XRAY

THE ART OF PERFORMANCE

XRAY T1 EVO 2

SET-UP BOOK

Contents:

Introduction

Car setup can be a difficult and controversial step in getting your car to its maximum performance. Even if you have extensive knowledge of your car and know all the theories on handling dynamics, this knowledge is still tedious to use in practice because of the inherent complexity in the set-up process itself.

Your new T1 EVO2 touring car with fully independent suspension features the highest number of adjustments possible to get the most performance out of any track condition. Setting the car is necessary to make the car perform well. We have developed these straight-forward procedures to help you set up your T1 EVO2 properly and easily. Always follow these procedures step-by-step, in the order presented, and always make sure that you make equal adjustments on both left and right sides of the car.

The set-up described here is a good starting point, but you may adjust the settings to better suit different track conditions. Only change one thing at a time, in order to get a better understanding of what consequence each change has on the handling of the car. Remember to document all the changes you make, and the effect they have on your car and lap times.

XRAY publishes new set-up information, hot tuning tips, and the latest hop-ups for your T1 EVO2 on the www.teamxray.com website. XRAY, as a member of www.myTSN.com, publishes all news at the myTSN.com RC portal. As a proud owner of a T1 EVO2, you can register your car at myTSN.com and you may post your own set-ups to the website, either as public or private data, and even link the set-ups directly to a particular track or event (providing that those are present on myTSN.com).

In the following pages we have used the tools and accessories listed below for perfect and optimal adjustment:

#10 8201 HUDY Set-up Board for 1/10
#10 8211 HUDY Set-up Board Decal for 1/10
#10 9300 HUDY Universal Set-up for All 1/10 Touring Cars
#10 7702 HUDY Chassis Droop Gauge Support Blocks
#10 7712 HUDY Chassis Droop Gauge -3 to 10 mm
#10 7715 HUDY Ride Height Gauge
#10 7610 HUDY Caster Clip Remover Tool
#10 7880 HUDY Chassis Balancing Tool
#18 1030 HUDY 3mm Turnbuckle Tool

Final Adjustments

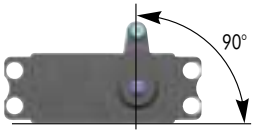
CHASSIS PREPARATION

XRAY has already taken the extra step of sanding the edges of the upper and lower chassis plates so they are smooth before shipping them. You might want to take it even further by sealing the outer edges of the lower chassis plate with cyanoacrylate (CA) glue, though this is not necessary, since the specially-designed overlapping nylon front bumper protects the leading edge of the chassis from abrasion. Put a drop of thick CA on a cotton swab and apply it to the edge of the chassis. Make sure not to let any excess glue drip on the surfaces of the chassis plate. Slowly work your way around the whole outer edge.

The battery cutouts in the T1 EVO2 chassis were designed to fit the latest 2400mAH and 3000mAH batteries. However, if you used excess glue when assembling your saddle packs they might not fit properly. File the edges of the battery cutouts at a 45-degree angle but be sure not to sand so much that the batteries sit below the bottom of the chassis.

RADIO ADJUSTMENTS

First, remove the servo horn from the steering servo, and disconnect the motor wires (be sure not to let the motor wires short circuit), then turn the transmitter on. Next, connect the battery pack and turn on the power switch on the speed control. Set the steering trim to neutral on your transmitter, then reconnect the servo horn so that it is leaning in slightly towards the center line of the chassis.



Now that the steering servo is centered, use the transmitter to turn the steering left and right, noting if the wheels are moving in the proper direction. If not, change the steering servo direction (servo reverse) on the transmitter and re-center the servo horn if necessary.

Next examine the T1's servo saver. Use the steering link adjustment to get the servo saver as centered as possible.

Next examine the front wheels. Make sure that they are pointing straight ahead. If not, adjust the two steering rods equally until the wheels point straight ahead.

When adjusting the servo, the steering must be adjusted so that the steering block does not hit the pivot balls. If it does, decrease steering throw with your radio's EPA setting, or with the dual-rate setting if EPA is not available. Failure to do so can greatly reduce the life of your servo and influence the racing performance.

SPEED CONTROL ADJUSTMENT

Set up the speed control according to the manufacturer's directions.

NOTE: Some manufacturers require the motor to be connected during adjustment.

CONNECT THE MOTOR

Elevate the T1 on a stand so that all four wheels can spin without touching anything. Switch the power on again. Check the speed control and steering settings once again to make sure they work properly. When finished, turn the power off and disconnect the batteries.

BATTERY AND SPEED CONTROL PLACEMENT

The speed control position depends on the position of batteries. The T1 EVO2 allows you to position the batteries forward or rearward on both sides of the chassis (3+3 saddlepacks), place all six batteries along one side of the chassis, or use 6-cell stick packs. The position of the batteries will change the handling characteristics of your car.

1. REAR

Batteries are placed in rear
= more rear traction, less steering.

2. CENTER

Batteries are placed in the middle
= slightly more steering than full rear
slightly less rear traction than full front.

3. FRONT

Batteries are placed in front
= less rear traction, more steering.

4. ALONG ONE SIDE

Batteries are placed along one side. Use when track layout has a high percentage of corners turning one direction or use for oval racing. Make sure to balance the car using additional weights on the other side of the chassis, if required. Note: It may be more difficult to balance the car.

5. STICK PACKS

Use the optional #306170 Stick Pack Holder to use 6-cell stick packs.

RECEIVER PLACEMENT

You have several options for mounting the receiver. The location will depend on the battery and speed control positions. Choose the location that provides the best weight distribution on your car. Use double-sided tape to mount the receiver.

NOTE: Depending on where you mount the receiver, you can install the antenna mount in two different places on the chassis.

MOTOR GEARING

To get maximum performance from your motor, proper gearing is critical. The gear ratios listed in the chart are the recommended starting gear ratios. Ratios can vary from track to track, but what we list is a good starting point for your tuning. Remember not to change pinions more than one tooth at a time, and that overgearing can damage your motor.

CAUTION: Excess heat caused by overgearing can destroy your motor.

NOTE: There should be just a tiny amount of play between the pinion teeth and the spur teeth.

Overall Gear Ratio Chart				pitch 1/48"
pinion / spur g.	87	90	93	96
20				10.20
21				9.71
22			8.98	9.27
23			8.59	8.87
24			8.23	8.50
25		7.65	7.91	8.16
26		7.36	7.60	
27		7.08	7.32	
28	6.60	6.83	7.06	
29	6.38	6.59		
30	6.16	6.38		
31	5.96	6.17		
32	5.78			
33	5.60			
34	5.44			

Overall Gear Ratio Chart				pitch 1/64"
pinion / spur g.	116	120	124	128
27				10.07
28				9.71
29			9.09	9.38
30			8.78	9.07
31			8.50	8.77
32			8.23	8.50
33		7.73	7.98	8.24
34		7.50	7.75	
35		7.29	7.53	
36		7.08	7.32	
37	6.66	6.89	7.12	
38	6.49	6.71		
39	6.32	6.54		
40	6.16	6.38		
41	6.01	6.22		
42	5.87			
43	5.73			
44	5.60			
45	5.48			

diff pulley 34T / one way pulley 16T

drive ratio 2.125 : 1

DIFFERENTIAL ADJUSTMENT

Differentials allow the wheels at opposite ends of the same axle to rotate at different speeds. Why is this important? When a car turns in a circle, for example, the outer wheel has a larger diameter circle to follow than the inner wheel. The outer wheel must travel further than the inner one in the course of the circle, so it needs to rotate faster to keep up. If the differential is too tight, the result is that the wheels "fight" each other for the proper rotation speed; the result is a loss of traction.

