SECTION 0B

GENERAL INFORMATION

SPECIFICATIONS

Technical Data

Performance - Manual Transaxle

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Maximum Speed	157 km/h (97.6 mph) - EURO III 156 km/h (96.9 mph) - EURO III	170 km/h (105.6 mph)	176 km/h (109.4 mph)
Minimum Turning Radius	4.8 m (15.7 ft)	4.8 m (15.7 ft)	4.8 m (15.7 ft)

Performance - Automatic Transaxle

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Maximum Speed	153 km/h (95.1 mph)	-	170 km/h (105.6 mph)
Minimum Turning Radius	4.8 m (15.7 ft)	-	4.8 m (15.7 ft)

Engine

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Engine Type	Overhead Cam L-4	←	←
Bore	68.5 mm (2.70 in.)	77.9 mm (3.06 in.)	←
Stroke	78.0 mm (3.07 in.)	73.4 mm (2.89 in.)	←
Total Displacement	1150 cc (70.2 $in.^3$)	1399 cc (85.4 in^3)	←
Compression Ratio	9.3 : 1	9.5 : 1	←
Maximum Power	53 kw (71.1 hp) (at 5,400 rpm)	61 kw (81.8 hp) (at 5,600 rpm)	69 kw (92.5 hp) (at 6,200 rpm)
Maximum Torque	104 N•m (76.7 lb-ft) (at 4,400 rpm)	123 N•m (90.7 lb-ft) (at 3,000 rpm)	130 N•m (95.9 lb-ft) (at 3,400 rpm)

Ignition System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Ignition Type	Direct Ignition System	←	←
Ignition Timing (BTDC)	1° (at 800 rpm)	10°	4°
Ignition Sequence	1-3-4-2	←	←
Spark Plug Gap	1.0 ~ 1.1 mm (0.039 ~ 0.043 in.)	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	1.0 ~ 1.1 mm (0.039 ~ 0.043 in.)
Spark Plug Maker	Woojin	Champion	NGK
Spark Plug Type	BPR5EY-11	RN9YC	BKR6E-11

Clutch

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Type	Single Dry Plate	←	←
Outside Diameter	184 mm (7.2 in.)	215 mm (8.5 in.)	←
Inside Diameter	127.5 mm (5.0 in.)	145 mm (5.7 in.)	←
Thickness	8.4 mm (0.331 in.)	←	←
Fluid	Common Use: Brake Fluid	←	←

Manual Transaxle

Application	1.2L SOHC	1.4L SOHC Wide Ratio	1.4L DOHC Semi-Wide Ratio
Maker	DWMC	DWMC	DWMC
Type or Model	Y4M	D-16	←
Gear Ratio :			
1st	3.416 : 1	3.545 : 1	3.545 : 1
2nd	1.950 : 1	1.952 : 1	1.952 : 1
3rd	1.280 : 1	1.276 : 1	1.276 : 1
4th	0.971 : 1	0.892 : 1	0.971 : 1
5th	0.757 : 1	0.707 : 1	0.763 : 1
Reverse	3.272 : 1	3.333 : 1	3.333 : 1
Final Drive Ratio	4.105 : 1	4.176 : 1	3.944 : 1
Oil Capacity	2.1L (2.2 qt)	1.8L (2 qt)	1.8L (2 qt)

Automatic Transaxle

Application	1.2L SOHC	1.4L DOHC Semi-Wide Ratio
Maker	-	AISIN
Type or Model	-	81-40LE
Gear Ratio :		
1st	-	2.875 : 1
2nd	-	1.568 : 1
3rd	-	1.000 : 1
4th	-	0.697 : 1

Application	1.2L SOHC	1.4L DOHC Semi-Wide Ratio
Reverse	-	2.300 : 1
Final Drive Ratio	-	4.052
Oil Capacity	-	5.9 ± 0.2L (6.2 ± 0.2 qts)

Brake

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Booster Size	241.3 mm (9.5 in.)	←	←
Master Cylinder Diameter	22.22 mm (0.875 in.)	←	←
Booster Ratio	5 : 1	←	←
Front Brake :			
Disc Type Disc Size	Ventilated 236 mm (9.29 in.)	← ←	← ←
Rear Brake :			
Drum Inside Diameter Wheel Cylinder Diameter	200 mm (7.9 in.) 19.05 mm (0.750 in.)	← ←	← ←
Fluid Capacity	0.5L (0.5 qt)	←	←

Tire and Wheel

Application	1.2 L SOHC / 1.4L SOHC / 1.4L DOHC		
Tire Size	155/80R13	175/70R13	185/60R14
Standard Wheel Size	5.0Jx13 (steel)	←	5.5Jx14 (steel)
Optional Wheel Size	-	-	5.5Jx14 (Aluminum)
Inflation Pressure at Full Load:			
155/80R13/175/70R13, 185/60R14	30 psi		

Steering System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Gear Type	Power Rack and Pinion	←	←
Overall Gear Ratio			
Manual Steering Power Steering	21.5 : 1 16 : 1	← ←	← ←
Wheel Diameter			
W/ Air Bag W/O Air Bag	380 mm (15.0 in.) 370 mm (14.5 in.)	← ←	← ←
Wheel Alignment :			

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
(Based on 2 Occupants) Front :			
Toe-In Caster Camber	2' ± 10' 2°30' ± 45' -24' ± 45'	← ← ←	← ← ←
Rear : Toe-In Camber	15' ± 20' -1°30' ± 30'	← ←	← ←
Oil Capacity	1.1L (1.2 qt)	←	←

Suspension

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Front Type	Macpherson Strut	←	←
Rear Type	Torsion Beam Axle	←	←

Fuel System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Fuel Delivery	MPI	←	←
Fuel Pump Type	Electric Motor Pump	←	←
Fuel Filter Type	Cartridge	←	←
Fuel Capacity	45L (11.9 gal)	←	←

Lubricating System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Lubricating Type	Forced Feed	←	←
Oil Pump Type	Rotary (Trochoid)	←	←
Oil Filter Type	Cartridge (Full Flow)	←	←
Oil Pan Capacity			
Including Oil Filter	3.2L (3.4 qt)	3.75L (3.96 qt)	←

Cooling System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Cooling Type	Forced Water Circulation	←	←
Radiator Type	Cross-flow	←	←
Water Pump Type	Centrifugal	←	←
Thermostat Type	Pellet Type	←	←
Coolant Capacity :			
Standard Heavy Duty	4.2L (4.4 qt) 4.2L (4.4 qt)	6.0L (6.3 qt) 6.0L (6.3 qt)	← ←

Electric System

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Battery	430 Cold Cranking Amps	550 Cold Cranking Amps	←
Alternator	75 Amps	85 Amps	←
Starter (No-Load Test Current Draw)	0.8 KW Maximum 53 Amps (at 11.5 volts) 5,000 rpm Min.	1.2 KW Maximum 90 Amps (at 11.5 volts) 2,600 rpm Min.	←

Vehicle Dimensions and Weights

Vehicle Dimensions

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Overall Length :			
4 Door 5 Door	4,235 mm (166.7 in.) 3,880 mm (152.6 in.)	← ←	← ←
Overhang : Front :			
4 Door 5 Door	813 mm (32.0 in.) 813 mm (32.0 in.)	← ←	← ←
Rear : 4 Door 5 Door	942 mm (37.1 in.) 587 mm (23.1 in.)	← ←	← ←
Overall Width	1,670 mm (65.7 in.)	←	←
Overall Height	1,495 mm (58.9 in.)	←	←
Minimum Ground Clearance	150 mm (5.9 in.)	←	←
Wheel Base	2,480 mm (97.6 in.)	←	←
Tread :			
Front Rear	1,450 mm (57.1 in.) 1,410 mm (55.1 in.)	← ←	← ←

Vehicle Weights – 4 Door

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Manual : Curb Weight :			
Standard Optional	960 kg (2,116.4 lb) 1,025 kg (2,259.7 lb)	995 kg (2,193.6 lb) 1,060 kg (2,336.9 lb)	1,030 kg (2,270.8 lb) 1,095 kg (2,414.1 lb)
Gross Vehicle Weight	1,455 kg (3,207.7 lb)	1,500 kg (3.306.9 lb)	1,535 kg (3,384.1 lb)

Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Automatic : Curb Weight :			
Standard Optional	- -	- -	1,035 kg (2,281.8 lb) 1,100 kg (2,425.1 lb)
Gross Vehicle Weight	-	-	1,540 kg (3,395.1 lb)
Passenger Capacity	-	5	←

Vehicle Weights – 5 Door

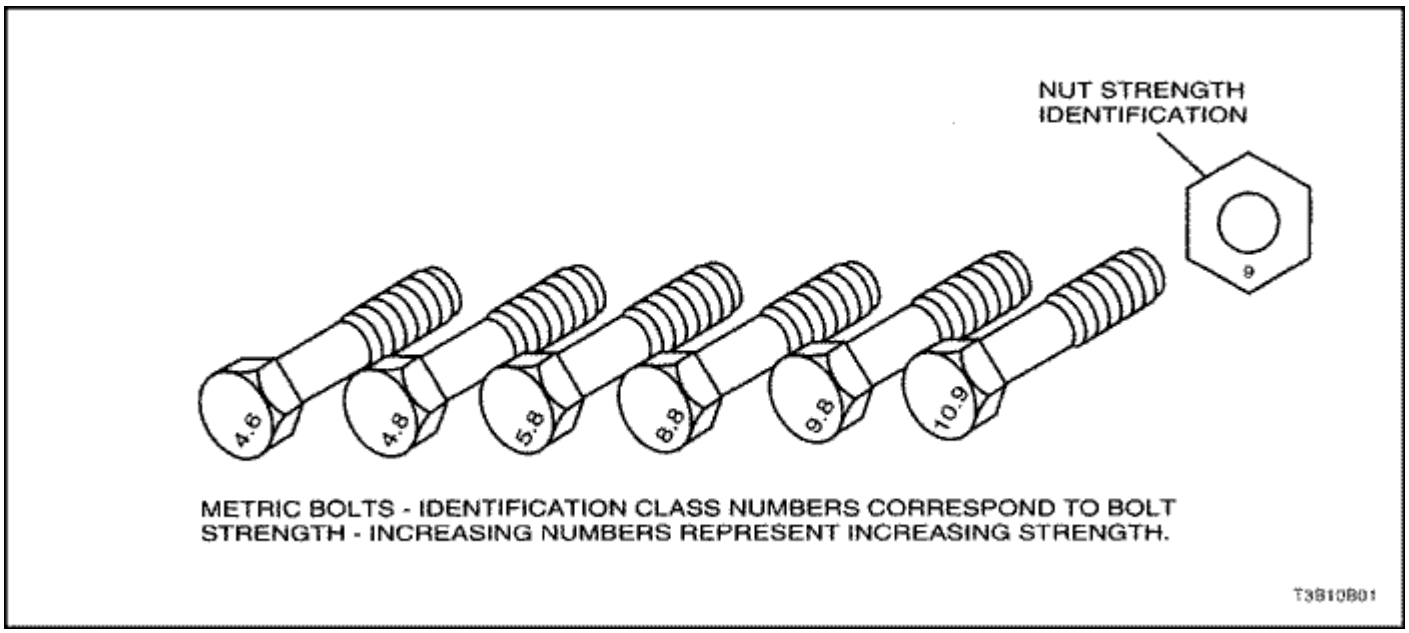
Application	1.2L SOHC	1.4L SOHC	1.4L DOHC
Manual : Curb Weight :			
Standard Optional	960 kg (2,116.4 lb) 1,025 kg (2,259.7 lb)	995 kg (2,193.6 lb) 1,060 kg (2,336.9 lb)	1,030 kg (2,270.8 lb) 1,095 kg (2,414.1 lb)
Gross Vehicle Weight	1,455 kg (3,207.7 lb)	1,500 kg (3,306.9 lb)	1,535 kg (3,384.1 lb)
Automatic : Curb Weight :			
Standard Optional	980 kg (2,161 lb) 1,040 kg (2,292.8 lb)	- -	1,035 kg (2,281.8 lb) 1,100 kg (2,425.1 lb)
Gross Vehicle Weight	-	-	1,540 kg (3,395.1 lb)
Passenger Capacity	5	←	←

Optional Weight : ABS, Sun Roof, A/C

Standard Bolt Specifications

Bolt*	4T - Low Carbon Steel	7T - High Carbon Steel	7T - Alloy Steel
M6 X 1.0	4.1-8.1 N•m (36-72 lb-in)	5.4-9.5 N•m (48-84 lb-in)	-
M8 X 1.25	8.1-17.6 N•m (72-156 lb-in)	12.2-23.0 N•m (108-204 lb-in)	16-30 N•m (12-22 lb-ft)
M10 X 1.25	20-34 N•m (15-25 lb-ft)	27-46 N•m (20-34 lb-ft)	37-62 N•m (27-46 lb-ft)
M10 X 1.5	19-34 N•m (14-25 lb-ft)	27-45 N•m (20-33 lb-ft)	37-60 N•m (27-44 lb-ft)
M12 X 1.25	49-73 N•m (36-54 lb-ft)	61-91 N•m (45-67 lb-ft)	76-114 N•m (56-84 lb-ft)
M12 X 1.75	45-69 N•m (33-51 lb-ft)	57-84 N•m (42-62 lb-ft)	72-107 N•m (53-79 lb-ft)

Bolt*	4T - Low Carbon Steel	7T - High Carbon Steel	7T - Alloy Steel
M14 X 1.5	76-115 N•m (56-85 lb-ft)	94-140 N•m (69-103 lb-ft)	114-171 N•m (84-126 lb-ft)
M14 X 2.0	72-107 N•m (53-79 lb-ft)	88-132 N•m (65-97 lb-ft)	107-160 N•m (79-118 lb-ft)
M16 X 1.5	104-157 N•m (77-116 lb-ft)	136-203 N•m (100-150 lb-ft)	160-240 N•m (118-177 lb-ft)
M16 X 2.0	100-149 N•m (74-110 lb-ft)	129-194 N•m (95-143 lb-ft)	153-229 N•m (113-169 lb-ft)
M18 X 1.5	151-225 N•m (111-166 lb-ft)	195-293 N•m (144-216 lb-ft)	229-346 N•m (169-255 lb-ft)
M20 X 1.5	206-311 N•m (152-229 lb-ft)	270-405 N•m (199-299 lb-ft)	317-476 N•m (234-351 lb-ft)
M22 X 1.5	251-414 N•m (185-305 lb-ft)	363-544 N•m (268-401 lb-ft)	424-636 N•m (313-469 lb-ft)
M24 X 2.0	359-540 N•m (265-398 lb-ft)	431-710 N•m (318-524 lb-ft)	555-831 N•m (409-613 lb-ft)
* Diameter X pitch in millimeters			



MAINTENANCE AND REPAIR

MAINTENANCE AND LUBRICATION

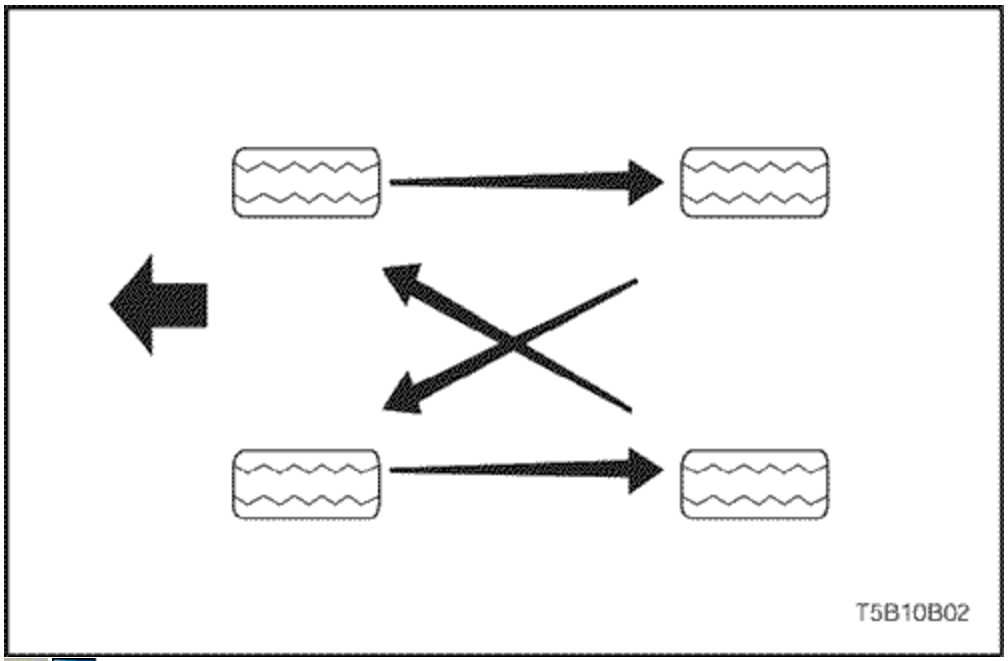
Normal Vehicle Use

The maintenance instructions contained in the maintenance schedule are based on the assumption that the vehicle will be used for the following reasons:

- To carry passengers and cargo within the limitation indicated on the tire placard located on the edge of the driver's door.
- To be driven on reasonable road surfaces and within legal operating limits.

Explanation of Scheduled Maintenance Services
The services listed in the maintenance schedule are further explained below. When the following maintenance services are performed, make sure all the parts are replaced and all the necessary repairs are done before driving the vehicle. Always use the proper fluid and lubricants.
Drive Belt Inspection
When a separate belt drives the power steering pump, the air conditioning compressor and the generator, inspect it for cracks, fraying, wear and proper tension. Adjust or replace the belt as needed.
Engine Oil and Oil Filter Change
API Classifications of Engine Oil
The International Lubricant Standardization and Approval Committee (ILSAC) and American Petroleum Institute classifies engine oils according to their performance quality. Always use oil rated API-SL (ILSAC GF-III) or better.
Engine Oil Viscosity
Engine oil viscosity (thickness) has an effect on fuel economy and cold weather operation. Lower viscosity engine oils can provide better fuel economy and cold weather performance; however, higher temperature weather conditions require higher viscosity engine oils for satisfactory lubrication. Using oils of any viscosity other than those viscosities recommended could result in engine damage.
Cooling System Service
Drain, flush and refill the system with new coolant. Refer to "Recommended Fluids And Lubricants" in this section.
Fuel Micro-Filter Replacement
Replace the engine fuel filter every 45,000 km (30,000 miles).
Air Cleaner Element Replacement
Replace the air cleaner element every 45,000 km (27,000 miles).
Replace the air cleaner more often under dusty conditions.
Throttle Body Mounting Bolt Torque
Check the torque of the mounting bolts.
Tighten the throttle body mounting bolts to 15 N•m (11 lb-ft) if necessary.

Spark Plug Replacement
Replace spark plugs with the same type.
Spark Plug Wire Replacement
Clean wires and inspect them for burns, cracks or other damage. Check the wire boot fit at the DIS module and at the spark plugs. Replace the wires as needed.
Brake System Service
Check the disc brake pads and the drum brake linings every 15,000 km (10,000 miles) or 12 months. Check the pad and the lining thickness carefully. If the pads or the linings are not expected to last to the next scheduledmaintenance service, replace the pads or the linings. Check the breather hole in the brake fluid reservoir cap to be sure it is free from dirt and the passage is open.
Transaxle Service
The manual transaxle fluid does not require changing. For automatic transaxles, refer to "Scheduled Maintenance Charts" in this section.
Tire and Wheel Inspection and Rotation
Check the tires for abnormal wear or damage. To equalize wear and obtain maximum tire life, rotate the tires. If irregular or premature wear exists, check the wheel alignment and check for damaged wheels. While the tires and wheels are removed, inspect the brakes. Refer to "Each Time The Oil Is Changed" in this section.
Tire Rotation



Scheduled Maintenance Charts
Engine

Maintenance Item	Maintenance Interval							
	Kilometers or time in months, whichever comes first							
x 1,000 km	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**
x 1,000 miles	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**
Drive belts (Alternator, power steering and A/C belt) - 1.4 S/D		**I**		**I**		**I**		**I**
Drive Belt (Alternator) - 1.2 S	**I**	**I**	**R**	**I**	**I**	**R**	**I**	**I**
Drive Belt (Power Steering, A/C) - 1.2 S	**I**	**I**	**I**	**I**	**R**	**I**	**I**	**I**
Engine oil & engine oil filter (1) (3)	R	R	R	R	R	R	R	R
Cooling system hose & connections	I	I	I	I	I	I	I	I
Engine coolant (3)	I	I	R	I	I	R	I	I
Fuel filter			R			R		
Fuel line and connections	I	I	I	I	I	I	I	I
Air cleaner element (2)	I	I	R	I	I	R	I	I
Spark plugs	I	R	I	R	I	R	I	R
Spark plug wires	Replace every 96,000 km(60,000 miles)							
Value Clearance - (1.2 S Only)	I	I	I	I	I	I	I	I
EVAP canister, vapor lines & solenoid valve filter			I			I		
PCV system		I		I		I		I
Timimg belt		l		R		l		R

Chart Symbols:

I -Inspect these items and their related parts. If necessary, correct, clean, replenish, adjust or replace.
R - Replace or change:
(1) Change the engine oil and oil filter every 7,500 km (5,000 miles) or 6months, whichever comes first, if the vehicle is operated under any of the following conditions:

- Short distance driving.
- Extensive idling.
- Driving in dusty conditions.

(2) Inspect the air cleaner element every 7,500 km (5,000 miles) or 6 months, if under dusty driving conditions.
(3) Refer to "Recommended Fluids And Lubricants"

Chassis and Body

Maintenance Item	**Maintenance Interval**							
	Kilometers or time in months, whichever comes first							
x 1,000 km	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**
x 1,000 miles	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**
Interior air filter (A/C) (1)	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Exhaust pipes & mountings	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Brake/Clutch fluid (4) (5)	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Rear brake drums and linings (3)	I	I	I	I	I	I	I	I
Front brake pads and discs (3)	I	I	I	I	I	I	I	I
Parking brake	I	I	I	I	I	I	I	I
Brake line and conne4ctions (Including booster)	I	I	I	I	I	I	I	I
Manual Transaxle Oil*(1) - 1.2 S	R	I	R	I	R	I	R	I
Manual Transaxle Oil*(1) - 1.4 S/D	I	I	I	I	I	I	I	I
Automatic transaxle fluid*(5)		I	I	I	I	I	I	I I
Tighten chassis	I	I	I	I	I	I	I	I

Maintenance Item	Maintenance Interval							
	Kilometers or time in months, whichever comes first							
x 1,000 km	15	30	45	60	75	90	105	120
x 1,000 miles	10	20	30	40	50	60	70	80
Months	12	24	36	48	60	72	84	96
and underbody bolts and nuts								
Wheel alignment (2)	Inspect when abnormal condition is noted							
Steering wheel and linkage	I	I	I	I	I	I	I	I
Power steering fluid & lines*(5)	I	I	I	I	I	I	I	I
Drive shaft boots	I	I	I	I	I	I	I	I
Seat belts, buckles and anchors	I	I	I	I	I	I	I	I
Lubrcate locks, hinges and hood latch	I	I	I	I	I	I	I	I

Chart Symbols:
I - Inspect and if necessary correct, clean, replenish, or adjust.
R - Replace or change:
(1) More frequent maintenance is required if under dsty driving conditions.
(2) If necessary, rotate and balance wheels.
(3) More frequentmaintenance is required if under severe conditions: short distance driving, extensive idling, frequent low-speed operaion in stop and go traffic, or driving in dusty conditions.
(4) Change the brake/clutch fluid every 15,000 km (10,000 miles), if the vehicle is mainly driven under the follwing severe conditions: driving in hilly or mountainous terrain, or towing a trailer/caravan frequently.
(5) Refer to Recommended Fluids And Lubricants.

OWNER INSPECTIONS AND SERVICES

Whle Operating The Vehicle

Horn Operation

Blow the horn occasionally tomake sure it works. Check all the button locations.

Brake System Operation

Be alert for abnormal sounds, increased brake pedal travel or repeated pulling to one side when braking. Also, if the brake warning light goes on, or flashes, something may be wrong with part of the brake system.

Exhaust System Operation

Be alert to any changes in the sound of the system or the smell of the fumes. These are signs that the system may be leaking or overheating. Have the system inspected and repaired immediately.

Tires,Wheels and Alignment Operation

Be alert to any vibration of the steering wheel or the seats at normal highway speeds. This may mean a wheel needs to be balanced. Also, a pull right or left on a straight, level road may show the need for a tire pressure adjustment or a wheel alignment.

Steering System Operation

Be alert to changes in the steering action. An inspection is needed when the steering wheel is hard to turn or has too much free play, or if unusual sounds are noticed when turning or parking.

Headlight Aim

Take note of the light pattern occasionally. Adjust the headlights if the beams seem improperly aimed.

At Each Fuel Fill

A fluid loss in any (except windshield washer) system may indicate a problem. Have the system inspected and repaired immediately.

Engine Oil Level

Check the oil level and add oil if necessary. The best time to check the engine oil level is when the oil is warm.

1. After stopping the engine, wait a few minutes for the oil to drain back to the oil pan.
2. Pull out the oil level indicator (dip stick).
3. Wipe it clean, and push the oil level indicator back down all the way.
4. Pull out the oil level indicator and look at the oil level on it.
5. Add oil, if needed, to keep the oil level above the MIN line and within the area labeled "Operating Range." Avoid overfilling the engine, since this may cause engine damage.
6. Push the indicator all the way back down into the engine after taking the reading.

If you check the oil level when the oil is cold, do not run the engine first. The cold oil will not drain back to the pan fast enough to give a true oil level reading.

Engine Coolant Level and Condition

Check the coolant level in the coolant reservoir tank and add coolant if necessary. Inspect the coolant. Replace dirty or rusty coolant.

Windshield Washer Fluid Level

Check the washer fluid level in the reservoir. Add fluid if necessary.

At least Monthly

Tire And Wheel Inspection and Pressure Check

Check the tires for abnormal wear or damage. Also check for damaged wheels. Check the tire pressure when the tires are cold (check the spare also, unless it is a stowaway). Maintain the recommended pressures that are on the tire placard that is in the glove box.

Light Operation

Check the operation of the license plate light, the headlights (including the high beams), the parking lights, the fog lights, the taillight, the brake lights, the turn signals, the backup lights and the hazard warning flasher.

Fluid Leak Check

Periodically inspect the surface beneath the vehicle for water, oil, fuel or other fluids, after the vehicle has been parked for a while. Water dripping from the air conditioning system after use is normal. If you notice fuel leaks or fumes, find the cause and correct it at once.

At least Twice a Year

Power Steering System Reservoir Level

Check the power steering fluid level. Keep the power steering fluid at the proper level. Refer to *Section 6A, Power Steering System.*

Brake Master Cylinder Reservoir Level

Check the fluid and keep it at the proper level. A low fluid level can indicate worn disc brake pads which may need to be serviced. Check the breather hole in the reservoir cover to be free from dirt and check for an open passage.

Clutch Pedal Free Travel

Check clutch pedal free travel and adjust as necessary. Measure the distance from the center of the clutch pedal to the outer edge of the steering wheel with the clutch pedal not depressed. Then measure the distance from the center of the clutch pedal to the outer edge of the steering wheel with the clutch pedal fully depressed. The difference between the two values must be greater than 130 mm (5.19 inches).

Weather-Strip Lubrication

Apply a thin film silicone grease using a clean cloth.

Each Time The Oil is Changed

Automatic Transaxle Fluid

Refer to 81-40LE fluid level service procedure of *Section 5A, AISIN Automatic Transaxle.*

Manual Transaxle

Check the fluid level and add fluid as required. Refer to *Section 5B, Five-Speed Manual Transaxle.*

Brake System Inspection

This inspection should be done when the wheels are removed for rotation. Inspect the lines and the hoses for proper hookup, binding, leaks, cracks, chafing, etc. Inspect the disc brake pads for wear. Inspect the rotors for surface condition. Also inspect the drum brake linings for wear and cracks. Inspect other brake parts, including the drums, the wheels cylinders, the parking brake, etc., at the same time. Check the parking brake adjustment. Inspect the brakes more often if habit or conditions result in frequent braking.

Steering, Suspension and Front Drive Axle Boot And Seal Inspection

Inspect the front and rear suspension and the steering system for damaged, loose or missing parts, signs of wear or lack of lubrication. Inspect the power steering lines and the hoses for proper hookup, binding, leaks, cracks, chafing, etc. Clean and inspect the drive axle boot and seals for damage, tears or leakage. Replace the seals if necessary.

Exhaust System Inspection

Inspect the complete system (including the catalytic converter if equipped). Inspect the body near the exhaust system. Look for broken, damaged, missing, or out-of-position parts as well as open seams, holes, loose connections, or other conditions which could cause heat buildup in the floor pan or could let exhaust fumes seep into the trunk or passenger compartment.

Throttle Linkage Inspection

Inspect the throttle linkage for interference or binding, damaged, or missing parts. Lubricate all linkage joints and throttle cable joints, the intermediate throttle shaft bearing, the return spring at throttle valve assembly, and the accelerator pedal sliding face with suitable grease. Check the throttle cable for free movements.

Engine Drive Belts

Inspect all belts for cracks, fraying, wear and proper tension. Adjust or replace the belts as needed.

Hood Latch Operation

When opening the hood, note the operation of the secondary latch. It should keep the hood from opening all the way when the primary latch is released. The hood must close firmly.

At Least Annually

Lap and Shoulder Belts Condition and Operation

Inspect the belt system including: the webbing, the buckles, the latch plates, the retractor, the guide loops and the anchors.

Movable Head Restraint Operation

On vehicles with movable head restraints, the restraints must stay in the desired position.

Spare Tire and Jack Storage

Be alert to rattles in the rear of the vehicle. The spare tire, all the jacking equipment, and the tools must be securely stowed at all times. Oil the jack ratchet or the screw mechanism after each use.

Key Lock Service

Lubricate the key lock cylinder.

Body Lubrication Service

Lubricate all the body door hinges including the hood, the fuel door, the rear compartment hinges and the latches, the glove box and the console doors, and any folding seat hardware.

Transaxle Neutral Switch Operation on Automatic Transaxle

Caution : Take the following precautions because the vehicle could move without warning and possibly cause personal injury or property damage:

- Firmly apply the parking brake and the regular brakes.
- Do not use the accelerator pedal.
- Be ready to promptly turn off the ignition if the vehicle starts.

On automatic transaxle vehicles, try to start the engine in each gear. The starter should crank only in P (Park) or N (Neutral).

Parking Brake and Transaxle P (Park) Mechanism Operation

Caution : In order to reduce the risk of personal injury or property damage, be prepared to apply the regular brakes promptly if the vehicle begins to move.

Park on a fairly steep hill with enough room for movement in the downhill direction. To check the parking brake, with the engine running and the transaxle in N (Neutral), slowly remove foot pressure from the regular brake pedal (until only the parking brake is holding the vehicle).

To check the automatic transaxle P (Park) mechanism's holding ability, release all brakes after shifting the transaxle to P (Park).

Underbody Flushing

Flushing the underbody will remove any corrosive materials used for ice and snow removal and dust control. At least every spring clean the underbody. First, loosen the sediment packed in closed areas of the vehicle. Then flush the underbody with plain water.

Engine Cooling System

Inspect the coolant and freeze protection fluid. If the fluid is dirty or rusty, drain, flush and refill the engine cooling system with new coolant. Keep the coolant at the proper mixture in order to ensure proper freeze protection, corrosion protection and engine operating temperature. Inspect the hoses. Replace the cracked, swollen, or deteriorated hoses. Tighten the clamps.

Clean the outside of the radiator and the air conditioning condenser. Wash the filler cap and the neck. Pressure test the cooling system and the cap in order to help ensure proper operation.

Recommended Fluids and Lubricants

Usage	Capacity	Fluid/Lubricant
Engine Oil	3.2L (3.4 qt) : 1.2L S 3.75L (3.96 qt) : 1.4L S/D	API SL (ILSAC GF-III) grade or better SAE 5W-30, SAE10W-30, SAE15W-40 (Cold area : SAE5W-30 Hot area : SAE 15W-40)
Engine Coolant	4.2L (4.4 qt) : 1.2L S 6.0L (6.3 qt) : 1.4L S/D	Mixture of water and good quality ethylene glycol base antifreeze (year-round coolant)
Brake Fluid and Clutch Fluid	0.5L (0.5 qt)	DOT-3 or DOT-4
Power Steering System	1.1L (1.2 qt)	DEXRON®-III or DEXRON®-IID
Automatic Transaxle	5.9 ± 0.2L (6.2 ± 0.2 qt) : 1.4L D	ESSO JWS 3309 or ISU DEXRON®–III
Manual Transaxle	2.1L (2.2 qt) : 1.2L S 1.8L (2.0 qt) : 1.4L S/D	SAE75W-85 : 1.2L S SAE80W : 1.4L S/D (Extremely cold area : SAE 75W)
Manual Transaxle Shift Linkage	As required	Multipurpose type grease meeting requirements NLGI No. 1 or 2
Key Lock Cylinders	As required	Silicone lubricant
Automatic Transaxle Shift Linkage	As required	Engine oil
Clutch Linkage Pivot Points	As required	Engine oil
Floor Shift Linkage Points	As required	Engine oil
Hood Latch Assembly a. Pivots and Spring Anchor b. Release Pawl	As required	a. Engine oil b. Multipurpose type grease meeting requirements NLGI No. 1 or 2
Hood and door hinges Fuel door hinge Rear compartment lid hinges	As required	Engine oil
Weatherstrips	As required	Silicone grease

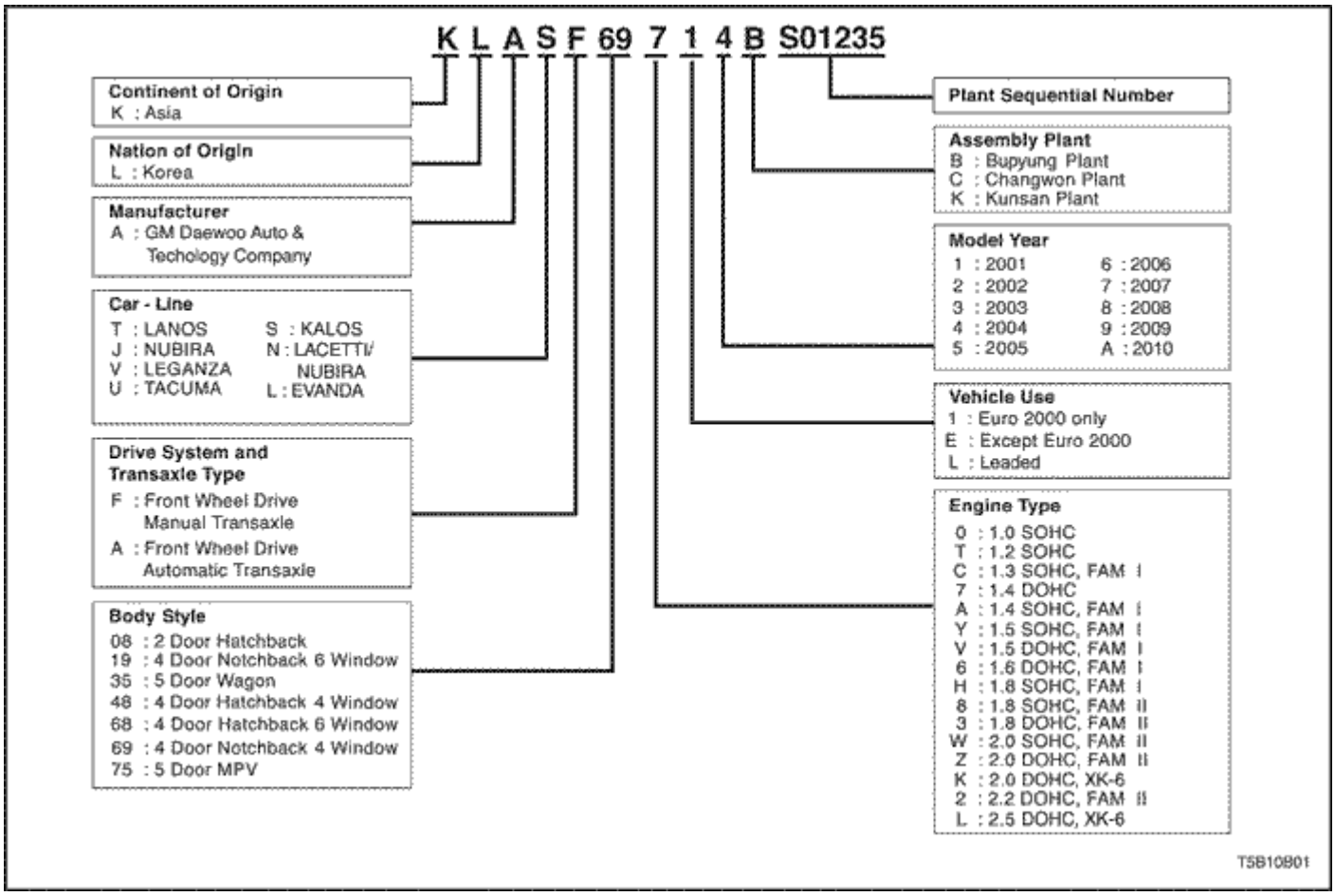
GENERAL DESCRIPTION AND SYSTEM OPERATION

General Repair Instructions

- If a floor jack is used, the following precautions are recommended.

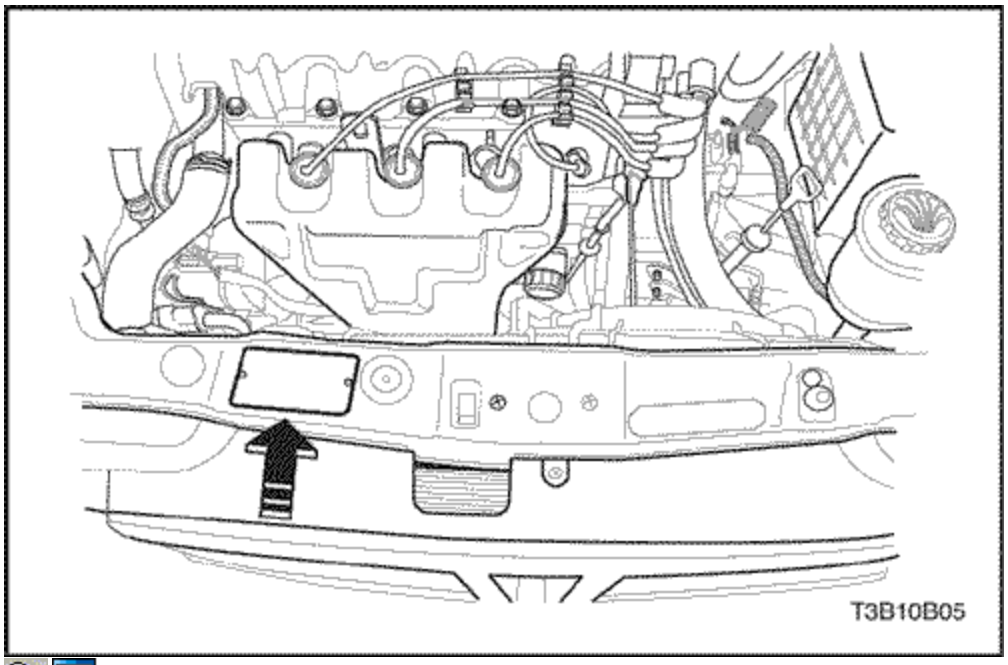
- Park the vehicle on level ground, “block” the front or rear wheels, set the jack against the frame, raise the vehicle and support it with chassis stands and then perform the service operation.
- Before performing the service operation, disconnect the negative battery cable in order to reduce the chance of cable damage and burning due to short-circuiting.
- Use a cover on the body, the seats and the floor to protect them against damage and contamination.
- Handle brake fluid and antifreeze solution with care as they can cause paint damage.
- The use of proper tools, and the recommended essential and available tools where specified, are important for efficient and reliable performance of the service repairs.
- Use genuine DAEWOO parts.
- Discard used cotter pins, gaskets, O-rings, oil seals, lock washers and self-locking nuts. Prepare new ones for installation. Normal function of these parts cannot be maintained if these parts are reused.
- Keep the disassembled parts neatly in groups to facilitate proper and smooth reassembly.
- Keep attaching bolts and nuts separated, as they vary in hardness and design depending on the position of the installation.
- Clean the parts before inspection or reassembly.
- Also clean the oil parts, etc. Use compressed air to make certain they are free of restrictions.
- Lubricate rotating and sliding faces of parts with oil or grease before installation.
- When necessary, use a sealer on gaskets to prevent leakage.
- Carefully observe all specifications for bolt and nut torques.
- When service operation is completed, make a final check to be sure service was done properly and the problem was corrected.

GENERAL DESCRIPTION
Vehicle and Component Identification
Passenger Car Vehicle Identification Number

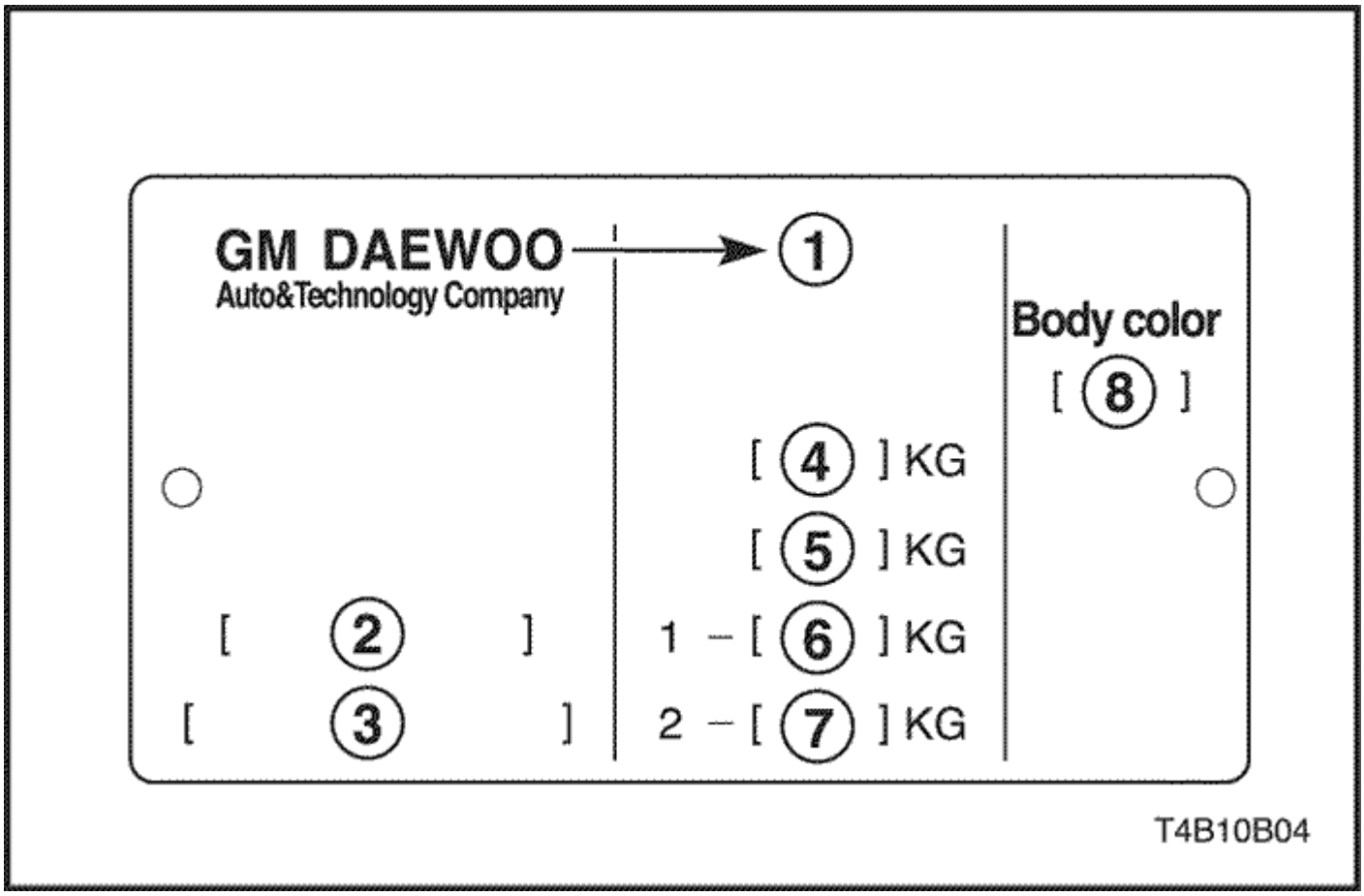


VIN Plate Location

The vehicle identification number (VIN) plate is attached to the top of the front panel support.

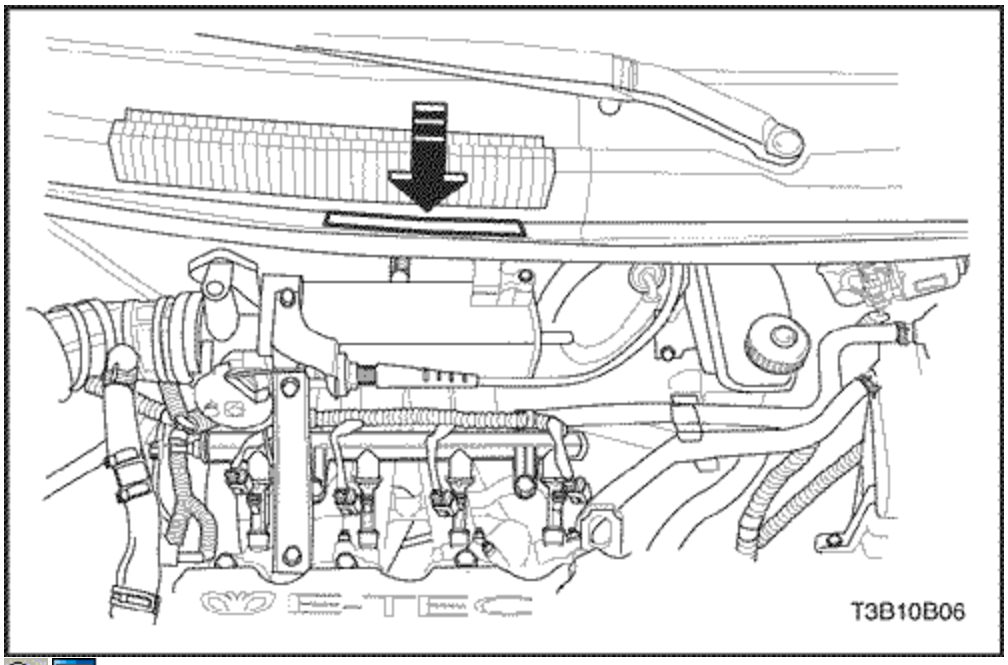


VIN Plate



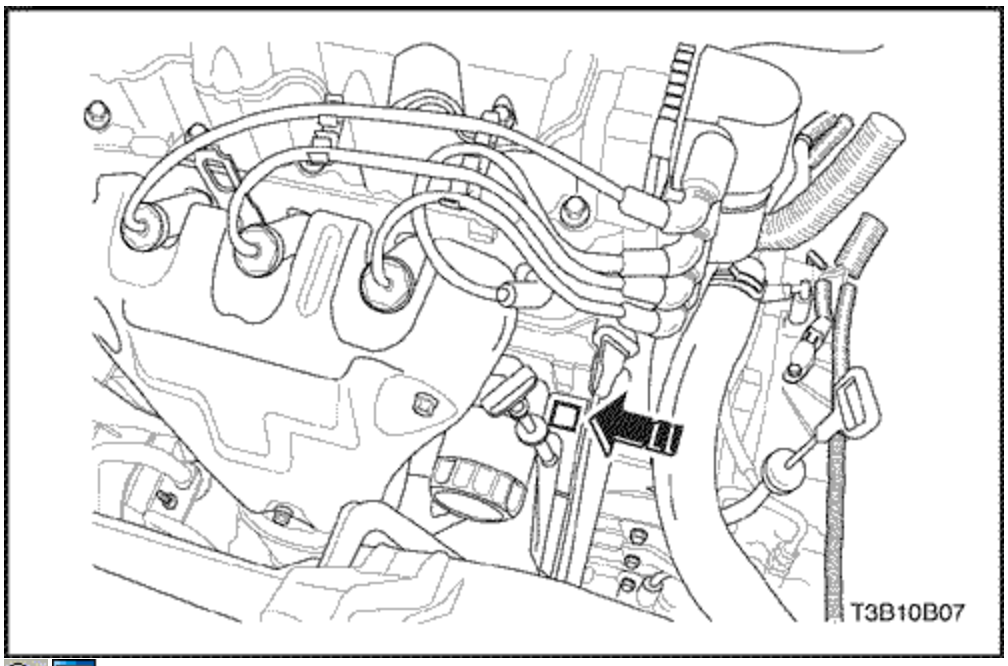
1. Manufacturer's Name
2. EC Whole Vehicle Type Approval No.
3. VIN (Vehicle Identification No.)
4. GVW
5. Combination Weight (GVW + Braked Trailer Weight)
6. Maximum Permissible Axle Weight - Front
7. Maximum Permissible Axle Weight - Rear
8. Color Code

Engraved VIN Location



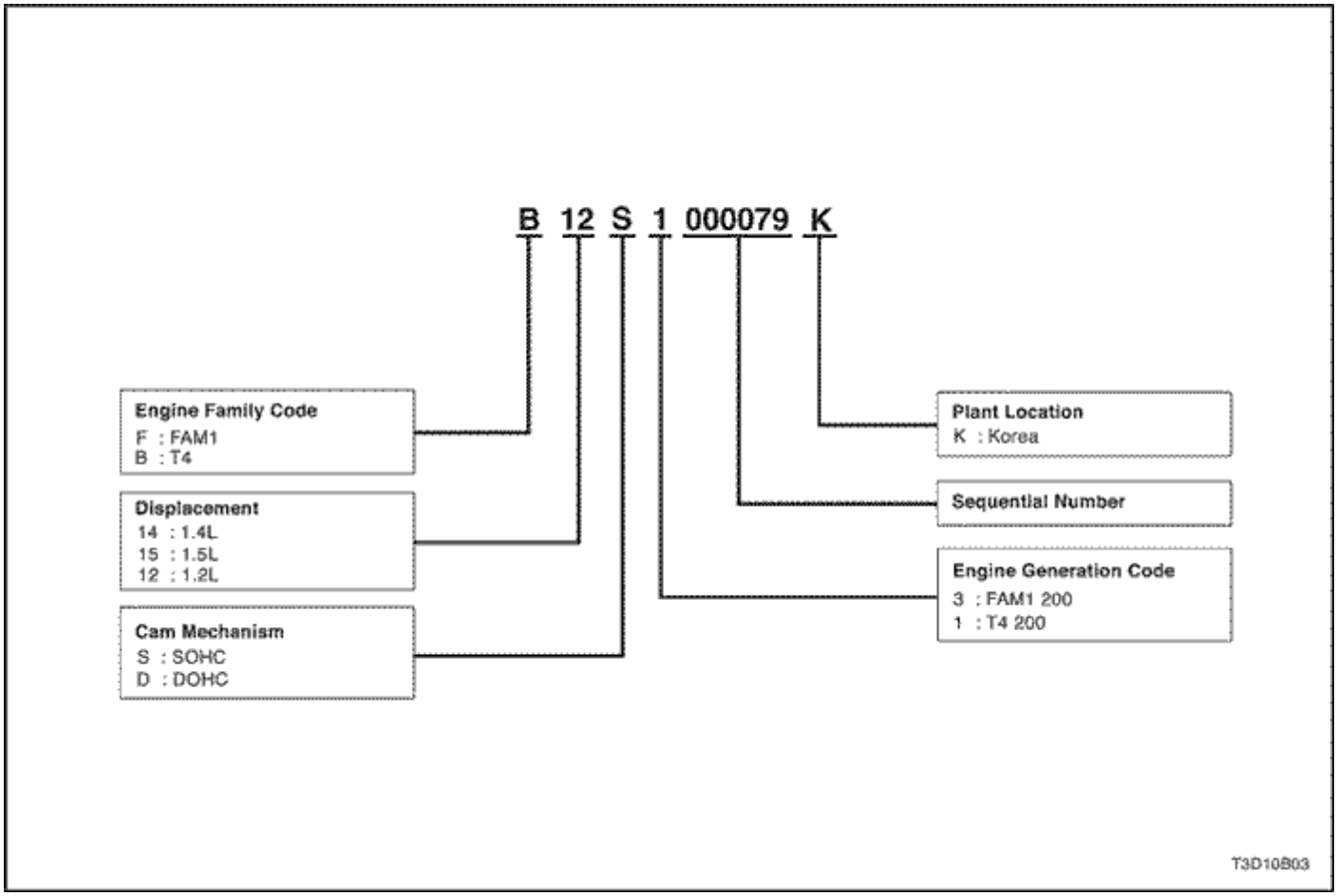
The vehicle identification number (VIN) is engraved in the top of the bulkhead.

Engine Number Location

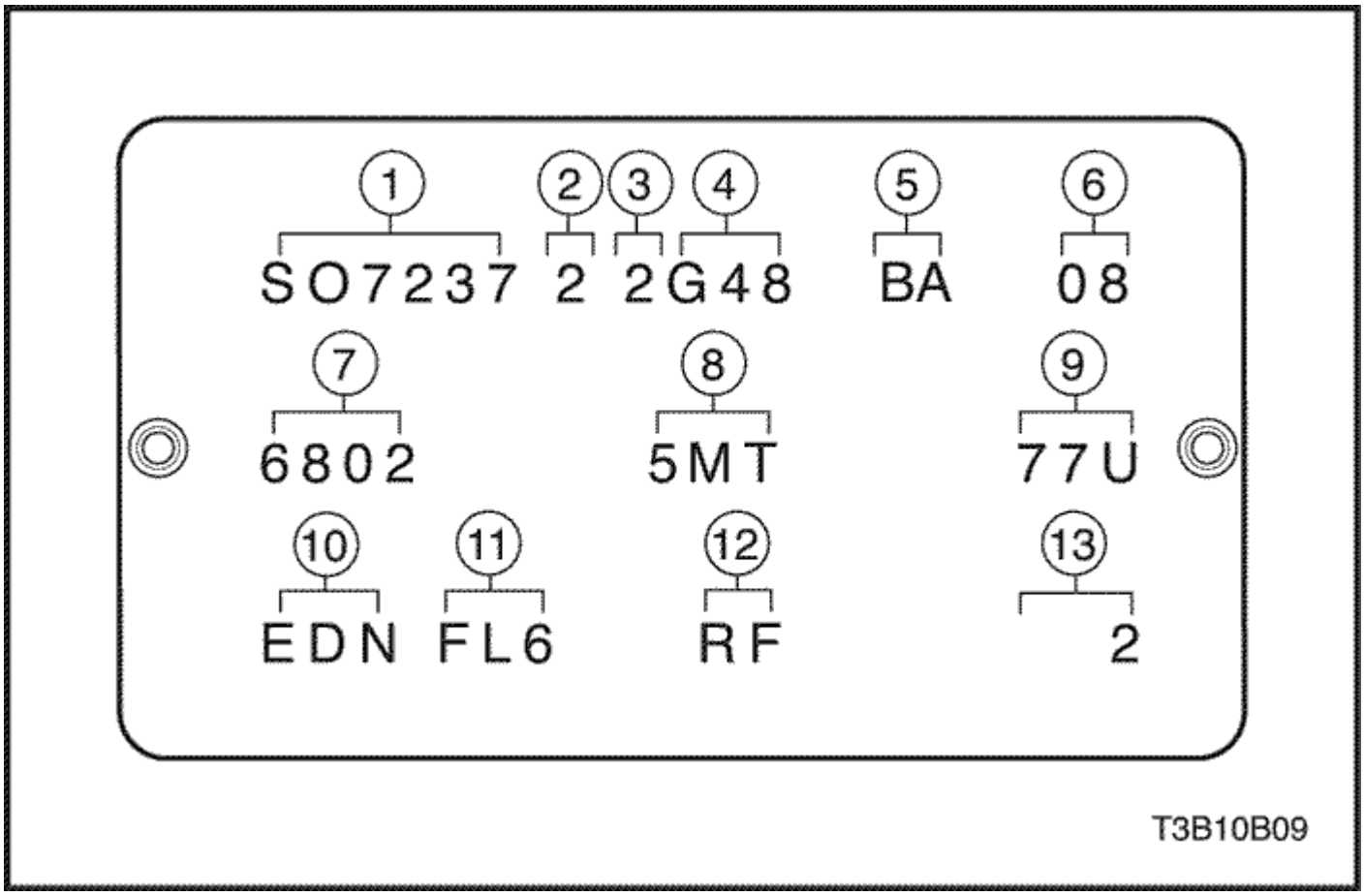


The engine number is stamped on the cylinder block under the No. 4 exhaust manifold of the engine.

Engine Number

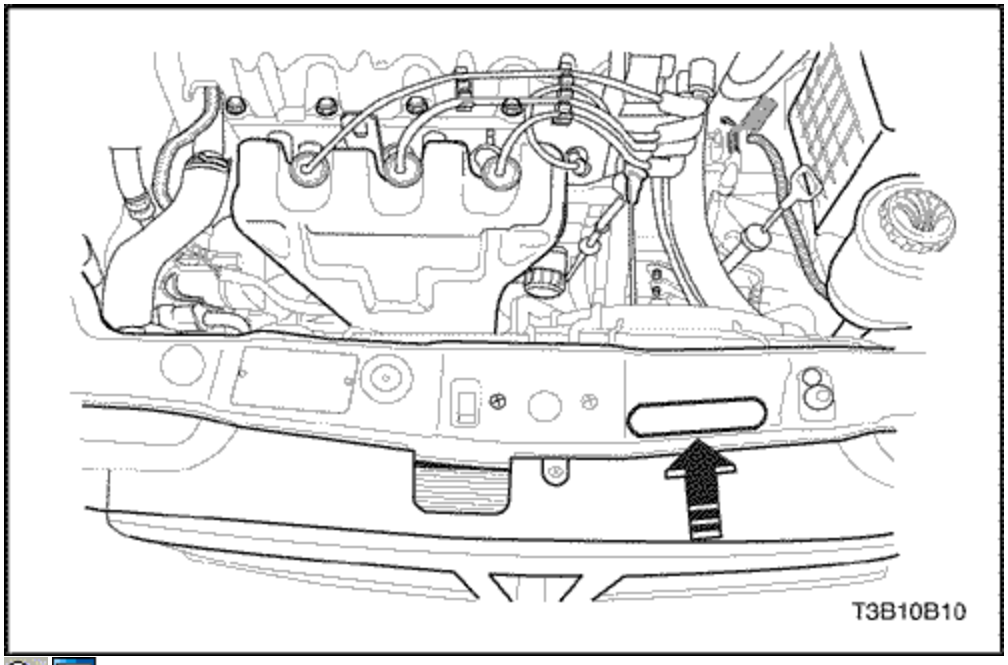


Body Identification Number Plate



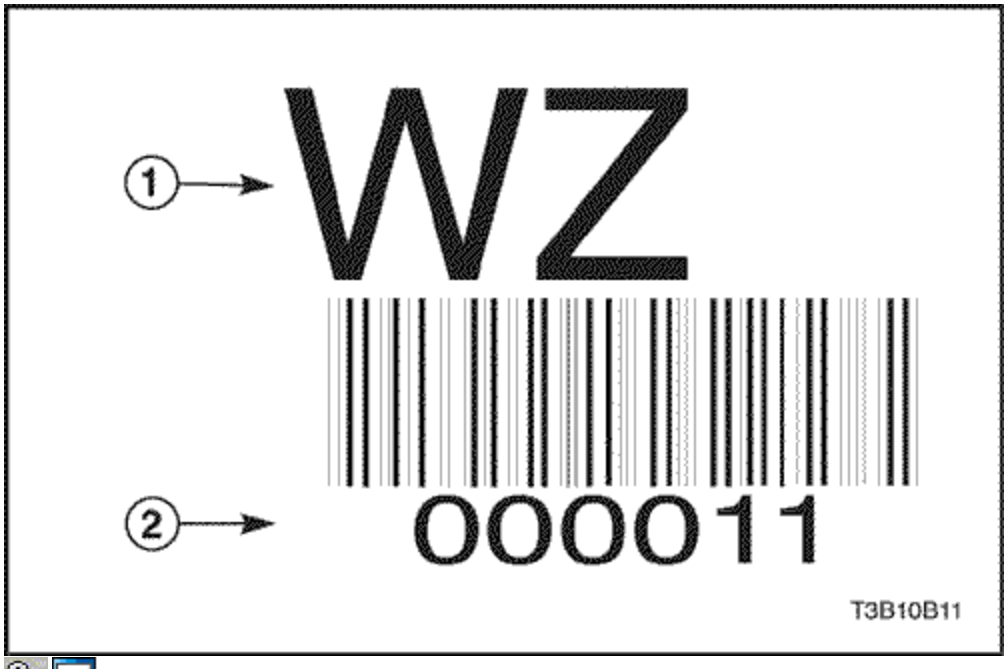
1. P/O Number
2. Check Digit
3. Car Type
4. Body Type
5. Battery Tray
6. Production Date
7. Sequential Number
8. Mission Type
9. Exterior Color
10. Export Country
11. Side Indicator lamp
12. Trunk Lid
13. P/O Plate Serial Number

Body Identification Number Plate Location



The body identification number plate is attached to the top of the front panel support.

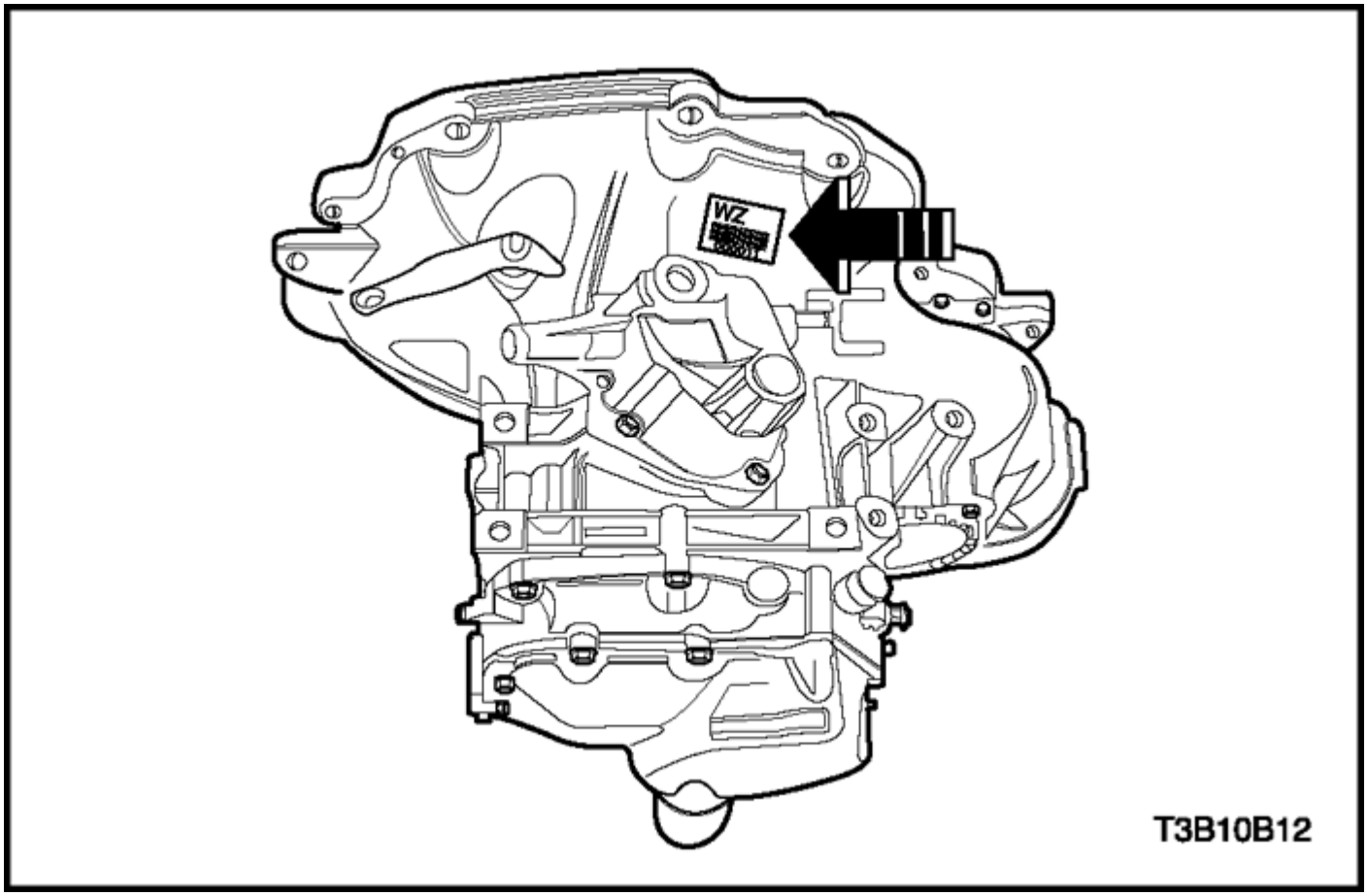
Manual Transaxle Identification Number Plate (D16)



1. Identification Code
2. Sequential Number

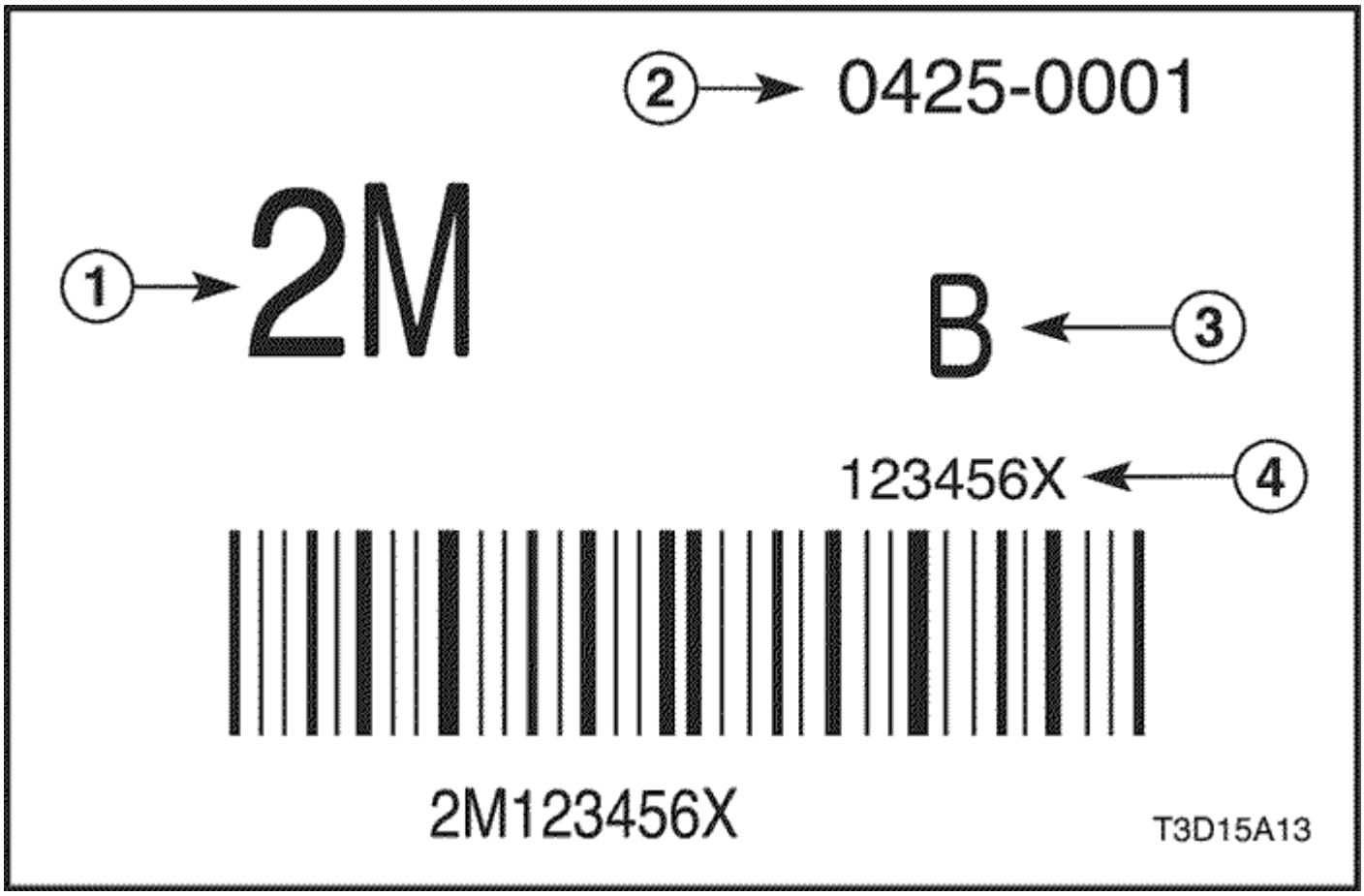
Identification Code	Engine	Gear Ratio
WZ	1.4L SOHC	4.176 W/R
SY	1.4L DOHC	3.944 Semi-Wide

Manual Transaxle Identification Number Plate Location (D16)



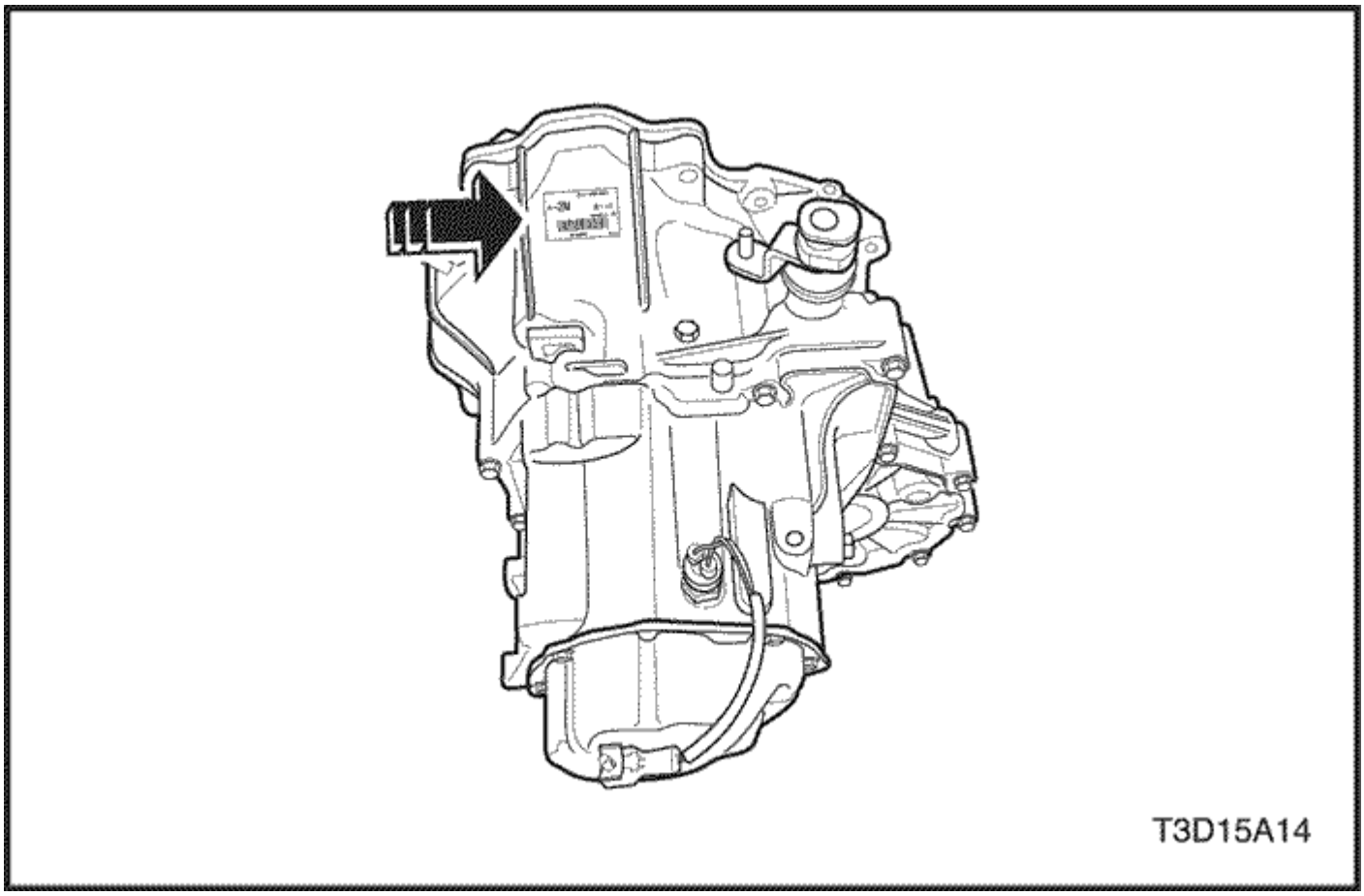
The manual transaxle identification number is attached to the top of the transmission case near the engine.

Manual Transaxle Identification Number Plate (Y4M)



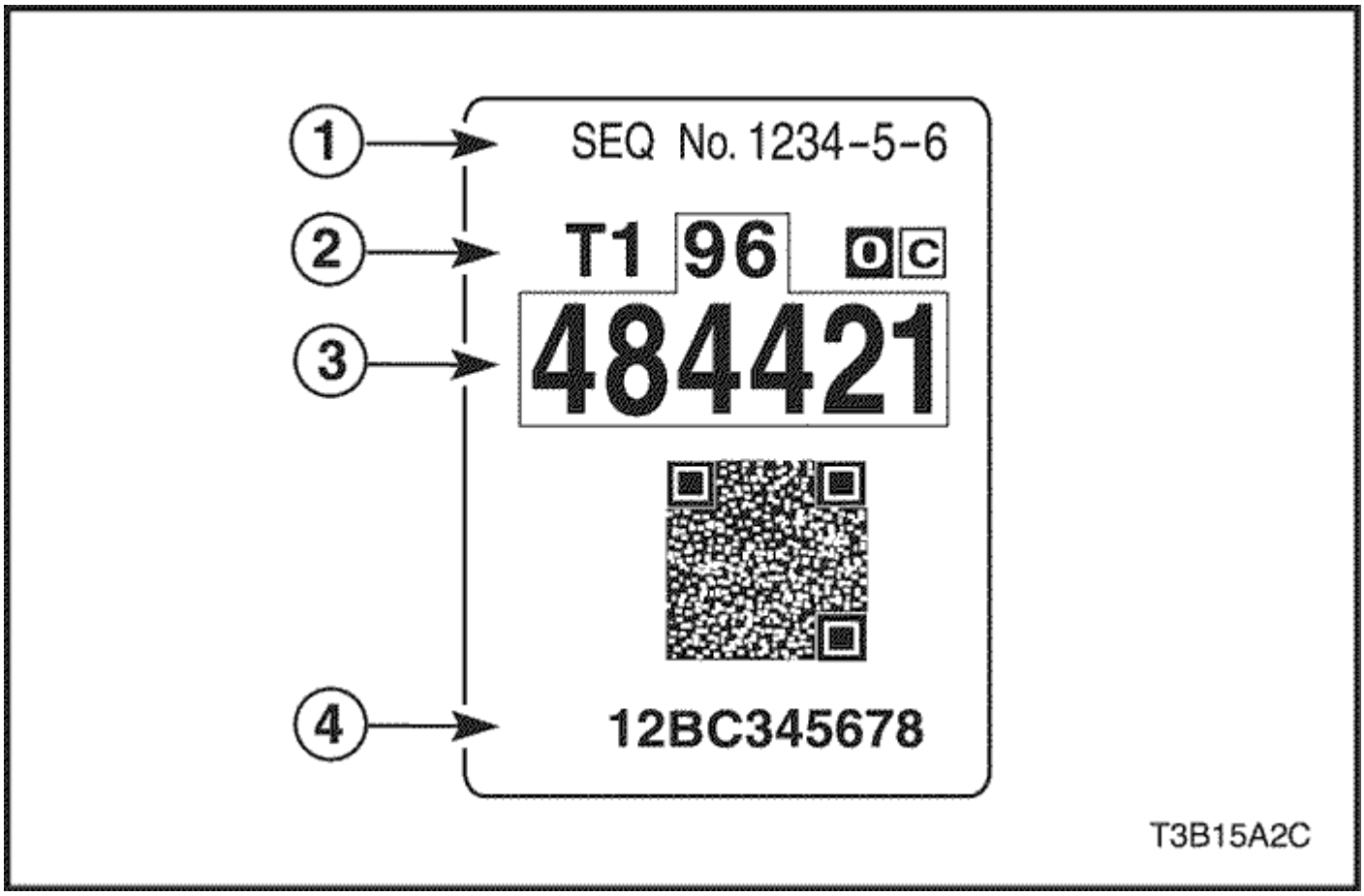
1. Identification Number
2. T/M Initial Manufacturing Date & Sequence Number
3. Plant to be Supplied
4. T/M Serial Number & Check Digit

Manual Transaxle Identification Number Plate Location (Y4M)



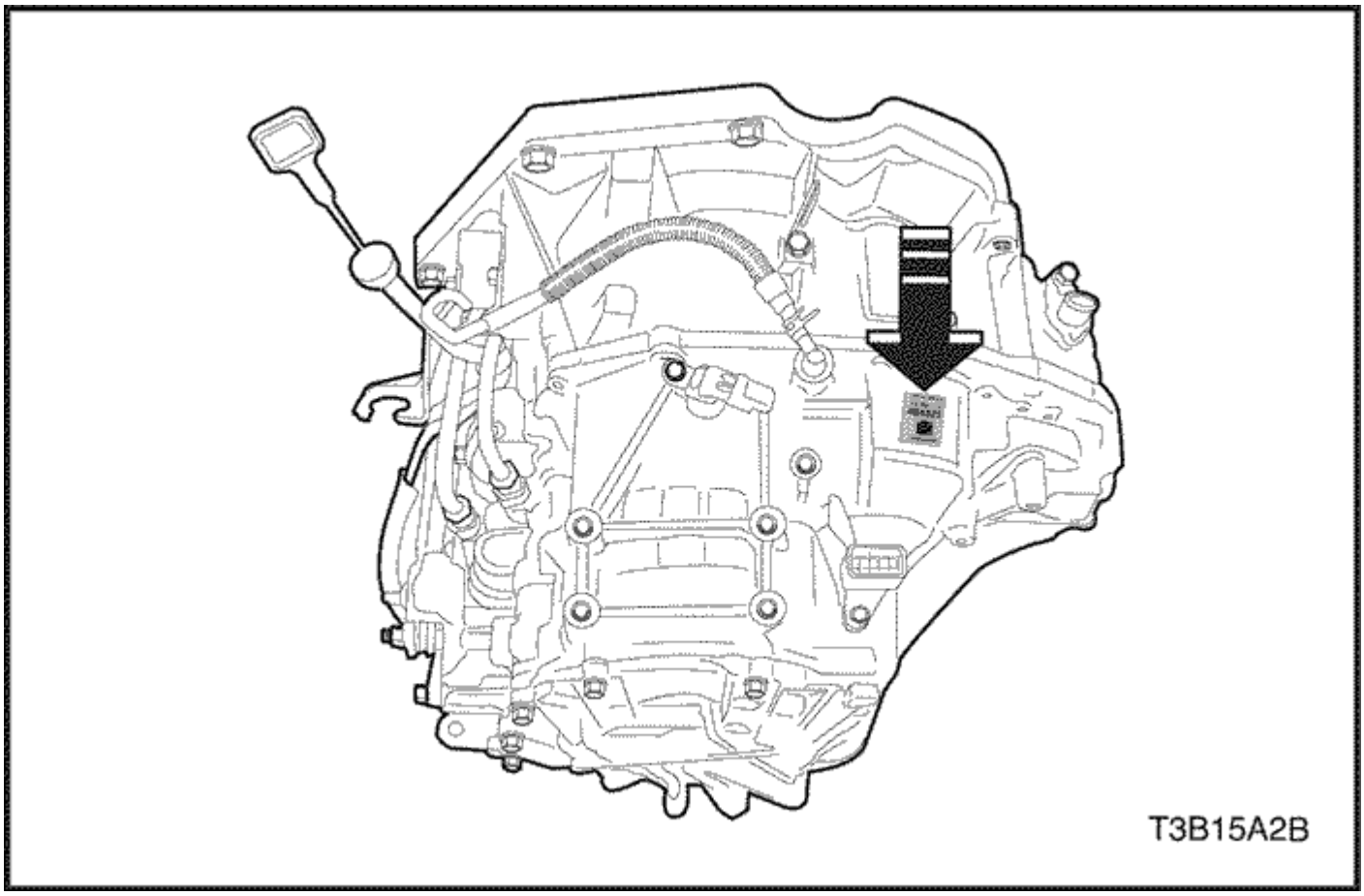
The manual transaxle identification number is attached to the top of the transmission case near the engine.

Automatic Transaxle Identification Number Plate



1. AW's Lot Number
2. Part ID Code
3. DW's Part Number
4. AW's Serial Number

Automatic Transaxle Identification Number Plate Location

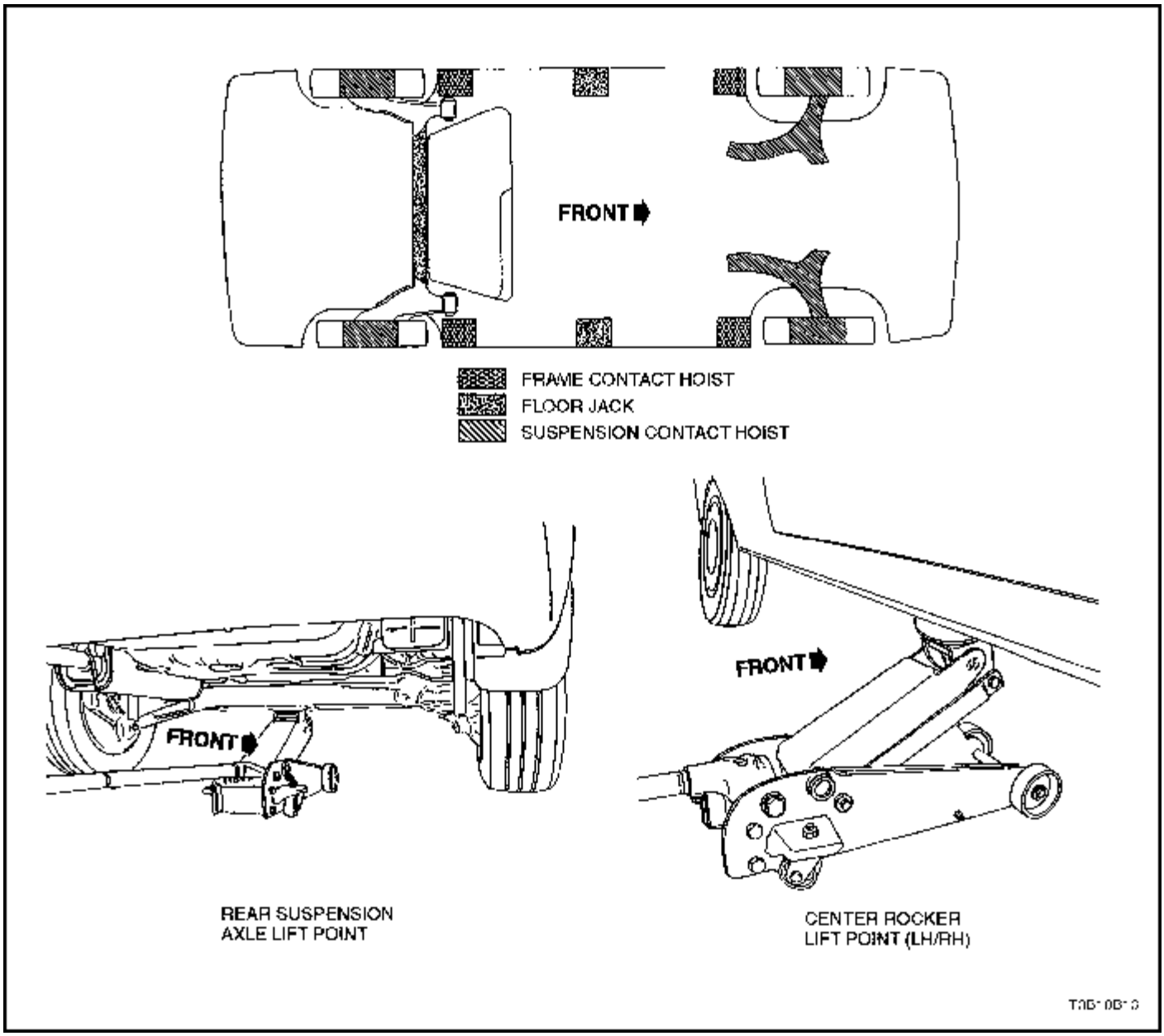


The automatic transaxle identification number plate is attached on the upper side of the transaxle case.

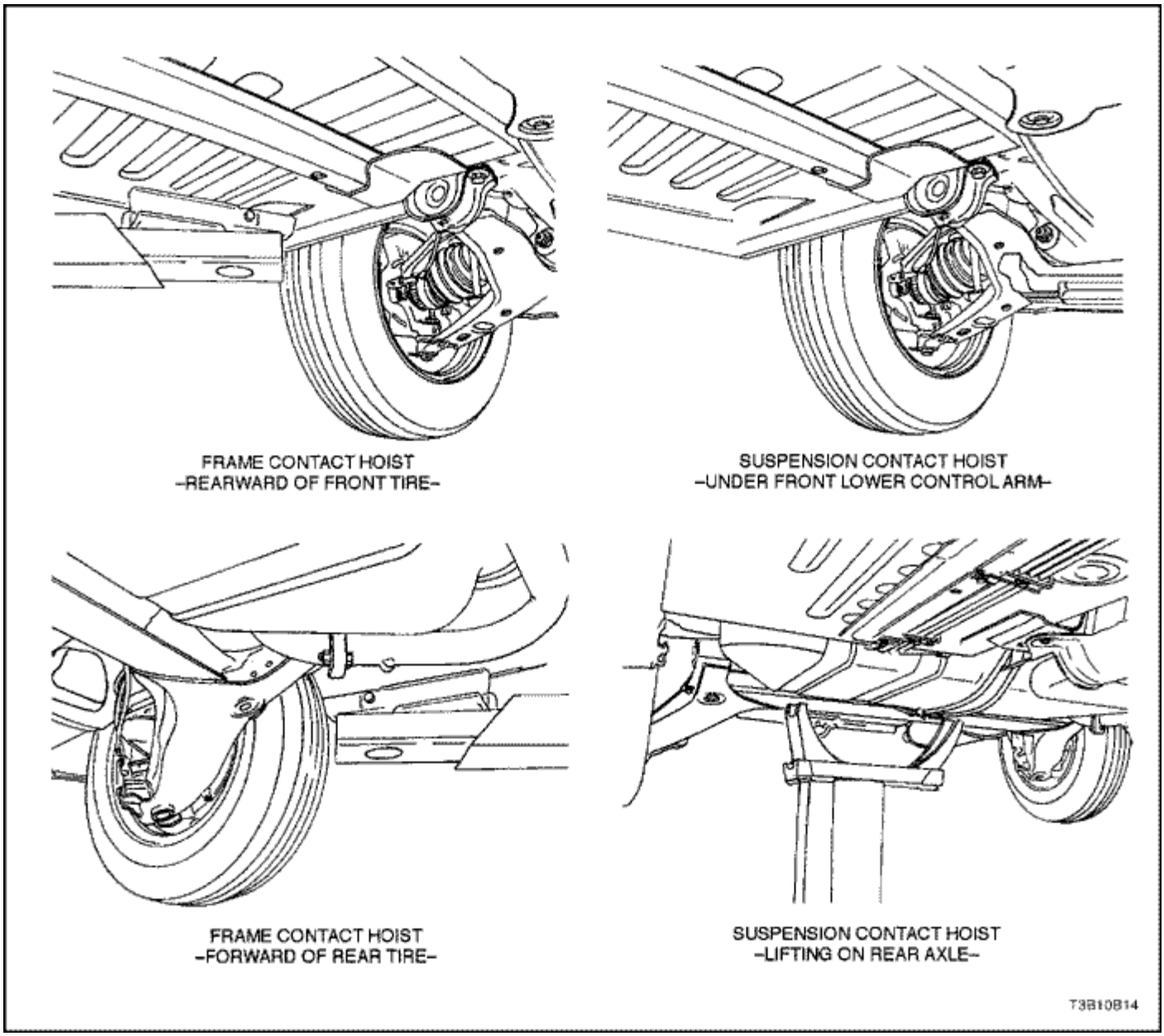
Vehicle Lifting Procedures

Notice : To raise the vehicle, place the lifting equipment only at the points indicated. Failure to use these precise positions may result in permanent vehicle body deformation. Many dealer service facilities and service stations are equipped with automotive hoists that bear upon some parts of the frame in order to lift the vehicle. If any other hoist method is used, use special care to avoid damaging the fuel tank, the filler neck, the exhaust system, or the underbody.

Vehicle Lifting Points



Vehicle Lifting Points



SECTION 1A

GENERAL ENGINE INFORMATION

DIAGNOSIS

Compression Test

Important : Disconnect the Crankshaft Position (CKP) Sensor connector to disable the fuel and the ignition systems.

Test the compression pressure for each cylinder. Low compression pressure may be the fault of the valves or the pistons. The following conditions should be considered when you check the cylinder compression:

- The engine should be at normal operating temperature.
- The throttle must be wide open.
- All the spark plugs should be removed.
- The battery must be at or near full charge.

1. Place approximately three squirts of oil from a plunger- type oiler into each spark plug port.
2. Place approximately three squirts of oil from a plunger- type oiler into each spark plug port.

2. Insert the engine compression gauge into each spark plug port.
3. Insert the engine compression gauge into each spark plug port.

3. Crank test each cylinder with four to five compression strokes using the starter motor.
4. Crank test each cylinder with four to five compression strokes using the starter motor.

4. The lowest reading should not be less than 70% of the highest reading. The compression gauge reading should not be less than 689 kPa (100 psi) for any of the cylinders.
5. The lowest reading should not be less than 70% of the highest reading. The compression gauge reading should not be less than 689 kPa (100 psi) for any of the cylinders.

5. Examine the gauge readings obtained after the four "puffs" per cylinder are obtained from cranking the starter motor. The readings are explained in the following descriptions:
6. Examine the gauge readings obtained after the four "puffs" per cylinder are obtained from cranking the starter motor. The readings are explained in the following descriptions:

- Normal Condition - Compression builds up quickly and evenly to the specified compression on each cylinder.
- Piston Rings Faulty - Compression is low on the first stroke and tends to build up on following strokes, but the compression pressure does not reach normal. The compression pressure improves considerably with the addition of oil into the cylinder.
- Valves Faulty - Low compression pressure on the first stroke. The compression pressure does not tend to build up on the following strokes. The compression pressure does not improve much with the addition of oil into the cylinder.

Oil Pressure Test

Step	Action	Value(s)	Yes	No
1	Is the oil pressure warning lamp on?	-	Go to *Step 2*	System OK
2	Check the oil level in the crankcase. Is the oil level low?	-	Go to *Step 3*	Go to *Step 4*
3	Add oil so that the oil level is up to the fullmark on the indicator. Is the repair complete?	-	Go to *Step 1*	-
4	Check the idle speed. Is the idle speed below the specified value ?	825 rpm	Go to *Step 5*	Go to *Step 6*
5	Increase the idle speed. Is the speed increased?	-	Go to *Step 1*	-
6	Inspect the oil pressure switch. Is the oil pressure switch incorrect or malfunctioning?	-	Go to *Step 7*	Go to *Step 8*
7	Install a new oil pressure switch. Is the repair complete?	-	Go to *Step 1*	-
8	Inspect the oil pressure gauge. Is the oil pressure gauge incorrect or malfunctioning?	-	Go to *Step 9*	Go to *Step 10*
9	Install a new oil pressure gauge. Is the repair complete?	-	Go to *Step 1*	-
10	Inspect the engine oil. Is the engine oil in the crankcase diluted or of	-	Go to *Step 11*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
	the improper viscosity?			
11	Install new engine oil of the proper viscosity for the expected temperatures. Is the repair complete?	-	Go to *Step 1*	-
12	Inspect the oil pump. Is the pump worn or dirty?	-	Go to *Step 13*	Go to *Step 14*
13	Replace the oil pump. Is the repair complete?	-	Go to *Step 1*	-
14	Inspect the oil filter. Is the oil filter plugged?	-	Go to *Step 15*	Go to *Step 16*
15	Install a new oil filter. Is the repair complete?	-	Go to *Step 1*	-
16	Inspect the oil pickup screen. Is the oil pickup screen loose or plugged?	-	Go to *Step 17*	Go to *Step 18*
17	Tighten or replace the oil pickup screen, as necessary. Is the repair complete?	-	Go to *Step 1*	-
18	Inspect the oil pickup tube. Are there any holes in the oil pickup tube?	-	Go to *Step 19*	Go to *Step 20*
19	Replace the oil pickup tube. Is the repair complete?	-	Go to *Step 1*	-
20	Inspect the bearing clearances. Are the bearing clearances more than the specified values?	Crankshaft 0.026 ~0.046 mm (0.0010~0.0018 in.) Connecting Rod 0.019 ~ 0.070 mm (0.0007 ~ 0.0027 in.)	Go to *Step 21*	Go to *Step 22*
21	Replace the bearing, if necessary. Is the repair complete?	-	Go to *Step 1*	-
22	Inspect the oil galleries. Are the oil galleries cracked, porous, or plugged?	-	Go to *Step 23*	Go to *Step 24*
23	Repair or replace the engine block. Is the repair complete?	-	Go to *Step 1*	-
24	Inspect the gallery plugs. Are any of the gallery plugs missing or installed improperly?	-	Go to *Step 25*	Go to *Step 26*
25	Install the plugs or repair, as necessary.	-	Go to *Step 1*	-

Step	Action	Value(s)	Yes	No
	Is the repair complete?			
26	Inspect the camshaft. Is the camshaft worn or is there evidence of poor machining?	-	Go to *Step 27*	System OK
27	Replace the camshaft. Is the repair complete?	-	Go to *Step 1*	-

Oil Leak Diagnosis

Most fluid oil leaks are easily located and repaired by visually finding the leak and replacing or repairing the necessary parts. On some occasions, a fluid leak may be difficult to locate or repair. The following procedures may help you in locating and repairing most leaks.

Finding the Leak:

1. Identify the fluid. Determine whether it is engine oil, automatic transmission fluid, power steering fluid, etc.
2. Identify where the fluid is leaking from.
    1. After running the vehicle at normal operating temperature, park the vehicle over a large sheet of paper.
    2. Wait a few minutes.
    3. Find the approximate location of the leak by the drippings on the paper.
3. Visually check around the suspected component. Check around all the gasket mating surfaces for leaks. A mirror is useful for finding leaks in areas that are hard to reach.
4. If the leak still cannot be found, it may be necessary to clean the suspected area with a degreaser, steam, or spray solvent.
    1. Thoroughly clean the area.
    2. Dry the area.
    3. Operate the vehicle for several miles at normal operating temperature and varying speeds.
    4. After operating the vehicle, visually check the suspected component.
    5. If you still cannot locate the leak, try using the powder or black light and dye method.

Powder Method:

1. Clean the suspected area.
2. Apply an aerosol-type powder, (such as foot powder), to the suspected area.

3. Operate the vehicle under normal operating conditions.
4. Visually inspect the suspected component. Trace the leak path over the white powder surface to the source.

Black Light and Dye Method:
A dye and light kit is available for finding leaks. Refer to the manufacturer's directions when using the kit.

1. Pour the specified amount of dye into the engine oil fill tube.
2. Operate the vehicle under normal operating conditions as directed in the kit.
3. Direct the light toward the suspected area. The dyed fluid will appear as a yellow path leading to the source.

Repairing the Leak
Once the origin of the leak has been pinpointed and traced back to its source, the cause of the leak must be determined in order for it to be repaired properly. If a gasket is replaced, but the sealing flange is bent, the new gasket will not repair the leak. The bent flange must be repaired also. Before attempting to repair a leak, check for the following conditions and correct them as they may cause a leak.
Gaskets:

- The fluid level/pressure is too high.
- The crankcase ventilation system is malfunctioning.
- The fasteners are improperly tightened or the threads are dirty or damaged.
- The flanges or the sealing surface is warped.
- There are scratches, burrs or other damage to the sealing surface.
- The gasket is damaged or worn.
- There is cracking or porosity of the component.
- An improper seal was used, (where applicable).

Seals:

- The fluid level/pressure is too high.
- The crankcase ventilation system is malfunctioning.
- The seal bore is damaged, scratched, burred or nicked.
- The seal is damaged or worn.
- Improper installation is evident.
- There are cracks in the component.
- The shaft surface is scratched, nicked or damaged.

- A loose or worn bearing is causing excess seal wear.

Knock Diagnosis

Definition for Knock

Engine knock refers to various types of engine noise. Heavy knock is usually very loud and the result of broken or excessively worn internal engine components. Light knock is a noticeable noise, but not as loud. Light knock can be caused by worn internal engine components. Loose or broken external engine components can also cause heavy or light knock.

Engine Knocks Cold and Continues for Two-Three Minutes and/or Knock Increases with Engine Torque

Step	Action	Value(s)	Yes	No
1	Does the engine knock when it is cold and continue for two to three minutes or does the knock increase with torque?	-	Go to *Step 2*	System OK
2	Inspect the flywheel. Is the flywheel contacting the splash shield?	-	Go to *Step 3*	Go to *Step 4*
3	Reposition the splash shield. Is the repair complete?	-	Go to *Step 1*	-
4	Inspect the balancer and the drive pulleys. Is either the balancer or the drive pulleys loose or broken?	-	Go to *Step 5*	Go to *Step 6*
5	Tighten or replace the balancer or the drive pulleys. Is the repair complete?	-	Go to *Step 1*	-
6	Inspect the piston-to-bore clearance. Is the clearance more than the specified value?	0.030 mm (0.001 in.)	Go to *Step 7*	Go to *Step 8*
7	1. Rebore the cylinder and hone to size. 2. Replace the piston. Is the repair complete?*	-	Go to *Step 1*	-
8	Inspect the connecting rod. Is the connecting rod bent?	-	Go to *Step 9*	System OK
9	Replace the connecting rod. Is the repair complete?	-	Go to *Step 1*	-

* Cold engine piston knock usually disappears when the cylinder is grounded out. Cold engine piston knock, which disappears in about 1.5 minutes, is considered acceptable.

Heavy Knock Hot with Torque Applied

Step	Action	Value(s)	Yes	No
1	Is there a heavy knock when the engine is hot and torque is applied?	-	Go to *Step 2*	System OK
2	Inspect the balancer and the pulley hub.	-	Go to *Step 3*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	Is the balancer or the pulley hub broken?			
3	Replace the broken balancer or the pulley hub. Is the repair complete?	-	Go to *Step 1*	-
4	Inspect the torque converter bolts. Are the bolts tightened to specified value?	45 N•m (33 lb-ft)	Go to *Step 5*	Go to *Step 6*
5	Tighten the torque converter bolts. Is the repair complete?	-	Go to *Step 1*	-
6	Inspect the accessory belts. Are the belts too tight or nicked?	-	Go to *Step 7*	Go to *Step 8*
7	Replace and/or tension the belts to specifications, as necessary. Is the repair complete?	-	Go to *Step 1*	-
8	Inspect the exhaust system. Is the system grounded?	-	Go to *Step 9*	Go to *Step 10*
9	Reposition the system, as necessary. Is the repair complete?	-	Go to *Step 1*	-
10	Inspect the flywheel. Is the flywheel cracked?	-	Go to *Step 11*	Go to *Step 12*
11	Replace the flywheel. Is the repair complete?	-	Go to *Step 1*	-
12	Inspect the main bearing clearance. Is the clearance more than the specified value?	0.026~0.046 mm (0.0010~ 0.0018 in.)	Go to *Step 13*	Go to *Step 14*
13	Replace the main bearings, as necessary. Is the repair complete?	-	Go to *Step 1*	-
14	Inspect the rod bearing clearance. Is the clearance more than the specified value?	0.019 ~ 0.070 mm (0.0007 ~ 0.0028 in.)	Go to *Step 15*	System OK
15	Replace the rod bearings, as necessary. Is the repair complete?	-	Go to *Step 1*	-

Light Knock Hot

Step	Action	Value(s)	Yes	No
1	Is there a light knock when the engine is hot?	-	Go to *Step 2*	System OK
2	Is detonation or spark knock evident?	-	Go to *Step 3*	Go to *Step 4*
3	Check the engine timing and the fuel quality. Was the problem found?	-	Go to *Step 1*	-
4	Inspect the torque converter bolts. Are the bolts tightened to the specified value?	45 N•m (33 lb-ft)	Go to *Step 5*	Go to *Step 6*
5	Tighten the torque converter bolts. Is the repair complete?	-	Go to *Step 1*	-

Step	Action	Value(s)	Yes	No
6	Inspect the manifold. Is there an exhaust leak at the manifold?	-	Go to *Step 7*	Go to *Step 8*
7	Tighten the bolts or replace the gasket. Is the repair complete?	-	Go to *Step 1*	-
8	Check the rod bearing clearance. Is the clearance within the specified value?	0.019 ~ 0.070 mm (0.0007 ~ 0.0028 in.)	Go to *Step 9*	System OK
9	Replace the rod bearings, as necessary. Is the repair complete?	-	Go to *Step 1*	-

Knocks During Initial Start-Up But Last Only a Few Seconds

Step	Action	Value(s)	Yes	No
1	Does the engine knock during initial start-up but last only a few seconds?	-	Go to *Step 2*	System OK
2	Check the engine oil. Is the proper viscosity oil used in the crankcase?	-	Go to *Step 4*	Go to *Step 3*
3	Install oil of the proper viscosity for the expected seasonal temperatures. Is the repair complete?	-	Go to *Step 1*	-
4	Inspect the hydraulic lifters. Is there evidence of hydraulic lifter bleed-down?	-	Go to *Step 5*	Go to *Step 6*
5	Clean, test and replace the lifters, as necessary. Is the repair complete?*	-	Go to *Step 1*	-
6	Inspect the crankshaft end clearance. Is the clearance more than specified value?	0.1 mm (0.0039 in.)	Go to *Step 7*	Go to *Step 8*
7	Replace the crankshaft thrust bearing. Is the repair complete?	-	Go to *Step 1*	-
8	Inspect the front main bearing clearance. Is the clearance more than the specified value?	0.026~0.046 mm (0.0010~ 0.0018 in.)	Go to *Step 9*	System OK
9	Replace the worn parts of the front main bearing. Is the repair complete?	-	Go to *Step 1*	-

* When the engine is stopped, some valves will be open. Spring pressure against the lifters will tend to bleed lifter down. Attempts to repair this should be made only if the problem is consistent.

An engine that is only operated for short periods between start-ups may have lifter noise that lasts for a few minutes. This is a normal condition.

Knocks at Idle Hot

Step	Action	Value(s)	Yes	No
1	Does the engine knock at idle when hot?	-	Go to *Step 2*	System OK
2	Inspect the drive belts. Are the belts loose or worn?	-	Go to *Step 3*	Go to *Step 4*
3	Tension or replace the belts, as necessary. Is the repair complete?	-	Go to *Step 1*	-
4	Inspect the A/C compressor and the generator. Is either the compressor or the generator faulty?	-	Go to *Step 5*	Go to *Step 6*
5	Replace the faulty A/C compressor or the generator. Is the repair complete?	-	Go to *Step 1*	-
6	Inspect the valve train. Are valve train components faulty?	-	Go to *Step 7*	Go to *Step 8*
7	Replace the faulty valve train components. Is the repair complete?	-	Go to *Step 1*	-
8	Check the engine oil. Is the proper viscosity oil used in the crankcase?	-	Go to *Step 10*	Go to *Step 9*
9	Install oil of the proper viscosity for the expected seasonal temperatures. Is the repair complete?	-	Go to *Step 1*	-
10	Inspect the piston pin clearance. Is the clearance more than the specified value?	0.020 mm (0.0008 in.)	Go to *Step 11*	Go to *Step 12*
11	Replace the piston and the pin. Is the repair complete?	-	Go to *Step 1*	-
12	Check the connecting rod alignment. Is the alignment faulty?	-	Go to *Step 13*	Go to *Step 14*
13	Check and replace rods, as necessary. Is the repair complete?	-	Go to *Step 1*	-
14	Inspect the piston-to-bore clearance. Is the clearance within the specified value?	0.030 mm (0.0012 in.)	Go to *Step 16*	Go to *Step 15*
15	Hone the bore and fit a new piston. Is the repair complete?	-	Go to *Step 1*	-
16	Inspect the crankshaft balancer. Is the balancer loose?	-	Go to *Step 17*	Go to *Step 18*
17	Torque or replace worn parts. Is the repair complete?	-	Go to *Step 1*	-
18	Check the piston pin offset. Is the offset at the specified value?	0.5 ± 0.1 mm (0.020 ~ 0.003 in.) Toward	Go to *Step 19*	System OK

Step	Action	Value(s)	Yes	No
		Thrust Side		
19	Install the correct piston. Is the repair complete?	-	Go to *Step 1*	-

Noise Diagnosis
Main Bearing Noise

Step	Action	Value(s)	Yes	No
1	Are dull thuds or knocks heard with every engine revolution?	-	Go to *Step 2*	System OK
2	Check the oil pump pressure. Is the oil pump pressure low?	-	Go to *Oil Pressure Test*	Go to *Step 3*
3	Inspect the crankshaft end play. Does the crankshaft end play exceed the specified value?	0.1 mm (0.0039 in.)	Go to *Crankshaft Replacement Procedure*	Go to *Step 4*
4	Inspect the crankshaft journals. Are the crankshaft journals out-of-round?	0.004 mm (0.0002 in.) max.	Go to *Crankshaft Replacement Procedure*	Go to *Step 5*
5	Inspect the belt tension. Does the belt tension exceed the specified value?	-	Go to *Timing Belt Replacement Procedure*	Go to *Step 6*
6	Inspect the crankshaft pulley. Is the crankshaft pulley loose?	-	Go to *Crankshaft Replacement Procedure*	System OK

Connecting Rod Bearing Noise Symptom

Step	Action	Value(s)	Yes	No
1	Is a knock noise heard under all engine speeds?	-	Go to *Step 2*	System OK
2	Inspect the crankshaft connecting rod journal. Is the crankshaft connecting rod journal worn?	-	Go to *Crankshaft Replacement Procedure*	Go to *Step 3*
3	Check the oil pump pressure. Is the oil pump pressure low?	-	Go to *Oil Pressure Test*	Go to *Step 4*
4	Inspect the crankshaft connecting rod journals. Are the journals out-of-round?	-	Go to *Crankshaft Replacement Procedure*	Go to *Step 5*
5	Inspect the connecting rods.	-	Go to *Pistons*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
	Is there a misaligned connecting rod?		*and Rods Replacement Procedure*	
6	Inspect the connecting rod bolts. Are the connecting rod bolts torqued properly?	-	System OK	Go to *Pistons and Rods Replacement Procedure*

Piston Noises

Step	Action	Value(s)	Yes	No
1	Are any of the following noises heard: a sharp double knock when the engine is idling, a light ticking with no load on the engine, or a "slapping" noise when the engine is cold?	-	Go to *Step 2*	System OK
2	Inspect the piston pin and the bushing. Is the piston pin or the bushing worn or loose?	-	Go to *Pistons and Rods Replacement Procedure*	Go to *Step 3*
3	Inspect the piston. Is the piston broken or cracked?	-	Go to *Pistons and Rods Replacement Procedure*	Go to *Step 4*
4	Inspect the connecting rods. Is there a misaligned connecting rod?	-	Go to *Pistons and Rods Replacement Procedure*	Go to *Step 5*
5	Inspect the piston position. Is the piston 180° out of position?	-	Go to *Pistons and Rods Replacement Procedure*	System OK

Valve Mechanism or Valve Train Noises

Step	Action	Value(s)	Yes	No
1	Is a light tapping sound heard from the engine?	-	Go to *Step 2*	System OK
2	Inspect the valve springs. Are the springs weak or broken?	-	Go to *Cylinder Head and Valve Train Components Replacement Procedure*	Go to *Step 3*
3	Inspect the valves. Are the valves sticking or warped?	-	Go to *Cylinder Head and*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
			Valve Train Components Replacement Procedure	
4	Inspect the valve lifters. Are the valve lifters dirty, stuck or worn?	-	Go to *Cylinder Head and Valve Train Components Replacement Procedure*	Go to *Step 5*
5	Inspect the camshaft lobes. Are the camshaft lobes damaged or improperly machined?	-	Go to *Camshaft Replacement Procedure*	Go to *Step 6*
6	Check the oil supply to the valve train. Is the oil supply insufficient or poor?	-	Go to *Cylinder Head and Valve Train Components Replacement Procedure*	Go to *Step 7*
7	Inspect the valve guides. Are the valve guides worn?	-	Go to *Cylinder Head and Valve Train Components Replacement Procedure*	Go to *Step 8*
8	Inspect the valve spring seat. Is the valve spring seat incorrect?	-	Go to *Cylinder Head and Valve Train Components Replacement Procedure*	System OK

GENERAL INFORMATION

Cleanliness and Care

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the ten-thousandths of an inch. When any internal engine parts are serviced, care and cleanliness are important. A liberal coating of engine oil should be applied to friction areas during assembly, to protect and lubricate the surfaces on initial operation.

Proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.
Whenever valve train components are removed for service, they should be kept in order. They should be installed in the same locations, and with the same mating surfaces, as when they were removed.
Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.

On-Engine Service

Caution : Disconnect the negative battery cable before removing or installing any electrical unit, or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

Notice : Any time the air cleaner is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material, which could follow the intake passage into the cylinder and cause extensive damage when the engine is started.

SECTION 1B1

1.2 SOHC ENGINE MECHANICAL

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical erminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Engine Specifications

Application	Description (Manual and Automatic)
General Data:	
Engine Type	4 Cylinder (In-Line)
Displacement:	1150 cm^3
Bore Stroke:	68.5 x 78.0 mm (2.70 in. x 3.07 in.)
Compression Ratio	9.3 ± 0.2 :1
Firing Order	1-3-4-2
Cylinder Bore:	
Diameter	68.5 mm (2.70 in.)
Out of Round (Maximum)	0.005 mm (0.00020 in.)
Taper (Maximum):	0.005 mm (0.00020 in.)
Piston :	
Diameter	68.465 ~ 68.485 mm (2.695 ~ 2.696 in.)
Clearance to Bore	0.025 ~ 0.045 mm (0.0010 ~ 0.0018 in.)
Piston Rings:	
Ring, End Gap:	
Top Compression	0.15 ~ 0.30 mm (0.006 ~ 0.012 in.)
2nd Compression	0.30 ~ 0.45 mm (0.012 ~ 0.018 in.)
Groove Clearance:	
Top Impression	0.02 ~ 0.06 mm (0.0008 ~ 0.002 in)
2nd Impression	0.02 ~ 0.06 mm (0.0008 ~ 0.002 in.)
Piston Pin :	
Diameter	16.995 ~ 17.000 mm (0.6691 ~ 0.6693 in.)
Pin Off-Set	0.4 ~ 0.6 mm (0.016 ~ 0.024 in.)
Camshaft:	
Lift Intake:	5.42 mm (0.213 in)
Lift Exhaust	5.38 mm (0.212 in.)
End Play	
Journal OD:	
No. 1	43.425 ~ 43.450 mm (1.710 ~ 1.711 in.)
No. 2	43.625 ~ 43.650 mm (1.718 ~ 1.719 in.)
No. 3	43.825 ~43.850 mm (1.725 ~ 1.726 in.)
No. 4	44.025 ~ 44.050 mm (1.733 ~ 1.734 in.)
No. 5	44.225 ~ 44.250 mm (1.741 ~ 1.742 in.)
Bearing OD:	
No. 1	43.500 mm (1.713 in.)

Application	Description (Manual and Automatic)
No. 2	43.700 mm (1.720 in.)
No. 3	43.900 mm (1.728 in.)
No. 4	44.100 mm (1.736 in.)
No. 5	44.300 mm (1.744 in.)
Crankshaft :	
Main Journal	
Diameter (All)	43.982 ~ 44.000 mm (1.7316 ~ 1.7323 in.)
Taper (Maximum)	0.005 mm (0.0002 in.)
Out of Round (Maximum)	0.005 mm (0.0002 in.)
Main Bearing Clearance (All)	0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)
Crankshaft End Play	0.11 ~ 0.31 mm (0.004 ~ 0.012 in.)
Connecting Rod Journal:	
Diameter (All)	37.982 ~ 38.000 mm (1.495 ~ 1.496 in.)
Taper (Maximum)	0.005 mm (0.0002 in.)
Out of Round (Maximum)	0.005 mm (0.0002 in.)
Rod Bearing Clearance (All)	0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)
Rod Side Clearance	0.10 ~ 0.25 mm (0.004 ~ 0.010 in.)
Valve System:	
Valve Lash Compensators	Mechanical
Face Angle (All)	45°
Seat Angle (All)	45°
Seat Runout (Maximum, All)	0.05 mm (0.0019 in.)
Face Runout (Maximum, All)	0.045 mm (0.0018 in.)
Seat Width:	
Intake	1.56 mm (0.061 in.)
Exhaust	1.56 mm (0.061 in.)
Valve Guide Inside Diameter (All)	5.500 ~ 5.512 mm (0.2165 ~ 0.2170 in.)
Valve Stem Diameter	
Intake	5.465 ~ 5.480 mm (0.215 ~ 0.216 in.)
Exhaust	5.440 ~ 5.455 mm (0.214 ~ 0.215 in.)
Valve Diameter (All):	
Intake	35.5 ~ 35.7 mm (1.398 ~ 1.406 in.)
Exhaust	31.7 ~ 31.9 mm (1.248 ~ 1.256 in.)
Valve Spring Loads:	
Valve Open	55.0 ± 3.3 Kgf (121.25 ± 7.28 lbs) @ 36.2 mm (1.425

Application	Description (Manual and Automatic)
	in.)
Valve Closed	25.2 ± 1.8 Kgf (55.56 ± 3.97 lbs) @ 44.2 mm (1.740 in.)
Oil Pump :	
Gap Between Oil Pump Body and Out Rotor	0.10 ~ 0.17 mm (0.0039 ~ 0.0067 in.)
Out Rotor Side Clearance	0.065 ~ 0.115 (0.0026 ~ 0.0045 in.)
Inner Rotor Side Clearance	0.065 ~ 0.115 (0.0026 ~ 0.0045 in.)
Relief Valve Spring Free Length	52.4 mm (2.06 in.)

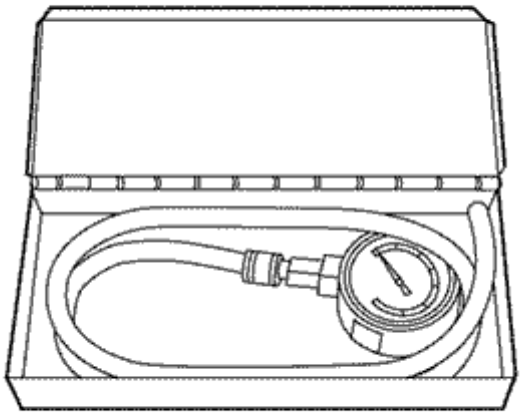
Fastener Tightening Specifcations

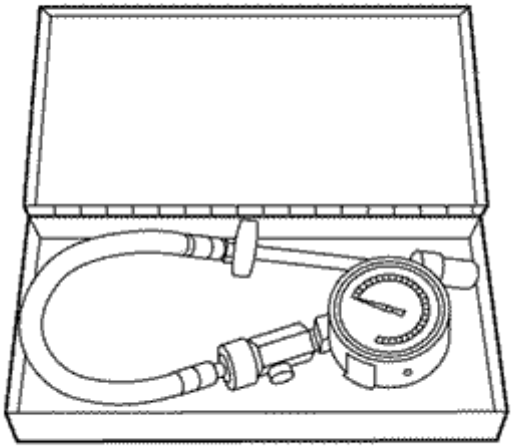
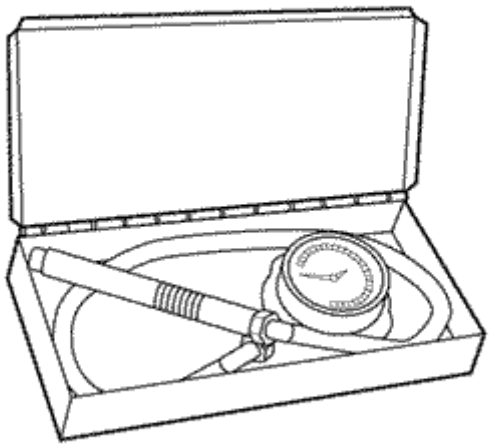
Application	N•m	Lb-Ft	Lb-In
Valve Cover Hexagon Bolts To	10.5	-	93
Cylinder Head Bolts	65 - 70	48 - 52	-
Cylinder Head Cover Hexagon Bolts	9 - 12	-	80 - 106
Catalytic Converter To Exhaust Manifold Nuts	25 - 35	18 - 25	-
Heat Shield Mounting Bolts	8 - 12	-	71 - 106
Timing Belt Rear Cover Bolts	9 - 12	-	80 - 106
Lower Timing Belt Cover Bolts	9 - 12	-	80 - 106
Upper Timing Belt Cover Bolts	9 - 12	-	80 - 106
Crankshaft Pulley Bolts	65 - 75	48 - 55	-
Air Cleaner Housing Bolts	7 - 9	-	62 - 80
Camshaft Thrust Plate Screws	10	-	89
Rocker Arm Shaft Mounting Bolts	10	-	89
Water Outlet Case Nuts and the Bolt	10.5	-	93
Valve Cover Hexagon Bolts	10.5	-	93
Tensioner Bolts to	19	14	-
Timing Belt Tensioner Bolt	19	14	-
Timing Belt Front Lower Cover Bolts	10.5	-	93
Oil Level Gauge Guide Tube Bolt	10.5	-	93
Timing Belt Front Upper Cover Bolts	10.5	-	93
Crankshaft Pulley Bolts	70	52	-
Air Cleaner Housing Bolts	12	-	106
Oil Pump Bolts to	10.5	-	93
Oil Pump Strainer Bolts	10.5	-	93
Rear Timing Belt Cover Bolts	10.5	-	93
Camshaft Gear Bolt to	55	41	-
Oil Pan Retaining Bolts and the Nuts	10	44	-

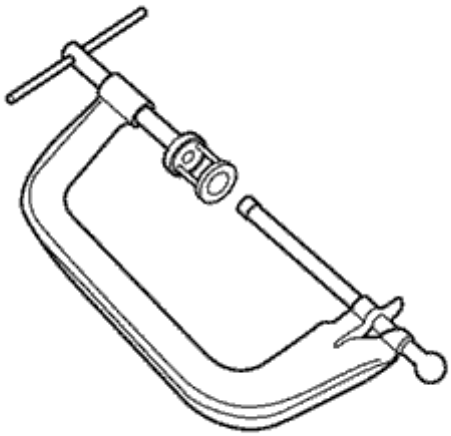
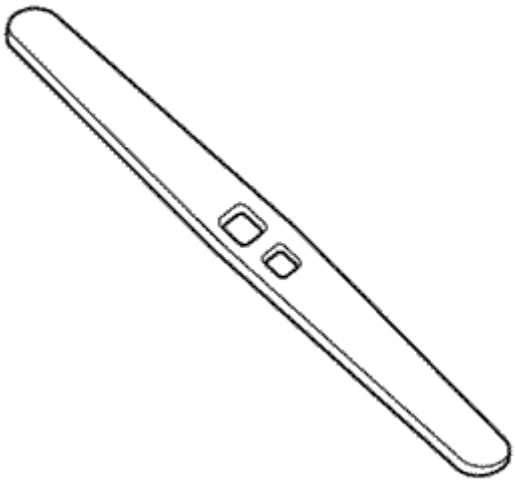
Application	N•m	Lb-Ft	Lb-In
Intake Manifold Retaining Nuts and Bolts	17	13	-
Exhaust Manifold Bolts and the Nuts	22	16	-
Front Exhaust Pipe Bracket Bolts	40	30	-
Catalytic Converter Lower Flange Nuts	40	-	30
Exhaust Manifold Heat Shield Bolts	10	-	89
Engine Mounting Bracket Bolt	55	41	-

SPECIAL TOOLS

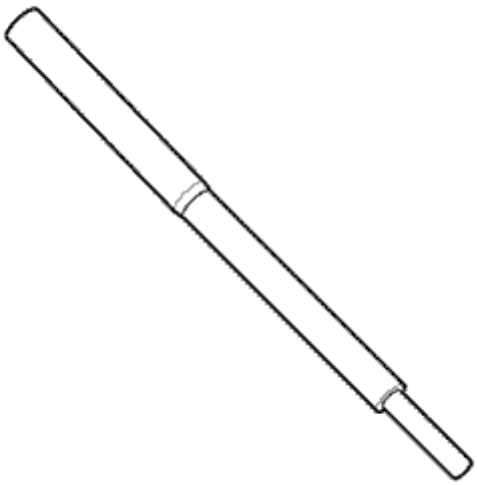
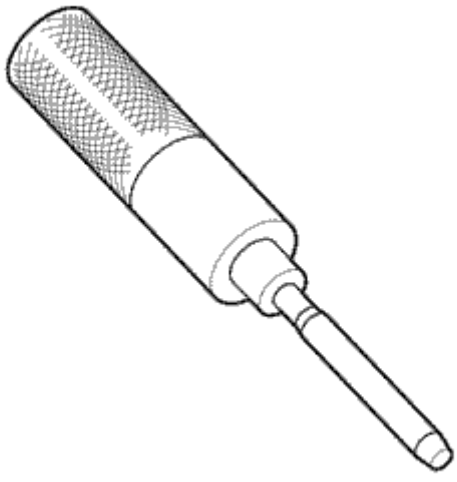
Special Tools Table

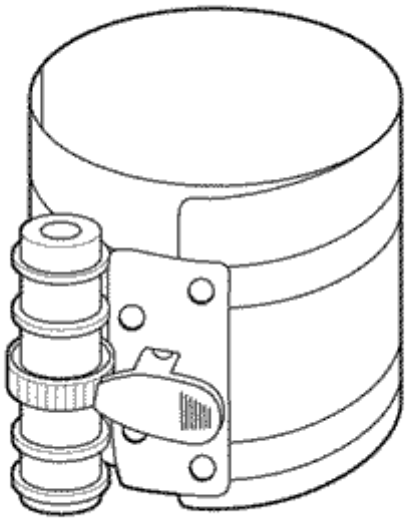
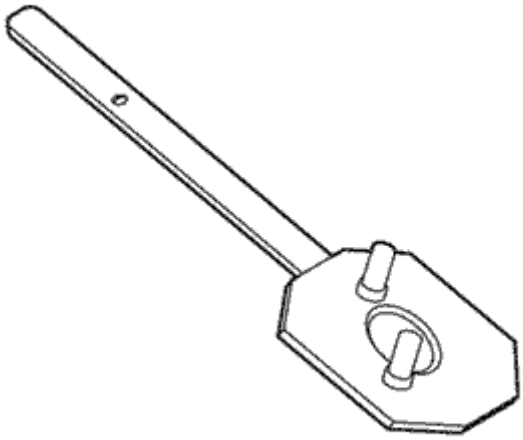
 M3C11B4X	09915-64510 Compression Pressure Gauge
	09915-67310 Vacuum Gauge

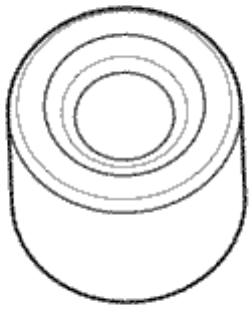
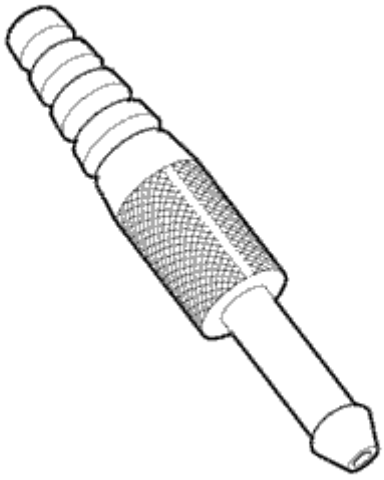
 M3C11B4Y	
 M3C11B4Z	09915-77310 Oil Pressure Gauge
	09916-14510 Valve Spring Compressor 09916-48210

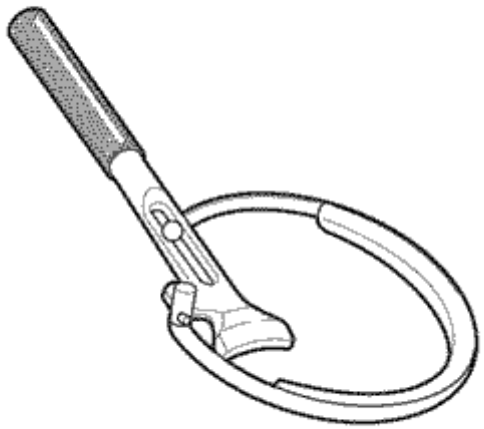
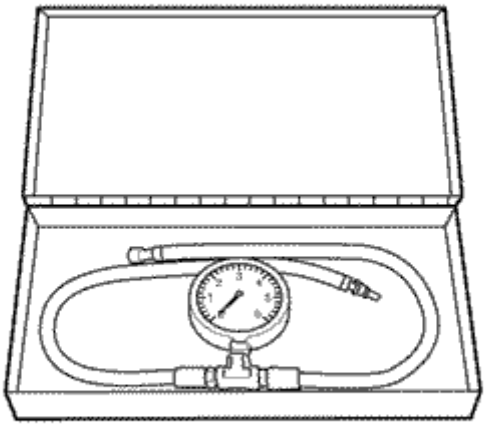
 M3C11B5A	Valve Spring Compressor Attachment
 M3C11B5B	09916-34541 Reamer Handle
	09916-37320 Valve Guide Reamer (5mm or 0.1969 in.)

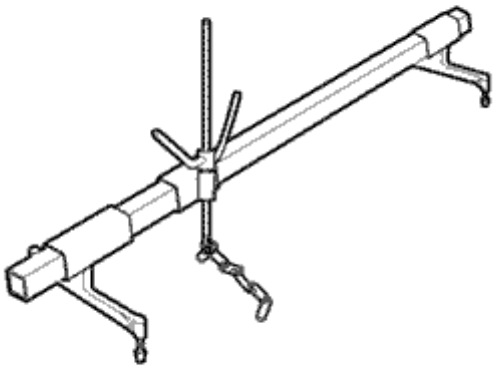
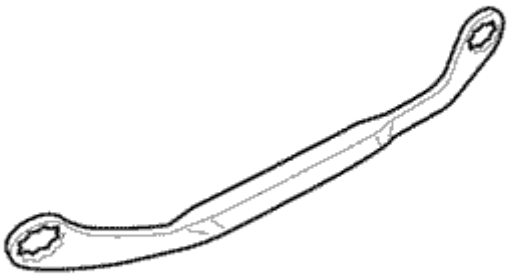
 M3C11B5C	
 M3C11B5D	09916-38210 Valve Guide Reamer (11mm or 0.4331 in.)
	09916-44910 Valve Guide Remover

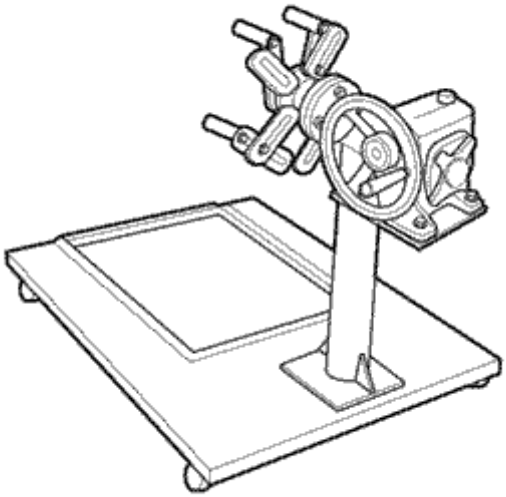
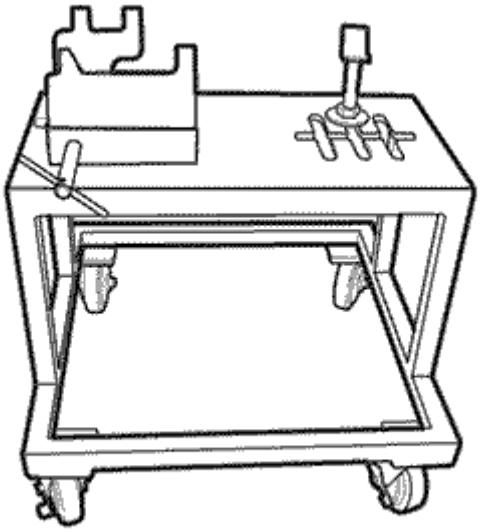
 M3C11B5E	
 M3C11B5F	09916-58210 Valve Guide Installer
	09916-77310 Piston Compressor

 M3C11B5G	
 M3C11B5H	09917-68220 Camshaft Sprocket Holder
	09917-88220 Valve Guide Installer Attachment

 M3C11B5I	
 M3C11B5J	09918-08210 Vacuum Gauge Joint
	09927-56020 Crankshaft Pully Holder

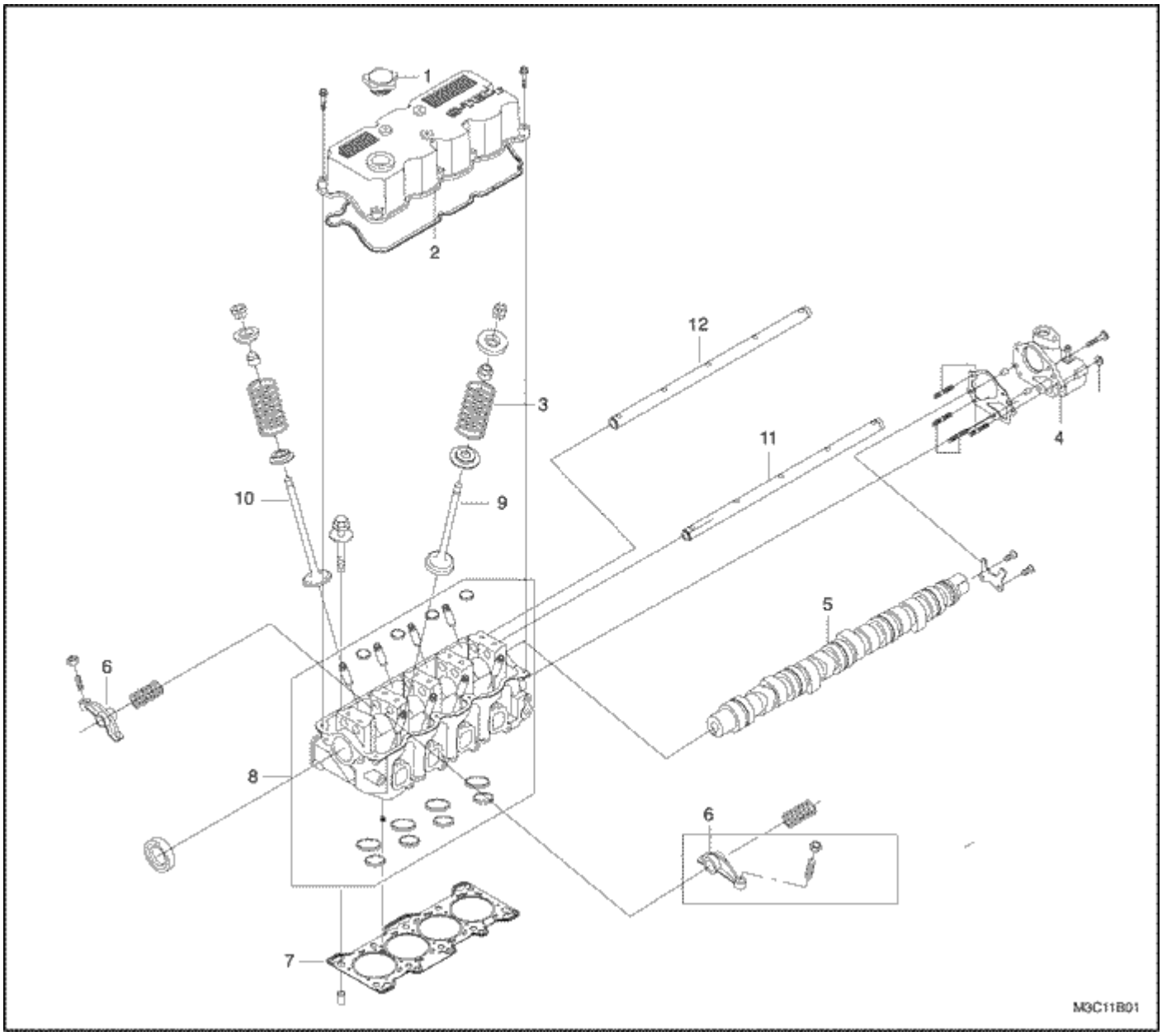
 M3C11B5L	
 M3C11B5M	DW 100-010 Fuel Pressure Gauge
	DW110-060 Engine Assembly Support Fixture

 DW110060	
 M3C11B5R	DW 150-020 Distributor Case Nut Remover/Installer
	KM - 412 Engine Overhaul Stand

 M3C11B5S	
 M3C11B5T	DW 010 - 010 Engine & Transaxle Assembly Support Remover/Installer

COMPONENT LOCATOR

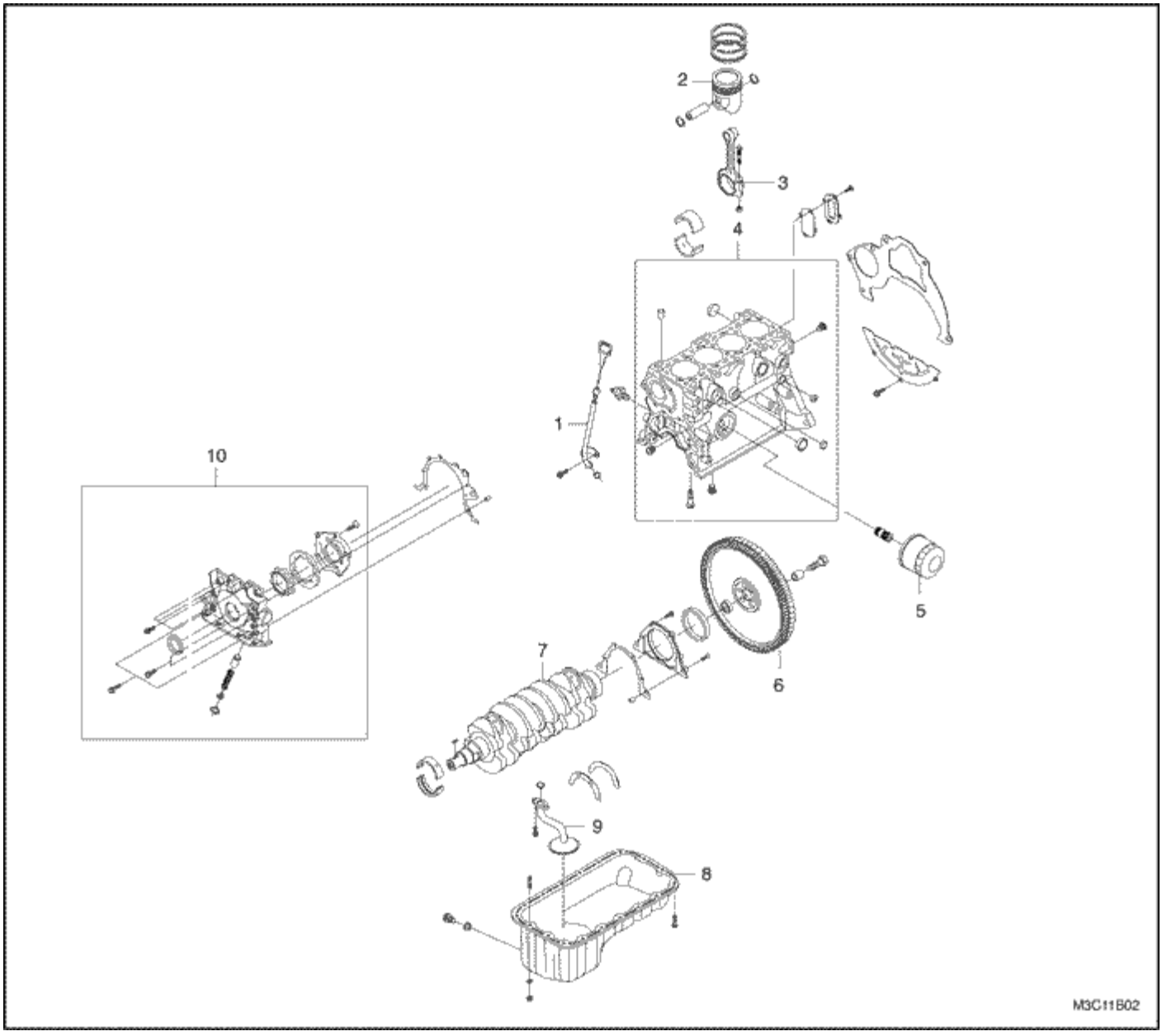
Cylinder Head



1. Oil Filler Cap
2. Cylinder Head Cover
3. Cylinder Head Cover (Euro III)
4. Distributor Case
5. Camshaft
6. Exhaust Rocker Arm

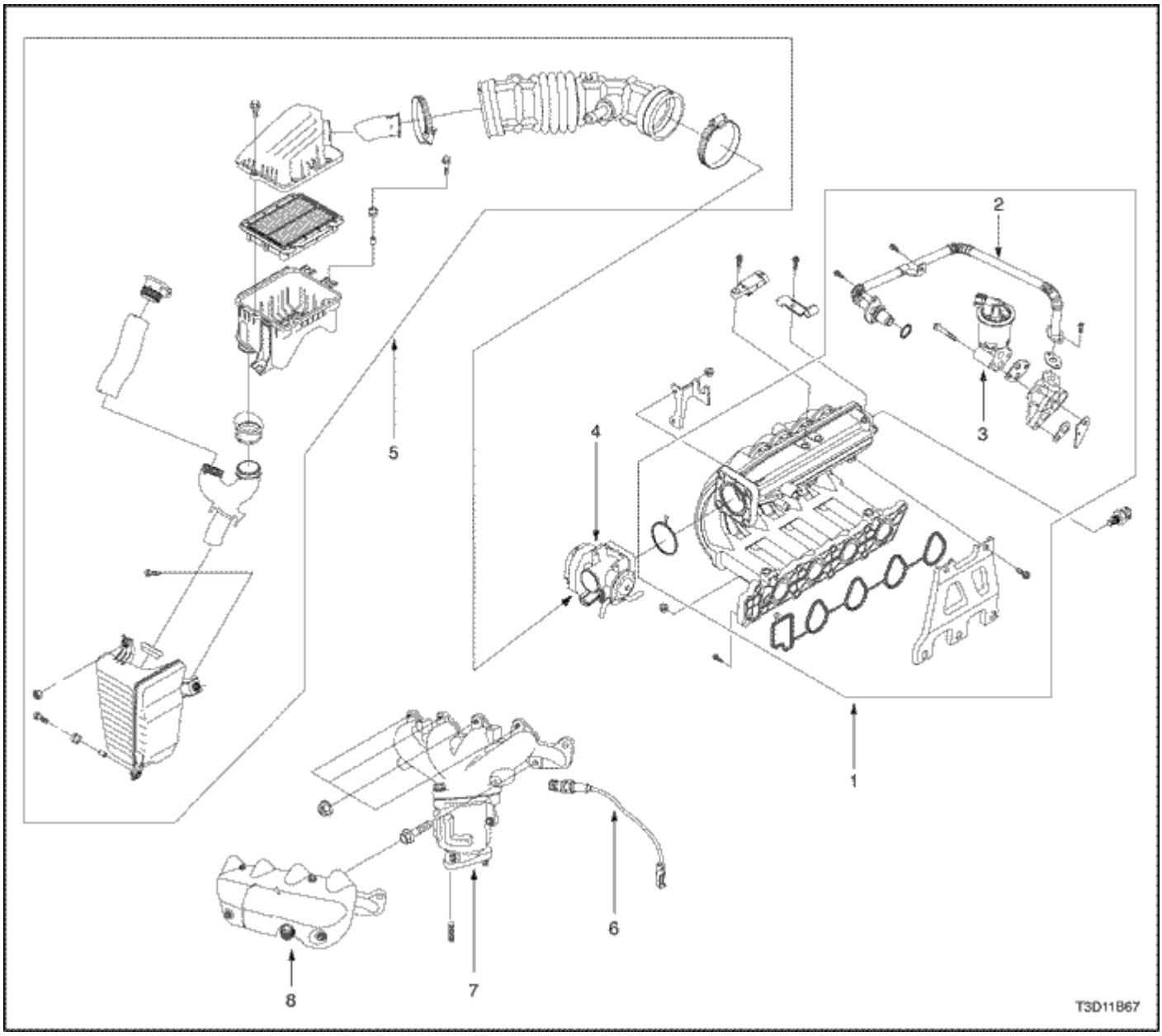
7. Cylinder Head Gasket
8. Cylinder Head
9. Intake Rocker Arm
10. Exhaust Valve
11. Intake Valve

Engine Block



1. Oil Level Gauge Stick
2. Piston
3. Connecting Rod
4. Engine Block
5. Oil Filter
6. Flywheel
7. Crankshaft
8. Oil Pan
9. Oil Pump Strainer
10. Oil Pump Assembly

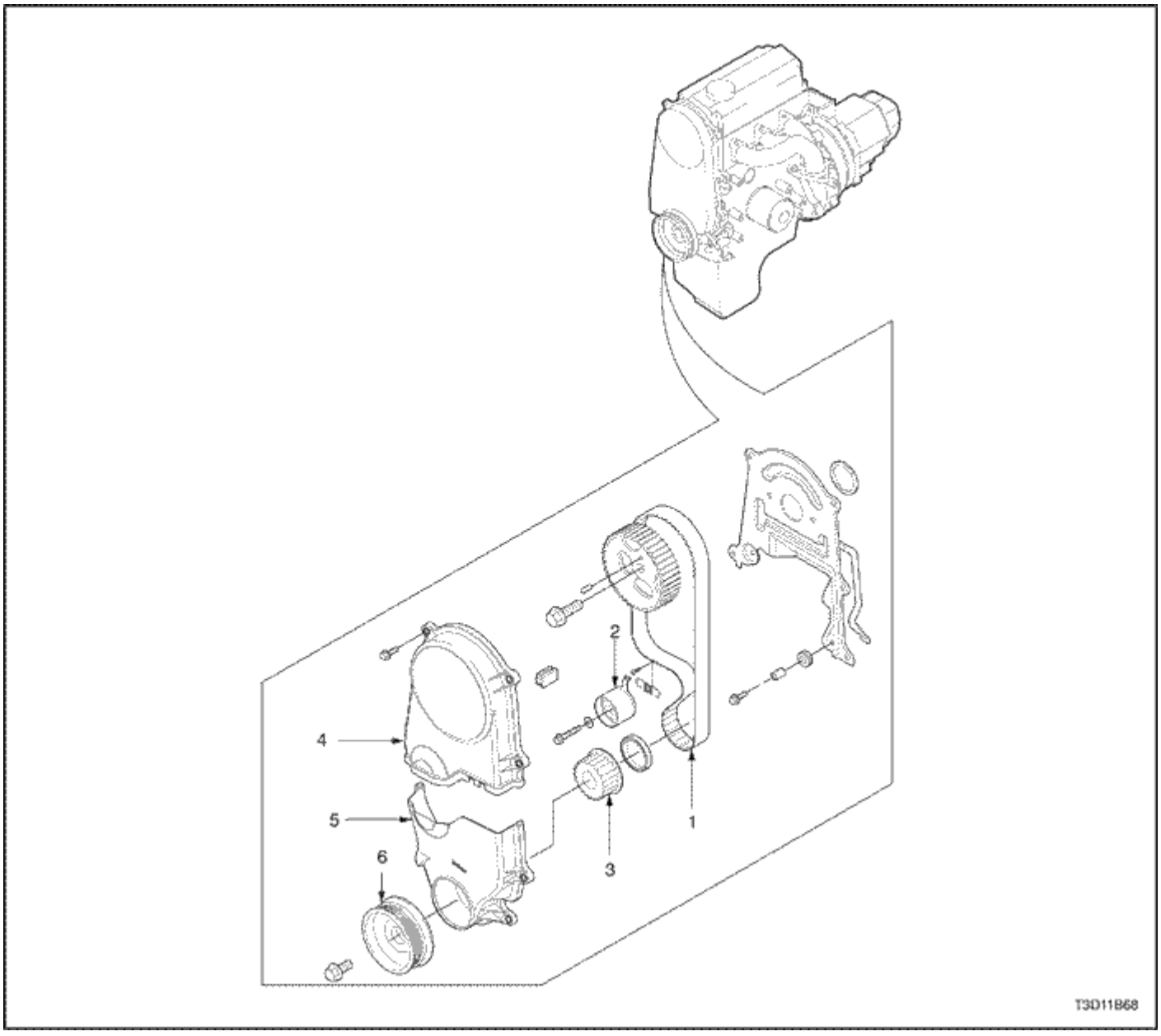
Manifold & Air Flow System



1. Intake Manifold
2. Exhaust Gas Recirculation (EGR) Pipe
3. Exhaust Gas Recirculation (EGR) Valve and Solenoid
4. Throttle Body Assembly
5. Air Filter Assembly
6. Resonator

7. Snorkel
8. Oxygen Sensor
9. Exhaust Manifold
10. Exhaust Manifold Heat Shield
11. Exhaust Manifold Heat Shield (Euro III)
12. Exhaust Manifold (Euro III)

Timing Belt



1. Engine Mount Damping Block
2. Engine Mount Intermediate Bracket
3. Engine Mount Brace Bracket
4. Transaxle Mount Bracket
5. Transaxle Mount Damping Block
6. Engine Mount Front Bracket
7. Engine Mount Front Damping Bush
8. Timing Belt
9. Timing Belt Tensioner
10. Crankshaft Gear
11. Timing Belt Upper Front Cover
12. Timing Belt Lower Front Cover
13. Crankshaft Pulley
14. Engine Mount Lower Bracket
15. Engine Mount Upper Bracket

SECTION 1B2

1.4/1.5 SOHC ENGINE MECHANICAL

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical erminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Engine Specifications (1.4 SOHC)

Application	Description (Manual and Automatic)
General Data:	
Engine Type	4 Cylinder (In-Line)
Displacement:	1399 cm^3 (85.37 in^3)
Bore Stroke:	77.9 x 73.4 mm (3.07 in. x 2.89 in.)
Compression Ratio	9.5 ± 0.2 :1
Firing Order	1-3-4-2
Cylinder Bore:	
Diameter	77.9 mm (3.07 in.)
Out of Round (Maximum)	0.0065 mm (0.00025 in.)
Taper (Maximum):	0.0065 mm (0.00025 in.)
Piston :	
Diameter	77.870 mm (3.066 in.)
Clearance to Bore	0.030 ± 0.010 mm (0.0012 ± 0.0004 in.)
Piston Rings:	
Ring, End Gap:	
Top Compression	0.15 ~ 0.30 mm (0.006 ~ 0.012 in.)
2nd Compression	0.30 ~ 0.50 mm (0.012 ~ 0.020 in.)
Groove Clearance:	
Top Impression	0.060 ~ 0.100 mm (0.0024 ~ 0.0039 in)
2nd Impression	0.050 ~ 0.090 mm (0.002 ~ 0.0035 in.)
Piston Pin :	
Diameter	17.990 ~ 17.995 mm (0.7083 ~ 0.7085 in.)
Pin Off-Set	0.5 ± 0.1 mm (0.020 ± 0.004 in.)
Camshaft:	
Lift Intake:	
1.5 SOHC	4.773 mm (0.188 in.)
Lift Exhaust	5.267 mm (0.207 in.)
End Play	0.09 ~ 0.21 mm (0.0035 ~ 0.0082 in.)
Journal OD:	
No. 1	39.435 ~ 39.455 mm (1.552 ~ 1.553 in.)
No. 2	39.685 ~ 39.705 mm (1.562 ~ 1.553 in.)
No. 3	39.935 ~ 39.955 mm (1.572 ~ 1.573 in.)
No. 4	40.185 ~ 40.205 mm (1.582 in.)
No. 5	40.435 ~ 40.455 mm (1.591 ~ 1.592 in.)
Bearing OD:	
No. 1	39.500 ~ 39.525 mm (1.555 ~ 1.556 in.)

Application	Description (Manual and Automatic)
No. 2	39.750 ~ 39.775 mm (1.564 ~ 1.565 in.)
No. 3	40.000 ~ 40.025 mm (1.574 ~ 1.575 in.)
No. 4	40.250 ~ 40.275 mm (1.584 ~ 1.585 in.)
No. 5	40.500 ~ 40.525 mm (1.594 ~ 1.595 in.)
Crankshaft :	
Main Journal	
Diameter (All)	54.982 ~ 54.994 mm (2.164 ~ 2.165 in.)
Taper (Maximum)	0.005 mm (0.0001 in.)
Out of Round (Maximum)	0.004 mm (0.0001 in.)
Main Bearing Clearance (All)	0.026 ~ 0.046 mm (0.0010 ~ 0.0181 in.)
Crankshaft End Play	0.1 mm (0.003 in.)
Connecting Rod Journal:	
Diameter (All)	42.971 ~ 42.987 mm (1.691 ~ 1.692 in.)
Taper (Maximum)	0.005 mm (0.0001 in.)
Out of Round (Maximum)	0.004 mm (0.0001 in.)
Rod Bearing Clearance (All)	0.019 ~ 0.070 mm (0.0007 ~ 0.0027 in.)
Rod Side Clearance	0.070 ~ 0.242 mm (0.0027 ~ 0.009 in.)
Valve System:	
Valve Lash Compensators	Hydraulic
Face Angle (All)	46° ± 7′30″
Seat Angle (All)	45°
Seat Runout (Maximum, All)	0.05 mm (0.0197 in.)
Face Runout (Maximum, All)	0.03 mm (0.0012 in.)
Seat Width:	
Intake	1.3 ~ 1.5 mm (0.051 ~ 0.059 in.)
Exhaust	1.6 ~ 1.8 mm (0.063 ~ 0.071 in.)
Valve Guide Inside Diameter (All)	6.000 ~ 6.015 mm (0.236 ~ 0.237 in.)
Valve Stem Diameter	
Intake	5.9970 ~ 5.984 mm (0.235 ~ 0.236 in)
Exhaust	5.960 ~ 5.974 mm (0.234 ~ 0.235 in)
Valve Diameter (All):	
Intake	38.0 ± 0.1 mm (1.49 ± 0.0039 in.)
Exhaust	31.0 ± 0.1 mm (1.22 ± 0.0039 in.)
Valve Spring Free Length:	
SOHC	40.9 mm

Application	Description (Manual and Automatic)
Valve Spring Loads:	
Valve Open	625 ± 25 N (461 ± 18 lbs) @ 21.5 mm (0.846 in.)
Valve Closed	275 ± 15 N (202 ± 11 lbs) @ 31.5 mm (1.240 in.)
Oil Pump :	
Gap Between Oil Pump Body and Out Rotor	0.400 ~ 0.484 mm (0.0157 ~ 0.0191 in.)
Out Rotor Side Clearance	0.045 ~ 0.100 mm (0.0018 ~ 0.0039 in.)
Inner Rotor Side Clearance	0.035 ~ 0.085 mm (0.0014 ~ 0.0033 in.)
Relief Valve Spring Free Length	81 mm (3.2 in.)

Engine Specifications (1.5 SOHC)

Application	Description (Manual and Automatic)
General Data:	
Engine Type	4 Cylinder (In-Line)
Displacement:	1,498 cm^3 (91.41 in^3)
Bore Stroke:	76.5 x 81.5 mm (3.012 in. x 3.209 in.)
Compression Ratio	9.5:1
Firing Order	1-3-4-2
Cylinder Bore:	
Diameter	76.5 mm (3.012 in.)
Out of Round (Maximum)	0.0065 mm (0.00025 in.)
Taper (Maximum):	0.0065 mm (0.00025 in.)
Piston :	
Diameter	77.870 mm (3.066 in.)
Clearance to Bore	0.030 mm (0.0012 in.) ± 0.01 mm
Piston Rings:	
Ring, End Gap:	
Top Compression	0.3 ~ 0.5 mm (0.012 ~ 0.020 in.)
2nd Compression	0.3 ~ 0.5 mm (0.012 ~ 0.020 in.)
Groove Clearance (Side Clearance)	
Top Compression	0.060 ~ 0.092 mm (0.0024 ~ 0.0036 in)
2nd Compression	0.050 ~ 0.082 mm (0.0020 ~ 0.0032 in.)
Piston Pin :	
Diameter	17.990 ~ 17.995 mm (0.7083 ~ 0.7085 in.)
Pin Off-Set	0.5 ± 0.1 mm (0.019 ± 0.039 in.)
Camshaft:	
Lift Intake:	

Application	Description (Manual and Automatic)
1.5 SOHC	4.773 mm (0.188 in.)
Lift Exhaust	5.267 mm (0.207 in.)
End Play	0.09 ~ 0.21 mm (0.0035 ~ 0.0082 in.)
Journal OD:	
No. 1	39.435 ~ 39.455 mm (1.552 ~ 1.553 in.)
No. 2	39.685 ~ 39.705 mm (1.562 ~ 1.553 in.)
No. 3	39.935 ~ 39.955 mm (1.572 ~ 1.573 in.)
No. 4	40.185 ~ 40.205 mm (1.582 in.)
No. 5	40.435 ~ 40.455 mm (1.591 ~ 1.592 in.)
Bearing OD:	
No. 1	39.500 ~ 39.525 mm (1.555 ~ 1.556 in.)
No. 2	39.750 ~ 39.775 mm (1.564 ~ 1.565 in.)
No. 3	40.000 ~ 40.025 mm (1.574 ~ 1.575 in.)
No. 4	40.250 ~ 40.275 mm (1.584 ~ 1.585 in.)
No. 5	40.500 ~ 40.525 mm (1.594 ~ 1.595 in.)
Crankshaft :	
Main Journal	
Diameter (All)	54.982 ~ 54.994 mm (2.164 ~ 2.165 in.)
Taper (Maximum)	0.005 mm (0.00020 in.)
Out of Round (Maximum)	0.004 mm (0.00016 in.)
Main Bearing Clearance (All)	0.026 ~ 0.042 mm (0.0010 ~ 0.00165 in.)
Crankshaft End Play	0.1 mm (0.0039 in.)
Connecting Rod Journal:	
Diameter (All)	42.971 ~ 42.987 mm (1.691 ~ 1.692 in.)
Taper (Maximum)	0.005 mm (0.0001 in.)
Out of Round (Maximum)	0.004 mm (0.0001 in.)
Rod Bearing Clearance (All)	0.019 ~ 0.071 mm (0.0007 ~ 0.0028 in.)
Rod Side Clearance	0.070 ~ 0.242 mm (0.0027 ~ 0.0095 in.)
Valve System:	
Valve Lash Compensators	Hydraulic
Face Angle (All)	46° ± 7′30″
Seat Angle (All)	45°
Seat Runout (Maximum, All)	0.03 mm (0.0012 in.)
Face Runout (Maximum, All)	0.03 mm (0.0012 in.)
Seat Width:	

Application	Description (Manual and Automatic)
Intake	1.3 ~ 1.5 mm (0.051 ~ 0.059 in.)
Exhaust	1.6 ~ 1.8 mm (0.063 ~ 0.071 in.)
Valve Guide Inside Diameter (All)	6.000 ~ 6.015 mm (0.236 ~ 0.237 in.)
Valve Stem Diameter	
Intake	5.977 ± 0.007 mm (0.235 ± 0.000276 in)
Exhaust	5.967 ± 0.007 mm (0.235 ± 0.000276 in)
Valve Diameter (All):	
Intake	38.0 ± 0.1 mm (1.49 ± 0.0039 in.)
Exhaust	31.0 ± 0.1 mm (1.22 ± 0.0039 in.)
Valve Spring Free Length:	
SOHC	40.9 mm
Valve Spring Loads:	
Valve Open	625 ± 25 N (461 ± 18 lbs) @ 21.5 mm (0.846 in.)
Valve Closed	275 ± 15 N (202 ± 11 lbs) @ 31.5 mm (1.240 in.)
Oil Pump :	
Gap Between Oil Pump Body and Out Rotor	0.400 ~ 0.484 mm (0.0157 ~ 0.0191 in.)
Out Rotor Side Clearance	0.045 ~ 0.100 mm (0.0018 ~ 0.0039 in.)
Inner Rotor Side Clearance	0.035 ~ 0.085 mm (0.0014 ~ 0.0033 in.)
Relief Valve Spring Free Length	81 mm (3.2 in.)

Fastener Tightening Specifcations

Application	N•m	Lb-Ft	Lb-In
A/C Compressor Hose Assembly Retaining Bolt	33	24	-
A/C Compressor Mounting Bolts	27	20	-
A/C Compressor Mounting Bracket Bolts	50	37	-
Air Filter Housing Bolts	8	-	71
Alternator Adjusting Bolt	25	18	-
Alternator Adjusting Bracket Retaining Bolt	25	18	-
Auxiliary Catalytic Converter-to-Exhaust Manifold Nuts and Bracket Bolts	40	30	-
Camshaft Gear Bolt	45	33	-
Camshaft Pressure Plate Bolts	10	-	89
Connecting Rod Bearing Cap Bolts	25 + 30°	18 + 30°	-
Coolant Pump Retaining Bolts	10	-	89
Coolant Temperature Sensor	20	15	-
Crankshaft Bearing Cap Bolts	50 + 45° + 15°	37 + 45° + 15°	-

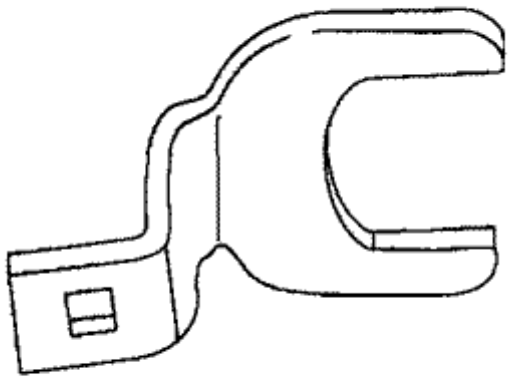
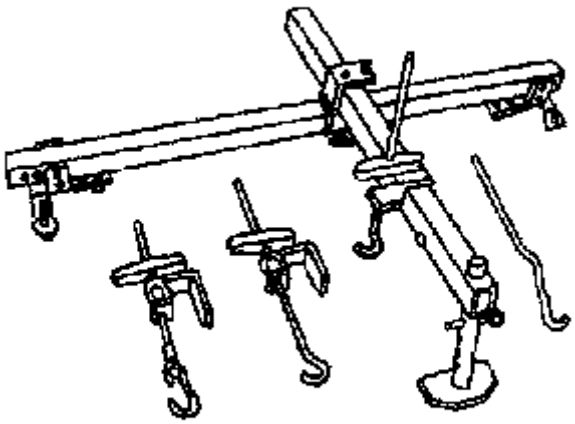
Application	N•m	Lb-Ft	Lb-In
Crankshaft Pulley Bolt	95 + 30° + 15°	70 + 30° + 15°	-
Crankshaft Position Sensor Retaining Bolt	10	-	89
Cylinder Head Bolts (Camshaft Support Housing & Cylinder Head Mounting Bolts)	25 + 70° + 70° + 30°	18 + 70° + 70° + 30°	-
Electronic Ignition System Ignition Coil Mounting Bolts	10	-	89
Electronic Ignition System Ignition Coil Mounting Plate Bolts	10	-	89
Engine Lift Bracket Bolt	25	18	-
Engine Mount Attaching Nuts	40	30	-
Engine Mount Bracket Retaining Bolt	65	48	-
Engine Mount Bracket-to-Engine Mount Retaining Bolts	60	44	-
Exhaust Manifold Heat Shield Bolts	15	11	-
Exhaust Manifold Nuts	25	18	-
Flexible Plate Bolts	60	44	-
Flexible Plate Inspection Cover Bolts	10	-	89
Flywheel Bolts	35 + 30° + 15°	26 + 30° + 15°	-
Flywheel Inspection Cover Bolts	12	-	106
FrontMuffler-to-Main Catalytic Converter Nuts	30	22	-
Fuel Rail Retaining Bolts	25	18	-
Intake Manifold Retaining Nuts	25	18	-
Intake Manifold Support Bracket Retaining Bolts	25	18	-
Lower Timing Belt Cover Bolts	10	-	89
Oil Pan Retaining Bolts	10	-	89
Oil Pan Drain Plug	35	25	-
Oil Pressure Switch	40	30	-
Oil Pump Retaining Bolts	10	-	89
Oil Pump/Pickup Tube and Support Bracket Bolts	10	-	89
Oil Pump Safety Relief Valve Bolt	30	22	-
Oil Pump Rear Cover Bolts	6	-	53
Power Steering Pump Mounting Bolts	25	18	-
Power Steering Pump Pulley Bolts	25	18	-
Rear Timing Belt Cover Bolts	10	-	89
Right Transaxle Brace Bolts	60	44	-
Spark Plugs	25	18	-

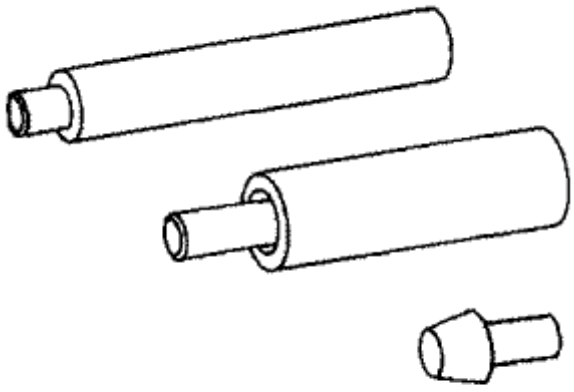
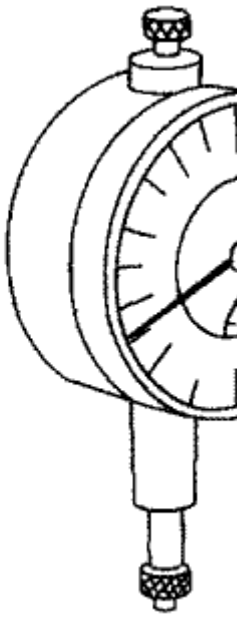
Application	N•m	Lb-Ft	Lb-In
Thermostat Housing Mounting Bolts	20	15	-
Throttle Cable Bracket Bolts	8	-	71
Timing Belt Automatic Tensioner Bolt	20	15	-
Transaxle Bell Housing Bolts	75	55	-
Transaxle Torque Converter Bolts	65	48	-
Upper Timing Belt Cover Bolts	10	-	89
Valve Cover Bolts	9	-	80

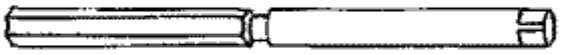
SPECIAL TOOLS

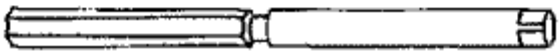
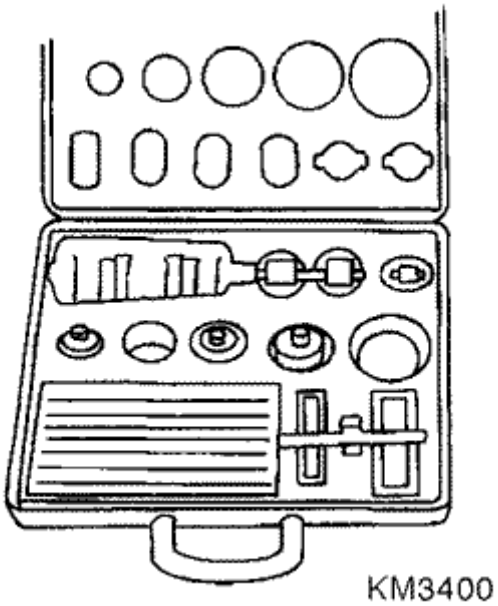
Special Tools Table

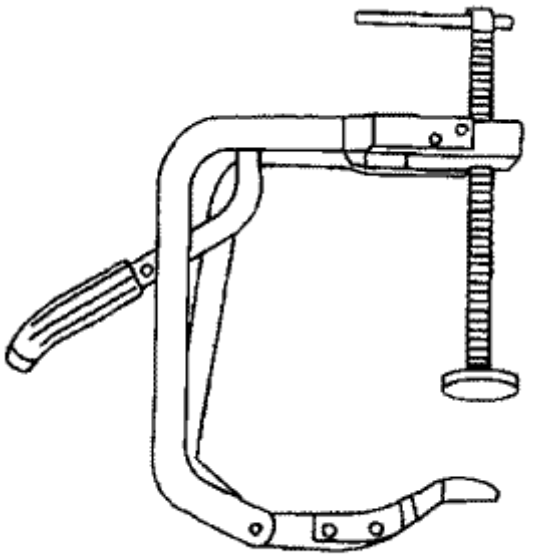
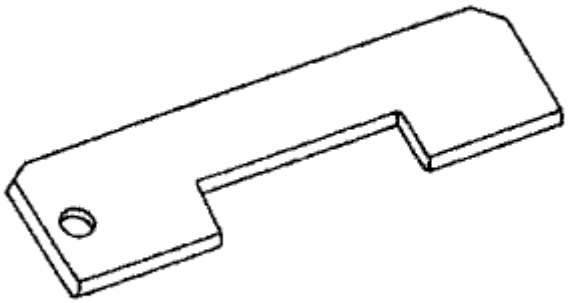
	KM-565-A Valve Spring Compressor
	J-42492 Timing Belt Adjuster

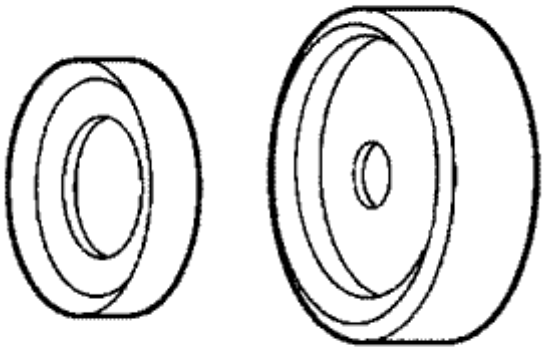
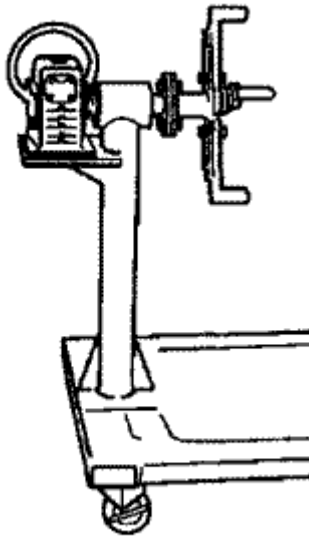
 J42492	
 J28467B	J-28467-B Engine Assembly Support Fixture
	KM-427 Piston Pin Service Set

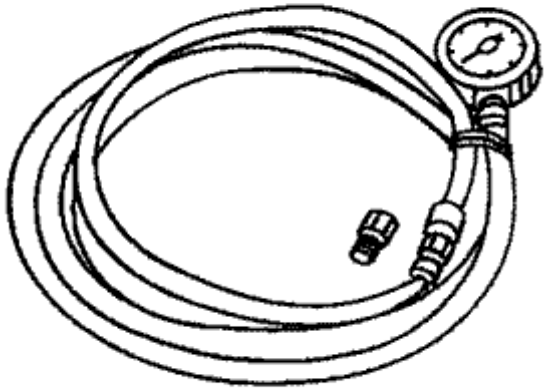
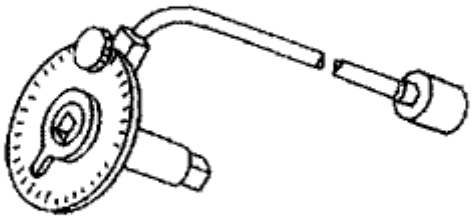
 KM427	
 MKM571B	MKM-571-B Gauge
	KM-253 Valve Guide Reamer

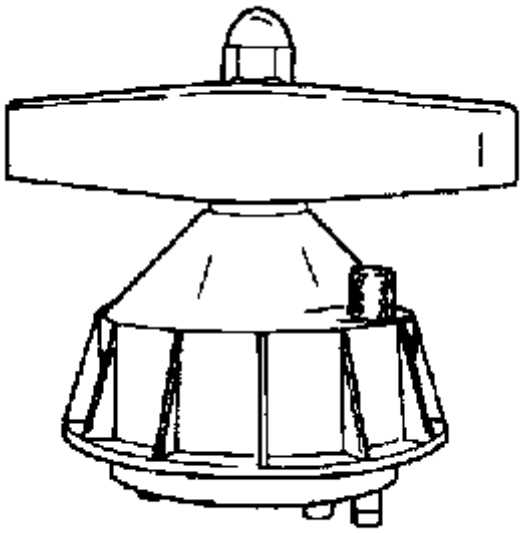
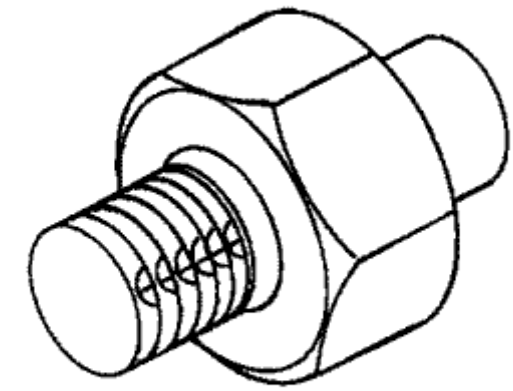
 KM253	
 KM254	KM-254 Valve Guide Reamer
	KM-255 Valve Guide Reamer

 KM255	
 KM3400	KM-340-0 Cutter Set Includes: KM-340-7 KM-340-13 KM-340-26
	KM-348 Valve Spring Compressor

 KM348	
 KM419	KM-419 Distance Gauge
	KM-635 Crankshaft Rear Oil Seal Installer

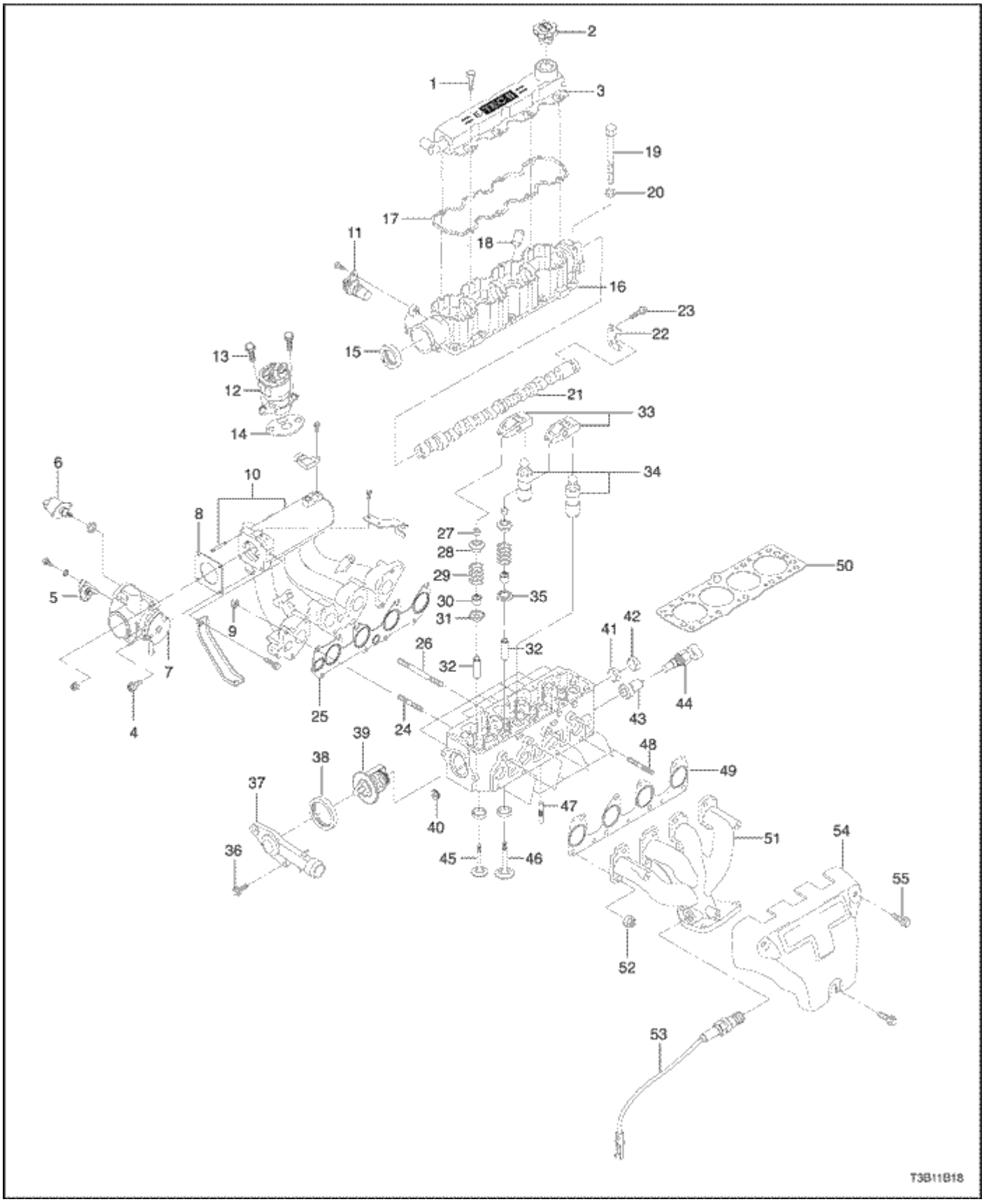
 KM635	
 MKM412	MKM-412 Engine Overhaul Stand
	KM-498-B Pressure Gauge

 KM498B	
 KM470B	KM-470-B Angular Torque Gauge
	J-36972 Crankshaft Rear Oil Seal Installer

 J36972	
 KM135	KM-135 Adapter

COMPONENT LOCATOR

Upper End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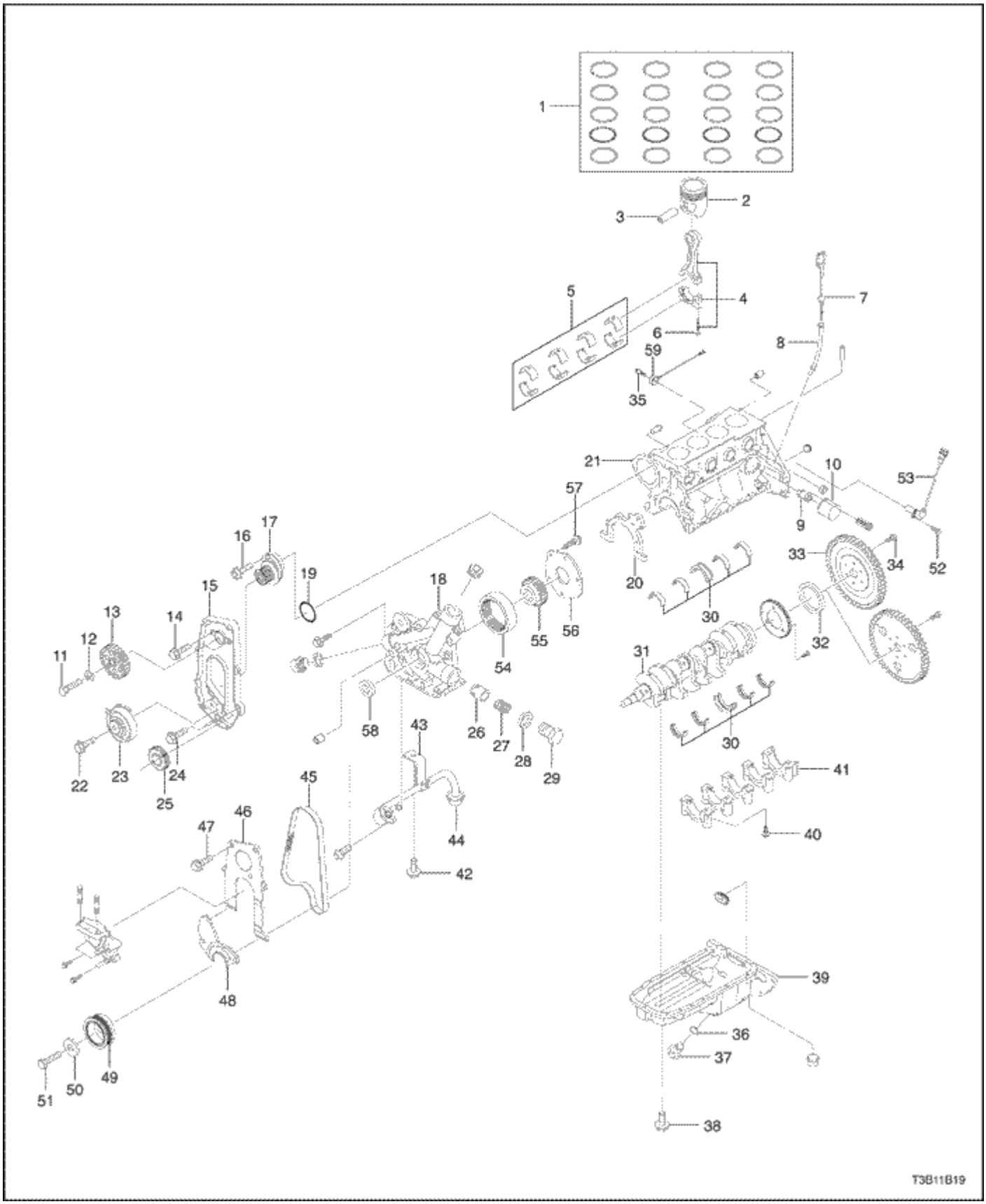
1. Bolt
2. Cap, Bayonet Joint
3. Valve Cover
4. Bolt
5. Throttle Position Sensor
6. Idle Air Control Valve
7. Throttle Body
8. Throttle Body Gasket
9. Nut
10. Intake Manifold
11. Camshaft Position Sensor
12. EGR Valve
13. Bolt
14. EGR Gasket
15. Shaft Seal Ring
16. Camshaft Support
17. Valve Cover Gasket
18. Tube
19. Cylinder Head Bolt
20. Washer
21. Camshaft
22. Camshaft Pressure Plate
23. Bolt
24. Bolt-Stud
25. Intake Manifold Gasket
26. Bolt-Stud
27. Valve Key
28. Valve Spring Plate
29. Valve Spring
30. Valve Stem Seal
31. Exhaust Valve Spring Seat
32. Valve Guide
33. Roller Follower
34. Roller Follower Lifter
35. Intake Valve Spring Seat
36. Bolt
37. Thermostat Housing

38. Thermostat Housing Seal Ring
39. Thermostat
40. Screw Plug
41. Oil Duct Cap
42. Oil Duct Cap
43. Adapter
44. Coolant Temperature Sensor
45. Exhaust Valve
46. Intake Valve
47. Cylinder Head Oil Duct Sleeve
48. Bolt-Stud
49. Exhaust Manifold Gasket
50. Cylinder Head Gasket
51. Exhaust Manifold
52. Nut
53. Exhaust Oxygen Sensor
54. Exhaust Manifold Heat Shield
55. Bolt
56. EGR Solenoid
57. Bracket

Lower End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1. Piston Ring Seat
2. Piston
3. Piston Pin
4. Connecting Rod
5. Connecting Rod Bearing Set
6. Connecting Rod Bolt
7. Oil Level Gauge Stick
8. Gauge Stick Tube
9. Connecting Piece
10. Oil Filter
11. Camshaft Gear Bolt
12. Washer
13. Camshaft Gear
14. Rear Cover Bolt
15. Rear Timing Belt Cover
16. Bolt
17. Coolant Pump
18. Oil Pump
19. Seal Ring
20. Oil Pump Body Gasket
21. Engine Block
22. Bolt
23. Auto Tensioner
24. Bolt
25. Crankshaft Gear
26. Pressure Relief Valve Plunger
27. Spring
28. Oil Pump Seal Ring
29. Bolt Plug
30. Crankshaft Bearing Set
31. Crankshaft
32. Shaft Seal Ring
33. Flywheel (Manual Transaxle)
34. Bolt (Manual Transaxle)
35. Bolt
36. Washer
37. Drain Plug

38. Bolt
39. Oil Pan
40. Main Bearing Cap Bolt
41. Main Bearing
42. Bolt
43. Bracket
44. Oil Pickup Tube
45. Timing Belt
46. Upper Timing Belt Front Cover
47. Bolt
48. Lower Timing Belt Front Cover
49. Crankshaft Pulley
50. Washer
51. Bolt
52. Bolt
53. Crankshaft Position Sensor
54. Gear
55. Gear
56. Cover
57. Bolt
58. Seal
59. Knock Sensor

SECTION 1C

DOHC ENGINE MECHANICAL

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical erminals. Disconnecting this

cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Engine Specifications

Application	Description
General Data:	
Engine Type	4 Cylinder (In-Line)
Displacement	1399 cm^3
Bore Stroke	77.9 x 73.4 mm (3.07 in. x 2.89 in.)
Compression Ratio	9.5 ± 0.2 :1
Firing Order	1-3-4-2
Cylinder Bore:	
Diameter	77.9 mm (3.07 in.)
Out of Round (Maximum)	0.0065 mm (0.00025 in.)
Taper (Maximum)	0.07 x 30°
Piston :	
Diameter	77.87 mm (3.07 in.)
Clearance to Bore	0.030 ± 0.010 mm (0.0012 ± 0.0004 in.)
Piston Rings:	
Ring, End Gap:	
Top Compression	0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.)
2nd Compression	0.3 ~ 0.5 mm (0.0118 ~ 0.0197 in.)
Groove Clearance:	
Top Impression	0.05 ~ 0.09 mm (0.00197 ~ 0.00354 in)
2nd Impression	0.06 ~ 0.1 mm (0.00236 ~ 0.00393 in.)
Piston Pin :	
Diameter	17.990 ~ 17.995 mm (0.7082 ~ 0.7085 in.)
Pin Off-Set	0.8 ± 0.1 mm (0.0315 ± 0.0039 in.)
Camshaft:	
Lift Intake:	7.2 mm (0.283 in)
Lift Exhaust	7.2 mm (0.283 in.)
End Play	0.1 ~ 0.25 mm (0.00394 ~ 0.00787 in.)
Journal OD:	
No. 1	29.935 ~ 29.95 mm (1.1785 ~ 1.1793 in.)
No. 2	26.935 ~ 26.95 mm (1.0604 ~ 1.0610 in.)
No. 3	26.935 ~ 26.95 mm (1.0604 ~ 1.0610 in.)
No. 4	26.935 ~ 26.95 mm (1.0604 ~ 1.0610 in.)
No. 5	26.935 ~ 26.95 mm (1.0604 ~ 1.0610 in.)

Application	Description
Bearing OD:	
No. 1	30.0 ~ 30.021 mm (1.1811 ~ 1.1819 in.)
No. 2	27.0 ~ 27.021 mm (1.0630 ~ 1.0638 in.)
No. 3	27.0 ~ 27.021 mm (1.0630 ~ 1.0638 in.)
No. 4	27.0 ~ 27.021 mm (1.0630 ~ 1.0638 in.)
No. 5	27.0 ~ 27.021 mm (1.0630 ~ 1.0638 in.)
Crankshaft :	
Main Journal	
Diameter (All)	55 mm (2.17 in.)
Taper (Maximum)	0.005 mm (0.000197 in.)
Out of Round (Maximum)	0.004 mm (0.000157 in.)
Main Bearing Clearance (All)	0.026 ~ 0.042 mm (0.00102 ~ 0.00165 in.)
Crankshaft End Play	0.1 mm (0.003 in.)
Connecting Rod Journal:	
Diameter (All)	43 mm (1.69 in.)
Taper (Maximum)	0.005 mm (0.000197 in.)
Out of Round (Maximum)	0.004 mm (0.000157 in.)
Rod Bearing Clearance (All)	0.019 ~ 0.070 mm (0.0007 ~ 0.0027 in.)
Rod Side Clearance	0.070 ~ 0.242 mm (0.0027 ~ 0.009 in.)
Valve System:	
Valve Lash Compensators	HLA
Face Angle (All)	45 ~ 45.25°
Seat Angle (All)	44.5 ~ 45°
Seat Runout (Maximum, All)	0.05 mm (0.00197 in.)
Face Runout (Maximum, All)	0.03 mm (0.00118 in.)
Seat Width:	
Intake	1.17 ~ 1.57 mm (0.0461 ~ 0.0618 in.)
Exhaust	1.4 ~ 1.8 mm (0.0551 ~ 0.0709 in.)
Valve Guide Inside Diameter (All)	6.0 ~ 6.02 mm (0.236 ~ 0.237 in.)
Valve Stem Diameter	
Intake	5.955 ~ 5.970 mm (0.234 ~ 0.235 in.)
Exhaust	5.935 ~ 5.950 mm (0.234 ~ 0.234 in.)
Valve Diameter (All):	
Intake	28.57 ± 0.12 mm (1.125 ± 0.0047 in.)
Exhaust	27.24 ± 0.14 mm (1.074 ± 0.0055 in.)

Application	Description
Valve Spring Loads:	
Valve Open	580 ± 29 N (426 ± 21 lbs) @ 23 mm
Valve Closed	260 ± 13 N (191 ± 9.6 lbs) @ 33 mm
Oil Pump :	
Gap Between Oil Pump Body and Out Rotor	0.400 ~ 0.484 mm (0.0157 ~ 0.0191 in.)
Out Rotor Side Clearance	0.045 ~ 0.100 mm (0.0018 ~ 0.0039 in.)
Inner Rotor Side Clearance	0.035 ~ 0.085 mm (0.0014 ~ 0.0033 in.)
Relief Valve Spring Free Length	81 mm (3.2 in.)

Fastener Tightening Specifcations

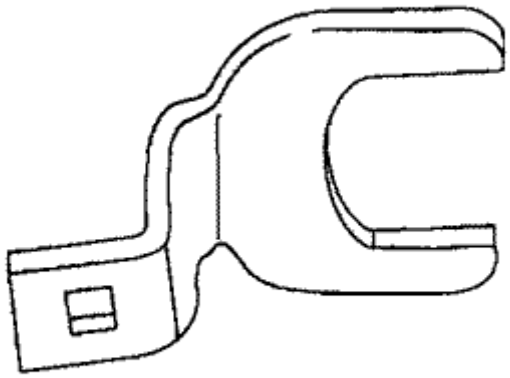
Application	N•m	Lb-Ft	Lb-In
A/C Compressor Hose Assembly Retaining Bolt	33	24	-
A/C Compressor Mounting Bolts	27	20	-
A/C Compressor Mounting Bracket Bolts	50	37	-
Air Filter Housing Bolts	12	-	106
Alternator Adjusting Bolt	20	15	-
Alternator Adjusting Bracket Retaining Bolt	20	15	-
Auxiliary Catalytic Converter-to-Exhaust Manifold Nust	40	30	-
Camshaft Cap Bolts	16	12	-
Connecting Rod Bearing Cap Bolts	25 +30° + 15°	18 +30° + 15°	-
Coolant Pump Retaining Bolts	10	-	89
Coolant Temperature Sensor	20	15	-
Crankshaft Bearing Cap Bolts	50 +45° + 15°	37 +45° + 15°	-
Crankshaft Pulley Bolt	95 +30° + 15°	70 +30° + 15°	-
Crankshaft Position Sensor Retaining Bolt	10	-	89
Cylinder HeadBolts(Camshaft Support Housing & Cylinder Head Mounting Bolts)	25 +60° + 60° +60° + 10°	18 +60° + 60° +60° + 10°	-
Electronic Ignition System Ignition Coil Mounting Bracket Bolts	10	-	89
Electronic Ignition System Ignition Coil Mounting Bolts	10	-	89
Engine Mount Bracket Retaining Bolt	65	48	-
Engine Mount Retaining Nuts	40	30	-
Engine Mount-to-Engine Mount Bracket Retaining	60	44	-

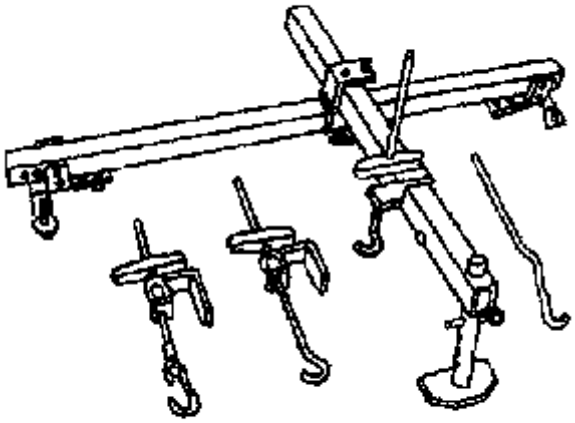
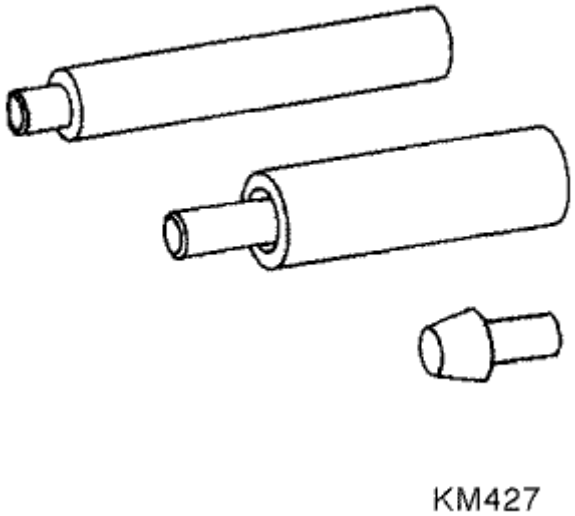
Application	N•m	Lb-Ft	Lb-In
Bolts			
Exhaust Camshaft Gear Bolt	67.5	49	-
Exhaust Flexible Pipe Bracket Bolts	40	30	-
Exhaust Gas Recirculation Valve Adapter Bolts	25	18	-
Exhaust Manifold Heat Shield Bolts	15	11	-
Exhaust Manifold Retaining Nuts	25	18	-
Flexible Plate Bolts	60	44	-
Flexible Plate Inspection Cover Bolts	10	-	89
Flywheel Bolts	35 +30° + 15°	25 +30° + 15°	-
Flywheel Inspection Cover Bolts	12	-	106
Front Muffler-to-Main Catalytic Converter Nuts	30	22	-
Fuel Rail Retaining Bolts	25	18	-
Intake Camshaft Gear Bolt	67.5	49	-
Intake Manifold Retaining Nuts/Bolts	25	18	-
Intake Manifold Support Bracket Upper Bolts	25	18	-
Intake Manifold Support Bracket Lower Bolt-to-Engine Block	40	30	-
Lower Front Timing Belt Cover Bolts	10	-	89
Oil Pan Retaining Bolts	10	-	89
Oil Pressure Switch	40	30	-
Oil Pump Rear Cover Bolts	6	-	53
Oil Pump Retaining Bolts	10	-	89
Oil Pump Pickup Tube and Support Bracket Bolts	10	-	89
Oil Pump Safety Relief Valve Bolts	30	22	-
Power Steering Pump Mounting Bolts	25	18	-
Power Steering Pump Pulley Bolts	25	18	-
Rear Timing Belt Cover Bolts	10	-	89
Spark Plug Cover Bolts	3	-	27
Spark Plugs	25	18	-
Thermostat Housing Mounting Bolts	20	15	-
Throttle Cable Bracket Bolts	8	-	71
Timing Belt Automatic Tensioner Bolts	25	18	-
Timing Belt Idler Pulley Bolt	40	30	-
Transaxle Bell Housing Bolts	75	55	-
Transaxle Brace Bolts	40	30	-
Transaxle Torque Converter Bolts	65	48	-

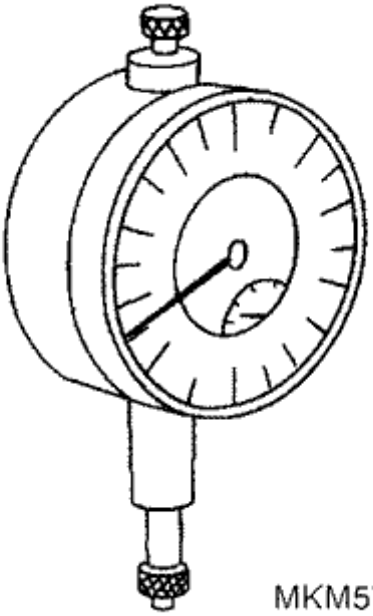
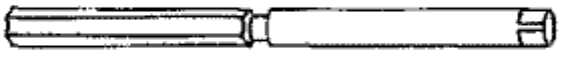
Application	N•m	Lb-Ft	Lb-In
Upper Front Timing Belt Cover Bolts	10	-	89
Valve Cover Nuts	10	-	89

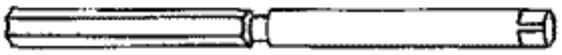
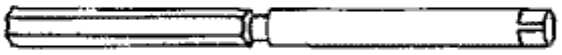
SPECIAL TOOLS

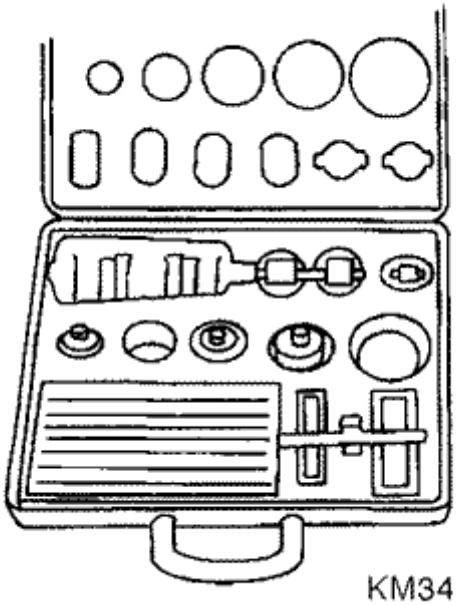
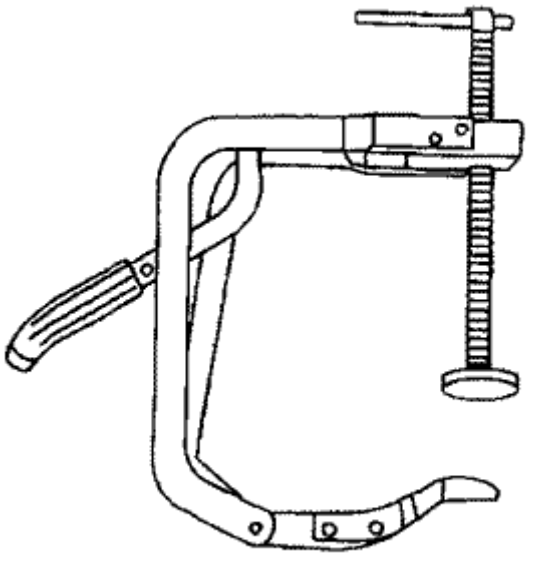
Special Tools Table

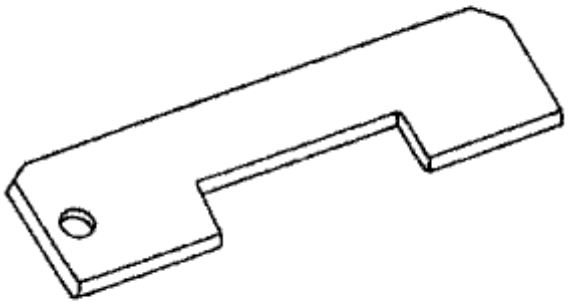
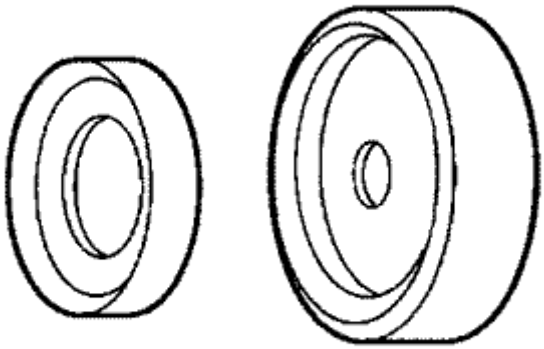
	J-42492 Timing Belt Adjuster
	J-28467-B Engine Assembly Support Fixture

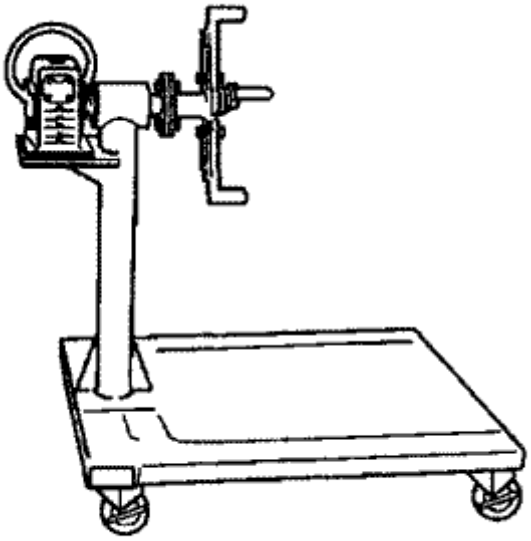
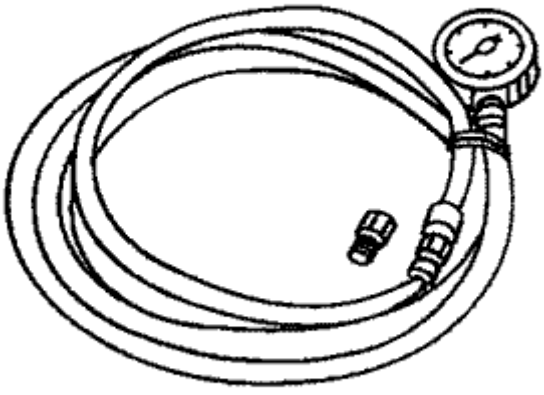
 J28467B	
 KM427	KM-427 Piston Pin Service Set
	MKM-571-B Gauge

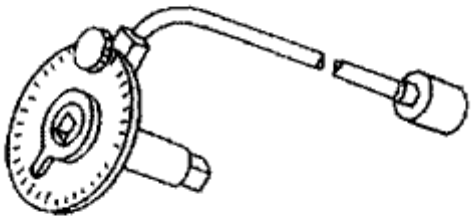
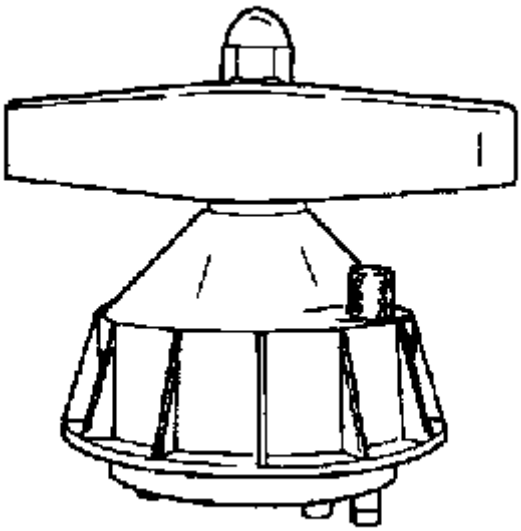
 MKM571B	
 KM253	KM-253 Valve Guide Reamer
	KM-254 Valve Guide Reamer

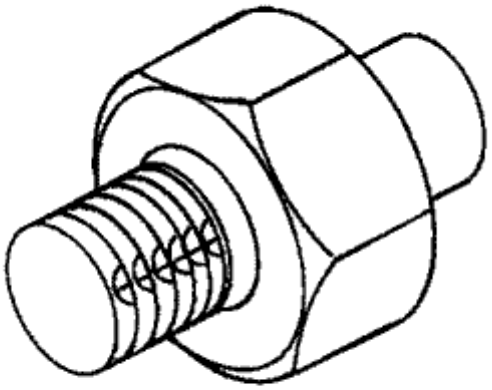
 KM254	
 KM255	KM-255 Valve Guide Reamer
	KM-340-0 Cutter Set Includes: KM-340-7 KM-340-13

	KM-340-26
	KM-348 Valve Spring Compressor
	KM-419 Distance Gauge

 KM419	
 KM635	KM-635 Crankshaft Rear Oil Seal Installer
	MKM-412 Engine Overhaul Stand

 MKM412	
 KM498B	KM-498-B Pressure Gauge
	KM-470-B Angular Torque Gauge

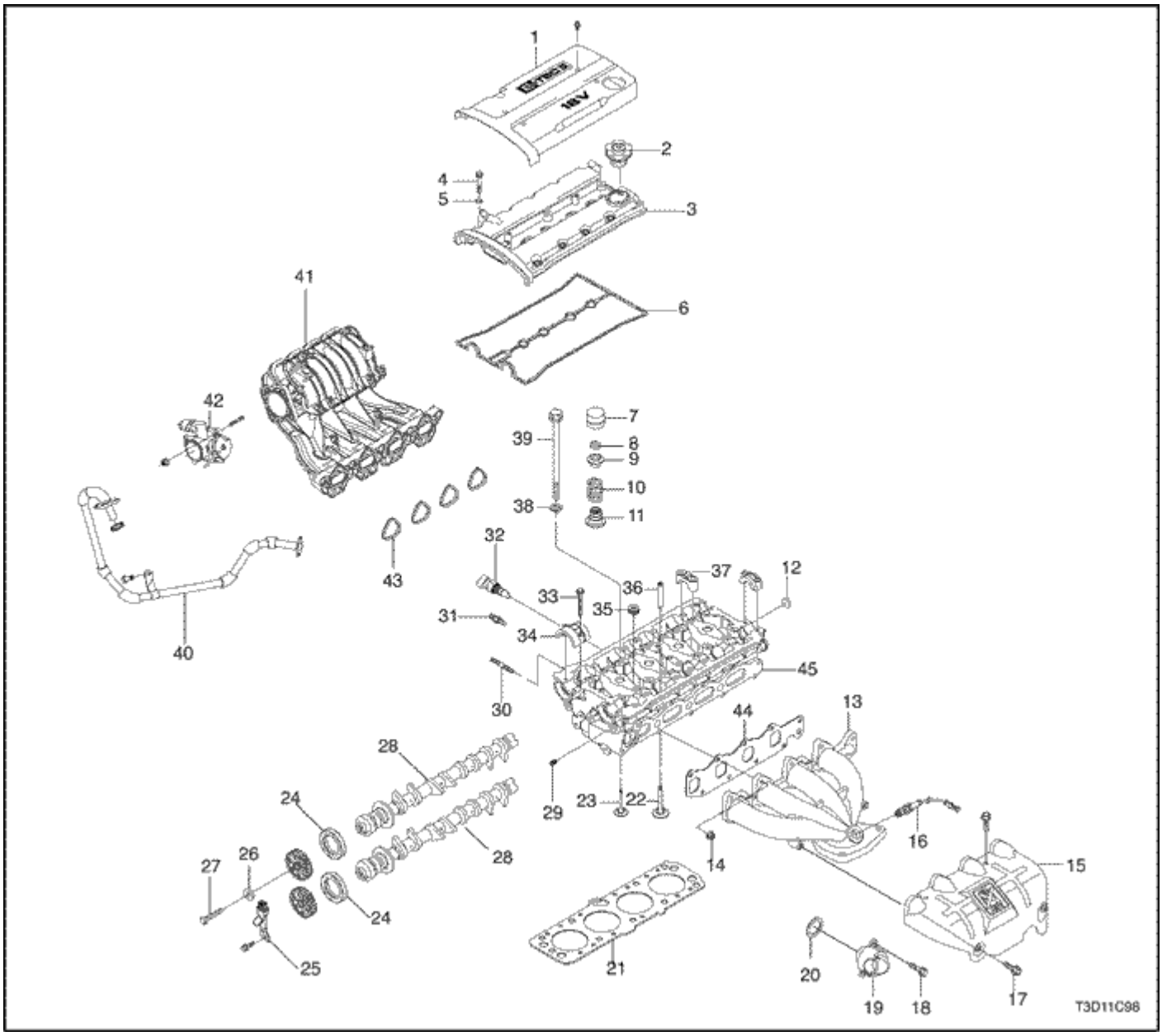
 KM470B	
 J36972	J-36972 Crankshaft Rear Oil Seal Installer
	KM-135 Adapter



KM135

COMPONENT LOCATOR

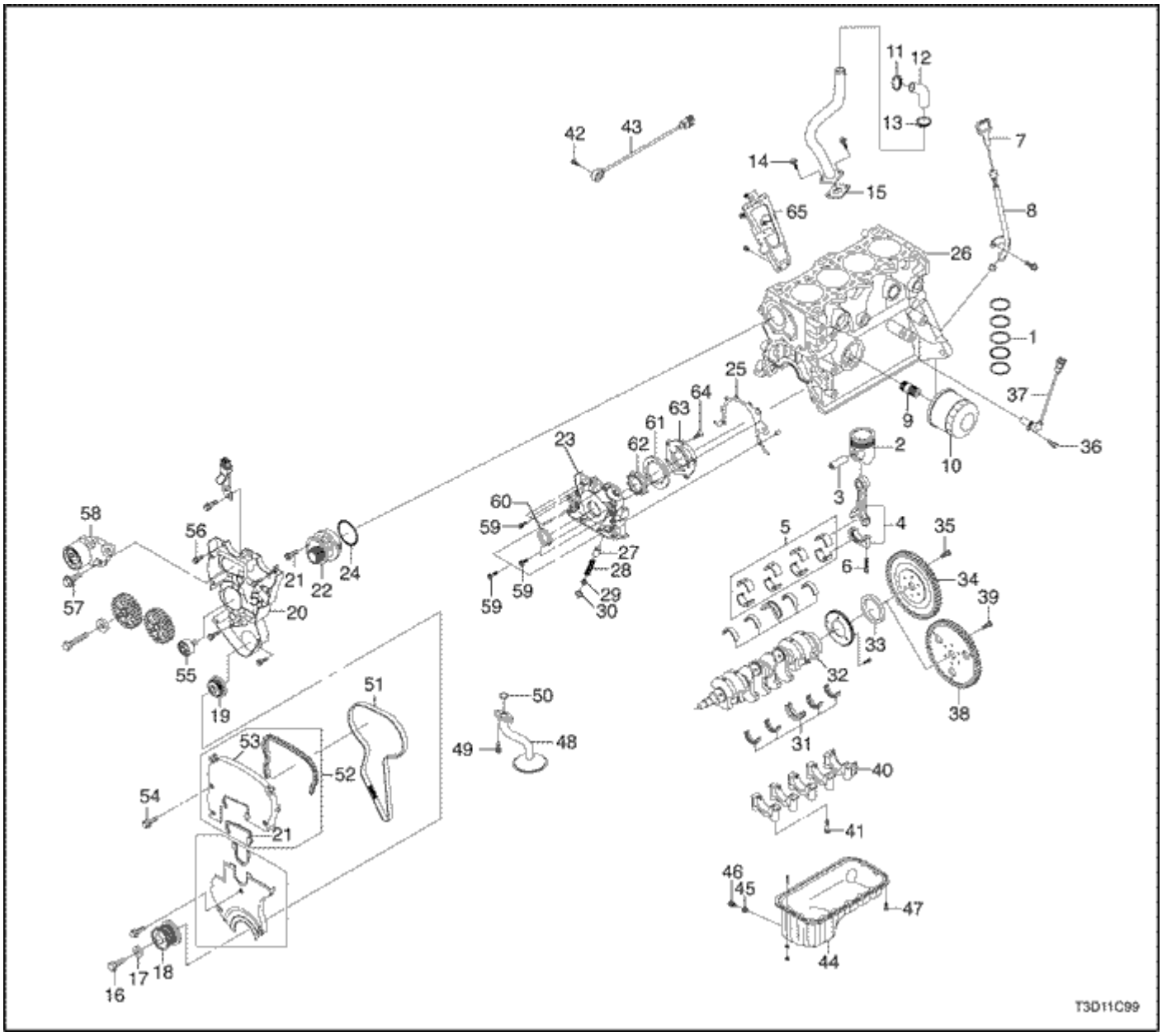
Upper End



1. Spark Plug Cover
2. Oil Cap
3. Valve Cover
4. Valve Cover Bolt
5. Valve Cover Washer
6. Valve Cover Gasket

7. Hydraulic Valve Lash Adjuster
8. Valve Key
9. Valve Spring Retainer
10. Valve Spring
11. Valve Stem Oil Seal
12. Freeze Plug
13. Exhaust Manifold
14. Nut
15. Exhaust Manifold Heat Shield
16. Oxygen Sensor
17. Bolt
18. Bolt
19. Thermostat Housing Assembly
20. Thermostat Housing Seal
21. Cylinder Head Gasket
22. Exhaust Valve
23. Intake Valve
24. Camshaft Seal
25. Camshaft Position Sensor
26. Washer
27. Camshaft Gear Bolt
28. Camshaft
29. Plug
30. Stud
31. Engine Coolant Temperature Sensor
32. Coolant Temperature Sensor
33. Bolt
34. Front Camshaft Cap
35. Plug
36. Valve Guide
37. Intermediate Camshaft Cap
38. Washer
39. Head Bolt
40. Exhaust Gas Recirculation Pipe
41. Intake Manifold
42. Throttle Body
43. Intake Manifold Gasket
44. Exhaust Manifold Gasket
45. Cylinder Head

Lower End



1. Piston Ring Set
2. Piston
3. Piston Pin
4. Connecting Rod
5. Connecting Rod Bearing Set
6. Connecting Rod Bolt

7. Oil Level Gauge Stick
8. Gauge Stick Tube
9. Connecting Piece
10. Oil Filter
11. Hose Clamp
12. Engine Ventilation Hose
13. Engine Ventilation Pipe
14. Bolt
15. Oil Separator Gasket
16. Crankshaft Pulley Bolt
17. Washer
18. Crankshaft Pulley
19. Crankshaft Gear
20. Rear Timing Belt Cover
21. Bolt
22. Coolant Pump
23. Oil Pump
24. Engine Block Seal Ring
25. Oil Pump Body Gasket
26. Engine Block
27. Pressure Relief Valve Plunger
28. Spring
29. Oil Pump Seal Ring
30. Bolt Plug
31. Crankshaft Bearing Set
32. Crankshaft
33. Shaft Seal Ring
34. Flywheel (Manual Transaxle)
35. Bolt (Manual Transaxle)
36. Bolt
37. Crankshaft Position Sensor
38. Flexible Plate (Automatic Transaxle)
39. Bolt (Automatic Transaxle)
40. Crankshaft Main Bearing Cap
41. Bolt
42. Bolt
43. Knock Sensor
44. Oil Pan
45. Threaded Ring
46. Bolt
47. Bolt

48. Oil Pickup Tube
49. Bolt
50. Seal
51. Timing Belt
52. Cover Seal
53. Cover
54. Bolt
55. Idler Pulley
56. Rear Cover Bolt
57. Bolt
58. Auto Tensioner
59. Seal
60. Bolt
61. Gear
62. Gear
63. Cover
64. Bolt
65. Intake Manifold Support Bracket

SECTION 1D

ENGINE COOLING

Caution : ENGINE COOLING CAUTION: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Cooling System Specification

Application	Description	Unit	Standard
Cooling System	Cooling Type	-	T/Belt Drive & Forced Water Cooling
Coolant	Capacity	L/qt	5.2L (5.5 qt) : 1.2 SOHC 7.0L (7.48 qt) : 1.4 SOHC/DOHC, 1.5 SOHC
Thermostat	Thermostat Type	-	Wax Expainsion Pellet Type
	Temperature (Opened Initially)	°C (°F)	87 (189)
	Temperature (Perpectly Opened)	°C (°F)	102 (216)
	Temperature (Perpectly Closed)	°C (°F)	82 (180)
	Stroke (Perpectly Opened)	mm (in)	7 (0.28)
Surege Tank Cap	Open Pressure of the Pressure Valve	kPa (psi)	120 - 150 (17.4 - 21.8)
	Open Pressure of the Vacuum Valve	kPa (psi)	10 (1.5)
Coolant Pump	Water Pump Type	-	T/Belt Drived Centrifugal
	Impeller Diameter	mm (in)	55 (2.17)
	Impeller Blade Number	EA	55 (2.17)

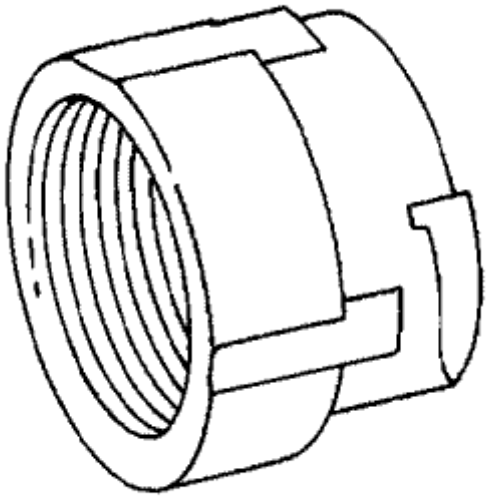
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Coolant Pump Mounting Bolts	10	-	89
Electric Cooling Fan Motor Nut	3.2	-	28
Electric Cooling Fan Motor Retaining Screws	4	-	35
Electric Cooling Fan Assembly Mounting Bolts	4	-	35
Engine Coolant Temperature Sensor	20	15	-
Negative Battery Terminal Retainer Bolt	15	11	-
Surge Tank Attaching Bolt	10	-	89
Thermostat Housing Mounting Bolts	20	15	-
Upper Left Radiator Retaining Bolt	10	-	89
Upper Right Radiator Retaining Bolt	10	-	89

SPECIAL TOOLS

Special Tools Table

	KM-471 Adapter



DIAGNOSIS

Thermostat Test

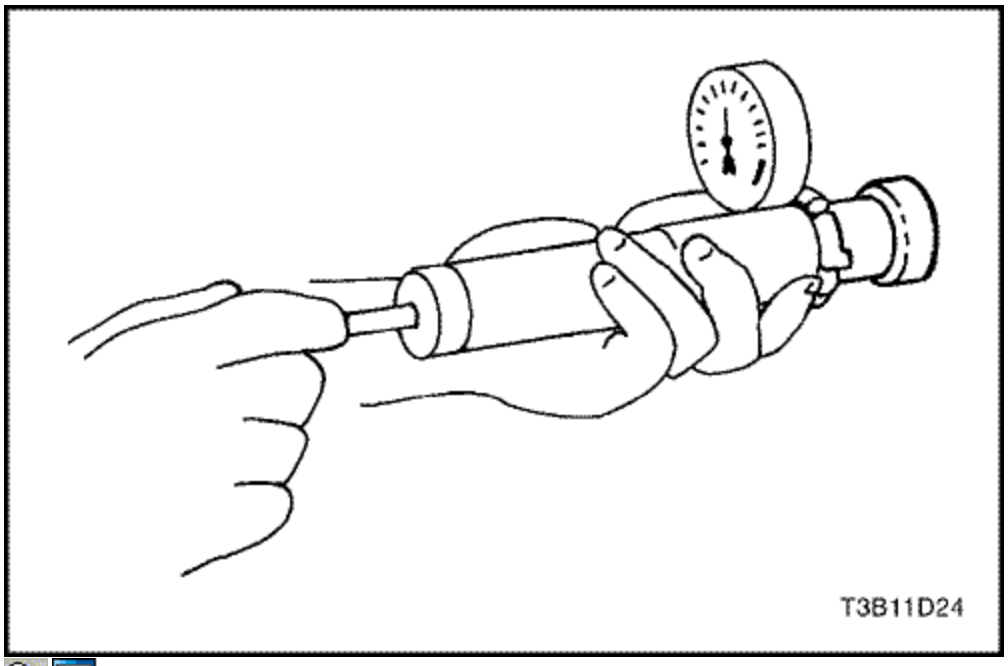
1. Remove the thermostat from the vehicle. Refer to "Thermostat" in this section.
2. Make sure the valve spring is tight when the thermostat is fully closed. If the spring is not tight, replace the thermostat.
3. Suspend the thermostat and a thermometer in a pan of 50/50 mixture of ethylene glycol and water. Do not let the thermostat or the thermometer rest on the bottom of the pan because the uneven concentration of heat on the bottom could result in inaccurate temperature measurements.
4. Heat the pan on a burner.
5. Use the thermometer to measure the temperature of the heated solution.
6. The thermostat should begin to open at 87°C (189°F) and it should be fully open at 102°C (216°F). If it does not open at these temperatures, replace the thermostat.

Surge Tank Cap Test
Special Tools
Tools Required

KM-471 Adapter

The surge tank cap maintains proper pressure, protects the system from high pressure by opening a pressure valve, and protects the coolant hoses from collapsing because of a vacuum.

1. Wash any sludge from the surge tank cap and the valve seat of the vacuum pressure valve for the surge tank cap.
2. Check for any damage or deformity to the vacuum pressure valve for the surge tank cap. If any damage or deformity is found, replace the cap.
3. Install a suitable cooling system pressure tester to the cap using the KM-471 adapter.
4. Pull the vacuum pressure valve open. If the surge tank cap does not seal properly, replace the surge tank cap.
5. Pressurize the cap to120 to 160 kPa (17 to 23 psi).
6. Wait 10 seconds and check the pressure held by the tank cap tester.



7. If the pressure held by the cooling system pressure tester falls below 80 kPa (16 psi) replace the surge tank cap.
8. If the pressure held by the cooling system pressure tester falls below 80 kPa (16 psi) replace the surge tank cap.

Cooling Systen Diagnosis

Engine Overheats

Checks	Action
Check for a loss of the coolant.	Add the coolant.
Check for a weak coolant solution.	Confirm that the coolant solution is a 50/50 mixture of ethylene glycol and water.
Check the front of the radiator for any dirt, any leaves, or any insects.	Clean the front of the radiator.
Check for leakage from the hoses, the coolant pump, the heater, the thermostat housing, the radiator, the core plugs, or the head gasket.	Replace any damaged components.
Check for a faulty thermostat.	Replace a damaged thermostat.
Check for retarded ignition timing.	Perform a code diagnosis using the engine control module (ECM) for a vehicle with a manual transaxle. Confirm the integrity of the timing belt.
Check for an improperly operating electric cooling fan.	Replace the electric cooling fan.
Check for radiator hoses that are plugged or rotted.	Replace any damaged radiator hoses.
Check for a faulty water pump.	Replace a faulty water pump.
Check for a faulty surge tank cap.	Replace a faulty surge tank cap.
Check for a cylinder head or an engine block that is cracked or plugged.	Replace a faulty water pump.Repair the damaged cylinder head or the damaged engine block.

Loss of Coolant

Checks	Action
Check for a leak in the radiator.	Replace a damaged radiator.
Check for a leak in the following locations: o Surge tank. o Hose.	Replace the following parts: o Surge tank. o Hose.
Check for the following loose or damaged parts: o Radiator hoses. o Heater hoses. o Connections.	Reseat the hoses. Replace the hoses or the clamps.
Check for leaks in the coolant pump seal.	Replace the coolant pump seal.
Check for leaks in the coolant pump gasket.	Replace the coolant pump gasket.
Check for an improper cylinder head torque.	Tighten the cylinder head bolts to specifications.

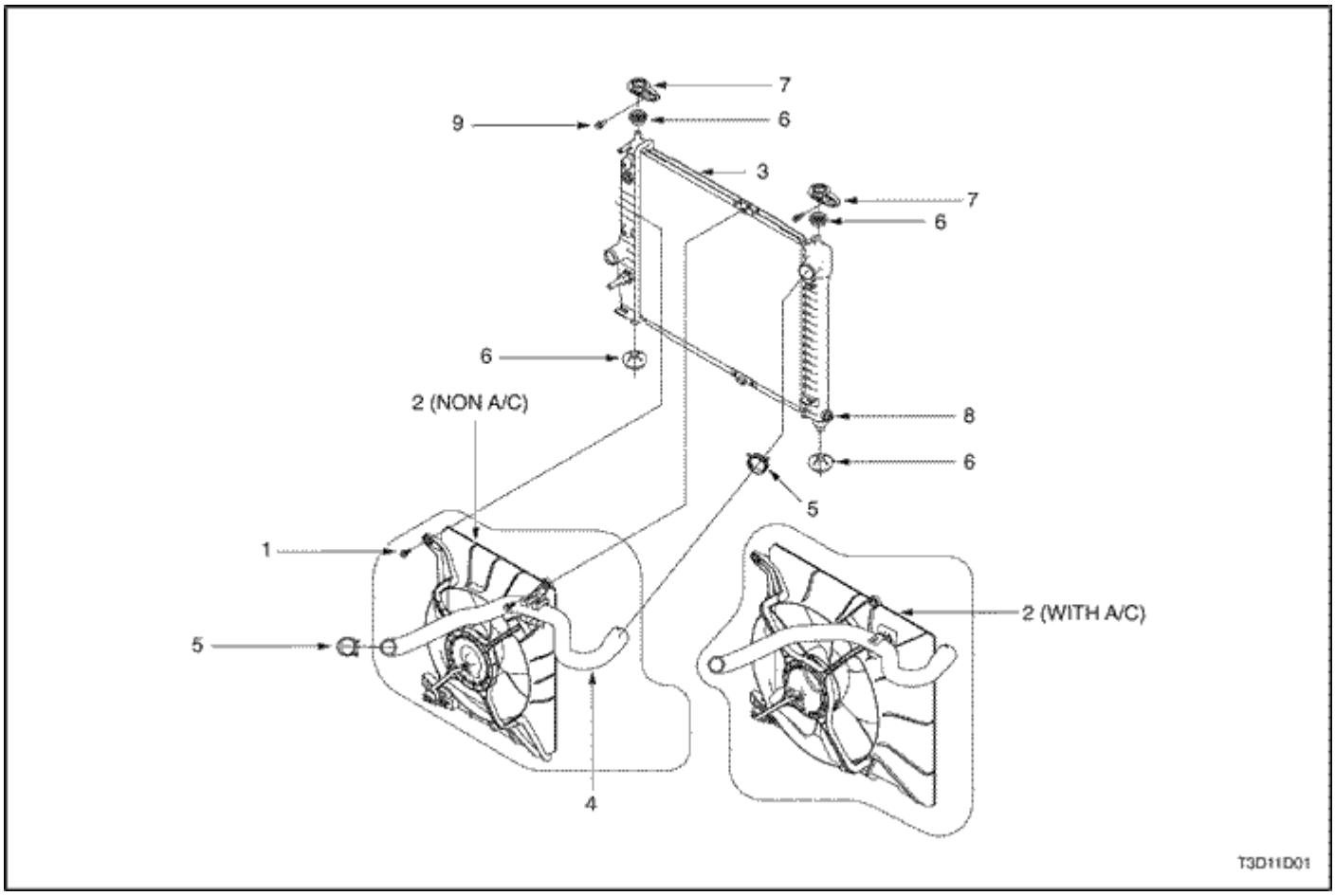
Checks	Action
	Replace the cylinder head gasket, if needed.
Check for leaks in the following locations: o Intake manifold. o Cylinder head gasket. o Cylinder block plug. o Heater core. o Radiator drain plug.	Repair or replace any components, as needed, to correct the leak.

Engine Fails to Reach Normal Operating Temperature or Cool Air from the Heater

Checks	Action
Check to determine if the thermostat is stuck open, or if it is the wrong type of thermostat.	Install a new thermostat of the correct type and heat range.
Check the coolant level to determine if it is below the MIN mark on the surge tank.	Add sufficient coolant to raise the fluid to the specified mark on the surge tank.

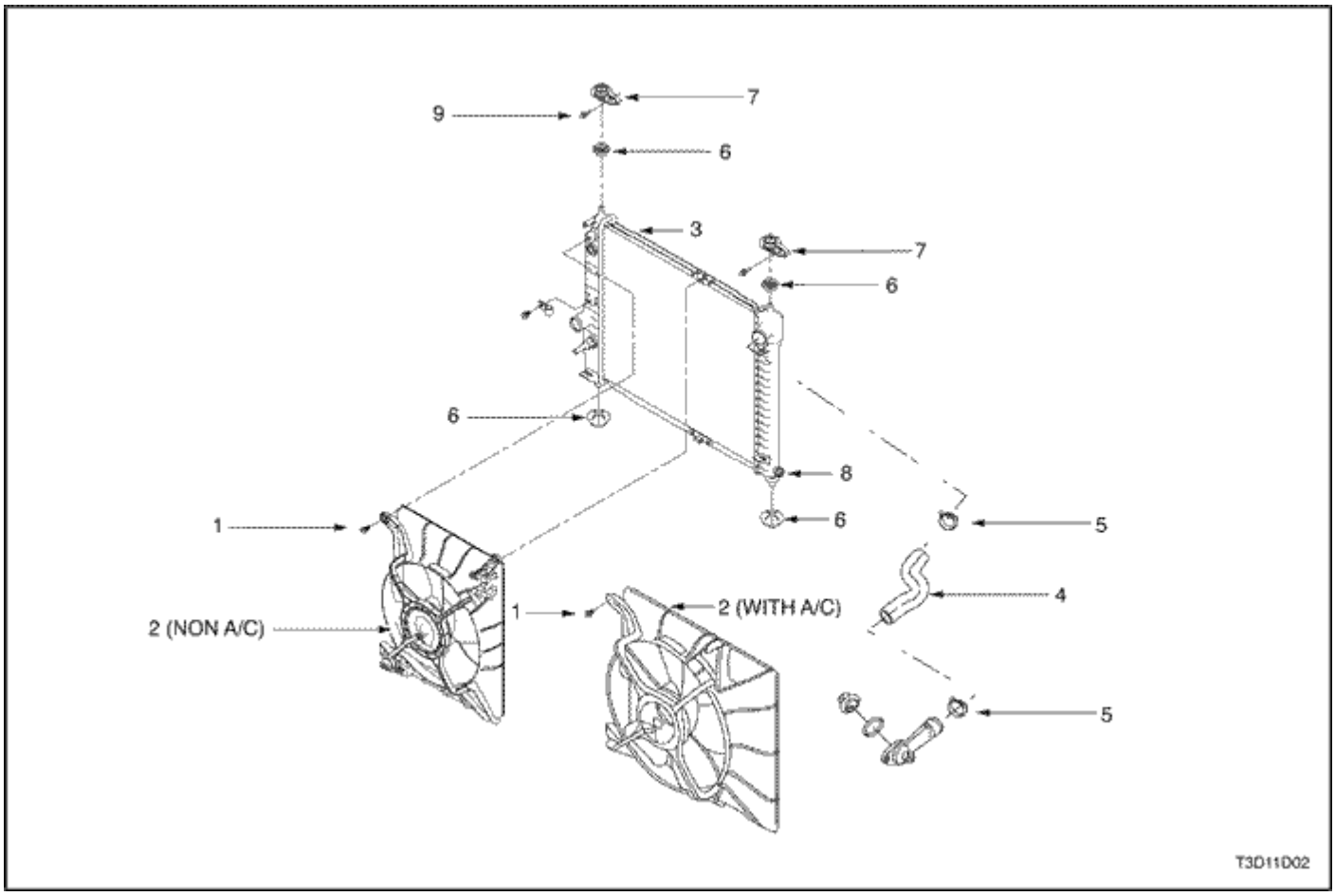
COMPONENT LOCATOR

Radiator/Fan (1.2 SOHC)



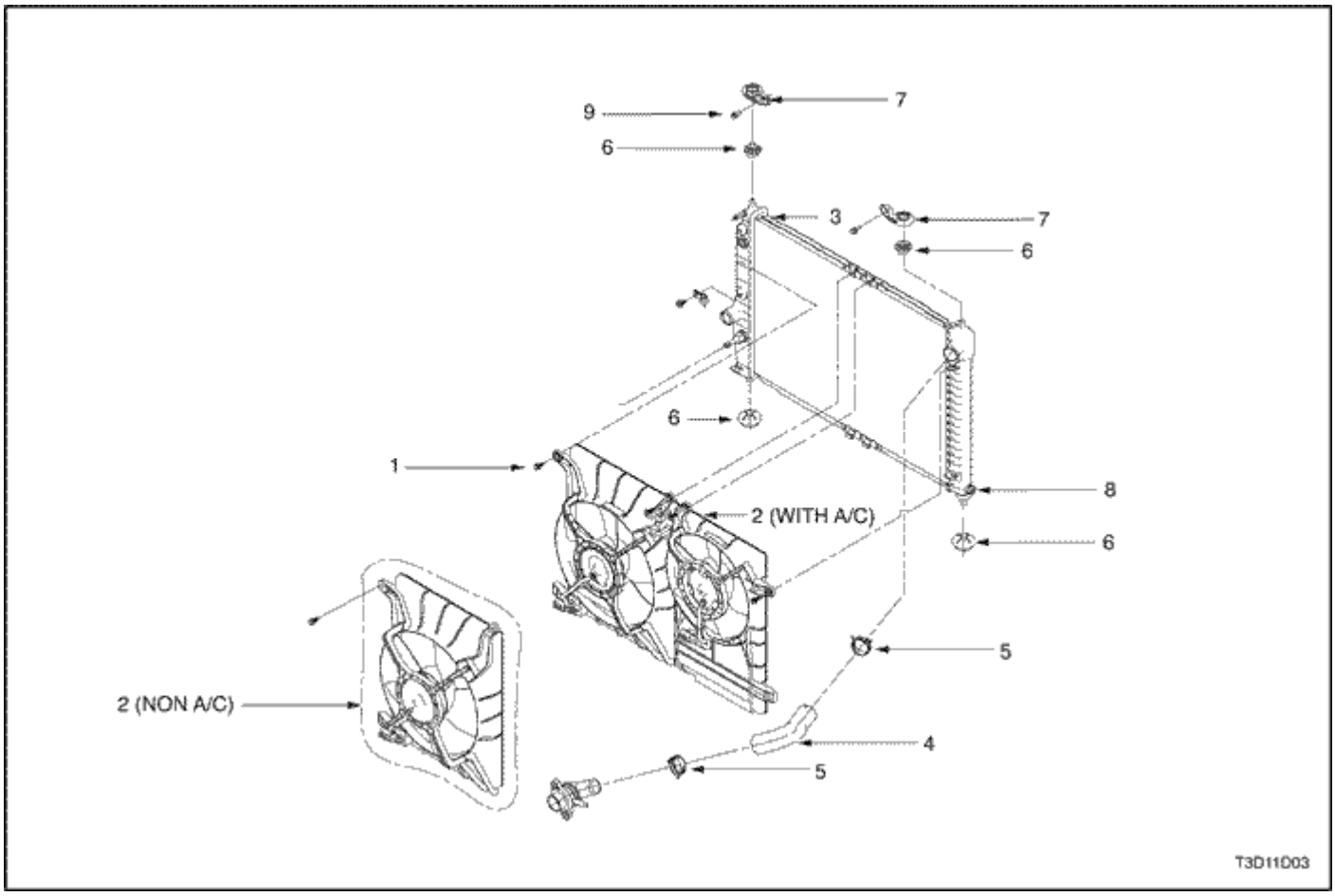
1. Bolt
2. Cooling Fan
3. Radiator
4. Upper Radiator Hose
5. Spring Clamp
6. Radiator Bumper
7. Radiator Bracket
8. Drain Cock
9. Bolt

Radiator/Fan (1.4/1.5 SOHC)



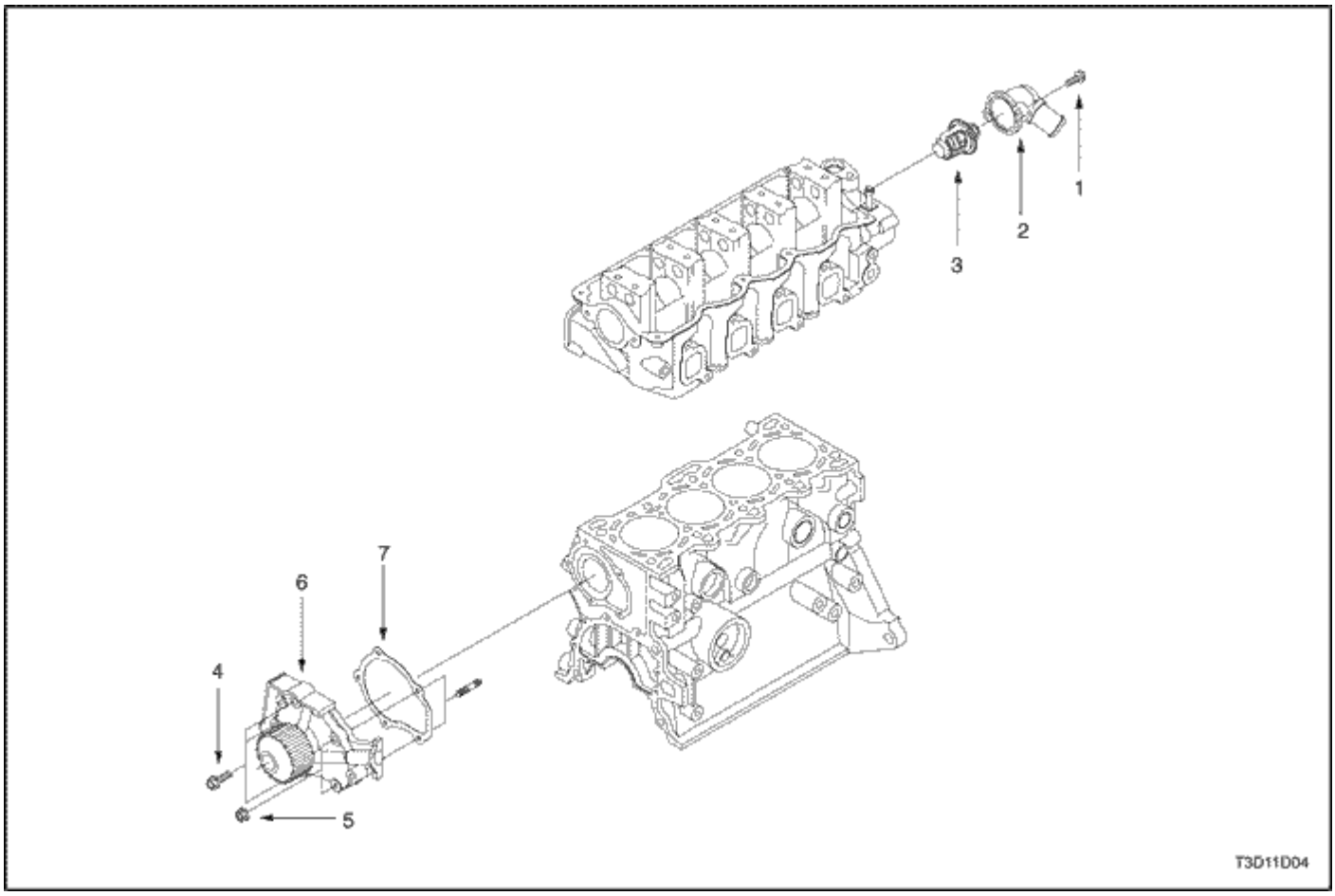
1. Bolt
2. Cooling Fan
3. Radiator
4. Upper Radiator Hose
5. Spring Clamp
6. Radiator Bumper
7. Radiator Bracket
8. Drain Cock
9. Bolt

Radiator/Fan (1.4 DOHC)



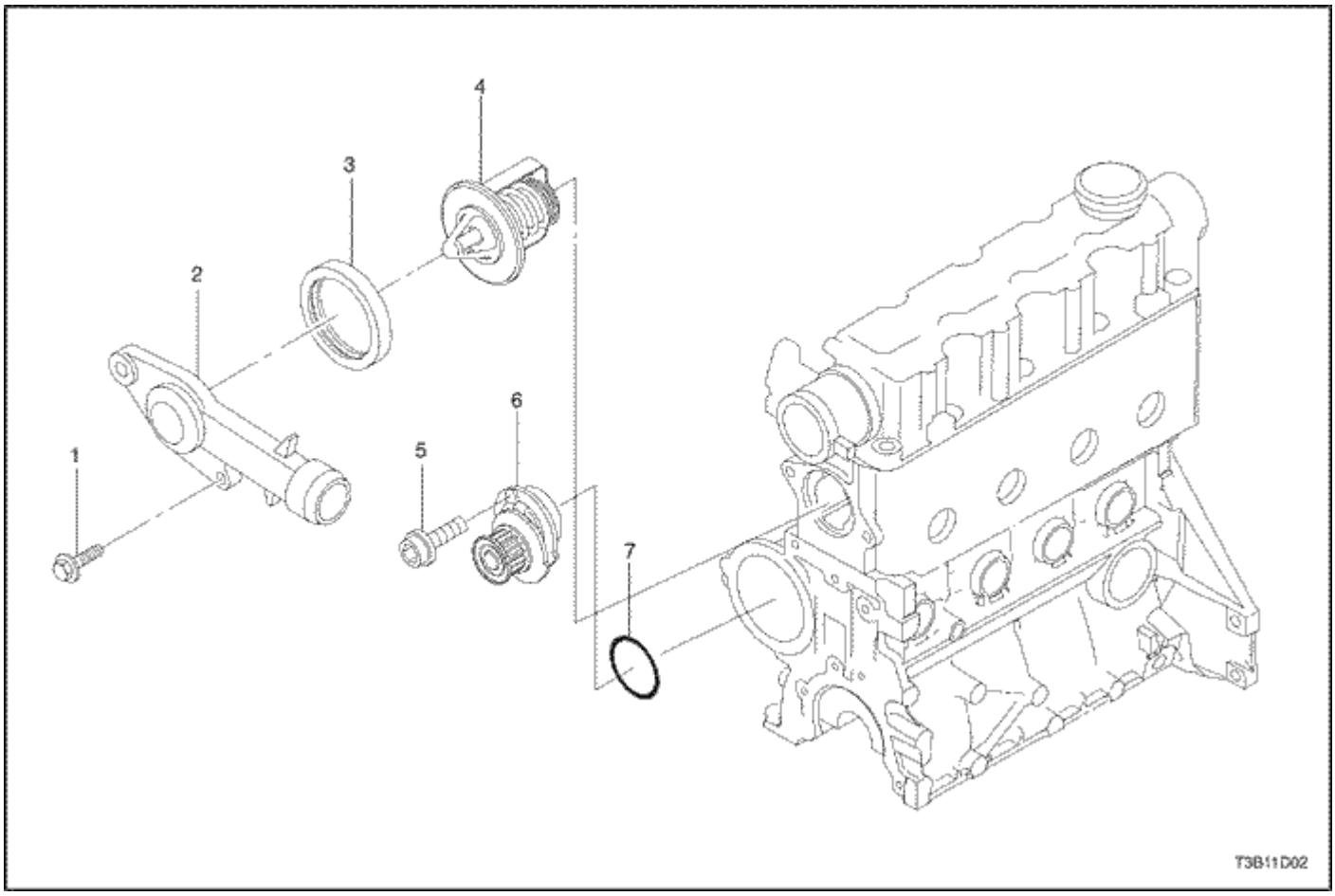
1. Bolt
2. Cooling Fan
3. Radiator
4. Upper Radiator Hose
5. Spring Clamp
6. Radiator Bumper
7. Radiator Bracket
8. Drain Cock
9. Bolt

Coolant Pump/Thermostat (1.2 SOHC)



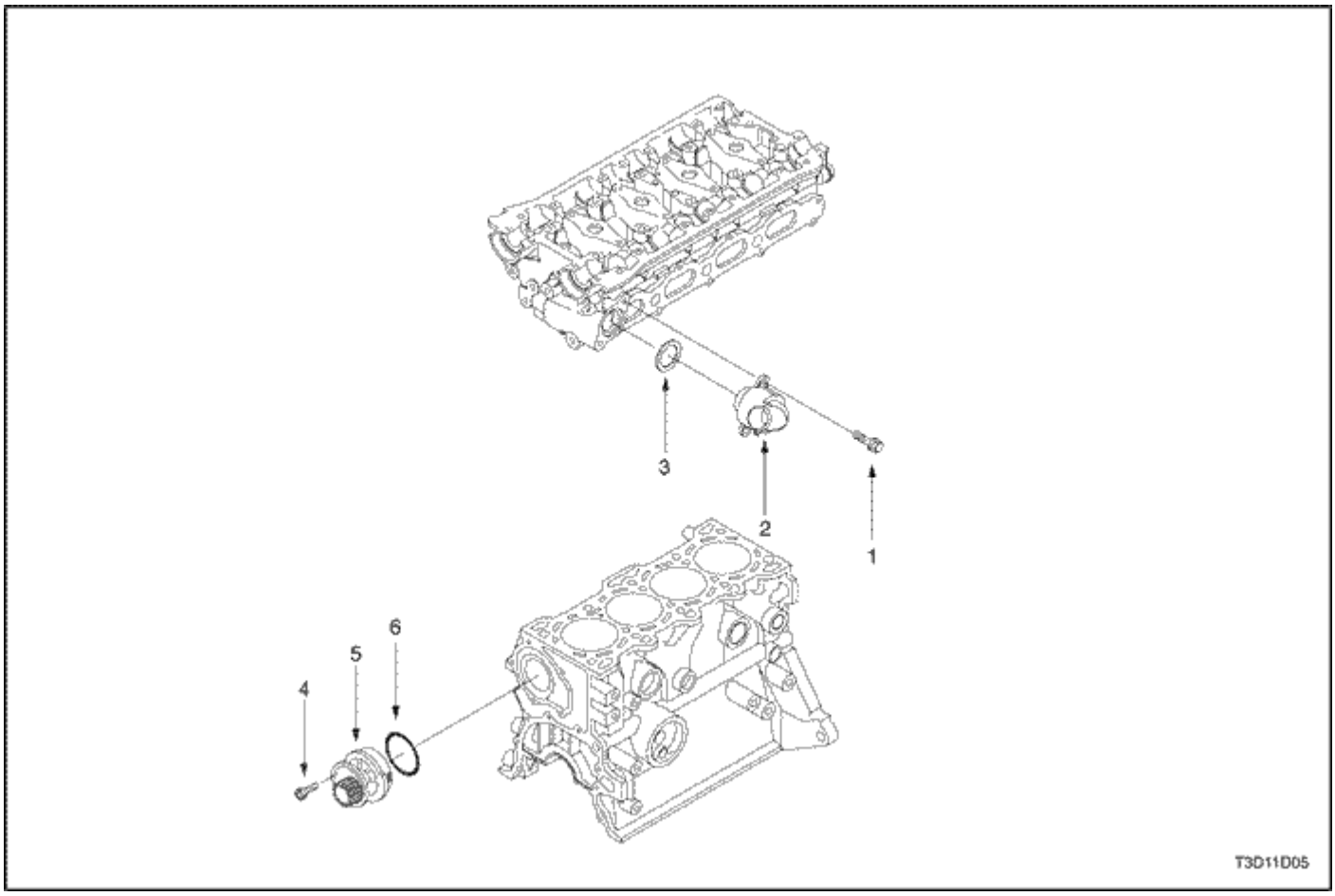
1. Thermostat Housing Bolt
2. Thermostat Housing
3. Thermostat
4. Coolant Pump Mounting Bolt
5. Coolant Pump Mounting Nut
6. Coolant Pump
7. Coolant Pump Gasket

Coolant Pump/Thermostat (1.4/1.5 SOHC)



1. Thermostat Housing Bolt
2. Thermostat Housing
3. Seal Ring
4. Thermostat
5. Coolant Pump Mounting Bolts
6. Coolant Pump
7. O-Ring

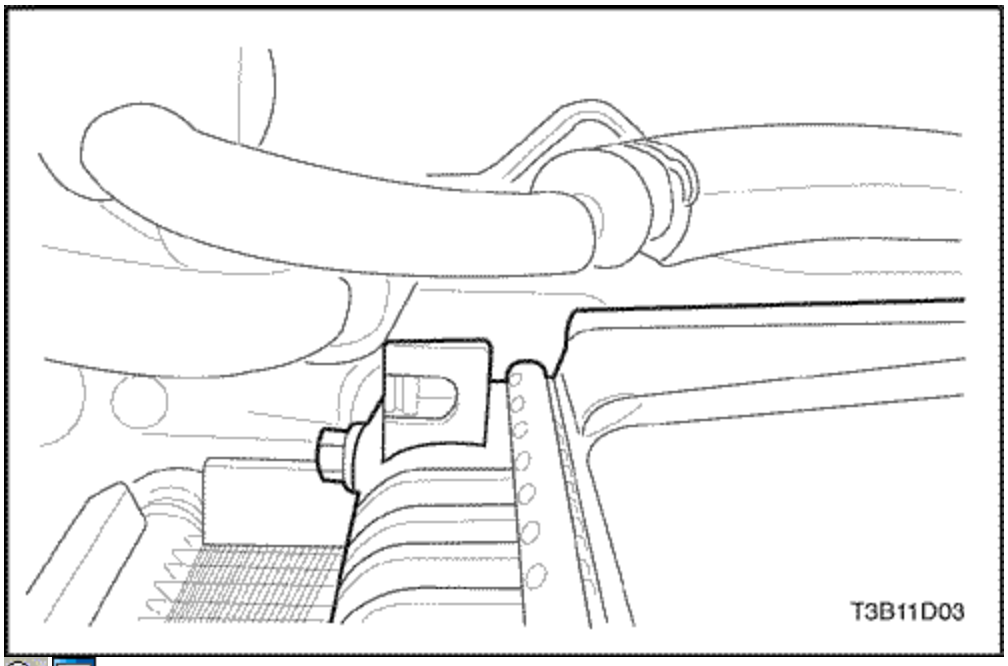
Coolant Pump/Thermostat (1.4 DOHC)



1. Thermostat Housing Bolt
2. Thermostat Housing Assembly
3. Seal Ring
4. Coolant Pump Mounting Bolts
5. Coolant Pump
6. O-Ring

MAINTENANCE AND REPAIR

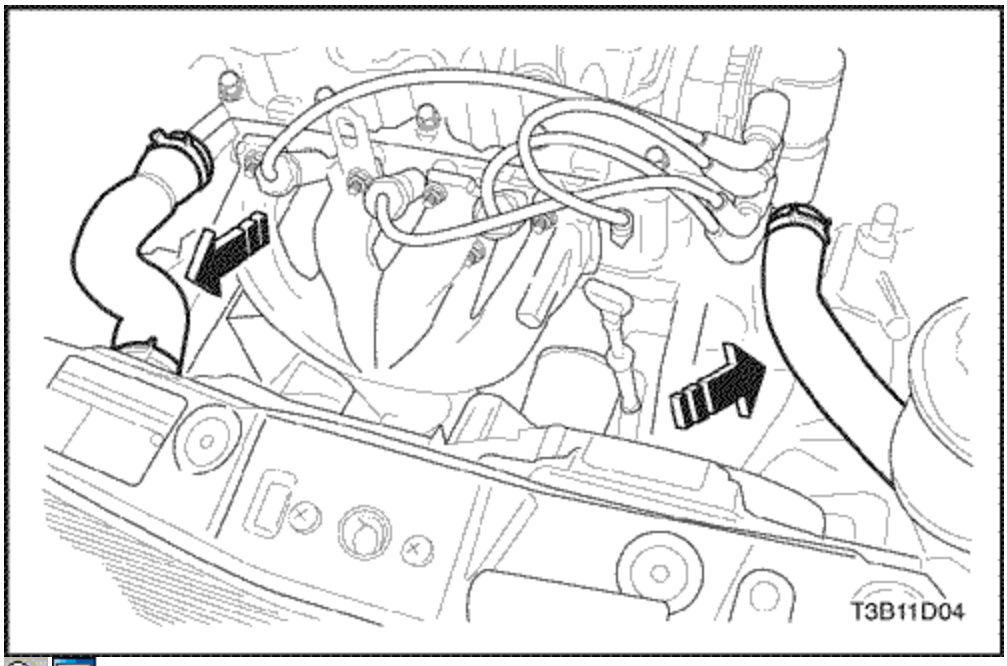
ON-VEHICLE SERVICE



Draining and Refilling the Cooling System

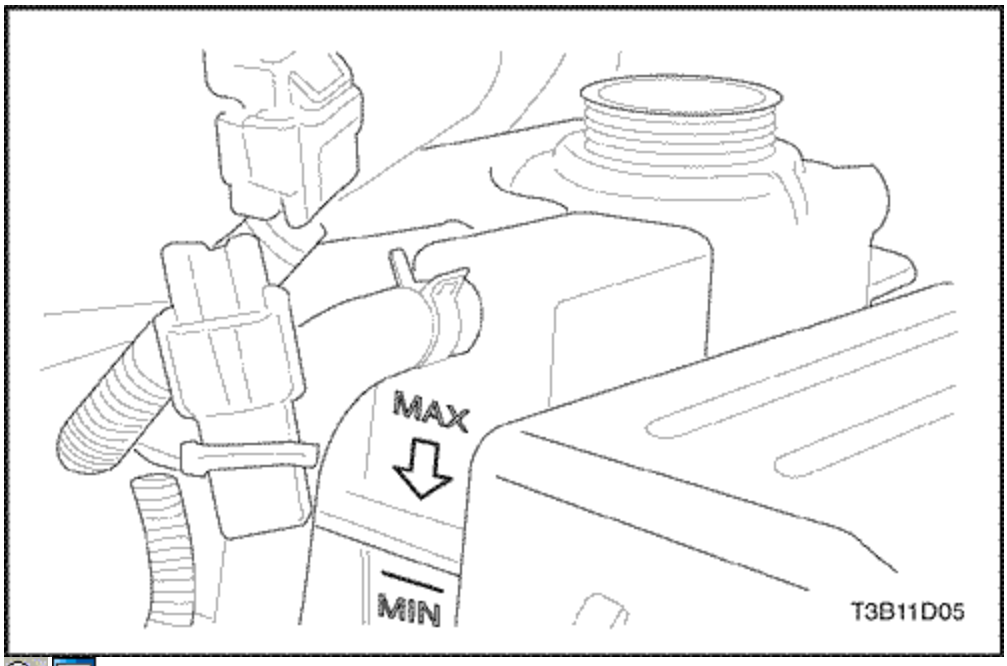
Caution : To avoid injury, do not remove the surge tank cap while the engine and the radiator are hot. Scalding fluid and steam may be blown out under pressure.

