



Laser Wheel Alignment

Wheel Alignment using a Laser

1. Introduction

Correct wheel alignment makes a huge difference to the handling, if it's accurate. You shouldn't necessarily rely on a new rear tyre being correctly aligned when fitted, and maker's graduations on the swing arm are not to be trusted either. In addition, each time the chain is adjusted, you run the risk of shifting the alignment. The time-honoured method of using string lines works just fine, but is time-consuming to set up and care is required to take the actual measurements.

I set out to build a laser rig to make the set-up and measurement faster, from materials that I already had at home. If you have access to an engineering workshop and/or industrial laser sources, you can make a more professional job but the "quick and dirty" method works just fine. There are multiple permutations on the design shown, and also variations in the way it can be used. The following method is just one way of approaching laser alignment.

2. Rig Construction

The rig is constructed in two parts: the laser beam emitter/support bracket and the laser light target. These are shown in **Illustration 1**.

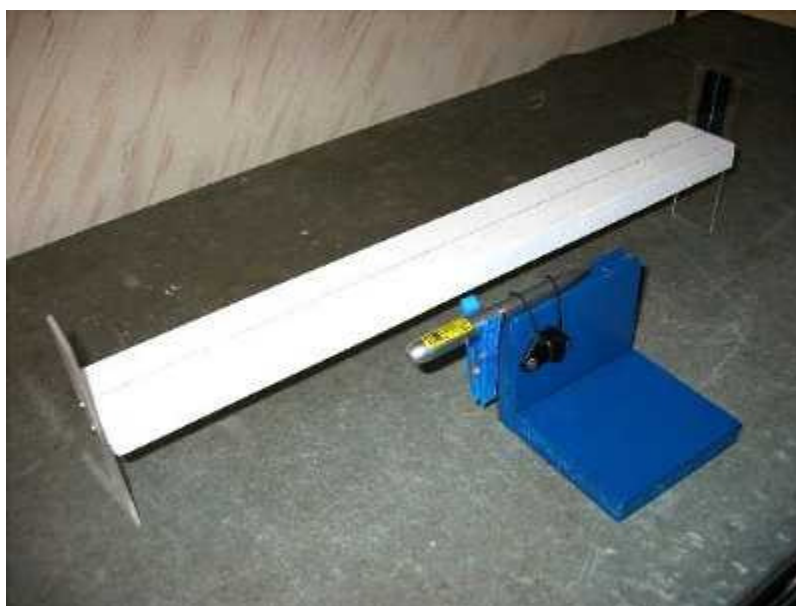


Illustration 1 – Alignment Rig components

The laser emitter is a laser pointer combined with a biro, but single purpose laser pointers can be obtained cheaply from electronics and office supplies shops etc.

The support bracket is constructed from MDF. It should be recessed in the top to provide stability to the laser pointer. In this case, two 3mm pieces of MDF were sandwiched to a wider piece of MDF. The pointer is held in place with elastic. A spring clothes peg is used to keep the laser switched on.

