SECTION 3F4

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) STEERING WHEEL AND COLUMN

CAUTION: The procedures in this section must be followed in the order listed to temporarily disable the Supplemental Inflatable Restraint (SIR) System and prevent false diagnostic codes from setting. Failure to follow procedures could result in possible air bag deployment, personal injury or otherwise unneeded SIR system repairs.

NOTICE: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. General Motors will call out those fasteners that require a replacement after removal. General Motors will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and joint clamping force, and may damage the fastener. When you install fasteners, use the correct sequence and tightening specifications. Following these instructions can help you avoid damage to parts and systems.

CONTENTS

GENERAL DESCRIPTION

The steering column is an energy-absorbing mechanism designed to collapse in the event of a collision, minimizing the possibility of injury to the driver.

The ignition switch is column-mounted and the column can be locked to inhibit theft. The combination switch controls the turn signal operation, headlamp operation, windshield wiper/washer operation and cruise control operation (if cruise control is equipped).

The steering column can be removed from the vehicle with relative ease. To ensure that proper column energy absorption is maintained, use only the specified screws, bolts and nuts and tighten them to the specified torques.

If the column assembly is removed from the vehicle, take special care when handling it. Using a steering wheel puller other than the one recommended in this manual, hitting the end of the steering shaft and sharply leaning on or dropping the assembly could shear or loosen the plastic injections that keep the column rigid.

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR)

During certain frontal crashes, the Supplemental Inflatable Restraint System (SIR) supplements the restraint of the driver's and passenger's seat belts by deploying an air bag from the driver inflator module mounted to the center of the steering wheel and the passenger inflator module mounted on the right side of the instrument panel. The inflator module houses the air bag and inflator and should be handled with care to prevent accidental deployment.

When servicing a vehicle equipped with SIR, be sure to observe all CAUTIONS and NOTICES. Refer to "Service Precautions" and "Handling Precautions" under "On-Vehicle Service" later in this section, and to SECTION 9J.

IGNITION LOCK SYSTEM

All automatic transmission equipped models of this vehicle are equipped with steering columns that contain a mechanical neutral start system. This system relies on a mechanical block to prevent starting the engine with the transmission in any position other than "P" (park) or "N" (neutral).

Also, a park lock (backdrive) cable connects the ignition switch to the gearshift selector. This cable prevents the gearshift selector from moving unless the ignition is in the "ON" position. Refer to SECTION 7A for further information.

LUBRICATION

Apply a thin coat of lithium grease to all friction points when reassembling.

DIAGNOSIS

For diagnosis of the steering wheel and column and ignition switch, refer to SECTION 3. For diagnosis of the brake transaxle shift interlock system, refer to SECTION 7A. For diagnosis of the supplemental inflatable restraint (SIR) system, refer to SECTION 9J.

INSPECTIONS REQUIRED AFTER AN ACCIDENT

For inspections required after an accident. Refer to SECTION 9J.

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

CAUTION: When performing service on or around SIR components or SIR wiring, follow the procedures listed below to temporarily disable the SIR. Failure to follow procedures could result in possible air bag deployment, personal injury or otherwise unneeded SIR repairs.

The sensing diagnostic module can maintain sufficient voltage to cause a deployment for up to two minutes after the ignition switch is turned to "LOCK" or the battery is disconnected. Many of the service procedures require disconnection of the Air Bag fuse (located at the airbag fuse box), the steering column circuit (SIR coil assembly and inflator module), and passenger-side inflator module circuit from the deployment loop to avoid an accidental deployment.

Disabling the SIR

Figure 1

Remove or Disconnect

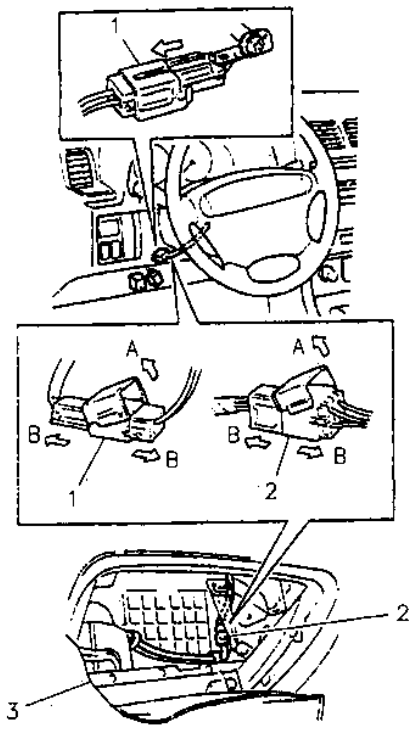
1. Turn the steering wheel so that the vehicle's wheels are pointing straight ahead.
2. Turn the ignition switch to "LOCK" position.
3. AIR BAG fuse from Airbag fuse box.
4. Remove steering wheel left side trim cover and disconnect driver inflator module yellow connector (Figure 1).
5. Pull out I/P compartment while pushing its stoppers from both right and left sides and disconnect passenger inflator module yellow connector (Figure 1).

Enabling the SIR

Figure 1

Install or Connect

1. Turn the ignition switch to "LOCK" position.
2. Passenger inflator module connector; secure with Connector Position Assurance (CPA). Close I/P compartment (Figure 1).
3. Driver inflator module connector; secure with CPA. Install steering wheel left side trim cover (Figure 1).



1 CONNECTOR POSITION ASSURANCE (CPA)–DRIVER'S SIDE
2 CONNECTOR POSITION ASSURANCE (CPA)–PASSENGER'S SIDE
3 INSTRUMENT PANEL COMPARTMENT

EJT0148C

Figure 1—SIR Driver and Passenger Inflator Module Connectors—(Location)

4. Air bag fuse to air bag fuse box.
5. Turn ignition switch to "ACC" or "ON" and verify that the air bag indicator flashes seven times and then turns off. If it does not operate as described, perform the "SIR Diagnostic System Check" in SECTION 9J.

General Safety Procedures

1. Inflator modules should not be stored at temperatures above 65° C (150° F).
2. Inflator Modules and the center sensor assembly should not be used if they have been dropped from a height of 91.4 cm (3-feet) or more.
3. Do not apply power to the SIR unless all components are connected or a diagnostic chart requests it. Powering up the SIR with components disconnected will set a diagnostic trouble code (DTC).
4. The "SIR Diagnostic System Check" in SECTION 9J must be the starting point of any SIR diagnostics. The "SIR Diagnostic System Check" will verify proper air bag indicator operation and will lead you to the correct chart to diagnose any SIR faults. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

Handling Precautions

Refer to SECTION 9J for procedures and precautions related to undeployed and deployed inflator modules, shipping of inflator modules and vehicle scrapping procedures.

