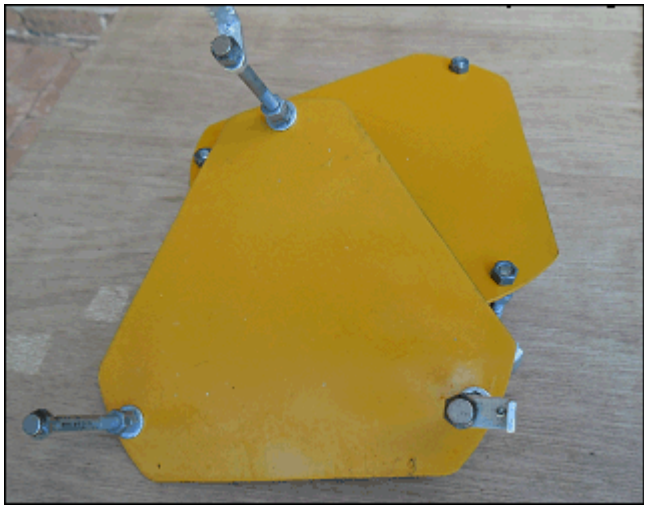
Front Wheel Alignment Kit for Can-Am Spyder.

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 Wheel Standoffs (photo →);
- Laminated instruction sheets;
- 1 card of spare AAA batteries.

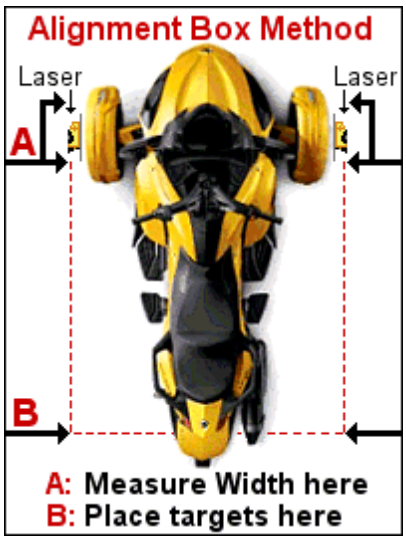
Power the Lasers. The battery terminals for the two yellow lasers have been covered with masking tape to avoid corrosion damage. Slide down the battery cover at the front end and remove the tape so that the batteries touch the terminals. There is also a card of spare AAA batteries in the Kit.

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 (←A→), then use those measurements to place the laser Targets outboard of the rear rim of the back wheel (←B→), 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:

For maximum accuracy, attach the standoffs to the front wheels 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.

► Park the Spyder and apply the Parking Brake.

Park 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.

► 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.

► Center the Steering

Align the handlebar roughly by eye first. Then triangulate to get the steering-head exactly central. There are many ways to do that, but to avoid complications like back-rests, sheepskin seat covers, top-boxes, racks... simply take a direct measurement from a central point like the ignition switch to each grab rail or arm-rest. If using the grab rails, one meter is a convenient distance, so stick a piece of masking tape on each rail and mark that (photo →).

Now measure from those two points to the opposite handlebar until you get left and right exactly the same. Handlebar risers or other custom bars mean that you can NOT rely on both bar ends being square to each other, so in that case triangulate to the actual steering-head casting, with its well-defined outside edges for reliable measurements. This makes the steering-head exactly square to the chassis, **no matter where the front wheels might be pointing** at this pre-alignment stage.

If you have BUDS available, connect it now, to reset the DPS sensor center while you have the steering-head exactly square. When incorrectly set, it causes uneven turn-signal cancellation and, when out substantially, 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, back to the opposite grab rail. Tighten the straps alternately, side after side, until they are both tight and the triangulation measurements on each side are still within a couple of millimeters of equal. Such a tiny variation between left and right is inconsequential.

► Measure the alignment box width.