1. Place a pan below the vehicle to catch the draining coolant.
2. Remove the surge tank cap.
3. Unplug the drain cock.



Caution : Dispose of the used coolant in a used coolant holding tank to be picked up with the used oil for disposal. Never pour the used coolant down the drain. Ethylene glycol antifreeze is an extremely toxic chemical. Disposing of it into the sewer system or the ground water can contaminate the local environment.

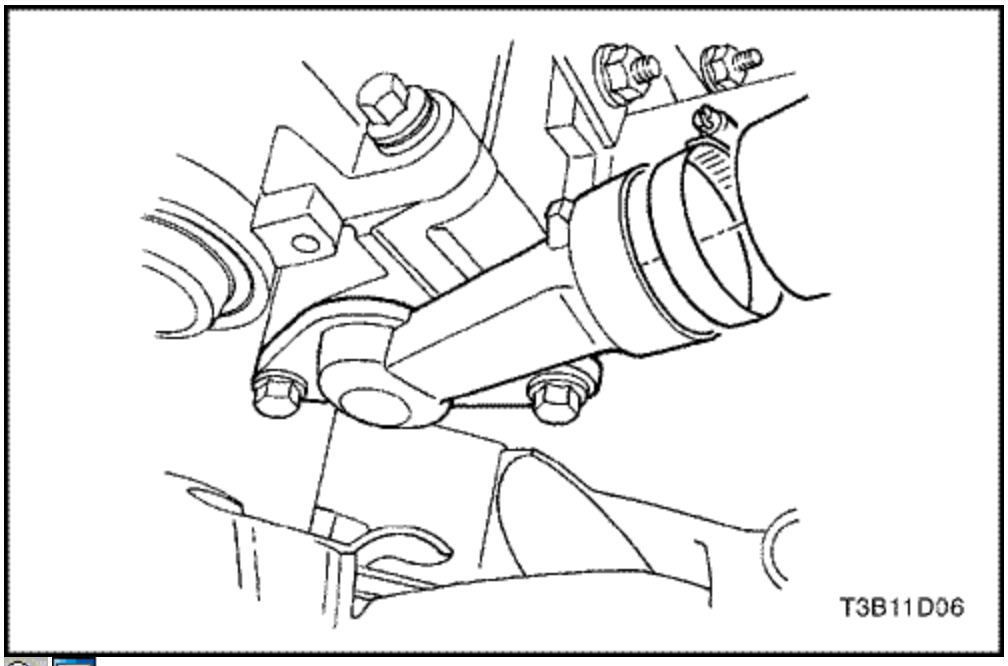
4. Catch the escaping fluid in a drain pan.
5. Remove all sludge and dirt from inside the surge tank. Refer to "Surge Tank"in this section.
6. Plug the drain cock.
7. Add clean water to the surge tank.
8. Fill the tank slowly so that the upper reservoir hose remains above the water line. This allows the air inside the cooling system to escape.
9. Start the engine.
10. Run the engine until the thermostat opens. You can tell the thermostat is open when both radiator hoses are hot to the touch.



11. Stop the engine.
12. Repeat Steps 1 through 9 until the drained water is clear and free of coolant and rust.

Notice : To avoid damaging the vehicle, never use an antifreeze mixture more concentrated than 60 percent antifreeze to 40 percent water. The solution freezing point increases above this concentration.

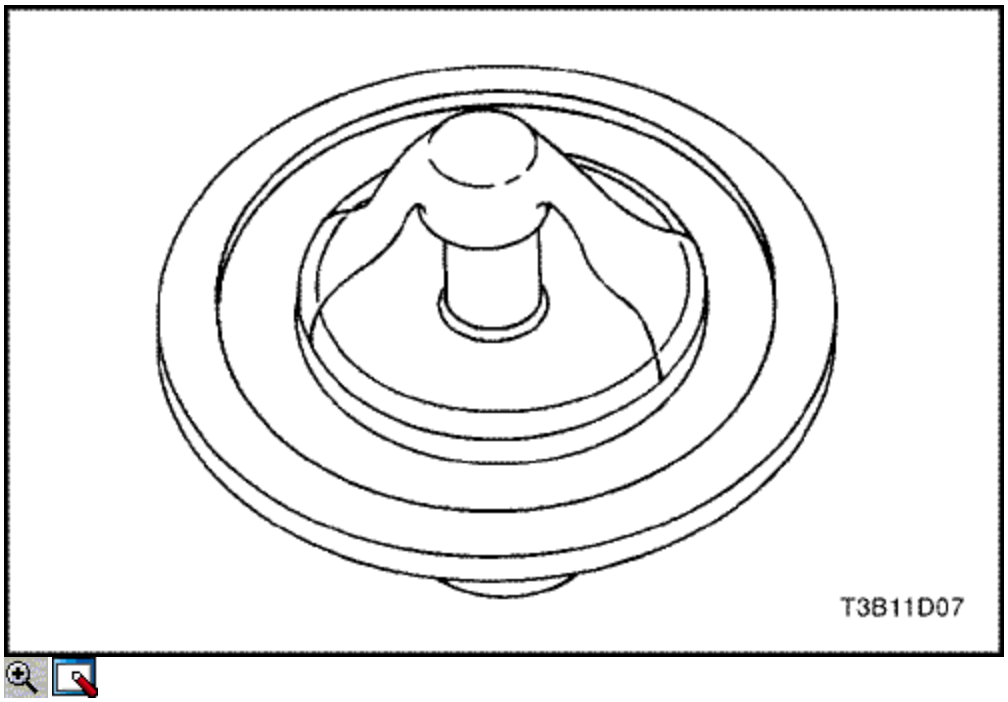
13. Fill the cooling system through the surge tank with a mixture of ethylene glycol antifreeze and water. The mixture must be at least 50 percent antifreeze, but not more than 60 percent antifreeze for cold weather operation.
14. Fill the surge tank to the specified MAX fill mark on the outside of the tank.



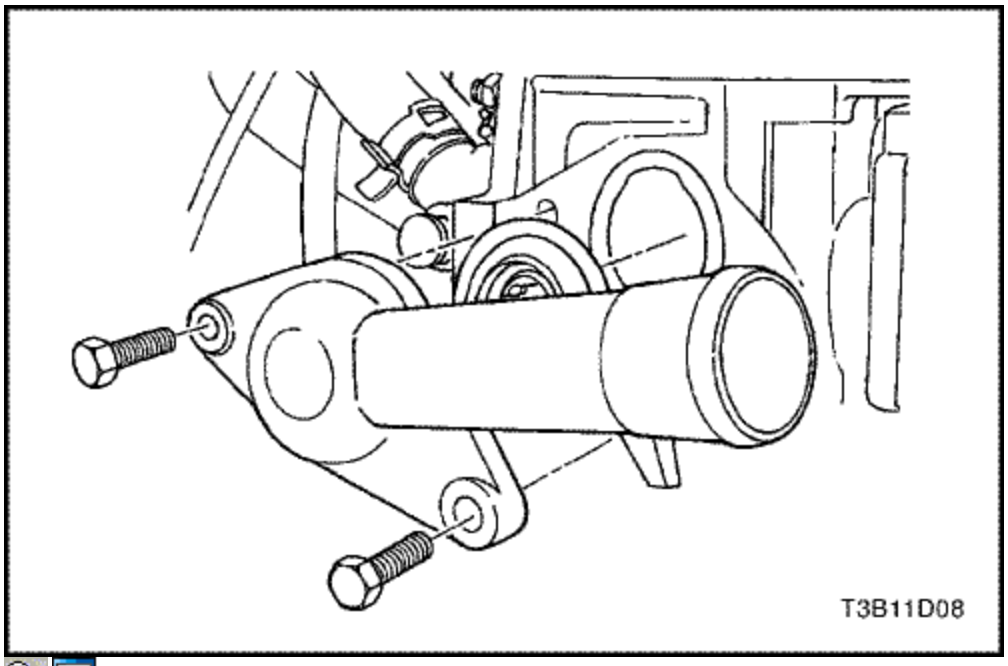
Thermostat
Removal Procedure

Caution : To prevent personal injury, do not remove the surge tank cap while the engine and the radiator are hot because the heat causes the system to remain under pressure. Scalding fluid and steam may be blown out under pressure.

1. Drain the coolant. Refer to "Draining and Refilling the Cooling System"in this section.
2. Remove the timing belt rear hood. Refer to *Section 1B2, SOHC Engine Mechanical.*
3. Loosen the hose clamp on the upper radiator hose at the thermostat housing.
4. Disconnect the upper radiator hose from the thermostat housing.



5. Remove the mounting bolts that hold the thermostat housing to the cylinder head.
6. Remove the thermostat housing from the cylinder head.
7. Remove the thermostat from its recess in the cylinder head.
8. Inspect the valve seat for foreign matter that could prevent the valve from sealing properly.
9. Inspect the thermostat for proper operation. Refer to "Thermostat Test" in this section.
10. Clean the thermostat housing and the cylinder head mating surfaces.

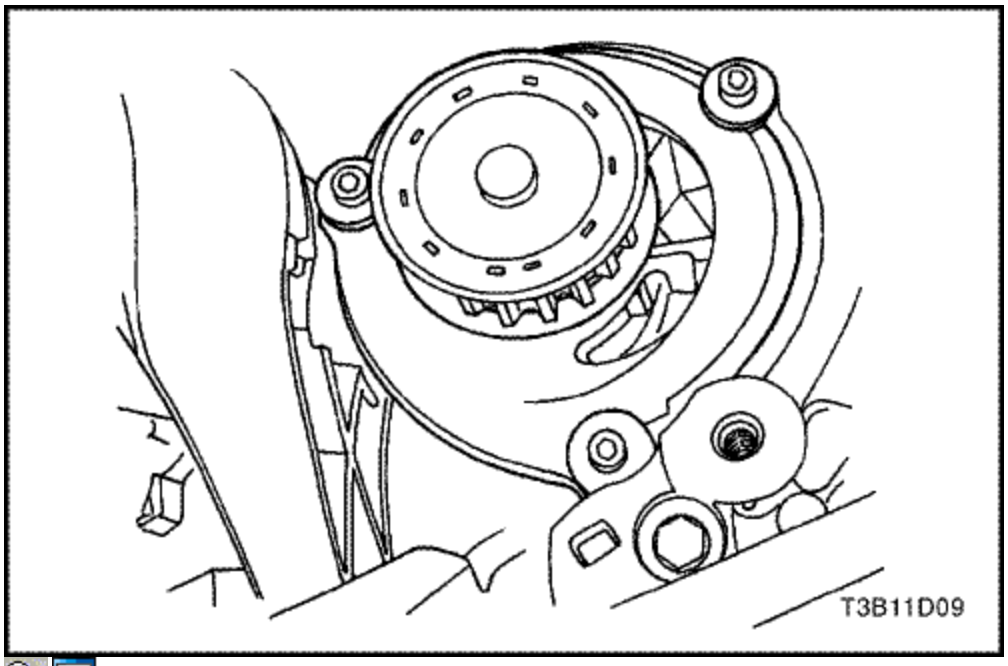


Installation Procedure

1. Install the thermostat into the cylinder head recess.
2. Install the thermostat housing.
3. Secure the thermostat housing to the cylinder head with the mounting bolts.

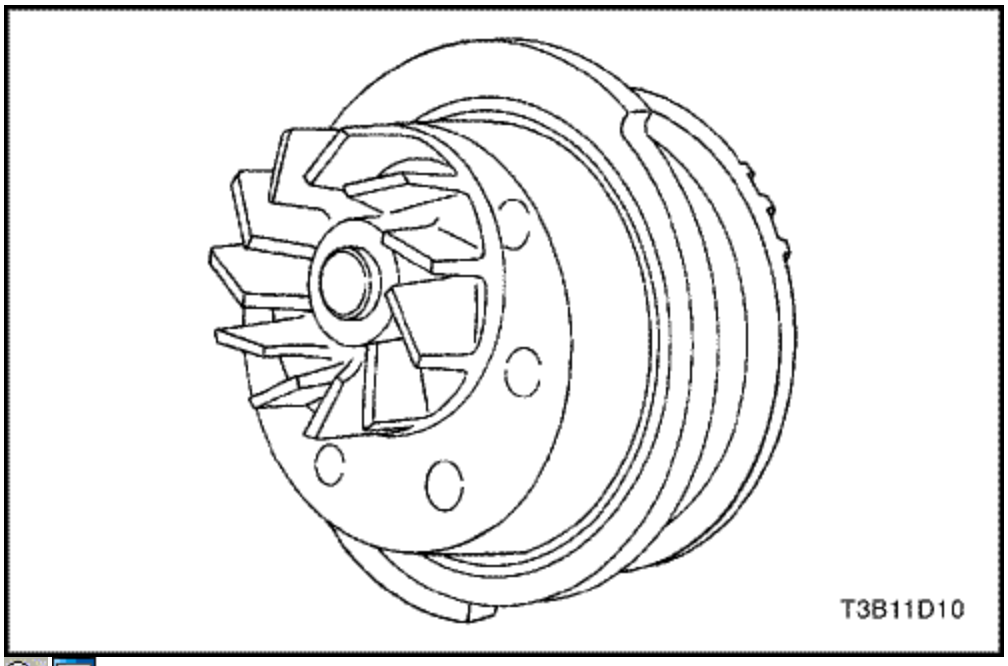
   Tighten
   Tighten the thermostat housing mounting bolts to 20 N•m (15 lb-ft).

4. Install the timing belt rear Hood. Refer to *Section 1B2, SOHC Engine Mechanical.*
5. Connect the upper radiator hose to the thermostat housing.
6. Secure the upper radiator hose to the thermostat housing with a hose clamp.
7. Refill the engine cooling system. Refer to "Draining and Refilling the Cooling System" in this section.



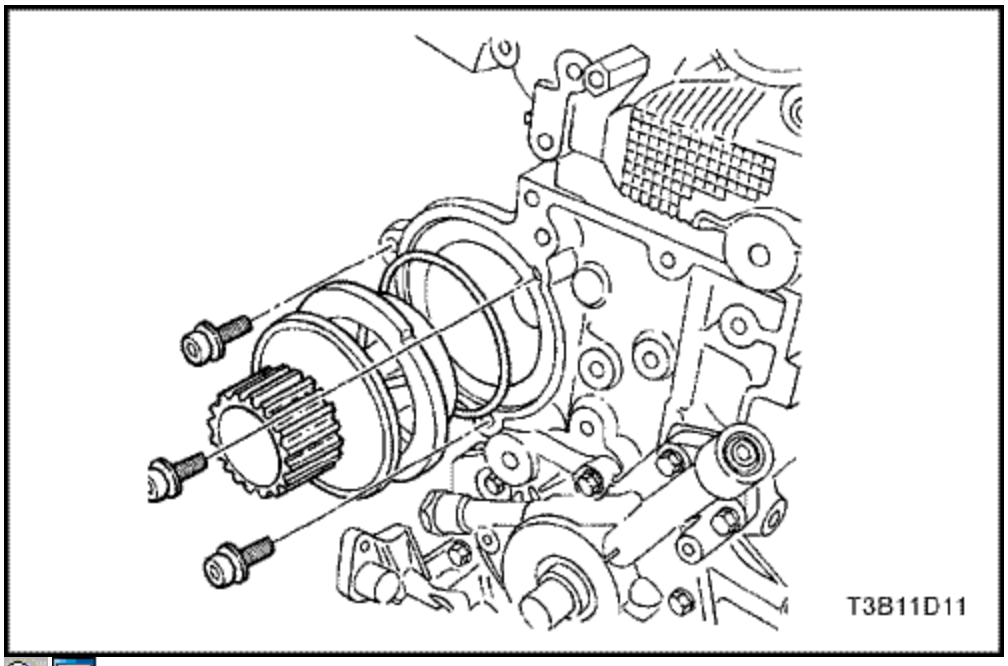
Coolant Pump
Removal Procedure

1. Drain the engine cooling system to a level below the thermostat housing. Refer to "Draining and Refilling the Cooling System"in this section.
2. Remove the timing belt rear hood. Refer to *Section 1B2, SOHC Engine Mechanical,*
3. Remove the coolant pump mounting bolts.
4. Remove the coolant pump from the cylinder block.
5. Remove the ring seal from the coolant pump.



Inspection Cleaning Procedure

1. Inspect the coolant pump body for cracks and leaks.
2. Inspect the coolant pump bearing for play or abnormal noise.
3. Inspect the coolant pump pulley for excessive wear. If the coolant pump is defective, replace the coolant pump as a unit.
4. Clean the mating surfaces of the coolant pump and cylinder block.

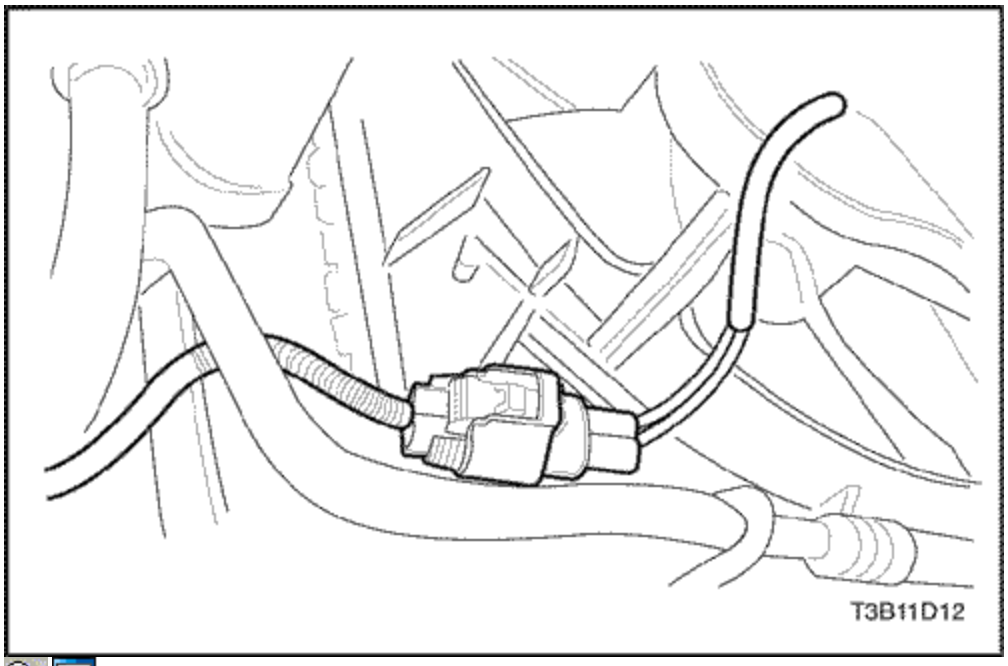


Installation Procedure

1. Install a new ring seal to the coolant pump.
2. Coat the sealing surface of the ring seal with Lubriplate®.
3. Install the coolant pump to the engine block.
4. Secure the coolant pump to the engine block with the mounting bolts.

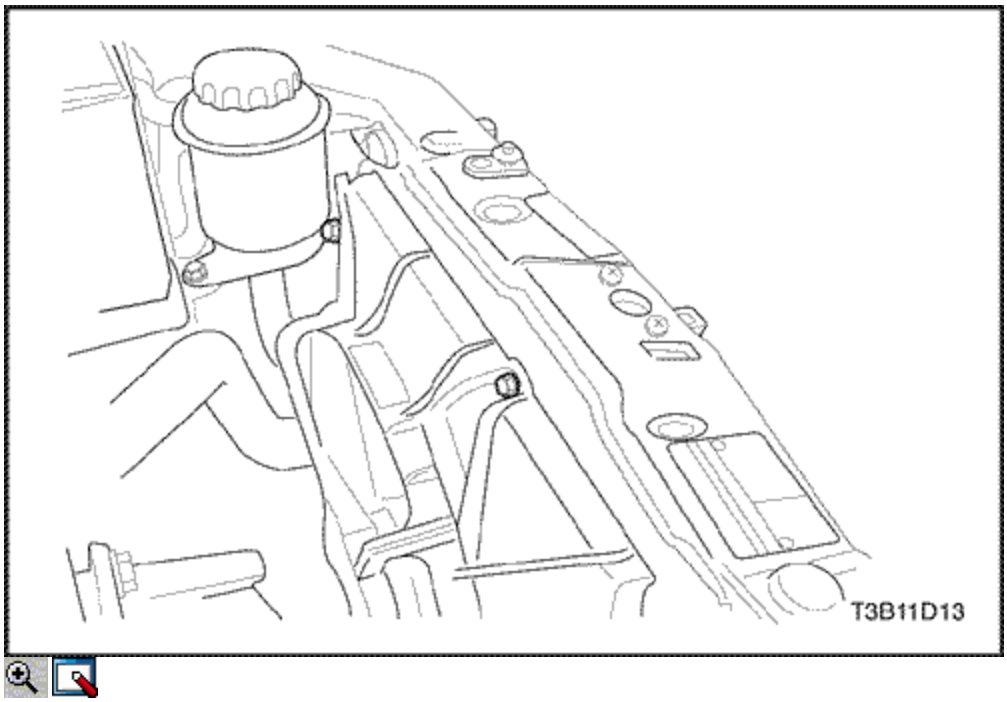
   Tighten
   Tighten the coolant pump mounting bolts to 10 N•m (89 lb-in).

5. Install the rear timing belt rear hood. Refer to *Section 1B2, SOHC Engine Mechanical.*
6. Refill the engine cooling system. Refer to "Draining and Refilling the Cooling System" in this section.

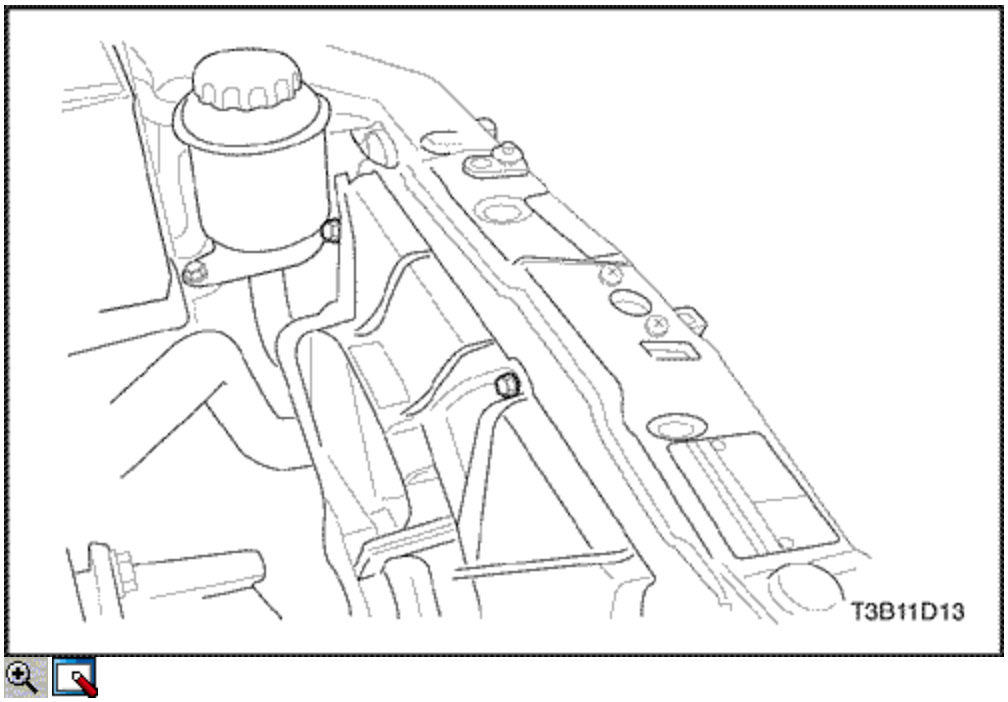


Electric Cooling Fan
Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the cooling fan electrical connector.



3. Remove the electric cooling Fan Mounting bolts.
4. Remove the electric cooling Fan.

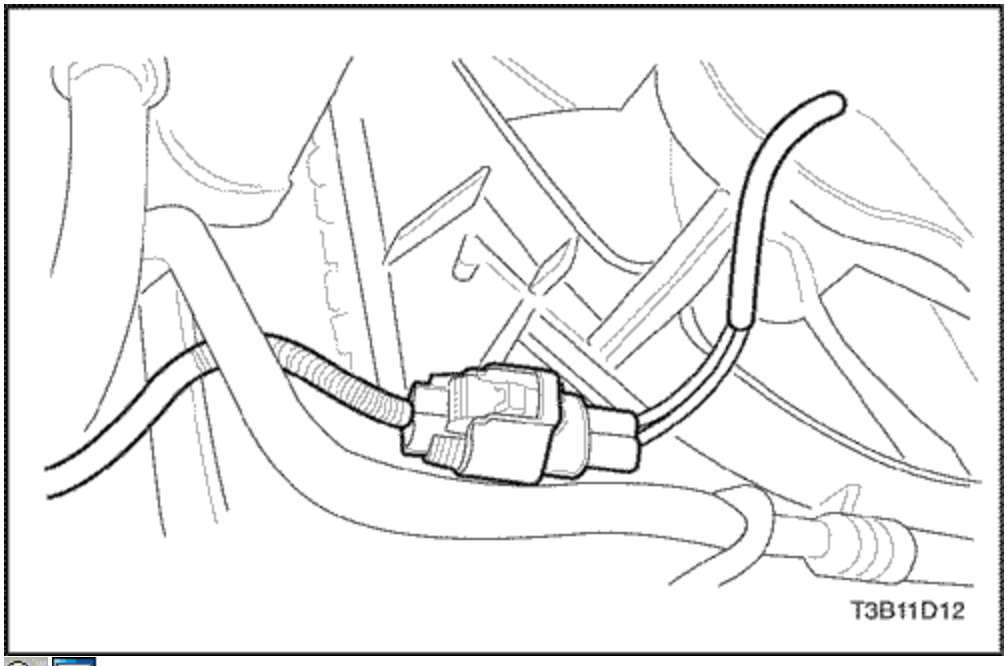


Installation Procedure

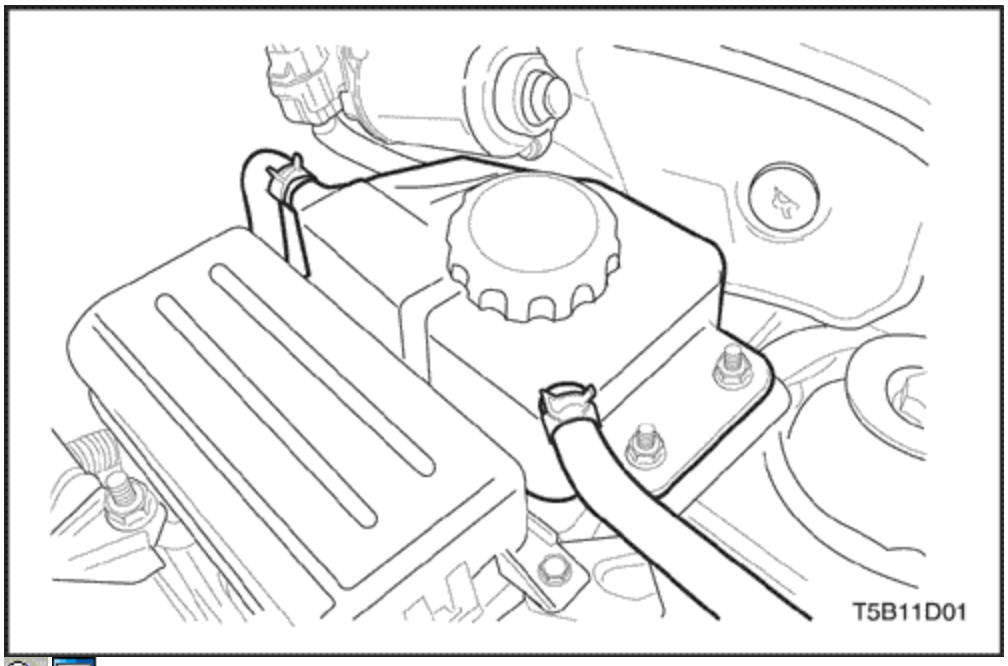
Caution : If a fan blade is bent or damaged in any way, no attempt should be made to repair or reuse the damaged part. A bent or damaged fan assembly must be replaced with a new fan assembly. It is essential that fan assemblies remain in proper balance. A fan assembly that is not in proper balance can fail and fly apart during use, creating extreme danger. Proper balance cannot be assured on a fan assembly that has been bent or damaged.

1. Install the electric cooling fan.
2. Install the electric cooling Fan Mounting bolts.

Tighten
Tighten the electrical cooling fan moumting bolts to 4 N•m (35 lb-in).



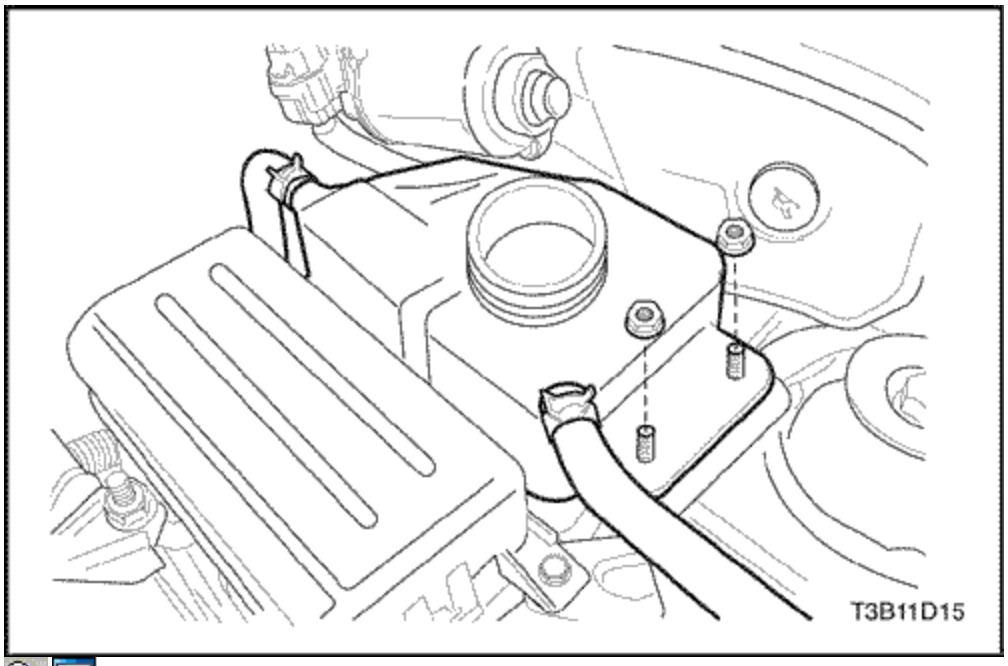
3. Connect the cooling fan electriceal connector



Surge Tank
Removal Procedure

Caution : To prevent personal injury, do not remove the surge tank cap while the engine and the radiator are hot, because the heat causes the system to remain under pressure. Scalding fluid and steam may be blown out under pressure.

1. Drain the engine coolant to below the level of the surge tank.
2. Loosen the overflow hose clamps and disconnect the overflow hose from the top of the surge tank.
3. Remove the tank attaching nuts.
4. Remove the tank from the vehicle.
5. Clean the inside and the outside of the surge tank and the surge tank cap with soap and water.
6. Rinse the surge tank and the cap thoroughly.

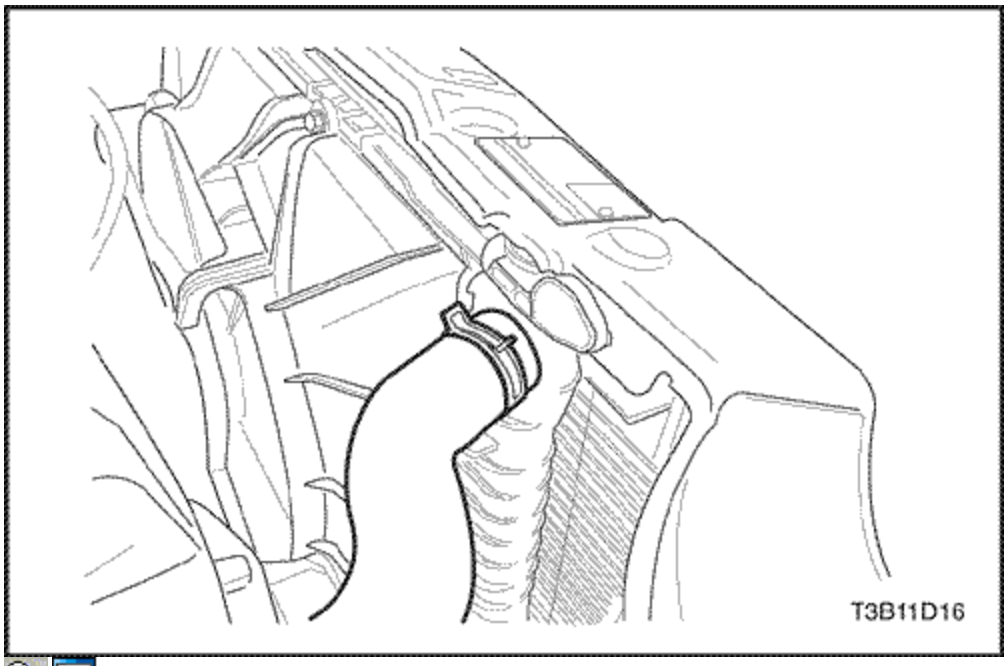


Installation Procedure

1. Install the surge tank to the vehicle.
2. Secure the surge tank with the attaching nuts.

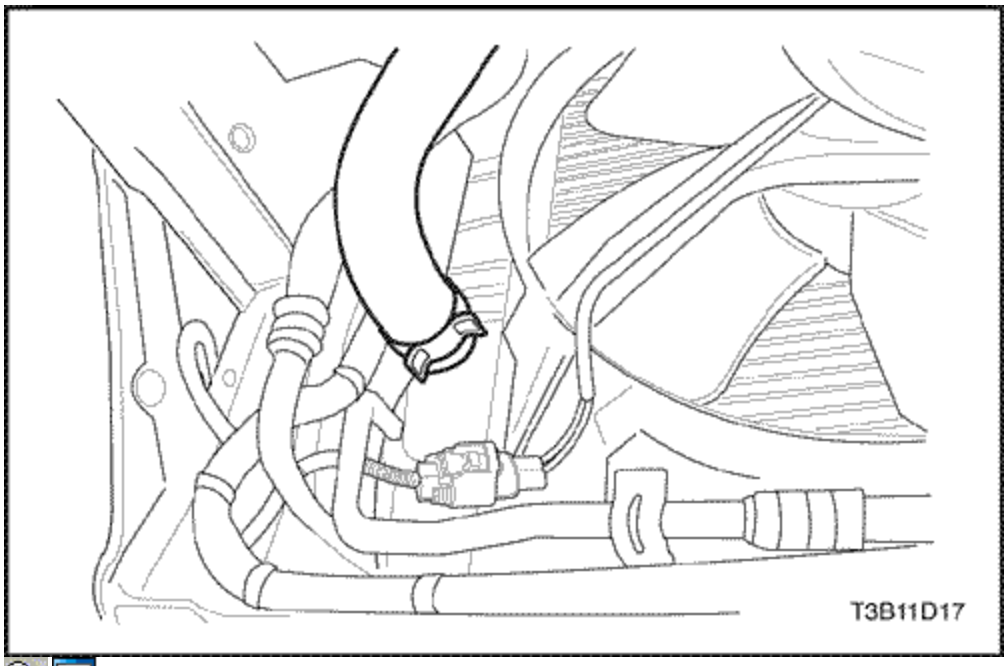
   Tighten
   Tighten the surge tank attaching nuts to 10 N•m (89 lb-in).

3. Connect the overflow hose to the surge tank.
4. Secure the overflow hose to the surge tank with the hose clamps.
5. Fill the surge tank with the coolant to the center ridge, or to the MAX mark.

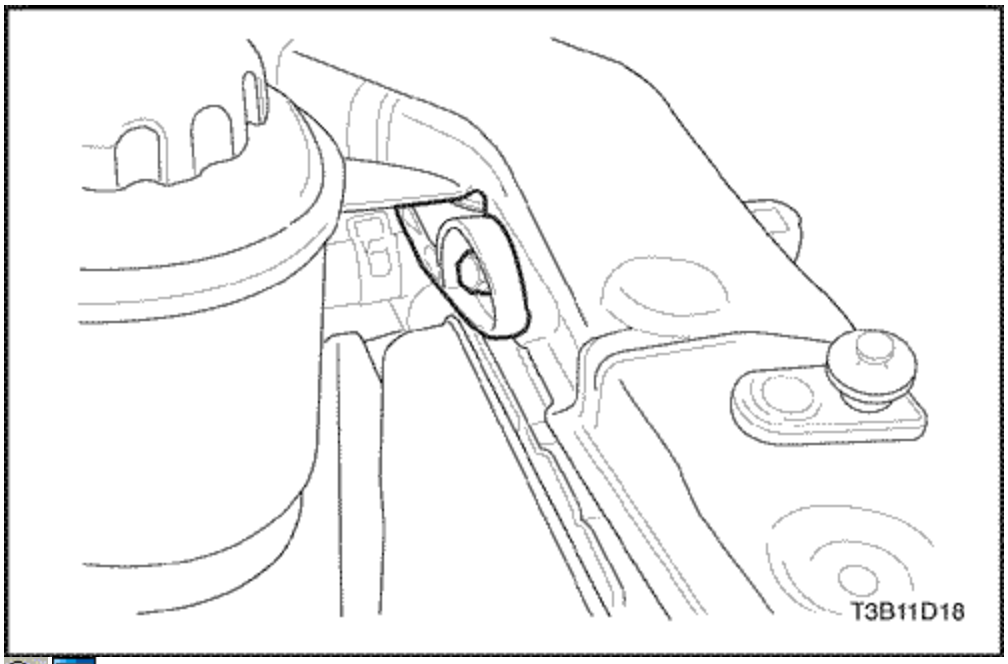


Radiator
Removal Procedure

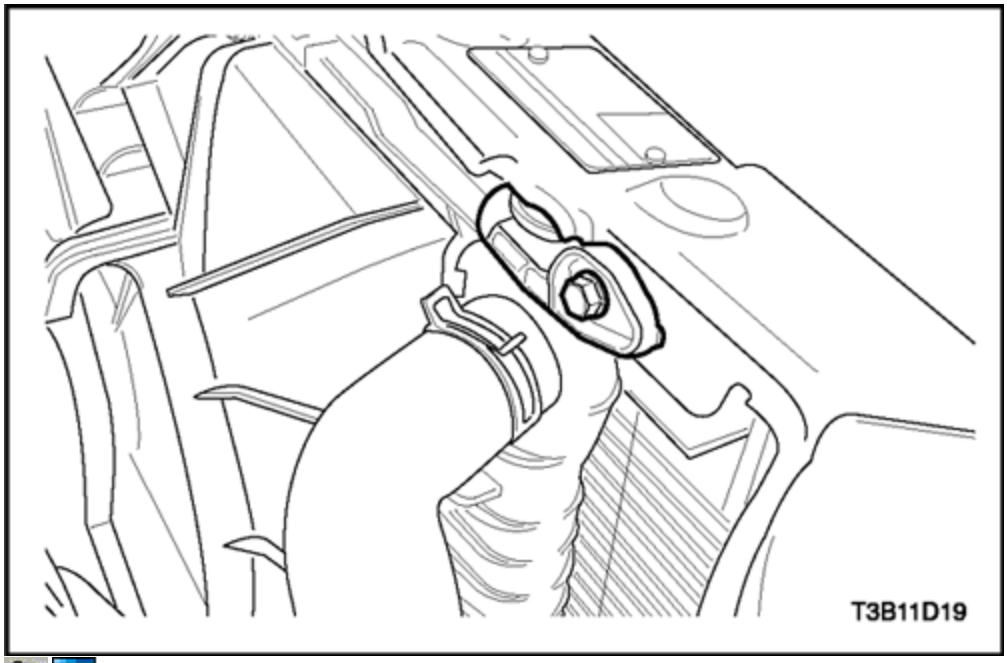
1. Disconnect the negative battery cable.
2. Drain the engine cooling system. Refer to "Draining and Refilling the Cooling System" in this section.
3. Remove the electric cooling fans. Refer to "Electric Cooling Fan" in this section.
4. Remove the upper radiator hose clamp.
5. Disconnect the upper radiator hose from the radiator.



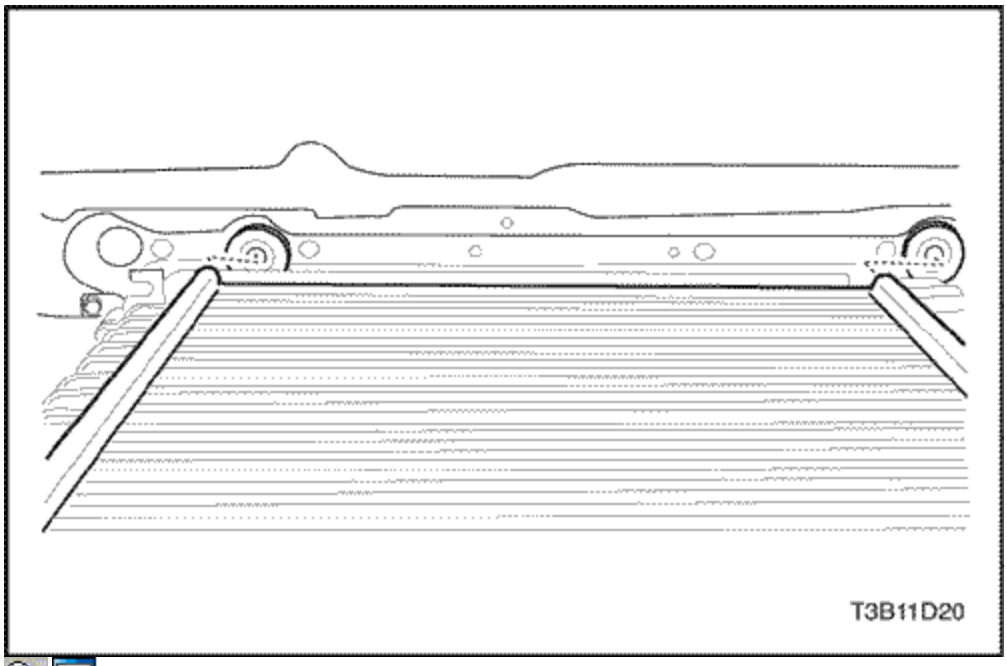
6. Disconnect the lower radiator hose from the radiator.
7. Remove the lower radiator hose clamp.



8. Remove the hose clamp from the surge tank hose at the radiator.
9. Disconnect the surge tank hose from the radiator.
10. Remove the left upper radiator retaining bolt.
11. Remove the left upper radiator retaining bracket.

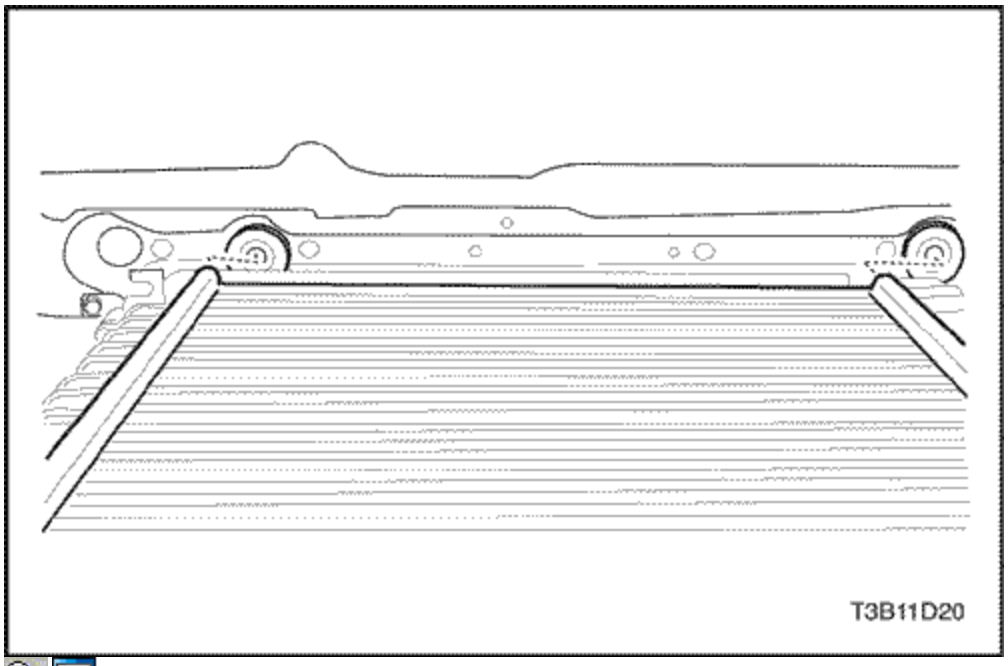


12. Remove the right upper radiator retaining bolt.
13. Remove the right upper radiator retaining bracket.



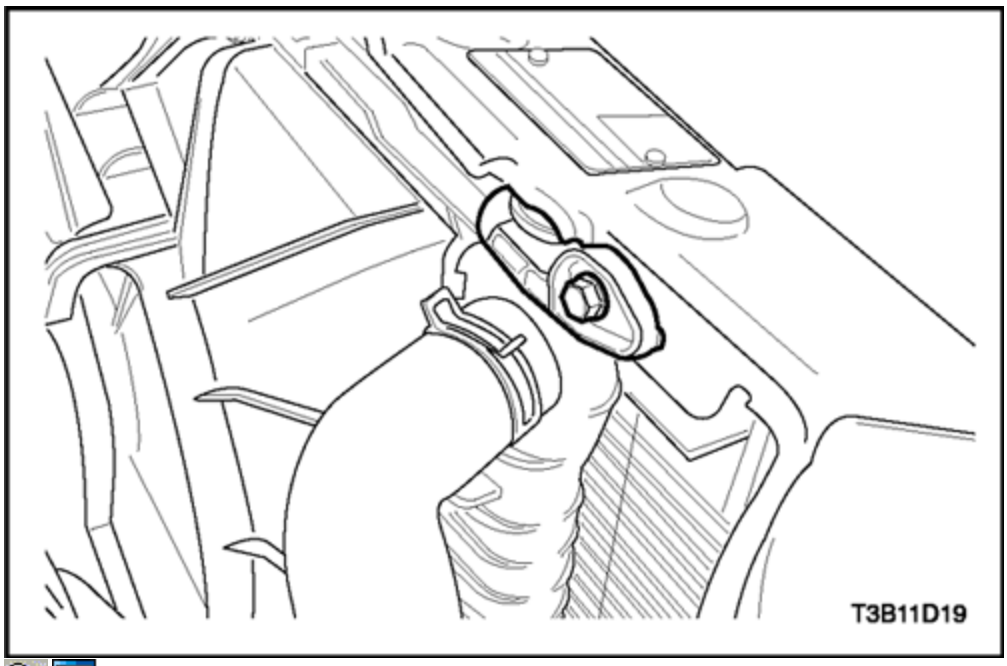
14. Remove the radiator from the vehicle.

Important : The radiator still contains a substantial amount of coolant. Drain the remainder of the coolant from the radiator into a drain pan.



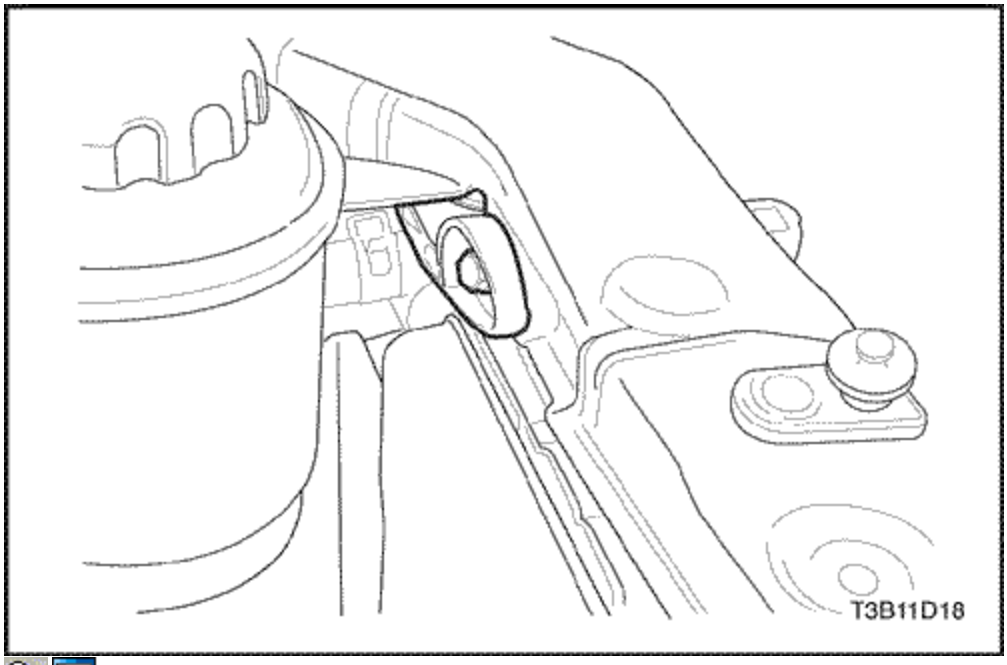
Installation Procedure

1. Set the radiator into place in the vehicle with the rediator bottom posts in the rubber shock bumpers.



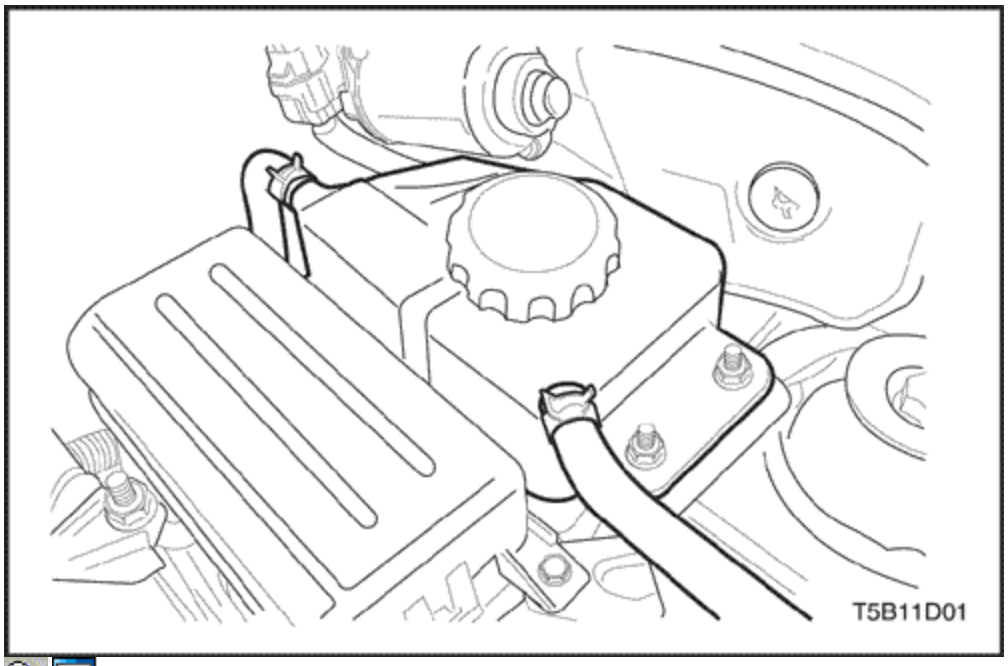
2. Position the radiator retainers in place.
3. Install the upper right radiator retaining bracket.
4. Install the upper right radiator retaining bolt.

Tighten
Tighten the upper right radiator retaining bolt to 10 N•m (89 lb-in).

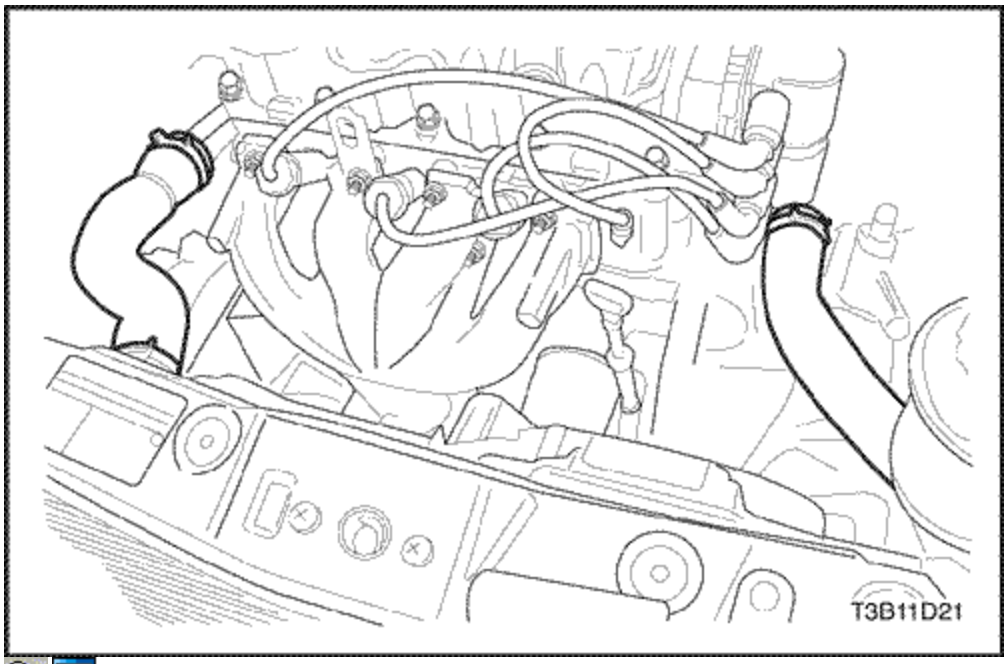


5. Install the upper left radiator retaining bracket.
6. Install the upper left radiator retaining bolt.

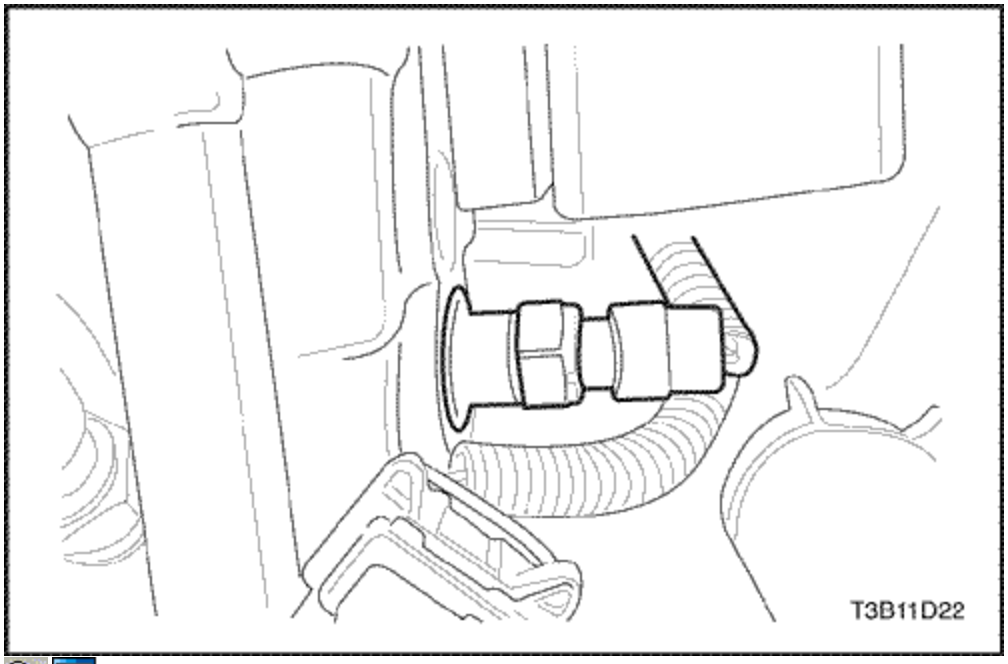
Tighten
Tighten the upper lef radiator retaining bolt to 10 N•m (89 lb-in).



7. Connect the surge tank hose to the radiator.
8. Secure the surge tank hose with a hose clamp.

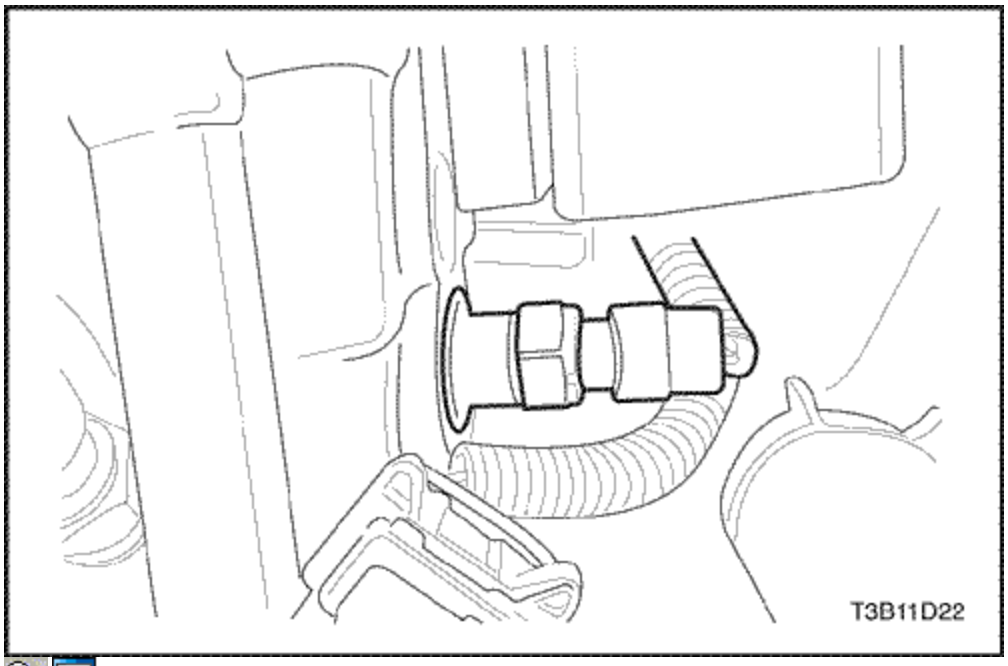


9. Connect the upper radiator hose and the lower radiator hose to the radiator.
10. Secure each hose with a hose clamp.
11. Install the electric cooling fans. Refer to "Electric Cooling Fan" in this section.
12. Refill the engine cooling system. Refer to "Draining and Refilling the Cooling System" in this section.
13. Connect the negative battery cable.



Coolant Temperature Sensor (1.4/1.5 SOHC)
Removal Procedure

1. Disconnect the negative battery cable.
2. Drain the coolant below the engine coolant temperature sensor level.
3. Disconnect the electrical connector from the engine coolant temperature sensor.
4. Remove the temperature sensor from the cylinder head.



Installation Procedure

1. Install the coolant temperature sensor into the threaded hole in the cylinder head.

   Tighten
   Tighten the coolant temperature sensor to 20 N•m (15 lb-ft).

2. Connect the electrical connector to the engine coolant temperature sensor.
3. Refill the coolant system. Refer to "Draining and Refilling the Cooling System" in this section.
4. Connect the negative battery cable.

GENERAL DESCRIPTION AND SYSTEM OPERATION

General Description

The cooling system maintains the engine temperature at an efficient level during all engine operating conditions. When the engine is cold, the cooling system cools the engine slowly or not at all. This slow cooling of the engine allows the engine to warm up quickly.

The cooling system includes a radiator and recovery subsystem, cooling fans, a thermostat and housing, a coolant pump, and a coolant pump drive belt. The timing belt drives the coolant pump.

All components must function properly in order for the cooling system to operate. The coolant pump draws the coolant from the radiator. The coolant then circulates through water jackets in the engine block, the intake manifold, and the cylinder head. When the coolant reaches the operating temperature of the thermostat, the thermostat opens. The coolant then goes back to the radiator where it cools.

This system directs some coolant through the hoses to the heater core. This provides for heating and defrosting. The surge tank is connected to the radiator to recover the coolant displaced by expansion from the high temperatures. The surge tank maintains the correct coolant level

The cooling system for this vehicle has no radiator cap or filler neck. The coolant is added to the cooling system through the surge tank.

Radiator

This vehicle has a lightweight tube-and-fin aluminum radiator. Two models of radiators are available: small, standard, and heavy duty. The two models vary only by capacity. Plastic tanks are mounted on the right and the left sides of the radiator core.

On vehicles equipped with automatic transaxles, the transaxle fluid cooler lines run through the left radiator tank. A radiator drain cock is on this radiator. To drain the cooling system, open the drain cock.

Surge Tank

The surge tank is a transparent plastic reservoir, similar to the windshield washer reservoir.

The surge tank is connected to the radiator by a hose and to the engine cooling system by another hose. As the vehicle is driven, the engine coolant heats and expands. The portion of the engine coolant displaced by this expansion flows from the radiator and the engine into the surge tank. The air trapped in the radiator and the engine is degassed into the surge tank.

When the engine stops, the engine coolant cools and contracts. The displaced engine coolant is then drawn back into the radiator and the engine. This keeps the radiator filled with coolant to the desired level at all times and increases the cooling efficiency.

Maintain the coolant level between the MIN and the MAX marks on the surge tank when the system is cold.

Coolant Pump

The belt-driven centrifugal coolant pump consists of an impeller, a drive shaft, and a belt pulley. The coolant pump is mounted on the front of the transverse-mounted engine, and is driven by the timing belt.

The impeller is supported by a completely sealed bearing.

The coolant pump is serviced as an assembly and, therefore, cannot be disassembled.

Thermostat

A wax pellet-type thermostat controls the flow of the engine coolant through the engine cooling system. The thermostat is mounted in the thermostat housing to the front of the cylinder head.

The thermostat stops the flow of the engine coolant from the engine to the radiator to provide faster warm-up, and to regulate the coolant temperature. The thermostat remains closed while the engine coolant is cold, preventing circulation of the engine coolant through the radiator. At this point, the engine coolant is allowed to circulate only throughout the heater core to warm it quickly and evenly.

As the engine warms, the thermostat opens. This allows the engine coolant to flow through the radiator where the heat is dissipated through the radiator. This opening and closing of the thermostat permits enough engine coolant to enter the radiator to keep the engine within proper engine temperature operating limits.

The wax pellet in the thermostat is hermetically sealed in a metal case. The wax wax element of the thermostat expands when it is heated and contracts when it is cooled.

As the vehicle is driven and the engine warms, the engine coolant temperature increases. When the engine coolant reaches a specified temperature, the wax pellet element in the thermostat expands and exerts pressure against the metal case, forcing the valve open. This allows the engine coolant to flow through the engine cooling system and cool the engine. As the wax pellet cools, the contraction allows a spring to close the valve. The thermostat begins to open at 87°C (189°F) and is fully open at 102°C (216 °F). The thermostat closes at 86°C (187°F).

Electric Cooling Fan

Caution : Keep hands, tools, and clothing away from the engine cooling fans to help prevent personal injury. This fan is electric and can turn ON whether or not the engine is running.

Caution : If a fan blade is bent or damaged in any way, no attempt should be made to repair or reuse the damaged part. A bent or damaged fan assembly should always be replaced with a new one.

The cooling fans are mounted behind the radiator in the engine compartment. The electric cooling fans increase the flow of air across the radiator fins and across the condenser on air conditioned (A/C)-equipped vehicles. This helps to speed cooling when the vehicle is at idle or moving at low speeds.

The fan size is 366 mm (14.4 inches) (Non-A/C model is 300mm (11.8inches))in diameter with five blades to aid the airflow through the radiator and the condenser. An electric motor attached to the radiator support drives the fan.

A/C Off or Non-A/C Model

- The cooling fan(s) are actuated by the powertrain control module (PCM) in vehicles with an automatic transaxle or the engine control module (ECM) using a low-speed cooling fan relay and a high-speed cooling fan relay. On A/C-equipped vehicles, a series/parallel cooling fan relay is also used.
- The PCM or the ECM will turn the cooling fan(s) on at low speed when the coolant temperature reaches 93°C (199°F) and high speed at 97°C (207°F).
- The PCM or the ECM will change the cooling fan(s) from high speed to low speed at 94°C (201°F) and turn the cooling fans off at 90°C (194°F).

A/C ON

- The PCM or the ECM will turn the cooling fans on at low speed when the A/C system is on. The PCM or the ECM will change to high speed when the coolant temperature reaches 97°C (207°F) or high-side A/C pressure reaches 1 882 kPa (273 psi).
- The cooling fans will return to low speed when the coolant temperature reaches 94°C (201°F) or high-side A/C pressure reaches 1 448 kPa (210 psi).

Coolant Temperature Sensor

The coolant temperature sensor (CTS) uses a thermistor to control the signal voltage to the engine control module (ECM) and controls the instrument panel temperature indicator. The engine coolant temperature sensor is located on the cylinder head, under the DIS on a SOHC engine.

Engine Block Heater

The vehicle is designed to accept an engine block heater. The engine block heater helps to warm the engine for improved cold weather starting. It can also help reduce fuel consumption when a cold engine is warming up.

The engine block heater utilizes an existing expansion plug for installation and is located under the intake manifold.

Contact your Daewoo dealer for further information or installation.

SECTION 1E

ENGINE ELECTRICAL

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Starter Specifications

Description	Unit	1.2 SOHC 1.5 SOHC M/T	1.4 SOHC/DOHC 1.5 SOHC A/T
Type	-	Permanent Magnet Straight Drive	Permanent Magnet Gear Reduction
Output (Capacity)	kW	0.8	1.2
No Load test@ (11.5)volts drive pinion Speed	A RPM	53 Max 5000 Min	90 Max 2600 Min
Brushes length	mm (in.)	7.125 (0.281)	8.25 (0.325)

Generator Specifications

Description	Unit	1.2 SOHC 1.5 SOHC M/T	1.4 SOHC/DOHC 1.5 SOHC A/T
Type	-	SG7K	CS121D O/B
Regulator Voltage	V	14.6	14.6
Brushes length	mm (in.)	18.8 (0.740)	18.8 (0.740)
Output (Capacity)	A	75	85

Battery Specifications

Description	Unit	1.2 SOHC 1.5 SOHC M/T	1.4 SOHC/DOHC 1.5 SOHC A/T
Capacity	AH	45	55
Cold Cranks Amps	CCA	410	550
Reserve Capacity Minimum	min	80	90
Load Test	amps	200	270
Minimum Voltage:	-	-	-
9.6	V	70°F (21°C) and above	70°F (21°C) and above

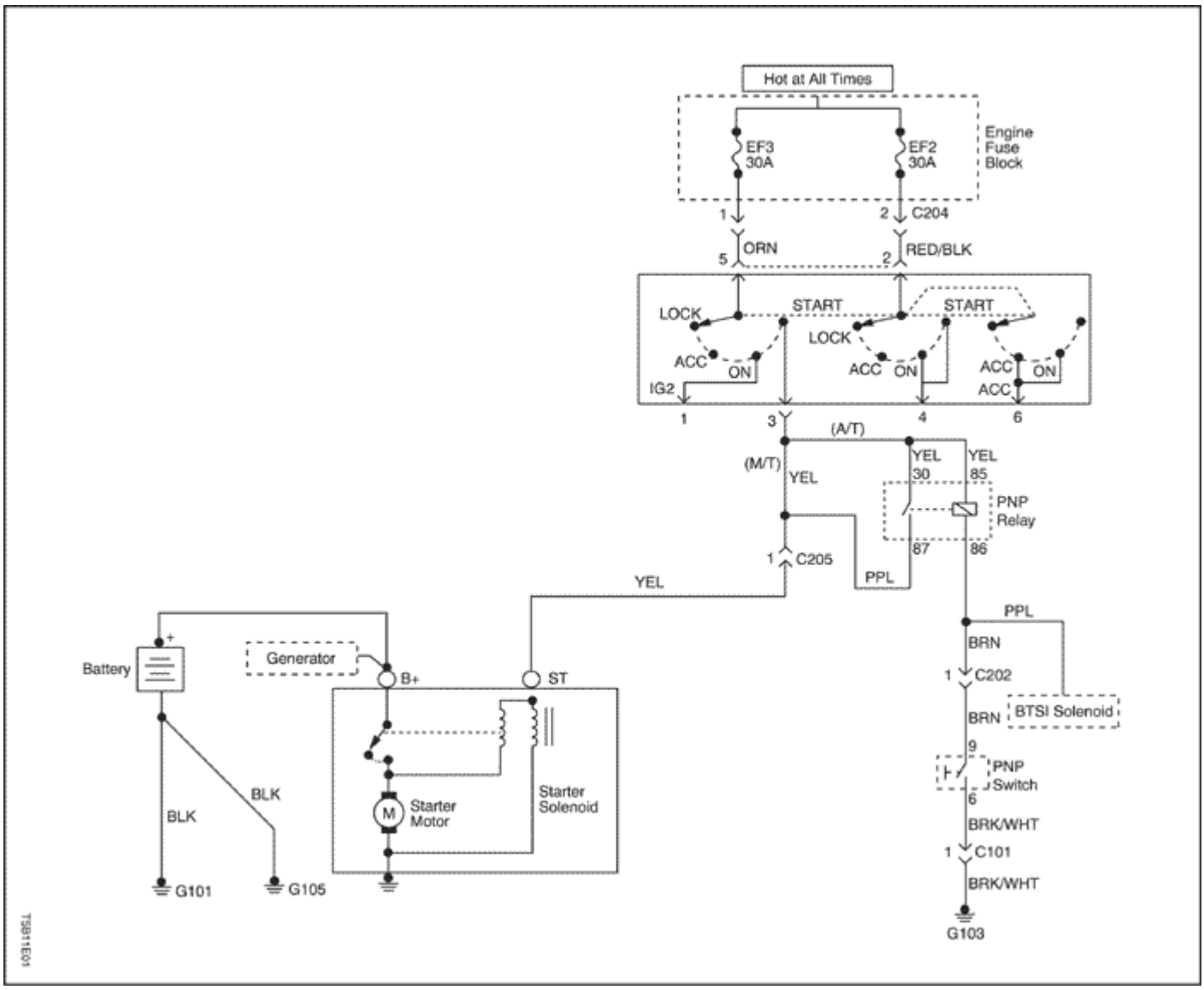
Description	Unit	1.2 SOHC 1.5 SOHC M/T	1.4 SOHC/DOHC 1.5 SOHC A/T
9.5	V	60°F (15.6°C)	60°F (15.6°C)
9.4	V	50°F (10°C)	50°F (10°C)
9.3	V	40°F (4.4°C)	40°F (4.4°C)
9.1	V	30°F (-1.1°C)	30°F (-1.1°C)
8.9	V	20°F (-6.7°C)	20°F (-6.7°C)
8.7	V	10°F (-12.2°C)	10°F (-12.2°C)
8.5	V	0°F (-17.8°C)	0°F (-17.8°C)

Fastener Tightening Specifications

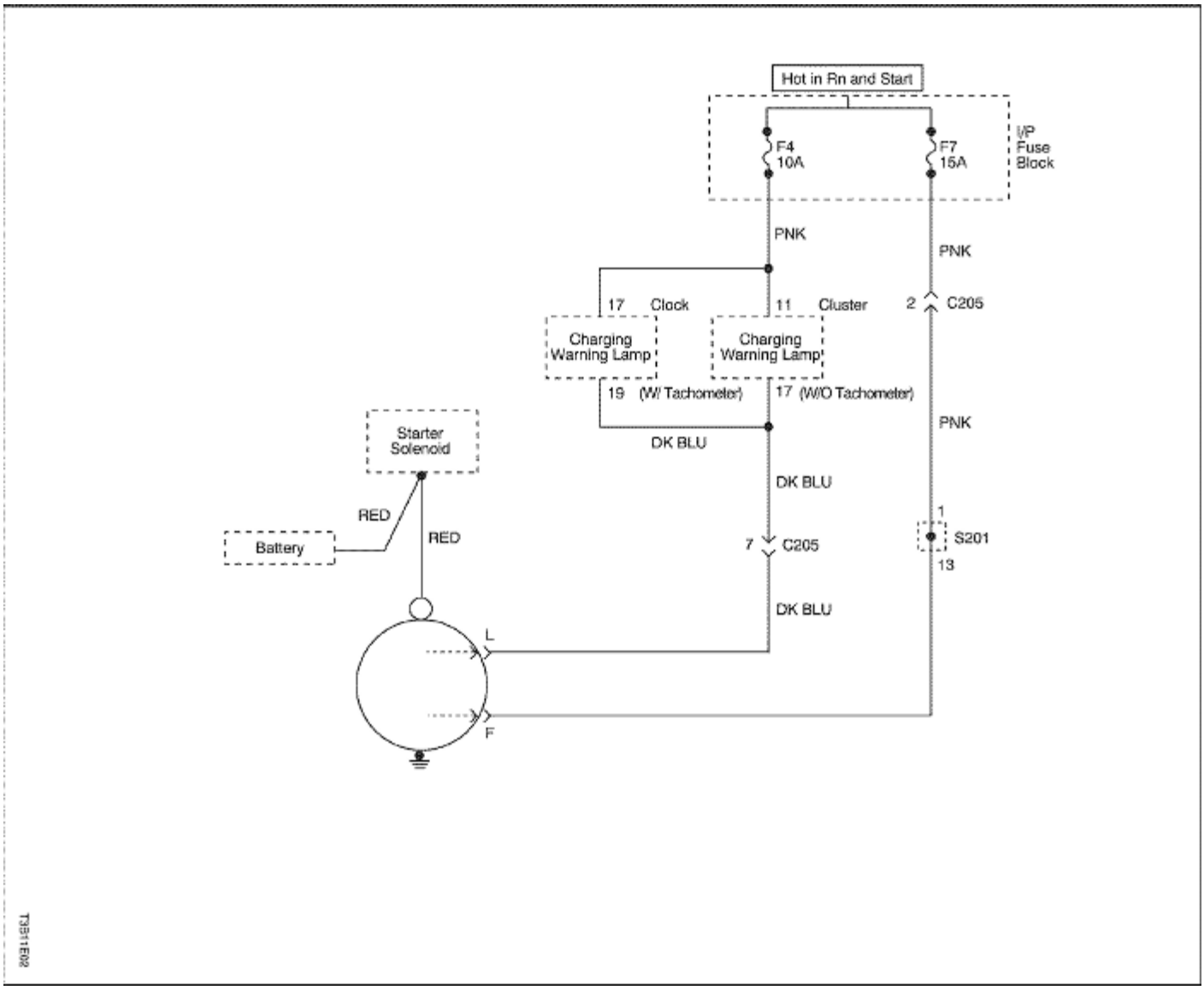
Application	N•m	Lb-Ft	Lb-In
Battery Cable Nuts	4.5	-	40
Battery Carrier Tray Lower Bolts	20	15	-
Battery Carrier Tray Upper Bolts	20	15	-
Battery Retainer Clamp-to-Battery Rod Nuts	4	-	35
Fuel Rail Retaining Bolts	20	15	-
Generator Battery Lead Nut	15	11	-
Generator Drive End Bearing Nut	81	60	-
Generator Lower Bracket-to-Generator Nuts	25	18	-
Generator Shackle Bracket Bolt	25	18	-
Generator Through-Bolts	10	-	89
Starter Field Coil Connector Nut	8	-	71
Starter Mounting Bolts	43	32	-
Starter Mounting Bolts (T4)	23	17	-
Starter Solenoid Assembly Screws	4.5	-	40
Starter Solenoid Nuts	7.5	-	66
Starter Through-Bolts	6.5	-	57

SCHEMATIC AND ROUTING DIAGRAMS

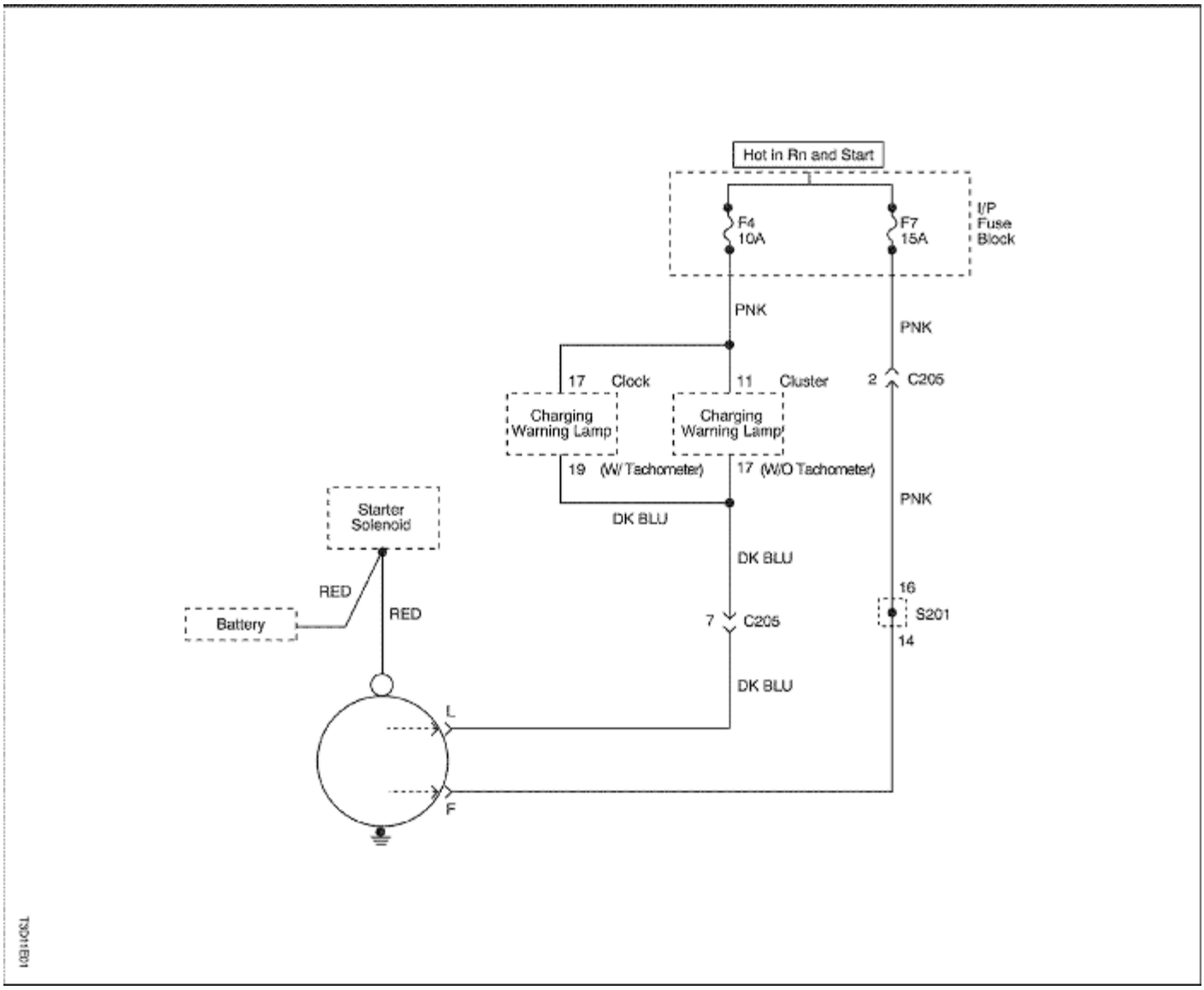
Startimg System



Charging System (1.4 SOHC/DOHC/1.5 SOHC)

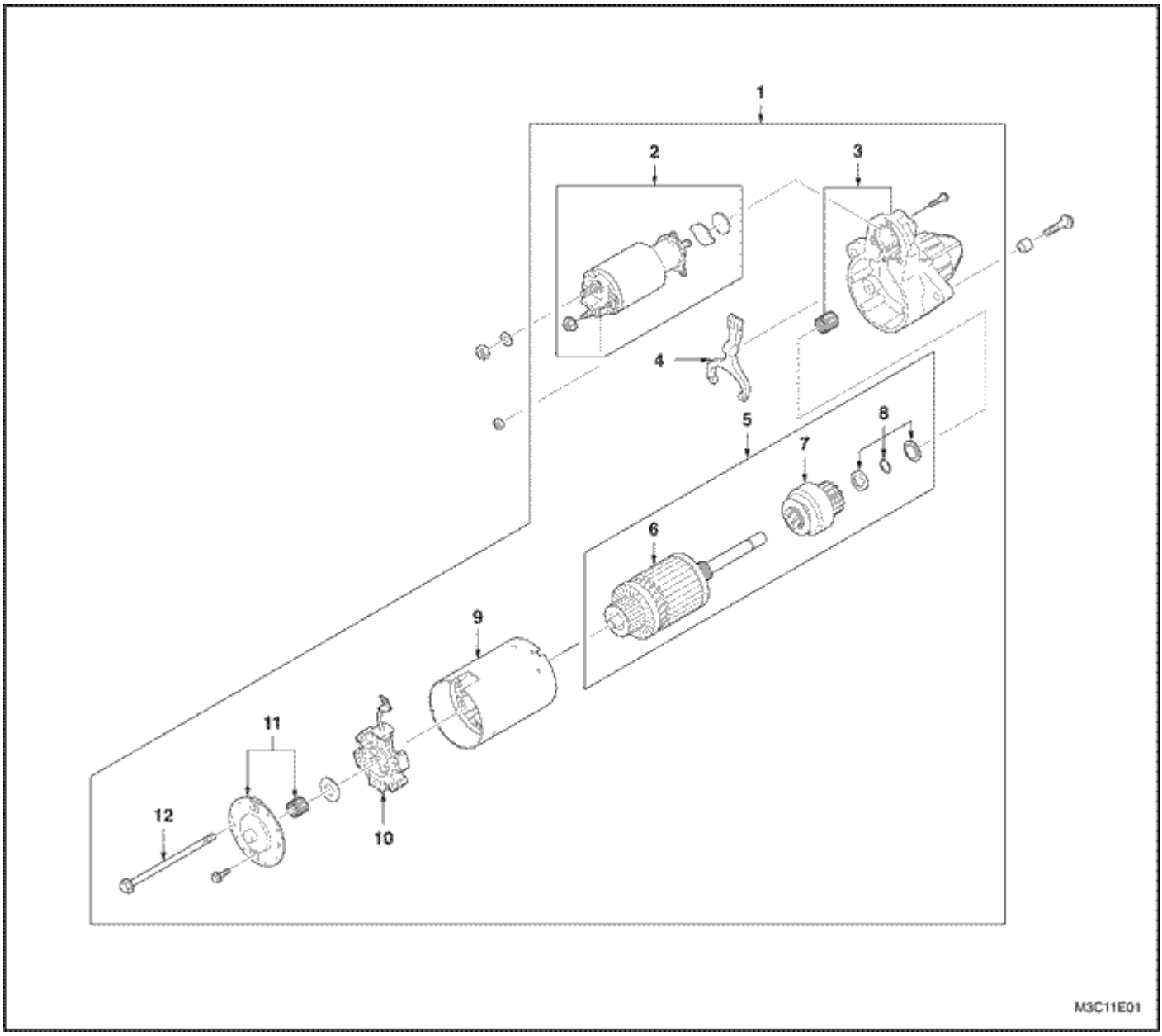


Charging System (1.2 SOHC)



COMPONENT LOCATOR

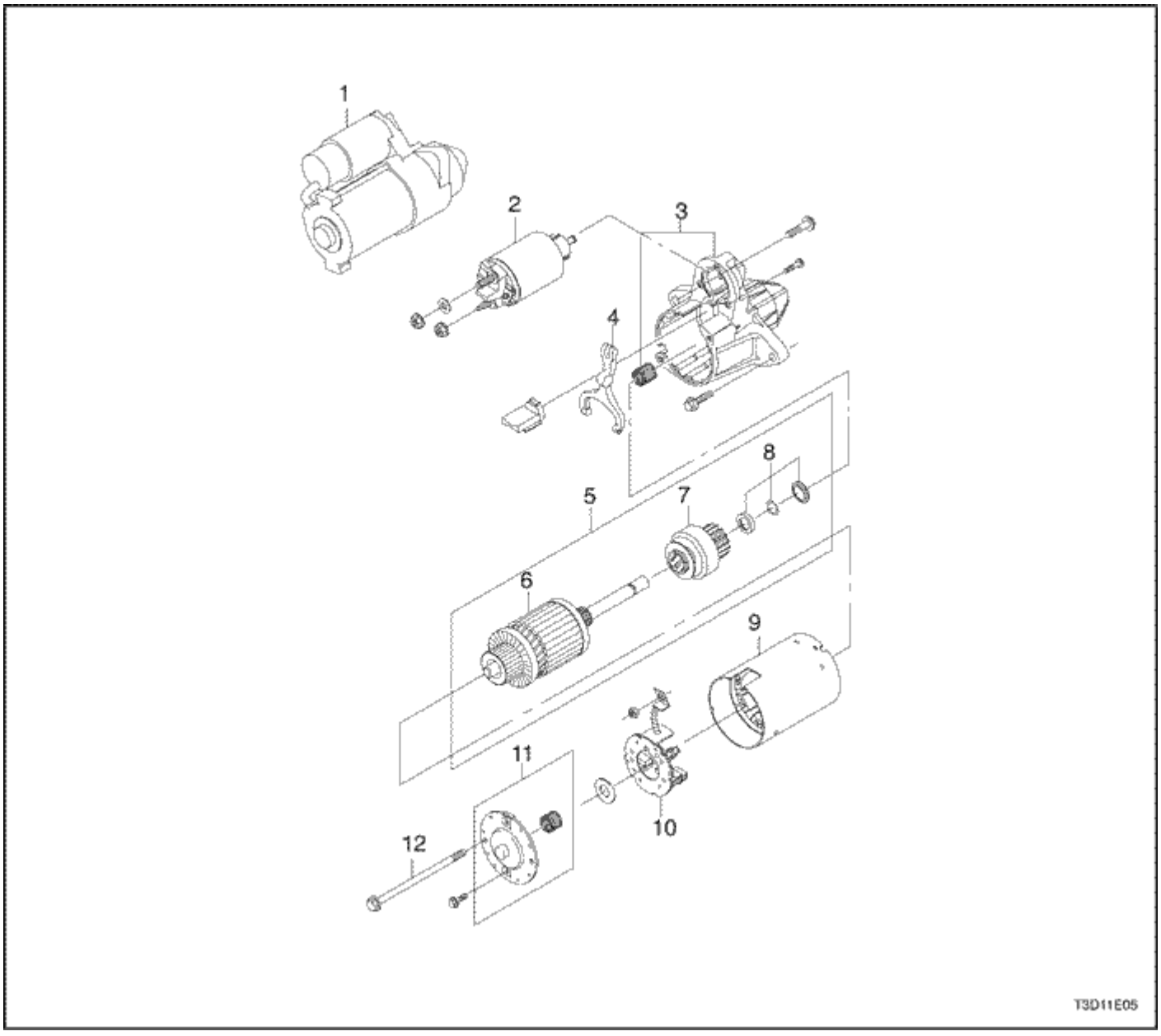
Staring System (1.2 SOHC)



1. Starter Motor Assembly
2. Starter Solenoid Assembly
3. Starter Housing
4. Shift Lever
5. Armature Set
6. Armature

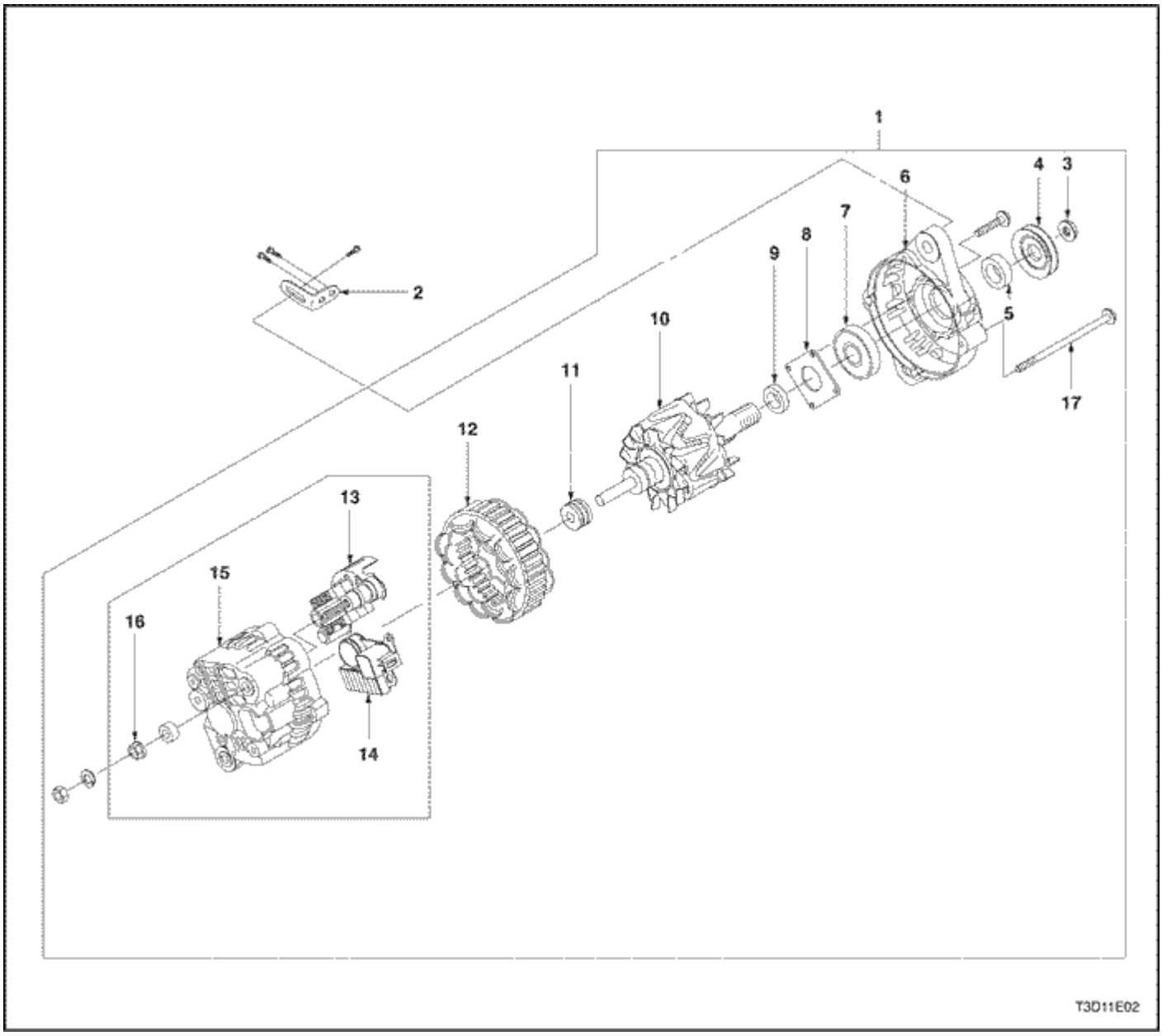
7. Pinion Gear Assembly
8. Ring Set
9. Field Frame Assembly
10. Brush Holder Assembly
11. Contact End Frame Assembly
12. Starter Through - Bolts

Staring System (1.4 SOHC/DOHC/1.5 SOHC)



1. Starter Motor Assembly
2. Starter Solenoid Assembly
3. Starter Housing
4. Shift Lever
5. Armature Set
6. Armature
7. Pinion Gear Assembly
8. Ring Set
9. Field Frame Assembly
10. Brush Holder Assembly
11. Contact End Frame Assembly
12. Starter Through - Bolts

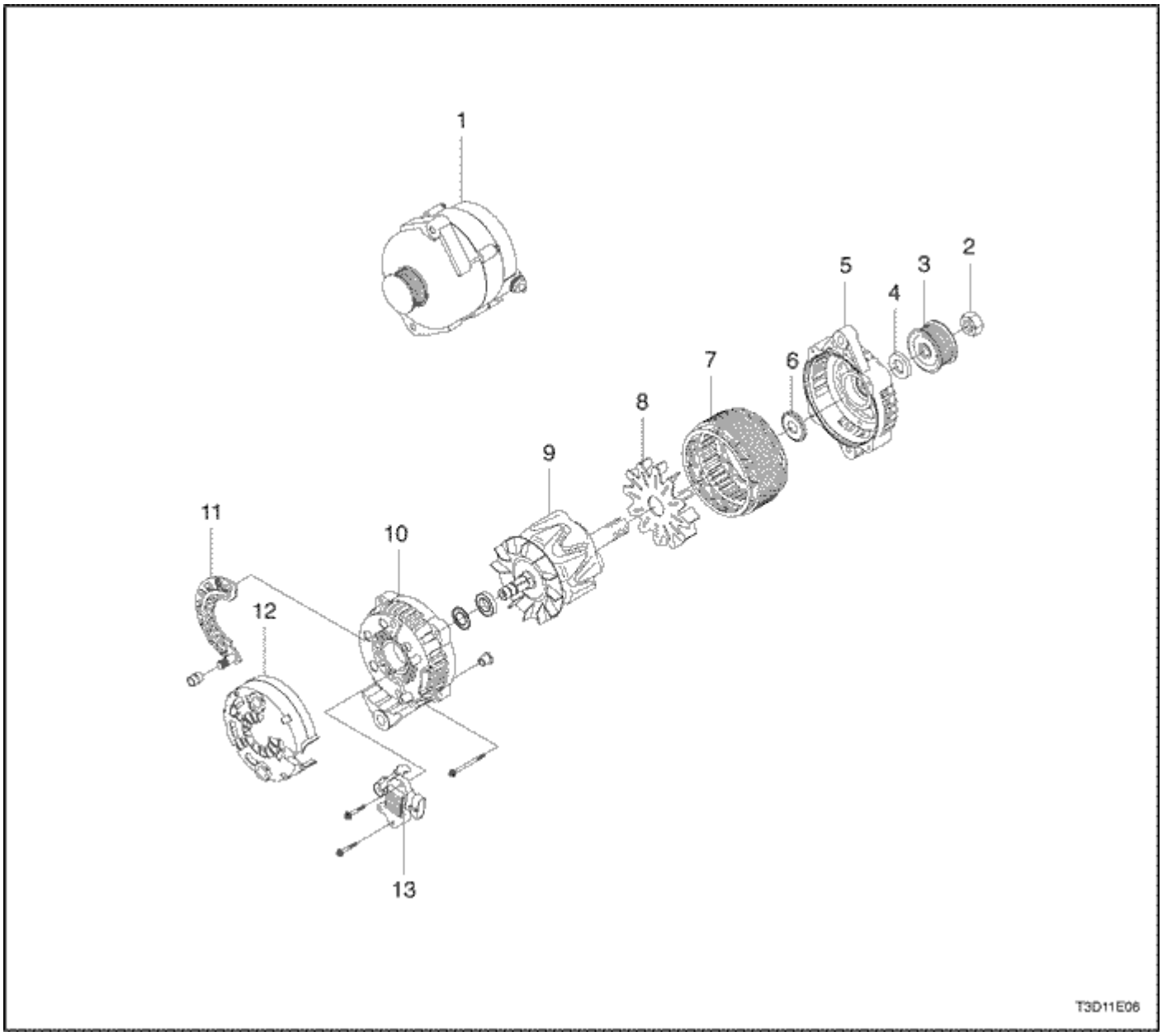
Charging System (Valeo : Mando)



1. Generator Assembly
2. Generator Shackle
3. Generator Drive End Nut
4. Generator Pully
5. Generator Collar (Large)
6. Generator Front Bracket

7. Front Bearing
8. Bearing Spot Plate
9. Generator Collar (Small)
10. Generator Rotor Assembly
11. Rear Bearing
12. Generator Stator Assembly
13. Rectifier Assembly
14. Voltage Regulator/Brush Holder Assembly
15. Generator Rear Bracket
16. Battery Positive Terminal Nut
17. Through Bolt

Charging System (1.4 SOHC/DOHC/1.5 SOHC)



1. Generator Assembly
2. Generator Drive End Nut
3. Generator Pully
4. Generator Collar
5. Generator Front Bracket
6. Front Bearing

7. Generator Stator Assembly
8. Fan
9. Generator Rotor Assembly
10. Generator Rear Bracket
11. Rectifier Assembly
12. Cover
13. Voltage Regulator/Brush Holder Assembly

DIAGNOSIS

No Crank

Step	Action	Value(s)	Yes	No
1	1. Press the clutch pedal completely down. 2. Turn the key to START. Does the vehicle start?	-	System OK	Go to *Step 2*
2	1. Disconnect the clutch pedal position switch wires. 2. Check for continuity between the switch terminals when the clutch pedal switch is pushed to the ON position. Does the ohmmeter indicate the value specified?	-	Go to *Step 4*	Go to Step 3
3	Replace the clutch pedal position switch. Does the vehicle start?	-	System OK	Go to *Step 4*
4	1. Turn the headlamps ON. 2. Turn the dome lamps ON. 3. Turn the key to START. Do the lights dim or go out?	-	Go to *Step 5*	Go to *Step 11*
5	Check the battery state of charge. Is the green eye showing from the built-in hydrometer?	-	Go to *Step 6*	Go to "Charging Procedure"
6	1. Connect the voltmeter positive lead to the positive battery terminal. 2. Connect the voltmeter negative lead to the negative battery terminal. 3. Turn the ignition to START. Does the voltmeter indicate the value specified?	< 9.6 v	Go to "Charging Procedure"	Go to *Step 7*
7	1. Connect the voltmeter negative lead to	> 0.5 v	Go to *Step 8*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
	the negative battery terminal. 2. Connect the voltmeter positive lead to the engine block. 3. Place the ignition in the START position. Is the repair complete?			
8	1. Clean and tighten the negative battery cable connections both at the battery end and at the ground end. 2. Replace the cable if needed. Is the repair complete?	-	System OK	-
9	1. Connect the voltmeter positive lead to the starter "B" terminal. 2. Connect the voltmeter negative lead to the negative battery terminal. 3. Check the cranking voltage. Does the voltmeter indicate the value specified?	< 9 v	Go to *Step 10*	Go to *Step 16*
10	Clean, tighten, or replace the positive battery cable. Is the repair complete?	-	System OK	-
11	Check system fuse EF3 in the engine fuse block. Is fuse EF3 blown?	-	Go to *Step 12*	Go to *Step 13*
12	Replace system fuse EF3. Is the repair complete?	-	System OK	-
13	Check the connection at the starter "S" terminal. Is the connection in good condition?	-	Go to *Step 15*	Go to *Step 14*
14	Repair the starter "S" terminal. Is the repair complete?	-	System OK	-
15	1. Connect the voltmeter positive lead to the starter "S" terminal. 2. Connect the voltmeter negative lead to the negative battery terminal. 3. Place the ignition in the START position. 4. Read the voltage present at the "S" terminal.	> 7 v	Go to *Step 16*	Go to *Step 17*

Step	Action	Value(s)	Yes	No
	Does the voltmeter indicate the specified value?			
16	Repair or replace the starter. Is the repair complete?	-	System OK	-
17	Turn on the heater blower. Does the blower operate?	-	Go to *Step 27*	Go to *Step 18*
18	1. Disconnect connector C204. 2. Connect the voltmeter positive lead to terminal 1 of connector C204. 3. Connect the voltmeter negative terminal to ground. Does the voltmeter indicate the specified value?	12 v	Go to *Step 20*	Go to *Step 19*
19	Repair the open in the RED/WHT wire from fuse EF3 to Connector C204. Is the repair complete?	-	System OK	-
20	Check the contacts of terminal 1 on connector C204. Are the contacts OK?	-	Go to *Step 22*	Go to *Step 21*
21	Repair the faulty contact of connector C204. Is the repair complete?	-	System OK	-
22	1. Reconnect connector C204. 2. Disconnect the ignition switch connector. 3. Connect the voltmeter positive lead to terminal 5 of the ignition switch connector. 4. Connect the voltmeter negative terminal to ground. Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 24*	Go to *Step 23*
23	Repair the open in the RED/WHT wire from terminal 1 of connector C204 to terminal 5 of the ignition switch connector. Is the repair complete?	-	System OK	-
24	Check the contacts of terminal 5 of the ignition switch connector. Are the contacts OK?	-	Go to *Step 26*	Go to *Step 25*
25	Repair the faulty contact of the ignition switch connector. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
26	Replace the ignition switch. Is the repair complete?	-	System OK	-
27	1. Disconnect connector C205. 2. Connect the voltmeter positive lead to terminal 1 of connector C205 on the I/P harness. 3. Connect the voltmeter negative lead to ground. 4. Turn the ignition switch to START. Does the voltmeter indicate the specified value?	12 v	Go to *Step 28*	Go to *Step 31*
28	Check terminal 1 on both sides of connector C205. Is one of them faulty?	-	Go to *Step 29*	Go to *Step 30*
29	Repair the faulty terminal. Is the repair complete?	-	System OK	-
30	Repair the open in the YEL wire from terminal 1 of connector C205 to the starter "ST" terminal. Is the repair complete?	-	System OK	-
31	1. Disconnect the ignition switch connector. 2. Connect the voltmeter positive lead to terminal ST of the ignition switch. 3. Connect the voltmeter negative lead to ground. 4. Turn the ignition switch to START. Does the voltmeter indicate the specified value?	12 v	Go to *Step 33*	Go to *Step 32*
32	Replace the ignition switch. Is the repair complete?	-	System OK	-
33	Check terminal ST on the ignition switch and terminal 3 of the ignition switch connector. Are the terminals in good condition?	-	Go to *Step 34*	Go to *Step 35*
34	Repair the open in RED wire between terminal 3 of the ignition switch connector and terminal 1 of connector C205. Is the repair complete?	-	System OK	-
35	Repair the faulty terminal. Is the repair complete?	-	System OK	-

Starter Motor Noise

To correct starter motor noise during starting, use the following procedure:

Checks	Action
Check for a high-pitched whine during cranking, before the engine fires. The engine cranks and fires properly.	The distance is too great between the starter pinion and the flywheel. Shimming the starter toward the flywheel is required.
Check for a high-pitched whine after the engine fires, as the key is being released. The engine cranks and fires properly. This intermittent complaint is often diagnosed as "starter hang-in" or "solenoid weak."	The distance is too small between the starter pinion and the flywheel. Shimming the starter away from the flywheel is required.
Check for a loud "whoop" after the engine fires but while the starter is still held engaged. The sound is like a siren if the engine is revved while the starter is engaged.	The most probable cause is a defective clutch. A new clutch will often correct this problem.
Check for a "rumble," a "growl," or, in severe cases, a "knock" as the starter is coasting down to a stop after starting the engine.	The most probable cause is a bent or unbalanced starter armature. A new armature will often correct this problem.

If the complaint is noise, correction can be achieved by proper shimming as follows:

1. Check for a bent or a worn flywheel.
2. Start the engine and carefully touch the outside diameter of the rotating flywheel ring gear with chalk or a crayon to show the high point of the tooth runout. Turn the engine OFF and rotate the flywheel so that the marked teeth are in the area of the starter pinion gear.
3. Disconnect the negative battery cable to prevent cranking the engine.
4. Check the pinion-to-flywheel clearance by using a wire gauge of 0.5 mm (0.02 inch) minimum thickness (or diameter). Center a pinion tooth between two flywheel teeth and the gauge. Do not gauge in the corners, where a misleading larger dimension may be observed. If the clearance is under this minimum, shimming the starter away from the flywheel is required.
5. If the clearance approaches 1.5 mm (0.06 inch) or more, shimming the starter toward the flywheel is required. This condition is generally the cause of broken flywheel teeth or the starter housing. Shim the starter toward the flywheel by shimming only the outboard starter mounting pad. A shim of 0.40 mm (0.016 inch) thickness at this location will decrease the clearance by approximately 0.30 mm (0.012 inch). If normal starter shims are not available, plain washers or other suitable material may be used as shims.

Battery Load Test

1. Check the battery for obvious damage, such as a cracked or broken case or cover, which could permit the loss of electrolyte. If obvious damage is noted, replace the battery.
2. Check the battery for obvious damage, such as a cracked or broken case or cover, which could permit the loss of electrolyte. If obvious damage is noted, replace the battery.

Caution : Do not charge the battery if the hydrometer is clear or light yellow. Instead, replace the battery. If the battery feels hot, or if violent gassing or spewing of electrolyte through the vent hole occurs, discontinue charging or reduce the charging rate to avoid personal injury.

2. Check the hydrometer. If the green dot is visible, go to the load test procedure. If the indicator is dark but green is not visible, charge the battery. For charging a battery removed from the vehicle, refer to "Charging a Completely Discharged Battery" in this section.
3. Check the hydrometer. If the green dot is visible, go to the load test procedure. If the indicator is dark but green is not visible, charge the battery. For charging a battery removed from the vehicle, refer to "Charging a Completely Discharged Battery" in this section.
4. Connect a voltmeter and a battery load tester across the battery terminals.
5. Apply a 300-ampere load for 15 seconds to remove any surface charge from the battery.
6. Remove the load.
7. Wait 15 seconds to let the battery recover, and apply a 270-ampere load.

Important : The battery temperature must be estimated by touch and by the temperature condition the battery has been exposed for the preceding few hours.

7. If the voltage does not drop below the minimum listed, the battery is good and should be reinstalled. If the voltage is less than the minimum listed, replace the battery. Refer to "Battery Specifications" in this section.
8. If the voltage does not drop below the minimum listed, the battery is good and should be reinstalled. If the voltage is less than the minimum listed, replace the battery. Refer to "Battery Specifications" in this section.

Genrator Output Test

1. Perform the generator system test. Refer to "Generator System Check"in this section.
2. Perform the generator system test. Refer to "Generator System Check"in this section.
3. Replace the generator if it fails that test. Refer to "Generator" in the On-Vehicle Service portion of this section. If it passes the test, perform the on-vehicle output check which follows.

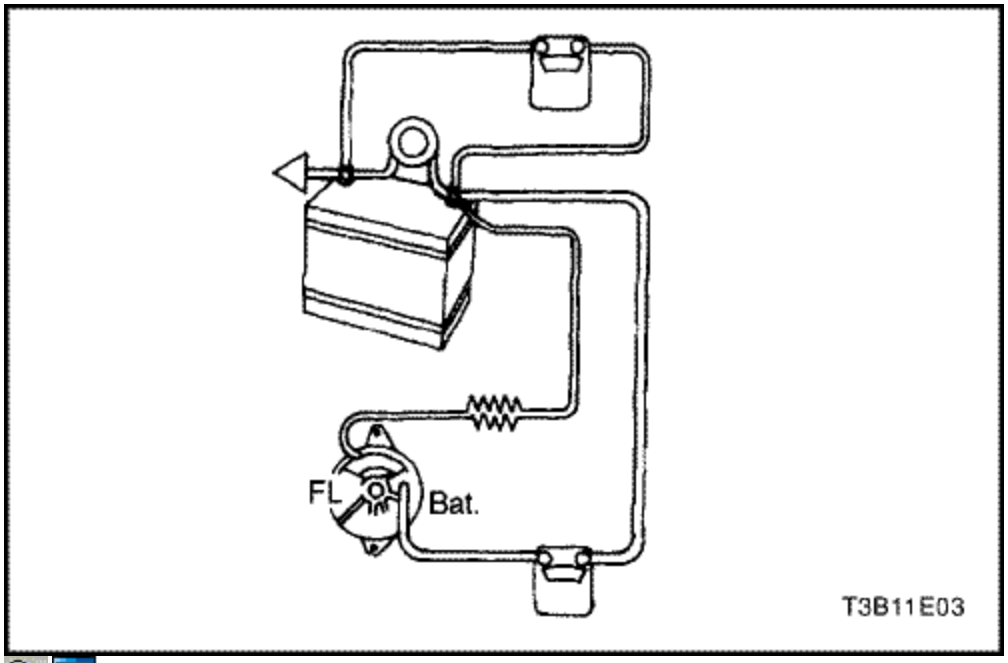
Important : Always check the generator for output before assuming that a grounded "L" terminal circuit has damaged the regulator.

3. Attach a digital multimeter, an ammeter, and a carbon pile load to the vehicle.
4. Attach a digital multimeter, an ammeter, and a carbon pile load to the vehicle.

Important : Be sure the vehicle battery is fully charged, and the carbon pile load is turned off.

4. With the ignition switch in the OFF position, check and record the battery voltage.
5. With the ignition switch in the OFF position, check and record the battery voltage.
6. Remove the harness connector from the generator.
7. Turn the ignition to RUN with the engine not running. Use a digital multimeter to check for voltage in the harness connector "L" terminal.
8. The reading should be near the specified battery voltage of 12 volts. If the voltage is too low, check the indicator “L” terminal circuits for open and grounded circuits causing voltage loss. Correct any open wires, terminal connections, etc., as necessary. Refer to "Charging System" in this section.
9. Attach the generator harness connector.
10. Run the engine at a moderate idle, and measure the voltage across the battery terminals. The reading should be above that recorded in step 14, but less than 16 volts. If the reading is over 16 volts or below the previous reading, replace the generator. Refer to "Generator" in the On-Vehicle Service section.
11. Run the engine at a moderate idle, and measure the generator amperage output.

12. Turn on the carbon pile, and adjust it to obtain the maximum amps while maintaining the battery voltage above 13 volts.
13. If the reading is within 15 amps of the generator's rating noted on the generator, the generator is good. If not, replace the generator. Refer to "Generator" in the On-Vehicle Service section.
14. With the generator operating at the maximum output, measure the voltage between the generator housing and the battery negative terminal. The voltage drop should be 0.5 volt or less. If the voltage drop is more than 0.5 volt, check the ground path from the generator housing to the negative battery cable.
15. Check, clean, tighten, and recheck all of the ground connections.



Generator System Check

When operating normally, the generator indicator lamp will come on when the ignition is in RUN position and go out when the engine starts. If the lamp operates abnormally or if an undercharged or overcharged battery condition occurs, the following procedure may be used to diagnose the charging system. Remember that an undercharged battery is often caused by accessories being left on overnight or by a defective switch that allows a lamp, such as a trunk or a glove box lamp, to stay on.

Diagnose the generator with the following procedure:

1. Visually check the belt and the wiring.

2. With the ignition in the ON position and the engine stopped, the charge indicator lamp should be on. If not, detach the harness at the generator and ground the "L" terminal in the harness with a 5-ampere jumper lead.
    - If the lamp lights, replace the generator. Refer to "Generator" in the On-Vehicle Service section.
    - If the lamp does not light, locate the open circuit between the ignition switch and the harness connector. The indicator lamp bulb may be burned out.

2. With the ignition switch in the ON position and the engine running at moderate speed, the charge indicator lamp should be off. If not, detach the wiring harness at the generator.
3. With the ignition switch in the ON position and the engine running at moderate speed, the charge indicator lamp should be off. If not, detach the wiring harness at the generator.
    - If the lamp goes off, replace the generator. Refer to "Generator" in the On-Vehicle Service section.
    - If the lamp stays on, check for a short to ground in the harness between the connector and the indicator lamp.

Important : Always check the generator for output before assuming that a grounded "L" terminal circuit has damaged the regulator. Refer to"Generator" in the Unit Repair section.

SECTION 1F

ENGINE CONTROLS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit o r w hen a tool or equipment could easily

come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Engine Data Display Tables

Engine Data Display

Parameter	Scaling	Value
Desired Idle Speed	RPM	ECM idle command (varies with temperature)
Engine RPM	RPM	± 50 RPM from desired RPM in drive (A/T) ± 50 RPM from desired RPM in neutral (M/T)
MAP	kPa	29 - 55 (varies with manifold and barometric pressure)
Throttle Position Volt	V	0 v
Start-up IAT	°C	varies
Intake Air Temperature	°C	10 - 90 °C
Coolant Temperature (Start-up)	°C	varies
Engine Coolant Temperature	°C	85 - 105 °C
IAC Motor Position	-	1 - 50
O2 Sensor (B1-S1)	mV	1-1000 mV (varies continuously)
O2 Sensor (B1-S2)	mV	1-1000 mV (varies continuously)
Fuel System Status	Closed Loop/Open Loop	"Closed Loop" (may enter "Open Loop" at extended idle)
Rich/Lean (B1-S1)	Rich/Lean	varies
Lean to Rich Average	mS	10 -211 ms or 0 ms
Rich to Lean Average	mS	10 -211 ms or 0 ms
Engine Load Value	%	0 - 100 % (varies)
Short Term Fuel Trim	%	-30 - 30%
Long Term Fuel Trim	%	-30 - 30%
Linear EGR Feedback	V	varies
EGR Duty Cycle	%	0 %
EGR EWMA Result	-	< = 0
Spark Advance	°	varies
MIL Odometer	Km	0 Km
MIL On Time	Min	0 Min
Base Injection PWM	mS	1.0 - 5.0 ms
Barometric Pressure	kPa	varies with altitude
Ignition Voltage	V	13.5 - 14.8 V

Parameter	Scaling	Value
Air/Fuel Ratio	Ratio	14.6 (Closed Loop Enable)
Calculated Air Flow	G/S	varies
Total Misfire (Current)	-	0
Misfire History Cyl. 1	-	0
Misfire History Cyl. 2	-	0
Misfire History Cyl. 3	-	0
Misfire History Cyl. 4	-	0
Vehicle Speed	Km/H	0 Km/H
A/C Pressure	V	varies
A/C Request	Yes/No	No
A/C Clutch	On/Off	Off
Fuel Pump Command	On/Off	On
Closed Loop	Yes/No	Yes
Throttle At Idle	Yes/No	No
O2 Ready (B1-S1)	Yes/No	Yes
Knock Present	Yes/No	No
Fan Low	On/Off	On/Off
Fan High	On/Off	On/Off
TCC Engaged (Only AT)	Yes/No	Yes
Park/Neutral (Only AT)	P/N and R/N/D	P/N
Fuel Level Input	V	varies
Fuel Level Output	%	varies
Fuel Trim Cell	-	18
G-Sensor	V	1.1 - 3.7 V (Non-ABS Only)
Engine Runtime	HH:MM:SS	Hours:Minutes:Seconds

* Condition: Warmed up, idle, park or neutral, A/C off

Engine Data Display Table Definitions

ECM Data Description

The following information will assist in diagnosing emission or driveability problems. A first technician can view the displays while the vehicle is being driven by second technician. Refer to Powertrain On-Board Diagnostic (EOBD) System Check for addition information.

A/C Clutch

The A/C Relay represents the commanded state of the A/C clutch control relay. The A/C clutch should be engaged when the scan tool displays ON.

A/C Pressure

The A/C High Side displays the pressure value of the A/C refrigerant pressure sensor. The A/C High Side helps to diagnose the diagnostic trouble code (DTC) P0533.

A/C Request

The A/C Request represents whether the air conditioning is being requested from the HVAC selector. The input is received by the instrument panel cluster and then sent serial data to the ECM and finally to the scan tool over KWP 2000 serial data.

Air Fuel Ratio

The Air Fuel Ration indicates the air to fuel ratio based on the Front Heated Oxygen Sensor (HO2S1) inputs. The ECM uses the fuel trims to adjust fueling in order to attempt to maintain an air fuel ratio of 14.7:1.

BARO

The Barometric Pressure (BARO) sensor measures the change in the intake manifold pressure which results from altitude changes. This value is updated at ignition ON and also at Wide Open Throttle (WOT).

Base Injection PWM

Indicates the base Pulse Width Modulation (PWM) or ON time of the indicated cylinder injector in milliseconds. When the engine load is increased, the injector pulse width will increase.

Calculated Air Flow

The calculated air flow is a calculation based on manifold absolute pressure. The calculation is used in several diagnostics to determine when to run the diagnostics.

Desired Idle Speed

The ECM commands the idle speed. The ECM compensates for various engine loads in order to maintain the desired idle speed. The actual engine speed should remain close to the desired idle under the various engine loads with the engine idling.

Engine Coolant Temperature

The Engine Coolant Temperature (ECT) sensor sends engine temperature information to the ECM. The ECM supplies 5 volts to the engine coolant temperature sensor circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold (internal resistance high), the ECM monitors a high voltage which it interprets as a cold engine. As the sensor warms (internal resistance decreases), the voltage signal will decrease and the ECM will interpret the lower voltage as a warm engine.

EGR Desired Position

The desired exhaust gas recirculation (EGR) position is the commanded EGR position. The ECM calculates the desired EGR position. The higher the percentage, the longer the ECM is commanding the EGR valve ON.

Engine Load

Indicates engine load based on manifold absolute pressure. The higher the percentage, the more load the engine is under.

Engine Run Time

The engine run time is a measure of how long the engine has been running. When the engine stops running, the timer resets to zero.

Engine Speed

Engine Speed is computed by the ECM from the fuel control reference input. It should remain close to desired idle under the various engine loads with the engine idling.

Fan

The Fan Control (FC) Relay is commanded by the ECM. The FC Relay displays the command as ON or OFF.

Fuel Level Sensor

The Fuel Level Sensor monitors the fuel level in the tank. The Fuel Level Sensor monitors the rate of change of the air pressure in the EVAP system. Several of the Enhanced EVAP System diagnostics are dependent upon the correct fuel level.

Fuel System Status

The Closed Loop is displayed indicating that the ECM is controlling the fuel delivery according to the Front Heated Oxygen Sensor (HO2S1) voltage as close to an air/fuel ratio of 14.7 to 1 as possible.

IAC Position

The scan tool displays the ECM command for the Idle Air Control (IAC) pintle position in counts. The higher the number of counts, the greater the commanded idle speed reads. The Idle Air Control responds to changes in the engine load in order to maintain the desired idle rpm.

Ignition 1 (Voltage)

The ignition volts represent the system voltage measured by the ECM at the ignition feed circuit.

Intake Air Temperature

The ECM converts the resistance of the Intake Air Temperature (IAT) sensor to degrees in the same manner as the engine coolant temperature (ECT) sensor. In take air temperature is used by the ECM to adjust fuel delivery and spark timing according to incoming air density.

Knock Present

The KS Noise Channel indicates when the ECM detects the KS signal. The ECM should display NO at idle.

Long Term FT
The Long Term Fuel Trim (FT) is derived from the short term fuel trim value. The Long Term FT is used for the long term correction of the fuel delivery. A value of 128 counts (0%) indicates that the fuel delivery requires no compensation in order to maintain a 14.7:1 air to fuel ratio. A value below 128 counts means that the fuel system is too rich and the fuel delivery is being reduced. The ECM is decreasing the injector pulse width. A value above 128 counts indicates that a lean condition exists for which the ECM is compensating.

MAP
The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure which results from engine load and speed changes. As the intake manifold pressure increases, the air density in the intake also increases and the additional fuel is required.

Misfire History #1-4
Indicates the number of misfires that have occurred after 195 current misfires have been counted. The current misfire counter will add its misfires to the history misfire counter after 195 total misfires have taken place. If 1 cylinder is misfiring, the misfiring current counter will have 195 misfires counted before adding to its history counter. If 2 cylinders are misfiring, the misfiring current counter will add to their history counters after 97 misfires. The counter increments only after a misfire diagnostic trouble code (DTC) has been set.

Front Heated Oxygen Sensor
The pre-converter Front Heated Oxygen Sensor (HO2S1) reading represents the exhaust oxygen sensor output voltage. This voltage will fluctuate constantly between 100 mv (lean exhaust) and 900 mv (rich exhaust) when the system is operating in a Closed Loop.

Rear Heated Oxygen Sensor
The post-converter Rear Heated Oxygen Sensor (HO2S2) represents the exhaust oxygen output voltage past the catalytic converter. This voltage remains inactive, or the voltage will appear lazy within a range of 100 mv (lean exhaust) and 900 mv (rich exhaust) when operating in a Closed Loop.

Short Term FT
The Short Term FT represents a short term correction to fuel delivery by the ECM in response to the amount of time the oxygen sensor voltage spends above or below the 450 mv threshold. If the oxygen sensor has mainly been below 450 mv, indicating a lean air/fuel mixture, short term fuel trim will increase to tell the ECM to add fuel. If the oxygen sensor voltage stays mainly above the threshold, the ECM will reduce fuel delivery to compensate for the indicated rich condition.

Spark Advance

This is a display of the spark advance Ignition Coil (IC) calculation which the ECM is programming in the ignition system. It computes the desired spark advance using data such as engine temperature, rpm, engine load, vehicle speed and operating mode.

TCC Engaged

When the brake pedal is applied, the Torque Converter Clutch (TCC) brake switch sends a signal to the ECM to disengage the TCC and disable the cruise control.

Total Misfire Current Counter

Indicates the total number of misfires that have been detected in all the cylinders after 100 engine cycles. One cycle equals one complete 4 stroke cycle. The total misfire only increments during the steady state cruise conditions.

TP Sensor

The ECM uses the TP Sensor in order to determine the amount of the throttle demanded by the vehicle's operator. The TP Sensor reads between 0.36-0.96 volts at idle to above 4 volts at WOT.

Vehicle Speed

The vehicle speed sensor signal is converted into mph or km/h for display. The vehicle speed output from the ECM is 4000 pulses per mile. The scan tool uses the KWP 2000 serial data from the ECM to obtain vehicle speed, while the Instrument Panel Cluster (IPC), cruise control module and the chime alarm module use the 4000 ppm output.

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Accessory Mounting Bracket Bolts	37	27	-
Camshaft Position Sensor Bolts	12	-	106
Crankshaft Position Sensor Retaining Bolt	6.5	-	58
Electronic Ignition System Ignition Coil Retaining Bolts	10	-	89
Electric Exhaust Gas Recirculation Valve Retaining Bolts (1.2 SOHC)	30	22	-
Engine Control Module Bolts	4	-	35
Engine Coolant Temperature Sensor Bolt (1.2 SOHC)	10	-	89
Engine Coolant Temperature Sensor Bolt (1.4 SOHC/DOHC)	20	15	-
Evaporative Emission Canister Flange Bolt	20	16	-
Evaporative Emission Canister Protective Cover	8	-	71
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5	-	44

Application	N•m	Lb-Ft	Lb-In
Evaporative Emission Vent Solenoid Bolt	8.5	-	75
Exhaust Gas Recirculation Valve Retaining Bolts (1.4 SOHC/DOHC)	30	22	-
Fuel Filter Mounting Bracket Assembly Bolt	4	-	35
Fuel Pressure Regulator Retaining Screw	12	-	106
Fuel Pump Retaining Bolts (1.2 SOHC)	4	-	35
Fuel Tank Retaining Bolts	20	15	-
Fuel Rail Retaining Bolts	25	18	-
Idle Air Control Valve Retaining Bolts	3	-	27
Intake Air Temperature Sensor	25	18	-
Knock Sensor Bolt	20	15	-
Manifold Absolute Pressure Sensor Mounting Bracket Bolt	4	-	35
Manifold Absolute Pressure Sensor Retaining Bolts and Nuts	10	-	89
Oxygen Sensor Bolt	42	31	-
Rear A/C Compressor Mounting Bracket Bolts	35	26	-
Spark Plug Cover Bolts	3	-	27
Throttle Body Retaining Nuts	15	11	-
Throttle Position Sensor Retaining Bolts	2	-	18
Variable Geometry Induction System Solenoid (1.4 DOHC)	10	-	89

Fuel System Specifications

Gasoline

All engines are designed to use unleaded fuel only. Unleaded fuel must be used for proper emission control system operation. Its use will also minimize spark plug fouling and extend engine oil life. Using leaded fuel can damage the emission warranty coverage. The fuel should meet specification ASTM D4814 for the U.S. or CGSB 3.5 M93 for Canada. All engines are designed to use unleaded fuel with a minimum U(R+M)/2e (pump) octane number of 87, where R=research octane number, and M=motor octane number.

Ethanol

You may use fuel containing ethanol (ethyl alcohol) or grain alcohol providing that there is no more than 10 percent ethyl alcohol by volume.

Methanol

Do not use fuels containing methanol. Methanol can corrode metal parts and cause damage to plastic and rubber parts in the fuel system.

Methyl Tertiary-Butyl Ether (MTBE)

You may use fuel containing Methyl Tertiary-Butyl Ether (MTBE) providing there is no more than 15 percent MTBE by volume.

Temperature Vs Resistance

°C	°F	ECT Sensor	IAT Sensor
		OHMS	
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300

SECTION 1G

ENGINE EXHAUST

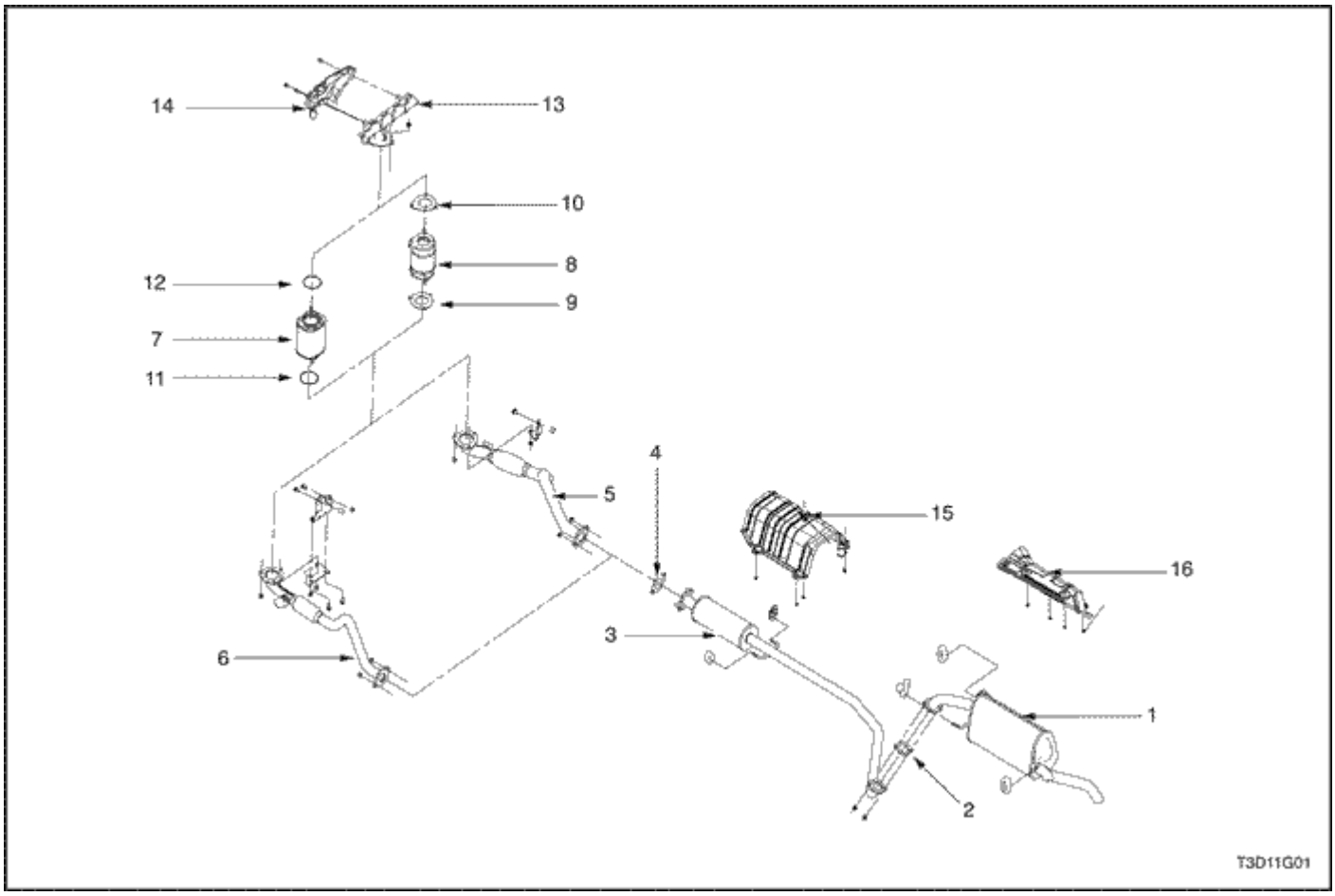
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Catalytic Converter-to-Exhaust Manifold Nuts	50	37	-
Exhaust Front Pipe-to-Catalytic Converter Nuts	40	30	-
Exhaust Manifold Cover Bolts	15	11	-
Front Muffler-to-Exhaust Front Pipe Nuts	30	22	-
Front Muffler-to-Rear Muffler Nuts	30	22	-
Heated Oxygen Sensor	41	30	-

COMPONENT LOCATOR

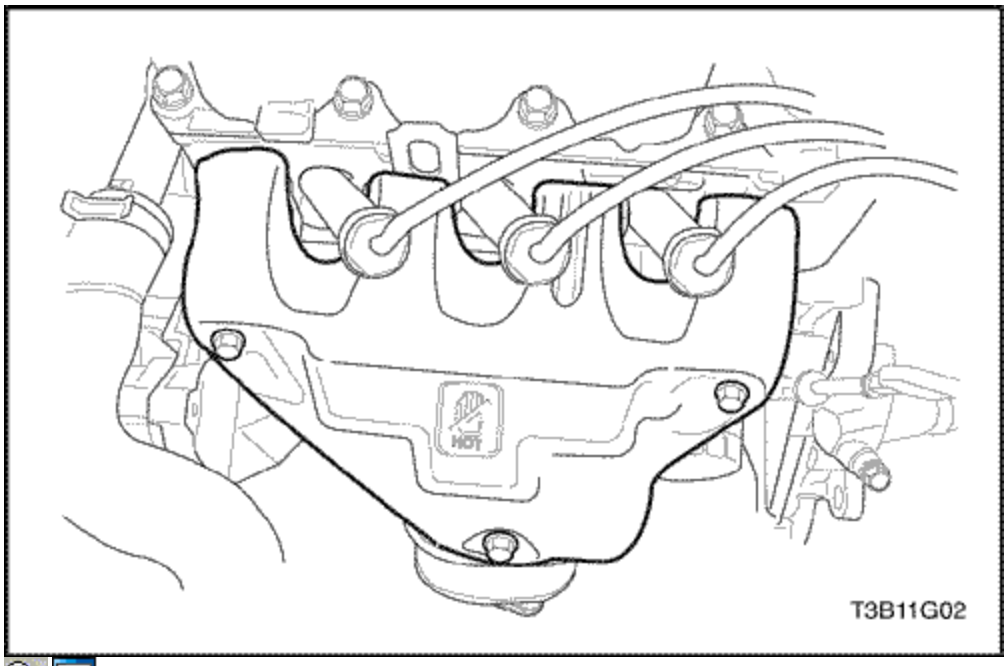
Exhaust System



1. Exhaust Rear Muffler
2. Muffler Gasket
3. Exhaust Front Muffler
4. Muffler Gasket
5. Exhaust Front Pipe (1.4S/1.4D)
6. Exhaust Front Pipe (1.2S)
7. Pop Converter
8. Exhaust Front Resonator
9. Exhaust Pipe Front Gasket
10. Exhaust Front Pipe Gasket
11. Pop Converter Gasket
12. Pop Converter Gasket
13. Exhaust Manifold
14. Exhaust Manifold Shield
15. Underbody Protective Shield

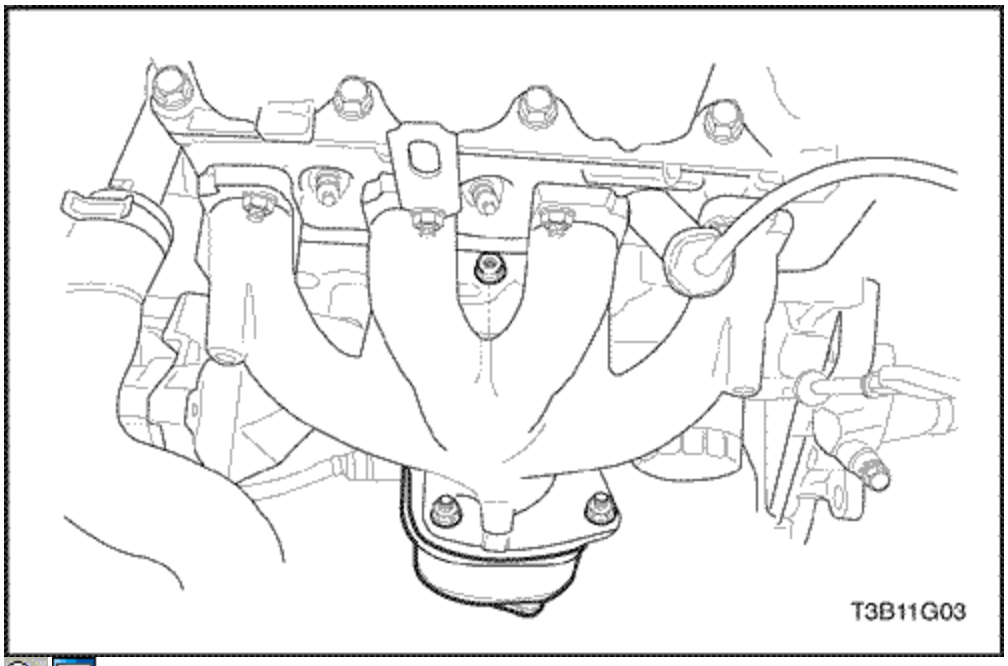
16. Underbody Protective Shield

MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE

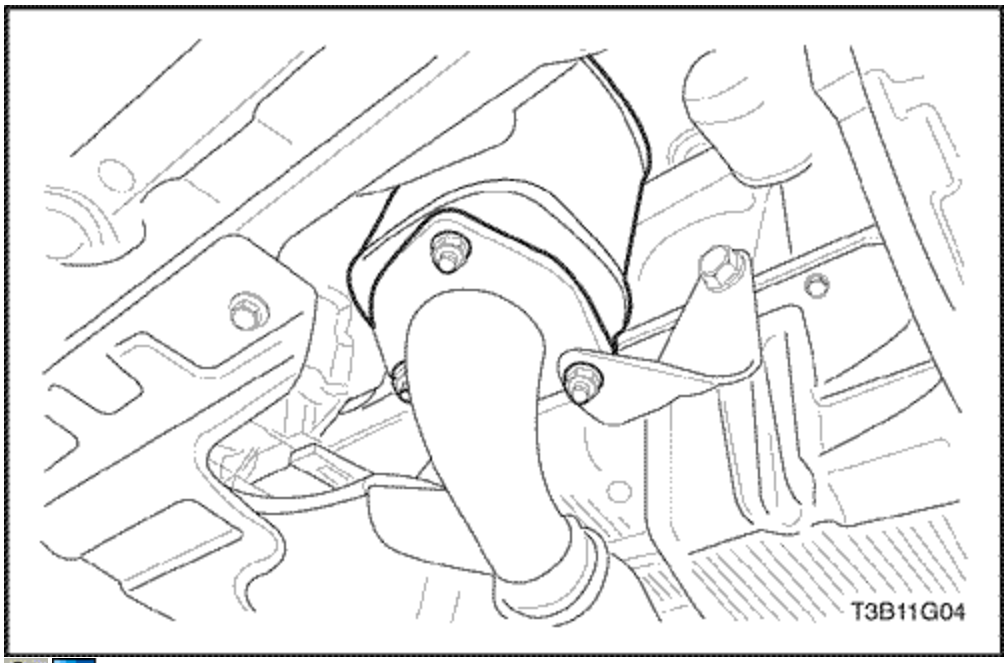


Catalytic Converter
Removal Procedure

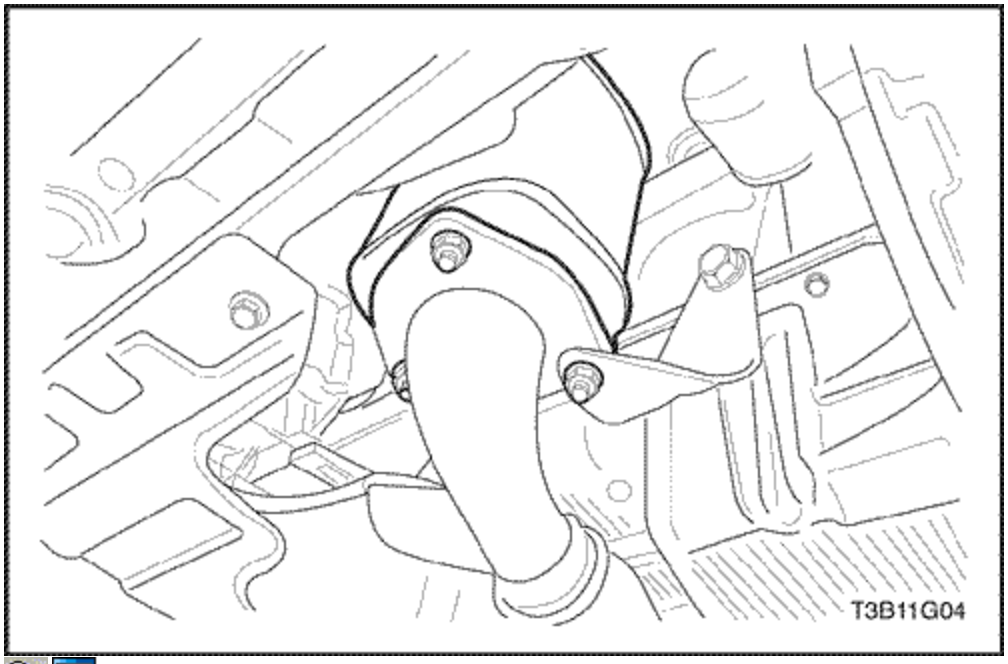
1. Remove the exhaust manifold cover with the bolts.



2. Remove the catalytic converter upper flange nuts.



3. Remove the exhaust front pipe mounting bracket bolt.
4. Remove the catalytic converter lower flange nuts.
5. Remove the catalytic converter and the gasket.



Installation Procedure

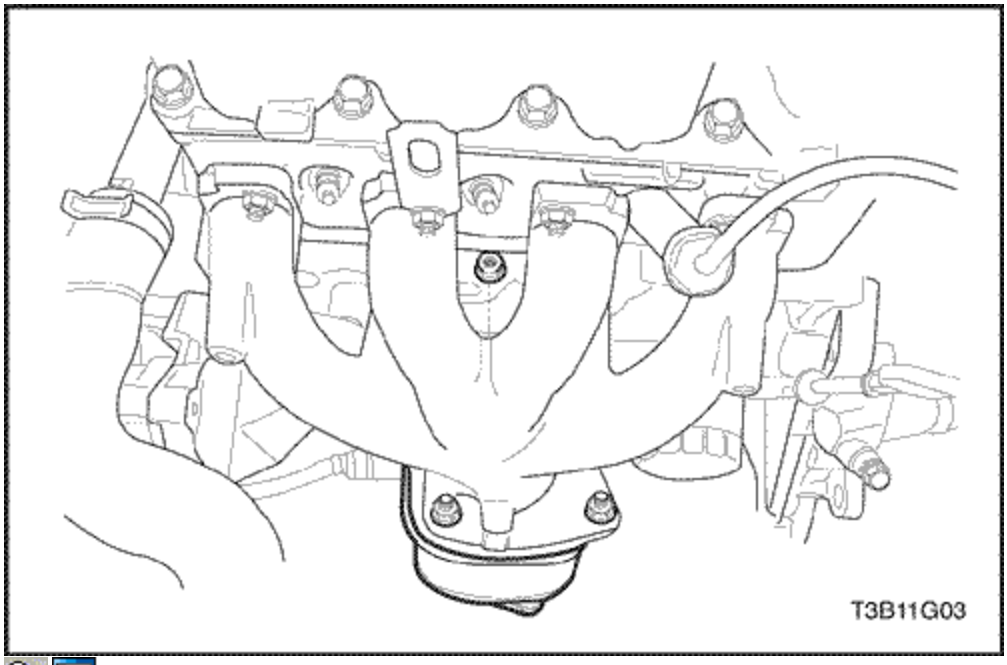
1. Install the catalytic converter and the gasket.

   Important : Position the catalytic converter onto the exhaust manifold flange with one upper flange nut .

2. Install the catalytic converter lower flange nuts and the exhaust front pipe mounting bracket.

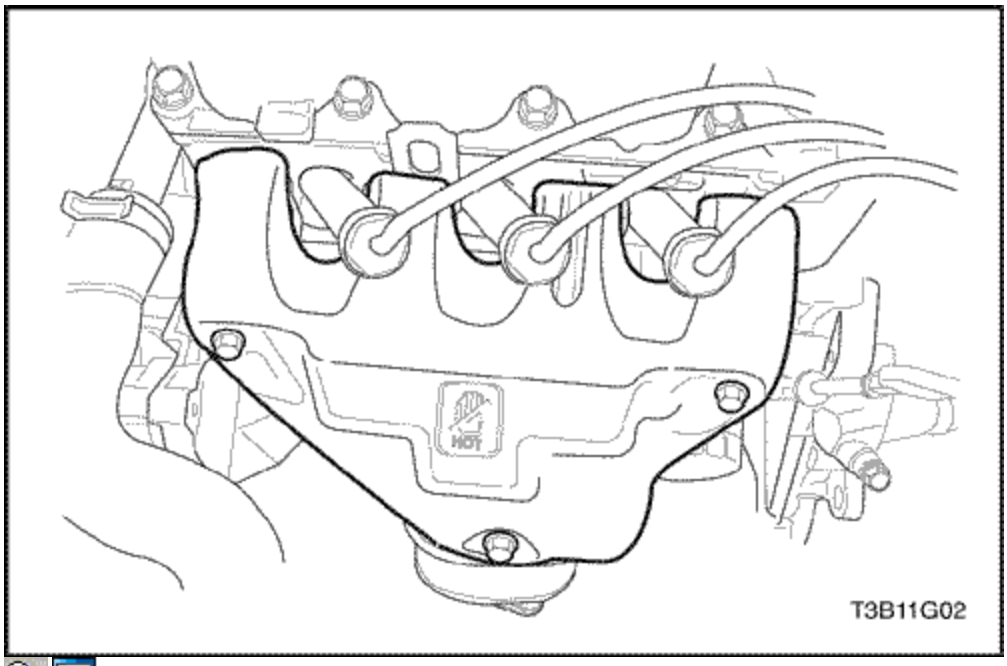
   Tighten

   - Tighten the exhaust front pipe to catalytic converter nuts to 40 N•m (30 lb-ft).
   - Tighten the exhaust front pipe mounting bracket bolt to 40 N•m (30 lb-ft).



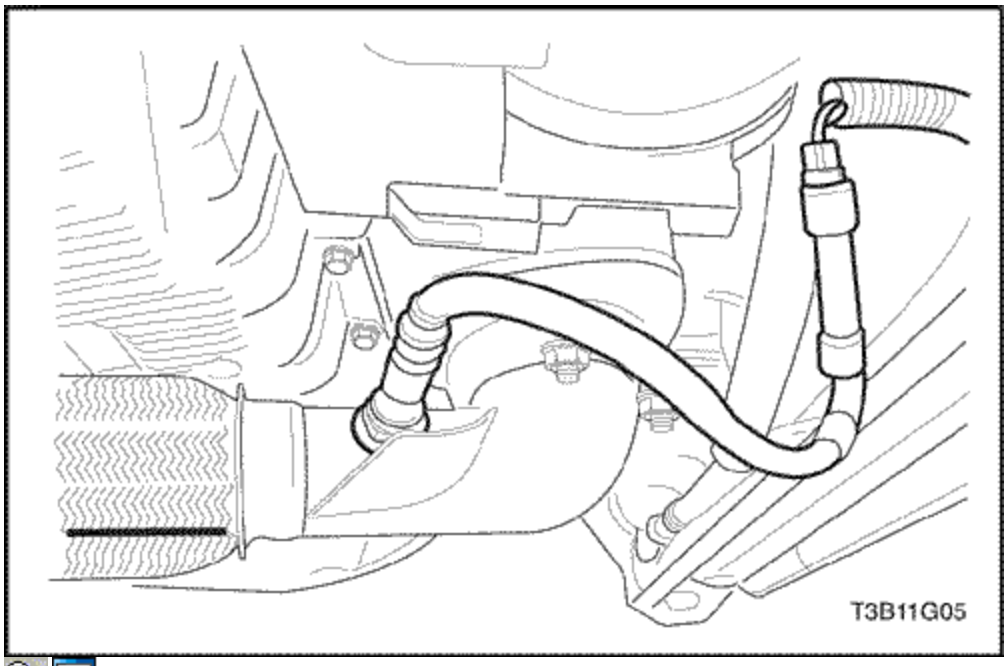
3. Install the catalytic converter upper flange nuts.

   Tighten
   Tighten the catalytic converter to exhaust manifold nuts to 50 N•m (37 lb-ft).



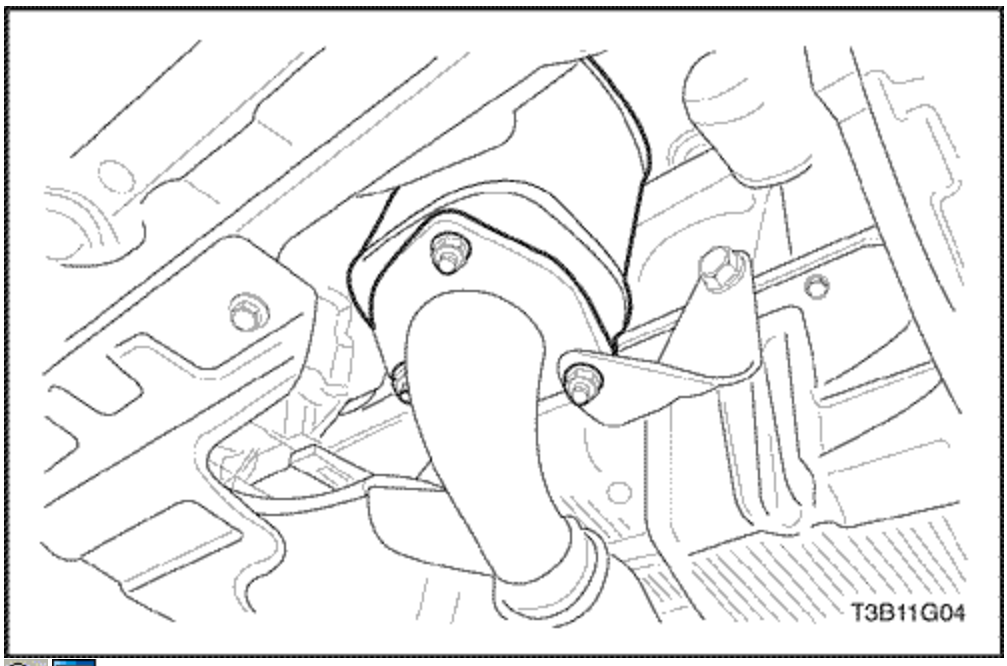
4. Install the exhaust manifold conver bolts.

   Tighten
   Tighten the exhaust manifold cover bolts to 15N•m (11 lb-ft).

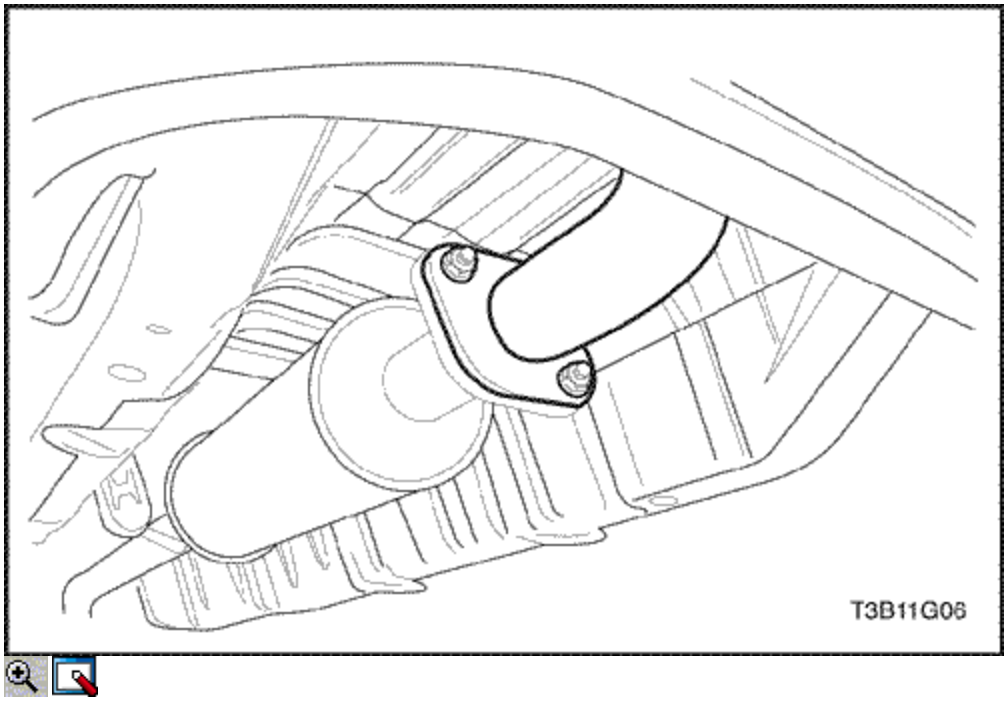


Exhaust Front Pipe
Removal Procedure

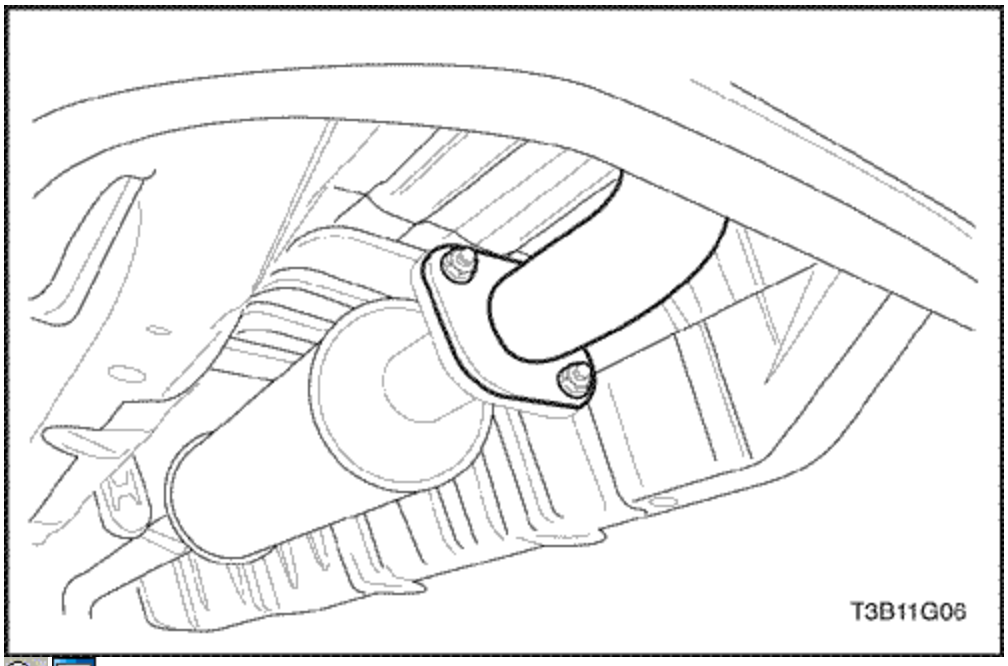
1. Remove the rear heated oxygen sensor.



2. Remove the exhaust front pipe mounting bracket bolt.
3. Remove the connecting pipe nuts and the gasket from catalytic converter.



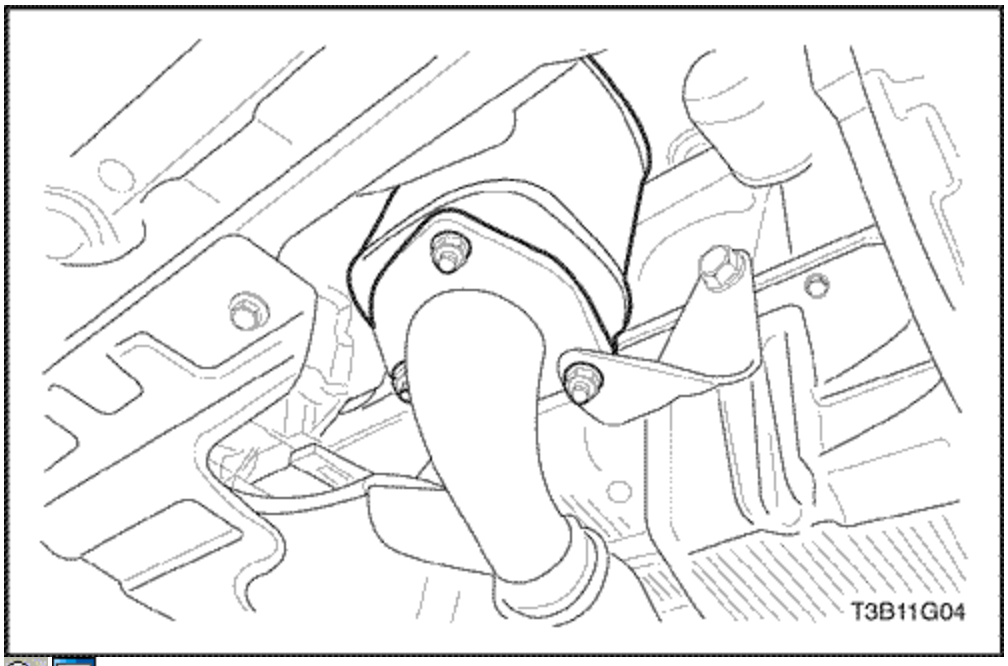
4. Remove the nuts from the front muttler pipe to the exhaust front pipe.
5. Clean the sealing surtaces on the front muttler pipe flange and the exhaust front pipe.
6. Check the exhaust front pipe for holes, damage, open seams, or other deterioration which could permit exhaust fumes to seep into the passenger compartment.



Installation Procedure

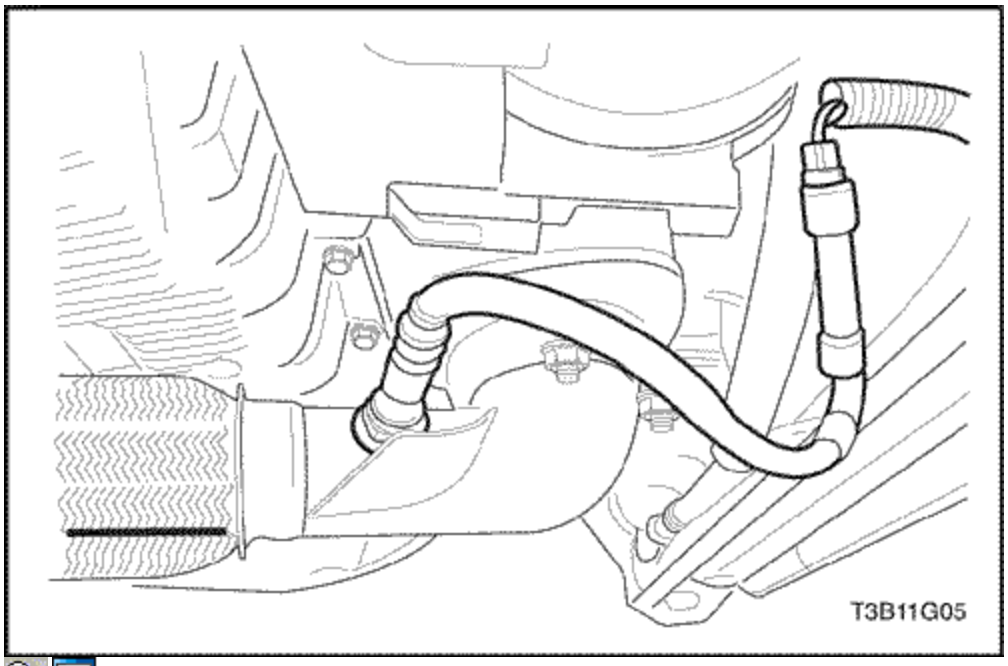
1. Install the catalytic converter and the exhaust front pipe and the gasket to the front muttler pipe flange.Use the nuts to secure the converter and the exhaust front pipe.

   Tighten
   Tighten the front muffler to exhaust front pipe nuts to 30 N•m (22 lb-ft).



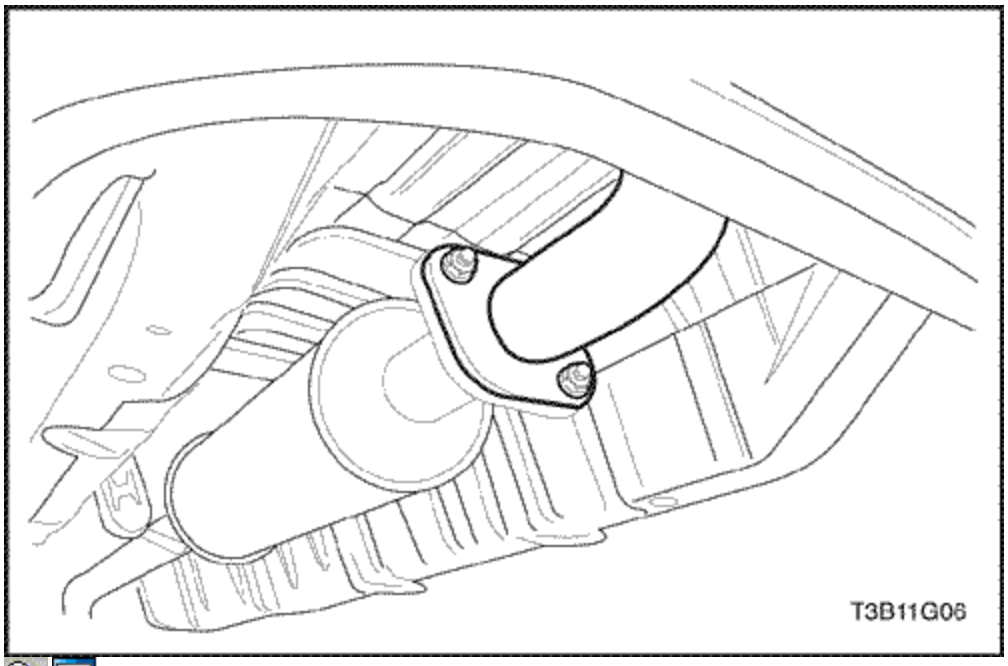
2. Using the nuts and the gasket secure the exhaust front pipe to the catalytic converter.

   Tighten
   Tighten the exhaust front pipe to catalytic converter nuts to 40 N•m (30 lb-ft).



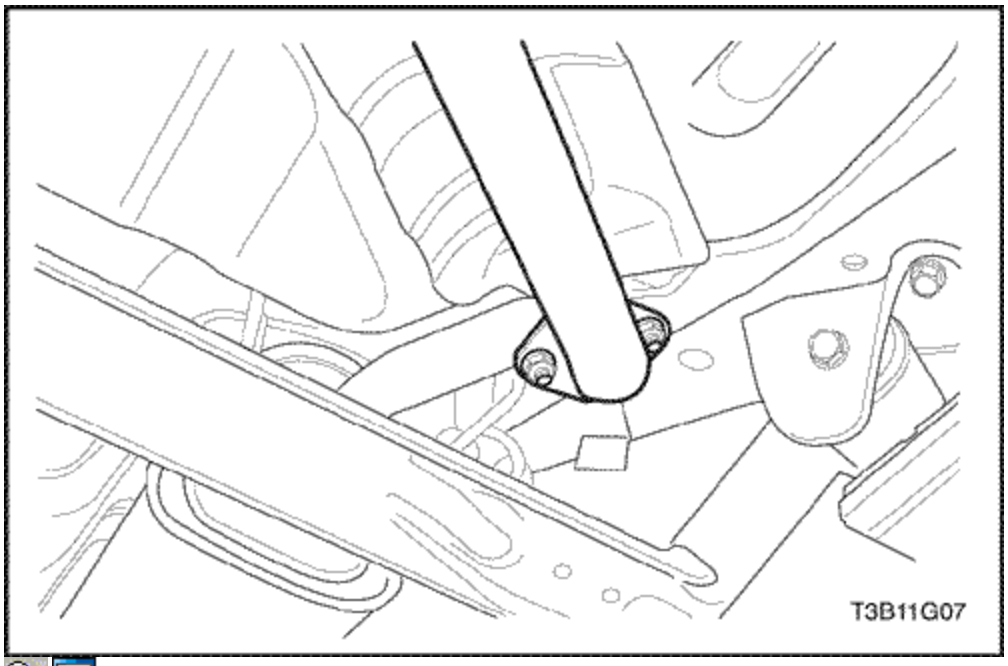
3. Install the rear heated oxygen sensor.

   Tighten
   Tighten the rear heated oxygen sensor to 41N•m (30 lb-ft).

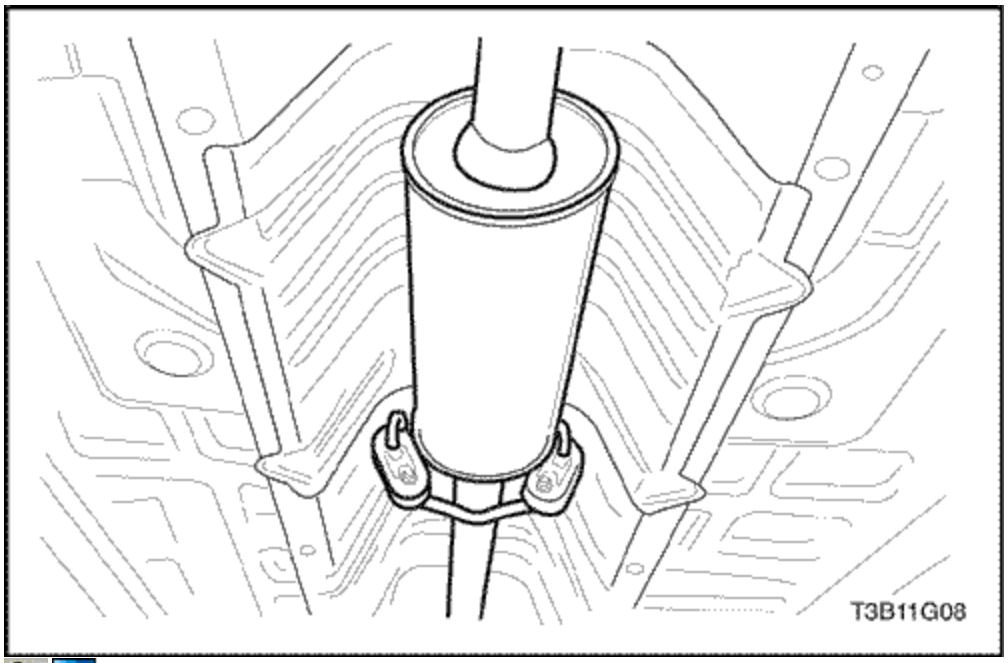


Muffler - Front
Removal Procedure

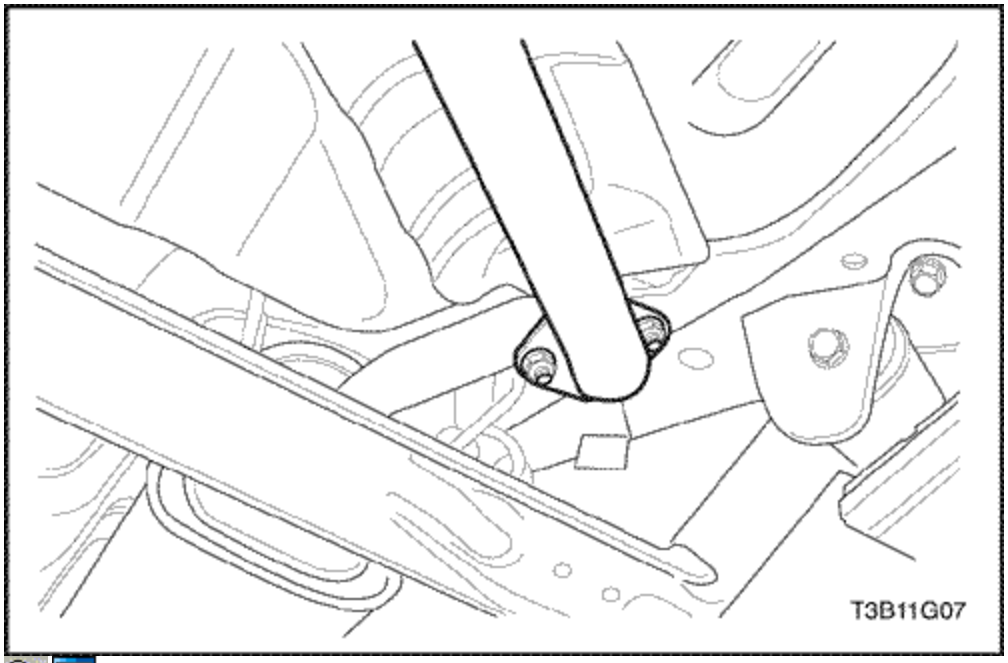
1. Remove the nuts and the gasket from the front muffler pipe to the exhaust front pipe flange.



2. Remove the nuts and the gasket from the rear muffler pipe flange.



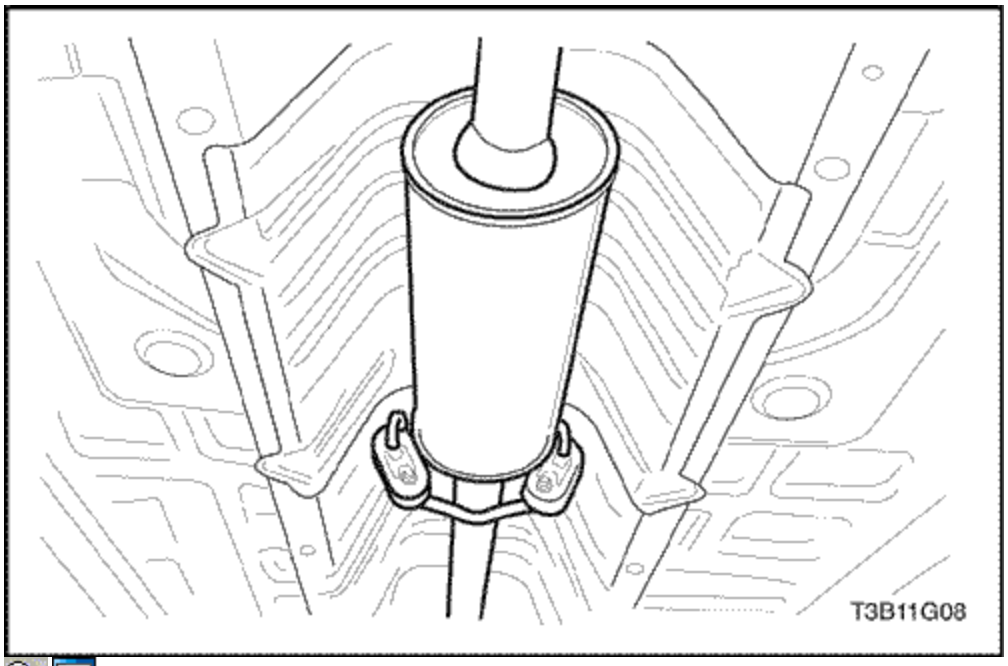
3. Disconnect the front muffler from the rubber hanger.
4. Remove the front muffler.
5. Check the exhaust pipe and the front muffler for holes, damage, open seams, or other deterioration which could permit exhaust fumes to seep into the passenger compartment or the trunk.



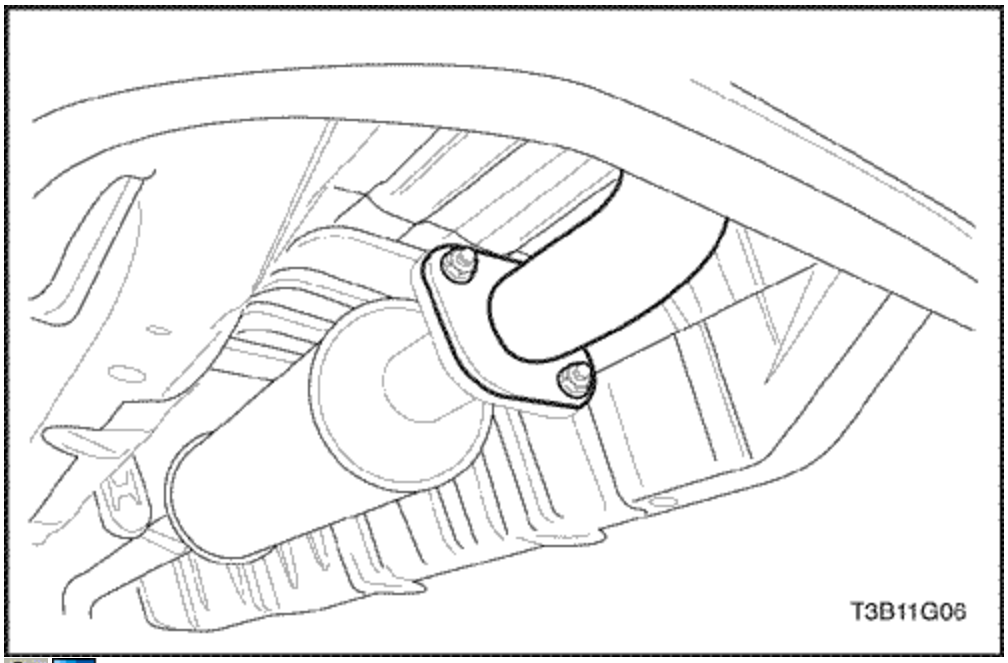
Installation Procedure

1. Connect the front muffler to the rubber hanger.
2. Attach the front muffler and the gasket to the rear muffler using the nuts. Secure the front muffler to the rubber hanger.

   Tighten
   Tighten the front muffler-to-rear muffler nuts to 30 N•m (22 lb-ft).

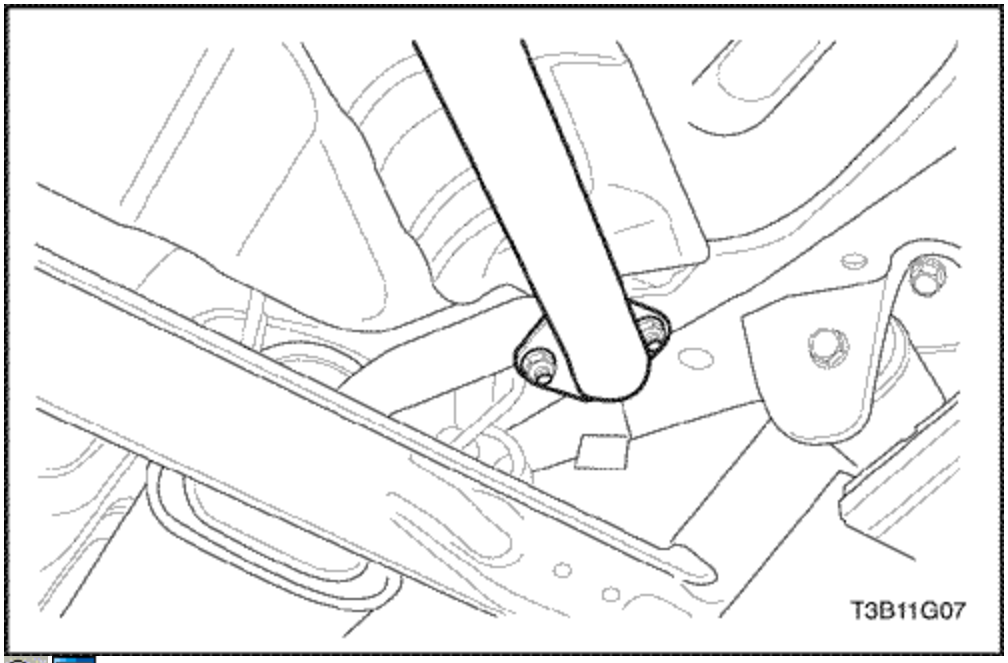


3. Loosely secure the front muffler assembly to the connecting pipe flange.



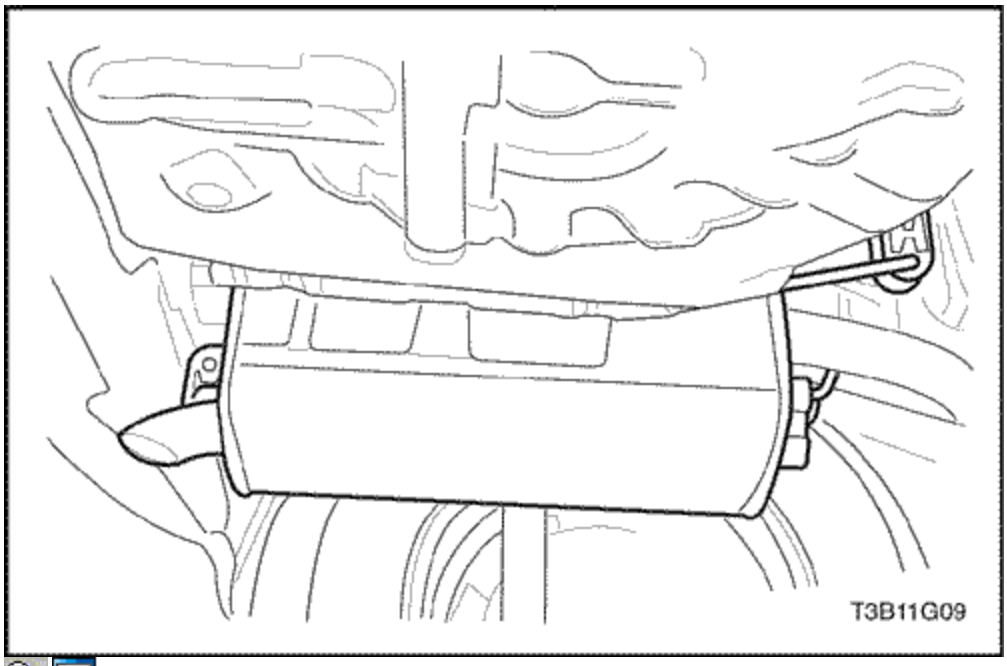
4. Secure the front muffler assembly to the connecting pipe flange with the nuts.

   Tighten
   Tighten the front muffler-to-exhaust front pipe nuts to 30 N•m (22 lb-ft).

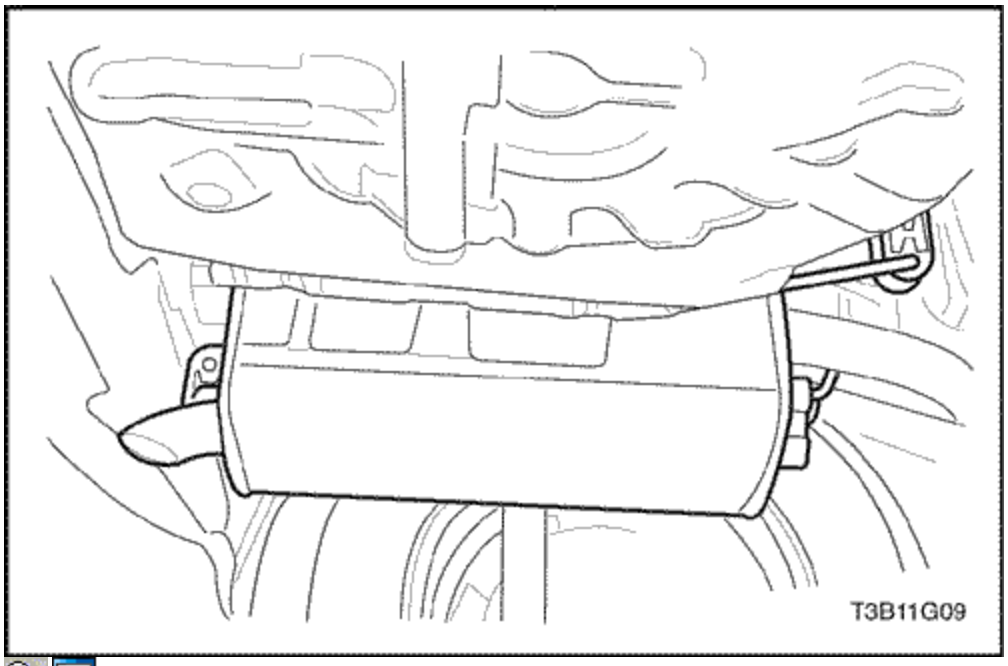


Muffler - Rear
Removal Procedure

1. Remove the nuts and the gasket from the rear muffler pipe flange-to-front muffler pipe flange.

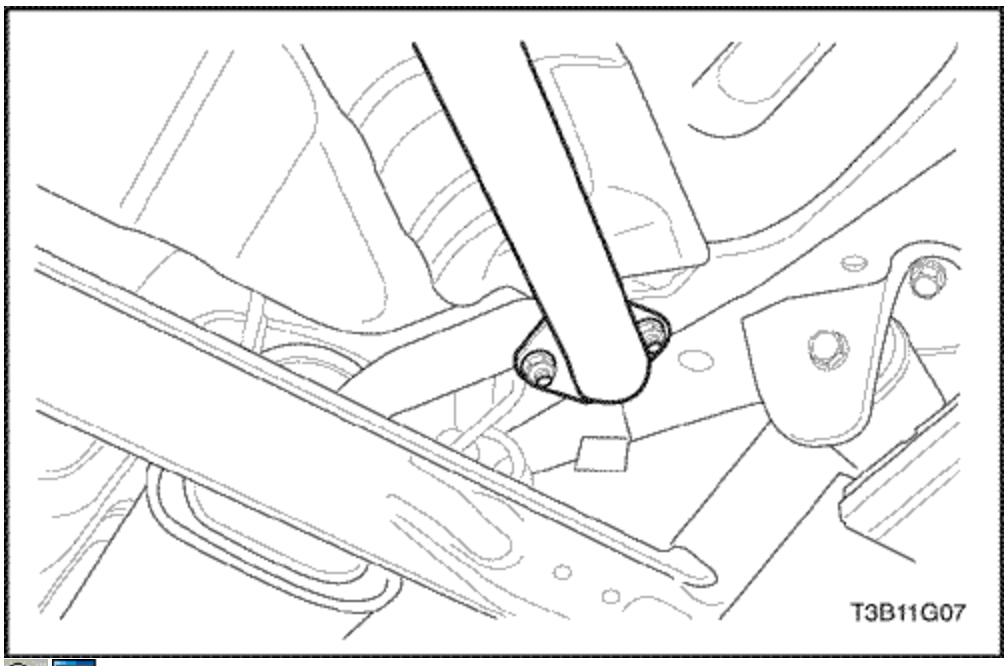


2. Detach the rear muffler assembly from the rubber hangers on the tail pipe end.
3. Remove the rear muffler assembly.
4. Check the rear muffler and the pipe for holes, damage, open seams, and other deterioration which could permit exhaust fumes to seep into the passenger compartment or the trunk.



Installation Procedure

1. Secure the rear muffler assembly to the rubber hangers on the tail pipe end.



2. Secure the nuts and the gasket from the rear muffler pipe flange-to-front muffler pipe flange.

   Tighten
   Tighten the front muffler-to-rear muffler nuts to 30 N•m (22 lb-ft).

GENERAL DESCRIPTION AND SYSTEM OPERATION

Exhaust System

Notice : When you are inspecting or replacing the exhaust system components, make sure there is adequate clearance from all points on the underbody to avoid possible overheating of the floor pan and possible damage to the passenger compartment insulation and trim materials.

Caution : Check the complete exhaust system and the nearby body areas and the trunk lid for broken, damaged, missing, or mispositioned parts, open seams, holes, loose connections, or other deterioration which could permit hazardous exhaust fumes to seep into the trunk or the passenger compartment. Dust or water in the trunk may be an indication of a problem in one of these areas. Any defects should be corrected immediately.

Muffler

If holes, open seams or any deterioration is discovered upon inspection of the front muffler and pipe assembly, the complete assembly should be replaced. The same procedure is applicable to the rear muffler assembly.

Heat shields in the front and the rear muffler assembly positions, as well as for the catalytic converter and the connecting pipe, protect the vehicle and the environment from high temperatures the exhaust system develops.

Catalytic Converters

Notice : The catalytic converter requires the use of unleaded fuel only, or damage to the catalyst will result.

The catalytic converters are emission control devices added to the exhaust system to reduce pollutants from the exhaust pipes.

The three-way catalyst has coatings which contain palladium, platinum and rhodium, which simultaneouly lower the levels of HC, CO and NOx.

SECTION 2A

SUSPENSION DIAGNOSIS

DIAGNOSIS

General Diagnosis

Problems in the steering, the suspension, the tires, and the wheels involve several systems. Consider all systems when you diagnose a complaint. Some problems, such as abnormal or excessive tire wear and scuffed tires, may be the result of hard driving. Always road test the vehicle first. If possible, do this road test with the customer.

Proceed with the following preliminary checks. Correct any substandard conditions.

Preliminary Checks

Checks	Action
Inspect the tires for improper pressure and uneven wear.	Inflate the tires to the proper pressure.
Inspect the joint from the steering column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Inspect the front and the rear suspension, the steering gear, and the linkage for loose or damaged parts.	Tighten the front and the rear suspension. Tighten the steering gear mounting bracket bolts. Tighten the coupling flange pinch bolts. Replace the front and the rear suspension as needed. Replace the steering gear as needed. Replace the coupling flange as needed.
Inspect for out-of-round tires.	Perform free runout test. Match-mount the tires.
Inspect for out-of-balance tires, bent wheels, and worn or loose wheel bearings.	Balance the wheels. Replace the wheels. Replace the wheel bearings.
Check the power steering pump drive belt tension.	Tighten the power steering pump drive belt.
Inspect the power steering system for leaks. Also check the power steering fluid level.	Repair any leaks. Perform a power steering gear test. Add power steering fluid.

Car Lead/Pull

Checks	Action
Inspect for mismatched or uneven tires.	Replace the tires.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for a radial tire lateral force.	Check the wheel alignment. Switch the tire and wheel assemblies. Replace the tires as needed.
Check the front-wheel alignment.	Align the front wheels.
Inspect for an off-center steering gear.	Reseat the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for front-brake dragging.	Adjust the front brakes.

Abnormal or Excessive Tire Wear

Checks	Action
Check the front-wheel and rear-wheel alignment.	Align the front and the rear wheels.
Inspect for excessive toe.	Adjust the toe.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for out-of-balance tires.	Balance the tires.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Check for a failure to rotate tires.	Rotate the tires. Replace the tires as needed.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for low tire inflation.	Inflate the tires to the proper pressure.

Scuffed Tires

Checks	Action
Inspect for incorrect toe.	Adjust the toe.
Inspect for a twisted or a bent suspension arm.	Replace the suspension arm.

Wheel Tramp

Checks	Action
Inspect for an out-of-balance tire or wheel.	Balance the tire or the wheel.
Inspect for improper strut dampener action.	Replace the strut dampeners.

Shimmy, Shake, or Vibration

Checks	Action
Inspect for an out-of-balance tire or wheel.	Balance the tire or the wheel.
Inspect for excessive wheel hub runout.	Measure the hub flange runout. Replace the hub as needed.
Inspect for excessive brake drum or brake rotor imbalance.	Adjust the brakes. Replace the brake rotor or the brake drum as needed.
Inspect for worn tie rod ends.	Replace the outer tie rods.
Inspect for wheel trim imbalance.	Balance the wheel.
Inspect for a worn lower ball joint.	Replace the lower ball joint.
Inspect for excessive wheel runout.	Measure the wheel runout. Replace the wheel as

Checks	Action
	needed.
Inspect for excessive loaded radial runout on the tire and wheel assembly.	Match-mount the tire and wheel assembly.

Hard Steering (Manual)

Checks	Action
Inspect for a lack of lubrication of the ball joints, the tie rods and the steering gear.	Lubricate the ball joints, the tie rods, and the steering gear. Replace the ball joints, the tie rods, and the steering gear as needed.
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear adjusment.	Adjust the steering gear.

Hard Steering (Power)

Checks	Action
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Check the hydraulic system. Test the power steering system pressure with a gauge.	Replace the seals and the hoses as needed.
Inspect for binding or catching in the steering gear.	Lubricate the steering gear. Repair or replace the steering gear as needed.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.

Too Much Play in Steering

Checks	Action
Inspect for worn or loose wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.
Inspect the joint from the column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

Poor Returnability (Manual)

Checks	Action
Inspect for a lack of lubrication of the ball joints, the tie rods and the steering gear.	Lubricate the ball joints, the tie rods, and the steering gear. Replace the ball joints, the tie rods, and the steering gear as needed.
Inspect for binding in the ball joints.	Replace the ball joints.
Inspect for binding in the steering column.	Lubricate the steering column. Replace the steering column as needed.
Inspect for a lack of lubrication in the steering gear.	Lubricate the steering gear. Repair or replace the steering gear as needed.

Checks	Action
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

Poor Returnability (Power)

Checks	Action
Inspect for lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as needed.
Inspect for binding in the ball joints.	Replace the ball joint.
Inspect for binding in the steering column.	Lubricate the steering column. Replace the steering column as needed.
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Inspect for a sticking valve.	Lubricate the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for binding in the coupling flange on the steering gear.	Replace the coupling flange.

Abnormal Noise, Front Suspension

Checks	Action
Inspect for a lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as needed.
Inspect for damaged suspension components.	Replace the damaged suspension components.
Inspect for worn control arm bushings or tie rod ends.	Replace the control arm bushings or the tie rods.
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for loose wheel bolts.	Tighten the wheel bolts.
Inspect for loose suspension bolts or nuts.	Tighten the suspension bolts or the nuts.
Inspect for loose wheel covers.	Tighten the wheel covers.
Inspect for worn strut dampeners or strut mountings.	Replace the strut dampeners. Tighten the strut mounting bolts.
Inspect for an improperly positioned strut spring.	Adjust the strut spring to the proper position.

Wander or Poor Steering Ability

Checks	Action
Inspect for mismatched or uneven tires.	Replace the tires.
Inspect for lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as

Checks	Action
	needed.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for a broken or a sagging spring.	Replace the spring.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Check the front-wheel and the rear-wheel alignment.	Align the front and the rear end wheels.

Erratic Steering when Braking

Checks	Action
Inspect for worn or loose wheel bearings.	Replace the wheel bearings.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for a leaking wheel cylinder or caliper.	Replace the wheel cylinder or the caliper.
Inspect for warped rotors.	Replace the rotors.
Inspect for an incorrect or an uneven caster.	If the caster is beyond specifications, check the frame and repair it as needed.

Low or Uneven Trim Height

Checks	Action
Inspect for a broken or a sagging spring.	Replace the spring.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for an incorrect or weak spring.	Replace the spring.

Ride Too Soft

Checks	Action
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for a broken or a sagging spring.	Replace the spring.

Ride Too Harsh

Checks	Action
Inspect for incorrect strut dampeners.	Replace the strut dampeners.
Inspect for an incorrect spring.	Replace the spring.

Body Leans or Sways in Corners

Checks	Action
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for worn strut dampeners or strut mountings.	Replace the strut dampeners. Tighten the strut assembly mounting bolts.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for a broken or a sagging spring.	Replace the spring.

Suspension Bottoms

Checks	Action

Checks	Action
Inspect for worn strut dampeners.	Replace the strut dampeners.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for a broken or a sagging spring.	Replace the spring.

Steering Wheel Kickback (Power)

Checks	Action
Inspect for air in the power steering system.	Purge the power steering system of air.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.
Inspect the joint from the column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Inspect for loose tie rod ends.	Tighten the tie rod ends. Replace the outer tie rods as needed.
Inspect for loose or worn wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.

Steering Wheel Surges or Jerks (Power)

Checks	Action
Check the hydraulic system. Test the power steering system pressure with a gauge.	Replace the seals and the hoses as needed.
Inspect for a sluggish steering gear valve.	Clean the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for a loose power steering pump drive belt.	Adjust the power steering pump drive belt.

Cupped Tires

Checks	Action
Check the front-wheel and the rear-wheel alignment.	Align the front and the rear wheels.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for worn or loose wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.
Inspect for excessive tire or wheel runout.	Match-mount the tires. Replace the tires as needed.
Inspect for a worn ball joint. Replace the wheels as needed.	Replace the ball joint.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

Torque Steer

A degree of torque steer to the right may normally be experienced during the use of heavy throttle on some front-wheel drive cars with drive axles of unequal length. This torque steer to the right results from the right drive axle

being longer than the left drive axle, which creates a difference in the drive axle angle. Cars with intermediate shaft assemblies have axles of almost equal length.
A difference in the drive axle lengths results in more torque toe-in in the left front wheel. You will notice the torque toe-in when the vehicle accelerates from a standing start or at lower speeds.

Inspection Procedure

1. Place a small piece of tape at the top center of the steering wheel.
2. Note the inches of steering wheel deflection required to keep the vehicle straight during heavy acceleration.
3. Compare this finding with similar cars.

Factors that may cause torque steer to be more apparent on a particular vehicle include:

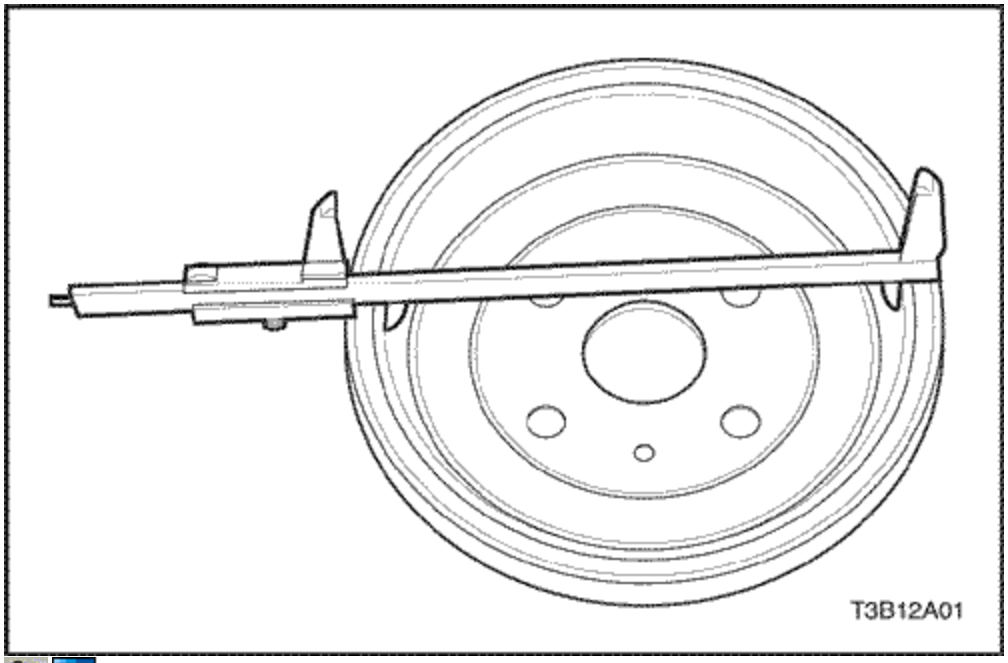
- Variations in the tire and wheel assemblies. This has the most significant effect on torque steer. A slightly smaller diameter on the right front tire will increase a right torque lead.
- Large differences in the right and the left front tire pressure.
- Looseness in the control arm bushings, the tie rod assemblies, or the steering gear mounting. This looseness permits a front wheel to pull forward and toe-in under a torque greater than the wheel on the opposite side. A loose suspension component may result in an opposite lead upon deceleration.
- A high front trim height. This height would increase the drive axle angle and could cause wobble at speeds between 24 to 48 km/h (15 to 30 mph).
- Binding or a tight drive axle joint. A tight drive axle joint or a high front trim height may also cause a wobble at speeds between 24 to 48 km/h (15 to 30 mph).
- Incorrect, worn, or loose engine mounts causing adverse drive angles.

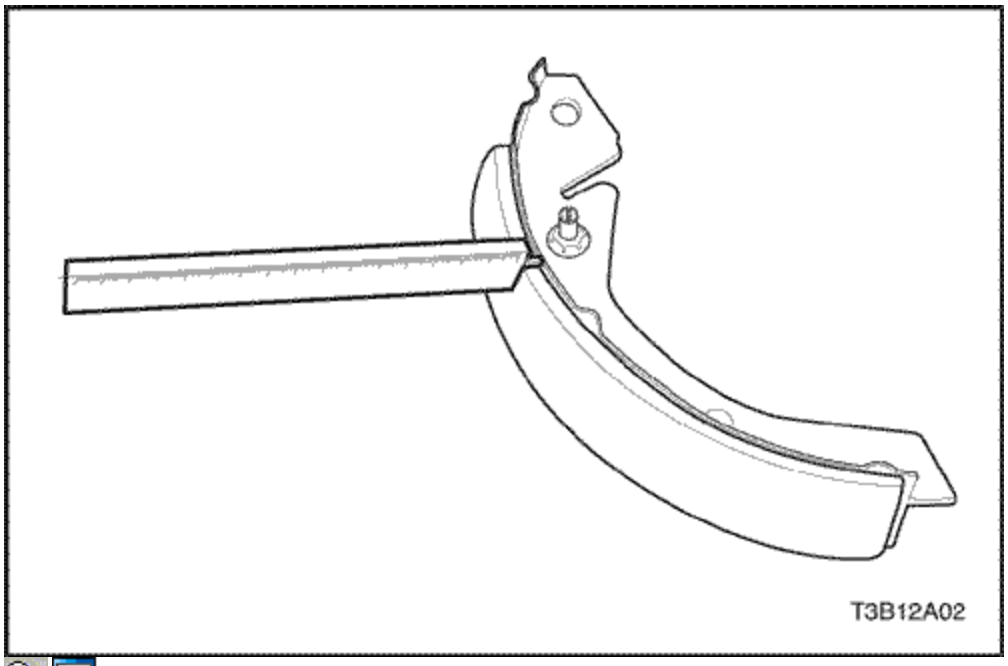
Refer to "General Diagnosis" in this section for actions to remedy these problems.
Conditions that may produce an effect similar to torque steer include:

- Incorrect front or rear alignment.
- Frame misalignment or defect.
- Front suspension damage.
- Incorrectly mounted rear crossmember.

Tapered Roller Bearing
Perform the following test to check for looseness in the bearing cartridge assembly:

1. Raise and suitably support the vehicle.
2. Remove the rear wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the brake drum. Refer to *Section 4E, Rear Drum Brakes.*
4. Check the drum (Crack,damage).
5. The maximum inner diameter of the drum is 201 mm and the minimum thickness of the brake lining is 0.5 mm
6. Install the rear brake drum. Refer to *Section 4E, Rear Drum Brakes.*
7. Install the rear wheel. Refer to *Section 2E, Tires and Wheels.*
8. Lower the vehicle.





Vehicles with antilock braking systems have sealed, non-serviceable cartridge bearings in the rear wheels. If any fault is found with a wheel bearing, it must be replaced.

Wheel Bearing Noise

A road test usually reveals excessive wheel bearing noise. Sealed wheel bearings emit a howling sound when loose or damaged. Wheel bearing noise is present only when the vehicle is moving. It is constant and unwavering and increases with the speed of the vehicle. If the wheel bearing noise cannot be positively diagnosed, or if the origin of the noise cannot be determined, perform the following test:

1. Raise and suitably support the vehicle.
2. Spin the wheels using your hand. Check for out-of-round or out-of-balance tires, bent rims, or loose wheel bearings.
3. Spin the rear wheels using a commerical wheel spinner.
4. If a noise can be heard from the passenger compartment, replace the noisy wheel bearing cartridge. Refer to *Section 2D, Rear Suspension.*
5. Lower the vehicle

SECTION 2B

WHEEL ALIGNMENT

SPECIFICATIONS

Wheel Alignment Specifications

Application	Front	Rear
Camber (°)	-24´ ± 45´	-1°30´ ± 30´
Caster - Manual Str'g	-	-
Caster - Power Str'g (°)	2°30´ ± 45´	-
Toe-in (2-person load) (°)	2´±10´	15´ ± 20´

Note : The above alignment specifications are with the vehicle in a normally loaded condition. Prior to inspection or alignment, place a weight of approximately 150 lbs. (68 kg) on each front seat cushion.

Difference Between Left and Right

Application	Front	Rear
Camber	1°max	30' max
Caster	1°max	-
Toe-in	-	15' max

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Front Toe Adjusting Nut	22	16	-

DIAGNOSIS

Tire Diagnosis

Irregular and Premature Wear

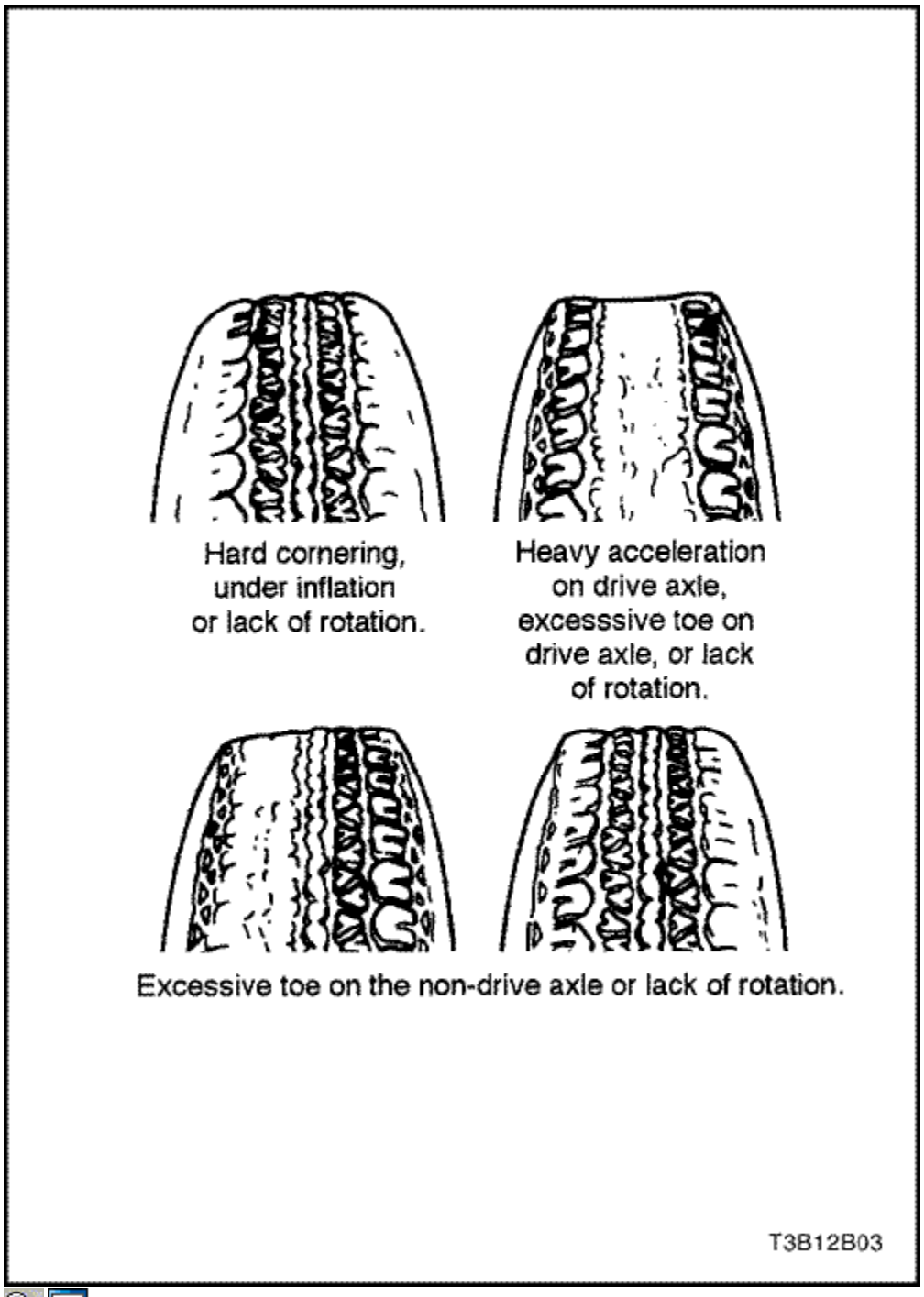
Irregular and premature tire wear has many causes. Some of them are incorrect inflation pressures, lack of regular rotation, poor driving habits, or improper wheel alignment. If the wheel alignment is reset because of tire wear, always reset the toe as close to zero degrees as the specification allows. Refer to "Rear Toe Check"in this section.

Rotate the tires if

- The front tire wear is different from the rear.
- The left and right front tire wear is unequal.
- The left and right rear tire wear is unequal.

Check wheel alignment if:

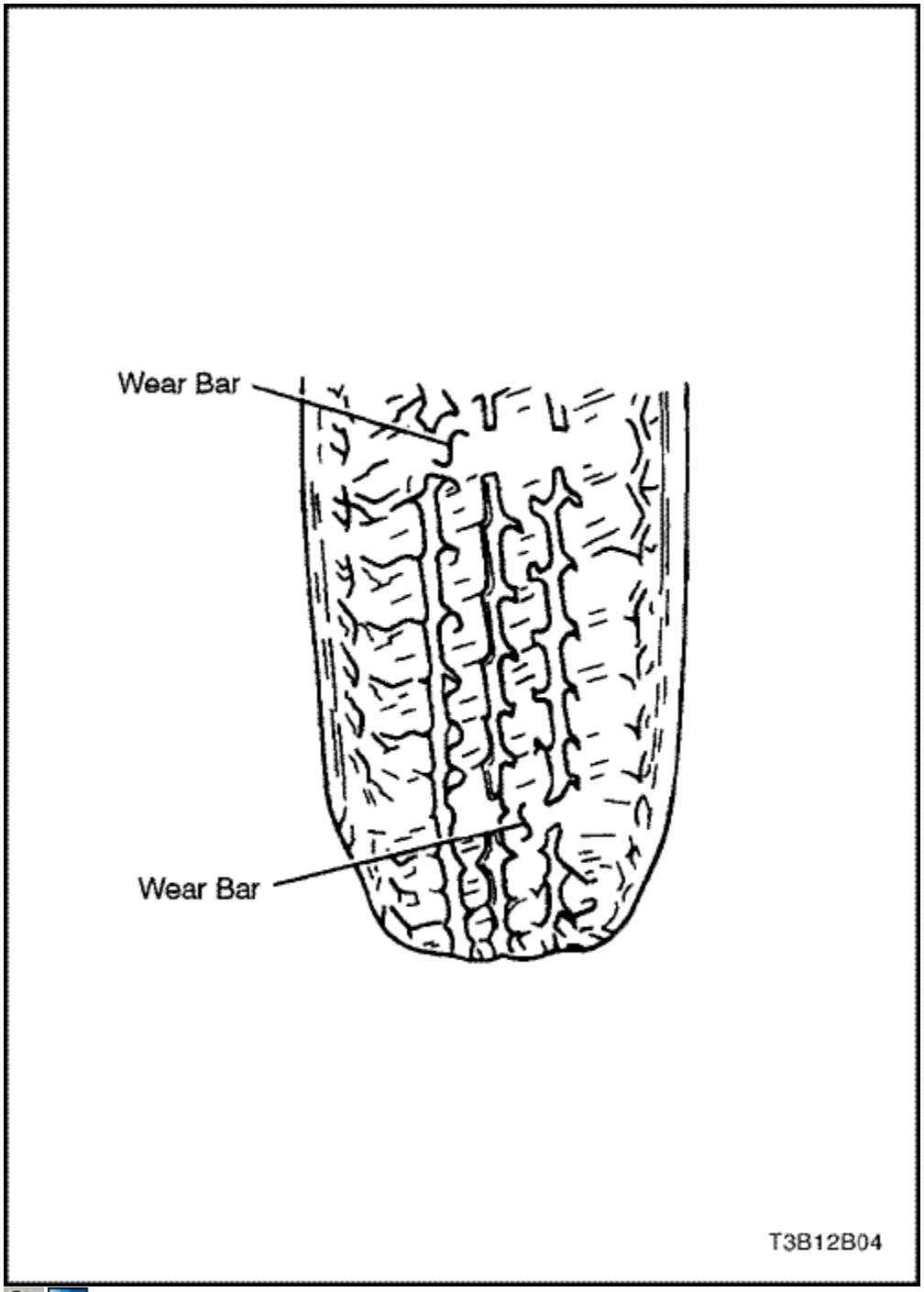
- The left and right front tire wear is unequal.
- The wear is uneven across the tread of either front tire.
- The front tire treads are scuffed with "feather" edges on the side of the tread ribs or blocks.



Tread Wear Indicators

The original equipment tires have built-in tread wear indicators to show when the tires need replacement. These indicators appear as bands when the tire

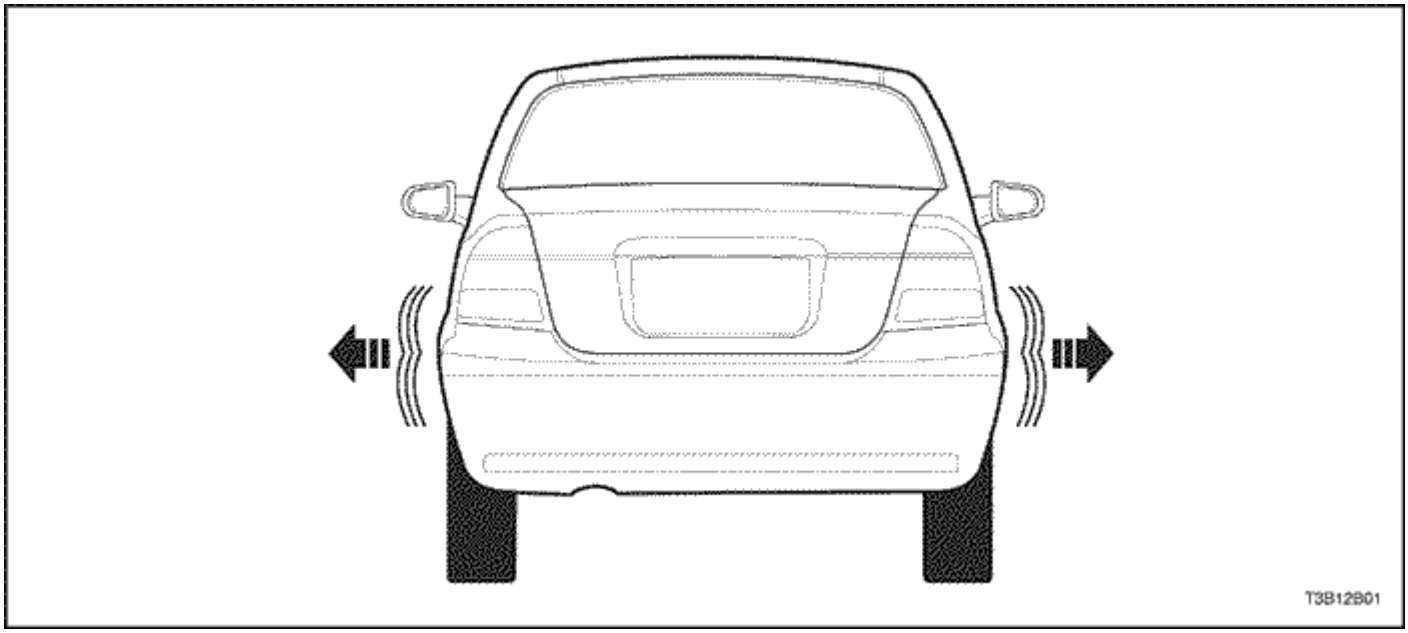
tread depth becomes shallow. Tire replacement is recommended when the indicators appear in three or more grooves at six locations.



Radial Tire Waddle

Waddle is side-to-side movement at the front or rear of the vehicle. It is caused by the steel belt not being straight within the tire, or by excessive lateral runout of the tire or wheel. It is most noticeable at low speeds, 8 to 48 km/h (5 to 30 mph), but may appear as ride roughness at 80 to 113 km/h (50 to 70 mph).
The vehicle must be road tested to determine which end of the vehicle has the faulty tire. The rear end of the vehicle will shake from side to side or ``waddle'' if the waddle tire is on the rear of the vehicle. From the driver's seat, it feels as though someone is pushing on the side of the vehicle. If the faulty tire is on the front of the vehicle, the waddle is more visual. The front sheet metal appears to be moving back and forth, and the driver's seat feels like the pivot point in the vehicle.
Waddle can be diagnosed using the method of substituting known good tire and wheel assemblies on the problem vehicle.

1. Road test the vehicle to determine if the waddle is coming from the front or the rear of the vehicle.
2. Install good tires and wheels from a similar vehicle in place of those on the offending end of the problem vehicle. If the source of the waddle is not obvious, change the rear tires.
3. Road test the vehicle. If there is improvement, install the original tires to find the offending tire. If there is no improvement, install good tires in place of all four offending tires.
4. Install original tires one at a time to find the offending tire.



Radial Tire Lead /Pull

Lead/pull is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel. Lead is usually caused by:

- Incorrect alignment.
- Uneven brake adjustment.
- Tire construction.

The way in which a tire is built can produce lead/pull in the vehicle. Off-center belts on radial tires can cause the tire to develop a side force while the vehicle rolls straight down the road. If one side of the tire has even a little larger diameter than the diameter of the other side, the tire will tend to roll to one side. Unequal diameters will cause the tire to develop a side force which can produce vehicle lead/pull.

The radial lead/pull diagnosis chart should be used to determine whether the problem originates from an alignment problem or from the tires. Part of the lead diagnosis procedure calls for tire rotation that is different from the proper tire rotation pattern. If a medium- to high-mileage tire is moved to the other side of the vehicle, be sure to check for ride roughness. Rear tires will not cause lead/pull.

Radial Tire Lead/Pull Diagnosis Chart

Step	Action	Value(s)	Yes	No
1	1. Perform wheel alignment preliminary inspection. 2. Check the brakes for dragging. 3. Road test the vehicle. Does the vehicle lead/pull?	-	Go to *Step 2*	System OK
2	1. Cross switch the front tire and wheel assemblies. 2. Road test the vehicle. Does the vehicle lead/pull?	-	Go to *Step 3*	System OK
3	1. Check the front wheel alignment. Is the alignment within specifications?	See page 2B-1	Go to *Step 4*	Adjust alignment
4	1. Compare the front camber and front caster to specifications.	See page 2B-1	Go to *Step 7*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
	Are they within specifications?			
5	1. Check the vehicle frame. Is the frame bent?	-	Go to *Step 6*	Go to *Step 1*
6	1. Straighten the frame. Is the repair complete?	-	Go to *Step 3*	-
7	1. The probable cause is the tires. 2. Switch the left front tire and wheel assembly with the left rear tire and wheel assembly. 3. Road test the vehicle. Does the vehicle still lead/pull?	--	Go to *Step 9*	Go to *Step 8*
8	1. Switch the left front tire and wheel assembly with the left rear tire and wheel assembly and replace the left front tire. Is the repair complete?	-	System OK	Go to *Step 1*
9	1. Switch the right front tire and wheel assembly with the right rear tire and wheel assembly. 2. Road test the vehicle. Does the vehicle still lead/pull?	-	Go to *Step 1*	Go to *Step 10*
10	1. Switch the right front tire and wheel assembly with the right rear tire and wheel assembly and replace the right front tire. Is the repair complete?	-	System OK	Go to *Step 1*

Vibration Diagnosis

Wheel imbalance causes most highway speed vibration problems. A vibration can remain after dynamic balancing because:

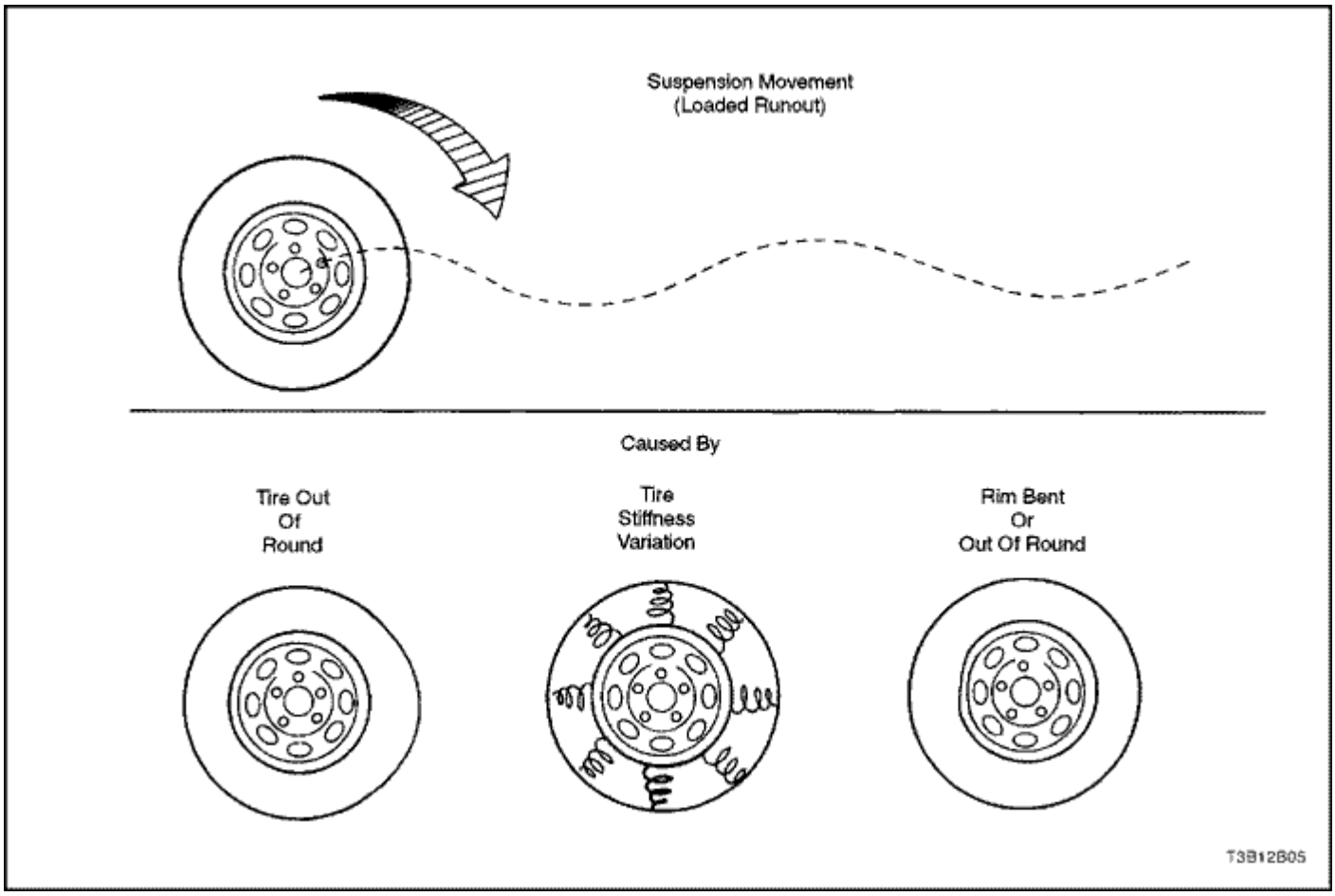
- A tire is out of round.
- A rim is out of round.
- A tire stiffness variation exists.

Measuring tire and wheel free runout will uncover only part of the problem. All three causes, known as loaded radial runout, must be checked using method of substituting known good tire and wheel assemblies on the problem vehicle. Low-speed vibrations, which occur below 64 km/h (40 mph), are usually caused by runout. High-speed vibrations, which occur above 64 km/h (40 mph), can be caused by either imbalance or runout.

Preliminary Checks

Prior to performing any work, always road test the car and perform a careful visual inspection for:

- Obvious tire and wheel runout.
- Obvious drive axle runout.
- Improper tire inflation.
- Incorrect trim height.
- Bent or damaged wheels.
- Debris build-up on the tire or the wheel.
- Irregular or excessive tire wear.
- Improper tire bead seating on the rim.
- Imperfections in the tires, including: tread deformations, separations, or bulges from impact damage. Slight sidewall indentations are normal and will not affect ride quality.



Tire Balancing

Balance is the easiest procedure to perform and should be done first if the vibration occurs at high speeds. Do an off-vehicle, two-plane dynamic balance first to correct any imbalance in the tire and wheel assembly.

An on-vehicle finish balance will correct any brake drum, rotor, or wheel cover imbalance. If balancing does not correct the high-speed vibration, or if the vibration occurs at low speeds, runout is the probable cause.

Runout

Runout can be caused by the tire, the wheel, or the way the wheel is attached to the vehicle. To investigate the possibility of wheel runout, refer to the following procedures as well as the wheel runout diagnosis chart in this section:

1. If runout is suspected, measure the on-vehicle free lateral and free radial runout of the tire and wheel assembly. Refer to *Section 2E, Tires and Wheels.* Both the free lateral and the free radial runout should be

less than 1.5 mm (0.06 inch). If either measurement exceeds this number, proceed to Step 2.

2. Mount the tire and the wheel on a dynamic balancing machine and remeasure the free lateral and the free radial runout. Record the amount of the free lateral and the free radial runout and the location of the highest measurement. Refer to *Section 2E, Tires and Wheels.* If the free radial or the free lateral runout exceeds 1.3 mm (0.05 inch) at the tire tread, proceed to Step 4.
3. Measure the wheel runout. Refer to *Section 2E, Tires and Wheels.* If the wheel exceeds specifications, replace it.
4. Deflate the tire and match-mount the high radial runout point of the tire to the low radial runout point of the wheel. Reinflate the tire and mount it on the dynamic balancing machine. Measure and record the free radial and the free lateral runout and their locations. In many cases, match mounting the tire on the wheel will bring the tire and wheel assembly's free runout into an acceptable range of 1.3 mm (0.05 inch) or less.
5. If the free runout of the tire and wheel assembly is 1.3 mm (0.05 inch) or less when it was measured off the vehicle, yet exceeds 1.3 mm (0.05 inch) when measured on the vehicle, the attachment of the tire and wheel assembly to the hub is the probable cause of the vibration. Rotate the assembly's two wheel studs and recheck the runout. Refer to *Section 2E, Tires and Wheels.* Several positions may have to be tried to find the best location for the studs.
6. If the tire and wheel assembly free runout cannot be reduced to 1.3 mm (0.05 inch) or less, remove the assembly.
    1. Measure the wheel stud runout using a dial indicator set with a magnetic base.
    2. Zero the dial indicator set button on one stud.
    3. Gently lift the set button off the stud. Rotate the flange to position the next stud against the dial indicator set.
    4. Record the runout of all the studs. The dial indicator should read zero when it is repositioned on the first stud that was checked.
    5. If the runout exceeds 0.76 mm (0.03 inch), the hub or the hub and bearing assembly should be replaced.

Whenever a tire is rotated on the wheel, or whenever a tire or wheel is replaced, rebalance the assembly.

Wheel Runout Diagnosis Chart

Step	Action	Value(s)	Yes	No
1	Road test the vehicle to verify the vibration complaint.	-	Go to *Step 2*	System OK

Step	Action	Value(s)	Yes	No
	Are the customer's concerns verified?			
2	1. Perform a vibration diagnosis preliminary check. 2. Repair any of the problems found. Is the vibration still present	-	Go to *Step 3*	System OK
3	Determine at what speed the vibration is present. Is the vibration over 64 km/h (40 mph)?	-	Go to *Step 4*	Go to *Step 6*
4	Perform an off-vehicle dynamic wheel balance. Is the vibration still present?	-	Go to *Step 5*	System OK
5	Perform an on-vehicle finish balance. Is the vibration still present?	-	Go to *Step 6*	System OK
6	Perform a free lateral and a radial on-vehicle runout check. Does the runout match the value specified?	1.5 mm (0.06 in.)	Go to *Step 4*	Go to *Step 7*
7	Perform a free lateral and a free radial off-vehicle runout check. Does the runout match the value specified?	1.3 mm (0.05 in.)	Go to *Step 8*	Go to *Step 12*
8	1. Index the tire and wheel assembly on the hub studs. 2. Obtain the least amount of runout possible. Does the runout match the value specified?	0.76 mm (0.03 in.)	Go to *Step 9*	Go to *Step 14*
9	Perform an off-vehicle dynamic wheel balance. Is the vibration still present?	-	Go to *Step 10*	System OK
10	Perform an on-vehicle finish balance. Is the vibration still present?	-	Go to *Step 11*	System OK
11	1. Check for any engine driveline imbalance. 2. Thoroughly inspect the drive axles and the constant velocity joints. 3. Repair any problems found. Are the repairs complete?	-	Go to *Step 1*	-
12	1. Match-mount the tire on the wheel. 2. Perform a free lateral and a free radial off-vehicle runout check.	1.5mm (0.06 in.)	Go to *Step 9*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
	Does the runout match the value specified?			
13	1. Dismount the tire from the wheel of the suspected assembly. 2. Measure the runout of the wheel. Does the runout match the value specified?	0.8 mm (0.03 in.)	Go to *Step 15*	Go to *Step 16*
14	Measure the hub flange runout. Does the runout match the value specified?	0.76 mm (0.03 in.)	Go to *Step 9*	Go to *Step 17*
15	Replace the tire. Is the repair complete?	-	Go to *Step 1*	-
16	Replace the wheel. Is the repair complete?	-	Go to *Step 1*	-
17	Replace the hub. Is the repair complete?	-	Go to *Step 1*	-

Preliminary Inspection

Checks	Action
Check the tires for proper inflation pressures and normal tread wear.	Inflate the tires to the proper tire pressure. Replace the tires as needed.
Check the wheel bearings for looseness.	Tighten the axle nut to the proper specification. Replace the strut wheel bearing as needed.
Check for loose ball joints and tie rod ends.	Tighten the ball joints and the tie rods.
Check the runout of the wheels and the tires.	Measure and correct the tire runout.
Check the vehicle trim heights.	Correct the trim heights. Make the correction before adjusting the toe.
Check for loose rack and pinion mounting.	Tighten the mounting brackets for the rack and pinion assembly.
Check for improperly operating struts.	Replace the strut assembly.
Check for loose control arms.	Tighten the control arm attachment bolts. Replace the control arm bushings as needed.

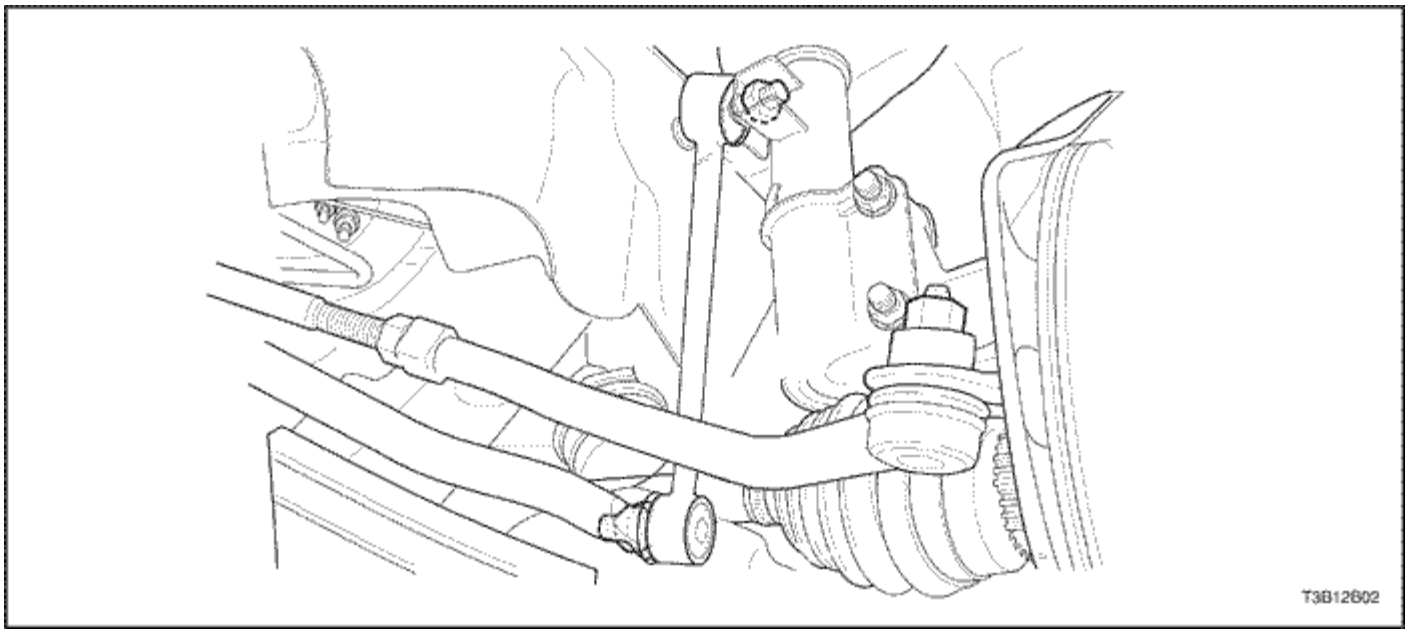
Front Toe Adjustment

1. Loosen the right and the left rod lock bolts.
2. Turn the right and the left tie rod adjusters to align the toe to 2 minutes -10 to +10 minutes.

In this adjustment, the right and left tie rods must be equal in length.

Tighten

Tighten the tie rod lock bolts to 64N•m (47lb-ft).



Front Camber and Caster Check

The front camber and caster are not adjustable. Refer to "Wheel Alignment Specifications" in this section. Jounce the bumper three times before measuring the camber or the caster in order to prevent an incorrect reading. If the front camber or caster measurements deviate from the specifications, locate and replace or repair any damaged, loose, bent, dented, or worn suspension part. If the problem is body related, repair the body.

Rear Camber Check

The rear camber is not adjustable. Refer to "Wheel Alignment Specifications" in this section. If the rear camber deviates from the specification, locate the cause and correct it. If damaged, loose, bent, dented, or worn suspension parts are found, they should be repaired or replaced. If the problem is body related, repair the body.

Rear Toe Check

The rear toe is not adjustable. Refer to "Wheel Alignment Specifications" in this section. If the toe deviates from the specification, check the rear axle assembly and the wheel spindle on vehicles without an anti-lock braking system (ABS) or the rear axle assembly and the hub and bearing assembly on vehicles with ABS for possible damage.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Four Wheel Alignment

The first responsibility of engineering is to design safe steering and suspension systems. Each component must be strong enough to withstand

and absorb extreme punishment. Both the steering system and the front and the rear suspension must function geometrically with the body mass.
The steering and the suspension systems require that the front wheels self-return and that the tire rolling effort and the road friction be held to a negligible force in order to allow the customer to direct the vehicle with the least effort and the most comfort.
A complete wheel alignment check should include measurements of the rear toe and camber.
Four-wheel alignment assures that all four wheels will be running in precisely the same direction.
When the vehicle is geometrically aligned, fuel economy and tire life are at their peak, and steering and performance are maximized.

Toe

Toe-in is the turning in of the tires, while toe-out is the turning out of the tires from the geometric centerline or thrust line. The toe ensures parallel rolling of the wheels.
The toe serves to offset the small deflections of the wheel support system which occur when the vehicle is rolling forward. The specified toe angle is the setting which achieves 0 degrees of toe when the vehicle is moving.
Incorrect toe-in or toe-out will cause tire wear and reduced fuel economy. As the individual steering and suspension components wear from vehicle mileage, additional toe will be needed to compensate for the wear
Always correct the toe dimension last.

Caster

Caster is the tilting of the uppermost point of the steering axis either forward or backward from the vertical when viewed from the side of the vehicle. A backward tilt is positive, and a forward tilt is negative. Caster influences directional control of the steering but does not affect tire wear. Weak springs or overloading a vehicle will affect caster. One wheel with more positive caster will pull toward the center of the car. This condition will cause the car to move or lean toward the side with the least amount of positive caster. Caster is measured in degrees and is not adjustable.

Camber

Camber is the tilting of the top of the tire from the vertical when viewed from the front of the vehicle. When the tires tilt outward, the camber is positive. When the tires tilt inward, the camber is negative. The camber angle is measured in degrees from the vertical. Camber influences both directional control and tire wear.
If the vehicle has too much positive camber, the outside shoulder of the tire will wear. If the vehicle has too much negative camber, the inside shoulder of the tire will wear.

