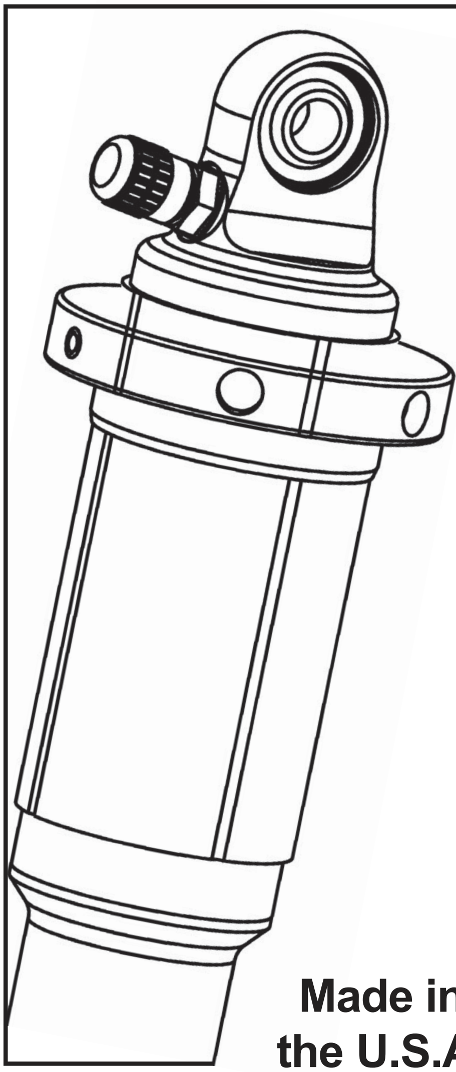
Congratulations on your new purchase of 7800 Series Shock. Each shock is equipped with the same quality, high performance components found in every Penske Racing Shock. They were designed and hand built after extensive development specifically for Quarter Midget cars.

This manual contains information about your shocks. If you have any questions regarding your 7800 Series Shocks, please contact us at 610-375-6180.

