2499 South Stockton St.
Lodi, CA 95240

(209) 368-5046 • (209) 368-5119 Fax

Technical Manual

167 & 206 Series Shocks

Congratulations on your new purchase of Axis Racing Shocks! Designed and manufactured from the finest materials available and using the latest in CAD/CAM technology, Axis Racing Shocks are the highest quality shock absorbers ever produced for ATVs. Taking the same quality found in most high performance road race cars and applying it to the ATV racing market, Custom Axis has introduced a high-quality line of performance products that utilize the full potential of your high performance ATV suspension.

One thing to keep in mind when you are dealing with shock absorbers is that suspension systems are 'dynamic'. Simply put, your suspension system is an interaction of forces that is constantly changing. Race tracks change, not only from track to track but during the course of the race. Rider ability levels can fluctuate as well. It can take up to six months before a person feels comfortable enough to push the limits of a new race chassis. During the process of familiarization, a rider will be pushing the limits of mind, body, and machine to go faster and harder. During that process adjustments will have to be made, be it minor setting adjustments or spring and/or valving changes to handle the increasing loads and forces of going faster. A properly tuned suspension allows the rider to spend most of his concentration on where he is going instead of reactions to undesirable chassis input.

The objective of this manual is to familiarize you, the rider, with the nature of the product you have purchased. The more you know about the equipment you are riding, the more capable you are of manipulating those components to your particulars, which in turn, enhances your focus during the race.

Please read the rest of this Owner's Manual carefully to ensure you get the full potential and service life from your investment in Custom Axis products.

Table of Contents

Basic Operations

1.0 Suspension Design

Having the right spring(s) and motion ratio is a very critical part of any suspension system. The spring(s) resist the forces of input from the ground to the chassis, the suspension's motion ratio determines how the spring(s) will operate, and the shock absorber controls the spring's reaction to those inputs. Obtaining a desired leverage curve and spring combination is the starting point of building a suspension system in relationship to the shock absorber. To understand how a shock absorber works in relationship with how a suspension system works, you need to know a little bit about motion ratios, spring rates and shock absorber damping.

1.1 Motion Ratios

The motion ratio or 'leverage ratio' is the path the shock absorber goes through its travel in relationship to wheel travel. This is determined by the type of suspension hardware arrangement and geometry that the chassis manufacturer decides to use. The most commonly used suspension hardware is either a linkage type or a direct shock type, more commonly referred to as a 'no-link'. The main difference between a linkage and no-link type system is packaging. Linkage systems in general utilize less space to operate, while no-links, by nature of design, usually require more space. Both types, however, have their assets and drawbacks. It is not the purpose of this manual to argue which is better. There are too many variables to consider. However, it is important to note that all linkage systems are not the same, all direct shock systems are not the same, and all shock absorbers are not the same.

1.2 Springs

Most of the springs you will see are straight rate or linear compression springs. Linear means that there is a constant progression of force in relationship to compression movement. For example: a linear spring with a rate of 200 lbs. means that it takes 200 lbs. of force to compress that spring one inch.

(1 inch = 200 lbs, 2 inches = 400 lbs, 3 inches = 600 lbs, etc.)

With a dual rate spring combination you have two springs stacked on top of each other and they are compressed simultaneously. Because both are moving at the same time, it takes less force or poundage to compress both springs one inch. For example: when you compress two linear 200 lb. springs stacked on top of each other for one inch, both springs are going to yield a linear rate of 100 lbs. Both of the 200 lb. springs will have compressed 1/2" or .50". By multiplying the spring movement .50 by the spring rate 200 lbs., it will give you the working spring rate (200 x .50 = 100).

The main purpose for using a dual rate spring combination is to enhance the progression of the chassis' motion ratio. A dual rate spring stack consists of two springs, a short tender spring on top and a long main spring on the bottom. This progressive rate system is used to produce a lighter initial spring rate for a desirable lower ride height as well as providing a smooth, supple ride over small surface irregularities. Then, at a determined point in the shaft travel, via the tender crossover height, the tender spring stops working and the initial rate then crosses over to the stiffer rate of the main spring. This progression to the stiffer rate is used to prevent harsh bottoming during high speed input, such as jumps or whoops, and also to prevent excessive chassis roll in corners.

The important thing to remember is that springs are resistance poundage. It takes a given amount of preload poundage to establish a desired ride height, a given amount of spring poundage to prevent chassis roll and given amount of final poundage to prevent extreme bottoming. Having the right spring combination and the correct crossover height is crucial to suspension performance.

1.3 Damping

The function of shock absorber damping is to control the spring's reaction to input. This is done using a special piston called a damping piston. It is attached to the end of the shock shaft inside the shock body. The damping piston has special through passages or 'ports' that allow fluid to pass from one side of the piston to the other. On either side of the piston there is a series of tuning washers or 'valve shims' which seal off fluid flow in one direction and restrict or 'dampen' fluid flow in the other direction. When the shock is compressed or retracted, the damping piston moves through the shock fluid, forcing the fluid through these passages. Damping is thus regulated by the assembly of the valve shims on either side of the damping piston. Compression damping regulates how fast the spring will compress, and rebound damping regulates how fast the spring returns after being compressed.

The compression damping should be taut, firm but not harsh. Too much compression damping and the ride will be stiff and choppy. Too much compression damping could also cause the shock to become solid or 'hydraulic'. This causes a number of undesirable effects, two of which are blown seals and bent shafts. Too little compression damping and the ride will be spongy and vague. Not having enough compression damping will also cause you to blow through the travel too fast.

The rebound damping should be on the slow side but not too slow or the shock will 'pack up'. Pack up means that after the shock has been compressed, the speed at which it returns is too slow to reach proper extension before the next compression stroke. With a gradual loss of shaft travel at each compression stroke, the shock could eventually run out of shaft travel and bottom out. Not enough rebound damping and the ride becomes springy with a buoyant feeling. In either case, not having the correct rebound damping prevents the tires from not staying planted on the ground, causing them to skip, wander and bounce, which results in loss of traction and control.

2.0 External Shock Adjustments

A fully adjustable Axis Racing Shock has four means of external adjustment: Preload, Tender Spring Crossover Height, Compression and Rebound Damping. **It is important to note that these adjustments were designed for a specific function and should be used within the parameters intended. Please read this manual.**

2.1 Static Preload

Static Preload is the amount of spring poundage your shock has in an unladen, fully extended condition. Basically it's how much the spring or springs are compressed when installed on the shock. Example, you put a 300 lb. spring on your rear shock and the spring has a free length of 10.00 inches before installation. After installation, you measure the spring again with the shock fully extended, and the compressed length is now 9 3/4 or 9.75 inches (10.00" - 9.75" = .25" of spring preload). Then multiply the spring preload by the spring rate and that will give you static preload (300 lbs. x .25 = 75 lbs. of static preload).

The main purpose of preload is to raise or lower the vehicle's ride height by means of adding or subtracting spring preload poundage. **Never add preload to prevent excessive chassis roll and bottoming.** By raising or lowering the ride height, you are also moving the vehicle's center of gravity (CG) up and down as well as changing the vehicle's weight bias, either to the front or to the back. Optimum ride height is a balance between a center of gravity low enough to maintain good cornering stability and a chassis clearance high enough to prevent the frame from hitting the ground. It is okay to graze or scrape the bottom of your frame now and then but you don't want it slamming the ground, knocking your hands and feet off.

2.2 Tender Spring Crossover

Tender spring crossover height is directly related to chassis roll and bottom out forces. Changing the tender spring crossover height is the most significant handling change you can make, using the shock's external adjustments. The crossover height moves the dual spring rate's point of progression in relationship to the shaft travel and motion ratio. Increasing the crossover height decreases tender spring travel, making the main spring crossover sooner in the wheel travel, providing stiffer spring poundage for more spring resistance during chassis roll and bottoming. Decreasing the crossover height increases tender spring travel, making the main spring crossover later in the wheel travel, resulting in less spring poundage for softer spring resistance during chassis roll and bottoming.

Therefore, increasing the tender spring crossover height makes the suspension stiffer. Decreasing the tender crossover height makes the suspension softer. Your suspension should bottom out at least once somewhere on the track not hard enough to knock your feet off the pegs but enough to know that you're using all the available travel.

Graphing Spring Rates, Leverage Ratios and Motion Ratios

Leverage Ratio is Shaft Travel versus Actual "vertical" Wheel Travel.

A. Obtain Leverage Ratio:

1. Set your bike on a stand or large box and level the bottom of your chassis with a level. Secure the handle bars so that they are pointing straight during this exercise.
2. Using either front as an example, you'll need to take off the shock and tire.
3. Measure the shock's "free length" or "eye to eye". Write it down.
4. Block up the spindle to where the distance between the center of the upper shock mount and the center of the lower shock mount equals that of your shock's free length. (Be careful not to upset the chassis while taking your measurements.)
5. Measure from the center of the spindle to the ground. Write it down.
6. Then block up the spindle to where the distance between the upper shock mount and the lower shock mount equals that of your shock's compressed length. (Compressed length = free length minus shaft travel.) DO NOT subtract for the bottom-out bumper. Measure the full length of the shaft. We want an absolute, metal to metal figure.
7. Measure from the center of the spindle to the ground. Write it down. The difference between the two shock mount measurements and the difference between the two spindle measurements is your "leverage ratio". For example, if your shock has 5 inches of travel and you measured 11 inches of spindle movement, your leverage ratio would equal 2.20. To be even more precise, take your measurements in ¼ inch increments and graph them on graph paper. By plotting in smaller increments, one is able to see the mechanical advantage or progression of the suspension geometry.

B. Find Preload Poundage:

1. Put the shock in a vise and take out the slotted retainer ring.
2. Measure the "relaxed combined" spring assembly. (The springs and spring dividers only. Do not measure the spring retainer or preload ring.)
3. Put the retainer clip back in and measure again. The difference is your preload.
4. Multiply your preload by your combined spring rate and that is your beginning poundage. Write it down. (Example: .25 in x 80 lb. spring rate = 20 lbs. of preload.)

C. To Find Cross-Over Poundage:

1. Take the springs off your shock.
2. Measure the height of your crossover(s), then add ½ inch, for spring hardware. That number is the tender spring's compressed spring length.
3. Measure the tender spring's free length.
4. Subtract the compressed length from the free length and multiply that number by that spring's rate. This is your crossover poundage. Write it down. (Example: A tender spring is 3 inches long, and has a rate of 125 lbs. The crossover(s) adds up to 1 3/8, or 1.375. Add .500 and you get 1.875. Subtract 1.875 from 3.0 and you get 1.125. Multiply 1.125 by 125 and you get crossover poundage of 141 pounds.)
5. Put your crossover(s) and springs back on your shock.

SPRING FORMULAS

Spring rates are determined by how many pounds of force it takes to compress a spring one full inch.

To rate an unknown spring:

$$\frac{11{,}500{,}000 \times (\text{wire diameter}) \text{ to the } 4^{th} \text{ power}}{8 \times (\text{ID and wire diameter}) \text{ cubed} \times \text{active coils}}$$

Example: wire diameter = .362; ID = 2.575; active coils = 9.2
Your rate is = 105.9

To figure out active coils:

Hold the spring upright and start from the bottom. When the flat end coil comes in contact with the first coil, that's zero. Up from there, count the number of turns until it touches the other flat end coil. In most cases, it won't end up on an even number. Divide the full turn into 10 units. (Active coils = 8.5; or 9.2; or 7.8, etc.).