WIRING REPAIRS

Special wiring repair procedures have been developed for use on the SIR due to to the sensitive nature of the circuitry. These specific procedures and instructions must be followed when working with SIR wiring and wiring components (such as connectors and terminals). Refer to SECTION 9J SIR wiring repair procedures.

INFLATOR MODULE

Figures 2, 3 and 4

Important

- In the event deployment has occurred, inspect the SIR coil assembly wire for any signs of scorching, melting or other damage due to excessive heat. If the coil assembly is damaged, replace it.

Remove or Disconnect

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

1. Place front wheels in a straight ahead position.
2. Negative (-) battery cable.
3. One right side trim cover from steering wheel and two horn wire connectors (Figure 2).
4. Two Torx® head screws and inflator module from steering wheel (Figure 3).

CAUTION: When carrying a live inflator module, make sure the bag and trim cover are pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the inflator module by the wires or connector on the underside of the module. When placing a live inflator module on a bench or other surface, always face the bag and trim cover up, away from the surface. Never rest a steering column assembly on the steering wheel with the inflator module face down and column vertical. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment. Otherwise, personal injury could result.

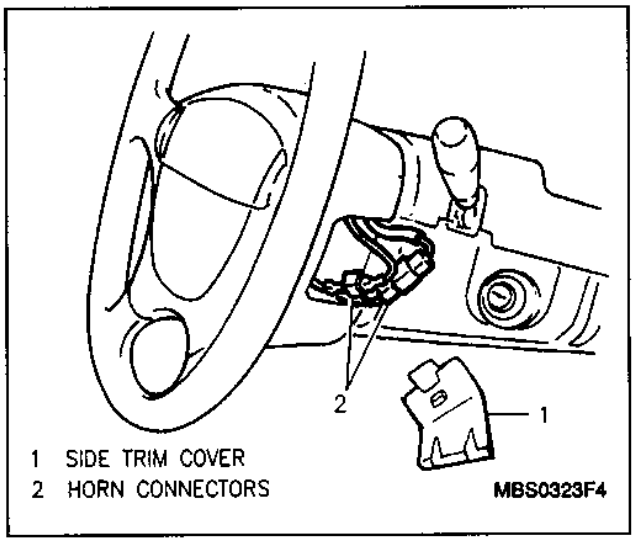


Figure 2—Right Side Trim Cover and Horn Wires

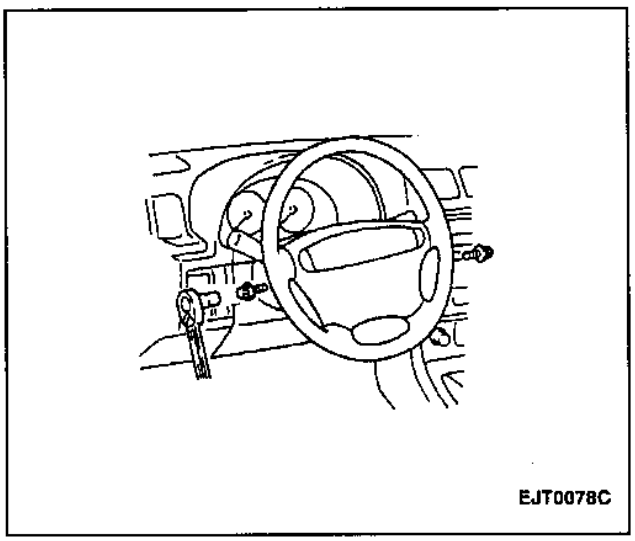
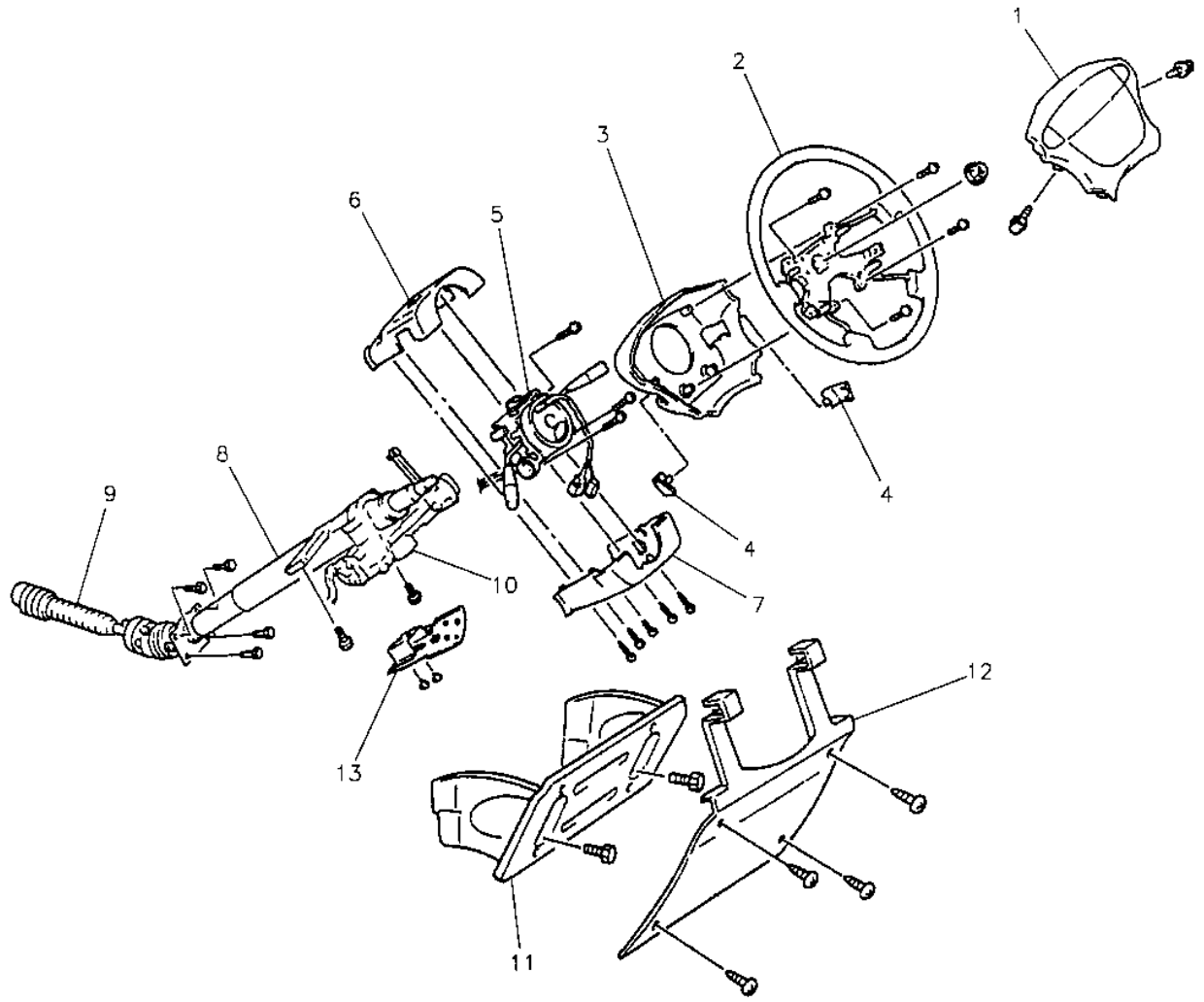


