STEERING LINKAGE 2M

INDEX

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.

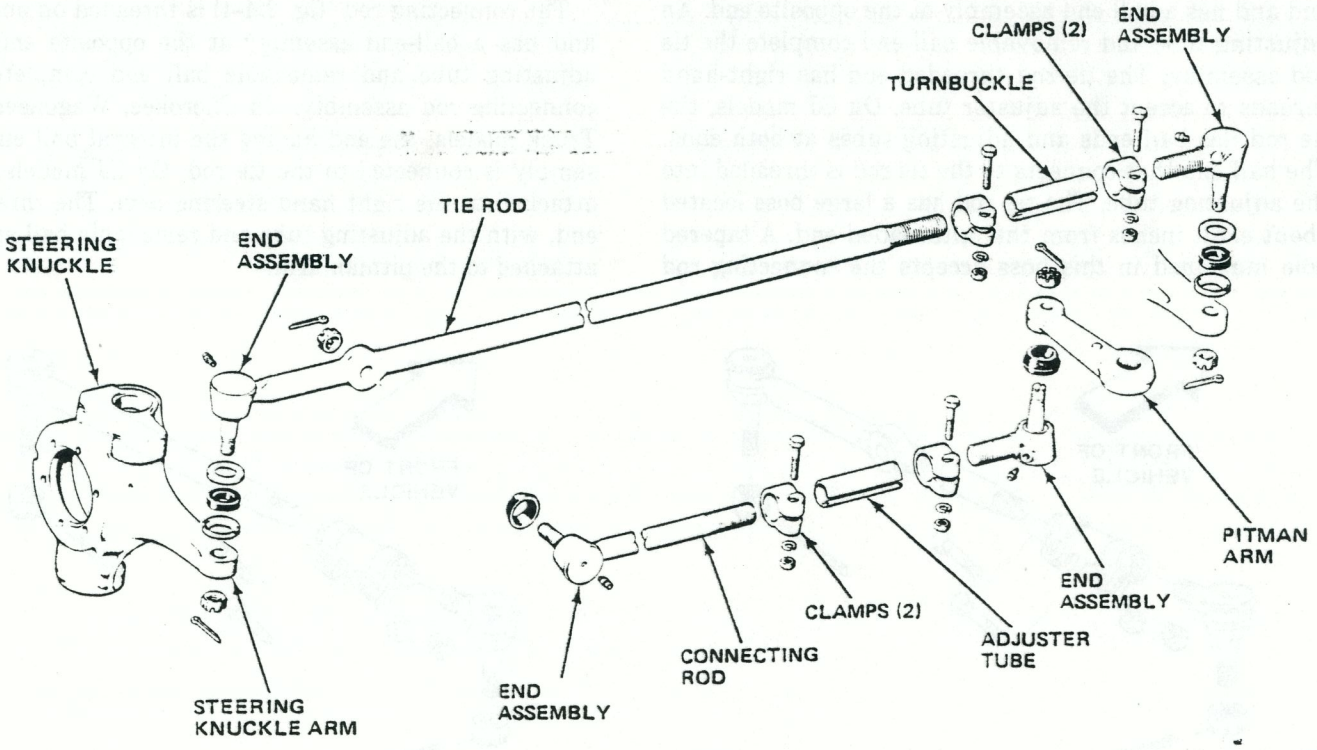

Fig. 2M-1 Steering Linkage—Cherokee-Wagoneer-Truck Models

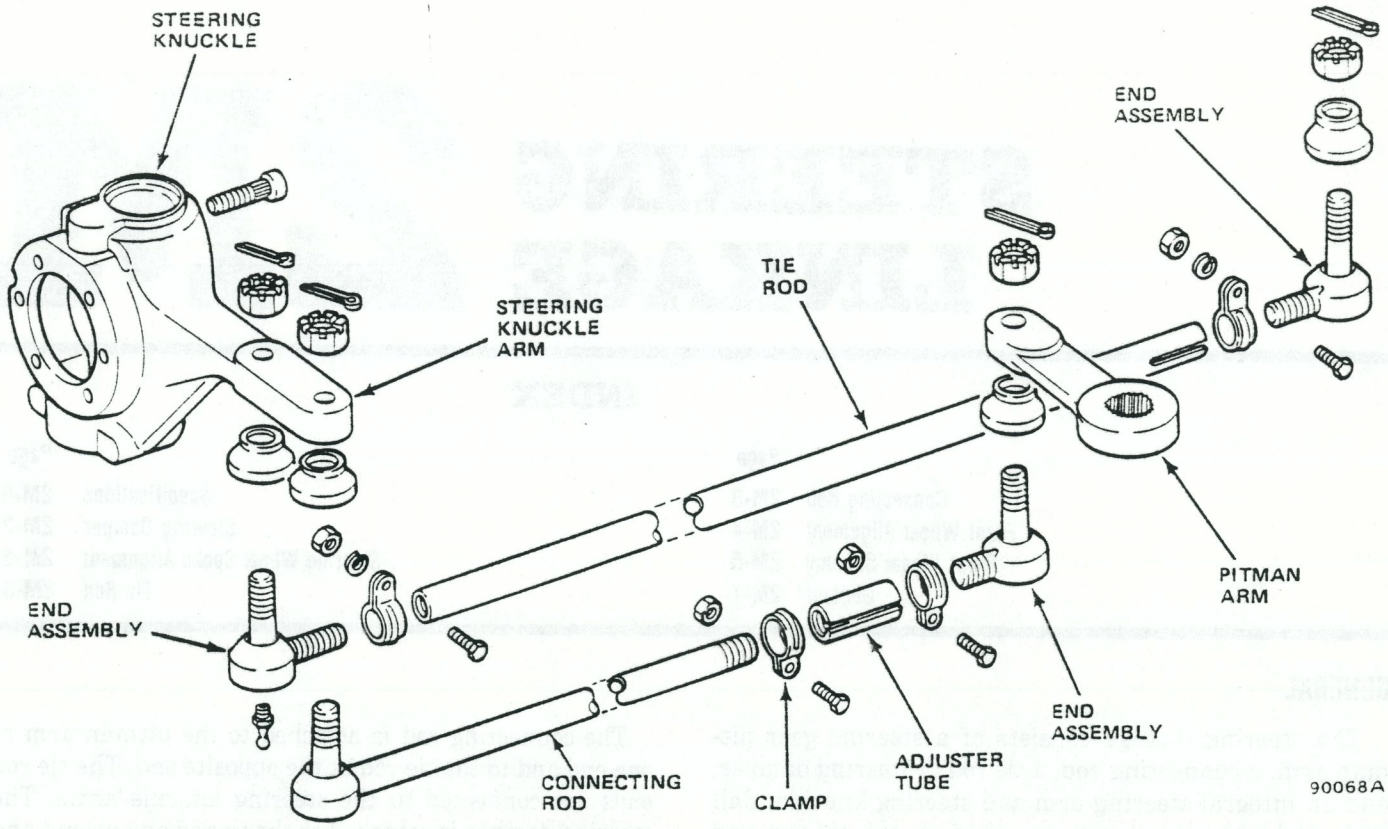

Fig. 2M-2 Steering Linkage—CJ Models

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.

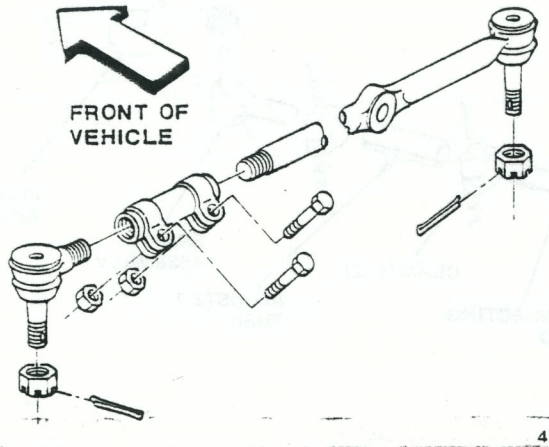

Fig. 2M-3 Tie Rod Assembly

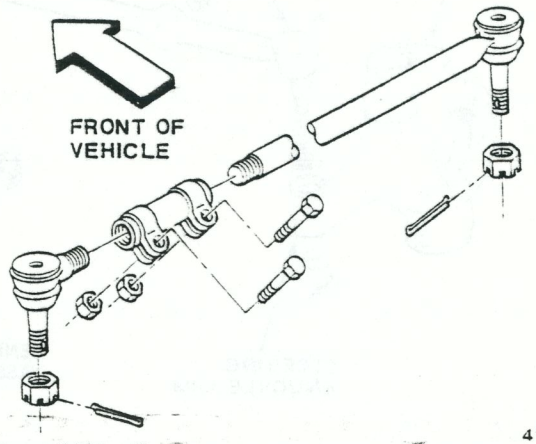

Fig. 2M-4 Connecting Rod Assembly

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 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.

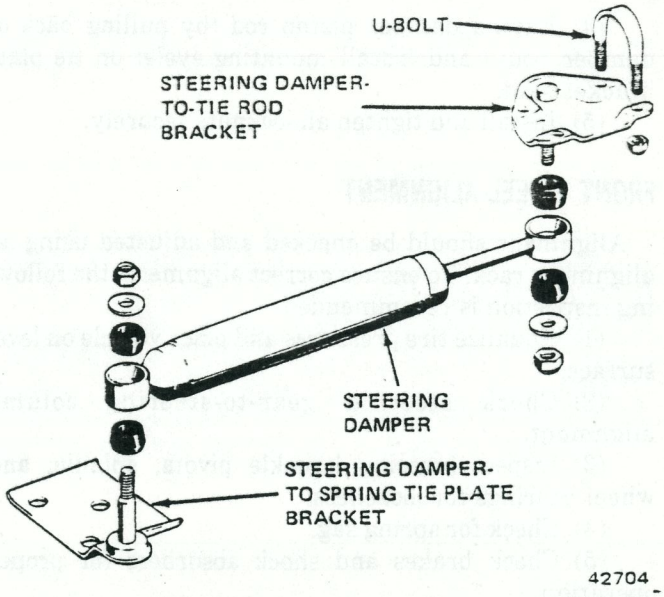

Fig. 2M-5 Steering Damper—Cherokee-Wagoneer-Truck Models

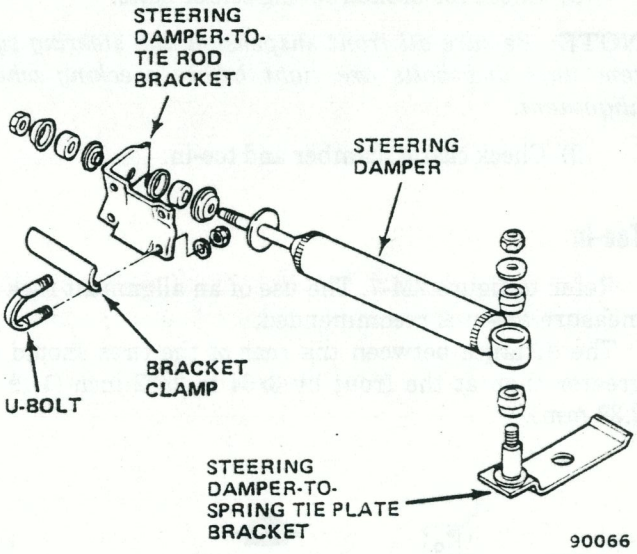

Fig. 2M-6 Steering Damper—CJ Models

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.

(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).

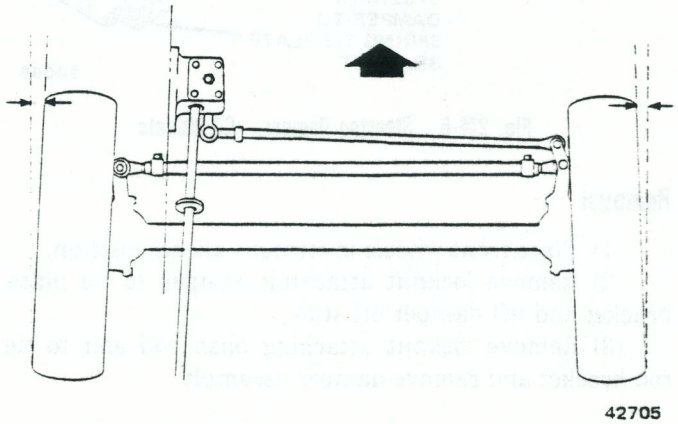

Fig. 2M-7 Front Wheel Toe-In (Top View)—Typical

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 of 0° is preset in the front axle at the time of manufacture and 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.*

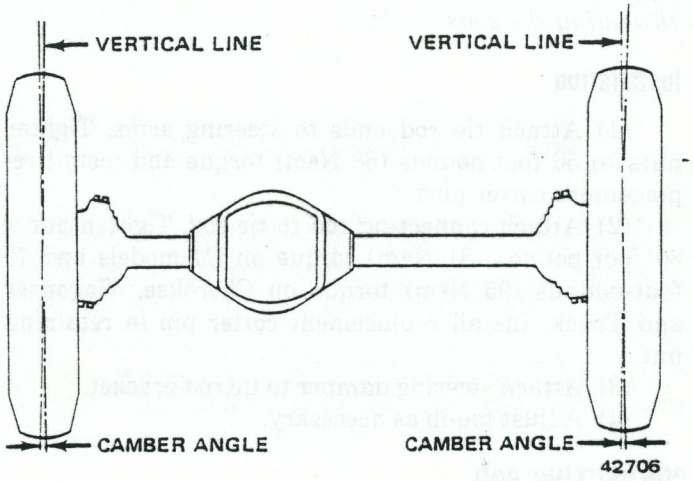

Fig. 2M-8 Front Wheel Camber

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.

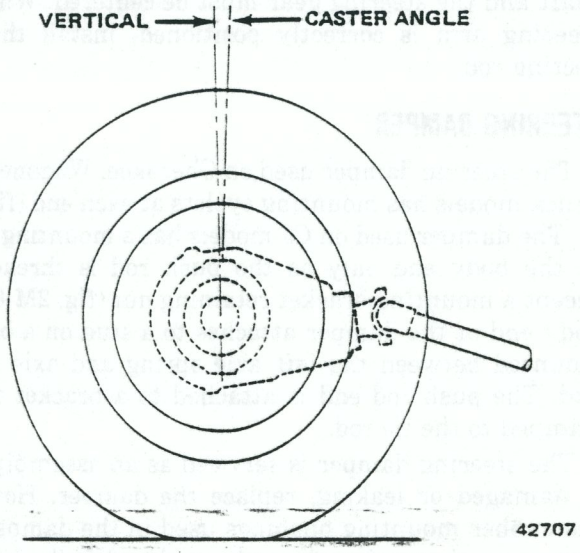

Fig. 2M-9 Front Wheel Caster

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 either side and the steering wheel returns to center unassisted, caster is correct. However, if the vehicle turns to either side easily but the steering wheel does not return to 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, reseat 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 bo[illegible]ball studs and clean threads in upper ball stud retain[illegible]nut.

(f) Posi[illegible] knuckle on axle yoke and install replacement lowe[illegible]ll stud jamnut finger tight (only).

(g) Install [illegible].d tighten upper ball stud slotted nut to 10-20 foot-p[illegible]nds (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-torqued 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	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	12	8-15	16	11-20
Steering Damper Locknut (3/8-24) CJ	22	16-28	30	22-38
Steering Damper Locknut (7/16-20) CJ	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	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	40 minimum		54 minimum	
Tie Rod Stud Nuts – Cke, Wag, Trk	60 minimum		81 minimum	
Wheel Nuts – CJ	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	+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	31° to 32°
Cherokee, Wagoneer, and Truck	37° to 38°

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SUSPENSION 2N

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GENERAL

Jeep vehicles are equipped with semi-elliptic leaf springs and dual-action hydraulic shock absorbers at front and rear. A front axle stabilizer bar is standard on Cherokee, Wagoneer, and Truck models and CJ models with the molded hard top. A front stabilizer bar is optional on all other CJ models.

Front and rear suspension springs are mounted parallel to the frame side rails. The forward end of the front springs and the rear end of the rear springs are attached to the frame by pivoting shackles. The opposite spring ends are attached to the frame by fixed pivot bolts. All spring ends have silent-block type rubber bushings which do not require lubrication.

The front springs are mounted below the axle on all Jeep vehicles. CJ models use multi-leaf front springs (fig. 2N-1). Cherokee, Wagoneer, and Truck models use tapered-leaf or multi-leaf front springs (fig. 2N-2).

The multi-leaf rear springs used on CJ models are mounted below the axle (fig. 2N-3).

The rear springs used on Cherokee, Wagoneer, and Truck models are either multi-leaf or tapered-leaf springs and are mounted above the axle (figs. 2N-4 and 2N-5).

The leaf springs on all Jeep models are attached to the axle by U-bolts and tie plates and are positioned on the axle by spring saddles welded to the axle tubes. Spring center bolts and spring clips are used to align and hold the spring leaves in position. If the vehicle is used for severe, off-road operation, the springs should be examined periodically for broken or shifted leaves, loose or missing clips, and broken center bolts.

Squeaking noises can be generated when movement between the spring bushings and metal parts occurs. This noise can usually be eliminated by tightening the spring attaching bolts to the specified torque. However, if squeak noises persist after bolt tightening, check for a bushing that is loose in the spring eye, or misaligned (not centered in spring eye), or spring misalignment caused by damaged suspension components. Repair as necessary if any of these conditions are discovered.

The spring eye bushings do not require any type of lubrication. Do not attempt to eliminate bushing noises by lubricating them. Grease and mineral oil-base lubricants can cause deterioration of the bushing rubber.

SUSPENSION JOUNCE AND WINDUP BUMPERS

A front axle windup bumper is used on CJ models only. The bumper consists of a stamped bracket with a rubber bumper attached to it (fig. 2N-6). The bracket is attached to the inner side of the right frame rail adjacent to and just above the front axle housing. During severe operation when extreme spring movement and front axle travel occurs, the bumper contacts a pad on the front axle housing to prevent excessive housing movement.

All models are equipped with frame-mounted jounce bumpers located at the front and rear of the vehicle suspension. The bumpers are attached to the underside of the frame rails and are positioned over and in line with the axle tubes.

SHOCK ABSORBERS

The hydraulic, dual-action shock absorbers used on Jeep vehicles are designed to control suspension spring movement. The shock absorber upper ends are attached to brackets located on the frame rails. The lower ends are attached to the spring tie plate or axle tube. Rubber bushings are installed in the shock mounting eyes to damp out road shock and noise.

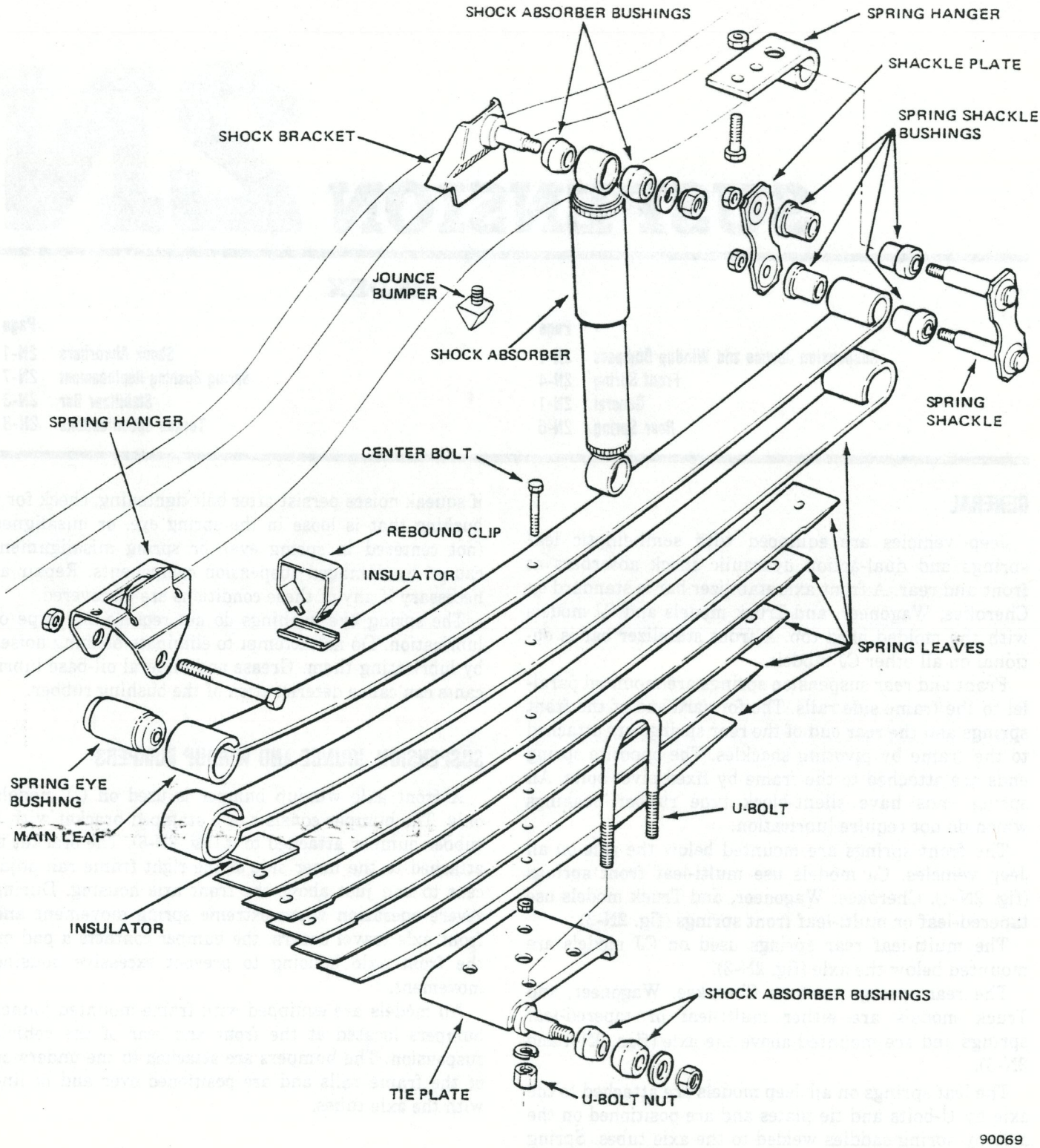

Fig. 2N-1 Front Spring and Shock Absorber—CJ

Dual front shock absorbers are available as an option on Cherokee and J-10 Truck models. The internal valving of these shock absorbers is designed to increase the damping forces needed to cushion the loads encountered in off-road operation.

Squeak noises from the shock bushings can be generated if movement between the bushings and metal parts occurs. This noise can usually be eliminated by tightening the shock mounting nuts. However, if squeak noises persist, check for damaged or worn bushings or

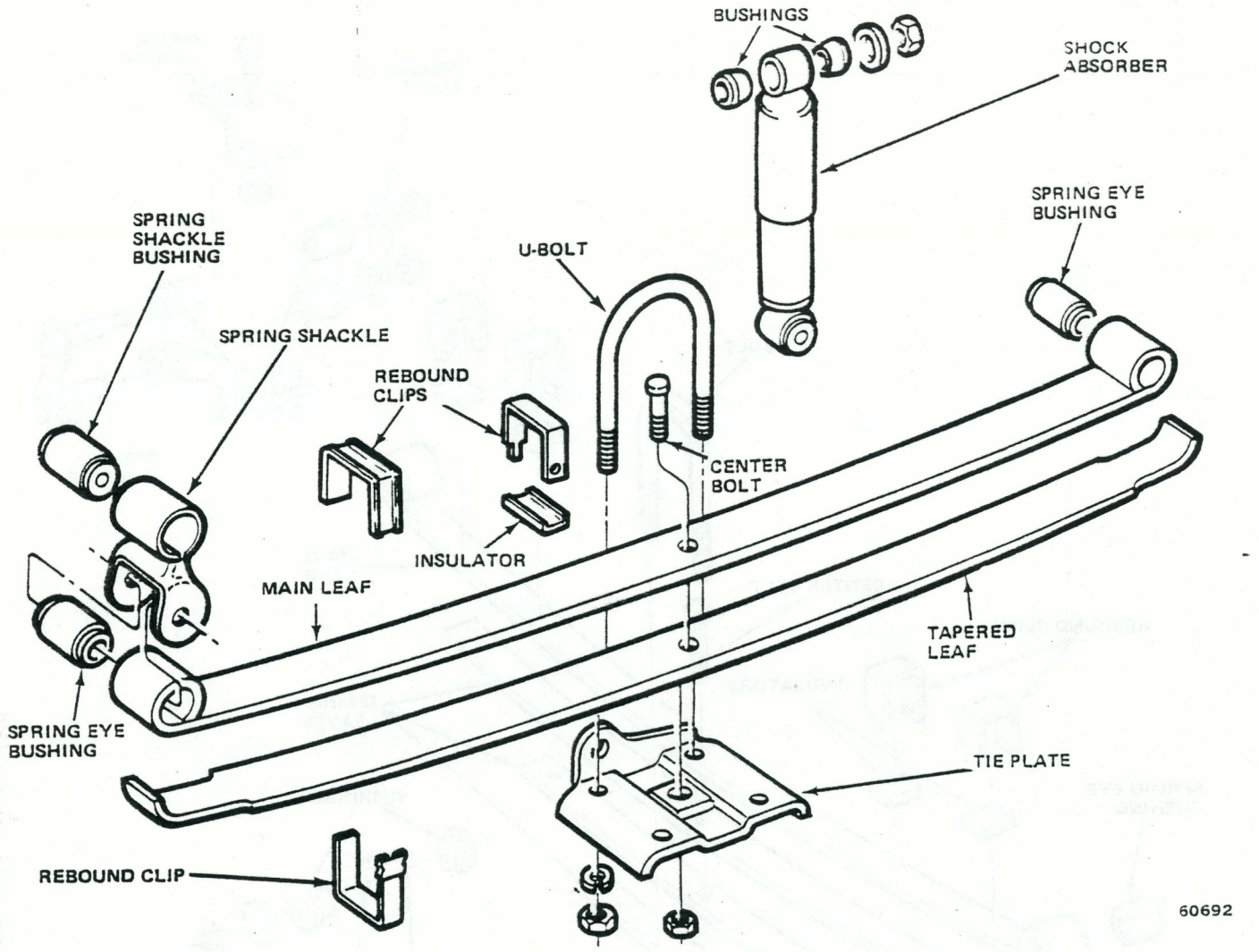

Fig. 2N-2 Front Spring and Shock Absorber—Cherokee-Wagoneer-Truck

damaged shock mounting components. Repair as necessary if any of these conditions are discovered.

The shock absorber bushings do not require any type of lubrication. Do not lubricate the bushings in an attempt to reduce bushing noises. Grease or mineral oil-base lubricants can cause deterioration of the bushing rubber.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced as an assembly. To test a unit, hold it in an upright position and work the shock piston up and down four or five times. Shock action throughout each stroke should be smooth and produce an equal amount of resistance in each direction.

Shock Absorber Replacement

(1) Raise vehicle.

(2) Position hydraulic jack under axle and raise axle to relieve springs of axle weight.

(3) Remove washers and locknuts attaching shock absorber to upper and lower mounting pins.

(4) Remove shock absorber and remove bushings from shock mounting eyes.

(5) Install replacement bushings in shock mounting eyes. Do not lubricate bushings, install them dry.

(6) Position replacement shock absorber on mounting pins.

(7) Install shock absorber attaching washers and locknuts. Tighten locknuts to specified torque.

(8) Lower vehicle and remove hydraulic jack.

STABILIZER BAR

The stabilizer bar extends across the front underside of the frame and is attached to the frame rails by clamps and rubber bushings (fig. 2N-7). The bar ends extend rearward to a position above the front springs and are connected to the axle and springs by connecting links (fig. 2N-8).

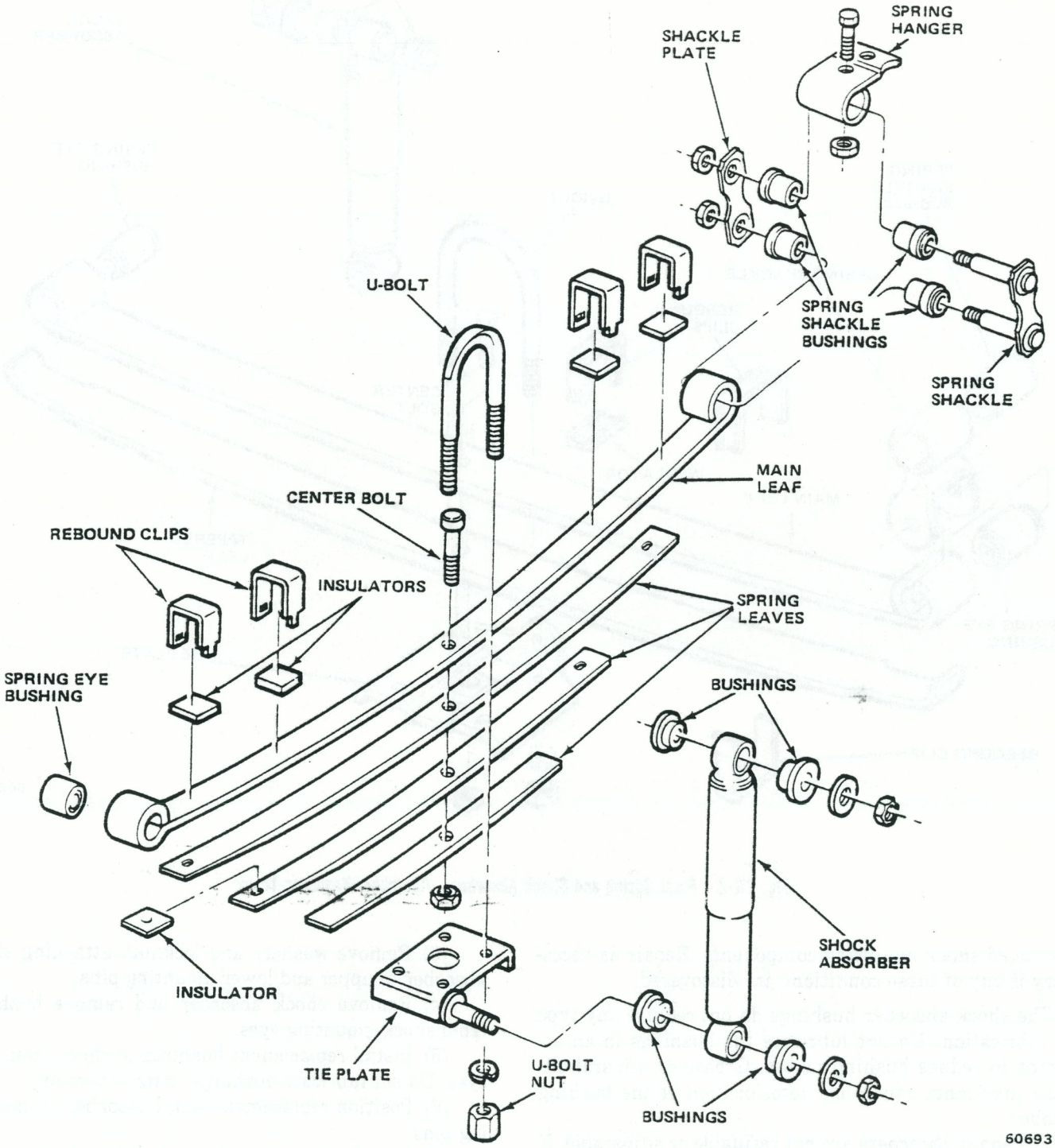

Fig. 2N-3 Rear Spring and Shock Absorber—CJ

FRONT SPRING

Removal

(1) Raise vehicle.

(2) Support vehicle using safety stands placed under frame rails.

(3) Position hydraulic jack under axle and raise axle to relieve springs of axle weight.

(4) Disconnect stabilizer bar, if equipped.

(5) Remove spring U-bolts and tie plates.

(6) Remove bolt attaching spring front eye to shackle.

(7) Remove bolt attaching spring rear eye to spring hanger.

(8) Remove spring.

NOTE: *The spring can be disassembled by removing the spring rebound clips and spring center bolt. If the spring bushings are to be removed, refer to Spring Bushing Replacement.*

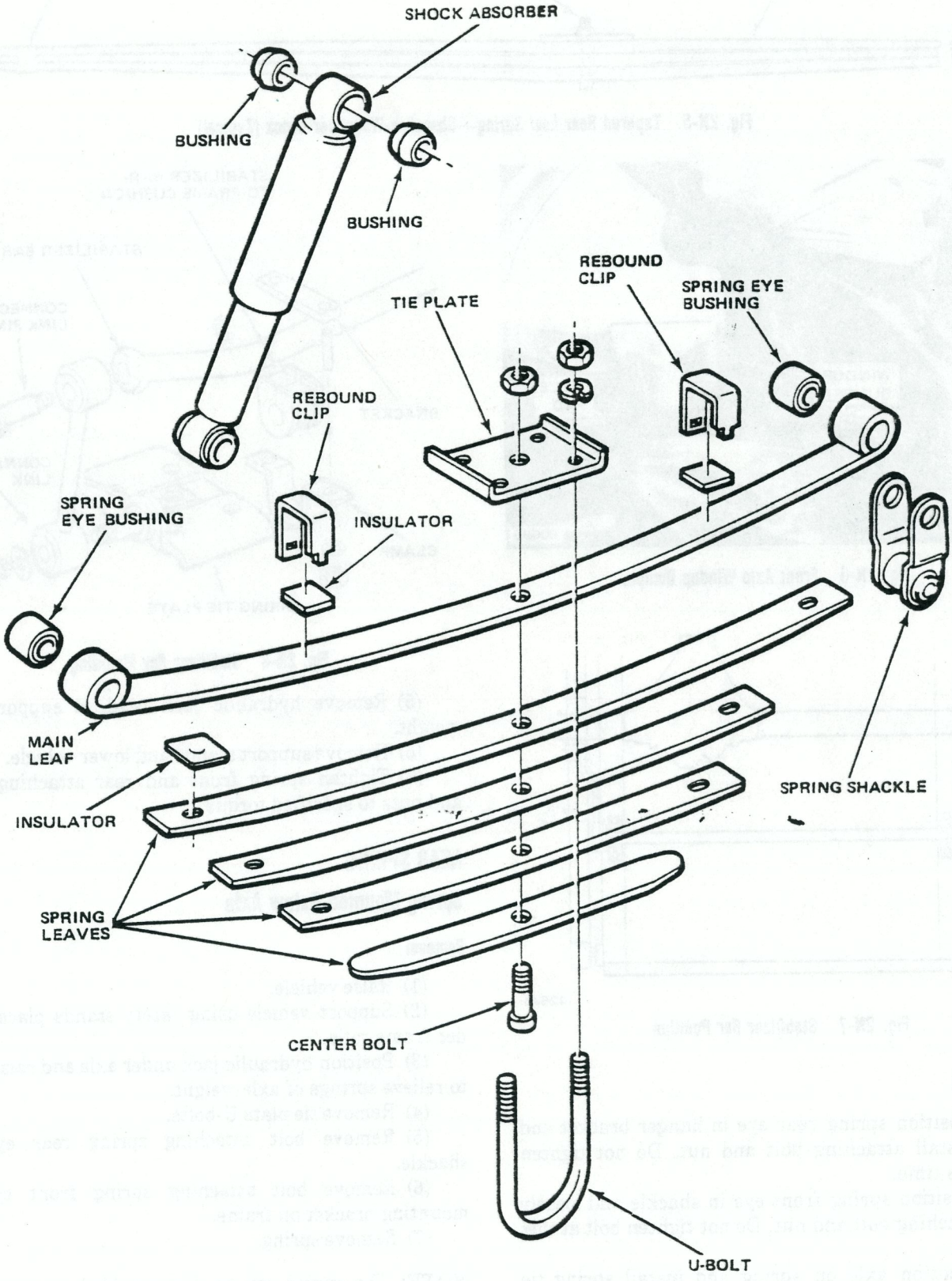

Fig. 2N-4 Rear Spring and Shock Absorber—Cherokee-Wagoneer-Truck

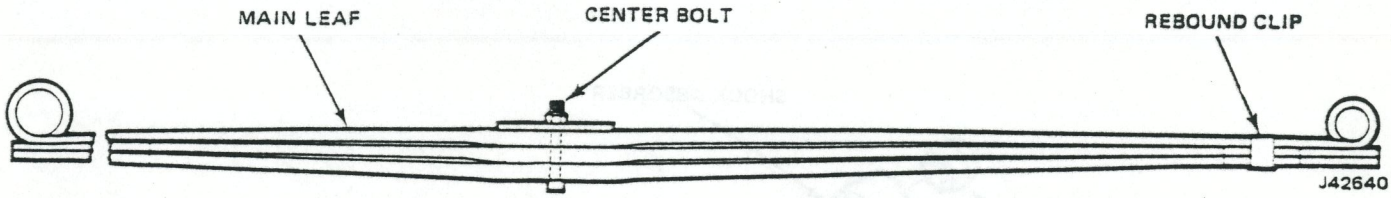

Fig. 2N-5 Tapered Rear Leaf Spring—Cherokee-Wagoneer-Truck (Typical)

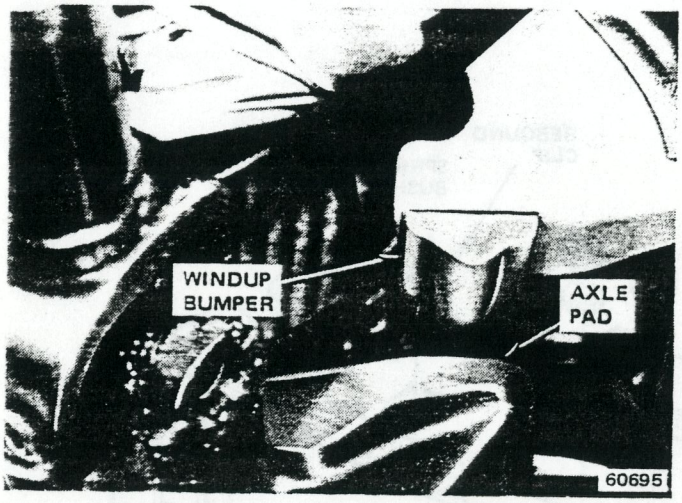

Fig. 2N-6 Front Axle Windup Bumper

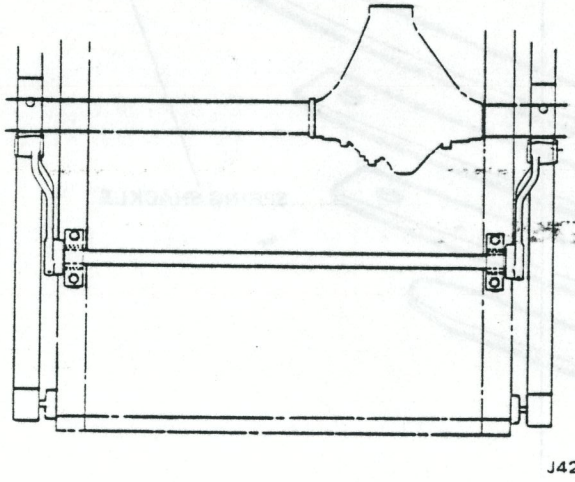

Fig. 2N-7 Stabilizer Bar Position

Installation

(1) Position spring rear eye in hanger bracket and loosely install attaching bolt and nut. Do not tighten bolt at this time.

(2) Position spring front eye in shackle and loosely install attaching bolt and nut. Do not tighten bolt at this time.

(3) Position axle on spring and install spring tie plate and U-bolts. Tighten U-bolt nuts to specified torque.

(4) Connect stabilizer bar, if equipped.

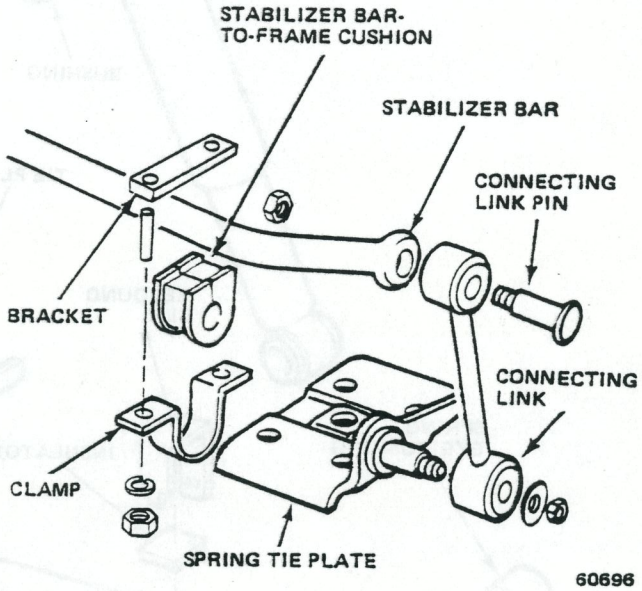

Fig. 2N-8 Stabilizer Bar Mounting

(5) Remove hydraulic jack used to support axle weight.

(6) Remove support stands and lower vehicle.

(7) Tighten spring front and rear attaching bolts and nuts to specified torque.

REAR SPRING

Spring Mounted Below Axle

Removal

(1) Raise vehicle.

(2) Support vehicle using safety stands placed under frame rails.

(3) Position hydraulic jack under axle and raise axle to relieve springs of axle weight.

(4) Remove tie plate U-bolts.

(5) Remove bolt attaching spring rear eye to shackle.

(6) Remove bolt attaching spring front eye to mounting bracket on frame.

(7) Remove spring.

NOTE: *The spring can be disassembled by removing the spring rebound clips and spring center bolt. If the spring bushings are to be removed, refer to Spring Bushing Replacement.*

Installation

(1) Position spring front eye in frame mounting bracket and loosely install attaching bolt and nut. Do not tighten bolt at this time.

(2) Position spring rear eye in shackle and loosely install attaching bolt and nut. Do not tighten bolt at this time.

(3) Install spring tie plate and U-bolts. Tighten U-bolt nuts to specified torque.

(4) Remove hydraulic jack used to support axle.

(5) Remove support stands and lower vehicle.

(6) Tighten spring eye mounting bolts and nuts to specified torque.

Spring Mounted Above Axle

Removal

(1) Raise vehicle.

(2) Support vehicle using safety stands placed under frame rails.

(3) If left-side spring is to be serviced, remove fuel tank skid plate.

(4) Position hydraulic jack under axle and raise axle to relieve springs of axle weight.

(5) Disconnect shock absorber at axle.

(6) Remove wheel.

(7) Remove tie plate U-bolts and tie plate.

(8) Remove bolt attaching spring rear eye to spring shackle.

(9) Remove bolt attaching spring front eye to spring hanger on frame rail.

(10) Remove spring.

NOTE: *The spring can be disassembled by removing the spring rebound clips and center bolt. If the spring bushings are to be removed, refer to Spring Bushing Replacement.*

Installation

(1) Position spring front eye in spring hanger and loosely install attaching bolt and nut. Do not tighten bolt at this time.

(2) Position spring rear eye in shackle and loosely install attaching bolt and nut. Do not tighten nut at this time.

(3) Position axle on spring and install spring tie plate and U-bolts. Tighten U-bolt nuts to specified torque.

(4) Connect shock absorber to axle.

(5) Install wheel.

(6) Install fuel tank skid plate if removed.

(7) Remove hydraulic jack.

(8) Remove support stands and lower vehicle.

(9) Tighten spring attaching bolts to specified torque.

SPRING BUSHING REPLACEMENT

Small Bushing

(1) Insert 3/8 by 8 inch (0.95 by 20.3 cm) length of threaded rod halfway through bushing.

(2) Place suitable size socket on one end of rod with open end of socket toward bushing. Socket will serve as bushing driver.

NOTE: *The socket must be large enough in diameter to bear against the metal outer sleeve on the bushing but still be small enough to pass through the spring eye.*

(3) Install one flat washer and one hex nut on rod behind socket (fig. 2N-9).

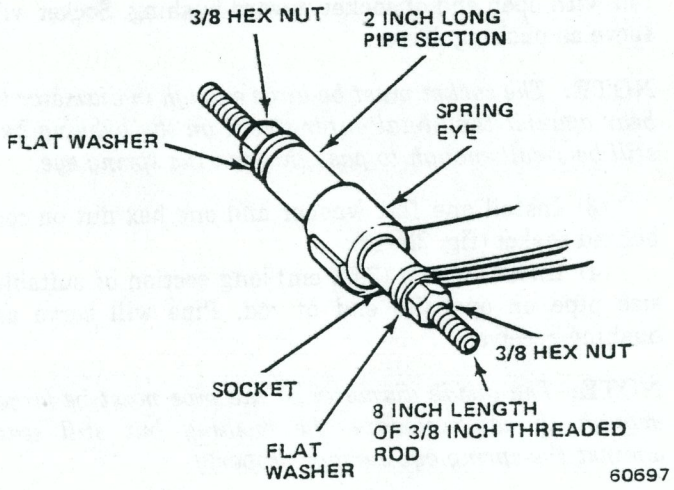

Fig. 2N-9 Bushing Replacement Tools—Small Bushing

(4) Install 2 inch (5.08 cm) long section of suitable size pipe on opposite end of threaded rod. Pipe will serve as bushing receiver.

NOTE: *The inside diameter of the pipe must be large enough to accommodate the bushing but still seat against the spring eye surface properly.*

(5) Install flat washer and hex nut on rod to secure pipe section. Be sure flat washer is large enough in diameter to support and maintain alignment of pipe section.

(6) Tighten both hex nuts finger-tight and align all components.

NOTE: *Be sure socket is positioned in the spring eye and aligns with the bushing. The pipe section must butt against the spring eye surface so the bushing can pass through it. The socket will act as a press ram and press the bushing out of the spring eye.*

(7) Tighten nut at socket end of rod until bushing is pressed out of spring eye.

(8) Remove bushing tools and old bushing.

(9) Install replacement bushing on threaded rod.

(10) Assemble and align bushing tools as outlined in previous steps.

(11) Align bushing with spring eye and press bushing into eye.

(12) Loosen bushing tools and check bushing position. Bushing must be centered in spring eye. Ends of bushing must be flush or slightly below side surfaces of spring eye.

(13) If bushing is not centered, reinstall bushing tools and correct bushing position as necessary.

Large Bushing

(1) Insert 1/2 by 11 inch (1.27 by 27.9 cm) length of threaded rod halfway through bushing.

(2) Install suitable size deep socket on one end of rod with open end of socket toward bushing. Socket will serve as bushing driver.

NOTE: *The socket must be large enough in diameter to bear against the metal outer sleeve on the bushing but still be small enough to pass through the spring eye.*

(3) Install one flat washer and one hex nut on rod behind socket (fig. 2N-10).

(4) Install 3 inch (7.62 cm) long section of suitable size pipe on opposite end of rod. Pipe will serve as bushing receiver.

NOTE: *The inside diameter of the pipe must be large enough to accommodate the bushing but still seat against the spring eye surface properly.*

(5) Install flat washer and one hex nut on rod behind pipe section. Be sure flat washer is large enough in diameter to support and maintain alignment of the pipe section.

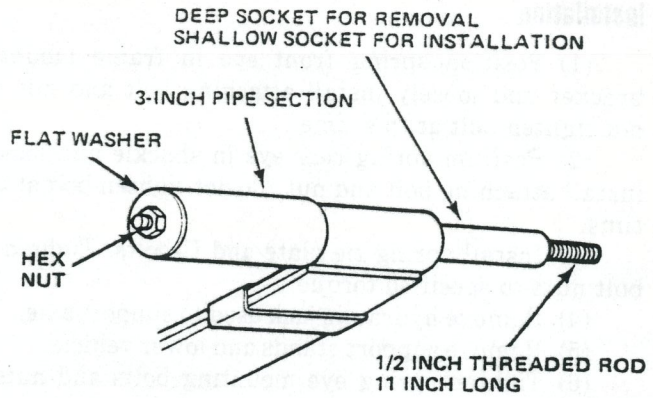

Fig. 2N-10 Bushing Replacement Tools—Large Bushing

(6) Tighten both nuts finger-tight and align all components.

NOTE: *Be sure the socket is positioned in the spring eye and aligns with the bushing. The pipe section must butt against the spring eye so that bushing can pass through it. The socket will act as a press ram and press the bushing out of the spring eye and into the section of pipe.*

(7) Tighten nut at socket and press bushing out of spring eye.

(8) Remove tools and old bushing.

(9) Install replacement bushing on threaded rod and assemble bushing tools as outlined in previous steps.

(10) Align bushing with spring eye and press bushing into eye.

(11) Loosen tools and check bushing position. Bushing must be centered in spring eye. Ends of bushing must be flush with or slightly below side surfaces of spring eye.

(12) If bushing is not centered, reinstall tools and correct bushing position as necessary.

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-torqued 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
Shock Absorber Upper Locknut (7/16-20)	35	25-40	47	34-54
Shock Aborber Lower Locknut (1/2-20)	45	35-50	61	47-68
Spring Pivot Bolts (CJ)	100	80-120	136	108-163
Spring Shackle Nuts (CJ)	24	18-30	33	24-41
Spring U-Bolt Nuts (9/16-18)	100	85-105	136	115-142
Spring U-Bolt Nuts (1/2-20)	55	45-65	75	61-88
Spring Shackle and Pivot Bolts/Nuts (Cke-Wag-Trk)	100	80-120	136	108-163
Stabilizer Bar Mounting Bracket Bolts (All)	35	27-45	47	37-61
Wheel Nuts (CJ)	85	65-90	115	88-122
Wheel Nuts (Cke-Wag-J10 Trk)	85	65-90	115	88-122
Wheel Nuts (J20 Trk)	130	110-150	176	149-203
Spring Center Bolts	35	25-40	47	34-54
Stabilizer Bar Link Nuts	55	48-62	75	65-84

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

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CHAPTER INDEX

PART 3

BODY

CHAPTER INDEX

PART 3 BODY

WATER LEAK/ WIND NOISE DIAGNOSIS AND REPAIR 3A

SECTION INDEX

WATER LEAKS

GENERAL

The problem of water leaks is closely related to dust leakage due to the fact that, under certain conditions, water can enter the vehicle body at any point where dirt and dust can enter.

