

SUSPENSION - FRONT

Article Text

1994 Celsior/Lexus LS 400

For Lextreme

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ARTICLE BEGINNING

1990 SUSPENSION

Front

ES250, LS400

DESCRIPTION

ES250 suspension is MacPherson strut-type independent suspension, consisting of stabilizer with integrated strut bar, lower arm, performance rod and shock absorbers using coil spring and suspension link.

LS400 suspension is a double wishbone-type independent suspension consisting of coil spring, shock absorber, stabilizer bar upper and lower wishbone arms.

NOTE: This article covers conventional suspension. Servicing procedures DO NOT apply to electronic-modulated suspensions.

WHEEL BEARINGS ADJUST (ES250)

ES250

1) Remove cotter pin and lock nut cap. Before removing disc brake caliper, loosen bearing lock nut while an assistant steps on brake pedal.

2) Remove caliper retaining bolts. Remove caliper from steering knuckle. Suspend caliper with wire. Place match marks on disc and hub. Remove disc from hub. Check bearing play in axial direction with a dial indicator. Maximum bearing play should be .002" (.05 mm).

3) Check axle hub runout. Maximum hub runout should be .0028" (.07 mm). If bearing play is excessive, replace axle bearing. If hub runout is excessive, replace hub. See WHEEL BEARINGS, HUB & KNUCKLE R & L.

WHEEL BEARINGS ADJUST (LS400)

LS400

1) Remove front wheels. Remove 2 front brake caliper retaining bolts and caliper. Suspend caliper using wire. Place match marks on disc and axle hub for reassembly reference. Remove disc.

2) Check bearing play in axial direction with a dial indicator. Maximum bearing play should be .002" (.05 mm). If bearing play is excessive, replace axle bearing. If hub runout is excessive, replace hub. See WHEEL BEARING, HUB & KNUCKLE ASSEMBLY R & L.

BALL JOINT CHECKING

1) Raise vehicle and place 8 inch (203 mm) wooden block under one front tire. Lower vehicle until there is approximately 1/2 load on one coil spring. Place jack stands under vehicle. Ensure wheels are in straight forward position.

2) Move lower arm up and down. Check vertical ball joint play movement. See BALL JOINT MOVEMENT SPECIFICATIONS table. If movement exceeds specification, replace ball joint. See BALL JOINT R & I.

BALL JOINT MOVEMENT SPECIFICATIONS

Application In. (mm)

ES250 Zero

LS400012 (.3)

STABILIZER BAR R & I (ES250)

Removal (ES250)

1) Remove 2 bolts and 2 nuts from suspension lower crossmember. Remove lower crossmember. See Fig. 1. Remove nuts and retainer holding stabilizer bar to lower suspension arms. Remove stabilizer bar brackets.

2) Remove 2 engine under covers. On automatic transmission models, remove control cable clamp bolts from engine center mount member. On all models, remove 6 engine center mount-to-center member bolts. Remove 4 center member-to-frame member bolts. Pull stabilizer bar from lower suspension arms. Remove retainers and spacers from stabilizer bar.

Installation

1) Install spacers and retainers to stabilizer bar. Install stabilizer bar to lower suspension arms. Install stabilizer bar bracket with cushions. Tighten stabilizer bar bracket nuts to specification.

2) Install engine center member bolts. Tighten 6 retaining engine center mount-to-center member bolts to specification. See TORQUE SPECIFICATIONS table at end of article. Tighten 4 center member-to-frame member bolts to specification. Install lower suspension crossmember.

3) Tighten crossmember bolts and nuts to specification.

SUSPENSION - FRONTArti

Tighten stabilizer mounting nuts to specification. Check wheel alignment. See WHEEL ALIGNMENT section. See Fig. 1.

