2.5.1.3 PAL / Dual Angle system

PAL / Dual Angle system

> `2.5.1c` layout

The **PAL (Performance Axis Layout) system** — referred to in Spectre Cloud as **Dual Angle** — is a ball layout method that uses three measured values to precisely define pin and mass bias placement relative to a bowler's PAP. Where VLS and 2LS use a chart-driven approach with a small number of inputs, PAL gives fitters direct, independent control over three distinct aspects of ball motion. It is the most precise of the four layout types supported in Spectre Cloud and is widely used in competitive and coaching environments.

Note: The PAL system is commonly referred to as the **Dual Angle layout** within Spectre Cloud's interface and throughout this wiki. The two names refer to the same system — PAL is the full name, Dual Angle is the shorthand. Both terms are used interchangeably in the industry. ⚠ *Verify with your Spectre team: confirm the exact label used in the Spectre Cloud UI — whether it reads "Dual Angle," "PAL," or both.*

□□ What Is the PAL / Dual Angle System?

The PAL system was developed to give pro shop operators and coaches a layout method where each of the three input values maps directly and independently to a specific aspect of ball motion — skid length, flip potential, and continuation through the pins. By adjusting each value separately, a fitter can tune a ball's reaction with a level of precision that chart-based systems like VLS and 2LS do not offer.

- □ Three inputs provide independent control over three distinct ball motion characteristics.
- □ Widely used in competitive bowling, coaching programmes, and high-performance fitting environments.
- □ Works for both thumb and thumbless bowlers — inputs are derived from the bowler's PAP regardless of delivery style.
- □ Results are highly repeatable when PAP is measured accurately and consistently.
- □ More complex than VLS or 2LS — requires a fitter comfortable working with three interdependent angle measurements.
- □ Not recommended as a default for shops serving primarily recreational bowlers — the added precision is most valuable for bowlers who can feel and articulate subtle differences in ball reaction.

□□ The Three PAL Inputs

Each of the three PAL inputs controls a different component of the ball's motion through the lane. Spectre Cloud displays all three as input fields when Dual Angle is the selected layout type on a spec sheet.

Input	What It Controls	Effect on Ball Motion
Drilling Angle	Angle from the PAP to the pin, measured relative to the VAL	Controls the flip potential and overall shape of the back-end reaction
Pin Distance	Distance from the PAP to the pin	Controls the length of skid — lower distance = earlier roll, higher = longer skid
VAL Angle	Angle of the mass bias relative to the VAL	Controls continuation through the pins and the smoothness of the transition

Note: The three inputs interact with each other and with the ball's RG (Radius of Gyration) and differential values. Changes to one input will influence the overall reaction shape even if the other two remain constant — always evaluate the full layout as a system rather than in isolation. ⚠ *Verify with your Spectre team: confirm the exact field labels used in Spectre Cloud's Dual Angle layout section, as naming conventions can vary between implementations of the PAL system.*

□□ PAL / Dual Angle vs. VLS and 2LS

	VLS	2LS	PAL / Dual Angle

Number of inputs	3–4	3–4	3
Input method	Chart-driven	Chart-driven	Direct angle measurement
Motion control	Combined — one set of inputs shapes overall reaction	Combined — calibrated for two-handed delivery	Independent — each input targets a specific motion characteristic
Best for	General pro shop; recreational to league	Two-handed bowlers	Competitive, coaching, high-performance fitting
Fitter experience needed	Low to medium	Low to medium	Medium to high

□□ PAL / Dual Angle in a Spectre Cloud Spec Sheet

When Dual Angle is selected as the layout type — either as the account default (see 2.5.1) or chosen manually on an individual sheet — Spectre Cloud displays the three PAL input fields in the layout section of the spec sheet. All three values are saved to the bowler's spec sheet history alongside the rest of their fitting data.

- □ All three PAL inputs are stored with the spec sheet and visible in the bowler's drilling history.
- □ Cloned spec sheets carry forward Dual Angle inputs — always review all three values for the new equipment before drilling, as ball RG and differential will differ between models.
- □ Arsenal Plus users can access suggested layouts, layout conversion, and 3D layout rendering based on recorded Dual Angle data. ⚠ *Verify with your Spectre team: confirm the extent of Arsenal Plus integration with Dual Angle spec sheets, including whether 3D rendering reflects the three PAL inputs accurately.*

□ Tips for Accurate PAL / Dual Angle Layouts

- □ Measure PAP from a freshly thrown ball — PAL results are highly sensitive to PAP accuracy. A measurement error of even a few millimetres will shift all three motion characteristics.
- □ Record the ball's published RG and differential values alongside the layout in the spec sheet comments field — this context is essential when reviewing historical layouts or

converting to a different ball model.

- When adjusting a layout for a new ball, change only one of the three inputs at a time where possible — this isolates the effect of each change and makes it easier to dial in the desired reaction.
- Use the spec sheet history to track how layout changes have affected ball motion over time — PAL's precision makes it especially well-suited to longitudinal fitting records.
- For bowlers new to PAL-drilled equipment, allow a few sessions before evaluating the layout — it takes time to adapt to a more precisely tuned reaction shape.

Arsenal Plus Plugin

The **Arsenal Plus plugin** extends Dual Angle functionality with suggested layouts, layout conversion between systems, and 3D layout rendering. For competitive bowlers with multiple balls drilled using PAL, Arsenal Plus provides a visual and analytical overview of the full arsenal's layout spread. ⚠ *Verify with your Spectre team: confirm how Arsenal Plus handles layout conversion between PAL/Dual Angle and VLS or 2LS formats, and whether the 3D rendering reflects all three PAL input values.*

Related Sections

- 2.5.1.2 — 2LS: Storm layout system for two-handed bowlers
- 2.5.1.1 — VLS: Storm layout system for bowlers using their thumb
- 2.5.1 — Default layout type: VLS, 2LS, Dual Angle, None
- 4.x — Spec Sheet: selecting and entering a layout
- 7.x — Arsenal Plus: suggested layouts, layout conversion, and 3D rendering
- 3.x — Bowlers: recording PAP in a bowler profile

Tip: PAL / Dual Angle rewards investment in accurate measurement. If your shop is moving toward PAL as a primary layout method, consider standardising how PAP is measured and recorded across your team — consistent measurement technique is the single biggest factor in getting reliable, repeatable results from the system.

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