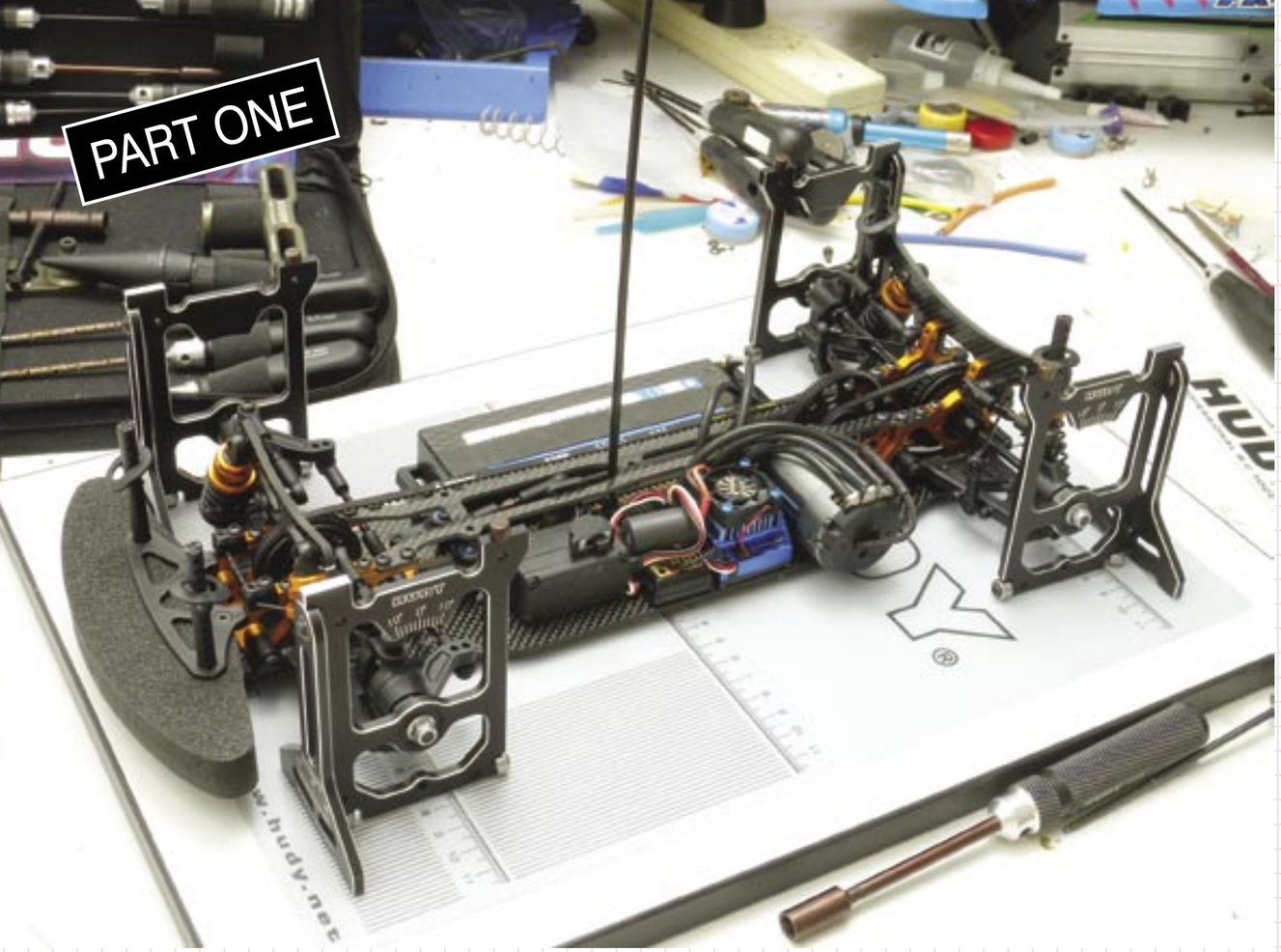


ON ROAD SETUP GUIDE

Commencing the first installment of the On Road Setup Guide by **ANTHONY ATACK.** Although the model used is an XRAY T3, the principles remain the same for almost all on road cars.

RIDE HEIGHT

RIDE HEIGHT is a measurement of how much clearance there is from the bottom of the chassis to the track surface.
It is an important setting, as if it is too low, the car will bottom out on the track, unsettling the car.

While if it is too high, it can cause the car to roll excessively and not handle to its full potential.

RIDE HEIGHT		
Lower ride height	Wind the spring collars up	• Better on smooth tracks • Car reacts faster • More overall grip
Higher ride height	Wind the spring collars down	• Better on bumpy track • Car reacts slower • Increased chassis roll • Less overall grip
Staggered ride height	Adjust collars so that rear ride height is 0.5mm higher than the front	• Increased steering into corner • Car holds into corner better • Increased oversteer on-power

Ride height is adjusted by the preload of the spring collars.

Winding them down will raise the ride height, while winding them up will decrease the ride height.

It is important to note that adjusting the spring collars does not alter the stiffness of the springs; it is used only for adjusting ride height.

Ride height is easily measured with a ride height gauge such as the one that comes with the Hudy setup system.

When measuring front ride height, you will want to pick a spot at the front of the car, such as under the front arms where there is no heavy chassis wear, for consistent results.

Same goes for measuring the rear ride height.