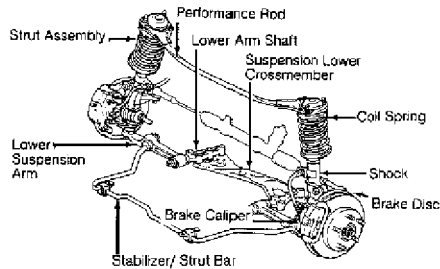


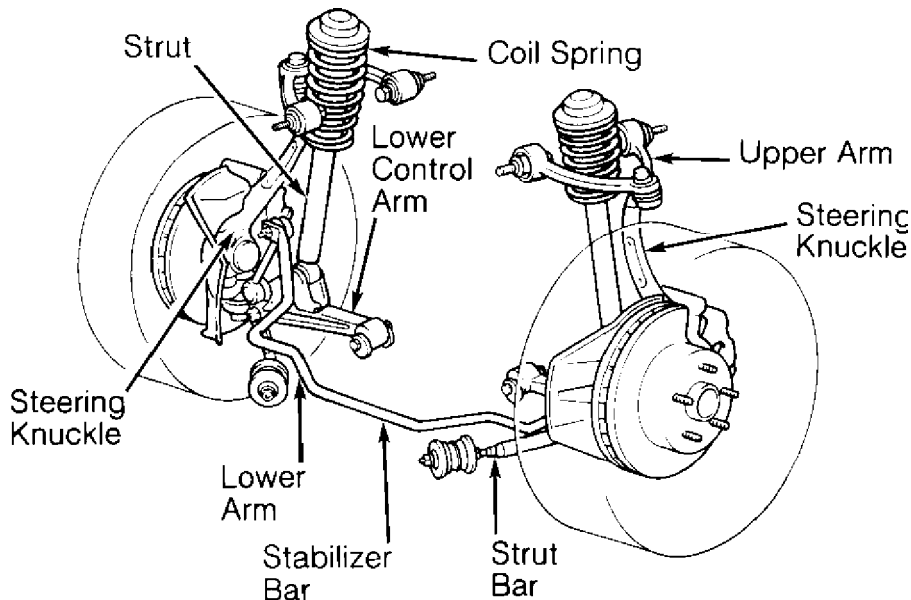
Fig. 1: Identifying Front Suspension Components (ES250)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

STABILIZER BAR R & I (IS400)

Removal & Installation (LS400)

1) Remove steering knuckle with axle hub. See WHEEL BEARING, HUB & KNUCKLE ASSEMBLY removal. Remove shock absorber lower bracket. Disconnect 2 nuts from strut bar at lower control arm. See Fig. 2. Remove 3 nuts from strut bar cushion. Remove strut bar with cushion. Remove right and left stabilizer bar brackets. Remove strut bar bracket with stabilizer bar.

2) To install, reverse removal procedures. See TORQUE SPECIFICATIONS table at end of article. See WHEEL ALIGNMENT section.



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Fig. 2: Identifying Front Suspension Components (LS400)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

WHEEL BEARING, HUB & KNUCKLE ASSEMBLY R & I (ES250)

Removal (ES250)

1) Remove cotter pin and lock nut cap. Before removing disc brake caliper, loosen bearing lock nut while an assistant steps on brake pedal. Remove rotor attaching bolts. Remove disc brake caliper from steering knuckle. Suspend caliper aside with wire. Place match marks on disc and hub for reassembly reference. Remove disc from hub.

2) Check bearing play in axial direction with a dial indicator. If bearing play is excessive, replace axle bearing. Check hub runout. If hub runout is excessive, replace hub. See WHEEL BEARINGS ADJUST.

3) Remove ABS speed sensor from steering knuckle. Remove 2 lower bolts and disconnect steering knuckle. Remove cotter pin and nut. Using Ball Joint Puller (09628-62011), disconnect tie rod end from steering knuckle. Remove steering knuckle.

4) Using a plastic-faced hammer, tap drive shaft and remove steering knuckle. Place knuckle in a soft-jawed vise. Remove inner grease seal. Remove bearing snap ring from knuckle. Remove 3 brake dust shield bolts. Remove dust cover. Using Universal Puller (099950-20017), push axle hub from knuckle. Remove inner bearing race from bearing.

5) Using a Torx (T30), remove speed sensor rotor from axle hub. Using universal puller, remove inner bearing outside race from axle hub. Using a screwdriver, remove outer grease seal. Place inner race outside of bearing being removed. Press bearing race from steering knuckle.

Installation

1) Always replace wheel bearing as a complete assembly. Install ABS speed sensor rotor with a Torx (T30) on hub. Press new bearing into steering knuckle with Steering Knuckle Oil Seal Replacer (09608-32010). Install outer grease seal.

