

# Steering Gears

## SAGINAW BALL BEARING WORM & NUT

American Motors  
Chrysler Corp.  
Ford Motor Co.  
General Motors.  
Jeep

*spots indicate damaged bearings or parts. Hard pull indicates excessive preload adjustment. Adjustments may be made with gear on or off vehicle. Always set worm bearing preload before setting sector shaft lash.*

### DESCRIPTION

Recirculating ball nut type. Ball nut, mounted on the worm, is driven through steel balls which circulate in helical grooves in both the worm and nut. Ball return guides, attached to the nut, serve to recirculate the two sets of balls in the grooves. When steering wheel is turned to right, nut moves upward; when turned to left, nut moves downward. The teeth on sector (forged as part of pitman shaft), and the ball nut, are so designed that a tighter fit exists between the two when the front wheels are straight ahead. Proper engagement between sector and ball nut is obtained by an adjusting screw, which moves pitman shaft endwise, permitting desired engagement of tapered teeth of the ball nut and sector gear. Worm bearing adjuster can be turned to provide proper preloading of the upper and lower bearings.

### ADJUSTMENT

**NOTE** — Before any adjustments are made to gear, check for binding at frame bracket mounting bolts, instrument panel bracket, or flexible coupling. Steering shaft should run through full range in both directions without binding. Binding indicates misaligned steering gear on mountings or coupling. Rough