You will want to find a spot towards the rear of the chassis that doesn't wear on the track heavily, such as under the rear arms.

A good starting point is 5 - 5.5mm of ride height.

This can be slightly lowered on smooth tracks and raised on bumpy tracks.

Running a stagger in the ride height, by running half a millimetre more ride height in the rear than the front, can help the car turn and hold into a corner better.

DROOP

DROOP IS a measurement of how much down travel the suspension has, or how much up travel the chassis has before the wheels leave the ground.

This is a powerful setting, as it controls weight transfer as the car pitches and rolls.

Droop is adjusted by screwing the droop screws in the arms in for less droop or out for more droop.

This is best measured with a droop gauge, such as the one that comes with the Hudy setup system.

A droop gauge measures the height of the outside of each arm in relation to the chassis, with a higher value indicating less actual droop and a lower value indicating more actual droop, as the arms hang closer to level with the chassis.

The ideal amount of droop will change depending on the size of the tyres you use, how much ride height you are running and also varies from brand to brand, so check your car's manual for a suggested starting point.

Typically it will be within a range of 4 – 7mm on the gauges.

It is important to set the droop equally from left to right, however it is not uncommon to use a different value on the front to the rear.

FRONT DROOP		
More front droop	Lower value on droop blocks Droop screw is backed out	• Increases weight transfer to rear on-power • Smoother steering reaction • Better on bumpy tracks • Decreases high speed steering
Less front droop	Higher value on droop blocks Droop screw is wound in	• Decreses weight transfer to rear on-power • More responsive steering reaction • Better on smooth tracks • Increases high speed steering
REAR DROOP		
More rear droop	Lower value on droop blocks Droop screw is backed out	• Increases weight transfer to front under brakes • Better on bumpy tracks • Car reacts more smoothly • More steering in tight corners
Less rear droop	Higher value on droop blocks Droop screw is wound in	• Decreases weight transfer to front under brakes • Better on smooth tracks • Car reacts quicker • More stable under braking

CAMBER

CAMBER REFERS to the angle of the wheel in relation to the track.
At 0° the wheel is perpendicular with the track.

A negative value has the top of the wheel leaning in towards the centre line of the chassis, while a positive value has the top of the wheel leaning away from the centre line of the chassis.

Camber is typically adjusted to achieve an even wear pattern across the contact patch of the tire.

A negative value is always used, with -1° to -2° camber proving optimal on most tracks.

The best way to measure and adjust camber is with a setup station or camber gauge while the car is resting at ride height with everything mounted in it, as if it is ready to run.

Increasing the amount of negative camber will generally result in more grip at that end of the car in corners, as the side-bite of the tire is increased.

More negative camber is gained by shortening the upper camber link, while lengthening the link will reduce the amount of negative camber.

FRONT CAMBER		
More negative camber	Shorten the front upper camber link	• Increased steering
Less negative camber	Lengthen the front upper camber link	• Decreased steering–easier to drive
REAR CAMBER		
More negative camber	Shorten the rear upper camber link	• Increased grip and stability in corners • Decreased high speed stability
Less negative camber	Lengthen the rear upper camber link	• Decreased grip and stability

TOE

TOE DEPICTS the parallel relationship between the left and right hand tyres at each end of the car.

When viewed from above, the wheels have toe-in when the front of both wheels angle inwards to a point in front of the car, while toe-out has the front of both wheels angling outwards.

On the front end, toe is most accurately adjusted by using a setup station with the car ready to run (minus the shell) and resting at its ride height.

While being careful to keep the right and left steering links equal to each other, shortening them will give more toe-out, while lengthening them will give more toe-in.

An optimal setting on most cars is somewhere between +1° toe-out and -1° toe-in.

Front toe-out will make the car easier to drive down the straights and can make the car more settled in high speed sweepers, with more overall steering.