- *For optimal performance, the rear differential should be as free as possible, with minimal slippage.*
- *When the front differential is looser than the rear one, steering response will increase.*
- *When the front differential is tighter, steering response decreases, but there is more stability in the turns.*
- *A tighter rear diff will make the car understeer slightly into the corner, but it will make the car more difficult to control out of the corner (powerslides).*
- *Make sure that neither diff slips under power, as this will cause power loss and excessive wear.*
- *On very high traction surfaces, the diffs can be adjusted tighter for better response.*

Building the differentials:

When you build a differential, DO NOT tighten it fully; build the diff and tighten very gently. If you overtighten the diff initially, the diff balls will mar the surface of the diff plates and the diff balls and plates will become damaged. For exceptionally smooth operation and long diff life, we advise that you use the XRAY Carbide Diff Balls #305091.

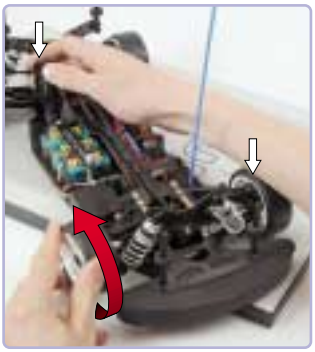
Tighten the diff until you feel some resistance. To check the diff, hold both wrenches in one hand and try to rotate the pulley. It should take some force to get the pulley to slip between the two outdrives. Then remove both wrenches and rotate one of the diff halves while holding the pulley stationery. The action should feel smooth. If it doesn't, loosen the diff screw 1/16 to 1/8 of a turn. Final adjustment will be made with the diff in the car and on the track.

Breaking in the differentials:

Differentials must be broken in properly in order to operate properly. When breaking in the diff, the balls create a groove in the diff rings; this is normal and essential for proper operation. If you tighten the diff fully the first time you build it, the ball will not create a proper groove, and will become damaged. After the car is completely assembled, run the car for few minutes, then tighten each diff a little bit. Repeat this several times to break in the diff and set the correct tightness.

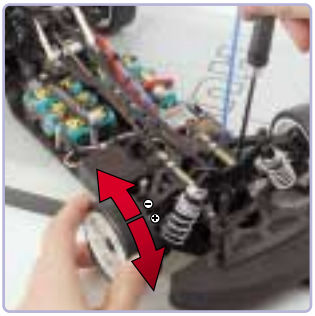
Adjusting the front differential:

Place the car on the table with the front end pointing towards you. To check front diff tightness, hold the spur gear with your right hand and hold the left front wheel against the table with your right forearm, and try to rotate the front right wheel with your left hand **backwards**. If the front right wheel rotates too easily, you need to tighten the front differential.



The diff output shaft on the left side of the car has a hole in it. Place a small hex wrench into the hole. Rotate the front right wheel until the wrench goes all the way through. With the wrench in place, rotate the front right wheel **forwards (+)** to **tighten** the diff. To **loosen** the diff, rotate the front right wheel **backwards (-)**.

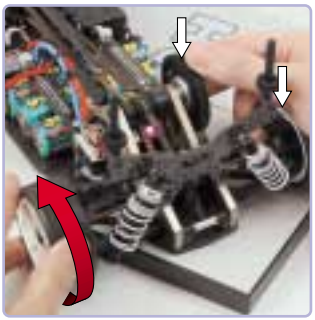
Tighten or loosen the diff only in 1/8 turn increments, checking the diff tightness with each adjustment.



<u>The initial setting</u> should be that the differential action is smooth, but tight enough so that it takes high effort to rotate the right wheel when the left one and the spur are held tight.

Adjusting the rear differential:

Place the car on the table with the rear end pointing towards you. To check rear diff tightness, hold the rear right wheel and the spur gear with your right hand, and try to rotate the rear left wheel with your left hand. If the rear left wheel rotates too easily, you need to tighten the rear differential.

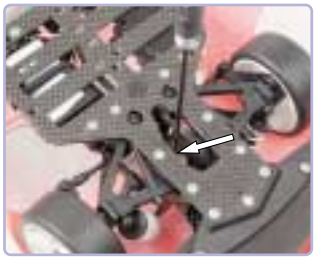


The diff output shaft on the right side has a hole in it. Place a small hex wrench into the hole. Rotate the rear left wheel until the wrench goes all the way through.

With the wrench in place, rotate the rear left wheel **backwards (+)** to **tighten** the diff. To **loosen** the diff, rotate the rear left wheel **forwards (-)**.

Tighten or loosen the diff only in 1/8 turn increments, checking the diff tightness with each adjustment.

<u>The initial setting</u> should be that the differential action is smooth, but tight enough so that it takes high effort to rotate the left wheel when the right one and the spur are held tight. Run the car for approximately one minute. Then recheck the diff adjustments by again following the steps above. Your diffs should be ready.



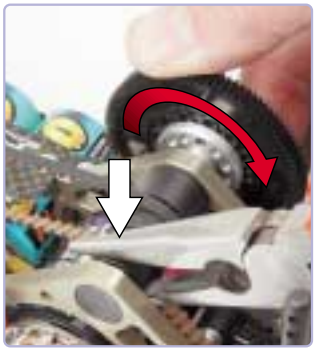
Hint: The chassis is designed so that you can very easily adjust the tightness of the differentials without taking the body off. Just turn the car over and adjust the differential from the bottom of the chassis.

ONE-WAY PULLEY ADJUSTMENT

The one-way pulley allows the front wheels to spin independently from the rear wheels. Our unique one-way system lets you determine how freely the front wheels spin. The plastic locknut on the spur layshaft can be fully tightened to lock the front wheels to the rear (full-time 4WD) or loosened to let the front free wheel off power (4WD on throttle, RWD off throttle). Or it can be set somewhere in between to match your driving style.

1. Loosened one-way pulley

The main effect of the loosened one-way is more off-power steering. However, it should only be used on high traction surfaces or large tracks where minimal braking is required; since only the rear wheels are used for braking, spins induced by a locked rear tire are more likely. One of the benefits of a loosened one-way pulley is less drive train drag at maximum speed. This can increase top speed.

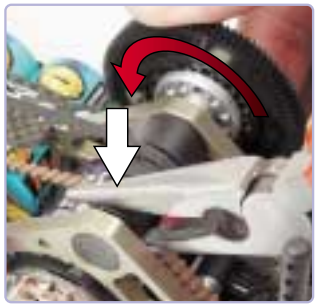


To let the front wheels freewheel, hold the locknut securely with pliers, then rotate the spur gear backwards. The locknut will back away from the fixed pulley and move towards the left bulkhead.

NOTE: Pull the fixed pulley away from the one-way pulley to let the front belt move freely without binding.

2. Tightened one-way pulley

The pulley should be tightened under slippery conditions, if you need to lessen steering, or if heavy braking is needed.



To tighten the one-way pulley, hold the locknut securely with pliers, then rotate the spur gear forwards. The locknut will tighten the fixed pulley and move towards the right bulkhead.

ONE-WAY FRONT DIFFERENTIAL (available option)

What is the difference between the one-way pulley and the optional one-way diff?

The one-way pulley allows differential action under acceleration. That means that when going through a turn on throttle, if the inside wheel breaks traction, it can still "unload" and prevent the outer wheel from getting any power. The optional front one-way differential (#30 5100) gets around this problem by giving each wheel its own independent one-way bearing. This way, the two wheels can rotate at different rates, like with a regular differential, but on throttle, if one wheel looses traction, the other one still gets power to pull the car through the turn.

Keep in mind that when using the one-way pulley with a loose setting or when using the one-way differential, no drag brake should be used. Most racers will also find it more convenient to set their radio to give less braking action (use the throttle EPA setting); this will prevent the rear tires from locking unexpectedly.

Use table below as a general guideline for the use of the one-way pulley and one-way differential.

