

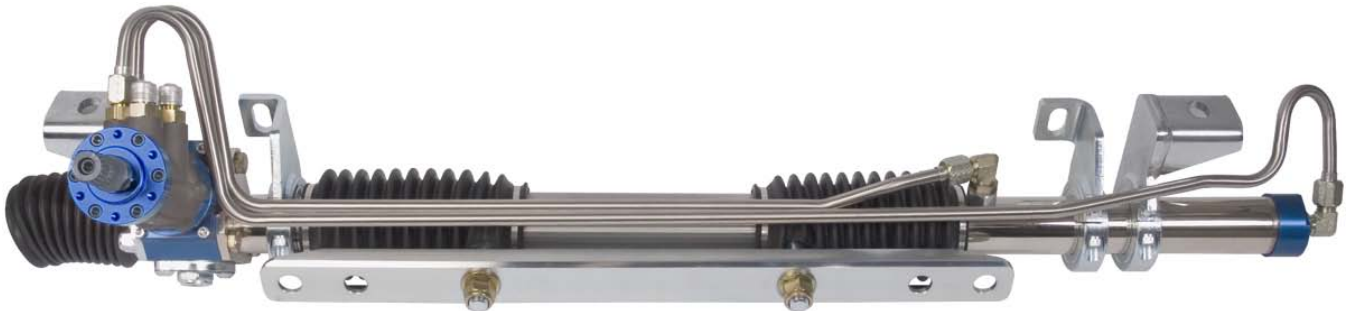
# INSTALLATION GUIDE



## Power Rack & Pinion 03

For 1960 – 1965 Falcon/Comet

**P/N: TCP RCKP-03**



**DESCRIPTION:** Power TCP Rack & Pinion with mounting brackets and hardware ONLY

**APPLICATIONS:** Fits '60-65 Falcon/Comet with 6-cylinder or small block V8 engines.

**NOTE:** The TCP Rack & Pinion has been engineered to work with the KRC power steering pump as a matched system. Using an alternate pump is not recommended or supported and will not yield optimum results.

**WARNING:** Use ONLY petroleum based power steering fluid with this product. Use of ATF or synthetic fluids will result in damage to the internal seals.

# PARTS LIST

## RACK & PINION

Item	Part Number	Description	Qty
1	TCP RCKP-03	Power TCP Rack Assembly only Small Block Falcon	1

### 7900-186 Rack Mounting Kit (Subparts list)

2	7900-100	Rack Clamp Collar Drilled Half	3
3	7900-113	Rack Bracket Weldment, Passenger Small Block, TCP Rack	1
4	7900-115	Rack Lower Weldment Passenger Small Block, TCP Rack	2

### 7918-004 Hardware Bag (Subparts list)

A	3100-050C2.00Y	Bolt 1/2-13 x 2" Hex Head Cap Screw Grade 8 Yellow Zinc Plated	2
B	3100-050C4.00Y	Bolt 1/2-13 x 4" Hex Head Cap Screw Grade 8 Yellow Zinc Plated	2
C	3101-050-13C	Locknut 1/2-13 Nylon Insert Grade 5 Clear Zinc Plated 3/4 Hex	2
D	3103-031F1.00C	Allen Head 5/16-24 x 1" Socket Head Cap Screw	6
E	3108-050L-C	Lock Washer 1/2 Regular, Steel Clear Zinc Plated	2
F	3110-050-13-8C	Nut 1/2-13 Hex Grade 5 Clear Zinc	2
G	3120-050S-Y	Washer 1/2 Flat SAE, Steel Clear Zinc Plated	8
H	3125-D4212	Hole Plug 1-5/8 ID Hole, Nickel Plated (not shown)	2
J	3108-031H-S	High Collar Lock Washer 5/16" (not shown – use with 'D')	6
K	7900-022	Spacer Frame Mount .25 Thick	2
L	7900-203	Spacer Frame Mount .125 Thick (not shown – use optional)	2