To convert to metric/kg:

Divide pounds by 55.88 (#105.9 = 1.9 kg)
Divide inches by .03937 (2.205 inches = 56 mm)

To figure out the combined rate using multiple springs:

The formula for two springs is: 1/K + 1/K2 = 1/K3
For three springs: 1/K + 1/K2 + 1/K3 = 1/K4
(K=spring rate)

Example: You have an #80 tender and a #370 spring combination.
1 divided by 80 + 1 divided by 370 = 1 divided by K3
#65.8 = K3

If you need to cut a spring to obtain a desired rate use this formula:
(K1 x Ac = K2 x AC) (K = spring rate)

Example: a 60 lb. spring with 8.5 active coils =78.5 lbs. x 6.5 active coils
Or
60 x 8.5 = 78.5 x 6

D. Setting the Preload

1. Put your tire and shock back on your bike and put the bike on the ground.
2. Set the preload. The correct way to set preload on an ATV is to establish a desired ride height from the bottom of the chassis to the ground WITH THE RIDER or someone who weighs the same ON the bike. Since an ATV has a lot more in common with a car than a motorcycle, we need to tune it like one. (Sag is for motorcycles, NOT for cars, so don't confuse yourself with it any longer.) Begin by taking two measurements – one in the front of the bike, right behind the back lower A-arm pivot. The other, in the rear of the bike right under the foot peg. You want to start with the bottom of the chassis level. Your right height should be about 8.0 inches; for MTGP, national and desert a little higher, TT and Circle Track, a little lower. You need to find what works best for you. Don't be afraid to experiment. That's what practice and testing is all about. Remember that you adjust preload to establish right height ONLY.
3. Convert the preload into poundage.
4. Measure the shock's "eye to eye" length at ride height. Write it down.

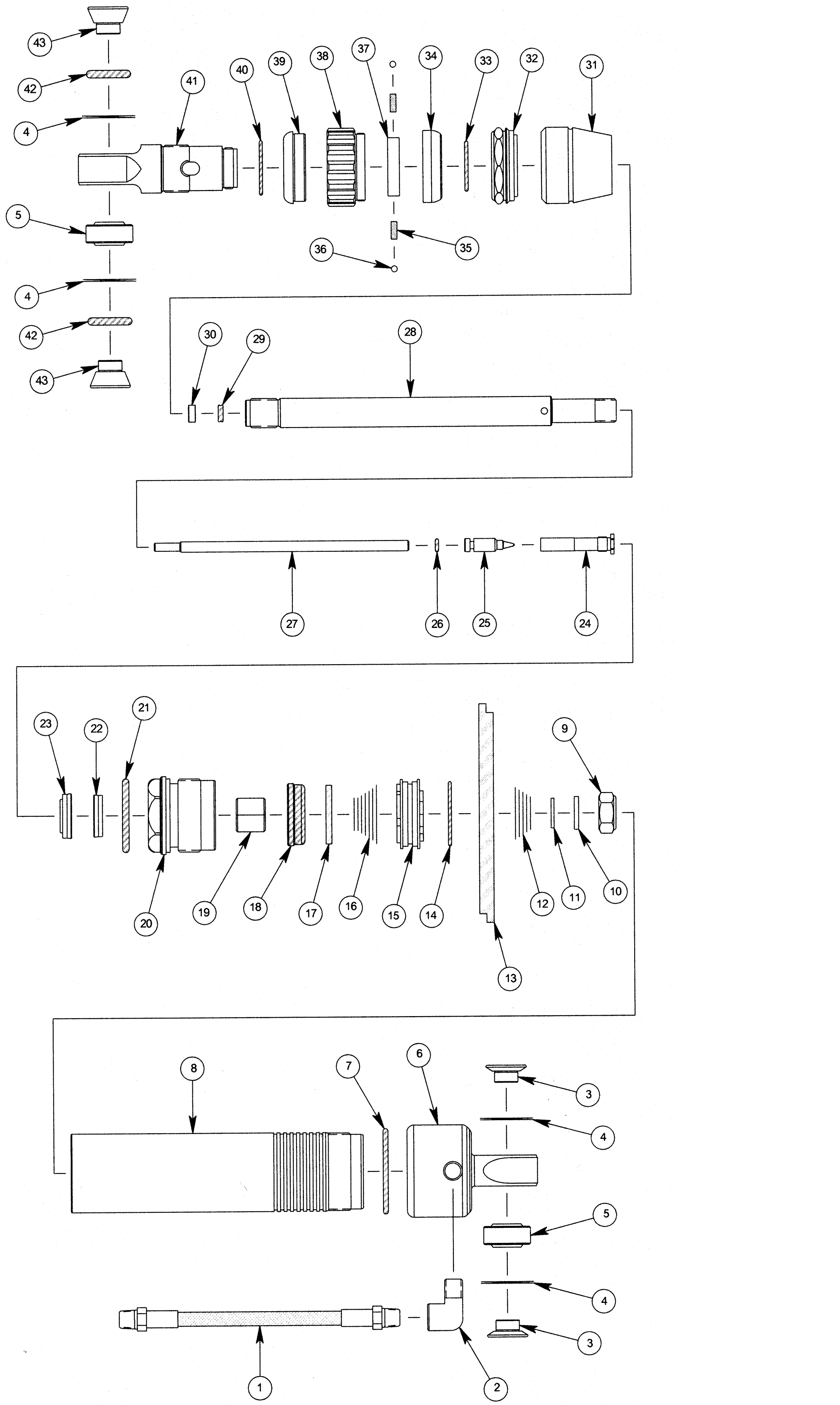
E. Making a Spring Graph:

1. Take a piece of graph paper and draw a vertical line the length of the page, about ½ inch from the left margin. Then draw another line horizontally all the way across, about 1 inch from the bottom. Label the vertical line "pounds" and the horizontal line "shaft travel". Where the two lines meet is zero.
2. Place a dot on the pound line to represent your "static" preload.
3. Take your crossover poundage and subtract from it the preload poundage. Then divide that number by your combined spring rate, and that will give you the point in your shaft travel at which the crossover takes place. Place a dot on the graph where your crossover poundage and the shaft travel it takes to get there meet.
4. Take your total shaft travel and subtract from it the crossover travel. Take that number and multiply it by the rate of your main spring. Take that number and add to it the crossover poundage. This figure is your theoretical bottom-out poundage. Place a dot on the graph where your bottom-out poundage and your total shaft travel meet.
5. Connect the dots.
6. Using your shock's ride height eye to eye length, calculate how much travel is used at that point, and figure out the poundage. Write both of them down and plot them on your graph. This is an "absolute" point.

Now you can use this information in conjunction with your leverage ratio to obtain your "motion ratio" and how it corresponds with the spring rates.

Rebound Adjustable Front Shock

CUSTOM AXIS

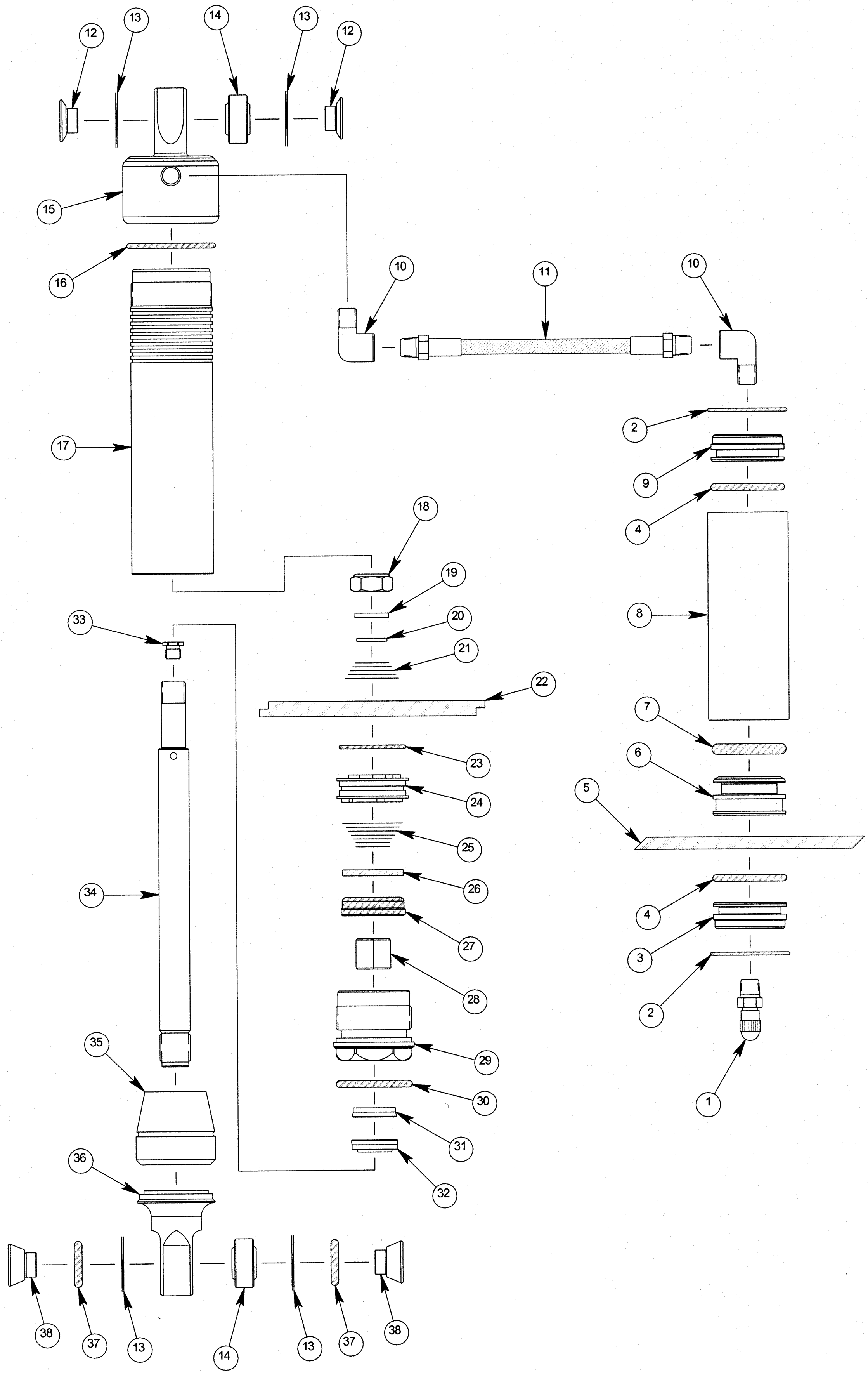


Rebound Adjustable Front Shock
PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
1	28-4__	Reservoir Hose, Braided Teflon
2	28-165	Street Elbow, Std. 90, 1/8-27 NPT, Forged Brass
	28-230	Street Elbow, Short 45, 1/8-27 NPT, B/S Brass
	28-238	Street Elbow, Std. 45, 1/8-27 NPT, Forged Brass
3	51-8__	Eyelet Reducer, -8 Bearing
4	01-102S	Retaining Ring, -8 Eyelet Bearing
5	51-850	Spherical Bearing, Teflon Lined, -8 Eyelet
6	10-8__	Body Cap, 167
7	02-130V	O-Ring, 167 Body Cap
8	41-0__	Shock Body, 167 Steel
9	05-902	Lock Nut, 175 Damp Plate
10	50-019	Valve Shim Backup, .700 x .500 x .090
11	50-009	Valve Shim Backup, .623 x .500 x .060
12	49-3__	Valve Stack, 167, Rebound
13	04-167	Piston Band, 167 Damping
14	02-026	O-Ring, 167 Damp Piston, 175 Damp Plate
15	08-161	Piston, 167, 0/0
	08-162	Piston, 167, 1/1
16	49-4__	Valve Stack, 167, Compression
17	50-079	Top Out Plate, 1.220 x .504 x .125
18	05-001	Top Out Bumper, 167 Bearing
19	05-1008	Bushing, .620 Shaft Bearing, 167/206 Short
	05-1010	Bushing, .620 Shaft Bearing 167/206 Std.

