DualSense Controller Optimization Guide - 2025

DualShock & DualSense Controller - Joystick Optimization Guide

A comprehensive guide answering most common questions.

Resolving sensor wear, choosing alternative & high-performance TMR sensors, potential extended lifespan, and calibrating analog sticks.

 Document compiled by **Vizr.** [Last Update] 2026-04-03

[Mobile best viewing experience: Dark Mode & Select the expand Arrows when needed]

⚙️ Tools/Models Supporting Calibration

Controller types	Firmware update	Customize
DualSense® wireless controller	✓	-
DualSense Edge™ wireless controller	✓	✓

- ~~PS3 Sixaxis & DualShock 3~~ (soon, driftguard support)
- PS4 DualShock 4
- PS5 DualSense 5, and PS5 DualSense-Edge

Note: Supported board revision

- **DualShock 4:** JDM-001 | JDM-020 | JDM-030
- **DualSense 5:** BDM-050 | BDM-040 | BDM-030 | BDM-020 | BDM-010 | DualSense (ZCT1W),
- *BDM-060 released with the new PS5-slim/pro.

- PC web-browser toolkits: supports recalibration for joysticks
  - DualShock-tools.Github.GUI [v2.24 -stable]
  - Mathiasm74_DualShock tools.GUI [v2.23next1-beta]
  -
  - [Repository] for older versions 2.1-2.19
- **Driftguard Team**: Provides more info and features
  - Driftguard.app [v0.4.8.7-alpha]
  - [v0.5.0.0-beta-dev]
    - New range/*ratio
    - Auto fine-tune calibration method
    - Website layout and resources improved
- **Alternative Method**:

- DualShock Calibration GUI [outdated by a year]
- Gulikit Test & Cal - simple approach, with a percentage slider
- For Edge Modules use this first GitHub - lewy20041/cal script

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💾 PS5 controller Firmware

🖥️ Update Instructions:

App Mirrors:

- 📥PlayStation® Accessories [Download for Windows] [official]

Changes:

- Version: 2.2.0
  - Hotfix
- Version: 2.2.1
  - Stability during use of some features has been improved.

Note: For detailed information and PS5 gamepad firmware [Changelog]

⛔ Troubleshooting | How To:

- Pair a DualSense Wireless controller - [**Sony Support**]
- Troubleshoot Controller Issues - [**Sony Support**]

📚 Calibration Tutorial (DS5 & DS-Edge)

⚠️ Important Behaviors

Bugs: *Calibration can break after voltage spikes or boot-ups, quick-action and rotations, cancellation of the tool before finalising the process.*

Causes irregular expansion, mis-coordinated inputs: as in physical inputs labeled in a different sector/quadrant, gamepad unrecognized joystick sensors.

Note: Although less prevalent with potentiometers & TMR sensors.

- First Rotation will be the calibrated circularity (upon gamepad reboot)
- Second and all rotations after will be your true results. 0.5-1% avg below

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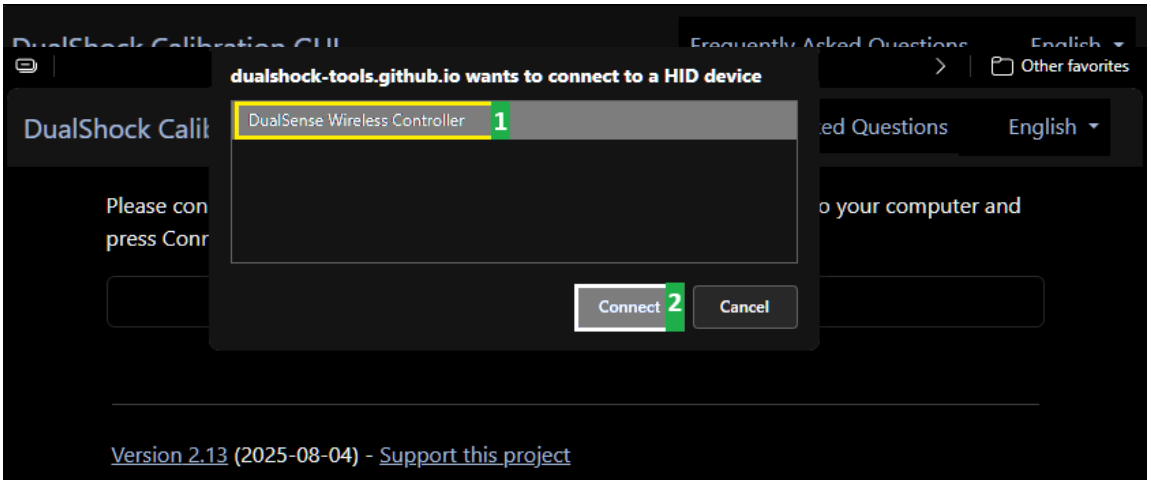
📙 Dualshock.Tools - Calibration Method:

TIP: Use hardwaretester.com/gamepad graph alongside the DualShock Calibration GUI

Note: Make sure your PS5 gamepad is on the latest firmware. Open both sites to follow its progression. side-by-side

- [ ] Select ***Connect** → open both sites to follow its progression. Side-by-Side



- [ ] Select your controller, then click ***Connect**
- [ ] Once connected → Click ON, ***Check Circularity** (Do a full rotation clockwise and Counter-clockwise)

Note: 12 Sectors will paint on each of the 4 Quadrants.

- [ ] Select ***Calibrate stick center**

- [ ] A pop-up window will show → Select ***Start** (follow the process in the

description)

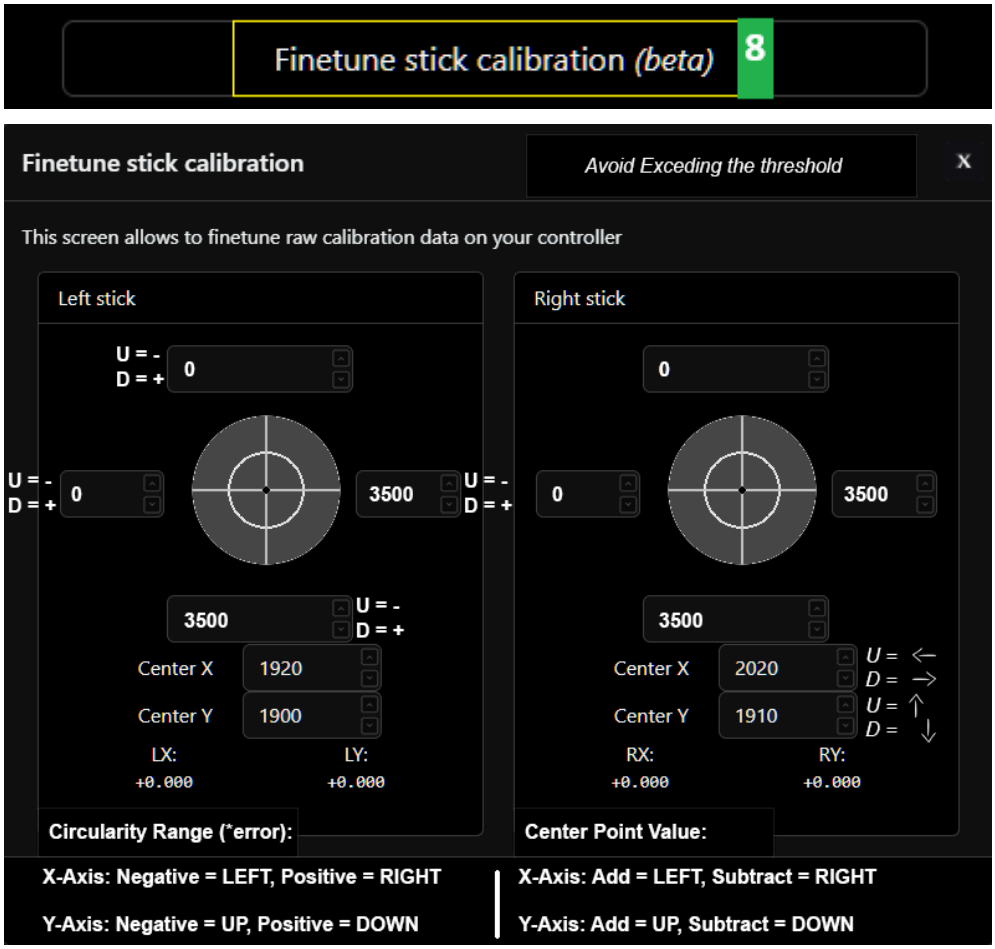
> **Note:** For the Diagonal input maintain it on the center yellow line of the 12 sectors. Then let go.

- [ ] Select ***DONE**. → Next you will Select ***Calibrate stick range**

- [ ] A new pop-up window will show, proceed to do 6 controlled rotations ***clockwise*** and ***counter clockwise*** (for a total of 12) on the Left-Stick & Right-Stick individually.

- [ ] Once completed → Select ***DONE**. → ***Save changes permanently**
- [ ] → ***Reboot Controller**

☐ Proceed to Select ***Finetune Stick Calibration** *(beta)*



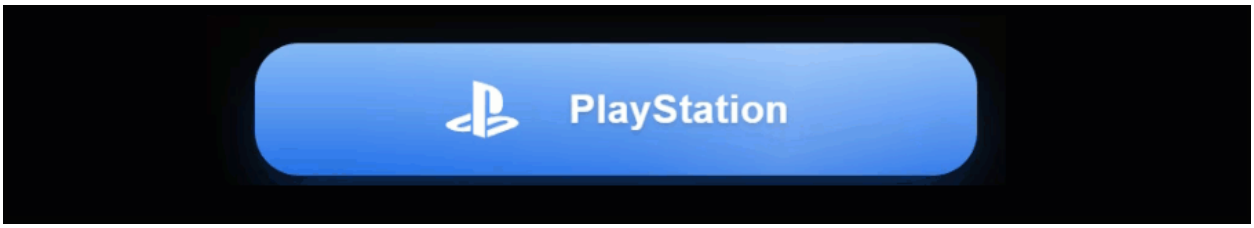
Note: if sporadic behavior occurs while calibrating. And solder joints are sound. Simply reboot the gamepad and retry again. (If you go below 2600 the Bottom or Right threshold simply increase the value, if you go over the threshold of 3942 decrease the value, You can't go below 0 on the Top or Left, don't exceed the upward threshold either.)

📓DriftGuard Calibration Method:

- **Driftguard:** [v0.4.8.7-alpha] or [v0.5.0.0-beta-dev]

About DriftGuard

DriftGuard helps you test, visualize and tune gamepads. It focuses on finding light stick drift, checking button response, and giving you tools to fine-tune calibration of trigger & analog sticks for consistent control..



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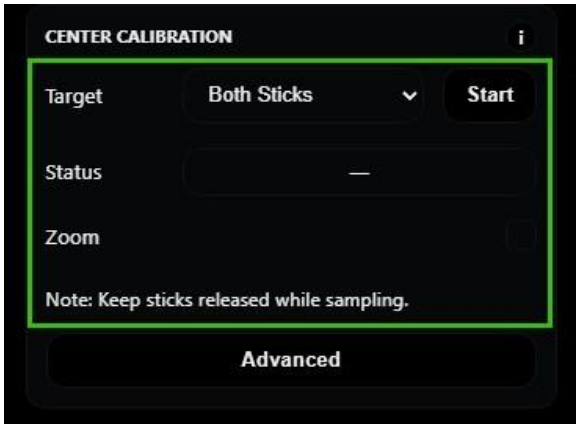
🕹️ Process:

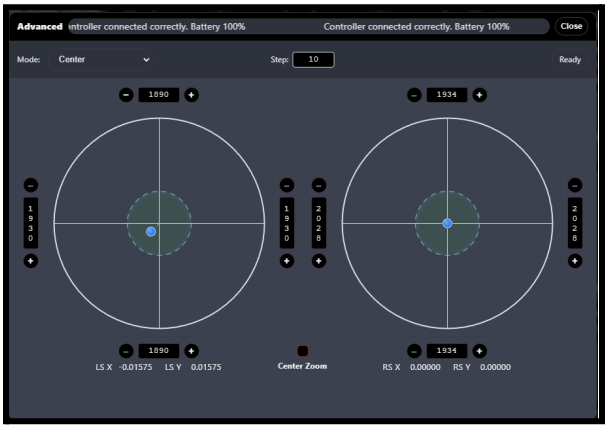
1. Open [DriftGuard – Dashboard] in the foreground; Select ***Click Here to Connect***
2. A popup window will show up, Select *DualSense Wireless ***Controller - Paired***

JOYSTICKS:

☐ **Center Calibration:**

1. *Target: [Left-Stick] or [Right-Stick] → Select **Center Zoom** → ***Start**
2. You will be ask to keep your ***Hands off sticks during center calibration**.
3. (optional) Select ***Advanced**.