The key to correcting any water leak problem is complete and accurate diagnosis. To do this a thorough check of the following five general causes of leakage must be accomplished:

- Maladjusted components
- Improperly installed, misrouted or faulty weatherstrips
- Omission of sealers
- Misfitted panels
- Missing body plugs

Leaks can be deceiving. The point where water is detected may not be the point where it entered the vehicle.

Spray Test

The first thing to do on any water leak problem, is to pin-point the leak. The best way to do this is to perform a water spray test.

Sit inside the vehicle and have someone spray water over the suspected leak area. **Always start spraying along the bottom. By starting at the bottom, the exact level at which the leaks occur will be determined.** If water was sprayed at the highest point, water would be at all suspect areas and it would be difficult to determine the exact problem area.

Do not rush the water spray test. The water may have to flow awhile before it shows up. Try to simulate as close as possible the effect of wind-driven water.

Ultrasonic Test

Another way to test the vehicle for water leaks is use the Listener Tool J-23455-01. This tool makes use of the fact that ultrasonic energy (high frequency sound) has certain properties that are similar to those of fluids (liquids and gases). Ultrasonic energy does not penetrate solids, such as glass or metal. It is, however, transmitted through cracks and openings, such as those that cause water or air leaks.

An operating ultrasonic generator placed inside vehicle body will fill the vehicle with sound energy. **This energy will leak at the same locations that permit water and air leaks.** The water path or opening must be dry since the ultrasonic sound will be blocked if an opening or hole is full of water.

An ultrasonic generator and detector gun form an ideal combination for determining the location and magnitude of water and air leaks. The ultrasonic leak detector can be used effectively as a diagnostic tool realizing it is not an exact tool and has certain limitations.

Light Test

Another method of finding water leaks is the light test. This method is good for finding sealer skips in the sheet metal joints and seams, particularly in the wheelhouse area. Sit inside the vehicle and have someone pass

a bright light along the seams and joints from under the vehicle.

Water/Rust Streaks

Another thing to look for in diagnosing water leaks is a pattern of rust or water streaks on interior sheet metal and trim. For instance, a symptom of rear window leakage or inadequately sealed coach joint is water dripping into the rear compartment. This will show up as water or rust streaks on the rear compartment trim or wheelhouse.

Adhesive, Sealant and Coating Materials

- Adhesives join or bond materials together
- Sealants close gaps or seams between sheet metal or materials and prevent the passage of water, dust, air, etc.
- Coatings protect against corrosion and abrasion, and dampen sound or vibration—and may also be used to seal out water and dust

Bonding Surface Preparation

For the various materials to adhere and form an effective bond, it is essential that they are applied to clean, dry surfaces. After a water test, dry the joint or seam with clean dry compressed air then wipe the joint, or seam, with a cloth dampened in 3M General Purpose Adhesive Cleaner, or equivalent.

WATER IN FRONT PASSENGER COMPARTMENT

Windshield

Leaks can occur between the windshield glass and rubber weatherstrip or between the rubber weatherstrip and body pinchweld flange. Leaks between the windshield glass and rubber weatherstrip will be indicated by water which is visible on the inside of the glass or on the front floor. Leaks between the rubber weatherstrip and body pinchweld flange will track down to appear on the front floor. Also, water can enter at the weld studs or burn holes in the body pinchweld flange.

Spray Diagnosis and Repair

(1) Remove windshield reveal mouldings, as described in Chapter 3N.

(2) Perform the following spray test using guidelines described under Spray Test above.

(a) Starting at base of windshield A-pillar on one side of vehicle, spray water onto glass across the bottom between the dash panel assembly and glass.

(b) Test vertical section of A-pillar and across top of glass.

(c) Repeat steps (a) and (b) for other side of vehicle.

(3) If leaks are noted, dry out suspect area as described under Bonding Surface Preparation.

(4) Seal windshield as described in detail in Chapter 3N.

(5) Repeat spray test to ensure that an effective repair has been made.

(6) Install windshield reveal mouldings.

Ultrasonic Diagnosis and Repair

(1) Dry suspect areas thoroughly. If an opening or hole is full of water, the ultrasonic sound will be blocked.

(2) Remove windshield reveal mouldings, as described in Chapter 3N.

(3) Using Listener Tool J-23455-01, perform Ultrasonic Test as follows:

(a) Place transmitter in vehicle adjacent to windshield and turn switch on.

(b) Close all doors, windows and air vents.

(c) Slowly pass listener all around windshield opening.

(d) Mark any area where a meter reading of approximately 5 is obtained, as a indication of a possible leak.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) Seal windshield as described in detail in Chapter 3N.

(6) Repeat ultrasonic test to ensure that an effective repair has been made.

(7) Install windshield reveal mouldings.

Dash Panel Assembly

Water leaks can occur at the inside of dash panel assembly due to spot weld burn holes or excessive gaps and/or lack of sealer at the dash panel joints. Water leaks from these burn holes or joints will result in water puddles forming on the front carpet or floorpan. Water can also enter through the many holes stamped into the dash panel assembly due to, loose grommets and/or incorrectly installed components and attaching hardware. Water will appear on the front carpet or floorpan having tracked down the inside of the dash panel assembly.

Spray Diagnosis and Repair

(1) Pull back carpet and sound insulation material, if equipped.

(2) Open hood.

(3) Perform the following spray test using guidelines described under Spray Test above.

(a) Starting at bottom of dash panel on one side of vehicle spray water onto suspect joints, grommets and components.

(b) Spray water across top of dash panel.

(c) Repeat spray test on other side of vehicle.

(4) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(5) Straighten any distorted flanges.

(6) Seal suspect spot weld burn holes and dash panel joints using 3M All-Around Autobody Sealant, or equivalent.

NOTE: *Use care not to direct sealer into air ducts.*

(7) Seal interior plenumn chamber leaks by attaching a length of flexible plastic hose to nozzle of applicator gun specified for use with 3M Joint and Seam Sealer, or equivalent.

(8) Check all grommets to be sure they are correctly installed. If necessary, apply sealant to ensure a water tight seal.

(9) Make sure that all suspect components and attaching hardware are properly installed. If necessary, apply sealant to ensure a water tight seal.

(10) Repeat spray test to ensure that an effective repair has been made.

(11) Properly position sound insulation material and carpet, if equipped.

(12) Close hood.

Ultrasonic Diagnosis and Repair

(1) Dry suspect areas thoroughly. If an opening or hole is full of water, the ultrasonic sound will be blocked.

(2) Pull back carpet and sound insulation material, if equipped.

(3) Open hood.

(4) Close all windows, doors and air vents.

(5) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to dash panel assembly and turn switch on.

(b) Slowly pass listener over each joint, grommet and component.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

(7) Straighten any distorted flanges or seams.

(8) Seal suspect spot weld burn holes and dash panel joints using 3M All-Around Autobody Sealant, or equivalent.

NOTE: *Use care not to direct sealer into air ducts.*

(9) Seal interior plenumn chamber leaks by attaching a length of flexible plastic hose to nozzle of applicator gun specified for use with 3M Joint and Seam Sealer, or equivalent.

(10) Check all grommets to be sure they are correctly installed. If necessary, apply sealant to ensure a water tight seal.

(11) Make sure that all suspect components and attaching hardware are properly installed. If necessary, apply 3M All-Around Autobody Sealant, or equivalent, to ensure a water tight seal.

(12) Repeat ultrasonic test to ensure that an effective repair has been made.

(13) Properly position sound insulation material and carpet, if equipped.

(14) Close hood.

Front Floorpan, Side Sills, Cowl Side Panels or Front Hinge Pillars

Water can enter at dash panel assembly-to-front floorpan seams due to gaps, distorted panels and/or lack of sealer. Water appears under the front carpet or on front floorpan.

Leaks can occur between the side sills, front floorpan, cowl side panels or front hinge pillars due to excessive gaps and/or lack of sealer at the panel joints. Water leaks from these joints will result in a wet front carpet, sound insulation material or front floorpan.

Also, leaking floorpan plugs will allow water to enter the front floorpan area or under the carpet and sound insulation material.

Spray Diagnosis and Repair

(1) Remove front seat(s).

(2) Remove front carpet and sound insulation material, if equipped.

(3) Open hood.

(4) Perform the following spray test using guidelines described under Spray Test above.

(a) Spray water from under front fender at joint of floorpan and cowl side panel or front hinge pillar.

(b) Next spray across floorpan-to-dash panel seam and towards rear of vehicle at floorpan plugs.

(c) Move spray slowly upwards until water is directed at joint of dash panel-to-cowl side panel.

(d) Repeat spray test on other side of vehicle.

(e) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(5) Straighten any distorted panels.

(6) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(7) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing the plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(8) Repeat spray test to ensure that an effective repair has been made.

(9) Close hood.

(10) Install sound insulation material and front carpet, if equipped.

(11) Install front seat(s).

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Remove front seat(s).

(3) Remove front carpet and sound insulation material, if equipped.

(4) Close all windows, doors and air vents.

(5) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.

(b) Slowly pass listener over each joint, plug and seam.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

(7) Straighten any distorted panels.

(8) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(9) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Repeat ultrasonic test to ensure that an effective repair has been made.

(11) Install sound insulation material and front carpet, if equipped.

(12) Install front seat(s).

Front Doors and Glass

An improperly adjusted door or defective sealing system will allow water to leak onto the front carpet or floor.

NOTE: *Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dried. Also, make sure that the door glass is properly adjusted.*

Spray Diagnosis and Repair

(1) Perform the following spray test using guidelines described under Spray Test above.

(a) Starting at front lower corner of door, spray water between door lower edge to rocker panel.

(b) Move slowly up door to roof level.

(c) Move to door lower rear corner and spray water between door rear edge and adjacent panel.

(d) Move slowly up door to roof level.

(e) Test door top edge to roof section.

(f) Repeat spray test on other side of vehicle.

(2) If leaks are noted, dry suspect area as described above under Bonding Surface Preparation.

(3) Examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced, as outlined in Chapter 3J.

(4) Correct improperly installed rubber sealers as outlined in Chapter 3J.

(5) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Close all windows, doors and air vents.

(3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle near suspect door and turn switch on.

(b) Slowly pass listener around all door edges and sealers.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) Examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3J.

(6) Correct improperly installed rubber sealers as outlined in Chapter 3J.

(7) Repeat ultrasonic test to ensure that an effective repair has been made.

WATER ON FRONT OR REAR SEATS

Front and Rear Doors and Glass

Improperly adjusted doors or defective sealing systems will allow water to leak onto the front or rear seats.

NOTE: *Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dried. Also, make sure that the door glass is properly adjusted.*

Spray Diagnosis and Repair

Repeat Front Doors and Glass Spray Diagnosis and Repair procedures for both front and rear doors.

Ultrasonic Diagnosis and Repair

Repeat Front Doors and Glass Ultrasonic Diagnosis and Repair procedures for both front and rear doors.

Rear Quarter Windows and Sun Roofs

The stationary and opening rear quarter window seals can leak water that may appear on the rear seats. The sun roof seals can leak water that may appear on front seats.

NOTE: *Before starting rear quarter window leak diagnosis, make sure that the rear quarter windows are properly adjusted. Also ensure that the sun roof seal is properly cleaned and lubricated with petroleum jelly.*

Spray Diagnosis and Repair

(1) Close and/or lock the windows.

(2) Perform the following spray test using guidelines described under Spray Test above.

(a) Start spray test along lower edge.

(b) Spray water all around edges of window and opening.

(c) Repeat spray test on other side of vehicle.

(3) If leaks are noted, dry suspect area as described above under Bonding Surface Preparation.

(4) In instances of leakage from stationary quarter window or sun roof, apply 3M Windshield Sealer, or equivalent, between glass and sealer or sealer and body flange.

(5) Open rear quarter windows or sun roof and examine rubber sealers for damage, distortion or incorrect position. Damaged or distorted rubber sealers should be replaced.

(6) Correctly install rear quarter window rubber sealers as outlined in Chapter 3K and sun roof seals as outlined in Chapter 3L.

(7) Make sure that flange is free from buckles or protrusions.

(8) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Close all windows, doors and air vents.

(3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to rear quarter window or sun roof and turn switch on.

(b) Slowly pass listener around window opening.

(c) Mark any area where a meter reading of approximately 5 is obtained as an indication of a possible leak.

(d) Repeat test on other side of vehicle.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) In instances of leakage from stationary quarter window, apply 3M Windshield Sealer, or equivalent, between glass and sealer or sealer and body flange.

(6) Open rear quarter windows or sun roof and examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced.

(7) Correctly install rear quarter window rubber sealers as outlined in Chapter 3K and sun roof seals as outlined in Chapter 3L.

(8) Also, make sure that flange is free from buckles or protrusions.

(9) Repeat ultrasonic test to ensure that an effective repair has been made.

WATER OFF HEADLINER

Luggage Racks and Sun Roofs

Spray Diagnosis and Repair

(1) Lower headliner in suspect area, if equipped.

(2) Perform the following spray test using guidelines described under Spray Test above.

(a) Spray water along luggage rack, skid strip mouldings or sun roof.

(b) If necessary, repeat spray test on other side of vehicle.

(3) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(4) Remove luggage rack support posts, in suspect area, and seal wellnuts or screw holes to body using 3M Drip-Chek Sealer, or equivalent. Install support posts.

(5) Remove luggage rack skid strips in suspect area, and ensure that all moulding clips are correctly installed. Remove sun roof as outlined in Chapter 3L.

(a) Replace improperly installed or defective moulding clips, if equipped.

(b) If necessary, add sealer to ensure a water tight seal.

(c) Install previously removed skid strips.

(6) Repeat spray test to ensure that an effective repair has been made.

(7) Install headliner.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Remove headliner, if equipped.
(3) Close all windows, doors and air vents.
(4) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.
(b) Slowly pass listener over each luggage rack support post, skid strip or sun roof.
(c) Mark any area reading approximately 5 on the meter as an indication of a possible leak.
(5) Clean suspect area as described above under Bonding Surface Preparation.
(6) Remove luggage rack support posts, in suspect area, seal wellnuts or screw holes to body using 3M Drip-Chek Sealer, or equivalent. Install support posts.
(7) Remove luggage rack skid strips, in suspect area, and ensure that all moulding clips are correctly installed, if equipped. Remove sun roof as outlined in Chapter 3L.
(a) Replace improperly installed or defective moulding clips.
(b) If necessary, add sealer to ensure a water tight seal.
(c) Install previously removed skid strips or sun roof.
(8) Repeat ultrasonic test to ensure that an effective repair has been made.
(9) Install headliner.

Drip Rail

Spray Diagnosis and Repair

(1) Drop headliner in suspect area, if equipped.
(2) Perform the following spray test using guidelines described under Spray Test above.
(a) Spray water along drip rail, starting at front of roof.
(b) If necessary, repeat spray test on other side of vehicle.
(3) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.
(a) Examine suspect area for small pin holes in drip rail sealer.
(b) Apply 3M Drip-Chek Sealer, or equivalent, to drip rail and touch up with matching body color when sealant is dry.
(4) Repeat spray test to ensure that an effective repair has been made.
(5) Install headliner, if equipped.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.
(2) Remove headliner, if equipped.
(3) Close all windows, doors and air vents.
(4) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.
(b) Slowly pass listener over suspect area.
(c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.
(5) Clean suspect area as described above under Bonding Surface Preparation.
(a) Examine drip rail for small pin holes in drip rail sealer.
(b) Apply 3M Drip-Chek Sealer, or equivalent, to drip rail and touch up with matching body color when sealant is dry.
(6) Repeat ultrasonic test to ensure that an effective repair has been made.
(7) Install headliner, if equipped.

WATER IN REAR PASSENGER COMPARTMENT

Rear Floorpan, Side Sills and Rear Wheelhouse Panels

Water can enter at front floorpan-to-rear floorpan seams due to gaps, distorted panels and/or lack of sealer. Water from these leaks appears on the floorpan or under the rear carpet, if equipped.

Leaks can occur between the side sills or leading edge of rear wheelhouse panels due to excessive gaps and /or lack of sealer at the joints. Water leaks from these joints appears on the floorpan or as wet rear carpet or sound insulation material, if equipped.

Also, leaking rear floorpan plugs will allow water to enter under the carpet and sound insulation material, if equipped.

Spray Diagnosis and Repair

(1) Remove rear seat, if equipped.
(2) Remove rear carpet and sound insulation material, if equipped.
(3) Perform the following spray test using guidelines described under Spray Test above.
(a) Spray water from under vehicle at joint of rear floorpan-to-side sill.
(b) Next spray across front floorpan-to-rear floorpan seam and towards rear of vehicle at floorpan plugs.
(c) Move spray slowly along rear floorpan-to-rear wheelhouse panel seams.
(d) Repeat spray test on other side of vehicle.
(4) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.
(5) Straighten out distorted panels.
(6) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.
(7) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing the plug from seating.

(b) Check the hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(8) Repeat spray test to ensure that an effective repair has been made.

(9) Install sound insulation material and rear carpet, if equipped.

(10) Install rear seat, if equipped.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Remove rear seat, if equipped.

(3) Remove rear carpet and sound insulation material, if equipped.

(4) Close all windows, doors and air vents.

(5) Using Listener Tool, J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.

(b) Slowly pass listener over each joint, plug and seam.

(c) Mark any area reading approximately 5 on the meter as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

(7) Straighten any distorted panels.

(8) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(9) Examine suspect area for loose or missing body plugs.

(a) Check for hardened sealer or road dirt preventing plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape rear floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Repeat ultrasonic test to ensure that an effective repair has been made.

(11) Install sound insulation material and rear carpet, if equipped.

(12) Install rear seat, if equipped.

Rear Doors and Glass

An improperly adjusted door or defective sealing system will allow water to leak onto the rear carpet or floorpan.

NOTE: *Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dry. Also, ensure that the door glass is properly adjusted.*

Spray Diagnosis and Repair

Repeat Front Doors and Glass Spray Diagnosis and Repair procedures for the rear doors.

Ultrasonic Diagnosis and Repair

Repeat Front Doors and Glass Ultrasonic Diagnosis and Repair procedures for the rear doors.

Rear Quarter Windows

The stationary and opening rear quarter window seals can leak water that may appear on the rear carpet or floorpan.

NOTE: *Before starting rear quarter window leak diagnosis, ensure that the rear quarter windows are properly adjusted.*

Spray Diagnosis and Repair

Repeat Rear Quarter Windows Spray Diagnosis and Repair procedures as described under Water on Front or Rear Seats.

Ultrasonic Diagnosis and Repair

Repeat Rear Quarter Windows Ultrasonic Diagnosis and Repair procedures as described under Water on Front or Rear Seats.

WATER IN CARGO AREA

Liftgate and Tailgate

Improperly adjusted liftgate, tailgate or defective sealing system will allow water to leak into the cargo area.

NOTE: *Before starting liftgate or tailgate leak diagnosis, ensure that the liftgate or tailgate are correctly set within the body opening. The mating surfaces of body opening and rubber sealer must be wiped clean and dry.*

Spray Diagnosis and Repair

(1) Perform the following spray test using guidelines described under Spray Test above.

(a) Start a lower corner of liftgate or tailgate, spray water between lower edge and body panel.

(b) Move slowly up to top of liftgate, or tailgate.

(c) Move to opposite lower corner and spray between edge and adjacent body panel.

(d) Move slowly up to top of liftgate, or tailgate.

(e) Finally, test top edge to adjacent body panel.

(2) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(3) Examine rubber sealers for damage, distortion or incorrect installation. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3H.

(4) Correct improperly installed rubber sealers as outlined in Chapter 3H.

(5) In instances of leakage from spot weld burn holes, apply 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color when dry.

(6) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Close all windows, doors, and air vents.

(3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle cargo compartment, turn switch on.

(b) Slowly pass listener around all edges and sealers.

(c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) Examine rubber sealers for damage, distortion or incorrect installation. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3H.

(6) Correct improperly installed rubber sealers as outlined in Chapter 3H.

(7) In instances of leakage from spot weld burn holes, apply 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color when dry.

(8) Repeat ultrasonic test to ensure that an effective repair has been made.

Rear Floorpan, Wheelhouse Panels, Cross Sills, Quarter Panels, Center Panels, and Extensions

Water can enter at the rear floorpan, wheelhouse panels and quarter panel seams due to gaps, distorted panels and/or lack of sealer. Leaks can occur between the rear cross sill, center panel, rear floorpan or extension panels due to excessive gaps and/or lack of sealer.

Water can enter around rear taillamp housings or side marker lamps due to defective sealer/gasket or damaged housings. Also, leaking floorpan plugs will allow water to enter.

The light test, described above, may also be used for finding water leaks in the cargo area.

Spray Diagnosis and Repair

(1) Remove spare tire.

(2) Remove cargo mat and/or carpet and sound insulation material, if equipped.

(3) Remove rear trim panels in suspect area.

(4) Perform the following spray test using guidelines described under Spray Test above.

(a) Spray water from under vehicle at rear floorpan, wheelhouse panels and quarter panel seams.

(b) Next spray water across rear floorpan, cross sill, center panel and extension panel seams.

(c) Also, spray water across rear floorpan and extension panel plugs.

(d) Move spray slowly upwards until water is directed at each wheelhouse panel seam.

(e) Direct spray on lamp housings and coach seams.

(f) Repeat spray test on other side of vehicle.

(5) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(6) Straighten any distorted panels.

(7) Seal small suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(8) Seal large suspect joints or seams using 3M Underseal Rubberized Undercoating, or equivalent.

(9) Examine suspect area for loose or missing body plugs.

(a) Check for hardened sealer or road dirt preventing plug from seating.

(b) Check plug hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan or extension panels locally and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Replace damaged or distorted lamp housing gaskets and/or seals. Also, tighten lamp housing attaching hardware.

(11) Seal coach seams with 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color after sealant has dried.

(12) Tighten fuel tank filler neck screws and seal any holes or breaks in gasket and/or sealer with above sealant.

(13) Repeat spray test to ensure that an effective repair has been made.

(14) Install previously removed rear trim panels.

(15) Install sound insulation material, if removed, and cargo mat and/or carpet.

(16) Install spare tire.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Remove spare tire.

(3) Remove cargo mat and/or carpet and sound insulation material, if equipped.

(4) Remove rear trim panels in suspect area.

(5) Close all windows, doors and air vents.

(6) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in cargo compartment, near suspect area, and turn switch on.

(b) Slowly pass listener around all suspect joints/seams.

(c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.

(7) Clean suspect area as described above under Bonding Surface Preparation.

(8) Straighten any distorted panels.

(9) Seal small suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(10) Seal large suspect joints or seams using 3M Underseal Rubberized Undercoating, or equivalent.

(11) Examine suspect area for loose or missing body plugs.

(a) Check for hardened sealer or road dirt preventing plug from seating.

(b) Check plug hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan or extension panels and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(12) Replace damaged or distorted lamp housing gaskets and/or seals. Also, tighten lamp housing attaching hardware.

(13) Seal coach seams with 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color after sealant has dried.

(14) Tighten fuel tank filler neck screws and seal any holes or breaks in gasket and/or sealer with 3M All-Around Autobody Sealant, or equivalent.

(15) Repeat ultrasonic test to ensure that an effective repair has been made.

(16) Install previously removed rear trim panels.

(17) Install sound insulation material, if removed, and cargo mat and/or carpet.

(18) Install spare tire.

INTERIOR WIND NOISES

GENERAL

A systematic diagnosis is necessary to isolate interior wind noises. The spot where the noise is heard may not be where the trouble really originates. Before proceeding with a noise diagnosis, consider the forces that act on the vehicle to generate wind noise.

Air impacts the windshield and is forced around the A-pillar and along the sides of the vehicle. This air motion causes a low pressure area that moves along with the vehicle near the A-pillar and along the sides of the body.

At the same time, air rammed into the vehicle interior by forward motion enters through the heating and ventilating to build a positive pressure inside the vehicle which tends to force the window glass outward.

To maintain a weather-tight, noise-free seal against these two forces, the doors and glass must be properly maintained and adjusted.

STATIC TEST

Before beginning a static test, visually inspect the fit of the doors, liftgates, tailgates and glass. Proper door, liftgate, tailgate and glass adjustments will cure most interior wind noise problems. Also, thoroughly inspect all weatherstrips to make sure they are not damaged or incorrectly installed. Correct improperly installed, misrouted or faulty weatherstrips.

Close all the doors, windows, and vents and turn the blower motor on high. Use a stethoscope to listen for air leakage in the suspected area. If the air leakage appears to be excessive compared with the other side of the vehicle, perform the necessary repairs to correct the air leakage and recheck the repaired area.

Another way to static test the vehicle is to use the Listener Tool J-23455-01. This tool makes use of the fact that ultrasonic energy (high frequency sound) has certain properties that are similar to those of fluids (liquids and gases). Ultrasonic energy does not penetrate solids, such as glass or metal. It is, however, transmitted through cracks and openings, such as those that cause water or air leaks.

An operating ultrasonic generator placed inside vehicle body will fill the vehicle with sound energy. This energy will leak at the same location that permits water

and air leaks. However, if an opening or hole is full of water the ultrasonic sound will be blocked. The water path or opening must be dry.

An ultrasonic generator and detector gun form an ideal combination for determining the location and magnitude of water and air leaks. The ultrasonic leak detector can be used effectively as a diagnostic tool realizing it is not an exact tool and has certain limitations.

To use the Listener, place the tone generator inside the vehicle, close the doors, windows and air vents and listen for the signal in the problem area with the listener. A meter in the listener measures the strength of the signal being received and gives a direct read-out on a dial. This gives an accurate reference point for checking the repair. If the first static test shows a high reading and the after-repairs test shows a low reading, the problem has been repaired.

ROAD TEST

If the wind noise was not located and corrected during the static test, it will be necessary to road test the vehicle. Also, the vehicle should be road tested after repairs are completed to verify that the problem has been corrected. Be prepared to make minor adjustments or repairs on the road test.

Take the following tools and materials on the road test:

- Stethoscope
- Body tape
- Weatherstrip adhesive
- Caulking cord
- Silicone Spray
- Screwdrivers
- Knife
- Small socket wrench set

With the above tools and materials, have an assistant drive the vehicle to the test area. Make sure the test road is dry and smooth as possible. It is difficult to hear wind noise on wet, bumpy roads.

While the assistant drives the vehicle, move the stethoscope slowly along the suspected problem area, and listen for the point where the most noise is coming from. Make sure to test the vehicle with the fresh air vents open, because ram air pressure has an effect on the wind noise level. Also, drive the vehicle in both directions on the test road, as prevailing wind conditions could change the noise level.

After determining where the most noise is coming from, stop the road test and carefully inspect the problem area. If the cause is minor, repair it with the tools and material taken along and retest the vehicle to find out if the repair has worked.

If in doubt that the problem area has been found, cover the suspected area with body tape and continue the road test. If the noise has been eliminated with the body tape, the problem area has been located. However, if the noise continues, apply additional strips of body tape to other areas that may be causing the problem. Continue road testing and applying or removing strips of tape until the wind noise has been isolated.

Many wind noise problems can be satisfactorily repaired while on the road test. However, repair of some of the problems, like aligning a window frame or adjusting a door or window, may require returning to the shop for completion.

DOOR ADJUSTMENTS

Refer to Chapter 3J for detailed procedures on door adjustments.

LIFTGATE-TAILGATE ADJUSTMENTS

Refer to Chapter 3H for detailed procedures on liftgate-tailgate adjustments.

WINDOW ADJUSTMENTS

Refer to Chapter 3J and 3K for detailed procedures on window adjustments.

EXTERIOR WIND WHISTLES

GENERAL

Noises generated by loose or unseated mouldings, trim, vibrating grille components, etc., can be difficult to diagnose. The most common noise is generally called a "tea kettle" whistle and is usually due to air flowing under instead of around or over a moulding.

ROAD TEST

There is no way to simulate the air flow that makes exterior wind whistles, so a road test is usually necessary. Take along a roll of body tape to help isolate the problem areas when they are located on the road test. It is usually helpful to have an assistant drive the vehicle

or locate the noise. Road test the vehicle with the front windows up and then down, to be sure the noise is coming from outside the vehicle. Also, drive the vehicle in both directions, as the prevailing wind could influence the noise level. Try to determine from which area of the vehicle the wind whistle is coming:

- Grille area
- Hood bezel
- Fender mouldings
- Windshield reveal mouldings
- Luggage rack

When the source of the wind whistle has been found, isolate that component by applying body tape to the suspected area. Retest the temporary repair. If the body tape stops the whistle, align and tighten the moulding/bezel or apply 3M Clear Auto Sealer or equivalent to fill the gap that is causing the whistle.

GRILLE AREA

A process of elimination is the only system to use in locating a wind whistle in the grille area. Make a wind deflector from a piece of cardboard, large enough to cover one-half of the grille area. Tape this deflector to the right front area of the vehicle and road test the vehicle. If the wind whistle is still there, move the deflector to the left front and road test the vehicle. After determining which half of the grille area is causing the wind whistle, apply body tape to all the mouldings and components around the grille opening. Continue road testing the vehicle, progressively remove tape segments until you have isolated the wind whistle. Align and tighten the mouldings or fill the gap with a clear sealer.

FENDER MOULDINGS

Fender mouldings that are not properly aligned or tightly seated to the fender can cause a wind whistle. If this is the case, apply body tape to the suspected moulding and road test the vehicle. If the wind whistle has been eliminated with the body tape, align and tighten the moulding or fill the gap with a clear sealer.

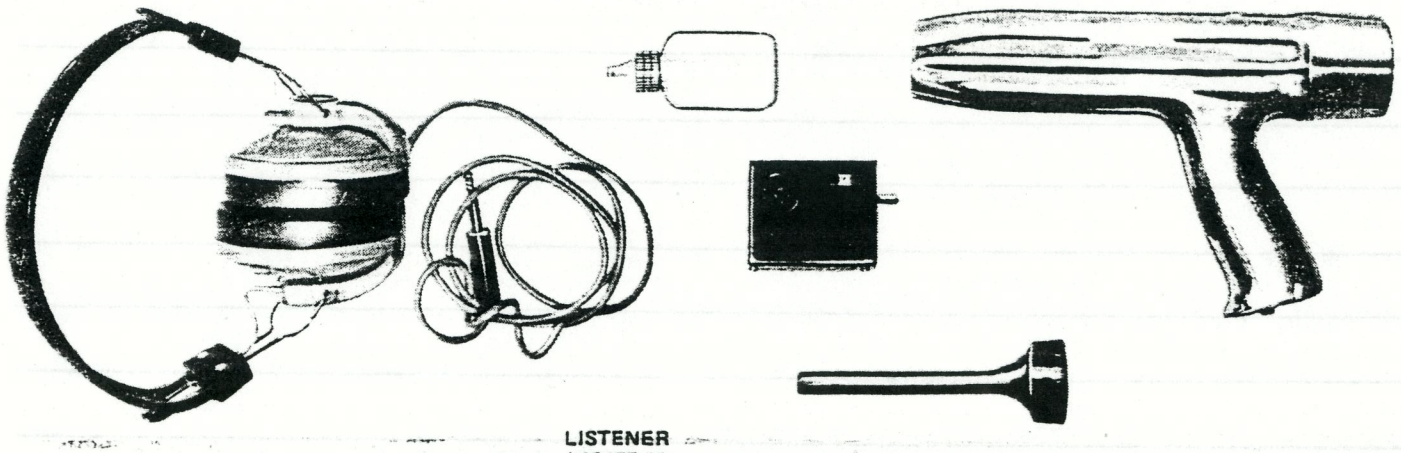
BODY MOULDINGS

Body or windshield reveal mouldings that are not properly aligned or tightly seated can allow air to flow under rather than over them, generating a wind whistle. Apply body tape to the suspected area and road test the vehicle. If the wind whistle is still there, apply additional strips of body tape to the area, until the wind whistle source is located. If a large area has been covered with body tape, continue the road test and progressively remove body tape segments until the wind whistle has been isolated. Align and tighten the moulding or fill the gap with a clear sealer.

LUGGAGE RACKS

Luggage racks present a problem area similar to the grille area covered above. Make a deflector from cardboard, large enough to cover one-half the frontal area of the luggage rack. Tape the deflector to the luggage rack and road test the vehicle. If the wind whistle is still there, move the deflector to the other side and repeat the road test. After determining which side of the luggage rack is causing the wind whistle, apply body tape to all mouldings, supports and rails. Continue the road test and progressively remove tape segments until the wind whistle has been isolated. Align and tighten the mouldings, supports and rails or fill the gap(s) with clear sealer.

Tools



LISTENER
J-23455-01

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NOTES

METAL REPAIR AND PAINTING 3B

INDEX

METAL REPAIR

The information contained herein provides instructions for bulge, crease and dent repair. The terms are defined as follows:

- Bulge—An impression in the metal from inside to outside.
- Crease—A depression in the metal up to 1/2-inch to 2 inches long or longer.
- Dent—A depression in the metal larger than 1/4-inch by 1/4-inch.

(1) Wash damaged area with mild detergent and water to remove dirt.

(2) Clean repair area using wax and silicone remover, such as DuPont Prep-Sol, Ditzler Acryli-Clean, or equivalent.

(3) Use a grinder to remove paint and to outline damaged area.

(a) Use a grade 24 disc for initial grinding.

(b) Follow up with a grade 50 disc to prevent coarse scratches from showing up in final finish.

(4) A bulge may require application of heat to shrink metal.

(a) Heat metal bulge with an oxygen-acetylene torch and immediately upset bulge area with a hammer and dolly.

(b) Do not attempt to hammer bulge below original contour completely while metal is hot or metal will be overshrunk.

(5) To restore contour of a bulge, crease or dent after straightening and grinding, apply plastic body filler, such as DuPont Polyester Autobody Filler, Ditzler "999" Body Filler, 3M Plastic Filler, or equivalent. For best results, mix plastic body filler and hardener according to manufacturer's instructions.

(6) Apply plastic filler with a plastic spreader. Use firm pressure to aid in removing air bubbles which will show up as pinholes.

(7) Use an air file or hand file board for shaping of plastic filler.

(a) For initial shaping of plastic filler, use a grade 36 paper.

(b) For final shaping and sanding contours in plastic filler, use a grade 40 paper.

(8) Featheredge paint into bare metal area as described in following steps.

(a) For rough featheredging, use a grade 80 disc on a random disc sander.

(b) For final featheredging, use grade 180 disc on random disc sander or 220 grade paper on a hand sanding block.

PAINT REPAIR WITH ACRYLIC ENAMEL

Recent advancements in acrylic enamels have produced a repair procedure which can be used to effectively spot repair a panel or an area where panels join. This procedure should be used only on secondary surfaces of the vehicle (all surfaces below the level of the top of the wheel openings). If repair of a panel requires more than one-half the total panel area, the entire panel should be refinished.

(1) Using a mild detergent and water, wash complete panel and rinse thoroughly.

(2) Clean repair area with a wax and silicone remover, such as DuPont Prep-Sol, Ditzler Acryli-Clean, or equivalent.

(3) Remove loose paint and rust with body grinder. Featheredge area with sandpaper.

(4) Apply metal conditioner, following manufacturer's instructions.

(5) Wash area to be painted.

(6) Mask area to be painted.

(7) If bare metal is showing through paint in repair area, use following steps to prime area.

(a) Apply metal conditioner to bare metal according to manufacturer's instructions.

(b) Mix primer following manufacturer's instructions.

(c) Apply primer and allow to air dry.

(d) Remove masking and wet sand repair area.

(e) If scratches or pin holes appear in surface, apply glazing putty according to manufacturer's instructions.

(f) After glazing putty dries, wet sand and clean area. Apply final coat of primer and allow to air dry.

(g) Wet sand and clean area with an after-sanding cleaner.

(8) Mask area to be painted.

(9) Mix acrylic enamel color using a paint shaker and following manufacturer's mixing instructions.

(10) Adjust air pressure at air regulator to obtain 40 psi at spray gun and spray test panel. Adjust gun to obtain desired pattern.

(11) Apply one medium color coat to primed area and allow paint to set up for 25 minutes.

(12) Apply two or more medium color coats. Overlap edges of each coat to produce a tapered edge. Allow each coat to flash completely.

(13) Adjust air pressure at air regulator to obtain 70 psi at spray gun and spray test panel. Adjust gun as necessary to obtain desired pattern and color match.

(14) Spray one full wet color coat over entire repair area. Overlap edges of previous coat.

(15) Empty gun and fill cup with enamel reducer. Reduce air pressure at air regulator to obtain 20 psi at spray gun.

(16) Spray blend-coat over edges of old and new paint.

(17) Spray one or two medium coats over entire area.

(18) Remove all masking when paint has tacked up.

NOTE: *If a haze appears over repair area after it has dried, rub area lightly with liquid polishing compound.*

FINISHING METAL REPLACEMENT PARTS

Metal body service replacement panels or assemblies are painted with a black factory primer. For proper adhesion of acrylic enamel color coats in service, the following refinish steps are necessary.

(1) Wash part with paint finish cleaning solvent, such as DuPont Prep-Sol, Ditzler Acryli-Clean, or equivalent.

(2) Scuff sand part with 360 grade dry sandpaper. Avoid cutting through and rewash part.

(3) Mix primer/sealer following manufacturer's instructions.

(4) Apply primer/sealer and allow to air dry.

(5) Wet sand smooth and clean with after sanding cleaner.

Painting Tips

- Use only one brand of refinish materials on each repair.
- Follow manufacturing instruction for use of refinisn materials.
- Use recommended reducer according to shop temperature and humidity conditions.
- Mix paint thoroughly.
- Spray a test panel and adjust gun to obtain desired color before attempting to spray vehicle.
- When matching colors:
  - A given color can be darkened by:
    1. decreasing air pressure
    2. increasing fluid setting on gun
    3. moving gun closer to surface
  - A given color can be lightened by:
    1. increasing air pressure
    2. decreasing fluid setting on gun
    3. moving gun farther from surface

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Metallic Color Guide

To Lighten a Metallic Color:

- Use a Fast-Drying Thinner
- Add More Reducer
- Raise Air-Pressure
- Apply Dryer Coats
- Wait Longer Between Coats
- Mist Coat
- Adjust Fluid Valve on Gun (Close)
- Adjust Air Valve on Gun (Open)
- Hold Gun Further From the Surface

To Darken a Metallic Color:

- Use a Slow-Drying Thinner
- Use Less Reducer than Normal
- Lower Air-Pressure
- Apply Wetter Coats
- Allow Less Waiting Time Between Coats
- Use Retarder in Paint
- Open Fluid Adjustment on Gun
- Close Air Adjustment on Gun
- Hold Gun Closer to the Surface

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(6) Apply acrylic enamel color coats as required.

(7) If part is a replacement fender, perform additional following steps:

(a) Clean inside of replacement fender and allow to dry.

(b) Apply 1/8-inch thick film of spray undercoating, using 3M Body Schutz Rubberized Coating (or equivalent) and 3M Applicator Gun (or equivalent), or a double coat of air-dry acrylic enamel to entire inside surface of fender.

FINISHING PLASTIC TRIM PARTS

General

Paintable plastic interior trim parts can be divided into three general types:

- Polypropylene plastic (Rigid)
- ABS plastic (Rigid)
- Vinyl plastic (Flexible)

It is important to be able to identify each plastic in order to paint it satisfactorily.

The purpose of the following test is to determine the identity of a given plastic so that proper paint procedures and materials can be used.

Test for Polypropylene and ABS Plastic

To determine if a service part to be painted is Polypropylene or ABS plastic, perform the following burn test:

(1) From hidden backside of part, remove a sliver of plastic with a sharp knife.

(2) Hold sliver of plastic with needlenose pliers and ignite plastic.

(3) Observe burning plastic closely.

(a) Polypropylene burns with a clear blue flame which has a yellow tip and no readily visible smoke. When extinguished, it gives off a white smoke with a odor of paraffin.

(b) ABS plastic burns with an orange flame and readily visible black, sooty smoke which hangs temporarily in air.

Test for Vinyl Plastic

To determine if a part to be painted is vinyl plastic, a copper wire test may be performed as follows:

(1) Heat a copper wire in a suitable flame such as a propane torch until wire glows (red).

(2) Touch heated wire to backside or hidden surface of part being tested in a manner so as to retain some of plastic material on wire.

(3) Return wire and retained plastic to flame and observe for a green turquoise blue flame. A flame in this color range indicates that plastic being tested is vinyl.

Procedure for Painting Rigid Polypropylene Plastic Parts

The system for painting polypropylene parts involves the use of a special primer. Since polypropylene plastic is rigid, it can be color coated after prime with appropriate Jeep color interior spray paint (plastic and vinyl) or equivalent.

CAUTION: *It is essential that the service part be primed first with a coating of Jeep 8993626 polypropylene primer (or equivalent) according to the instructions. Failure to use the required primer as directed will result in the color coat lifting or peeling.*

(1) Wash part thoroughly with paint finish cleaning solvent, such as DuPont Prep-Sol, Ditzler Acryli-Clean, or equivalent.

(2) Apply a thin, wet coat of polypropylene primer according to instructions on label. Wetness of primer is determined best by observing gloss reflection of spray application in adequate lighting. Be sure primer application includes all edges.

(3) Allow primer to flash completely.

(4) Apply appropriate color coat of interior spray paint and allow to air dry before installing part.

Procedure for Painting Rigid ABS Plastic Parts

Rigid ABS plastic requires no primer. Jeep color interior spray paint (plastic and vinyl) or equivalent will adhere satisfactorily to rigid ABS plastics.

(1) Wash part thoroughly with a paint finish cleaning solvent, such as DuPont Prep-Sol, Ditzler Acryli-Clean, or equivalent.

(2) Color coat part using appropriate Jeep color interior spray paint (plastic and vinyl) or equivalent.

(3) Allow to dry and then install part.

NOTE: *Apply only sufficient color for proper hiding to avoid washout of grain effect.*

Procedure for Painting Flexible Vinyl Plastic Parts

The paint system for flexible vinyl plastic involves the use of Jeep interior spray paint (plastic and vinyl) or equivalent.

NOTE: *No special primer is required when painting flexible vinyl plastic parts.*

(1) Wash part thoroughly with a vinyl cleaner. Wipe off cleaner while still wet with a clean, lint-free cloth.

(2) Immediately after wiping surface dry, apply appropriate Jeep color interior spray paint (plastic and vinyl) or equivalent in wet coats allowing sufficient flash time between coats.

(3) Allow to dry completely before installing part.

NOTE: *Apply only sufficient color for proper hiding to avoid washout of grain effect.*

NOTES

INSTRUMENT PANELS AND COMPONENTS 3C

SECTION INDEX

CJ INSTRUMENT PANEL

GENERAL

CJ instrument panels are of formed sheet metal construction and are reinforced with braces and fastened to adjacent body panels with screws.

A crash pad is available for CJ models and is attached to the instrument panel (fig. 3C-1).

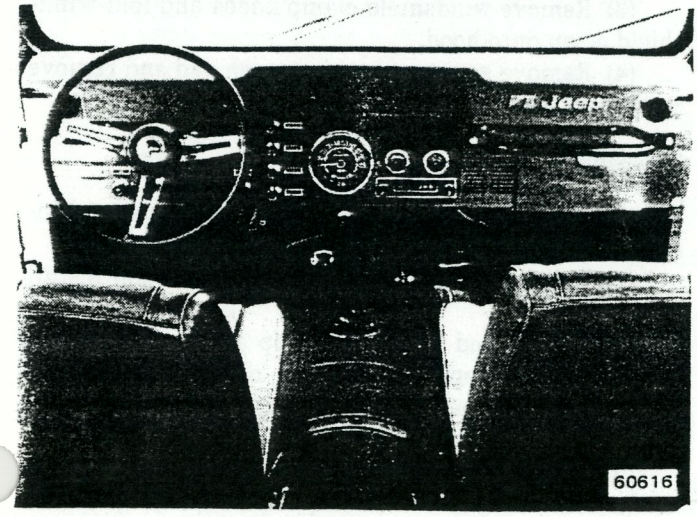

Fig. 3C-1 Instrument Panel

INSTRUMENT CLUSTER

Removal

NOTE: *If equipped with air conditioning, remove screws attaching evaporator assembly to instrument panel and lower evaporator assembly.*

(1) Disconnect battery negative cable.
(2) Disconnect speedometer cable.
(3) Remove cluster attaching screws and remove cluster.
(4) Mark bulb and wire connectors, and disconnect cluster electrical connectors and lamps.

Installation

(1) Connect cluster lamps and electrical connectors.
(2) Position cluster on instrument panel and install attaching screws.
(3) Connect speedometer cable.
(4) Connect battery negative cable.

INSTRUMENT PANEL

Removal

NOTE: *If equipped with air conditioning, remove screws attaching evaporator assembly to instrument panel and lower evaporator assembly.*

(1) Disconnect battery negative cable.

(2) Remove screws attaching steering column bezel to instrument panel. Remove bezel.

(3) Disconnect emergency brake bracket from instrument panel.

(4) Disconnect speedometer cable.

(5) Disconnect heater control cables from damper door levers.

(6) Remove windshield clamp knobs and brackets.

(7) Remove crash pad, if equipped.

(a) If equipped with a soft top, unsnap top snaps at windshield corners, unfasten straps at center and sides of front top support, lay top support back to rear, and release top from header retainer.

(b) If equipped with a hardtop enclosure, remove hardware attaching enclosure to windshield and rear quarter panels and support enclosure with wood blocking (fig. 3C-2).

(c) Fold windshield down onto hood.

(d) Remove screws attaching crash pad, if equipped, and remove crash pad.

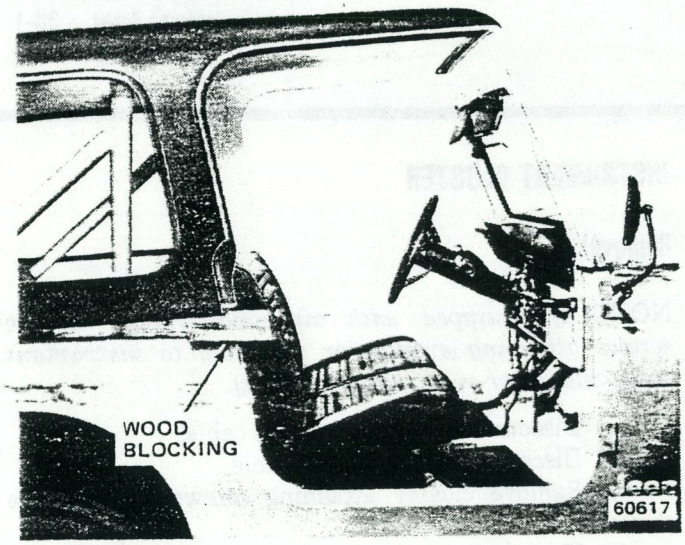

Fig. 3C-2 Hardtop Enclosure Suppported with Wood Blocking

(8) Disconnect all electrical connections.

(9) Remove steering wheel.

(10) Remove automatic transmission shift lever, if equipped.

(a) Place automatic transmission shift lever in Park.

(b) Drive out roll pin attaching shift lever to shift bowl and remove shift lever.

(11) Remove instrument panel-to-dash panel attaching screws and remove instrument panel.

Installation

(1) Position instrument panel in vehicle and install attaching screws.

(2) Install automatic transmission shift lever, if equipped. Insert shift lever in shift bowl and install roll pin.

(3) Install steering wheel.

(4) Connect all electrical connections.

(5) Install crash pad, if equipped.

(a) Position crash pad on instrument panel and install attaching screws.

(b) Raise windshield to upright position.

(c) If equipped with a hardtop enclosure, remove wood blocking supporting top and lower top onto body and windshield. Install hardware attaching top to windshield and rear quarter panels.

(d) If equipped with a soft top, engage top with header retainer, position top support in upright position and fasten center and side straps, and fasten top snaps at windshield corners.

(6) Install windshield brackets and clamp knobs.

(7) Connect heater control cables to damper door levers.

(8) Connect speedometer cable.

(9) Install emergency brake bracket to instrument panel.

(10) Position steering column bezel on instrument panel and install attaching screws.

(11) Connect battery negative cable.

CRASH PAD

Removal

(1) If equipped with a soft top, unfasten top snaps at windshield corners, unfasten straps at center and sides of front top support, lay top support back to rear and release top from header retainer.

(2) If equipped with a hardtop enclosure, remove hardware attaching top to windshield and rear quarter panels and support top with wood (fig. 3C-2).

(3) Remove windshield clamp knobs and fold windshield down onto hood.

(4) Remove screws attaching crash pad and remove crash pad.

Installation

(1) Position crash pad on instrument panel and install attaching screws.

(2) Raise windshield to upright position and install clamp knobs.

(3) If equipped with a hardtop enclosure, remove wood blocking supporting top and lower top onto body and windshield. Install hardware attaching top to windshield and rear quarter panels.

(4) If equipped with a soft top, engage top with header retainer, position top support in upright position and fasten center and side straps, and fasten top snaps at windshield corner.

GLOVE BOX ASSEMBLY

Removal

(1) Remove glove box-to-instrument panel attaching screws.

(2) Remove striker.

(3) Compress glove box at the crease lines and remove box through opening.

Installation

(1) Compress glove box at the crease lines and insert box in opening.

(2) Install glove box-to-instrument panel attaching screws.

(3) Install and adjust striker.

Glove Box Door and Hinge

Removal

The glove box door hinge mounting holes are elongated to provide adjustment. The hinge screws may be loosened and the door moved in the desired direction to fit the door opening.

(1) Remove hinge-to-instrument panel attaching screws.

(2) Remove door and hinge assembly.

Installation

(1) Position door and hinge assembly on instrument panel.

(2) Install hinge-to-instrument panel attaching screws.

(3) Adjust door.

Striker Adjustment

The glove box door lock striker is attached to the instrument panel opening with sheet metal screws. The striker can be moved in or out for door closing adjustment.

INSTRUMENT ILLUMINATION

Instrument panel illumination is provided by three bulbs in the instrument cluster, six molded lamps in the instrument panel, and one bulb each in the voltmeter and oil gauge. Protection for the panel bulbs and lamps is provided by the 3-amp fuse located in the fuse panel. The 3-amp fuse is fed from the headlamp switch through a rheostat.

Do not pull on the bulb wires to remove the bulb socket. Grasp the socket and pull straight out.

To remove the molded lamps, remove the wire connectors. Squeeze the lamp together at the top and bottom to release the small retaining tabs. Push the lamp through the panel (toward the steering wheel). To install the molded lamps, push into the panel until the retaining tabs snap into place.

