

FRONT SUSPENSION MEASUREMENT WORKSHEET

Double-wishbone (SLA) kinematics simulator • Car #4T • every blank maps to a field in the tool

1 Set your zero (datum)

All numbers are measured from one fixed origin so the geometry lines up. Pick the origin once and keep it for every point:

- **Origin** = a point on the ground, on the car's centerline, directly under the front-axle centerline.
- **x** = fore/aft distance from the front-axle centerline. **Forward is +**, rearward is **-**.
- **out** = sideways distance from the car centerline. Always entered as a **positive** number (the tool adds the side).
- **z** = height straight up from the ground.

Marking the datum on the floor

- Drop a plumb bob from each front hub center; the floor mark gives you the front-axle centerline. Snap a chalk line across both.
- Find the car centerline: equal measurements off a symmetric frame reference front and rear, or plumb the center of the rear-end housing and the front crossmember and snap a line down the middle.
- Where those two chalk lines cross is your origin. Tape a tape-measure down each line so you can read x and out straight off the floor.

Getting x / out / z for any point

- Hang a plumb bob from the point down to the floor and mark it.
- Read **x** = that mark's distance fore/aft of the axle line, and **out** = its distance from the centerline.
- Read **z** = vertical height from the floor up to the point.
- Measure to the **center of the pivot or ball**, not the edge of the bracket or housing.

Before you measure: car on a flat level floor, at race ride height, shocks/springs installed, tires aired to your numbers. Roll it forward a few feet and let it settle so nothing is bound up. Steering centered. Measure both sides — don't assume it's symmetric.

2 Tools

- Tape measure + a good steel ruler/scale
- Level (and/or digital camber gauge)
- Toe plates or a string box
- Notepad / phone camera to log as you go
- Plumb bob & chalk line
- Framing/machinist square
- Masking tape & marker to flag each point

3 Vehicle & tire numbers

Field	What / how	Value
Wheelbase	Front hub center to rear hub center (used for Ackermann %).	
Tire radius	Loaded radius: floor to hub center at ride height (½ of tire OD).	
Tire width	Section / tread width — visual only, not critical.	
Toe gauge dia	The fore-aft span between the two points you read toe across (tire OD if you measure front/back of the tires; rim dia if you measure on the wheel).	

4 Camber & toe

Static camber

Camber gauge against each front wheel at ride height. Top leaning in = negative. Enter per corner.

Static toe — your method (LF straight, set the RF)

- Set the **left front straight ahead** (parallel to the car centerline). That's your reference → enter **Left static toe = 0**.
- Measure the **right front** against that straight LF and put all the toe on the RF.
- In the tool, **toe-in is +** and **toe-out is -**. Running the RF toed out (the usual circle-track case) means a **negative** number, e.g. 1/8" out = -0.125.
- Make sure **Toe gauge dia** above matches where you took the reading, or the inch value won't agree with your tape.

	LEFT front	RIGHT front
Static camber (deg)		
Static toe (in) +in / -out	0 (reference)	

Heads up: a straight LF at static won't stay straight through travel — bump steer moves it as the car dives and rolls. The sim shows that; this sheet just captures your bench setting.

5 Right corner hardpoints

Twelve points, each in x / out / z. **out** is the distance from centerline (positive). Measure to the center of each pivot or ball joint.

Point	How to find it	x (in)	out (in)	z (in)
Lower arm – front pivot	Center of the FRONT inner pivot bolt of the lower control arm.			
Lower arm – rear pivot	Center of the REAR inner pivot bolt of the lower control arm.			
Lower ball joint	Center of the lower ball-joint stud (the pivot point, not the housing edge).			
Upper arm – front pivot	Center of the FRONT inner pivot / cross-shaft of the upper control arm.			
Upper arm – rear pivot	Center of the REAR inner pivot / cross-shaft of the upper control arm.			
Upper ball joint	Center of the upper ball-joint stud.			
Wheel center	Spindle centerline at the hub. out = half-track to the wheel mounting face; z = spindle height; x = 0 if on the axle line.			
Tie-rod outer (steering arm)	Center of the OUTER tie-rod end stud where it bolts to the steering arm / spindle.			
Spring – lower seat	Center of the lower spring perch / where the spring sits on the lower arm.			
Spring – upper seat	Center of the upper spring pocket in the frame / tower.			
Shock – lower mount	Center of the lower shock eye / mounting bolt.			
Shock – upper mount	Center of the upper shock mount bolt.			

*Symmetric front end? You can measure this corner, enter it, hit **Mirror R→L** in the tool, then spot-check the left. Asymmetric setup → measure the left for real on the next page.*

6 Left corner hardpoints

Same twelve points for the left side. Enter **out** as a positive distance from centerline — the tool handles the left-side sign for you.

Point	How to find it	x (in)	out (in)	z (in)
Lower arm – front pivot	Center of the FRONT inner pivot bolt of the lower control arm.			
Lower arm – rear pivot	Center of the REAR inner pivot bolt of the lower control arm.			
Lower ball joint	Center of the lower ball-joint stud (the pivot point, not the housing edge).			
Upper arm – front pivot	Center of the FRONT inner pivot / cross-shaft of the upper control arm.			
Upper arm – rear pivot	Center of the REAR inner pivot / cross-shaft of the upper control arm.			
Upper ball joint	Center of the upper ball-joint stud.			
Wheel center	Spindle centerline at the hub. out = half-track to the wheel mounting face; z = spindle height; x = 0 if on the axle line.			
Tie-rod outer (steering arm)	Center of the OUTER tie-rod end stud where it bolts to the steering arm / spindle.			
Spring – lower seat	Center of the lower spring perch / where the spring sits on the lower arm.			
Spring – upper seat	Center of the upper spring pocket in the frame / tower.			
Shock – lower mount	Center of the lower shock eye / mounting bolt.			
Shock – upper mount	Center of the upper shock mount bolt.			

7 Steering linkage

Pitman / center link / idler. These drive Ackermann and bump steer. Here **y is signed**: measure from the car centerline and write **+** for the right side of center, **-** for the left.

Point	How to find it	x (in)	y (in) +R/-L	z (in)
Pitman pivot (box output)	Steering-box output-shaft axis at the pitman arm (the point the pitman swings about).			
Pitman arm end (link L)	Center of the outer pitman ball where the center / drag link attaches.			
Idler pivot	Frame-side idler arm pivot axis.			
Idler arm end (link R)	Center of the idler ball where the center link attaches.			

Tie-rod length is set automatically from the outer tie-rod point (page 5/6) and the matching link end here — no separate measurement needed.

Transferring to the tool

Open **Hardpoints & setup** in the simulator and type each value into the matching field (every label on this sheet matches a field name). Then hit **Save setup file** to keep this baseline — name it for the car/track, e.g. 4T-baseline.json.