Z	7900-078	Spacer, .50 ID x 1.25 OD x .25 Thick (Supplied in TCP EE-03)	0
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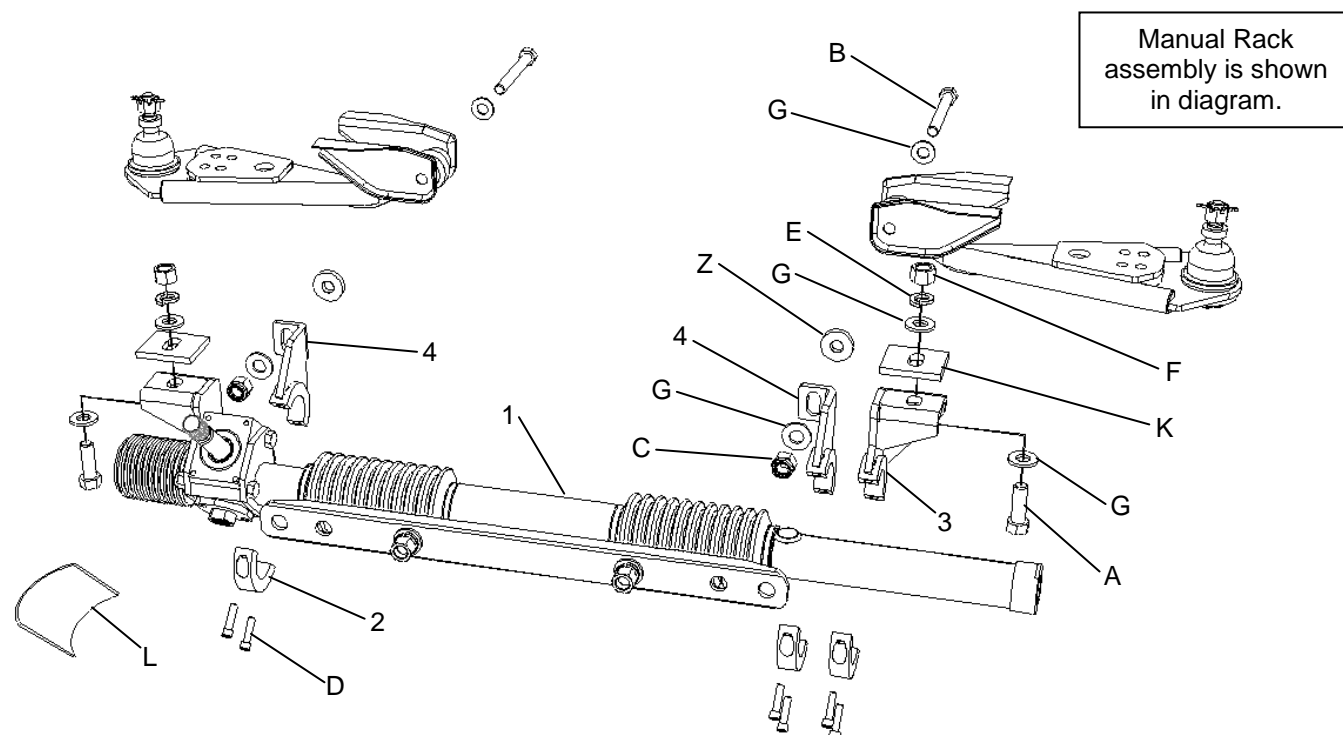


Figure 1-1

# INSTRUCTIONS

1. Remove battery cable from negative side of battery.
2. Raise the vehicle using a two-post lift or jack and secure with jack stands so that the suspension hangs freely and the vehicle is safe to work underneath.
3. (OEM power steering cars only)
  - a. Disconnect the two power steering lines at the control valve. (Figure 2-1)
  - b. Fluid will be present, so be prepared to plug the lines or drain remaining fluid from system.
  - c. Unbolt power ram bracket from frame.
  - d. Loosen fastening bolts to power steering pump and swing pump down to remove fan belt.
  - e. Unbolt all power steering pump brackets and remove pump, brackets and hoses as an assembly.
4. Remove inner tie rods from center link. (Figure 2-3)
  - a. Straighten, and then remove cotter pins from castle nuts.
  - b. Remove castle nuts.
  - c. Pull inner tie rods from center link using ball joint separator or similar tool.
  - d. If replacing tie rod assemblies, the outer tie rod can be removed at spindle leaving tie rods and center link as an assembly.

