



FALCON

4 Wheel Laser Aligner



USER MANUAL

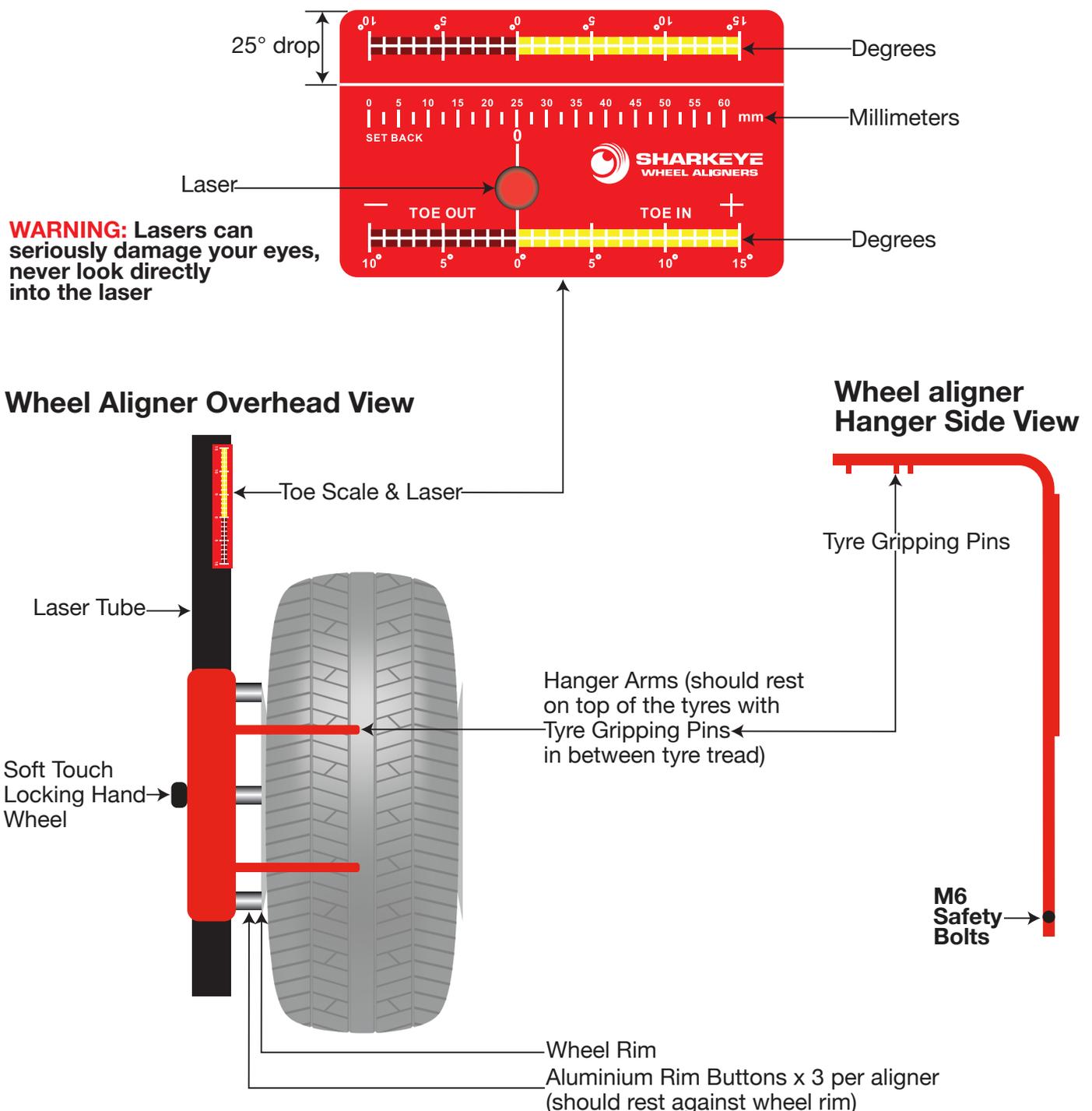
Model No. LC4WLA

Made in
SHEFFIELD ENGLAND

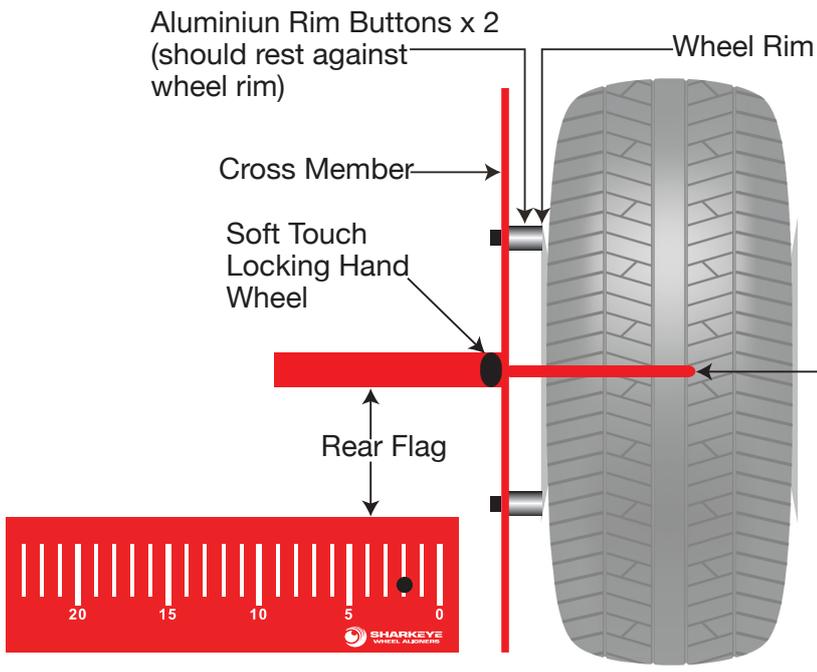


Follow these steps prior to use

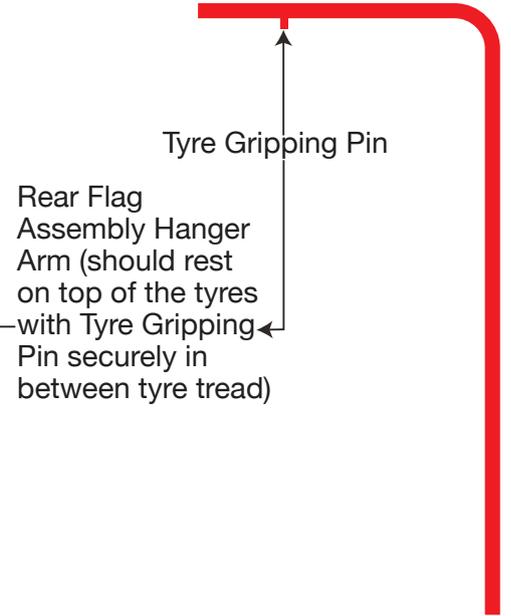
1. After Opening your package, first remove the two M6 safety bolts from the two wheel hangers.
2. Unlock the soft touch hand wheel on the wheel frame and then slide the wheel hanger down into the frame. Re-lock the hand wheel and then re-fit the two M6 safety bolts.
3. Switch operation - The switch is simply an on/off switch. When put on charge always turn it off. Hang the laser heads onto the tyres and ensure the three aluminium rim buttons are touching the wheel rim. Set the spirit level on both of the laser heads.
4. Switch on both lasers on each laser head so both lasers are pointing at each toe scale, this will give you your measurement reading.
5. Once you have completed these steps your aligner is ready to use.



