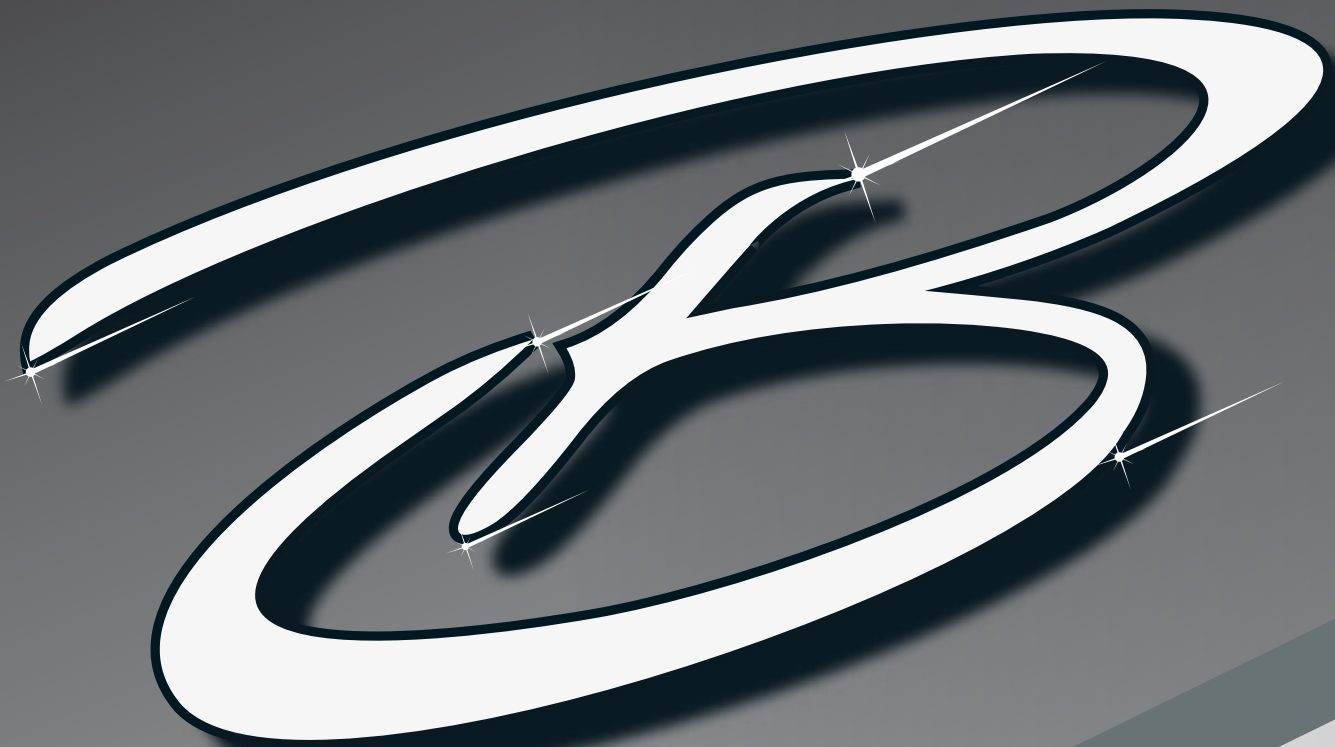


**BICKNELL**  
RACING PRODUCTS



**SET-UP BOOK**



## ***Bicknell Racing Products Customer Relations Policy***

Our company policy has always focused on customer service. Our company has thrived by being available at various race tracks, trade shows, or just visiting with our racers, and or Bicknell dealers.

During the race season, a Bicknell representative from our factory in St Catharines Ontario, will be at various race tracks during the season, to assist you with race car handling and performance

In the unlikely event that a Bicknell product might be thought to be defective, it will have to be returned to the factory, or inspected by a Bicknell representative. Due to the nature of auto racing, Bicknell reserves the right to determine if a failure or defect might have been caused by the rigors of competition.

For any possible warranty issues, please consult our sales staff to determine the most effective means to assess a failure. Bicknell Racing Products, requires the original invoice from the original purchaser to be provided with the product or part.

Peter Bicknell, Randy Williamson, Bob Slack  
Bicknell Racing Products

## ***e-mail general questions to:***

[administrator@bicknellracingproducts.com](mailto:administrator@bicknellracingproducts.com)



## ***Bicknell Racing Products Inc.***

For technical support on chassis setup

***PHONE: 905-685-4291***  
***SELECT OPTION 3 @ MENU***



## ***PARTS AND TIRE SALES***



**IN CANADA CALL:**

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**Canadian Retail Store Hours**

Monday - Thursday: 8:00am - 5:30pm

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Saturday 9:00am - 12:00pm

**Open Saturdays From Jan 1st until 1 week after Labour Day**

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St. Catharines, Ontario (FRONT)  
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## CAR OWNER / CHASSIS SERIAL #

PLACE LABEL  
HERE

### Important Information

Congratulations on your purchase of a Bicknell race car. Before beginning the assembly of this vehicle, read and understand the following information. **FAILURE TO READ AND UNDERSTAND THIS INFORMATION MAY LEAD TO AN OCCURRENCE OR MALFUNCTION WHICH WILL INCREASE THE RISK OF SERIOUS INJURY OR DEATH.**

- Use only fasteners supplied by Bicknell Racing Products or their exact equivalent, and use them in the manner and position detailed in these instructions and the parts list supplied with the manual.
- Tighten all fasteners to recommended or industry standard torque specifications.
- Replace any fastener which is damaged in any way or which may have been over-tightened
- Where nylon lock or other lock nuts are used, replace the nut each time it is removed
- Light-weight components may increase performance, but are more likely to fail under stress. **DO NOT USE ANY COMPONENT NOT APPROVED BY BICKNELL RACING PRODUCTS IN THE ASSEMBLY AND OR OPERATION OF THIS RACE CAR**
- Adjustments to the suspension will affect the driver's ability to control the race car. Do not operate this race car with any suspension settings not recommended by Bicknell Racing Products unless qualified
- **DO NOT OPERATE VEHICLE WITH ANY SAFETY GUARD REMOVED**
- **DO NOT OPERATE MOTOR WITHOUT ADEQUATE VENTILATION.** Running engines give off carbon monoxide. AN ODORLESS, COLOURLESS, POISON GAS. BREATHING CARBON MONOXIDE WILL CAUSE NAUSEA, FAINTING AND DEATH
- **FUELS USED IN MOTORSPORTS ARE EXTREMELY FLAMABLE AND EXPLOSIVE. FIRE OR EXPLOSION CAN CAUSE SEVERE BURNS OR DEATH.**
- This race car is NOT EQUIPPED with a parking brake. USE CAUTION TO PREVENT INJURY CAUSED BY A ROLLING CAR
- Do not work under or near a car which is raised on a jack. ALWAYS SUPPORT CAR WITH JACK STANDS OR WORK STANDS BEFORE WORKING NEAR OR UNDER IT.
- Tire mounting should only be performed by qualified personnel. Always tighten all fasteners to industry specified torque. CAREFULLY INSPECT TIRES FOR DAMAGE AFTER ANY CAR TO CAR OR CAR TO BARRIER CONTACT. REPLACE DAMAGED TIRES BEFORE RESUMING OPERATION OF RACE CAR. DO NOT OVER-INFLATE TIRE PRESSURES.
- Running engines produce heat. CONTACT WITH HOT AREAS OF THE ENGINE AND EXHAUST SYSTEM CAN CAUSE BURNS ON CONTACT
- Replace any component which is damaged or worn before resuming operation of race car. INSPECT ALL COMPONENTS ON RACE CAR AFTER ANY CAR TO CAR OR CAR TO BARRIER CONTACT.
- Read and understand all instructions supplied with components, parts or accessories not supplied by Bicknell Racing Products before installing them on this race car. In the event that any instruction conflicts with those contained in this manual, consult Bicknell Racing Products or a qualified expert BEFORE OPERATING RACE CAR.
- **AUTO RACING IS A VERY DANGEROUS ACTIVITY WITH A HIGH RISK OF SERIOUS INJURY OR DEATH, WHICH CANNOT BE ELIMINATED. FAILURE TO OPERATE THIS RACE CAR IN CONFORMITY WITH THESE INSTRUCTIONS INCREASES THE RISK OF INJURY OR DEATH.**

#### **THE FOLLOWING QUOTES ARE WHAT ANY SMART RACER MUST REMEMBER:**

- The only stupid question is the one that is never asked.
  - SMOOTH IS FAST.
  - To finish first, first you must finish.
- Handling begins at the starters stand, then corner entry, then corner mid turn, and then finally corner exit.



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## CHASSIS TERMINOLOGY

Here are some common terms you will see in this book, and will most likely hear at the race track.

**Left Side Percentage** - This is the weight of the left side of the car. To calculate the left side percentage, add the left rear wheel weight and the left front wheel weight and divide by the total. In the below example, the left side percentage is 54.3%.

The more left side % the car has, the better it will steer into the corner. BRP recommends left side % between 54.2% and 54.4%.

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LF WEIGHT} + \text{LR WEIGHT} \div \text{TOTAL WEIGHT} = \text{LEFT SIDE \%}$$

$$475 + 730 \div 2220 = .5428 \text{ or } 54.3\%$$

NOTE: BRP recommends the following left percentage: 54.2% - 54.4%. This example is for total weight or 2200 pounds before driver.

**Rear Percentage** - This is the weight of the rear of the race car. To calculate the rear percentage, add the left rear wheel weight to the right rear weight and divide by the total. In the example below, the rear percentage is 64.9%. The more rear percentage a race car has, the tighter on the throttle it tends to be. Too much rear percentage can also make the back of the car swing on corner entry, causing a loose on entry / lack of side bite condition. This is called 'pendulum loose'.

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RR WEIGHT} \div \text{TOTAL WEIGHT} = \text{REAR \%}$$

$$730 + 710 \div 2220 = .6486 \text{ or } 64.9\%$$

NOTE: BRP recommends the following rear percentage:  
big block : 63.5 - 64.5%  
small block / sportsman : 64.9 - 66%

**Diagonal Percentage** - This is the weight of the diagonal of the race car. To calculate the diagonal percentage, add the left rear weight and the right front weight and divide by the total. In the below example, the diagonal percentage is 46.7%. The higher the diagonal % in the race car, the tighter the car will be. Left rear weight or wedge greatly effect the diagonal % so the more wedge a car has, the more diagonal the car will have.

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RF WEIGHT} \div \text{TOTAL WEIGHT} = \text{DIAGONAL \%}$$

$$730 + 305 \div 2220 = .4662 \text{ or } 46.7\%$$

NOTE: BRP recommends the following diagonal percentage: 46.5% - 47.5% to start.

**Left Rear Weight or Wedge** - This is the amount that the left rear tire is heavier than the right rear tire. To calculate left rear weight, subtract the right rear weight from the left rear and you are left with your wedge or left rear weight. Left rear weight usually makes the car tighter on throttle, but can also make the the car loose on entry as it will take away side bite because of the physic al weight it takes off of the right rear tire.

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RR WEIGHT} = \text{LEFT REAR WEIGHT}$$

$$730 - 710 = 20\# \text{ LR WEIGHT}$$

**Ballast Weight** - Any weight bolted to the chassis strictly to increase the total weight of the car. The placement of the ballast weight is very important, and has a drastic effect on a race car's handling. The added weight can alter race car balance and percentages. Try to avoid adding ballast weight to the driveshaft cover.

**Wheel Lead** - The difference in wheel base from the left side to the right side. The longer the left side wheel base is, the tighter the car will be. The longer the right side, the looser the car will be.

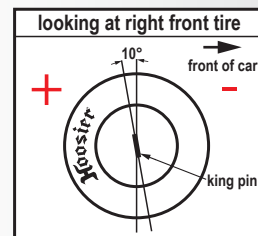
**Chassis Tilt** - Chassis tilt is difference in ride heights between the left and right of the chassis. Generally the lower the left side of the car is, the tighter the car will be on exit. It could also take away side bite from the car, making for a loose mid-turn condition.



**Chassis Rake** - The difference in ride height between the front and rear of the chassis. The higher the front ride heights are, the tighter the car will be on corner entry. The lower the front frame heights, the looser the car will be on corner entry. The higher the rear frame heights are, the looser the car will be on corner exit. The lower the rear frame heights, the tighter the car will be on corner exit. Higher ride heights = more chassis roll.

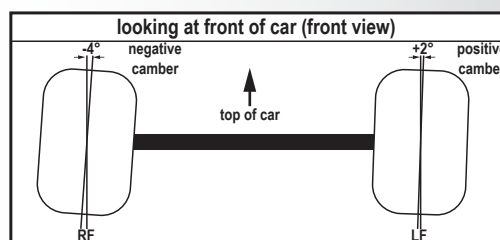
**Caster** - The angle to which the pivot or king pin is tilted forward or rearward from vertical as viewed from the side. If the kingpin is tilted back at the top, then the caster is positive.

If it is tilted forward at the top, the caster is negative. The more caster a car has, the better the feel the driver will have but the stiffer the steering will be. The less caster a car has, the less feel the driver will have but the softer it will be. The general rule of thumb is run as much caster as you can handle. Bicknell recommends 11.5° of caster on the right front, and 7.5° of caster on the left front.



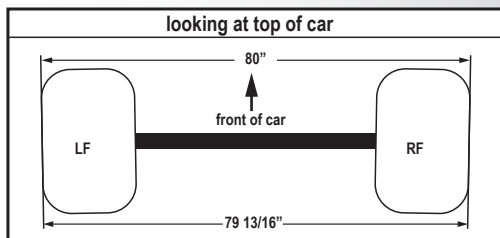
**Camber** - The angle of the tire relative to vertical as viewed from the front. If the top of the tire is leaning toward the center of the chassis, it has negative camber. If it is leaning toward the outside of the chassis, it has positive camber.

Camber is built into the front axle so the only way to change the camber is to install a camber adjustable spindle on the front axle. Camber adjustable spindles have 2° of camber adjustment positive and negative. Bicknell recommends -8° of camber on the right front, and +1.5° to +2° camber on the left front.



**Toe In/Toe Out** - The angle of the tires relative to each other as viewed from the top - much like looking down at your toes.

Toe in is the front of the wheels pointing toward the centerline of the chassis. Toe out is the front of the wheels pointing away from the centerline of the chassis. Bicknell recommends 1/8" - 3/16" toe out.

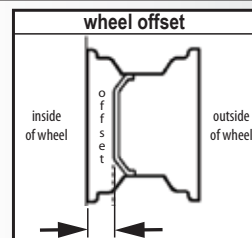


**Wheel Track** - The measurement taken from a wheel on one side of the car to the wheel on the opposite side of the car (usually taken from the center of the wheel/tire).

**Wheel Base** - The measurement taken from the centerline of the front axle to the centerline of the rear axle. Also related to wheel lead (see page 3).

**Wheel Offset** - The measurement taken from the back edge of the rim where the tire seals, to the mounting flange of the wheel. The wheel offset has a great impact on the percentages of the race car and should always be checked. Bicknell recommends 14" x 3" offset right rear wheel, 13" x 3" offset left rear wheel, with a 10" x 4" offset left front wheel and a 12" x 5" offset right front wheel.

Wheel offset may also be referred to as wheel backset.



**Frame Heights** - The measurement from the bottom of the 2X4 frame rail to the ground. The front frame height is measured at the front of the 2X4 frame rail. The back is measured at the back of the 2X4 frame rail just in front of the rear tires. Frame heights can vary from track to track, but recommended starting frame heights are 5 1/4" (5 1/2" for AR tires) on both left front and right front, and 6 1/2" on both left rear and right rear. Always use the flattest part of the floor when setting frame heights to ensure accurate measurements.

**Chassis Bind** - Refers to anything that restricts or limits the movement of the suspension. There are many items that commonly cause chassis bind such as bent or seized heim ends, bent or dented shocks, front radius rods bound up, torsion arms rubbing birdcages, improper shock height installation, torque arms, torsion rollers, torsion bearings or bushings, etc.



**Brake Bias** - The difference in brake pressure between the front and rear of the race car. Bicknell recommends a 1" front master cylinder mounted to the top of balance bar and a 7/8" rear master cylinder mounted to the bottom of the balance bar. This provides an equalized brake-pad-to-pressure ratio to allow the race car proper brake balance. Brake pad compound can also influence brake bias because a stickier pad grips better.

**Sprung Weight** - The portion of the car's mass that is supported above the suspension. This includes the chassis itself, the body, the fuel cell, ballast weight, etc.

**Un Sprung Weight** - The mass of the suspension and the components connected to it. This includes the axles, wheels, tires, hubs, etc. The heavier un sprung components are, the more difficult they are to control. Un sprung weight can also increase tire wear, and can be hard on shocks. When un sprung components are heavy, the shock has to work harder to control these components decreasing life of the shock.

**Rotating Weight** - The portion of the car's mass that accelerates and decelerates. This includes axles, driveshaft, wheels, tires, etc. Four things determine the effect of rotating weight on the car.

- 1- How quickly and how often the mass or weight accelerates or decelerates.
- 2- How heavy the rotating mass is.
- 3- The rotating weights distance from the centerline.
- 4- How fast the weight spins.

Each one of the above factors effect the car in different ways, so lightening the appropriate items is key.

**Stagger** - The measured difference between the left and right side tires. If a right rear tire is 92", and the left rear tire is 86"- the race car has 6" of stagger. Stagger has a huge effect on race car handling. More stagger makes the car looser on corner entry and corner apex, while less stagger makes the car tighter on corner entry and corner apex. Insufficient stagger can also cause the car to be loose in the apex caused by corner entry tight causing the car to sheer loose.

**Tight Car** - A term used to classify a car that will not steer. This means the car will not turn as attempts to negotiate the corner. The rear tires have more grip than the front tires. This condition is also known as understeer.

**Loose Car** - A term used to classify a car that wants to spin out or come around. This means the car turns too good or the front tires have more grip than the rear tires. This condition is also known as oversteer.

**Side Bite** - A term used to describe the amount of traction a car has as it slides across the track. There are many things that effect side bite including ballast weight placement, height and angle of panhard bars, ride heights, shocks, wheel offsets, etc.

**Forward Bite** - A term used to describe the amount of traction a car has as it accelerates forward. There are many things that effect forward bite including ballast weight placement, rear radius rod location, length of torque arm, left rear weight, shocks, tire preparation and compound, tire pressures, etc.

**Shock Bump (or compression)** - This is a term used to describe the force experienced when the shock is being compressed. A good example would be when you hit a bump on the track. If there was no compression in your shock, the tire would just move upward along with the car, and the tire would lose contact with the track. With compression, the tire will stay in contact with the track, and reduce the car's motion. The basic theory is it converts the upward travel of the wheel from track imperfections into heat, and controls the car's motion.

**Shock Extension (or rebound)** - This is a term used to describe the force experienced when the shock returns from its compressed state, to its original state. When a shock is in the process of rebounding, the spring or torsion bar is going from being compressed back to normal ride height and releases its stored energy. Basically, the shock is converting the energy from the compressed spring into heat, and dissipating the car's motion. We have all seen an old 70's Monte Carlo with bad shocks- it will just keep bouncing for days! But the shock no longer has control of the spring, hence why it bounces.  
See page 49-52 for more information on shocks.



## SCALING PROCEDURE

The following is the scaling procedure we use at Bicknell Racing Products. Please consult attached set-up sheet for accurate set-up. Set-ups are ever changing, and depend on track, engine combination, and tire selection etc. A more detailed set-up sheet can be obtained by e-mailing your serial #, division, engine combination, and brand of tire you will be racing on to the following e-mail address:

**tech@bicknellracingproducts.com**

- 1- Set air pressure in tires. Measure stagger both front and rear.
- 2- Set frame heights using the procedure on page 12.
- 3- Place car on Scales.
- 4- Adjust front and rear panhard bars to obtain the proper left side percentage.  
(BRP recommends 54.2% - 54.4% left side percentage)
- 5- Install ballast weight (maintain left side percentage).
- 6- Recheck frame heights and adjust as necessary.
- 7- Check rear end squareness off keystocks using procedure on page 18.
- 8- Double check birdcage timing using procedure on page 19 - 22.
- 9- Set front caster using procedure on page 16 - 17.  
NOTE: adjusting caster could affect frame heights, so double check them after setting.
- 10- Check front end for squareness off of front shock towers using procedure on page 16 - 17.
- 11- Recheck frame heights and adjust as necessary.
- 12- Set left rear weight using formula on page 13-14.

NOTE: You should always jack 1 rear tire off the scales to free wheel the rear tires. This will avoid the tires being bound up. Most often times, scale inconsistencies are caused by the tires being bound up. Another way to avoid this is to take 1 axle out while scaling.

- 13- Check for necessary shock stem heights and proper spring pre-load.  
NOTE: If the tech department has given you measurements for spacers between the axle and chassis, then your shock stem height will already be set.
- 14- Check car for binds using the procedure on page 37.
- 15- Set toe to 1/8" to 3/16" out at the tires.
- 16- Crack you favorite beer.....

### WARNING

ALL CHASSIS SETTING AND ADJUSTMENTS ARE INTENDED FOR USE BY PROFESSIONAL RACE TEAMS AND TO BE PERFORMED BY QUALIFIED TECHNICIANS. IF YOU ARE NOT QUALIFIED TO DO THE WORK, SEEK THE ASSISTANCE OF A QUALIFIED TECHNICIAN. IF YOUR DRIVER IS NOT EXPERIENCED IN THE OPERATION OF A RACE CAR OF THIS TYPE, SEEK THE ASSISTANCE OF A QUALIFIED RACE DRIVING INSTRUCTOR OR SCHOOL BEFORE OPERATING THIS RACE CAR.