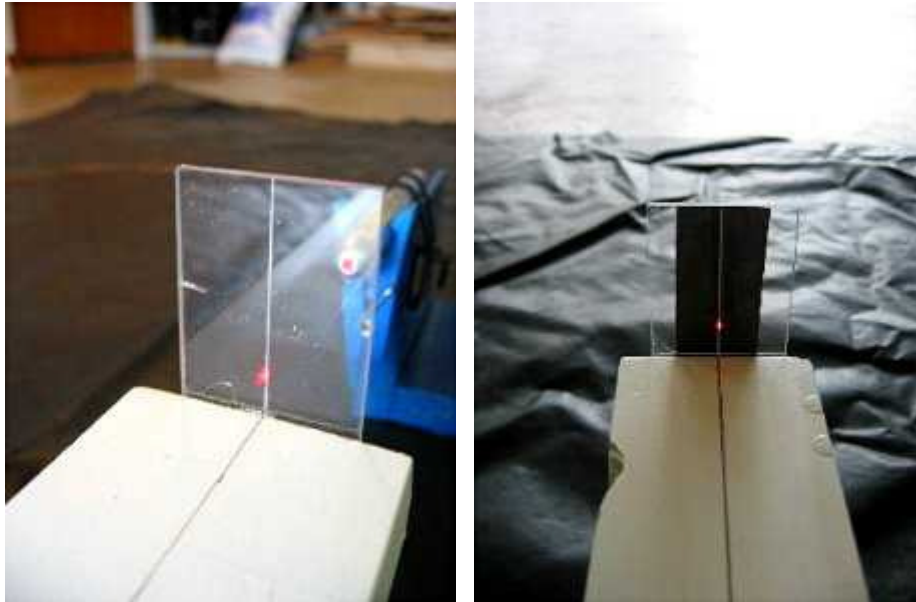


Illustration 2

The centre line of the laser is 85mm above datum, which is close to the maximum height that can be used for a Honda Blackbird on its centre stand with a 6mm ride height spacer under the shock absorber. **Refer to Illustration 2**, above. It is very close to the inward curve of the centre stand.

The laser target is constructed from a piece of **straight** dressed timber painted white, with Perspex end-pieces. The overall length is 500 mm, the height above datum of the timber surface is 80 mm and the height of the Perspex end-pieces is 130mm. The timber is 58mm wide with a centre line marked on it. The centre line of 29mm equates to half the difference between the widths of the front and rear tyres. If this is different for other tyre combinations, it doesn't really matter as a steel rule can be used to measure how far away the laser beam is from the edge of the front tyre.

Both end-pieces have a vertical line scored in them with a scribe. The score lines are on the inside faces of the Perspex. This helps to slightly scatter the laser light on the line and make alignment easier (much like a rifle sight). The target end piece has a strip of black insulating tape behind it to make the laser easier to see. **Illustrations 3 & 4** below show the end-pieces being struck by the beam.



Illustrations 3 & 4 above– Laser light striking the Perspex end-pieces

3. Using the Alignment Rig



Illustration 5 – General arrangement of the rig

Prior to commencing the alignment process, spin the front and rear tyres to look for any significant oscillation on the widest part of the tyre wall. The laser beam can be helpful for this purpose. If the rims are in good order and the tyre has been fitted properly, it will be negligible. If any movement is $>1-2\text{mm}$, then position the wheel so that the laser is roughly at mid-point of the oscillation.

Align the front wheel as close as possible to the centre line of the bike by eye. The target part of the rig is then pushed up against the front tyre. It can be held in place with light elastic if there is any concern over possible movement. The laser emitter and support assembly are placed at the back of the rear tyre so that the beam just kisses the widest part of the tyre front and aft.

Illustration 6 shows the beam touching front and aft rear at maximum tyre width. Turn the forks until the laser beam lines up with the lines on the Perspex end plates, or runs parallel with it. This is shown in **Illustration 7**. In the latter case, measure the distance from the beam to the widest part of the tyre.

Move both parts of the alignment rig to the other side of the bike and set the front rig parallel to the laser beam. If the distance of the laser beam from the widest part of the tyre is identical to the measurement on the other side of the front wheel, then it is properly aligned. This is shown in **Illustration 8 and 9**. If there is a difference, then alignment is required. Looking from the rear of the bike, the front of the rear tyre should be moved on the adjusters in the direction of the side with the shortest measured distance. It's difficult to be precise about how close the measured difference between both sides of the front wheel should be to be acceptable. However, the rig allows accuracy of 1mm or less to be achieved quite quickly.



Illustration 6 – laser beam touching tyre at 2 points



Illustration 7 – laser beam running parallel to centre line



Illustrations 8 and 9 – identical measurements on both sides of the bike

Re-check the alignment when tightening the rear axle to ensure that nothing has moved. A suggestion to increase the interval between full alignments is to scratch some small alignment marks on the swing arm and adjusters if the stock ones are inaccurate. Eccentric adjusters require a slightly different approach.

Caveats

These instructions have been provided in good faith, but offer no warrantee, guarantee or any other assurance of the accuracy, or implied accuracy, or otherwise, of these guidelines as to mechanical soundness, applicability or appropriateness for purpose. These instructions are purely a record of a single installation, applied to a specific motorcycle and assume onus on the user to verify the correctness of their content and suggested procedures. No liability will be accepted by the author in the application of this material, in whatsoever manner it may be applied.

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