

# STEERING LINKAGE

# 2M

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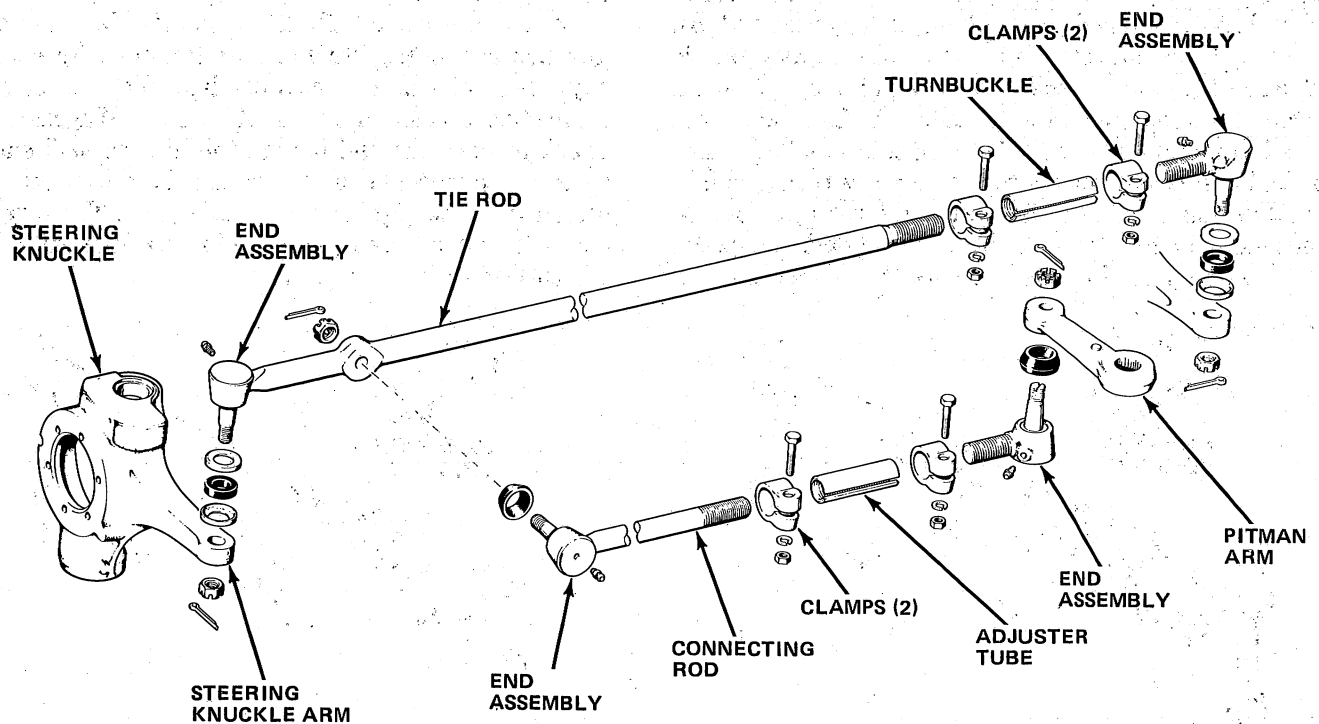
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### GENERAL

