

JAGUAR POWER-ASSISTED RACK & PINION

XJ6
XJ12

DESCRIPTION

Vehicles are equipped with a power assisted rack and pinion type steering system. The system consists of two main components: the rack and pinion steering gear and the power assist pump. The two components are connected by flexible fluid lines. The power assist pump and fluid reservoir are combined.

CHECKING & ADJUSTING

CONTROL VALVE & PINION ADJUSTMENT

If vehicle is experiencing a pulling condition in the steering, first check suspension components, tires, and steering geometry. If, after determining that these items are in proper condition, pulling is still present, trouble may be assumed to be in the trimming of the steering unit valve. Check the control valve and pinion as follows:

1) Connect a 100-psi pressure gauge into the pump return line, start engine and allow to idle. Pressure reading should be approximately 40 psi. Turn steering gear left and right a small amount. Pressure increase, as wheel is turned, should register an equal amount on either side of center.

2) If pressure is not balanced, as indicated by a slight pressure drop on either side before rising, the valve and pinion assembly must be replaced. If steering kicks to one side on engine start, replace valve and pinion assembly. *NOTE - Pinion assembly may be removed without detaching rack housing from vehicle.*

3) Back off rack adjuster pad fully before removing the pinion housing and readjust to give .010" (.254 mm) end play. Note position of pinch bolt slot in the input shaft before removing and ensure slot is in same position after replacing pinion (allow for spiral in pinion when reassembling).

CENTRALIZING RACK

1) Inflate tires to correct pressure. Set front wheels in straight-ahead position. Remove grease nipple from rack adjuster pad. Insert centralizing tool (as shown) and adjust position of rack until pointed end of tool engages with locating hole in rack. Check alignment, using suitable equipment.