Figure 3—Drivers Inflator Module Torx® Head screws—(Location)



1 SIR INFLATOR MODULE
2 STEERING WHEEL
3 STEERING WHEEL LOWER COVER
4 STEERING WHEEL SIDE TRIM COVERS
5 CONTACT COIL AND COMBINATION SWITCH ASSEMBLY
6 STEERING COLUMN UPPER COVER
7 STEERING COLUMN LOWER COVER
8 STEERING COLUMN ASSEMBLY
9 LOWER STEERING SHAFT
10 IGNITION SWITCH
11 KNEE BOLSTER
12 KNEE BOLSTER TRIM COVER
13 KNEE PROTECTOR

EJT0068C

Figure 4—Sir Steering Wheel and Column

Install or Connect

1. Infator module to steering wheel.
2. Two Torx® head screws; securing inflator module to steering wheel.

Tighten

- Inflator module-to-steering wheel bolts to 23 N.m (17 lb. ft.).

3. Two horn wire connectors and right side steering wheel trim cover.
4. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).
- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

STEERING WHEEL

Figures 5, 6 and 7

Remove or Disconnect

Tool Required:
J 1859-A Steering Wheel Puller

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

1. Negative (-) battery cable.
2. Inflator module. Refer to "Inflator Module" earlier in this section.
3. Steering wheel retaining nut from shaft.
4. Scribe an alignment mark across the wheel and the steering shaft. This will ease installation.
5. Install a J 1859-A to the steering wheel and remove wheel from steering shaft (Figure 5).

Install or Connect

Important

- When installing the steering wheel, the two lugs on the SIR coil must line up with the two grooves on the back side of the steering wheel or the SIR coil will be damaged when turning the steering wheel (Figure 6).

1. Steering wheel to steering shaft, matching alignment marks on wheel and shaft; secure with steering wheel retaining nut. (Figure 7).

Tighten

- Steering wheel retaining nut to 33 N.m (24 lb. ft.).

2. Inflator module. Refer to "Inflator Module" earlier in this section.
3. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).
- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

SIR COIL AND COMBINATION SWITCH

Figures 8, 9 and 10

Important

- In the event deployment has occurred, inspect the SIR coil assembly wire for any signs of scorching, melting or other damage due to excessive heat. If the coil assembly is damaged, replace it.

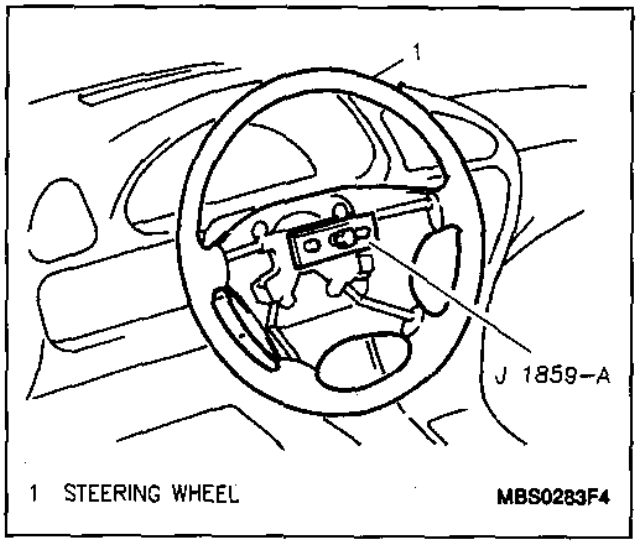


Figure 5—Remove Steering Wheel

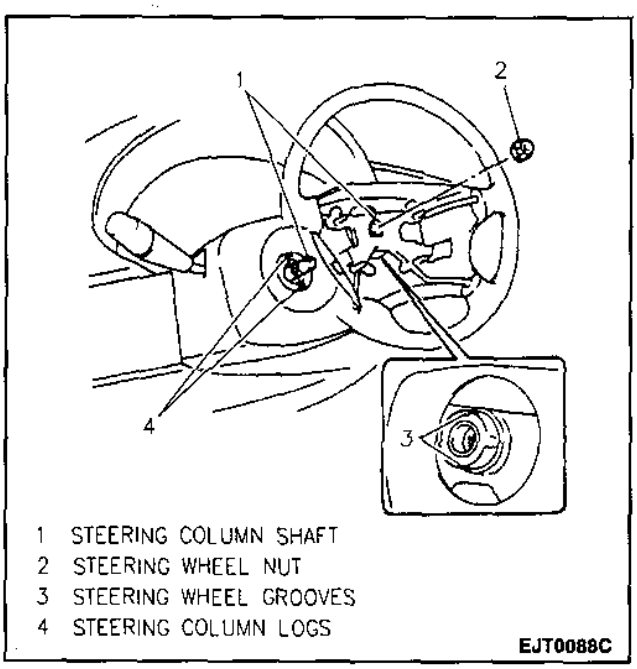


Figure 6—Aligning Steering Wheel To Sir Coil

Remove or Disconnect

NOTICE: Place the ignition switch in the "LOCK" position to prevent the SIR coil assembly from becoming uncentered.

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

1. Negative (-) battery cable.
2. Steering wheel from steering column. Refer to "Steering Wheel" earlier in this section.
3. Four screws and knee bolster trim cover (Figure 8).
4. Two bolts and knee bolster from steering column (Figure 8).
5. Five screws from steering column lower cover and remove upper and lower covers (Figure 9).
6. SIR coil and combination switch electrical connectors.
7. Retaining bands securing SIR coil and combination switch wiring harness to steering column.
8. Three retaining screws and SIR coil and combination switch from steering column (Figure 10).

Install or Connect

1. SIR coil and combination switch to steering column; secure with three screws.
2. SIR coil and combination switch electrical connectors.
3. Secure SIR coil and combination switch wiring harness to steering column with retaining bands.
4. Upper and lower steering column covers to column; secure with five screws.
5. Knee bolster to steering column; secure with two bolts.
6. Lower steering column trim panel; secure with four screws.

