Front Wheel Alignment Kit for Can-Am Spyder.

The Alignment Kit consists of :

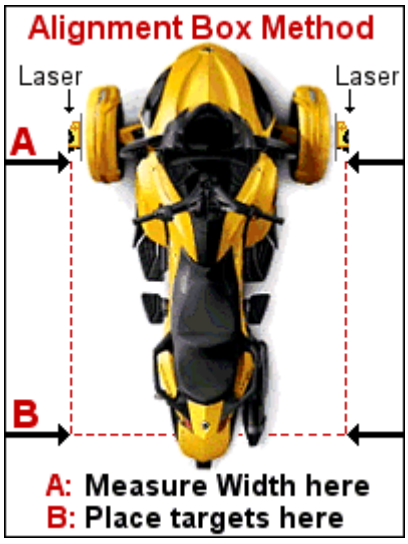
- 2 yellow Shinty LE007 magnetic-base Laser Levels (batteries included) NB: These levels are accurate but made of plastic. They may be knocked out of alignment if handled roughly or dropped. Please treat them with care;
- 1 18mm Crow-foot spanner suitable for a ½" socket-set extension arm, for 2013> models;
- 3 open-end spanners: 10mm, 16mm, 18mm sizes;
- 2 Laser Targets with graduations;
- 2 ratchet straps for immobilizing handlebar;
- 1 roll of masking tape;
- 1 set-square (with center-line marked);
- 2 complete Wheel Standoffs, no assembly required (photo →);
- Laminated instruction sheets;
- 1 card of spare AAA batteries.

Power the Lasers. The battery terminals for the two yellow lasers have been covered with masking tape to avoid corrosion damage. Slide down the battery cover at the front end and remove the tape so that the batteries touch the terminals. There is also a card of spare AAA batteries in the Kit.

Always be careful not to point a laser beam anywhere near eyes.

Tools that you need: A measuring tape and, if using the supplied 18mm crow-foot spanner for tie-rod lock-nuts on the left side of 2013> models, a ½" socket-set with an extension bar. Lastly, a trolley-jack or similar may be needed to lift front wheels off the floor to rotate them a little.

The Alignment Box Method:



Standoffs attach to the front wheels, and the yellow magnetic-base lasers adhere to these. You measure the laser beam-to-beam Width of the bike at the front wheels (←→), then use those measurements to place the laser Targets outboard of the rear rim of the back wheel (←wheel→), very close to 5 times the diameter of the front wheels away – forming a box. This ensures that left and right Targets are equidistant from the rear wheel, so the alignment of each front wheel can be accurately measured relative to the whole chassis, not just to the other front wheel.

Laser Accuracy:

With 3 legs, wheel standoffs rely on the TOP TWO legs to provide the exact longitudinal parallel plane relative to the brake disc and the whole bike chassis, and the bottom leg, although exactly the same length, merely supports those two top legs. On all Spyder models, it is necessary to place the standoff with the rear-most L-collared leg immediately adjacent to the brake calliper housing, so that the top edge of the triangular standoff plate is as close to **parallel to the floor** as possible.

1: Park the Spyder

...on a flat solid surface. You might prefer to park it with a sheet or two of newspaper under each tyre to allow them to squirm around easily, or you might not – pressing the tyre firmly sideways to adjust the exact direction of wheels is necessary at times. Using paper underneath makes that a little easier; not using it makes it less frequent but a little harder. It's really just your preference.

2: Apply the Parking Brake.

3: Attach the Wheel Standoffs.

Make sure that a gap between spokes exists on both front wheels for the rear-most top leg of the wheel standoff to clear the brake calliper housing. Use a trolley-jack or similar to briefly lift a wheel clear of the floor and rotate it if necessary.

With two legs with L-collars at the top, poke the legs of the standoff through the wheel spokes so that they attach to the brake disc. The rear-most L-collared leg should be immediately adjacent to the brake calliper housing so that the top edge of the standoff plate is as close to parallel to the floor as possible. The L-collars on the two top legs should sit on the rim of the brake disc to stop the standoff from sliding down, while the magnets hold the plate securely against the disc.

It doesn't matter if the standoff is not exactly central on the wheel, as long as the whole standoff is firmly attached with its legs sitting flat on the brake disc, and it COVERS the hub center, where you will attach the magnetic-base laser pointer.