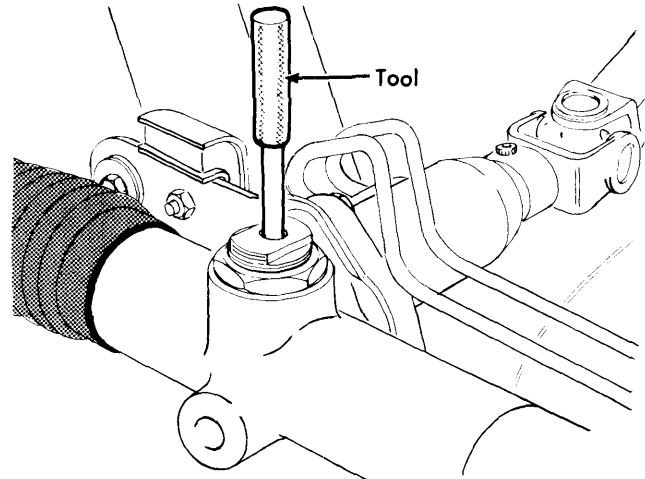


Fig. 1 Using Special Tool to Centralize Rack

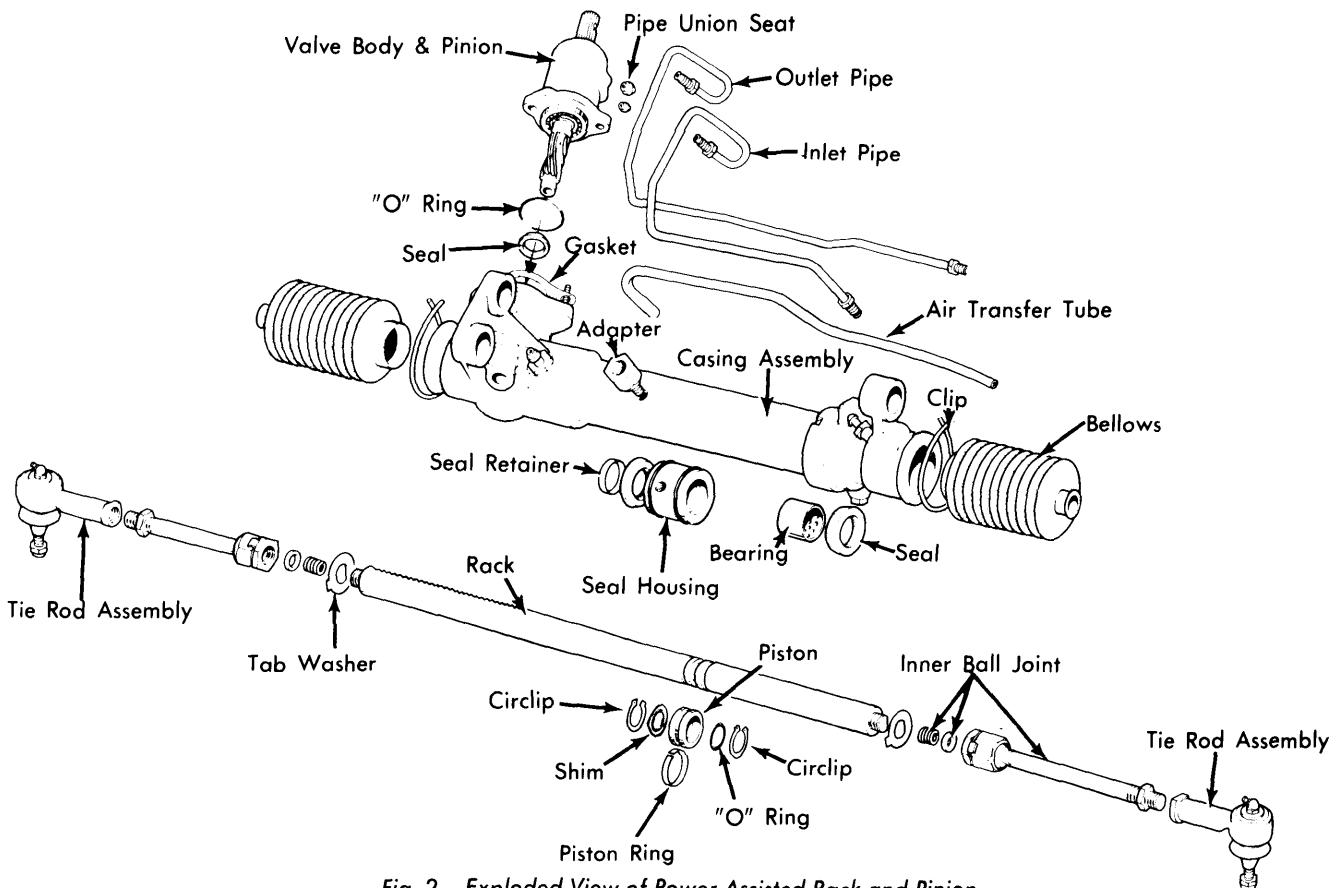


Fig. 2 Exploded View of Power Assisted Rack and Pinion

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2) If adjustment is necessary, proceed as follows: Slacken lock nuts at outer end of each tie rod. Release outer clips securing rack bellows. Turn tie rods an equal amount until alignment is correct. Measurement of tie rods should be 11.75" (28.8 cm) as measured from center-to-center of ball studs. Also see *Jaguar* in *WHEEL ALIGNMENT* section. Tighten lock nuts and recheck. Replace bellows, remove tool, and insert grease nipple.

BALL PIN KNOCK

Ball pin knock, evident when turning steering wheel, is due to wear of inner ball pin assembly. This will only be apparent after long periods of service and no adjustment must be made to compensate for developing wear. When wear is evident, a new ball pin/track rod assembly must be installed. See *Steering Gear* under *Removal & Installation* in this article.

RACK RATTLE

NOTE — Rattle is usually apparent when driving on rough surface.

1) Release lock nut retaining pad adjusting screw. Turn screw in until a firm resistance is felt, then back off screw $\frac{1}{6}$ turn on XJ6 models, or $\frac{1}{6}$ turn on XJ12 models. Grip ball pin arm protruding from pinion end of steering gear and move it toward rack back-up pad: spring resistance should be felt.

2) Total amount of play at rack pad should not exceed .010" (.254 mm). Check by removing the grease fitting and inserting a dial indicator through rack pad and rack adjusting screw until stem contacts back of rack. By pulling rack against spring, the total amount of end play can be measured. If spring resistance is not noticeable, remove rack pad screw and check that spring is not broken.

CHECKING HYDRAULIC SYSTEM

1) Connect a pressure gauge into the pressure line (see illustration), start engine, and run at idle. Turn steering to full lock and continue to increase steering wheel effort until pressure ceases to rise. Peak pressure should be 1100-1250 psi and should not increase with rise in engine RPM. If, however, pressure is below 1100 psi but increases with advance in engine RPM, then trouble is caused by either a faulty control valve in the pressure pump or by excessive internal leakage in the steering gear.