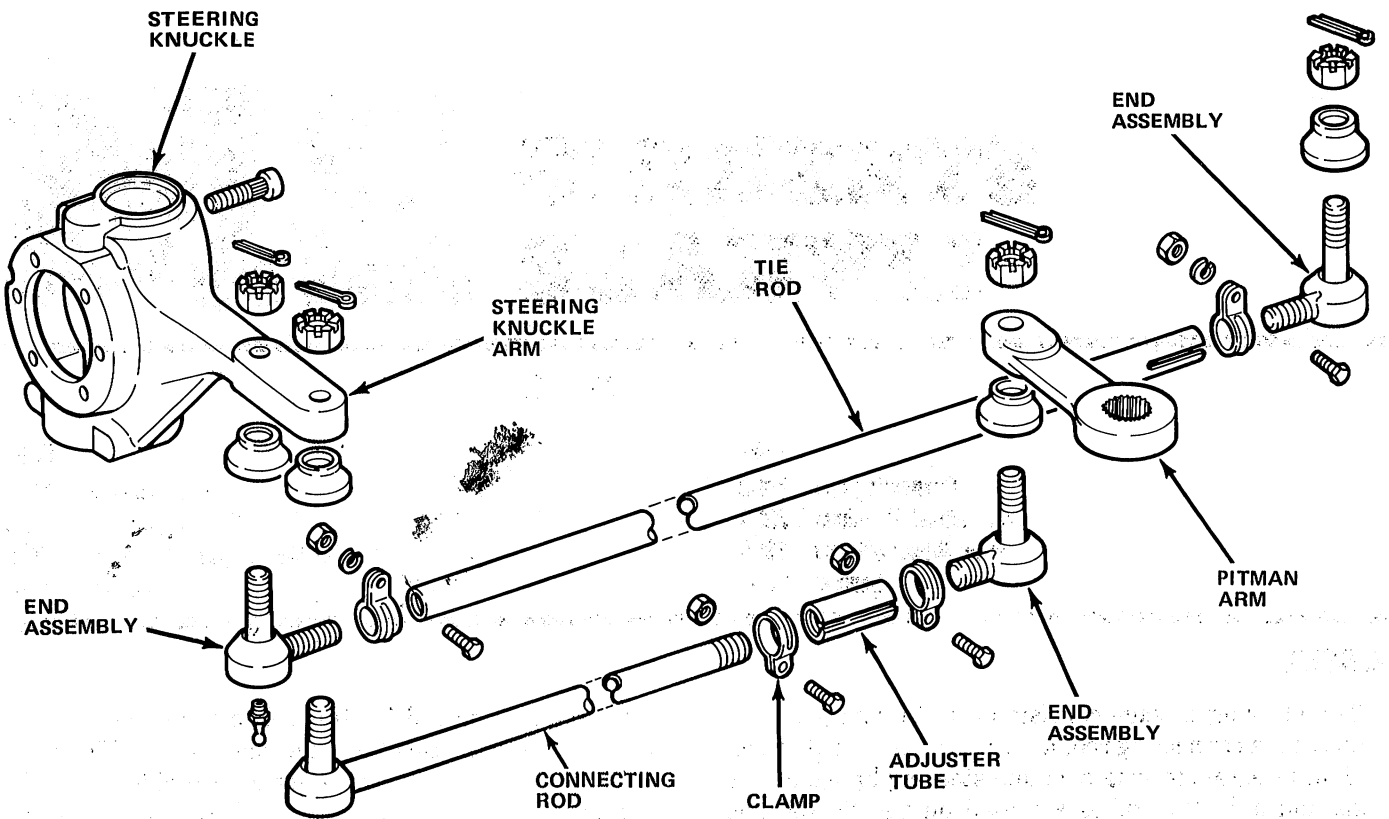
The steering linkage consists of a steering gear pitman arm, a connecting rod, a tie rod, a steering damper, and an integral steering arm and steering knuckle. Ball ends and adjusting tubes are used on the tie rod and connecting rod for toe-in adjustment and steering wheel alignment (figs. 2M-1 and 2M-2).

The connecting rod is attached to the pitman arm at one end and to the tie rod at the opposite end. The tie rod ends are connected to the steering knuckle arms. The steering damper is attached to the tie rod on one end and to a bracket on the left spring tie plate at the opposite end.