Best Regards,

Jeff S. Ryan
V.P. / General Manager
Penske Racing Shocks

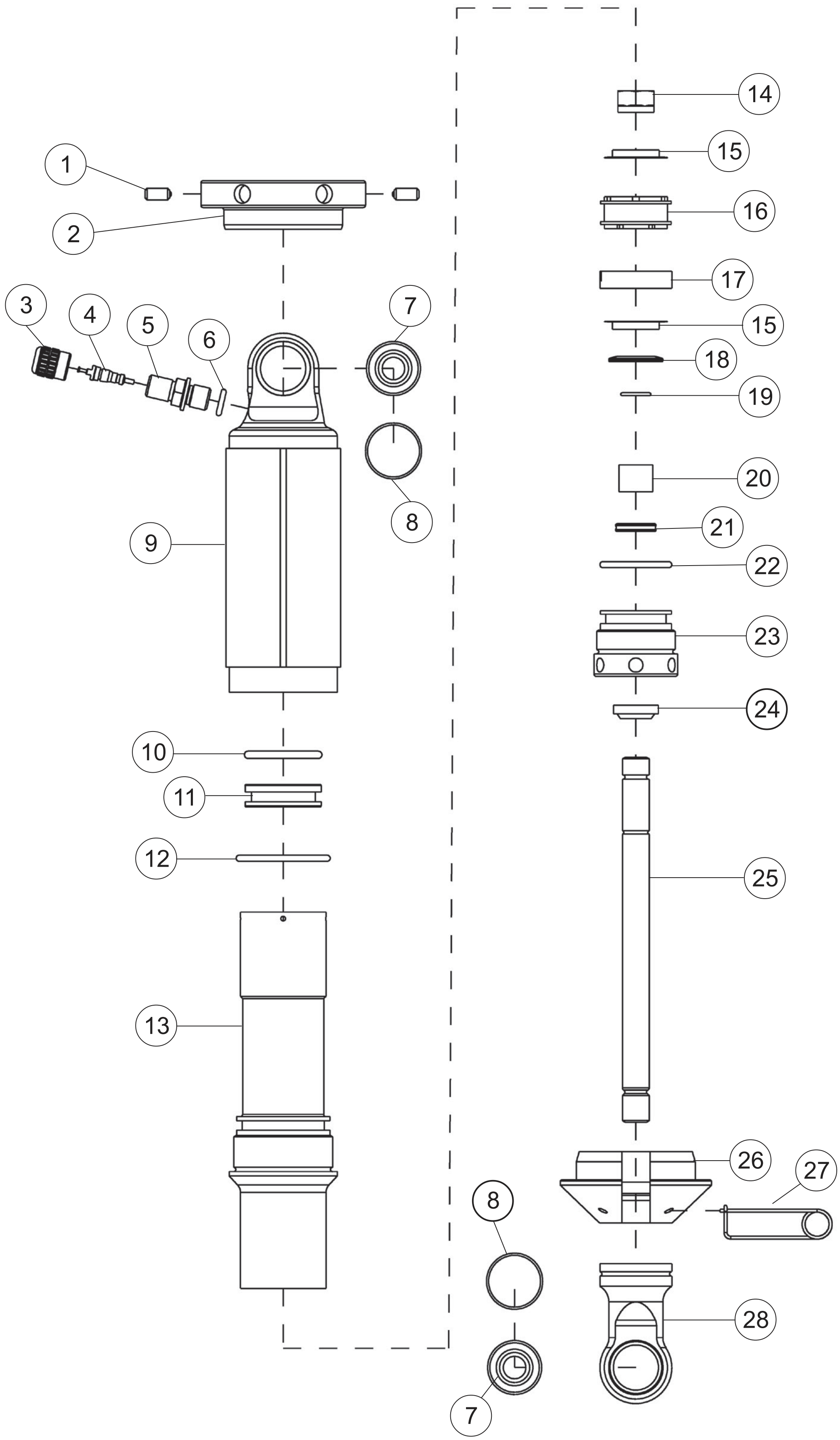
Table of Contents



Made in the U.S.A.

REV: 10/04/05

7800 Series Parts List

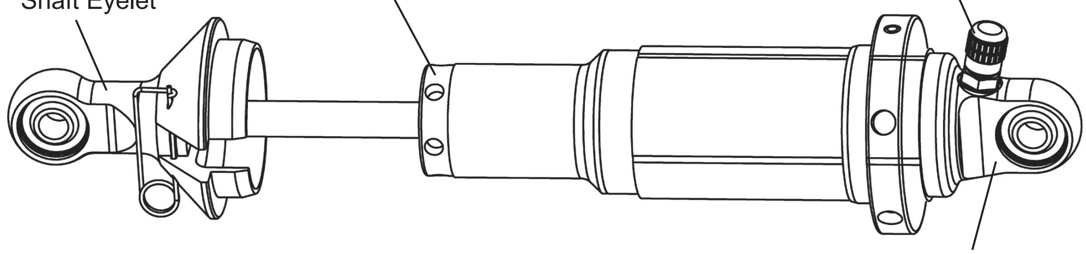


7800 Series Parts List

ITEM NO.	PART NO.	DESCRIPTION
1	SC-50	Screw, Ball Plunger
2	RH-78175	Ride Height Adjuster, 7800, 1.75"
3	IU-06	Valve Cap, High Temperature
4	IU-04	Valve Core, 2000 psi
5	IU-22-S	Air Valve, Port O-Ring, S.S.
6	OR-2010-B	O-Ring, 2-010, Buna 70 Duro
7	MO-5	Mono Ball, .312" ID X .375" W
8	RR-75	Retaining Ring, .783" OD, VH-75
9	BC-78	Body Cap, 7800
10	OR-2117-B	O-Ring, 2-117, Buna 70 Duro
11	PI-78	Floating Piston, 7800 SERIES
12	OR-2122-B	O Ring, 2-122, Buna 70 Duro
13	BD-78250	Body, 7800, 2 1/2" Stroke
14	NT-375R	Ring Nut, .375" X 16
15	VW-	Valve Shims
16	PI-110025	Piston, 1°/1°, 0 Bld, 25mm
17	PB-25	Piston Band, 25mm (1.00")
18	VW-7800	Top Out Plate, 7800
19	RR-37	Wire Ring, .043" Wire Dia. X .375" ID
20	BU-06DU06	Bushing, DU .375" X .375"
21	OR-2110-V	O-Ring, 2-110, Viton 90 Duro
22	OR-2206-B	O-Ring, 2-206, Buna 70 Duro
23	SB-78	Shaft Bearing, 7800
24	SL-375	Shaft Wiper, 3/8" Shaft Bearing
25	SH-78NA250	Shaft, 7800 Non-Adj., 2 1/2" Stroke
26	SR-78175	Spring Retainer, 7800, 1.75"
27	RR-46	Retaining Pin, 7800 Spring Retainer
28	EY-78NA	Eyelet, 7800, Non-Adjustable

