# Quarter Midget Baseline Chassis Setup

**The following steps are intended to help handlers understand the basic steps required to setup their quarter midget chassis. Actual settings are not provided as they are different for each brand and model of car plus the class the driver is racing in.**

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| **1. Tire Pressures** | Each time the car is setup make sure to put the tires at the pressure you will race them to make sure that any other measurements taken are relative to how the car will be raced. For asphalt this can be anywhere from 10 to 14 lbs for the right sides at the start of a race and between 5 and 8 for the left rear and 8 to 10 for the left front. |
| **2. Approximate Ride Heights** | Put the car on a level flat surface and then set each corner to the height you want it in race trim. Even though this step will be repeated later it is important to do it now at this point also to ensure the next steps are accurate. Choose whether or not to complete these steps with or without driver and then always do it the same way for uniformity. Because this is kids racing and they are not always easy to find doing without driver is the most common. This means that comparing ride heights with other handlers may not always be a proper apples to apples comparison but it will make sure your process is consistent. If you were to measure from the bottom of the car to a level surface underneath your left side heights are going to be somewhere around ¾ to 1 ½ inches while the right side will be about 1 ½ inches. All car manufacturers have different settings they prefer and I recommend following those. |
| **3. Square the car** | Most often this is done by taking off the wheels and hubs and placing the car into a set of alignment bars. While some setups result in the rear axle being slightly out of square, for a baseline start with it parallel to to the lower roll cage bar in front of or behind the engine. Be careful to measure precisely using squares to your level surface for references to make sure your measurements on each side are consistent. Even 1/16th of an inch in variance will make a big difference. Adjust your rear radius rods accordingly to put the axle square. |

**4. Square birdcages**

Most brand cars are designed so that the rear bird cages or "bearing carriers" are positioned so that the two radius rod mounting points are directly above / below each other. If a line was drawn from the top point to the bottom and continued to your level surface it would be perpendicular to the level surface. Not being square can result in some funny rear axle steering movement as it travels up and down. This is also adjusted by lengthening and shortening the radius rods, again be careful to either make equal adjustments on top and bottom or to re square the rear axle when you are finished.

**5. Set Axle Lead**

Next the front axle lead is measured by tape measuring from the outside edge of the front axle with wheels in straight position (if they were on the car) back to the rear axle with the table parallel to the outside frame rail of the car. There is a big difference is brands of cars with this setting. Anything from from the right side shorter by a quarter inch to the right side longer by a whole inch. This is adjustment by lengthening or shortening the front radius rods. Making sure to adjust the top and bottom rods evenly on the side adjustments are made.

**6. Set Caster Camber**

Caster can be set with either a caster / camber guage or an angle finder. Use an angle finder to measure the angle from the top of the spindle bolt to the bottom parallel to the length of the car front to back. Right front caster is usually set somewhere between 2 and 5 degrees. Caster is adjusted most often by shortening or lengthening a single radius rod on that corner of the car. Tiny adjustments make a big difference. Most front axles have a caster split built into them so setting the caster is done on a single corner and the LF will be what it will be.

**7. Set Front Alignment**

The Toe-In / Toe-Out is set next so that the front wheels are are parallel with each other while the car is in the alignment bars or has the wheels on it on a level surface.

**8. Final Ride Heights**

With all the wheels and tires back on the car and back on your level surface check the tire pressures one more time then re-measure to make sure each corner of the car is set to the desired height.

**9. Wheel Spacing**

Make sure the wheels are moved in or out to the desired position for each corner. This usually means the left sides are tucked in as far as legally possible (not inside the side nerf bars) and right rear in the middle of its adjustment range.

