
JET Racing
2014
SETUP
MANUAL
WINNER
DUEL IN THE DESERT
TINY LUND
MEMORIAL
FEATURE
WINNER
LANE AUTO PARTS
Beatrice Speedway
BEATRICE SPEEDWAY
VICTORY LANE

Welcome to Jet Racing Inc

Table of Contents

Johnny “The Jet” Saathoff
1996, 1997, 1998, and 1999
IMCA Modified National Champion

Jet Mod History

Johnny “The Jet” Saathoff and Kevin Snyder began building race cars in 1995. They started with a swing-arm car called the Viper. In 1996, Johnny and his #96 “Viper” started 65 races with an average of 30 cars per race and won 31 times. He finished off the season with the 1996 IMCA National Championship Title. The Viper is our top selling car with over 430 sold, and they continue to sell and win.

In 1999 came the Lear, which started as a swing-arm car and was converted to a 4-bar. And in 2000 we introduced a 2-link car called the Cobra. We have made many improvements and updated our cars.

2005 and 2006 saw the birth of the Stealth. The stealth is an overslung car. It has 4-bar on both sides. It can be built with a 68-72 Chevelle Stub or a 77-87 Impala Stub.

In 2008, we simplified our chassis ordering process. We still offer the same chassis’ but it’s now easier for our customer’s to know what they want. Instead of a Cobra, Lear, Viper or Stealth you now order a Jet Mod with several different types of options. Call us today to find out what options will work best for you.

Today Jet Racing Inc. is proud to say that **our cars have 7 IMCA National Championships** as well as numerous track, state and regional championships. Jet Mods have hundreds of special event wins and thousands of feature wins. We have sold over 800 cars and each one is built to customer specifications.

Jet Racing at work for you

HELPING YOU GET THE BEST OUT OF YOUR JET MOD

Besides for producing winning cars, Jet Racing offers an array of other services.

Parts

We carry a large inventory with everything you need to get your car to the front. We will match or beat any competitor's price and we'll get your order out the same day that you place it.

Online Store

We have a full service secure online store. Feel safe shopping online with Jet Racing. There's nothing like getting what you need when it's convenient for you. Don't know exactly what you need? Give us a call and we'll be happy to help you out.

Technical Support

If you need technical support, you won't find a better place. We offer free expert technical support by phone, fax or email . Our goal is to help you reach yours.

Drivers and Winners

Jet Racing is proud of our drivers and their accomplishments. We work for you. If there is anything we can do to help you succeed, we are just a phone call or an email away.

How to tell what kind of car you have

To determine the chassis model, look at the front stub. Vipers say JET MOD followed by a three digit number. Lears say JET MOD II followed by a three digit number, Cobras say JET MOD III followed by a three digit number. And Stealths say JET S followed by a three digit number. There are some cars that were special builds, those numbers are different. New cars have the last two numbers of the year on the front stub.

To determine the year your car was built, look at the three digit number on the front stub.

Car #'s 001 - 079 were built in 1995-1999, these were all Vipers.
Car # 080 was built in 1999 and was the first Lear.
Car #'s 081 - 122 were built in 1999.
Car #'s 123 - 188 were built in 2000.
Car # 156 was built in 2000 and was the first Cobra.
Car #'s 189 - 246 were built in 2001.
Car #'s 247 - 299 were built in 2002.
Car #'s 300 - 343 were built in 2003.
Car #'s 344 - 387 were built in 2004.
Car #'s 388 - 424 were built in 2005.
Car #'s 425 - 460 were built in 2006.
Car # 438 was built in 2006 and was the first Stealth.
Car #'s 461 - 490 were built in 2007.
Car #'s 491 - 521 were built in 2008.
Car #'s 522 - 531 were built in 2009.
Car #'s 532 - 555 were built in 2010.
Car #'s 556 - 581 were built in 2011.
Car #'s 582 & Newer were built in 2012.

Dylan Smith

Dylan Smith is a Jet Mod driver from Osceola, NE.

- IMCA Supernationals Champion in 2013
- IMCA Modified National Champion in 2009
- IMCA Modified Central Region Champion in 2009
- IMCA Modified Nebraska State Champion in 2008, 2009, & 2010
- US 30 Speedway Track Champion 2009, 2010, 2012
- I-80 Speedway Track Champion in 2008, 2009 & 2012
- Eagle Raceway Track Champion in 2012
- Canyon Raceway Winter Series Champion in 2010
- Tiny Lund Memorial Race Winner in 2012
- RPM Speedway's Mod Mania Winner in 2012

- 66 Starts, 18 Wins, 13 Seconds in 2009

Jesse Sobbing

Jesse Sobbing is a Jet Sport Mod driver from Glenwood, IA

- IMCA Northern Sport Mod National Champion in 2012 & 2009
- Perfect Season in 2012 - 35 IMCA Qualified Wins
- Nascar Division II Dirt National Champion in 2011, 2010
- Shelby County Speedway Track Champion in 2012, 2011, 2010, 2009
- Dawson County Raceway Track Champion in 2012
- Southern Iowa Speedway Track Champion in 2012
- Buena Vista Raceway Track Champion in 2011
- Iowa State Fairgrounds Track Champion in 2011, 2009
- I-80 Speedway Track Champion in 2011, 2010, 2009
- Butler County Motorplex Track Champion in 2010

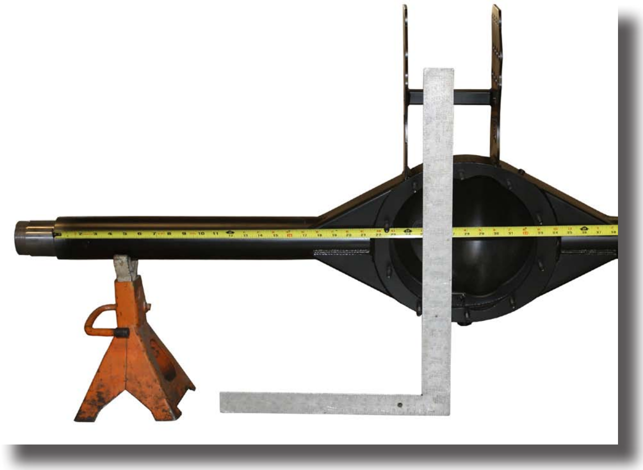
- 95 Starts, 58 Wins, 20 top fives in 2012
- 94 Starts, 56 Wins, 24 top fives in 2011

Jon Thompson

- IMCA Modified National Champion in 2002
- IMCA Modified Central Region Champion in 2002
- 36 Feature Wins in 2002

Setup
Rear-ends

INSTALLING THE REAR-END

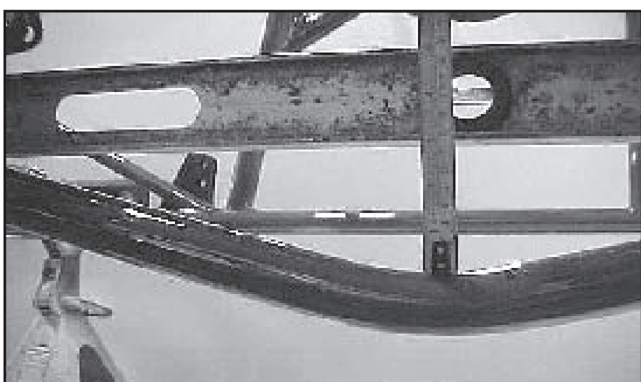


A- Measure to the center of the rear end housing.

B- Mark the top and bottom of the housing.

1. Finding the Center of the Rear Housing.

If your rear end has the brake rotors installed, measure from the inside of one brake rotor to inside of the other. If the brake rotors are not installed, measure as shown in Figure A from one side to the other. Half of the measurement will be the center. (If the measurement is 56 inches, then your center will be at 28 inches.) Double check your measurement from the other side. Mark the top and bottom of the housing at the center point. Make sure your marking is very visible, as it will be used to align the rear end in the chassis and install the pull bar.



C- Left frame rail showing drop measurement

D- Ride height block on left lower frame rail underslung.

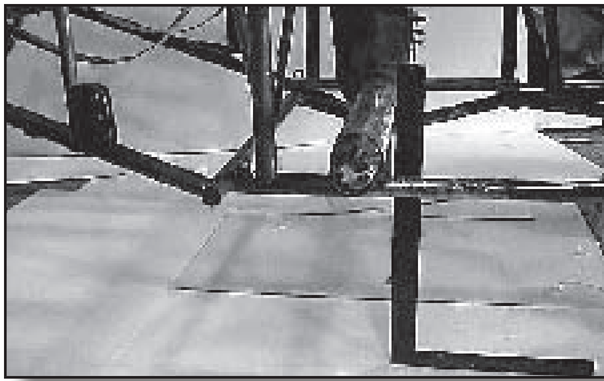
2. Installing the Rear-End in the Chassis

When Installing the rear-end in the chassis, use ride height blocks. Place the blocks between the housing and the lower frame rails (See Figure D). Use a 2.5 inch block on the right. If the left frame rail is dropped (known as the “underslung”), measure the amount of drop by placing a straight edge on the flat areas and measure down. (See Figure C). Add 2.5 inches to this to make your left ride height block. Then install between the rear end and the lower left frame rail.

Most cars built after 1999 have dropped left lower frame rails. When Jet Racing has a rear-end to install we use a 2 3/4 inch x 32 inch ride height block (Shown in figure D) on the left and a 2 7/8 inch ride height block on the right side frame rails. Our ride height blocks are available by calling us at 888-290-9696.

Once the rear-end is properly situated on the ride height blocks, it must be aligned.

3. Finding the Front to Rear Measurement


K - Use a Carpenter's square to measure

Car's #523 and newer: Use this step to check your measurements. Installing the rear end with correct bar lengths should put your rearend in place from front to rear.

Car's #522 and older: Measure from the front of the motor plate to the center mark on your rear-end. This distance needs to be at 72 1/8 inches. (A rule in most sanctioning bodies). Put a carpenter's square from the floor to the front of the housing. Then measure from the front of the motor place to the edge of the carpenter's square. (Use the edge that's touching the front of the housing) This amount should be at least 70 5/8 inches. This will put the center line of the housing at 72 1/8 inches from the back of the motor. You should always allow yourself 1/8 inch tolerance.

Setup Rear Ends

4. Checking the Square of the Rear-End

All Jet Mods 2009 and Newer - Set bar lengths as this book says and rear-end will be square in car. If you want to add some trail, set the left rear bars 1/4 inch longer to give 1/4 trail.

All Jet Mods 2005 to 2008 - measure from the motorplate to the rear-end in the car.

All Jet Mods 2004 and Older - Put a carpenter's square from the floor to the front of the rear-end housing. Hook a measuring tape onto the lower ball joint grease zerk of the right control arm. Then measure to the front of the rear-end housing using the carpenter's square as a guide.


L. - Measure from the lower ball joint zerks to the front of the rear end housing **on cars 2008 & older**

Write this number down here_______________.

Repeat on the left side. This number should be 3/8 inches longer than the right.

Once you have this number, write it down here_______________.

Then measure from another point in the back of the car.
Keep all these measurements and how you got them in case the front-end of your car gets wrecked.

Notes____

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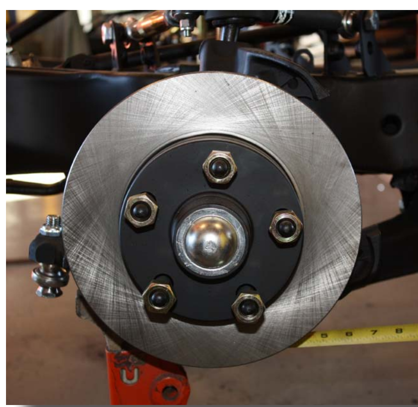

M - Lower Ball Joint Grease Zerks

5. Aligning the Rear-End

To align the rear-end in the chassis, find your car below.

Cars #532 and newer - Chevelle: Left Underslung to center of rear-end should be 12 3/8 Inches. Impala: Left underslung to center of rear-end should be 11 1/2 Inches.

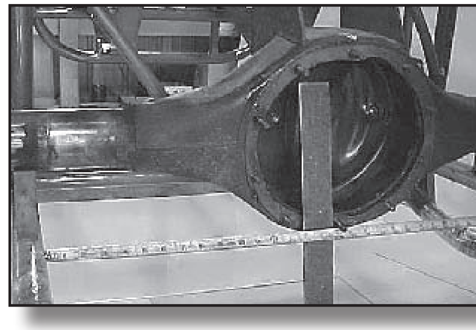
Sport Mods - The measurement from the left underslung to center on an Impala stub should be 11 3/4 Inches. A Chevelle stub would be 12 1/2 inches.

All cars 2006 and Newer - Measure from the pan-hard bar mount or the 1.5 square tube to the center of the pinion. Your measurement should be 15 1/8 inches. Your measurement from the left underslung to center should be 11 1/2 inches.

All Lears #'s 080 to 294 - measure from the inside of the right frame rail under the housing to the center mark on your rear-end. Your measurement should be 16 1/4 inches.

2004 and Newer Lears - Measure from the left underslung to the center mark on your rear-end. The measurement should be 10 1/2 inches.

2001 and Older Vipers - Measure from the right underslung to the center mark on your rear-end. The measurement should be 15 1/4 inches.



E - Measuring from the frame rail to the center mark of the housing .

All cars add 2" to center of rear-end

Setup Bar Lengths

Many cars were built with different bar lengths. This chart should help you get started. These bar lengths are listed by car and year. If you are not sure, or if these numbers don't seem right, don't chance it. Call us and we'll look it up for you. Lots of cars are custom built and their numbers will not be here, call us and we'll be happy to help you.

For More on Bar Lengths, See Pages 35 and 36

All Jet Mods #532 & Newer (2009 to 2011)

Left Upper 16"	Right Upper 16"
Left Lower 14"	Right Lower 14"

2008 & 2009 Standard 4-Bar to car #531

Left Upper 17"	Right Upper 17"
Left Lower 15"	Right Lower 15"

2009 & Newer Northern Sport Mods

Left Lower 16 1/4"	Right Lower 16 1/4"

2008 & Newer with Set Back Cage up to car #531

Left Upper 16"	Right Upper 18"
Left Lower 14"	Right Lower 16"

2007 Lear 4-Bar with Double-Shear Pin Kit

Left Upper 15 1/4	Right Upper 15 1/4
Left Lower 13 1/4	Right Lower 16 1/4

2006 Lear 4-Bar

Left Upper 15 1/4	Right Upper 15 1/4
Left Lower 16	Right Lower 16

2006 Stealth

Left Upper 16 3/8	Right Upper 16 5/8
Left Lower 14 3/4	Right Lower 16 5/8

2005 Lear 4-Bar with Double-Shear Pin Kit

Left Upper 15	Right Upper 18 7/8
Left Lower 17 7/8	Right Lower 19 1/4

2005 Viper 4-Bar with Double-Shear Pin Kit

LR Upper Radius 16	RR Upper Radius 18 1/8
LR Radius 17 7/8	RR Swing Arm 19 1/4

2003-2005 4-Bar/Swing Arm Viper

Left Upper 15 1/8	Right Upper 18 1/2
Left Lower 15 1/8	Right Lower 21 1/2

2003 - 2005 Viper Swing Arm

Left Upper 17 7/8	Right Upper 18 1/2
Left Lower 15 1/8	Right Lower 21 1/2 or 19*

1999 - 2003 Lear Swing Arm

LR Swing Arm 19 3/4	RR Swing Arm 19 9/16
LR Upper Radius 16 3/8	RR Upper Radius 16 5/8

1999 - 2003 Lear 4-Bar/Swing Arm

LR Radius 19 3/4	RR Swing Arm 19 9/16
LR Upper Radius 13 3/4	RR Upper Radius 16 5/8

1996 - 2002 Viper

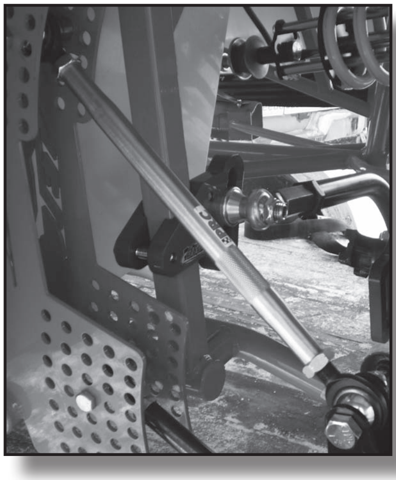
LR Swing Arm 21 1/8	RR Swing Arm 21
LR Upper Radius 19	RR Upper Radius 18 7/8

Setup
J-Bars and Panhard Bars

4. Installing the J-Bar on the Left Side of the Pinion

J-Bar - Go to the third hole up on the pinion side level with pinion (See Image H).
On the frame side, use a 1.5 inch square clamp and go to the far side closest to the tire. Put clamp 5 inches to the bottom of the bracket. On Cars 531 and older, the J-bar will be 23 inches from center to center.
Car #'s 532 and Newer - Your J-Bar is 19 1/4 inches from the inside when mounted on the inside of the bracket away from the LR tire (See Image G).

