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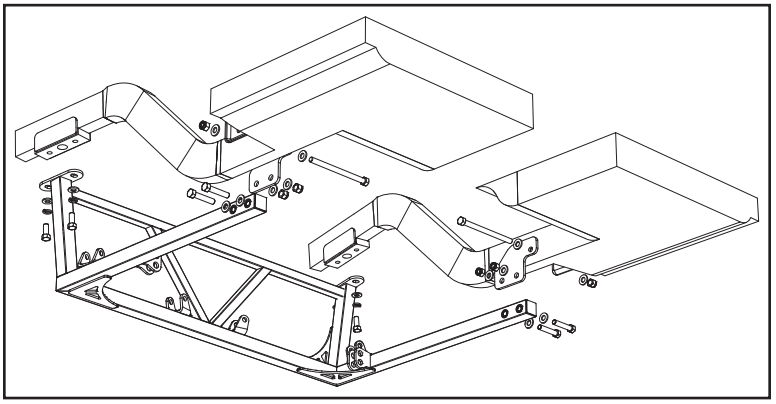
Laydown Shock Rear Pushrod Suspension System with FAB9™ Direct Fit Housing for '64-'70 Mustangs and Cougars

Rear Pushrod Suspension System

The TCP Rear Pushrod Suspension System enables dramatically improved handling performance for Classic Mustangs and Fords in a high-tech, self-contained package. The original leaf spring suspension relies heavily on the springs to handle rear end housing movement in six-directions as well as torque reactions during acceleration and braking. We've replaced the leaf springs with double-adjustable VariShock™ coil-over shocks, tubular trailing arms, watts link assembly, and heavy-duty torque arm. This separation of control jobs to individual components enables a superior level of positioning and geometry accuracy. The result is consistent, predictable handling suitable for the most demanding of performance applications. Additional benefits include significant improvement to chassis rigidity and extremely precise tuning adjustments such as ride height, wheel base, housing alignment, instant center, pinion angle, shock valving, as well as a choice of spring rates. High quality construction combined with a wide range of adjustments make this system equally at home on the street, strip, or road course.

Installation

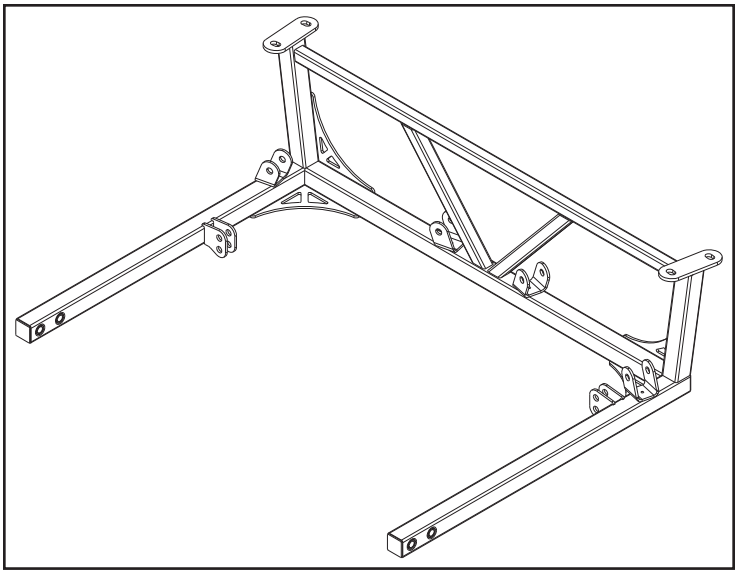


Our engineers paid particular attention to simplifying the installation by employing a detachable clip assembly similar to systems used on modern race cars. Our tubular subframe connectors along with four mounting brackets are welded directly to the chassis. Existing factory mounting locations serve as index features to accurately position the mounting brackets and subframe connectors without risk of incorrect measurements or installer error. The rear clip assembly and subframe connector support are then bolted securely to the mounting brackets and weld-in subframe connectors. The remaining suspension components simply bolt to existing mounts on the rear clip assembly, subframe connector support, and rear end housing. To guide you through each step of installation, setup, and fine tuning, a detailed, illustrated instruction manual is provided with each kit.

Exhaust Installation

Use of the TCP Rear Pushrod Suspension System will require a custom exhaust installation. Up to 3" diameter exhaust tubing can be used without modification to the floor pan or installed components. Side exhaust systems must be routed underneath the rear portion of the subframe connectors and should use oval tubing or 'boom tubes' to maximize ground clearance. Rear exit systems should be routed over the rear end housing and through the clip assembly above the shocks.