SPEEDOMETER

A magnetic type speedometer is used on all CJ models.

All speedometers are equipped with a ratchet device to prevent turning the odometer backward.

The following data is supplied for testing and calibrating the speedometer heads.

Speedometer Calibration

Shaft Speed (rpm)	Indication (mph)
333.3	20 ± 1.5
666.7	4.0 ± 1.5
916.7	55 ± 1.5

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Speedometer Head Replacement

Speedometer head replacement includes resetting the replacement odometer to the same mileage as the one removed, unless such setting conflicts with local ordinances.

(1) Remove cluster.

(2) Carefully uncrimp lip of outer bezel. Remove outer bezel, glass and glass retaining bezel.

(3) Remove attaching screws from speedometer housing. Remove speedometer and face plate assembly.

(4) On replacement speedometer, unhook odometer retaining clip. Twist and push down to disengage clip.

(5) Remove odometer and set to proper mileage. Refer to Odometer Setting Procedures.

(6) Install odometer.

NOTE: *Check anti-backup spring for proper positioning.*

(7) Install retaining spring clip using needlenose pliers. Do not force clip against dial face.

(8) Check all light guards for proper positioning. Install speedometer and face plate assembly. Install speedometer attaching screws and washers.

(9) Remove all fingerprints and debris from inside surface of glass.

(10) Install glass, glass retaining bezel and outer bezel. Carefully crimp outer bezel lip four places.

(11) Install cluster.

Odometer Setting Procedure

The following procedure applies with the odometer removed from the speedometer head. Refer to figure 3C-3.

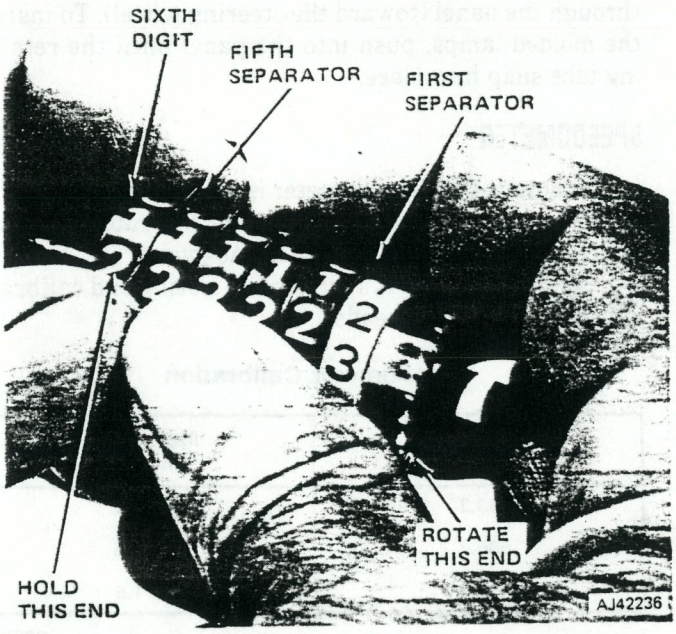

Fig. 3C-3 Advancing Odometer Reading (for Replacement Only)

Hold the fifth separator and rotate the last five numerals in their normal direction until the desired sixth digit is obtained. When the desired sixth digit is obtained, align the fourth separator in line with the fifth separator. Rotate the last four numerals, repeating the process until the desired total mileage is obtained. When installing the odometer, the separators must straddle a cross bar to maintain proper number alignment.

Speedometer Cable Inspection

Visually inspect cable for breaks, kinks, cracks, burns or other physical damage. Remove core from cable assembly and place on a flat surface in the form of an inverted U and then cross the open ends. Hold one end in the left hand, the other in the right hand. Twist one end, applying light finger pressure to the other end. If the core is satisfactory, the turning action will be smooth. A damaged core will react by jumping about on a flat surface.

The speedometer cable requires graphite grease for lubrication.

CLOCK

The clock is attached to the instrument panel by a retaining bracket secured with two screws. To reset the clock, pull out the adjustment knob and rotate. Hands of *fast running* clocks should be turned *backward*, and *slow running* clocks *forward*. Clock speed will then be corrected automatically after one or two adjustments.

CIGAR LIGHTER

The cigar lighter is attaching to the bottom of the instrument panel on all CJ models.

The lighter can be removed by removing the battery feed wire and ground wire and unscrewing the sheil that surrounds the lighter.

The lighter circuit is protected with a 10-amp fuse located at the fuse panel.

CHEROKEE - WAGONEER - TRUCK INSTRUMENT PANEL

GENERAL

All Cherokee-Wagoneer-Truck instrument panels are of formed sheet metal construction and are reinforced with braces and fastened to adjacent body panels with bolts.

A vinyl-covered polyurethane crash pad is attached to the instrument panel on all models (fig. 3C-4).

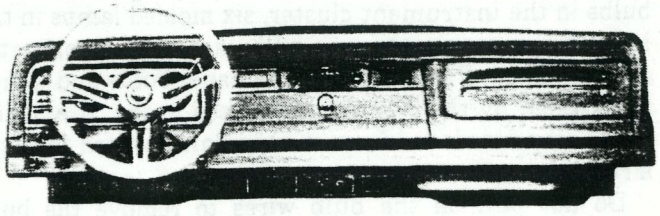

Fig. 3C-4 Instrument Panel

INSTRUMENT CLUSTER

Removal

(1) Disconnect battery negative cable.
(2) Disconnect speedometer cable.
(3) Cover steering column to prevent damaging paint.
(4) Remove cluster attaching screws and tilt top of cluster toward interior of vehicle.
(5) Mark electrical connectors and hoses, and disconnect electrical connectors and heater vacuum hoses.
(6) Disconnect blend air door control cable.
(7) Remove cluster.

Installation

(1) Position cluster on instrument panel.
(2) Connect blend air door control cable.
(3) Connect electrical connectors and heater vacuum hoses.
(4) Install cluster attaching screws.
(5) Connect speedometer cable.
(6) Connect battery negative cable.
(7) Remove covering on steering column.
(8) Check heater and gauge operation.

INSTRUMENT PANEL

Removal

(1) Disconnect battery negative cable.
(2) Remove instrument panel crash pad, as outlined in this chapter.
(3) Remove evaporator assembly and ducts, if equipped with air conditioning.
(4) Remove instrument cluster.
(5) Remove radio and amplifier fader switch, if equipped.
(6) Remove parking brake lever assembly.
(7) Remove air vent cables.
(8) Disconnect electrical connectors and remove courtesy lights.
(9) Disconnect defroster hoses.
(10) Remove steering column trim panel.
(11) Remove bolt from center of brace and lower steering column.
(12) Remove instrument panel attaching screws and remove panel.

Installation

(1) Position instrument panel and install attaching screws.
(2) Raise steering column and install bolt in center of brace.
(3) Install steering column trim panel.
(4) Connect defroster hoses.
(5) Connect electrical connectors and courtesy lights.
(6) Install air vent cables.
(7) Install parking brake lever assembly.
(8) Install instrument cluster.
(9) Install radio and amplifier fader switch, if removed.
(10) Install evaporator assembly and ducts, if removed.
(11) Install instrument panel crash pad.
(12) Connect battery negative cable.

CRASH PAD

Removal

(1) Remove windshield and windshield weatherstrip to expose crash pad retaining screws at base of windshield (refer to Windshield Removal—Chapter 3N).
(2) Remove instrument cluster.
(3) Remove glove box.
(4) Remove ashtray and retainer.
(5) Remove radio, if equipped.
(6) Remove crash pad-to-instrument panel attaching screws and nuts.

NOTE: *The nuts are accessible through the cluster, ashtray, and glove box openings.*

Installation

(1) Position crash pad on instrument panel.
(2) Install attaching screws and nuts.
(3) Install radio, if equipped.
(4) Install ashtray and retainer.
(5) Install glove box.
(6) Install instrument cluster.
(7) Install windshield weatherstrip and windshield (refer to Windshield Installation—Chapter 3N).

GLOVE BOX ASSEMBLY

Removal

(1) Remove glove box-to-instrument-panel attaching screws.
(2) Remove striker.
(3) Remove lockout control switch, if equipped.
(4) Move glove box down and out from rear of instrument panel.

NOTE: *On vehicles equipped with air conditioning, compress the glove box at the crease lines and remove box through opening.*

Installation

(1) Position glove box in glove box opening.
(2) Install glove box-to-instrument panel attaching screws.
(3) Install lockout control switch, if removed.
(4) Install and adjust striker.

Glove Box Door and Hinge

Removal

The glove box door hinge mounting holes are elongated to provide adjustment. The hinge screws may be loosened and the door moved in the desired direction to fit the door opening.

(1) Remove hinge-to-instrument panel attaching screws.

NOTE: *On vehicles equipped with air conditioning, the evaporator housing must be lowered to obtain access to the hinge-to-instrument panel attaching screws.*

(2) Remove door-to-hinge attaching screws.
(3) Remove hinges and glove box door.

Installation

(1) Position hinges on instrument panel and install attaching screws.
(2) Install door-to-hinge attaching screws.
(3) Adjust door.

Striker Adjustment

The glove box door lock striker is attached to the instrument panel opening with sheet metal screws. The striker can be moved in or out for door closing adjustment.

Lock Cylinder Replacement

The glove box lock assembly is inserted through the glove box door from the outside. The assembly is held in place by a screw through the lock clamp cup and into the lock case.

(1) Insert key in lock and rotate cylinder counterclockwise to expose the tumblers.
(2) Remove key and press retainer tumbler down.
(3) Insert key and remove lock cylinder.
(4) If replacement lock cylinder is being installed, insert original key into replacement cylinder and file tumblers flush with cylinder. Stake tumblers into cylinder.
(5) Press retainer tumbler down on lock cylinder and insert key in cylinder.
(6) Insert cylinder into lock case.
(7) Hold cylinder in place and remove key.

INSTRUMENT ILLUMINATION

Four bulbs provide lighting for the instrument cluster (fig. 3C-5) and two bulbs illuminate the heater control panel. Panel lights are fed from the fuse panel through the headlamp switch rheostat. To replace instrument cluster bulbs, reach up behind the cluster, twist the bulb socket counterclockwise (viewed from the rear) and pull out. To replace the heater control panel bulb, pry the bulb socket down to free the spring clip which attaches the socket to the panel.

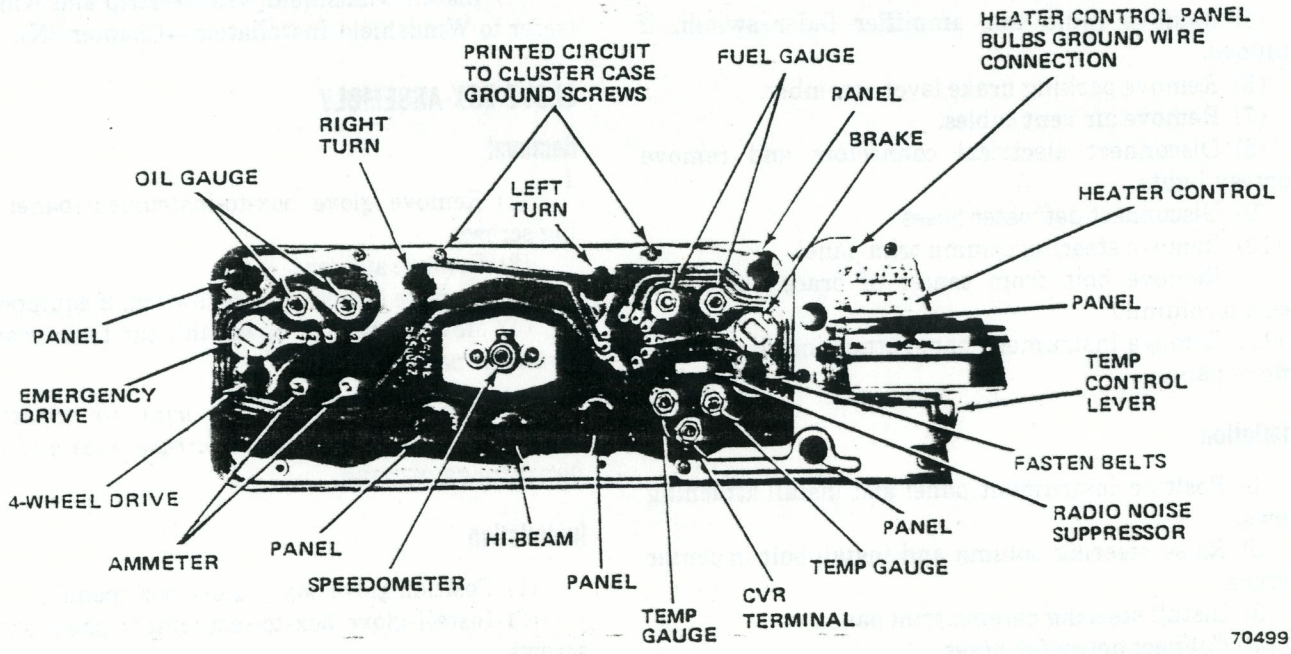

Fig. 3C-5. Instrument Cluster—Rear View

SPEEDOMETER

A magnetic type speedometer is used on all models.

All speedometers are equipped with a ratchet device to prevent turning the odometer backward.

The following data is supplied for testing and calibrating the speedometer heads.

Speedometer Calibration

Shaft Speed (rpm)	Indication (mph)
333.3	20 ± 1.5
666.7	4.0 ± 1.5
916.7	55 ± 1.5

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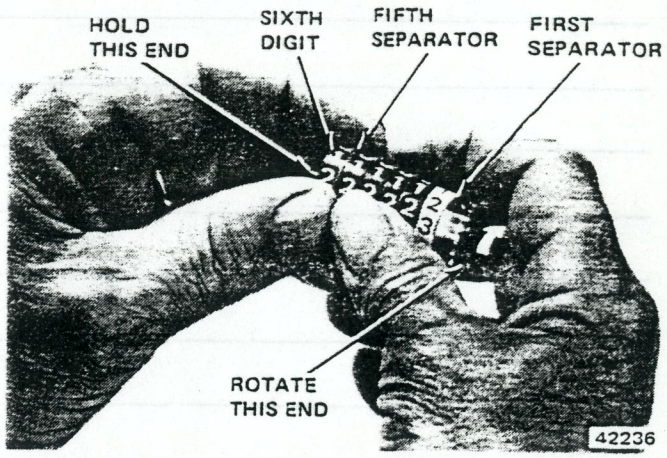

Fig. 3C-6 Advancing Odometer Reading (for Replacement Only)

Speedometer Head Replacement

Speedometer head replacement includes resetting the replacement odometer to the same mileage as the one removed, unless such setting conflicts with local ordinances.

(1) Remove cluster.

(2) Remove printed circuit board attaching screws and separate cluster case from bezel.

(3) Remove two speedometer attaching screws and speedometer.

(4) Remove odometer retaining clip.

(5) Remove odometer.

(6) Install odometer assembly.

NOTE: *Check anti-backup spring for proper positioning.*

(7) Install retaining spring clip.

(8) Install speedometer head.

(9) Install printed circuit board.

(10) Install cluster.

Odometer Setting Procedure

This procedure applies with the odometer removed from the speedometer head. Refer to figure 3C-6.

Hold the fifth separator and rotate the last five numerals in their normal direction until the desired sixth digit is obtained. When the desired sixth digit is obtained, align the fourth separator in line with the fifth separator. Rotate the last four numerals, repeating the process until the desired total mileage is obtained. When installing the odometer, the separators must straddle a cross bar to maintain proper number alignment.

Speedometer Cable Inspection

Visually inspect cable for breaks, kinks, cracks, burns, or other physical damage. Remove core from cable assembly and place on a flat surface in the form of an inverted U and then cross the open ends. Hold one end in the left hand, the other in the right hand. Twist one end, applying light finger pressure to the other end. If the core is satisfactory, the turning action will be smooth. A damaged core will react by jumping about on a flat surface.

The speedometer cable requires graphite grease for lubrication.

CLOCK

The clock is attached to the instrument panel with two nuts.

If the vehicle is not equipped with air conditioning, the clock may be removed by reaching behind the instrument panel and removing the nuts.

If the vehicle is equipped with air conditioning, access to the clock can be obtained by removing the glove box liner attaching screws and pulling down the top portion.

To reset the quartz clock, press left side of rocker bar to set hours. Press right side of rocker bar to set minutes.

CIGAR LIGHTER

The cigar lighter is mounted to the instrument panel on all models.

The lighter can be removed by disconnecting the battery feed wire and unscrewing the shell that surrounds the lighter.

The lighter circuit is protected with a 10-amp fuse located at the fuse panel.

NOTES

HEATER 3D

SECTION INDEX

CJ HEATER

GENERAL

The blend-air type heater and defroster system is used on all CJ vehicles. The blend-air method of heating uses a constant flow system with engine coolant continuously flowing through the heater core. The temperature of the heated air entering the passenger compartment is controlled by regulating the quantity of air which flows through the heater core air passages, then blending it with a controlled amount of cool, fresh air which bypasses the heater core. System controls and operation are described in this section.

When servicing a malfunctioning heater system, refer to the Service Diagnosis for a list of the possible causes and recommended service procedures.

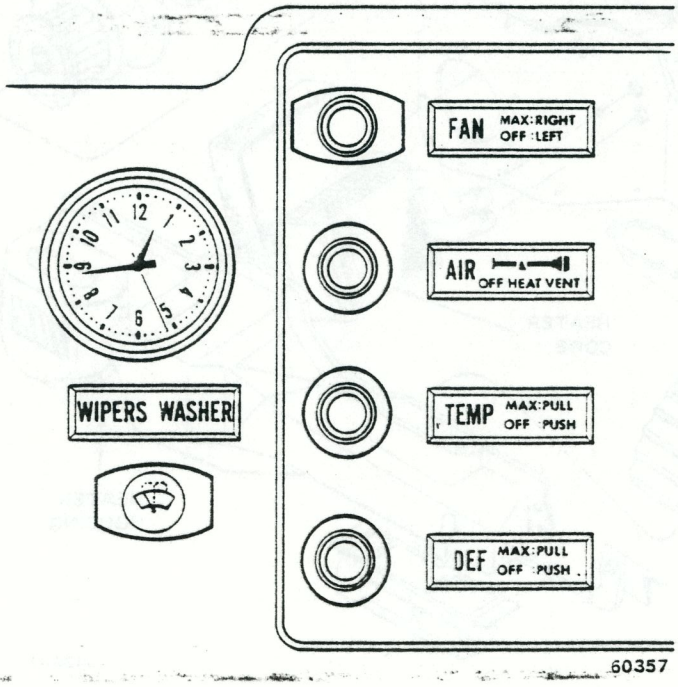

Fig. 3D-1 Heater and Defroster Controls

SYSTEM CONTROLS

The heater and defroster controls consist of a fan control switch and three push-pull knobs and cable assemblies which are located on the instrument panel (fig. 3D-1).

The air control is a dual function control. When the control is pulled to the first position (Heat), it opens a door in the fresh air inlet to allow air to enter the heater. When the control is pulled completely out (Vent), it opens two additional doors (one in the left end of the fresh air inlet and one on the right side of the heater) to allow fresh air to enter the passenger compartment. A new fresh air duct has been added to direct fresh air to the driver's side.

The defrost control knob operates a door in the heater housing which regulates heater and defroster operation by directing the flow of air through the defroster hose or floor outlet.

The temperature control knob adjusts the amount of airflow around the heater core and through the heater core air passages. This regulates the degree of heat entering the passenger compartment.

The fan control is a four-position control switch (Off, Low, Med and High), which regulates the blower motor and airflow for heat and defrost.

HEATER AND DEFROSTER OPERATION

The heater is part of the engine cooling system and depends on normal engine operating temperature and airflow through the cowl fresh air intake to heat the interior of the vehicle. During heater operation, close the fresh air vent.

The air control knob operates a door in the fresh air intake duct which allows air to enter the heater housing. When the knob is pushed in, no air will enter the heater. As the knob is pulled out to the first position (Heat), the door opens, allowing airflow to the heater. The air control knob must be pulled to the Heat position to operate the heater.

The temperature control knob operates the blend air door in the heater housing (fig. 3D-2). At the full out position, all air is directed through the heater core, providing maximum heat flow. At the full in position, all air is directed around the heater core, providing unheated fresh air. Any in-between position of the control allows a blend of cool, fresh outside air and heated air. The defrost control knob must be pushed in for the blended air to enter through the floor heat duct. When the defrost control knob is pulled out completely, all airflow will be directed through the defroster hose and onto the windshield. Any in-between position of the defrost control divides the airflow between the defroster hose and the floor heat duct.

If additional airflow is required, the blower motor should be operated at one of the three available speeds.

FRESH AIR VENTILATION

The fresh air ventilating system directs outside air through the air inlet to a door in the left end of the air inlet to provide air to the driver's side and also through a door on the right side of the heater to provide air to the passenger side. These doors are cable and linkage controlled. When the air control knob is pulled all the way out to the vent position, the driver's vent door is opened by linkage on the air inlet and the passenger vent door is opened by a cable that is attached to the linkage on the air inlet. When the air control is pushed in, no air will enter the vehicle.

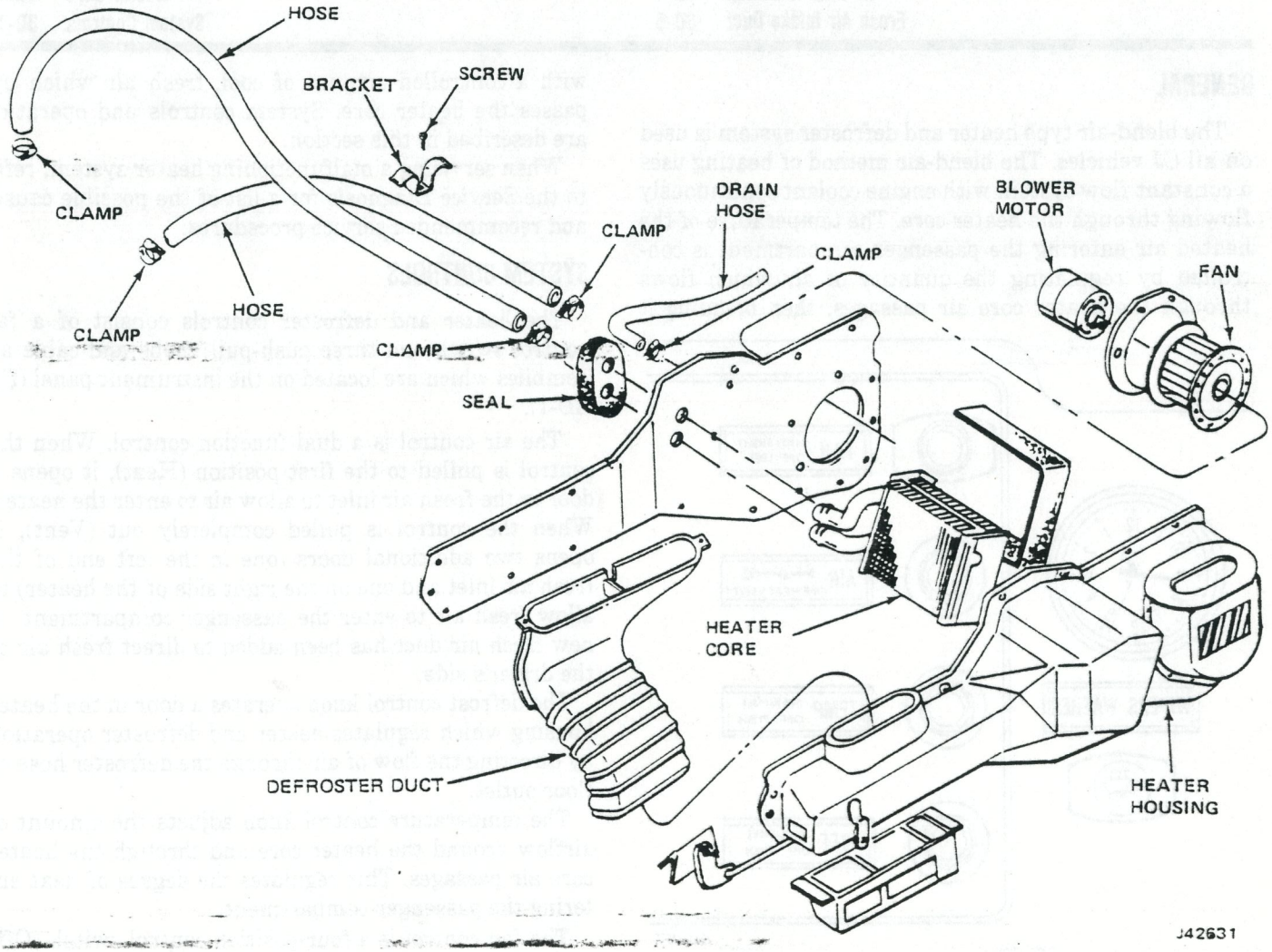

Fig. 3D-2 Heater and Defroster Components

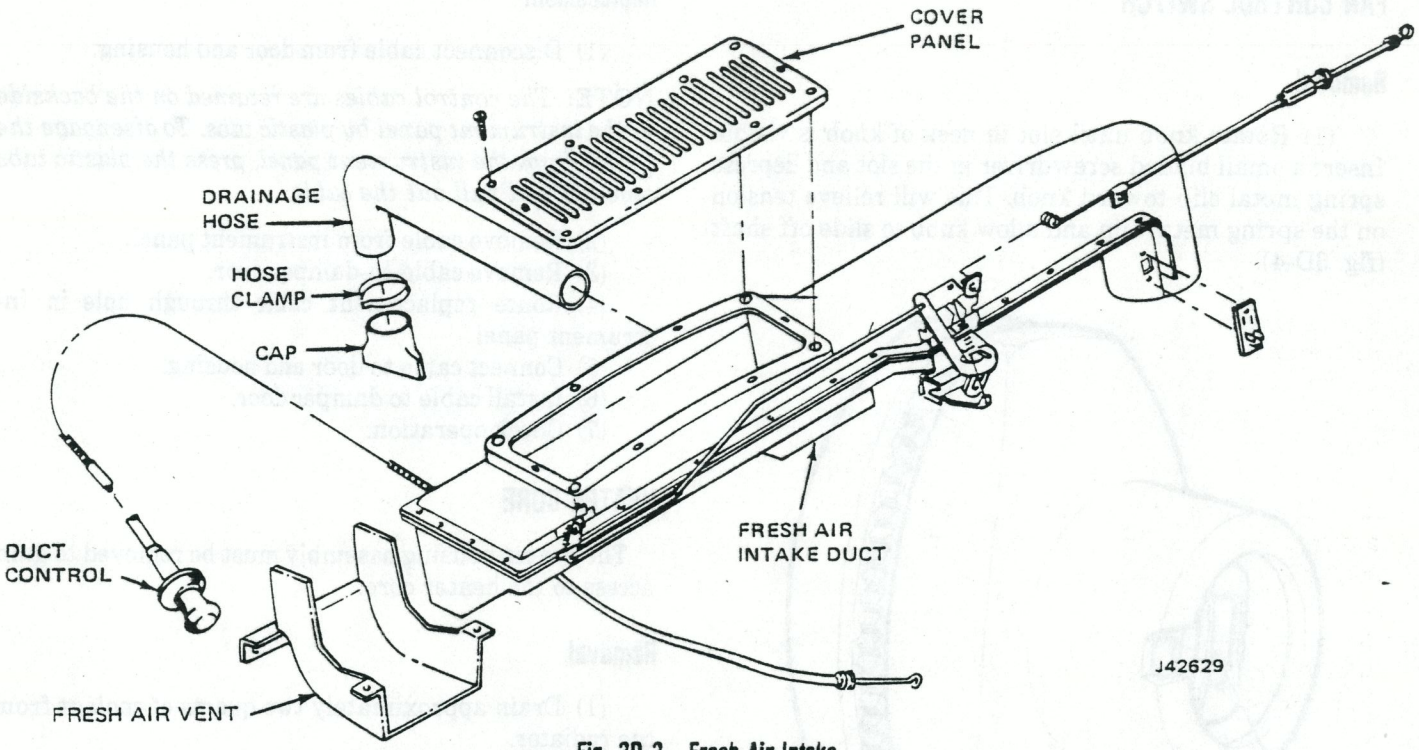

Fig. 3D-3 Fresh Air Intake

Service Diagnosis

Condition	Possible Cause	Correction
FAN MOTOR WILL NOT RUN AT ANY SPEED	(1) Blown fuse	(1) Replace fuse
	(2) Loose connection	(2) Inspect and tighten
	(3) Poor ground	(3) Clean and tighten
	(4) Faulty switch	(4) Replace switch
	(5) Faulty motor	(5) Replace motor
	(6) Faulty resistor	(6) Replace resistor
FAN MOTOR RUNS AT ONE SPEED ONLY	(1) Faulty switch	(1) Replace switch
	(2) Faulty resistor	(2) Replace resistor
FAN RUNS BUT DOES NOT CIRCULATE AIR	(1) Intake blocked	(1) Clean intake
	(2) Fan not secured to motor shaft	(2) Tighten securely
HEATER WILL NOT HEAT	(1) Coolant does not reach proper temperature	(1) Check and replace thermostat if necessary
	(2) Heater core blocked internally	(2) Flush or replace core if necessary
	(3) Heater core air-bound	(3) Purge air from core
	(4) Blend-air door not in proper position	(4) Adjust cable
WILL NOT DEFROST	(1) Control cable adjustment incorrect	(1) Adjust control cable
	(2) Defroster hose damaged	(2) Replace defroster hose

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FAN CONTROL SWITCH

Removal

(1) Rotate knob until slot in neck of knob is visible. Insert a small bladed screwdriver in the slot and depress spring metal clip toward knob. This will relieve tension on the spring metal clip and allow knob to slide off shaft (fig. 3D-4).

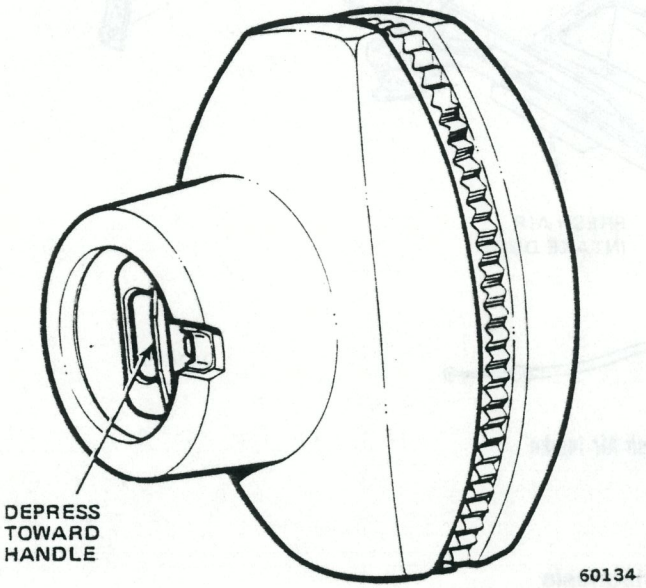

Fig. 3D-4 Fan Control Knob Locking Feature

(2) Remove retaining nut and trim ring.
(3) Remove switch from instrument panel and disconnect wires.

Installation

(1) Connect wires and position switch in instrumentpanel.
(2) Install trim ring and retaining nut.
(3) Install control knob.

CONTROL CABLES

Adjustment

The only cable that is adjustable is the cable from the air inlet linkage to the passenger vent door at the right side of the heater. This cable has a turnbuckle adjustment located approximately six inches above the cable attachment to the right side of the heater. Adjust this cable until the passenger vent door is closed when the air control knob is pushed in.

NOTE: *If the cable is adjusted beyond the closed door position it will cause a bind in the linkage and may prevent the driver's vent door from closing.*

Replacement

(1) Disconnect cable from door and housing.

NOTE: *The control cables are retained on the backside of the instrument panel by plastic tabs. To disengage the cables from the instrument panel, press the plastic tabs together and pull out the cable.*

(2) Remove cable from instrument panel.
(3) Remove cable-to-damper door.
(4) Route replacement cable through hole in instrument panel
(5) Connect cable to door and housing.
(6) Install cable to damper door.
(7) Check operation.

HEATER CORE

The heater housing assembly must be removed to gain access to the heater core.

Removal

(1) Drain approximately two quarts of coolant from the radiator.
(2) Disconnect heater hoses.
(3) Disconnect damper door control cables.
(4) Disconnect blower motor wire.
(5) Disconnect water drain hose and defroster hose.
(6) Remove nuts from heater housing studs in engine compartment.
(7) Remove heater housing assembly by tilting down to disengage from air inlet duct and pulling to the rear of the vehicle.
(8) Remove heater core from heater housing.

Installation

(1) Install heater core in housing.
(2) Position heater core housing and install attaching nuts.

NOTE: *Make sure that the seals around the core pipes and blower motor are in position before installing the heater to the dash panel. Do not over-torque the heater to dash panel nuts as this can cause distortion of the heater assembly. Tighten until two threads are visible beyond the nut.*

(3) Connect water drain hose and defroster hose.
(4) Connect blower motor wire.
(5) Connect and adjust damper door control cables.
(6) Connect heater hoses.
(7) Replace coolant.
(8) Check heater operation.

BLOWER MOTOR

The heater housing assembly must be removed to replace the blower motor.

Removal

(1) Remove heater assembly as outlined above.
(2) Remove blower motor assembly-to-heater housing attaching screws and remove blower motor assembly.

Installation

(1) Position blower motor assembly to heater housing and install attaching screws.
(2) Reinstall heater assembly as outlined above.
(3) Check blower motor and heater control operation.

DEFROSTER DUCT

Removal

(1) Disconnect negative battery cable.
(2) Drain two quarts of antifreeze from radiator.
(3) Remove heater hoses.
(4) Remove drain tube from heater housing.
(5) Remove screws attaching evaporator housing to instrument panel and lower housing.
(6) Disconnect wiring from A/C switch.
(7) Remove screw attaching heater motor housing to bracket.
(8) Remove nuts attaching heater housing-to-dash panel from engine compartment.
(9) Disconnnect speedometer cable.
(10) Remove glove box.
(11) Tilt heater housing assembly back and pull to rear and lower housing.
(12) Disconnect heater control cables.
(13) Remove fresh air cover panel from cowl.
(14) Remove fresh air intake duct assembly.
(15) Lower windshield.
(16) Remove screws from defroster duct and remove defroster duct and tube.

Installation

(1) Position defroster duct and install attaching screws and tube.
(2) Raise windshield and secure.
(3) Install fresh air intake duct assembly.
(4) Install fresh air cover panel on cowl.
(5) Install heater control cables.
(6) Position heater housing assembly on dash panel.
(7) Install nuts attaching heater housing to dash panel.
(8) Install glove box.
(9) Install speedometer cable.
(10) Install screw attaching heater housing to bracket.
(11) Connect wiring to A/C switch.
(12) Install evaporator housing to instrument panel.
(13) Connect drain tube to heater housing.
(14) Connect heater hoses.
(15) Refill radiator.
(16) Connect negative battery cable.

FRESH AIR INTAKE DUCT

Removal

(1) Disconnect negative battery cable.
(2) Drain two quarts of antifreeze from radiator.
(3) Remove heater hoses.
(4) Remove drain tube from heater housing.
(5) Remove screws attaching evaporator housing to instrument panel and lower housing.
(6) Disconnect wiring from A/C switch.
(7) Remove screw attaching heater motor housing to bracket.
(8) Remove nuts attaching heater housing to dash panel from engine compartment.
(9) Disconnnect speedometer cable.
(10) Remove glove box.
(11) Tilt heater housing assembly back and pull to the rear a lower housing.
(12) Disconnect heater control cables.
(13) Remove fresh air cover panel from cowl.
(14) Remove fresh air intake duct assembly.

Installation

(1) Position defroster duct and install attaching screws and tube.
(2) Raise windshield and secure.
(3) Install fresh air intake duct assembly.
(4) Install fresh air cover panel on cowl.
(5) Install heater control cables.
(6) Position heater housing assembly on dash panel.
(7) Install nuts attaching heater housing to dash panel.
(8) Install glove box.
(9) Install speedometer cable.
(10) Install screw attaching heater housing to bracket.
(11) Connect wiring to A/C switch.
(12) Install evaporator housing to instrument panel.
(13) Connect drain tube to heater housing.
(14) Connect heater hoses.
(15) Refill radiator.
(16) Connect negative battery cable.

CHEROKEE - WAGONEER - TRUCK HEATER

GENERAL

The blend-air type heater and defroster system is used on all Cherokee, Wagoneer and Truck models. The blend-air method of heating uses a constant flow system with engine coolant continuously flowing through the heater core. The temperature of the heated air entering the passenger compartment is controlled by regulating the quantity of air which flows through the heater core air passages, then blending it with a controlled amount of cool, fresh air which bypasses the heater core. System controls and operation are described in this section.

When servicing a malfunctioning heater system, refer to the Service Diagnosis for a list of the possible causes and recommended service procedures.

SYSTEM CONTROLS

The heater and defroster controls consists of a fan control switch, a vacuum control switch operated by three pushbuttons, and a slide temperature control lever (fig. 3D-5).

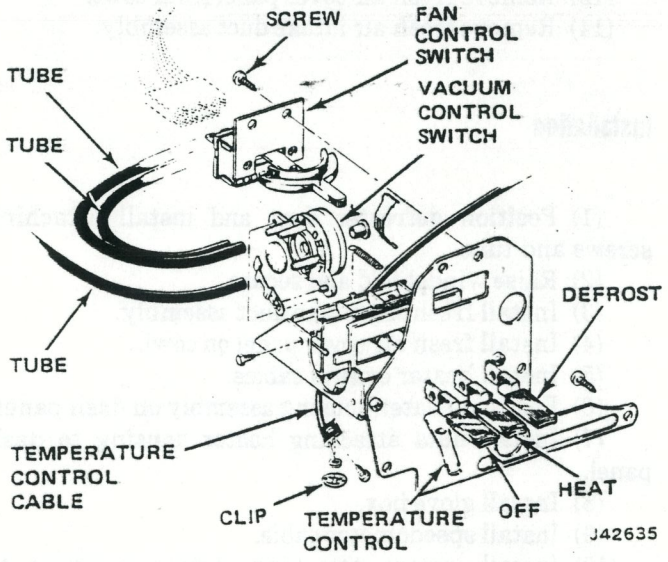

Fig. 3D-5 Heater and Defroster Controls

The three pushbuttons manually operate the vacuum control switch which directs vacuum to two vacuum motors, controlling airflow and point of air distribution.

The temperature control lever adjusts the amount of airflow around the heater core and through the heater core air passages. This regulates the degree of heat entering the passenger compartment.

The fan control is a four-position control switch (Off, Low, Medium, and High), which regulates the blower motor and airflow for heat, defrost, and fresh air ventilation.

There has been a vacuum storage tank added to prevent the heater doors from closing on acceleration and is located in the engine compartment in the center of dash panel.

HEATER AND DEFROSTER OPERATION

The heater is part of the engine cooling system and depends on normal engine operating temperature and airflow through the cowl fresh air intake to heat the interior of the vehicle. During heater operation, close the fresh air vents.

The Off, Heat and Def buttons (fig. 3D-5) on the heater control panel operate a vacuum control switch which controls two vacuum motors. When the off button is pressed, the vacuum switch shuts off vacuum to the air inlet door vacuum motor. A spring closes this door, preventing any outside air from entering the heater (fig. 3D-6).

When the Heat button is pressed, the air inlet door is opened by the air inlet vacuum motor and air will flow through the heat transition housing and out of the floor heat distributor.

When the Def button is pressed, the vacuum switch directs vacuum to the defrost vacuum motor, which closes the door to the floor heat distributor. Airflow is then directed through the defroster hoses onto the windshield. The air inlet door remains open to allow airflow through the heat transition housing.

The Temperature control lever operates the blend air door in the heater core housing. At the full right position, all air is directed through the heater core providing maximum heat flow. At the full left position, all air is directed around the heater core providing unheated fresh air. The temperature control lever may be placed in any in-between position to provide a blend of cool, fresh, outside air and heater air. However, either the Heat or Def button must be pressed before any air can enter the vehicle.

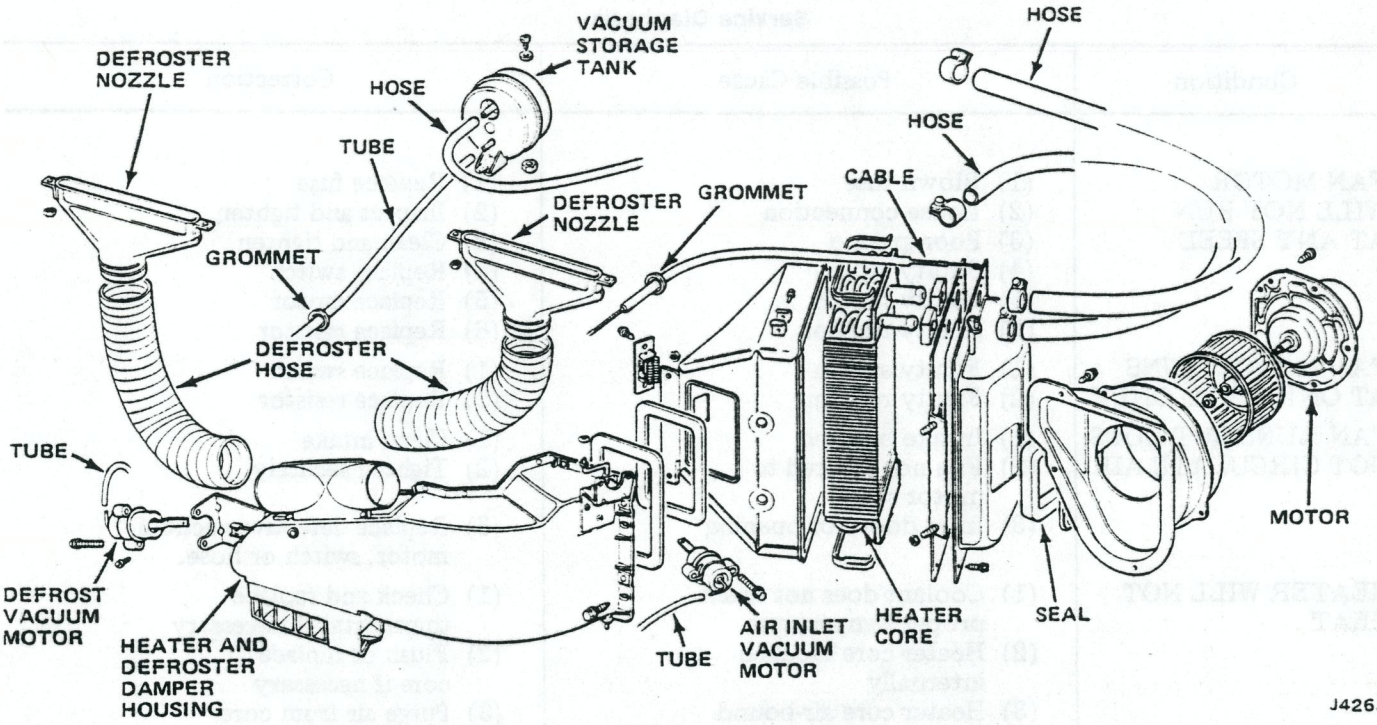

Fig. 3D-6 Heater and Defroster

If additional airflow is required, the blower motor should be operated at one of the three available speeds.

FRESH AIR VENTILATION

The ventilating system has two fresh air vents, one in the right cowl trim panel and one in the left cowl trim panel (fig. 3D-7). Both vents are cable controlled with the control knobs mounted on the instrument panel to the right and left of the steering column.

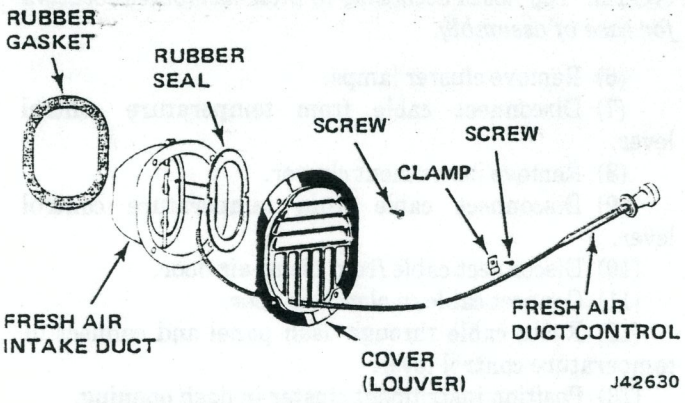

Fig. 3D-7 Fresh Air Intake Duct and Control

HEATER CONTROL PANEL

Removal

(1) Disconnect battery negative cable.
(2) Remove instrument cluster retaining screws.
(3) Disconnect speedometer cable.
(4) Disconnect electrical connectors from cluster.
(5) Disconnect vacuum hoses from vacuum control switch.

NOTE: *Tag hoses according to their numbered location for ease of assembly.*

(6) Remove cluster lamps.
(7) Disconnect cable from temperature control lever.
(8) Remove instrument cluster.
(9) Remove heater and defroster control attaching screws and remove control from cluster.
(10) Remove fan control switch attaching screws and remove switch.

Installation

(1) Install fan control switch.
(2) Install heater and defroster control to cluster.
(3) Position instrument cluster in dash opening.
(4) Install cluster lamps.
(5) Connect cable to temperature control lever.
(6) Connect vacuum hoses.
(a) Number 1 on vacuum control switch goes to defroster vacuum motor.
(b) Number 3 on vacuum control switch goes to vacuum storage tank.
(c) Number 4 on vacuum control switch goes to air inlet door vacuum motor.
(7) Connect cluster electrical connectors.
(8) Connect speedometer cable.
(9) Install cluster retaining screws.
(10) Connect battery negative cable.
(11) Check heater, defroster and fan operation.

Service Diagnosis

Condition	Possible Cause	Correction
FAN MOTOR WILL NOT RUN AT ANY SPEED	(1) Blown fuse	(1) Replace fuse
	(2) Loose connection	(2) Inspect and tighten
	(3) Poor ground	(3) Clean and tighten
	(4) Faulty switch	(4) Replace switch
	(5) Faulty motor	(5) Replace motor
	(6) Faulty resistor	(6) Replace resistor
FAN MOTOR RUNS AT ONE SPEED ONLY	(1) Faulty switch	(1) Replace switch
	(2) Faulty resistor	(2) Replace resistor
FAN RUNS BUT DOES NOT CIRCULATE AIR	(1) Intake blocked	(1) Clean intake
	(2) Fan not secured to motor shaft	(2) Tighten securely
	(3) Inlet door not opening	(3) Replace defective vacuum motor, switch or hose.
HEATER WILL NOT HEAT	(1) Coolant does not reach proper temperature	(1) Check and replace thermostat if necessary
	(2) Heater core blocked internally	(2) Flush or replace core if necessary
	(3) Heater core air-bound	(3) Purge air from core
	(4) Blend-air door not in proper position	(4) Adjust cable
WILL NOT DEFROST	(1) Vacuum motor not operating	(1) Check for engine vacuum at vacuum motor
	(2) Vacuum control switch inoperative	(2) Check for engine vacuum at switch
	(3) Defroster hose damaged	(3) Replace defroster hose

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CONTROL CABLE

Adjustment

The blend-air door control cable is equipped with a turnbuckle to simplify adjustment. The turnbuckle is located in the engine compartment close to the vacuum can.

(1) Rotate turnbuckle counterclockwise to obtain complete closing of the blend-air door when the temperature control lever is in the far left Cool position.

(2) Check blend-air door operation by moving temperature control lever-to-be the Warm position and back to the Cool position. Adjust cabel if necessary.

Replacement

(1) Disconnect battery negative cable.
(2) Remove instrument cluster retaining screws.
(3) Disconnect speedometer cable.
(4) Disconnect electrical connectors from cluster.
(5) Disconnect vacuum hoses from vacuum control switch.

NOTE: *Tag hoses according to their numbered location for ease of assembly.*

(6) Remove cluster lamps.
(7) Disconnect cable from temperature control lever.
(8) Remove instrument cluster.
(9) Disconnect cable from temperature control lever.
(10) Disconnect cable from blend-air door.
(11) Connect cable to blend-air door.
(12) Route cable through dash panel and connect to temperature control lever.
(13) Position instrument cluster in dash opening.
(14) Install cluster lamps.
(15) Connect cable to temperature control lever.
(16) Connect vacuum hoses.
(a) Number 1 on vacuum control switch goes to defroster vacuum motor.
(b) Number 3 on vacuum control switch goes to vacuum storage tank.
(c) Number 4 on vacuum control switch goes to air inlet door vacuum motor.

(17) Connect cluster electrical connectors.
(18) Connect speedometer cable.
(19) Install cluster retaining screws.
(20) Connect battery negative cable.
(21) Check heater, defroster and fan operation.
(22) Adjust cable.
(23) Check cable operation.

HEATER CORE

Removal

(1) Drain approximately two quarts of coolant from radiator.
(2) Disconnect temperature control cable from blend-air door.
(3) Disconnect heater hoses at heater core.
(4) Disconnect blower motor resistor wires.
(5) Remove heater core housing to dash panel attaching nuts.
(6) Remove heater core housing assembly.
(7) Remove attaching screws holding housing halves together and separate housing.
(8) Remove heater core to housing attaching screws and remove core.

Installation

(1) Position heater core in housing and install attaching screws.
(2) Seal and assemble two halves of heater core housing and install attaching screws.
(3) Position heater core housing on dash panel and install attaching nuts.
(4) Connect heater resistor wires.
(5) Connect heater hoses.
(6) Connect temperature control cable to blend air door.
(7) Replace coolant.
(8) Check heater operation.

BLOWER MOTOR

Removal

(1) Disconnect blower motor electrical connector.
(2) Remove blower motor-to-blower motor housing attaching screws and remove blower motor and fan assembly.

Installation

(1) Position blower motor and fan assembly on blower motor housing and install attaching screws.
(2) Connect blower motor electrical connector.
(3) Check blower motor operation.

NOTES

AIR CONDITIONING 3E

SECTION INDEX

CJ AIR CONDITIONING

GENERAL

When driving at normal highway speeds the CJ air conditioning system (fig. 3E-1) will provide maximum efficiency. However, when operating under stop-and-go city driving conditions, a slight reduction in cooling efficiency generally will be experienced.