Camber is not adjustable.

Steering Axis Inclination

Steering Axis Inclination (SAI) is the tilt at the top of the steering knuckle from the vertical. Measure the SAI angle from the true vertical to a line through the center of the strut and the lower ball joint as viewed from the front of the vehicle.

SAI helps the vehicle track straight down the road and assists the wheel back into the straight ahead position. SAI on front wheel drive vehicles should be negative.

Included Angle

The included angle is the angle measured from the camber angle to the line through the center of the strut and the lower ball joint as viewed from the front of the vehicle.

The included angle is calculated in degrees. Most alignment racks will not measure the included angle directly. To determine the included angle, subtract the negative or add the positive camber readings to the Steering Axis Inclination (SAI).

Scrub Radius

scrub radius The scrub radius is the distance between true vertical and the line through the center of the strut and lower ball joint to the road surface. Scrub radius is built into the design of the vehicle. Scrub radius is not adjustable.

Setback

The setback is the distance in which one front hub and bearing assembly may be rearward of the other front hub and bearing assembly. Setback is primarily caused by a road hazard or vehicle collision.

Turning Angle

The turning angle is the angle of each front wheel to the vertical when the vehicle is making a turn.

SECTION 2C

FRONT SUSPENSION

SPECIFICATIONS

General Specifications

Application	Trim Height
Center of Front Wheel to Bottom of Front Wheel Well	344 mm (13.5 in.)
Center of Rear Wheel to Bottom of Rear Wheel Well	343 mm (13.5 in.)

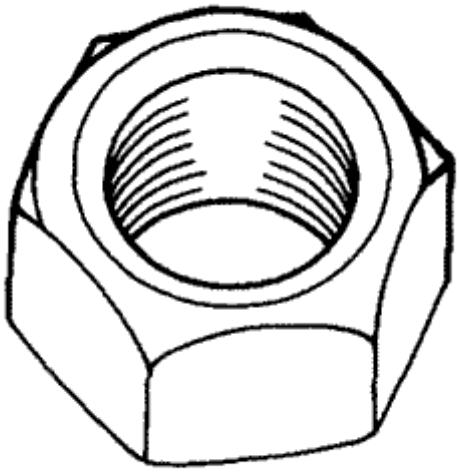
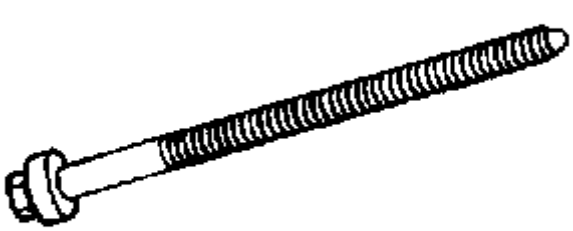
Fastener Tightening Specifications

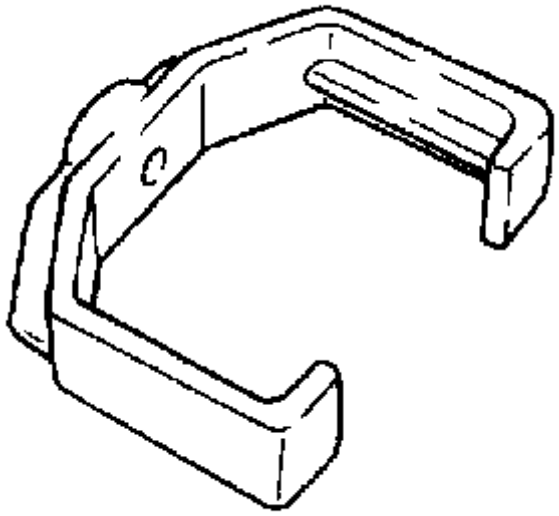
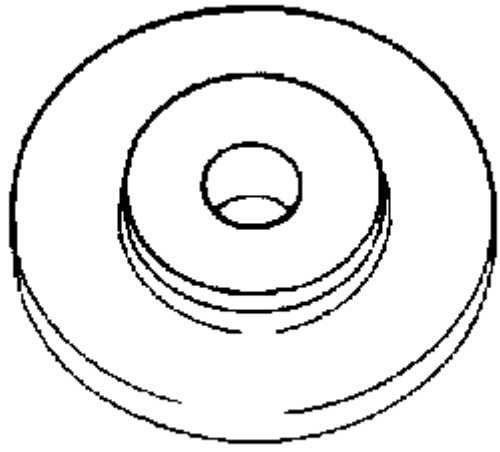
Application	N•m	Lb-Ft	Lb-In
Ball Joint-to-Control Arm Nuts	50	37	444
Ball Joint-to-Knuckle/Strut Nut	55	41	487
Control Arm Front Mounting Bolts	110	81	972
Drive Axle-to-Hub Caulking Nut	300	221	2655
Piston Rod Nut	60	44	531
Stabilizer Shaft-to-Iink nut	50	37	-
Strut Assembly-to-Body Nuts	60	44	531
Strut Cartridge Closure Nut	200	148	1776

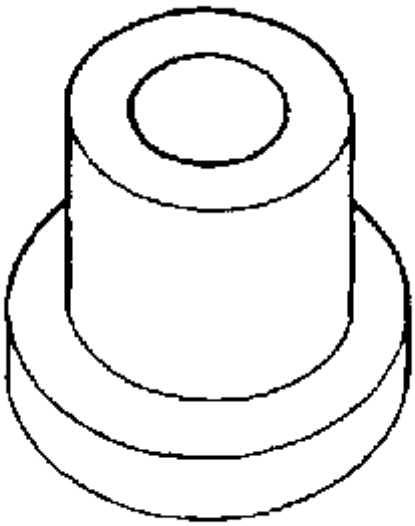
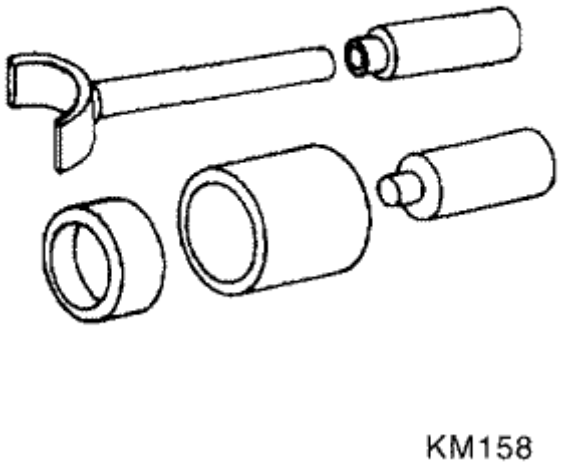
SPECIAL TOOLS

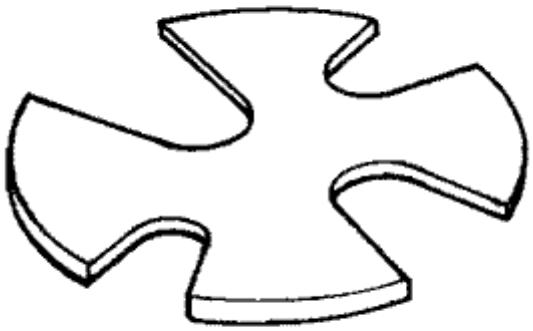
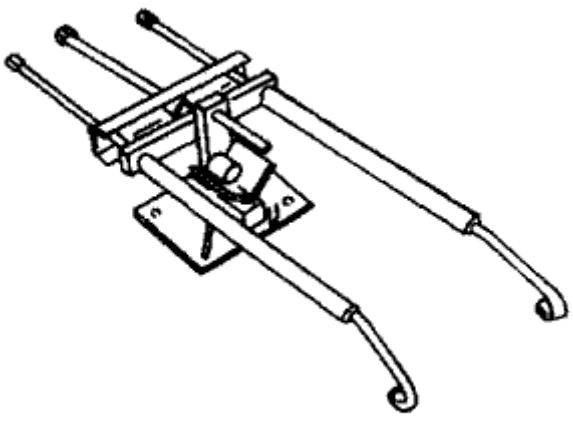
Special Tools Table

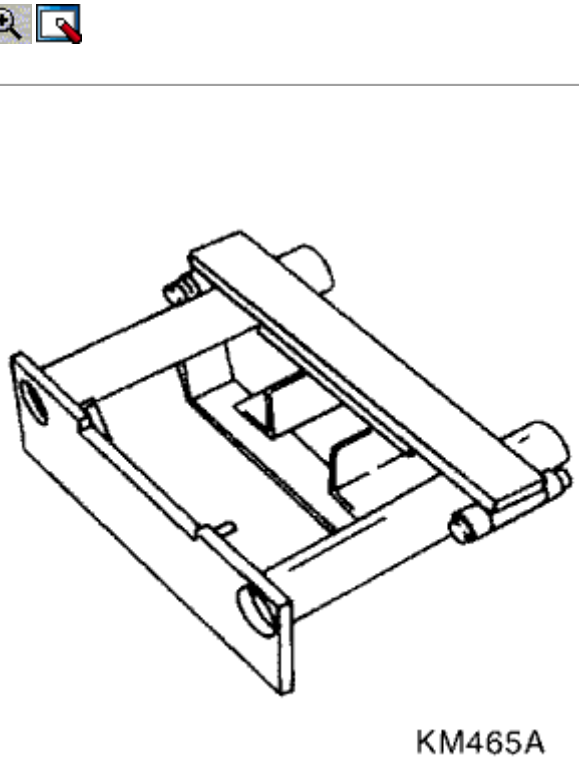
	500-20 Hex Nut

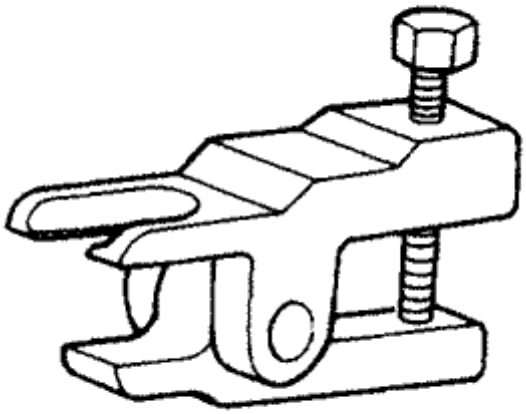
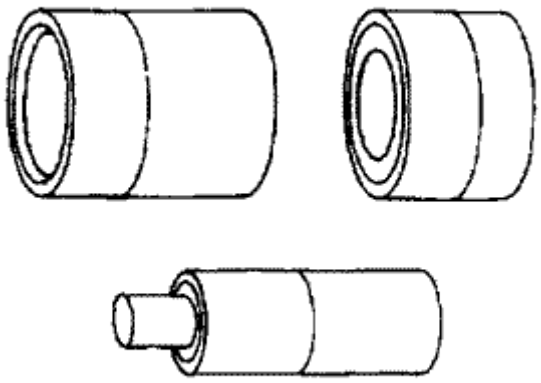
 50020	
 J366612	J-36661-2 Forcing Screw
	J-37105-B-1 Support Bridge

 J37105B1	
 J37105B2	J-37105-B-2 Bearing Adapter
	J-37105-B-3 Hub Adapter

 J37105B3	
 KM158	KM-158 Remover/Installer
	KM-307-B Removal Plate

 KM307B	
 KM329A	KM-329-A Spring Compressor
	J-42468 Front Strut Mount Nut Wrench

 J42468	
 KM465A	KM-465-A Front Spring Compressor
	KM-507-B Ball Joint Remover

 KM507B	
 KM508A	KM-508-A Remover/Installer

DIAGNOSIS

Strut Dampener

A strut dampener is basically a shock absorber. However, strut dampeners are easier to extend and retract by hand than are shock absorbers. Strut dampeners are used only on the front in most vehicles, including this vehicle. Shock absorbers are used on the rear wheels.

Struts Seem Weak

Checks	Action
Check the tire pressures.	Adjust the tire pressures to the specifications on the tire placard.
Check the load conditions under which the vehicle is normally driven.	Consult with the owner to confirm the owner's understanding of normal load conditions.
Check the compression and rebound effectiveness of the strut dampener.	Quickly push down and then lift up on the corner of the bumper nearest the strut dampener being tested. Compare the compression and rebound with those of a similar vehicle that has an acceptable ride quality. Replace the strut dampener, if needed.

Struts Are Noisy

Checks	Action
Check the mountings for looseness or damage.	Tighten the strut dampener. Replace the strut dampener, if needed.
Check the compression and rebound effectiveness of the strut dampener.	Quickly push down and then lift up on the corner of the bumper nearest the strut dampener being tested. Compare the compression and rebound with those of a similar vehicle that has an acceptable ride quality. Replace the strut dampener, if needed.

Leaks

Checks	Action
Check for a slight trace of fluid.	The strut dampener is OK.
Check the seal cover on the fully extended strut.	Replace the strut dampener.
Check for an excessive amount of fluid on the strut dampener.	Replace the strut dampener.

Ball Joint and Knuckle

Ball Joint Inspection

1. Raise the front of the vehicle to allow the front suspension to hang free.
2. Grasp the tire at the top and the bottom.
3. Move the top of the tire in an in-and-out motion.
4. Look for any horizontal movement of the knuckle relative to the control arm.

5. Ball joints must be replaced under the following conditions:
    - The joint is loose.
    - The ball seal is cut.
    - The ball stud is disconnected from the knuckle.
    - The ball stud is loose at the knuckle.
    - The ball stud can be twisted in its socket with finger pressure.

Ball Stud Inspection

Make sure to check the tightness of the ball stud in the knuckle boss during each inspection of the ball joint. One way to inspect the ball stud for wear is to shake the wheel and feel for movement of the stud end or the castellated nut at the knuckle boss.

Another way to inspect the ball stud for wear is to check the fastener torque at the castellated nut. A loose nut can indicate a stressed stud or a hole in the knuckle boss.

Worn or damaged ball joints and knuckles must be replaced.

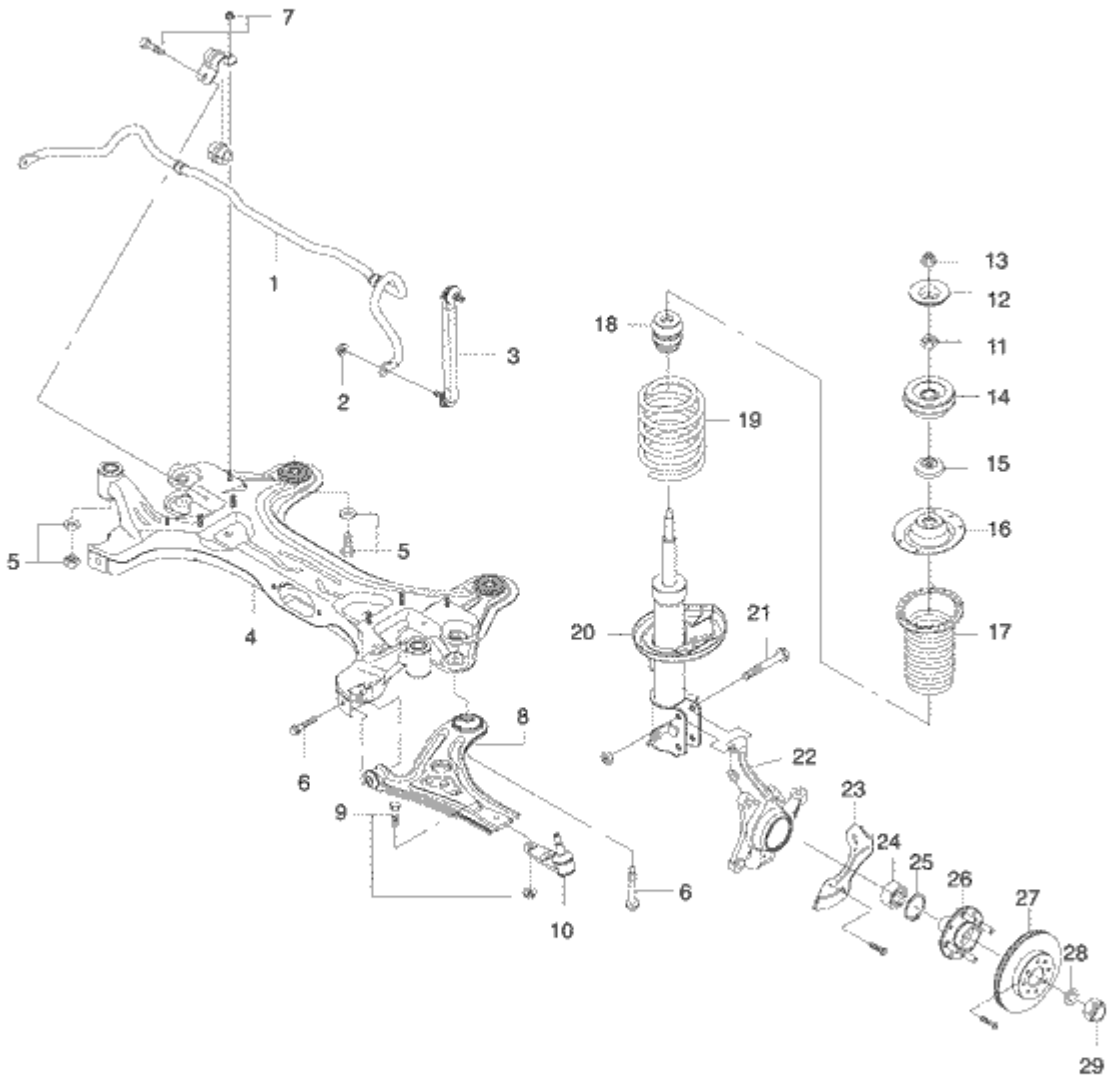
Excessive Friction Check

Use the following procedure to check for excessive friction in the front suspension:

1. Enlist the help of another technician to lift up on the front bumper, raising the vehicle as high as possible.
2. Slowly release the bumper, allowing the vehicle to assume its normal trim height. See "General Specifications" in this section.
3. Measure the distance from the street level to the center of the bumper.
4. Push down on the bumper, release slowly, and allow the vehicle to assume its normal trim height.
5. Measure the distance from the street level to the center of the bumper.
6. The difference between the two measurements should be less than 12.7 mm (0.5 inch). If the difference exceeds this limit, inspect the control arms, the struts, and the ball joints for damage or wear.

COMPONENT LOCATOR

Front Suspension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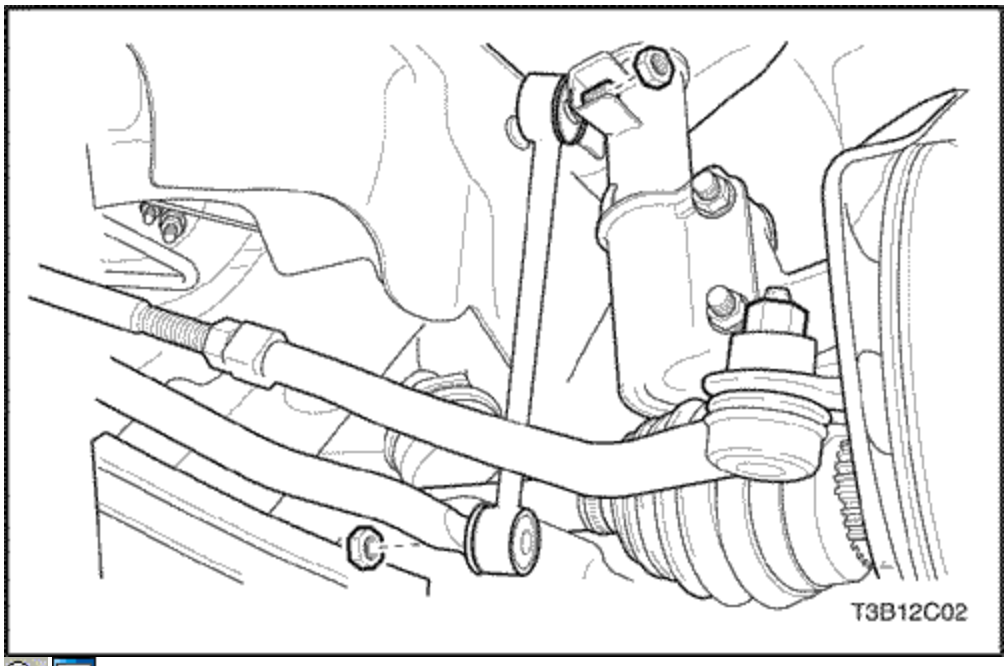
1. Stabilizer bar
2. Stabilizer link nut
3. Stabilizer link
4. Crossmember
5. Crossmember nut (front direction)
6. Control arm connecting bolt
7. Stabilizer bar nut
8. Control arm
9. Ball joint connecting bolt
10. Ball joint
11. Piston rod nut
12. Washer
13. Strut upper nut
14. Strut mount
15. Bearing
16. Spring upper seat
17. Spring upper insulator
18. Hallow bumper
19. Coil spring
20. Thrust
21. Thrust bracket bolt
22. Steering knuckle
23. Cover seat
24. Wheel bearing
25. Retaining ring
26. Wheel hub
27. Brake disc
28. Washer
29. Caulking nut

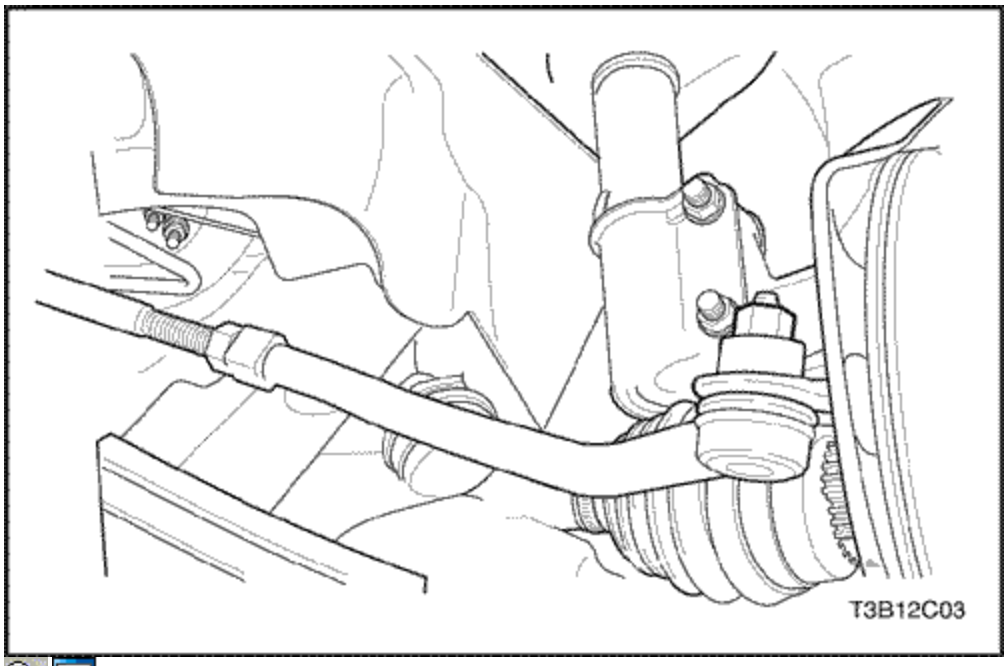
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

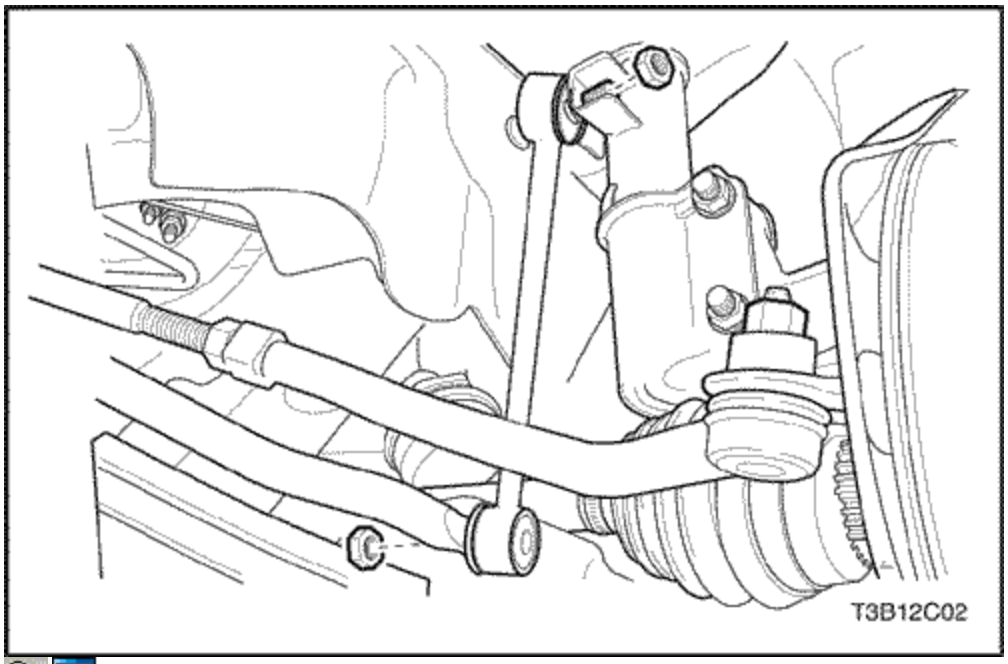


Stabilizer Shaft Link
Removal Procedure

1. Lift and suitably support the vehicle, allowing the front suspension to hang free.
2. Remove the front wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the stabilizer shaft-to-knuckle nut and the shaft-to-link nut.



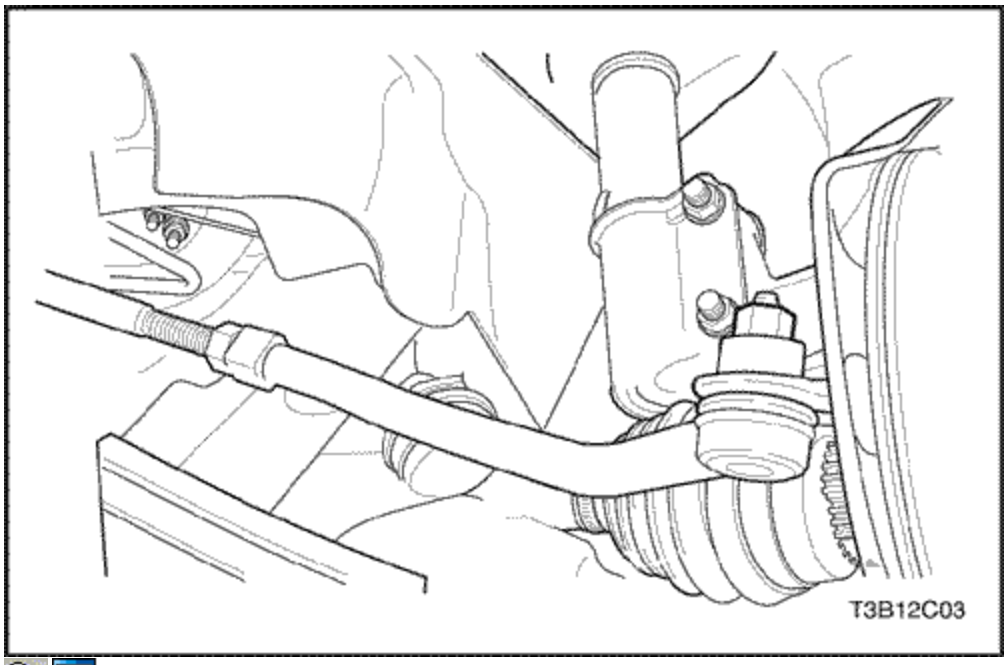
4. Disconnect the stabilizer shaft from the knucle by removing the stabilizer shaft link assembly.

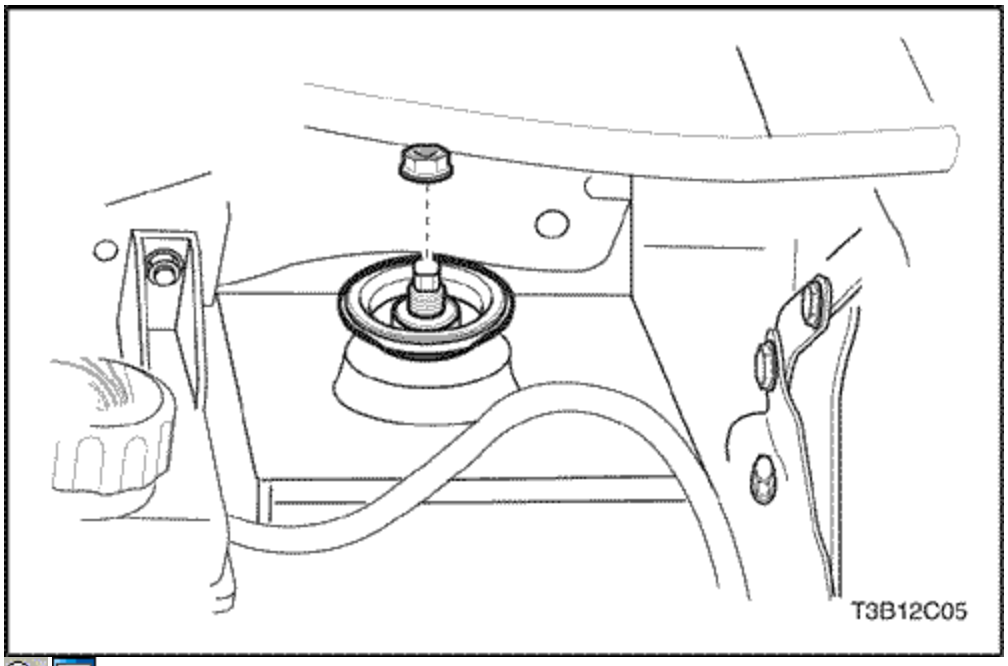


Installation Procedure

1. Install the stabilizer shaft into the vehicle.
2. Install the stabilizer shaft-to-knuckle nut and the shaft-to-link nut.

   Tighten
   Tighten the stabilizer shaft link nuts to 50 N•m (37 lb-ft).

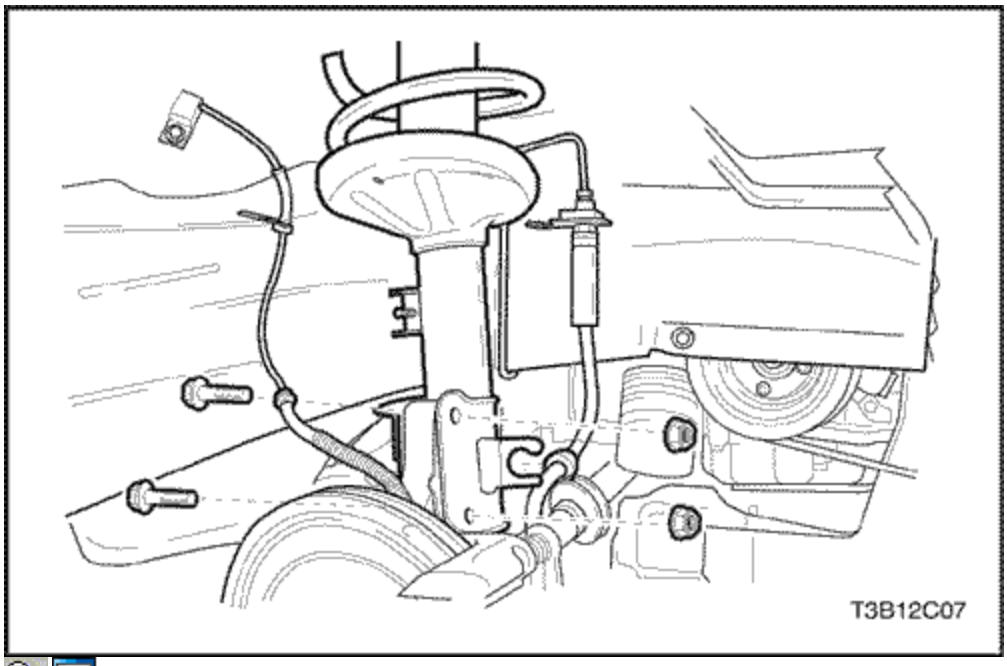




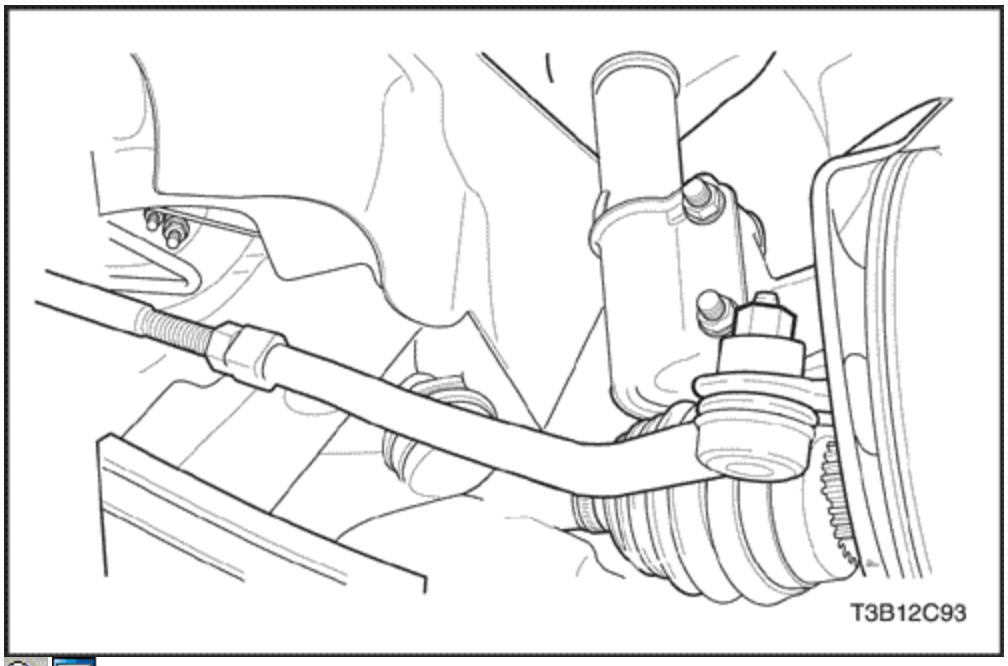
Strut Assembly
Tools Required

KM-507-B Ball Joint Remover
Removal Procedure

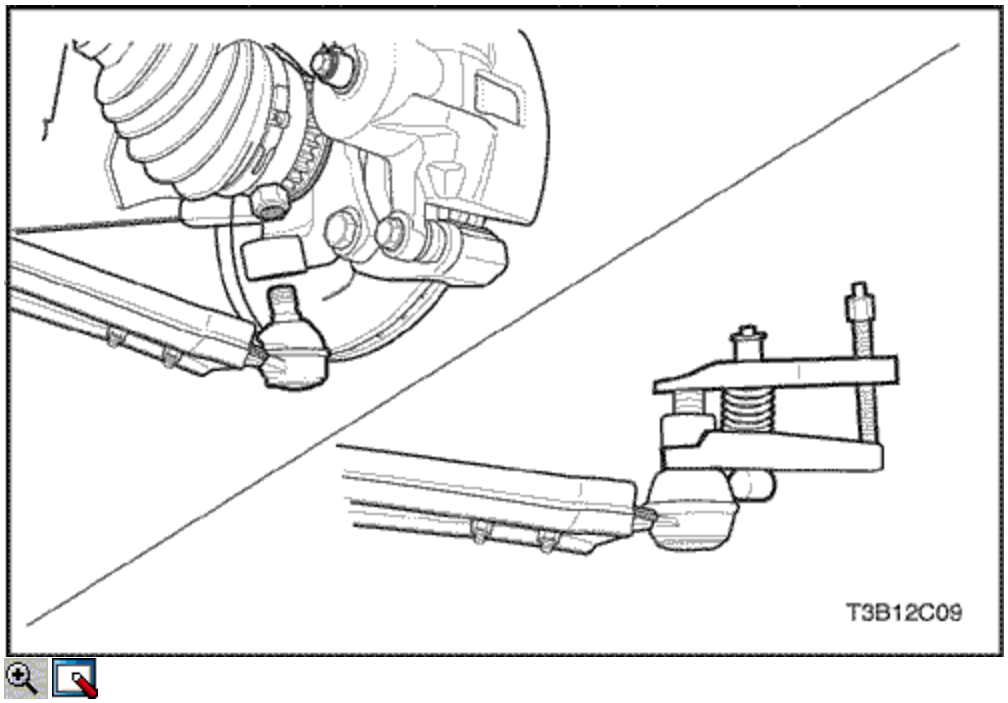
1. Loosen the strut assembly -to-body nut that attach the top of the strut assembly to the vehicle.



2. Raise and suitably support the vehicle.
3. Place the jackstands under the frame of the vehicle.
4. Lower the vehicle slightly so the weight of the vehicle rests on the jackstands and not on the control arms.
5. Remove the wheel. Refer to *Section 2E, Tires and Wheels.*
6. Disconnect the brake caliper from the knuckle/strut assembly and support the caliper. Do not hang the caliper from the hydraulic brake hose. Refer to *Section 4D, Front Disc Brakes.*
7. Disconnect the ABS speed sensor electrical connector, if applicable.



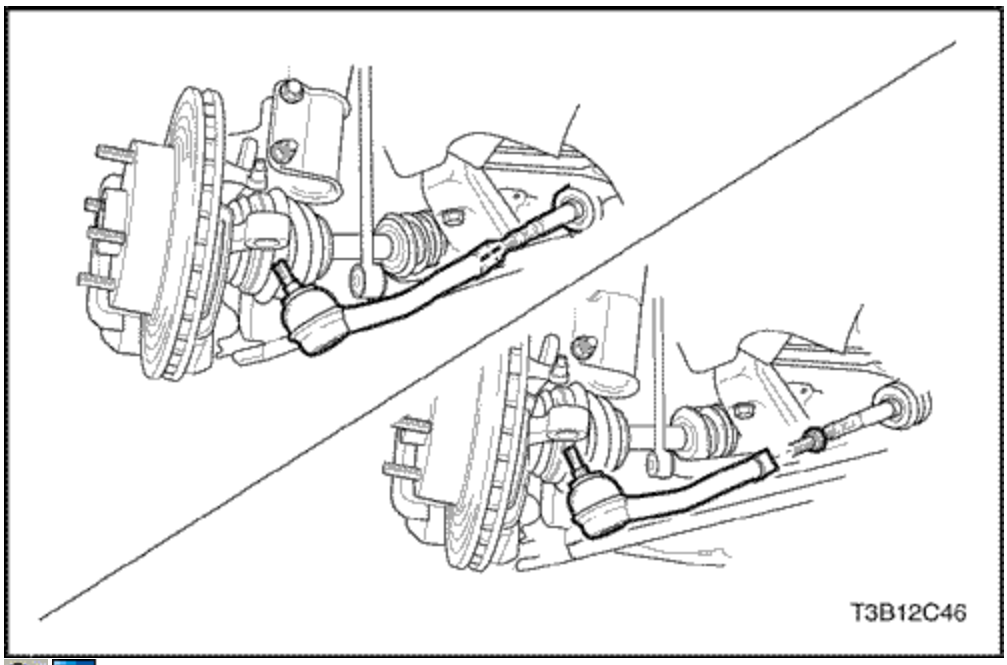
8. Remove the ball joint-to-knuckle-strut nut.



Notice : Failure to use the recommended tool for separating the ball joint from the steering knuckle assembly may damage the ball joint and seal.

9. Separate the steering knuckle assembly from the ball joint using the ball joint remover KM-507-B.
10. Remove the outer tie rod from the steering knuckle assembly. Refer to *Section 6C, Power Steering Gear [Includes Rack & Pinion Gear]* or *Section 6D, Manual Steering Gear [Includes Rack & Pinion Gear].*

Notice : Take care to prevent the axle joints from being overextended. When either end of the shaft is disconnected, the joint can become overextended. This overextension can cause the internal components to separate. This separation can cause joint failure. Use drive axle joint seal protectors during any service on or near the drive axles. Failure to use joint seal protectors can damage the interior joint seal and cause joint failure.

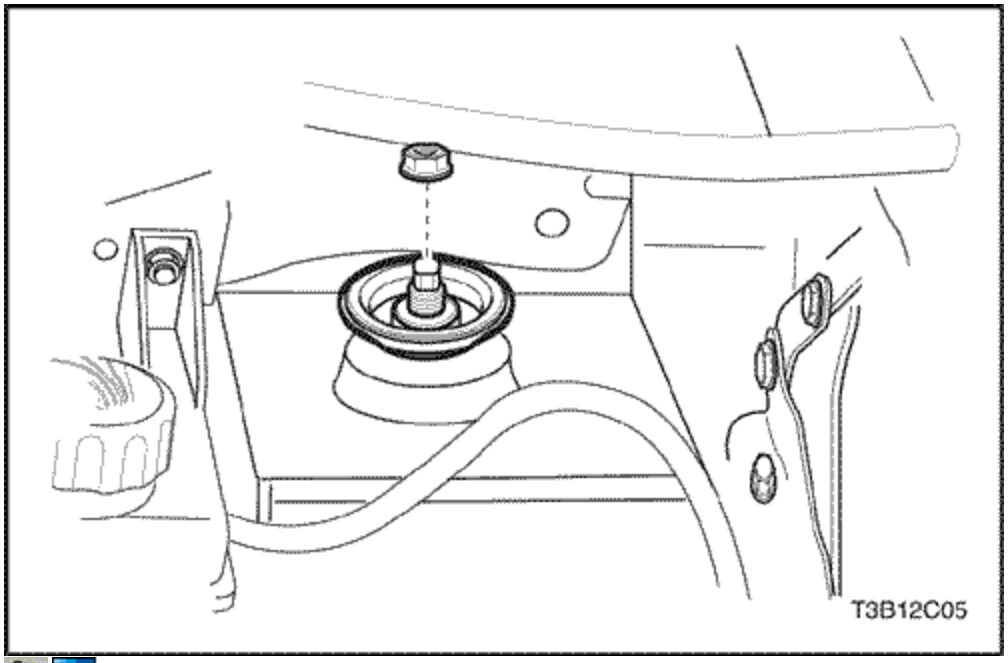


11. Push the drive axle shaft from the front wheel hub.
12. Support the drive axle.

13. Lower the vehicle in order to gain access to the strut-to-body nuts and the washers.

Notice : Chipping or scratching the spring coating when handling the front suspension coil spring can cause the spring to fail.

14. Remove the strut assembly-to-body nuts.
15. Remove the strut assembly from the vehicle.

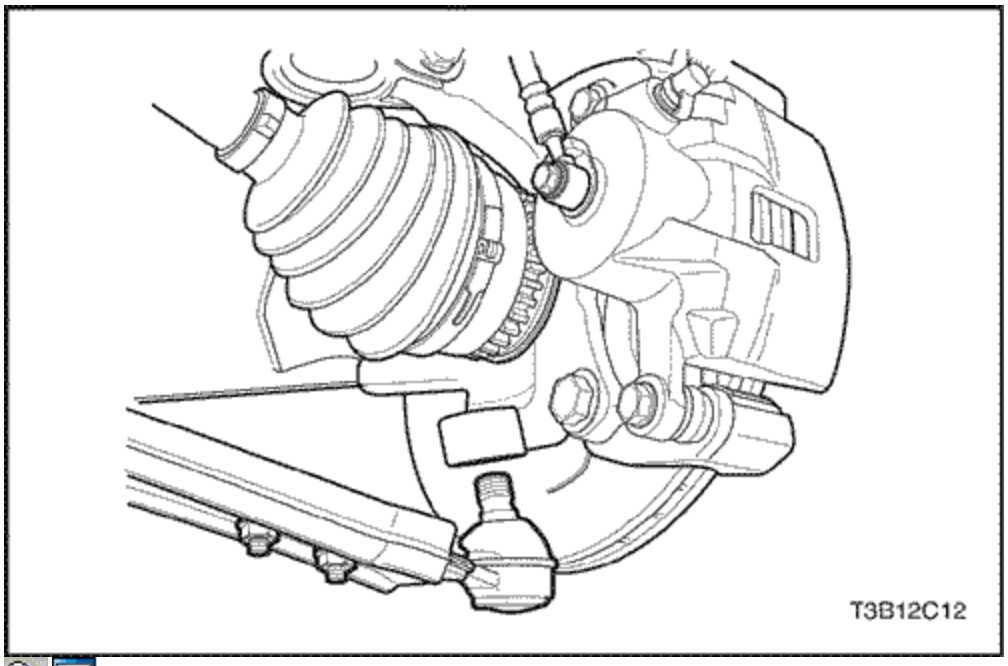


Installation Procedure

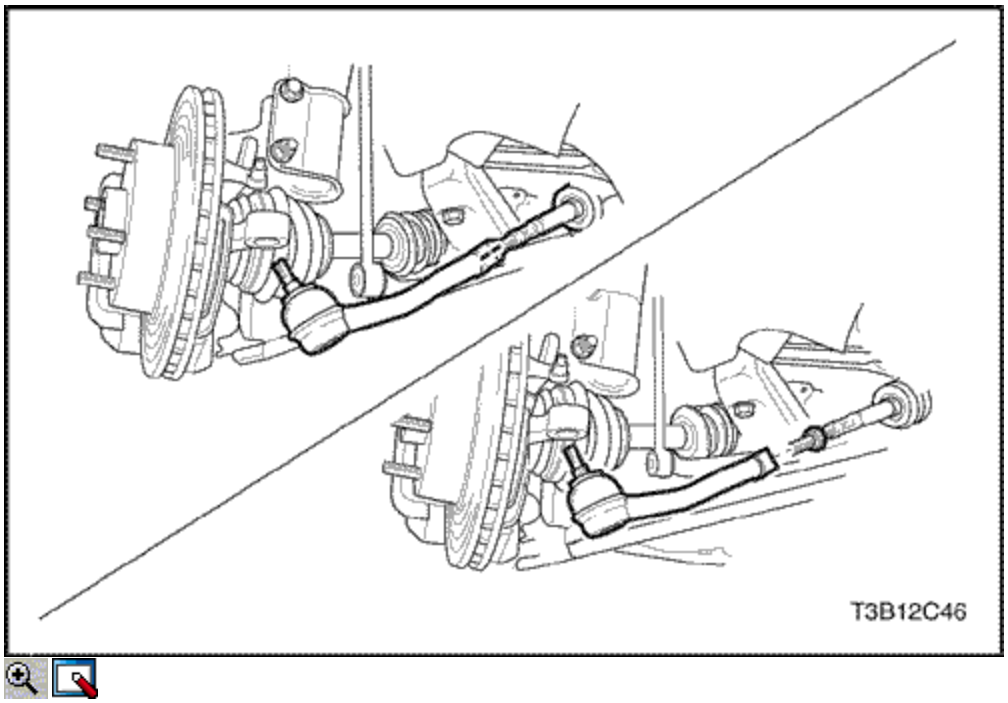
Notice : Chipping or scratching the spring coating when handling the front suspension coil spring can cause the spring to fail.

1. nstall the strut assembly into the vehicle with the strut assembly-to-body nuts.

Tighten
Tighten the strut assembly-to-body nut to 60 N•m (44 lb-ft).

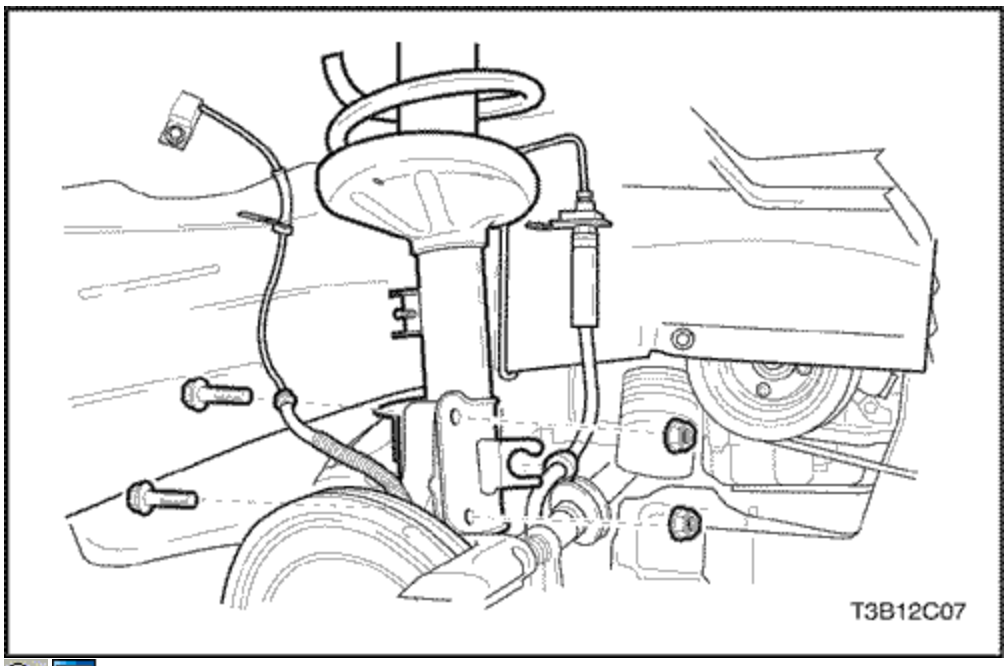


2. Connect the drive axle to the front wheel hub.

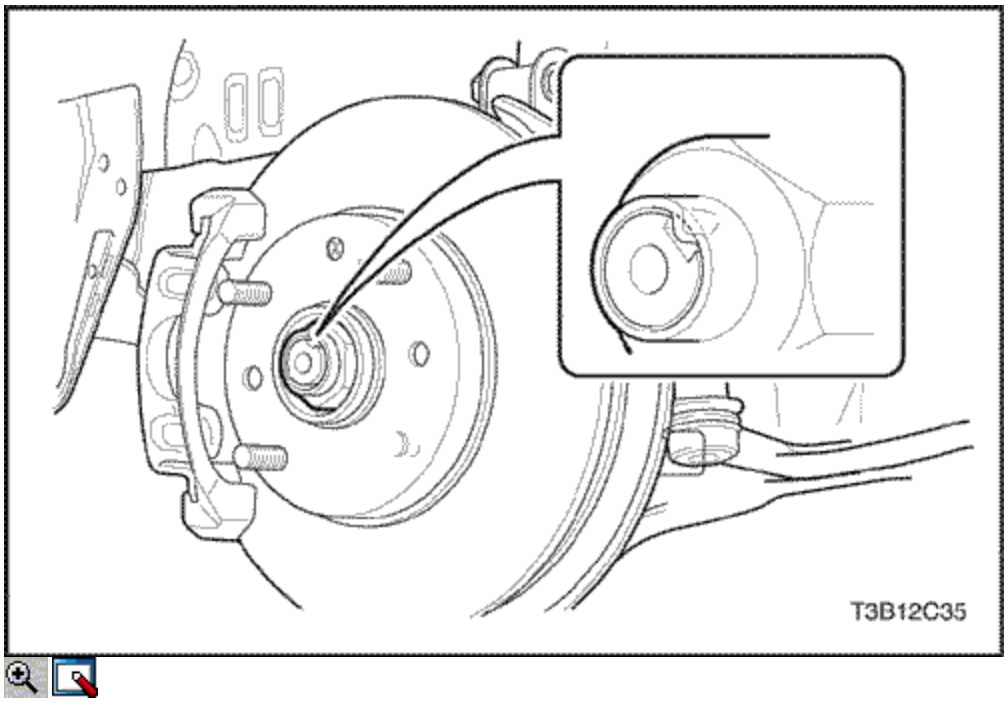


3. Connect the outer tie rod to the steering knuckle assembly. Refer to *Section 6C, Power Steering Gear [Includes Rack & Pinion Gear]* or *Section 6D, Manual Steering Gear [Includes Rack & Pinion Gear].*
4. Connect the ball joint to the steering knuckle assembly.
5. Install the ball joint-to-knuckle/strut nut.

   Tighten
   Tighten the ball joint-to-knuckle/strut nut to 55 N•m (41 lb-ft).



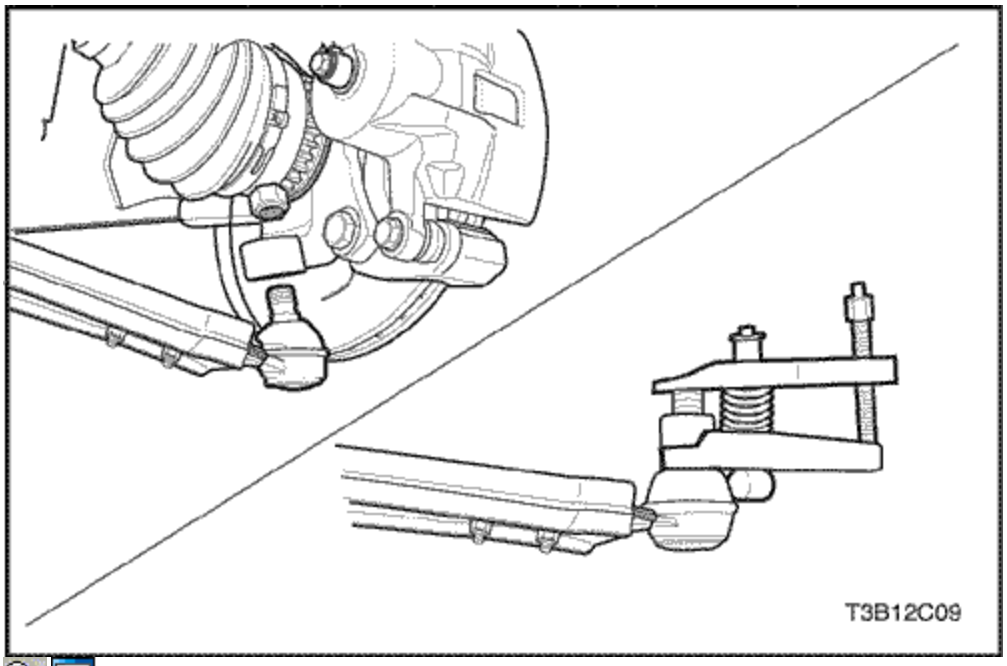
6. Connect the ABS speed sensor electrical connector, if applicable.



7. Connect the brake caliper to the knuckle/strut assembly. Refer to *Section 4D, Front Disc Brakes.*
8. Install the wheel. Refer to *Section 2E, Tires and Wheels.*
9. Install a new drive axle-to-hub caulking nut.

   Tighten
   Tighten the drive axle-to-hub caulking nut to 300 N•m (221 lb-ft).

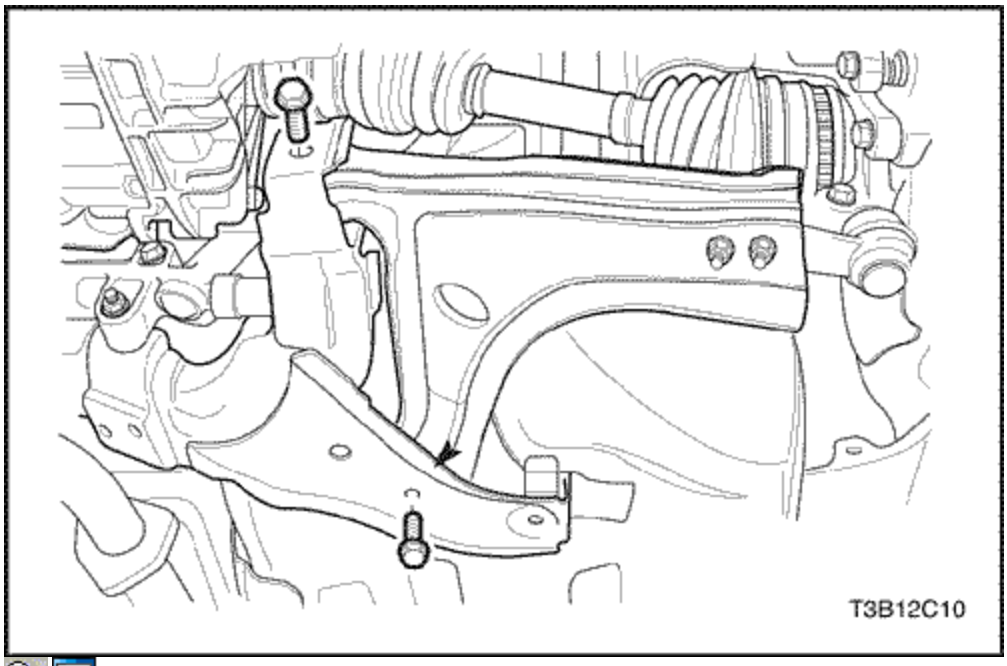
10. Crimp the caulking nut sleeve onto the drive axle shaft.



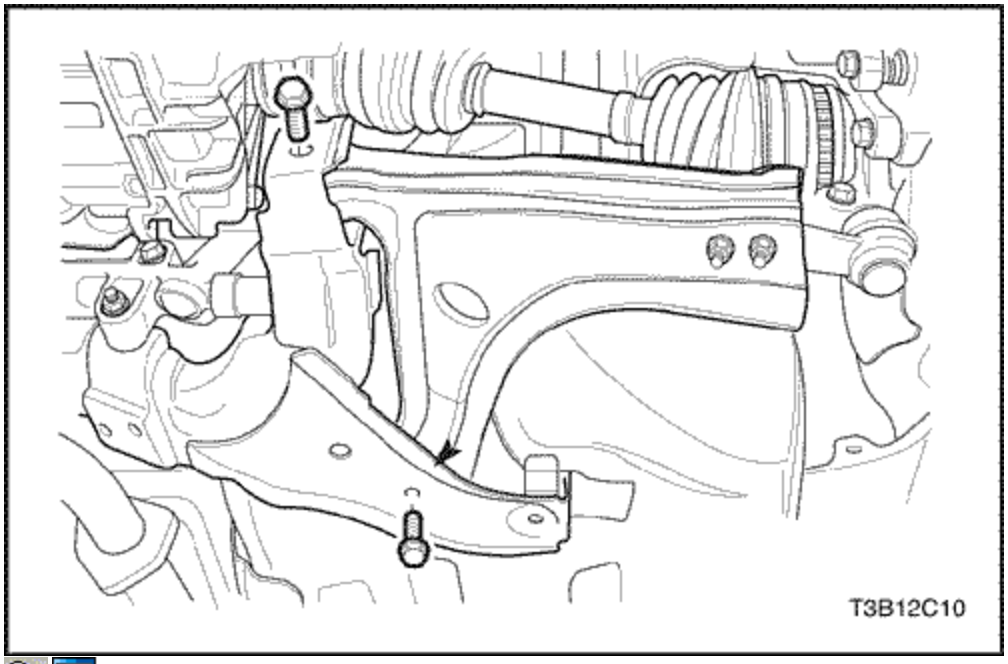
Control Arm
Tools Required

KM-507-B Ball Joint Remover
Removal Procedure

1. Raise and suitably support the vehicle.
2. Place the jackstands under the frame of the vehicle.
3. Lower the vehicle slightly so the weight of the vehicle rests on the jackstands and not on the control arms.
4. Remove the wheel. Refer to *Section 2E, Tires and Wheels.*
5. Disconnect the stabilizer shaft from the control arm by removing the control armlink bolt assembly.Refer to "Stabilizer Shaft and Insulators" in this section.
6. Remove the retaining clip and the ball joint-to-knuckle/strut nut from the ball joint.
7. Disconnect the ball joint from the steering knuckle using the ball joint remover KM-507-B.



8. Remove the control arm front mounting bolt.
9. Remove the control arm rear mounting bolts and the bracket.
10. Remove the control arm from the vehicle.



Installation Procedure

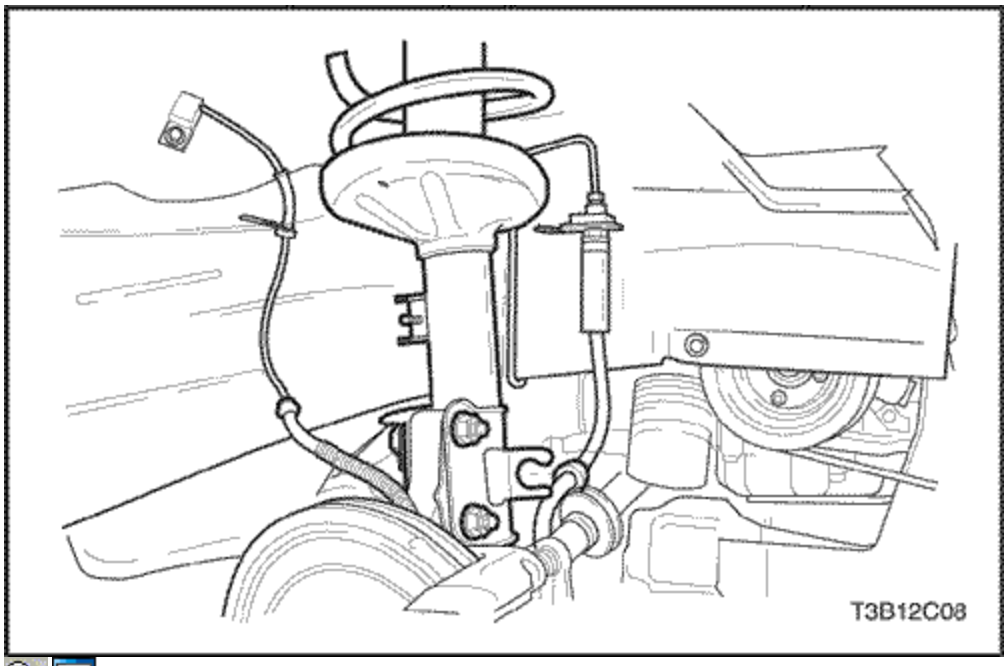
1. Install the control arm onto the vehicle.
2. Connect the front of the control arm to the body of the vehicle with the front mounting bolt and the washer.
3. Apply a thread sealer to the control arm rear mounting bolts.
4. Connect the rear of the control arm to the body of the vehicle with the rear mounting bracket and bolts.

   Important : Do not tighten the control arm bolts at this point.
   Notice : Use a new self-locking nut to install the control arm link bolt assembly. Failure to do so will allow the normal vibration of the vehicle to loosen the nut and damage the vehicle.

5. Install the stabilizer shaft link bolt assembly. Refer to "Stabilizer Shaft and Insulators" in this section.
6. Connect the ball joint to the steering knuckle.
7. Tighten the ball joint-to-knuckle/strut nut.

   Tighten
   Tighten the ball joint-to-knuckle/strut nut to 55 N•m (41 lb-ft).

8. Connect the retaining clip to the ball joint stud.
9. Install the wheel. Refer to *Section 2E, Tires and Wheels.*
10. Raise the vehicle.
11. Place the jackstands under the control arms.
12. Lower the vehicle.



Important : The control arms must support the weight of the vehicle while the control arm mounting bolts are being tightened.

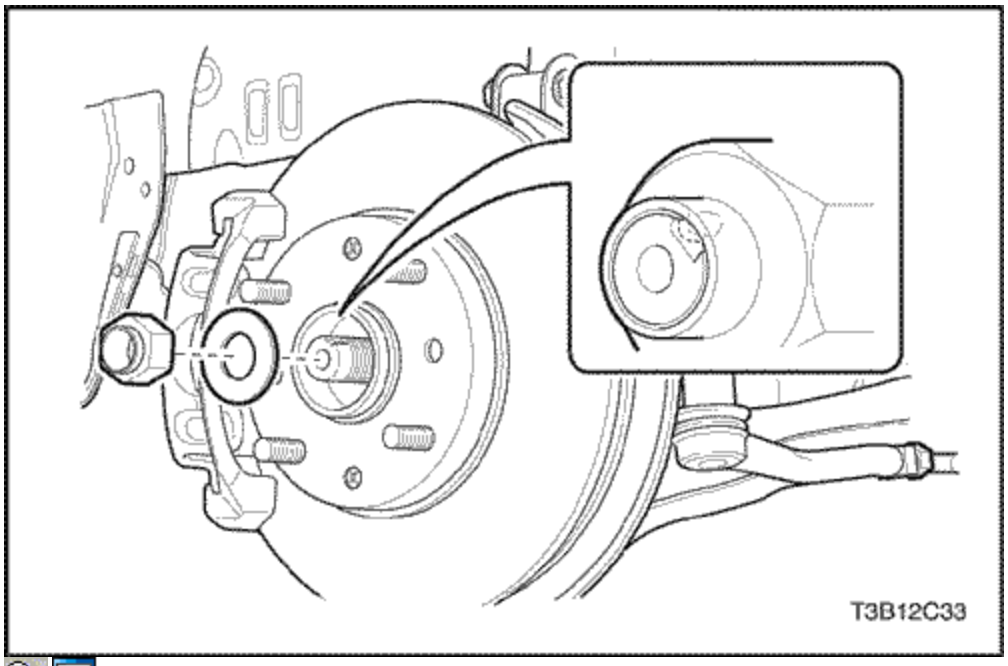
13. Tighten the control arm rear mounting bolts.

Tighten
Tighten the control arm rear mounting bolts to 110 N•m (81lb-ft).

14. Tighten the control arm front mounting bolt.

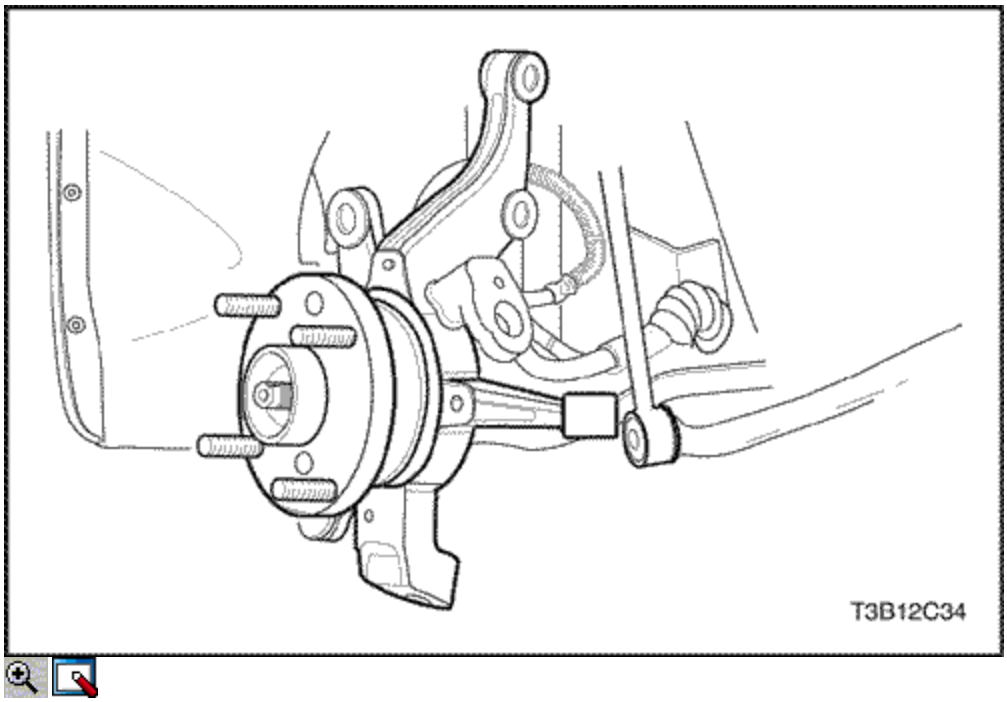
Tighten
Tighten the control arm front mounting bolt to 110 N•m (81 lb-ft).

15. Raise the vehicle.
16. Remove the jackstands.
17. Lower the vehicle.

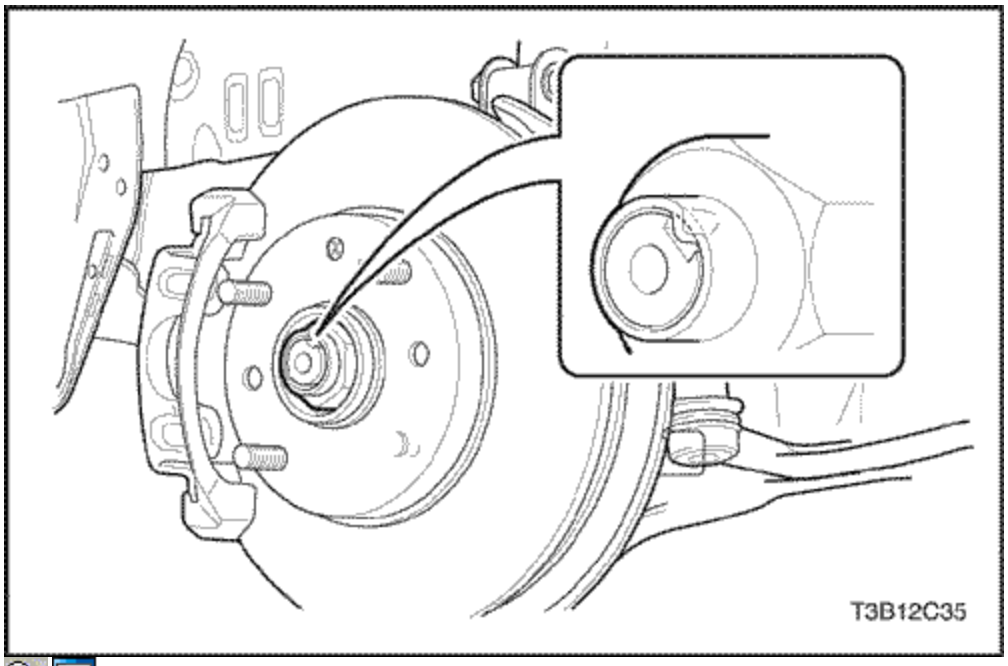


Steering Knuckle
Removal Procedure

1. Remove the front wheels.Refer to *Section 2E, Tires and Wheels.*
2. Remove the caulking nut.
3. Remove the tie rod end from the knuckle.
4. Remove the control arm ball joint.
5. Remove the brake caliper.
6. Remove the brake disk.Refer to *Section 4E, Front Disk Brakes.*



7. Remove the ABS wheel speed sensor, if equipped Refer to *Section 4F, ABS from the knuckle.*
8. Remove the backing plate.
9. Remove the front strut bolts.
10. Remove the knuckle assembly.



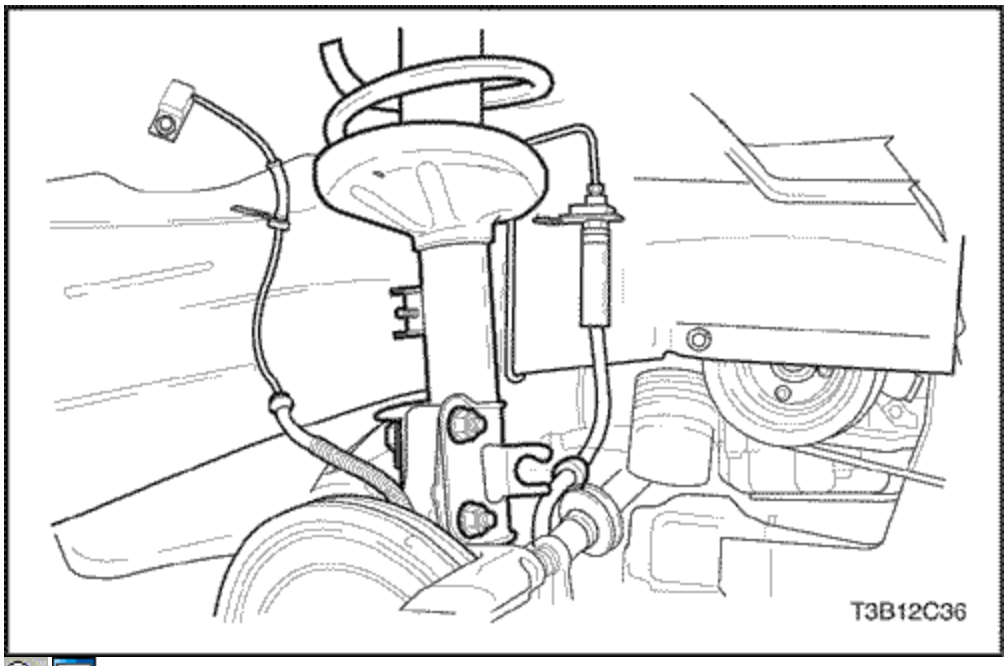
Installation Procedure

1. Install the knuckle assembly to the front strut with bolt and nuts.

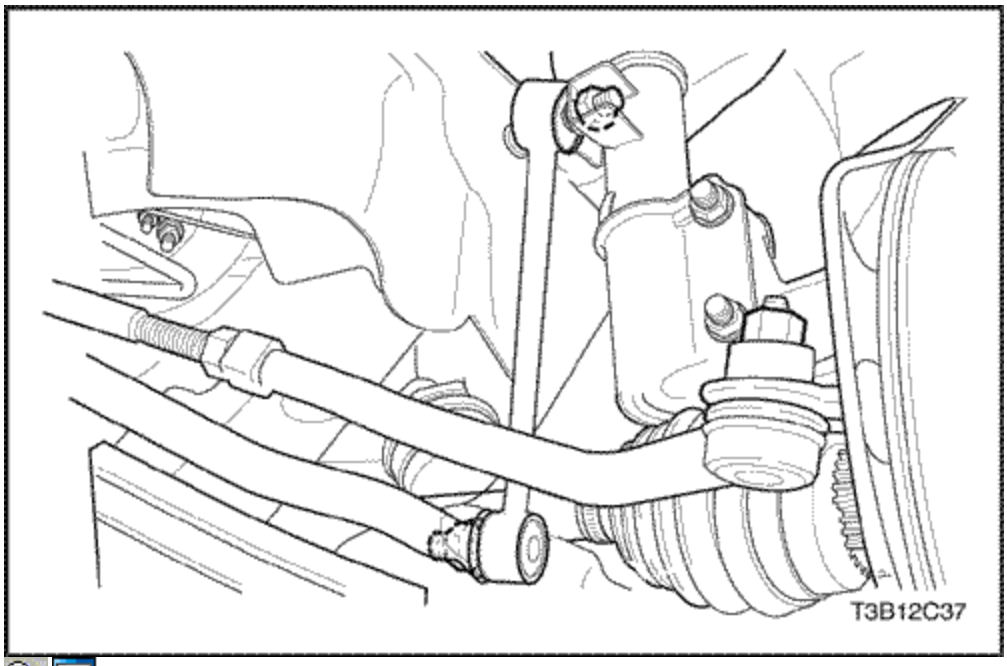
   Tighten
   Tighten the knuckle assembly to the front strut with bolt and nuts to 100 N•m (74lb-ft).

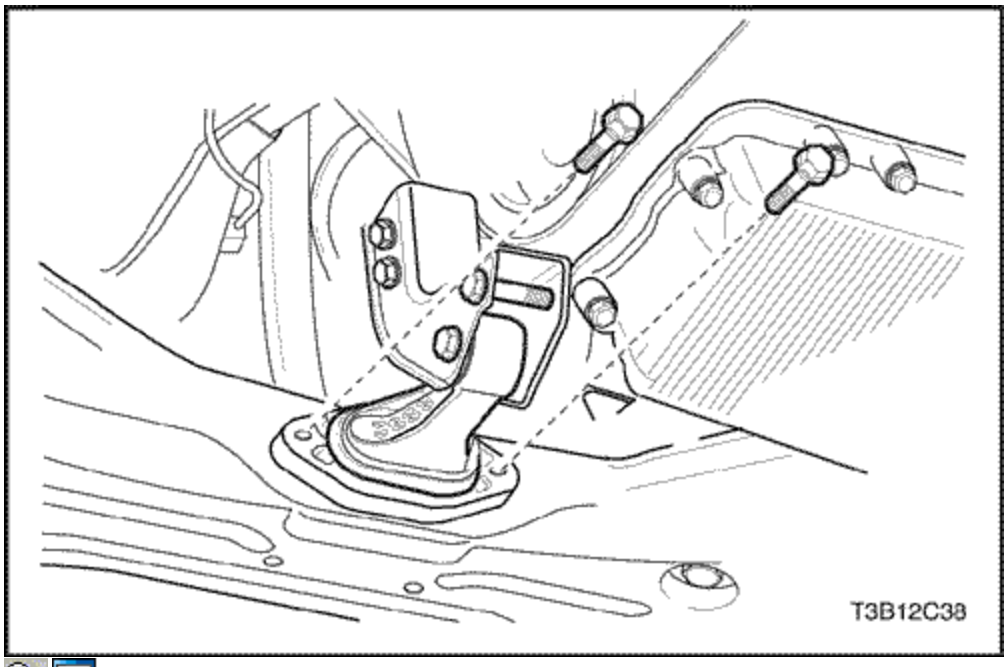
2. Install the backing plate with the screws.

   Tighten
   Tighten the backing plate with the screws to 4 N•m (3lb-ft).



3. Install the ABS wheel speed sensor.
4. Install the brake disk and caliper.Refer to *Section 4D, Front Disk Brakes.*
5. Install the control arm ball joint.Refer to *this Section, Unit Repair*
6. Install the tie rod end to the knucke. Refer to *this Section.*

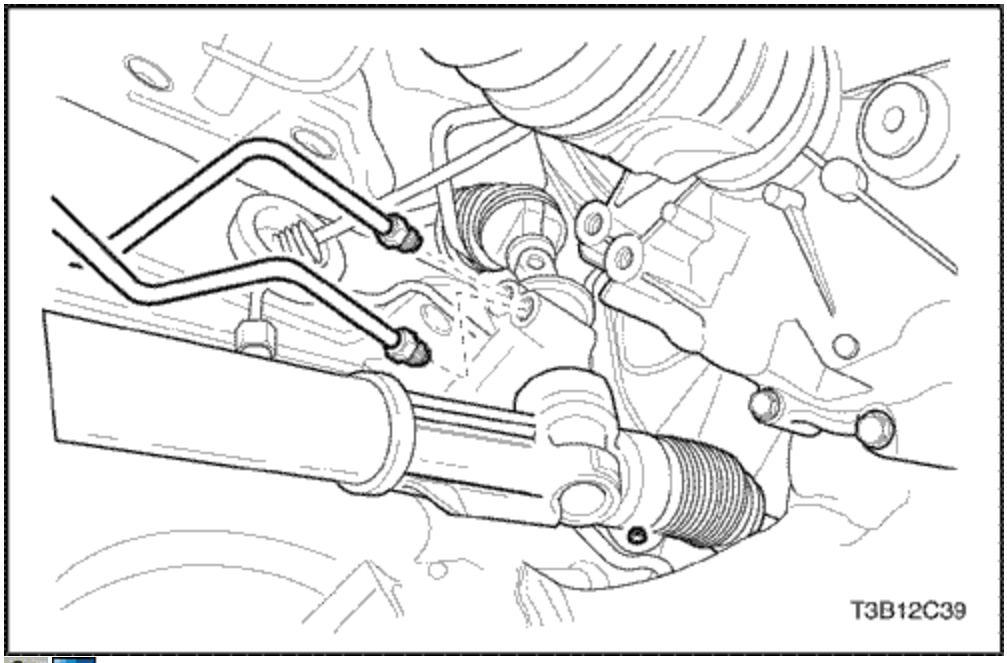




Crossmember Assembly
Removal Procedure

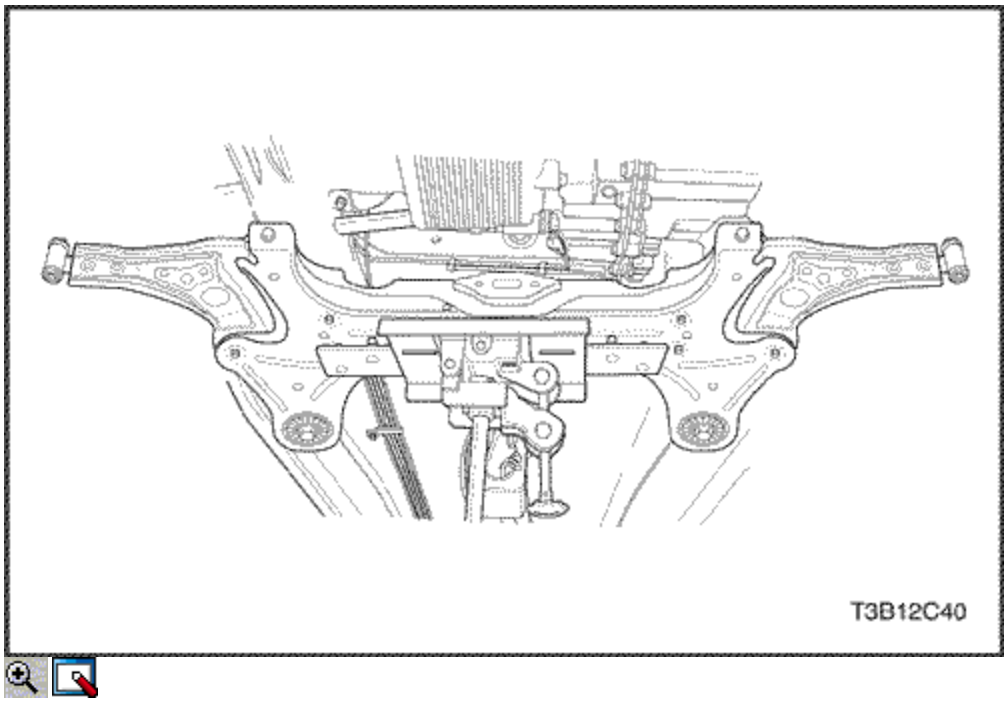
1. Remove the front wheels.

2. Remove the control arm ball joint and stabilizer shaft link nut (lower). Refer to *this Section.*
3. Remove the tie rod end ball joint. Refer to *this Section.*
4. Remove the engine mounting reaction rod bolts.



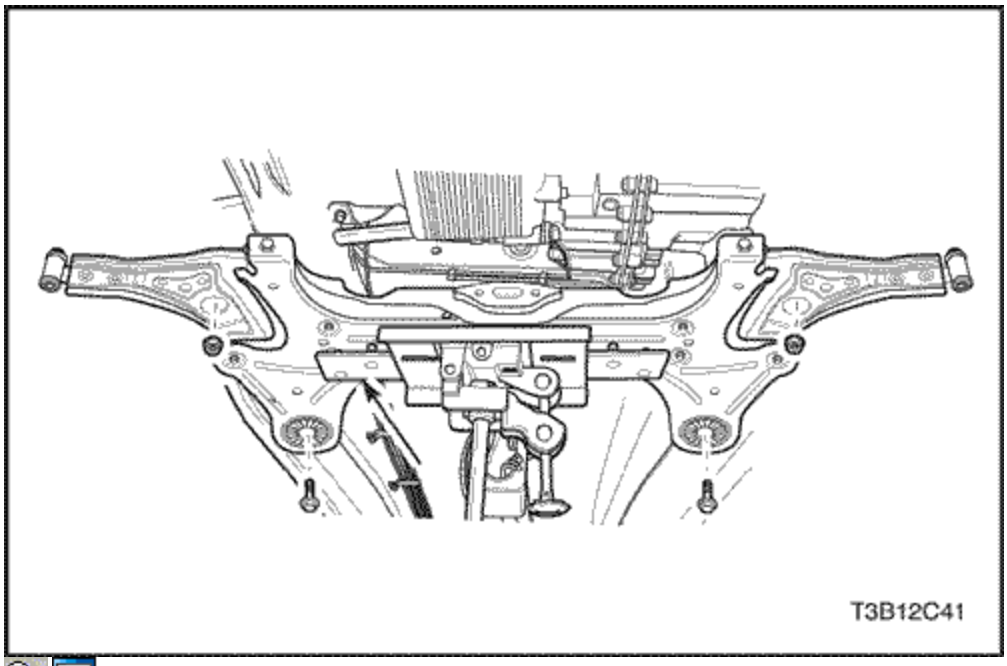
5. Drain the power steering fluid.
6. Remove the power steering pipe fittings.
7. Remove the interm shaft lower joint.

Caution : When the engine is hot, do not remove the above parts from the vehicle otherwise, personal injury can be caused by hot components of the vehicle.

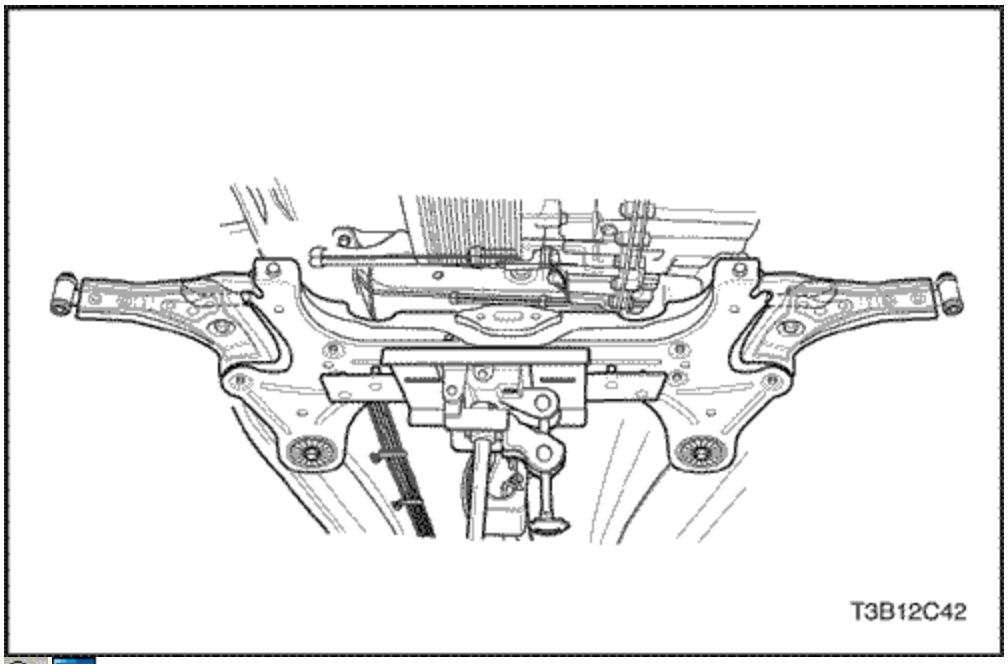


8. Remove the crossmember assembly.

Caution : To avoid personal injury or vehicle damage, the crossmember should be supported by jackstand prior to the removal.



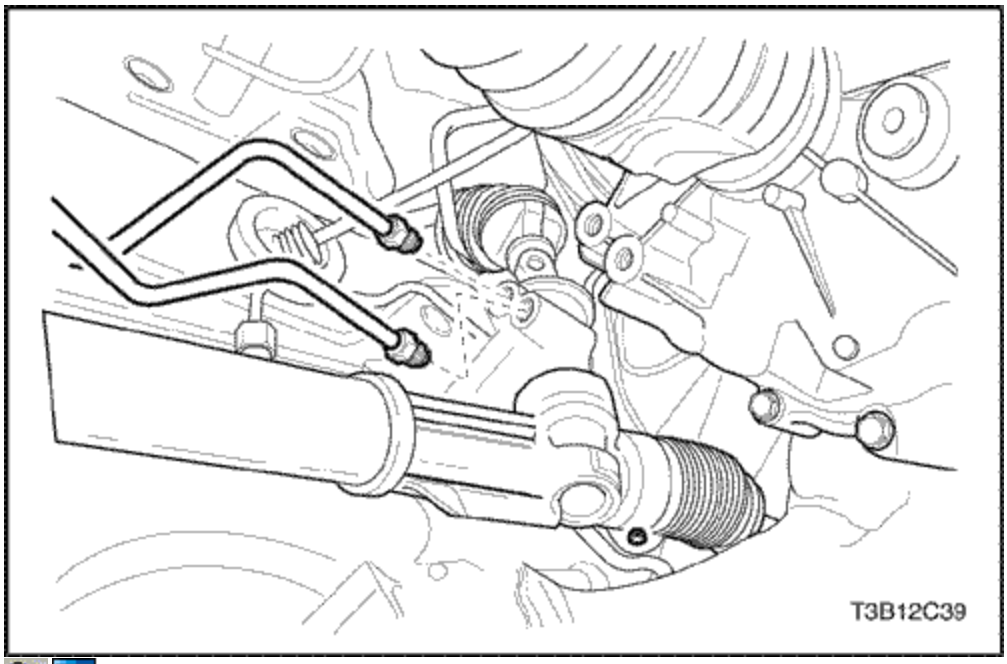
9. Remove the stabilizer bar, power steering gear set and control arm from the crossmember.



Installation Procedure

1. Install the stabilizer bar, power steering gearset and control arm from the crossmember.
2. Install the crossmember assembly front to body nut and the crossmember assembly rear to body bolt.

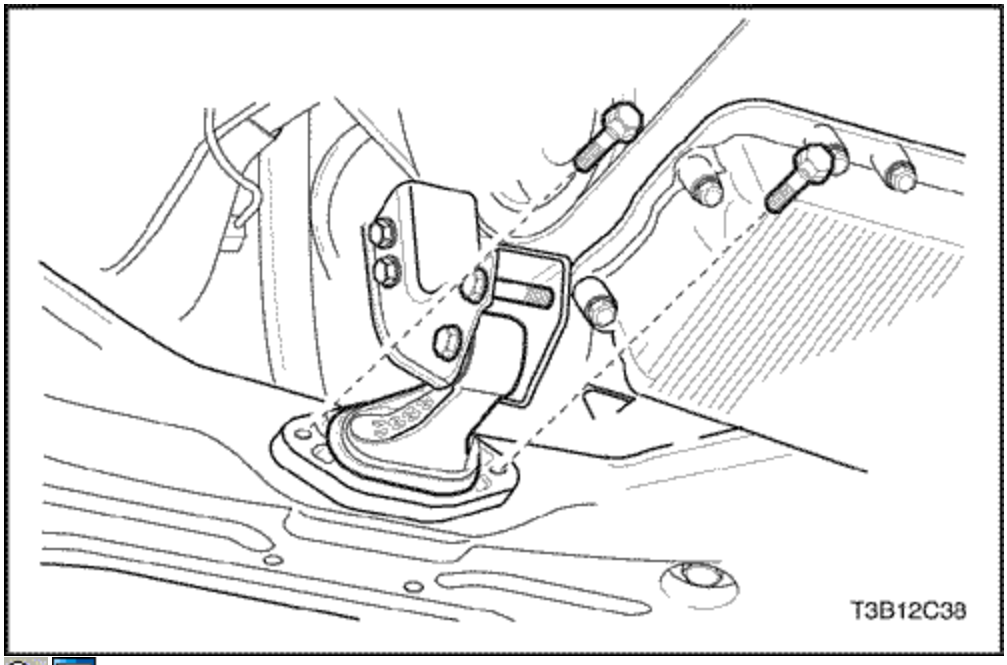
   Tighten
   Tighten the crossmember assembly front to body nut and rear to body bolt to 150 N•m (111 lb-ft).



3. Connect the interm shaft lower joint and power steering pipe fittings.

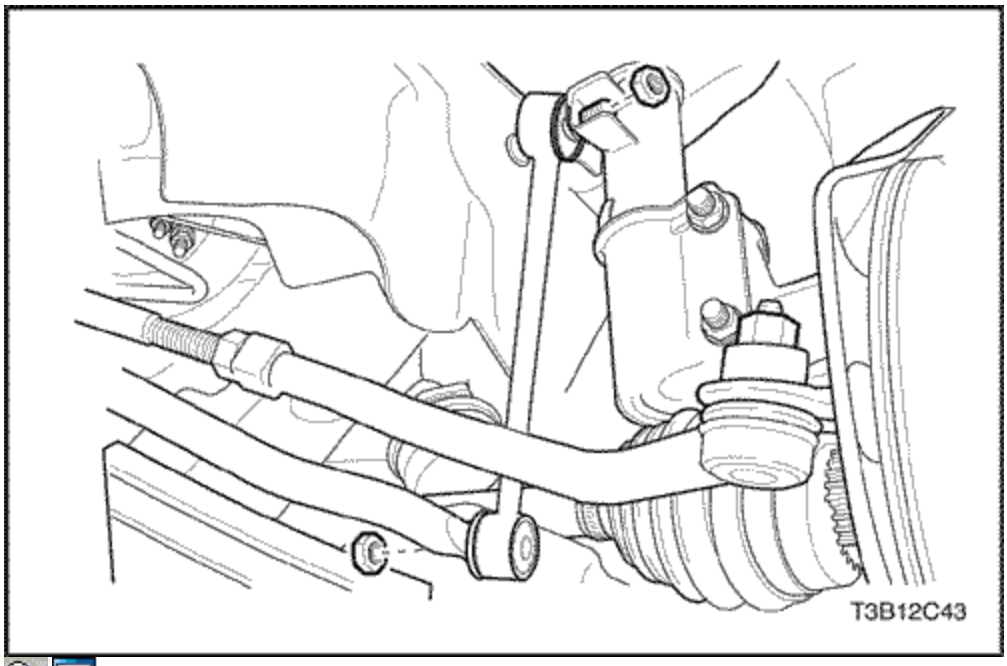
   Tighten
   Tighten the power steering pipe fittings to 22 N•m (16 lb-ft).

4. Fill the fluid reservoir with the power steering fluid.
5. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to *Section 6A, Bleeding the Power Steering System.*



6. Install the engine mounting reaction rod bolts.

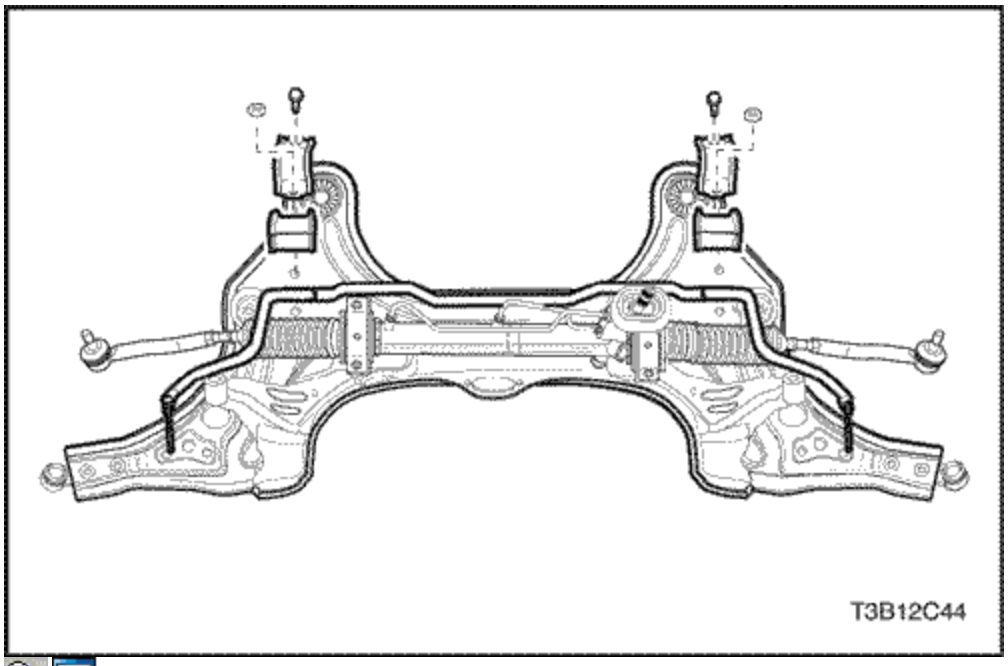
   Tighten
   Tighten the engine mounting reaction rod bolts to 60 N•m (44 lb-ft).



7. Install the tie rod end ball joint nut.

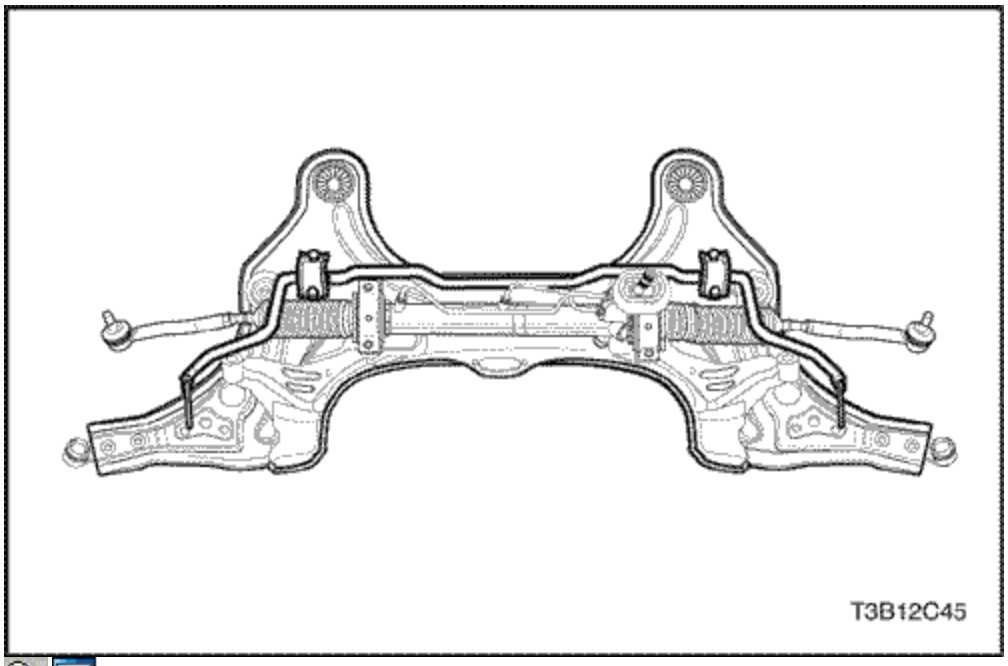
   Tighten
   Tighten the tie rod end ball joint nut to 45 N•m (33 lb-ft).

8. Install the control arm ball joint and stabilizer shaft link nut (lower). Refer to *this Section.*



Stabilizer Bar
Removal Procedure

1. Remove the crossmember assmbly. Refer to *this Section*
2. Remove the stabilizer bar from the crossmember assembly by unscrewing the u-clamp bolts.



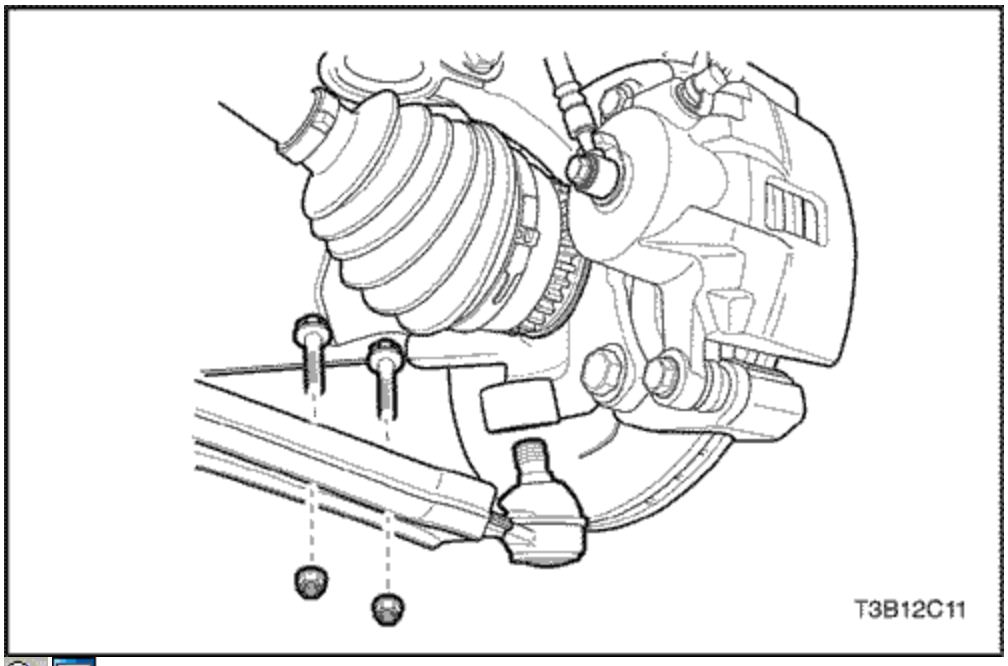
Installation Procedure

1. Install the u-clamp bolts to the stabilizer bar.

   Tighten
   Tighten the u-clamp bolts to the stabilizer bar to 25 N•m (18 lb-ft).

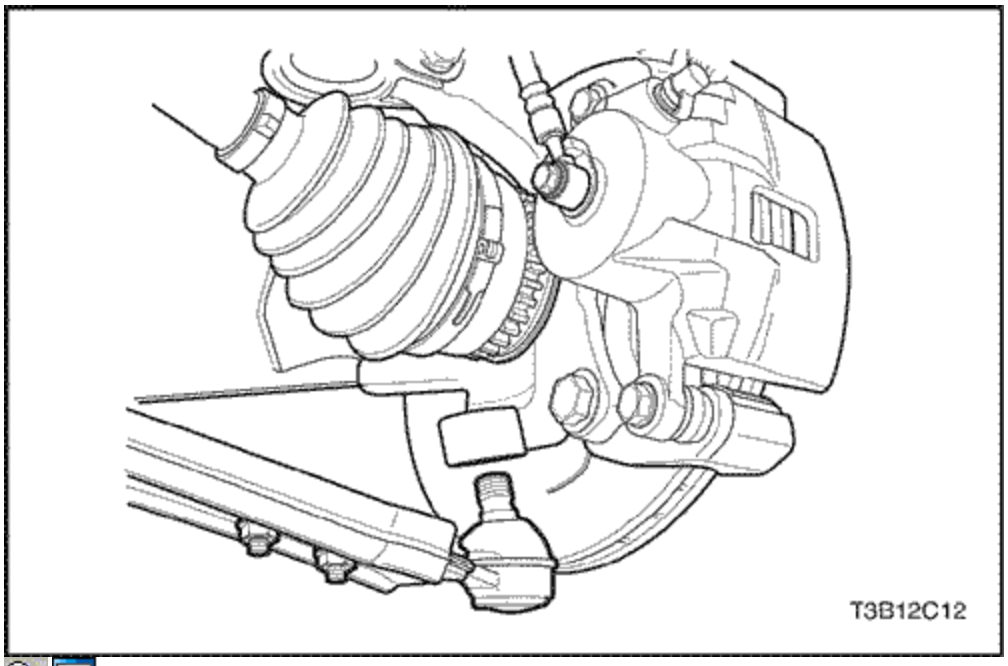
2. Remove the crossmember assmbly. Refer to *this Section*

UNIT REPAIR



Ball Joint
Disassembly Procedure

1. Raise and suitably support the vehicle.
2. Place the jackstands under the frame of the vehicle and lower the vehicle slightly so the weight of the vehicle rests on the jackstands and not on the control arms.
3. Remove the wheel. Refer to *Section 2E, Tires and Wheels.*
4. Remove the control arm. Refer to "Control Arm" in this section.
5. Remove the ball joint mounting bolts.

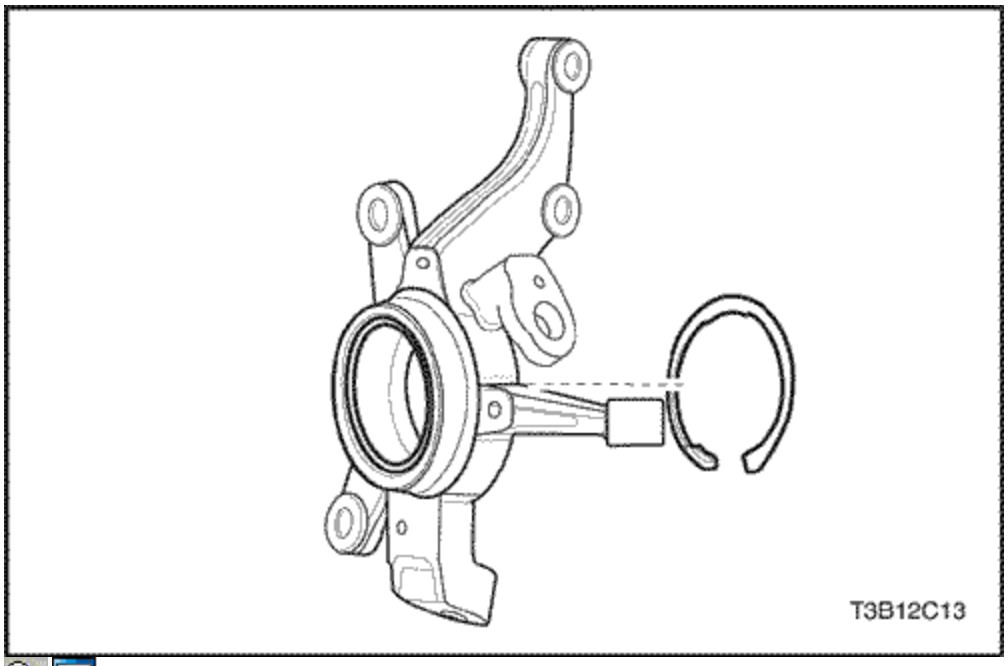


Assembly Procedure

1. Connect the ball joint to the control arm with the mounting bolts.
2. Install the nuts to secure the bolts from below the control arm.

   Tighten
   Tighten the ball joint-to-control arm nuts to 64 N•m (47 lb-ft).

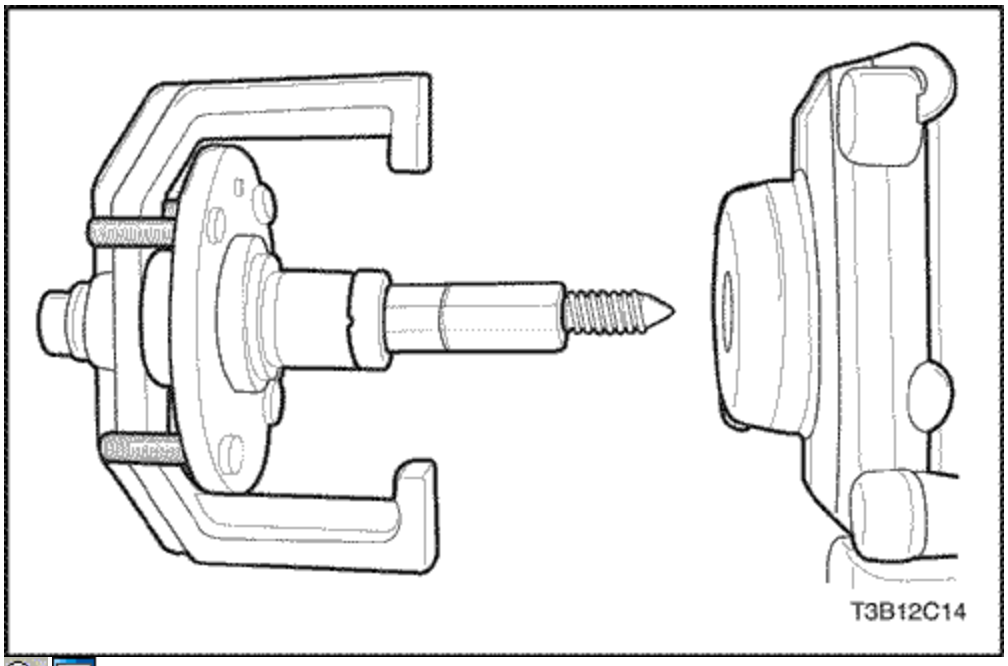
3. Install the control arm. Refer to "Control Arm" in this section.



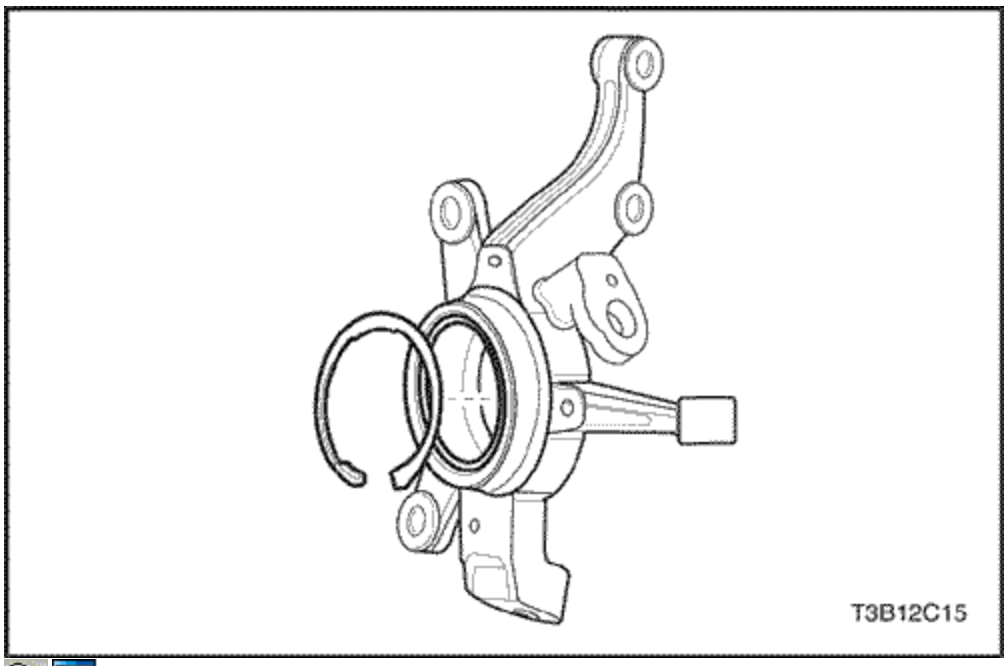
Hub and Bearing
Tools Required

500-20 Hex Nut
J-36661-2 Forcing Screw
J-37105-B-1 Support Bridge
J-37105-B-2 Bearing Adapter
J-37105-B-3 Hub Adapter
Disassembly Procedure

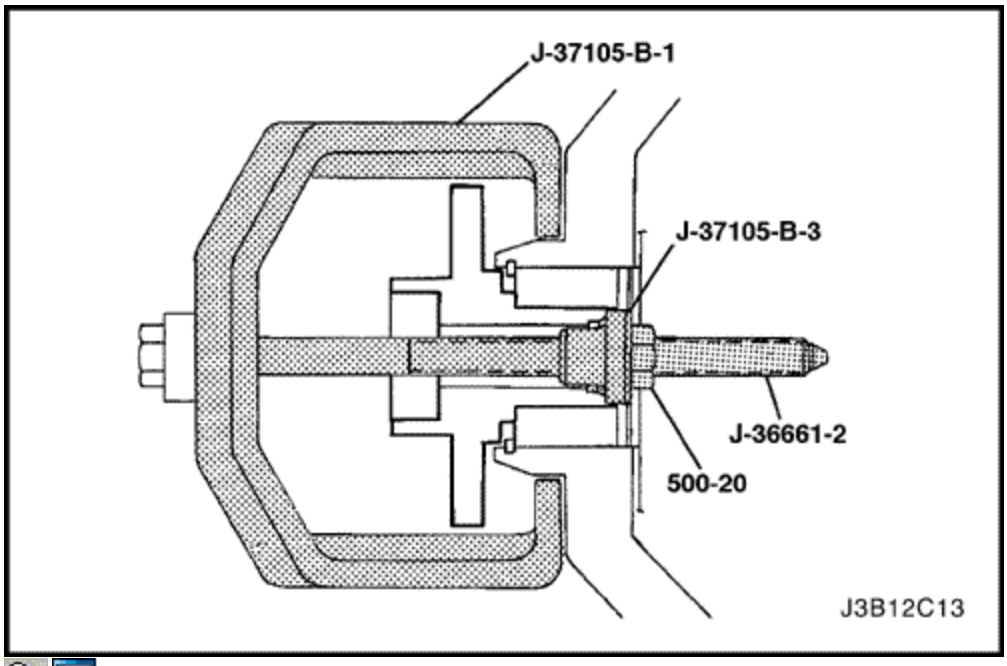
1. Remove the drive axle from the front wheel hub. Refer to "Strut Assembly" in this section.



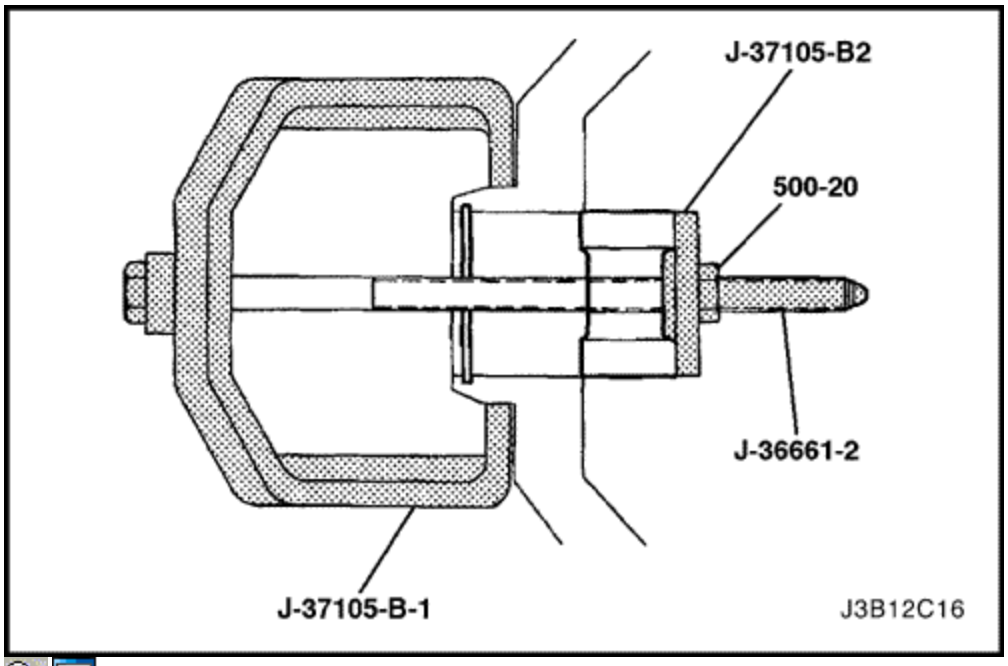
2. Remove the wheel hub with the support bridge J-37105-B-1, the hub adapter J-37105-B-3, the hex nut 500-20, and the forcing screw J-36661-2.



3. Remove the brake shield. Refer to *Section 4D, Front Disc Brakes.*
4. Remove the outer snap ring.

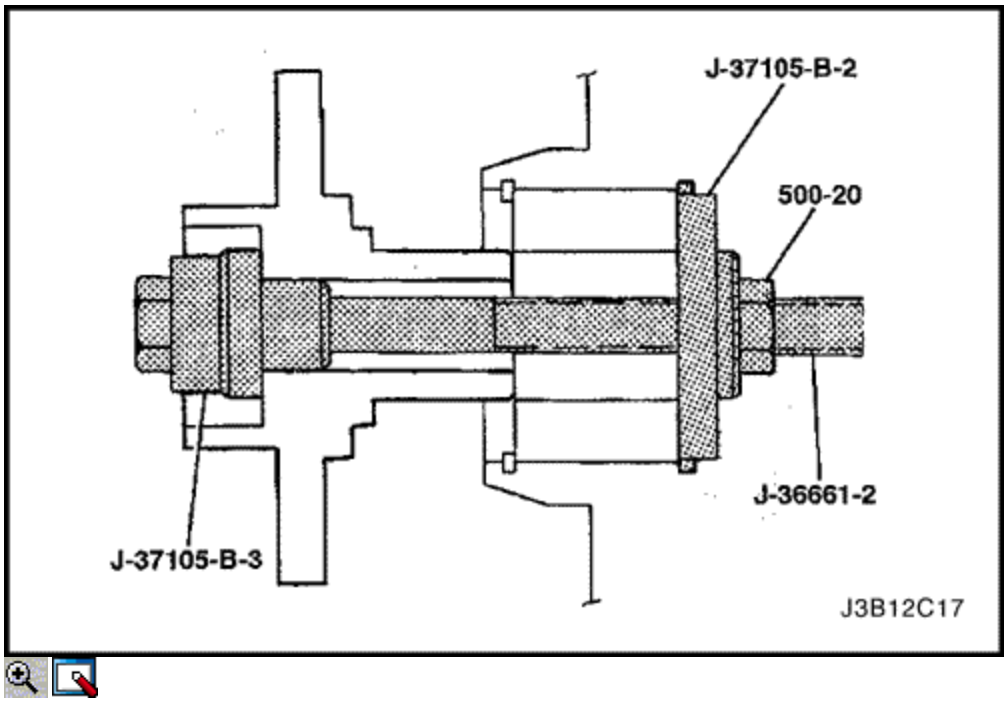


5. Remove the wheel bearing with the support bridge J-37105-B-1, the bearing adapter J-37105-B-2, the hex nut 500-20, and the forcing screw J-36661-2.
6. Clean the bore of the knuckle.

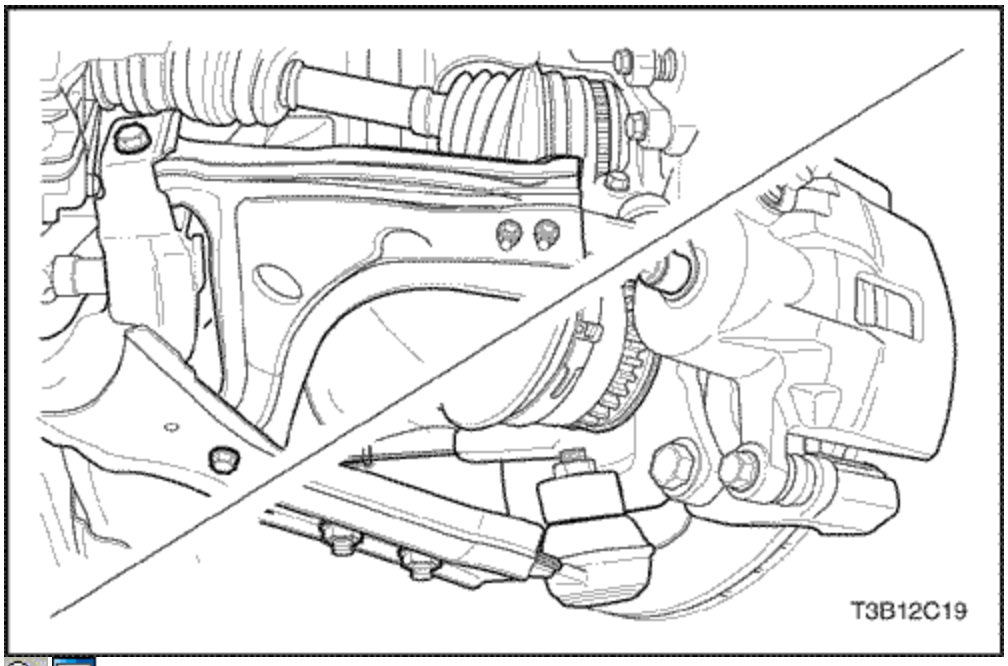


Assembly Procedure

1. Install the outer snap ring and push the wheel bearing into place with the support bridge J-37105-B-1, the bearing adapter J-37105-B-2, the hex nut 500-20, and the forcing screw J-36661-2.



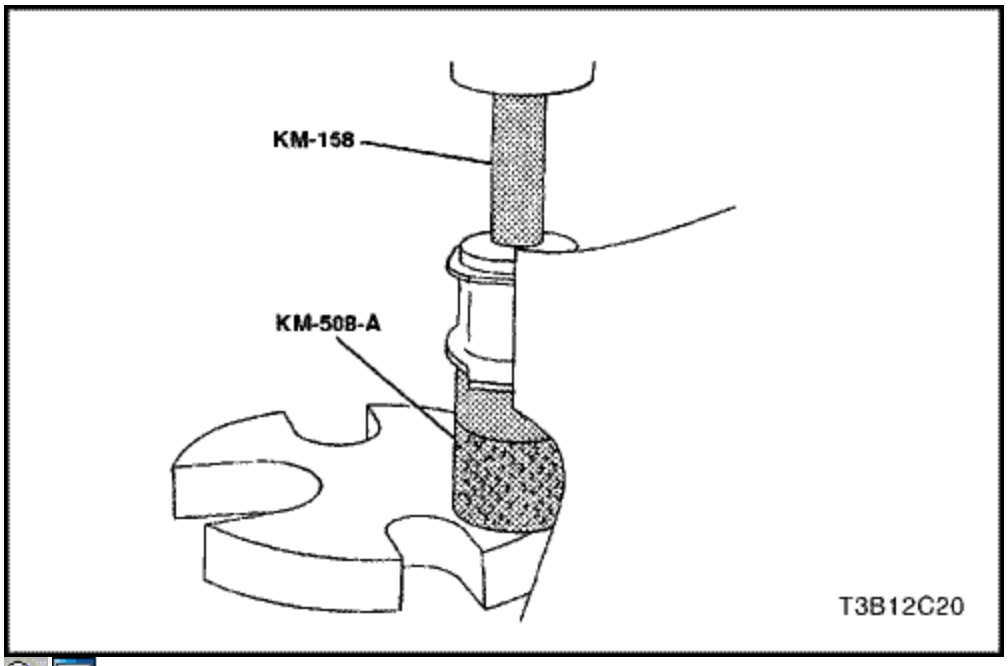
2. Install the brake shield. Refer to *Section 4D, Front Disc Brakes.*
3. Push the wheel hub into place with the hub adapter J-37105-B-3, the bearing adapter J-37105-B-2, the hex nut 500-20, and the forcing screw J-36661-2.
4. Install the drive axle into the front wheel hub. Refer to "Strut Assembly" in this section.



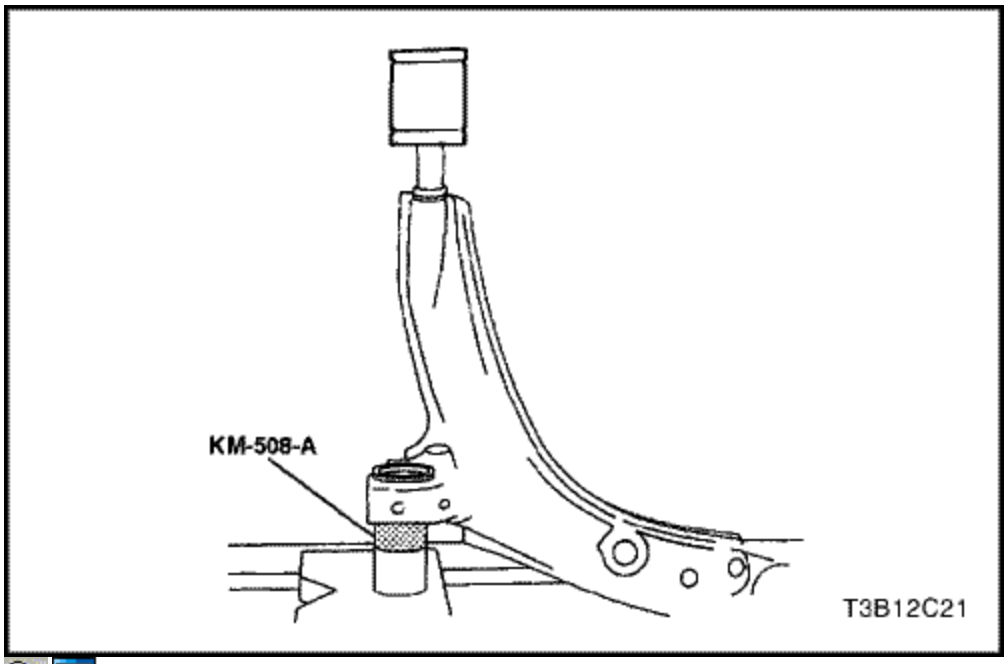
Control Arm Bushings
Tools Required

KM-508-A Remover/Installer
KM-158 Remover/Installer
KM-307-B Removal Plate
Disassembly Procedure

1. Remove the control arm. Refer to "Control Arm" in this section.
2. Press off the rear bushing using a press, the remover/installer KM-158, and the removal plate KM-307-B.

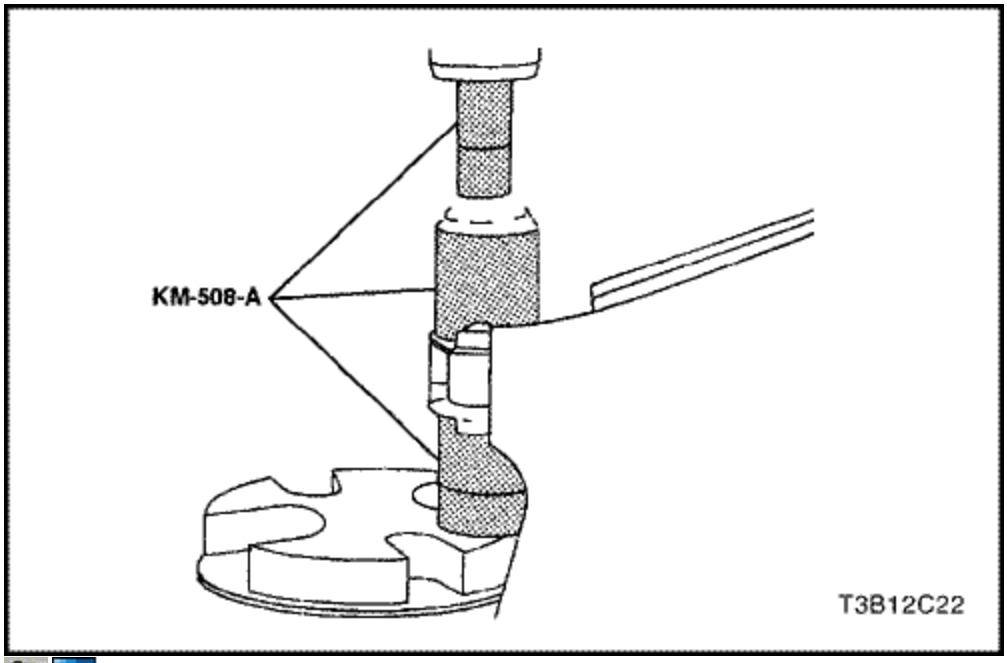


3. Press out the front bushing using the remover/installer KM-508-A, and the remover/installer KM-158.

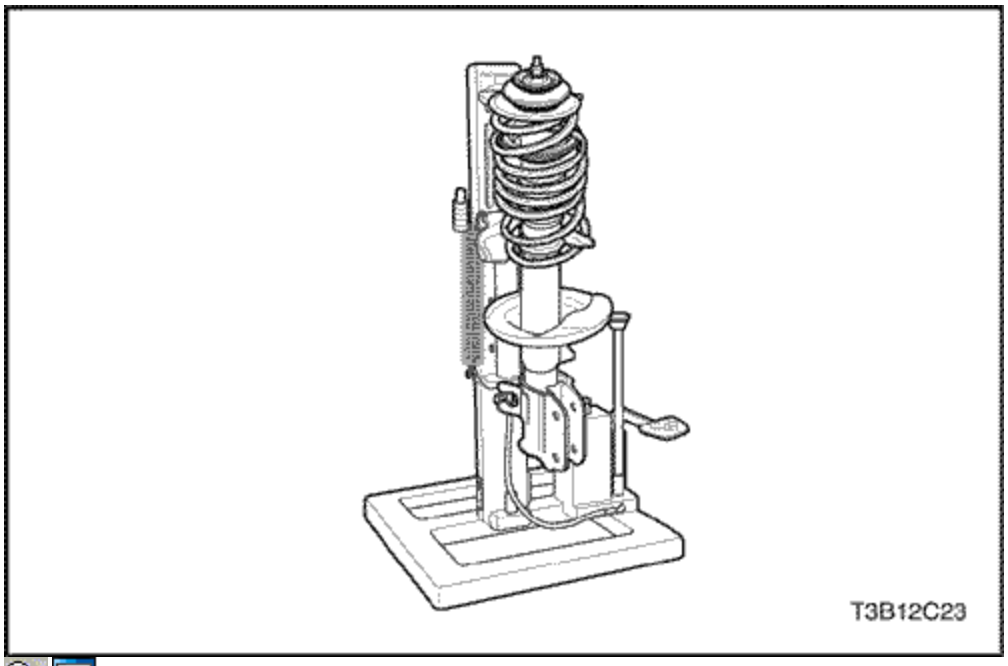


Assembly Procedure

1. Coat the control arm rear shaft with a multipurpose lubricant. Refer to *Section 0B, General Information.*
2. Press the rear bushing onto the shaft. The flat of the bushing must be on the top side, the same as the ball joint. Use the remover/installer KM-508-A to support the control arm.



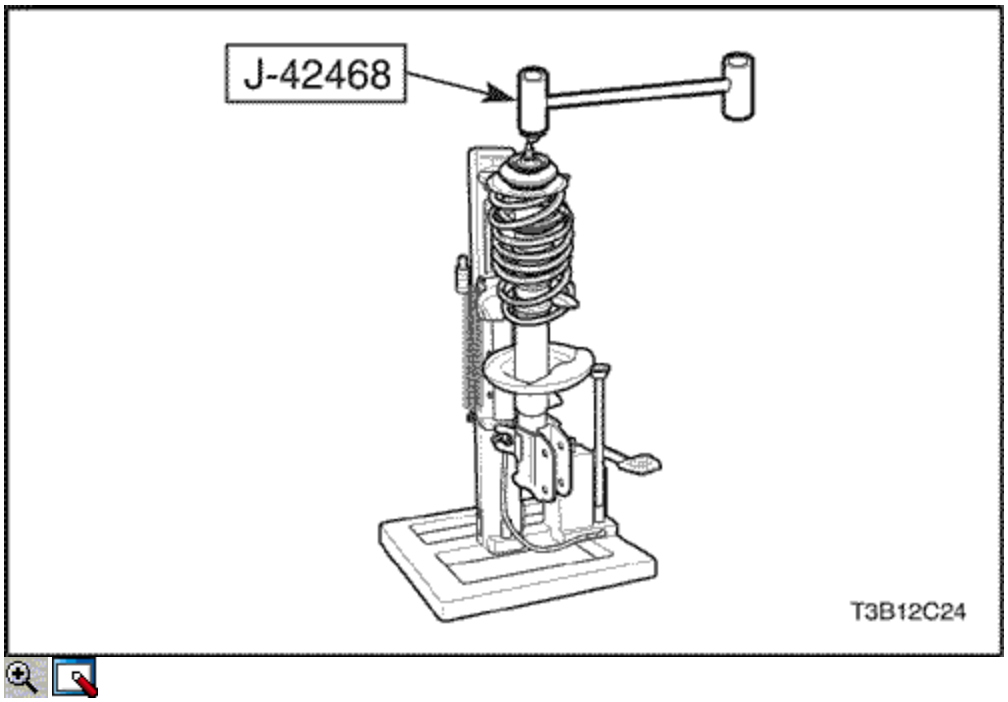
3. Coat the outside of the front bushing and the inside of the lower control arm with a multipurpose lubricant. Refer to *Section 0B, General Information.*
4. Press the new bushing into the control arm from the back to the front, using the remover/installer KM-508-A.
5. Center the bushing.
6. Install the control arm. Refer to "Control Arm" in this section.



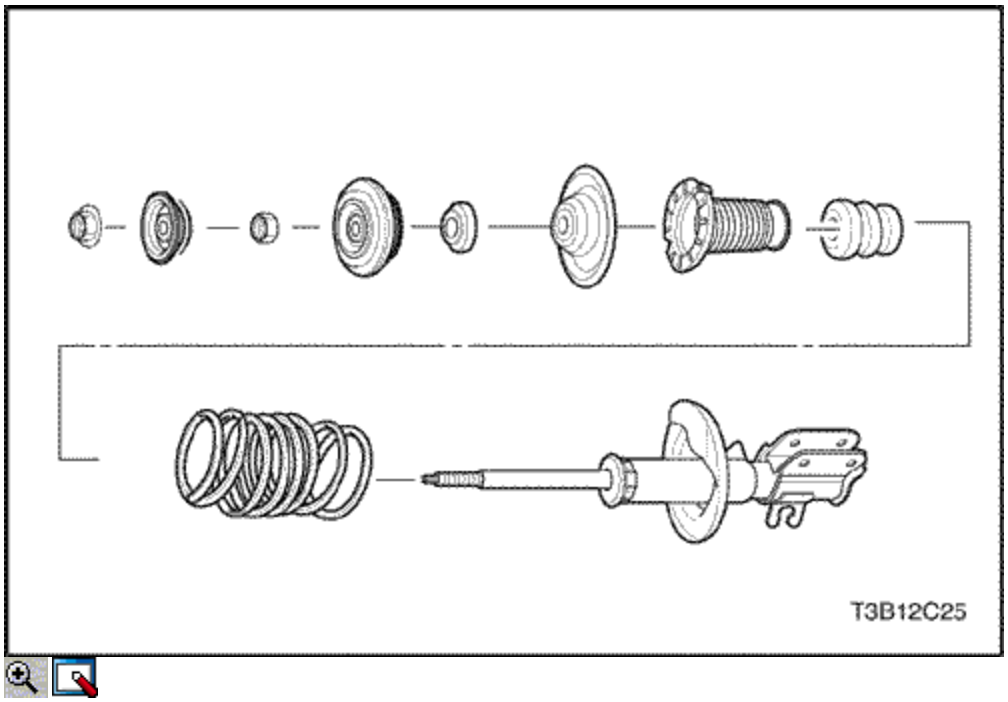
Front Strut Assembly
Tools Required

KM-329-A Spring Compressor
J-42468 Front Strut Mount Nut Wrench
Disassembly Procedure

1. Remove the strut assembly. Refer to "Strut Assembly" in this section.
2. Fasten the strut assembly to the spring compressor KM-329-A. Make sure the hooks are seated on the strut spring properly.
3. Compress the front spring with the front spring compressor KM-329-A.

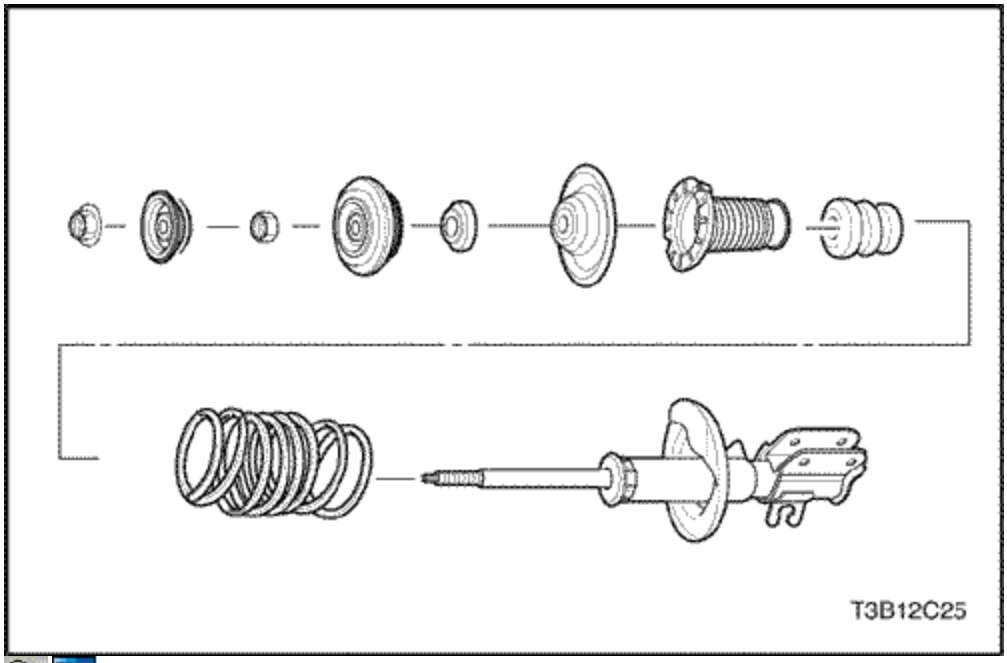


4. Use an open end wrench to hold the threaded piston rod while removing the piston rod nut with J-42468 front strut mount nut wrench.



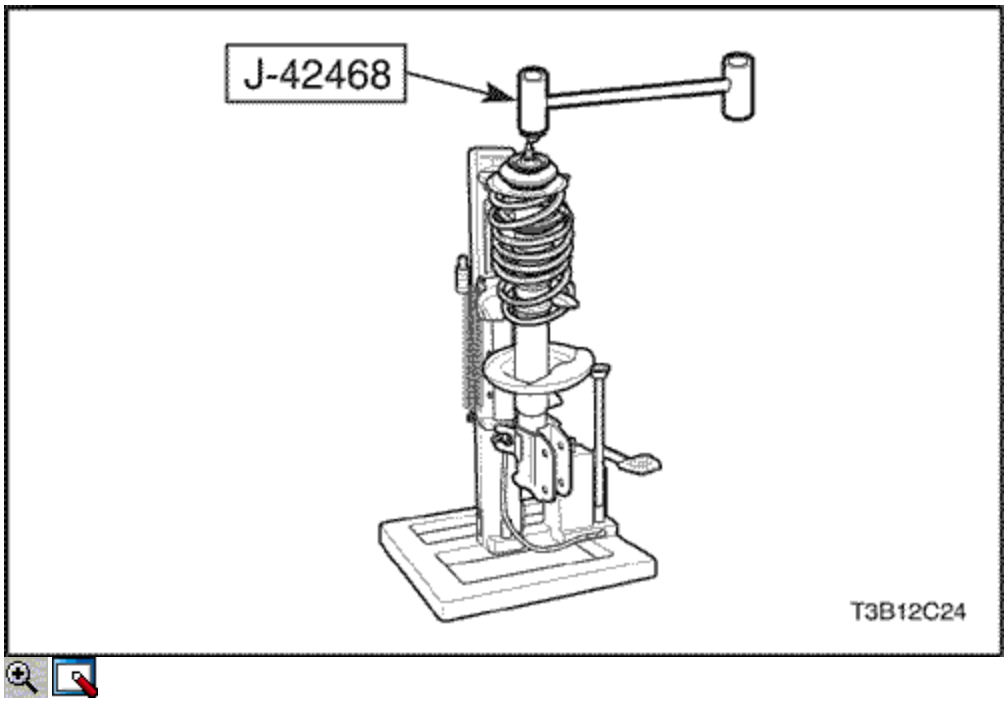
5. Remove the strut mount, strut bearing, spring upper seat, spring upper insulator, hallow bumper, coil spring and strut step by step.

   Important : Record the position of the front spring seat relative to the strut assembly-to-knuckle bracket. Place the front spring locator back in the same position during assembly.



Assembly Procedure

1. Install the lower spring insulator and the spring.
2. Comopress the spring using the spring compressor KM-329-A.
3. Install the strut mount, strut bearing spring upper seat, spring upper insulator, hallow bumper, coil spring and strut step by step.



4. Use an open end wrench to hold the threaded piston rod while installing the piston rod nut with J-42468 front strut mount nut wrench.

   Tighten
   Tighten the piston rod nut to 60 N•m (44 lb-ft).

   Important : Locate the coil spring to the original position on th coil spring seat. Check the installation condition of the coil spring.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Front Suspension

The front suspension for this vehicle is a combination knuckle/strut and spring design.

The control arms pivot from the body. The lower control arm pivots use rubber bushings. The upper end of the strut is isolated by a rubber mount and contains a bearing to allow the wheel to turn.

The lower end of the steering knuckle pivots on a ball joint bolted to the control arm. The ball joint is fastened to the steering knuckle with a nut, and to the lower control arm with rivets.

When servicing the control arm-to-body attachment and the stabilizer shaft-to-body insulators, make sure the attaching bolts are loose until the control arms are moved to the trim height, which is curb height. Trim height is the normal

position to which the control arms move when the vehicle is sitting on the ground. Refer to"General Specifications" in this section.

SECTION 2E

TIRES AND WHEELS

SPECIFICATIONS

Tire Size and Pressure Specifications

Inflation Pressure at Full Load

Engine	Tires	Wheel	Front		Rear	
			kPa	psi	kPa	psi
1.2S	155/80R13	13x5J (steel)	207	30	207	30
	175/70R13	14x5.5J (Aluminum)	↑	↑	↑	↑
	185/60R14	↑	↑	↑	↑	↑
1.4S	155/80R13	13x5J (Steel)	↑	↑	↑	↑
	175/70R13	14x5.5J(Steel/Alu)	↑	↑	↑	↑
	185/60R14	↑	↑	↑	↑	↑
1.4D	175/70R13	13x5J (Steel)	↑	↑	↑	↑
	185/60R14	14x5.5J(Steel/Alu)	↑	↑	↑	↑
1.5S	155/80R13	13x5J (Steel)	↑	↑	↑	↑
	175/70R13	14x5.5J(Aluminum)	↑	↑	↑	↑
	185/60R14	↑	↑	↑	↑	↑

Inflation Pressure Conversion Pecifications

kPa	kPa	kPa	psi	kPa	psi
140	20	185	27	235	34
145	21	190	28	240	35

kPa	kPa	kPa	psi	kPa	psi
155	22	200	29	250	36
160	23	205	30	275	40
165	24	215	31	310	45
170	25	220	32	345	50
180	26	230	33	380	55

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Wheel Nut (Aluminum Wheel)	120	88	-
Wheel Nut (Steel Wheel)	120	88	-

DIAGNOSIS

Wheel Runout

Measure wheel runout with an accurate dial indicator. Measurements may be taken with the wheels either on or off the vehicle, using an accurate mounting surface such as a wheel balancer. Measurements may be taken with or without the tire mounted on the wheel.

Measure radial runout and lateral runout on both the inboard and the outboard rim flanges. With the dial indicator firmly seated next to the wheel and tire assembly, slowly rotate the wheel one revolution and record the indicator reading. If any measurement exceeds the following specifications and there is a vibration that wheel balancing will not correct, replace the wheel. Disregard any indicator readings due to welds, paint runs, or scratches.

Steel Wheels

- Radial runout: 0.8 mm (0.03 inch)
- Lateral runout: 1.0 mm (0.04 inch)

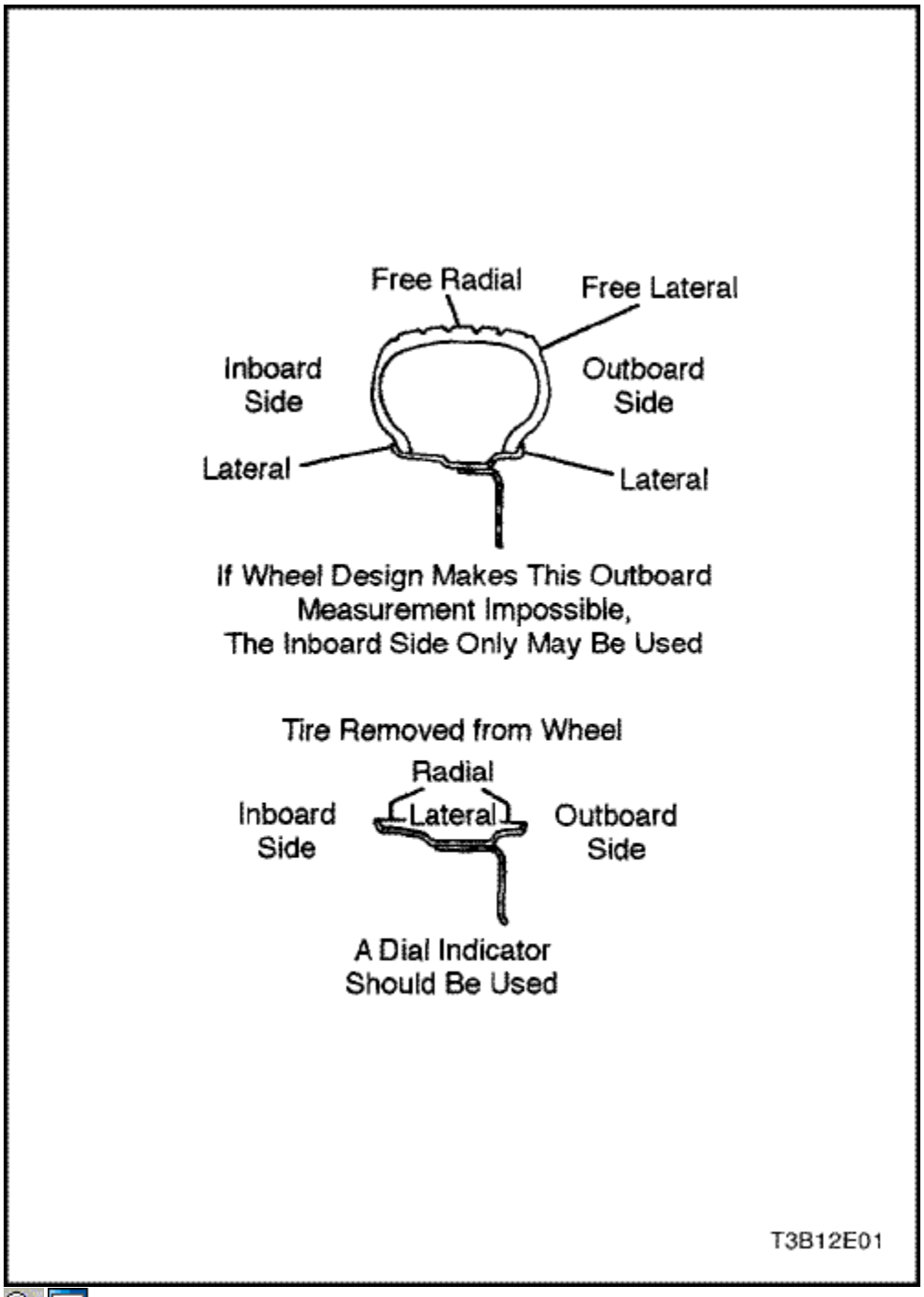
Aluminum Wheels

- Radial runout: 0.8 mm (0.03 inch)
- Lateral runout: 0.8 mm (0.03 inch)

Measure free radial runout on the center of the tire tread. The tread can be taped to present a smooth surface. Measure free lateral runout on the outboard side of the tire nearest to the tread.

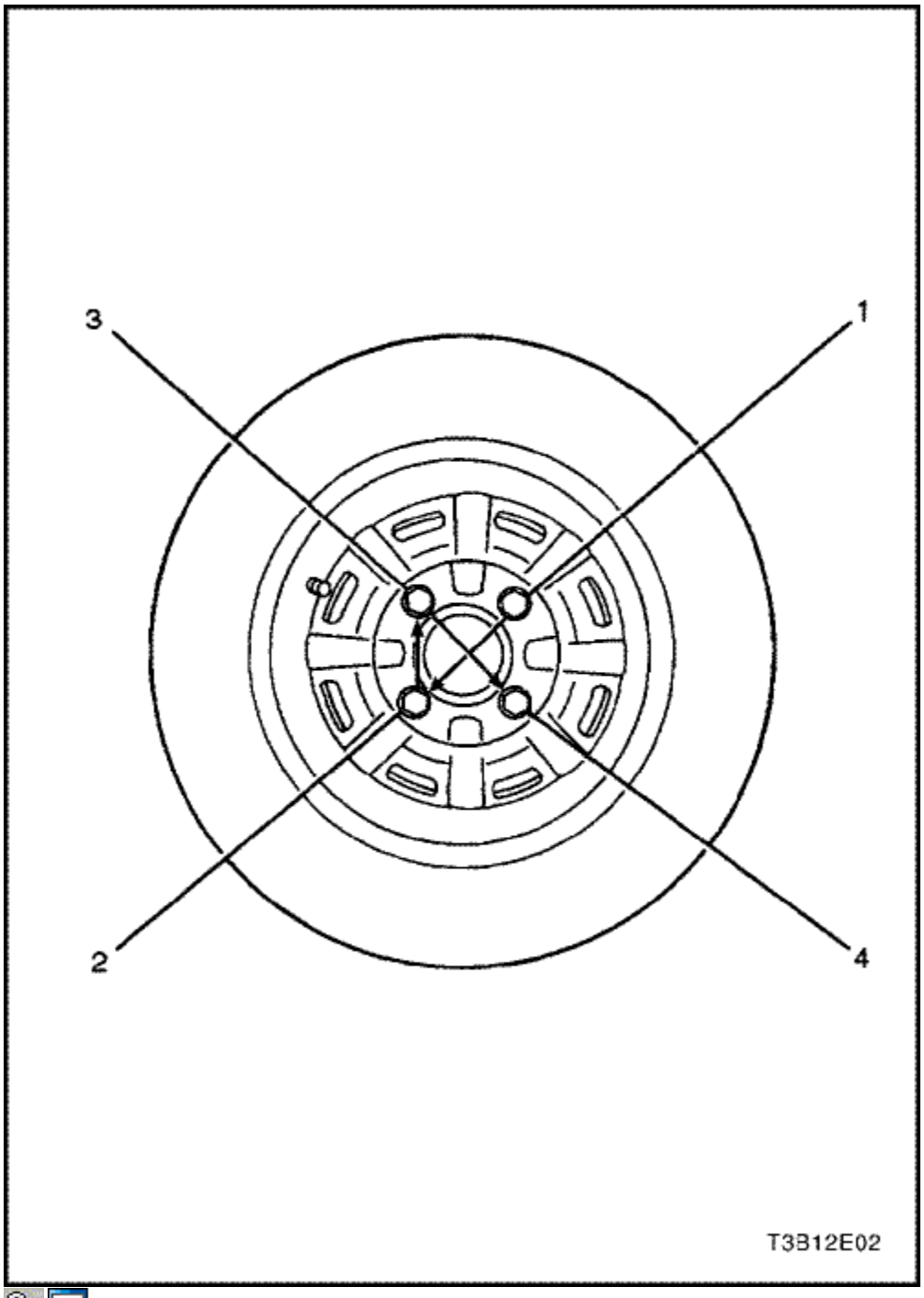
Steel and Aluminum Wheels

- Free radial runout: 1.5 mm (0.06 inch)
- Free lateral runout: 1.5 mm (0.06 inch)



MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



Wheel
Removal Procedure

1. Loosen the wheel nuts.
2. Raise and suitably support the vehicle.
3. Remove the wheel nuts.

Notice : Never use heat to loosen a tight wheel. It can shorten the life of the wheel, the wheel nuts and the wheel bearings. Excessive force, such as hammering the wheel or tire, can also cause damage and is not recommended. Slight tapping of the wheel sidewall with one's hand or with a rubber mallet is acceptable.

4. Remove the wheel.

   Difficulty in removing the wheels from the vehicle can be due to foreign material or to a tight fit between the wheel centerhole and the hub or the rotor. These wheels can be removed by

1. Retightening the wheel nuts on the affected wheel and then loosening the wheel nuts by two turns.
2. Lowering the vehicle and rocking it from side to side as hard as possible, using one or more person's body weight to loosen the wheel.
3. Raising the vehicle and removing the wheel.

Caution : Do not allow the penetrating oil to get on the vertical surfaces between the wheel and the drum (or rotor) because penetrating oil in this area could cause the wheel to work loose as the vehicle is driven, resulting in loss of control and an injury accident.

Penetrating oil is not effective in removing tight wheels. If it is used, however, apply it sparingly and only to the wheel's centerhole area.

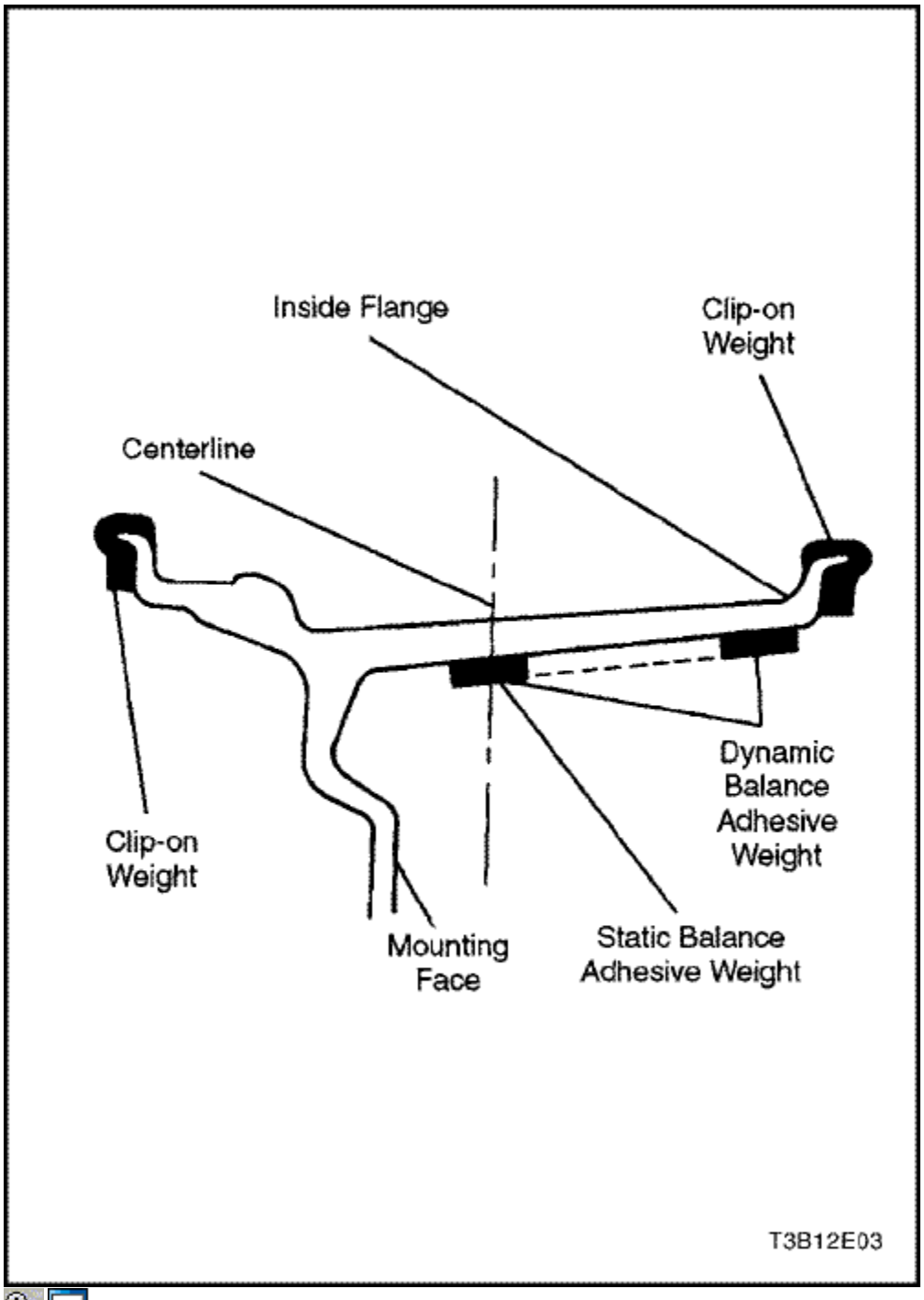
Installation Procedure

Notice : Before installing the wheels, remove any buildup of corrosion on the wheel mounting surface and the brake drum or the rotor mounting surface by scraping and brushing them with a wire brush. Installing the wheels without good metal-to-metal contact at the mounting surfaces can cause the wheel nuts to loosen, which can later allow a wheel to come off while the vehicle is moving. Wheel nuts must be tightened in sequence and to the proper torque to avoid bending the wheel, the brake drum or the rotor.

1. Mount the wheel.
2. Install the wheel nuts and tighten the wheel nuts in the sequence shown.
3. Lower the vehicle.

Tighten

Tighten the wheel nuts to 120 N•m (88 lb-ft).



On-Vehicle Balancing

On-vehicle balancing will help correct vibrations due to brake drum, rotor, and wheel cover imbalances.
Notice : Do not allow the front suspension to hang free. When the drive axle is run at an extreme angle, extra vibrations can occur, as well as damage to seals and joints.

1. During on-vehicle balancing, do not remove the balance weights from the off-vehicle dynamic balance.
2. If more than 1 ounce of additional weight is required, split the weight between the inner and the outer rim flanges.

Caution : Do not spin the drive wheels faster than 55km/h (35 mph) as indicated by the speedometer. This limit is necessary because the speedometer indicates only one-half of the actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Personal injury and damage may result from high-speed spinning.

3. Spin the driven tire and wheel assemblies using the engine.

UNIT REPAIR

Aluminum Wheel Porosity

Wheel repairs that use welding, heating or peening are not approved.

1. Raise and suitably support the vehicle.
2. Remove the tire and wheel assembly. Refer to "Wheel" in this section.

Caution : To avoid serious injury, do not stand over the tire when inflating, because the bead may break when it snaps over the safety hump. Do not exceed 275 kPa (40 psi) of air pressure in any tire if the beads are not seated. If 275 kPa (40 psi) of air pressure will not seat the beads, deflate the tire. Relubricate the beads. Reinflate the tire. Overinflation may cause the bead to break and cause serious injury.

3. Locate leaking areas by inflating the tire to 345 kPa (50 psi) and dipping the tire and wheel assembly into a water bath.
4. Mark the leak areas and remove the tire from the wheel.
5. Scuff the inside wheel surface at the leak area with 80-grit sandpaper. Clean the leak area with a general-purpose cleaner.
6. Apply a 3.3 mm (0.13 inch) thick layer of adhesive/ sealant to the leak area. Allow it to dry for 12 hours.

7. Install the tire on the wheel. Inflate the tire to 345 kPa (50 psi) and check for leaks as in step 3.
8. Adjust the tire pressure to meet specifications. Refer to "Tire Size and Pressure Specifications" in this section.

Balance the tire and wheel assembly. Refer to "Tire and Wheel Balancing" in this section.
Install the tire and wheel assembly. Refer to "Wheel" in this section.
Lower the vehicle.

Aluminum Wheel Refinishing

A protective clear or color coating is applied to the surface of the original equipment cast aluminum wheels. Surface degradation can develop if this clear coating is damaged or removed. This can happen at some automatic car wash facilities that use silicone carbide-tipped tire brushes to clean white walls and tires. Once the protective coating is damaged, exposure to caustic cleaners or road salt causes further surface degradation. The following procedure details how to strip, clean and recoat aluminum wheels.

Caution : Follow the manufacturer's recommendations and cautions when using these materials.

Required materials:
Amchem Alumi Prep No. 23, stock No. DX533 or equivalent cleaning and conditioning chemical for aluminum.
Amchem Alodine No. 101, stock No. DX50T or equivalent coating chemical for aluminum.
Ditzler Delclear Acrylic Urethane Clear, Stock No. DAU-75 or equivalent.
Ditzler Delthane Ultra-Urethane Additive, Stock DXR-80 or equivalent.
Before repairing the aluminum damage or the clear coat damage, prepare the wheels and the tires.

1. Remove the wheel from the vehicle.
2. Mark the location of the outboard weights and remove them.
3. Wash the wheel inside and out with a water-based, all-purpose cleaner. Remove the grease and oil with a solvent cleaner.
4. Mask the tire prior to painting.
5. Using a 400-grit wet or dry sandpaper, sand over the painted areas that will not require recoloring. Sanding will promote the adhesion of the clear coat.

Aluminum Damage on Wheel Surface

1. Mount the wheel on a brake lathe and spin the assembly slowly.

   Sand the wheel with a backing block or pad. Hold the backing block or pad flat to the surface of the wheel and sand slowly back and forth from the center to the outer edge of the tire to remove the damage. Use the following sandpaper grits in the order listed:

   1. 80 grit.
   2. 150 grit.
   3. 240 grit.

Clear Coat Damage on Unpainted Wheels

1. Apply the chemical stripper Amchem Alumi Prep No. 23. Use a small 1/4-inch detail brush to apply the stripper around the perimeter and spoke-like areas.
2. Remove the stripper according to manufacturer's recommendations.

   Caution : To avoid serious personal injury, do not use engine power to rotate the wheel while sanding.

3. Sand the wheel with 240-grit sandpaper by rotating the wheel on a slow-spinning brake lathe or by mounting the wheel on the car and spinning it by hand. Sanding restores the machined appearance and promotes adhesion.

   After repairing the aluminum or clear coat damage, the wheels must be recoated.

Recoating Procedure

Caution : To avoid serious personal injury when applying any two-part component paint system, follow the specific precautions provided by the paint manufacturer. Failure to follow these precautions may cause lung irritation and an allergic respiratory reaction.

1. Clean the surface.

   Soak the wheel with Amchem Alumi Prep No. 33 or equivalent for 1 to 3 minutes. Rinse the wheel with water and blow it dry.
   Soak the wheel with Amchem Alodine No. 1001 or equivalent for 1 to 3 minutes. Rinse the wheel with water and blow it dry.

Finish with Ditzler Delclear Urethane and Ditzler Ultra- Urethane Additive or equivalent, using three coats.
1st coat - spray on a light mist coat; let dry.
2nd coat - spray or paint on a light coat; let dry.
3rd coat - spray or paint on a heavy double wet coat; let dry.
Let the urethane dry for 24 hours or flash for 30 minutes and force dry at 60°C (140°F) for 30 minutes. Allow the urethane to cool for 5 minutes before mounting the wheel on the vehicle.

Off- Vehicle Balancing

Perform wheel balancing with an electronic off-vehicle balancer. The balancer is easy to use and gives both a static and a dynamic balance. Unlike on-vehicle balancing, the off-vehicle balancer does not correct for drum or rotor imbalance. This drawback is overcome by its accuracy (usually to within 1/8 ounce). Secure the wheel on the balancer with a cone through the back side of the centerhole, not through the wheel bolt holes.

Correcting Non- Uniform Tires

There are two ways to correct properly balanced tires which still vibrate. One method uses an automatic machine which loads the tire and buffs small amounts of rubber from high spots on the outer two tread rows. Correction by this method is usually permanent and, if it is done properly, does not significantly affect the appearance or the tread life of the tire. Tire truing with a bladetype machine is not recommended because it substantially reduces the tread life and often does not correct the problem permanently.

Another method is to dismount the tire and rotate it 180 degrees on the rim. Do this only on the tire and wheel assemblies which are known to be causing a vibration because this method is just as likely to cause good assemblies to vibrate.

Tire and Wheel Match-Mounting

The tires and wheels are match-mounted at the assembly plant. Match-mounting aligns the radially stiffest part of the tire, or high spot, to the smallest radius, or low spot, of the wheel.

The high spot of the tire is originally marked by a red paint mark or an adhesive label on the outboard sidewall.

The low spot of the wheel will be at the location of the valve stem.

Before dismounting a tire from its wheel, scribe a line on the tire at the valve stem to assure that it is remounted in the same position.

Replacement tires that are of original equipment quality will have their high and low spot marked in the same manner.

Tire Mounting and Dismouting

Notice : ***Use a tire-changing machine to mount or dismount the tires. Follow the equipment manufacturer's instructions. Do not***

use hand tools or tire irons to change tires. These tools may damage the beads or the wheel rim.

1. Clean the rim bead seats with a wire brush or coarse steel wool to remove lubricants, old rubber, and light rust. Before mounting or dismounting a tire, lubricate the bead area well with an approved tire lubricant.

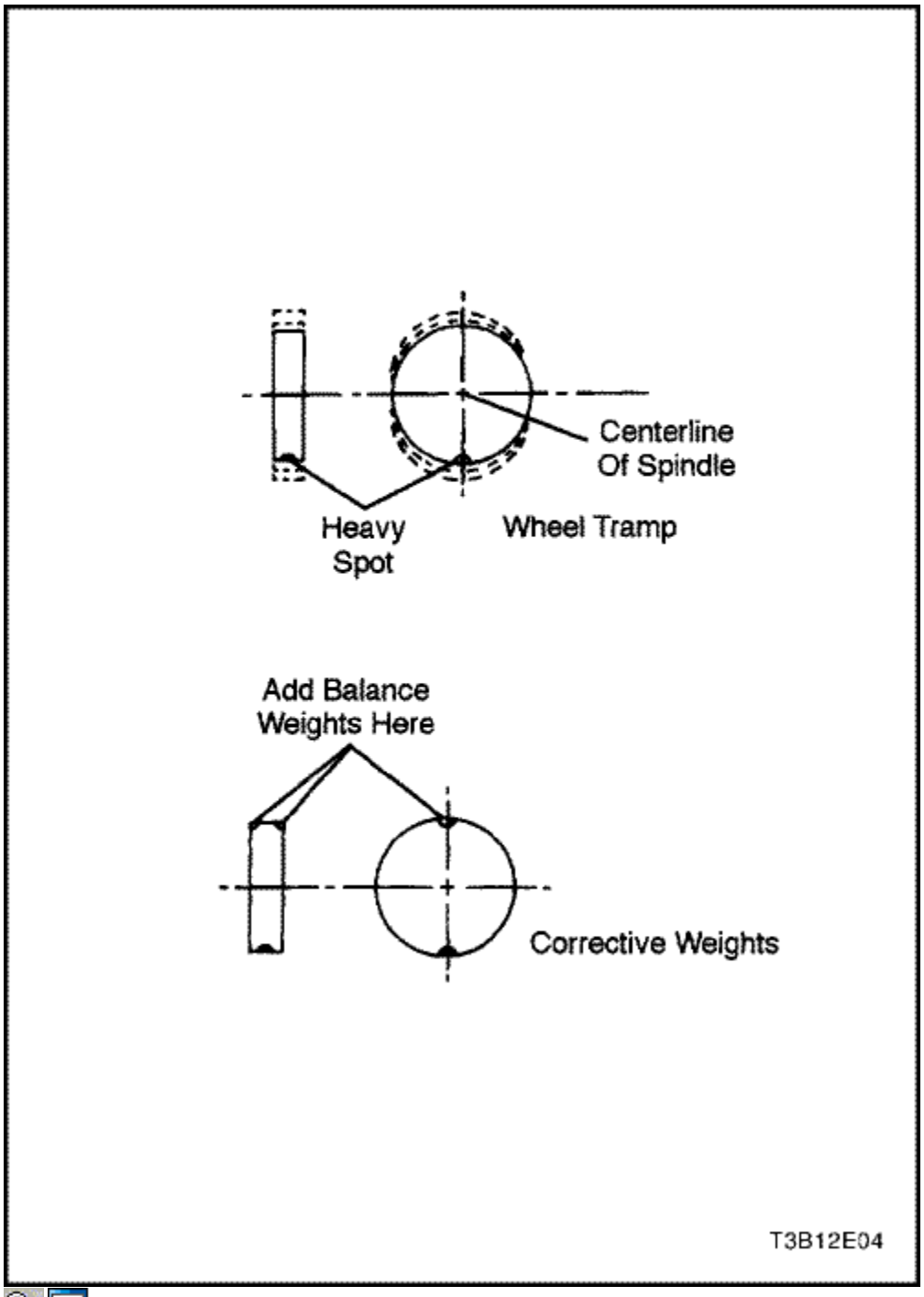
   Caution : To avoid serious injury, do not stand over the tire when inflating it, because the bead may break when it snaps over the safety hump. Do not exceed 275 kPa (40 psi) of air pressure in any tire if the beads are not seated. If 275 kPa (40 psi) of air pressure will not seat the beads, deflate the tire. Relubricate the bead and reinflate the tire. Overinflation may cause the bead to break and cause serious injury.

2. After mounting the tire, inflate it until the beads are seated. Never exceed 275 kPa (40 psi) to seat the beads.
3. Install the valve core and inflate the tire to the proper pressure. Make sure the locating ring outside of the bead of the tire shows around the rim flanges of the wheel on both sides. This positioning of the tire will insure that the bead of the tire is seated.

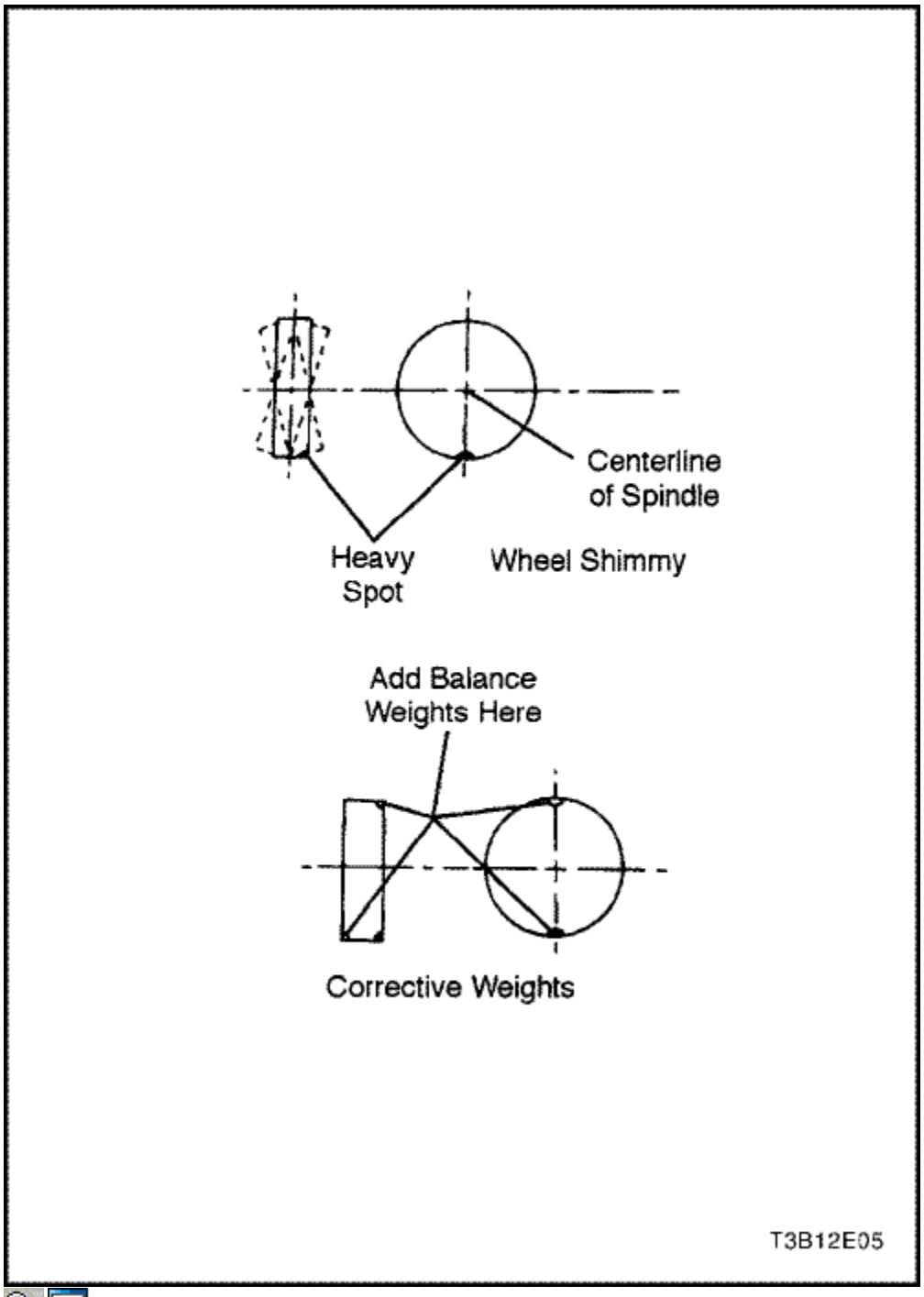
GENERAL DESCRIPTION AND SYSTEM OPERATION

Tire and Wheel Balancing

There are two types of tire and wheel balancing: static and dynamic. Static balance is the equal distribution of weight around the wheel. Assemblies that are statically unbalanced cause a bouncing action called wheel tramp. This condition may eventually cause uneven tire wear.



Dynamic balance is the equal distribution of weight on each side of the centerline so that when the assembly spins there is no tendency for it to move from side to side. Assemblies that are dynamically unbalanced may cause wheel shimmy.



General Balance Precautions

Remove all deposits of foreign material from the inside of the wheel.

Caution : Remove stones from the tread in order to avoid operator injury during spin balancing.

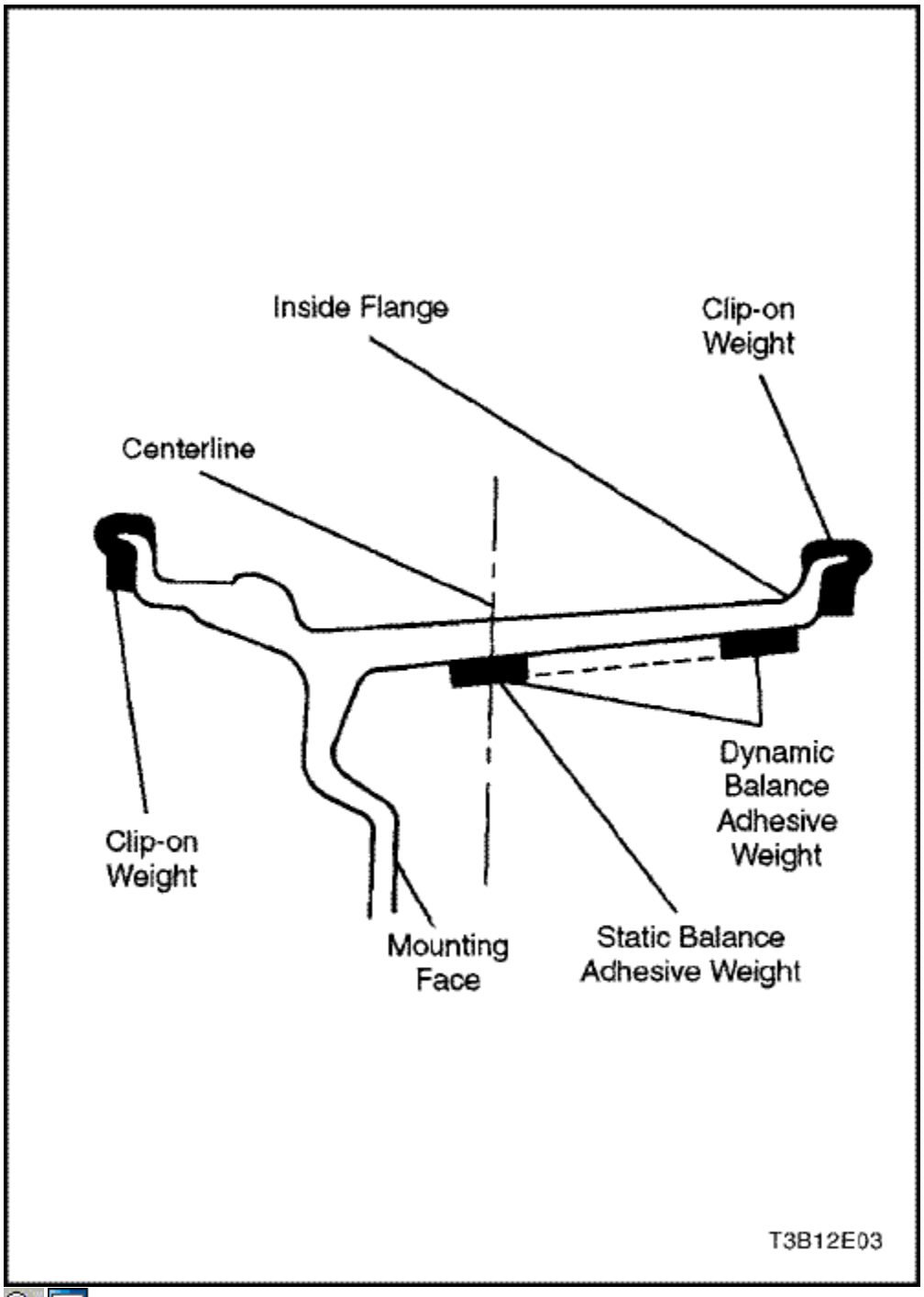
Inspect the tire for any damage. Balance the tire according to the equipment manufacturer’s recommendations.

Wheel Weights

If more than 85 grams (3.0 ounces) are needed to static balance the wheel, split the wheel weights as equally as possible between the inboard and the outboard flanges.

Balancing the assemblies with factory aluminum wheels requires the use of special nylon-coated, clip-on wheel weights. These weights are designed to fit over the thicker rim flange of the aluminum wheel. Install these weights with a plastic-tipped hammer.

Adhesive wheel weights are also available. Use the following procedure to install adhesive wheel weights.



Adhesive Wheel Weight Installation

1. Clean the wheel by sanding it to bare alloy where the wheel weight will be installed.

2. Use a clean cloth or paper towel saturated with a mixture of half isopropyl alcohol and half water to wipe the place where the wheel weight will be installed.
3. Dry the area with hot air. The surface of the wheel should be warm to the touch.
4. Warm the adhesive backing on the wheel weights to room temperature.
5. Remove the tape from the back of the weights. Do not touch the adhesive surface.
6. Apply the the wheel weight and press it on with hand pressure.
7. Secure the wheel weight with a 70-110 N (16-25 lb) force applied with a roller.

Tire Chain Usage

Due to limited tire-to-body clearance on certain vehicles, recommendations for tire chain use are published in the Owner's Manual. When tire chains need to be used, most current Daewoo vehicles require SAE Class "S" tire chains. These may also be designated as 1100 Series, type PL tire chains. These chains are specifically designed to limit the "fly off" effect which occurs when the wheel rotates.

Be sure that only fine-link chains are used which do not add more than 15 mm (0.590 inch), including the lock, to the tread surface and the inner sides of the tires.

Manufacturers of tire chains have a specific chain size for each tire size to ensure a proper fit when the chain is installed. Be sure to purchase the correct chains for the tires on which they are to be used. Use rubber adjusters to take up any slack or clearance in loose chains.

Use of chains may adversely affect vehicle handling.

When tire chains are installed, follow these precautions:

- Adjust speed to road conditions.
- Avoid sharp turns.
- Avoid locked-wheel braking.

To prevent chain damage to the vehicle, install the chains on the front tires as tightly as possible. Tighten them again after driving 0.4 to 0.8 kilometer (0.3 to 0.5 mile). The use of chains on the rear tires is not recommended because they may contact the vehicle and possibly damage it. If chains must be used on the rear tires, be sure there is sufficient clearance between the chains and the body. Do not exceed 70 km/h (45 mph) or the chain manufacturer's speed limit, if lower. Avoid large bumps, potholes, severe turns and any other maneuvers which could cause the tires to bounce. Follow any other

instructions of the chain manufacturer which do not disagree with the above instructions.

Replacement Tires

A Tire Performance Criteria (TPC) specification number is molded in the sidewall near the tire size of all original equipment tires. This specification number assures that the tire meets performance standards for traction, endurance, dimensions, noise, handling and rolling resistance. Usually a specific TPC number is assigned each tire size.

Caution : Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because vehicle handling may be seriously affected and may result in loss of control.

Use only replacement tires with the same size, load range, and construction as the original. The use of any other tire size or construction type may seriously affect ride, handling, speedometer/odometer calibration, vehicle ground clearance, and tire clearance to the body and the chassis. This does not apply to the spare tire furnished with the vehicle.

It is recommended that new tires be installed in pairs on the same axle.the same axle.

If it is necessary to replace only one tire, pair it with the tire having the most tread to equalize the braking action.

Although they may appear different in tread design, tires built by different manufacturers with identical TPC specifications may be used on the same vehicle.

All Season Tires

Most vehicles are now equipped with steel-belted all season radial tires as standard equipment. These tires qualify as snow tires, with a 37 percent higher average rating for snow traction than the non-all season radial tires previously used. Other performance areas, such as wet traction, rolling resistance, tread life, and air retention, have also been improved. This was done by improvements in both tread design and tread compounds. These tires are identified by an "M + S" molded in the tire sidewall following the size number. The suffix "MS" is also molded in the sidewall after the TPC specification number.

The optional handling tires used on some vehicles are not all season tires. These will not have the "MS" marking after the tire size or the TPC specification number.

Passenger Metric Sized Tires

All Daewoo vehicles now use Passenger (P) metric sized tires. P-metric tires are available in two load ranges: standard load (35 psi maximum) and extra load (41 psi maximum). Most passenger vehicle tires are standard load.

Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. For example, a P175/70R13 is not exactly equal in size and load-carrying capacity to an FR70-13. For this reason, replacement tires should be of the same TPC specification number as the originals. If P-metric tires must be replaced with other sizes, consult a tire dealer. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines.

The metric term for measuring tire inflation pressure is the kilopascal (kPa). Tire pressure may be printed in both kPa and psi. One psi equals 6.895 kPa. See the tire label or refer to "Tire Size and Pressure Specifications" in this section for tire inflation pressures.

Tire LAbel

The tire label is permanently located on the rear face of the driver's door and should be referred to for tire information. It lists the maximum vehicle load, the tire size (including the spare tire), and the cold inflation pressure (including the spare tire).

Spare Tire

This vehicle comes equipped with a full-sized spare tire and wheel.

Wheels

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, leak air through welds, have elongated bolt holes, or if the wheel bolts won't stay tight or are heavily rusted. Wheels with excessive runout may cause vehicle vibration. Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim width, offset, and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, vehicle ground clearance, and tire clearance to the body and the chassis. The wheel offset is 49 ± 1 mm (1.93 ± 0.04 inches). Steel wheels may be identified by a two- or three-letter code stamped into the rim near the valve stem. Aluminum wheels should have the code, the part number, and the manufacturer ID cast into the back side.

Inflation of Tires

The pressure recommended for any vehicle line is carefully calculated to give a satisfactory ride, handling, tread life, and load-carrying capacity.

Tire pressure should be checked monthly or before any extended trip. Check the tires when they are cold, after the vehicle has sat for 3 hours or more or has been driven less than 1 mile. Set the tire pressure to the specifications on the tire label located on the rear face of the driver's door. Tire inflation pressure is also given under "Tire Size and Pressure Specifications" in this section.

Valve caps or extensions should be on the valves to keep dust and water out.

For sustained driving at speeds up to 140 km/h (85 mph), inflate the tires to the pressure recommended on the tire. Sustained driving at speeds faster than 140 km/h (85 mph), even if permitted by law, is not advised unless the vehicle has special high-speed tires available from many tire dealers. Tire pressures may increase as much as 41 kPa (6 psi) when the tires are hot. Higher than recommended tire pressure can cause:

- Hard ride.
- Tire bruising or damage.
- Rapid tread wear at the center of the tire.

Lower than recommended pressure can cause

- Tire squeal on turns.
- Hard steering.
- Rapid and uneven wear on the edges of the tread.
- Tire rim bruises and rupture.
- Tire cord breakage.
- High tire temperatures.

Unequal tire pressures on same axle can cause

- Uneven braking.
- Steering lead.
- Reduced handling.
- Swerve on acceleration.
- Torque steer.

AUTOMATIC TRANSAXLE DRIVE AXLE

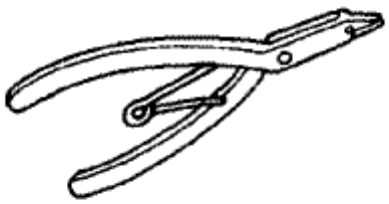
SPECIFICATIONS

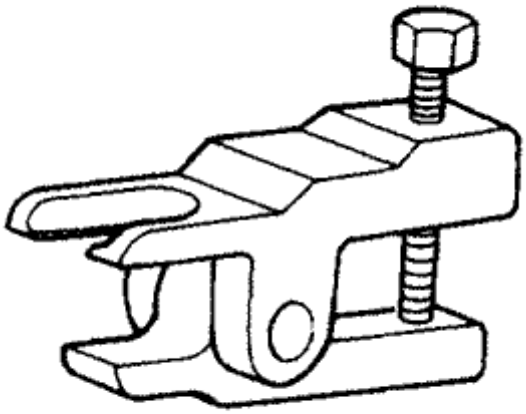
Fastener Tightening Specifications

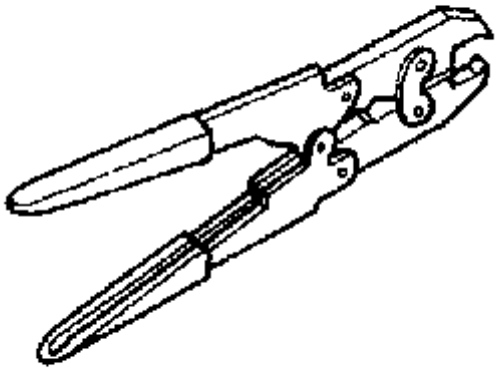
Application	N•m	Lb-Ft	Lb-In
Axle Shaft Caulking Nut	300	221	-
Lower Ball Joint Nut	50	37	-
Tie Rod Nut	45	33	-
Wheel Nuts	120	88	-

SPECIAL TOOLS

Special Tools Table

 J8059	J-8059 Snap Ring Pliers
	KM-507-B Ball Joint Remover

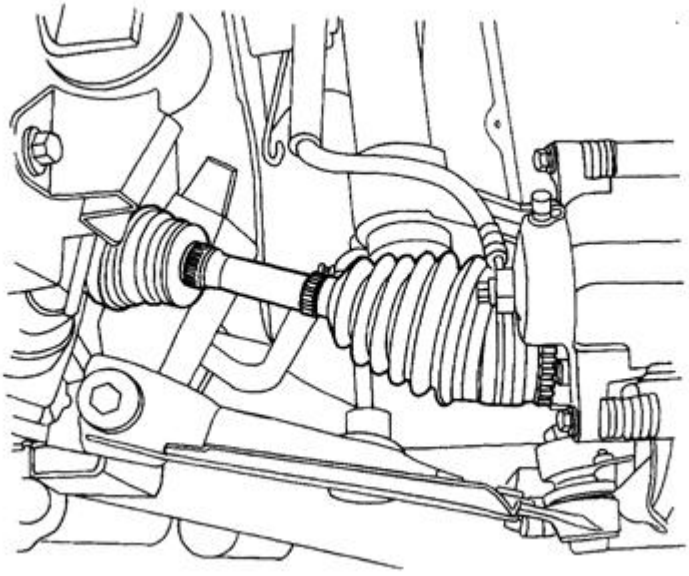
 KM507B	
 DW340110	DW340-110 Axle Shaft Remover
	J-35566 Seal Clamp Pliers



J35566

COMPONENT LOCATOR

Front Drive Axle



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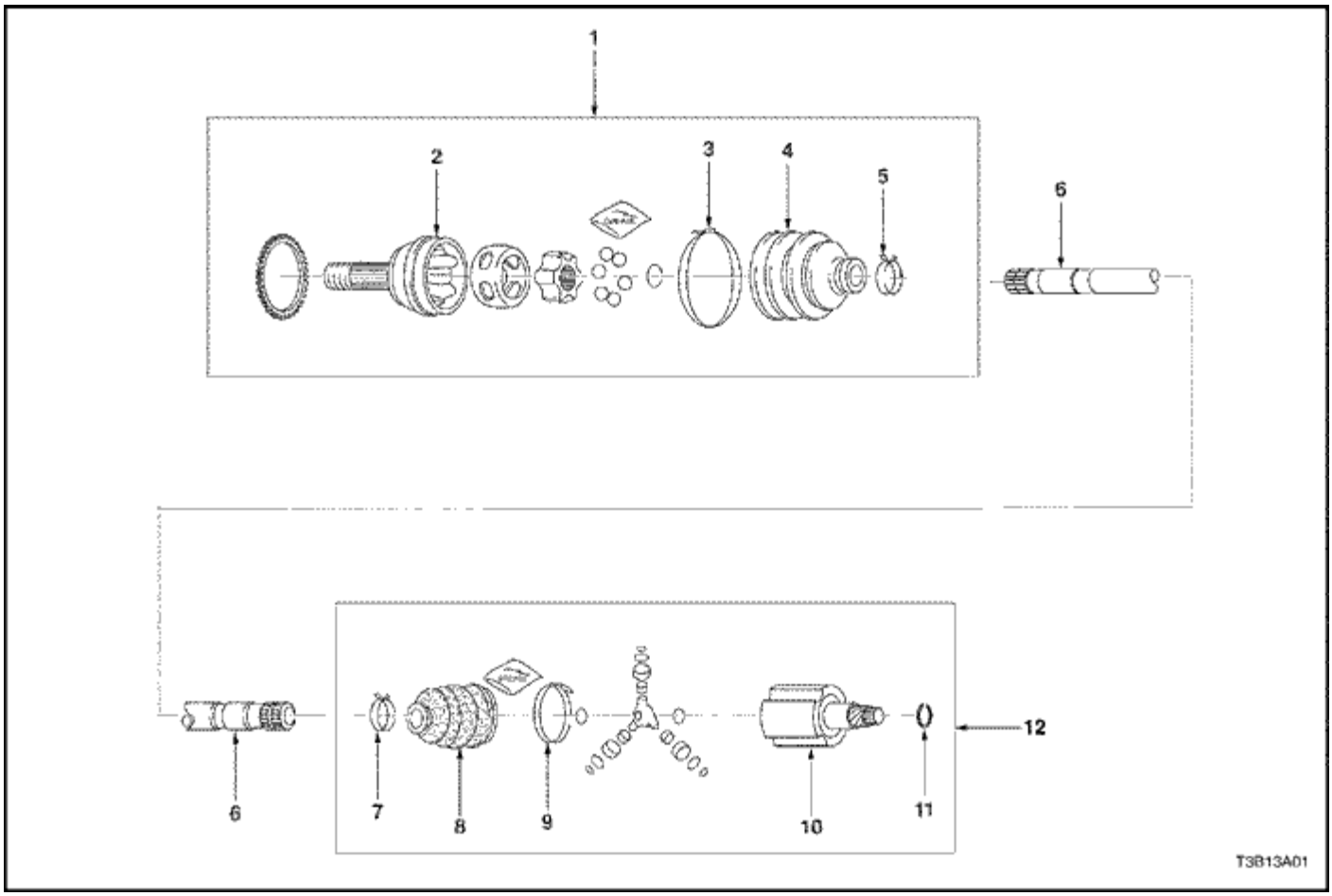
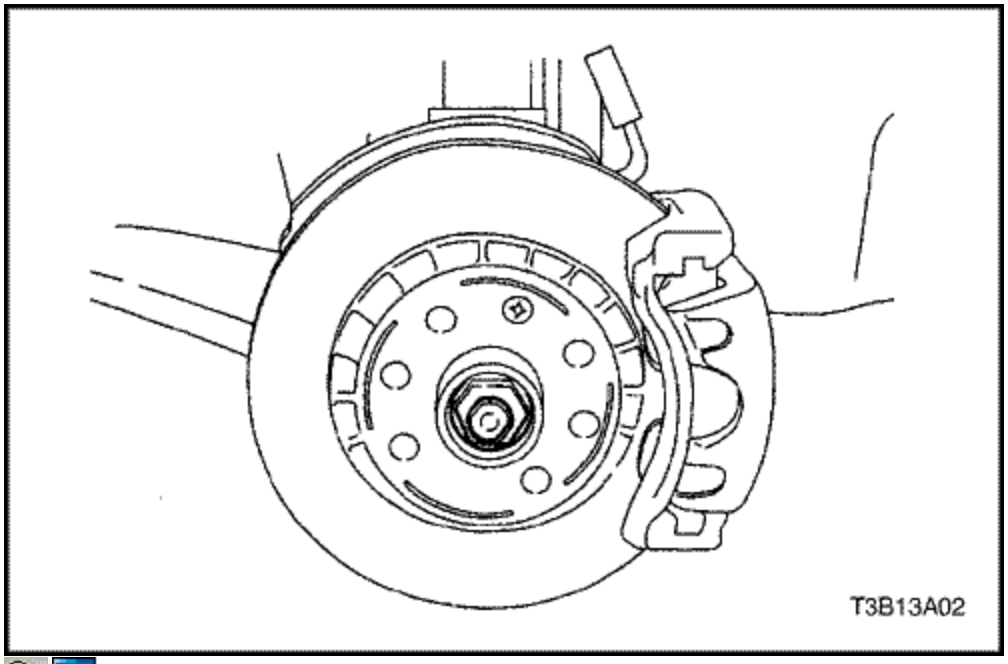


1. C/V Joint Assembly
2. C/V Joint
3. Seal Retaining Clamp
4. Drive Axle Outboard Seal
5. Seal Retaining Clamp
6. Axle Shaft (Left-hand Drive Shown, Right-hand Drive Similar)
7. Seal Retaining Clamp
8. Drive Axle Inboard Seal
9. Seal Retaining Clamp
10. Tripot Housing
11. Snap Ring
12. Tripot Joint Assembly

MAINTENANCE AND REPAIR

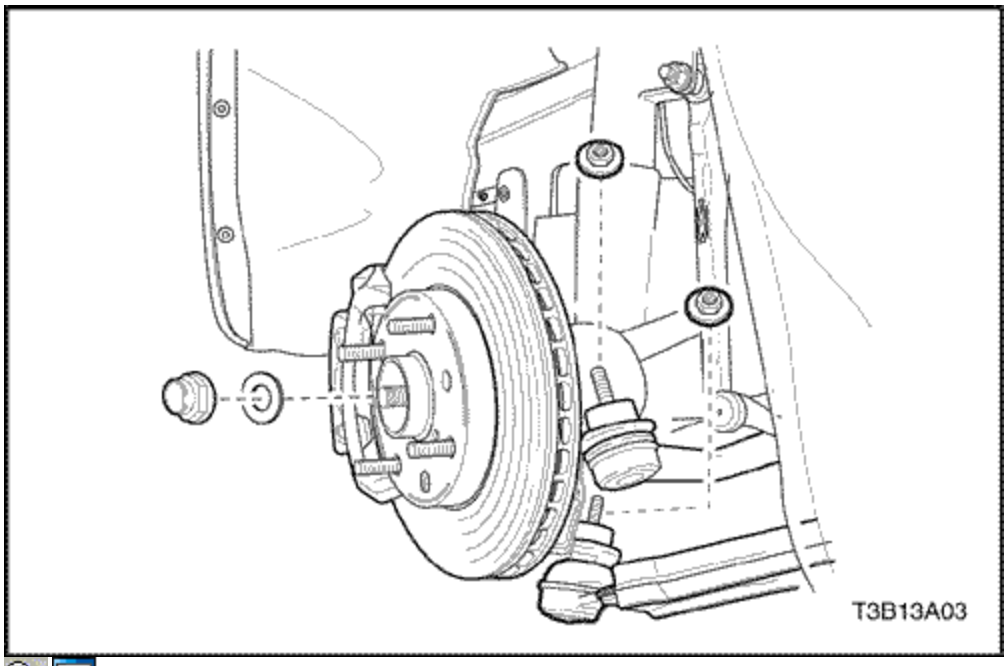
ON-VEHICLE SERVICE



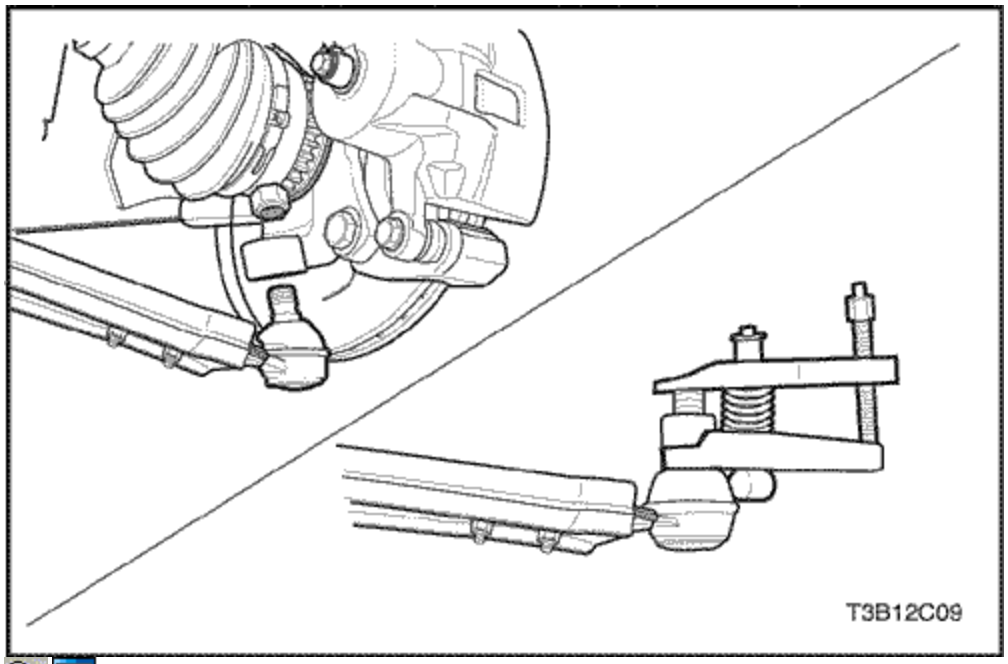
Drive Axle Assembly
Tools Required

KM-507-B Ball Joint Separator
DW340-110 Axle Shaft Remover
Removal Procedure

1. Raise and suitably support the vehicle.
2. Remove the wheels. Refer to *Section 2E, Tires and Wheels.*
3. Remove the engine under covers. Refer to *Section 9N, Frame and Underbody.*

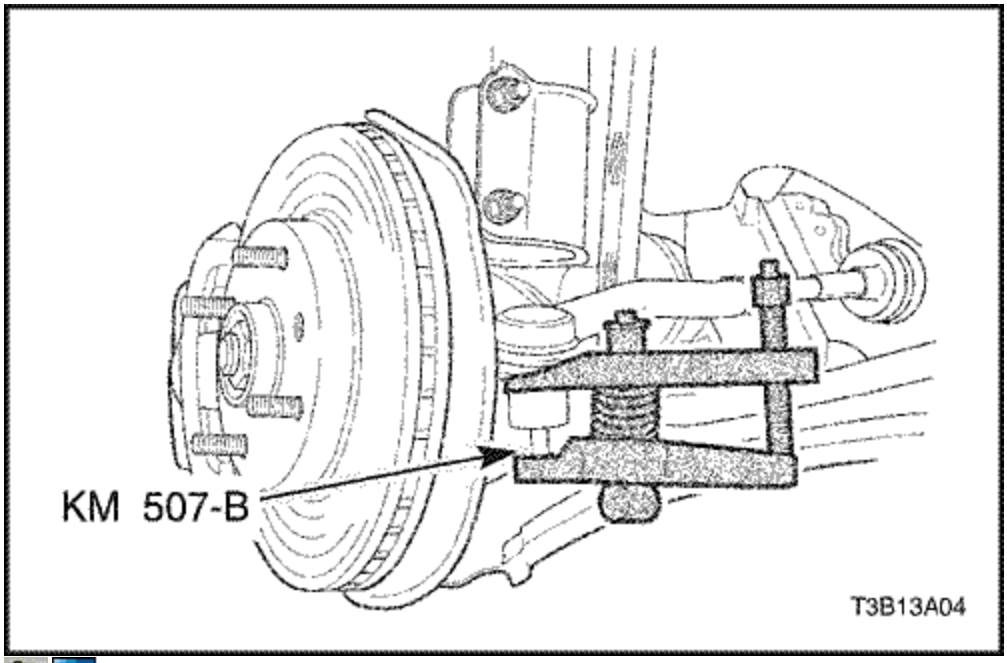


4. Remove the axle shaft caulking nut. Discard the nut.
5. Remove the lower ball joint nut.



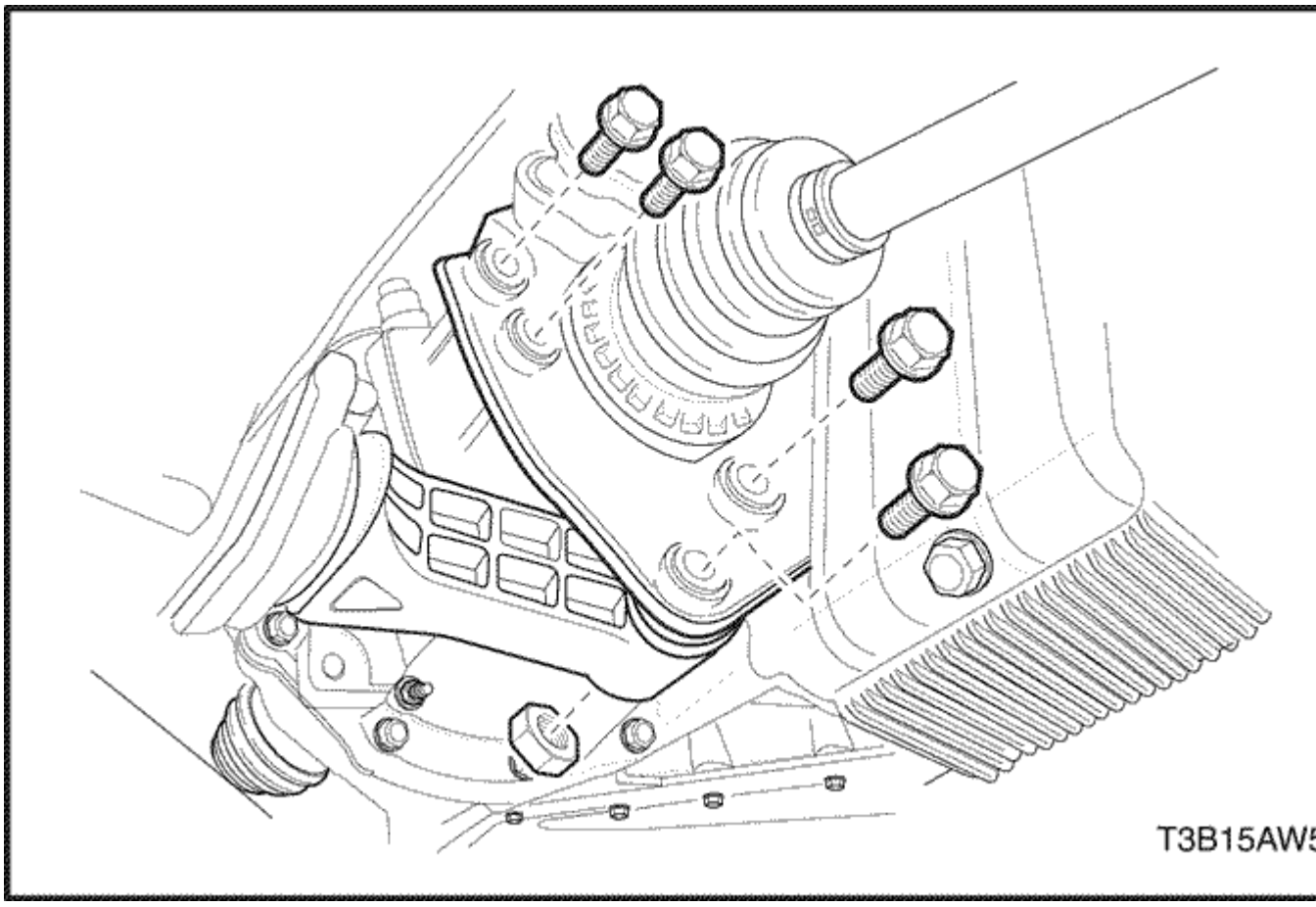
Notice : Use only the recommended tool for separating the lower ball joint. Failure to use the recommended tool may cause damage to the ball joint and the seal.

6. Separate the steering knuckle from the lower ball joint using the ball joint separator KM-507-B.
7. Remove the tie rod nut.

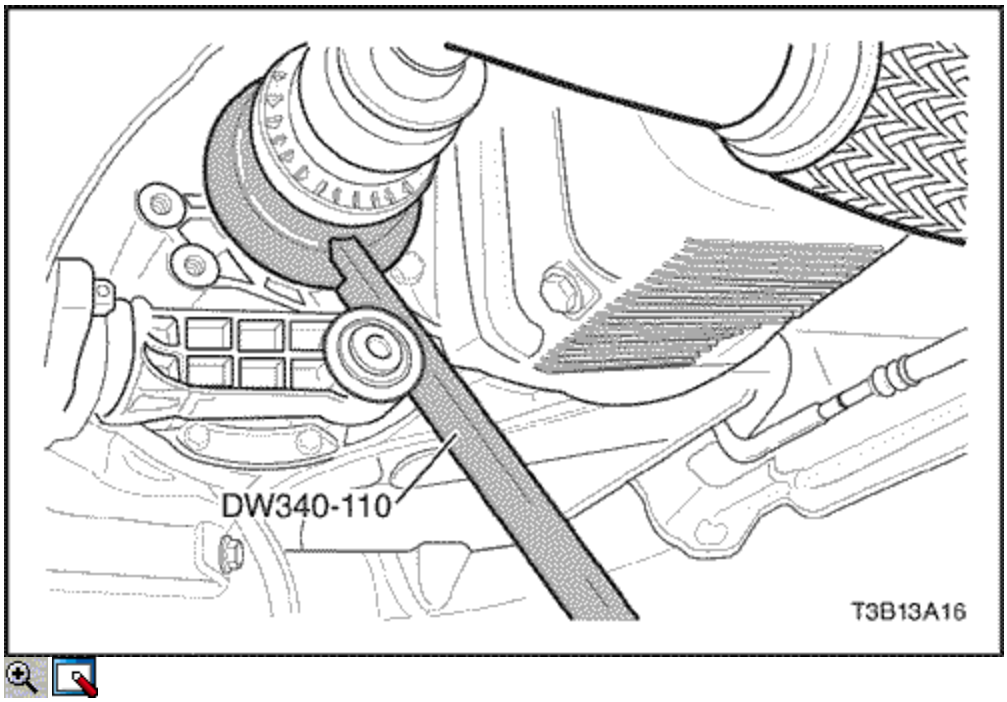


Notice : Use only the recommended tool for separating the tie rod from the knuckle/strut assembly. Failure to use the recommended tool may cause damage to the knuckle/strut assembly.

8. Separate the tie rod end using the ball joint separator KM-507-B.



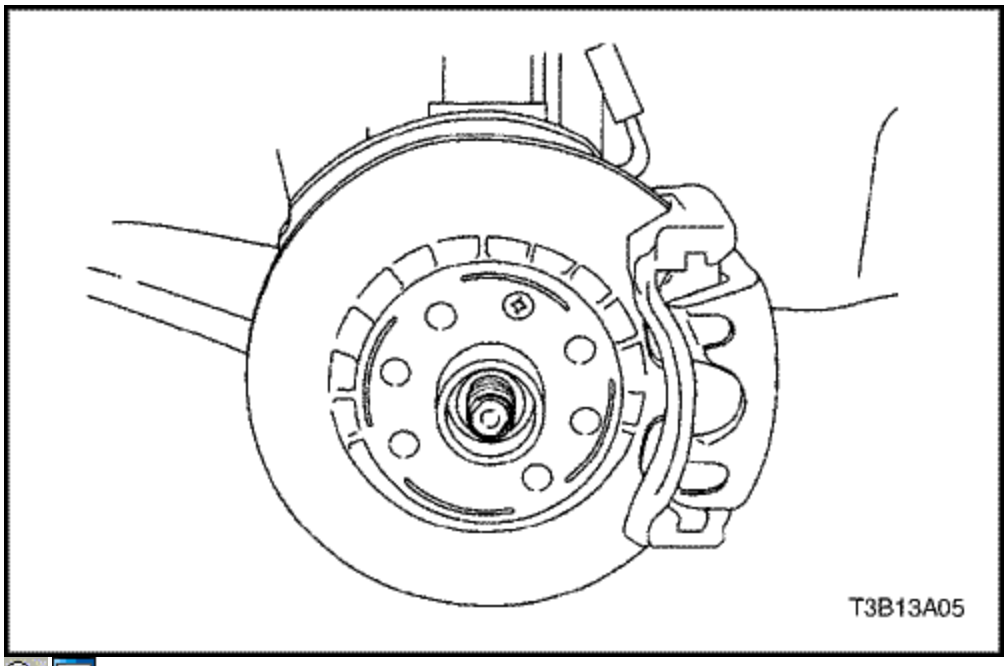
9. Remove the damping block connection nut and bolt.
10. Remove the rear mounting bracket bolts and the bracket.



11. Push the drive axle shaft from the wheel hub.

Important : Support the unfastened end of the drive axle. Do not allow the drive axle to dangle freely from the transaxle for any length of time after it has been removed from the wheel hub.
Important : Place a drain pan below the transaxle to catch the escaping fluid. Cap the transaxle drive opening after the drive axle has been removed to keep the fluid in and any contamination out.

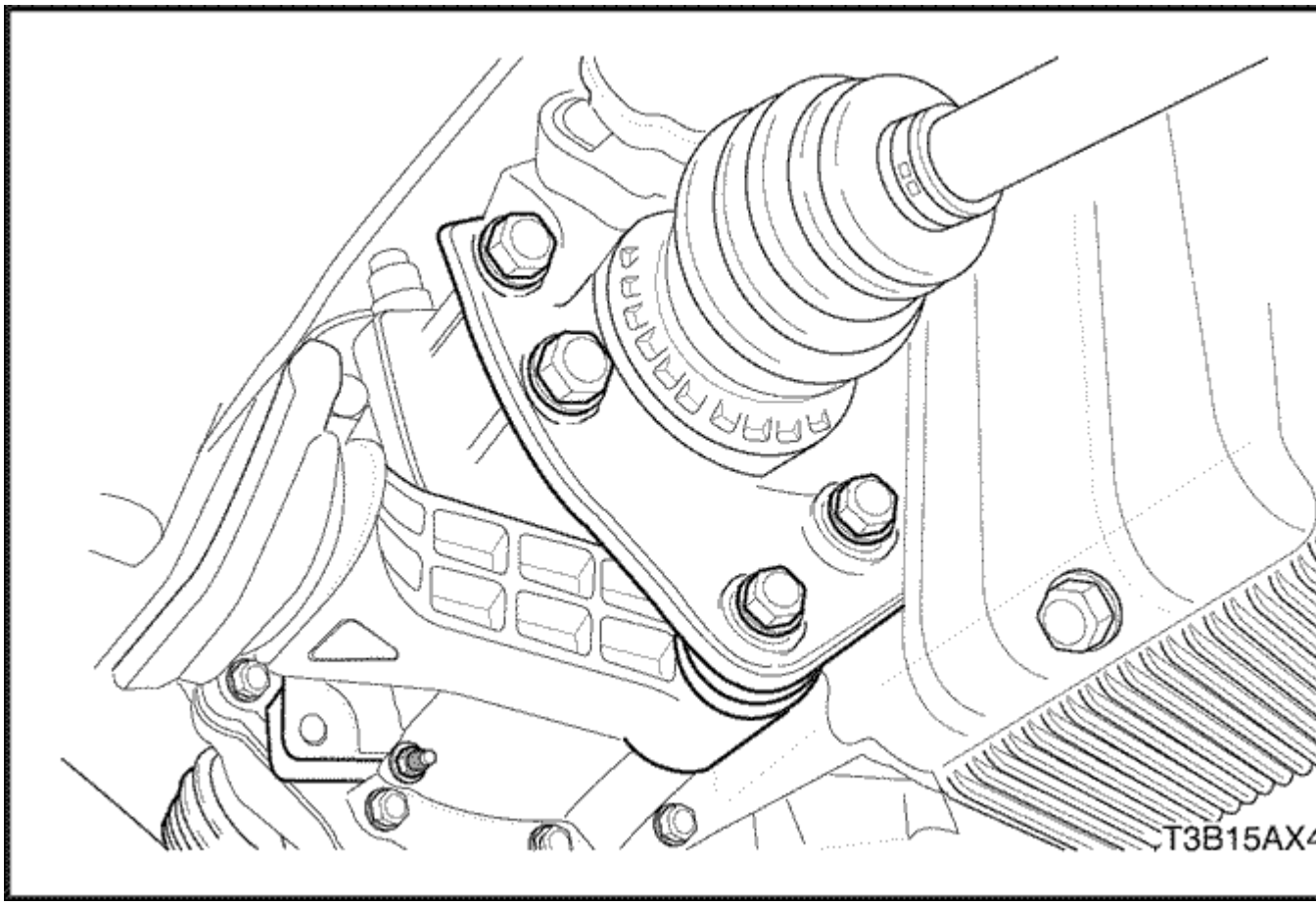
12. Remove the drive axle from the transaxle using the axle shaft remover DW340-110.



Installation Procedure

Notice : Do not damage the seals.

1. Clean the hub seal and the transaxle seal.
2. Install the drive axle into the transaxle.
3. Install the wheel hub onto the axle shaft.

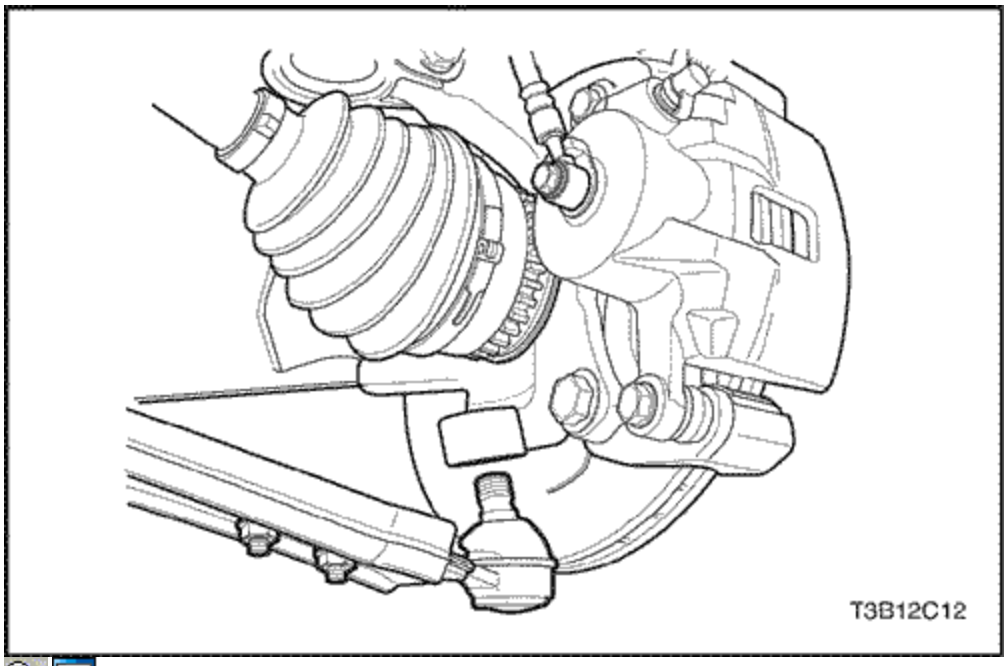


4. Install the rear mounting bracket bolts and the braket.

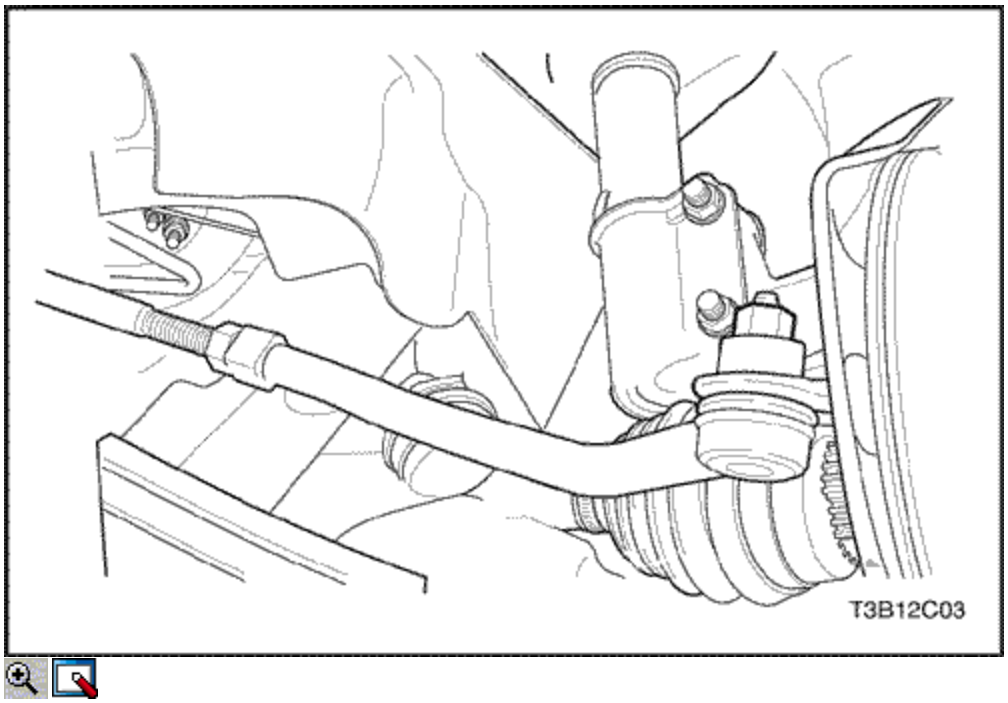
   Tighten
   Tighten the rear mounting bracket bolts to 60 N•m (44 lb-ft).

5. Install the damping block connection nut and bolt.

   Tighten
   Tighten the damping block connection nut and bolt to 80 N•m (59 lb-ft).

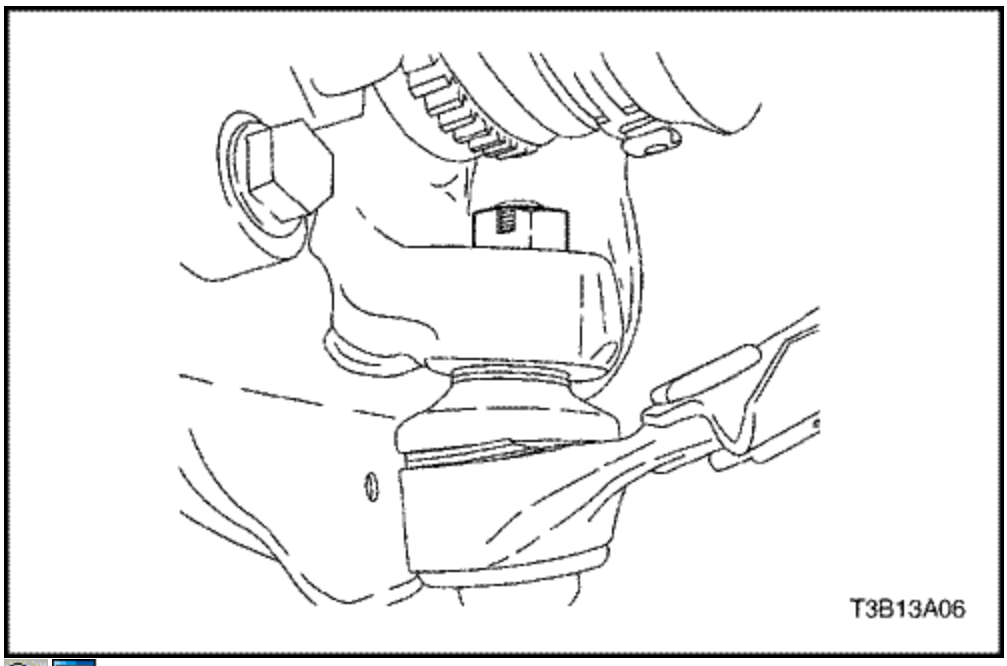


6. Mount the steering knuckle onto the lower ball joint.



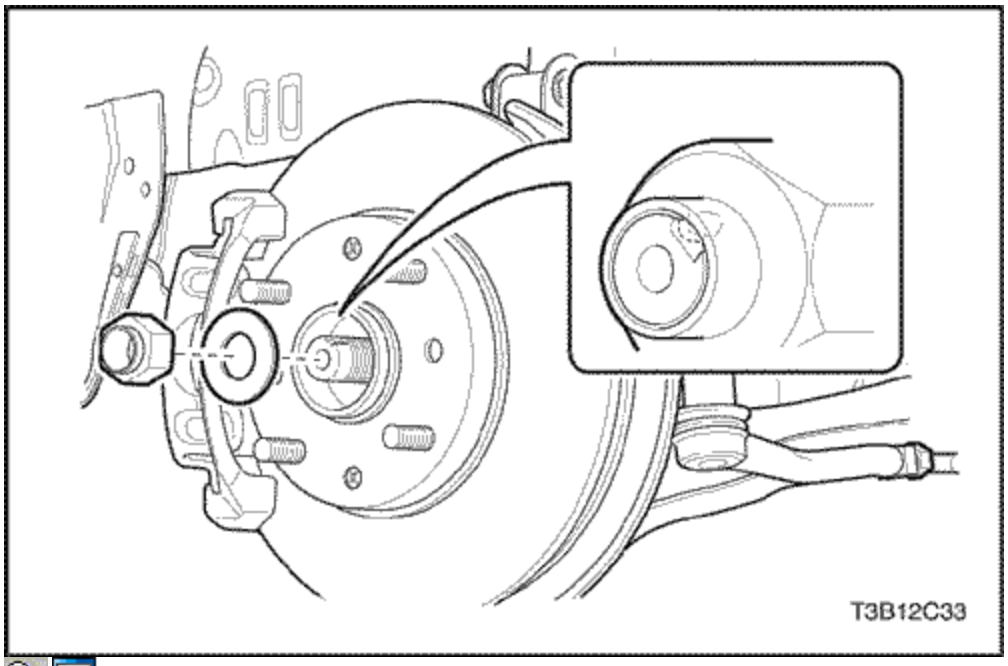
7. Install the tie rod into the knuckle/strut and install the tie rod nut.

   Tighten
   Tighten the tie rod nut to 45 N•m (33 lb-ft).

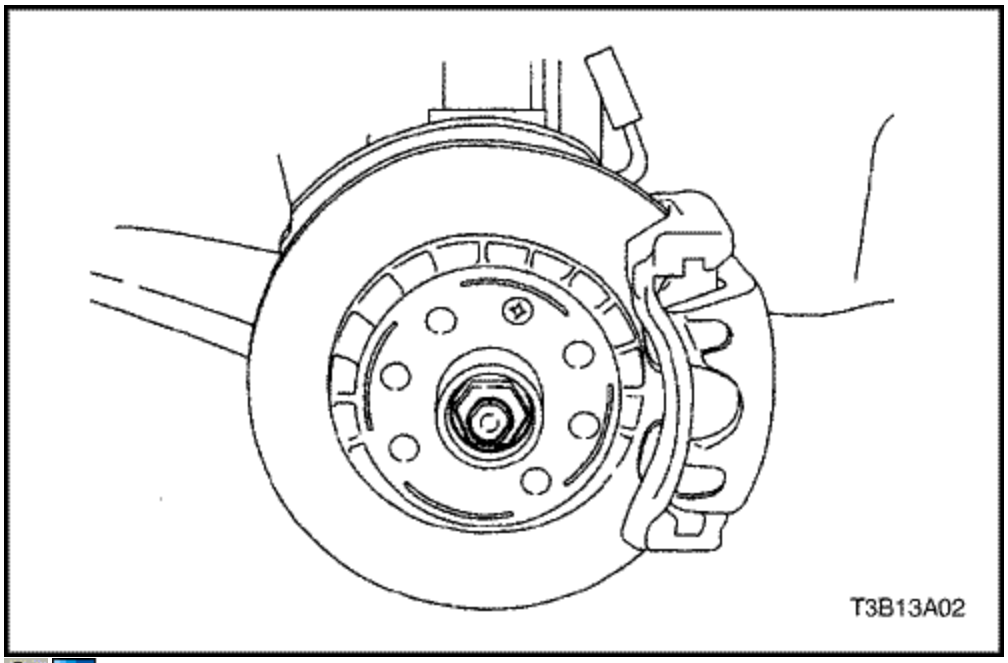


8. Install the lower ball joint nut.

   Tighten
   Tighten the lower ball joint nut to 50 N•m (37 lb-ft).



9. Loosely install a new axle shaft caulking nut. Always use a new nut.

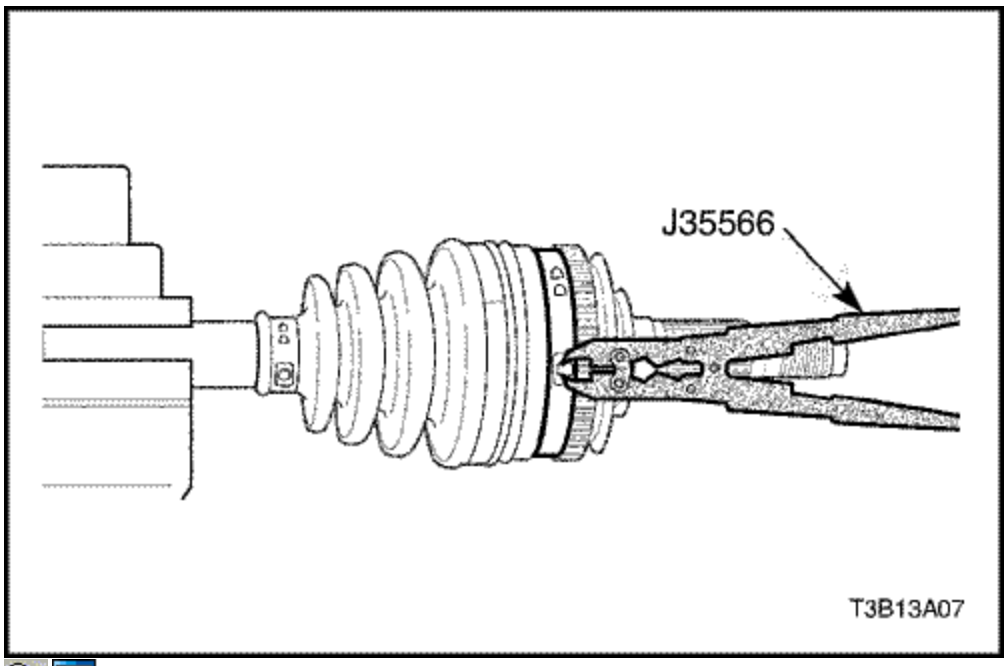


10. Install the wheels. Loosely install the nuts. Refer to *Section 2E, Tires and Wheels.*
11. Lower the vehicle to the floor.

Tighten
Tighten the wheel nuts to 120 N•m (88 lb-ft).

12. Tighten the axle shaft caulking nut to 300 N•m (221 lb-ft).
13. Peen the caulking nut with a punch and a hammer until the nut is locked into place on the axle shaft hub.
14. Install the engine under covers. Refer to *Section 9N, Frame and Underbody.*
15. Refill the transaxle fluid to the proper level. Refer to *Section 5A, AISIN Automatic Transaxle.*

UNIT REPAIR

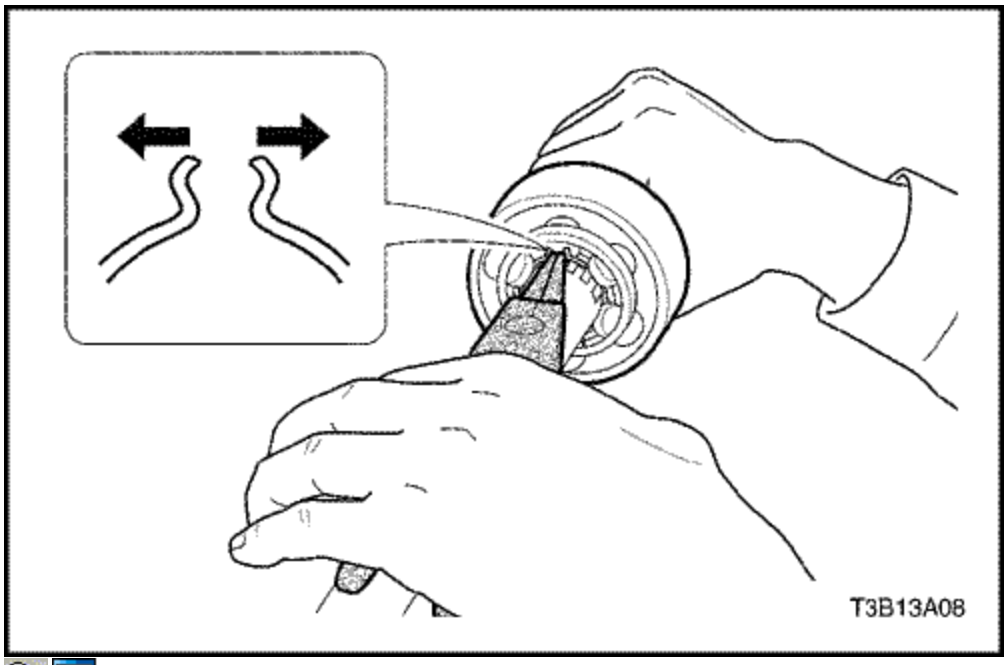


Outer Joint Seal
Tools Required

J-8059 Snap Ring Pliers
J-35566 Seal Clamp Pliers

Removal Procedure

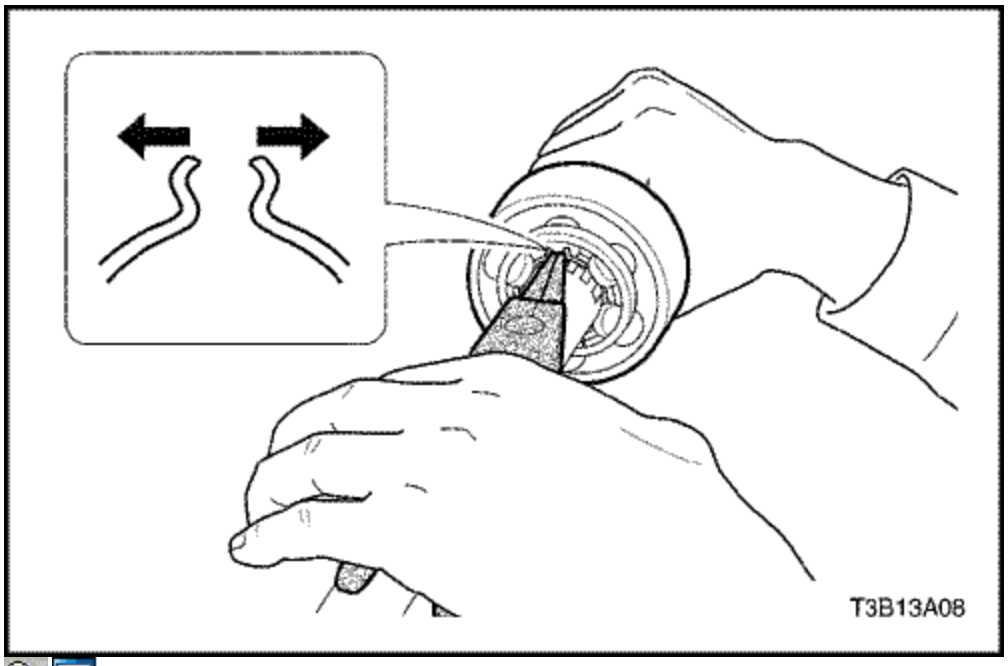
1. Remove the drive axle from the vehicle. Refer to "Drive Axle Assembly" in this section.
2. Remove the large seal retaining clamp. Discard the clamp.
3. Remove the small seal retaining clamp. Discard the clamp.



4. Degrease the joint.
5. Spread the snap ring using the snap ring pliers J-8059 and remove the outer joint the axle shaft.

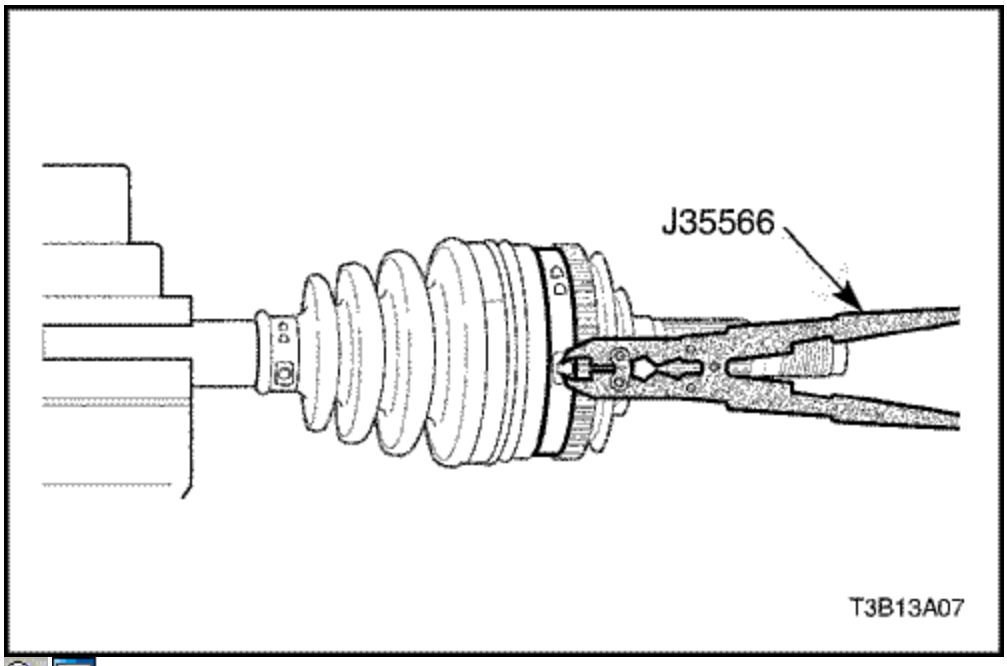
   Caution : Do not disassemble the outer joint assembly. Parts are match fit and cannot be serviced separately. Improper reassembly will adversely affect both performance and safety.

6. Remove the seal from the joint assembly.

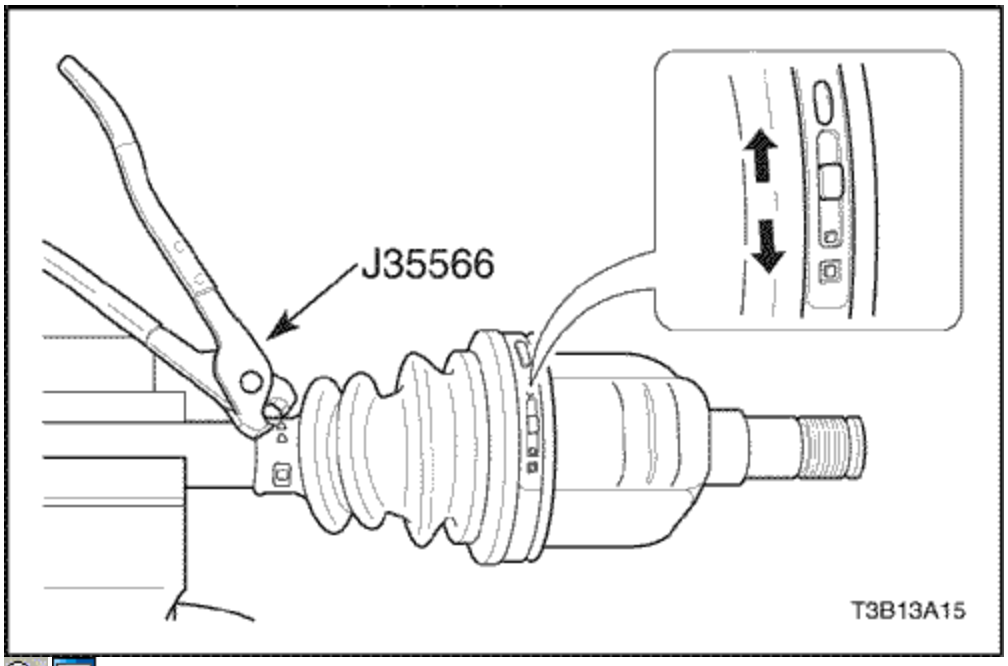


Installation Procedure

1. Install the seal onto the axle shaft.
2. Spread the snap ring using the snap ring pliers J-8059 and remove the outer joint the axle shaft.
3. Fill the joint seal with 110 to 130 g (3.9 to 4.6 ounces) of the recommended grease. Repack the joint with 110 to 130 g (3.9 to 4.6 ounces) of the recommended grease.



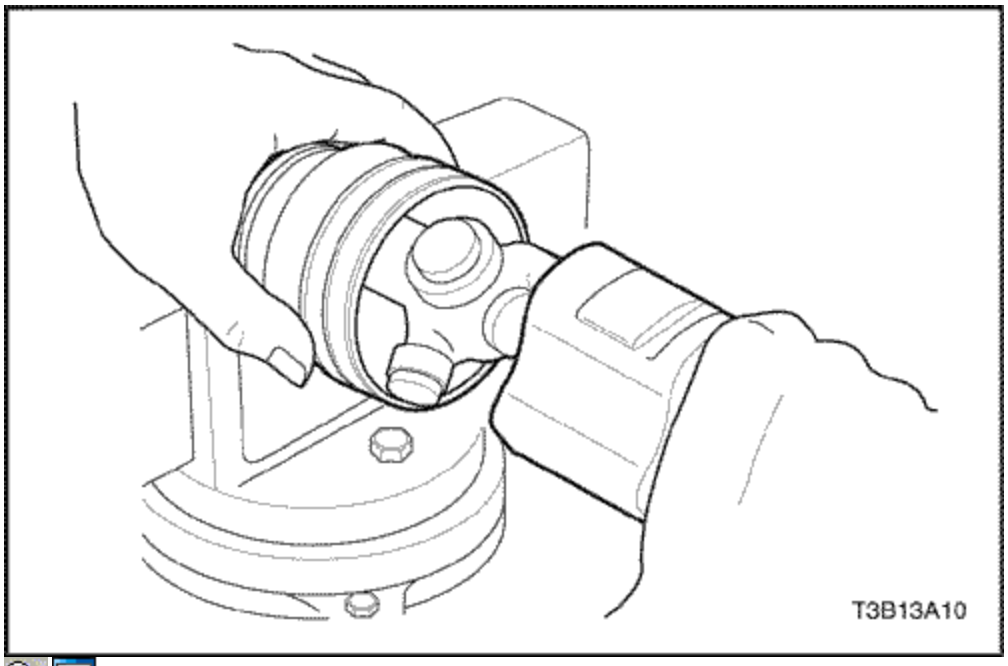
4. Install a new large seal retaining clamp and a new small seal retaining clamp.
5. Crimp the new small seal retaining clamp and the new large seal retaining clamp using the seal clamp pliers J-35566.
6. Install the drive axle shaft to the vehicle. Refer to "Drive Axle Assembly"in this section.