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Fig. 2M-1 Steering Linkage—Cherokee-Wagoneer-Truck Models



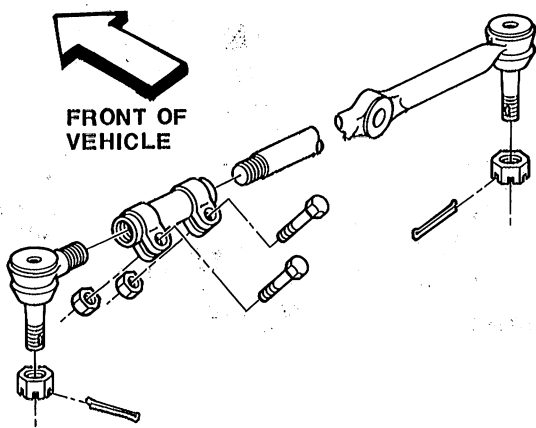
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Fig. 2M-2 Steering Linkage—CJ and Scrambler Models

On Cherokee, Wagoneer and Truck models, the tie rod (fig. 2M-3) consists of a solid rod that is threaded on one end and has a ball-end assembly at the opposite end. An adjusting tube and removable ball end complete the tie rod assembly. The tie rod threaded end has right-hand threads to accept the adjuster tube. On CJ models, the tie rod has ball ends and adjusting tubes at both ends. The ball end that connects to the tie rod is threaded into the adjusting tube. The tie rod has a large boss located about eight inches from the unthreaded end. A tapered hole machined in this boss accepts the connecting rod

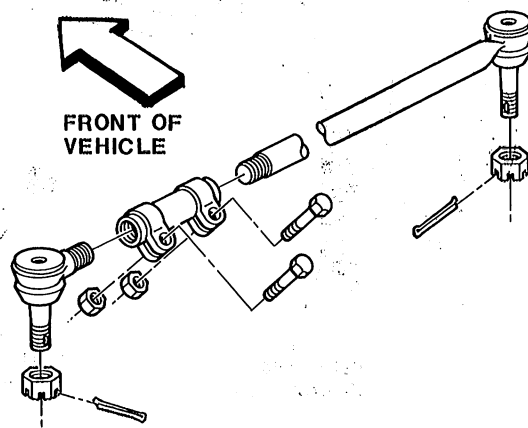
end. The steering damper is connected to a bracket clamped to the center of the tie rod.

The connecting rod (fig. 2M-4) is threaded on one end and has a ball-end assembly at the opposite end. An adjusting tube and removable ball end complete the connecting rod assembly. On Cherokee, Wagoneer and Truck models, the end having the integral ball end assembly is connected to the tie rod. On CJ models, it is attached to the right hand steering arm. The threaded end, with the adjusting tube and removable ball end, is attached to the pitman arm.



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Fig. 2M-3 Tie Rod Assembly



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Fig. 2M-4 Connecting Rod Assembly

## TIE ROD

### Removal

(1) Remove cotter pins and retaining nuts at both ends of tie rod and from end of connecting rod where it attaches to the tie rod.

(2) Remove nut attaching steering damper push rod to tie rod bracket and move damper aside.

(3) Remove tie rod ends from steering arms and connecting rod using puller.

**NOTE:** After removal, the tie rod ends can be removed by loosening the adjusting tube clamp bolts and unthreading the ends.

### Installation

(1) Attach tie rod ends to steering arms. Tighten nuts to 50 foot-pounds (68 N•m) torque and install replacement cotter pins.

(2) Attach connecting rod to tie rod. Tighten nut to 60 foot-pounds (81 N•m) torque on CJ models and 70 foot-pounds (95 N•m) torque on Cherokee, Wagoneer and Truck. Install replacement cotter pin in retaining nut.

(3) Attach steering damper to tie rod bracket.

(4) Adjust toe-in as necessary.