It is recommended that intermediate temperature and high fan setting be used for average city driving and intermediate temperature and medium fan setting for highway driving.

When driving at relatively high speed for an extended period of time, the cooling coil may possibly frost over, resulting in a temporary loss of cooling. Should this occur, simply turn the TEMP knob to OFF and allow the blower to operate for a few minutes to allow the cooling coil to defrost. Then turn the TEMP knob to a setting which is not as cold as the setting at which frosting occurred.

To maintain maximum cooling efficiency, periodically remove bugs and foreign matter from the condenser and radiator fins. DO NOT install a bug screen or other screen material in front of the condenser and radiator.

Water forming under a vehicle, at a point below the cooling case, is condensation water draining from the system and is considered normal.

The engine temperature gauge pointer will indicate a slightly higher than normal temperature when the air conditioning system is operating. However, should excessive overheating occur, check the condition of all water hoses, check the radiator for rust or scaling conditions, and make sure that the condenser is free of bugs or other foreign matter.

The air conditioner also can be used for fast, efficient defogging of windows during cool, damp weather.

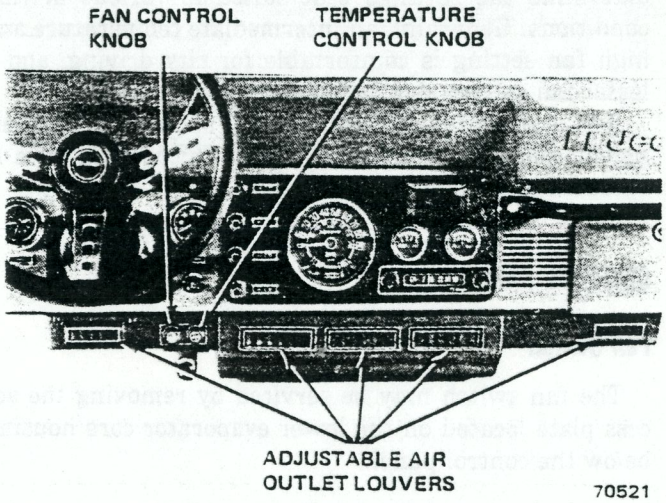


Fig. 3E-1 Air Conditioner—CJ

The condenser is mounted ahead of the radiator and the remaining components are in the engine compartment.

The compressor is a two-cylinder, belt-driven pump. An electromagnetic clutch couples the compressor to the drive pulley. The drive pulley freewheels when the air conditioner is not in use.

The start position on the ignition switch automatically disconnects all accessories, including the air conditioner, to reduce battery load and provide easier starting.

CONTROL OPERATION

For fast, maximum efficiency, purge the vehicle of hot air by driving the equivalent of two or three city blocks with at least one window open. During this time, place the TEMP control in the MAX position and the FAN control in the HI position. This permits the evaporator to precool in hot weather.

Adjust the air outlets to obtain desired airflow distribution by moving the louver levers left, right, up, or down. Airflow can be adjusted for quick delivery to a specific spot or for gentle diffusion of air throughout the vehicle.

When the interior of the vehicle has cooled to the desired temperature, the FAN knob may be set to obtain the desired volume of air from the air outlets. The TEMP knob may be rotated to vary the temperature. It may be necessary to experiment with the TEMP knob to determine the settings best suited to various driving conditions. Generally, an intermediate temperature and high fan setting is comfortable for city driving, and a lesser fan setting comfortable for open road driving.

Run the engine well above idle speed for more efficient cooling under conditions in which the system is operated with the vehicle standing.

CONTROL PANEL

Fan Switch

The fan switch may be serviced by removing the access plate located on the lower evaporator core housing below the control panel.

Temperature Control Thermostat

To service the temperature control thermostat, the evaporator core housing must be disassembled.

When installing a replacement temperature control thermostat, insert the capillary tube into the evaporator coil a minimum of two inches (fig. 3E-2).

CAUTION: *Handle the tube with care to avoid bends or kinks which could cause the thermostat to malfunction.*

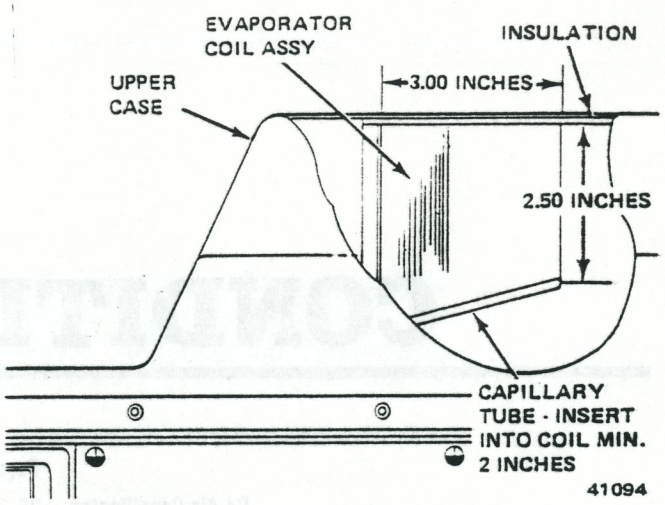


Fig. 3E-2 Capillary Tube Position

CONDENSER AND RECEIVER/DRYER ASSEMBLY

Removal

(1) Discharge refrigerant from system as described in General Information section of this chapter.

NOTE: *Discharge system slowly to prevent loss of compressor oil.*

(2) Drain radiator.
(3) Remove fan shroud and radiator.
(4) Disconnect pressure line at condenser.
(5) Remove condenser attaching screws and tilt bottom of condenser toward engine.

NOTE: *Plug all open connections to prevent entry of dirt and moisture.*

(6) From underside of vehicle, disconnect receiver/dryer-to-evaporator hose at receiver/dryer.
(7) Remove condenser and receiver/dryer assembly.
(8) Remove receiver/dryer from condenser, if necessary.

Installation

(1) If removed, install receiver/dryer to condenser.
(2) Place condenser in position and connect receiver/dryer-to-evaporator hose at receiver/dryer.
(3) Install condenser attaching screws.
(4) Connect pressure line at condenser.
(5) Install radiator and fan shroud.
(6) Fill radiator.
(7) Evacuate, leak test, and charge system as described in General Information section of this chapter.

RECEIVER/DRYER

Removal

(1) Discharge refrigerant from system as described in General Information section of this chapter.

NOTE: *Discharge system slowly to prevent loss of compressor oil.*

(2) Disconnect evaporator and condenser lines from receiver/dryer.

(3) Remove attaching screws from receiver/dryer bracket and remove receiver/dryer.

Installation

(1) Install receiver/dryer to support bracket.

(2) Install evaporator and condenser line to receiver/dryer.

(3) Evacuate, charge system and leak test as described in General Information section of this chapter.

EVAPORATOR HOUSING ASSEMBLY

Removal

(1) Discharge system as described in General Information section of this chapter.

(2) Disconnect inlet (suction) line at compressor.

(3) Disconnect receiver/dryer-to-evaporator hose.

(4) Remove hose clamps and dash grommet retaining screws.

(5) Remove evaporator housing-to-instrument panel attaching screws and the evaporator housing-to-mounting bracket screw (fig. 3E-3).

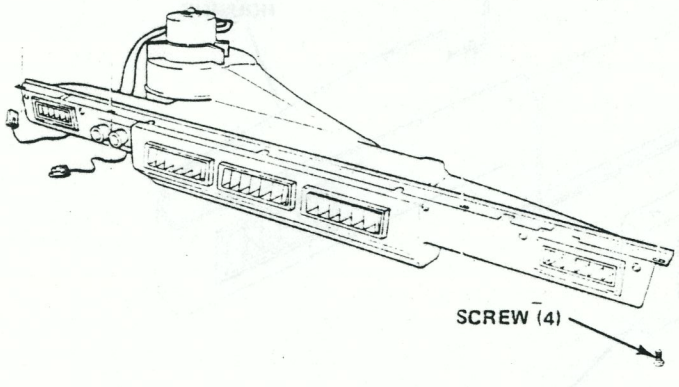


Fig. 3E-3 Evaporator Housing Mounting—CJ

(6) Lower evaporator housing and pull hoses and grommet through opening.

The blower motor, blower motor housing, and evaporator core may be serviced after the evaporator housing is removed (fig. 3E-4).

NOTE: *It is not necessary to discharge the system to service the blower motor. The evaporator housing may be lowered from the instrument panel to gain access to the blower motor attaching screws.*

Installation

(1) Push hoses through grommet opening, and install grommet by pushing toward engine compartment of vehicle and fasten to dash panel with two attaching screws.

(2) Raise evaporator and install evaporator housing-to-instrument-panel attaching screws and the evaporator-to-mounting bracket screw.

(3) Install hose clamps and grommet attaching screws.

(4) Connect receiver/dryer-to-evaporator hose.

(5) Connect inlet (suction) line to compressor.

(6) Evacuate, leak test, and charge system as described in General Information section of this chapter.

EXPANSION VALVE SERVICE

The valve is preset and should not be adjusted. A defective valve requires replacement.

(1) Discharge system as described in General Information section of this chapter.

(2) Remove evaporator housing assembly.

(3) Remove insulation wrapped around suction line and expansion valve. Mark capillary tube location on suction line.

(4) Disconnect inlet and outlet connections, capillary tube clamp, and equalizer tube.

(5) Remove expansion valve.

(6) Clean suction line to provide a positive contact with replacement expansion valve capillary tube.

(7) Connect inlet and outlet hoses. Clamp capillary tube at marked position and connect equalizer tube.

NOTE: *Clamp capillary tube securely so that a firm contact with the suction line is formed.*

(8) Wrap expansion valve and line with insulation.

(9) Install evaporator housing assembly.

(10) Evacuate, leak test, and charge system as described in General Information section of this chapter.

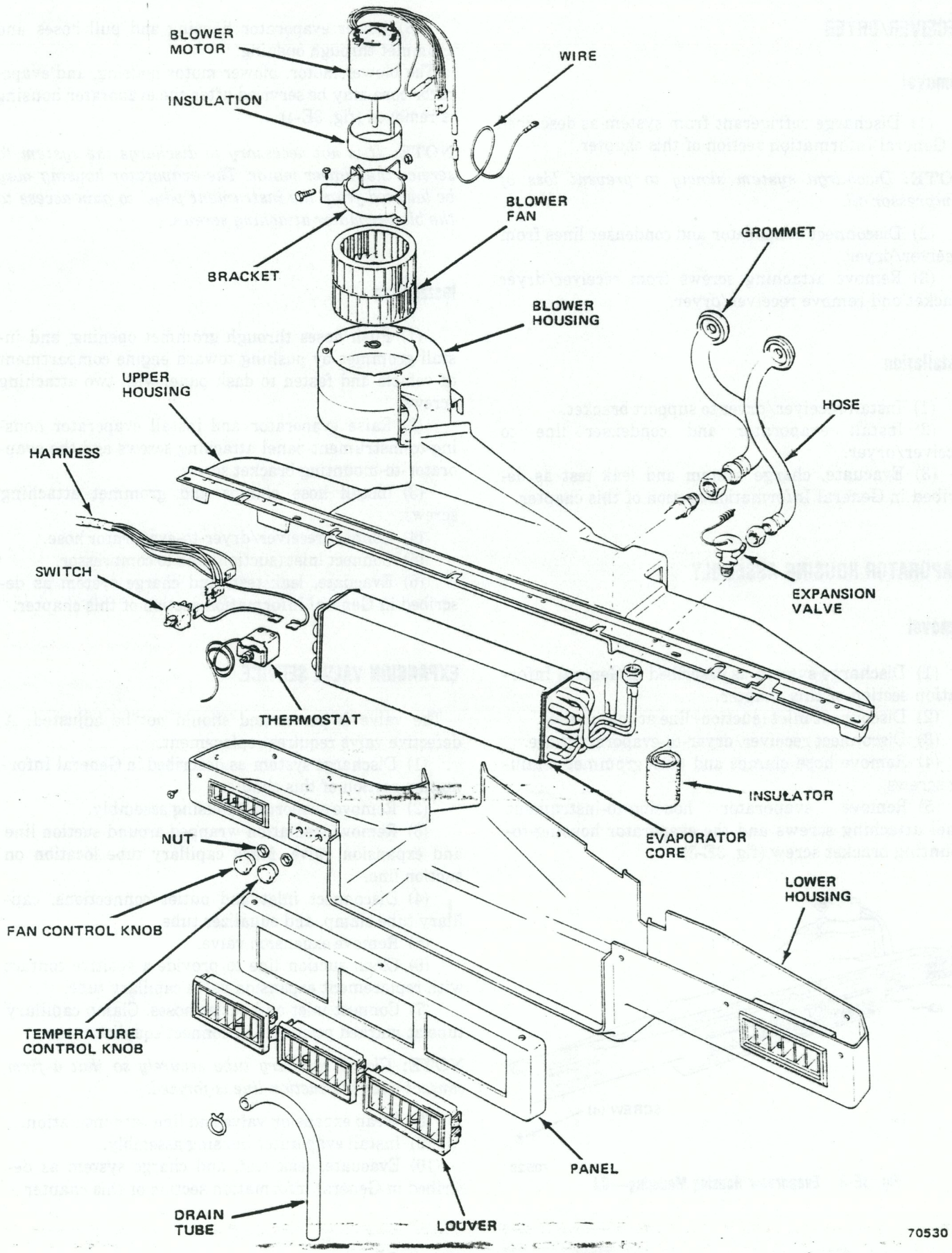


Fig. 3E-4 Evaporator Housing Assembly—CJ

CHEROKEE - WAGONEER - TRUCK AIR CONDITIONING

GENERAL

When driving at normal highway speeds the Jeep air conditioning system will provide maximum efficiency. However, when operating under stop-and-go city driving conditions a slight reduction in cooling efficiency generally will be experienced.

It is recommended that intermediate temperature and high fan setting be used for average city driving and intermediate temperature and medium fan setting for highway driving.

The air conditioning system, as shown for the Wagoneer in figure 3E-5, is applicable to Cherokee and Truck models.

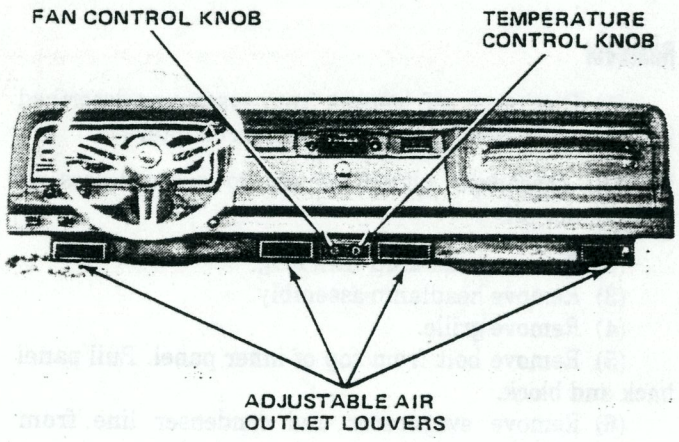


Fig. 3E-5 Air Conditioner—Cherokee-Wagoneer-Truck Models

When driving at relatively high speed for an extended period of time, the cooling coil may possibly frost over, resulting in a temporary loss of cooling. Should this occur, simply turn the TEMP knob to OFF and allow the blower to operate for a few minutes to allow the cooling coil to defrost. Then turn the TEMP knob to a setting which is not as cold as the setting at which frosting occurred.

To maintain maximum cooling efficiency, periodically remove bugs and foreign matter from the condenser and radiator fins. DO NOT install a bug screen or other screen material in front of the condenser and radiator.

Water forming under a vehicle, at a point below the cooling case, is condensation water draining from the system and is considered normal.

The engine temperature gauge pointer will indicate a slightly higher than normal temperature when the air conditioning system is operating. However, should excessive overheating occur, check the condition of all water hoses, check the radiator for rust or scaling conditions, and make sure that the condenser is free of bugs or other foreign matter.

The air conditioner also can be used for fast, efficient defogging of windows during cool, damp weather.

The condenser is mounted ahead of the radiator and the remaining components are in the engine compartment.

The compressor is a two-cylinder, belt-driven pump. An electromagnetic clutch couples the compressor to the drive pulley. The drive pulley freewheels when the air conditioner is not in use.

The start position on the ignition switch automatically disconnects all accessories, including the air conditioner, to reduce battery load and provide easier starting.

CONTROL OPERATION

For fast, maximum efficiency, purge the vehicle of hot air by driving the equivalent of two or three city blocks with at least one window open. During this time, place the TEMP control in the MAX position and the FAN control in the HI or PC position. This permits the evaporator to precool in hot weather.

CAUTION: *Do not leave fan control on PC for longer than 30 seconds. Move the fan control to HI position and raise all windows.*

Adjust the air outlets to obtain desired airflow distribution by moving the louver levers left, right, up, or down. Airflow can be adjusted for quick delivery to a specific spot or for gentle diffusion of air throughout the vehicle.

When the interior of the vehicle has cooled to the desired temperature, the FAN knob may be set to obtain the desired volume of air from the air outlets. The TEMP knob may be rotated to vary the temperature. It may be necessary to experiment with the TEMP knob to determine the settings best suited to various driving

conditions. Generally, an intermediate temperature and high fan setting is comfortable for city driving, and a lesser fan setting comfortable for open road driving.

Run the engine well above idle speed for more efficient cooling under conditions in which the system is operated with the vehicle standing.

CONTROL PANEL

Fan Switch

The fan switch may be serviced by removing the access plate located on the lower evaporator core housing below the control panel.

Temperature Control Thermostat

To service the temperature control thermostat, the evaporator core housing must be disassembled.

When installing a new temperature control thermostat, insert the capillary tube into the evaporator coil a minimum of two inches (fig. 3E-6).

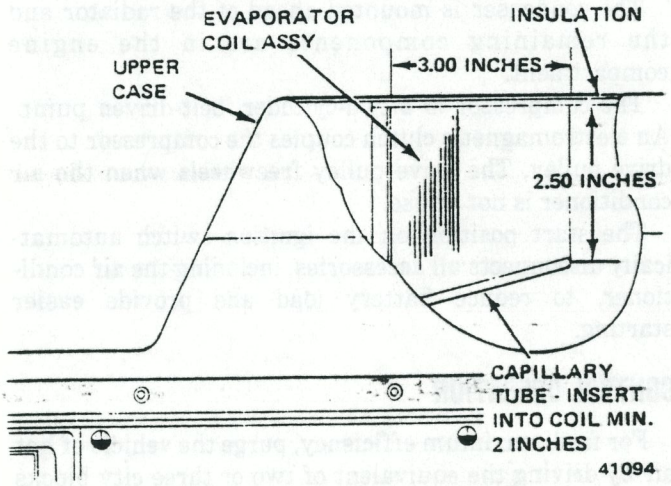


Fig. 3E-6 Capillary Tube Position

CAUTION: *Handle the tube with care to avoid bends or kinks which could cause the thermostat to malfunction.*

CONDENSER AND RECEIVER/DRYER ASSEMBLY

Removal

(1) Discharge refrigerant from system as described in General Information section of this chapter.

NOTE: *Discharge system slowly to prevent loss of compressor oil.*

(2) Drain radiator.

(3) Remove fan shroud and radiator.

(4) Disconnect pressure line at condenser.

(5) Remove condenser attaching screws and tilt bottom of condenser toward engine.

NOTE: *Plug all open connections to prevent entry of dirt and moisture.*

(6) From underside of vehicle, disconnect receiver/dryer-to-evaporator hose at receiver/dryer.

(7) Remove condenser and receiver/dryer assembly.

(8) Remove receiver/dryer from condenser, if necessary.

Installation

(1) If removed, install receiver/dryer to condenser.

(2) Place condenser in position and connect receiver/dryer-to-evaporator hose at receiver/dryer.

(3) Install condenser attaching screws.

(4) Connect pressure line at condenser.

(5) Install radiator and fan shroud.

(6) Fill radiator.

(7) Evacuate, leak test, and charge system as described in General Information section of this chapter.

RECEIVER/DRYER

Removal

(1) Discharge refrigerant from system as described in General Information section of this chapter.

NOTE: *Discharge system slowly to prevent loss of compressor oil.*

(2) Remove headlamp trim ring.

(3) Remove headlamp assembly.

(4) Remove grille.

(5) Remove bolt from top of inner panel. Pull panel back and block.

(6) Remove evaporator and condenser line from receiver/dryer.

(7) Remove screws from receiver/dryer bracket and remove receiver/dryer.

Installation

(1) Install receiver/dryer to radiator support bracket.

(2) Install evaporator and condenser lines to receiver/dryer.

(3) Remove block and install inner panel bolt.

(4) Install grille.

(5) Install headlamp assembly.

(6) Install headlamp trim ring.

(7) Evacuate, charge system and leak test as described in General Information section of this chapter.

EVAPORATOR HOUSING ASSEMBLY

Removal

(1) Discharge system as described in General Information section of this chapter.

(2) Disconnect inlet (suction) line at compressor.

(3) Disconnect receiver/dryer-to-evaporator hose at quick-disconnect coupling (fig. 3E-7).

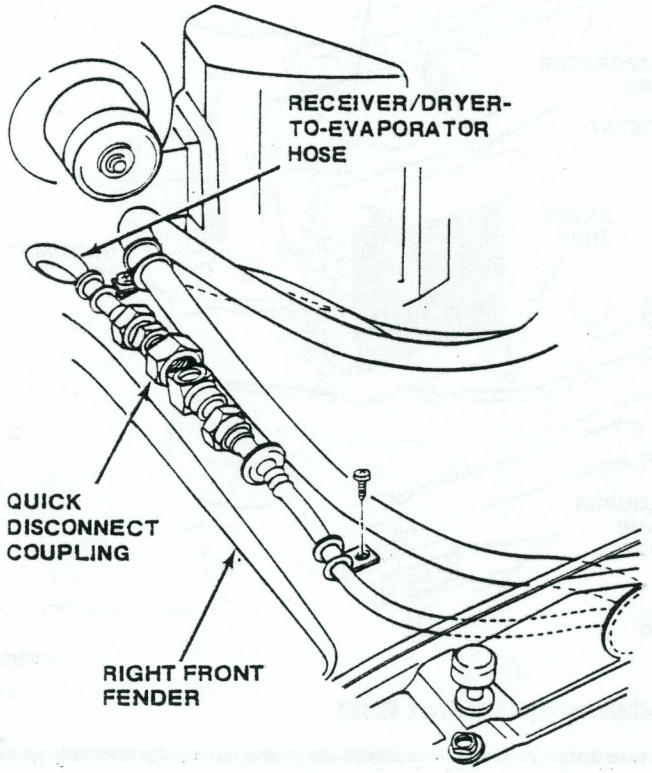


Fig. 3E-7 Quick-Disconnect Coupling

(4) Remove hose clamps and dash grommet retaining screws.

(5) Remove evaporator housing-to-instrument panel attaching screws and evaporator housing-to-mounting bracket screw (fig. 3E-8).

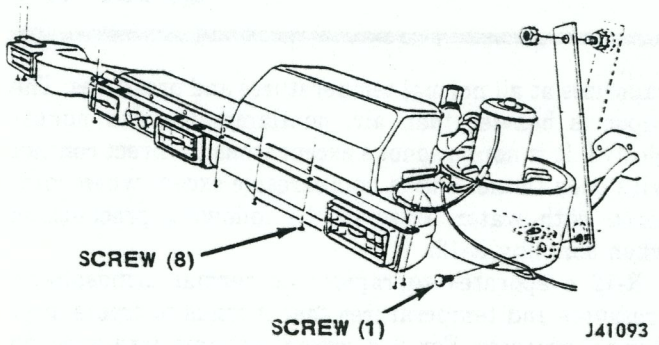


Fig. 3E-8 Evaporator Housing Mounting—Cherokee-Wagoneer-Truck Models

(6) Lower evaporator housing and pull hoses and grommet through opening.

The blower motor, blower motor housing, and evaporator core may be serviced after the evaporator housing is removed (fig. 3E-9).

NOTE: *It is not necessary to discharge the system to service the blower motor. The evaporator housing may be lowered from the instrument panel to gain access to the blower motor attaching screws.*

Installation

(1) Push hoses through grommet opening, and install grommet by pushing toward engine compartment of vehicle and fasten to dash panel with two attaching screws.

(2) Raise evaporator and install evaporator housing-to-instrument-panel attaching screws and evaporator-to-mounting bracket screw.

(3) Install hose clamps and grommet attaching screws.

(4) Connect receiver-to-evaporator hose at quick-disconnect coupling.

(5) Connect inlet (suction) line to compressor.

(6) Evacuate, leak test, and charge system as described in General Information section of this chapter.

EXPANSION VALVE SERVICE

The valve is preset and should not be adjusted. A defective valve requires replacement.

(1) Discharge system as described in General Information section of this chapter.

(2) Remove evaporator housing assembly.

(3) Remove insulation wrapped around suction line and expansion valve. Mark capillary tube location on suction line.

(4) Disconnect inlet and outlet connections, capillary tube clamp, and equalizer tube.

(5) Remove expansion valve.

(6) Clean suction line to provide a positive contact with replacement expansion valve capillary tube.

(7) Connect inlet and outlet hoses. Clamp capillary-tube at marked position and connect equalizer tube.

NOTE: *Clamp capillary tube securely so that a firm contact with suction line is formed.*

(8) Wrap expansion valve and line with insulation.

(9) Install evaporator housing assembly.

(10) Evacuate, leak test, and charge system as described in General Information section of this chapter.

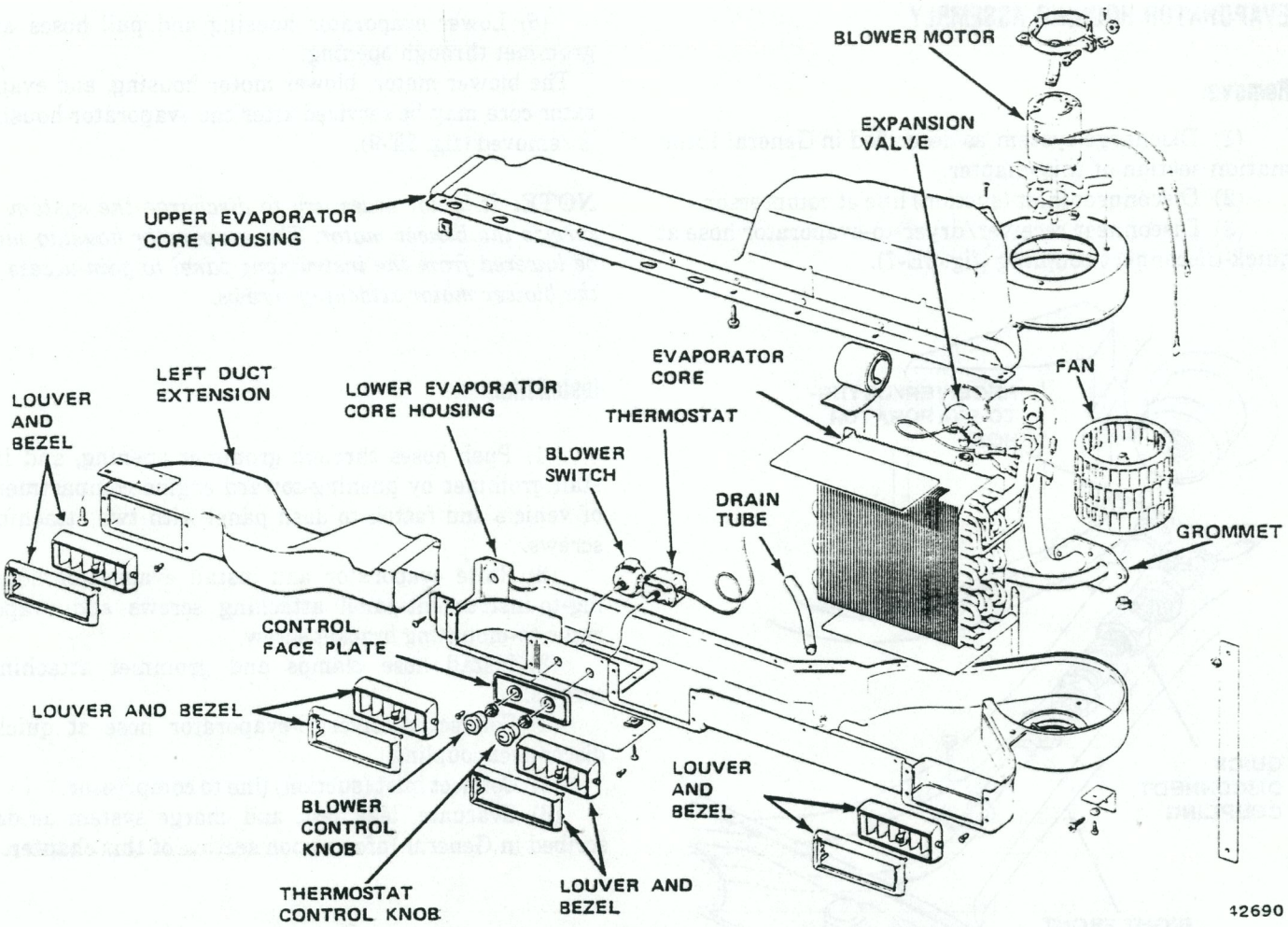


Fig. 3E-9 Evaporator Housing Assembly—Cherokee-Wagoneer-Truck Models

GENERAL INFORMATION

GENERAL

The following service procedures apply to all factory installed air conditioning systems unless otherwise specified.

REFRIGERANT SAFETY PRECAUTIONS

The refrigerant used in automotive air conditioning systems is dichlorodifluoromethane, commonly known as Refrigerant-12 or R-12. It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of **21.7°F below zero** at atmospheric pressure, it vaporizes at all normal temperatures and pressures. The vapor is heavier than air, nonflammable and nonexplosive. It is nonpoisonous except when in direct contact with open flame, and is noncorrosive except when combined with water. Observe the following precautions when handling R-12.

R-12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

WARNING: *Always wear safety goggles when servicing the refrigeration part of the air conditioning system. Keep a bottle of sterile mineral oil and a weak solution of boric acid handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out (R-12 is rapidly absorbed by oil). Next, wash the eyes with the weak solution of boric acid. Call a doctor immediately, even though irritation has ceased after the first aid treatment.*

WARNING: *Do not heat R-12 above 125°F.*

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over 125°F is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld, steam clean or heat the system components or refrigerant lines.

CAUTION: *Keep R-12 containers upright when charging the system, so as to utilize the vapor instead of the liquid.*

When metering R-12 into the refrigeration system, **keep the supply tank or cans in an upright position.** If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

WARNING: *Always work in a well-ventilated area.*

Always maintain good ventilation in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.

Although R-12 vapor is normally nonpoisonous, it can be changed into a very poisonous gas if allowed to come in contact with an open flame. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the halide torch leak detector. Avoid inhaling the fumes from the leak detector.

CAUTION: *Do not allow liquid refrigerant to touch bright metal.*

Refrigerant will tarnish bright metal and chrome surfaces. Avoid splashing refrigerant on any surface. Refrigerant in combination with moisture is very corrosive and can cause extensive damage to all metal surfaces.

SERVICE VALVES

The discharge and suction service valves are mounted directly to the compressor head. The valves are used for diagnosis, charging, discharging, evacuating, and component removal.

The service valves are three-position valves (fig. 3E-10). The normal operating position, shown in figure 3E-10, View B, has the valve stem turned **counterclockwise** to the **back-seated** (full-out) position.

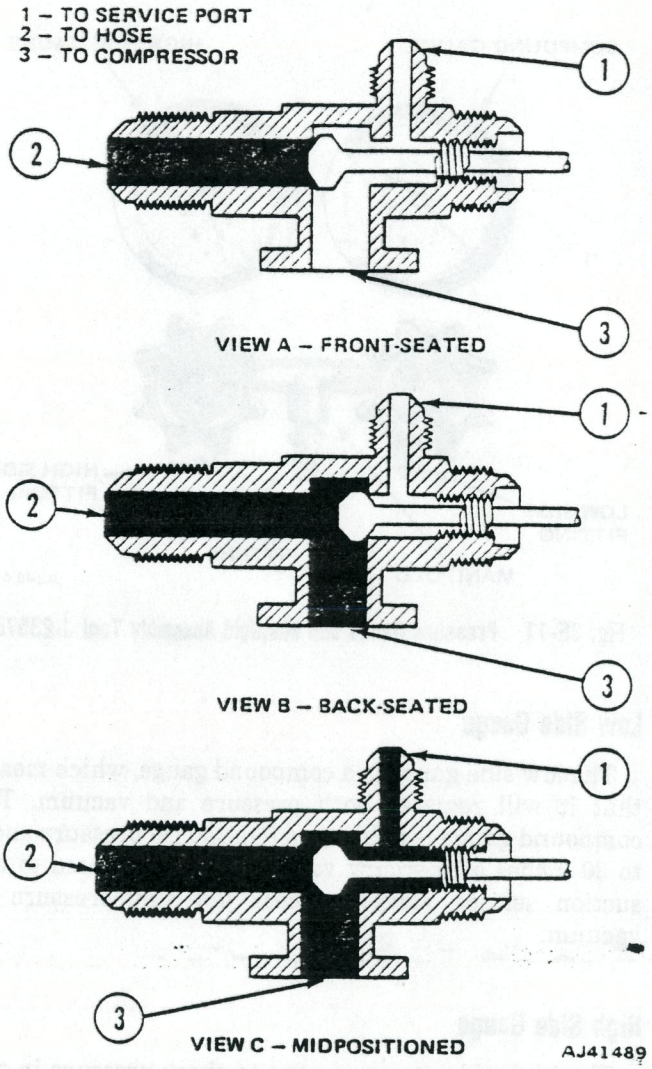


Fig. 3E-10 Service Valve Operating Positions—Typical

When the valve stem is turned **clockwise** to the **front-seated** (full-in) position (fig. 3E-10, View A), the compressor is isolated from the system. This position is used when removing the compressor or when checking compressor oil level.

When the valve is **mid-positioned** (cracked) (fig. 3E-10, View C), the gauge port is **open.** This position is used when charging, discharging, evacuating, and checking system pressure.

PRESSURE GAUGE AND MANIFOLD ASSEMBLY

The pressure gauge and Manifold Assembly Tool J-23575 (fig. 3E-11) is the most important tool used to service the air conditioning system. The gauge assembly is used to determine system high and low side gauge pressures, the correct refrigerant charge, and for system

diagnosis. It is designed to provide simultaneous high and low side pressure indications, because these pressures must be compared to determine correct system operation.

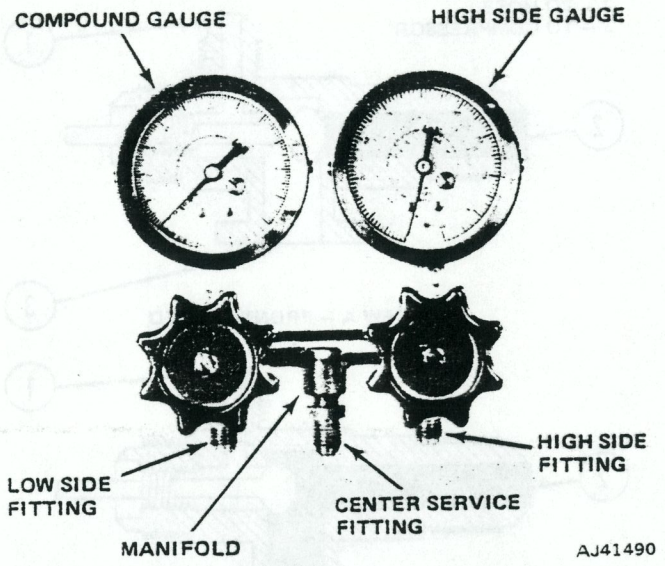


Fig. 3E-11 Pressure Gauge and Manifold Assembly Tool J-23575

Low Side Gauge

The low side gauge is a compound gauge, which means that it will register both pressure and vacuum. The compound gauge is calibrated 0 to 150 psi pressure and 0 to 30 inches of mercury vacuum. It is connected to the suction service valve to check low side pressure or vacuum.

High Side Gauge

The high side gauge is used to check pressure in the discharge side of the air conditioning system.

Manifold

The gauges are connected into the air conditioning system through a manifold (fig. 3E-11). The manifold has three connections. The low side hose and fitting is connected directly below the low side gauge. The high side hose and fitting is connected below the high side gauge.

The center connection of the manifold is used for charging, discharging, evacuating, and any other necessary service. Both the high and low sides of the manifold have hand shutoff valves. The hand shutoff valves open or close the respective gauge connections to the center service connection or to each other. The manifold is constructed so that pressure will be indicated on the gauges regardless of hand valve position.

Connecting the Pressure Gauge and Manifold Assembly

(1) Remove protective caps from service valve gauge ports and valve stems.

(2) Close both hand valves on gauge manifold set.

(3) Connect compound gauge hose to compressor suction service valve gauge port (low-side).

(4) Connect high pressure gauge hose to discharge service valve gauge port (high-side).

NOTE: *If necessary, to facilitate installation of the gauge set, loosen the service valve-to-compressor fitting and* ***rotate the service valve slightly****. Do not allow line to contact engine or body components. Tighten the service valve-to-compressor fitting to 25 foot-pounds (34 N•m) torque or 15 foot-pounds (20 N•m) torque for flange-type service valve screws.*

(5) Set both service valve stems to mid- or cracked-position. The gauges will indicate high and low side pressure respectively.

(6) Purge any air from high side test hose by opening high side hand valve on manifold for three to five seconds (center connection on manifold must be open).

(7) Purge any air from low side test hose by opening low side hand valve on manifold for three to five seconds (center connection on manifold must be open).

(8) Air conditioning system may be operated with gauge manifold assembly connected in this manner. Gauges will indicate respective operative pressures.

CHECKING SYSTEM PRESSURES

The pressure developed on the high side and low side of the compressor indicate whether the system is operating properly.

WARNING: *Use extreme caution when engine is operating. Do not stand in direct line with fan. Do not put hands near pulleys, belts or fan. Do not wear loose clothing.*

(1) Attach pressure gauge and manifold assembly.

(2) Close both hand valves on gauge and manifold assembly.

(3) Set both service hand valve stems to mid-position.

(4) Operate air conditioning system with engine running at 1500 rpm and controls set for full cooling but not into the MAX or COLD detent.

(5) Insert thermometer into discharge air outlet and observe air temperature.

(6) Observe high and low side pressures and compare with those shown in the Normal Operating Temperatures and Pressures Chart. If pressures are abnormal, refer to Pressure Diagnosis Chart.

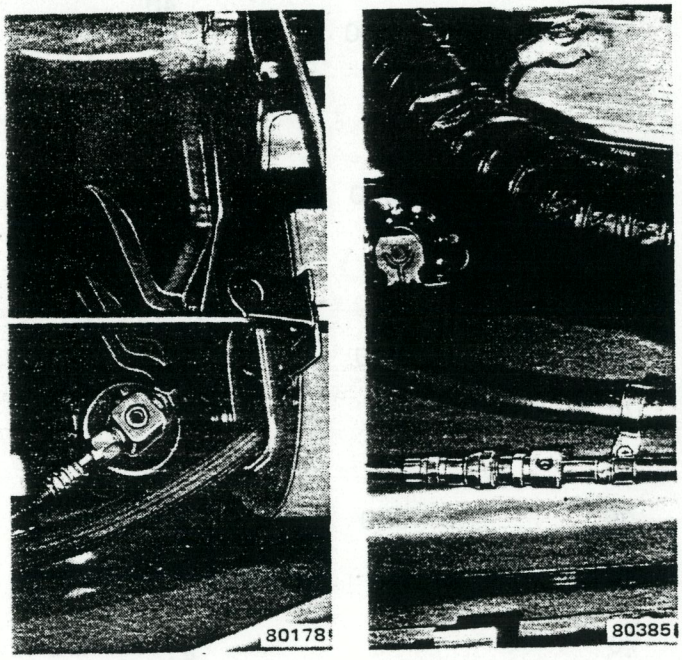
Normal Operating Temperatures and Pressures *

Relative Humidity (percent)	Surrounding Air Temperature (° F)	Engine Speed (RPM)	Maximum Desirable Center Register Discharge Air Temp. (° F)	Suc Pres PS (RE
20	70	1500	40	1
	80		41	1
	90		42	2
	100		43	2
30	70	1500	40	1
	80		41	16
	90		42	22
	100		44	26
40	70	1500	40	13
	80		42	18
	90		43	23
	100		44	26
50	70	1500	40	14
	80		42	19
	90		44	25
	100		46	27
60	70	1500	41	15
	80		43	21
	90		45	25
	100		46	28
70	70	1500	41	16
	80		43	22
	90		45	26
	100		46	29
80	70	1500	42	18
	80		44	23
	90		47	27
	100		—	—
90	70	1500	42	19
	80		47	24
	90		48	28
	100		—	—

*Operate engine with transmission in neutral. Keep vehicle out of direct sunlight.

SIGHT GLASS

A sight glass is incorporated in the receiver-to-evaporator hose at the receiver end (fig. 3E-12). The sight glass provides a visual check of the system refrigerant level. A continuous stream of bubbles will appear in the sight glass of a system which is not properly charged. Properly charged and completely discharged systems will appear similar through the sight glass because of a lack of bubbles. To distinguish between the two situations, cycle the magnetic clutch Off and On with the engine running at 1500 rpm. During the time the clutch is off, bubbles will appear if the refrigerant is in the system and will disappear when the clutch is on. If no bubbles appear when cycling the magnetic clutch, there is no refrigerant in the system since some bubbles would appear in a fully charged system. If the system is discharged, it will be necessary to leak test, repair as required, evacuate, and charge the system.



CJ CHEROKEE-WAGONEER-TRUCK

Fig. 3E-12 Sight Glass

DISCHARGING SYSTEM

Refrigerant should be discharged from the system before replacing any part in the system except the compressor.

(1) Connect pressure gauge and manifold assembly to proper service valves.

(2) Turn both manifold hand valves to maximum counterclockwise (open) position.

(3) Open both service valves a slight amount (from back-seated position) and allow refrigerant to discharge **slowly** from system (fig. 3E-13).

CAUTION: *Do not allow the refrigerant to rush out, as the oil in the compressor or system will be forced out along with it.*

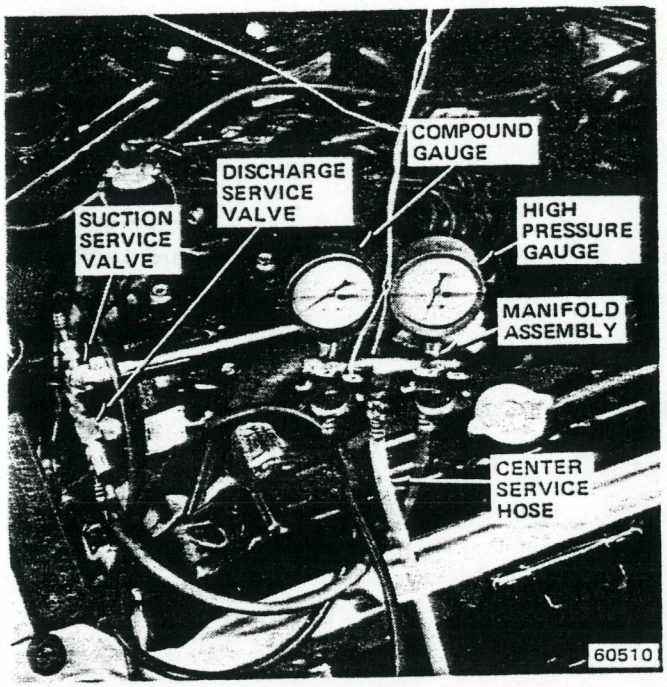


Fig. 3E-13 Typical Pressure Gauge and Manifold Assembly Connections for Discharging System

EVACUATING SYSTEM

A system with the refrigerant removed during repair, or one that is excessively low on refrigerant must be evacuated with a vacuum pump before new refrigerant is installed. The reason for evacuating a system is to remove any air and moisture that may have entered the system.

Moisture in any quantity is extremely harmful to the air conditioning system. Moisture may collect and freeze in the thermostatic expansion valve orifice, blocking refrigerant flow and preventing system cooling. Moisture will also react with R-12 to form hydrochloric acid which will corrode metal parts of the system. Corrosion particles may become detached and block the small passages and orifices in the system.

Unwanted air and moisture are removed from the system by proper evacuation of the system. A vacuum pump is used to lower the pressure sufficiently so that moisture boiling temperature is reduced to a point where the water will vaporize and can be evacuated from the system.

Water boils at 212°F at 14.7 psi (sea level). As the vacuum pump lowers the pressure of the closed air conditioning system, the boiling point of the moisture in the system will also be lowered. In evacuating the system, it is necessary to lower the boiling point of any moisture in the system to a point lower than the ambient (surrounding) temperature to ensure that all moisture is boiled

off. At an ambient temperature of 75°F, when the desired vacuum of 29.5 in. Hg is reached, water will boil at approximately 54°F and a complete boiling off of all moisture in the system is assured when this vacuum reading has been reached.

At altitudes higher than sea level, it will not be possible to obtain a vacuum reading of 29.5 in. Hg on the low side compound gauge. For each 1,000 feet of altitude, the vacuum gauge must be corrected by one in. Hg to compensate for a change in atmospheric pressure. For example, at altitudes of 1,000 feet, a gauge reading of 28.5 in. Hg will be the same as a gauge reading of 29.5 in. Hg at sea level. When this vacuum is reached, a minimum of 30 minutes should be allowed in evacuating the system to ensure complete moisture removal.

Evacuating Procedure with J-26695 Vacuum Pump

The J-26695 Vacuum Pump and motor is a self-contained unit equipped with a carrying handle and stand. The unit must be kept upright at all times to prevent oil from spilling.

(1) Connect pressure gauge and Manifold Assembly Tool J-23575.

(2) Discharge system.

(3) Connect center service hose to inlet fitting of vacuum pump (fig. 3E-14).

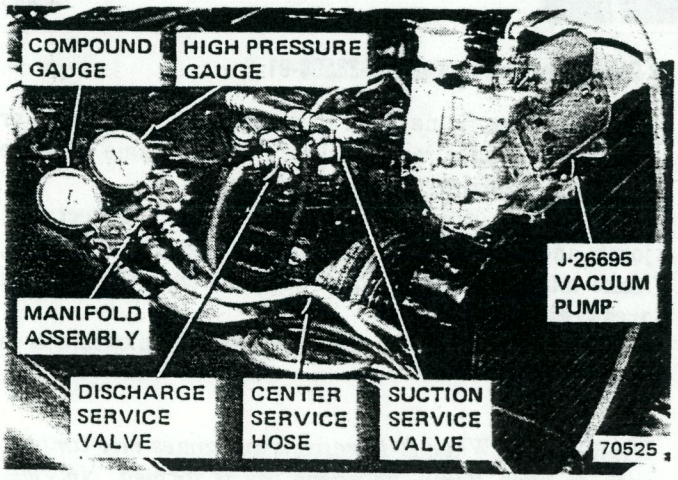


Fig. 3E-14 Typical Connections for Evacuating System with J-26695 Vacuum Pump

(4) Open both manifold hand valves wide open.

(5) Start vacuum pump; note compound gauge reading.

(6) Operate pump a MINIMUM of 30 minutes after reaching lowest vacuum.

(7) Test system for leaks. Close both manifold hand valves, turn off vacuum pump, and note compound gauge reading. Gauge needle should remain stationary at point at which pump was turned off.

(8) If gauge needle returns to zero rapidly, install a partial charge in system and locate leak with leak detector. Repair leak and repeat evacuation procedure.

(9) If gauge needle remains stationary and vacuum is maintained for three to five minutes, resume evacuation for minimum of 30 minutes.

(10) Close both manifold hand valves and stop vacuum pump.

(11) Disconnect center service hose from vacuum pump. System is now ready for charging.

Evacuation Procedure with J-23500-01 Portable Air Conditioning Service Station

The J-23500-01 Portable Air Conditioning Service Station (fig. 3E-15) is a completely portable station equipped with vacuum pump, metering-charging cylinder, refrigerant supply, gauges, hoses and hand control valves.

The control switch for the vacuum pump is mounted on the front of the charging station. It should be in the Off position before inserting plug into the power source.

NOTE: *Be certain system is completely depressurized before evacuating. With the system under pressure, refrigerant may enter vacuum pump and damage the pump.*

(1) Close all hand valves.

(2) Connect red charging hose to discharge service valve port on compressor.

(3) Connect blue charging hose to suction service valve port on compressor.

(4) Discharge system, leaving suction and discharge service valves in the mid- or cracked-position.

(5) Connect vacuum pump hose to vacuum pump inlet.

(6) Open low pressure hand control valve and high pressure hand control valve on charging station.

(7) Start vacuum pump and open vacuum control valve; note compound gauge reading.

(8) Operate pump **minimum of 30 minutes** after reaching lowest vacuum.

(9) Fill charging cylinder, as described below, while system is evacuating.

(10) Close vacuum control valve and stop vacuum pump. Observe blue compound gauge to determine if leak exists. System is now ready for charging.

CHECKING FOR LEAKS

Whenever a system requires more than 1/2 pound of refrigerant after a season's operation, a serious leak is indicated which must be located and repaired.