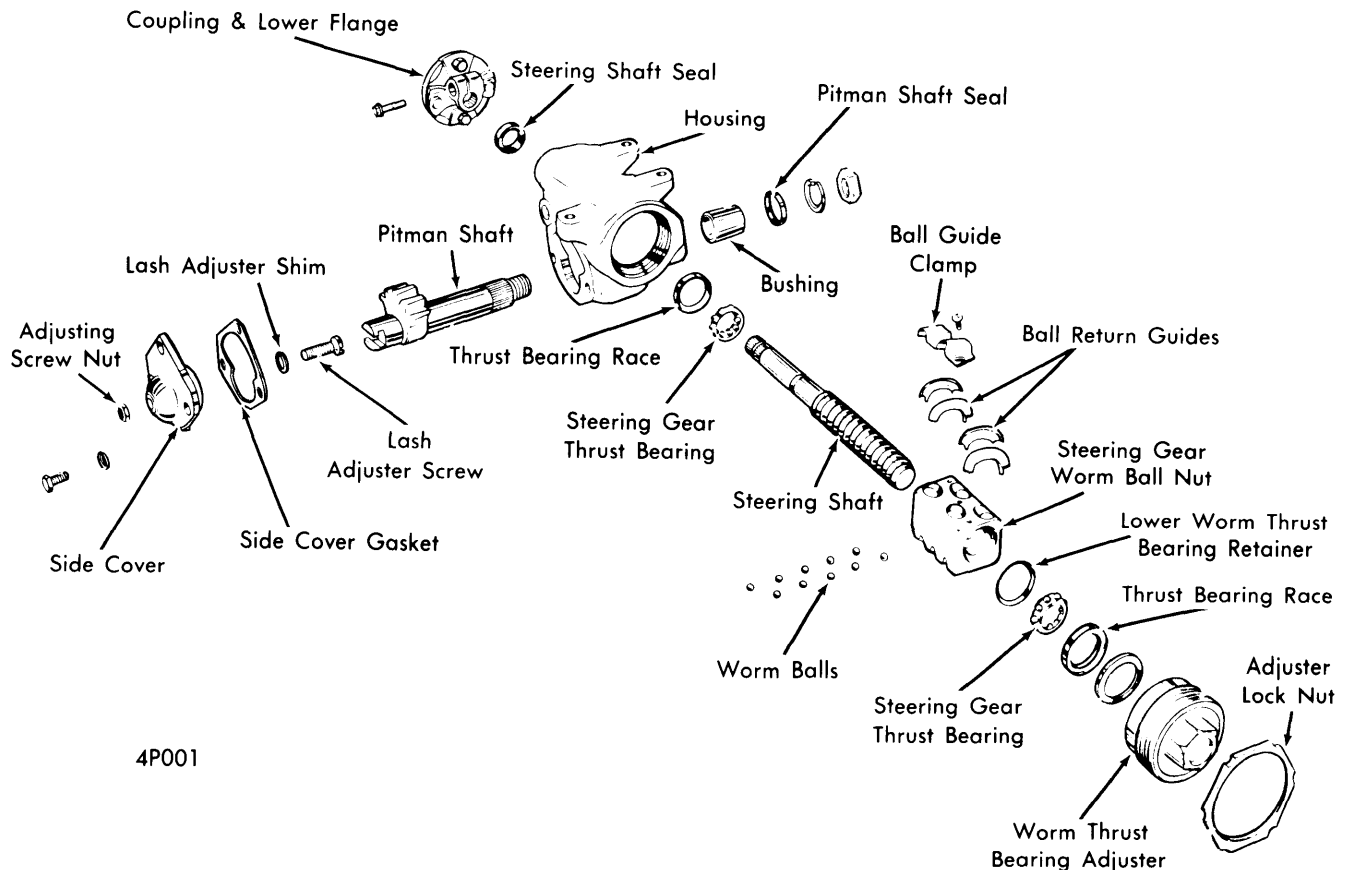
### WORM BEARING PRELOAD

1) If steering gear is on vehicle, remove horn ring or horn button, then remove steering arm from pitman shaft using a suitable puller. Turn steering wheel ½ turn from either stop, then loosen pitman shaft adjusting screw lock nut and back off adjusting screw several turns. Using an INCH lb. torque wrench attached to steering wheel nut, rotate steering wheel through a 90° arc and note torque reading.

2) If less than desired (see specifications), loosen adjuster plug lock nut and turn adjuster plug. Viewed from bottom of gear, turning plug clockwise will increase preload, counterclockwise will decrease preload. After desired preload is obtained, tighten lock nut and recheck preload.

### SECTOR SHAFT OVERCENTER ADJUSTMENT

Rotate steering wheel from stop to stop counting total number of turns, then back off one stop half of total number of turns to find center. Rotate steering wheel ½ turn on either side of center. Using an INCH lb. torque wrench on steering wheel nut, rotate wheel over gear center and note torque. Loosen adjusting screw lock nut and tighten or loosen adjusting screw until torque required to rotate wheel over gear center is correct (see specifications). After adjustments are completed, replace steering arm and tighten nut.



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## SAGINAW BALL BEARING WORM & NUT STEERING GEAR

## SAGINAW BALL BEARING WORM & NUT (Cont.)

### Worm Bearing Preload

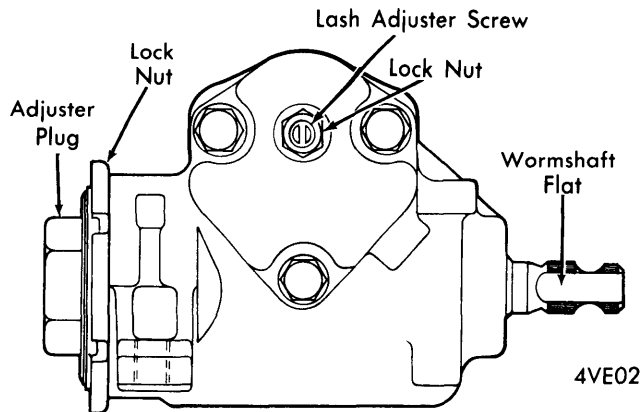
Model	Preload (INCH Lbs.)
American Motors	5-8
Chrysler Corp.	1 1/8 - 4 1/2
Ford Motor Co.	3-8
General Motors	5-8
Jeep	8

### Sector Shaft Overcenter Adjustment

Model	Mesh Load (INCH Lbs.)
American Motors	① 4-10
Chrysler Corp.	② 8-11
Ford Motor Co.	② 10-16
General Motors	① 4-10
Jeep	② 18 (Max.)

① — In excess of worm bearing preload. Total not to exceed 16 INCH Lbs.

② — Including worm bearing preload.