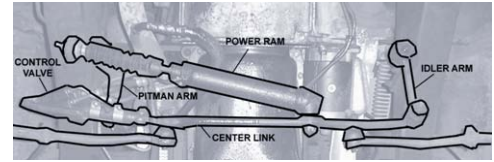


Figure 2-1

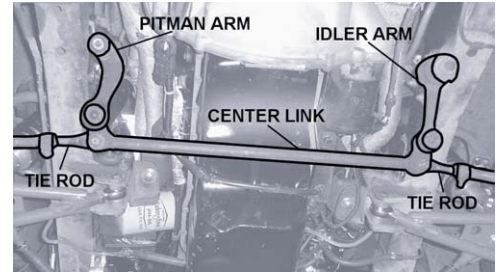


Figure 2-2



Figure 2-3



Figure 2-4

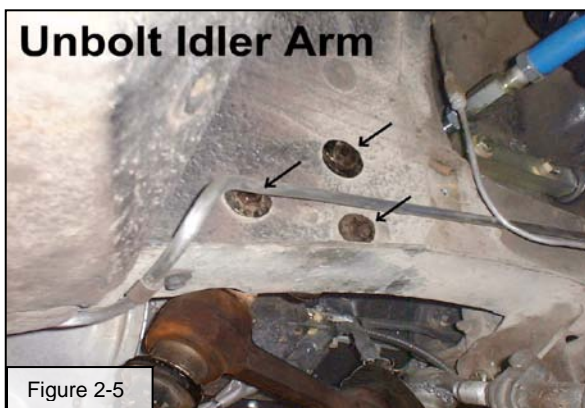
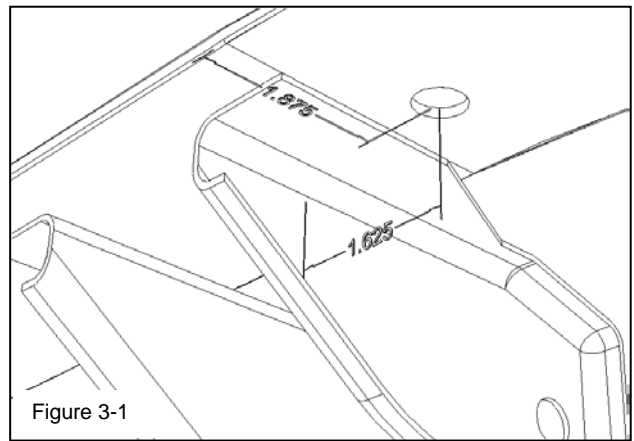


Figure 2-5

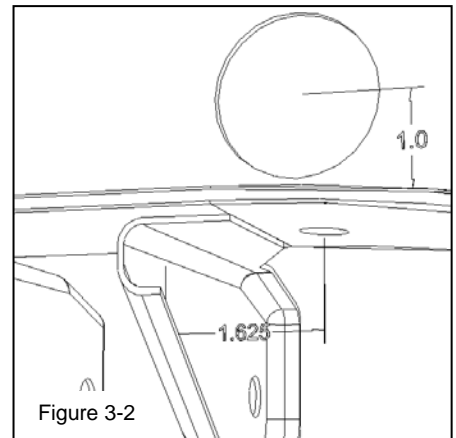


Figure 2-6

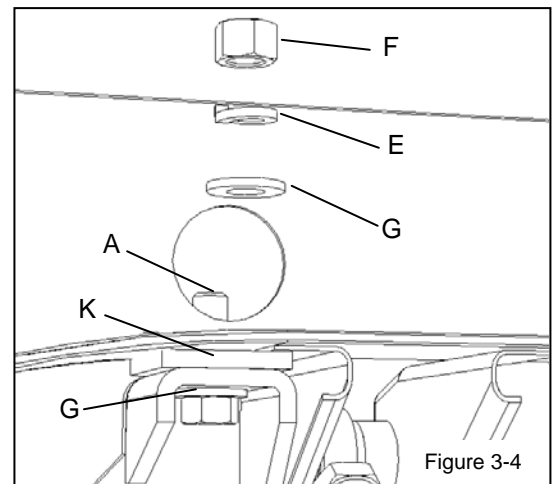
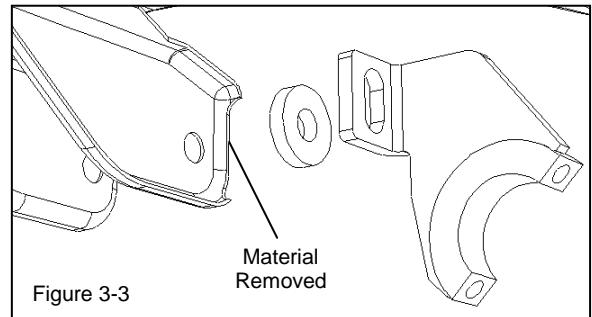
5. Separate center link from pitman arm. (Figure 2-4)
  - a. Straighten, and then remove cotter pin from castle nut.
  - b. Remove castle nut.
  - c. Separate center link from pitman arm using ball joint separator or similar tool.