Most leaks will be located at points of connection and are caused by automobile vibration. Correction of this type of leak may only require retightening of the connection. However, some leaks may occur only at periods

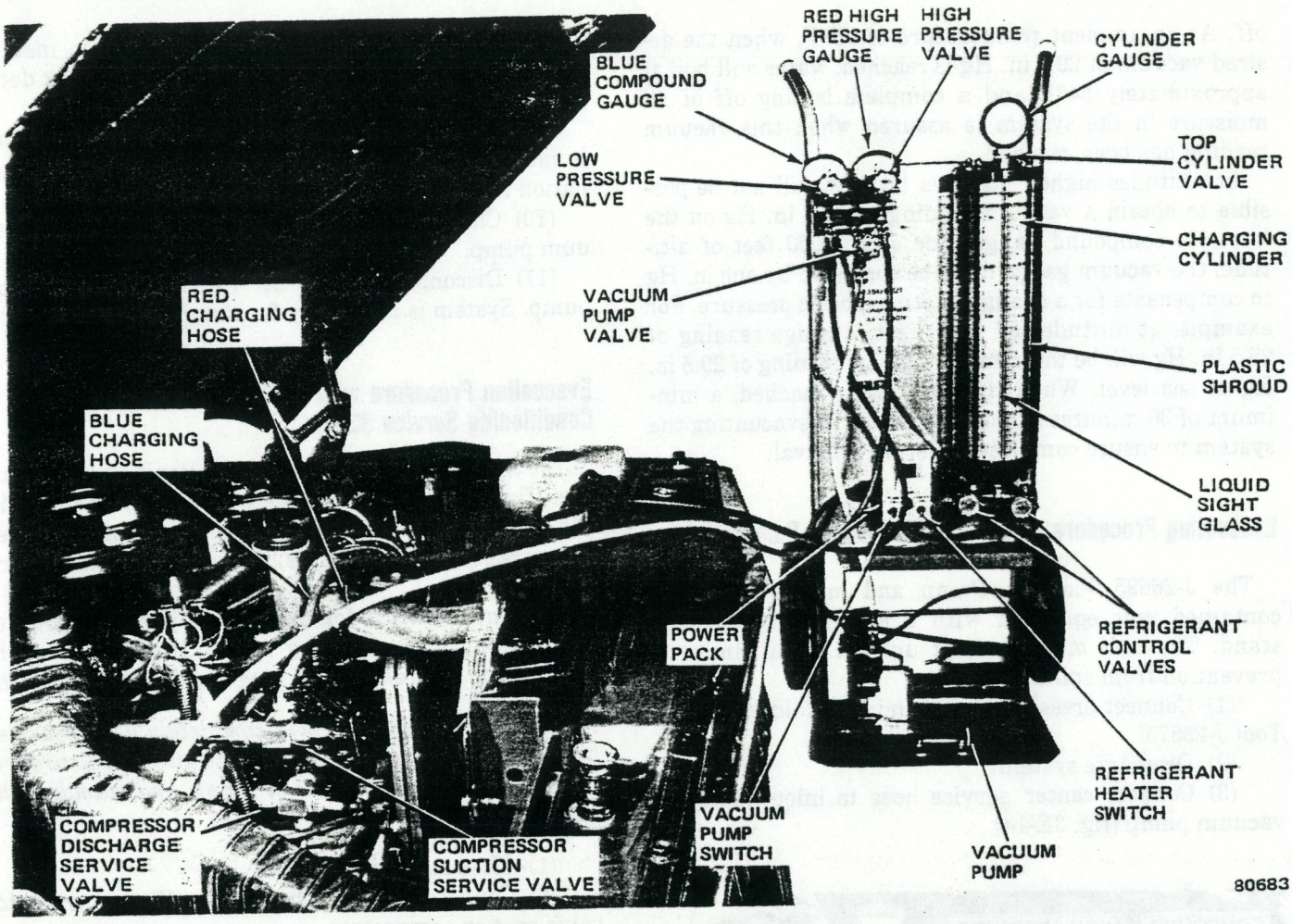


Fig. 3E-15 Typical Connections for Portable Air Conditioning Service Station J-23500-01

of high traffic on a very warm day. This type of leak most often occurs through the compressor shaft seal or service valve gasket.

A system must contain an adequate quantity of refrigerant to be properly leak tested. If a system is completely discharged, evacuate and install 1/2 pound of refrigerant.

Halide Torch Leak Detection

External leaks are detected and located with a Halide Torch Tool J-6084 (fig. 3E-16). The torch burns propane fuel and is equipped with a search hose. When air is drawn into the hose by the torch, it contacts a heated copper reactor ring in the torch. If refrigerant gas is present in the air, the normally light blue flame will change color. A small refrigerant leak will change the flame color to yellow. A large refrigerant leak will change it to green or purplish-blue.

Leak Test Procedure Using Halide Torch

(1) Open torch valve and light torch, adjusting flame just high enough to heat copper reactor ring to a cherry red.

(2) Lower flame until it is about 1/4 inch above or even with copper reactor ring. Smaller flame is more sensitive to refrigerant.

(3) Move search hose slowly **under** all connections, joints and seals. Because refrigerant is heavier than air, leaks may be more readily detected on lower side of areas being checked.

(4) Watch for color change of flame indicating area of leak.

WARNING: *When R-12 refrigerant comes into contact with an open flame, phosgene gas is formed. NEVER INHALE THE VAPORS OR FUMES FROM THE HALIDE TORCH; they are poisonous.*

(5) Repair leaks as required.

(6) Evacuate and leak-test system after all leaks are corrected.

(7) Charge system.

Electronic Leak Detection

External leaks are detected and located with the Electronic Leak Detector Tool J-26933. The leak detector is

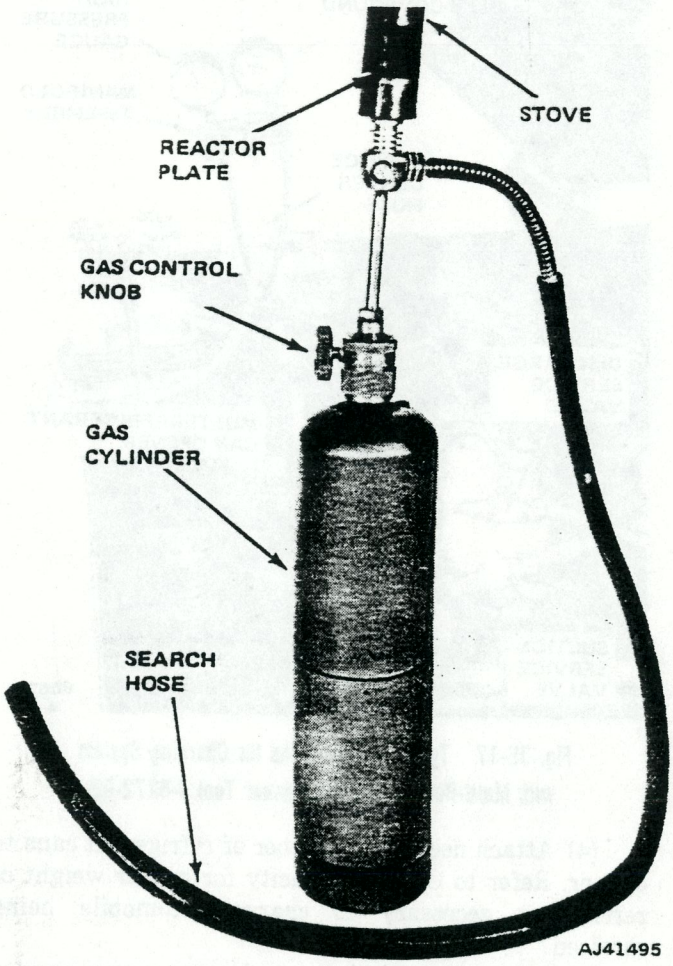


Fig. 3E-16 Halide Torch Tool J-6084

an electronic instrument designed to detect R-12 refrigerant leaks as small as one-half ounce per year. The 18-inch flexible probe gets at inaccessible places. Follow the manufacturer's calibration instructions, included with the unit, to set up the electronic leak detector for proper operation.

NOTE: *Using the Electronic Leak Detector Tool J-26933, will NOT expose the user to phosgene gas vapors or fumes.*

Leak Test Procedure Using Electronic Detector

(1) Unwind flexible probe from case.

(2) Activate Off/On switch, place flexible probe tip near leak port and adjust BAT thumbwheel a few teeth until light goes on and goes out when tip is removed from leak port.

(3) Move flexible probe slowly **under** suspected connections, joints, and seals. R-12 refrigerant is heavier than air, leaks may be detected more readily on lower side of areas being checked.

(4) When a leak is found, its presence will be indicated by white signal light.

NOTE: *If probe tip is held too long on the leak, the white signal light will go out.*

(5) Repair leaks, as required.

(6) Evacuate system after all leaks are corrected.

(7) Charge system.

FLUSHING SYSTEM

Anytime a failure of the compressor causes foreign material to be passed into the system, the condenser must be flushed and the receiver/drier replaced. Filter screens in the compressor at the suction side and in the receiver/drier will confine foreign material to the compressor, condenser, receiver/drier and connecting hoses.

Flushing Procedure

(1) Install replacement compressor and connect service valves and hoses.

NOTE: *System must be in a discharged state.*

(2) Using Portable Air Conditioning Service Station J-23500-01, close all control valves, and connect red high pressure to compressor discharge service valve.

WARNING: *Wear goggles to protect eyes.*

(3) Open refrigerant drum valve. Bleed charging cylinder through valve located on back of control panel directly above cylinder. When two pounds of refrigerant is in charging cylinder, close bleed valve.

(4) Close refrigerant drum valve.

(5) Disconnect receiver/drier from condenser. Place a shop towel on condenser outlet to catch oil that will be forced from system.

(6) Center compressor discharge valve.

(7) Fully open high pressure valve on control panel and allow liquid refrigerant to flow through condenser.

WARNING: *Always maintain good ventilation in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.*

(8) When charging cylinder is empty, close high pressure valve on control panel.

(9) Check compressor oil level.

(10) A replacement receiver/drier should be installed, and system evacuated before charging.

FILLING CHARGING CYLINDER

(1) Be certain refrigerant drum is inverted and valve is open.

(2) Open right hand valve at base of charging cylinder and fill with required amount of refrigerant to charge system (refer to Charge Capacity). Liquid refrigerant will be observed rising in charging cylinder sight glass.

(3) Crack open valve at top of cylinder when pressure in charging cylinder equals pressure in supply tank. This relieves head pressure and allows refrigerant to continue filling cylinder.

(4) Observe pressure gauge at top of cylinder and rotate plastic shroud until pressure heading column corresponds with gauge pressure in line with sight glass.

NOTE: *If pressure gauge at top of cylinder reads, for example, 70 psi, find the column with the pressure heading of "70" and rotate shroud so the "70" column aligns with the sight glass.*

(5) When refrigerant reaches desired level in sight glass, close both the right hand valve at base of cylinder and refrigerant drum valve. Be certain top cylinder valve is fully closed.

NOTE: *If bubbling occurs in sight glass, tilt charging station back momentarily.*

(6) Connect heating element cord to heating element receptacle of power pack and turn heater switch On. Allow refrigerant to heat (building up pressure proportionately) for about ten minutes while vacuum pump is running.

CHARGING SYSTEM

Before making a complete charge, check the compressor oil level, leak test if necessary, and evacuate the system.

Charge Capacity

The recommended charge for the respective systems is as follows: CJ—2-1/2 pounds R-12; Cherokee, Wagoneer and Truck—2-1/4 pounds R-12. Capacities are also indicated on a decal attached to compressor.

NOTE: *Replacement of a hose, receiver/dryer, condenser, expansion valve or evaporator requires the addition of one ounce of AMC Oil 8132400, or equivalent.*

Charging Procedure with Multi-Refrigerant Can Opener Tool J-6272-02

The following charging procedure is based on the use of pressure gauge and Manifold Assembly J-23575, and Multi-Refrigerant Can Opener J-6272-02. Refer to figure 3E-17.

WARNING: *Wear goggles to protect eyes.*

(1) Connect pressure gauge and Manifold Assembly J-23575 and evacuate system. Keep both service valves in mid- or cracked-position.

(2) Close both gauge hand valves.

(3) Disconnect service hose from vacuum pump and connect it to center of Multi-Refrigerant Can Opener J-6272-02. Close four petcock valves on dispenser.

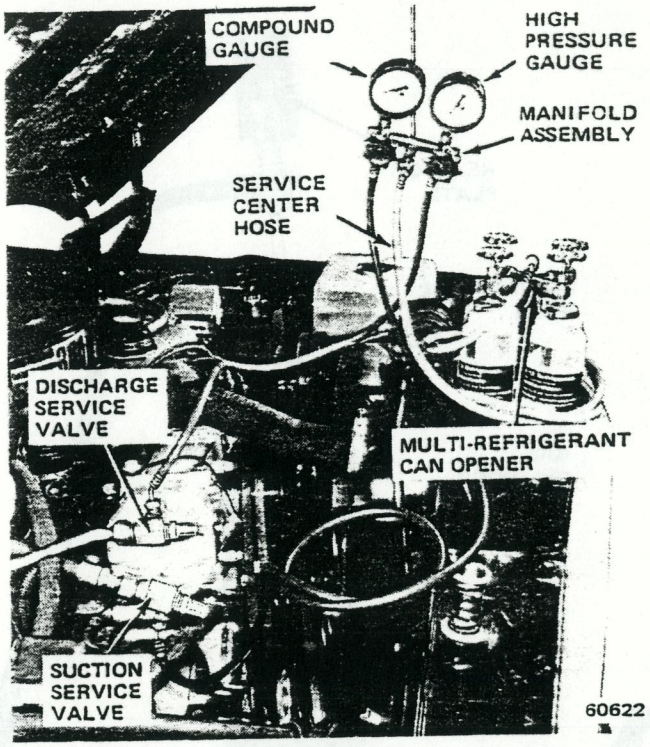


Fig. 3E-17 Typical Connections for Charging System with Multi-Refrigerant Can Opener Tool J-6272-02

(4) Attach necessary number of refrigerant cans to opener. Refer to Charge Capacity for proper weight of refrigerant necessary to charge automobile being serviced.

(5) Open one petcock valve. Loosen center service hose at pressure gauge and manifold assembly allowing refrigerant to purge air from line. Tighten service hose connection and close petcock valve.

(6) Open suction (compound) gauge hand valve and one petcock valve. Do not open discharge (high pressure) gauge hand valve.

WARNING: *Use extreme caution when engine is operating. Do not stand in direct line with fan. Do not put hands near pulleys, belts or fan. Do not wear loose clothing.*

(7) Start engine and place air conditioning controls in maximum cooling position. The compressor will operate and help pull refrigerant gas into suction side of system.

NOTE: *The refrigerant cans may be placed upright in warm water NO HOTTER THAN 125°F to speed up the charging process.*

(8) When first refrigerant can is empty, open another petcock valve to continue charging system.

(9) Continue charging until specified amount of refrigerant is in system. The frost line on refrigerant can will indicate what portion of refrigerant in can has entered system. This may be used as a guide when a system requires a fraction of a full can.

NOTE: *If an accurate scale is available, weigh the refrigerant cans before and during the charging procedure to assure that the correct amount of refrigerant is being used.*

(10) When system is fully charged, close suction (compound) gauge hand valve and all petcock valves.

(11) Operate system five to ten minutes to allow it to normalize and to determine if system will cycle properly. Refer to Checking System Pressures.

(12) Upon completion of operational check, back-seat suction and discharge service valves to their normal operating position by turning them fully counterclockwise.

(13) Loosen pressure gauge and manifold assembly service hoses to allow refrigerant trapped in hoses to discharge.

(14) Remove pressure gauge and manifold assembly and install dust caps on fittings.

Charging Procedure with Portable Air Conditioner Service Station J-23500-01

NOTE: *Fill charging cylinder as described above.*

WARNING: *Wear goggles to protect eyes.*

(1) Discharge and evacuate system as described above.

(2) Close low pressure valve on charging station, fully open left hand refrigerant control valve at base of cylinder and high pressure valve on charging station, and allow required charge of refrigerant to enter high side of system. When full charge has entered system, close refrigerant control valve and high pressure valve on charging station.

CAUTION: *Do not permit liquid level to drop below zero on cylinder sight glass.*

(3) Close manifold gauges after completion of charging, and check high and low pressures and system operation.

CAUTION: *Read gauges with high and low pressure valves on charging station closed. The low pressure gauge could be damaged if both high and low pressure valves of manifold are opened. The high pressure developed in discharge side (high side) of compressor would peg indicator needle of low pressure gauge and damage the gauge.*

(4) Close all valves on charging station and close refrigerant drum valve when all operations are completed.

(5) Upon completion of operational check, back-seat suction and discharge service valves to their normal operating position by turning them fully counterclockwise.

(6) Disconnect high and low pressure charging hoses from compressor with care. (A small amount of refrigerant remaining in hoses will escape.) Replace charging hoses on hose holder on charging station to keep air and dirt out of hoses.

(7) Open valve at top of cylinder to remove remaining refrigerant.

NOTE: *The charging cylinder is not designed to store refrigerant.*

(8) Replace quick seal caps on compressor service valves when service is completed.

SERVICE PROCEDURES — 49-STATE SIX AND EIGHT-CYLINDER MODELS

GENERAL

This section consists of a general description of each component and the system operation of all components used with the 49-State six- and eight-cylinder engines. Service information for the compressor and magnetic clutch is also contained within this section. All other service information can be found in the CJ Air Conditioning and Cherokee-Wagoneer-Truck Air Conditioning sections or the General Information section of this chapter.

The 49-State six- and eight-cylinder engine components are as follows.

Compressor—The compressor used on the 49-State six- and eight-cylinder engines is a two-cylinder in-line unit that is driven by a single V-belt. It is used to circulate and increase the pressure of the refrigerant in the system. It is mounted to the engine as shown in figures 3E-18 and 3E-19.

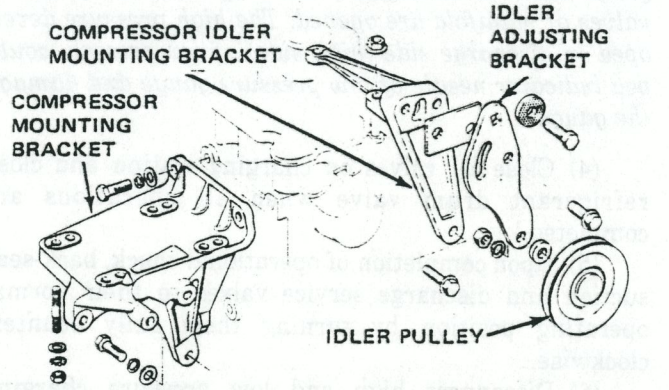


Fig. 3E-18 Compressor Mounting—49-State Six-Cylinder Engine

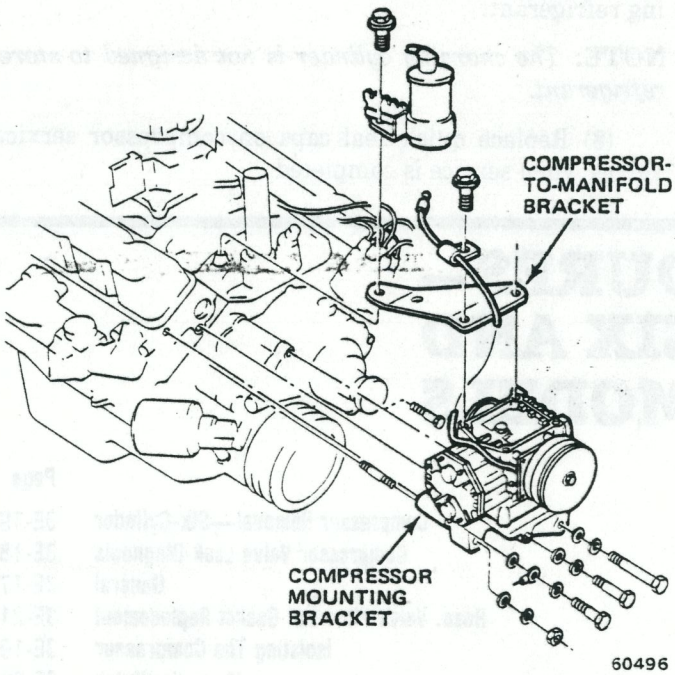


Fig. 3E-19 Compressor Mounting—49-State Eight-Cylinder Engine

Condenser—The condenser is mounted in front of the radiator to allow air to flow over the cooling fins and remove heat from the refrigerant. As the refrigerant passes through the condenser, it liquifies (condenses).

Receiver/Drier—The receiver/drier is a reservoir used to store the precise amount of refrigerant required by the system. The refrigerant level in the receiver/drier must be adequate to provide a steady flow of refrigerant to the expansion valve. The receiver/drier contains a desiccant to remove moisture from the system. The receiver/drier must be replaced anytime the system has been open to atmosphere due to a system component failure. If during servicing the receiver/drier is removed from the system, it must be tightly capped immediately.

Expansion Valve—The thermostatic expansion valve is located at the inlet of the evaporator. It meters the refrigerant to the evaporator, so as to maintain the proper flow for the various evaporator heat load requirements encountered during operation. The metering action of the expansion valve is controlled by the temperature sensing bulb mounted on the outlet (suction) line of the evaporator.

Evaporator—The evaporator is an air cooler and dehumidifier. As the refrigerant enters the evaporator core, it begins to boil. The heat in the air passing over the evaporator transfers or gives up its heat to the boiling refrigerant. As the air cools, the moisture in the air condenses on the evaporator core and is drained off as water.

SYSTEM OPERATION

The compressor increases the pressure and temperature of the system refrigerant. The heated refrigerant vapor is then pumped into the condenser where it cools by giving off heat to air passing over the condenser fins. As the refrigerant cools in the condenser, it condenses into a liquid. Still under high pressure, the liquid refrigerant passes into the receiver. The receiver acts as a reservoir to furnish refrigerant to the expansion valve at all times. From the receiver, the high pressure liquid refrigerant passes to the expansion valve. The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by the suction side of the compressor. As it enters the evaporator, the refrigerant immediately begins to boil by absorbing heat from the air passing over the evaporator core. Having given up its heat to boil the refrigerant, the air is cooled and passes into the passenger compartment of the vehicle. From the evaporator the vaporized refrigerant is drawn back to the compressor to repeat the cycle.

COMPRESSOR VALVE LEAK DIAGNOSIS

The compressor should be at operating temperature to perform an accurate test.

(1) Install pressure gauge and Manifold Assembly J-23575.

(2) Front-seat the suction and discharge service valve by turning them clockwise.

(3) Discharge refrigerant remaining in compressor by opening suction gauge hand valve **slowly**.

(4) Open suction gauge hand valve and close the high pressure gauge hand valve.

(5) Start engine and operate compressor. Pressure will build up rapidly. Stop engine/compressor at 150 to 200 pounds pressure.

NOTE: *Pressure should hold if the discharge valve is operating properly. Loss of pressure indicates leaking compressor discharge valve or head gasket.*

COMPRESSOR BELT TENSION

Belt tensions are important and should be inspected at time of new vehicle predelivery and at subsequent scheduled maintenance intervals.

Belt Tension Gauge, Tool J-23600, will provide accurate belt tension adjustments. Install the gauge on the longest accessible belt span. Belt tension for new vehicle predelivery and all belts with previous service should be 90 to 115 pounds (400 to 512 newtons).

Belt tension is adjusted by moving the idler mounting bracket.

When a replacement belt is installed, it should be adjusted to 125 to 155 pounds (556 to 689 newtons), 155 pounds (689 newtons) preferred, tension to compensate for the initial run-in loss that occurs within the first several minutes of operation.

NOTE: *New belt tension specifications apply only to service replacement belts. Once a belt has been tensioned and run, it is considered a used belt and should be adjusted to used-belt specifications.*

A characteristic of the **Dacron type belt(s)** used to drive the A/C compressor is that **it tends to increase in tension, rather than stretch, when subjected to heat.** The loss in belt tension which can be observed after the initial run-in is the result of wear-in which allows the belt to ride deeper in the V-groove of the pulleys.

If a belt is run with less than the specified tension, slippage can occur and cause the belt contact surfaces to become glazed. A glazed belt looses some of its load carrying capabilities and may slip even when adjusted to specified belt tension.

Belt **vibration**, particularly on six-cylinder engine models, is usually the result of improper belt tension. When excessive belt vibration or flutter is encountered, adjust the belt tension to specifications. Adjusting to higher tensions will not stop vibration but will increase stress on the idler assembly.

ISOLATING THE COMPRESSOR

It is not necessary to discharge the system for compressor removal. The compressor can be isolated from the remainder of the system, eliminating the need for recharging when performing compressor service.

(1) Connect pressure gauge and Manifold Assembly J-23575.

(2) Close both gauge hand valves and mid-position (crack) both service valves.

(3) Start engine and operate air conditioning.

(4) Turn the suction service valve slowly clockwise toward front-seated position. When suction pressure is reduced to zero or less, stop engine and compressor and quickly finish front-seating the suction service valve.

(5) Front-seat discharge service valve.

(6) Loosen oil check plug slowly to release any internal pressure in compressor. The compressor is now isolated from the remainder of the system. Service valves can be removed from compressor.

COMPRESSOR REMOVAL— SIX-CYLINDER

(1) Isolate compressor.

(2) Remove both service valves and cap compressor and valves.

(3) Loosen compressor belt and move aside.

(4) Remove alternator belt and adjusting bolt.

(5) Remove upper alternator mounting bolt.

(6) Loosen lower alternator mounting nut.

(7) Remove back idler.

(8) Remove compressor mounting nuts and remove compressor.

COMPRESSOR INSTALLATION—SIX-CYLINDER

(1) Position compressor and install mounting nuts.

(2) Install back idler.

(3) Install alternator upper mounting bolt.

(4) Tighten lower mounting nut.

(5) Install alternator adjusting bolt.

(6) Install alternator drive belt and adjust to proper tension.

(7) Install compressor drive belt and adjust to proper tension.

(8) Attach compressor service valves and lines.

(9) Purge compressor of air and open service valves.

(10) Connect clutch wire.

COMPRESSOR REMOVAL—EIGHT-CYLINDER

(1) Isolate compressor.

(2) Remove both service valves and place protective caps over compressor head fittings and service valve openings.

(3) Loosen and remove compressor belt(s).

(4) Disconnect clutch wire.

NOTE: *Remove alternator mounting bracket to obtain working clearance for removing compressor mounting bracket attaching bolts and nuts.*

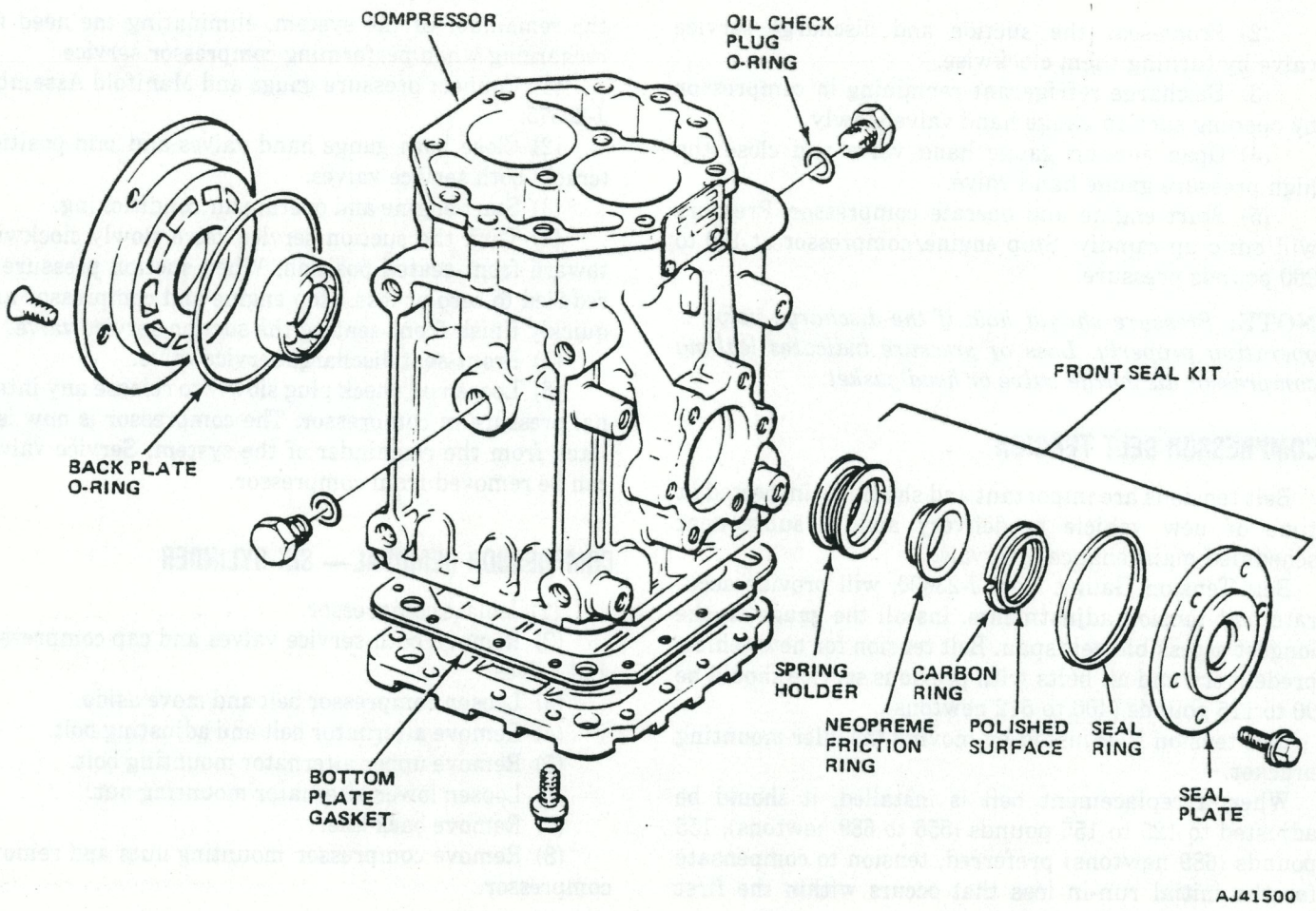


Fig. 3E-20 Compressor Seal Components and Gaskets

(5) Remove compressor and mounting bracket as an assembly and place on work bench.

(6) Remove bracket and bracket attaching nuts and studs.

COMPRESSOR INSTALLATION—EIGHT-CYLINDER

(1) Install mounting bracket to compressor.

(2) Install compressor and bracket assembly to engine.

(3) Install alternator mounting bracket, if removed.

(4) Install compressor drive belt(s) and adjust to proper tension.

(5) Attach compressor service valves and lines.

(6) Purge compressor of air and open service valves.

(7) Connect clutch wire.

COMPRESSOR FRONT SEAL REPLACEMENT

The compressor front seal is serviced in kit form. Kit components are shown in figure 3E-20. All seal parts must be replaced if a leak has been detected at the seal.

NOTE: *A small amount of oil around the shaft seal is normal and does not indicate a seal leak. All seal parts were dipped in oil at the time of assembly and operation may force out surplus oil.*

(1) Isolate compressor.

(2) Remove belt.

(3) Remove clutch and woodruff key from compressor shaft.

(4) Remove seal plate capscrews. Pry seal plate loose and remove.

(5) Carefully pry behind spring holder (that part of the seal assembly farthest back on the shaft) and remove seal assembly.

(6) Lubricate new seal assembly with clean refrigeration oil.

NOTE: *Cleanliness, careful handling, and clean refrigeration oil are important for successful seal replacement.*

(7) Push neoprene friction ring and spring holder over compressor shaft.

(8) Move assembly in and out on compressor shaft to seat neoprene friction ring.

(9) Push assembly in until spring holder contacts bearing race. Position carbon ring in spring holder with polished side facing out.

NOTE: *The carbon ring must seat in the retainer. Engage notches in carbon ring with drive tangs in spring holder.*

(10) Coat mating surfaces of compressor and seal plate with film of refrigeration oil. Position seal ring in groove on compressor.

(11) Install seal plate with polished face toward carbon ring.

(12) Install seal plate capscrews and tighten evenly. Center seal plate on shaft by lightly tapping plate. Tighten the capscrews in a diagonal pattern to 6 foot-pounds (8 N•m) torque.

(13) Turn compressor shaft by hand, using clutch mounting bolt, to seat seal.

(14) Install clutch and woodruff key.

(15) Install belt.

(16) Purge compressor of air.

(17) Leak test system. Evacuate and charge, if necessary.

BACK PLATE O-RING SEAL REPLACEMENT

NOTE: *It is not necessary to remove the compressor for seal replacement on six-cylinder engines.*

(1) Isolate and remove compressor.

(2) Remove four back plate attaching screws using Torx Bit Tool J-25359-C.

(3) Remove back plate by gently prying it loose from crankcase. Pry in such a manner to pull parallel to bearing surface.

(4) Remove O-ring seal from back plate.

(5) Clean back plate and apply light film of refrigeration oil to O-ring sealing area.

(6) Position O-ring seal on back plate and install back plate over rear bearing and into crankcase.

(7) Install four back plate attaching screws and tighten in diagonal pattern to 13 foot-pounds (18 N•m) torque.

(8) Install and purge compressor of air.

(9) Leak test system. Evacuate and charge, if necessary.

HEAD, VALVE PLATE AND GASKET REPLACEMENT

(1) Isolate compressor.

(2) Remove service valves from compressor. The compressor head service valve ports are identified as **D** for discharge and **S** for suction.

(3) Remove compressor head attaching screws.

(4) Tap under valve plate ears (short, half-round projections on the valve plate) to remove head and valve plate.

(5) Tap valve plate ears while holding the compressor head to separate head from valve plate.

(6) Clean all gasket material from head, valve plate, and compressor using care not to scratch or nick sealing surfaces.

(7) Coat all machined sealing surfaces with light film of refrigeration oil.

(8) Install new valve plate cylinder gasket on compressor body, locating gasket on dowel pins.

(9) Install valve plate on compressor, locating it on dowel pins so that discharge valve is at top. Figure 3E-21 shows correct assembly sequence.

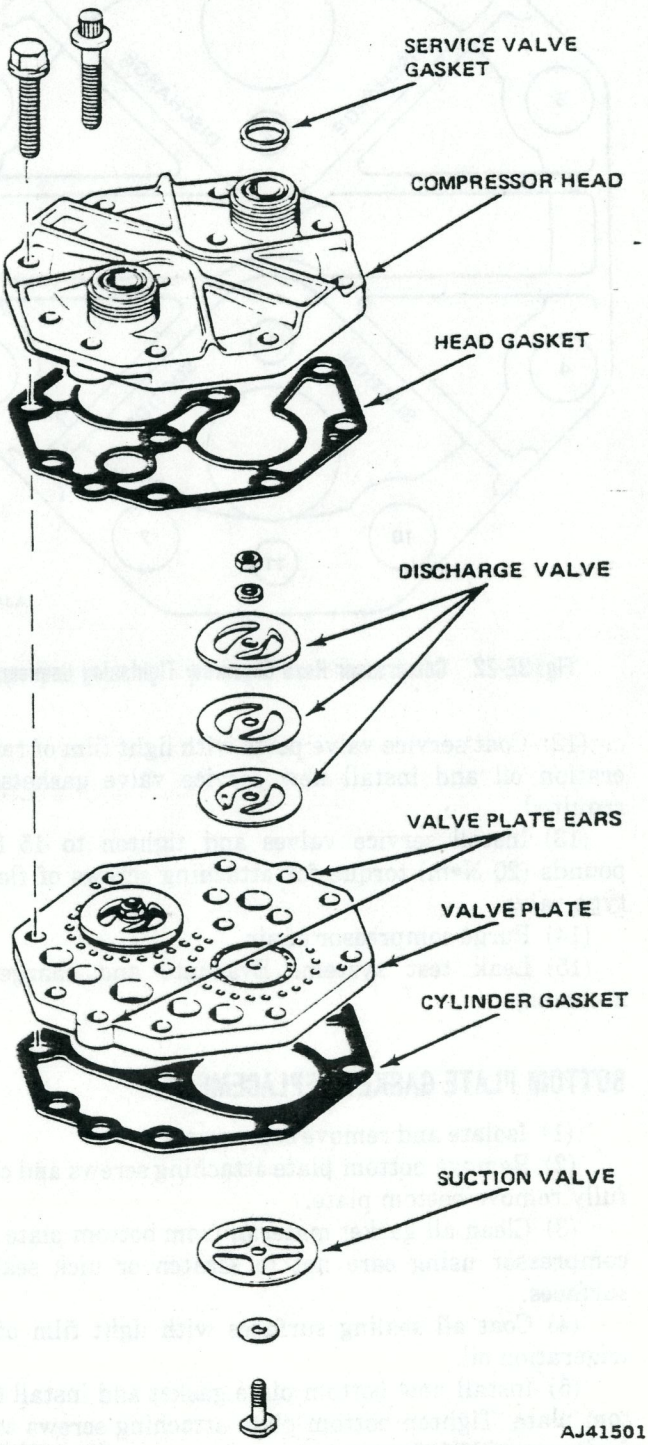


Fig. 3E-21 Head and Valve Plate Assembly Sequence

(10) Install replacement head gasket, locating it on dowel pins.

(11) Install head. Tighten compressor head capscrews to 15 foot-pounds (20 N•m) torque, following sequence outlined in figure 3E-22.

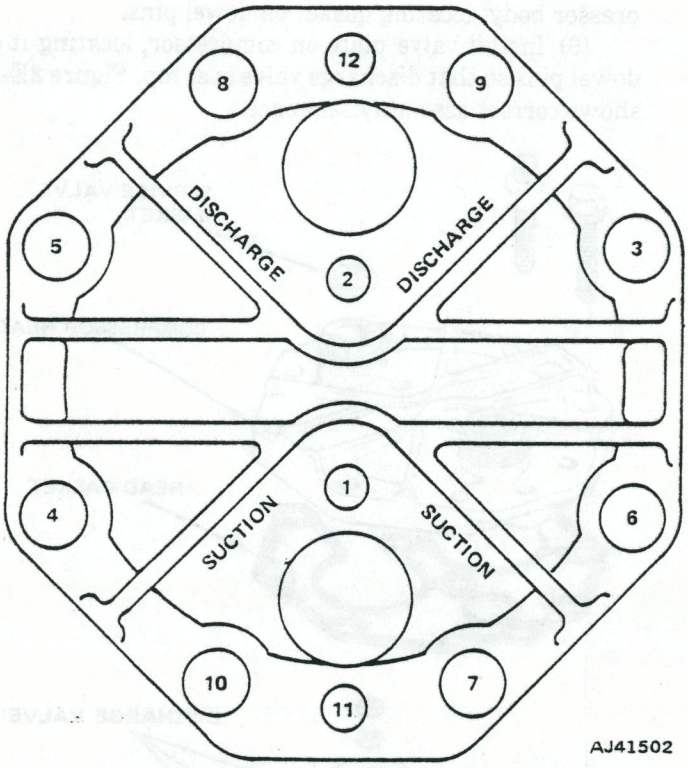


Fig. 3E-22 Compressor Head Capscrew Tightening Sequence

(12) Coat service valve ports with light film of refrigeration oil and install new service valve gaskets, as required.

(13) Install service valves and tighten to 15 foot-pounds (20 N•m) torque for attaching screws of flange type valve.

(14) Purge compressor of air.

(15) Leak test system. Evacuate and charge, if necessary.

BOTTOM PLATE GASKET REPLACEMENT

(1) Isolate and remove compressor.

(2) Remove bottom plate attaching screws and carefully remove bottom plate.

(3) Clean all gasket material from bottom plate and compressor using care not to scratch or nick sealing surfaces.

(4) Coat all sealing surfaces with light film of refrigeration oil.

(5) Install new bottom plate gasket and install bottom plate. Tighten bottom plate attaching screws to 15 foot-pounds (20 N•m) torque.

(6) Install and purge compressor of air.

(7) Leak test system. Evacuate and charge, if necessary.

CHECKING COMPRESSOR OIL LEVEL

Initially, the compressor has 7 ounces of refrigeration oil in the crankcase (Approved oil: Sun Oil Suniso 5, Texaco Capella E, or equivalent). In normal operation, a small amount of oil is always circulating with the refrigerant in the system. Unless the system has developed a leak, the oil level will remain the same in the system.

CAUTION: *The oil level should be checked whenever the system is discharged for a service part replacement, and especially after a rapid loss of refrigerant has occurred.*

NOTE: *Check compressor oil level with compressor in operating position, and only after the vehicle interior air has been cooled to the desired temperature. Operating the system stabilizes the oil entrained in the system, and provides an accurate oil level reading. The oil check plugs are located on either side of the compressor crankcase.*

Before installing a replacement compressor, check the oil level in the compressor to be replaced prior to removing it. The oil level in the replacement compressor must be adjusted to correspond with that of the replaced compressor.

(1) Isolate compressor.

(2) Loosen crankcase oil check plug slowly to release any internal pressure in compressor. Remove check plug when all pressure is relieved.

(3) Fabricate dipstick rod as shown in figure 3E-23.

(4) Hold dipstick as vertical as possible and insert in check plug opening. The oil level should be within specified levels indicated.

(5) Add clean refrigerant oil, if necessary.

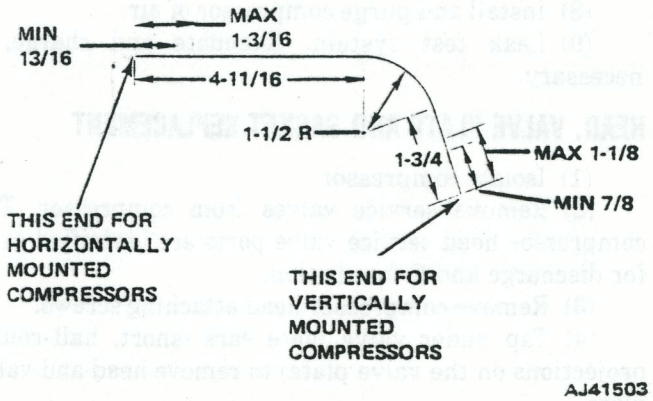


Fig. 3E-23 Oil Dipstick Fabrication Dimensions (Inches)

NOTE: *Refrigeration oil readily absorbs moisture. Keep the container capped until ready to use, and recap immediately after use.*

(6) Install oil check plug O-ring seal. Be sure O-ring is not twisted.

NOTE: *Oil filler plug leaks are usually due to a damaged O-ring or dirt on the seat.*

(7) Install plug and tighten to 4 foot-pounds (5 N•m) torque.

(8) Purge compressor of air.

PURGING COMPRESSOR OF AIR

The compressor must be purged of air whenever it has been isolated for oil level check or other service procedures without discharging the entire system.

(1) Cap service gauge ports on both service valves.

(2) Back-seat the suction service valve to allow system refrigerant to enter compressor.

(3) Place discharge service valve in mid- or cracked-position.

(4) Loosen discharge service valve gauge port cap to permit refrigerant to force any air out of the compressor.

(5) Back-seat the discharge service valve and tighten the gauge port cap.

The compressor is now ready for service.

MAGNETIC CLUTCH

The magnetic clutch consists of a stationary electromagnetic coil and a rotating pulley and plate assembly.

The electromagnetic coil is mounted on four bosses on the compressor. The pulley and plate assembly is mounted on the compressor shaft. When the air conditioner is off, the pulley is free to turn on the clutch hub bearing. When the clutch is energized, the plate is magnetically attracted to the pulley and turns the compressor crankshaft.

Do not attempt to replace the bearing, pulley or clutch plate separately. These components are serviced only as a complete assembly. The coil is serviced as a separate unit.

Electrical Diagnosis

Refer to the Magnetic Clutch Troubleshooting Guide when diagnosing magnetic clutch malfunctions.

Diagnosis for Noisy Clutch

Spin the pulley by hand. There must be no interference between the field and the rotor assembly. The clutch coil must be mounted properly using the special capscrews which position the field coil to the compressor.

A worn pulley bearing can be detected by the roughness felt when spinning the pulley. Do not attempt to replace the bearing. Replace the clutch as an assembly.

A replacement clutch may emit a short squeal when initially engaged. After a few cycles of operation, the noise will disappear.

Clutch Removal

(1) Remove compressor belt(s).

(2) Energize the clutch or use a spanner wrench to hold clutch plate while removing the clutch-to-shaft attaching bolt and washer.

(3) Install a 5/8-inch by 11 standard thread bolt in the threaded center of the clutch plate.

(4) Tighten bolt and pull clutch from shaft.

CAUTION: *Do not pry on clutch to remove.*

(5) Remove four capscrews which retain the magnetic coil and disconnect coil wire. Remove coil.

Clutch Installation

(1) Install magnetic coil with the four special capscrews provided with the replacement unit. These capscrews are used to ensure coil is positioned properly on the compressor.

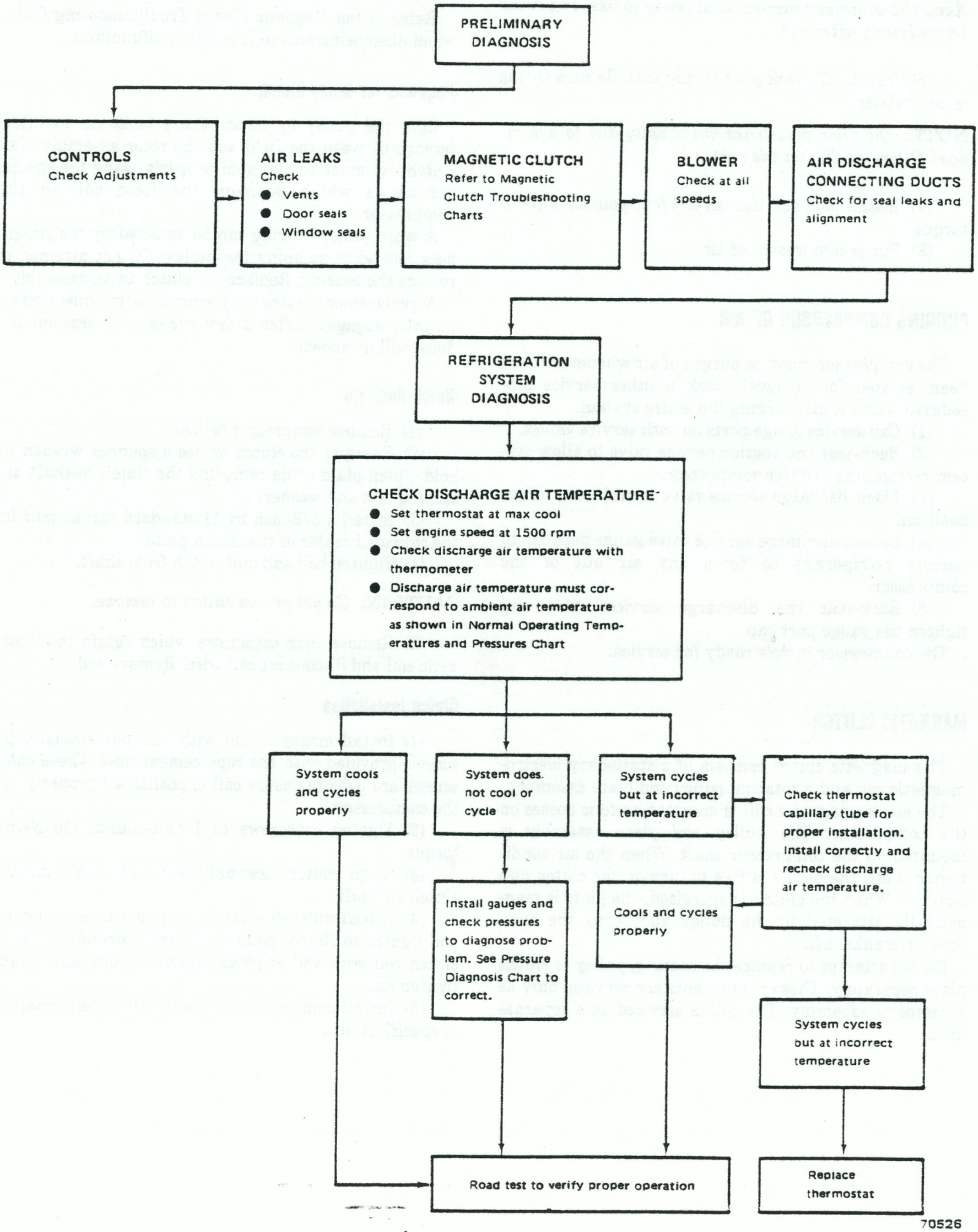
(2) Tighten capscrews to 7 foot-pounds (10 N•m) torque.

(3) Align clutch assembly with key and install clutch on shaft.

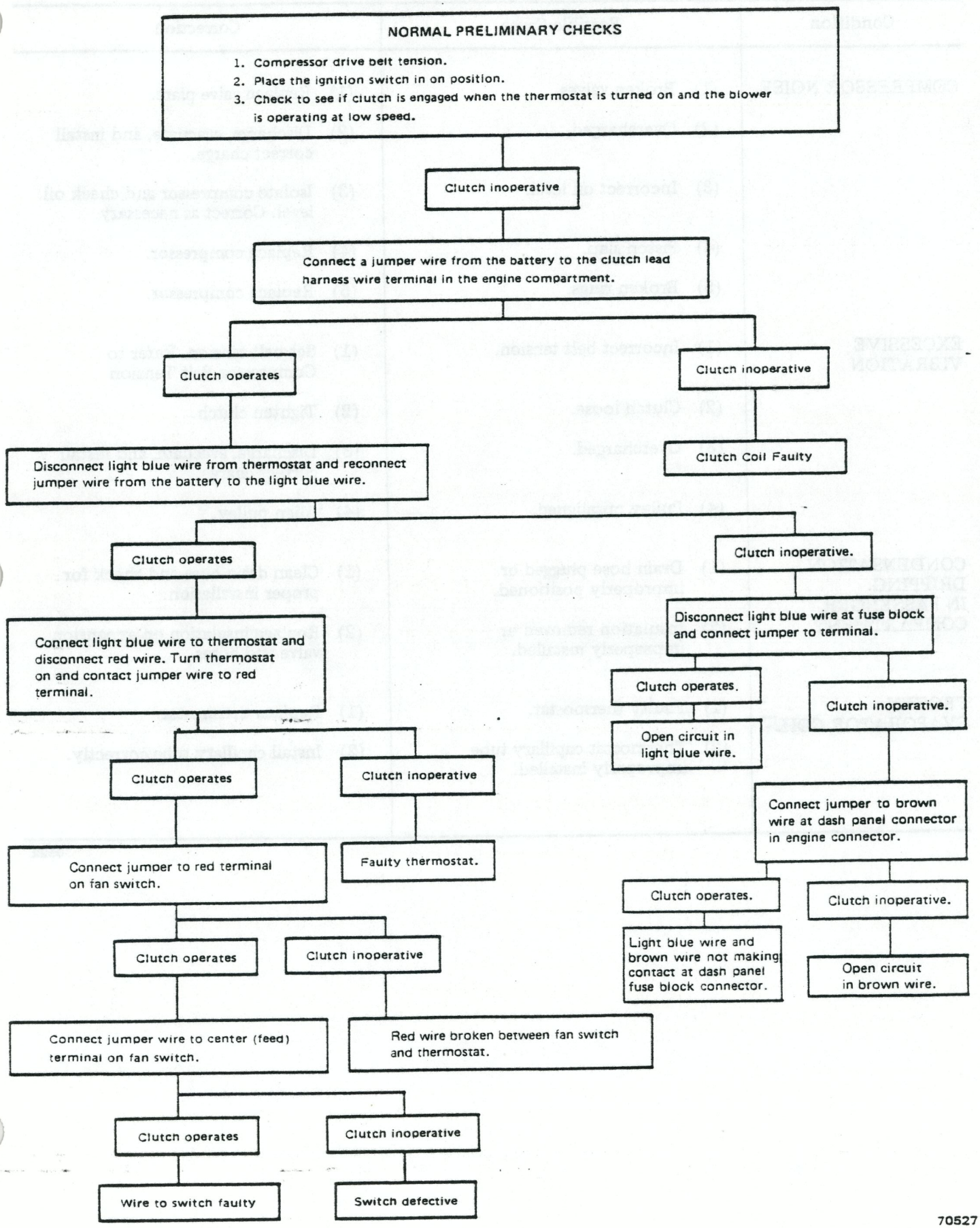
(4) Install clutch-to-shaft attaching washer and bolt and tighten to 20 foot-pounds (27 N•m) torque. Connect clutch coil wire and energize clutch to hold unit when tightening.