TOOLS AND ACCESSORIES		
	KT-78SHIMS	Shim Kit, 7800 Series
	TL-78SC	7800 Shaft Clamp
	TL-78W	7800 Bearing Wrench

Disassembly / Assembly Instructions



Disassembly Instructions

1. **Depressurize** the shock.
2. Clamp the body cap eyelet in the vise with the shaft eyelet pointing up.
3. Unscrew the shaft bearing assembly from the shock body and remove the shaft assembly using a Penske bearing wrench (part number TL-78W)
4. Drain the oil, when needed. Please dispose of properly.
5. Clamp the shaft eyelet in the vise with the piston pointing up.
6. Remove the 1/2" ring nut to access valving.

Assembly Instructions

1. Install shaft bearing. Be sure to grease seals and o-rings to prevent any damage.
2. Reinstall eyelet. Use Red Loctite on eyelet threads and tighten securely.
3. Reassemble the shaft, be sure that the piston is properly positioned. With the shaft still in the vise, the compression valve stack is on the bottom of the piston and the rebound on the top. Bleed holes are on the rebound side (facing ↑)
4. Torque 1/2" ring nut to 150 in•lbs.
5. Pressurize body to 50 psi. Fill body with oil*, stopping at lower threads.

   **Penske Suspension Fluid (Silkolene Pro RSF 2.5 wt.) is recommended. Use of alternate fluids may have an adverse effect on the damper's internal sealing components.*
6. Insert shaft assembly with piston band into body. Move piston assembly up and down slowly (1"-2" strokes) to extract all air. DO NOT pull piston assembly out of the oil at this time.
   NOTE: *this step is very important; take your time, repeat as needed.* When all air is bled out, slide the shaft bearing down and screw it into the body until it is snug. **Let the pressure out of the shock and finish tightening the bearing. (DO NOT OVER TIGHTEN).**
7. With the shaft fully extended, charge shock with desired pressure.
   (DO NOT EXCEED 150 PSI)

Replacing the Shaft Bearing Seals / Eyelet

1. Remove eyelet from shaft using a shaft clamp (Part number TL-78SC)
2. ONLY REMOVE SHAFT BEARING OVER EYELET THREADS.
3. Replace seals and wiper if needed.

Continue following steps 1 through 7 in the Assembly instructions above.

Specifications

Ring nut, 150 in•lbs

Eyelet to Shaft, (Red Loctite)

