

## BMW RACK & PINION

320i

### DESCRIPTION

Direct-acting manual rack and pinion gear on resilient rubber mounts is of ZF design. Steering is dampened by a single tube-type hydraulic damper. Tie rods attached at outer end of central steering rack connect to steering knuckles.

### ADJUSTMENT

Steering gear assembly should be removed for proper adjustment. See *OVERHAUL procedures in this article*.

### REMOVAL & INSTALLATION

#### STEERING GEAR

**Removal and Installation** — Disconnect tie rods from steering knuckles with special tool (32 2 050). Detach steering gear mounting bolts at front axle support. Remove pinch bolt from

steering shaft and pull steering gear loose from universal coupling. To install, reverse removal procedure noting that wheels must point straight ahead and raised mark on dust seal must align between raised marks on steering gear box.

### OVERHAUL

**Disassembly** — 1) Mount gear in suitable holding fixture held in a vise. Bend open right lockplate and slide rack in up to stop. Detach damper at holder.

2) Using special tool (32 2 110), detach right tie rod at rack. Loosen bellows clamp and slide bellows off housing. Move rack in far enough to apply special tool (32 2 100) to left side of rack. Loosen clamp and slide back bellows onto rack. Bend open lockplate and detach left tie rod at rack.

3) Remove cap from pinion housing, then pull out cotter pin holding set screw. Unscrew set screw with special tool (32 1 040) and remove spring retainer and spring. Lift rack to remove pressure pad and "O" ring from housing.

4) Remove pinion shaft dust cover, "V" lock ring and notched ring. Remove pinion shaft set screw with special tool (32 1 040), then pull out "O" ring and washer.