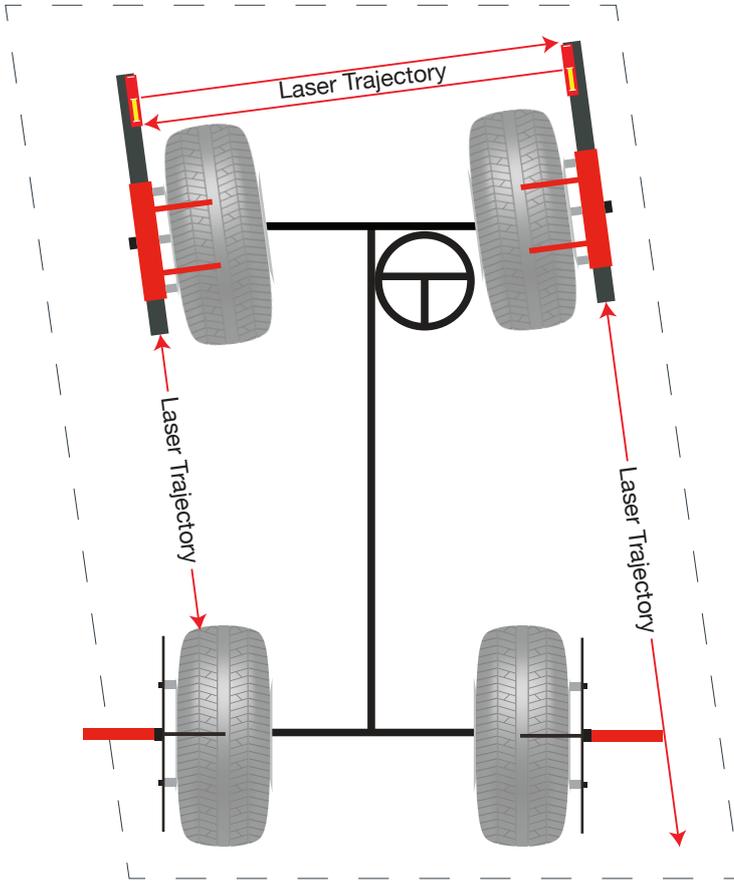
Rear Flag Assembly Overhead View



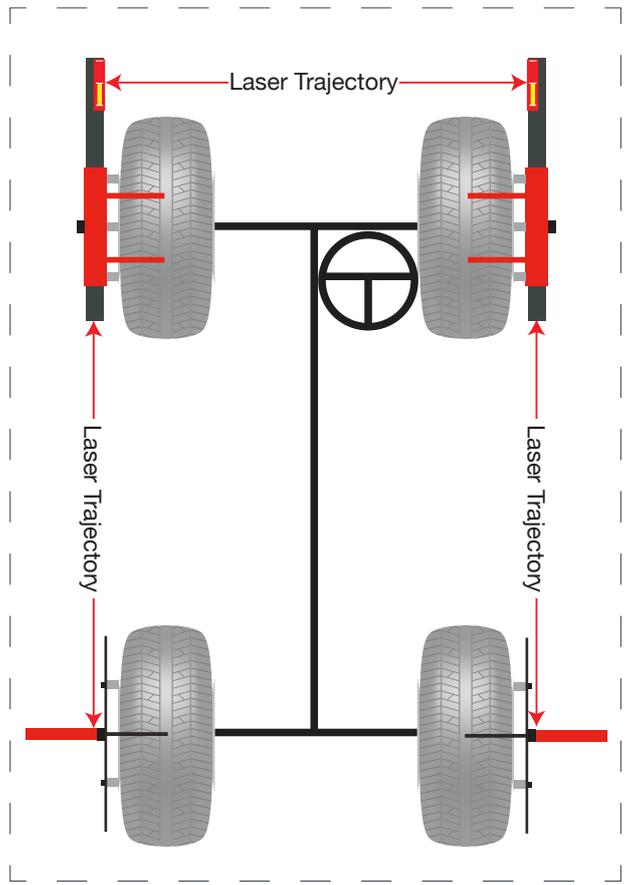
Rear Flag Hanger Side View



Misaligned Wheels (overemphasized example)



Aligned Wheels



4 - Wheel Laser Alignment In Brief

Three different wheel alignment methods can be performed with the 4-wheel laser alignment system as follows:

- **Center-line Alignment**
- **Thrust Angle Alignment**
- **4-Wheel Alignment**

Choose the appropriate method from the following descriptions that will provide the results you desire.

Installation of the equipment is the same regardless of which alignment method is used. The laser sensors are installed with the toe scales extending away from the vehicle regardless of which axle they are placed on. When installed on the rear axle in this manner, they must be read in reverse of what is indicated. Indicated toe-in will actually be toe-out, and indicated toe-out will actually be toe-in, as the scales are being viewed in an opposite manner of the front axle.

Each laser sensor hangs from the top of the tires tread surface. When installing the laser sensor, adjust the position of the sensor so that the level vial has a centred bubble while at the same time positioning all three aluminium stand-off pins firmly against the wheel's edge. When properly installed the sensor should be exactly parallel with the tire side-wall. The two lower aluminium stand-off pins are for toe while the single upper pin is for camber.