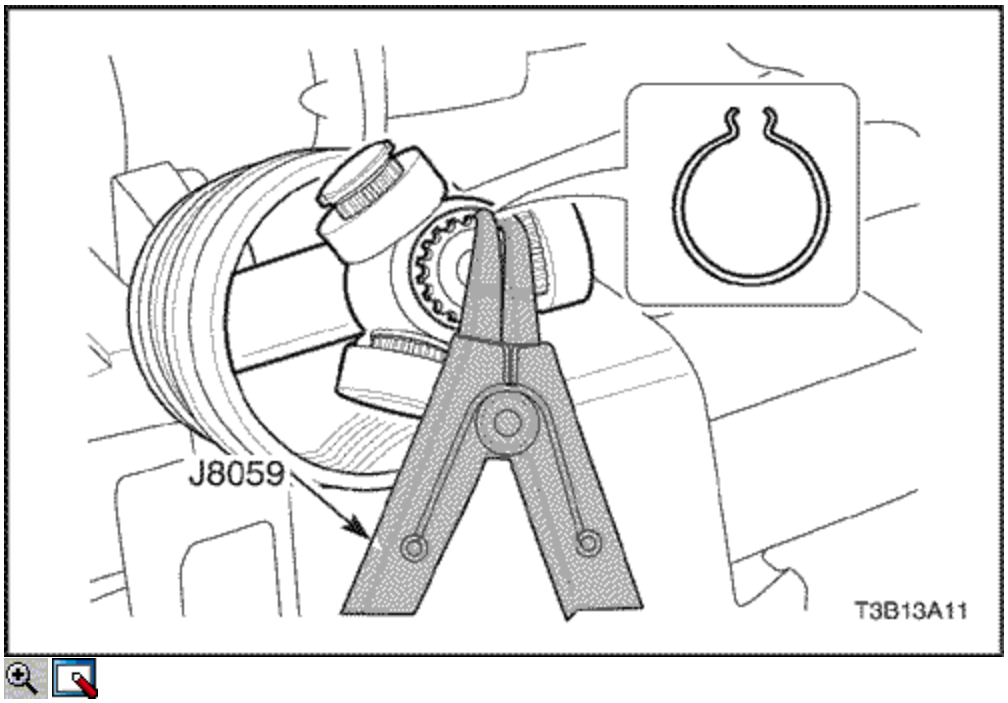
Inner Tripot Seal
Tools Required

J-35566 Snap Ring Pliers
J-8059 Snap Ring Pliers
Removal Procedure

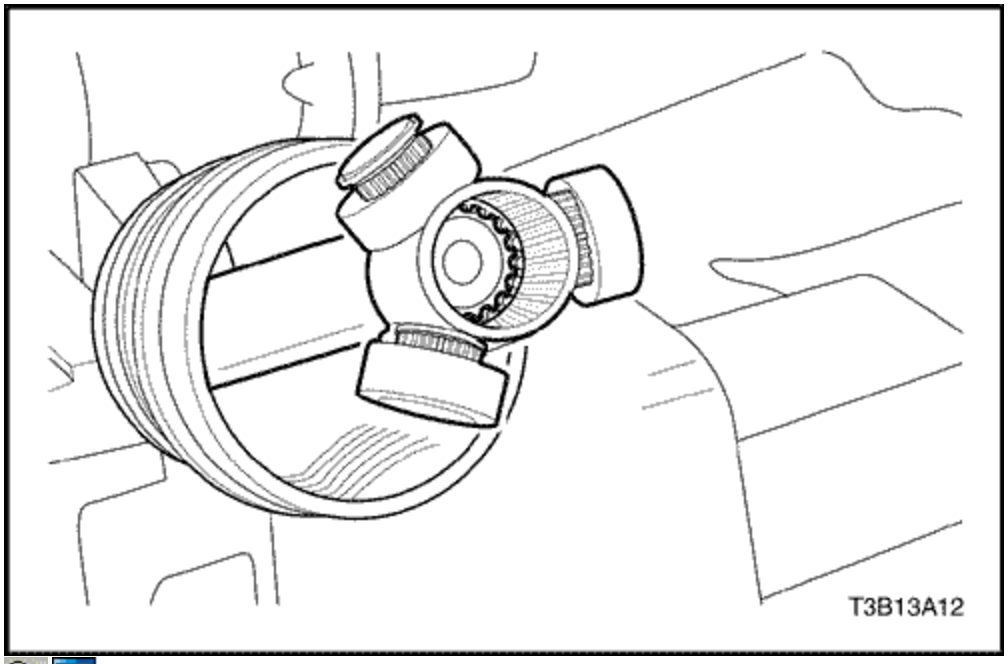
1. Remove the drive axle from the vehicle. Refer to *"Drive Axle"* in this section.
2. Remove the large seal retaining clamp. Discard the clamp.
3. Remove the small seal retaining clamp. Discard the clamp.



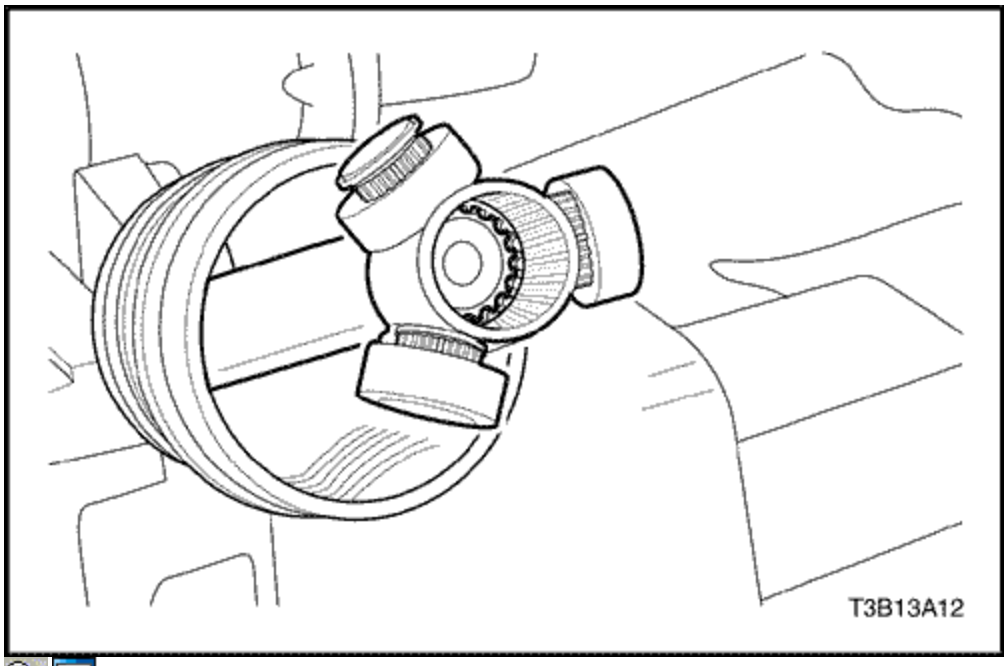
4. Separate the joint housing from the boot.



5. Degrease the tripot assembly.
6. Remove the shaft retaining ring using the snap ring pliers J-8059.



7. Remove the tripot and the tripot joint retaining ring from the axle shaft.
8. Remove the tripot joint seal from the axle shaft.

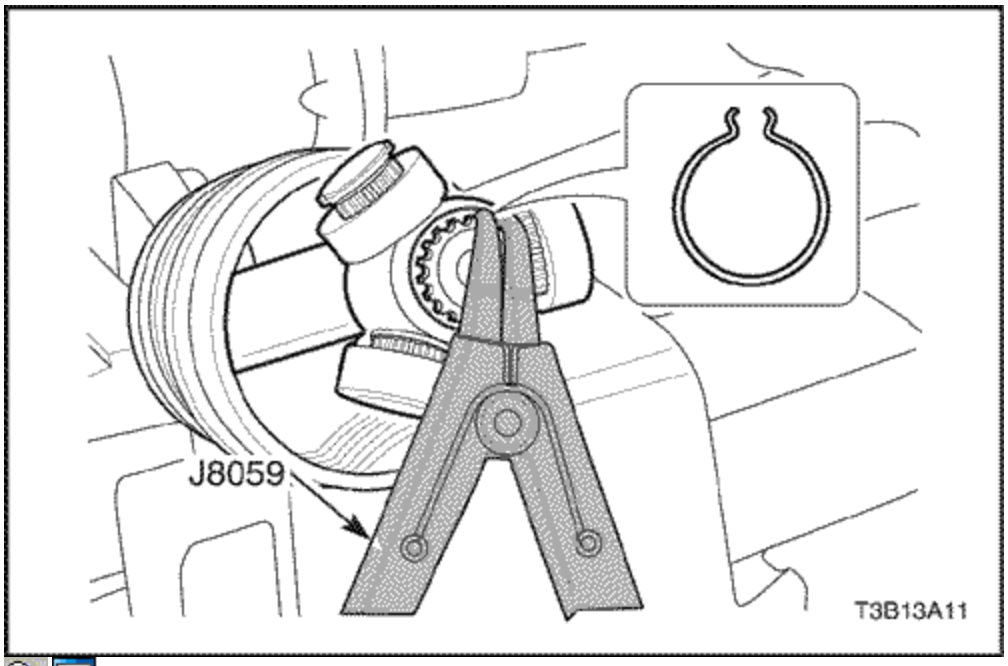


Installation Procedure

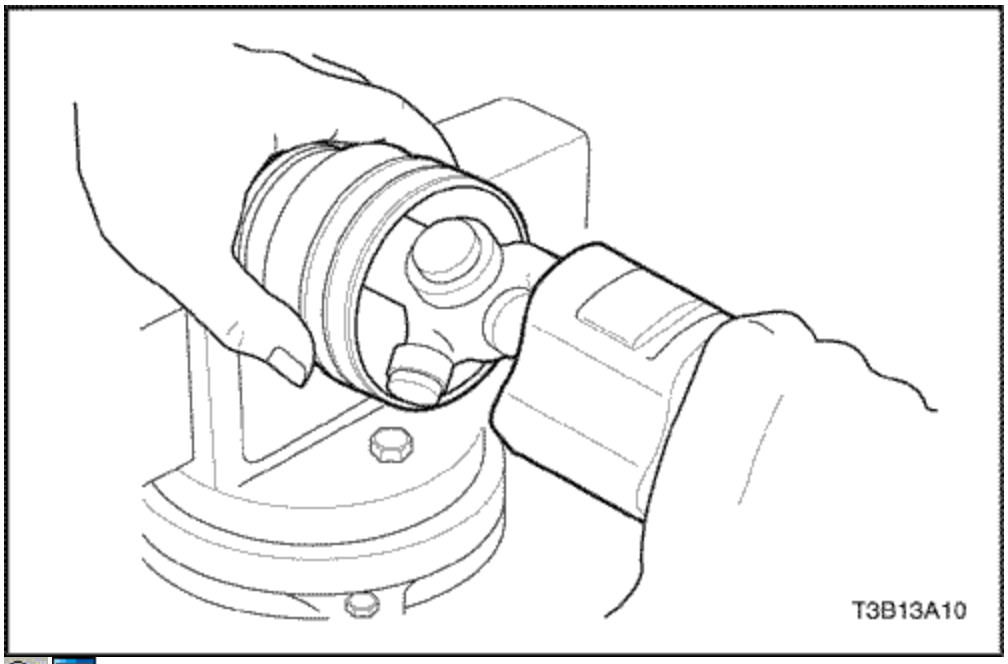
Tools Required

J-8059 Snap Ring Pliers
J-35566 Seal Clamp Pliers

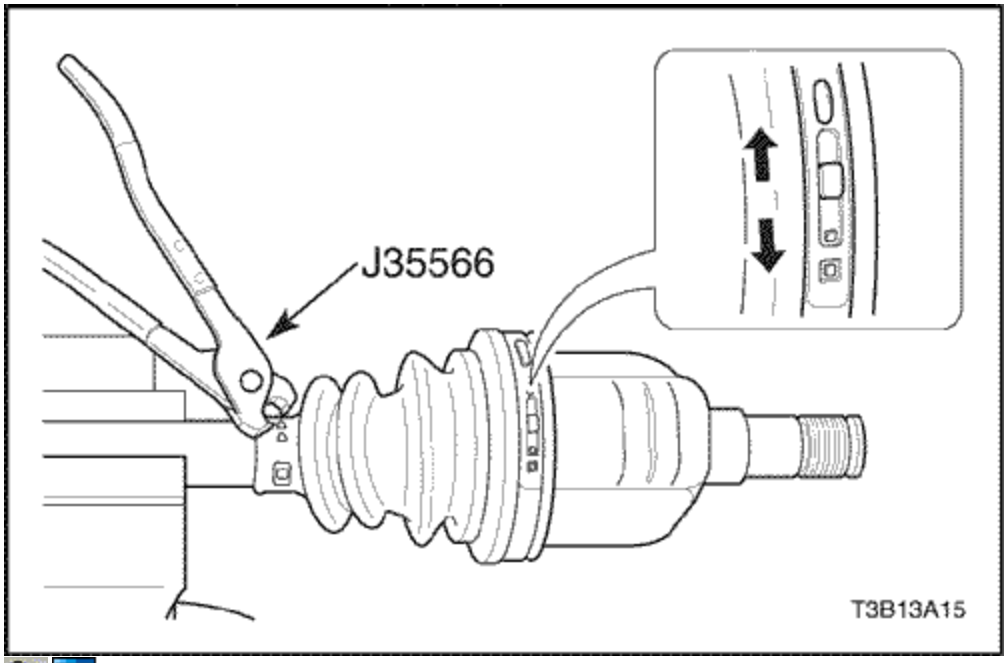
1. Install a new small seal retaining clamp onto the seal.
2. Install the seal onto the axle shaft.



3. Install the shaft retaining ring onto the axle shaft using the snap ring pliers J-8059.



4. Fill the tripot housing with 195 to 215 g (6.9 to 7.6 ounces) of the recommended grease. Repack the tripot with 195 to 215 g (6.9 to 7.6 ounces) of the recommended grease.
5. Install the boot to the joint housing.



6. Install a new large seal retaining clamp. Crimp the large seal retaining clamp using the seal clamp pliers J-35566.
7. Crimp the new small seal retaining clamp using the seal clamp pliers J-35566.
8. Install the drive axle shaft to the vehicle. Refer to "Drive Axle Assembly" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Front Drive Axle

General Description

Drive axles are flexible shaft assemblies that transmit rotational force from the transaxle to the front-wheel assemblies. Each axle assembly consists of an inner and an outer constant-velocity joint connected to an axle shaft. The inner joint is completely flexible and has the ability to move in and out. The outer joint is also flexible, but it cannot move in and out.

The drive axles use one type of outboard joint and one type of inboard joint. The inboard ends of both drive axles incorporate a female spline that installs over a stub shaft protruding from the transaxle.

SECTION 3B

MANUAL TRANSAXLE DRIVE AXLE

SPECIFICATIONS

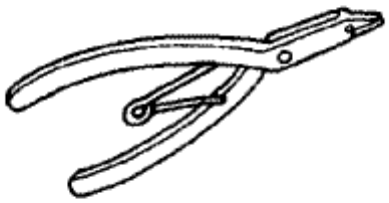
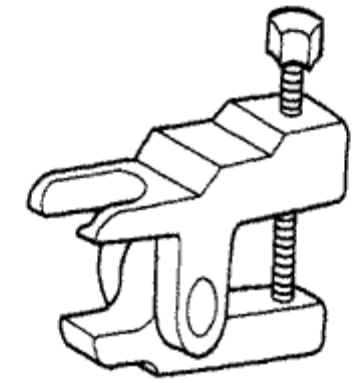
Fastener Tightening Specifications

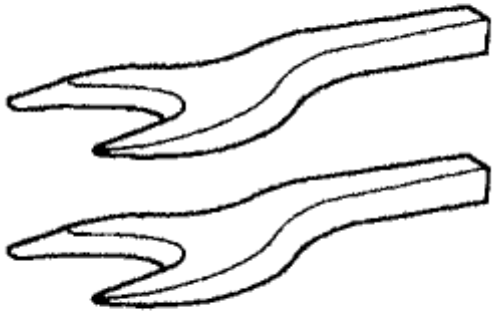
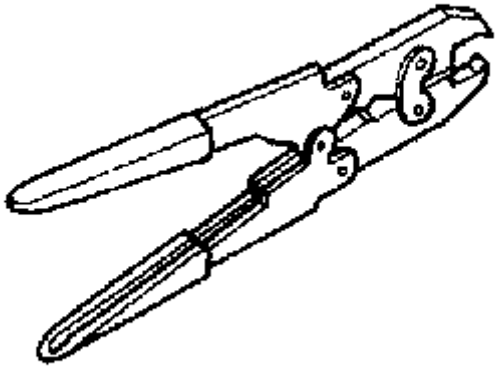
Application	N•m	Lb-Ft	Lb-In
Axle Shaft Caulking Nut	300	221	-
Lower Ball Joint Nut	50	37	-
Tie Rod Nut	45	33	-
Wheel Nuts	120	88	-

SPECIAL TOOLS

Special Tools Table

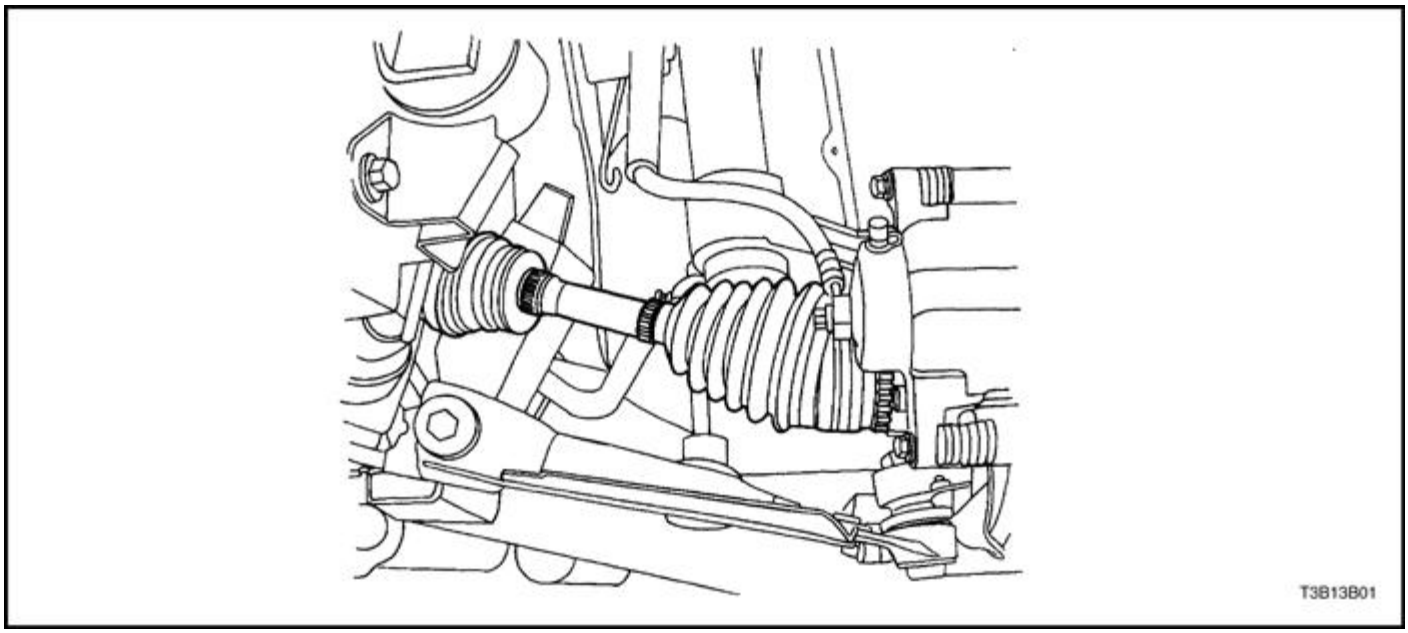
	J-8059 Snap Ring Pliers

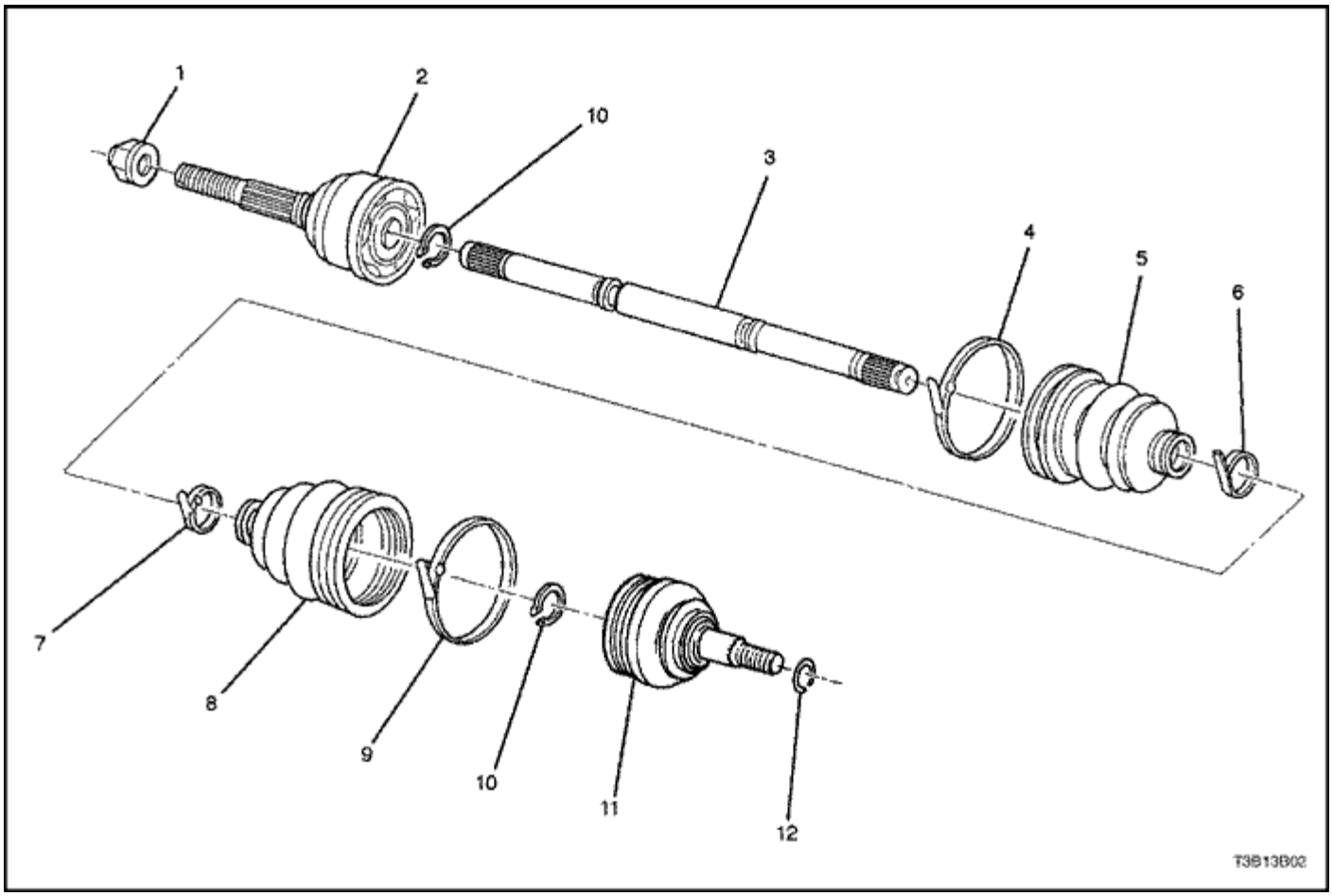
 J8059	
 KM507B	KM-507-B Ball Joint Remover
	KM-460-A Axle Shaft Remover

 KM460A	
 J35566	J-35566 Seal Clamp Pliers

COMPONENT LOCATOR

Front Drive Axle

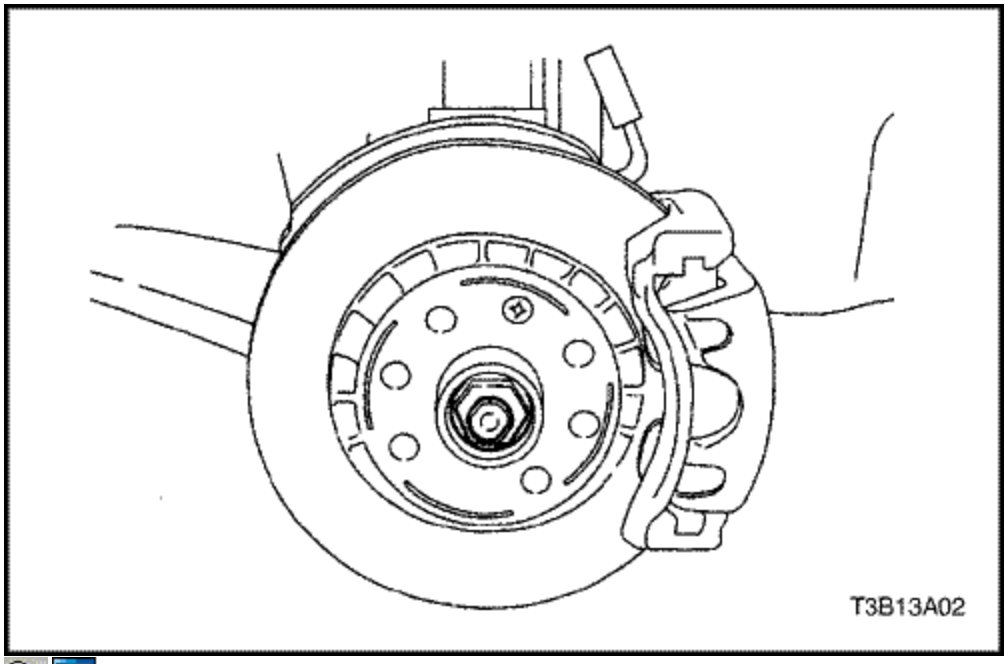

T3B13B01



1. Caulking Nut
2. C/V Joint
3. Axle Shaft
4. Seal Retaining Clamp
5. Drive Axle Outboard Seal
6. Seal Retaining Clamp
7. Seal Retaining Clamp
8. Drive Axle Inboard Seal
9. Seal Retaining Clamp
10. Race Retaining Ring
11. Cross Groove Joint
12. Retaining Ring

MAINTENANCE AND REPAIR

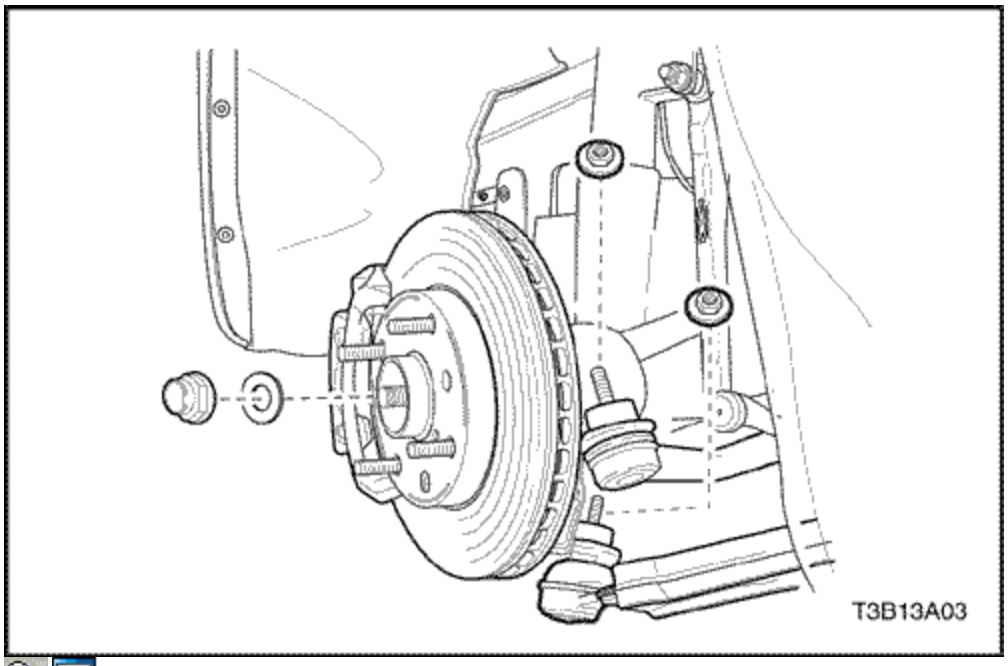
ON-VEHICLE SERVICE



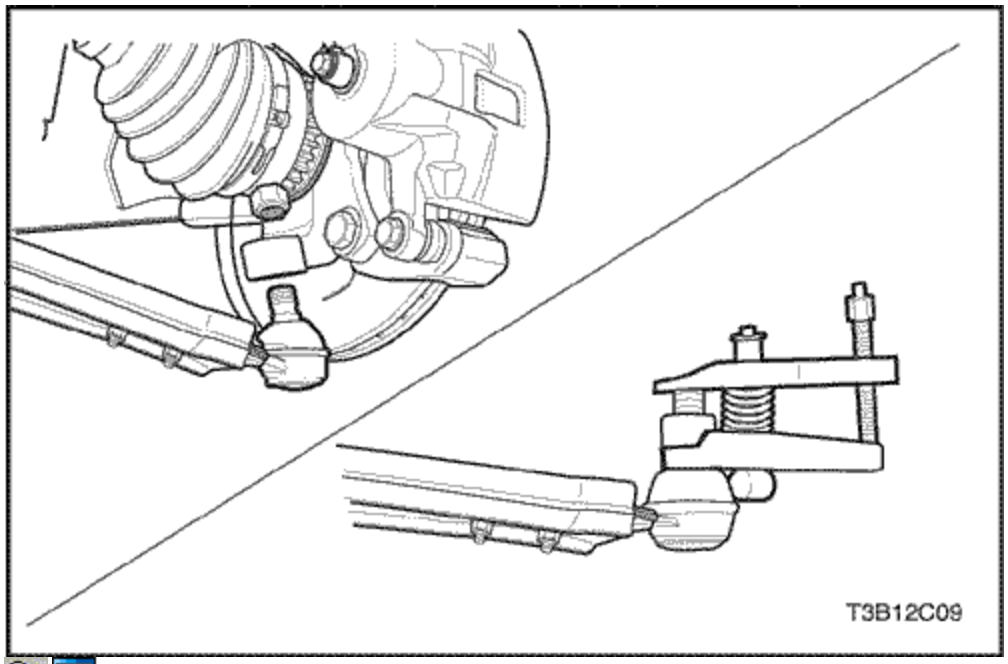
Drive Axle Assembly
Tools Required

KM-507-B Ball Joint Separator
KM-460-A Axle Shaft Remover
Removal Procedure

1. Raise and suitably support the vehicle.
2. Remove the wheels. Refer to *Section 2E, Tires and Wheels.*
3. Remove the engine under cover. Refer to *Section 9N, Frame and Underbody.*

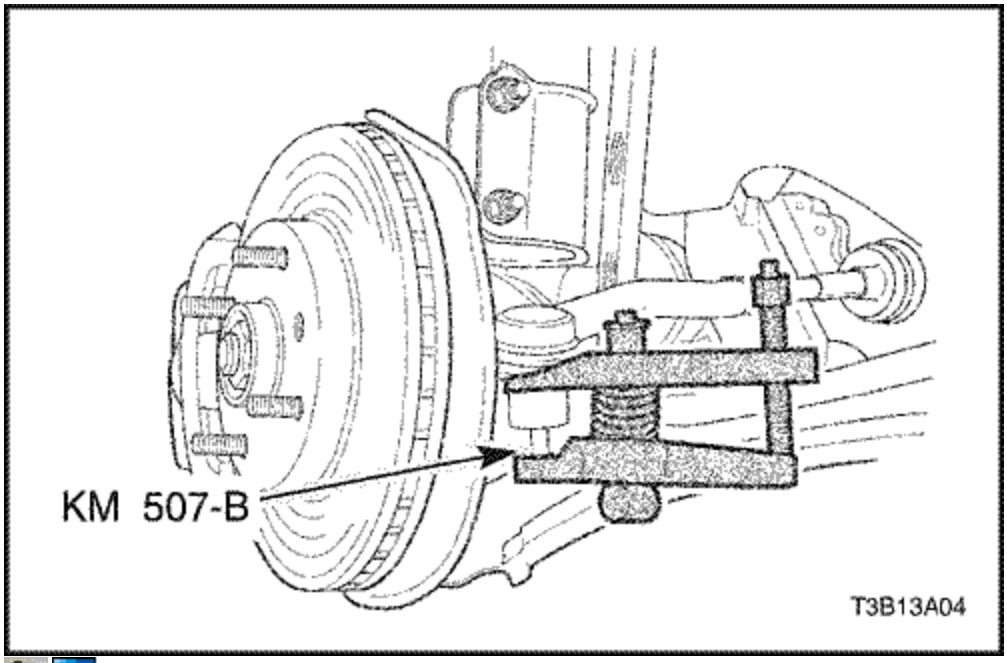


4. Remove the axle shaft caulking nut. Discard the nut.
5. Remove the lower ball joint nut.



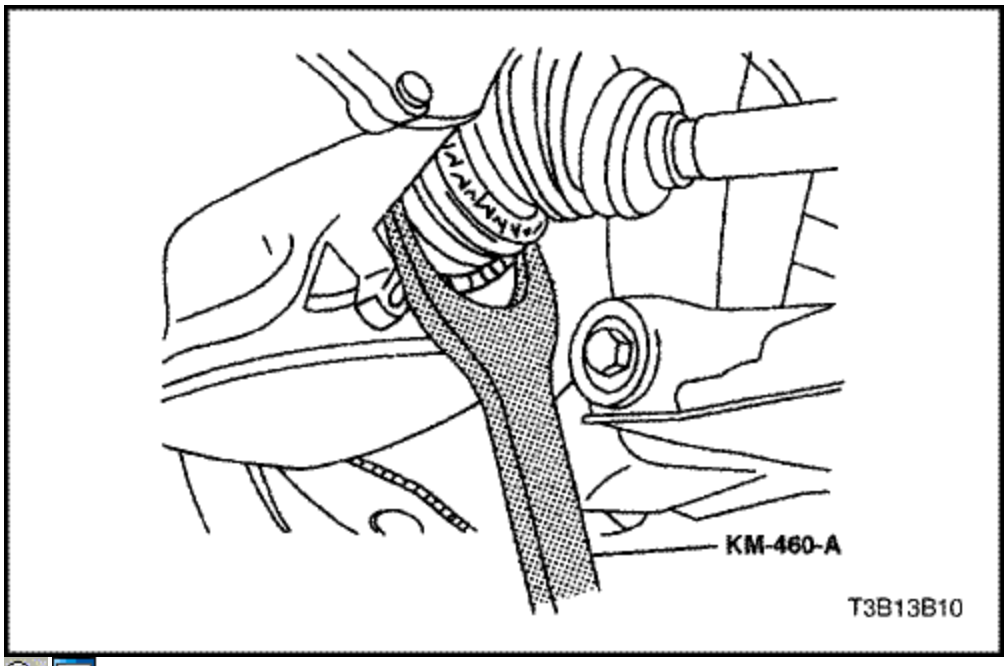
Notice : Use only the recommended tool for separating the lower ball joint. Failure to use the recommended tool may cause damage to the ball joint and the seal.

6. Separate the steering knuckle from the lower ball joint using the ball joint separator KM-507-B.
7. Remove the tie rod nut.



Notice : Use only the recommended tool for separating the tie rod from the knuckle/strut assembly. Failure to use the recommended tool may cause damage to the knuckle/strut assembly.

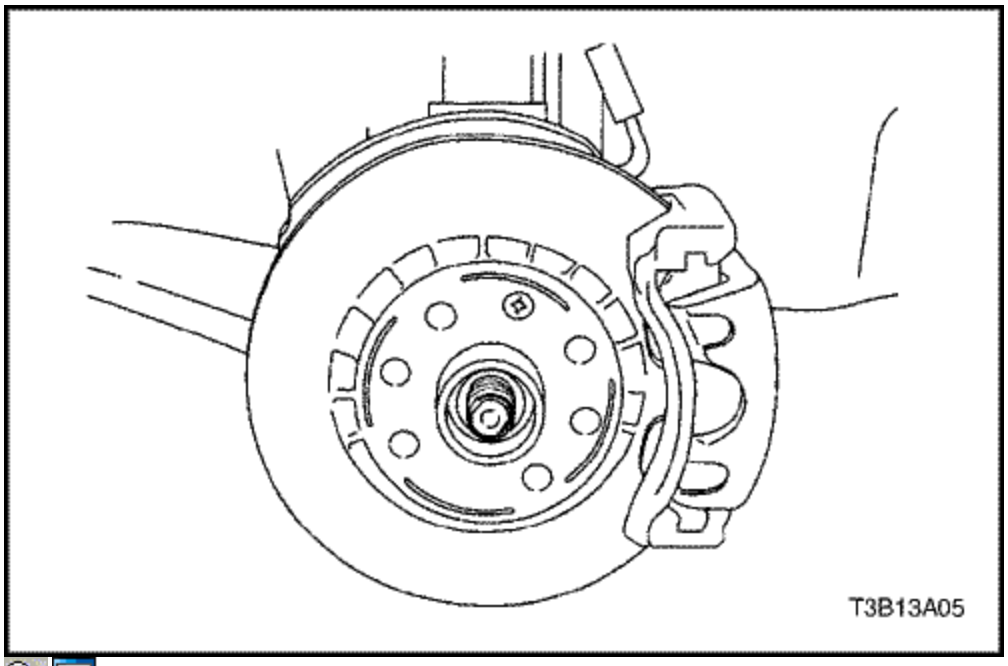
8. Separate the tie rod end using the ball joint separator KM-507-B.



9. Push the drive axle shaft from the wheel hub.

   Important : Support the unfastened end of the drive axle. Do not allow the drive axle to dangle freely from the transaxle for any length of time after it has been removed from the wheel hub.
   Important : Place a drain pan below the transaxle to catch the escaping fluid. Cap the transaxle drive opening after the drive axle has been removed to keep the fluid in and any contamination out.

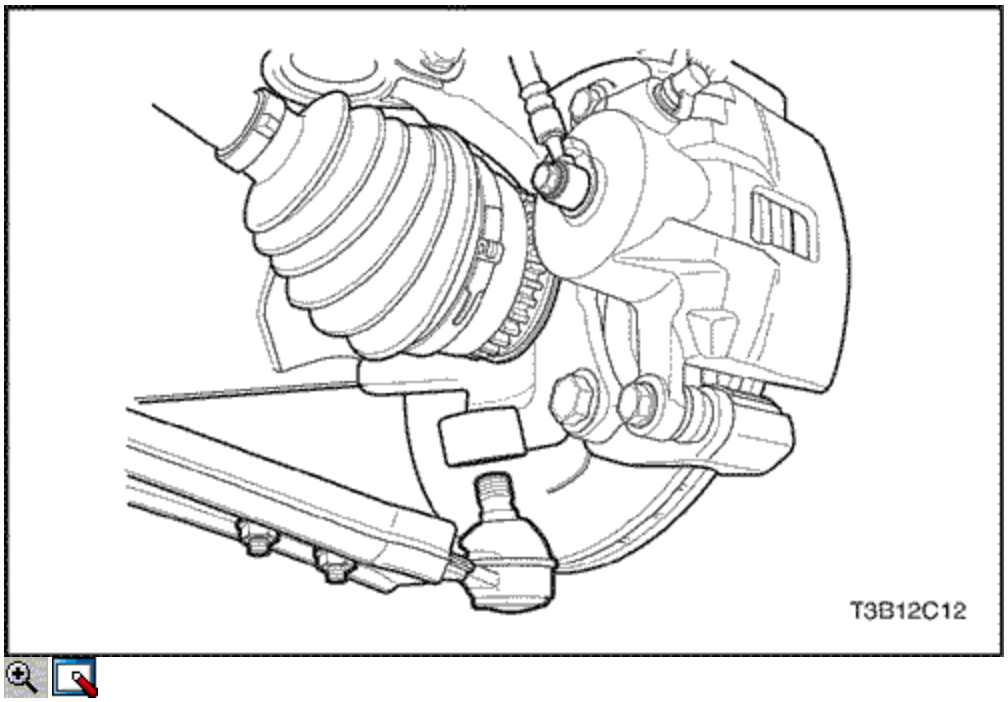
10. Remove the drive axle from the transaxle using the axle shaft remover KM-460-A.



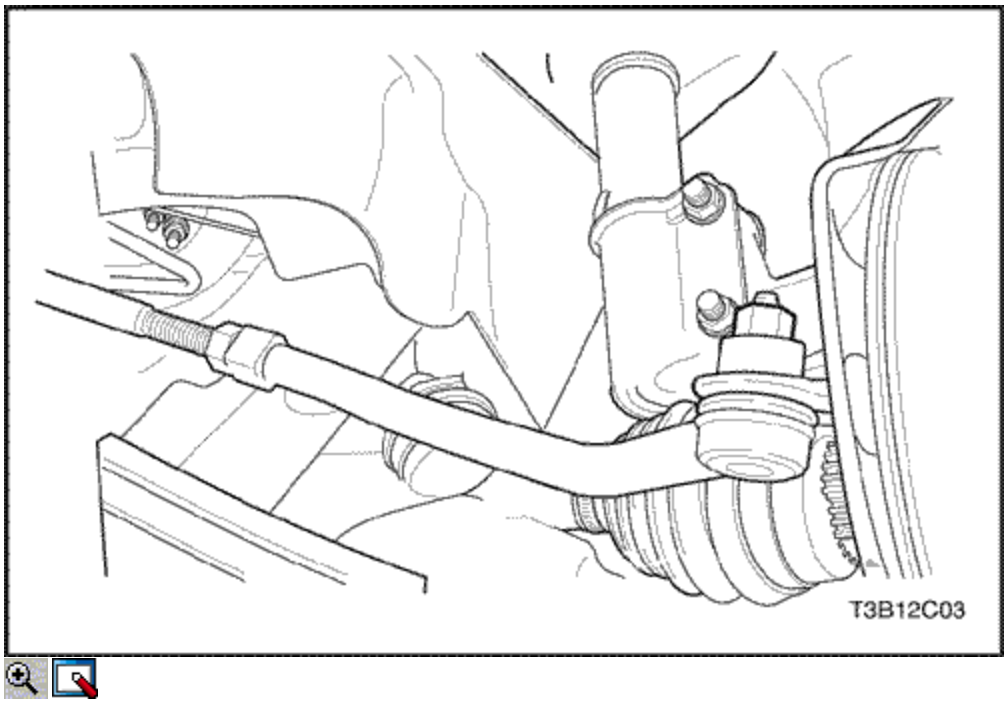
Installation Procedure

Notice : Do not damage the seals.

1. Clean the hub seal and the transaxle seal.
2. Install the drive axle into the transaxle.
3. Install the wheel hub onto the axle shaft.

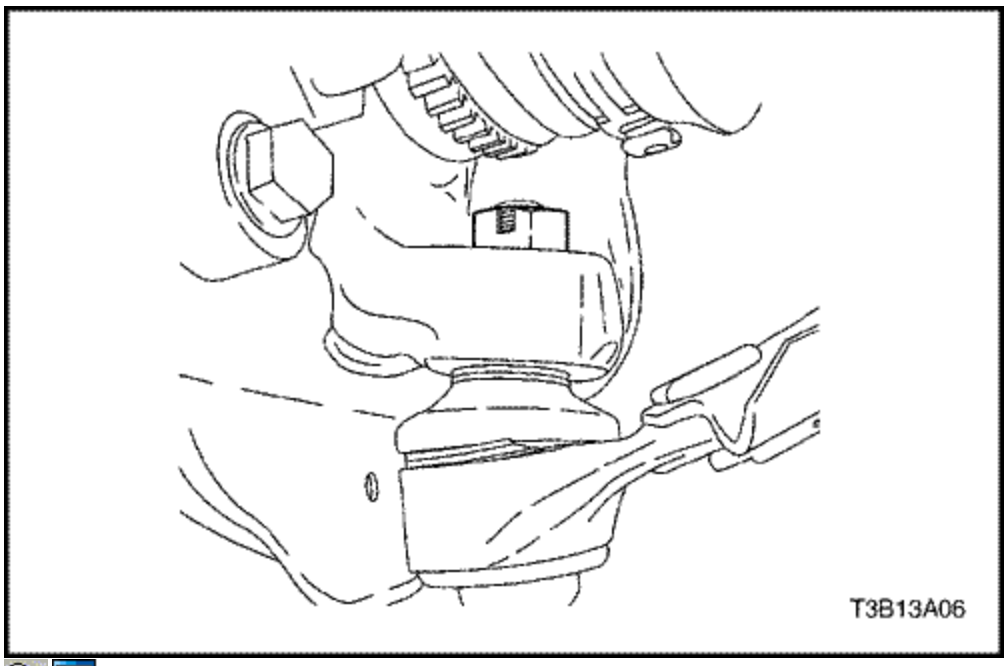


4. Mount the steering knuckle onto the lower ball joint.



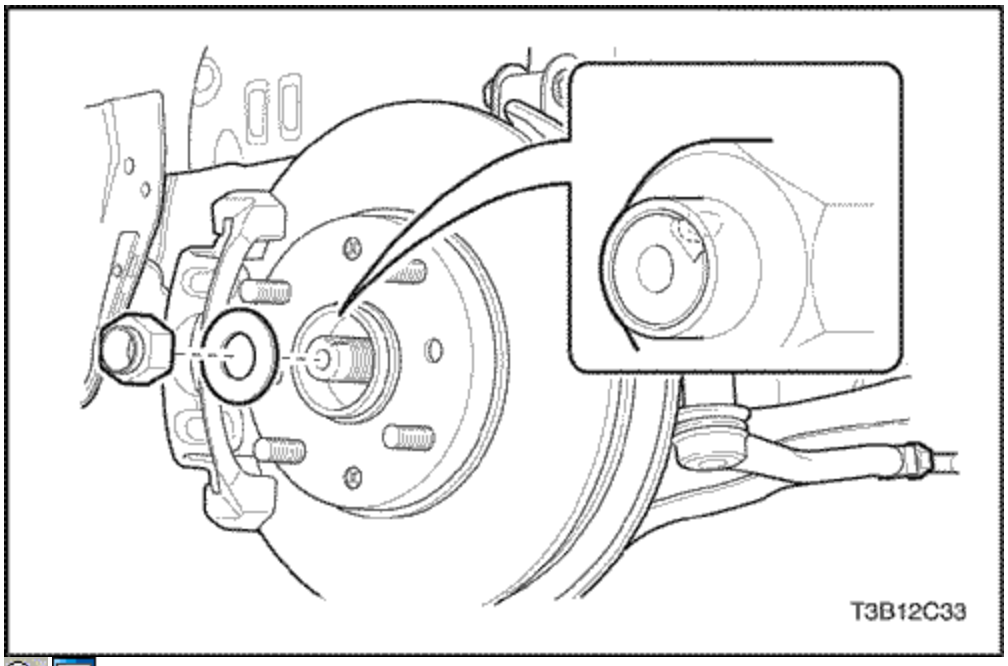
5. Install the tie rod into the knuckle/strut and install the tie rod nut.

   Tighten
   Tighten the tie rod nut to 45 N•m (33 lb-ft).

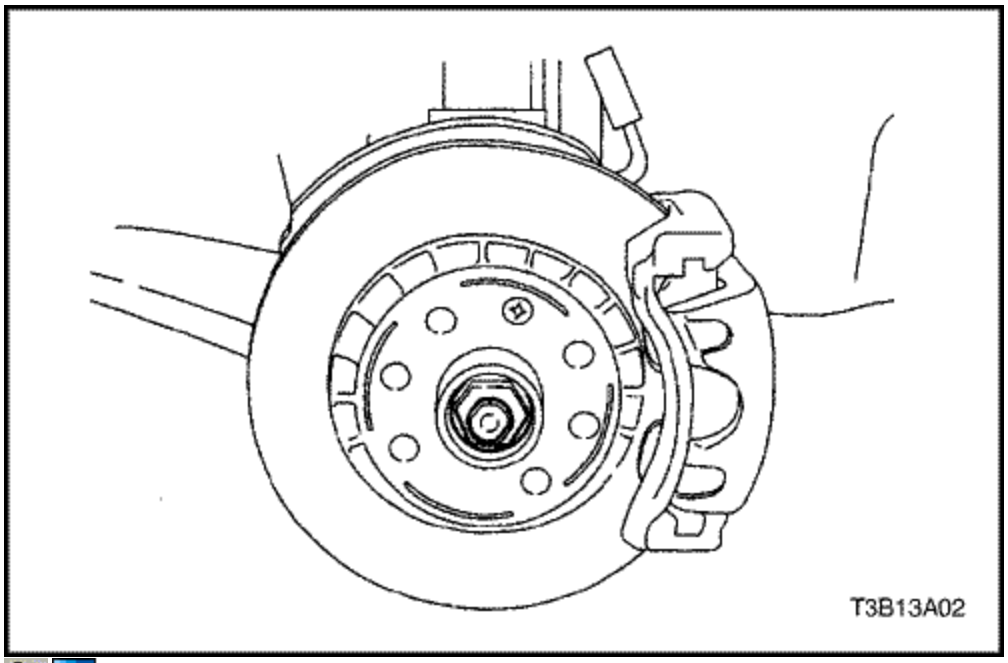


6. Install the lower ball joint nut.

   Tighten
   Tighten the lower ball joint nut to 50 N•m (37 lb-ft).



7. Loosely install a new axle shaft caulking nut. Always use a new nut.

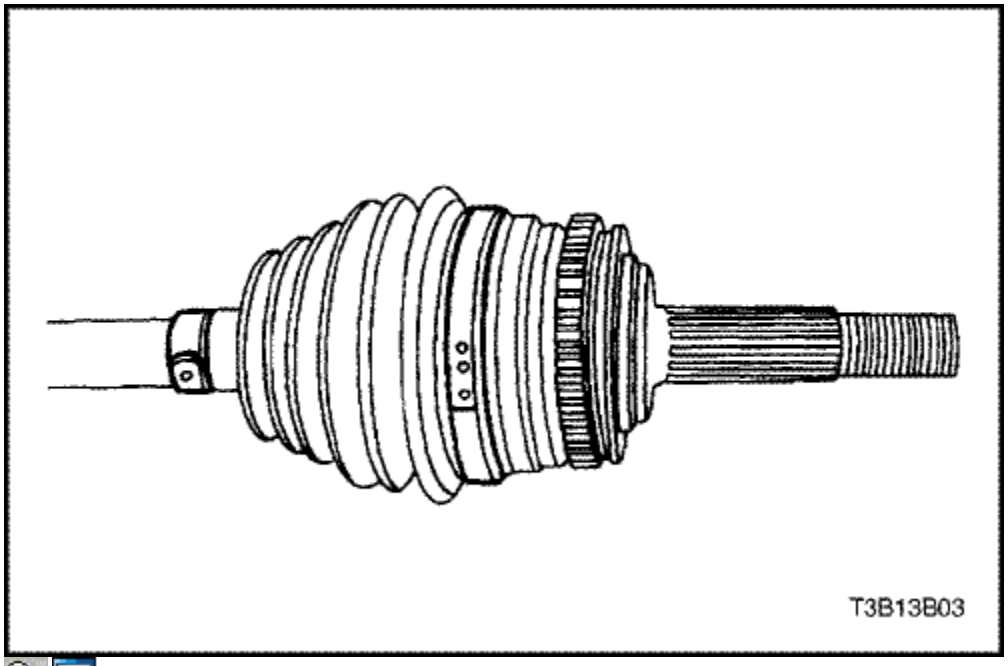


8. Install the wheels. Loosely install the nuts. Refer to *Section 2E, Tires and Wheels.*
9. Lower the vehicle to the floor.

Tighten
Tighten the wheel nuts to 120 N•m (88 lb-ft).

10. Tighten the axle shaft caulking nut to 300 N•m (221 lb-ft).
11. Peen the caulking nut with a punch and a hammer until the nut is locked into place on the axle shaft hub.
12. Install the engine under covers.
13. Refill the transaxle fluid to the proper level. Refer to *Section 5B, Five-Speed Manual Transaxle.*

UNIT REPAIR



Outer Joint Seal
Tools Required

J-8059 Snap Ring Pliers
J-35566 Seal Clamp Pliers
Removal Procedure

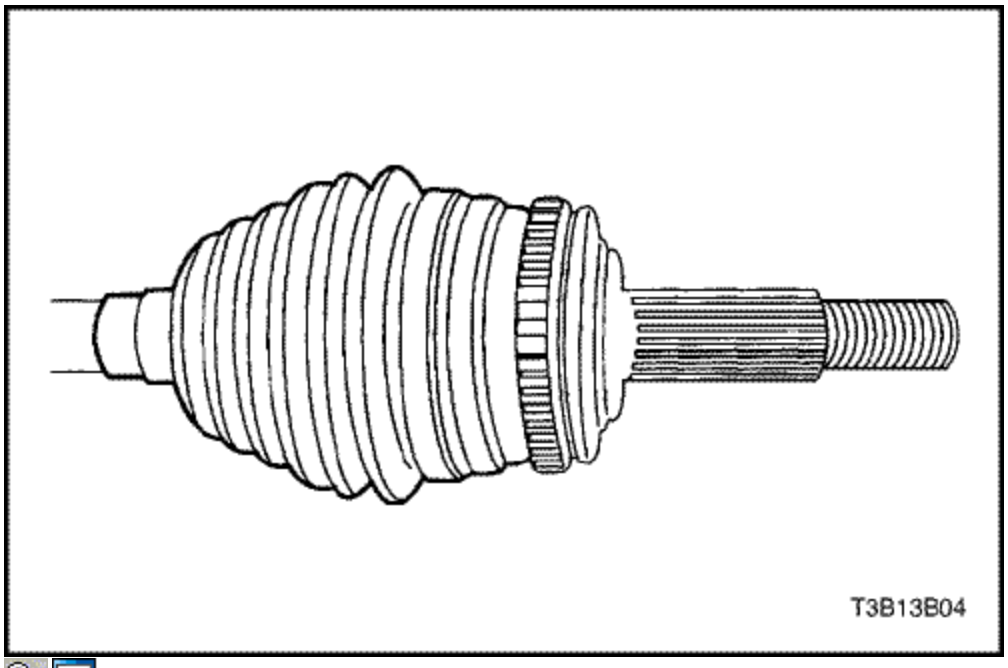
1. Remove the criss groove joint seal assembly. See "Cross Groove Joint Seal" in this section.
2. Remove the large seal retaining clamp. Discard the clamp.
3. Remove the small seal retaining clamp. Discard the clamp.

---

4. Degrease the joint.

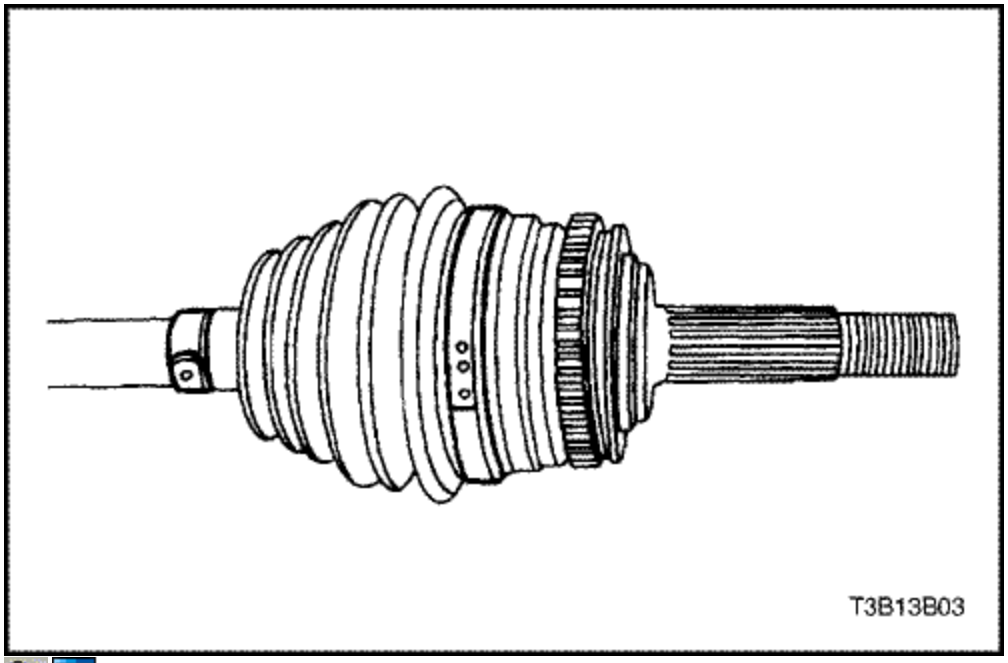
   Caution : Do not remove the axle shaft from the outer joint assembly or disassemble the outer joint assembly. Parts are match fit and cannot be serviced separately.Improper reassembly will adversely affect both performance and safety.

5. Remove the seal from the joint assembly.

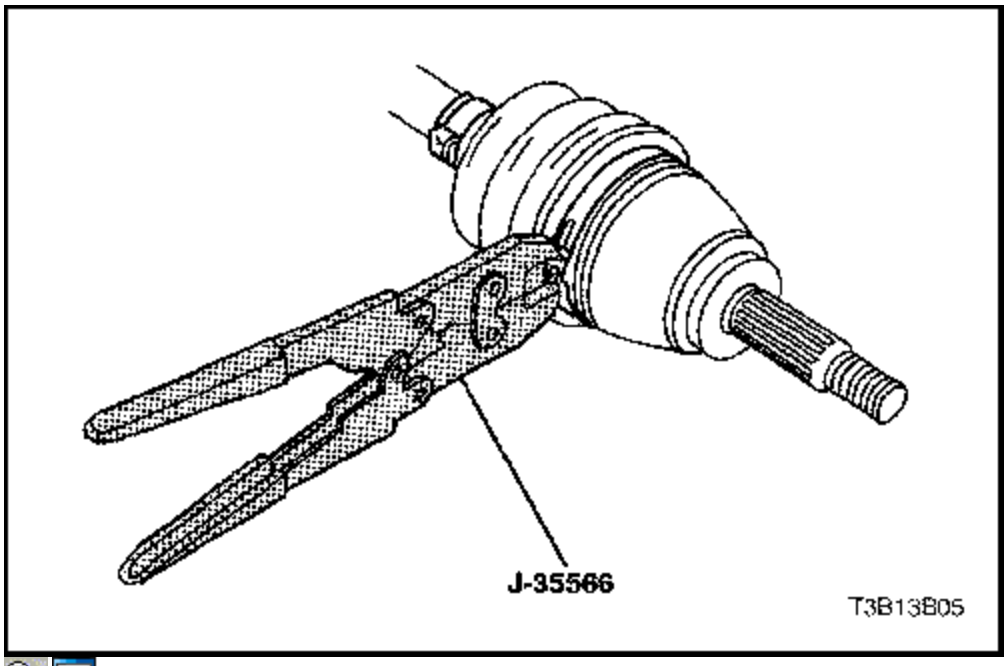


Installation Procedure

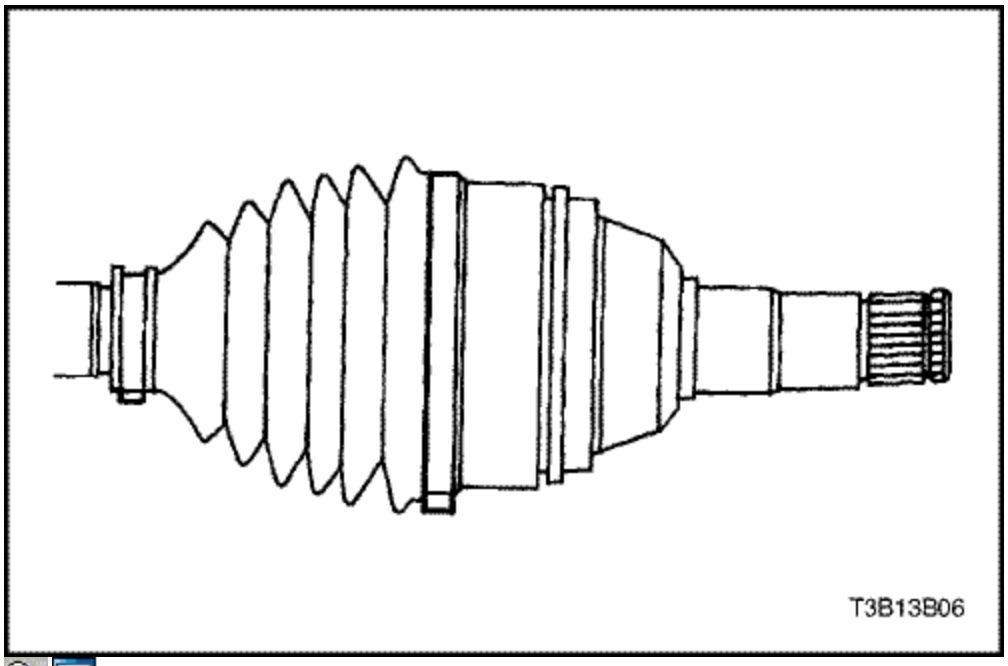
1. Install the seal onto the axle shaft.
2. Fill the joint seal with 110 to 130 g (3.9 to 4.6 ounces) of the recommended grease. Repack the joint with 110 to 130 g (3.9 to 4.6 ounces) of the recommended grease.



3. Install a new large seal retaining clamp and a new small seal retaining clamp.



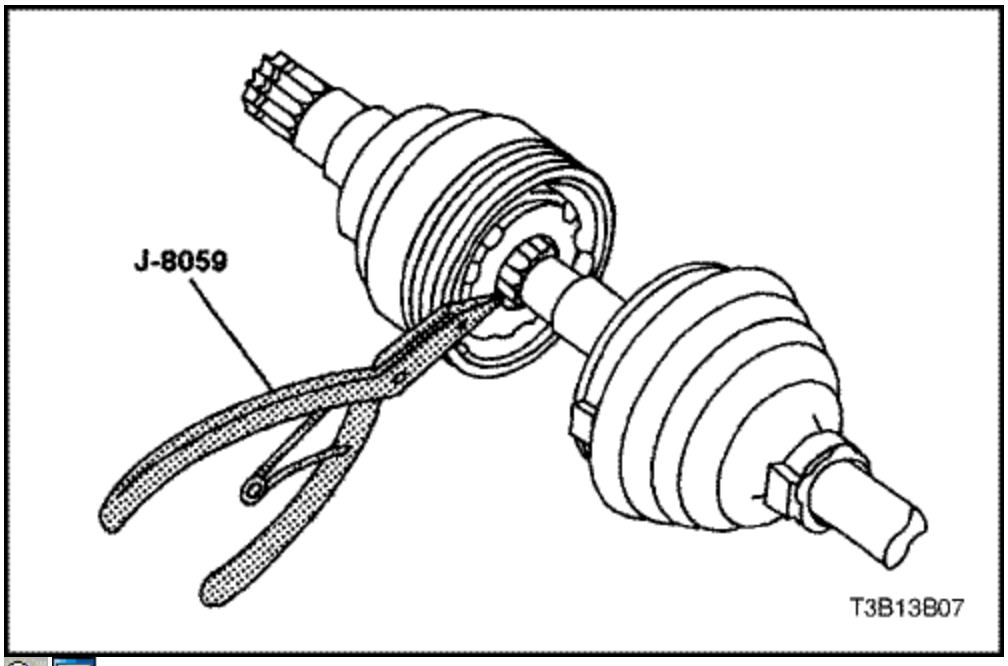
4. Crimp the new small seal retaining clamp and the new large seal retaining clamp using the seal clamp pliers J-35566.
5. Install the cross groobe joint seal assembly. Refer to "Cross Groove Joint seal" in this section.



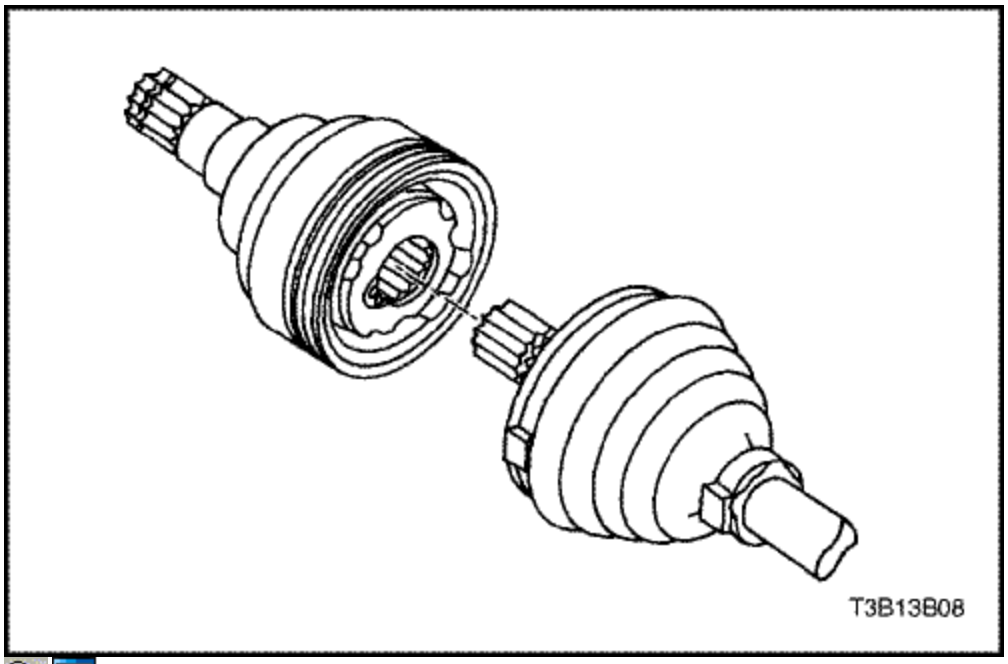
Cross Groove Joint Seal
Tools Required

J-35566 Seal Clamp Pliers
J-8059 Snap Ring Pliers
Removal Procedure

1. Remove the large seal retaing clamp.Discard the clamp.
2. Remove the small seal retaining clamp. Discard the clamp.



3. Degrease the joint.
4. Remove the shaft retaining ring using the snap ring pilers J-8059.



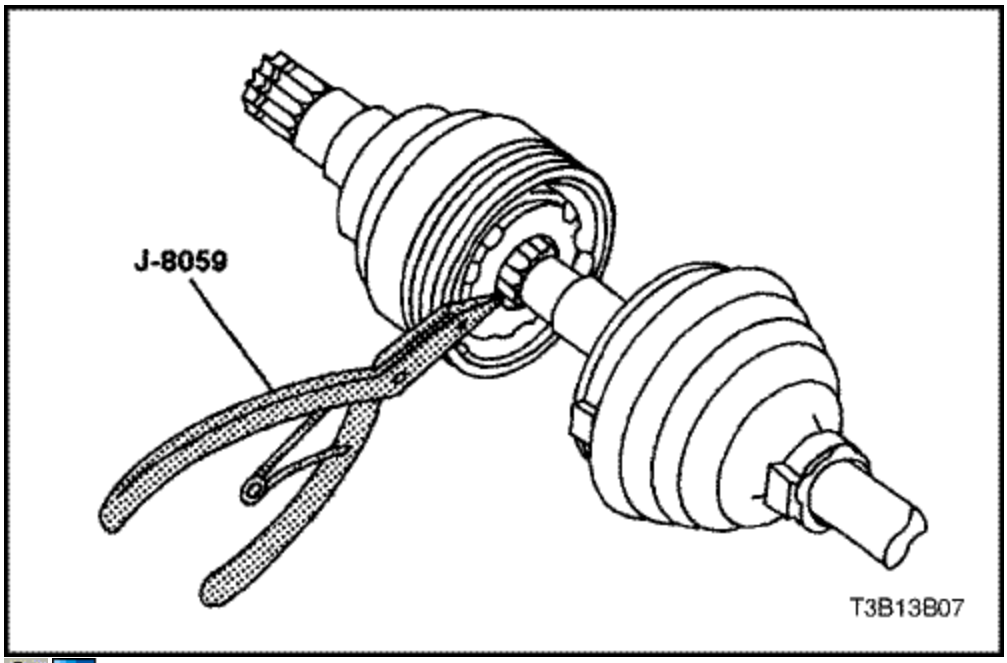
5. Remove the axke shaft from the joint assembly.

   Caution : The ball retainer is staked in position and must not be disassmbled. Cross groove joint internal parts are match fit and cannot be serviced separately. Improper reassembly will adversely affect both performance and safety.

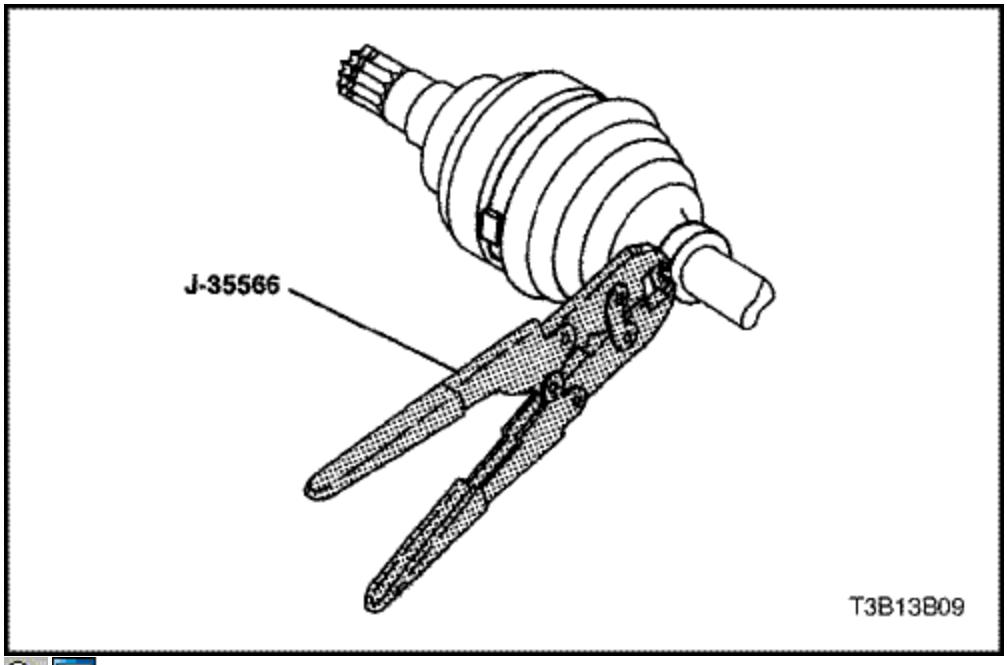
6. Remove the seal from the joint assembly.

Installation Procedure

1. Install a new small seal retaining clamp onto the seal. Do not crimp.
2. Install the seal onto the axle shaft.
3. Install the joint assembly onto the axle shaft.



4. Install the shaft retaining ring using the snap ring pilers J-8059.



5. Fill the joint assembly with 120 to 140 g (4.2 to 4.9 ounces) of the recommended grease. Repack the tripot with 120 to 140 g (4.2 to 4.9 ounces) of the recommended grease.
6. Install the a new large seal retaining clamp.
7. Crimp the new large seal retaining clamp using the seal clamp pliers J-35566.
8. Crimp the new small retaining clamp using the seal clamp pliers J-35566.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Front Drive Axle

General Description

Drive axles are flexible shaft assemblies that transmit a rotational force from the transaxle to the front-wheel assemblies. Each axle assembly consists of an inner constant-velocity joint and an outer constant-velocity joint connected to an axle shaft. The inner joint is completely flexible and has the ability to move in and out. The outer joint is also flexible, but it cannot move in and out. The drive axles use one type of outboard joint and one type of inboard joint. The inboard ends of both drive axles incorporate a male spline that interlocks with the transaxle gears using snap rings.

SECTION 4A

HYDRAULIC BRAKES

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.otherwise noted.

SPECIFICATIONS

General Specifcations

Application	Millimeters	Inches
Brake Drums:		
Inside Diameter	200.00	7.87
Maximum Revore Diameter	201.00	7.91
Out-to-Round	0.03	0.001
Brake Rotors:		
Discard Thickness	19.00	0.75
Lateral Runout (Installed)	0.030	0.001
Rotor Diameter	236.00 (256*)	9.29 (10.08*)
Rotor Thickness (New)	20.00 (24*)	0.79 (0.94*)
Thickness Variation	0.005	0.0002
Master Cylinder:		
Bore Diameter	22.22	0.87
Minimum Bore Diameter	20.64	0.81

Application	Millimeters	Inches
Caliper		
Piston Minimun Diameter	52 (54*)	2.05 (2.12*)
Wheel Cylinder Diameter:		
Front	52 (54*)	2.05 (2.12*)
Rear	20.64	0.81

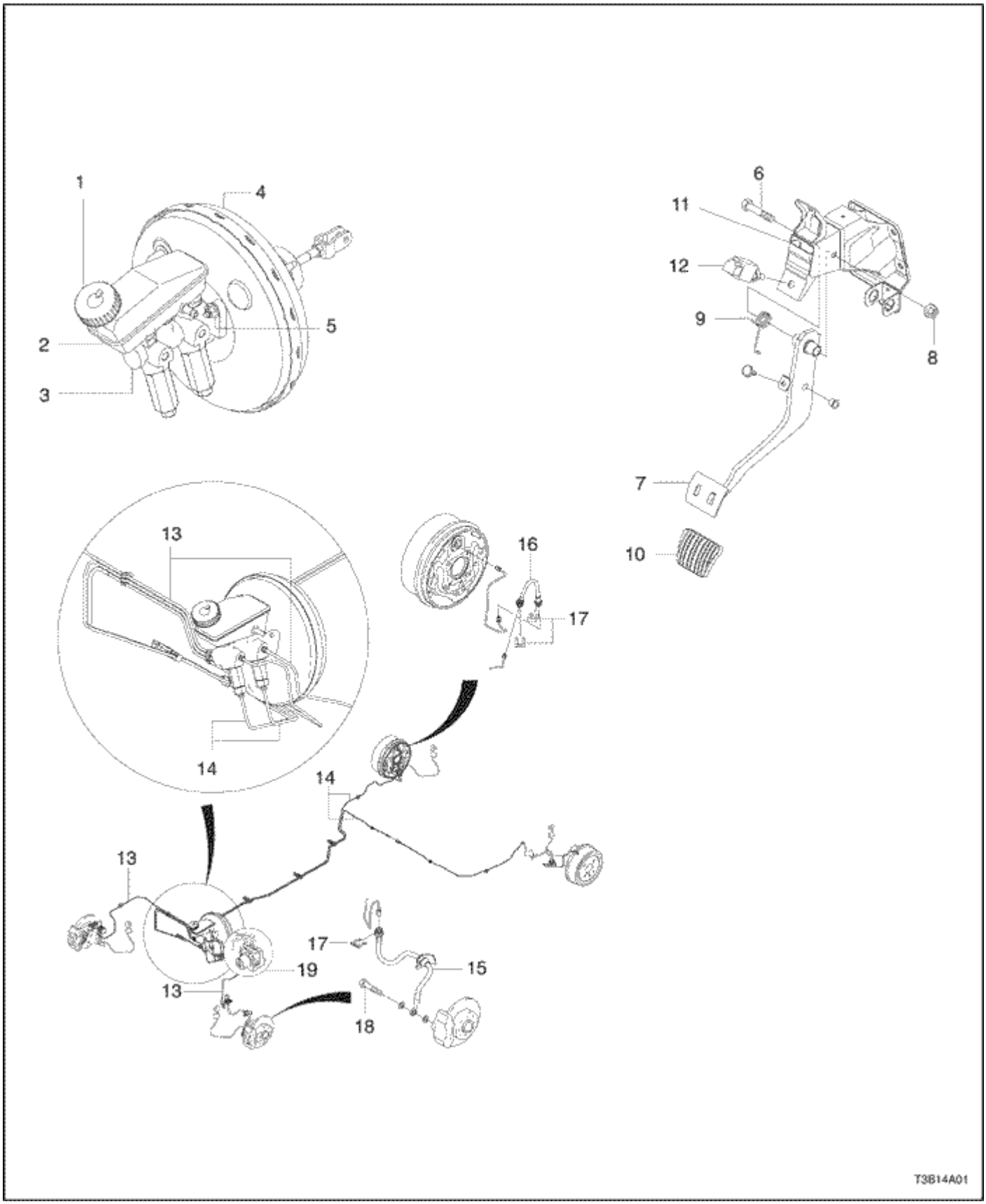
* : Optional (High Altitude)

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Frint brake hose-to-caliper bolt	40	30	354
Bleeder Screw	9	7	80
Caliper Maunting Bolt	100	74	885
Hub-to-Disc Screws	4.5	3.3	40
Dust Cover Screws	4.5	3.3	40
Brake Lines	16	12	142
Trim Panel Screws	7	-	62
Brake Pedal-to-Pedal Bracket Hex nut	22	16	-

COMPONENT LOCATOR

Brake System (ABS)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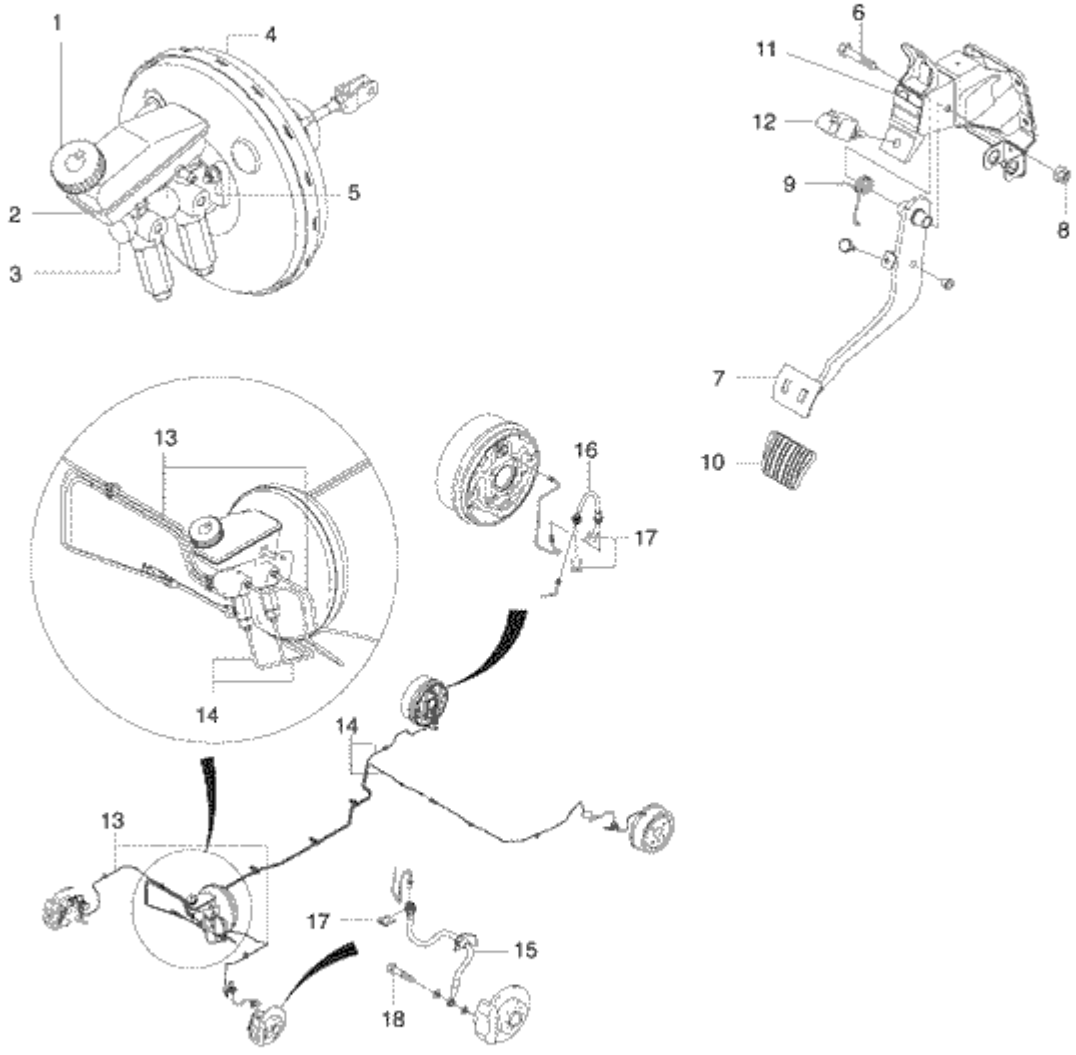
18
T3B14A01

1. Brake oil tank cap
2. Brake oil tank
3. Master cylinder
4. Brake booster
5. Brake booster nut
6. Pedal bolt
7. Pedal
8. Pedal nut
9. Spring
10. Brake pedal cover
11. Pedal bracket assembly
12. Stoplamp switch
13. Front brake pipe
14. Rear brake pipe
15. Front brake hose
16. Rear brake hose
17. E-ring
18. Union bolt
19. ABS assembly

Brake System (NON-ABS)



T3B14A02

1. Brake oil tank cap
2. Brake oil tank
3. Master cylinder
4. Brake booster
5. Brake booster nut
6. Pedal bolt
7. Pedal
8. Pedal nut
9. Spring
10. Brake pedal cover
11. Pedal bracket assembly
12. Stoplamp switch
13. Front brake pipe
14. Rear brake pipe
15. Front brake hose
16. Rear brake hose
17. E-ring
18. Union bolt

DIAGNOSIS

Brake System Testing

Brakes should be tested on a dry, clean, reasonably smooth and level roadway. A true test of brake performance cannot be made if the roadway is wet, greasy, or covered with loose dirt whereby all tires do not grip the road equally. Testing will also be adversely affected if the roadway is crowned so as to throw the weight so roughly that the wheels tend to bounce.

Test the brakes at different vehicle speeds with both light and heavy pedal pressure; however, avoid locking the brakes and sliding the tires. Locked brakes and sliding tires do not indicate brake efficiency since heavily braked, but turning, wheels will stop the vehicle in less distance than locked brakes. More tire-to-road friction is present with a heavily braked, turning tire than with a sliding tire.

Because of the high deceleration capability, a firmer pedal may be felt at higher deceleration levels.

There are three major external conditions that affect brake performance:

- Tires having unequal contact and grip of the road will cause unequal braking. Tires must be equally inflated, and the tread pattern of the right and the left tires must be approximately equal.
- Unequal loading of the vehicle can affect the brake performance since the most heavily loaded wheels require more braking power, and thus more braking effort, than the others.
- Misalignment of the wheels, particularly conditions of excessive camber and caster, will cause the brakes to pull to one side.

To check for brake fluid leaks, hold constant foot pressure on the pedal with the engine running at idle and the shift lever in N (Neutral). If the pedal gradually falls away with the constant pressure, the hydraulic system may be leaking. Perform a visual check to confirm any suspected leaks.
Check the master cylinder fluid level. While a slight drop in the reservoir level results from normal lining wear, an abnormally low level indicates a leak in the system. The hydraulic system may be leaking either internally or externally. Refer to the procedure below to check the master cylinder. Also, the system may appear to pass this test while still having a slight leak. If the fluid level is ormal, check the vacuum booster pushrod length. If an incorrect pushrod length is found, adjust or replace the rod.
Check the master cylinder using the following procedure:

- Check for a cracked master cylinder casting or brake fluid leaking around the master cylinder. Leaks are indicated only if there is at least one drop of fluid. A damp condition is not abnormal.
- Check for a binding pedal linkage and for an incorrect pushrod length. If both of these parts are in satisfactory condition, disassemble the master cylinder and check for an elongated or swollen primary cylinder or piston seals. If swollen seals are found, substandard or contaminated brake fluid should be suspected. If contaminated brake fluid is found, all the components should be disassembled and cleaned, and all the rubber components should be replaced. All of the pipes must also be flushed.

Improper brake fluid, or mineral oil or water in the fluid, may cause the brake fluid to boil or cause deterioration of the rubber components. If the primary piston cups in the master cylinder are swollen, then the rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston seals on the drum brake wheels.
If rubber deterioration is evident, disassemble all the hydraulic parts and wash the parts with alcohol. Dry these parts with compressed air before reassembly to keep alcohol out of the system. Replace all the rubber parts in the system,

including the hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the linings.
If the master cylinder piston seals are in satisfactory condition, check for leaks or excessive heat conditions. If these conditions are not found, drain the fluid, flush the master cylinder with brake fluid, refill the master cylinder, and bleed the system. Refer to "Manual Bleeding the Brakes" or "Pressure Bleeding the Brakes" in this section.

Brake Hose Inspection

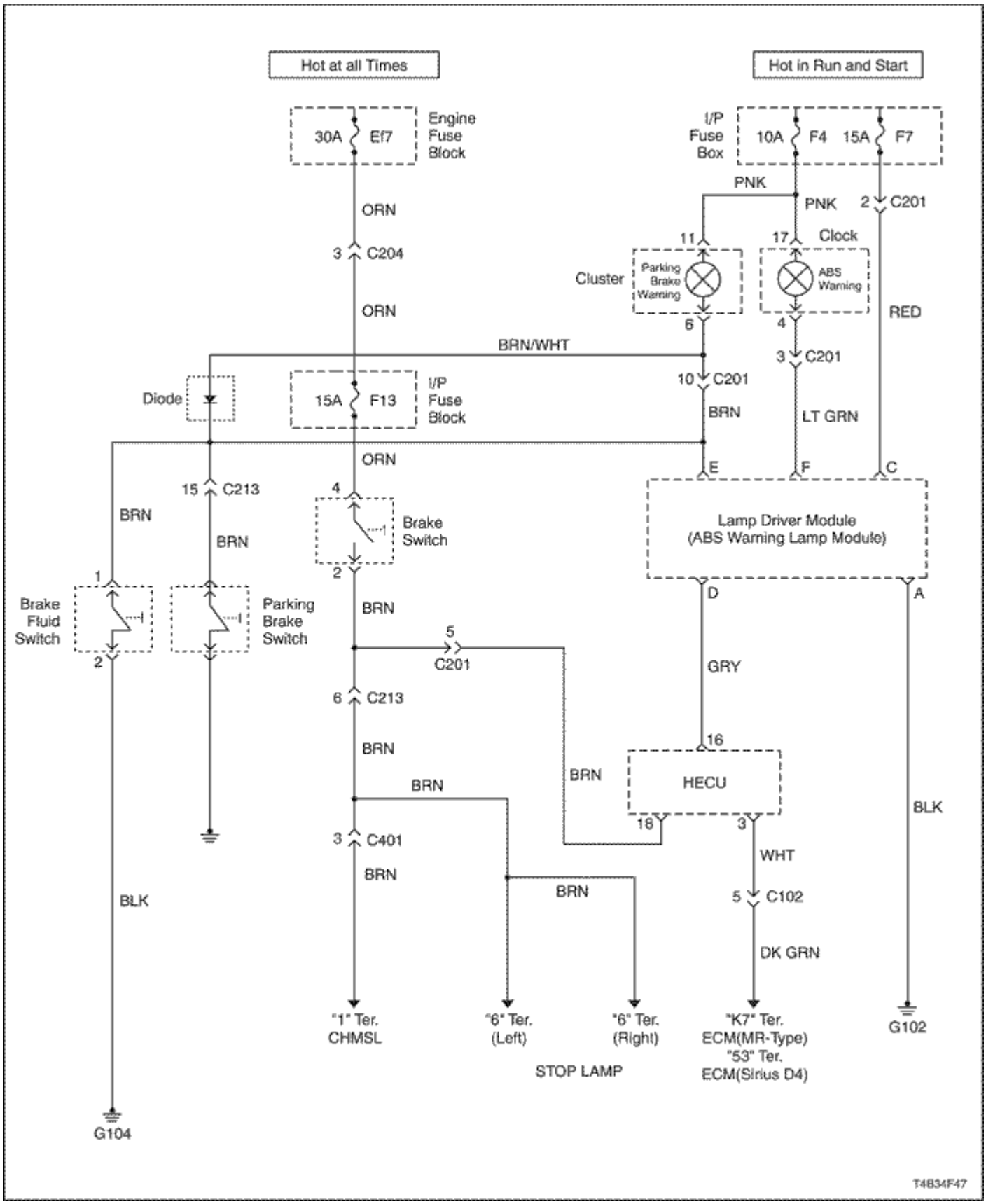
The hydraulic brake hoses should be inspected at least twice a year. The brake hose assembly should be checked for road hazard damage, cracks, chafing of the outer cover, and for leaks or blisters. Inspect the hoses for proper routing and mounting. A brake hose that rubs on a suspension component will wear and eventually fail. A light and a mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, adjust or replace the hose as necessary.

Warning Lamp Operation

This brake system uses a BRAKE warning lamp located in the instrument cluster. When the ignition switch is in the START position, the BRAKE warning lamp should glow and then go off when the ignition switch returns to the RUN position.
The following conditions will activate the BRAKE lamp:

- Parking brake applied. The light should be on whenever the parking brake is applied and the ignition switch is ON.
- Low fluid level. A low fluid level in the master cylinder will turn the BRAKE lamp on.
- As a test of the lamp circuit. Vehicles with antilock brakes will illuminate the BRAKE lamp for 3 seconds when the ignition starter is turned ON.

Brake lamp Warning Circuit Diagnosis


Hot at all Times
Hot in Run and Start
30A
Ef7
Engine Fuse Block
I/P Fuse Box
10A
F4
15A
F7
PNK
PNK
2
C201
ORN
3
C204
11
17
Clock
Cluster
Parking Brake Warning
ABS Warning
6
4
RED
ORN
BRN/WHT
3
C201
10
C201
Diode
15A
F13
I/P Fuse Block
BRN
LT GRN
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C
15
C213
4
Brake Switch
Lamp Driver Module (ABS Warning Lamp Module)
BRN
BRN
1
2
D
A
Brake Fluid Switch
Parking Brake Switch
BRN
5
C201
GRY
6
C213
16
BRN
BRN
HECU
BRN
18
3
BLK
3
C401
WHT
BRN
5
C102
BRN
BLK
DK GRN
"1" Ter. CHMSL
"6" Ter. (Left)
"6" Ter. (Right)
"K7" Ter. ECM(MR-Type) "53" Ter. ECM(Sirius D4)
G102
STOP LAMP
G104
T4B34F47

Test Description
The number(s) below refer to step(s) on the diagnostic table.

1. There are three possible symptoms of a problem: the brake warning lamp is always on; the brake warning lamp is never on; the brake warning lamp will not operate for a particular function. This test takes you to the appropriate starting point in the procedure.

2. This test checks whether the Antilock Brake System (ABS) system has turned on the brake warning lamp. If the vehicle is not equipped with ABS, the answer will be NO.

4. 5. These steps test for simple conditions that can turn on the brake warning lamp.

7. This checks whether the brake fluid level switch is faulty.

9. This checks whether the parking brake switch is faulty.

12. This removes the circuit to the electronic brake control module (EBCM) in a vehicle with ABS.

14. This removes the parking brake switch circuit.

16. This removes the brake fluid level switch circuit.

18. This checks the only remaining circuitry that can activate the brake warning lamp.

20. This tests for the presence of battery voltage used by both the oil pressure lamp and the brake warning lamp.

21. This step begins a sequence that will restore voltage to the lamps.

29. This checks for a burned out indicator lamp.

31. This begins a sequence that will find the open that prevents contact to ground needed to operate the lamp.

33. This checks whether the ABS system has tried to turn on the brake warning lamp and could not. If the vehicle is not equipped with ABS, the answer is NO.

34. This step begins a search for a problem in the parking brake switch circuit.

38. This step begins a search for a problem in the brake fluid level switch circuit.

Brake Lamp Warning Circuit Diagnosis

Step	Action	Value(s)	Yes	No
1	Turn the ignition ON. Is the brake warning lamp always on?	-	Go to *Step 2*	Go to *Step 19*
2	Check the ABS warning lamp. Is the ABS warning lamp also on?	-	Go to *Step 3*	Go to *Step 3*
3	Use a scan tool to check for diagnostic trouble codes (DTCs) and follow the procedures for any DTCs found. Is the lamp still on?	-	Go to *Step 4*	System OK
4	Release the parking brake fully. Is the lamp off?	-	System OK	Go to *Step 5*
5	Check the brake fluid level. Is the fluid level acceptable?	-	Go to *Step 7*	Go to *Step 6*
6	1. Fill the brake fluid reservior with clean DOT 3 equivalent hydraulic fluid. 2. Replace the cap on the brake fluid reservoir. Is the lamp stil on?	-	*Go to Step 7*	System OK
7	Unplug the harness connector from the brake fluid sensor switch. Is the lamp still on?	-	Go to *Step 9*	Go to *Step 8*
8	Replace the parking brake lever switch. Is the repair complete?	-	System OK	-
9	1. Reconnect the brake fluid level switch. 2. Remove the rear console cover to expose the parking brake mechanism. 3. Release the brake completely. 4. Slide off the terminal with the BRN/BLK wire from the wiring harness.	-	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
	Does the lamp go out?			
10	Replace the switch. Is the repair complete?	-	System OK	-
11	Replace the terminal back onto the switch. Is the vehicle equipped with ABS?	-	Go to *Step 12*	Go to *Step 14*
12	Unplug connector C201. Does the lamp go out?	-	Go to *Step 13*	Go to *Step 14*
13	Repair the short to ground in circuit BRN between terminal 5 of connector C201 and terminal 18 on the EBCM. Is the repair complete?	-	System OK	-
14	Disconnect connector C213. Is the lamp still on?	-	Go to *Step 16*	Go to *Step 15*
15	Repair the short to ground in circuit BRN between connector C213 and connector C201 or between connector C213 and the parking brake switch. Is the repair complete?	-	System OK	-
16	Disconnect connector C201. Does the lamp go out?	-	Go to *Step 17*	Go to *Step 18*
17	Repair the short to ground in circuit BRN between connector C201 and the brake fluid level switch. Is the repair complete?	-	System OK	-
18	Repair the short to ground in circuit BRN between terminal 11 of the instrument cluster and connector C201or connector C213. Is the repair complete?	-	System OK	-
19	Check the brake lamp after doing each of the following functions: • Apply the parking brake. • Remove the cap from the brake fluid reservoir. • Command the lamp on using a scan tool. Does the brake warning lamp operate for any of these conditions?	-	Go to *Step 32*	Go to *Step 20*
20	Turn the ignition ON. Does the oil pressure indicator light?	-	Go to *Step 24*	Go to *Step 21*
21	Check fuse 4.	-	Go to *Step 23*	Go to *Step 22*

Step	Action	Value(s)	Yes	No
	Is the fuse in good condition?			
22	Replace fuse 4 with another 10-amp fuse. Does the brake warning lamp function now?	-	System OK	-
23	Check EF7 in the engine fuse block. Is EF7 in good condition?	-	Go to *step 25*	Go to *Step 24*
24	Replace EF7 with another 30-amp device. Is the repair complete?	-	System OK	-
25	1. Unplug C206 from the connection box behind the left-side kick panel. This is the largest connector at the bottom of the box. 2. Use a digital volt meter (DVM) to measure voltage from terminal 11 of the cluster. Does the DVM indicate the specified voltage?	11-14 v	Go to *Step 27*	Go to *Step 26*
26	Repair the open in circuit PNK from terminal 11 in the connection box fuse 4 in the I/P fuse block. Is the repair complete?	-	System OK	-
27	1. Reconnect harness terminal 11 to the connection box. 2. Gain access to the rear of the instrument cluster. 3. Unplug the instrument 10-pin cluster connector. 4. Use a DVM to measure the voltage from terminal 6 of the instrument cluster connector to ground. Does the DVM show the specified value?	11-14 v	Go to *Step 28*	Go to *Step 29*
28	Repair the open in circuit PNK between terminal 6 and 11 or from there in circuit BRN to terminal 10 of connector C201 Is the repair complete?	-	System OK	-
29	Remove the brake indicator lamp from its socket and examine it. Is the lamp burned out?	-	Go to *Step 30*	Go to *Step 31*
30	Replace the brake indicator lamp. Is the repair complete?	-	System OK	-
31	1. Return the brake indicator lamp to its socket the instrument cluster. 2. Look for the open in circuit BRN	-	System OK	-

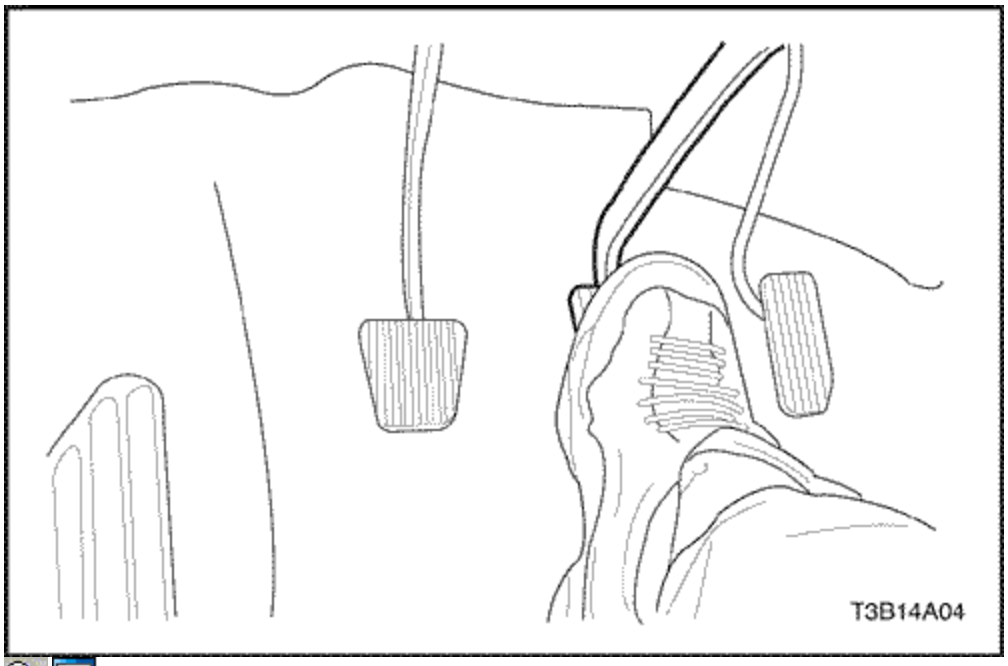
Step	Action	Value(s)	Yes	No
	between terminal 11of the cluster and terminal 10 of connector C201. 3. Repair any open found in circuit BRN/BLK. Is the repair complete?			
32	Check the ABS lamp. Is the ABS lamp flashing?	-	Go to *Step 33*	Go to *Step 34*
33	Use a scan tool to determine what DTCs are present and repair them according to the tables for the DTCs involved. Is the repair complete?	-	System OK	-
34	Try applying the parking brake fully. Does the brake warning lamp fail to light when the parking brake is applied?	-	Go to *Step 35*	Go to *Step 38*
35	1. Expose the parking brake mechanism by removing the rear console. Use a jumper to short the terminal from the 2. BRN wire to ground. Does the lamp come on?	-	Go to *Step 36*	Go to *Step 37*
36	Replace the parking brake switch or repair the grounding between the parking brake switch and the brake handle mounting or between the brake handle mounting and the vehicle body. Is the repair complete?	-	System OK	-
37	Repair the open in circuit BRN. This will be in one of two places: • The I/P harness between terminal 6 of cluster and terminal 15 of connector C213. • The floor harness between terminal 10 of connector C213 and the parking brake switch. Is the repair complete?	-	System OK	-
38	If the brake warning lamp is not indicating low brake fluid, remove the cap from the brake fluid reservoir to lift the sensor from the brake fluid. Does the lamp come on?	-	System OK	Go to *Step 39*
39	1. Unplug the harness connector from the	-	Go to *Step 40*	Go to *Step 41*

Step	Action	Value(s)	Yes	No
	sensor on the brake fluid reservoir cap. 2. Use a jumper to short the terminals in the harness connector together. Does the lamp come on?			
40	Install a new fluid level sensor switch into the brake fluid reservoir. Is the repair complete?	-	System OK	-
41	Use the jumper to short terminal 1 (BRN wire) to ground. Does the lamp come on?	-	Go to *Step 42*	Go to *Step 43*
42	Repair the open to ground in circuit BLK between the terminal 2 (BLK wire) of the harness connector for the level sensor switch and ground G104 at the left front corner of the vehicle. Is the repair complete?	-	System OK	-
43	Repair the open in circuit BRN. There are two possible locations for this open: • The I/P harness between terminal 6 of cluster and terminal 10 of connector C201. • The front harness between terminal 10 of connector C201and terminal 1 of the harness connector for the level sensor switch. Is the repair complete?	-	System OK	-

A low brake fluid level in the master cylinder will turn the BRAKE lamp ON. Refer to "Brake System Testing" in this section to test for fluid leaks.

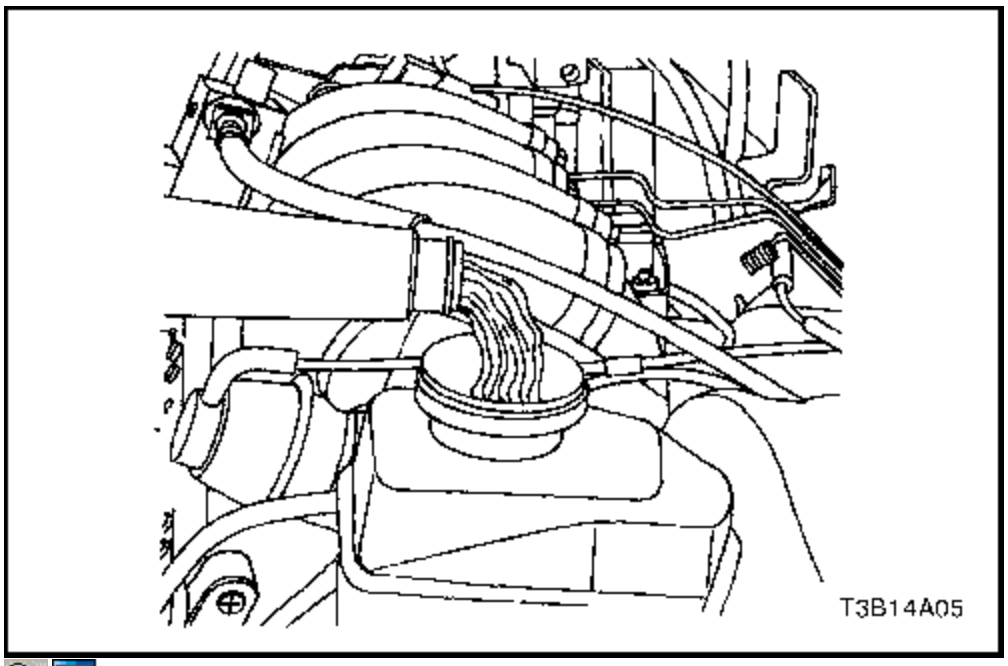
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



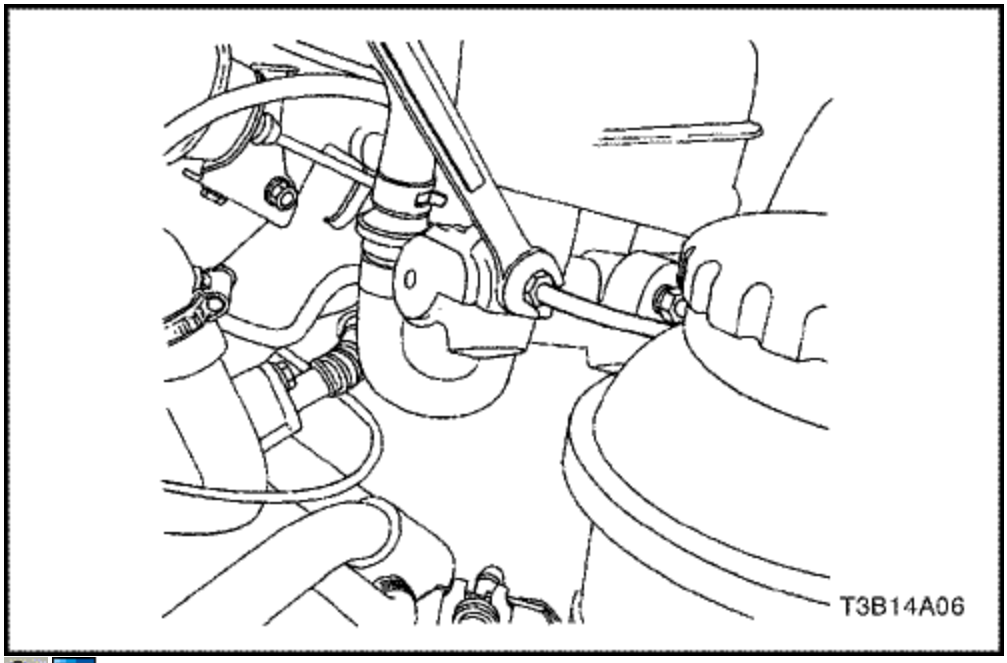
Manual Bleeding the Brakes

1. Remove the booster reserve by applying the brakes several times with the engine OFF until all the reserve is depleted.



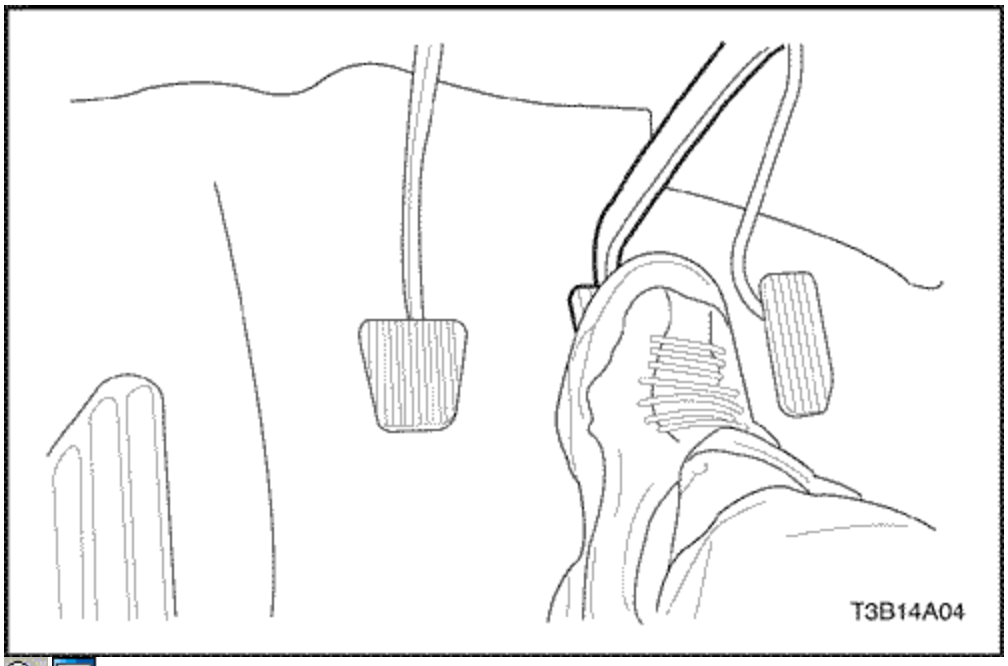
Important : If the master cylinder is known or suspected to have air in the bore, then it must be bled before any wheel cylinder or caliper is bled.

2. Fill the master cylinder reservoir with brake fluid. Keep the master cylinder at least one-half full of fluid during the bleeding operation.

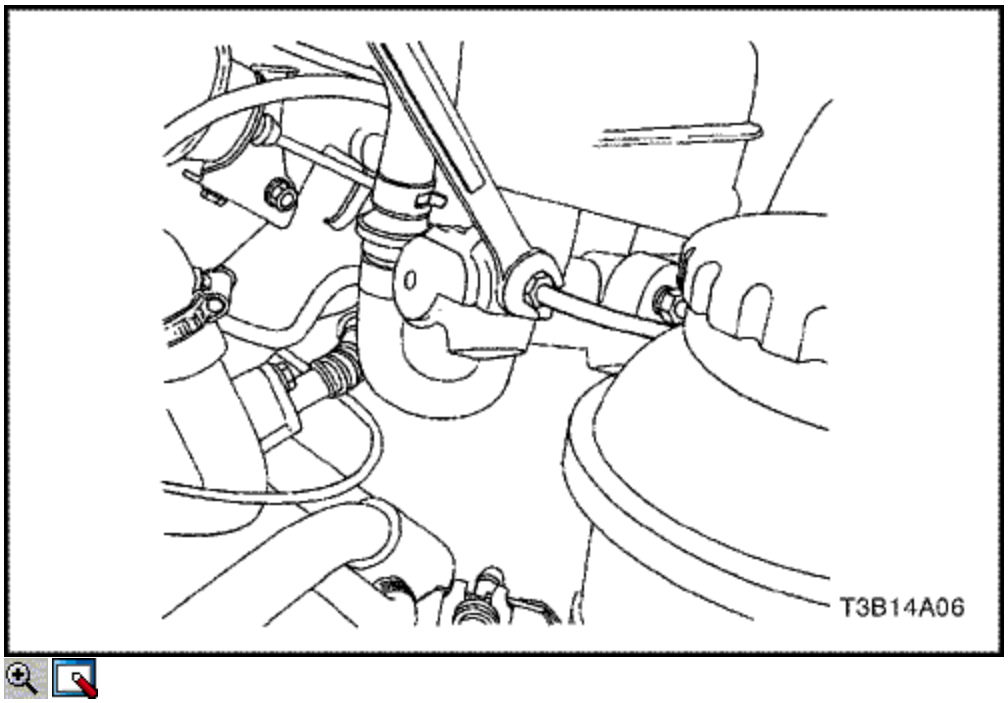


3. Disconnect the front brake line(s) at the master cylinder.
4. Allow the brake fluid to fill the master cylinder until it begins to flow from the front pipe connector port.
5. Connect the front brake line(s) to the master cylinder.

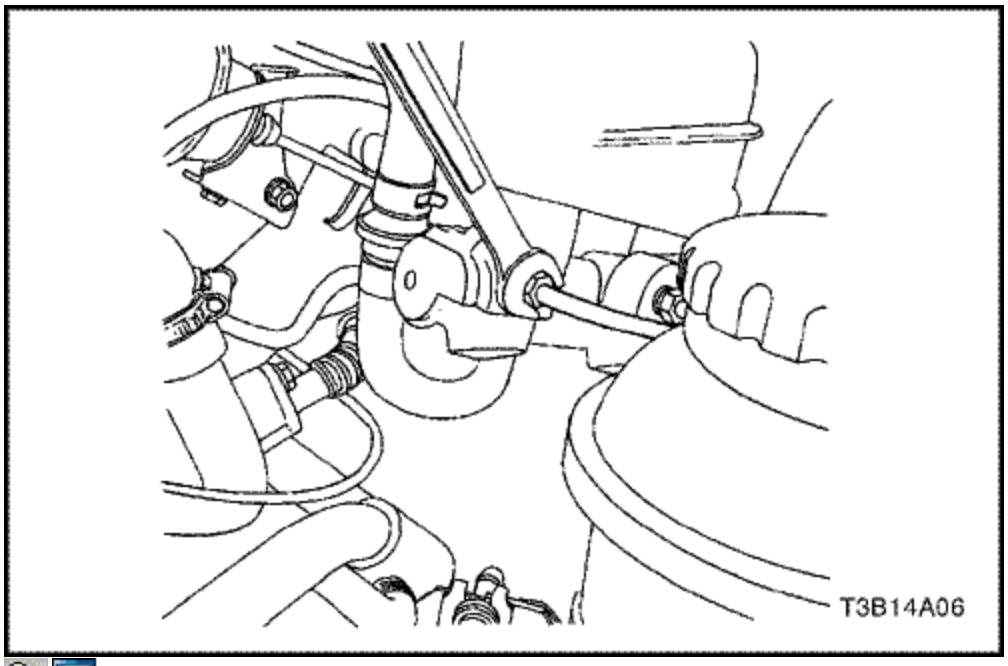
Tighten
Tighten the brake lines to 16 N•m (12 lb-ft).



6. Slowly push and hold the brake pedal one time.

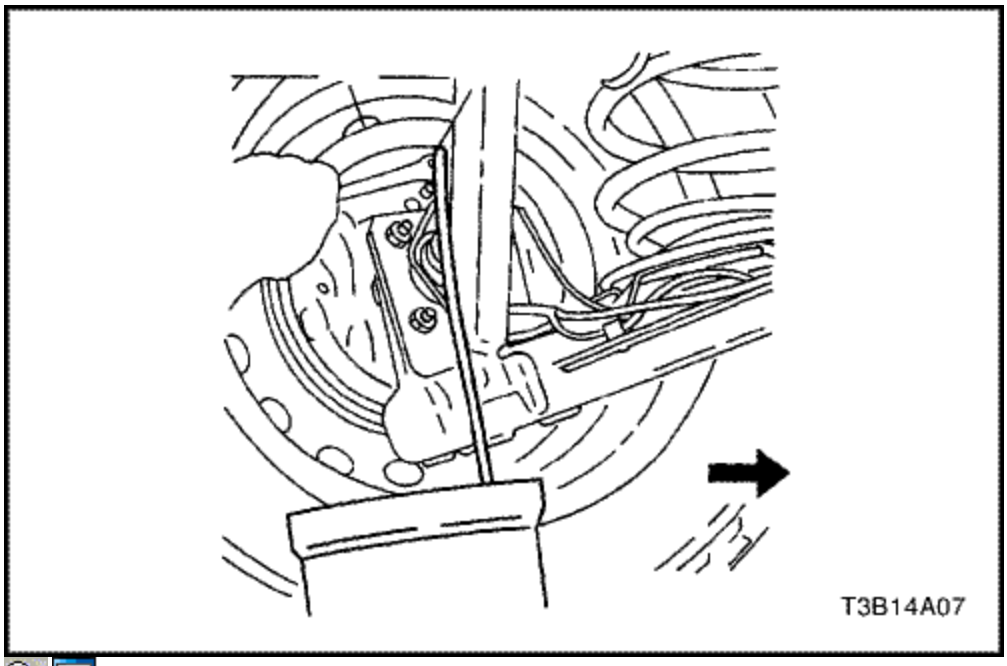


7. Loosen the front brake line at the master cylinder to purge all air from the cylinder.
8. Tighten the brake line as in Step 5, and then release the brake pedal slowly. Wait 15 seconds before proceeding to the next step.
9. Repeat the sequence, including the 15-second wait, until all the air is removed from the master cylinder bore.



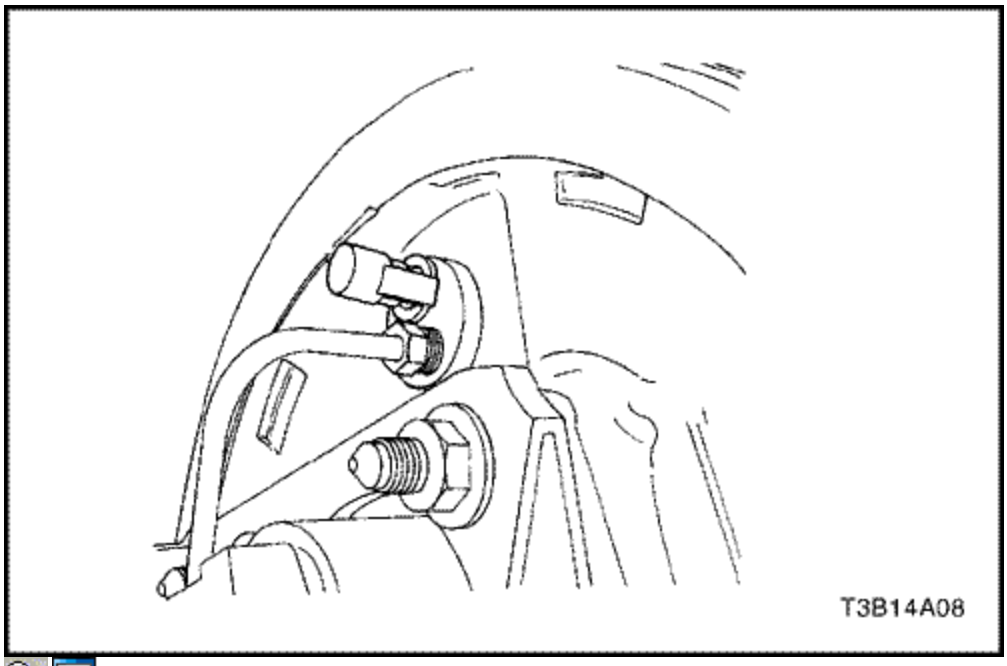
Notice : Care must be taken to prevent brake fluid from contacting any painted surface to prevent damage to the paint finish.

10. After all the air has been removed at the forward connection(s), bleed the master cylinder at the rear (cowl) connection(s) in the same manner as with the front connections.



Important : For vehicles equipped with a non-antilock braking system, non-ABS, the bleeding sequence is as follows: right rear, left front, left rear, and right front. For ABS-equipped vehicles, refer to *Section 4F, Antilock Brake System* for the correct sequence and bleeding procedure.

11. Attach a transparent tube over the valve. Allow the tube to hang submerged in brake fluid in a transparent container.



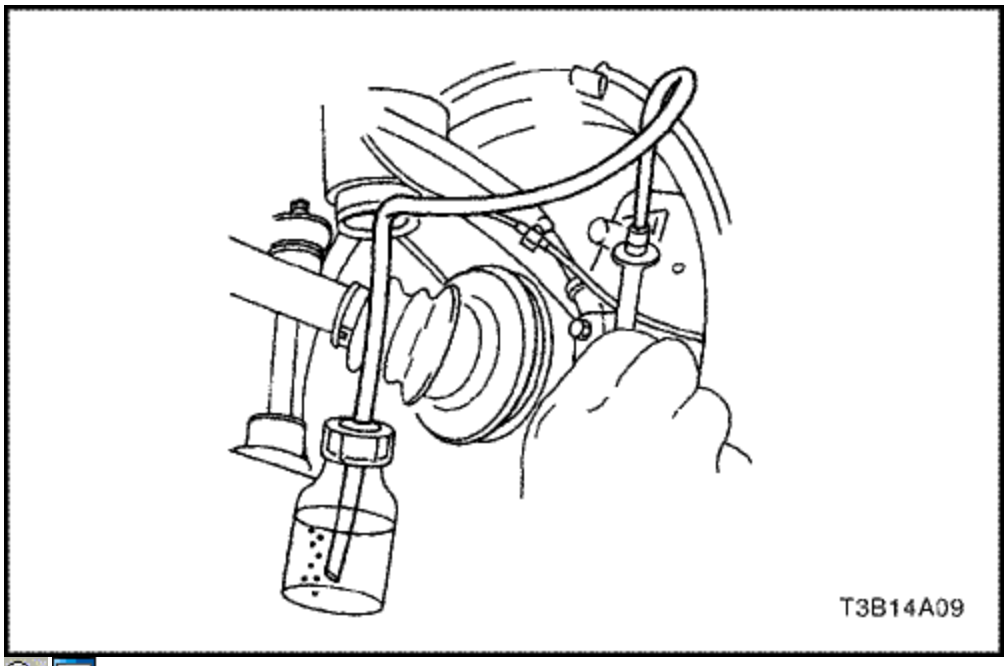
12. Slowly push and hold the brake pedal one time.
13. Remove the bleeder cap and loosen the bleeder screw to purge the air from the cylinder.
14. Tighten the bleeder screw.

Tighten
Tighten the bleeder screw to 9 N•m (80 lb-in).

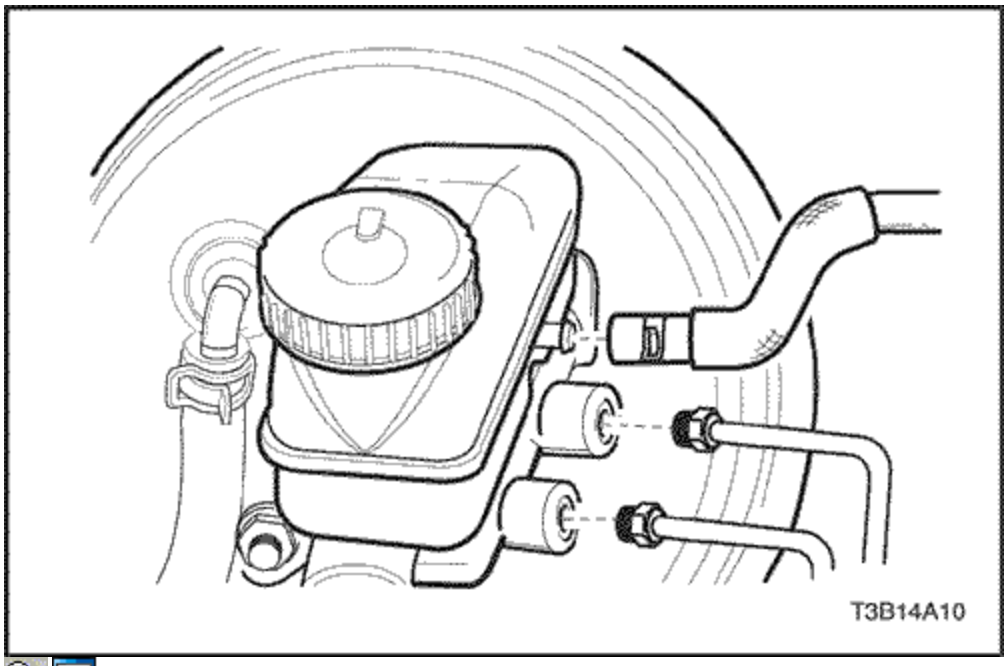
15. Slowly release the brake pedal. Wait 15 seconds before proceeding with the next step.

Important : Rapid pumping of the brake pedal pushes the master cylinder secondary piston down the bore in a manner that makes it difficult to bleed the system.

16. Repeat the sequence, including the 15-second wait, until all the air is removed. It may be necessary to repeat the sequence 10 or more times to remove all the air.
17. Locate the front bleeder caps.



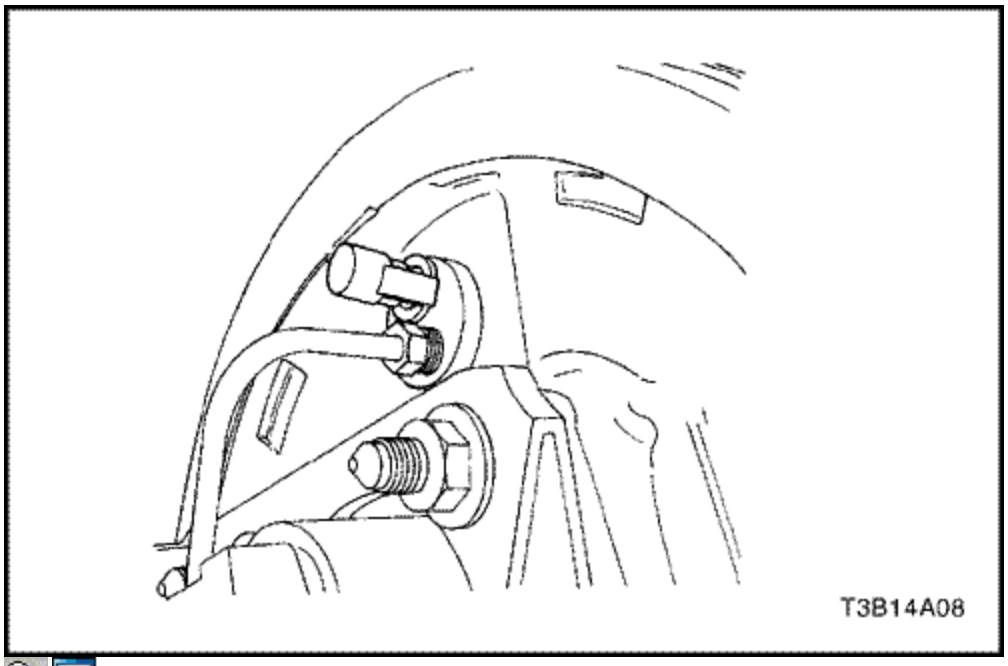
18. Proceed to bleed the front brakes following the appropriate sequence, beginning with Step 12.
19. Check the brake pedal for sponginess. Repeat the entire bleeding procedure to correct this condition.



Pressure Bleeding the Brakes

Notice : Pressure bleeding equipment must be of the diaphragm type. It must have a rubber diaphragm between the air supply and the brake fluid to prevent air, moisture, oil, and other contaminants from entering the hydraulic system. Contamination could lead to deterioration of the braking components and loss of braking action.

1. Disconnect the master cylinder electrical connector.
2. Remove the master cylinder reservoir cap.



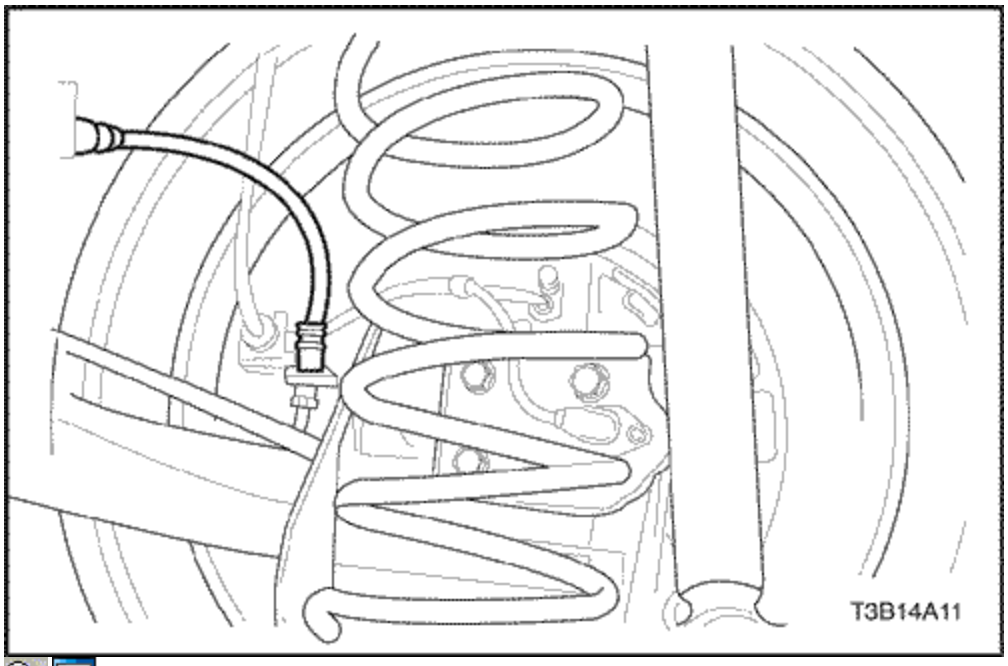
3. Connect the bleeder with the adapter to the master cylinder reservoir.
4. For vehicles with the antilock brake system (ABS), locate and remove the hydraulic modulator bleeder valves. Refer to *Section 4F, Antilock Brake System*
5. Charge the bleeder ball to 140 to 172 kPa (20 to 25 psi).
6. Connect the line to the adapter. Open the line valve.
7. Raise and suitably support the vehicle.

Important : The bleeding sequence is as follows: right rear, left front, left rear, and right front.

8. Attach the bleeder hose to the bleeder valve. Submerge the opposite end of the hose in a clean container partially filled with brake fluid.
9. Open the bleeder valve one-half to three-fourths of a turn and allow the fluid to flow until no air is seen in the fluid.

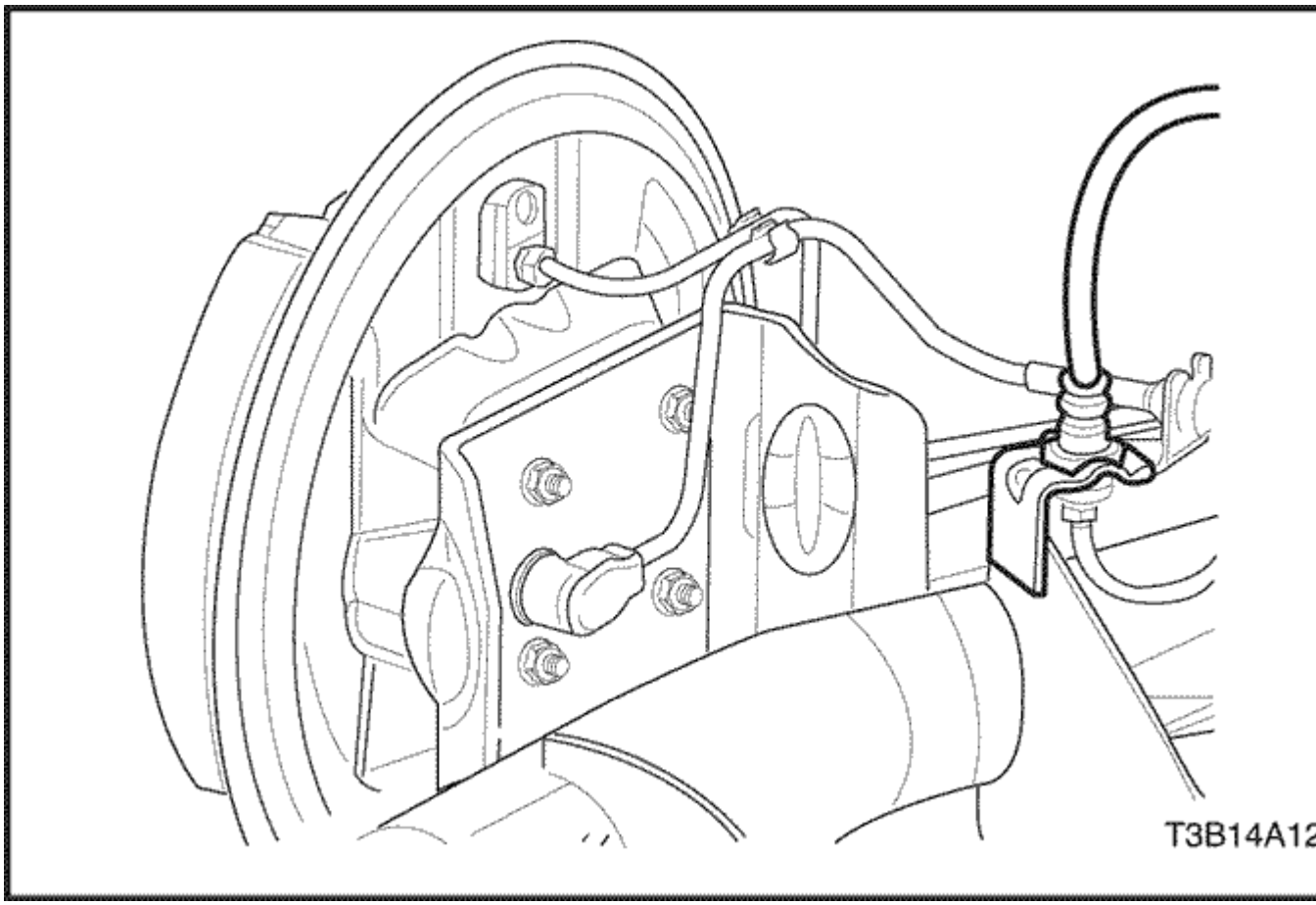
Notice : After the bleeding operation, the brake reservoir may be pressurized. While disconnecting the bleeder hose or the unthreaded adapter cap, cover the cap and the connection with a shop towel to protect painted surfaces from contact with the brake fluid.

10. Inspect the brake pedal for sponginess. Repeat the entire bleeding procedure to correct this condition.



Brake Hose (Rear)
Removal Procedure

1. Raise and suitably support the vehicle.
2. Disconnect the brake lines from the brake hoses at the body and the rear axle brackets.

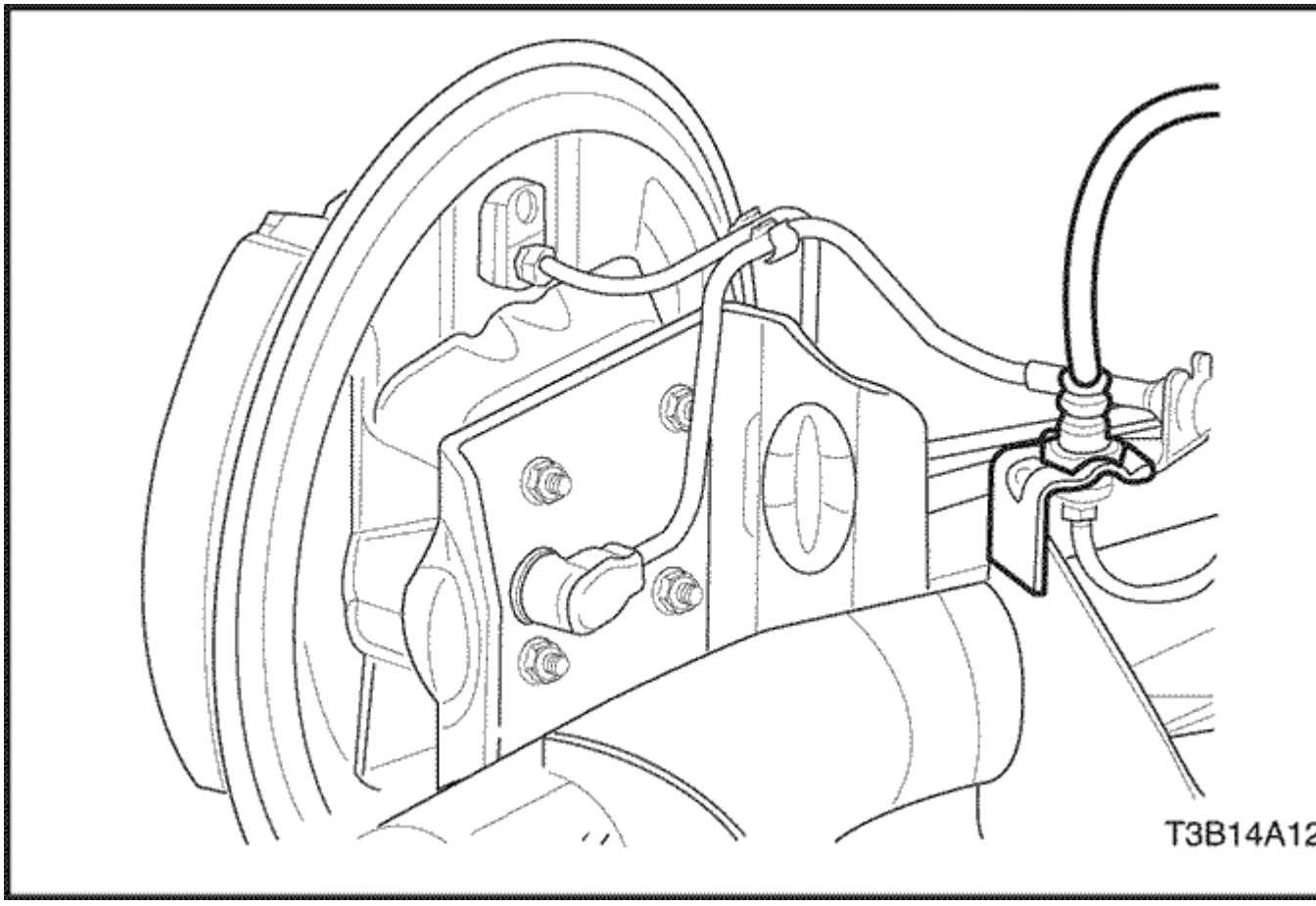


3. Remove both brake hose E-ring retainers.
4. Remove the brake hoses from the brackets.

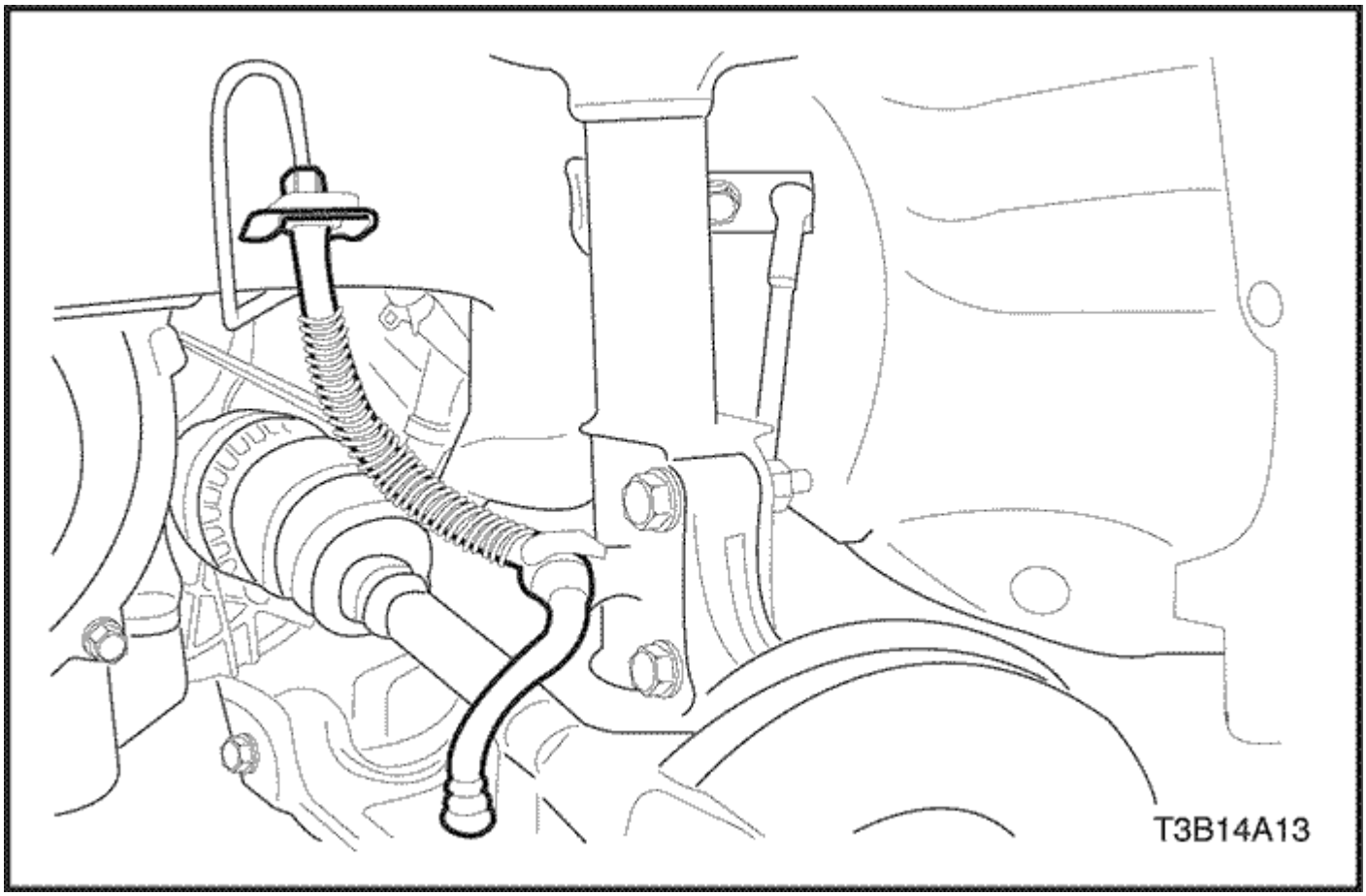
Installation Procedure

1. Install the brake hoses to the body and the rear axle brackets.
2. Connect the brake lines to the brake hose.

   Tighten
   Tighten the brake lines to 16 N•m (12 lb-ft).

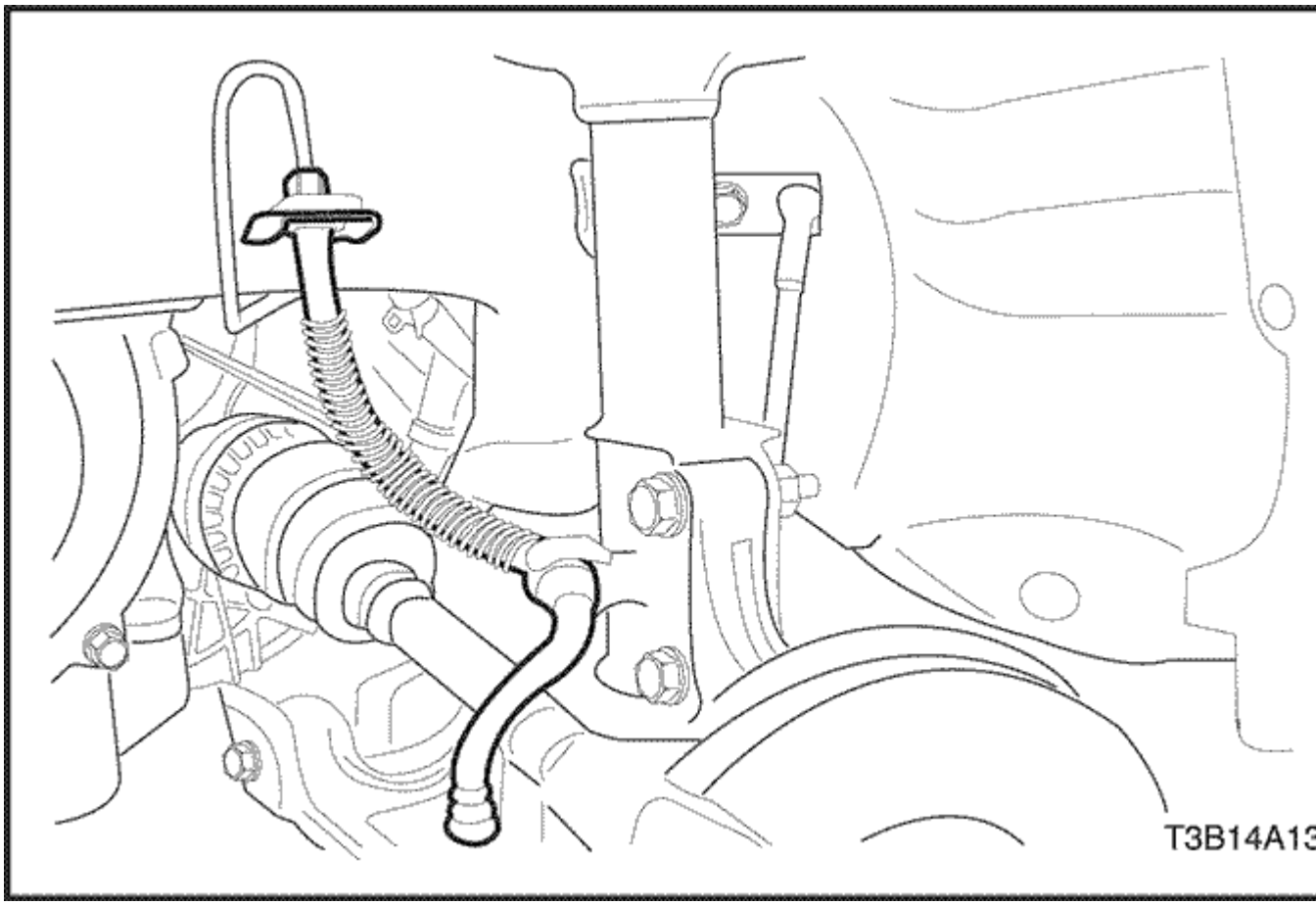


3. Install the brake hose retainers.
4. Lower the vehicle.
5. Bleed the brake system. Refer to "Manual Bleeding the Brakes" in this section.
6. Check the brake system for leaks.

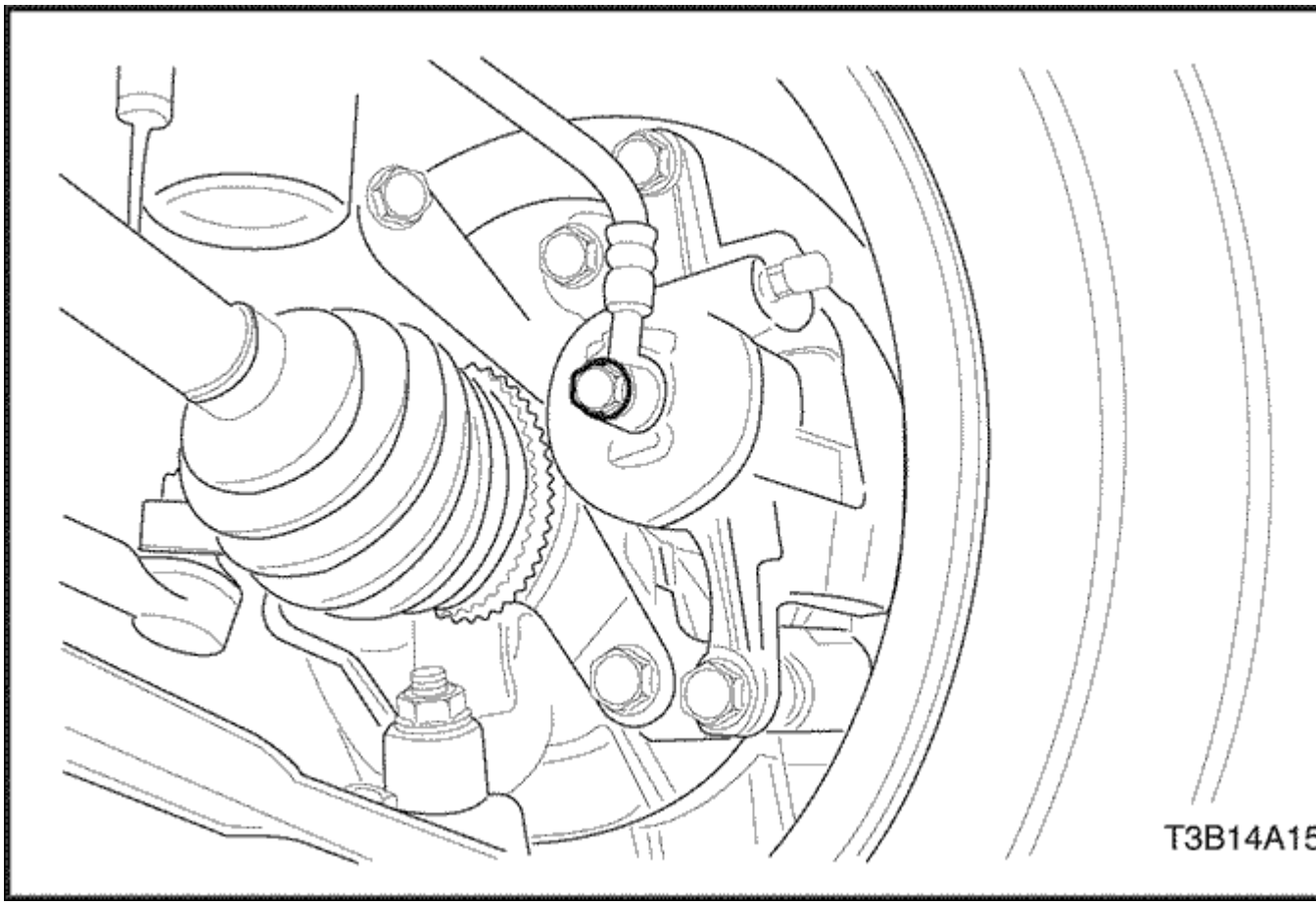


Brake Hose (Front)
Removal Procedure

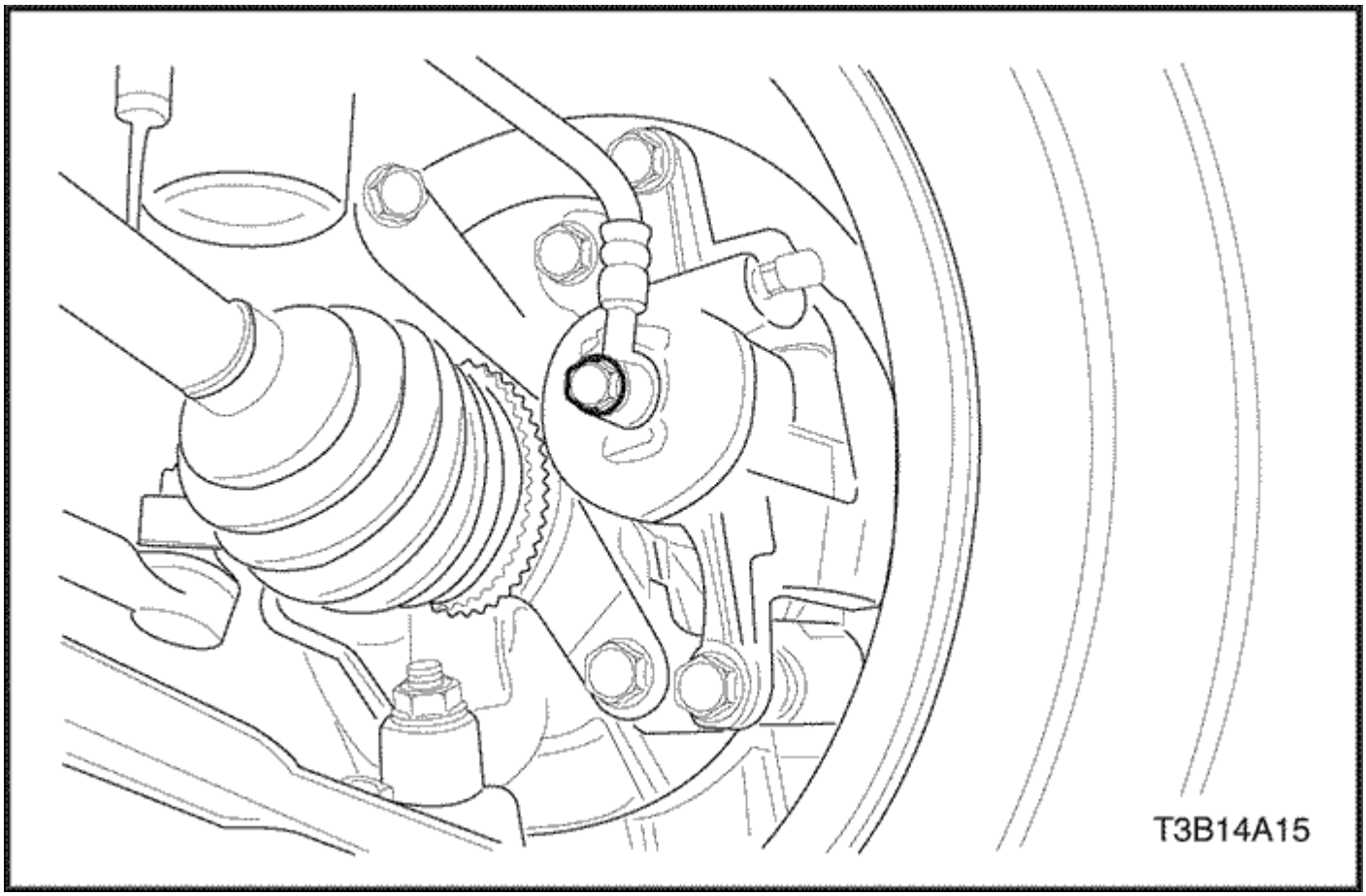
1. Raise and suitably support the vehicle.
2. Disconnect the brake line from the brake hose support bracket on the wheel housing.
3. Remove the E-ring retainer.



4. Remove the brake hose from the wheel housing bracket.



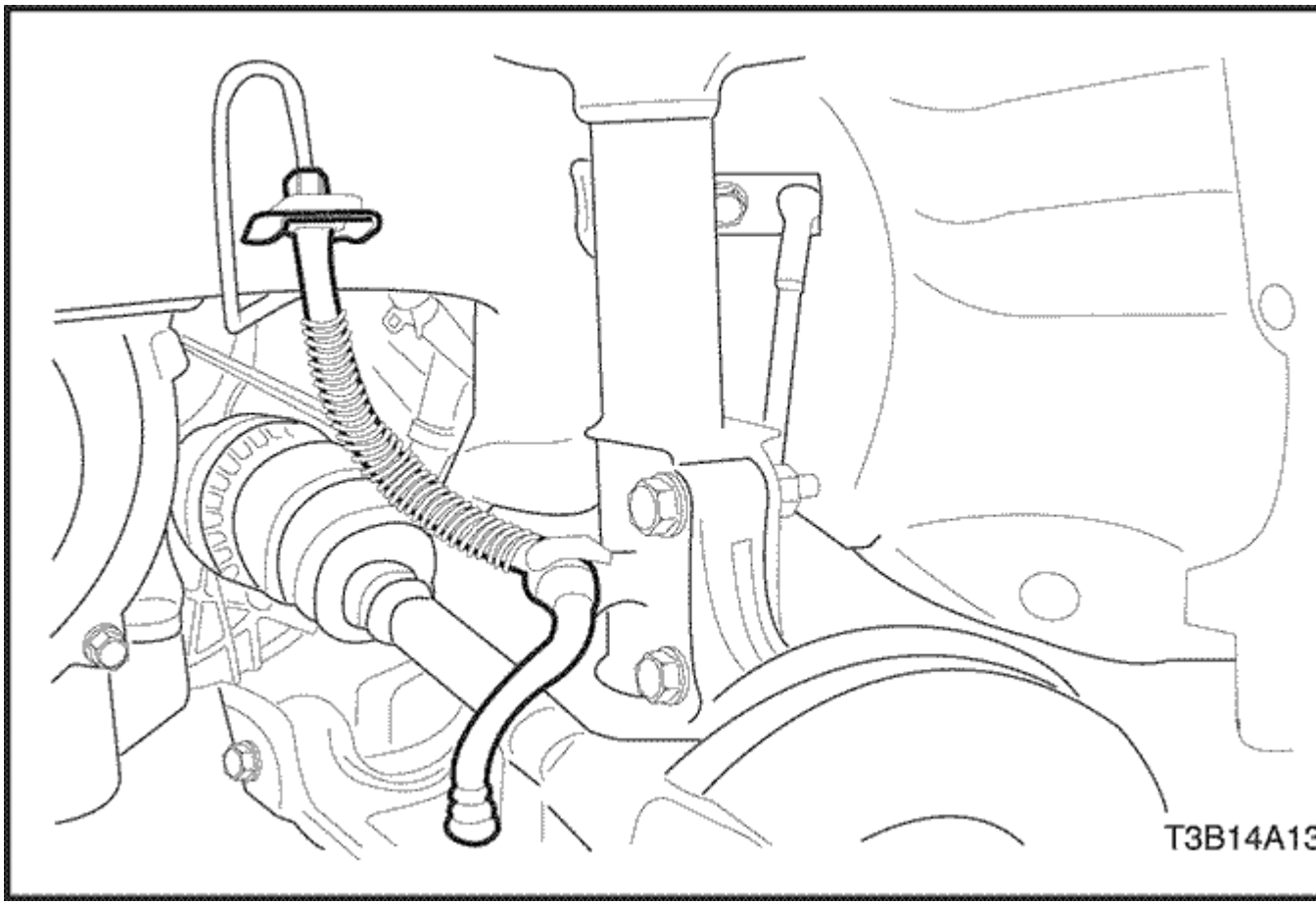
5. Remove the bolt from the brake caliper.
6. Remove the seal rings and the brake hose.



Installation Procedure

1. Install the new brake hose to the caliper with new seal rings and the bolt.

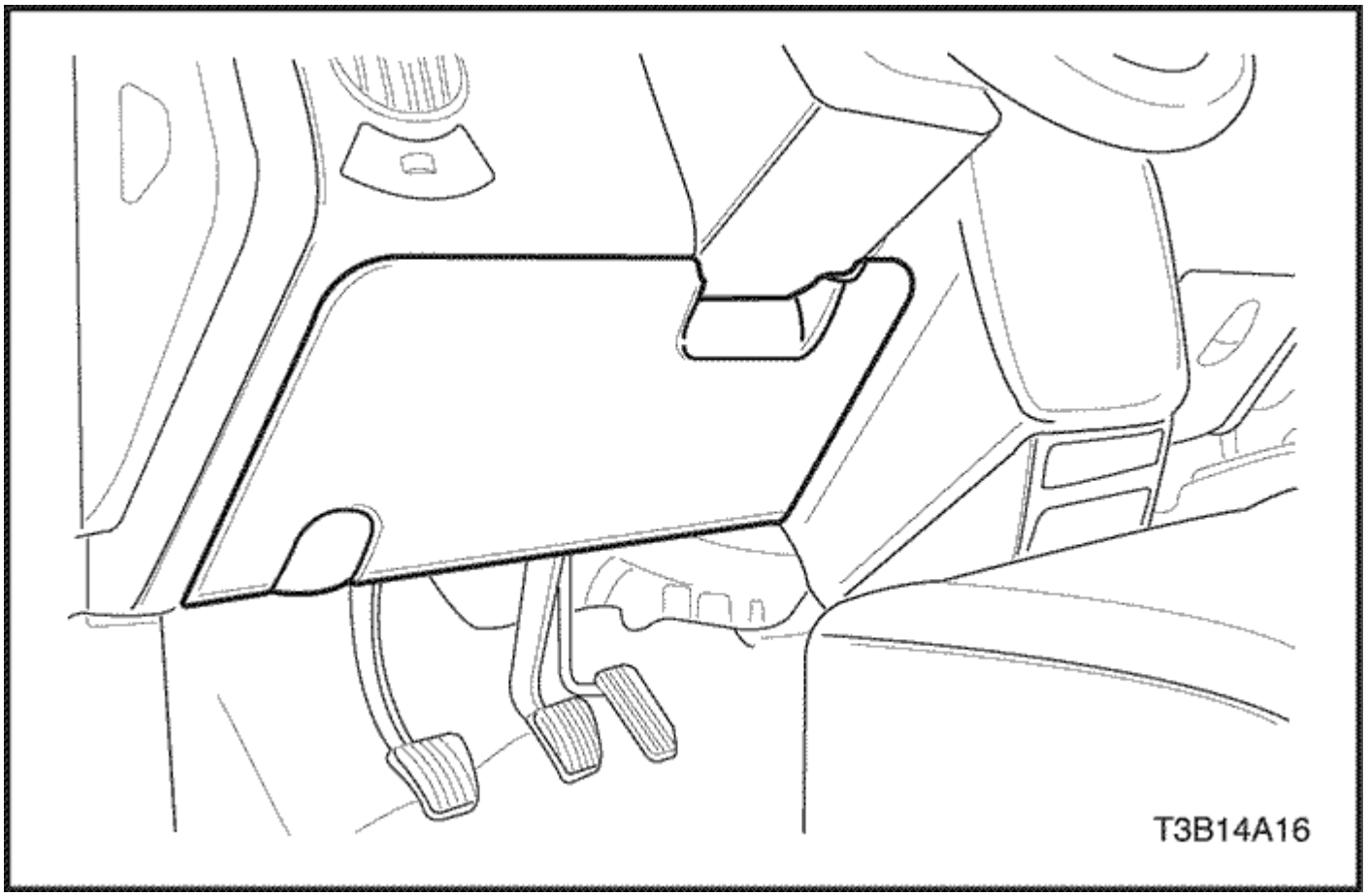
   Tighten
   Tighten the front brake hose-to-caliper bolt to 40 N•m (30 lb-ft).



2. Install the brake hose and the E-ring retainer to the wheel housing bracket.
3. Connect the brake line to the brake hose.

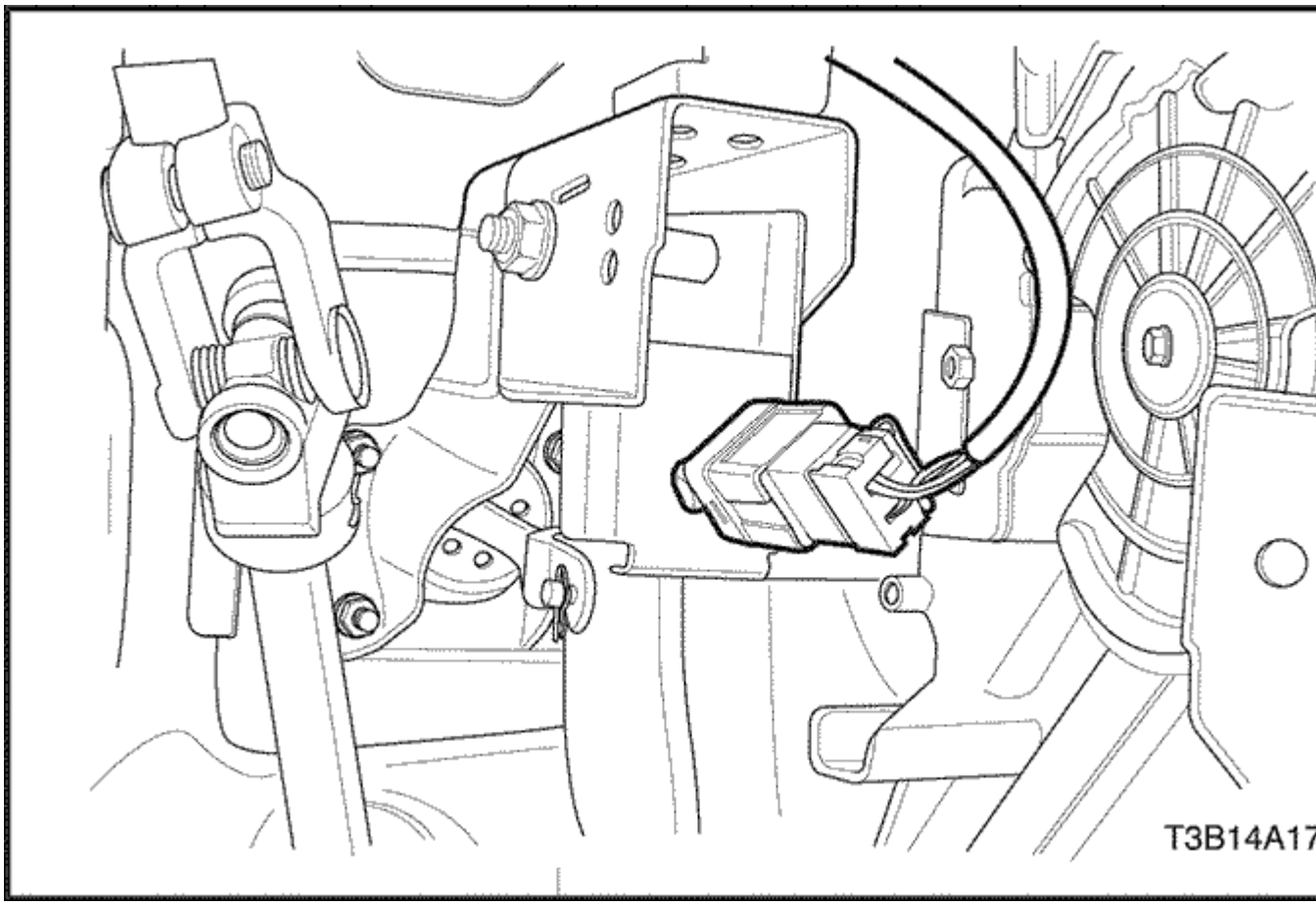
   Tighten
   Tighten the brake line to 16 N•m (12 lb-ft).

4. Lower the vehicle.
5. Bleed the brake system. Refer to "Manual Bleeding the Brakes" in this section.
6. Check the brake system for leaks.

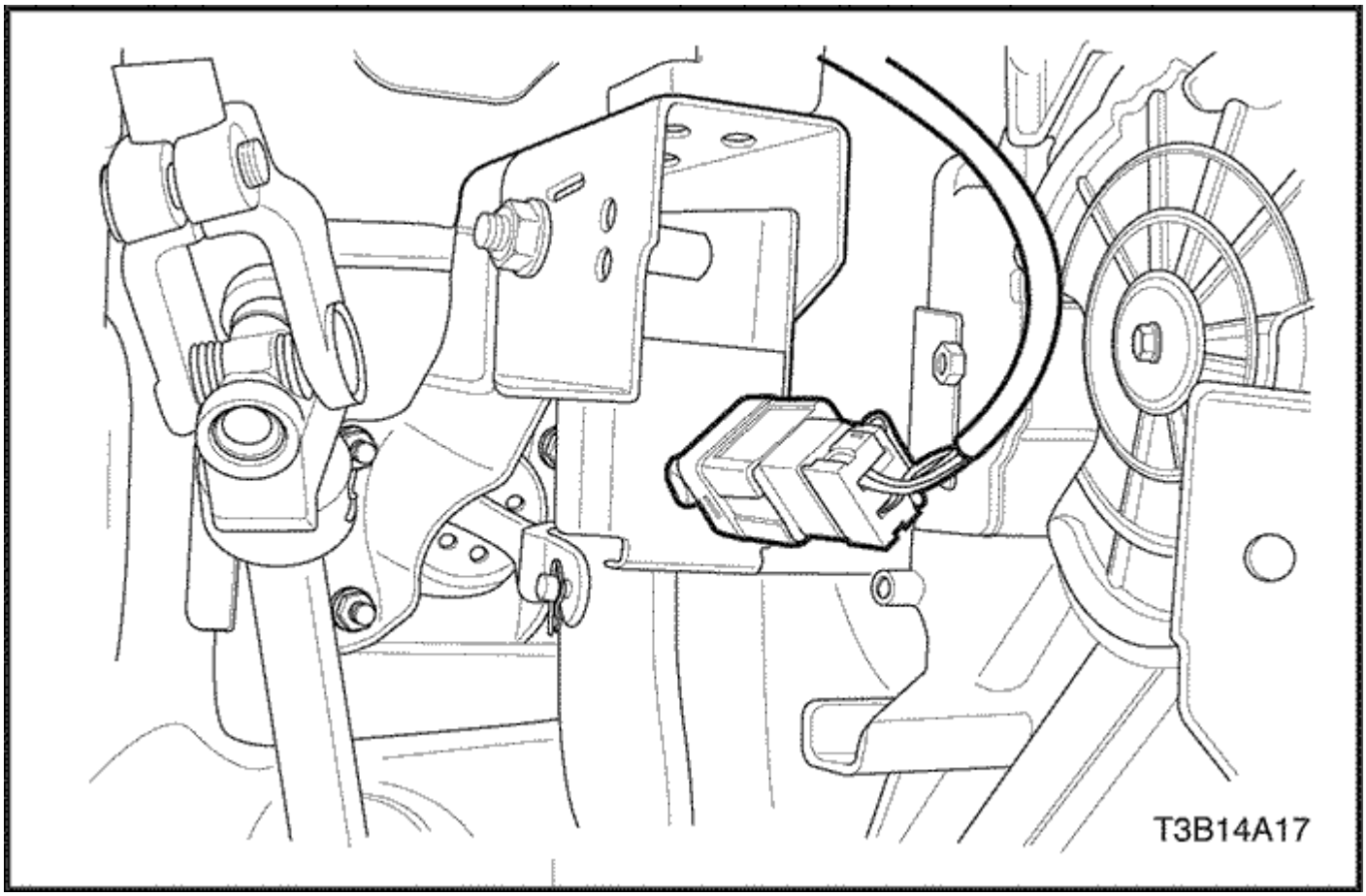


Stoplamp Switch
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the trim panel screws.
3. Remove the trim panel.

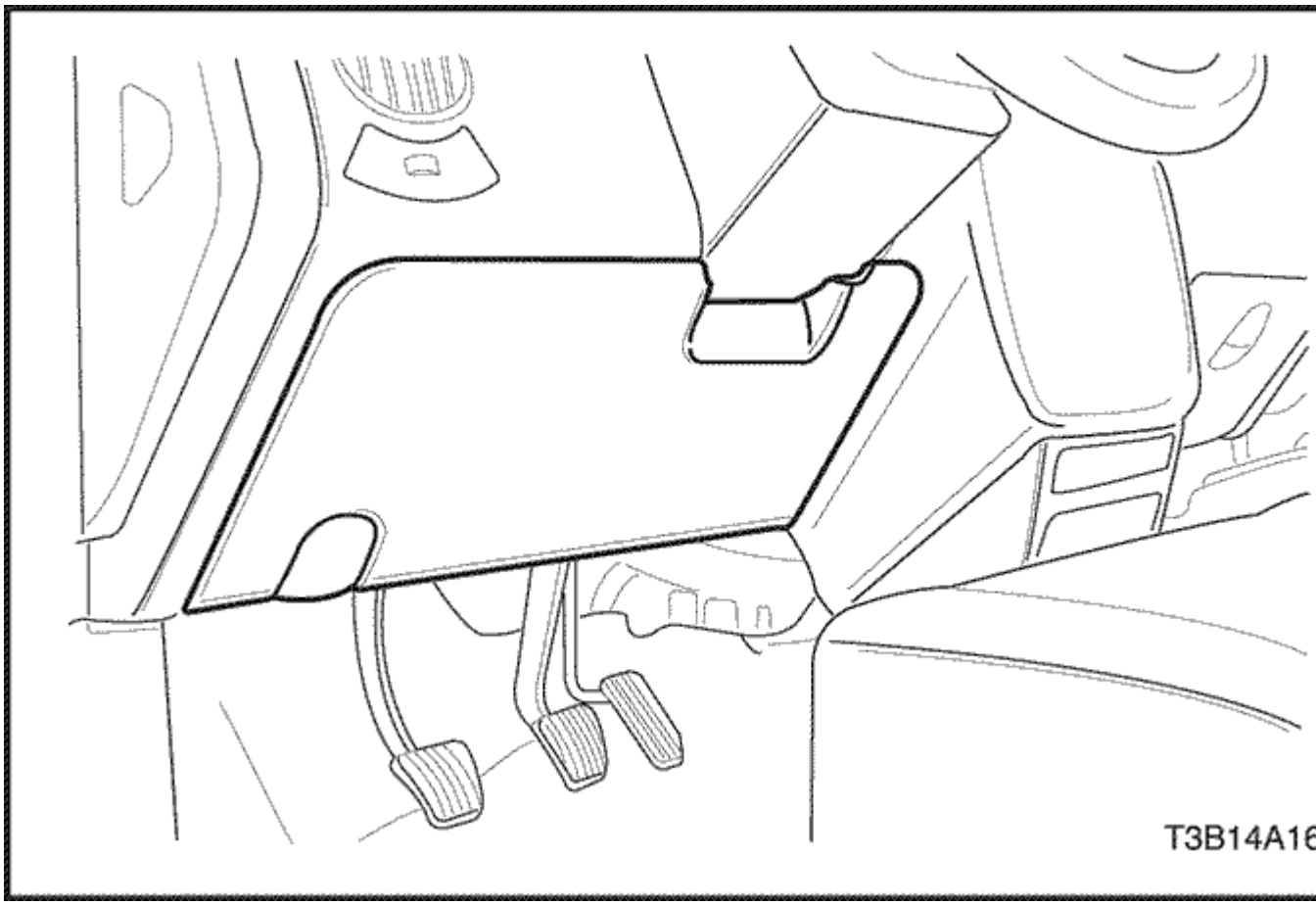


4. Turn the stoplamp switch and the connector assembly, and pull it from the brake pedal bracket.
5. Separate the stoplamp switch from the connector to replace the stoplamp switch.



Installation Procedure

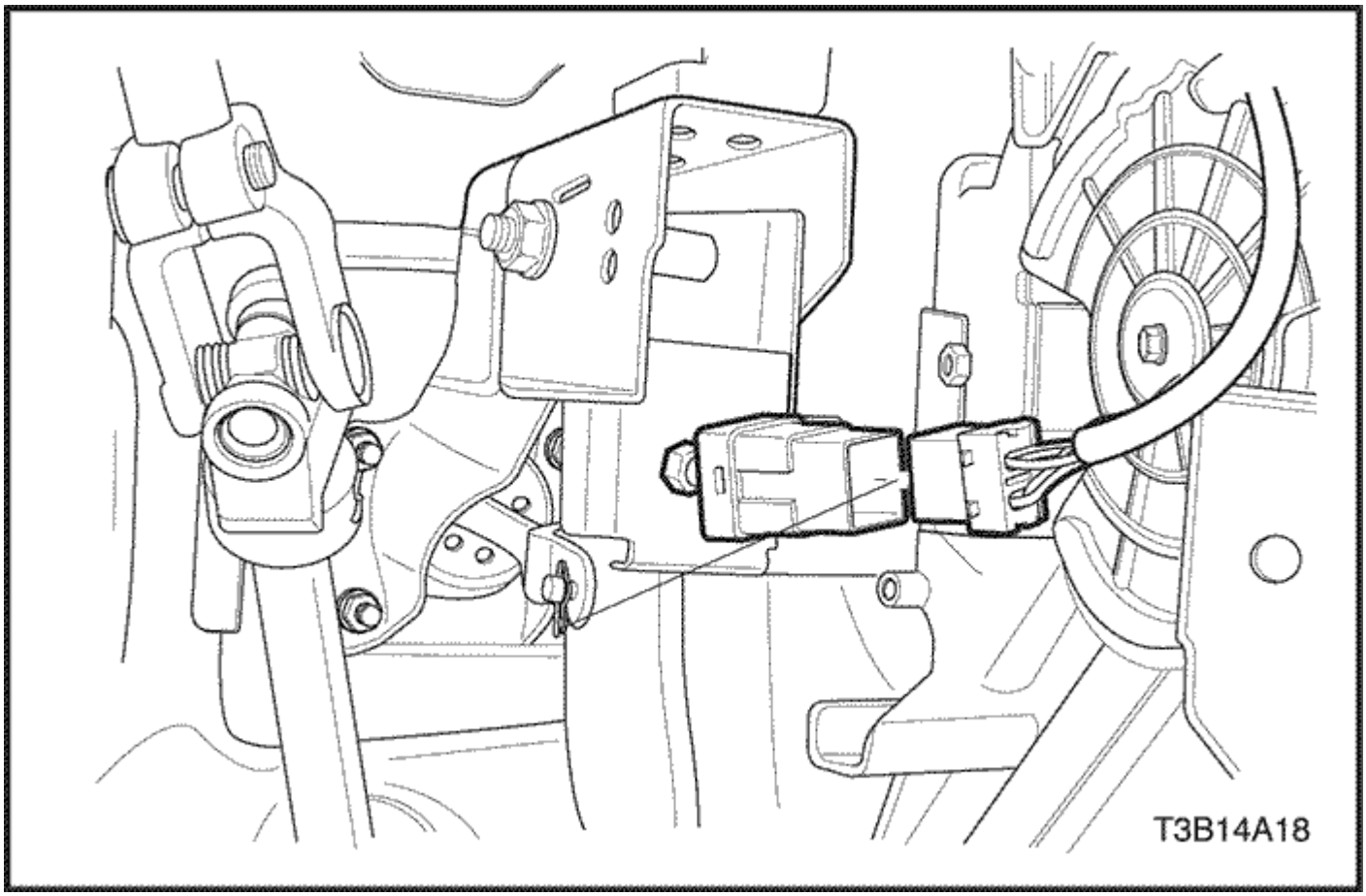
1. Install the connector to the stoplamp switch.
2. Turn the stoplamp switch and the connector assembly, and twist it into the brake pedal bracket.



3. Press the brake pedal and pull the switch plunger to its maximum setting to adjust the switch.
4. Release the plunger and pull up on the pedal.
5. Install the trim panel screws.

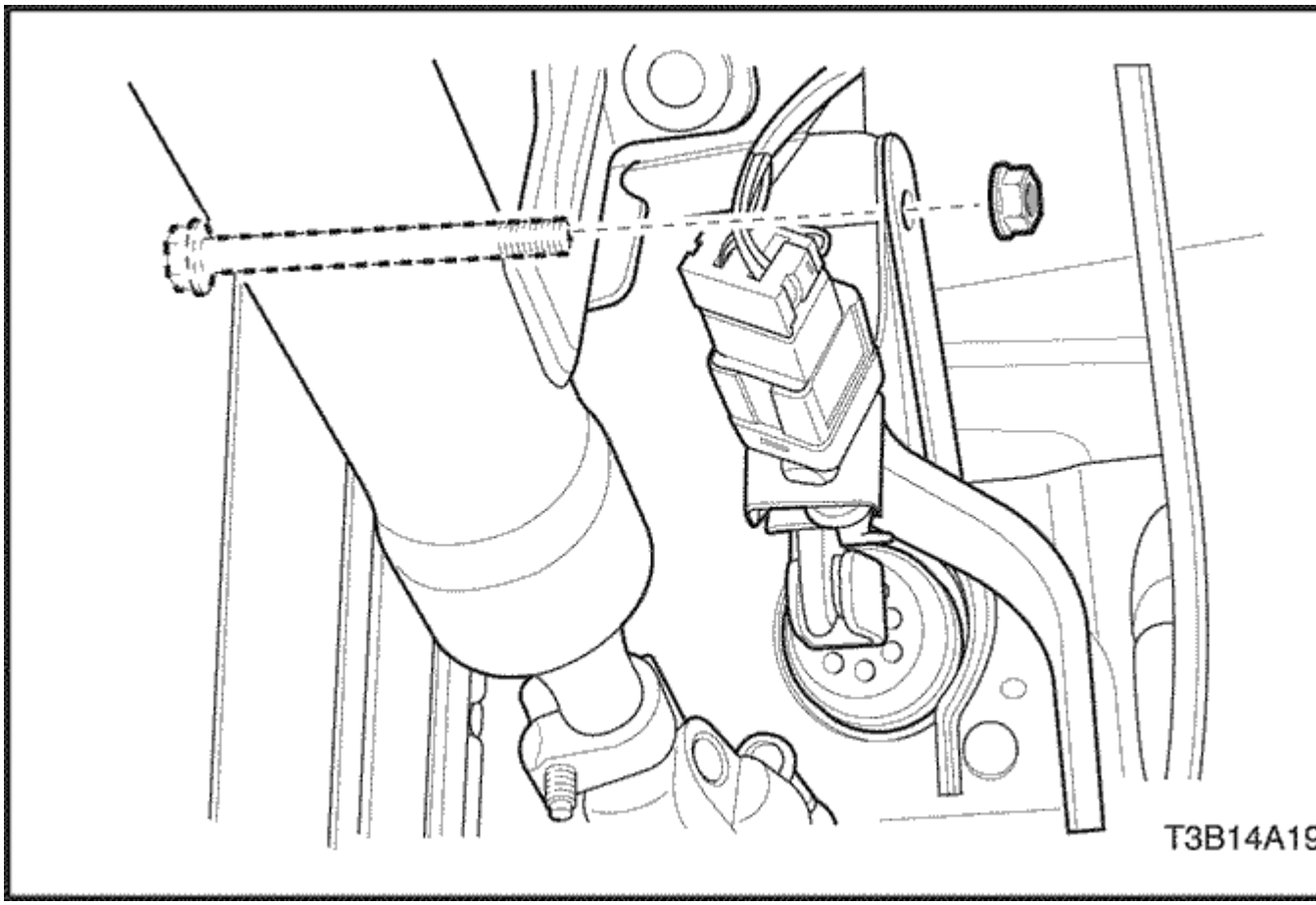
   Tighten
   Tighten the trim panel screws to 7 N•m (62 lb-in).

6. Press the brake pedal and pull the switch plunger to its maximum setting to adjust the switch.

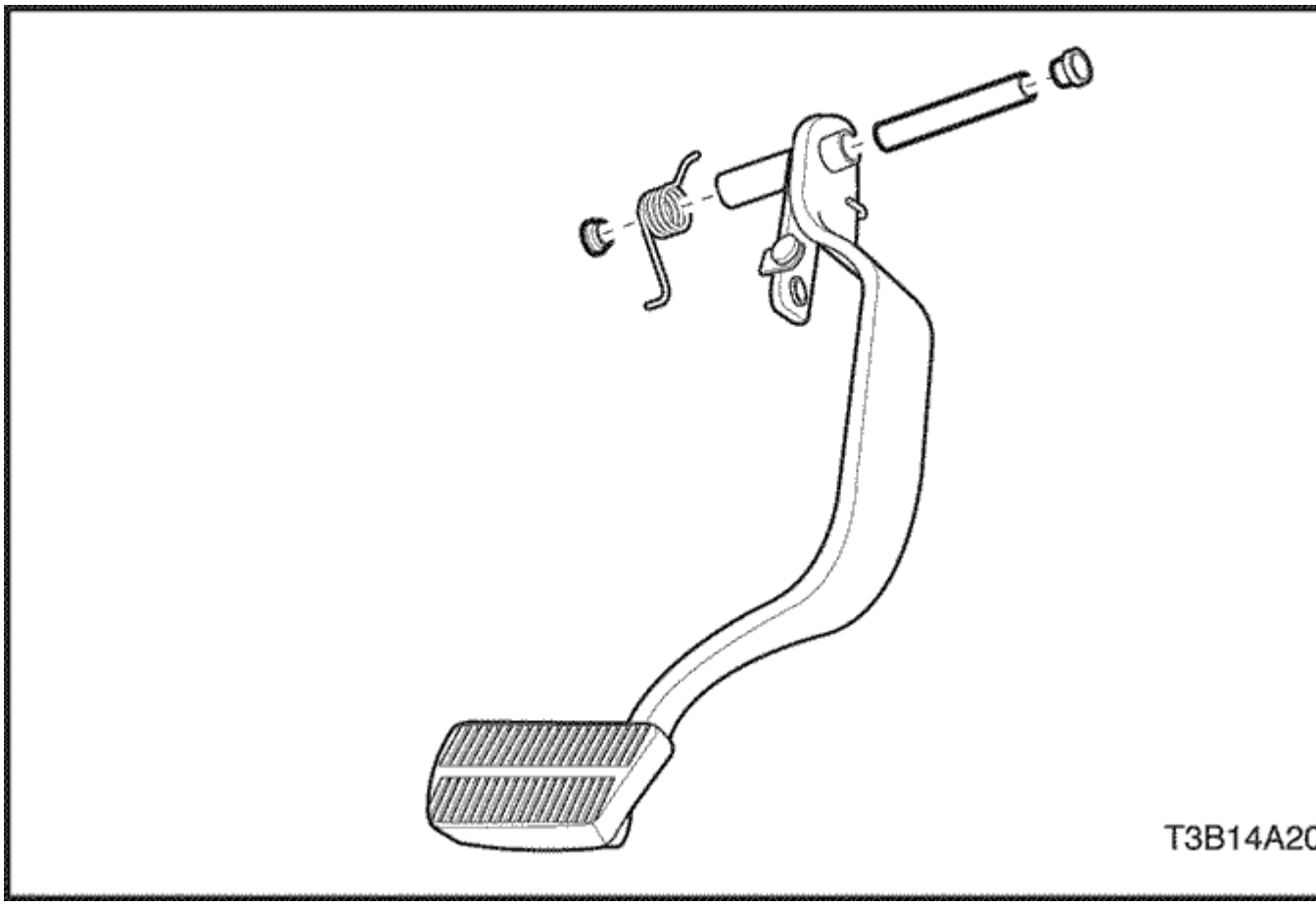


Brake Pedal
Removal Procedure

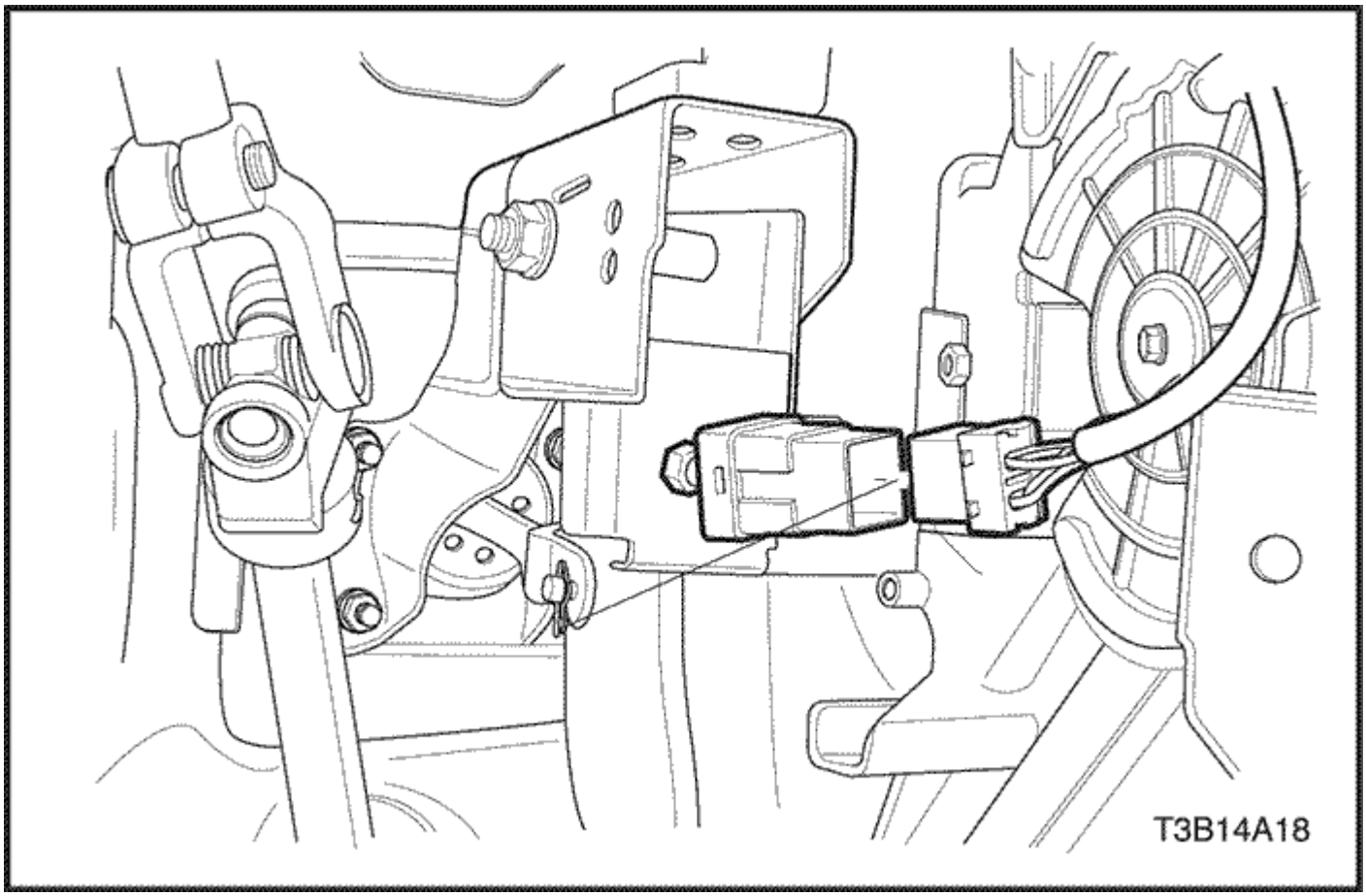
1. Remove the screws that hold the trim panel to the instrument panel.
2. Remove the trim panel.
3. Remove the stoplamp switch. Refer to "Stoplamp Switch" in this section.
4. Disconnect the retaining ring, the pin, and the spring from the pushrod/brake pedal connection.



5. Remove the pedal mounting shaft and nut.
6. Remove the brake pedal, exposing the brake booster pushrod and the pedal-to-dash panel bracket.



7. Remove the brake pedal cover.

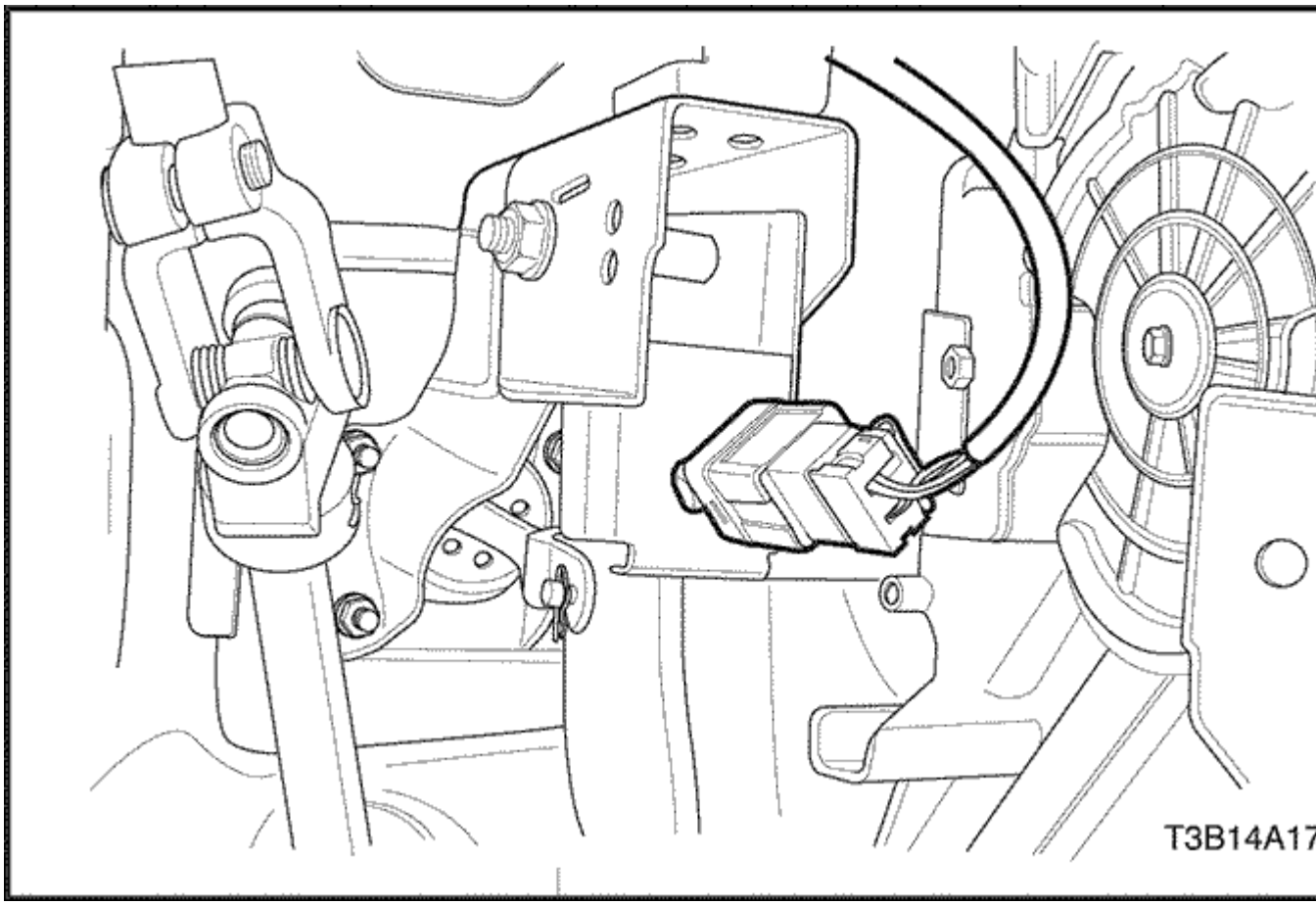


Installation Procedure

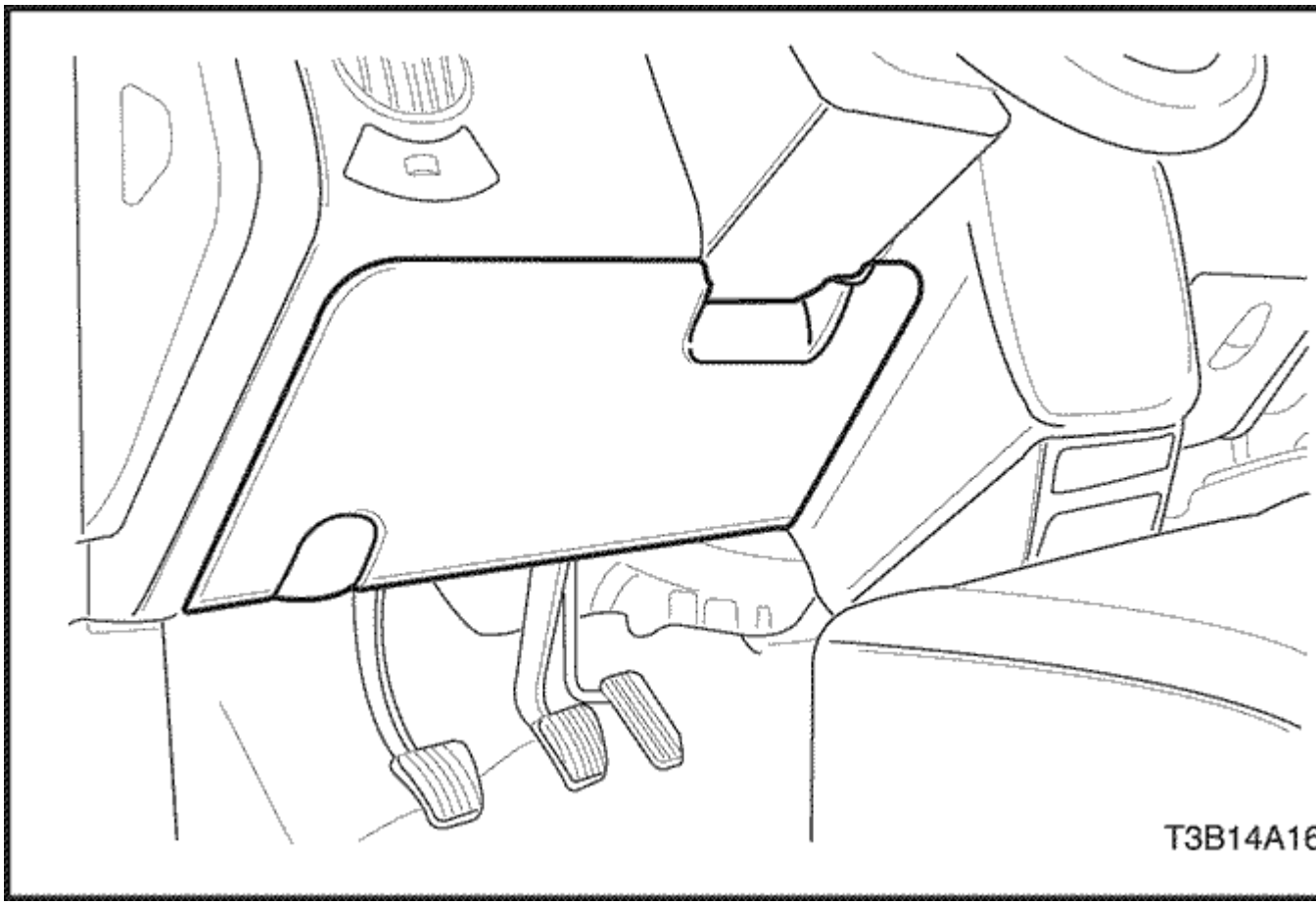
1. Install a new brake pedal cover, if needed.
2. Coat the pedal shaft with grease.
3. Position the brake pedal on the pedal-to-dash panel bracket and the pedal shaft.
4. Place the nut on the pedal mounting shaft.

   Tighten
   Tighten the brake pedal-to-pedal bracket nut to 22 N•m (16 lb-ft.)

5. Install the pushrod to the pedal with the pin and the retaining ring.



6. Install the spring on the shaft in its original position.
7. Connect the stoplamp switch and the connector assembly by twisting it into the pedal bracket.



8. Install the trim panel with the screws.

   Tighten
   Tighten the trim panel screws to 7 N•m (62 lb-in).

GENERAL DESCRIPTION AND SYSTEM OPERATION

Hydraulic Fluid

Master cylinder fluid should meet the DOT 3 specification. Use DOT 4 for heavy duty applications, such as trailer towing or mountain driving.
Use only clear fluid from a sealed container. Fluid that is exposed to the air will absorb moisture. Water in the master cylinder fluid will cause the fluid to boil and the rubber components to deteriorate.
Thoroughly clean the master cylinder reservoir cap before removing it. Do not let any dirt or foreign material fall into the fluid reservoir.

There is a fluid level switch in the master cylinder reservoir. When the fluid level is low, the BRAKE lamp in the instrument cluster will turn on. The correct master cylinder fluid level is marked on the left side of the master cylinder reservoir. If the fluid level is below the MIN indicator mark, check the hydraulic brake system for leaks, and then refill the reservoir to the MAX indicator mark.

SECTION 4B

MASTER CYLINDER

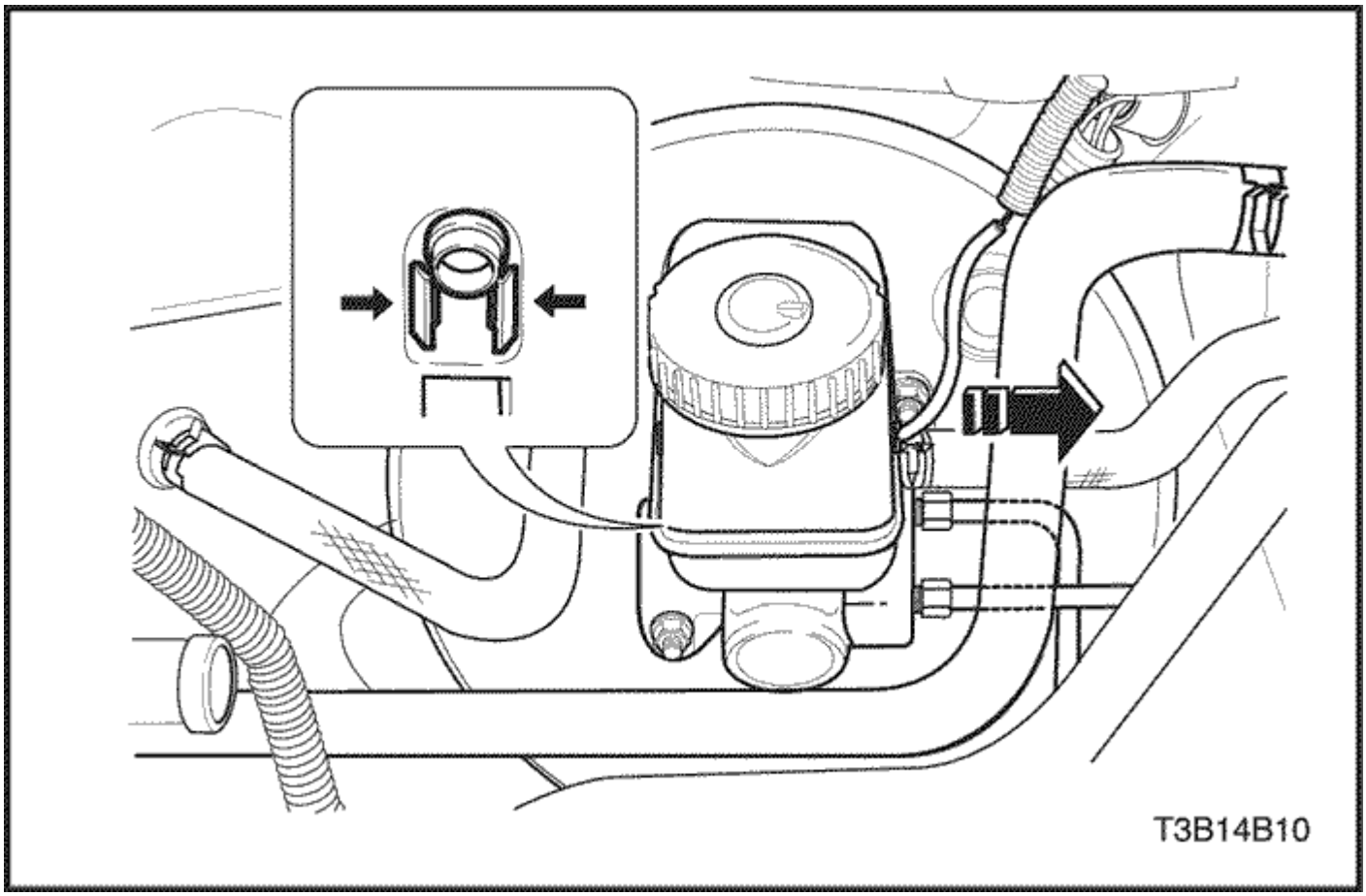
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Brake Lines	16	12	-
Master Cylinder Attaching Nuts	18	13	-
Proportioning Valves	40	30	-
Bleeder Valves	6	-	53

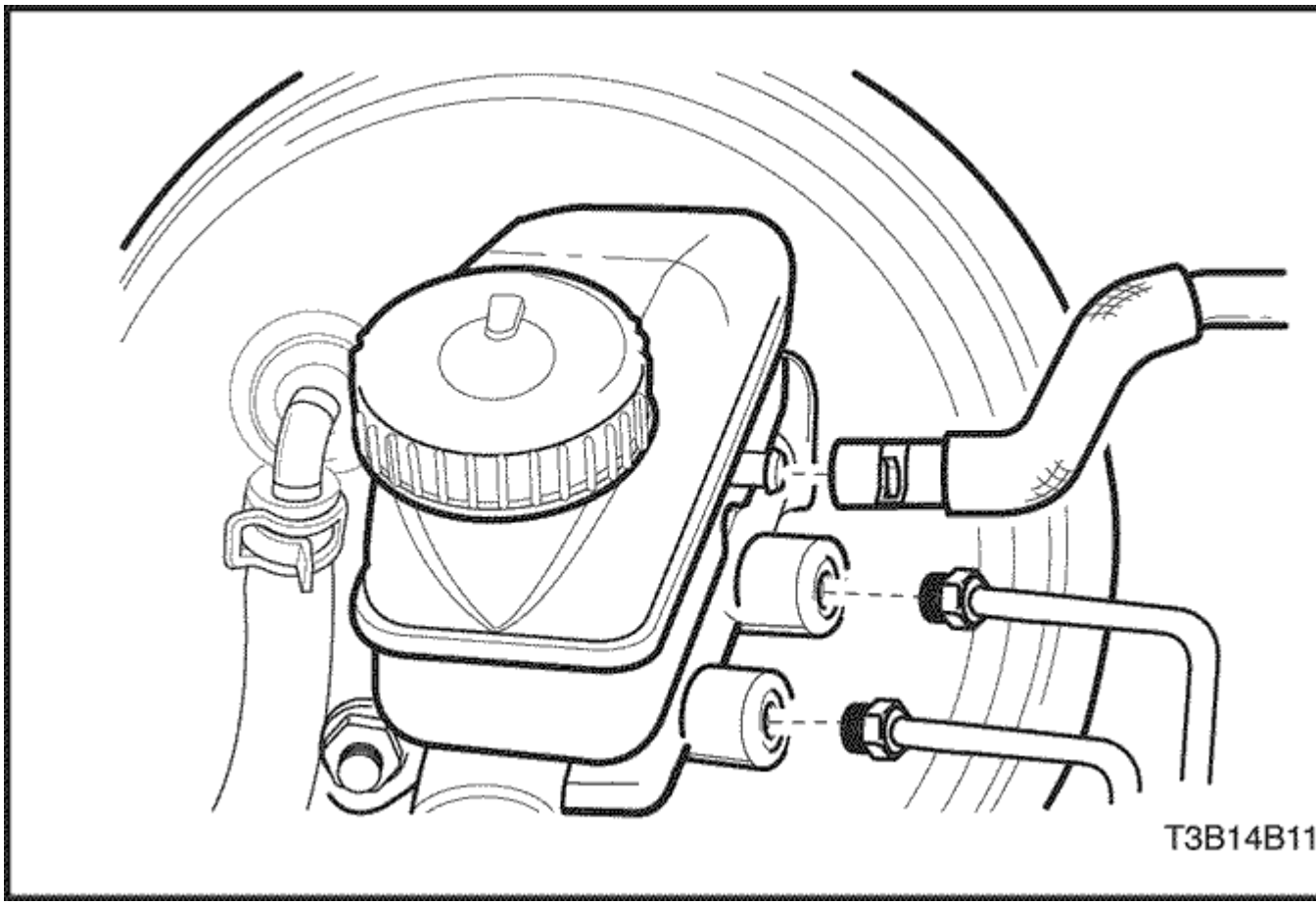
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

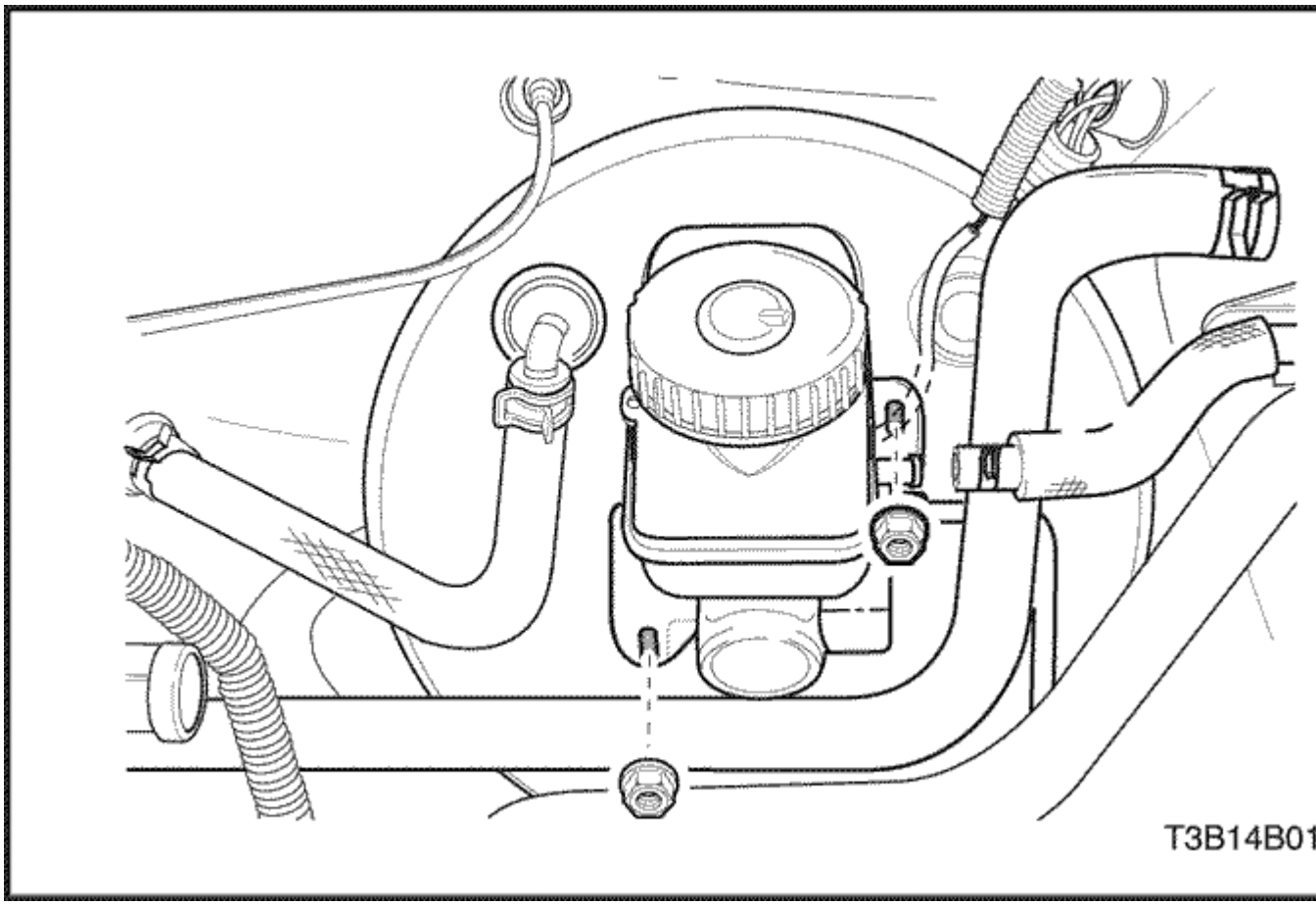


Master Cylinder Assembly
Removal Procedure

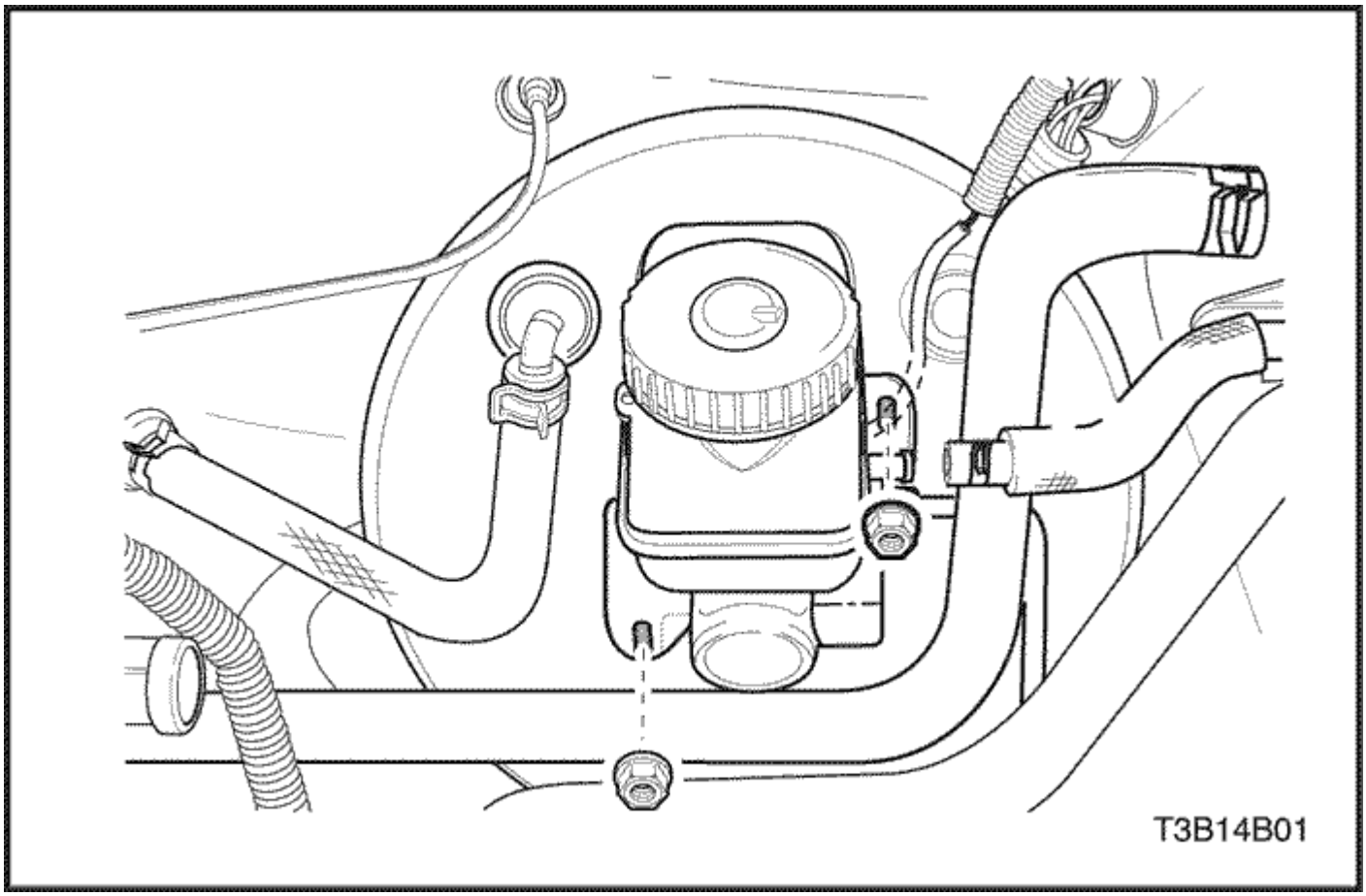
1. Disconnect the electrical connector from the reservoir.



2. For vehicles with the ABS braking system, disconnect the brake lines from the master cylinder body.
3. For vehicles with the non-ABS braking system, disconnect the brake lines from the proportioning valves.
4. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection at the master cylinder.
5. Plug the opening to the brake lines to prevent fluid loss and contamination.



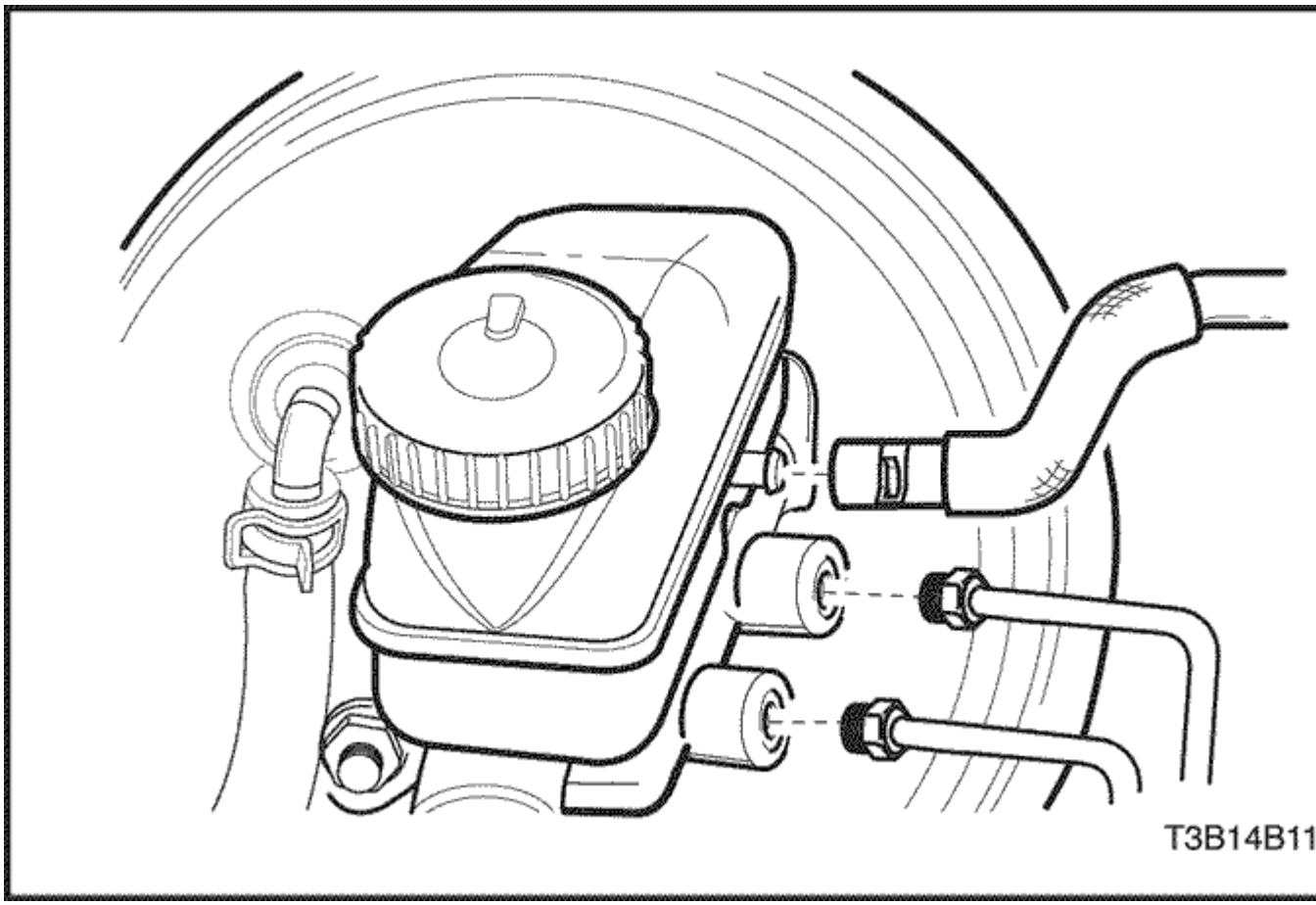
6. Remove the attaching nuts from the power booster.
7. Remove the master cylinder assembly.
8. Remove the seal from the booster housing. Discard the seal.
9. Drain the brake fluid.



Installation Procedure

1. Install the master cylinder assembly with the new attaching nuts.
2. Install the new seal to the booster housing.

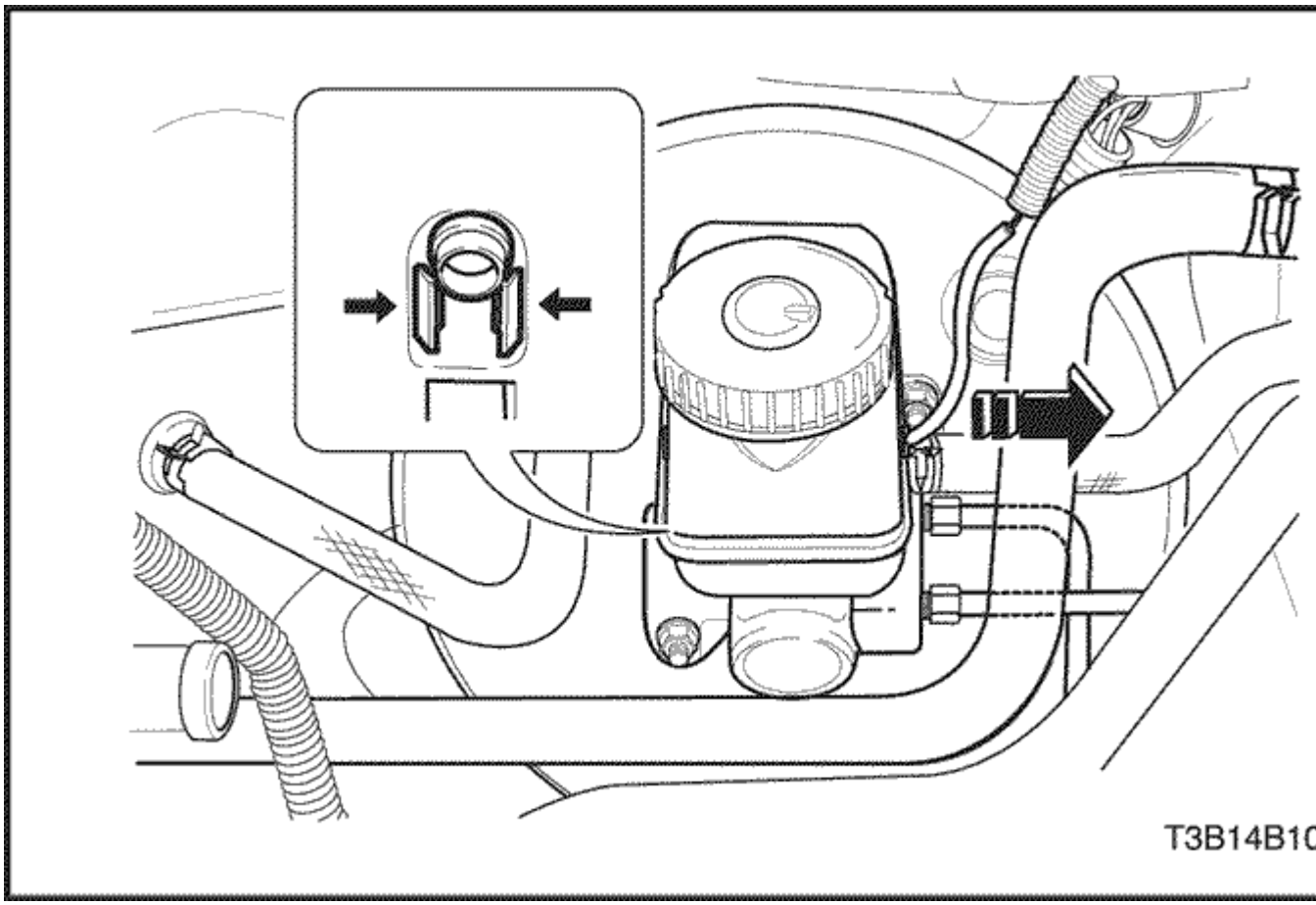
   Tighten
   Tighten the master cylinder attaching nuts to 18 N•m (13 lb-ft)..



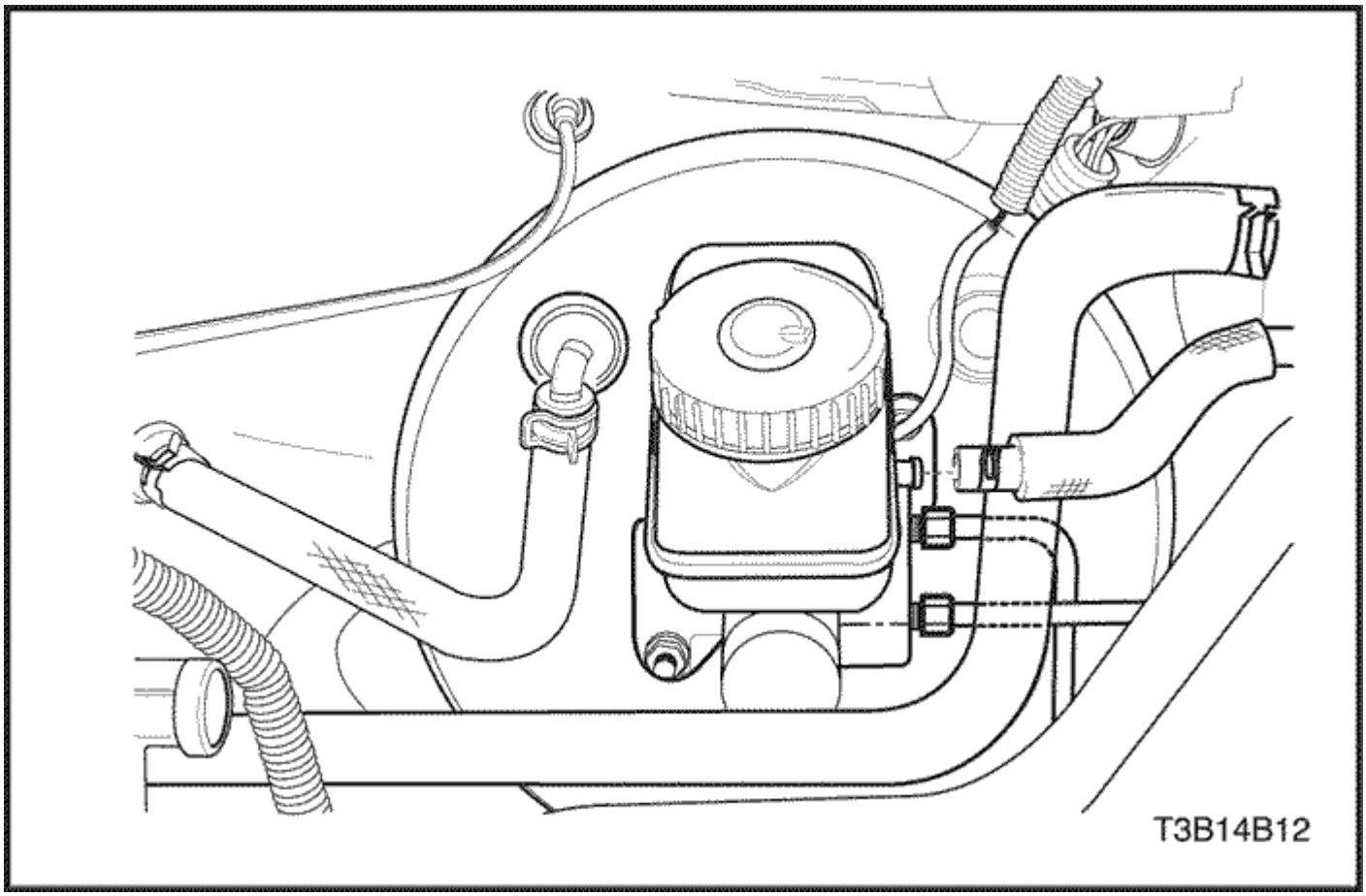
3. For vehicles with the ABS braking system (as shown), connect the brake lines to the cylinder body.
4. For vehicles with the non-ABS braking system, connect the brake lines to the proportioning valves.

   Tighten
   Tighten the brake lines to 16 N•m (12 lb-ft).

5. For vehicles with the manual transaxle, connect the clip to the clutch hose connection at the master cylinder.



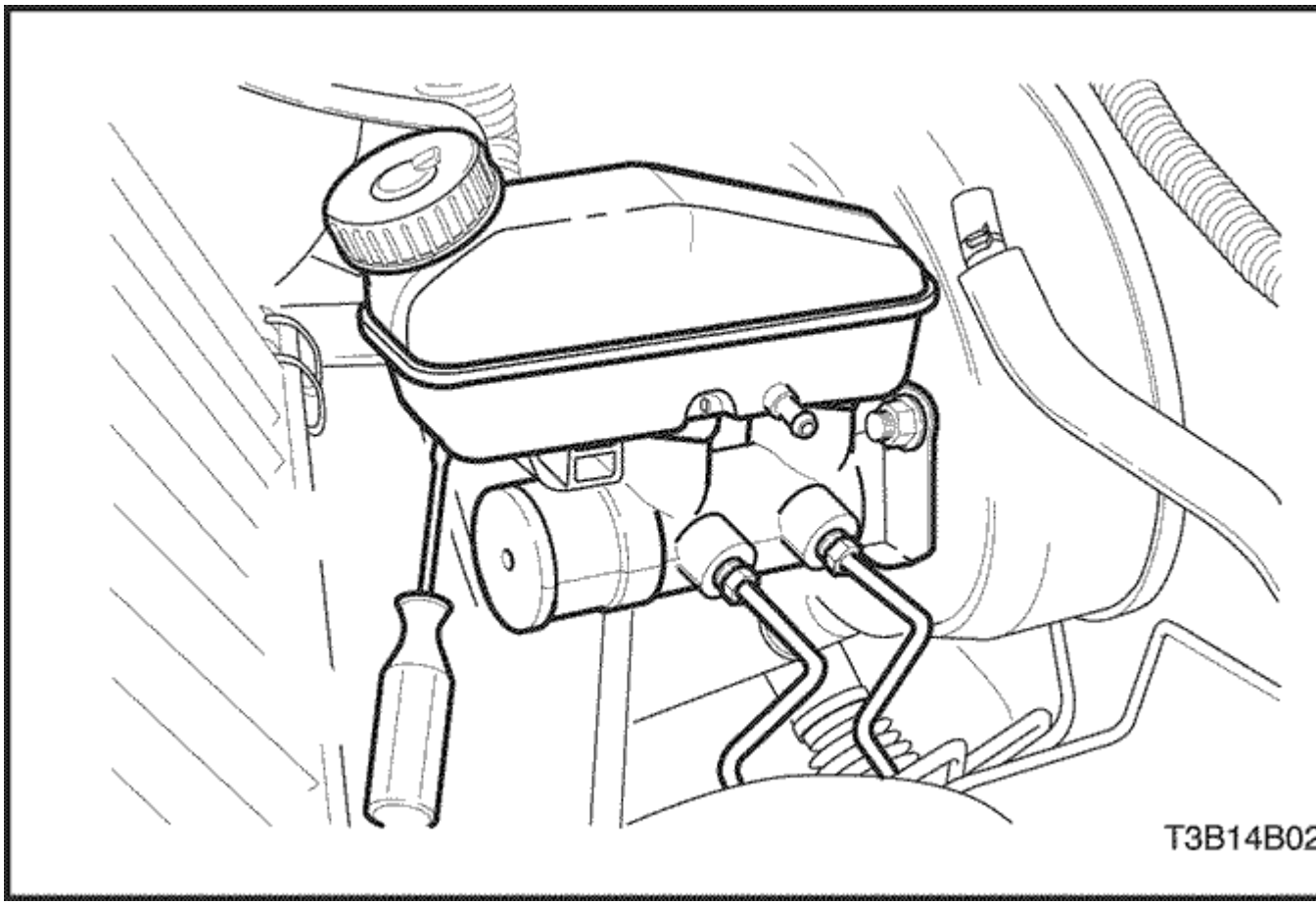
6. Connect the electrical connector on the reservoir.
7. Add brake fluid.
8. Check for leaks and recheck the fluid level.
9. Bleed the brake system. Refer to *Section 4A, Hydraulic Brakes.*



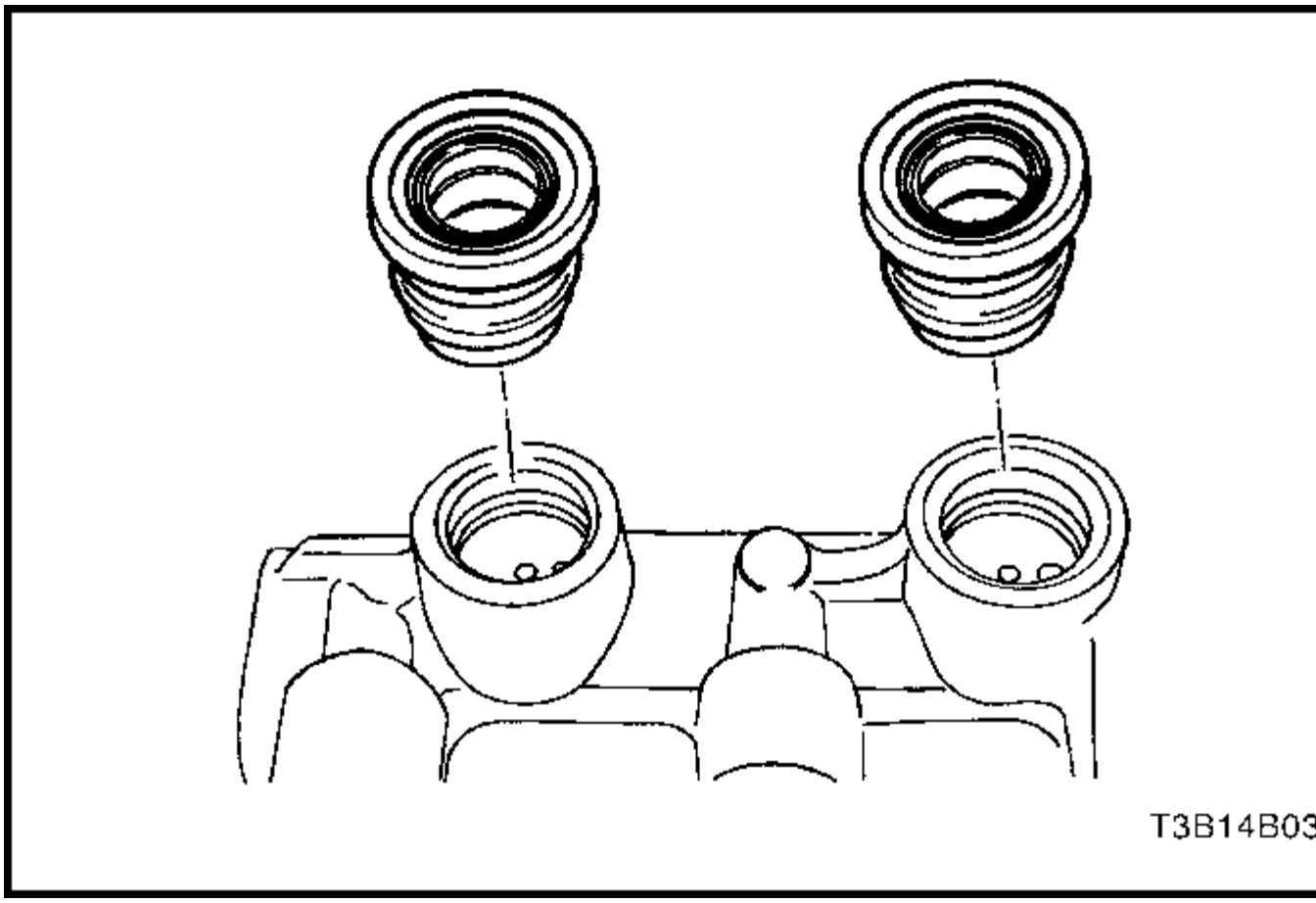
Brake Fluid Reservoir
Removal Procedure

Important : Remove the reservoir only when replacing a damaged or a leaking reservoir.

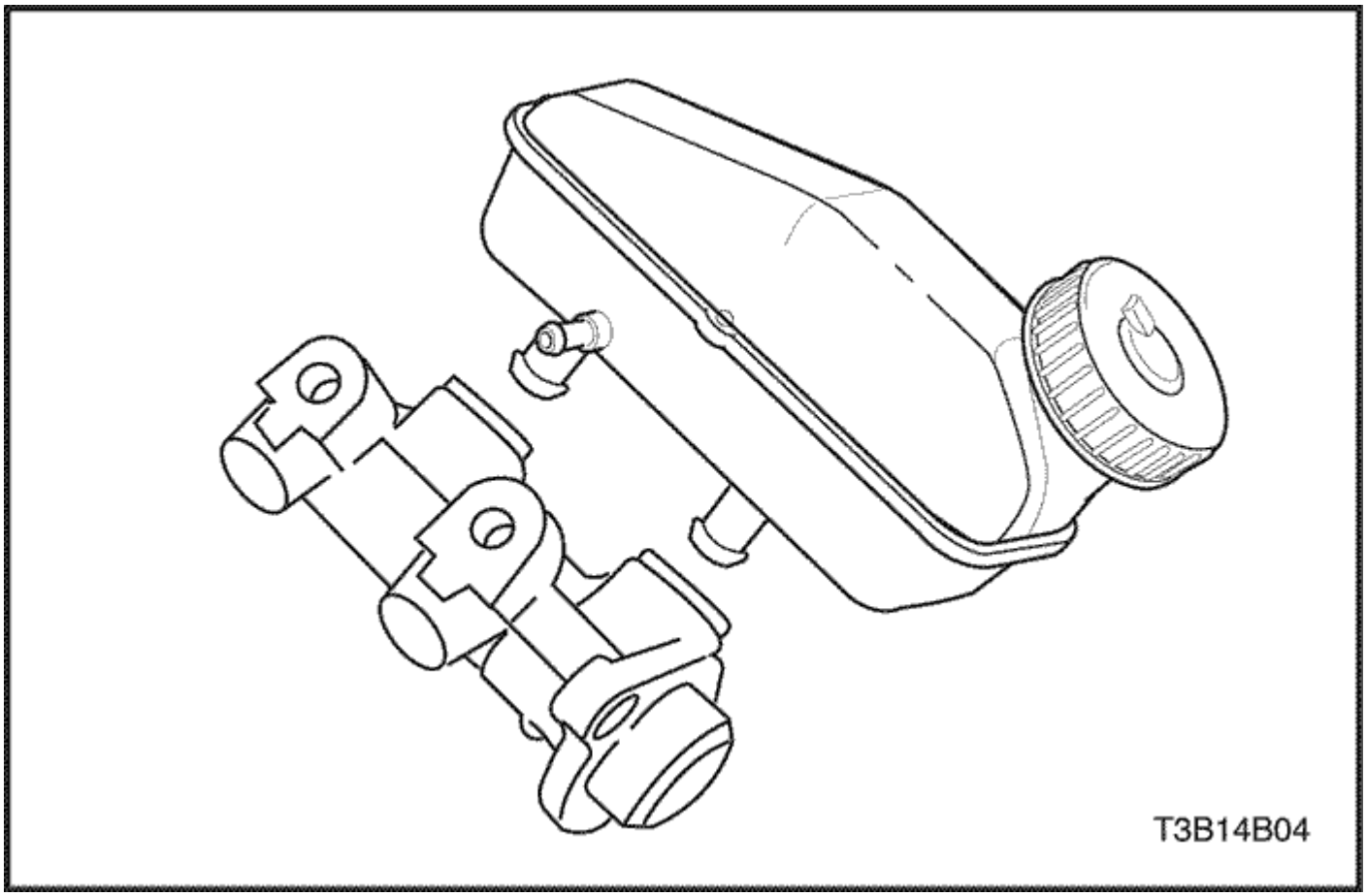
1. Disconnect the electrical connector from the reservoir.



2. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection at the master cylinder.
3. Gently pry upward with a screwdriver to release the reservoir.
4. Tilt the reservoir and pull it upward in order to remove it.

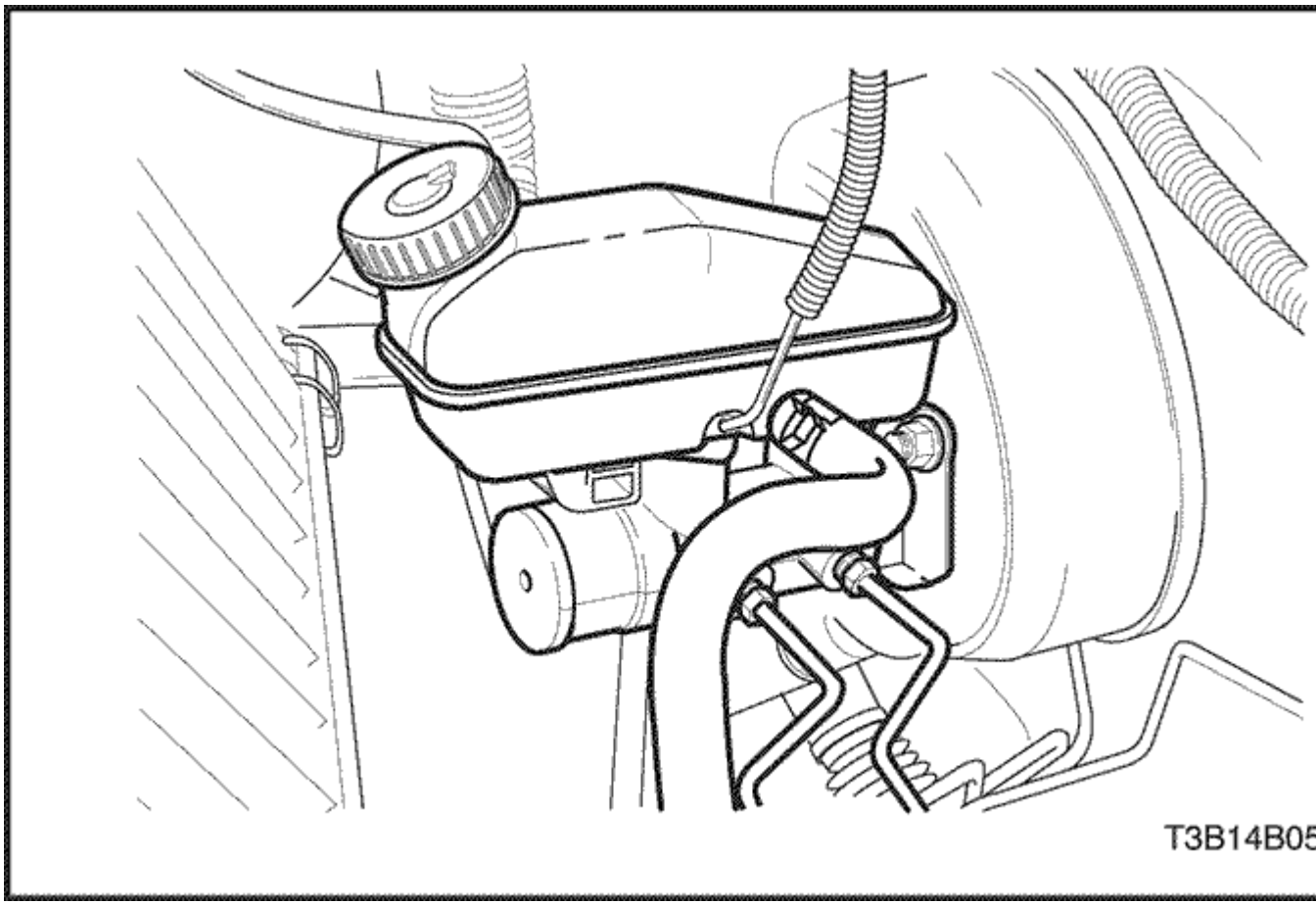


5. Remove the reservoir seals from the master cylinder body.

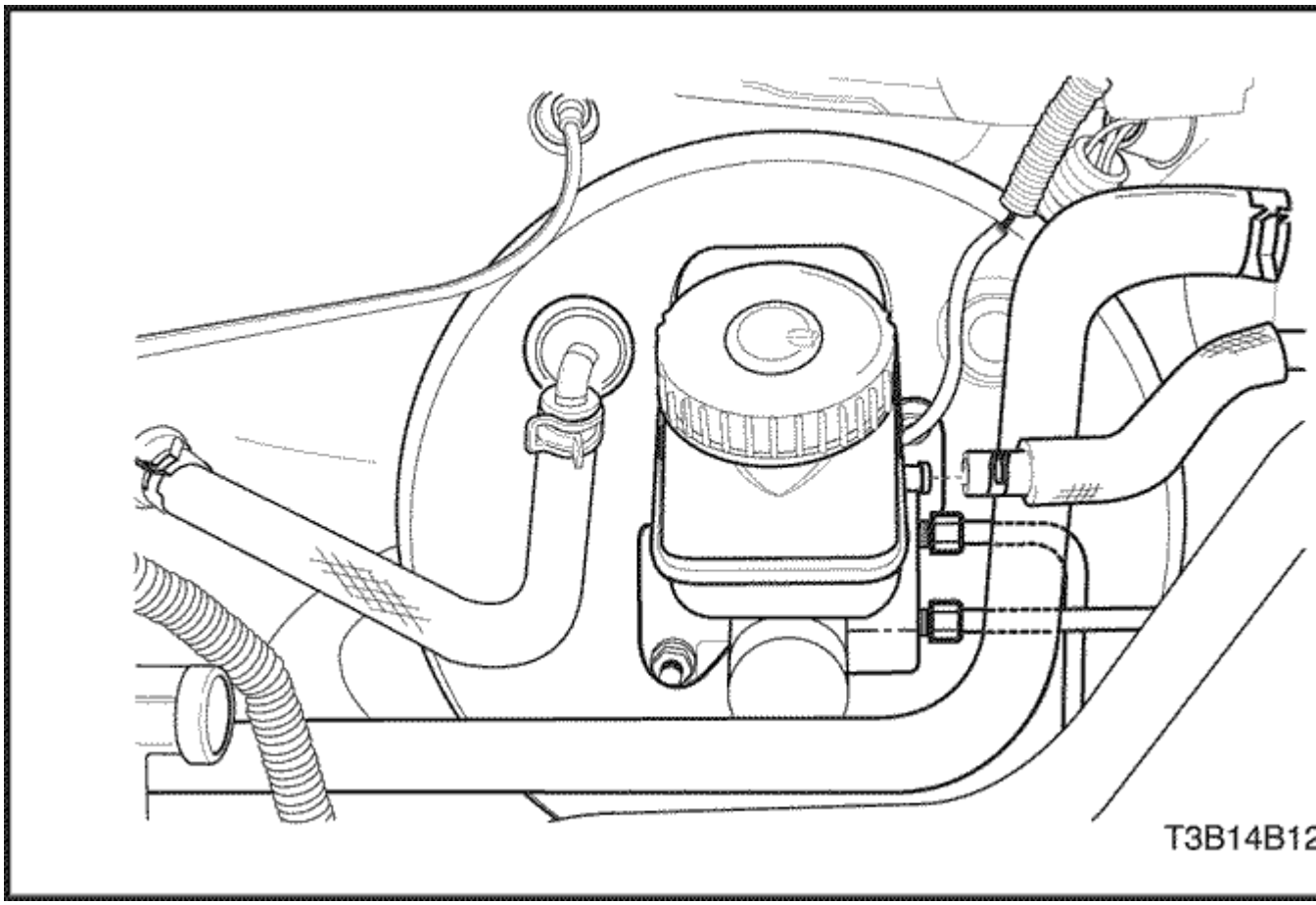


Installation Procedure

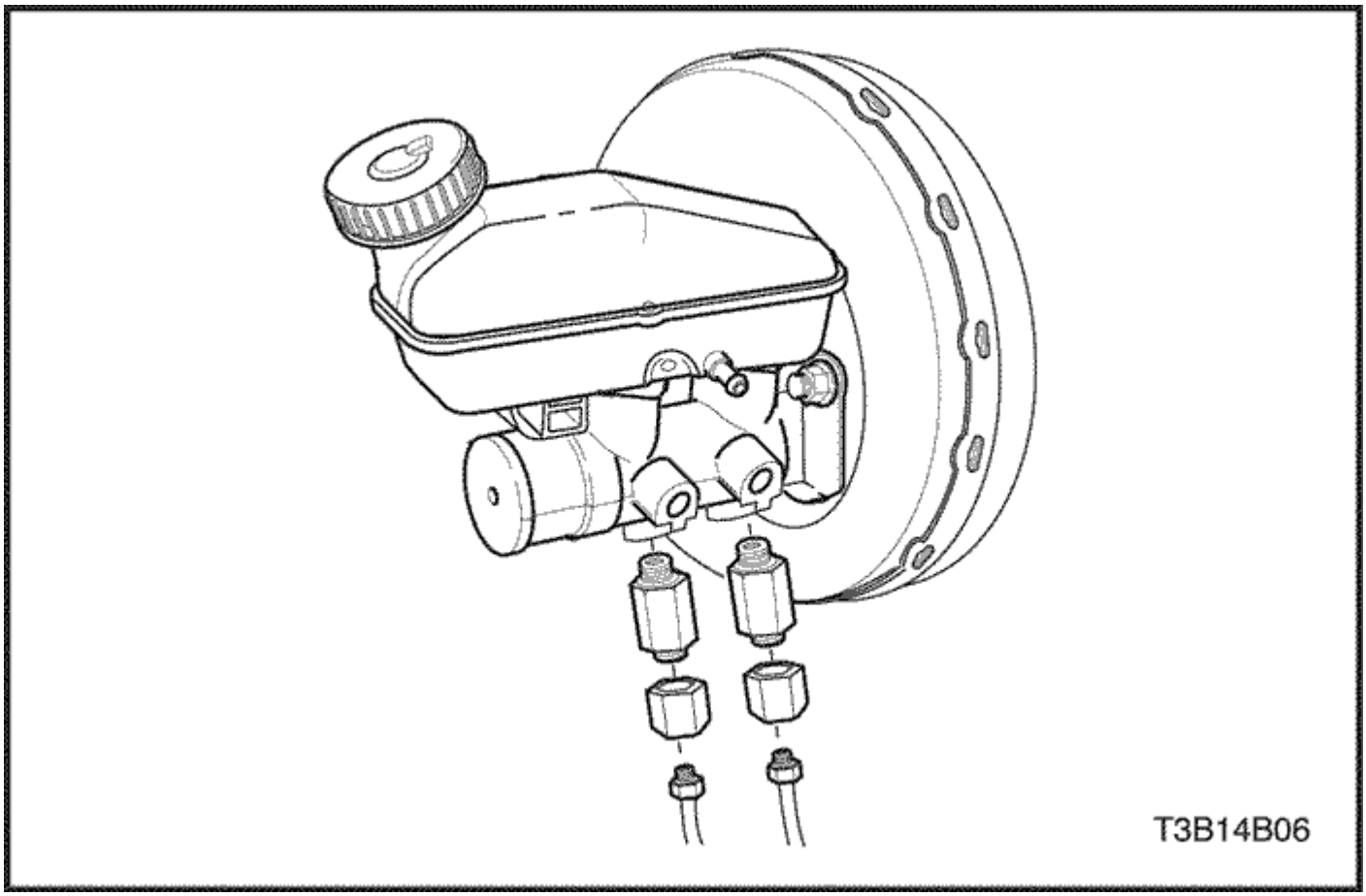
1. Lubricate the new seals with clean brake fluid. Install the seals into the cylinder body.
2. Install the reservoir on the master cylinder body. (The ABS system is shown.)