**SERIOUS INJURY OR DEATH CAN OCCUR IN AUTO RACING.**

**DO NOT WORK ON RACE CAR BEFORE SUPPORTING IT ON ADEQUATE JACK STANDS OR OTHER SUITABLE WORK STANDS. NEVER WORK NEAR OR UNDER A RACE CAR SUPPORTED ONLY ON A JACK. WORK ONLY ON A LEVEL, HARD SURFACE CAPABLE OF SUPPORTING STANDS.**



## CHASSIS SPECIFICATIONS

The following are chassis specifications for all 2001-to-present Midrail dirt modified chassis. Under certain situations, different parts or specs may be required based on serial number. If you have any questions, all chassis are kept on record to verify components and specs. If you have any questions, please call our tech department @ 905-685-4291 Option #3 after the operator, or e-mail tech@bicknellracingproducts.com

Always keep torsion bushing and bearing lubed, and keep space between torsion stop and bushing. Always try to keep all unsprung weight as light as possible. This prevents tire wear and is easier on suspension components. Keep all turning weight such as hubs, driveshaft, etc. as light as possible because 1 pound of turning weight is like 10 pounds of static weight for the purposes of acceleration and deceleration.

**PLEASE NOTE:**

DO NOT USE ANY COMPONENTS NOT APPROVED BY BICKNELL RACING PRODUCTS. IF YOU ARE UNSURE, OF THE SUITABILITY OF A COMPONENT FOR USE ON YOUR BICKNELL RACE CAR, CALL, E-MAIL OR WRITE TO BICKNELL RACING PRODUCTS BEFORE OPERATING A THE RACE CAR WITH THE COMPONENT INSTALLED.

\*WARNING- CHECK ALL FLUID LEVELS AND DRAIN PLUG TIGHTNESS BEFORE RACING.\*  
 RECOMMENDED SETUP SPECS ARE GUIDELINES ONLY. CAR SHOULD BE SETUP TO THESE SPECS INITIALLY AND THEN FINE TUNED AT THE TRACK TO FIT EACH DRIVER OWN PERSONAL DRIVING STYLE. WHEN THE CAR IS WORKING WELL, MAKE YOUR OWN SETUP SPECS THAT YOU WILL BE ABLE TO REFER BACK TO.

**PLEASE NOTE:** below specs are generic - Please refer to particular race track setup sheet for more info.

POSITION	FRAME HEIGHT	SPRING	TORSION BAR	INTEGRA SHOCK	HOOSIER TIRE PRESSURE	AMERICAN RACER TIRE PRESSURE
LEFT FRONT	5 1/4"	225		LF RSR-76	9#	10#
RIGHT FRONT	5 1/4"	150 - 175		RF RSR-76	9#	10#
LEFT REAR	6 1/2"	100 - 200	950	LR RSR-76	6#	8#
RIGHT REAR	6 1/2"	165 - 200	925	RR RSR-76	10#	12#

**FRONT SPRINGS:** Big block - recommend start point is a 175 # right front spring. Small block / sportsman cars - recommend 150# right front spring. Start with a 225# spring on the left front. If the car pushes on entry, sometimes it can be corrected by lowering the front panhard on the outboard side and inboard side - see front panhard bar location on page 16-17.

**REAR SPRINGS:** General starting point for rear coil cars and short link cars is 200# rear springs. Slick track spring package will depend on track, but most common coil over package is a pair of 175# springs. Most common short link coil is LR - 150# spring with 75# flat wire tender and 175# RR spring. See pages 26-31 for more info.

**TORSION BARS:** We recommend for big block, small block, and sportsman to start with a 950 left rear bar and a 925 right rear bar with both rollers in the rear holes. If you race on a highly banked track, for example Lebanon Valley, or a very heavy/tacky race track you may have to stiffen up the right rear bar. In general, If the car rolls to the right rear too much, you can install a 950 right rear torsion bar. Always remember that moving the roller on the birdcages to the front holes will SOFTEN the spring rate while the roller in the back holes will be stiffer. The shorter the torsion arm, the stiffer the spring. The longer the torsion arm, the softer.

**RIGHT REAR HELPER SPRING:** Sometimes IF you are at the track and the car is rolling on the right rear too much and you don't have time to change the torsion bar, a coil assist spring of 80# can be used on the right rear to limit the amount of chassis roll. Have the assist spring nut touching the coil at ride height to start. Sometimes a stiffer right rear shock can help as well as more gas pressure in the right rear shock.



**WHEEL BASE:** Square the rear end in the car 9" from the front of the rear end tube to the back edge of the keystocks for -5° bird-cage timing cars, or 8 3/4" for 0° birdcage timing cars. Coil cars and short link cars MUST be squared at 9" of the keystocks to avoid driveshaft failures. For more information on birdcage timing, please consult pages 19-22 of this manual. Square the rear end side to side -- see page 18 of this manual for info. Square the front end 1 1/2" between the front of the front axle to the back of the shock towers- See page 16-17 of this manual for more information. This should set the wheelbase to 105 1/2" - 105 3/4" on both sides. If the car is tight, lead the left rear ahead 3/8", which also softens the LR spring rate.

**FRONT AXLE AND PANHARD LOCATION:** Install the front panhard bar as per instructions on page 16-17 of this manual. On setup blocks or at ride height, there should be approximately 1/2" clearance between the left front shock tower and the lower bolt holding the shock onto the axle bracket.

**TOE OUT:** 1/8" -3/16" toe out at the wheels, or 1/16" toe out at the rotors.

**CASTER:** The left front should be 7.5°, and the right front should be 11.5°. The caster split is built into the axle. Always make sure the right front is 3-4° more than the left front - see page 16-17 for more information. The more caster you run, the stiffer the steering will feel. Also it will not add as much left rear weight on corner entry (loose) and more left rear weight on corner exit (tight).

**LEFT REAR WEIGHT:** for more information, please see page 14 of this manual.

Dry slick track = 60 to 110 pounds more on left rear (start at 40#)

Wet or tacky track = 0 to 30 pounds more on left rear (start at 30#)

Very heavy track = you may need 30# right rear weight.

**TIRE STAGGER:** Front stagger = 1/2" to 1 1/2" - smaller tire on the left front.

Rear stagger = 7" to 8" on a heavy track, 6" to 7" on medium tracks, and 5-6" for slick tracks.

Corner entry must be slow enough to prevent car from sliding out. Insufficient stagger will cause slow corner entry, and could cause a push when the throttle is applied. Too much stagger may slow down straight away speeds and make the car loose on exit. If a quick decision must be made, always keep stagger on the higher side than the lower side because its possible to drive a loose race car, but impossible for most drivers to drive a tight race car.

**RADIUS ROD LENGTHS:** Note: All lengths are rod lengths with no heim ends.

	LENGTH	STEEL	LW ALUM.	HD ALUM.
LEFT FRONT (all cars)***	25"	BRP RR25S	BRP 1250BK	BRP RR25BK
RIGHT FRONT (all cars)	25"	BRP RR25S	BRP 1250BK	BRP RR25BK
FRONT PANHARD (all cars)	21"	BRP RR21S	BRP 1210BK	BRP RR21BK
LEFT REAR (long rod)	27 1/2"	BRP RR271/2S		BRP RR271/2BK
RIGHT REAR (long rod)	28"	BRP RR28S		BRP RR28BK
RIGHT SIDE REAR PANHARD	15"	BRP RR15S	BRP 1150BK	BRP RR15BK
LEFT REAR (short rod)	17 1/2"	BRP RR171/2S		BRP RR171/2BK
RIGHT REAR (short rod)	18 1/2"	BRP RR181/2S		BRP RR181/2BK
LEFT SIDE REAR PANHARD	12"	BRP RR12S	BRP 1120BK	BRP RR12BK
DRAG LINK (STEERING IN FRONT HOLES)	64"	BRP RR64BS		BRP RR64B
DRAG LINK (STEERING IN MIDDLE HOLES)	66"	BRP RR66BS		BRP RR66B
DRAG LINK (STEERING IN BACK HOLES)	68"	BRP RR68BS		BRP RR68B
TIE ROD (STD ARMS)	48 1/2"	BRP RR481/2S		BRP RR481/2
TIE ROD (AKERMAN ARMS OR BERT/WINTERS)	47 1/2"	BRP RR471/2S		BRP RR471/2

\*\*\* OPTIONAL 24 1/2" radius rod for Left Front Top rod

**REAR SPRING ROD (long rod):** BRP 1399-900-171/2BK (comes with 17 1/2" radius rod)

Compress spring to 3 3/4" for tacky track. 4" for normal track and 4 1/4" for slick track.



**FRONT AXLE:** BRP EC52BOC-8 4 bar cambered front axle. Use BRP 9200 OR 9210 spindles for small bearing and BRP 4588 spindles for large bearing hubs.

**FRONT HUBS:** SMALL BEARING - BRP 4570BK WITH BRP 9200 spindle / BRP 821BK WITH BRP 9210 Spindle  
LARGE BEARING - BRP 9382 WITH BRP 4588 Spindle

**BUMPERS:** FRONT : BRP 464T-1.5  
REAR : BRP 7111

RIGHT SIDE : OUTER - BRP 7102 MIDDLE : BRP 447 REAR INNER : BRP 7100  
LEFT SIDE : OUTER - BRP 7101 MIDDLE : BRP 447 REAR INNER : BRP 7100  
DOUBLE RAIL SIDE BARS - RIGHT : BRP 7129 LEFT : BRP 7128

\*\*\*NOTE: FOR CHROME BUMPERS, ADD "C" TO END OF PART NUMBER\*\*\*

**BODY MOUNTS:** LEFT DOOR MOUNT - BRP 7105S  
RIGHT DOOR MOUNT - BRP 7106S  
REAR QUARTER MOUNTS - LEFT : 2 x BRP 7096, 1 x BRP 7097  
- RIGHT : BRP 9592  
ROOF MOUNTS - FRONT : BRP 7108 REAR : BRP 7109 EXTENSIONS : BRP 7112  
- LEFT SIDE T ROOF MOUNT - BRP 9477  
FRONT SPOILER MOUNTS : LEFT - BRP 7210 RIGHT - BRP 7211 or BRP 7210R  
FOR MORE INFORMATION, PLEASE CONSULT CATALOG PAGE 184

**REAR TORSION ARMS:** LEFT : BRP 4400 or BRP 9360 RIGHT : BRP 4402 or BRP 9361

**SHOCK SLIDERS:** LEFT FRONT : BRP 9636 RIGHT FRONT : BRP 9143RBK  
REAR : PLEASE SEE CATALOG FOR PART NUMBERS AND OPTIONS  
FOR COIL OVER REAR SHOCK MOUNTS, PLEASE SEE PAGE 26-30

**REAR END:** DMI CT1-486 - SEE PAGE 47 - 48 of the BRP CATALOG FOR MORE OPTIONS

**REAR END TUBE / AXLE LENGTHS:**

	8 BOLT	SMART TUBE	QUAD LOCK W/ RING
RIGHT REAR TUBE	BRP 3576	BRP 3800-60	BRP 4050-60
LEFT REAR TUBE	BRP 3520	BRP 3800-05	BRP 4050-05
RIGHT REAR AXLE	BRP 3076	BRP 3060B	BRP 3060B
LEFT REAR AXLE	BRP 3020	BRP 3005B	BRP 3005B

SEE PAGE 50 - 52 of the BRP CATALOG FOR MORE OPTIONS

**TRANSMISSION:** GEN 1 - BERT MOZ or WIN 60150  
GEN II - BER 1200 NOTE: USE TORCO MTF FLUID AND CHANGE EVERY 10 RACES  
GEN II SHIFTER - BER78-SG

**TORQUE ARMS AND DRIVE LINE:** 0° torque arm : BRP 426 -3° torque arm : BRP 9743 or BRP 9295  
**BRP RECOMMENDS BRP 9743 TORQUE ARMS**

Rubber Biscuit - BRP 9425 / BRP 9702 Driveshaft - BER 253 (20" long)  
Driveshaft Cover - BRP 1645 for GEN 1 transmission or BRP 9020 for GEN II transmissions  
Strange Complete driveshaft kit with yokes and u-joints- (1310 U-joints) STG DKM203  
(1350 U-joints) STG DKM202A

**NOTE: To void risk of bottoming out, closed length of driveshaft must be no more than 22 3/8" long**

STD Slip Yoke - BRP 509 STD U Joint - BRP 512  
Slider Plate - BRP 417S (optional BRP 9701) Slider Collars - BRP 181-1A (2 or 4 required)  
Slider Rods - stock floor : BRP 421 (2 required) Rubber floor : BRP 9115 (2 required)

NOTE: Do not use internal collars on BRP 419



**BRAKES:** NOTE: Bleed brakes every 1-2 weeks to keep fluid fresh. Never use silicon fluids. Never mix fluid types.  
 BRC Calipers 3/8" front rotor width : BRC 170-1526 or BRC 170-1526BK for black.  
 BRC Calipers .810" rear rotor width: BRC 170-4090 or BRC 170-4090BK for black.  
 BRC Radial Mount Calipers .810" rear rotor width: BRC 170-5810

## REAR PANHARD MOUNT:

**RIGHT SIDE:** Start with the panhard in the second hole down on the rear end and the 6th hole down on the outside BRP 4550 plates (non adjustable) or aprox 3" up on the adjustable outboard mount.

Right rear panhard mount kit -	BRP 4551
Right rear cockpit adjustable panhard mount kit-	BRP 4549
Inner right rear panhard mount -	BRP 1626

**LEFT SIDE:** Start with the panhard in the top hole down on the rear end and the 3rd hole up on the outside BRP 9594 or BRP 9675 plates.

Left rear panhard only mount kit -	BRP 9675
Left rear cockpit adjustable panhard mount kit-	BRP 9588
Left rear panhard & j bar mount kit -	BRP 9594
Inner left rear panhard mount -	BRP 1626L
Inner left rear cockpit adjustable mount -	BRP 9598

**REAR BIRDCAGES:** NOTE \*-indicates available in red or black. All other available in black only

### TORSION BAR

	8 BOLT	SMART TUBE	-5° QUAD LOCK	0° QUAD LOCK	QUAD LOCK ADJUST.
RIGHT REAR	BRP 4293*	BRP 4257*	BRP 9033*	BRP 9466-3	BRP 9310-3
LEFT REAR	BRP 4292*	BRP 4255*	BRP 9032*	BRP 9465-3	BRP 9310-3

### COIL OVER

	8 BOLT	SMART TUBE	0° QUAD LOCK
RIGHT REAR	BRP 540*	BRP 542*	BRP 9469
LEFT REAR	BRP 540*	BRP 542*	BRP 9469

**REAR SHORT LINK BRACKETS:** Birdcage adaptor bracket- BRP 9549 - optional BRP 9723  
 Left rear bolt on radius rod mount- BRP 9099L-1  
 Right rear bolt on radius rod mount- BRP 9099R-1  
 Right rear support bracket for 9099R-1- BRP 9099R-1B  
 Right or left upper shock mount- BRP 9574  
 Optional short right rear shock mount- BRP 9637  
 Optional left rear wedge bolt style mount- BRP 9560

FOR NEW STYLE BOLT ON SHOCK MOUNTS, PLEASE CALL SALES STAFF

**BRAKE BALANCE BAR:** BRC 310-9070 (or BRC310-9085 with 1" & 7/8" master cylinders installed) or BRP310-1000  
 BRC 310-9085-7/8 : 2 x 7/8" master cylinders installed  
 WIL260-10374B = 7/8" rear master cylinder WIL26010375B = 1" front master cylinder  
 SEE PAGES 24-28 FOR MORE INFORMATION

**WHEELS:** LF:10" X 4" RF: 12" X 5" LR: 13" X 3" RR14" X 3"

**SETUP BLOCK HEIGHTS:** LF - BRP 9706 RF - BRP 9707  
 LR DROP RAIL - BRP 9708 RR - BRP 9709

FOR MORE INFORMATION, PLEASE CONSULT OUR CATALOG FOR FULL  
 PARTS LIST LOCATED ON PAGE 176-177.



## CALCULATING WEIGHTS AND PERCENTAGES

Most modern scale systems give you all this information, but here is the formulas for calculating percentages. The only way to change the percentages of a race car is to move the physical weight in the chassis (ballast weight), change the location of the rear end and front end, or by changing the frame heights or wheel offsets. Also the physical weight of the tires will have an effect on percentages.

**Note: This example is for a 2220 pound car before driver.**

### Left Side Percentage

#### NOTE

For customers that have wireless scales:  
If the percentages are different then what you had the previous week, double check and make sure each scale pad reads the same. If not, replace the batteries in that pad. Weak batteries can cause the pads to read inaccurate wheel weights.

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LF WEIGHT} + \text{LR WEIGHT} \div \text{TOTAL WEIGHT} = \text{LEFT SIDE \%}$$

$$475 + 730 \div 2220 = .5428 \text{ or } 54.2\%$$

### Rear Percentage

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RR WEIGHT} \div \text{TOTAL WEIGHT} = \text{REAR \%}$$

$$730 + 710 \div 2220 = .6486 \text{ or } 64.9\%$$

### Diagonal or Cross Percentage

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RF WEIGHT} \div \text{TOTAL WEIGHT} = \text{DIAGONAL \%}$$

$$730 + 305 \div 2220 = .4662 \text{ or } 46.7\%$$

### Left Rear Weight

LF <b>475</b>	RF <b>305</b>
LR <b>730</b>	RR <b>710</b>

$$\text{LR WEIGHT} + \text{RR WEIGHT} = \text{LEFT REAR WEIGHT}$$

$$730 - 710 = 20\# \text{ LR WEIGHT}$$

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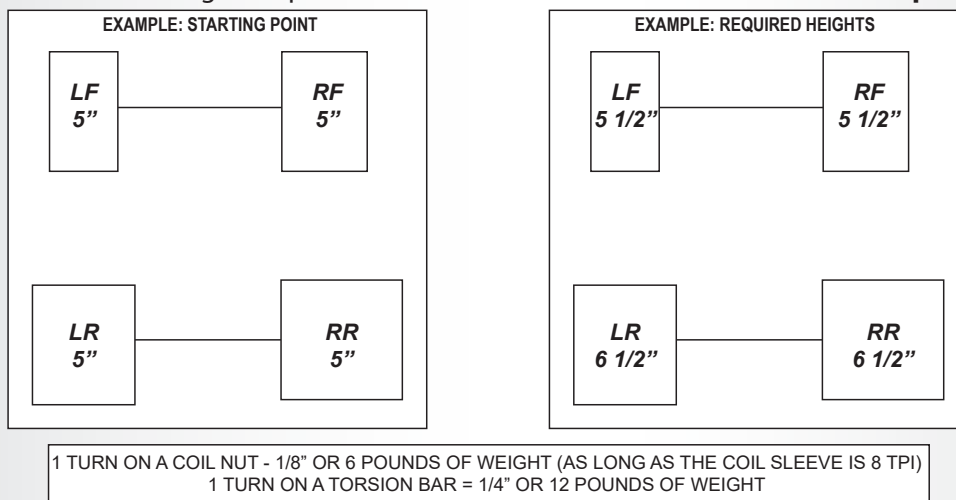
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## SETTING FRAME HEIGHTS

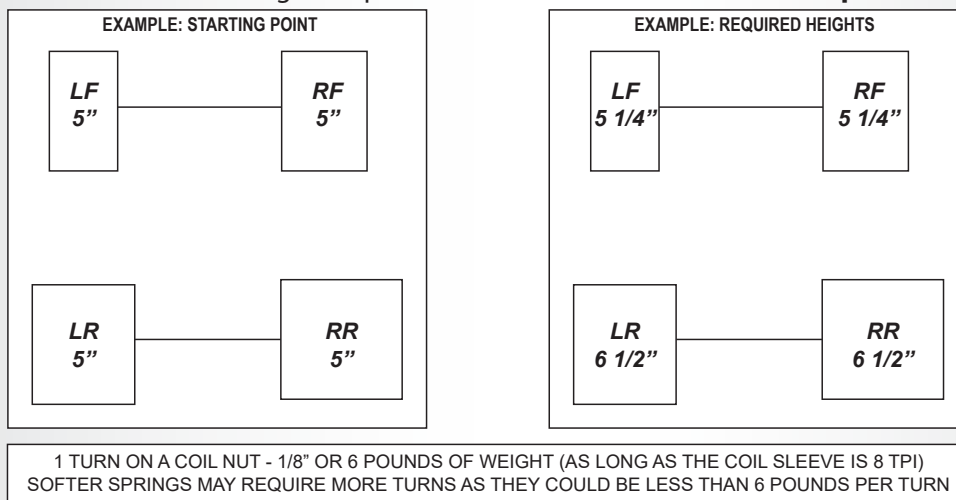
\*\*\*NOTE: The following examples are for **coil over front and torsion bar rear suspension**. \*\*\*



By using the information that we have listed above, getting the required frame heights will be easy.

- 1- You will need to raise the front up 1/2" on both sides.
- 2- As noted in the above example, 4 turns will raise the front of the car 1/2". Just wind the coil nuts down 4 turns on both sides.
- 3- Now, move to the rear and you will need to raise both sides by 1 1/2".
- 4- As also noted above, you need to put 6 turns on each torsion stop bolt - 1 turn for every 1/4" you need to go up.
- 5- Recheck both front and rear and make final adjustments as needed before moving onto the next step.

\*\*\*NOTE: The following examples are for **coil over front and rear suspension**. \*\*\*



By using the information that we have listed above, getting the required frame heights will be easy.

- 1- You will need to raise the front up 1/4" on both sides.
- 2- As noted in the above example, 2 turns will raise the front of the car 1/4". Just wind the coil nuts down 4 turns on both sides.
- 3- Now, move to the rear and you will need to raise both sides by 1 1/2".
- 4- As also noted above, you need to put 12 turns on each rear coil nut - 1 turn for every 1/8" you need to go up.
- 5- Recheck both front and rear and make final adjustments as needed before moving onto the next step.



## Adjusting Weight Percentages And Frame Heights

A few things should be noted before we start. All information is based on a 2050-2250 pound race car after ballast weight is added and WITHOUT DRIVER.

- 1 turn on a torsion stop bolt will change the weight on that tire aprox. 12 pounds. It will also change the frame height of that corner aprox. 1/4".
- 2 turns on a standard coil over front shock nut will have the same effect - 1/4" of ride height and 12 pounds of weight assuming the coil nut is 8 TPI (threads per inch). If they are not, see note.
- Left rear torsion bars should have 5-6 turns of pre-load with no rear shocks installed.
- Right rear torsion bars should have 6-7 turns of pre-load with no rear shocks installed
- Always never seize your torsion stop bolts.
- Always set your frame heights first.