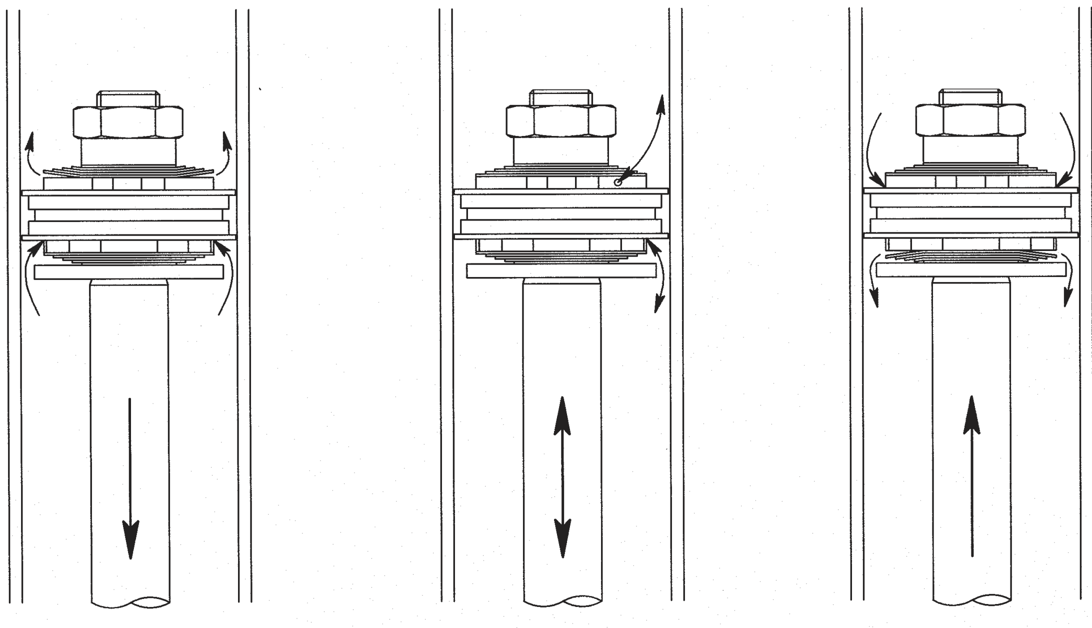
Suggested Maintenance

Shocks should be serviced yearly by an authorized dealer or Penske Racing Shocks.

Trouble Shooting

LOSS OF NITROGEN PRESSURE	Valve core is not tight or needs to be replaced, o-ring on air valve needs to be replaced
OIL LEAK AROUND SHAFT.........................	Shaft seal o-ring or wiper needs to be replaced. ***Note: minimal oil seepage is normal.***
OIL LEAK BETWEEN SHAFT BEARING AND BODY	Shaft bearing o-ring needs to be replaced.

General Valving Characteristics



High Speed Rebound | **Low Speed* Compression and Rebound** | **High Speed Compression**

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 “3” compression valving, where all the shims in the stack are .XXX thick and you replace them with a “4” compression valving, which consists of all .XXX thick shims, the compression damping will increase.

* When the shaft is moving very slowly oil passes through the bleed hole(s), if there is one, before it passes to the shims.

A Guide To Damper Tuning

The ultimate purpose of a shock is to work together with the spring to keep the tire on the track. In compression (bump) to help control the movement of the wheel and in rebound to help absorb the stored energy of the compressed spring.

Usually in low grip situations allowing more bleed or less low speed damping is desirable to delay tire loading upon initial roll.

In dry high grip conditions adding damping or restricting bleed will load the tire sooner upon initial roll increasing platform stability.