Track surface	One-way pulley		One-way front differential
	locked	loosened	
Low traction	✔		
Medium traction (slow, tight corners)	✔	✔	
High traction (slow, tight corners)		✔	
High traction (fast, sweeping corners)			✔

SHOCKS

Shocks, or shock absorbers, are a part of the suspension that allow the wheels to keep as much contact with the running surface as possible. Damping, mounting position, spring tension, and spring preload are all characteristics that determine how the shock performs.

Shock settings:

The T1 EVO2 features unique 4-step externally adjustable racing shocks that do not require you to change pistons or change the oil to alter the damping. Initially, the damping should be set separately for the front and the rear so that the car quickly settles when dropped from approximately 5 cm (2"). For our initial settings, if it bounces before settling, it is too stiff. If it slaps the table, it is too soft.

- ***Soft damping*** *will produce most grip (both front and rear) through chassis roll, but this will also decrease the cornering speed.*
- ***Hard damping*** *will make the car break traction more easily, but with less chassis roll and higher cornering speed.*

Springs:

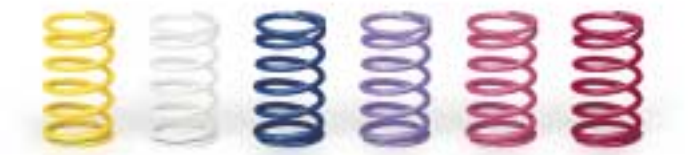
The shock springs support the weight of the car. Different spring tensions determine how much of the car's weight is transferred to the wheel relative to the other shocks. The spring tension also influences the speed at which a shock rebounds from compression.

Spring selection depends on the whether the track is fast or slow, or has high or low traction.

- ***Stiffer springs:*** *Makes the car feel more responsive, more direct. The car will react faster to driver input. Stiff springs are suited for tight, high-traction tracks that aren't too bumpy. Usually when you stiffen the whole car, you lose a small amount of steering. Stiffer springs reduce chassis roll.*
- ***Softer springs:*** *Better for bumpy and very large and open tracks. They can also make the car feel as if it has a little more traction in low-grip conditions. Springs that are too soft make the car feel sluggish and slow. Softer springs allow more chassis roll.*
- ***Stiffer front springs:*** *The car will be more stable, but will have less front traction and less steering. It will be harder to get the car to turn, the turn radius will be bigger. The car will have a lot less steering exiting corners. On very high-grip tracks, if the track itself feels tacky or sticky, very stiff springs are preferred.*
- ***Softer front springs:*** *The car will have more steering, especially in the middle and exit of the corner. Front springs that are too soft can make the car oversteer.*

- ***Stiffer rear springs:*** *Rear traction is reduced. The car will have more steering in the middle and exit of the corner. This is especially apparent in long, high-speed corners.*
- ***Softer rear springs:*** *Rear traction is increased in corners as well as through bumpy sections and while accelerating.*

XRAY spring tensions:



YELLOW	WHITE	BLUE	VIOLET	PURPLE	RED
super-soft (#30 8393)	soft (#30 8394)	soft-medium (#30 8395)	medium (#30 8396)	medium-hard (#30 8397)	hard (#30 8398)

Spring preload:

Adjust the spring collar on the shocks so that the springs are only slightly compressed when the car is fully equipped, ready-to-run. Spring preload should only be used to alter ride height. It is advised to change to a softer or harder spring to change the characteristic of the springs, rather than fully loosening or tightening the standard included ones.

Hint: File a small notch on the top of each spring collar so you can tell when you have adjusted it one full rotation.

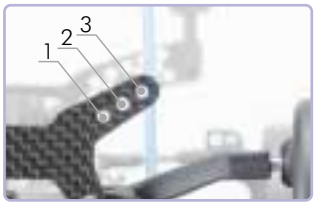
Shock position:

The upper and lower shock mounting points determine how much leverage the lower suspension arm has on the shock when compressing it, and the progressiveness of the suspension. The different settings change how the shock reacts to compression.

- ***Shocks more inclined:*** *More progressive, smoother feel and more lateral grip. Having all shocks inclined makes the car very easy to drive, and it feels like the car has more grip, but it's not always fastest.*
- ***Shocks more vertical:*** *More direct feel, but less lateral grip (side-bite).*
- ***Front shocks more inclined than rear shocks:*** *Steering will feel very smooth and there will be a little more mid-corner steering. Mounting the rear shocks very upright can result in the rear feeling unpredictable and more nervous in turns.*
- ***Rear shocks more inclined than front shocks:*** *The car will feel aggressive turning in, but most of the time the car have a little less steering. The car will have a lot of side traction in the rear, and turning radius won't be very tight.*

Upper positions - front shocks:

There are three upper shock mounting positions to choose from on the front shock tower.

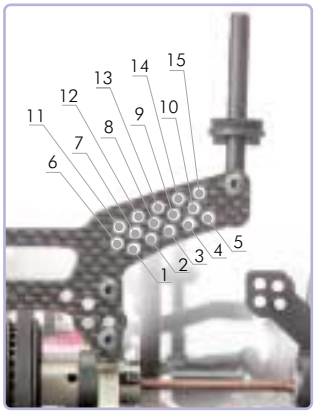


Initial setting:
Front shocks: position #2

Upper positions - rear shocks:

There are numerous upper shock mounting positions to choose from on the rear shock tower.

- ***Top row of holes:*** *use with Serpent shocks (longer)*
- ***Middle row of holes:*** *use with larger tires and XRAY shocks (shorter)*
- ***Lower row of holes:*** *use with smaller tires and XRAY shocks (shorter)*

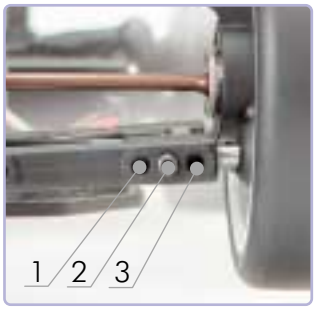


Initial setting:
Rear shocks: position #7

Lower positions - rear shocks:

There are three lower shock mounting positions to choose from on the rear lower arms.

- ***Outside position #3:*** *Harder damping - less grip but lower chassis roll. Stability is decreased, but high-speed cornering, traction permitting, is increased.*
- ***Middle position #2:*** *Optimum position for most tracks.*
- ***Inner position #1:*** *Softer damping - higher stability. Traction is increased, but so is chassis roll; not good for fast corners.*



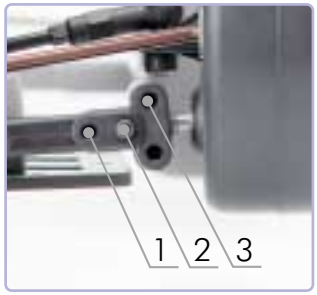
Initial setting:
Rear shocks: middle position (#2), both rear arms.

Lower position - front shocks:

There are three lower shock mounting positions to choose from on the front lower arms.

- ***Outside position #3****: More stable, less steering. With the front suspension stiffer, there is more stability.*
- ***Middle position #2****: Optimum position for most tracks.*
- ***Inner position #1****: softer damping, better steering. As the front suspension gets softer, more traction is taken away from the rear, causing the car to lose stability.*

NOTE: Never use the lower of the two holes that are on top of each other in the outer position. Use of the lower hole will severely restrict the front end ride height.



Initial setting:
Front shocks - middle position (#2), both front arms.

Shock absorber damping:

Shock absorber damping influences the responsiveness of the chassis during cornering, and helps to maintain proper contact between the tire and the road surface during vertical movement. Setting the right damping is therefore always a compromise and requires a lot of "hands on" experience.
No shock damping means that the spring rate determines how long it takes for the spring to compress and the suspension to reach a stable position.