## CONNECTING ROD

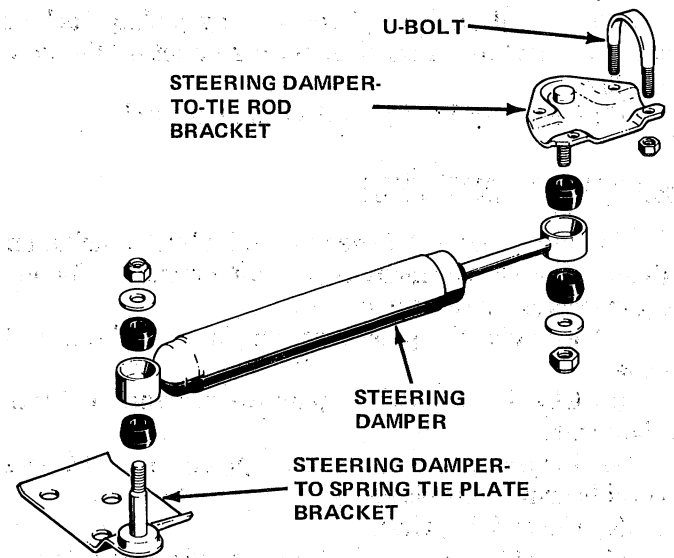
The steering connecting rod can be removed by removing the cotter pins and nuts from both ball ends and removing the rod. The steering connecting rod ball stud ends cannot be disassembled for service.

When installing the steering connecting rod, place the wheels in the straight-ahead position and place the steering arm parallel to the centerline of the vehicle. The steering gear pitman arm must be indexed with the alignment marks on the pitman arm and steering gear shaft and the steering gear must be centered. When the steering arm is correctly positioned, install the connecting rod.

## STEERING DAMPER

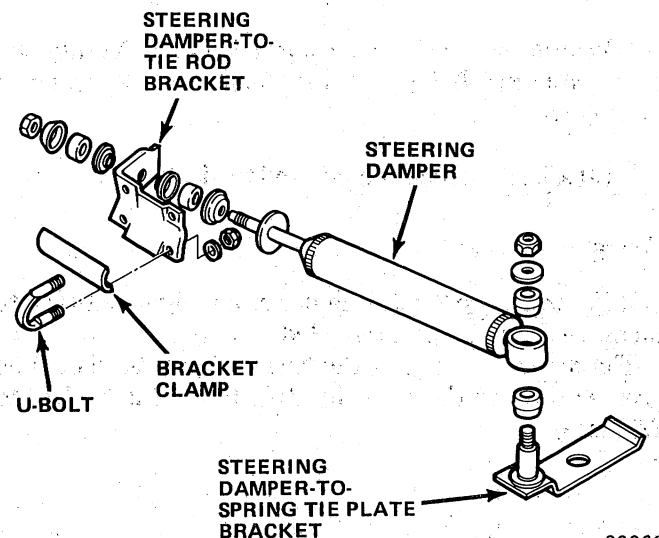
The steering damper used on Cherokee, Wagoneer and Truck models has mounting eyelets at each end (fig. 2M-5). The damper used on CJ models has a mounting eyelet at the body end only as the push rod is threaded to accept a mounting bracket retaining nut (fig. 2M-6). The body end of the damper attaches to a stud on a bracket mounted between the left axle spring and axle spring pad. The push rod end is attached to a bracket that is clamped to the tie rod.

The steering damper is serviced as an assembly only. If damaged or leaking, replace the damper. However, the rubber mounting bushings used in the damper eyelets or on the push rod can be replaced individually if necessary.



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Fig. 2M-5 Steering Damper—Cherokee-Wagoneer-Truck Models



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Fig. 2M-6 Steering Damper—CJ Models

### Removal

- (1) Place front wheels in straight-ahead position.
- (2) Remove locknut attaching damper to tie plate bracket and lift damper off stud.
- (3) Remove locknut attaching push rod end to tie rod bracket and remove damper assembly.

### Installation

- (1) Insert rubber bushings in damper eyelets or on push rod.
- (2) Position push rod on tie rod bracket stud and install attaching parts.
- (3) Install rubber bushings in damper body mounting eyelet.

## 2M-4 STEERING LINKAGE

(4) Extend damper piston rod (by pulling back on damper body) and install mounting eyelet on tie plate bracket stud.

(5) Install and tighten all locknuts securely.

### FRONT WHEEL ALIGNMENT

Alignment should be checked and adjusted using an alignment rack. To ensure correct alignment, the following inspection is recommended.

(1) Equalize tire pressures and place vehicle on level surface.

(2) Check steering gear-to-steering column alignment.