Try our Trick Solid Adjustable J-bars. Four Lengths Available. Only $109.00



G - Installing the J-Bar in cars #532 and Newer

H - Putting the J-bar in the center of the Pinion Plate

Installing the Pan-Hard Bar on Rear

Lear and Viper (2004 and Older) - For the rear mount pan-hard bar, mount the bracket onto the frame at 4 1/8 inches up from the bottom rail to the bottom of the bracket (Image J). Mount the bracket onto the rear-end so that it makes the pan-hard bar as short as possible, keeping the edge of the bracket inside the right rear frame rail. Measure the length between holes using a 23 inch swedge tube. Use this number to set the pan-hard bar length. Install the bar while maintaining the left to right alignment on the rear end housing. Start with a 6 degree downward angle to the right rear tire (Image I)

2009 & Newer Sport Mods - Mount the pan-hard bar bracket at 6 1/2" up from the bottom rail to the bottom of bracket.

I - Using an angle finder to check the angle of the panhard bar. Start at 18°.

J- Mount the pan-hard bar bracket at 6 1/2" up from the bottom rail to the bottom of bracket.

Track Application - Start with a 15° angle. As the track gets slicker, you can move the pan-hard bar's rear-end side down to tighten entry.

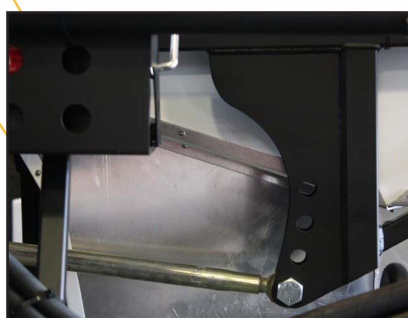
Setup
Pull Bars

Now that you have the rear-end aligned and centered and the j-bar or pan-hard bar installed, you can install the pull bar.

7. Installing the Pull Bar

Set the rear end at a 8-degree downward pinion angle. Measure from the bottom hole of the rear-end housing pull bar bracket to the bottom hole on the chassis pull bar bracket. Set your pull bar with 5 turns preload. Using a bolt, the pull bar should be installed directly over the center mark on the rear-end housing that you made earlier.

N - Pull Bar located in the middle-third hole on the rear-end housing



O - Pull bar located in the bottom hole on the frame bracket

P - Torque Link or Solid Pull Bar located in the bottom hole on the frame bracket.

Are you missing a part? Jet Racing carries a full selection of pull bars, pull bar brackets, pull bar springs and accessories. Call us, and we'll ship your part to you the same day you order.

PULL BAR ADJUSTMENTS

Viper, Lear, and Stealth - Move the pull bar to the left as the track gets slicker, to the right of center if the track gets rough and tacky. Move up in front when track gets slicker. If the track gets very heavy, move the pull bar up in the back. This will make the spring seem stiffer. You can also run as much angle as your foot can handle when the track seems slick. And if your tires are spinning, less pull bar angle will help smooth it out.

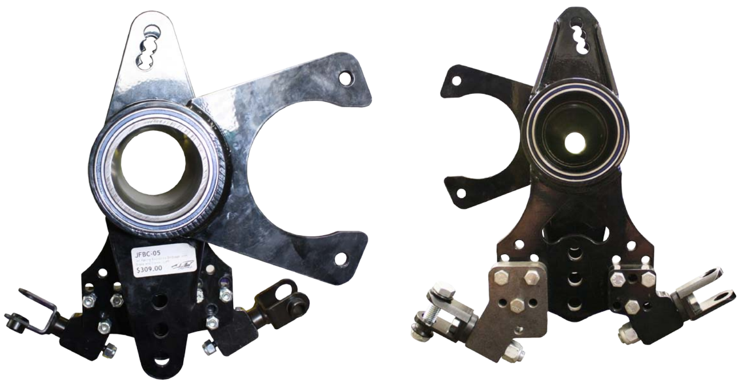
4 bar and Swing Arm cars - 1000/1600 on tacky track. If the track starts to slicken up; soften the pull bar as the track slows down. Decrease to a 900/1300 or 600/1200 for a slow, very dusty track. The bigger the track, the softer the spring.

2-link - 800lb spring.

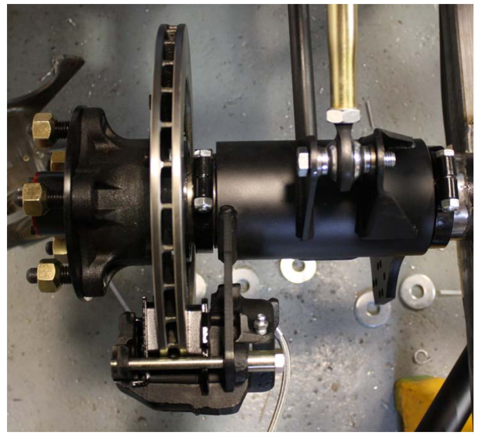
Setup Birdcages

8. Birdcage Assembly - BSB Birdcages

If your birdcage is not assembled, like the BSB Style Birdcages, use the blueprint included with the birdcage to help you. If you have a 4-bar birdcage, mock it up and put it in line before welding. When installing the brake bracket, make sure that the bolts are not too long. You don't want them to go through the brake bracket and rub on the bolts that lock the brake.



Jet Racing's Exclusive Bearing Birdcage with Brake Caliper Bracket and 45° Shock Mounting Blocks. Call Jet Racing to get yours today!



S - Measure ftom the outside of the brake bracket to the inside of the rotor

9. Birdcage Installation

Viper and Lear Swing Arm Cars - Slide your birdcages onto the rear-end. Install a clamp ring to the inside of one of the birdcages to keep them in place. Align them with the front swing arm mount so they are straight with the chassis. Using a carpenter's square against the birdcage, make sure the top is 3/16 of an inch back.

Jet 4-bar Birdcage - When installing a 4-bar birdcage, the brake bracket will be installed so that there is a 1 1/16 difference between the outside of the brake bracket and the inside of the rotor (Image S).The 4-bar birdcage should be straight with no indexing. You can use an angle finder to help.

Northern Sport Mod - The chassis should be level and the rear-end should be set up on blocks. The pinion angle should be set. And the rear-end should be aligned from left to right. Loosen the bolts on the cage and slide the bracket onto the rear-end housing, aligning the spring pocket on the clamp bracket with the weight jack hole. Use a plumb bob to check the alignment. The top of the spring pocket should be level. Use a level or angle finder to make sure its level (Image U).

T - Jet 4-bar birdcage run straight up.

U - Jet Mod Sport Mod 2-Link Brackets

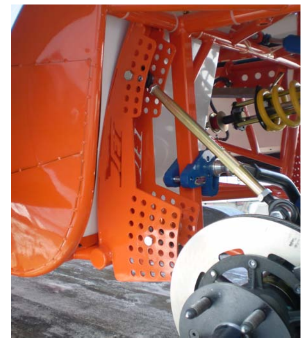
Installing your Left Rear Spring and Shock - With the birdcage straight up and down, Install your shock on the front of the birdcage with 2" of shaft showing.

Our Adjustable Mounts allow for easy installation of coilovers and shocks. Available in two lengths.

Setup
Swing Arms and Radius Rods

10. Swing Arm Lengths and Installation

Now you need to prepare your swing arms and radius arms. With your birdcage tilted back 3/16 of an inch, measure from the center of the lower hole on the birdcage to the second hole up from the bottom. This will be the length of the swing arm.

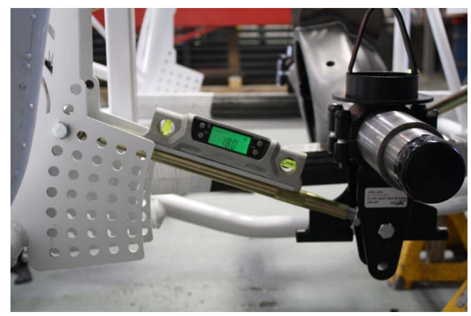


V - Chassis #479 and Newer Lear, Viper, and Stealth

Chassis 479 and Newer - For left side bar placement, see image V.
(All Jet Mods #'s 532 and Newer: L-Lower - 8 Degrees L-Upper - 26 Degrees
R-Lower - 3 Degrees R-Upper - 21 Degrees)

Viper Swing Arm Rear Suspension - The swing arms go in the second hole up from the bottom on the front. The left rear radius rod goes in the center hole at the rear. And the right rear radius rod goes in the third hole up. Important - maintain all measurements while installing the suspension arms.

2004 to 2006 Stealths and Lears 4-bar both sides and double-shear brackets and a pin kit (Image W) - The left lower bar goes in the second hole up. The right lower bar goes in the second hole up. The left upper bar goes in the second hole down. And the right upper goes in the third hole down.

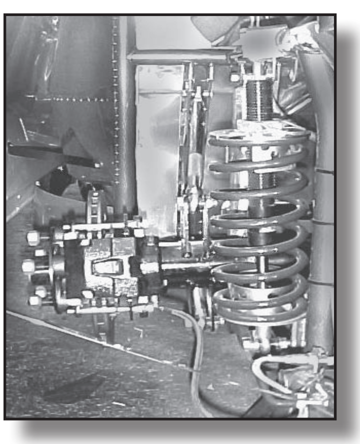


W - Left lower bar showing an 18°angle.

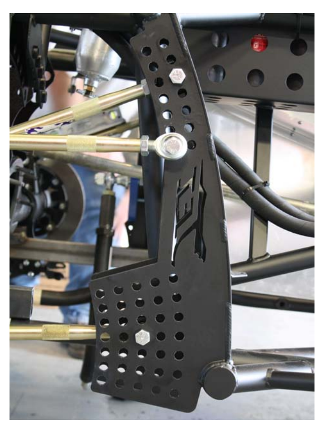
2-Link - The left lower link bar in the third hole up from the bottom starts at 12 degrees. The right lower link bar starts at 6 degrees

New Northern Sport Mod - The left lower link bar in the 7th hole up from the bottom starts at 18 degrees. The right lower link bar starts at 11 degrees

For More on Bar Placement, See Pages 35 and 36

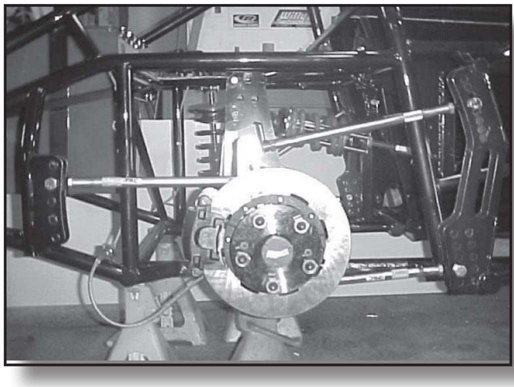


X - Spring on the back of the birdcage

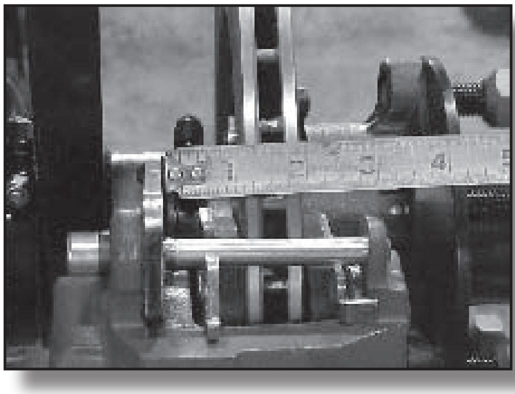


X - #532 and Newer Cars

Setup
Brakes



Z - Right brake floater rod positioning. This Image shows car on Z-link.



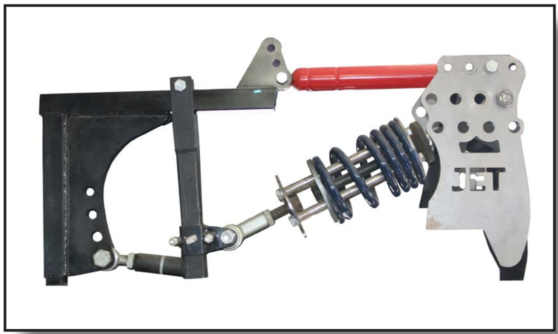
AA - Measure from the outside of the brake bracket to the inside of the rotor

11. Clamped and Floated Brakes

When installing the brake floaters on a Lear or Viper, make sure the bleeder screws on the calipers are straight up. When installing the radius rods, the left side bar should be level and the right side bar should start in the middle hole The brake brackets should be positioned so that there is a 1 1/16 difference between the inside of the brake rotor and the inside of the brake bracket. This measurement is the same for clamped and floated brakes.

Track Application - The LR Brake Floater can be moved up to help corner entry.

Setup
The 90/10



BB - 90/10 with Jet Racing's new pull-bar brackets. Picture shows the pull bar mounted on our trick Pull Bar Shortener

12. Installing the 90/10

The 90/10 is a shock that is mounted above your pull bar onto the rear end housing. The 90/10 dampens the rebound of your rear-end. Install the 90/10 if your car is equipped with the mounting bracket. When you bolt in the 90/10; make sure there is no more than 31/2 inches of the shaft showing. This will leave enough necessary for pull bar movement. Keep the 90/10 as level and as straight in the chassis as possible. Our new pull bar brackets have three holes; so you can adjust the length of the 90/10.

This new QA1 Trick 90/10 Shock is a must for good handling on your car. It has new valving for corner entry and it will help you tighten your car. Perfect for a dusty, slick , slow track. And its IMCA Legal.

Get yours for only $129.00 today!

Setup Springs

Installing your Left Rear Spring and Shock

- With the birdcage straight up and down, Install your shock on the front of the birdcage with 2" of shaft showing.

13. Springs

Once all of the previous steps have been completed or checked, you can remove the ride height blocks and install the springs and shocks. The spring rating numbers below provide a starting point.

4-Bar Impala Stub	Impala Sport Mod	Northern Sport Mod - Chevelle	4-Bar '68 - '72 Chevelle Stub	Swing Arm Impala Stub	4-Bar LR/ Swing Arm RR
LF 750 RF 700	LF 700 RF 650	LF 600 RF 550	LF 650 RF 600	LF 750 RF 850	LF 700 RF 750
LR 225 RR 200	LR 225 RR 175	LR 200 RR 175	LR 225 RR 200	LR 250 RR 225	LR 225 RR 250

Here are some suggestions on making changes with your springs. Keep in mind that these are only suggestions, other factors such as bar angles can make a difference in spring changes.

Non 4-bar cars - If the track gets slick and slow, soften the right rear.
4-bar cars - If the track gets slick and slow, soften the left rear.
All cars - If the track gets rough and tacky, stiffen the left rear by 25 lbs.
All cars - If you are running a small track such as a 1/4 mile, soften the car all around.

We can help you decide which springs you need for specific applications. Give us a call, and we'll be glad to help.

Setup Shocks

14. Shocks

Now that the springs have been installed, you can bolt the shocks on. Jet Racing provides our custom valved 10-Shock Packages to make your shock decisions as simple as possible. The 10 shocks included in each package will be all the shocks most drivers will need. They cover a variety of tracks and track conditions for a variety of setups. The shocks are easy to use and come with a simple setup sheet so you'll never be confused.

If you already have your own shocks, the following is a listing of shock numbers by vendor that should serve as a starting point. Advanced shock information will follow.

QA1 Shocks for 2-Link Suspensions

Shock Location	Stroke Length	Comp/ Rebound	Our Part#
Left Front	7"	5/5	QA1-5075
Right Front	7"	5/3	QA1-5075-3
Left Rear	9"	3/5	QA1-5093-5
Right Rear	9"	4/4	QA1-5094

Vendor	Shock Location	Stroke Length	Comp/ Rebound	Our Part #
Bilstein	Left Front	7 Inches	40/40	BIS-S7Z-4040
Bilstein	Right Front	7 Inches	50/30	BIS-S7Z-3050
Bilstein	Left Rear	9 Inches	50/30	BIS-S9Z-3050
Bilstein	Right Rear	9 Inches	40/40	BIS-S9Z-4040
QA1	Left Front	7 Inches	5/5	QA1-21A75
QA1	Right Front	7 Inches	3/5	QA1-21A73-5
QA1	Left Rear	9 Inches	2/6	QA1-21A96-2
QA1	Right Rear	9 Inches	4/4	QA1-21A94

Understanding Shocks

Shocks are controlled suspension timing devices and are necessary to maintain the maximum tire-track contact as the car goes around the track. They dampen the compression and control the rebound of the spring. Each shock has a different valve rate that controls when the movement happens and how fast the movements occur. In other words, Spring rates determine how far your chassis rolls, pitches or squats. And shock rates determine the length of time it takes for each of those movements to occur. A better understanding of shock technology can make the difference between leading the pack or staring at the back of someone elses fuel cell all night. However, you must keep in mind that shocks are not a catch-all and will not solve a bad handling problem. They are meant to be a fine tuning device to improve handling. Changing a shock can hide a bad handling problem. So, making a change to shocks should only be done once you have given consideration to tire stagger, wheel spacers, wheel offset, weight ballast, bar angles, and correct spring combinations.