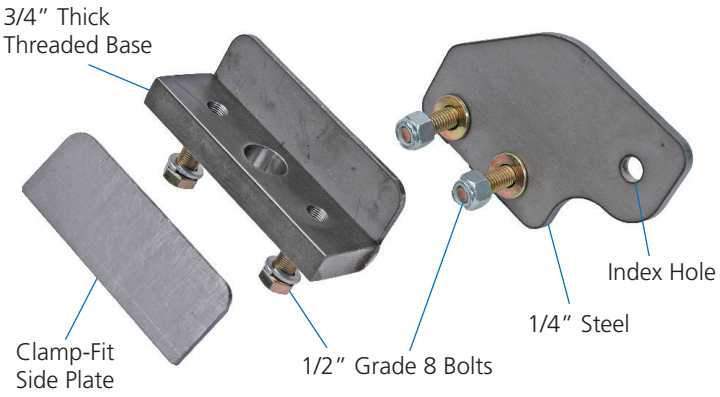
Rear Clip Weld Assembly



The main structural component of the system is the rear clip welded assembly. It has been designed to handle vertical and lateral suspension forces, as well as increase torsional rigidity of the chassis. In order to provide a stable platform for the shock, rocker, and watts link mounts, load bearing lengths of the clip are constructed using 1-1/2" x .120" wall square steel tubing. A diagonal truss bracing structure, made of 1" x .120" wall square tubing, effectively reinforces the shock mounting area and provides the majority of lateral support for loads transmitted through the watts link tubes. The lower corners of the clip are further strengthened by 3/16" thick sheet metal gussets. Each piece of tubing is capped to improve torsional strength and to prevent moisture from entering the assembly. Vertical uprights are fitted with stout 1/4" thick mounting plates with slotted holes to allow for chassis variances during installation. Clip frame rails are capped at their leading edge and fitted with two bolt sleeves to prevent the tube from collapsing when mounting hardware is tightened.

Mounting Brackets

The rear clip assembly is secured to the vehicle by four mounting brackets that must be welded to the chassis. Forward brackets are positioned by the front leaf spring mounting bolt, then welded along the inside edge of the factory frame rail. Rear upright brackets are shipped as two separate components; a welded base-to-side plate assembly, and a separate loose side plate. The mount bases are a stout 3/4" thick to provide sturdy thread engagement for the clip mounting bolts. During installation a clamp is used to sandwich the factory frame rail between the base assembly and loose plate. This ensures a perfect bracket fit and eliminates the possibility of filling gaps around the bracket when welding. The clip assembly is secured to the welded chassis brackets by eight 1/2" Grade 8 bolts.



Laydown Shock Configuration

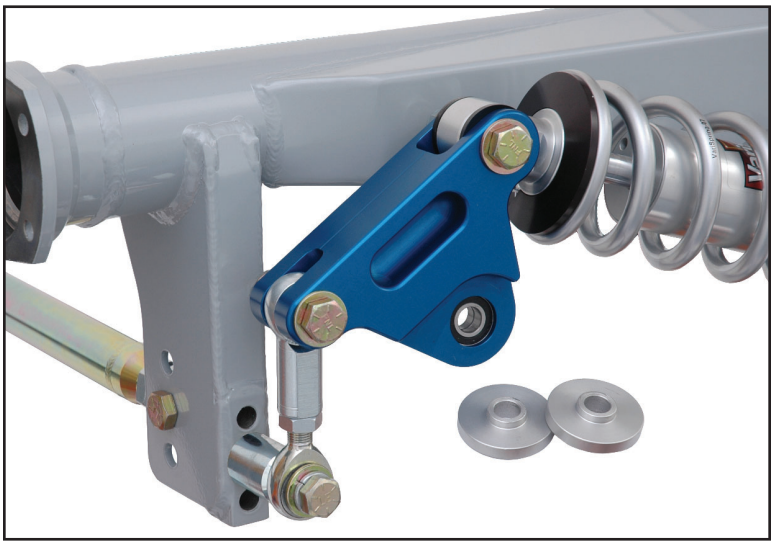
The most eye-catching feature of the system is the pushrod, rocker, and shock arrangement. This configuration enables vehicle corner balancing and over two inches of ride height adjustment without affecting the designed travel balance of the shocks.

Adjustable Length Pushrods

Adjustable length, rod end assemblies make up the pushrods mounted to the rear end housing axle brackets. Pushrods can be fastened in one of three ride height positions (one, two, or three inches below stock) and can also be adjusted for length within a 1/2" range. Rod ends are high strength 4130 Chrome-moly and feature Teflon® bearing races for quiet operation and extended service life.

Roller Bearing Rockers

As the rear end housing moves, the pushrod rotates the rocker, compressing the coil-over shock. The rocker uses increasing rate geometry to improve ride quality without sacrificing performance potential. Rocker bodies are CNC machined from 6061-T6 aluminum and feature a full width outside bridge and closed weight reduction pockets for maximized strength with minimal deflection. Dual sealed roller bearings are contained in each rocker body and held in place by a retaining ring. Specially machined aluminum spacers sit on each side of the bearing stack to further protect the bearings and extend service life.



Double-Adjustable VariShocks™

The VariShock™ coil-over features separate 16-position compression and rebound valve adjustments enabling a wide range of tuning capabilities. Adjustment knobs are easily accessible at the base of the shock and allow adjustments to be made by hand in just a few seconds, without removing or unbolting the shock. "Deflective Disk Valving" is used to regulate shock fluid transfer. This method eliminates spring fatigue and the resulting reduction of adjustment range and effectiveness commonly found in competitors products. Piston rods are made from 5/8" centerless ground hard chrome steel for wear resistance and long service life. Shock mounting eyes are fitted with premium urethane bushings with up to 350% more material and higher load capacity than common poly bushings. A unique, one-piece, locking lower spring seat makes pre-loading the spring to achieve correct shock travel balance quick and simple. Two spring-loaded ball bearings (ball locks) seat into grooves machined through the threads on the reservoir body. During adjustment an audible click indicates one-half turn has been completed. This makes it very easy to equally adjust travel balance at each shock. Once adjusted correctly, a simple turn of an allen wrench at each set screw locks the bearings into their grooves. VariShock™ coil-overs are also rebuildable in the event they are ever damaged.