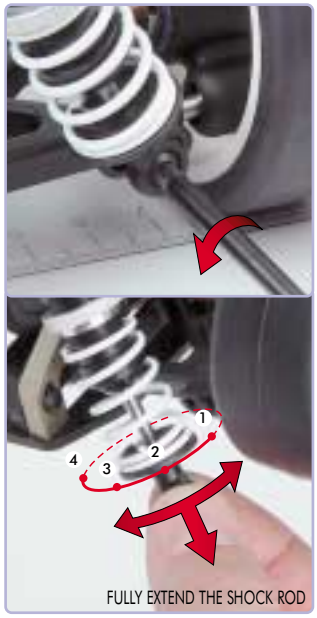
Damping only comes into play when the suspension is moving, and loses its effect when the suspension has reached a stable position. When the spring is compressed or decompressed, the shock absorber oil resists this movement. The two factors that determine the speed at which the shock reacts are the thickness of the oil and the piston valving (the number of holes in the shock piston the oil passes through).

Damping adjustment:

Disconnect the lower shock mount from the arm. Fully extend the shock rod and turn it slightly to lock the piston in the shock body.

- Turning the shock rod fully **CCW** aligns 4 holes in the pistons = **softest damping**.
- Turning the shock rod fully **CW** aligns only 1 hole in the pistons = **hardest damping**.

The XRAY adjustable shocks have 4 settings, each of which can be felt by a little "click".



Initial settings:
Front shocks: 2 holes open (medium)
Rear shocks: 4 holes open (lightest)

Oil:

- ***Thicker oil*** *- slower shock action -- slower chassis weight transfer from side to side or front to rear. In general, the slower shock action means less traction, but the slower weight transfer means the car is less likely to get unsettled with sharp direction changes, like chicanes.*
- ***Thinner oil*** *- faster shock action -- faster chassis weight transfer. Faster shock action means that the suspension can work faster to keep the tire in contact with the surface quicker; that means more traction. But it also means the chassis is more susceptible to chassis roll and getting unsettled in sharp direction changes.*

Keep in mind that thicker oil will require the use of heavier springs to compensate for the heavy damping action. Likewise, thinner oil requires lighter springs.

Pistons:

- ***Less pistons open:*** *acts much like using thicker oil.*
- ***More pistons open:*** *acts much like using thinner oil.*

TIRES & INSERTS

Tires and inserts are probably the most important factors in getting the best performance from your car; getting them right is the first thing you should do. When you arrive at the track with a basic car set-up, select the best tires and inserts for your track, then fine-tune your set-up. Check with the other racers who frequent your track for a good starting point. As a general guideline, use treaded or radial pattern tires on dusty or unprepared surfaces, and use slicks on high-traction prepared surfaces.

Here are a few basic rules: Select the rubber compound according to the track temperature. Higher temperatures usually require harder compounds. Firm inserts are better for quick direction changes, since they'll scrub off less speed in high-speed chicanes. Soft inserts give a little more grip, and they also make the car easier to slide: the difference between gripping and slipping (one end sliding out) isn't as harsh. Soft inserts allow you to 'throw' the car into the corner, and they probably make the car easier to drive. Sponge-type inserts are much lighter, (less rotating mass means quicker acceleration), but they don't retain heat as well. So it's more likely that the tires will overheat towards the end of the race. Molded inserts are heavier, but they retain heat better.

Regularly rotate your tires from side to side for even wear. If the same compound and inserts are used on all four corners, then rotate front to rear as well.

BODIES & AERODYNAMICS

Aerodynamics play an important role in the performance of the car. One body may simply work better than another body. Aerodynamic effects are more apparent at high speeds, and have little influence in slow corners.

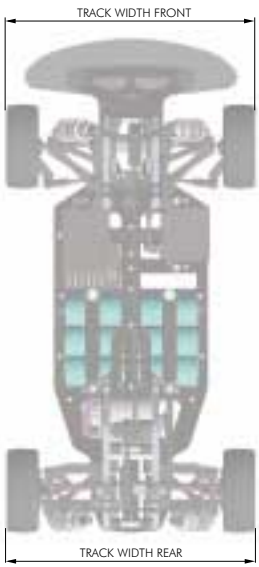
In general, blunt-nosed bodies are more stable, and have less steering than bodies with a sloped nose. Another important consideration is the rear wing. The higher it's mounted, and the bigger it is, the more rear downforce it will generate. A body with high downforce will help the car get lots of traction throughout the turns. But high downforce usually comes at the expense of drag, so the car may not be the fastest on a long straightaway.

Experiment with bodies that have different frontal areas and different wing shapes to find the one that works best for you. Like most other tuning parameters, body style is also a compromise. Experiment to find out what bodies work best at your track.

Chassis Set-up

TRACK-WIDTH

Front track-width affects the car's understeer and steering response. Increasing track-width will result in more understeer, while decreasing it will result in less understeer and faster steering response.



The track-width is measured on the outside of the wheels.

It is important that the track-width is adjusted symmetrically, meaning that the right and left wheels must be the same distance from the center-line of the chassis.

Hint: Use the Hudy Set-up Board with Set-up Board Decal nicely marked with 1 mm grid.

Setting Front Track-width:

Turn both pivot balls IN equally to reduce track-width, turn them both OUT equally to increase track-width.
Remember to reset the front toe setting by adjusting the lengths of the steering rods equally to compensate for the width adjustment.

Initial setting:
Front track-width: 189mm

Setting Rear Track-width:

We recommend that you DO NOT change the rear track-width, otherwise it would decrease the stability of the car. But if necessary, you can change the trackwidth to accommodate different wheels with different offsets.

Initial setting:
Rear Track-width: 189mm

DOWNSTOPS

Downstops limit how far the suspension arms travel downward, which determines how far upwards the chassis rises. The amount of downward suspension travel affects the car's handling, as it directly impacts the weight transfer of the chassis. Restricting upward chassis travel (more downstop) reduces the weight transfer of the chassis, making the car more stable. Allowing more upward chassis travel (less downstop) increases the weight transfer of the chassis, making the car more responsible but less stable; it is also better on a bumpy track. The effect may change with the type of track and/or amount of grip available. It is very important to adjust the downstops such that the left and right sides are equal. Downstops are checked with the chassis elevated above a reference surface.

Hint: Use Hudy Set-up Board and Droop Gauge Tool.

Perform these initial steps:
1. Remove the wheels from the car. Disconnect anti-roll bars if mounted.
2. Place the #10 7702 support blocks on the reference surface, then place the chassis on the elevating blocks.

Front downstops:

Using the #10 7712 measuring gauge, measure the distance from the reference surface to the bottoms of the steering blocks. Positive numbers indicate the distance (in mm) ABOVE the level of the support blocks (or, above the bottom of the chassis). Negative numbers indicate the distance (in mm) BELOW the level of the support blocks (or, below the bottom of the chassis).

Adjust the front downstop screws so that the bottoms of the steering blocks are at the recommended setting on the gauge.

Initial setting: 2 mm on gauge.
(Actual measurement = 2 mm above the level of support blocks).

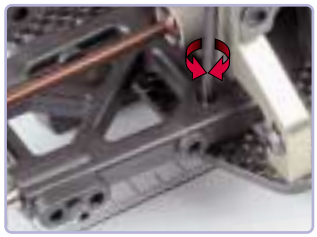
The downstops depends on the diameter of tires and track condition. The above setting was for smaller tires (approx. 63 mm) and a smooth track.

Rear downstops:

Adjust the rear downstop screws so that the bottoms of the rear uprights are at the recommended setting on the gauge. Note that the REAR pivot ball hole should be used for downstop measuring.

Initial setting: 6mm on gauge.
(Actual measurement = 6mm above the level of support blocks).