ITEM NO.	PART NO.	DESCRIPTION
20	06-108	Bearing, 167 x .20, Type IV, Std.
	06-109	Bearing, 167 x .620, Type IV, Short
21	02-219	O-Ring, 167 Bearing-All
22	03-620	Shaft Seal, 167 Type III & Type IV Bearing
23	03-603	Shaft Wiper,167/206 Type I & Type IV Bearing
24	14-600	Jet, Adjustable, 1.570
	14-601	Jet, Adjustable, 1.520
25	14-2__	Rebound Needle
26	02-M01	O-Ring, Rebound Needle
27	14-3__	Metering Rod
28	13-4__	Shaft, Adj
29	02-106Q	Quad Ring, Metering Rod Backup
30	14-500	Guide Bushing, Metering Rod, .358 x .150
31	05-101	Bottom Out Bumper, .620 x 1.500
32	11-902	AE Spring Retainer Perch, 167/206, Old Style
33	02-021	O-Ring, Rebound Knob Cap
34	14-403	Rebound Knob Cap
35	01-503	Detent Spring, .1250D x .380L
36	01-501	Detent Ball, .1250D
37	14-404	Rebound Knob Cross Pin
38	14-401	Rebound Adjuster Knob
39	14-402	Rebound Knob Insert
40	02-023	O-Ring, Rebound Knob Insert
41	07-851	Eyelet, AE-8 x 2.7500
42	02-M12	O-Ring, Metric, -8 Eyelet Reducer

Non-Adjustable Front Shock

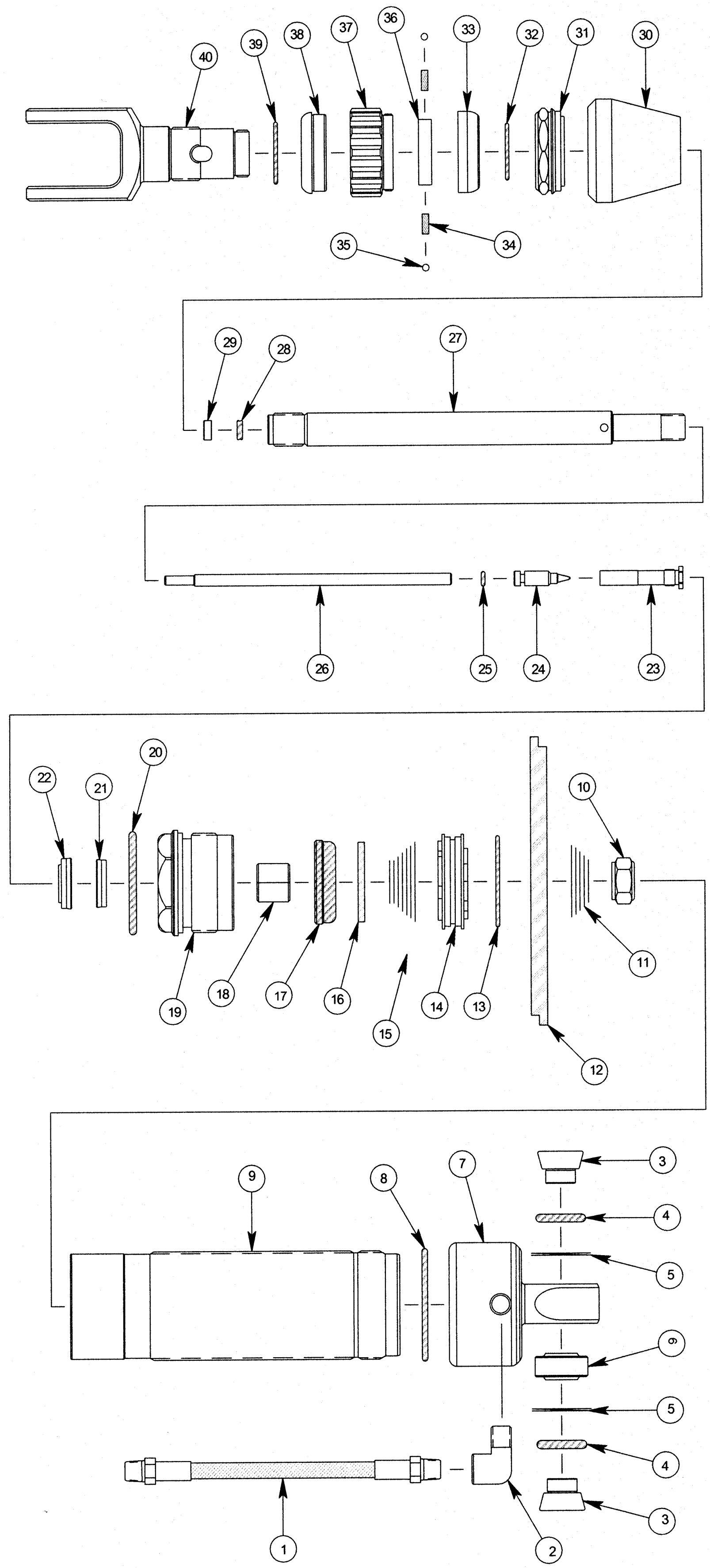


Non-Adjustable Front Shock
PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
1	28-008	Air Valve Assembly, 1/8-27 NPT, Schrader
2	01-121	Retaining Ring, 150 Reservoir Cap
3	09-121	Cap, 150 Reservoir, Air Valve End
4	02-218	O-Ring, 150 Reservoir End Cap
5	04-150	Piston Band, 150 Reservoir
6	09-131	Piston, 150 Reservoir
7	02-320	O-Ring, 150 Reservoir Piston, Aluminum Body
8	09-510	Body, 150 Reservoir, 4.22 Aluminum
9	09-122	Cap, 150 Reservoir, Hose End
10	28-165	Street Elbow, Std. 90, 1/8-27 NPT, Forged Brass
	28-238	Street Elbow, Std. 45, 1/8-27 NPT, Forged Brass
11	28-4__	Reservoir Hose, Braided Teflon
12	51-8__	Reducer, -8 Eyelet Bearing
13	01-102S	Retaining Ring, -8 Eyelet Bearing
14	51-850	Spherical Bearing, Teflon Lined, -8 Eyelet
15	10-8__	Body Cap
16	02-130V	O-Ring, 167 Body Cap
17	41-0__	Shock Body, 167 Steel
18	05-902	Lock Nut, 175 Damp Plate
19	50-019	Valve Shim Backup, .700 x .500 x .090
20	50-009	Valve Shim Backup, .623 x .500 x .060

ITEM NO.	PART NO.	DESCRIPTION
21	49-3__	Valve Stack, 167, Rebound
22	04-167	Piston Band, 167 Damping
23	02-026	O-Ring, 167 Damp Piston, 175 Damp Plate
24	08-161	Piston, 167, 0/0
	08-162	Piston, 167, 1/1
25	49-4__	Valve Stack, 167, Compression
26	50-079	Top Out Plate, 1.220 x .504 x .125
27	05-001	Top Out Bumper, 167 Bearing
28	05-1008	Bushing, .620 Shaft Bearing, 167/206 Short
	05-1010	Bushing, .620 Shaft Bearing, 167/206 Std.
29	06-108	Bearing, 167 x .620, Type IV, Stc.
	06-109	Bearing, 167 x .620, Type IV, Short
30	02-219	O-Ring, 167 Bearing-All
31	03-620	Shaft Seal, 167 Type III & Type IV Bearing
32	03-603	Shaft Wiper, 167/206 Type I & Type IV Bearing
33	14-___	Jet
34	13-4__	Shaft, Adj
35	05-101	Bottom Out Bumper, .620 x 1.500
36	07-801	Eyelet, H-8 x 1.500
37	02-M12	O-Ring, Metric, -8 Eyelet Reducer

Rebound Adjustable Rear Shock



Rebound Adjustable Rear Shock

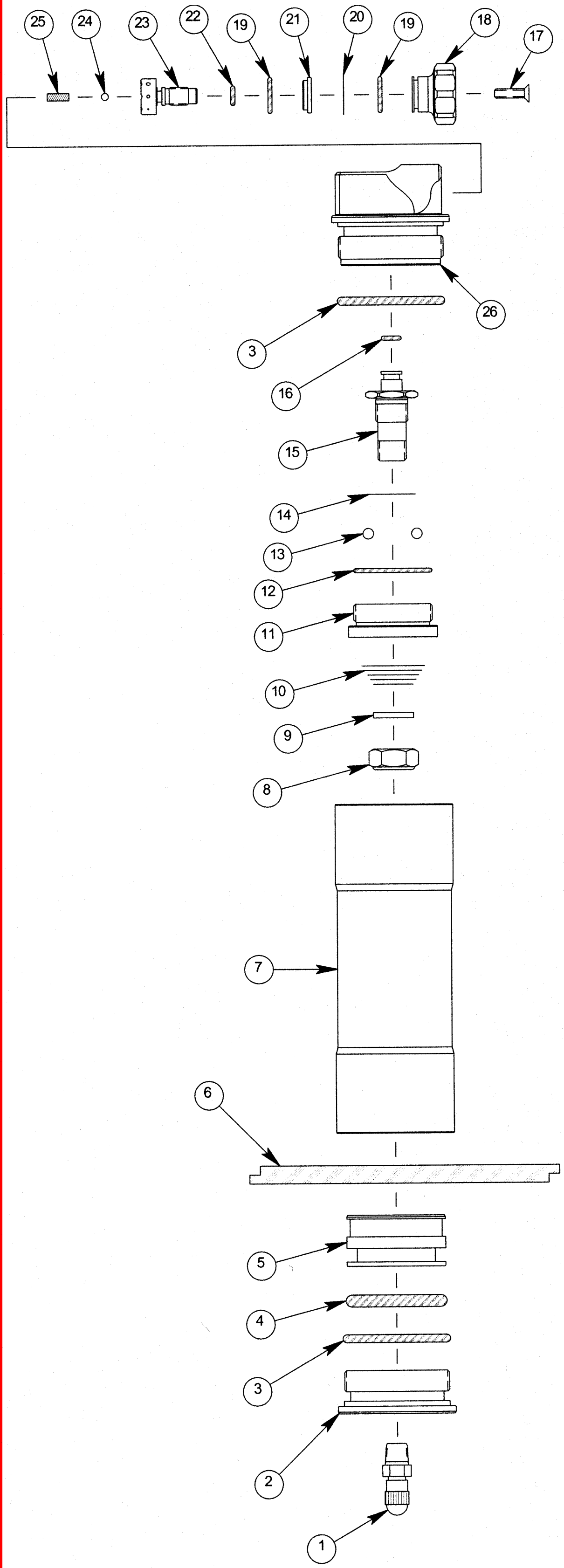
PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
1	28-5__	Reservoir Hose, Braided Teflon
2	28-165	Street Elbow, Std. 90, 1/8-27 NPT, Forged Brass
	28-230	Street Elbow, Short 45, 1/8-27 NPT, B/S Brass
	28-238	Street Elbow, Std. 45, 1/8-27 NPT, Forged Brass
3	51-9__	Reducer, -9 Eyelet Bearing
4	02-209	O-Ring, -9 Body Cap Eyelet Reducer
5	01-112S	Retaining Ring, -9 Eyelet Bearing
6	51-950	Spherical Bearing, Teflon Lined, -9 Eyelet
7	10-9__	Body Cap, 206 Steel Coil-over
8	02-135V	O-Ring, 206 Body Cap
9	42-0__	Shock Body, 206 Steel, Coil-over
10	05-900	Ring Nut, 206 Piston
11	49-5__	Valve Stack, 206, Rebound
12	04-206	Piston Band, 206 Damping
13	02-029	O-Ring, 206 Damp Piston
14	08-202	Piston, 206, 0/0
	08-204	Piston, 206, 1/1
15	49-6__	Valve Stack, 206, Compression
16	50-099	Top Out Plate, 1.500 x .506 x .125
17	05-002	Top Out Bumper, 206 Bearing
18	05-1008	Bushing, .620 Shaft Bearing, 167/206 Short
19	06-208	Bearing, 206 x .620, Type IV, Std.
	06-209	Bearing, 206 x .620, Type IV, Short
20	02-223	O-Ring, 175 CD Housing, 206 Bearing

ITEM NO.	PART NO.	DESCRIPTION
21	03-610	Shaft Seal, 206 Type III & Type IV Bearing
22	03-603	Shaft Wiper, 167/206 Type I & Type IV Bearing
23	14-600	Jet, Adjustable, 1.570
	14-601	Jet, Adjustable, 1.520
24	14-2__	Rebound Needle
25	02-M01	O-Ring, Rebound Needle
26	14-3__	Metering Rod
27	13-4__	Shaft, Adj
28		
29	14-500	Guide Bushing, Metering Rod, .358 x .150
30	05-102	Bottom Out Bumper, .620 x 1.750
31	11-902	AE Spring Retainer Perch, 167/206 Old Style
32	02-021	O-Ring, Rebound Knob Cap
33	14-403	Rebound Knob Cap
34	01-503	Detent Spring, .1250D x .380L
35	01-501	Detent Ball, .1250D
36	14-404	Rebound Knob Cross-Pin
37	14-401	Rebound Adjuster Knob
38	14-402	Rebound Knob Insert
39	02-023	O-Ring, Rebound Knob Insert
40	07-100	Clevis, Honda TRX250R
	07-101	Clevis, Honda CR500
	07-104	
	07-952	