2) Install brake dust shield. Apply moly grease on grease seal lips. Using Countershaft Bearing Replacer (09310-35010), press axle hub into steering knuckle. Install snap ring in steering knuckle. Rotate and insert side lips of new grease seal into oil seal replacer and tap grease seal into steering knuckle. Using oil seal replacer, drive dust deflector into steering knuckle.

3) Install steering hub and knuckle assembly onto drive axle. Connect steering knuckle to shock absorber lower bracket. Tighten shock mount bolts to specification. See TORQUE SPECIFICATIONS table at end of article. Connect tie rod end to steering knuckle. Tighten castle nut to specification. If cotter pin will not go through castle

SUSPENSION - FRONT Article Text (printed) DO NOT use for extreme
castle nut.

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4) Tighten lower ball joint mounting bolts to specification. Connect ABS speed sensor. Install brake disc on hub reference disassembly marks. Install disc brake caliper on steering knuckle. Install bearing lock nut while an assistant depresses brake pedal. Install lock cap and new cotter pin. Check front end alignment. See WHEEL ALIGNMENT section.

WHEEL BEARING, HUB & KNUCKLE ASSEMBLY R & I (LS400)

Removal (LS400)

1) Raise and support vehicle. Pry off grease cap from rear of steering knuckle. See Fig. 3. Using a chisel and hammer, unstake nut. While applying brakes, loosen axle shaft nut.

2) Remove brake caliper and rotor. Remove 2 retaining bolts and steering knuckle from lower ball joint. Using Ball Joint Puller (09628-62011), press steering knuckle off upper ball joint. Remove steering knuckle and hub.

3) Place steering knuckle and hub in a soft-jawed vise. Remove axle nut and ABS speed sensor rotor. DO NOT scratch speed sensor rotor serrations. Turn knuckle over in vise, remove 4 brake dust cover bolts.

4) Press axle shaft from knuckle with Universal Puller (09950-20017). Remove inner bearing race from axle shaft with universal puller. Remove grease seal with Oil Seal Puller (09308-00010). Remove snap ring from knuckle. Place inner race outside of bearing being removed. Press bearing race from steering knuckle.

Installation

1) Using Axle Hub and Drive Pinion Bearing Tool Set (09608-35014), press new bearing into steering knuckle. Install snap ring in steering knuckle. Using Steering Knuckle Oil Seal Replacer (09608-32010), press in new grease seal until flush with steering knuckle surface. Install dust cover on steering knuckle.

2) Using steering knuckle oil seal replacer and axle hub and drive pinion bearing tool set, press axle hub into steering knuckle. Install speed sensor rotor. Install a new nut on axle hub and temporarily tighten nut by hand. Completely torque nut once rotor and caliper are on steering knuckle.

