from the bowlers PAP that places the core at a 45-degree angle to the axis line. This is an unstable position for a dynamic core. The core wants to move away from this location causing track flare. The track flare increases the friction between the ball and lane, which gets the ball into an early roll. Depending on the bowlers style, the added friction can sometimes increase the sharpness of the turn at the break point (especially for low RPM players); or for others (higher RPM players), cause the ball to slow down too much in the oil. This uses up the energy in the oil where the ball cannot hook very easily and reduces the turn at the break point.
- Mass Bias : A mark on the surface of the ball that indicates the position of center of mass of the positive half of the core on a pin-out ball.
- Mica : Technically a rock material. It is added to balls to pearlize them. Pearlized balls normally skid further and then snap harder.
- Mid line : This is a terminology used on drilling sheets. It is the horizontal line that extends from the center of the grip perpendicular to the midline.
- Mid plane : This is a terminology used on drilling sheets. It is also called the vertical axis line. It is the line that runs vertically through the PAP, 90 degrees from the mid-line.

- Moment of inertia : This, by definition, is the resistance to rotating motion. Mathematically, it is equal to the mass times the distance squared. The further the mass is away from the rotation point the harder it is to rotate (or to slow down). It is interchangeable with radius of gyration as far as the effect to the ball reaction.
- Particle balls : These are the newest super hookers : reactive resin on steroids. They create the most friction in heavy oil, generally suited for dry lanes.
- Pin : A mark on the surface of the ball that indicates the position of the top of the core, or the position of the weight block, inside the ball.
- Pin in : This is a ball that was manufactured with the pin and the center of gravity within 1-1/2" of one another.
- Pin out : This is a ball that was manufactured with the pin and the center of gravity distance greater than 1-1/2" from one another.
- Positive axis point (PAP) : This is the point on a ball that it wants to initially rotate about when a bowler releases it. The bowler's style determines this location. Each bowler should remember the location of their PAP. It is measured from the center of the grip over a distance along the midline and up or down a distance along the mid-plane (vertical axis line). For example: 5-1/4 and 1/4 up.
- Radius of Gyration (RG) : Essentially is an indication of the resistance to rotation motion. It is equal to the square root of the moment of inertia divided by the weight. ABC/WIBC limits are 2.430 : 2.800.
- Reactive Resin : Offers more versatility and pin action with lots of hook potential. They are more sensitive to lane conditions and operator error, so reactive ball are generally more difficult to control. They can be sanded or polished to change their breakpoint. They are by nature less durable, but offer more striking power.

- Spinner : This is a style of bowling referring to how a bowler releases the ball. The bowler's wrist rotates around the top of the ball at release causing the ball to spin down the lane (similar to a top). The axis is tilted up in the air and the track is small and far away from the gripping holes. This style helps to get the ball down the lane before it hooks.
- Stack Leverage : A drilling layout where the pin is 3-3/8" from the PAP and the CG is between 3" and 3-1/2" from the PAP and a line between the two is parallel or roughly parallel to the centerline of the grip. The balance hole is placed on a line from the grip center thru the CG on the vertical axis line.
- Rev Leverage : The pin is placed 3-3/8" from the PAP and slightly above the grip midline in a 12:00 direction from the CG. The CG is placed 3" to 4" from the PAP in the thumb positive quadrant. The balance hole is 6" from the grip center on a line thru the CG. Balance hole should bring ball back to 1/2 oz. negative side weight.
- Track flare : this is the movement of the ball track on a ball caused by the differential RG designed into a ball. See differential RG.
- Urethane : A very durable coverstock that can be sanded for more friction. It has much better pin action than polyester with a moderate hook potential. These are good all-purpose balls for the bowler who wants to use only one ball.
- Vertical Axis Line : See Mid plane.
- Weight Block : A puck or puddle shaped dense material inside a ball, manufactured for balance purposes.