### Note:

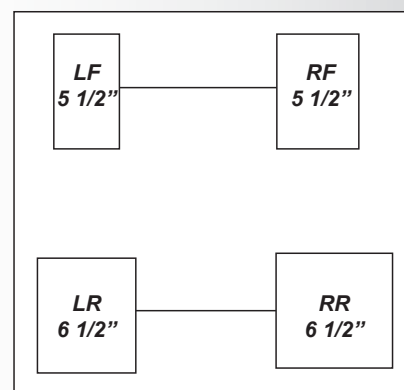
a standard coil nut is 8 TPI (threads per inch), which means every turn is moving the nut 1/8". Some shocks have different threads per inch so you will need to figure out how many turns it takes to move your coil nut 1/8". If it is 12 threads per inch, it would take 3 turns to move the nut 1/8" or 6 turns to move the nut 1/4".

### Formula For Adjusting Left Rear Weight - Torsion Bar

Put your car on scales and set left side percentage between 54.2% - 54.4% before adding any ballast weight to car. First, shorten the front panhard bar as much as possible until the lower mounting bolt of the left front shock is 1/4" away from the shock tower. If the left side percentage still is low, you can shorten the rear panhard bar until you achieve the necessary left side percentage.

Set your rear percentage to 64-64.5% for BB or 65-66% for SB/sports. Using ballast weight is okay to achieve this, but remember to maintain your left side percentage.

For example, if at this point the car has 100 pounds of left rear weight and we are trying to achieve 0 pounds left rear weight - here is the formula to achieve it.  
 (note- if you are going by cross weight percentage, 100 pounds of left rear weight will be aprox. 50% cross)



The easy solution might be to just wind one corner and take all that weight out.... But we have our frame heights to worry about! What you need to do is take that 100 pounds of left rear weight and divide it by all 4 corners of the car. 100 divided by 4 = 25 pounds of weight per corner. Why 4 you ask? Because we are going to take out left rear weight by adjusting all 4 corners of the car to maintain our frame heights. Basically, we need to change all 4 corners of the car by 25 pounds of weight.

We already know from above that 1 turn on a torsion bar is equal to 12 pounds of weight adjustment on that corner, and 2 turns on a coil nut is also 12 pounds of weight adjustment on that corner.

Always remember that all weights are diagonal on a race car. If you increase weight on a corner, it will always put weight on the diagonal corner.

So, we need to take 2 turns out of the left rear torsion stop, and put 2 turns into the right rear torsion stop. We do diagonally the same we need to take 4 turns out of the right front coil nut and put 4 turns into the left front coil nut. Recheck your wheel weights and frame heights and you will see that you are very close. A few slight adjustments may be necessary.

---continued on next page---

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## Left Rear Weight Quick Checks (torsion bar) IF FRAME HEIGHTS ARE CORRECT

ADDING 25 # LEFT REAR			
LF	RF		
1 turn out	1 turn in		
LR	RR		
1/2 turn in	1/2 turn out		

ADDING 50 # LEFT REAR			
LF	RF		
2 turn out	2 turn in		
LR	RR		
1 turn in	1 turn out		

REMOVING 25 # LEFT REAR			
LF	RF		
1 turn in	1 turn out		
LR	RR		
1/2 turn out	1/2 turn in		

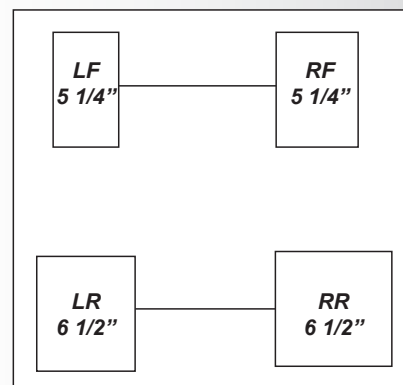
REMOVING 50 # LEFT REAR			
LF	RF		
2 turn in	2 turn out		
LR	RR		
1 turn out	1 turn in		

## Formula For Adjusting Left Rear Weight - Coil Over

Put your car on scales and set left side percentage between 54.2% - 54.4% before adding any ballast weight to car. First, shorten the front panhard bar as much as possible until the lower mounting bolt of the left front shock is 1/4" away from the shock tower. If the left side percentage still is low, you can shorten the rear panhard bar until you achieve the necessary left side percentage.

Set your rear percentage to 64-64.5% for BB or 65-66% for SB/sports. Using ballast weight is okay to achieve this, but remember to maintain your left side percentage.

For example, if at this point the car has 100 pounds of left rear weight and we are trying to achieve 0 pounds left rear weight - here is the formula to achieve it. (note- if you are going by cross weight percentage, 100 pounds of left rear weight will be approx.50% cross)



The easy solution might be to just wind one corner and take all that weight out.... But we have our frame heights to worry about! What you need to do is take that 100 pounds of left rear weight and divide it by all 4 corners of the car. 100 divided by 4 = 25 pounds of weight per corner. Why 4 you ask? Because we are going to take out left rear weight by adjusting all 4 corners of the car to maintain our frame heights. Basically, we need to change all 4 corners of the car by 25 pounds of weight.

We already know from above that 1 turn on a coil nut is equal to 6 pounds of weight adjustment on that corner. 25# divided by 6 is 4 turns.

Always remember that all weights are diagonal on a race car. If you increase weight on a corner, it will always put weight on the diagonal corner.

So, we need to take 4 turns out of the left rear coil nut, and put 4 turns into the right rear coil nut. We do diagonally the same we need to take 4 turns out of the right front coil nut and put 4 turns into the left front coil nut. Recheck your wheel weights and frame heights and you will see that you are very close. A few slight adjustments may be necessary.

## Left Rear Weight Quick Checks (torsion bar) IF FRAME HEIGHTS ARE CORRECT

ADDING 25 # LEFT REAR			
LF	RF		
1 turn out	1 turn in		
LR	RR		
1 turn in	1 turn out		

ADDING 50 # LEFT REAR			
LF	RF		
2 turn out	2 turn in		
LR	RR		
2 turn in	2 turn out		

REMOVING 25 # LEFT REAR			
LF	RF		
1 turn in	1 turn out		
LR	RR		
1 turn out	1 turn in		

REMOVING 50 # LEFT REAR			
LF	RF		
2 turn in	2 turn out		
LR	RR		
2 turn out	2 turn in		

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## TORSION BAR PRELOAD INSTRUCTIONS

These instructions are assuming that you already have the rear end installed, squared using setup blocks and that the torsion bars and torsion arms are slid into place and tightened down.

- 1- Make sure the rear shocks are unhooked.
- 2- Take the rear end off the setup stands and let it hang down. At this point, if you have an 1 1/2" left rear drop rail you must put an 1 1/2" block between the bottom of the left rear tube and top of the left rear frame connector. If car doesn't have a drop left rear rail, the rear end will sit on the lower chassis rails.
- 3- Make sure the torsion stop adjuster bolt are never seized and installed in the stops. Back the stop adjuster bolts all the way out.
- 4- Slide the torsion stops into place. You may need to pry the left rear torsion bar out slightly to have enough room to slide the left rear stop into place. Use a pry bar on the left rear torsion arm to slide the torsion bar and arm out enough to slide torsion stop into place. If you need to, you can also lengthen the rear panhard bar to achieve this as well. Make sure the stop is rotated as close to the adjustment pad as possible.
- 5- Adjust the stop bolts until they just touch the adjustment pad on chassis and you feel a slight amount of tension starting.
- 6- Starting with the left rear bar, wind the required 5-6 turns into the stop bolt. Remember the stop on the right hand side of the car controls the left rear bar.
- 7- Next, do the same to the right rear bar, but put 6-7 turns into it. Now the car should be taken off the jack stands and set on the shop floor.
- 8- Torsion bars must now be seated. Bounce the back of the car by placing your knee on the rear bumper. Moderately bounce on the car for 3-5 minutes.
- 9- Re-install shocks. Make sure when you hook the shocks back up that the rear end tubes touch the frame rail on the left rear, and right rear is 1"-1.5" off the lower frame connector.
- 10- Scale car as necessary.

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## FRONT END SET-UP



image 1A

1- First, ensure the brackets are properly installed on the axle. The brackets go to the grandstand side of the welded on slugs. The radius rods bolt on to the infield side of the axle brackets.

FRONT AXLE PART # BRP EC52BOC-8



image 1B



image 2A

2- Next, set the height of the panhard slider. BRP recommends to start the slider at the bottom (see image2A)

On newer chassis with the welded on brackets, start in the second hole from the bottom (see image2B)



image 2B



image 3

3- The panhard drop bracket should be installed in the second hole down from the top. (see image 3)

DROP BRACKET PART # BRP 1503 (2 HOLES OFF AXLE CENTERLINE)  
BRP 1622 (1 HOLE OFF AXLE CENTERLINE)



image 4

4- Place set-up blocks between axle and chassis. This will simulate ride height. Contact your chassis dealer to obtain a set. ( see image 4)

RIGHT FRONT SET-UP BLOCK- BRP 9707

LEFT FRONT SET-UP BLOCK- BRP 9706

5- Next, set the front end left to right in the chassis. Between the 2 main rails, it should measure  $12 \frac{7}{8}$ ". Make a mark at  $6 \frac{7}{16}$ ". This is the center of the chassis. Next draw a line at 24" on the axle from the center-line of the left front king pin. Adjust panhard bar until the 2 marks line up. A 21" panhard bar should be very close to bottoming out. (see image 5)  
Also note that there should be approximately  $\frac{1}{4}$ " -  $\frac{1}{2}$ " of gap between the head of the shock bolt and left front shock tower (see image 6)

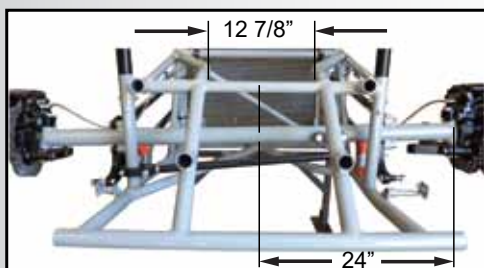


image 5

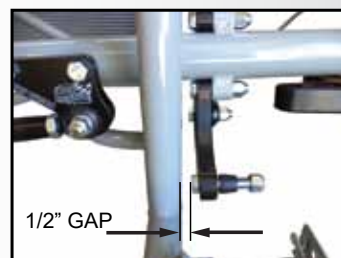


image 6



## FRONT END SET-UP CONTINUED



image 7

6- Next, make sure the chassis is level with a digital protractor. This will make setting the caster easier. (see image 7)



image 8

7- With the chassis level, we can now set the caster. BRP recommends the caster to be set at 13° on the right front and 9° on the left front. However on the set-up blocks, we need to set the caster 1.5° more than actual to allow for the tilt in the chassis when we set the car at proper ride heights. So in image 8, we have 13° of caster on the set-up blocks, but at ride height we will have 11.5°. On the left front in image 9, we have 9°, but when we set the chassis at proper ride heights the caster will be aprox. 7.5°. Adjust the caster using both top radius rods or both bottom radius rods. NOTE: While setting the front end, you could also take the upper right front radius rod off to make sure the the front end is neutral.



image 9

8- After the caster has been set, we can square the front end. Set the wheel base adjusting the radius rods so the axle is 1 1/2" away from the back of the shock towers. A piece of 1 1/2" tubing works well for this (figure 10). Adjust rods evenly so the caster does not change. Be sure to double check both sides as measurements may change as you adjust the opposite side.



image 10

9- Next, jam down all jam nuts except for the right front top radius rod. This rod must be free at all times. The left side is the load carrying side and will be slightly snug, but the right side radius rods should be free at all times. Once the car is set-up, go back and adjust the right front top radius rod until it is free. This will ensure a bind free front end.

10- Once car set on ground, set toe out to 1/8"-3/16 using toe plates.

Front end set-up is now complete!



## REAR END SET-UP - TORSION BARS

NOTE: SEE PAGE 26-31 FOR COIL OVER, J BAR, AND LEFT SIDE PANHARD SETUPS



image 1

1- First, set the rear end on set-up stands with the torsion stops removed. (image 1 and 2)  
Left Rear- BRP 9708 Right Rear- BRP 9709

2- Set the rear panhard bar height. BRP recommends to start the outer panhard at 3" on the adjustable, 6th hole from the top on the non-adjustable. (image 3) Set the inner panhard in the second hole from the top (image 4).

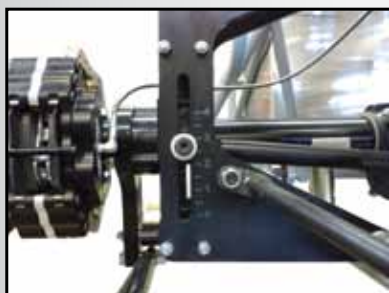


image 3

3- Once the panhard is set, center the rear end. Measure from the outside of the 2X4 frame rail to the outside of the torque arms 11 7/16". This dimension should be the same on both sides. (images 5 and 6) The rear end can be offset to obtain proper left side percentage, just make the torsion arms do not hit the birdcages as the suspension moves.

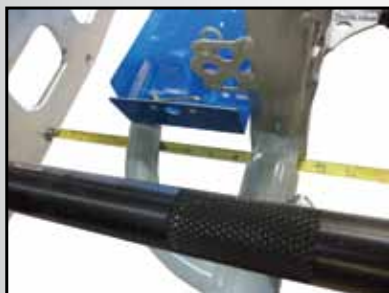


image 5

4- Now square the rear end. Measure 8 3/4" or 9" (depending on birdcage timing - See page 19-22) from the back side of the keystick to the front side of the rear end tube. (images 7 and 8)

5- We recommend starting with both rear radius rods in the middle holes (image 9)  
Set the spring rod to 3 3/4" for heavy tracks and adjust for track conditions.



image 7

6- Next, ensure birdcage timing is correct. The birdcage timing is important because this sets the spring rate of the torsion bars. See birdcage timing (page 19-22) for more information about this topic.

7- BRP recommends starting with both rollers in the bottom rear holes. (image 10)



image 9

8- The torsion arms should line up approx. in the center of the birdcages at this point. They can be offset to obtain left side percentage as long as the torsion arms don't rub on the birdcages. If using quad lock tubes, you can also slide the birdcages on the tube to re-align the torsion arms in the center of the birdcages.

Note: If more left side percentage is required, you can shorten the rear panhard bar to achieve this. Always ensure there is at least 1/4" of clearance between torsion arms and birdcage plates.



image 2



image 4



image 6



image 8



image 10



## BIRDCAGE TIMING

All the talk about birdcage timing... why is it so important anyways? It is important because it is what sets the spring rate of your rear torsion bars. Imagine having a coil spring on the right front of your car that was marked a 150 but actually measured 225. If your birdcage timing is incorrect, this is the exact same effect it will have on your race car. You should always use a digital angle finder (PT# BRP 9316) as the rotary style angle finders that are available at your local hardware store will not be able to measure the birdcage timing accurately enough. Also remember that if you are checking birdcage timing in the chassis, make sure the chassis is level.

### QUAD LOCK BIRDCAGE TIMING OPTION A + 5°

**Birdcage timing option A:** +2° in front of rear end center line with -3° torque arms (birdcage timing +5° in relation to rear end cover)

This option helps corner entry but makes a looser race car. It loads the torque arms down on deceleration. This option is better suited to limited horsepower applications or tracks that need a loose race car.

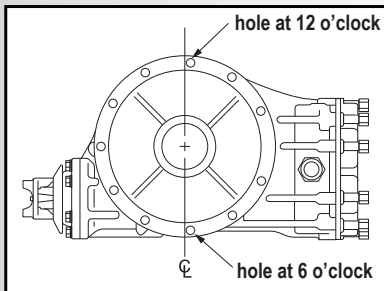


image 1



image 2

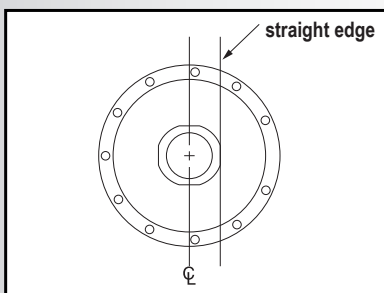


image 3



image 4

#### Step 1- Installing the tube in the rear end bell-

The tube is designed to be installed in the bell at 0°. So the flats on the tube need to be parallel with the mounting holes in the bell that are located at 12 o'clock and 6 o'clock (see image 1). The easiest way to achieve this is to put a piece of angle iron on the rear flat of the tube (see image 2). As the tube is installed, you can look down the angle iron and align it to the holes on the bell (see figure 3). This option uses BRP 9032-3 / BRP 9033-3 birdcages.

#### Step 2- Installing the birdcage-

The rear end tube sets the birdcage timing. If the timing of the tube is correct, then the timing of the birdcage will be correct. We aim for +2° forward (see page 30) with -3° torque arms. **THERE IS +5° BUILT INTO A STANDARD QUAD LOCK BIRDCAGE.** If you measure the birdcage timing in relation to the rear cover, it should be +5°. If you set the rear end in the car and use the setup blocks, the timing should be +2° (or 2° forward at the bottom see page 30)

An adjustable birdcage is also available if the tube is installed incorrectly, or if you would like to experiment with birdcage timing.

To locate the birdcage on the tube left to right, measure from the outside of the rear end tube (where the threads are) to the outside birdcage plate. It should measure approx. 6 3/4" for both sides. If you have offset the rear end to gain left side percentage, then these measurements may differ.

As a reference, if you set the rear cover of the rear end on the ground to measure birdcage timing, the birdcages will actually be at +5° forward at the bottom.



## BIRDCAGE TIMING

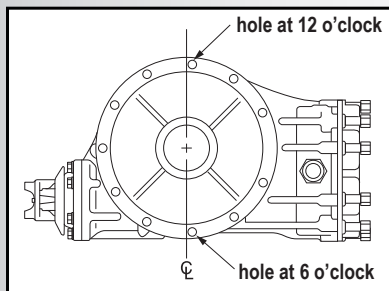


image 1



image 2

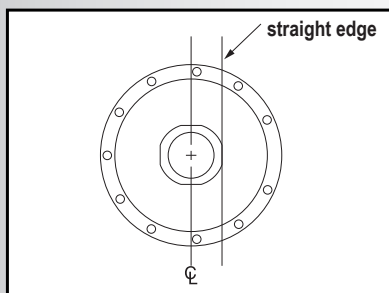


image 3

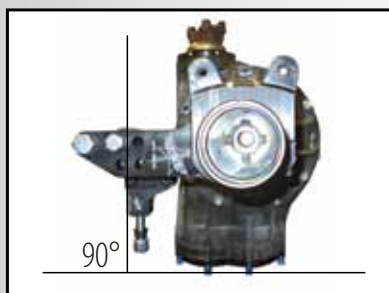


image 4



image 5

### QUAD LOCK BIRDCAGE TIMING OPTION B 0°

**Birdcage timing option B-** 3° behind rear end center line with -3° torque arms (birdcage timing 0° in relation to rear end cover)

This option makes the rear end load more because the roller is behind rear end center line which will pre-load the torque arm.

This option will make the car tighter on corner entry, and tighter on acceleration.

This option is better suited to high horsepower applications and race tracks that are typically dry.

**NOTE: For option B you must use BRP 9310-3 adjustable birdcages or BRP 9465-3/9466-3**

#### Step 1- Installing the tube in the rear end bell-

The tube is designed to be installed in the bell at 0°. So the flats on the tube need to be parallel with the mounting holes in the bell that are located at 12 o'clock and 6 o'clock (see image 1). The easiest way to achieve this is to put a piece of angle iron on the rear flat of the tube (see image 2). As the tube is installed, you can look down the angle iron and align it to the holes on the bell (see figure 3).

#### Step 2- Installing the birdcage-

Install the adjustable birdcages on the rear end tubes as normal. If the rear end is NOT installed in the race car, then rotate the rear end so it is on the back cover. Install the proper pills in the BRP 9310-3 birdcages so the bottom of the birdcage is 90° to the rear end center line (see image 4). If the tube is installed correctly, then the 5° pills should be installed in the birdcages.

As a reference, if you set the rear cover of the rear end on the ground to measure birdcage timing, the birdcages will actually be at 0°.

If the rear end is installed in the race car, set the rear end on the set-up blocks. Make sure the chassis is level. Install the proper pills in the birdcage so the birdcage measures -3°. The birdcages should be -3° behind the rear end center line (see image 5).



## BIRDCAGE TIMING CONTINUED

### SMART TUBE REAR END

#### Step 1- Installing the tube in the rear end bell-

When installing a smart tube into the bell, the tube does not need to be timed. All the timing is done on the birdcage, so the tube can be installed in any position.



image 5

#### Step 2- Installing the birdcage-

2A- To time the birdcages on a smart tube rear end, the rear radius rods and rear panhard bar should all be installed.

2B- Place rear end on setup stands.

2C- If you are using the brake brackets that came with the birdcages, install hubs and calipers. This will align the birdcages left to right. If using bolt on brake brackets, install hubs and calipers after birdcages have been timed.

2D- Square the rear end left to right off the torque arms.

2E- Ensure the torsion arms are centered in the birdcages.

2F- MAKE SURE CHASSIS IS LEVEL AT THIS POINT.

2G- Put the angle finder on the top of the birdcage (see image5) and set birdcage timing. See page 19-20 for birdcage timing options. (Option A: +2° forward, Option B: -3° backward)

2H- Drill and tap the birdcage into the tube, and tighten pinch bolt.

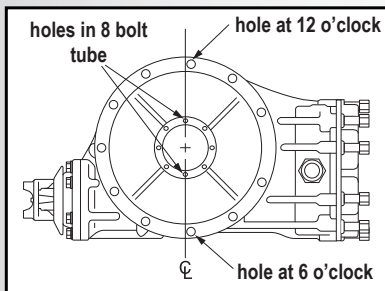


image 6

### 8 BOLT REAR END

#### Step 1- Installing the tube in the rear end bell-

The tube is designed to be installed in the bell at 0°. The holes in the end of the tube need to line up with the mounting holes at 12 o'clock and 6 o'clock in the bell (see image 6). The rear end tube sets the birdcage timing, so if the tube is installed correctly then the birdcage timing will also be correct.

#### Step 2- Installing the birdcage-

2A- Install birdcages and spindles as per normal.

2B- MAKE SURE CHASSIS IS LEVEL.

2C- Place setup blocks under rear end tubes.