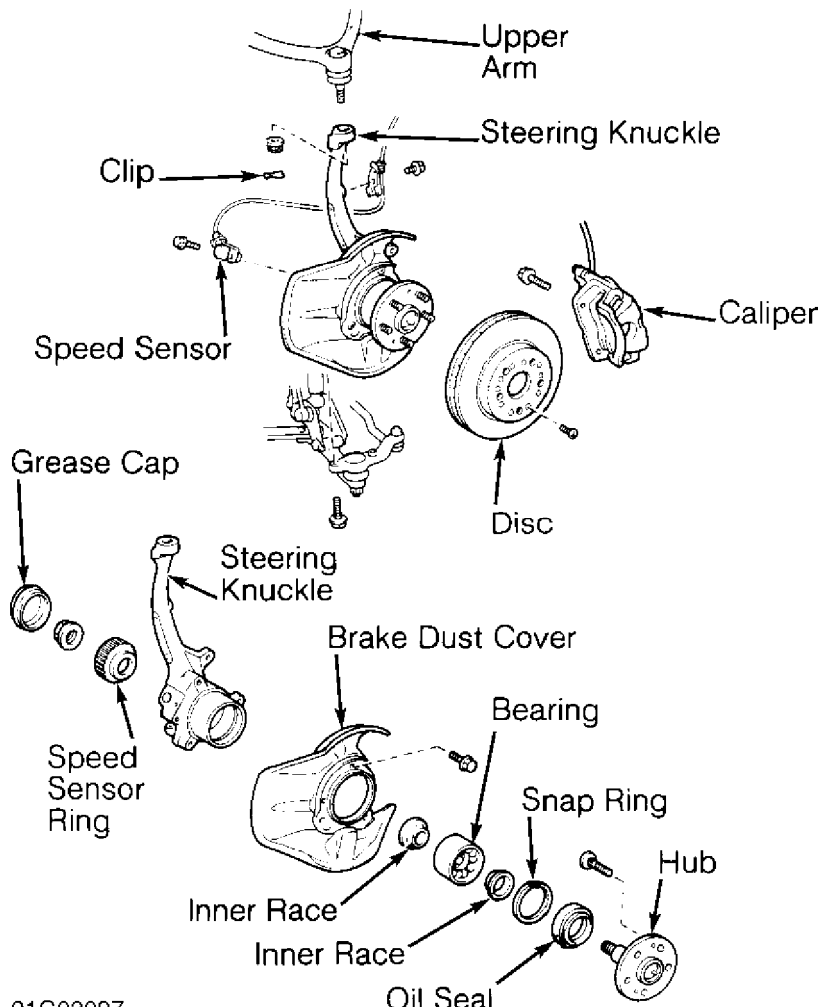
3) Install steering knuckle to lower ball joint. Temporarily tighten 2 retaining bolts. Install steering knuckle to upper arm. Tighten steering knuckle to specification. See TORQUE SPECIFICATIONS table at end of article. Tighten 2 lower ball joint bolts to specification. Install brake rotor. Reference match marks made during disassembly. Install brake caliper. Tighten caliper retaining bolts to specification.

4) Tighten axle nut to specification. See TORQUE SPECIFICATIONS table at end of article.

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with a punch. Install grease cap. Install speed sensor on steering knuckle. Install front wheels and lower vehicle. Tighten lug nuts to specification. Check wheel alignment. See WHEEL ALIGNMENT section.



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Fig. 3: Exploded View of Steering Knuckle (LS400)
Courtesy Of Courtesy of Toyota Motor Sales, U.S.A., Inc

STRUT ASSEMBLY R & I (ES250)

WARNING: Hydraulic system may be under high pressure. Use caution when opening hydraulic system.

Removal (ES250)

Disconnect ABS speed sensor wire from strut assembly. Remove brake hose union bolt from brake caliper. See Fig. 4. Remove brake line "C" clip from strut assembly. Disconnect steering knuckle from strut assembly. Remove 3 strut-to-suspension support tower nuts. Remove strut assembly from vehicle.

Disassembly

1) Clamp strut assembly securely in vise at lower mounting bracket. Install a coil spring compressor on strut spring and compress spring. Remove shock absorber center nut from spring seat.

2) Remove suspension support, spring seat, insulator and bumper from strut tower. Replace shock absorber as a complete assembly. Slowly loosen ring nut 2-3 turns to release gas pressure before discarding shock absorber.

Assembly

1) Place shock absorber securely in vise. Install lower insulator and spring bumper on shock absorber piston rod. Align coil spring end with lower seat hollow. Install spring upper insulator on piston rod. Face upper insulator OUT mark facing outside of vehicle.

2) Install dust seal on spring seat. Pack suspension support with moly grease. Install suspension support. Tighten new suspension support nut to specification.

Installation

1) Install strut assembly in vehicle. Install 3 strut retaining nuts. Tighten strut assembly retaining to specification. See TORQUE SPECIFICATIONS table at end of article. Connect steering knuckle to strut assembly. Tighten strut-to-steering knuckle retaining bolts to specification.

2) Place brake hose through strut support bracket and replace "C" clip. Connect brake hose with union bolt (use new gaskets) to brake caliper. Tighten union bolt to specification. Bleed brake lines. Replace wheels and lower vehicle. See WHEEL ALIGNMENT. See Fig. 4.