3. For vehicles with the manual transaxle, connect the clip to the clutch hose connection at the master cylinder.



4. Add brake fluid.
5. Raise and suitably support the vehicle.
6. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brake System.*Bleed the clutch master cylinder. Refer to *Section 5C, Clutch.*
7. Lower the vehicle.
8. Connect the reservoir electrical connector.



Prorortilning Valve
Removal Procedure

1. Disconnect the brake lines from the proportioning valves.
2. Remove the valves from the master cylinder body.

Installation Procedure

Important : Since these valves are adjusted in pairs to the correct control range, they must be replaced in pairs.

1. Install the proportioning valves to the cylinder body.

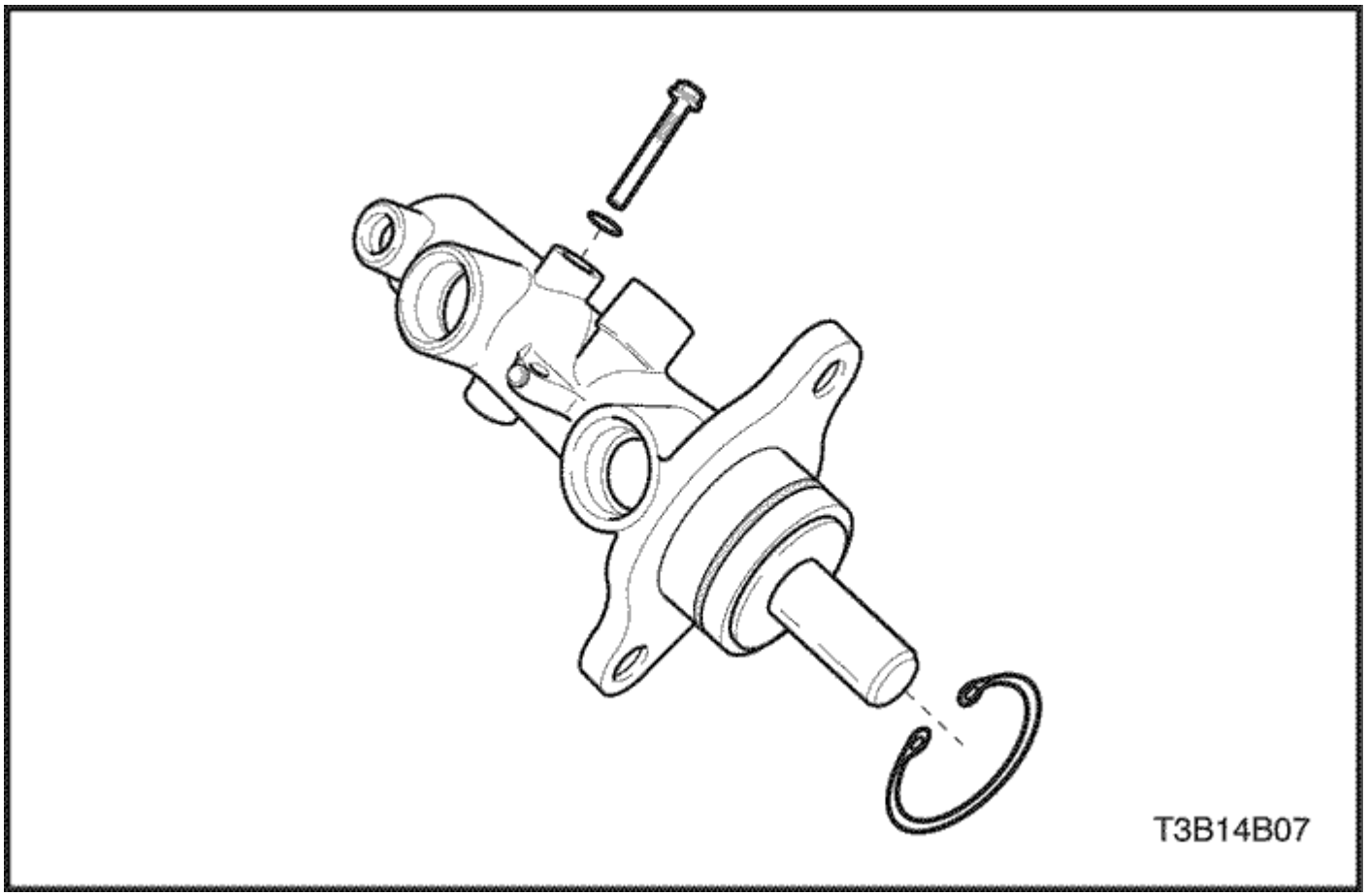
   Tighten
   Tighten the proportioning valves to 40 N•m (30 lb-ft).

2. Connect the brake lines to the valves.

Tighten
Tighten the brake lines to 16 N•m (12 lb-ft).

3. Raise and suitably support the vehicle.
4. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brake System.*
5. Lower the vehicle.

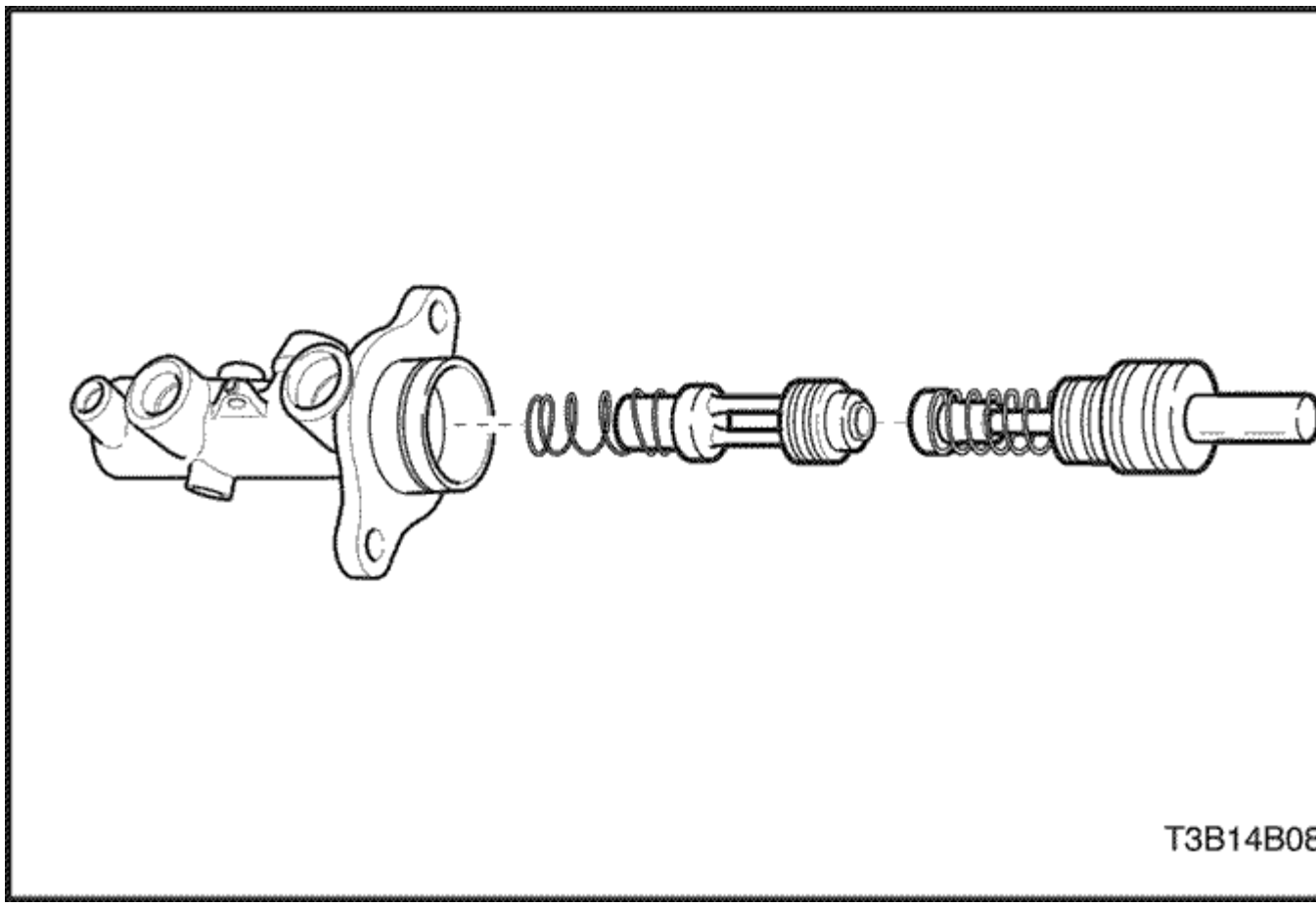
UNIT REPAIR



Master Cylinder Overhaul
Disassembly Procedure

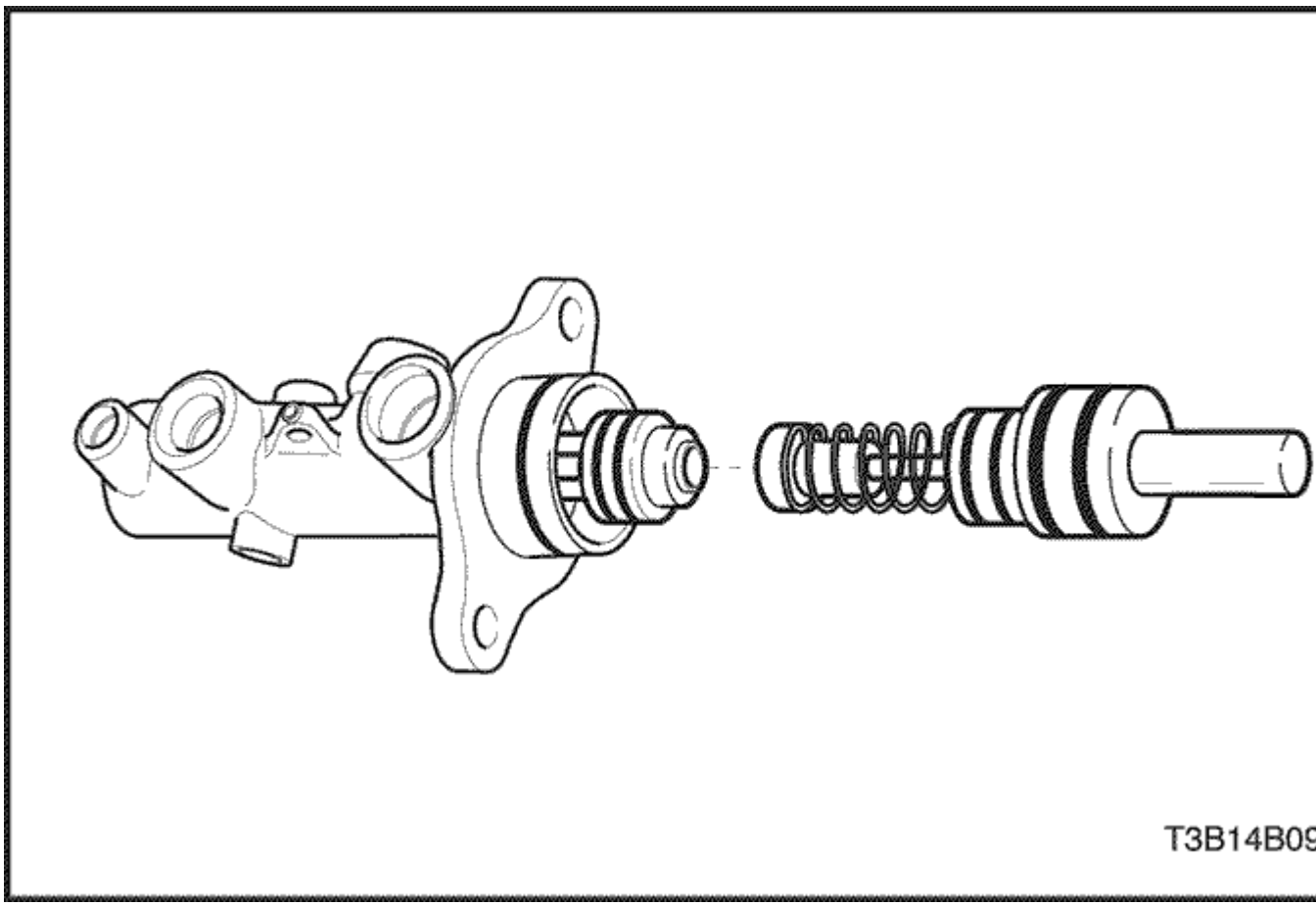
1. Remove the master cylinder. Refer to "Master Cylinder Assembly" in this section.
2. Remove the brake fluid reservoir. Refer to "Brake Fluid Reservoir" in this section.
3. Remove the seal ring from the cylinder bore.

   Notice : When removing the retaining ring, avoid damaging the piston or the cylinder wall.

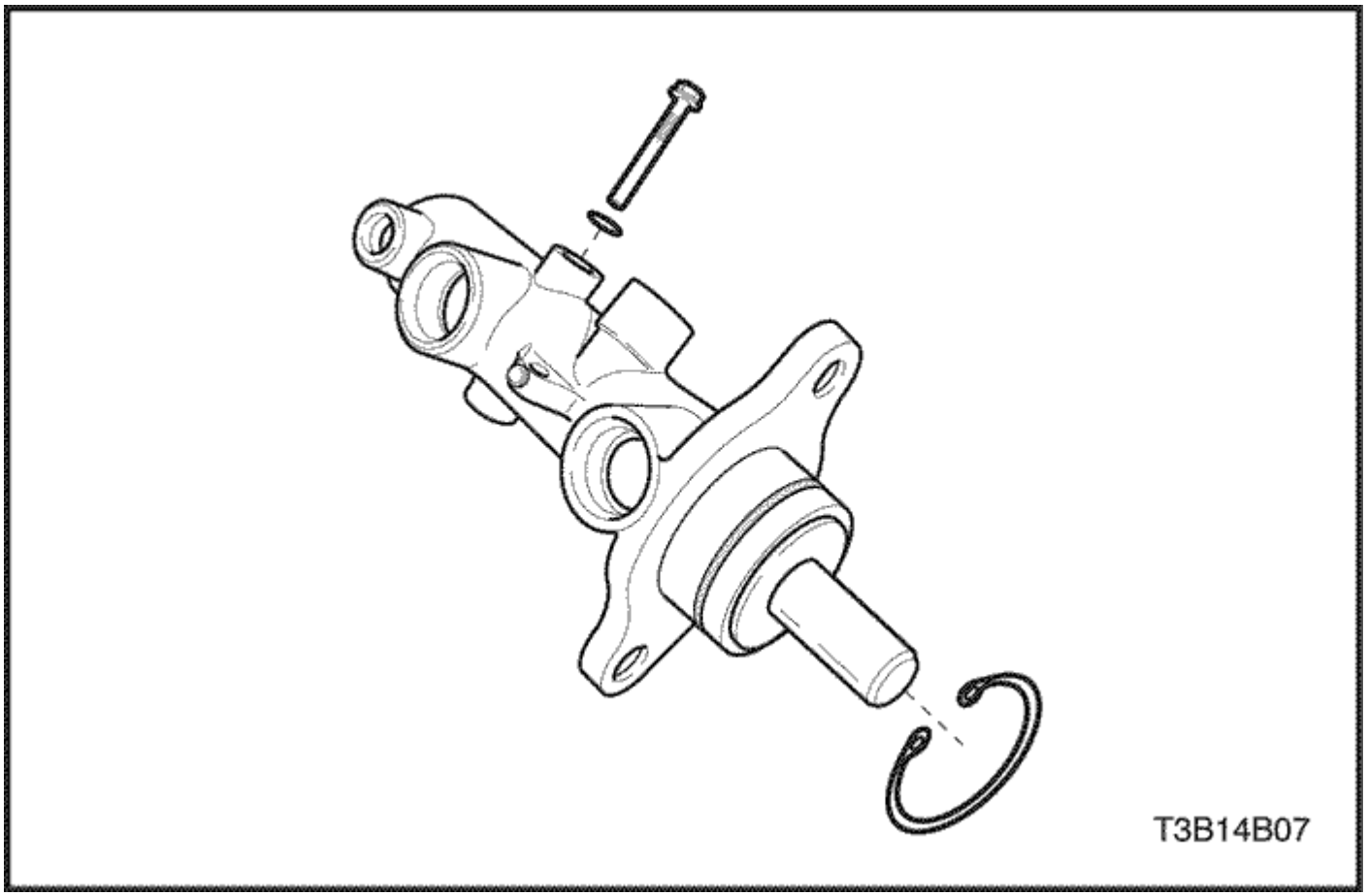


   Important : A welding rod or its equivalent can be used in a compensating port to keep the piston pressed down.

4. Remove and discard the retaining ring from the cylinder body using a suitable screwdriver. (The non-ABS master cylinder body is shown.)



5. Remove the primary piston. (The ABS master cylinder body is shown.)
6. Carefully remove the secondary piston assembly and the spring from the master cylinder bore.

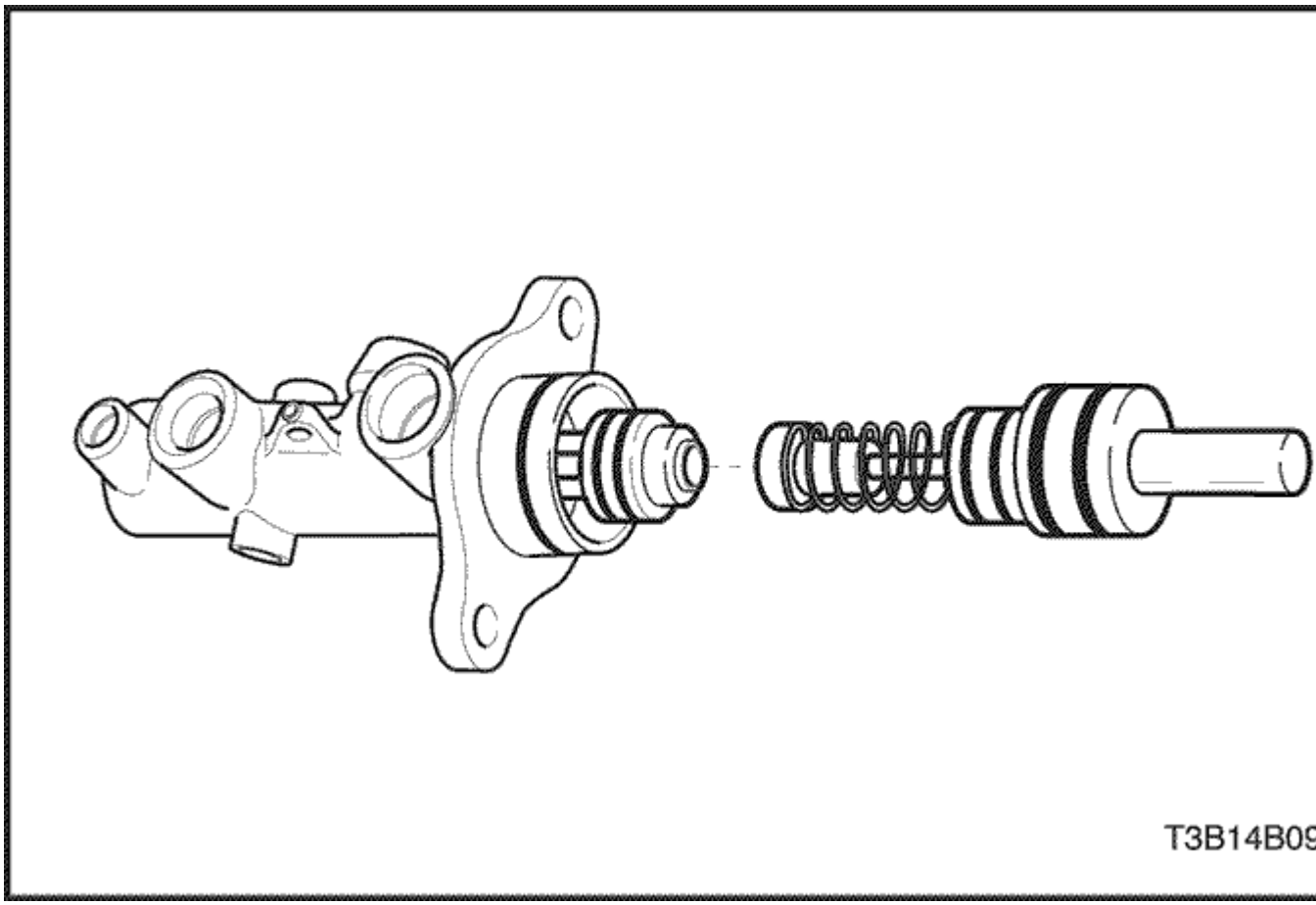


Assembly Procedure

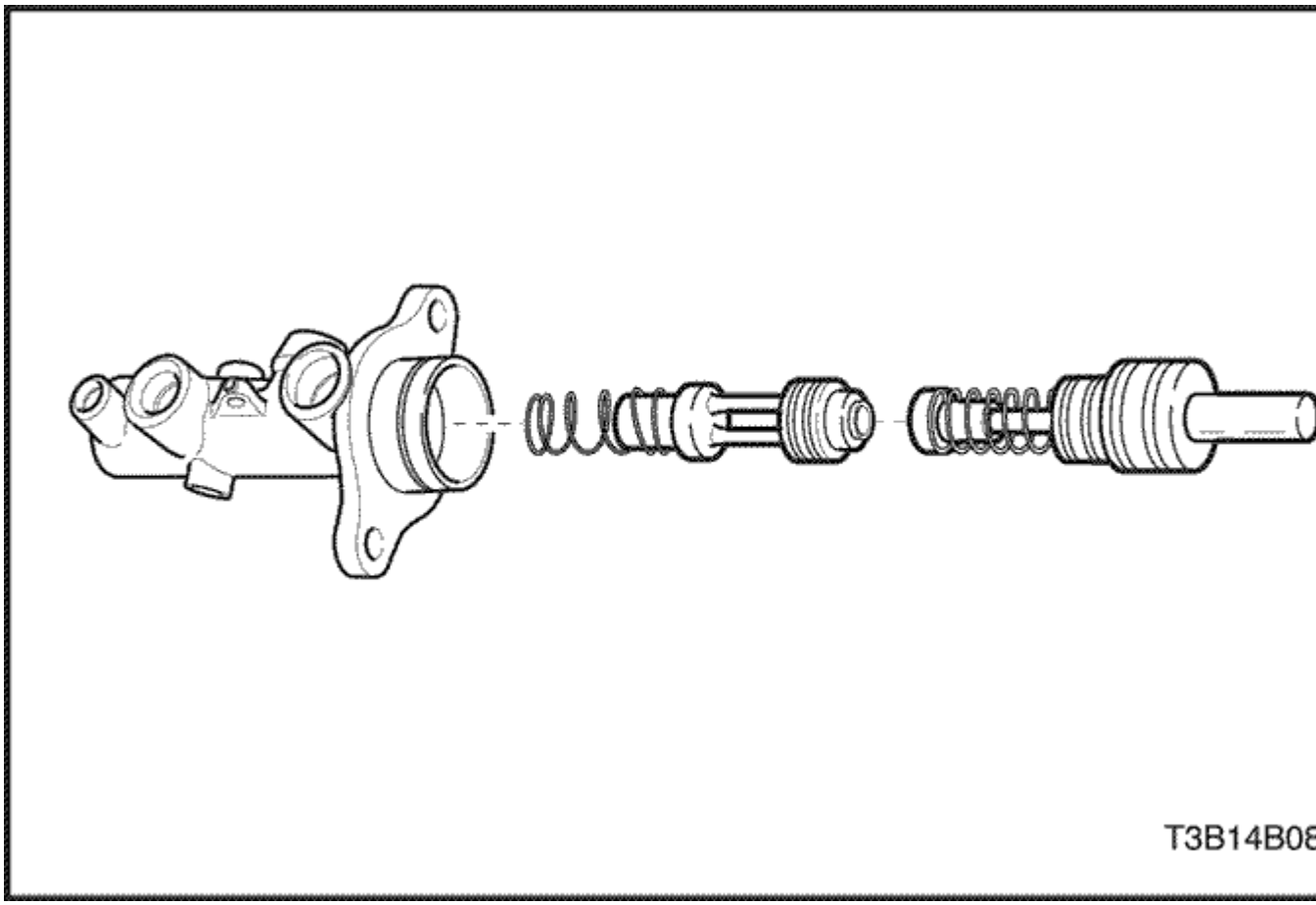
Notice : Do not use abrasives in the master cylinder bore. Abrasives can damage the bore.

Important : Rubber parts and retaining rings must be discarded and replaced with new parts

1. Clean all parts with denatured alcohol or clean brake fluid. Dry the parts with compressed air.
2. Inspect the master cylinder bore for scoring or corrosion. If scoring or corrosion is evident, replace the master cylinder body.
3. Lubricate the master cylinder bore with clean brake fluid. (The non-ABS master cylinder is shown.)



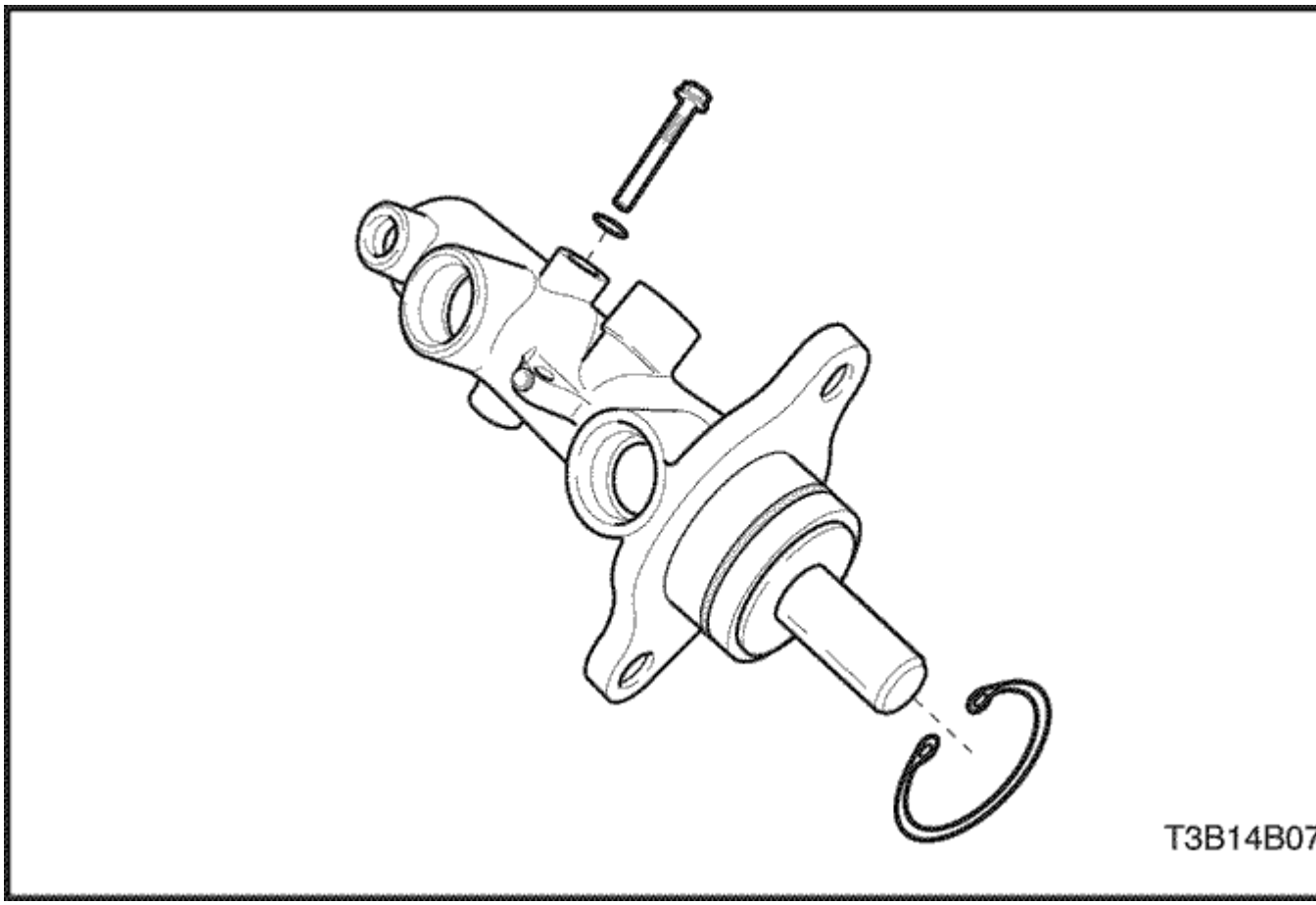
4. Carefully insert the secondary piston assembly bore until the secondary piston contacts the base of the cylinder body. Use a wood or a plastic drift, if necessary.
5. Insert the primary piston.



6. Press the pistons into the cylinder bore using a wooden or a plastic drift.

   Notice : When installing the new retaining ring, take care not to damage the cylinder bore.

7. Insert the new retaining ring into the groove in the cylinder bore. (The non-ABS cylinder body is shown.) Remove the welding rod.
8. Move the pistons backward and forward after installation to check for free movement.



9. Lubricate the seal ring and insert the seal on the shaft into the cylinder bore. The open side must face outward until the seal rests on the piston.
10. Install the brake fluid reservoir to the master cylinder. Refer to "Brake Fluid Reservoir" in this section.
11. Install the master cylinder assembly. Refer to Master Cylinder Assembly in this section
12. Raise and suitably support the vehicle.
13. Bleed the braking system. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brake System.*
14. Lower the vehicle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Master Cylinder

The master cylinder is designed for use in a diagonalsplit system. One front and one diagonally opposite rear brake are served by the primary piston. The

opposite front and rear brakes are served by the secondary piston. The master cylinder incorporates the functions of the standard dual master cylinder, plus a low fluid level indicator and the proportioning valves in the non-antilock braking system. The proportioning valves limit the outlet pressure to the rear brakes after a predetermined master cylinder pressure has been reached.

Notice : Do not use lubricated shop air on brake parts, as this may damage rubber components.

Important :

- **Replace all the components included in the repair kits used to service this master cylinder.**
- **Lubricate rubber parts with clean brake fluid to ease assembly.**
- **if any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.**
- **The torque values specified are for dry, unlubricated fasteners.**
- **Perform all service operations on a clean bench, free from all traces of mineral oil.**

Proportioning Valves

The proportioning valves limit the outlet pressure to the rear brakes on the non-antilock braking system after a predetermined master cylinder pressure has been reached. This is used when less rear apply force is needed to obtain optimum braking and is usually found on disc/drum brake configurations. On ABS-equipped vehicles, refer to Section 4F, Antilock Brake System.

Fluid Level Sensor

The master cylinder is equipped with a fluid level sensor. This sensor will activate the BRAKE light if a low fluid level condition is detected. Once the fluid level is corrected, the BRAKE light will go out.

SECTION 4C

POWER BOOSTER

SPECIFICATIONS

Fasrener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Booster and Support Bracket-to-Dash Panel Nuts	24	18	-
Booster Pushrod Hex Nut	16	12	-
Booster-to-Support Bracket Nuts	12	9	-
Master Cylinder Attaching Nuts	24	18	-

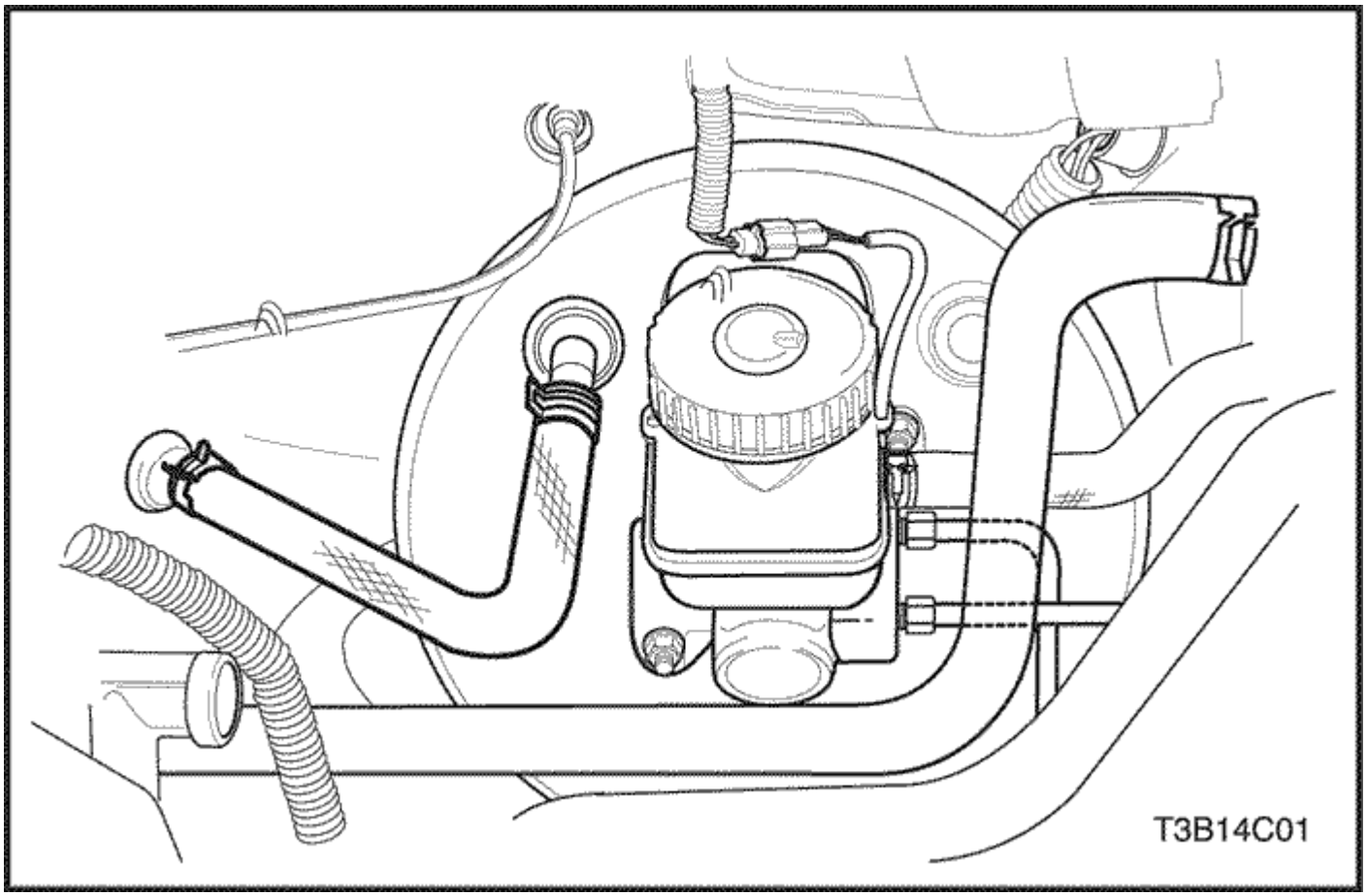
DIAGNOSIS

Power Booster Functional Check

1. With the engine stopped, eliminate the vacuum in the booster by pumping the brake pedal several times.
2. Push the pedal down and hold it in this position.
3. Start the engine.
4. The booster is OK if the pedal drops further because of extra force produced.
5. If the brake pedal does not drop, the vacuum system (vacuum hoses, check valve, etc.) is probably defective and should be checked.
6. If no defect is revealed by checking the vacuum system, the defect is in the booster itself.

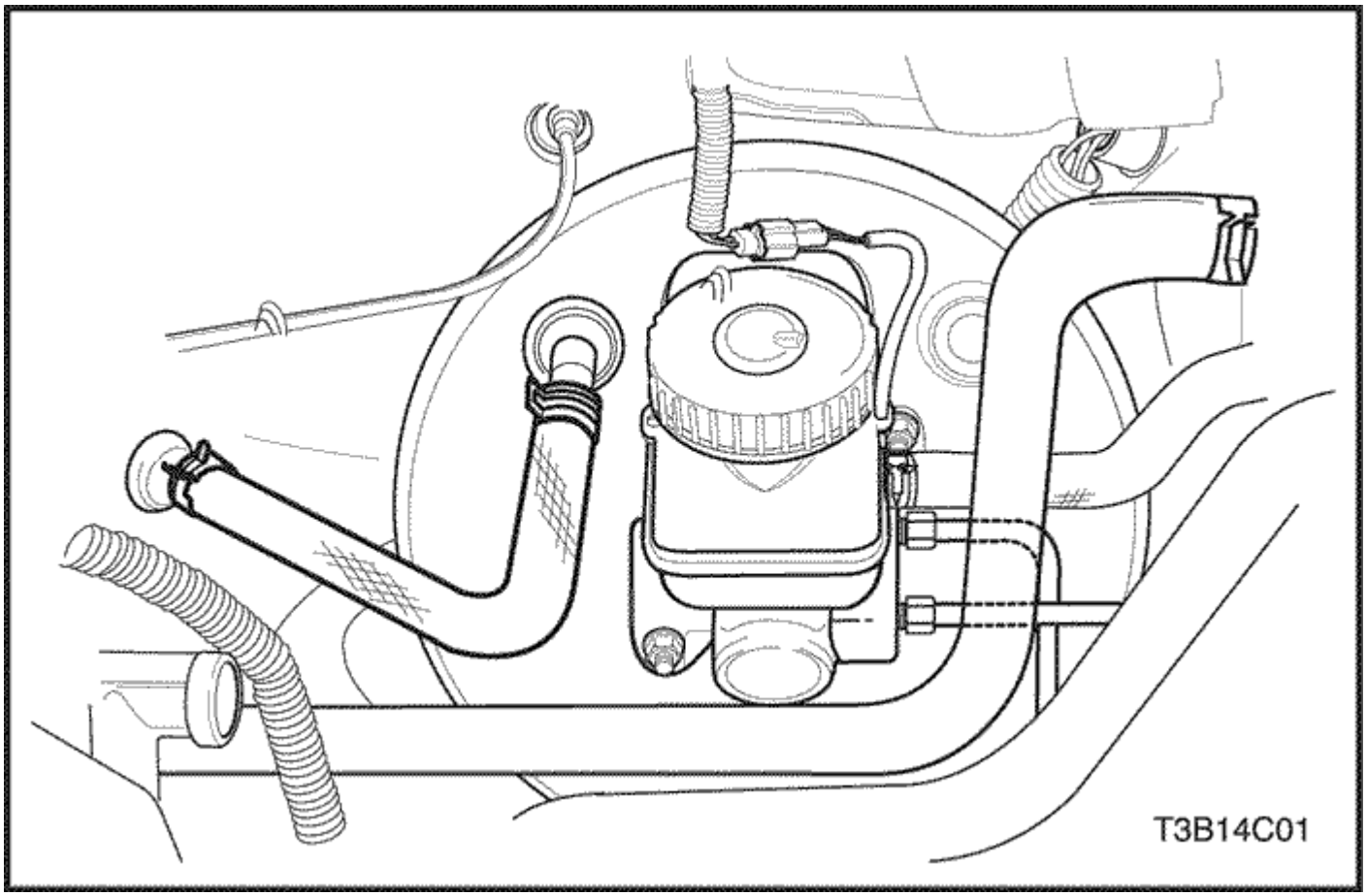
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



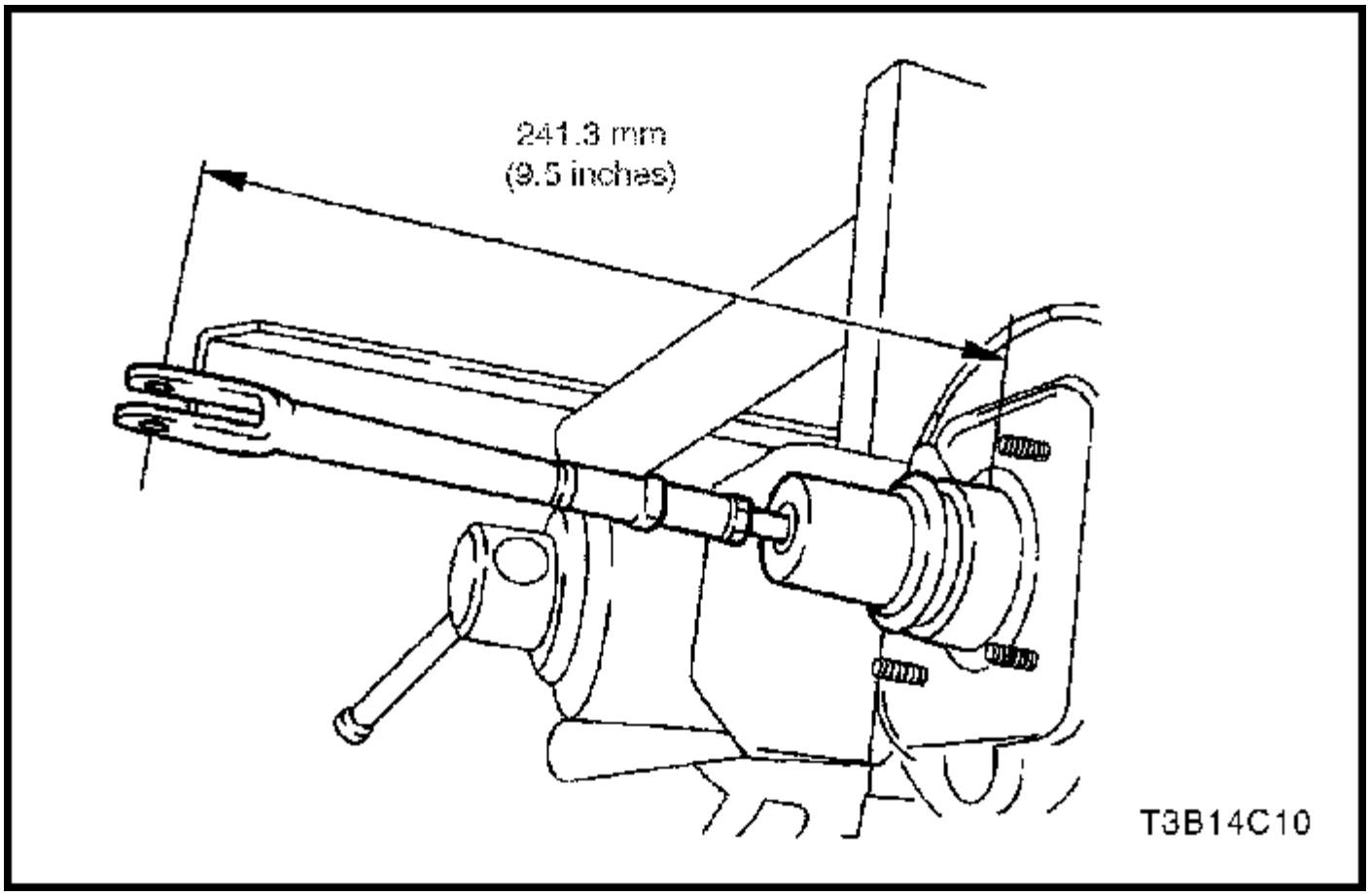
Vacuum Hose
Removal Procedure

1. For vehicles with a DOHC engine, remove the clip on the vacuum hose connection at the intake manifold.
2. Pull the hose from the union nut connection. If the hose does not remove easily or is deteriorated, pry off and discard the hose.
3. For vehicles with a SOHC engine, similarly remove the clip on the vacuum hose nut connection to the intake manifold.
4. Pull the hose from the union nut connection. If the hose can not be removed easily or is deteriorated, pry off and discard the hose.
5. Remove the clip on the vacuum hose connection to the brake booster.
6. Remove the vacuum hose.



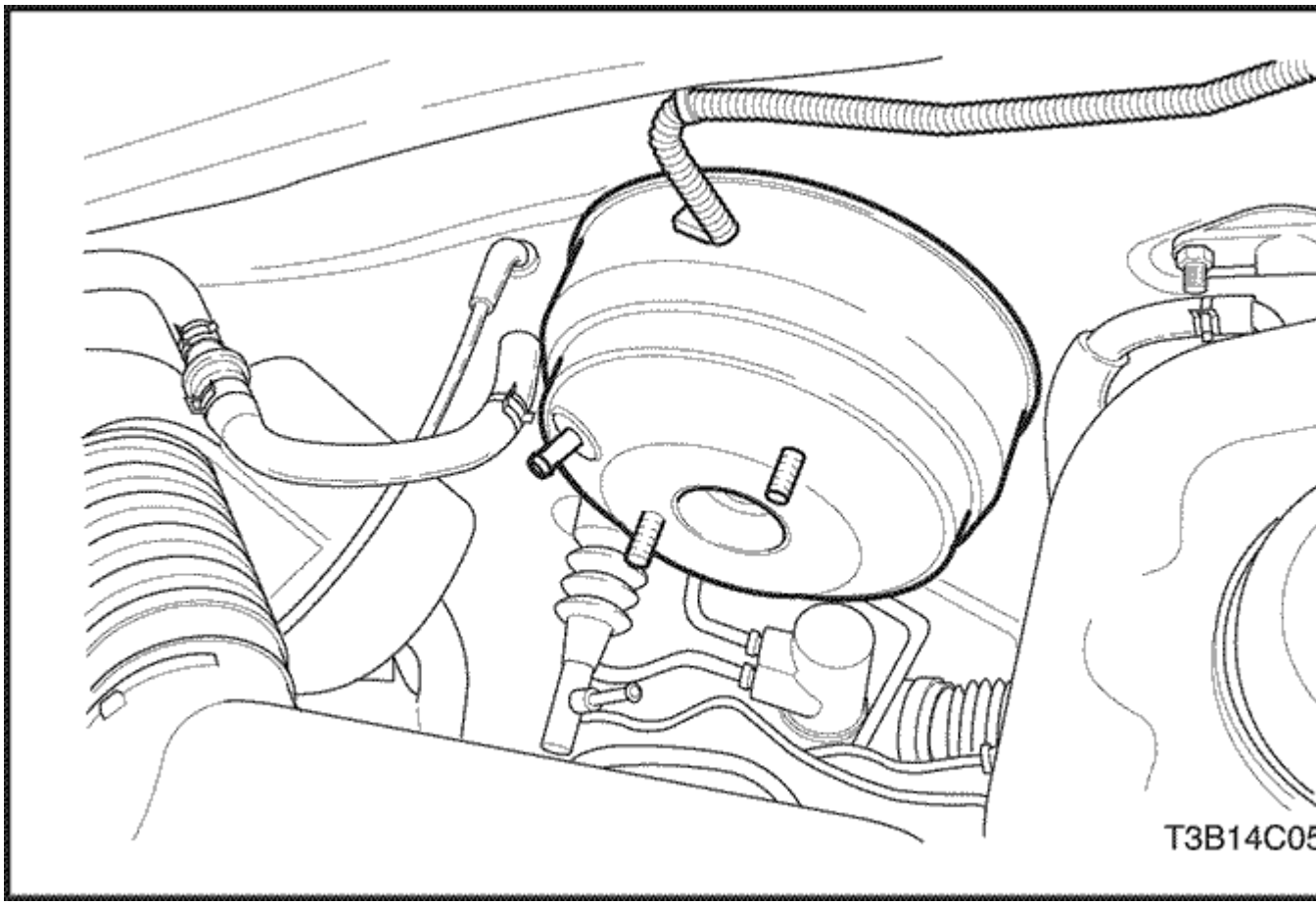
Installation Procedure

1. Mount the vacuum hose (DOHC engine connection shown), and make sure the connections are tight on each end.
2. Install the vacuum hose clips.
3. Check the function of the booster. Refer to the "Power Booster Functional Check" in this section.

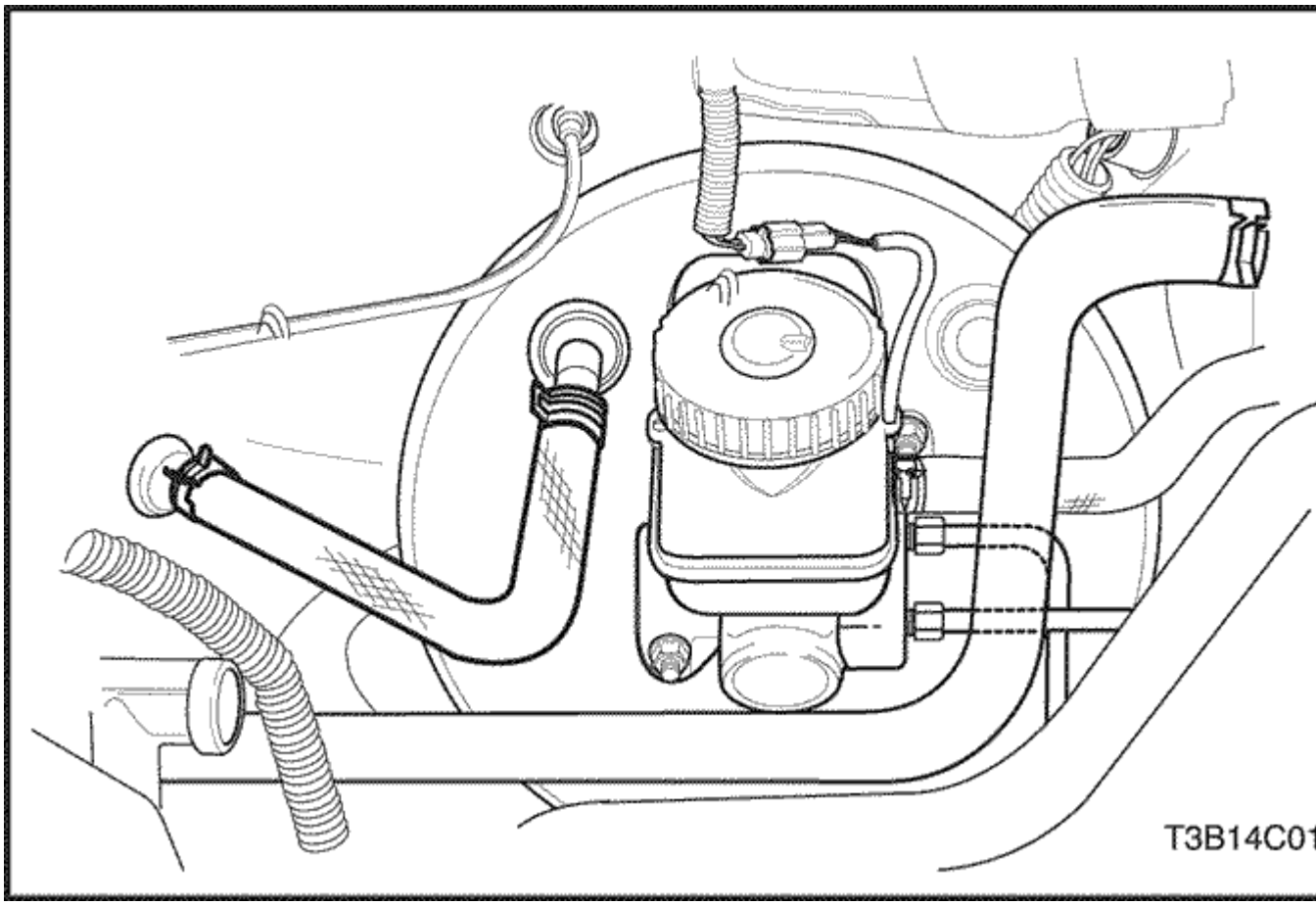


Power Booster Assembly
Removal Procedure

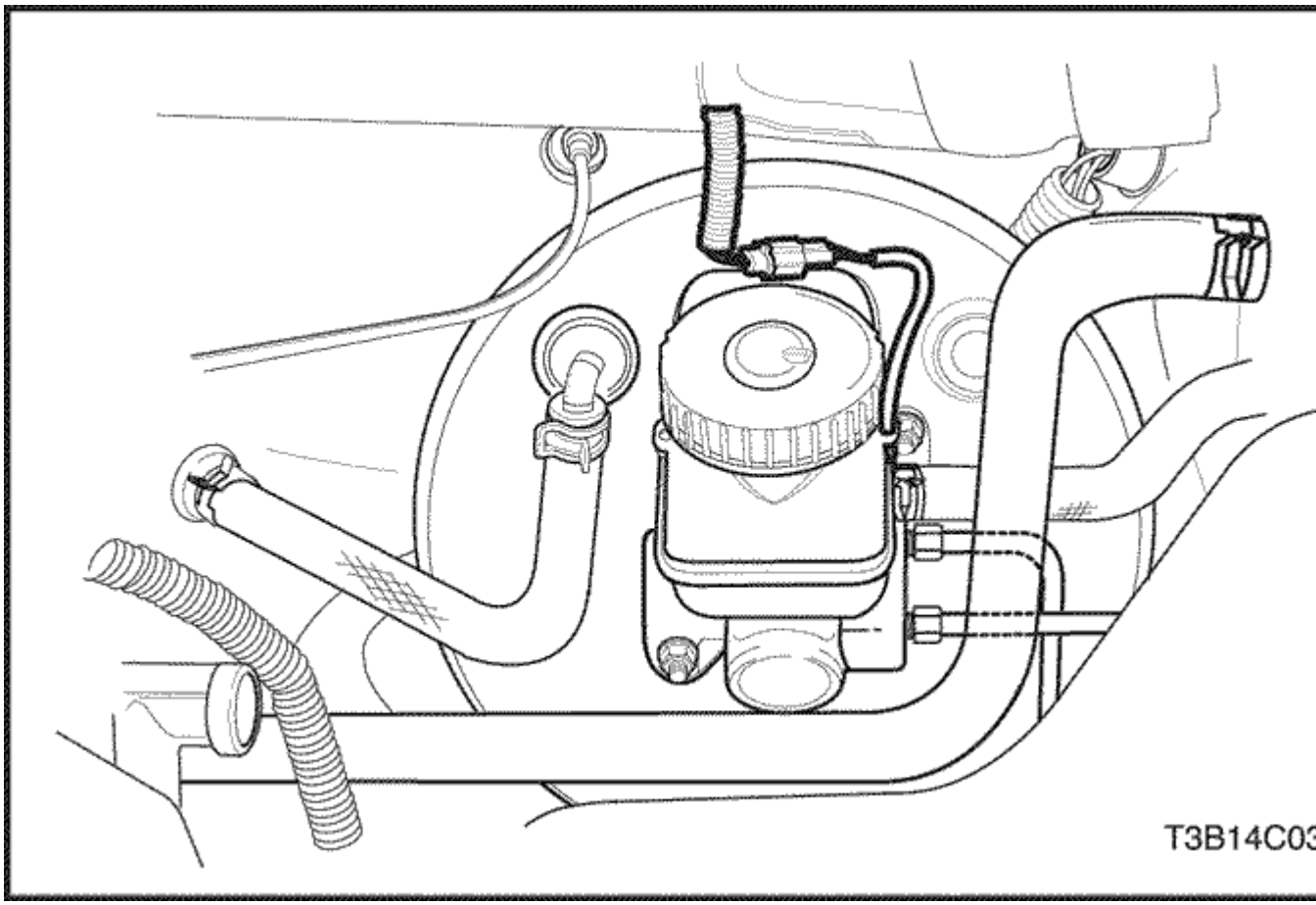
1. Disconnect the electrical connector from the reservoir.



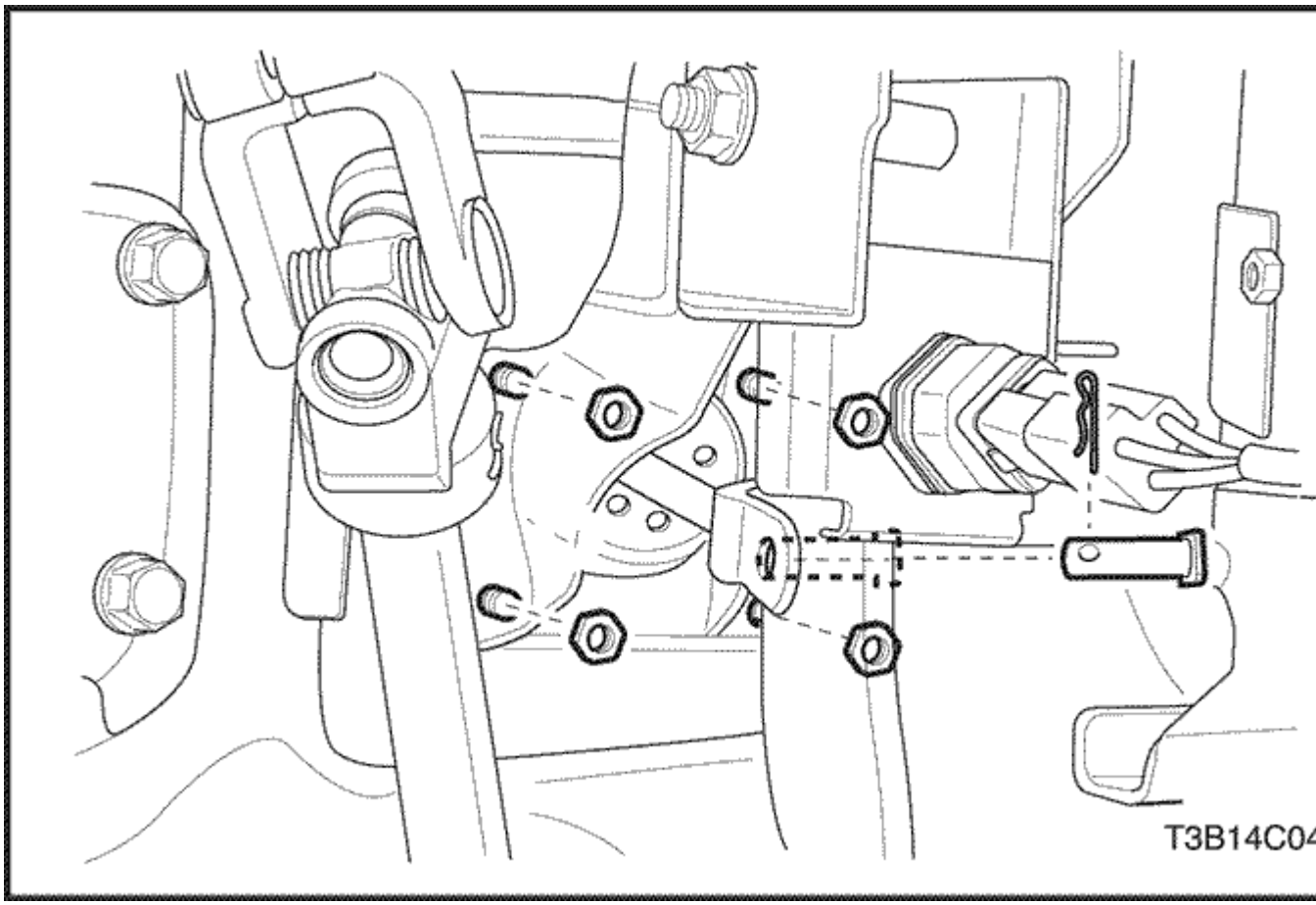
2. For vehicles with a manual transaxle, disconnect the clip on the clutch hose connection to the master cylinder.
3. Plug the clutch hose and the master cylinder so that the fluid does not escape.



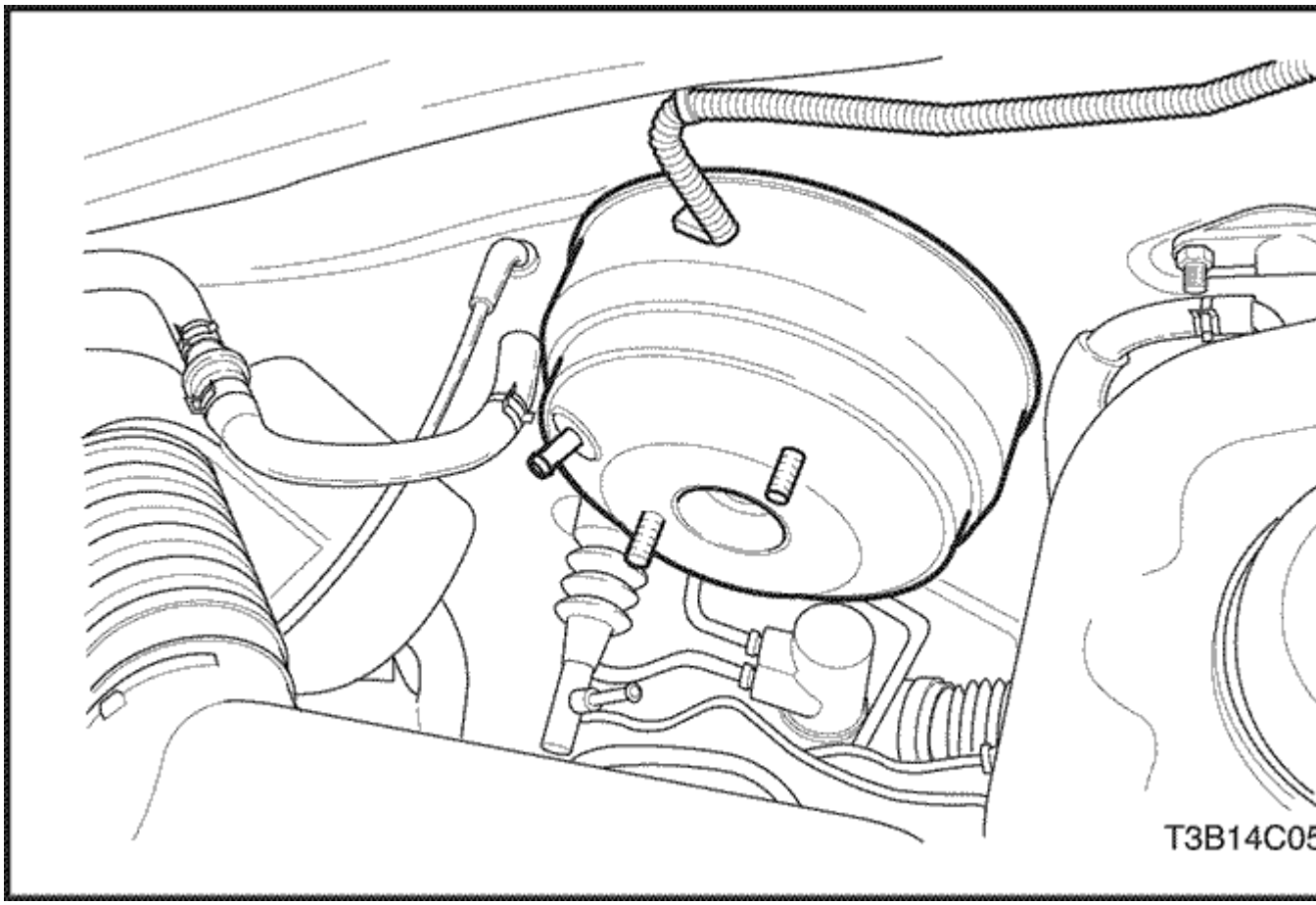
4. Remove the master cylinder attaching nuts.
5. Push the master cylinder forward slightly and move it out of the way. Do not disconnect the brake lines.
6. Remove and discard the booster housing seal.



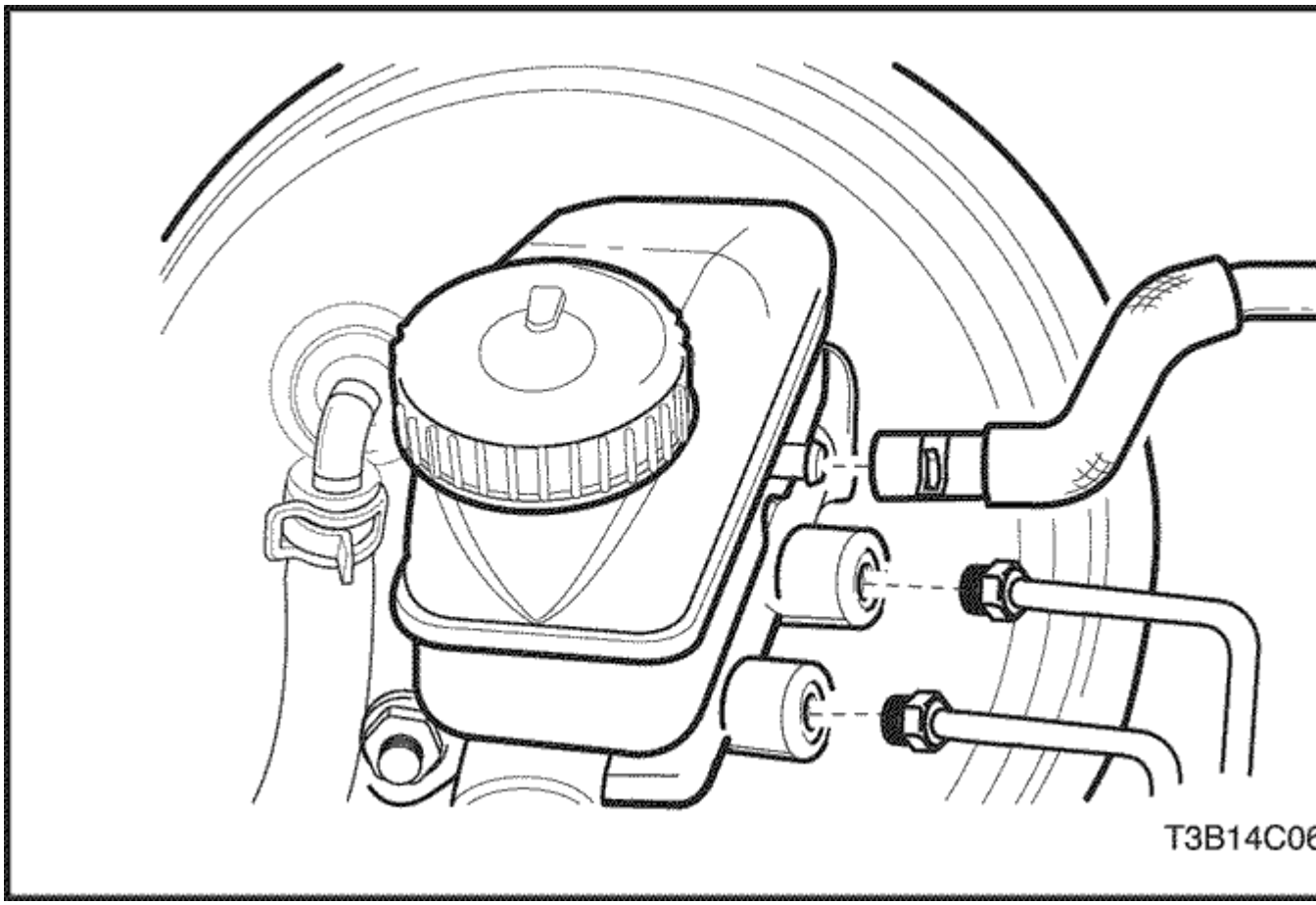
7. Remove the clip on the vacuum hose connection to the booster (DOHC engine connection shown).
8. Disconnect the brake lamp switch.
9. Remove the brake pedal spring.
10. Disconnect the clip and the pushrod pin from the pedal bracket assembly. Refer to *Section 4A, Hydraulic Brakes.*



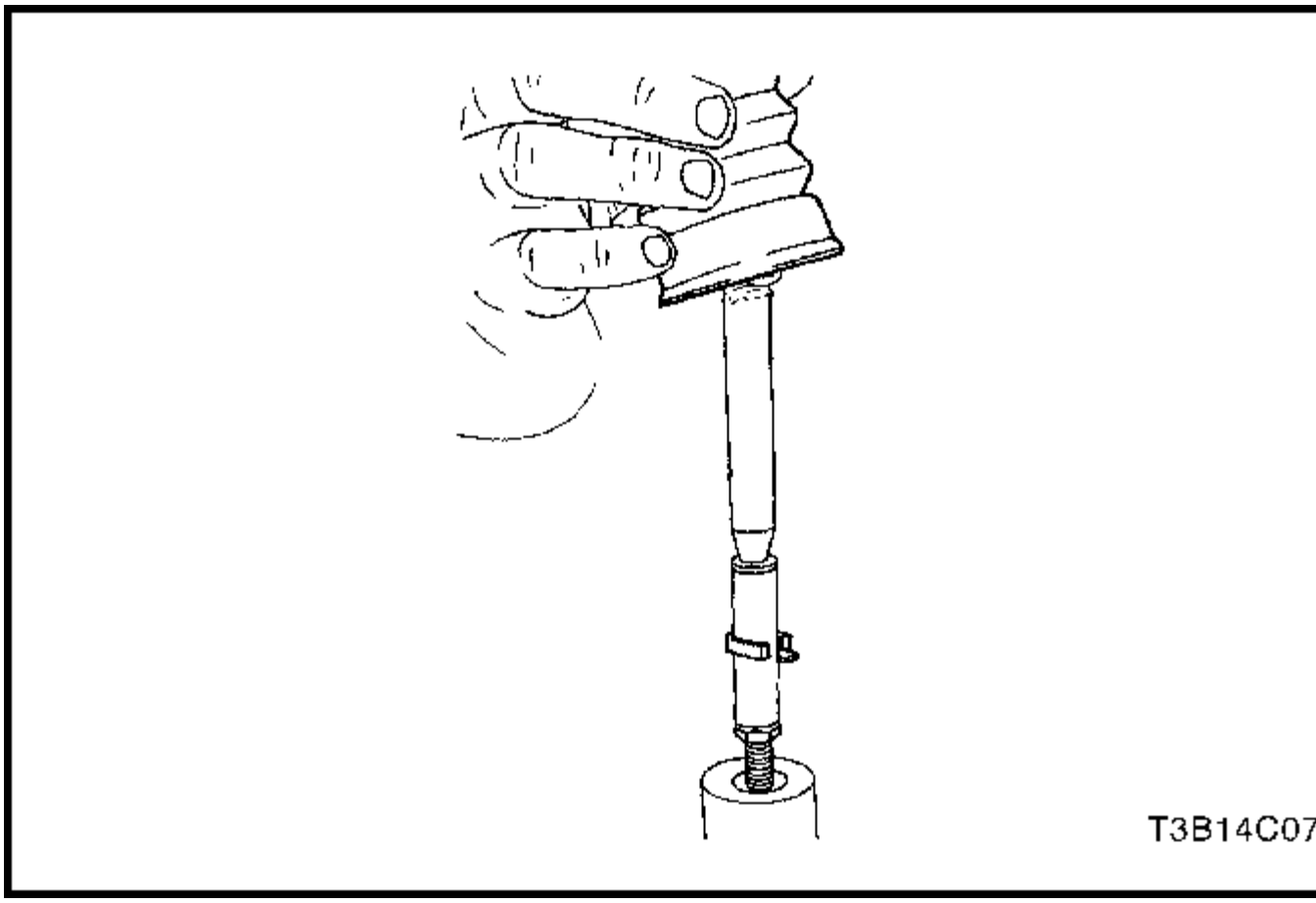
11. Remove the booster and the support bracket-todash panel nuts.



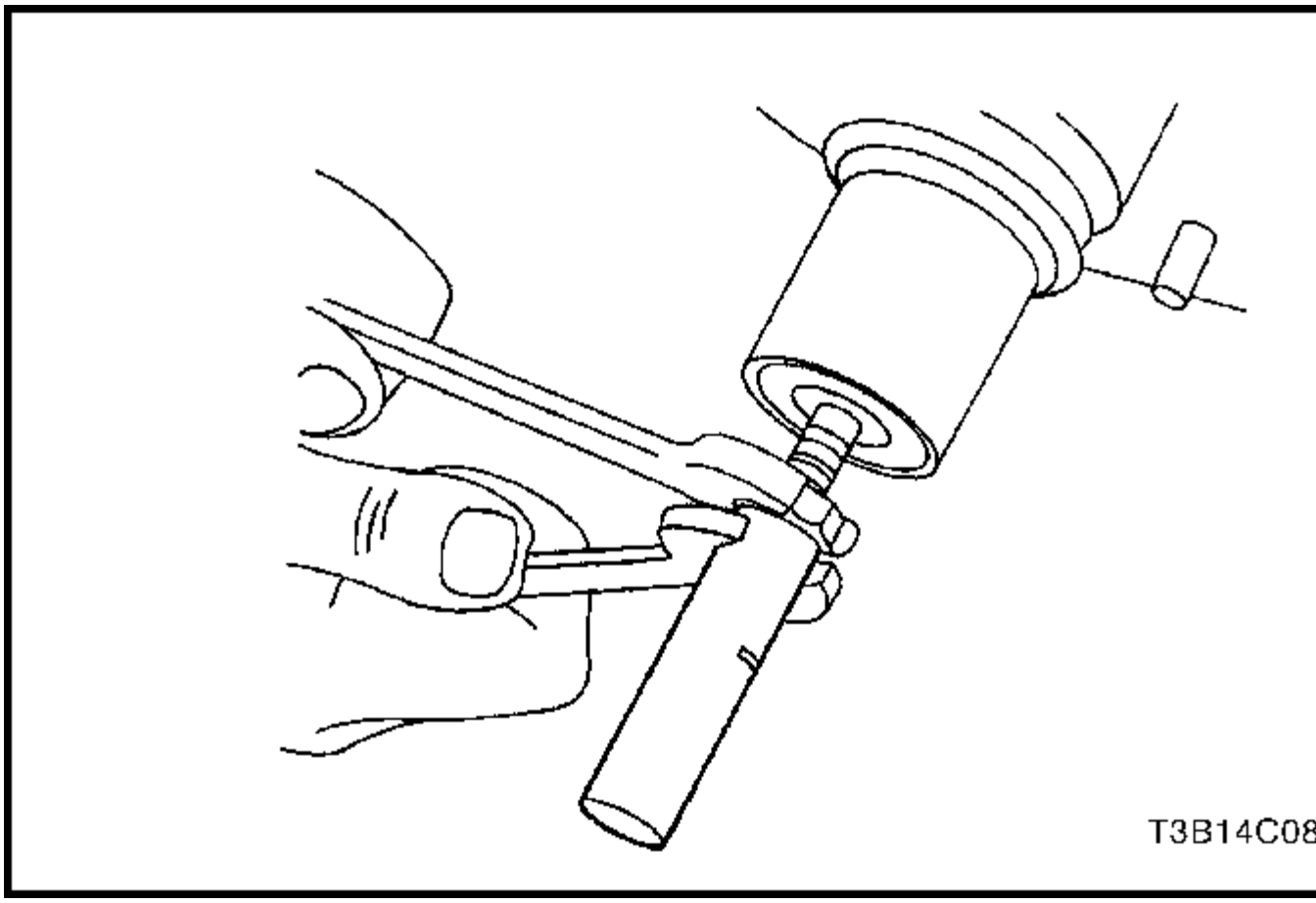
12. Remove the booster and the bracket assembly from the dash panel.



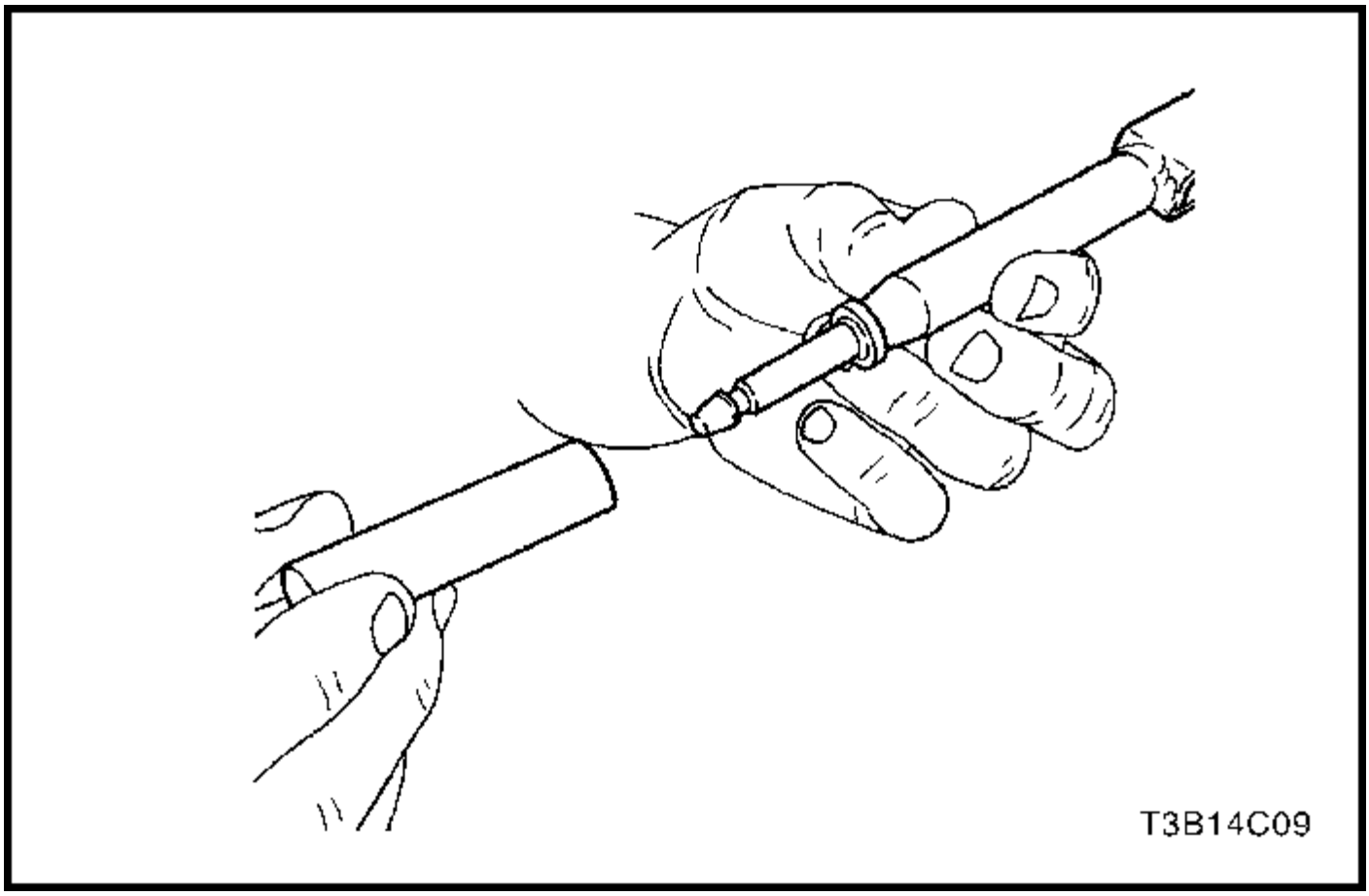
13. Remove the bracket nuts from the booster and remove the booster.



14. Remove the rubber boot and the retainer.

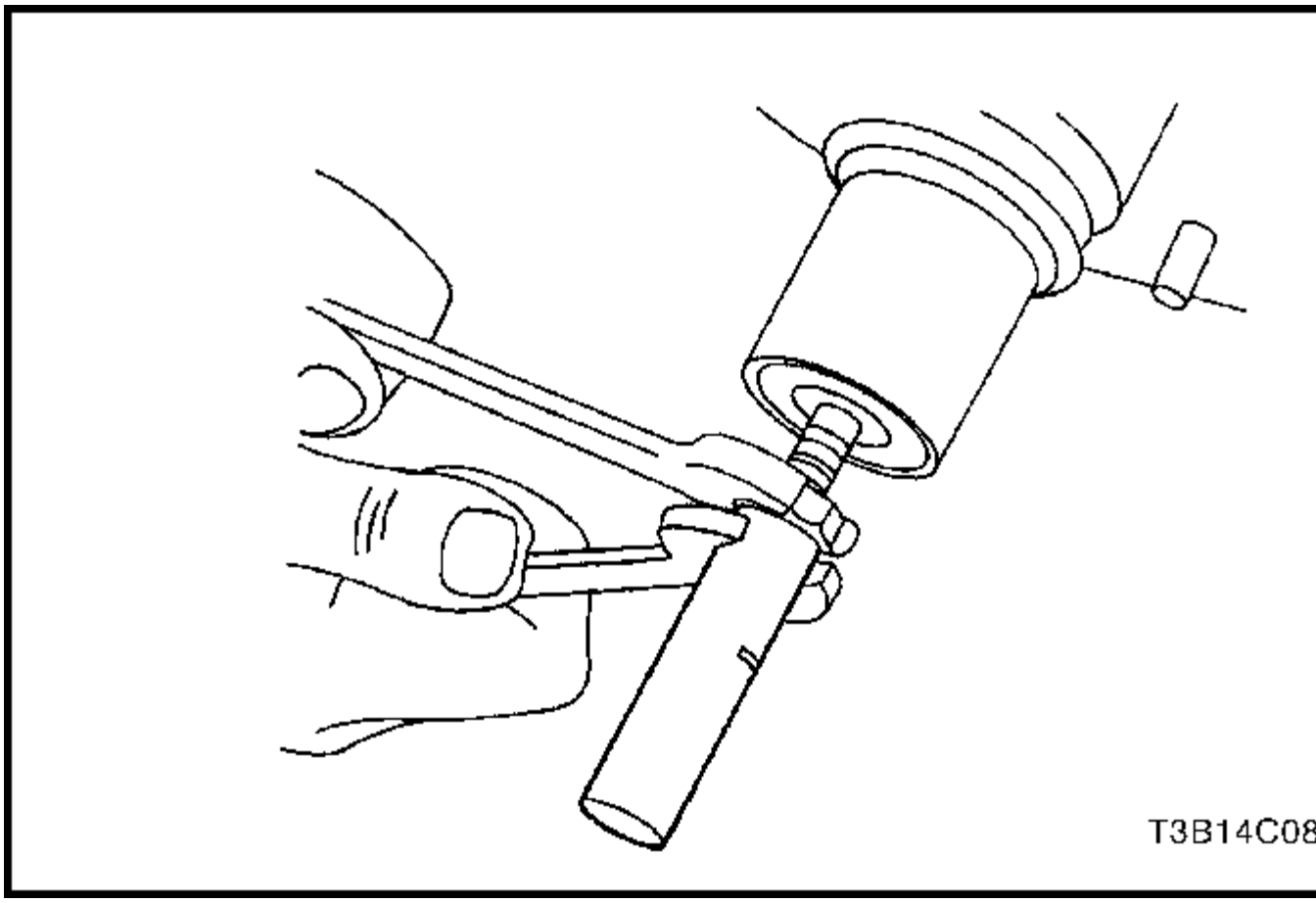


15. Remove the pushrod.
16. Remove the adjustment sleeve from the pushrod.
17. Remove the hex nut.



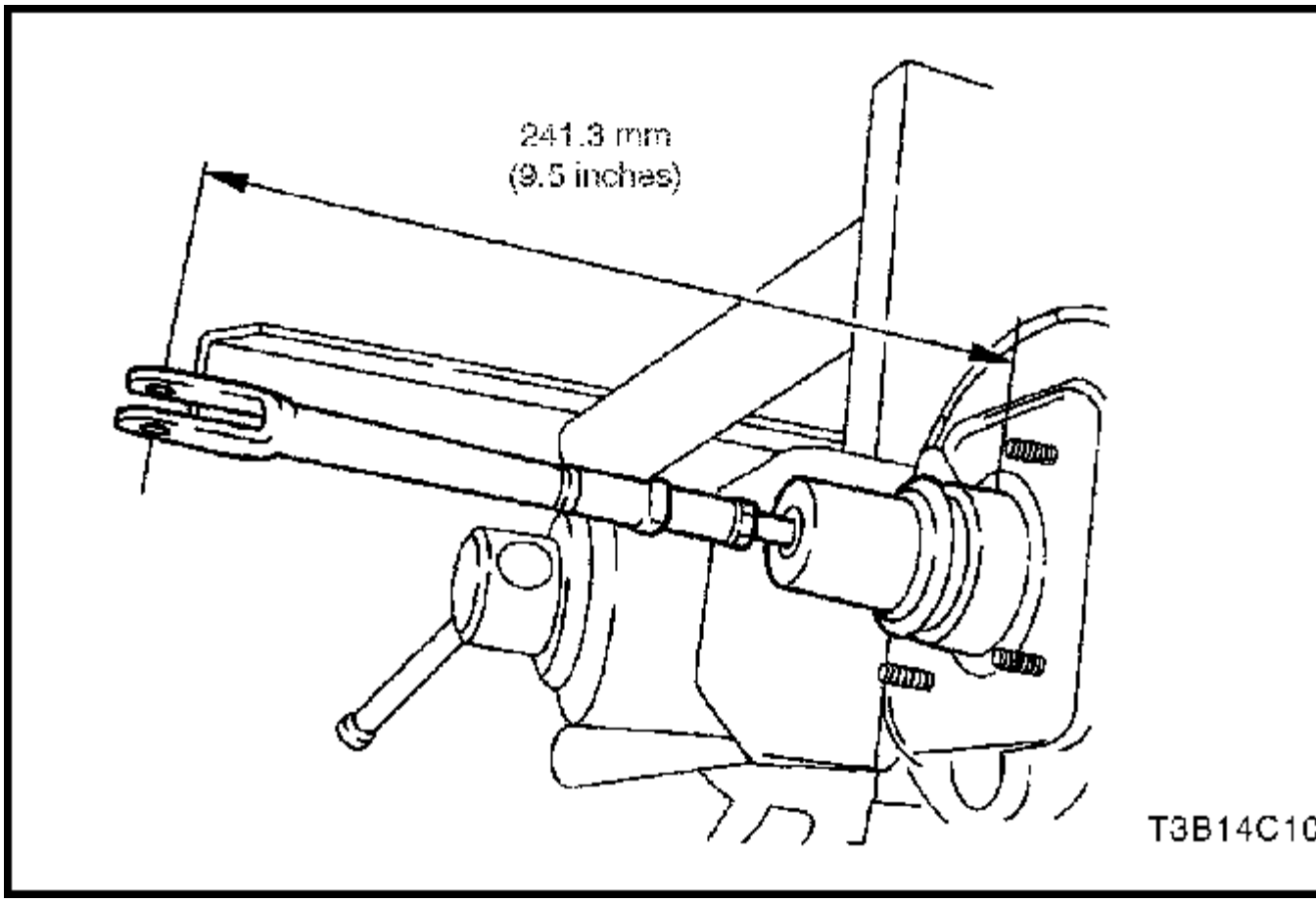
Installation Procedure

1. Check the pushrod and the adjustment sleeve for damage and proper fit.

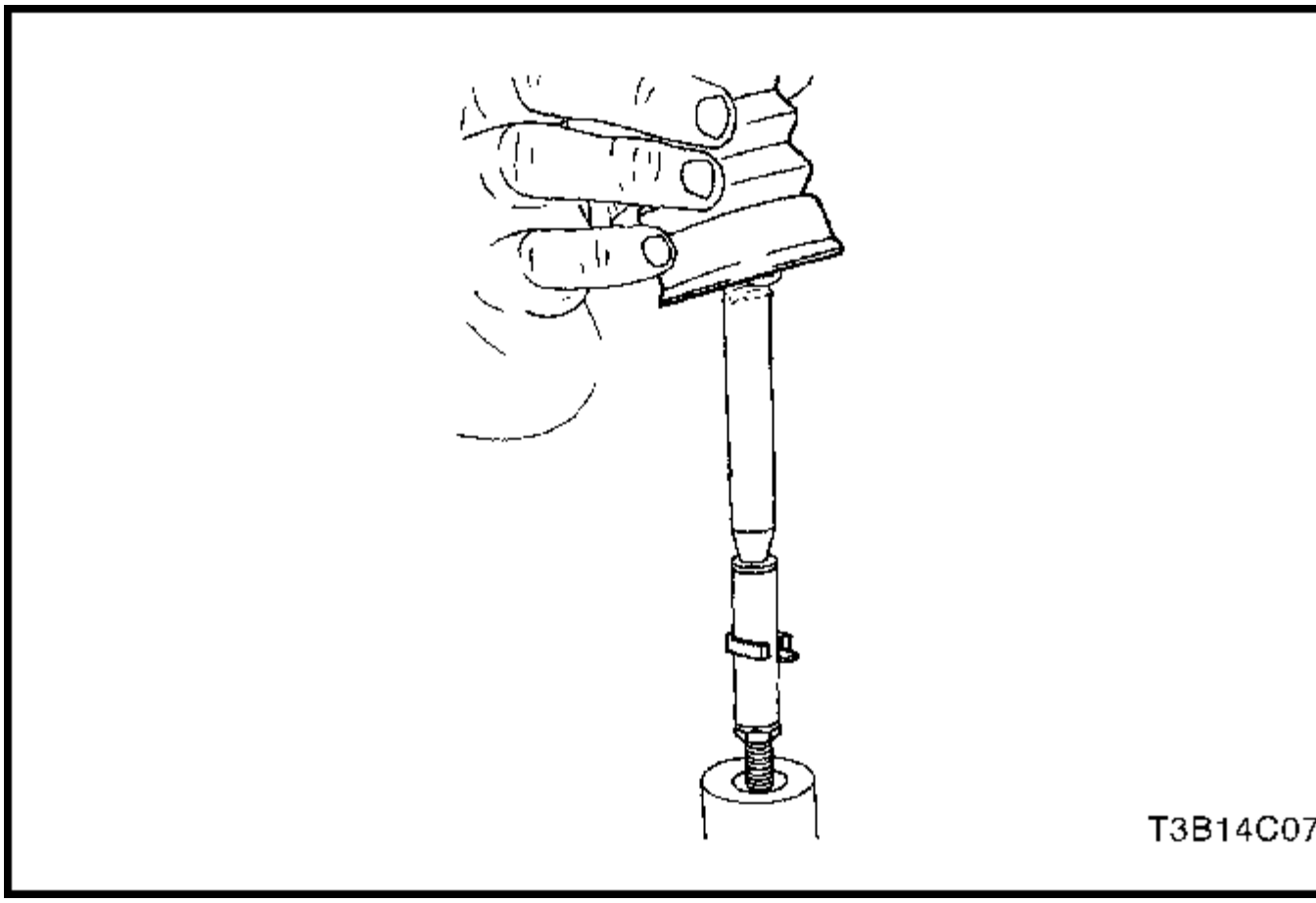


2. Install the hex nut and the adjustment sleeve on the booster.

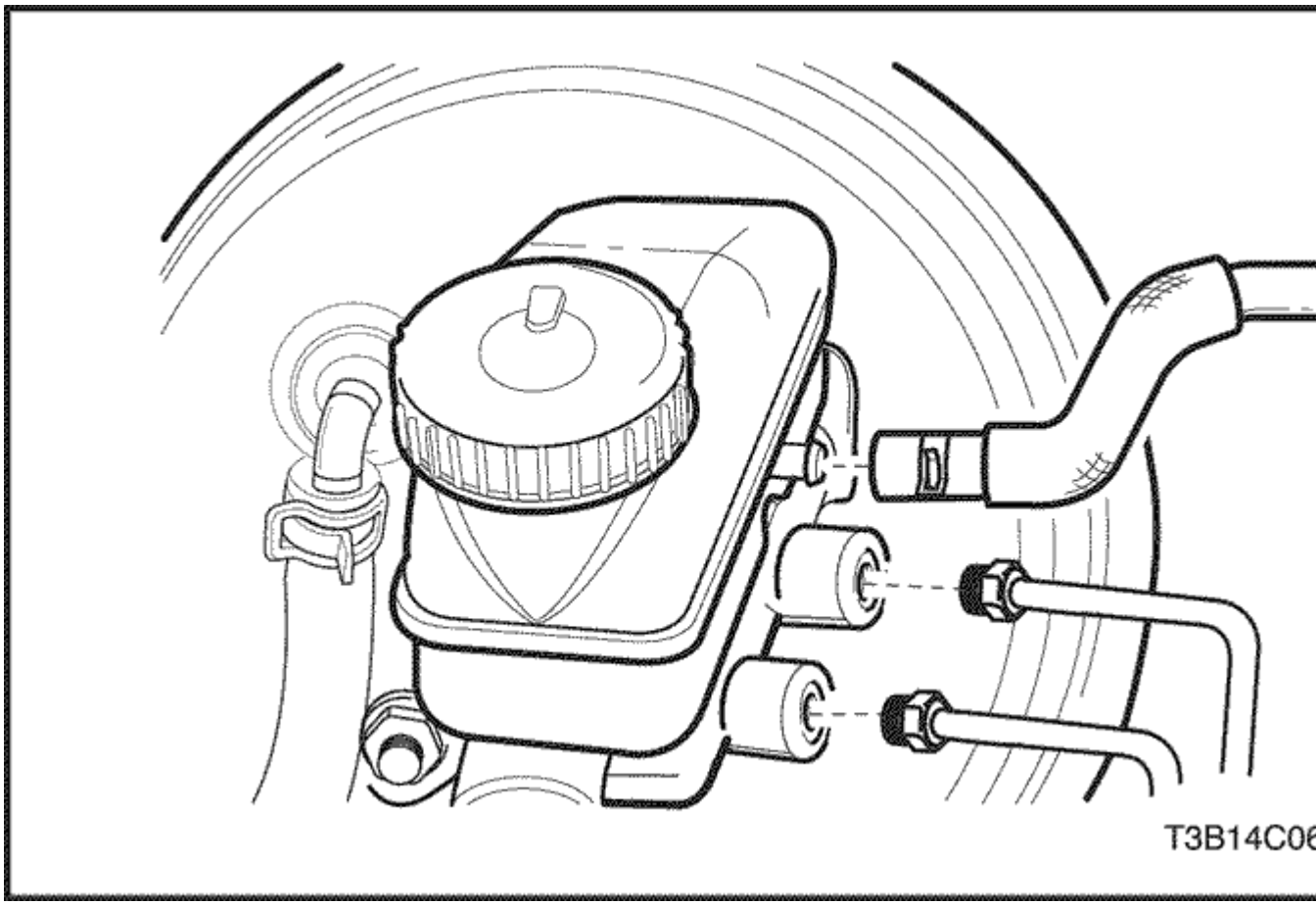
   Tighten
   Tighten the booster pushrod hex nut and the adjustment sleeve to 16 N•m (12 lb-ft).



3. Insert the pushrod in the adjustment sleeve and mount the retainer.
4. Measure the distance from the booster to the center of the fork bin bore.

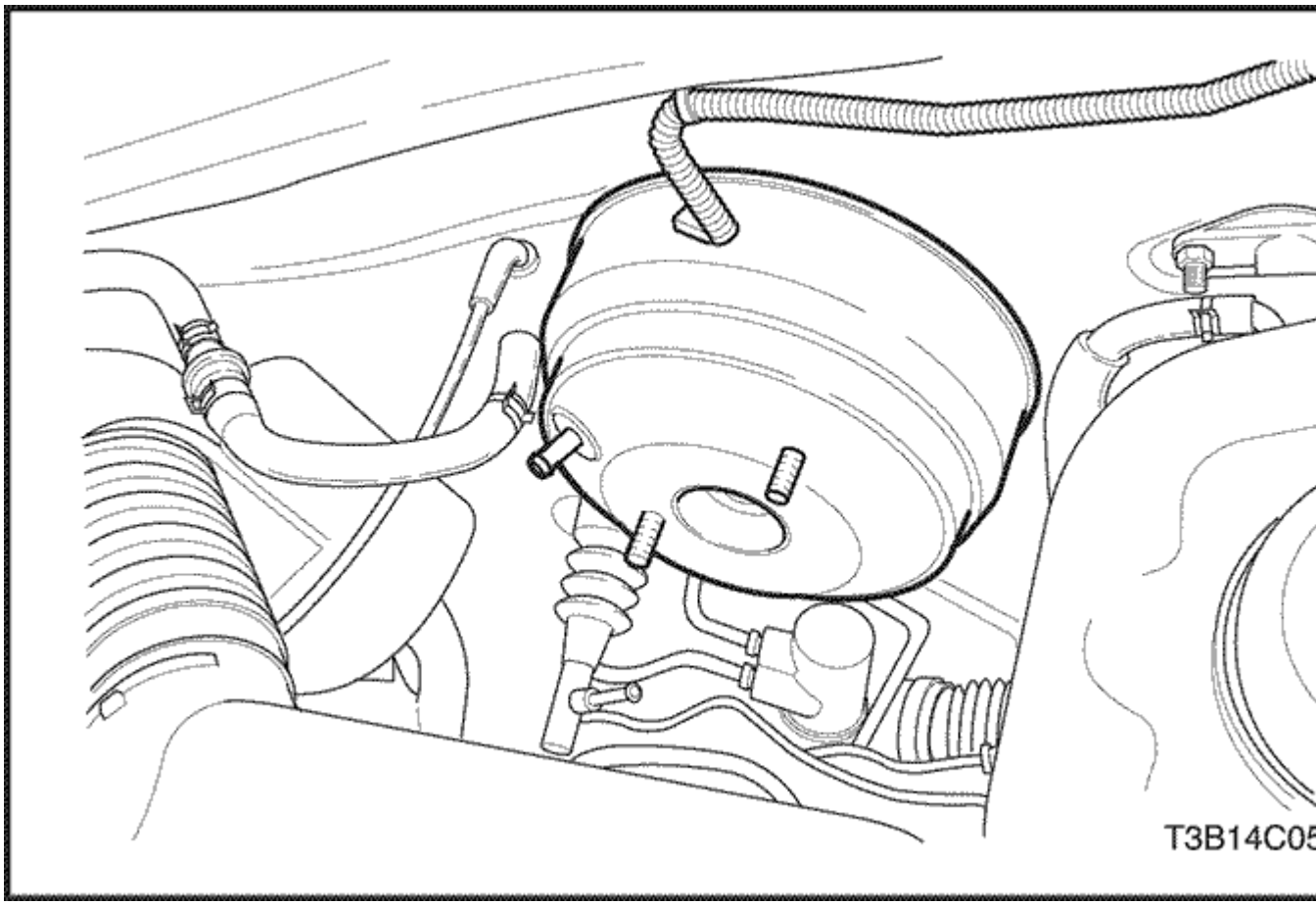


5. Install the rubber boot on the booster.



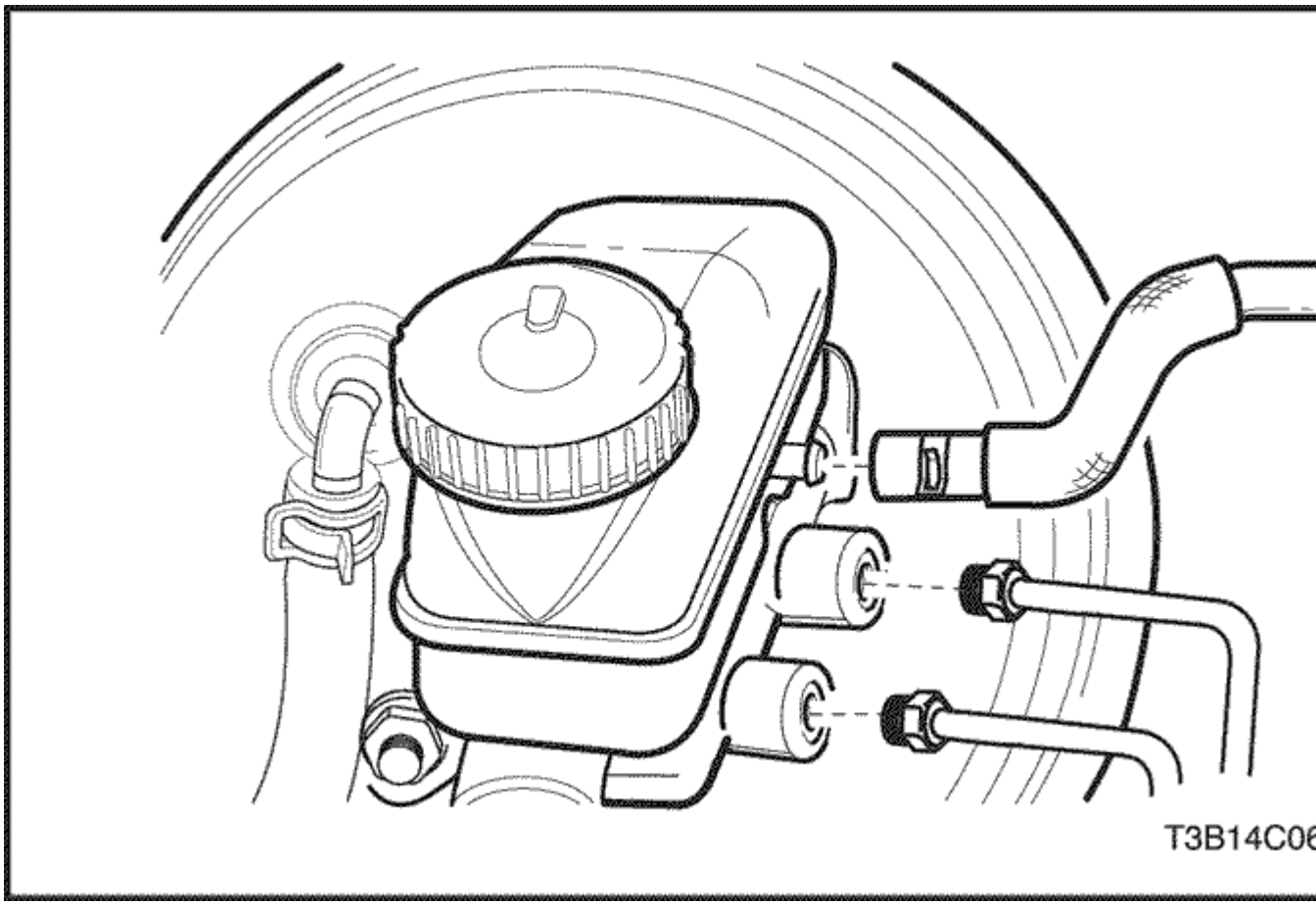
6. Install the brackets to the booster.

Tighten
Tighten the booster-to-support bracket nuts to 12 N•m (9 lb-ft).



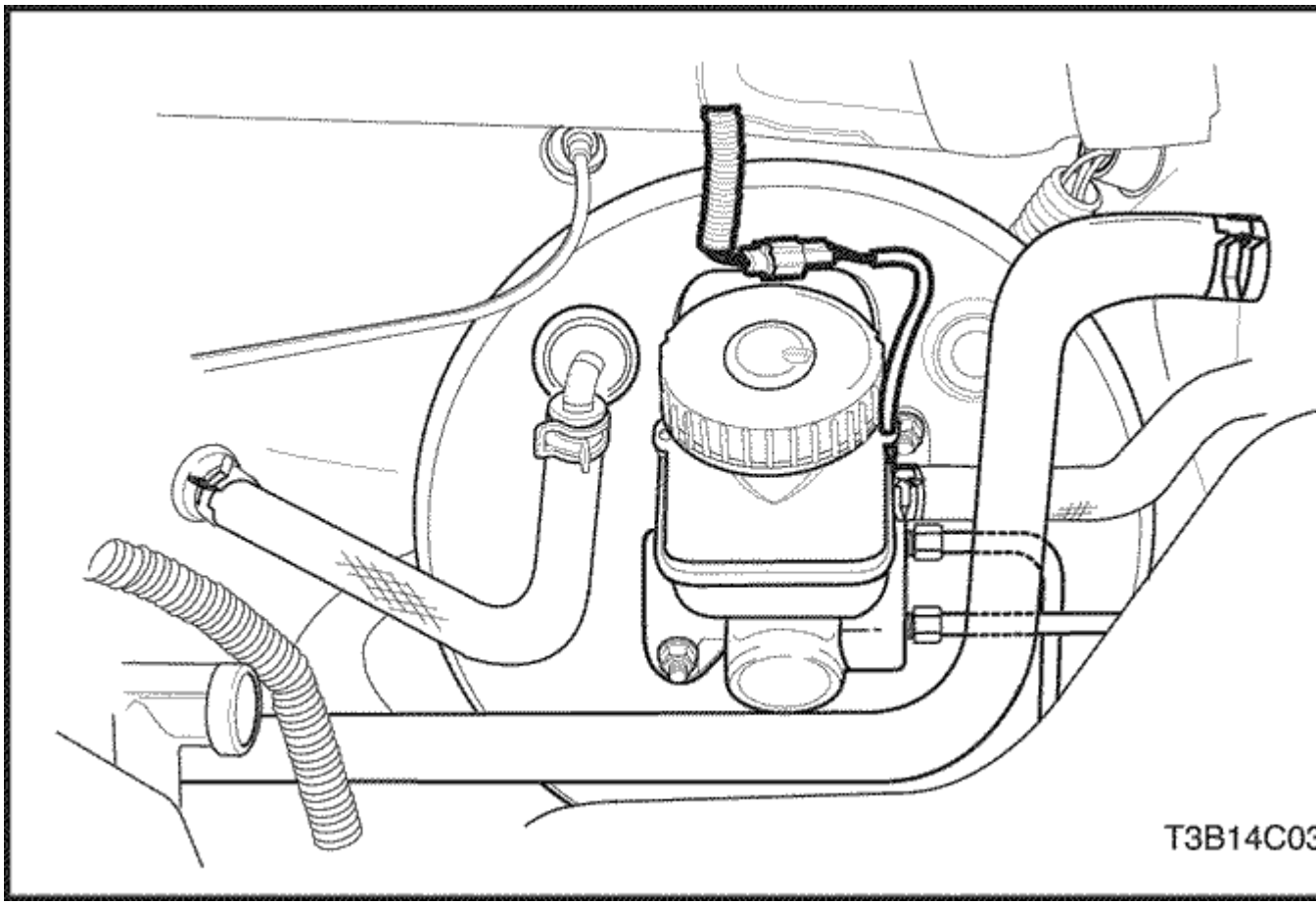
7. Install the booster and the bracket assembly to the dash panel.

   Tighten
   Tighten the booster and support bracket-to-dash panel nuts to 24 N•m (18 lb-ft).



8. Connect the master cylinder to the booster and install a new booster housing seal.

   Tighten
   Tighten the master cylinder attaching nuts to 24 N•m (18 lb-ft).



9. Install the new vacuum hose to the booster (DOHC engine connection shown). Refer to “Vacuum Hose” in this section.
10. Install new hose clamps on the vacuum hose.
11. Install the pushrod pin to the brake pedal bracket assembly and connect the clip and the spring. Refer to *Section 4A, Hydraulic Brakes.*
12. Install the brake lamp switch.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Power Booster

This booster is a single diaphragm, vacuum-suspended unit. In a normal operating mode, with the service brakes in the release position, a vacuum-suspended booster operates with a vacuum on both sides of its diaphragm. When the brakes are applied, air at atmospheric pressure is admitted to one side of the diaphragm to provide the power assist. When the brakes are released, atmospheric air is shut off from that side of the diaphragm. The air is

then drawn from the booster through the vacuumcheck valve by the vacuumsource.

Important : If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.

SECTION 4D

FRONT DISC BRAKES

SPECIFICATIONS

Fastener Tightening Specirications

Application	N•m	Lb-Ft	Lb-In
Brake Hose Inlet Fitting-to-Caliper Bolt	40	30	-
Caliper Bleeder Valve	6	-	53
Caliper-to-Steering Knuckle Mounting Bolts	95	70	-
Retaining Frame-to-Caliper Housing Bolts	27	20	-
Rotor-to-Front Wheel Hub Detent Screw	4	-	35
Splash Shield-to-Steering Knuckle Screws	4	-	35

DIAGNOSIS

Lining Inspection

1. Raise and suitably support the vehicle.
2. Remove the front wheels. Refer to *Section 2E, Tires and Wheels.*
3. Visually check the linings for minimum thickness and wear.

4. Measure the thickness.

Important : The minimum thickness of the inner or the outer pad is 7 mm (0.28 inch).

5. Install the brake pads in axle sets only.
6. Install the brake pads in axle sets only.
7. Install the front wheels. Refer to *Section 2E, Tires and Wheels.*
8. Lower the vehicle.

Rotor Inspection

Thickness variation can be checked by measuring the thickness of the rotor at four or more points around the circumference of the rotor. All measurements must be made at the same distance in from the edge of the rotor.

Thickness variation can be checked by measuring the thickness of the rotor at four or more points around the circumference of the rotor. All measurements must be made at the same distance from the edge of the rotor. A rotor that varies by more than .10 mm (0.004 inch) can cause pedal pulsation and/or front end vibration during braking. Thickness can be measured with a commercial-ly available micrometer.

A rotor that varies by more than 0.10 mm (0.004 inch) can cause pedal pulsations and/or front end vibration during brake applications. A rotor that does not meet these specifications should be refinished to specifications or replaced.

Lateral runout cannot exceed 0.10 mm (0.004 inch). If lateral runout exceeds the specification, make sure that there is no dirt between the rotor and the hub and that hub-to-rotor contact surfaces are smooth and free from burrs. Use a commercially available dial indicator to check the lateral runout according to the following procedure:

During manufacturing, the brake rotor and the tolerances of the braking surface regarding flatness, thickness variation, and lateral runout are held very close.

The maintenance of close tolerances on the shape of the braking surfaces is necessary to prevent brake roughness.

In addition to these tolerances, the surface finish must be held to a specified range. The control of the braking surface finish is necessary to avoid pulls and erratic performance and to extend lining life.

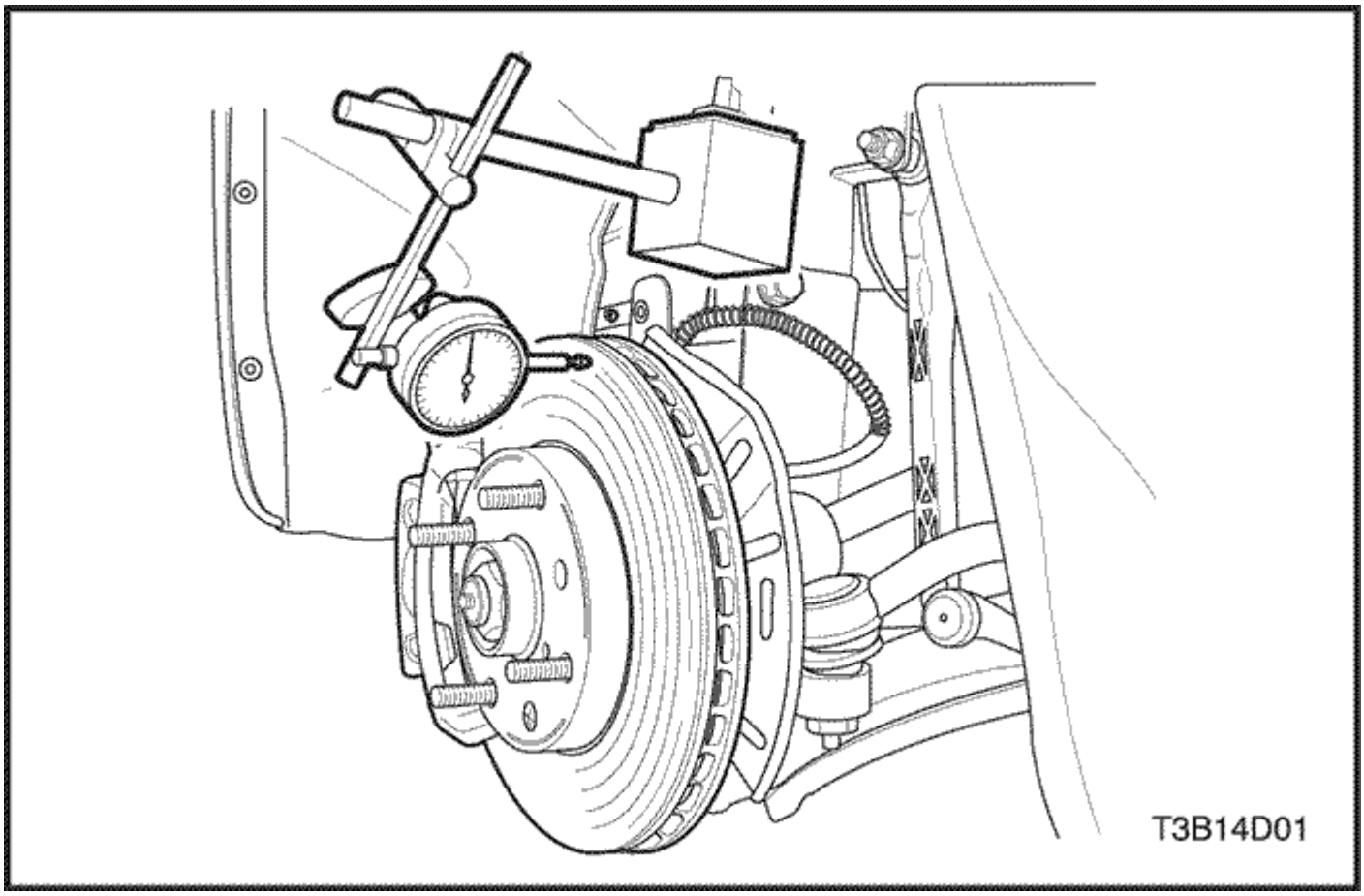
Light scoring of the rotor surfaces not exceeding 0.40 mm (0.016 inch) in depth, which may result from normal use, is not detrimental to brake operation. Using a commercially available dial indicator, check lateral runout as follows:

Notice : Permissible lateral runout is a maximum 0.10 mm 0.004 inch). If lateral runout exceeds the specification, make sure there is no dirt between the rotor and the hub and that contact surfaces are smooth and free from burrs.

1. Position the transaxle in NEUTRAL.
2. Remove the rotor. Refer to "Rotor" in this section.
3. Fasten the brake rotor to the wheel hub with two wheel bolts.
4. Fasten a dial indicator to the brake caliper.
5. Set the gauge probe tip to approximately 10 mm (0.39 inch) from the outer edge of the brake rotor, perpendicular to the disc and under slight preload.
6. Remove the dial indicator and connecting wheel bolts to the hub.

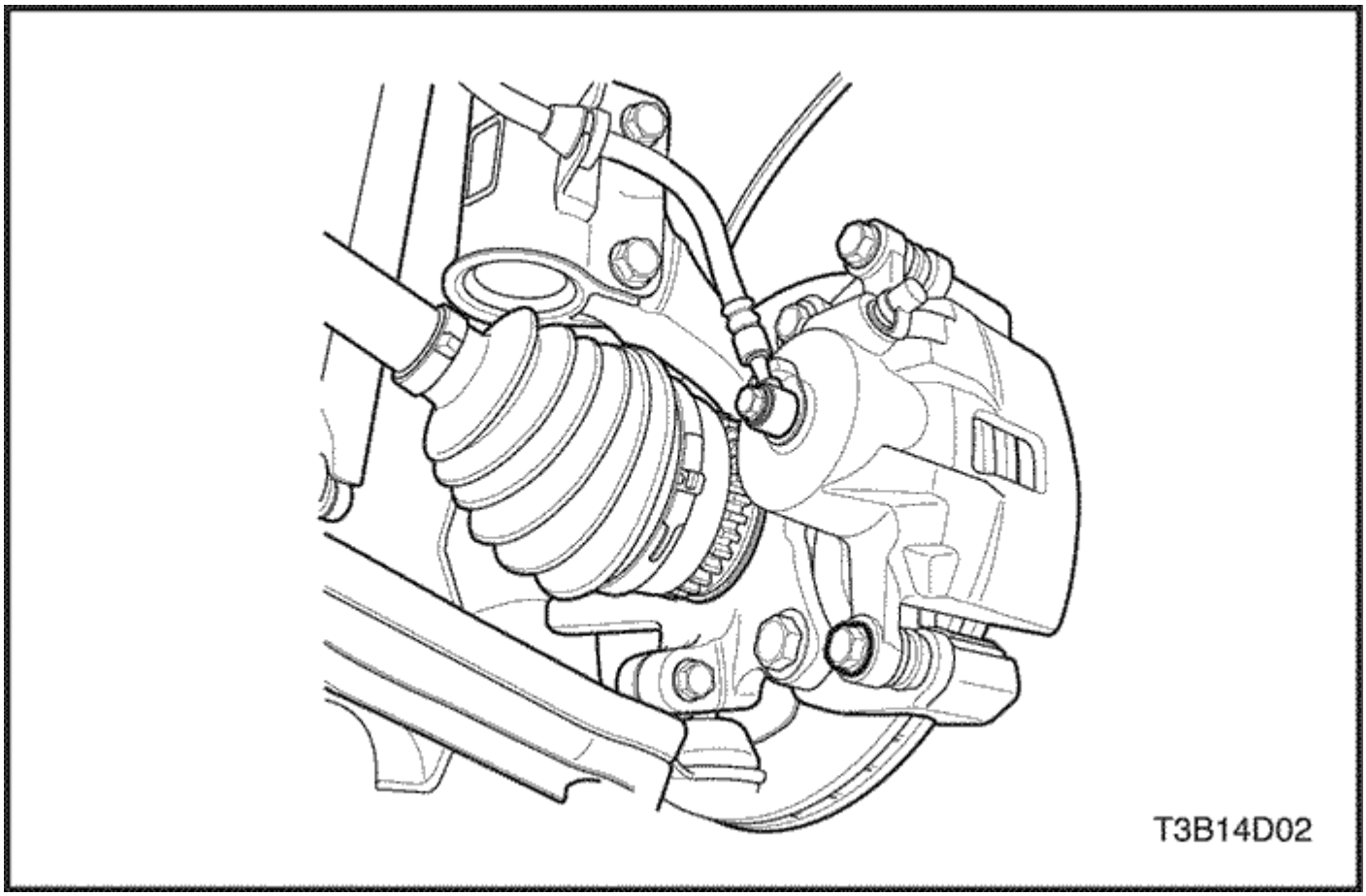
Important : Since accurate control of the rotor tolerances is necessary for proper performance of the disc brakes, refinishing of the rotor should be done only with precision equipment.

7. Refinish the rotor, if required, with precision equipment.
8. Refinish the rotor, if required, with precision equipment.
9. Install the rotor. Refer to "Rotor" in this section.



MAINTENANCE AND REPAIR

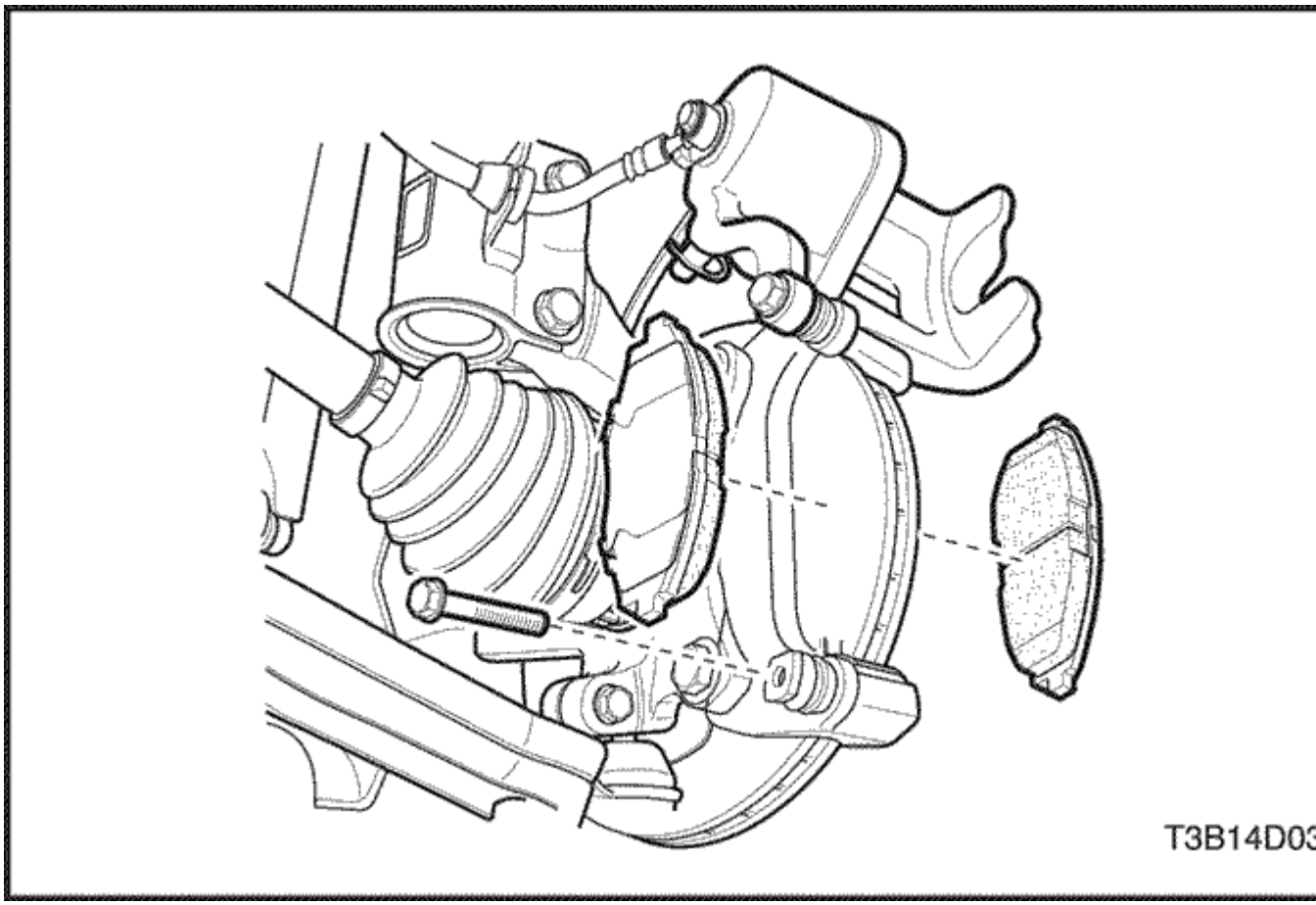
ON-VEHICLE SERVICE



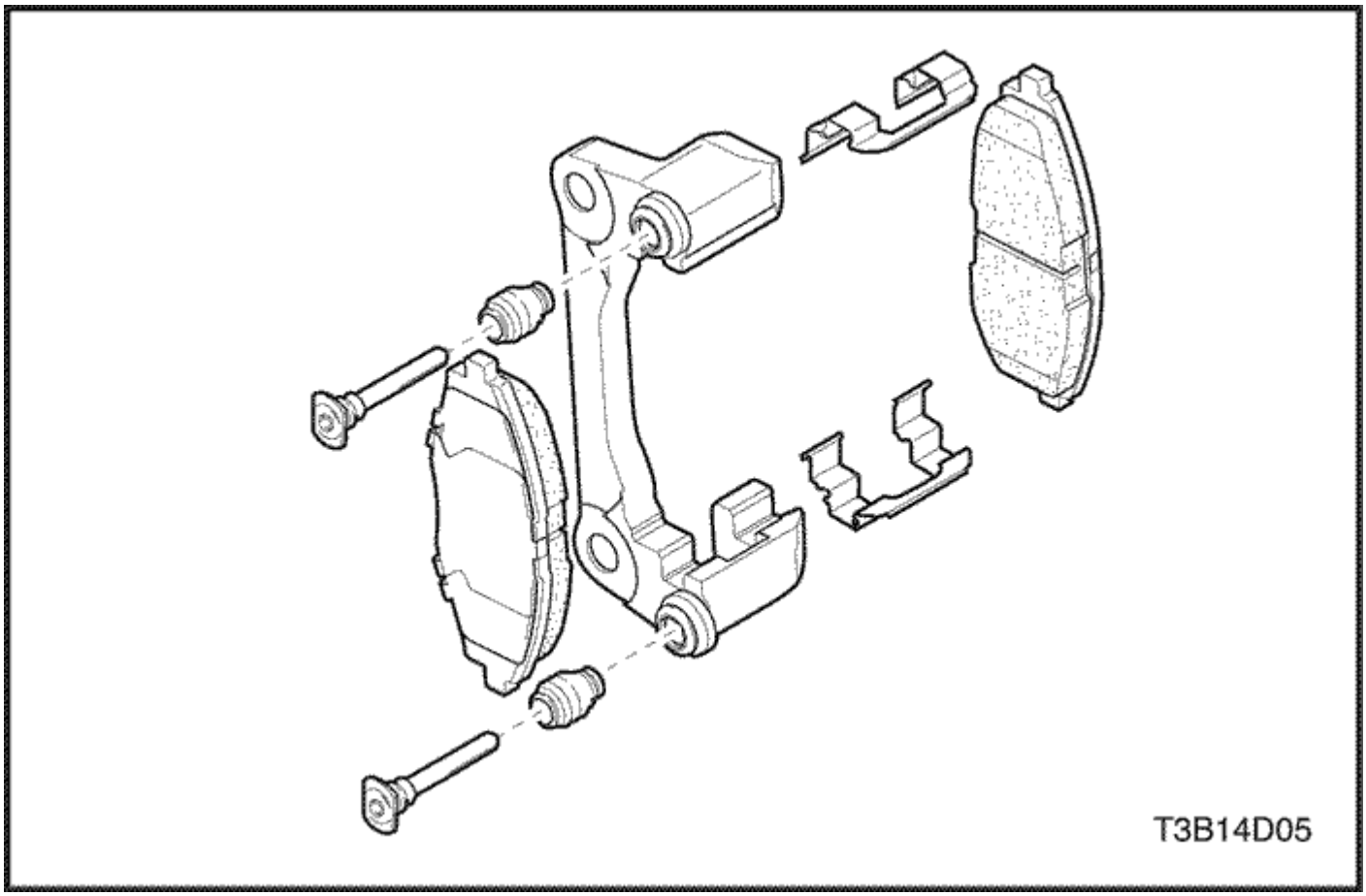
Shoe and Lining
Removal Procedure

1. Raise and suitably support the vehicle.
2. To pressure wheel balance, mark the relative positions of the wheel and the hub, and remove the front wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the lower bolt of the caliper assembly retaining frame.

   Important : It is not necessary to remove the caliper to service the brake shoes.

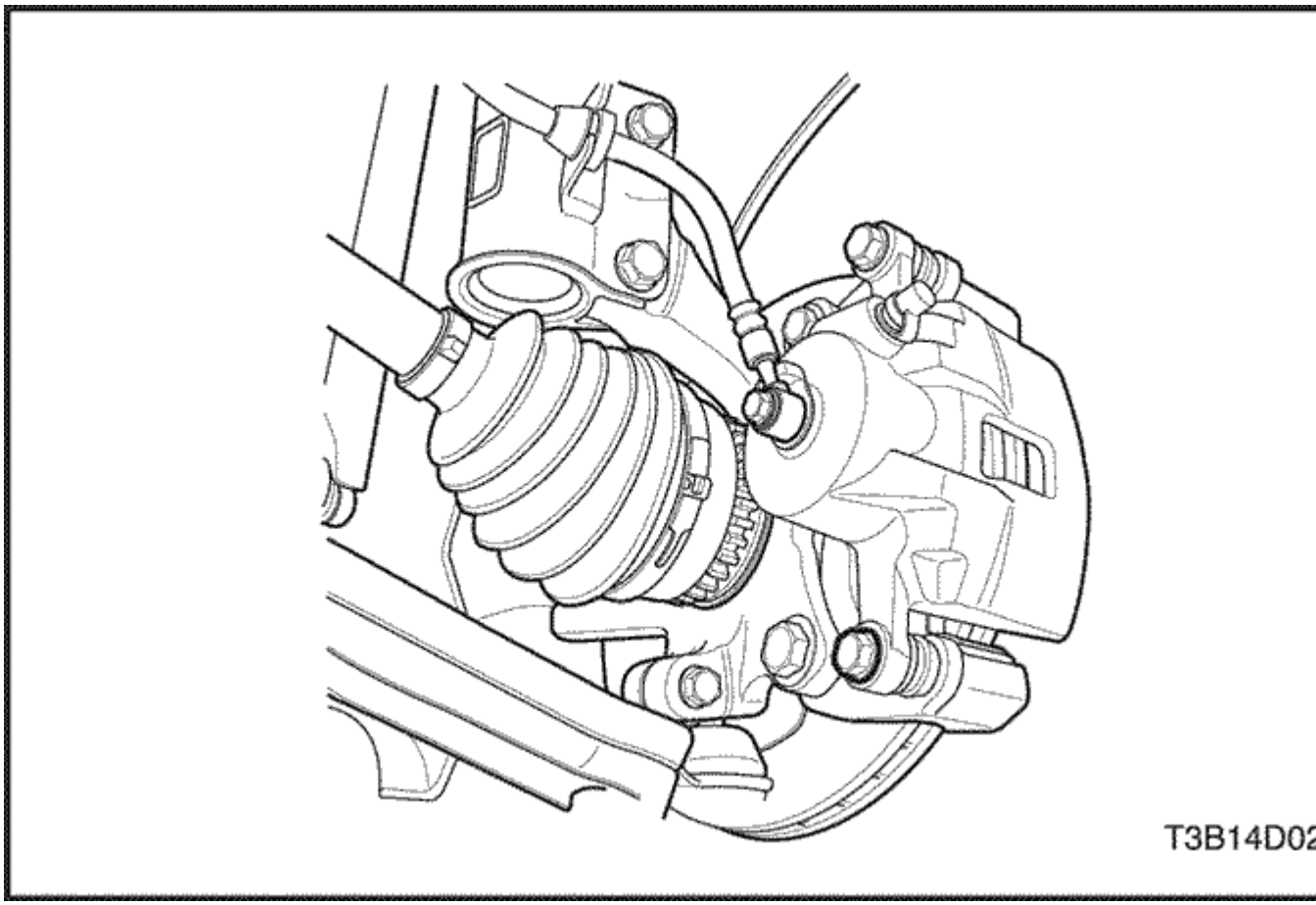


4. Pull the caliper piston housing up.
5. Remove the brake pads.



Installation Procedure

1. Measure the minimum lining thickness. Refer to "Lining Inspection" in this section.
2. Install the brake pads into the caliper.
3. Push the piston inward, if necessary.

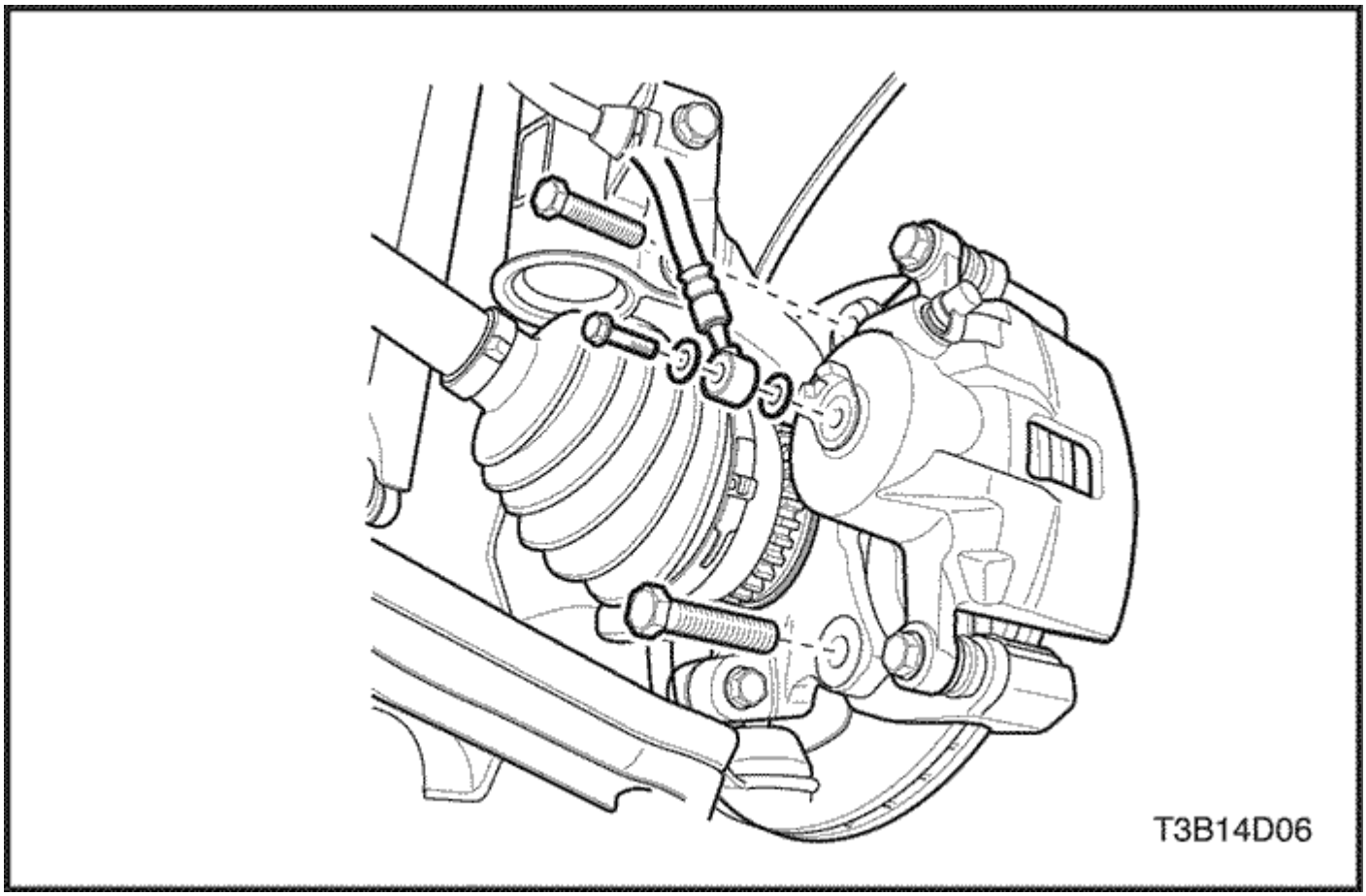


Notice : Take care not to damage the piston seal when the piston housing is pulled down.

4. Pull down the caliper piston housing and secure it to the retaining frame with the lower bolt.

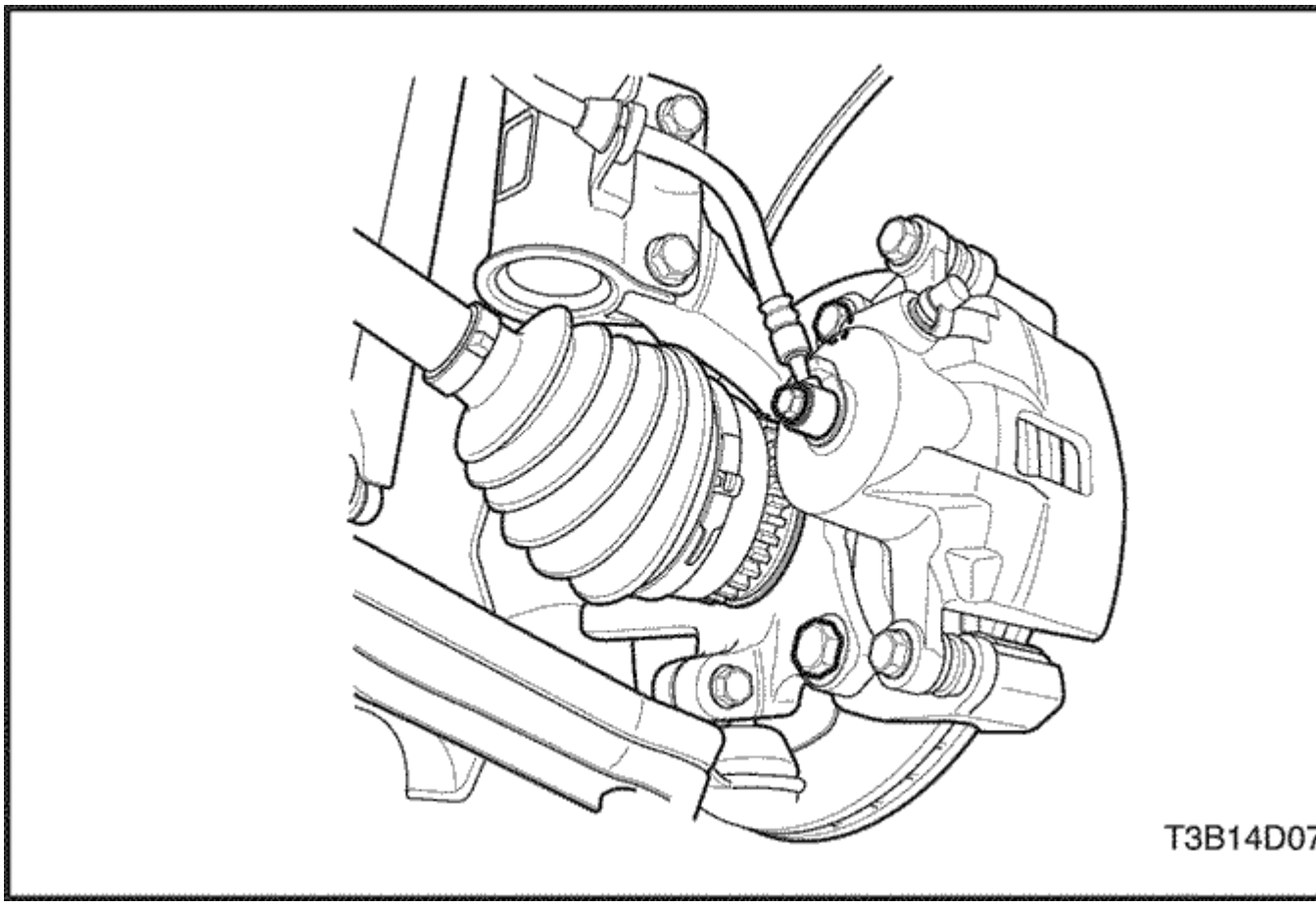
   Tighten
   Tighten the retaining frame-to-caliper housing bolts to 27 N•m (20 lb-ft).

5. Align the marks that were made before the wheel removal and install the front wheels. Refer to *Section 2E, Tires and Wheels.*
6. Lower the vehicle.

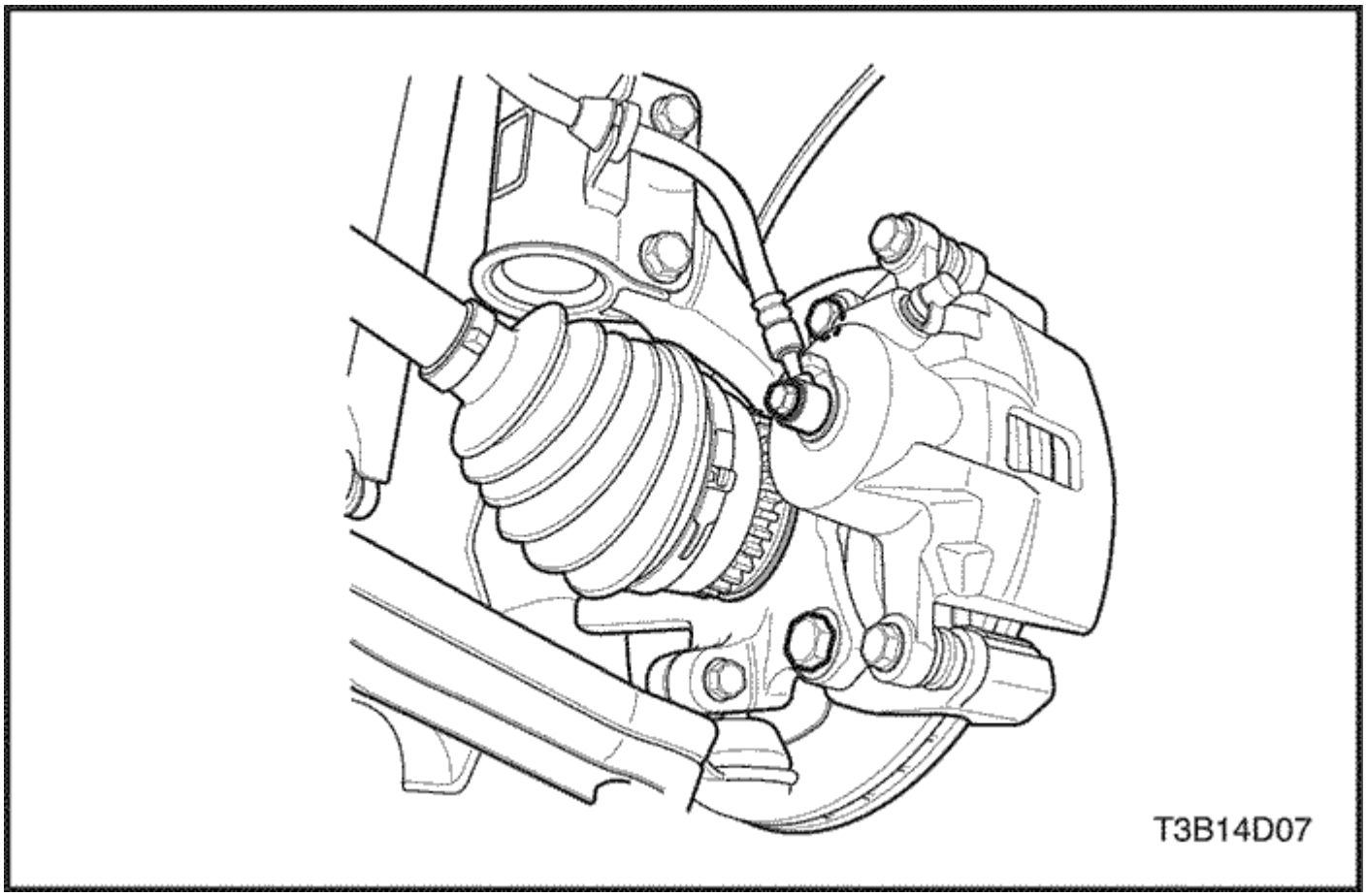


Caliper Assembly
Removal Procedure

1. Raise and suitably support the vehicle.
2. Mark the position of the front wheels relative to the wheel hubs and remove the wheels. Refer to *Section 2E, Tires and Wheels.*
3. Remove the bolt and the washers that attach the brake hose to the caliper.



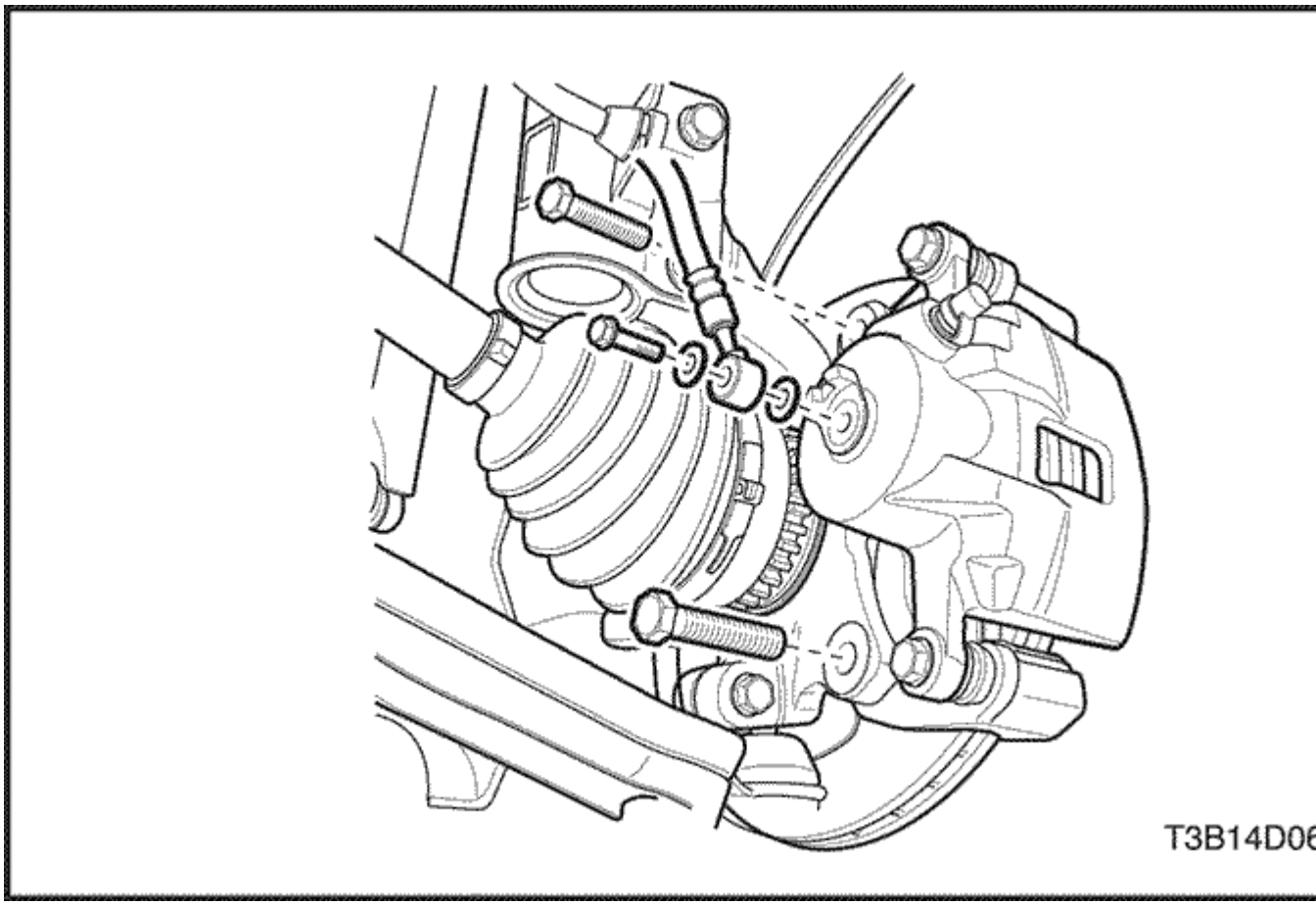
4. Disconnect the brake hose, and plug the openings in the caliper and the brake hose to prevent fluid loss and contamination.
5. Remove the caliper mounting bolts from the steering knuckle, and remove the caliper assembly.



Installation Procedure

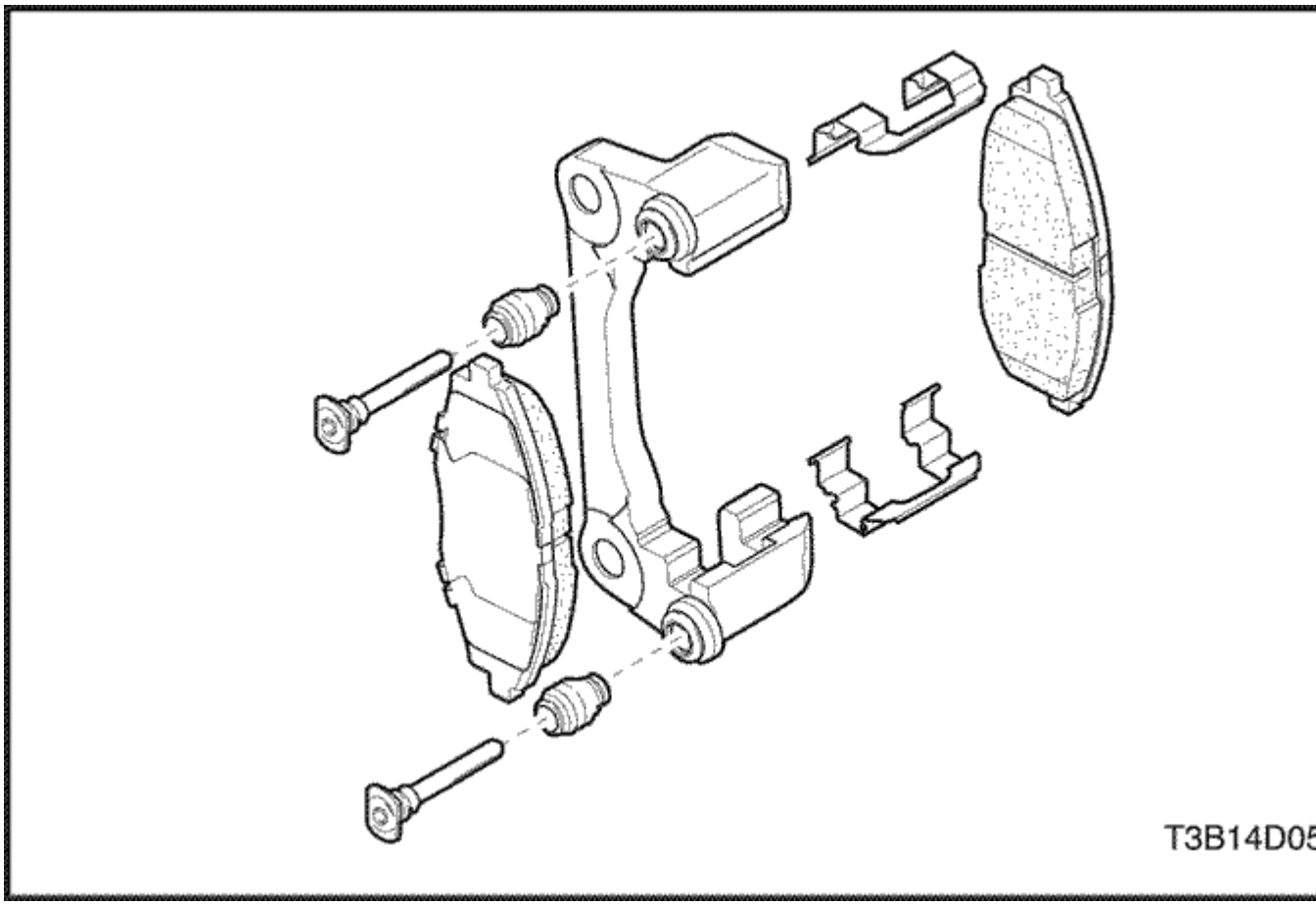
1. Install the caliper assembly with the mounting bolts.

   Tighten
   Tighten the caliper-to-steering knuckle mounting bolts to 95 N•m(70 lb-ft).



2. Connect the brake hose.

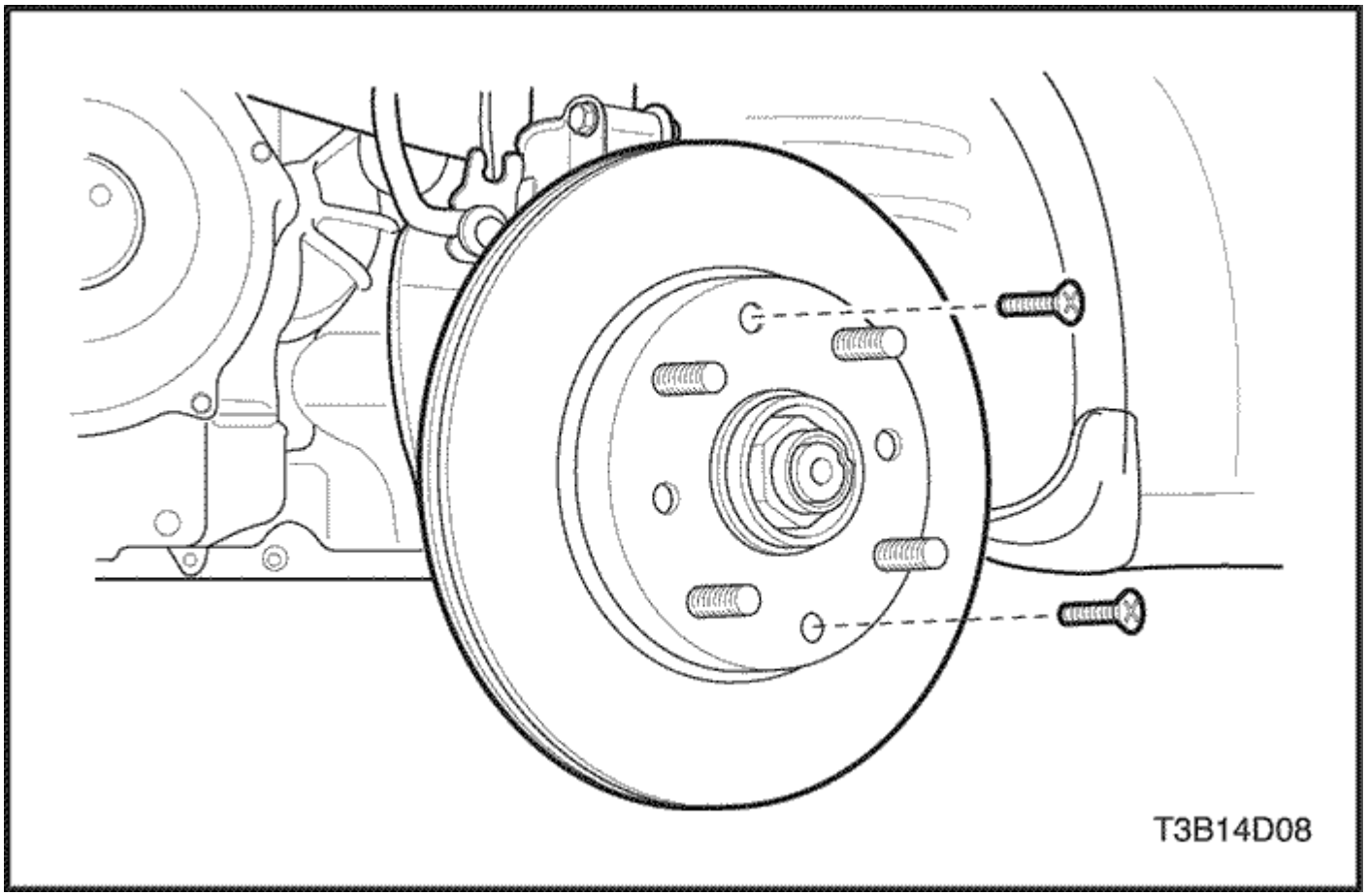
   Tighten
   Tighten the brake hose inlet fitting-to-caliper bolt and washers to 40 N•m (30 lb-ft).



3. Install the front wheels. Refer to *Section 2E, Tires and Wheels.*
4. Lower the vehicle.
5. Fill the master cylinder to the proper level with clean brake fluid.
6. Bleed the caliper. Refer to *Section 4A, Hydraulic Brakes* or *Section 4F, Antilock Brakes,* if applicable.
7. Recheck the fluid level.

   Notice : Do not move the vehicle until a firm pedal is obtained, or improper braking action will result.

8. Repeatedly press the brake pedal to bring the pads in contact with the rotor.,



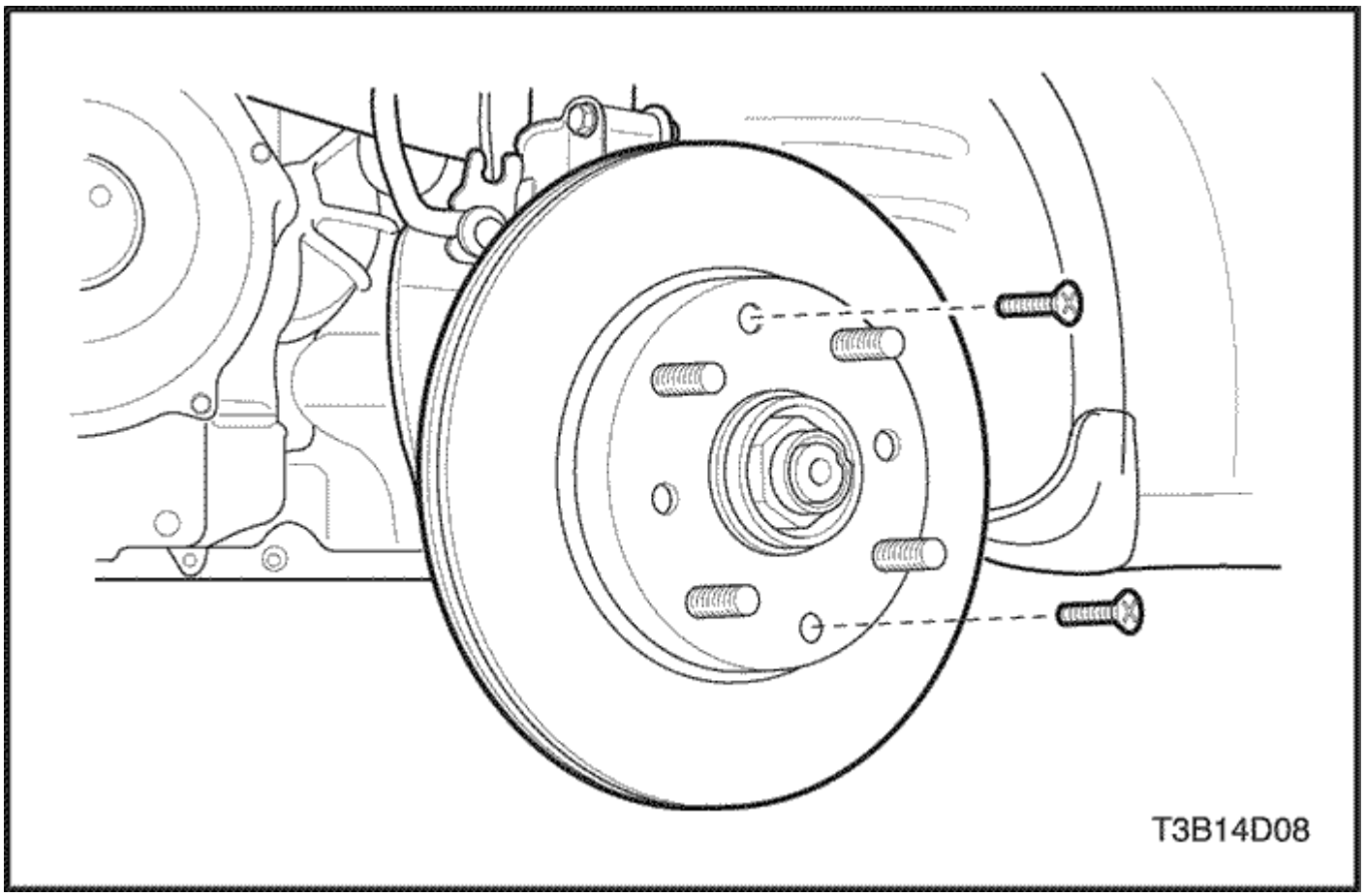
Rotor

Removal Procedure

Notice : Do not hang the caliper assembly from the brake hose. Any resulting internal hose restriction will impede uniform braking action.

Important : To guarantee uniform braking on both sides, both rotors must have identical surfaces regarding smoothness and scoring depth. For this reason, always replace both rotors.

1. Remove the caliper assembly without disconnecting the brake hoses. Refer to "Caliper Assembly" in this section.
2. Remove the caliper bracket.
3. Remove the rotor-to-front wheel hub detent screw from the rotor and the front wheel hub.
4. Pull off the rotor.



Installation Procedure

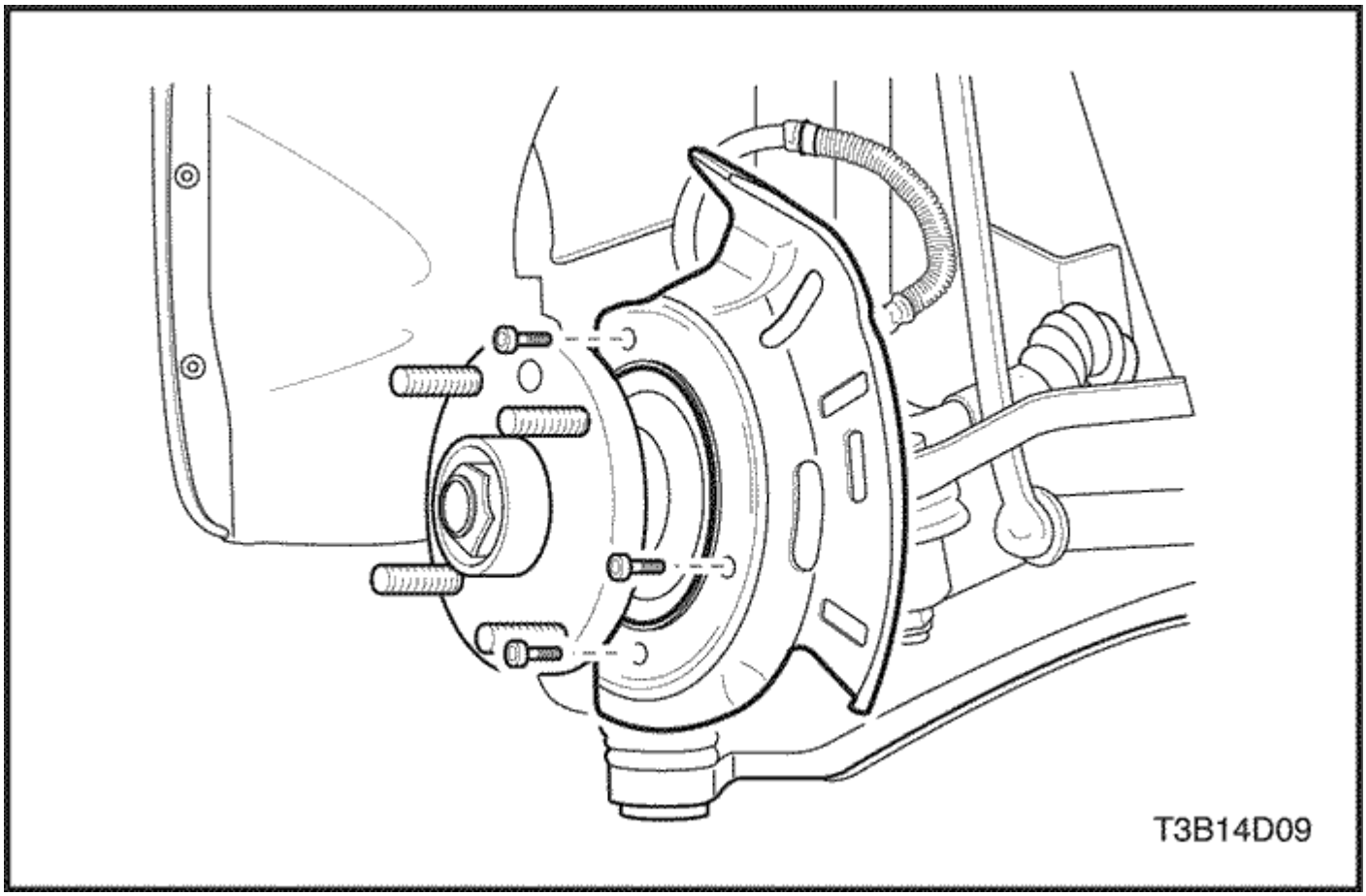
1. Inspect the rotor. Refer to "Rotor Inspection" in this section.
2. Install the rotor to the front wheel hub by tightening the detent screw.

   Tighten
   Tighten the rotor-to-front wheel hub detent screw to 4 N•m (35 lb-in).

3. Install the caliper bracket.

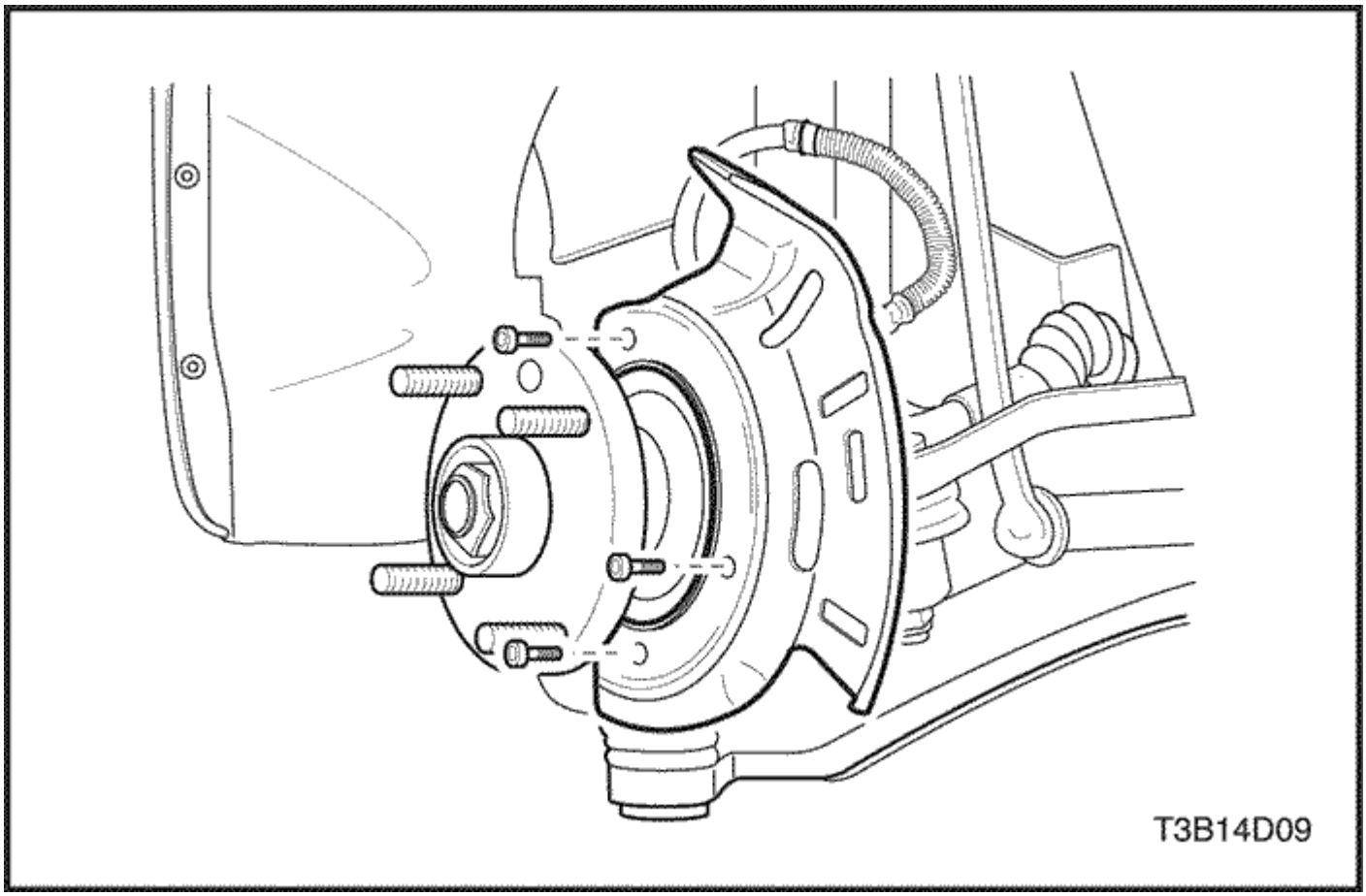
   Tighten
   Tighten the caliper bracket mounting bolts to 95 N•m (70 lb-ft).

4. Install the caliper assembly. Refer to "Caliper Assembly" in this section.



Splash Shield
Removal Procedure

1. Remove the rotor. Refer to "Rotor" in this section.
2. Remove the screws for the splash shield from the steering knuckle.
3. Remove the splash shield.



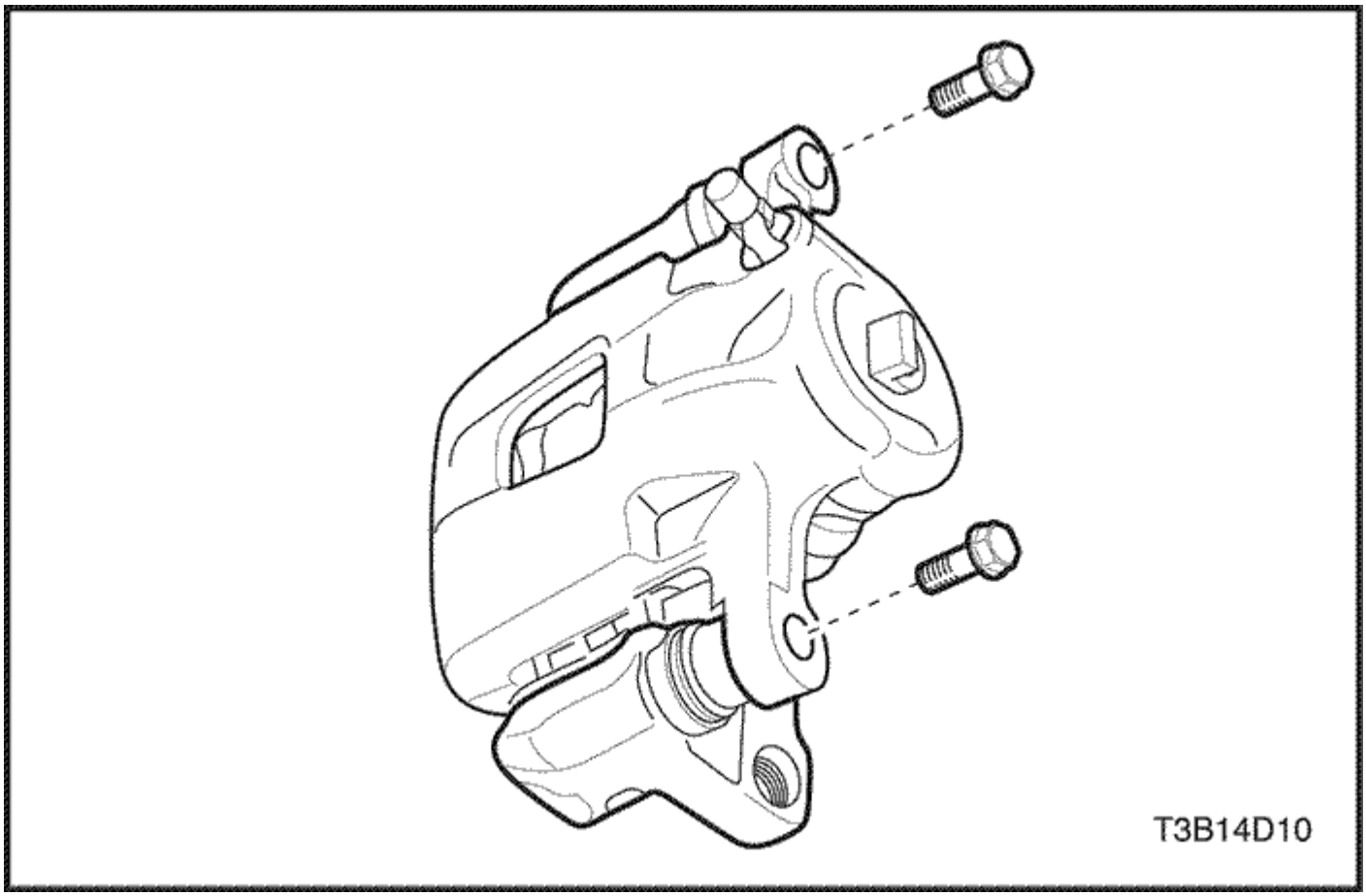
Installation Procedure

1. Install the splash shield.
2. Secure the splash shield to the steering knuckle with the screws.

   Tighten
   Tighten the splash shield-to-steering knuckle screws to 4 N•m (35 lb-in).

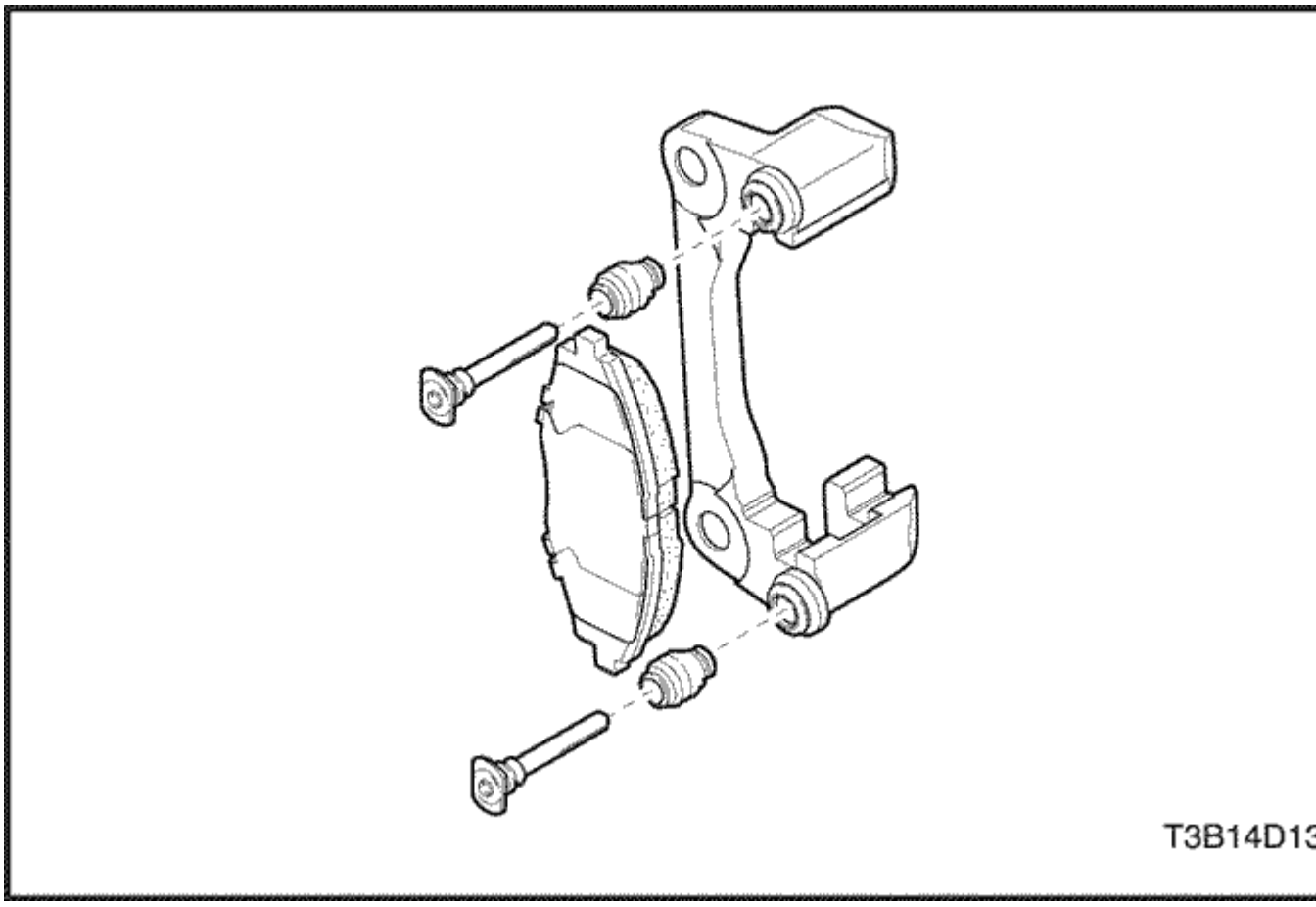
3. Install the rotor. Refer to "Rotor" in this section.

UNIT REPAIR

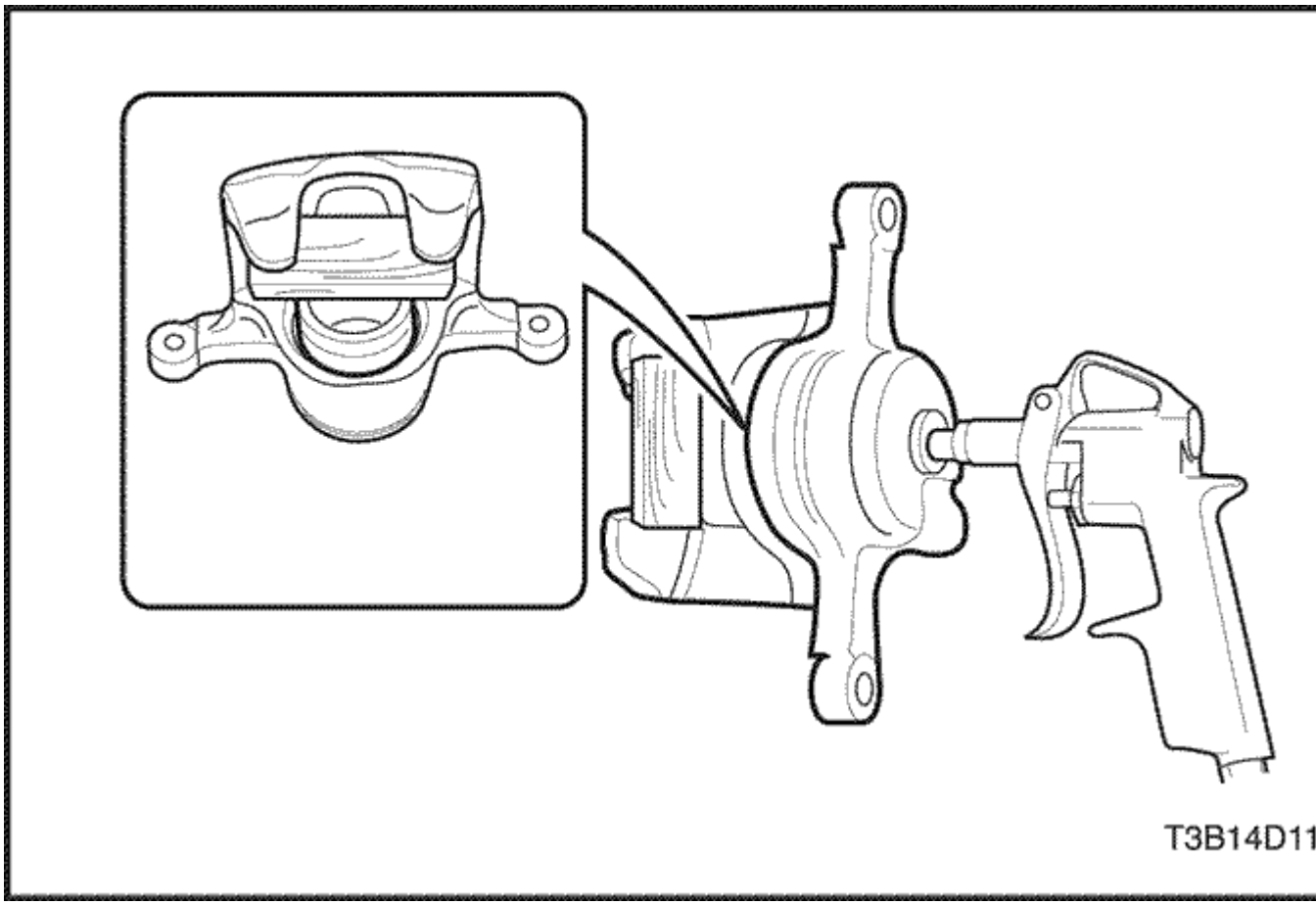


Caliper Overhaul
Disassembly Procedure

1. Remove the caliper assembly. Refer to "Caliper Assembly" in this section.
2. Remove the caliper guide pin that connects the caliper piston housing to the retaining frame.



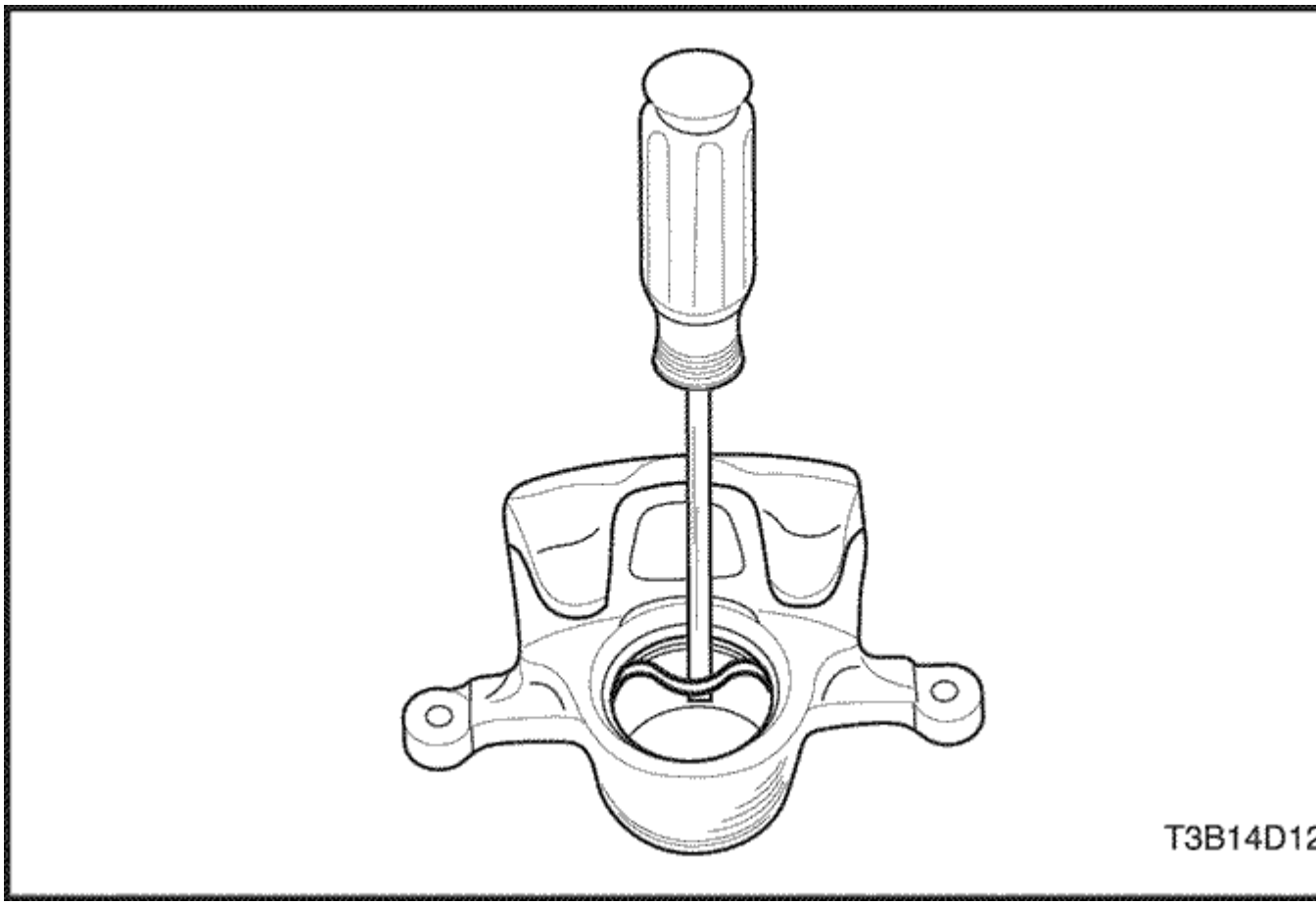
3. Remove the bleeder valve protector and the bleeder valve.
4. Pull out the pins and the rubber boots.



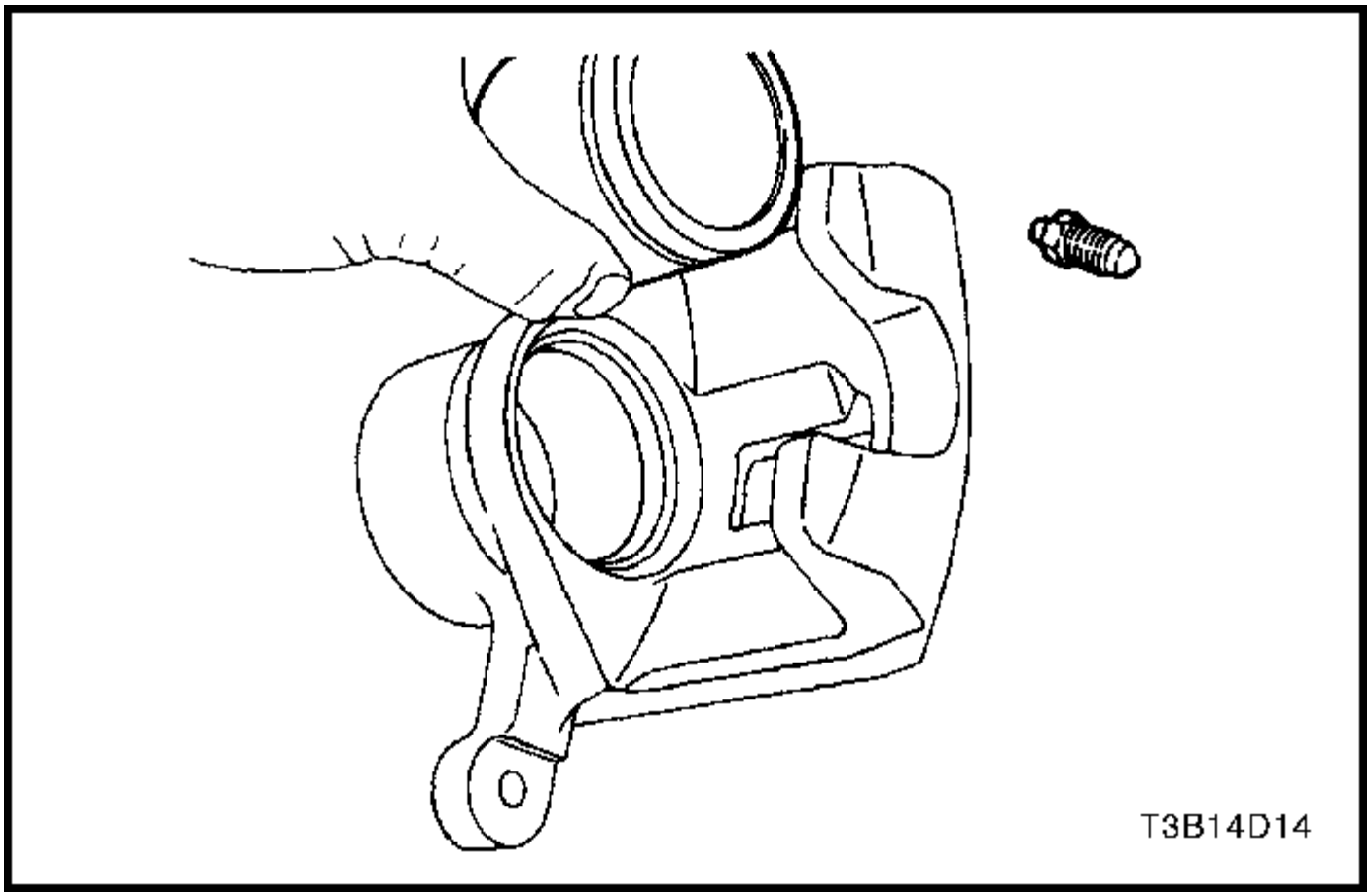
5. Remove the front pad brake set, including the pad springs, from the caliper. Refer to "Shoe and Lining" in this section.

   Caution : Do not attempt to catch the piston when removing the piston with compressed air. The piston will pop out of its bore with enough force to damage a hand or finger.
   Important : Insert a piece of hardwood into the caliper housing interior when removing the piston.

6. Using compressed air, blow out the piston from the housing.
7. Remove the outer seal.



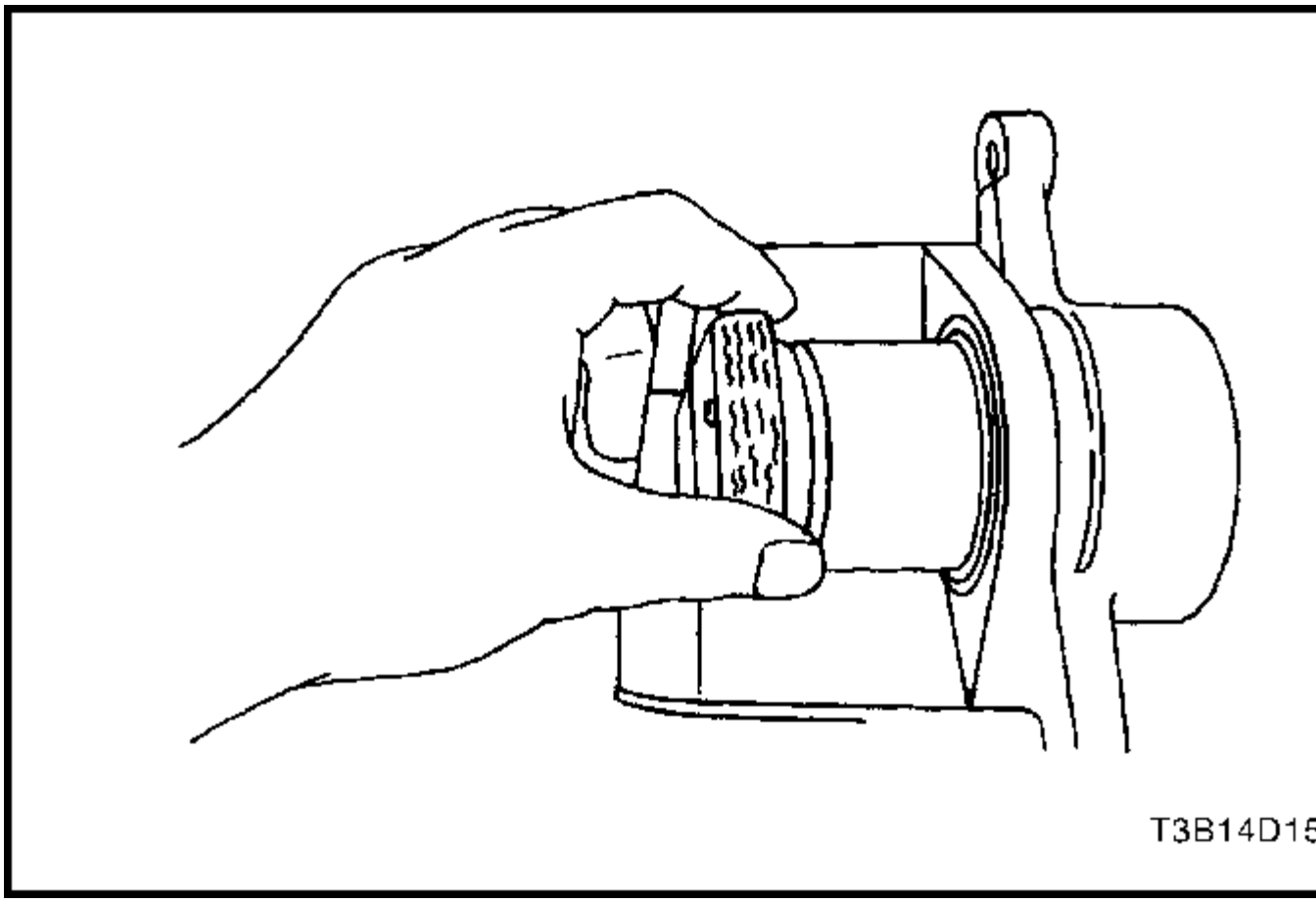
8. Remove the inner seal from the caliper piston bore.



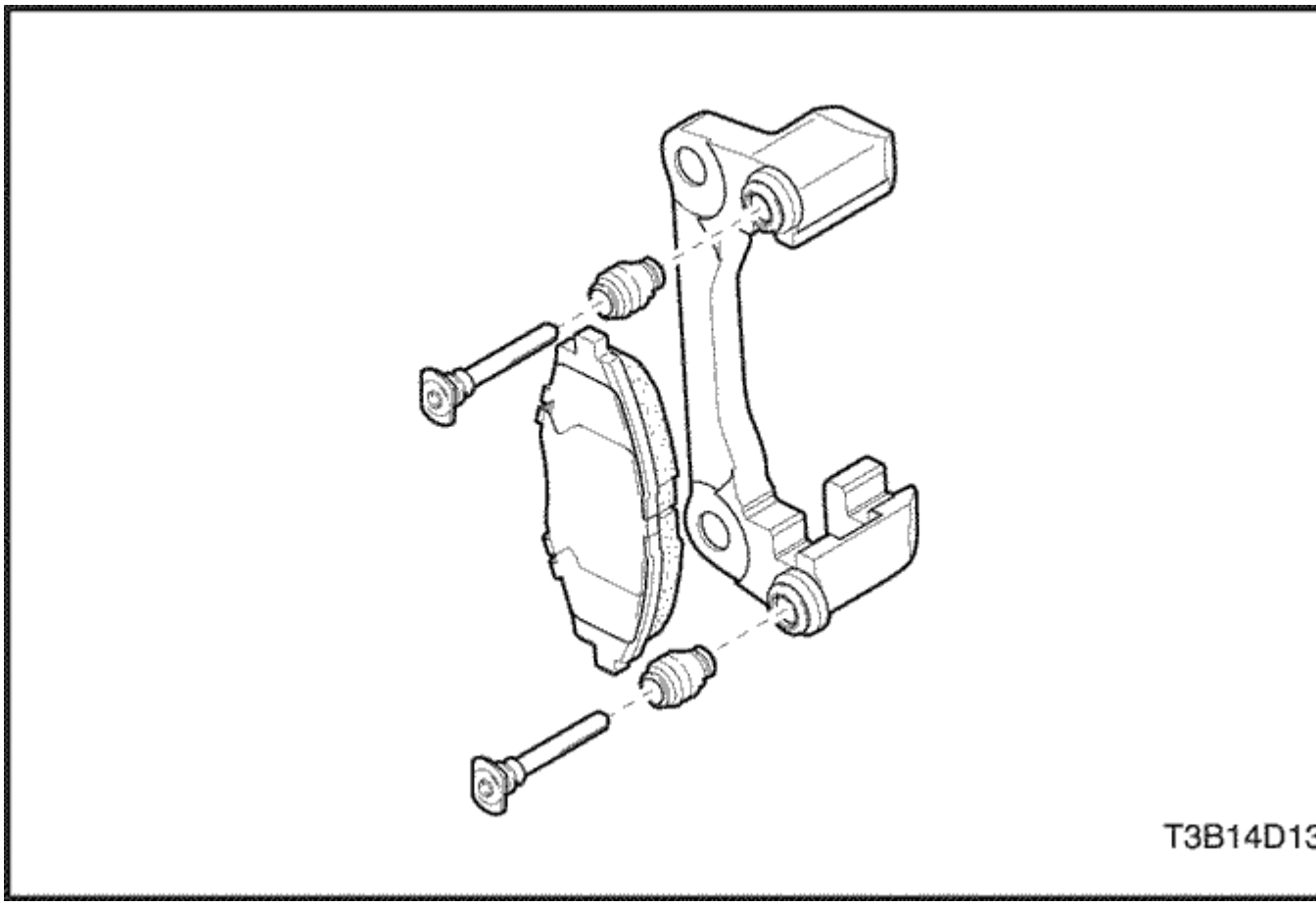
Assembly Procedure

1. Clean all parts in denatured alcohol or brake fluid. Dry the parts with unlubricated compressed air and blow out all passages in the housing and the bleeder valve.
2. Inspect the piston and the caliper for scoring, nicks, and corrosion. Replace components if these elements are found.
3. Inspect the caliper bleeder valve.

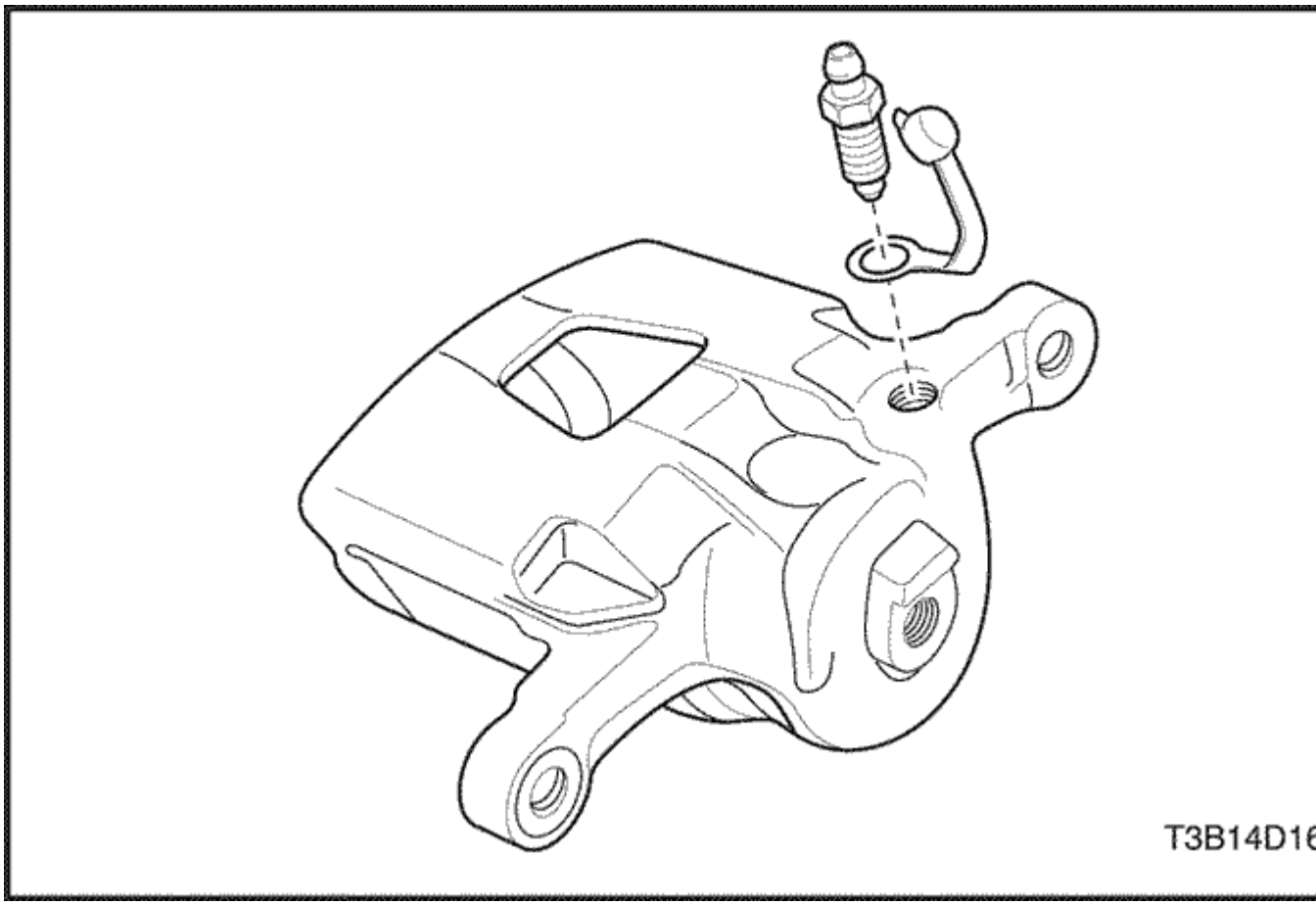
Important : Do not use a hone or any other procedure to remove material from the piston or the caliper bore.



4. Lubricate a new piston inner seal.
5. Install the piston inner seal into the caliper housing groove. Make sure the seal is not twisted.
6. Install the outer piston dust seal in the groove.
7. Lubricate the piston with brake fluid.
8. Push the piston into its bore and make sure the dust seal is seated in the piston groove.



9. Coat the pins with rubber grease and install the boots.

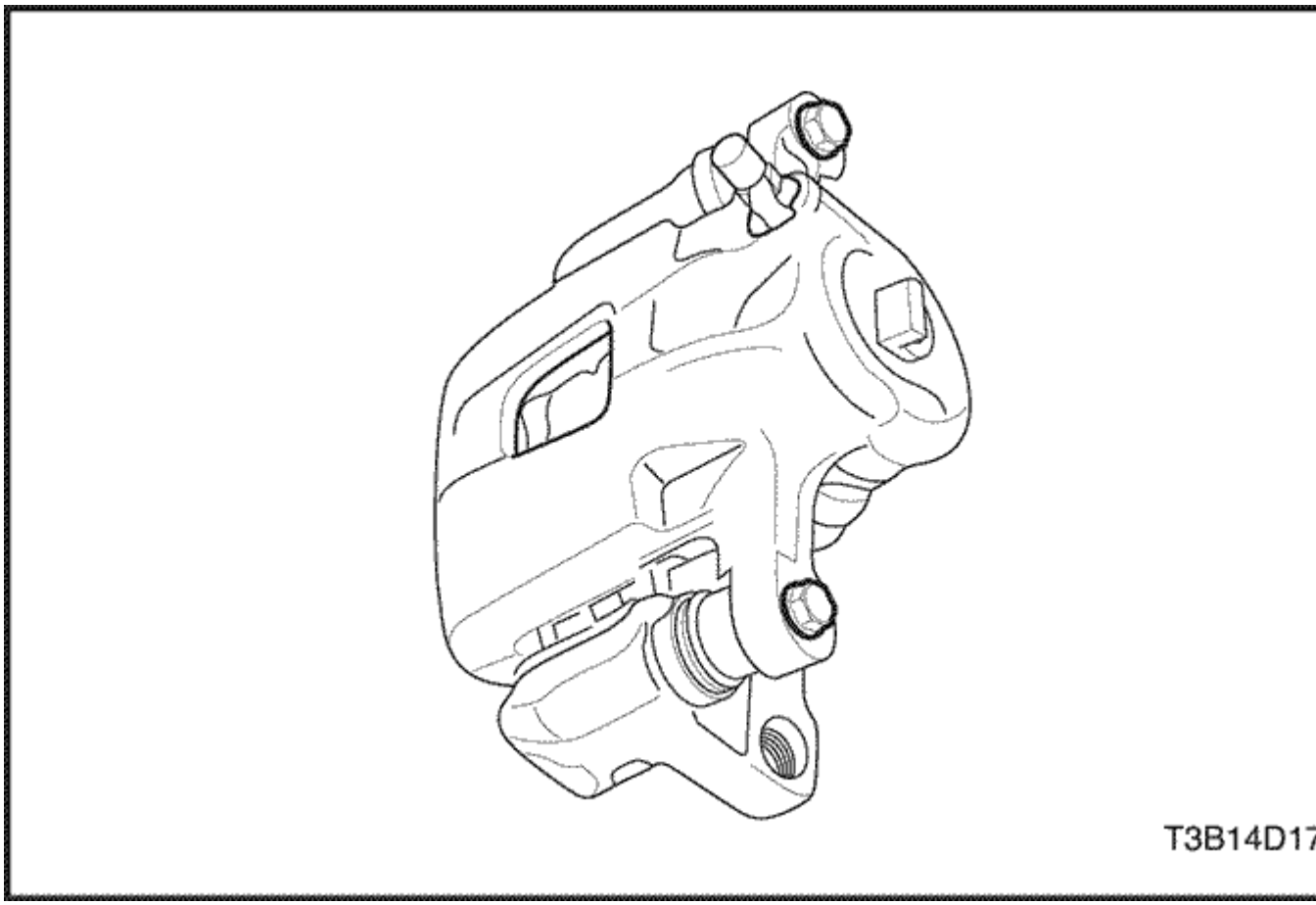


10. Install the caliper bleeder valve and the dust cap.

Tighten
Tighten the caliper bleeder valve to 6 N•m (53 lb-in).

11. Connect the brake pads and the pad springs.

Important : Make sure the pad springs are properly installed.



12. Connect the retaining frame to the caliper housing with the guide pin bolts.

    Tighten
    Tighten the retaining frame-to-caliper housing bolts to 27 N•m (20 lb-ft).

13. Install the caliper assembly. Refer to "Caliper Assembly" in this section.
14. Bleed the brake system. Refer to *Section 4A, Hydraulic Brakes* (or *Section 4F, Antilock Brakes,* if applicable.)
15. Repeatedly apply the brakes until a firm pedal obtained.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Disc Brake Caliper Assembly

This caliper has a single bore and is mounted to the steering knuckle with two mounting bolts. Hydraulic pressure, created by applying the brake pedal, is converted by the caliper to a stopping force. This force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to slide the caliper inward, resulting in a clamping action on the rotor. This clamping action forces the linings against the rotor, creating friction to stop the vehicle.

Important :

- **Replace all components included in the repair kits used to service this caliper.**
- **Lubricate the rubber parts with clean brake fluid to ease assembly.**
- **Do not use lubricated shop air on brake parts, as damage to the rubber components may result.**
- **If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.**
- **Replace the pads in axle sets only.**
- **The torque values specified are for dry, unlubricated fasteners.**
- **Perform the service operations on a clean bench, free from all mineral oil materials.**

SECTION 4E

REAR DRUM BRAKES

SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Brake Line	16	12	-
Brake Wheel Hub/Backing Plate-to-Rear Axle Nuts	28	21	-
Rear Hub Caulking Nut	190	140	-
Wheel Cylinder-to-Backing Plate Bolt	8	-	71

DIAGNOSIS

Lining Inspection

1. Raise and suitably support the vehicle.
2. Remove the wheel. Refer to *Section 2E, Tires and Wheels.*
3. Release the parking brake.
4. Remove the drum. Refer to " Drum" in this section.
5. Measure the lining thickness. The minimum lining thickness is 0.5 mm (0.02 inch).

Caution : To avoid injury when servicing brake parts, do not create dust by grinding or sanding the brake linings or by cleaning the wheel brake parts with a dry brush or with compressed air.

Important : Replace the shoe and lining assembly in axle sets only.

6. Install the drum, if removed. Refer to "One-Piece Drum" or "Two-Piece Drum" in this section.

7. Install the wheel, if removed. Refer to *Section 2E, Tires and Wheels.*

8. Lower the vehicle.

Drums

Whenever brake drums are removed, they should be thoroughly cleaned and inspected to see if the drums are cracked, scored, deeply grooved, or beyond the specified out-of-round limit.

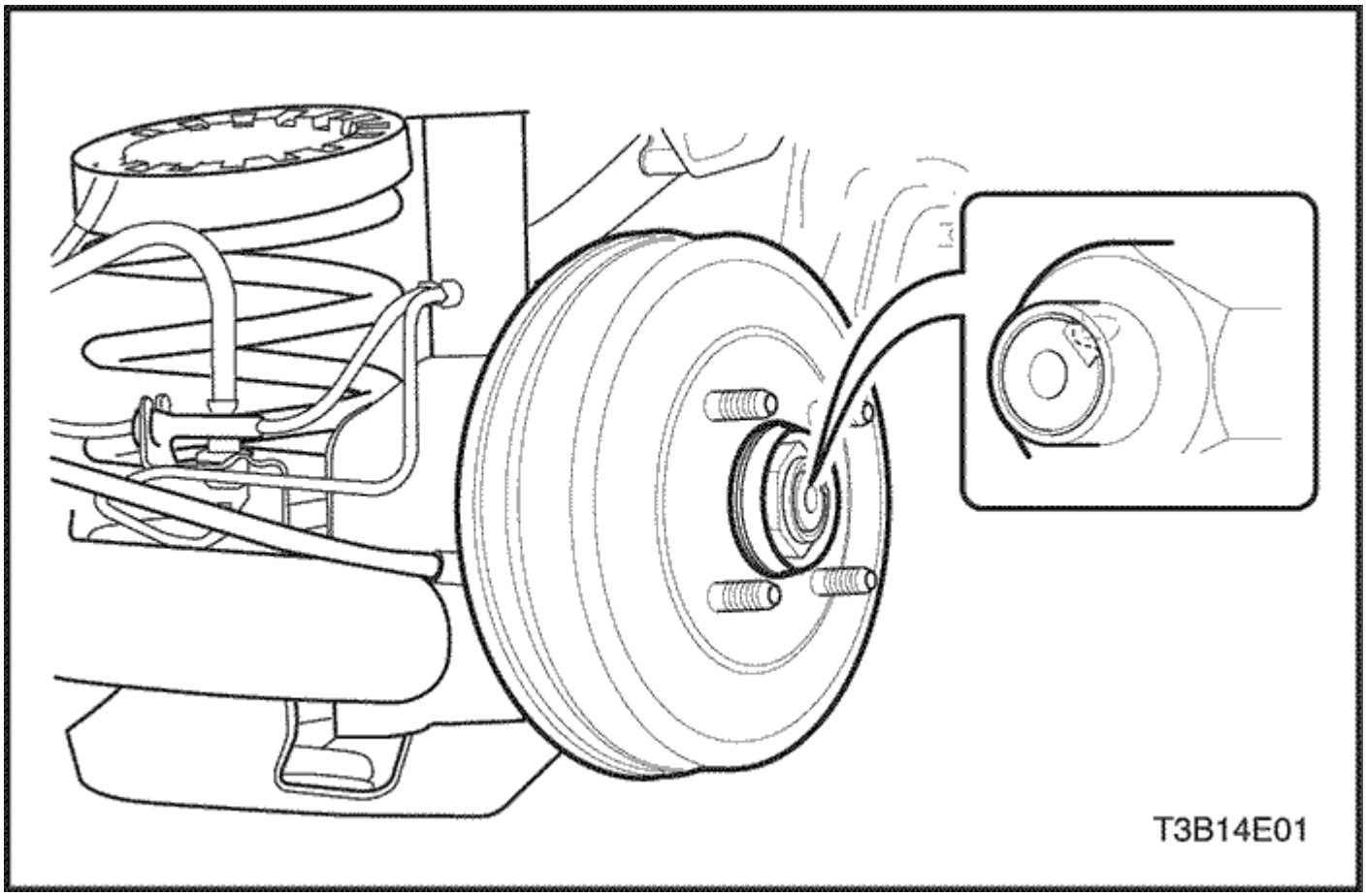
- A cracked drum is unsafe for further service andmust be replaced. Do not attempt to weld a cracked drum. Smooth out any slight scores.
- Heavy or extensive scoring will cause excessive brake lining wear and may require refinishing the drum braking surface.
- If the brake linings are slightly worn but are still reusable and the drum is grooved, polish the drum with a fine emery cloth but do not refinish it. Eliminating all grooves in the drum and smoothing the ridges on the lining would remove too much metal and lining. If left alone, the grooves

and ridges match, and satisfactory service can be obtained. If the brake linings need to be replaced, refinish a grooved drum. A grooved drum, used with a new lining, will not only wear the lining, but also will make it difficult, if not impossible, to obtain proper brake performance.

- An out-of-round drum makes accurate brake shoe adjustment impossible and is likely to cause excessive wear of other parts of the brake mechanism. An out-of-round drum can also cause severe and irregular tire tread wear, as well as a pulsating brake pedal.
- The extent to which a drum is worn or out of round can be measured accurately with an inside micrometer fitted with the proper extension rods. When measuring a drum for wear or the extent to which it is out of round, take measurements from the inside edge to the outside edge of the machined surface at 90-degree intervals around the circumference of the drum. When the drum exceeds the specified out-of-round limit, refinish the drum.

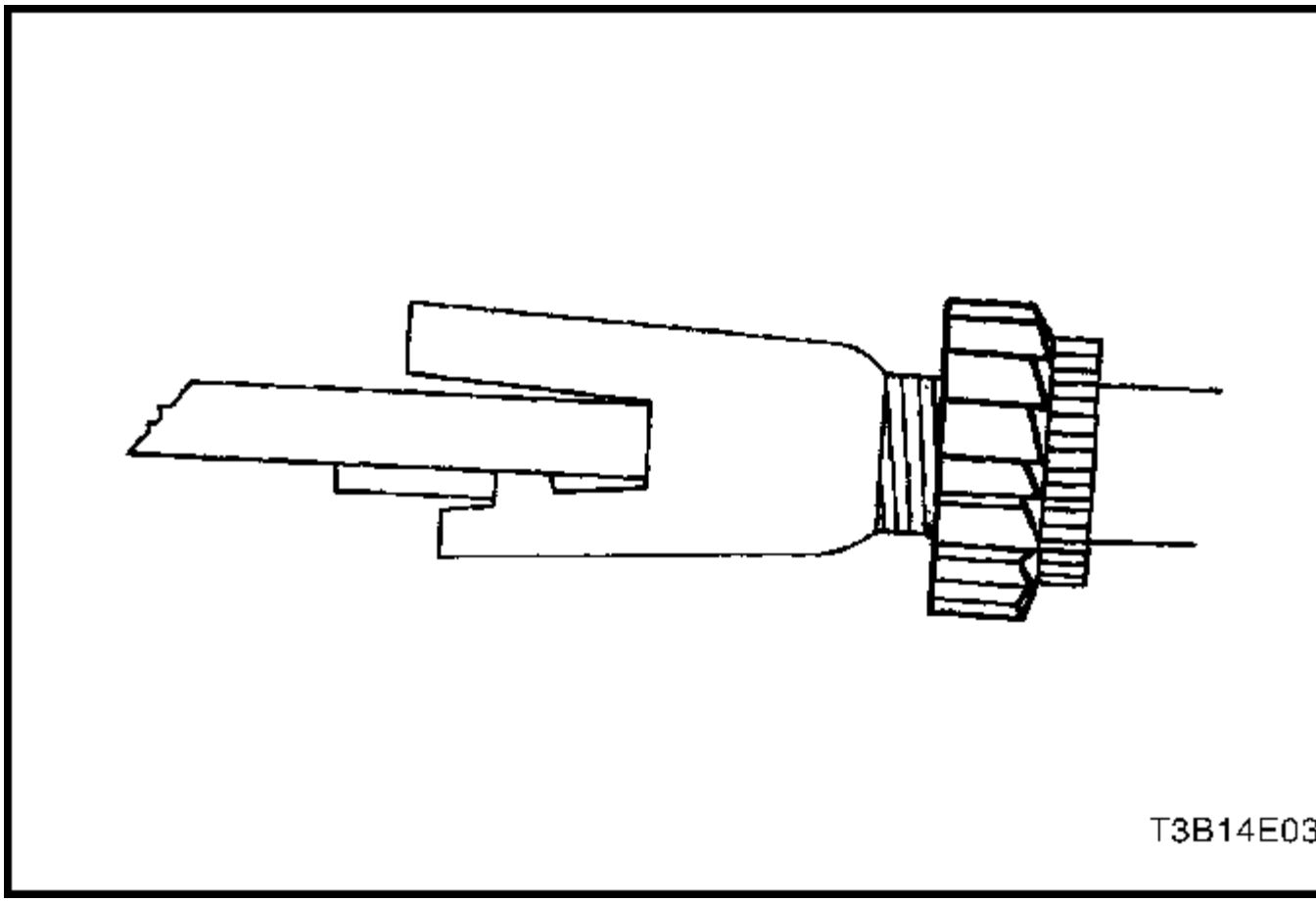
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

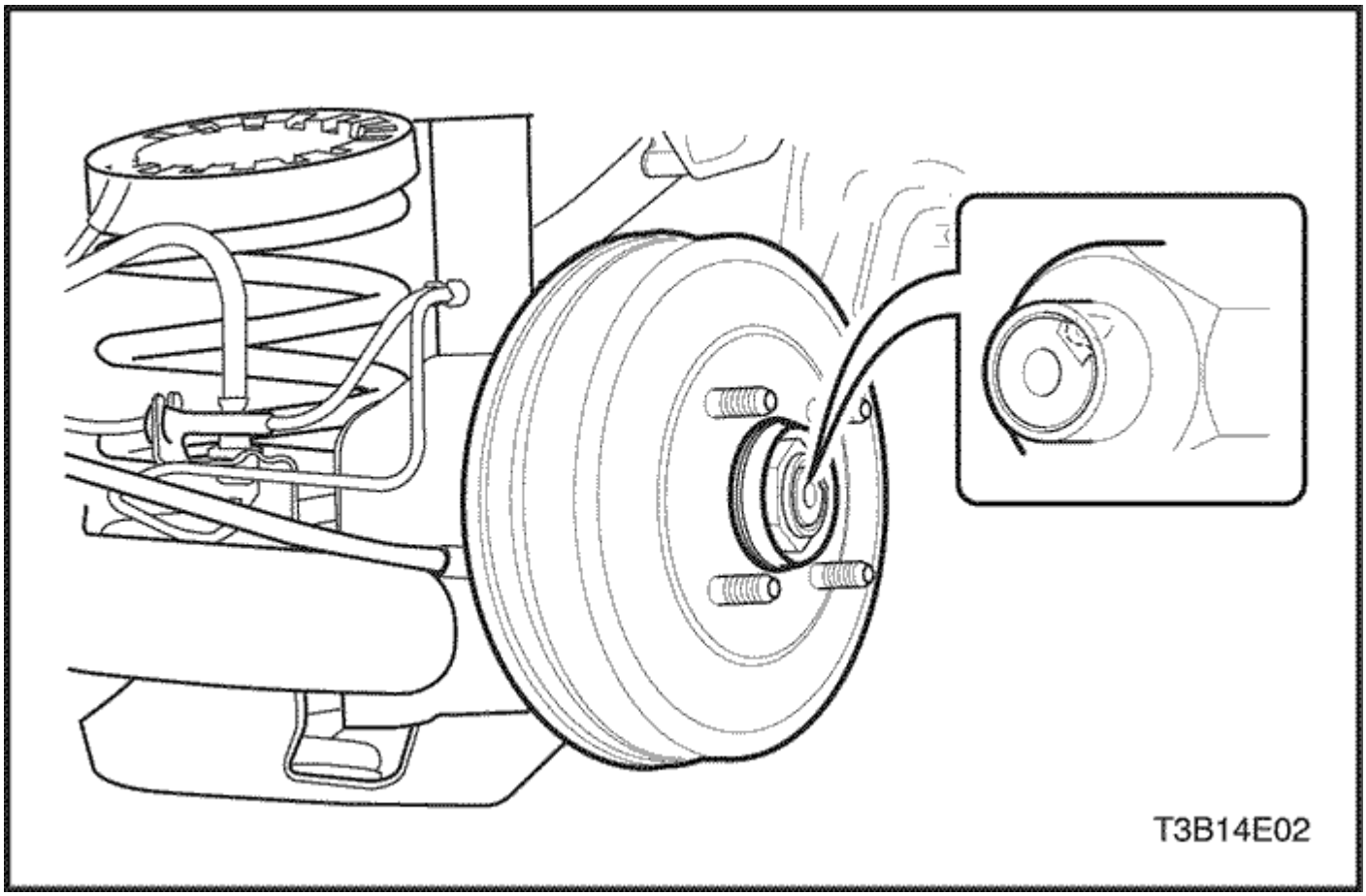


Brake Adjustment
Removal Procedure

1. Release the parking brake.
2. Operate the brake at least 10 times until the jumping of the adjustment spring on the adjustment nut can no longer be heard on either brake drum.
3. Raise and suitably support the vehicle.
4. Remove the rear wheels. Refer to *Section 2E, Tires and Wheels.* Mark the position of the wheels relative to the wheel hubs.
5. Remove the caulking nut.
6. Remove the brake drum.



7. Using the rear brake adjuster nut, turn the adjuster assembly in until there is a sufficient amount of drag on the brake drum.
8. Make sure that the parking brake lever stops are against the edge of the shoe web. If they are not, loosen the parking brake cable at the equalizer. Refer to*Section 4G, Parking Brake.*



Installation Procedure

1. Position the rear brake drum. Fasten the rear hub caulking nut.

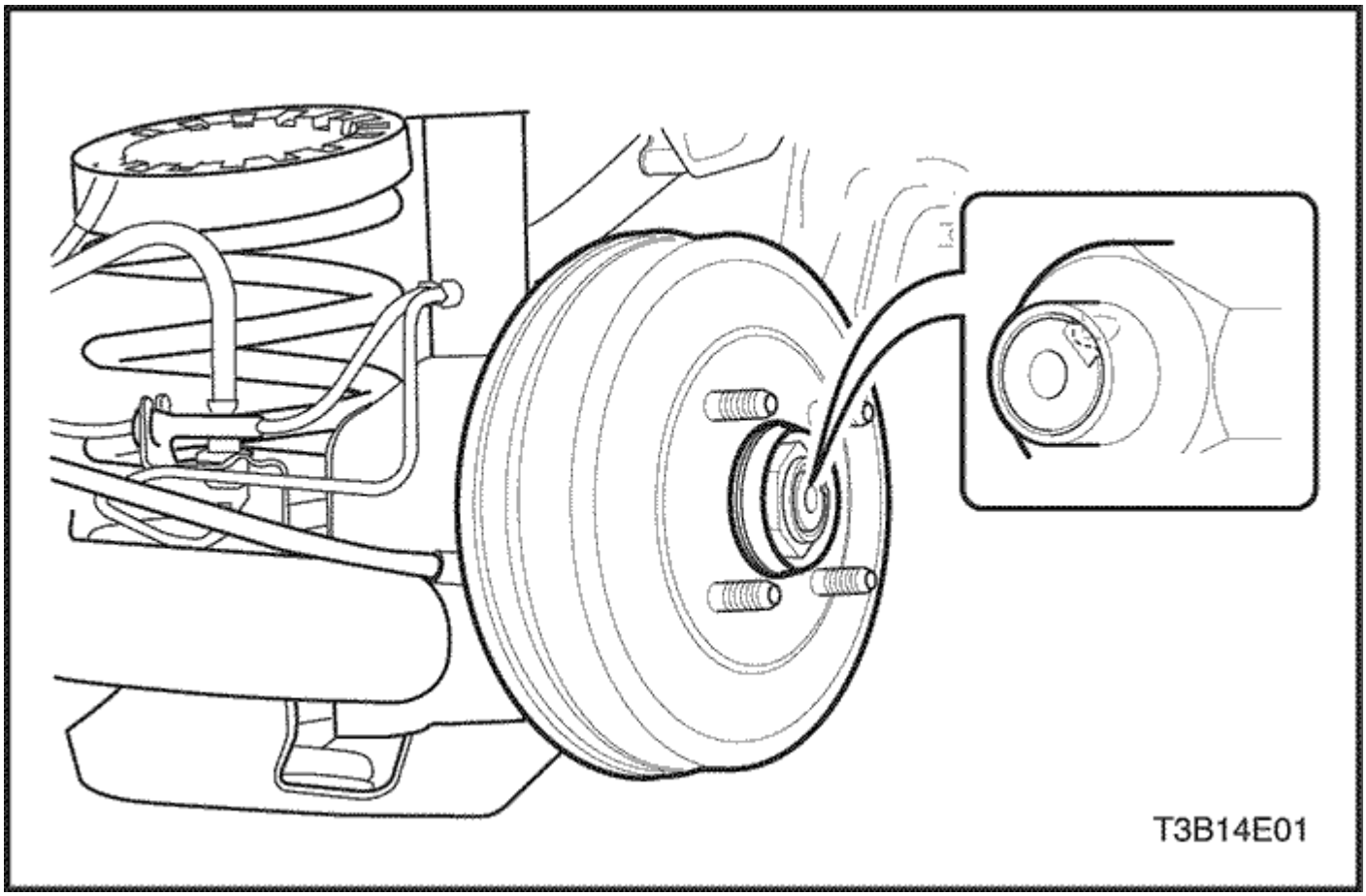
   Tighten
   Tighten the one-piece rear hub caulking nut to 190 N•m (140 lb-ft).

2. Install the rear wheels. Refer to *Section 2E, Tires and Wheels.* Mark the position of the wheels relative to the wheel hubs.

   Important : The brake pedal must be operated more than 10 times. When the clicking can no longer be heard, the clearance between the brake shoe and drum is adjusted.

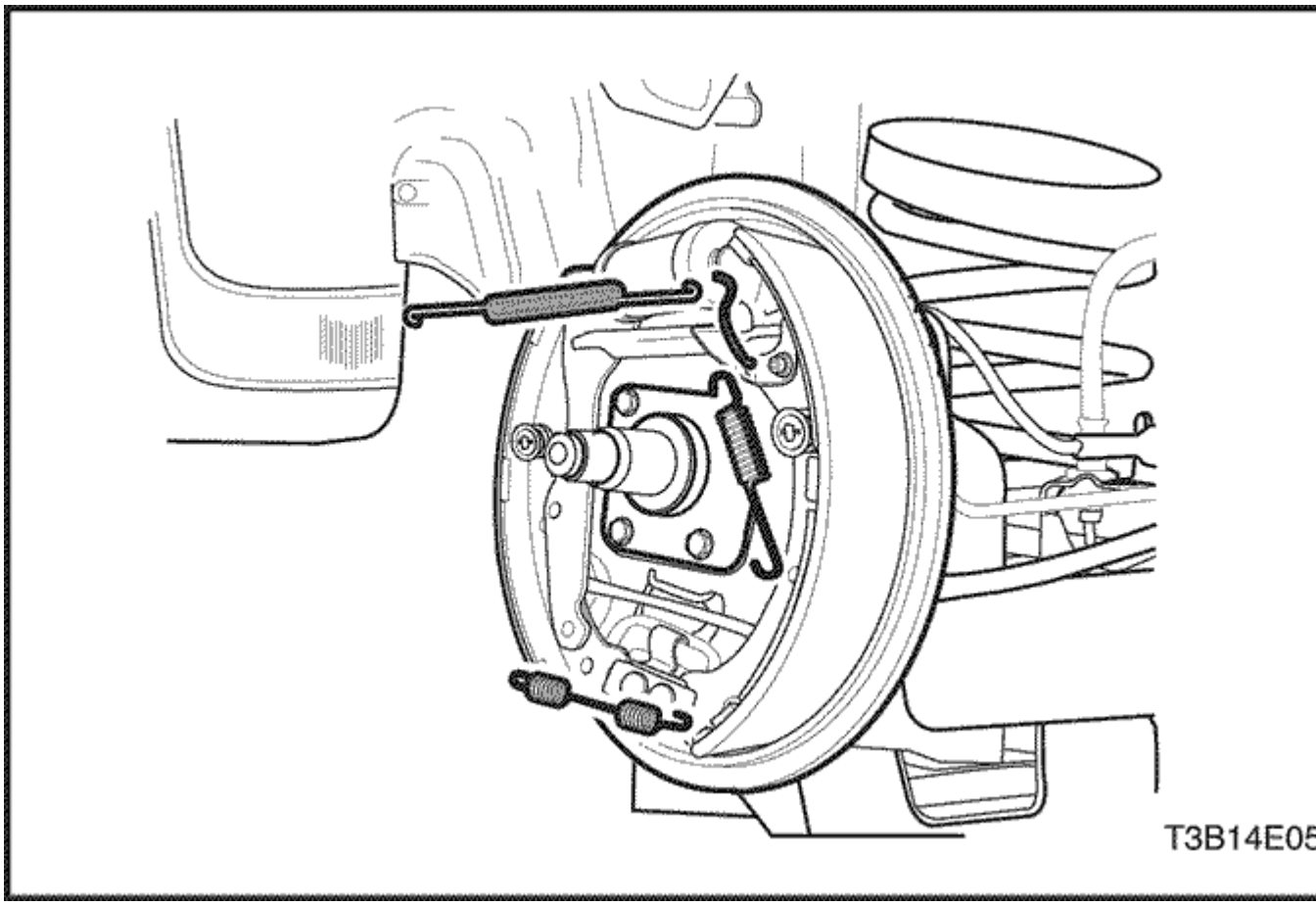
3. Apply the foot brake several times until the clicking of the adjustment actuator can no longer be heard.

4. Adjust the parking brake. Refer to *Section 4G, Parking Brake.*

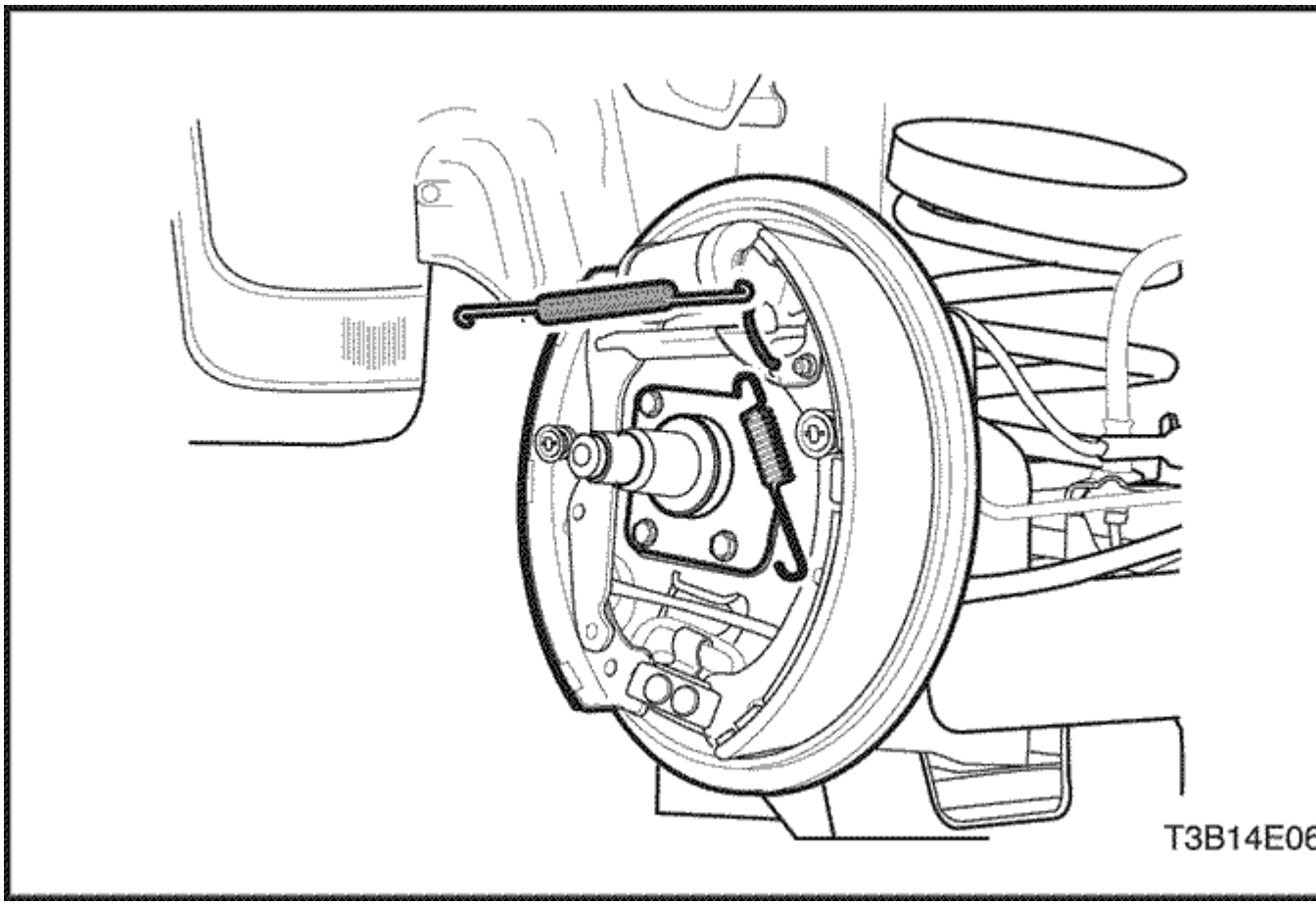


Shoe and Lining
Removal Procedure

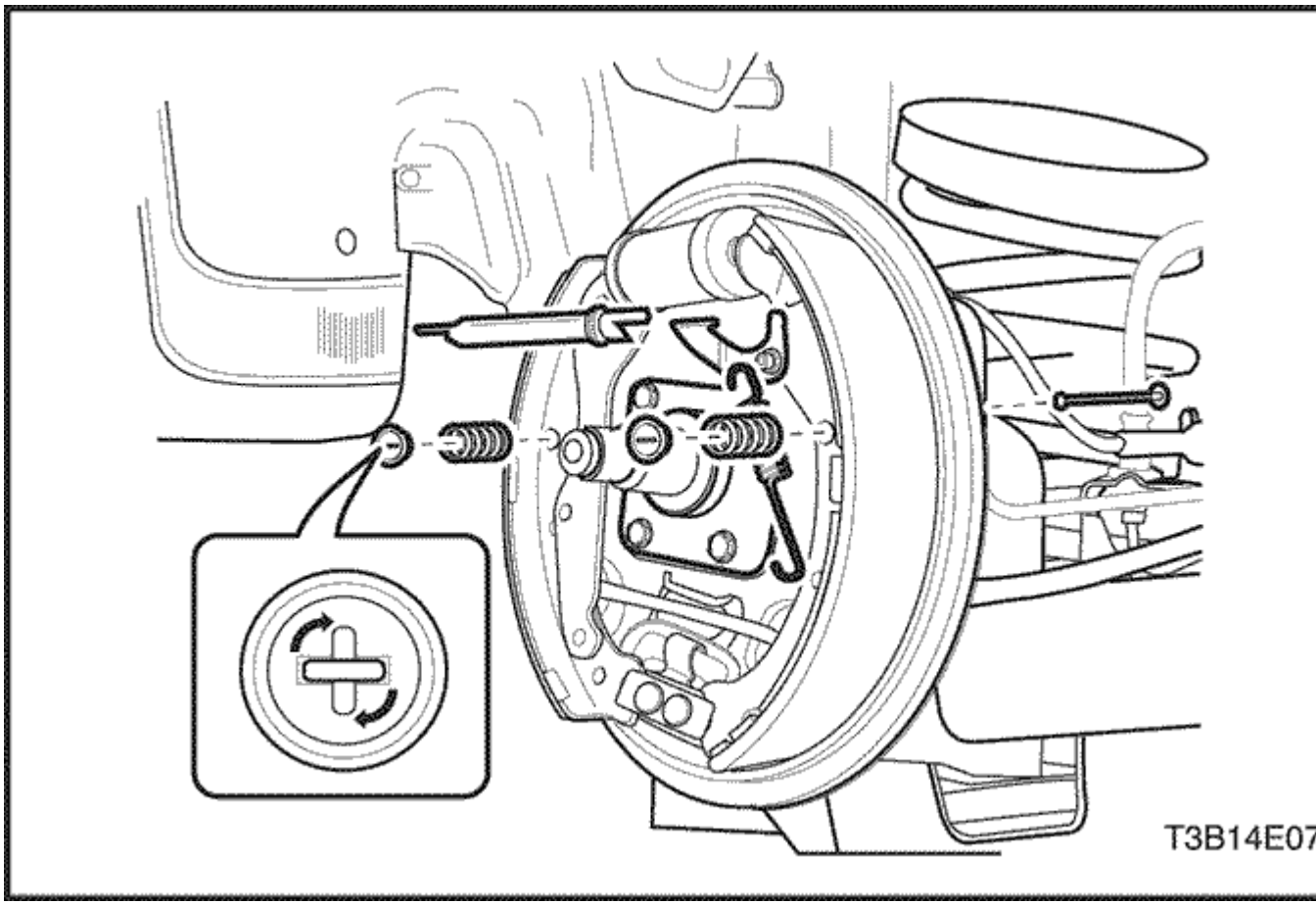
1. Raise and suitably support the vehicle.
2. Remove the rear wheels. Refer to *Section 2E, Tires and Wheels.* Mark the position of the wheels relative to the wheel hubs.
3. Mark the position of the wheels relative to the wheel hub.
4. Loosen the parking brake cable. Refer to *Section 4G, Parking Brake.* Mark the position of the wheels relative to the wheel hubs.
5. Remove the drum caulkimg nut and the brake drum.