2D- Place the angle finder at the bottom of the shock mount and check the birdcage timing. The birdcage/tube timing should be approx. 2.75°. If the birdcage timing is incorrect, a blank cup (PT # BRP 4308B) will need to be purchased and re-drilled to obtain the proper timing.

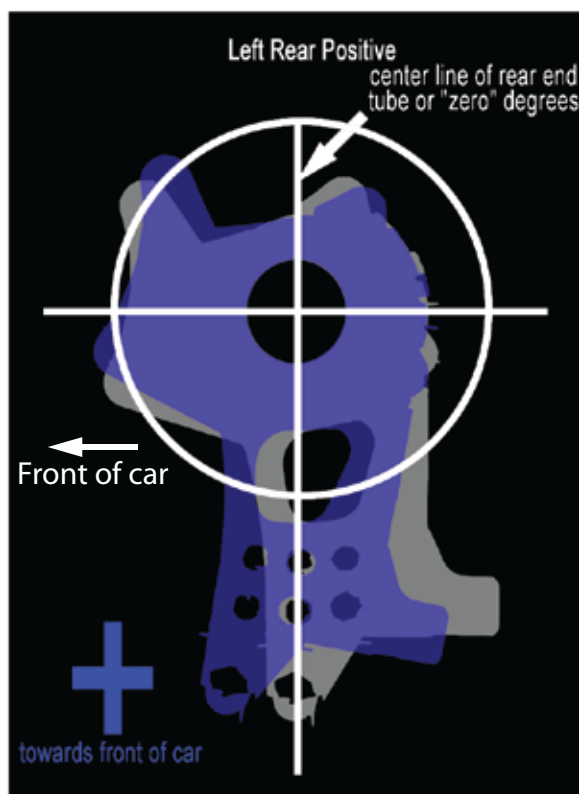
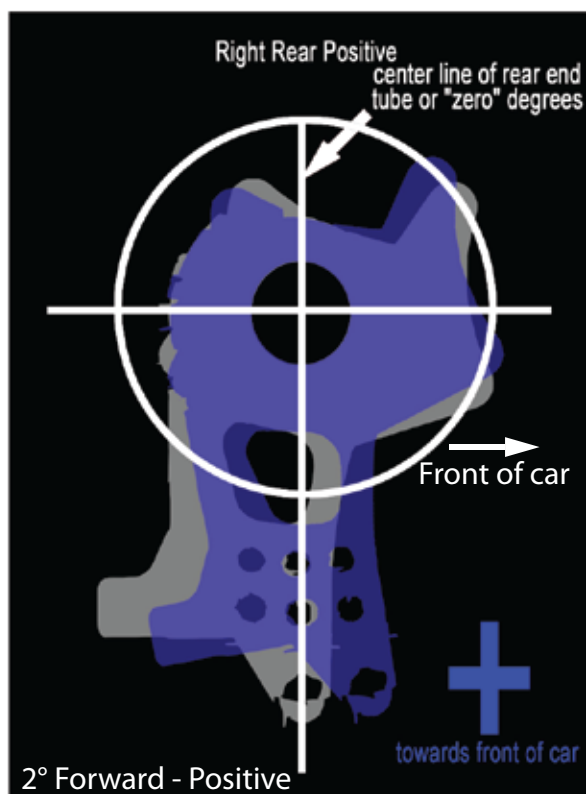


image 7

Please e-mail the tech department if you have any questions regarding birdcage timing.  
[tech@bicknellracingproducts.com](mailto:tech@bicknellracingproducts.com)



## BIRDCAGE TIMING





## STOCK FLOOR TORQUE ARM SLIDER SETUP

1- First, ensure the slider heim (BRP 425) is the proper length. It should measure **2 1/4"** from the center of the heim to the end of the threads (as seen in image1). This is very critical as this determines the pinion angle. If the heim was purchased from Bicknell Racing Products, (BRP 425) it will already be cut to the proper length of 2 1/4".



image 1

2- Next, be sure the torque arm rubbers are the correct length. For dry, slick tracks the torque arm rubbers can be cut down to as much as 1 1/8" high. For heavier tracks, it is better to leave rubbers at their shipped length. Be sure the rubbers are cut no less than 1 1/8" as they will have no compression if they are cut too short. (see image 2)



image 2

**SEE RUBBER BUSHING CHART ON PAGE 25  
FOR MORE BUSHING OPTIONS**

3- Prior to installation, ensure the slider rods (BRP 421 for standard floors, see page 24-25 for rubber floors) will slide into the chassis with ease. If they do not go in easy, clean them out with a drill or die grinder.

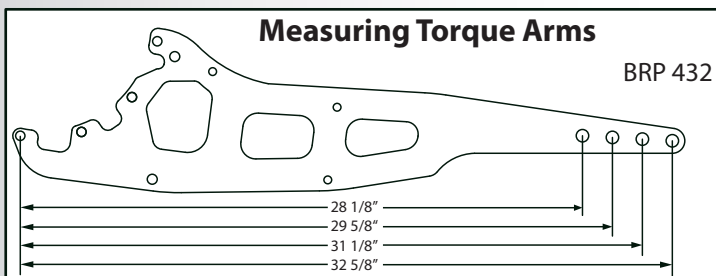
4- Install the rods and the safety collars and the slider plate (BRP 417S or 418)

Make sure the slider plate travels the entire length of the slider. Make sure the grease fittings point towards the bottom on BRP 418, the 417S is marked "top".

5- Next install the heim. Be sure the steel sleeve goes in the center of the rubbers. The steel washers should go on the top and bottom of the rubbers (see image 3). Also ensure the bolt tightens all the way up. Red Loctite can be also be used.


 COMPLETE - BRP 424BL  
 image 3

Note: Stock floor cars must use 2 BRP 421 slider rods and BRP 417S or 418 slider. It also requires 2 BRP 181-1A lock collars. The following biscuits can be used: BRP 9425, BRP 424, or BRP 424BL.



### TORQUE ARM PART NUMBERS:

BRP 426: 0° STD quick change  
 BRP 432: -3° STD quick change  
 BRP 430: 0° NON quick change  
 BRP 433: 0° V8 quick change  
 BRP 439: -3° V8 quick change  
 BRP 9295: -3° quick change for engine back cars

## TRIPLE BISCUIT SETUP - BRP 9425

The triple biscuit (BRP 9425) enhances traction by giving the tires more time to hook up. It has a more negative pinion angle, and also has more rubbers to allow more upward movement of the torque arms. This assembly uses an 1 7/8" heim (see image 4).

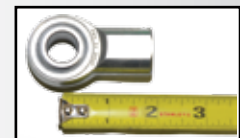
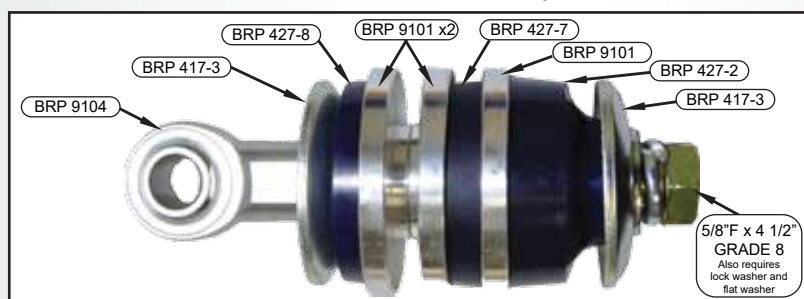


image 4



Note: You can either use the 2 BRP 9104's that come with the BRP 9425, or the steel slider (BRP 417S) comes with 2 with a snap ring. If you use these, then take out the 2 BRP 9101's



## VER. 2 RUBBER FLOOR SETUP

1- First, install tie rod between floor members. This tie rod is used to space the frame rails to the appropriate width (see image 1)

2- Next, install the engine plate (BRP 292). Use the tie rod to adjust the chassis in or out so the engine plate bolts install without the use of a hammer. The bolts should slide in place without any resistance.

**NOTE: DO NOT DRILL OUT ENGINE PLATE OR FRAME FOR ALIGNMENT.**

3- Once the engine plate is bolted in place, the floor cross beams can be installed. Take off the bottom cross beam plate (6 X 1/4" bolts). Place the front cross brace into the 2 X 4 floor saddle, and install the 1/2" shoulder bolts. Again, the shoulder bolts should install without any resistance. (see image 2) **NOTE:** There should be an even gap all the way around the half moon shaped notch in the cross brace. If the gap is not even, repeat step 2.

4- After the front cross brace is installed, the rear cross brace can be installed. Again, the shoulder bolts should install with no resistance. The shoulder bolts are longer than the saddles. This is necessary to ensure the saddles don't restrict the movement of the cross braces. (see image 3). They may appear to be too long, but they are correct.

5- Now that the braces are installed, the bottom cross beam plates can be installed. They are installed with 1/4"C X 3/4" long bolts. (see image 4). Again they should install with no resistance. There may be a gap between the cross beam and the lower cross beam plates. This is built by design and the gap will close once all the bolts are tight. At this point, both cross braces should move freely. Move them back and forth, and up and down to ensure they are not obstructed in any way.

6- At this point, the slider rods (BRP 9115) can be installed. (see image 5) The slider rods install directly into the rubber, so some grease will aid in this process. Also make sure there is a lock collar in place on either side of the slider box itself as it may be a little difficult to remove the slider rods once they are installed. Make sure the slider is installed the correct way- there will be a 'T' marked on the top (see image 6 and 7) or offset the plate to bottom of car.

7- Once the slider box (BRP 417S) is installed, the lock collars can be tightened up. They should just touch the rubber bushings so they won't restrict the movement of the cross braces. Move the slider from front to back to ensure it moves free. It is designed to be sloppy. Install biscuit assembly.

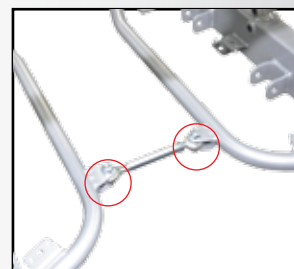


image 1

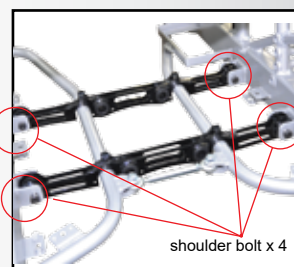


image 2



image 3

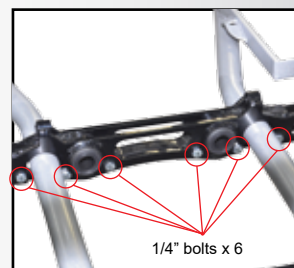


image 4



\*You can also remove the link after installing the engine, and race with it removed.\*

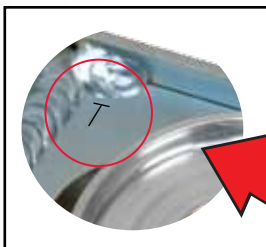


image 7

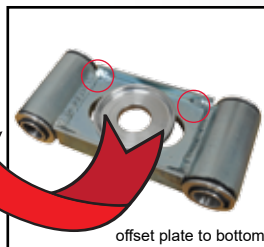


image 6



image 5

**Note:** Ver. 2 Rubber floor cars must use 2 BRP 9115 slider rods and BRP 417S slider. It also requires 4 BRP 181-1A lock collars. The following biscuits can be used: BRP 9425, BRP 424, or BRP 424BL.



## VER. 3 RUBBER FLOOR SETUP

1- First, install the rubber bushings (BRP 2208G) in the floor. The sleeves welded to the floor have a tapered side, and a non-tapered side (see image 1). The bushings must be installed from the tapered side. Install the bushing by inserting it into the mounting sleeve, and striking the bushing with a hammer. A large flat hammer works well, or a flat object can be placed between the bushing and the hammer. You will have to strike the bushing quite hard, so safety glasses is a must! When you hit the bushing, ensure you hit it square so the bushing doesn't cock in the sleeve. The bushing should slide into place with 1 swift hit.

NOTE: it is easier to install the floor bushings before the engine plate and transmission.

2- Next, install the slider rods (BRP 421). They install directly into the rubber bushing, so a little grease will aid in the rod sliding into the rubber (see image 2). Ensure the lock collars are inserted on the rods as well as the slider plate (BRP 417S). There will be a "T" on the slider to mark the top (see image 4 & 5).

3- Once the slider box (BRP 417S) is installed, the lock collars can be tightened up. They should just touch the rubber bushings so they won't restrict the movement. Move the slider from front to back to ensure it moves free. It is designed to be sloppy. You can then install the biscuit assembly.

Note: Ver. 3 Rubber floor cars must use 2 BRP 9115 slider rods and BRP 417S slider. It also requires 4 BRP 181-1A lock collars. The following biscuits can be used: BRP 9425, BRP 424, or BRP 424BL.



image 1

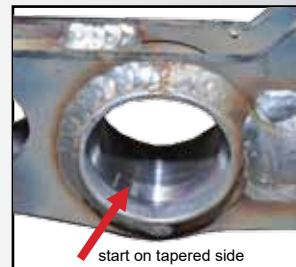


image 2



image 3



image 6

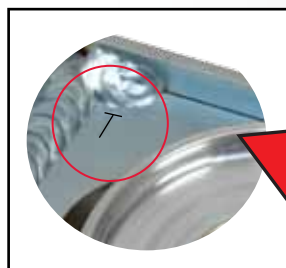


image 5

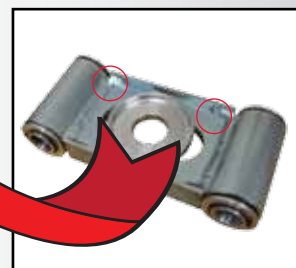


image 4

## RUBBER BUSHING CHART

PART NUMBER	MATERIAL	HEIGHT	DUROMETER
BRP 427-1	black urethane	1 3/8"	70
BRP 427-2	red urethane	1 3/8"	50
BRP 427-5	blue urethane	1 3/8"	60
BRP 427-6	blue urethane	1 1/8"	60
BRP 427-7	blue urethane	3/4"	60
BRP 427-8	blue urethane	1/2"	60
BRP 9596	red natural rubber	1 3/8"	50



## REAR COIL-OVER SETUP - NON SHORT LINK (LONG ROD)



image 1



image 2



image 3



image 4



image 5

Most of these procedures are the same as a torsion bar car with the exception of coil over birdcages instead of torsion. This procedure uses BRP 9469 trailing arm brackets, with BRP 9595 upper shock mounts.

1- Install trailing arm brackets (birdcages) on tubes. Set the LR 6 3/4" from the end of the rear end bell to the inside of the trailing arm (see image 1). Set the RR 14 3/4" from the end of the bell to the inside of the trailing arm (see image 2)

**Note: For EZ tube rear ends, LR 6 5/8" and RR 14 5/8"**

1- First, set the rear end on set-up stands with no springs or shocks. (See image 3).

Use the following setup stands:

Left rear Drop Rail- BRP 9708

Right Rear- BRP 9709

2- Set the rear panhard bar height. If using right side panhard, start the outer panhard mount at 3" on the adjustable mount and 6th hole down on the non adjustable mount. Start the inner panhard at the second hole from the top (see image 4) NOTE: If using a left side panhard bar, go to page 28 of this manual for setup info. If using a left side J-Bar, go to page 31 of this manual for setup info.

3- Once the panhard bar or J-Bar has been set, center the rear end. Measure from the outside of the 2 X 4 frame rails to the outside of the torque arms at 11 3/8" or 11 7/16". This dimension should be the same on both sides. The rear end can be offset to achieve proper left side percentage as well. To increase the left side percentage, move the left side of the rear end closer to the center of the race car (see image 5).

4- Now square the rear end. BRP recommends 9" on the right rear, and 8 3/4" on the left rear. The birdcage timing is less important on coil over cars as the spring rate is not dependant on the torsion arm length- the spring rate is built into the coils so the angle of the birdcages isn't as important as a torsion bar car. To square the rear end, measure from the front of the rear end tube to the back side of the key stocks on the chassis. For a square rear end, make both measurements the same. With the right rear at 9" and the left rear at 8 3/4", the rear will have 1/4" of lead (see image 6).

5- BRP recommends starting with both radius rods in the middle holes on the stock mounts. This setup will use the following radius rod lengths:

Left Rear - 27" or 27 1/2" rod length

Right Rear - 27 1/2" or 28" rod length (see catalog for spring rod lengths)

If you think you need more roll steer, you can always shorten the left rear radius rod length. BRP offers a 2" shorter adaptor bracket (BRP 9099L) and a 4" shorter adaptor bracket (BRP 9099L-4). These setups will use the following radius rod lengths:

Left Rear 2" shorter adaptor: 25 1/2" rod length

Left Rear 4" shorter adaptor: 23 1/2" rod length

Note: You can also use a regular birdcages with a coil over adaptor (BRP 9485) and BRP 9060BK upper shock mounts, but this mounts the coil spring higher and is not recommended.



## REAR COIL-OVER SETUP - NON SHORT LINK (LONG ROD) CONT'D

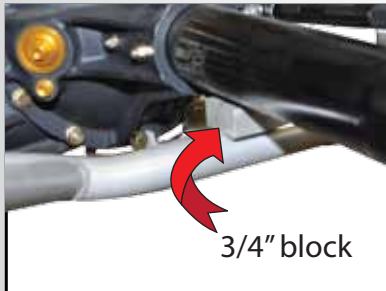


image 6

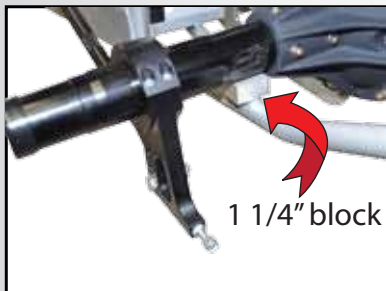


image 7



image 8



image 9



image 10

6- Once the rear end is centered and squared, the setup blocks can be removed. Again, this setup procedure is for BRP 9469 trailing arm brackets (birdcages) and BRP 9595 upper shock mounts.

7- Hang the rear end on the chassis. Put a 3/4" spacer under the rear end tube on the right side. For a regular left rear rail, hang the rear end directly on the chassis. If the chassis has a 1 1/2" drop rail, put a 1 1/4" block between the rear end and the chassis (See image 7).

NOTE: If you want more droop (more LR extension), the on the drop rail don't use the spacer.

8- Install upper shock mounts - THE SHOCKS SHOULD BE FULLY EXTENDED. It is easier to have the shocks with NO coils on them at this point (see image 8). You may need to rotate the mounts forward or backward once the car is at ride height, so snug up the upper shock mounts but don't tighten them fully. Also, you draw a line on the chassis to ensure the mounts don't move in the next step.

9- Next, you can install the setup blocks again and square the shocks. Again, the shocks should have NO coils on them. On the setup blocks the shocks should be as straight up and down as possible. The left rear should have an inward angle of 10°, and the right rear should have an inward angle of 12°. You can also do this step at ride height, but is is easier to do with no coils on the shocks and the setup blocks back under the rear end (see images 9 - 12).

10- Once step 9 is completed, ensure the upper shock mounts are tight. Remove the setup blocks and install the coils on the shocks. The right rear spring will need to be pre-loaded. A good starting point is to compress the right rear spring until the spring compresses to approx. 13". The left rear spring will be off the cup by approx. 1 1/2".

Recommended starting points for coils are the following:

Right Rear: 14" x 200#

Left Rear: 14" x 200#

OPTIONAL OR SLICK PACKAGE:

358 / BB / DEYO

LR: 14" x 150# W/ 5" x 75# flatwire

RR: 12" x 175#

SPORTSMAN

LR: 16" x 100#

RR: 12" x 175#



image 11



image 12



## REAR SHORT LINK SETUP



image 1

Note: The rear brake calipers **MUST** be mounted on top of the rear end., especially on the left side. Make sure there is clearance between the rotor and the left side panhard mount.

The procedures for squaring and centering the rear end are the same for short link cars as they are with torsion bar cars. The components are different, but the measurements for both are the same. This procedure will focus more on the component installation, and will assume some procedures.



image 2

1- Install the front radius rod shortening brackets. The left rear (BRP 9099L-1) will bolt to the existing radius rod post and the threaded slug in the 2X4 frame rail (see image 1). The right rear (BRP 9099R-1) bracket will bolt directly to the existing radius rod tree. Also required is the support bracket (BRP 9099R-1B) to complete the installation (see image 2).

Note: On short link only chassis, the stock location is the 3rd hole from the bottom. The bottom slug is used as a mount to the 2X4 rail, thus making it unusable.

2- Install the BRP 9469 trailing arms (birdcages) on the rear end quad lock tubes. The birdcages should be installed with the following dimensions from the end of the rear end bell to the inside of the birdcage.

LEFT REAR - 6 3/4"

RIGHT REAR - 14 3/4" (see image 3)

**Note: For EZ tube rear ends, LR 6 5/8" and RR 14 5/8"**



image 3

3- Next, install the birdcage adaptor brackets (BRP 9549). This bracket lowers the shock mount as well as shortens the radius rod mounting location (see image 4). This is required for both sides.

4- This setup generally uses the left side panhard (see image 5). For further information on the left side panhard bar, please see page 30 of this manual. Install the panhard bar in the top hole on the rear end, and the 3rd hole from the bottom on the frame brackets.



image 4

5- Install the rear radius rods. The left rear radius rod should be installed the 4th hole from the bottom on the bolt on (BRP 9099L-1) chassis mount, and the bottom hole on the birdcage. On the short link only chassis, install the radius rod in the 3rd hole from the bottom. The right rear should be installed in the bottom hole on the chassis mount, and the bottom hole on the birdcage.

6- Once all the components are installed, then you can square and center the rear end. These procedures are again the same as any other car. Install the setup blocks in the normal fashion between the rear end tube and the chassis. Also at this point no shocks or springs should be installed. Use the following setup stands:

Left rear Drop Rail- BRP 9708

Right Rear- BRP 9709



image 5

7- Square the rear end on the setup blocks at 9" for both sides. Center the rear end in the chassis at 11 3/8" both sides from the outside of the 2X4 frame rail to the outside of the torque arms. This dimension should be the same for both sides. To gain left side percentage, you can lengthen the left side panhard bar to move the left rear tire closer to the center of the chassis. Remember the left side panhard is **OPPOSITE** to the right side panhard bar.