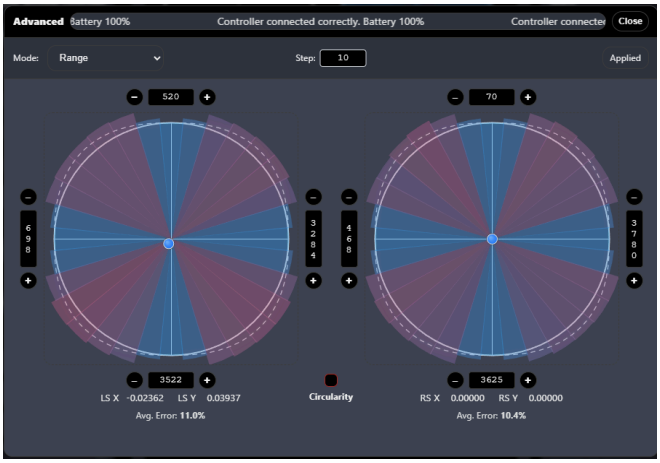


4. Once complete → hit close (top right of pop up) → select * [**SAVE**]

☐ **Circularity Range Calibration**:

1. *Target: [Left-Stick] or [Right-Stick] → Select **Start**
2. Perform 10 controlled rotations. All Within 15 second time-Window. Once complete → select * [**SAVE**] → Reboot the gamepad
    - 5 Clockwise
    - 5 Counter Clockwise.
3. (optional) Select ***Advanced**.
4. You will now be able to adjust the calibrated range. By increments of choice.

5. Once complete → hit close (top right of pop up) → select * [**SAVE**]

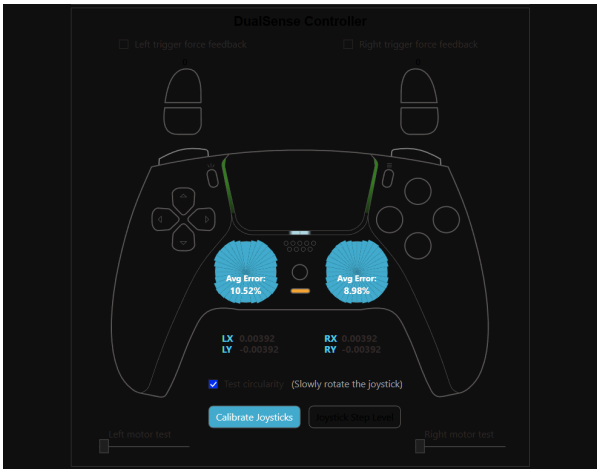


☐ **Alternative Range Calibration**: [NEW-Feature]

6. *Target: [Left-Stick] or [Right-Stick] → Select **Start**
    - **Type: [Built-in] or [Custom]** → Select **Custom** → Avg. Error 8-12%
7. Perform controlled rotations. For 5 stages of auto-calibration and auto-finetune. Once complete → select * [**SAVE**] → Reboot the gamepad
    -
8. (optional) Select ***Advanced**.
9. You will now be able to adjust the calibrated range. By increments of choice.
10. Once complete → hit close (top right of pop up) → select * [**SAVE**]

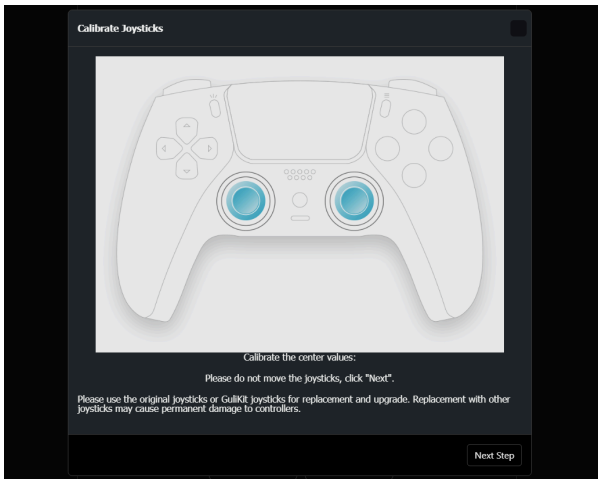
📘 Gulikit Playstation Method:

1. Open Gulikit: test & cal in the foreground; Select *[***Calibrate Joystick]***
2. A popup window will show up, Select *DualSense Wireless ***Controller - Paired***



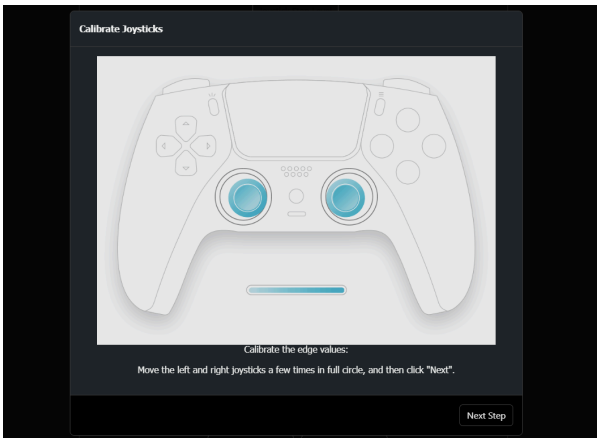
☐ **Circularity Range Calibration**:

3. A pop up will show, don't move the analogs wait 10 seconds → then Select *[**Next Step]**

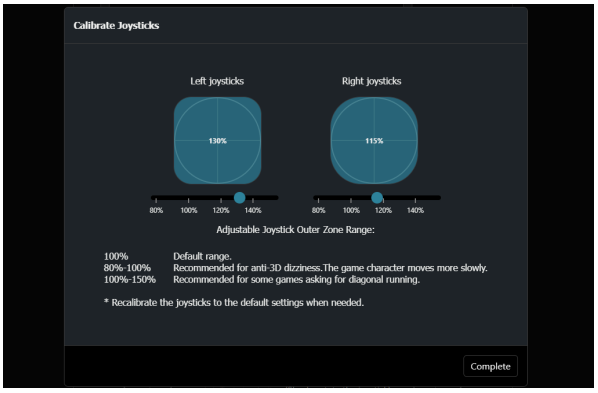


☐ **Circularity Range Calibration**:

4. Perform 10 controlled rotations. All Within 15 second time-Window.
    - 5 Clockwise
    - 5 Counter Clockwise.

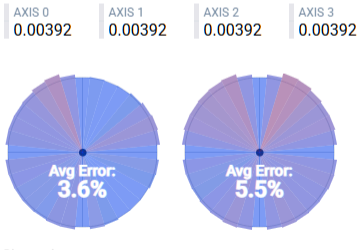


5. Once complete → select *[Next Step]

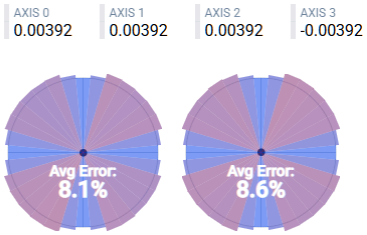


6. Set your calibrate ranges to
    - ***Left-Stick:** at 115-130%_10-20% error
    - ***Right-Stick:** at 110-115%_8-10% error

Before: Left-Gulikit_v1 | Right-Hallpi_v5 (a flawed/poor install can still be corrected)



After: *fine-tune

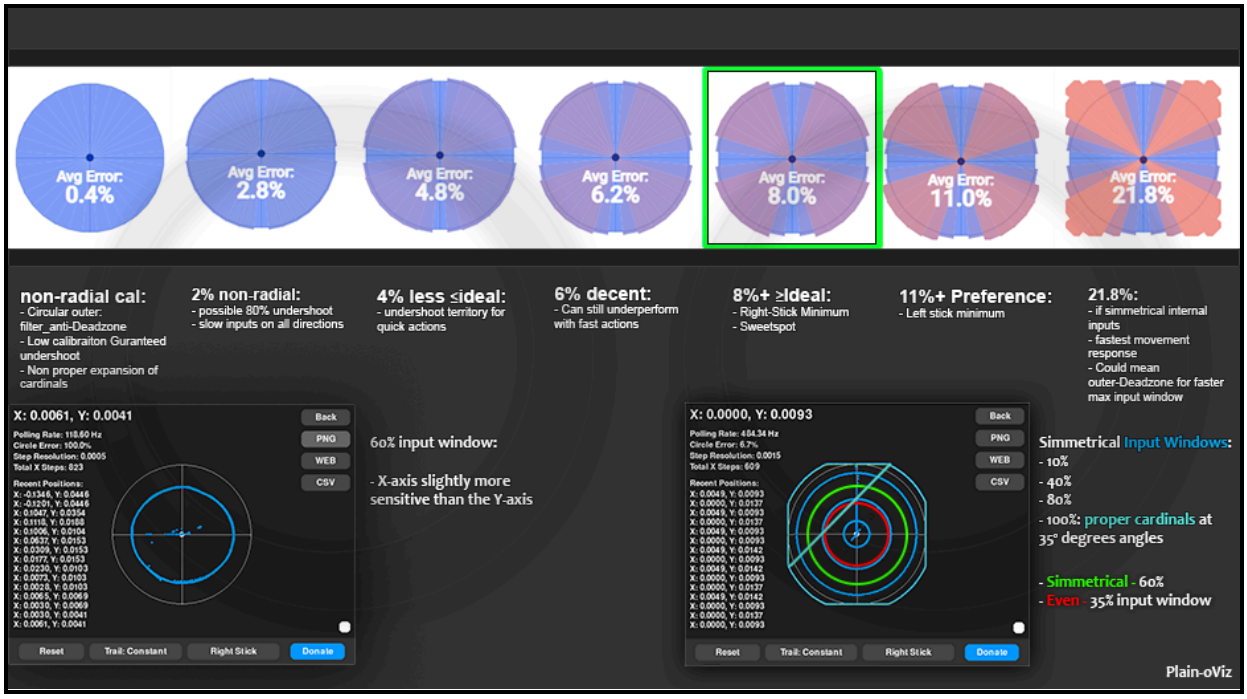


Note: For an in def look at the version 2.16+ update. Be sure to check out

Video Tutorial - by Baro-Fix [youtube]

💎 **Ideal result:** `Factory Standard of a Symmetrical ~8% Circularity.`

- **Cardinals**: 1.0 = 100%, max out at 0.5mm off the gate. With proper expansion at 35° angles.
- ***Error**: This means range; the circle is a point of reference, not a sweet spot.
    - Percentage Displays the amount of ***UNDERSHOOT*** or ***OVERSHOOT*** is happening.
    - ***Even Numbers***: 2-20; Display symmetry
    - ***Odd Numbers***: 1-21; Display Asymmetry or one axis being more sensitive than the other.
    - ***Decimals***: .2, .4, .6, .8; will show when sectors may expand more. With .1, .3, .5, .7, .9 showing un-even asymmetrical expansion of a sector.
- Color Palette:
    - Range: Green, Light Blue = bad
    - Cardinals:
        - Green, Light Blue, white below the line = bad
        - Blue = min
        - with further color extension up to 35° = ideal
    - Diagonals:
        - Light Blue, Blue, Purple = to low
        - Hint of pink = min
        - Pink = ideal
        - Red = to far



HQ image: [imgur]

Reasoning: *Engineers at MS/Sony went through an extensive R&D process and have found a minimum range that most gamepads try to meet. Game Developers then create their inputs based on templates. Going below can have a detrimental performance impact.*

Graphs above were captured under the right conditions (Don't break your head over perfection. These only display a controlled environment)

Comparing images to ones Calibration. On non-radial; first party axis independent squared method. If too low an avg the descriptions better inform the user of possible issues/behavior one could experience. Don't be fooled by third party gamepads applying an outer *anti-deadzone filter. Similar to the 1st image.

Although real world performance can shift extension based on the quadrant at which you start your rotation. If you Calibrate your sensors at an adequate range (*error) you'll have less issues of undershoot. The circle is a point of reference not a sweet spot.

Producing similar results will allow for the quickest development of muscle memory for a new unit. (suggest measuring your internal input windows also)

Issues with asymmetrical expansions can be a strain. Repeating a certain physical pattern to compensate for a certain quadrant over expanding could impede progress also. Symmetrical internal input Windows + adequate range + lower mechanical friction = no hindrance

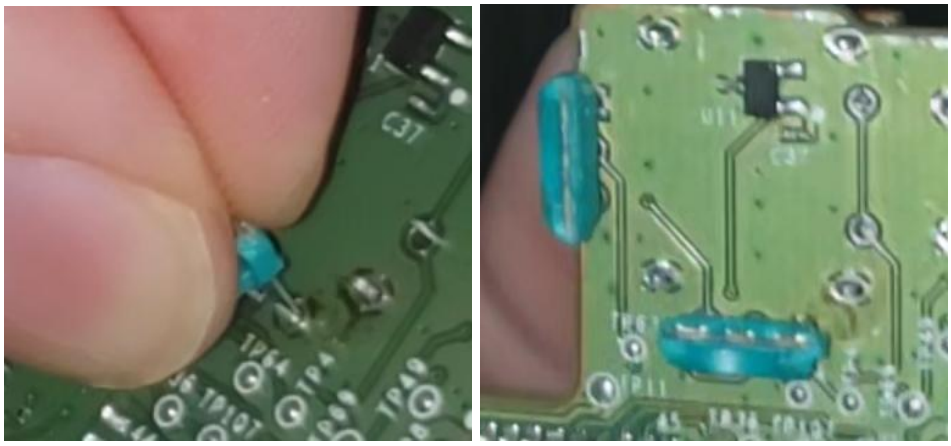
Recommend: Using Firmware *__5.22.16.0__ for Best/optimal Results.

