GROUP 12A
FRONT SUSPENSION

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The front suspension uses the strut type suspension which has a shock absorber made integral with a knuckle spindle and mounted with a coil spring. It is fixed to the wheelhouse at its upper end and to the steering knuckle arm (wheel spindle) at its lower end. The strut assembly is provided with an oilless ball bearing at its upper end and ball joint at its lower end to allow smooth swing of the steering knuckle.

The front wheel camber and caster angles are prefixed and require no alignment.

Up and down motions of the car as the car wheels encounter irregularities in the road are absorbed by the coil spring installed on the respective shock absorbers and rebound of the coil springs is absorbed by the shock absorbers. A stabilizer bar is provided with the front suspension system to minimize roll.

### Front Suspension Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspension system</td>
<td>Strut type</td>
</tr>
<tr>
<td>Coil spring (Wire dia. x O. D. x Free length - Effective number of loops)</td>
<td>0.472 x 5.591 x 13.481 in. - 4.75</td>
</tr>
<tr>
<td>Shock absorber, type and cylinder I. D.</td>
<td>Hydraulic double-acting cylinder type 1.26 in.</td>
</tr>
<tr>
<td>Stabilizer dia.</td>
<td>0.7 in.</td>
</tr>
</tbody>
</table>

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(1) Strut insulator assembly  (4) Knuckle arm  (7) Lower arm assembly  
(2) Front spring  (5) Stabilizer  (8) Lower arm shaft  
(3) Strut assembly  (6) Ball joint  (9) Stabilizer link kit

**Fig. 1 Front Suspension Components**
of the car body. Highly rigid shaped steel lower arms protect the front suspension from shocks applied to them along the longitudinal axis of the car.

SEC. 1 SUSPENSION

1. Removal and Installation

1-1 Removal

(1) Remove the front wheel, and then the caliper ass'y, front hub with disk wheel and dust cover.

(2) Disconnect the stabilizer link and the lower arm. Remove the strut assembly, knuckle arm and strut insulator retaining bolts and remove the strut assembly from the wheelhouse. (Fig. 2)

(3) Using the tie rod end puller (Special Tool CT-1116), disconnect the steering knuckle arm and the tie rod ball joint. (Fig. 3)

(4) Using the knuckle arm puller (Special Tool CT-1104), disconnect the knuckle arm and the lower arm ball joint. (Fig. 4)

(5) Remove the bolts installing the lower arm to the sub-frame, and remove the lower arm assembly.

(6) Remove the stabilizer bracket frame retaining bolts and remove the stabilizer.

1-2 Installation

(1) Securely install the lower arm assembly to the cross member by tightening the special nut to the specified torque. The special nut should be installed with the chamfered end directed toward the round surface of the bracket. (Fig. 5)

<table>
<thead>
<tr>
<th>Part to be tightened</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower arm-to-cross member nut</td>
<td>51 to 57 ft-lbs.</td>
</tr>
</tbody>
</table>

(2) Tighten the steering knuckle arm to the lower arm ball joint to the specified torque.
(3) Secure the top of the strut assembly to the strut assembly mounting bracket on the wheelhouse. Subsequently, after applying a sealant (THREE-BOND No. 4) to the lower end of the assembly, connect it with bolts to the knuckle arm with the dowel pins registering in their holes in the arm's flange surface.

(4) Mount the stabilizer bracket with the rubber insulator on the stabilizer and retain the bracket to the frame. Then assemble the lower arm link with the lower arm.

(5) Install the backing plate assembly, brake drum/wheel hub assembly and then the front wheel.

NOTE: Cf. Group 11A, Section 1 and Section 4, and Group 14A, Section 2.

(6) Pack the strut upper bearing with grease and install the dust cap.

2. Disassembly and Reassembly

2-1 Lower Arm

2-1-1 Disassembly

(1) Remove the bolts from both ends of the lower arm to the wheelhouse and to the knuckle arm.

(2) Remove the bolts retaining stabilizer brackets to the frame.

(3) Remove the bolts retaining strut assembly to the wheelhouse and to the knuckle arm.

(4) Mount the stabilizer bracket with the rubber insulator on the stabilizer and retain the bracket to the frame. Then assemble the lower arm link with the lower arm.

(5) Install the backing plate assembly, brake drum/wheel hub assembly and then the front wheel.