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| **10.Scale the car** | Using anything from accurate bathroom scales to electronic scales put each wheel on its appropriate scale pad and record the weights. Make adjustments to the coil spring collars or torsion bar adjusters to each the Cross Weight or Left Rear Split you are looking for. Make sure to make 4 equal adjustments all the way around the car. This will ensure that the ride heights remain where they should be.<br><br>For example if the cross weight is 50% (LR + RF) / Total and you are looking for 54% then put 1 turn in the LR and RF (clockwise) and take a turn out of RR and LF (counter-clockwise). |
| **11. Practice** | Put the car and driver on the track |

# Quarter Midget Chassis Glossary of Terms

**Ackerman Steering:** As the front wheels turn through the corner the left front turns a shaper corner than the right front. Ackerman is the principle of creating steering geometry so that as the driver turns the steering wheel the left front will turn more than the right. Some quarter midgets have a set amount built in to the spindle and others leave it adjustable.

**Alignment Bars:** These devices are used to line up the front and rear axles for squaring and to set the toe for the front wheels. After the wheels are taken off the car the rear axle and front spindles are placed into the appropriate fixture.

**Axle Lead:** This measures how far out of square an axle is set in the car. Most car builders recommend setting the rear axle with no lead so that when at ride height it is perfectly perpendicular to the cars main frame rails. Front axle lead anywhere from 0 to 3/4 inch is commonly found on various cars, this would be the right side of the axle forward of the left. Front axle lead is determined by measuring from the outside edge of the rear axle forward to the outside edge of the front spindle and comparing the two sides of the car.

**Baseline Setup:** Refers to basic starting points for your chassis setup and includes a setting for each of the variables that can be adjusted. Every type of car uses different baselines and many have different baselines for different type of tracks based on banking, grip, surface, etc. A common practice is to always revert the car to its baseline for the upcoming track so you know exactly where you are when its time for adjustments.

**Bicycling:** This what a car is called when it goes up on two wheels. In the center or exit of a corner a car with too much side bite or grip can transfer enough weight to lift the two left side tires.

**Birdcage Timing:** The birdcages, or "bearing carriers" are the free-floating pieces on the rear axle that connect the axle to the rest of the car. For suspension systems that use two radius rods to join the birdcage to the car frame the "timing" or bird cage angle is important to car setup. Even after the axle is squared it should still be checked. Most cars are designed so that the upper and lower arms are mounted directly above one another. This is because the shock is also connected to the birdcage and if the timing is off then as the car goes through travel the shock mount could rotate forward / back or up / down and create unpredictable results by "jacking" weight onto or off that corner.

**Body Roll:** This is what the car does as it is turned into and goes through the corner. How much the body rolls does not change how much weight transfers but affects how fast and where it transfers from and to the different corners of the car.

**Camber:** Describes the angle of each front wheel and tire if you were looking at the car directly from the front. It is measured in degrees and can be negative or positive. Negative camber means the top of the tire is leaned in towards the car and positive camber means the top of the tire is leaned out away from the car. A small amount negative camber is used on the right front tire of quarter midgets to keep the tire from rolling over when it gets loaded during cornering. Left front tires are usually straight up or have an smaller amount of positive camber. Some cars have specific camber adjustments in their spindles and others are adjusted by using different sized tires on the two sides.

**Caster:** This is angle of the part of the front spindle that it rotates around. Looking at the spindle bolt or "king pin" from the side of the car. If the top is leaned backwards it is known as positive caster and if the top is leaned forward it is negative caster. Too much positive caster and the car will be hard to turn, not enough and it can be very "twitchy" or "darty" for the driver. Most quarter midget axles have a "caster split" built into them of 2 to 5 degrees or so, so that more positive caster can be run on the right front and less positive, 0, or even a small bit of negative caster on the left front. Besides providing tracking and driver feel caster does two other important things. When wheels are turned with caster in them the ride height for that corner is changed so the corner weight is adjusted or "jacked". In addition negative camber is added or "gained" as a wheel with positive caster is turned.