Shocks

Your shocks are a crucial component of your car and your success. Take the guess work out of your shock decisions with our new Jet Racing Custom Shock Packages.Each Package Includes 10 Shocks. Each shock is custom valved for Jet Racing and labeled for easy use. You can choose between a Bilstein or QA1 Shock Package. These shock packages are divided into 4 application sets so you'll know exactly what to use no matter what the track conditions look like.

Call us at 888-290-9696 To get your shock package today!

QA1

Set#1 Mud, Choppy, Tacky

LF JS1-1
Muddy, To Help
Car Turn

RF JS1-2
Tie-Down
Mud, Tacky

LR JS1-3
LR: Mud, Tacky
RR: Dusty Slick

RR JS1-4
Mud, Tacky

Set#2 Slick Center w/Cushion Top

LF JS1-1
Muddy, To Help
Car Turn

RF JS1-2
Tie-Down
Mud, Tacky

LR JS2-3
Hold-Up, Cushion
with Slick Center

RR JS1-4
Mud, Tacky

Set#3 Slick

LF JS3-1
Slick, Hold Side
Bite

RF JS3-2
Slick, Hold Car
On Nose

LR JS3-3
Hold Car on RF
To keep side bite

RR JS3-4
Slick, Without
Cushion

Set#4 Dusty Slick

LF JS3-1
Slick, Hold Side
Bite

RF JS4-2
Dusty Slick
Tighter Turn

LR JS3-3
Hold Car on RF
To keep side bite

RR JS1-3
LR: Mud, Tacky
RR: Dusty Slick

Bilstein

Set#1 Mud, Choppy, Tacky

LF JS01-1
Muddy, To Help
Car Turn

RF JS01-2
Tie-Down
Mud, Tacky

LR JS01-3
LR: Mud, Tacky
RR: Dusty Slick

RR JS01-4
Mud, Tacky

Set#2 Slick Center w/Cushion Top

LF JS01-1
Muddy, To Help
Car Turn

RF JS01-2
Tie-Down
Mud, Tacky

LR JS02-3
Hold-Up, Cushion
with Slick Center

RR JS01-4
Mud, Tacky

Set#3 Slick

LF JS03-1
Slick, Hold Side
Bite

RF JS03-2
Slick, Hold Car
On Nose

LR JS03-3
Hold Car on RF
To keep side bite

RR JS03-4
Slick, Without
Cushion

Set#4 Dusty Slick

LF JS03-1
Slick, Hold Side
Bite

RF JS04-2
Dusty Slick
Tighter Turn

LR JS03-3
Hold Car on RF
To keep side bite

RR JS01-3
LR: Mud, Tacky
RR: Dusty Slick

Making Changes

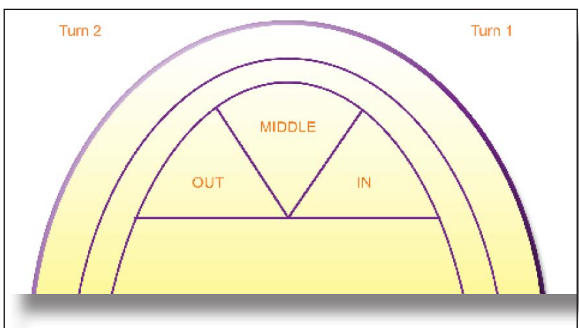
Consider the following affects that shock changes will have:

Front Compression Rate
Deceleration
or Corner Entry

Front Rebound Rate
Acceleration
or Corner Exit

Rear Compression Rate
Acceleration
or Corner Exit

Rear Rebound Rate
Deceleration
or Corner Entry



Problem	Step 1	Step 2	Step 3	Step 4
Loose In	Decrease Compression on RF	Decrease Rebound on Left Sides	Increase Compression on RR	
Loose Middle	Increase Compression on LF	Increase Compression on LR		
Loose Out	Increase Compression on LR	Decrease Rebound on both Fronts		
Tight In	Increase Compression on RF	Decrease Compression on LF		
Tight Middle	Increase Rebound on LF	Increase Rebound on both Fronts	Decrease Compression on LR	
Tight Out	Decrease Rebound on RF	Increase Rebound on LF	Decrease Compression on LR	Increae Compression on RR

Let's say that you need some more traction coming out of the corner. Decreasing rebound on the front right shock will increase the speed that the car transfers weight to the left rear tire. Decreasing compression on the left rear will also increase the speed that the weight transfers to the left rear tire.

Shock Suggestions Continued

QA1

Swing Arm Cars	4-bar Cars
	Tacky/Rough
LF - 21A74 RF - 21A75-3 LR - 21A94 RR - 21A94	LF - 21A75 RF - 21A75-3 LR - 21A94 RR- 21A94
LF - 21A74 RF - 21A75-3 LR - 21A93-5 RR - 2A194	LF - 21A74 RF - 21A75-3 LR - 21A93-5 RR - 21A94
	Tacky, Slick, or Rough
LF - 21A75-3 RF - 21A73-5 LR - 21A93-5 RR - 21A93-5	LF - 21A75-3 RF - 21A75-3 LR - 21A95-3 RR - 21A94
	Slick
LF - 21A75-3 RF - 21A73 LR - 21A93-5 RR - 21A93-5	LF - 21A75-3 RF - 21A73-5 LR - 21A98-2 RR - 21A93-5

Bilstein

Swing Arm Cars	4-bar Cars
	Tacky/Rough
LF - 40/40 RF - 45/55 LR - 40/40 RR - 40/40	LF - 40/40 RF - 45/55 LR - 40/40 RR- 40/40
LF - 40/40 RF - 30/50 LR - 50/30 RR - 40/40	LF - 40/40 RF - 30/50 LR - 50/30 RR - 40/40
	Tacky, Slick, or Rough
LF - 30/40 RF - 30/50 LR - 50/30 RR - 50/30	LF - 30/40 RF - 30/50 LR - 30/50 RR - 40/40
	Slick
LF - 30/50 RF - 50/30 LR - 40/20 RR - 50/30	LF - 30/50 RF - 50/30 LR - 20/80 RR - 50/30

Setup Wheels and Tires

15. Wheels and Tires

Install your wheels and tires next. Shoot for 1 inch of stagger on the front and 2 inches of stagger on the rear.

If the track dries out, move the right rear in. If the track slows, move the left rear out.

Tire Pressure Recommendations

LF 10 PSI RF 13 PSI
LR 9 PSI RR 14 PSI

Tire Tips: When you purchase a new tire, there are some things you need to do. These things will maximize the life of your tires and insure the best tire-track relationship. First, take the big white sticker off. Once that sticker is off, you need to get rid of all those little rubber nubs. They interfere with your tire's contact to the track. The best way to knock them off is to grind them off. If you don't have a grinder, get one. A grinder can get you more nights out of your tires and save you money.

Next, take the tires out for some hot laps. Go back to the trailer and remove the new tires and put them back on the trailer until the next race. By doing this, you are allowing the tire to go through a crucial heat cycle. If you don't do this, the tire tends to seal over and you've just wasted your money. If you must put a new tire on your car, try to put it on the left front.

To get the most money out of your tires, you need to grind them. It may seem like grinding your tires will wear them down faster, but it actually does the opposite. Grinding them reduces wear and makes your car faster.

In addition, a proper throttle pedal can really make your tires last longer. A roller pedal gives you more control of the throttle and prevents excessive wear on your tires. And when you store your tires, make sure they sit out of direct sunlight and away from extreme temperature changes which could make them stretch.

Setup Ride Heights and Scaling

16. Ride Heights

The ride heights are at the bottom of the chassis and not from the stock stub. The front ride heights are checked where the tubing (round or square) connects to the front stub. The rear ride heights are checked where the rear hoop (behind the driver) connects to the bottom of the lower rails. Round rails are easier to check with a ride height checker rather that a tape measure.

Before you adjust your ride heights, make sure the car has all fluids filled. Such as fuel, oil, etc. Adjust the ride heights by turning the weight jack bolts evenly. Here are some suggestions. Based on IMCA Stamped Hoosier G60 tires.

Impala Stub	
LF - 5 3/4	RF - 5 7/8
LR - 6	RR - 6

Sport Mods	
LF - 5 3/4	RF - 5 7/8
LR - 6 1/4	RR - 6 1/4

Chevelle Stub up to Chassis #580	
LF - 6 3/4	RF - 6 7/8
LR - 7	RR - 7

Chevelle Stub 581 & Newer	
LF - 5 3/4	RF - 6 7/8
LR - 6	RR - 7

Another Way to Check Ride Heights: Impala: Put your left front Upper A to 15° and your right front upper A to 11° **Chevelle:** Put your left front Upper A to 17° and your right front upper A to 14°

17. Scaling the Car

We have included a Chassis Setup Sheet to use when scaling your car on page 22. Make sure you have checked or completed all previous steps. Make sure the tire pressures are set and all fluids are full. Set your car on the scales. (All percentages are figured without the driver's weight.) When mounting lead on to your car, maintain the ride heights and use your weight jacks to adjust your bite numbers. Make sure you keep your ride heights the same when you scale your car. Once your car is correctly scaled, lock all weight jacks down using hose clamps or 3/4 inch nuts. After you remove your car from the scales, check the front end settings and adjust as necessary.

Swing Arm	2-Link	4-Bar	Northern Sport Mod
180 lbs LR Bite	100 lbs LR Bite	50 - 100 lbs LR Bite	60 lbs LR Bite
Rear - 57.5% to 58.5%	Rear - 57%	Rear - 57% to 58%	Rear - 54%

Left Side Percentages are based on your driver's weight. If your driver is around:
150 lbs - 52% to 52.8%
200 lbs - 51.5% to 52%
250 lbs - 50.8% to 51.5%

Tip - If the track gets slow and you are having trouble getting in to the corner, lessen the left side. Driving styles may vary. So, if you're a hard and aggressive driver, keep the left side down. If you are a smooth driver and your try to keep the rear end from tailing out, use more left side weight. The more rear percentage you use, the tighter your car will be in the center of the corner. If you drive straight in to the corner or if you throw the car into the corner, too much rear can give your can a pendulum effect.

Chassis Troubleshooting

Adjustment Area	To Tighten Going In	To Loosen Going In	To Tighten Coming Off	To Loosen Coming Off
Front Springs	Stiffen Left	Stiffen Right	Stiffen Right	Soften Right
Front Shocks			Soften Extension	Stiffen Extension
Rear Springs	Stiffen Right	Soften Right	Stiffen Left and/or Soften Right	Soften Left and/or Stiffen Right
Rear Shocks	Soften Left	Stiffen Left Compression	Soften Left Compression	
Stagger	Decrease	Increase	Decrease	Increase
Left Rear Bite	Decrease	Increase	Increase	Decrease
Left Side Weight	Decrease	Increase		
Rear Weight	Increase	Decrease	Increase	Decrease
Third Link Position	Raise on Chassis	Lower on Chassis	Lower on Chassis	Raise on Chassis
Pan-hard Bar Position	Lower	Raise		
Rear Steer	Lead Right Rear	Lead Left Rear	Lead Right Rear	Lead Left Rear
Spring Rod Preload			Decrease	Increase
Damper Position	Raise Front, add 2nd Damper	Lower Front		
Gear Ration			Decrease	Increase
Center of Gravity Height			Decrease	Increase
Brake Bias	Decrease Rear	Increase Rear		

Too Much side bite will take forward bite and vis versa

Chassis Tech

	Shock Area	Spring Rate	Chassis Percentages	Pan-hard bar Locations
Push (B) Corner Entry	Decrease LF & RF Compression	Decrease RF Increase LF	Increase Pin RF Increase Diagonal % and Unhook RR	Raise Bar or Decrease Angle
Push (C) Corner Entry	Increase RR Comp. Increase LR Ext.	Decrease both front rates	Increase Left Side % RR has too much load	Raise Bar or Decrease Angle
Push (D) Mid Corner	Increase LR Comp. Increase RF Ext.	Increase RR Rate	Lower Ballast Wt. Decrease LR % Decrease Rear %	Raise Bar or Decrease RR Angle
Push (E) Mid Corner	Decrease LF Ext. Decrease RR Comp	Decrease RF to LR Rate	Decrease LR % Decrease Rear %	See Other Adjustments
Push (F) Corner Exit	Increase LR Comp Decrease RR Comp	Decrease LR Rate	Decrease LR % Decrease Rear %	See Other Adjustments
Push (G) Corner Exit	Increase LR Comp Decrease RR Comp	See Other Adjustments	Decrease Rear %	See Other Adjustments
Push (H) Corner Exit	Increase LR Comp Decrease RR Comp	See Other Adjustments	Decrease Rear %	See Other Adjustments
Loose (B & C) Corner Entry	Increase LF Comp	Increase Front Rate	Raise Ballast Wt. Decrease Left %	Lower Bar or increase angle to RR
Loose (D) Mid Corner	Decrease LR Comp	Decrease RR Rate	Increase LR % Increase Rear %	Lower bar or increase angle to RR
Loose (E) Mid Corner	Decrease RF Ext	Increase LR Rate	Increase LR % Increase Rear %	See Other Adjustments

Setup
Front Suspension

CONTROL ARMS / A-ARMS

Lower Control Arms

Impala Stub

Lower A-Arm: 77-87 Impala with an Elgin 1K6117 Ball Joint or QA1-1210-108 Low Friction Ball Joint.

Chevelle Stub

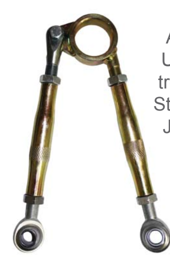
Lower A-Arm: 68-72 Chevelle with an Elgin 1K6117 Ball Joint or QA1-1210-108 Low Friction Ball Joint.

These IMCA Approved Upper Control Arm Assemblies allow easy adjustment of caster/camber and can be easily fixed by replacing individual parts. Depending on your car and application, you may need different lengths of swedge tubes. Call us at 888-290-9696.

Upper Control Arms
- Cars # 231 & Newer

Impala Stub
Right: 5 1/2" Swedge Tubes
Left: 6" Swedge Tubes

Impala Stub With Trick Collar:
Left : 6 1/2" Trick Collar and a 6" Tube
Right: 6" Trick Collar and a 5.5" Tube



Adjustable Upper Control Arm with Standard Ball Joint Collar

Chevelle Stub - Using 1/2" Heims:
Right: 6" Swedge Tubes
Left: 6" Swedge Tubes

Chevelle Stub - Using 5/8" Heims
Right: 5" Swedge Tubes
Left: 6" Swedge Tubes

Adjustable Upper Control Arm with **Trick** Ball Joint Collar

Chevelle Stub With Trick Collar:
Left : 6 1/2" Trick Collar and a 6" Tube
Right: 5 1/2" Trick Collar and a 5" Tube

Ball Joints

Jet Racing recommends using the QA1 Low Friction Ball Joints on all of our cars. QA1 provides the ultimate in low friction ball joints . QA1 Low Friction Ball Joints are rebuildable. Damaged studs can be easily replaced. The QA1 Ball Joints are self lubricating and adjustable. **Get QA1 Low Friction Ball Joints at Jet Racing!**

Cross Reference

QA1	Elgin
1210-101	1K6024
1210-104	1K5208
1210-105	1K772
1210-108	1K6117
1210-109	1K6145

TIE RODS

Tie Rod Lengths

Impala Stub
Left - 18" Right - 18 7/8"

Chevelle Stub
Left - 19" Right - 19"

Tie Rod Spacers

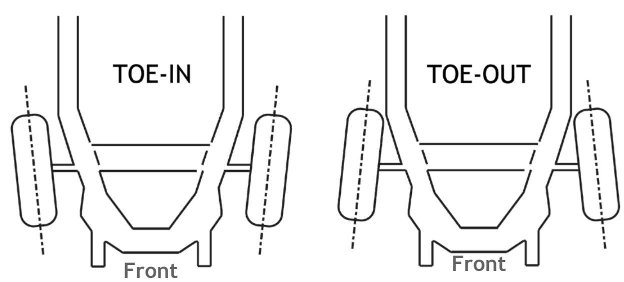
Impala Stub
Left - 7/16" Right - 3/4"

Chevelle Stub
Left - 1 1/2" Right - 1 1/2"

Setup
Front End Scaling

Toe-In / Toe-Out

"Toe" refers to the pointing in or out of the front tires. If the front edges of the tires points in towards the motor - you have toe-in. If the front edges of the tires points out away from the motor , you have toe-out.



