

Toe-in Adjustment – an EVOLVE TRIKES TECHNICAL GUIDE

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This guide is for trikes employing Evolve folding technology. Because the trikes have cambered front wheels all toe-in measurements between the front wheels **must** be measured at the same height front and back of the front wheels. For reliable measurement we prefer measuring to the rim edge adjacent to the tire. For best accuracy the measurement should ideally be made at axle height.

The trike shown is a prototype trike that will have differences to production trikes but the methods are the same. Since our trikes can be rolled forward when folded both standard and folded wheel toe-in need to be set up correctly. This guide describes the setting up of both.

Toe-in should be checked/adjusted before first use and thereafter only when:

- (a) the trike is involved in any front wheel collision or impact.
- (b) or if abnormal front tire wear is observed or any steering parts are replaced.
- (c) or if the cross-arm catches are adjusted or replaced (affects folded wheel toe-in only).

SUMMARY: Check the Standard Toe-in is within 0 to 1.5mm (0-1/16in) i.e. narrower at the front.

If incorrect, adjust by adjusting tie-rod length evenly both sides.

Adjust the folded wheel toe-in only if the folded trike is difficult to wheel forward or waddles.

WARNING: Incorrect toe-in can cause excessive tire wear and possibly poor handling.

Tools Required:

- 1 10mm spanner for the M6 locknuts,
- 1 each hex keys to suit the screws through rod ends (usually 4mm and 5mm.)
- 1 Small hex key e.g. 2.5mm if tie-rods have through-holes or a second spanner.
- 2 straight alignment boards each nominally 4x2cm, 50cm long, (2x1in, 2ft long)
- 1 Tape measure
- 1 Toe-in measuring tool - see also the guide for Toe-in Measurement Aids.

1. PREP: Tie-rod Setup (first time only, usually in factory)

- (a) To make it easier to make adjustments evenly on both sides ideally the tie rods should be arranged as follows in Fig.1 From the right side of the trike looking from the rear a RH (right hand) rod end (ball joint), LH, RH, and finally LH. At about 5cm (2in) from the inner ends the tie-rods will have flats for a spanner or 1/8in (3mm) holes thru-holes for using a pin or hex key to rotate the actual rod. With this arrangement rotating the top of the tie-rods forward increases the rod length and toe-in, rotating the top rearwards reduces toe-in.
- (b) There should be about the same amount of thread showing on each rod-end. If the thread visible at one end of a tie rod is different to the other then remove the fixing screw through one rod-end, unlock tie-rod lock nuts and adjust them so that they are equal, and reinstall the fixing screw. Note that LH locknuts have a nick on all 6 corners of the nut flats and unlock opposite to the usual way.
- (c) If the left and right tie-rods do not have an even amount of thread showing, similarly adjust them to be equal.
- (d) Loosen the steering pivot arm lock screws (see Fig.1) and adjust the pivot arm so the screws are midway along their slots. Re-tighten the pivot arm lock screws.
- (e) Rotate the left and right tie-rods evenly using the hex key or spanner to adjust for any difference so the front wheels are near parallel.

When set up as above with M6 thread rod-ends, rotating both tie-rods adjusts the same amount adjusts the toe-in approximately as follows:

Degrees rotation	Fraction of a turn	mm	inch
22.5	1/16 T	1	0.04
45	1/8 T	2	5/64
90	1/4 T	4	5/32
180	1/2 T	8	5/16
360	1 T	16	5/8