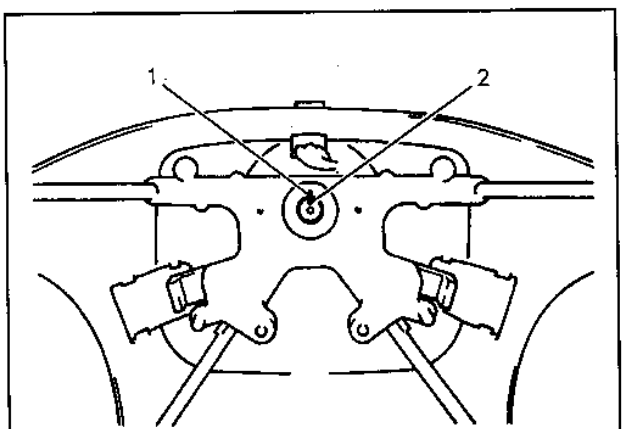


Figure 7—Aligning Steering Wheel and Shaft

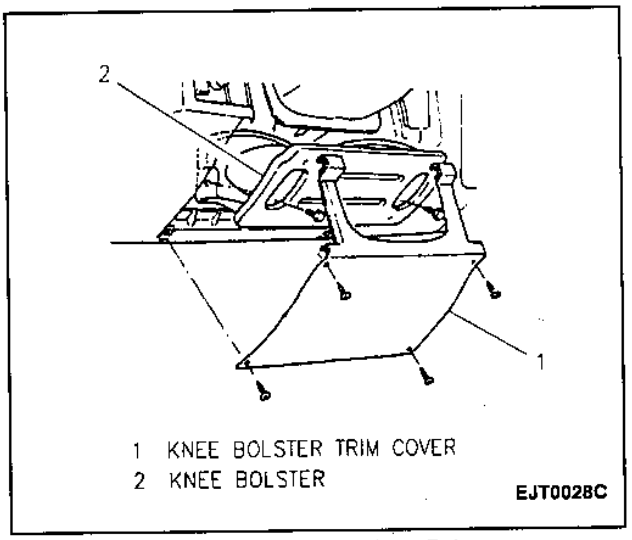


Figure 8—Removing Knee Bolster

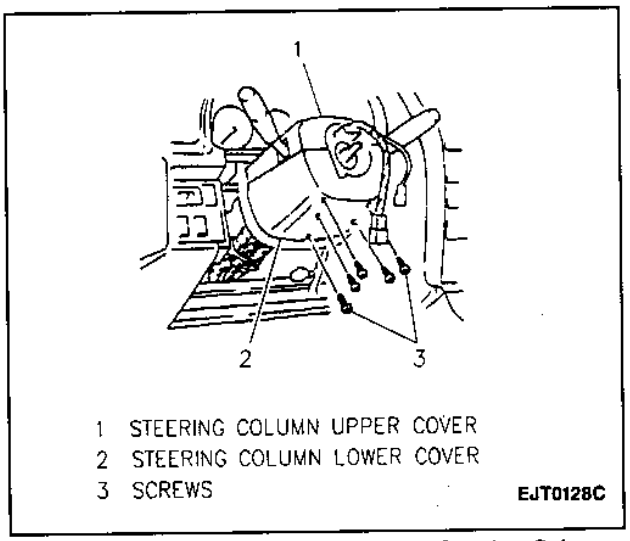


Figure 9—Removing Upper and Lower Steering Column Covers

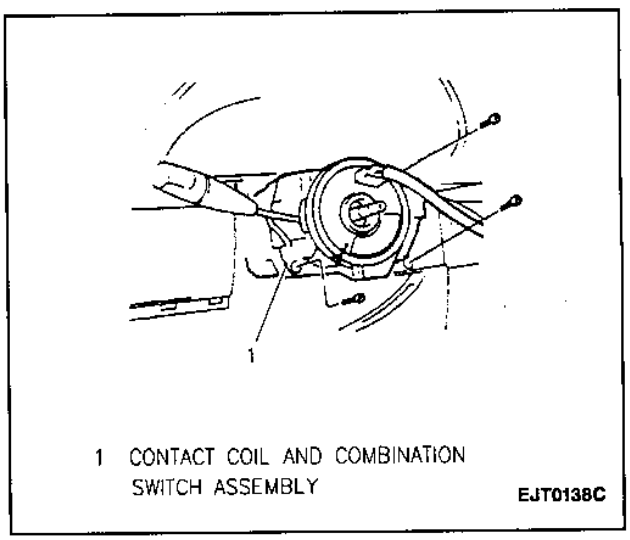


Figure 10—Removing Sir Contact Coil and Combination Switch

7. Steering wheel to steering column. Refer to "Steering Wheel" earlier in this section.
8. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).
- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

Centering the SIR Coil Assembly

Figure 11

1. Make sure that the front wheels are facing straight ahead position.
2. Turn the SIR coil counterclockwise by hand slowly untill it reaches the stop.
3. Turn the SIR coil clockwise two and a half turns and align the arrows (Figure 11).

HORN SWITCH

The horn switch is incorporated into the steering wheel pad and is not serviceable. If the horn switch is found to be defective, the steering wheel pad must be replaced.

HAZARD WARNING SWITCH

The hazard warning switch is incorporated into the SIR coil and combination switch. Refer to "SIR Coil and Combination Switch" earlier in this section for service information.

IGNITION SWITCH

Figures 12 through 15

Remove or Disconnect

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

1. Negative (-) battery cable.
2. Steering wheel from steering column. Refer to "Steering Wheel" earlier in this section.
3. Steering column from vehicle. Refer to "Steering Column" later in this section.
4. Mount steering column securely in a table vise.

NOTICE: Use care not to damage steering column when mounting it in the table vise. Use a soft-jawed vise, or wrap a shop cloth around the steering shaft assembly where it contacts the vise.

NOTICE: Be sure not to damage the aluminum ignition switch body with the chisel.

5. Two ignition switch mounting bolts. Using a hammer and chisel, create slots on the top of the mounting bolts, then remove the bolts with a screwdriver (Figure 12).
6. Turn key in ignition switch to "ON" or "ACC" and remove ignition switch from steering column.

Install or Connect

1. Position the oblong hole in the steering shaft so that it is visible through and in the center of the hole in the steering column (Figure 13).
2. Ignition switch to column, with the ignition key still in either the "ON" or "ACC" position.
3. Turn the ignition key to the "LOCK" position and remove the key from the ignition switch.
4. Align the ignition switch hub with the oblong hole in the steering shaft; rotate the shaft to ensure that the steering shaft is locked (Figure 14).
5. Two new break-away head bolts to ignition switch.

Tighten

- Break-away head bolts until the heads break off (Figure 15).