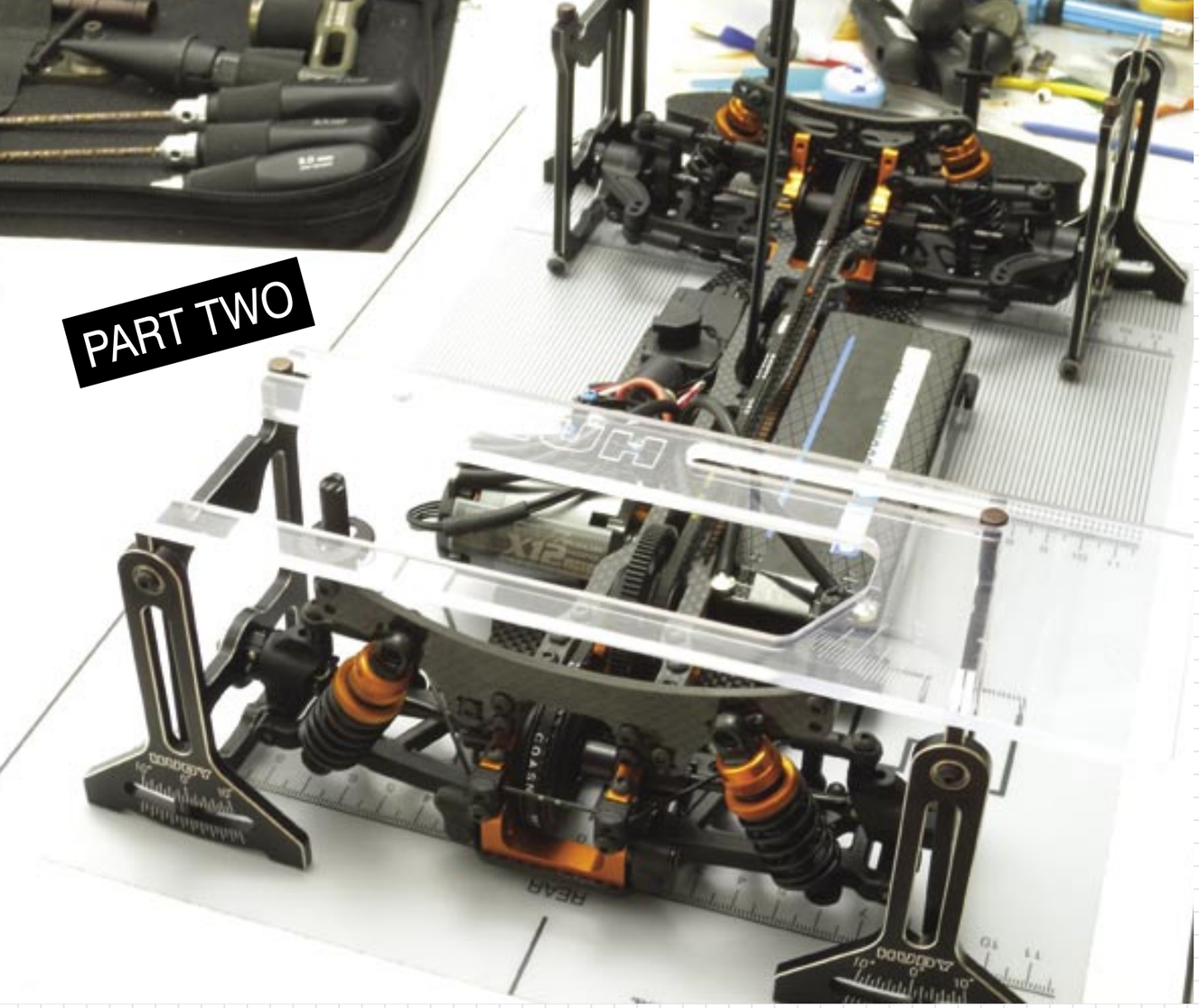
Toe-in often has the opposite effect on the car.

On the rear end, toe is controlled by the toe blocks.

This is commonly adjusted within a range of -2° and -3.5° toe-in, by either adding/removing shims or using aftermarket toe blocks to change the angle of the arms.

Increasing the rear toe-in increases the grip and stability of the rear end; while reducing the amount of toe-in frees the car up, allowing it to rotate more in corners.

FRONT TOE		
More toe-in	Lengthen the front steering link	• More nervous off centre • Car wanders more on straights • Decreases overall steering • Makes the car more difficult to drive
More toe-out	Shorten the front steering link	• Car track straighter • More stable in high speed sweepers • Increased overall steering • Makes the car easier to drive
REAR TOE		
More toe-in	Decreases the spacing at the front of arms Increase the spacing at the rear of arms	• Increased rear grip • Increased stability • Increased understeer
Less Toe-in	Increase the spacing at the front of arms Decrease the spacing at the rear of arms	• Decreased rear grip • Reduced stability • More rotation, decreased understeer



PART TWO

ON ROAD SETUP GUIDE

Continuing the On Road Setup Guide by **ANTHONY ATACK.** Although the model used is an XRAY T3, the principles remain the same for almost all on road cars, EP or GP.

STEERING THROW & TRIM

IN ORDER for your car to be as easy to drive as possible, it's important that it drives in a straight line when the steering wheel is centred.

Equal turning circles at full lock in both directions will also ensure that the car is as predictable as possible in the turns.

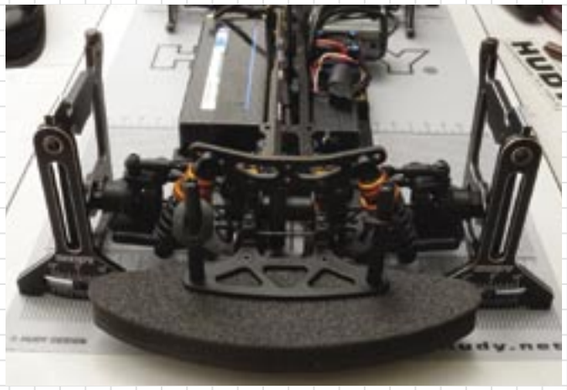
Once the steering trim has been adjusted on the radio to centre the steering, the next step is to set the steering throw in both directions.

This is best done on the setup station, allowing you to precisely measure the amount of steering in degrees so that it is equal in both directions.

If, however, you don't have a setup station, this can be done by eye and but you will need to measure out the turning circles in both directions on the track to ensure they are equal.

On most cars you will want to increase the steering end points slowly until the physical steering throw on the car maxes out, and then subtract a few clicks to ensure the servo isn't trying to strain against the steering beyond this point.

Once on the track, you can turn the overall steering percentage back until you achieve the desired amount of steering, which is purely personal preference.



GEAR RATIOS

FINDING THE ideal gear ratio is all about keeping the motor running in its optimum range for as much of the lap as possible.