There are several methods for checking for toe-in or toe-out. And it is important to do so because it will effect your directional stability.

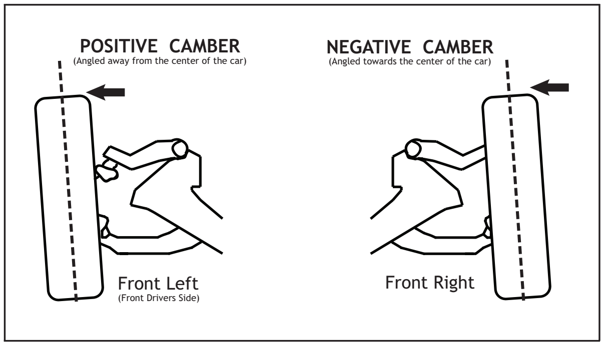
The most common method for checking "toe" is the toe plate method. Once your Jet Mod is completely race ready, put your toe plates flat against both the front tires. Then take a measurement of the distance between the forward edges of the both plates. And a measurement of the read edges of the both plates. A smaller measurement of the rear edges indicates toe out.

Jet Racing recommends having an 1/8" on big tracks, and a 1/4" on smaller tracks.

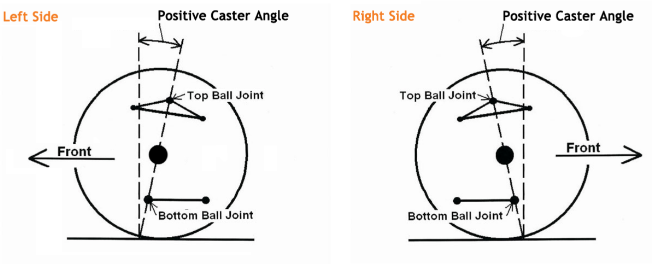
Setup
Caster / Camber

Camber

Camber is the tilt of the tire as viewed from the front or rear of your Jet Mod. The degree of tilt is is partly caused by the upper and lower ball joints and their relationship to each other.
Simply put, if a tire leans out away from the center of your car, you have positive camber. If a tire leans in towards the center of your car, you have negative camber.
The degree of camber will have a significant impact on how your car corners. Having optimum camber settings will make your car faster and will also increase the life of your tire.
Camber is easy to measure and set with a Caster Camber Gauge. And camber is adjusted by using adjustable upper control arms and shims.
Most dirt track drivers run positive camber on the left front and negative camber on the right front.



Recommended Camber
LF: +2.5° RF: -4°



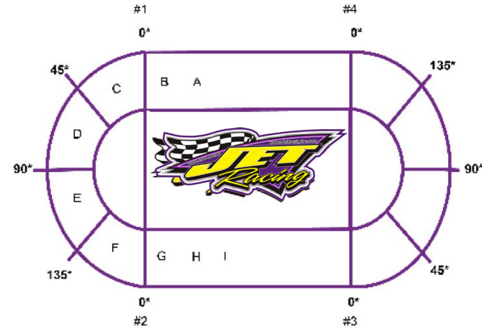
Caster

Caster is based on the angle of your steering axis, or the angle of an imaginary line between the upper and lower ball joints. From the side view, this imaginary line will tilt forward or backward. The angle of the tilt is your caster measurement.
If your caster tilts back towards the rear of the car, you have positive caster. If your caster tilts towards the front of the car, you have negative caster.
Positive caster will provide directional stability, but too much positive caster will make steering difficult. Power steering allows you to run more positive caster. Negative caster requires less effort to steer, but can cause your car to wander down the straightaway.
Most circle track drivers will run more positive caster on the right side than on the left. That caster split helps the car into the turns, helps the car turn in the center, and helps it stay hooked up on corner exit.

Recommended Caster
LF: +2° RF: +6°

Tip - If you drive your car straight, use less caster split. If your throw your car into the corner, use more caster split. For big circle tracks, use less caster split. For tight corner tracks, use more caster split.

Diagnosing Problems



Understanding Your Car

Communication between crew and driver is important. Understanding the driver's responses to the car is crucial. Determining what and where a handling problem is and where it really starts is very important. When resolving a handling problem, be sure to diagnose handling issues on the full race track. If you don't, you may make an adjustment for one part of the track that creates a bigger problem somewhere else. Winning races isn't accidental, it's done by making smooth consistent laps. Your car will be faster, more consistent and easier on equipment when the car is setup to allow the driver to run freely around the whole track. Consistently making changes to your suspension will become frustrating.

Too make it easier to diagnose handling problems, diagram the race track and note where the problems occur. Use a visible mark on your steering wheel to help your crew know where the front wheels are when the problems occur. You can also mark the left side tires to help determine wheel spin.

Remember, the only thing your car has in common with the track is the tire patch your car is riding on. You want to use all the tires, not three of them or 75% of the four. You will see that lap times will be faster when all four tires are in contact with the track, you're keeping the car straight, and using smooth throttle and brake applications.

We have created a Chassis Trouble Shooting table on page 15 to help you fix handling problems. Jet Racing is always here to help. Our tech support can help you diagnose a handling problem and make suggestions on how to fix. Don't hesitate to give us a call.

Setup

Understanding 4-Links

The following is a Featured Tech article written by Chris Smyser that appeared in the November, 2007 issue of Speedway Illustrated. It is used with permission.

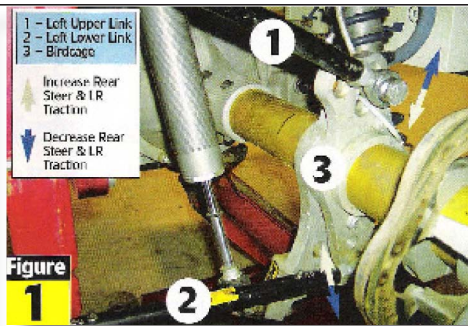


Figure 1

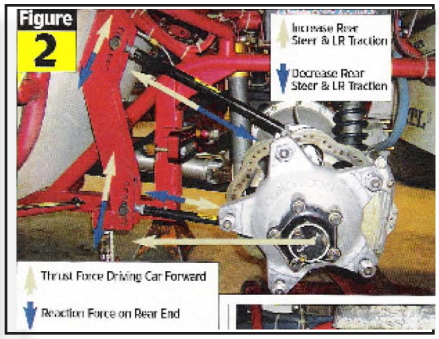


Figure 2

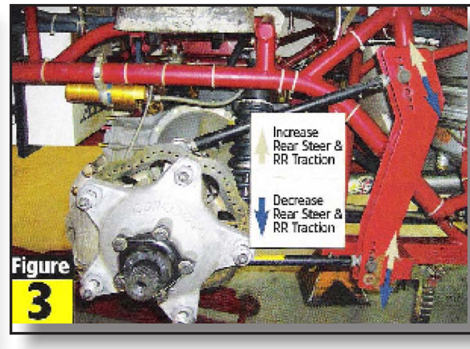


Figure 3

Part I: The Basics

The 4-bar rear suspension has been around for a long time and it is one of the most popular suspensions on dirt late model and modified race cars. It gets its name from the four links that attach the rear end to the chassis - two on the left side and two on the right. It's a durable and highly adjustable suspension setup.

The 4-bar suspension is designed to use body roll during cornering to steer the rear end and help the car turn more efficiently. The links are attached at locating holes on each side of the chassis. Most builders provide adjustment holes for both the upper and lower links so guys like me can take a good car and mess up the handling by changing too much.

The links are attached to components called birdcages on the rear end. The birdcages can rotate freely about the rear end as the rear axle travels up and down during suspension movements. The shocks are mounted on each side of the rear end to the birdcages. The typical 4-bar setup has one shock on the right side, and one or two (yes, I said two - more on that later) shocks on the left side. Typically, the left side brake caliper is mounted to a bracket clamped on to the axle housing, while the right side brake caliper is mounted to a bracket on the birdcage. Mounting the right side caliper to the birdcage allows the upper link to transfer the braking force from the right rear wheel to the chassis. That causes the reaction force through the link to load the right rear tire and help keep the car tighter on corner entry.

Part II: The Details

Figure 1, a close up of the left rear of a typical 4-bar setup, shows the upper and lower links, the birdcage and the two shocks mounted to the birdcage. Notice that the spring is mounted on the rear shock. Typically the front shock is valved to provide a lot of resistance to compression and very little resistance to rebound to help the car "hike up" and create traction. The traction is provided by the links' vertical angle. The rear shock can be set up as a "dummy" with no valving, or it can provide additional compression resistance and a little rebound resistance.

On a modified, the shock might be mounted in front of the axle and a slider might be used to mount the spring behind the axle. The shock in front of the rear end controls the damping and also how far the axle can drop relative to the chassis. If the frame rails do not pass under the axle and a shock is not mounted in front of the axle, a restraining chain must be used, either mounted in place of the front shock, or attached to the axle housing and bolted to the upper frame rail. This prevents the birdcage from rolling over center and either becoming stuck or possible damaging the lower link.

Mounting the left rear spring behind the axle is one reason that the 4-bar makes such good traction. As the car rolls over in the corner, the left side raises and increases the angle of the left-side links. At the same time, the birdcage "indexes" or rotates with the top moving toward the front of the car. This momentarily increases the load on the spring and increases traction. As the car begins to accelerate, the thrust force in the axle driving the car forward is transferred through the links and into the chassis (see figure 2). If the left-rear tire has enough grip, the thrust force in the rear end will lift the chassis and the rear end will essentially try to drive up under the chassis on the left side. This adds a lot of rear steer to the car and it also puts a lot more vertical angle into the links.

The left rear spring also unloads as this happens - sometimes to the point that the tire is the only spring acting at the left-rear corner. This is not good if the track is rough or has a lot of bite which causes a lot of 4-bar cars to act like pogo-sticks in the corner . The lower frame rail (if the car has one), the front shock, or the restraining chain ultimately limits the amount that the left side of the rear end can drive up under the car. This is important to remember as you tune your car to the track conditions. If the tracks is rough or has a lot of bite, increase the rebound damping in the left rear shock(s) and decrease the angle of the upper link to tame the car and make it more comfortable.

Part III: Tuning

Now we can look at the effect that moving the links around in all those different adjustment holes will have on handling. Figures 1, 2 , and 3 are illustrated with arrows to show what moving the links will do to the traction and rear steer on both sides of the car. To tighten the car, we typically decrease the rear steer and increase the traction. To loosen the car we do the opposite. To tighten the car on entry and through the corner, we typically want to decrease the angle of the right lower link by lowering the chassis mount point. This reduces steer at the right rear wheel as the body rolls in the corner, with a minimal effect on traction. To loosen the car on entry we raise the right lower link at the frame point mount.

To increase traction, the typical adjustment is to raise the left upper link on the frame and/or lower it on the birdcage. This increases the vertical loading of the let rear tire to help drive the car straighter off the corner, but it also decreases the rear steer. If the increase in rear steer makes the car too loose, lowering the left lower link at the frame mounting point will counteract this and keep the car tighter. Raising the left lower link also increases traction, but it increases rear steer more than raising the upper link. If we've made all the adjustments for minimizing roll steer and maximizing traction and we still need the car to be tighter, we can shorten the right-side links and/or lengthen the left side links to help offset the rear steer caused by acceleration.

There are many more adjustments that you can make, including shocks, springs, tire stagger, and panhard bars to name a few. But I focused mainly on the adjustments available with the links to give an idea of what you can do to tune your handling to the track conditions - no matter what they are.

SETTING-UP AND TUNING 4-LINK SUSPENSIONS

It All Starts with the Links . . . Part One

Back in the mid-1980's, C.J. Rayburn decided to replace his then mono-leaf/coil-over rear suspension with four trailing arms (links), two birdcages and a panhard bar. Hence the 4-link rear suspension was born. Rayburn's invention has certainly passed the test of time. It has long been the rear suspension of choice for the majority of Dirt Late Model and Modified races, and for good reasons. The basic design of the 4-link, coupled with it's adjustability, provide races with a rear suspension that works well and is very tunable in all track conditions. The versatility of the 4-link has made it the all-purpose, dirt rear suspension.

The 4-link layout is simple, however its workings can be complex. Through experience, most races have learned enough basic 40link adjustments to get by. But the key to setting up and tuning a 4-link or any other type of rear suspension to full advantage is to understand how all of the different components of the suspension work separately, and how they work together.

It's very difficult to fix or improve something (including your race car), if you don't first understand how it works. So, in this first article on 4-link suspensions, I'll breakdown the basic fundamentals of a 4-link suspension, including the three key elements that are influenced by the link adjustments that we make.

LINKS ARE KEY

By far, the most common 4-link tuning technique is to change the mounting points of one or more of the suspension's links. Through the years, a myriad of 4-link mounting provisions have been added to birdcages and chassis in order to fine-tune handling. Link angle adjustments as little as 2.5° and link length changes as small as 1" can change handling noticably because the side view angle of a link, along with its length, affect numerous key elements of all birdcage suspension including drive angle, roll steer and birdcage indexing.

The multitude of link adjustment options an today's race cars enable knowledgeable chassis tuners to accurately tighten or loosen handling anywhere on the race track, and cause less-inclined chassis tuners to be confused. If you want to intelligently set up and tune a 4-link, or any other type of birdcage suspension, you must understand how links and their adjustments affect the three key elements of birdcage suspensions previously mentioned.

DRIVE ANGLE

Every rear suspension has a left and right drive angle. These are the angles at which axle thrust pushes the chassis ahead during acceleration. Drive angles are described for birdcage suspensions as the side view angle of the line connecting the center of the axle to the imaginery intersection or "instant center" of the trailing arms for each side of the suspension (See Illustration 1A)

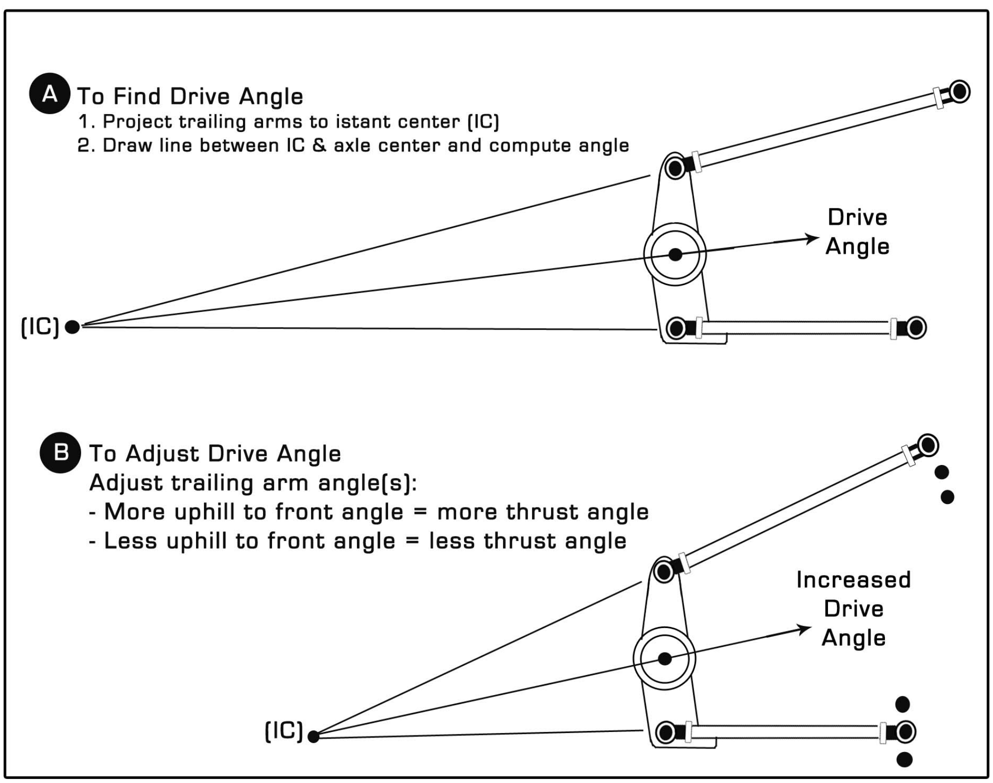
Drive angles have a big affect on forward bite. When a drive angle runs uphill to the front some of the forward thrust of the rear axle is used to separate the chassis from the axle. The chassis lifts as a result and, at the same time, the associated tire is forced towards the race track. The process is referred to as "anti-squat". We use anti-squat to enhance the forward bite or "drive" of the left and/or right rear tires. If we increase the uphill to the front inclination of a drive angle, we'll increase chassis and axle separation, and to a point, the forward bite of the associated tire. If the drive angle is inclined downhill towards the front, the axle and chassis will be forced together during acceleration, which tends to reduce forward bite. This process is referred to as "squat".