(3) Inspect steering knuckle pivots, spindle, and wheel bearings for looseness.

(4) Check for spring sag.

(5) Check brakes and shock absorbers for proper operation.

(6) Check steering gear adjustment.

(7) Check front and rear wheel tracking.

(8) Check for broken spring center bolts.

**NOTE:** Be sure all front suspension and steering system nuts and bolts are tight before checking wheel alignment.

(9) Check caster, camber and toe-in.

### Toe-In

Refer to figure 2M-7. The use of an alignment rack to measure toe-in is recommended.

The distance between the rear of the tires should be greater than at the front by 3/64 to 3/32 inch (1.19 to 2.38 mm).

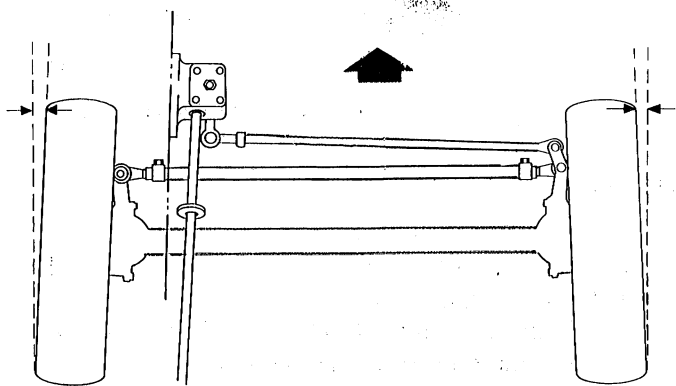


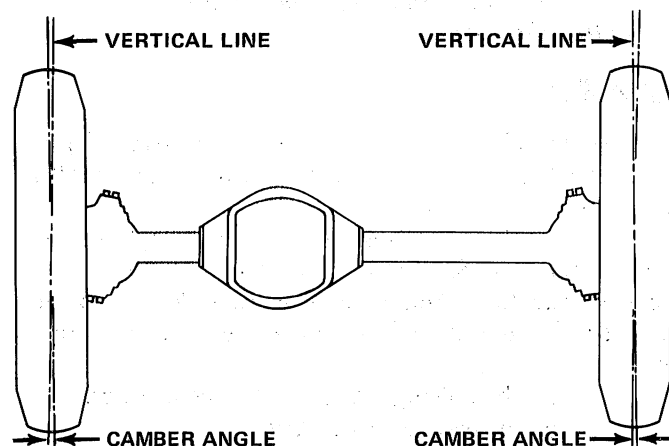
Fig. 2M-7 Front Wheel Toe-In (Top View)—Typical

To adjust toe-in, loosen the adjuster tube clamp bolts and turn the tie rod in or out with a small pipe wrench. The tie rod has both right- and left-hand threads to provide equal adjustment at each wheel. After adjustment, tighten the clamp bolts to specified torque.

### Camber

Refer to figure 2M-8. Correct wheel camber is preset at 0° for all models. Camber cannot be altered by adjustment. It is important that camber be the same on both front wheels. Camber angle should be checked using wheel alignment equipment.

**CAUTION:** Do not attempt to adjust the camber angle by heating or bending the axle or any suspension components. If camber is incorrect, the component(s) causing an incorrect camber angle should be replaced.

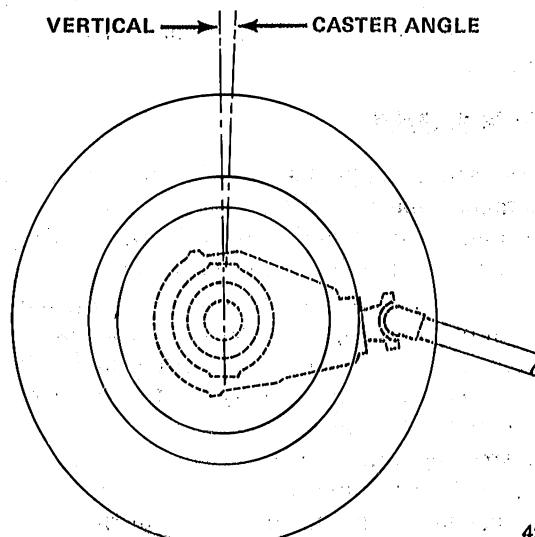


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Fig. 2M-8 Front Wheel Camber