This will vary from track to track, as a bigger track with longer straights will require you to 'gear up' so that the motor isn't reaching full RPM too early on the straight.

While on smaller tracks, you will need to 'gear down' to ensure the motor is able to rev out and not be stifled by trying to push too big of a gear.

This is something that becomes easier with experience.

Different motors, even of the same wind, produce different power bands so the starting ratio for each motor will be different.

It is, therefore, best to consult the manufactures' recommended ratios and ask the fast guys at your local track what a good starting point would be.

This will help you avoid damaging your motor, as running incorrect gearing can cause it to build up heat very quickly.

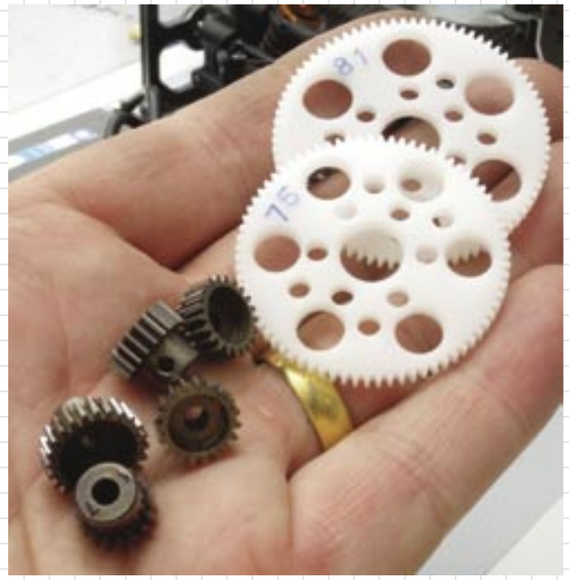
The most common measurement of gear ratio is Final Drive Ratio (FDR).

This is calculated by dividing the number of teeth on the spur (S) by the number of teeth on the pinion (P) and then multiplying that by the car's internal drive ratio (I) which is usually found in the back of your car's manual. (S / P * I).

Increasing the size of the pinion is often referred to as gearing up.

Resulting in a 'taller' gear ratio as the FDR is a smaller number, meaning the wheels turns over closer to 1:1 with the motor.

Going to a smaller pinion is commonly referred to as gearing down and results in a FDR of a higher number, meaning the motor has to turn over more times for each revolution of the wheels.



GEAR RATIOS		
Gear up – "taller ratio" *FDR of a lower value*	Use a bigger pinion or smaller spur gear	• For longer tracks • Motor takes longer to reach full RPM, with increased top speed.
Gear down – "shorter ratio" *FDR of a higher value*	User a smaller pinion or bigger spur gear	• For shorter tracks • Motor accelerates to full RPM quicker, with increased acceleration

DIFFERENTIALS

THE HIGH speeds in the modern EP Touring classes means most common choice of front differential is a locked diff, commonly referred to as a spool.

This is because a spool makes the car more stable to drive than any of the other options, providing excellent braking capabilities with all four wheels acting when the brakes are applied.

The locked action then helps to pull the car out of the corner on-power.

The other option that may prove advantageous in the Stock classes, especially on flowing tracks with no heavy braking zones, is the one-way.

A one-way allows the front wheels to free wheel off-power, providing more steering and corner speed, while still driving all four wheels on-power to pull the car out of corners.

However, because the front wheels are disengaged off-power, only the rear wheels will be acting when the brakes are applied.

This can cause the car to spin quite easily, if the brakes are applied, so a different driving style is required.

Ball differentials have long been the standard option for the rear end, however gear differentials are now being explored as an option.

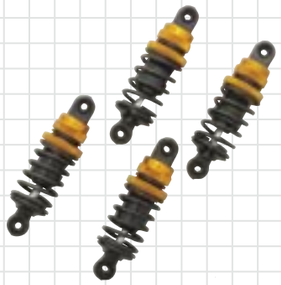
With increased rotation and on-power drive out of the corners, gear differentials are proving a useful tuning option on smooth medium to high bite tracks.

On low grip tracks, however, they can make the car quite difficult to drive.

ON ROAD SETUP GUIDE

Continuing the On Road Setup Guide by **ANTHONY ATACK.** This month Anthony concentrates on shock absorbers, although not covering building and maintenance of the shocks as signalled last issue. That will be the subject of a separate article soon. Although the model used is an XRAY T3, the principles remain the same for almost all on road cars, EP or GP.

SHOCK REBOUND



REBOUND is a measurement of how far your shocks push back out after being fully compressed (without springs).

This is controlled by the volume of oil in the shock when it is being assembled.

The method for altering rebound when building shocks may vary from car to car but the more oil that is bled from the shock, the less rebound it will have.

Typically this is adjusted by how far the piston is pushed into the shock before the bladder is put in place and the shock is assembled.

More rebound generally results in a car that is more responsive and generates more grip, however it can become more upset when a curb is touched.

Reducing rebound will make for a car that is smoother and more forgiving to drive, which can be ideal in high grip conditions.

REBOUND		
More rebound	Less oil is bled from the shock during the building process.	• Car generates more grip. • Car is more responsive. • Car more easily upset by curbs/corner markers. • Can cause car to traction roll in high grip situations.
Less rebound	More oil is bled from the shock during the building process.	• Car generates less grip. • Car is smoother and more forgiving to drive. • Can be useful in high grip conditions.