DRIVE ANGLE ADJUSTMENTS

The drive angle adjustment rule is very simple; if you increase the angle of any of your rear suspension's four links to be more uphill towards the front, you will increase the associated tire's drive angle. In other words, raise the chassis mount or lower the birdcage mount to increase drive angle and subsequently, forward bite. (See Illustration AB). Opposite adjustments reduce drive angle and diminish forward bite. Link adjustments made on a birdcage have a slightly greater effect on drive angles than similar link adjustments made on a chassis because link/birdcage-adjustments relocate the instant centers slightly different than do link/chassis adjustments.

Basic chassis tuning tells us that we'll tighten handling off the corners and down the straights if we increase left rear and/or decrease right rear forward traction. Whereas we'll loosen handling off the corners and down the straights if we decrease left rear and/or increase right rear forward traction. Drive angle adjustments are an effective means to change the balance of forward traction between the rear tires and are commonly made to tighten or loosen corner exit handling.

Keep in mind that too much drive angle causes violent axle/chassis separation that can cause tire chatter. The problem shows up as a loss of forward bite after the race car initially launches off the



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corner. Link angles that resemble a flag pole may be good for mounting a flag, but are not good for handling.

So which links should you adjust to fix a handling problem? The answer comes from understanding the workings of a 4-link suspension, knowing the inter-related effects of its link adjustments and experience. When you are considering an adjustment to any of your links, you must remember that link angle and length adjustments influence not only dynamic drive angles, but also roll steer and birdcage indexing, all of which influence handling. You must look beyond the primary intention of any link adjustment you are considering for complimentary and/or counteracting secondary effects, otherwise your planned link adjustment may not totally fix your handling problem, and/or may create another. This holds particularly true for 4-link and other birdcage suspensions, because a single link adjustment affects so much. For example, if you raise the left bottom link on your chassis, you will increase the drive angle of the left rear, which in itself would tend to tighten on-throttle handling. But this adjustment also adds loose roll steer and reduces indexing, which not only counteracts the on-throttle handling as well. The information and guides in this article will help you to decide what link to adjust when and where.

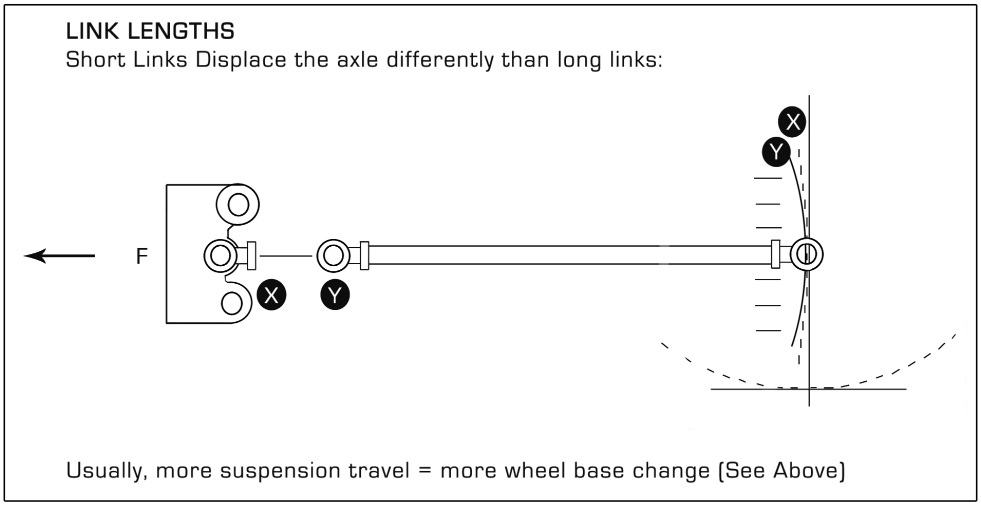


Illustration #2

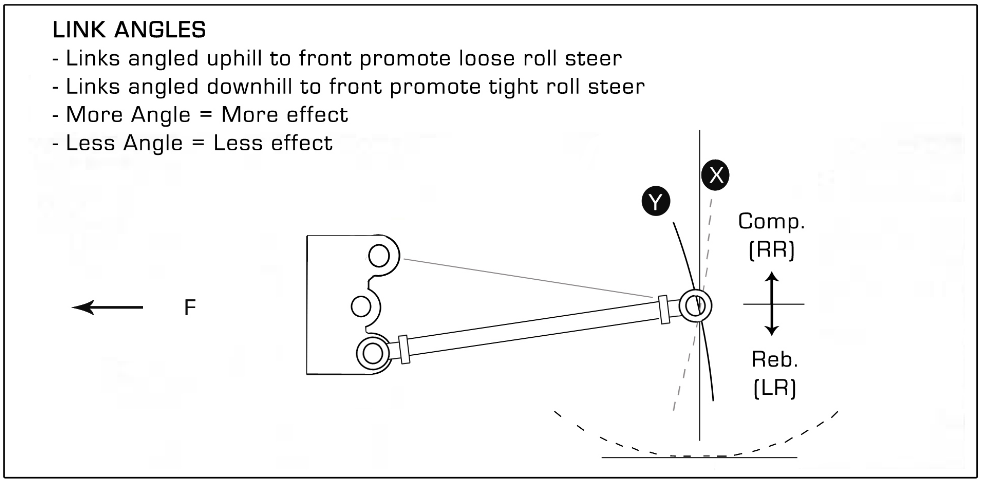


Illustration #3

ROLL STEER

It's difficult to turn a race car where rear traction exceeds front traction, which is common with 4-link equipped race cars. Fortunately, 4-link suspensions help the chassis to turn by steering the rear axle towards the outside of the race track when the chassis rolls (loose roll steer). Most 4-link equipped race cars depend heavily on loose roll steer to help turn the corners. Like stagger, the amount of roll steer that you set-up generates is critical to handling.

Roll steer occurs when the link layout of the rear suspension causes the rear axle to steer during chassi roll. The type and amount of roll steer is mostly determined by the lengths and angles of the suspension links and amount of chassis roll.

LINK LENGTH

Most chassis builders provide various chassis link mounts or mount adapters to enable races to chang the length of their suspension links without disturbing static rear axle alignment. In illustration #2 the area of the links during suspension travel show how both the short and long link contribute to tight roll steer on right side suspensions, and loose roll steer on left side suspensions. In either case, the short link steers more than the long link. But, a bigger influence on roll steer comes from link angle.

LINK ANGLE

The rule is simple, when it comes to the influence of link angle on roll steer. A link angled uphill to the front generates loose roll steer, whereas a link angled downhill to the front generates tight roll steer (more angle = more steer).

Illustration #3 shows how a link angled uphill to the front (see X in illustration #3) steers th axle loose by moving the axle ahead on the left side and back on the right side during roll. The illustration also shows how a link angled downhill to the front (see Y in illustration #3) steers the axle tight by moving the axle back on the left side and ahead on the right side during roll. Link angle adjustments made on the birdcage have a slightly greater influence on roll steer than similar adjustments made on the chassis.

We can combine the roll steer/link angle rule with the previous drive angle/link angle rule to " A link angled uphill to the front generates loose roll steer and positive angle drive, whereas a link angled downhill to the front generates tight roll steer and negative drive angle.

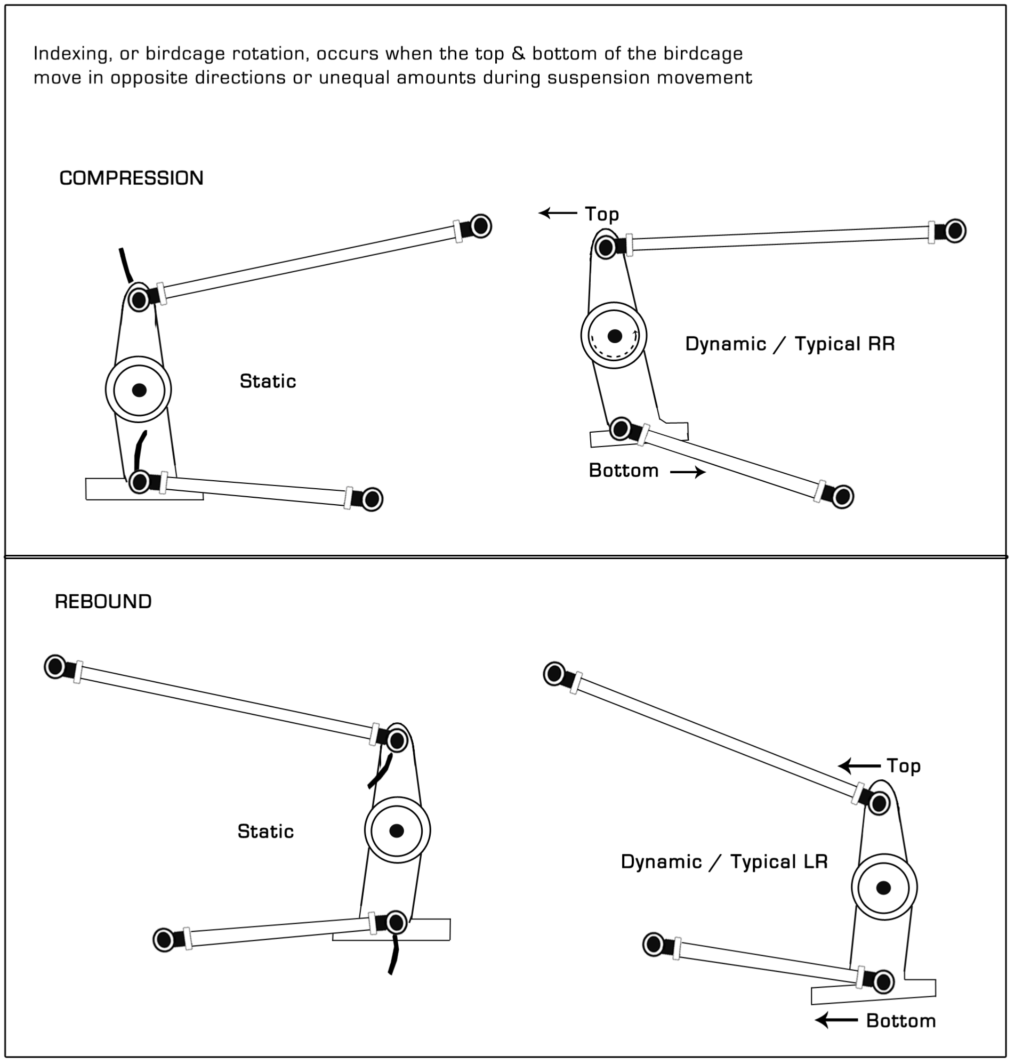
CHASSIS ROLL

Race cars equipped with 4-link suspensions steer loose during roll, and the steer increases as the chassis rolls (see illustration #2). Keep in mind that any chassis adjustments or changes in track conditions that affect how much your chassis rolls, will also affect the ability of your race car to turn. If necessary, you can change the static alignment of your rear axle (to the front tires) to compensate for changes in roll steer. Wheelbase changes as little as a 1/4" on either side of the rear axle can cause a noticeable handling change. You should adjust top and bottom link lengths proportionately, not equally as is the common practice, to maintain wheel weights an static birdcage orientation on the axle when making wheelbase changes.

BIRDCAGE INDEXING

Whenever a 4-link suspension moves, its birdcages rotate because because the attached top and bottom suspension links move in different arcs (See Illustration #4). The birdcages must be completely free to rotate or "index" around the axle tube, otherwise the suspension will bind and your driver won't be happy. Indexing affects the "motion ratio" or leverage that a birdcage mounted spring has to resist suspension travel. Birdcage indexing has a big influence on dynamic ride heights, wheel loads and consequently, handling. For example, during chassis roll a 4-link's right side birdcage indexes and causes its spring mount to rotate into the suspension spring at the same time the upper spring mount on the chassis is moving downward to compress the spring (See Illustration #5). The extra help that indexing provides to load the spring from the bottom alleviates some of the need for the chassis to roll and load the spring from the top. If indexing is increased, the suspension becomes stiffer and chassis roll decreases with this arrangement. You can feel the effect of the right rear birdcage indexing into the spring by pushing down on the right side of the rear bumper on a 4-link equipped race car. You won't push very far. The effects are reversed and the suspension is softened when the spring is mounted behind the axle, as is the case with 4-link left rear suspensions.

Basic chassis fundamentals dictate that lateral weight transfer increases between the rear tires when the right rear suspension is stiffened. Common sense tells us that an increase in rear lateral weight transfer will reduce the left rear tire's ability to stop and accelerate the race car and increase the right rear tire's ability to do the same. When we move stopping power to the right, race cars tend to turn right or tighten during deceleration, just the opposite of what happens when you shut off the right front brake. The right rear indexing effect, provided by 4-link suspensions, promotes lateral weight transfer across the rear tires and tends to tighten deceleration handling, a common trait amongst 4-link race cars!



The math is simple for the effect of right rear indexing on deceleration handling:

- Increased indexing tightens deceleration handling
- Decreased indexing loosens deceleration handling

Now you might be thinking that right rear birdcage indexing tends to loosen corner exit handling, since the high amount of lateral weight transfer generated by the indexing effect reduces dynamic wedge, and your thinking would be correct. But, corner exit looseness is not the norm for 4-link equipped race cars, which is easy to understand when you look at the effects of birdcage indexing on the left side of the axle.

One of the biggest improvements to 4-link suspensions came when GRT chassis building Joe Garrison and driver Skip Arp moved the left rear spring from ahead of - to beind the axle. This small adjustment revolutionized the 4-link. When your race car enters the corner and slows, weight transfer causes the left rear spring to unload and the chassis to hike up. At the same time, the left rear birdcage rotates and will index into a spring mounted behind the axle. This process tries to reload the unloading spring (See illustration 6). The laws of physics dictate that the left rear must unload in this situation, so the chassis hikes up further to offset the reloading effect caused by indexing.

The increase in hike-up increases weight transfer, left rear drive angle, panhard bar rake (if the panhard is attached to the left of the chassis), and roll steer. The first three items tend to tighten handling, and the last helps the race car to turn. Sounds like what every driver dreams about, a race car with a bunch of traction that turns! It's important to set up your race carto have the correct amount of indexing.

The math is simple for the effect of left rear birdcage indexing on chassis hike-up:

- Increased indexing adds hike-up
- Decreased indexing reduces hike-up

INDEXING ADJUSTMENTS

Indexing amounts are affected by the same factors that affect roll steer: link lengths, link angles, and the amount of chassis roll.

Link Length - Illustration #7 shows how the length of the trailing arms affect indexing. Length adjustments change how far the top and bottom of a birdcage move forward or rearward during suspension travel. As is the case with roll steer, it takes at least a 1" link length change to effectively change indexing

Link Angle - Illustration #8 shows how link angle adjustments affect indexing. Angle adjustments change how far the top and bottom of the birdcage moves foward or rearward during suspension movement. Keep in mind that link angle adjustments made on the birdcage have a slightly greater affect on indexing than similar adjustments made on the chassis.

Chassis Roll - It's safe to assume that indexing increases with chassis roll, given today's versions of the 4-link suspension. Keep in mind that chassis adjustments and changes in track conditions that affect chassis roll will also affect indexing amounts. For example, when the track slows, chassis roll decreases and indexing is reduced. The reduction in indexing decreases hike-up and tends to reduce traction and loosen overall handling. We have to make appropriate chassis adjustments to compensate for these changes. If track conditions never changed, racing on dirt would be a lot easier for most.

WHICK LINK(S) BEST FIX HANDLING PROBLEMS?

The first step neccesary to effectively fix any handling problem is to correctly identify the problem. You can use the information below, the Link Adjustment Guide, and your skills to determine what link adjustment(s) best address your handling problem. Choose link adjustments that produce the most complimentary effects on drive angle(s), roll steer, and indexing. Keep good notes on the effectiveness of your adjustments.