Compression Adjuster
Front or Rear

CUSTOM AXIS

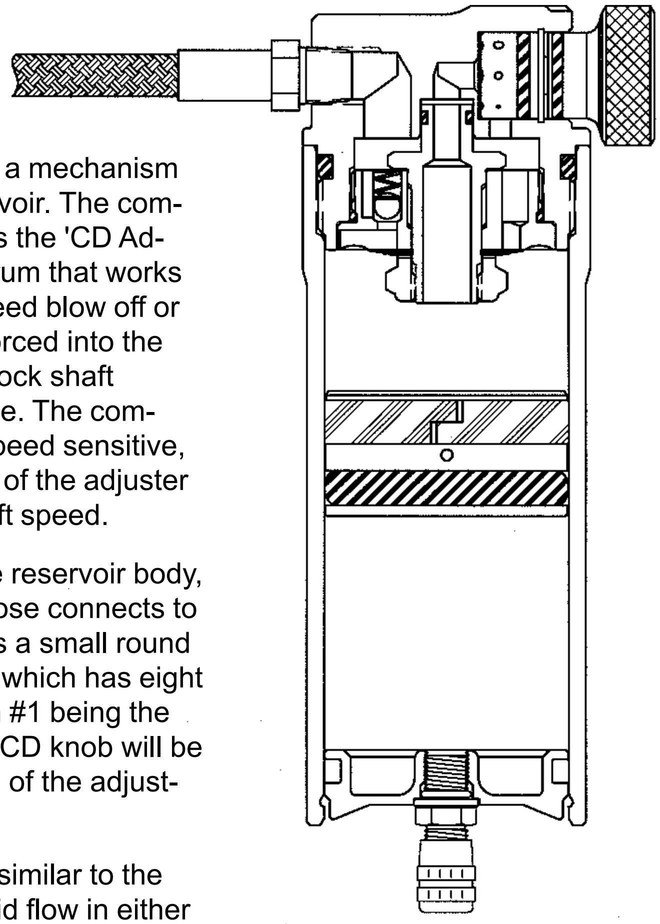


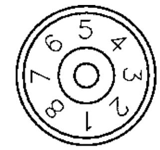
PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
1	28-007	Air Valve Assembly, 1/8-27 NPT, Dill
2	09-721	Cap Assembly, 175 Reservoir, Threaded
3	02-223	O-Ring, 175 CD Housing, 206 Bearing
4	02-324	O-Ring, 175 Reservoir Piston
5	09-732	Piston, 175 Reservoir
6	04-175	Piston Band, 175 Reservoir
7	09-70__	Body, 175 Reservoir
8	05-902	Lock Nut, 175 Damp Plate
9	05-019	
10	49-9__	Valve Stack, 175 CD Damp Plate
11	09-761	CD Damp Plate, 175 Reservoir
12	02-026	O-Ring, 167 Damp Piston, 175 Damp Plate
13	01-502	Check Ball, .1875D
14	50-100	Thrust Washer, 175 CD Inner Shaft
15	09-772	CD Inner Shaft, 175 Reservoir
16	02-010	O-Ring, 175 CD Inner Shaft
17	01-602	Cap Screw, 175 CD Knob
18	09-781	CD Adjuster Knob, 175 Reservoir
19	02-014	O-Ring, 175 CD Knob Assembly
20	01-062	Retaining Ring, 175 CD Drum
21	09-740	CD Drum Back-Up, 175 Reservoir
22	02-M02	O-Ring, Metric, 175 CD Drum
23	09-742	CD Drum, 175 Reservoir
24	01-501	Detent Ball, .1250D
25	01-503	Detent Spring, .1250D x .380L

Compression Adjuster

External Compression Adjustment





The external compression adjuster is a mechanism that regulates fluid flow into the reservoir. The compression adjuster otherwise known as the 'CD Adjuster' is an adjustable eight orifice drum that works in conjunction with a tunable high speed blow off or 'damp plate'. The fluid that is being forced into the reservoir is the volume of fluid the shock shaft displaces during a compression stroke. The compression adjuster is therefore shaft speed sensitive, meaning the damping characteristics of the adjuster are progressive in relationship to shaft speed.

The CD adjuster knob is found on the reservoir body, located next to where the reservoir hose connects to the reservoir. The CD adjuster itself is a small round drum connected to the adjuster knob which has eight different size metering holes, position #1 being the softest and #8 being the stiffest. The CD knob will be set on #4 from the factory, the middle of the adjustment range.

The damp plate on the other hand is similar to the damping piston in that it regulates fluid flow in either direction. The difference being that the damp plate is stationary and uses tuning washers on the compression side only and check balls on the rebound side. The tuning washers regulate internal fluid pressure caused from high speed compression strokes and the check balls allow unrestricted fluid flow from the reservoir to the shock body. The damp plate is located inside the CD housing.

Important:

- When changing the compression adjuster setting, feel the detent 'clicks' of the adjuster mechanism. Make sure you stop on an adjustment setting. Setting the CD adjuster knob between clicks seals off fluid flow through the drum and will make the compression damping 'very stiff'.
- DO NOT use the compression adjustment to compensate for incorrect spring settings. External compression adjustments are for fine tuning damping only.
- Due to the design of the CD adjuster drum, the CD knob will turn freely in either direction without damage to the mechanism.
- The CD knob should turn easily with your fingers. If at any time the CD knob becomes difficult to turn or find a setting, contact the Custom Axis Service Department.
- DO NOT attempt to fix the CD adjuster or turn the CD knob by force, such as using pliers or vise grips. Damage to yourself and the CD assembly may result.

Rebound Adjuster

External Rebound Adjustment

The external rebound adjuster is a fluid metering mechanism that bypasses the damping piston. The rebound adjuster assembly regulates fluid flow from one side of the damping piston to the other by means of a tapered needle and jet assembly located in the shock shaft. A fixed jet is located in the end of the shock shaft, while the needle is supported by a metering rod that runs inside the shaft and rests on a cross pin inside the rebound adjuster knob. The needle and metering rod are held in place by internal shock pressure. Rebound adjustments are made by turning the rebound adjuster knob in or out, which in turn pushes the needle in and out of the jet.

The rebound adjuster knob is located on the shaft eyelet or clevis. There are approximately 25-30 effective rebound settings or 'clicks', depending on the degree of needle used. The rebound knob will be set at '12 clicks out' from the factory, approximately the middle of the adjustment range. To find an adjustment position, screw the rebound knob in towards the shaft until it stops, turning in the same direction you would tighten a bolt or screw. Then screw the knob back out, counting the clicks as you go. Screwing the adjuster knob in pushes the needle into the jet, slowing the rebound.

NOTE: The rebound adjuster mechanism is basically a low speed adjustable bypass bleed with a greater emphasis of change noticed on rebound versus compression. If large adjustments are required for desired performance, adjusting the CD adjuster may be necessary. Example: If you go from '12 out' to '6 out' on rebound, you might need to go to a softer compression adjuster setting. If you go from '8 out' to '20 out' on rebound, you might need to go to a stiffer compression adjuster setting.

Important:

- DO NOT over tighten rebound adjuster knob.
- If the rebound knob becomes difficult to turn, spray some WD-40 on either end of the knob. If it is still difficult to turn, contact the Custom Axis Service Department.
- DO NOT attempt to fix the rebound adjuster or turn the rebound knob by force, such as using pliers or vise grips. Damage to rebound adjuster assembly will result.

Remember:

- Suspension tuning is a balance of compromises.
- Whatever changes you make to the front suspension is going to affect the rear suspension.
- Make only one change at a time.
- Write everything down.
- Preload should be no less than 1/8" and no more than 3/4".

Shock Service

Keeping a note pad or shock journal is highly recommended. This manual will provide technical information on the workings of Axis Shocks, but because your shock(s) were custom valved and sprung for you and your particular application, it is a good idea to document this information for future reference.

A. Remove eyelet spacers/sleeve from shock body cap and clamp upside down in a vise, shaft end up, using a rag in vise jaws not to damage finish while clamping.

B. On a note pad, write down the compression and/or rebound settings. Then adjust your compression setting to position #1 and the rebound at full open. (Approximately 30 clicks out.)

C. Using a tape measure or machinist scale, measure the compressed length of the total spring stack, including nylon spring dividers and write it in your note pad and label it ‘Compressed Length’ or ‘C/L’. Then remove the spring retainer from shaft eyelet and remove springs. If you are working on a triple rate shock, be careful not to get your tender springs and crossover rings mixed up. Tender springs are marked with a paint stripe on one end to identify the spring rate. Main springs will have the rate ground on one end of the spring coil. Next, write down the crossover height associated with the tender spring(s). Finally, stack the spring stack on your workbench, same as they were on the shock, and measure the “free length” of the total spring stack. Label this measurement ‘Free Length’, and enter it above the compressed length. The ‘free length’ minus the compressed length is your static spring preload.

D. Now that your adjustments and spring data has been documented, thoroughly clean your shocks using a scrub brush and water soluble cleaner such as ‘simple green'. Try to avoid exposing the foam shock bumper to water, cleaner, and especially solvent.

IMPORTANT NOTE: Extreme cleanliness is of utmost importance during all disassembly and assembly operations to prevent any dirt or foreign particles from getting in the shock(s).

DISASSEMBLY

1. Clamp shock body cap eyelet in a vise, same as before.
2. Remove air valve cap from reservoir and depressurize nitrogen. Note: It is not recommended that you remove air valve core from air valve fitting unless you have a new one to replace it.
3. Remove reservoir end cap. (a) On thread on style caps, unscrew using a 3/16 pin spanner. (b) On retaining ring style caps, push the reservoir cap into the reservoir body, exposing the wire ring. It may be necessary to brake the cap loose by lightly tapping the cap in, using a soft mallet, with air cap or air valve puller installed to prevent damage to air valve. Using your fingers, remove retaining ring by pushing in on the two ends of the ring. This will cause the opposite end of the ring to turn towards you allowing easy removal. Using a end cap puller or a pair of pliers with air valve cap installed, remove reservoir cap. A small squirt of WD40 will ease cap removal. Clean snap ring groove with a rag followed by wiping out inside of reservoir body. If necessary, clean wire ring using a piece of scotch brite or 600 grit sand paper.

Note: The inside of the reservoir body is a sealing surface. Therefore, it is critical that you do not scratch the ID. It is for this reason that we recommend using your fingers and not scribes or small screwdrivers, to remove retaining ring.

4. Using a wrench, 1 3/8” for 167 and 1 5/8” for 206 Series, unscrew the shaft bearing and remove shaft assembly. Piston wear band may fall off while removing shaft assembly, be prepared to catch it. (Wrapping a rag around shock body just below shaft bearing will help contain shock oil runoff to a minimum).
5. Remove shock from vise and dump oil in a waste oil container.
6. Remove floating piston. (a) 175 Adjuster Series. Looking into the reservoir, you will see a threaded hole in the center of the reservoir piston. Using a piston plunger tool or a piece of 10/32" threaded rod, remove piston by threading tool into the piston and slowly pulling on the threaded rod. Drain the remaining oil from the into waste oil container. (b) 150 Non-Adjuster Series. Because there is no threaded hole for a plunger tool, you will need to eject the piston with compressed air. Use caution while performing this exercise. Find a small box or tray and place a few rags in one corner. Hold shock body such that the open end of the reservoir body is up against the rags in the box. While firmly holding shock body in one hand, place compressed air nozzle into the shock body using the other hand, cup hand over opening and nozzle, sealing opening, then pressurize using short bursts. The reservoir piston should pop out into box. If you have difficulty performing this due to inadequate sealing, come back to it later. Once you have removed the shaft bearing, you can thread in to the body and use the much smaller shaft hole for the air nozzle.
7. Once you have removed the reservoir piston, pour a small amount of oil into the reservoir and the shock body. Swish it around a bit and then dump it into the waste oil container. Do not rinse shock body assembly with solvent! Solvent is meant to be a cleaner, not a shock fluid additive.

Tip: Using a 5 gallon bucket and a piece of 2x4 wider than the bucket, hang the shock in the bucket to drain. It is a good idea to fix the bucket to a table leg using a cable tie. Oil spills are no fun.

8. Remove o-rings from reservoir piston and end cap. Wipe off oil residue and dirt with a rag, blow of with compressed air, install new o-rings, and set aside on a clean rag.