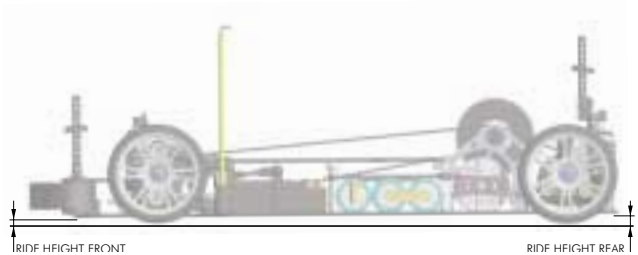
The downstops depends on the diameter of tires and track condition. The above setting was for smaller tires (approx. 63 mm) and a smooth track.
Also, if you have too much steering while coming into corner off throttle or while braking, try adding 1mm to the rear downstop setting. This will cut down on the amount of weight that is transferred away from the rear tires when off the throttle.



RIDE HEIGHT

This describes the height of the chassis in relation to the surface it is sitting on. This adjustment must be made with the chassis ready-to-run but with no body. The shock preload collars are used for raising and lowering the ride height.

Perform these initial steps:
1. Prepare the car ready-to-run, without body.
2. Place the car on Hudy Set-up Board and use #10 7715 Ride Height Gauge to measure the ride height in front and rear.



Use the shock preload collars to raise or lower the ride height.

Initial settings:
Front ride height: 5mm
Rear ride height: 6mm

Try using a slightly lower ride height for high traction conditions, such as carpet racing.

ANTI-ROLL BARS (available option)

Anti-roll bars are used to stabilize the car from excessive chassis roll (which occurs when the car leans through the turns by centrifugal force).
Anti-roll bars are generally used on smooth, high traction track conditions. If the conditions are very bumpy, then anti-roll bars are probably not necessary.

NOTE: Anti-roll bars adjustment is performed with disconnected shocks.

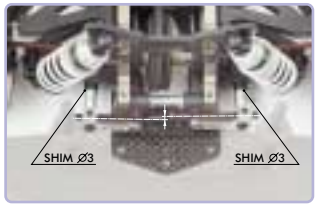
Front anti-roll bars:

If you are driving on a high traction surface and your car tends to oversteer, use the optional front anti-roll bar kit (#30 2400). This will decrease the front chassis roll and decrease steering throughout the corner. This will give your car more rear traction.

Installing the front anti-roll bar:

1. Mount the anti-roll bar levers to the holes on the lower arms.
2. Insert both male and female anti-roll bars into the holes and secure them with a screw in the top of the duraluminum levers.

NOTE: If you look at the anti-roll bar from above, the male anti-roll bar needs to fit straight into the female anti-roll bar. When viewed from above, the male and female anti-roll bars should appear to make a straight line. If this is not the case, insert shims as needed between the duraluminum anti-roll bar lever and the arm to get the female and male anti-roll bars to fit straight.



Adjusting the front anti-roll bar:

The front anti-roll bar is very easy to adjust. Loosen the screws on the top of the duraluminum levers and rotate the blades. To soften the anti-roll setting, rotate the blades so they lay flat. To stiffen the anti-roll setting, rotate the blades so they are vertical. You can also adjust the hardness of the anti-roll bar anywhere in between flat and vertical for fine tuning.

Blades flat (parallel to ground) -- softest setting

Blades at 45-degree angle -- medium setting

Blades vertical (perpendicular to ground) -- hardest setting

Checking the front anti-roll bar for proper functioning:

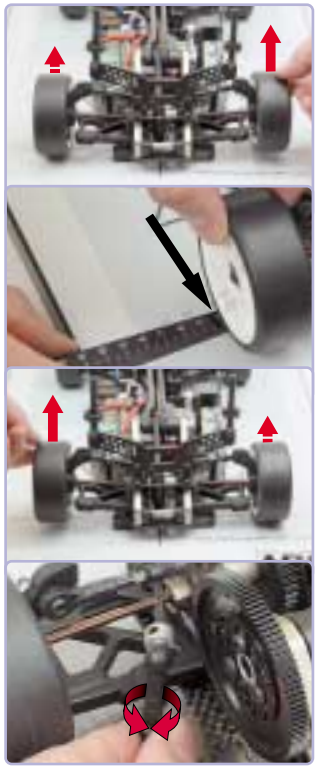
1. First, be sure you have adjusted the downstops equally on both sides.
2. Place the car on the flat board and disconnect the shocks.
3. Lift up the front right wheel very slowly. When the front left wheel starts to lift off the surface, note how far the front right wheel has been lifted.
4. Do the same thing on the other side. Lift up the front left wheel very slowly. When the front right wheel starts to lift off the surface, note how far the front left wheel has been lifted.
5. When properly adjusted, both wheels should start to move up at the same lifted position of the other wheel. If this is not the case, then the eccentric cam needs to be adjusted.
6. Loosen the eccentric cam screw from the front (you will need to use a wrench under the foam bumper).
7. Rotate the eccentric cam little by little until both wheels move up at the same lifted distance. Tighten the set screw when the adjustment is complete.

Hint: If you have the anti-roll bar installed and the track conditions do not require its use, you do not need to dismount the anti-roll bar. Just loosen the two screws on the top of the anti-roll bar levers, then move both the male and female anti-roll bars so they disconnect, then tighten the screws again. Now the anti-roll bars are disconnected.

Rear Anti-roll bar:

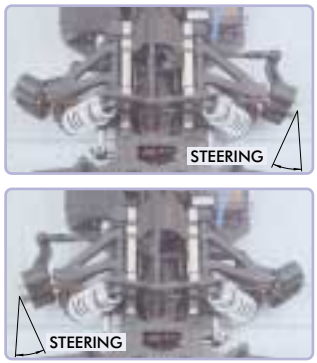
If your car is understeering, then try the optional rear anti-roll bar (#30 3400). The rear anti-roll bar will decrease rear chassis roll and decrease rear traction. This will give your car more steering.

Checking the rear anti-roll bar for proper functioning:



1. First, be sure you have adjusted the downstops equally on both sides.
2. Place the car on the flat board and disconnect the shocks.
3. Lift up the rear right wheel very slowly. When the rear left wheel starts to lift off the surface, note how far the rear right wheel has been lifted.
4. Do the same thing on the other side. Lift up the rear left wheel very slowly. When the rear right wheel starts to lift off the surface, note how far the rear left wheel has been lifted.
5. When properly adjusted, both wheels should start to move up at the same lifted position of the other wheel.
If this is not the case, then the anti-roll bar needs to be adjusted.
6. Make sure the wire is not tweaked. If it is, correct it by carefully bending it straight.
7. If the wire is straight, try to decrease or increase the height of the pivot link on one of sides by adjusting the distance of the pivot balls. Adjust it little by little until both wheels move up at the same lifted distance.

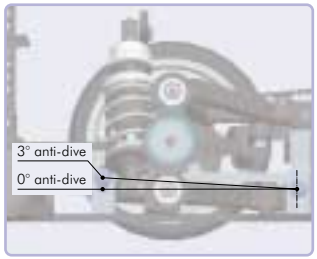
ACKERMAN AND STEERING THROW SYMMETRY



Ackerman is a term describing the effect of the inside front wheel turning tighter than the outside front wheel. We have designed the T1's steering system with the optimal Ackerman setting for a touring car, so you do not need to waste time adjusting it. But it is important that turning radii are the same when the car is turning either left or right. Put the car on a Hudy Set-up to make sure that the steering turns as sharply to the left as it does to the right. If it is not the case and if your radio has EPA (End Point Adjustment) settings, adjust the EPA on your transmitter in order to achieve symmetry The wheels should turn equally in both directions for balanced handling.

When adjusting the servo, the steering must be adjusted in the way so the steering block does not hit the pivot balls. If it does decrease steering throw with your radio's EPA setting or with the dual-rate setting, if EPA is not available.