Drive Angles

- Right Rear (Increase) - Loosens acceleration
- Right Rear (Decrease) - Tightens acceleration

- Left Rear (Increase) - Tightens acceleration
- Left Rear (Decrease) - Loosens acceleration

Birdcage Indexing

- Right Rear (Increase) - Tightens deceleration & Loosens acceleration
- Right Rear (Decrease) - Loosens deceleration & Tightens acceleration

- Left Rear (Increase) - Tightens acceleration
- Left Rear (Decrease) - Loosens acceleration

Roll Steer

- Loose (Increase) - Loosens overall handling
  (decrease - Tightens overall handling

Indexing towards a spring in compression stiffens the suspension

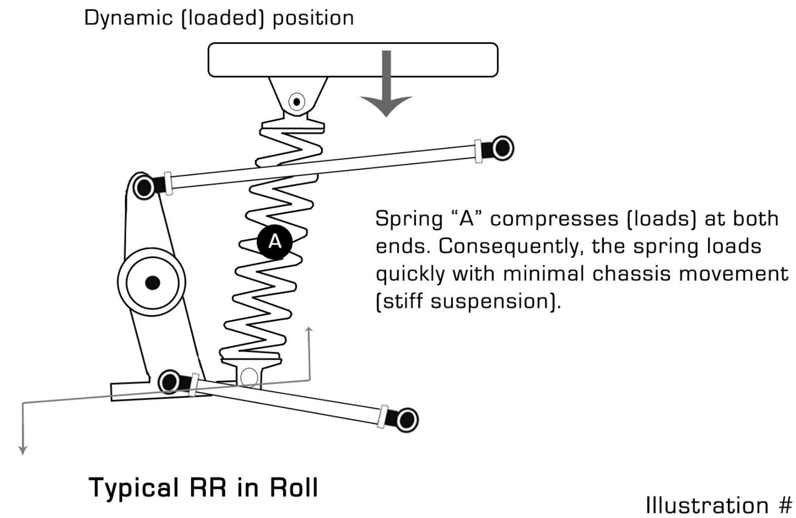


Illustration #5

Indexing towards a spring in rebound increases chassis hike

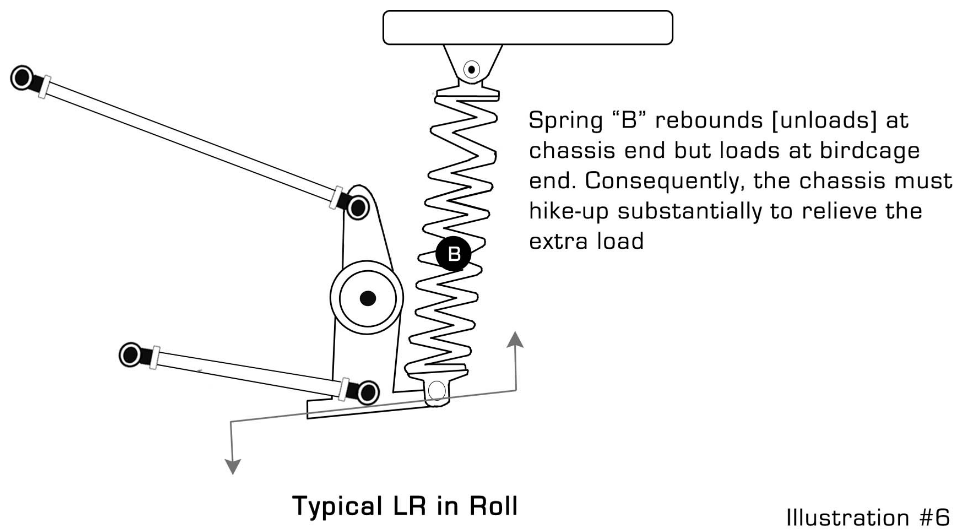


Illustration #6

BASIC TUNING TIPS

1.) Adjust upper links to change on-throttle handling. For example, to tighten corner exit handling, it’s more effective to raise the left upper link on the chassis than the left bottom link. The upper link adjustment increases indexing that adds hike-up and additional drive angle, whereas a similar lower link adjustment decreases indexing and reduces hike-up.

2.) Link adjustments often require associated adjustments to compensate for unwanted side effects. For example, a shortened left upper link adds indexing and hike-up. and gains drive angle quicker than a longer link. This adjustment effectively increases left rear traction off the corner. This adjustment also adds loose roll steer, which tends to loosen overall handling. Shortening the right side wheelbase and/or dropping the right bottom link are two adjustments that would help to compensate for any unwanted loose roll steer effects caused by the shortened link.

3.) Adjust the right bottom link to tune corner entry deceleration handling. Adjustments to this link cause complimentary changes to roll steer and indexing during deceleration and have little to no influence on corner exit handling, as do upper link adjustments.

4.) Raise the left bottom link on the chassis to loosen handling in the middle of the corner during the deceleration-acceleration transition. The adjustment adds loose roll steer, especially when the driver first picks up the throttle. You may have to use a link bent to eliminate any interference with the axle whenever the axle moves forwards during roll steer. Make opposite changes to tighten transition handling.

5.) To substantially loosen overall handling, raise the right upper link five degrees on the chassis and the right bottom link 10 degrees on the chassis. The adjustments increase loose roll steer and right side drive angle and decrease indexing. Move the links downward by the same amounts to substantially tighten overall handling.

6.) To moderately loosen overall handling, drop the left upper link and raise the right lower link five degrees each on the chassis.

7.) To moderately tighten overall handling, raise the left upper link and drop the right lower link five degrees each on the chassis.

THE REST OF THE STORY

There’s more that makes a 4-link suspension tick than 4-links, but we’re out of time and spacer for now. We’ve got plenty more to talk about in Part Two to help you understand and adjust you 4-link, so stay tuned.

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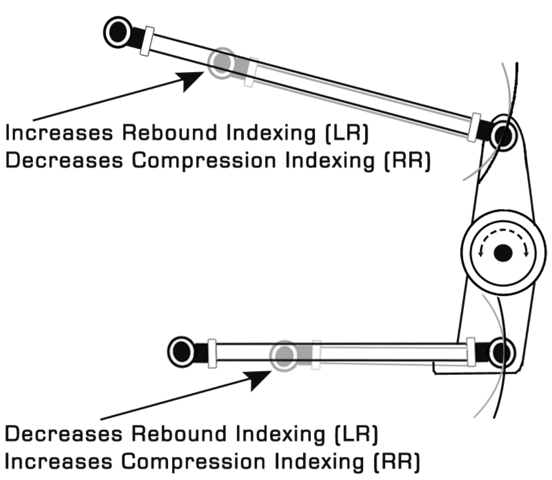
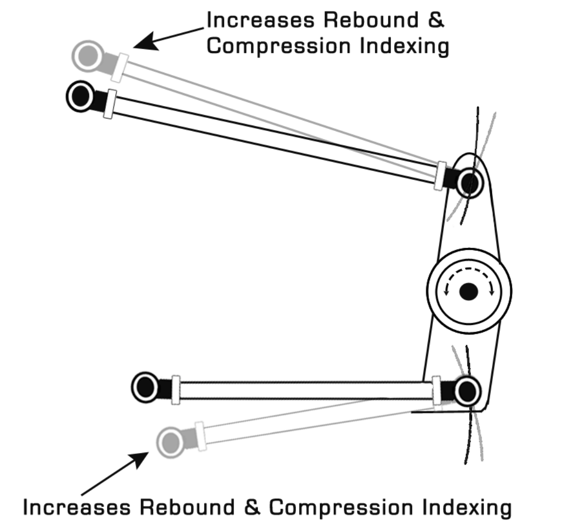
Link Lengths



NOTE: Longer links produce effects opposite to those listed

Illustration #7

Link Angles



NOTE: Above adjustments increase indexing. Adjustments that position chassis links closer together or birdcage links further apart, decrease indexing.

Illustration #8

NOTE: Results below refer to dynamic changes

Left Rear				Right Rear		
LINK LENGTHS						
Steer	Drive Angle	Indexing	Link Adjustment:	Indexing	Drive Angle	Steer
(Looser)	↑	↓	Shorten Bottom	★ ↑	↓	(Tighter)
(Tighter)	↓	↑	Lengthen Bottom	★ ↓	↑	(Looser)
(Looser)	↑	↑ ★	Shorten Top	↓	↓	(Tighter)
(Tighter)	↓	↓	Lengthen Top	↑	↑	(Looser)
LINK ANGLES - Adjust at chassis						
Steer	Drive Angle	Indexing	Adjustment / Chassis:	Indexing	Drive Angle	Steer
(Looser)	↑	↓ ★	Raise Bottom Link	★ ↓	↑	(Looser)
(Tighter)	↓	↑ ★	Lower Bottom Link	★ ↑	↓	(Tighter)
(Looser)	↑	↑ ★	Raise Top Link	★ ↑	↑	(Looser)
(Tighter)	↓	↓ ★	Lower Top Link	★ ↓	↓	(Tighter)
LINK ANGLES - Adjust at birdcage						
Steer	Drive Angle	Indexing	Adjustment / Birdcage	Indexing	Drive Angle	Steer
(Tighter)	↓	↑	Raise Bottom Link	★ ↑	↓	(Tighter)
(Looser)	↑	↓ ★	Lower Bottom Link	↓	↑	(Looser)
(Tighter)	↓	↓ ★	Raise Top Link	↓	↓	(Tighter)
(Looser)	↑	↑ ★	Lower Top Link	★ ↑	↑	(Looser)

★ Popular Adjustments

SETTING-UP AND TUNING 4-LINK SUSPENSIONS

Beyond Link Adjustments . . . Part Two

Part One of this series on 4-link suspensions centered on the most commonly adjusted components of this suspension - the links. In Part One we pointed out that handling is very sensitive to link angle and length adjustments, because roll steer, drive angle and birdcage indexing, all of which influence handling, are affected by these adjustments. The article included some basic facts that chassis tuners must understand about today's 4-link suspensions, including the following:

- Links angled uphill to the front promote chassis hike-up during acceleration, increase forward bite and generate loose roll steer.
- Links angled downhill to the front promote chassis squat during acceleration, reduce forward bite and generate tight roll steer.
- Adjustments that move the links further apart on the chassis or closer together on the birdcage, increase birdcage indexing.
- Adjustments that move the links closer together on the chassis or further apart on the birdcage, decrease indexing.
- The indexing of the left birdcage into the spring during cornering increases chassis hike, which increases left rear drive angle and subsequently forward bite, loose roll steer and side bite, especially when the panhard bar is attached to the left side of the frame (and near the pinion on the axle). The effects tend to tighten overall handling.
- The indexing of the right rear birdcage into the spring during cornering stiffens the right rear suspension and enhances weight transfer to the right rear tire, which tends to tighten deceleration handling and loose acceleration handling.

When the 4-link suspension first appeared, tuning was pretty much limited to link angle adjustments. But, after years of 4-link refinements, smart racers have learned that there's more performance to be had from a 4-link suspension than what link angle adjustments provide. It's time to move beyond link adjustments and check out some of the other ways we can improve the performance of 4-link suspensions.

SPRINGS

We all know that springs have a big influence on handling. Spring rates help determine the distribution of dynamic weight transfer, and subsequently, affect dynamic wedge (the difference in weight between the rear tires at various points on the race track). Basically, weight transfer is distributed to and from pairs of tires. For example, weight moves from the pair of left side tires to the pair of right side tires during cornering (lateral weight transfer). The transfer of weight supported by the springs (sprung weight) is distributed to the right front and right rear tires in proportion to the stiffness of their suspensions, with the stiffer suspension receiving proportionately more weight than the softer suspension. It's a common misconception that you can increase weight transfer to a tire by softening its associated spring. If this were the case, you could load a tire to the ultimate amount by removing the spring altogether.

This basic weight transfer principle has been used to tune handling ever since Fred Flinstone drove a race car. It seems perfectly logical that corner exit handling would tighten if we stiffen a left rear spring. The stiffened spring causes extra weight to transfer off the front and to the left rear tire and less to the right rear tire during acceleration. The subsequent gain in dynamic wedge helps the left rear tire to accelerate our race car off the corner, and decreases the right rear tire's ability to do the same. As a logical result, corner exit handling tightens. However, 4-link suspensions dont appear to behave logicallly when it comes to left rear spring changes. For example, we can tighten corner exit handling on 4-link equipped race cars by softening the left rear spring!

Softening the Left Rear Spring

A softer left rear spring rebounds or extends further than a stiffer spring when weight transfers off the left rear tire during cornering and deceleration (See Illustration #1). Consequently, a softened left rear spring enhances chassis hike-up, which quickens th development of, and can increase, left rear drive angle. The effect tightens corner exit handling on race cars equipped with suspensions like the 4-link that hike up the left rear when the throttle is applied.

If you think about it, 4-link suspensions do follow the weight transfer distribution rule. A softer left rear spring allows the chassis to fet off the spring and onto its suspension links quicker than a stiffer spring at corner exit. The left rear suspsnsion attracts a lot of weight transfer when the much stiffer rear suspension links, and not the much softer spring, support the chassis. What I'm saying is that we can cause the left rear suspension to stiffen during acceleration by softening the left rear spring. Doing so helps put the chassis up on its links on 4-link and other suspensions that hike up because of drive angle.

Keep in mind that when race tracks slow and corner speeds drop, less weight transfers dynamically, and chassis hike-up is reduced. The reduction in hike-up reduces the drive angle of the left rear suspension, the race of the panhard bar, and has a negative effect on weight transfer. These changes tend to reduce traction and loosen overall handling.

You can restore chassis hike-up and handling, to a degree, by softening the left rear spring. Just be careful that there's enough compression travel left in the spring (when loaded) to keep its coils from binding during normal suspension travel. You can switch to a longer spring if additional travel is necessary. This is usually the case when using 13" long springs rated below approximately 175#/inch (or stiffer for springs less than 13" in free height) on most dirt modifieds.

If you soften your left rear sping, you'll likely have to re-adjust your weight jack or slider adjuster nut to restore your left rear ride height and wheel weight. If the spring is so soft that you have to crank the jack bolt or slider adjuster nut to a point that causes the distance between the spring retainers to be less than the free height of the spring when the left rear suspension is completely extended, the spring will become "preloaded". That is, the spring will not be free from its retainers at full suspension rebound travel.

A common misconception is that the length of the spring affects whether or not a spring remains loaded at full suspension extension. If you switched to a longer (but not softer) spring, you'd have to back-off your slider adjuster nut to restore ride height and wedge so nothing would change as far as preload on the spring. It's primarily spring rate, static load and the amount of suspension rebound travel that determine whether or not the spring remains loaded during hike-up.

A preloaded spring assembly (at full extension), eliminates the possibility of chassis from coming completely off the spring during hike-up, as is common on

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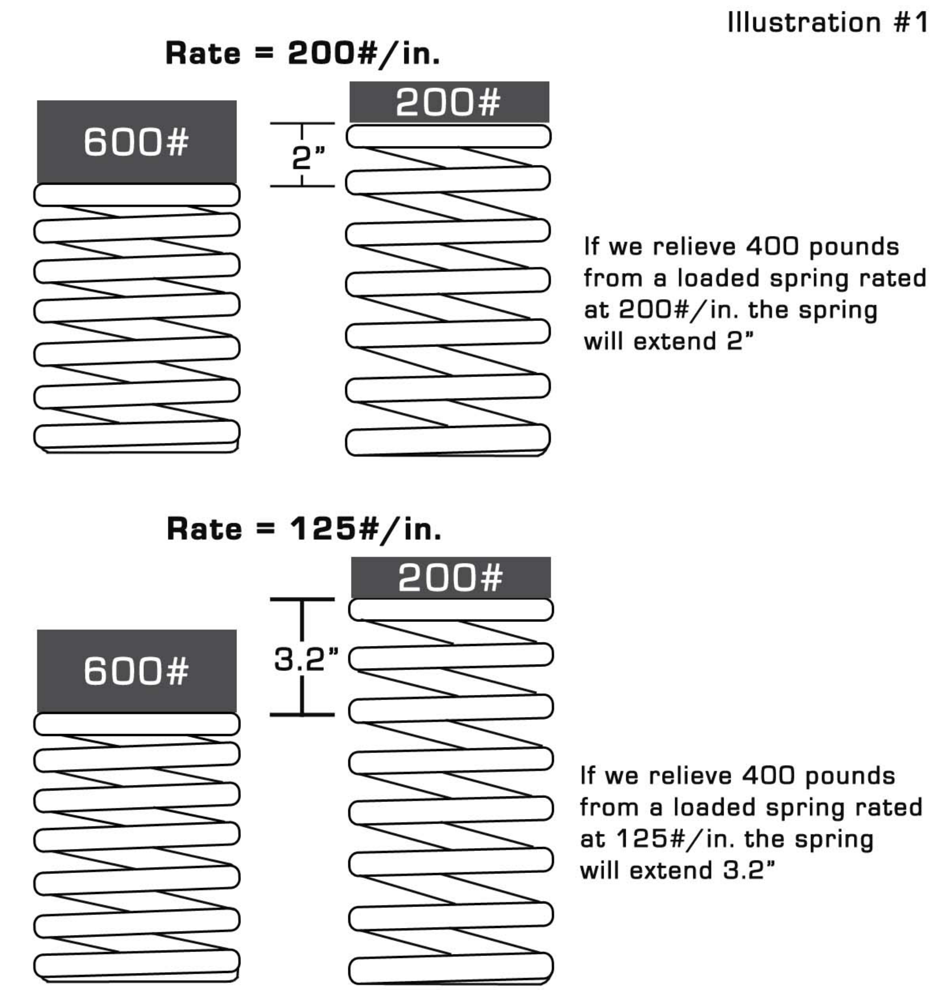


The softer the left rear spring, the more the chassis will hike up anytime eight transfers off the left rear.

many of today's race cars. A preloaded left rear spring can soften some of the chassis drop when the driver lifts the throttle, and can help forward bite on patchy traction race tracks. Keep in mind that it's the links that are holding up the race car during acceleration when axle thrust enables drive angle to lift the chassis off the spring. If there's any interruption to axle thrust, like hitting a slick spot on the race track or if the driver has to lift the throttle, when the chassis is off the spring, the chassis will have to settle back onto the spring before its weight can reload the associated tire (see illustration #2). The reloading process is quickened and handling is more consistent when we keep the chassis on its springs.