SHOCK OIL

THE viscosity of shock oils is usually quantified by a measurement of Wt. or cSt.

In either case, the higher the number, the thicker or 'heavier' the shock oil will be, however it is important to note that this rating can vary from manufacturer to manufacturer, so oils of the same brand should be used for consistent adjustments and results.

Shock oils are usually adjusted to suit conditions with grip and ambient temperature being the main factors taken under consideration.

Thinner oils can help the car generate more traction when grip is low, while heavier oils can increase corner speed, decrease traction rolling and prevent tires from overheating when grip is high.

All shock oils thin out in high ambient temperatures so it can be beneficial to go for thicker in oil on a hot day.

The balance of the car can also be changed by altering the stagger in shock oils from front to rear.

For example, more steering can be gained by increasing the stagger in oil from the front to the rear, with heavier oil in the front shock and thinner oil in the rear shock

SHOCK OIL		
Thinner oil	Use shock oil of a lower weight in the shocks.	• Car will react faster. • Car will roll more, generating more grip. • Can be advantageous in cold conditions.
Thicker oil	Use shock oil of a higher weight in the shocks.	• Car will feel smoother and more stable. • Helps prevent the car from traction rolling in high grip conditions. • Helps to prevent the tires from overheating. • Can be advantageous in hot conditions. • Car won't handle bumpy tracks as well.

SHOCK SPRINGS

SPRINGS are an important part of the car's setup as they control weight transfer from front to rear and side to side.

Conditions such as track temperature and grip level, as well as how open or technical the layout is, will influence spring selection.

Springs are cheap and easy to change, so it can be advantageous to have a selection of springs within the range you are likely to use.

Just be sure to re-set your ride height when changing between different springs.

Typically springs are marked either numerically or by colour codes to identify their rate.

While different brands of springs may be rated in different units, a spring with a higher rate value will be stiffer.

It is important to note that adjusting the spring collars does not alter the stiffness of the springs–it is used only for adjusting ride height.

FRONT SPRINGS		
Stiffer front springs	Install a stiffer spring (higher rate) on the front shocks.	• Increases initial steering into corner. • Decreases steering mid-corner and out. • Car more responsive, can become nervous off centre.
Softer front springs	Install a softer spring (lower rate) on the front shocks.	• Car will have less initial steering, especially under braking. • Car will have more steering through and out of corners. • Car will feel smoother.

REAR SPRINGS		
Stiffer rear springs	Install a stiffer spring (higher rate) on the rear shocks.	• Car will have less rear grip. • More steering, especially on power.
Softer rear springs	Install a softer spring (lower rate) on the rear shocks.	• Car will have more rear grip in all stages of cornering. • Car will feel smoother.

SHOCK LOCATION

THE amount of leverage the car has on the shocks can be altered by changing the location that the shocks are mounted, either on the shock tower or lower suspension arms.

This is a quick adjustment that can be easily be made at the track and can have a noticeable effect on the car's handling.

Changing the location on the lower arms has a much more profound effect, while changing the location on the shock tower gives a finer adjustment.

It is important to remember to re-check your ride heights after changing the shock location, as they may have changed.

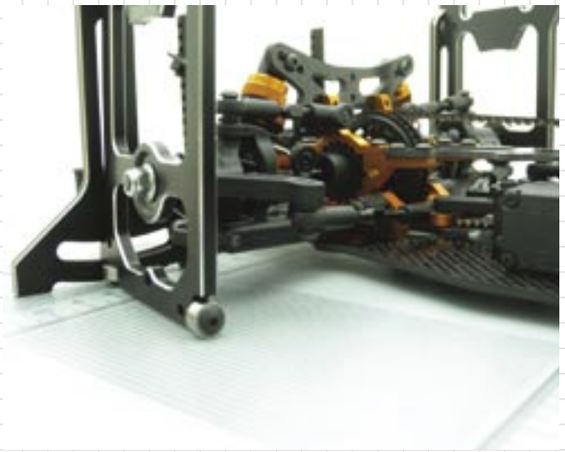
Leaning the shocks over on more of an incline will make the suspension softer initially, then become progressively stiffer, as it compresses.