⚠️ **Important: Avoid Misalignment**

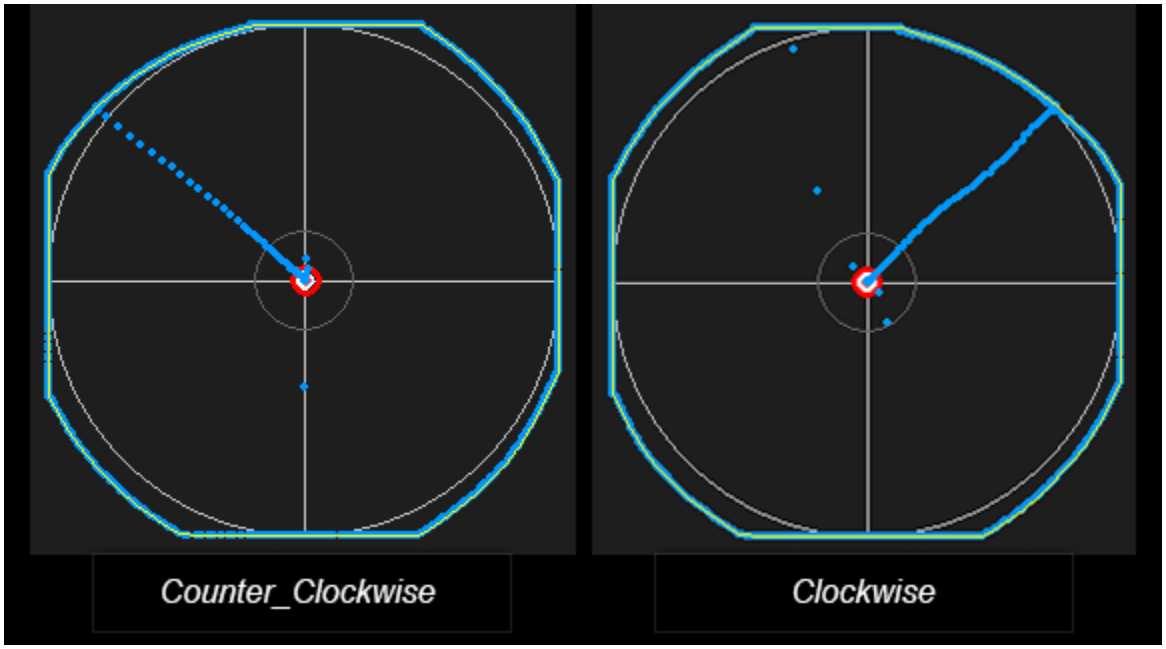
- Shifting circularity based on rotation clockwise & counter.
  - ☐ Avoid misalignment. Keep a flat Module on PCB.
  - ☐ Don't push against it laterally with excessive force while soldering
  - ☐ Keep the Sensors levelled. No tilt x-axis pivot lifting on one end of z-axis.
  - ☐ Make sure one side is not pushed outward on the top y-axis.
- **Tip**: If you are having trouble with alignment. Insert clean potentiometer headers from the inner part of the vias. (Make sure you cut the pots in half so the circuit doesn't complete.) Then make sure your module is flat on the board. Even sensor gaps on both ends.

- Solder your 4 ground pins. Don't click the tach switch down. Simply solder to two most outward pads. Then you can test your ranges. While the extra headers are making contact with the TMR headers and vias. Position the front faceplate and do a test calibration.

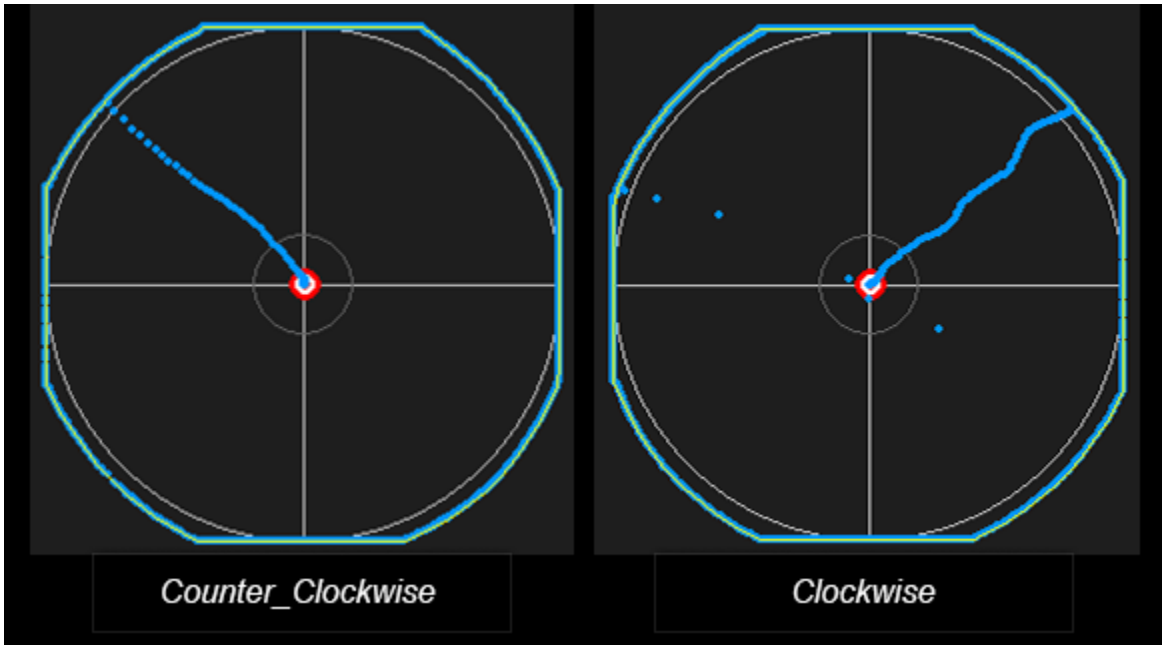
- If your module is properly aligned and you aren't getting this shifting of ranges. Then remove the extra headers and solder your sensors in. Including the two leftover voltage pads for the tach switch. Reassemble and make sure nothing else is warping. From over tighten screws. (Install each screw in the same hole it used from the factory to avoid the plastics from warping)

- **Alternatively**: certain sensors are delicate and can bend. After aligning → Solder the 3 sensor headers → then the four ground pins → finish with the tach switch for last.
- 

Before: Sensor Misalignment (tool used here by John Punch)



After: Module, Sensor, Magnet aligned (*before fine-tune)



💬 Community Help & Support

[Document will be Updated often as new information becomes available]

Connect with modders, testers, and volunteer support:

- AKNES Discord
- AliExpress HE/TMR Discord
- Driftguard Discord
- Dualshocktools

DualSense Firmware Changelog

[Placeholder]

Note: Will need help from users with known firmwares. Sony doesn't publish much of anything. Sometimes it does reference or acknowledge a controller update.

DualSense Firmware Changelog

-

2020-2022

Hardware:

- ☐ Sony Dualsense 5 controller, model **BDM-010 (V1) -** November 2020
- ☐ Sony Dualsense 5 controller, model **BDM-020 (V1) -** Mid-2021
- ☐ Sony Dualsense 5 controller, model **BDM-030 (V1) -** Early 2022

Changes:

- ☐ Sony Dualsense 5 controller, model **BDM-010 (V1) -** November 2020
  - Initial Launch model
  - Joystick Modules: ALPS RJ13 (Green) or Favor Union FJR10K (Yellow)
  - Original Haptic feedback and trigger mechanism
- ☐ Sony Dualsense 5 controller, model **BDM-020 (V1) -** Mid-2021 (around June-August 2021)
  - First internal revision
  - Stronger trigger springs
  - minor **PCB** changes.
- ☐ Sony Dualsense 5 controller, model **BDM-030 (V1-v2) -** (around February-April 2022)
  - Additional **PCB** refinements for improved efficiency
  - Improved Joystick Module batches
    - Specification: ALPS ALPINE - RJ13-XV (Green)

Changelog:

B-01XX: Nov 2020

- First DualSense firmware (BDM-010).
-

B-011X: Apr 2021

- First public DualSense firmware update.
-

B-012X: Sep 2021

- Stability + trigger tuning improvements.
-

B-03XX: Mar 2022

- Firmware for BDM-030 era units.
-

B-03XX: Sep 2022

- Bluetooth stability + stick calibration tweaks.
-

2023-2025

Hardware:

- [ ] Sony Dualsense 5 controller, model **BDM-040 (V1) -** Late 2023 (confirmed November 3, 2023)
- [ ] Sony Dualsense 5 controller, model **BDM-050 (V1-v3) -** Mid-Late 2024
- [ ] Sony Dualsense-Edge controller, model **BDM-E-CFI-ZCP1 (V1) -** January 26, 2023

Changes:

- [ ] Sony Dualsense 5 controller, model **BDM-040 (V1) -** Late 2023 (confirmed November 3, 2023)
  - Major internal redesign
  - new board layout
  - new battery supplier.
- [ ] Sony Dualsense 5 controller, model **BDM-050 (V1-v3) -** Mid-Late 2024
  - Fifth revision
  - new MCU
  - new trigger motor supplier
  - firmware B-0520 era.
- [ ] Sony Dualsense-Edge controller, model **BDM-E-CFI-ZCP1 (V1) -** January 26, 2023
  - Uses **Hall-effect trigger sensors** (unlike standard DualSense)
  - Uses **modular stick units** (replaceable)
    - Improved Joystick Module batches
    - Specification: ALPS ALPINE - RJ13-XV (Blue)
  - Has a **different internal MCU** than standard DualSense

    - Firmware updates are bundled with PS5 system updates, same as regular controllers

Changelog:

B-0EXX: Jan 2023
- **DualSense Edge launch firmware**.
-

B-0E2X: Apr 2023
- **Edge** trigger tuning + stick module calibration.
-

B-04XX: Nov 2023
- Firmware for BDM-040 units.
-

B-042X: Nov 2023
- Bluetooth stability
- Battery usage and optimization
-

B-0520: June 24, 2024

B-052X: Aug, 2024
-

B-052X: Mar, 2025
- General controller stability improvements.

2025-2026

Hardware:

- ☐ Sony Dualsense 5 controller, model **BDM-060 (V1) -** Late 2025
- ☐ Sony Dualsense-Edge controller, model **BDM-060 (V1) -** JAN 00, 2000

Changes:

- ☐ Sony Dualsense 5 controller, model **BDM-060 (V1) -** Late 2025 [Example - Placeholder]
    - Sixth revision
    - likely minor board refresh/revision
    - aligns with your date.
- ☐ Sony Dualsense-Edge controller, model **BDM-E60 (V2) -** JAN 00, 2000

Changelog:

B-0630: July 4, 2025

- Firmware for BDM-060 units.
- Unified branch for BDM-050 units
- All Dualsense can now be paired with up to 4 devices; stored in memory.

🔍 Alternative Modules/Sensors

[If on mobile Select the expand Arrows]

🔍 Understanding Drift

- ***DRIFT**, is not simply sensor failure - often caused by worn potentiometers, noise, misreads, uncoordinated or calibration errors can produce similar symptoms.
- ***Mechanical Slop** - instances of this phenomenon can be attributed to give & slack. Warpage of compression springs. Wobble from misalignment is especially common in older controllers with use due to failing internal components. These issues can be present if manual assembly wasn't the best at the factory.
- [Link Placeholder - Differences & Distinctions]

🧠 Sensor Education: Learn About TMR Encoders

1. On-Axis vs. Off-Axis Sensors (Allegro Micro)
2. *TMR Angle Sensors vs On-Axis(Allegro Micro)
3. Sensor variants and applications.pdf (Allegro Micro)
4. TMR Sensor Overview (NVE Corp)
5. Peplacing and Solutions: HE with TMR Sensor (CK Associates)
6. Electronics Modding Channel - MetalPlasticElectronics354
7. Conntek_Application catalog.[Download.pdf]

- 🧲 **TMR sensor technology:** Uses magnetic field sensing for contactless operation, eliminating the issues of sensor wear from degradation of a carbon filament from a standard Potentiometer.
- 🔋 **Low power consumption:** Typically between 0.1 - 0.3 mA, much lower than traditional Hall effect sensors or Standard Potentiometers that can use 5-10x more than TMR.
- 🛠️ **Direct replacement:** No circuit modifications needed, though soldering is required.
- **TMR** has the potential to last longer. This allows the module to max out its mechanical lifespan.
- **Solutions/Variants**: Off-Axis Linear, On-Axis, TAS Angle

Disclaimer: *Random burn out, sporadic behavior is possible, prone to magnetic interference (EMI), extended Heat exposure while installation is done can shorten its lifespan exponentially. Handle with care. (Sensors are rated for 2+1 sec at 200°c.). Allow for adequate heat dispersion when applying solder.*

- Drift Solution or Hype by Greg's Gaming
- [Link Placeholder]

🕹️ Alternative - Joystick Modules & Sensors:

Max Stars = 60, adjusted to ⭐**0-5 RATING**

🟥	🟠	🟡	🟩	🟢	🟦	🟣	🟫
F	D	C	B	A	S	O	Z
0-0.9 -0.7	1.0-1.9 -0.25-0.5	2.0 – 2.9	3.0 – 3.9	4.0 – 4.9	+0.25	+0.5	+0.25

📊 **Rating Level:** Simplified: Grading System and Formula 3

Note: Ratings changes will be made as newer revisions get released or issues are found. These are basic assessments. May not tell the full story. This is used to track for possible tainted batches or poor QC, tuning, etc.