## REAR SHORT LINK SETUP CONT'D



image 6



image 7



image 8



image 9

8- Next, remove the setup blocks from under the rear end. Install the upper shock mounts next. Place a 3/4" spacer block under the right side and left side of the rear end to space the rear end tubes off the chassis. If more LR droop is desired, then drop the rear end tube all the way down onto the drop rail.

9- Install upper shock mounts - THE SHOCKS SHOULD BE FULLY EXTENDED. It is easier to have the shocks with NO coils on them at this point. You may need to rotate the mounts forward or backward once the car is at ride height, so snug up the upper shock mounts but don't tighten them fully. Also, you draw a line on the chassis to ensure the mounts don't move in the next step. The upper shock mounts can either be BRP 9560 (image 6) or BRP 9574 (see image 7). The BRP 9574 or BRP 9637 has exhaust clearance, so it is better suited to the right rear. For 2022 to present, use BRP 9559 LR jack bolt, and BRP 9741/9742/9745 bolt on RR mount.

9- Next, you can install the setup blocks again and square the shocks. Again, the shocks should have NO coils on them. On the setup blocks the shocks should be as straight up and down as possible. The left rear should have an inward angle of 10°, and the right rear should have an inward angle of 12°. You can also do this step at ride height, but it is easier to do with no coils on the shocks and the setup blocks back under the rear end.

10- Once step 9 is completed, ensure the upper shock mounts are tight. Remove the setup blocks and install the coils on the shocks. The right rear spring will need to be pre-loaded. A good starting point is to compress the right rear spring until the spring compresses to approx. 13 1/4" (see image 9). The left rear spring will be off the cup approx. 2" with a 200# spring (see image 10).

Recommended starting points for coils are the following:

Right Rear:	14" X 200# spring
Left Rear:	14" X 200# spring with 5# tender spring

### OPTIONAL OR SLICK PACKAGE:

358 / BB / DEYO	SPORTSMAN
LR: 14" x 150# W/ 5" x 75# flatwire	LR: 16" x 100#
RR: 12" x 175#	RR: 12" x 175#

11- Image 8 shows the completed right rear installation, while image 9 shows the completed left rear.



image 10



image 11



## LEFT SIDE PANHARD BAR SETUP



image 1



image 2



image 3



image 4



image 5

Note: The rear brake calipers **MUST** be mounted on top of the rear end., especially on the left side. Make sure there is clearance between the rotor and the left side panhard mount.

### PART NUMBERS

Inner non-adjustable mount	BRP 1626L
Inner adjustable mount	BRP 9598
Outer non-adjustable mount (left side panhard or J-bar)	BRP 9594
Outer non-adjustable mount (left side panhard only)	BRP 9675
Outer adjustable mount	BRP 9588
Left side panhard bar (12" rod length)	BRP 1120BK

The left side panhard is usually installed on rear coil spring cars, but can be installed on torsion bar cars as long as the birdcages are widened, and wider rollers are used.

The wide roller kits are available for the following birdcages:

BRP 9582 (fits BRP 9032,9033, 9465,9466,4255, 4257,4292,4293)

BRP 9583 (fits BRP 9310 birdcages only)

Start with the inboard left side panhard mount (BRP 1626L) in the top hole (see image1). The lower panhard is mounted on this mount, the more side bite you will get. BRP also offers a cockpit adjustable inner panhard mount (BRP 9598) see image2

Start with the outboard side in the 3rd hole from the bottom. The adjustment for the left side panhard is the opposite of the right side panhard. To gain side bite or to tighten the car up, you raise the chassis side (or the left side). Also to gain side bite, you could lower the panhard bar at the rear end (left side). To free the car up, the opposite is true. Raising the panhard bar at the rear end, or lowering it on the chassis will reduce side bite.

The BRP 9594 outer panhard plates have 2 sets of holes. The bottom 4 holes are designed for the left side panhard, while the top 5 holes are designed for the left side J-bar. The holes appear to be different because the length of the J-bar and the panhard bar are different. This makes the arc they travel on different. You can still use the other holes, just be sure to check the rear end side to side to ensure the measurements from the side of the 2X4 to the side of the torque arms are where you had them.

Another good idea is to install both left and right inner panhard mounts. You can dual mount the inner panhard mounts with the BRP 9563 bolt kit. This way, you can run left side panhard, right side panhard or left side J-bar (see image 5).



## LEFT SIDE J-BAR SETUP

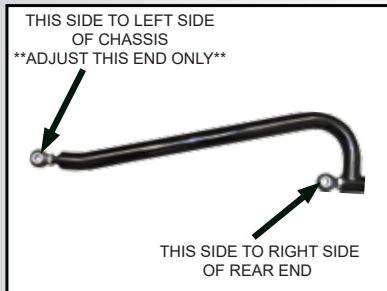


image 1

Note: The rear brake calipers **MUST** be mounted on top of the rear end., especially on the left side. Make sure there is clearance between the rotor and the left side panhard mount.

### PART NUMBERS

Inner non-adjustable mount	BRP 1626
Outer non-adjustable mount	BRP 9594
Left side J-bar	BRP 9584

NOTE: Aprox. center to center is 24-1/4"



image 2

The left side J-bar is usually installed on rear coil spring cars, but can be installed on torsion bar cars as long as the birdcages are widened, and wider rollers are used. The wide roller kits are available for the following birdcages:

BRP 9582 (fits BRP 9032,9033, 9465,9466,4255, 4257,4292,4293)

BRP 9583 (fits BRP 9310 birdcages only)



image 3

The left side J-bar uses the left side outer panhard mount (BRP 9594) and attaches to the right side of the rear end using the BRP 1626 panhard mount. This is the same inner panhard mount that is utilized for the right side panhard mount. Start with an approximate center to center of 24 1/4" (see image2). To start, bottom out the rod end on that attaches to the right side of the rear end. This end has no adjustment. To adjust the length, only use the rod end on the left side of the J-bar (see image1)

Start with the inboard right side panhard mount (BRP 1626) in the top hole (see image3) and the left side that attaches to the chassis (BRP 9594) in the 2nd hole from the top (see image 4,5). This will be a good starting point for a semi slick track. For a heavy track, you may need to start with the J-bar in the 3rd or 4th hole from the top.



image 4

The BRP 9594 outer panhard plates have 2 sets of holes. The bottom 4 holes are designed for the left side panhard, while the top 5 holes are designed for the left side J-bar. The holes appear to be different because the length of the J-bar and the panhard bar are different. This makes the arc they travel on different. You can still use the other holes, just be sure to check the rear end side to side to ensure the measurements from the side of the 2X4 to the side of the torque arms are where you had them.



image 5

The adjustment for the left side J-bar is the opposite of the right side panhard. To gain side bite or to tighten the car up, you raise the chassis side (or the left side). Also to gain side bite, you could lower the J-bar at the rear end (right side). To free the car up, the opposite is true. Raising the J-bar at the rear end, or lowering it on the chassis will reduce side bite.



## BALANCE BAR SET-UP

### BRC 310-1000 Balance Bar Setup

Bicknell balance bar assemblies allow precise adjustment between front and rear brake bias. They have been specifically designed for racing purposes. When properly set-up, this unit will give you the proper amount of bias adjustment. Always remember to keep the bar well lubed and free of debris. The bar should have approximately 1/4" of up and down movement. This means the bar can pivot freely without obstructions. It is also important to ensure the brake pedal returns to the relaxed position freely and that there is no pressure exerted on the master cylinder.

Thread the master cylinder pushrods into the clevises on the balance bar. A good starting point can be found in Figure 1. From the end of the clevis to the front side of the master cylinder mounting surface should be 3 3/4" for front and 4" for the rear in a typical dirt car set-up. The balance bar should be straight up and down under moderate pedal effort (Figure 2). This may lead to the balance bar being cocked under no pedal effort. This is perfectly fine as long as there is NO pressure on the master cylinder push rods when the pedal is in the relaxed position.

Figure 1

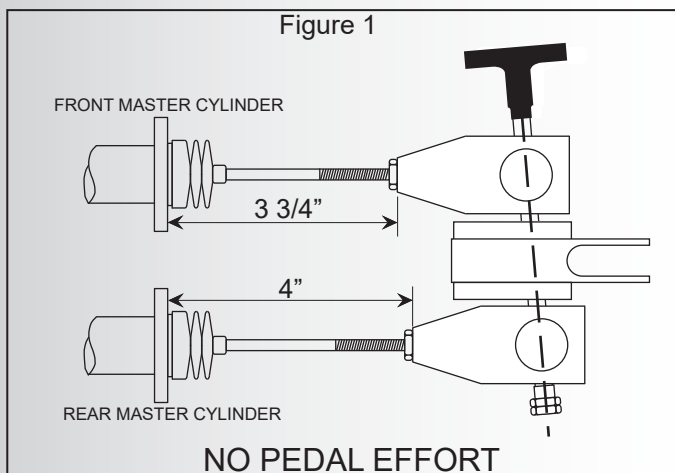
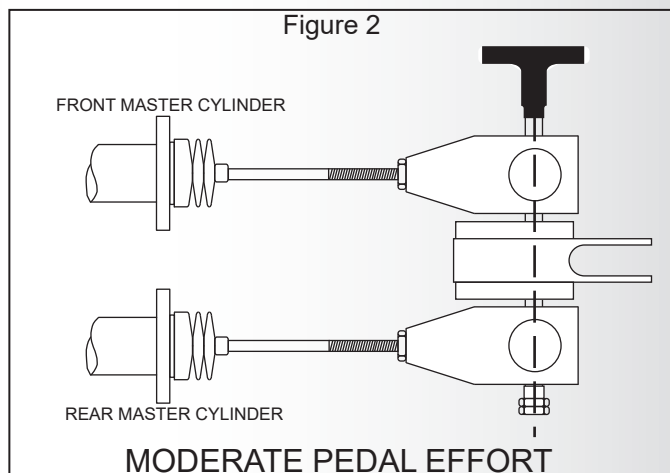


Figure 2



Please note: the above pushrod adjustment is for a typical dirt application with small front calipers and large rear calipers. Master cylinder size and caliper size have a large effect on the adjustment. If you have any questions, please call 905-685-4291.

In the neutral position, the balance bar should have approximately 1/4" of play between the clevises (figure 3). If there is too much play the master cylinder pushrods will be at the incorrect angle as shown in figure 4. The clevises should be set from the factory, but should be double checked to ensure they are in the correct location.

FIGURE 3

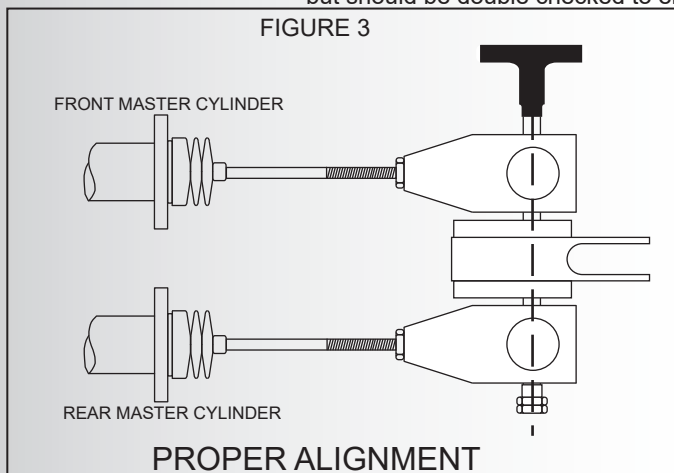
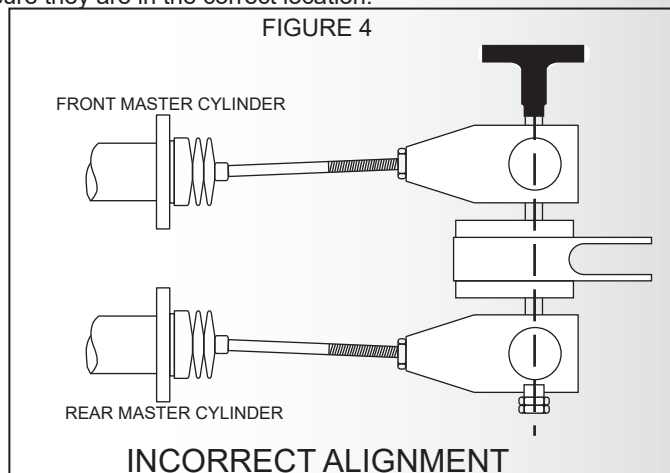


FIGURE 4



Please e-mail the tech department if you have any questions regarding balance bars: [tech@bicknellracingproducts.com](mailto:tech@bicknellracingproducts.com)  
Or call the tech department @ 905-685-4291



## BALANCE BAR SET-UP

### BRC 310-9070 Balance Bar Setup

1. REMOVE THE STANDARD JAM NUTS THAT COME ON THE MASTER CYLINDER RODS. SCREW THE LONG SLIDER BUSHINGS ONTO YOUR MASTER CYLINDERS PUSH RODS. THE FLATS FOR THE WRENCH NEED TO BE AT THE FARTHEST END AWAY FROM THE MASTER CYLINDER BODY. THE TOP MASTER IS FOR YOUR FRONT BRAKES, THE BOTTOM ONE IS FOR YOUR REAR BRAKES. SCREW THE TOP ONE ON SO THAT THERE IS  $\frac{1}{2}$ " TO  $\frac{5}{8}$ " OF THE MASTER CYLINDER PUSH ROD THREADS SHOWING. SCREW THE BOTTOM ONE ON SO THAT THERE IS  $\frac{5}{16}$ " -  $\frac{3}{8}$ " OF THE MASTER CYLINDER PUSH ROD THREADS SHOWING.



2. SLIDE BOTH MASTER CYLINDERS INTO PLACE AND TIGHTEN THE MOUNTING NUTS. BE SURE TO RECHECK THEM ONCE THE UNIT IS MOUNTED IN THE CAR. **IF AT THIS POINT THE MASTERS RODS DO NOT MOVE IN AND OUT FREELY. LOOSEN NUTS. RE POSITION AND TRY AGAIN. RE TIGHTEN. SOME MASTERS MIGHT BE NOT BE 100% PERPENDICULAR BETWEEN THE FACE AND THE BORE. IF THEY ARE NOT. IT CAN CAUSE A BIND. YOU WILL HAVE TO FILE OUT THE BRONZE BUSHING TO MAKE THEM SLIDE EASILY. DO NOT BE ALARMED IF YOU HAVE TO DO THIS. BUT DO NOT CONTINUE IF IT SEEMS IMPOSSIBLE FOR THESE TO MOVE FREELY IN AND OUT. CALL BICKNELL RACING FOR HELP.**

3. TAKE THE PIVOT BLOCK ASSEMBLY WITH THE BRAKE ROD CLEVIS POINTING FORWARDS AND THE ADJUSTER KNOB POINTING UP AND WIND THE TOP ROD END ONTO THE MASTER CYLINDER ROD. BE SURE THAT THE ROD AND THE BUSHING ARE NOT TURNING. YOU NEED TO MAINTAIN THAT  $\frac{1}{2}$  TO  $\frac{5}{8}$  OF THREAD TO SCREW INTO THE ROD END. **FAILURE TO DO SO CAN RESULT IN BRAKE FAILURE.** ONCE YOU HAVE WOUND THE HEIM UP TO THE LONG SLIDER BUSHING, TAKE TWO  $\frac{7}{16}$  WRENCHES AND LOCK THEM TOGETHER BY TURNING THEM OPPOSITE DIRECTIONS.





4. REMOVE THE CLEVIS PIN THAT HOLDS THE BOTTOM ROD END IN PLACE AND REMOVE THE ROD END. SCREW THAT ROD END ONTO THE LOWER MASTER CYLINDER ROD AND AGAIN MAKE SURE THAT THE RODS AND BUSHINGS ARE NOT TURNING. YOU NEED TO MAINTAIN 5/16" TO 3/8" OF THREAD TO SCREW INTO THE HEIM. **FAILURE TO DO SO CAN RESULT IN BRAKE FAILURE.** ONCE YOU HAVE WOUND THE ROD END UP TO THE LONG SLIDER BUSHING, TAKE TWO 7/16" WRENCHES AND LOCK THEM TOGETHER BY TURNING THEM OPPOSITE DIRECTIONS.



5. NOW SLIDE THE LOWER ROD END BACK INTO ITS SLOT IN THE PIVOT BLOCK. THE PIN GOES IN FROM THE TOP SIDE WITH TWO WASHERS ON THE TOP AND ONE WASHER AND A COTTER PIN ON THE BOTTOM. BEND THE COTTER PIN ALL THE WAY AROUND SO THAT IT WILL NOT FALL OUT OR INTERFERE WITH ANY MOUNTING BOLTS, STRAPS, LOOSE CLOTHING ETC.. HOLD THE TOP OF THE PIN WITH A PAIR OF PLIERS IF NEEDED TO ASSIST IN PROPER BENDING OF THE COTTER PIN.



NOTE 2 WASHERS ON TOP

6. NOW THAT THE UNIT IS ASSEMBLED, MAKE SURE TO LIGHTLY LUBRICATE THE ADJUSTER ROD AND THE SLIDER BUSHINGS AND BRONZE BUSHINGS. DO NOT SATURATE IN OIL AS THIS WILL DO NOTHING MORE THAN COLLECT DUST AND DIRT. TOO MUCH OF A LUBRICANT WILL NOT MAKE IT BETTER!!!

7. BEFORE INSTALLING THE COMPLETE UNIT IN THE CAR, **DOUBLE CHECK ALL HARDWARE TO ENSURE IT IS TIGHT AND FREE OF BINDS. MAKE SURE ALL SAFETY CLIPS AND COTTER PINS ARE IN PLACE. DO NOT OVER TIGHTEN DETENT PIN, JUST MAKE SURE THAT THE 1/4 NUT IS TIGHT. IT IS PRESET FROM FACTORY. OVER TIGHTENING WILL RESULT IN PREMATURE WEAR OF SHAFT AND OR IMPAIR BIAS ADJUSTMENT.**

8. MAKING SURE YOU HAVE SHORTENED THE MOUNTING STUD IN STEP 1, YOU ARE READY TO INSTALL THE UNIT IN THE CAR. YOU MAY HAVE TO ADJUST THE LENGTH OF YOUR BRAKE ROD OR REPLACE IT WITH A LONGER ONE. YOU NEED TO MAINTAIN 1/2" OF THE CLEVIS THREADED INTO THE BRAKE ROD. **FAILURE TO DO SO CAN RESULT IN BRAKE FAILURE. THIS UNIT WILL NOT REQUIRE TWO ROD ENDS ON YOUR BRAKE ROD.**

REMOVE THE RIGHT HAND MALE ROD END AND SCREW YOUR BRAKE ROD DIRECTLY ONTO THE PUSH CLEVIS THAT IS SUPPLIED ON THE UNIT AFTER YOUR PROPER LENGTH HAS BEEN DETERMINED. **IT IS VERY IMPORTANT TO MAKE SURE THAT YOUR BRAKE ROD IS IN LINE WITH THE MASTER CYLINDER RODS. IT CANNOT BE POINTED LEFT OR RIGHT. IT WILL BIND IF IT IS NOT RUNNING PARALLEL TO THE MASTER CYLINDER RODS**

[www.bicknellracingproducts.com](http://www.bicknellracingproducts.com)



**IT IS VERY IMPORTANT TO MAKE SURE THAT YOUR BRAKE ROD IS IN LINE WITH THE MASTER CYLINDER RODS. IT CANNOT BE POINTED LEFT OR RIGHT. IT WILL BIND IF IT IS NOT RUNNING PARALLEL TO THE MASTER CYLINDER RODS. IF NEEDED YOU CAN ADD SPACERS BEHIND THE ROD END ON THE BRAKE PEDAL TAB. IF IT BINDS THE BALANCE BAR WILL NOT WORK PROPERLY. FAILURE TO COMPLETE THIS STEP MAY RESULT IN BRAKE FAILURE. SEE PICTURES BELOW**



TOP VIEW  
FRAME, MASTER CYLINDER RODS  
BRAKE ROD ALL RUNNING PARALLEL

9. USE A THREAD LOCKING COMPOUND ON THE 4 MOUNTING STUDS AND TIGHTEN THE 4 NYLOCK NUTS.

10. ONCE EVERYTHING IS IN PLACE AND TIGHT, CHECK TO MAKE SURE YOU DO NOT HAVE ANY BINDS AND THAT ALL MOVING PARTS MOVE IN AND OUT FREELY.

AFTER WORKING THE PEDAL UP AND DOWN A FEW TIMES, MAKE SURE THE MASTERS ARE RETURNING ON THEIR OWN. IF NOT, LOOSEN THE 2 MOUNTING BOLTS THAT HOLD THE MASTERS ONTO THE BALANCE BAR SLIGHTLY, WORK THE PEDAL AGAIN TO LET THE MASTERS SELF CENTER THEMSELVES, THEN RE- TIGHTEN THE MOUNTING BOLTS AGAIN.

11. BLEED YOUR BRAKES AS YOU NORMALLY WOULD.

12. REMEMBER THAT THE SETTINGS ARE STARTING RECOMMENDATIONS.

IF YOU NEED TO ADJUST YOUR ROD LENGTH SO THAT THE PIVOT BLOCK SITS STRAIGHT UP AND DOWN WHEN BRAKE PEDAL IS DEPRESSED. TO ADJUST THE LENGTHS YOU CAN CRACK THE SLIDER NUTS LOOSE FROM THE ROD ENDS AND TURN THE RODS FROM THE BACKSIDE WITH A PAIR OF PLIERS. SEE PIC. MAKE SURE TO RE TIGHTEN THEM AFTER ADJUSTING

13. WEEKLY MAINTENANCE.

**MAKE SURE TO WEAR SAFETY GLASSES.**

**DO NOT POINT COMPRESSED AIR AT ANY PARTS OF YOUR BODY**

BLOW OFF ALL LOOSE DIRT WITH COMPRESSED AIR.

USE BRAKE CLEAN TO BREAK ANY CAKED ON DIRT AND GRIME FREE

ONCE CLEANED, LIGHTLY LUBRICATE AS DESCRIBED IN STEP #6.

DO NOT WASH CAR AND LET UNIT SIT WITH WATER ON IT. IF IT RUSTS, IT WILL NOT WORK PROPERLY.