### Caster

Refer to figure 2M-9. Axle caster is preset at +6° for CJ models and +4° for Cherokee, Wagoneer and Truck models. Caster should be checked using wheel alignment equipment. If caster is incorrect, adjustment can be made by installing tapered shims between the axle pad and suspension springs.



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Fig. 2M-9 Front Wheel Caster

If caster is correct and the axle is not bent or twisted, a satisfactory check may be made by road testing the vehicle and checking steering wheel return.

Before road testing, check and correct tire inflation pressures. Be particularly careful to inflate both front tires to exactly the same pressure.

During the road test, turn the steering wheel from side-to-side and make turns to both the left and right. If the vehicle turns easily to the either side and the steering wheel returns toward center unassisted, caster is correct. However, if the vehicle turns to either side easily but the steering wheel does not return toward center unassisted, incorrect caster is indicated.

## STEERING WHEEL SPOKE ALIGNMENT

After checking and adjusting front wheel alignment, align the steering wheel spokes as follows:

- (1) Turn steering wheel until spokes are in centered position and clamp steering wheel in place.
- (2) Loosen connecting rod adjusting tube clamps and turn tube until front wheels are in straight-ahead position.
- (3) Tighten adjusting tube clamps.
- (4) Road test and check steering wheel alignment.

## FRONT WHEEL SHIMMY

Front wheel shimmy can be caused by one or more of the following conditions:

- Loose front wheel bearings
- Worn, unbalanced, or out-of-round front tires
- Loose steering damper bracket
- Steering damper malfunction
- Worn or loose tie rod ends
- Worn, loose, or incorrectly preloaded steering knuckle ball studs
- Incorrect tire inflation pressures

The following procedure outlines a method for determining and correcting the causes of wheel shimmy:

- (1) Raise vehicle front end.
- (2) Inspect front tire condition and check and correct inflation pressures. Check tires for evidence of unbalance such as cupping, scalloping, flat spots, or bald spots. Balance or replace tires exhibiting these conditions.
- (3) Check and correct front wheel bearing adjustment, if necessary. Refer to Chapter 2H for procedure.
- (4) Inspect steering damper mounting brackets or retaining nuts for being loose. If loose, tighten nuts or center bracket on tie rod and tighten attaching bolts.
- (5) Check steering damper operation. Disconnect damper at tie rod bracket and alternately compress and extend damper piston fully. Piston action should be smooth and uniform throughout each stroke. Higher

resistance on extension stroke than compression stroke is normal condition. Replace damper if lack of resistance is evident.

(6) Inspect tie rod ends. Replace any tie rod end that exhibits excessive play.

(7) Inspect steering knuckle ball studs. Insert pry bar between knuckle and yoke, adjacent to ball stud, and pry against each stud. If studs do not move or appear to be loose in stud socket, proceed to next step. If any stud moves or appears loose, reseal both studs in that side of axle as follows:

- (a) Remove wheels and axle shafts.
- (b) Loosen lower ball stud jamnut and remove cotter pin and slotted nut from upper ball stud.
- (c) Unseat both ball studs by striking them with lead hammer and remove upper ball stud split ring seat using tool J-25158. Discard seat after removal.
- (d) Remove lower ball stud jamnut and remove steering knuckle. Discard jamnut after removal.
- (e) Clean split ring seat threads and lower stud taper in steering knuckle. Clean threads and tapered surfaces of both ball studs and clean threads in upper ball stud retaining nut.
- (f) Position knuckle on axle yoke and install replacement lower ball stud jamnut finger-tight (only).
- (g) Install and tighten upper ball stud slotted nut to 10-20 foot-pounds (13-27 N•m) torque to draw lower ball stud into tapered hole in axle yoke. Do not install upper ball stud split ring seat at this time.
- (h) Tighten replacement lower ball stud jamnut to 80 foot-pounds (108 N•m) torque.
- (i) Remove upper ball stud slotted nut and install replacement split ring seat using Tool J-25158. Tighten seat to 50 foot-pounds (68 N•m) torque. Install and tighten upper ball stud slotted nut to 100 foot-pounds (136 N•m) torque. Align and install cotter pin without loosening slotted nut.
- (j) Loosely install axle shafts and steering spindles and measure turning effort of each steering knuckle. Refer to Ball Stud Preload Measurement in Chapter 2F—Axles. If turning effort is less than 10 foot-pounds (14 N•m) torque, proceed to next substep. If turning effort is more than 10 foot-pounds (14 N•m) torque, replace upper and lower ball studs and repeat Ball Stud Preload Correction procedure in Chapter 2F—Axles.
- (k) Install axle shafts and repeat procedure outlined in step (7).
- (l) Install wheels and lower vehicle.
- (8) On CJ models not equipped with steering damper, install steering damper kit if steering components are OK.
- (9) Lower vehicle.
- (10) Road test vehicle to verify effectiveness of repairs.

**SPECIFICATIONS**

**Torque Specifications**

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-tightened item.

	USA (ft. lbs.)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Connecting Rod Clamp Bolt — CJ-Scrambler . . . . .	12	10-15	16	14-20
Connecting Rod Clamp Bolts — Cke, Wag, Trk . . . . .	30	25-35	41	34-47
Connecting Rod End-to-Tie Rod Nut (5/8-18) . . . . .	70 minimum		95 minimum	
Connecting Rod End-to-Pitman Arm Nut (9/16-18) . . . . .	60 minimum		81 minimum	
Pitman Arm to Pitman Shaft Nut . . . . .	185	160-210	251	217-285
Steering Damper Locknuts — Cke, Wag, Trk . . . . .	30	24-36	41	33-49
Steering Damper Bracket U-Bolts — CJ-Scrambler . . . . .	12	8-15	16	11-20
Steering Damper Locknut (3/8-24) CJ-Scrambler . . . . .	22	16-28	30	22-38
Steering Damper Locknut (7/16-20) CJ-Scrambler . . . . .	30	24-36	41	33-49
Upper Ball Stud Retaining Nut . . . . .	100	—	136	—
Lower Ball Stud Jamnut . . . . .	80	—	108	—
Upper Ball Stud Split Ring Seat . . . . .	50	—	68	—
Tie Rod Clamp Bolt (5/16-24) CJ-Scrambler . . . . .	12	10-15	16	14-20
Tie Rod Clamp Bolt (7/16-14) Cke, Wag, Trk . . . . .	30	25-35	41	34-47
Tie Rod Stud Nuts — CJ-Scrambler . . . . .	40 minimum		54 minimum	
Tie Rod Stud Nuts — Cke, Wag, Trk . . . . .	60 minimum		81 minimum	
Wheel Nuts — CJ-Scrambler . . . . .	75	65-90	102	88-122
Wheel Nuts — Cke, Wag, J-10 Trk . . . . .	75	65-80	102	88-108
Wheel Nuts — J-20 Trk . . . . .	130	110-150	176	149-203

All torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

\*Tightened to castellated nut slot only. Do not loosen nut to obtain desired torque.

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**Front Wheel Alignment Specifications**

Steering Axis Inclination . . . . .	8-1/2°
Caster	
CJ-Scrambler . . . . .	+ 6° (+ 1°)
Cherokee, Wagoneer, and Truck . . . . .	+ 4° (+ 1°)
Camber . . . . .	0° (+ 1/2°)
Toe-In . . . . .	.3/64 to 3/32-Inch (1.19 to 2.38 mm)
Turning Angle	
CJ-5 . . . . .	29°
CJ-7/Scrambler . . . . .	32°
Cherokee, Wagoneer, and Truck . . . . .	36° to 37°

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