High-Travel VariSprings™

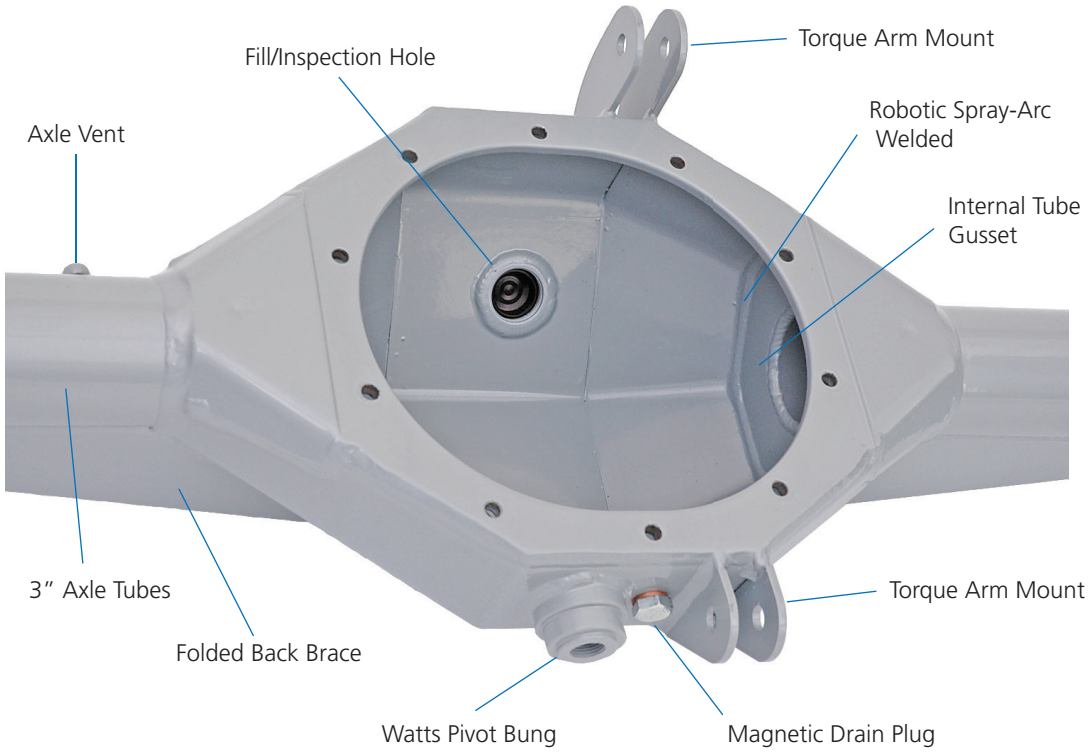
The VariSpring™ line of springs was specifically designed to compliment the VariShock™ line of coil-over shocks. VariSprings™ use a new high tensile wire, stronger than chrome-silicon wire used by other manufacturers. This material improvement allows the springs to compress until the coils touch without damaging the spring or causing it to 'take a set'. The additional usable travel enables a smaller, lighter weight spring, with greater travel than a comparable spring of the same rate. Available spring rates range from 185 lb/in to 450 lb/in with steps between rates sufficiently close to make very fine adjustments in vehicle cornering balance and ride quality. A variance of ±3% is maintained for all spring rates, well below the ±10% range commonly found. Springs are finished in silver powder-coating and labeled with part number and spring rate for easy reference.

Part Number	Length (in.)	Rate (lb/in.)	Travel (in.)
VAS 21-09185	9	185	5.71
VAS 21-09210	9	210	5.64
VAS 21-09240	9	240	5.57
VAS 21-09275	9	275	5.46
VAS 21-09310	9	310	5.57
VAS 21-09350	9	350	5.17
VAS 21-09400	9	400	5.07
VAS 21-09450	9	450	4.90

FAB9™ Direct Fit Housing

Chassisworks FAB9™ housing offers exceptional strength, performance, reliability, and adjustability with a simple, direct-fit installation. Finite element analysis software was used to create a fabricated 9" (FAB9™) center section stronger yet lighter than its OEM counterpart. Angular panels, internal gussets, and a heavy wall front face are assembled by a robotic spray-arc welder to ensure every housing is built to exacting standards. Axle tubes are 3" in diameter and welded along the internal tube gusset as well as the tapered edge of the center section. Tying the center section and axle tubes together are the folded back braces, exact fit boxed structures spanning from the outer edge of the back panel to the inside edge of the axle mounts. Their tapered design is broad closest to the center section for maximum support and narrows toward the housing ends for lighter weight. It is the enclosed chambers at each end of the center section and along the backside of the axle tubes that give the entire assembly superior strength over any other housing design.