6. Unbolt idler arm from car and remove steering system assembly. (Figures 2-5 & 2-6).
7. Removal of steering box is covered in Column Set Instructions (7903-COLM-XX).
8. Unbolt lower control arms at frame mounts.
  - a. With suspension at full extension the lower control arm can be safely unbolted. Use caution as the arm may shift once the bolt is removed.
9. Drill a 1/8" pilot hole into the driver side frame rail, location of hole is shown in illustration (Figure 3-1).
  - a. 1-5/8" back from lower arm mount;
  - b. 1-7/8" in from outer edge of frame rail;
10. Drill 1/2" hole into driver side frame rail using 1/8" pilot hole as a guide.
11. Using a 1-5/8" standard or 1-1/4" pipe (1-5/8" outside diameter) hole saw, cut an access hole into the outside of the frame rail 1" directly above the 1/2" mounting hole. Refer to illustration (Figure 3-2).



- a. Use a file to remove any sharp edges.
12. Repeat steps 9-11 for passenger side frame rail.
13. The inner most edge of the driver side lower control arm mount must be ground to allow clearance for the mounting bracket.
  - a. Refer to illustration (Figure 3-3).
14. Bolt both lower rack brackets (Item 4) to lower control arm mounts in orientation shown in Figure 1-1.
15. Refer to installation guide (7903-EE-03) packaged with Rack & Pinion Mount Spacers (TCP EE-03) for specific instructions regarding mounting hardware.
16. Bolts should be snug to remove slack but still allow brackets to pivot and slide vertically by hand.
17. Loosely bolt frame rack bracket (Item 3) to mounting point on passenger side frame rail using hardware indicated in illustration (Figure 3-4).
  - a. Hardware must be inserted into access hole.
  - b. Hold nut with finger while starting the bolt.
18. Raise rack and pinion assembly into position along brackets.



- a. Check for potential clearance issues between the steering linkage and frame rail. It may be necessary to notch the rail for clearance.
19. Loosely install clamp collar (Item 2) on passenger side frame rack bracket (Item 3).
20. Loosely bolt attached frame bracket of rack and pinion assembly to mounting point on driver side frame rail using hardware indicated in illustration (Figure 3-4).
  - a. Hardware must be inserted into access hole.
  - b. Hold nut with finger while starting the bolt.
21. The passenger side mounting bolt can now be tightened to remove slack.
  - a. Loctite must be applied to threads just below nut.
  - b. Apply pressure to rack & pinion assembly as bolts are tightened to properly seat rack tube into rack brackets (Items 3 & 4).
  - c. If frame brackets cannot be drawn up to frame rail without unseating the rack tube from lower rack brackets (Items 4), insert supplied spacers (Items K and/or L) between frame brackets and frame rails and repeat procedure.

### **Mounting Bracket Alignment**

22. **IMPORTANT:** If any of the mounting brackets do not easily align with the vehicle mounting points do not use the hardware to draw the rack and brackets into place. Doing so will bend the rack tube and create a binding condition that hinders performance and could potentially damage the rack. Each of the mounting brackets is slotted and additional optional-use spacers are included to accommodate differences in chassis dimensions.
  - a) If the outer brackets do not seat against the frame rails, use the 1/8"- and/or 1/4"-thick spacers to take up any slack. Some installations may require uneven spacer stacks to correctly align the rack brackets. Each vehicle is different and will need to be shimmed accordingly.
  - b) The inner brackets at the lower control arm mounts should seat against a 1/4" thick spacer ('64-66) or 1/4" eccentric eliminator plate ('67-70) with the frame brackets seated squarely against the frame rails.
  - c) In rare instances it may be necessary to increase the slot length of the brackets to achieve a proper fit. For safety purposes the brackets are made from mild steel and can be modified with fairly common tools.
23. Verify that each of the three clamps are just tight enough to correctly align the bracket with the rack tube before lightly tightening the outer-bracket bolts into the frame rails.
  - d. The rack and pinion is now accurately positioned.