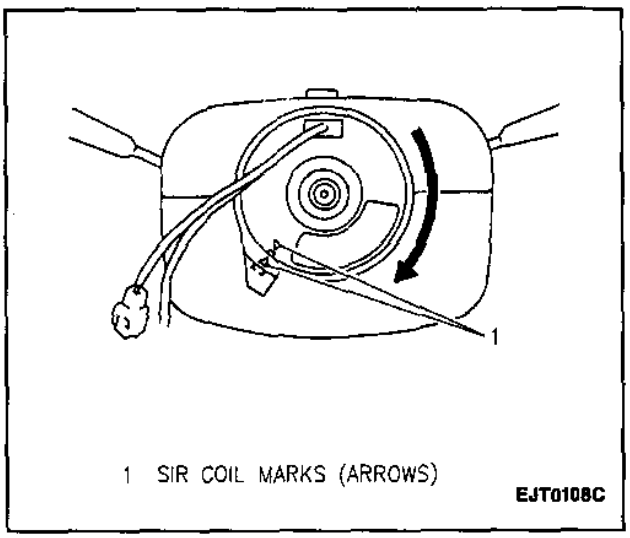


Figure 11—Aligning Sir Coil Arrows

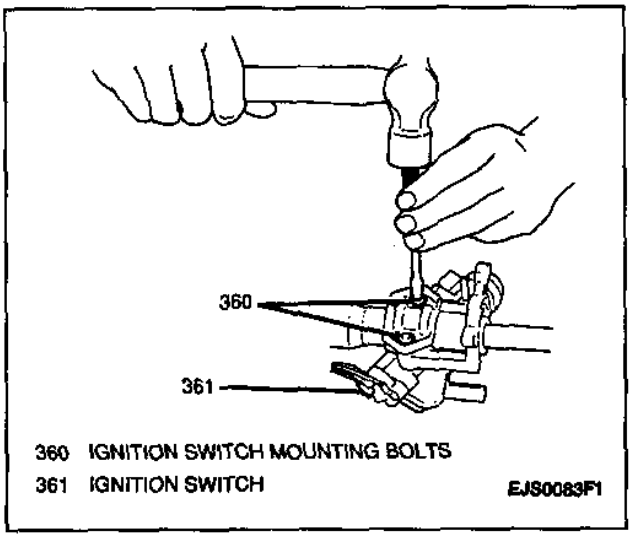


Figure 12—Removing Ignition Switch Mounting Bolts

6. Turn ignition key to the "ACC" or "ON" position; check to make sure that the shaft rotates smoothly. Also check for proper lock operation.
7. Remove steering column from vise.
8. Steering column to vehicle. Refer to "Steering Column" later in this section.
9. Steering wheel from steering column. Refer to "Steering Wheel" earlier in this section.
10. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).
- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

STEERING COLUMN

Figures 4, 8, 9, 10 and 16 through 19

NOTICE: The steering column is extremely susceptible to damage once it has been removed from the vehicle. Dropping the column assembly on its end could collapse the steering shaft or loosen plastic injections which maintain column rigidity. Leaning on the column could cause it to bend or deform. Any of the above damage could impair the column's collapsible design. If it is necessary to remove the steering wheel, use only the specified steering wheel puller. Under no conditions should the end of the shaft be hammered, as such action could loosen plastic injections, undermining the column's rigidity.

NOTICE: The vehicle's wheels must be in a straight-ahead position and the key must be in the "LOCK" position when removing or installing the steering column. Failure to do so may cause the SIR coil assembly to become uncentered and may result in unneeded SIR repairs.

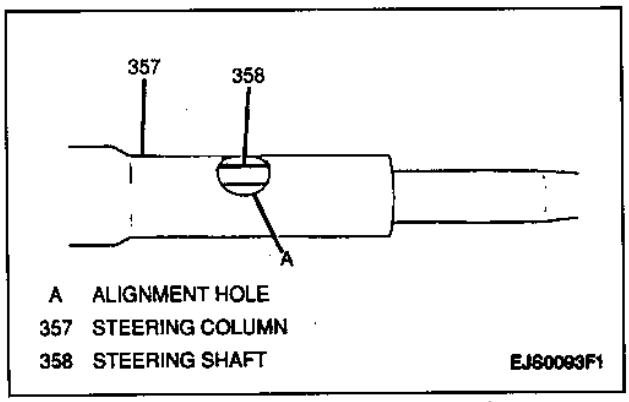


Figure 13—Aligning Steering Shaft

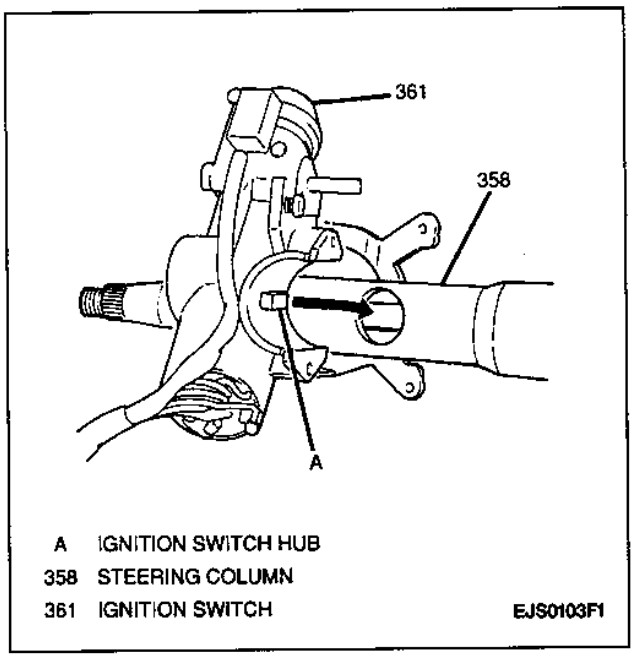


Figure 14—Aligning Ignition Switch Hub With Steering Shaft Hole

Important

- In the event deployment has occurred, inspect the SIR coil assembly wire for any signs of scorching, melting or other damage due to excessive heat. If the coil assembly is damaged, replace it.

NOTICE: The steering column should never be supported by only the lower support bracket—damage to the column lower bearing adapter could result.

Remove or Disconnect

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

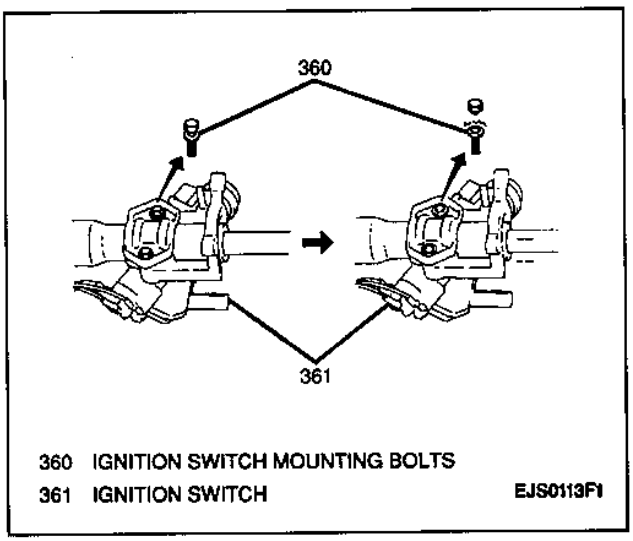


Figure 15—Break-Away Head Bolts

1. Negative (-) battery cable.
2. Steering wheel, if necessary. Refer to "Steering Wheel" earlier in this section.
3. Four screws and knee bolster trim cover (Figure 8).
4. Two bolts and knee bolster from steering column (Figure 8).