To install the flag scale assembly hang the assembly from the top of the tires tread surface. The vertical round rod should be visually perpendicular fore and aft to the floor surface. Adjust the two lower aluminium stand-off pins firmly against the wheel's edge. The flag scale should face toward the other axle and be positioned parallel with the tires tread surface. Move the top of the round vertical rod in toward the sidewall or out away from the side-wall until the level vial bubble is roughly centred. Both aluminium pins on this assembly are used for toe-tracking. The flag scale assembly should not be used to reference camber measurements.

Although not normally required, it may be helpful on some tire and wheel assemblies to use a "bungee" type rubber strap to keep the flag scale firmly in position. Be careful not to over-tighten and distort the flag scale rod, just light pressure is all that is needed.

4-Wheel Alignment Methods - Described

A **Center-line Alignment** assumes that the rear axle is exactly perpendicular to the vehicle's geometric center-line with both rear wheels exactly parallel to each other and parallel to the vehicle's geometric center-line. It does not compensate for any thrust-angle that may be present in the rear axle. Therefore any thrust angle that is present can result in a crooked steering wheel.

Due to road forces that occur while driving, the front wheels will automatically turn into the direction needed to become parallel with the rear wheels and match any thrust in the rear axle. If a non-compensated thrust angle exists, a crooked steering wheel is a result even though the steering wheel was straight when the vehicle toe was set.

A crooked steering wheel does not always present a tire wear problem and does not mean that the total toe is incorrect. However, in cases of a severe rear axle thrust angle, excessive tire

wear and incorrect vehicle handling will occur. See the Thrust Angle Alignment section next to understand why.

A **Thrust Angle Alignment** is performed on a solid non-adjustable rear axle. This type of alignment compensates for any normal (less than .4 degree) rear axle thrust angle so that all alignment angles are within specification and the steering wheel is centred while driving. This is done by aligning the front wheels to be parallel with the rear axle wheels rather than referencing the geometric center-line of the vehicle. In a large majority of cases, a vehicle's thrust angle will be below .4 degrees and can be compensated for during a "thrust angle" alignment procedure. Thrust angle becomes difficult to compensate for when it exceeds .4 degree and is considered severe when it exceeds .5 degree. A severe thrust angle requires repositioning of the axle before a proper wheel alignment can be performed.

Tire wear can occur with severe thrust angle. As the front wheel spindle steers into a turn, it moves in an arc. This results in a camber change that occurs throughout the turn. This is designed into the suspension system. Working in conjunction with caster and SAI, this design aids in better handling during turning, and steering wheel return as the turn is completed. If the front wheels have to turn too far to become parallel with the rear axle, an out-of-specification camber angle can exist while driving. In this instance, a steering pull, and excessive tire wear, are normally noted. If you experience this condition after you have properly performed a thrust angle alignment look into the possibility that excessive rear axle thrust angle is present.

A **4-Wheel Alignment** is very similar to a thrust angle alignment except that it is performed on vehicles that incorporate an adjustable rear axle. In this case "rear axle thrust" can be reduced and more often eliminated depending on the adjustments available.

In this procedure, the rear axle is adjusted first to match the vehicle's geometric center-line as closely as possible. After rear axle adjustment is complete, the front axle wheels are adjusted to be in parallel alignment with the rear axle wheels. This procedure can be performed on a vehicle with independent rear suspension that has factory-provided adjustments, or can be adjusted with after-market kits.

This procedure can be performed on a front-wheel-drive vehicle using a rear axle comprised of a spindle bolted onto an axle tube. Mini-vans commonly have this type of rear axle. Tapered shims are available for these types of rear axles which are inserted between the spindle and the axle tube to correct toe and or camber tolerances.

CAUTION: *Never remove a steering wheel that incorporates an airbag deployment system without following the vehicle manufacturer's instructions to deactivate the system or serious personal injury could result.*

Performing A 4-Wheel Alignment

Begin by placing the laser sensors on the front wheels and the flag scales on the rear wheels. Sit in the vehicle and visually center the steering wheel. It is helpful to start the engine on power steering equipped vehicles during this process. Once centered, verify equal steering wheel free play side to side and shut off the vehicle.

If you have the steering wheel lock tool and the steering wheel level indicator tool now is a good time to install them. The steering wheel locking tool is very helpful, but not absolutely required. However, without the steering wheel locking tool, the job will require more frequent re-centering of the wheel during and after toe adjustments.