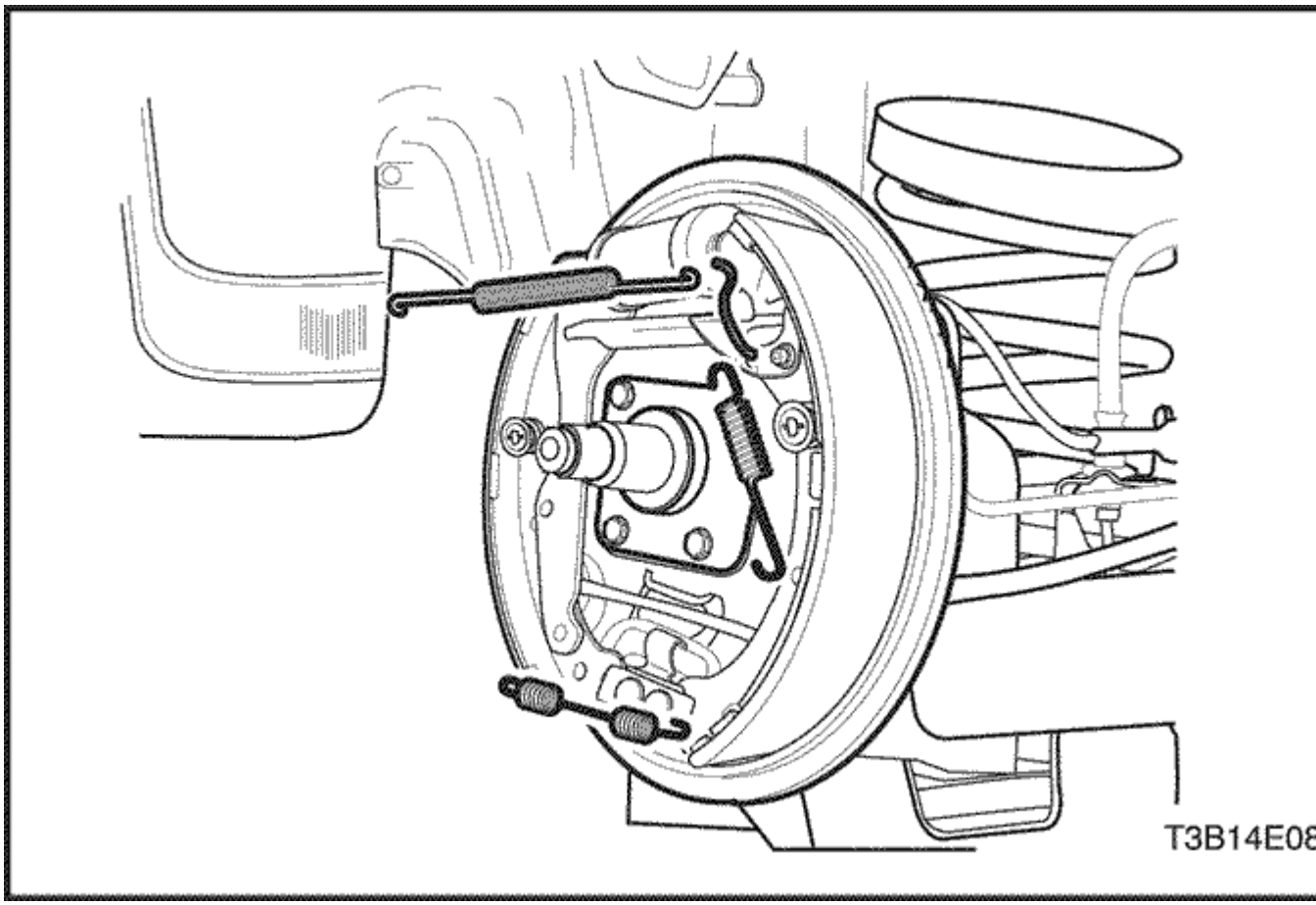
6. Loosen the leading shoe hold-down return spring. (The ABS braking system configuration is illustrated.)



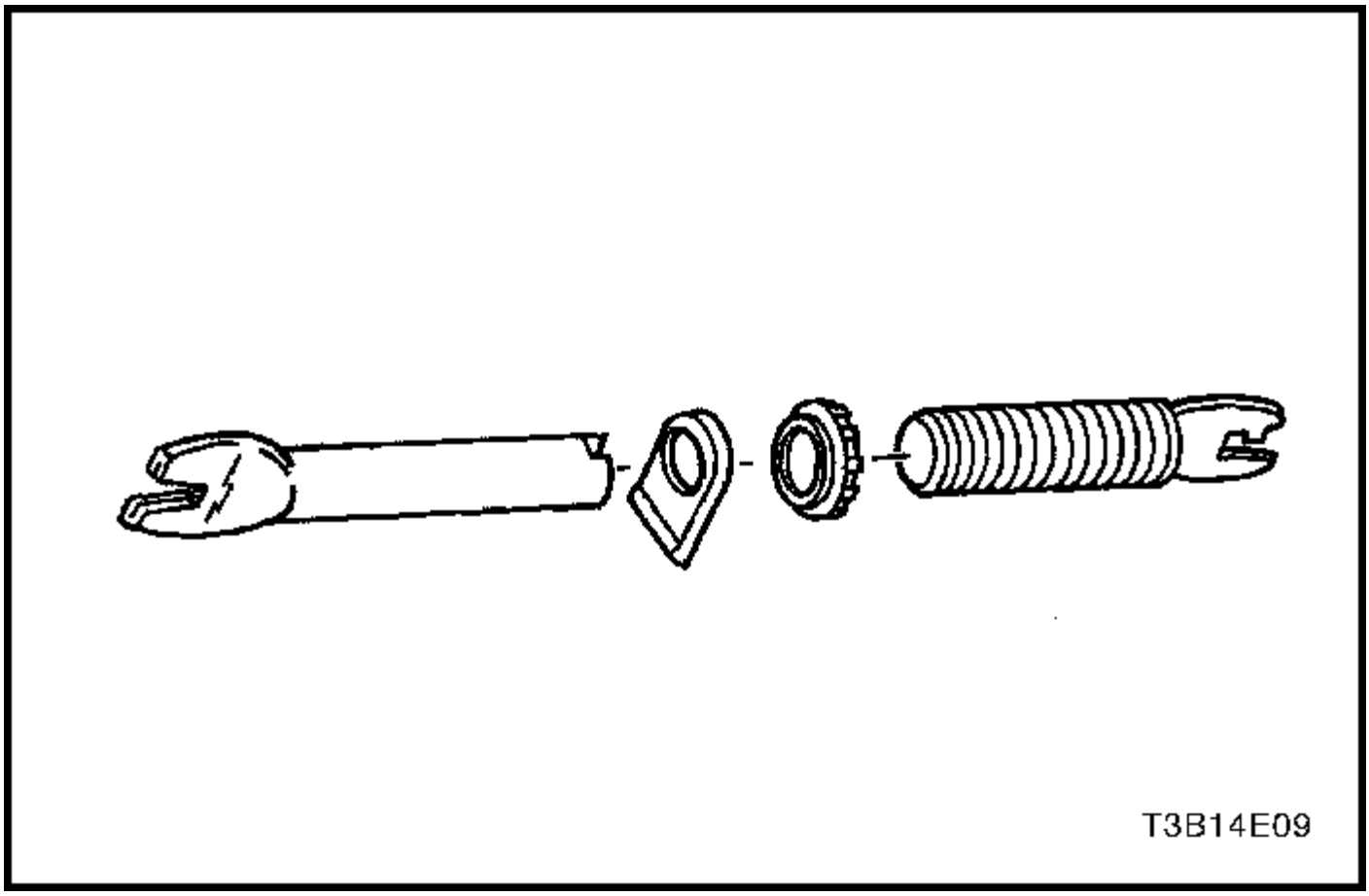
7. Disconnect the upper link of the connecting link spring of the leading shoe to relieve tension on the upper return spring.
8. Remove the upper return spring and the adjuster.



9. Unfasten the trailing shoe and lining assembly holddown return spring.



10. Disconnect the trailing shoe and lining assembly on the right side.
11. Detach the lower return spring.

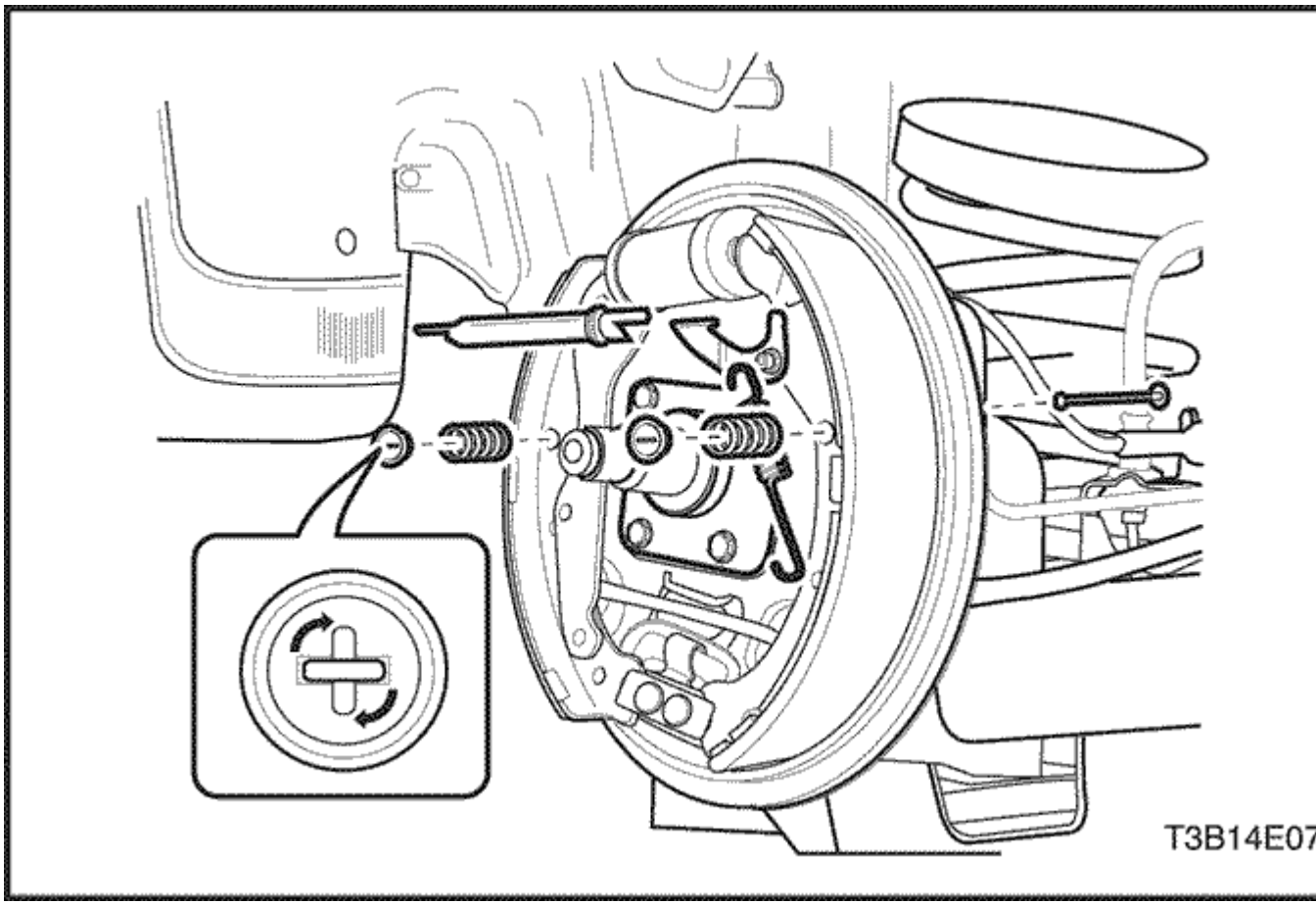


Installation Procedure

1. Measure the minimum brake lining thickness. Refer to "Lining Inspection" in this section.
2. Clean the adjuster assembly and apply grease.

   Notice : If any parts are of questionable strength or quality because of heat discoloration, excessive stress, or wear, the shoes, the springs, or the adjuster assembly should be replaced.

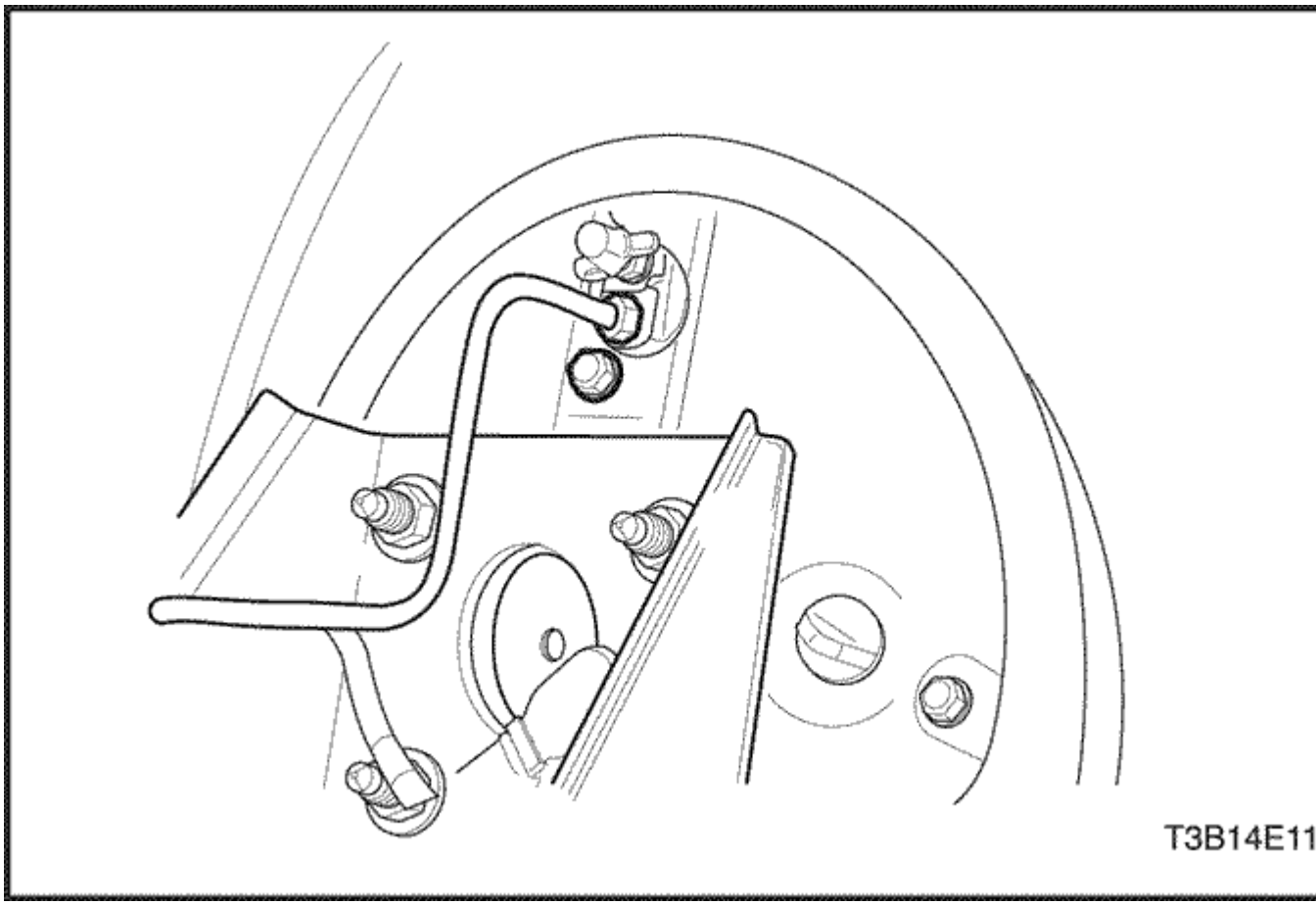
3. Inspect the threads of the adjuster assembly for smooth rotation.



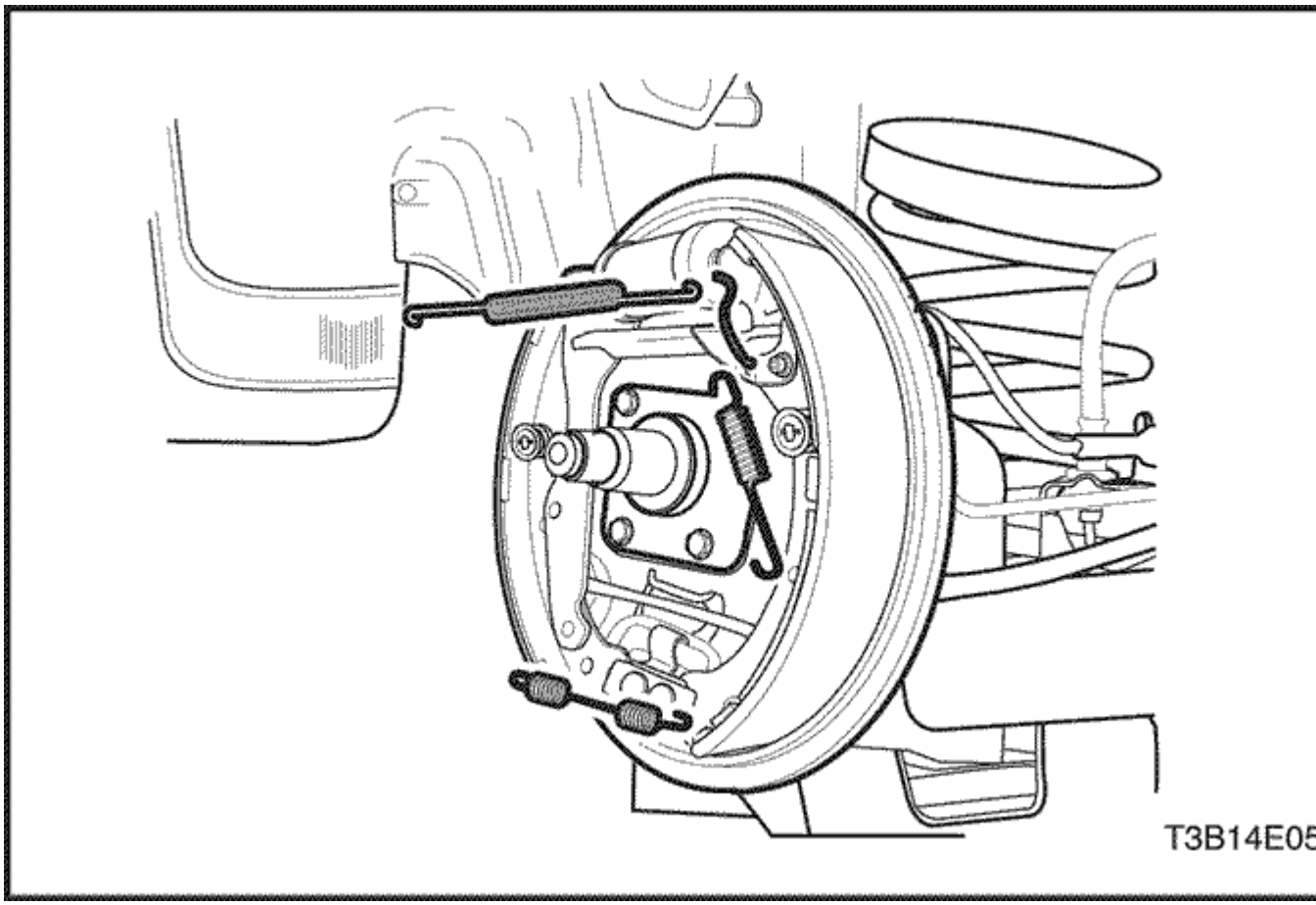
4. Install the trailing shoe and lining assembly with the hold-down spring, the washer, and the pin.
5. Make sure the parking brake cable is properly routed and attached to the shoe lever.

   Notice : Do not overstretch the lower return spring.

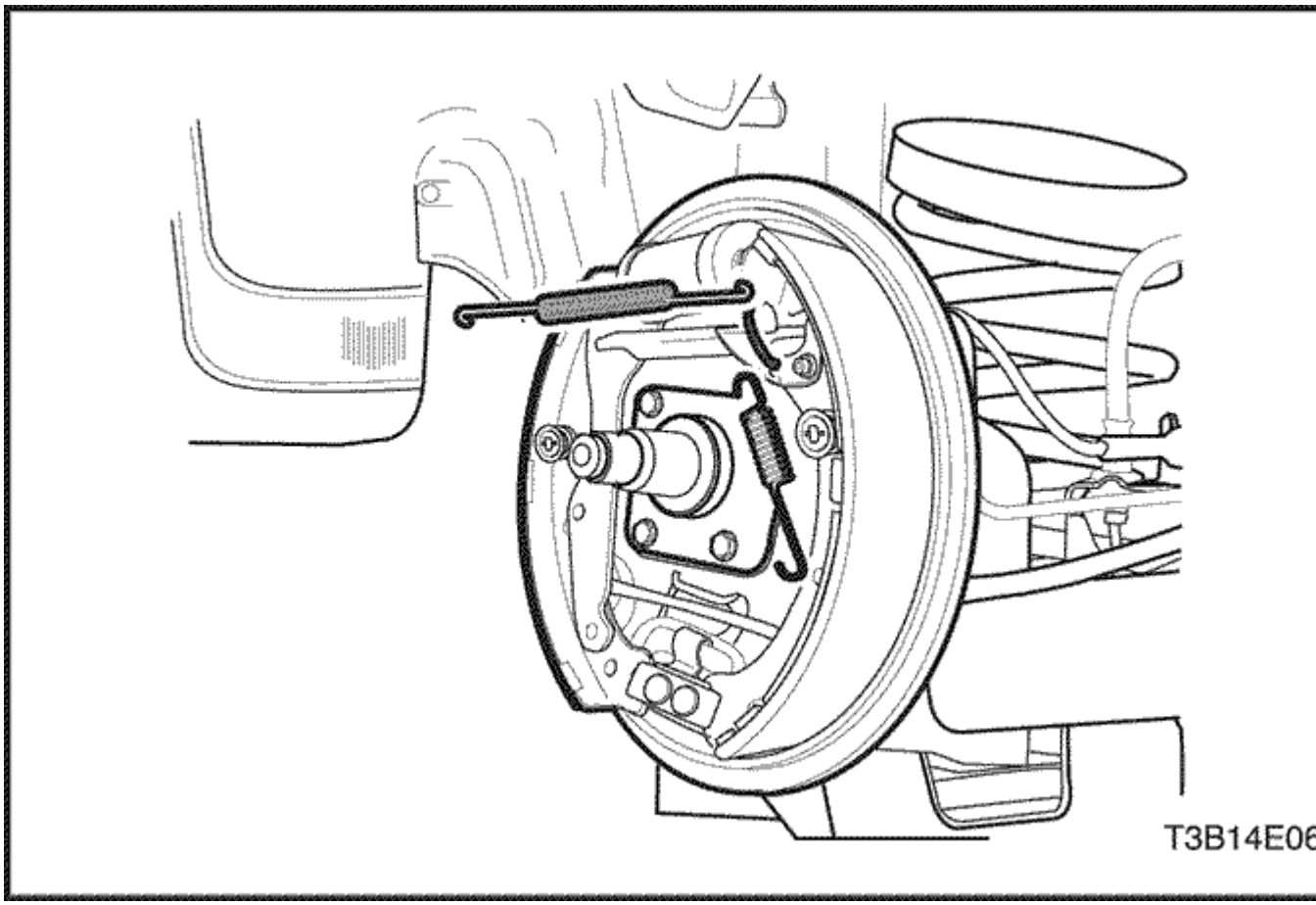
6. Fasten the lower return spring on the shoe.



7. Position the leading shoe and the adjuster assembly against the backing plate.
8. Fasten the lower return spring to the leading shoe.



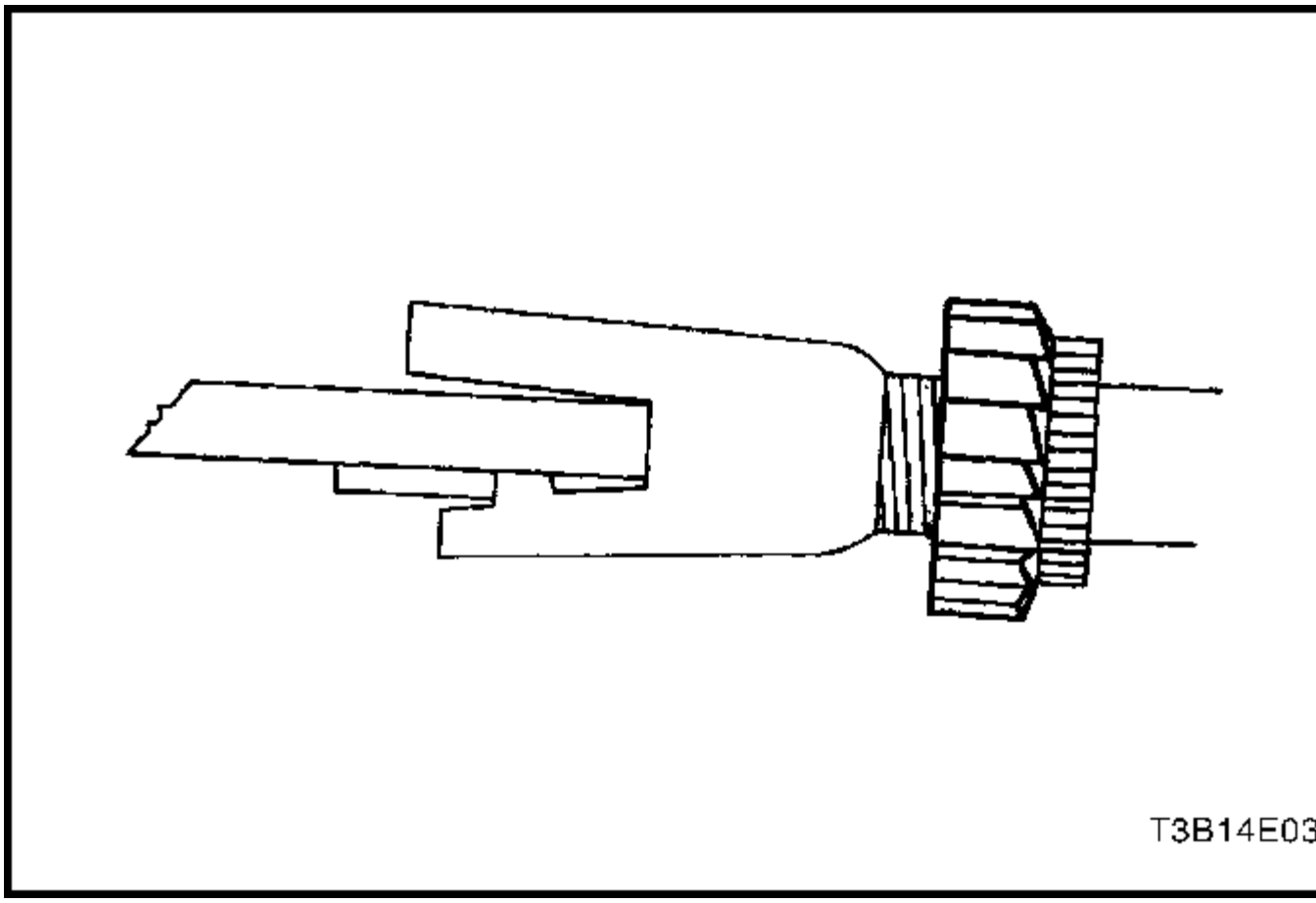
9. Install the adjuster assembly.
10. Turn the adjuster in as far as possible.
11. Position the spring clip toward the backing plate.
12. Install the leading shoe with the hold-down spring.



13. Attach the leading shoe upper link-spring connection, which applies tension to the upper return spring.

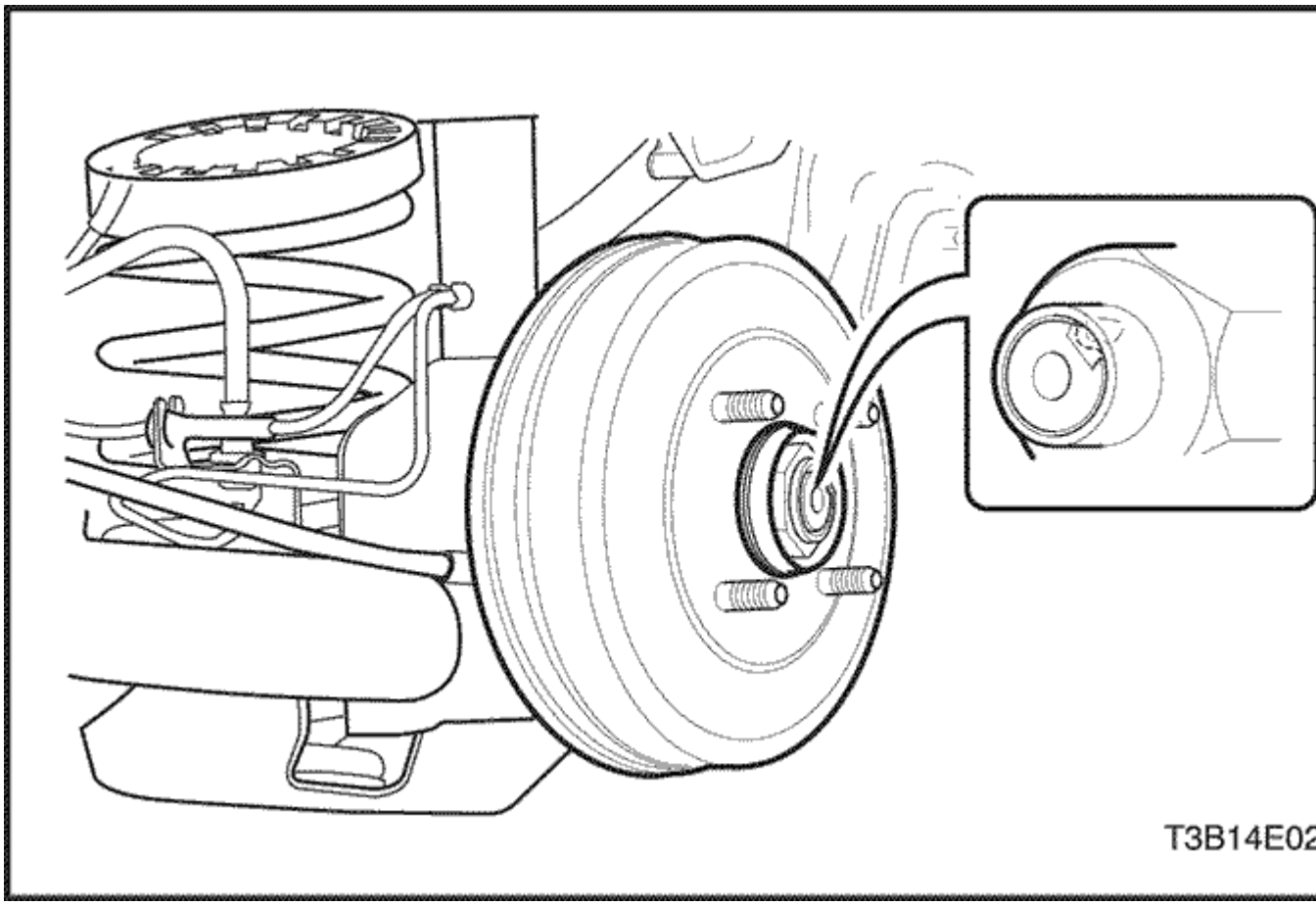
Notice : Do not overstretch the upper return spring.

14. Install the upper return spring from the spring connecting link to the brake shoe.



Notice : The nut must not lock firmly at the end of the adjustment assembly.

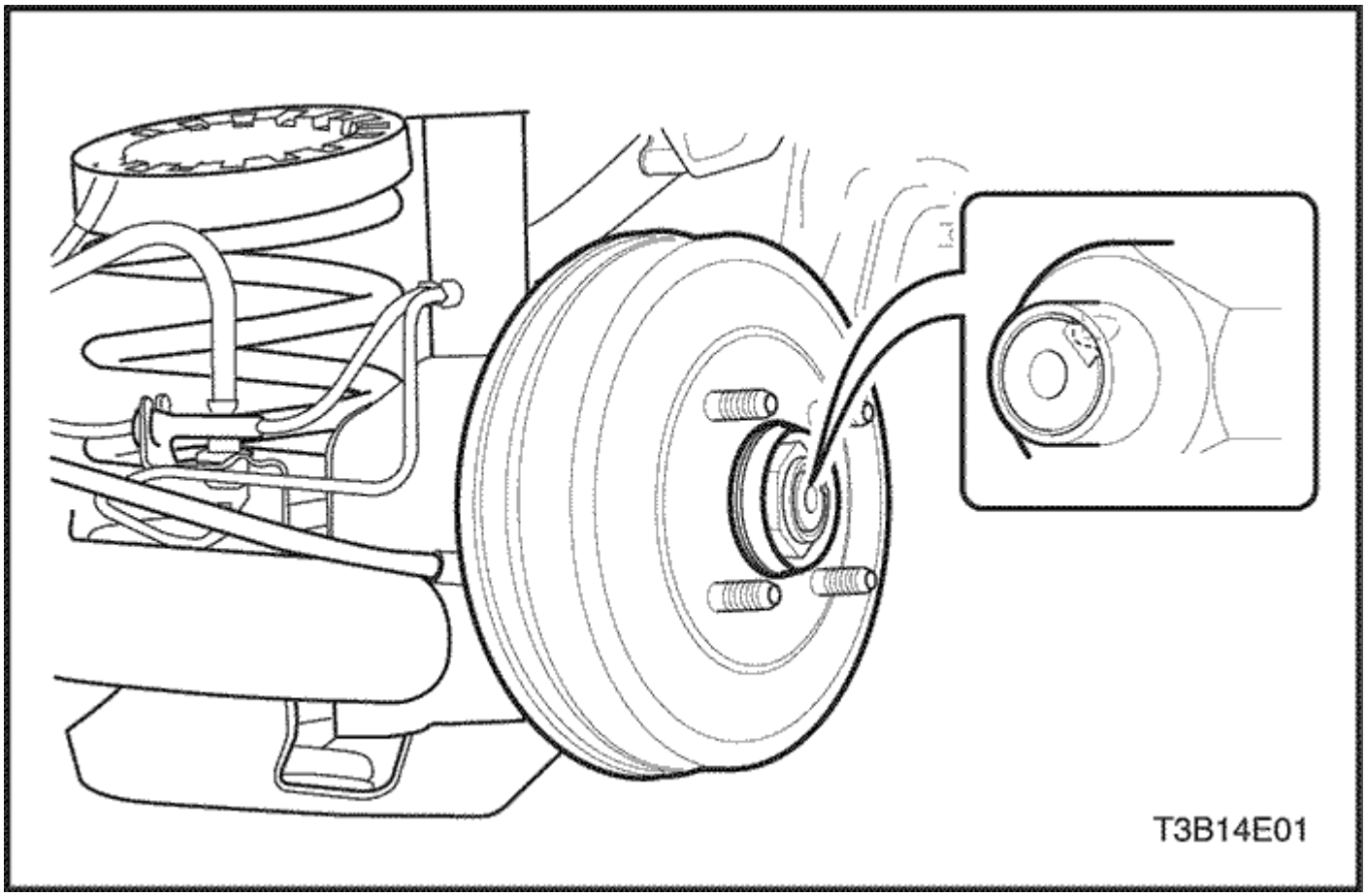
15. Before installing the brake drum, make sure the adjuster assembly nut is drawn all the way to the stop.



16. Install the brake drum and fasten it with the rear hub caulking nut .

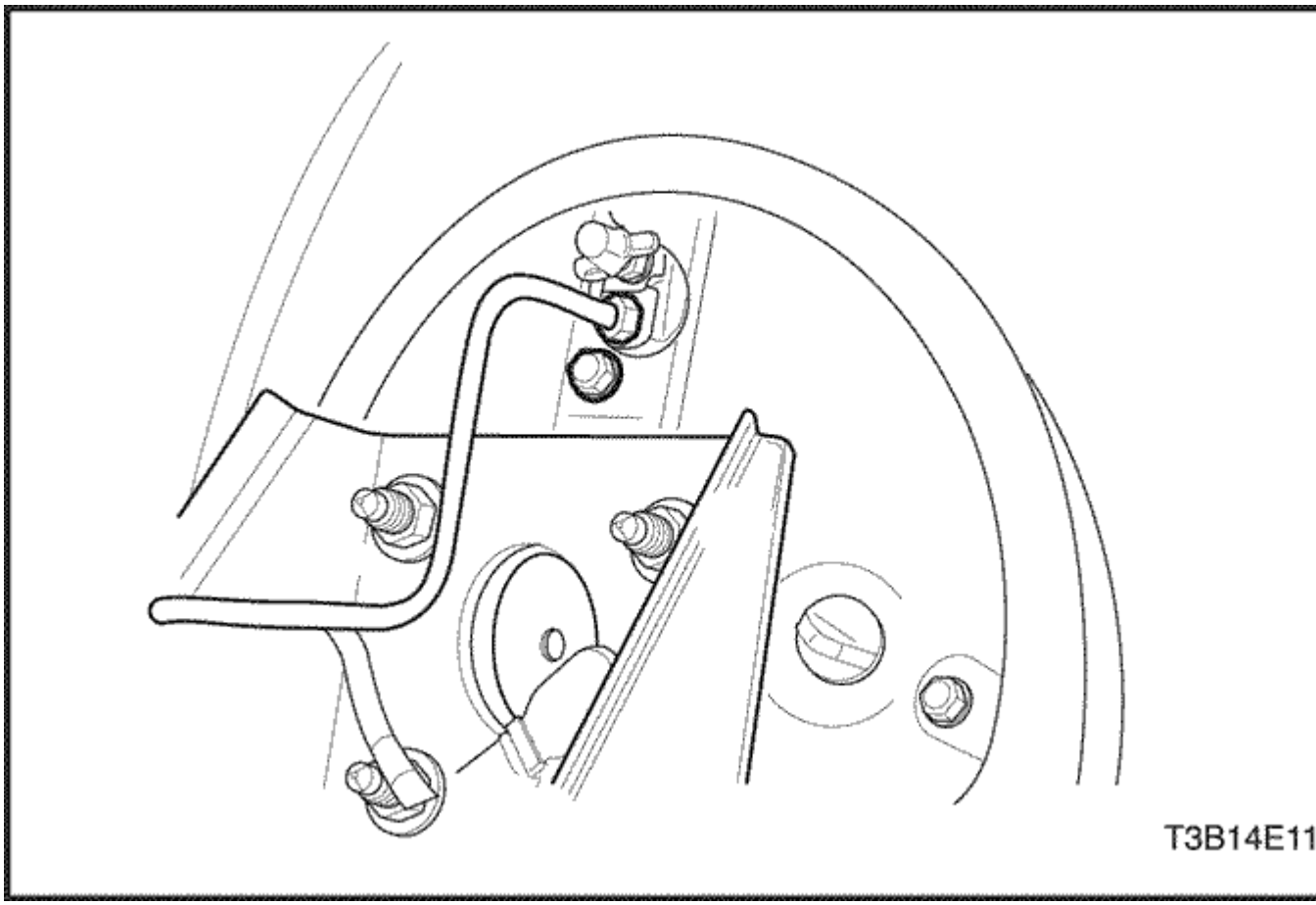
Tighten
Tighten the rear hub caulking nut to 190 N•m (140 lb-ft).

17. Install the rear wheels. Refer to *Section 2E, Tires and Wheels.*
18. Adjust the rear wheel brakes. Refer to "Brake Adjustment" in this section.
19. Adjust the parking brake. Refer to *Section 4G, Parking Brake.*
20. Lower the vehicle.

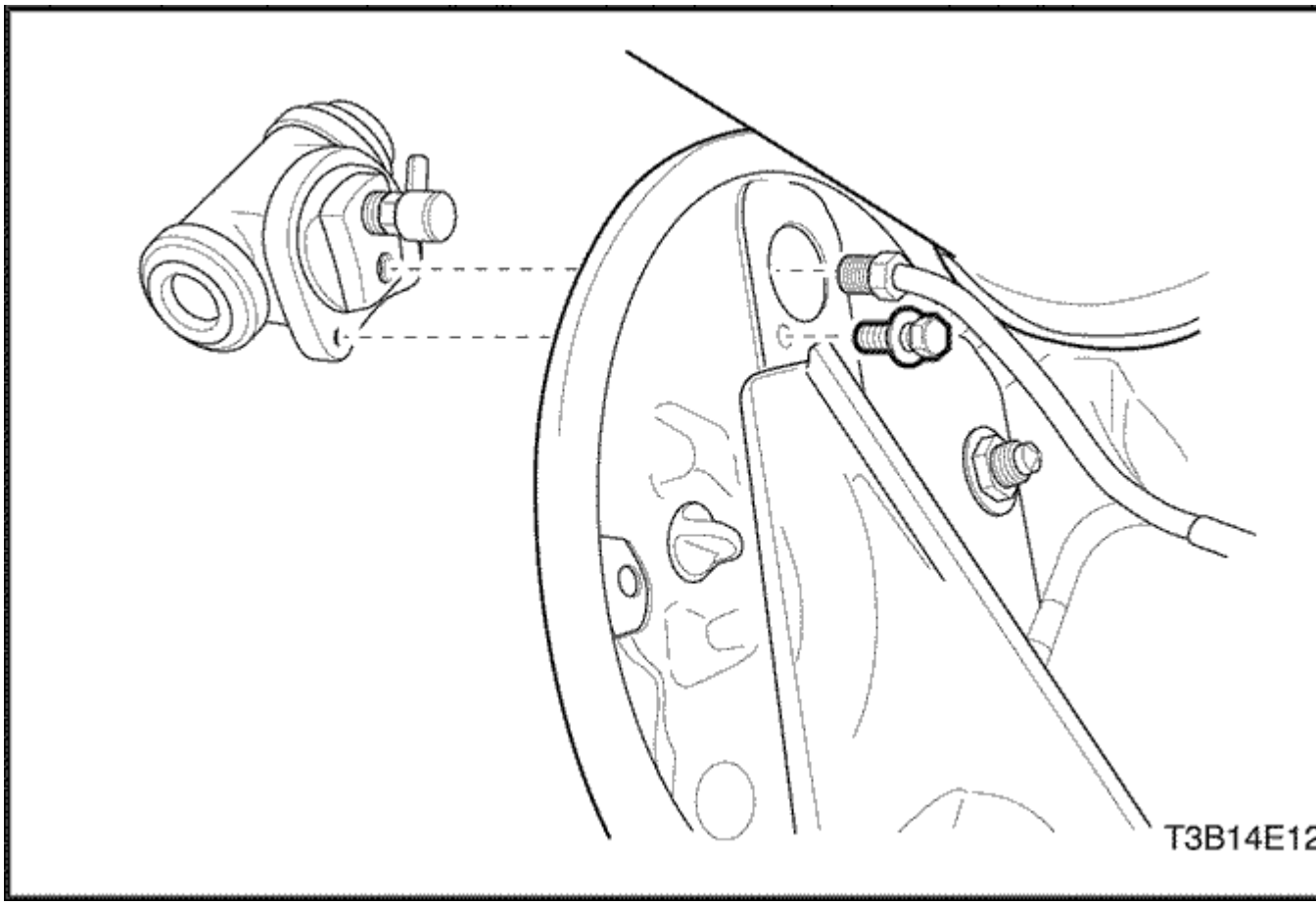


Wheel Cylinder Assembly
Removal Procedure

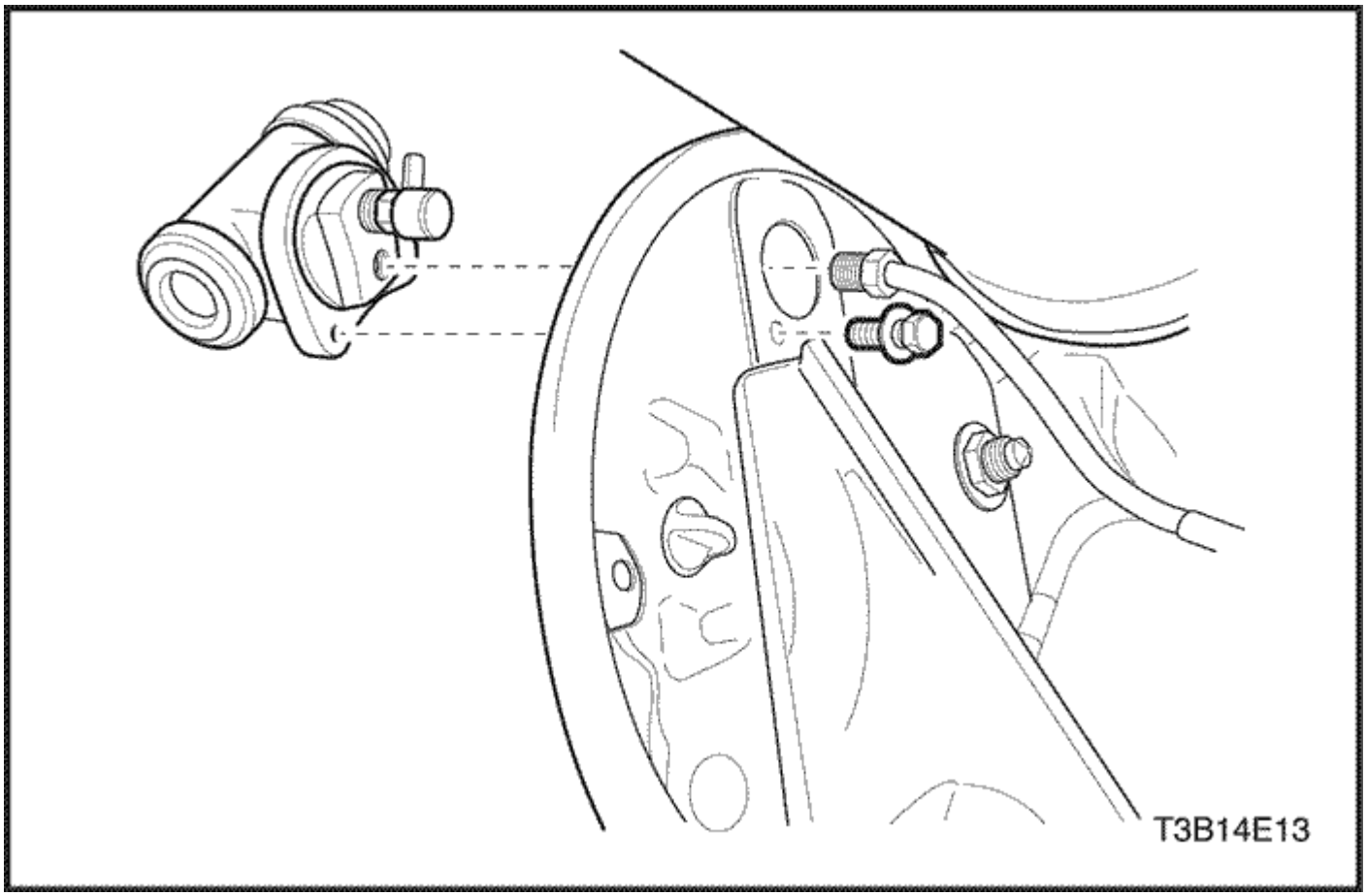
1. Raise and suitably support the vehicle.
2. Remove the rear wheels. Refer to *Section 2E, Tires and Wheels.*
3. Mark the position of the wheels relative to the wheel hubs.
4. Remove the brake drum.
5. Remove the shoe and lining. Refer to "Shoe and Lining" in this section.



6. Clean dirt and foreign material from around the wheel cylinder brake line inlet, the pilot, and the bolt.
7. Disconnect the brake line from the wheel cylinder.
8. Plug the opening in the brake line to prevent fluid loss or contamination.



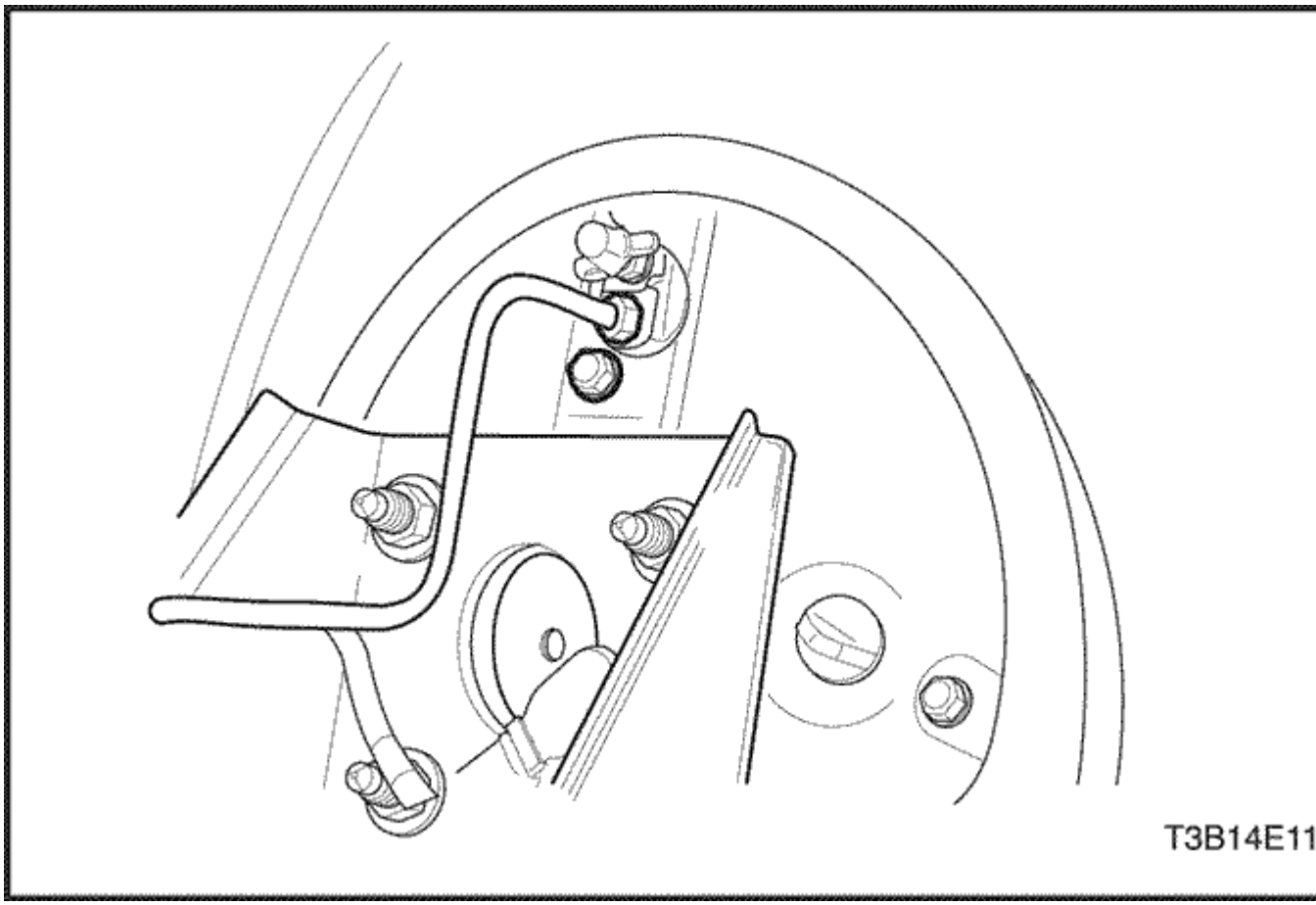
9. Remove the wheel cylinder-to-backing plate bolt.
10. Gently tap out the wheel cylinder from the backing plate, using care not to damage the bleeder valve or its cap.



Installation Procedure

1. Install the wheel cylinder to the backing plate with the wheel cylinder bolt.

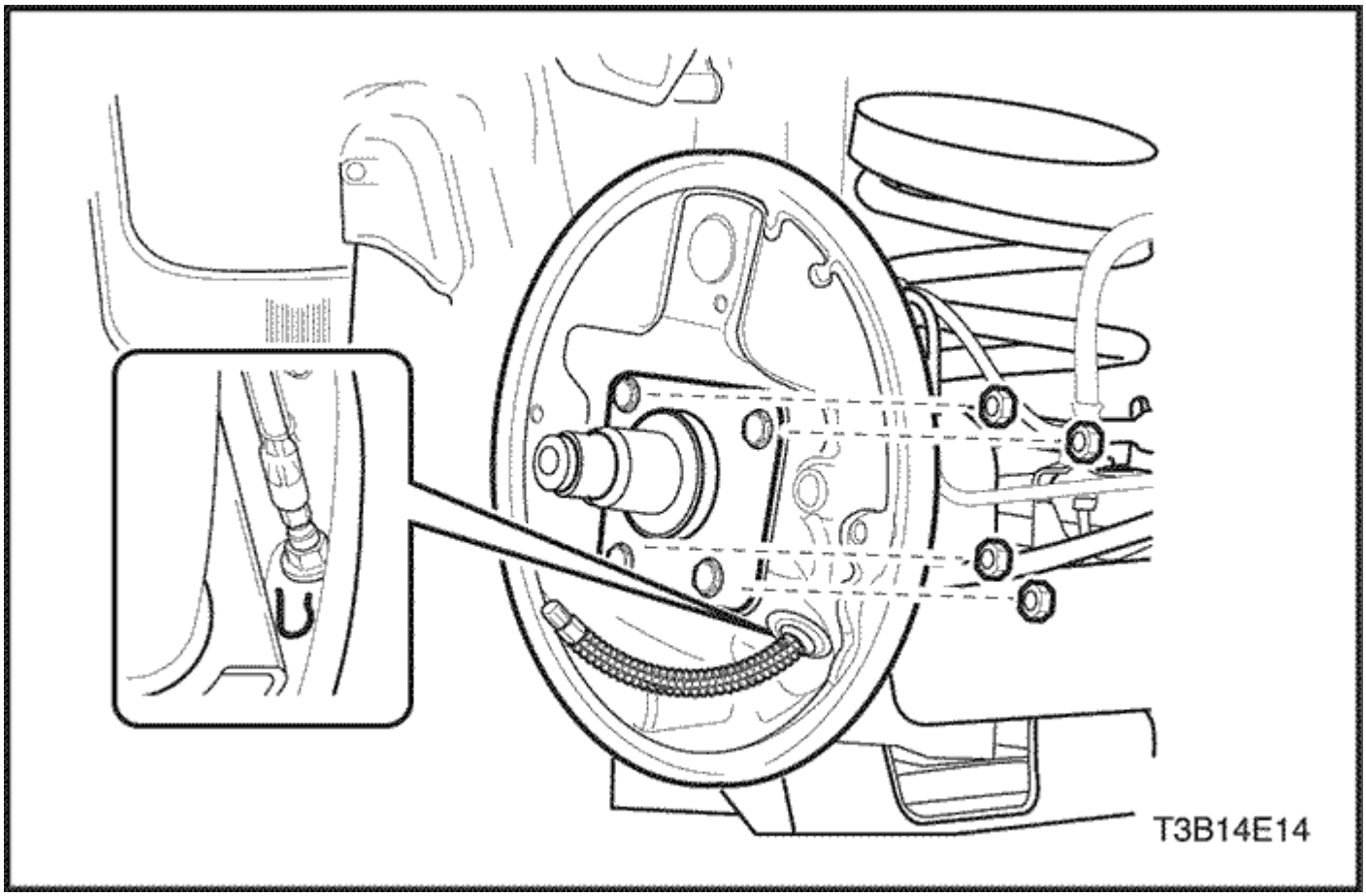
   Tighten
   Tighten the wheel cylinder-to-backing plate bolt to 8 N•m (71 lb-in).



2. Connect the brake line to the wheel cylinder.

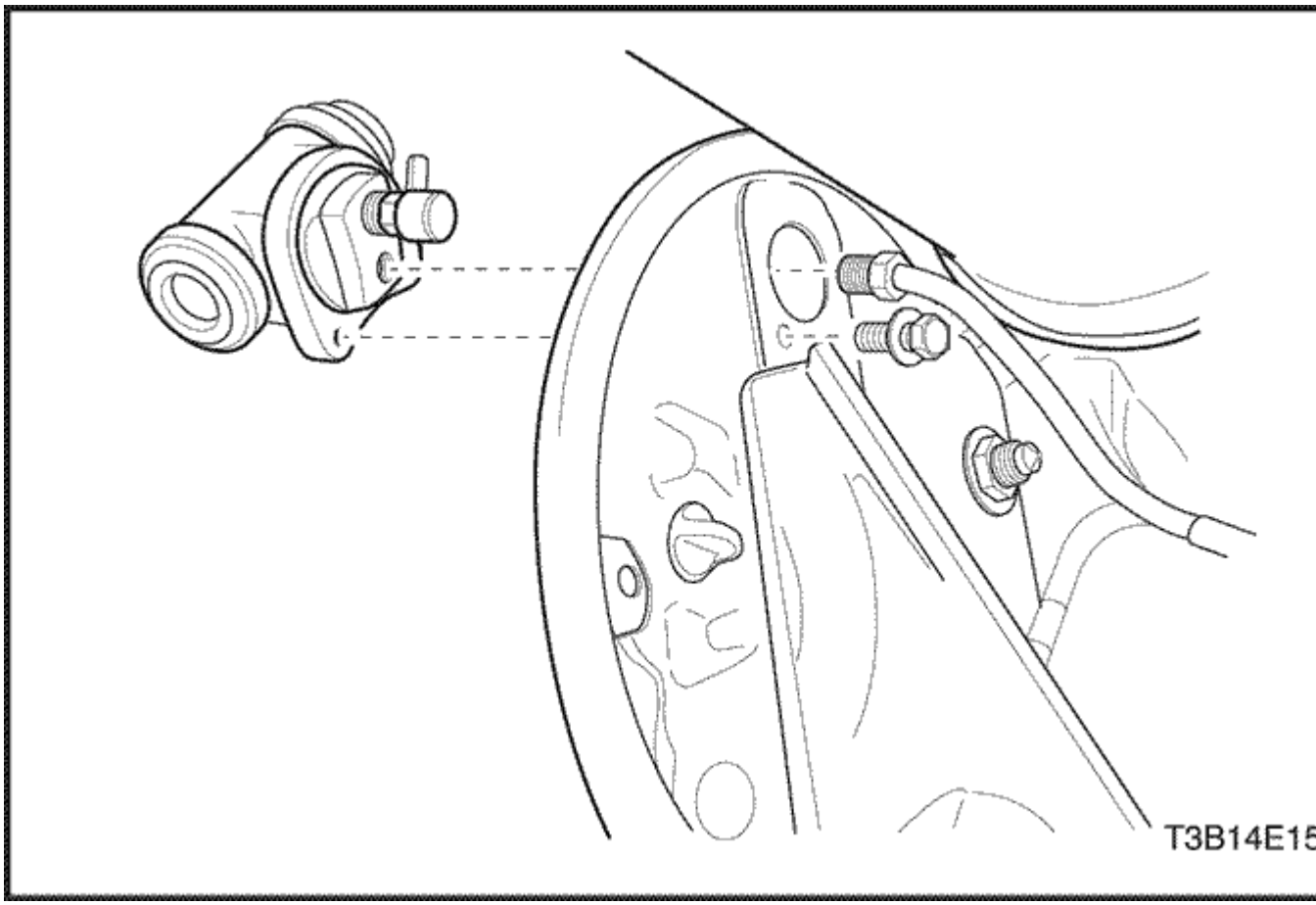
   Tighten
   Tighten the brake line to 16 N•m (12 lb-ft)

3. Install the shoe and lining, and the brake drum. Refer to "Shoe and Lining" in this section.
4. Bleed the brakes. Refer to *Section 4A, Hydraulic Brakes.*



Backing Plate
Removal Procedure

1. Raise and suitably support the vehicle.
2. Remove the brake shoe components, including complete removal of the parking brake with the retainer. Refer to "Shoe and Lining" in this section and*Section 4A, Hydraulic Brakes.*
3. Remove the nuts that secure the wheel hub assembly to the backing plate.
4. Remove the brake line and plug the opening in the line to prevent fluid loss or contamination.



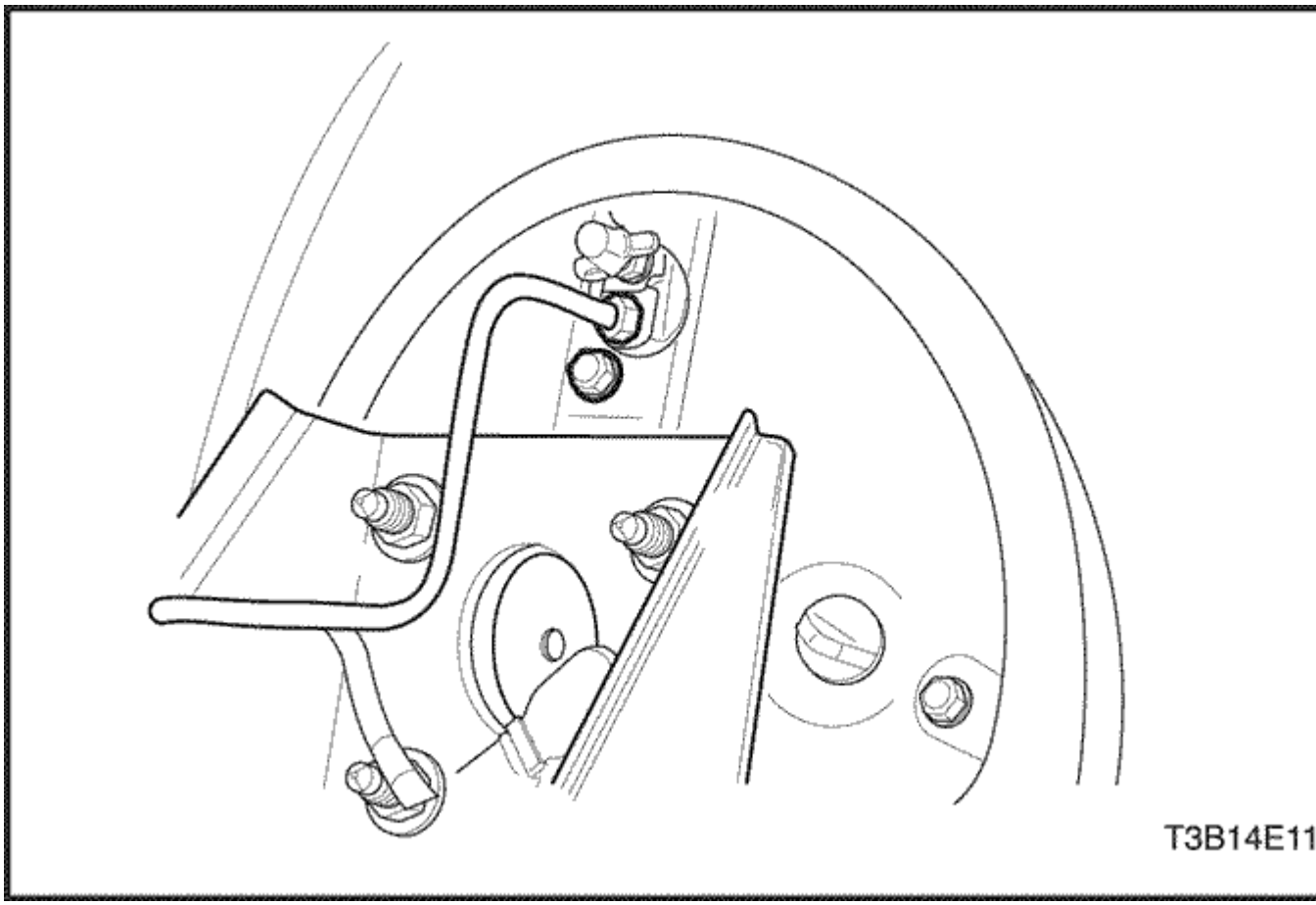
5. Remove the wheel cylinder assembly. Refer to "Wheel Cylinder Assembly" in this section.
6. Remove the wheel hub assembly.
7. In case of ABS brake, disconnect the cable that goes to the wheel speed sensor.
8. Separate the backing plate and the gasket.

Installation Procedure

1. Place the backing plate with a new gasket on the wheel hub. (The ABS hub is shown.).
2. Insert the complete wheel hub/backing plate assembly into the rear axle plate. In case of ABS Brakes, Install the nuts and connect the wheel speed sensor.

   Tighten

Tighten the brake wheel hub/backing plate-to-rear axle nuts to 28 N•m (21 lb-ft).



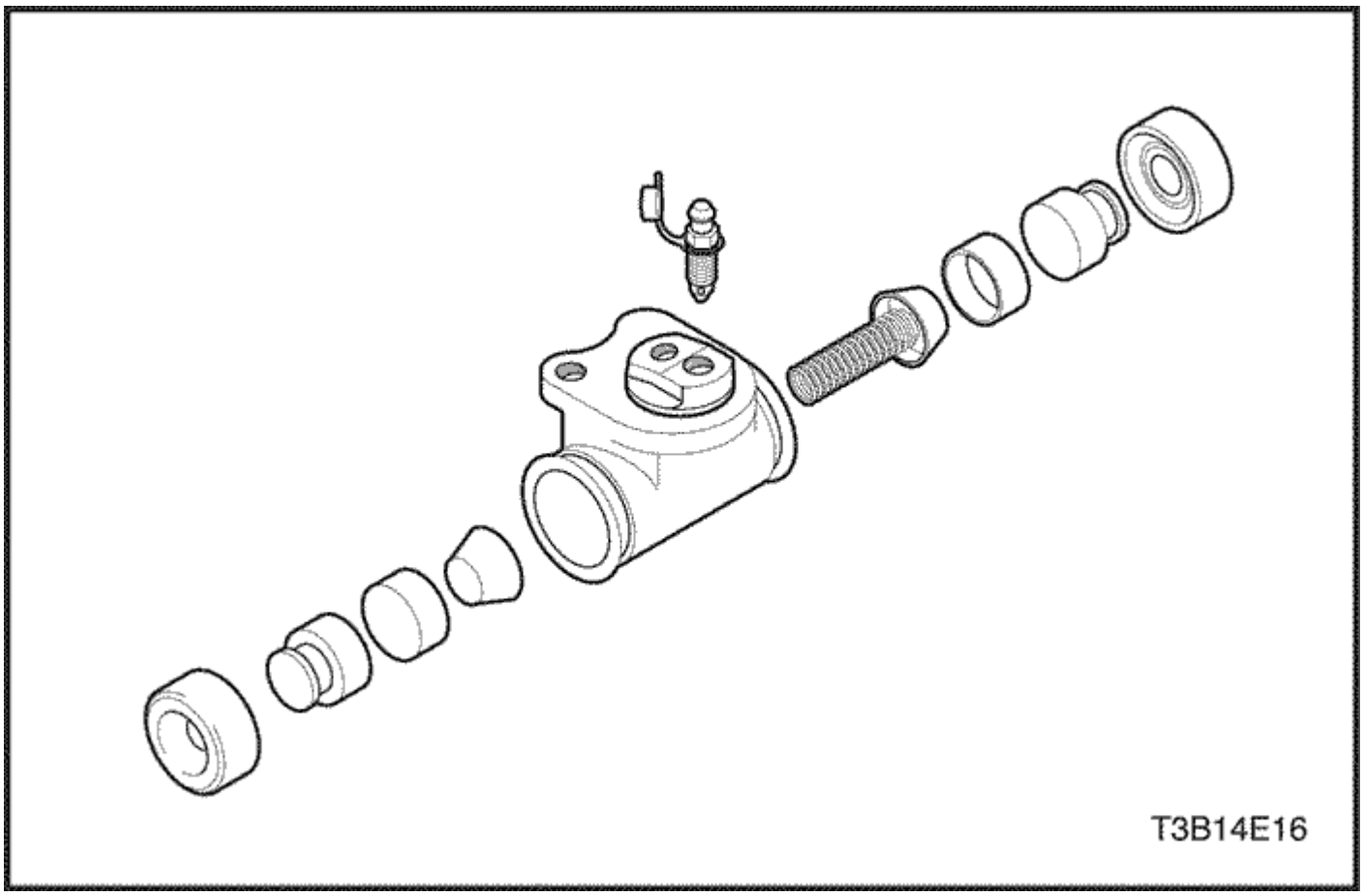
3. Install the brake wheel cylinder assembly to the backing plate. Refer to "Wheel Cylinder Assembly" in this section.
4. Connect the brake line.

   Tighten
   Tighten the brake line to 16 N•m (12 lb-ft).

5. Install the brake components. Refer to "Shoe and Lining" in this section.
6. Install the parking brake cable with the retainer by attaching the cable to the brake shoe lever. Refer to *Section 4G, Parking Brake.*

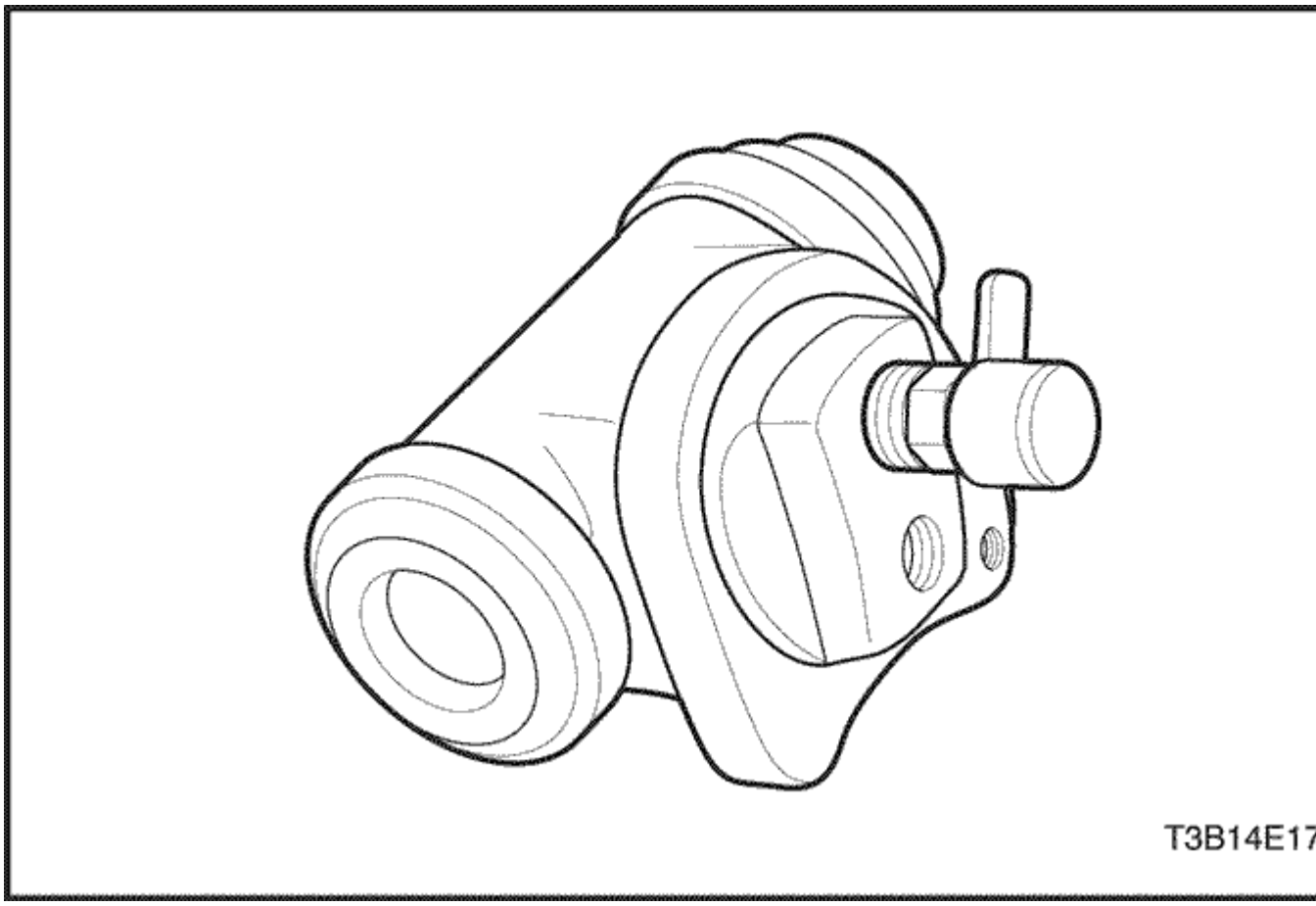
7. Bleed the brakes. Refer to *Section 4A, Hydraulic Brakes.*
8. Lower the vehicle.

UNIT REPAIR

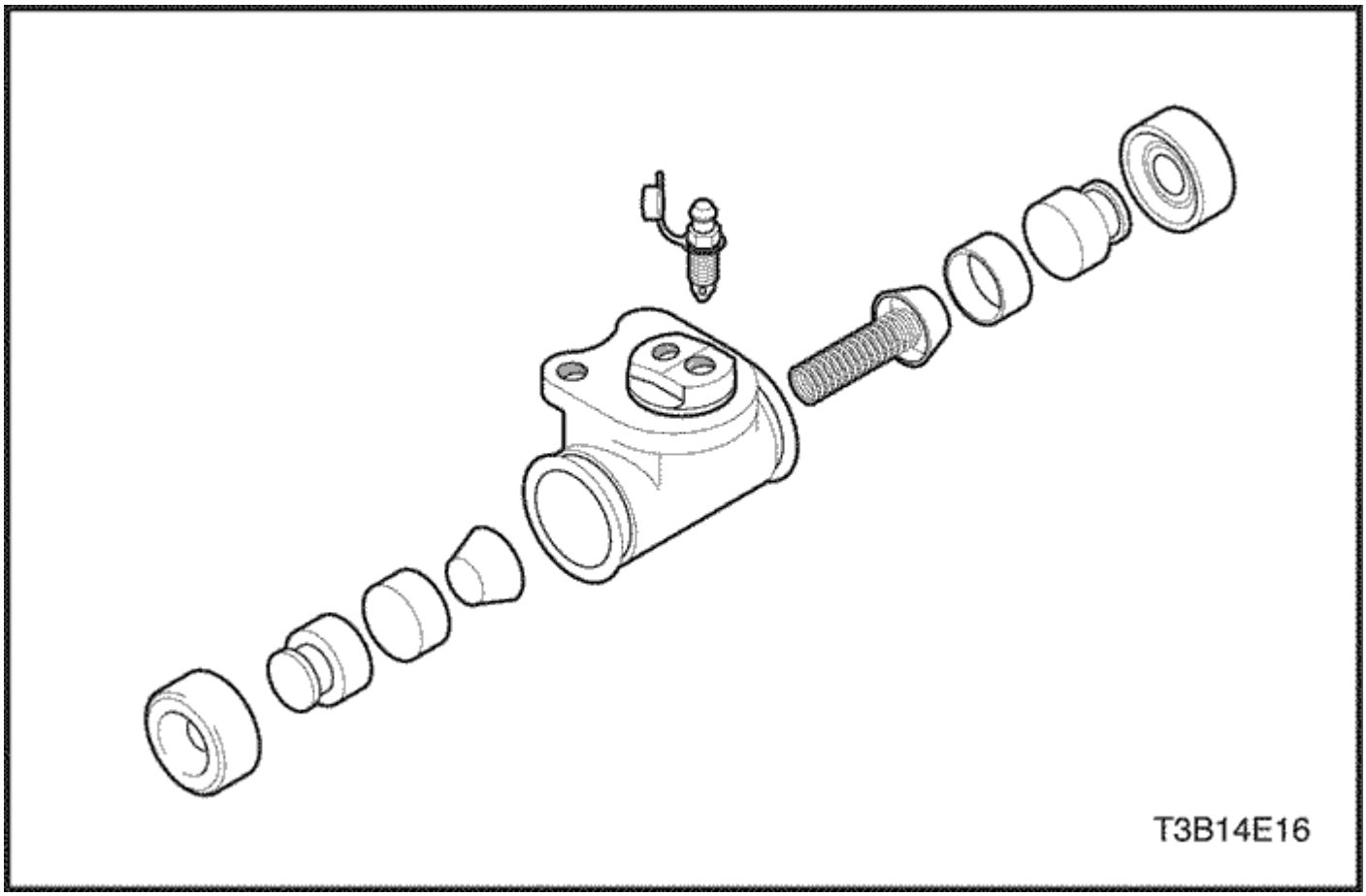


Wheel Cylinder
Disassembly Procedure

1. Remove the wheel cylinder assembly from the backing plate. Refer to "Wheel Cylinder Assembly" in this section.
2. Twist off the boots, the pistons, and the seals from each end of the wheel cylinder.
3. Remove the spring assembly.



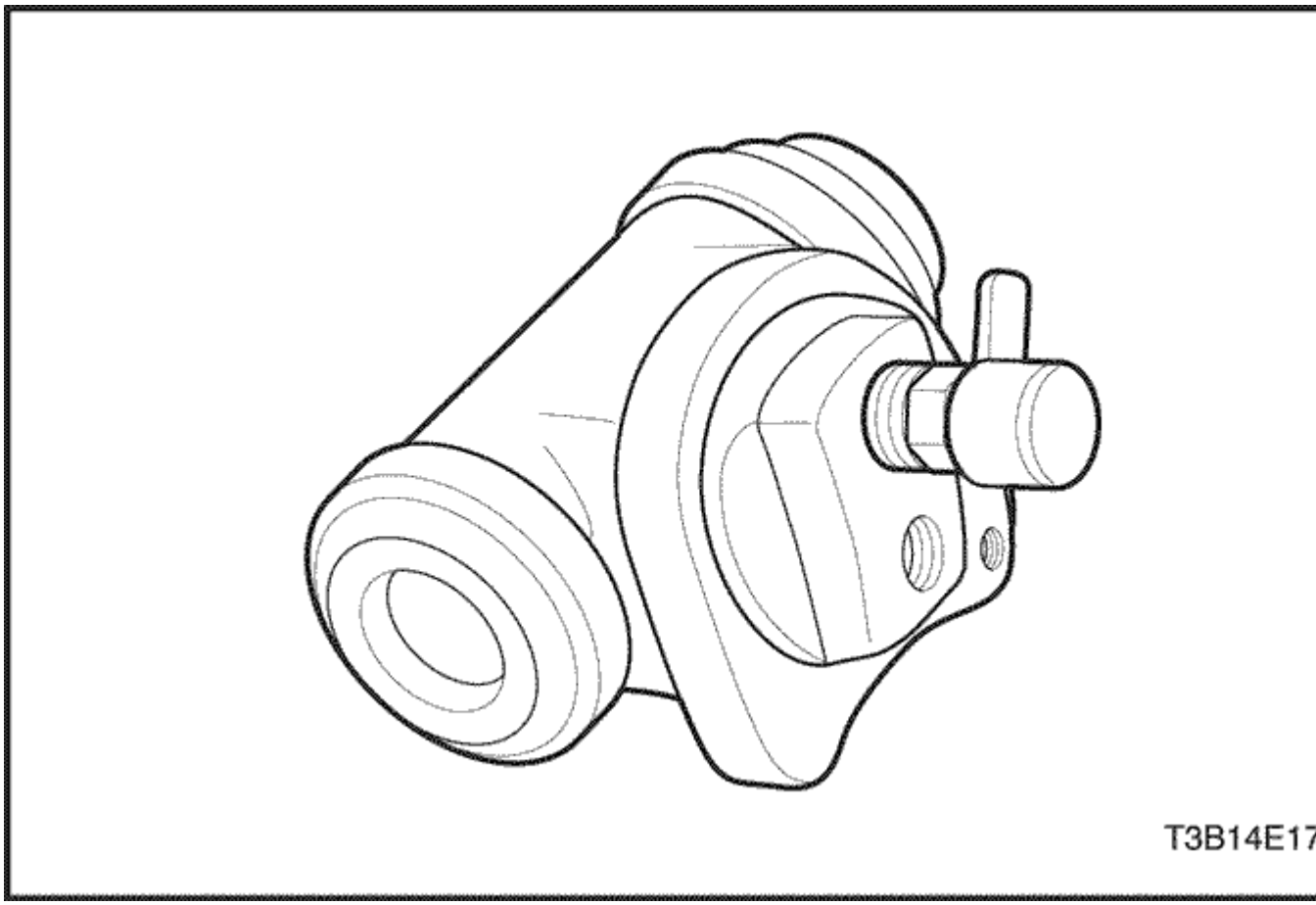
4. Remove the bleeder cap and the bleeder valve.



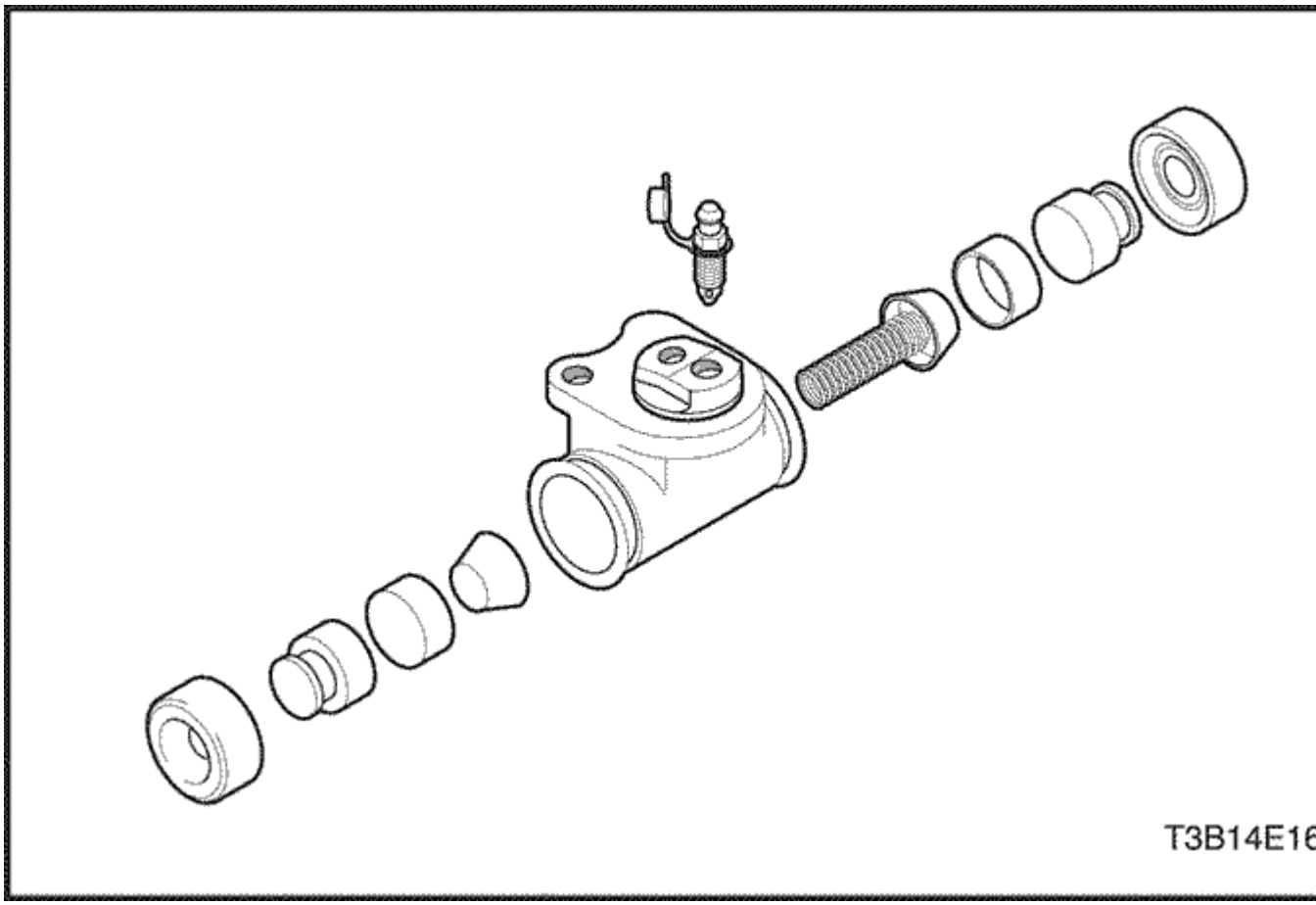
Assembly Procedure

1. Inspect the wheel cylinder bore and the pistons for scoring, nicks, corrosion, and wear.
2. Use a crocus cloth to polish out light corrosion in the wheel cylinder bore.

   Important : If the bore will not clean up with a crocus cloth, replace the assembly.



3. Clean all the parts in clean denatured alcohol or brake fluid. Dry all the parts with unlubricated compressed air and lubricate the new seals, the pistons, and the wheel cylinder bore with clean brake fluid before assembly.
4. Thinly coat all the parts except the dust caps with brake cylinder fluid.
5. Fasten the bleeder valve and the cap to the wheel cylinder.



6. Attach to the wheel cylinder the spring assembly, followed by the pistons, the seals, and the boots.
7. Inspect the pistons for free movement.
8. Install the wheel cylinder assembly. Refer to "Wheel Cylinder Assembly" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Drum Brakes

This drum brake assembly is a leading/trailing shoe design. Both brake shoes are held against the wheel cylinder pistons by the lower return spring and the fixed anchor plate near the lower return spring. When the brakes are applied, the wheel cylinder pistons move both shoes out to contact the drum. With forward wheel rotation, the forward brake shoe will wrap into the drum and become self-energized. With reverse wheel rotation, the rear brake shoe is self-energized. Force from the brake shoes is transferred to the anchor plate

through the backing plate to the axle flange. Adjustment is automatic and occurs on any service brake application. Do not switch the position of shoes that have been in service, as this may render the self-adjustment feature inoperative and result in increased pedal travel.

Notice : To avoid damaging the vehicle, observe the following directions:

- Replace all the components included in the repair kits used to service this drum brake.
- Do not use lubricated shop air on the brake parts, as damage to the rubber components may result.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the braking system.
- Replace the shoe and linings in axle sets only.
- The torque values specified are for dry, unlubricated fasteners.
- Perform service operations on a clean bench that is free from all mineral oil materials.

SECTION 4F

ANTILOCK BRAKE SYSTEM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

General Specifications

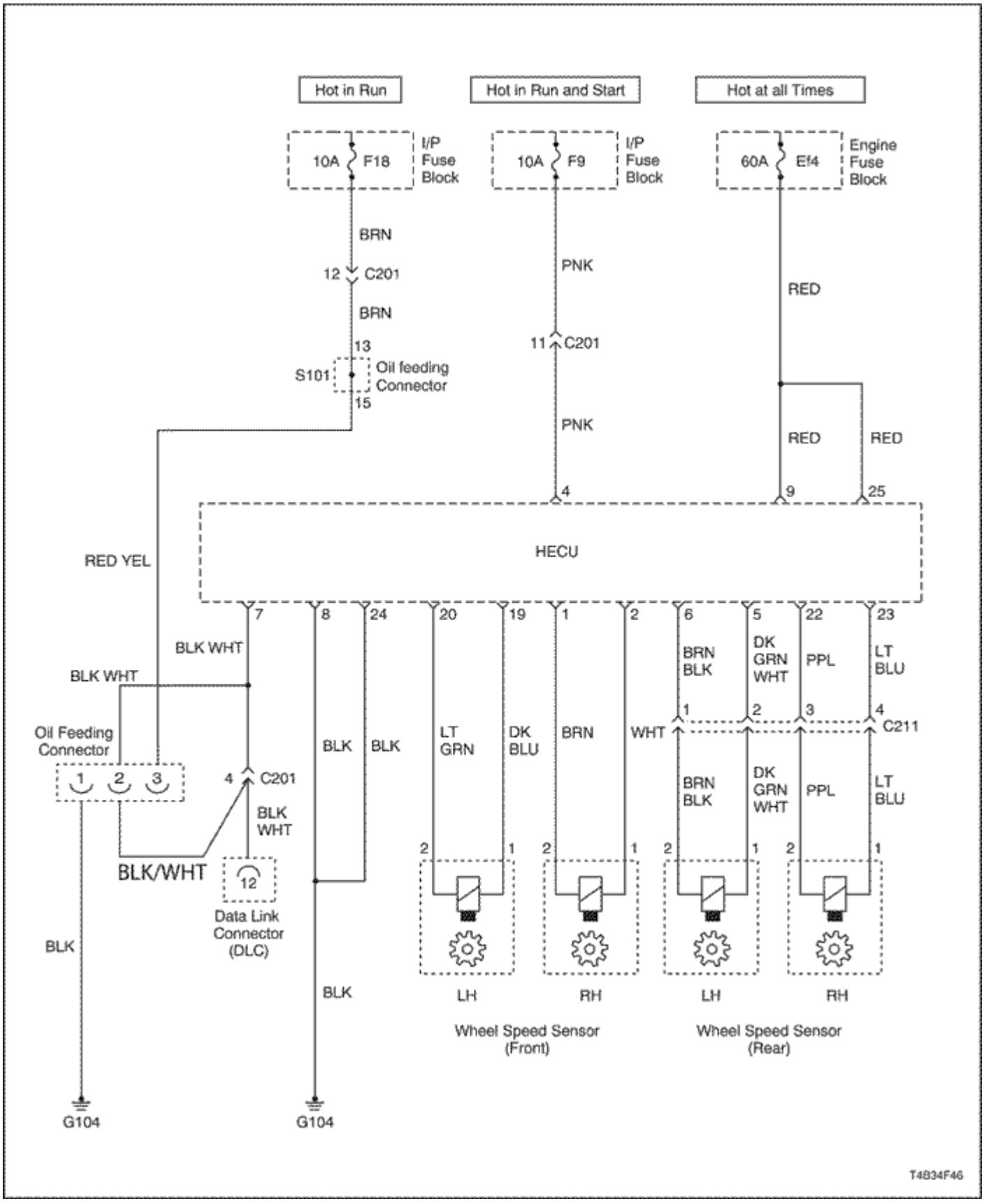
Application	Unit	Description
Antilock Brake System (ABS) Mode	-	4 Channel 4 Sensor
ABS Main Relay Operation Voltage	V	10~16
Front Wheel Speed Sensor:	-	-
Resistance	Ω	988~1,208
Air Gap	mm (inch)	0.5~1.2 (0.0197~0.0472)
Rear Wheel Speed Sensor:	-	-
Resistance	Ω	2,295~2,500
Air Gap	mm (inch)	0.6~1.2 (0.0236~0.0472)
Speed Ring	-	-
Outside Diameter (Front)	mm (inch)	83.72 (3.2961)
Outside Diameter (Rear)	mm (inch)	77 (3.0315)
Inside Diameter (Front)	mm (inch)	73.75 (2.9035)
Inside Diameter (Rear)	mm (inch)	67 (2.6378)
Tooth Volume of the Speed Ring (Front)	EA	47
Tooth Volume of the Speed Ring (Rear)	EA	34
Brake Oil	-	-
Type	-	DOT-3
Capacity	L (qt.)	0.5 (0.53)

Fastener Tightening Specifications

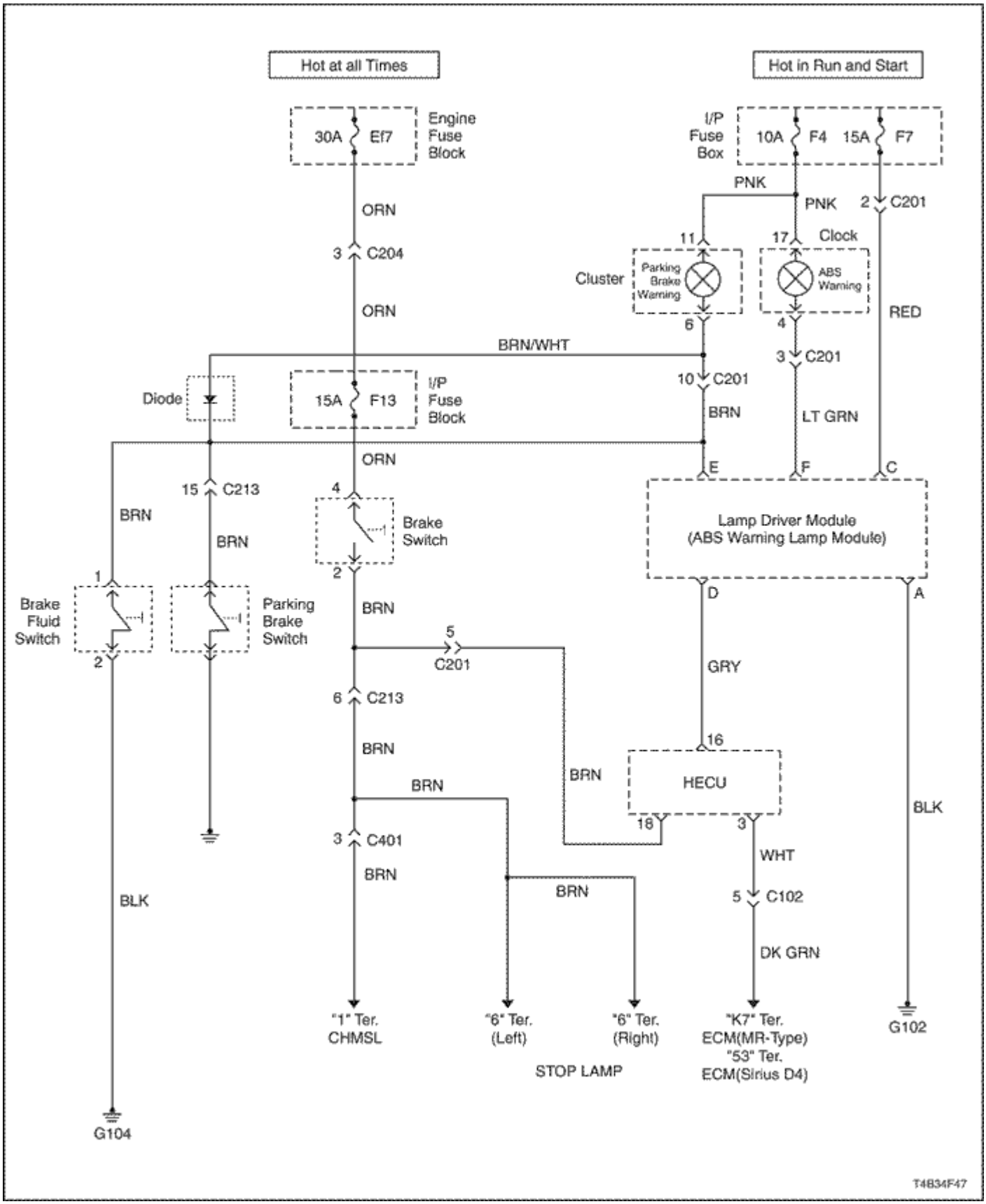
Application	N•m	Lb-Ft	Lb-In
Brake Pipe Fitting Nut (Hydraulic Unit)	16	12	-
ABS Mounting Bracket Bolt	22	16	-
Front Wheel Speed Sensor Bolt	9	6	80
Rear Wheel Speed Sensor Bolt	9	6	80

SCHEMATIC AND ROUTING DIAGRAMS

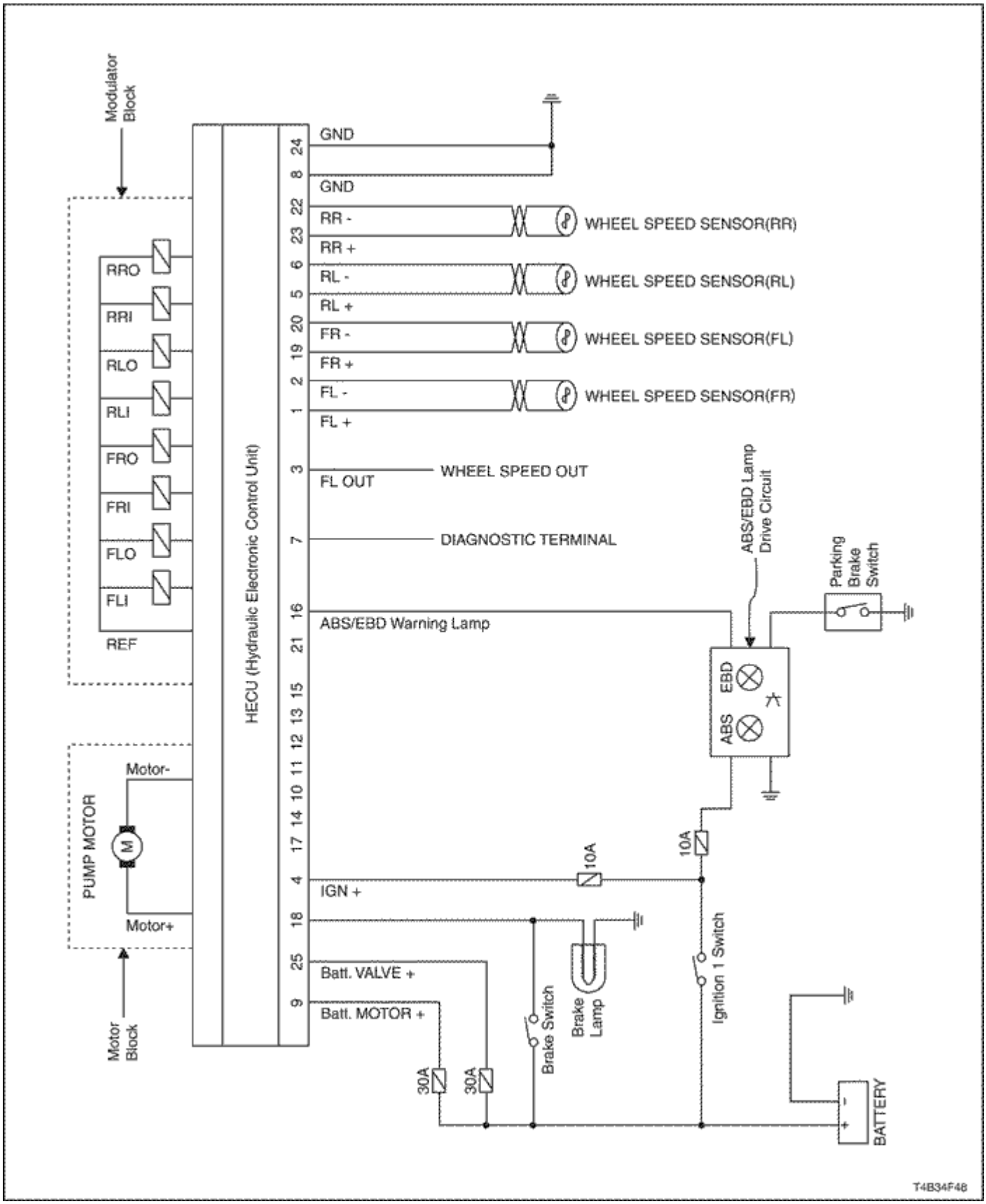
Abs System Circuit (I)


Hot in Run
Hot in Run and Start
Hot at all Times
10A
F18
I/P Fuse Block
10A
F9
I/P Fuse Block
60A
Ef4
Engine Fuse Block
BRN
12
C201
BRN
13
S101
Oil feeding Connector
15
PNK
11
C201
PNK
4
RED
RED
RED
9
25
HECU
RED YEL
7
8
24
20
19
1
2
6
5
22
23
BLK WHT
BLK WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
1
2
3
4
C211
Oil Feeding Connector
1
2
3
4
C201
BLK
BLK
LT GRN
DK BLU
BRN
WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
BLK WHT
BLK/WHT
12
Data Link Connector (DLC)
BLK
BLK
LH
RH
LH
RH
Wheel Speed Sensor (Front)
Wheel Speed Sensor (Rear)
G104
G104
T4B34F46

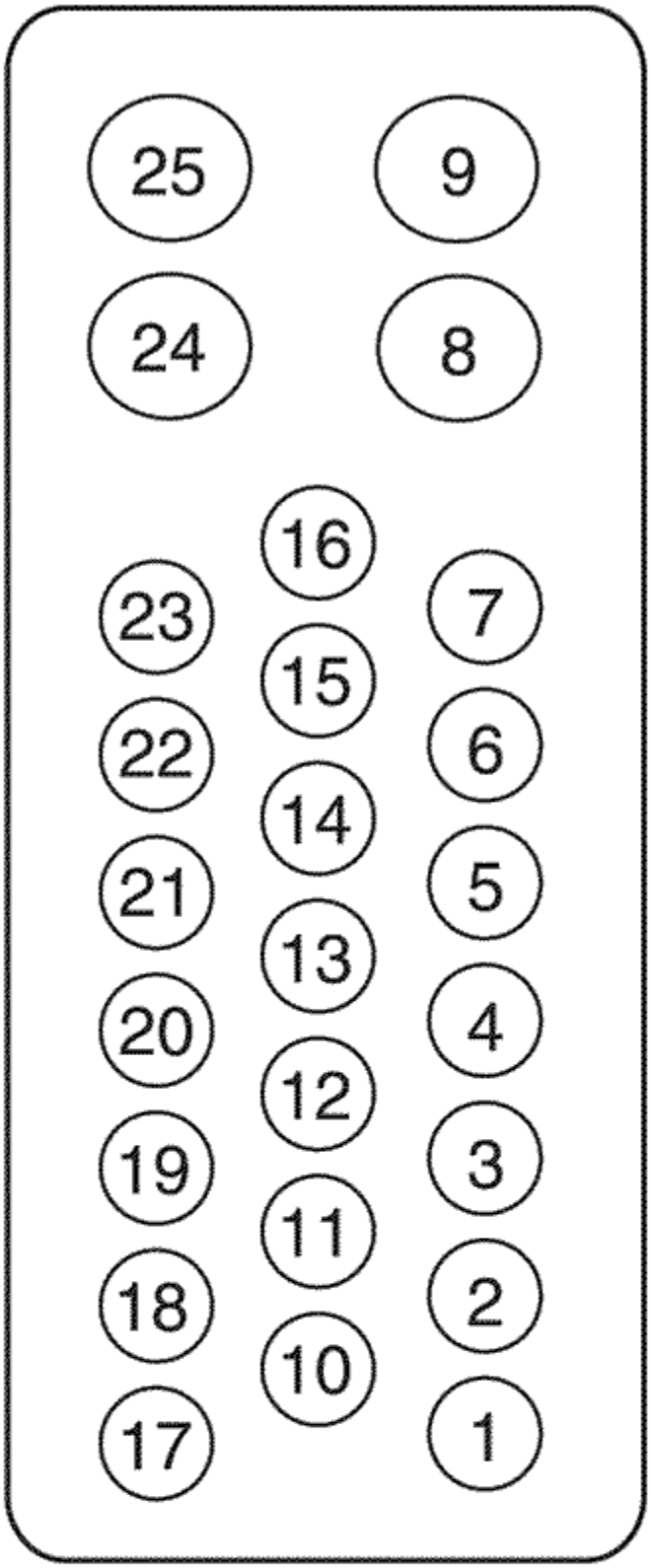
Abs System Circuit (II)


Hot at all Times
Hot in Run and Start
30A
Ef7
Engine Fuse Block
I/P Fuse Box
10A
F4
15A
F7
PNK
PNK
2
C201
ORN
3
C204
11
17
Clock
Cluster
Parking Brake Warning
ABS Warning
6
4
RED
ORN
BRN/WHT
3
C201
10
C201
Diode
15A
F13
I/P Fuse Block
BRN
LT GRN
ORN
E
F
C
15
C213
4
Brake Switch
Lamp Driver Module (ABS Warning Lamp Module)
BRN
BRN
1
2
D
A
Brake Fluid Switch
Parking Brake Switch
BRN
5
C201
GRY
6
C213
16
BRN
BRN
HECU
BRN
18
3
BLK
3
C401
WHT
BRN
5
C102
BRN
BLK
DK GRN
"1" Ter. CHMSL
"6" Ter. (Left)
"6" Ter. (Right)
"K7" Ter. ECM(MR-Type) "53" Ter. ECM(Sirius D4)
G102
STOP LAMP
G104
T4B34F47

Electrical Schematic


Modulator Block
RRO
RRI
RLO
RLI
FRO
FRI
FLO
FLI
REF
HECU (Hydraulic Electronic Control Unit)
24
8
22
23
6
5
20
19
2
1
3
7
16
21
15
13
12
11
10
14
17
4
18
25
9
GND
GND
RR -
RR +
RL -
RL +
FR -
FR +
FL -
FL +
WHEEL SPEED SENSOR(RR)
WHEEL SPEED SENSOR(RL)
WHEEL SPEED SENSOR(FL)
WHEEL SPEED SENSOR(FR)
FL OUT
WHEEL SPEED OUT
DIAGNOSTIC TERMINAL
ABS/EBD Warning Lamp
ABS/EBD Lamp Drive Circuit
Parking Brake Switch
EBD
ABS
PUMP MOTOR
Motor-
M
Motor+
Motor Block
IGN +
10A
10A
Batt. VALVE +
Batt. MOTOR +
30A
30A
Brake Switch
Brake Lamp
Ignition 1 Switch
BATTERY
T4B34F48

HECU Harness Connector end View and Pin Layout

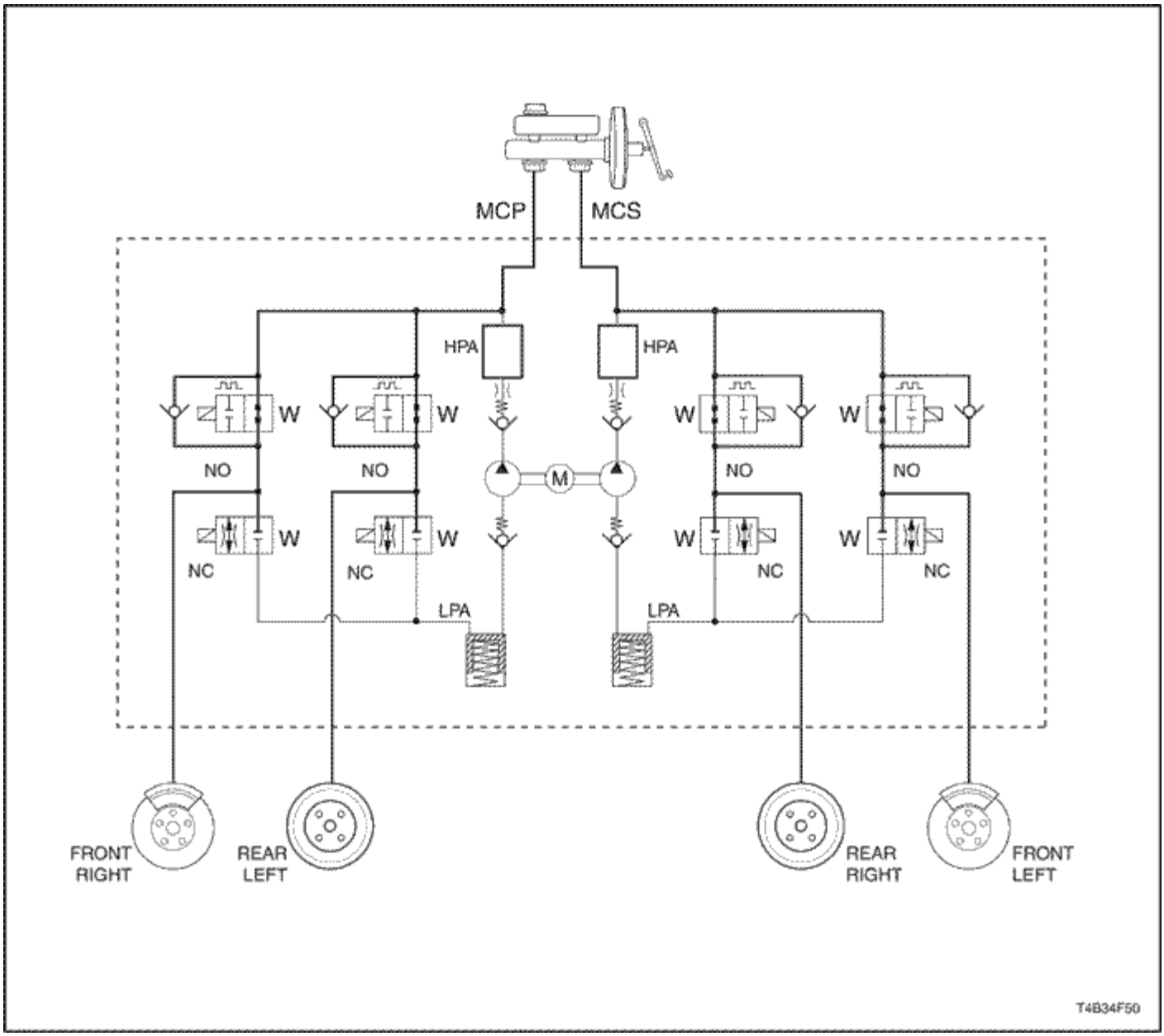


Female
(Front view)

ABS (Export) Pin Assignments

Pin Location	Circuit Function
1	RIGHT FRONT WHEEL SPEED SENSOR
2	RIGHT FRONT WHEEL SPEED SENSOR
3	WHEEL SPEED SIGNAL TO ECM (ENGINE CONTROL MODULE)
4	IGNITION
5	LEFT FRONT WHEEL SPEED SENSOR
6	LEFT FRONT WHEEL SPEED SENSOR
7	DIAGNOSTIC
8	GROUND (G104)
9	BATTERY (HECU MOTOR)
10	-
11	-
12	-
13	-
14	-
15	-
16	ABS/EBD WARNING LAMP OUTPUT
17	-
18	STOP LAMP SWITCH INPUT
19	LEFT FRONT WHEEL SPEED SENSOR
20	LEFT FRONT WHEEL SPEED SENSOR
21	-
22	RIGHT REAR WHEEL SPEED SENSOR
23	RIGHT REAR WHEEL SPEED SENSOR
24	GROUND (G104)
25	BATTERY (SOLENOID VALVE)

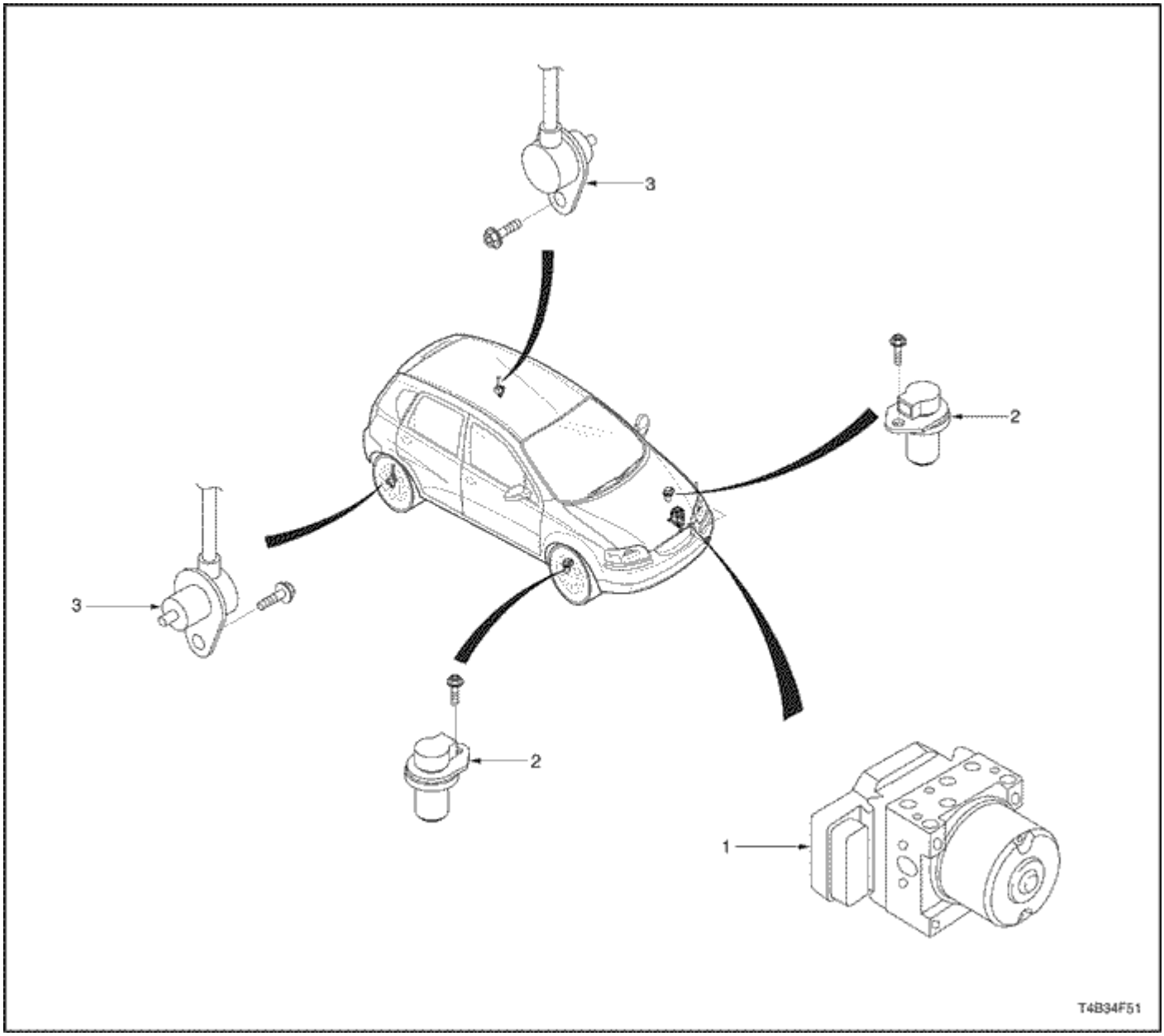
Hydraulic Diagram



MCP : Master Cylinder Primary
MCS : Master Cylinder Secondary
NO : Normal Open Solenoid Valve
NC : Normal Close Solenoid Valve
M : Electric Motor
LPA : Low Pressure Accumulator
HPA : High Pressure Accumulator

COMPONENT LOCATOR

ABS System



1. Hydraulic Electronic Control Unit
2. Front Wheel Speed Sensor
3. Rear Wheel Speed Sensor

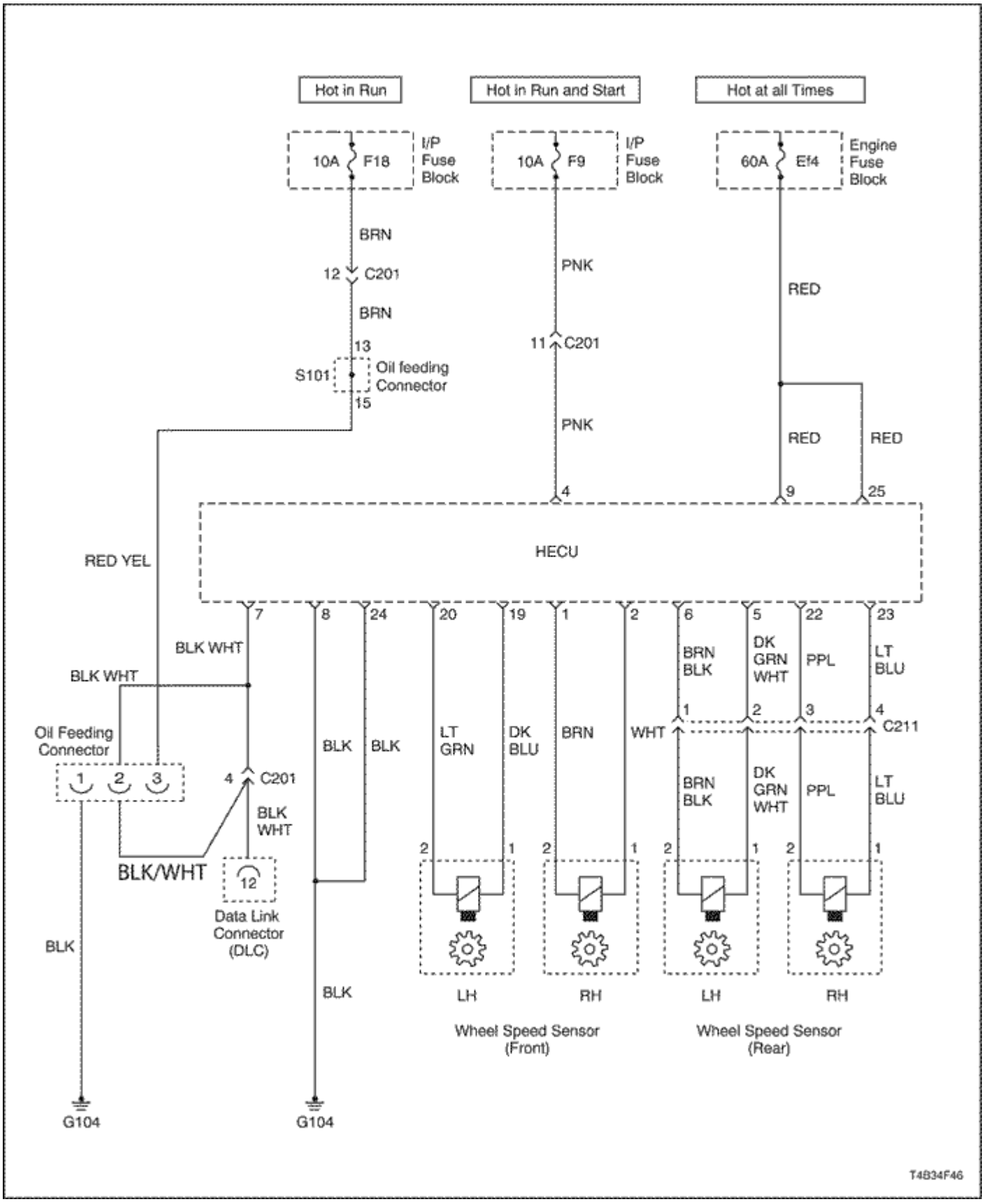
DIAGNOSIS

Diagnostic Trouble Code AND Description

DTC	Decsription	Check Point (Value)
C1101	Battery voltage too high	16V or higher
C1102	Battery voltage too low	9.4V or lower
C1200	Left front wheel speed sensor circuit open or shorted	Sensor, Wiring Harness, Connector
C1201	Left front wheel speed excessive variation	Sensor, Wiring Harness, Connector, Airgap
C1202	Left front wheel speed sensor no signal	Sensor, Wiring Harness, Connector, Airgap, HECU*
C1203	Right front wheel speed sensor circuit open or shorted	Sensor, Wiring Harness, Connector
C1204	Right front wheel speed excessive variation	Sensor, Wiring Harness, Connector, Airgap
C1205	Right front wheel speed sensor no signal	Sensor, Wiring Harness, Connector, Airgap, HECU
C1206	Left rear wheel speed sensor circuit open or shorted	Sensor, Wiring Harness, Connector
C1207	Left rear wheel speed excessive variation	Sensor, Wiring Harness, Connector, Airgap
C1208	Left rear wheel speed sensor no signal	Sensor, Wiring Harness, Connector, Airgap, HECU
C1209	Right rear wheel speed sensor circuit open or shorted	Sensor, Wiring Harness, Connector
C1210	Right rear wheel speed excessive variation	Sensor, Wiring Harness, Connector, Airgap
C1211	Right rear wheel speed sensor no signal	Sensor, Wiring Harness, Connector, Airgap, HECU
C1604	HECU internal fault	HECU
C2112	Valve relay or fuse failure	Fuse, HECU
C2402	Pump motor failure	Motor, Fuse, Connector

* HECU : Hydraulic Electronic Control Unit

Diagnostic Circuit Check


Hot in Run
Hot in Run and Start
Hot at all Times
10A
F18
I/P Fuse Block
10A
F9
I/P Fuse Block
60A
Ef4
Engine Fuse Block
BRN
12
C201
BRN
13
S101
Oil feeding Connector
15
PNK
11
C201
PNK
4
RED
RED
RED
9
25
HECU
RED YEL
7
8
24
20
19
1
2
6
5
22
23
BLK WHT
BLK WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
1
2
3
4
C211
Oil Feeding Connector
1
2
3
4
C201
BLK
BLK
LT GRN
DK BLU
BRN
WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
BLK WHT
BLK/WHT
12
Data Link Connector (DLC)
BLK
BLK
LH
RH
LH
RH
Wheel Speed Sensor (Front)
Wheel Speed Sensor (Rear)
G104
G104
T4B34F46

System Description

The Diagnostic Circuit Check is an organized method of identifying any problems caused by a malfunction in the ABS/DDRP system.

A service technician should begin diagnosis of any ABS/DDRP complaint with the Diagnostic Circuit Check. The Diagnostic Circuit Check directs a service technician to the next logical step when diagnosing a complaint.

Serial Data is transmitted/received by the HECU through terminal 7. The HECU is supplied with constant battery feed voltage through terminals 9 and 25, and switched ignition voltage through terminal 4. The HECU ground is provided through terminal 8 and 24.

Diagnostic Process

Use the following ordered procedure when servicing the ABS/DDRP system.

1. Inspect the vehicle for any mechanical conditions related the brake system.
    - Brake reservoir fluid level correct.
    - Inspect master for fluid for contamination.
    - Inspect brake master/modulator for leaks.
    - Inspect brake master/modulator for leaks.
    - Inspect brake components at all wheels.
    - Verify no brake drag exists (brake switch adjustment).
    - Verify even brake apply (no pull or lead).
    - Inspect for worn/damaged brake pads.
    - Inspect for worn/damaged wheel bearings
    - Inspect wheel speed sensors/wiring.
    - Inspect exciter rings for damage
    - Inspect tires for tread depth/wear.
    - Road test the vehicle to verify the complaint
2. Perform the Diagnostic Circuit Check and proceed to the applicable Diagnostic Trouble Chart as necessary.
3. Clear the ABS DTCs (Diagnostic Trouble Codes) after all of the system malfunctions have been corrected.

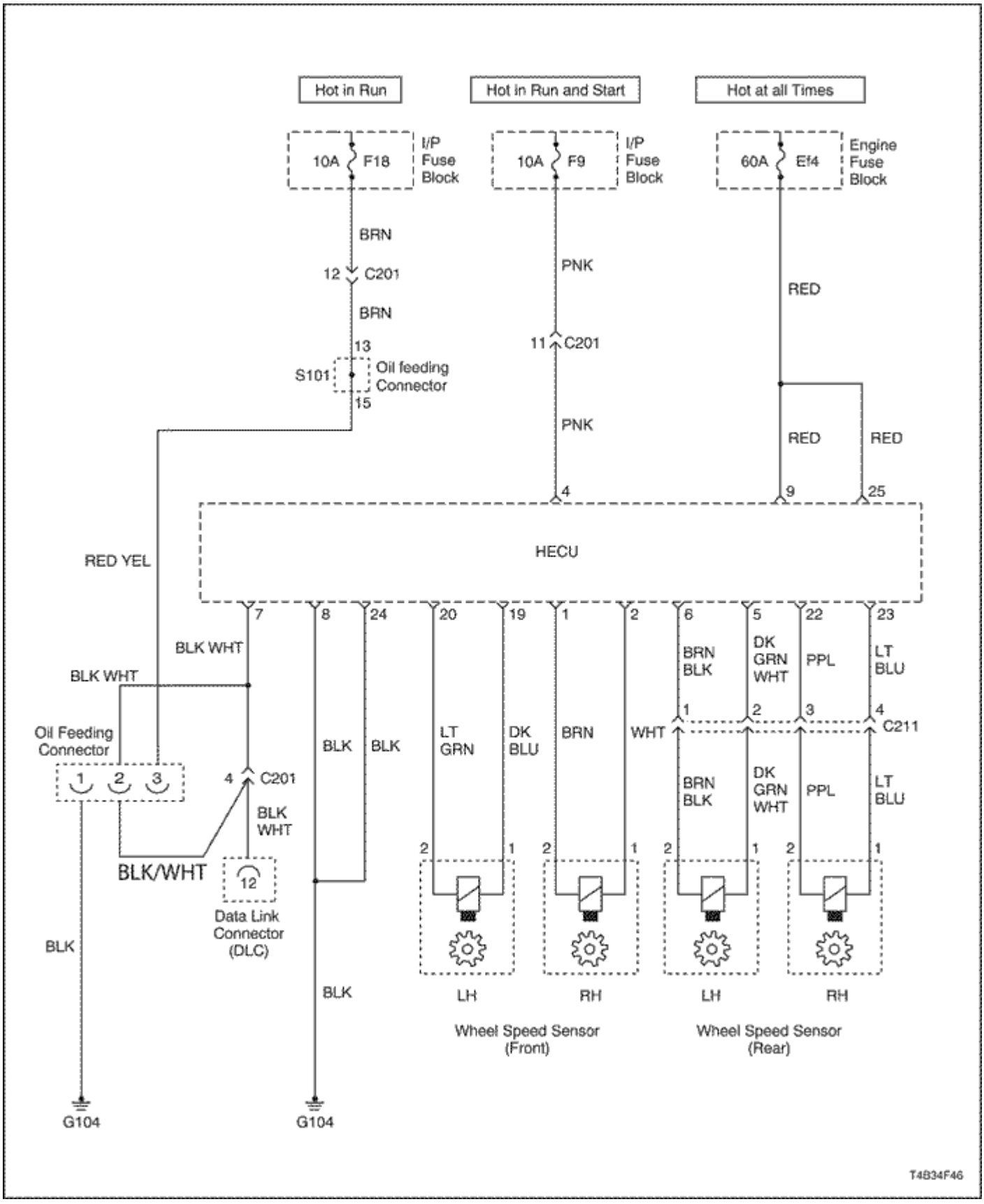
Diagnostic Circuit Check

Step	Action	Value(s)	Yes	No
1	1. Connect or install all previously disconnected or removed components if applicable. 2. Ignition switch "ON"	-	Go to *Step 2*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	3. Install the applicable Scan Tool into the DLC and attempt to communicate with the HECU. Does the Scan Tool communicate with the HECU?			
2	Were any DTC(s) stored current or history?	-	Go to *Step 3*	Go to *Step 7*
3	1. Document Current DTC(s). 2. Document History DTC(s). 3. Document Enhanced History Data such as o number of times each DTC set. o number of times since each DTC first set. o number of times each DTC set. o speed when each DTC set. o other Enhanced Data which may assist with diagnosis. 4. Do not clear DTC(s) prior to fully documenting the information from the scan tool. 5. Refer to the applicable Diagnostic Trouble Code(s).	-	Go to the table for the DTC(s)	-
4	Does the Scan Tool communicate with other Modules on the data line?	-	Go to *Step 5*	Go to *Step 6*
5	Go to the no communication with HECU with HECU trouble chart.	-	Go to "No Communication with HECU"	System OK
6	Repair the DLC harness. Replace the DLC harness as needed.	-	System OK	-
7	1. Ignition switch "OFF" 2. Wait 10 seconds. 3. Ignition switch "ON" 4. Observe the amber ABS lamp when the key is turned on. Did the ABS Warning Lamp and Brake Warning Lamp turn on for 3 seconds and then turn off? (bulb test)	-	Go to *Step 8*	Go to *Step 9*
8	System functioning as designed.	-	System OK	-
9	Did the any lamp stay on?	-	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
10	Go to appropriate lamp "ON" trouble chart.	-	-	-
11	Go to appropriate lamp "INOPERATIVE" trouble chart	-	-	-

No Communication with HECU


Hot in Run
Hot in Run and Start
Hot at all Times
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F18
I/P Fuse Block
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F9
I/P Fuse Block
60A
Ef4
Engine Fuse Block
BRN
12
C201
BRN
13
S101
Oil feeding Connector
15
PNK
11
C201
PNK
4
RED
RED
RED
9
25
HECU
RED YEL
7
8
24
20
19
1
2
6
5
22
23
BLK WHT
BLK WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
1
2
3
4
C211
Oil Feeding Connector
1
2
3
4
C201
BLK
BLK
LT GRN
DK BLU
BRN
WHT
BRN BLK
DK GRN WHT
PPL
LT BLU
BLK WHT
BLK/WHT
12
Data Link Connector (DLC)
BLK
BLK
LH
RH
LH
RH
Wheel Speed Sensor (Front)
Wheel Speed Sensor (Rear)
G104
G104
T4B34F46

Circuit Description

Serial Data is transmitted/received by the HECU through terminal 7. The HECU is supplied with constant battery feed voltage through terminals 9 and 25, and switched ignition voltage through terminal 4. The HECU ground is provided through terminal 8 and 24.

Diagnostic Aids

Typical causes of no communication with the HECU.

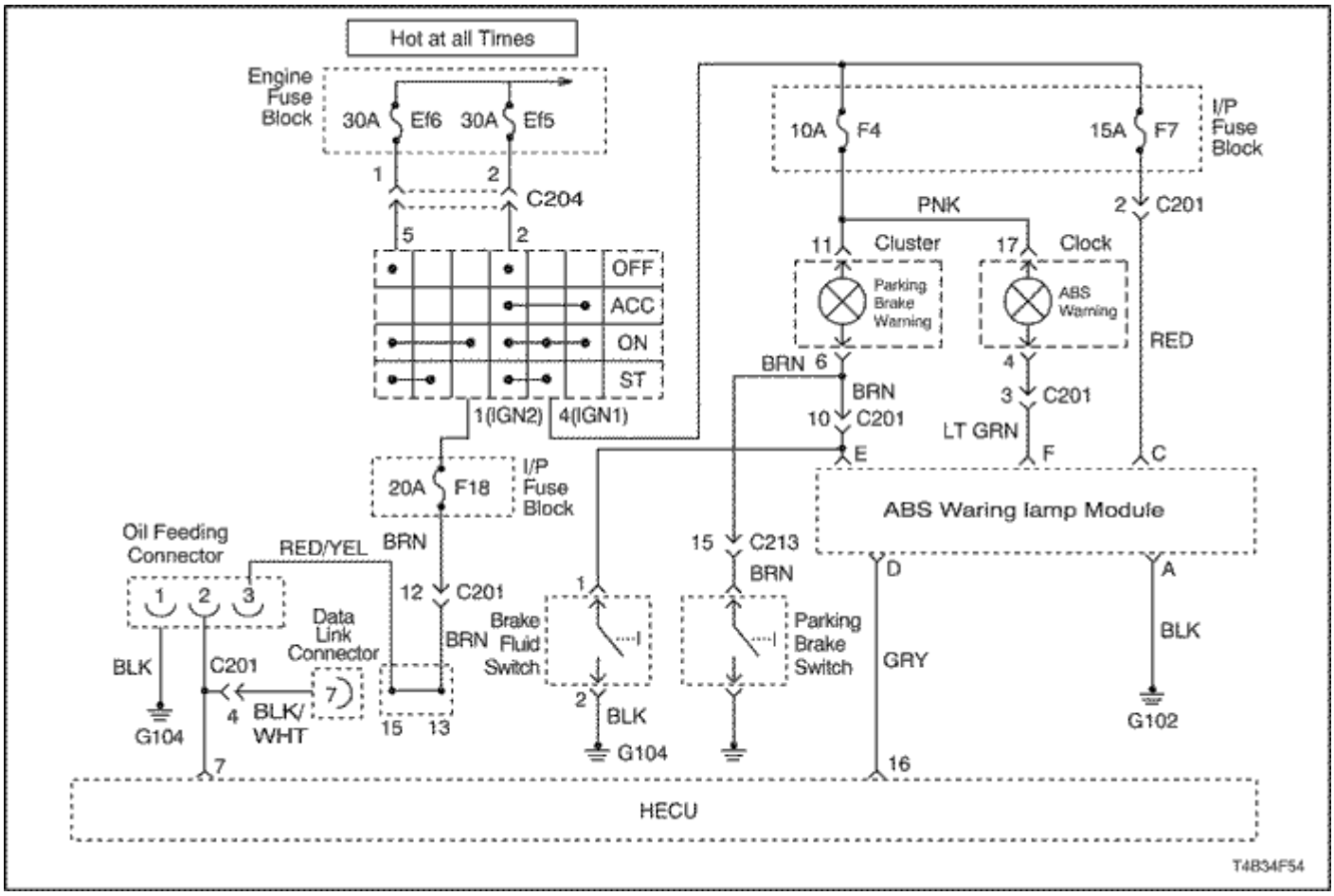
1. Poor terminal contact at the HECU.
2. Loss of HECU ground to terminal 8 and 24
3. Loss of battery voltage at HECU terminals 9 and or 25.
4. Loss of ignition voltage at HECU 4.
5. Open/grounded data line.
6. Data line with high resistance.

No Communication with HECU

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic Circuit Check Performed?	-	Go to *Step 3*	Go to *Step 2*
2	Perform the Diagnostic Circuit Check. Did you find problem?	-	Go to *Step 3*	System OK
3	1. Ignition switch "OFF" 2. Disconnect the HECU harness. 3. Connect a voltmeter to HECU harness terminal 9 and then to body ground. Was the voltage within the specified range?	Battery Voltage	Go to *Step 5*	Go to *Step 4*
4	Repair the source of low voltage to terminal 9. Inspect for an open fuse, poor terminal contact, or a grounded wire.	-	System OK	-
5	Connect a voltmeter to HECU harness terminal 25 and then to body ground. Was the voltage within the specified range?	Battery Voltage	Go to *Step 7*	Go to *Step 6*
6	Repair the source of low voltage to terminal 25. Inspect for an open fuse, poor terminal contact, or a grounded wire.	-	System OK	-
7	1. Ignition switch "ON" 2. Connect a voltmeter to HECU harness	Battery Voltage	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	terminal 4 and then to body ground. Was the voltage within the specified range?			
8	Repair the source of low voltage to terminal 4. Inspect for an open fuse, poor terminal contact, or a grounded wire.	-	System OK	-
9	1. Ignition switch "OFF" 2. Connect a voltmeter to HECU harness terminal 8 and 24 and then to body ground. Was the voltage within the specified range?	Less than 2 ohms	Go to *Step 11*	Go to *Step 10*
10	Repair the source of high resistance between terminal 8 and 24 and body ground. Find and check the ground location where the circuit is secured to body ground.	-	System OK	-
11	1. Ignition switch "OFF" 2. HECU harness still disconnected from the HECU. 3. Connect an ohmmeter to HECU harness terminal 7 and DLC terminal 7. Was the voltage within the specified range?	Less than 2 ohms	Go to *Step 13*	Go to *Step 12*
12	Repair the source of high resistance between terminal 7 and DLC terminal 7.	-	System OK	-
13	1. Ignition switch "OFF" 2. HECU harness still disconnected. 3. Connect an ohmmeter to HECU harness terminal 7 and then to body ground. Was the voltage within the specified range?	OL (open circuit)	Go to *Step 15*	Go to *Step 14*
14	Find and repair the short to ground on the data line.	-	System OK	-
15	Replace the HECU.	-	System OK	-

ABS Warning Lamp Inoperative/No DTC Set



Circuit Description

The Hydraulic Electronic Control Unit (HECU) controls the operation of the amber ABS Warning Lamp by means of a lamp driver module contained within the Cluster.

Battery voltage is supplied to the I/P Cluster terminal 11, and HECU terminal 4 when the ignition switch is turned on. HECU terminals 9 and 25 are 'hot at all times'.

The default state is for the Lamp Driver Module to turn ON the amber ABS Warning Lamp, by supplying a ground path through the Lamp Driver Module. When the HECU commands the ABS lamp off, the HECU will ground the ABS Warning Lamp control circuit. This causes the Lamp Driver Module to open the path to ground for the bulb.

When the ignition switch is turned to the ON position, the HECU turns ON the ABS Warning Lamp for 3 seconds for a bulb check.

Whenever a malfunction is detected within the ABS system, the HECU turns ON the ABS Warning Lamp, notifying the driver that ABS needs to be serviced.

Diagnostic Aids

Typical causes of the ABS warning lamp inoperative with no DTC(s) set.

1. Faulty ABS bulb/ loose socket.
2. I/P fuse open.
3. Faulty Cluster/Lamp Driver Module.
4. Faulty HECU.

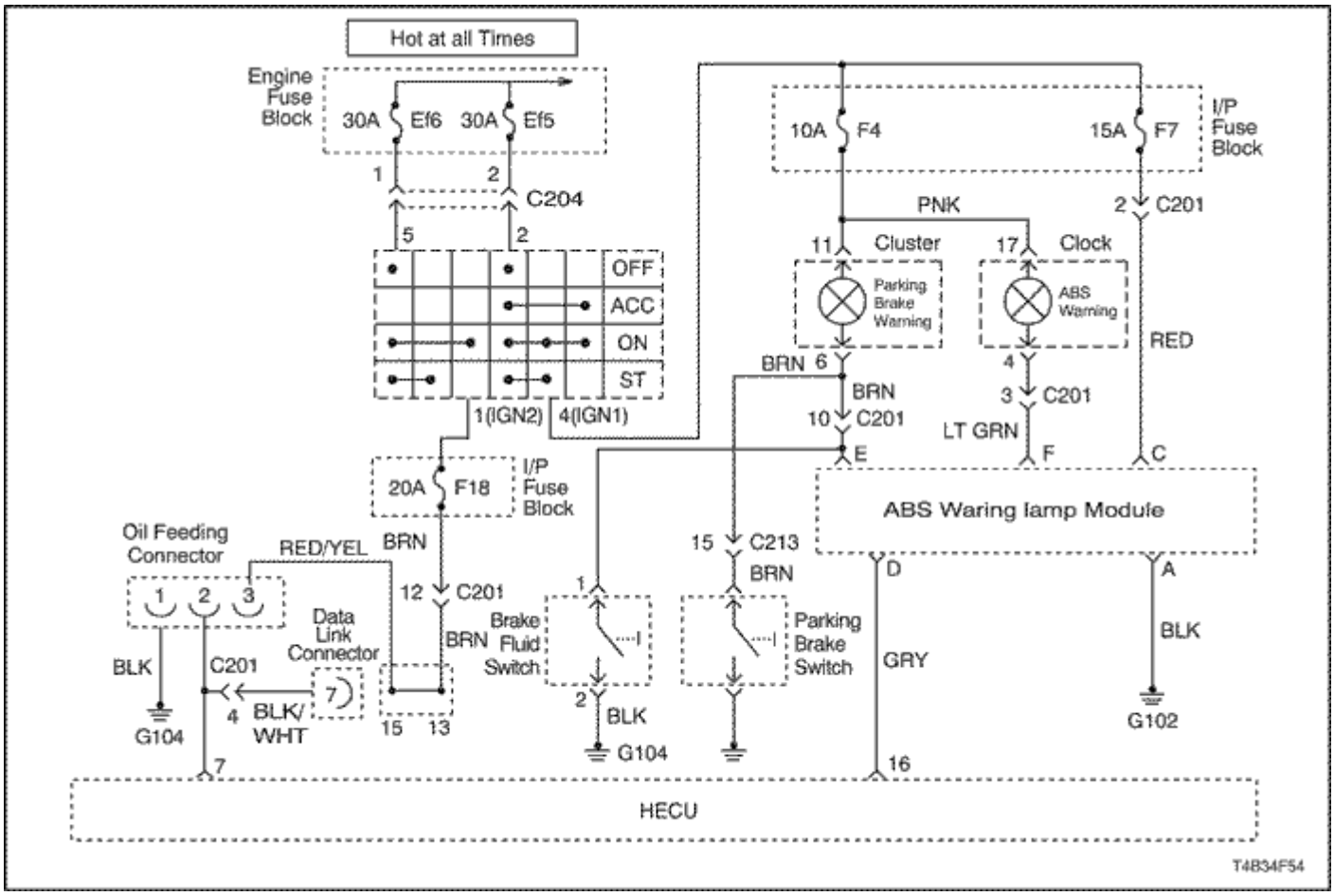
19. Grounded circuit between the HECU and the Cluster.
20. Grounded circuit between the HECU and the Cluster.

ABS Warning Lamp Inoperative/No DTC Set

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic Circuit Check performed?	-	Go to *Step 3*	Go to *Step 2*
2	Perform the Diagnostic Circuit Check. Did you find problem	-	Go to *Step 3*	System OK
3	1. Disconnect the HECU harness from the HECU. 2. Key on. Did the amber ABS lamp turn on?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the HECU.	-	System OK	-
5	Check the Cluster fuse. Is the fuse and terminal contact ok?	-	Go to *Step 7*	Go to *Step 6*
6	Replace the open fuse and/or repair the loose terminals. Find the short, which caused the fuse to open, if applicable.	-	System OK	-
7	Remove the amber ABS bulb from the Cluster and inspect for an open bulb filament or poor socket contact? Was the socket and bulb ok?	-	Go to *Step 9*	Go to *Step 8*
8	Replace the Bulb/Socket as needed.	-	System OK	-
9	1. Ignition switch "OFF". 2. HECU harness still disconnected. 3. Remove the Cluster Assembly from the Instrument Panel. 4. Disconnect the white Cluster harness connector from the Cluster Assembly. 5. Ignition switch "ON".	Battery Voltage	Go to *Step 11*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
	6. Connect a voltmeter to terminal 11 of the white Cluster harness and then to body ground. Was the voltage within the specified range?			
10	Find and repair the source of low voltage on the cluster voltage supply terminal.	-	System OK	-
11	1. Ignition switch "OFF". 2. Disconnect the White Cluster harness connector from the Cluster Assembly. 3. Connect an ohmmeter between white Cluster harness terminal 4 and ABS Warning Lamp Module terminal F. Was the resistance within the specified range?	Less than 2 ohms	Go to *Step 13*	Go to *Step 12*
12	Repair the open or high resistance between the cluster and the ABS Warning Lamp Module.	-	System OK	-
13	1. Ignition switch "OFF". 2. ABS Warning Lamp Module harness and HECU harness still disconnected. 3. Connect an ohmmeter to HECU harness terminal 16 and then to body ground. Was the resistance within the specified range?	OL (open circuit)	Go to *Step 15*	Go to *Step 14*
14	Find the repair the short to ground between the Cluster harness and the HECU harness.	-	System OK	-
15	Replace the ABS Warning Lamp Module. Is the repair complete?	-	System OK	Go to *Step 16*
17	Replace the Cluster Assembly.	-	System OK	-

ABS Warning Lamp On/No DTC Set



Circuit Description

The Hydraulic Electronic Control Unit (HECU) controls the operation of the amber ABS Warning Lamp by means of a lamp driver module contained within the Cluster.

Battery voltage is supplied to the I/P Cluster terminal 11, and HECU terminal 4 when the ignition switch is turned on. HECU terminals 9 and 25 are `hot at all times'.

The default state is for the Lamp Driver Module to turn ON the amber ABS lamp, by supplying a ground path through the Lamp Driver Module.

When the HECU commands the ABS lamp off, the HECU will ground the ABS Warning Lamp control circuit. This causes the Lamp Driver Module to open the path to ground for the bulb.

When the ignition switch is turned to the ON position, the HECU turns ON the ABS Warning Lamp for 3 seconds for a bulb check.

Whenever a malfunction is detected within the ABS system, the HECU turns ON the ABS Warning Lamp, notifying the driver that ABS needs to be serviced.

Diagnostic Aids

Typical causes of the ABS warning lamp on with no DTC(s) set.

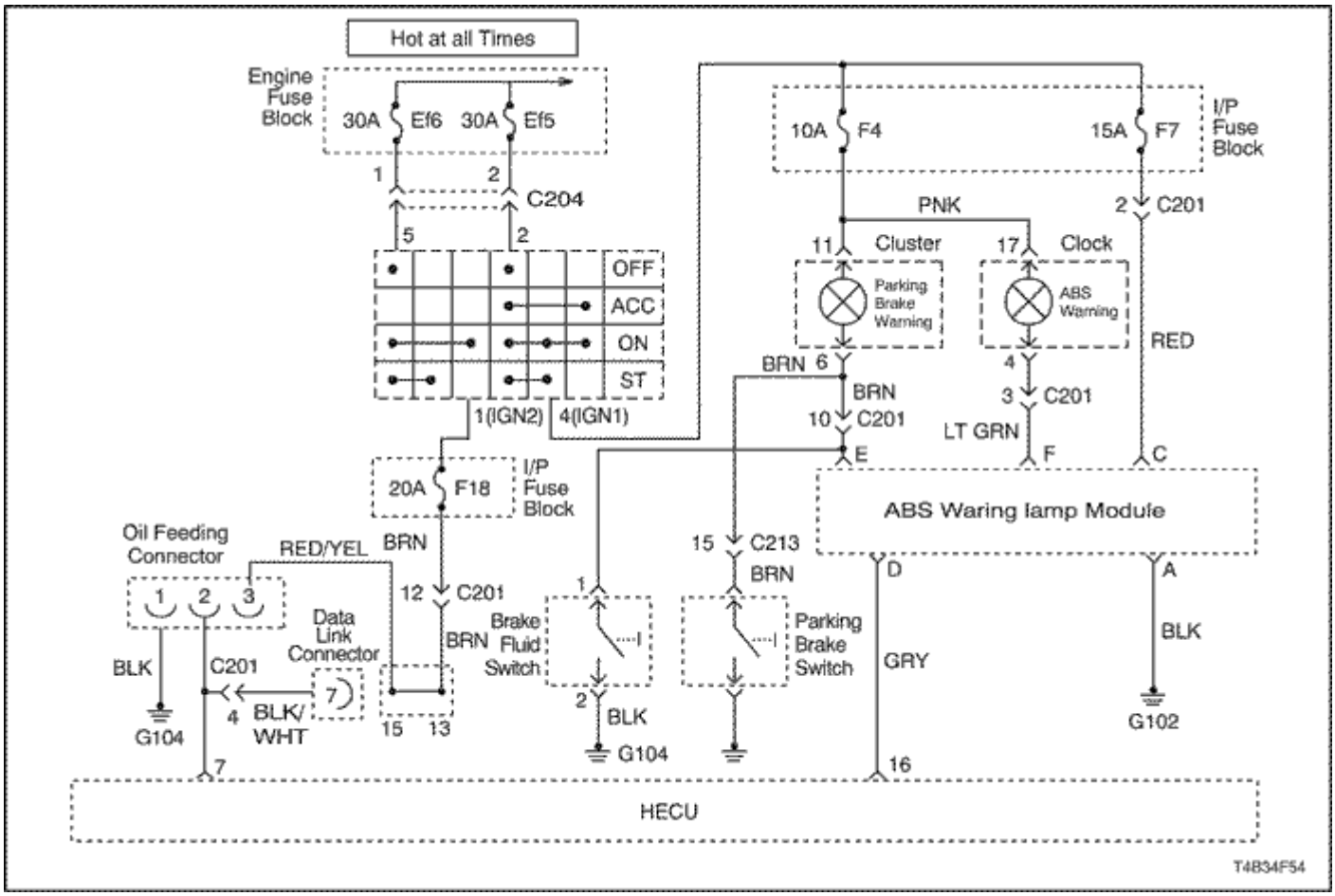
1. Grounded circuit between the Cluster and the HECU.
2. Faulty Cluster/Lamp Driver Module.
3. Faulty HECU.

ABS Warning Lamp On/No DTC Set

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic Circuit Check performed?	-	Go to *Step 3*	Go to *Step 2*
2	Perform the Diagnostic Circuit Check. Did you find problem?	-	Go to *Step 3*	System OK
3	1. Ignition switch "OFF". 2. Disconnect the HECU harness from the HECU. 3. Ignition switch "ON". 4. Connect a fused jumper wire between terminal 16 of the HECU harness and body ground. Did the amber ABS lamp turn off?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the HECU.	-	System OK	-
5	1. Ignition switch "OFF". 2. Remove the Cluster Assembly from the I/P. 3. Disconnect the white Cluster harness connector from the Cluster Assembly. 4. Disconnect the ABS Warning Lamp Module harness connector from the ABS Warning Lamp Module. 5. Connect an ohmmeter to cluster harness terminal 4 and then to body ground. Was the resistance within the specific range?	OL (open circuit)	Go to *Step 7*	Go to *Step 6*
6	Find the repair the short to ground between the Cluster harness and the ABS Warning Lamp Module harness.	-	System OK	-
7	1. Ignition switch "OFF". 2. Disconnect the HECU harness from the	Less than 2 ohms	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	HECU. 3. Disconnect the ABS Warning Lamp Module harness from the ABS Warning Lamp Module. 4. Connect an ohmmeter to terminal D of the ABS Warning Lamp Module harness and then to HECU harness terminal 16. Was the resistance within the specific range?			
8	Repair the open or high resistance between the ABS Warning Lamp Module and the HECU.	-	System OK	-
9	Replace the ABS Warning Lamp Module. Is the repair complete?	-	System OK	Go to *Step 10*
10	Replace the Cluster Assembly.	-	System OK	-

Brake Warning Lamp On



Circuit Description

The Hydraulic Electronic Control Unit (HECU) controls the operation of the Brake Warning Lamp by means of a lamp driver module contained within the Cluster.

Battery voltage is supplied to the I/P Cluster terminal 11, and HECU terminal 4 when the ignition switch is turned on HECU terminals 9 and 25 are `hot at all times'

The default state is for the Lamp Driver Module to turn ON the Brake Warning Lamp, by supplying a ground path through the Lamp Driver Module.

When the HECU commands the Brake Warning Lamp off, the HECU will ground the ABS Warning Lamp control circuit. This causes the Lamp Driver Module to open the path to ground for the bulb.

When the ignition switch is turned to the ON position, the HECU turns ON the Brake Warning Lamp for 3 seconds for a bulb check.

Whenever a malfunction is detected within the general brake system or MANDO MGH25 ABS system, the HECU may turn ON the Brake Warning Lamp, notifying the driver that either Brake System or MGH25 needs to be serviced.

Diagnostic Aids

Typical causes of the Brake Warning Lamp on with no DTC(s) set

1. Faulty Emergency brake switches.
2. Low brakes fluid level or faulty brake fluid switch.
3. DDPR is disabled due to the following fault conditions in MGH25 ABS system.

   Two Wheel Speed Sensors inoperative on same axle.
   Battery 2(Motor Input) short to ground.
   Battery 1(ECU Input) Open or short to ground.
   Motor ground open or short to battery.
   ECU ground open or short to battery.
   Ignition open or short to ground.

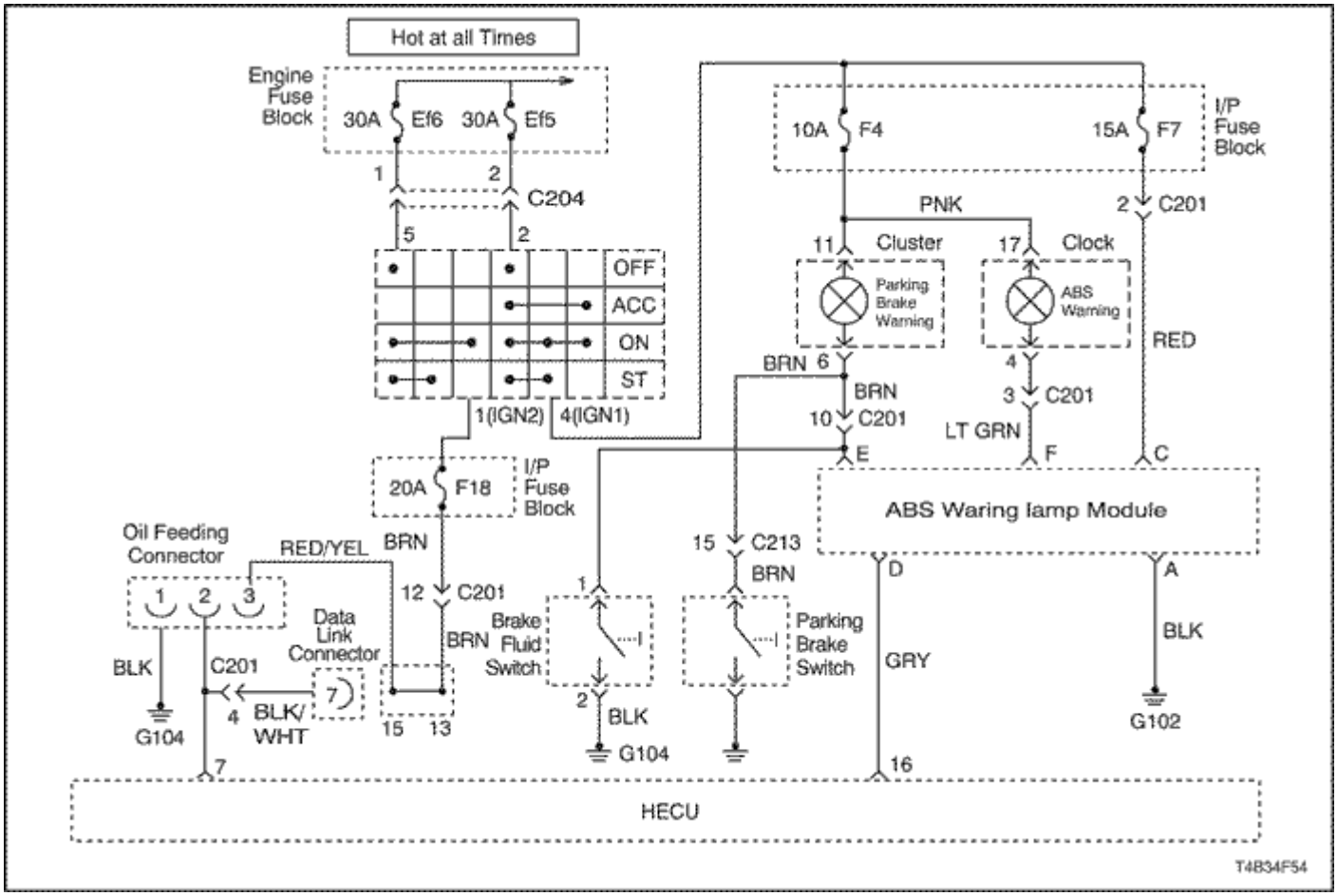
4. Grounded circuit between the Cluster and the HECU.
5. Faulty Cluster/Lamp Driver Module.
6. Faulty HECU.

Brake Warning Lamp On

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic Circuit Check performed?	-	Go to *Step 3*	Go to *Step 2*
2	Perform the Diagnostic Circuit Check. Did you find problem?	-	Go to *Step 3*	System OK
3	1. Observe ABS Warning Lamp. Does ABS Warning Lamp ON also?	-	Go to *Step 5*	Go to *Step 4*
4	Possibility of general brake system failure. Repair the brake system.	-	System OK	-
5	1. Connect Scan Tool and retrieve DTC. Did DTC exist?	-	Go to *Step 6*	Go to *Step 7*
6	Go to appropriate DTC diagnostic section.	-	System OK	-
7	1. Ignition switch "OFF". 2. Disconnect the HECU harness from the HECU. 3. Ignition switch "ON". 4. Connect a fused jumper wire between terminal 16 of the HECU harness and body ground. Did the Brake Warning Lamp turn off?	-	Go to *Step 8*	Go to *Step 9*
8	Replace the HECU.	-	System OK	-
9	1. Ignition switch "OFF". 2. Remove the Cluster Assembly from the I/P. 3. Disconnect the white Cluster harness connector from the Cluster Assembly. 4. Disconnect the ABS Warning Lamp Module harness connector from the ABS Warning Lamp Module. 5. Connect an ohmmeter to cluster harness 6 and then to body ground. Was the resistance within the specific range?	OL (open circuit)	Go to *Step 11*	Go to *Step 10*
10	Find the repair the short to ground between the Cluster harness and the ABS Warning Lamp Module harness.	-	System OK	-
11	1. Ignition switch "OFF". 2. ABS Warning Lamp Module harness and HECU harness still disconnected 3. Connect an ohmmeter to terminal D of the ABS Warning Lamp Module harness and then to HECU harness	Less than 2 ohms	Go to *Step 13*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
	terminal 16. Was the resistance within the specific range?			
12	Repair the open or high resistance between the ABS Warning Lamp Module and the HECU.	-	System OK	-
13	Replace the ABS Warning Lamp Module. Is the repair complete?	-	System OK	Go to *Step 14*
14	Replace the Cluster Assembly.	-	System OK	-

Brake Warning Lamp Inoperative/No DTC Set



Circuit Description

The Hydraulic Electronic Control Unit (HECU) controls the operation of the red Brake Warning Lamp by means of a lamp driver module contained within the Cluster.

Battery voltage is supplied to the I/P Cluster terminal 11, and HECU terminal 4 when the ignition switch is turned on HECU terminals 9 and 25 are `hot at all times'
When the HECU commands the Brake Warning lamp off, the HECU will ground the Brake Warning Lamp control circuit. This causes the Lamp Driver Module to open the path to ground for the bulb.
When the ignition switch is turned to the ON position, the HECU turns ON the Brake Warning Lamp for 3 seconds for a bulb check.
Whenever a malfunction is detected within the General Brake system or DDRP, the HECU turns ON the Brake Warning Lamp, notifying the driver that Brake System or DDRP needs to be serviced.

Diagnostic Aids

Typical causes of the Brake Warning Lamp inoperative with no DTC(s) set.

1. Faulty bulb/ loose socket.
2. I/P fuse open.
3. Faulty Cluster/Lamp Driver Module.
4. Faulty HECU.
5. Grounded circuit between the HECU and the Cluster.

Brake Warning Lamp Inoperative/No DTC Set

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic Circuit Check performed?	-	Go to *Step 3*	Go to *Step 2*
2	Perform the Diagnostic Circuit Check. Did you find problem?	-	Go to *Step 3*	System OK
3	1. Disconnect the HECU harness from the HECU. 2. Ignition switch "ON". Did the Brake Warning Lamp turn on?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the HECU.	-	System OK	-
5	Check the Cluster fuse. Is the fuse and terminal contact ok?	-	Go to *Step 7*	Go to *Step 6*
6	Replace the open fuse and/or repair the loose terminals. Find the short, which caused the fuse to open, if applicable.	-	System OK	-
7	Remove the Brake Warning Lamp bulb from the Cluster and inspect for an open bulb filament or poor socket contact? Was the socket and bulb ok?	-	Go to *Step 9*	Go to *Step 8*
8	Replace the Bulb/Socket as needed.	-	System OK	-

Step	Action	Value(s)	Yes	No
9	1. Ignition switch "OFF". 2. HECU harness still disconnected. 3. Remove the Cluster Assembly from the Instrument Panel. 4. Disconnect the white Cluster harness connector from the Cluster Assembly. 5. Ignition switch "ON". 6. Connect a voltmeter to terminal 11 of the white Cluster harness and then to body ground.. Was the voltage within the specified range?	Battery Voltage	Go to *Step 11*	Go to *Step 10*
10	Find and repair the source of low voltage on the cluster voltage supply terminal.	-	System OK	-
11	1. Ignition switch "OFF". 2. Disconnect the White Cluster harness connector from the Cluster Assembly. 3. Connect an ohmmeter between white Cluster harness terminal 6 and ABS Warning Lamp Module harness terminal E. Was the resistance within the specific range?	Less than 2 ohms	Go to *Step 13*	Go to *Step 12*
12	Repair the open or high resistance between the cluster and the ABS Warning Lamp Module.	-	System OK	-
13	1. Ignition switch "OFF". 2. ABS Warning Lamp Module harness and HECU harness still disconnected 3. Connect an ohmmeter to HECU harness terminal 16 and then to body ground.. Was the resistance within the specific range?	OL (open circuit)	Go to *Step 15*	Go to *Step 14*
14	Find the repair the short to ground between the ABS Warning Lamp Module harness and the HECU harness	-	System OK	-
15	Replace the ABS Warning Lamp Module. Is the repair complete?	-	System OK	Go to *Step 16*
16	Replace the Cluster Assembly.	-	System OK	-

SECTION 4G

PARKING BRAKE

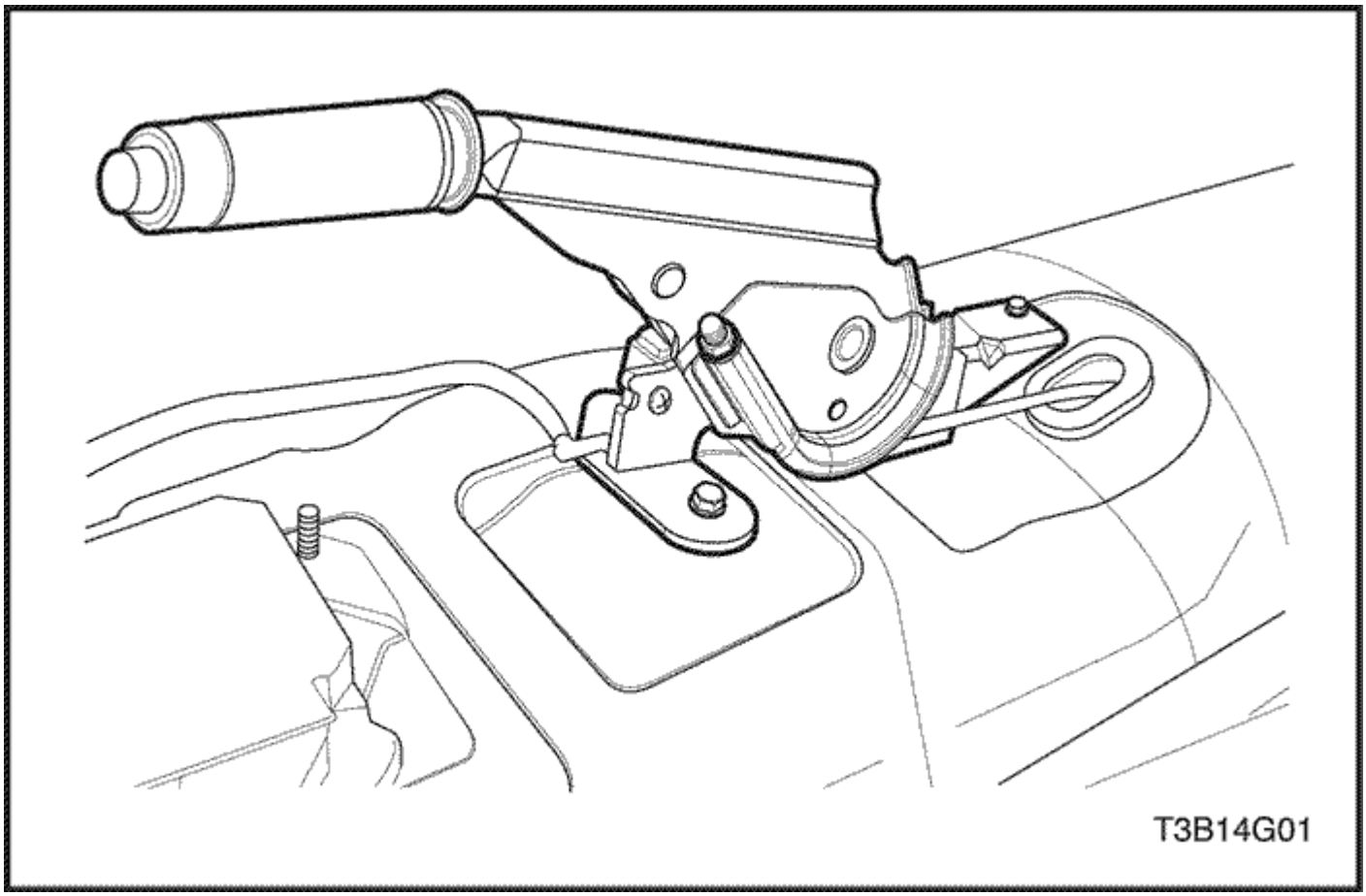
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Front Muffler Heat Shield Nuts	2.5	-	22
Parking Brake Cable-to-Rear Axle Bracket Bolt	12	-	106
Parking Brake Cable-to-Underbody Side and Near Side Bracket Nuts	12	-	106
Parking Brake Console Hood-to-Tunnel Bracket Screws	2.5	-	22
Parking Brake Lever-to-Vehicle Underbody Bolts	20	15	-
Parking Brake Switch-to-Parking Brake Lever Screw	4	-	35
Rear Hub Caulking Nut	190	140	-

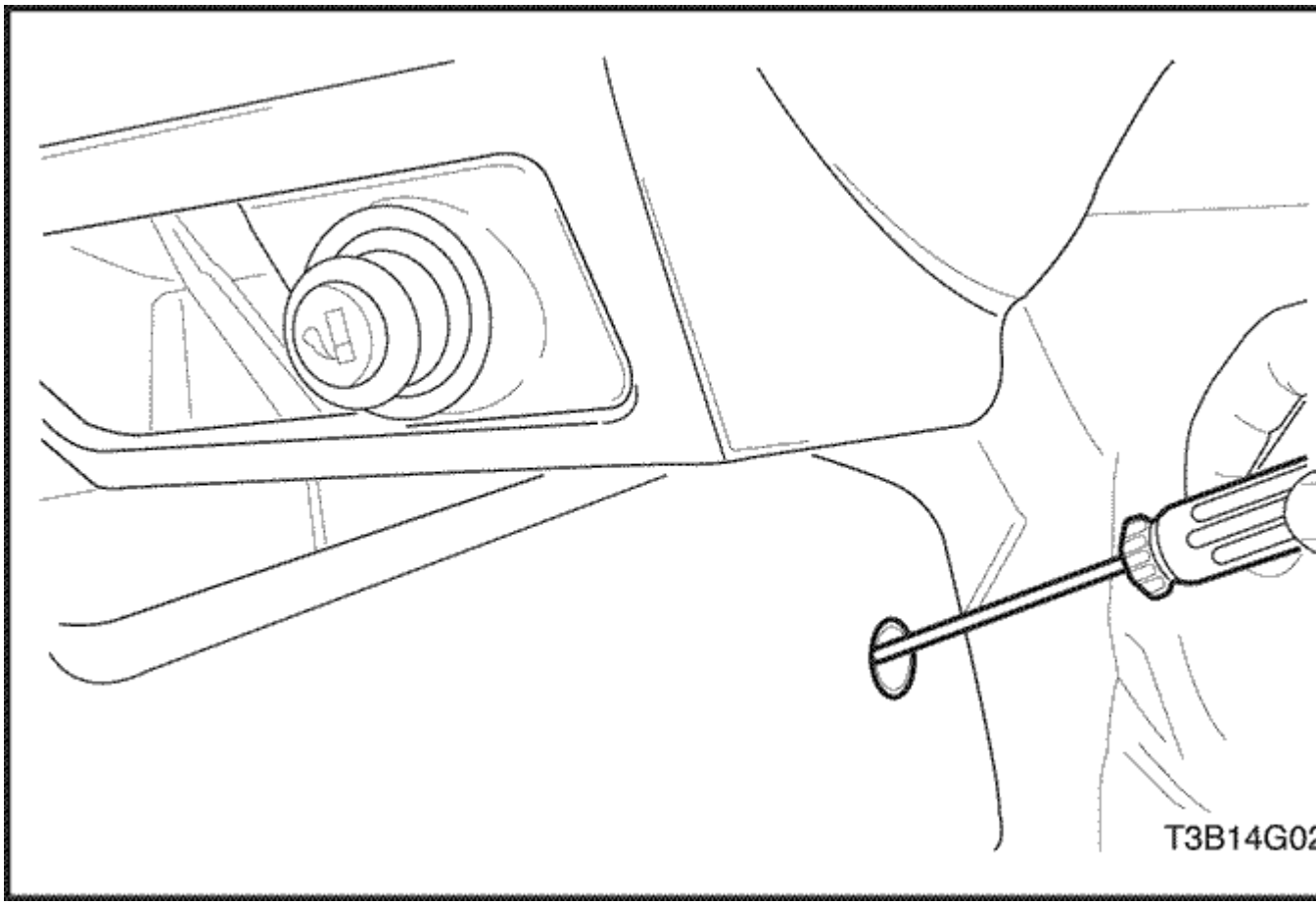
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

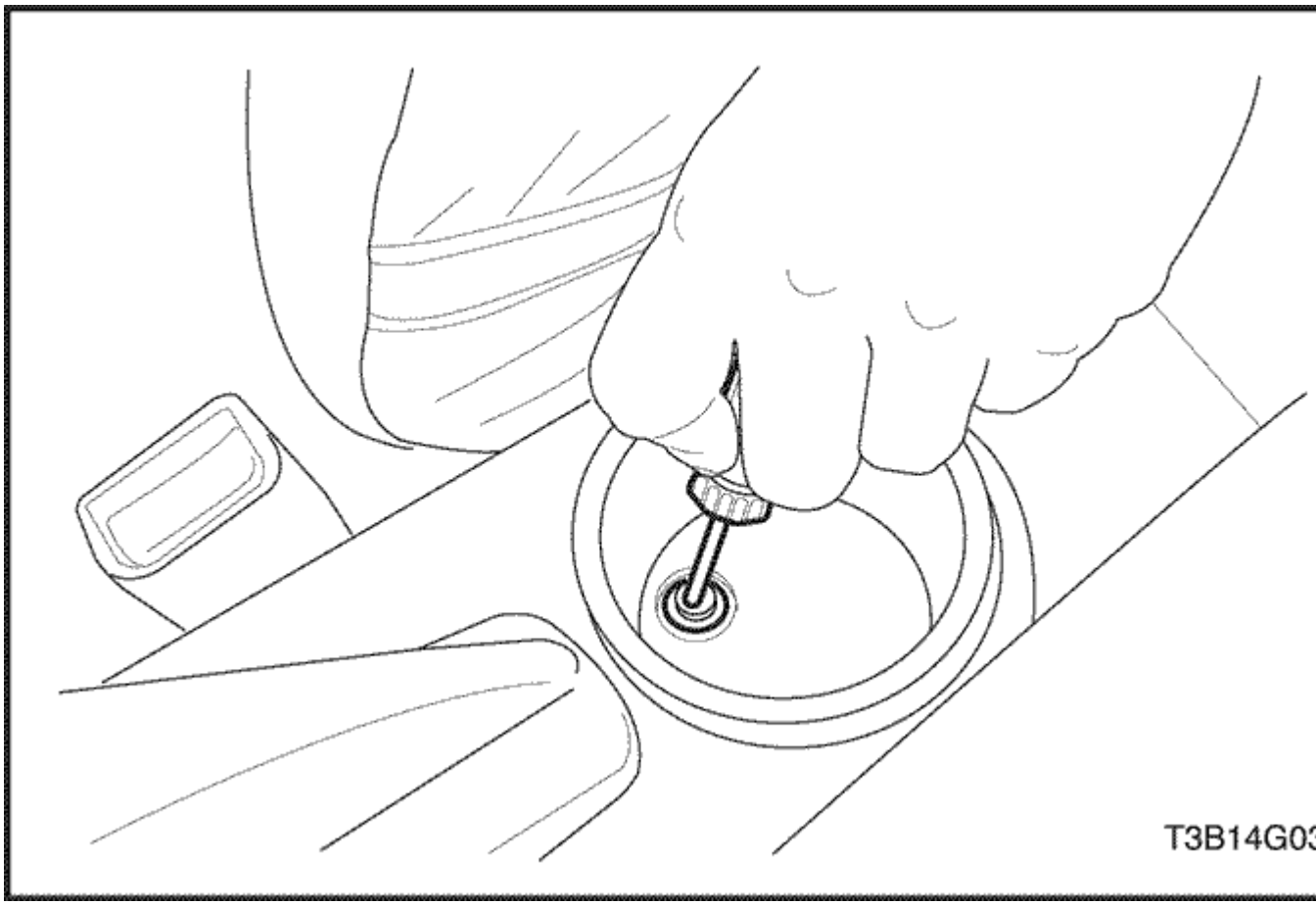


Parking Brake Adjustment
Adjustment Procedure

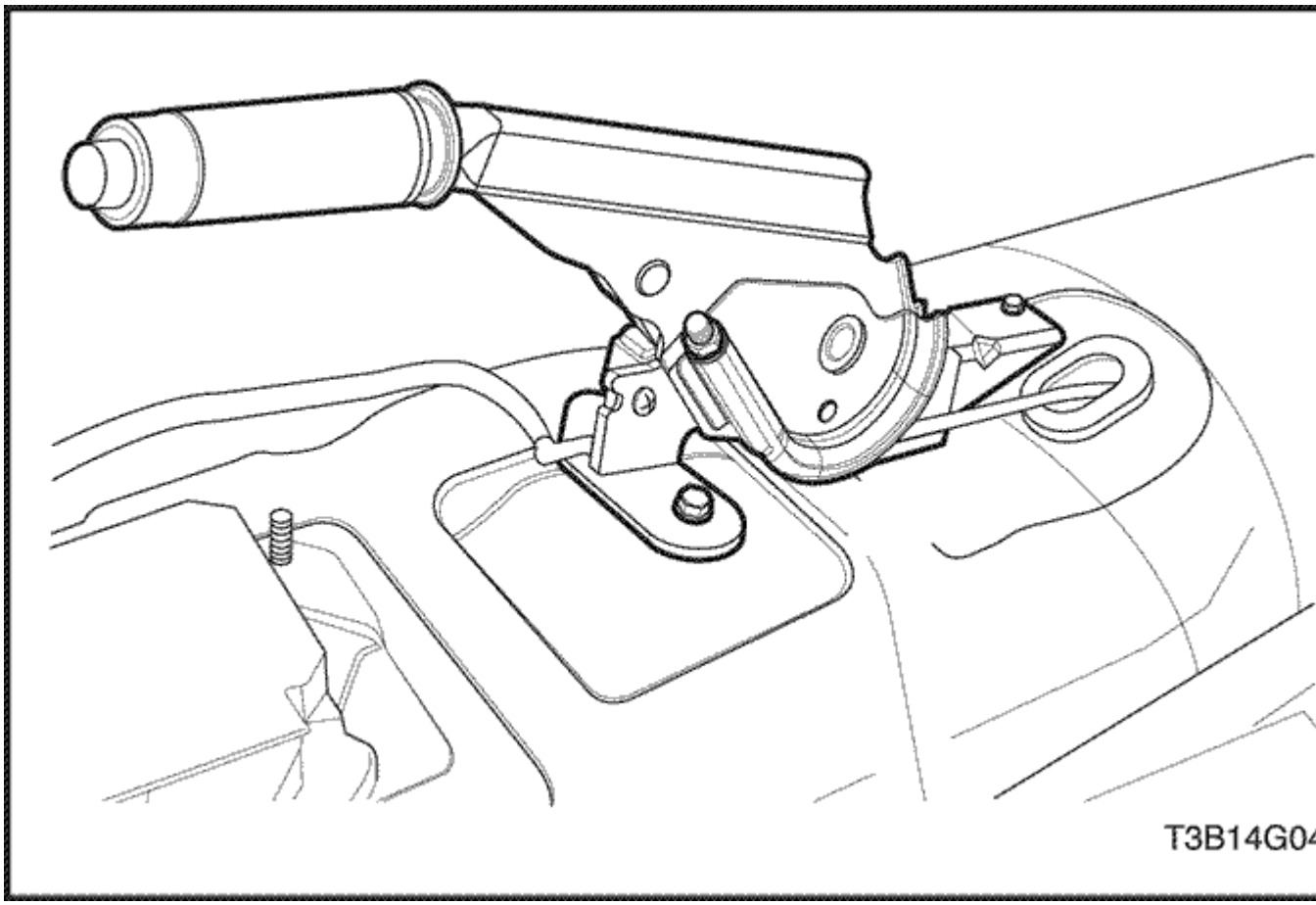
1. Adjust the rear brakes. Refer to *Section 4E, Rear Drum Brakes.*
2. Release the parking brake.
3. Raise and suitably support the vehicle.
4. Check the parking brake cables for free movement.



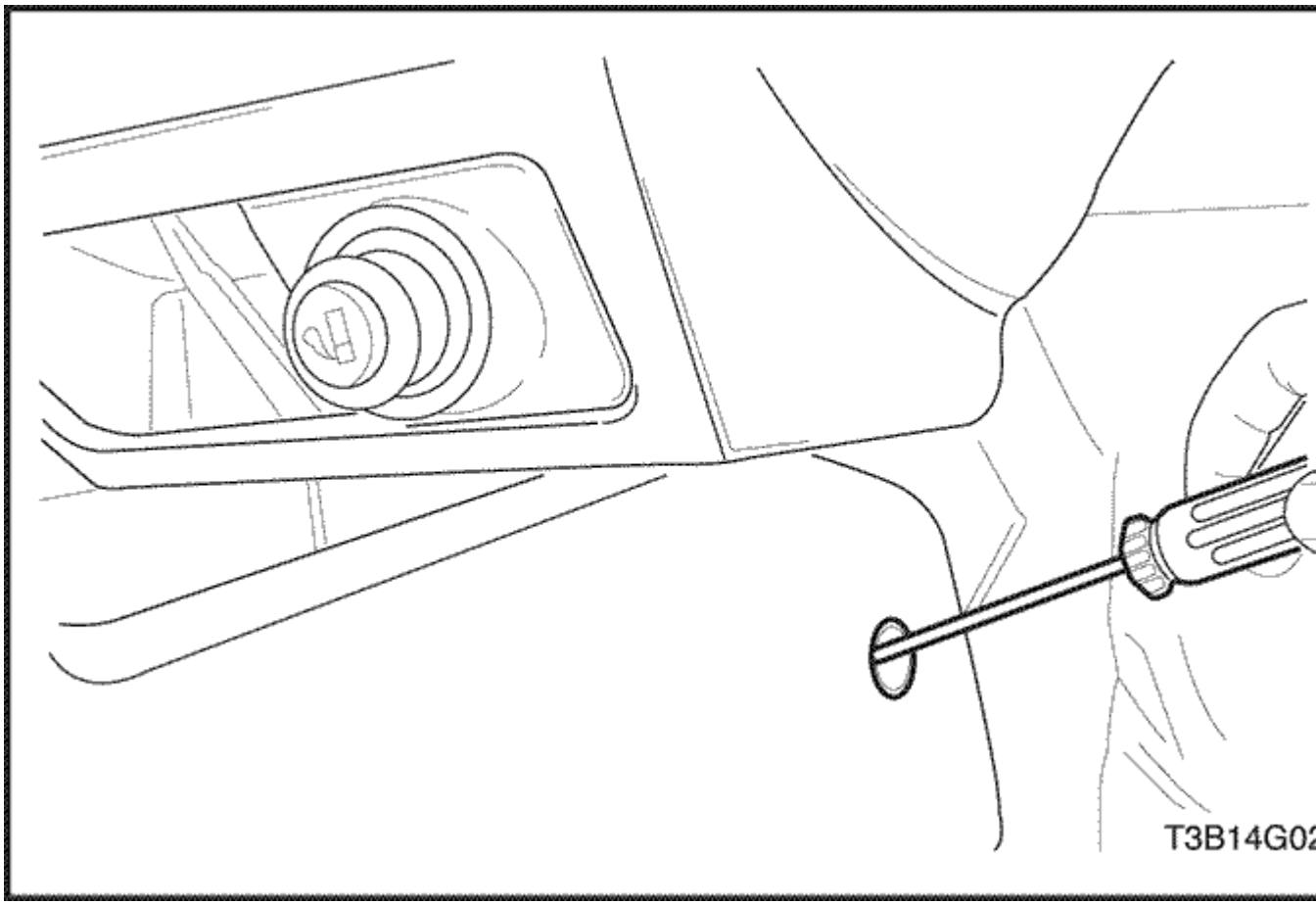
5. Lower the vehicle
6. Move the front seats backward to ensure the enough working space.
7. Pry off the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.
8. Unfasten the screws that secure the parking brake console hood to the tunnel brackets.



9. Raise the console hood to expose the parking brake lever assembly and the adjustment nut.



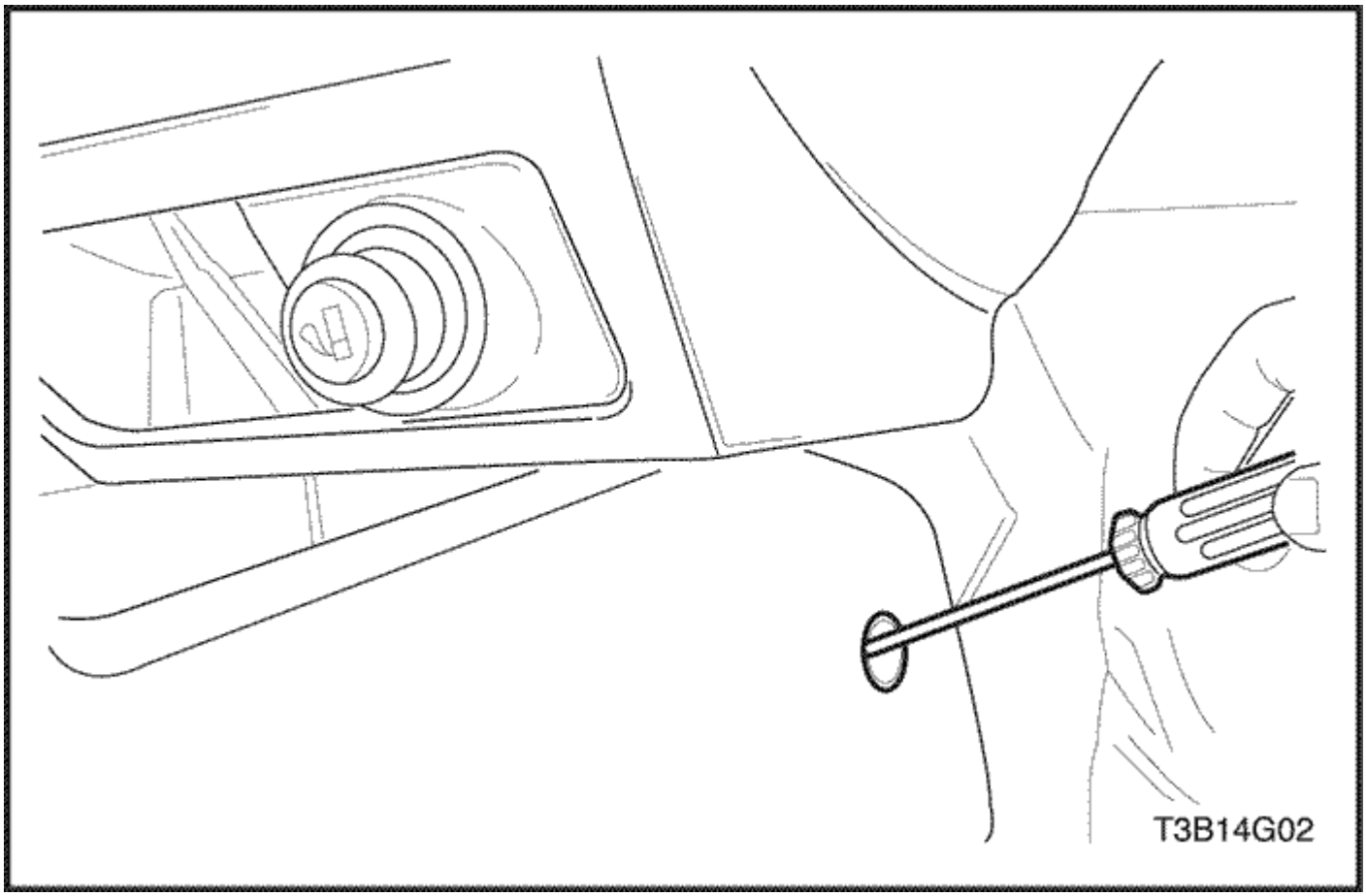
10. Partially raise and suitably support the vehicle.
11. Turn the adjustment nut on the lever assembly until the wheels are difficult to turn.
12. Loosen the nut until the rear wheels are just free to turn.



13. Lower the vehicle.
14. Position the parking brake console hood and fasten it to the tunnel brackets with the screws.

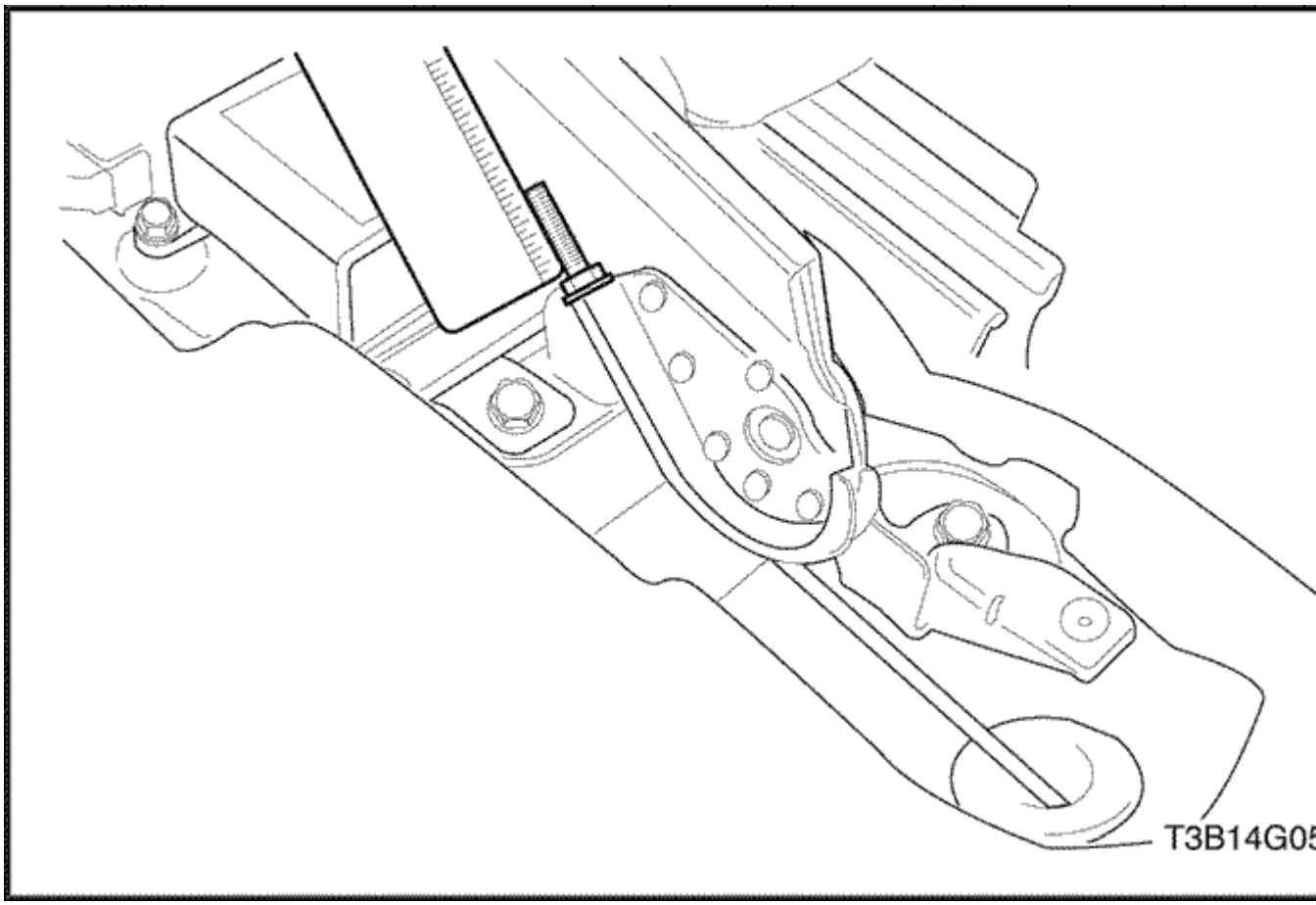
    Tighten
    Tighten the parking brake console hood-to-tunnel bracket screws to 2.5 N•m (22 lb-in).

15. Snap in the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.
16. Adjust the front seats to their previous position.

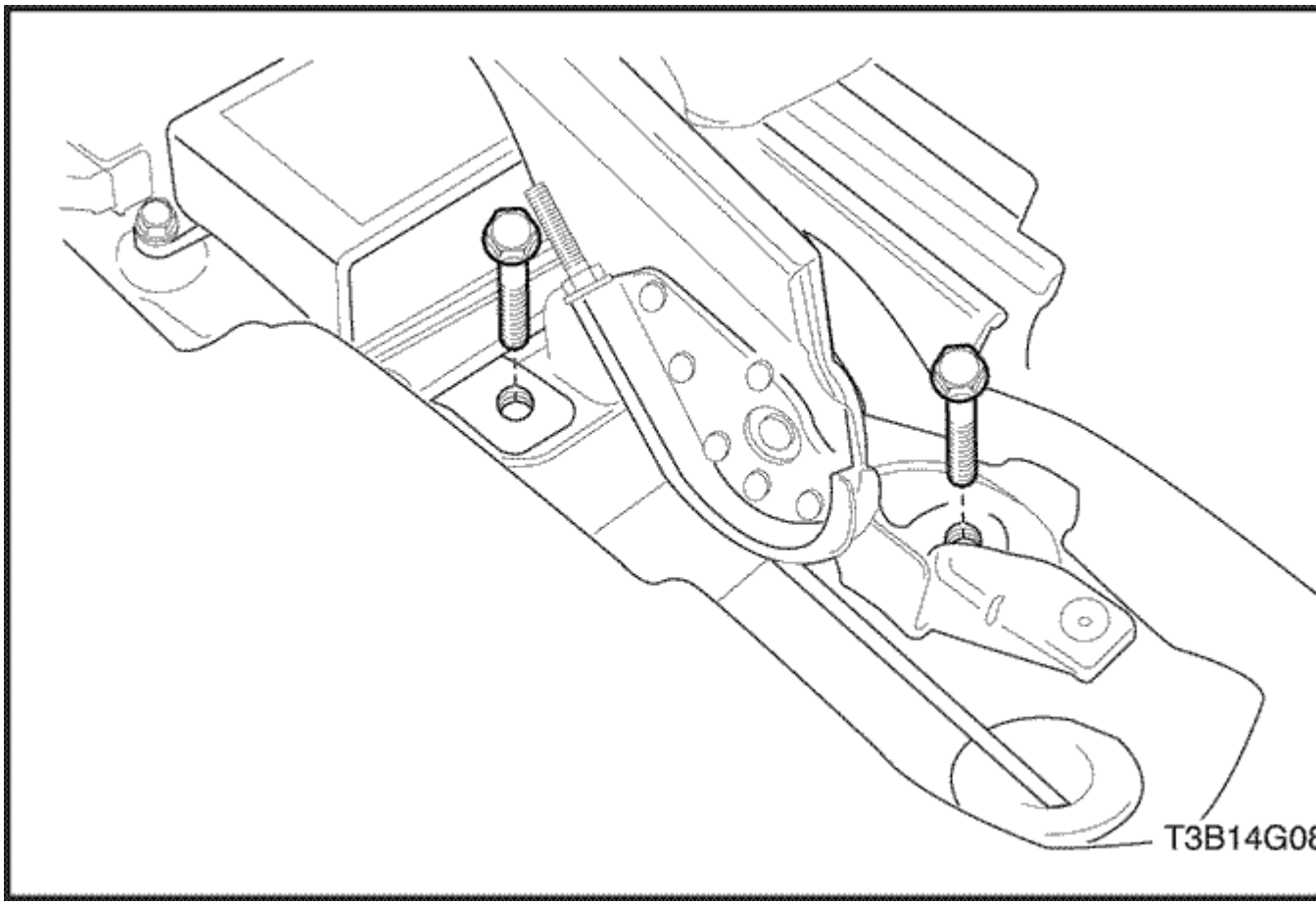


Parking Brake Lever
Removal Procedure

1. Release the parking brake.
2. Move the front seats forward.
3. Pry off the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.
4. Remove the screws that secure the parking brake console hood-to-the-tunnel brackets. Raise the console hood.



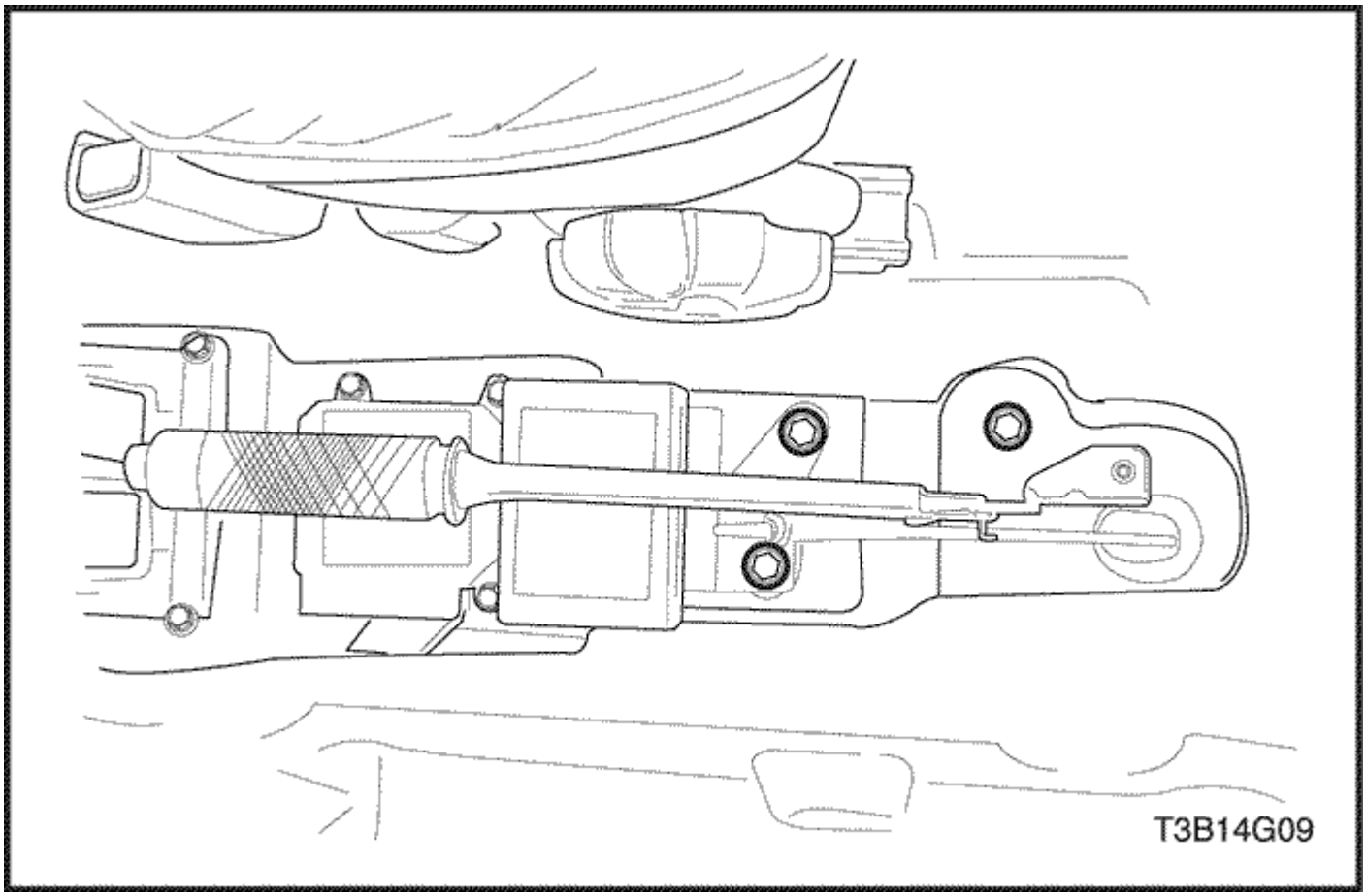
5. Measure the thread length from the end of the pushrod to the adjustment nut before removing the adjustment nut.



6. Remove the complete parking brake lever assembly and the cable from the assembly by unfastening the parking brake lever-to-vehicle underbody bolts and removing the adjustment nut.
7. Disconnect the parking brake warning lamp switch connector.

   Notice : The parking brake switch should be replaced if the BRAKE warning light in the instrument panel cluster does not glow when the parking brake is applied with the ignition switch ON.

8. If necessary, remove the parking brake switch, which is attached to the parking brake lever assembly by a small screw.
9. Inspect the parking brake lever cable and the lever grip for damage, and replace if necessary.



Installation Procedure

Notice : If the parking brake lever is bent or damaged or if a new grip is required, replace the complete parking brake lever assembly, which includes a new parking brake switch and lever cable.

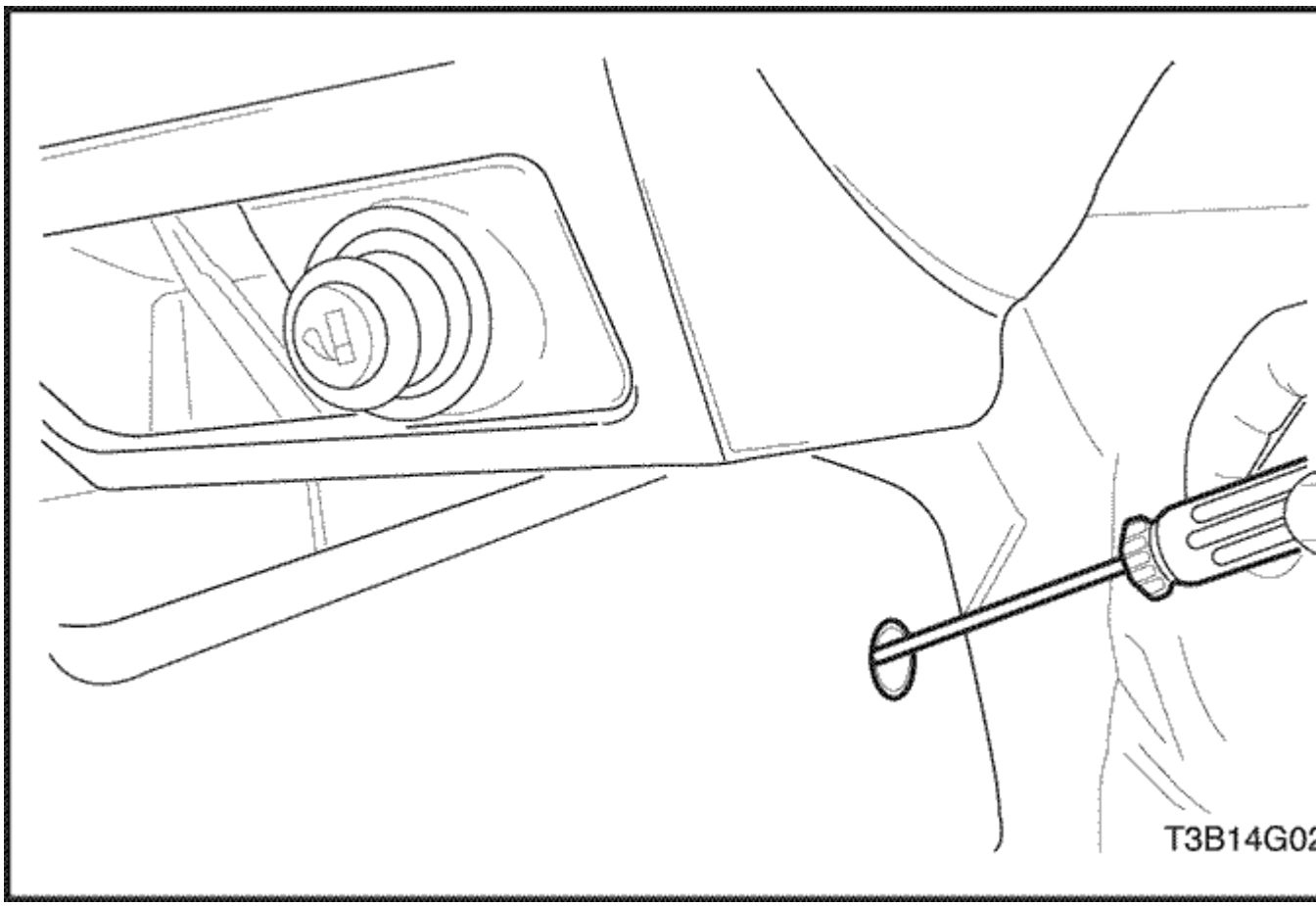
1. Fasten the parking brake switch to the parking brake lever with the screw.

   Tighten
   Tighten the parking brake switch-to-parking brake lever screw to 4 N•m (35 lb-in).

2. Fasten the parking brake lever assembly to the vehicle underbody. Insert the cable, to the pushrod.

3. Tighten the hex adjusting nut on the pushrod approximating the measurement noted in the removal procedure.

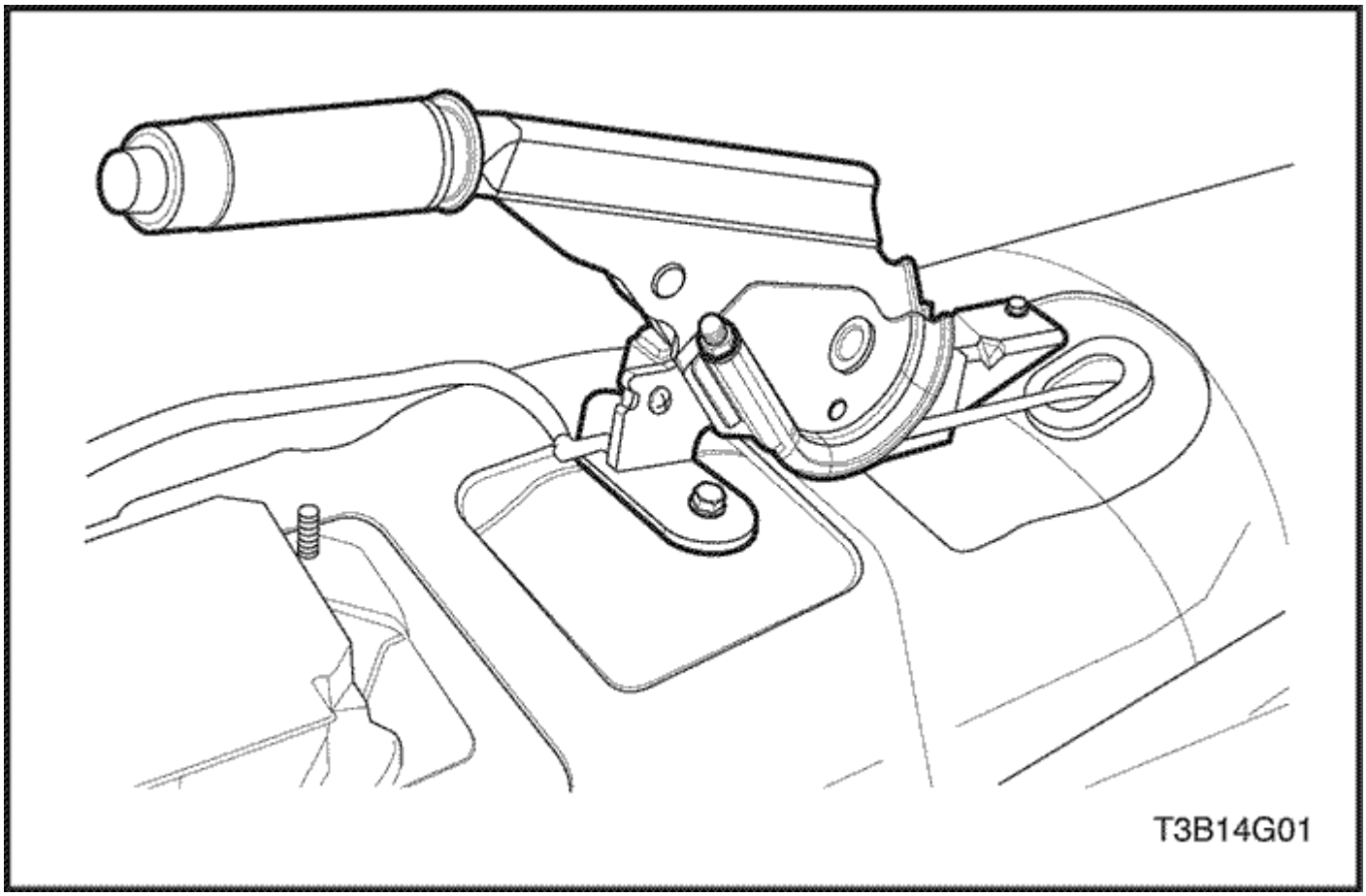
   Tighten
   Tighten the parking brake lever-to-vehicle underbody bolts to 20 N•m (15 lb-ft).



4. Connect the parking brake warning lamp switch connector.
5. Install the screws that secure the parking brake console hood to the tunnel brackets.

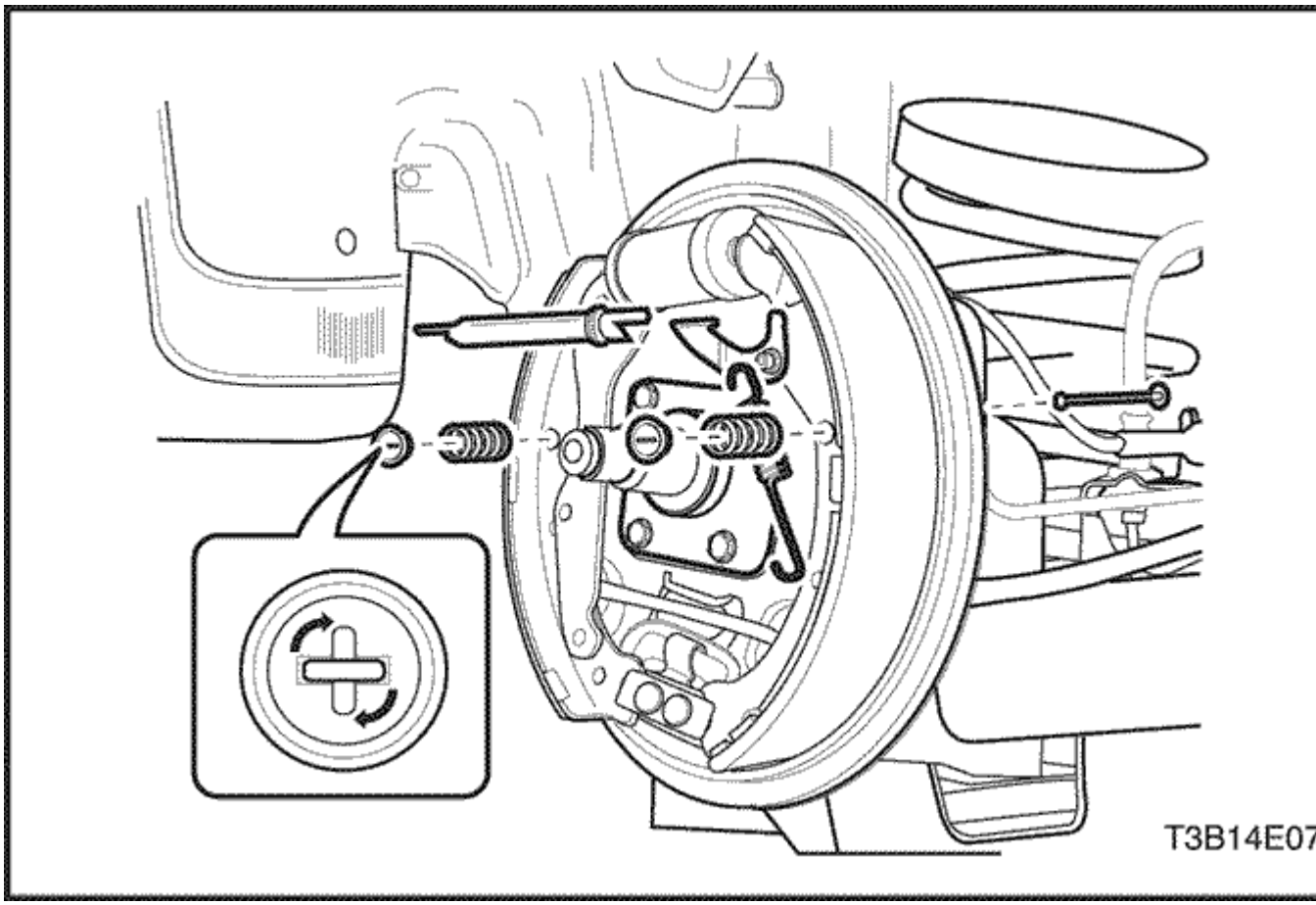
   Tighten
   Tighten the parking brake console hood-to-tunnel bracket screws to 2.5 N•m (22 lb-in).

6. Install the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.

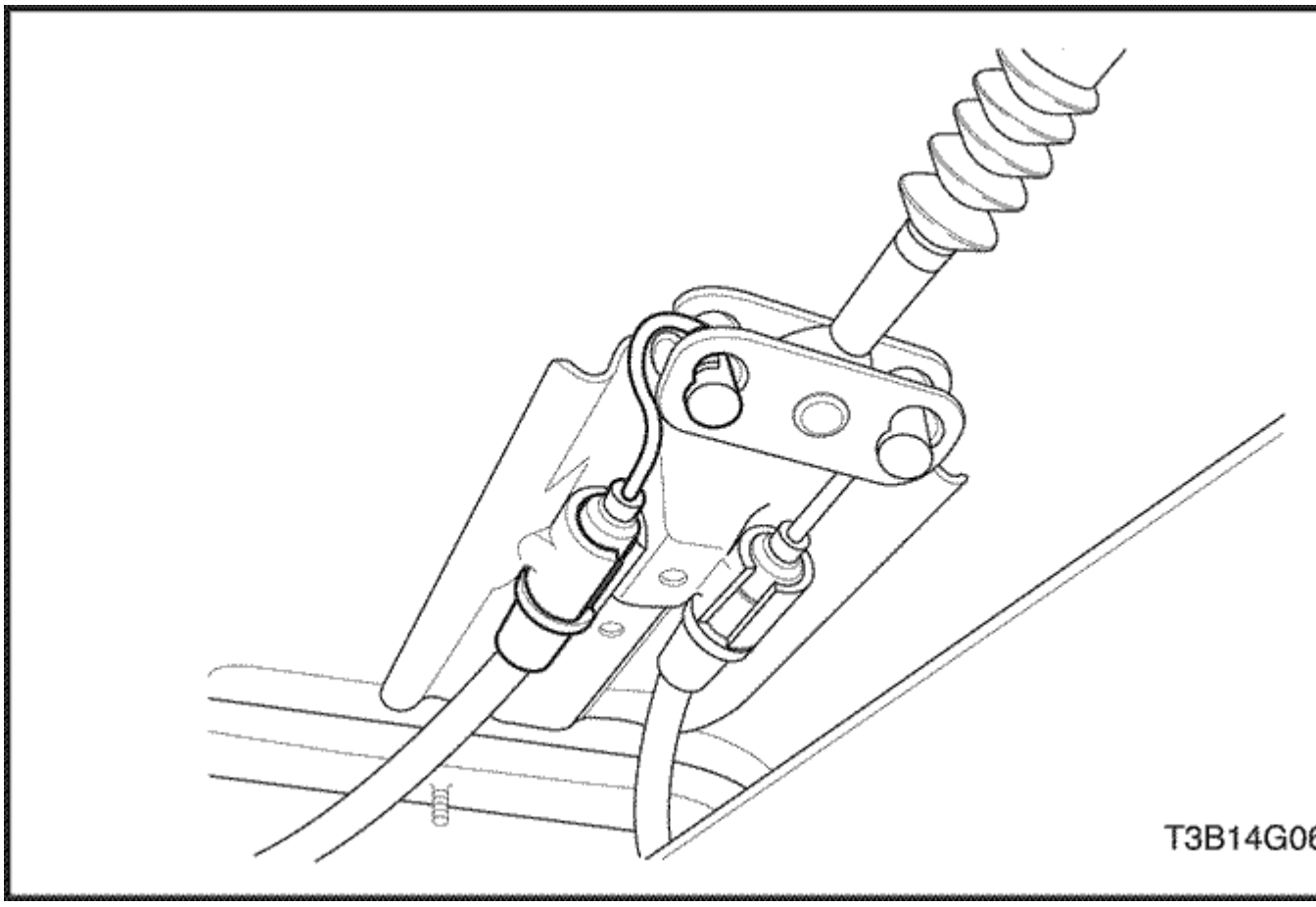


Parking Brake Cable
Removal Procedure

1. Release the parking brake lever.
2. Remove the rear wheels. Refer to *Section 2E, Tires and Wheels.*



3. Remove the retaining ring for the parking brake cable on each side of the vehicle.
4. Remove the plastic sleeve.
5. Remove the brake cable from the parking brake shoe lever and from the brake backing plate.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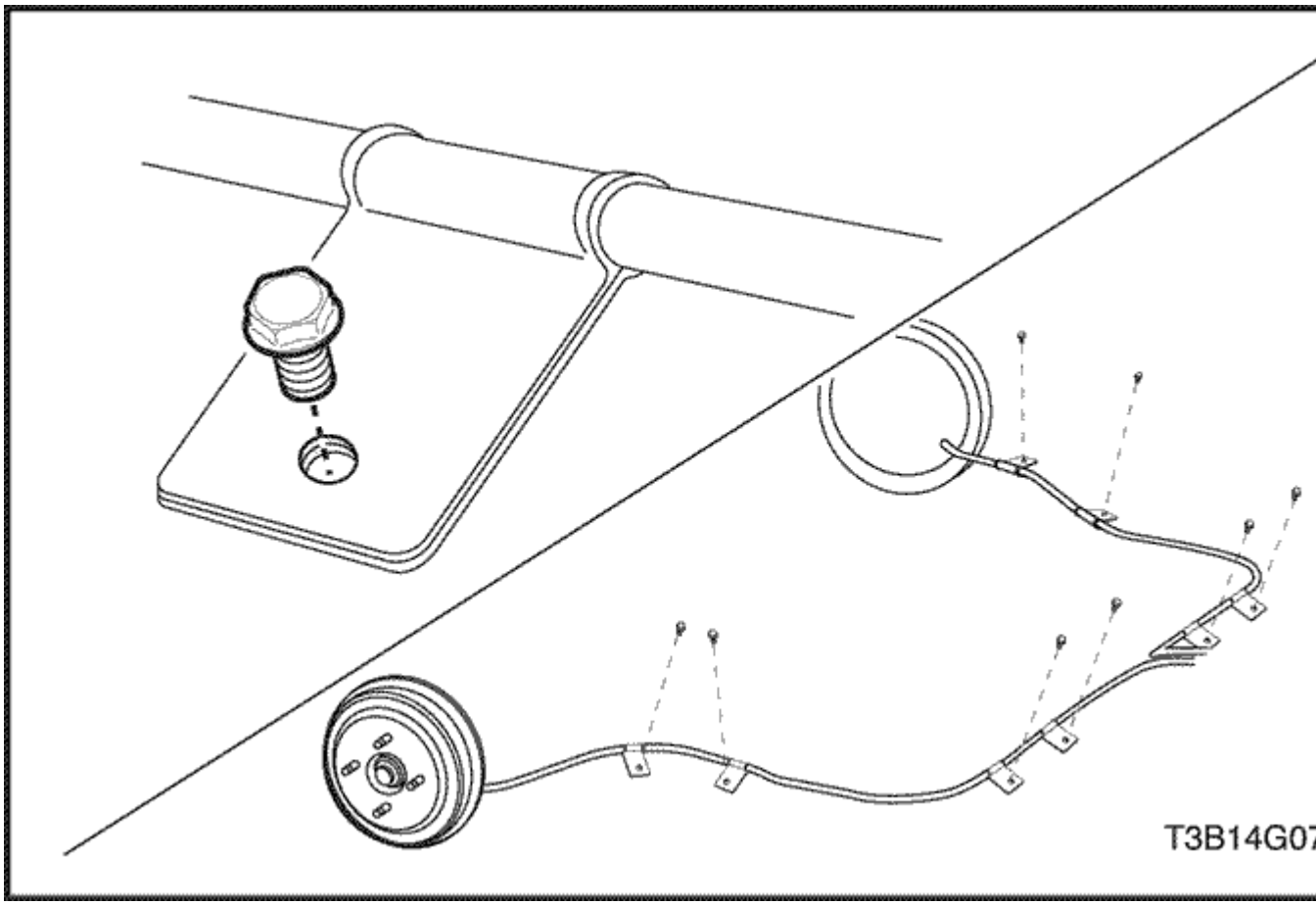
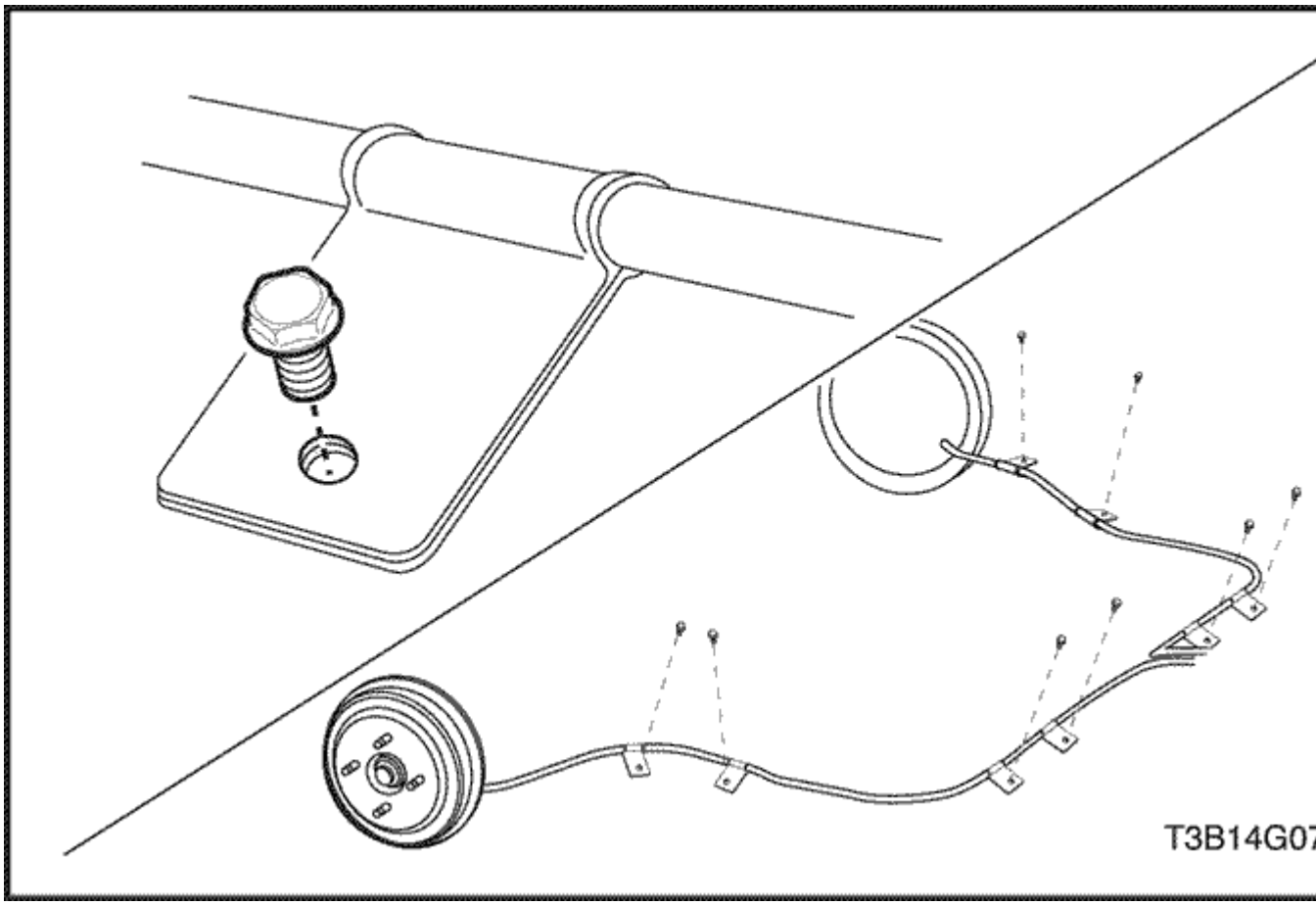
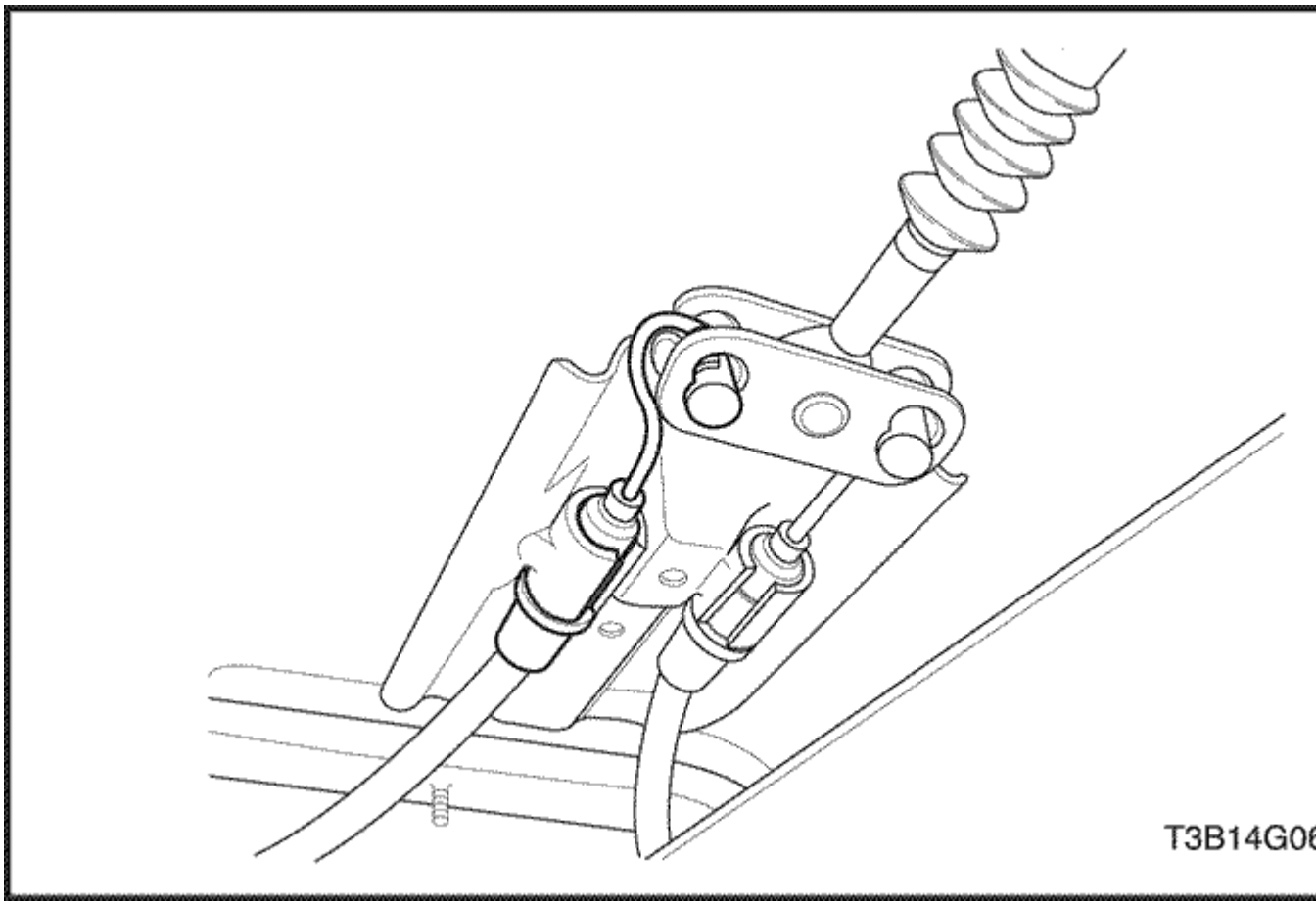


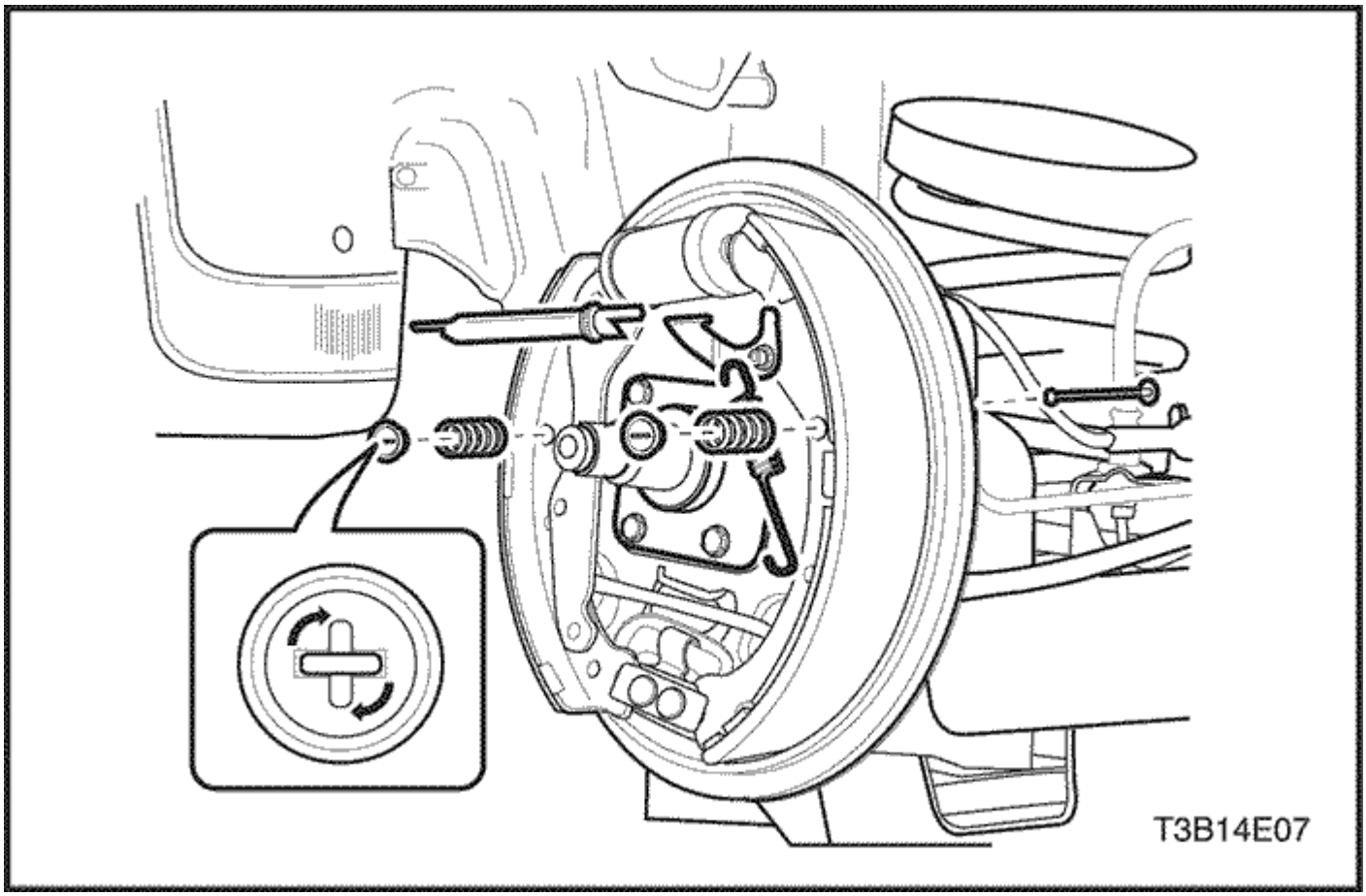
6. Remove the bolts that fastens the brake cable to the holding bracket on the rear axle. Remove the bolts from the rear alxe mounting bracket on each side of the vehicle.



7. Remove the bolt that fastens the brake cable to the underbody side bracket on each side of the vehicle. Remove the cable.

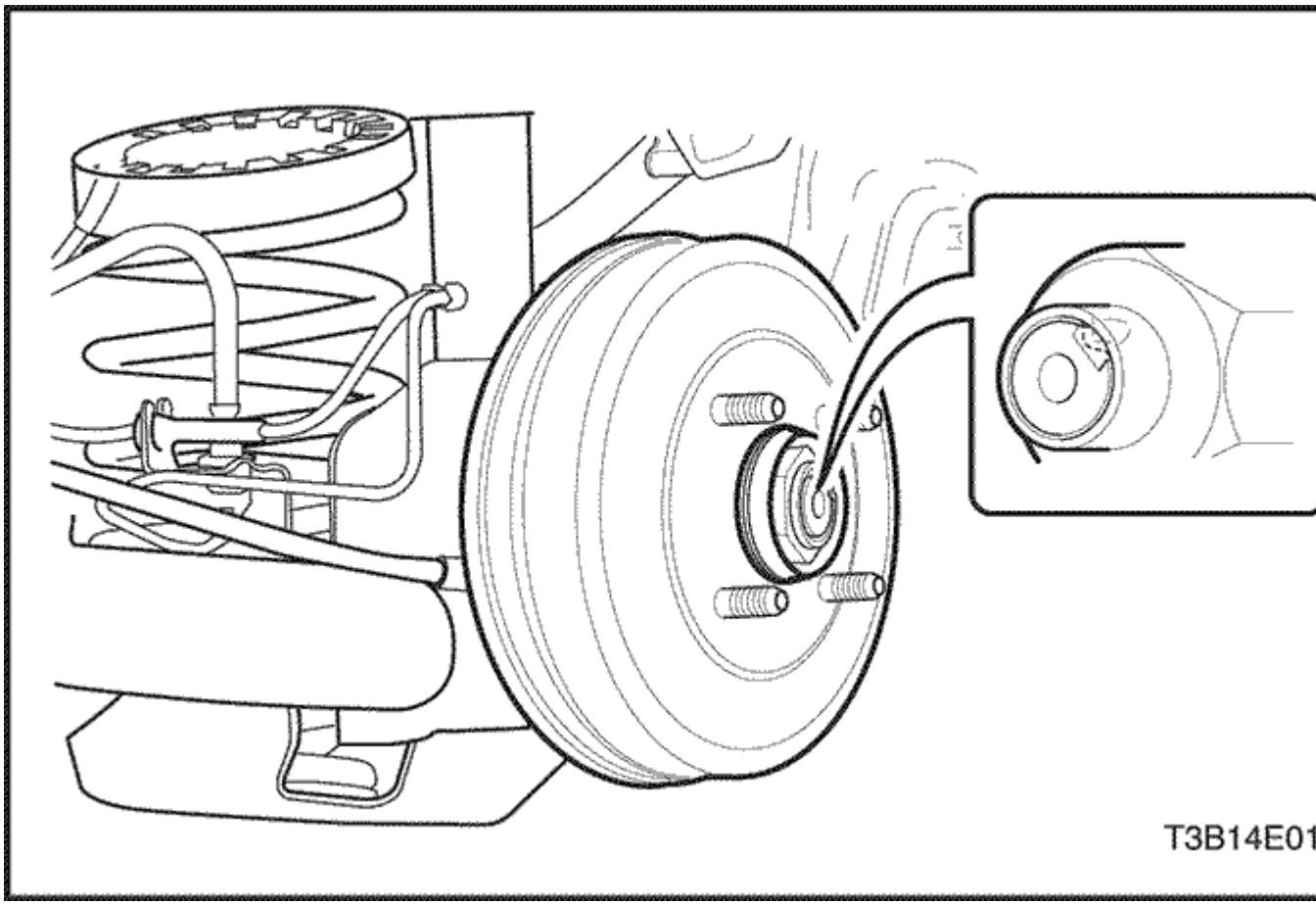


8. Remove the parking brake cables from the welded body bracket.



Installation Procedure

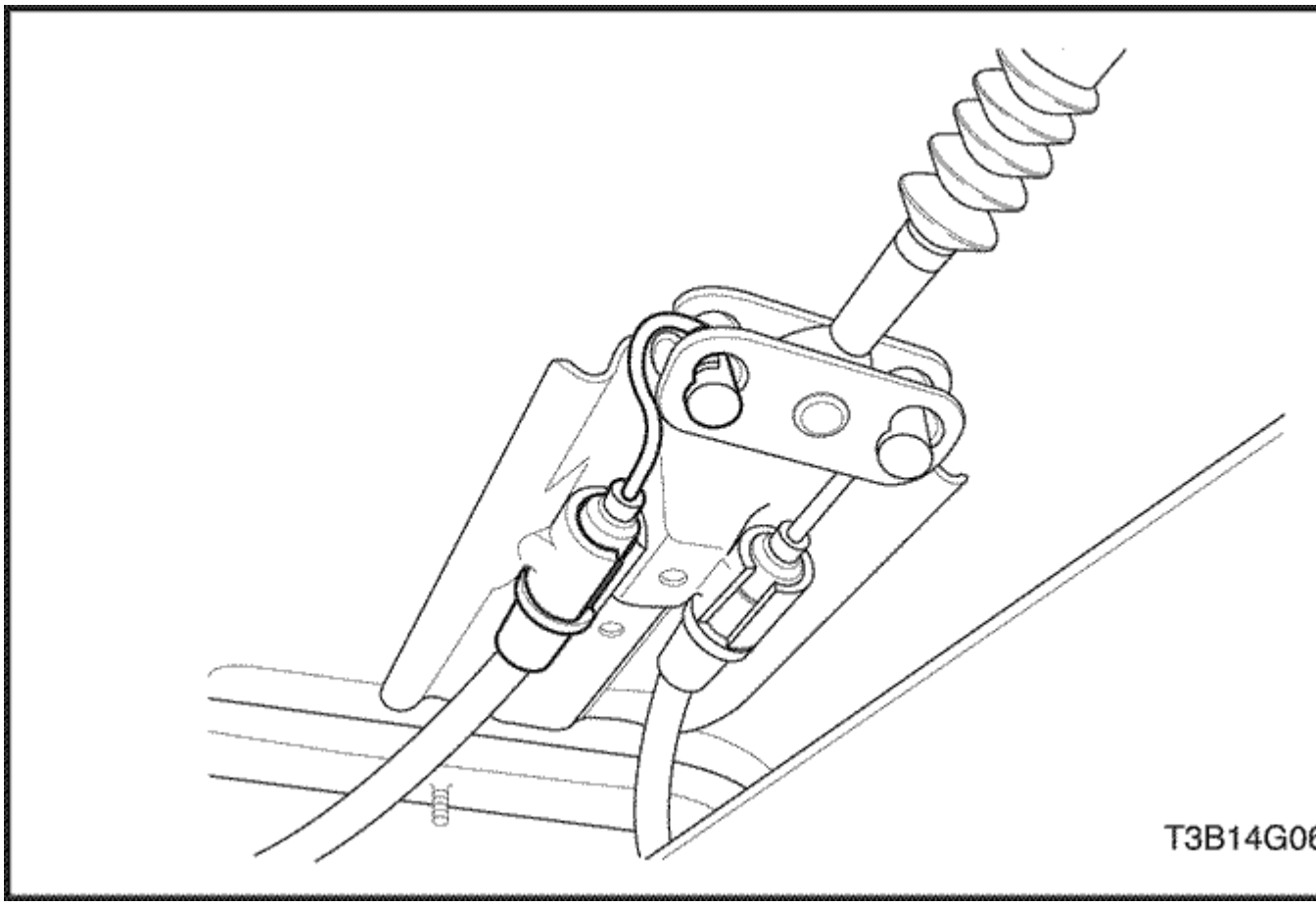
1. Install the new parking brake cable through the brake backing plate. Use a new cable if the original is frayed or damaged. Attach the cable to the parking brake shoe lever.



2. Insert the plastic sleeve into the brake backing plate and press in the retaining ring. Make sure the parking brake cable is routed correctly.
3. Install the brake drums and fasten the rear hub caulking nut.

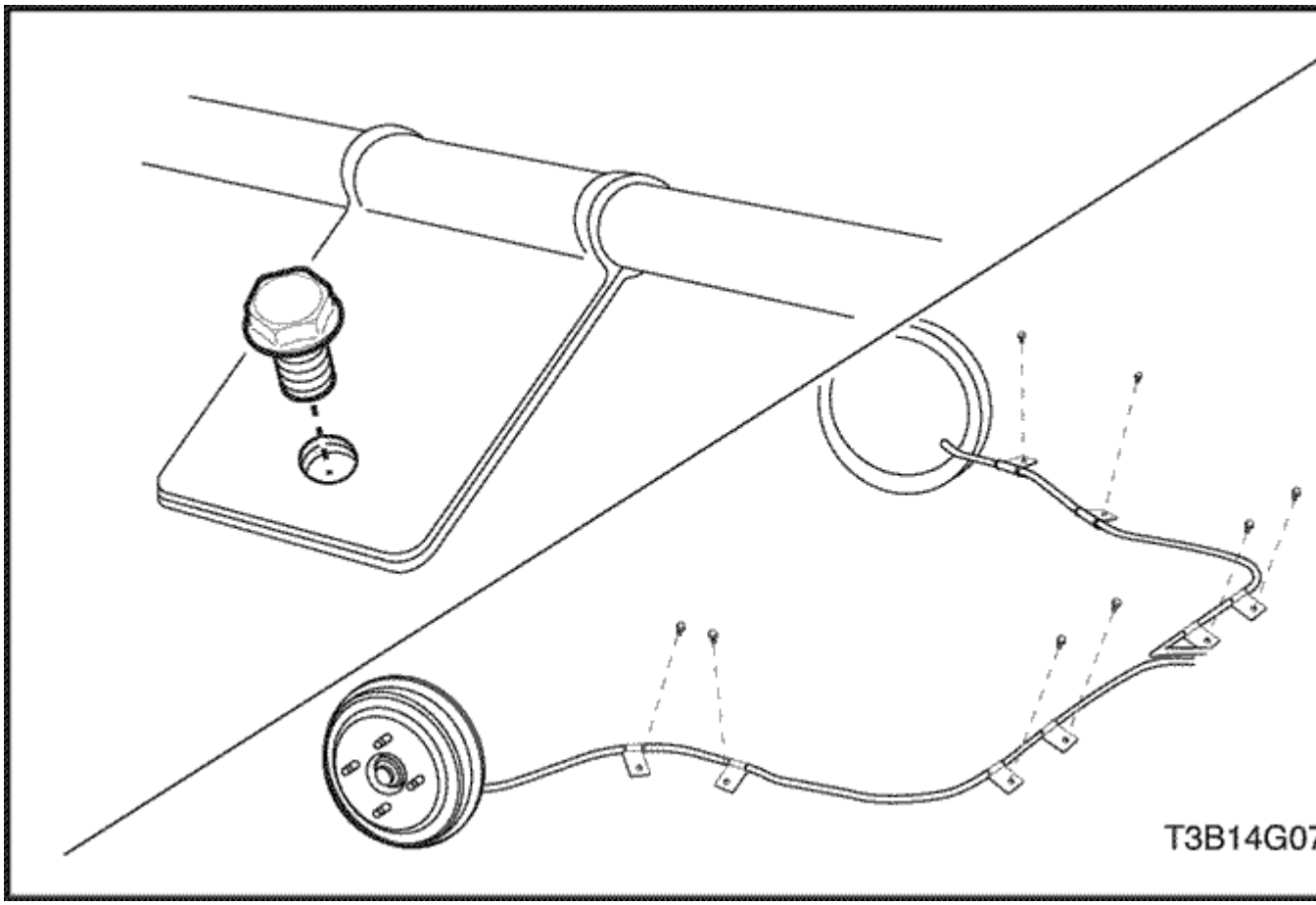
   Tighten
   Tighten the rear hub caulking nut to 190 N•m (140 lb-ft).