Some modules suffer from an assembly flaw. Minor gap on the Y-axis point of rotation. Shifting alignment up&down. Re-assemble can fix the issue. [Video Example]

Inputs: Categories (11) Response Curve & Linearity tests are performed under controlled time frames of 1.8, 2.4, 3.6, 4.6, 6 & 8 seconds. 10 instances for each. A *Linear Stepper Motor + John Punch - LINE program [Download - exe]. Testing Rotations at multiple Directions. (with up to ±0.2seconds in deviation to account for error.)

🔄 Off-Axis Linear TMR Sensors

Gulikit: LinearTMR

1. Gulikit TMR → v1 **[24.75] [⭐2.06]**

- Decent Input Response, Steady signal, Minor Delay in curve, 83% overall avg, 2-4% circularity avg
  - ☐ Black & Green_WVB°2F (older variant, underperform)
  - ☐ Model: NS51 PS5

2. Gulikit TMR → v2 **[28.70] [⭐2.39]**

- Great Input Response, Steady signal, Marginal in curve, 89% overall avg, 5-6% circularity avg
  - ☐ Black_XCB°2F or XCA°2F (improved QC, improved inner voltage)
  - ☐ Model: NS51 PS5

3. Gulikit TMR → v3 **[41.40] [⭐3.45]**

- Fast Input Response, Signal Stable, Nominal curve. 93.33% overall avg. 6-7% circularity avg
  - Sensor Revision: Black_ZND°BF [placeholder]
  - Model: NS51 PS5
- *Variants*:
  - Module:RJ13-variant, Lower Friction and improve yet Firm mobility [B]
    - Max Degree/Tilt: 30°
    - Tension: 75+5gF tension

        - combine magnet & sensor assembly
        - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.6mm
        - Total: L21.35mm x W17.75mm
        - Total Height: 19.1mm
    - Module:RJ13-variant, Lower Friction and improve yet Firm mobility [B]
        - Max Degree/Tilt: 30°
        - Tension: 85+5gF tension
        - Housing:
        - Shaft: combine magnet & sensor assembly +0.2mm Y-Axis Offset, can add friction
        - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.8mm
        - Total: L21.35mm x W17.75mm
        - Total Height: 19.1mm
- *Improvements*:
    - v1.1 - Sep2024: Hallpi corrected the issues of housing developing Rust from the early Gulikit batches
    - v2 - Sep2025: tuned with Hallpi v4 parameters to improve response 89% avg resulting in less non-linearity
    - v2.1 - Oct2025: Range increase 6% circularity avg
    - v3 - Jan2026: Using Hallpi v6 new Sensor class and factory tuning parameters
- Issues:
    - v1 & test units - June-July2024: Housing Developing Rust if on High Moisture Environment
    - Y-Axis under performance. Most units, rotation and clicking cause a new point of pivot. Leveraging the component laterally if there's give on the module. (Flaw on all rj13 on this spec) [Video Example]
    - v1 - Low Range_Higher after adjustment 8%, without the re-alignment sudden shifts in range can happen from shifting voltage outputs
- Video Example & Video MPE - Youtube
- Gallery

4. Gulikit **720°** TMR → v1 **[28.45] [⭐2.37]**

- Great Input Response, Steady signal, Marginal in curve, 89% overall avg. 5-6% circularity avg
    - ☐ Black_XCB°2F [*out now*]
    - ☐ Model: NS55 PS5
- *Variants*:
    - Module: RJ13-variant, Lower Friction and improve yet Firm mobility [B]
        - Max Degree/Tilt: 26°

        - Tension: 75±30 tension (adjustable)
        - Housing:
        - Shaft: combine magnet & sensor assembly
        - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.8mm
        - Thumbcap Diameter: Plastic 9.45mm, Metal Ring 10.5mm,
            - Height: Base to Dome_17.65mm, Base to top_23.9mm
        - Total Height: ≥27.4 - ≥34mm
- *Improvements*:
    - v1 - July2025: tuned with Hallpi v4 parameters to improve response resulting in less non-linearity
    - Range increase 6% circularity avg
    - v1.1 - Aug2025: Tries to correct issues with misalignment of the dome
    - v1.2 - Sep2025: tries to correct issues with dome seated to high for Switch, Xbox models
    - v1.3 - Oct2025: Black_XCB°2F & Green_XCB°2F. Properly labels sensor assemblies
- Issues:
    - Poor QC
    - Range shifts. Due to extra pressure added onto internal components
    - Fork/Lateral support warp leading to a change in the magnets position
    - Can't remove the Dome
    - The retention ring can break-off leading to a wobbling thumbcap.
    - Too tight tolerances for the ID if the shaft/lever. Causes the plunger to get stuck leading to stiff rotations. Likely to cause warping of plastics. [Example]
    - Video Example by **Omeli** [YouTube]
    - Video Example by **Barofix** [YouTube]
- Gallery

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*A AKNES: LinearTMR

1. Hallpi TMR → v1 **[24.75] [⭐2.06]**

- Decent Input Response, Steady signal, Minor Delay in curve, 83% overall avg, 2-4% circularity avg [Example]
    - [ ] Blue_WVB°2F (older variant, underperform) & Green_XJH°2F

2. Hallpi TMR → v4 **[27.45] [⭐2.29]**

- Decent Input Response, Steady signal, Marginal in curve, 88% overall avg, 4-6% circularity avg [Example]
    - [ ] Blue_XJG°2F (improved QC, improved inner voltage)
    - [ ] Model: ak205 PS5

3. (beta) Hallpi TMR → v0.5 **[31.95] [⭐2.66]**

- Great Input Response, Signal Consistent, Nominal curve. 92.25% overall avg. 6% circularity avg
    - [ ] Blue_XOD°2F

- [ ] Model: ak205 PS5

4. (final) Hallpi TMR → v5 **[33.45] [⭐2.79]**

- Fast Input Response, Signal Stable, Close curve. 94.6% overall avg. 2-4% circularity avg. [Example] [2] [3] (Higher if adjusted 8-12%,) [Example]
  - [ ] Blue_YOD°2F
  - [ ] Model: ak205 PS5
- *Variants*:
  - Module:RJ13-variant, Lower Friction and improve yet Firm mobility [B]
    - Max Degree/Tilt: 30°
    - Tension: 85+5gF tension
    - Housing:
    - Shaft: combine magnet & sensor assembly, can add friction
    - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.8mm
    - Total: L21.35mm x W17.75mm
    - Total Height: 19.1mm
- *Improvements*:
  - v1.1 - Aug2024: Hallpi corrected the issues of housing developing Rust from the early Gulikit batches
  - v4 - Dec2024: tuned to improve response resulting in less non-linearity
  - improved Production and Quality Control
  - Corrects inner voltage instability
  - v4 - Range increase 6% circularity avg
  - highly supported, great customer service
  - v4.2 -
  - v0.5 - June2025: tuned to improve response resulting in less non-linearity
  - *early test kits*, outer range extended avg of ≥1.5% over v4, circularity stabilised
  - v0.5.1 - July2025: tries to adjust voltage output to correct an issue from exceeding the threshold
  - v0.5.2 - July2025: improves on module QC
  - v0.5.3 - Sep2025: new molds for Magnet and Sensor Assembly [Example]
  - v5 - Oct2025: tuned to improve response, resulting in less non-linearity
  - Further optimization for signal stability
- Issues:
  - Y-Axis under performance. Most units, rotation and clicking cause a new point of pivot. Leveraging the component laterally if there's give on the module. (Flaw on all rj13 on this spec) [Video Example]
  - Range shift from voltage, instability of module
  - v4.2 April2025: tainted batch may have issues exceeding the threshold 0v or 1.8v to early while restricted
  - v5 - Oct2025: Due to the extra tuning, they played it safe to avoid ever exceeding the threshold. Range was lowered. Desperate need for a *Fine-Tune
- Performs best after applying a *Fine-tune; 8-12%

- Video Example from MPE - Youtube
- Gallery

Note: For Off axis sensors on the top position. Your thumbcap must sit at a certain height. If too low a position. When calibrating there can be less range. If too high the same phenomenon can happen. To help with this,

- Lift the thumbcap by 0.4-1.4mm depending on clearance/preference.
  - Example: Assembled thumbstick height.
  - Using a few layers of tape or 0.6-1.4mm Riser [Download .stl file]
- For X | Y-Axis underperformance - “Fine Tune” via physical methods or software toolkit
  -
- Gallery.

5. (Beta) Hallpi Off-Axis Linear TMR → v0.6 **[40.40] [⭐3.37]**

- Fast Input Response, Signal Consistent, Nominal curve. 92.25% overall avg. 7-9% circularity avg [Example]
  - [ ] Sensor Revision: Blue_YWE°BF [Gallery]
  - [ ] Model: ak205 PS5

6. (Final) Hallpi TMR → v6 **[42.40] [⭐3.53]**

- Fast Input Response, Signal Stable, Nominal curve. 93.33% overall avg. 7-8% circularity avg
  - Sensor Revision: Blue_ZND°BF [Gallery]
  - Model: ak202 PS5
- Module: RKJ13-variant, Lower Friction and improve yet Firm mobility [B]
  - Max Degree/Tilt: 30°
  - Tension: 85+5gF tension
  - Housing:
  - Shaft: combine magnet & sensor assembly +0.2mm Y-Axis Offset, can add friction
  - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.8mm
  - Total: L21.35mm x W17.75mm
  - Total Height: 19.1mm
- *Improvements*:
  - v0.6 - Dec 2025: Utilises a programmable sensor. Tuned during the time of production. (Xbox, ps4, switch, ps5). One size fits all no longer in use.
  - Overcame production Challenges
  - improves on module QC
  - Magnet [1] & Sensor Assembly [2]: new molds, utilise an automated production process.
  - Offsets the magnet +0.2mm on the Y-Axis [e.g. Gallery]
  - Could be using a similar sensor to that of Ginfull? [e.g. Gallery]
  - Inherent Response Curve: Tuned to improve response resulting in less non-linearity
  - Input windows: symmetry is improved substantially.
  - Voltage Windows: are stable outputting at the sweet spot of 0.3-0.4v left, 0.8-0.9v idle, 1.3-1.4v right
  - v6 - Jan 14, 2026: [Gallery]

    - Further optimize chips main algorithm
- Issues:
    - To be Determined
    - Sectors can underperform; on quick rotations or when clicking the switch while on a cardinal. (Make sure a careful install is performed and calibrated to ~8%+ if the avg varies) [Example]
- PS5 variants perform at a greater initial range. Give it a few weeks for newer xbox batches.
- [Gallery]

Note: Mass Production has completed, limited order begins on the 15th of Jan 2026. With product being sent to local AliExpress and Amazon distribution centers, guaranteed product by the end of month.

Jinfu/GINFULL: LinearTMR

1. LT4J (beta)
2. LT4K → 1st Batch **[32.95] [⭐2.75]**

- Great Input Response, moderate signal instability, Nominal curve, 92% overall avg, 5-7% circularity avg
    - [ ] Orange_XKF°BF (minor QC hiccups)
    - [ ] Alt.Model: 13-VR, ALPS mount variant LT-5A_XKG°BF

3. LT5B (5A) → 2nd Batch **[34.95] [⭐2.91]**

- Great Input Response, moderate signal instability, Nominal curve, 93.4% overall avg, 7-9% circularity avg
    - [ ] Orange_XLC°BF (early Rev.)_XMP°BF (decent range)
    - [ ] Alt.Model: 13-VR, ALPS mount variant LT-5B_XML°BF

4. LT5C → 3rd Batch **[34.45] [⭐2.95]**

- Great Input Response, Steady signal, Close curve, 94% overall avg, 5-6% circularity avg
    - [ ] Orange_XMO°BF or XMP°BF (low range)
    - [ ] Alt.Model: 13-VR, ALPS mount variant LT-3CC_XMJ°BF

5. LT5E or LT5F/RT5E → 4TH Revision **[41.70] [⭐3.45]**

- Fast Input Response, Consistent signal, Close curve, 95% overall avg, 7-9% circularity avg
    - [ ] Orange_YOE°BF, YOG°BF, YOJ°BF

6. LT5H/RT5H → 5TH Revision **[42.70] [⭐3.56]**

- Fast Input Response, Consistent signal, Close curve, 95% overall avg, 7-8% circularity avg
    - [ ] Orange_YQE°BF
    - [ ] Alt.Model: 13-VR, ALPS/Hallpi mount variant LT-5I_YRJ°BF

7. LT5L/RT5L → 6TH Revision **[44.95] [⭐3.75]** after bonus **[⭐3.98]**

- Fast Input Response, Consistent signal, Close curve, 95.8% overall avg, 7-8% circularity avg

- [ ] Orange_YIA°BF,YVC°BF, YVF°BF, YVG°BF
- [ ] Alt.Model: 13-VR, ALPS/Hallpi mount variant LT-5J_YSI°BF
- [ ] Alt.Model: 13-VR, ALPS/Hallpi mount variant LT-5K YSG°BF