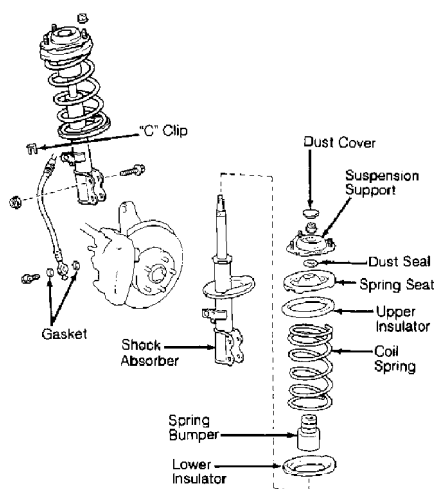


Fig. 4: Exploded View of Strut Assembly (ES250)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

STRUT ASSEMBLY R & I (LS400)

Removal (LS400)

Jack up vehicle and remove wheels. Remove cotter pin and nut from steering knuckle upper ball joint with ball joint press. Use tie wire to keep steering knuckle load off brake line. Remove lower strut-to-steering knuckle bolt. Loosen, but DO NOT remove, center shock absorber nut. Remove 3 strut retaining nuts and strut assembly from vehicle.

Disassembly & Assembly

- 1) Carefully compress coil spring with spring compressor. Remove shock absorber center nut. Remove suspension support, coil spring and spring bumper. Remove insulator from shock absorber rod.
- 2) Replace shock absorber as a complete unit. Install insulator to suspension support. Match bolt of suspension support with cutout part of insulator. Install spring bumper on shock absorber.
- 3) Install compressed spring over extended shock absorber rod. Ensure spring end is seated in strut spring support stop. Install suspension support to tie rod. Temporarily tighten new center shock absorber nut. Align one suspension support stud perpendicular to lower shock absorber mounting bolt. Remove spring compressor from strut assembly.

Installation

- 1) Install strut assembly into vehicle shock tower. Tighten 3 retaining bolts to specification. Tighten center shock absorber nut to specification. Install lower shock absorber bolt to steering knuckle. Tighten lower shock absorber nut to specification.
- 2) Install upper steering knuckle ball joint nut. Tighten upper steering knuckle nut to specification. Install new cotter pin. Check wheel alignment. See WHEEL ALIGNMENT.

LOWER CONTROL ARM & BALL JOINT R & I (ES250)

Removal (ES250)

- 1) Remove nut and cotter holding stabilizer bar to lower suspension arm. Remove lower suspension arm shaft-to-lower suspension arm shaft nut. Remove 2 bolts and disconnect lower ball joint. Remove lower arm shaft mounting nut and bolt.
- 2) Remove 2 bolts, nuts and suspension lower crossmember. Remove lower arm shaft mounting nut and bolt. Remove lower arm with lower arm shaft. Remove cotter pin and nut from lower ball joint. Remove lower ball joint from suspension arm.

Installation

1) Install lower ball joint to lower arm with castle nut and secure it with a new cotter pin. Tighten ball joint nut to specification. See TORQUE SPECIFICATIONS table at end of article. Temporarily install lower arm mounting nut with retainer.

2) Insert lower arm on stabilizer bar. Install lower arm shaft to body. Temporarily install a new nut and cotter pin. Hold stabilizer bar to lower arm. Install lower arm shaft-to-body bolt and tighten to specification. Connect lower ball joint to steering knuckle with 2 bolts.

3) Tighten ball joint bolts to specification. Install and tighten crossmember nuts and bolts to specification. Tighten lower suspension stabilizer bar to lower suspension arm to specification. Replace wheels and lower vehicle. Check wheel alignment. See WHEEL ALIGNMENT.

LOWER CONTROL ARM & BALL JOINT R & I (LS400)

Removal (LS400)

1) Raise and support vehicle. Remove front wheels. Remove brake caliper. Remove steering knuckle with axle hub. See WHEEL BEARING, HUB & KNUCKLE ASSEMBLY.

2) Remove strut as an assembly. See STRUT ASSEMBLY R & I. Remove cotter pin and nut from tie rod steering knuckle arm.

3) Remove tie rod using tie rod press tool. Remove shock absorber lower bracket. Remove 2 nuts and disconnect strut bar from lower arm. Place match marks at camber adjusting cam for reassembly reference. Remove nut, adjusting cam and lower arm with ball joint.