Housings ship as an uncoated welded assembly, complete with torque arm mounts, watts pivot bung, multiple position trailing arm and pushrod mounts, folded back braces, axle tube vent, and big bearing late Ford Torino housing ends. Housings are available in stock widths of 51.75" (57.25" wheel-to-wheel) and 53.75" (59.25" wheel-to-wheel with 1/4" thick hats). Standard priced FAB9™ housings are constructed from mild steel but can be upgraded to 4130 chrome-moly for an additional charge.



Torque Arm

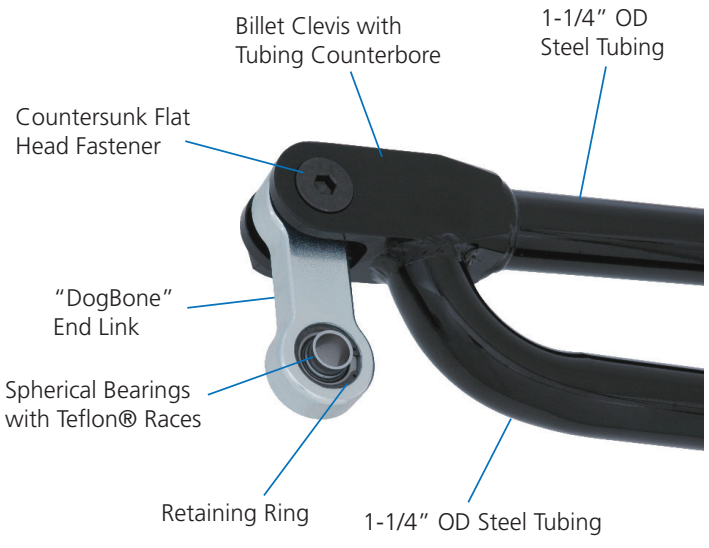
The TCP Torque Arm is a bolt-on, pinion angle adjustable, traction device that can be used with our rear pushrod or factory leaf spring suspension systems. Similar to traction bars, the arm converts torque to downward force at the tires, but has the benefit of providing improved traction during both straight line and cornering acceleration.

How it Works

The arm is mounted at three points; a swiveling connection at the connector support, and two solid mounts at the rear end housing. As torque is applied to the rear wheels, the arm (now fixed to the housing) rotates to push upward at the chassis mount while simultaneously pushing downward onto the wheels. Downward force creates additional traction that is equally distributed to each tire regardless of current body roll or suspension travel state. The arms rigid construction and extremely stable mounting points provide instant torque control. As a result, throttle response and acceleration are immediate due to an increase in available traction and lack of leaf spring "wrap-up," a common source of wheel hop.

DogBone Spherical Bearing End Link

Traditional torque arm front mounting methods are subject to bushing and fastener wear. Generally, they do not allow for side-to-side movement, relying on flexing of the arm to compensate for binding. Consequently, a torque arm cannot be mounted solidly to the chassis. Our unique DogBone end link was created to securely anchor the torque arm to the subframe connector support. The DogBone features dual spherical bearings with high strength, wear resistant, Teflon® races. The bind-free mounting link enables the arm to act against vertical loading with movement in all directions for suspension travel, body roll, and roll steer.