Important

- If you are servicing the steering column or any column-mounted component, remove the steering wheel. If you are removing the steering column simply to gain access to instrument panel components, leave the steering wheel installed on the column.

5. SIR coil and combination switch (if steering wheel was removed):
   A. Upper and lower steering column covers by removing five screws from lower cover (Figure 9).
   B. SIR coil and combination switch electrical connectors.
   C. Loosen retaining bands securing switch electrical harness to steering column.
   D. SIR coil and combination switch from column by removing three screws (Figure 10).
6. Ignition switch electrical connector.
7. Park lock cable from ignition switch by removing one bracket retaining screw and C-clip at the ignition switch lock cylinder (automatic transmission equipped models, Figure 16).
8. Four bolts from the steering column-to-bulkhead plate (Figure 17).
9. Steering shaft from lower steering shaft joint by removing one bolt (Figure 18).
10. Two steering column mounting (Torx®) bolts and remove column from vehicle (Figure 19).

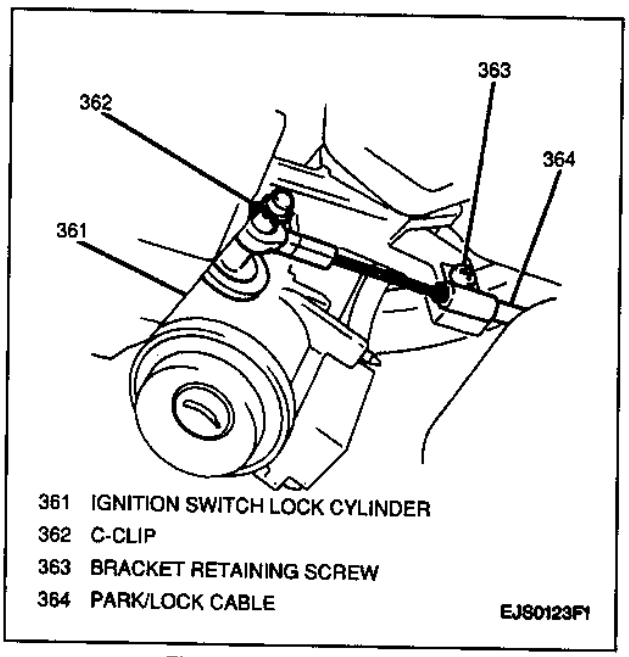


Figure 16—Park Lock Cable

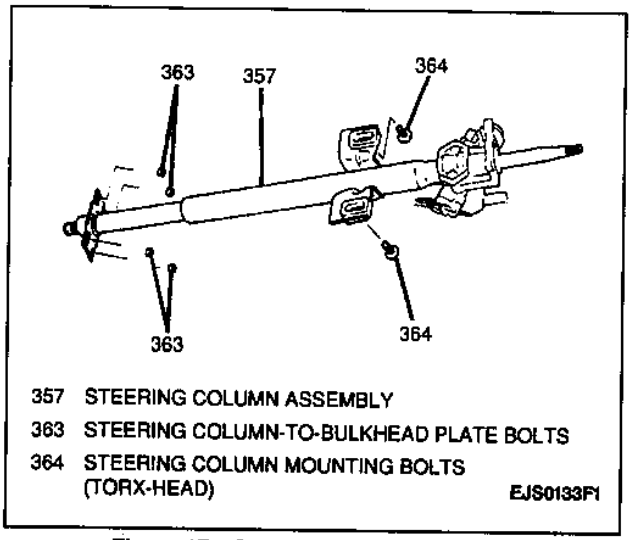


Figure 17—Steering Column Fasteners

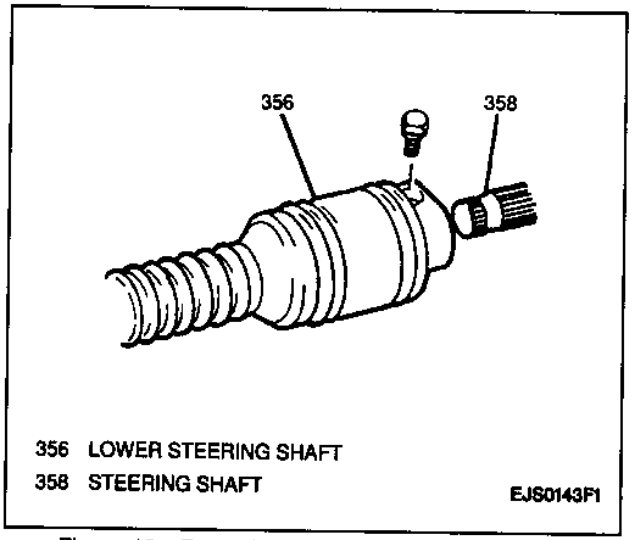


Figure 18—Removing Steering Column Joint Bolt

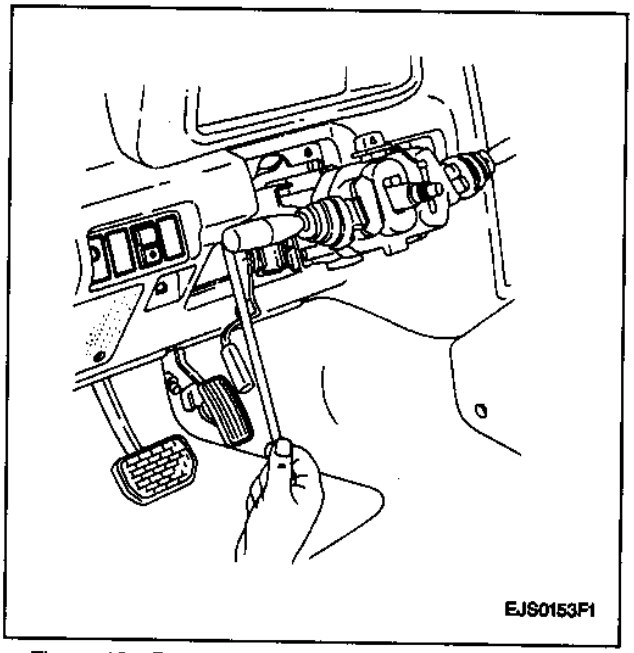


Figure 19—Removing Steering Column Mounting Bolts

Install or Connect

1. Position steering column in vehicle, inserting the steering shaft into the lower shaft joint; secure with joint bolt.

Tighten

- Steering shaft joint bolt to 25 N.m (18 lb. ft.).