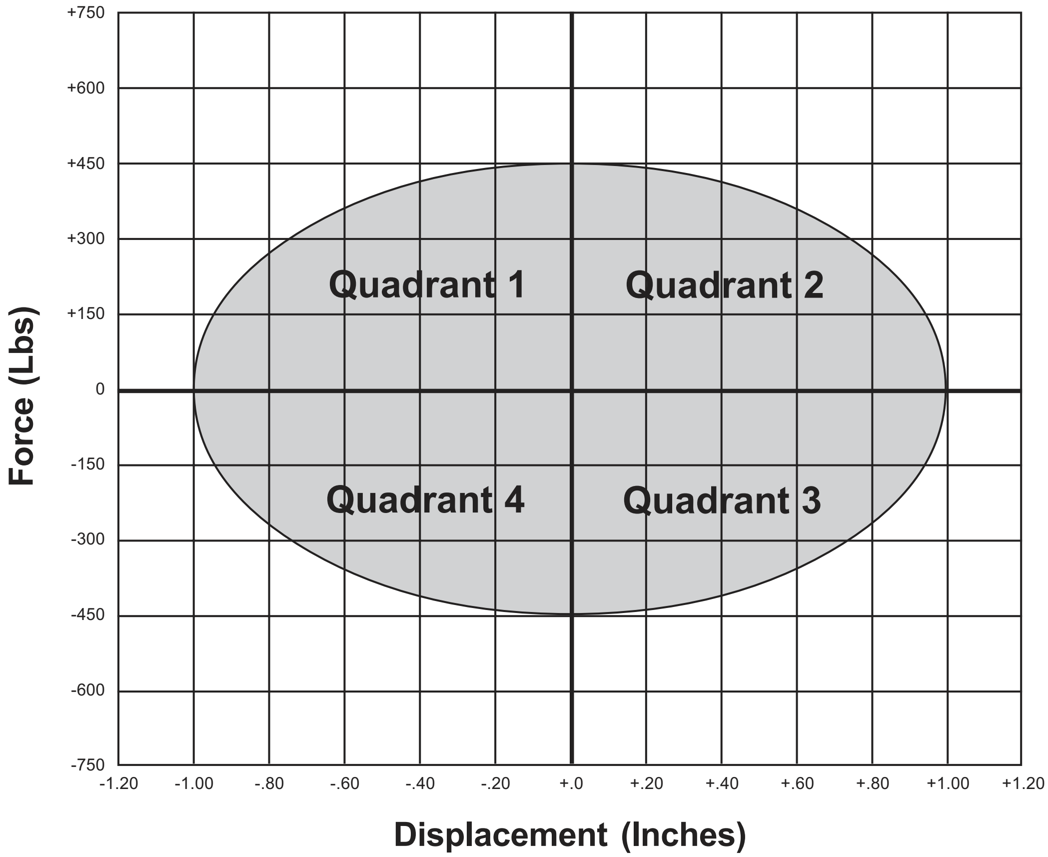
A car with too much low speed damping will usually lack grip in change of directions, cannot put power down in slower corners (wheel spin) and lack overall grip after initial turn in.

If traction is a problem coming off slow corners, reducing low speed damping or adding more bleed will help weight transfer at the rear thus increasing traction.

Also, the amount of rebound can have a great influence on weight transfer. Less front rebound allows weight transfer to the rear under acceleration. Less rebound in the rear allows for a greater amount of weight transfer to the front under braking and turn in.

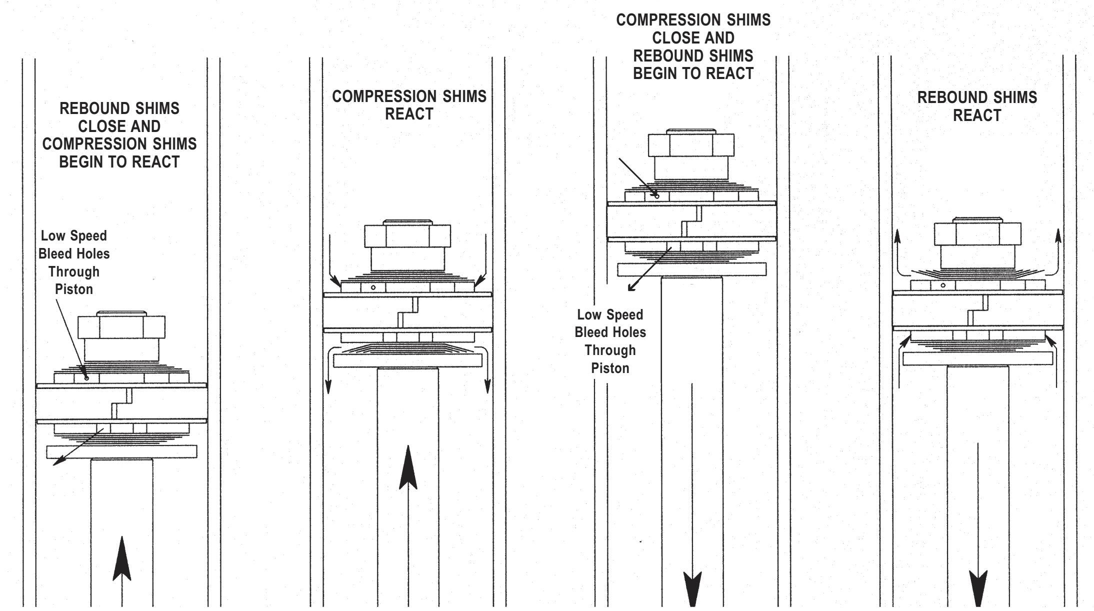
When a shock is over damped in rebound it can pack down in a series of bumps and a driver will recognize this as too stiff and usually will think it is compression damping. Too much rebound can cause lack of grip on cornering.