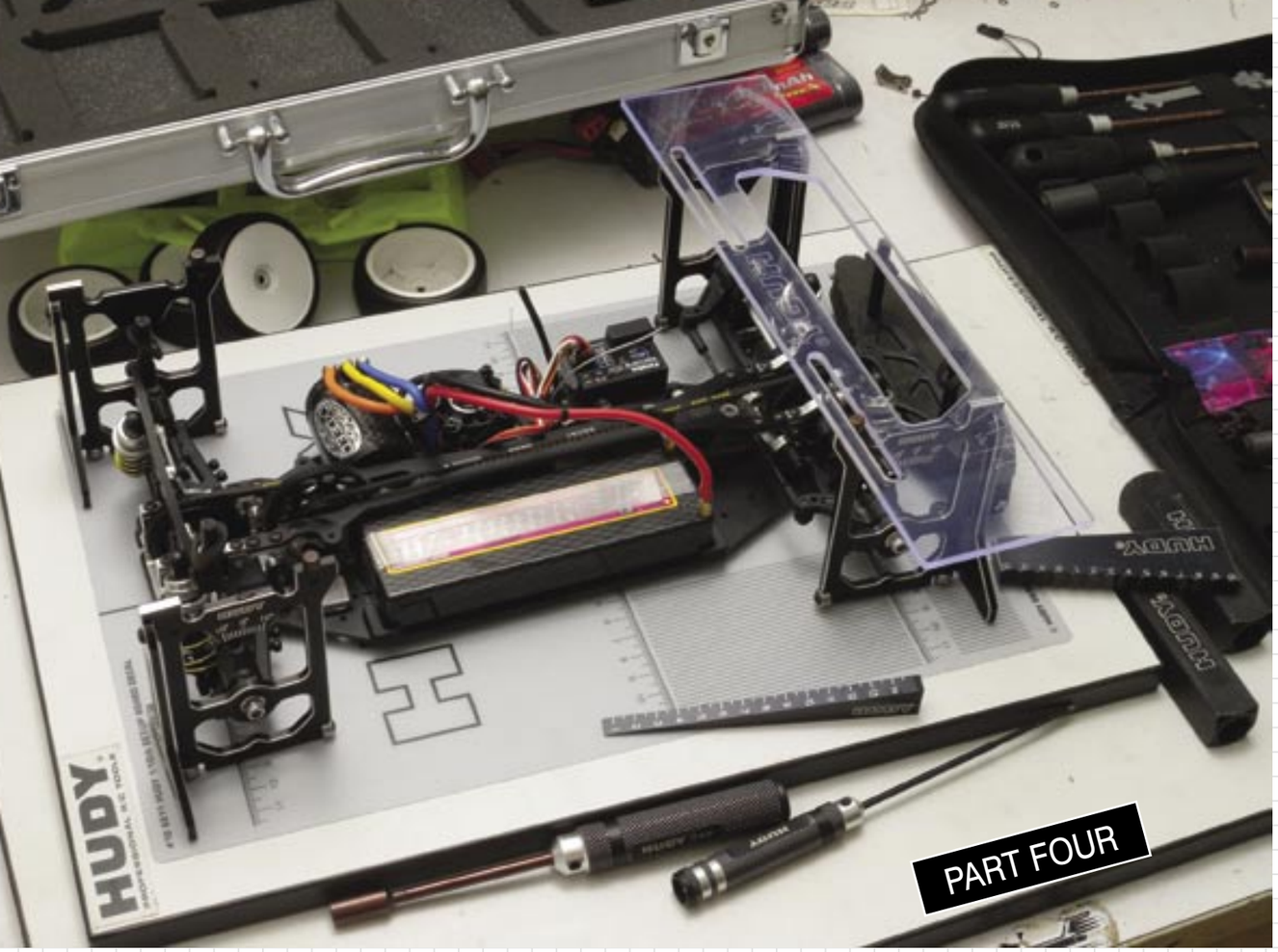
This results in the car having a smoother initial feel, but less overall grip at that end of the car.

Standing the shocks up to be more upright makes the suspension feel stiffer initially, then staying more linear, as it compresses.

This results in a more responsive car, with more grip at that end of the car.

WHEELBASE		
Longer wheelbase	Space arms away from the centre of the chassis.	• Increased stability. • Better on high speed, flowing tracks. • Decreased rotation in corners.
Shorter wheelbase	Space arms towards the centre of the chassis.	• Decreased stability. • Better on tight, technical tracks. • Increased rotation in corners.
upright	the shock tower or in on the lower suspension arm.	more overall steering. • Increased on power grip and steering. • Can be useful on small, technical tracks or low grip conditions.
REAR SHOCK LOCATION		
Shock more inclined	Move the shock location in on the shock tower or out on the lower suspension arm.	• Makes car smoother to drive. • Increases rotation in corners. • Decreases forward bite on-power. • Can be useful on large, flowing tracks or in high grip conditions.
Shock more upright	Move the shock location out on the shock tower or in on the lower suspension arm.	• Makes car more responsive to drive. • Decreases rotation in corners. • Increases forward bite on-power. • Can be useful on small, technical tracks or in low grip conditions.





ON ROAD SETUP GUIDE

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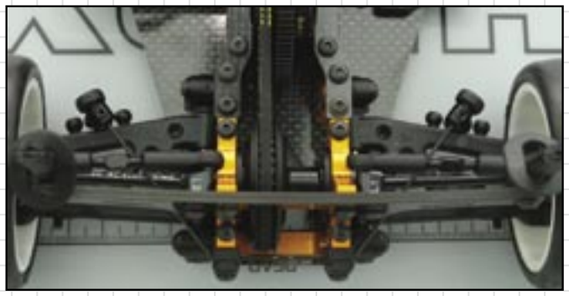
SWAY BARS