BEFORE MOVING VEHICLE, ALWAYS MAKE SURE THAT PARTS ARE FREE AND WORKING PROPERLY AND THAT BRAKES ARE WORKING WHEN APPLIED. IT IS YOUR RESPONSIBILITY TO HAVE PROPERLY WORKING BRAKES BEFORE YOU DRIVE ANY MOTORIZED VEHICLE AT ANY TIME.

### Brake Bleeding Tips

- 1- Ensure bleed screws in calipers point straight up to ensure no air gets trapped in the caliper.
- 2- Always use a high quality fluid.
- 3- Never mix different types of fluids. Different brands and fluid types can react with each other and gel up.
- 4- Always make sure the master cylinders fully retract. This minimizes wear and heat on the pads and rotors.
- 5- Ensure balance bar is functioning properly, and free of dirt and debris.
- 6- Use a vacuum bleeder whenever possible to bleed the brakes. If not possible, gravity bleed brakes.
- 7- Always test brakes before going on the race track.

Approximate Brake Pressure All Front Brake
Front: 600 PSI
Rear: 400 PSI

Approximate Brake Pressure 50/50 Brake
Front: 450 PSI
Rear: 550 PSI

Approximate Brake Pressure All Rear Brake
Front: 320 PSI
Rear: 700 PSI

## ADJUSTING THROTTLE LINKAGE

The throttle linkage is probably one of the most overlooked items on the race car, along with the brakes. The throttle linkage is important because it is what connects you (the driver) to the engine. This makes adjusting the throttle linkage critical for optimum race car performance. If the throttle is too fast, then the power from the engine will be applied too quick and the tires will spin on a slick track, but if the throttle isn't fast enough, the power will be applied too slowly for tacky conditions. Ultimately, it is driver preference on how the throttle should be setup. More often than not, it is best to make the throttle as slow as possible for slick track conditions, and allow the driver to adjust his or her driving style for tacky conditions and just 'mash the gas'.

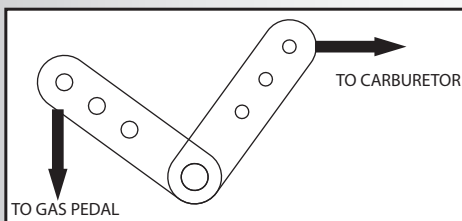


FIGURE 1

The throttle cross rod is the heart of the system. It is a simple bellcrank, which changes direction of movement (see figure 1). The downward movement of the gas pedal is converted to backward movement of the carburetor linkage. The carburetor side should always stay within the motion shown in figure 2 or the linkage could over center and bind up.

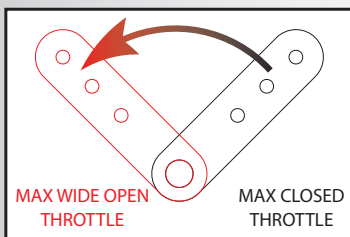
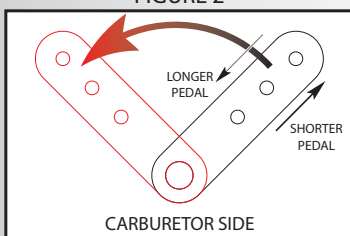
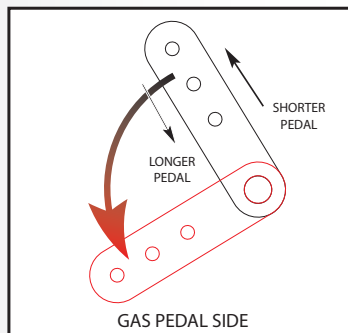


FIGURE 2



CARBURETOR SIDE

The linkage on almost all Holley carburetors has 2 1/2" of stroke. The carburetor side of the cross shaft is really what sets your linkage. The closer you are to the center of the pivot, the longer the pedal or the more control you have. The longest hole gives you the shortest pedal or the least amount of control. The gas pedal side of the cross rod can give the pedal a mechanical advantage or disadvantage depending on the holes that are chosen. So on both sides of the throttle cross rod the closer to the center the more control you will have or the slower the pedal will be.



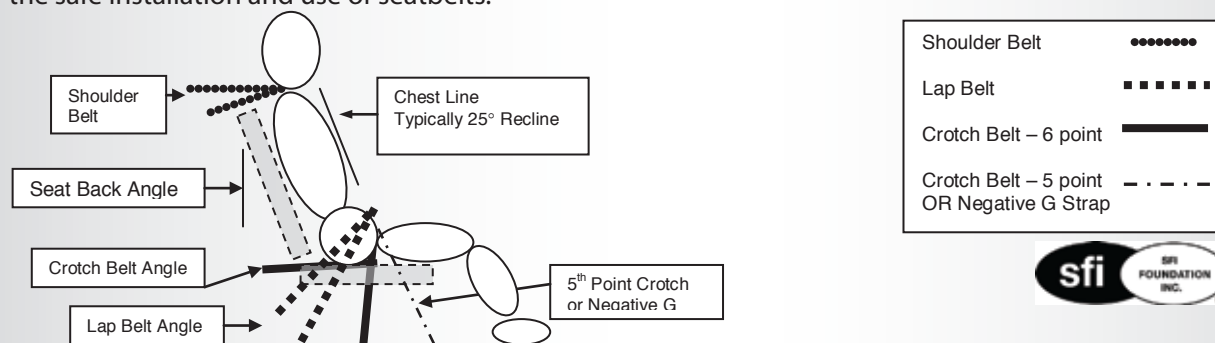
GAS PEDAL SIDE



# SEAT BELT INSTALLATION

## SEATBELT INSTALLATION GUIDE\* FOR UPRIGHT SEATING (UP TO 25° RECLINE SEAT BACK ANGLE)

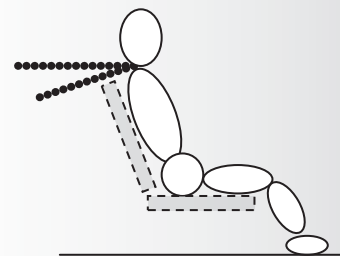
**\*IMPORTANT NOTICE:** The purpose of this guide is to provide motorsports vehicle drivers, owners and mechanics with additional information on seatbelt installation. This guide is for informational purposes only and in no way should it be construed to be an express or implied warranty of safety or guarantee that Driver Restraint Systems mounted in accordance with this guide will prevent any injury, systems failure, property damage, or death. Participation in motorsports carries with it the risk of serious injury, property damage and death at all times regardless of which driver restraint systems are used. This informational guide does not supersede or replace product manufacturers' installation instructions or sanctioning body rules and requirements. This guide applies to Driver Restraint Assemblies which pertain to the SFI Specification 16.1 and SFI Specification 16.5 compliance programs. Prior to any seatbelt installation or installation modification, consult with the motorsports vehicle builder, seatbelt manufacturer, and sanctioning body. At all times the driver and vehicle owner have prime responsibility for the safe installation and use of seatbelts.



### SHOULDER BELTS

Shoulder Belt Angle:  $0$  to  $-20^\circ$  ( $-10^\circ$  optimum) from horizontal

- Clear passage of webbing from top of shoulder (or head and neck restraint) back to the harness bar or mounting point without any interference of the seat openings
- Belts should be as short as possible back to the mounting points



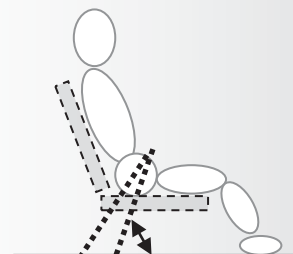
### PROPER WRAP OF SHOULDER BELTS



### LAP BELTS

Lap Belt Angle:  $-45^\circ$  to  $-80^\circ$  from the horizontal

- Belt should ride within the curvature of the pelvic bone preferably just below the iliac crest
- There should be clear passage through the seat opening without webbing being corded or binding on edges of seat openings with a direct path to the mounting point
- The webbing should not ride against any hardware such as seat mounting brackets, bolts, or tabs
- Lap belt adjusters should be clear of the seat openings. Pull-up adjusters if outside the seat opening should be a minimum of 2" below the opening when the lap belt is tightened
- Belts to the mounting point should be as short as possible mounted beside the seat and never behind the seat
- Lap belt should be allowed to pivot freely at the mounting point
- Webbing should be allowed to pull on hardware in plane (straight)



*continued on page 38*



## SEAT BELTS INSTALLATION CONT'D

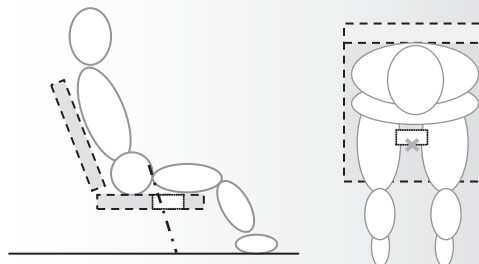
Position of the Cam Lock or Latch and Link

- Centered on the body 1 to 2 inches below the belly button when all belts are tightened

### CROTCH BELT – 5-POINT

Sports Car “Shell Type Seat” and aluminum seats with single crotch belt hole forward of the inside seat back from 11 to 13 inches:

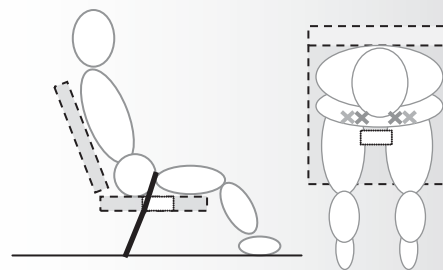
- Crotch Belt Angle: Chest line to 20° through the hole
- Crotch Belt should never wrap around the front of the seat – there should be a pass through
- Crotch belt is used only to maintain position of the lap belt



### CROTCH BELT – 6-POINT

Sports Car “Shell Type Seat” and aluminum seats with single crotch belt hole forward of the inside seat back from 10 to 12 inches: *(NOTE: Seats with a single hole positioned more than 12 inches from the inside seat back are designed for 5 point belt installations and may not be as effective for 6-point installations):*

- Crotch Belt Angle: -20° (2” rearward) through the hole
- Two separate anchors 4 to 6 inches apart (x)

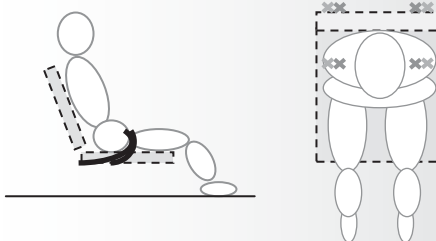
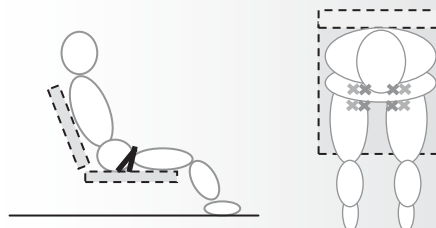


Containment Seats with Crotch belt mounting directly to seat bottom OR through holes provided at the back of the seat bottom: *(Driver is sitting on the Crotch belts)*

- Crotch Belt Angle -10° to -20° from the perpendicular just in front of the crotch with anchors 4 to 6 inches apart (x)

OR

- Crotch Belt Angle Horizontal rearward to under the butt or to the back of the seat (x)



Option (typically for single-seat wide cockpits):

Crotch Belt mounting to the front side of the outboard lap anchors. (Option not illustrated)

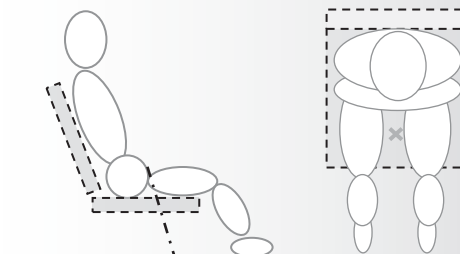
Considerations:

- Routing of crotch belts should have a clear and unobstructed path to the mounting point

### NEGATIVE G BELT – (7<sup>TH</sup> POINT)

Negative G Strap Angle: 20° to 25° (Chest line extension on a 25° seat back angle)

- Used in conjunction with a 6-point crotch belt system as an additional point to maintain the position of the lap belt in “Negative G” i.e. rollovers





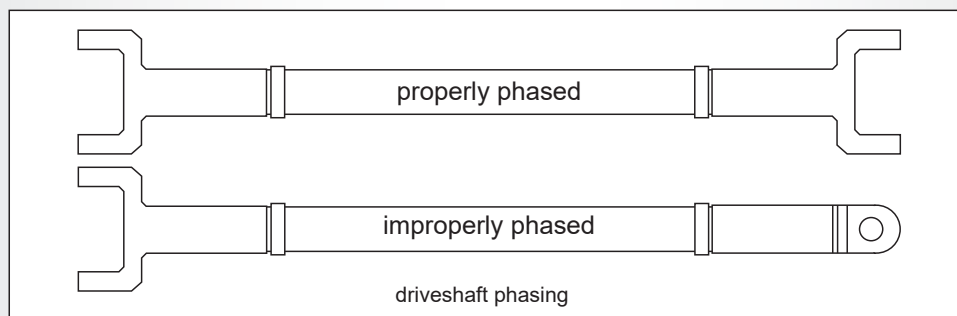
## LOCATIONS TO LOOK FOR BINDS

It is important to the operation of a race car that the suspension move freely. A bind is anything that inhibits the movement of the suspension. There are many items that can create a bind, but the majority of the time a bind is caused by a bent part. It is important to inspect all parts on the car for bends or cracks. A bind in the suspension can have dramatic effects on the handling, and can also cause the driver to mis-diagnose what the car is actually needing. For example, if a car has a front radius rod that is bound up and the car doesn't get on the right front the driver could complain about the car being tight on corner entry when in fact the bind in the radius rod has made the car tight. It could lead you into making chassis adjustments that are not needed. Here is a list of locations to look for binds:

- 1- Rear torsion bearings seized up - make sure bearings spin free
- 2- Rear torsion rollers seized up - make sure rollers turn free
- 3- Torsion bars - make sure bars aren't bent and they turn free in torsion rack
- 4- Rod ends - check for bent rod ends and make sure radius rods are free
- 5- Torque arm slider - make sure slider is lubed and slides free
- 6- Torque arm front slider shaft - make sure it slides free
- 7- Rear end tubes - make sure tubes are straight and axles run true (check toe and camber on rear)
- 8- Bent shock shafts - make sure shafts are straight and shocks go in and out
- 9- Dented shock bodies - make sure shocks go in and out with no sticky spots
- 10- Make sure the rear end doesn't hit the seat plate - especially on driver back chassis

(NOTE: KIRKEY 89 series seats should be approx. 22 1/2" from back of engine plate)

- 11- Make sure shocks aren't bottoming out and proper shock stem heights are achieved
- 12- Make sure driveshaft is phased properly so it doesn't bind and/or vibrate. Ensure driveshaft has 1/2" to 3/4" of end play at ride height to make sure it doesn't bottom out



- 13- Rear torsion arms rubbing on birdcages- make sure arms aren't hitting birdcages
- 14- Rear torsion arms rubbing on radius rods - make sure they aren't rubbing
- 15- Rear torsion arms - make sure no flat spots or excessive wear on rollers or wear plates
- 16- Drag link and tie rod clearanced on radius rods - no rubbing
- 17- Left front or right front bolt or lower shock bolt hitting chassis during chassis roll

**NOTE: For short link cars BRP highly recommends Strange driveline with billet yokes  
 MAXIMUM DRIVESHAFT ASSEMBLY = 22 1/4" CLOSED**

### IMPORTANT

Inspect race car after every day of racing. When inspecting suspension binding, it is imperative that the condition of all rod ends be checked. While performance may not be hurt by any rod ends that are not free, ANY ROD END THAT IS WORN BEYOND TOLERANCE MUST BE REPLACED BEFORE OPERATION OF THE RACE CAR IS RESUMED.

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## RADIUS ROD LOCATIONS

Both rear radius rods in middle holes is stock BRP location (see page 16).

This creates a tight (pushy entry) because you will have reverse roll steer of the rear end. This will make the car slightly pushy on entry and mid turn until the throttle is applied. If the car is in what we call a driveable push, then the car will still get good forward drive off the corner.

### **If you raise only the right rear radius rod:**

This will create more roll steer, as the right rear will move back further on corner entry. The car will be looser on corner entry. This will also cause the car to be looser when the throttle is applied. The higher the right rear radius rod gets, the looser the car will be. If the car is laying on the right rear too much, you have the choice to increase the right rear torsion bar or raise the right rear radius rod. Raising the right rear radius rod will also loosen corner exit when throttle is applied. If you only install a larger torsion bar, this will stop the car from rolling to the right rear, but will still allow better forward drive as long as the car does not get loose before throttle is applied.

### **If you raise the left rear radius rod:**

This will cause a looser corner entry, and then better forward drive when the throttle is applied.

### **If you raise both rear radius rods:**

This will create maximum roll steer on corner entry (loose race car) and will also make the car more erratic on throttle as the car will be lifting when throttle is applied. This will also allow the rear radius rods to aid in lifting the chassis, and create more drive off.

## 29" TORSION BAR RATES

	14"	15"	16"	17"	18"
0.875	147	128	112	100	89
0.900	164	143	126	111	99
0.925	183	160	140	124	111
0.950	204	178	156	138	123
0.975	226	197	173	153	137
1.000	250	218	192	170	152
1.025	276	241	212	187	167
1.050	304	265	233	206	184
1.075	334	291	256	227	202
1.100	367	319	281	249	222
1.125	401	349	307	272	243



## CHASSIS ADJUSTMENTS - CAR TIGHT ON ENTRY

**Car Tight On Entry** - There are a few questions to ask when the driver is tight on corner entry:

- 1- Is the driver on the throttle or off the throttle?
- 2- Does the car have body roll?
- 3- Is the driver on the brakes and is it a brake push?

Item	Adjustment
front end bind	free up and lube
rear spoiler	decrease in size or remove / gurney lip back
rear stagger	increase rear stagger
right rear wheel offset (move wheel out)	decrease right rear wheel offset (watch rules)
left rear weight	increase right rear weight. (sometimes too much right rear weight will also pin right rear on corner entry). Start with 0 - 30 pounds left rear weight.
brake bias	increase rear brake and ensure master cylinder sizes are proper, ensure brake pad compounds are correct.
caster split	check caster split - ensure 4° of split
right front camber	increase right front camber (more pounds per square inch on tire)
front springs	install stiffer left front spring to help car roll to right front - also ensure right front shock has 5" of shaft
wheel lead	bring left rear wheel ahead 3/8"
left rear shock	NOTE: on a torsion bar car this softens the LR spring rate add more gas pressure, or add compression or rebound depending on whether driver is entering the corner on the throttle or off throttle
left front shock	add more rebound
front panhard bar	mount lower on outboard side
right side rear panhard bar	raise outboard side and/or lower inboard side
left side rear panhard bar	lower outboard side and/or raise inboard side
left side rear j-bar	lower outboard side and/or raise inboard side
rear torsion bars or springs	stiffen left rear or both
frame heights	raise rear frame heights, or lower front frame heights. Also flatten chassis left to right
rear radius rods	raise the right rear rod up to create roll steer on corner entry
race car balance	ensure car has 54-54.4% left side percentage and 64% - 66% rear percentage

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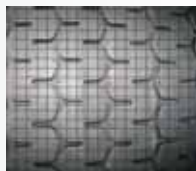
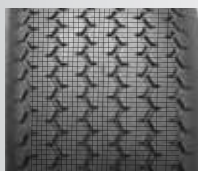


## CHASSIS ADJUSTMENTS - CAR LOOSE ON ENTRY

**Car Loose On Entry** - There are a few questions to ask when the driver is loose on corner entry:

- 1- Is the car okay on the straight away?
- 2- Is the driver entering the corner reasonably or is he entering too fast? (slower entry = fast exit)
- 3- Is the driver on the brakes and is it brake loose? Use an in car camera to verify what the driver is saying. Pictures can also help as well.

Item	Adjustment
rear stagger	reduce (watch rear stagger does not get too low causing the car to shear loose)
front springs	stiffen right front and soften left front and stiffen right front shock compression
brake bias	increase front brake bias, or install stickier brake pads
rear end bind	lube and free up
left rear weight	increase left rear weight (sometimes too much left rear weight can cause loose entry - no weight on right rear tire to plant the right rear tire)
left rear shock	soften left rear rebound or take nitrogen out of shock
right rear panhard bar	lower outboard side and/or raise inboard side
left rear panhard bar	raise outboard side and/or lower inboard side
left rear J bar	raise outboard side and/or lower inboard side
left rear spring/torsion bar	install softer torsion bar or spring (on torsion bar car move roller forward to front hole)
toe out	increase toe out - as much as 1/4"
frame height	raise front frame height, or lower rear frame height
rear spoiler	add more rear spoiler where applicable (gurney lip forward)
rear radius rods	move both rear radius rods in the bottom holes
tires	sipe and grind all tires (if rules permit) on a track that is not abrasive. Track conditions dictate siping patterns- start with sipes 1/8" deep and go deeper until tire begins to chunk then decrease siping a touch on the blocks that do chunk.