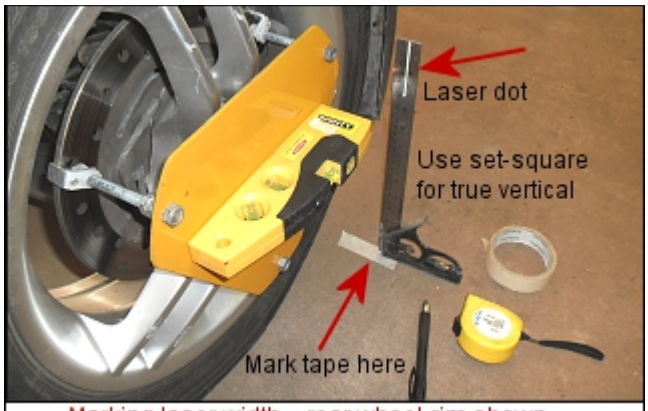
Ideally, you should measure the width directly under the center of the front wheels, but you can't use a measuring-tape there and you can't point the lasers straight down because of wheel camber – the dot would be a few millimeters off **true vertical**. Camber is NOT adjustable on a Spyder, and varies slightly from bike to bike. Laser levels on wheels are accurate **only when parallel to the floor.**

You CAN measure width directly under either the fore or aft front wheel-rims, BUT any existing toe-in or toe-out that the wheels might have would affect those measurements. Perhaps only by a small amount, but perhaps by quite a large amount if the alignment is very wrong! The safest solution on a Spyder with unknown alignment is to measure the width at both fore and aft rims, then use an average of the two measurements to calculate a true width **at the wheel hub**. The two measurements will commonly be only 3-4 millimeters different, but COULD be as much as 20mm different.

• Mark the width on the floor.

To avoid the camber problem, use a set-square on the floor to force **true vertical**. Place the lasers, pointing rearward, as close as possible to hub height. Stick masking tape on the floor directly below the **rear edge** of the wheel rim, then slide the square on the floor until it just touches the laser beam (photo →). Mark that position on the tape.

Next, turn the lasers around to point forward, stick masking tape on the floor below the **front edge** of the wheel rim, and also mark that point – do this on both sides of the Spyder.



Marking laser width – rear wheel-rim shown

• Measure the two widths.

Lay a measuring tape on the floor between these marks and **accurately measure** the beam-to-beam width (photo →).

You will have two measurements: fore-&-aft wheel-rim widths between the laser beams. Any existing toe-in or toe-out WILL make these figures slightly different. The width at the hub is always the **average of the two figures**.

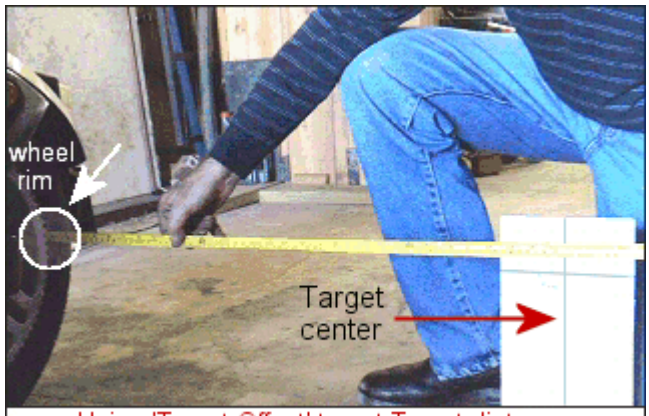

Measuring Alignment Box width – rear rim shown

► Calculate Target Offset.

You now have an accurate width for the front of the Alignment Box – next, you need to determine the rear, where the laser targets will be positioned. The width of the Spyder rear wheel is 202mm, so half of that is 101mm. Halve the beam-to-beam width (the average of the two measured widths), then deduct 101... This **Target Offset** is the distance from the laser beam to the rear wheel outer rim (←wheel→), exactly central to the chassis, and where the two alignment targets must be positioned.

Target Offset = (average beam-to-beam width ÷ 2) – 101
...WRITE THIS DOWN – if you accidentally bump a target, you can reset it without re-measuring.

► Set the Laser Targets.