ADJUSTMENT LOCATIONS (TYPICAL)

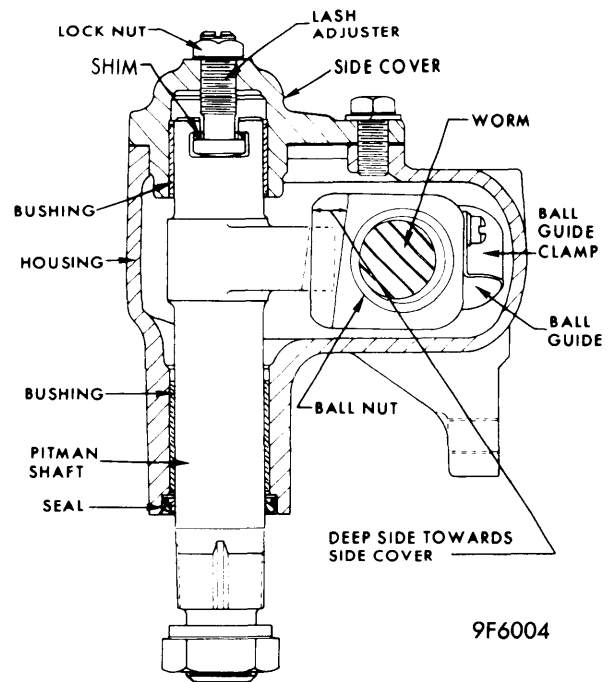
### REMOVAL & INSTALLATION

#### STEERING GEAR

**NOTE** — Steering gear is removed after disconnecting pitman arm from steering gear, and steering shaft at flexible coupling (where used). Any special instructions are listed below. To install reverse removal procedure.

**American Motors** — When reinstalling gear, center steering gear with index mark up. Mark on shaft of flange must be aligned at assembly. Tighten flexible coupling nuts to 25 ft. lbs., and pinch bolt to 30 ft. lbs. Tighten gear mounting screws to 65 ft. lbs. and pitman arm nut to 115 ft. lbs. **NOTE** — Whenever gear assembly is removed or mounting bolts loosened, steering column must be realigned.

**Chrysler Corp., All Models** — **CAUTION** — To avoid damage to the energy-absorbing steering column, it is recommended that the column be completely detached at the floor and at the instrument panel before steering gear is removed. To remove gear, remove steering arm retaining nut and lockwasher from under the car, use a suitable puller C-4150, or equivalent, to remove steering arm from shaft. Remove gear-to-frame retaining bolts and lift steering gear out. To install, reverse removal procedure, tighten retaining bolts to 100 ft. lbs. torque, and tighten steering arm nut to 175 ft. lbs. torque.



STEERING GEAR-SECTIONAL VIEW

**Ford Motor Co., All Models** — When removing, to obtain clearance on some models equipped with standard transmission, it may be necessary to disconnect the clutch linkage. On some 8-cylinder models, it may be necessary to lower the exhaust system. Remove bolts retaining flex coupling to steering shaft, remove nut and lockwasher retaining pitman arm on sector shaft, then use suitable puller (T64P-3590-F) to remove arm from shaft. **CAUTION** — Do not hammer on puller on shaft as this will damage steering gear. Remove gear-to-side rail retaining bolts and lift steering gear out. To install, reverse removal procedure, tighten gear-to-frame bolts to 50-65 ft. lbs. torque, connect flex coupling, position pitman arm on sector shaft, install nut and lockwasher and tighten nut to 150-225 ft. lbs. torque.

**Jeep Models** — Disconnect flexible coupling bolts. Remove pitman arm using puller J-5566-04, or equivalent. Remove steering gear mounting screws and lower gear. When installing, center steering gear with index mark up. Mark on shaft flange must be aligned at assembly. Install flexible coupling bolts, and tighten to 20 ft. lbs. Tighten pinch bolt to 30 ft. lbs. Tighten gear mounting screws to 60 ft. lbs. and install pitman arm and torque to 115 ft. lbs. **NOTE** — After tightening pitman nut, stake threads to insure retention.