If you are not changing the seals but changing the shock fluid only, skip to #5.

9. Clamp shaft assembly in a vise, holding on eyelet or clevis and remove valving nut.
10. Carefully remove damping piston assembly from shaft and place on a clean rag or valving peg. Place your thumb on the end of the shaft and your first two fingers under the thick top-out washer. Gently hold together and lift straight off. Pay close attention to the piston orientation upon removal! The valving on the nut side is ‘rebound’. The valving on the thick top-out washer side is ‘compression’.

Shock Service (continued)

11. Separate valving stacks from piston. If necessary, use a marker and write ‘compression’ and ‘rebound’ on the rag and lay the valving thus. Remove piston o-ring, blow off with compressed air, and install new o-ring.
12. Using a shaft bullet, remove shaft bearing from shaft. Place the bullet on the end of the shaft, hold the shaft against the table to make sure the bullet stays in place, and quickly push the bearing onto the bullet. Then remove the bearing from the bullet.
13. Using a scribe, remove the wiper by poking it at a 45 degree angle, pulling it into the center and pushing it down. This procedure works best by firmly holding the bearing on a rag, on the table. Don’t poke too deep! Poking too deep can scratch the surface and could cause seal damage during installation and/or seal failure during operation. Inner seal comes out the same way. Pay close attention to seal type and seal orientation during seal removal! To remove top out bumper, poke in deep at a 45 degree angle. Pry up slightly, moving the bearing around, similar to dismounting a tire. Once the seals have been removed, wash with solvent and a tooth brush. Make sure the outer wiper gland is free of packed in dirt. Blow off with compressed air, spray with water based cleaner, rinse with water, and blow dry with compressed air. It is important the bearing is dry before installing the seals. Water and oil don’t mix.

ASSEMBLY

1. Using a Q-tip, bend the swab below cotton tip, dip in shock fluid and lubricate the inner seal gland and then the outer wiper gland.
2. Install the outer wiper first. These seals can be somewhat challenging to install for the novice. Soaking them in hot tap water for a minute will make them a lot more flexible, just make sure you blot them with a towel before installing them. The inner seal ID lip(s) integrity is critical! It is a must that the inner seal is installed correctly. If the seal lips are damaged during installation, the seal will fail. If the seal is installed backwards, the seal will fail. Special seal installation tools are available upon request. Installing the urethane top out bumper can be equally challenging. Using a Q-tip, lubricate the bumper gland and bumper base, line up one of the three bumper slots with the bleed hole before installation. Using an arbor press makes lite work of this, but it still requires that you work it around like mounting a tire on a wheel.
3. Once your bearing has been stuffed, use another Q-tip, dipped in a standard lithium grease, and lubricate the inner seal. Slide the bearing onto the shaft bullet. Install the bullet onto the shaft, press bullet and shaft assembly against table, and quickly slide bearing onto shaft.

Note: If needed, revalving is done at this point. Refer to Axis valving chart for valving information.

4. Install damping piston assembly using same three finger assembly technique. Thread on valving nut until there is a gap between the nut and valving about the thickness of a dime. Blow off piston assembly with compressed air. Snug tighten valving nut, then torque to: 25 ft•lbs (300 in•lbs) for 167 Series shocks or 30 fl•lbs (360 in•lbs) for 206 series shocks. Rebound jet torque setting: 80 in•lbs. CD Valving nut torque setting: 200 in•lbs.
5. Clamp shock body cap in vise. (It’s a good idea at this point to gather the oil, reservoir piston and piston band, placing them within reach of vise before proceeding). While holding reservoir body in one hand, pour shock fluid into shock body about 1-2 inches above hose fitting port. Hold reservoir body such that the hose fitting port on reservoir is lower than hose fitting port on shock body. Using the palm of your free hand, pat shock body opening to help force fluid through hose and into reservoir. When you see fluid seeping into reservoir canister, fill reservoir up to base of threads or up to snap ring groove, depending on type of reservoir. You want to make sure that you hold the reservoir low enough to prevent the fluid from seeping back into the shock body.
6. Install floating piston and piston band into reservoir body being careful not to pinch off part of the wear band by forcing piston into body. Once in, push piston past threads or snap ring groove then set your compression adjuster on #8.
7. Using the wooden/plastic end of your mallet, push floating piston all the way up. If mallet end will not fit into reservoir body, a sawed off piece of broom handle will do. It is important that you use something softer than metal to prevent scratching the ID finish of the reservoir.
8. Using a cloth rag, wipe oil residue left in reservoir ID. Then, wipe a light film of lithium grease on ID just behind floating piston and on end cap o-ring. This will lubricate the backside of the o-ring preventing unnecessary stiction.
9. Set CD adjuster knob to #1. Install your piston plunger tool or threaded rod onto the reservoir piston. Then slowly pull piston out to ID thread or snap ring groove. You don’t want to pull to fast or too far. Pulling too fast will pull a vacuum, cavitating the oil. This creates thousands of tiny little bubbles and will set you back about ten or fifteen minutes waiting for them to dissipate. Pulling too far could leave you with a wet foot. During this exercise, you want to hold the reservoir upright, hose up, plunger tool going down, forcing the trapped air up and out the hose and not get trapped in the piston.
10. Set CD adjuster knob to #8 and push piston all the way back in. Repeat this exercise four or more times until no more air bubbles can be seen coming up. Remember to set the CD knob on #1 before pulling the piston out and then switching back to #8 before pushing back in. This cycles the fluid in through the compression ports and out through the rebound ports, thoroughly purging the CD adjuster of air.
11. When you are comfortable there is no more air to purge, install the reservoir end cap. CAUTION! On retaining ring end caps, make sure the retaining ring is completely seated into the snap ring groove. If snap ring is not properly installed, the end cap could burst out, damaging the cap, the reservoir body and possibly you or someone else.
12. Pressurize the remote reservoir with air to at least 100 psi (standard air compressor line pressure). This will hold the floating piston in position while you bleed the shaft assembly.
12. Fill the shock body with oil to about 1/2” below the bottom of the threads.
13. Insert the piston/shaft assembly with the teflon band into the shock body, using a slight oscillating motion until piston gets

past the threads. This can be a tight fit! Care and patience must be applied while pushing the piston past the threads. Forcing the piston in too fast could clip or shave off a piece of the wear band. Left undetected, these pieces could get lodged in the piston or CD valving, causing a lack of valving.

14. Once safely past the threads, slowly push the shaft assembly in the oil until the piston is a good inch below the surface of the fluid. Add a bit more oil, up to the top of the threads, then firmly but not too fast, push the shaft assembly into the oil. The object of this exercise is to force the piston through the oil fast enough to open the shim valves, releasing trapped air, but not too fast that it creates turbulence bubbles on the back side. Repeat this stroking exercise a few times being careful not to pull the shaft out too fast causing the oil to cavitate, or too far, exposing the cross holes, sucking air underneath the piston.
15. Now for your next plunge stroke, tap the eyelet/clevis with a plastic tipped hammer or mallet while gently pushing down on the shaft assembly. Repeat this a few times until you don't see any more bubbles. On occasion while doing this exercise, the rebound needle may move down, closing off the through bleed. This could make it difficult or impossible to pull up. If this happens, hit the end of the eyelet/clevis with a firm blow with your mallet while pushing down on the eyelet. This will create a brief pressure increase, which should push the needle back to an open position.
16. When you are comfortable there is no more air to purge, slowly pull up on the shaft assembly, adding fluid if necessary, until fluid level reaches the top of the threads and the shaft cross holes are just beneath the surface of the oil.
17. Next, push the shaft to the side at a slight angle, then slowly slide the bearing down the shaft, using a rotary movement, until it contacts the body. You don't want to cause the bearing to slide down too fast while the shaft is straight up and down. Doing so may grant you a taste of the 'ring of oil'.
18. Position the shaft straight up and down and begin sliding the bearing down until it contacts the threads. It is very IMPORTANT that you hold the shaft in place while positioning the bearing. If you accidentally pull up the shaft and air is sucked past the piston, you will have to start over at step #14. If you accidentally allow the shaft to slide into the body a bit too far, the reservoir piston will not be displaced correctly.
19. Gently turn the bearing counterclockwise until you feel it drop into the first thread, then screw the bearing in clockwise about a half a turn. Using your bearing wrench, quickly screw the bearing on, being careful not to slip and ding the shaft, until the full cross section of the bearing's outer o-ring is exposed just above the end of the shock body. While screwing on the bearing, you should notice that the shaft will come out until it tops out on the bearing's top out bumper. At this point, it will get more difficult to screw in. The oil is now under pressure because the bearing's displacement has pushed back the reservoir piston. You will need to wait until the pressure in the reservoir has pushed the reservoir piston all the way back up. You will know this when you no longer feel pressure when wiggling the shaft. You might find on some older style bearings that the oil bleeds past the bearing too fast for the shaft to top out. If this occurs, you will need to push the shaft in a bit, unscrew the bearing, add a bit more oil and try again. Only this time you will need to hold the shaft in place while you screw in the bearing.

Note: It is very IMPORTANT that the shaft is topped out and bearing is in place before air in reservoir is released or correct reservoir piston position will not be achieved.

20. Once internal pressure has dissipated, fully release the air pressure in the reservoir and screw on the bearing. Be careful that you don't pinch the bearing's outer o-ring during this step. You want the bearing on tight, but not too tight that you will need a cheater bar to break it loose.
21. Pressurize the shock with 200 psi of NITROGEN and install air valve cap. (Nitrogen pressure for 4" non-adjuster reservoirs: 175 psi.)
22. Using a rag lightly sprayed with contact cleaner, wipe oil residue off reservoir body and then shock body.
22. Install springs and mounting hardware.

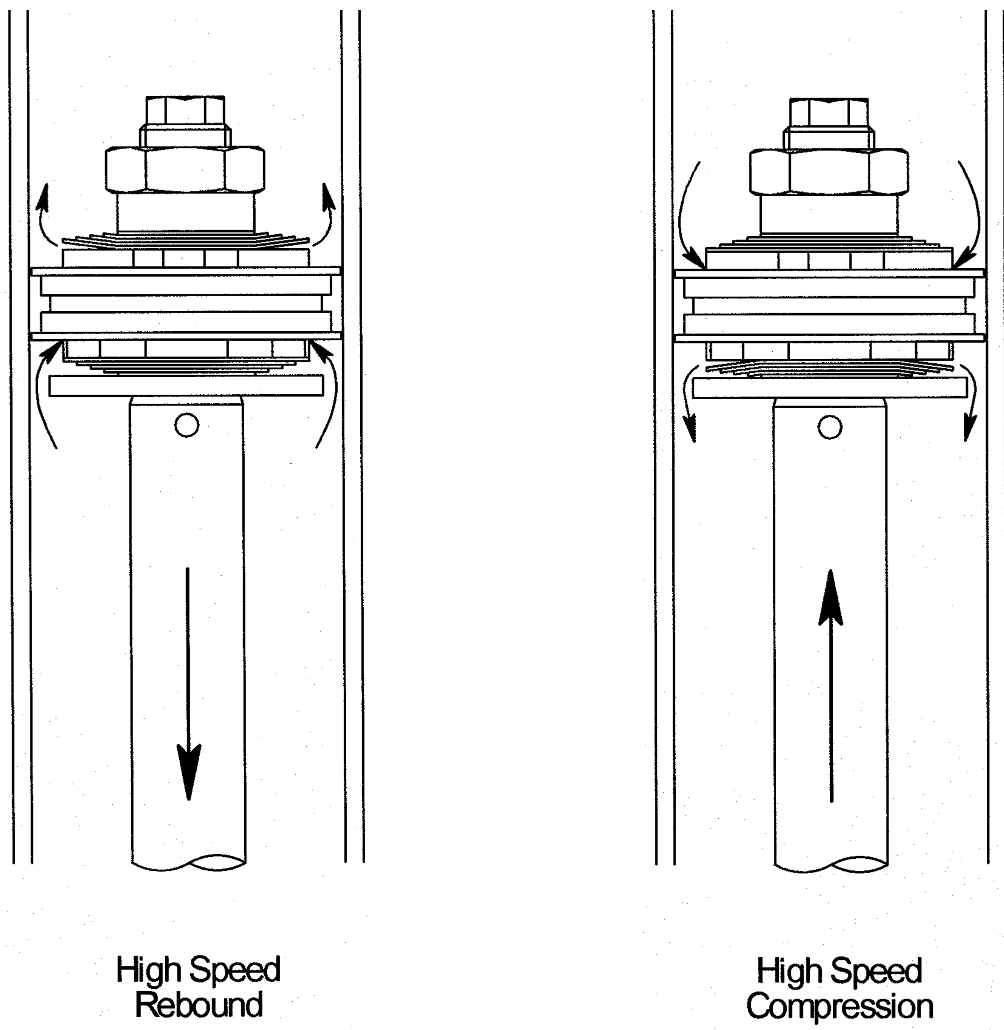
"CONGRATULATIONS"

Please call if you have any questions.