8. LT5M/RT5M → 7TH Revision **[00.00] [⭐0.00] FEB2026**

- *Variants*:
  - Module: RJ13a1p, Supple initial yet Lowest Resistance smooth mobility [B]
    - Max Degree/Tilt: 30°
    - Tension: 60gF tension (white-platform)
    - Housing: same dimension for 4points of contact
    - Shaft: Separate magnet off-axis, no-contact sensor assembly
    - Mechanism: Platform, Exceptional recentering ±2% (0.01), Wider Lateral Support ≥1.8mm,
    - Metal Housing aligns clicker
    - Total: L21.65mm x W17.35mm
    - Total Height: 19.35mm
  - Module: RJ13a1p, Firm initial Resistance/Lower Resistance smooth mobility [C]
    - Max Degree/Tilt: 30°
    - Tension: 80gF tension (grey-platform)
    - Housing: same dimension for 4points of contact
    - Shaft: Separate magnet off-axis, no-contact sensor assembly
    - Mechanism: Plunger,Exceptional recentering ±1% (0.005), Wider Lateral Support ≥1.8mm,
    - Metal Housing aligns clicker
    - Total: L21.65mm x W17.35mm
    - Total Height: 19.5mm
- *Improvements*:
  - **2nd Revision**: improve with misalignment making range slightly more stable
  - Optimizing: for non-linearity, Nominal curve, 93.4% overall avg
  - Extends range further
  - **3rd Revision**: stabilises inner point voltage, overlooks range.
  - Optimizing for non-linearity, Close curve, 94% avg
  - **4th Revision**: June/Aug2025 - Removes filter/Bypass or Decoupling Cap
  - Improve Tuning for more consistency with the voltage output
  - Noise reduction
  - Improve Symmetry of ranges
  - Corrected circularity issues from the 3rd Batch
  - Improvements with Module Assembly & QC+
  - Range is maintained even on newer firmware 5.23.6.0/5.24.4.0 that filter out more than 5.22
  - **5th Revision:** Sep/Nov2025
  - **6th Revision:** Dec2025-Jan2026 - Correct many issues with tolerances [Gallery]
    - Fork: both points of contact are a proper circle, removing the issues with egg shapes.

        - Axle: Point of contact also corrects this, allowing proper assembly and rotation. The magnet will now be stationary when clicking the tach-switch. Likely to lead to more stable ranges.
        - *13-VR: versions contain a Decouple-cap. On VCC/IN may help reduce noise for certain firmwares.
    - **7th Revision:**
- *Issues:*
    - 1st Batch: revision may have either sensor issues or an assembly misalignment from loose tolerances.
    - Causes downward inputs on the Y-Axis to expand further than its calibration. It can be mitigated by shifting the magnet then calibrating.
    - New v1+ modules with the White Lateral Support have an odd wobble when rotating. Switching to the older slightly transparent plastic supports and reassembling can remove the issue.
    - 3rd Batch: some have issues with range. With some producing a less than ideal circularity. 5-6%
    - 4th batch: tested 10 pcs. Noticed some inconsistent-underperforming bottom left sectors when compared to other corners. Most perform well though. (Could be the gamepad shell warp or sensor alignment on the pcb.)
    - 6th Revision: to be Determined
    -
- Video Example from MPE - Youtube
- Gallery

Note: Manufacturer is strictly producing and selling the 80gF modules. Where initial requires around 90-120gF to move, restricting micro adjustments. Defeat the purpose. I suggest the older 60gF module (tough to find) or replace with a spring @0.5x8.5x5-7mm in length to reduce the initial effect.

-

Minor Module dimensional difference can alter the overall height based on units for PS5, Xbox/PS4, Switch. Trimming plastic off the stem can be done when clearance is needed. For shorter modules; you can increase the stem length for the Right-Sticks Thumbcap

By Using a few layers of tape or 0.6-1.4mm Riser [Download .stl file]

1. ***Ginfull*** (Yet to test)

- Sensor Labelled_???°BF
- *New Module:*
    - Model name: RJ*13-PX:* *Precision Through Structure*
    - Full Metal Housing: By using the entire metal shell for alignment, Ginfull is addressing one of the most persistent issues in these modules. Micro-gaps that cause lateral wobbles and warping of internal components.
    - Improved Assembly Tolerances: This design minimizes sensor misalignment during production, which could mean better consistency across batches.
    - Likely Benefits:
        - May reduce calibration changes

    - Smoother return-to-center
    - Less need for post-install shimming or adjustment
    - Fixed 4points of contact.
- Gallery

Note: Minor Module dimensional difference can alter the overall height based on units for PS5, Xbox/PS4, Switch. Trimming plastic off the stem can be done when clearance is needed. For shorter modules; you can increase the stem length for the Right-Sticks Thumbcap

By Using a few layers of tape or 0.6-1.4mm Riser [Download .stl file]

F *Puyao/Favor Union: LinearTMR*

1. [M] - 2511-2522 Batch **[26.45] [⭐2.20]**

- Great input response, (+ lacks decoupling/filter caps, moderate signal instability [C]), Nominal curve [B], 92.6% overall avg, 2-5% circularity avg [Example]
    - [ ] Sensor: Green_XLF°BF, XLG°BF (Black base @90gF module) [Gallery]
    - [ ] Model: *FJHK10K-0011a_to_0022a*
    - [ ] *Alt.Model:* Modiflow - 2510-2516 Batch

2. [M] - 2526-2531 Batch **[29.45] [⭐2.45]**

- Fast input response, Steady signal, Close curve, 94% overall avg, 4-6% circularity avg [Example]
    - [ ] Sensor: Green_XLJ°BF (light grey Base @80gF module) [placeholder]
    - [ ] Model: *FJHK10K-0026a_to_0031a*
    - [ ] *Alt.Model:* Modiflow - 2524-2526 Batch
- *Variants*:
    - Module: FJHK-10K-S3M, Less friction and improve mobility, Firm initial Resistance/ [C]
        - Tension: 80gF tension (light grey base)
        - Housing: same dimension for 4points of contact
        - combine magnet & sensor assembly
        - Notable Recentering ±3% (0.015), Thin Lateral Supports ≥0.7mm, Wider tach switch clicker
        - Total Height: 19.5mm
    - Module: FJHK-10K-S3M, Less friction and improve mobility, Stiff initial Resistance/ [C]
        - Tension: 90gF tension (Black base)
        - Housing: same dimension for 4points of contact
        - combine magnet & sensor assembly
        - Notable Recentering ±3% (0.015), Thin Lateral Supports ≥0.7mm, Wider tach switch clicker

        - Total Height: 19.5mm
- *Improvements*:
    - Tuning adjustment to allow for more initial range
    - Slight improvement on QC
- Issues:
    - Overall poor QC: its conical compression spring has trapezoidal-obtuse warpage = poor quality
    - Calibrates too low in range = terribly inconsistent
    - Forks/Lateral supports have too much slack, overall rating drops exponentially with recentering ±6% in a short time frame.
    - Magnet sits high for the sensor's position
    - Bent stems, modules and plastic heavily scratched. Are they even new units or just slapped a new label on them?
- Video Example from MPE - Youtube
- Gallery

Note: Although it uses a similar sensor to that of Ginfull; magnet/sensor position, a module can drastically change the performance in a negative way.

For Off-Axis sensors on the bottom position. Your thumbcap must sit at a certain height. If too high a position. When calibrating there can be less range. To help with this,

- File plastic either off the base or the stem by 0.2-0.6mm depending on clearance/preference. Can help.
    - Example: Assembled thumbstick height.
    - Just in case, not needed_Favor-Union Thumbcap Riser just in case 0.6-1.8mm [Download .stl file]
- For X | Y-Axis underperformance - Adjust magnet Position
    - By 0.1 - 0.4mm
    - Gallery

📐 Angle TMR Sensors

Note: speculated to behave with Very Close [96-97.9%] or True Linearity [98-100%]; possibly the first real replacement for potentiometer. But could have lower yields due to production issues with a decent percentage of units depending on manufacturer. First revisions didn't meet expectations. Keep an eye out!

K K-Silver: AngleTMR

1. *Initial Release* → v1 Off-Axis [***DISCONTINUED***]
    - ☐ Sensor: Blue_5E°WM
    - ☐ Model: *JS13-001*
2. 1st & 2nd batches **[24.60]** *after penalty* [⭐2.05]

- Fast Input Response, moderate signal instability, Nominal curve, 91.7% overall avg, 6-7% circularity avg
    - [ ] Sensor: Blue_WYA°3D or WYB°3D [Example]
    - [ ] Model: *JS13-006 "Pro"*

3. 3rd Revision **[32.45] [⭐2.70]**

- Fast Input Response, Steady signal, Close curve, 95.4% overall avg, 7-8% circularity avg
    - [ ] Blue_XQA°3D or XQB°3D
    - [ ] Model: *JS13-006 "Pro"*

4. 4th Revision **[30.45] [⭐2.54]**

- Fast Input Response, Steady signal, Close curve, 95.6% overall avg, 5-6% circularity avg
    - [ ] Sensor: Blue_XQC°3D
    - [ ] Model: JS13-Pro+

5. 5th Revision **[00.00] [⭐0.00] Nov-Dec2025**

- Fast Input Response, Steady signal, Very-Close curve, 96% overall avg, 6-8% circularity avg
    - [ ] Sensor: Blue YXA°3D, YXB°3D & Green YXB°3D, YXC°3D [Example]
    - [ ] Model: JS13-Pro+

6. 6th Revision **[00.00] [⭐0.00] JAN-FEB2026**

- Fast Input Response, Consistent signal, Close curve, 95.4% overall avg, 6-8% circularity avg
    - [ ] Sensor: Blue ZDH°3D, ZFA°3D [Example]
    - [ ] Model: JS13-006-SH3B174A4-KS Pro+ [Video Example]

7. 7th Revision **[00.00] [⭐0.00] MAR-APR2026**

- Fast Input Response, Consistent signal, Close curve, 95.8% overall avg, 6-8% circularity avg [e.g]
    - [ ] Sensor: Blue ZQE°3D, ZRA°3D [Example]
    - [ ] Model: JS13-006-SH3B174A4-KS Pro+ [Video Example]
- ***Variants***:
    - Module: [Initial-OEM] RJS13-006, Lower Friction and improve mobility [B]
        - Max Degree/Tilt: 26°
        - Tension: fixed at 65gF
        - Housing: Housing: uses a Non Ferrous Metal alloy, fixed magnet
        - Shaft: fixed magnet, no-contact sensor assembly
        - Mechanism: Plunger, Inconsistent Recentering ±6% (0.030), Thin Lateral Supports ≥0.6mm,
        - Total: L21.8mm x W18.50mm
        - Total Height: 19.4mm
    - Module: [Revised-Retail Edition] RJS13-pro+ [Schematic] [Box Set]
        - Housing: Housing: uses a Non Ferrous Metal alloy, fixed magnet
        - Shaft: fixed magnet, no-contact sensor assembly
        - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.75mm

        - Total: L21.75mm x W18.25mm
        - Total Height: 19.5mm
    - Module: RJT13-008-pro+, Lower Friction and improve moderate mobility [B],
        - Max Degree/Tilt: 26°
        - Tension: adjustable for 30-80gF
        - Housing: Non Ferrous Metal alloy - Iron-Nickle
        - Shaft: Fixed magnet on-axis, no-contact sensor assembly
        - Mechanism: Plunger, Great recentering ±5% (0.025), Thin Lateral Supports ≥0.75mm
        - Total Height: 19.8mm
- ***Improvements***:
    - **2nd Revision** - April2025: Tries to correct the QC issues
        - Minor reduction of internal pressure
        - Minor Adjustment of plastic components
        - Optimised: Close curve, 94.7% overall avg, 7-8% circularity avg
    - **3rd Revision** - Aug2025: Tries to correct the QC issues
        - Symmetry improved, more stable sensor Batch
    - **4th Revision** - Oct2025: Reverts back to previous sensor batch *XQA°3D
        - Tuning: improvement with stability of output
        - Base: has an X pattern internally around the platform for added support. (Likely to avoid the arching)
        - Corrects sensor assembly by reducing the length of protrusion. Allow them the fit in EDGE modules or Xbox Left-Stick positions without modifications. [Example]
        - “optimised” on poor accuracy
        - Improved reflection of electromagnetic-interference (*EMI)
    - **5th Revision** - Nov2025: “optimised” on poor accuracy
        - Improved reflection of electromagnetic-interference (*EMI)
    - **6th Revision:** Dec2025-Jan2026:
    -
- **Issues**:
    - **v1**: Plenty of issues with the module, **[Product Discontinued]**
    - **1st Revision** - Dec2024: small % of units initial input pulls back then bounces forward. Voltage leaks, random burn out, or DOA.
        - Messy tolerances..
        - Can be assembled with give shifting components.
        - The base is too thin and brittle can be packed too tight creating a concave warped base.
        - Warping & Shifting:
            - Fork/lateral support too thin ≥0.6mm
            - Leftward movements shift the axle away from the sensors 0.05-0.1mm,
            - Downward movements shift the magnet towards the sensor 0.1-0.2mm
            - Consistent underperformance; shifts internal input windows
        - Inconsistent centering: 0.003-0.06