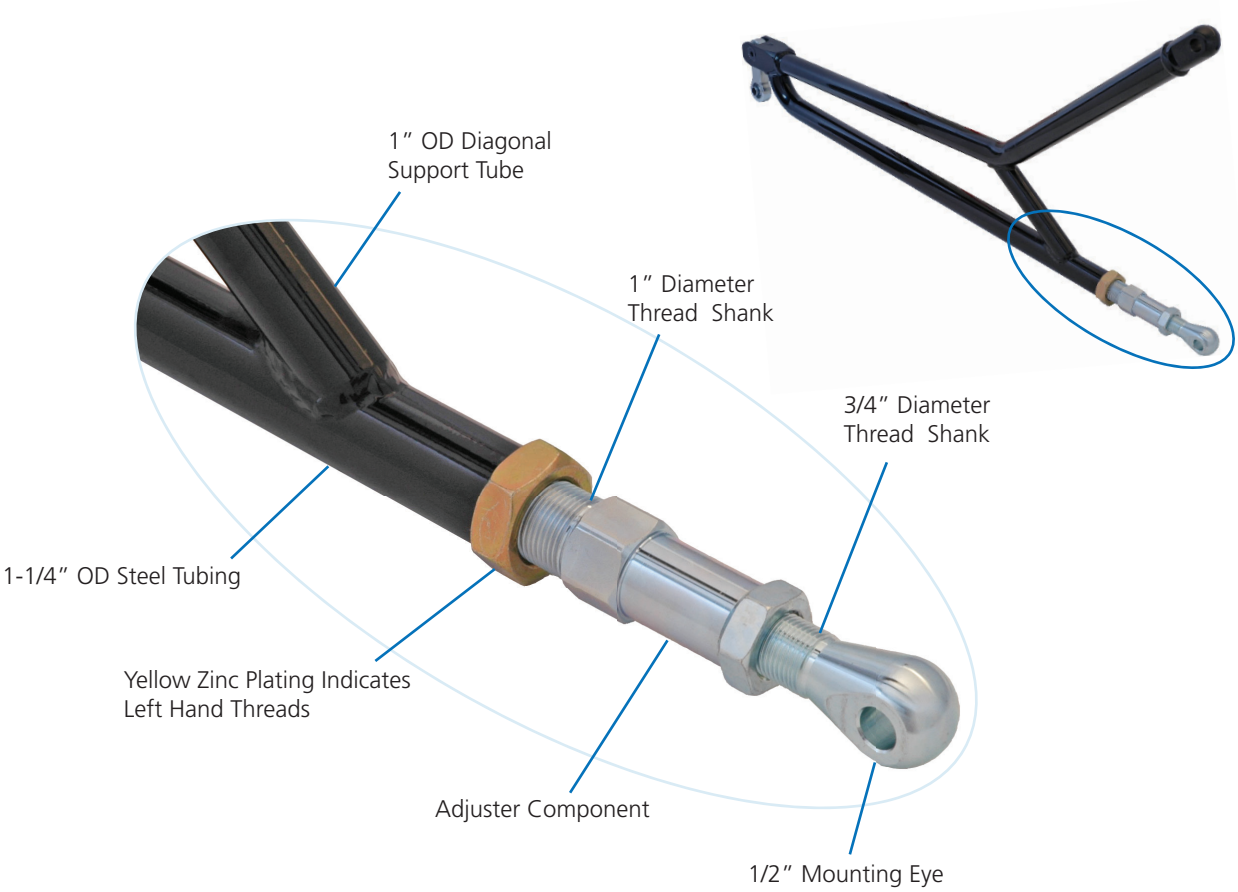


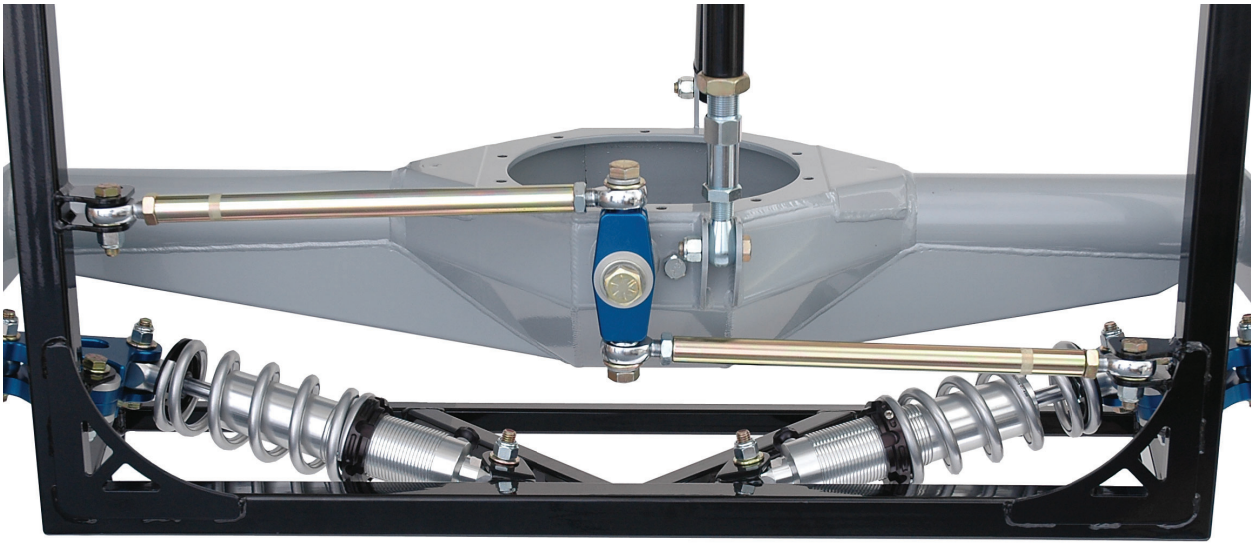
Construction

The torque arm is constructed from 1-1/4" x .156 wall, round tubing. The design features an angled tubular brace to minimize flex at the underbody clearance bend of the upper tube. Tubes and billet end mounts are robotic spray arc welded for consistent, maximum weld penetration. A strong yet ductile structure is created to safely withstand continuous bending forces. The torque arm and all supporting hardware are powder-coated or zinc plated for corrosion resistance.

Pinion Angle

The addition of a torque arm provides significant pinion angle related benefits. The range of dynamic pinion angle change is greatly reduced from acceleration to deceleration. Also, a means to precisely adjust pinion angle is enabled. Only 1-1/2 to 2 degrees of negative pinion angle is required versus 4 to 7 degrees when relying on leaf springs for torque control. The drive line remains closer to its ideal, most efficient position at all times. A double-adjustment coupler located along the lower arm tube provides a simple means of precise pinion angle adjustment within a 6-1/2 degree range.