4: Center the Steering

Align the handlebar roughly by eye first. Then lay a tape measure across the grab rails at their back 'corner' and halve the measurement. Stick a piece of masking tape on the seat and mark that half-way point (arrowed). The grab rails are bolted to the frame, but you will probably find that the seat is slightly off to one side, and NOT central.

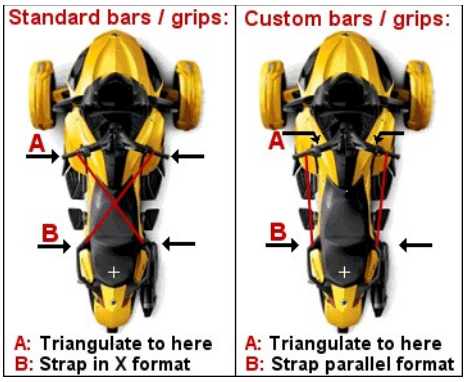
Now measure from that central point to the handlebar to get a triangulation. Handlebar risers or other custom bars mean that you can NOT rely on both bar ends being square to each other, so triangulate to the ends of the actual steering-head casting in that case. On any Spyder model this always has well-defined outside edges from which you can measure reliably. This makes sure that the steering-head is exactly square, no matter where the front wheels might be pointing prior to alignment.

If you have BUDS available, connect it now, just to reset the critical DPS sensor center while you have the steering-head exactly square. When incorrectly set, it causes uneven turn-signal cancellation and, when out by more than 5°, the Power Steering causes the bike to veer slightly left or right despite the steering and alignment being perfect. Most DIY owners don't have BUDS available, so this step is not essential – the wheel alignment will still be accurate without it – but do it if you can.

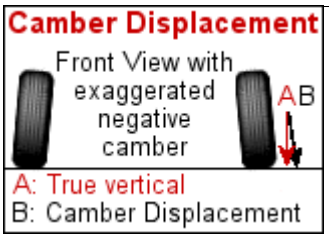
Now secure the handlebar with the ratchet-straps: Apply a ratchet-strap to each side, on or near the grips. **BUT...** because the straps tend to cross the path of the tape measure, it is hard to check the measurements and very easy to accidentally move the handlebar off-center while tightening the ratchet-straps to immobilize it.

(↓ more)

Simple Solution: for STANDARD bars (measuring to the hand-grip ends), attach the ratchet-straps in an X-shape – right grab-rail to left hand-grip and vice versa – so that you can check your triangulation measurements without the straps getting in the way. For CUSTOM bars (measuring to the steering-head casting ends) attach them in parallel form – right-to-right, left-to-left – to measure clear of the straps. Tighten the straps alternately, side after side, until they are both tight and the triangulation measurements on each side are still within 2 or 3mm of your original measurements. Such a tiny variation between left and right equates to less than one degree of steering deflection.



For 2013> Models. Strapping the handlebar will not completely stop the wheels moving, because of the sprung steering. Check for movement frequently.



• Important Precaution: Avoid camber displacement!
Laser levels on Spyder wheels are accurate **only when pointing parallel to the floor!** Wheel camber will cause inaccuracy in any other direction. If you point the laser down to the floor it WILL be pointing outward.

Force **true vertical** by using a set-square on the floor to measure width.

5a: Mark the Width on the floor.

Place the lasers, pointing rearward, as close as possible to hub height, also Target scale height, 270mm above the floor. Use a set-square 'along' the bike to place masking tape on the floor exactly below the rear edge of the wheel rim, then slide the square on the floor 'across' the bike until it just touches the laser beam (photo →). Mark that position on the tape.

Marking Laser beam-to-beam Width

5b: Measure the Width on the floor.

Using the laser beam width marked on each side of the bike, directly below the rear edge of each front wheel rim, lay a measuring tape on the floor between these marks and **accurately measure** the beam-to-beam width. (photo →)


Using tape to measure beam-to-beam Width

There can be differences between the width of different Spyders of the same model and year. **Measure** it – don't just use figures from a previous Spyder.

Maths 101: Halve this beam-to-beam width, then deduct 101... Why? Because the rim-to-rim width of the rear wheel is 202mm. This **Rim-Width** is the distance from the laser beam to the rear wheel rim (←wheel→), exactly central to the chassis.

Rim-Width = (beam-to-beam width ÷ 2) – 101
...WRITE THIS DOWN on the masking tape on the floor – if you accidentally bump a target, the figure is there to reset it without re-measuring.

6: Set the Laser Targets.