NOTE: Cf. Group 11A, Section 1 and Section 4, and Group 14A, Section 2.

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(5) Install the backing plate assembly, brake drum/wheel hub assembly and then the front wheel.

NOTE: Cf. Group 11A, Section 1 and Section 4, and Group 14A, Section 2.

(6) Pack the strut upper bearing with grease and install the dust cap.
arm shaft, and using the lower arm shaft bushing adapter (Special Tool CT-1113A and CT-1113B) in combination with a ram press draw out the lower arm shaft together with the front bushing, with the ram applied to the front stopper. (Fig. 7)

(2) After removing the stopper rubber, remove the front bushing using the lower arm bushing installer (Special Tool CT-1114A and CT-1113B) and a vise in the same manner as specified under 2-1-3 (1). (Fig. 7)

(3) Remove the joint cover by sliding a screwdriver in the entire circumference of the lower arm ball joint cover ring.

(4) Remove the ball joint using the ball joint installer/remover (CT-1109A and B) and a hydraulic press as shown in Fig. 8.

2-1-2 Inspection

(1) Bushings once removed are not reusable; they should be replaced. If they are to be reused without being removed, make sure that they are free from deterioration, cracks, and wear in the internal serrations. (Fig. 9)

(2) Check the lower arm shaft for bend and crack, and replace if necessary.

(3) Check the lower arm for deformation, cracks and wear in the bushing installation bore. Replace as necessary.

2-1-3 Reassembly

(1) After installing the lower arm front bushing with the lower arm shaft bushing installer (CT-1113B and CT-1114A), install the stopper rubber at the stopper washer jointing side of the lower arm shaft. And then fit in the bushing.

For the rear end of the lower arm shaft, install the rear bushing with the shaft axle pointing the bushing bore center using the lower arm shaft bushing installer (CT-1113B and CT-1114A). Force in the bushing until its flange contacts the lower arm bore edge. Apply the lower arm spreader (Special Tool CT-1114B) to the lower arm opening (branches) to protect the lower arm from deformation as shown in Fig. 10.

If the bushing is not installed at the standard pressure, shift the serration of bushing and install the bushing. If the standard pressure is not obtained by this procedure, replace either lower arm or bushing.

<table>
<thead>
<tr>
<th>Description</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower arm shaft</td>
<td>Internal pressure 660 lbs.</td>
</tr>
<tr>
<td>Bushing installation</td>
<td>Final pressure 3,300 lbs.</td>
</tr>
</tbody>
</table>
(2) Install the lower arm shaft retaining bolts with washers for temporary assembly.

**NOTE:** 1. The lower arm shaft retaining bolts should be tightened to the specified torque with the front wheel touching the ground with full load of the car after reassembly of the front suspension has been completed.

2. Use new washers for reassembly of the lower arm shaft assembly.

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening of thrust washers to both ends of lower arm shaft</td>
<td>40 to 47 ft-lbs.</td>
<td>To be tightened under full load condition</td>
</tr>
</tbody>
</table>

(3) Install the ball joint using the ball joint installer/remover (CT-1109A and B) and a hydraulic press. Use care not to slant the ball joint case in the lower arm ball joint seating. (Fig. 11)

If the ball joint is installed at a pressure lower than the standard pressure, replace either the ball joint or the lower arm.

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Standard values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball joint installation pressure</td>
<td>Initial pressure over 1,500 lbs. 0.118 to 0.236 in. and final 11,000 lbs.</td>
</tr>
<tr>
<td>Ball joint installation location</td>
<td>Align the lower arm end punched mark with the ball joint punched mark.</td>
</tr>
</tbody>
</table>

(4) Apply packing seal compound, “Three Bond” #4 or equivalent, to the joint cover metal ring, and using the ball joint remover/installer (CT-1109A), and a hammer or a hydraulic press, force in the joint cover until it contacts the lower arm surface. (Fig. 12)

**NOTE:** 1. The joint cover should be replaced once it is removed.

2. Fill about 0.7 cu.in. grease in the joint cover.

3. The joint cover has been filled with a highly durable special grease. When refilling, be sure to use a genuine brand.

2-2 Ball Joints

2-2-1 Inspection

Carry out the inspection of the ball joints and replace if defects are found, as follows:

(1) Check the ball stud for wear.