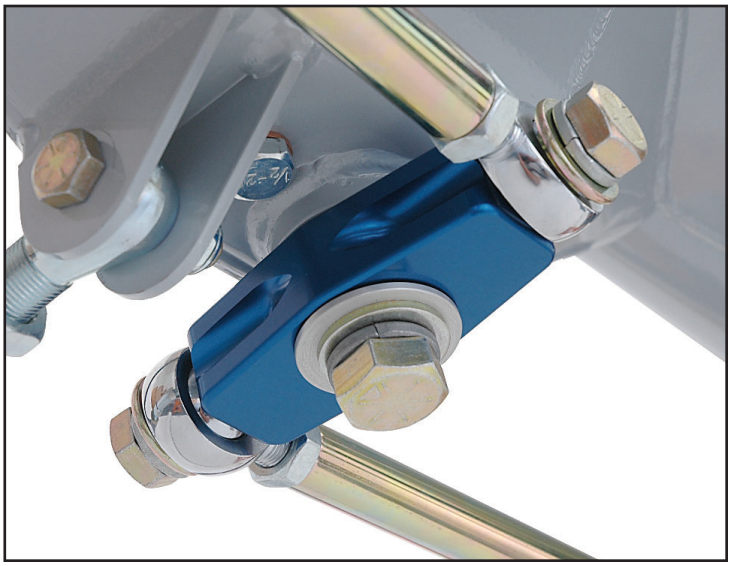
Watts Link System

The watts link assembly is responsible for keeping the rear end housing centered in relation to the chassis and defining the rear suspension's roll center. The assembly is comprised of two staggered links mounted to the rear clip weld assembly and a central pivot attached to the rear end housing. When cornering, link tubes handle forces in the most structurally efficient method, compression and tension, rather than as a bending member such as a leaf spring suspension. This results in immediate, positive location of the rear end when entering and exiting corners. As the rear end housing moves vertically the central pivot rotates slightly to follow the two arcs defined by the link assemblies. This pivoting action splits the difference between the two arcs allowing the housing to travel in a perfectly straight line. Vehicle performance benefits include extremely consistent cornering balance and identical turn-in characteristics for both left and right-hand turns, neither possible with panhard bars or leaf springs.

Low Roll Center

The watts pivot's mounting position, at the bottom of the rear end center section, defines the rear suspension roll center. A low roll center has the benefit of reduced "jacking forces", or the cars tendency to lift during cornering. High roll center geometry induces an unsettling feeling for the driver as the chassis begins to rise during cornering. In extreme cases this can increase a vehicles ability to overturn. The low roll center design of the system has minimal jacking forces, allowing the driver to physically feel the vehicle "taking a set" into each corner. This settled feeling increases driver confidence and the ability to comfortably push the vehicle closer to its cornering limits.

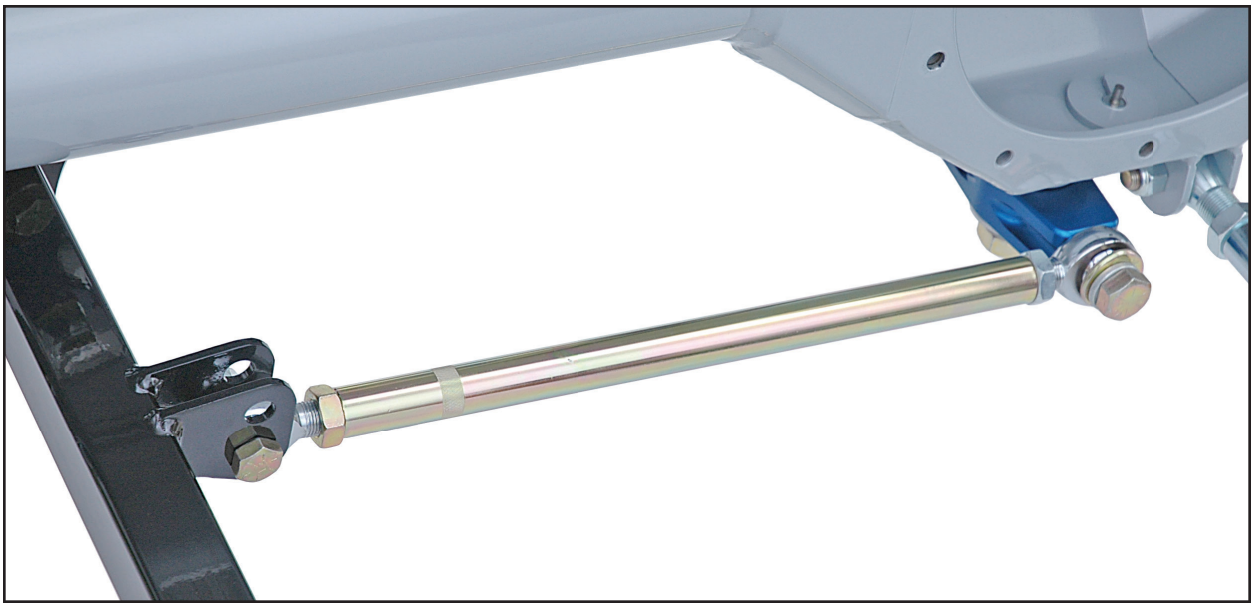
Billet Aluminum Pivot



As a vehicle generates lateral g-forces during cornering, the load is shared by each watts link tube assembly and converges as a bending load across the watts link pivot body. Due to the heavy loads placed upon the pivot body, a simple solid tapered design was selected to maximize material around the bearing bore and link tube mounting holes. The outside surface at which the two tapered planes meet, as well as the milled pockets, feature smooth corners to avoid stress risers; better dispersing the load throughout the entire pivot body. The body is machined from 6061-T6 aluminum, a heat treated aluminum alloy commonly used for its excellent strength and light weight. The pivot rotates on a press fit, sealed roller bearing, secured by a retaining ring. A 3/4" Grade 8 bolt secures the pivot assembly to a specially designed broad based mounting bung welded directly to the bottom of the FAB9™ center section.