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 holes. When the shaft reaches a certain velocity, the low speed bleed holes shut off and the compression valve stack begins to react.

QUADRANT #2

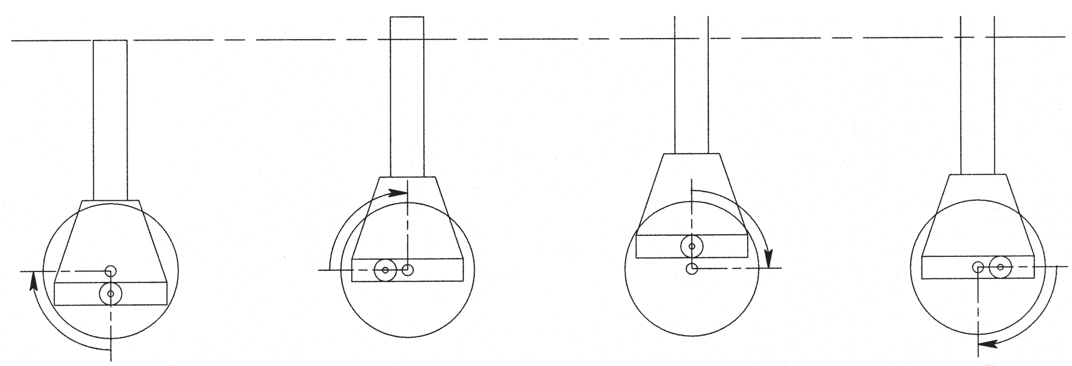
This quadrant begins with the compression valve stack open. Where the graph crosses the zero line (inches) in quadrant #2 is the maximum force produced by the compression valving. As the shock approaches the full compression point, the compression valve stack begins to close as it approaches the rebound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



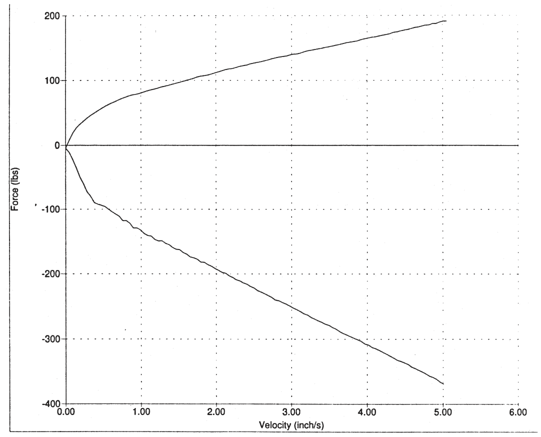
An easy way to help picture what is going on here is to relate the graph's shape to what the dyno is doing to the shock. The dyno uses a scotch yoke system (shown above), where the motor turns a crank and the sliding yoke allows the main dyno shaft to make the up and down movement at the preset stroke. 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

Penske Racing Shocks 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

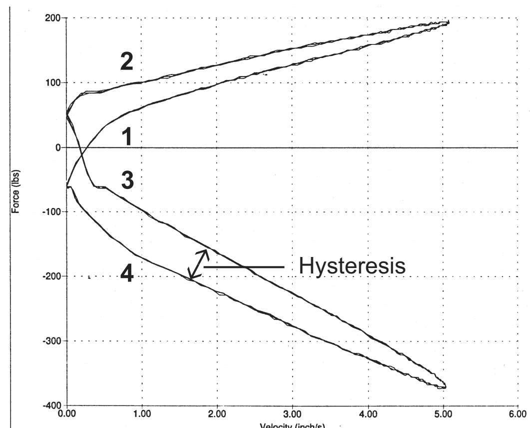
This graph shows the averages of the accelerating and decelerating compression and rebound forces. It is a good quick, general review of the shock curve, but is the least accurate of the options displayed.