(5) Install compressor belt and adjust belt tension to specifications.

System Troubleshooting



Magnetic Clutch Troubleshooting



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Performance Diagnosis—All Models

Condition	Possible Cause	Correction
COMPRESSOR NOISE	(1) Broken valves.	(1) Replace valve plate.
	(2) Overcharged.	(2) Discharge, evacuate, and install correct charge.
	(3) Incorrect oil level.	(3) Isolate compressor and check oil level. Correct as necessary.
	(4) Piston slap.	(4) Replace compressor.
	(5) Broken rings.	(5) Replace compressor.
EXCESSIVE VIBRATION	(1) Incorrect belt tension.	(1) Set belt tension. Refer to Compressor Belt Tension
	(2) Clutch loose.	(2) Tighten clutch.
	(3) Overcharged.	(3) Discharge, evacuate, and install correct charge.
	(4) Pulley misaligned.	(4) Align pulley.
CONDENSATION DRIPPING IN PASSENGER COMPARTMENT	(1) Drain hose plugged or improperly positioned.	(1) Clean drain hose and check for proper installation.
	(2) Insulation removed or improperly installed.	(2) Replace insulation on expansion valve and hoses.
FROZEN EVAPORATOR COIL	(1) Faulty thermostat.	(1) Replace thermostat.
	(2) Thermostat capillary tube improperly installed.	(2) Install capillary tube correctly.

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Pressure Diagnosis—All Models

Condition	Possible Cause	Correction
LOW SIDE LOW—HIGH SIDE LOW	(1) System refrigerant low.	(1) Evacuate, leak test, and charge system.
LOW SIDE HIGH—HIGH SIDE LOW	(1) Internal leak in compressor — worn.	(1) Remove compressor cylinder head and inspect compressor. Replace valve plate assembly if necessary. If compressor pistons, rings, or cylinders are excessively worn or scored, replace compressor.
	(2) Head gasket leaking.	(2) Install new cylinder head gasket.
	(3) Expansion valve.	(3) Replace expansion valve.
	(4) Drive belt slipping.	(4) Set belt tension.
LOW SIDE HIGH—HIGH SIDE HIGH	(1) Clogged condenser fins.	(1) Clean out condenser fins.
	(2) Air in system.	(2) Evacuate, leak test, and charge system.
	(3) Expansion valve.	(3) Replace expansion valve.
	(4) Loose or worn fan belts.	(4) Adjust or replace belts as necessary.
LOW SIDE LOW—HIGH SIDE HIGH	(1) Expansion valve.	(1) Replace expansion valve.
	(2) Restriction in liquid line.	(2) Check line for kinks — replace if necessary.
	(3) Restriction in receiver.	(3) Replace receiver.
	(4) Restriction in condenser.	(4) Replace condenser.
LOW SIDE AND HIGH SIDE NORMAL (INADEQUATE COOLING)	(1) Air in system.	(1) Evacuate, leak test, and charge system.
	(2) Moisture in system.	(2) Evacuate, leak test, and charge system.

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SERVICE PROCEDURES — CALIFORNIA SIX-CYLINDER MODELS

GENERAL

This section consists of a general description of each component and the system operation of all components used with the California six-cylinder engine. Service information for the rotary compressor and magnetic clutch, which are unique to vehicles equipped with the California six-cylinder engine, is also contained within this section. All other service information can be found in the CJ Air Conditioning and Cherokee-Wagoneer-Truck Air Conditioning sections or the General Information section of this chapter.

The air conditioning system components used with the California six-cylinder engine are as follows.

Compressor—The compressor on the California six-cylinder engine, is a five-cylinder rotary unit driven by a serpentine drive single belt system (fig. 3E-24). The compressor is used to circulate and increase the pressure

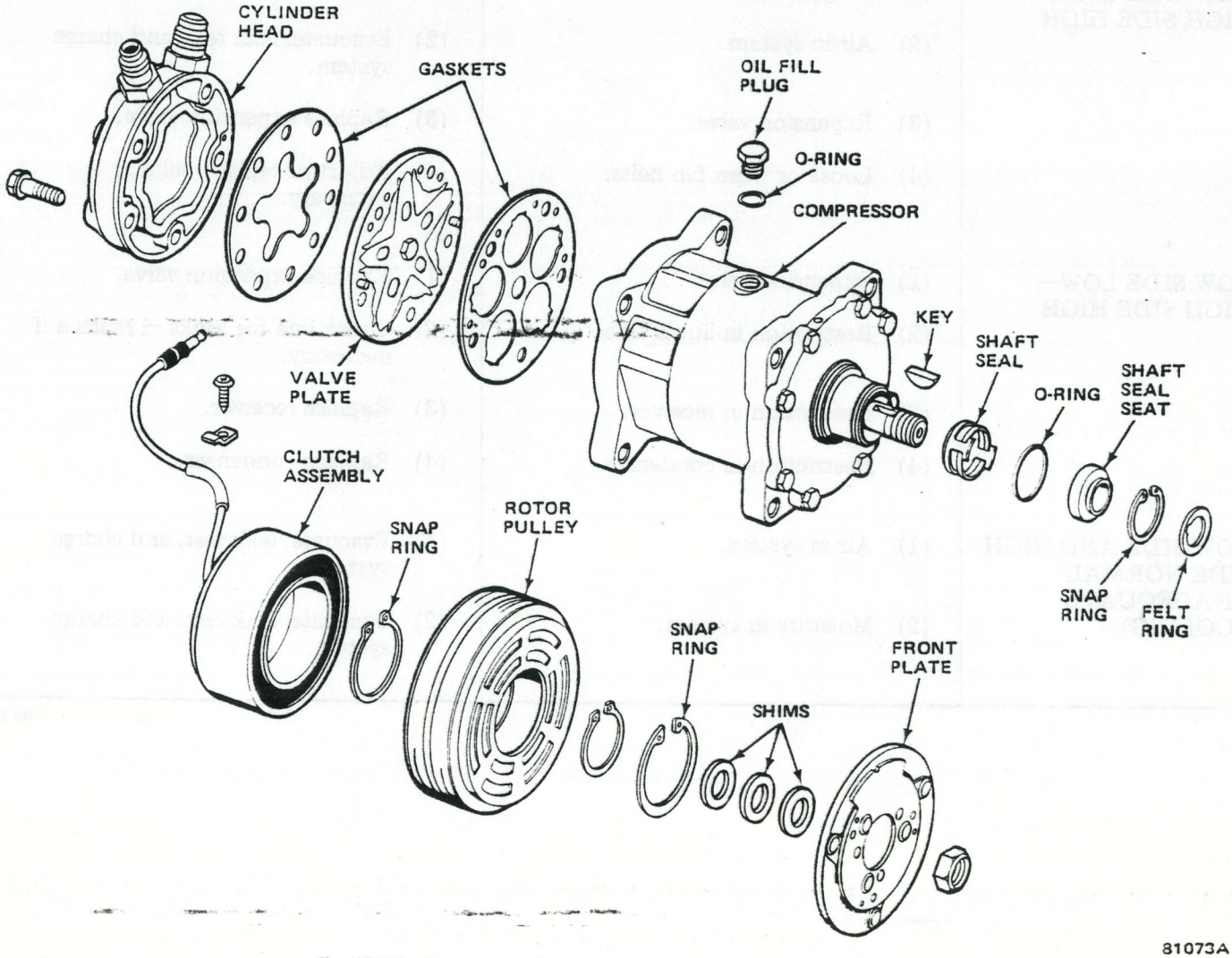


Fig. 3E-24 Compressor Components—California Six-Cylinder Engine

of the refrigerant in the system. Refer to the Trouble-shooting chart at the end of this section for Diagnosis Procedures. The compressor is mounted to the engine as shown in figure 3E-25.

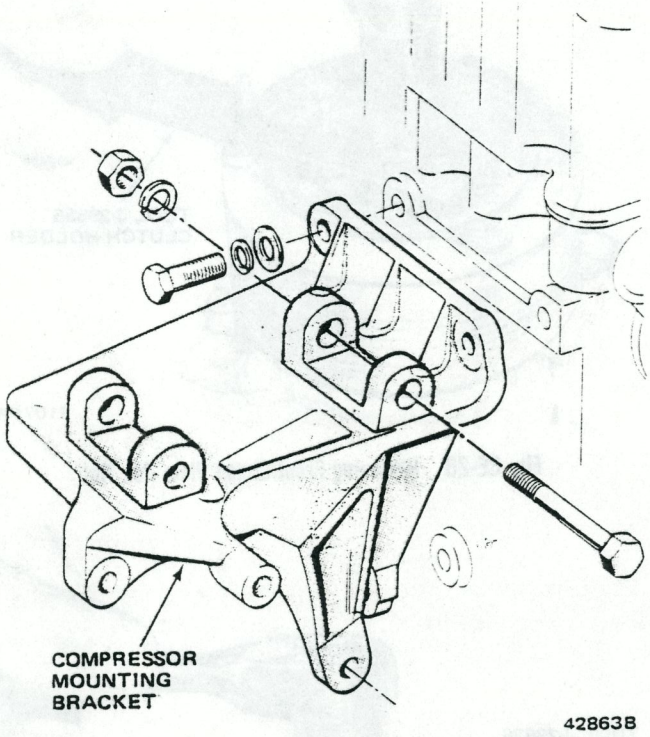


Fig. 3E-25 Compressor Mounting—California Six-Cylinder Engine

Condenser—The condenser is mounted in front of the radiator to allow air to flow over the cooling fins and remove heat from the refrigerant. As the refrigerant passes through the condenser, it liquifies (condenses).

Receiver/Drier—The receiver/drier is a reservoir used to store the precise amount of refrigerant required by the system. The refrigerant level in the receiver/drier must be adequate to provide a steady flow of refrigerant to the expansion valve. The receiver/drier contains a desiccant to remove moisture from the system. The receiver/drier must be replaced anytime the system has been open to atmosphere due to a system component failure. If during servicing the receiver/drier is removed from the system, it must be tightly capped immediately.

Expansion Valve—The thermostatic expansion valve is located at the inlet of the evaporator. It meters the refrigerant to the evaporator, so as to maintain the proper flow for the various evaporator heat load requirements encountered during operation. The metering action of the expansion valve is controlled by the temperature sensing bulb mounted on the outlet (suction) line of the evaporator.

Evaporator—The evaporator is an air cooler and dehumidifier. As the refrigerant enters the evaporator core, it begins to boil. The heat in the air passing over the evaporator transfers or gives up its heat to the boiling refrigerant. As the air cools, the moisture in the air condenses on the evaporator core and is drained off as water.

SYSTEM OPERATION

The compressor increases the pressure and temperature of the system refrigerant. The heated refrigerant vapor is then pumped into the condenser where it cools by giving off heat to air passing over the condenser fins. As the refrigerant cools in the condenser, it condenses into a liquid. Still under high pressure, the liquid refrigerant passes into the receiver. The receiver acts as a reservoir to furnish refrigerant to the expansion valve at all times. From the receiver, the high pressure liquid refrigerant passes to the expansion valve. The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by the suction side of the compressor. As it enters the evaporator, the refrigerant immediately begins to boil by absorbing heat from the air passing over the evaporator core. Having given up its heat to boil the refrigerant, the air is cooled and passes into the passenger compartment of the vehicle. From the evaporator the vaporized refrigerant is drawn back to the compressor to repeat the cycle.

COMPRESSOR VALVE LEAK DIAGNOSIS

The compressor should be at operating temperature to perform an accurate test.

(1) Install pressure gauge and Manifold Assembly J-23575.

(2) Front-seat suction and discharge service valve by turning them clockwise.

(3) Discharge refrigerant remaining in compressor by opening suction service valve **slowly**.

(4) Open suction gauge hand valve and close high pressure gauge hand valve.

(5) Start engine and operate compressor. Pressure will build up rapidly. Stop engine/compressor at 150 to 200 pounds pressure.

NOTE: *Pressure should hold if the discharge valve is operating properly. Loss of pressure indicates leaking compressor discharge valve or head gasket.*

COMPRESSOR BELT TENSION

For the serpentine drive belt tension procedure refer to Section 1C.

ISOLATING THE COMPRESSOR

It is not necessary to discharge the system for compressor removal. The compressor can be isolated from the remainder of the system eliminating the need for recharging when performing compressor service.

(1) Connect pressure gauge and Manifold Assembly J-23575.

(2) Close both gauge hand valves and mid-position (crack) both service valves.

(3) Start engine and operate air conditioning.

(4) Turn suction service valve slowly clockwise toward front-seated position. When suction pressure is reduced to zero or less, stop engine and compressor and quickly finish front-seating suction service valve.

(5) Front-seat discharge service valve.

(6) Loosen oil check plug slowly to release any internal pressure in compressor. The compressor is now isolated from remainder of system. Service valves can be removed from compressor.

COMPRESSOR REPLACEMENT

Removal

(1) Disconnect battery negative cable.

(2) Isolate the compressor (see previous procedure).

(3) Remove discharge and suction hoses from compressor, then cover all openings with tape or plastic plugs.

(4) Remove drive belts by loosening alternator.

(5) Remove alternator from mounting bracket and lay aside.

(6) Remove compressor from engine mounting bracket.

Installation

(1) Install compressor to engine mounting bracket.

(2) Install alternator to alternator mounting bracket.

(3) Install drive belt and tighten as specified in Section 1C.

(4) Remove tape or plastic plugs from all suction and discharge openings and install hoses on compressor.

(5) Evacuate and charge system as described under General Information.

(6) Connect battery negative cable.

COMPRESSOR FRONT SEAL REPLACEMENT

(1) Remove compressor.

(2) Insert two pins of Front Plate Spanner J-29635 into any two bolt holes in clutch front plate (fig. 3E-26). Hold clutch plate stationary and remove nut.

(3) Remove clutch plate using Clutch Plate Puller J-29636, and remove key from shaft (fig. 3E-27).

(4) Using snap ring pliers, insert pliers into two holes in felt ring metal retainer and lift out felt ring.

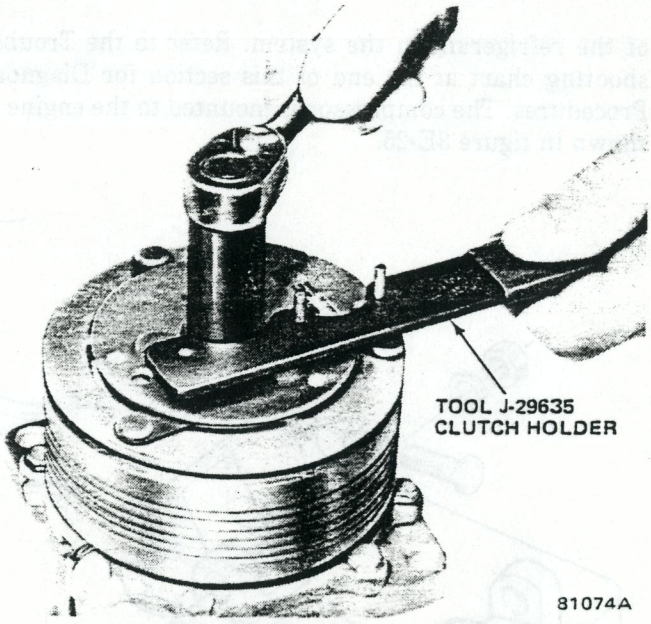


Fig. 3E-26 Removing Front Clutch Plate Hex Nut

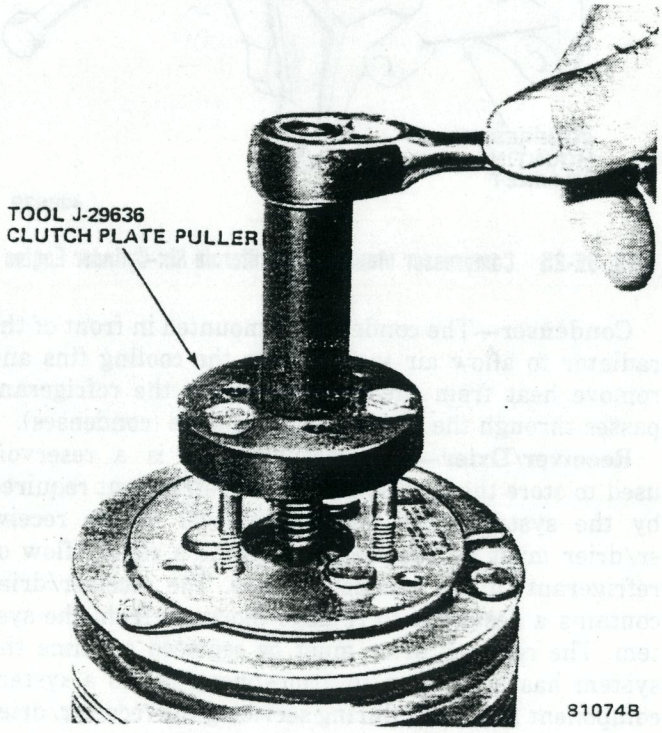


Fig. 3E-27 Removing Front Clutch Plate with Puller

(5) Remove clutch shims. Use O-ring hook and small screwdriver to prevent shim from binding on shaft.

(6) Remove shaft seal seat retaining snap ring with pliers.

(7) Remove shaft seal seat using Seal Retainer Tongs J-9393-2 (fig. 3E-28).

CAUTION: *When removing shaft seal O-ring, do not scratch the O-ring groove with O-ring hook.*

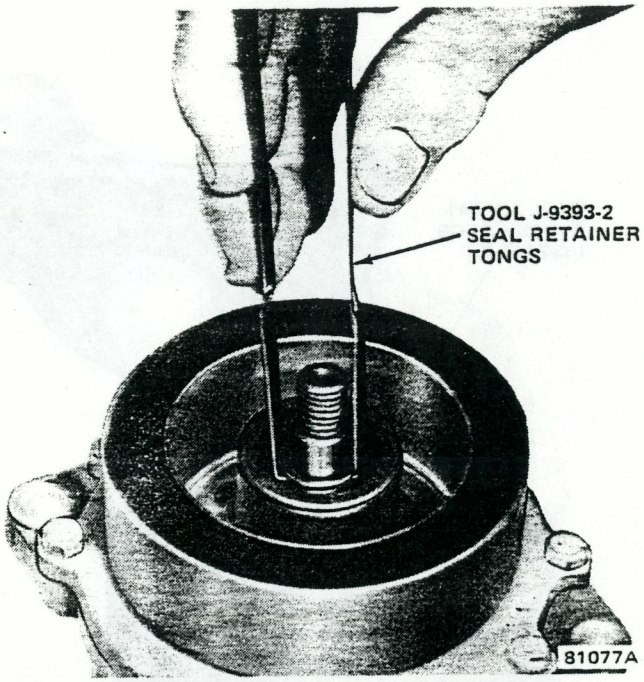


Fig. 3E-28 Removing Shaft Seal Seat Using Tongs

(8) Use O-ring Hook J-9553-01 to remove shaft seal O-ring (fig. 3E-29).

(9) Insert Seal Installer and Remover J-29639 into seal bore, press down against seal spring and twist tool until it engages in slots in seal cage and lift seal out (fig. 3E-30).

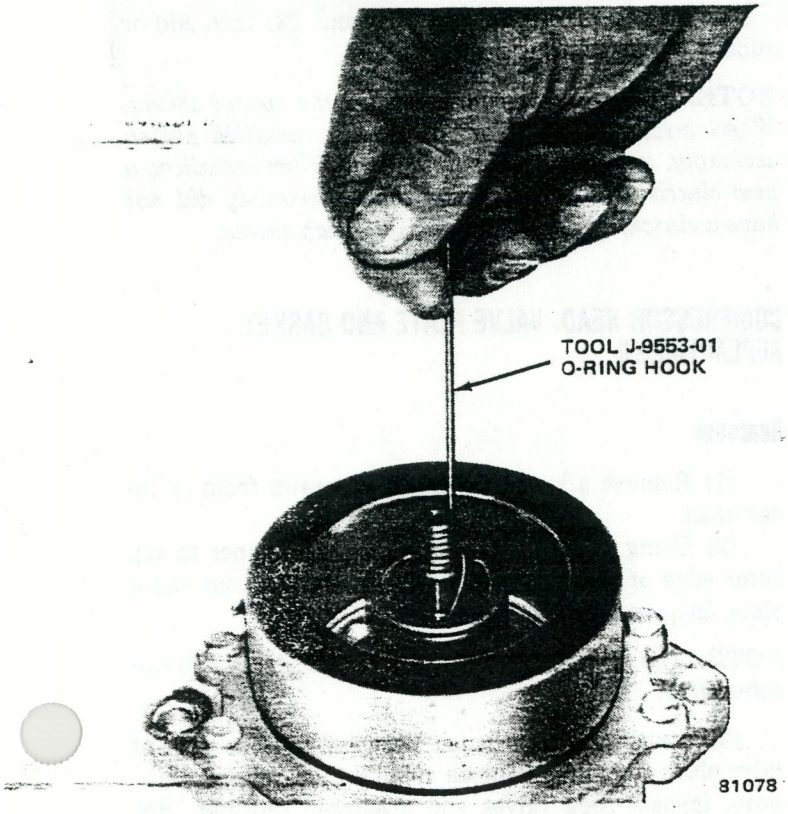


Fig. 3E-29 Removing O-Ring

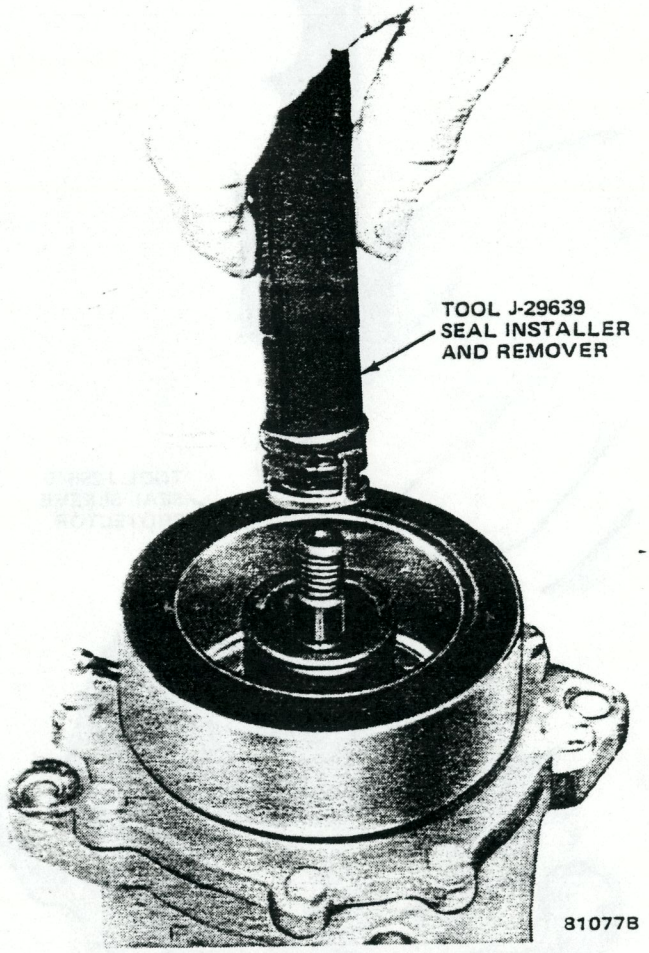


Fig. 3E-30 Removing Shaft Seal

(10) Clean seal cavity thoroughly with "lint-free" or synthetic cloth and clean refrigerant oil and then blow out with clean dry air.

NOTE: *Be sure all foreign materials are removed from the seal bore prior to seal installation.*

(11) Insert Seal Sleeve Protector J-29640 over compressor shaft (fig. 3E-31).

CAUTION: *Do not touch the new seal lapping surfaces.*

(12) Dip mating surfaces of seal lapping surfaces in clean refrigerant oil.

(13) Engage slots of Seal Remover and Installer J-29639 in slots in seal cage and insert seal assembly firmly into place in compressor seal cavity. Twist tool in opposite direction to disengage tool from seal cage (fig. 3E-30).

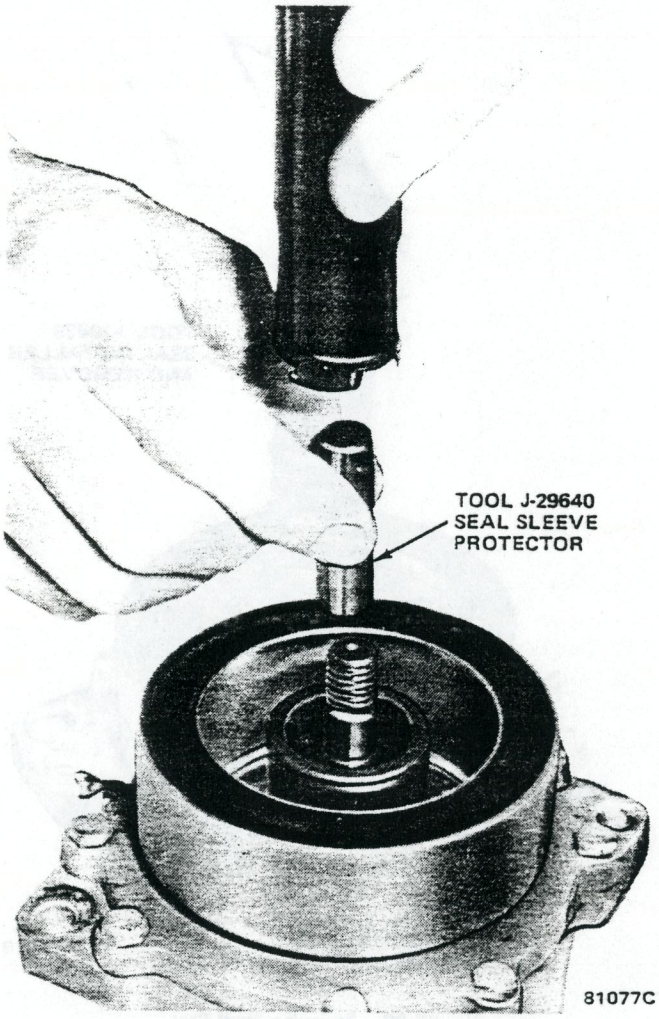


Fig. 3E-31 Shaft Seal Replacement

CAUTION: *When installing shaft seal O-ring, do not scratch the O-ring groove with O-ring hook.*

(14) Coat O-ring with clean refrigerant oil and carefully place in seal groove with O-ring Hook J-9553-01.

(15) Coat seal retainer with clean refrigerant oil and install with Seal Retainer Tongs J-9393-2. Press retainer lightly against seal.

(16) Install snap ring with beveled edge outward (away) from compressor.

NOTE: *It may be necessary to lightly tap the snap ring to seat it in its groove.*

(17) Install clutch spacer shims.

(18) Tap new felt ring into place and install compressor shaft key.

(19) Align front plate keyway to compressor shaft key.

(20) Using Clutch Face Installer J-29641 (fig. 3E-32), tap front plate to shaft until it has bottomed on clutch shims.

NOTE: *When the front plate bottoms on the shims a distinct sound change will take place.*

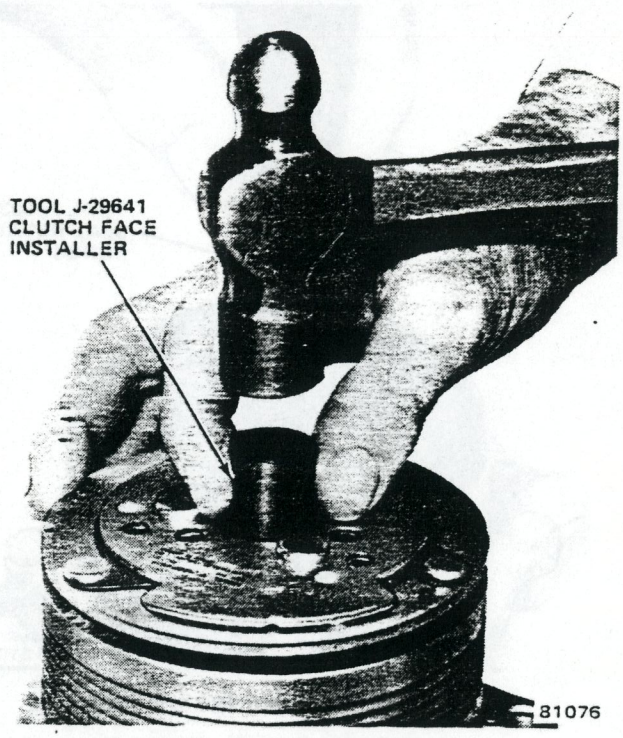


Fig. 3E-32 Front Plate Installation

(21) Install shaft nut and torque to 25 to 30 foot-pounds (34 to 41 N•m).

(22) Check air gap with feeler gauge which must be between .016 and .031 inch. If air gap is not consistent pry up lightly at minimum variations and tap down lightly at points of maximum variation.

If the air gap is not between .016 and .031 inch add or subtract shims as necessary.

NOTE: *The air gap is controlled by the spacer shims. When installing a new or previously installed clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use .040, .020 and .005-inch shims.*

COMPRESSOR HEAD, VALVE PLATE AND GASKET REPLACEMENT

Removal

(1) Remove all cylinder head capscrews from cylinder head.

(2) Using small hammer and gasket scraper to tap outer edge of cylinder head until separated from valve plate. Inspect for damage.

NOTE: *The cylinder head gasket normally sticks to the valve plate.*

(3) Position gasket scraper between outside edge of valve plate and cylinder block and lightly tap valve plate loose. Inspect reed valves and discharge retainer. Replace any damaged portion.

CAUTION: *When cleaning gasket material from cylinder head or valve plate of cylinder head be careful not to damage machined surfaces.*

(4) If valve plate and/or cylinder head are to be reinstalled, carefully remove gasket materials with gasket scraper.

(5) Inspect cylinder head for fitting or thread damage. Replace cylinder head if damaged.

(6) Inspect service ports on back of cylinder head. Remove valve core with valve core tool to inspect.

(7) Remove service port to inspect O-ring; if damaged replace O-ring.

Installation

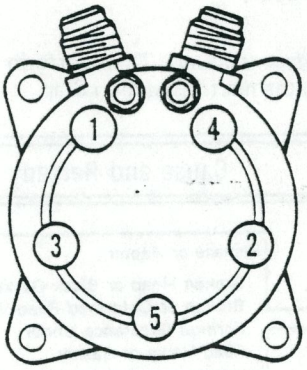
(1) Coat valve plate gasket with clean refrigerant oil.

(2) Install valve plate gasket.

NOTE: *Align valve plate gasket to locating pin holes and oil orifice in cylinder block.*

(3) Install cylinder head with fittings pointing up or in line with oil filler plug.

(4) Insert cylinder head capscrews finger-tight. Torque cylinder head bolts to 22 to 25 foot-pounds (30 to 25 N•m) torque following torque sequence (fig. 3E-33).



81073B

Fig. 3E-33 Cylinder Head Bolt Tightening Sequence

Checking Compressor Oil Level

When replacing a compressor that contains uncontaminated oil, use the following oil level check.

(1) Drain oil from new compressor.

(2) Drain and measure oil from old compressor.

(3) Measure new oil equal to amount drained from old compressor and add one ounce of additional oil. Fill new compressor with this oil.

NOTE: *This compressor is a high-speed compressor. Satisfactory operation depends on sufficient lubrication, however too much oil decreases cooling efficiency.*

MAGNETIC CLUTCH

The magnetic clutch consists of a stationary electromagnetic coil and a rotating pulley and plate assembly.

The electromagnetic coil is retained on the compressor with a snap ring and is slotted to maintain its position.

The pulley and plate assembly are mounted on the compressor shaft. When the compressor is not pumping, the pulley freewheels on the clutch hub bearing. When the coil is energized the plate is magnetically engaged with the pulley and turns the compressor shaft.

Magnetic Clutch Noise Diagnosis

When a magnetic clutch assembly is suspected of being the source of unusual noises, follow the sequence given on the Troubleshooting Chart.

Magnetic Clutch Removal

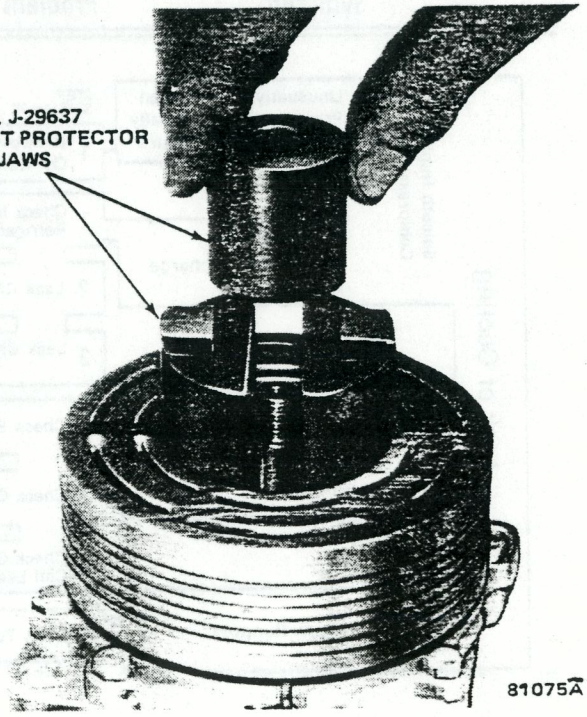
(1) Insert two pins of front plate spanner J-29635 into any two bolt holes in front clutch plate. Hold clutch plate stationary and remove nut as shown in figure 3E-26.

(2) Remove clutch plate using Clutch Plate Puller J-29636 and remove key from shaft as shown in figure 3E-27.

(3) Remove internal bearing snap ring.

(4) Remove external front snap ring.

(5) Remove rotor pulley assembly using Shaft Protector and Jaws J-29637 as shown in figure 3E-34. Insert lip of jaws into internal bearing snap ring groove. Place rotor puller shaft protector over exposed compressor shaft. Align thumb head bolts to puller jaws and finger-tighten. Turn puller center bolt clockwise to remove rotor pulley.



81075A

Fig. 3E-34 Removing Rotor Pulley with Jaws Installed

(6) Remove field coil lead wire from clip on top of compressor front housing.

(7) Using snap ring pliers remove snap ring and then remove field coil.

Magnetic Clutch Installation

(1) Install field coil.

NOTE: *Coil flange protrusion must align with hole in front housing to prevent coil movement and correctly locate lead wire.*

(2) Support compressor by four mounting ears on rear of compressor. Do not clamp compressor in vise with jaws on compressor body.

(3) Align rotor assembly squarely on front housing hub. Use suitable driver to drive rotor assembly onto shaft.

(4) Install internal bearing snap ring and then external bearing snap ring.

NOTE: *All snap rings have a straight edge and a beveled edge on the circumference. Position the snap rings so that the flat edge is toward the compressor and the beveled edge is outward.*

(5) Install front plate assembly using original clutch shims on compressor shaft.

(6) Install compressor shaft key.

(7) Align front plate keyway to compressor shaft key and using Clutch Face Installer J-29641 tap front plate onto shaft until it bottoms on clutch shims as shown in figure 3E-32.

NOTE: *When installing the front plate a distinct change in the sound will be heard when the front plate bottoms.*

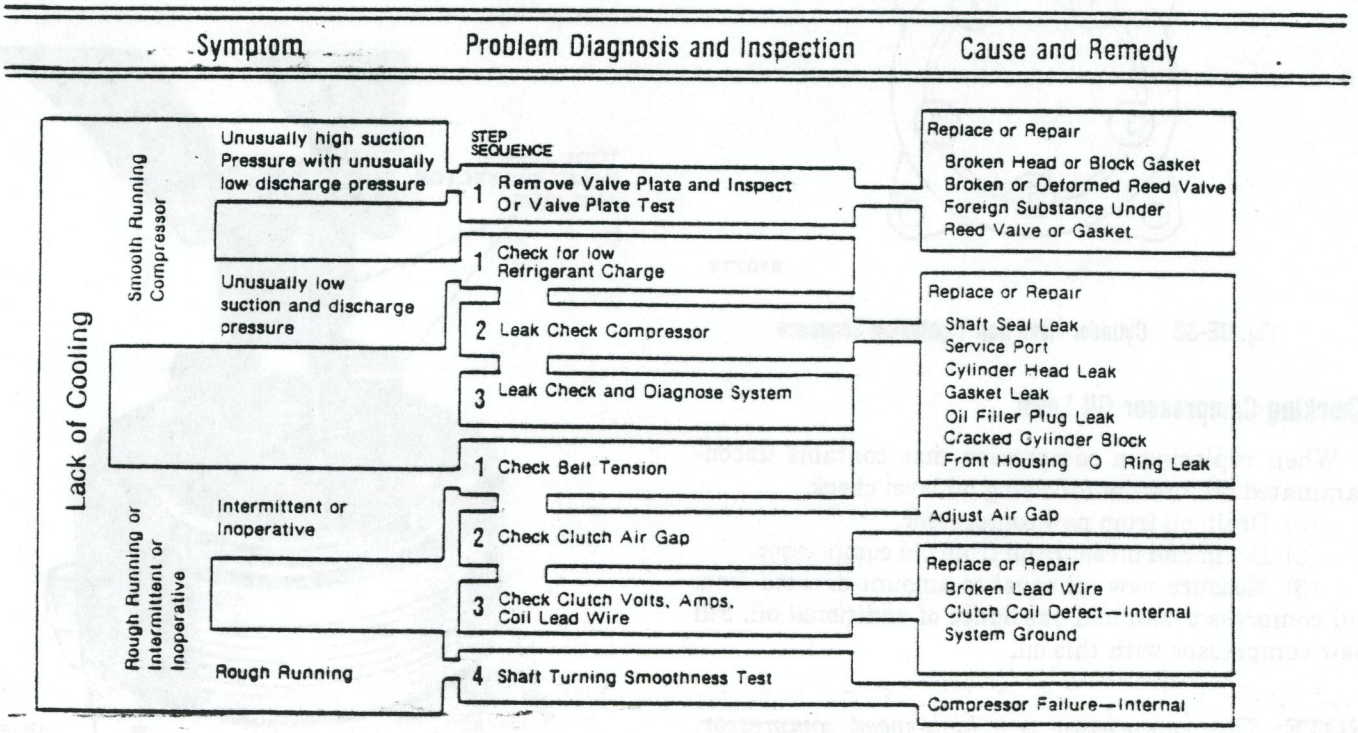
(8) Install hex nut and torque to 25 to 30 foot-pounds (34 to 41 N•m) torque.

(9) Check air gap with feeler gauge. Air gap should consistently be .016-.031 inch around circumference of magnetic clutch. If air gap varies, pry up lightly at minimum variations and tap down at maximum variations. If air gap does not meet specifications remove hex nut and front plate.

NOTE: *The air gap is determined by the spacer shims. When assembling existing or new clutch components try the original shims first. When installing a new clutch onto a compressor that previously had no clutch use a .040-.020 and .005-inch shim.*

TROUBLE SHOOTING CHART

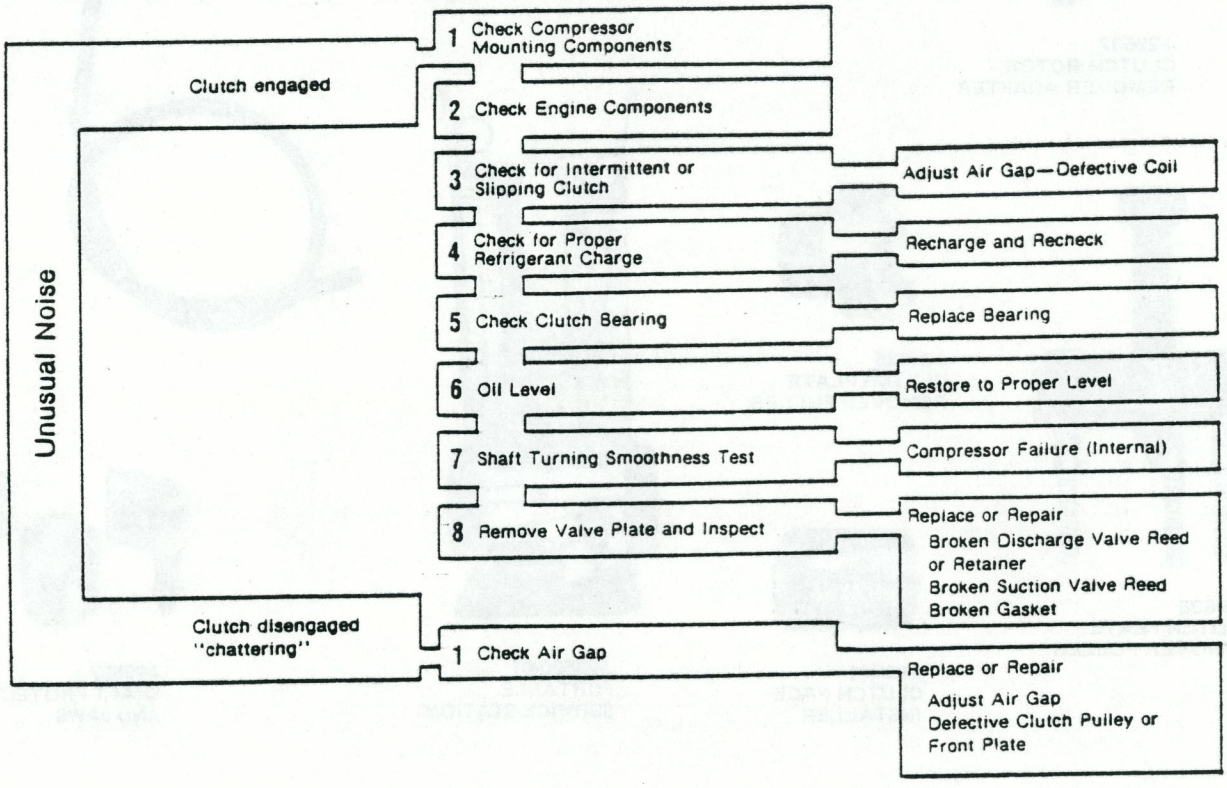
During diagnosis follow the inspection procedures in the sequence shown until a defect is found. Then perform the repair in the Cause and Remedy Section. If this repair does not fully solve the problem, proceed to the next Inspection Step.



81152

TROUBLE SHOOTING CHART (Continued)

During diagnosis follow the inspection procedures in the sequence shown until a defect is found. Then perform the repair in the Cause and Remedy Section. If this repair does not fully solve the problem, proceed to the next Inspection Step.



81152

SPECIFICATIONS

Torque Specifications

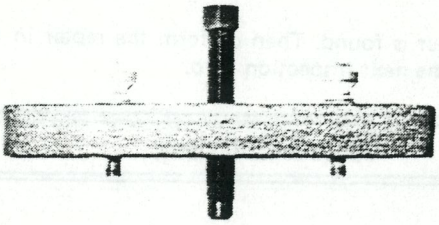
Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (ft-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
A/C Service Valve (Flange Type)	15	13-17	20	17-24
A/C Service Valve (Rototype)	Wet Torque			
Clutch Retaining Nut	27	25-30	37	34-39
Cylinder Head Cap Screws	24	22-25	33	30-34
Discharge Hose Fitting	20	18-22	27	24-30
Oil Filler Plug	24	22-25	33	30-34
Suction Hose Fitting 5/8 inch Flange				

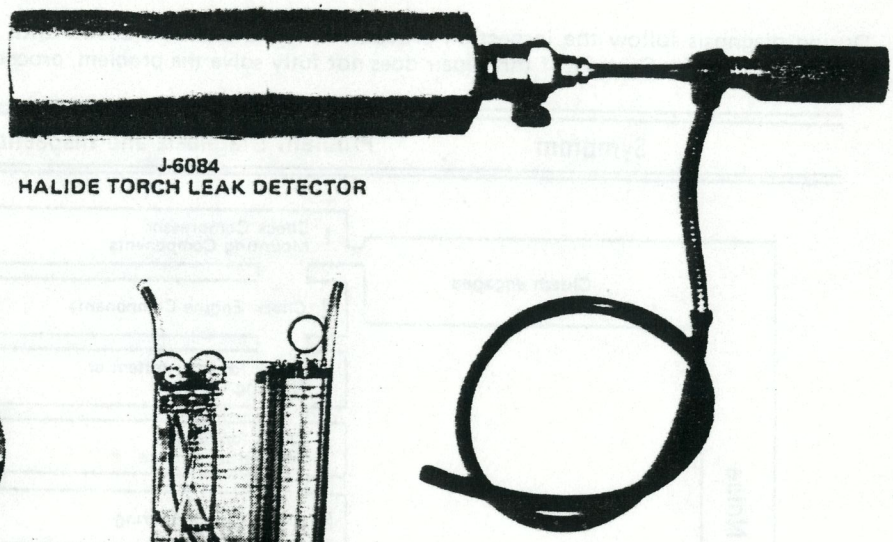
All Torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

81145

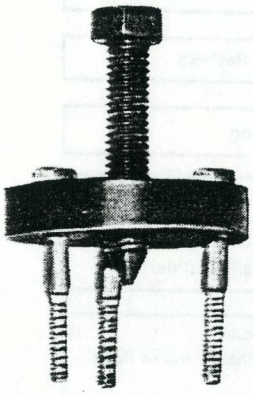
TOOLS



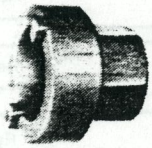
J-29637
CLUTCH ROTOR
REMOVER ADAPTER



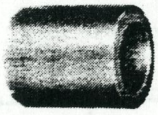
J-6084
HALIDE TORCH LEAK DETECTOR



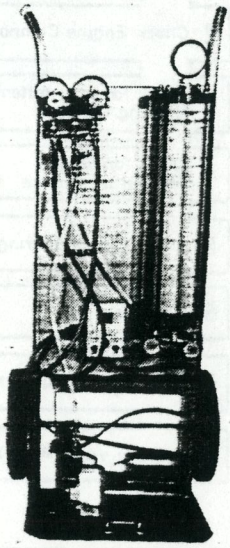
J-29636
CLUTCH PLATE
REMOVER PULLER



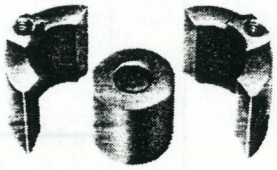
J-29636
CLUTCH PLATE
REMOVER PULLER



J-29641
CLUTCH FACE
INSTALLER

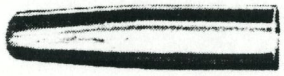


J-23500-01
PORTABLE
SERVICE STATION



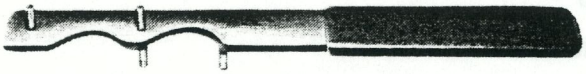
J-29637
SHAFT PROTECTOR
AND JAWS

J-6105
1/4-INCH RATCHET

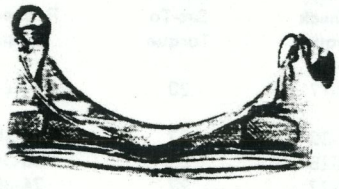


J-22974
SHAFT SEAL
PROTECTOR

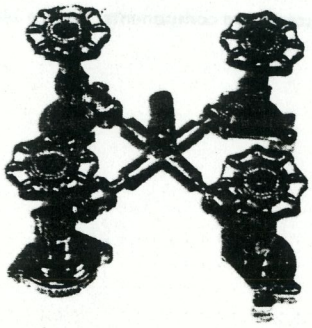
J-9392
SEAL REMOVER



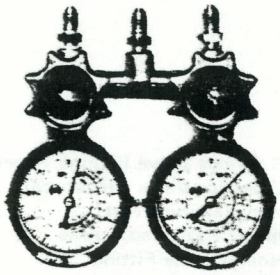
J-29635
CLUTCH HOLDER



J-5453
GOGGLES



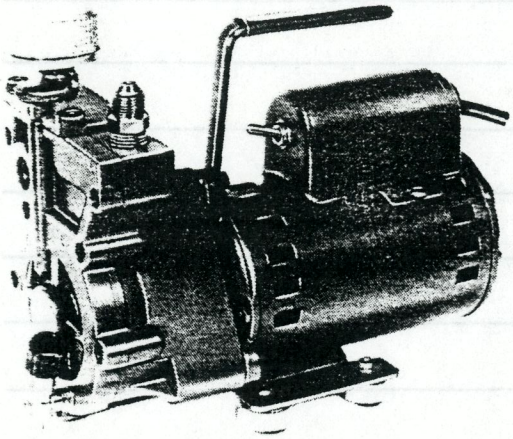
J-6272-02
NO. 4 MULTI-REFRIGERANT
CAN OPENER



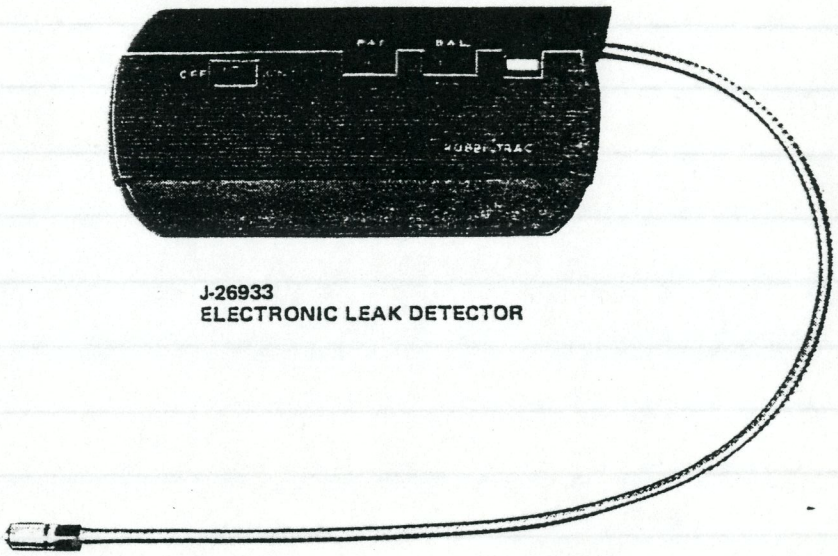
B W R

42866

Tools

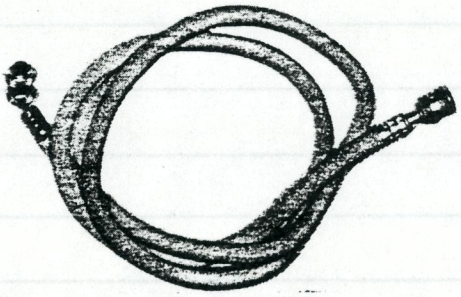


J-26695
VACUUM PUMP



J-26933
ELECTRONIC LEAK DETECTOR

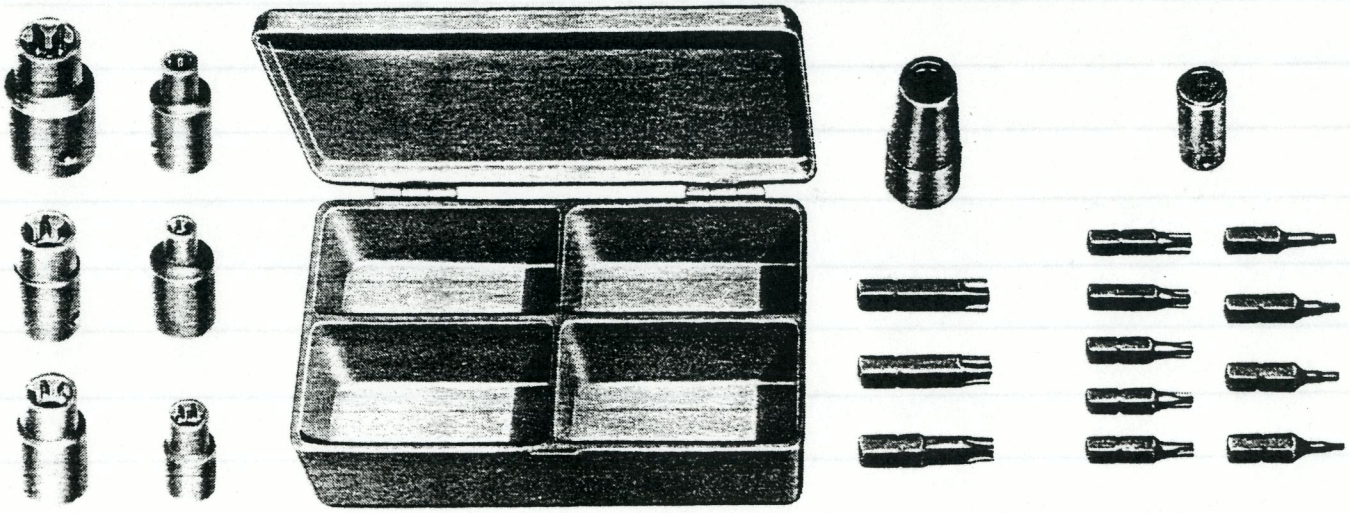
BLUE



WHITE

RED

J-23575 PRESSURE GAUGE AND MANIFOLD ASSEMBLY



J-25359-02
TORX BIT AND SOCKET SET

42866

NOTES

BODY AND FRAME COMPONENTS 3F

SECTION INDEX

BODIES

BODY CONSTRUCTION

General

Jeep vehicles are of all-steel construction, with insulated body mounting points that provide a secure attachment to the chassis frame.