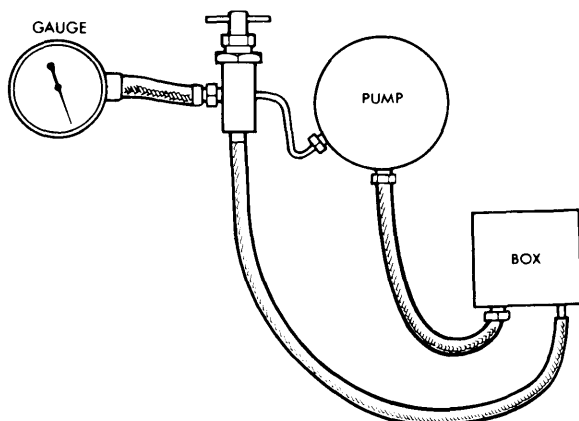


Fig. 3 Tool Set Up for Checking System Pressure Leaks

2) Connect a pressure test gauge into pressure line with an ON-OFF tap in series between gauge and steering unit (see illustration). Start engine, open tap, and turn steering to full lock. Check pressure reading; it should be 1200 psi. If pressure does not rise to this figure, close tap for a maximum of five seconds and note gauge readings. Pressure should now be 1200 psi (pump blow off pressure). If this reading is obtained, leaks are confined to steering unit, which should be removed and overhauled.

BLEEDING THE SYSTEM

Fill reservoir to full mark on dipstick. Start engine and turn steering from lock to lock several times (to expel all air). Recheck fluid level and refill as required.

REMOVAL & INSTALLATION

STEERING GEAR

Removal — **NOTE** — Amount and location of all washers and spacers must be noted for correct reinstallation. Remove upper and lower steering columns (XJ6 only). Disconnect high and low pressure lines, drain gear oil, and block off pipe connections. Remove nuts and washers and disconnect track rod ball joints from steering arms. Remove pinion pinch bolt. Unbolt and remove rack assembly from vehicle.

Installation, XJ6 — Install rack assembly in reverse of removal procedure, noting the following: Ensure all pressure line connections are clean before attaching. Centralize rack before connecting to lower steering column. Refill reservoir with suitable fluid and bleed system by turning wheel from lock to lock several times, with engine running, to expel any air in system. **NOTE** — If replacement rack is installed, it will be necessary to detach lower column from upper steering column at universal joint to ensure correct centering.

Installation, XJ12 — 1) Position rack against mounting brackets. Select proper shims and washers in order to locate the single rack lug (at opposite end of rack from pinion) midway between crossbeam bracket lugs. **NOTE** — The use of an assistant is required for this operation. Add further shims as required and check that a gap of .10-.12" (2.54-3.05 mm) exists between rubber faces of thrust washers and inner faces of crossbeam lugs.

2) Ensure pinion shaft has entered universal joint and insert mounting bolts, but do not fully tighten self-locking nuts. Detach inner end of rubber bellows and push back from housing. Locate two attachment brackets of suitable service tool (JD.36) on two large hex head bolts of lower control arms (see illustration).

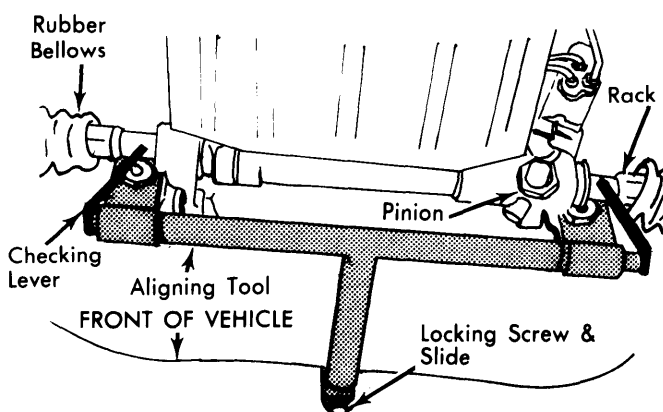


Fig. 4 Installing Rack and Pinion Gear on Jaguar XJ12

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3) Release locking screw and adjusting position of slide attached to tool until slot registers with weld flange at front of crossbeam. Lock slide in this position. Lift two coupled checking levers until contact is made with one or both rack shafts. Adjust position of rack assembly if necessary to bring both levers into contact. Tighten nuts of three securing bolts to lock in this position.

4) Remove checking tool. Replace bellows, using new clamps. Reverse remaining removal procedures. Refill system with recommended fluid and bleed. Check wheel alignment. **NOTE** — *It is important that distance between rubber faces of thrust washers and adjacent crossbeam lugs be no less than .10" (2.54 mm). This is necessary to allow adequate rack movement. If a replacement rack is installed, it will be necessary to detach lower column from upper column to obtain correct centralization of splines.*

POWER STEERING PUMP

Removal — Unscrew nut securing pump mounting bracket bottom bolt and remove set screw and washer securing adjusting link to water pump. Swing pump inboard, lift pulley against spring pressure, and remove pump drive belt. Detach low pressure hose, drain fluid, and remove high pressure line. Block all hose connections. Unbolt and remove pump from mounting bracket, noting any spacing shims for replacement in original position.