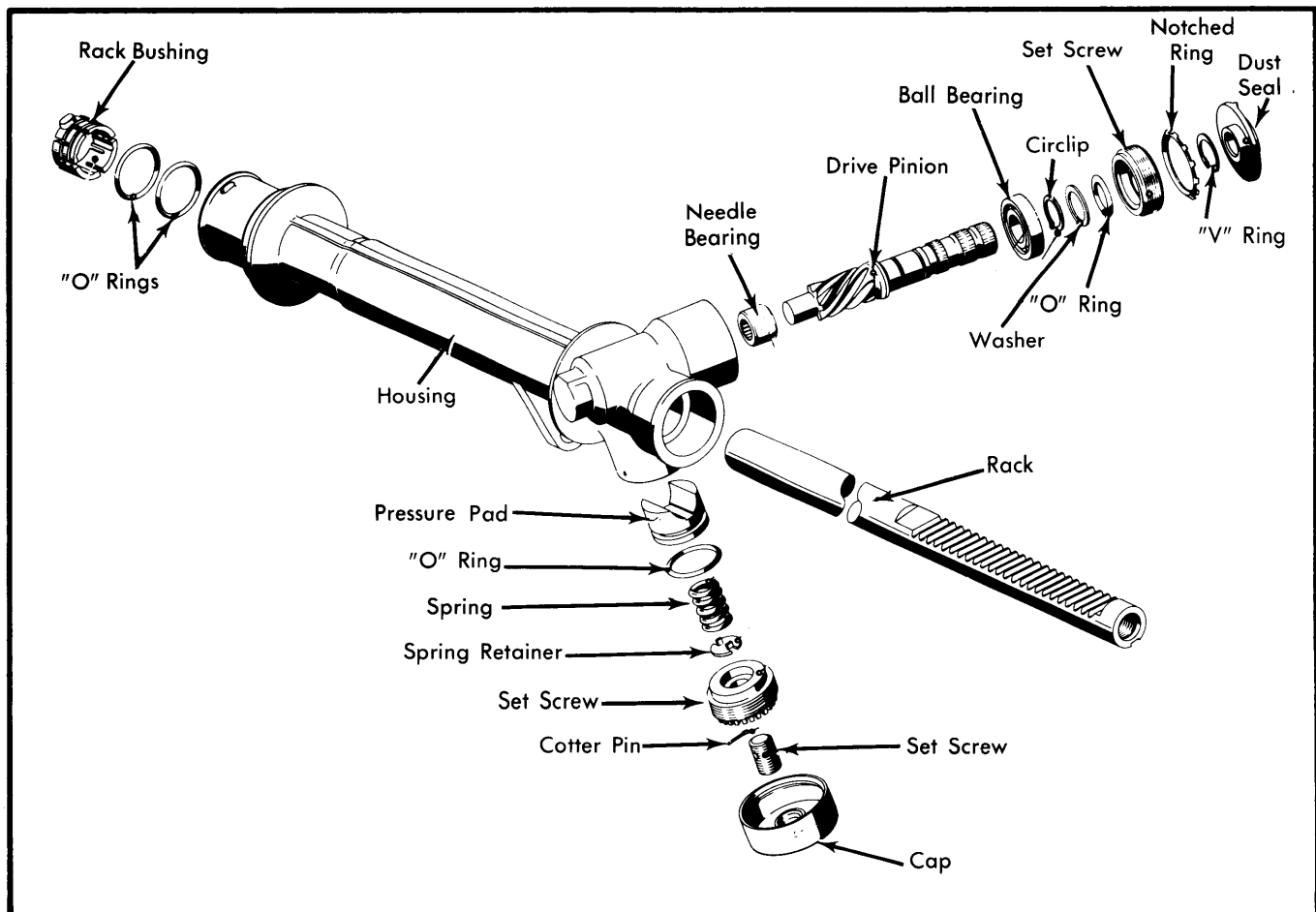


Fig. 1 Exploded View of BMW Rack & Pinion Steering Gear Assembly

## BMW RACK & PINION (Cont.)

5) Clamp drive pinion spline in soft jawed vise and remove drive pinion from housing by tapping housing with plastic hammer. Remove circlip from pinion shaft and press ball bearing off of drive pinion shaft.

6) Needle bearing may be removed from housing with suitable screw type puller (Kukko 00 8 510). Remove rack bushings from housing by prying out with two screwdrivers.

**Assembly** — 1) Place new "O" rings on rack bushings and install bushings in steering box. Locking tabs must engage in housing lock holes. Drive needle bearing, flat side down, into box using suitable mandrel.

2) Press ball bearing onto drive pinion with closed end facing spline and install circlip. Apply thick coat of grease to spline surface of rack and thin coating to remainder of surface. Insert rack into box. Dip assembled pinion shaft in grease and install in box. Install plastic washer and "O" ring to pinion shaft.

3) Tighten set screw to specifications. Insert "V" ring up to groove and press notched ring up to stop. Center rack in housing. Right end of rack should extend 3.031" (77 mm) beyond housing. Place dust seal on shaft so mark on seal is between marks on housing. Place "O" ring into pressure pad and slide pad into steering box.

4) Place spring and retainer on pressure pad. Tighten notched set screw against stop, then back off socket head set screw until it extends approximately 1/2" (12 mm) above edge of housing.

**Adjustment** — 1) Tighten notched set screw to 4 ft. lbs. (.6 mkg), then back off by 1 full castle slot to cotter pin hole. Install adapter (32 1 000) and torque wrench (00 2 000) on pinion shaft. Turn rack over entire length to check for sticking or binding. Set screw may be backed off no more than one notch in event of sticking or binding.

2) Move rack to center position and determine turning torque. If not within specifications, self locking set screw may be turned right to increase or to left to decrease friction.

3) Use new seals and lock plates and complete assembly procedure in reverse order of disassembly.

**NOTE** — *Shoulder of lock plates must engage opening of rack when installing tie rods. If replacing rubber bushing supporting steering damper, short spacers must be in place prior to tightening cover plate.*

### TIGHTENING SPECIFICATIONS

| Application                       | Ft. Lbs. (mkg)                 |
|-----------------------------------|--------------------------------|
| Tie Rod to Rack .....             | 51-56 (7-8)                    |
| Tie Rod to Steering Knuckle ..... | 25-29 (3.5-4.0)                |
| Steering Gear to Axle .....       | 35-39 (4.9-5.4)                |
| Pinion Shaft Pinch Bolt .....     | 18-20 (2.5-2.8)                |
| Pinion Shaft Set Screw .....      | 16-19 (2.2-2.6)                |
| Steering Damper Mounting .....    | 11-13 (1.5-1.8)                |
| Steering Gear Turning Torque      |                                |
| At Center .....                   | 7.8-11.2 INCH lbs. (9-13 cmkg) |
| Beyond Center (Max.) .....        | 17.4 INCH lbs. (20 cmkg)       |