4. Install the rear wheels. Refer to *Section 2E, Tires and Wheels.*

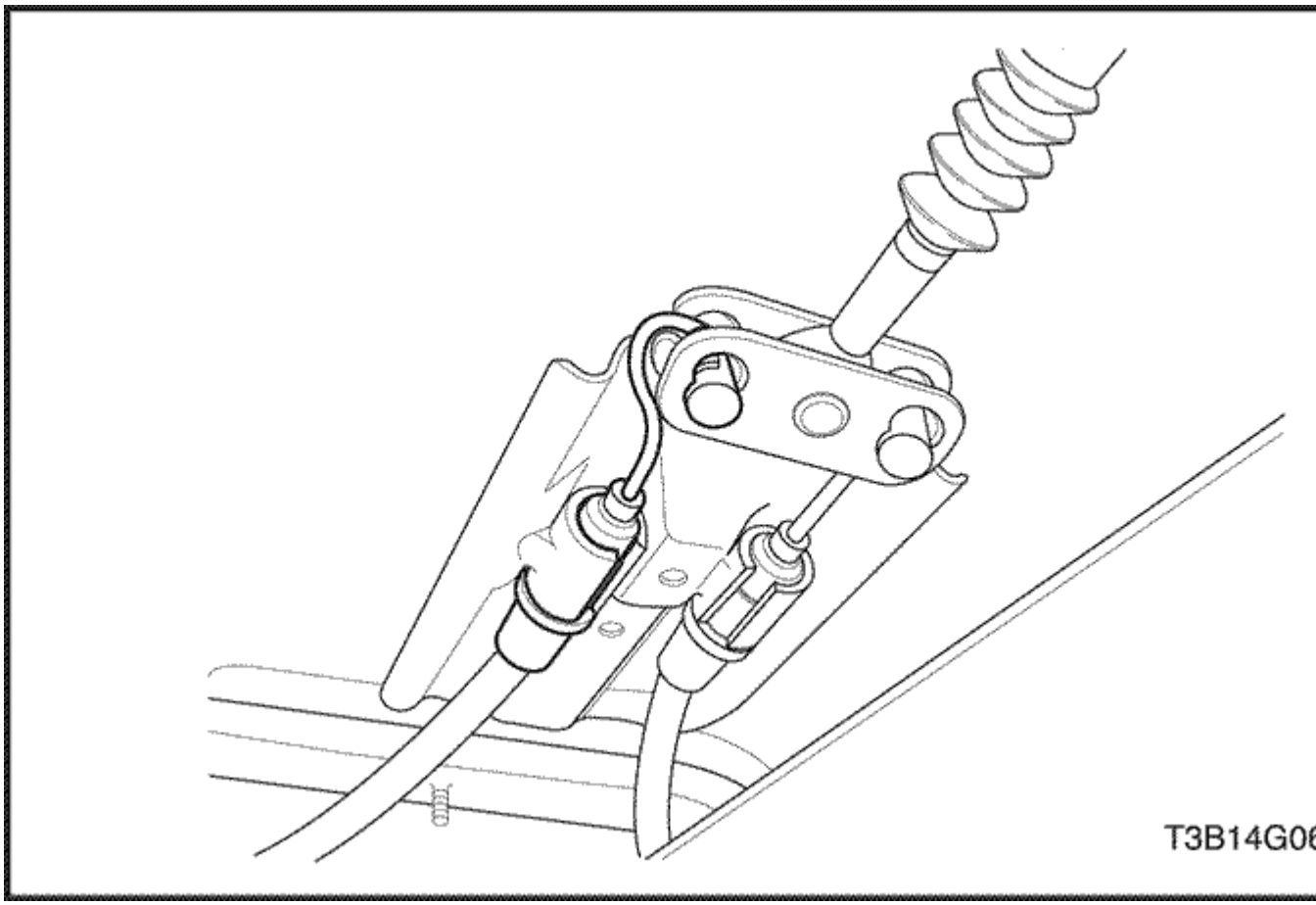


5. Install the parking brake cable to the underbody side brackets on each side of the vehicle, and a bracket near the underbody side bracket.

   Tighten
   Tighten the parking brake cable-to-underbody side and near side bracket bolts to 12 N•m (106 lb-in).

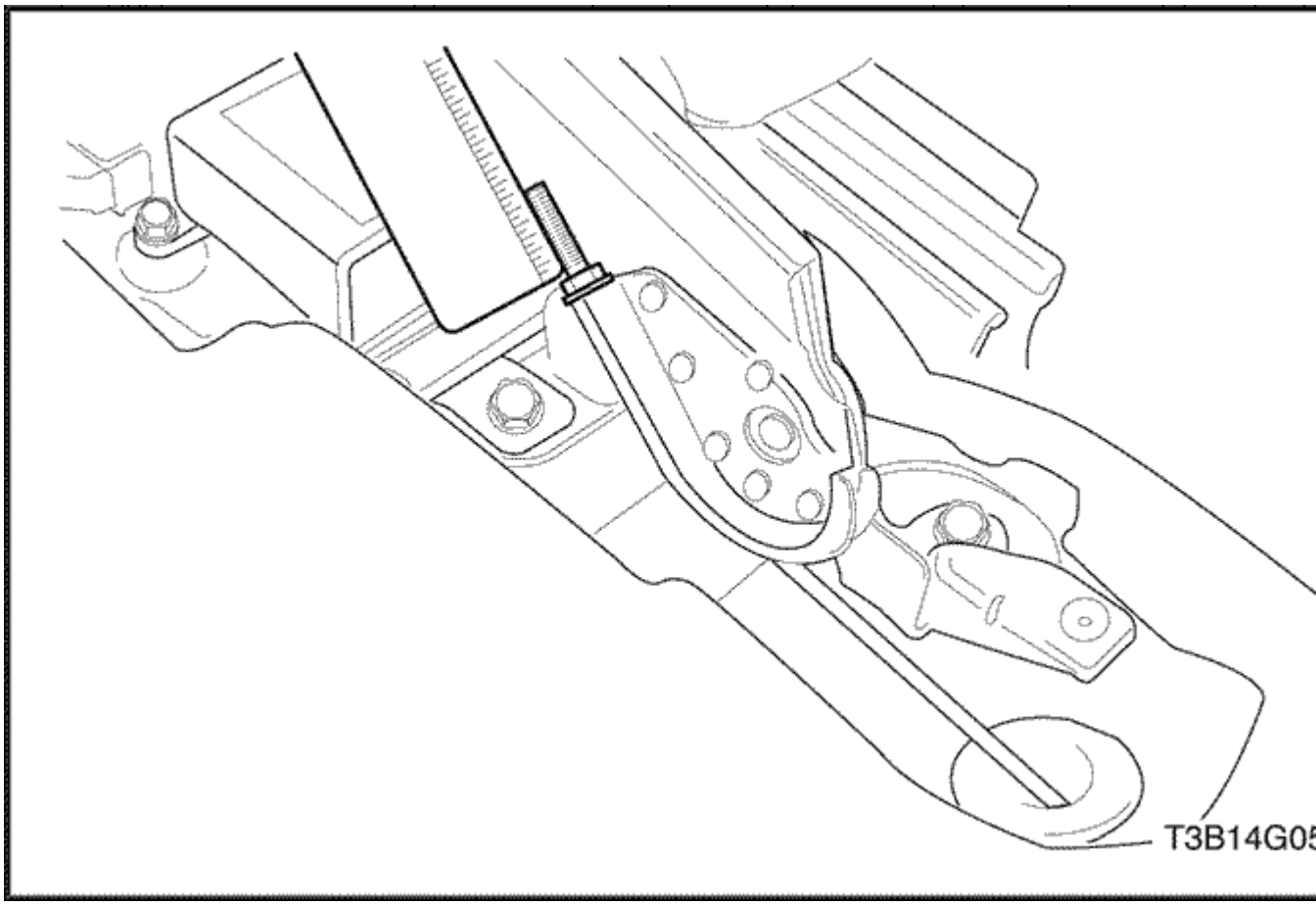


6. Install the parking brake cable on the rear axle brackets on each side of the vehicle.



Tighten
Tighten the parking brake cable-to-rear axle bracket bolt to 12 N•m (106 lb-in).

7. Insert the parking brake cables through the welded body bracket.



8. Adjust the length of parking brake cable. Refer to *this section, parking brake adjustment.*

GENERAL DESCRIPTION AND SYSTEM OPERATION

Parking Brake

This braking system uses a BRAKE warning light located in the instrument panel cluster. When the ignition switch is in the START position, the BRAKE warning light should glow and go off when the ignition switch returns to the RUN position. Whenever the parking brake is applied and the ignition switch is ON, the BRAKE warning light should glow.

When the brake is firmly applied, the parking brake should securely hold the vehicle with ample pedal travel remaining. Check for frayed cables, rust, etc., or any condition that may inhibit present (or future) free movement of the parking brake lever assembly.

SECTION 5A

AISIN AUTOMATIC TRANSAXLE

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical erminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

General Specifications

	Definition	
	1.2 SOHC	**1.4 DOHC**
Transaxle Fluid Type	ESSO JWS 3309 or ISU DEXRON III	ESSO JWS 3309 or ISU DEXRON III
Transaxle Fluid Capacity	5.6 ± 0.2 L (5.9 ± 0.2 qts)	5.9 ± 0.2 L (6.2 ± 0.2 qts)

Transaxle Gear Ratio

Gear	**Ratio**	
	1.2 SOHC	**1.4 DOHC**
First	2.875	←
Second	1.568	←

Gear	Ratio	
	1.2 SOHC	1.4 DOHC
Third	1.000	←
Fourth	0.697	←
Reverse	2.300	←
Counter	1.019	←
Differential	3.750	4.052

Fluid Capacity

	Capacity	
	1.2 SOHC	1.4 DOHC
Transaxle Fluid (dry fill)	5.6 ± 0.2 L (5.9 ± 0.2 qts)	5.9 ± 0.2 L (6.2 ± 0.2 qts)
Transaxle Fluid (drain and refill)	2.1L (2.2 qts)	2.1L (2.2 qts)

Notice : Fluid capacity (drain and refill) could be changed according to the some condition, therefore be sure to check the fluid using the oil stick guage.

Line Pressure Specification

Application	Idling	Stall
At "D" range	3.9-4.2 kg/cm² (55-60 psi)	11.3-12.5 kg/cm² (161-178 psi)
At "R" range	6.0-6.9 kg/cm² (85-98 psi)	16.2-18.6 kg/cm² (230-265 psi)

Fastener Tightening Specifications

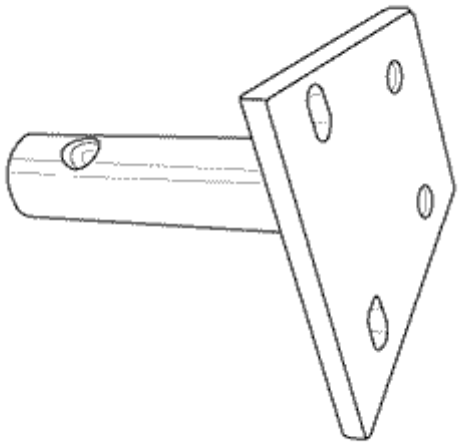
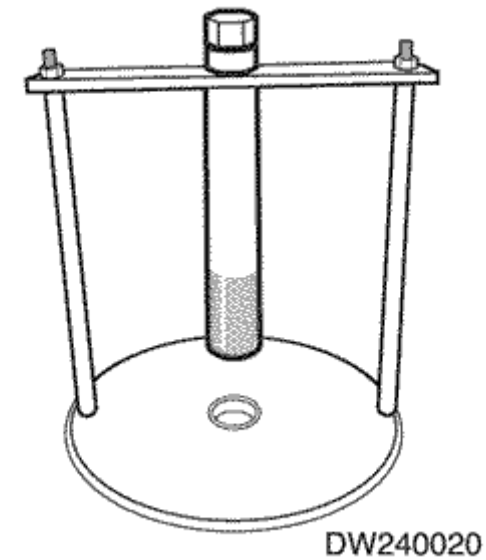
Application	N•m	Lb-Ft	Lb-In
Drain Plug	17	13	-
Control Cable Adjusting Nut	8	-	71
Shift Control Lever Assembly Mounting Bolts	8	-	71
Manual Valve Lever Shaft Nut	12	-	106
Park/Neutral Position Switch Bolts	5.4	-	48
Input Speed Sensor Retaining Bolt	5.4	-	48
Output Speed Sensor Retaining Bolt	7.4	-	65
TCM Retaining Bolts	5	-	44
Fluid Cooler Inlet Pipe Fitting Nut	35	26	-
Fluid Cooler Inlet Pipe Bolt	9	-	80
Fluid Cooler Rear Outlet Pipe Fitting Nut	35	26	-
Fluid Cooler Rear Outlet Pipe Clip Bolt	9	-	80
Front Outlet Pipe Union Bolt	35	26	-
Front Outlet Pipe Clip Bolt	9	-	80
Lower Transaxle-to-Engine Retaining Bolts (a)	73	54	-
Lower Transaxle-to-Engine Retaining Bolts (b)	31	23	-

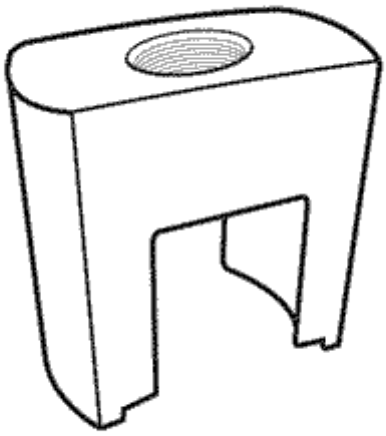
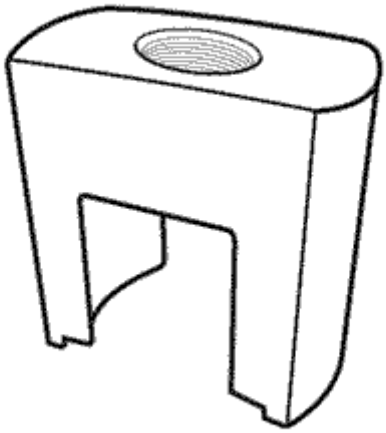
Application	N•m	Lb-Ft	Lb-In
Lower Transaxle-to-Engine Retaining Bolts (c)	21	15	-
Upper Transaxle-to-Engine Mounting Bolts	73	54	-
Upper Transaxle Mounting Bracket Bolts	60	44	-
Rear Mounting Bracket Bolts	60	44	-
Damping Block Connection Nut and Bolt	80	59	-
Torque Converter Bolts	45	43	-
Screw Plugs	7.4	-	65
Transaxle Apply Clamp Bolt	5.4	-	48
Oil Reservoir Lock Plate Bolts	5.4	-	48
Transaxle Case Plate Bolt	9.8	-	87
Transaxle Housing Bolts	29	22	-
Manual Detent Spring Bolt	9.8	-	87
Parking Lock Pawl Bracket Bolts	7.4	-	65
Planetary Ring Gear Nut (Standard)	9.8	-	87
Planetary Ring Gear Nut (Maximum)	29	22	-
Transaxle Rear Cover Bolts	25	18	-
Oil Pump Bolts	25	18	-
Valve Body Bolts	11	-	97
Oil Strainer Bolts	9.8	-	87
Oil Pan Bolts	7	-	62
Unions	25	18	-
Stator Shaft Bolts	25	18	-
Shift Solenoid Valve Bolts	11	-	97
Differential Case-to-Differential Ring Gear Bolt	102	75	-

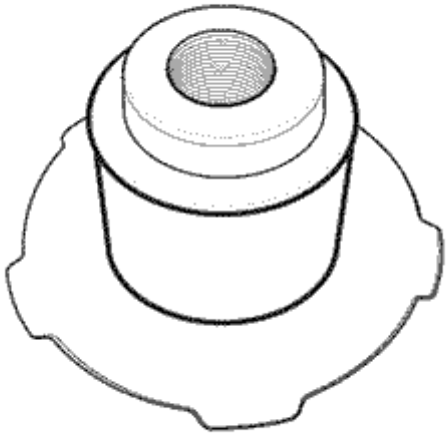
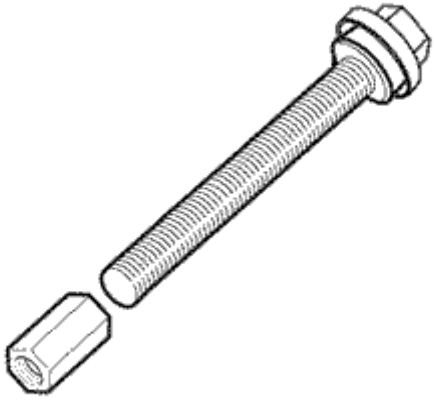
SPECIAL TOOLS

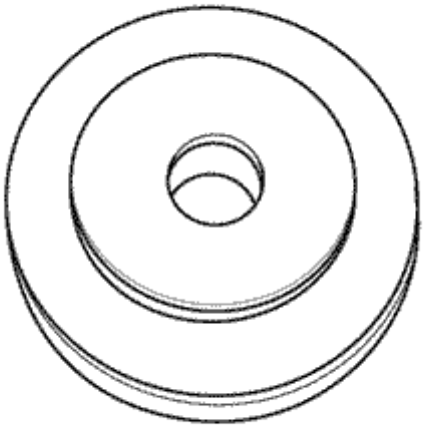
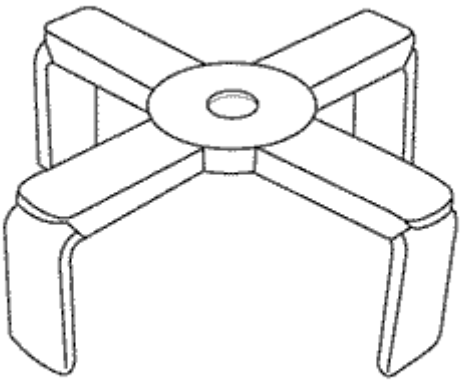
Special Tools Table

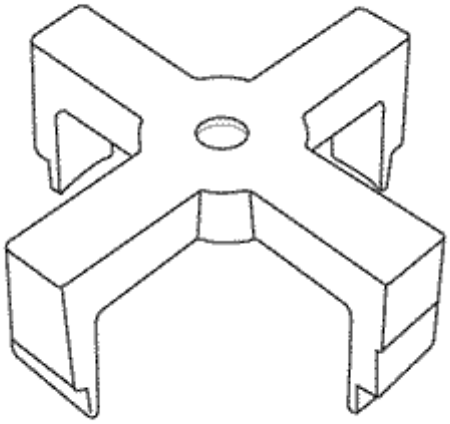
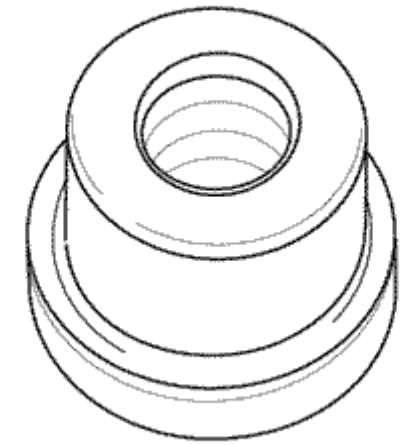
	DW260-021-01 (80-40 LE) DW260-021-02 (81-40 LE) Automatic Transaxle Overhaul Fixture

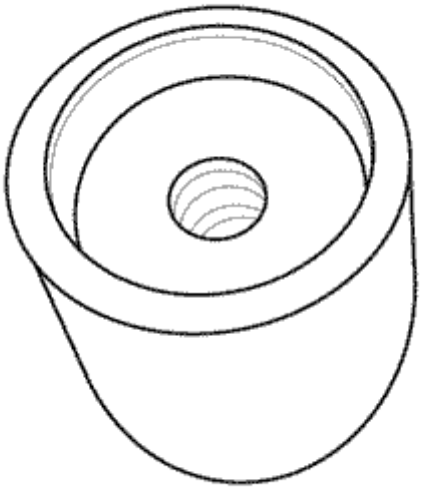
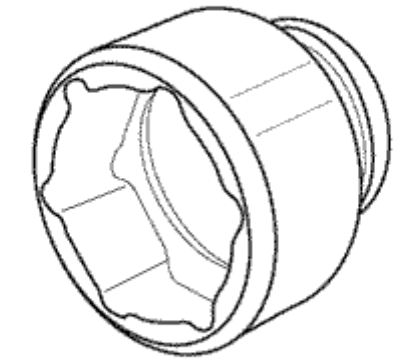
 DW260021	
 DW240020	DW240-020 Brake/Clutch Spring Compressor
	DW240-030 Forward Clutch Adapter

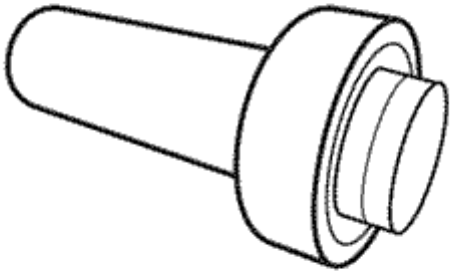
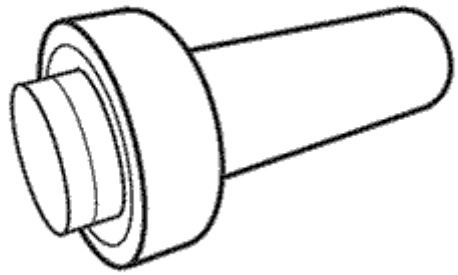
 DW240030	
 DW240040	DW240-040 Direct Clutch Adapter
	DW240-050 Overdrive Brake Adapter

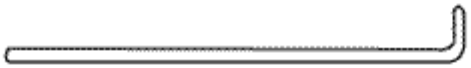
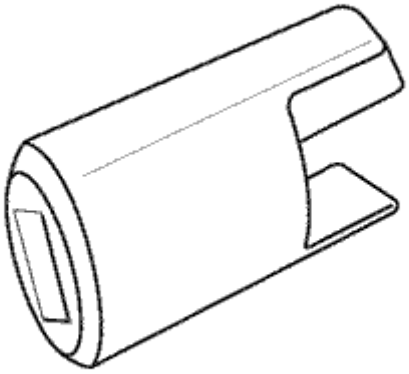
 DW240050	
 DW24006A	DW240-060-01 Brake Spring Compressor Bolt/Nut
	DW240-060-02 Brake Spring Compressor Plate

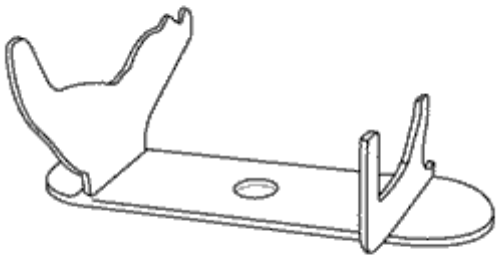
 DW24006B	
 DW240070	DW240-070 1st/Reverse Brake Adapter
	DW240-080 2nd Brake Adapter

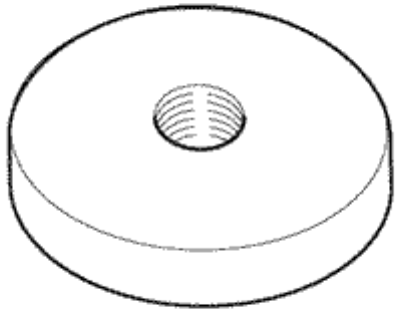
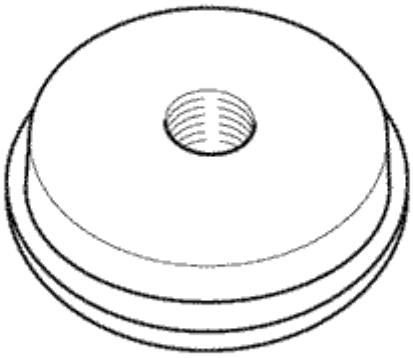
 DW240080	
 DW240090	DW240-090 Planetary Ring Gear Remover
	DW240-100 Counter Drive Gear Installation Adapter

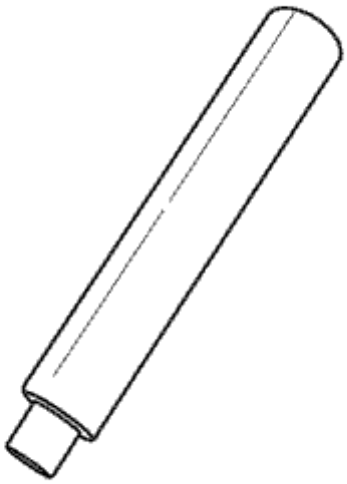
 DW240100	
 DW260041	DW260-041 Planetary Ring Gear Nut Removal/Installation Socket (52mm)
	DW260-031-01 Tranaxle Housing Oil Seal Installer

 DW26003A	
 DW26003B	DW260-031-02 Tranaxle Case Oil Seal Installer
	DW240-120 Measuring Terminal

 DW240120	
 DW240130	DW240-130 Differential Preload Adapter
	DW260-011 (80-40 LE) DW260-012 (81-40 LE) Transaxle Support Fixture

 DW260012	
 DW240140	DW240-140 Transaxle Housing Side Bearing Outer Race Adapter
	DW240-150 Transaxle Case Side Bearing Outer Race

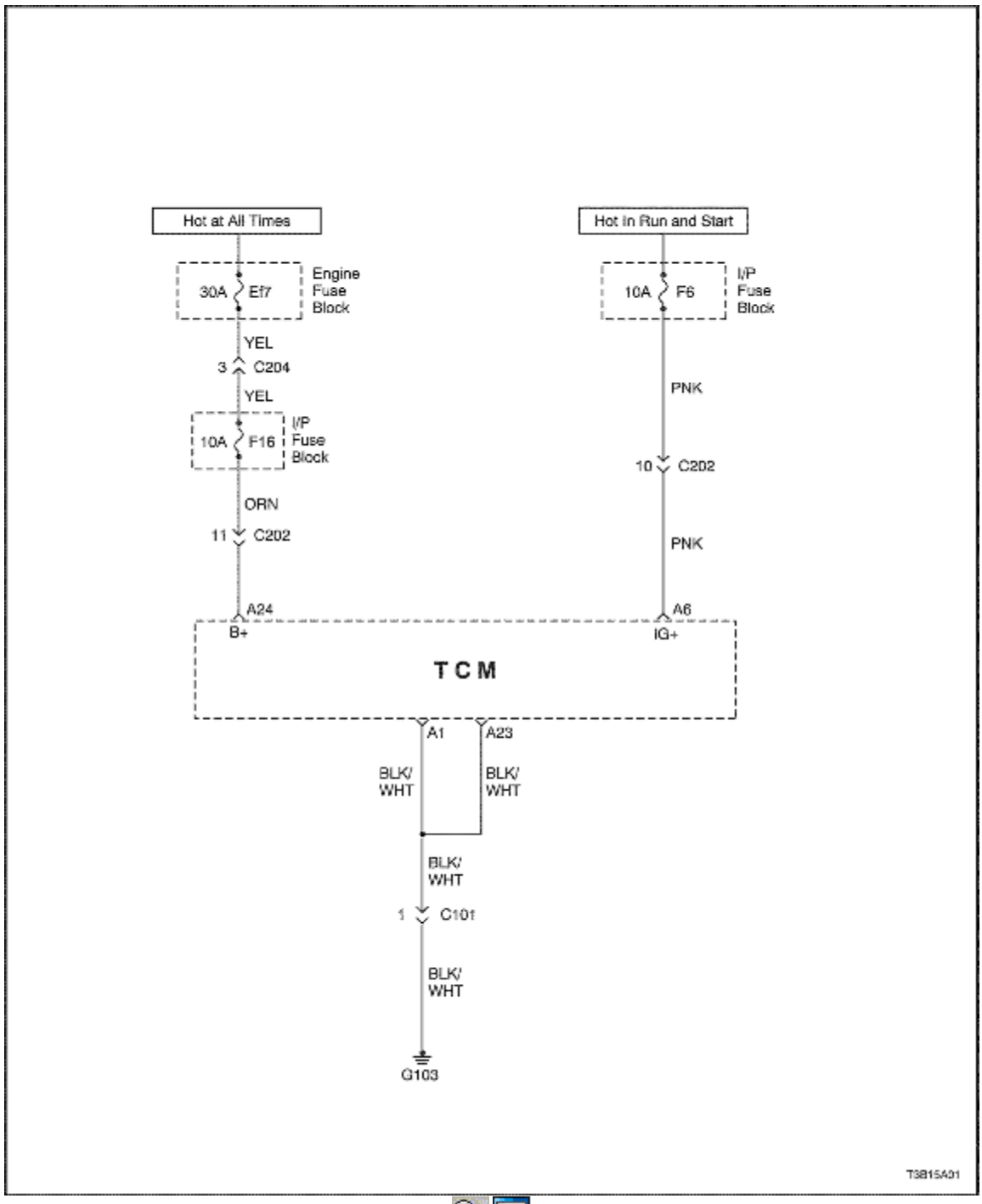
 DW240150	Adapter
 DW240160	DW240-160 Transaxle Case Outer Tapered Roller Bearing Race Adapter
	DW240-170 Adapter Handle



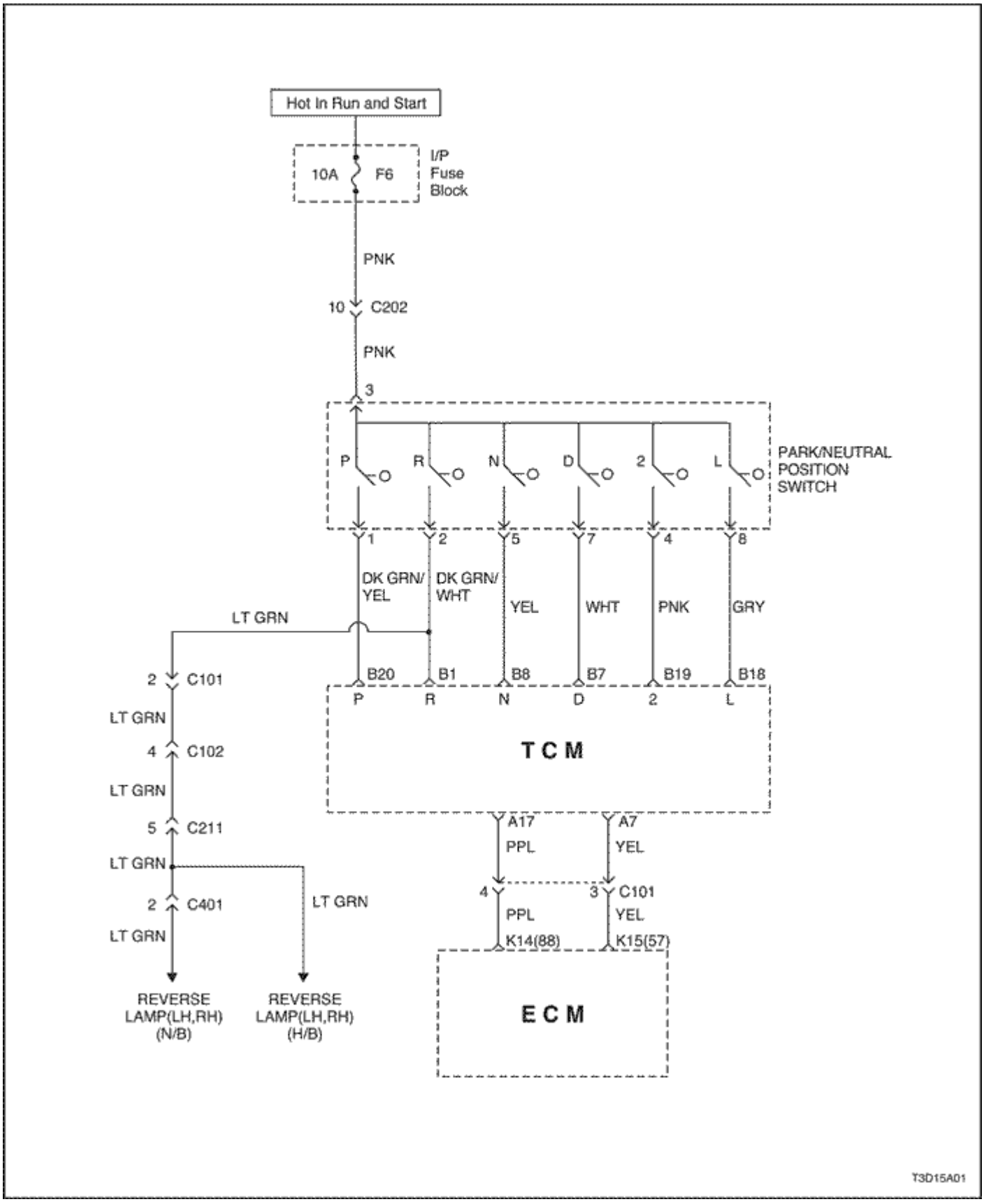
DW240170

SCHEMATIC DIAGRAMS

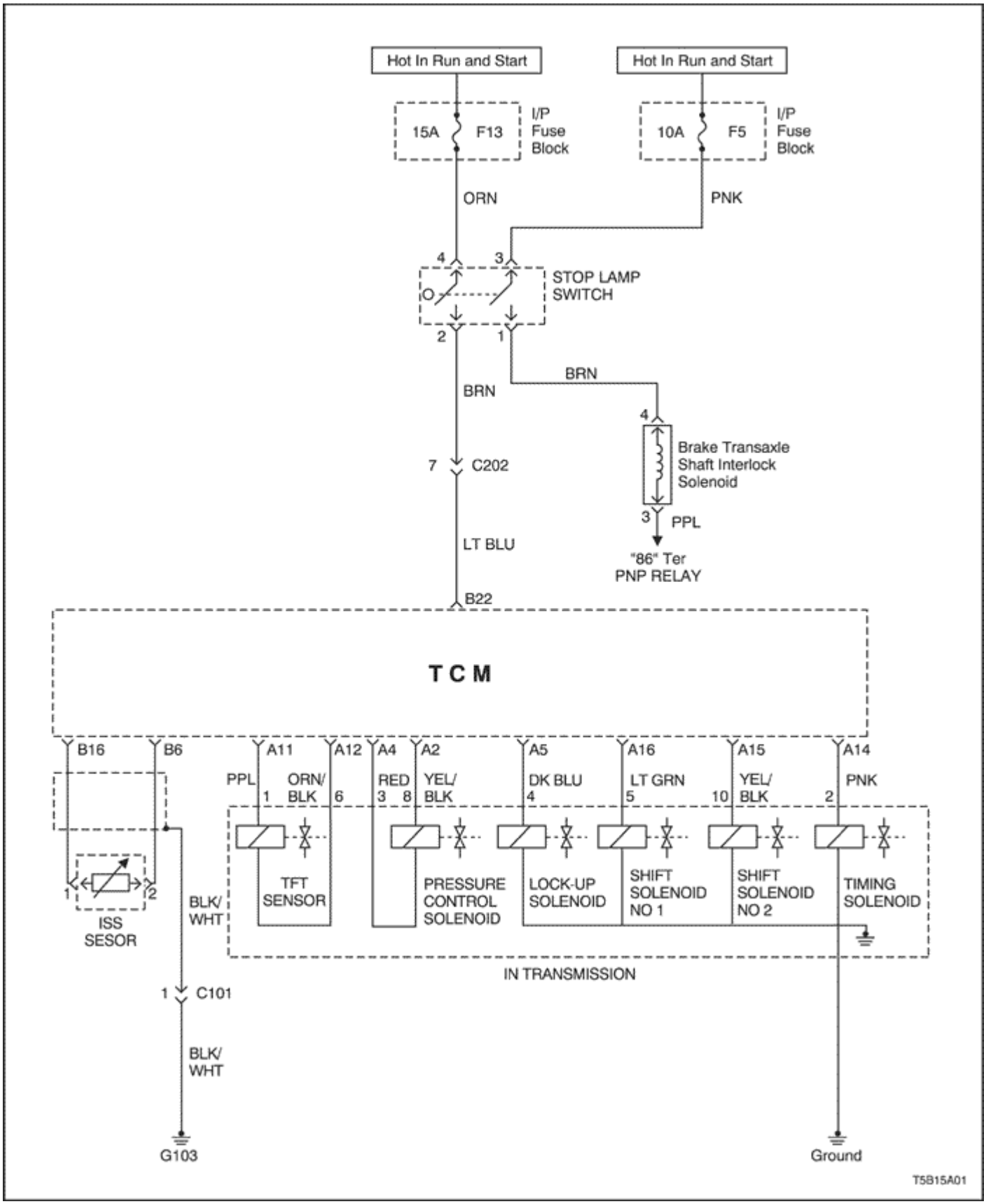
Transmission Control Module (1 of 4)



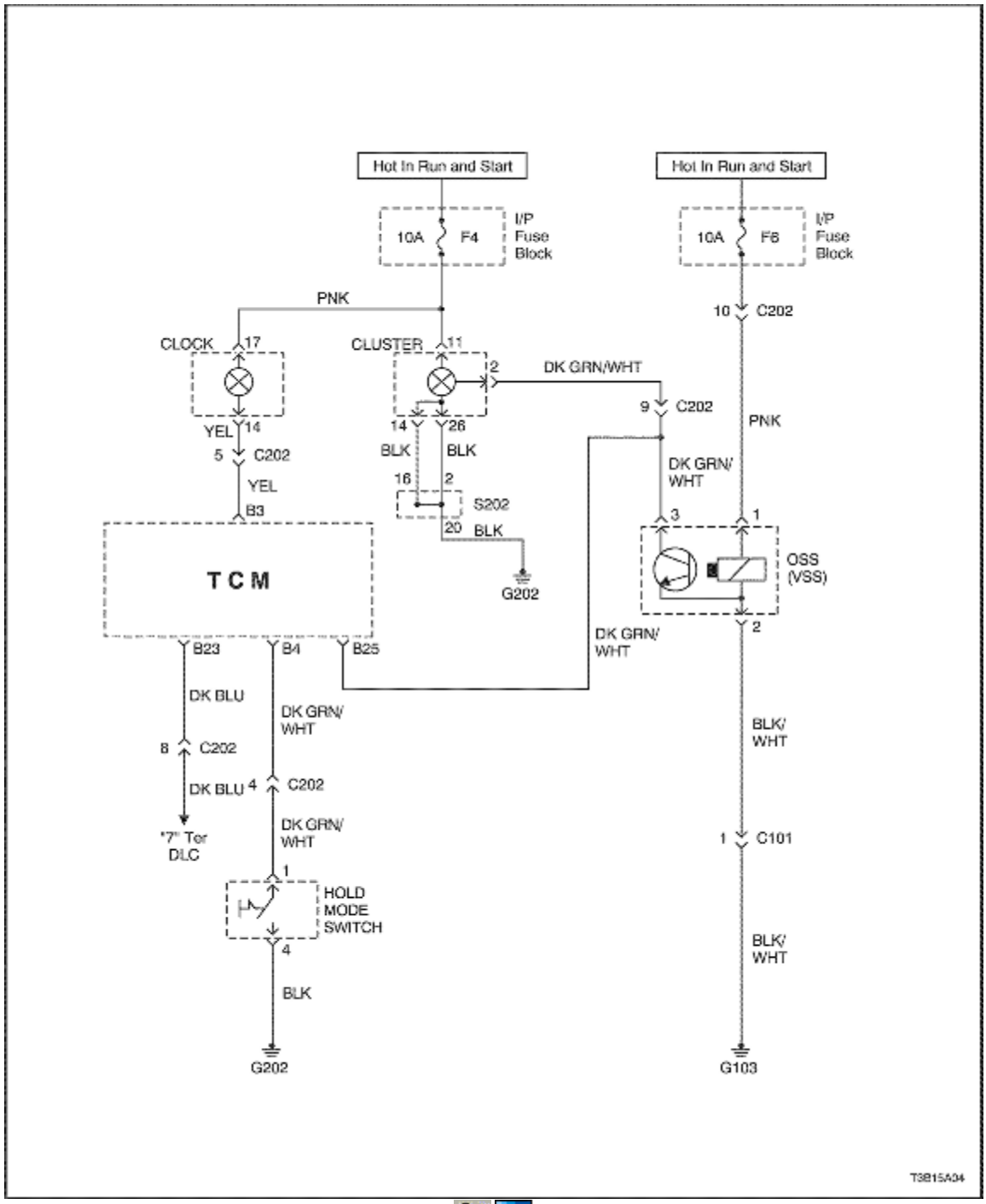
Transmission Control Module (2 of 4)


Hot In Run and Start
10A
F6
I/P
Fuse
Block
PNK
10
C202
PNK
3
P
R
N
D
2
L
PARK/NEUTRAL
POSITION
SWITCH
1
2
5
7
4
8
DK GRN/
YEL
DK GRN/
WHT
YEL
WHT
PNK
GRY
LT GRN
2
C101
LT GRN
4
C102
LT GRN
5
C211
LT GRN
2
C401
LT GRN
B20
B1
B8
B7
B19
B18
P
R
N
D
2
L
TCM
A17
PPL
A7
YEL
4
3
C101
PPL
YEL
K14(88)
K15(57)
ECM
LT GRN
REVERSE
LAMP(LH,RH)
(N/B)
REVERSE
LAMP(LH,RH)
(H/B)
T3D15A01

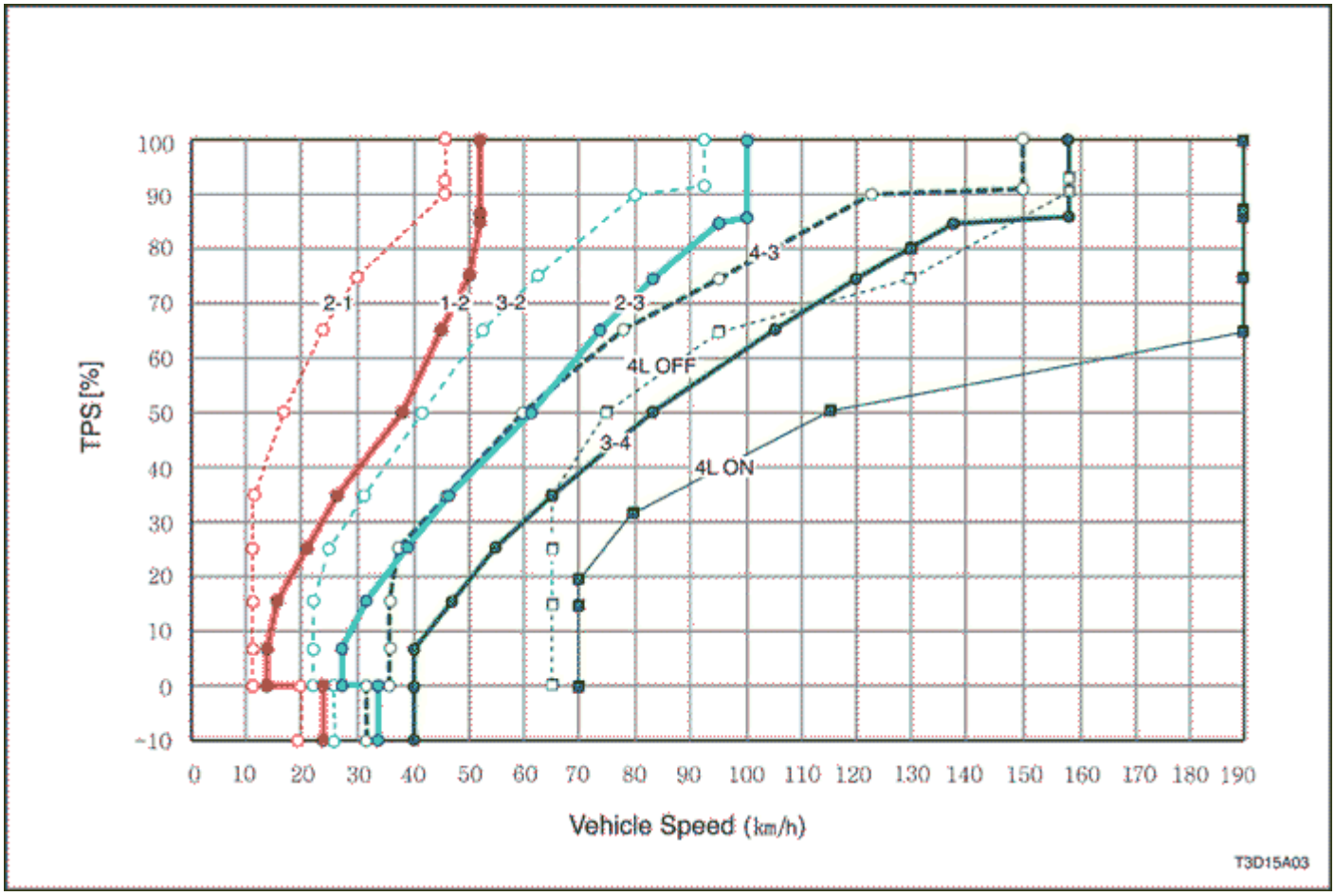
Transmission Control Module (3 of 4)


Hot In Run and Start
Hot In Run and Start
15A
F13
I/P Fuse Block
10A
F5
I/P Fuse Block
ORN
PNK
4
3
STOP LAMP SWITCH
2
1
BRN
BRN
4
Brake Transaxle Shaft Interlock Solenoid
7
C202
3
PPL
LT BLU
"86" Ter PNP RELAY
B22
T C M
B16
B6
A11
A12
A4
A2
A5
A16
A15
A14
PPL
1
ORN/ BLK
6
RED
3
8
YEL/ BLK
DK BLU
4
LT GRN
5
10
YEL/ BLK
2
PNK
TFT SENSOR
PRESSURE CONTROL SOLENOID
LOCK-UP SOLENOID
SHIFT SOLENOID NO 1
SHIFT SOLENOID NO 2
TIMING SOLENOID
IN TRANSMISSION
1
2
ISS SESOR
BLK/ WHT
1
C101
BLK/ WHT
G103
Ground
T5B15A01

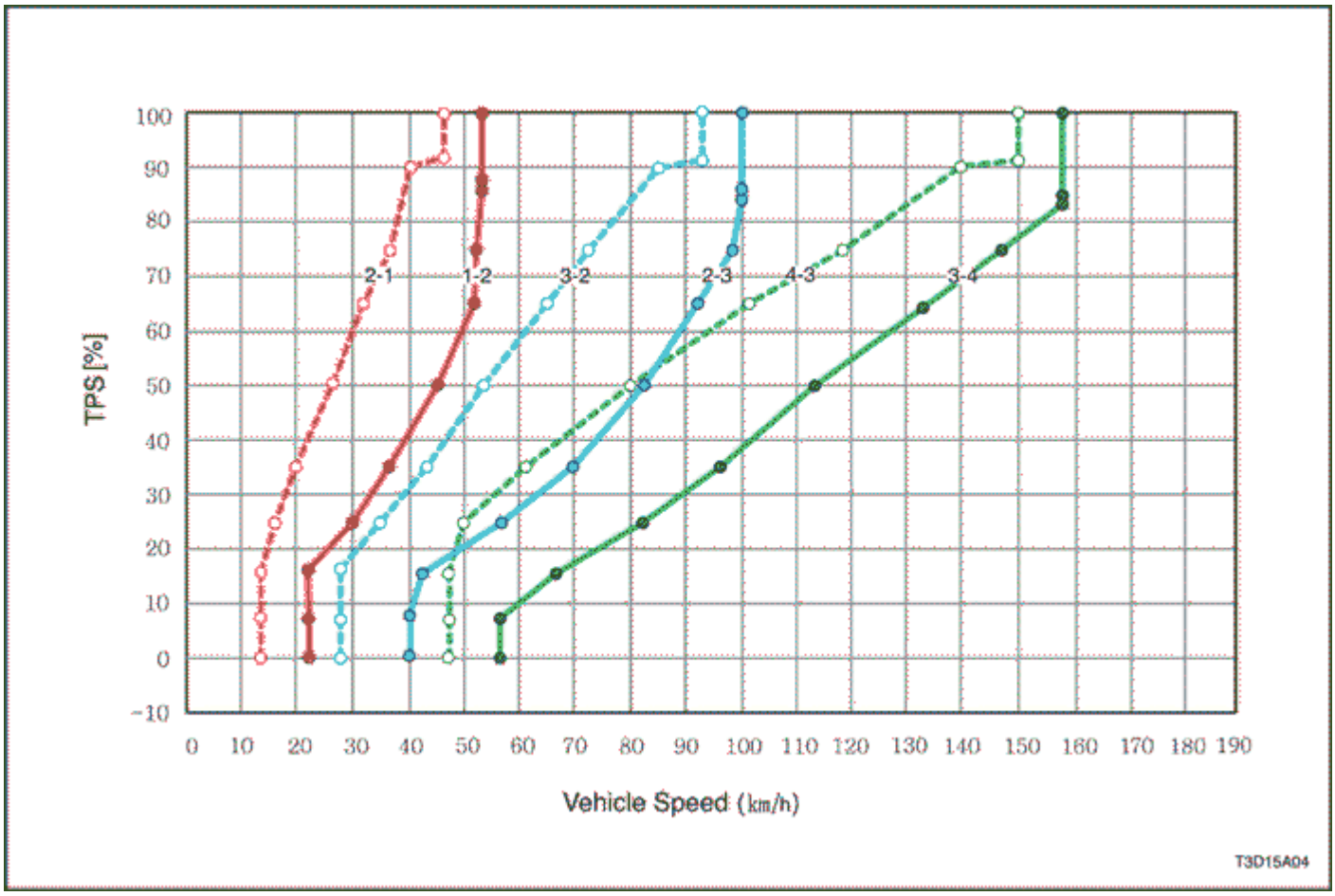
Transmission Control Module (4 of 4)



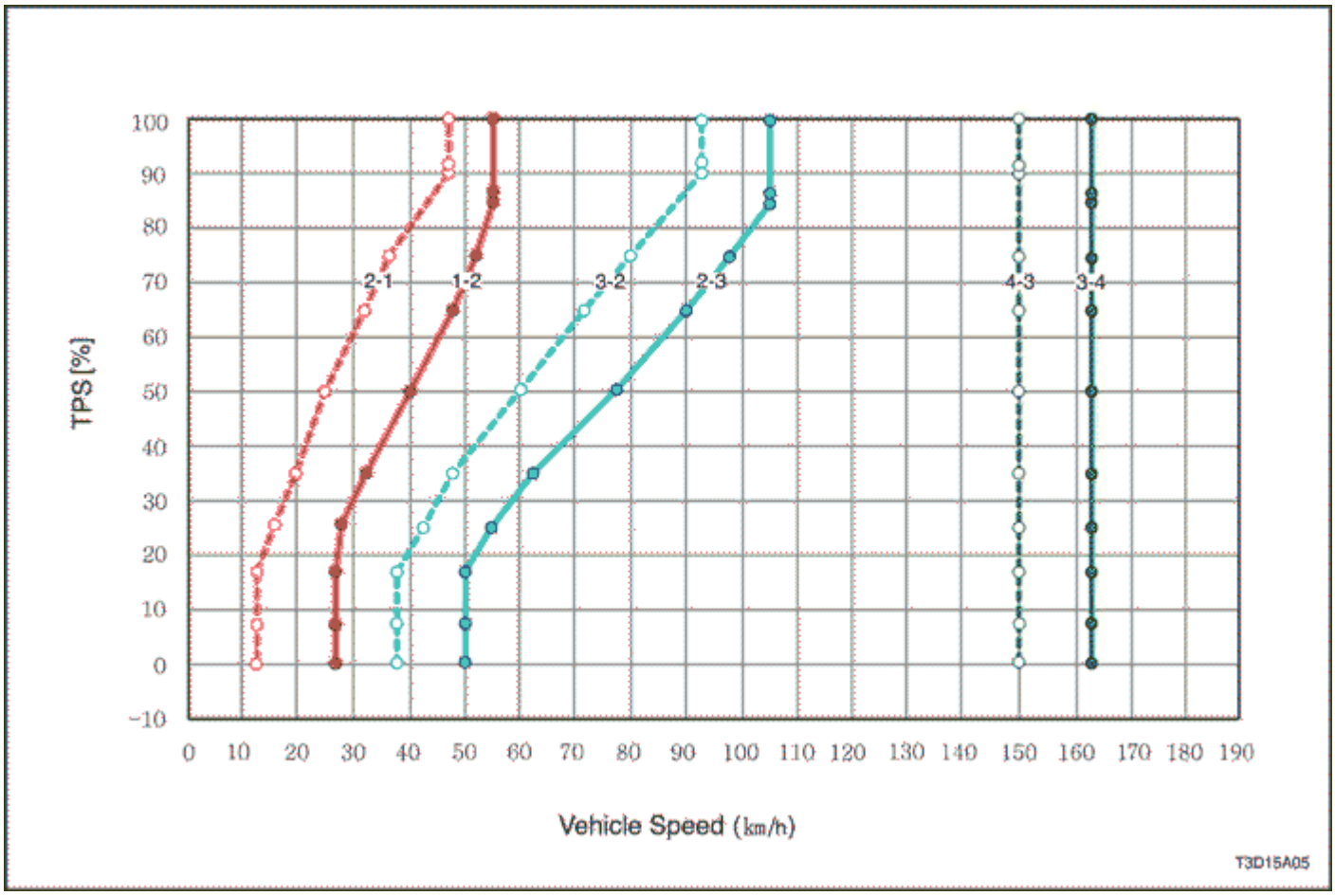
Shift Mode Diagram
Economic Mode (1.2 SOHC)



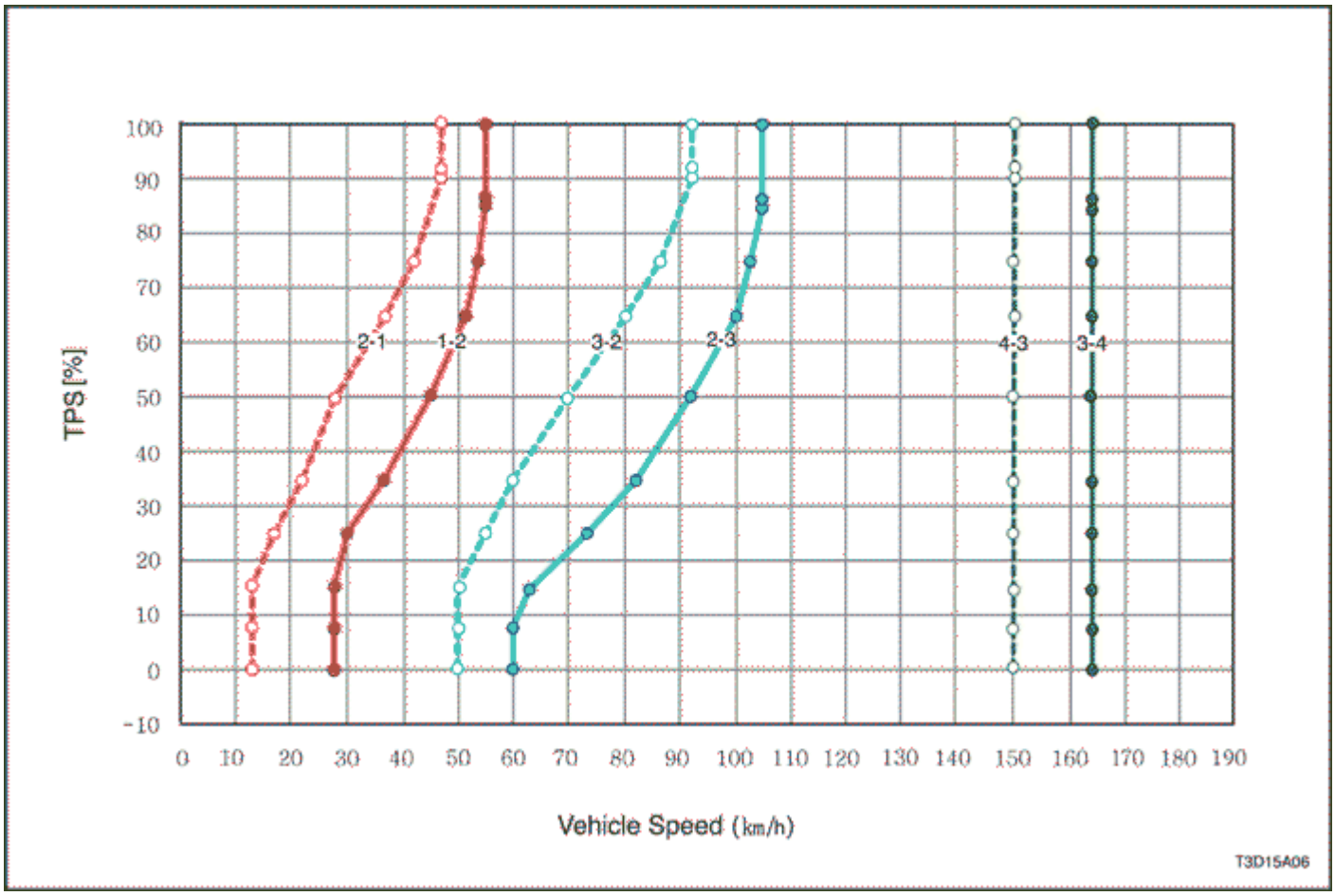
Power Mode (1.2 SOHC)



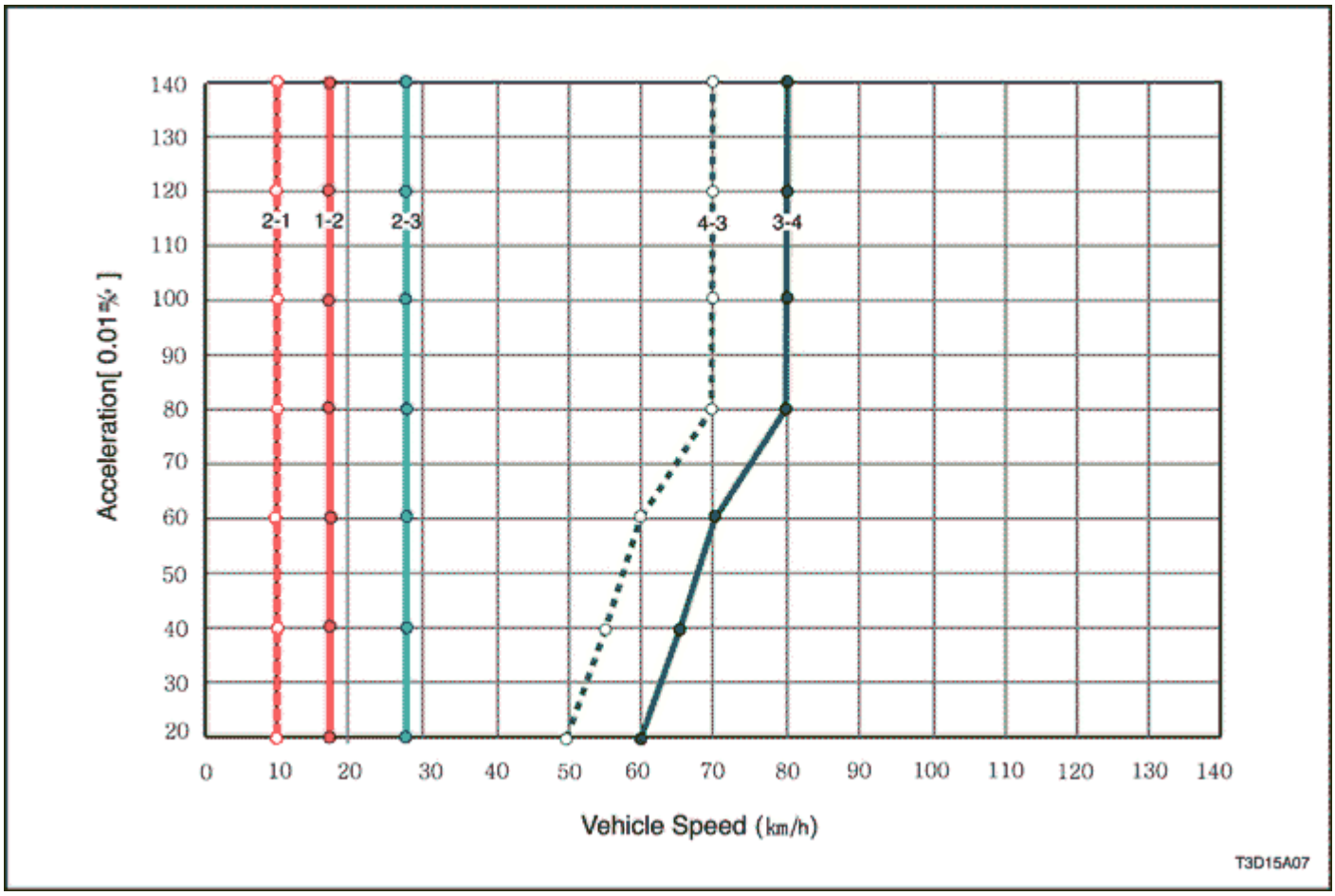
Up-Slope 1 Mode (1.2 SOHC)



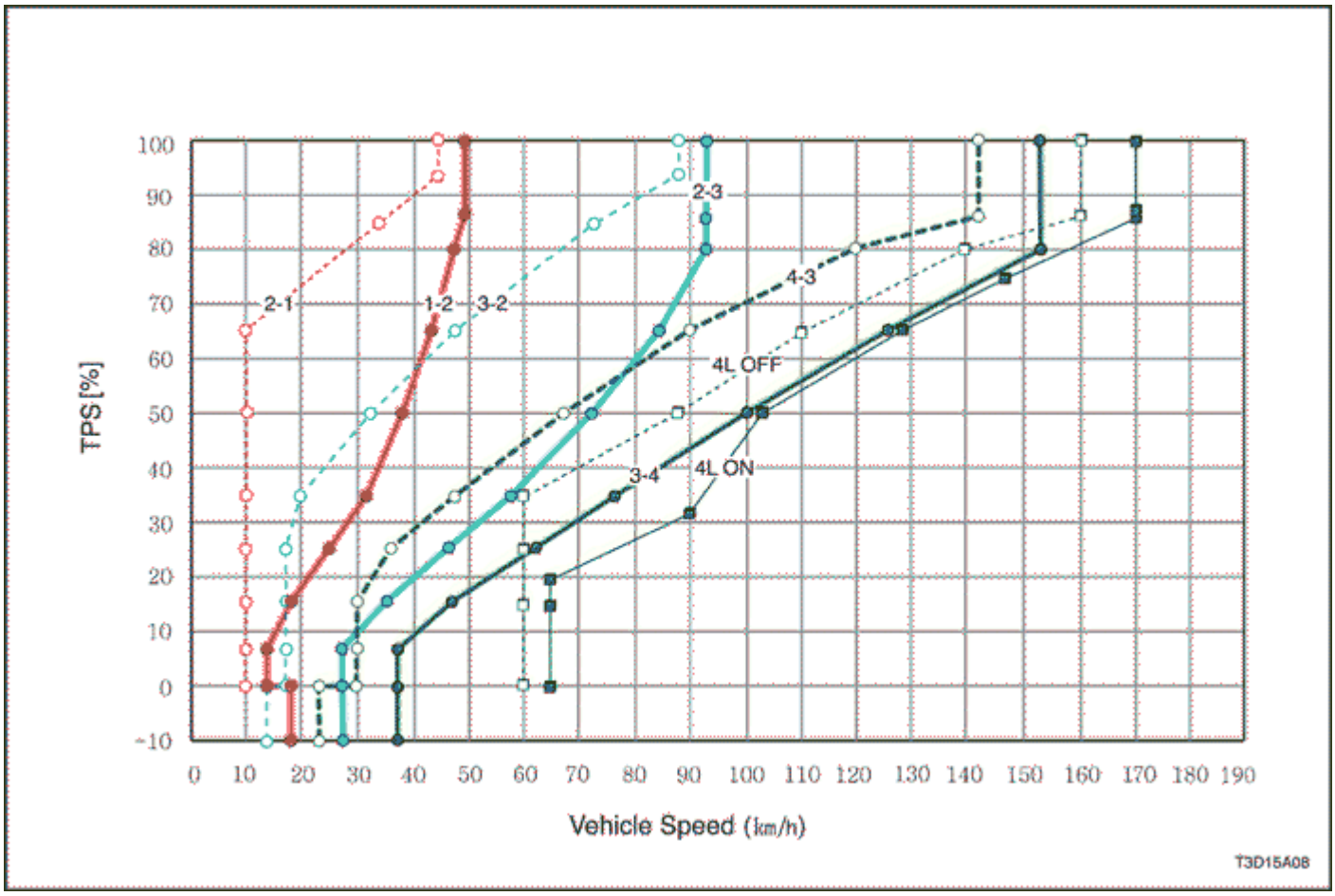
Up-Slope 2 Mode (1.2 SOHC)



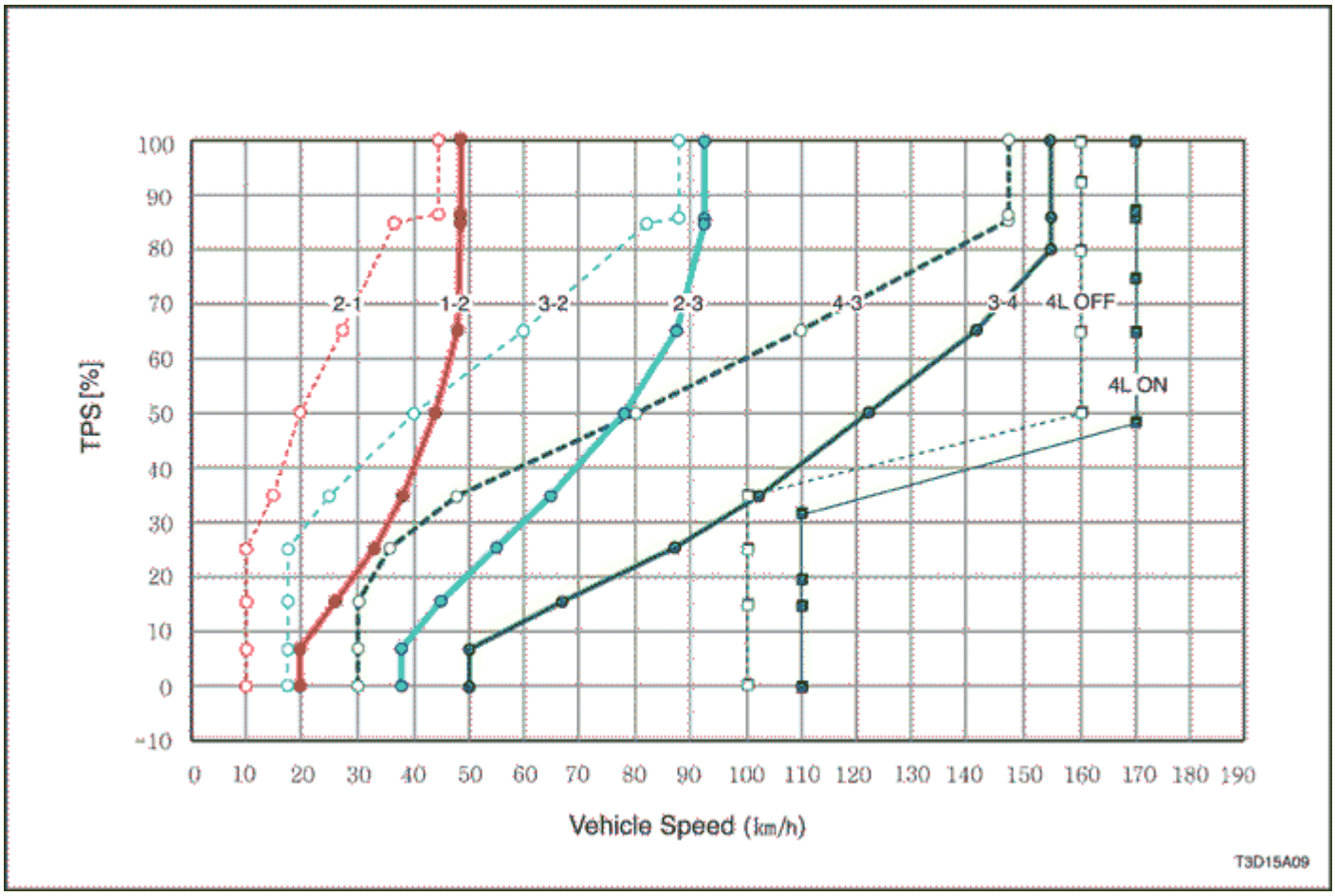
Down-Slope Mode (1.2 SOHC)



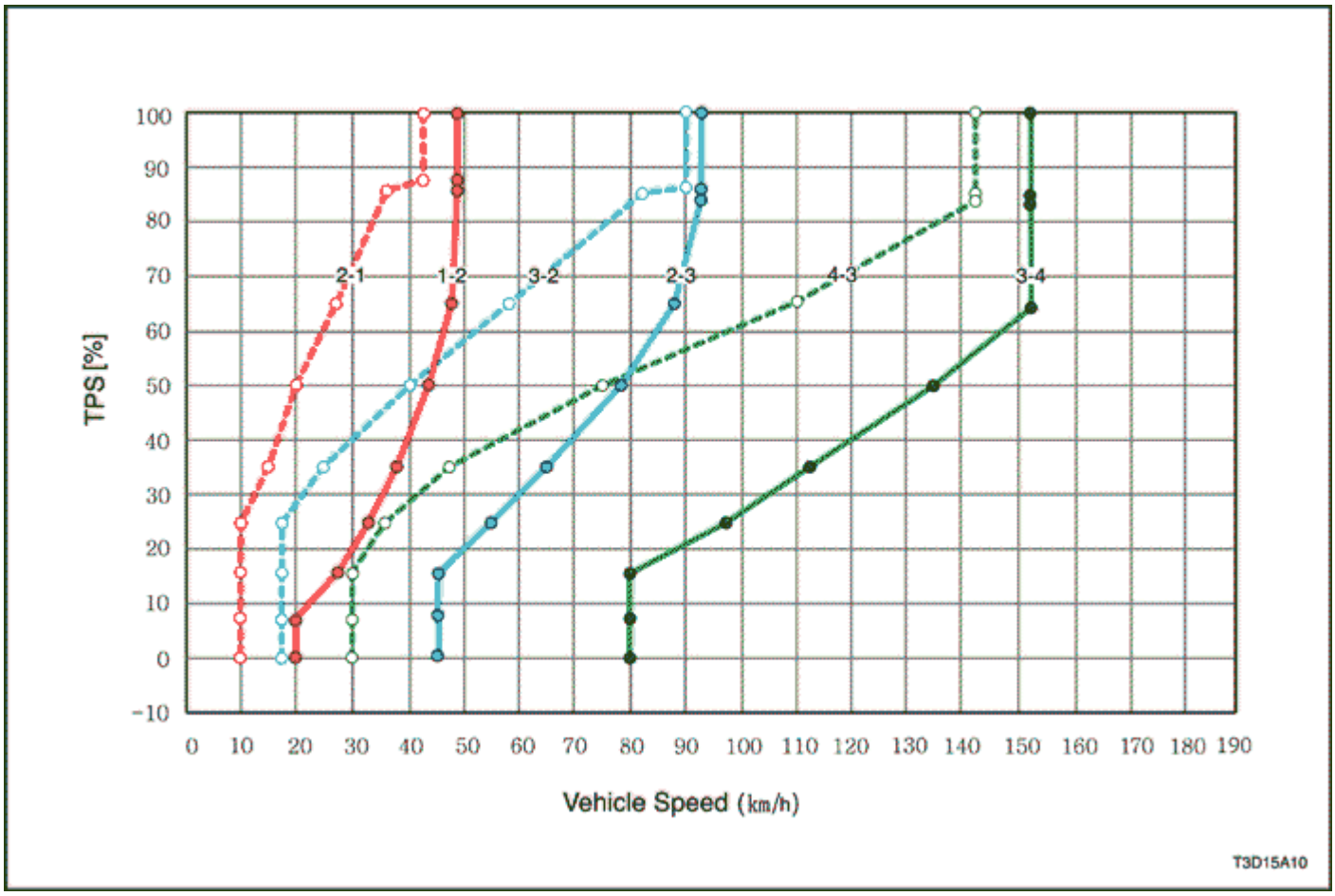
Economic Mode (1.4 DOHC)



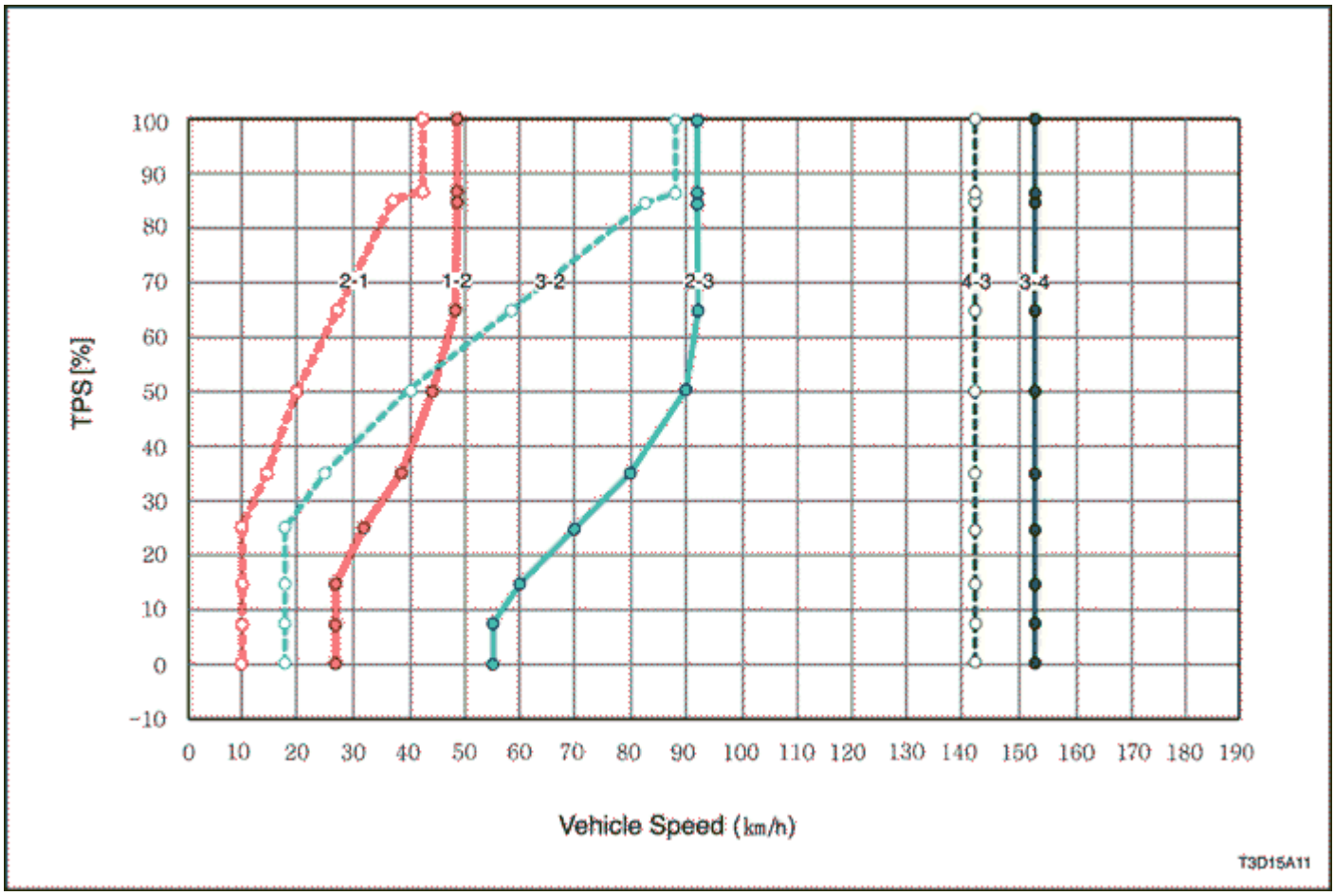
Power Mode (1.4 DOHC)



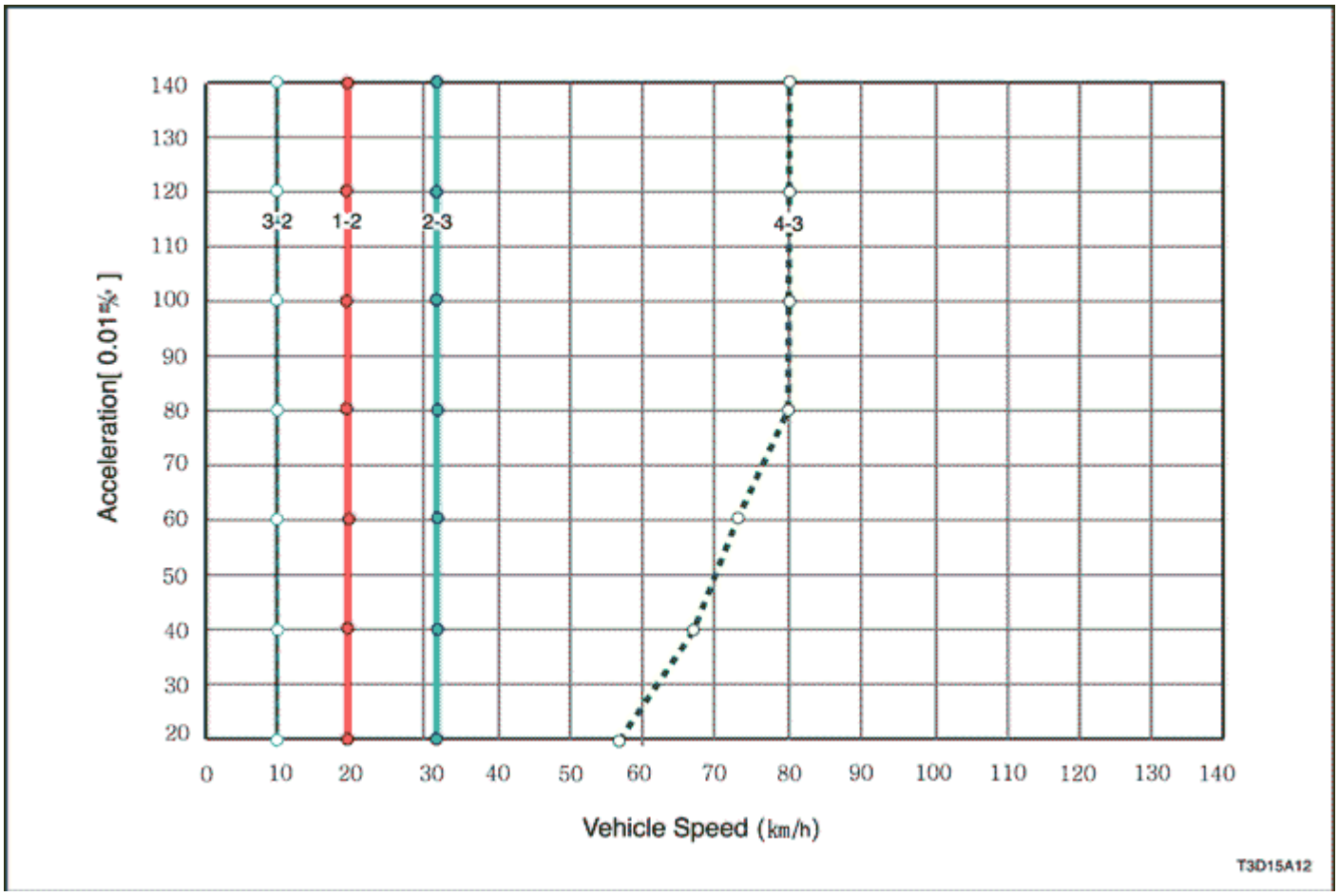
Up-Slope 1 Mode (1.4 DOHC)



Up-Slope 2 Mode (1.4 DOHC)



Down-Slope Mode (1.4 DOHC)



SECTION 5B

FIVE-SPEED MANUAL TRANSAXLE (D16)

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

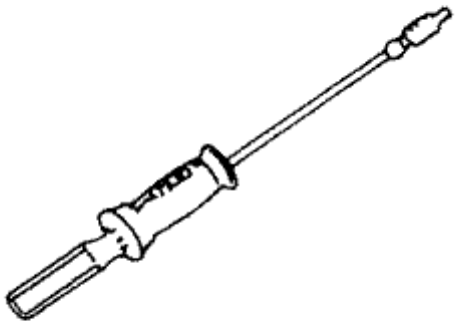
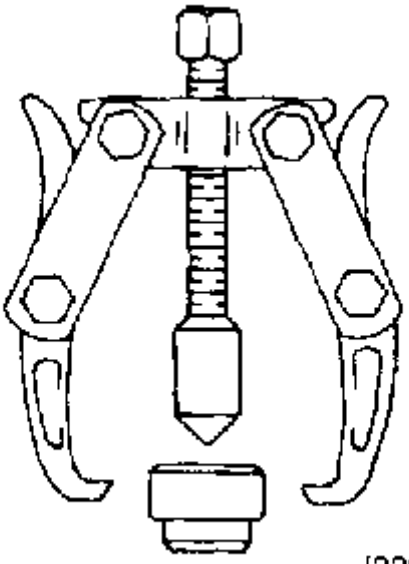
SPECIFICATIONS

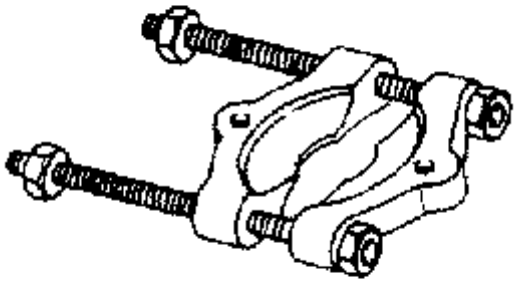
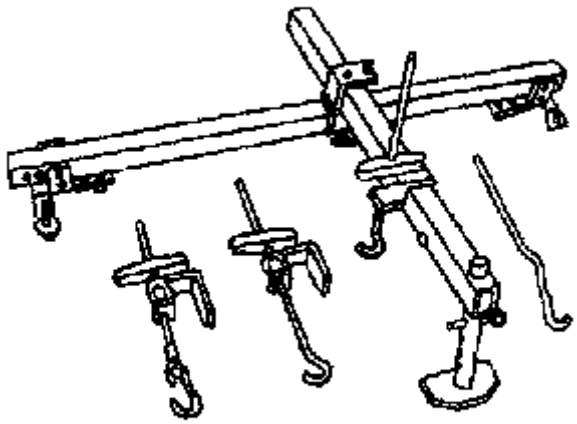
Fastener Tightening Specifications

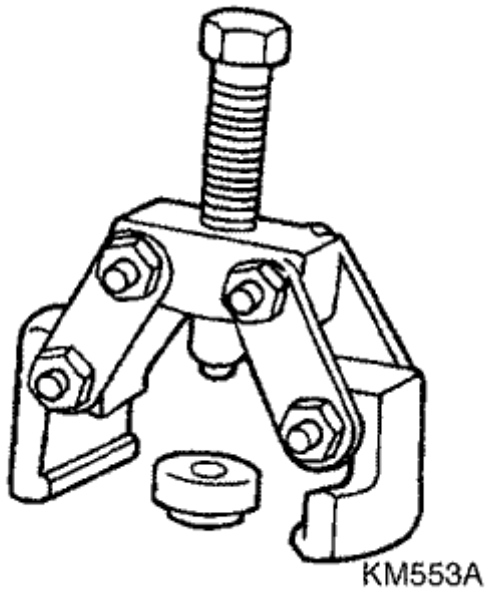
Application	N•m	Lb-Ft	Lb-In
Backup Lamp Switch	20	15	-
Bearing Plate Bolts	22	16	-
Bearing Retainer Bolts, Right Side	25	18	-
Bearing-Adjusting Ring-Retainer Plate Bolt	5	-	44
Clutch-Release Cylinder Retaining Bolts	20	15	-
Damping Block Connection Nut and Bolt	80	59	-
Differential Cover Bolts	40	30	-
Fifth-Gear Fork Bolts	22	16	-
Fifth-Gearshift Connector Bolts	7	-	62
Flywheel Inspection Cover Bolts	7	-	62
Gearshift Housing Bolts	7	-	62
Gearshift Lever Cover Bolts	22	16	-
Input Driveshaft Detent Screw	15	11	-
Rear Damping Block Retaining Bolts	55	41	-
Rear Mounting Bracket Bolts	80	59	-
Ring-Gear Bolts	70	52	-
Rod Clamp Bolt	14	-	124
Speedometer Housing Retaining Bolt	4	-	35
Speedometer-Driven Gear Bolt	5	-	44
Transaxle Cover Bolts	18	13	-
Transaxle Lower Retaining Bolts(a)	73	54	-
Transaxle Lower Retaining Bolt(b)	31	23	-
Transaxle Lower Retaining Bolts(c)	21	15	-
Transaxle Upper Retaining Bolts	73	54	-
Transaxle Upper Mounting Bracket Bolts	60	44	-

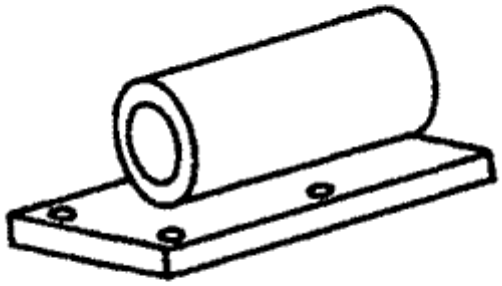
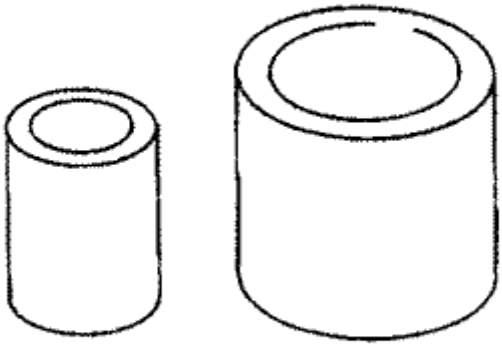
SPECIAL TOOLS

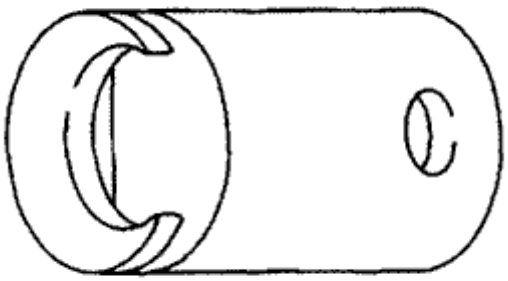
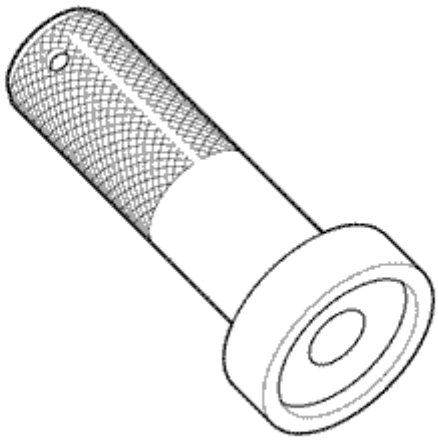
Special Tools Table

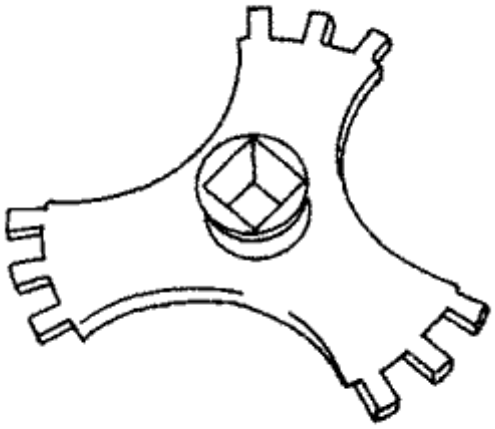
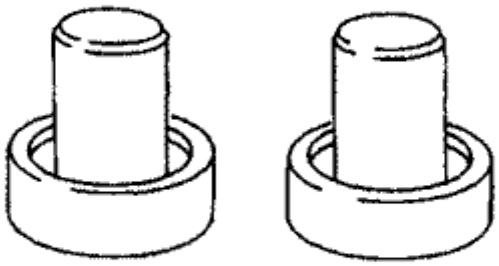
 J6125B	J-6125-B Slide Hammer
 J22888	J-22888-20-A Bearing Puller with J-22888-35 Puller Legs
	J-22912-01 Universal Bearing Puller

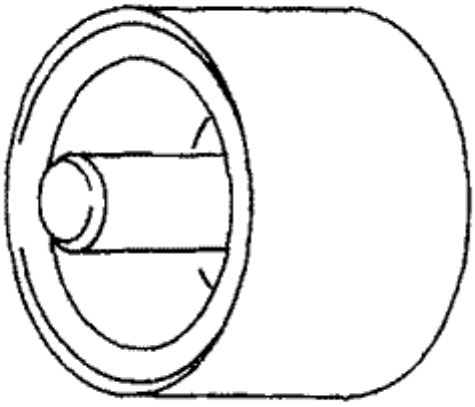
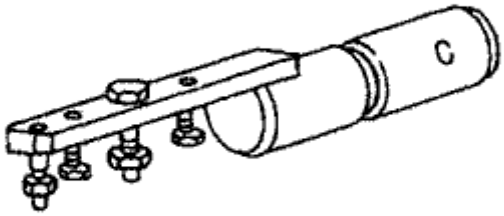
 J22912	
 J28467B	J-28467-B Engine Support Fixture
	KM-553-A Fifth-Gear Puller

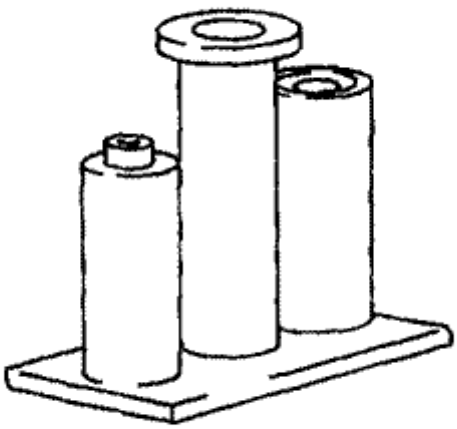
	
	J-36633 Snap Ring Retainer
	KM-113-2 Base

 KM1132	
 KM334	KM-334 Installer Sleeve
	J-42469 Shift Rod Remover

 J42469	
 KM519	KM-519 Ring Installer
	KM-520 Remover/Installer

 KM520	
 KM522	KM-522 Installer
	KM-525 Installer

 KM525	
 KM552	KM-552 Fixture
	KM-554 Installer



KM554

DIAGNOSIS

Isolate Noise

Identify the cause of any noise before attempting to repair the clutch, the transaxle, or their related link-ages.

Symptoms of trouble with the clutch or the manual transaxle include:

- A great effort required to shift gears.
- The sound of gears clashing and grinding.
- Gear blockout.

Any of these conditions requires a careful analysis. Make the following checks before disassembling the clutch or the transaxle for repairs.

Road Travel Noise

Many noises that appear to come from the transaxle may actually originate with other sources such as the:

- Tires.
- Road surfaces.
- Wheel bearings.
- Engine.
- Exhaust system.

These noises may vary according to the:

- Size of the vehicle.
- Type of the vehicle.
- Amount of insulation used in the body of the vehicle.

Transaxle Noise

Transaxle gears, like any mechanical device, are not absolutely quiet and will make some noise during normal operation.

To verify suspected transaxle noises:

1. Select a smooth, level asphalt road to reduce tire and resonant body noise.
2. Drive the vehicle far enough to warm up all the lubricants thoroughly.
3. Record the speed and the gear range of the transaxle when the noise occurs.
4. Check for noises with the vehicle stopped, but with the engine running.
5. Determine if the noise occurs while the vehicle operates in:
    - Drive - under a light acceleration or a heavy pull.
    - Float - maintaining a constant speed with a light throttle on a level road.
    - Coast - with the transaxle in gear and the throttle partly or fully closed.
    - All of the above.

Bearing Noise

Differential Side Bearing Noise

Differential side bearing noise and wheel bearing noise can be confused easily. Since side bearings are pre-loaded, a differential side bearing noise should not diminish much when the differential/transaxle is run with the wheels off the ground.

Wheel Bearing Noise

Wheel bearings produce a rough growl or grating sound that will continue when the vehicle is coasting and the transaxle is in NEUTRAL. Since wheel bearings are not pre-loaded, a wheel bearing noise should diminish considerably when the wheels are off the ground.

Other Noise

Brinelling

A brinelled bearing causes a "knock" or "click" approximately every second revolution of the wheel because the bearing rollers do not travel at the same speed as the wheel. In operation, the effect is characterized by a low-pitched noise.

A brinelled bearing is caused by excessive thrust which pushes the balls up on the pathway and creates a triangular-shaped spot in the bearing race. A

brinelled bearing can also be caused from pressing one race into position by applying pressure on the other race.
A false indication of a brinelled bearing occurs as a result of vibration near the area where the bearing is mounted. Brinelling is identified by slight indentations, resulting in a washboard effect in the bearing race.

Lapping

Lapped bearing noise occurs when fine particles of abrasive materials such as scale, sand, or emery circulate through the oil in the vehicle, causing the surfaces of the roller and the race to wear away. Bearings that wear loose but remain smooth, without spalling or pitting, are the result of dirty oil.

Locking

Large particles of foreign material wedged between the roller and the race usually causes one of the races to turn, creating noise from a locked bearing. Pre-loading regular taper roller bearings to a value higher than that specified also can result in locked bearings

Pitting

Pitting on the rolling surface comes from normal wear and the introduction of foreign materials.

Spalling

Spalled bearings have flaked or pitted rollers or races caused by an overload or an incorrect assembly that results in a misalignment, a cocking of bearings, or adjustments that are too tight.
After completing these checks, refer to the "Diagnosis Chart" in this section.

Symptom Diagnosis

Checks	Action
Check for a knock at low speeds.	• Replace any worn drive axle CV joints. • Replace any worn side gear hub.
Check for a noise most pronounced on turns.	• Correct any abnormalities in the differential gear.
Check for a clunk upon acceleration or deceleration.	• Tighten any loose engine mounts. • Replace any worn drive axle inboard joints. • Replace any worn differential pinion shaft in the case. • Replace any worn side gear hub in the case.
Check for a clunking noise in turns.	• Replace any worn outboard CV joint.
Check for a vibration.	• Replace any rough wheel bearing.

Checks	Action
	• Replace any bent drive axle shaft. • Replace any out-of-round tires. • Balance any unbalanced tire. • Replace any worn CV joint in the drive axle shaft. • Correct an excessive drive axle angle by adjusting the trim height.
Check for a noise in the NEUTRAL gear with the engine running.	• Replace any worn cluster bearing shaft. • Replace any worn clutch-release bearing. • Replace any worn input shaft cluster gears. • Replace any worn first-gear/bearing. • Replace any worn second-gear/bearing. • Replace any worn third-gear/bearing. • Replace any worn fourth-gear/bearing. • Replace any worn fifth-gear/bearing. • Replace any worn mainshaft bearings.
Check for a noise in the first gear (1) only.	• Replace any chipped, scored, or worn first-gear constant mesh gears. • Replace any worn first-second gear synchronizer. • Replace any worn first-gear/bearing. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear. • Adjust, repair, or replace the shift lever and the rods.
Check for a noise in the second gear (2) only.	• Replace any chipped, scored, or worn second-gear constant mesh gears. • Replace any worn first-second gear synchronizer. • Replace any worn second-gear/bearing. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear. • Adjust, repair, or replace the shift lever and the rods.
Check for a noise in the third gear (3) only.	• Replace any chipped, scored, or worn third-gear constant mesh gears.

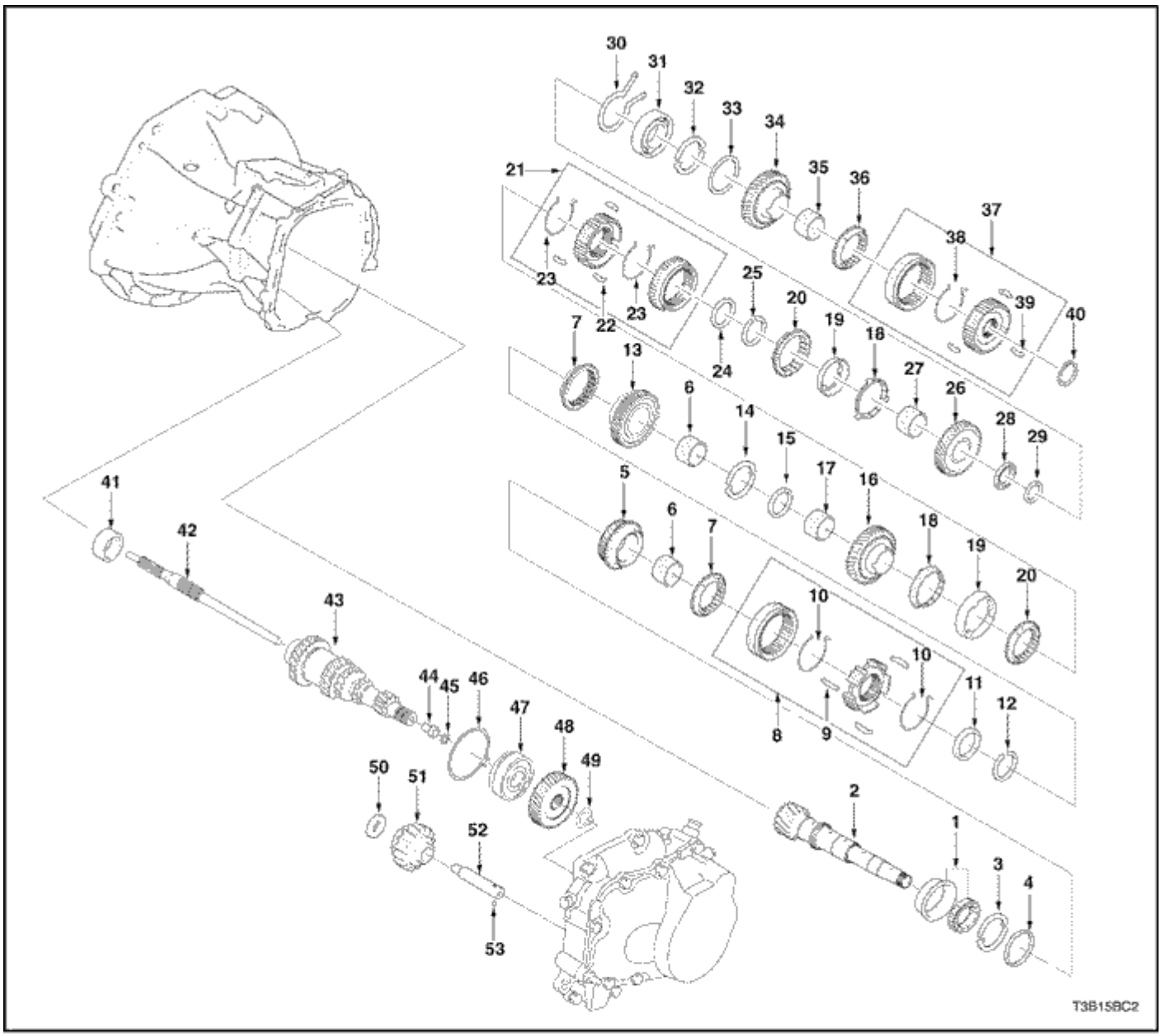
Checks	Action
	• Replace any worn third-fourth gear synchronizer. • Replace any worn third-gear/bearing. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear. • Adjust, repair, or replace the shift lever and the rods.
Check for a noise in the fourth gear (4) only.	• Replace any chipped, scored, or worn fourth gear or output gear. • Replace any worn third-fourth gear synchronizer. • Replace any worn fourth-gear/bearing. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear. • Adjust, repair, or replace the shift lever and the rods.
Check for a noise in the fifth gear (5) only.	• Replace any chipped, scored, or worn fifth gear or output gear. • Repair any worn fifth-gear synchronizer. • Replace any worn fifth-gear/bearing. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear. • Adjust, repair, or replace the shift lever and the rods.
Check for a noise in the reverse (R) gear only.	• Replace any chipped, scored, or worn reverse idler gear, idler-gear bushing, input gear, or output gear. • Replace any worn first-second gear synchronizer. • Replace any worn output gear. • Replace any worn differential-gear/bearing. • Replace any worn-ring gear.
Check for a noise in all gears.	• Add sufficient lubricant. • Replace any worn bearings. • Replace any chipped, scored, or worn

Checks	Action
	input-gear shaft or output-gear shaft.
Check for the transaxle slipping out of gear.	• Adjust or replace the linkage, as needed. • Adjust, repair, or replace any binding shift linkage. • Tighten or replace the input-gear bearing retainer, as needed. • Repair or replace any worn or bent shift fork.
Check for a leak in the area of the clutch.	• Repair the transaxle casing. • Replace any damaged release bearing guide.
Check for a leak at the center of the transaxle.	• Repair the transaxle casing. • Repair the shift mechanism. • Replace the damaged backup lamp switch.
Check for a leak at the differential.	• Adjust or replace the bearing retainers. • Tighten or replace the differential cover. • Adjust or replace the drive axle shaft seals.
Check for a hard shift.	• Replace any damaged release-bearing guide. • Adjust, repair, or replace the shift mechanism. • Adjust, repair, or replace the clutch-release system. • Replace any chipped, scored, or worn fifth-gear synchronizer. • Replace any chipped, scored, or worn first-second gear synchronizer. • Replace any worn third-fourth gear synchronizer. • Adjust, repair, or replace the shift lever and the rods.
Check for a clashing of gears.	• Replace any damaged release-bearing guide. • Adjust, repair, or replace the clutch-release system. • Replace the chipped, scored, or worn

Checks	Action
	input shaft/gear-cluster gears. • Replace any worn fifth-gear synchronizer. • Replace any worn fifth-gear/bearing. • Replace any worn first-gear/bearing. • Replace any worn first-second gear synchronizer. • Replace any worn second-gear/bearing. • Replace any worn third-gear/bearing. • Replace any worn third-fourth synchronizer. • Replace any worn fourth-gear/bearing. • Replace any worn reverse-idler gear.

COMPONENT LOCATORS

Gears and Case

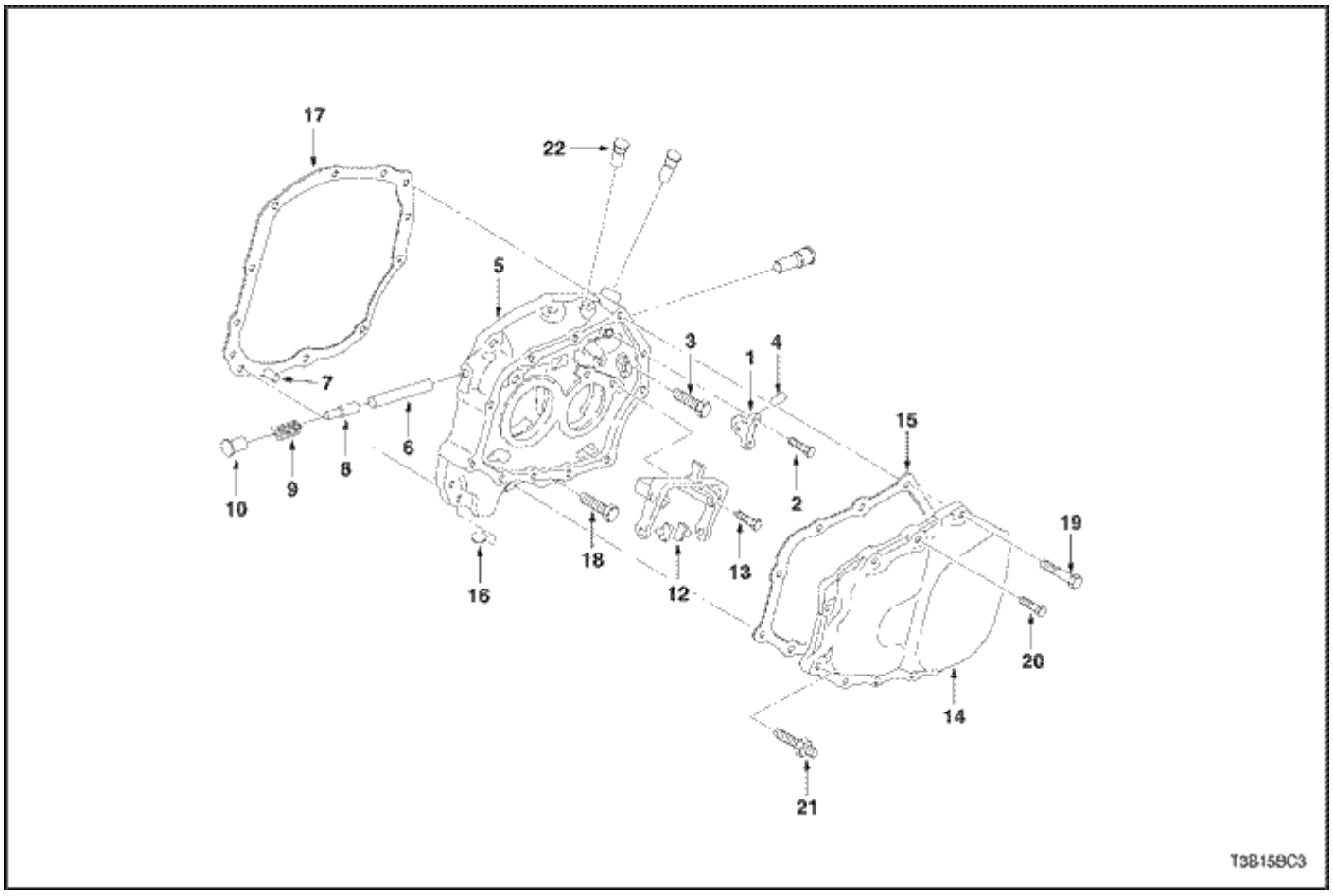


1. Roller Bearing

2. Transaxle Main Shaft
3. Washer
4. Washer Retaining Ring
5. 4th Speed Gear
6. Needle Cage
7. Synchronizer Ring
8. Shift Sleeve
9. Synchronizer Key
10. 3rd & 4th Synchronizer Spring
11. Washer
12. Circlip
13. 3rd Speed Gear
14. Washer
15. Washer Retaining Ring
16. 2nd Speed Gear
17. Needle Cage
18. Inside Synchronizer Ring
19. Intermediate Ring
20. Outside Synchronizer Ring
21. Sliding Gear
22. 1st & 2nd Synchronizer Key
23. 1st & 2nd Synchronizer Spring
24. Washer
25. Circlip
26. 1st Speed Gear
27. Needle Cage
28. Needle Cage
29. Main Shaft Disc
30. Retaining Ring
31. Groove Ball Bearing
32. Washer
33. Retaining Ring
34. 5th Speed Gear
35. Needle Cage
36. Synchronizer Ring
37. 5th Shift Sleeve
38. 5th Synchronizer Spring
39. 5th Synchronizer Key
40. Retaining Ring
41. Needle Sleeve
42. Input Drive Shift

43. Input Shaft Cluster Gear
44. Bolt
45. Retaining Ring
46. Cluster Bearing Ring
47. Groove Ball Bearing
48. Cluster 5th Speed Gear
49. Retaining Ring
50. Washer
51. Reverse Idler Gear
52. Reverse Idler Gear Shaft
53. Ball

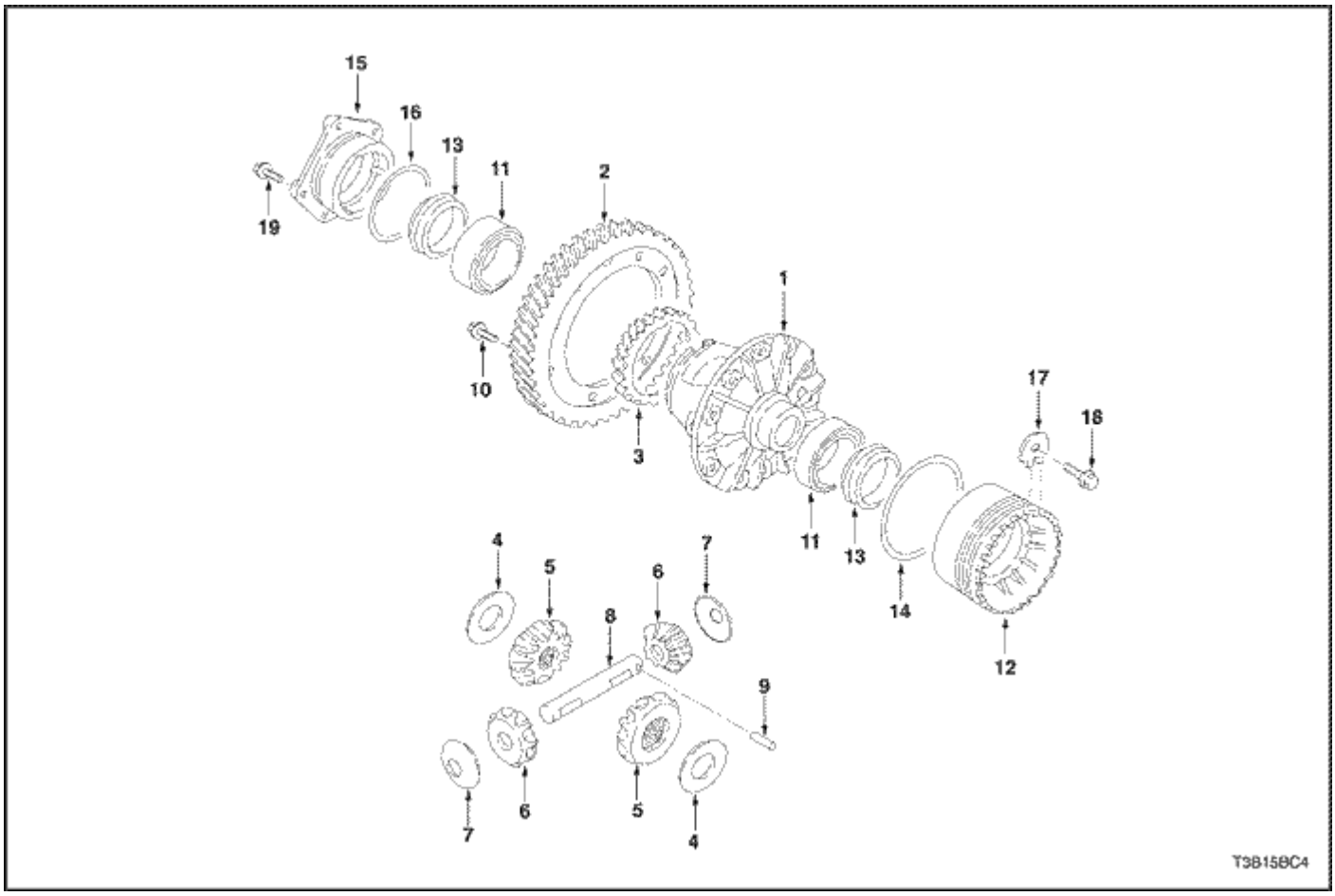
Bearing Plate



1. Strain Bolt Bridge

2. Bolt
3. Bolt
4. Bolt
5. Bearing Plate
6. Bolt
7. Pin
8. Blocking Pin
9. Compression Spring
10. Plug
11. Gear Shift Sliding Fork
12. GearShift Shoe
13. Screw
14. Transaxle Cover
15. Transaxle Cover Gasket
16. Magnet
17. Bearing Plate Gasket
18. Bolt
19. Bolt
20. Bolt
21. Screw
22. Detent Sleeve

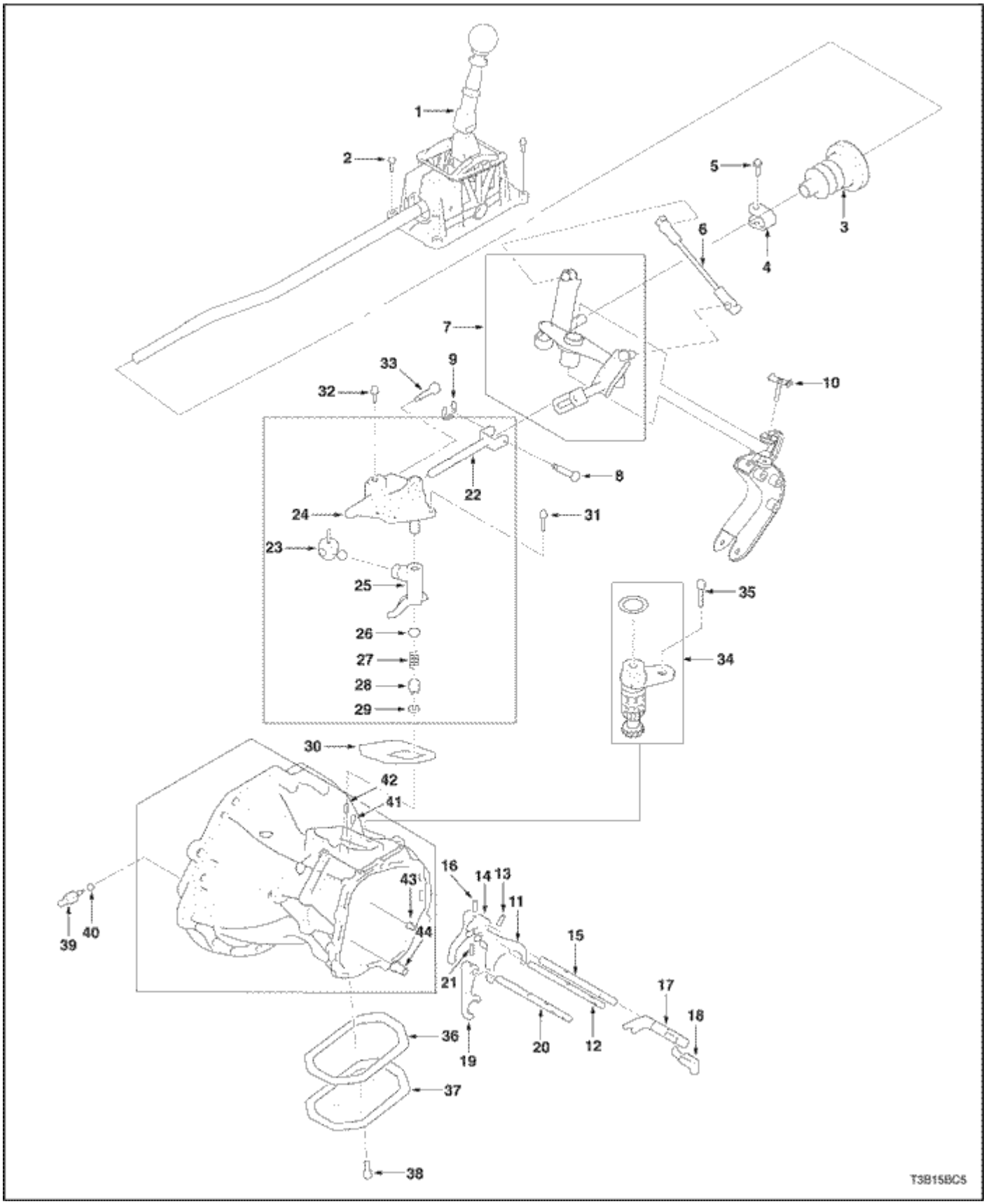
Differential Gear



1. Differential Gear Housing
2. Differential Gear
3. Speedometer Drive Gear
4. Washer
5. Side Gear
6. Bevel Differential Gear
7. Bevel Gear Disc
8. Differential Gear Shaft
9. Differential Spring Pin
10. Bolt
11. Taper Roller Bearing
12. Differential Bearing Ring
13. Shaft Seal Ring
14. O-Ring
15. Differential Gear Bearing Flange

16. O-Ring
17. Locking Plate
18. Bolt
19. Bolt

Shift Linkage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T3B15BC5

1. Gear Shift Control
2. Bolt
3. Gear Shift Tube Bellows
4. Clamp
5. Bolt
6. Gear Shift Control Mode
7. Gear Shift Guide Control
8. Pin
9. Clip
10. Bolt
11. 1st & 2nd Gear Shift Fork
12. 1st & 2nd Gear Shift Rod
13. Pin
14. 3rd & 4th Gear Shift Fork
15. 3rd & 4th Gear Shift Rod
16. Pin
17. 5th Speed Engaging Piece
18. Gear Shift Rod Pawl
19. Reverse Gear Shift Fork
20. Reverse Gear Shift Rod
21. Pin
22. Gear Shift Rod
23. Shift Finger
24. Gear Shift Lever Cover
25. Gear Shift Inter Lever
26. Plate
27. Compression Spring
28. Bush
29. Retaining Ring
30. Gear Shift Cover Gasket
31. Bolt
32. Plug
33. Plug
34. Speedometer Driven Gear
35. Bolt
36. Differential Gear Cover Gasket
37. Differential Gear Cover

38. Screw
39. Backup Lamp Switch
40. O-ring
41. Pin
42. Pin
43. Sleeve
44. Bush

SECTION 5B2

FIVE-SPEED MANUAL TRANSAXLE (Y4M)

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in B unless otherwise noted.

SPECIFICATIONS

General Specifications

Application	Description		Unit	Standard	Limit
General	Type	Forward gear	-	Synchronized mesh type	-
		Reverse gear	-	Sliding mesh type	-
	Gear ratio	1st	-	3.416	-
		2nd	-	1.950	-
		3rd	-	1.280	-

Application	Description		Unit	Standard	Limit
			4th	-	0.971 -
			5th	-	0.757 -
			Reverse	-	3.272 -
	Final drive ratio		-	4.105	-
	Fluid capacity		L(qt)	2.1 (2.21)	-
	Fluid classification		-	75W-85 (GL-4)	-
Service	Key groove width of synchronizer ring	1st, 2nd, 3rd, 4th gear	mm (in.)	9.6 (0.378)	10.0 (0.394)
		5th gear	mm (in.)	9.4 (0.370)	9.8 (0.386)
	Shift fork end thickness	Low speed shift fork (1st~2nd)	mm (in.)	8.7 (0.343)	8.1 (0.319)
		High speed shift fork (3rd~4th)	mm (in.)	7.8 (0.307)	7.2 (0.283)
		5th gear shift fork	mm (in.)	7.8 (0.307)	7.2 (0.283)
	Clearance between gear and synchronizer ring		mm (in.)	1.0 (0.039)	0.5 (0.020)
	Clearance between sleeve and shift fork		mm (in.)	0.2-0.6 (0.008-0.024)	1.0 (0.039)
	Thrust free play of differential side gear		mm (in.)	0.05-0.33 (0.002-0.013)	-
	Speedometer gear ratio(Driven/Drive)		-	17/18 (0.944)	-

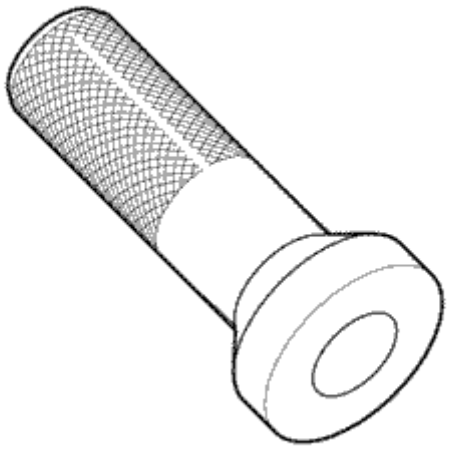
Fastener Tightening Specifications

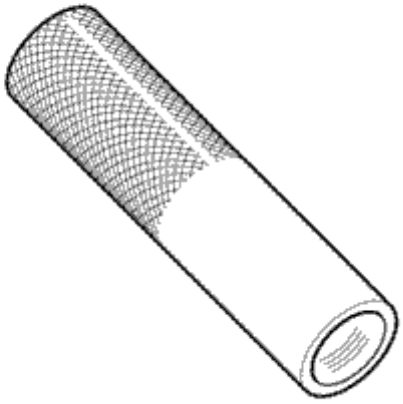
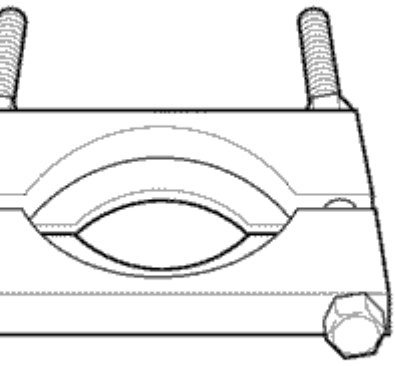
Application	N•m	Lb-Ft	Lb-In
5th/Reverse Gear Shift Shaft Bolt	10-16	7-12	-
Back Up Light Switch Nut	15-18	11-13	-
Counter Shaft 5th Gear Nut	60-80	44-59	-
Crankshaft Position Sensor Bolt	5-8	-	44-70
Differential Ring Gear Bolt	80-100	59-74	-
High Speed Shift Shaft Bolt	10-16	7-12	-
Low Speed Shift Shaft Bolt	10-16	7-12	-
Oil Drain Plug	25-30	18-22	-
Oil Level Plug	25-30	18-22	-
Radiator Lower Hose Bracket Bolts	8-15	-	70-132

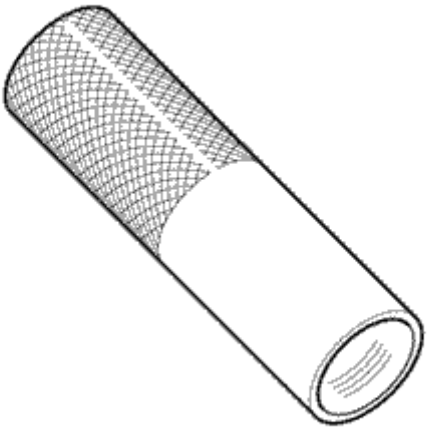
Application	N•m	Lb-Ft	Lb-In
Reverse Idle Gear Shaft Bolt	18-28	13-21	-
Reverse Shift Lever Bolt	18-28	13-21	-
Cable Bracket Bolt	18-28	13-21	-
Left Case Plate Screw	6-7	-	53-62
Shift Interlock Bolt	18-28	13-21	-
Side Cover Bolt	8-12	-	71-106
Speedometer Driven Gear Bolt	5-8	-	44-71
Transaxle Case Bolt	15-22	11-16	-
Transaxle Lower Bolt (Engine Side)	55-65	41-48	-
Transaxle Mounting Bracket Bolts	55-65	41-48	-
Transaxle Upper Bolt (Engine Side)	55-65	41-48	-
Rear Damping Block Retaining Bolts	50-60	37-44	-
Rear Mounting Bracket Bolts	55-65	41-48	-
Damping Block Connection Nut and Bolt	75-85	55-63	-

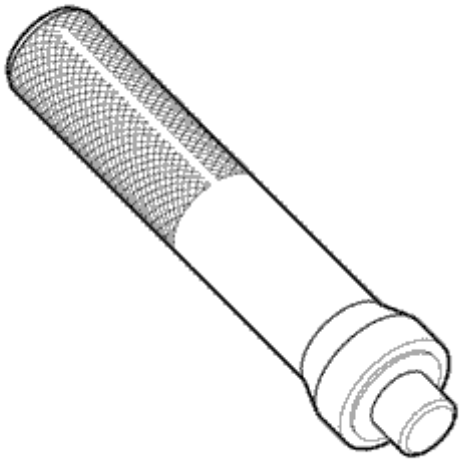
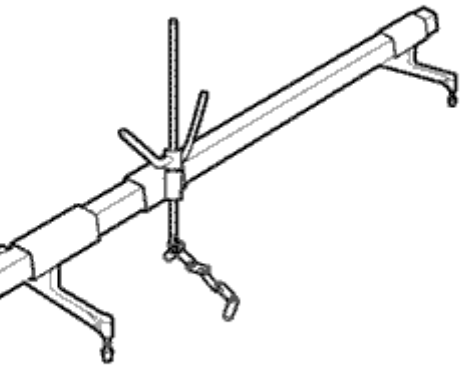
SPECIAL TOOLS

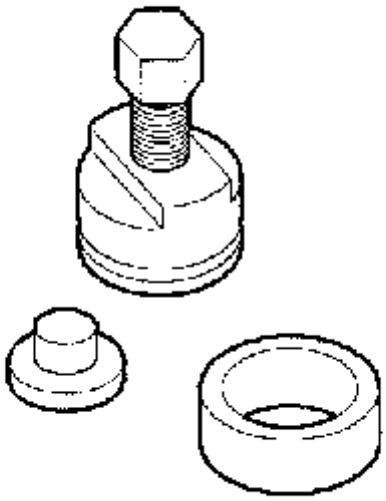
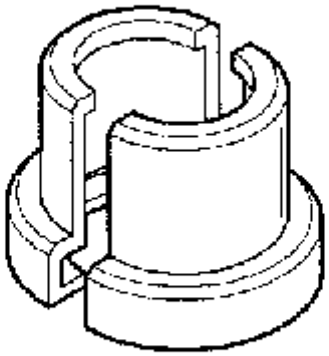
Special Tools Table

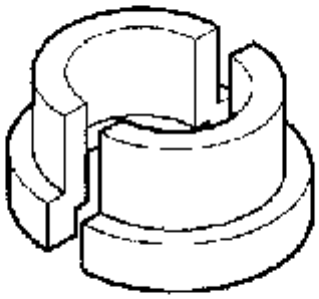
	09913-76010 Bushing, Seal Installer
	DW09913-80112 Gear, Bearing Installer

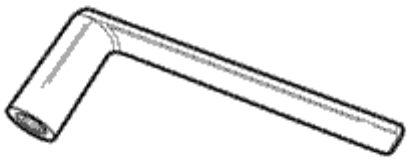
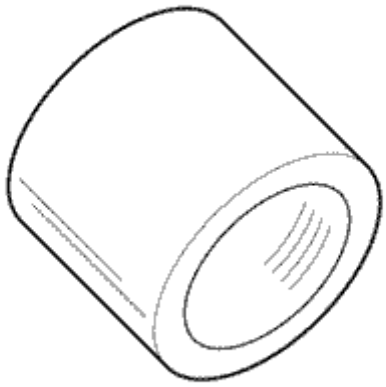
 80112	
 57810	DW09921-57810 Gear, Bearing Remover
	DW09925-98221 Gear, Bearing Installer

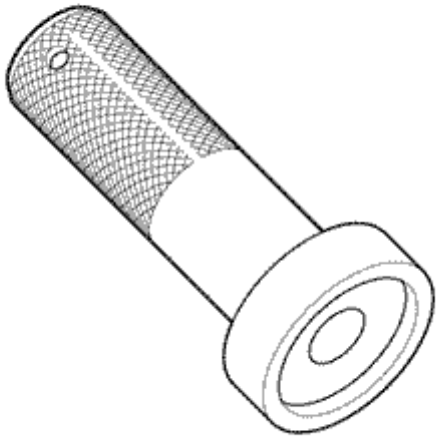
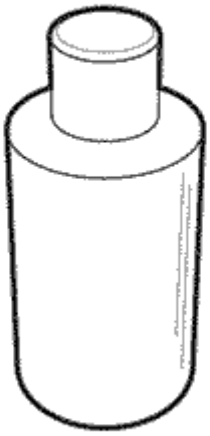
 98221	
 53111	DW09940-53111 Gear, Bearing Installer
	DW09943-78210 Bushing, Seal Installer

 78210	
 DW110060	DW110-060 Engine Assembly Support Fixture
	DW220-020A-01 Differential Bearing Puller

 DW22002A	
 DW22002B	DW220-020A-02 Differential Bearing Plate Adapter
	DW220-020A-03 Differential Bearing Plate Adapter

 DW22002C	
 DW220100	DW220-100 Needle Bearing Remover
	DW220-120 Input Shaft Holder

 DW220120	
 KM466A	KM466-A Gear, Bearing Remover / Installer
	KM519 Oil Seal Installer

 KM519	
 DW220110	DW220-110 Needle Bearing Installer

DIAGNOSIS

General Diagnosis

Condition	Probable Cause	Correction

Condition	Probable Cause	Correction
Gear Slipping Out of Mesh	• Worn shift fork.	• Replace shift fork.
	• Worn synchronizer sleeve or gear.	• Replace sleeve or gear.
	• Worn bearings on input shaft or counter shaft.	• Replace bearing.
	• Weakened or damaged location spring.	• Replace spring.
	• Loose or damaged synchronizer spring.	• Replace synchronizer spring.
	• Excessive back-lash of gear.	• Adjust back-lash of gear.
Gear Catching	• Bent or distorted shift shaft or shift fork.	• Replace shift shaft or shift fork.
	• Weakened or damaged synchronizer spring.	• Replace spring.
Hard Shifting	• Worn synchronizer ring.	• Replace synchronizer ring.
	• Worn synchronizer sleeve or gear.	• Replace sleeve or gear.
	• Bent or distorted shift shaft.	• Replace shift shaft.
	• Excessive free travel of all gears in axial direction.	• Replace gear.
	• Worn bearings on input shaft or counter shaft.	• Replace bearing.
	• Poor adjustment of clutch cable.	• Adjust clutch cable.

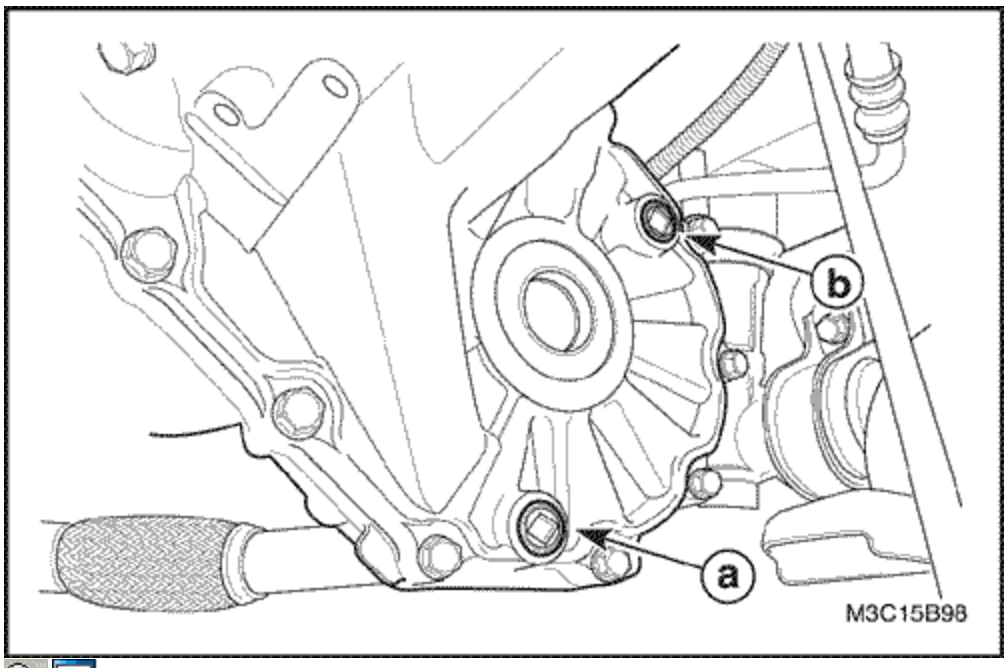
Condition	Probable Cause	Correction
	• Distorted or broken clutch disc.	• Replace clutch disc.
	• Damaged clutch cover.	• Replace clutch cover.
Noise in the Neutral Gear	• Insufficient lubricant.	• Supply lubricant.
	• Worn input shaft gear.	• Replace gear.
	• Worn bearings on the input shaft gears.	• Replace bearing.
	• Worn clutch release bearing.	• Replace clutch release bearing.
Noise in the All Gears	• Insufficient lubricant.	• Supply lubricant.
	• Worn bearings on input shaft or counter shaft.	• Replace bearing.
	• Worn input shaft or counter shaft gear.	• Replace gear.
	• Worn or damaged synchronizer ring.	• Replace synchronizer ring.
	• Worn or damaged synchronizer sleeve.	• Replace synchronizer sleeve.
	• Worn differential gear or bearing.	• Replace gear or bearing.
Noise in the Peculiar Gear	• Worn or damaged synchronizer ring in the peculiar gear.	• Replace synchronizer ring.
	• Worn or damaged gear in the peculiar gear.	• Replace gear.
	• Worn or damaged bearing in the peculiar gear.	• Replace bearing.

Condition	Probable Cause	Correction
Leak of Lubricant	• Damaged oil seal.	• Replace oil seal.

Checking Fluid Level

Check for a leak in the area of transaxle case and sealing and then check fluid level and condition after removing oil level plug.

1. Operate the engine until it comes to normal operating temperature(Coolant temperature : 80~90°C (176~ 194°F)).
2. Stall the engine and raise the vehicle.
3. Remove the oil level plug and check the fluid level.
4. The fluid should slightly flow out from the oil level plug hole.
5. If the level is low, add the recommended fluid through the oil level plug hole until the fluid begins to run out.
6. If the fluid is contaminated or discolored, replace it with the recommended fluid.
7. Reinstall the oil level plug and tighten it securely.



Changing Fluid

1. Operate the engine until it comes to normal operating temperature(Coolant temperature : 80~90°C (176~ 194°F)).
2. Stall the engine and raise the vehicle.

3. Drain the fluid after removing the drain plug.
4. Reinstall the drain plug and tighten it securely after coating sealant.
5. Remove the oil level plug and replenish the fluid until it begins to run out.

   a. Oil drain plug.
   b. Oil level plug.

6. Reinstall the oil level plug and tighten it securely.

Fluid Specification	75W-85(GL-4)
Fluid Capacity	2.1L (2.21qt)
Service interval	Refer to Owner's Manual

Checking Transaxle Noise

Many noises that appear to come from the transaxle may actually originate with other sources such as tires, road surfaces, wheel bearings, or engine and exhaust system.

Identify the cause of any noise before attempting to repair the clutch, the transaxle, or their related linkages.

To verify suspected transaxle noises,

1. Select a smooth, level asphalt road to reduce tyre and resonant body noise.
2. Drive the vehicle far enough to warm up all the lubricants thoroughly.
3. Record the speed and the gear range of the transaxle when the noise occurs.
4. Check for noises with the vehicle stopped, but with the engine running.
5. Determine if the noise occurs while the vehicle operates in.
   - Drive - Under a light acceleration or a heavy pull.
   - Float - Maintaining a constant speed with a light throttle on a level road.
   - Coast - With the transaxle in gear and the throttle partly or fully closed.
   - All of the above.

Checking Bearing Noise

Differential Side Bearing Noise

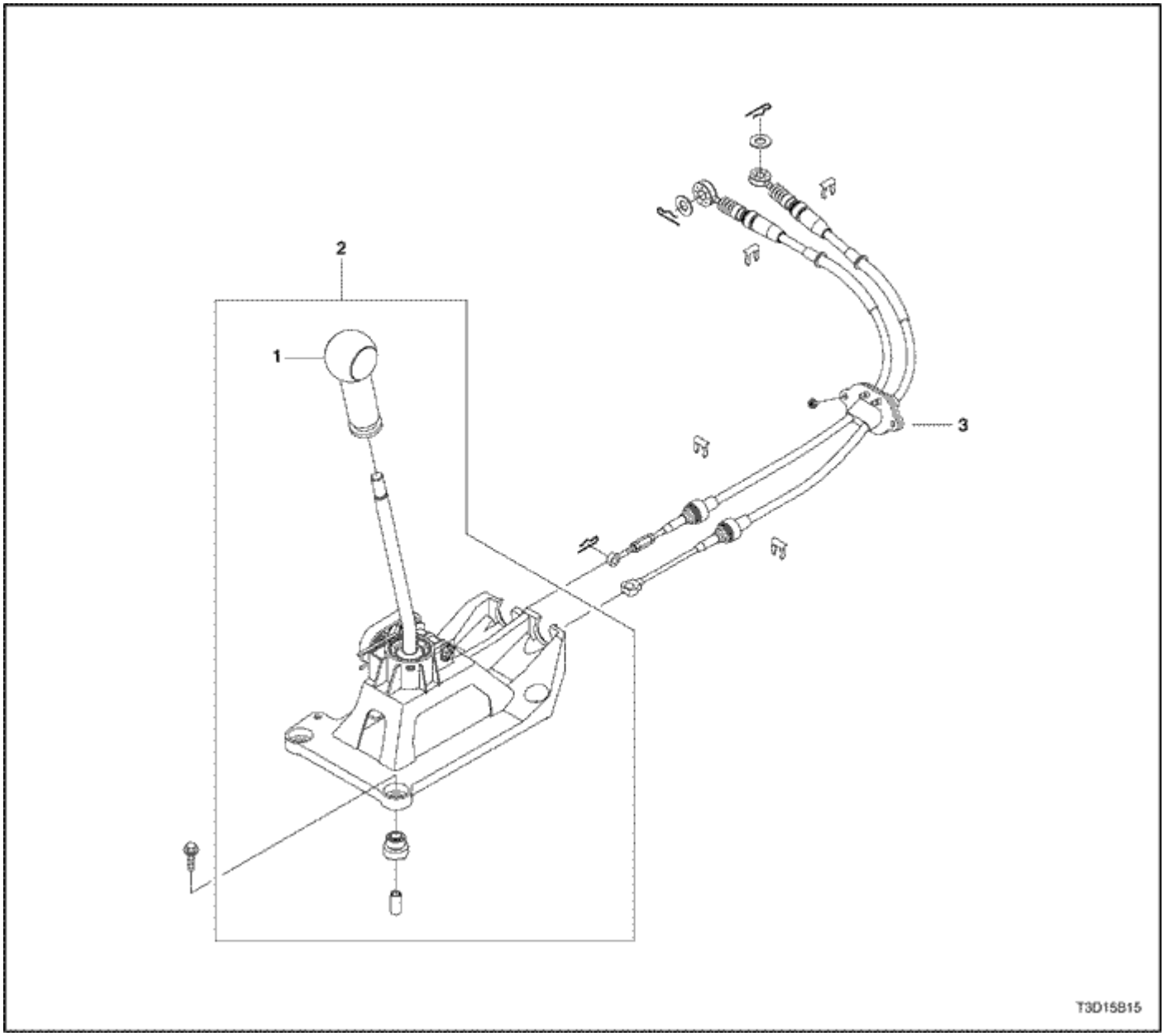
Differential side bearing noise and wheel bearing noise can be confused easily. Since side bearings are pre-loaded, a differential side bearing noise should not diminish much when the differential/transaxle is run with the wheels off the ground.

Wheel Bearing Noise

Wheel bearings produce a rough growl or grating sound that will continue when the vehicle is coasting and the transaxle is in NEUTRAL. Since wheel bearings are not pre-loaded, a wheel bearing noise should diminish considerably when the wheels are off the ground.

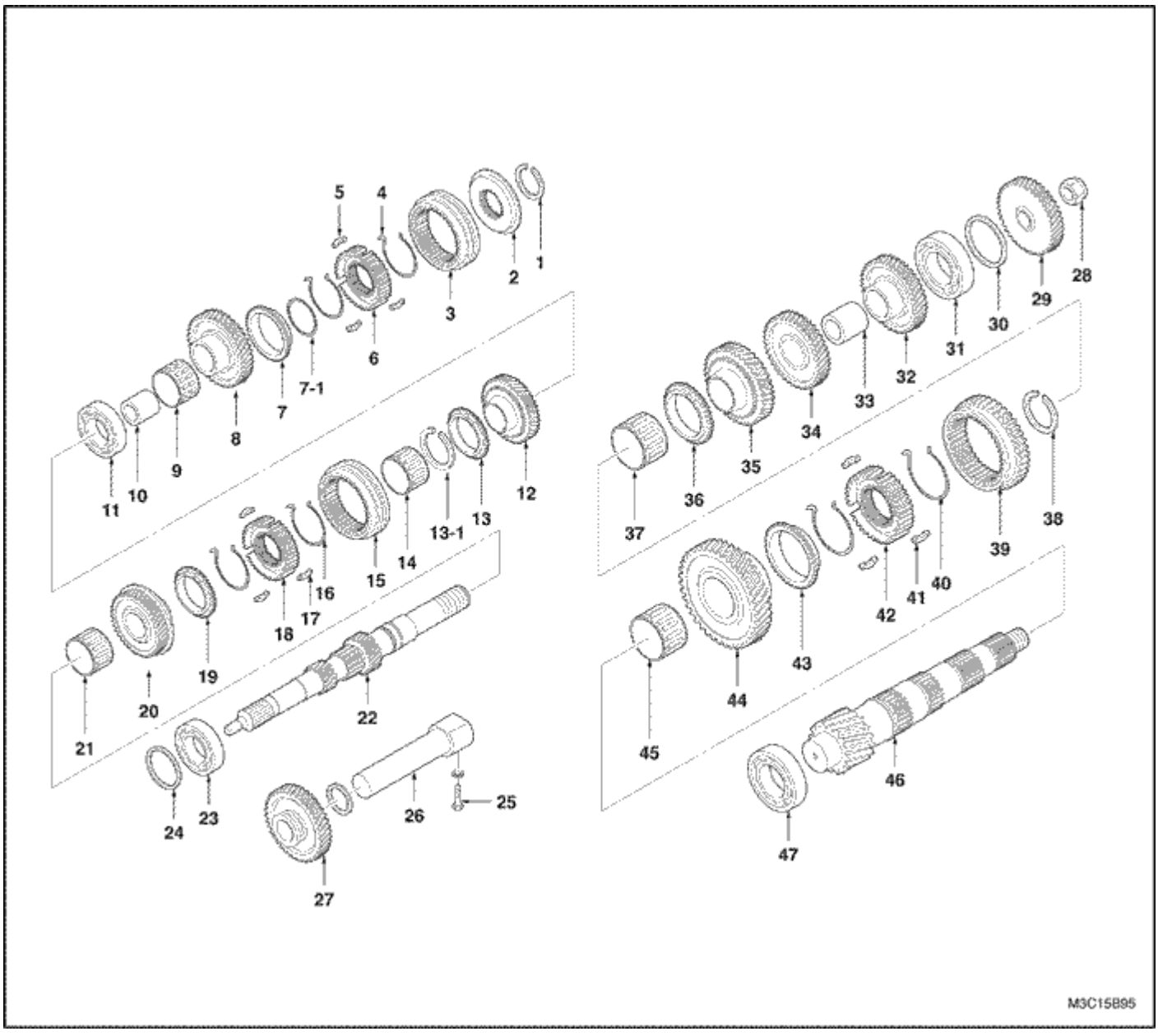
COMPONENT LOCATORS

Gear Shift Control



1. Gear Shift Control Lever Knob
2. Gear Shift Control Lever Assembly
3. Select and Shift Cable

Input Shaft and Counter Shaft Gear



1. Input Shaft Circlip

2. 5th Gear Synchronizer Plate
3. 5th Gear Synchronizer Sleeve
4. 5th Gear Synchronizer Spring
5. 5th Gear Synchronizer Key
6. 5th Gear Synchronizer Hub
7. 5th Gear Synchronizer Ring

7-1 Wave Spring

8. Input Shaft 5th Gear

9. Input Shaft 5th Gear Bearing

10. Input Shaft 5th Gear Spacer

11. Input Shaft Bearing(Left)

12. Input Shaft 4th Gear

13. 4th Gear Synchronizer Ring

13-1 Circlip

14. Input Shaft 4th Gear Bearing

15. 3rd-4th Gear Synchronizer Sleeve

16. 3rd-4th Gear Synchronizer Spring

17. 3rd-4th Gear Synchronizer Key

18. 3rd-4th Gear Synchronizer Hub

19. 3rd Gear Synchronizer Ring

20. Input Shaft 3rd Gear

21. Input Shaft 3rd Gear Bearing

22. Input Shaft

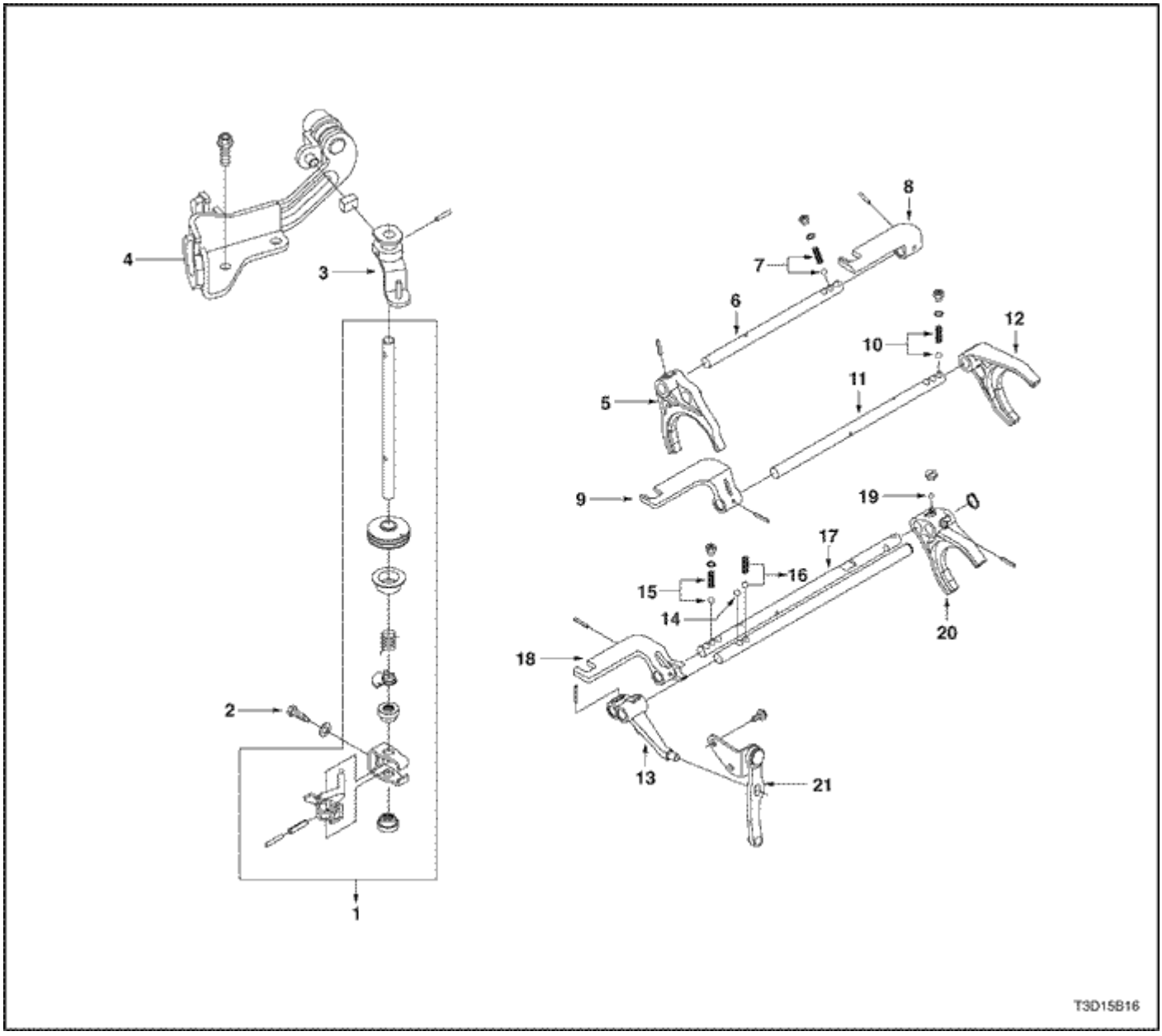
23. Input Shaft Bearing(Right)

24. Input Shaft Oil Seal
25. Reverse Gear Shaft Bolt
26. Reverse Gear Shaft
27. Reverse Idle Gear
28. Counter Shaft Nut
29. Counter Shaft 5th Gear
30. Counter Shaft Bearing Shim
31. Counter Shaft Bearing(Left)
32. Counter Shaft 4th Gear
33. Counter Shaft 3rd-4th Gear Spacer
34. Counter Shaft 3rd Gear
35. Counter Shaft 2nd Gear
36. 2nd Gear Synchronizer Ring
37. Counter Shaft 2nd Gear Bearing
38. 1st-2nd Gear Synchronizer Circlip
39. 1st-2nd Gear Synchronizer Sleeve
40. 1st-2nd Gear Synchronizer Spring
41. 1st-2nd Gear Synchronizer Key
42. 1st-2nd Gear Synchronizer Hub
43. 1st Gear Synchronizer Ring
44. Counter Shaft 1st Gear
45. Counter Shaft 1st Gear Bearing

46. Counter Shaft

47. Counter Shaft Bearing(Right)

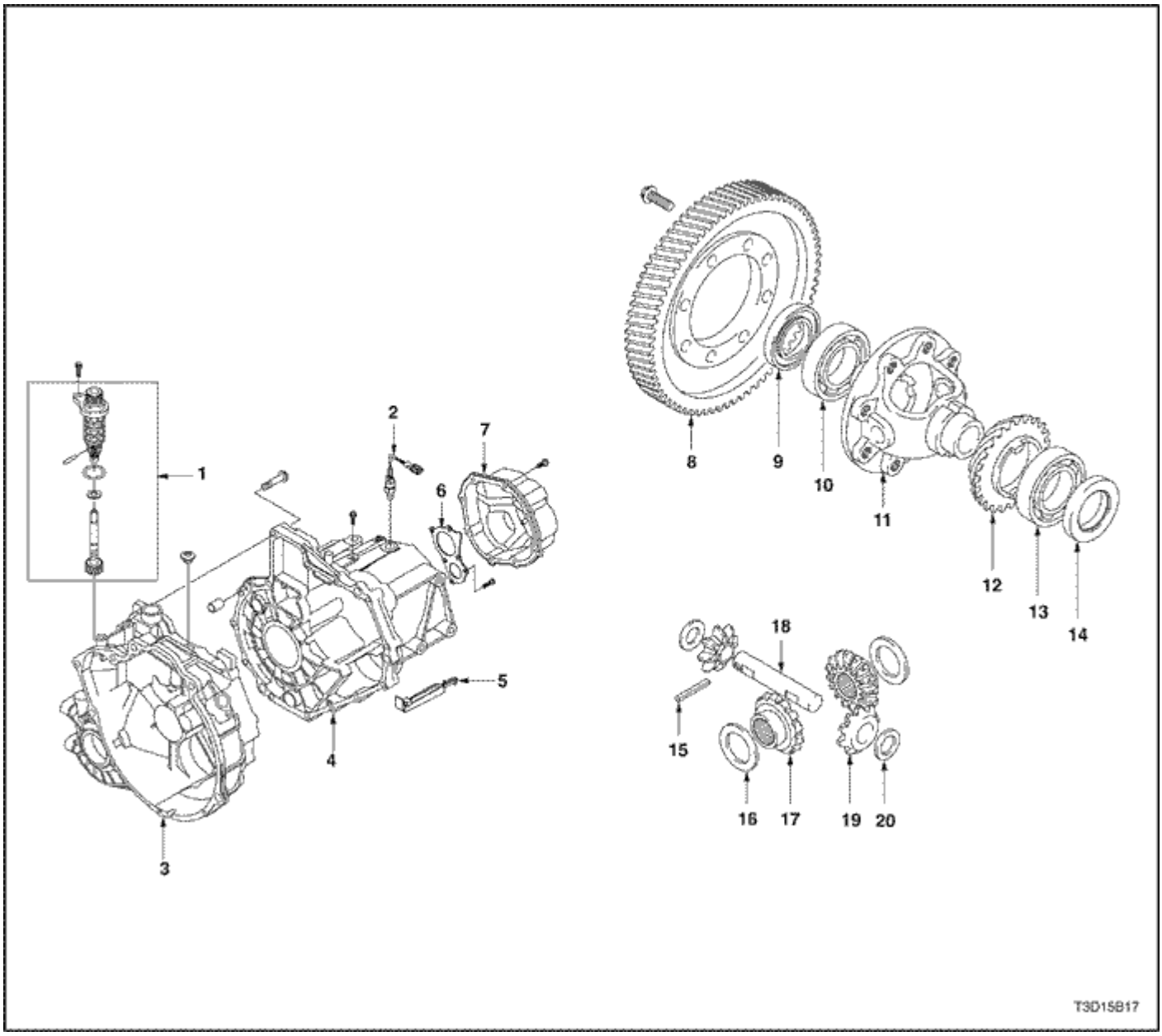
Gear Shift Fork



1. Shift and Select Shaft

2. Shift Interlock Bolt
3. Shift Lever
4. Bracket
5. Low Speed Shift Fork
6. Low Speed Shift Shaft
7. Low Speed Shift Shaft Spring/Ball
8. Low Speed Shift York
9. High Speed Shift York
10. High Speed Shaft Spring/Ball
11. High Speed Shift Shaft
12. High Speed Shift Fork
13. Reverse Shift Arm
14. 5th/Reverse Shift Ball
15. 5th/Reverse Shift Shaft Spring/Ball
16. Reverse Shift Shaft Guide Spring/Ball
17. 5th/Reverse Shift Shaft
18. 5th/Reverse Shift York
19. 5th/Shift Fork Guide Ball
20. 5th/Shift Fork
21. Reverse Shift Lever

Differential and Case



1. Speedometer Driven Gear
2. Back Up Light Switch
3. Transaxle Case(Right)
4. Transaxle Case(Left)
5. Oil Gutter
6. Left Case Plate

7. Side Cover
8. Differential Ring Gear
9. Differential Oil Seal(Left)
10. Differential Bearing(Left)
11. Differential Case
12. Speedometer Drive Gear
13. Differential Bearing(Right)
14. Differential Oil Seal(Right)
15. Differential Pinion Gear Shaft Pin
16. Differential Side Gear Adjust Shim
17. Differential Side Gear
18. Differential Pinion Gear Shaft
19. Differential Pinion Gear
20. Differential Pinion Gear Washer

SECTION 5C1

CLUTCH (HYDRAULIC TYPE)

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

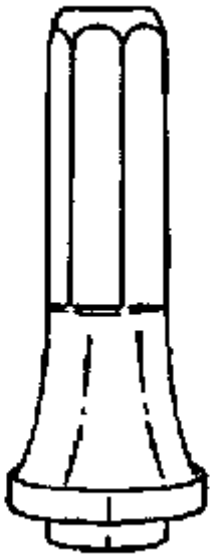
Fastener Tightening Specifications

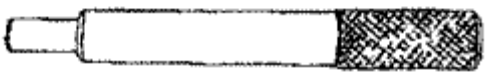
Application	N•m	Lb-Ft	Lb-In
Clutch Master Cylinder Nuts	22	16	-

Application	N•m	Lb-Ft	Lb-In
Clutch Pedal Shaft Nut	20	15	-
Pressure Plate-to-Flywheel Bolts	15	11	-
Release Cylinder Bolts	20	15	-

SPECIAL TOOLS

Special Tools Table

	J-36547 Input Shaft Seal Installer
	J-42474 Clutch Arbor



J42474

DIAGNOSIS

Clutch Operation

Fails to Release

Checks	Action
DEFINITION: When the pedal is pressed to the floor, the shift lever does not move freely in and out of reverse gear.	
Check for a loose linkage.	Repair or replace loose linkage, if necessary.
Check for a damaged clutch disc.	Replace the damaged clutch disc.
Check for an improperly installed fork shaft.	Remove and properly reinstalled the fork shaft. Very lightly lubricate the fork fingers at the release bearing with wheel bearing grease.
Check for the clutch disc hub binding on the input shaft splines.	Repair or replace the clutch disc hub.
Check for a warped or bent clutch disc.	Replace the warped or bent clutch disc.

Slipping

Checks	Action
Check for the driver improperly operating the vehicle.	Correct the driver's operation of the vehicle as necessary.
Check for an oil-soaked clutch disc.	Correct the leak at its source and install a new clutch disc.
Check for a worn facing or facing torn from the disc.	Replace the worn disc with a new disc.

Checks	Action
Check for a warped pressure plate or a warped flywheel.	Replace the warped pressure plate or the warped flywheel.
Check for a weak diaphragm spring.	Replace the pressure plate.
Check for a driven plate that is not seated.	Start the engine 30 to 40 times. Do not overheat the engine.
Check for a driven plate that is overheated.	Allow the driven plate to cool.

Grabbing (Chattering)

Checks	Action
Check for a burned or a glazed facing caused by oil on the facing.	Correct the leak at its source and install a new clutch disc.
Check for worn splines on the input shaft.	Replace the worn input shaft.
Check for a warped pressure plate or a warped flywheel.	Replace the warped pressure plate or the warped flywheel.
Check for a burned or smeared resin on the flywheel or the pressure plate.	Sand off the burned or smeared resin if it is superficial. Replace any burned or heat-checked parts.

Rattling (Transaxle Click)

Checks	Action
Check for weak retracting springs.	Replace the pressure plate.
Check for a loose release fork.	Remove and reinstall the release fork properly.
Check for oil in the driven plate bumper.	Correct the cause of the oil leak and replace the driven disc.
Check for a damaged driven plate damper spring.	Replace the driven disc.

Release Bearing Noise with Clutch Fully Engaged

Checks	Action
Check for the driver improperly operating the vehicle.	Correct the driver's operation of the vehicle as necessary.
Check for a binding release bearing.	Clean and re-lubricate the release bearing. Inspect the release bearing for burrs and nicks.
Check for an improperly installed release lever.	Remove and reinstall the release lever properly.
Check for a weak linkage return spring.	Replace the weak linkage return spring.

Noisy

Checks	Action
Check for a worn release bearing.	Replace the worn release bearing.
Check for a improperly installed release lever.	Remove and properly reinstall the fork shaft. Very lightly lubricate the fork fingers at the release bearing with wheel bearing grease.

Pedal Stays on Floor When Disengaged

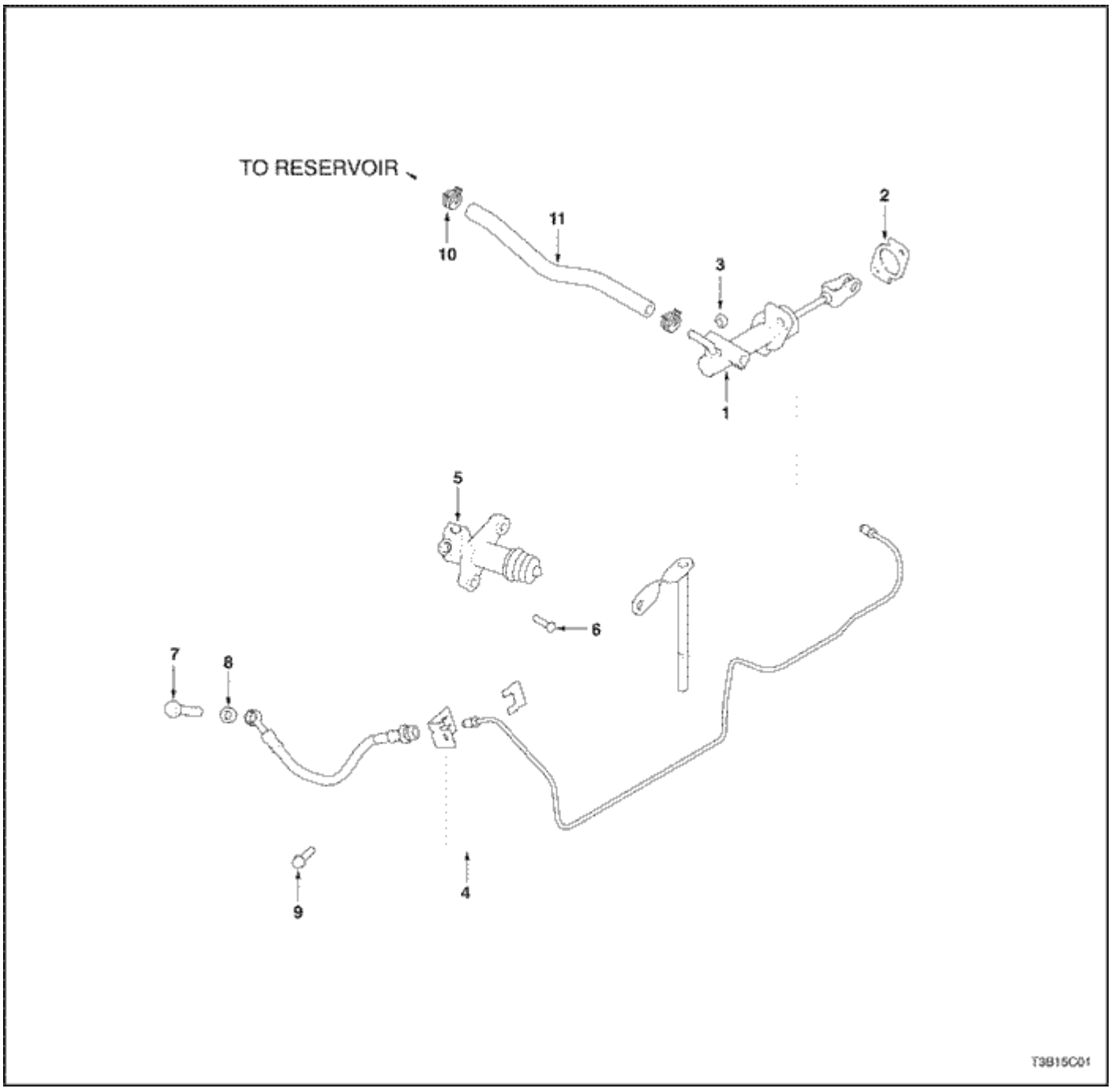
Checks	Action
Check for binding in the linkage or the release bearing.	Lubricate and free-up the binding linkage or the release bearing.
Check for weak pressure plate springs.	Replace the pressure plate.

Hard Pedal Effort

Checks	Action
Check for binding in the linkage.	Lubricate and free-up the binding linkage.
Check for a worn driven plate.	Replace the worn driven plate.

COMPONENT LOCATOR

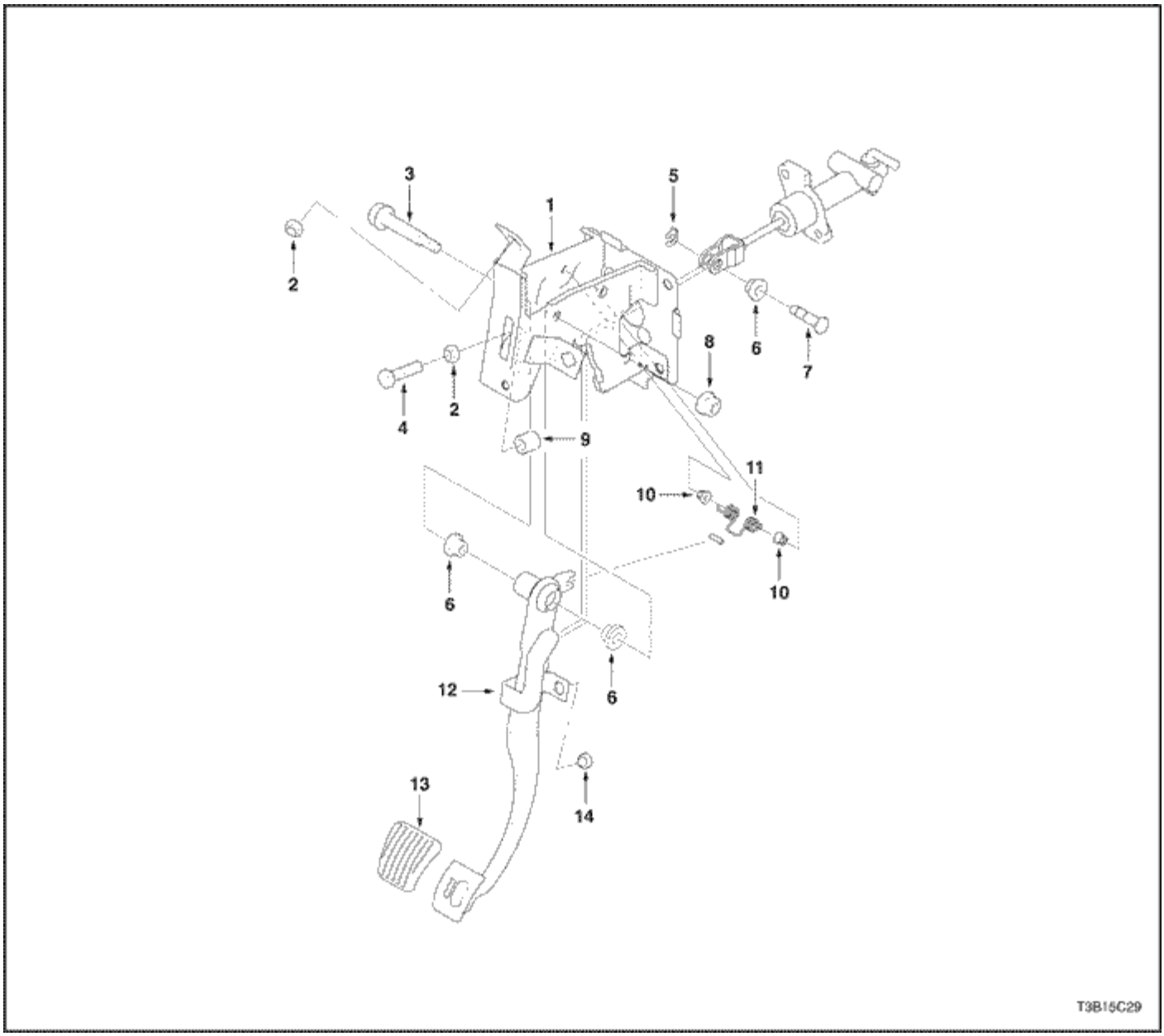
Hydraulic Clutch



1. Clutch Master Cylinder
2. Clutch Master Cylinder Gasket
3. Nut
4. Clutch Master Cylinder Pipe

5. Clutch Release Cylinder
6. Bolt
7. Bolt
8. Washer
9. Bolt
10. Clip
11. Reservoir Tank Hose

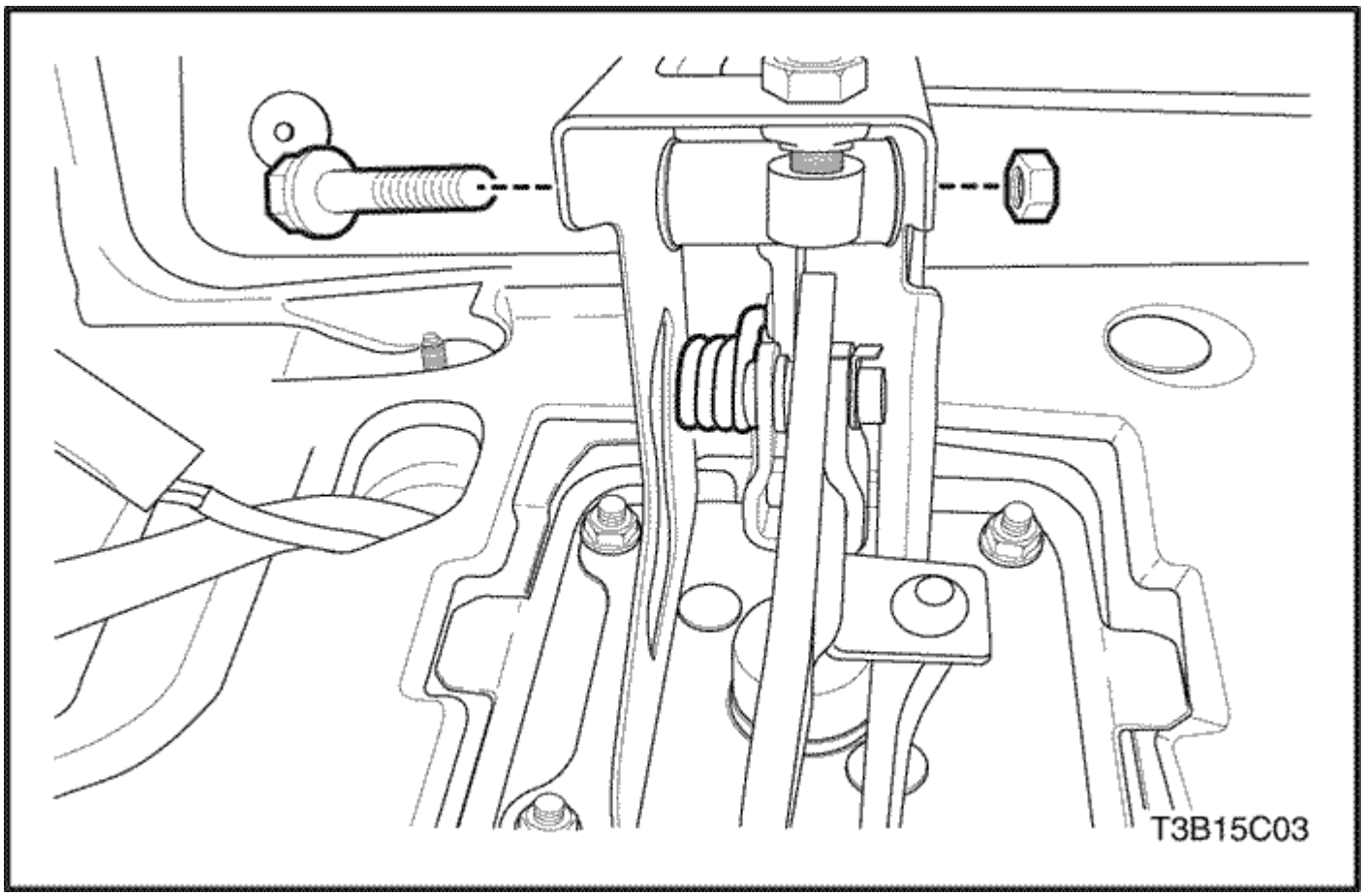
Clutch Pedal



1. Clutch Pedal Brace
2. Nut
3. Pedal Shaft
4. Bolt
5. E-Ring
6. Bushing
7. Pin

8. Nut
9. Clutch Pedal Buffer
10. Bushing
11. Turn Over Spring
12. Clutch Pedal
13. Clutch Pedal Pad
14. Clutch Pedal Buffer

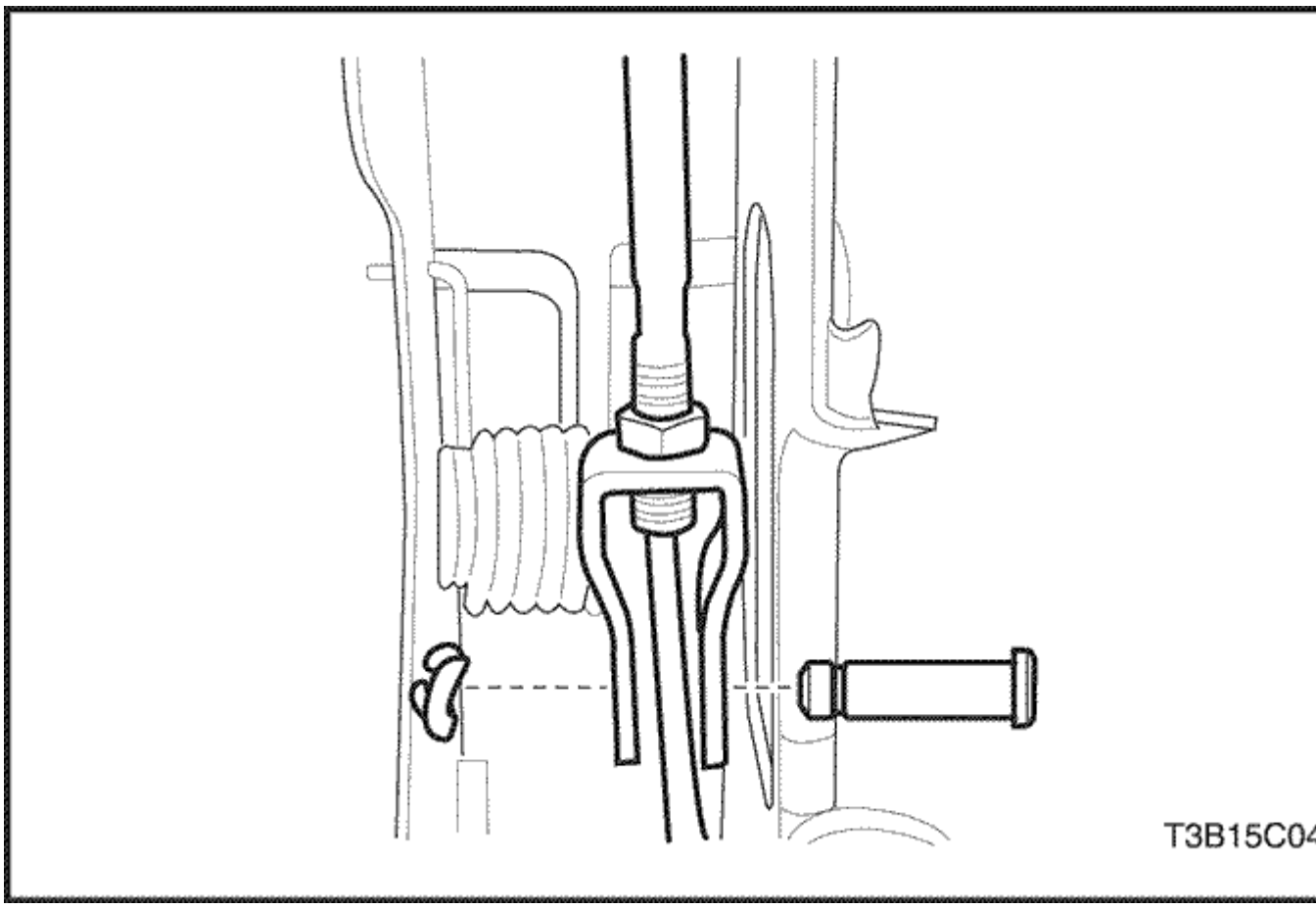
MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



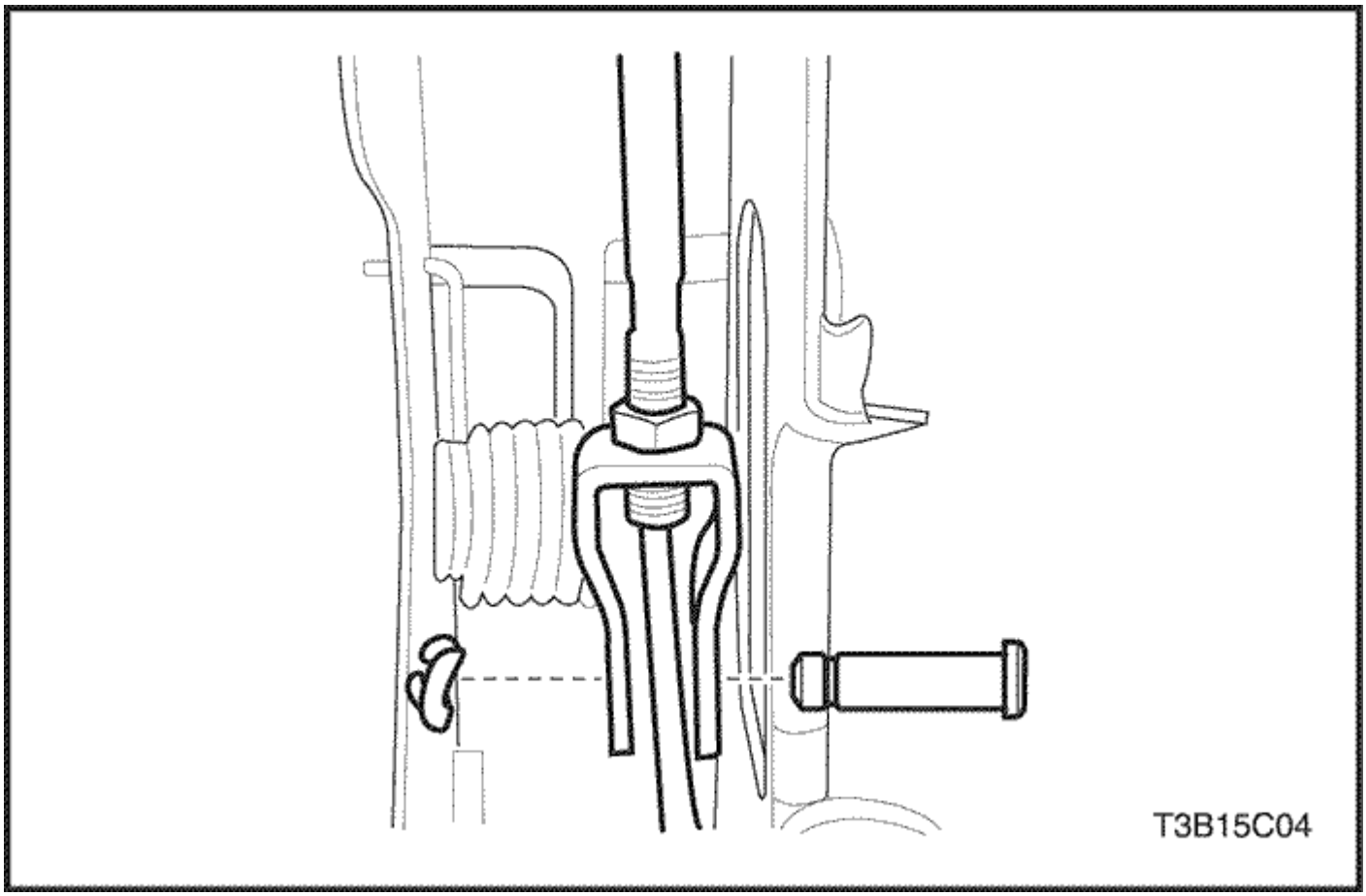
Clutch Pedal
Removal Procedure

1. Disconnect the negative battery cable.

2. Disconnect the return spring from the clutch pedal.
3. Remove the nut, the washer, and the pedal mounting shaft.

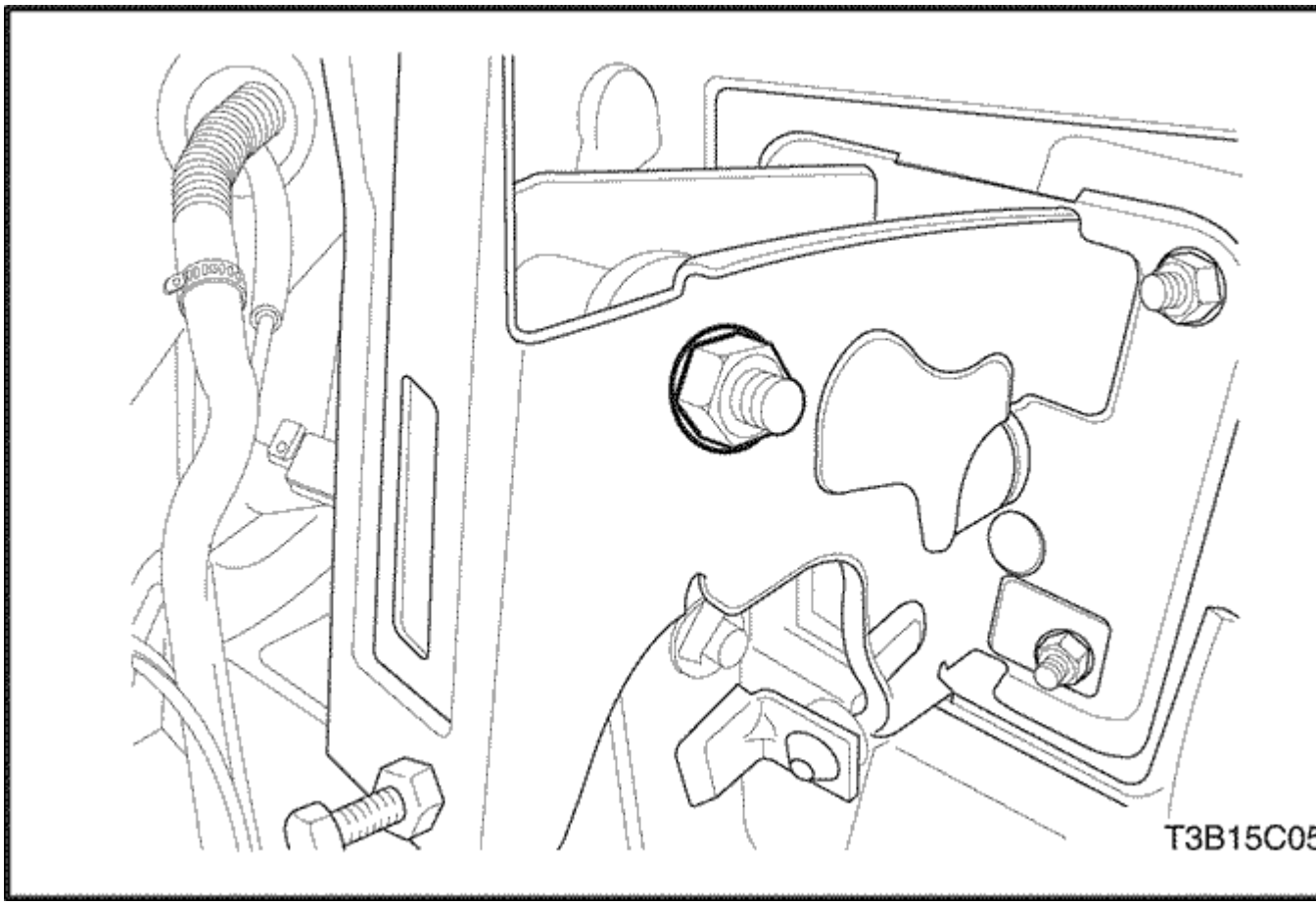


4. Remove the locking clip and push rod fixing pin.
5. Remove the push rod from the clutch pedal.
6. Remove the clutch pedal.



Installation Procedure

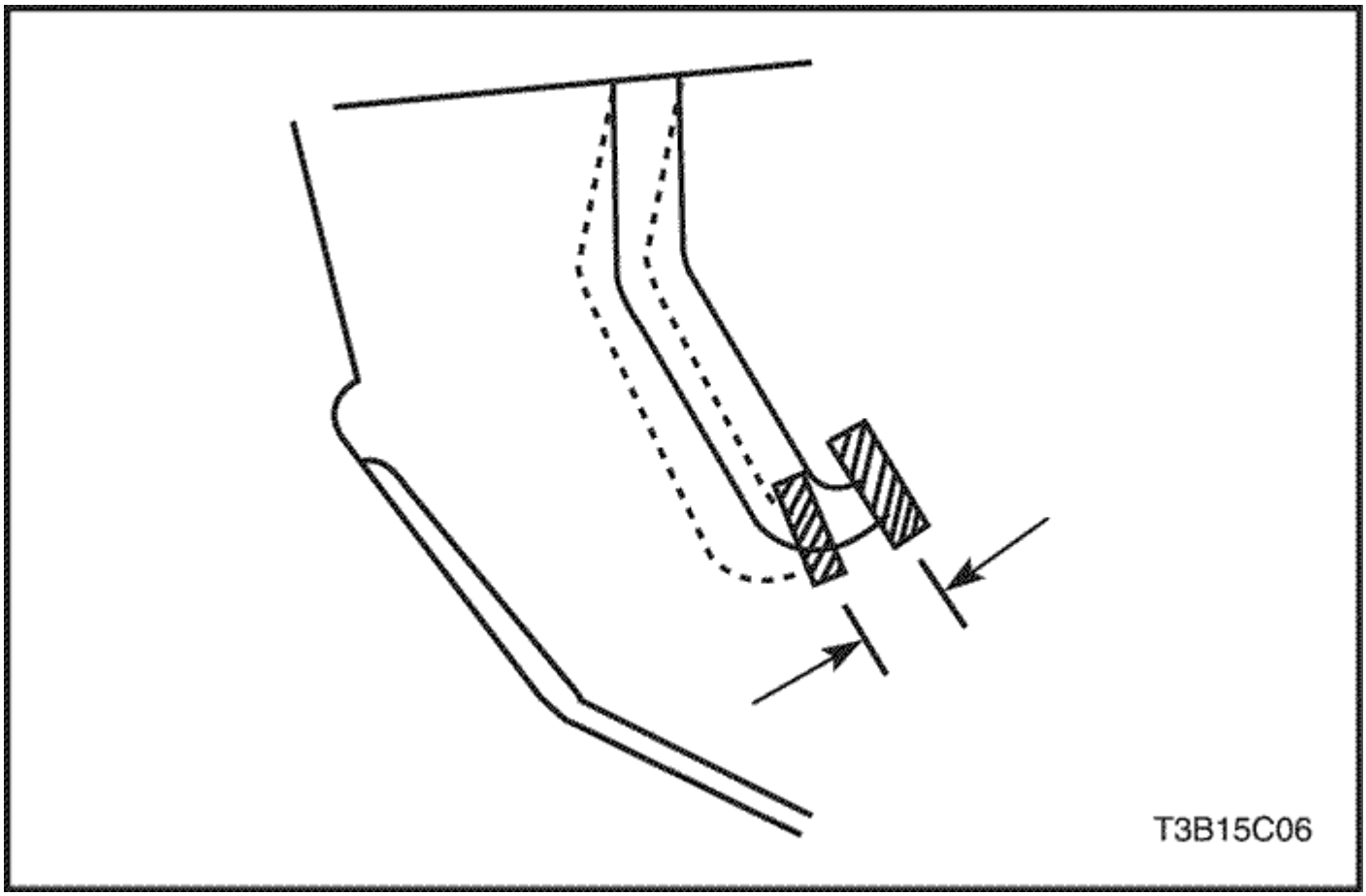
1. Install the clutch pedal.
2. Coat the push rod with multi-purpose grease.
3. Install the push rod to the clutch pedal.
4. Install the locking clip and push rod fixing pin.



5. Coat the pedal mounting shaft with multi-purpose grease.
6. Install the nut, the washer, and the pedal mounting shaft.

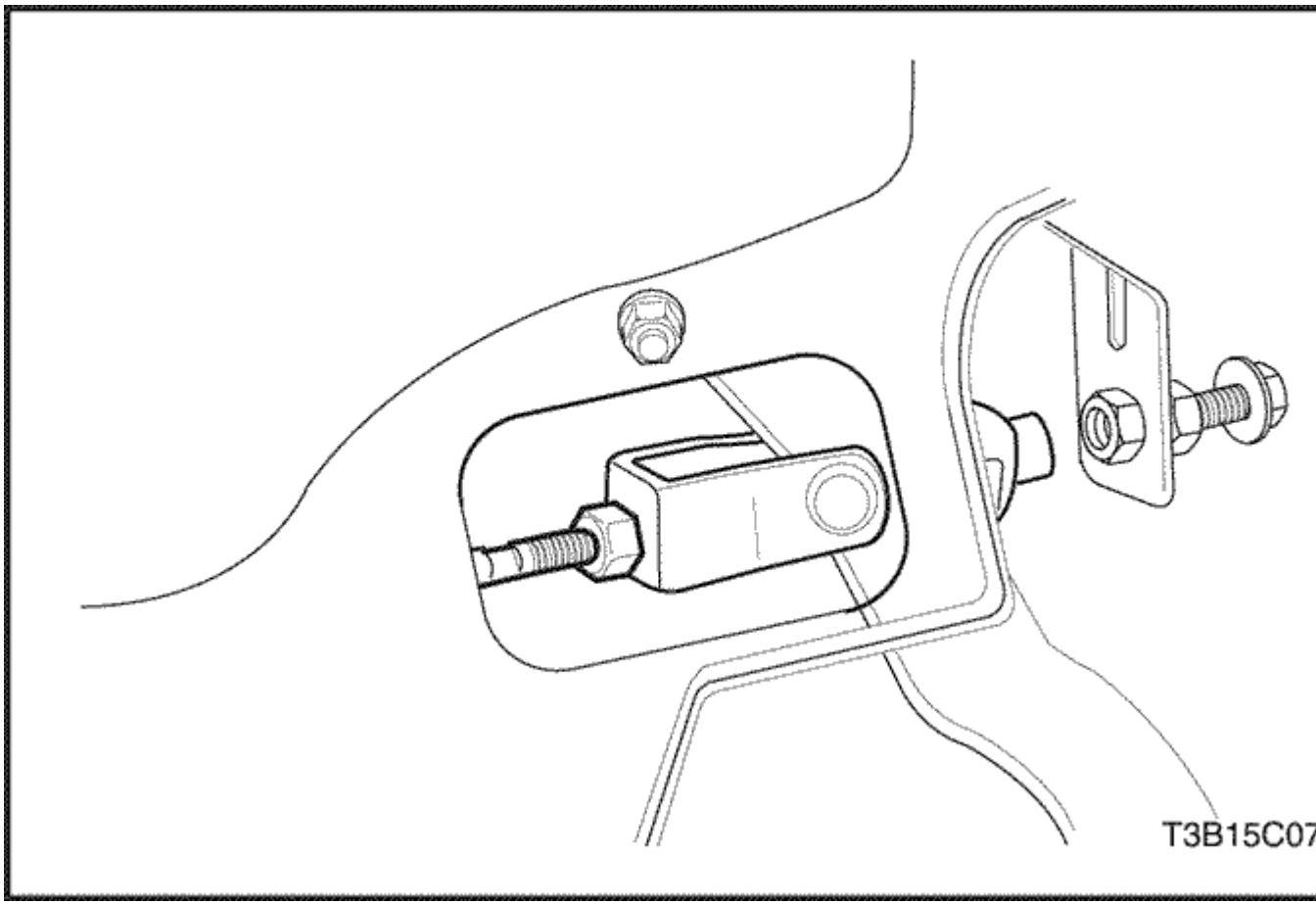
   Tighten
   Tighten the nut to 20 N•m (15 lb-ft).

7. Connect the return spring to the clutch pedal.
8. Connect the negative battery cable.

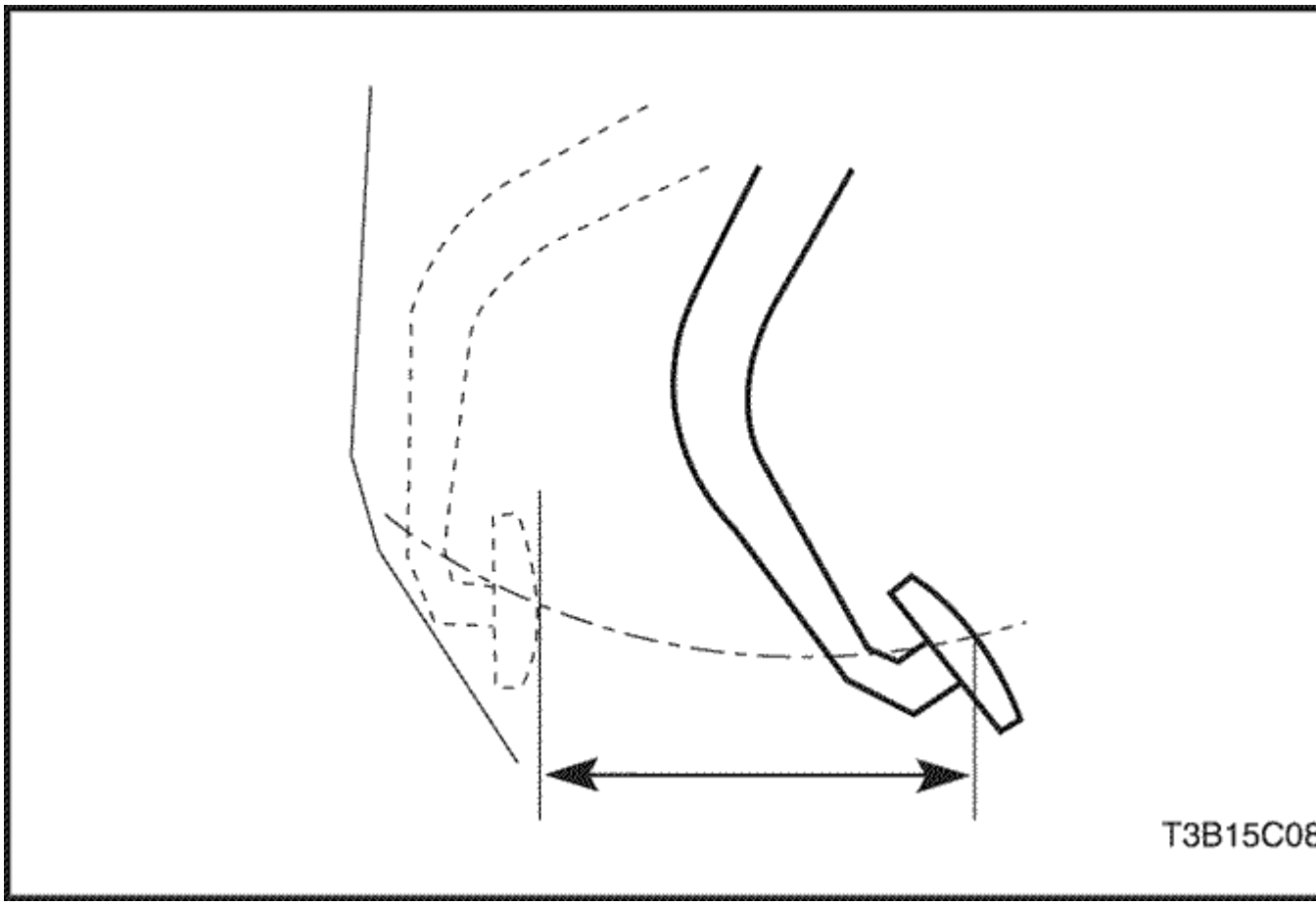


Clutch Pedal Adjustment (Hydraulic)
Adjustment Procedure

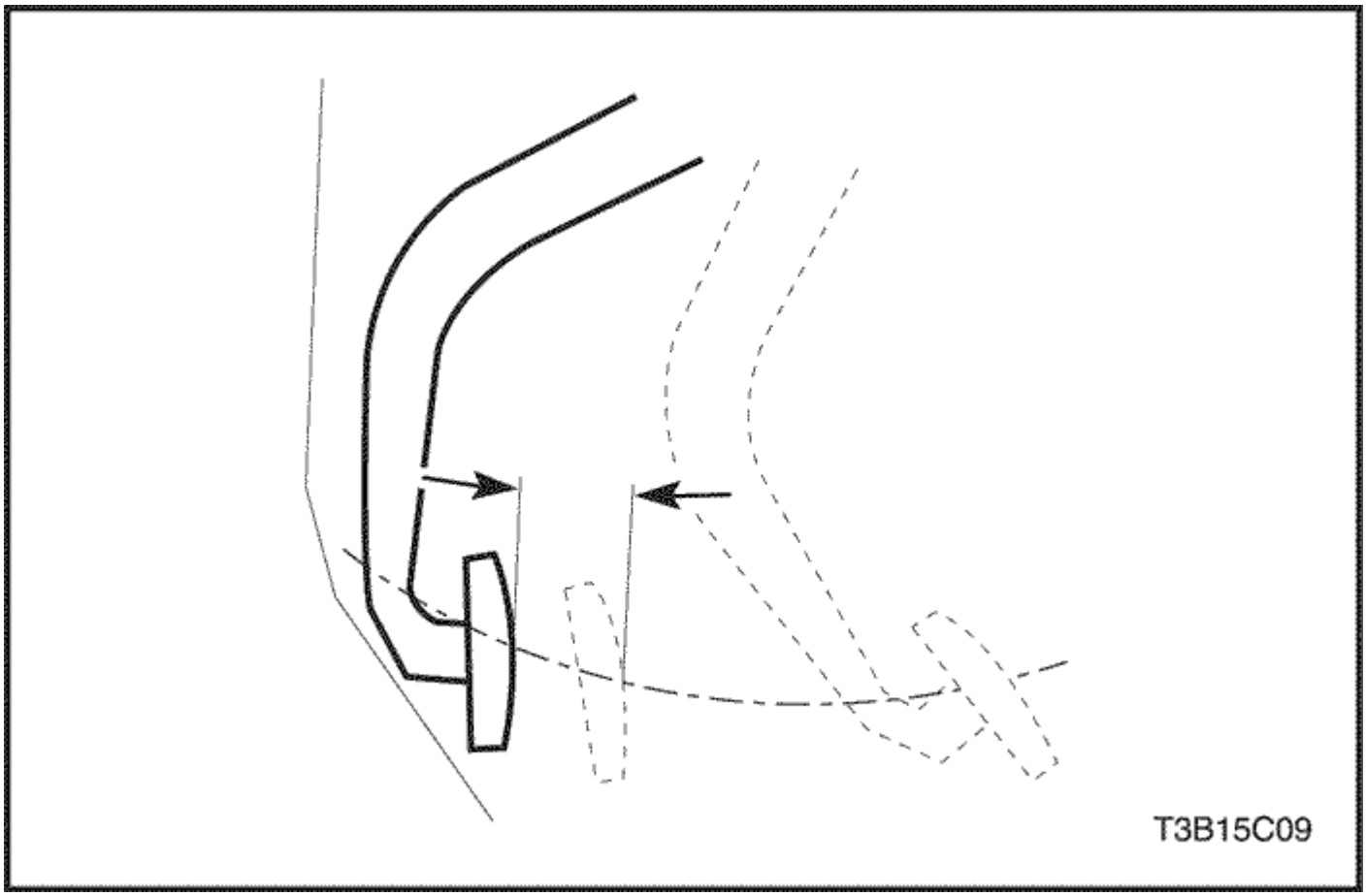
1. Determine the clutch pedal play. Depress the clutch pedal lightly with your hand and measure the distance when you feel resistance.



2. Adjust the clutch pedal play. Loosen the locknut and turn the pushrod. Clutch pedal play should measure 10 to 12 mm (0.4 to 0.5 inch). Tighten the locknut after adjustment.

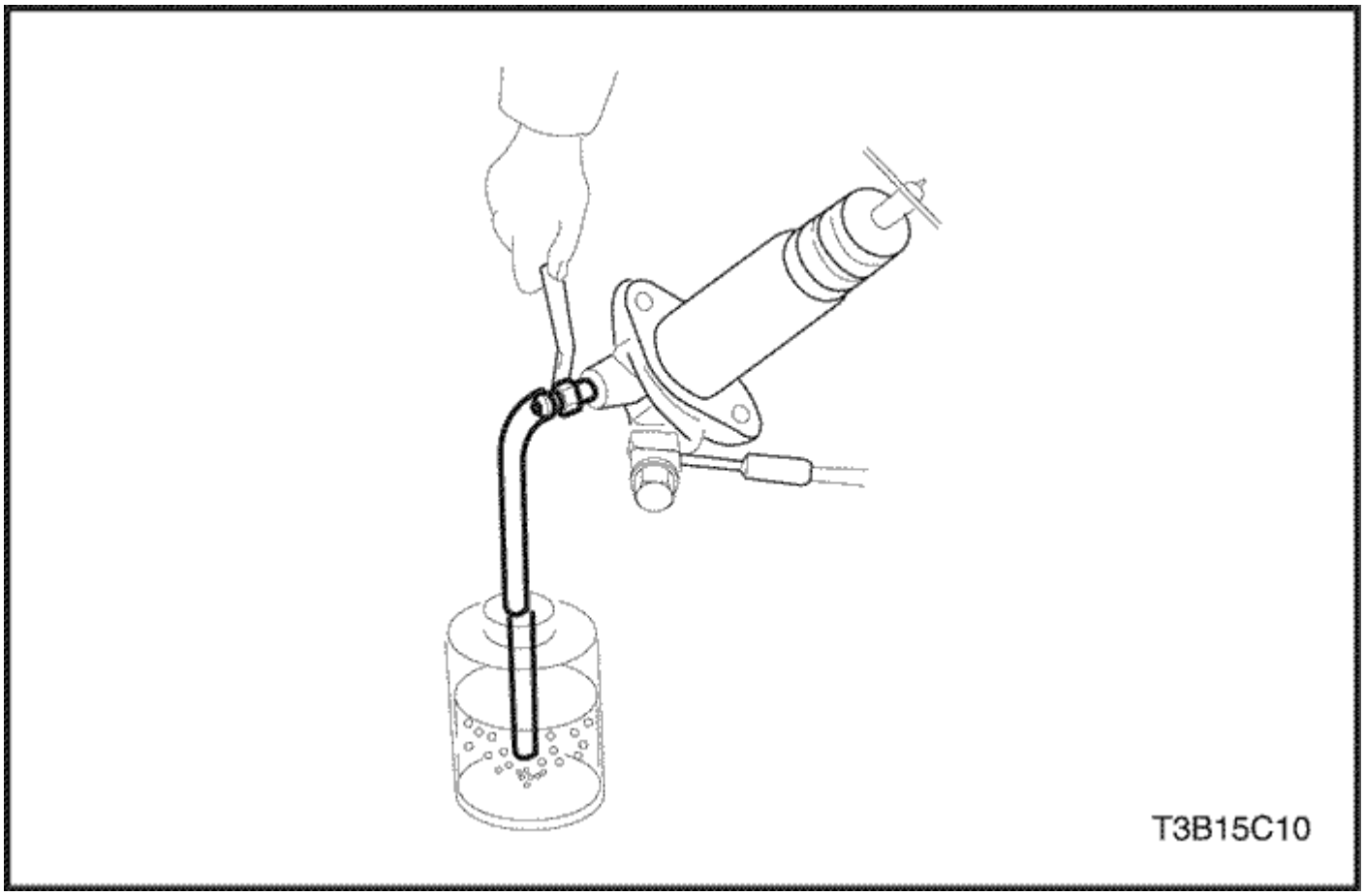


3. Measure the clutch pedal travel. Press the clutch pedal all the way to the floor. Measure from the starting position to the ending position.
4. Adjust the clutch pedal travel. Loosen the locknut and turn the bolt. Clutch pedal travel should measure 120 to 125 mm (4.7 to 4.9 inches). Tighten the locknut after adjustment.



Clutch Release Point Adjustment (Hydraulic)
Adjustment Procedure

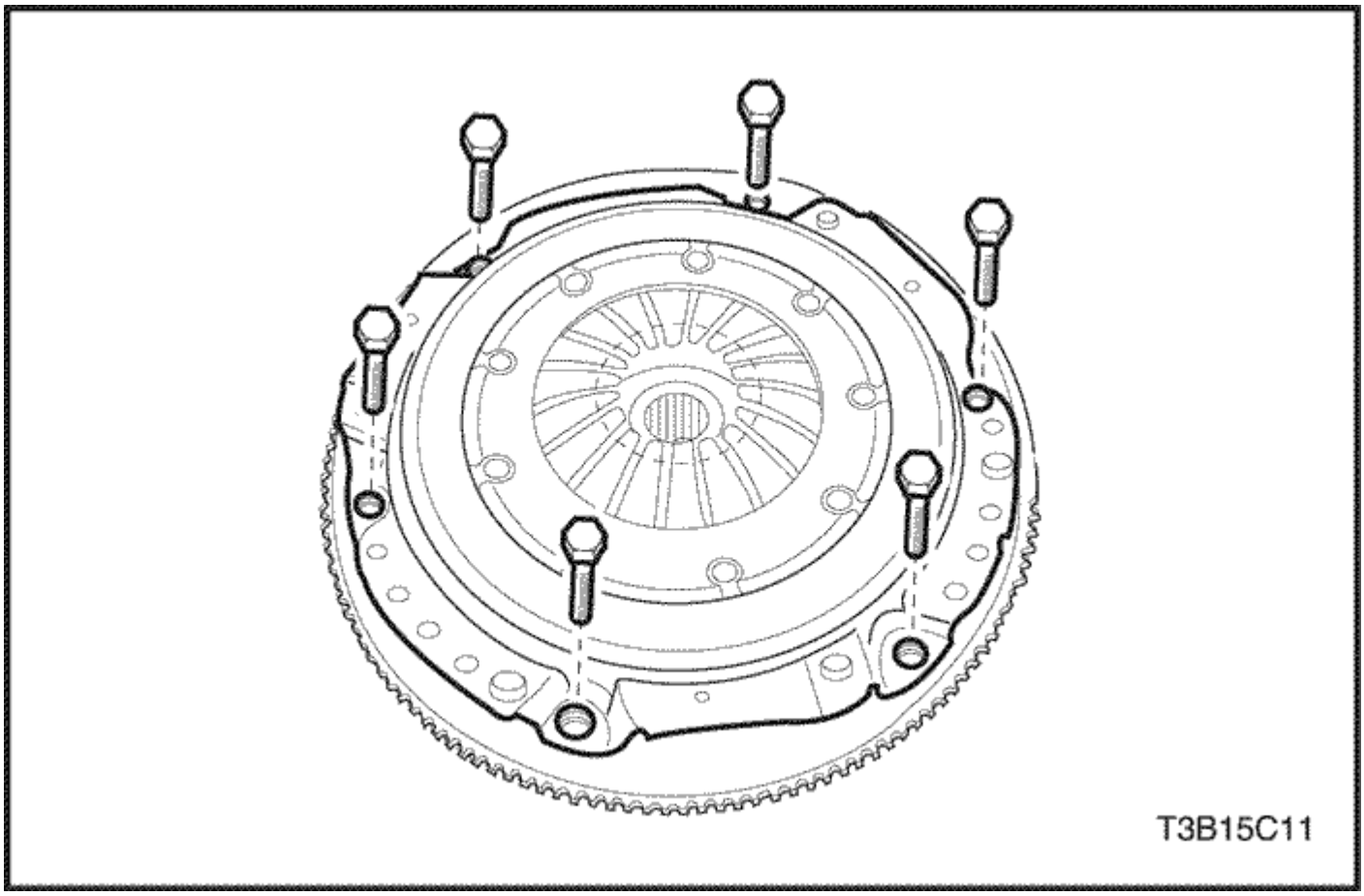
1. Apply the parking brake.
2. Run the engine at idle speed.
3. While you move the shift lever into the reverse position, depress the clutch pedal slowly and measure the distance between the point when gear noise is not heard and the point the clutch pedal is completely depressed. The distance should be 30 to 35 mm (1.2 to 1.4 inches).
4. If the distance is not within the specified value, check the following:
    - Clutch pedal height
    - Clutch pedal play
    - Air in the system
    - Clutch cover and disc pressure plate



Air Bleeding

Bleed the hydraulic system to remove the air which entered When the pipes were disconnected for repairs. The clutch/brake fluid in the clutch/brake reservoir must be maintained at the MIN level or higher during air bleeding.

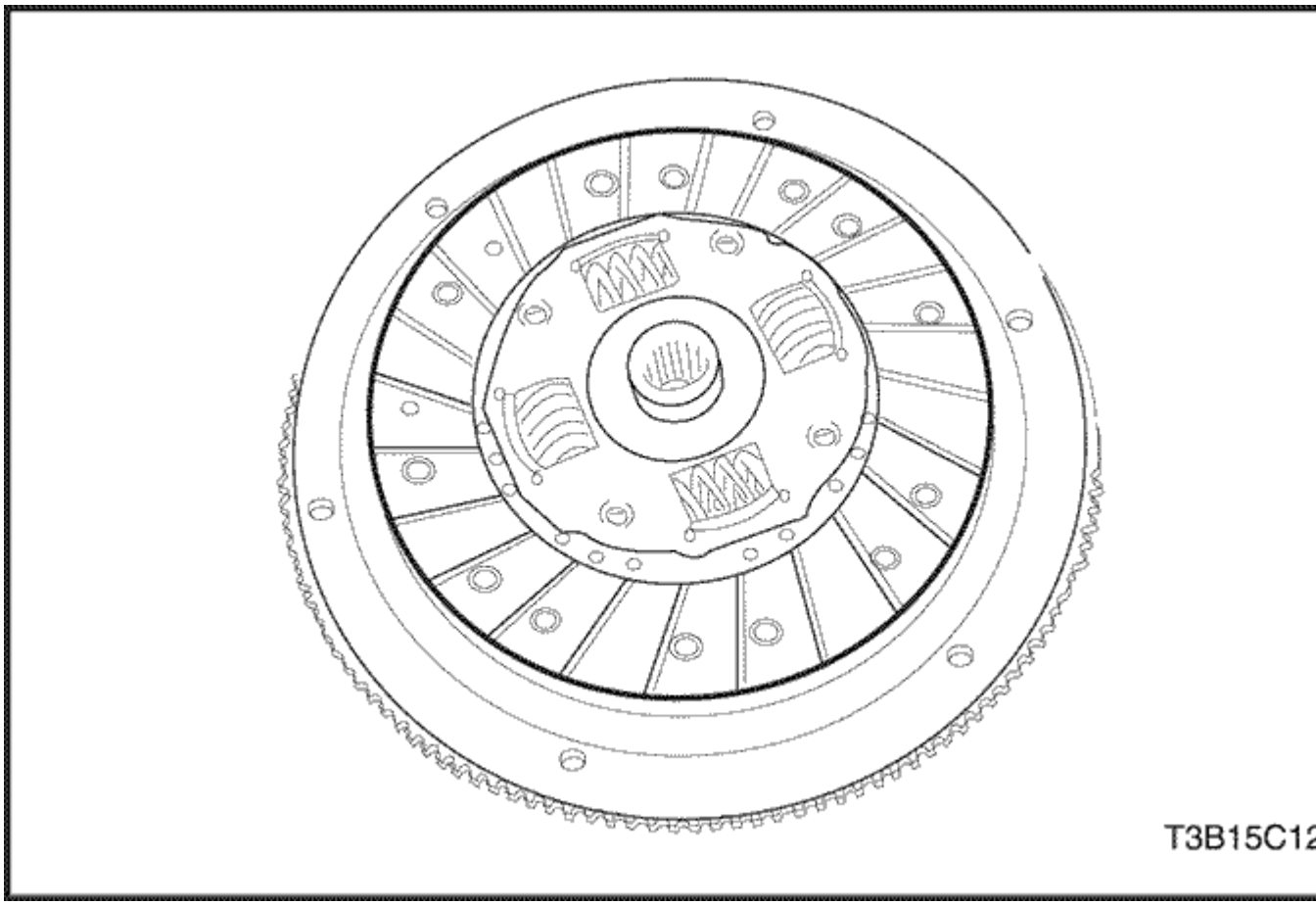
1. Attach a vinyl hose to the bleeder plug. Place the other end of the vinyl tube in a glass container half-filled with brake fluid.
2. Slowly pump the clutch pedal several times.
3. While you press the clutch pedal, loosen the bleeder screw until the fluid starts to run out. Close the bleeder screw.
4. Repeat Step 3 until there are no air bubbles in the fluid.
5. Fill the reservoir with brake fluid up to the MAX level.



Pressure Plate and Clutch Disc
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the transaxle from the vehicle. Refer to *Section 5B1, Five-Speed Manual Transaxle (D16).*
3. Remove the pressure plate bolts and the pressure plate.

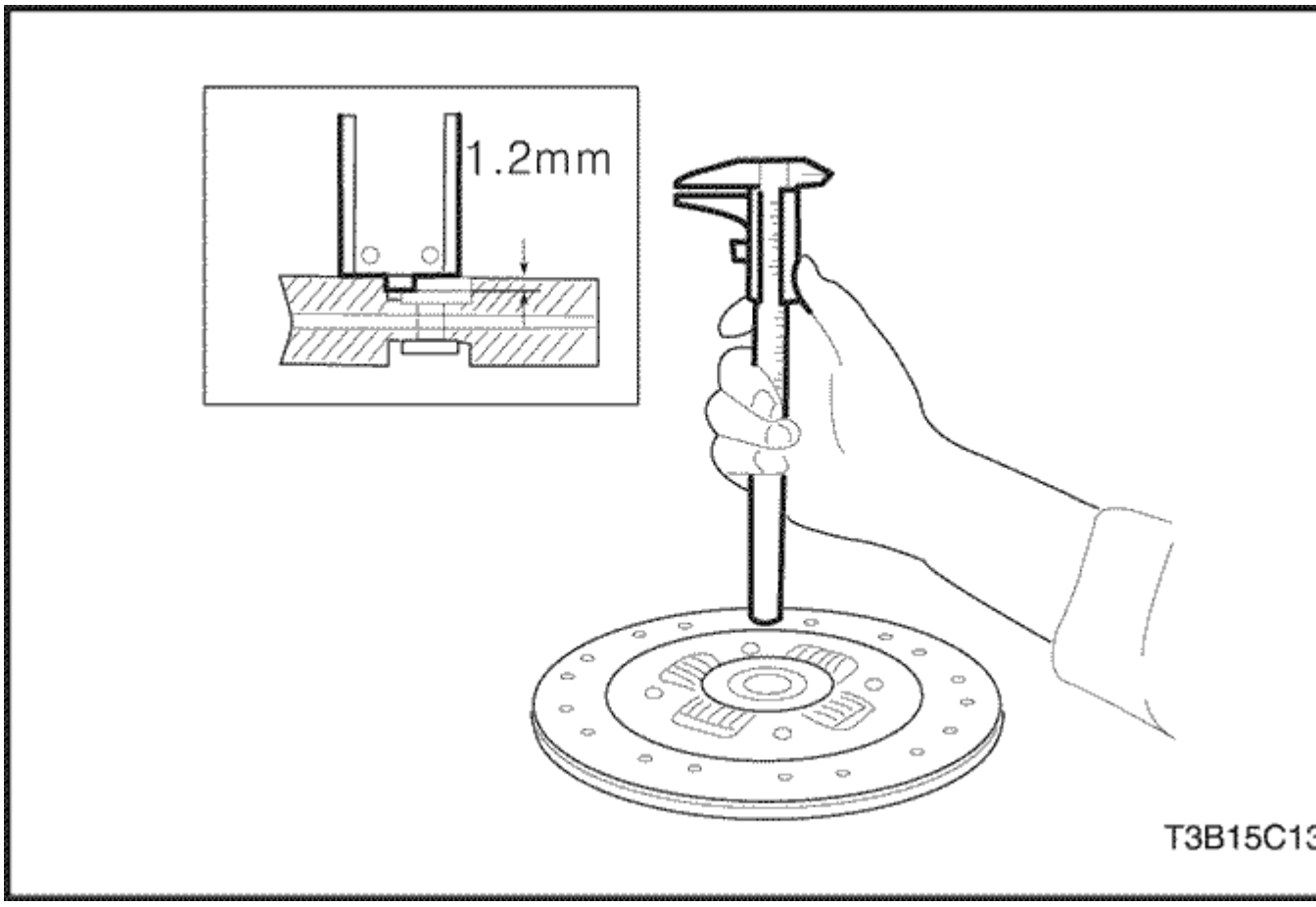
   Important : Support the pressure plate when you remove the last bolt.



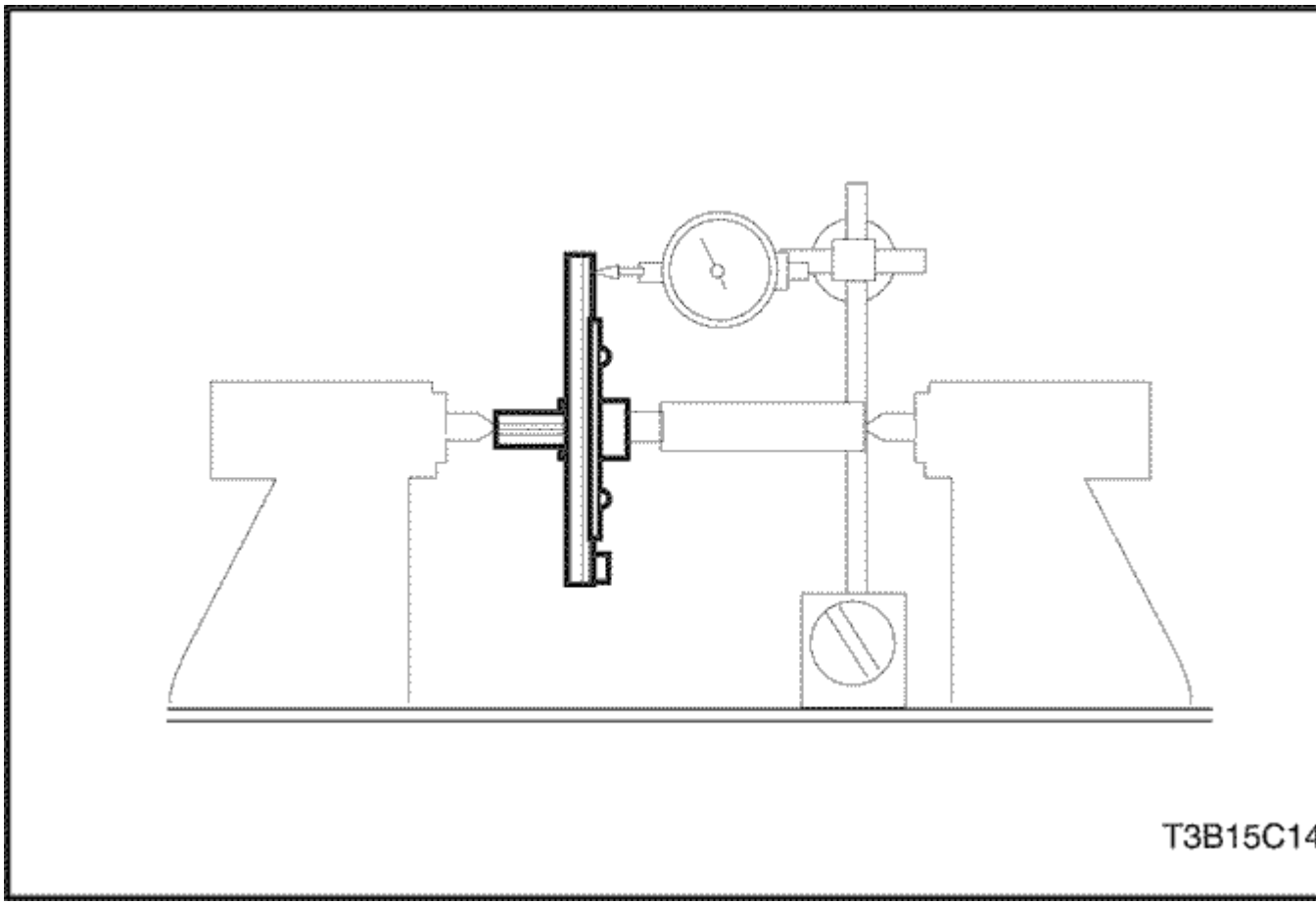
4. Remove the clutch disc from the flywheel.

Inspection Procedure – Clutch Disc

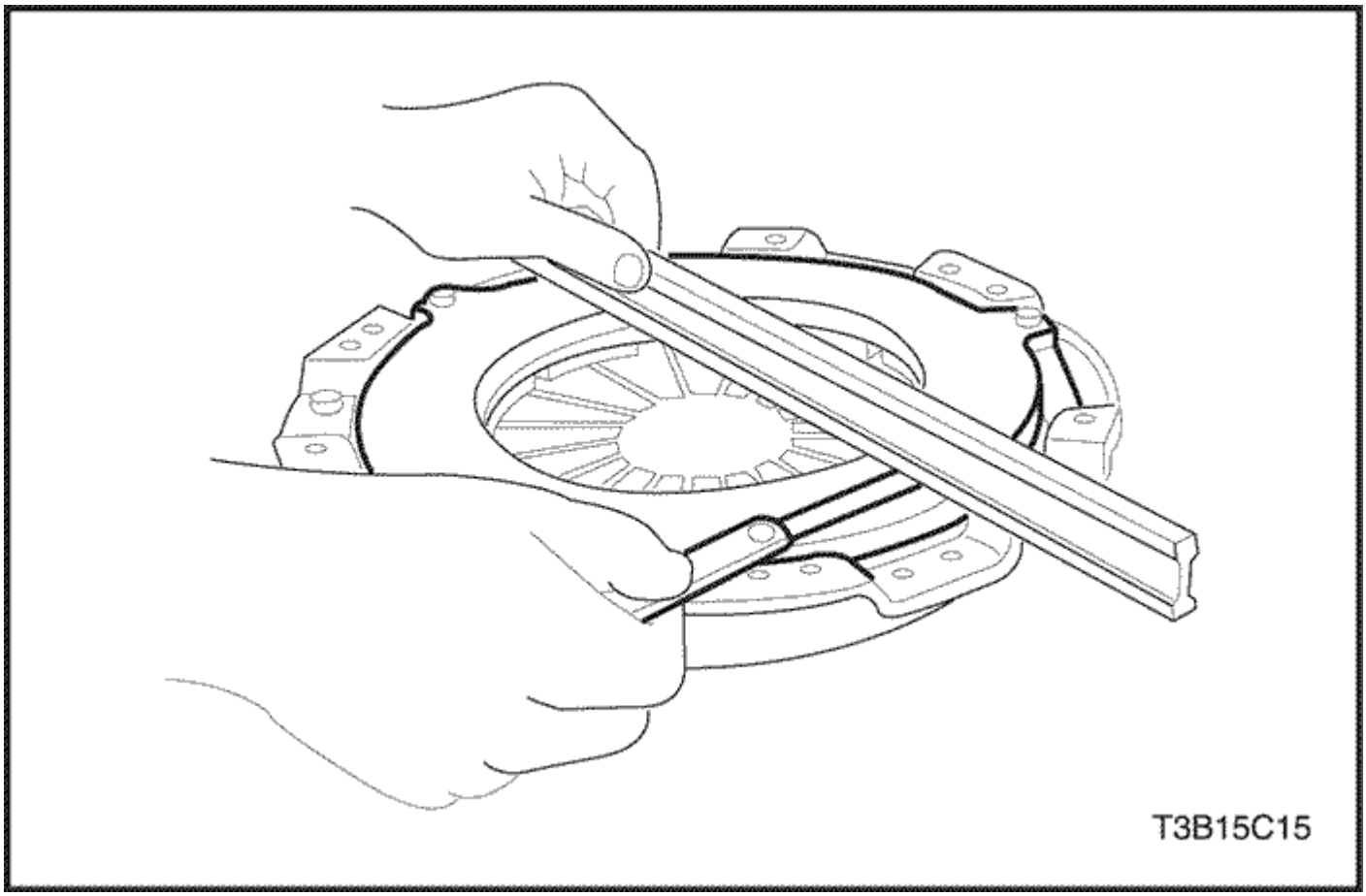
1. Visual Inspection
   - Inspect the worn or oily contamination on the clutch surface.
   - Inspect the damaged or weakened torsion spring.
   - Inspect the a warped or bent clutch disc. After inspection, replace new clutch disc, if necessary.



2. Clutch Disc Inspection
   - Measure the rivet head depth from the clutch disc surface.
   - Replace the clutch disc if the measured value is below the limit.
   - Rivet Head Depth (Limit) : 1.2 mm (0.047 in)

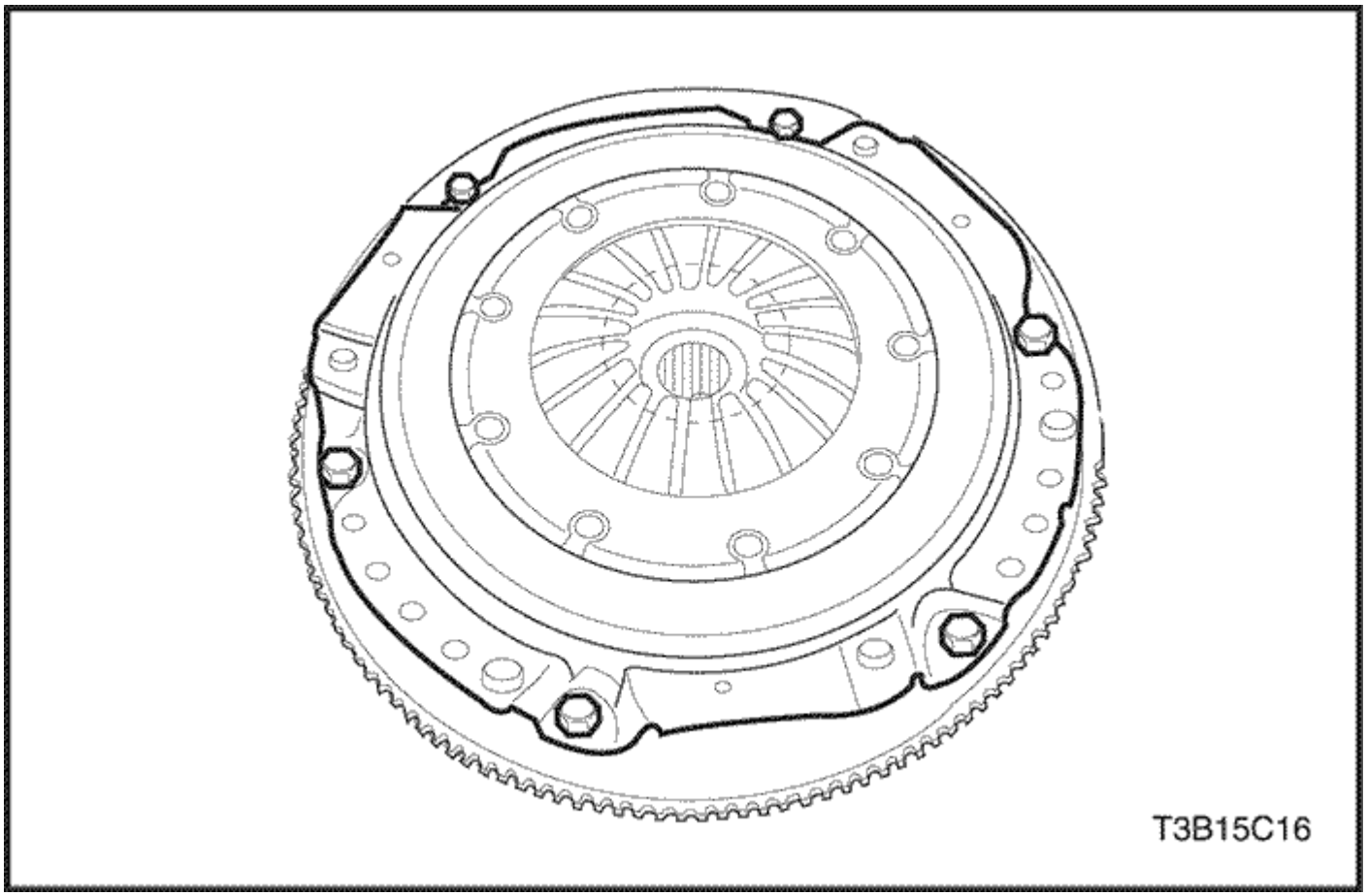


3. Clutch Disc Runout in Rotational Direction Inspection
    - Measure runout using the dial gauge.
    - If runout exceeds limit, replace the clutch disc.



Inspection Procedure – Pressure Plate

1. Check for a worn diaphragm spring finger.
2. Check for a worn or cracked pressure plate surface.
3. Check for the polluted face by the oil. After inspection, replace the pressure plate if necessary.

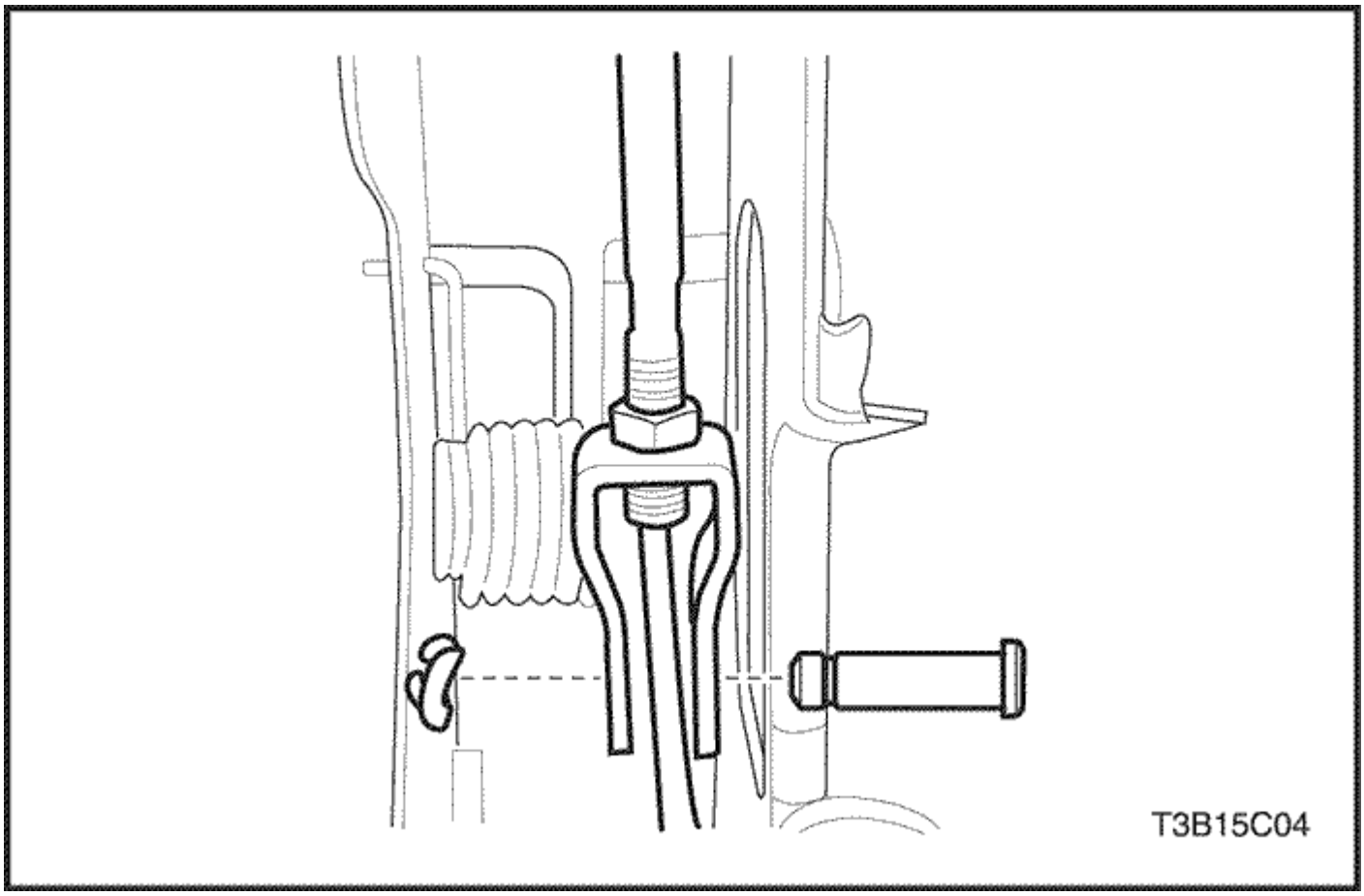


Installation Procedure

1. Coat the spline on the clutch disc with multi-purpose grease.
2. Align the pressure plate and the clutch disc onto the flywheel using the clutch arbor J-42474.
3. Install the pressure plate bolts.

   Tighten
   Tighten the bolts to 15 N•m (11 lb-ft).

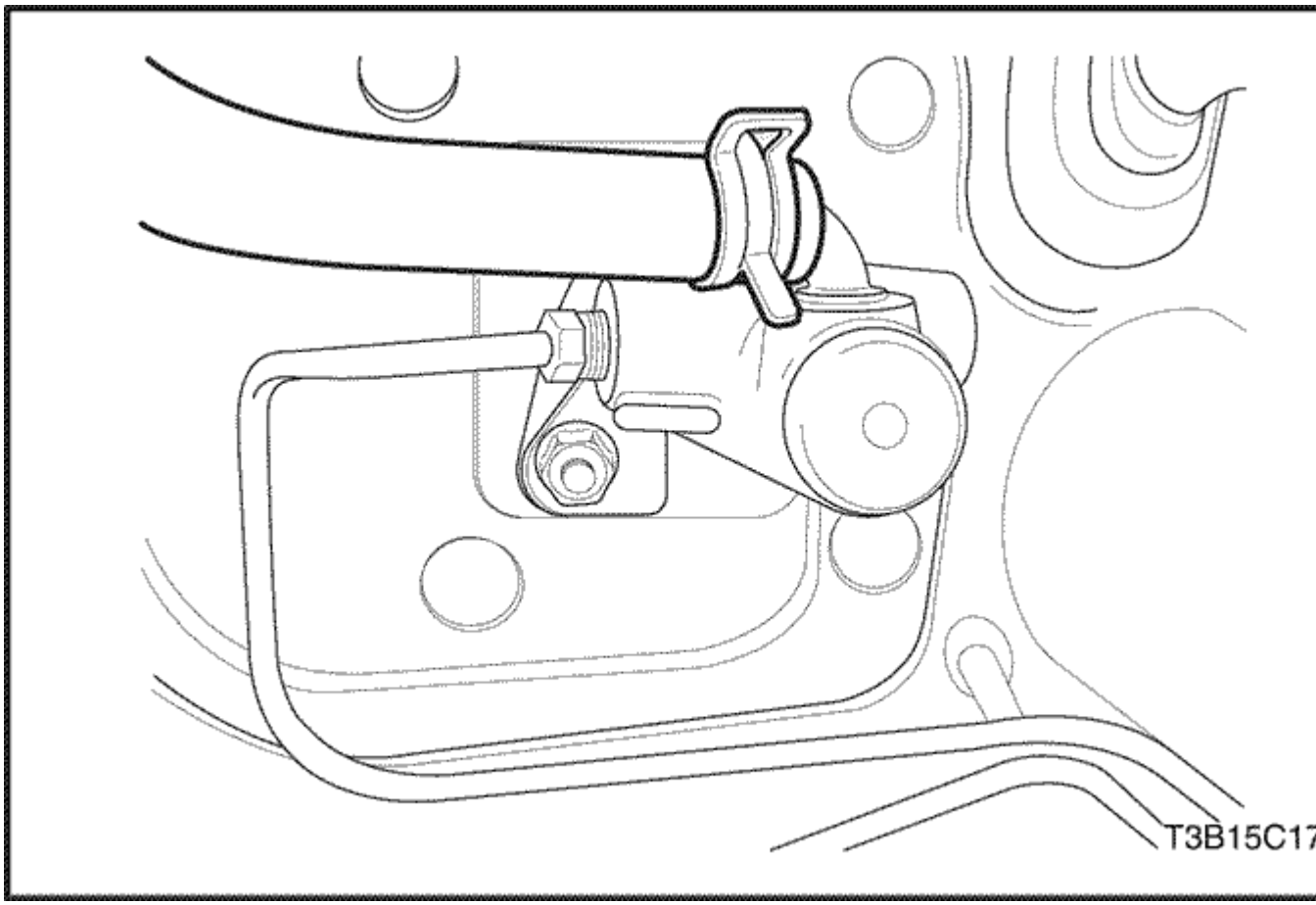
4. Remove the clutch arbor J-42474.
5. Install the transaxle into the vehicle. Refer to *Section 5B1, Five-Speed Manual Transaxle (D16).*
6. Connect the negative battery cable.



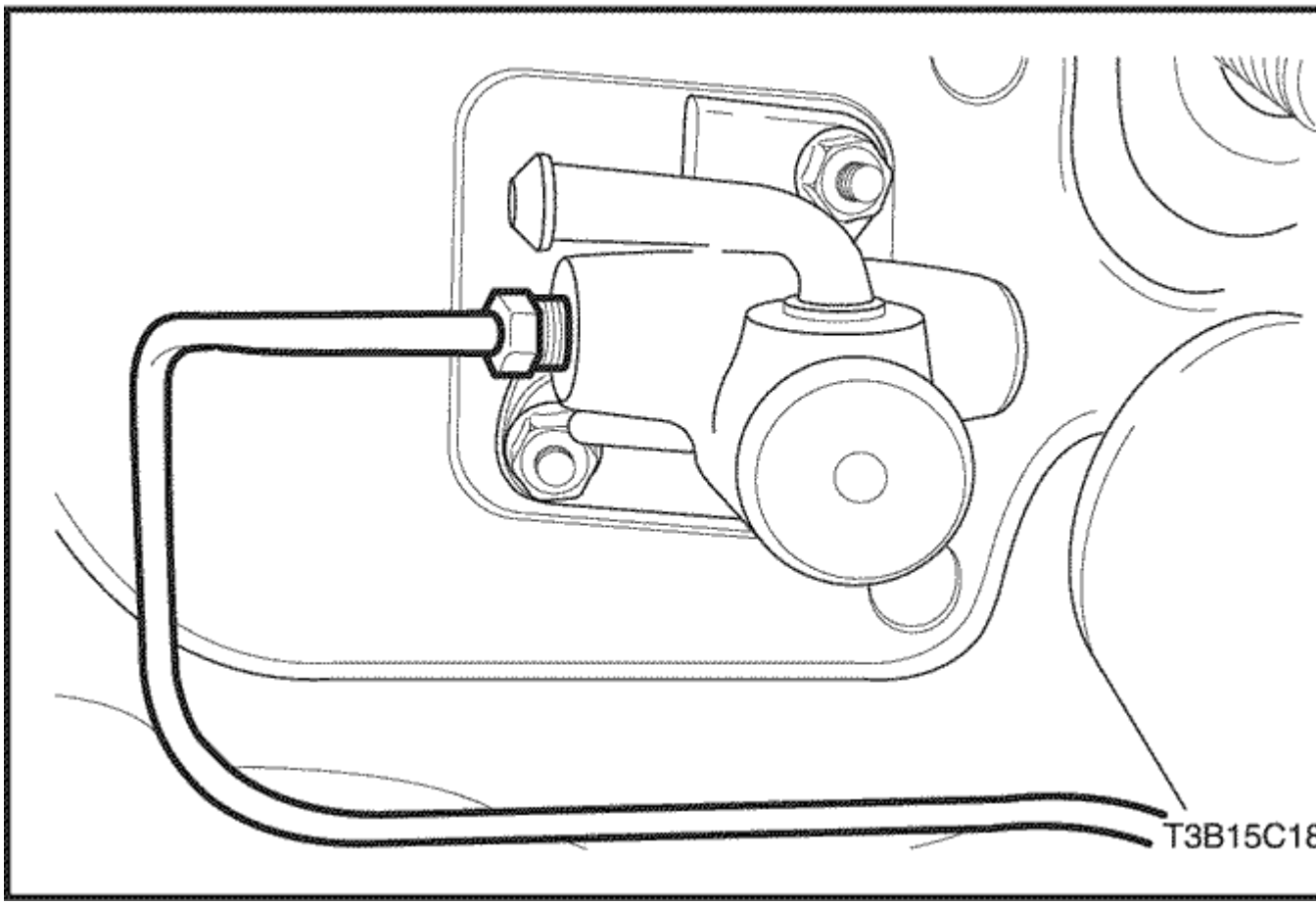
Clutch Master Cylinder Assembly
Removal Procedure

Before disconnecting the reservoir tank hose, remove the clutch/brake fluid from the reservoir tank.