Installation — Replace pump in reverse of removal procedure, noting the following: Ensure hose connections are clean before replacement. Fill reservoir with suitable fluid and bleed by turning pulley counterclockwise a few times to dispel any air. After pump is fully installed, bleed system as described for power steering pump.

OVERHAUL

STEERING GEAR

Disassembly — 1) Thoroughly clean outside of rack assembly before attempting to dismantle. **NOTE** — *Do not disturb outer ball joints unless they are to be replaced.* Remove external pipes from pinion housing. Unclamp and back off bellows to expose inner ball pins. Straighten lock tap of washer securing inner ball pin to rack shaft. Remove inner ball pin and track rod as a unit (do not dismantle ball pin assembly). Retain thrust spring and spacer.

2) Release lock nut retaining rack adjusting pad screw, remove screw, spring, and pad. Mark location of pinion housing in relation to rack housing. Remove three nylon locking nuts retaining valve body assembly to rack housing. Withdraw assembly and discard the joint. Note location of pinch bolt slot before withdrawing valve body assembly from housing. **NOTE** — *Depending on fault ascertained during system checking, either valve and pinion assembly or rack and tube assembly may be further disassembled.*

Reassembly — 1) Place a new joint seal over three studs in rack housing. Replace pinion housing, noting position as marked during disassembly. Ensure pinch bolt slot is in same relative position. Replace inner ball joints and track rod as removed. Reconnect outer ball joint and adjust length of each tie rod to 11.75" (29.8 cm) between ball joint centers.

2) Adjust rack backup pad, as described under *Checking & Adjustments* in this article. Replace grease fitting and external

fluid connections. Coat rack ball pin connection with grease, reposition and clamp bellows. Lubricate further at grease fittings.

POWER STEERING PUMP

Disassembly — 1) Drain pump fluid. Detach rear mounting bracket and note size and location of all spacers. Withdraw two set screws and lock washers and detach trunion front mounting bracket and spacers. Thoroughly clean pump exterior before proceeding.

2) Remove pulley. Detach high pressure outlet union and two mounting studs. Separate pump reservoir from body and remove "O" ring. Remove three "O" rings from pump body recess. Insert suitable pin punch in hole of pump body and push retaining ring away from groove. Pry ring out with screwdriver (see illustration).

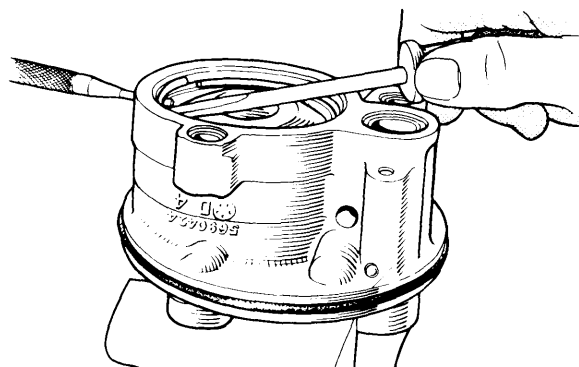


Fig. 5 Prying Out End Plate Ring

3) Remove end plate (tap lightly to free, if necessary). Remove spring. Withdraw end plate "O" ring from internal recess in pump body. Separate rotor assembly components, taking care not to damage rotor vanes. Remove circlip and release rotor and thrust plate. Remove drive shaft oil seal.

Inspection — Clean all parts in solvent and replace all "O" rings and seals. **NOTE** — *Do not immerse new seals in solvent.* Check all parts for scoring or other damage. If bushing on shaft is damaged, shaft assembly must be replaced. Check flow control valve for free movement in bore.

Assembly — 1) Lubricate a new shaft seal with petroleum jelly and place seal to pump body. Insert pump shaft, splined end first (from hub end of body). Insert dowel pins with ported face up.