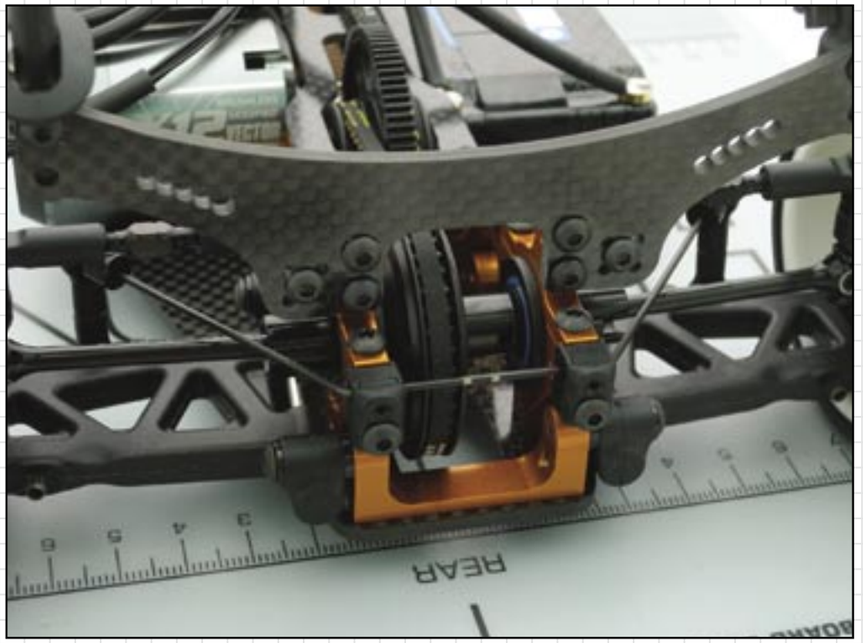
SWAY bars or anti-roll bars are used to resist lateral roll in the corners.

They do this by transferring the load from the outside wheel to the inside wheel, keeping the car flatter through the corner.



However because the load is decreased on the outside wheel during cornering, the feeling of grip at that end of the car is reduced.

Changing sway bars is a quick and easy change that can



FRONT SWAY BAR		
Heavier front sway bar	Attach a thicker front sway bar.	• Decreases chassis roll. • Decreases off-power steering into corners. • Decreases front grip in corners. • Increases steering response.
Lighter front sway bar	Attach a thinner front sway bar.	• Increases chassis roll. • Increases off-power steering into corner. • Increases front grip in corners. • Decreases steering response.

REAR SWAY BAR		
Heavier rear sway bar	Attach a thicker rear sway bar.	• Decreases chassis roll. • Decreases rear grip in corners. • Increases on-power steering. • Car responds quicker in changes of direction.
Lighter rear sway bar	Attach a thinner rear sway bar.	• Increases chassis roll. • Increases rear grip in corners. • Decreases on-power steering. • Car responds more slowly in changes of direction.

BODY AND WING

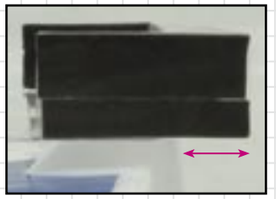
CHANGING the body shell can be a powerful adjustment for changing the feel of the car.

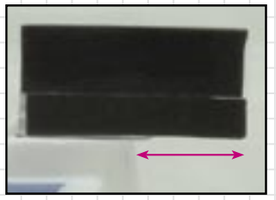
Some bodies smooth the car out, with less steering and a more planted rear end, while others can increase steering, especially in higher speed corners, but can make the car edgy to drive.

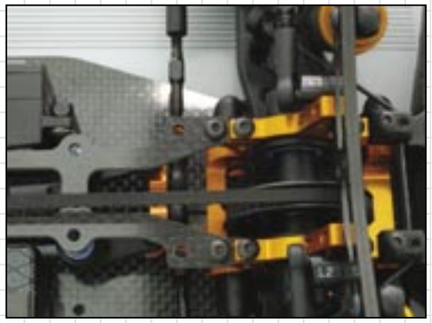
Take for example PROTOform's range of bodyshells, which range from the smooth handling Mazda 6 shell, followed by the Speed 6 and LTC-R which become progressively sharper, to the R9-R shell which is extremely aggressive.

How the body and wing is mounted also affects handling.

The further forward a body is mounted the more steering it will have.








CHASSIS FLEX

SOME cars come with different flex settings, simply changed by adding or removing screws in the top deck or main chassis plate.

This can be a good adjustment for attaining the desired feel in different conditions.

A softer flex setting can help widen the car's set up window, helping it to generate more grip and becoming more forgiving to drive, which can be useful in low to medium grip conditions.

Too much flex however can cause the car to become unpredictable in the corners.

ACKERMANN

THE Ackermann angle controls the difference in steering angles between the inside and outside wheels during cornering.

Ackermann is commonly adjusted by changing the angle of the steering links, either by an adjustable steering plate or by adding shims behind the inner steering link's ball studs.

Altering the angle of the links this way changes the Ackermann effect and will increase or decrease how much more the inside wheel turns in relation to the outside wheel when steering through a corner.

On most cars spacing the inner link forwards reduces the Ackermann effect, so that the difference in steering throw between the inside and outside wheels is reduced.

Spacing the inner link backwards has the opposite effect, increasing the Ackermann effect and therefore increasing how much the inside wheel turns in relation to the

ACKERMANN		
More Ackermann effect *(Straighter steering links)*	Space the inside of the steering link more rearward.	• Inside wheel turns more in relation to outside wheel. • If your car steers well off-power but pushes on-power, you can try more Ackermann effect while reducing your steering end points on your transmitter.
Less Ackermann effect *(More angled steering links)*	Space the inside of the steering link more forward.	• Difference between steering throw of inside and outside wheels is reduced. • If your car steergs well on-power but pushes off-power or if the inside wheel is chattering at full lock on the track, you can try reducing the Ackermann effect while increasing your steering end points on your transmitter.