FRONT ANTI-DIVE



Front anti-dive refers to the angle at which the front suspension is mounted in relation to horizontal when looked from the side of the car.

NOTE: Only the two lower holes are used for the front anti-dive. The front upper hole is a production hole.

You have two possibilities:

Lower hole (0° anti-dive): This setting works especially well in bumpy conditions, due to the constant caster angle when the suspension is compressed. However, steering is not as responsive as the 3° anti-dive setting.

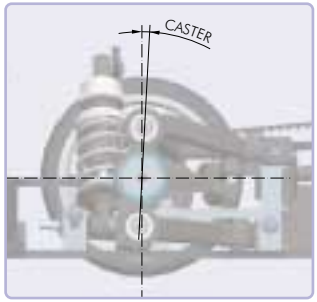
Upper hole (3° anti-dive): This setting gives the T1 more aggressive steering when braking and especially while cornering, due to a decrease in caster when turning off-throttle.

Front anti-dive is adjusted very easily.
Loosen the screws that mount the rear lower suspension holders. Now remove the two screws that hold the front lower suspension holders and move the whole suspension up or down and tighten the screws back.

Initial setting:
Front anti-dive: 3° (upper hole)

CASTER ANGLE

Caster angle is the angle between an imaginary line connecting the top pivot ball and the bottom pivot ball of the steering block, with respect to a line perpendicular to the ground. Caster angle affects on- and off-power steering, as it will tilt the chassis more or less depending on how much caster is applied.



Less caster (more vertical) increases OFF-power steering INTO a corner, but decreases straight-line stability.
More caster (more laid-down) increases ON-power steering OUT OF a corner, and increases straight-line stability, but makes the car harder to turn in.

The caster angle is adjusted with nylon spacers which are inserted either in front of or behind the upper front suspension arm. More spacers in front of the arm will increase the caster angle; less spacers will decrease the caster angle.

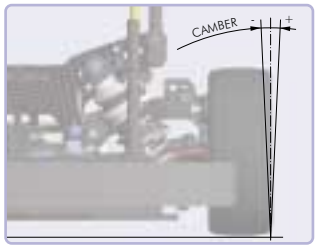
Use the table below as guideline for setting the caster angle. Use clips 3, 2 and 1 mm.
The clips indicated are used before the arm and the rest behind the arm.

Clip mm	0	1	2	3	3+1	3+2	3+2+1
Caster	0.6°	2.5°	4.3°	6.2°	8.0°	9.8°	11.5°

Initial setting:
Front caster: 2mm gap (2mm shim in front of the upper arm, 1+3 mm shims behind)

DRIVING CAMBER

This describes the angle the wheels ride relative to the ground when looked at from the front or back.
Negative camber means that the tire leans inward at the top.
Positive camber means that the tire leans outward at the top.



Camber affects the car's traction. In general, more negative camber means increased grip since the side-traction of the wheel increases. Never use positive camber, and never use more than 2.5-degrees negative camber.

Hint: Use Hudy Set-up.Perform these initial steps:
A. Remove wheels.
B. Put the car on the Hudy Set-up.
C. Press down the suspension of the car a few times to let the suspension settle.

Adjusting front camber:

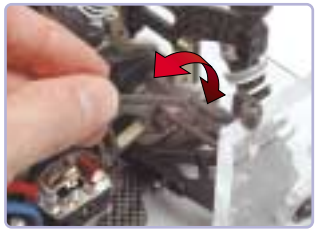
Adjust the front camber with the upper pivot-ball. When tightening it in you will increase the negative camber. By loosening it you will decrease the negative camber. If you tighten the upper pivot ball one rotation, the lower pivot-ball should be loosened by the same amount.

Initial setting:
Front camber: -1.0° (tops of front wheels leaning inwards)

NOTE: The amount of front camber required to maintain the maximum contact patch largely depends on the amount of caster. Higher degrees of caster require little or no camber, while lower degrees of caster require more negative camber.

Adjusting rear camber:

Adjust the rear camber making the upper link longer or shorter. Longer upper link will make the camber less negative. Shorter upper link will make the camber more negative (larger camber).



Initial setting:
Rear camber: -1.5° (tops of rear wheels leaning inwards)

Rear camber link position:

We have thoroughly tested the settings for the camber link position on the bulkheads and the point on the adjustable ball end is the optimal one. On the rear uprights you have four mounting locations.

Initial setting:
Position 3 (outer, bottom).

If you make adjustments:
Longer link = more traction and less stability.
Shorter link = less traction and greater stability.
Lower mounting positions will provide more traction.
Higher mounting positions will give less traction.

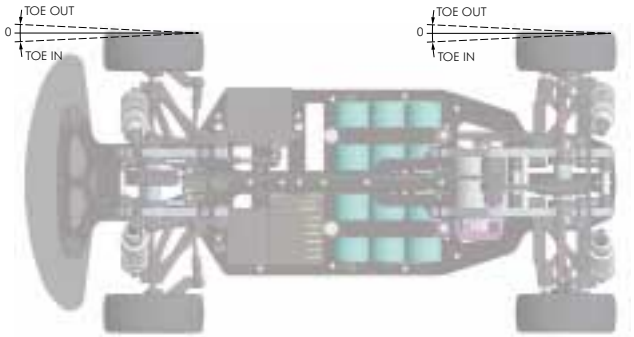
NOTE: Always use the same link position on both sides of the car, for example, the top outermost hole on the left upright, and the top outermost hole on the right upright.

TOE-IN & TOE-OUT

Toe-in is the angle of the wheels as looked at from directly above the car. When the wheels are parallel the toe-in is 0-degrees. When the front of the wheels are pointing away from each other, that is called toe-out. When the front of the wheels are pointing in towards each other, that is called toe-in.

Toe-in is used to stabilize the car at cost of traction. In case of oversteer (the rear end losing traction before the front end does) extra toe-in on the front may take some oversteer away but also some steering. In case of understeer (the front end losing traction before the rear end does) some toe-in on the rear may help, but this makes on-power cornering a little more difficult.

Front toe-in will make your car easier to drive by improving stability during acceleration, and gives a slight increase in steering exiting corners.
Front toe-out will increase steering when entering corners but will be slightly more difficult to drive.
Perform these initial steps:
A. Remove wheels.
B. Put the car on the Hudy Set-up.
C. Turn the receiver and radio on and turn the wheels left and right to let the steering set into the neutral position.
D. Press down the suspension of the car a few times to let the suspension settle.



Adjusting front toe-in:

Front toe-in is adjusted with the steering-rods that connect the servo-saver to the steering blocks. Making the steering-rods longer will create more toe-in,

while making them shorter will toe-out the wheels. Be sure to adjust both steering-rods in equal amounts to reach the desired toe angle.
Measure the front toe-in using Hudy Set-up tool.

Initial setting:
Front toe-in: 0° (front wheels are parallel)

Adjusting rear toe-in:

Rear toe-in is adjusted with the pivot balls in the lower part of the rear upright. Adjustments must be made by equally turning in one pivot ball and the turning out the other pivot ball the same amount to maintain the preset camber angle. It is important that the right and left rear toe-in angles are adjusted equally, otherwise the car may pull to one side.

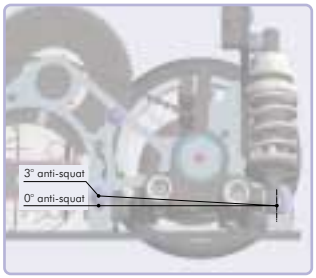
For more rear toe-in, turn in the front pivot ball and turn out the rear pivot ball. For less rear toe-in, turn out the front pivot ball and turn in the rear pivot ball. Remember to make equal (but opposite) adjustments to the pivot balls so as not to change the track-width.