2. Two steering column mounting (Torx®) bolts and four bolts to the column-to-bulkhead plate (Figure 19).

Tighten

- All steering column fastening bolts to 14 N.m (124 lb. in.).

3. Park lock cable to ignition switch; secure with one bracket retaining screw and C-clip at the ignition switch lock cylinder (automatic transmission equipped vehicles, Figure 16).
4. Ignition switch electrical connector.
5. SIR coil and combination switch (if steering wheel was removed):
   A. SIR coil and combination switch to steering column; secure with three screws (Figure 10).
   B. SIR coil and combination switch electrical connectors and electrical wiring harness to column secure; with retaining bands.
   C. Upper and lower steering column covers; secure with five screws (Figure 9).
6. Knee bolster to steering column; secure with two bolts (Figure 8).
7. Knee bolster trim cover; secure with four screws.
8. Steering wheel to steering column (if steering wheel was removed). Refer to "Steering Wheel" earlier in this section.
9. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).

- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

LOWER STEERING SHAFT

Figures 4, 18, 20 and 21

NOTICE: The vehicle's wheels must be in a straight-ahead position and the key must be in the "LOCK" position and removed when removing or installing the steering shaft joint. Failure to do so may cause the SIR coil assembly to become uncentered and may result in unneeded SIR repairs.

Remove or Disconnect

1. Make sure the front wheels are in a straight-ahead direction before removing lower steering shaft.

- Disable the SIR. Refer to "Disabling the SIR" located under "Service Precautions" earlier in this section.

2. Negative (-) battery cable.
3. Four screws and lower steering column trim panel.
4. Two bolts and knee bolster from steering column.
5. Steering shaft from lower steering shaft by removing one joint bolt (Figure 18).
6. Lower shaft-to-steering gear joint bolt (Figure 20).
7. Loosen all steering column mounting bolts—two upper Torx® and four steering column-to-bulkhead plate bolts.
8. Move steering column rearward.
9. Lower steering shaft from steering gear, steering column and vehicle.

Install or Connect

1. Lower shaft to steering gear, aligning flat on steering gear shaft and lower shaft (Figure 21).
2. Lower shaft-to-steering gear joint bolt.
3. Lower shaft to steering shaft; secure with one joint bolt.

Tighten

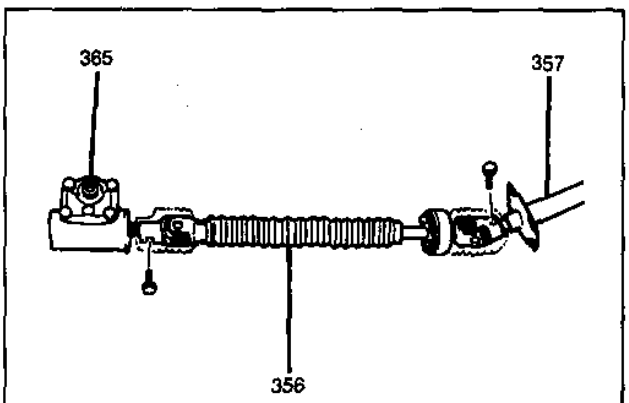
- Lower steering shaft joint bolts to 25 N.m (18 lb. ft.).

4. Move steering column forward to its correct position.

Tighten

- All steering column fastening bolts to 14 N.m (124 lb. in.).

5. Knee bolster to steering column; secure with two bolts.
6. Knee bolster trim cover; secure with four screws
7. Negative (-) battery cable.



356 LOWER STEERING SHAFT
357 STEERING COLUMN
365 STEERING GEAR
EJS0163F1

Figure 20—Lower Steering Shaft Bolts

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lb. ft.).
- Enable the SIR. Refer to "Enabling the SIR" located under "Service Precautions" earlier in this section.

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

Figures 22 through 25

NOTICE: Vehicles involved in accidents resulting in frame damage, major body or sheet metal damage where the steering column has been impacted or the SIR deployed may also have a damaged or misaligned steering column. In such cases, the following steps should be performed.

Important

- The steering shaft and column are not serviced separately. If either the shaft or column is found to be defective, replace the unit as an assembly.

Inspect

- Capsules on steering column bracket; each capsule should be attached securely to the steering column (Figure 22). If capsules are loose, the steering column assembly should be replaced.

Measure

Tools Required:
J 8001 Dial Indicator
J 26900-13 Magnetic Base

1. Steering shaft length. If the length is shorter than specification, replace the column assembly (Figure 23).
   — Steering column length:
   Measurement A—99 mm (3.90-inches).
   Measurement B—778 mm (30.63-inches).

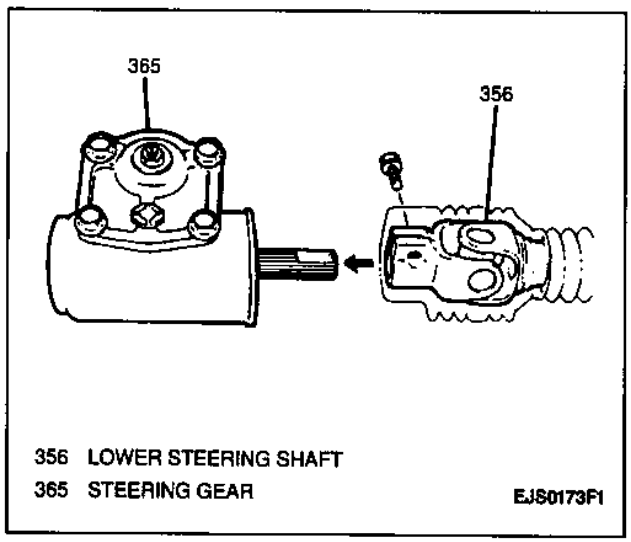


Figure 21—Aligning Lower Shaft and Steering Gear

2. Lower steering shaft length. If the length is shorter than specification, replace the lower steering shaft (Figure 24).
   — Lower steering shaft length:
   With power steering—262 mm (10.30-inches).
   With manual steering—303 mm (11.90-inches).
3. Lower steering shaft runout using a J 8001 and a J 26900-13 (Figure 25). To ensure accuracy, clean area of the lower shaft where measurement will be taken. If runout exceeds specified limits, replace it with a new one.
   — Lower steering shaft maximum allowable runout—2 mm (0.079-inch).

Inspect

1. Steering shaft joints and shaft for any damage such as cracks, breaks, malfunctions or excessive play. If anything is found faulty, replace as shaft assembly.
2. Steering shaft for smooth rotation. If found defective, replace as column assembly.