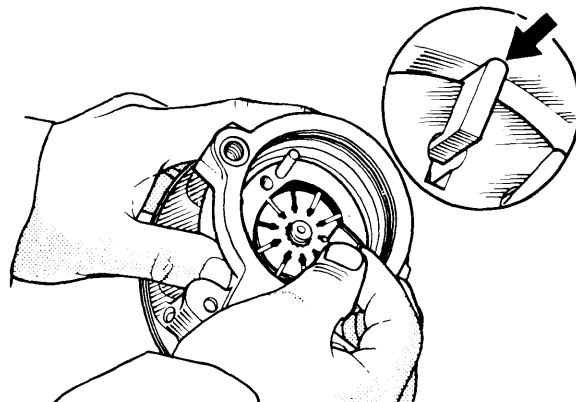


Fig. 6 Placing Vanes in Rotor Plate

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2) Fit rotor to splined shaft with countersunk side downward (toward thrust plate). Rotor must be free on splines. Fit retaining clip to groove in end of shaft. Position pump ring to dowel pins with rotation arrow upward.

3) Place vanes in rotor slot, ensuring rounded edge of each vane faces outward (see illustration). Coat pressure plate "O" ring with petroleum jelly and install in lowest groove in pump body.

4) Lubricate circumference of pressure plate and install dowel pins with circular recess for spring upward. **NOTE** — Do not

tap plate into position. Coat "O" ring with petroleum jelly and install in groove in pump body. Position spring into groove in pressure plate.

5) Grease circumference of end plate with petroleum jelly, to avoid damaging "O" ring. Place end plate in position with retaining ring on top. Ensure gap in clip is not opposite hole used for removal. Place assembly under a press and apply pressure until clip springs into body groove.

6) Insert valve (spring first) into pump bore. Position new "O" rings for reservoir retaining bolts and outlet union. Coat large reservoir "O" ring with petroleum jelly and fit into body groove. Fit reservoir retaining studs outlet union with "O" ring located in groove in union. Replace pulley key and pulley; secure with tab washer and nut.

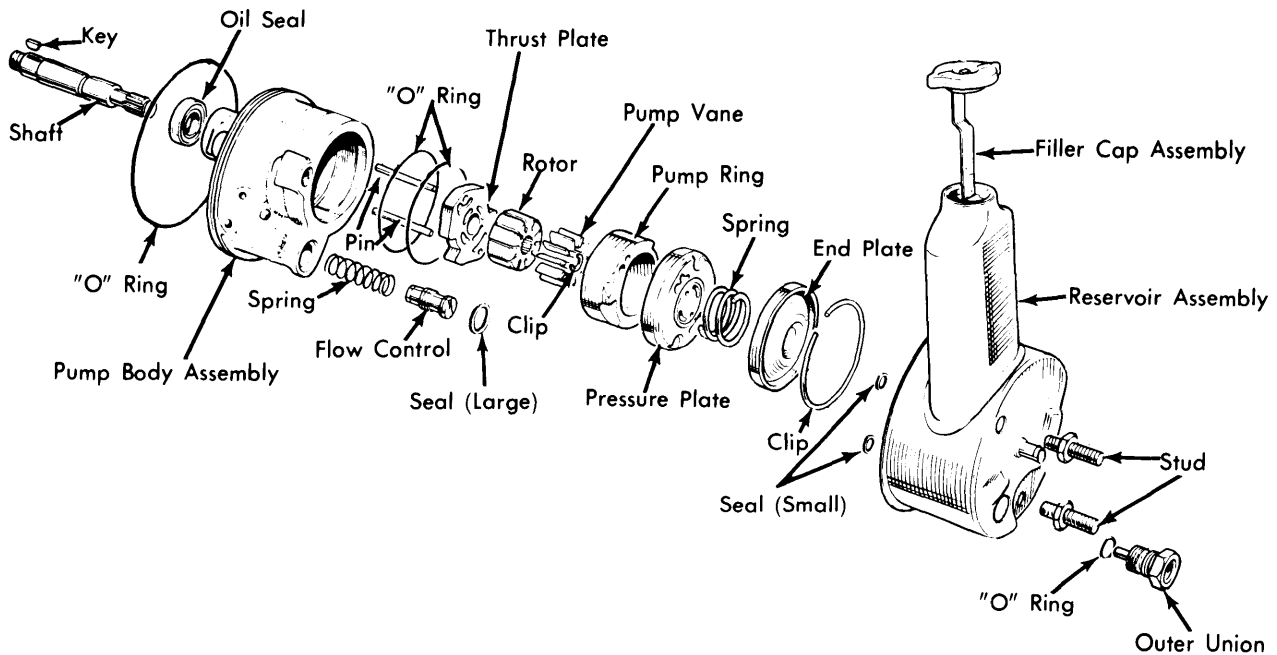


Fig. 7 Exploded View of Jaguar Power Steering Pump