Using 'Rim-width' to set Target distance

For postage economy, the Targets are very lightweight. It is easy to accidentally bump a Target, so rest something heavy on the bases to steady them.

An assistant is useful for this step. Use a tape to measure as squarely as you can by eye directly out from the rear-most point of the rear wheel rim, then place each laser target with its center-line exactly on this **Rim-Width** distance. That makes the target centers exactly in line with the lasers at the front and square to the whole bike frame.

A strip of masking tape on the floor, with the center marked, is a good extra precaution for if a target gets knocked – it can be easily reset if that happens.

7: Check the existing alignment.

With the lasers over the front wheel hubs, aim them so that the laser dots hit the targets at the height of the scales – marked in 5mm steps at the same height as the front wheel hubs. If the laser dot is INBOARD of the center-line, that wheel has toe-out. If the dot is OUTBOARD of center, that wheel has toe-in. The laser targets are positioned at 5 times the diameter of the front wheels away, so whatever you read on the target is 5 times what the wheel is set to.

If the laser dot points to well outside the central scale (when alignment is out substantially) or even right off the target (that sometimes happens, too, when the alignment is dramatically out), stand the set-square alongside the target like an extra target so you can at least see the dot.

8: Decide what alignment settings to use.

BRP recommends 0.5mm toe-in for all models, all loads, all conditions... completely impractical! Because the Spyder is rear-wheel drive, always pushing the mass of the front-end geometry, the wheels spread in motion by about 0.5mm, so using BRP specs results in ZERO toe-in on the road, or even creeping into toe-out, which is why the steering is often so twitchy on less-than-perfect roads.

For RS/GS, ST, or F3 models: For best results, use between 1.0mm and 2.0mm across-the-wheel with 1.5mm optimum for standard suspension and normal rider weight. Use more toe-in for heavier riders or two-up loads; or less for stiff suspension. (*e.g.* heavy load + stiff suspension = normal)
For RT models: A heavier bike, so use between 1.5mm and 2.5mm across-the-wheel with 2.0mm optimum. Adjust more / less as with RS / ST models.
For 2013> models: The new chassis design causes much more camber deflection under suspension compression than the old chassis, plus more toe-out bias, which was barely discernible on the old chassis. So adding an extra 0.5mm toe-in across-the-wheel to counter this is a sensible precaution.

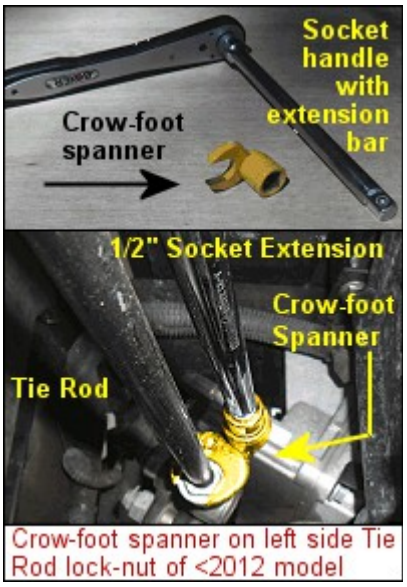
This means that you want to see the laser dots OUTBOARD of the target center-lines by 5 times the chosen setting.

Examples:
Using 1.5mm across-the-wheel means adjusting the laser dot to point at 7.5mm on the target scale;
Using 2.0mm across-the-wheel means pointing to 10mm on the target scale;
Using 2.5 across-the-wheel means 12.5mm at the target.

9: Slacken the tie-rod lock-nuts.

This is the most physically demanding part of the whole job. Tackle only one wheel at a time. Start by slackening the 18mm outer lock-nut, which has a **reverse** thread (clockwise to loosen, anti-clockwise to tighten). The inner lock-nuts have a **normal** thread (clockwise to tighten, anti-clockwise to loosen).

- **For <2012 models** (old chassis) it is easiest to access both inner lock-nuts from below. Lie down on the floor at the front of the bike and reach under the plastic skid-plate. There is a rectangular opening, and an 18mm spanner can be poked up through that to loosen or tighten the inner lock-nuts. An assistant is useful – otherwise it can be done by 'feel'. A torch or inspection light is also useful.
- **For 2013> models** (new chassis) it is very awkward to get at the inner lock-nut on the **left** side of the bike. It is just possible with a normal spanner working from the side, but easier to use the 18mm crow-foot spanner supplied in the Kit. This fits to an extension arm from a ½" socket-set to allow you to turn a nut at right angles, making this awkward job easier. Right side access is straight-forward like other models.