**Buick** — When removing pitman arm from gear, do not hammer on end of puller. Tapping on side of pitman arm may help in removal. When reinstalling, tighten gear mounting bolts to 70 ft. lbs. and pinch bolt to 30 ft. lbs. Tighten pitman arm nut to 140 ft. lbs. **NOTE** — Make sure to reinstall coupling flange so that tab on flange is aligned with mark on steering stub shaft.

**Chevrolet** — **NOTE** — When reinstalling, make sure coupling is installed far enough on wormshaft for coupling bolt to pass through undercut on wormshaft. Tighten mounting bolts to 70 ft. lbs. (30 ft. lbs. on Corvette), coupling flange bolt to 30 ft. lbs., and flange nuts to 20 ft. lbs. Tighten pitman arm nut to 140 ft. lbs. on Nova, 93 ft. lbs. on Vega, 185 ft. lbs. on all others.

# Steering Gears

## SAGINAW BALL BEARING WORM & NUT (Cont.)

**Oldsmobile** — Before installing gear, lubricate frame pads where gear bolts to frame to prevent squeaks. Tighten gear mounting bolts to 70 ft. lbs. and pitman arm shaft nut to 180 ft. lbs. Tighten flex coupling nuts to 20 ft. lbs., and flex coupling to gear bolt to 30 ft. lbs.

**Pontiac** — Tighten gear mounting bolts to 70 ft. lbs., flange attaching bolts and nuts to 20 ft. lbs., and pitman shaft nut to 140 ft. lbs. on Ventura, 185 ft. lbs. on all others.

### OVERHAUL

#### DISASSEMBLY

**NOTE** — On Chrysler Corp. vehicles, ball nut and wormshaft are serviced as an assembly and are not to be disassembled. Do not disturb ball return guides. Cross shaft cover assembly, including needle bearing or bushing, is also serviced as an assembly only.

1) Mount gear in a suitable holding fixture, or clamp gear in a vise with wormshaft horizontal. Turn wormshaft until sector gear is centered on worm nut (straight ahead position), then remove side cover attaching bolts. Tap lightly on sector shaft, or on Chrysler Corp. models, use suitable arbor tool (C-3875) to follow up sector shaft as it is removed from housing. **NOTE** — Arbor must be left in housing to retain sector shaft needle bearings until shaft is reinstalled. If sector gear does not clear opening in housing, turn wormshaft slightly to line up gear with opening. Remove sector shaft and side cover from housing as an assembly. Separate shaft from cover by loosening adjusting screw locknut and turning screw clockwise until free from cover. Remove adjusting screw from sector shaft slot using care not to lose shim on screw.

**CHEVROLET VEGA NOTE** — On this gear, adjusting screw is retained in end of sector shaft by a nut which is staked in place. Do not attempt to remove adjusting screw as entire assembly is serviced as a unit.

2) Scribe a locating mark on flexible coupling and worm shaft, remove coupling from shaft. Loosen worm shaft adjuster locknut (use special spanner wrench or brass drift), remove adjuster nut and bearing assembly (bearing retained in nut by a snap ring). Pull worm shaft and ball nut assembly out of housing (**CAUTION** — Do not allow ball nut to run down to either end of worm which would cause damage to ball guides). Remove second worm shaft bearing from end of worm shaft or from within housing.

3) Do not disassemble ball nut unless there is indication of binding or tightness (On Chrysler Corp. models, ball nut and worm shaft are serviced as an assembly). To disassemble, remove ball nut return guide clampscrew, clamp and guides. Invert assembly over a clean cloth and remove all balls from each circuit (turn worm shaft slowly from side to side to aid in ball removal). After all balls removed, nut will slip off worm shaft.

#### INSPECTION & REPAIR

Wash all parts with clean solvent and blow dry with air. Inspect worm and nut grooves and ball surfaces for scoring or pitting, inspect all bearings, bearing cups, shaft surfaces, bushings and oil seals for wear or damage, replace as required.

**Sector Shaft Bushings & Bearings** — If necessary to replace these parts, press or pry oil seal out, then press old bushings (needle bearings on Chrysler Corp.) out and use

correct tools to press new parts in to same position in housing. **NOTE** — Side cover bushing (or bearing) should not be removed, the entire side cover assembly is serviced as an assembly.