NOTES

1. Recommended suspension fluids: 167 Series Axis Front Shocks, Primus 5EP (Axis Synthetic 2.5 wt) 206 Series Axis Rear Shocks, Primus 9EP (Axis Synthetic 5.0 wt).
2. Seal replacement is recommended at every service but is not mandatory. Use your own discretion. Normal shock operating temperatures range from 90 to 140 degrees for front shocks and 130 to 180 for rear shocks. Shocks enduring extended periods of high heat, such as a rough desert or cross country race, can reach temperatures over 200 degrees. Shocks exposed to this kind of heat for extended periods of time will eventually experience seal failure if not replaced soon enough. Over a period of time, depending on varying factors of heat and pressure, all shock seals will take a 'set' and/or become deformed, especially when exposed to temperatures over 200 degrees. The degree of set or deformity has an effect on how long these seals will last and set seals are even less reliable once the shock has been taken apart and reassembled.
3. Cleaning internal parts with a water soluble cleaner, rinsed, and then thoroughly blown dry, AFTER washing with solvent is highly recommended. Never rinse the shock body & reservoir assembly with solvent or water based cleaners. Solvent and water based cleaners are used to break down and remove oil and therefore do not belong in the shock absorber.
4. DO NOT use grease on eyelet pivot bearings. Teflon lined spherical bearings and teflon filament bushings are SELF LUBRICATING. Applying grease to a teflon spherical bearing not only attracts dirt but it also causes the teflon fiber to swell, allowing it to get pounded out under load. Applying grease to a teflon filament bushing will accelerate sleeve and bushing wear because the grease dries and cakes onto the sleeve, making it abrasive to the bushing.

General Valving Characteristics

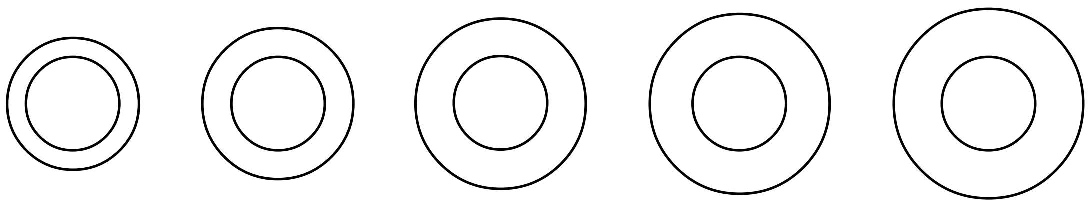


The damping characteristics of your shock are determined by the compression and rebound valve stacks located on the main piston.

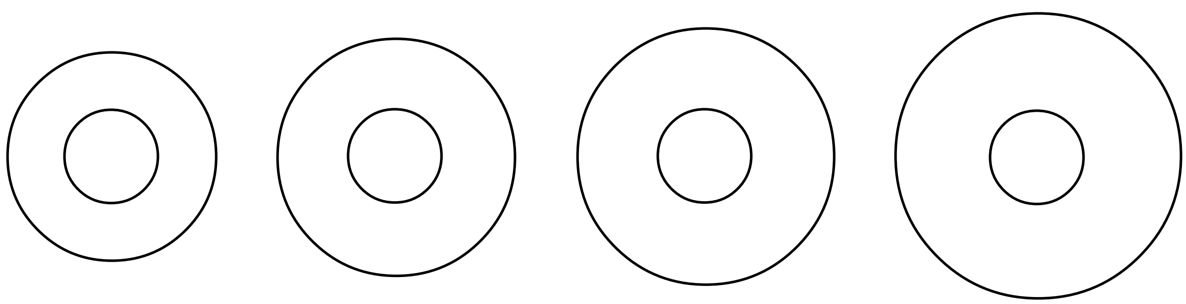
The valve stacks are made up of a series of high quality shims, which are made to flex under the force of oil flowing through the piston ports and then return to their original state.

The thickness of the individual shims determines the amount of damping force the shock will produce. By changing the thickness of the individual shims, damping forces will be altered. For example, if you are running an “A” compression valving, where all the shims in the stack are .006 thick and you replace them with a “B” compression valving, which consists of all .008 thick shims, the compression damping will increase.

Available Shim Sizes



.700 O.D.	.800 O.D.	.900 O.D.	.950 O.D.	1.00 O.D.
x 0.006	x 0.006	x 0.006	x 0.004	x 0.006
x 0.008	x 0.008	x 0.008	x 0.006	x 0.008
x 0.010	x 0.010	x 0.010	x 0.008	x 0.010
x 0.015	x 0.012	x 0.012	x 0.010	x 0.012
x 0.020	x 0.015	x 0.015	x 0.012	x 0.015
			x 0.015	



1.100 O.D.	1.250 O.D.	1.350 O.D.	1.500 O.D.
x 0.004	x 0.004	x 0.006	x 0.006
x 0.006	x 0.006	x 0.008	x 0.008
x 0.008	x 0.008	x 0.010	x 0.010
x 0.010	x 0.010	x 0.012	x 0.012
x 0.012	x 0.012	x 0.015	x 0.015
x 0.015	x 0.015		

Damping Adjustments

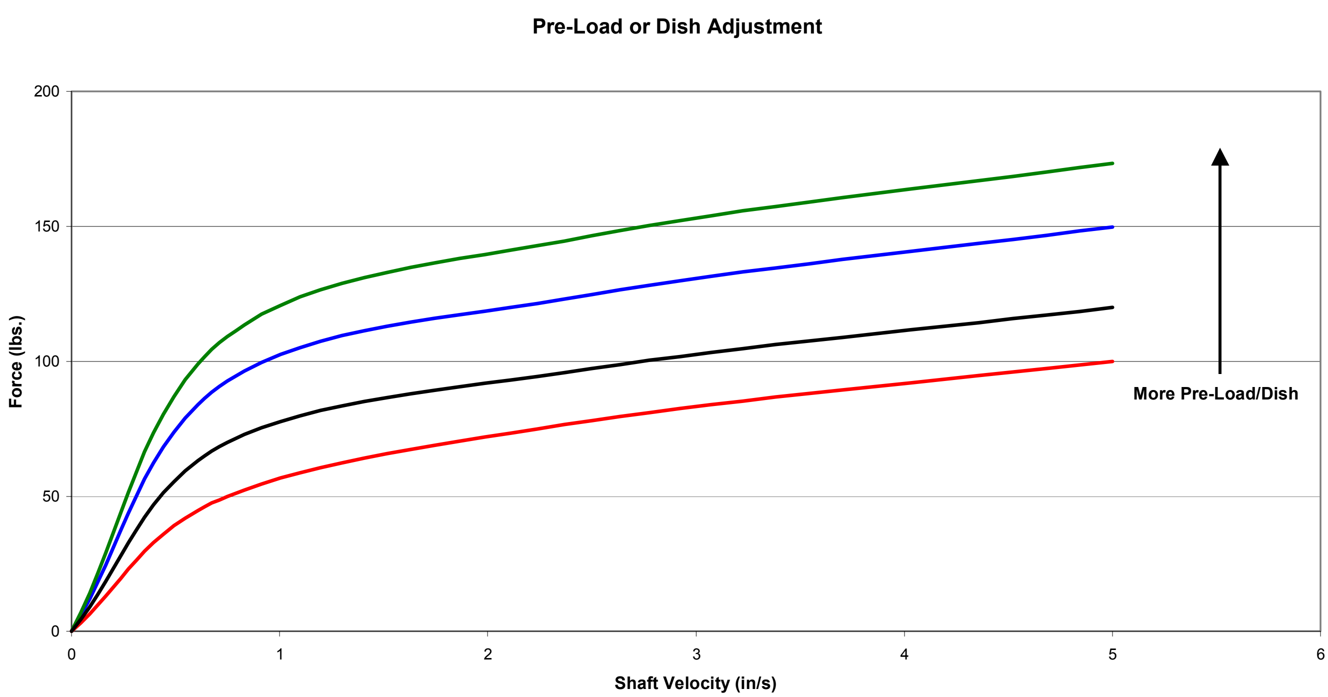
There are three major ways in which you can vary the damping produced by the main piston: Shim stiffness, shim pre-load and the amount of bleed past the shims. These graphs help to visualize the way in which the damping is affected by each of these changes.

Figure 1 shows the effect of changing the pre-load or dish on the pistons. Adding pre-load will create a lot more low speed damping. In compression, it will cause the tire to be loaded quicker and give a “snappy” feel. In rebound, it will help to tie the vehicle down and let it take a set quicker.

Figure 2 shows the effect of increasing the stiffness of the shim stack. Increasing the thickness of the shim stack (i.e., .004 to .010) stiffens the damping rate of the shock across the whole velocity range. While the other two adjustments only affect the lower shaft speeds, the shim stiffness is the best way to adjust damping at higher shaft speeds. The shims give the damping that chassis dynamics require.

Figure 3 shows the effect of adding bleed to the piston. Bleed is simply a low speed bypass for the shims and softens the shock at lower shaft speeds. This will improve the compliance of the chassis to the ground under low amplitude movements which can improve grip. It will give the driver a softer ride, but will let the chassis move more and take away support.