        - Prone to EMI interference. Besides the minor LT effect. Pressing Right-Trigger somehow also affects the Right-Stick
    - **3rd & 4th Revision** Aug-Oct2025: Instability of module still present
        - inconsistent ranges: caused from tolerance discrepancies.
        - Axle: continues to not only rock side-to-side, but also shifts up&down.
        - Fork: The end/shaft of this component used to align and rotate on the axis. Gets pushed outward by the lever. Around
        - Still Requires firmware 5.23 (5% built-in inner deadzone)
    - **5th Revision** - Nov2025:
        - Component instability continues to plague this Module [Example]
        - Irregular Expansion still occurs [Example]
        - Tainted Batches: Devices running on 3.3v seem to be getting hot. The concentrated heat source is causing magnets to lose the field. Or degradation of lifespan.
    - **6th Revision:** Dec2025-Jan2026:
    - **7th Revision:** Feb-Apr2026: Sporadic behavior can occur as the sensor heats up.
        - Loss of Magnetic field lower output
        - Now spread across 1.8v and 3.3v devices. On JS13, FKJ10 v2550+, DS13
        -

- **Video Overviews:**
    - **1st-2nd Revision:**
        - K-Silver JS13 TMR Review by MPE - Youtube
    - **3rd Revision:**
        - TMR solutions, replace Potentiometers? by Eythavon - [bilibili] [CHN]
        - More on the K-Silver TMR Joystick by MPE - [Youtube]
        - In-Def Assessment by monuru - [Youtube] [JPN]
        - K-Silver JS13 module, ehh… from Vizr [youtube]
    - **4th Revision:**
        - Exploring Variants: Pro, Pro+, and Future by MPE [YouTube]
    - **5th Revision:**
        - Quick Assessment by Vizr [Imgur]
    - **6th Revision:**
    -
- Gallery

Note: For Elite 2 setups (try the older jh13 adjustable module + Hallpi sensors] this method by TryhardCustoms

- Protruding Text: 1st-3rd revision batches
- Indented Text: 4th-6th revision batches

Tip: JS13 sensor assemblies can have minor separation between the PCB and plastic. Around 0.1-0.2mm even though there's an elephant foot trying to hold them back. Knowing this when soldering. Position the

unit into the motherboard. Then solder the sensor headers first. Then the 4 ground headers. People's first instinct is to push down while soldering. Causing plastics to warp.

---

zZesum: AngleTMR+

1. Initial **[41.25] [⭐3.44]**

- Fast Input Response, steady signal, Close curve, 94.5%, 5-7% circularity avg
  - ☐ Sensor: Teal_XQA°3D
  - ☐ Alt.Model: *to K-Silver*

2. Revised **[44.95] [⭐3.75]**

- Fast Input Response, Consistent signal, Close curve, 95.6% overall avg, 5-7% circularity avg
- Sensor: Teal_ZOH°3D
  - ☐ Alt.Model: *to K-Silver*
- *Variants*:
  - Module:RJ13 alternative, some Friction and improve mobility yet Firm
    - Tension: 65+20gF Tension increases on tilt
    - Housing: Housing: uses a Non Ferrous Metal alloy, fixed magnet
    - fixed magnet, no-contact sensor assembly
    - Mix mechanism: Ball & socket + platform [S]
    - Notable Recentering ±2% (0.01), Wider Lateral supports ≥1.2mm,
    - Total Height: 19.4mm
- *Improvements:*
  - more stable than JS13-pro
- Issues: loud
- Video Assessment from MPE - [YouTube]
- Gallery

Note: PS5 polarity is the only one currently available. But you can mount Xbox JS13pro sensors on this alternative module. Or isolate the metal contact with a silicon sleeve and lead a wire for the correct pins. Flipping the magnet may be required.

Jinfu/GINFULL: TAS-AngleTMR+

1. (beta) Test-kit Batch **[41.00] [⭐3.42]**

- Fast Input Response, Consistent signal, Close curve 95% overall avg, 6% circularity avg
  - ☐ Peach_36Y°AK
  - ☐ Model: DS*13-Max*

2. **OEM** Release **[47.00] [⭐3.92]**

- Fast Input Response, Signal Stabilised, Very-close curve 96.2% overall avg, 6-7% circularity avg [e.g]
    - [ ] Peach & Sky Blue 36Y°AK
    - [ ] Model: DS*13-Max-802a*

3. **1st** Revision **[43.00] [⭐3.58] Oct-Dec2025**

- Fast Input Response, Signal Steady, Very-close curve 96.1% overall avg, 5-6% circularity avg [e.g]
    - [ ] Peach & Sky Blue 36Y°AK
    - [ ] Model: DS*13-Max-802a*

4. **2nd** Revision **[00.00] [⭐0.00] FEB-MAR2026**

- Fast Input Response, Consistent signal, Close curve, 95.8% overall avg, 6-8% circularity avg [e.g]
    - [ ] Peach_ZAH°3D & Sky Blue_ZEH°3D
    - [ ] Model: DS*13-Max-803a*
- *Variants*:
    - Module: DS13-XP, Firm initial Resistance/Lower Resistance yet smooth mobility [C]
        - Max Degree/Tilt: 30°
        - Tension: 80gF tension (Grey-platform)
        - Housing: same dimension for 4points of contact
        - Shaft: fixed magnet, no-contact sensor assembly
        - Mechanism: Platform, Exceptional recentering ±1% (0.01), Wider Lateral Support ≥1.8mm,
        - Metal Housing aligns clicker
        - Total: L21.60mm x W17.40mm
        - Total Height: 19.35mm
    - Module: DS13-PX, Stiff initial Resistance, yet smooth mobility [C]
        - Max Degree/Tilt: 30°
        - Tension: 100gF tension (Grey-platform)
        - Housing: same dimension for 4points of contact
        - Shaft: fixed magnet, no-contact sensor assembly
        - Mechanism: Platform, Exceptional recentering ±1% (0.005), Wider Lateral Support ≥1.8mm,
        - Metal Housing aligns clicker
        - Total: L21.60mm x W17.40mm
        - Total Height: 19.5mm
- ***Changes***:
    - **Change Sensor Class:** Now sports the same Chip-Manufacturer sensor as K-Silver, FavorUnion, Zesum for the ***AngleTMR+*** solution.
- *Improvements*:
    - Improved QC
    - Optimised Tuning for signal stability and response

    - Reduced size of magnet
- **Issues**:
    - **OEM Revision** - Sep2025:
        - Tainted Batches: Devices running on 3.3v seem to be getting hot. The concentrated heat source is causing magnets to lose the field. Or degradation of lifespan.
    - **1st Revision:** Oct-Dec2025:
    - **2nd Revision:** Feb-Apr2026: Sporadic behavior can occur as the sensor heats up.
        - Loss of Magnetic field lower output
        - Now spread across 1.8v and 3.3v devices. On JS13, FKJ10 v2550+, DS13
        - Oct-Dec2025: Tainted Batches: Devices running on 3.3v seem to be getting hot. The concentrated heat source is causing magnets to lose the field. Or degradation of lifespan.
        - Feb-Apr2026: Sporadic behavior can occur as the sensor heat up.
        - Loss of Magnetic field lower output
        - Now spread across 1.8v and 3.3v devices. On JS13, FKJ10 v2550+, DS13

Note: (AliExpress & Taobao resellers are calling this the DS13-Max based on Ginfulls catalog or giving them an odd label.)

- Begun distribution (OCT 14-20, 2025) [AliExpress] [1pc] or [2pc] NH [2pc] [10/30pcs]
    - Fixed Magnet, End-Pole Configuration: Instead of rotating the magnet, Ginfull centers it and places the poles at the ends - ideal for angle-based TMR sensor solutions.
    - Why This Matters?: These sensors are highly sensitive to angular changes, so a stable magnetic field with clear pole separation improves its resolution.
    - This setup can likely enhance diagonal accuracy and reduce signal noise from off-axis movement.
    - Potential Perks:
        - Could mean improved linearity than Off-Axis counterparts with higher fidelity inputs for competitive gaming
        - Better compatibility with custom firmware or remapping tools.
    - Potential Issues:
        - Current test kits make use of the older module. Without the full metal housing. Human error while assembling could lead to shifting components which will ruin the performance drastically as seen on the JS13-pro.
- Video Example from PlaySpace [bilibili]
- Video Example from Eythovon [bilibili]
- Gallery

F *Puyao/Favor Union: AngleTMR*

1. [M] - 2536-2541 Batch **[36.45]** [⭐**3.04**] [alibaba - 10pcs]

- Fast Input Response, Consistent signal, Close curve 94.3% overall avg, 3-4% Circularity avg
    - [ ] Sensor: Green_???°3D & Yellow_???°3D (light grey Base @80gF module)
    - [ ] Model: *FJHK10K-0036a_to_0041a*

2. [M] - 2546-2548 Batch **[42.00] [⭐3.50]** [alibaba - 10pcs] wait for aliexpress resellers

- Fast Input Response, Consistent signal, Close curve 95% overall avg, 6-7% Circularity avg
    - [ ] Sensor: Green_ZEH°3D & Yellow_ZEF°3D (light grey Base @80gF module) [Gallery]
    - [ ] Model: *FJHK10K-0046a_to_0048a*

3. Alt. Modiflow [M] v2 -2546+ Batch **[42.40] [⭐3.53]**

- Fast Input Response, Consistent signal, Close curve 95.6% overall avg, 7-8% Circularity avg
    - [ ] *Alt.Model:* Modiflow - 2536 Batch
    - [ ] Model: *FJHK10K-0046a+*
- *Variants*:
    - Module: FJHK10K-S, Lower Friction and improve mobility, Firm initial Resistance/ [C]
        - Tension: 80gF tension (light grey base)
        - Housing: same dimension for 4points of contact
        - fixed magnet, no-contact sensor assembly
        - Notable Recentering ±2% (0.01), Wider Lateral supports ≥1.2mm, Wider tach switch clicker
        - Total Height: 19.5mm
    - Module: FJHK-10K-S, Less friction and improve mobility, Stiff initial Resistance/ [C]
        - Tension: 100gF tension (Black base)
        - Housing: same dimension for 4points of contact
        - fixed magnet, no-contact sensor assembly
        - Notable Recentering ±2% (0.01), Wider Lateral supports ≥1.2mm, Wider tach switch clicker
        - Total Height: 19.5mm
- *Improvements*: (after 20 years, adjustment are finally being made)
    - Improved QC with alignment
    - Significant mold adjustments
    - Wider Lateral supports ≥1.2mm
    - Changed compression springs:. The wipers' smaller diameter and less pronounced protrusion may allow for micro-adjustments.
    - Magnet assembly centered/fixed to the module
    - TAS Angle Solution
    - 2546 - Nov2025: Improve QC for Stability of module
- **Issues**: To be Determined
- Gallery

⚙️?? Sensors Set for Release:

*🅰 *AKNES:*

* 🅺 *K-Silver*:

1. **JS13:** 6th Revision **[00.00] [⭐0.00] DEC-JAN2026**

- Fast Input Response, Consistent signal, Close curve, 95.4% overall avg, 6-8% circularity avg
  - ☐ Sensor: Blue ZDH°3D, ZFA°3D [Example]
  - ☐ Model: JS13-006-SH3B174A4-KS Pro+ [Video Example]

2. 7th Revision **[00.00] [⭐0.00] FEB-MAR2026**

- Fast Input Response, Consistent signal, Close curve, 95.8% overall avg, 6-8% circularity avg [e.g]
  - ☐ Sensor: Blue ZQE°3D, ZRA°3D [Example]
  - ☐ Model: JS13-006-SH3B174A4-KS Pro+ [Video Example]

3. ***JT13*:** OEM Release **[00.00] [⭐0.00]** (yet to test)

- |–| Input Response, |–| signal, |–| curve, |–|% overall avg, |–|% circularity avg
  - ☐ Sensor: *1st* Blue ZFA°3D, ZFB°3D (Red Gamesir OEM) [Example] **Jan2026**
  - ☐ Sensor: 2nd Blue ZQE°3D, ZQF°3D (Red Gamesir OEM) **FEB-MAR2026**
  - ☐ Sensor: 3rd Blue ZRA°3D, ZRB°3D **MAR-APR2026**
  - ☐ Data sheet: [.pdf]
- Module: JS13-006 or JT13-009, Lower Friction and improve moderate mobility [B],
  - ☐ Max Degree/Tilt: JS13_26° | JT13_30°
  - ☐ Normal Operation/Tilt: 23°
  - ☐ Tension: Fixed 65±5g or adjustable for 55±25g
  - ☐ Housing: Non Ferrous Metal alloy - Iron-Nickle
  - ☐ Shaft: Fixed magnet on-axis, no-contact sensor assembly
  - ☐ Mechanism: Plunger, Great recentering ±5% (0.025_JS13) | (±3_0.015_JT13), Thin Lateral Support Guides ≥0.75mm
  - ☐ Total Height: 19.8mm or 24.25mm
- ***Mechanical Changes*:**
  - **a.** Tension: adjustable tension mechanism with a target range of 30-80gF±20.gF.cm
  - b. Thumbcap: Rotates 2 full turns clock wise and counter
- ***Improvements*:**
  - ☐ **Initial Version:**
- **Issues:**
  - ☐ Fork/Guide: The lateral guides seem to sport the same dimensions. At a glance they look to be 0.75mm thick.
  - ☐ Axles: shaft still have the same tolerance issues as before. Causing it to wobble.
- ***Demonstration:***
  - ☐ K-SILVER's Official Store [bilibili]

Note: video from a K-Silver official source, uploaded 5months ago. So adjustments could have been made.