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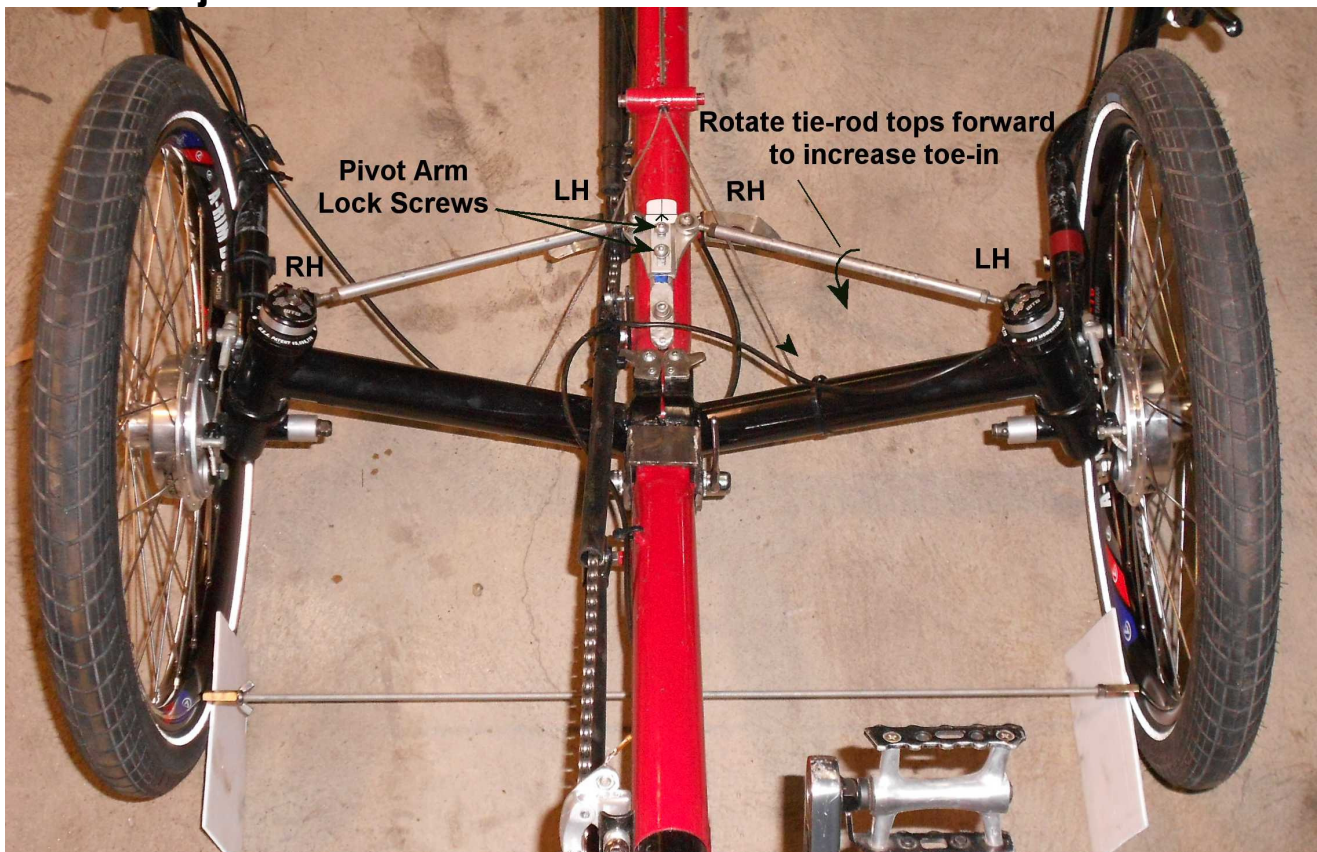


Fig.1 Standard toe-in setup using an adjustable rod tool. [Note that for clarity, in this image a substitute overclamp is used on the hinge so the seat could be raised.]

Note that when using an “adjustable rod” toe-in measuring aid, the rests are leant against the inside of each wheel as per Fig.1 and the threaded rod rested on them against the rim. The rod couplers are adjusted to just fit between the rims and the wingnut tightened. A tape measure is used to measure the length of the adjustable rod.

2. Checking Standard Toe-in

NOTE: It is imperative for optimum toe-in checking and adjustment that:

- the kingpin HEADSETS, rod-ends have minimal free-play and all steering fasteners (screws ,nuts) are tight
- the steering pivot arm is aligned along the axis of the trike.
- for standard (erect) toe-in the main hinge is held firmly closed.
- the front wheels are not buckled or one point on the rim is chosen and the wheel is rotated each time to always measure at that point.
- standard toe-in is best set with the rider sitting on the trike. An assistant can make this easier. Trike frames flex under rider weight and this can affect toe-in, possibly by as much as 1 or 2mm. Also rider weight will helpfully preload any parts with minor free movement (rod-ends etc) to the usual riding position.

- (a) For easier steering pivot arm alignment checking, fold the seat back, carefully align the pivot arm with the main tube and place marked tape as alignment labels as shown in Fig.1 on the rear of the steering pivot arm and on the main tube behind it. Lower the seat and close and firmly lock the hinge Quick Release.
- (b) With the steering pivot arm aligned to the labels, and rider sitting on the trike, measure the toe-in by the difference in the front wheel rim width at front and rear of the wheels. (can be done without the rider's weight but at lower accuracy)

Standard Toe-in should be: 0 to 1.5mm (0-1/16in) i.e. narrower at the front.

If incorrect adjust toe-in to suit as below in step 3.

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3. Adjusting Standard Toe-in

- Before any adjustment mark the same side of each tie-rod to be able to determine their relative rotation. Or place tape around each tie-rod and mark the same side.
- Unlock tie-rod lock-nuts while preventing rotation of the tie-rod by using a hex key through the tie-rod hole or a spanner on the flats. Note that LH locknuts have a nick on all 6 corners of their head and unlock opposite to the usual way.
- Rotate the left and right tie-rods evenly using the hex key or spanner to adjust for any difference.
- Re-tighten the lock nuts. Before locking the 2nd tie-rod locknut rotate rod-end to make the flat faces of the rod-ends generally parallel. (Prevents binding when folding) You should be able to rotate each tie-rod very slightly on their axes both when the trike is erect and when folded.