<table>
<thead>
<tr>
<th>Description</th>
<th>Standard dimension</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free play of ball joint in axial and sideway directions</td>
<td>0 in.</td>
<td>Ball joint proper</td>
</tr>
</tbody>
</table>

**NOTE:** Since the ball joint is not provided with a grease nipple, replace the plug at each time of grease replenishment as necessary. (Fig. 13)
2-3 Strut Assembly

Construction and Operation of Strut Type Shock Absorber

The shock absorbers used for the front suspension are larger than ordinary shock absorbers because the shock absorbers are designed not only to dampen out spring oscillations but also to directly sustain the front spring axial stress in support to the coil springs. The shock absorbers can be disassembled for servicing. The shock absorbers act in two ways of compression and rebound.

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### Table: Recommended Brands

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommended Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball joint grease</td>
<td>SAE J310a ELI Chassis Grease or equivalent</td>
</tr>
</tbody>
</table>

(2) Check the ball joint rotation starting torque and replace the ball joint if the torque is below the specification.

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### Table: Torque Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball joint rotation starting torque</td>
<td>Should smoothly rotate at 2.6 ft-lbs. or more torque.</td>
</tr>
</tbody>
</table>

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**Fig. 14 Strut Assembly Components**

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**Fig. 15 Shock Absorber Construction**

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(1) Knuckle arm
(2) Knuckle
(3) Strut sub-assembly (shock absorber)
(4) Front suspension spring
(5) Rubber bumper
(6) Dust cover plate
(7) Dust cover
(8) Upper spring seat
(9) Ball bearing
(10) Insulator
(11) Dust cover
(12) Stopper
(13) Guide
(14) "O" ring
(15) Seal assembly
(16) Stopper
(Rebound Operation)

As the front suspension tends to rebound, or the coil spring expands, the piston rod of the shock absorber extends, forcing the oil in the upper chamber of the piston to flow into the lower chamber of the piston through the restricted oil passage of the leaf valve (solid arrow mark lines).

As the piston rebound speed reaches a certain level (during the course of the rod extension action), the working pressure of the oil in the upper chamber increases in proportion to the piston speed, and as the result the leaf valve (upper) will flex to narrow the oil passage further restricting the flow of the oil into the lower oil chamber and the oil starts flowing into the cylinder through the bottom orifices (dotted arrow mark lines).

At this stage the damping power is generated by the flow resistance of the fluid.

As the piston rod further extends toward its end of action, the disk of the base valve is lifted up opening the orifices to supply fluid into the piston lower chamber from the sub-tank with minimum fluid resistance.

(Compression Operation)

As the piston rod starts moving into the cylinder, the fluid under the piston is compressed and flows out into the space above the piston and also into the sub-tank (solid arrow mark lines).

As the piston retracting speed reaches a certain level (during the course of the rod retracting action), the fluid pressure of the oil in the piston lower chamber increases in proportion to the rod speed, flexing the lower leaf valve to force the oil into the sub-tank (dotted arrow mark lines).

At this stage the damping power is generated by the flow resistance of the fluid.

As the piston rod further retracts, the disk of the piston is lifted up opening the orifices to deliver fluid into the piston upper chamber with minimum fluid resistance.

2-3-1 Disassembly and Inspection

(1) Securely hold the strut assembly in a vise and first remove the dust cover. Then remove the nuts coupling the insulator to the strut sub-assembly and remove the insulator, and then the spring. (Fig. 18)

NOTE: 1. Use the spring compressor (Special Tool CT-1105) before removing the nuts so that nut threads will not be damaged while the nuts are being unscrewed.

2. The steering knuckle is welded to the strut sub-assembly and both parts cannot be disassembled.

3. In case of removing the piston rod insulator retaining nuts, lock each nut using the special wrench (Special Tool CT-1112) mentioned under (3) (b).

(2) Check all disassembled parts for loss of tension, cracks, fracture, etc. and replace any defective part as necessary.

NOTE: Since the insulator ball bearing is built in the insulator assembly, if the ball bearing is found defective the whole insulator assembly should be replaced.
(3) If the check of strut sub-assembly (shock absorber) indicates oil leakage, disassemble it in the following manner and replace defective parts or the assembly as necessary.

(a) Before disassembly, thoroughly remove dirt from the outside walls of the strut sub-assembly, and use care not to permit dirt into the cylinder or the fluid while the disassembly work.