Measure the rear toe-in using the Hudy Set-up tool.

Initial setting:
Rear toe-in: +2.0° (fronts of rear wheels pointing inwards).

Never use more than 4.0 degrees or less than 1.0 degree (except maybe when using foam tires on carpet).

REAR ANTI-SQUAT



Rear anti-squat refers to the angle at which the rear suspension is mounted in relation to horizontal when looked at from the side of the car.
The rear anti-squat can be adjusted very easily. Move one end of the suspension at a time. (For example, move the rear left and right lower suspension holders, then move the front left and right lower suspension holders.) Remove the two screws of the holders you are going to move, and loosen the screws of the other holders. Shift the holders with the removed screws to the appropriate holes, then reinsert the screws. Tighten all four screws when you have finished.

0° anti-squat (lower holes 2 and 1): Improves acceleration in bumpy conditions, and gives more side-bite, on-power and while braking. The car will feel easier to drive in low-grip situations, and will be easier to slide the rear end.

3° anti-squat (holes 3 and 1): Provides good rear traction, makes the rear of the car more sensitive to throttle input. The car will have more steering while braking, and also a little more powering out of corners.

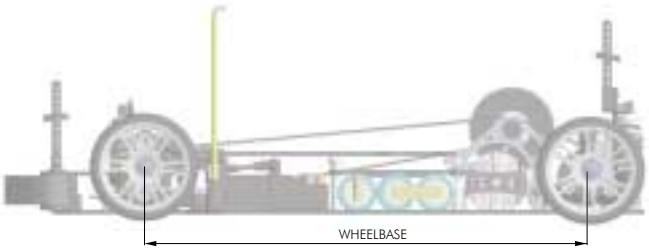
By moving the lower suspension holders to both upper positions, you alter the car's roll center (upper holes 3 and 4 = 0° anti-squat).

Initial setting:
Rear anti-squat: 3° rear anti-squat (holes 3 and 1)

WHEELBASE

The T1 is the only touring car that offers wheelbase adjustment in a 9 mm range that enables you to adjust this car for all conditions, either asphalt or carpet, fast or technical. The wheelbase is adjusted very easily using clips on the pivot pins.
Moving the spacers in front of the rear arm will lengthen the wheelbase.
Moving more spacers behind the rear arm will shorten the wheelbase.

• A ***shorter wheelbase*** makes the car more aggressive and turn better. It also increases rear traction by placing more weight behind the rear arms. Shorter wheelbases are better on carpet tracks.
• A ***longer wheelbase*** makes the car more stable, but reduces rear traction. Longer wheelbases are better on smooth, fast tracks especially asphalt tracks with long corners.
For wheelbase adjustment always use only the 4, 3 and 2 mm clips. Anyway, if you wish, you can use also the 1 mm clips, but keep in mind that the sum of all the clips used must always be 9 mm.



Hint: Use the Hudy Caster Clip Remover for easy adjustments.

Initial setting:
Wheelbase: 3+2mm clips in front of arm, 4 mm clip behind arm

When adjusting the wheelbase, keep in mind that you will need to adjust the distance that the adjustable ball protrudes from the bulkhead. A shorter wheelbase will require you to extend the ball from the bulkhead, while a longer wheelbase will require you to insert the adjustable ball further into the bulkhead.

Initial setting:
Extend ball 10mm from the bulkhead

To change the length of the adjustable balls, loosen the top screw in the bulkhead and slide the ball in or out according to your wheelbase setting.

Make sure that the left and right settings match. For accuracy, use the depth gauge of a caliper to measure the distance between the top of the ball and the side of the bulkhead.

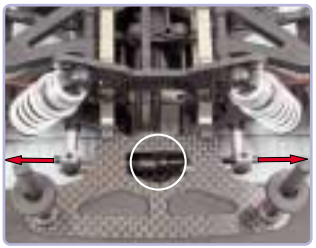
Use this table as the guideline to calculate the wheelbase setting.

Clips (mm) before arm	Clips (mm) behind arm	Wheelbase (mm)
0	4+3+2	252
1	4+4	253
2	4+3	254
3	4+2	255
4	3+2	256
3+2	4	257
4+2	3	258
4+3	2	259
4+4	1	260
4+3+2	0	261

CHECKING FOR SUSPENSION TWEAK

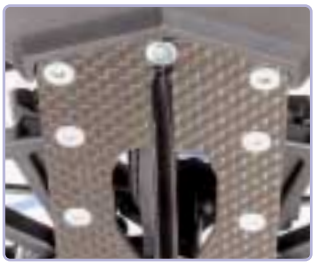
A "tweaked" car is an unbalanced car, and has a tendency to pull to one side under acceleration or braking. Tweak is caused by an uneven wheel-load on one particular axle. Now that the suspension geometry set-up has been completed, you must check for suspension tweak before you reconnect the anti-roll bars (optional).

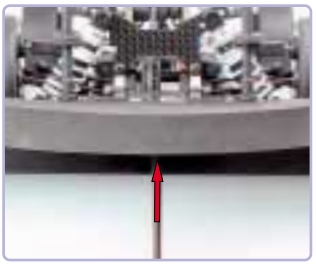
Perform these initial steps:
1. Place the car on a flat reference surface.
2. Make sure that both front and rear anti-roll bars are disconnected.



Checking for tweak from the front of the car:

Lift and drop the front end of the car a few centimeters to let the suspension settle. Place a sharp tool underneath the chassis at its middle point, and lift the front end.
If one front wheel lifts before the other, the rear of the car is tweaked. Adjust the preload on the rear springs until both front wheels lift at the same time.





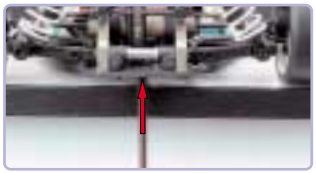
If, for example, the front right wheel lifts earlier, you must increase the preload on the rear left spring, and decrease the preload on the rear right spring.
You must adjust both rear springs, otherwise you will change the driving camber!
Reconnect the rear anti-roll bar, and check for tweak again by lifting the front end of the car. If again one

front wheel lifts before the other, the rear anti-roll bar may be tweaked. Check the anti-roll bar with both shocks disconnected from the arms and with the chassis suspended on blocks. Make sure that the downstop adjustments are set equally. Then adjust the length of one or both rear anti-roll bar push rods until both front wheels lift at the same time. There might happen that the wire is tweaked and therefore the

suspension with connected anti-roll bars is tweaked as well. Carefully straighten the wire, and then check for tweak again. Both wheels must start lifting up at the same time.

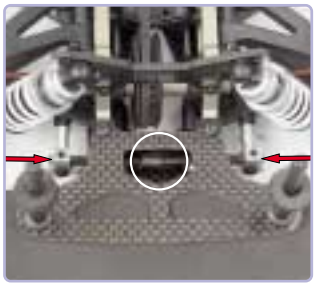
Checking for tweak from the rear of the car:

Lift and drop the rear end of the car a few centimeters to let the suspension settle. Place a sharp tool underneath the chassis at its middle point, and lift the rear end. If one rear wheel lifts before the other, the front of the car is tweaked.



Adjust the preload on the front springs until both rear wheels lift at the same time.
If, for example, the rear right wheel lifts earlier, you must increase the preload on the front left spring, and decrease the preload on the front right spring.
You must adjust both front springs, otherwise you will change the driving camber!

Reconnect the front anti-roll bar, and check for tweak again by lifting the rear end of the car. If one rear wheel still lifts before the other, the front anti-roll bar is tweaked. Loosen the screw on the left front anti-roll bar mount. Adjust the eccentric cam until both rear wheels lift from the ground at the same time. Tighten the screw to secure the adjusting cam.