### **Install Intermediate Shaft**

24. The intermediate shaft can now be measured and cut to the correct length.
  - a) Refer to installation guide (7903-ISFT-XX), packaged with your intermediate shaft set (TCP ISFT-XX), for specific instructions
  - b) The two inner-clamp halves and the driver-side frame bolt will need to be removed to allow installation of the intermediate shaft.

***Intermediate shaft procedures must be complete before proceeding.***

### **Mounting Bracket – Final Installation**

*The rack and pinion should be held in position by the outer frame brackets and properly seated against the lower rack brackets (Items 4 and 5).*

**NOTE:** For ease of installation, initial tightening is performed with the weight of the vehicle carried by the frame rails instead of the suspension. Vehicles exhibiting signs of excessive chassis flex must loosen and re-torque all brackets and clamps after installation and adjustment have been completed, with the vehicle fully supported by the suspension. This allows the rack and pinion to be installed in a neutrally-loaded state. Spacer shims may need to be added or removed. Car ramps, a four-post drive-on lift, or ideally an alignment rack should be used.

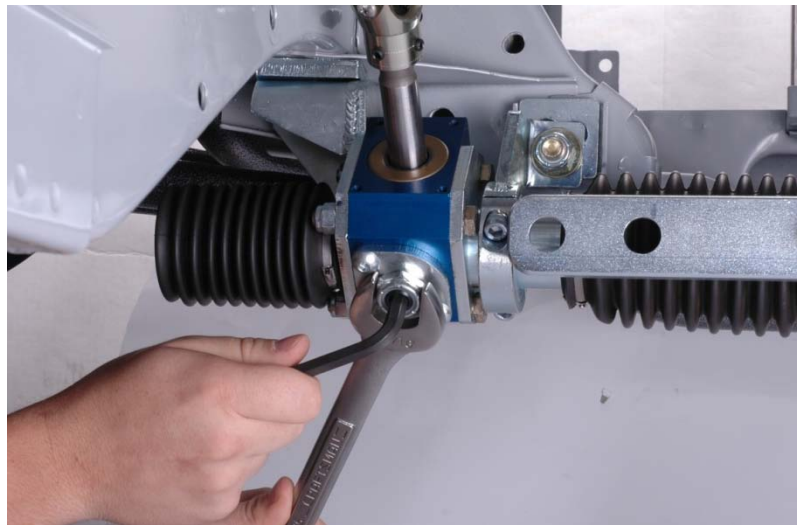
25. Install the clamps back onto the rack and evenly tighten to prevent the brackets from rocking, but still allowing rotation and sliding movement.
26. The procedure for tightening each of the four mounting brackets is similar to torquing down a cylinder head or intake manifold. The 1/2" bolts will be tightened progressively in the following order: driver-inner 1<sup>st</sup>, passenger-inner 2<sup>nd</sup>, driver-outer 3<sup>rd</sup>, passenger-outer 4<sup>th</sup>.
  - a) Begin by snugging up each bolt to remove any free play.
  - b) Verify that each bracket will seat squarely against its mounting surface without drawing the rack tube.
  - c) Make two to three passes through the tightening order to bring each bolt to its specified torque value.
    - Inner brackets – 60 lb-ft.
    - Outer brackets – 75 lb-ft.

### Check for Binding

At each step of final tightening, the rack must be checked for binding or tightness throughout its range of travel. A slight bend in the rack tube or the tube being pinched into a slight oval will create additional friction against the rack's internal guide bushing or piston (power rack). Binding symptoms, probable causes, and solutions are explained in the following steps.

27. Using an even motion, turn the steering wheel from lock-to-lock. The amount of resistance should feel even from one end of the travel range to the other. Any noticeable increase or decrease in tension indicates a possible issue.

- a) **Notchy feeling or bump every 1/8<sup>th</sup> turn** – The pinion set screw adjustment at the base of the pinion housing is too tight. Loosen the large lock nut (15/16" hex) surrounding the set screw (5/16" allen) at the bottom of the pinion housing.



While lightly rocking the steering wheel back and forth, tighten the set screw until it is seated then loosen 1/4 turn. Hold the set screw in position with an allen wrench and tighten the lock nut. The steering should feel smooth and have zero to 1/8" of play at the steering wheel. Too loose of an adjustment allows excessive play at the steering wheel. Too tight of an adjustment makes steering overly sensitive and can prevent the system from returning to center while driving.