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## CHASSIS ADJUSTMENTS - CAR TIGHT IN APEX OFF THROTTLE

Item	Adjustment
right rear panhard bar	raise inboard and outboard panhard bar up 1"
left rear panhard bar	lower outboard side
left rear J-bar	lower outboard side
right rear radius rod	increase angle by moving to top hole
front weight percentage	install 25# ballast weight high on front nose to left front
right front shock	add more rebound to right front
right rear shock	install stiffer compression only (leave rebound same) or less rebound
left rear shock	take away left rear rebound to get car on the right front
right rear spring rate	stiffen right rear spring rate
rear end offset	make sure you have maximum rear end offset as per rules
rear wheel track	make sure you have maximum rear wheel track as per rules
frame heights	raise right rear frame height 1/2" and lower left front frame height 1/2"

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**CHASSIS ADJUSTMENTS - CAR LOOSE IN APEX OFF THROTTLE**

Item	Adjustment
right rear panhard bar	lower outboard side
left rear panhard bar	raise outboard side
left rear J-bar	raise outboard side
left rear torsion bar / spring rate	install softer left rear spring or torsion bar (on torsion bar car move roller ahead to front hole)
left rear weight	decrease left rear weight when track is slick to gain side bite back (0-20 # left rear weight)
frame heights	raise chassis heights 1/4" to 1/2" to aid in side bite or raise LF, LR and RF only
left front shock	decrease left front rebound
left rear shock	take away left rear rebound to get car on right front and right rear
ballast weight	raise over rear end

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## CHASSIS ADJUSTMENTS - CAR TIGHT IN APEX ON THROTTLE

Item	Adjustment
spring rod	remove and install solid radius rod
left rear weight	decrease left rear weight - closer to even or 0 # left rear weight
left rear torsion bar / spring rate	install stiffer left rear spring or torsion bar (if torsion roller is front hole, move to back hole)
rear ride height	raise rear of car 1/4" - 1/2" (watch rear spoiler height)
left rear shock	increase left rear nitrogen pressure to as much as 250 #
left front shock	increase rebound on the left front shock
right front shock	increase rebound on the right front shock
right rear shock	decrease rebound on right rear shock

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**CHASSIS ADJUSTMENTS - CAR LOOSE IN APEX ON THROTTLE**

Item	Adjustment
left rear spring / torsion bar	install softer left rear spring / torsion bar (on torsion bar car move roller to front hole)
front springs	stiffen right front spring, soften left front spring but no more than 175 RF spring
right rear shock	more rebound on right rear shock
left front shock	decrease left front rebound
left rear shock	lower left rear nitrogen pressure
left rear weight	add more left rear weight 40# - 60#, or 110#
spring rod	install spring rod and set spring length at 4 1/4"
torque arm	ensure -3° torque arms are installed, and pick up is the 29 1/2" hole (from the bottom hole in the rear end)
birdcage timing	ensure birdcage timing is set to 0°

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## CHASSIS ADJUSTMENTS - CAR TIGHT ON EXIT

**Car Tight On Exit** - There are a few questions to ask when the driver is tight on corner exit:

- 1- Is the car entering the turns okay?
- 2- Does the car push on throttle in apex? See page 11.

Item	Adjustment
rear stagger	increase rear stagger - may cause loose entry
left rear weight	decrease left rear weight
wheel base	bring left rear wheel ahead 3/8"
left rear spring / torsion bar	install stiffer left rear spring / torsion bar (on torsion bar cars, move roller to back hole)
front shocks	stiffen rebound on both front shocks
ride heights	raise rear frame heights 1/4" and/or drop front frame heights 1/4"
rear weight percentage	decrease rear weight percentage and increase left front weight
spring rod	remove spring rod and install solid rod
rear radius rods	install right rear radius rod in top hole, move left rear radius rod to bottom hole

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## CHASSIS ADJUSTMENTS - CAR LOOSE ON EXIT

**Car Loose On Exit** - There are a few questions to ask when the driver is loose on corner exit:

- 1- Is the car entering the turns okay?
- 2- Is the car loose on throttle in apex? See page 42, 44.
- 3- Is the driver loose on exit because the car is tight on corner entry and he is shearing the car loose in the apex? See page 39.

Item	Adjustment
rear stagger	reduce rear stagger - may cause tight entry or too little stagger causing tight entry can cause loose exit
left rear weight	increase left rear weight
front shocks	soften rebound on both front shocks or install digressive shocks
left rear shock	soften compression on left rear shock
left rear spring / torsion bar	install softer left rear spring / torsion bar (on torsion bar car move roller to front hole)
right front spring	stiffen right front coil MAX 175#
ride heights	raise front ride heights and lower rear ride heights
wheel lead	square rear end (no lead) or bring right rear forward or LR back 1/4"
spring rod	install spring rod with spring at 4 1/4"
torque arm	shorten torque arm (go from 2nd hole to 3rd hole from transmission - 3rd hole is 29 1/2" from bottom hole)
tires	make sure tires are siped and ground where applicable
tire pressures	make sure gauge is reading properly - normal pressure build up should be no more than 4# (use air drier)
rear radius rods	raise left rear radius rod up

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DRIVER'S ABILITY TO CONTROL THE RACE CAR MAY BE ADVERSELY AFFECTED AFTER CHASSIS ADJUSTMENT. USE CAUTION WHEN RESUMING OPERATION AFTER ANY CHASSIS ADJUSTMENT.

**DO NOT WORK ON RACE CAR BEFORE SUPPORTING IT ON ADEQUATE JACK STANDS OR OTHER SUITABLE WORK STANDS. NEVER WORK NEAR OR UNDER A RACE CAR SUPPORTED ONLY ON A JACK. WORK ONLY ON A LEVEL, HARD SURFACE CAPABLE OF SUPPORTING STANDS.**



## CHASSIS ADJUSTMENTS - INCREASING FORWARD BITE

**Increasing Forward Bite** - There are a few questions to ask when the driver needs forward bite:

- 1- Is the car entering the turns okay? Most times lack of forward bite is caused by insufficient corner entry and/or midturn speed.
- 2- Are the tires siped and ground properly? Are the proper tire compounds on the car?
- 3- Is the shock travel correct?

Item	Adjustment
front shocks	soften rebound on front shocks - install digressive shocks
rear shocks	soften compression on rear shocks or install digressive LR
front springs	stiffen right front spring and soften left front spring
rear spring / torsion bar rates	soften left rear spring torsion bar or both - start with LR only. <b>Note: this may also tighten your entry</b>
left rear weight	increase left weight and rear percentage
ride heights	lower rear frame heights, raise front frame heights
rear percentage	increase rear percentage
tire pressures	soften rear tire air pressures (check gauge to ensure it is reading properly)
rear spoiler	add more rear spoiler where applicable (gurney lip forward)
rear radius rods	raise both rear radius rods - may cause loose corner entry due to more roll steer or just LR up
torque arm	shorten torque arm (go from 2nd hole to 3rd hole back from transmission 29 1/2" from bottom hole in rear end)
nitrogen pressure	increase front nitrogen and decrease rear nitrogen (125# front and 75# rear)

### WARNING

ALL CHASSIS SETTING AND ADJUSTMENTS ARE INTENDED FOR USE BY PROFESSIONAL RACE TEAMS AND TO BE PERFORMED BY QUALIFIED TECHNICIANS. IF YOU ARE NOT QUALIFIED TO DO THE WORK, SEEK THE ASSISTANCE OF A QUALIFIED TECHNICIAN. IF YOUR DRIVER IS NOT EXPERIENCED IN THE OPERATION OF A RACE CAR OF THIS TYPE, SEEK THE ASSISTANCE OF A QUALIFIED RACE DRIVING INSTRUCTOR OR SCHOOL BEFORE OPERATING THIS RACE CAR.

**SERIOUS INJURY OR DEATH CAN OCCUR IN AUTO RACING.**

### CHASSIS ADJUSTMENTS TO IMPROVE PERFORMANCE IN SPECIFIC AREAS

Auto Racing, especially on dirt tracks, require finding a delicate balance of adjustments which will maximize the performance of the race car both relating to acceleration and top speed on the straights and reducing the needs to slow or increasing the speed through the corners. Any adjustment which will improve the performance of the race car relating to its ability to accelerate in a straight line, may decrease its ability to maintain speed while cornering. Conversely, those adjustments, which will enable the race car to go faster while cornering, may decrease its ability to accelerate in a straight line.

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## CHASSIS ADJUSTMENTS - INCREASING SIDE BITE

**Increasing Side Bite** - There are a few questions to ask when the driver needs side bite:

- 1- Is the car entering the turns okay? Most times lack of side bite is caused by tight entry, and then the driver shears the car loose at the apex. Once you break traction, the car will not have side bite.
- 2- Are the tires siped and ground properly? Are the proper tire compounds on the car?
- 3- Is the shock travel correct?

Item	Adjustment
right rear panhard bar	lower outboard panhard bar or raise inboard side or install BRP 9120 rubber panhard bar
left rear panhard bar	raise outboard panhard bar or raise inboard side
left rear J-bar	raise outboard panhard bar or raise inboard side
rear tires	lower rear tire air pressure
left rear weight	decrease left rear weight (put more weight on the right rear tire)
right rear spring / torsion bar	soften right rear spring (sometimes too soft a spring will not plant the tire - car rolls too much)
right rear shock	soften compression on right rear shock and stiffen rebound
ride heights	raise all 4 corners of car to raise the center of gravity in the car - flatten car from left to right
center of gravity	raise weight (ballast) higher in chassis to increase body roll or install over rear end
body measurements	make sure doors are to maximum legal measurements
birdcage timing	check page 19-22 for proper birdcage timing

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## WHAT ARE SHOCKS?

A shock absorber is a mechanical or hydraulic device designed to absorb and dampen spring oscillation. It does this by converting kinetic energy into another form of energy - typically heat. So basically, it takes the motion of the car (kinetic energy) and transfers the energy into heat within the fluid in the shock. Always remember that springs only store energy, shocks absorb energy. In race cars, springs control how much weight moves to a particular corner, while the shock controls how fast or slow weight moves to a particular corner.

Most shocks used in racing today are monotube (or gas pressurized) shock. It consists of a single tube, with 2 pistons. The main piston or working piston houses the valve stacks, and controls the vehicle while the floating piston separates the oil from the gas pressure.

So why does a gas shock need nitrogen pressure?

First, we use nitrogen gas because it is less affected by heat. As stated earlier, shocks convert motion into heat. So it is very important that the small amount of gas in the shock not expand due to heat which would build up the pressure inside the shock. 2nd, the gas pressure prevents the oil from cavitating. The oil needs pressure to keep it from being pulled apart.

How much gas is needed is directly related to the amount of compression a shock has. So a shock that has a relatively soft compression stack, would only need 100 psi of gas pressure while a shock with a stiff compression stack would need 150 psi. This is why the initial or 'factory' gas pressure settings are different on many shocks. Typically the front shocks have very little compression stack in them, so 100psi is all the gas they need where rear shocks typically have more compression and require 125-150 psi.

So how much gas pressure can you change in a shock? Again, depends on the shock. Typically no more than + or - 50 psi from the factory recommended setting. Anything more or less, tells you you have the wrong spring combination or shock valving. For every 25 pounds of gas pressure change, you are changing approx. 10 pounds of spring. The valving is unaffected by gas pressure. A 4 valve is always a 4 valve (or a 162/55 is always a 162/55). For example, let's say you have a shock on the RF with 100 psi and 150 pound spring and you increase the gas pressure to 150 psi. You have increased the gas pressure by 50 psi, so you have added 20 pounds of spring making the RF feel like it has a 170 pound spring now.

On page 5, we have discussed the difference between compression and rebound of the shock but how can we affect the handling of the car? Remember compression is a term used to describe the shock being pushed in - or weight moving toward that particular corner. So compression controls how fast weight gets to a particular corner while the rebound controls how long the weight stays on that particular corner. The spring's job is still to control how much weight is moved, but a shock controls how fast the weight is moved.

Vehicle dynamics are very complex, but if you can understand where weight is moving in the car and how fast it is moving, then you can really begin to understand the race car. Understanding this movement of weight, and applying it to different track conditions is what makes the good drivers good. Below is a simple cheat sheet of what shock DO and DON'T DO for reference:

### WHAT SHOCKS DON'T DO:

1. Shocks do not support the car.
2. Shocks do not control weight transfer - they control speed of weight transfer.
3. Shocks do not affect chassis balance at mid-turn.
4. Shocks are not a cure-all for basic handling problems

### WHAT SHOCKS DO:

1. Shocks control (limit speed of) motion of the chassis and suspension.
2. Shocks, with varying designs of resistance, allow more or less rapid movement of a suspension corner than opposing corners.
3. Shocks regulate the amount of time it takes for a corner of the car, while in transition, to assume a new ride height.
4. Shocks can be used to redistribute the amount of weight on the four corners of the car as the car is in transition on corner entry and exit.

So now we understand a bit more about shocks, but how do we take that information and apply it to our car? We need a way of classifying or 'putting a number' on a shock. How much compression and rebound does a specific shock have? Enter the shock dyno, and more importantly the graph of a shock.

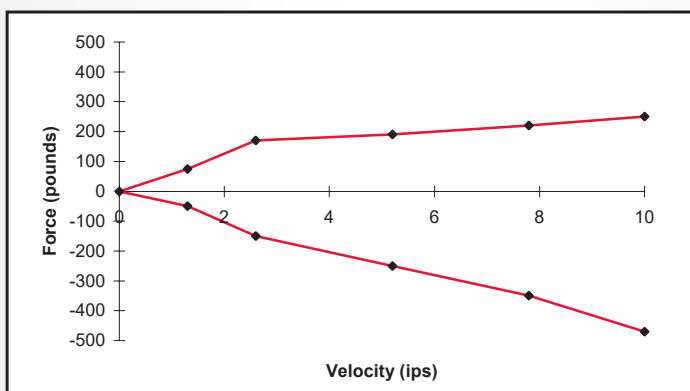


## WHERE SHOCK GRAPHS COME FROM

So where do shock graphs come from anyways? Almost every custom shock available comes with a dyno sheet. Reading and understanding these graphs can be the key to understanding the “voodoo” magic of shocks.

There really isn't any magic to shocks. A shock is basically an oil pump installed between the tire and the chassis. It controls or “dampens” the chassis movement in relation to the race track. How fast or slow the shock moves in and out is really the critical factor, which is where a shock dyno graph comes in.

A shock is velocity sensitive. It only knows how fast it is moving. So the typical graph that you receive with most shocks are force vs. velocity graphs. It shows you the amount of force the shock makes at a specific speed. The force in the below graph is on vertical, while the velocity (speed) is horizontal.



Here is a good way to think about a shock dyno - think of a shock like an engine. If your engine builder tells you your engine makes 700 horsepower, and doesn't tell you at the RPM it makes it he hasn't given you a clear picture. Imagine if your engine builder told you your engine makes 700 horsepower, but it makes it at 10,000 RPM. It is unrealistic to tell you horsepower ratings at that RPM because your engine will not race at that RPM. A shock is the same way - you have to look at the numbers on the graph where you will be racing that shock. If the engine builder then tells you the engine makes 500 horsepower at 3,000 RPM he has given you a clearer picture where you will actually be racing at.

A shock is the same way. If a shock is a 4 valve, at what speed is it a 4 valve? This is where the dyno graph comes into play. There is no set of “standards” for what a 4 valve actually is. A 4 valve is just a number to classify the shock. That is one of the biggest misconceptions about shocks. A 4 valve from manufacturer A may be different from manufacturer B. The biggest thing is keeping notes and understanding why a certain shock performed better than another, and in the situation that it worked better. There is no such thing as the “wrong” shock - only the wrong situation or track condition for that particular shock.

Typically, low shaft speeds control the race car on cornering. Low shaft speeds are from the 1 inch per second to 5 inch per second range.

High shaft speeds control the race car as you encounter bumps on the track or if you hit the cushion. High velocity shaft speeds are typically 6 inches per second to 10 inches per second.

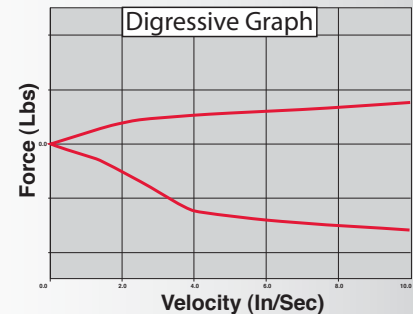
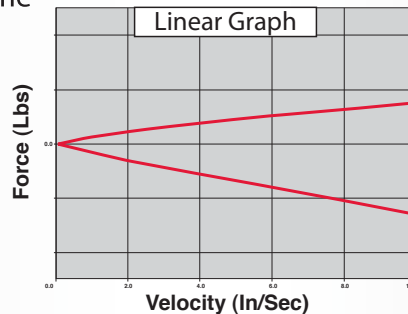
Another critical factor regarding shocks to remember is that as the race track slows down on the stop watch, so does the motion of the race car. So let's say you are at your Saturday night race track. The heat races are tacky, and the lap times are 18 seconds. In the feature the track slicks off and the lap times go to 21 seconds. The lap times have slowed, so the actions of the race car have also slowed. Think of how much more critical throttle pedal movement is when the track is slick.

So on a tacky, fast race track the motion of the race car may be controlled by a shock in the 2 in per second to 6 inch per second range, where that same track in the feature may need a shock that is controlled by a shock in the 1 in per second to 4 inch per second range. Same race track- 2 different sets of criteria for what shock to pick. The point is- there is no “magic” shock, only the correct shock for YOUR race car on THAT night.



**Linear VS. Digressive-** The difference between a linear and digressive shock is the piston design. Their are advantages to each piston. A linear piston has a flatter more predictable slope on the graph, where the digressive has a pre-determined point where the valve blows open. A linear shock is more predictable, and more forgiving making it the baseline for almost all shock manufacturers. A digressive is more track specific, and can improve handling in some cases. It is more difficult to predict, and can make the car feel unpredictable. All shocks are available in linear and digressive, so knowing what situation to bolt each on is the key.

Another thing to remember about digressive shocks is the low speed and high speed are independent on both compression and rebound. There is a lot of tuning ability in a digressive shock, but it does make things more complicated for the average racer. A 4 valve in a linear shock doesn't necessarily correlate to a 4 valve in a digressive shock so the understanding the graph is the key.



## TUNING WITH SHOCKS

### SHOCKS

INCREASE OR DECREASE DAMPING:  
MAKE ONLY ONE CHANGE

**BUMP = COMPRESSION**  
**REBOUND = EXTENSION**

**BOLD IS BEST CHANGE**

RIGHT FRONT	RIGHT FRONT	LEFT FRONT	LEFT FRONT	RIGHT REAR	RIGHT REAR	LEFT REAR	LEFT REAR
BUMP	REBOUND	BUMP	REBOUND	BUMP	REBOUND	BUMP	REBOUND

CORNER ENTRY PUSH							
DECREASE			INCREASE				<b>INCREASE</b>

MID- CORNER PUSH							
			<b>INCREASE</b>				

CORNER EXIT PUSH							
	<b>INCREASE</b>					INCREASE	

CORNER ENTRY LOOSE							
INCREASE							<b>DECREASE</b>

MID-CORNER LOOSE							
			<b>DECREASE</b>	DECREASE	<b>INCREASE</b>		

CORNER EXIT LOOSE							
	DECREASE					DECREASE	

### SHOCK TIPS

1. Tune entry performance first. If there are no entry problems, make small changes if you want to experiment to see if entry can be improved. Entry problems include a tight car or a loose car. The worst problem, by far, would be the loose-in condition. Nine times out of 10 this is an alignment problem and not shock related.
2. Tune exit performance last. If there are no exit problems, don't make any significant changes. Exit problems can include a car that pushes under acceleration or one that goes loose under power. Be sure that you do not have a tight /loose condition where the car is basically tight and goes loose just past mid-turn.
3. On dirt tracks, reduce rebound settings on the left side and decrease the compression rates on the right side for dry, slick surfaces to promote more chassis movement. This helps to maintain grip as the car goes through the transitional phases of entry and exit.



## BASELINE SHOCK PACKAGES



### Integra Heat / Heavy Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	LF STD+1R	PCR 45170-LF+1REB	PCR 310-40170+1R
<b>RF</b>	RF STD+1C	PCR 45170-RF+1C	PCR 310-40170+1C
<b>LR</b>	LR Medium	PCR 45190-LR-MED	PCR 310-40190L-MED
<b>RR</b>	RR Medium	PCR 45190-RR-MED	PCR 310-40190R-MED

### Integra Average to Slick Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	LF Standard	PCR 45170-LF-STD	PCR 310-40170
<b>RF</b>	RF Standard	PCR 45170-RF-STD	PCR 310-40170
<b>LR</b>	LR Standard	PCR 45190-LR-STD	PCR 310-40190L
<b>RR</b>	RR Standard	PCR 45190-RR-STD	PCR 310-40190R

### Integra All Track Package - SHORT LINK W/ COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	LF FSR	PCR 45170-LF-FSR	PCR 310-40170-LF-FSR
<b>RF</b>	RF FSR	PCR 45170-RF-FSR	PCR 310-40170-RF-FSR
<b>LR</b>	LR RSR	PCR 45190-LR-RSR	PCR 310-40190-LR-RSR
<b>RR</b>	RR RSR	PCR 45190-RR-RSR	PCR 310-40190-RR-RSR



### Fox Heat / Heavy Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	60C/200R	FOX 983-91-507-11	FOX 983-90-007-11
<b>RF</b>	75C/165R	FOX 983-91-507-12	FOX 983-90-007-12
<b>LR</b>	115C/230R	FOX 983-91-509-18	FOX 983-90-009-18
<b>RR</b>	120C/270R	FOX 983-91-509-94	FOX 983-90-009-94

### Fox Average to Slick Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	65C/190R-D	FOX 983-91-507-50	FOX 983-90-007-50
<b>RF</b>	75C/165R-D	FOX 983-91-507-51	FOX 983-90-007-51
<b>LR</b>	145C/145R-D	FOX 983-91-509-52	FOX 983-90-009-52
<b>RR</b>	100C/200R-D	FOX 983-91-509-53	FOX 983-90-009-53

### Fox All Track Package - SHORT LINK W/ COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM PART #
<b>LF</b>	60C/230R	FOX 983-91-507-17	FOX 983-90-007-17
<b>RF</b>	75C/300R	FOX 983-91-507-24	FOX 983-90-007-24
<b>LR</b>	150C/175R	FOX 983-91-509-41	FOX 983-90-009-41
<b>RR</b>	125C/200R	FOX 983-91-509-29	FOX 983-90-009-29



### Bilstein Heat / Heavy Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM AS2 PART #	ALUMINUM XVA PART #
<b>LF</b>	208/55	BIL B46-0210-208/55	BIL 33-247915-208/55	BIL 33-252506-208/55
<b>RF</b>	208/72	BIL B46-0210B	BIL 33-247915-208/72	BIL 33-252506-208/72
<b>LR</b>	230/120	BIL B46-0207-230/120	BIL 33-247892-230/120	BIL 33-252520-230/120
<b>RR</b>	270/120	BIL B46-0207-270/120	BIL 33-247892-270/120	BIL 33-252520-270/120

### Bilstein Average to Slick Track Package - TORSION OR COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM ASN PART #	ALUMINUM BGT PART #
<b>LF</b>	208/55	BIL B46-0210-208/55	BIL 33-247915-208/55	BIL 33-252506-208/55
<b>RF</b>	208/72	BIL B46-0210B	BIL 33-247915-208/72	BIL 33-252506-208/72
<b>LR</b>	162/120	BIL B46-0207-162/120	BIL 33-247892-162/120	BIL 33-252520-162/120
<b>RR</b>	230/72	BIL B46-0207-230/72	BIL 33-247892-230/72	BIL 33-252520-230/72

### Bilstein All Track Package - SHORT LINK W/ COILS

POSITION	DESCRIPTION	STEEL PART #	ALUMINUM ASN PART #	ALUMINUM BGT PART #
<b>LF</b>	208/55	BIL B46-0210-208/55	BIL 33-247915-208/55	BIL 33-252506-208/55
<b>RF</b>	300/78	BIL B46-0210-300/78	BIL 33-247915-300/78	BIL 33-252506-300/78
<b>LR</b>	162/150	BIL B46-0207-162/120	BIL 33-247892-162/120	BIL 33-252520-162/120
<b>RR</b>	230/120	BIL B46-0207-230/120	BIL 33-247892-230/120	BIL 33-252520-230/120

\*\*\*NOTE: Although there are many other shock valvings out there, the above packages are what BRP recommends as a baseline. Please call the tech department at 905-685-4291 or e-mail tech@bicknellracingproducts.com to discuss further shock package options.\*\*\*



## COIL SPRING FAQ

Here are some frequently asked questions regarding coil springs. Obviously we can write a separate book on coil springs and spring smashers and what they do, but here are some answers to the more common questions.