**Worm Shaft Bearings** — To remove bearing from adjuster, use screwdriver to pry out bearing retainer ring, lift out bearing. To remove bearing races, use suitable puller and slide hammer to pull bearing race, or use punch to tap race out being careful to drive race out evenly. Use suitable tools to press new bearing races in place.

**Oil Seals** — To replace oil seals, pry or drive old seals out. Use suitable driver to install new seals (socket or sleeve which will bear on outer diameter of seal without damaging seal lip).

#### REASSEMBLY

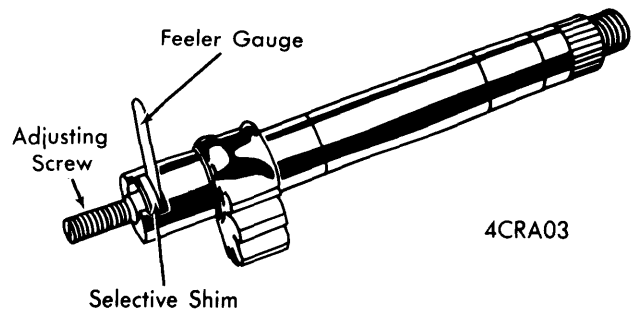
**NOTE** — Some steering gears have ball nut guides with top loading hole for balls. To assemble this type, coat inside of worm, ball nut and guides with oil then install guides into ball nut with nut installed on worm. Load all balls through holes in guide then install guide clamp. Clamps for side loading guide are not the same as for top loading guide. Do not interchange or balls will fall out.

1) Lubricate all seals, bushings and bearings before assembly. Place worm shaft flat on bench and slip nut over worm with ball guide holes up and shallow end of rack teeth to left of steering wheel position.

2) Divide ball bearings to provide an equal number for each circuit. Fill each of the return guides with balls, using vaseline to hold balls in place. Insert remaining balls in each circuit of the ball nut. Rock steering shaft slightly to aid in installing balls. Install return guide clamp and screws. **CAUTION** — Do not rotate shaft while installing balls, balls may enter crossover passage between circuits causing improper operation.

3) Place bearing on shaft above worm, center ball bearing nut on worm; then slide steering shaft, bearing and nut into housing. **NOTE** — Do not damage steering shaft seal in housing. Place bearing in worm adjuster, install bearing retainer, and install adjuster and locknut on housing. **NOTE** — Adjuster should be installed just tight enough to hold bearings in place. Final adjustment will be made later.

4) Install pitman shaft adjusting screw and selective shim in pitman shaft. **NOTE** — Screw must be free to turn but have no more than .002" end play. For proper clearance, shims are furnished in four thicknesses: .063", .065", .067" and .069".



#### CHECKING END CLEARANCE

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## SAGINAW BALL BEARING WORM & NUT (Cont.)

5) On General Motors cars where steering gear is packed with 11 ozs. (9 ozs. on Vega) of special lubricant (GM Specification GM4673M or equivalent), lubricant should be installed during reassembly as follows: Rotate shaft until ball nut is at one end of travel, then pack as much lubricant as possible into housing without losing it out sector shaft opening, then rotate shaft so that ball nut is at opposite end of travel and pack other end of housing with lubricant. After sector shaft installed (without side cover), pack remaining portion of lubricant into housing.

6) Turn worm shaft so that ball nut is at center of travel, Insert sector shaft in housing using care that splined end of shaft does not damage oil seal and make certain center

tooth on sector meshes with center space of ball nut. On General Motors cars, pack remaining portion of lubricant into housing. Place new side cover gasket on housing, position side cover on gasket by reaching through adjusting screw hole with a screwdriver and turning adjusting screw counterclockwise into cover until screw bottoms and side cover is seated against gasket, then back screw off one turn and install locknut loosely (adjustment will be made later). Install side cover bolts and tighten to specified torque.

7) On steering gears other than General Motors, fill gear with correct amount of specified lubricant through filler plug hole (or one side cover bolt hole). Adjust steering gear (see Adjustments).