The way it works is 2 full rotations clockwise and counter. There is no need to remove the caps like other solutions in the past. Time will tell how it holds up when users are rotating, pushing and pulling at odd angles. If it will suddenly increase and lower the tension on the person.

* Ginfull:

1. ***AngleTMR+*: 2nd** Revision **[00.00] [⭐0.00] FEB-MAR2026**

- Fast Input Response, Consistent signal, Close curve, 95.8% overall avg, 6-8% circularity avg [e.g]
  - ☐ Peach_ZAH°3D & Sky Blue_ZEH°3D
  - ☐ Model: DS*13-Max-803a*
- ***Major Changes*:**
  - ☐ **Change Sensor Class:** Now sports the same Chip-Manufacturer sensor as K-Silver, FavorUnion, Zesum for the ***AngleTMR+*** solution.
- **Issues**:
  - ☐ Besides NOV-DEC2025, Batches of sensors are getting hot. The concentrated heat source is causing magnets to lose the field. These newer from JAN-APR2026 batches although not wide spread can experience this.

2. ***OFF-Axis LinearTMR:*** LT5M/RT5M → 7TH Revision **[00.00] [⭐0.00] FEB2026**

- |–| Input Response, |–| signal, |–| curve, |–|% overall avg, |–|% circularity avg [e.g]
  - ☐ Peach_XXX°BF
  - ☐ Model: RJ13-PX

⛔ **Disclaimer:** Categorised Input Response; when compared to much slower older generation Hall Effect Sensors. Latest TMR encoders are getting close to standard Potentiometers given their longevity. They are a fantastic alternative.

Categorised/Rating Based; for overall module performance and behavior.

*PS5 Fine-tune OPTION and EDGE response curve adjustment can help mitigate most issues with range and input response for each sensor variant.

⚫ Potentiometers:

Note: Users that still prefer potentiometers (although short lifespan) for their reliable inputs. Or unwilling to adjust to experimental sensors.

ALPS ALPINE: 10k ohm

1. RKJ13-XV series - Blue: Circularity 8% avg (Higher quality)
2. RKJ13-XV series - Green: Circularity 10-12% avg (avg quality)
3. Older RJ13 Adjustable tension - Black: Circularity 10% avg

- Gallery

Jinfu/Ginfull:

1. RJ13a1p - Green: 2.3k ohm (60° 2f): Circularity 9% avg [aliebaba]
2. RJ13a1p - Black: 2.3k ohm (60° 4E) (longer lasting carbon)

- Gallery

3. RJ13a1k: 2.3k ohm (60° 2d)

- Gallery

Poly/FavorUnion, C&K, Falcon:

1. FJR10K - Yellow: 2.3k ohm (50° or 60°): Circularity 6% avg

- Gallery

Fanrui:

1. TJ13KS-01 - Black 2.3k±1% ohm (50°) [Aliebaba] (stable, like the ginfull)

Kailh:

1. CPJ13 - Teal - 2.3k±2% ohm (50°) [AliExpress]

- [Gallery - Placeholder]

💬 Community Help & Support

[Document will be Updated often as new information becomes available]

Connect with modders, testers, and volunteer support:

- AKNES Discord
- AliExpress Hall Effect

🧰 Installation Guides

[If on mobile Select the expand Arrows]

🧰 Installation Guides:

- **Disassembly:** How to by iFixit [PS5] or [Edge]
  - ifixit: PlayStation Controller Repair Help: Learn How to Fix It Yourself.
  -
- **Soldering/Desoldering:** [Video Link Placeholder]
  - Quality of soldering job will determine usability
  - Ultimate Microsoldering tool Guide by nanofix
  - Soldering Crash Coarse by wermy
  - Desoldering Made Easy by Mr Solderfix
  - Try this before by StuckatPrototype
  - Desoldering tool by Greg's Gaming, etsy
  - Desoldering technique by Budd's
  - Desoldering & Installation by SOSS Gaming
  - Desoldering & Installation Methods by DJbaro
  - [Link Placeholder]

🪛 *Entry Level Tools: [Amazon & AlieExpress shops]*

- [ ] $11-20 80watt@110v kit
- [ ] $4 | MG-Chemicals #426 copper solder wick
- [ ] $8 Metal pump with silicon tips
- [ ] $5 | MECHANIC TY-V866: Leaded Solder (tin [Sn] 63%, lead [Pb] 37%, 1-3% flux)
- [ ] $8 Essmetuin or $3 2pcs NC-559-ASM no clean flux
- [ ] $10 | 30pcs Precision Screwdriver kit
- [ ] $14 Adjustable PCB holder
- [ ] $6 Copper wire or 6pcs Brass wire cleaner
- [ ] $7 YuiHF Tip tinner
- [ ] Multimeter - $8 Venlab, $9 LPXHHU, $40 FNIRSI DMT-99, $60 DST-210

Note: Advised to set your Soldering Iron to 350°c, working no longer than 3 seconds per joint for your new TMR sensors. Make sure to center and align the module with the motherboard's white label [example - place holder]. Flat on the board. And position the sensors evenly to avoid Calibration error such as undershoot or over extension. Variations between rotation. Counter or clockwise.

Peripheral Schematics and Board Views:

- ***Sony Playstation**: PS5*_**BDM-010** to **BDM-040** [schematic]

- ***Sony Playstation**: PS5-Edge* [Placeholder - Link]

~~**Tweak and QOL adjustments:** [PLACEHOLDER]~~
- ~~*3d files .stl/.step:*~~
  - ~~**Bumpers:**~~
  - ~~**Trigger stops:**~~
  - ~~**Triggers:** tach or mouse switch~~
  - ~~**Back Button Mount:** paddle mechanism, hinge mechanism, simple switch.~~

PC Emulation Remap Apps: [Downloads]

PS5 QA Inspection & test tool:
- Reference: **UberMicroRepairs** [YouTube]
- Mirrior: [GDrive - Download] , [gifile.io - Download]
- Hard Drive flash Tool: [official link - Download]

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Compression Springs Dimensions

[If on mobile Select the expand Arrows]

🌀 Module Compression Springs and levels of Tension:

Platform Mechanism:

- **Favor Union, Modiflow, C&k, Falcon FJHK10K Modules:**
  - Standard:
    - Canonical (obtuse warpage) 0.4xSOD4xLOD8.5x 8mm@2.1mm pitch → 90gF
  - Lower or Increased: use dimensions from Ginfull
  - [New Module] **FJHK10K-0036_46A:**
  - Standard: On paper_80±5gF
    - 0.5x8.5x5.5mm @1.4mm pitch
    - Initial: 70+10g
    - Axial: 65gF
    - Compression Force: 240±10g+tachswitch = 460g material: Stainless 305 or 316

- **Ginfull RJ13a1p Modules:** [General Specs]
  - v1 → SOLD with white label (HE) revisions.
  - v2 → SOLD with black/red label (HE) v2-v4 revisions. Some resellers have included them with the TMR sensor batches.
  - v1+ → SOLD with custom order TMR batches.
  - RJ13-PX: SOLD with TMR 5th batch_LT5H
  - DS13-Max: SOLD with ANGLE TMR

Note: the White platform will produce less tension than the new grey platform. From a minor change in dimensions.

- **Compression Springs**:
  - Feather: 0.4x8.6x5 or 10mm → 30gF
  - Light: 0.5x8.6x5mm → 40gF
  - Lower: 0.5x8.6x7mm → 50gF (with sensitive micro-adjustment)
  - Standard: 0.5×8.6×10mm - base, platform, metal composition changes rigidity
    - **60gF module**: Initial 60+10g, axial 45gF; cF 200±10g+tachswitch = 400g material: Stainless 305
    - **80gF module**: Initial 80+10g, axial 65gF; cF 240±10g+tachswitch = 460g material: Stainless 305 or 316
    - **100gf module**: Initial 100+20g, axial 85gF; cF 360±10g+tachswitch = 520g material: Stainless 305 or 316

- Increased: 0.6×8.5×5mm → 100gF (use v1+ modules, micro-adjustments possible)
- Extreme: 0.6x8.5x5-8mm → 160-180gF+ (use v1+ modules, may not perform well)
- JUST WHY: wire 0.7-0.8mm x OD8.6mm x L5-10mm → 200-400gF
- [Download .stl file - placeholder] (needs internal support, again why)

Plunger Mechanism:

- **Gulikit NS51, NS55 Hallpi RJ13-ak Modules:**
- **Compression Springs**:
  - [ ] Source JH16:
  - Air: Use JH16 wiper
    - Spring: ≥0.45x4.25x5mm_4 coils@1.25mm Pitch (ID3.3mm) → 25gF
    - On-paper 35±5gF
      - ≥0.45x3.8x5.8mm_5 coils@1.15mm pitch (ID2.8mm)
      - Initial: 40*g* (avg)
      - Axial: 40+40*gF*
      - *cF* of 260±10*g*+tachswitch = 420g
  - Feather: ≥0.45x4.25x5mm_4 coils@1.25mm Pitch (ID3.3mm) → 40gF
    - On-paper 35±5gF
      - ≥0.45x3.8x5.8mm_5 coils@1.15mm pitch (ID2.8mm)
      - Initial: 40*g* (avg)
      - Axial: 40+40*gF*
      - *cF* of 280±10*g*+tachswitch = 440g
      -
  - [ ] Spring Source JS16:
  - Light Initial; Increased axial force : 0.5x4.3x5.25mm_4 coils@1.3mm pitch (ID3.2mm)
  -
  - Less: ≥0.45x4.5x6mm → 50-65gF
  - Lower: 0.5x4.7x6.5mm → 75gF
  - Standard: On paper_85±5gF
    - 0.5x4.65x7.1mm_4 coils@1.8mm Pitch (ID3.6mm)
    - Initial: 80g (avg)
    - Axial: 85+40gF
    - cF of 520±20g+tachswitch (160±20) = 720g
  - Increased: 0.5x4.7x8mm → 120gF
  - Extreme: 0.6x4.7x8mm → 180gF+
  - [ ] Source NS55 720° adjustable:
  - Standard: On-paper 75±30gF
    - ≥0.45x3.8x5.8mm_5 coils@1.15mm pitch (ID2.8mm)

        - Initial: 65*g* (avg)
        - Axial: 60+40*gF*
        - *cF* of 440±20*g*+tachswitch = 680g
        - Screw center: 60±10*g*, 0.25 Turn ±5*g*, 0.5 Turn ±10*g*
            - Lower Counter: -1*T*_35*gF*
            - Increased Clockwise: +1*T*_80*gF*, +2*T*_95*gF*, +2.25*T*_125+10*gF*
            - *T* + Turn, *cF* = Compression force, *gF* = grams of Force, *g* = Grams

- **ALPS Alpine RJ13, K-Silver JH13 (JS) Modules:**
- **Compression Springs**: (Certain Modules allow for adjustments)
- [Older Module] ALPS RJ13-XIII:
    - Light: ≥0.4x3.8x5mm _4 coils@1.4mm Pitch → 30-40gF
    - Lower: ≥0.45x3.8x5mm_5 coils@1.05mm Pitch
        - Initial 50+5g, axial 60+35gF; cF of 400±20g+tachswitch = 600g
    - Standard: On paper_65±5gF
        - 0.44x3.8x5.25mm_5 coils@1.4mm Pitch (ID2.9mm)
        - Initial: 60g (avg)
        - Axial: 65+40gF
        - cF of 500±20g+tachswitch = 700g
    - Standard: ≥0.44x3.8x5.25mm → 75±30gF (adjustable)
    - Increased: ≥0.44x3.8x6mm → 85+10gF
    - Extended: [D] [L] PC021-148-6000-SST-0250-CG → 70gF-160gF
    - Extreme: [D] PC021-148-6000-MW-0270-C-IN-N → 120gF-210gF
    -
- [Older Module] K-Silver JH13:
    - Standard: ≥0.44x3.8x6mm → 50+10gF (internal dimension difference)
    - Standard: ≥0.44x3.8x6mm → 80±25gF (adjustable)
    -
- [New Module] ALPS RKJ13-XVS: [Blue & Green]
    - ☐ Source JH16:
    - Light: ≥0.45x4.25x5mm_4 coils@1.25mm Pitch (ID3.3mm) → 30-40gF
    - ☐ Source JS16:
    - Less Initial; Increased axial force : 0.5x4.3x5.25mm_4 coils@1.3mm pitch (ID3.2mm)
    -
    - Lower: ≥0.45x4.5x6mm → 50+15gF
    - Standard: On paper_75±5gF
        - 0.5x4.7x6.5mm_4 coils@1.6mm Pitch (ID3.6mm)

        - Initial: 70g (avg)
        - Axial: 75+40gF
        - compression force of 480±20g+tachswitch = 680g
    - Increased: 0.5x4.65x7.1mm → 85±5gF
- [New Module] K-Silver JS13-pro:
    - Standard: On paper_65±5gF
        - ≥0.45x4.55x6mm_4 coils@1.5mm Pitch (ID3.6mm)
        - Initial: 60g (avg)
        - Axial: 65+40gF
        - cF of 500±20g+tachswitch = 700g
    - Increased: 0.5x4.7x6.5mm → 65+15gF
    - Extended: 0.5x4.65x7.1mm → 90gF
- Gallery:

Note: Value for axial and rotational force; for movement of the shaft. Actuating the LS3/RS3 action can be 1.5-2.5 times + the tachswitch rating. (Example: From 55+20gF.cm x 2.1 = Travel distance 0.1-0.5mm + 160±10 + 200gF = Total Operating Force) cF = compression force

Changing between spring length could lower or increase initial input force required. As well as the compression force required to click the tach-switch. Picking between wire sizes will change the overall axial force required to perform rotations. Choosing between #302, 304 A4, #305, #310, #316. #631 17-7 ph_Stainless Steel will create a loose or more stiff metal. But also determine how well it can resist temp, wear/fatigue, or combat environmental factors.