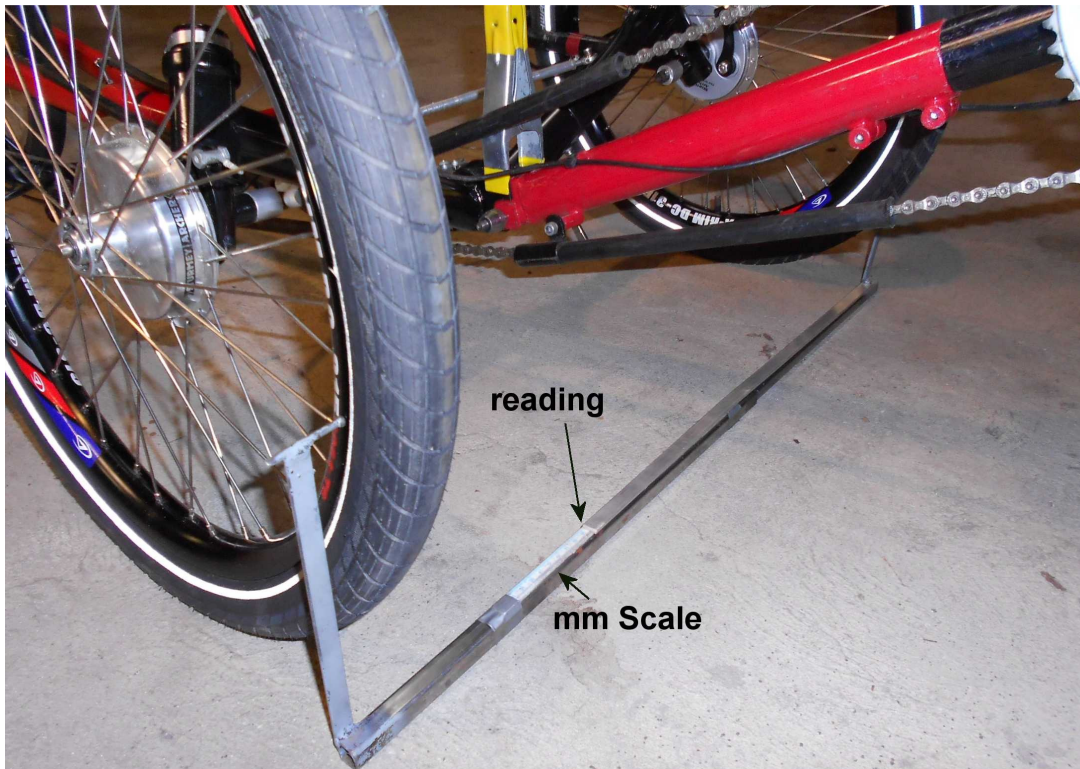


Fig.2 Simple standard toe-in measurement using the Evolve Trammel. It shows using an extra- strong spring clamp to hold the hinge tightly closed.

4. Folded wheel toe-in

Since the trike can be rolled forward when folded the folded wheel toe-in may need to be checked/adjusted. This is not as critical as the standard erect trike toe-in but the front wheels should be generally parallel when folded.

If there is too much folded wheel toe-in the trike will tend to waddle (alternately lift left and right wheels) as you try rolling it. If there is too much folded wheel toe-out, it will be difficult to roll the folded trike forward. If either problem then adjust it as follows:

- Release the hinge quick-release and fold the seat back. Fold the front wheels back to their folded position to engage the cross-arms in their catches. Leave the boom forward. [If the trike is fitted with a steering arm alignment catch, the bright centering pin should now engage in the arm's slot automatically as shown in fig 2a. Occasionally you may have wiggle the steering until it does.



fig 2a:]

- Check how parallel the folded front wheels are by the method shown in Fig.3 by placing alignment boards on the ground against the tires and comparing the width to the outside of those boards at the same distance forward of and behind the front wheel axle or checking by eye.
- If adjustment is required loosen the steering pivot arm lock screws (see Fig.1) so the pivot arm can slide with resistance, and push either the front or rear of the front wheels together to make them parallel, allowing the pivot arm to slide along its slot. When parallel re-tighten the pivot arm lock screws.

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- (d) Check that the trike can roll easily forward, and without waddling. If not repeat steps (b) to (d). When the adjustment is complete firmly tighten the pivot arm lock screws.
- (e) If the trike steers to one side when folded then that can be adjusted out by differential adjustment of the left and right tie-rods (shortening one and lengthening the other by the same amount). This should only be done if necessary. It is a fine adjustment and must be done in very small increments, taking care to rotate both rods the same amount, and checking folding after each adjustment.
- (f) If the folded wheel toe-in has been adjusted then step 2(c) should ALWAYS be repeated, beginning with re-erecting the trike and clamping the hinge firmly closed.



Fig.3 Folded wheel toe-in setup

5. Completion

Once all adjustments are complete lock up all tie-rod locknuts and ensure the steering pivot arm lock screws are tight and test ride the trike.

6. NOTES

We recommended regular checking for any unusual looseness of screws, nuts and fittings especially in the steering system parts, particularly in the first few months as the trike settles. The rod-ends should be checked for abnormal wear and the tie-rod lock nuts and pivot arm lock screws should be checked to ensure nothing has moved out of alignment.