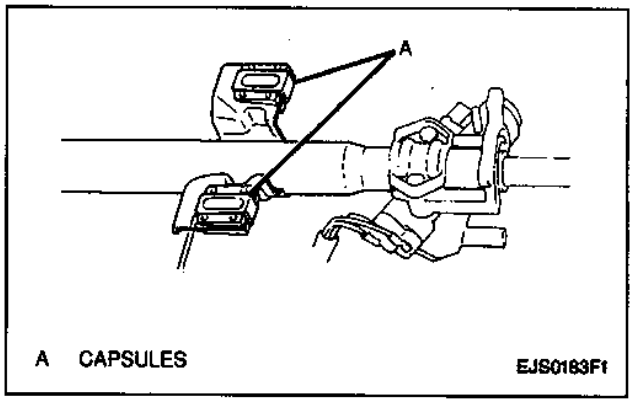


Figure 22—Inspecting Capsule

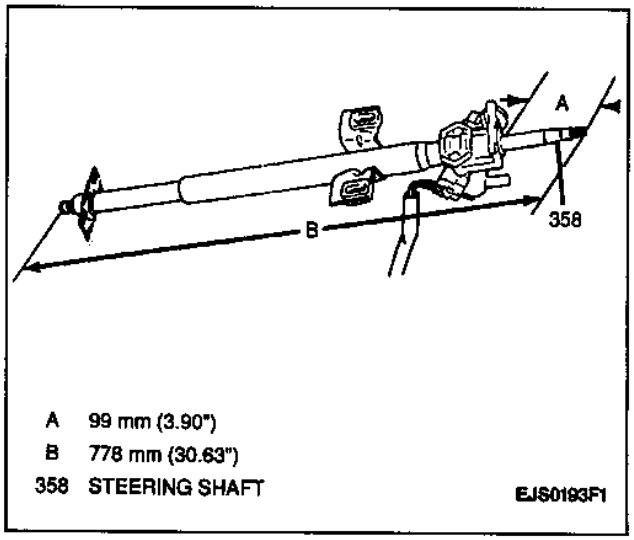


Figure 23—Measuring Steering Shaft

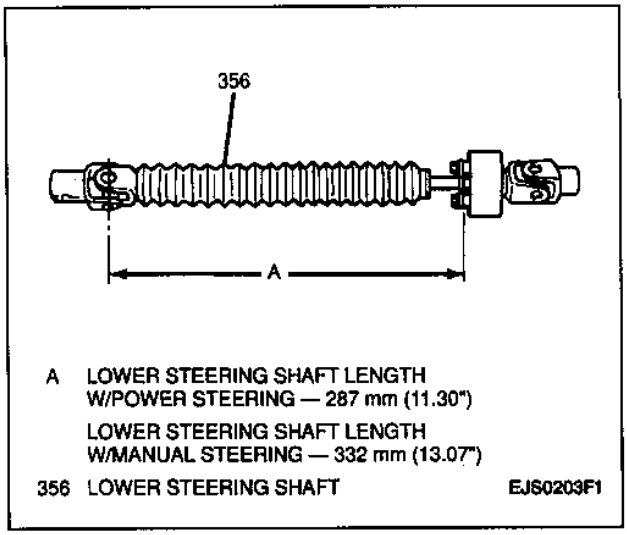


Figure 24—Measuring Lower Steering Shaft

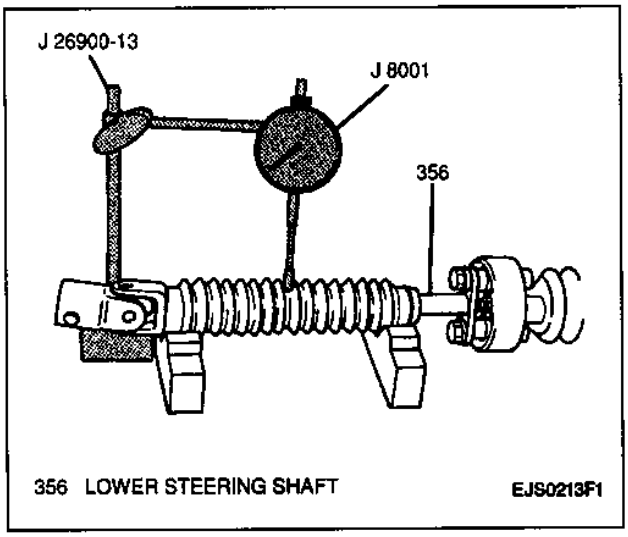


Figure 25—Measuring Lower Steering Shaft Runout

SPECIFICATIONS

FASTENER TORQUES

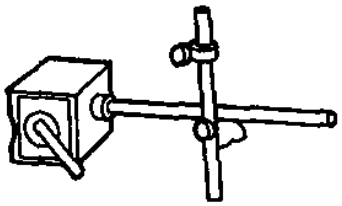
Inflator Module Retaining Bolts	23 N·m (17 lb. ft.).
Steering Wheel Retaining Nut	33 N·m (24 lb. ft.)
Negative (-) Battery Cable-to-Negative (-) Battery Terminal Retainer	15 N·m (11 lb. ft.)
Steering Column Fastening Bolts	23 N·m (17 lb. ft.)
Steering Shaft Joint Bolts	25 N·m (18 lb. ft.)
Lower Steering Shaft-to-Steering Gear Bolt	25 N·m (18 lb. ft.)

STEERING COLUMN SPECIFICATIONS

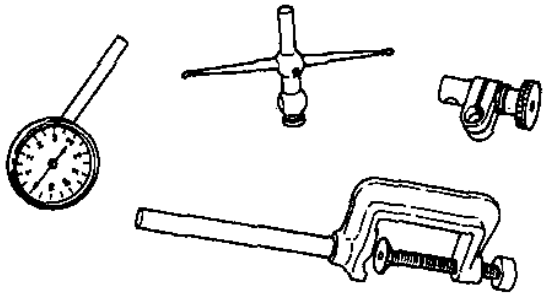
Steering Column Length	
Measurement A	99 mm (3.90 in.)
Measurement B	778 mm (30.63 in.)
Lower Steering Shaft Length:	
With Power Steering	262 mm (10.30 in.)
With Manual Steering	303 mm (11.90 in.)
Lower Steering Shaft Maximum Allowable Runout	2 mm (0.079 in.)

SPECIAL TOOLS

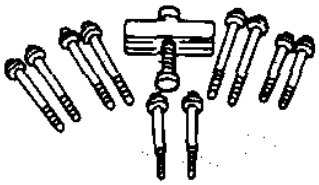
1
J 26900-13



3
J 8001



2
J 1859-A



1 MAGNETIC BASE
2 STEERING WHEEL PULLER
3 DIAL INDICATOR

EJS0223F1