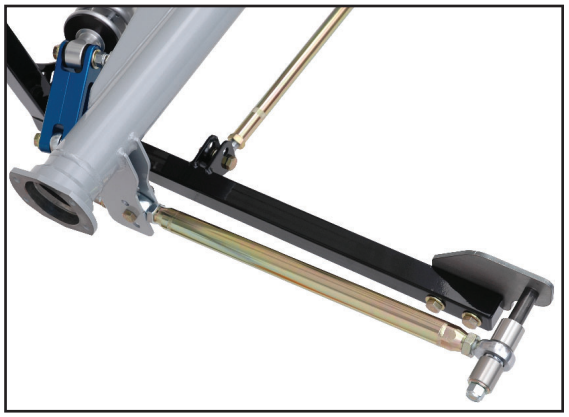
Watts Link Tube Assemblies

Due to the high loads placed on the watts link system, link assemblies are built using steel tubing. Steel tubing provides superior thread strength over strip proned aluminum links found in competitor designs. To facilitate centering the rear end housing, link assemblies are made adjustable by the use of 5/8" shank alloy steel rod ends. Links are mounted to the central pivot body by 5/8" Grade 8 bolts and to the clip assembly mount by 1/2" Grade 8 bolts, loaded in double-shear. Depending upon selected ride height, one of two clip mounting positions is available to ensure the pivot and rod ends remain within their misalignment range.



Chrome-Moly Trailing Arms

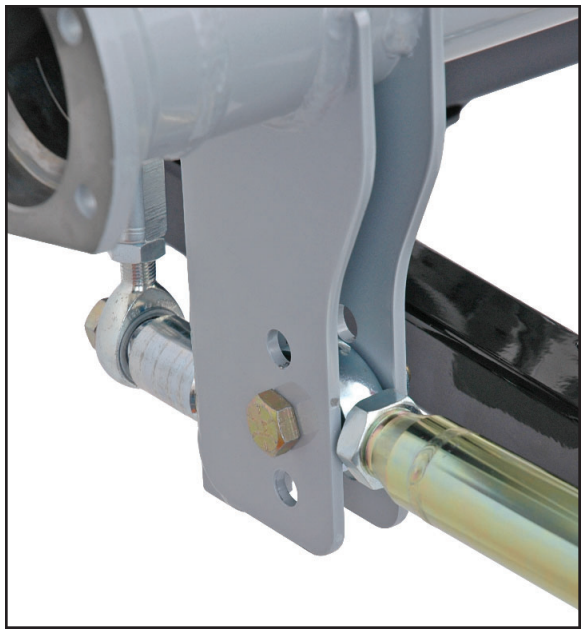
The primary job of trailing arms are to control the fore/aft positioning of the rear end housing in relation to the chassis and to direct force forward, into the chassis during acceleration. Trailing arm assemblies are mounted at the factory front leaf spring mount and attached to the rear end housing axle bracket in one of three available positions. Each position alters the specific point at which force, transferred through the suspension link, is directed into the chassis — commonly known as the 'instant center'. The ability to move the instant center enables a useful tuning aid for acceleration and cornering characteristics.

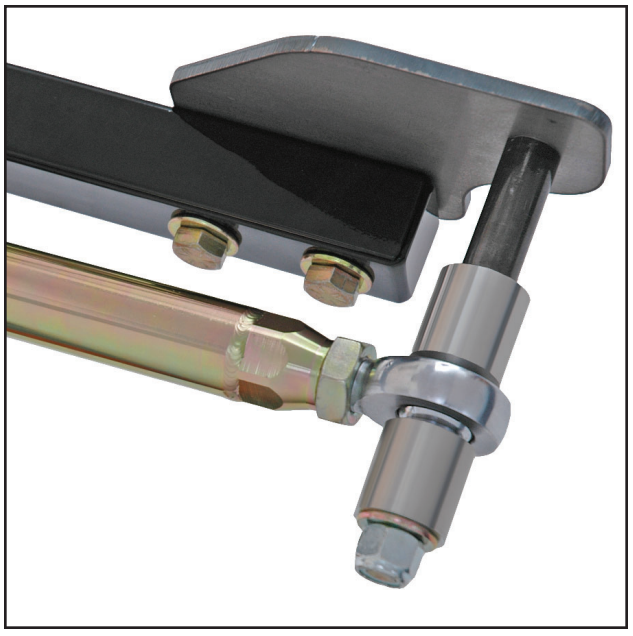


Each end of the trailing arm is secured by 1/2" Grade 8 bolts, mounted double shear. The front mount uses a unique mounting method due to the larger span intended for the leaf spring eye and bushing. To avoid concentrated bending forces at the center of the bolt span, specially designed stainless steel reducing spacers are used. Each spacer features a reducing sleeve that inserts into the 3/4" bearing bore, and a broad flat to seat against the bearing face. The remaining portion of the component provides a broad stable base against the factory sheet metal mounts.

