7.1.6 Manually entering Drilling Angle, Pin to PAP, and VAL Angle

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> 7.1.6 arsenal

For shops that work from a layout plan rather than Suggested Layouts — or for any situation where the fitter is entering a pre-determined layout rather than generating one from the system — Spectre Cloud's spec sheet provides dedicated fields for manual layout entry. This page covers three of the most important: **Drilling Angle**, **Pin to PAP distance**, and **VAL Angle**. These are the core measurements of the VLS layout system and appear on spec sheets whenever VLS is selected as the layout method.

□□ What Each Value Represents

Before entering values, it helps to be clear on exactly what each field is measuring — confusion between these three values is one of the most common sources of layout entry errors.

Pin to PAP distance

The straight-line distance, in inches, from the ball's **pin** to the bowler's **positive axis point (PAP)**. This is the primary driver of flare potential and overall ball motion strength. A shorter pin-to-PAP distance increases flare and produces a stronger, earlier-reading ball motion. A longer distance reduces flare and moves the breakpoint further downlane.

- Typical range: `2"` to `5"`. Values outside this range are physically possible but uncommon in standard fingertip fitting.
- Measured from the centre of the pin to the bowler's PAP mark on the ball surface — or calculated from the PAP coordinates if the ball has not yet been marked.
- The single most impactful layout variable for most bowlers — small changes here produce noticeable differences in ball motion.

VAL Angle

The angle, in degrees, between the bowler's **Vertical Axis Line (VAL)** and the line connecting the PAP to the pin. The VAL angle controls the shape and timing of the breakpoint — a lower VAL angle produces a smoother, more arcing motion, while a higher angle produces a more angular, later-breaking reaction.

- Typical range: `0°` to `90°`, though most fits fall between `15°` and `75°`.
- A VAL angle of `45°` is a common starting point for a balanced, benchmark motion on a medium-differential ball.
- VAL angle interacts with pin-to-PAP distance — a high VAL angle on a short pin-to-PAP produces a very different result than the same angle on a long pin-to-PAP. They are not independent variables.

Drilling Angle

The angle at which the ball is placed in the drilling jig — specifically, the rotation of the ball around the vertical axis relative to the grip centre. The drilling angle determines where the mass bias (MB) marker ends up in relation to the VAL and the grip, completing the three-dimensional placement of the core inside the finished ball.

- Drilling angle is most significant for **asymmetric cores**, where the MB marker's position relative to the VAL directly affects the strength and shape of ball motion.
- For **symmetric cores**, the drilling angle still affects ball motion but the MB is less dominant — the pin-to-PAP and VAL angle carry more of the layout's effect.
- Expressed in degrees, typically from `0°` to `90°`. The exact value depends on the intended MB placement and the ball's core geometry.

□□ Entering These Values on Desktop

1. Open the spec sheet for the ball being drilled.
2. Navigate to the **Layout** section and confirm the layout system is set to **VLS**.
3. Click into the **Pin to PAP** field and enter the distance in inches — use decimal or fractional notation consistent with your shop's standard (e.g., `3.5` or `3 1/2`).
4. Click into the **VAL Angle** field and enter the angle in degrees.
5. Click into the **Drilling Angle** field and enter the angle in degrees.
6. Review all three values together before saving — they should be consistent with each other and with the intended ball motion discussed with the bowler.
7. Save the spec sheet.

□□ Entering These Values on Mobile or Tablet

1. Open the spec sheet and scroll to the **Layout** section.
2. Confirm **VLS** is selected as the layout system.
3. Tap each field — **Pin to PAP**, **VAL Angle**, **Drilling Angle** — in turn and enter the values using the numeric keyboard.
4. Tap **Save** or allow auto-save to capture the entries.

⚖ How the Three Values Work Together

Pin to PAP, VAL Angle, and Drilling Angle are not independent — they define a three-dimensional orientation of the ball's core relative to the bowler's release. Changing one without considering the others can produce an unintended result. The relationships to keep in mind:

Variable	Primary effect	Interacts most strongly with
Pin to PAP distance	Flare potential and overall motion strength	VAL Angle — together they set breakpoint timing and shape

Variable	Primary effect	Interacts most strongly with
VAL Angle	Breakpoint shape — arcing vs. angular	Pin to PAP — high angle on short distance reads very differently from high angle on long distance
Drilling Angle	MB placement — most significant on asymmetric cores	Core type — effect is amplified on high-differential asymmetrics, subtle on low-differential symmetrics

Note: When using Arsenal Plus, the 3D layout rendering panel updates in real time as these values are entered — providing a visual confirmation of the core orientation before drilling begins. If the rendered position does not match the intended layout, it is a signal to re-check one or more of the entered values.

Common Entry Mistakes and How to Avoid Them

Confusing VAL Angle with Drilling Angle

These are the most commonly confused values in manual VLS entry. The VAL angle is measured from the bowler's VAL to the pin line — it is a property of the *layout geometry*. The drilling angle is the rotation of the ball in the jig — it is a property of the *machine setup*. They are related but not interchangeable.

- If you are working from a layout plan produced by an external tool or manufacturer guide, confirm which convention that tool uses before entering values in Spectre Cloud — some tools express these in slightly different terms.
- If Arsenal Plus is active, use the 3D rendering to visually verify that the pin and MB are positioned where the layout plan intends before committing to the values.

Using the wrong PAP for the suggestion

Pin to PAP distance is only meaningful if the PAP used to calculate it matches the bowler's current PAP. A distance calculated from an old or estimated PAP produces a layout that performs differently from what was planned.

- Before entering Pin to PAP, confirm which PAP measurement you are working from — and that it is current.
- If the bowler's PAP is on file in their spec sheet history, cross-check your planned value against the recorded PAP coordinates rather than working from memory.

Entering fractional inches as decimals inconsistently

Pin to PAP is typically expressed in inches with a fractional component. Spectre Cloud accepts both decimal and fractional entry, but mixing conventions within a spec sheet — `3.5"` on one ball and `3 1/2"` on another — makes comparisons across spec sheets harder to read at a glance.

- Settle on one format as a shop standard and apply it consistently. Either convention is correct — consistency is what matters.

Cross-Checking Against a Layout Plan

When entering layout values from a pre-determined drilling plan — a manufacturer's recommendation, a coach's specification, or an Arsenal Plus suggestion that has been adjusted — use the following cross-check before saving:

1. Confirm **Pin to PAP** matches the plan value exactly. If the plan expresses this as a range, enter the midpoint of the range or the value you have chosen within it.
2. Confirm **VAL Angle** matches the plan. If the plan uses a different angle convention, convert before entering — do not enter the unconverted value and plan to remember the difference later.
3. Confirm **Drilling Angle** is consistent with the intended MB placement. For symmetric balls where the drilling angle is less critical, note this in the spec sheet so future readers know the value was a secondary consideration.
4. If Arsenal Plus is active, review the 3D rendering and confirm the visual matches the plan before drilling.

Related Sections

- 7.1.5 — Suggested Layouts feature — using bowler data to suggest a layout
- 7.2.2 — Arsenal Plus: 3D layout rendering
- 7.2.3 — Arsenal Plus: layout conversion between systems
- 6.1.5 — Step 5: Select layout (VLS, 2LS, PAL, or manual)
- 04.x — Spec Sheets: layout field reference

Tip: When training a new driller on layout entry, have them enter all three values and then describe aloud what they expect the ball to do — earlier or later, arcing or angular, strong or benchmark. If their description matches the intended motion, the values are almost certainly

correct. If it does not, the disconnect is usually in one of the three fields and the conversation surfaces it faster than a visual check alone.

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