- b) **Notchy feeling or bump every ½ or ¼ turn** – This usually indicates a binding condition at the intermediate steering shaft u-joints. Verify that the steering shafts do not extend into the open area of u-joint, causing it to bind.
  - c) **Gradual increase in resistance** - The rack tube may be slightly bent due to bracket misalignment. This must be corrected before proceeding.
  - d) **Light variations in tension** – This is very common and will smooth out once the internal guide bushings have developed wear patterns (approx. 1,000 miles); similar to piston rings seating within a cylinder.
28. Continue by tightening the passenger-side outer clamp to 13-15 lb-ft., and check for binding.
- a) **Tightness near full-left lock (manual rack) or center of travel (power rack)** indicates that the passenger-side clamp has created one of the following issues.
    - The clamp is too tight and needs to be loosened slightly.
    - The clamp is not square to the bracket-side clamp. Check by measuring the gap at the opposite ends of the clamp.
    - There is debris, a burr, or other imperfection on the clamp or rack tube that must be removed.
  - b) Recheck for binding.
29. Tighten the two inner clamps to 13-15 lb-ft., and check for binding.
- a) **Tightness near full-left lock (manual rack) or center of travel (power rack)** indicates that the passenger-side clamp has created one of the following issues.
    - The clamp is too tight and needs to be loosened slightly.
    - The clamp is not square to the bracket-side clamp. Check by measuring the gap at the opposite ends of the clamp.
    - There is debris, a burr, or other imperfection on the clamp or rack tube that must be removed.
  - b) Recheck for binding.

### **Connect Power Steering Pump and Lines**

*The power steering pump must be installed before proceeding.*

30. Instructions for assembly and installation of the TCP hose kit (TCP HOSE-XX), power steering pump (TCP PSP-FD), and bracket set (TCP PBS-FD-XX) are packaged with their respective kits.
31. Power steering hoses and fittings must meet or exceed a pressure rating of 2000 psi., and vacuum rating of 28 in./Hg to safely handle potential spikes in system pressure from wheel impacts and prevent the pump feed hose from collapsing during periods of high fluid demand.
32. When connecting hoses to the pump, rack-and-pinion control servo, and reservoir, carefully inspect all fittings and hose ends for defects or debris. Even minor damage, such as a nick or dent, on an exposed male fitting or tapered flare can prevent the fitting from forming a tight seal, resulting in a leak.
- a) The control servo ports are marked:
    - “P” for the high-pressure line from the pump output
    - “T” for the low-pressure return line to the reservoir
33. Verify that all fittings and hose ends are tight and that the area around each connection is completely dry before filling the system with fluid.
- a) If the lines must be removed use two wrenches to remove the hose end without unscrewing the fitting.

### **Fill the System with Fluid**

34. Fill the reservoir using only petroleum based power steering fluid. DO NOT USE SILICON SYNTHETIC FLUID, or any fluid containing resealing or anti-foaming agents. Fluids other than the required petroleum based fluid can potentially damage the rack and pinion's internal seals, react chemically with the assembly lubricant, and negatively affect the performance and reliability of the power steering system.
35. Turn the steering wheel lock to lock repeatedly while maintaining the fluid level in the reservoir to fill the rack cylinder and hard lines. DO NOT start the engine at this time.
36. Verify that the power steering pump belt is correctly tensioned and then start the engine.
  - a) Top off the fluid level immediately to replace the volume of fluid required to fill the hoses.
  - b) Operating the power steering pump without fluid will cause damage.
37. Turn the steering wheel lock to lock repeatedly to bleed air from the system.

### **Check for Air in the System**

38. With the reservoir cap removed, check the fluid returning to the reservoir for signs of air being introduced into the system. Potential causes can include the following:
  - a) Splashing from fluid return can be eliminated by raising the fluid level.
  - b) Air drawn in from the reservoir feed line due to extremely low fluid level requires adding fluid.
  - c) Air drawn in through leaky fitting on feed line to pump. The fluid demand from the pump creates a low pressure condition that can suck in air if the fittings are not completely sealed.