(b) Securely hold the strut sub-assembly vertically and using the special wrench (Special Tool CT-1112) remove the shock absorber seal assembly. Lower the piston rod assembly to its lowest position while carrying out the work. (Fig. 19)

(c) Drain fluid. Then using a small screwdriver pull out the square section "O" ring. Slowly draw the piston rod assembly and guide out upward and remove the guide from the piston rod. (Fig. 20)

(d) Except for non-metal parts, rinse all disassembled parts in lead-free gasoline and dry using compressed air. Clean all non-metal parts using

NOTE: Following service parts are available and if any part other than those is found to be defective the whole strut sub-assembly should be replaced.
(1) Shock absorber assembly
(2) Seal assembly
(3) "O" ring (square section)
(4) Shock absorber fluid

(e) Inspection

If oil leakage is found, replace the seal assembly, and check the piston rod for bend and other defects. Pay special care in checking for fracture, flaw and bend of the piston rod since these defects will form the direct cause for oil leakage. (Fig. 22)
2-3-2 Reassembly
(1) Coat friction surfaces of the shock absorber cylinder and piston with fluid. Use utmost care not to permit foreign particles on those parts.
(2) Carefully insert the piston rod in the cylinder. Compress the piston ring with the fingers as it slides into the cylinder.
(3) Assemble the cylinder piston assembly with the strut outer shell.
(4) Fill fresh fluid in the shock absorber.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock absorber fluid</td>
<td>20.7 cu. in.</td>
</tr>
</tbody>
</table>

NOTE: 1. Since air inside the cylinder must be expelled while filling the fluid, it may take a little time to complete the filling. Slowly move the piston rod until the whole amount of oil is filled.

2. The above table specifies the amount of oil to be filled when the shock absorber is dry. Therefore, the amount should be adjusted considering the amount of oil coated on the cylinder wall at the time of reassembly.

(5) With the guide flange locating at top, insert the piston rod until the guide flange contacts the shock absorber cylinder end.

(6) Install the “O” ring between the guide and the strut outer cylinder. Use care to seat the “O” ring free from deflection.

NOTE: The “O” ring should always be replaced when the shock absorber has been disassembled.

(7) Cover the piston rod end with the seal guide (Special Tool CT-1111B); slide in the seal after applying sufficient amount of oil to the seal lip; and using the special tool (CT-1112), tighten the seal assembly until the seal nut edge contacts the strut outer cylinder. (Fig. 23)

NOTE: Make sure to replace the seal assembly when the shock absorber has been disassembled.

(8) Assemble the coil spring to the strut.

(a) Install the spring compressor (Special Tool CT-1105) on the coil spring to compress the spring as shown in Fig. 24, and after having fully compressed the spring install it on the strut sub-assembly.

(b) Extend the shock absorber piston rod fully and insert the bumper rubber.

(c) Align the spring seat upper assembly with the dent on the piston rod and the D-shaped hole, and install the insulator assembly, and then the self-locking nut and tighten it for temporary assembling.

NOTE: Coil springs are color-coded to identify their positions of installation, as follows:
Fig. 25 Front Suspension Spring Color Code Position

Fig. 26 Tightening the Spring Seat and Insulator Assembly

Position of Front Suspension Springs

<table>
<thead>
<tr>
<th>Installation</th>
<th>Combination</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right side</td>
<td>White Yellow Red</td>
<td>Diagonal line: Recommended spring combination</td>
</tr>
<tr>
<td>Left side</td>
<td>White Yellow Red</td>
<td>Vertical line: In case above combination is impossible</td>
</tr>
</tbody>
</table>

Front Suspension Spring Load Classification

<table>
<thead>
<tr>
<th>Color code</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>468.5 to 481.8 lbs.</td>
</tr>
<tr>
<td>Yellow</td>
<td>481.8 to 495.0 lbs.</td>
</tr>
<tr>
<td>White</td>
<td>495.0 to 508.3 lbs.</td>
</tr>
</tbody>
</table>

(9) After having correctly seated the upper and lower ends of the coil spring on the grooves of the upper and lower spring seats, loosen the spring compressor (CT-1105).

(10) Using the special tool (CT-1112), fix the upper spring seat and tighten it to the specified torque. (Fig. 26)