### **What is spring rate?**

Spring rate is the measurement of how much a coil spring can hold until it compresses 1 inch. The spring rate is normally specified by the manufacture. If a spring has a rate of 100 then the spring would compress 1 inch with 100 pounds of load. To compress the spring 2", it will take 200 pounds and so on.

### **Does the length of a coil spring matter?**

In simple terms, the length of the spring does not matter unless a spring rubber is used. If we talk about a 100 pound spring, we know from the above definition that it takes 100 pounds to compress the spring 1". So a 14" spring will compress to 13", while a 12" spring will compress to 11". There are a few instances where the length of the spring does matter:

- 1 - When using spring rubbers, the shorter the spring the faster the spring rate will ramp up.
- 2 - When talking about coil bind.

A longer LR spring with the same rate will NOT give you more extension load. It will take the same amount of spring compression to get the car back to ride height because it carries the same load. Angles and mounting location will affect how much weight a spring carries, and will change the installed height of the spring (at ride height) but the overall length of the spring doesn't matter.

### **What is spring pre-load or droop load?**

Spring pre load (or droop load) is the measurement a coil spring is compressed to when the shock is fully extended. Typically the right rear for instance, will be pre loaded. For instance a 200 pounds spring on a 9" shock will usually be pre-loaded 1" (a 14" X 200 pound spring will be compressed to 13" on the shock even when fully extended).

### **What is extension load?**

Extension load is the same as pre load, but we usually refer to left rear springs in terms of extension load and right rear spring in terms of pre load. On a left rear spring, we typically want to know how much load the spring has when it is fully extended.

### **How can we build extension load on the left rear?**

We can build extension load on the left rear by decreasing the spring rate, which will increase the pre load on the spring. Remember it takes the same amount of energy to get the car back to its ride height, so a softer spring will need more turns in it (or pre load) in order to get the car to sit proper. The softer the spring, the more extension load it will have and more pre load.

### **What is a spring rubber?**

A spring rubber is a donut shaped rubber or polyurethane spring spacer designed to quickly adjust spring rate. Spring rubbers come in a variety of thicknesses and hardnesses so it is important to keep track of the ones you use. Spring rubbers will affect your spring rate based on the following:

- the rate of the spring.
- the length of the spring.
- the number of active coils in the spring.
- the gap between the coils
- the installed height of the spring (or how much pre load the spring has).
- the thickness of the spring rubber.
- the density (hardness) of the spring rubber.



2	<b>BRC 170-1526BK</b>	Front Billet 1000 series Bicknell calipers
1	<b>BRC 310-9085-7/8</b>	Bicknell Premium brake balance bar assembly
1	<b>BRC 190-0426</b>	PREBENT Brake Line Kit
2	<b>BRC 170-5810</b>	Radial mount brake caliper for .810" brake rotor
2	<b>BRC BRP 9487</b>	Radial mount bracket (9488 for 10.875" or 9487 for 11.75"
1	<b>BRP 421BK</b>	Front Brake Line Guard
1	<b>BRP 428BK</b>	Front Brake Line Guard
4	<b>BRP 50</b>	Rear Rotor Bolt Kit for Smart tube hubs 8 POINT BOLTS
2	<b>BRP 67</b>	12" front waved brake rotors for Smart tube hubs
1	<b>BRP 162BK</b>	Steering Wheel Quick Release
2	<b>BRP 181-1A</b>	Slider Collars for T/A (SOLD IN PAIRS)
1	<b>BRP 209BK</b>	Left Ford Steering Arm
1	<b>BRP 211BK</b>	Right Ford Steering Arm
1	<b>BRP 215BK</b>	Centre steering side mounts
1	<b>BRP 274BK</b>	Center Mount
1	<b>BRP 292</b>	Rear motor Plate
1	<b>BRP 304</b>	Left side engine mount
1	<b>BRP 325 or 327</b>	Right front engine plate
2	<b>BRP 345BK</b>	Rear axle drive flanges for Smart Tube
1	<b>BRP 408-3</b>	Chassis Bolt Kit
1	<b>BRP 410R-2</b>	Gas Pedal rod
1	<b>BRP 410R-4</b>	Complete BIG BLOCK throttle link kit to carb
1	<b>BRP 411</b>	Brake Pedal
1	<b>BRP 4340-13</b>	Brake Pedal Rod
1	<b>BRP 414</b>	Aluminum gas pedal
1	<b>BRP 417S</b>	STEEL Rubber floor slider plate
1	<b>BRP 419</b>	Front T/A Pick Up Slider Rod
2	<b>BRP 432</b>	Torque arms -3 degree
1	<b>BRP 578-3</b>	Power steering pressure line
1	<b>BRP 582-3BK</b>	Power Steering Return Hose Kit
1	<b>BRP 778</b>	5/16 R.H. Jam Nut (gas pedal rod)
1	<b>BRP 779</b>	5/16 L.H. Jam Nut (gas pedal rod)
1	<b>BRP 781</b>	3/8 L.H. Jam Nut (brake Rod)
10	<b>BRP 786</b>	5/8 R.H. Jam Nut
10	<b>BRP 787</b>	5/8 L.H. Jam Nut
1	<b>BRP 1210BK</b>	Front Panhard Bar
2	<b>BRP 1505BK</b>	Front Axle Brackets
1	<b>BRP 1598-24</b>	24 GALLON FUEL CELL BOX
1	<b>BRP 1623BK</b>	Front Panhard Axle Mount
1	<b>BRP 1646</b>	Front Driveshaft Hoop
1	<b>BRP 1647</b>	Rear Driveshaft Hoop
20	<b>BRP 2051AD</b>	5/8 Course Wheel Nuts-----ALUMINUM
1	<b>BRP 3005B</b>	BIG BLOCK BEARS Solid Rear Axle
1	<b>BRP 3060B</b>	BIG BLOCK BEARS Solid Rear Axle
2	<b>BRP 4588</b>	Front Aluminum Billet Large bearing spindles
4	<b>BRP 6223</b>	Snap rings for Large bearing hubs
8	<b>BRP 6224</b>	Inner and Outer hub bearings
2	<b>BRP 6225</b>	Front and rear hub seals
2	<b>BRP 6226BK</b>	Front hub dust caps
1	<b>BRP 7119-1X2</b>	Tall cage window screen
1	<b>BRP 9020</b>	Driveshaft cover guard
1	<b>BRP 9020-4</b>	Cover Plate for BRP 9020
1	<b>BRP 9044</b>	GME right side steering center mount
1	<b>BRP 9591</b>	Driver knee guard
1	<b>BRP 9047BK</b>	Shock slider safety collars
1	<b>BRP 9053BK</b>	Front 1.25" rad mounts----- <b>PACKAGE OF 2 PARTS</b>
2	<b>BRP 9115</b>	Slider rods for the rubber floor assembly
1	<b>BRP 9143RBK</b>	RF shock mount with top stud shock mount
1	<b>BRP 9636</b>	LF shock mount with top stud shock mount
1	<b>BRP 9300</b>	4" Turbo Tornado helmet fan
2	<b>BRP 9363</b>	Front brake line axle clamps
1	<b>BRP 9372</b>	Power steering resevoir tank
1	<b>BRP 9400</b>	Front rad screen kit (includes 2 BRP 9053BK clamps)
1	<b>BRP 9425</b>	Triple biscuit torque arm center pick up
4	<b>BRP 9489</b>	Large bearing SPINDLE NUT assembly
1	<b>BRP 9508</b>	Hood pin kit
1	<b>BRP 9509</b>	SHORT Heavy duty Pitman arm for quick steer gear
1	<b>BRP 9661</b>	COIL CAR Ballast weight bar
1	<b>BRP RR241/2S</b>	Front Chrome Moly radius rods TOP LEFT
3	<b>BRP RR25S</b>	Front Chrome Moly radius rods
1	<b>BRP RR 48 1/2S</b>	Tie rod---CHROME MOLY
1	<b>BRP RR 66BS</b>	Drag Link Bent---CHROME MOLY
1	<b>BRP EC52BOC-8</b>	Front Axle Caster split 4 degree RF @ -8 & LF @ +4 degree
2	<b>BRP 9392</b>	Front bearing preload spacer kit
2	<b>BRP 9393</b>	Rear bearing preload spacer kit
2	<b>BRP 9386</b>	8 Steel T Nuts & Bolts BRAKE FLOATER KIT 8 on 7
2	<b>BRP 9387</b>	8 bolt / 8 on 7 to 8on7 brake rotor adaptor plate
<b>SHORT LINK PARTS &amp; HARDWARE</b>		
1	<b>BRP 1626L</b>	Left Rear Panhard Mount
1	<b>BRP 9675</b>	LEFT REAR <b>FOR PAN HARD ONLY MOUNT</b>
1	<b>BRP 9099L-1</b>	LEFT REAR FRAME BRACKET BOLTS TO
1	<b>BRP 9099R-1</b>	RIGHT REAR FRAME BRACKET
1	<b>BRP 9099R-1B</b>	BOLT ON BRACKET FOR 9099R-1
2	<b>BRP 9469</b>	QUAD LOCK COIL OVER BRACKET
2	<b>BRP 9549</b>	QUAD LOCK ADAPTOR BRACKET FOR SHORT ROD
1	<b>BRP 9560</b>	LR UPPER SHOCK MOUNT
1	<b>BRP 9637</b>	RR UPPER SHOCK MOUNTS
1	<b>BRP RR171/2BK</b>	Left Rear Radius Rod
1	<b>BRP RR181/2BK</b>	Right Rear Radius Rod
1	<b>BRP 1120BK</b>	Left Side Rear Panhard Rod
1	<b>ART 2010F</b>	DIRT Left side oil line
1	<b>PTR 09-0439</b>	IN Line oil filter
1	<b>ART 500103CB</b>	2 piece round ARTS dry sump tank
1	<b>MOR 23996</b>	Oil tank heater Pad
1	<b>BRP 556</b>	Dry Sump Tank Mount

1	<b>BSC 500-30405</b>	Oil cooler / 2022
2	<b>XRP 993205BB</b>	1/2" Pipe plugs for oil cooler
1	<b>CHA 227</b>	Oil cooler Mount for left side rail
1	<b>TRC A200022CE</b>	TORCO Transmission fluid
1	<b>BER 300-CF-NFC</b>	Inboard bellhousing-----NO FLYWHEEL-----NO COUPLER
1	<b>BER 332</b>	Big Block starter
2	<b>BER CTD-001-BK</b>	Rear large bearing hubs / with Snap rings
2	<b>BER CTDNYM-H01-BK</b>	Front large bearing hubs
2	<b>BRP 9530</b>	Front caliper brackets for 4588 spindles
1	<b>BER SG-1200</b>	Generation II open transmission-----no shifter
1	<b>BER 78-SG</b>	Remote shifter assembly for BER1200 tranny
1	<b>BRE 1051L</b>	5/16 L.H.
1	<b>BRE 1051R</b>	5/16 R.H. Male Gas Rod
1	<b>BRE 1061L</b>	3/8 L.H. Brake Rod
3	<b>BRE 5101L</b>	5/8-5/8 L.H. Male Rod End
3	<b>BRE 5101R</b>	5/8-5/8 R.H. Male Rod end
1	<b>BRE 2101L</b>	5/8-5/8 L.H. Male Prec. For Tie Rod End
1	<b>BRE 2101R</b>	5/8-5/8 R.H. Male Prec. For Tie Rod end
2	<b>BRE 5081L</b>	5/8 -1/2 L.H. Male
2	<b>BRE 5081R</b>	5/8 -1/2 R.H.Male
4	<b>BRE 7101L</b>	5/8 -1/2 L.H. Male-----ALUMINUM
4	<b>BRE 7101R</b>	5/8 -1/2 R.H.Male-----ALUMINUM
1	<b>DMI EZCT1-412SG-4050</b>	4:12 DMI Mag center with <b>QUICK CHANGE BELL</b> & REM R/P
2	<b>BRP 4050-01</b>	Steel rings for seals when using 4050- series tubes
2	<b>WIN 7289V</b>	Hub seals for the 4050 quad lock tubes
1	<b>SAF FC-1002</b>	FIRE BOTTLE Steel braided 24" & 84" lines
1	<b>BRP 9610</b>	Mount for Fire Bottle and Safe Craft Drivers Nozzle
1	<b>BRP 9611</b>	Mount for Fire Bottle and Safe Craft Fuel Cell Nozzle
1	<b>FUE RB224</b>	24 Gallon fuel cell---comes with filler top
3	<b>XRP 520008</b>	#8 BLACK push lock cell vent hose
1	<b>XRP 239008BB</b>	90 Degree #8 Push lock fitting
1	<b>KNE 62-1010</b>	Vent Filter for Fuel cell
1	<b>GAU 5110-01</b>	Dash Panel W/ Gauges
1	<b>GAU 5091</b>	Remote starter PUSH button for firewall
1	<b>GAU 6000</b>	2 pin MSD coil wiring harness
1	<b>GAU 6001</b>	Car side wire harness
1	<b>GAU 6004</b>	Car wire harness to MSD 6430 box (removable chip style)
1	<b>MYL 40R407CC</b>	X 2 Transponder holder
1	<b>MSD 6430</b>	MSD 6ALN Big Block Ignition box
1	<b>MSD 8252</b>	Blue Ignition coil
1	<b>TAY 45409</b>	Ignition coil wire
1	<b>TEL OTP</b>	Tachometer - Oval Track - 10,000 RPM
1	<b>GME GA951850NH</b>	9:1 Aluminum quick steer gear
3	<b>XRP 239010BB</b>	AN10 90° Push-On Hose End
3	<b>XRP 234510BB</b>	AN10 45° Push-On Hose End
2	<b>XRP 981610BB</b>	Adapter, -10 Flare to 1/2 NPT
8	<b>XRP 520010</b>	AN10 BLACK PUSH LOCK HOSE
1	<b>XRP 992410BB</b>	AN10 AN ALUM. BULKHEAD NUT
1	<b>XRP 983310BB</b>	AN10 90 DEGREE BULKHEAD UNION
1	<b>KBP 216</b>	SHUTOFF VALVE, 1/2" NPT
1	<b>BRP 5039BK</b>	Fuel Filter
1	<b>XRP 234510BB</b>	AN10 45° Push-On Hose End
1	<b>XRP 520010</b>	AN10 BLACK PUSH LOCK HOSE
1	<b>KIR 00021</b>	Steering Wheel Padding
2	<b>KIR 99021</b>	SFI High density roll bar padding
1	<b>KIR 89150KIT</b>	Kirkey 10 degree Fully contained 15" racing seat with Padding
1	<b>CHA 131</b>	Seat spacer 1" BOTTOM
1	<b>LON 52-56801</b>	15" Dished Steering Wheel
1	<b>PAT 5</b>	Pats CROSS FLOW LIGHT WEIGHT 18.6# radiator
1	<b>BRB 7</b>	Bicknell aluminum 2" deep fan shroud
1	<b>LON 52-75265</b>	29# to 31# Rad cap
1	<b>PFR 7757.14.12.44</b>	Front 14 series brake pads
1	<b>PFR 7754.11.16.44</b>	Rear 11 series brake pads
1	<b>PFR 299.20.0045.01</b>	Left rear directional brake rotor 11.75"
1	<b>PFR 299.20.0045.02</b>	Right rear directional brake rotor 11.75"
1	<b>310-40170-LF-FSR</b>	LEFT Front for Short rod
1	<b>310-40170-RF-FSR</b>	RIGHT Front for Short rod
1	<b>310-40190-RR-RSR</b>	RIGHT rear for short rod
1	<b>310-51190</b>	Left Rear LONG BODY for short rod
1	<b>PCR 310-30336</b>	Thread protector for Threaded body shocks---Right front
1	<b>PCR 310-3006-005</b>	Take up springs---LEFT FRONT
2	<b>PCR 310-30549-1</b>	Divider for left rear & Left front stack coils <b>NYLON STYLE</b>
4	<b>BRP 9052</b>	Integra coil over kits
1	<b>EIB 1200.2530.0165</b>	12" X 165 Right front coil spring
1	<b>EIB 1000.2530.0225</b>	10" x 225 Left front coil spring
1	<b>EIB SR.2530.0060</b>	PURPLE Spring rubber
3	<b>EIB SR.2530.0070</b>	Green Spring Rubber
1	<b>EIB 0350.250.0075</b>	Linear Tender spring for LEFT REAR
1	<b>EIB 1400.2530.0150</b>	14" x 150 REAR BARREL coil springs
1	<b>EIB 1200.2530.0175</b>	12" x 175 REAR BARREL coil springs
1	<b>SIM 29063BKH</b>	Simpson seat belts---3" lap and 2" shoulder for HANS
1	<b>STG DKM202A</b>	COMPLETE Strange driveline assembly
1	<b>BRP 9662</b>	Needle style Grease fittings
1	<b>TP 1500</b>	800 CCA 31# Battery
1	<b>TP CK-BRP-01</b>	Complete + and - Heavy duty battery cable kit
1	<b>TP GK-BRP-02</b>	Engine ground wire kit
1	<b>TP TP75904-01</b>	Master disconnect switch
1	<b>BRP 9467</b>	Master Switch PROTECTOR for Total Power #TP75904-01
1	<b>GAU 6020</b>	Master Switch by pass wire for remote ON / OFF SWITCH
3	<b>WIL 290-0632</b>	575 degree brake fluid
1	<b>BRP 9152</b>	Rear end filler
1	<b>XRP 234510BB</b>	45 degree #10 Push On Fitting
1	<b>XRP 230010BB</b>	Straight #10 Push On Fitting
3	<b>XRP 520010</b>	AN10 push on BLACK hose for rear end filler
1	<b>XRP 980009</b>	Side bell filler plug for DMI rear



## TERMS OF PAYMENT FOR Peter Bicknell Automotive Inc.

- All orders will be shipped PREPAID.
- Canadian Currency
- Credit Card (Visa & Mastercard) or Debit
- Money order, certified cheque
- On-Line E transfers
- Please send E-transfers to:  
brpadmin@cogeco.net
- Returned Check Fee \$40.00
- All other charges are extra- shipping, boxing,handling, and insurance.

## TERMS OF PAYMENT FOR Bicknell Racing Products USA Ltd.

- U.S. Currency
- Company Check (on approved accounts)
- Credit Card (Visa, Mastercard)
- Returned Check Fee \$40.00
- All other charges are extra- shipping, boxing,handling, and insurance.

## TERMS OF PAYMENT FOR Bicknell Racing Products Inc.

- Canadian / U.S. Currency
- COD - UPS Company Check (on approved accounts)
- Credit Card (Visa, Mastercard)
- Debit (Canadian Funds)
- Returned Check Fee \$40.00
- All other charges are extra- shipping, boxing,handling, and insurance.

## COMPANY POLICIES

**FREIGHT:** Freight charges are based on dimensions- Length X Width X Height, and weight. Extra large items, tires, bumpers, body pieces (irregular sizing) may need to be placed on a skid for reduced charge. Carriers are charging handling fees for non- boxed items, (ie. tires) and new this year for October 1 through January a peak surcharge. Overnight and airfreight deliveries are available if requested. Bodies and body panels, depending on the size, normally require shipping by truck freight and there is a boxing charge. We cannot ship to P.O. Box numbers so make sure to provide us with a physical street address or if in a rural area the lot, Concession and township.

**DAMAGED OR MISSING SHIPMENTS:** Any damage claims must be filled out by the customer with the freight carrier immediately upon receiving. Save all packaging, packing material and damaged merchandise for inspection by the freight carrier otherwise no damage claims will be honored.

**DROPSHIP:** All dropship items from a vendor will be subject to a fee based on their particular charges.

**Sales Tax:** All orders are subject to county / state / provincial and/or Federal sales tax.

**Returns:** All returns must have **RETURN GOODS AUTHORIZATION NUMBER (RGA)**. No returns on TIRES, WHEELS, ELECTRICAL or ELECTRONIC ITEMS.

- All returns must be in a new and saleable original packaging.
- Items must NOT be installed.
- Special orders, discontinued items, and custom 'build to order' items are not eligible for returns.
- Returns for stock are **SUBJECT TO 20% RESTOCKING CHARGE**.
- A copy of the original invoice must accompany RGA number and credit will be issued based on invoice price, which is independent of price at time of return.
- No cash refunds will be issued - Return to stock for credit only.
- Items received without an RGA number clearly marked will be scrapped within 15 days of receipt without credit given.

**Special Orders:** All items not listed in the catalog are considered special order and are non-returnable. A deposit will be required for all special order items.

**Shortages or Damages:** Inspect all merchandise upon receipt. Shortages must be reported within 3 business days. Any damages must be reported to freight carrier immediately. Hold original cartons, packaging, and damaged merchandise for further inspection by the freight carrier.

**Back Orders:** Any item not available at the time of purchase will be placed on back order. The item will remain on back order unless other arrangements are made. Items will remain on back order unless cancelled by customer, and will be shipped upon receipt.

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