🎚️ What am I using?

LS: Ginfull module + Hallpi v6 (beta) sensors **@40gF - 21.8% + 2mm outer-deadzone (early max out)**

RS: Hallpi Module + Hallpi v6 (beta) sensors **@65gF - 10%**

Reason for this joystick:

- Some describe it as “Floaty” & “light”, ultra-smooth feel due to low friction
- Even distribution of pressure while performing rotations
- Near-perfect mechanical recenters (0.00499 or below = mechanical 0%) while combined with 0% inner-deadzone filters
- Long-lasting and mod-friendly - closest to drift-free perfection this form factor has to offer
- Module Allows the use of alternative sensor assemblies
- Certain Sensor models can be used on modules of choice.

Not-a-Recommendation: Just my own use case. *After weigh-in on the pros & cons. Sensor Stability, predictable and overall module performance & lifespan.*

🌀 Deep Dive: Tension Adjustments

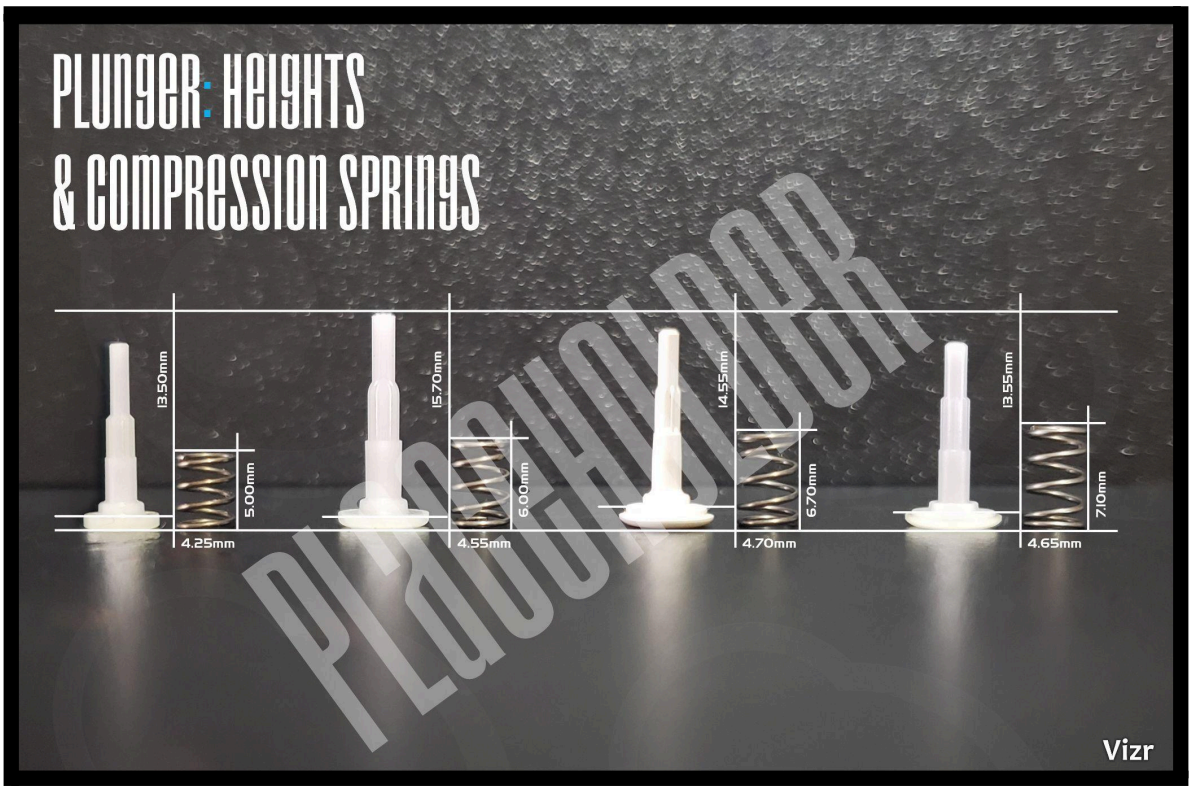
Deep Dive: Module Tension Adjustments

01

Parts:

Housing	Fork	Shaft/Axle	Plunger	Base	Spring
ALPS RKJ13	0.6mm	Red/Moderate	H 14.55mm	Blue (RKJ13)	0.5x4.7x6.5mm
ALPS RJ13_old	0.6mm	N/A	N/A	Grey (RJ13)	N/A
Hallpi RKJ13	0.8mm	Blue/Stable	H 13.55mm	White (RJ13ak)	≤0.5x4.65x7.1mm
K-Silver JS13	0.7mm (JS13)	N/A	H 15.70mm (N/A)	White (JS13)	≥0.45x4.55x6mm
K-Silver JH13_old	0.6mm (JH13)	N/A	N/A	White (JH13)	N/A
K-Silver JH16	N/A	N/A	H 13.5	N/A	≥0.45x4.25x5mm


MODULES: PARTS
PLACEHOLDER
Vizr


PLUNGER: HEIGHTS
& COMPRESSION SPRINGS
13.50mm
5.00mm
4.25mm
15.70mm
6.00mm
4.55mm
14.55mm
6.70mm
4.70mm
13.55mm
7.10mm
4.65mm
PLACEHOLDER
Vizr

Adjustment & Variations:

- **Hallpi RJ13-ak Modules:**
- **Compression Springs**:
  - Air:
    - Spring: ≥0.45x4.25x5mm_4 coils@1.25mm Pitch (ID3.3mm) → 25gF
    - On-paper 25±5gF
      - Initial: 25*g* (avg)
      - Tilt: 25+20*gF*
      - Axial*:* 25+10*gF*
      - *cF* of 260±10*g*+tachswitch = 420g
    - Recenter Rating: ±9% (0.045)
  - Feather:
    - Spring: ≥0.45x4.25x5mm_4 coils@1.25mm Pitch (ID3.3mm) → 35gF
    - On-paper 35±5gF
      - Initial: 35*g* (avg)
      - Tilt: 40+20*gF*
      - *Axial: 35+10gF*
      - *cF* of 280±10*g*+tachswitch = 440g
    - Recenter Rating: ±7% (0.035)
  - Ultra-Light:
    - ≥0.45x4.55x6mm_4 coils@1.5mm Pitch (ID3.6mm) → 40gF
      - On-paper 40±5gF
      - Initial: 40*g* (avg)
      - Tilt: 45+20*gF*
      - *Axial: 40+20gF*
      - *cF* of 340±10*g*+tachswitch = 480g
    - Recenter Rating: ±6% (0.03)
  - Med-Less:
    - Spring: ≥0.45x4.5x6mm → 65gF
      - On-paper 65±5gF
      - Initial: 60*g* (avg)
      - Tilt: 65+20*gF*
      - *Axial: 60+20gF*
      - *cF* of 340±10*g*+tachswitch = 480g
    - Recenter Rating: ±5% (0.025)

- Lower:
  - Spring: 0.5x4.7x6.5mm_4 coils@1.6mm Pitch (ID3.6mm) → 75gF
    - On-paper 75±5gF
    - Initial: 70*g* (avg)
    - Tilt: 75+30*gF*
    - *Axial: 70+20gF*
    - *cF* of 380±10*g*+tachswitch = 520g
  - Recenter Rating: ±5% (0.025)
- Standard:
  - Spring: 0.5x4.65x7.1mm_4 coils@1.8mm Pitch (ID3.6mm) → 85gF
    - On paper_85±5gF
    - Initial: 80g (avg)
    - Tilt: 85+30gF
    - Axial: 80+20gF
    - cF of 520±20g+tachswitch (160±20) = 720g
  - Recenter Rating: ±4% (0.02)
- Increased: 0.5x4.7x8mm → 120gF
- Extreme: 0.6x4.7x8mm → 180gF+

03

Behavior:

Initial: 0-2° usually -5g from the on-paper rating

Tilt: 0-30° usually add +10-40g from the on-paper rating depending on the combination.

Axial: upon rotation° usually add +10-20g from the on-paper rating depending on combination.

Compression Force: increases or degrees; depending on wire diameter, pitch, and spring length.

04

Adjustment & Combinations:

- Air: 25±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✕	✕	✔	✕
Spring	✕	✕	✕	✔

- Alps plunger + JH16 spring + Hallpi base = 25+30g
- Hallpi plunger + JS13 spring + ALPS base = 20g+20g
- ALPS plunger + JS13 spring + ALPS base = 25g+20g
-

- Feather: 35±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✔	✕	✕	✕
Spring	✕	✔	✕	✕

Note: For 35±5gF with no added tension while a tilt is applied use, Hallpi plunger + ALPS spring + Hallpi base

- Hallpi plunger + JS13 spring + ALPS base = 35g+5g
- Hallpi plunger + JS13 spring + Hallpi base = 35g+20g
-

- Ultra-Light: 40±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✕	✕	✔	✕
Spring	✕	✔	✕	✕

Note: For 45±5gF with no added tension while a tilt is applied use, Hallpi plunger + ALPS base
For a slightly more firm rotation use ALPS plunger + Hallpi base + js13 spring.

- Hallpi plunger + JS13 spring + Hallpi base = 40g+15g
- JS13 plunger + JS13 spring + ALPS base = 45g+10g
- ALPS plunger + JS13 spring + Hallpi base = 40g+20g
- Hallpi plunger + JS13 spring + JS13 base = 45g+20g

- Light: 50±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✔	✕	✕	✕
Spring	✕	✔	✕	✕

Note: For 55±5gF with no added tension while a tilt is applied use, ALPS plunger + ALPS base

- JS13 plunger + JS13 spring + Hallpi base = 45g+20g
- Hallpi plunger + ALPS spring + Hallpi base = 50g+20g

- ALPS plunger + ALPS spring + Hallpi base = 50g+30g
- ALPS plunger + JS13 spring + JS13 base = 50g+25g

- Med-Less: 65±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✕	✔	✕	✕
Spring	✕	✔	✕	✕

Note: For 65±5gF with no added tension while a tilt is applied use, Hallpi plunger + ALPS base

- ALPS plunger + ALPS spring + ALPS base = 65g+10g
- ALPS plunger + ALPS spring + Hallpi base = 65g+15g
- JS13 plunger + JS13 spring + JS13 base = 65g+20g
-

- Med/Lower: 75±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✔	✕	✕	✕
Base	✔	✕	✕	✕
Spring	✕	✕	✔	✕

Note: For 75±5gF with no added tension while a tilt is applied use, ALPS plunger + ALPS base

- ALPS plunger + ALPS spring + ALPS base = 65g+10g
- ALPS plunger + Hallpi spring + ALPS base = 75g+5g
- Hallpi plunger + Hallpi spring + ALPS base = 75g+10g
- JH16 plunger + ALPS spring + Hallpi base = 70g+20g
- ALPS plunger + ALPS spring + JS13 base = 75g+30g

- Standard: 85±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✕	✔	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✕	✕	✔	✕
Base	✕	✕	✔	✕
Spring	✕	✕	✔	✕

Note: For 85±5gF with no added tension while a tilt is applied use, ALPS plunger + Hallpi spring + ALPS base

- ALPS plunger + Hallpi spring + ALPS base = 80g
- ALPS plunger + Hallpi spring + Hallpi base = 85g+10g
- Hallpi plunger + Hallpi spring + Hallpi base = 85g+20g
- Hallpi plunger + Hallpi spring + JS13 base = 85g+30g
-

- Increased/Firm: 95±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	K-SILVER JH16
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕

Plunger	✕	✕	✔	✕
Base	✕	✔	✕	✕
Spring	✕	✕	✔	✕

Note: For 85±5gF with no added tension while a tilt is applied use, ALPS plunger + Hallpi spring + ALPS base

- Hallpi plunger + Hallpi spring + JS13 base = 95g+20g

- High/Stiff: 120±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	Custom
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✕	✕	✔	✕
Base	✕	✔	✕	✕
Spring	✕	✕	✕	✔0.5x4.7x8mm

- Extreme: 140±5gF

Parts Used	ALPS RKJ13-XV	K-Silver JS13	Hallpi RKJ13-ak	Custom
Housing	✕	✔	✕	✕
Fork	✕	✕	✔	✕
Shaft/Axle	✕	✕	✔	✕
Plunger	✕	✕	✔	✕

Base	✕	✔	✕	✕
Spring	✕	✕	✕	✔0.6x4.7x8mm