Crow-foot spanner on left side Tie Rod lock-nut of <2012 model

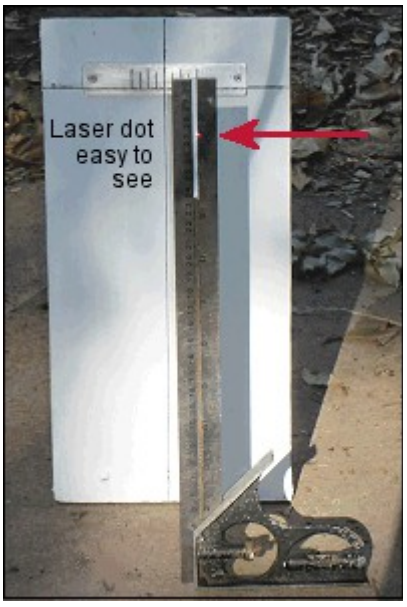
10: Adjust the tie-rods.

With both lock-nuts loose, use a 10mm (<2012 models) or 16mm (2013> models) spanner on small flat sections of the actual tie-rod to turn it – or perhaps just turn it by hand. This is where you really need an assistant who can watch BOTH the laser targets.

For the wheel that is NOT being adjusted, the dot will 'creep' away from where the initial reading showed – because adjusting the tie-rod on the **other** wheel will make it move (the straps on the handlebar restrict this, but not stop it). It will be necessary to 'bump' that wheel from time to time to jolt the dot back to its original position. You will need to do this several times, and an assistant is useful for this. Using newspaper under the tyres allows the wheels to 'squirm' a little – just grip the tyre and push it sideways to make the dot move back to its original position.


Adjusting the tie-rod, with spanners on the tie-rod and the lock-nut.

- **Use the set-square as a narrow extra Target:** (photo →) For the wheel NOT being adjusted, you don't need to remember a specific measurement. You can place the set-square in front of the Target so that the laser dot is exactly on the center-line, making it easy to see when that wheel moves while the other one is being adjusted. As soon as the other wheel has been aligned, swap sides and position the set-square on the dot again. It's just a bit easier than checking to see a specific graduation. (↓ more)



Once the first wheel is aligned, nip the lock-nuts up to prevent any movement of the tie-rod while adjusting the other wheel. Use the 10mm or 16mm spanner (<2012 or 2013>) on the tie-rod flats to be sure that the tie-rod does not turn, while you use the 18mm spanner to nip the lock-nuts up.

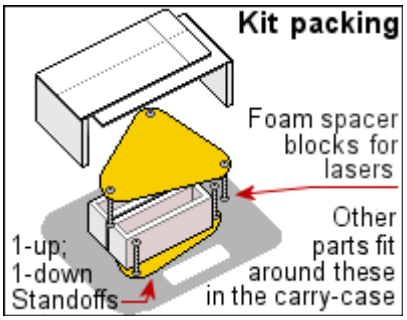
Repeat that adjustment procedure on the second wheel until **both** laser dots point to the desired measurement.

11: Tighten the tie-rod lock-nuts.

As you tighten the lock-nuts beyond the 'nip' stage, the laser dots WILL move slightly, because the ball-joints at the ends of the tie-rods will rotate to take up the thread slack.

Once the lock-nuts have been tightened, the alignment is done. Remove the handlebar straps. Please insert a strip of masking tape over the laser battery terminals, and repack the Kit.

Hint: Pack the standoffs and lasers first – before you put any other metal objects in the case – to avoid those strong rare-earth magnets grabbing them. It is surprisingly hard to pack the standoffs using the locators in the bottom of the case, with their feet / tops trying to attract each other like... well, like magnets.



12: Enjoy!

...enjoy riding a properly-aligned Spyder.

—end—

This Kit is supplied by Lindsay Whipp on the understanding that you will use it, then pay the cost of postage to the next group or individual who wants to use it. You may use the Kit, or copy any of the equipment, but if another person or group is not waiting for the Kit within a week or so, please return it to me at:

Lindsay Whipp
148 Macadamia Drive
Maleny Qld 4552
— when posting, use my mobile number as contact reference on the Satchel label, then email me the Tracking Number from AusPost. A personal business card is included in the Kit so you have these details available when you lodge the Kit with AusPost.

— land-line (07) 5494 3818, mobile 0411 690 320, or email: lindsay.whipp@lindsayroland.com