Chassis Balancing

Battery positions:

The chassis can be balanced by moving the batteries into multiple possible configurations, influencing placement of the speed control and receiver. Refer to page 3 for the different battery placements and the influence onto the cars behavior.

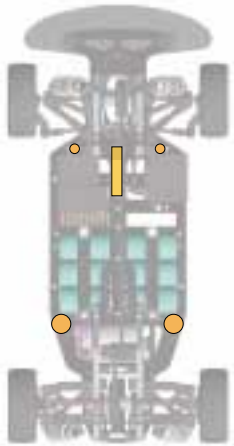
Chassis weights:

For advanced balancing, you can use a special, but simple tool from Hudy #10 7880. Place the chassis on the two holes drilled on the center line of the chassis.
When the chassis falls to one side the other side is not balanced. Use one of the following additional weights to balance the chassis so the both sides have the same weight and chassis stays in vertical position when placed on the chassis balancing tool:

- #30 9820 Additional Weights for Chassis Balancing (front - 2 pcs)
- #30 9830 Additional Weights for Chassis Balancing (rear - 6 pcs)

If you need to load the front suspension use:

- #30 9850 Additional Flat Weights for Chassis Balancing (center - 3 pcs)



The orange spots show where the additional weights should be mounted onto the pre-drilled holes.

All these adjustments depend on the type of the track. If the tracks has more left-corners, put the load to the left side. If the track has more right corners, put the load on the right side.

Fake transponder:

If you are preparing for a race where transponders will be used, you will benefit from practicing with weight distribution you will be actually racing with. If you use the optional **Precut Foam Bumper For Transponder (#30 1221)** and optional **Graphite Upper Holder For Precut Bumper (#30 1214)**, you should purchase Hudy's Fake Transponder For Chassis Balancing (Hudy #10 7890). This fake transponder has the same weight and dimensions as a real transponder, and using it is a great way to check the weight distribution on your car, fully equipped, ready-to-run with transponder.

Maintenance & Tips

Maintenance is of utmost importance. First, maintain your car, and then work on chassis set-up. Before every race, examine the following items:

Drive train:

Check the drive shafts, wheel axles and differential pulleys for wear. Excessive wear may cause these transmission joints to lock-up and affect the suspension movement. Also check the middle layshaft and belts and all gears. Remove any debris (dirt, grass, sand, pebbles) which may have become embedded between the teeth.
We recommend putting a little grease on the plastic blades at the end of the drive shafts and onto the drive shaft coupling.

Drive train binding:

Disconnect the pinion gear and pull the belt. If there is binding in either the front or rear belt, one or more of the bearings may either be installed improperly or worn out. Check the bearings that support the diff outdrives (in the bulkheads) and the ones that support the axles (in the rear uprights and steering blocks).

Belts:

The belts should not be taut like a guitar string. They should be loose enough that you can wobble the belt up and down, but tight enough that the belt does not slip off a pulley under braking or acceleration.

Belt tensioner (available option):
The T1 EVO2 chassis was designed to eliminate any fore/aft chassis flex. And it's Kevlar-reinforced belts will resist stretching longer than most others.
There is an optional belt tensioner available (#30 3070), but it will mostly likely not be required on the T1 EVO2.
The T1 EVO2 has special bulkheads and eccentric ball-bearing hubs that allow you to adjust front and rear belt tension without having to use an the optional front belt tensioner.

Differential maintenance:

You should rebuild the differentials when the action gets somewhat "gritty" feeling. Clean all parts with motor spray, then reassemble and re-adjust them. If they still feel gritty, the diff washers and steel balls should be replaced. If the gritty feeling remains, check the small 3x8 axial ball-bearing (thrust ball-bearing) and washers, and replace as necessary.

Suspension:

Disconnect shocks and check the suspension arms for free movement. A tight arm may indicate a bent pivot pin, which should immediately be replaced. Excess play indicates that the a pivot pin holder is worn out. Check for the correct orientation of the plastic suspension holders. They should be in the same direction.

Shocks:

Check the shocks for proper functioning. Check for air bubbles and make sure that the left and right sides have the same damping setting.

Pivot balls: Check the pivot ball joints. Remove any excess play by tightening the aluminum adjustment plugs. If they are binding, loosen the plug slightly. If loosening the plug does not free up the action, take it out and clean the whole assembly (pivot ball, cup, plug, and upright).

Ball cups and shock ends: If you have any play (side-to-side, or lateral play; this doesn't refer to the 'looseness' of the ball cup) in these parts, you need to replace the plastic part so you get a more responsive suspension setup.

Bearings: Freely rotating bearings are one of the most important factors in getting maximum performance from a car's drive train. Be especially sure that the bearings in the steering blocks and rear uprights, as well as the bearings supporting the ball diffs, are perfectly clean and rotate freely. Check all the bearings, including the one-way bearing, for wear.
Use light machine oil on the ball-bearings, and special one-way bearing oil on the one-way bearing. If they start to feel gritty, they should be cleaned with motor spray and then lubricated with a light oil. If they still feel gritty after being cleaned and lubricated, or if the bearing races develop play, they will need to be replaced.

Motor: Between every run, carefully inspect the brushes to ensure that they move freely in the brush hood. Do this by removing the spring and sliding the brush in and out of the hood. If the action is not smooth, remove the brush and wipe it clean. This will help ensure that the brush gets proper contact with the commutator. Also after every run, remove the brushes from the hoods and examine the brush face for wear and/or burning. If there is noticeable wear, replace them with a fresh pair. If the tip is a purple or blue color, that means they have been overheated and burnt. Burnt brushes have more resistance that fresh ones, so be sure to replace them if they are burnt.

About every other run they should be thoroughly cleaned. Spray the motor cleaner directly on the commutator area through the brush hoods. Spray in short bursts until the runoff is clear and clean. After cleaning, apply a small amount of lightweight oil to each bushing or bearing for lubrication. Be careful not to apply too much oil, for this will pick up dirt and contaminate the commutator and brushes. Around every ten runs, we recommend rebuilding the motor by cutting the commutator. If you have a motor with low winds and high-capacity batteries, we recommend cutting the commutator more often. We recommend using lathes from the R/C accessory manufacturer with the highest quality - **HUDY®.**

Radio equipment : Check your radio equipment, speed control, motor and batteries for proper functioning.

Screws: When assembling or rebuilding your T1, if you find that a screw has an eccentric or defective head, exchange it for the same type in the "last-aid-package". If you mount the eccentric screw on the chassis instead of exchanging or replacing it, the screw might tweak the chassis and negatively influence the car's handling.

Last-aid-package:
In the kit there is a small package with some mounting hardware. We have prepared and included this special "last-aid-package" for the times when you might loose some of the smaller hardware, either during assembly or when racing. We know how distracting that situation can be, especially when you want to keep focused on properly preparing your T1 for the track. This package contains a few spare pieces of each fastener and clip used on your T1 that should help you if you get caught in that situation.

Replacement mounting hardware:
Contact your XRAY dealer for replacement mounting hardware, using the following part numbers:
#30 9300 Hardware Mounting Package
#30 9310 Wheels Mounting Hardware (4+4)
#30 9320 Hex Screw Set for T1 (30)
#30 9400 Body Clip (8)
#30 9401 Long Clip For Transponder (2)

Front wheel axle disassembly:
In an extreme crash, the front wheel axle may get pressed out, which will make it hard to disassemble the wheel axle and exchange it, because the assembly will be recessed inside the steering block.
If this happens, support the two pivot holes a few centimeters off the table with metal or wood blocks, and let the hex axle point down towards the table.

Then use a small hammer to tap on the end of the drive shaft (you may want to first remove the plastic blade) until the axle and bearing assembly can be easily removed from the steering block.

Use a file to remove any material from the axle that was pressed out along with the axle assembly.