**CG Height:** Center of Gravity Height, refers to the center mass of the car. The higher the CG Height the more body roll will occur. Most important at two points, directly above the front and rear roll centers. If a line was drawn from the front CG Height and rear CG Height it should be parallel with a line drawn between the front and rear roll centers to provide unbound body roll.

**Corner Weights:** When setting up the car it is important to set the corner weights. This means actually weighing each corner of the car on a scale adjusting them by changing the ride heights for each corner. Every car manufacturer has different recommendations for their car that should be followed depending on the springs and shocks that are used.

**Cross Weight:** This term refers the percentage calculated by adding the diagonal combination of left rear and right front corner weights and dividing by the entire car weight. Depending on whether the car is *locked* or not and

depending on how much it is using the LF tire changing the cross weight will either tighten or loosen the car up. Different cars react different.

**Durometer:** Device used to measure the hardness of the rubber on a tire. The readings can be used to compare different compounds of new tires or to track the life of an existing tire that will get harder over time until it is no longer an effective tire.

**Gas Shocks:** Shock absorbers or "dampers" that have a small chamber in them filled with nitrogen to keep pressure against the shock oil so that bubble are not created when the shaft goes in and out.

**Gear Ratio:** A measure of the actual RPM reduction from the engine to the rotating rear axle. It is calculated by dividing the number of teeth on the axel gear by the number of teeth on the engine gear and multiplying that by the engine's gear box reduction ratio. For Honda engines this is 6.0 and for DECO engines it is 5.73. For example a 30 engine gear with a 25 axel gear would be 25 / 30 * 6 = 5.00

**Locked:** Refers to the type of left rear wheel hub used. A locked car uses a hub that directly connects the wheel to the axel while an unlocked car connects the wheel to a hub with a free spinning wheel bearing. A locked car uses both rear wheels to drive the car and an unlocked car uses only the right rear. A locked car is more stable and tighter in the corners but will scrub speed on the straights.

**Loose:** Describes the cars handling when it wants to turn more than the driver is trying to turn it. Also known as over steer.

**Pattern:** The line around the track that the drivers takes the car. Low in the corner and high in the straight for asphalt tracks. Different tracks have different preferred patterns with small differences like how close to the wall the car should be, how far down the straight the car should be before it turns, and just where in the corner the driver should apex. A driver can also adjust their pattern to accommodate the car's handling. Different classes sometimes have different patterns because of the power differences.

**Panhard Bars:** The suspension link that locates each axle laterally in the car. One per axle, this normally straight bar with rod ends connects on one end to the axle and the other on the chassis frame. The center of this bar determines both the height and left to right location of the roll center for that particular end of the car.

**Push / tight:** A car with this handling condition does not turn as much as it should. Its hard to get down to the bottom of the corner in the middle and hard to keep off the wall coming out. It results from the rear tires having more grip than the front. In addition to being hard to keep off the wall this

condition can also bog down the motor exiting the corner.

**Rake:** The difference in ride heights from the back to the front of the car. Positive rake means the rear of the car is higher and is common for asphalt tracks.

**Rear Split:** The difference between the two rear corner weights. Expressed as a single number it is usually expressed as how much more the left rear corner weighs than the right rear. Negative rear split would means the right rear corner weighs more than the left rear.

**Ride Heights:** This measurement describes how far the bottom of the chassis from the ground. It is taken at each corner of the car. Some manufacturers recommend taking from cross tubes whiles others measure directly from the underside of the frame. It is important to track and maintain proper ride heights so the chassis geometry stays as intended.

**Roll Center:** The imaginary point of the chassis that it pivots "over" as is rolls into and our of the corners. Each car has a front and rear roll center. For most QM suspension types it is determined by find the center of the panhard bar for each end of the car. Typically raising the roll center results in less body roll and loosens the car while lowering it lets the body roll more and tightens it up.

**Scaling:** Process of determining how much static weight is on each corner of the car while it is just sitting there. It is done by sitting the car on four individual scales or scale pads.