Due to the high loads transferred through the trailing arm assemblies, 4130 chrome-moly steel tubing is used. Large diameter 1-1/4" x .083" wall tubing has the benefit of greater strength without the additional weight of smaller diameter, thicker wall material. In order to safely use rod ends with thin wall tubing CNC machined tube adapters must be TIG welded to the end of each tube. Adapters provide the necessary thread strength, with the left-thread adapter also serving as a 1-1/8" adjustment hex.

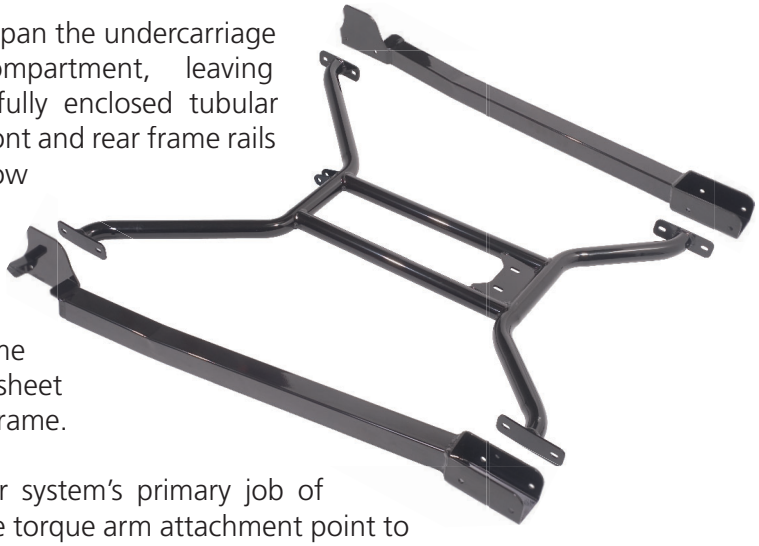
Eliminating compression deflection from the trailing arms provides more immediate vehicle response to acceleration so spherical bearing rod ends are used. Rod ends have the benefit of maintaining a specific length, while allowing free rotational movement. Spring rates and shock valving can then be effectively adjusted to control single wheel 'bump' and body roll without the additional variables of bushing resistance and leaf spring flex.





Subframe Connector System

The factory unibody frame rails do not span the undercarriage directly below the passenger compartment, leaving independent bracing structures. Our fully enclosed tubular steel subframe connectors bridge the front and rear frame rails together. Previously separate braces now work as a single structure extending from the radiator support to the rear bumper. Chassis twisting forces from bumps, cornering and acceleration are now distributed along the entire subframe structure rather than directly into the sheet metal floor pan at the end of each subframe.



In addition to the subframe connector system's primary job of stiffening the chassis it also serves as the torque arm attachment point to the vehicle. During heavy acceleration the torque arm pushes upward upon the chassis with great force. The connector assembly distributes the vertical forces from the torque arm across a broad area of the undercarriage. This reduces localized stresses and also creates a more stable crossmember for a noticeable improvement in torque control and throttle response.

The subframe connector system can also be used without the rear pushrod suspension. Detailed technical information regarding our weld-in subframe connectors and bolt-in connector supports can be downloaded from our website.
(http://www.totalcontrolproducts.com/download/datasheets/SUB_DS_WEB.pdf)

Hardtop System
Shown with optional
Driveshaft Safety Loop

Convertible System
Not available with
Driveshaft Safety Loop

Applications & Pricing

Make	Model	Year	Bodystyle
Ford	Mustang	1964-1966	Coupe
			Convertible
			Fastback
		1967-1970	Coupe
			Convertible
			Fastback
Mercury	Cougar	1967-1970	Convertible
			Hardtop

Note:
Includes clip weld assembly, FAB9™ housing, torque arm, VariShock™ coil-overs, springs, rocker assemblies, trailing arms, watts link assembly, subframe connectors, and connector support

Subframe Connector Options
Subframe Connectors and Connector Support
Driveshaft Safety Loop (coupe, fastback, hardtop)

VariSpring™ Options
Choice of spring rate: 185, 210, 240, 275, 310, 350, 400, or 450 lb/in
Second set of different rate springs for tuning

FAB9™ Rear End Housing Options
Mild Steel, 51.75" housing width, 57.25" wheel-to-wheel (stock width '64-'66)
Mild Steel, 53.75" housing width, 59.25" wheel-to-wheel (stock width '67-'70)
4130 Chrome-Moly, 51.75" housing width, 57.25" wheel-to-wheel (stock '64-66)
4130 Chrome-Moly, 53.75" housing width, 59.25" wheel-to-wheel (stock '67-'70)

Note:
Shorter 51.75" housings can be selected for use on 1967-1970 vehicles. Wheels will require custom width and backspacing.