Figure 1



Damping Adjustments

Figure 2

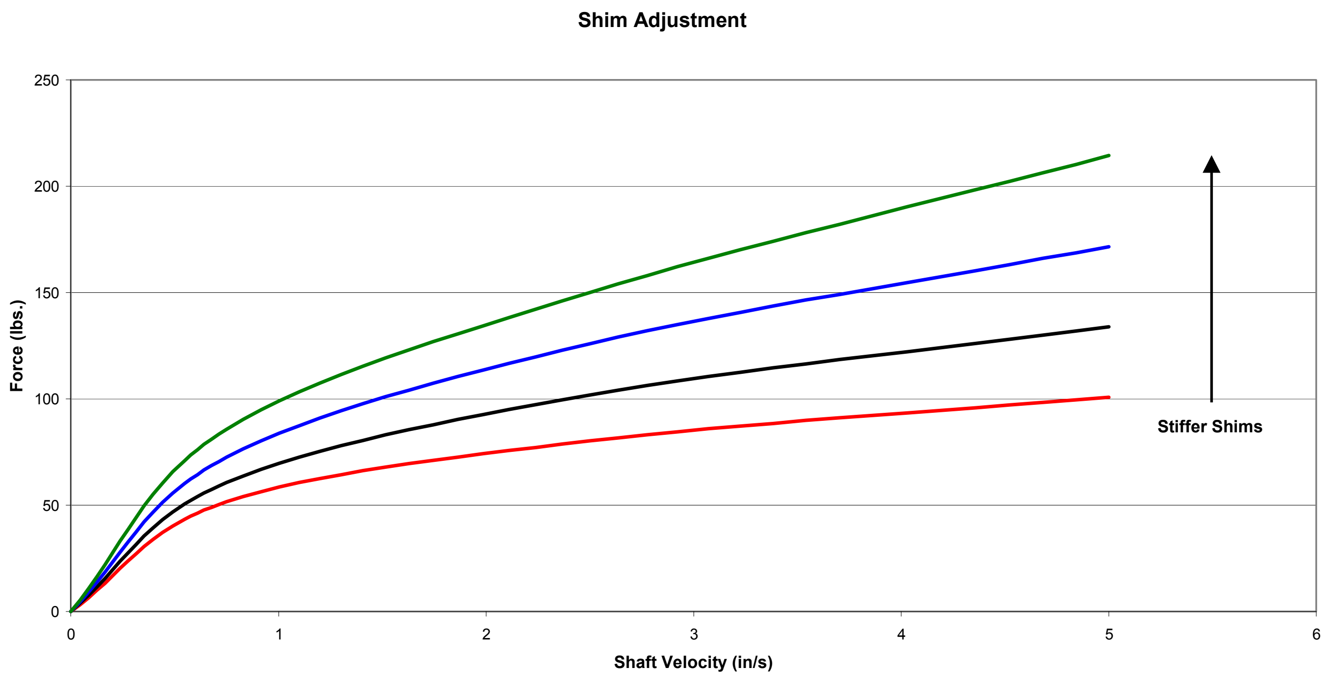
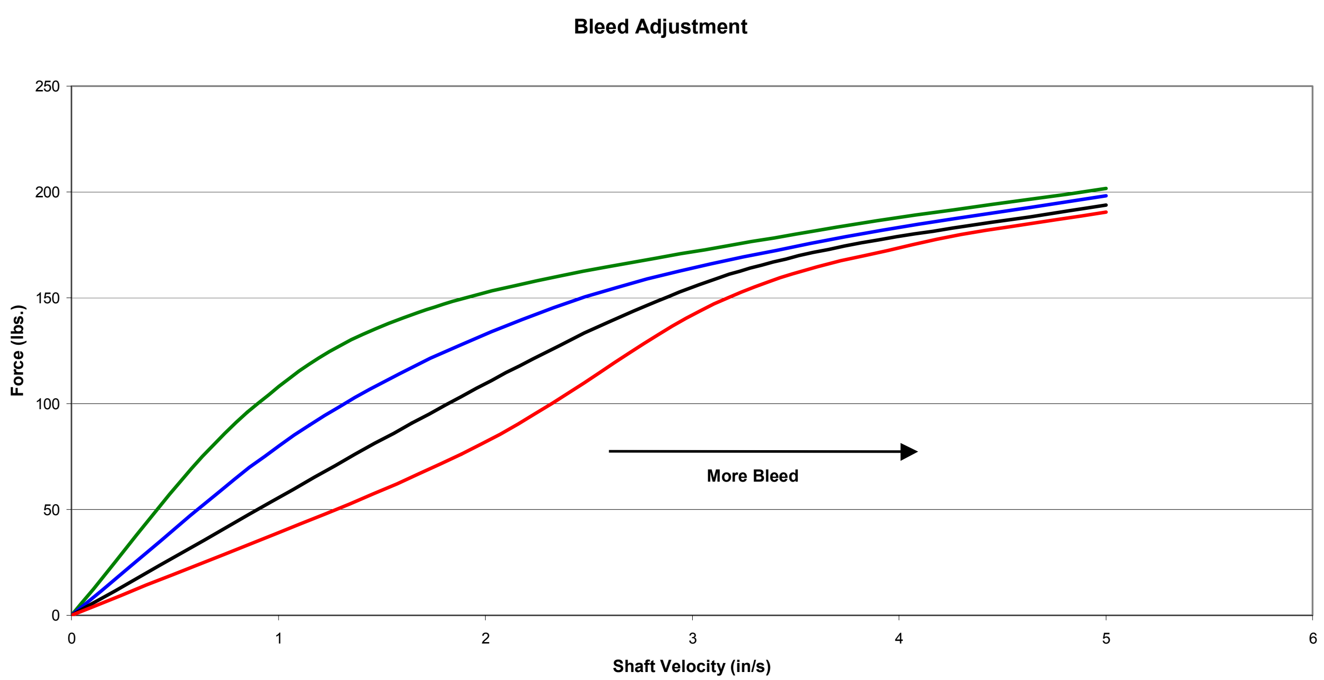
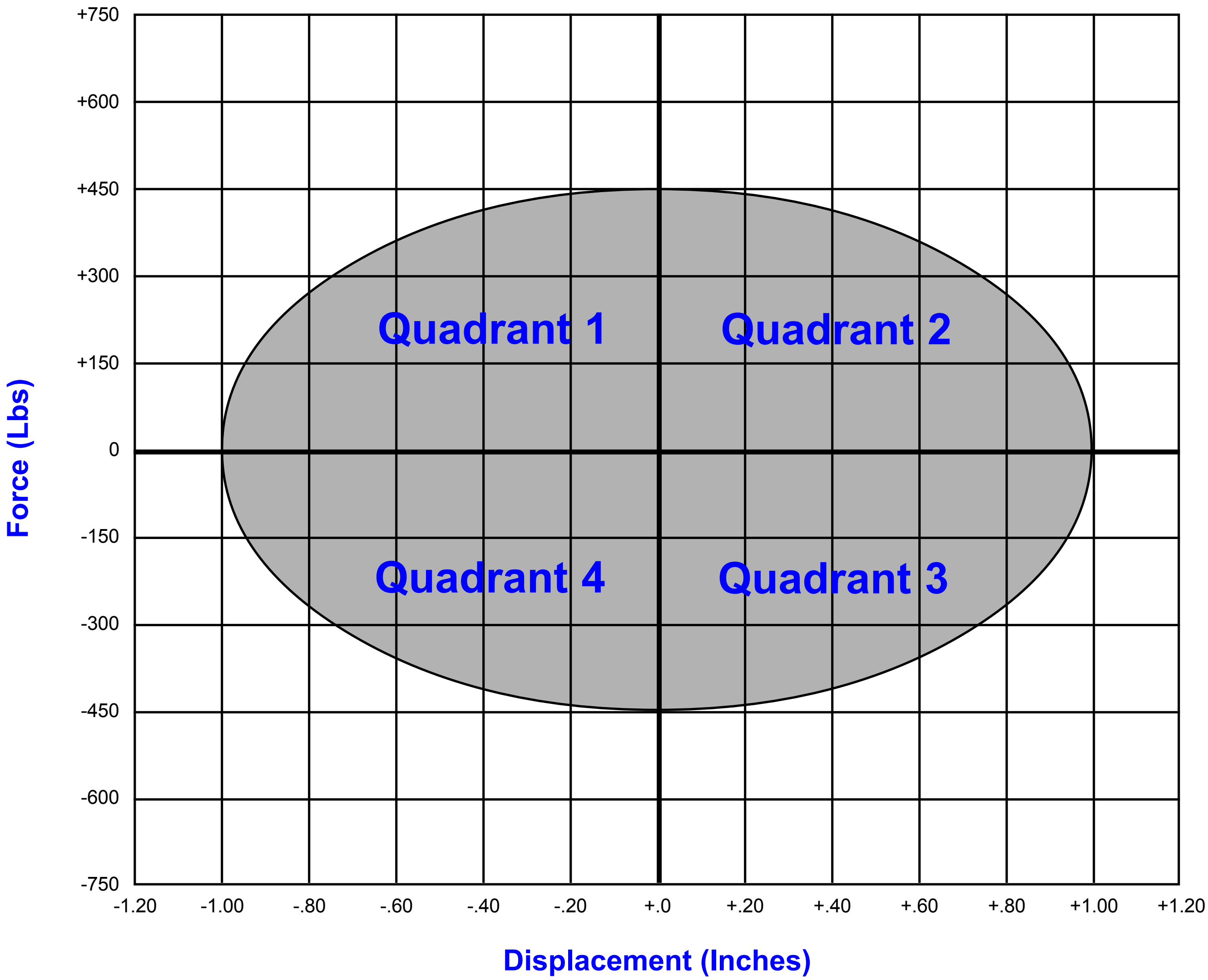


Figure 3

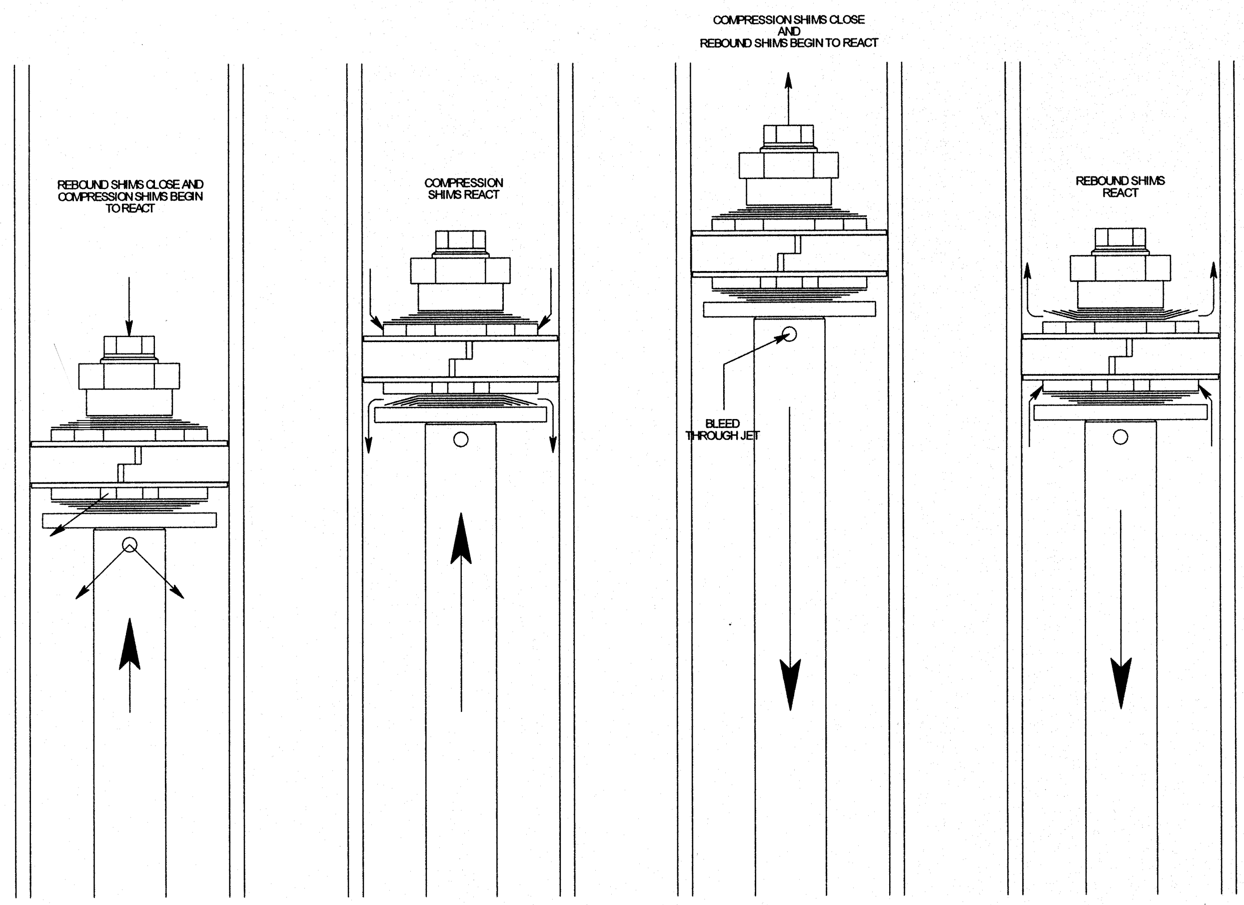


Dyno Graph Overview



This section of the manual illustrates different valving combinations in the form of graphs. The graph shown is force vs. displacement graph. The force vs. displacement graph is a very accurate and simple way to assess valving characteristics. If you are not familiar with this type of graph, it is explained on the following page along with the graph above, showing the four different quadrants.

Dyno Graph Overview



QUADRANT #1

This is the beginning of the compression stroke. Where the graph crosses the zero line (pounds) in quadrant #1 begins the compression stroke. Approximately the first 1/2" of displacement is formed with relation to the low speed bleed bypass. When the shaft reaches a certain velocity, the low speed bleed bypass shuts off and the compression valve stack begins to react.