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 and the shims used. The bleed hole(s) will close the gap or soften the low speed forces.



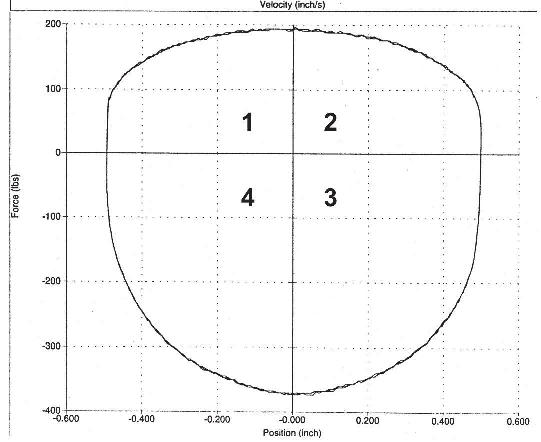
OVAL (Force / Displacement)

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 holes choke off and the compression valve stack begins to react.

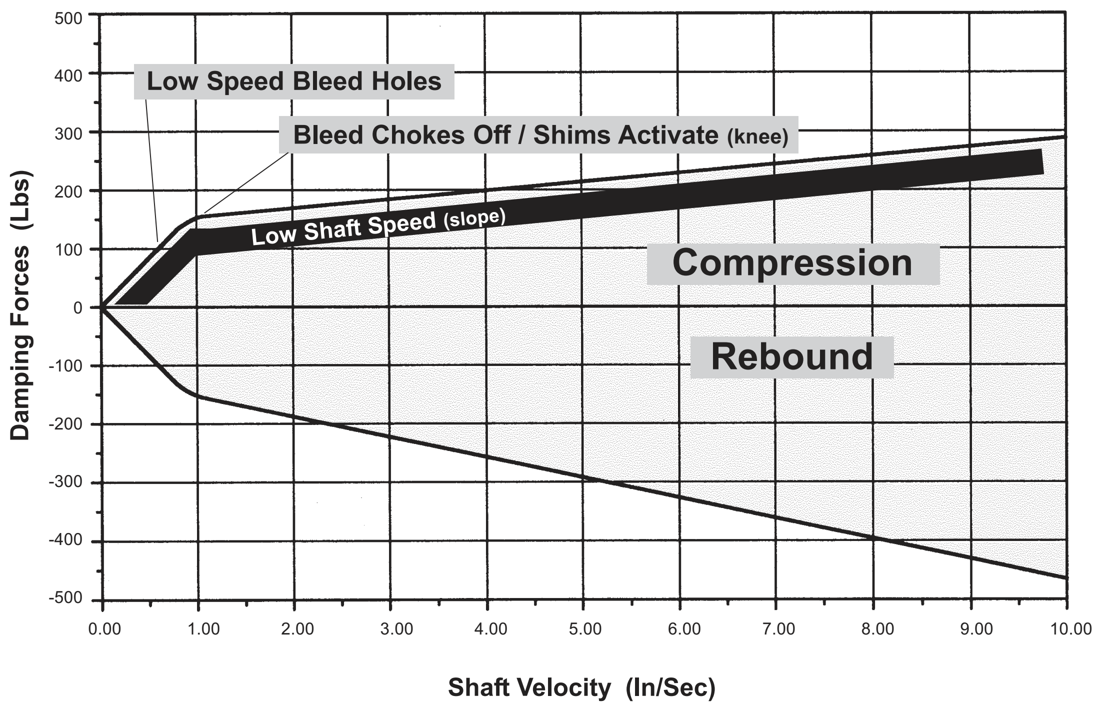
QUADRANT #2
This quadrant begins with the compression valve stack open. Where the graph crosses the zero line (inches) in quadrant #2 is the maximum force produced by the compression valving. As the shock approaches the full compression point, the compression valve stack begins to close as it approaches 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 piston. 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 bleed hole(s) in the piston, not the valve stacks.

Notes