BUMP STEER

BUMP steer occurs when the vertical angle of the steering links causes the front wheels to toe-in or out as the suspension is compressed.

In On Road this is largely considered an undesirable effect and most cars are best set to have no bump steer.

Running bump-in reduces off-power steering, however it can result in the car feeling inconsistent, while bump out can increase off-power steering.

In most cases this is adjusted by adding or

PART FIVE

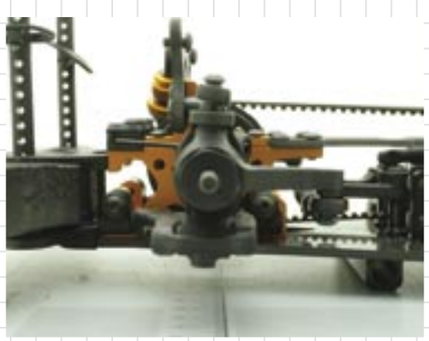
ON ROAD SETUP GUIDE

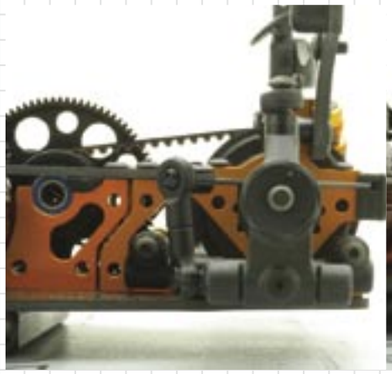
This month we conclude our On Road Setup Guide by **ANTHONY ATACK.** Our final topics in this five part series deals with Dive and Squat, Diff Height and Belt Tension and like all our previous topics, to get top performance from your car, it's essential you get these areas right.

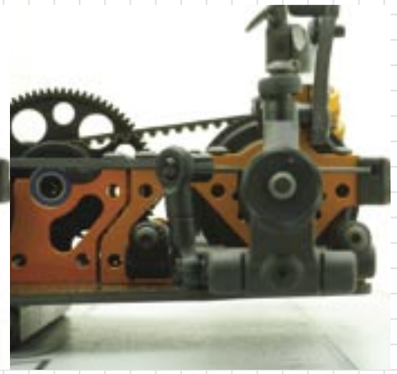
DIVE AND SQUAT

DIVE AND squat refer to the angle of the hinge pin from parallel with the chassis.

Most cars come standard with level hinge pins front and rear, however when this angle is changed, it affects the way weight is transferred as the car accelerates and brakes.







FRONT – DIVE		
Anti-dive *(Rear of the hinge pin is higher than the front)*	Raise the rear of the hinge pin. Or lower the front of the hinge pin.	• Front suspension resists compression, reducing steering on corner entry. • Overall caster is reduced, giving less steering through and out corners. • Increased stability under brakes on smooth, medium to high grip tracks. • Reduces car's ability to handle bumpy track–can
Pro-dive (kick-up) *(Front of the hinge pin is higher than the rear)*	Raise the front of the hinge pin. Or lower the rear of the hinge pin.	• Weight is transferred forward more easily, increasing steering into corners. • Overall caster is increased, giving more steering through the corner and out. • Car is more forgiving to drive, especially on bumpy tracks.
REAR – SQUAT		
Anti-squat *(Front of the hinge pin is higher than the rear)*	Raise the front of the hinge pin. Or lower the rear of the hinge pin.	• Rear suspension resists compression, increasing on-power steering. • Increases the car's ability to handle bumpy tracks.
Pro-squat *(Rear of the hinge pin is higher than the front)*	Raise the rear of the hinge pin. Or lower the front of the hinge pin.	• Weight is transferred forward more easily off-power, increasing steering into and through the corner until throttle is applied. • When throttle is applied, the weight transfers back to the rear of the car more easily, resulting in more on-power grip and less on-power steering.

cars that don't.

Dive is used to describe this angle on the front end of the car, with anti-dive being generated when the rear of the front hinge pin is raised to be higher than the front.

Pro-dive (also referred to as kick-up) is generated by the opposite, when the front of the hinge pin is higher than the rear.

Anti-dive prevents weight from transferring forward as easily, as the suspension resists compression.

This can help make the car more stable under brakes on smooth tracks, however on bumpy tracks, it can make the car quite hard to drive.

Kick-up on the other hand can make the car more forgiving to drive, particularly on bumpy tracks.

The car will generally have more steering, especially on corner entry.

On the rear end, squat is the term used to describe this angle.

With anti-squat referring to a hinge pin that is higher in the front, while pro-squat describes a hinge pin that is lower in the front than the rear.

DIFF HEIGHT

SOME CARS give you the ability to adjust diff height, which can change the way the car handles quite drastically.

This is because the angle of the drive shaft influences how easily the car rolls over as they are spinning.

Running the diffs higher will generate more overall grip at that end of the car, giving a more responsive feel with the car staying flatter.

Running the diffs low will cause the car to roll more, keeping it in the turn longer, however the car will respond

BELT TENSION

IT IS important to have the belt tension set correctly on your car–too loose and they will skip under acceleration and braking.

Too tight and it will start to cause unnecessary binding in the drive train.

Most modern touring cars use eccentric cams to adjust the belt's tension, so always be sure to have them set the same from left to right.

For faster motors a good setting is to be able to push the belt down around 3mm.

With Stock motors you can go a tad looser to ensure the freest possible drive train.