QUADRANT #2

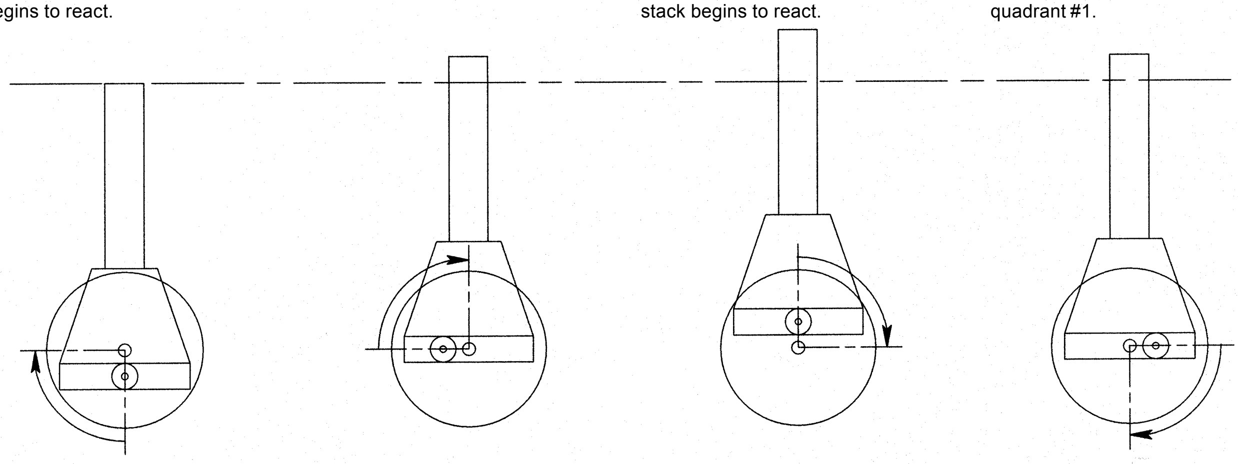
This quadrant begins with the compression valve stack open. Where the graph crosses the zero line (inches) in quadrant #2 is the maximum force produced by the compression valving. As the shock approaches the full compression point, the compression valve stack begins to close as it approaches the rebound movement.

QUADRANT #3

This quadrant begins with the shock at full compression and the compression valve stack closed. Where the graph crosses the zero line (pounds) in quadrant #3 begins the rebound stroke. Approximately the first 1/2" of displacement is formed with relation to the rebound bleed through the shaft and jet. When the shaft reaches a certain velocity, the bleed shuts off and the rebound valve stack begins to react.

QUADRANT #4

This quadrant begins with the rebound valve stack open. Where the graph crosses the zero line (inches) in quadrant #4 is the maximum force produced by the rebound valving. As the shock approaches the full extension point, the rebound valve stack begins to close as it approaches the compression movement. At this point the cycle starts over again in quadrant #1.



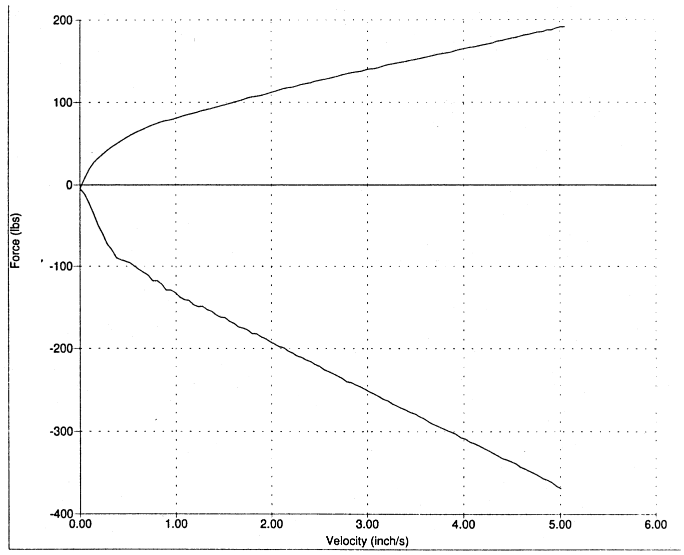
An easy way to help picture what is going on here is to relate the graph's shape to what the dyno is doing to the shock. The dyno uses a scotch yoke system (shown above), where the motor turns a crank and the sliding yoke allows the main dyno shaft to make the up and down movement at the preset stroke. The dyno software takes thousands of measurements throughout a single revolution of the crank. The sampled points are connected to form the graph. By relating the crank's position to the corresponding graph quadrant and the circular crank movement may help in reading the graphs.

Dyno Graph Overview

Custom Axis uses SPA Dynamometers because of its versatility and low speed metering and sample rates. Penske Shocks primarily uses the Force Average display, but SPA offers Decelerating CD/ Accelerating RD and Accelerating CD/Decelerating RD viewing options for all its graph displays.

Force / Velocity   Average

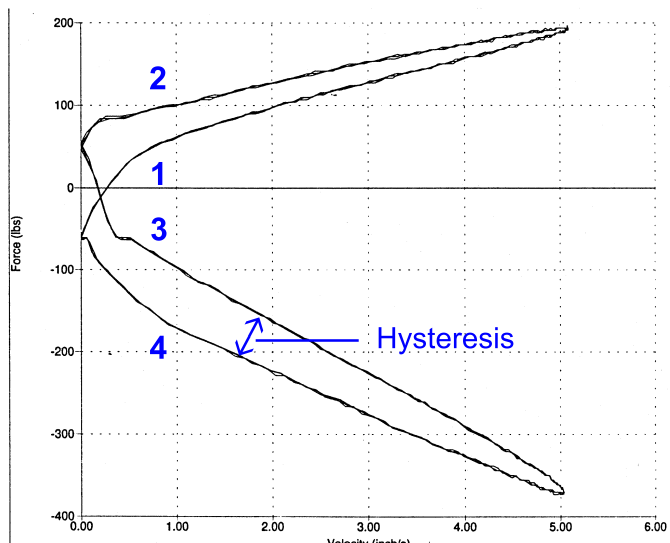
This graph shows the averages of the accelerating and decelerating compression and rebound forces. It is a good quick, general review of the shock curve, but is the least accurate of the options displayed.



Force / Velocity

This graph displays the accelerating and decelerating compression and rebound forces. Think of this graph as the Force / Displacement graph (below) folded in half.

* Hysteresis is the gap between accelerating and decelerating compression and rebound damping. It is affected by the type of piston, the shims used and the relative position of high and low speed adjusters. The bleed hole will close the gap or soften the low speed forces.



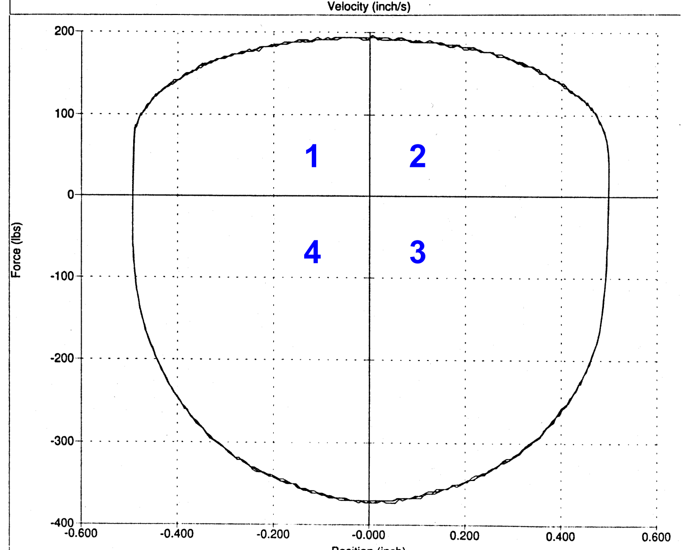
OVAL (Force / Displacement)

QUADRANT #1
This is the beginning of the compression stroke. Where the graph crosses the zero line (pounds) in quadrant #1 begins the compression stroke. Approximately the first 1/2" of displacement is formed with relation to the low speed bleed bypass. When the shaft reaches a certain velocity, the low speed bleed bypass chokes off and the compression valve stack begins to react.

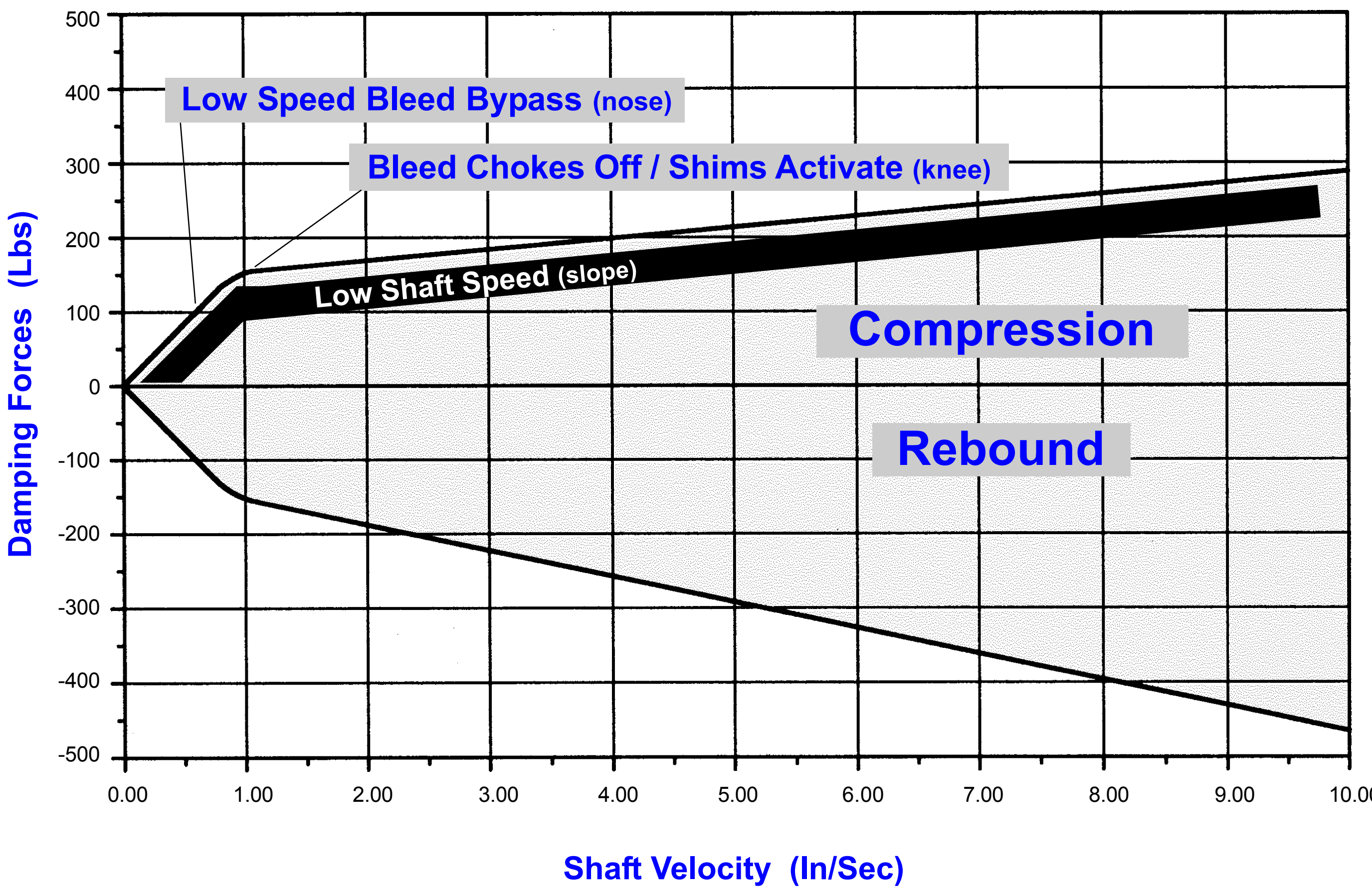
QUANDRANT #2
This quadrant begins with the compression valve stack open. Where the graph crosses the zero line (inches) in quadrant #2 is the maximum force produced by the compression valving. As the shock approaches the full compression point, the compression valve stack begins to close as it approaches the rebound movement.

QUADRANT #3
This quadrant begins with the shock at full compression and the compression valve stack closed. Where the graph crosses the zero line (pounds) in quadrant #3 begins the rebound stroke. Approximately the first 1/2" of displacement is formed with relation to the rebound bleed through the shaft and jet. When the shaft reaches a certain velocity, the bleed chokes off and the rebound valve stack begins to react.

QUADRANT #4
This quadrant begins with the rebound valve stack open. Where the graph crosses the zero line (inches) in quadrant #4 is the maximum force produced by the rebound valving. As the shock approaches the full extension point, the rebound valve stack begins to close as it approaches the compression movement. At this point the cycle starts over again in quadrant #1.



Dyno Graph Overview



Note: Remember that low speed damping characteristics are controlled by bleed through the low speed adjuster and the bleed hole in the piston, not the valve stacks.

Notes