Using 'Target Offset' to set Target distance

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 **Target Offset** distance. That makes the target centers exactly in line with the lasers at the front and square to the whole bike frame.

For postage economy, the Targets are very lightweight and easy to accidentally bump. Rest something heavy on the bases to steady them. A strip of masking tape on the floor, with the center marked, is another good precaution for if a target gets knocked – it can be easily reset if that happens.

► 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.

The laser dot might point to well outside the central scale when alignment is out substantially. It might even be right off the whole target. If that happens, stand the set-square alongside the target like an extra target so you can at least see the dot.

► Decide what alignment settings to use.

BRP recommends 0.5mm toe-in across-the-wheel (measuring from fore-to-aft wheel rims) 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.

► Slacken the tie-rod lock-nuts.

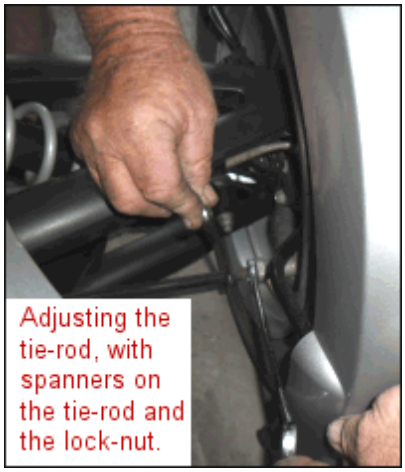
Tackle only one wheel at a time. Start by slackening the 18mm outer lock-nut, which has a **reverse** thread (clockwise to loosen, anti-clockwise to tighten). The inner lock-nuts have a **normal** thread (clockwise to tighten, anti-clockwise to loosen).

- **For <2012 models** (old chassis) it is easiest to access both inner lock-nuts from below. There is a rectangular opening in the plastic skid-plate, 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-nuts. It is easiest 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. An inspection light is useful for this.

- **Useful Tip:** Loosening or tightening the tie-rod lock-nuts will always be from outside the wheel so, with both normal and reverse threads, both lock-nuts should be turned the same way **as you see them** from that point. To loosen, turn both of them clockwise. To tighten, turn both of them anti-clockwise.

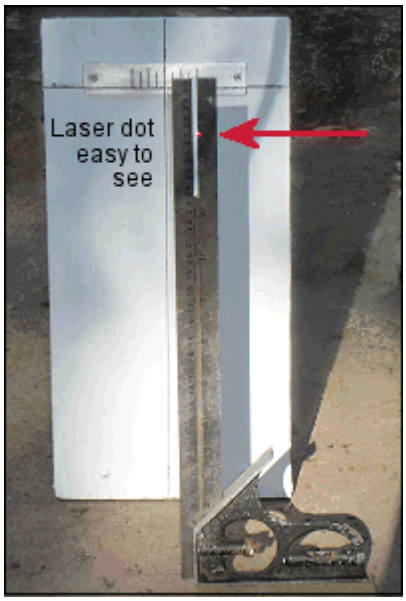
► Adjust the tie-rods.

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.


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

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.

Use the set-square as a narrow extra Target: (photo →)
For the wheel NOT being adjusted, 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. 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.



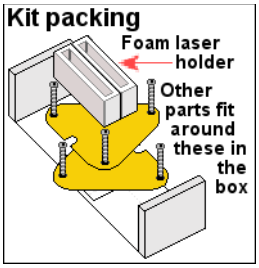
Repeat that adjustment procedure on the second wheel until **both** laser dots point to the desired measurement.

► 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 targets, standoffs and lasers first – before you put any other metal objects in the case – to avoid those strong rare-earth magnets grabbing them. Once those items are in the box, other kit items will fit around them. Loosen the set-square handle so it can slide, and fit diagonally in a gap.



► 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, please 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. The kit fits snugly in an AusPost Parcel Post Satchel – extra-large size – available at your local Post Office.

— land-line (07) 5494 3818; mobile (rarely used, so I would prefer you don't use this) 0411 690 320; or email (this is the most certain contact method) : lindsay.whipp@lindsayroland.com