Installation

To install, reverse removal procedure. Ensure camber adjusting cam match marks align. Tighten fasteners to specifications. See TORQUE SPECIFICATIONS table at end of article. Check wheel alignment. See WHEEL ALIGNMENT.

LOWER CONTROL ARM BUSHING R & I (ES250)

Removal & Installation (ES250)

Remove lower control arm. See LOWER CONTROL ARM & BALL JOINT R & I in this article. Measure distance bushing protrudes from control arm. Press bushing from lower control arm. To install, press bushing into control arm. To complete installation, reverse removal procedure. See TORQUE SPECIFICATIONS table at end of article.

SUSPENSION - FRONTArticle Text (p. 9)1990 Lexus LS 400

LOWER CONTROL ARM BUSHING R & I (LS400)

Removal (LS400)

Raise vehicle and remove front wheels. Remove lower control arm. See LOWER CONTROL ARM & BALL JOINT R & L. Place control arm in a vise. Bend up bushing flange tab with a chisel and hammer. Support lower control arm on a press. Press bushing from lower control arm with suitable press tool.

Installation

Place new bushing over control arm on press. Press bushing into control arm. Ensure bushing is centered in control arm. To install, reverse removal procedure. See TORQUE SPECIFICATIONS table at end of article.

UPPER CONTROL ARM & BALL JOINT R & I (LS400)

Removal & Installation (LS400)

Remove strut assembly from vehicle. See STRUT ASSEMBLY R & I.
Remove 2 upper control arm bolts. Place upper control arm in press.
Press ball joint from upper control arm. To install, reverse removal
procedure. Install upper control arm and tighten 2 retaining bolts to
specification. Install strut assembly.

TORQUE SPECIFICATIONS (ES250)

TORQUE SPECIFICATION (ES250)

Application		Ft. Lbs. (N.m)

Ball Joint Nut 90 (123)
 Center Member Bolts-to-Frame Member 29 (39)
 Engine Center Mount 32 (43)
 Lower Arm Shaft-to-Body 153 (207)
 Lower Arm Shaft-to-Suspension Arm 156 (212)
 Lower Ball Joint Mounting
 Bolt-to-Steering Knuckle 83 (113)
 Lower Ball Joint-to-Lower
 Suspension Arm 90 (123)
 Lower Suspension Crossmember Bolts 153 (207)
 Lower Suspension Crossmember Nut 153 (207)
 Lug Nuts 76 (103)
 Shock Mount Bolts 224 (304)
 Stabilizer Bar Bracket Nut 94 (127)
SUSPENSION - FRONT

Suspension Arm	156 (212)
Steering Knuckle Retaining Bolts	224 (304)
Strut Assembly Retaining	47 (64)
Suspension Support Nut	34 (47)
Union Bolt-to-Brake Caliper	22 (30)
AA	

TORQUE SPECIFICATIONS (LS400)

TORQUE SPECIFICATIONS (LS400)	
AA	
Application	Ft. Lbs. (N.m)
Axle Shaft Nut	147 (199)
Caliper Retaining Bolts	87 (118)
Camber Adjusting Cam Nut	185 (251)
Center Shock Absorber Nut	20 (27)
Lower Ball Joint Mounting Bolts	83 (113)
Lower Ball Joint-to-Lower Arm	112 (152)
Lower Suspension Stabilizer	
Bar-to-Suspension Arm	156 (212)
Lower Shock Absorber	
Bolt-to-Steering Knuckle	106 (143)
Lug Nuts	76 (103)
Shock Absorber Bracket	
Inner Bolt-to-Lower Arm	43 (59)
Outer Bolt-to-Lower Arm	83 (113)
Stabilizer Bar Link Nut	70 (95)
Stabilizer Bar Bushing	21 (28)
Steering Knuckle	48 (65)
Strut Assembly Retaining	27 (36)
Strut Bar Assembly Retaining Bolts	59 (80)
Strut Bar-to-Lower Arm Nuts	121 (164)
Strut Bar (Front Nut)	87 (118)
Union Bolt-to-Caliper	22 (30)
Upper Ball Joint Nut	83 (113)
Upper Ball Joint-to-Steering Knuckle	48 (65)
Upper Control Arm Retaining Bolts	83 (113)
Upper Steering Knuckle Nut	48 (65)
AA	

END OF ARTICLE