Stiffening the Left Rear Spring

It should be obvious that you can stiffen the left rear spring on your 4-link equipped race car to free corner exit handling. The stiffened left rear spring reduces hike-up during cornering, which reduces the development of left rear drive angle and, subsequently, can free acceleration handling.

Keep in mind that the stiffer the left rear spring, the less hike-up it takes to get the chassis off the spring. You can keep the chassis on the spring by adjusting the rebound travel limits of your left rear suspension, but beware, you may have to make other adjustments to compensate for the subsequent loss of loose roll steer and drive angle.

Recommendations - Left Rear Spring Rate

We have often pointed out how chassis hike-up and drop affect a multitude of handling factors, including some that counteract others. Consequently, the potential handling effects of changing a left rear spring on a 4-link suspension can be mind boggling and have been known to lead to hair loss, so let's simplify things. The key is to pay attention and note how your race car reacts to chassis adjustments, especially those adjustments that produce multiple and/or counteracting handling effects - it's that simple! Sometimes a second chassis adjustment is needed to counteract any negative side-effects of the first adjustment.

My simple recommendations for 4-link left rear spring changes are:

- Soften the spring when your chassis won't hike up and go forward
- Stiffen the spring when your chassis hikes up so much that handling is erratic and/or you can't relieve a throttle push.

Softening the Right Rear Spring

There's nothing unusual about changing the right rear spring rate of a 4-link suspension. Softening the spring reduces weight transfer from the left rear to the right rear during cornering. The subsequent increase in dynamic wedge tends to loosen corner entry deceleration handling and tighten handling off the corner. Additionally, a softened right rear spring attracts less front-to-rear weight transfer and causes additional weight to transfer to the left rear when the race car accelerates. It's not suprising that right rear spring changes have a profound influence on corner exit handling!

Stiffening the Right Rear Spring

A stiffened right rear spring tends to reduce dynamic wedge when weight transfers, especially when the driver applies the throttle. Consequently, you can expect to tighten cover entry deceleration handling and, to a greater degree, free acceleration handling off the corner when you stiffen your right rear spring.

Recommendations - Right Rear Spring Rate

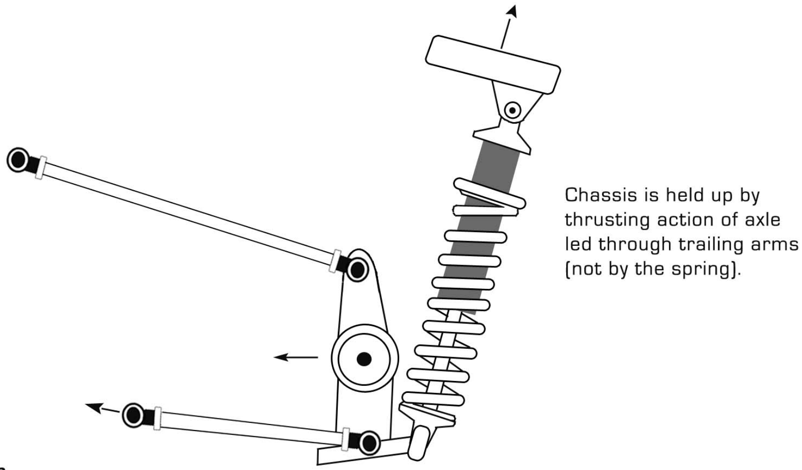
- Soften the spring to free corner entry deceleration handling, unless your race car is too tight when the throttle is applied.
- Stiffen the spring to tighten corner entry deceleration handling, unless your race car is loose when the throttle is applied.
- Soften the spring to tighten handling when the throttle is applied, unless your race car is loose during corner entry deceleration
- Stiffen the spring to free handling when the throttle is applied, unless your race car is tight during corner entry deceleration.

NOTE: Right rear spring changes have opposite effects on deceleration handling into the corner and acceleration handling off the corner as shown above. Be prepared to make additional chassis adjustment to correct any undesirable side effects brought on when changing right rear spring rates.

SHOCKS

It's no secret that shocks are critical to handling, no matter what the suspension type. The dampening characteristics of your shocks must suit your suspension type if handling is to be maximized. The workings of a 4-link suspension are somewhat unique and, consequently, require somewhat unique shocks.

Problem:
When the chassis is off the spring as shown, any interruption to the thrusting action of the axle (slick spots, bumps, driver backs off throtle, etc) diminishes traction until the chassis drops & loads the spring or until the chassis begins to lift off the spring again.

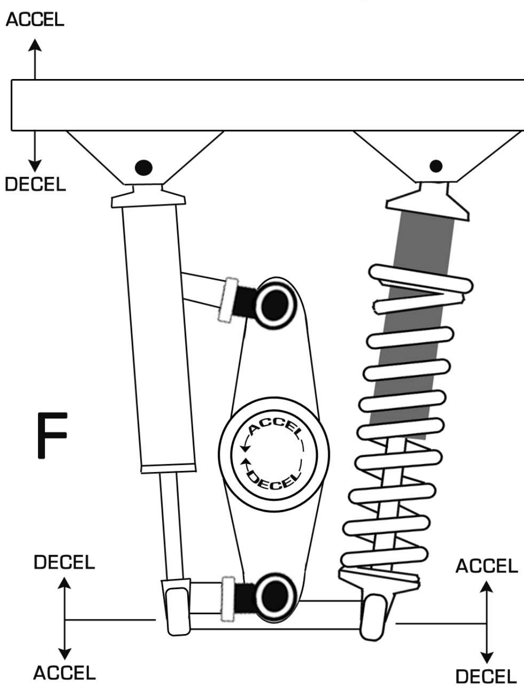


Solution
Keep LR srping loaded when the LR suspension is in the full rebound position by:
- Limiting hike-up
- Spftening LR spring rate until the amount of preload necessary to set wedge keeps the spring loaded whenever the suspension is in the full rebound posistion.

NOTE:
❶ The softer spring rate enhances hike-up also.
❷ The softer spring may have to be taller to eliminate coil bind during compression travel

Illustration #2

SHOCK PLACEMENT / TUNING - BIRDCAGE
(Ahead or Behind)



A front shock travels more than a rear shock or slider when the birdcage rotates as shown (typical 4-link), Consequently:

- A shock mounted to the front of the birdcage provides more damening than when mounted to the rear.
- The front shock will usually top and bottom out before the rear shock or slider.

TIP

You can add a shock extension to or raise the birdcage shock mount of a topped out front shock to increase hike potential (LR).

Illustration #3

Left Rear Shocks - Originally, the left rear shock and spring were located ahead of the axle on 4-link suspensions. When Late Model racers moved to the left rear spring behind the axle, the shock followed, which, due to the indexing direction of the shock mount on the birdcage during suspension movement, reduced the effectiveness of the shock (See Illustration #3). The repositioning of the shock behind the axle helped the chassis to hike up (less rebound dampening) and reduced the ability of the shock to keep the chassis from crashing down when the driver lifted the gas pedal (less compression dampening). It didn't take long to figure out that we needed to mount a second shock ahead of the axle in order to provide enough compression dampening to eliminate crash landings at corner entry, but at the same time, not overly restrict hike-up. Consequently, the 4-0, 6-0 type shocks were born. In reality, Late Model races cound have used a dummy (zero resistance) shock or slider to mount the spring behind the axle and a properly valved front shock to regulate hike-up and slow chassis drop - just like Modified racers have done from the start!

Basically, we need our left rear shock/s to:

- Allow the chassis to drop at a rate that provides good handling and stability at corner entry during deceleration.
- Allow the chassis to hike up at a rate that provides good handling during cornering and acceleration.

It's very important that you understand the influence of your left rear shock/s on the attitude of your race car as it travels around the race track. When we change left rear shock dampening or gas pressure (if applicable), the race car's attitude changes, which influences dynamic roll steer, drive angle, weight transfer rates, panhard bar rake, and subsequently, handling. The handling performance of any 4-link equipped race car is highly dependent on the dampening rates and gas pressure of its left rear shock/s.

Compression Control / Gas Pressure - If we add compression dampening or gas pressure to the left rear suspension, chassis drop slows, which helps to maintain roll steer, panhard bar rake (assuming a left side frame mounting) and left rear drive angle through the corner. This adjustment can improve corner entry stability and usually tightens both decerlation and accerelation handling. Next time you're at a race track, watch how the rear of many race cars wiggle whel the driver lifts off the throttle. This instability is usually a result of rapid changes in tire loadings, panhard bar rake and roll steer caused by insufficient left rear suspension compression resistance that allows the chassis to drop too quickly. A driver who treats the gas and brake pedals like they were on/off switches magnifies the probelm as can too much hike-up.

LR SHOCK TUNING GUIDE

- Critical to handling at corner entry and exit
- Affects hike-down rates and amounts at entry and hike-up rates and amounts at exit.
- Helps determine dynamic CG heights, LR drive angles, panhard rake (For LS frame mounted panhard bar(s) and roll steer at corner entry & exit.

SLICK TRACKS	MEDIUM TRACKS	HEAVY TRACKS
Ahead: 7-2 to 9-2 non-gas or 6-3 gas with 100psi to 200psi	Ahead: 6-3, 7-2 non-gas or 6-3 gas with minimal psi	Ahead: 4. 4-5, 4-6, 6-3 non-gas

NOTE: Add as much rebound as needed to stop throttle push

Illustration #4

Be careful to avoid excessive left rear compression dampening or gas pressure, which can cause the left rear tire to bounce and lose traction on rough race tracks. Other problems may include: corner looseness, if too much loose roll steer is maintained into the corner, or entry tightness, if too much panhard bar rake is maintained. A type of four wheel drift results at entry when too much loose roll steer and a lot of panhard bar rake are maintained into the corner. The driver has to counter steer to offset the loose steer effect of the rear axle, which causes the whole race car to head up the race track. At the same time, the large amount of panhard bar rake keeps the race car from turning properly. A similar drift problem occurs at corner exit when excessive left rear suspension compression resistance keeps the chassis hiked-up and puts too much loose roll steer and left rear drive angle into our set-up. This situation is particularly undersirable when there's only traction at the bottom of the race track.

Rebound Control - It's been a long-standing common practice for racers to use very little left rear rebound control to allow the chassis to hike up quickly and gain left rear drive angle. This technique is effective in tightening corner exit handling but is often overused, which can result in a race car that doesn't want to turn when the throttle is applied and/or isn't very good when the left rear tire has to run over bumps (the tire flutters and loses traction). If your race car hikes up quickly and proceeds to shove the front end up the race track when the throttle is applied, you may need to reduce left rear drive. You can help the situation by increasing left rear rebound control, reducing left rear gas pressure or using a non-gas left rear shock. I'm amazed at how much left rear rebound contol it takes, at times, to allow the driver to apply the throttle early in the corner and not shove the nose of the race car up the race track. Don't let the numbers scare you, just give the chassis what it's telling you it needs!

Illustation #4 will help you to determine the proper left rear shocks for various track conditions.

Right Rear Shocks - Right rear shock tuning is pretty conventional on 4-link suspensions:

- Soft compression dampening tends to tighten corner entry deceleration handling by speeding up the loading of the right rear tire at entry.
- Stiff compression dampening tends to loosen corner entry deceleration handling by slowing the loading of the right rear tire at entry
- Soft rebound dampening tends to loosen acceleration handling by allowing the right rear suspension to rebound off the corner and increase right rear drive angle
- Stiff rebound dampening tends to tighten acceleration handling by not allowing the right rear suspension to rebound off the corner and increase right rear drive
- Reduce gas pressure or use a non-gas shock to tighten corner entry deceleration handling

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QA1

Set#1 Mud, Choppy, Tacky

LF JS1-1
Muddy, To Help Car Turn

RF JS1-2
Tie-Down Mud, Tacky

LR JS1-3
LR: Mud, Tacky
RR: Dusty Slick

RR JS1-4
Mud, Tacky

Set#2 Slick Center w/Cushion Top

LF JS1-1
Muddy, To Help Car Turn

RF JS1-2
Tie-Down Mud, Tacky

LR JS2-3
Hold-Up, Cushion with Slick Center

RR JS1-4
Mud, Tacky

Set#3 Slick

LF JS3-1
Slick, Hold Side Bite

RF JS3-2
Slick, Hold Car On Nose

LR JS3-3
Hold Car on RF To keep side bite

RR JS3-4
Slick, Without Cushion

Set#4 Dusty Slick

LF JS3-1
Slick, Hold Side Bite

RF JS4-2
Dusty Slick Tighter Turn

LR JS3-3
Hold Car on RF To keep side bite

RR JS1-3
LR: Mud, Tacky
RR: Dusty Slick

Bilstein

Set#1 Mud, Choppy, Tacky

LF JS01-1
Muddy, To Help Car Turn

RF JS01-2
Tie-Down Mud, Tacky

LR JS01-3
LR: Mud, Tacky
RR: Dusty Slick

RR JS01-4
Mud, Tacky

Set#2 Slick Center w/Cushion Top

LF JS01-1
Muddy, To Help Car Turn

RF JS01-2
Tie-Down Mud, Tacky

LR JS02-3
Hold-Up, Cushion with Slick Center

RR JS01-4
Mud, Tacky

Set#3 Slick

LF JS03-1
Slick, Hold Side Bite

RF JS03-2
Slick, Hold Car On Nose

LR JS03-3
Hold Car on RF To keep side bite

RR JS03-4
Slick, Without Cushion

Set#4 Dusty Slick

LF JS03-1
Slick, Hold Side Bite

RF JS04-2
Dusty Slick Tighter Turn

LR JS03-3
Hold Car on RF To keep side bite

RR JS01-3
LR: Mud, Tacky
RR: Dusty Slick

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Jet Mod Scale & Setup Sheet

Date: Track: Car:

LF
Tire Circumference-
Shock-
Spring-
Ride Height-
Camber-
Caster-
Rim Offset-
Tire Pressure-

Toe:

F.Stagger:

RF
Tire Circumference-
Shock-
Spring-
Ride Height-
Camber-
Caster-
Rim Offset-
Tire Pressure-

LF Weight:

RF Weight:

LR Weight:

RR Weight:

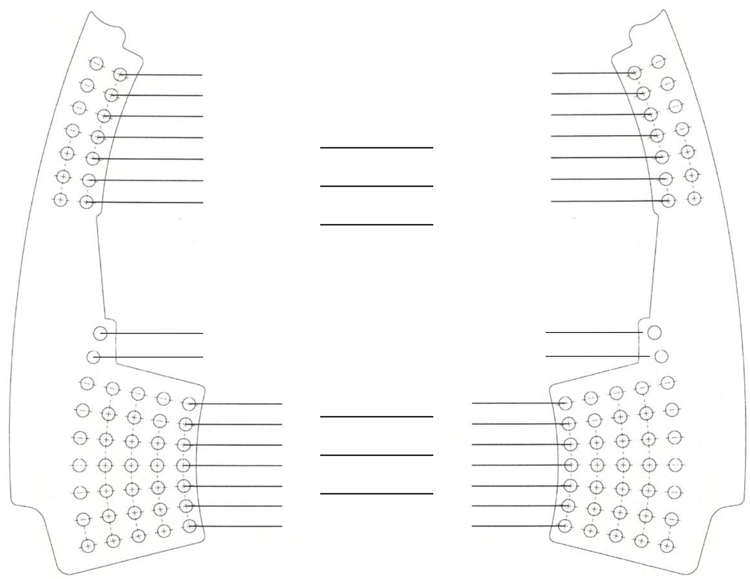
Total Weight:

Rear %:

Left %

Cross % / Left Rear Bite:

4-Bar LR 4-Bar RR



LR
Tire Circumference-
Shock-
Spring-
Ride Height-
Rim Offset-
Tire Pressure-
Birdcage Tilt-

R.Stagger:

RR
Tire Circumference-
Shock-
Spring-
Ride Height-
Rim Offset-
Tire Pressure-
Birdcage Tilt-

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Jet Mod Scale & Setup Sheet

Date: Track: Car:

LF

Tire Circumference-
Shock-
Spring-
Ride Height-
Camber-
Caster-
Rim Offset-
Tire Pressure-

Toe:

F.Stagger:

RF

Tire Circumference-
Shock-
Spring-
Ride Height-
Camber-
Caster-
Rim Offset-
Tire Pressure-

LF Weight:

RF Weight:

LR Weight:

RR Weight:

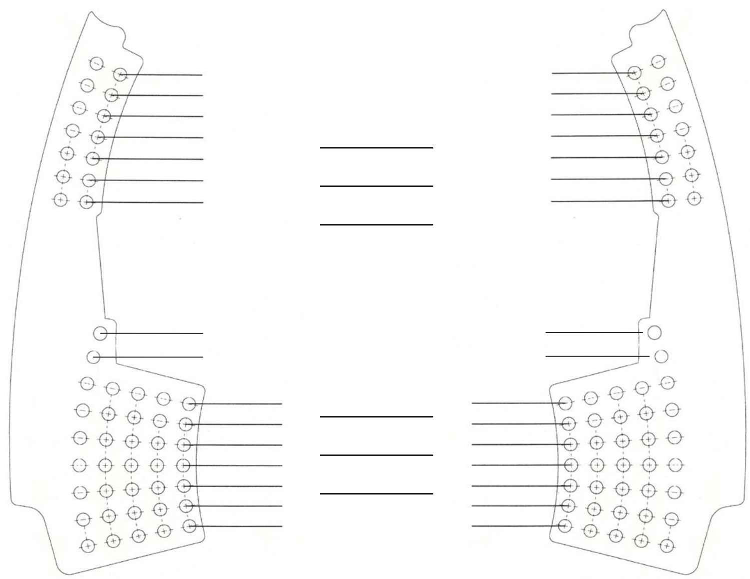
Total Weight:

Rear %:

Left %

Cross % / Left Rear Bite:

4-Bar LR 4-Bar RR



LR

Tire Circumference-
Shock-
Spring-
Ride Height-
Rim Offset-
Tire Pressure-
Birdcage Tilt-

R.Stagger:

RR

Tire Circumference-
Shock-
Spring-
Ride Height-
Rim Offset-
Tire Pressure-
Birdcage Tilt-

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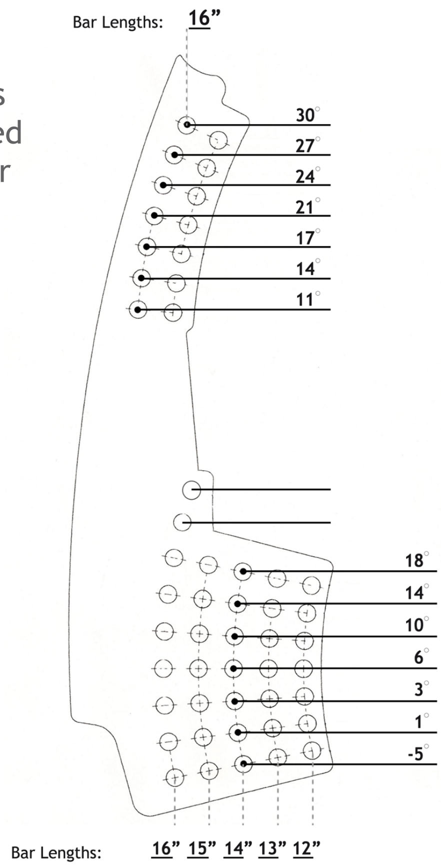
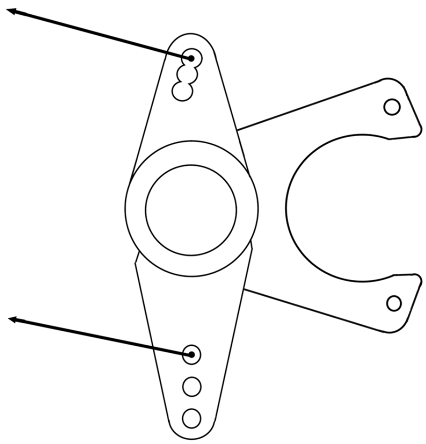
Bar Angles Cars #532 and Newer

IMCA Modified

Left

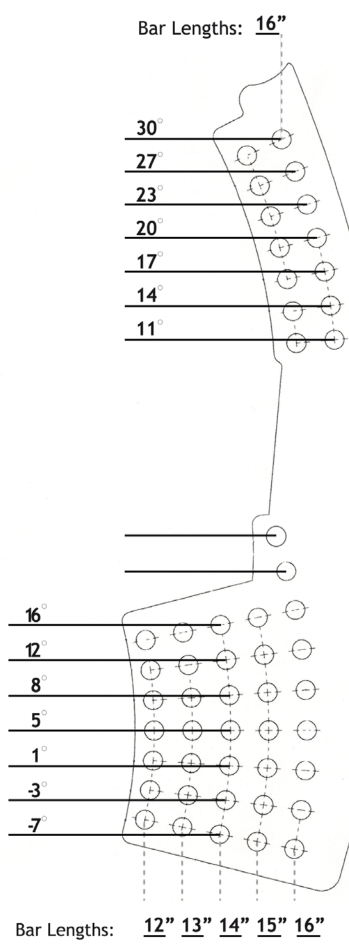
Bar lengths are measured from center of heim to center of heim.

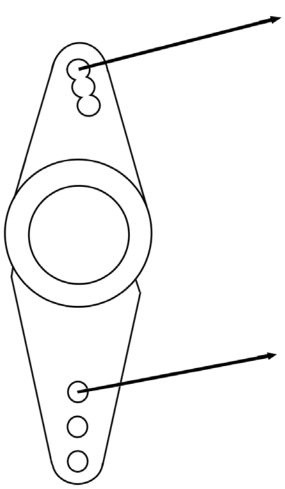




Right

Bar lengths are measured from center of heim to center of heim.





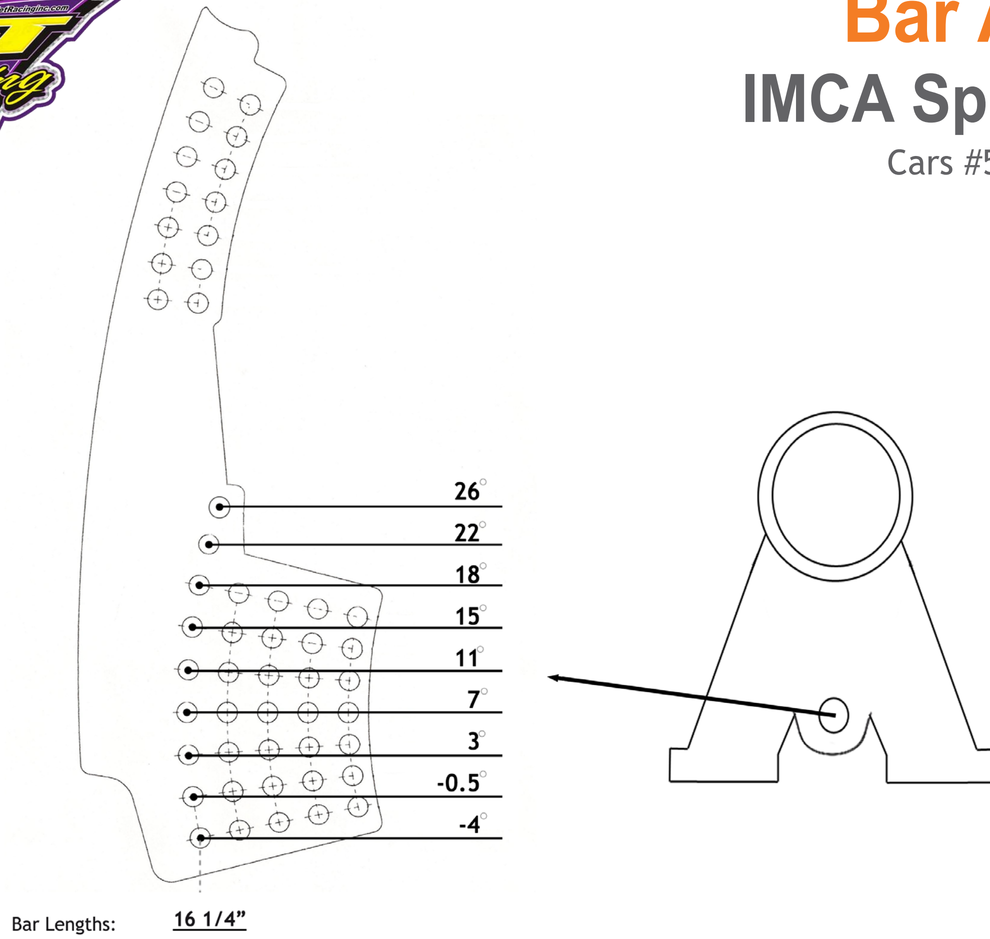
Bar Angles

IMCA Sport Mod

Cars #532 and Newer

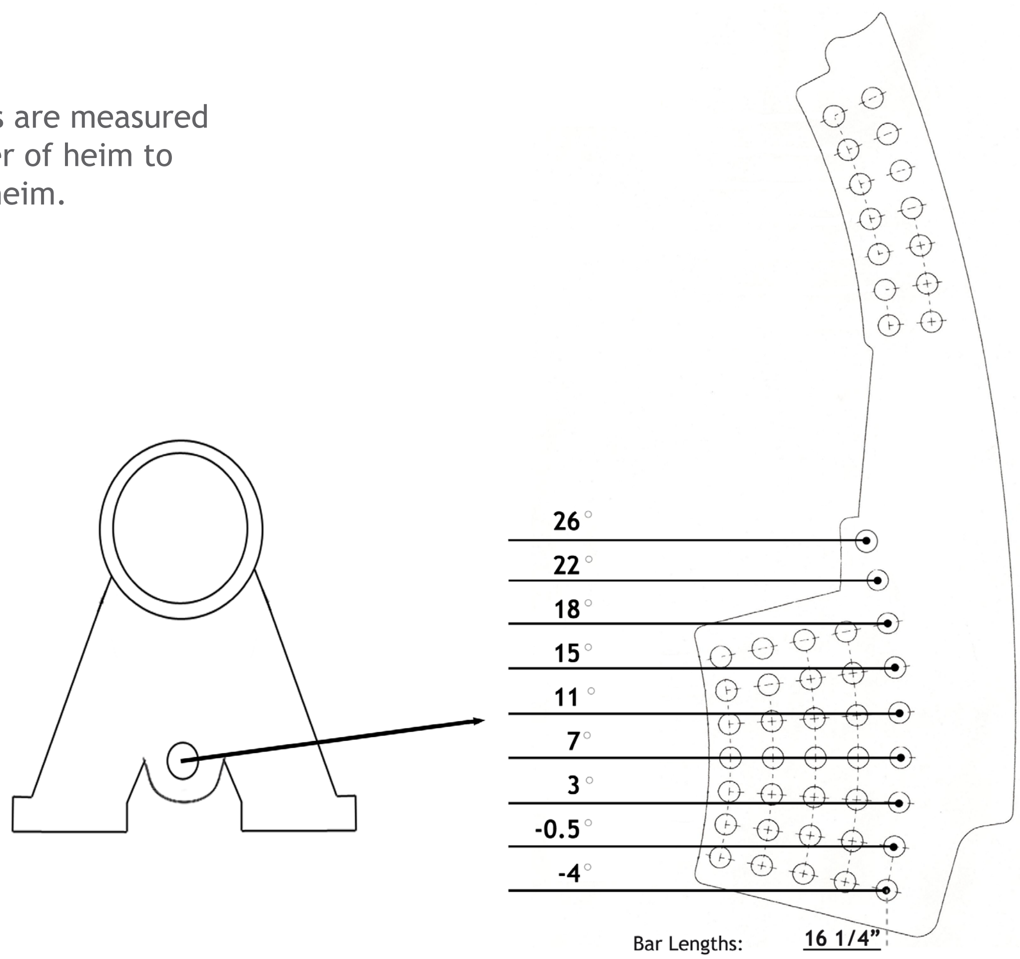
Left

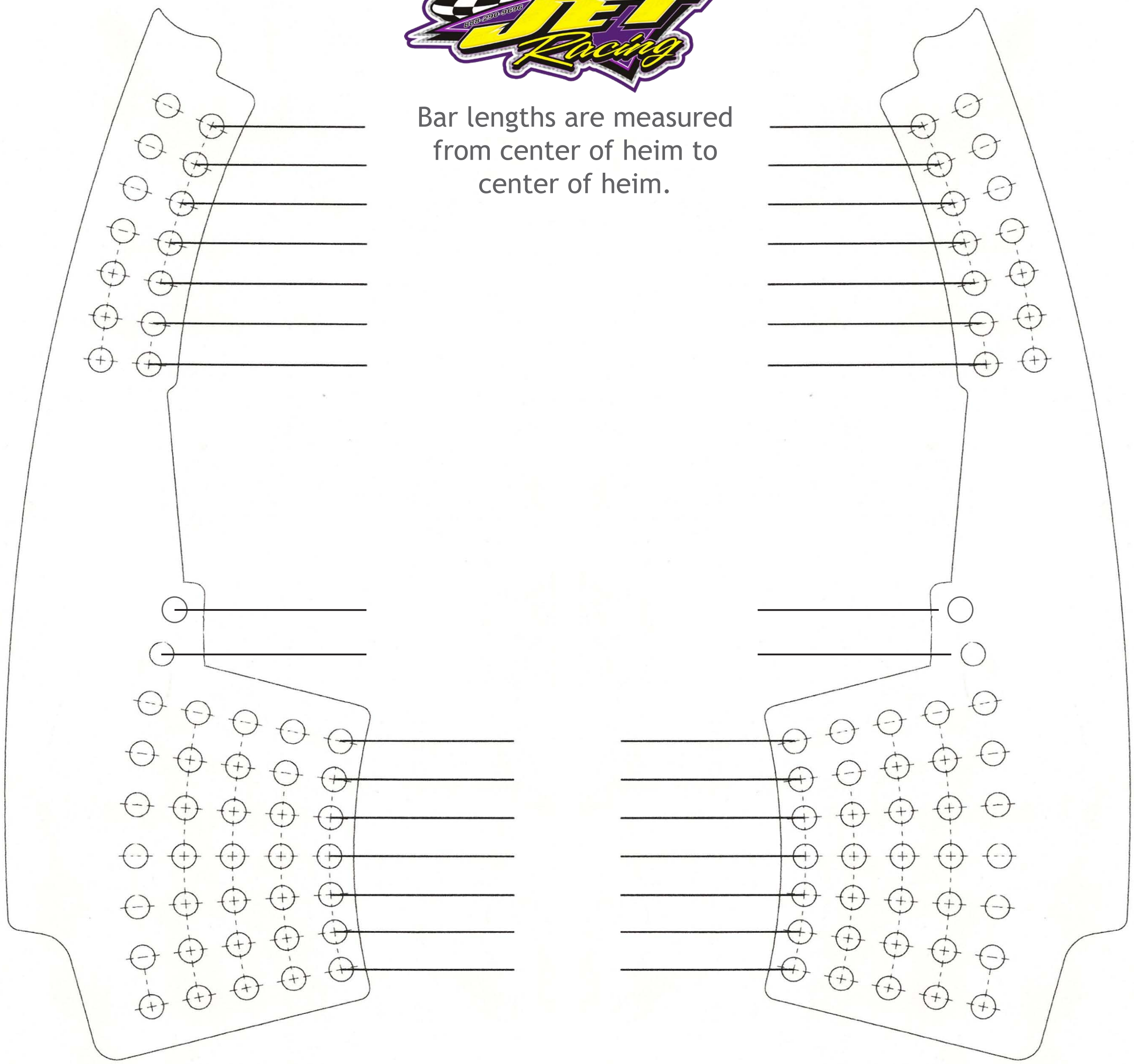
Bar lengths are measured from center of heim to center of heim.



Right

Bar lengths are measured from center of heim to center of heim.





Bar lengths are measured from center of heim to center of heim.

Notes

Notes

Notes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