While maintaining the steering wheel in a centered position, adjust the front toe to bring both toe scales to zero, or the preferred setting if a small amount of toe-in or toe-out is desired. Toe normally should not exceed one reference mark on the toe scales.

Note the readings at the rear flag scales. Add these readings together and divide by two to obtain the "preferred" reading. For example drivers side reads 12 and passenger side reads 10. Added together is 22, divided by two is 11. Using this example the "preferred" reading is 11. Adjust the tie rods to obtain the preferred reading on the flag scales while maintaining a centered steering wheel.

NOTE: On vehicles with adjustable tie rods for each steerable wheel this will require equal adjustment on each side.

NOTE: it is not critical at this point to have the steering wheel perfectly centered because further adjustments are going to be performed requiring re-centering of the steering wheel.

A rear axle measurement and adjustment will now be performed. It is important at this point that the front wheels are not moved from their present position. If you have the steering wheel lock tool now is a good time to install it regardless of whether the steering wheel is centered or not. It is important that the front wheels maintain their exact position until the rear axle measurement and adjustment are completed.

Carefully remove the laser sensors and the flag scales and reinstall them in reverse without disturbing wheel position. Install the laser sensors on the rear wheels and the flag scales on the front wheels. If rear camber adjustments are to be made they should be made before final rear toe adjustments.

NOTE: If the rear toe is severely out of adjustment it is recommended to "rough" the rear toe-in before camber adjustments, see the following paragraph for toe adjustment procedures.

To measure and adjust the rear axle toe it is necessary to reference rear axle tracking with the flag scale readings. The following procedure will align the rear wheels to the geometric center-line of the vehicle. Adjust the rear toe to bring both toe scales to zero, or the preferred setting if a small amount of toe-in or toe-out is desired. Toe normally should not exceed one reference mark on the toe scales.

NOTE: while the sensors are installed on the rear axle, the toe scales will extend rearward away from the vehicle. In this case, the toe scales must be read in reverse. Indicated toe-in will actually be toe-out, and indicated toe-out will actually be toe-in, as the scales are being viewed in an opposite manner.

Note the readings at the flag scales. Add them together and divide by two, this is the preferred setting. For example the drivers' side indicates a flag scale reading of 12 and the passenger side indicates a flag scale reading of 10. Added together the result is 22, divided by two is 11. This is the preferred setting.

NOTE: flag scales have reference marks only and are not a unit of measure.

Adjust rear axle toe on each side in a manner to maintain correct total toe, and as required to obtain the preferred setting on the flag scales. This completes rear axle measurement and adjustment.

NOTE: not all rear axles have factory-provided for adjustments for all required adjustments. If replacement components are not available to provide the necessary adjustments, or if it is decided not to make these final adjustments, then the final front axle adjustments should follow the procedure for Thrust Angle Alignment.

Next complete the 4-wheel alignment procedure by verifying that the front wheels are in parallel alignment with the rear axle wheels and the vehicle's geometric center-line. This will often require some fine tuning if rear axle adjustments were made.

Once again remove the laser sensors and the flag scales and reinstall them in reverse. Install the laser sensors on the front wheels and the flag scales on the rear wheels.

Sit in the vehicle and visually center the steering wheel. It is helpful to start the engine on power steering equipped vehicles during this process. Once centered, verify equal steering wheel free play side to side and shut off the vehicle. If you have the steering wheel lock tool and the steering wheel level indicator tool now is a good time to install them. The steering wheel locking tool is very helpful, but not absolutely required.

However, without the steering wheel locking tool, the job will require more frequent re-centering of the steering wheel during and after toe adjustments.

If required, fine tune the front toe to bring both toe scales to zero, or the preferred setting if a small amount of toe-in or toe-out is desired. Toe normally should not exceed one reference mark on the toe scales.

Note the readings at the rear flag scales. At this point it is desired to have equal flag scale readings. If these readings are not equal add them together and divide by two to obtain the "preferred" reading. For example drivers side reads 12 and passenger side reads 10. Added together is 22, divided by two is 11. Using this example the "preferred" reading is 11. Adjust the steering axle tie rods equally to obtain the preferred reading on the flag scales, while maintaining the desired toe setting, and a centered steering wheel.

When any 4-wheel alignment is completed it is recommended to perform the steering wheel centering procedure as described previously one last time to verify all readings.

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