All major body panels are of heavy gauge steel, reinforced, flanged, and welded. The bodies are completely detachable from the chassis unit and are insulated from the frame by body spacers placed between the body and frame and held in position with body bolts.

Spacers are located between the body and chassis mounting points to insulate against vibrations and road noises.

Periodic inspection is necessary to determine the condition of body spacers and holddown bolts. Worn, loose, or fatigued spacers permit the body to settle causing body lean or possible interference between the floorpan and various chassis components.

BODY MOULDINGS

Trim Mouldings

Trim mouldings on the front fenders, front and rear doors and rear quarter are attached with adhesive backing and/or screws and snap-in clips. To replace mouldings, remove attaching screws and use a wedge-shaped fiber stick to pry mouldings from body.

Rocker Panel Mouldings

The CJ rocker panel mouldings are attached with studs and nuts. To replace rocker panel mouldings, remove attaching nuts and remove moulding.

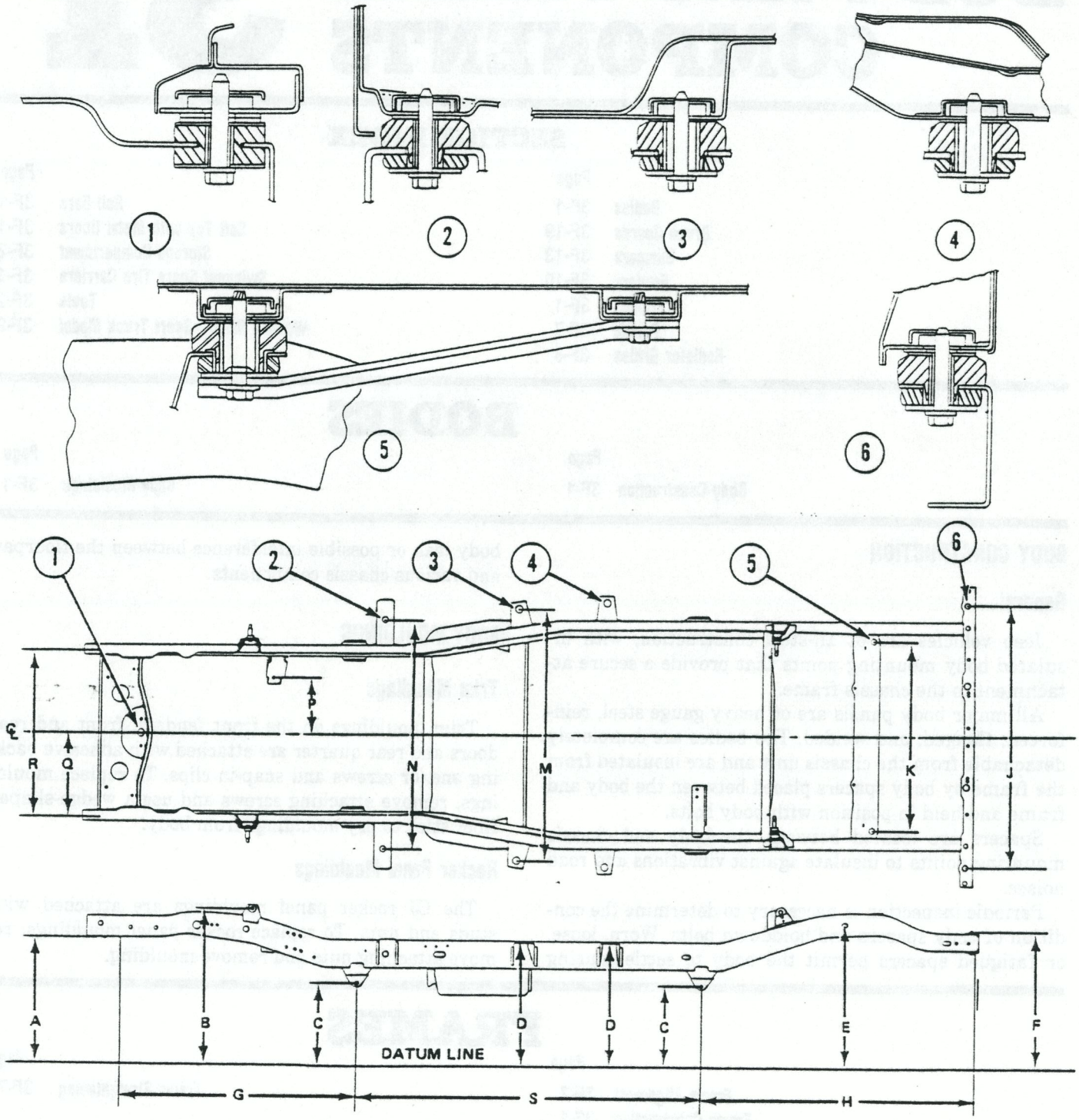
FRAMES

FRAME CONSTRUCTION

The frame is the foundation and structural center of the vehicle. In addition to carrying the load, it mounts and supports the power unit while maintaining correct relationship and alignment of the power train. This relationship assures normal functioning of the units and freedom from excessive wear, stress, and strain. The

frame is constructed of heavy channel steel side rails and crossmembers. The crossmembers maintain the proper positions of the side rails in direct relationship to each other, providing maximum resistance to torsional twist and strains.

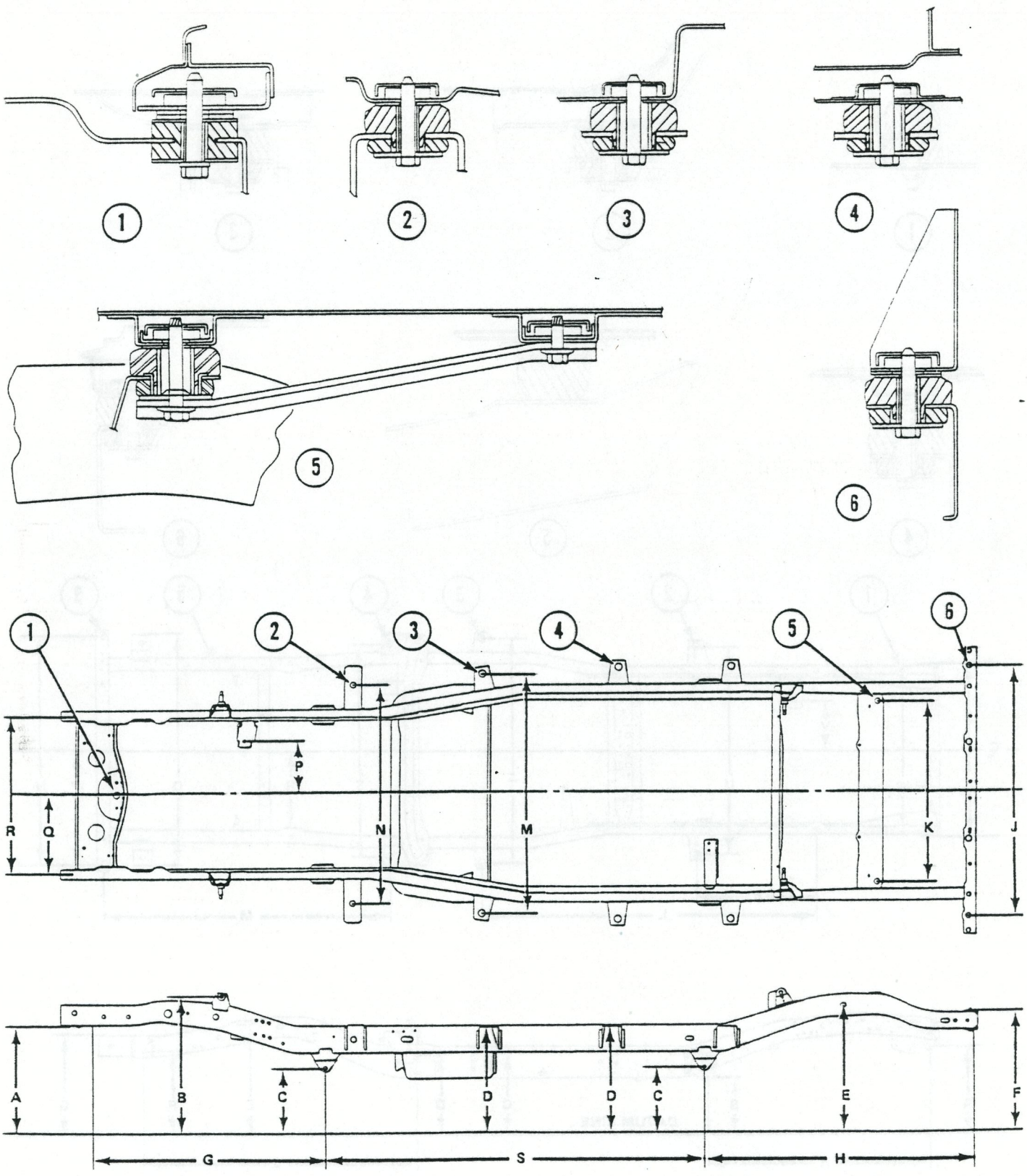
In the event of collision damage, it is important that the frame alignment be checked and realigned to frame dimensions shown on the individual dimension charts (figs. 3F-1 through 3F-5). Wheel geometry and axle alignment should be checked.



A—	12.51	E—	15.73	J—	43.50	P—	9.39
B—	17.50	F—	14.57	K—	31.26	Q—	13.75
C—	5.20	G—	40.61	M—	41.52	R—	27.50
D—	12.19	H—	46.16	N—	37.84	S—	39.06

60581

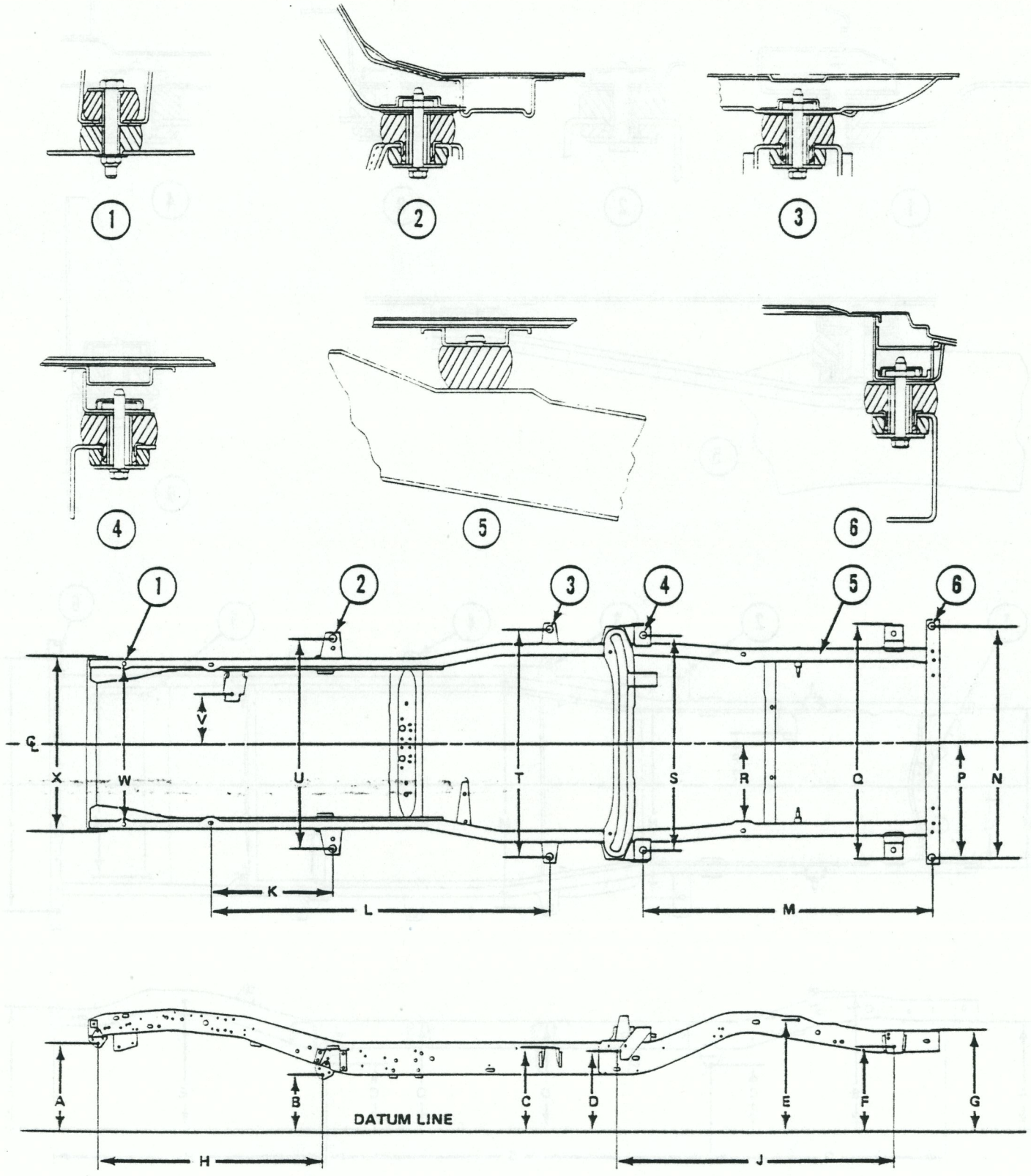
Fig. 3F-1 CJ-5 Model Frame Dimensions (Inches)



A—	12.51	F—	14.57	K—	31.26	Q—	13.75
B—	17.50	G—	40.61	M—	41.52	R—	27.50
C—	5.20	H—	46.16	N—	37,84	S—	49.06
D—	12.19	J—	43.50	P—	9.39		
E—	15.73						

60582

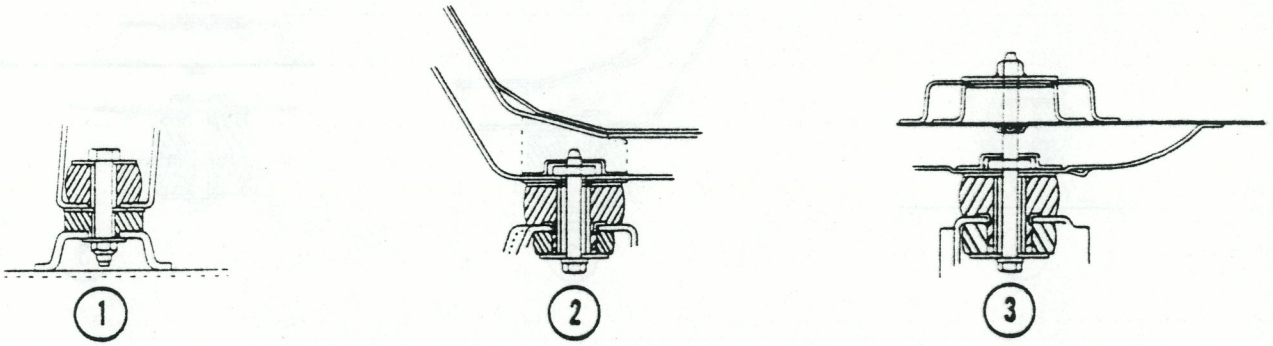
Fig. 3F-2 CJ-7 Model Frame Dimensions (Inches)

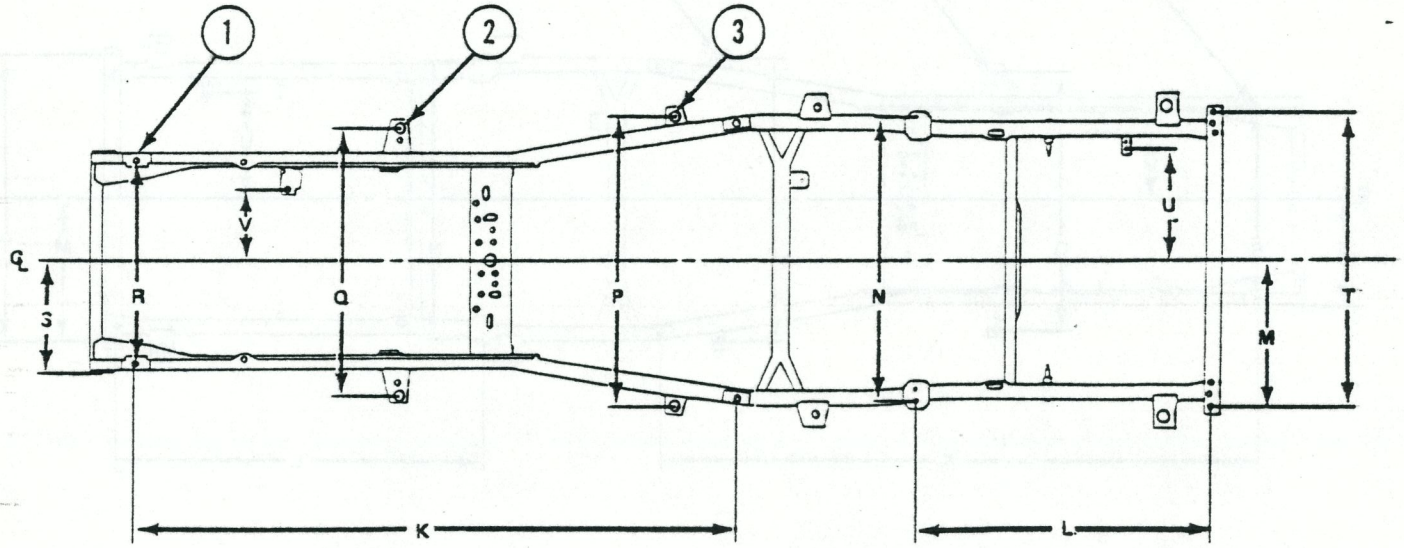


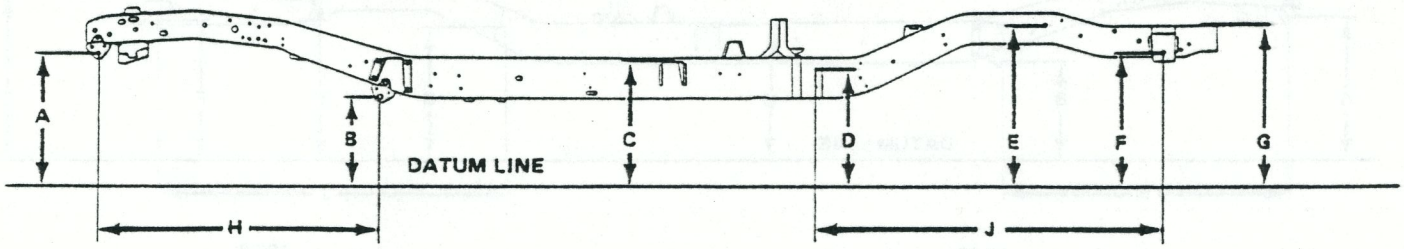
A –	12.05	G –	14.03	M –	59.63	T –	45.88
B –	5.46	H –	45.26	N –	46.76	U –	42.50
C –	10.60	J –	57.25	P –	23.38	V –	11.52
D –	9.94	K –	24.68	Q –	47.02	W –	32.40
E –	16.17	L –	69.00	R –	17.88	X –	34.22
F –	10.82			S –	43.54		

60583

Fig. 3F-3 Cherokee and Wagoneer Frame Dimensions (Inches)



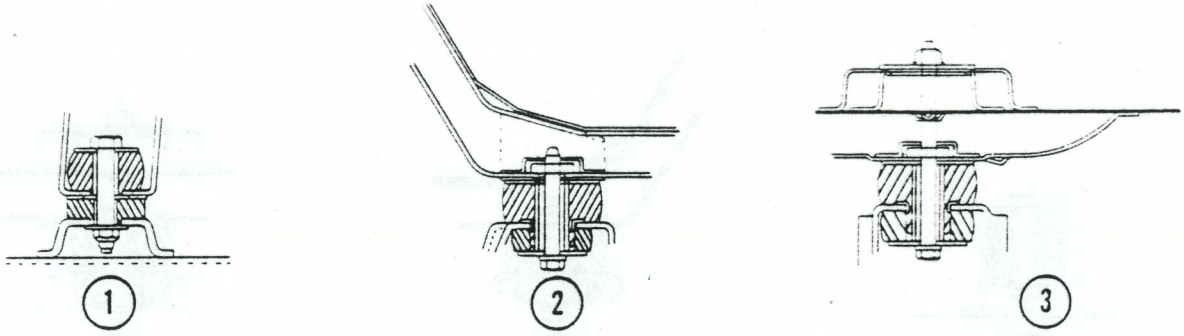


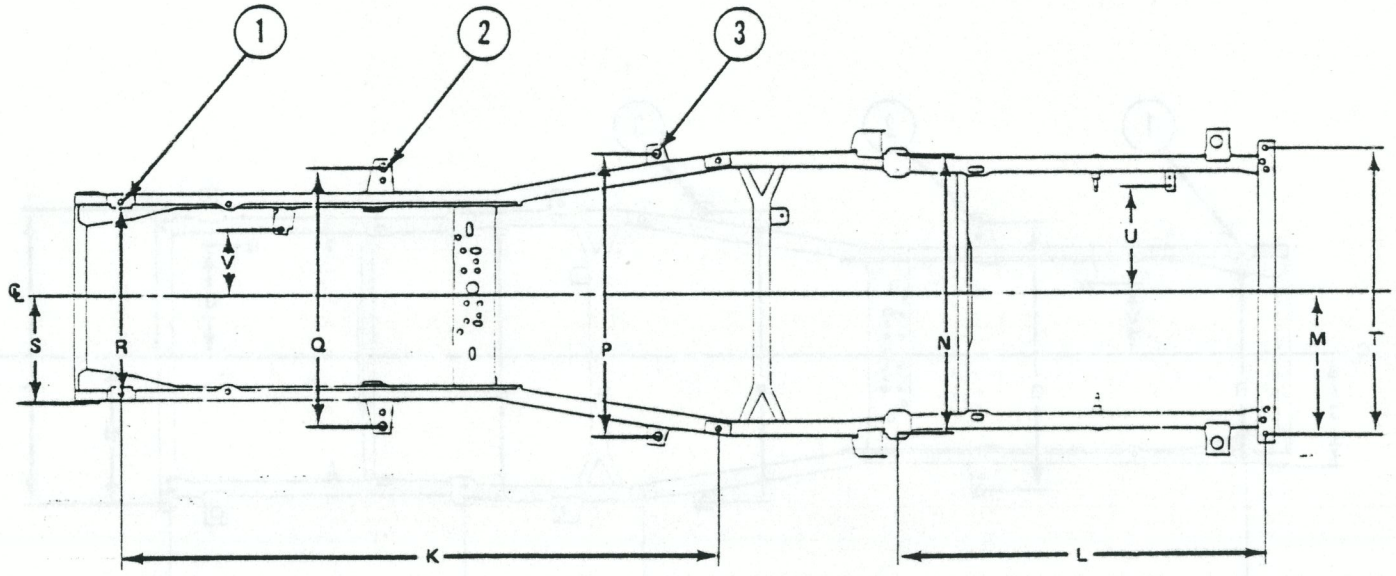


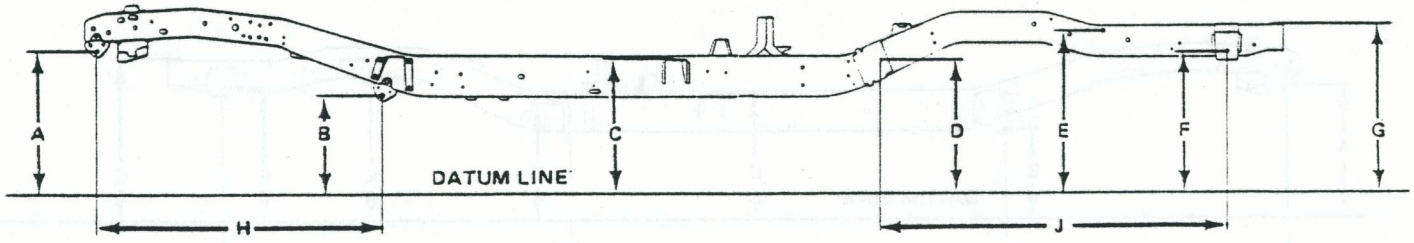
A –	11.97	L –	48.79
B –	5.39	M –	23.38
C –	11.35	N –	45.72
D –	9.94	P –	45.92
E –	16.80	Q –	42.52
F –	12.55	R –	32.40
G –	16.78	S –	17.89
H –	45.23	T –	46.75
J –	57.22	U –	17.06
K –	96.80	V –	11.52

60584

Fig. 3F-4 Truck Frame Dimensions—119-Inch Wheelbase (Inches)







A –	11.97
B –	5.39
C –	11.35
D –	9.94
E –	15.92
F –	12.57
G –	16.78
H –	45.23
J –	56.47
K –	96.80

L –	60.79
M –	23.38
N –	45.72
P –	45.92
Q –	42.52
R –	32.40
S –	17.69
T –	46.75
U –	17.06
V –	11.52

60585

Fig. 3F-5 Truck Frame Dimensions—131-inch Wheelbase (Inches)

FRAME ALIGNMENT

The most efficient method of checking frame alignment is with a frame alignment machine.

NOTE: *The following procedure is adequate for checking most frame dimensions. However, if torsional twist or frame rail height is in question, the vehicle must be checked on an alignment machine using datum gauges. Follow alignment machine manufacturer's instructions.*

If a frame straightening machine is not available, frame alignment may be determined by using the "X" or diagonal method. Figures 3F-1 through 3F-5 provide all frame dimensions.

The most convenient method of checking frame dimensions is to locate with a plumb-bob and chalk mark on a level floor all dimensional points from which measurements are taken. This is known as "plumb-bobbing" the frame. If working on a cement floor, clean it so that the chalk marks will be visible underneath the frame. If working on a wooden floor, lay sheets of paper underneath the vehicle. Drop a plumb-bob from each point indicated in figures 3F-1 through 3F-5, marking the floor directly underneath the point. Satisfactory checking depends on the accuracy of the marks in relation to the frame.

To check points that have been marked, carefully move the vehicle away from the layout on the floor, and proceed as follows:

Check the frame at front and rear end using corresponding marks on the floor. If widths correspond to frame specifications, draw a centerline the full length of the vehicle, halfway between the marks indicating front and rear widths. If frame width is not correct and the centerline cannot be laid out from checking points at the end of the frame, it can be drawn through intersections of any two pairs of equal dimensions.

With the centerline correctly laid out, measure the distance to several opposite points over the entire length of the frame. If the frame is in proper alignment, opposite measurement should be the same.

To locate the points at which the frame is sprung, measure the diagonals between selected points on the frame (figs. 3F-1 through 3F-5).

If the diagonals in each pair are within 1/8 inch, that part of the frame included between points of measurement may be considered as properly aligned. These diagonals should also intersect at the centerline. If the measurements do not agree within the above limits, it means that a frame alignment correction is necessary and will have to be made between those points that are not equal.

NOTE: *During the process of straightening the frame, be extremely careful not to overstretch the frame. This could cause the already aligned sections of the frame to become misaligned or weakened.*

FRAME STRAIGHTENING

A bent or twisted frame may be straightened, provided the extent of misalignment is not excessive. Severely damaged frame parts should be replaced.

PANELS

GENERAL

Assembled sections or any of the individual panels available for replacement are complete and may be installed as a unit. When only a portion of the unit is damaged, the damaged unit may be cut from the body at the location best suited for welding, and the new unit cut to the desired size and welded in place.

Galvanized Panels

For protection against corrosion, vulnerable panels on all models are galvanized. A conversion coating must be applied to these panels prior to painting to ensure good adhesion of the paint.

Replacement

Where replacement is required, careful examination should be made as to the extent of damage to determine which panels require replacement.

In most cases, the weld joints of one panel to another are visible and can be separated for installation of a new panel.

DOORS

The complete door, with outer and inner door panels flanged and welded together and primed, is available as well as the outer panel only.

These outer panels may be used in cases in which the inner panel and pillar assemblies are not damaged to avoid the extra expense of using a complete door.

REAR QUARTER PANELS

The rear quarter panels are welded to the body as indicated in figures 3F-6 through 3F-8.

Whenever a rear quarter panel is replaced, it is very important to apply a suitable corrosion preventive such as a weld primer to all mating surfaces prior to welding.

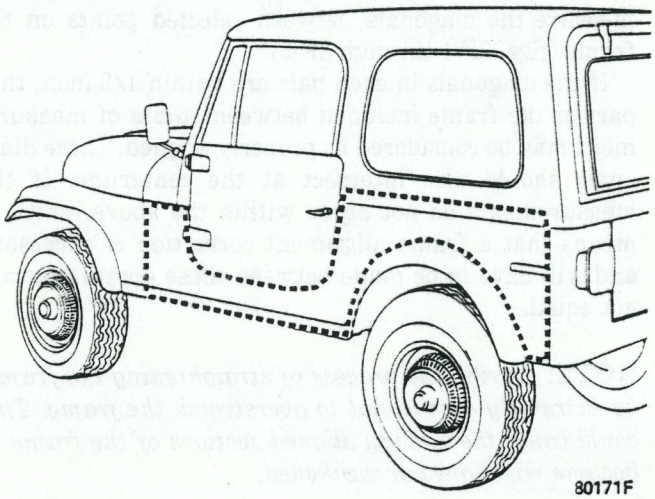


Fig. 3F-6 Rear Quarter Panel—CJ Models

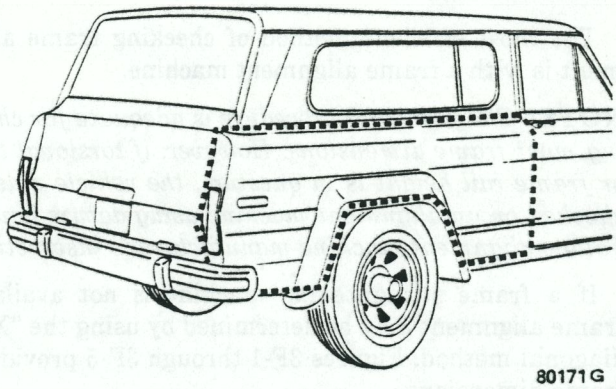


Fig. 3F-7 Rear Quarter Panel—2-Door Cherokee

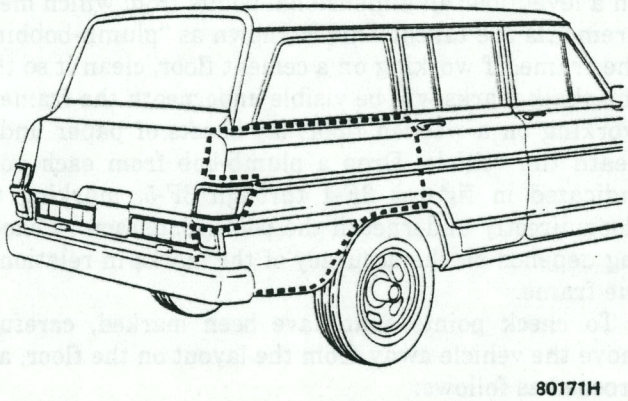


Fig. 3F-8 Rear Quarter Panel—Wagoneer (4-Door Cherokee Similar)

RADIATOR GRILLES

CJ MODELS

The CJ grille and the support and baffle are welded together to form a maximum-strength radiator grille guard (fig. 3F-9).

Removal

(1) Remove front crossmember cover, if equipped.

(2) Remove screws and washers attaching radiator and shroud to radiator grille guard panel.

(3) Remove bolts and washers attaching guard panel to fenders.

(4) Remove radiator grille to frame crossmember holddown assembly. Note sequence of parts.

(5) Loosen nuts attaching two radiator support rods to radiator grille guard support brackets.

(6) Remove rods from brackets.

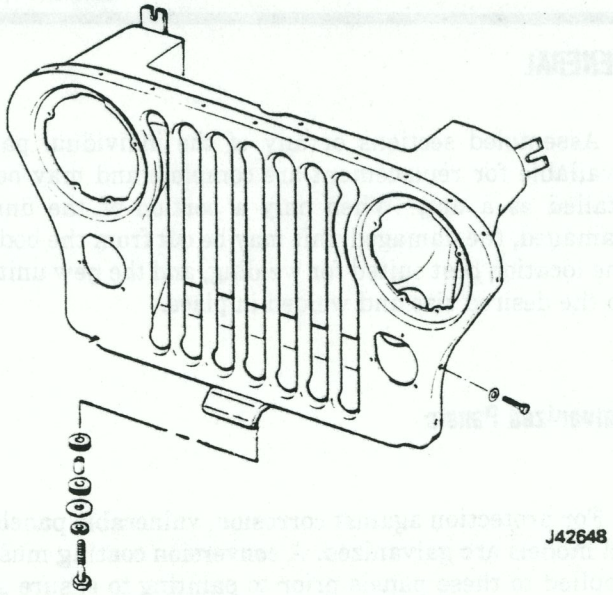


Fig. 3F-9 Grille Panel—CJ Models

(7) Tilt grille panel forward and disconnect electrical wiring at head lamp sealed beam unit and parking lamp assembly wiring harness at connectors.

(8) If equipped with air conditioning, proceed as follows:

(a) Discharge air conditioning system as outlined in Chapter 3E—Air Conditioning.

(b) Disconnect air conditioning high pressure hose at sight glass connection and cap hose and sight glass fitting to prevent entry of dirt and moisture.

(c) Disconnect air conditioning high pressure hose at fitting on compressor and cap hose and compressor fitting to prevent entry of dirt and moisture.

(9) Lift radiator grille panel from vehicle.

Installation

(1) Position guard panel and connect electrical wiring at headlamp sealed beam unit and parking lamps.

(2) If equipped with air conditioning, proceed as follows:

(a) Remove caps from high pressure hose and compressor and connect hose to compressor.

(b) Remove caps from sight glass and high pressure hose and connect hose to sight glass.

(3) Position radiator support rods in radiator grille support brackets and install attaching hardware.

(4) Install radiator grille to frame crossmember holddown assembly.

(5) Position grille panel to fenders and install attaching bolts and washers.

(6) Install radiator and radiator shroud to radiator grille panel attaching screws and washers.

(7) Install front crossmember cover, if equipped.

(8) If equipped with air conditioning, evacuate, leak test, and charge the system as outlined in Chapter 3E—Air Conditioning.

CJ MODEL GRILLE APPLIQUE

General

The chrome grille applique is installed over the grille assembly requiring the use of weil nuts and screws as well as using the headlight and parking light attaching screws to retain the applique.

Removal

(1) Raise hood.

(2) Remove headlamp doors.

(3) Remove headlamp body retaining screws.

(4) Disconnect and remove headlamp and body assemblies.

(5) Remove parking lamp retaining screws.

(6) Disconnect and remove parking lamp assemblies.

(7) Remove front crossmember cover, if equipped.

(8) Remove torx bit screws and bumpers across top of radiator grille using Torx Bit Tool J-25359-C.

(9) Remove grille applique.

(10) Remove double back tape along bottom of applique.

Installation

(1) Install double-back tape along bottom on backside of applique.

(2) Position grille applique over grille assembly and press along bottom.

CAUTION: *Torx screws are installed into well nuts, do not overtighten.*

(3) Install torx screws and bumpers using Torx Bit Tool J-25359-C.

(4) Connect and position headlamp and body assemblies.

(5) Install retaining screws.

(6) Install headlamp doors.

(7) Connect and position parking lamp assemblies.

(8) Install parking lamp retaining screws.

(9) Close hood.

(10) Install front crossmember cover, if equipped.

CHEROKEE-TRUCK MODELS

Removal

(1) Remove headlamp doors.

(2) Remove plastic drive rivets attaching grille insert to grille housing (fig. 3F-10).

(3) Remove grille insert.

(4) Remove screws attaching grille housing to face panel (fig. 3F-10).

(5) Remove grille housing.

Installation

(1) Position grille housing in body opening.

(2) Install attaching screws.

(3) Position grille insert in grille housing.

(4) Install attaching rivets.

(5) Install headlamp doors.

WAGONEER MODELS

Removal

(1) Remove screws attaching grille panel (fig. 3F-10).

(2) Remove grille panel.

Installation

(1) Position grille in body opening.

(2) Install attaching screws and washers.

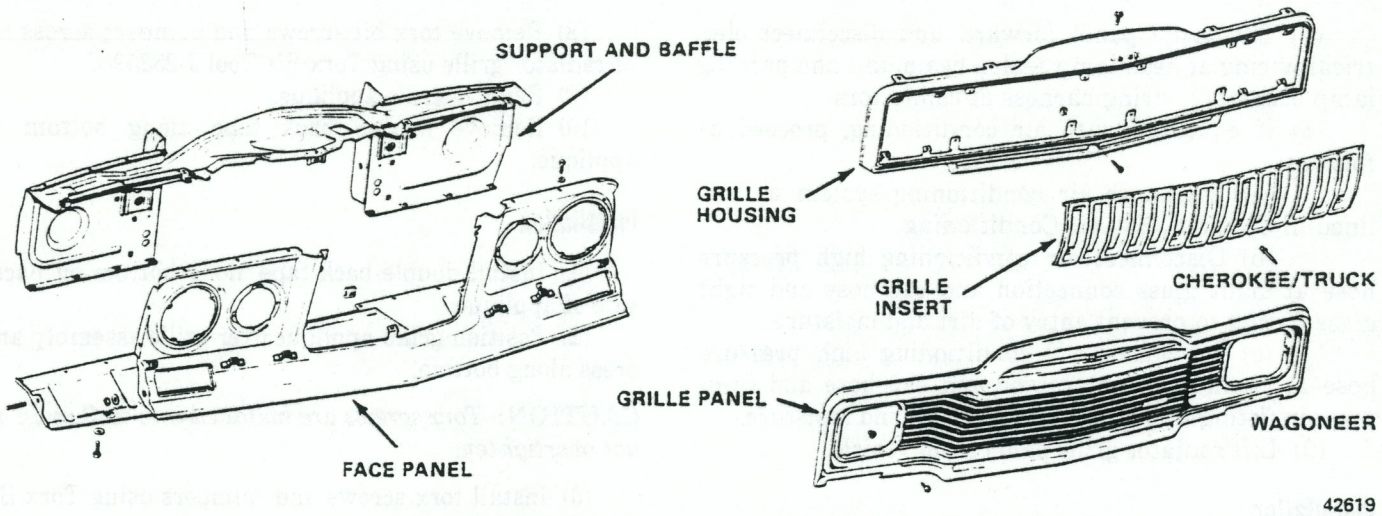


Fig. 3F-10 Grille Panels—Wagoneer-Cherokee-Truck Models

FENDERS

CJ MODELS

Replacement

(1) Remove or disconnect all items attached to apron of fender.

(2) Disconnect electrical connector at side marker lamp.

(3) Remove rocker panel moulding, if equipped.

(4) Remove bolts and washers attaching fender and brace to dash panel (fig. 3F-11).

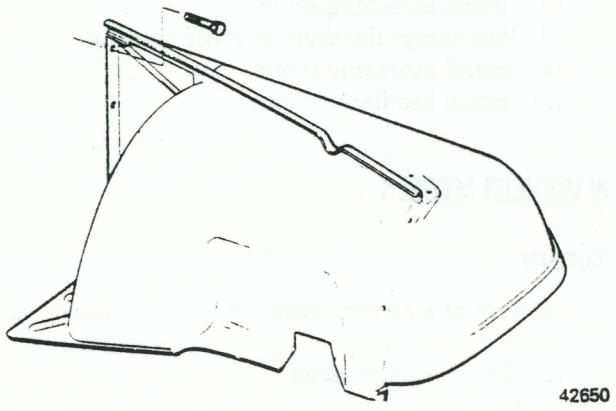


Fig. 3F-11 Front Fender—CJ Models

(5) Remove bolts, washers, and nuts attaching fender to radiator grille panel.

(6) Pull fender outboard and lift from vehicle.

(7) Position fender on vehicle and install fender-to-radiator grille panel attaching bolts, washers, and nuts.

(8) Install fender and brace-to-dash panel attaching bolts and washers.

(9) Connect side marker lamp electrical connector.

(10) Install and connect items previously removed from apron of fender.

(11) Install rocker panel moulding, if equipped.

CHEROKEE-WAGONEER-TRUCK MODELS

Removal

(1) Remove front bumper.

(2) Remove headlamp to gain access through opening.

(3) Reach through headlamp opening and remove bolts and washers attaching fender to grille face panel.

(4) Remove side marker lamp reflector lens and disconnect lamp socket assembly from lens.

(5) Remove bolts and washers attaching fender to grille face panel.

(6) Disconnect brace at fender (fig. 3F-12).

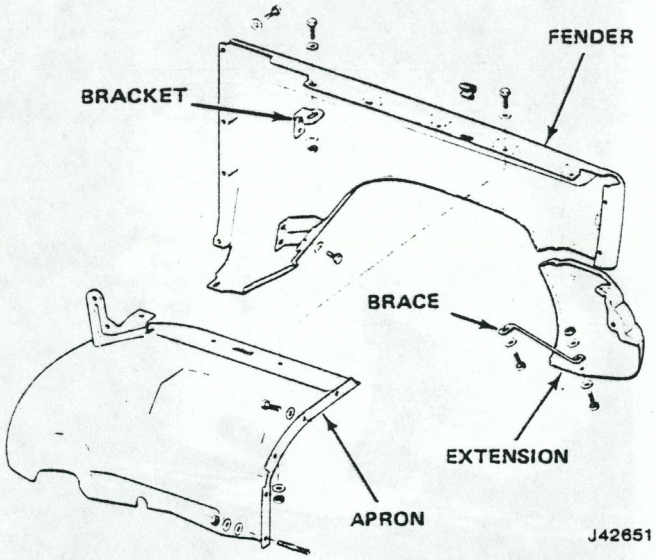


Fig. 3F-12 Front Fender—Cherokee-Wagoneer-Truck Models

(7) Remove bolts and washers attaching fender to rocker panel just below the hinge pillars.

(8) Remove bolts and washers attaching top of fender to fender apron, hood hinge support bracket, and fender-to-dash panel bracket.

NOTE: *Note the number and position of shims between fender and rocker panels so they can be assembled in the same position.*

(9) Open doors and remove fender from vehicle.

(10) Remove or disconnect all items attached to fender apron.

(11) Remove bolts and washers attaching fender apron to radiator support and two brackets on dash panel.

Installation

(1) Spread sealer evenly over and along surfaces where fender and apron make metal-to-metal contact with other sheet metal parts.

(2) Install apron and fender in place and finger tighten bolts until all bolts and washers have been installed. Tighten all nuts and bolts.

(3) Install and reconnect all items removed from fender and apron, such as wiring harness, electrical components.

(4) Secure items, such as headlamp, grille and front bumper, which were released or removed to facilitate removal of fender and apron.

CJ FENDER EXTENSIONS

Removal

(1) Remove screws and nuts attaching inner and outer reinforcements and fender extension to fender (fig. 3F-13).

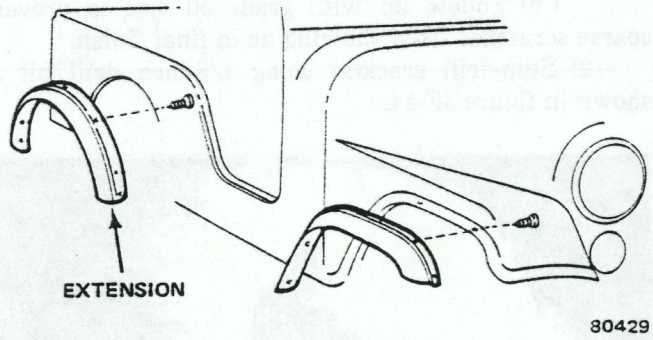


Fig. 3F-13 Fender Extension—CJ Models

(2) Remove inner and outer reinforcements and extension from fender.

Installation

(1) Position fender extension and inner and outer reinforcements on fender and align screw holes.

(2) Install screws and nuts attaching fender extension and reinforcements to fender.

REAR FENDERS—SPORT TRUCK

General

The Sport Truck model rear fenders are constructed of lightweight, dent resistant fiberglass. No special paint system is required for refinishing the fenders.

Removal

(1) Support fender.
(2) Remove all attaching hardware.
(3) Remove fender from vehicle.

Installation

(1) Position fender on vehicle and support.
(2) Install all attaching hardware.

Repair

In the event of damage, the following materials are necessary for a quality repair.

- Fiberglass mat or cloth
- Fiberglass resin and hardener
- Structural Adhesive (3M brand or equivalent)
- Auto Body Repair Tape (3M brand or equivalent)
- Glazing Putty
- Aluminum Foil
- Plastic Spreader

Crack Repair

(1) Use grinder to remove paint and to outline damaged area.

(a) Use grade 24 disc for initial grinding.

(b) Follow up with grade 50 disc to prevent coarse scratches from showing up in final finish.

(2) Stop-drill crack(s) using 1/8-inch drill bit as shown in figure 3F-14.

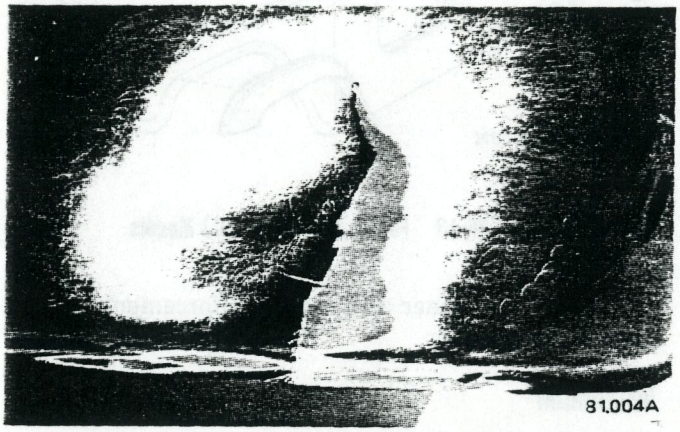


Fig. 3F-14 Stop-Drilling Cracks

(3) Bevel edges of crack(s) using rotary file.