**Scrub Radius:** The imaginary line between the center of a front tire contact patch and the axis that it pivots around when the wheel is turned. Newer cars tend to have a much shorter scrub radius that results in easier steering and potentially less speed "scrubbed" off through the corner.

**Shock Valving:** The inside make up of a shock that determines how easy or hard it is to push it in or extend it out. Straight valved shocks are the same in both directions while split valve shocks require different levels of force to move them in from moving them out. The higher the shock number the stiffer it is 'valved'. Shocks determine how fast weight is transferred from corner to corner in a car, now how much weight is transferred. Heavier valved shocks are typically required for heavier and faster cars.

**Spring Rate:** The wire thickness, coil diameter, and number of coils a spring has determine the rate of a spring. It is measured as how many pounds of force are required to compress the spring one inch.

**Squaring:** Process of making sure the rear axle of the car is perpendicular to the frame of the car and that front axle is parallel with that. A axle accidentally out of alignment will cause undesired steering.

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| **Stagger:** | Difference in circumference between the two rear tires. When the rear axle is locked up it is important to have the proper amount of stagger so that the rear tires can work together through the corner and not fight each other and scrub speed. Since the outside tire has to go around a bigger circle it requires a bigger size because the same axle is turning both tires at the same time. |
| **Sway Bar:** | A rigid bar that connects one corner of the of the suspension to the other on the same end of the car. Also called an Anti-Roll bar its purpose is to provide roll stiffness to lessen the amount of body roll into and out of a corner. |
| **Tilt:** | The difference in ride heights from the right side of the car to the left side. Positive tilt means the right side of the car is higher than the left. Negative tilt would mean the left side is height. A car with 1/8 inch of tilt would mean the right side of the car is 1/8 inch higher than the left. |
| **Tire Compound:** | Type of rubber used to construct the contact surface of the tire. Every manufacturer has different letter codes to designate the hardness and type of rubber. Softer tires are stickier and provide traction faster but will wear faster and can become too sticky. Harder tires last longer but take longer to "come in" and don't always provide enough traction. The right tire depends on the track surface, class of quarter midget, and chassis setup used. |
| **Tire Pressure:** | Measurement of how much air is in the tire, expressed in pounds per square inch or PSI. Right side quarter midget tires on asphalt are typically between 10 and 15 psi while left sides are typically below 10. |
| **Tire Temps:** | Handlers will often measure and record the surface temperature of the contact area of each tire when a practice or race run is completed to help them make setup adjustments to balance the chassis. Extreme temperatures on a single tire usually indicates a setup that is not balanced. |
| **Toe In / Out:** | "Toe" refers to one of the front wheel alignment adjustments. Looking at the front wheels from the top of the car if they are parallel to each other then the toe is set to zero, the most common setup for a quarter midget. Toe In means the front of the tires are pointed to each other and Toe Out means the front of the tires are pointed away from each other. Too much Toe either direction will scrub speed from the car but a slight bit of Toe Out can provide some steering stability, especially for newer drivers. |
| **Torsion Bar** | A rigid bar that is mounted on each corner of the car so that when the chassis goes up and down it twists and absorbs force like a coil spring does. Very common on dirt cars and older quarter midgets. |

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| **Weight Percentages:** | Used to record corner weights when scaling a car. Left side percentage, Rear percentage, and Cross Weight are all calculated by adding the two appropriate corner weights and dividing them by the total. |
| **Wheel Offset:** | Used to describe how a particular width wheel is divided between its "inside" and "outside" halves. For two piece wheels its is the width of each half while one piece wheels are described by their total width and the distance between the plate where the hub mounts and the inside edge. For example an 8 inch wheel with a 3 inch backspace. |
| **Wheel Spacing:** | Refers to where the wheel is positioned on its axle in relation to inside or out. Right rear wheel spacing is a common adjustment for then handling of the car. Moving that wheel in tightens the car while moving it out can loosen the car. |