### **Check for Fluid Leaks**

*Each rack and pinion is factory tested at fluid pressure levels that exceed normal operating conditions.*

39. Turn off the engine before checking the entire system for signs of leaking fluid.
40. Check each connection point on the reservoir, pump, and rack and pinion, including:
  - Hose to hose ends
  - Hose ends to fittings
  - Fittings to mounting bosses at the reservoir, pump, and rack.
  - Servo base to pinion housing
41. Any leaks will need to be corrected.

### **Verify Steering Bias is Centered**

42. With the engine running, lightly throw the steering wheel in either direction.
  - a) If the steering system continues to drift in that direction, the steering bias is offset and should be adjusted.
  - b) Conduct this test in both directions.

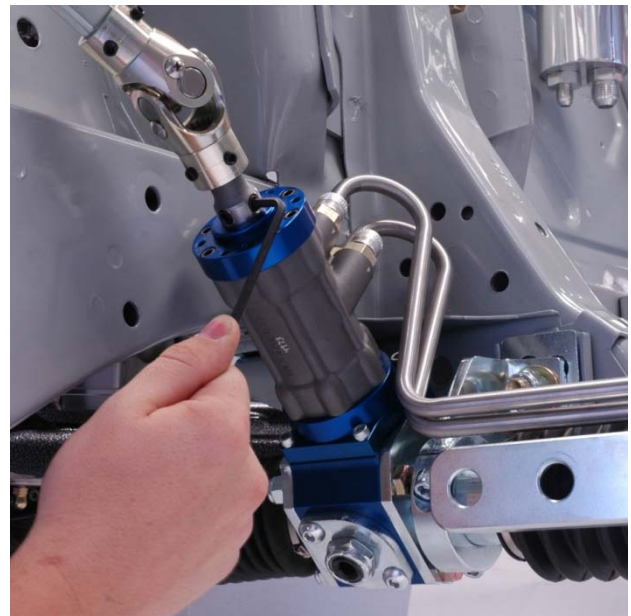
### **Adjusting Steering Bias**

Prior to shipping servos are adjusted to provide centered or neutral steering effort for vehicles with symmetrical alignment settings. The vast majority of installations should retain the factory setting.

The control servo features two set screws, 90° apart, at the base of the pinion shaft to adjust steering bias. Each set screw is seated against a flat on the torsion bar within the pinion shaft and control servo. The torsion bar controls the operation of the spool valve that directs fluid to provide hydraulic assist. Offsetting the center position of the torsion bar by adjusting the set screws alters the balance of constant pressure directed to each side of the rack-and-pinion piston.

**ENGINE MUST BE OFF PRIOR TO ADJUSTING.**

(Perspective as viewed from underneath the rack and facing the front of the vehicle. The steering shaft must be rotated to position the set screws toward the bottom half of the shaft, closest to your vantage point.)



43. **If the steering wheel is drifting toward the left (counter clockwise)**, loosen the left set screw 1/12 of a turn, and then tighten the right set screw.
  - a) Start the engine and test steering bias.
44. **If the steering wheel is drifting toward the right (clockwise)**, loosen the right set screw 1/12 of a turn, and then tighten the left set screw.
  - a) Start the engine and test steering bias.
45. Verify that both set screws are tight. Any slack between the set-screw point and the torsion-bar flat will have a negative effect on steering performance, which may occur gradually or immediately.

**Tie-Rod Installation**

46. Verify that the rack has full travel.
  - a) Turn the steering wheel to full left lock.
  - b) From one of the frame rails, measure the distance that the center link travels from full left to full right lock. The rack should travel 6-3/8".
    - If travel is less than 6-3/8", look for binding at the u-joints or with exhaust headers that may be limiting travel.
47. Center the rack.
  - a) From full right lock, move the center link 3-3/16" toward the left. This is the rack and pinion's center of travel.
48. Tie-rod assemblies can now be installed as described in their respective installation guides (7903-TIER-XX).
  - a) Installation of inner tie rod requires use of vehicle specific tie-rod adapter packaged with rack and pinion.
49. Adjusting the tie-rods to correctly set the alignment toe must be done with the suspension fully weighted and the rack and pinion at its center of travel.
50. Recheck all hardware for each portion of the steering system (aftermarket and OEM) to ensure it has been tightened to the proper torque specification.

# ALIGNMENT

The rack & pinion must be professionally aligned after installation has been completed. Prior to setting "Toe," the rack & pinion must be at its center of travel. Our recommended alignment specs are to serve as a starting point for your particular application. Installed components, driver preference and specific application will have a great affect on the chosen settings for your vehicle.