NOTE: *Edges should be beveled to ensure sufficient surface area for good bonding.*

(4) Clean inside of fender repair area and apply Auto Body Repair Tape (fig. 3F-15), fiberglass or equivalent.

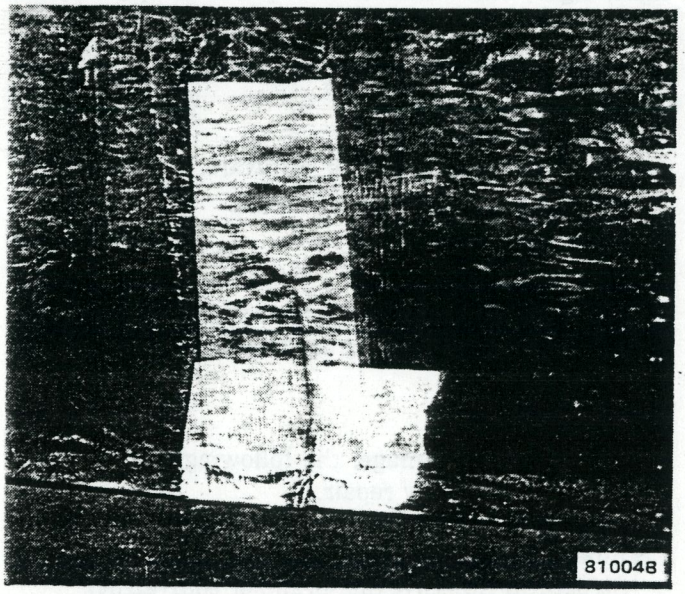


Fig. 3F-15 Installation of Auto Body Repair Tape

NOTE: *The application of Auto Body Repair Tape or fiberglass to the inside of the fender is essential to prevent moisture from entering the repair area.*

(5) Mix Structural Adhesive, according to manufacturer's instructions, apply liberally to break as shown in figure 3F-16.

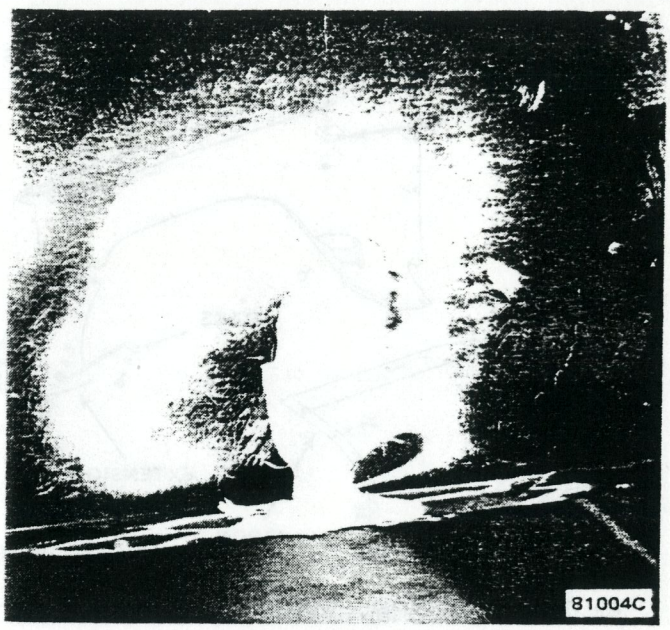


Fig. 3F-16 Structural Adhesive Applied to Fractured Area

(6) Use air file or hand file board for shaping of hardened Structural Adhesive.

(a) For initial shaping, use grade 24 paper.

(b) For shaping and sanding contour in Structural Adhesive, use grade 220 paper.

(c) For finish sanding, use grade 360 paper.

(7) Apply glazing putty over repair area for smooth finish.

(8) Finish repair area using grade 400 paper.

(9) Apply sealer and color coat fender (refer to Chapter 3B).

Hole Repair

(1) Use grinder to remove paint and to outline damaged area.

(a) Use grade 24 disc for initial grinding.

(b) Follow up with grade 50 disc to prevent coarse scratches from showing up in final finish.

NOTE: *If there are any cracks extending out from the hole, it will be necessary to stop-drill the crack(s) using a 1/8-inch drill bit.*

(2) Clean inside of fender around hole.

NOTE: *It may be necessary to grind inside of fender to ensure proper adhesion of fiberglass resin.*

(3) Position fiberglass mat or cloth on repair area, cut out piece, allow one inch extension beyond damaged area.

(4) Clean damaged area.

(5) Place fiberglass on piece of aluminum foil.

(6) Pour fiberglass resin into clean container.

(7) Mix appropriate amount of hardener with resin, according to manufacturer's instructions.

(8) Apply resin mixture to both sides of fiberglass.

(9) Apply fiberglass and aluminum foil over repair area, on inside of fender, with plastic spreader. Use firm pressure with spreader to remove air bubbles. Allow resin to cure. Remove aluminum foil.

(10) Sand top surface of fender with grade 180 paper.

(11) Mix Structural Adhesive, according to manufacturer's instructions, apply liberally to repair area.

(12) Use an air file or hand file board for shaping hardened Structural Adhesive.

(a) For initial shaping, use grade 24 paper.

(b) For shaping and sanding contour in Structural Adhesive, use grade 220 paper.

(c) For finish sanding, use grade 360 paper.

(13) If necessary, apply glazing putty over repair area according to manufacturer's instructions.

(14) Finish sanding repair area with grade 400 paper.

(15) Apply sealer and color coat fender (refer to Chapter 3B).

BUMPERS

GENERAL

Front bumpers on CJ models are of one-piece construction. When vehicle is equipped with rear mounted spare, two separate bumperettes are used.

Front bumpers on the Cherokee, Wagoneer, and Truck models are one-piece chromed aluminum. Rear bumpers are the same construction and are used on the Cherokee and Wagoneer. Trucks, when equipped with a rear bumper, have a one-piece step bumper.

Front bumper guards are available as an option on standard bumpers on all except CJ models. All CJ models have a new front crossmember cover which covers the area between the grille panel and front bumper rail (fig. 3F-17).

FRONT BUMPERS

CJ Models

Removal

(1) Disconnect and remove fog lamps, if equipped.

(2) Remove nuts and bolts attaching front bumper rail (fig. 3F-17) to frame extensions.

(3) Remove front bumper rail from frame extensions.

Installation

(1) Position front bumper rail on frame extension.

(2) Install bolts and nuts attaching front bumper rail to frame extension.

(3) Install and connect fog lamps, if equipped.

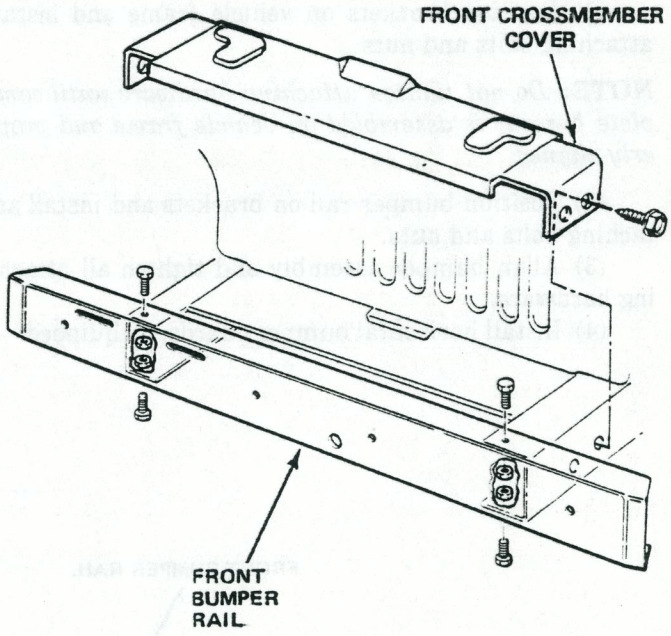


Fig. 3F-17 Front Bumper—CJ Models

Front Crossmember Cover—CJ Models

Removal

(1) Remove nuts and bolts attaching front crossmember cover (fig. 3F-17) to frame extensions.

(2) Remove front crossmember cover from frame extensions.

Installation

(1) Position front crossmember cover on frame extensions.

(2) Install bolt and nuts attaching front crossmember cover to frame extensions.

Cherokee-Wagoneer-Truck Models

Removal

(1) Disconnect and remove fog lamps, if equipped.
(2) Remove vertical bumper guards (fig. 3F-18) from bumper rail, if equipped.
(3) Remove horizontal bumper guards from bumper rail, if equipped.
(4) Remove front air deflector (fig. 3F-18), if equipped.
(5) Remove nuts and bolts attaching bumper rail to frame mounted bumper brackets. Remove bumper rail from vehicle.
(6) Remove nuts and bolts attaching bumper brackets to vehicle frame. Remove brackets from vehicle frame.

Installation

(1) Position brackets on vehicle frame and install attaching bolts and nuts.

NOTE: *Do not tighten attaching hardware until complete bumper is assembled on vehicle frame and properly aligned.*

(2) Position bumper rail on brackets and install attaching bolts and nuts.
(3) Align bumper assembly and tighten all attaching hardware.
(4) Install horizontal bumper guards, if equipped.
(5) Install and connect fog lamps, if equipped.
(6) Install vertical bumper guards, if equipped.
(7) Install front air deflector, if equipped.

Replacement

(1) Remove bumper rail as described above.
(2) Position replacement bumper rail on work bench and secure.
(3) Position horizontal bumper guards on bumper rail and mark hole locations on bumper rail.
(4) Center punch and drill 1/2-inch holes at marked locations.
(5) Position horizontal bumper guards on bumper rail and install screws attaching bumper guards to bumper rail.

NOTE: *Some filing of holes may be required for proper fit.*

(6) Position vertical bumper guards on bumper rail at desired locations and mark hole location on bumper rail.
(7) Center punch and drill 3/8-inch holes at marked locations.
(8) Position vertical bumper guards on bumper rail and install screws attaching bumper guards to bumper rail.

NOTE: *Some filing of holes may be required for proper fit.*

(9) Install bumper rail as described above.

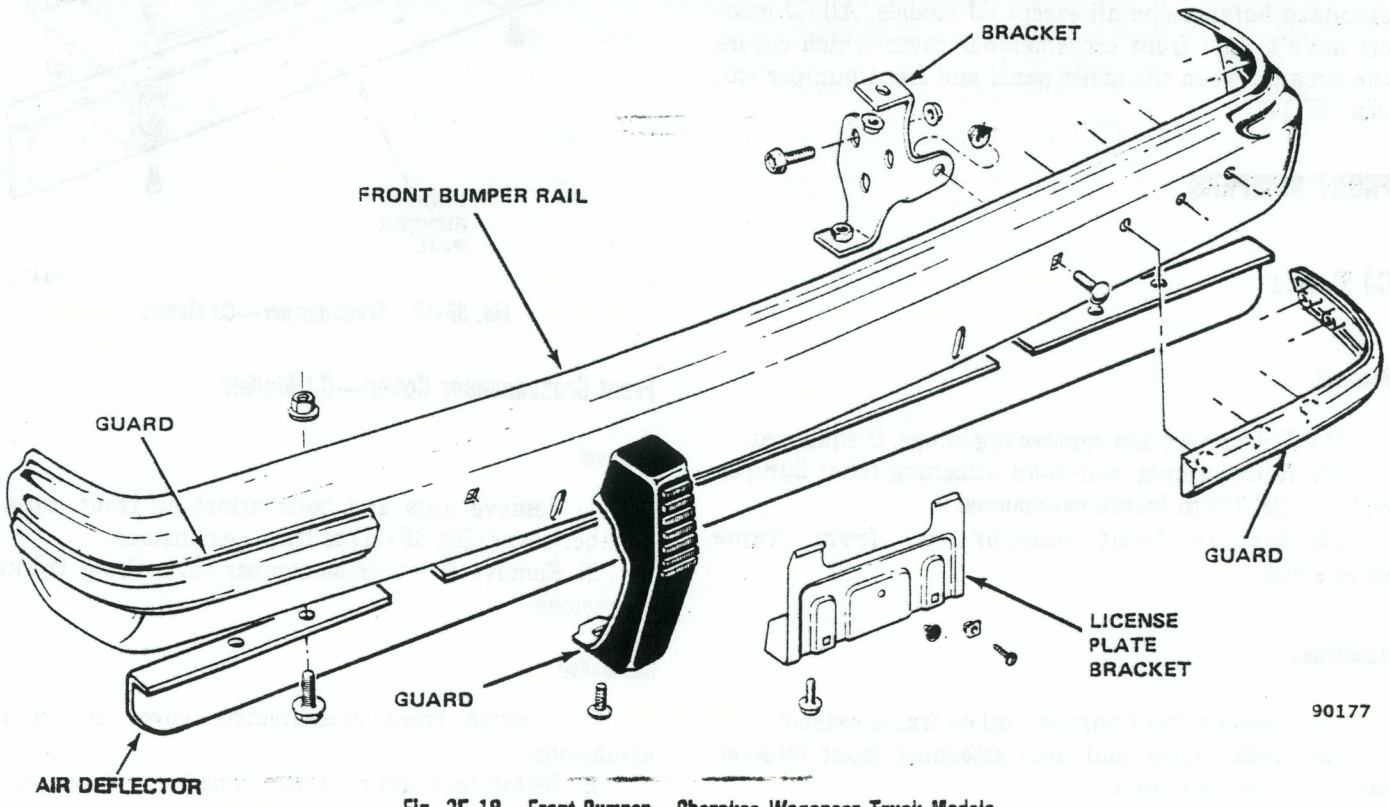


Fig. 3F-18 Front Bumper—Cherokee-Wagoneer-Truck Models

REAR BUMPERS

CJ Models

Removal

(1) Remove nuts and bolts attaching rear bumperettes (fig. 3F-19) to vehicle frame.

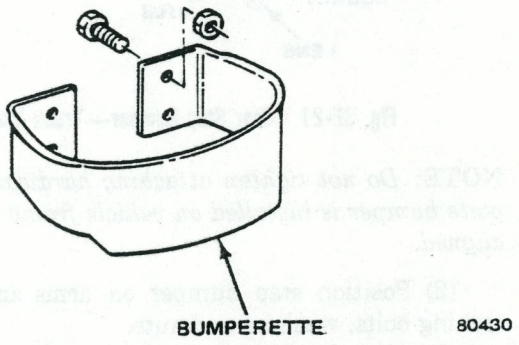


Fig. 3F-19 Rear Bumperette—CJ Models

(2) Remove rear bumperettes from vehicle frame.

Installation

(1) Position rear bumperettes on vehicle frame.
(2) Install bolts and nuts attaching rear bumperettes to vehicle frame.

Cherokee-Wagoneer Models

Removal

(1) Remove bumper guards (fig. 3F-20) from bumper rail, if equipped.
(2) Remove nuts and bolts attaching bumper rails to bumper brackets.
(3) Remove bumper rail from vehicle.
(4) Remove nuts and bolts attaching brackets to vehicle frame.
(5) Remove brackets from vehicle frame.

Installation

(1) Position brackets on vehicle frame and install attaching bolts, washers and nuts.

NOTE: *Do not tighten attaching hardware until complete bumper is assembled on vehicle frame and properly aligned.*

(2) Position bumper rail on brackets and install attaching bolts and nuts.
(3) Align bumper assembly and tighten all attaching hardware.
(4) Install horizontal bumper guards on bumper end rails, if equipped.

Replacement

(1) Remove bumper rail as described above.
(2) Position replacement bumper rail on work bench and secure.

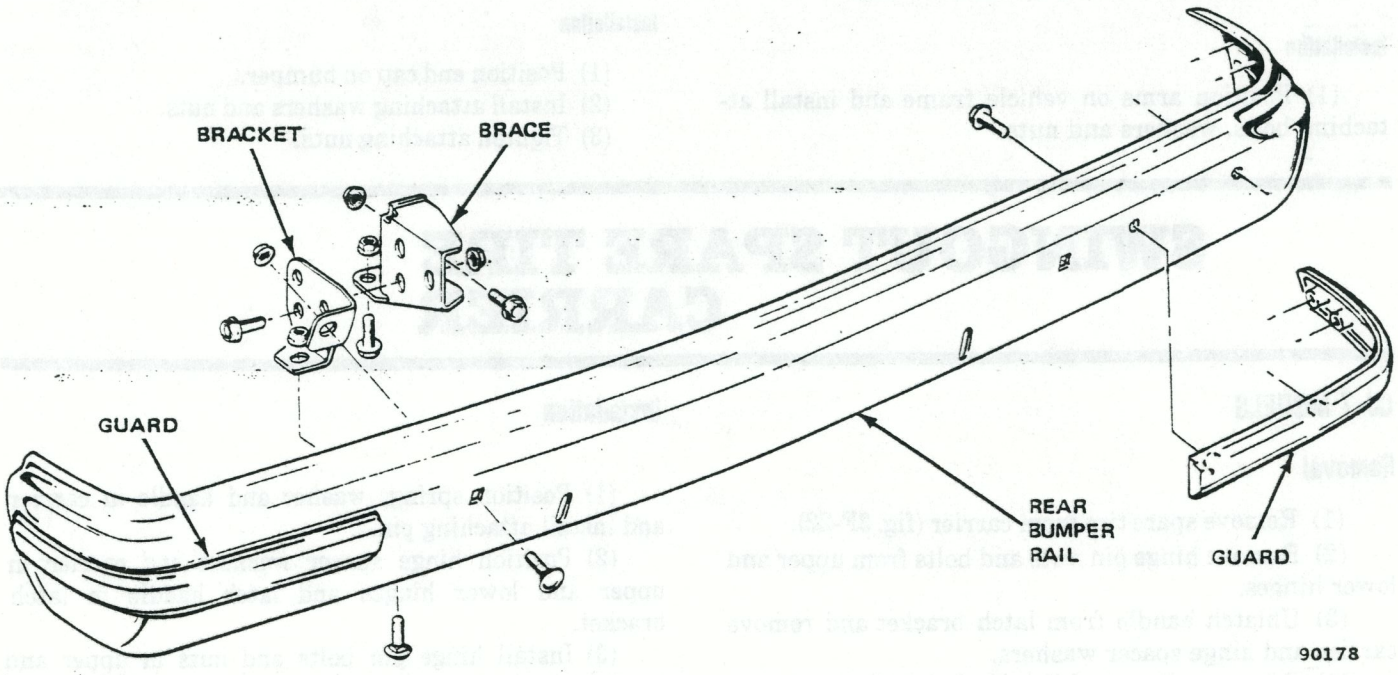


Fig. 3F-20 Rear Bumper—Cherokee-Wagoneer Models

(3) Position horizontal bumper guards on bumper rail and mark hole locations on bumper rail.

(4) Center punch and drill 1/2-inch holes at marked locations.

(5) Position horizontal bumper guards on bumper rail and install screws attaching bumper guards to bumper rail.

NOTE: *Some filing of holes may be required for proper fit.*

(6) Position vertical bumper guards on bumper rail at desired locations and mark hole location on bumper rail.

(7) Center punch and drill 3/8-inch holes at marked locations.

(8) Position vertical bumper guards on bumper rail and install screws attaching bumper guards to bumper rail.

NOTE: *Some filing of holes may be required for proper fit.*

(9) Install bumper rail as described above.

Truck Models Rear Step Bumper

Removal

(1) Disconnect license lamp wiring (fig. 3F-21) from vehicle wiring.

(2) Remove nuts, washers and bolts attaching step bumper to arms.

(3) Remove step bumper from arms.

(4) Remove nuts, washers and bolts attaching arms to vehicle frame. Remove arms from vehicle.

Installation

(1) Position arms on vehicle frame and install attaching bolts, washers and nuts.

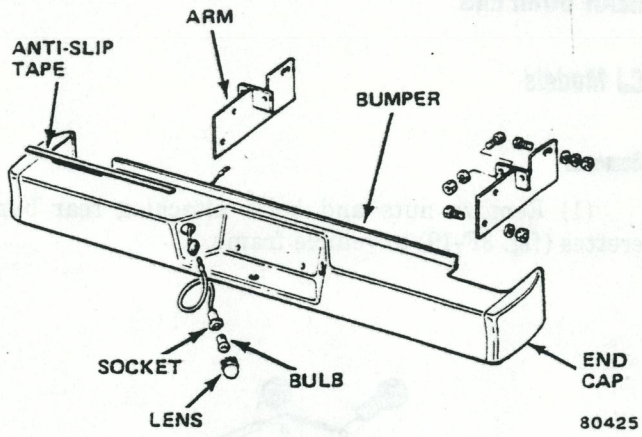


Fig. 3F-21 Rear Step Bumper—Truck Models

NOTE: *Do not tighten attaching hardware until complete bumper is installed on vehicle frame and properly aligned.*

(2) Position step bumper on arms and install attaching bolts, washers and nuts.

(3) Align bumper assembly and tighten all attaching hardware.

(4) Connect license lamp wiring to vehicle wiring.

End Cap

Removal

(1) Remove end cap attaching nuts and washers from studs.

(2) Remove end cap.

Installation

(1) Position end cap on bumper.

(2) Install attaching washers and nuts.

(3) Tighten attaching nuts.

SWINGOUT SPARE TIRE CARRIER

CJ-7 MODELS

Removal

(1) Remove spare tire from carrier (fig. 3F-22).

(2) Remove hinge pin nuts and bolts from upper and lower hinges.

(3) Unlatch handle from latch bracket and remove carrier and hinge spacer washers.

(4) Remove pin attaching latch handle to carrier and remove handle, spring and washer.

Installation

(1) Position spring, washer and handle in carrier and install attaching pin.

(2) Position hinge spacer washers and carrier in upper and lower hinges and latch handle in latch bracket.

(3) Install hinge pin bolts and nuts in upper and lower hinges.

(4) Install spare tire on carrier.

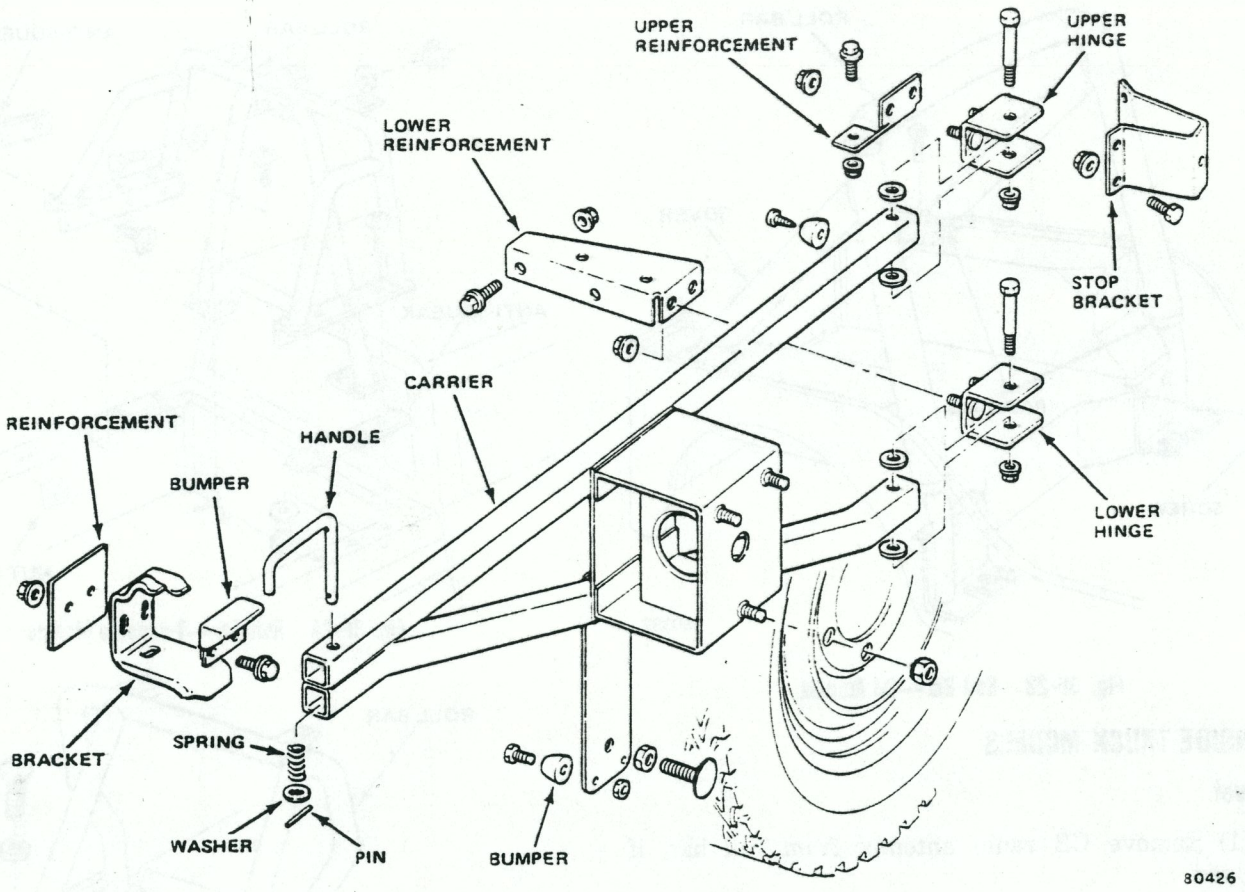


Fig. 3F-22 Swingout Spare Tire Carrier—CJ-7 Models

ROLL BARS

CJ MODELS

Removal

(1) Remove left front seat assembly.

(2) Remove hardtop or fold soft top back, if equipped.

(3) Tilt right front seat to forward position.

(4) Remove necessary carpeting, if equipped.

(5) Remove screws attaching roll bar to body (fig. 3F-23) using Torx Bit Tool J-25359-C.

(6) Heat area around mounting brackets (to soften sealer) with Heat Gun J-25070 and remove roll bar assembly.

Installation

(1) Position roll bar on body and align screw holes with body.

(2) Install screws attaching roll bar to body using Torx Bit Tool J-25359-C.

NOTE: *Do not tighten attaching screws until roll bar is completely installed and properly aligned.*

(3) Align roll bar assembly and tighten all attaching hardware using Torx Bit Tool J-25359-C.

(4) Install left front seat assembly.

(5) Install carpeting, if removed.

(6) Install hardtop or soft top, if equipped.

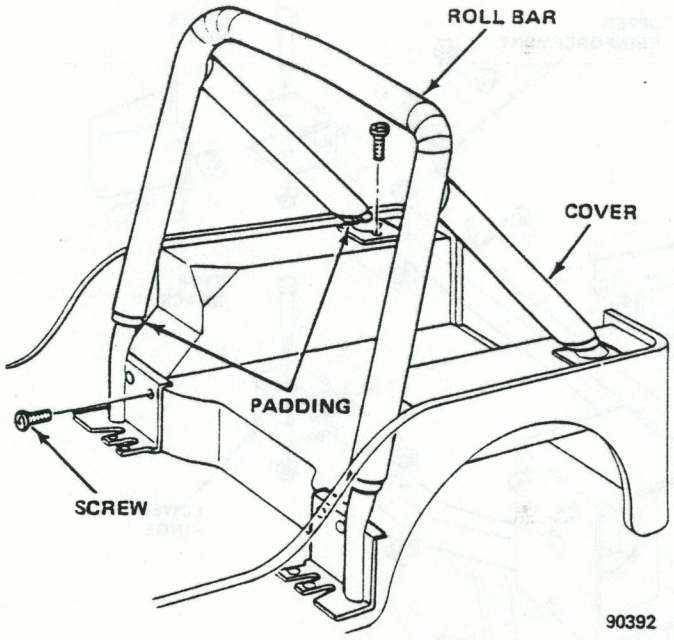


Fig. 3F-23 Roll Bar—CJ Models

TOWNSIDE TRUCK MODELS

Removal

(1) Remove CB radio antenna from roll bar, if equipped.

(2) Remove nuts, washers, bolts and nut plates (fig. 3F-24) attaching roll bar to side of pickup box, using Torx Bit Tool J-25359-C.

(3) Remove nuts, washers and bolts attaching roll bar to bed of pickup box, using Torx Bit Tool J-25359-C.

(4) Remove roll bar assembly and anti-squeak material from pickup box.

Installation

(1) Position anti-squeak material and roll bar assembly on pickup box.

(2) Install bolts, washers and nuts attaching roll bar to bed of pickup box, using Torx Bit Tool J-25359-C.

NOTE: *Do not tighten attaching hardware until roll bar is completely installed and properly aligned.*

(3) Install bolts, washers, nuts and nut plates attaching roll bar to side of pickup box.

(4) Align roll bar assembly and tighten all attaching hardware using Torx Bit Tool J-25359-C.

(5) Install CB radio antenna on roll bar, if equipped.

SPORT TRUCK MODELS

Removal

(1) Remove CB radio antenna from roll bar, if equipped.

(2) Remove wooden side rails, if equipped.

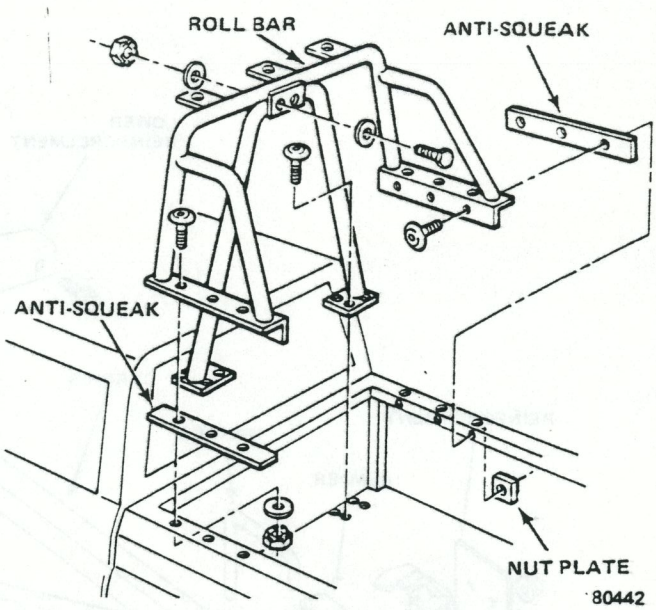


Fig. 3F-24 Roll Bar—Townside Models

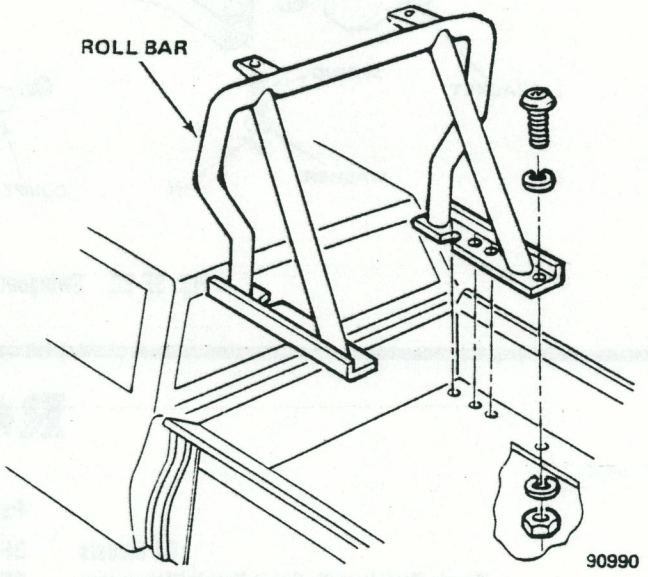


Fig. 3F-25 Roll Bar—Sport Truck Models

(3) Remove nuts, washers and bolts attaching roll bar to bed of pickup box, using Torx Bit Tool J-25359-C (fig. 3F-25).

(4) Remove roll bar assembly from pickup box.

Installation

(1) Position roll bar on bed of pickup box.

(2) Install bolts, washers and nuts attaching roll bar to bed of pickup box using Torx Bit Tool J-25359-C.

NOTE: *Do not tighten attaching hardware until roll bar is completely installed and properly aligned.*

(3) Align roll bar assembly and tighten all attaching hardware using Torx Bit Tool J-25359-C.

(4) Install wooden side rails, if equipped.

(5) Install CB radio antenna on roll bar, if equipped.

BRUSH GUARDS

CHEROKEE-TRUCK MODELS

Removal

(1) Disconnect and remove fog lamps, if equipped.

(2) Remove bolts and washers attaching brush guard (fig. 3F-26) to frame rails.

(3) Remove nuts and bolts attaching brush guard to bumper bolts and remove brush guard.

Installation

(1) Position brush guard on bumper and install attaching bolts and nuts.

NOTE: *Do not tighten attaching hardware until complete brush guard is assembled on vehicle and properly aligned.*

(2) Install bolts and washers attaching brush guard to frame rails.

(3) Align brush guard assembly and tighten all attaching hardware.

(4) Install and connect fog lamps, if equipped.

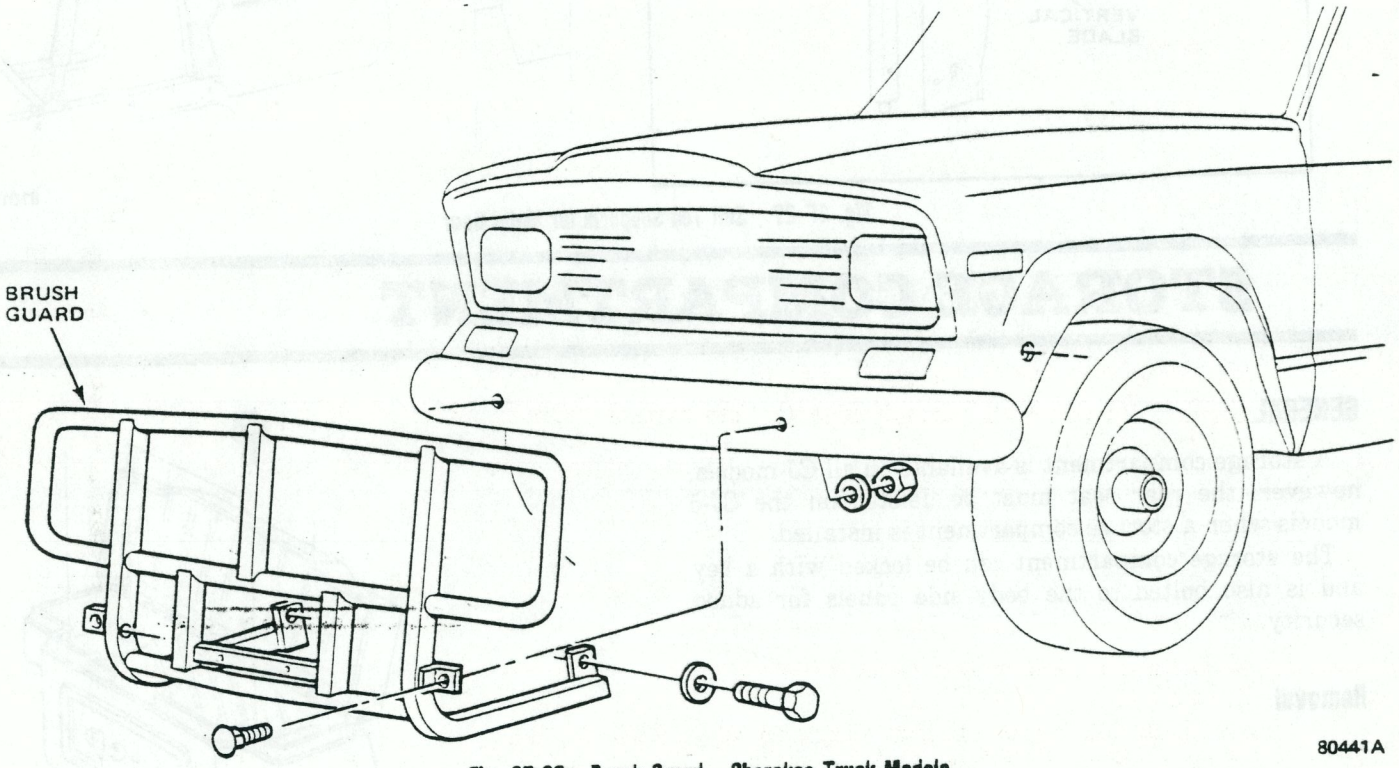


Fig. 3F-26 Brush Guard—Cherokee-Truck Models

SOFT TOP WITH METAL DOORS—CJ MODELS

GENERAL

A soft top with metal doors is available on the CJ-7 models. This option offers the convenience of a soft top with the security of metal doors. The adjustment of the doors remains the same as if equipped with a hard top.

See Chapter 3J for door and window service procedures.

It is possible to adjust the soft top at the rear of the door to achieve an air-tight seal between door and soft top.

ADJUSTMENT

(1) Unsnap soft top from vertical support blade (fig. 3F-27).

(2) Loosen adjusting screws.

(3) Reposition vertical support blade.

(4) Tighten adjusting screws.

(5) Reposition and snap soft top into place.

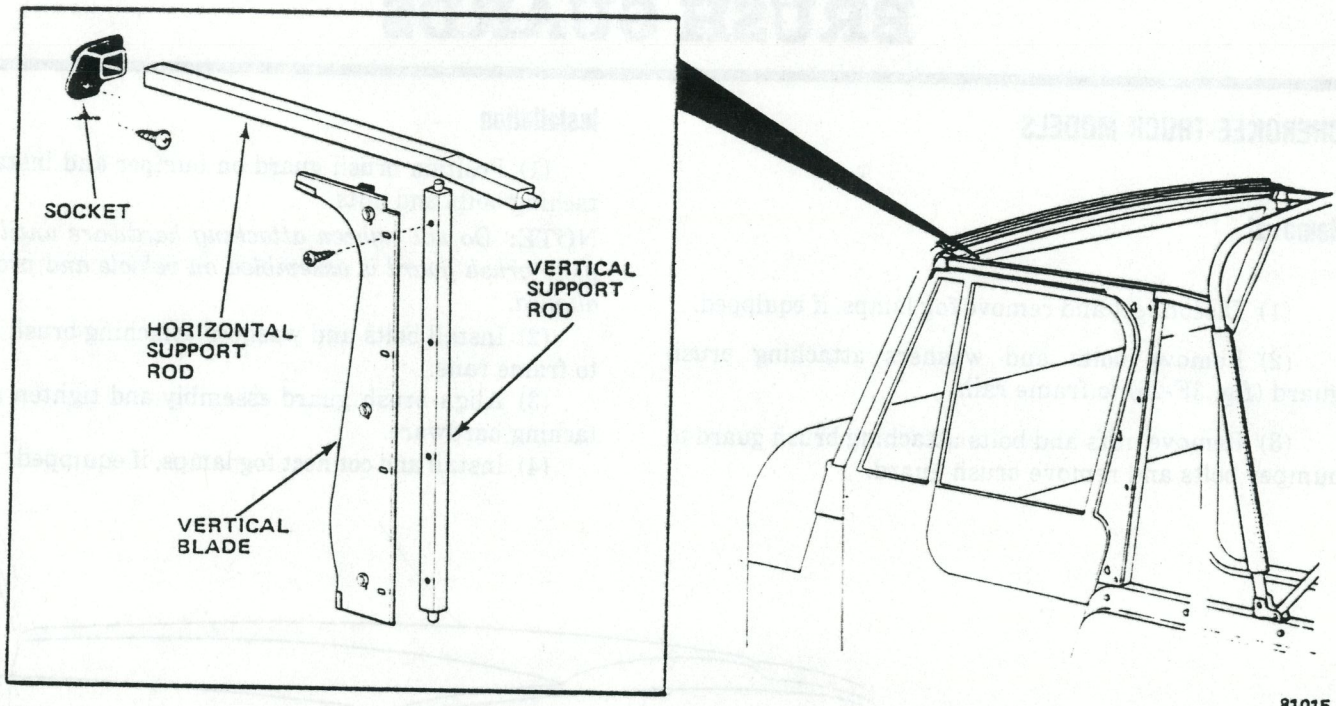


Fig. 3F-27 Soft Top Supports for Metal Door

STORAGE COMPARTMENT

GENERAL

A storage compartment is available on all CJ models, however, the rear seat must be deleted on the CJ-5 models when a storage compartment is installed.

The storage compartment can be locked with a key and is also bolted to the body side panels for added security.

Removal

(1) Open storage compartment and remove attaching screws and washers shown in figure 3F-28.

(2) Remove storage compartment assembly.

(3) Remove rubber washers from wheelhouse.

Installation

(1) Position rubber washers on storage compartment mounting holes.

(2) Position storage compartment assembly in vehicle and align holes with rubber washers and holes in wheelhouse.

(3) Install storage compartment attaching screws and washers, tighten to 10 to 15 foot-pounds torque.

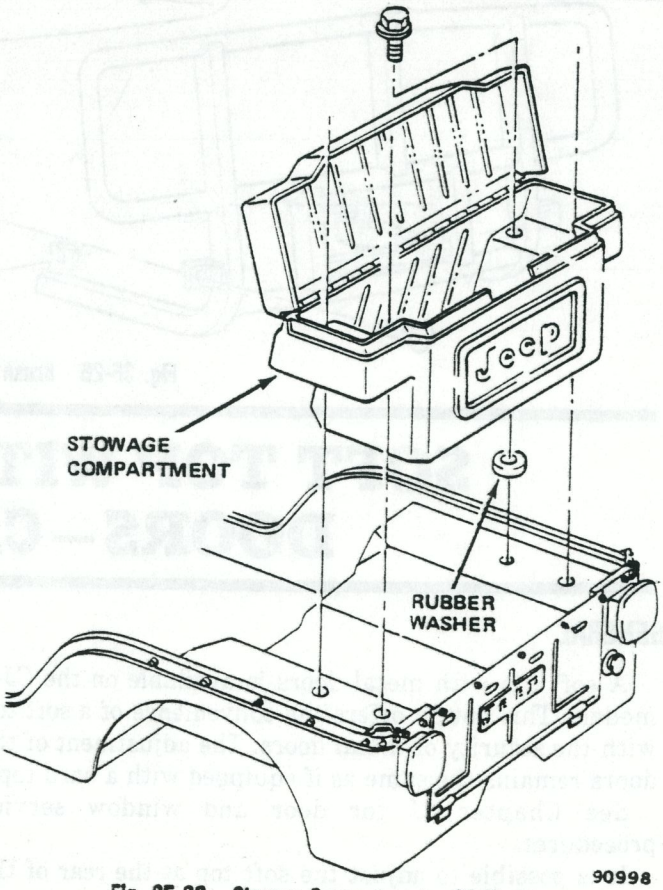


Fig. 3F-28 Storage Compartment—CJ Models

LOCK CYLINDER

Removal

(1) Open storage compartment and remove screw retaining lock rods.
(2) Remove lock rods from lock cylinder.
(3) Remove nut from lock cylinder.
(4) Remove lock cylinder.

Installation

(1) Position lock cylinder into storage compartment.
(2) Install nut on lock cylinder and tighten.
(3) Install lock rods onto lock cylinder and tighten retaining screw.

WOODEN RAILS— SPORT TRUCK MODEL

GENERAL

Wooden front and side rails are available for the Sport Truck models equipped with a roll bar. They are installed in the stake pockets and retained with special screws. The key type wrench located in the glove box or Torx Bit Tool J-25359-C may be used to remove the screws.

Removal

(1) Remove attaching screws from pickup box (fig. 3F-29) using Torx Bit Tool J-25359-C or key wrench located in glove box.
(2) Disengage side rails from roll bar bracket.
(3) Remove side rail assemblies.
(4) Remove front rail assembly.

Installation

(1) Position front rail assembly in pickup box stake pockets.
(2) Position side rail assemblies in pickup box stake pockets making sure end brackets are located in roll bar brackets.
(3) Install and tighten attaching screws using Torx Bit Tool J-25359-C or key wrench located in glove box.

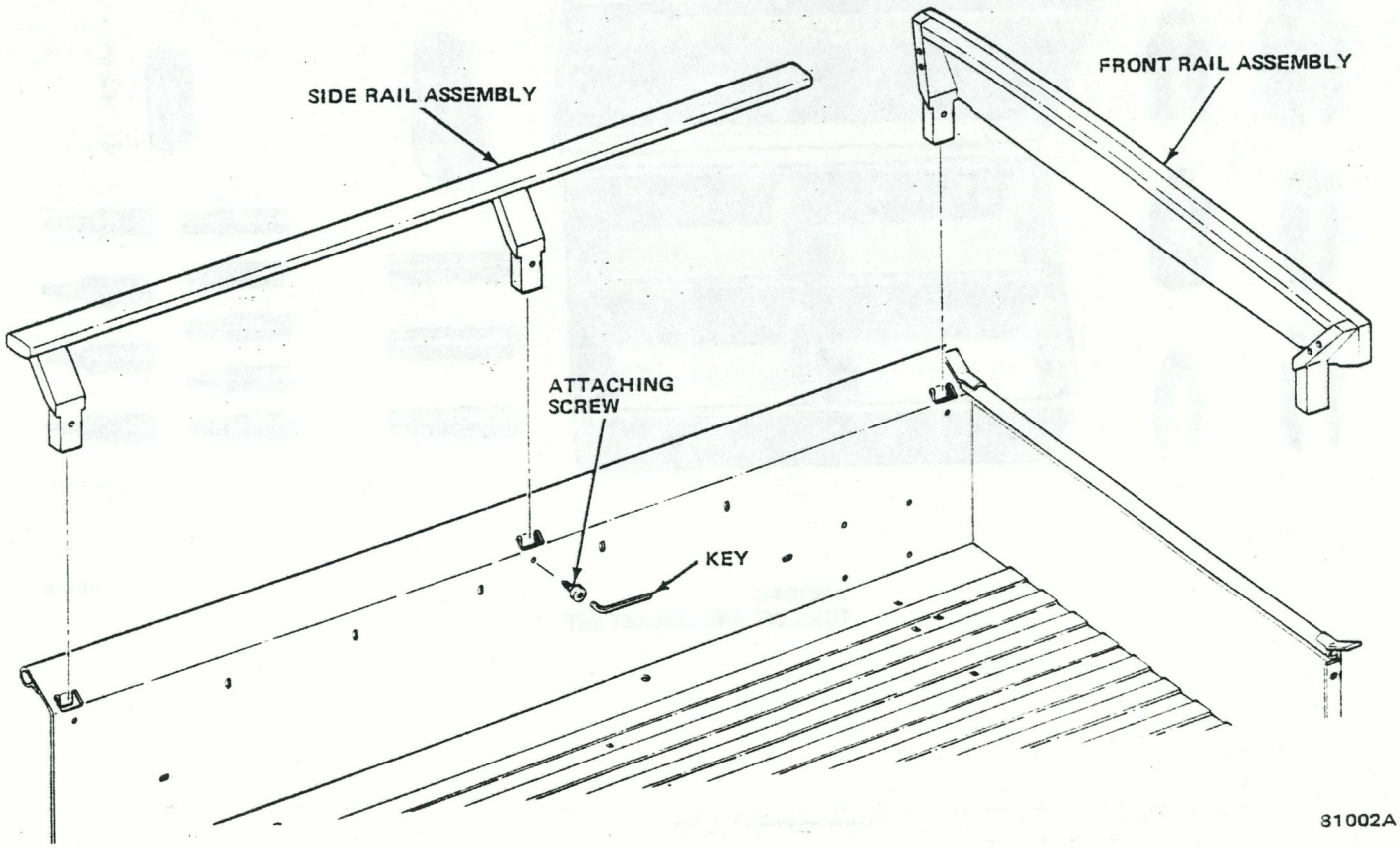
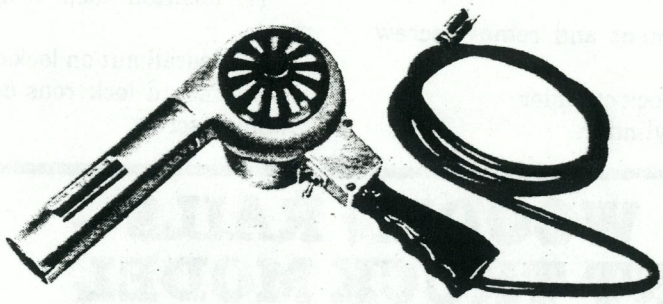


Fig. 3F-29 Wood Rails—Sport Truck Models

Tools



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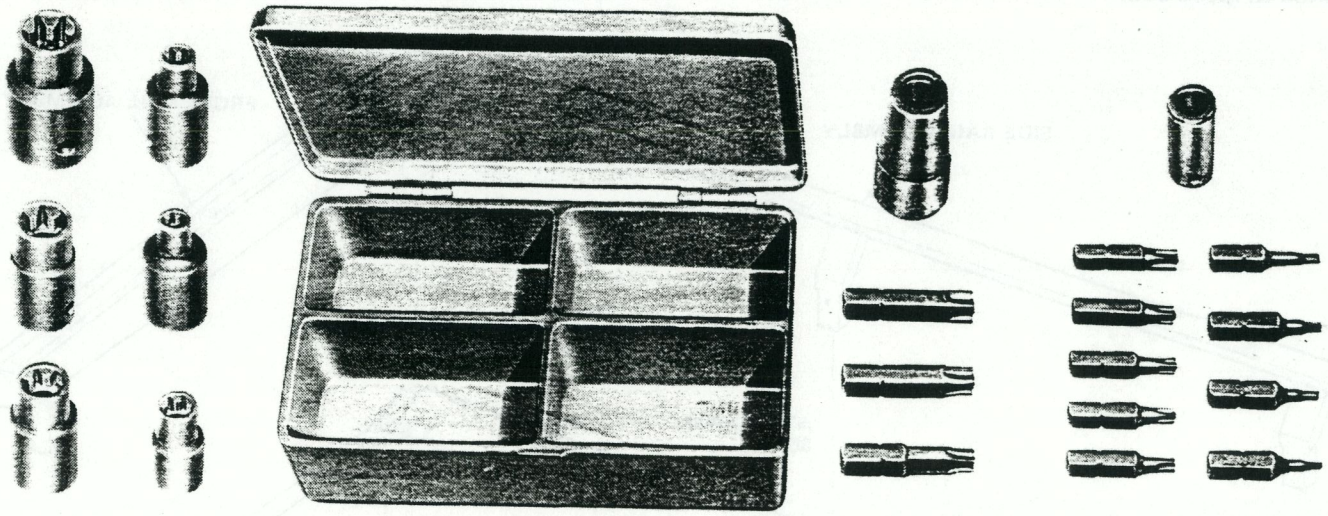
J-25070 HEAT GUN



J-25359-C
TORX BIT AND SOCKET SET

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