	Street Performance	Road Course	Drag Strip
<b>Caster</b>	3-1/2° to 4° pos.	3-1/2° to 4° pos.	4° to 6° pos.
<b>Camber</b>	0° to 1/2° neg.	1-1/2° to 2° neg.	0°
<b>Toe (total)</b>	1/16" to 1/8" IN	1/16" OUT to 1/16" IN	1/16" to 1/8" IN

## **IMPORTANT: Notify the alignment technician of the following information.**

Some applications must slightly offset the rack's travel to gain clearance between the passenger-side tie-rod assembly and the end of the rack and pinion. This condition can be identified by turning the steering to full right lock and moving the suspension through its range of travel. If the tie-rod contacts the rack, the passenger-side tie-rod assembly must be lengthened until there is 1/8" clearance. Usually one to two full turns of the adjuster will be enough, which only increases the tie-rod length less than 1/10 of an inch. The overall toe will then be set using the driver-side tie-rod assembly. If your alignment has already been set, the driver-side tie-rod assembly must be shortened by an equal amount. The steering wheel will need to be centered to match the alignment.

## POST INSTALLATION INFORMATION

### **1000 Mile Break-In Period**

Internal guide bushings will develop wear patterns and reduce friction in the steering system. After approximately one-thousand street-driven miles you will notice slight reduction in steering effort and improvement to the steering systems ability to return to center after a turn.

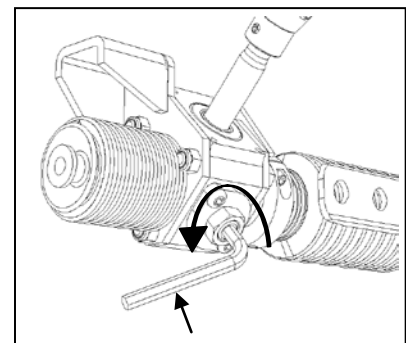
### **Return to Center**

If the return to center does not improve after the initial break in period, loosening the gear lash adjustment or adding positive caster will help.

### **Gear Lash Adjustment**

After the initial break-in period (roughly 1000 miles) you may begin to notice a small amount of 'play' or slack at the steering wheel and then again every 3-5 years depending upon level of use. The bottom of the blue anodized pinion housing has a large jam nut surrounding an allen set screw. This set screw is the adjustment for gear lash between the 'rack' and 'pinion' gears. Loosen the jam nut then tighten the setscrew about 1/16th of a turn. Tighten the jam nut while holding the setscrew in its position. If there is still 'play' at the wheel, repeat the above steps. If the steering begins to feel 'notchy' or too sensitive while driving, you will need to

loosen the setscrew.



## Steering Assist Issues

If you notice any of the following symptoms, after you have verified that the alignment settings and tire pressures are correct, it may be necessary to adjust the steering bias. Each of these symptoms can be caused by a loose or misadjusted bias setting. Refer to “Adjusting Steering Bias” section for adjustment instructions.

- **Steering effort is extremely light**, such that the steering wheel can be turned with your smallest finger while the car is on the ground.
- **Steering assist is erratic**, possibly darting, pulling to either side, or hydraulic assist comes in and out.
- **Uneven steering effort**. Steering will feel heavier in one direction than the other.

## MAINTENANCE

### Regular Inspection

As with any of your vehicle’s key components, the rack and pinion unit and additional steering components should be inspected on a regular basis. It is a good habit to check for loose mounting hardware or worn components, such as tie rods and ball joints, at every oil change or tire rotation. Because of the age of these vehicles we strongly suggest monitoring the structural integrity of the sheet metal and welds at high stress areas of the chassis. These include, but are not limited to, shock towers; lower arm mounting points; strut rod mounting points; leaf spring mounts; rear shock mounts.

## ONLINE INFORMATION

### Technical Support

Additional resources for trouble-shooting and correcting possible issues are available in the technical support section of our website or by emailing our tech support staff.

[www.totalcontrolproducts.com/tech](http://www.totalcontrolproducts.com/tech)  
[tcptech@cachassisworks.com](mailto:tcptech@cachassisworks.com)

### Document Library

Complete documentation including installation instructions for all kit components and technical data sheets can be accessed through our online document library.

[www.totalcontrolproducts.com/docs](http://www.totalcontrolproducts.com/docs)

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