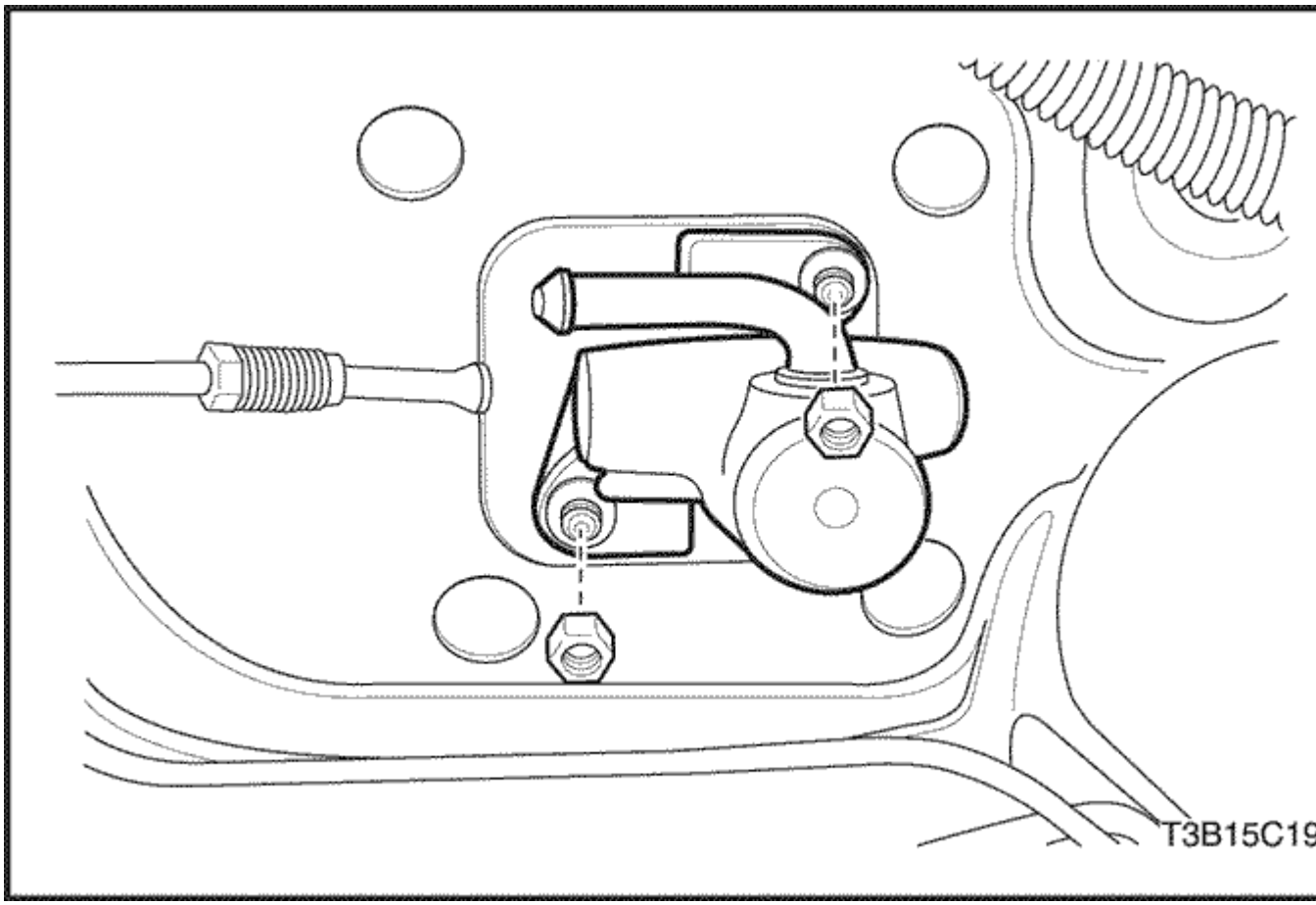
1. Remove the locking clip.
2. Remove the push rod fixing pin and push rod.



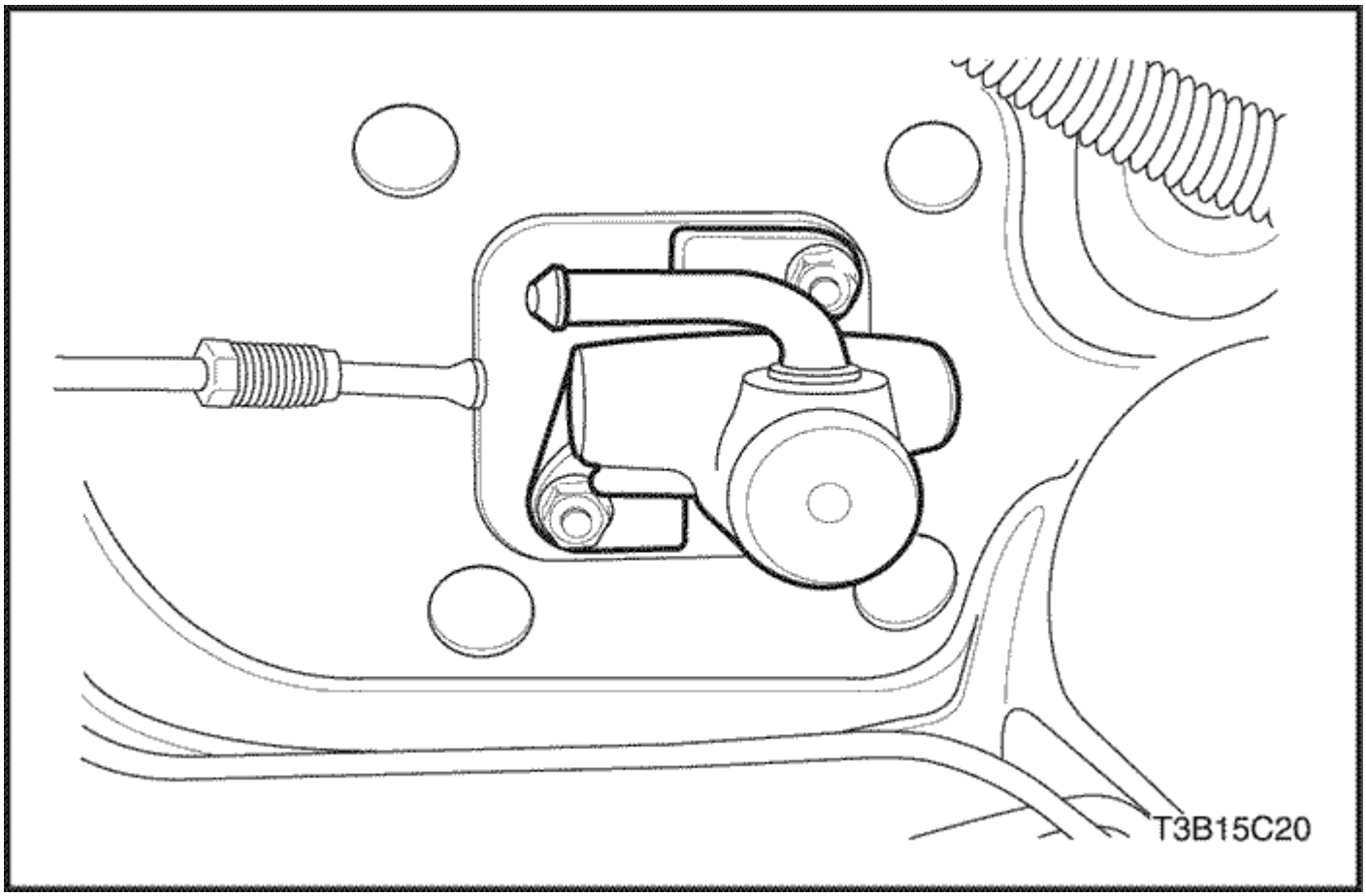
3. Disconnect the hose clamp on the master cylinder.
4. Disconnect the master cylinder hose.



5. Remove the master cylinder pipe.



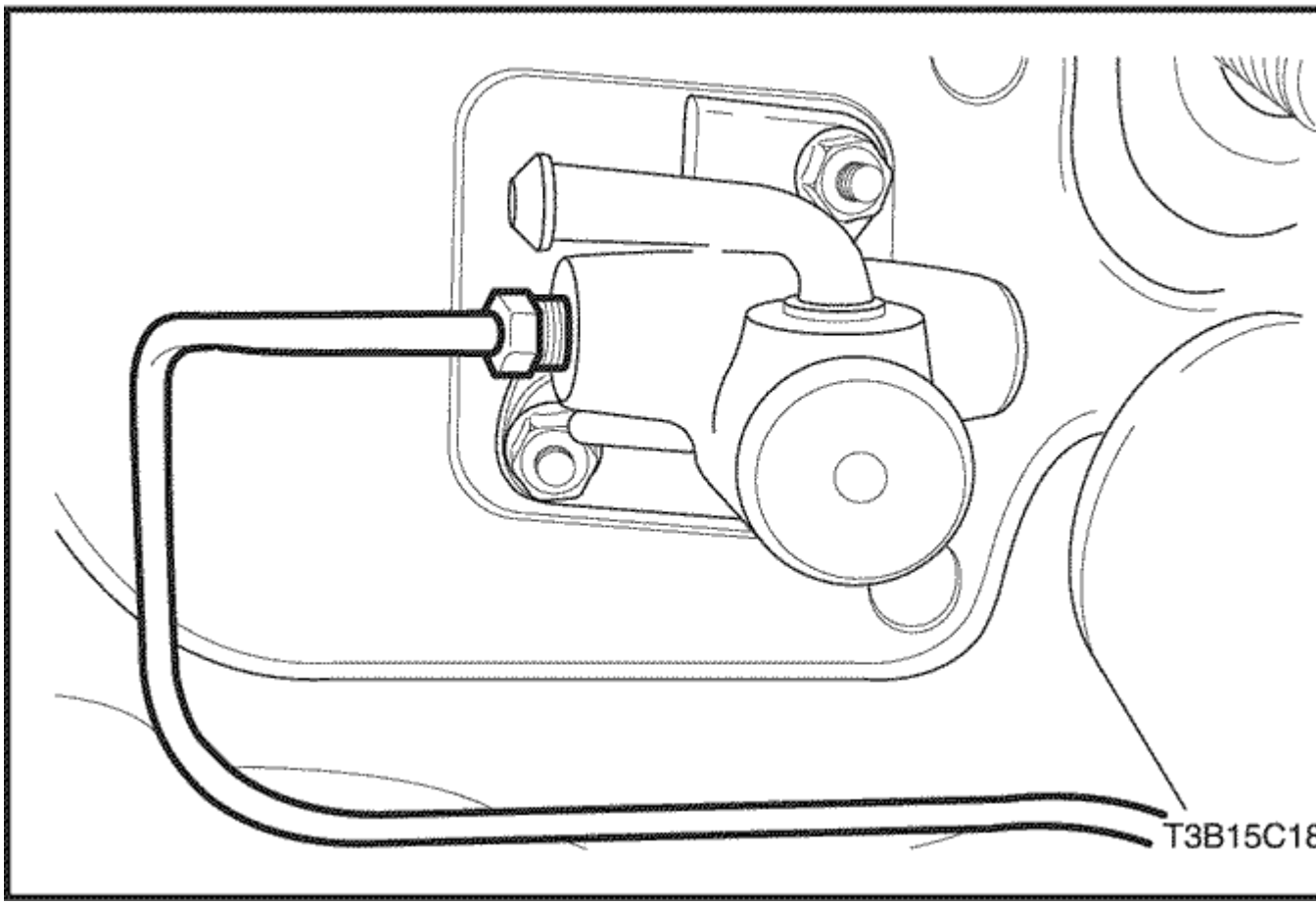
6. Remove the clutch master cylinder nuts.
7. Remove the clutch master cylinder.



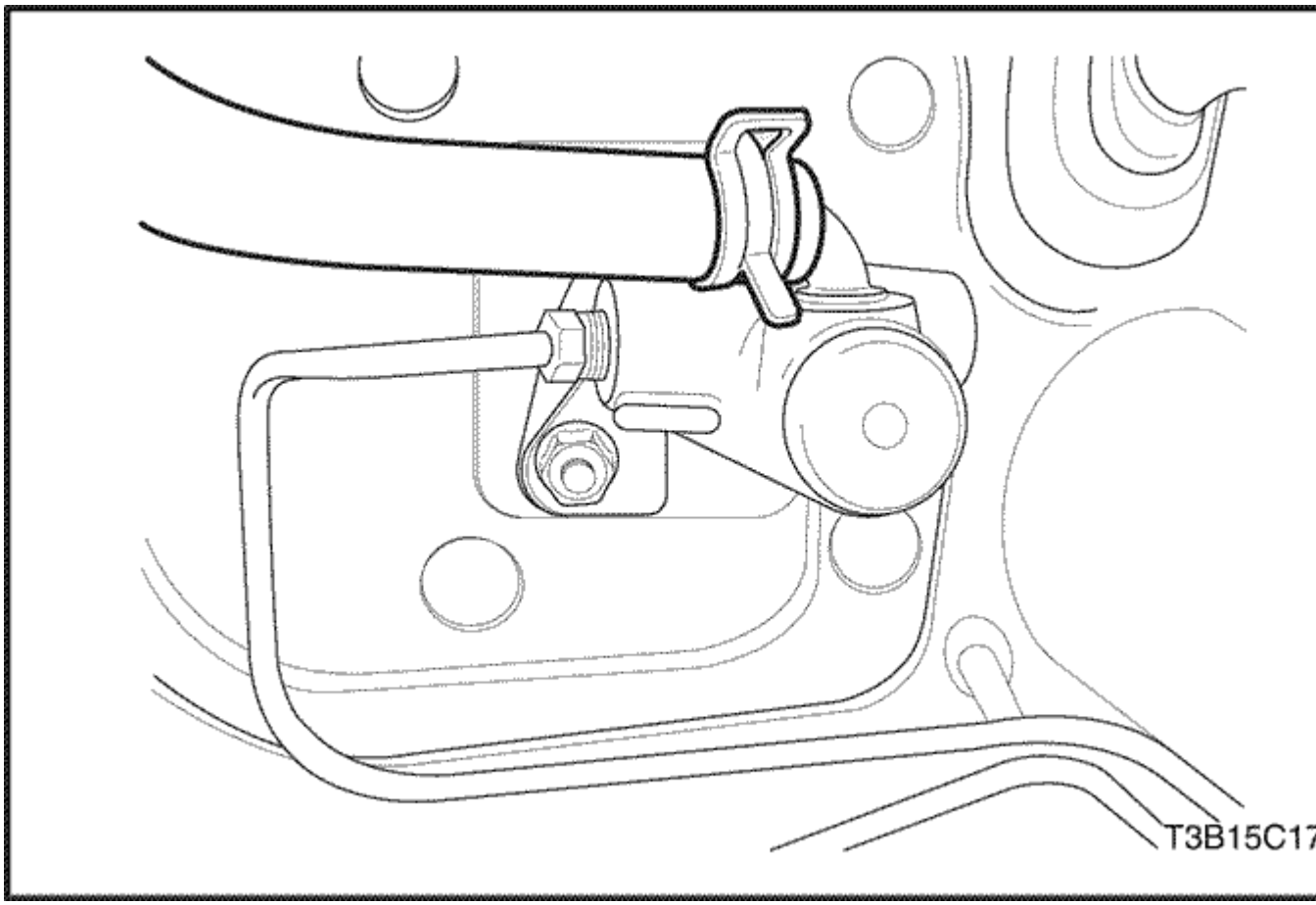
Installation Procedure

1. Install the clutch master cylinder and clutch master cylinder nuts.

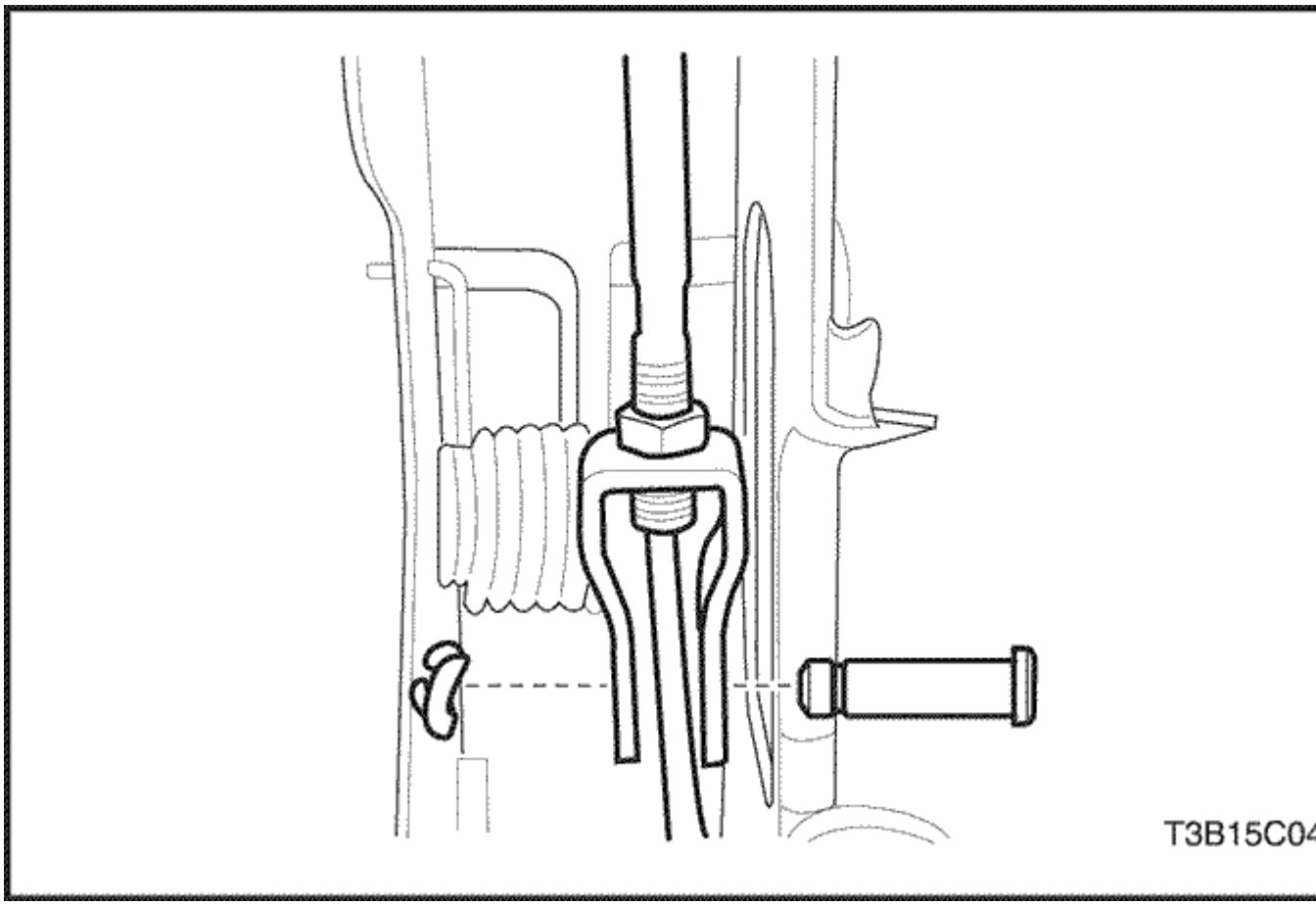
   Tighten
   Tighten the clutch master cylinder nuts to 22 N•m (16 lb-ft).



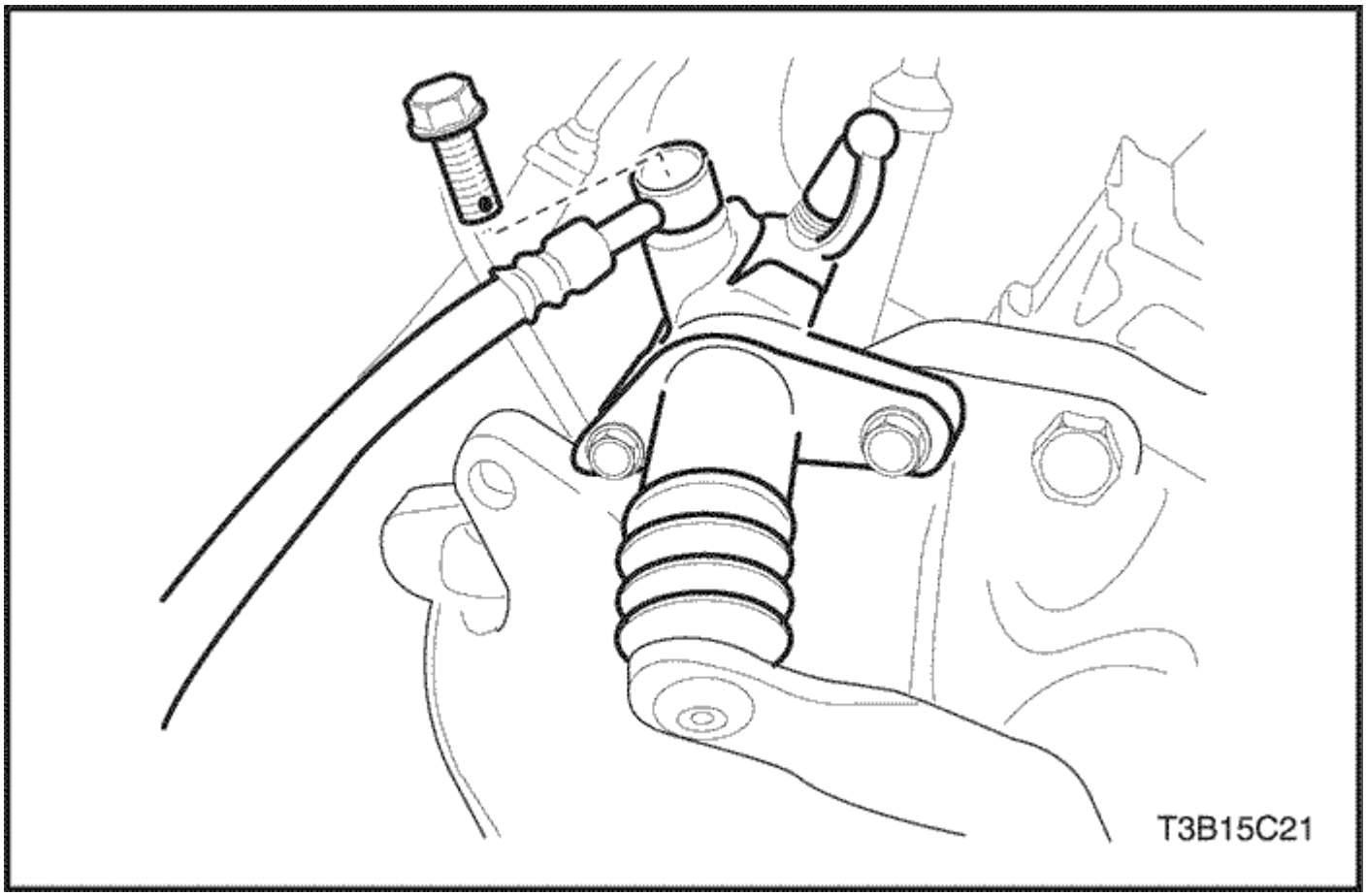
2. Install the master cylinder pipe.



3. Connect the master cylinder hose.
4. Connect the hose clamp on the master cylinder.

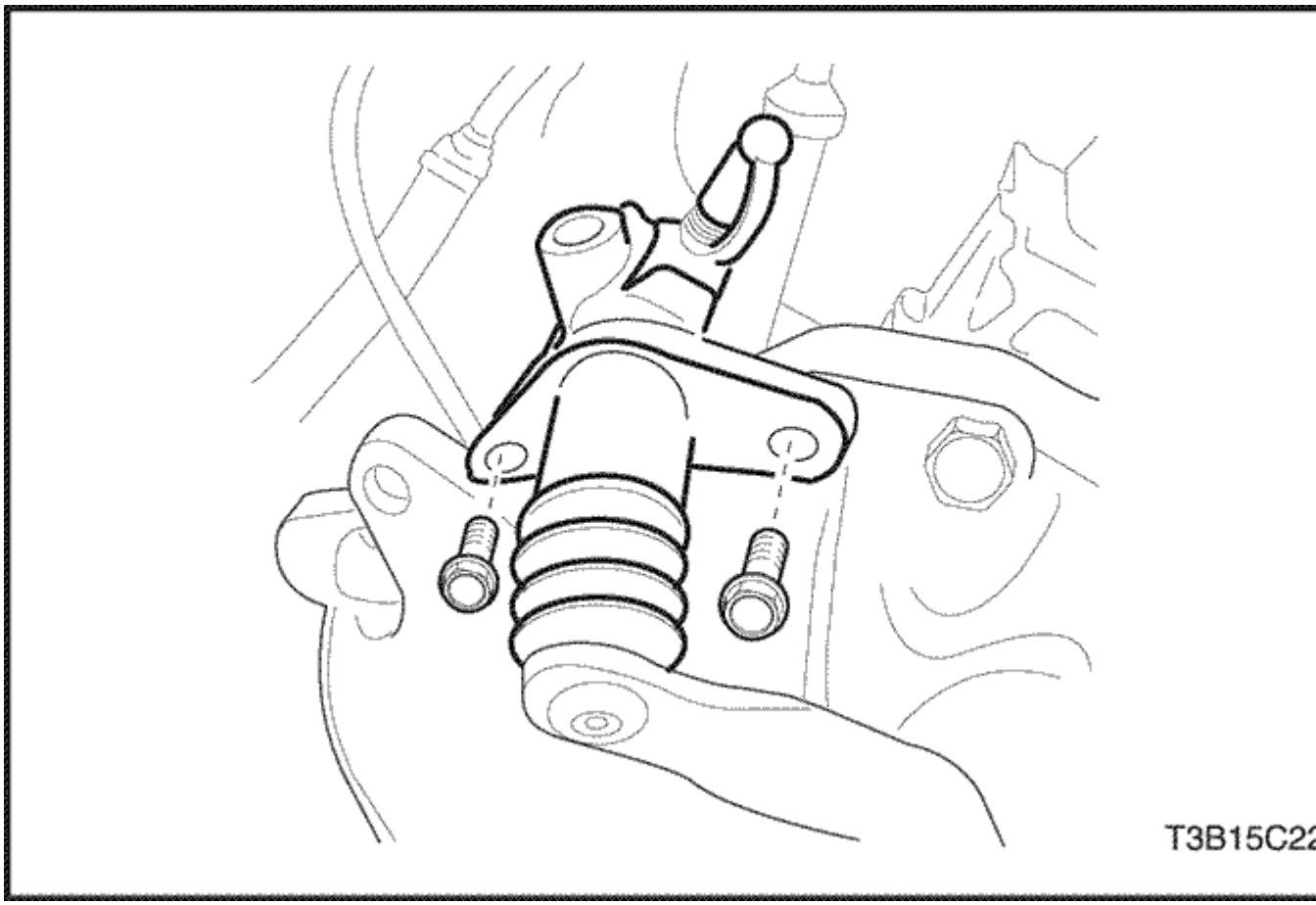


5. Install the push rod fixing pin and push rod.
6. Install the locking clip.
7. Bleed the air. Refer to "Air Bleeding" in this section.
8. Adjust the clutch pedal. Refer to "Clutch Pedal Adjustment" in this section.
9. Fill the reservoir with clutch/brake fluid up to the MAX level.

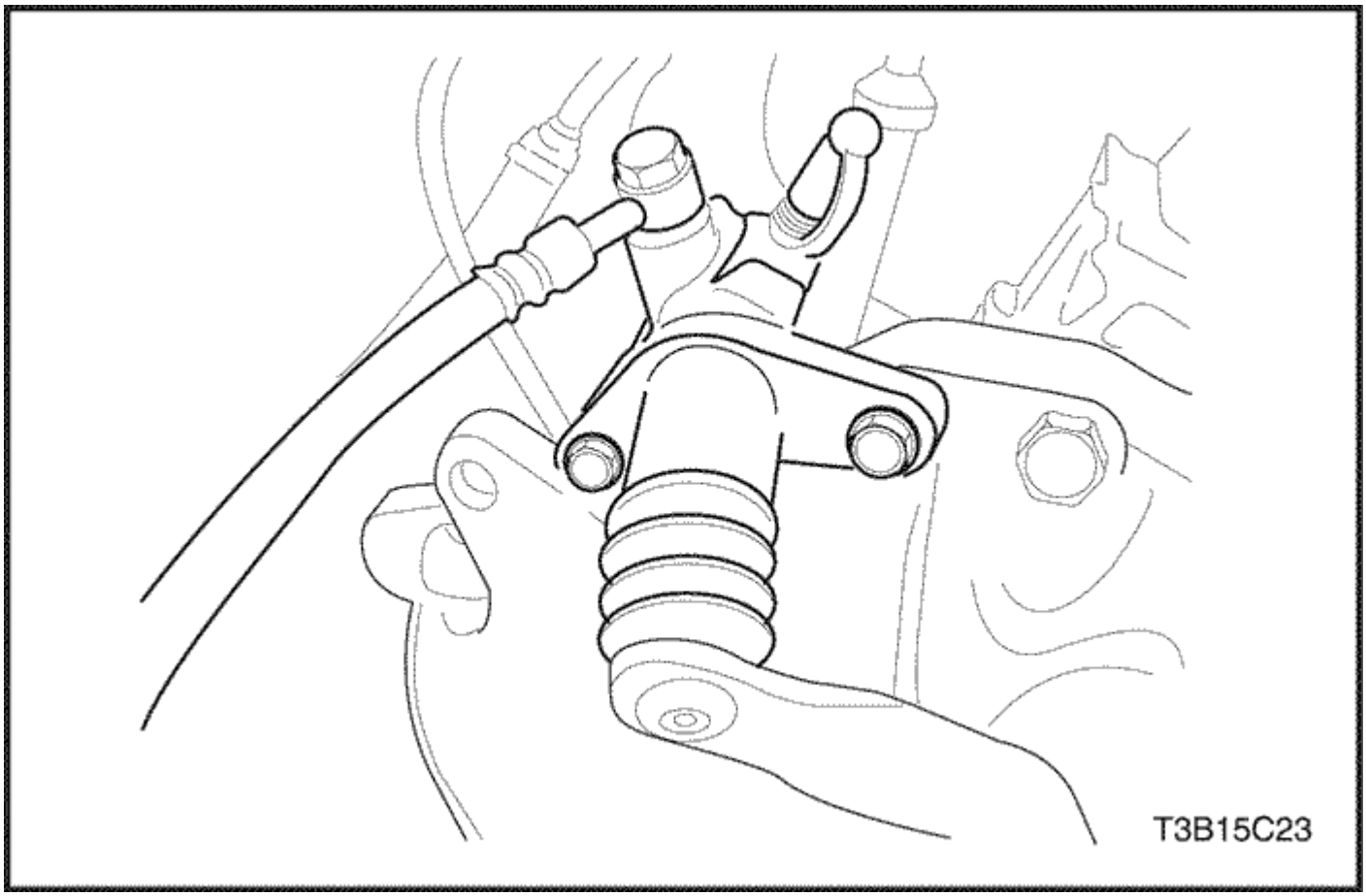


Clutch Release Cylinder Assembly
Removal Procedure

1. Remove the bolt and disconnect the hose from the clutch release cylinder.



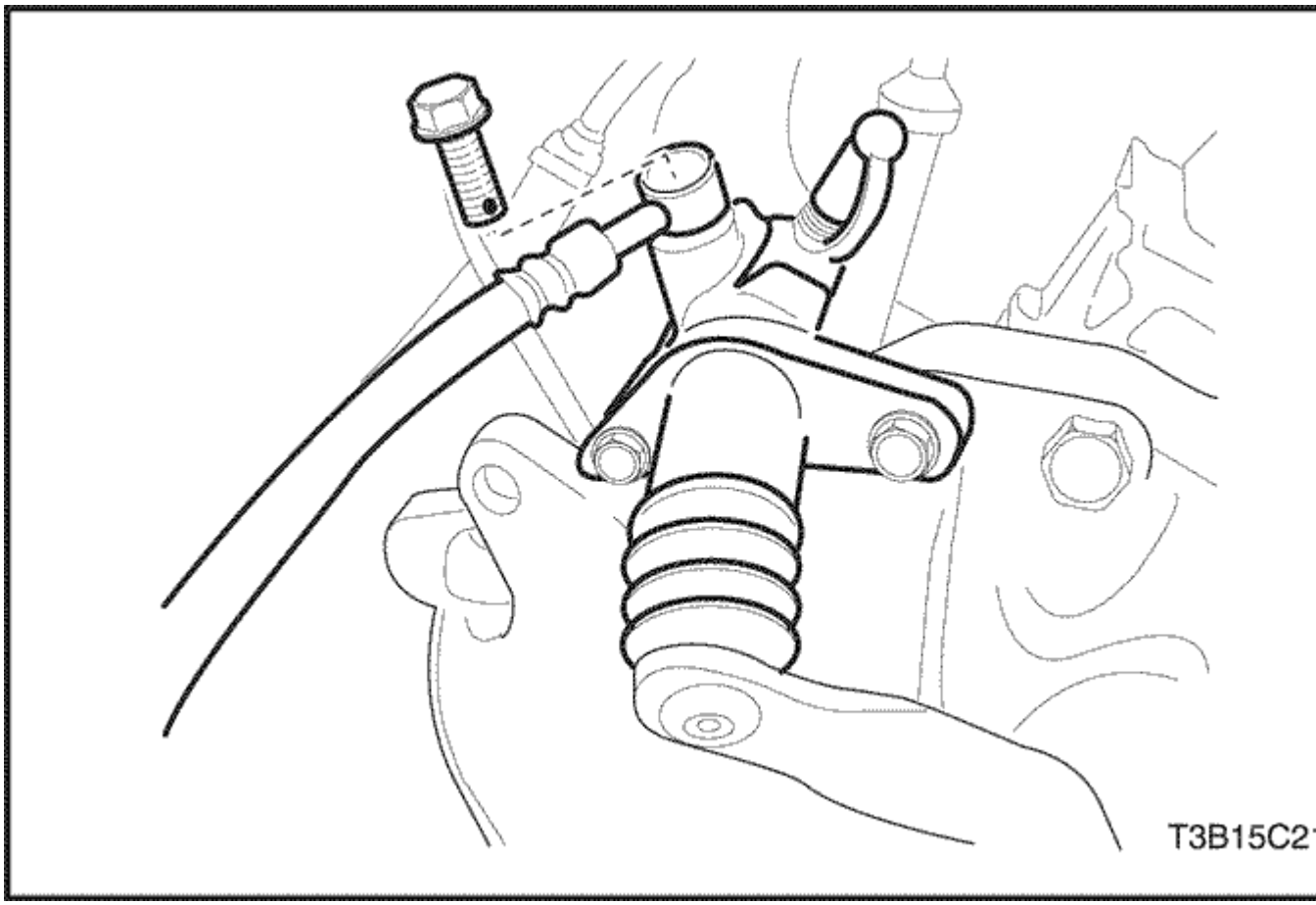
2. Remove the clutch release cylinder bolts and remove the release cylinder from the transaxle.



Installation Procedure

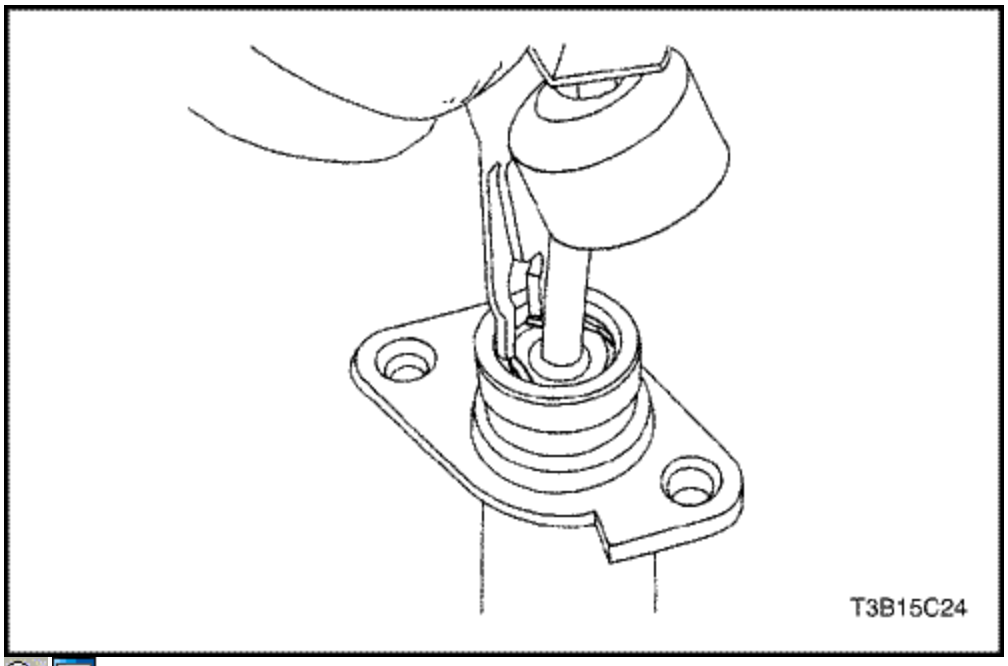
1. Connect the release cylinder to the transaxle and install the bolts.

   Tighten
   Tighten the release cylinder bolts to 20 N•m (15 lb-ft).



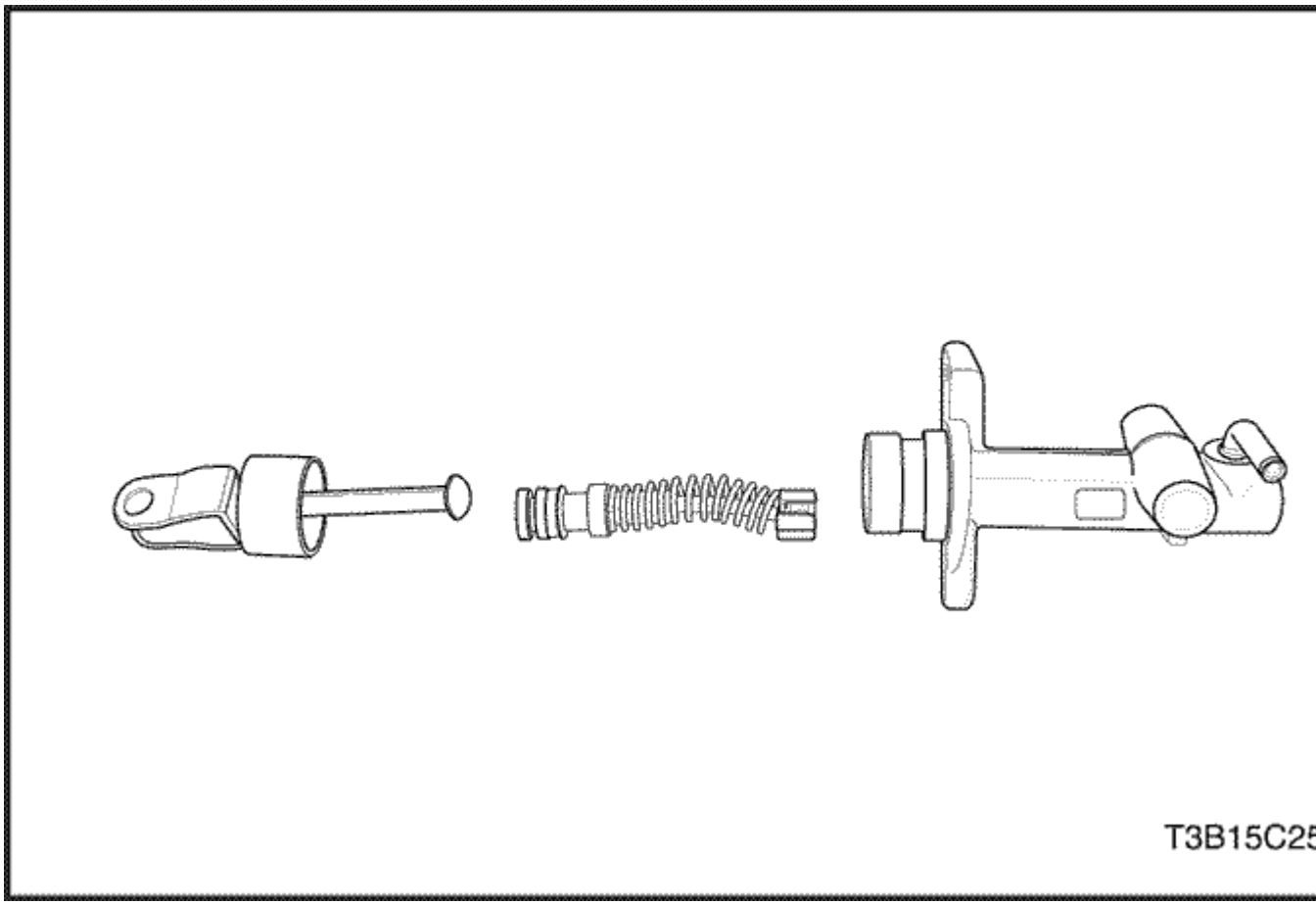
2. Connect the hose assembly to the cylinder body.
3. Apply grease where the pushrod connects to the release lever. Be careful not to stain the boot.
4. Bleed the air. Refer to "Air Bleeding" in this section.
5. Adjust the clutch pedal. Refer to "Clutch Pedal Adjustment (Hydraulic)" in this section.
6. Fill the reservoir with clutch/brake fluid up to the MAX level.

UNIT REPAIR

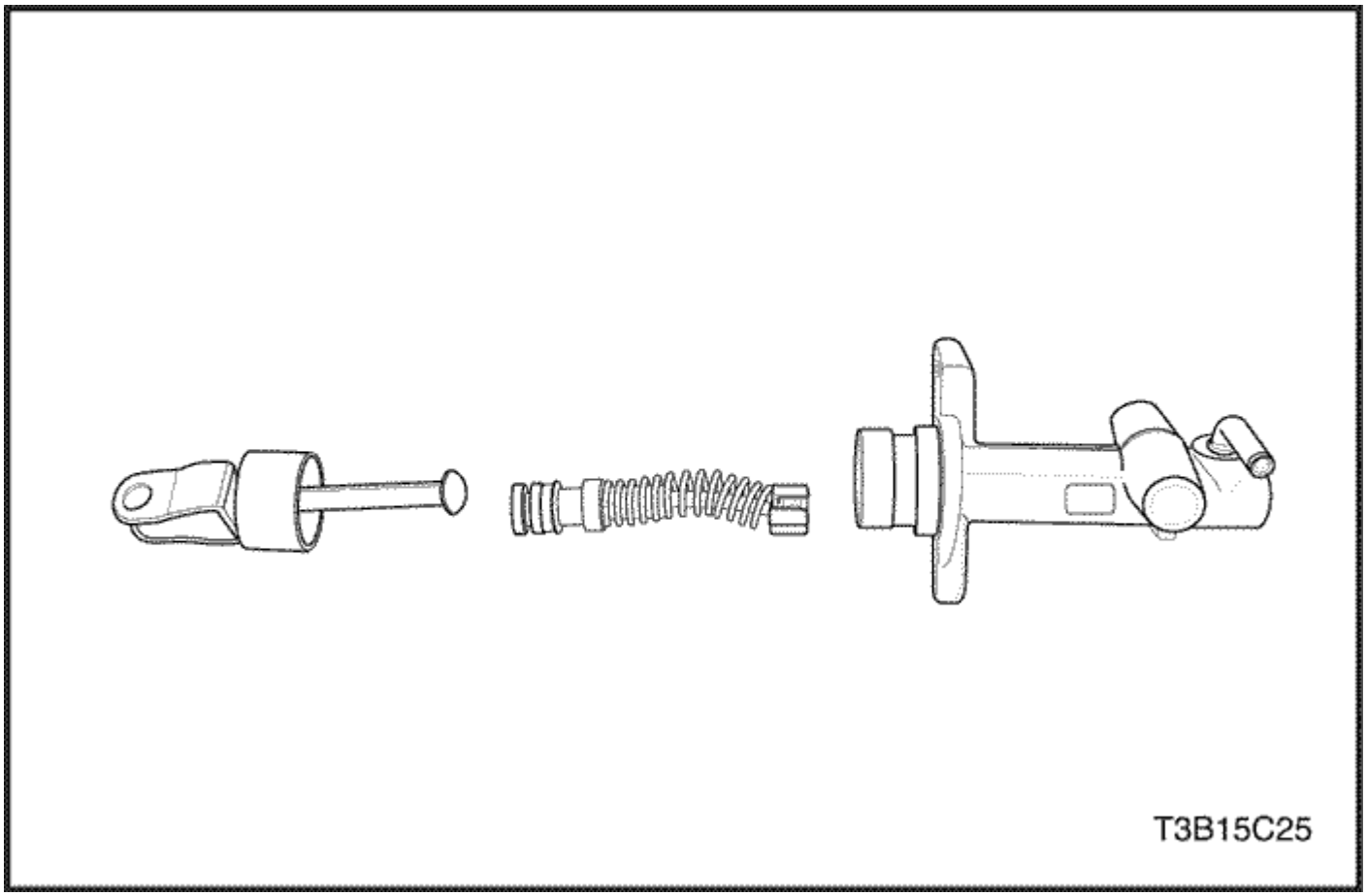


Clutch Master Cylinder
Disassembly Procedure

1. Remove the clutch master cylinder assembly from the vehicle. Refer to "Clutch Master Cylinder Assembly" in this section.
2. Remove the boot and disconnect the piston stop ring using ring pliers.

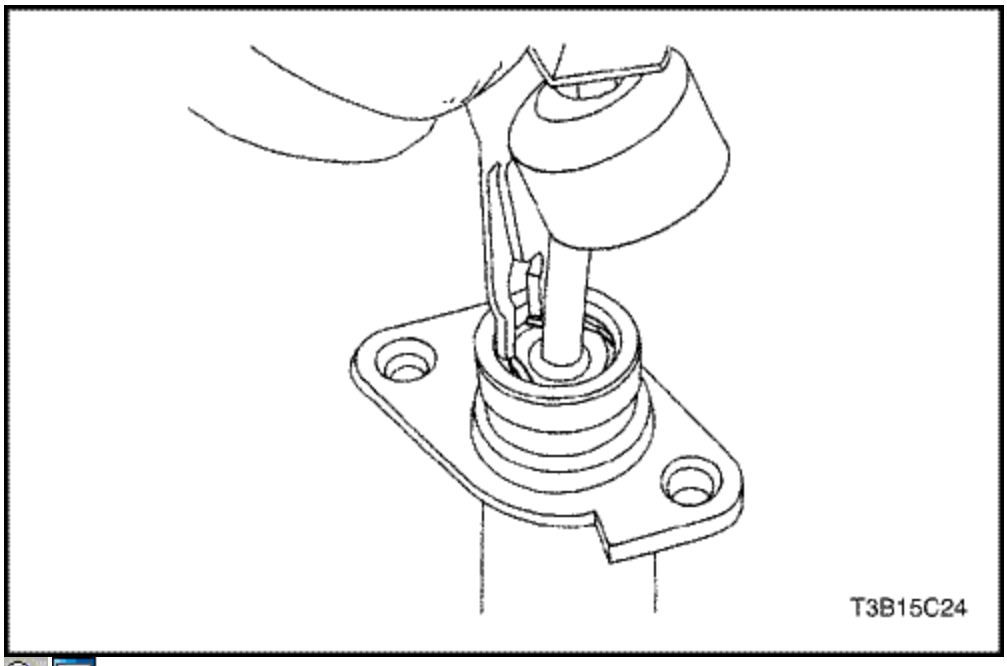


3. Remove the pushrod assembly and the piston assembly.
4. Inspect the clutch master cylinder wall and the piston for wear. Replace the piston if necessary.
5. Inspect the cup and the piston for wear. Fluid leaks will show wear on the cup and the piston. Replace the cup and the piston if necessary.
6. Inspect the pushrod for wear. Repair the pushrod if necessary.

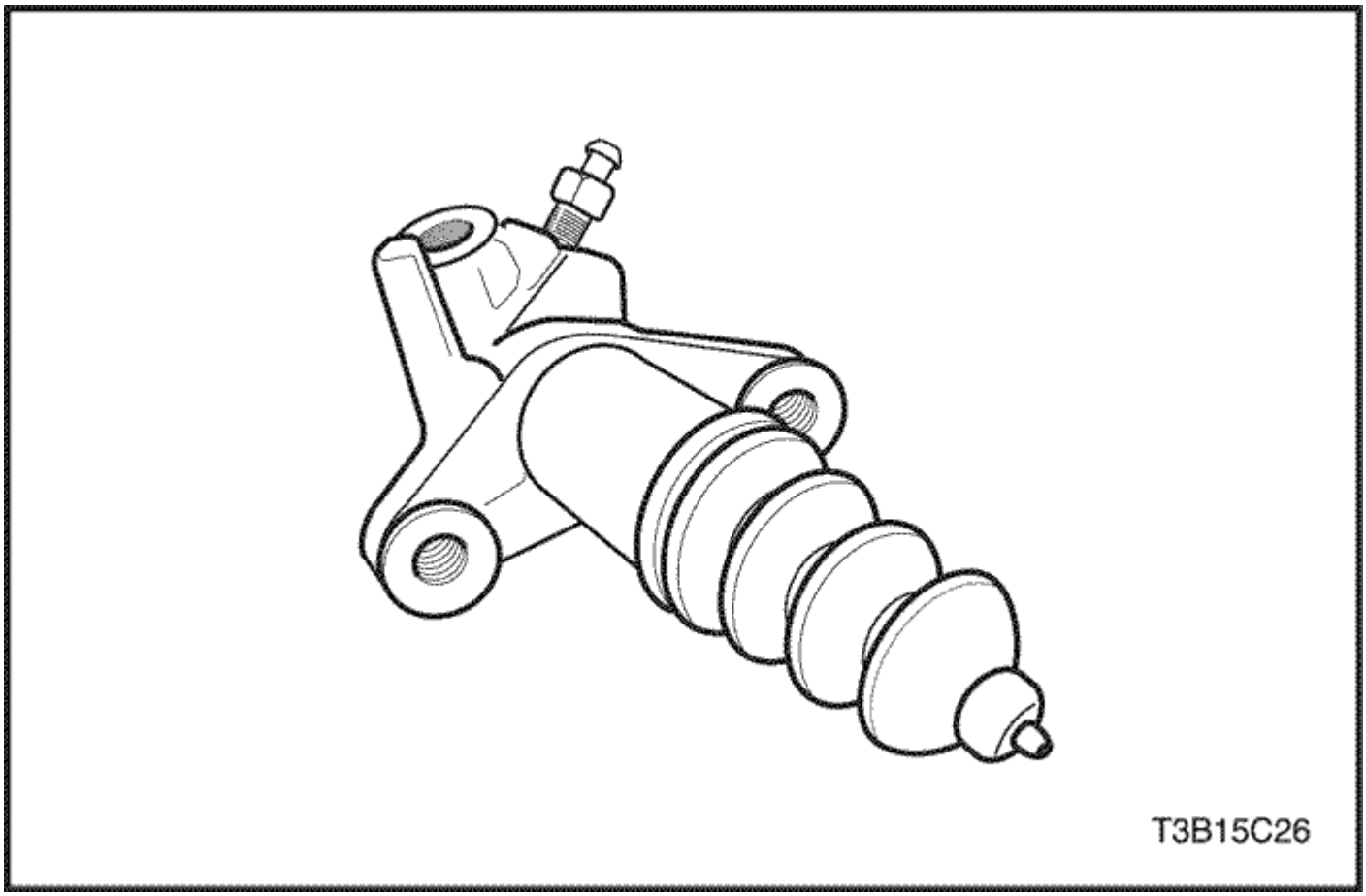


Assembly Procedure

1. Apply clean fluid to the piston assembly cup and insert the piston assembly and the pushrod assembly into the master cylinder body.

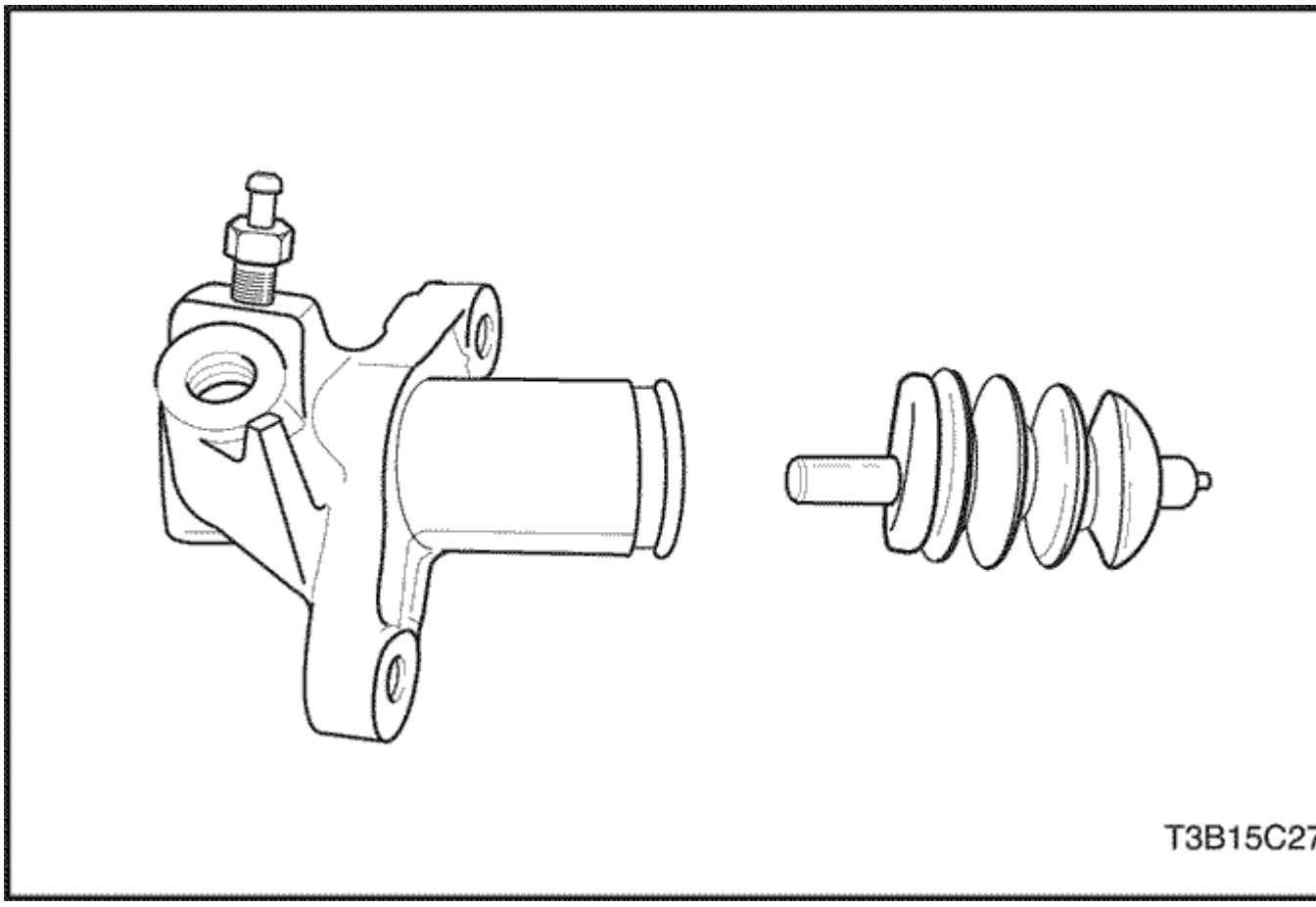


2. Install the piston stop ring using ring pliers. Install the boot.
3. Install the clutch master cylinder assembly into the vehicle. Refer to "Clutch Master Cylinder Assembly" in this section.

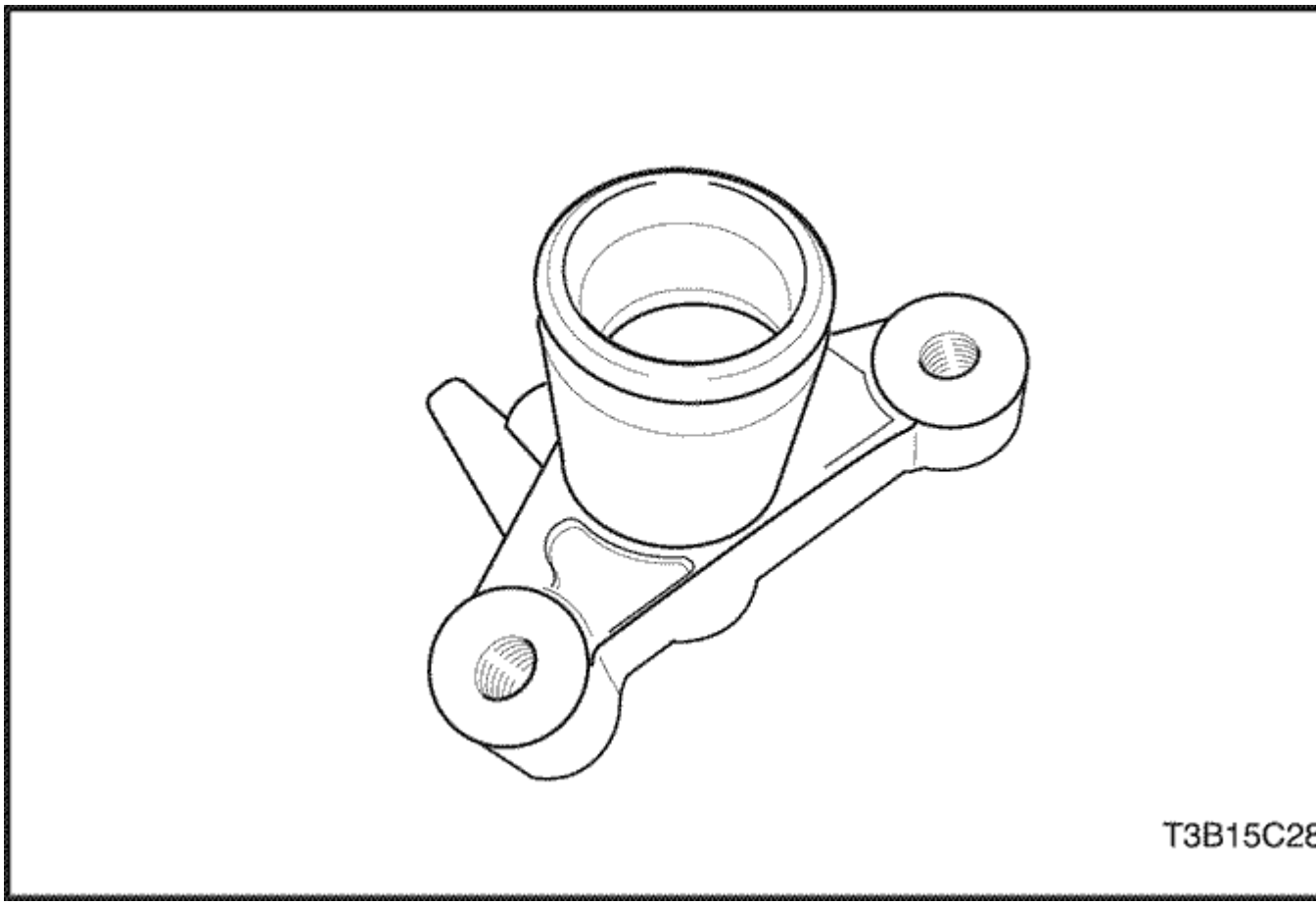


Clutch Release Cylinder
Disassembly Procedure

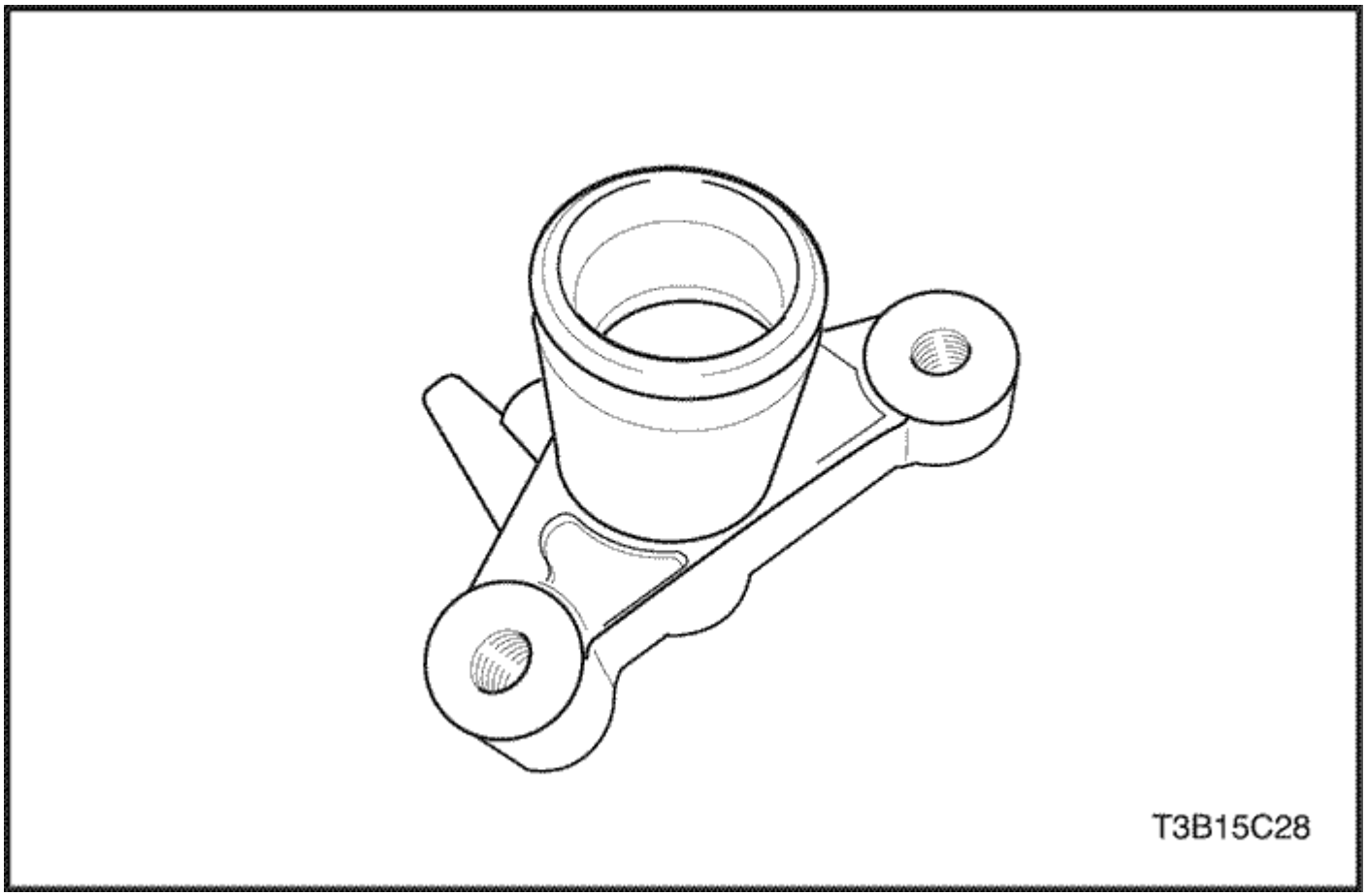
1. Remove the clutch release cylinder assembly from the vehicle. Refer to "Clutch Release Cylinder Assembly" in this section.
2. Remove the bolts and brackets.



3. Remove the boot and the pushrod.

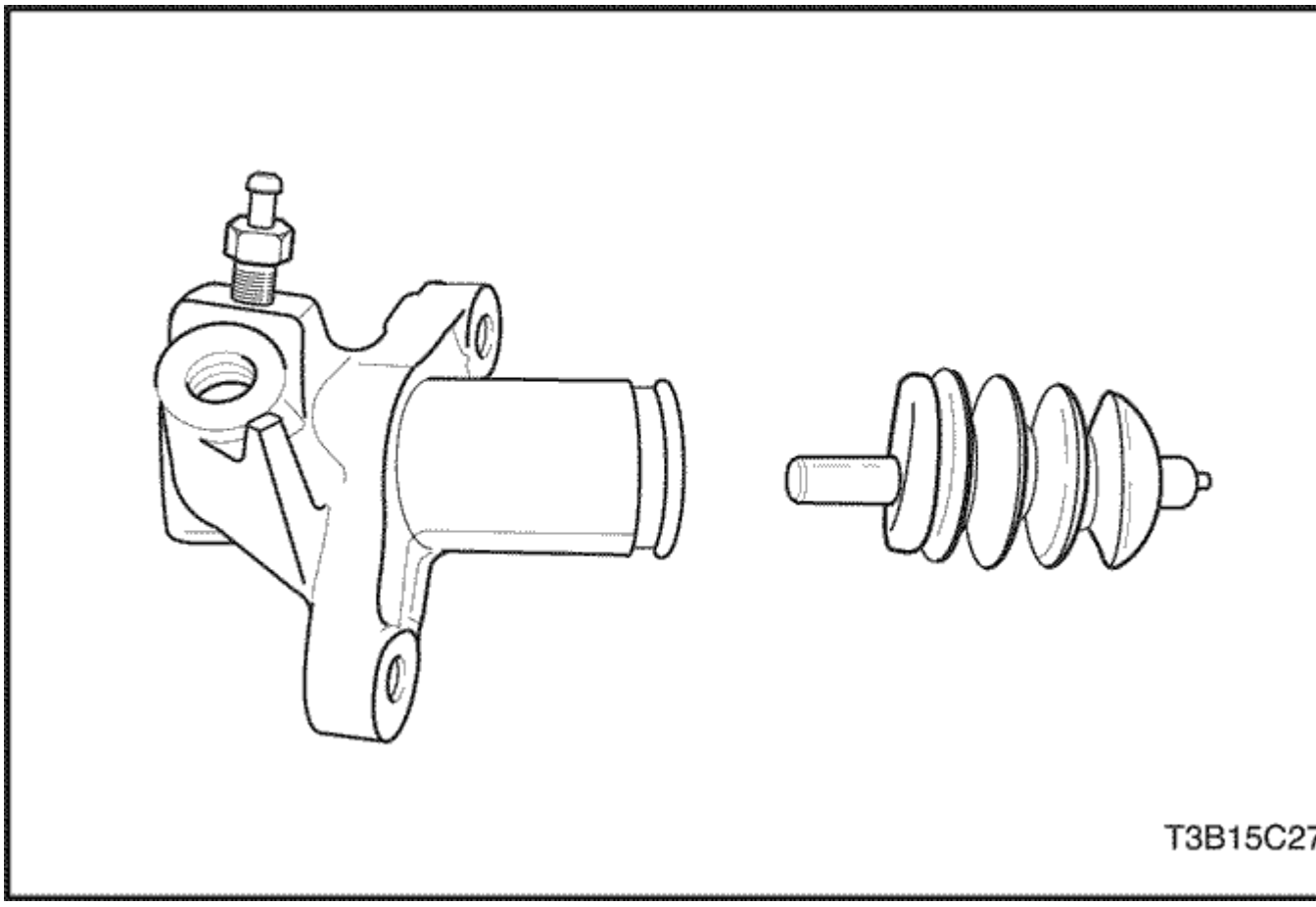


4. Compress the piston with a driver and remove the snap ring with snap ring pliers.
5. Remove the piston assembly.

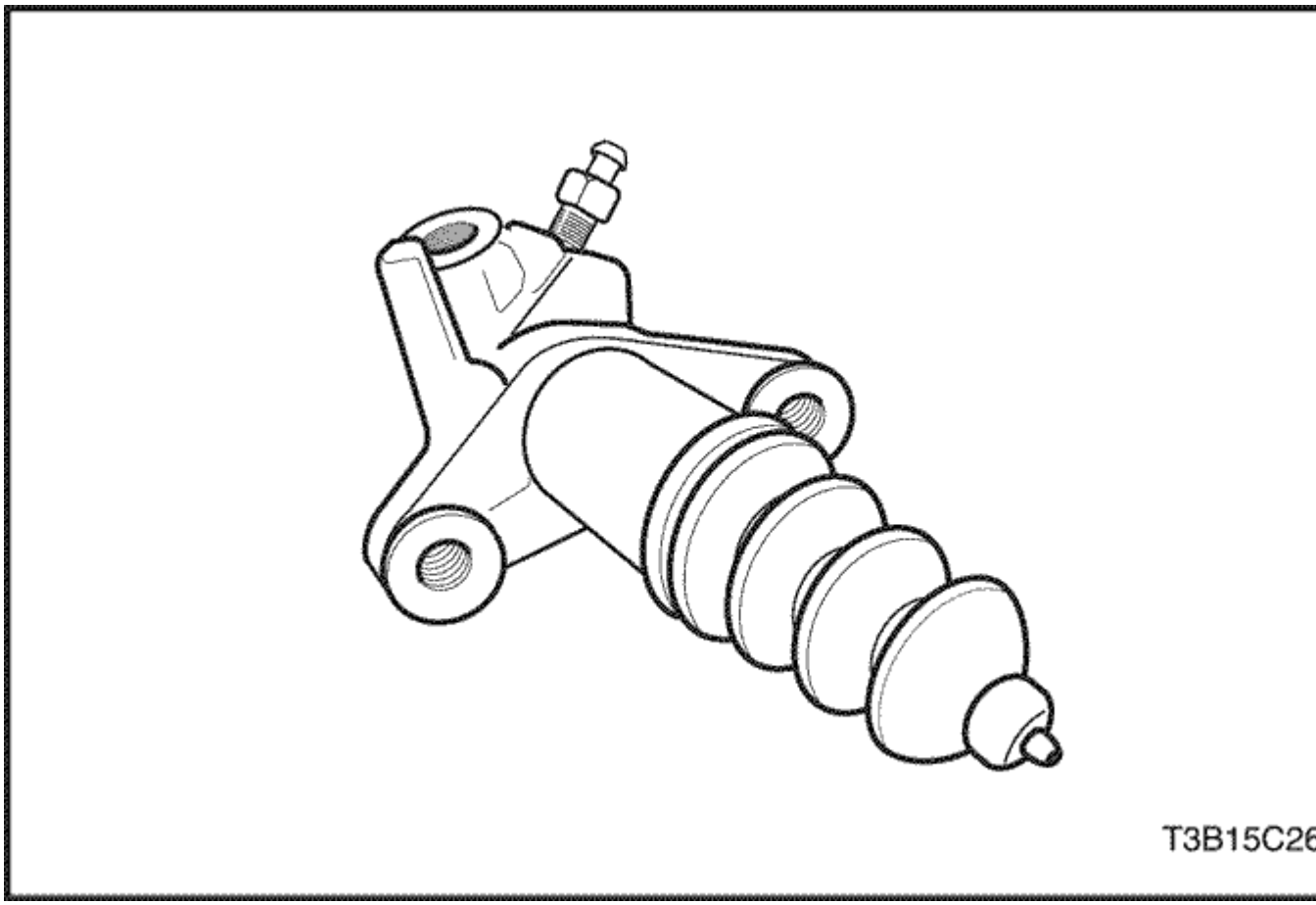


Assembly Procedure

1. Apply clean clutch fluid to the piston and the cup.
2. Install the spring to the piston, and insert the assembly into the cylinder body.
3. Compress the piston with a driver, then install the snap ring with snap ring pliers.



4. Install the pushrod and the boot.



5. Install the brackets and the bolts.
6. Install the clutch release cylinder assembly. Refer to "Clutch Release Cylinder Assembly" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Driving Members

The driving members consist of two flat surfaces machined to a smooth finish. One of these is the rear face of the engine flywheel and the other is the pressure plate. The pressure plate is fitted into a steel cover which is bolted to the flywheel.

Driven Members

The driven member is the clutch disc with a splined hub.The splined hub is free to slide lengthwise along the splines of the input shaft and drives the input shaft through these same splines.

The driving and driven members are held in contact by spring pressure. This pressure is exerted by a diaphragm spring in the pressure plate assembly.

Operating Members

The clutch release system consists of the clutch pedal, the clutch shaft, the fork, and the release bearing. When pressure is applied to the clutch pedal, the fork pivots on its shaft and the inner end pushes against the release bearing. The bearing then pushes against the release levers in the pressure plate assembly, thereby releasing the clutch.

SECTION 5C2

CLUTCH (CABLE TYPE)

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in B unless otherwise noted.

SPECIFICATIONS

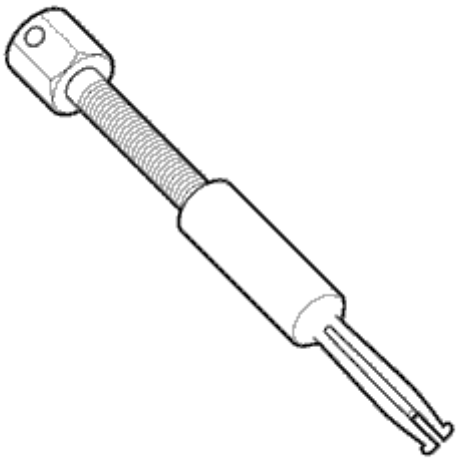
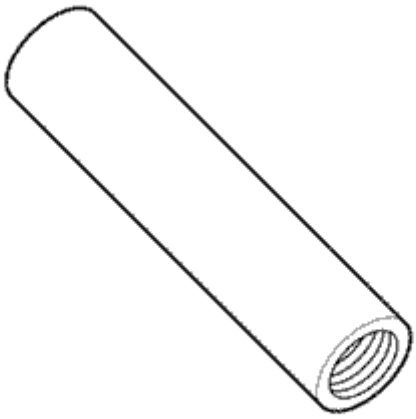
Fastener Tightening Specifications

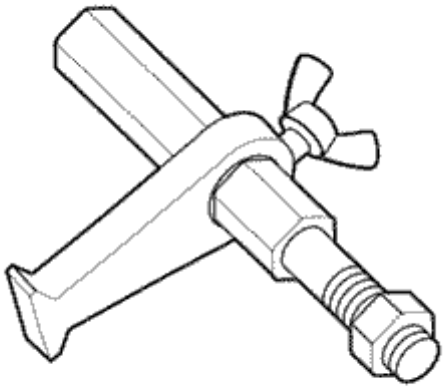
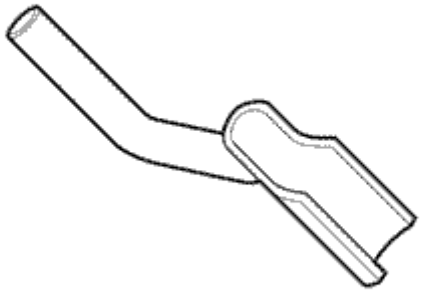
Application	N•m	Lb-Ft	Lb-In
Pressure Plate Bolt	18 - 28	13 - 21	-
Clutch Release Arm Bolt and Nut	10 - 16	7.5 - 12	-
Clutch Cable Nuts	9 - 13	-	80 - 115

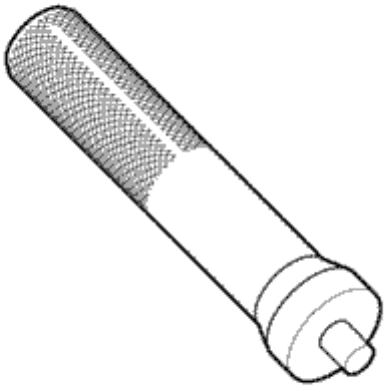
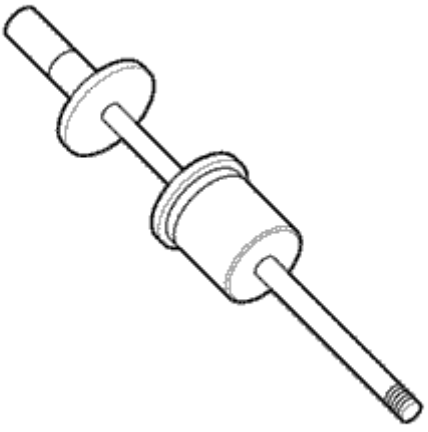
SPECIAL TOOLS

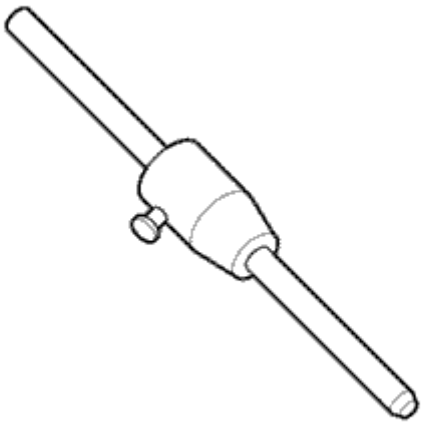
Special Tools Table

	09917-58010 Input Shaft

 58010	Bearing Remover
 DW210030	DW210-030 Bushing Joint Pipe
	09924-17810 Fly Wheel Holder

 17810	
 DW210040	DW210-040 Bushing Remover/ Installer
	09925-98210 Input Shaft Bearing Installer

 98210	
 30102	09930-30102 Sliding Shaft
	09943-88211 Bushing, Bearing Installer

 88211	
 DW210010	DW210-010 Clutch Center Guide

DIAGNOSIS

General Diagnosis

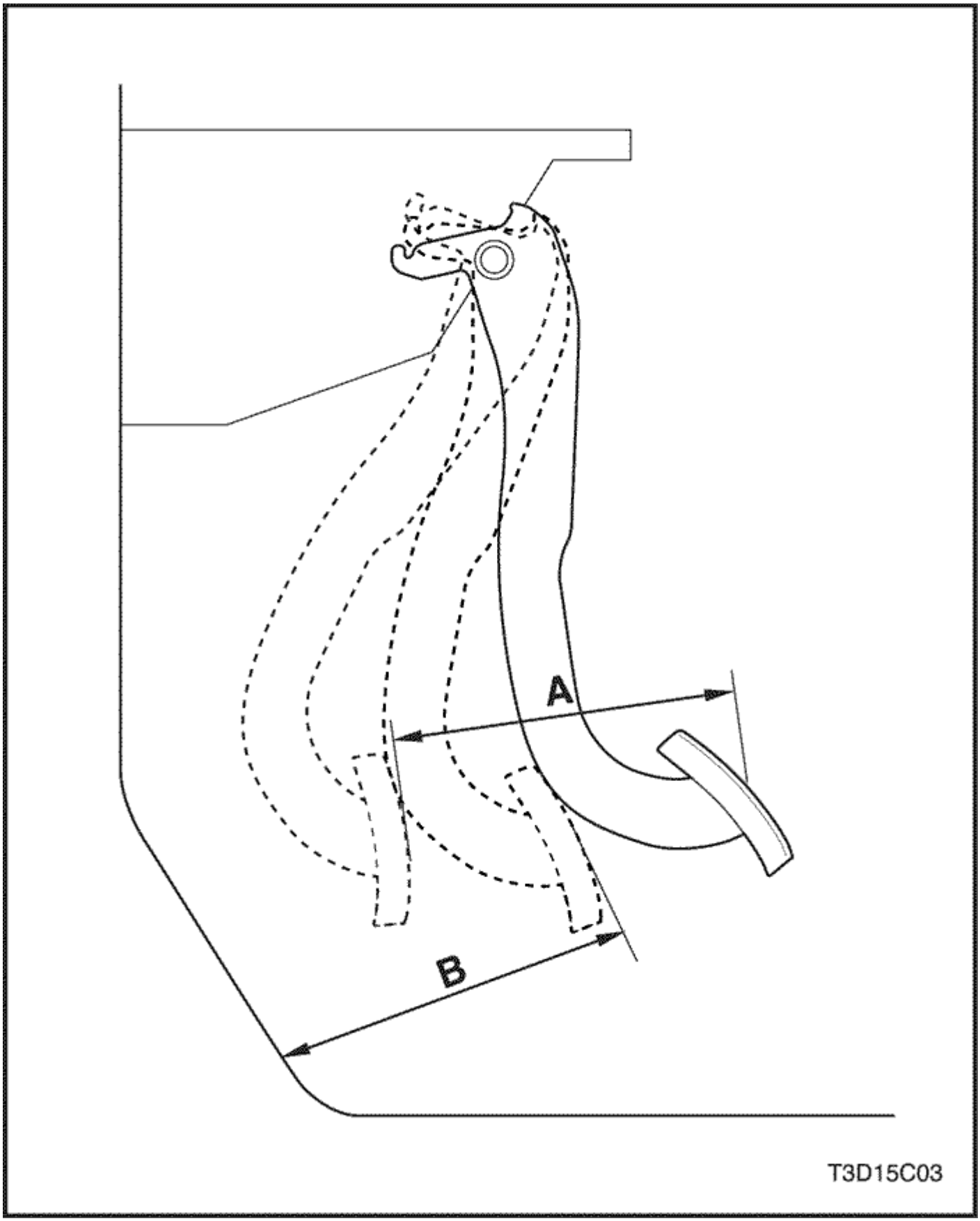
Condition	Probable Cause	Correction

Condition	Probable Cause	Correction
Slipping Clutch	• Improper clutch cable adjustment.	• Adjust clutch cable.
	• Worn or oily contamination on clutch disc surface.	• Replace clutch disc.
	• Worn or oily contamination on pressure plate, flywheel surface.	• Replace pressure plate, flywheel.
	• Damaged or weakened diaphragm spring.	• Replace pressure plate.
	• Rusted clutch cable.	• Replace clutch cable.
Dragging Clutch	• Improper clutch cable adjustment.	• Adjust clutch cable.
	• Worn or weakened diaphragm spring.	• Replace pressure plate.
	• Worn or rusted splines of input shaft or clutch disc.	• Replace input shaft or clutch disc.
	• Excessively wobbly clutch disc.	• Replace clutch disc.
	• Worn clutch disc.	• Replace clutch disc.
Fails to Release	• Bent or damaged clutch disc.	• Replace clutch disc.
	• Worn or rusted splines of input shaft or clutch disc.	• Replace input shaft or clutch disc.
	• Improper operation of clutch release shaft.	• Replace clutch release shaft.
	• Broken or damaged clutch cable.	• Replace clutch cable.
Pedal Stays on	• Interfered clutch release	• Lubricate and adjust clutch

Condition	Probable Cause	Correction
Floor When Disengaged	bearing.	release bearing.
	• Weakened diaphragm spring.	• Replace pressure plate.
	• Broken or damaged clutch cable.	• Replace clutch cable.
Clutch Vibration	• Clutch facing with oily contamination.	• Replace clutch disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	• Lubricate retainer release bearing.
	• Wobbly clutch disc or poor facing contact.	• Replace clutch disc.
	• Loose clutch disc rivets.	• Replace clutch disc.
	• Weakened clutch disc torsion spring.	• Replace clutch disc.
	• Distorted pressure plate or flywheel surface.	• Replace pressure plate or flywheel.
	• Weakened engine mounting or loosened installing bolt or nut.	• Retighten or replace mounting.
Clutch Noise	• Worn or broken release bearing.	• Replace release bearing.
	• Worn input shaft bearing.	• Replace input shaft bearing.
	• Cracked clutch disc.	• Replace clutch disc.
	• Pressure plate and diaphragm spring rattling.	• Replace pressure plate.
	• Improper clutch cable adjustment.	• Adjust clutch cable.

Condition	Probable Cause	Correction
	• Worn clutch cable.	• Replace clutch cable.
Grabbing Clutch	• Clutch disc facing with oily contamination.	• Replace clutch disc.
	• Excessively worn on clutch disc facing.	• Replace clutch disc.
	• Rivet head showing out of facing.	• Replace clutch disc.
	• Weakened clutch torsion spring.	• Replace clutch disc.

Clutch Pedal Operation


A
B
T3D15C03

Clutch Pedal Free Travel

It is designed that there is no clutch pedal free travel.

Clutch pedal travel (A)

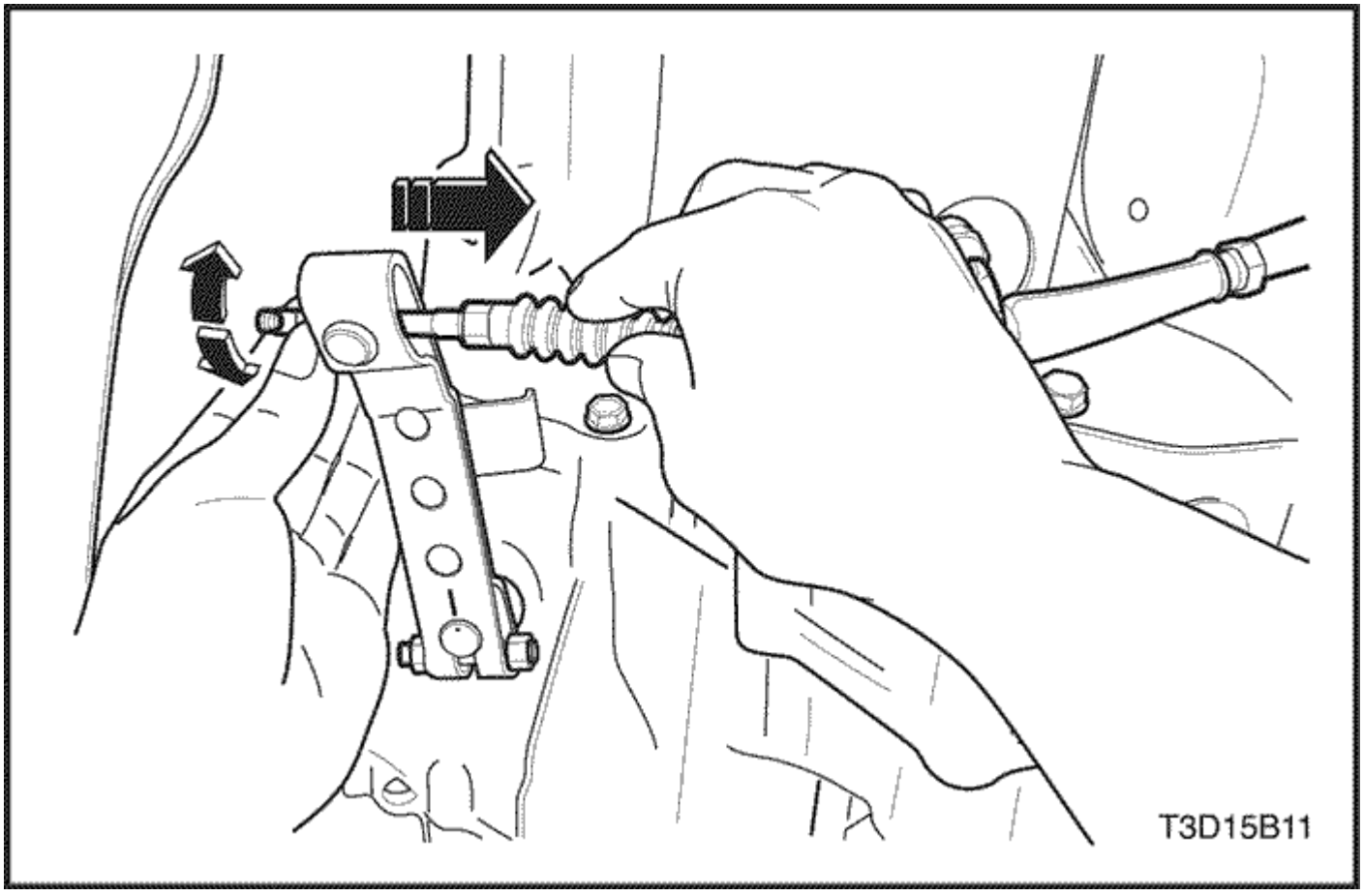
Pedal Travel	120 - 130 mm (4.7 - 5.1 in.)

Clearance between pedal and floor just before clutch connection (B)

After starting the engine, check if the clearance between pedal and floor is within specified range in condition of idling, lifting, parking brake and drawing out clutch pedal.

Clearance Between Pedal and Floor just Before Clutch Connection	50 - 60 mm (1.9 - 2.3 in.)

Clutch Cable Adjustment



If clutch connction/disconnection is operated unsmoothly, adjust the clutch cable by adjusting clutch cable adjustnut.

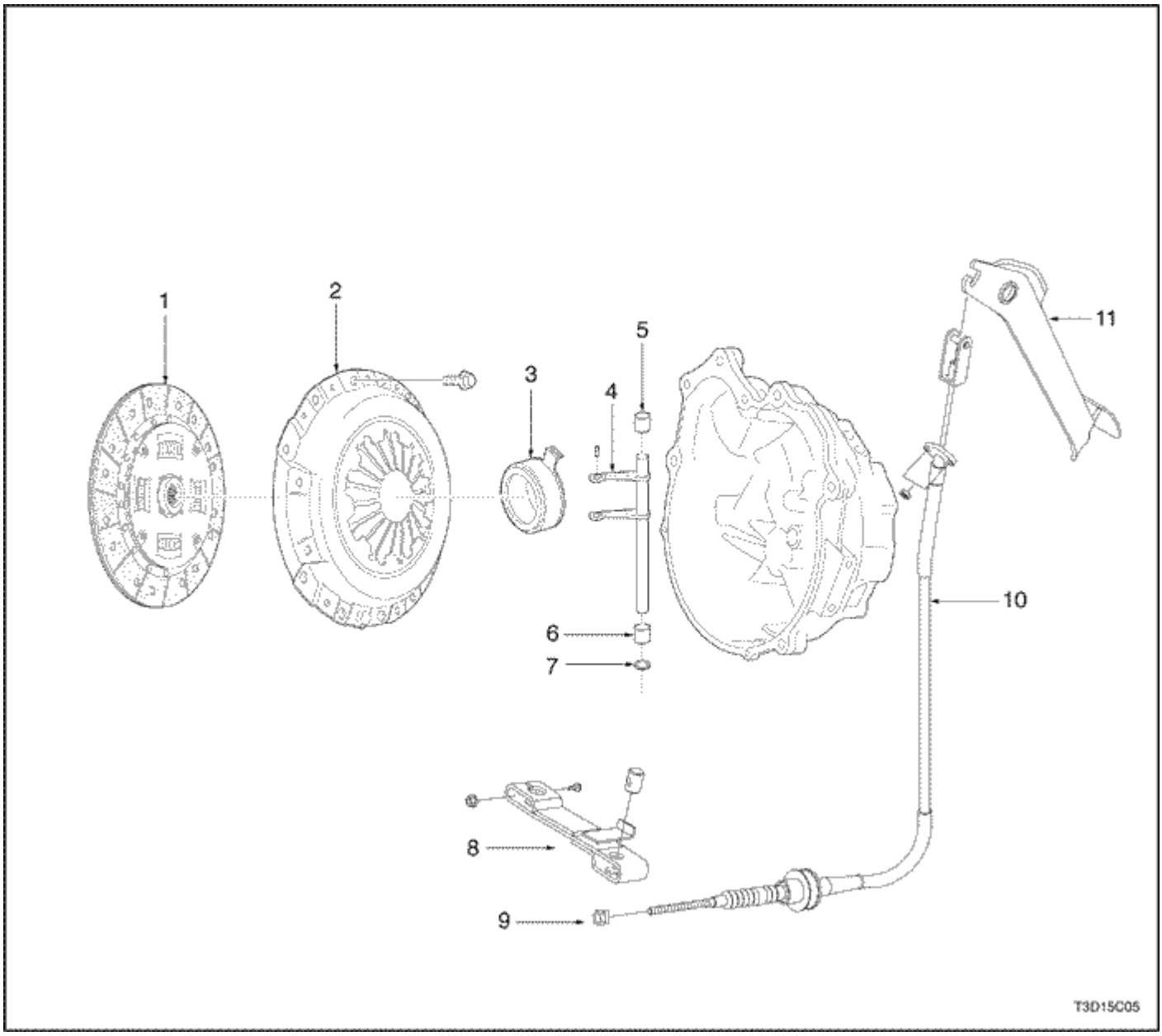
Clutch Cable

Check clutch cable and replace it any of followings exists.

- Excessively worn cable
- Loose cable
- Bent or distorted cable
- Damaged boot
- Worn end

COMPONENT LOCATOR

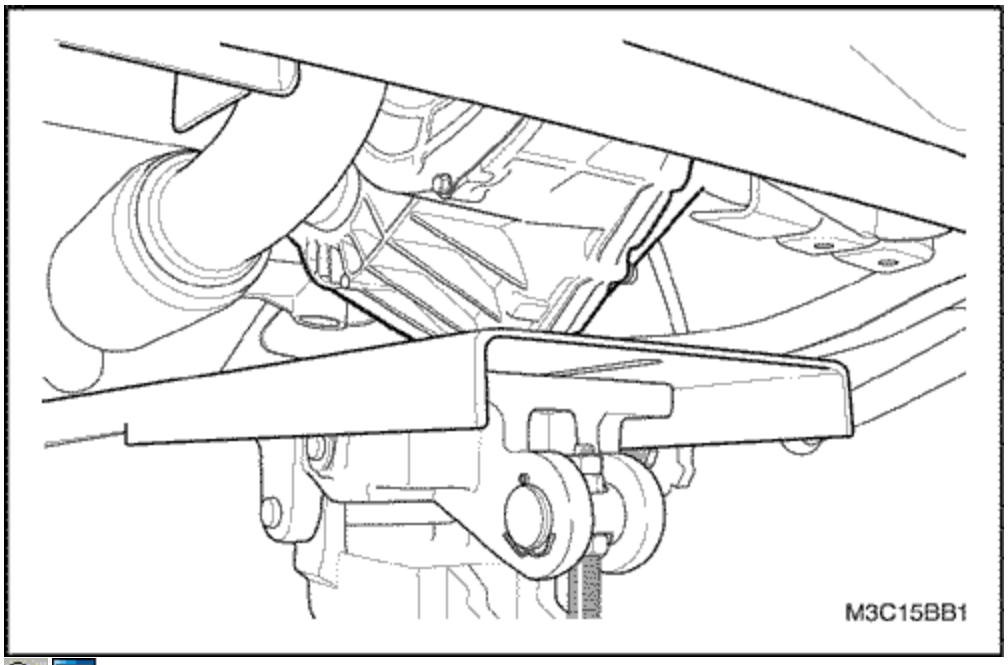
Clutch Components



1. Clutch Disc
2. Pressure Plate
3. Release Bearing
4. Release Shaft
5. Release Shaft Bushing (No.1)
6. Release Shaft Bushing (No.2)

7. Release Shaft Seal
8. Release Arm
9. Clutch Cable Adjusting Nut
10. Clutch Cable
11. Clutch Pedal

MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE

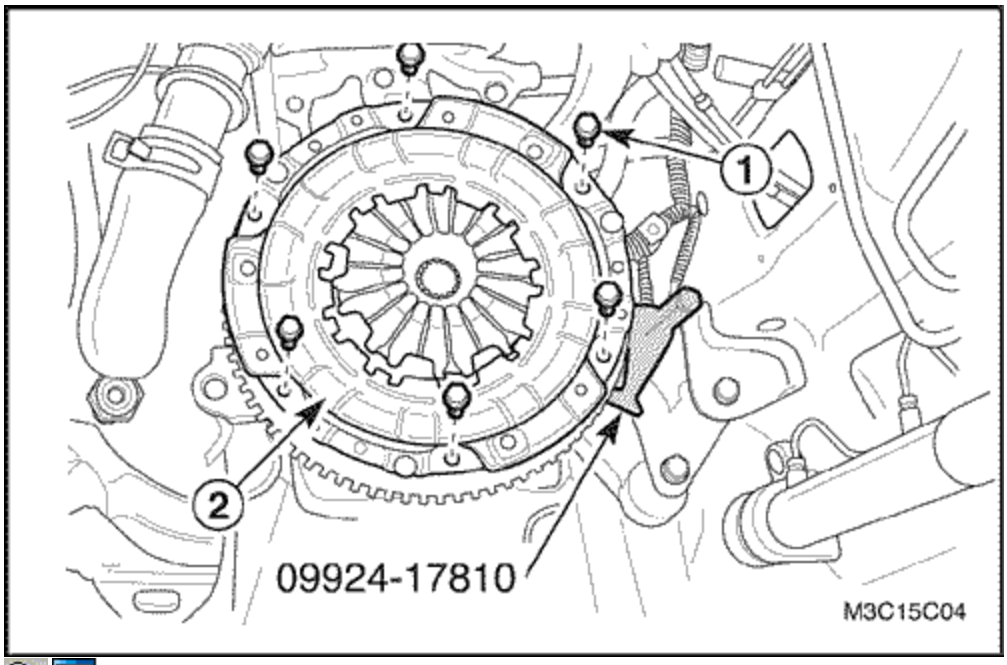


Pressure Plate, Clutch Disc and Input Shaft Bearing
Tools Required

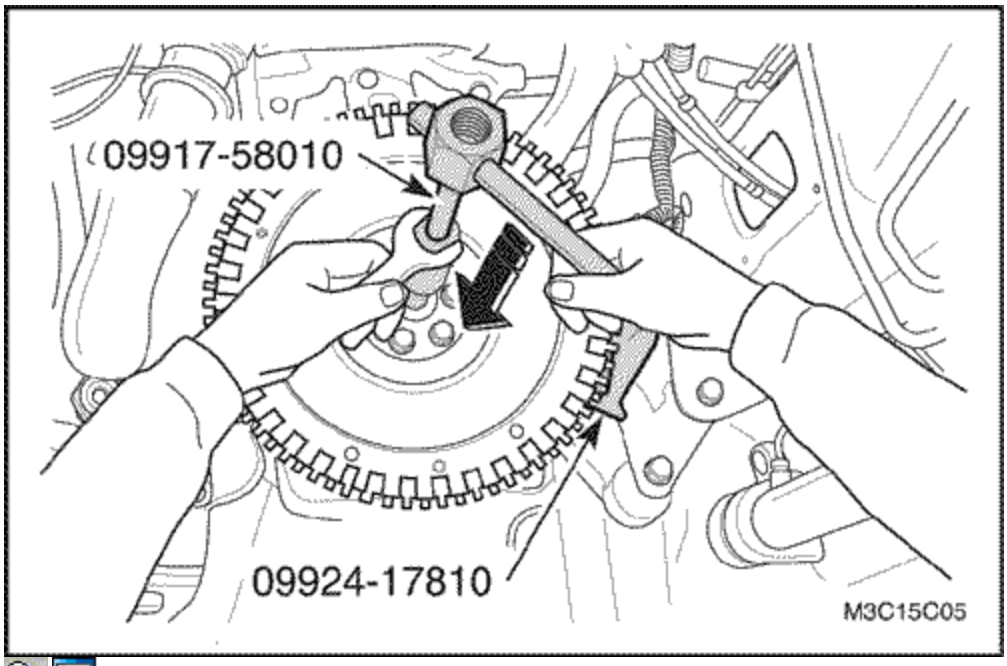
09917-58010 Input Shaft Bearing Remover
09924-17810 Flywheel Holder
09925-98210 Input Shaft Bearing Installer
DW210-010 Clutch Center Guide

Removal Procedure

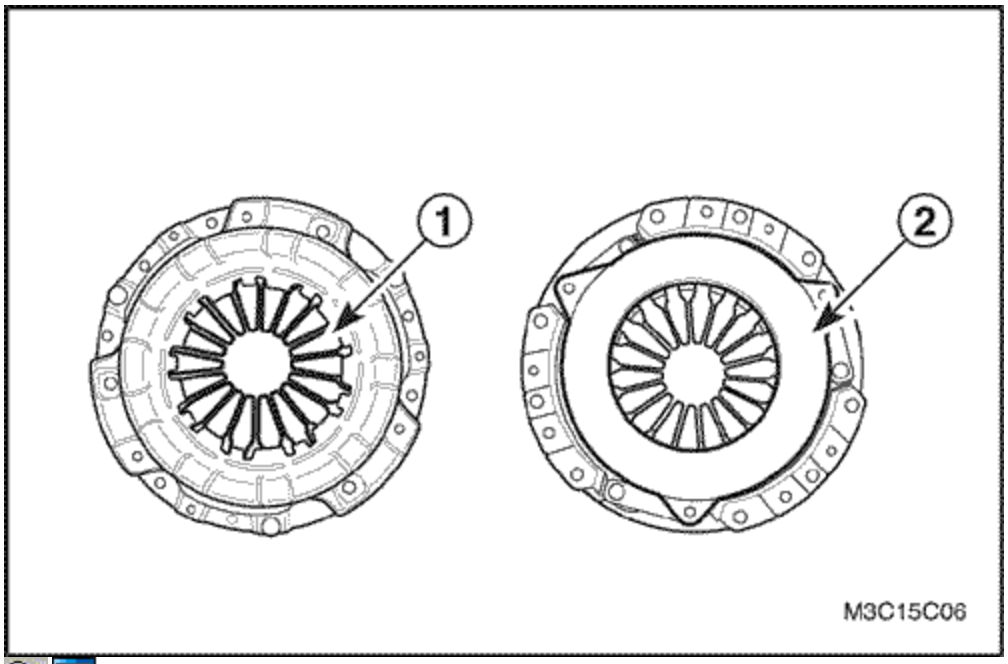
1. Remove the transaxle from the vehicle. Refer to *Section 5B2, Five-Speed Manual Transaxle (Y4M).*



2. Remove the pressure plate and the clutch disc.
    - Fix the fly wheel using the fly wheel holder 09924-17810.
    - Remove the pressure plate bolts (1).
    - Remove the pressure plate and the clutch disc (2).

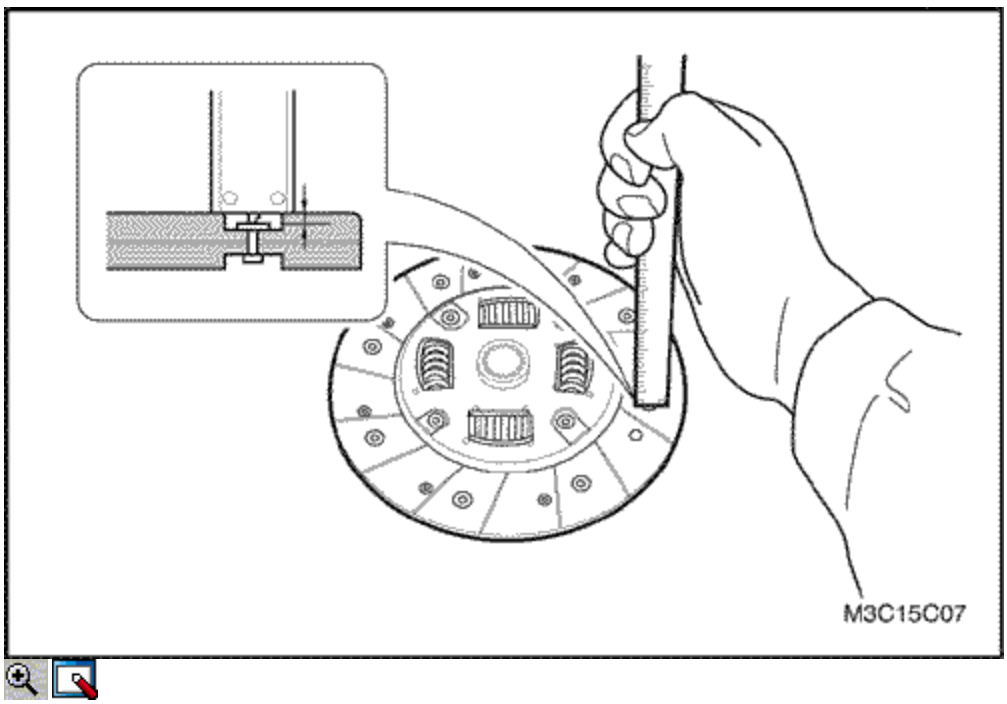


3. Remove the transaxle input shaft bearing using the input shaft bearing remover 09917-58010, the flywheel holder 09924-17810 and a spanner.



Inspection Procedure - Pressure Plate and Clutch Disc

1. Pressure plate inspection .
    - Check the weak and damaged diaphragm spring (1).
    - Check the polluted face by the oil, grease (2).

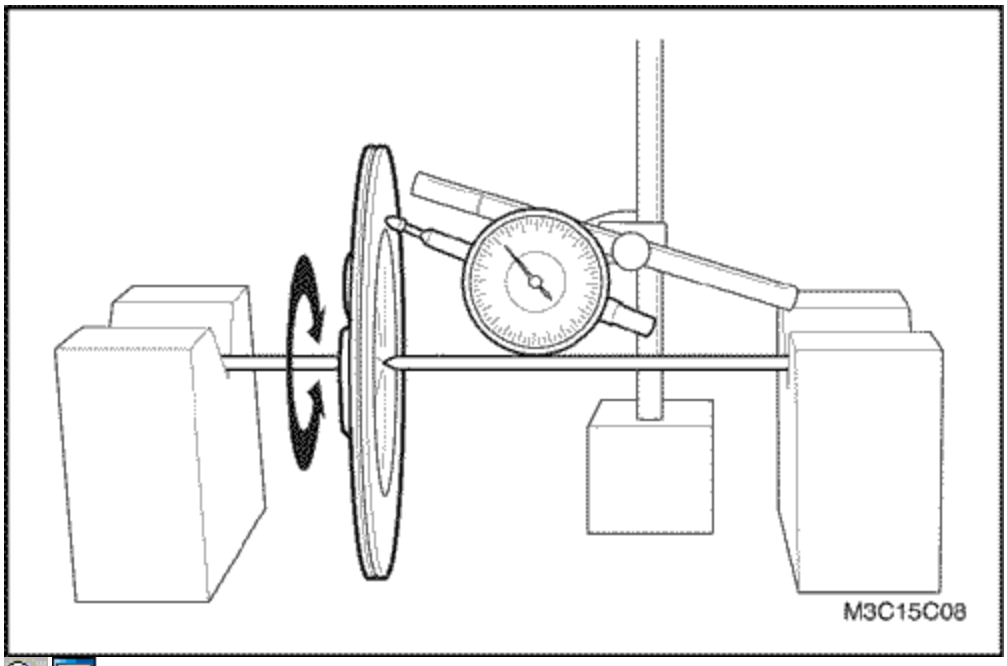


2. Clutch disc inspection.
    - Measure rivet head depth from clutch disc surface and replace if below limit.

Unit : mm (in.)

Rivet Head Depth	Standard	Limit
	1.2 (0.047)	0.5 (0.02)

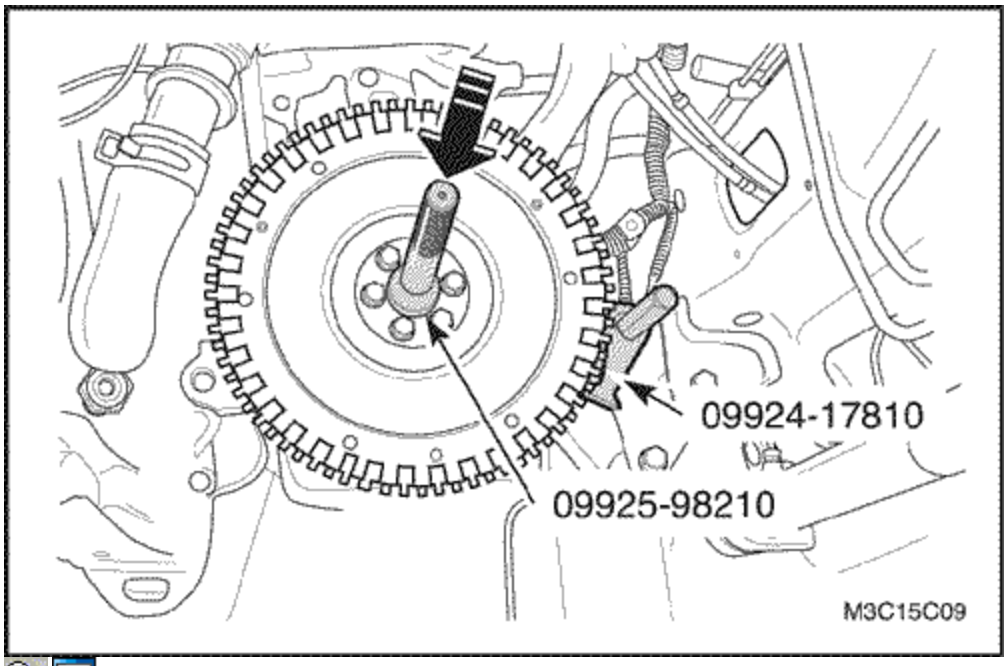
    - Replace the clutch disc if clutch disc surface is contaminated or clutch disc rivets are loosen.



3. Clutch disc runout in rotational direction inspection.
    - Measure runout in rotational direction and replace if runout exceeds limit.

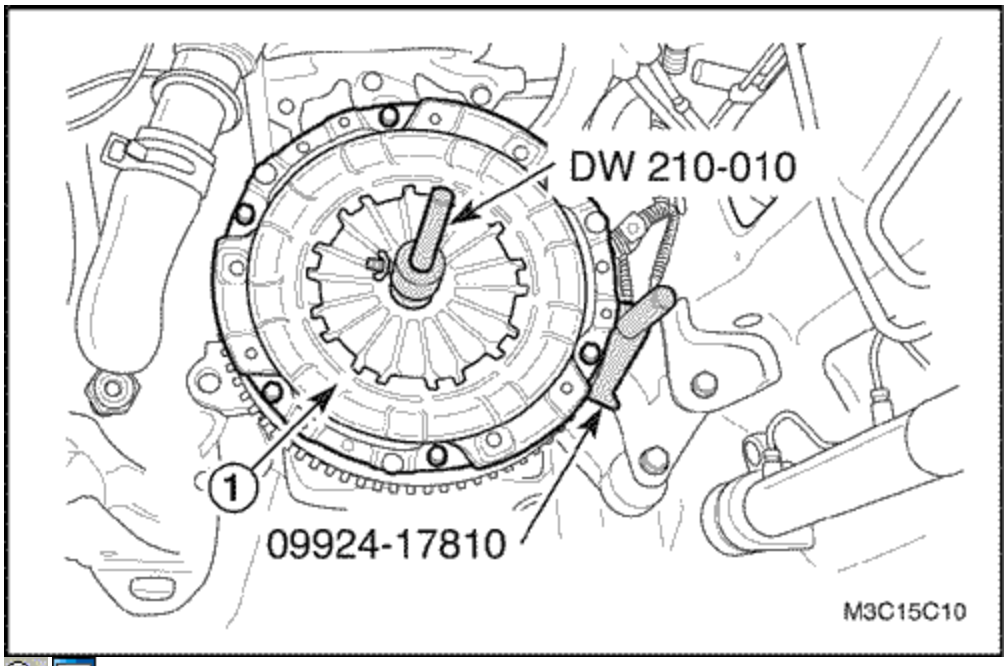
Unit : mm (in.)

Disc Runout Limit in Rotational Direction (Periphery)	0.7 (0.028)



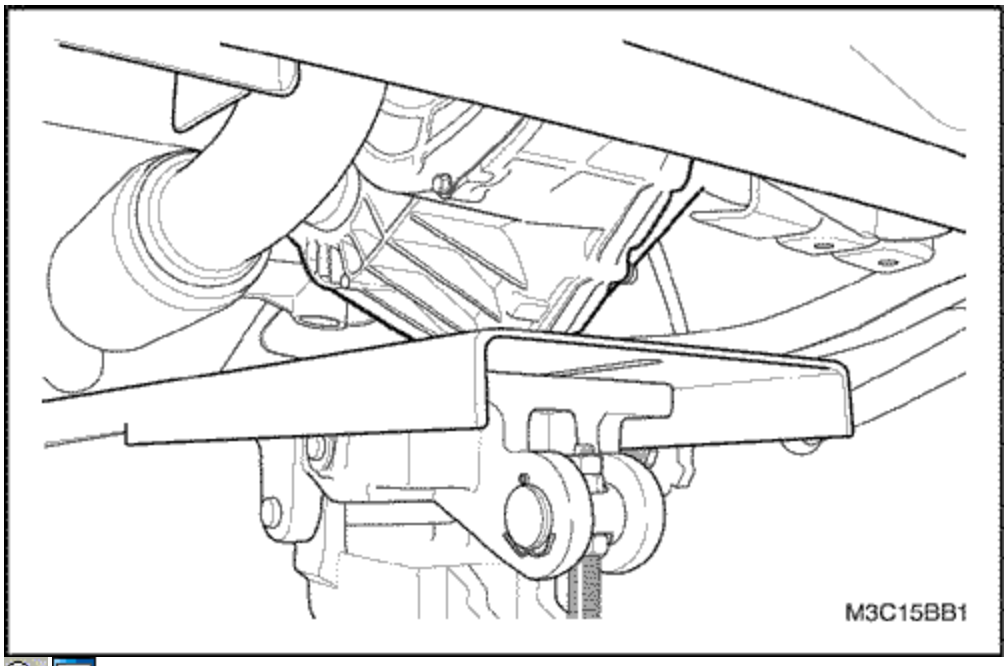
Installation Procedure

1. Install in the reverse order of removal.
2. Install the input shaft bearing using the input shaft bearing installer 09925-98210 and the flywheel holder 09924-17810.

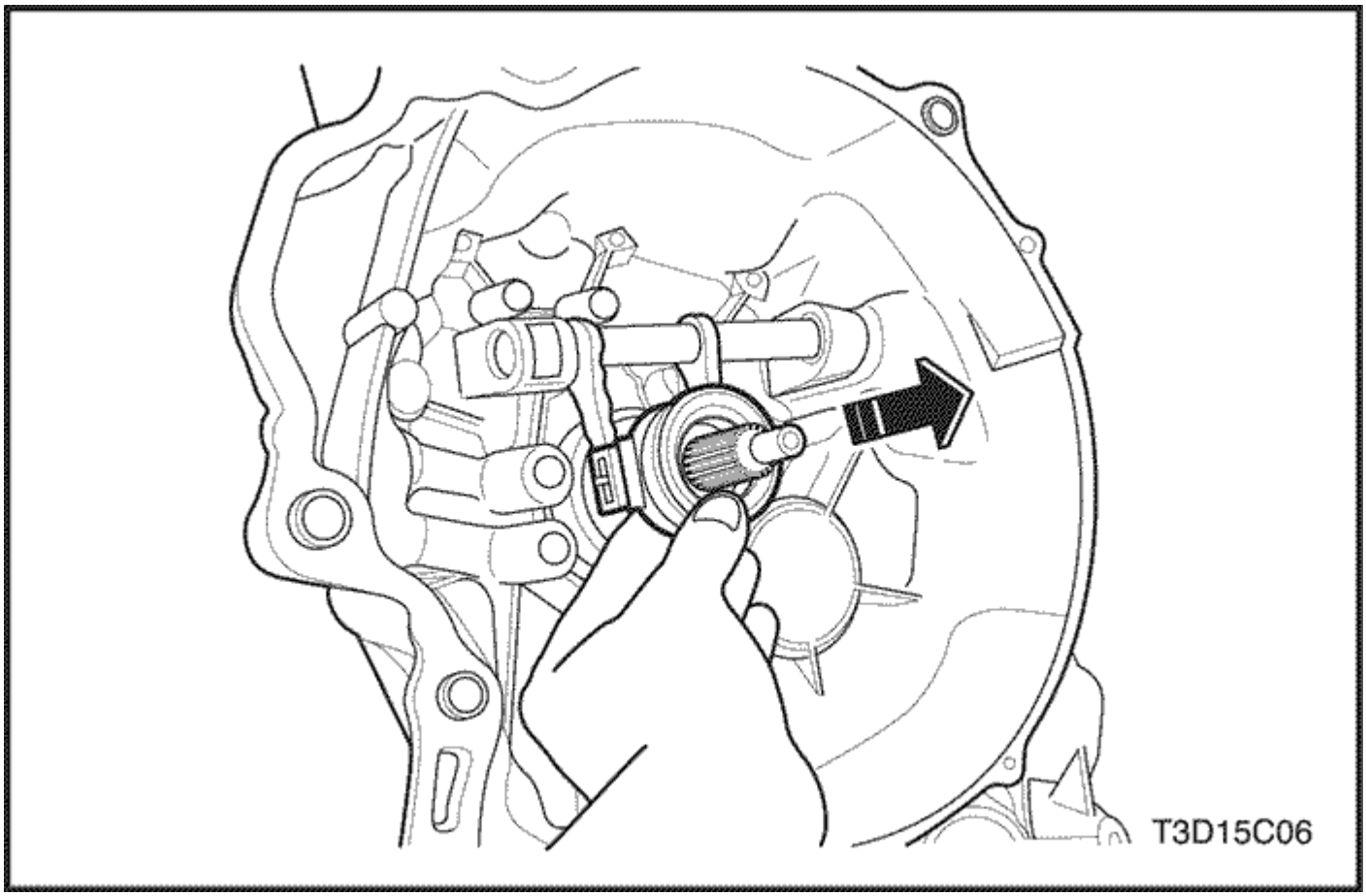


3. Install the pressure plate and the clutch disc.
    - Install the clutch disc.
    - Install the pressure plate (1).
    - Align the pressure plate and the clutch disc onto the flywheel using the clutch center guide DW210-010 and the flywheel holder 09924-17810.
    - Install the pressure plate bolts.

    Tighten
    Tighten the bolts to 18-28 N•m (13-21 lb-ft).



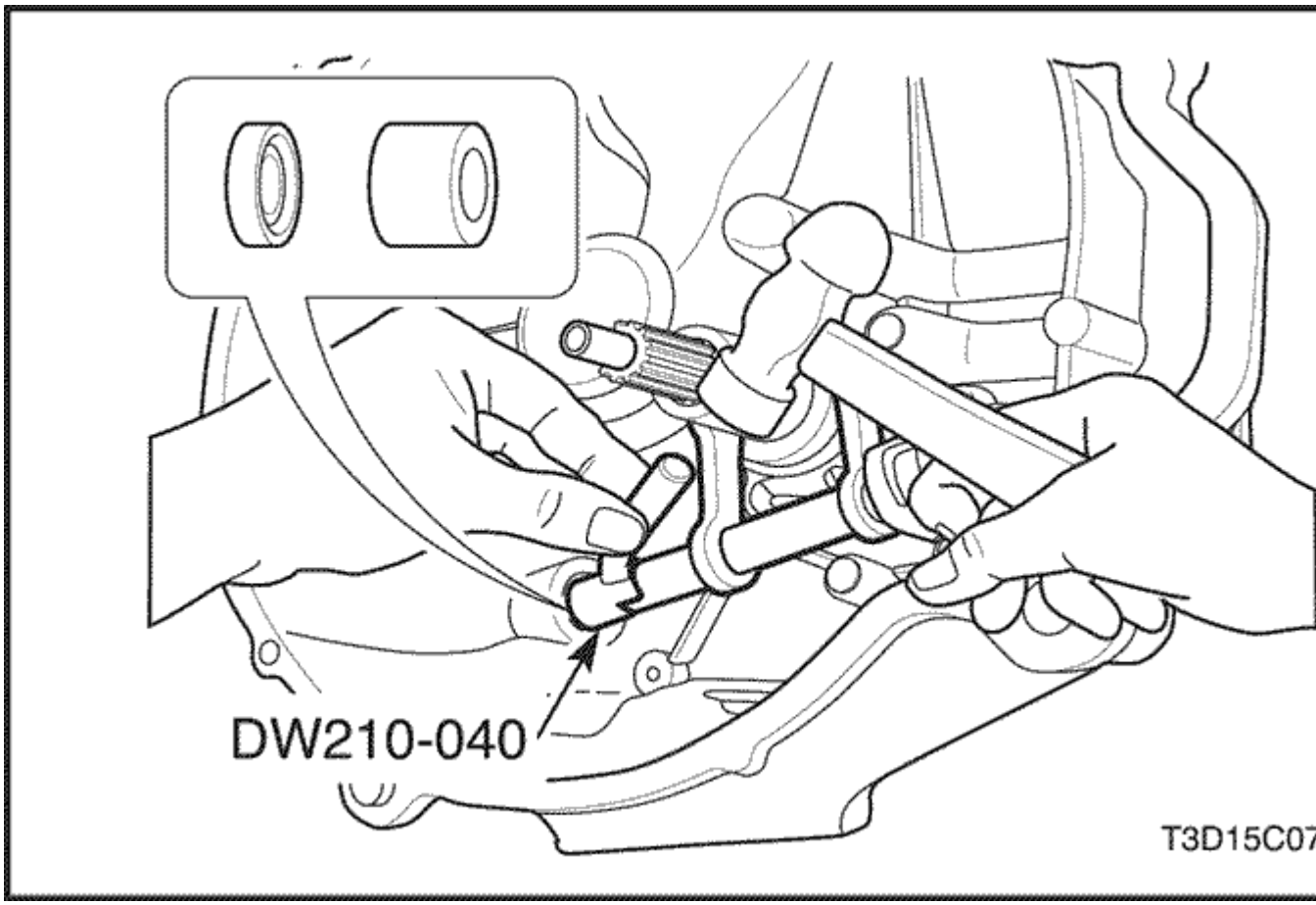
4. Install the transaxle into the vehicle. Refer to *Section 5B2, Five-Speed Manual Transaxle (Y4M).*



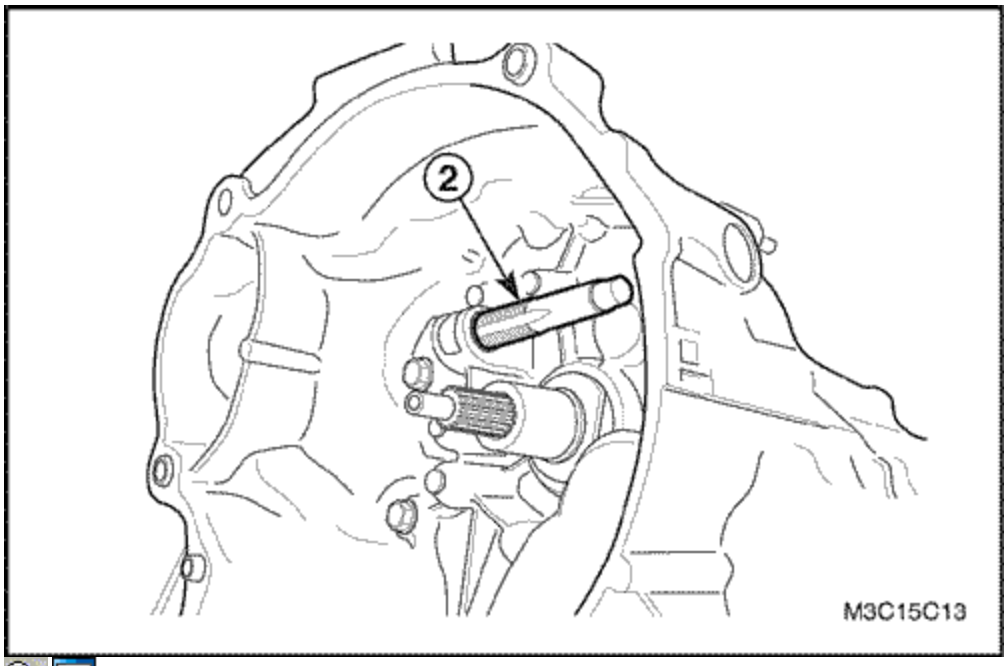
Clutch Release Bearing, Shaft and Bushing
Tools Required

DW210-030 Bushing Joint Pipe
DW210-040 Bushing Remover/Installer
09930-30102 Sliding Shaft
09943-88211 Bushing, Bearing Installer
Removal Procedure

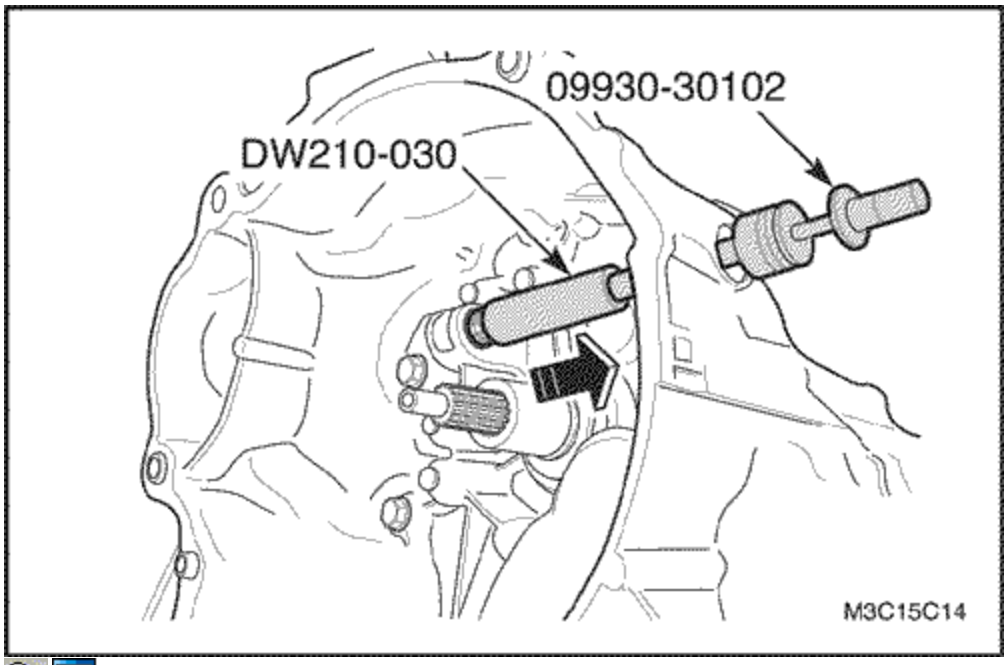
1. Remove the transaxle from the vehicle. Refer to *Section 5B2, Five-Speed Manual Transaxle (Y4M).*
2. Remove the release arm. Refer to "Clutch Release Arm" in this section.



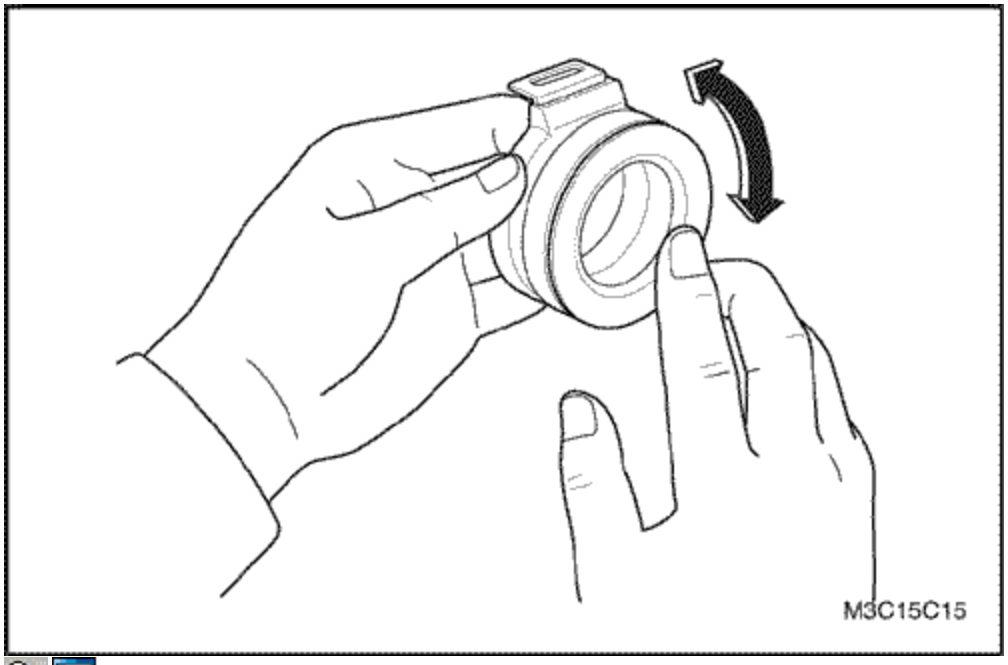
3. Remove the release bearing.
4. Remove the release shaft and bushing.
    - Remove the bushing (No.2) and seal using the bushing remover DW210-040 and hammer.
    - Remove the release shaft (1).



- Insert the tap (M16X1.5) to the bushing (No.1) (2).

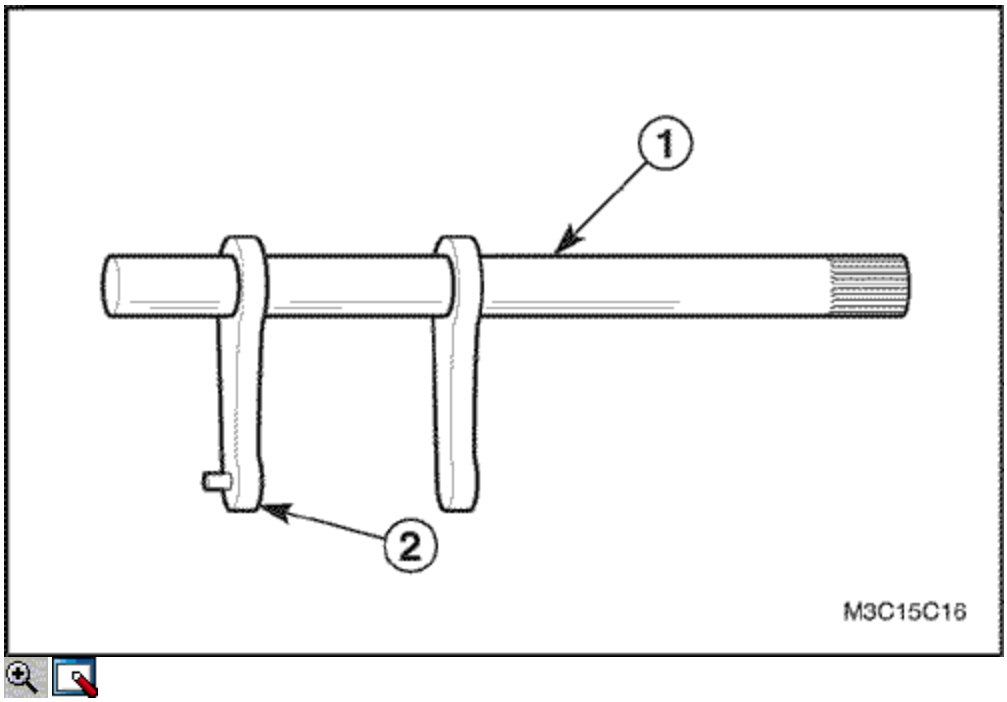


- Insert the bushing joint pipe DW210-030 to the tab.
- Connect the sliding shaft 09930-30102 to the end of the bushing joint pipe DW210-030.
- Remove the bushing (No.1) by pulling.

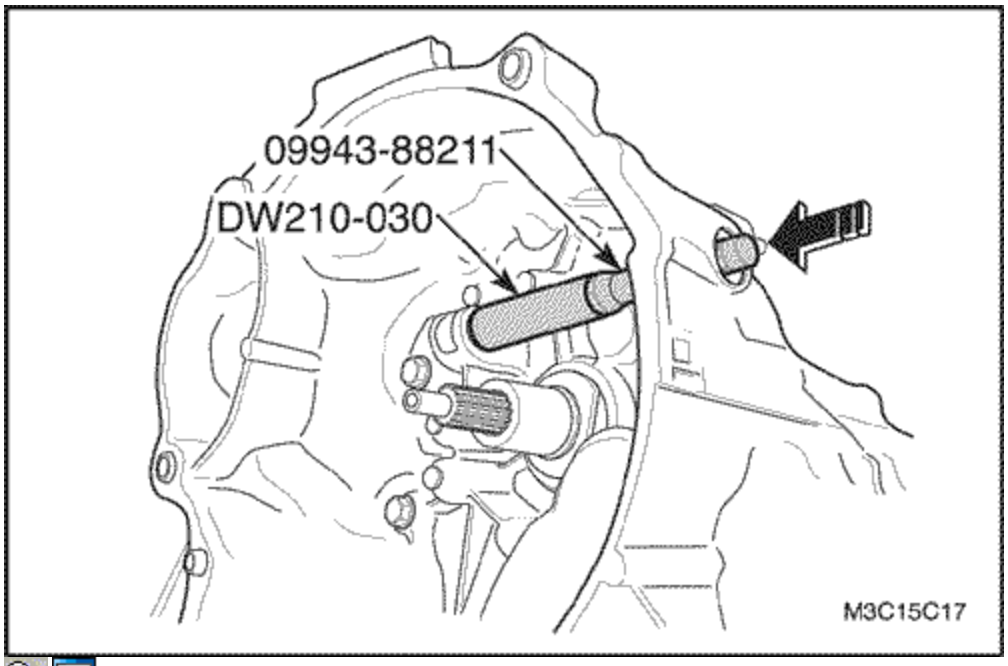


Inspection Procedure - Release Bearing and Shaft

1. Release bearing inspection.
   - Check for noisy, worn and damaged release bearing.
   - Check for a grabbing rotation of release bearing.
   - Replace the release bearing if necessary.

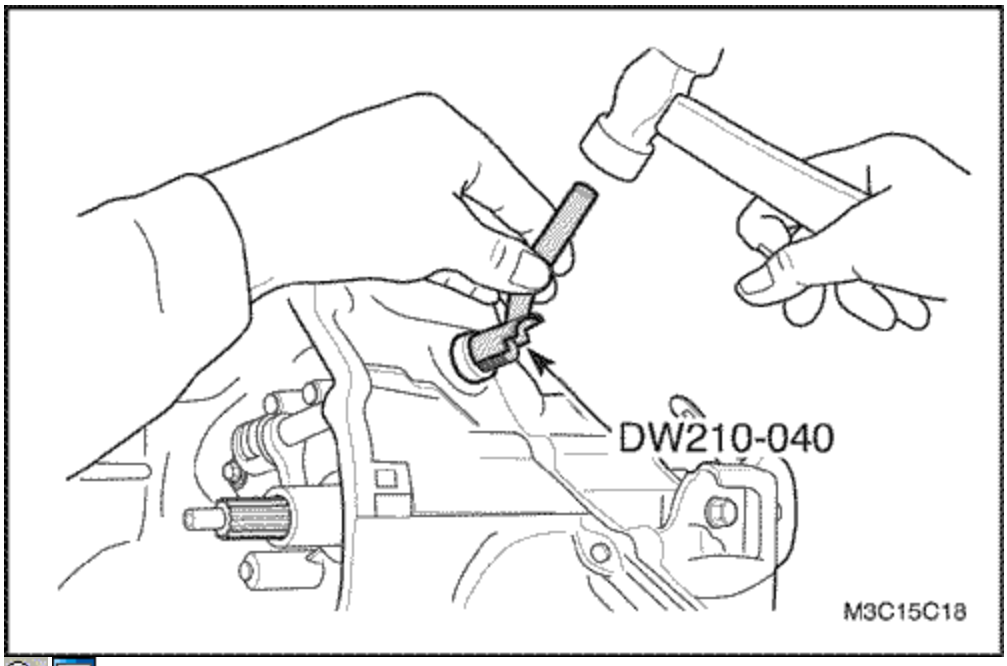


2. Release shaft inspection.
    - Check for a warped shaft (1).
    - Check for a worn fork (2).
    - Replace the shaft if necessary.

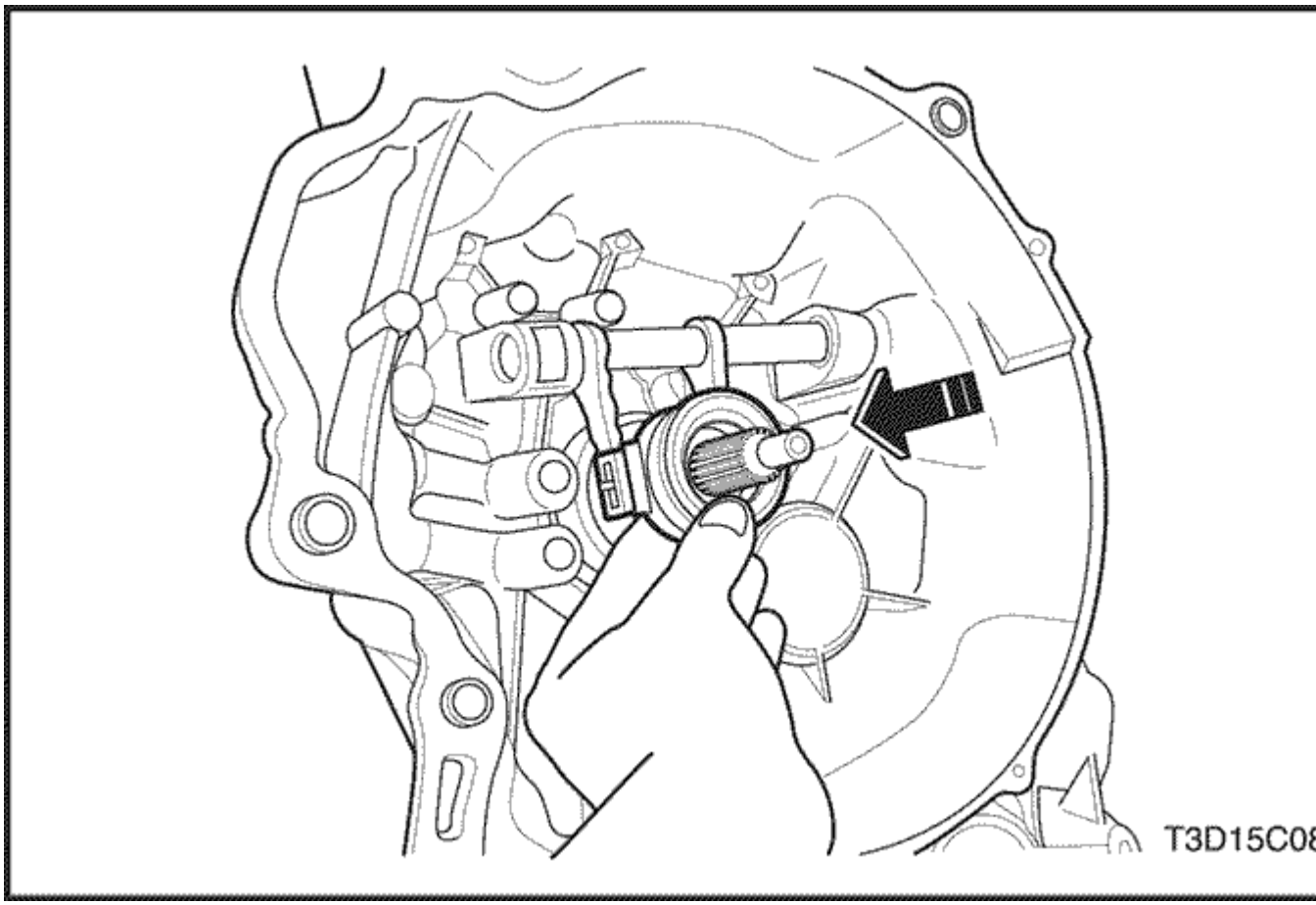


Installation Procedure

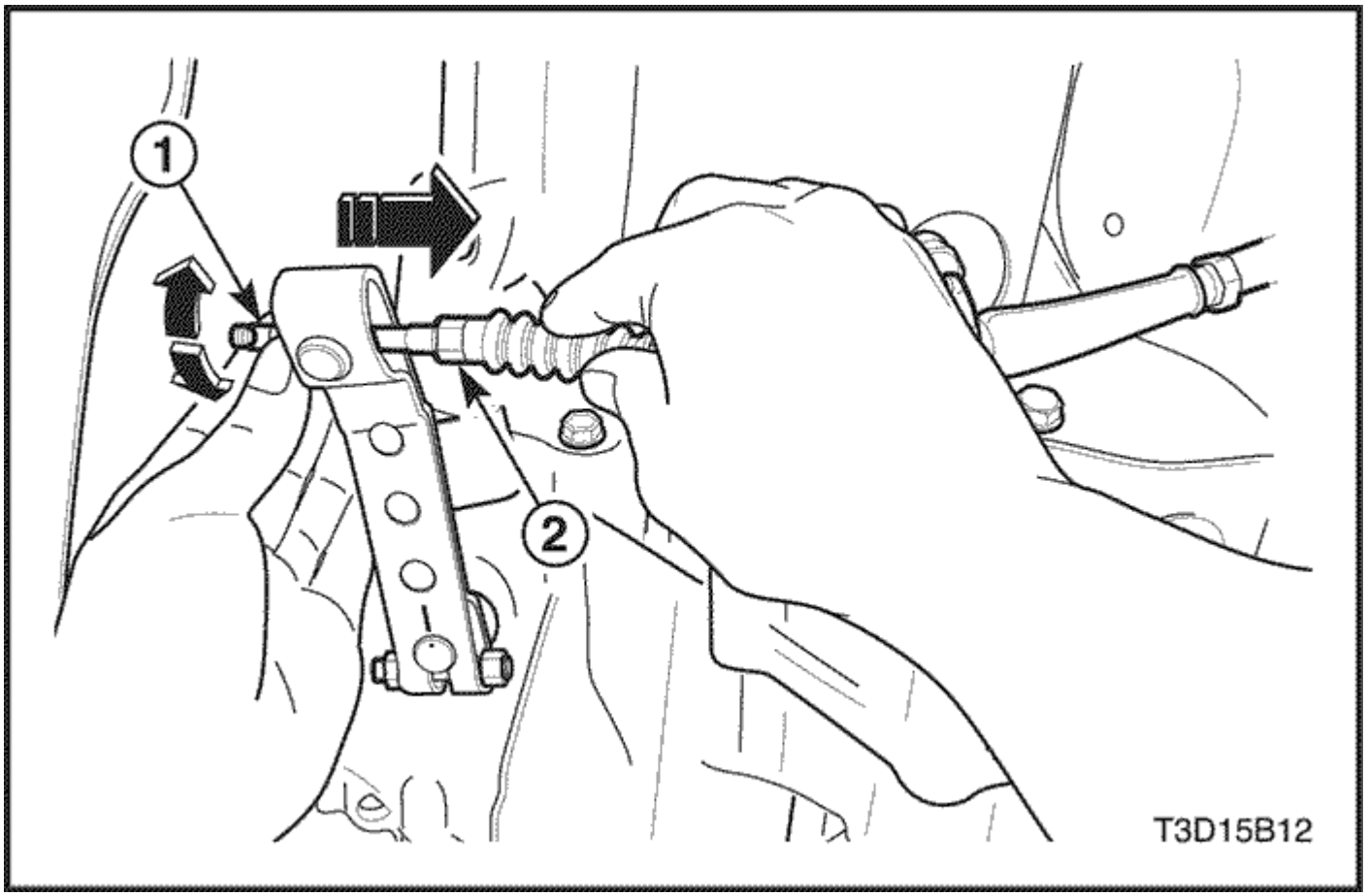
1. Install in the reverse order of removal.
2. Install the release shaft bushing (No.1) using the bushing joint pipe DW210-030, bushing, bearing installer 09943-88211 and a hammer.



3. Install the release shaft.
    - Coat the release shaft and bushing with grease.
4. Install the release shaft bushing (No.2) and seal using the bushing remover/installer DW210-040 and a hammer.

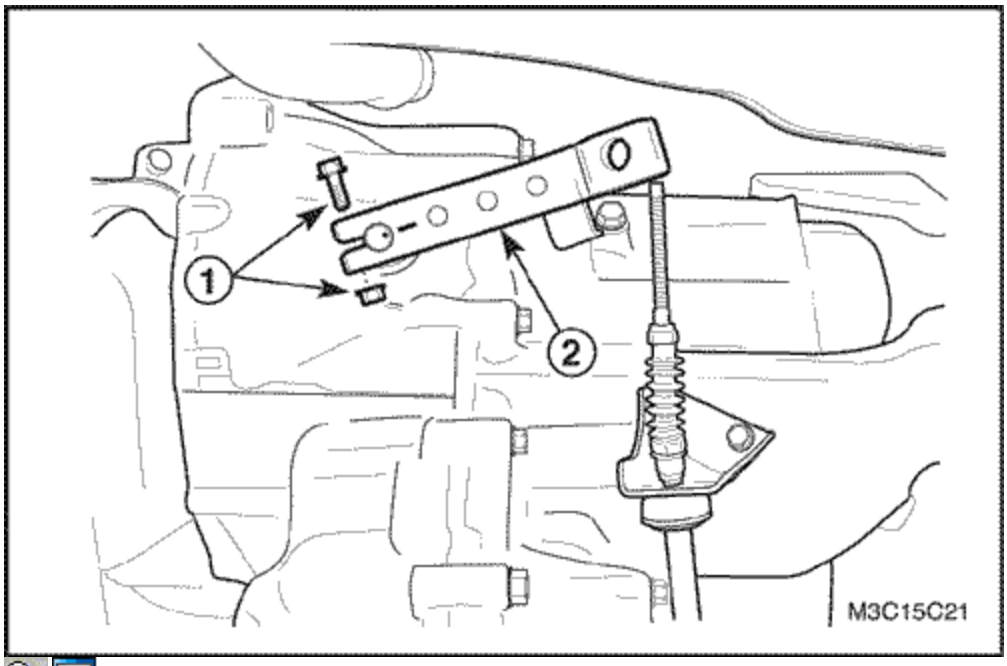


5. Install the release bearing.
    - Coat the spline of transaxle input shaft with multi-purpose grease (1).
    - Coat the release bearing bore and the connecting of release shaft with multi-purpose grease (2).
    - Install the release bearing.
6. Install the release arm. Refer to "Clutch Release Arm" in this section.
7. Install the transaxle into the vehicle. Refer to *Section 5B2, Five-Speed Manual Transaxle (Y4M).*

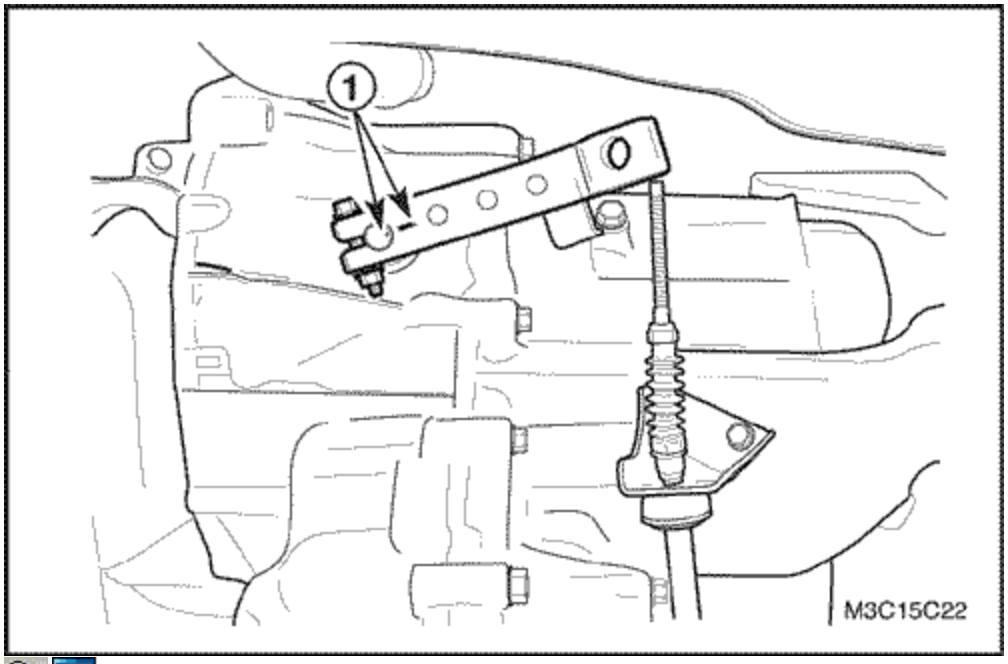


Clutch Release Arm
Removal Procedure

1. Disconnect the clutch cable.
    - Remove the adjusting nut (1).
    - Disconnect the cable (2).



2. Remove the clutch release arm.
    - Remove the bolt and nut (1).
    - Remove the release arm (2).

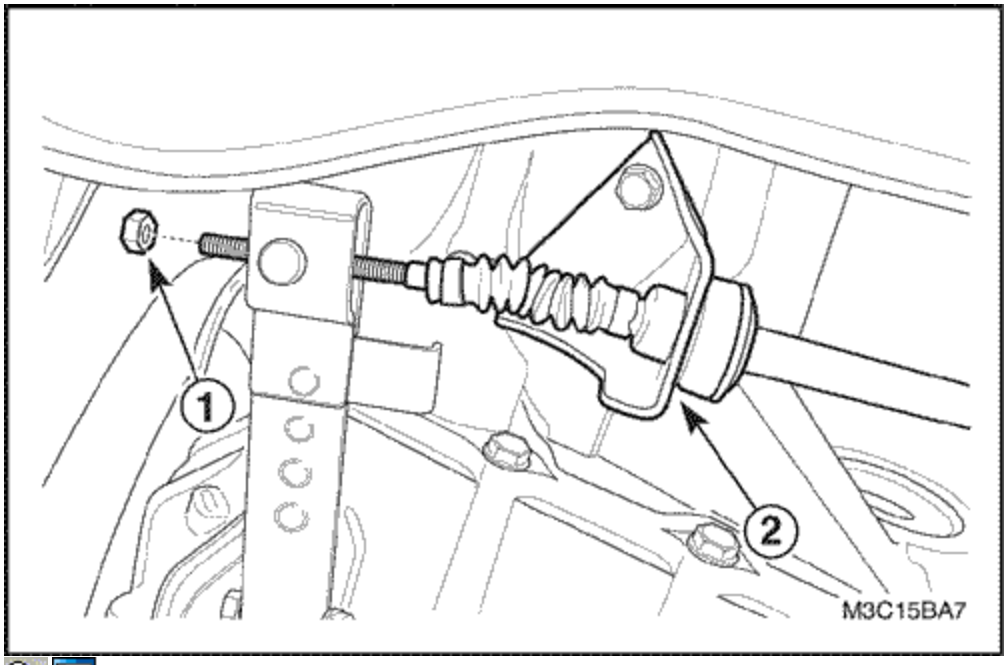


Installation Procedure

1. Install in the reverse order of removal.
2. Install the clutch release arm.
    - Install the clutch release arm matching to punched mark (1).

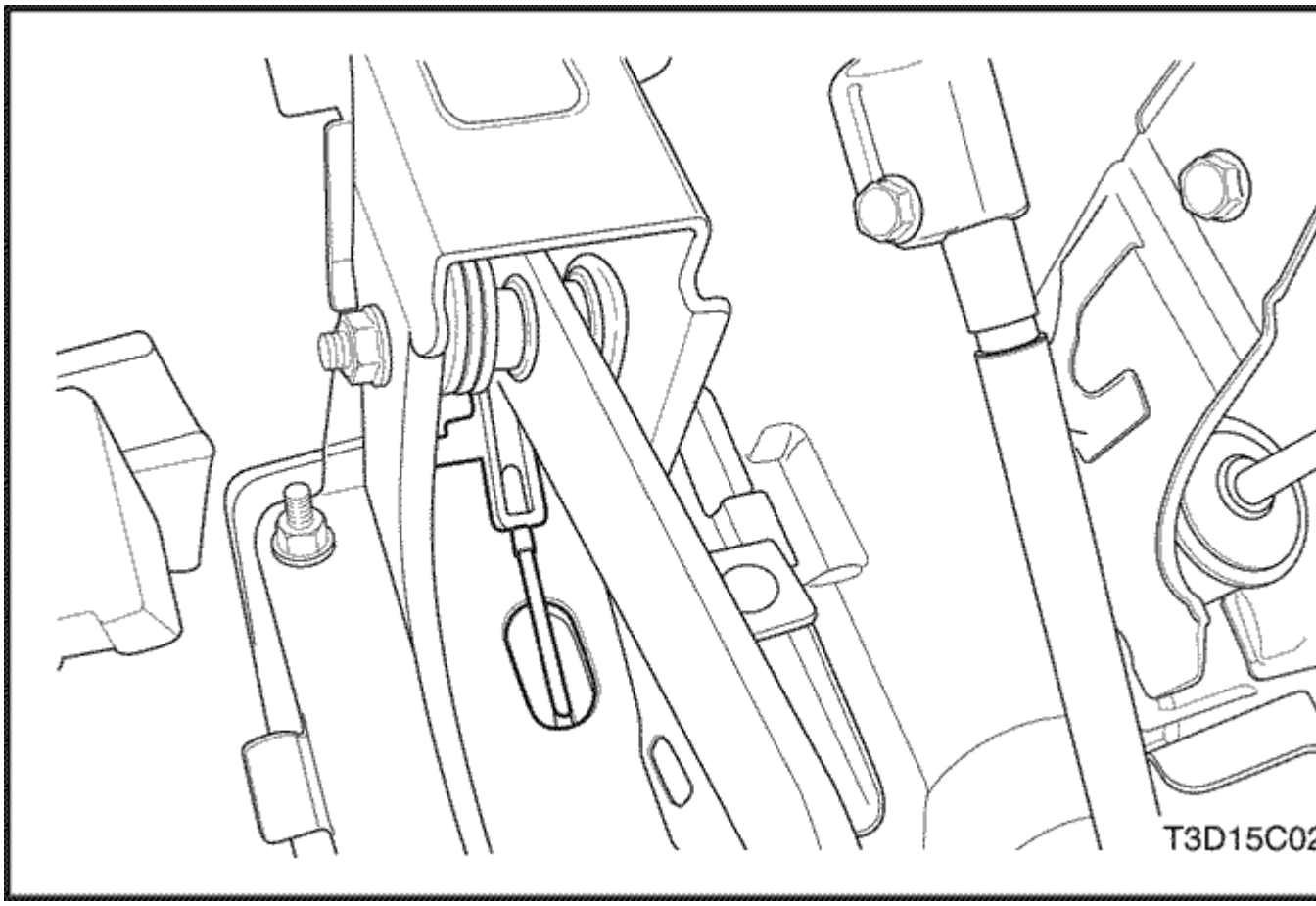
    Tighten
    Tighten the bolt and nut to 10-16 N•m (7.5-12 lb-ft).

3. Adjust the clutch cable. Refer to "Diagnosis" in this section.

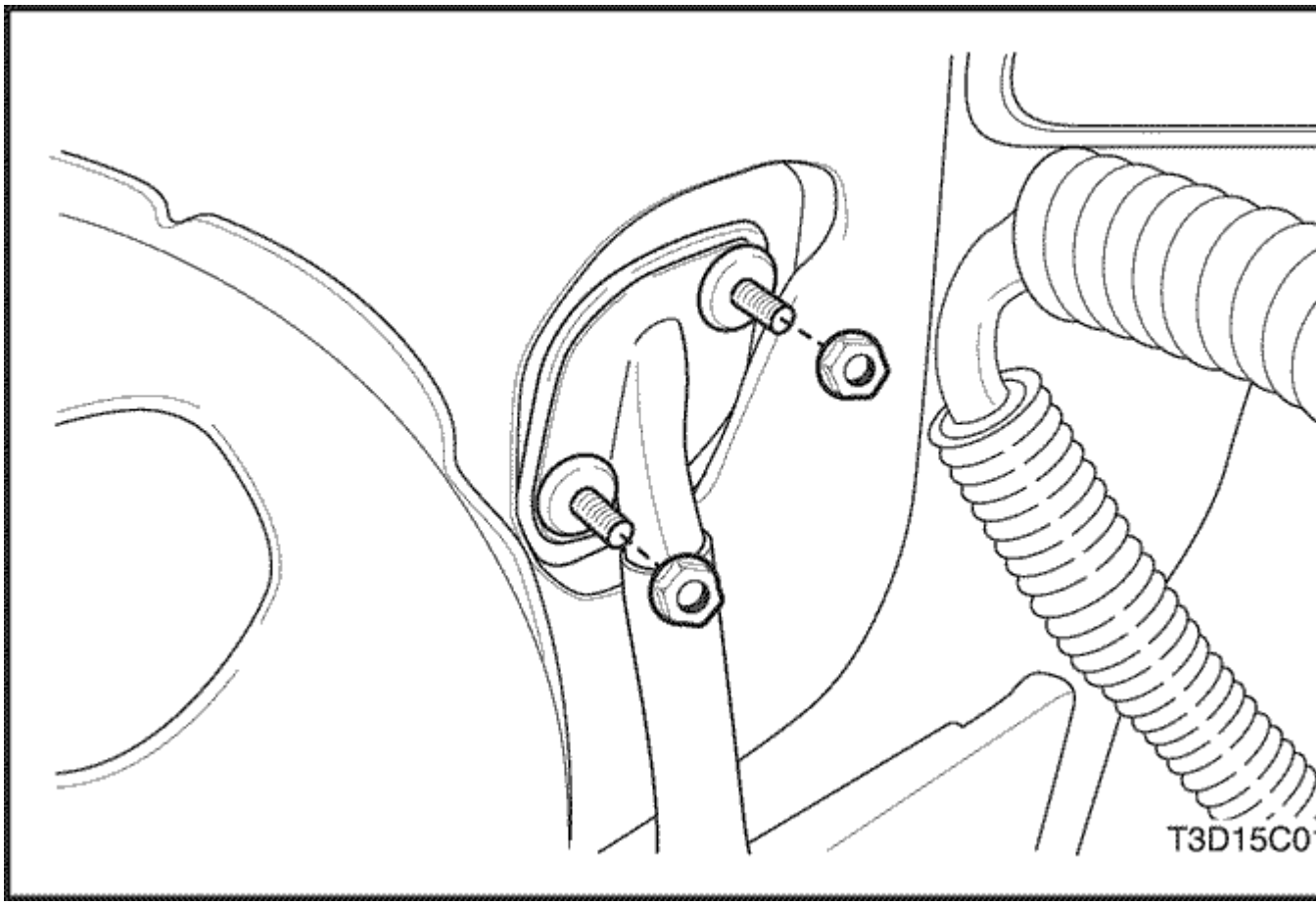


Clutch Cable
(Left-Hand Drive Shown, Right-Hand Drive Similar)
Removal Procedure

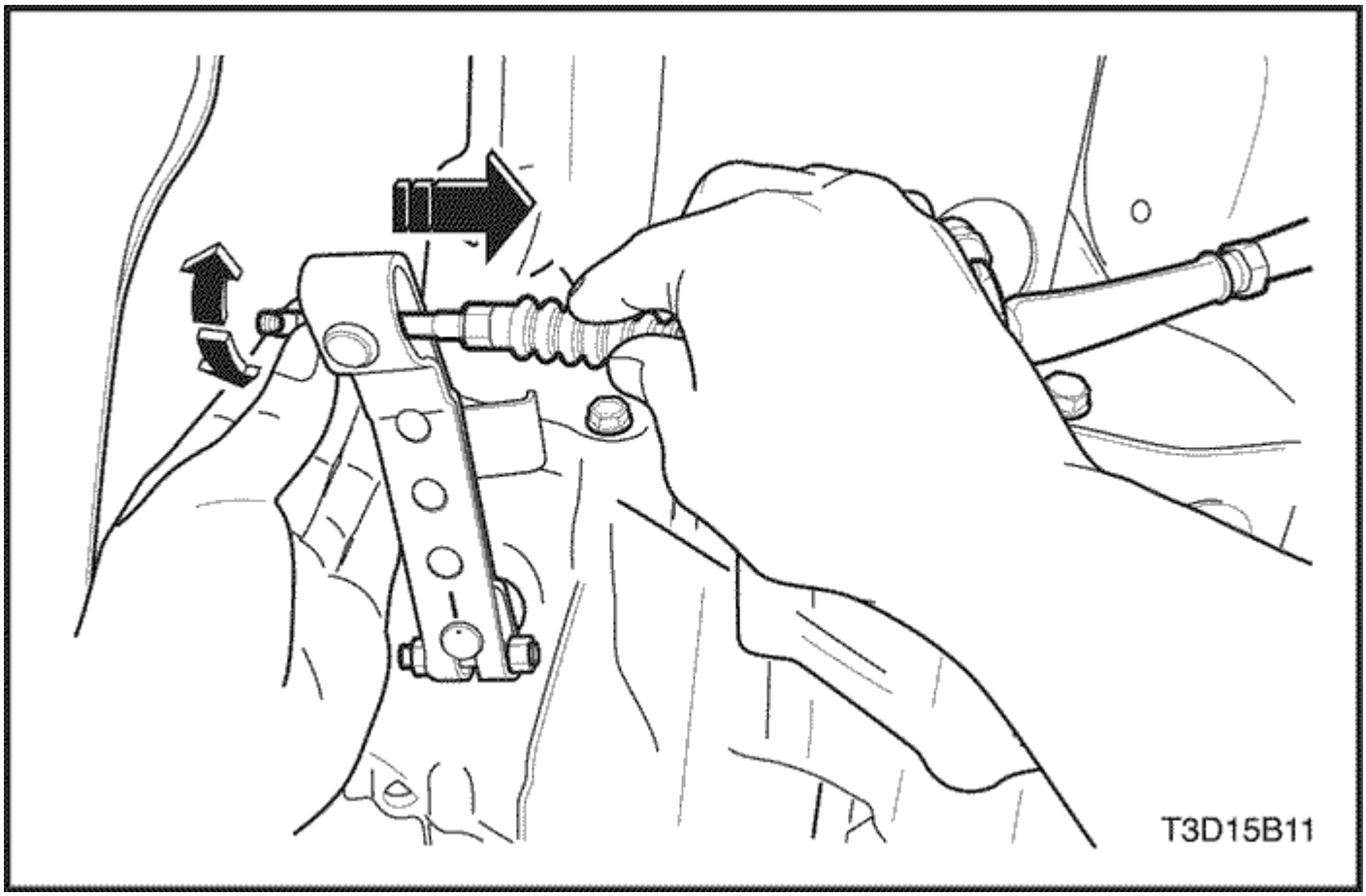
1. Disconnect the clutch cable from the transaxle.
    - Remove the adjusting nut (1).
    - Pull and remove the cable from the transaxle mount hole (2).



2. Disconnect the clutch cable from the pedal.



3. Remove the battery. Refer to *Section 1E, Engine Electrical.*
4. Remove the clutch cable nuts and the cable.

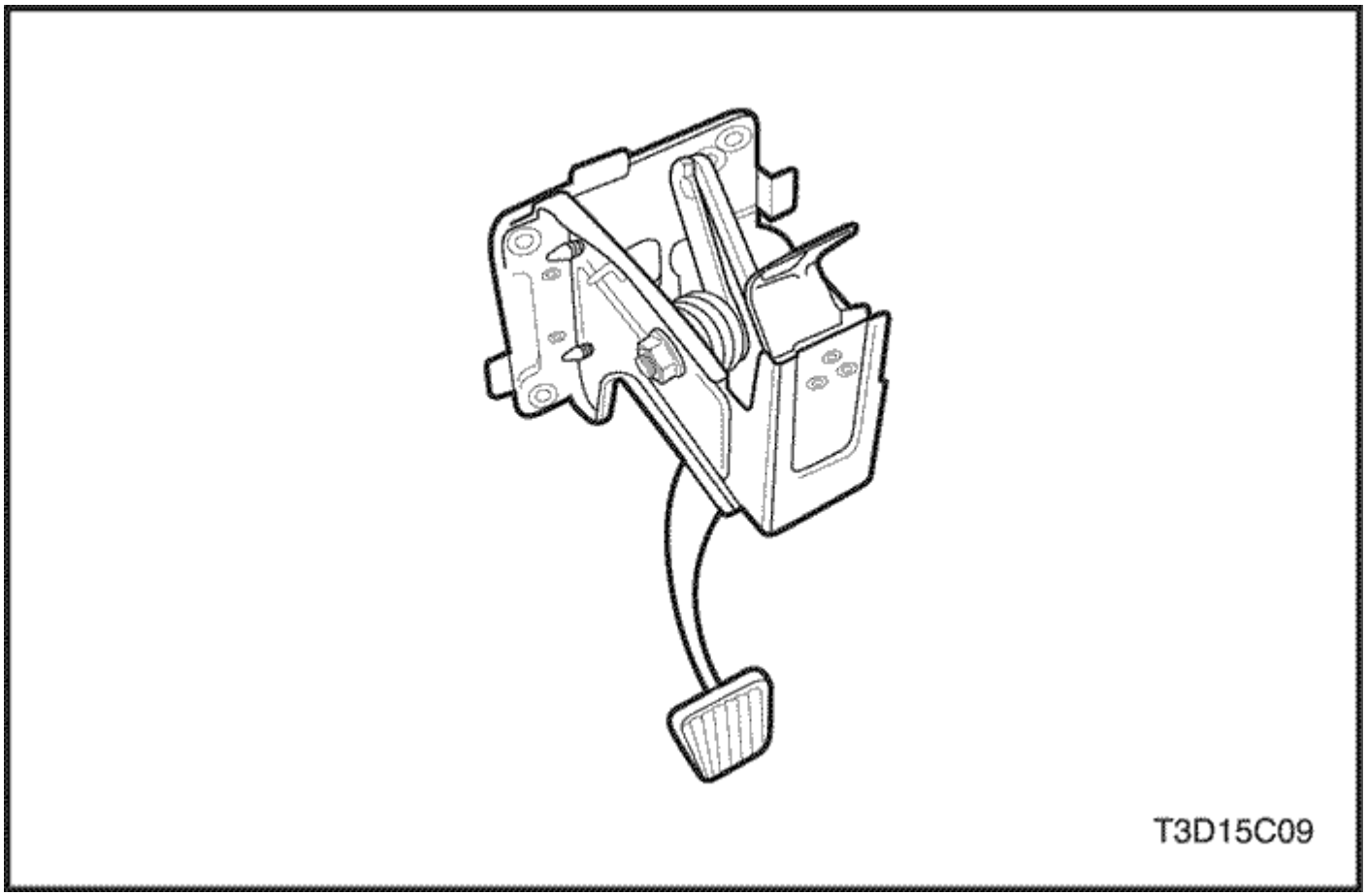


Installation Procedure

1. Install the clutch cable and nuts.

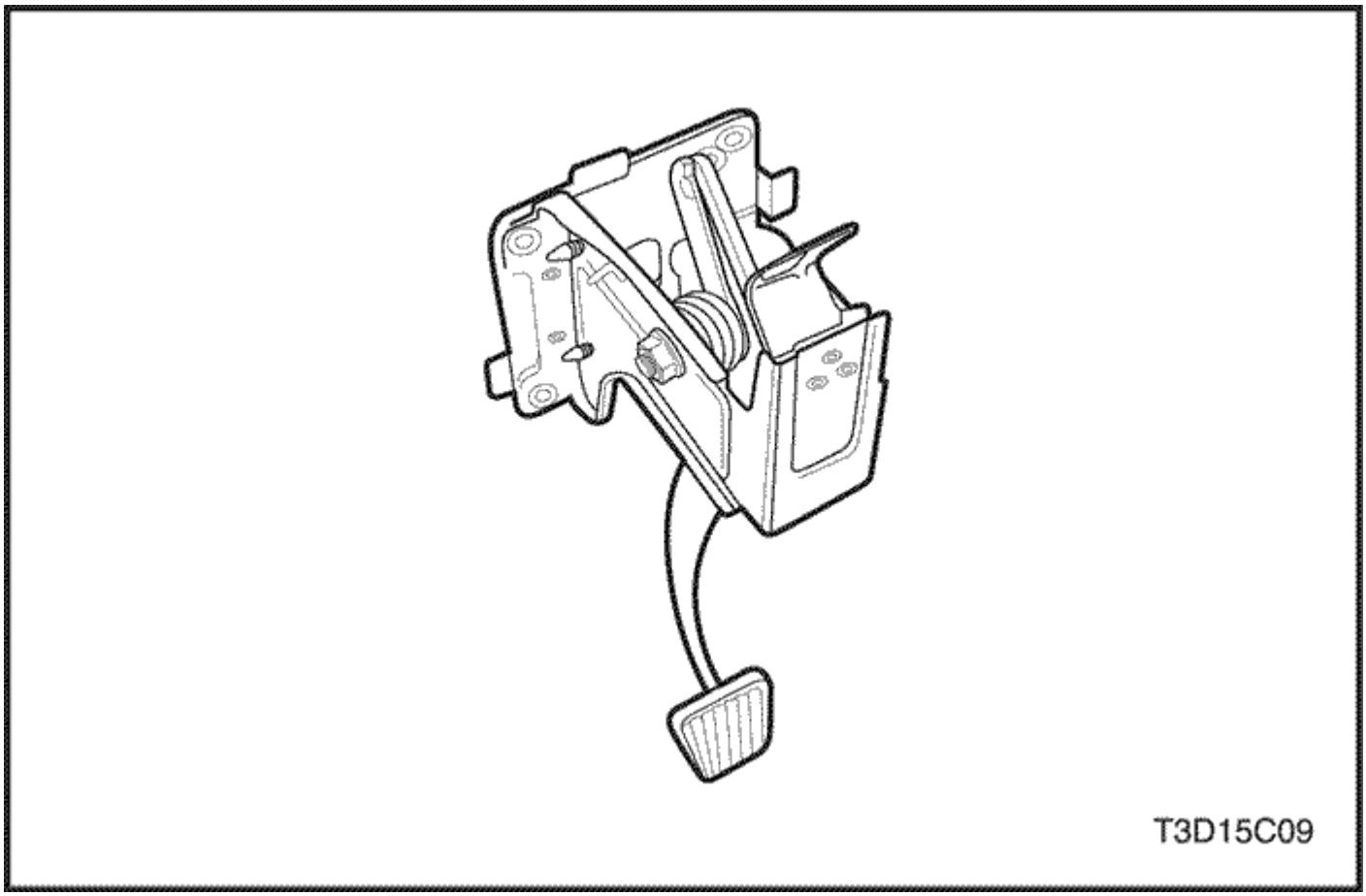
   Tighten
   Tighten the nuts 9-13 N•m (80-115 lb-in).

2. Install the battery.
3. Connect the clutch cable to the pedal.
4. Connect the clutch cable to the transaxle.
5. Adjust the clutch cable. Refer to "Diagnosis" in this section.
6. Coat the pin with grease.



Clutch Pedal
(Left-Hand Drive Shown, Right-Hand Drive Similar)
Removal Procedure

1. Disconnect the clutch cable. Refer to "Clutch Cable" in this section.
2. Remove the clutch pedal.
    - Release the pedal return spring.
    - Remove the nut.
    - Remove the shaft.
    - Remove the clutch pedal.
    - Remove the bushings.
    - Remove the pedal return spring.



Installation Procedure

Notice : Be sure to coat the shaft, the bushings and the spring with grease.

1. Install the pedal return spring.
2. Install the bushings.
3. Install the clutch pedal.
4. Install the shaft.
5. Install the nut.
6. Fix the pedal return spring.
7. Connect the clutch cable.
8. Adjust the clutch cable. Refer to "Diagnosis" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Driving Members

The driving members consist of two flat surfaces machined to a smooth finish. One of these is the rear face of the engine flywheel, and the other is the pressure plate. The pressure plate is fitted into a steel cover, which is bolted to the flywheel.

Driven Members

The driven member is the clutch disc with a splined hub which is free to slide lengthwise along the splines of the input shaft, but which drives the input shaft through these same splines.

The driving and driven members are held in contact by spring pressure. This pressure is exerted by a diaphragm spring in the pressure plate assembly.

Operating Members

The clutch release system consists of the clutch pedal, the clutch release shaft, the clutch cable, the release arm and the release bearing. When pressure is applied to the clutch pedal, the clutch release shaft pushes against the release bearing by rotating. The bearing then pushes against the diaphragm spring in the pressure plate assembly, thereby releasing the clutch.

SECTION 6A

POWER STEERING SYSTEM

SPECIFICATIONS

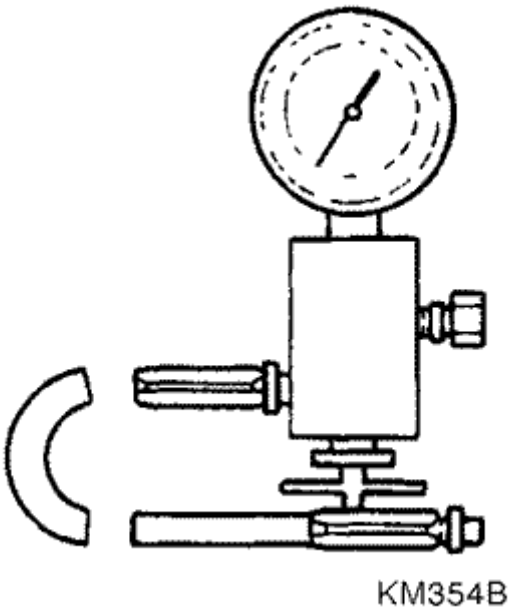
Fastener Tighteming Specifications

Application	N•m	Lb-Ft	Lb-In
Air Cleaner Housing Bolts	12	-	106
Power Steering Fluid Reservoir Attaching Bolts	7	-	62
Power Steering Line Fittings-Cylinder End	28	21	-
Power Steering Line Fittings-Valve End	18	13	-

Application	N•m	Lb-Ft	Lb-In
Power Steering Pump Pressure Line Union Nut	27	20	-
Steering Gear Inlet and Outlet Pipe Fittings	28	21	-

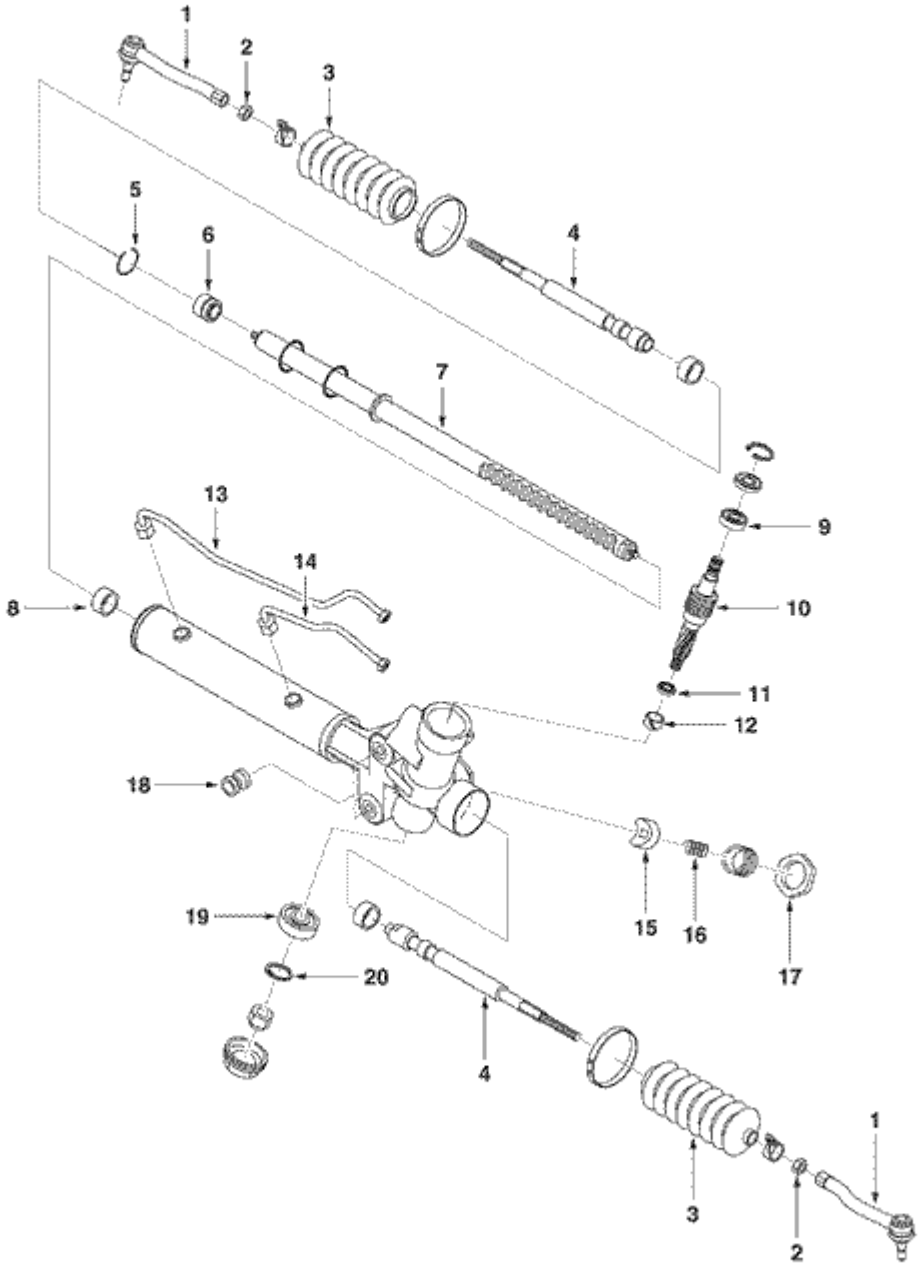
SPECIAL TOOLS

Special Tools Table

	KM-354-B Pressure Test Gauge Kit

COMPONENT LOCATOR

Rack and Pinion Steering Gear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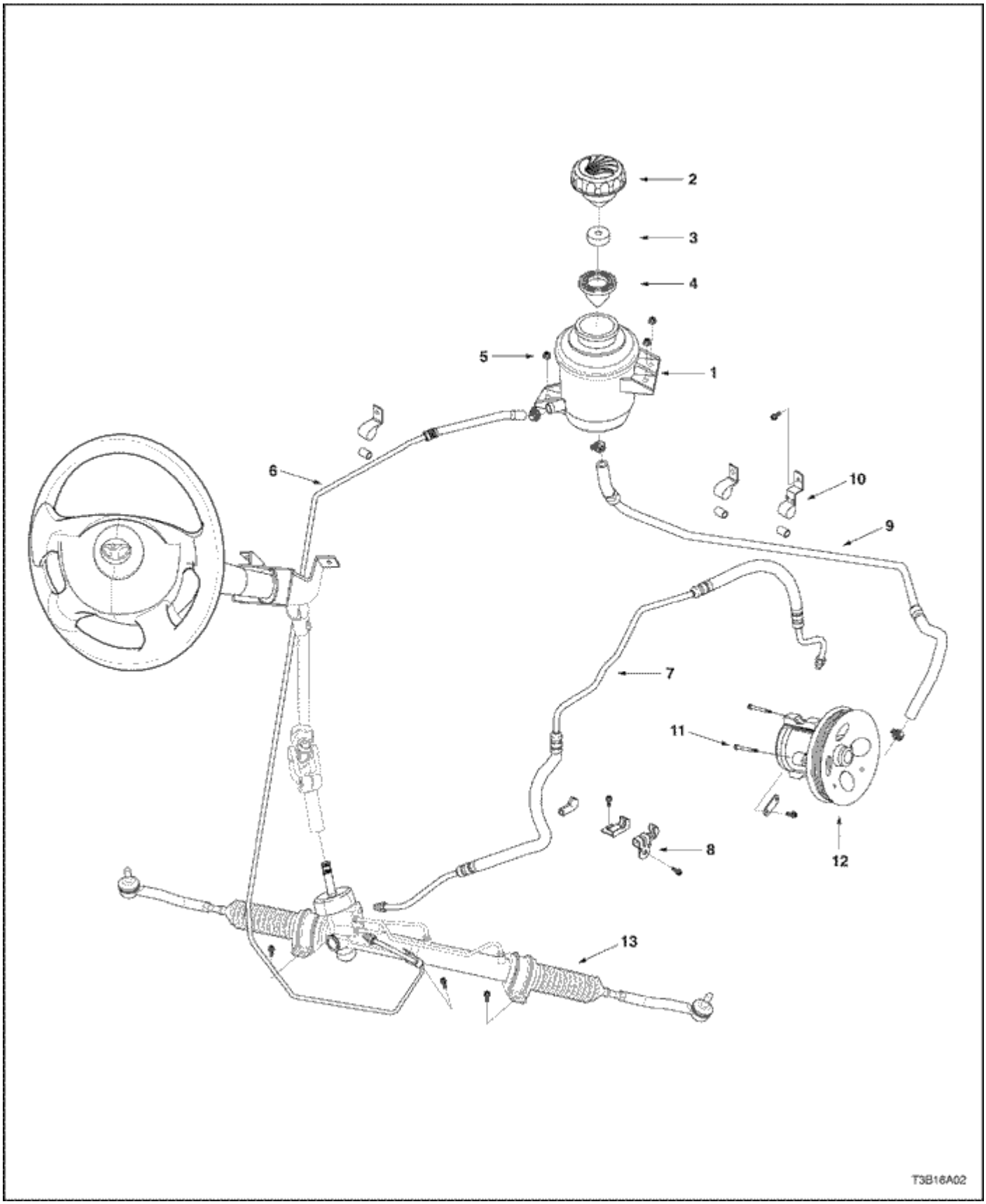
1. Tie Rod End
2. Tie Rod End Lock Nut
3. Rack & Pinion boot
4. Tie Rod
5. Bulk head Retaining Ring
6. Bush & Cylinder Bulk Head
7. Steering Rack Gear
8. Rack Inner Seal
9. Bearing
10. Pinion Valve
11. Pinion Shaft Seal
12. Bushing
13. Cylinder Liner Cut
14. Cylinder Liner Cut
15. Rack Bearing
16. Adjudt Spring
17. Adjust Plug
18. Grommet
19. Pinion Bearing
20. Retaining Ring

Power Steering System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1. Power Steering Oil Tank
2. Power Steering Oil Tank Cap
3. Power Steering Oil Tank Sponge
4. Power Steering Oil Tank Shield
5. Power Steering Oil Tank Nut
6. Oil Return Hose
7. Power Steering Pump High Pressure Pipe.
8. Clamp
9. Oil Suction Hose
10. Clamp
11. Power Steering Pump Bolt
12. Power Steering Pump
13. Power Steering Gear Set

DIAGNOSIS

Power Steering System Pressure Test
Tools Required

KM-354-B Pressure Test Gauge Kit
Check the fluid pressure as follows to determine whether the trouble is in the pump or the gear unit.
Test Procedure

1. Check the power steering fluid level and the power steering pump belt tension. Refer to "Checking and Adding Fluid" in this section and *Section 6B, Power Steering Pump.*
2. Disconnect the high pressure line at the pump. Use a small container to catch any fluid.
3. Connect the hose of the pressure test gauge kit KM-354-B to the power steering pressure hose from the power steering pump.
4. Place the gear selector lever in PARK (automatic transaxle-equipped vehicles) or NEUTRAL (manual transaxle-equipped vehicles). Set the parking brake.
5. Open the gauge valve fully.
6. Start the engine and let it idle.
7. Turn the steering wheel from lock-to-lock several times to warm the fluid to operating temperature.

8. Increase the engine speed to 1,500 rpm.

Notice : The power steering pump could be damaged if the valve is fully closed for more than five seconds.

9. Close the gauge valve fully, and read the pressure. The pump pressure with the valve closed should be between 7 088 kPa to 8 619 kPa (1,028 psi to 1,250 psi).
10. Close the gauge valve fully, and read the pressure. The pump pressure with the valve closed should be between 7 088 kPa to 8 619 kPa (1,028 psi to 1,250 psi).
11. Immediately open the gauge valve fully.
12. Turn the steering wheel all the way to the left and the right. If the pressure is within the specified limits, the problem is not in the pump. Check the power steering gear for leaks.

Power Steering System Leak Test
General Procedure
Inspect the following:

- The fluid reservoir for overfill.
- Fluid for aeration and overflow.
- The hoses for loose connections.
- The torsion bar, stub shaft and adjuster seals for leaks.
- The component sealing surfaces for damage.

Important : Verify the exact point of the leak. The point from which the fluid is dripping is not necessarily the point at which the system is leaking. When service is required, clean the leak area upon disassembly, replace the leaking seal, check the component sealing surfaces for damage and reset the torque bolt to specifications, where required.
External Leak Check
The purpose of this procedure is to pinpoint the location of the leak. In some cases, the leak can be easily located, but seepage-type leaks may be harder to find. To locate seepage leaks, use the following method:

1. With the engine off, wipe dry the complete power steering system.
2. Check the power steering fluid level in the pump's reservoir. Adjust the fluid level as necessary. Refer to "Checking and Adding Fluid" in this section.

Notice : Do not hold the steering wheel at a stop for any length of time as this can damage the power steering pump.

3. Start the engine. Turn the steering wheel counterclockwise and clockwise from stop to stop several times.
4. Start the engine. Turn the steering wheel counterclockwise and clockwise from stop to stop several times.
5. Find the exact area of the leak and repair it.

MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

Bleeding the Power Steering System

If the power steering hydraulic system has been serviced, an accurate fluid level reading cannot be obtained until the air is bled from the system. Follow these steps to bleed the air from the system.

1. Turn the wheels all the way to the left and add the power steering fluid to the MIN mark on the fluid level indicator.

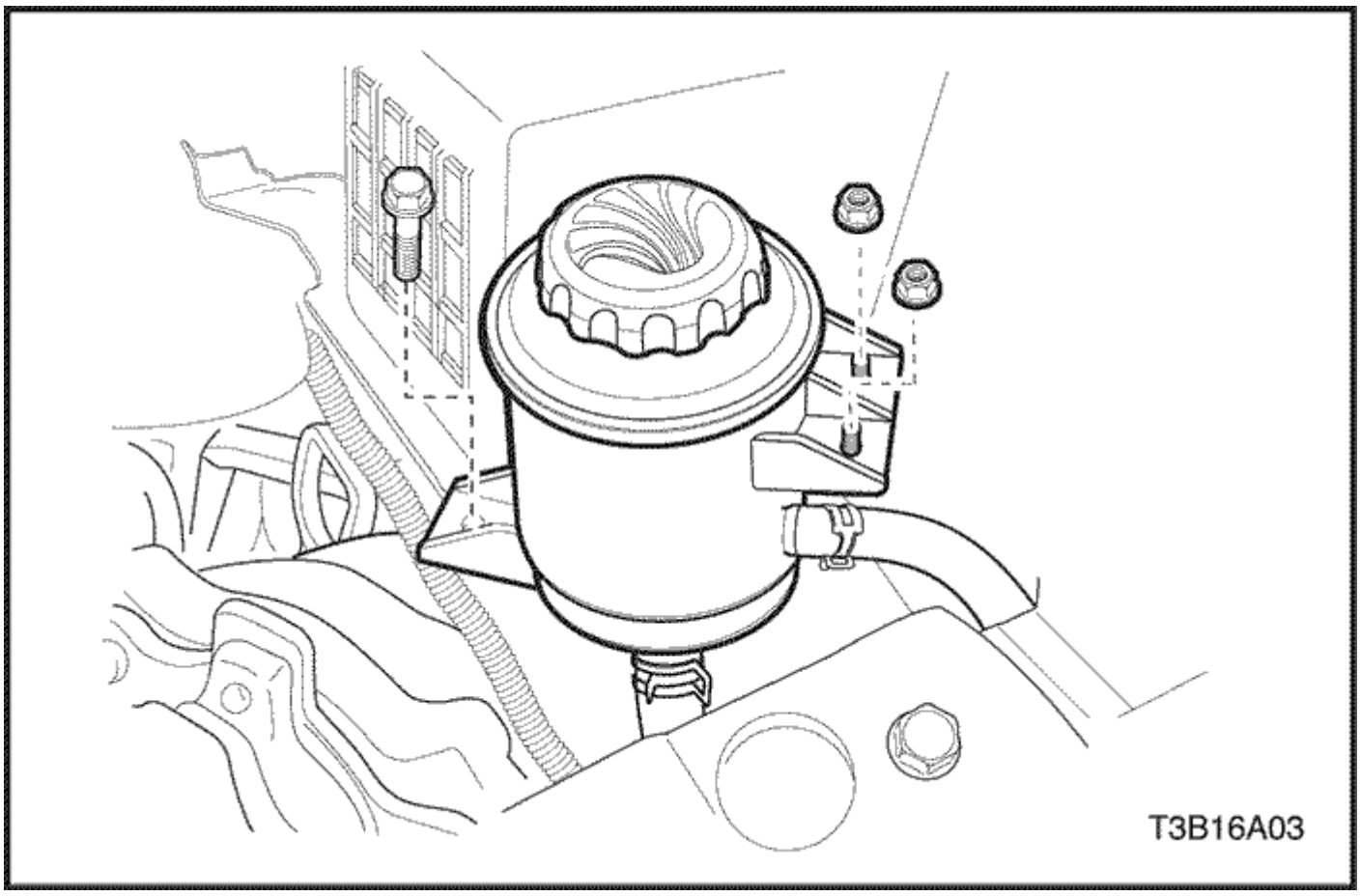
   Notice : When adding fluid or making a complete fluid change, always use DEXRON ® III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

2. Start the engine. With the engine running at fast idle, recheck the fluid level. If necessary, add fluid to bring the level up to the MIN mark.
3. Bleed the system by turning the wheels from side to side without reaching the stop at either end. Keep the fluid level at the MIN mark. The air must be eliminated from the fluid before normal steering action can be obtained.
4. Return the wheels to the center position. Continue running the engine for two to three minutes.
5. Road test the car to be sure the steering functions normally and is free from noise.
6. Recheck the fluid level as described in steps 1 and 2. Make sure the fluid level is at the MAX mark after the system has stabilized at its normal operating temperature. Add fluid as needed.

Checking and Adding Fluid

Notice : When adding fluid or making a complete fluid change, always use DEXRONR ® III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

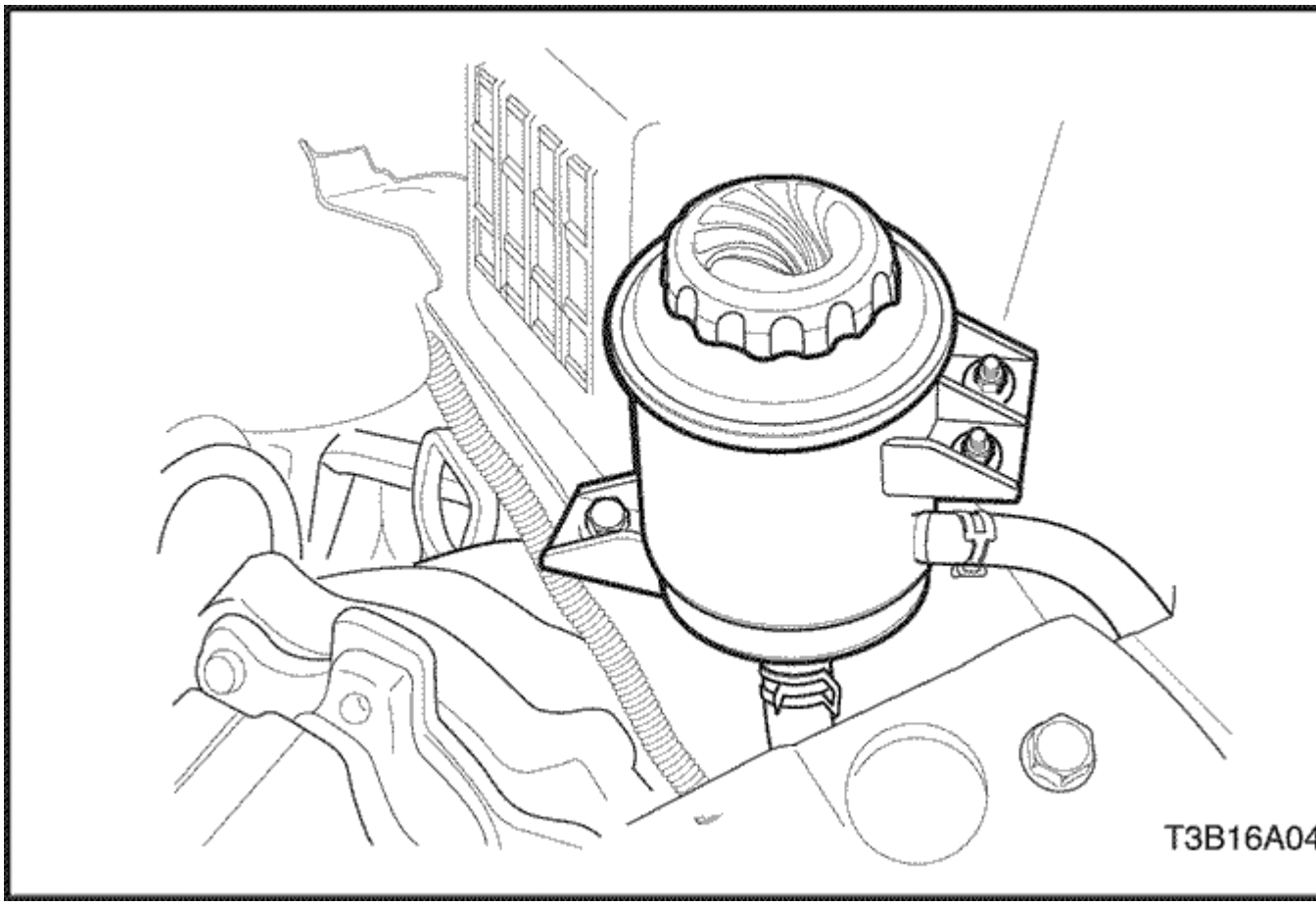
1. The power steering fluid level is indicated either by marks on a see-through fluid reservoir or by marks on a fluid level indicator on the fluid reservoir cap.
2. If the fluid is warmed up to 66°C (150°F), the fluid level should be between the MAX and MIN marks. Add fluid as needed.
3. If the fluid is cool, 21°C (70°F), the fluid level should be at the MIN mark. Add fluid as needed.



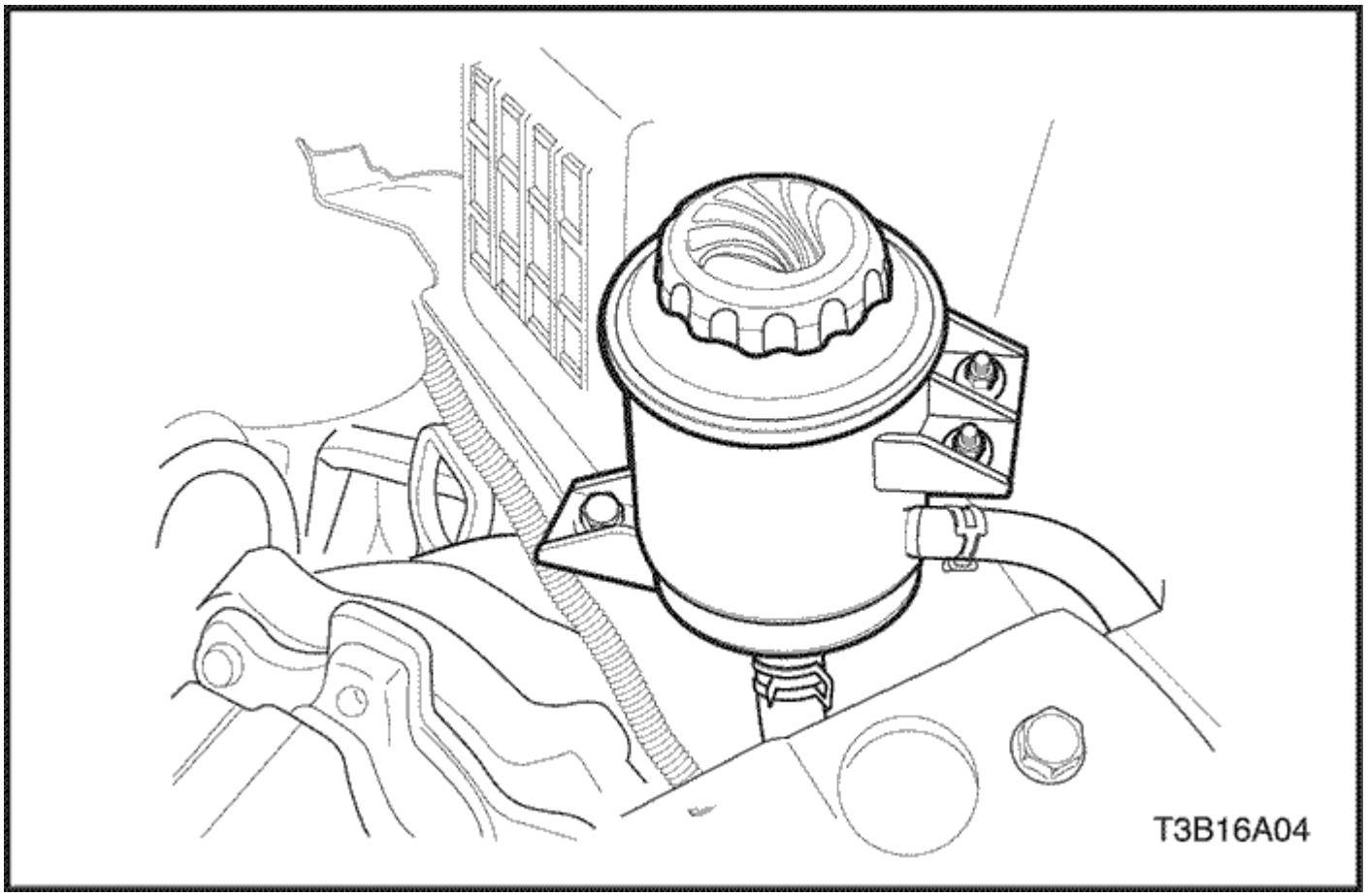
Fluid Reservoir
Removal Procedure

1. Siphon the power steering fluid from the fluid reservoir.
2. Loosen the hose clamps and remove both hoses.

Notice : The hoses must be clogged just after removal to prevent foreign material contaminants from entering the power steering system. Contamination could lead to deterioration of the steering components and loss of steering action.



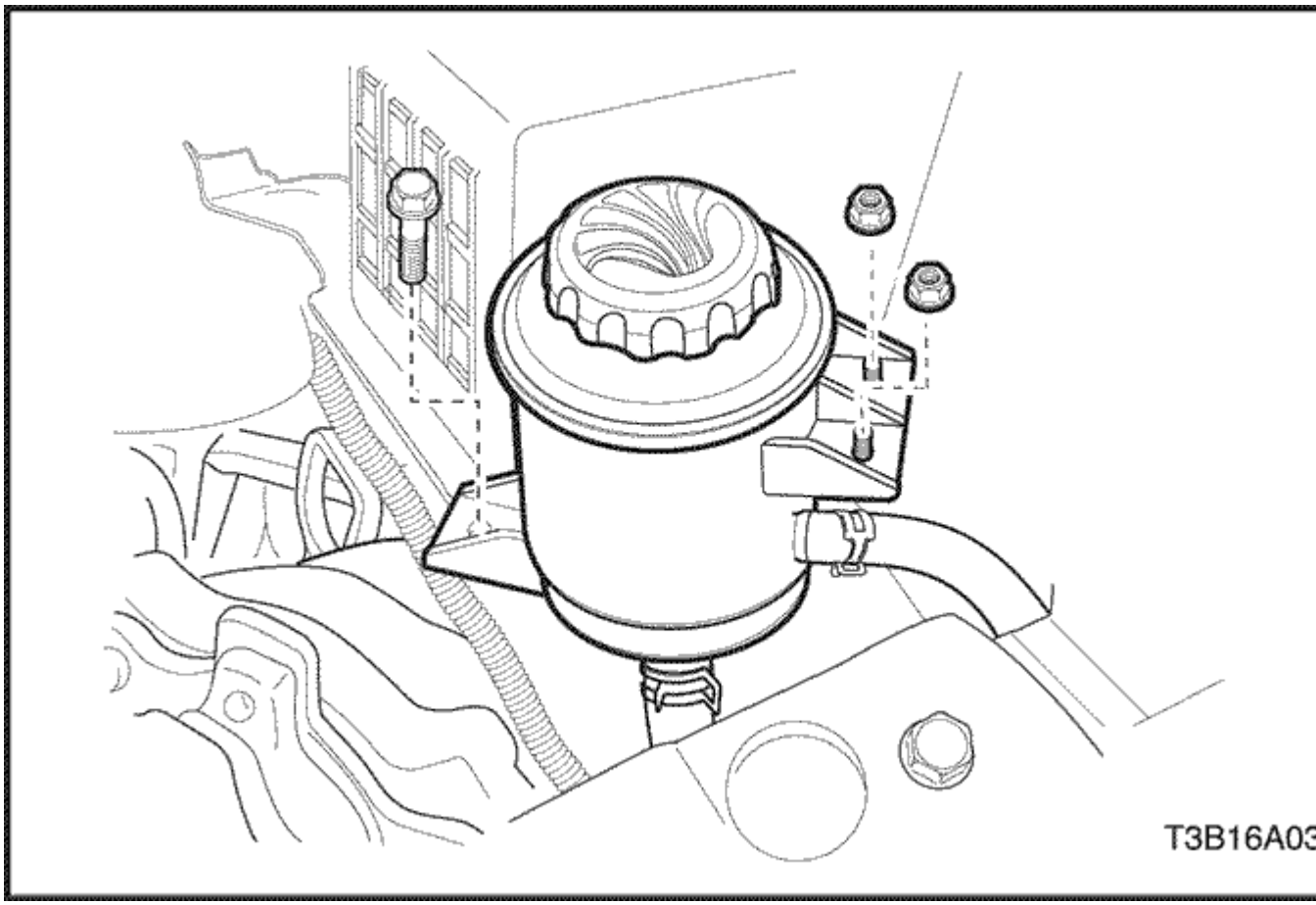
3. Remove the fluid reservoir attaching bolts and remove the fluid reservoir.



Installation Procedure

1. Attach the fluid reservoir with the power steering fluid reservoir attaching bolts.

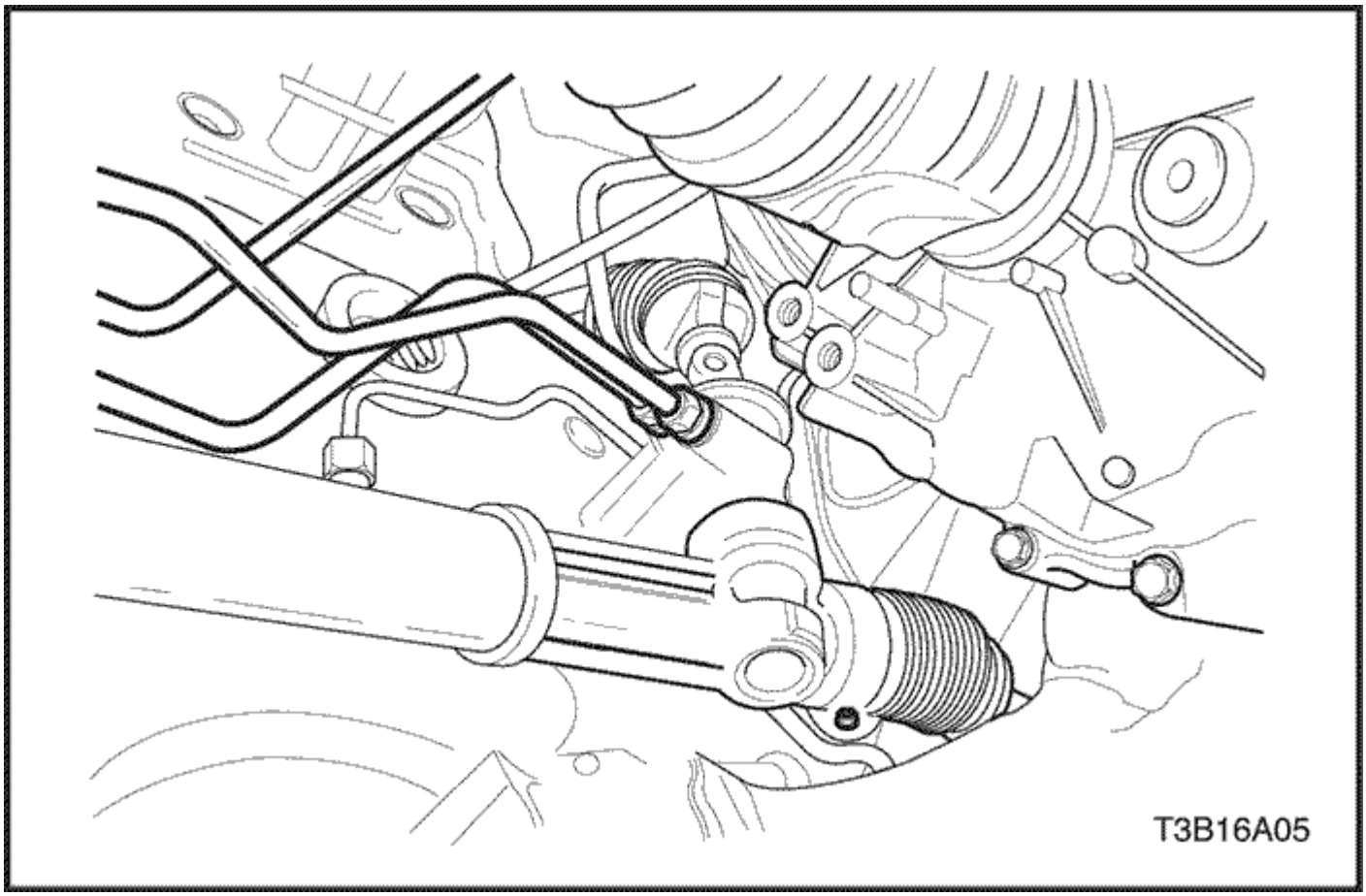
   Tighten
   Tighten the power steering fluid reservoir attaching bolts to 7 N•m (62 lb-in).



2. Connect both hoses and secure the hose clamps.

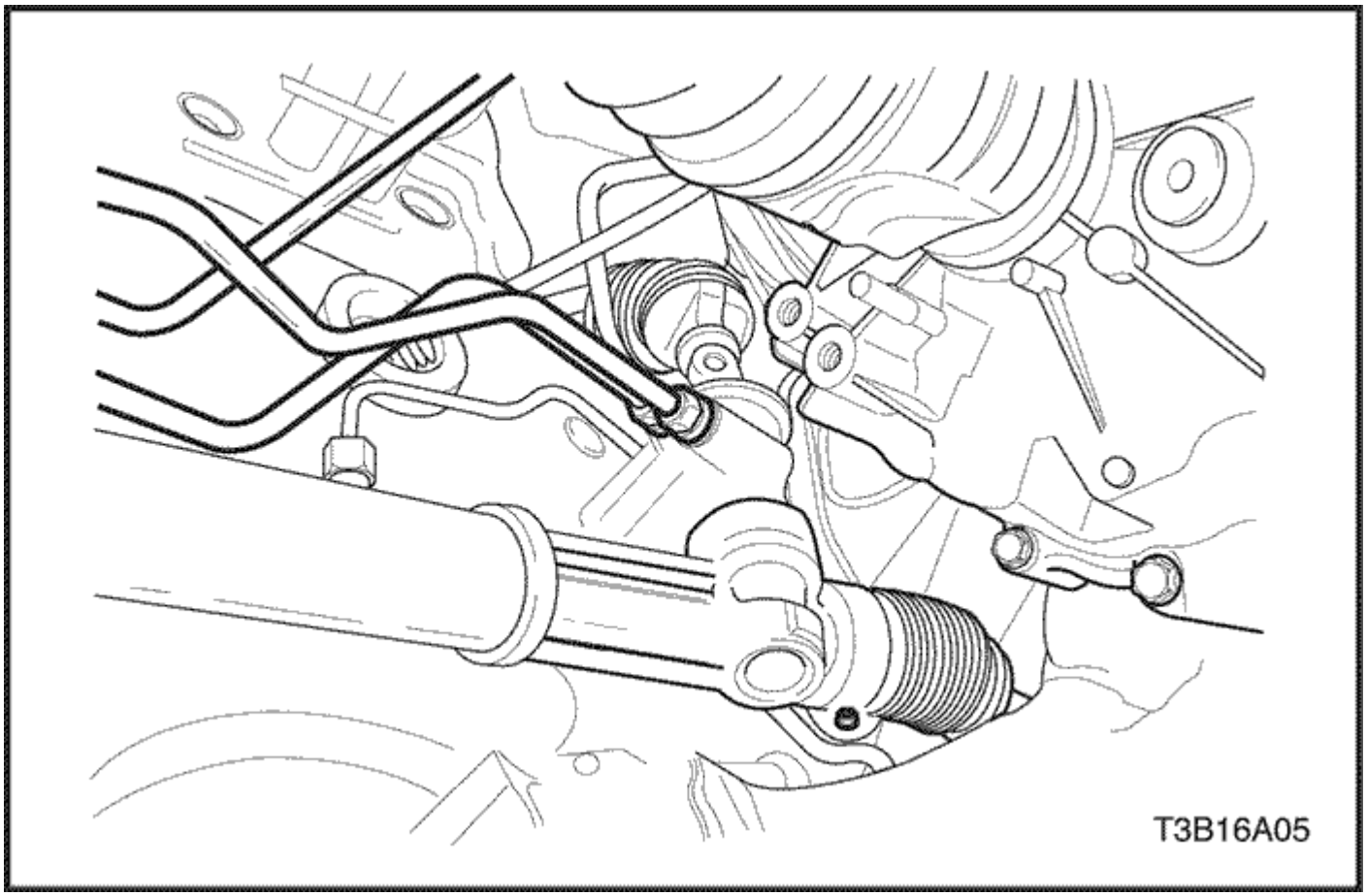
   Notice : When adding fluid or making a complete fluid change, always use DEXRON ® III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

3. Fill the fluid reservoir with power steering fluid.
4. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to "Bleeding the Power Steering System"in this section.



Hoses and Pipes
Steering Gear Cylinder Pipes
Removal Procedure

1. Siphon the power steering fluid from the fluid reservoir.
2. Disconnect and remove the steering gear cylinder pipes at the rack and pinion housing. Remove the O-ring seals from the housing.



Installation Procedure

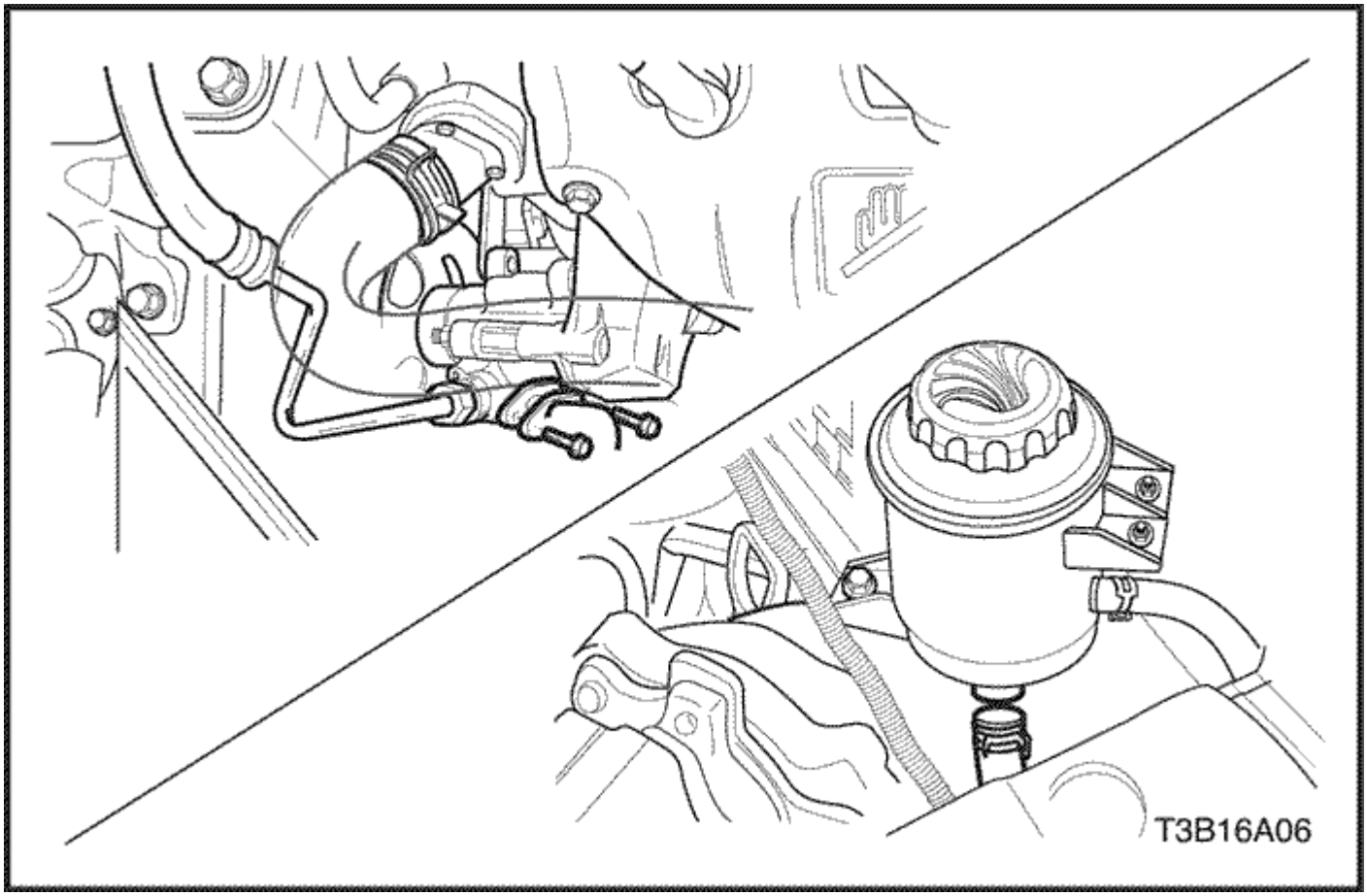
1. Install new O-rings onto the cylinder pipes. Install the steering gear cylinder pipes into the rack and pinion housing.

   Tighten
   Tighten the power steering line fittings at the cylinder end to 28 N•m (21 lb-ft).

   Tighten
   Tighten the power steering line fittings at the valve end to 18 N•m (13 lb-ft).

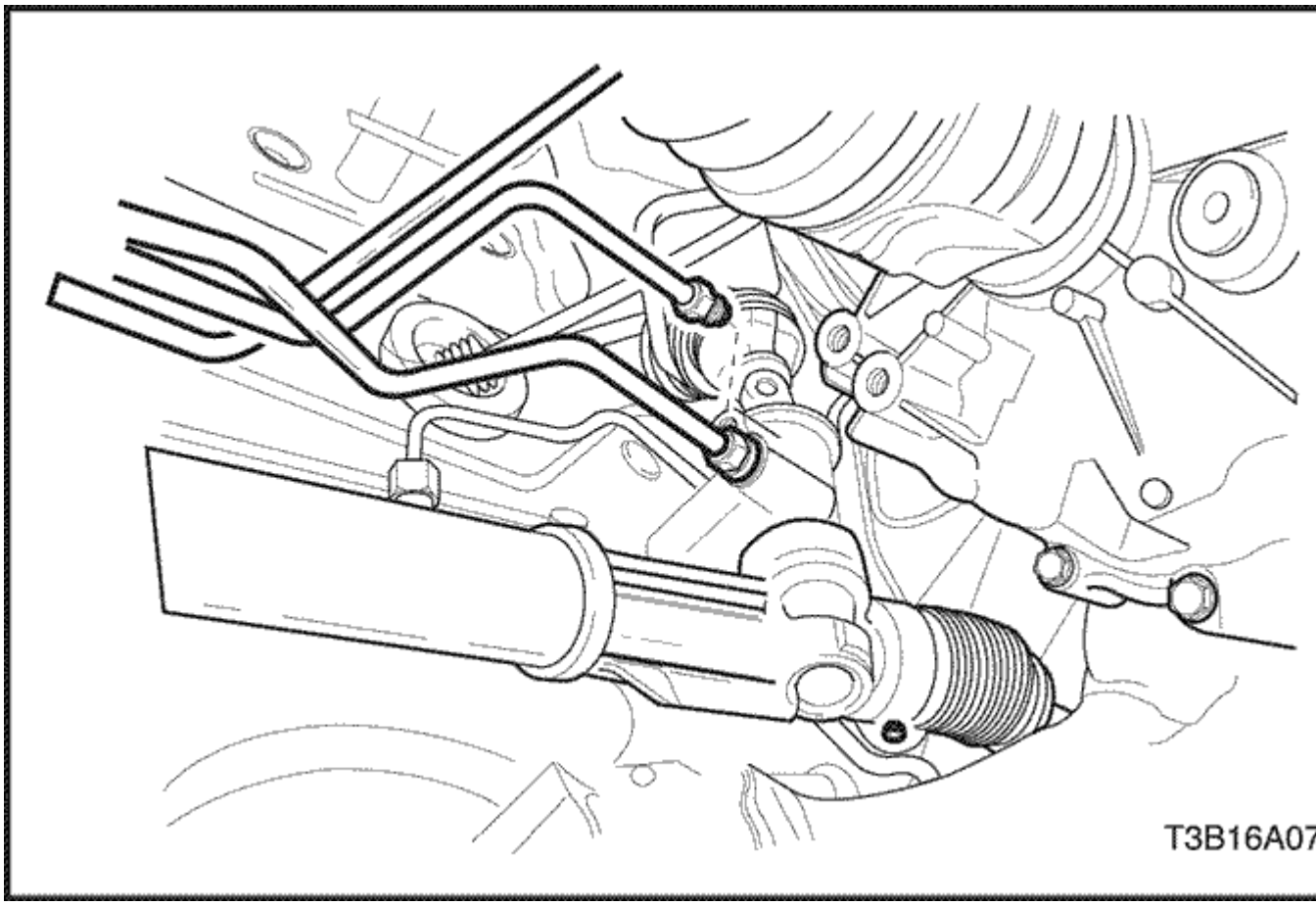
2. Fill the fluid reservoir with power steering fluid.

3. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to "Bleeding the Power Steering System"in this section.
4. Lower the vehicle.

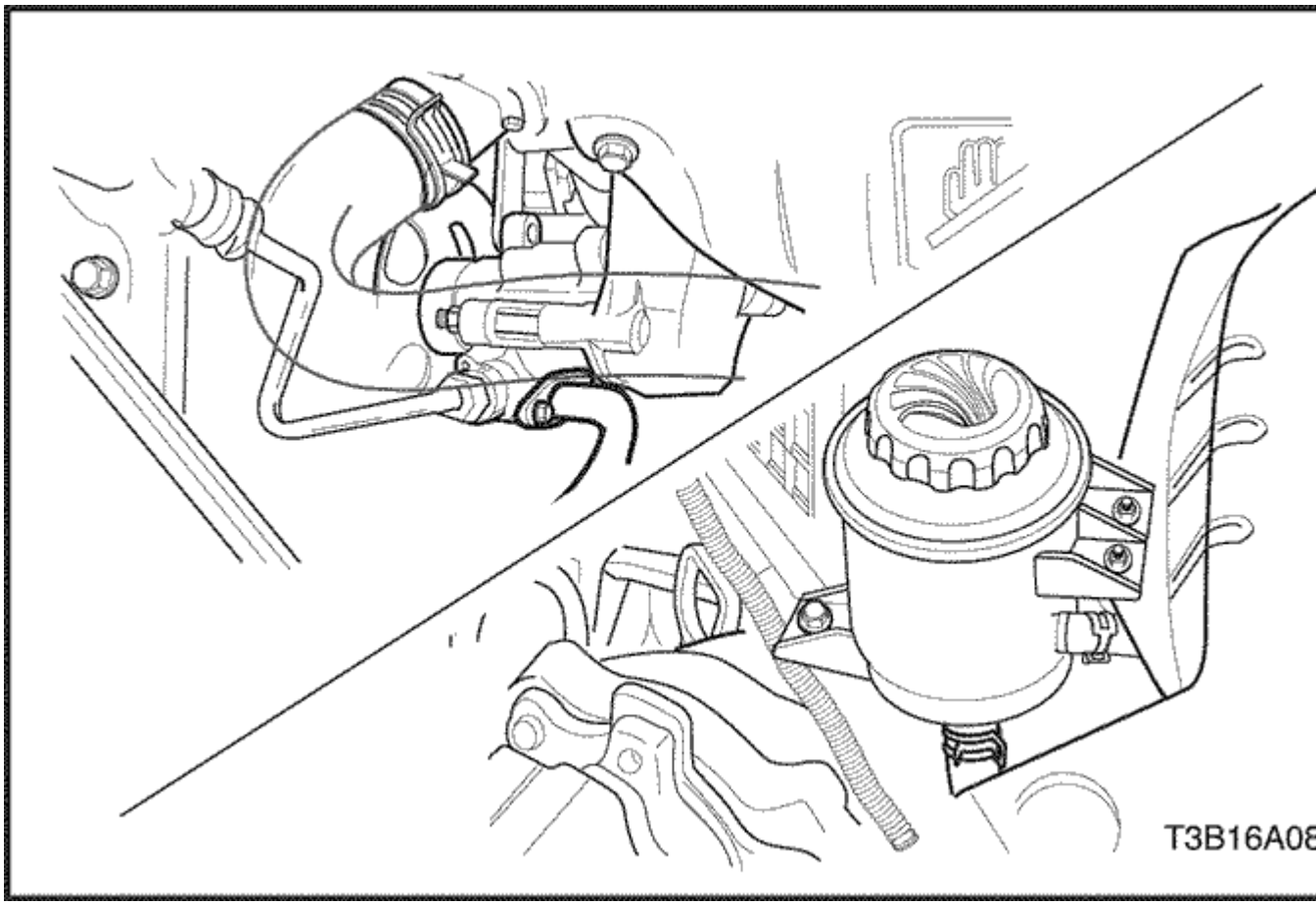


Power Steering Pump Hoses and Pipes
Removal Procedure

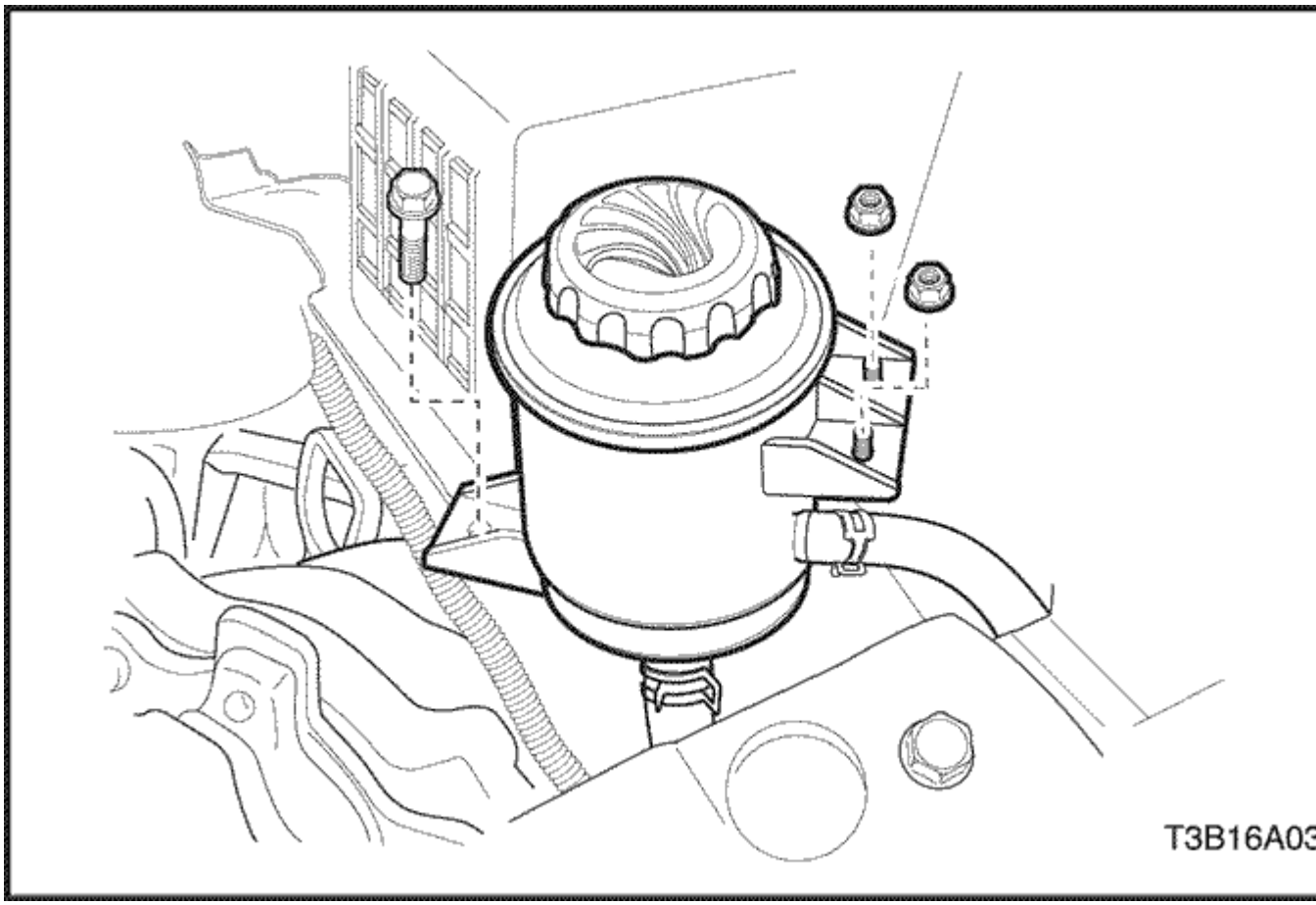
1. Siphon the power steering fluid from the fluid reservoir.
2. Disconnect the pressure line pipe and the supply line hose from the inlet and outlet connections on the power steering pump.
3. Remove the air cleaner housing, if needed.



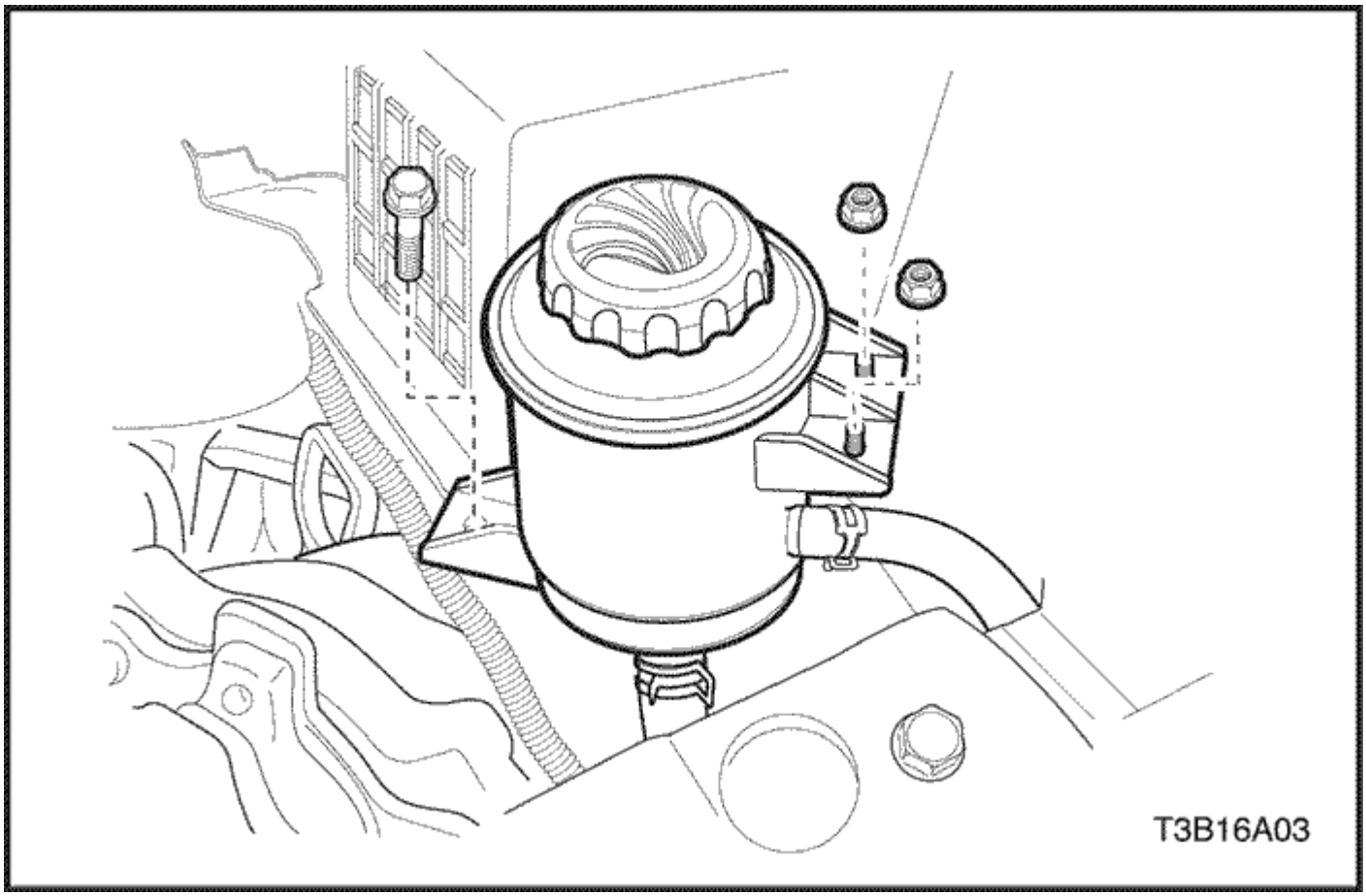
4. Disconnect the pressure line and return line hoses from the retaining clips at the bottom and the side of the radiator.



5. Disconnect the pressure line inlet pipe from the steering gear.

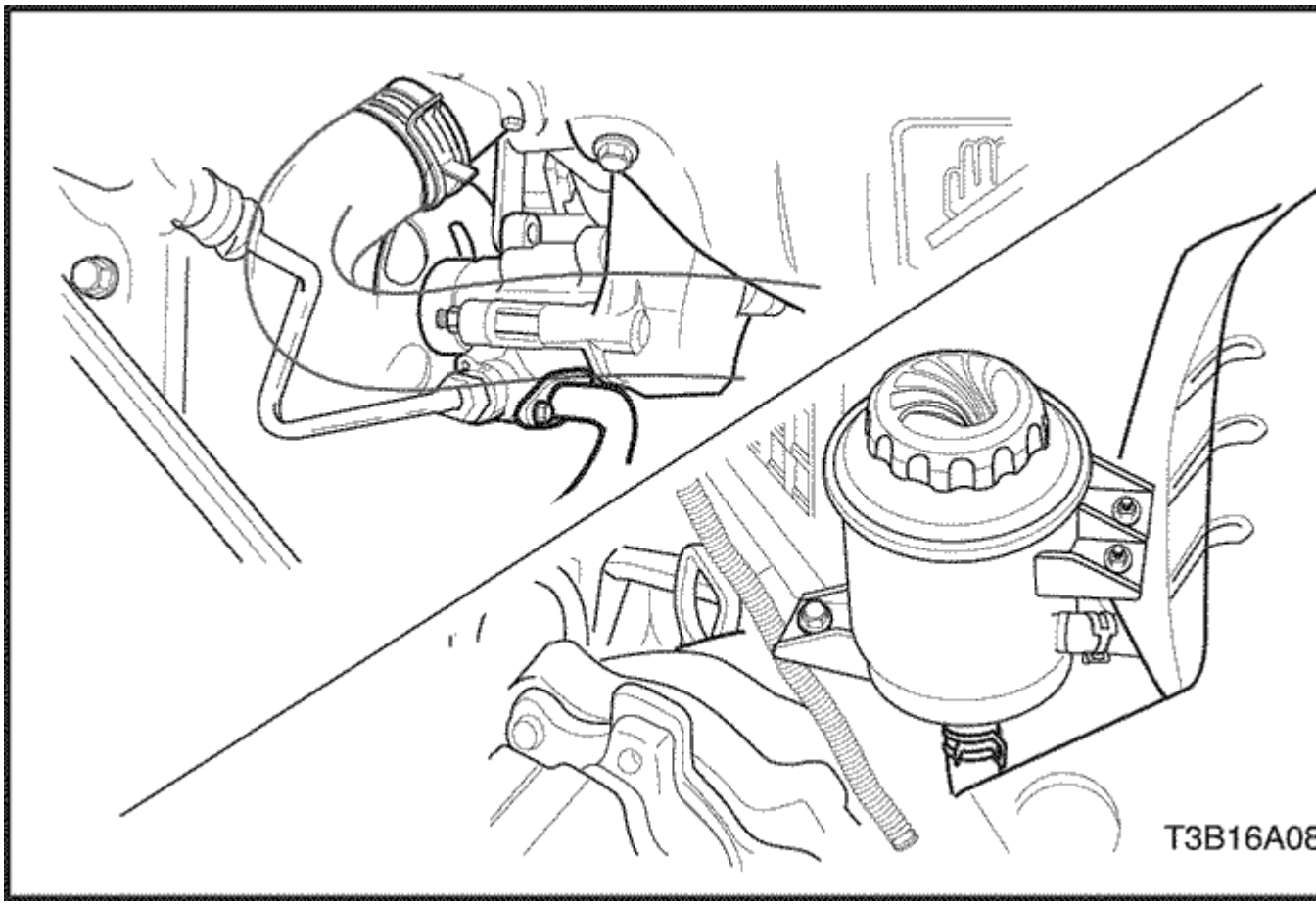


6. Disconnect the supply line hose from the power steering fluid reservoir.
7. Remove the power steering pump pressure line and return line.



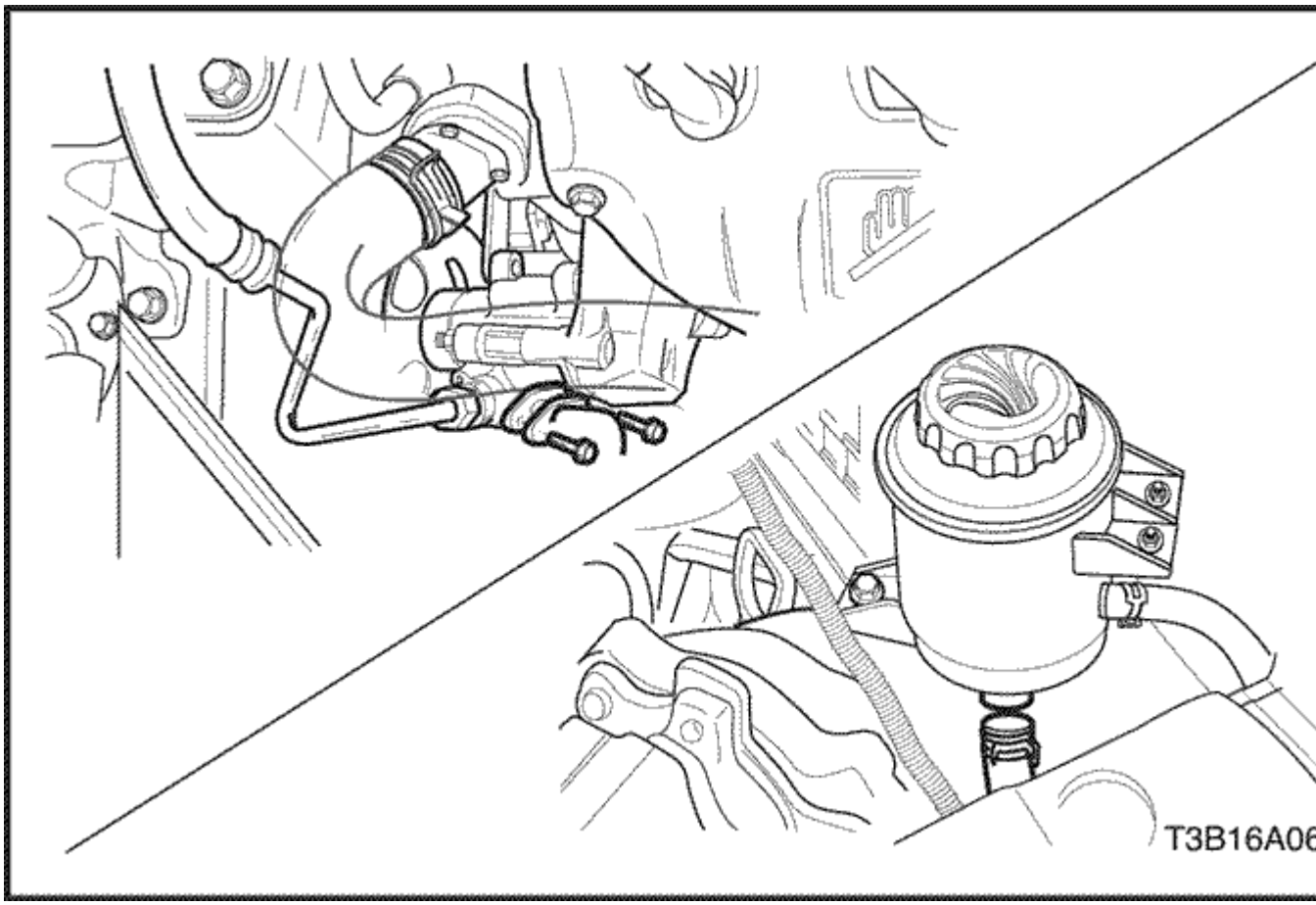
Installation Procedure

1. Install the power steering pump pressure line and return line.
2. Connect the supply line hose to the power steering fluid reservoir.



3. Connect the pressure line inlet pipe to the steering gear.

   Tighten
   Tighten the steering gear inlet pipe fitting to 28 N•m (21 lb-ft).



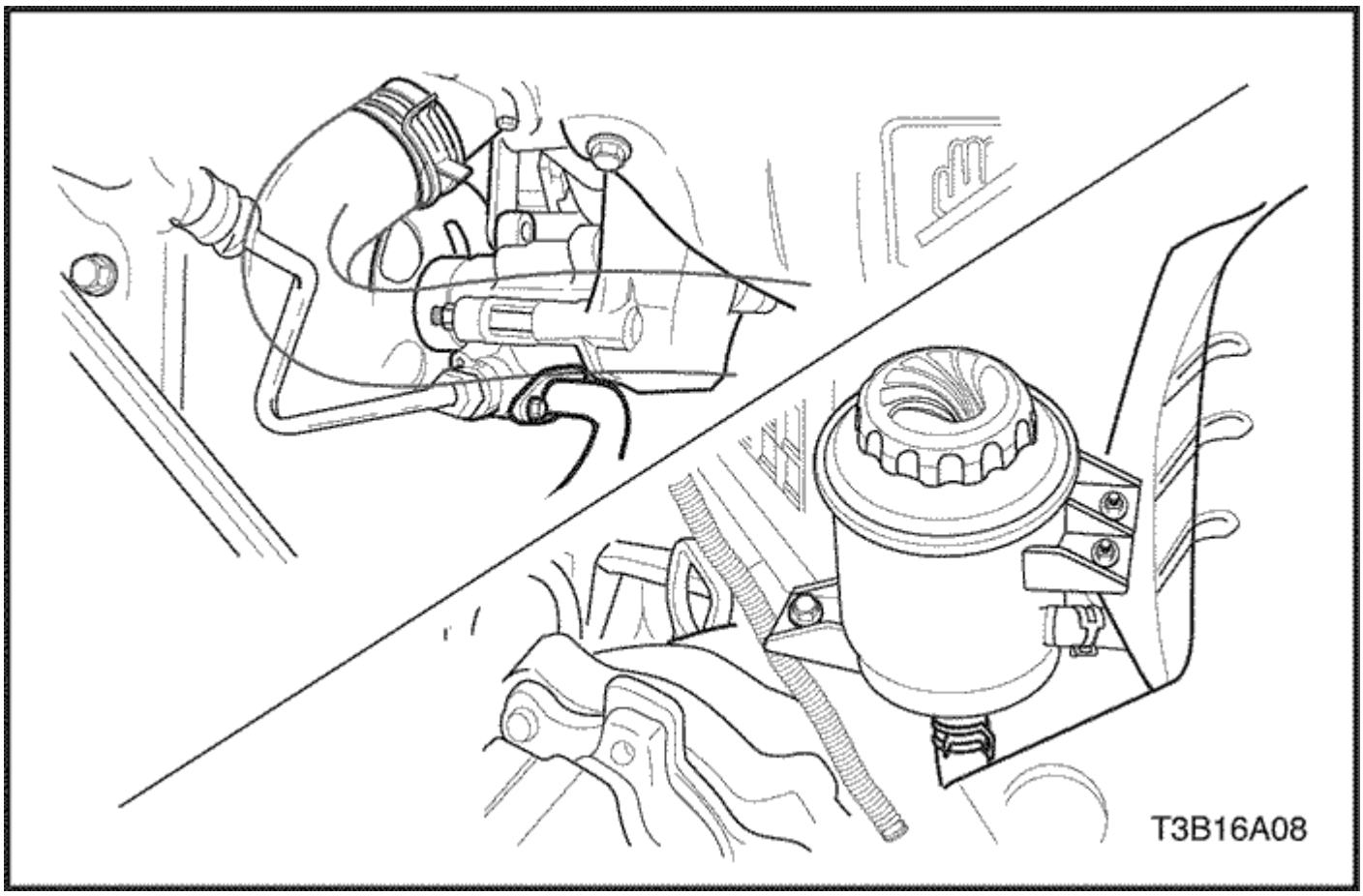
4. Connect the pressure line and return line hoses to the retaining clips at the bottom and the side of the radiator.
5. Connect the pressure line pipe and the supply line hose to the inlet and outlet connections on the power steering pump.
6. On DOHC engines, Install the air cleaner housing,if removed.

   Tighten
   Tighten the air cleaner housing bolts to 12 N•m (106 lb-in).

   Tighten
   Tighten the power steering pump pressure line union nut to 28 N•m (21 lb-ft).

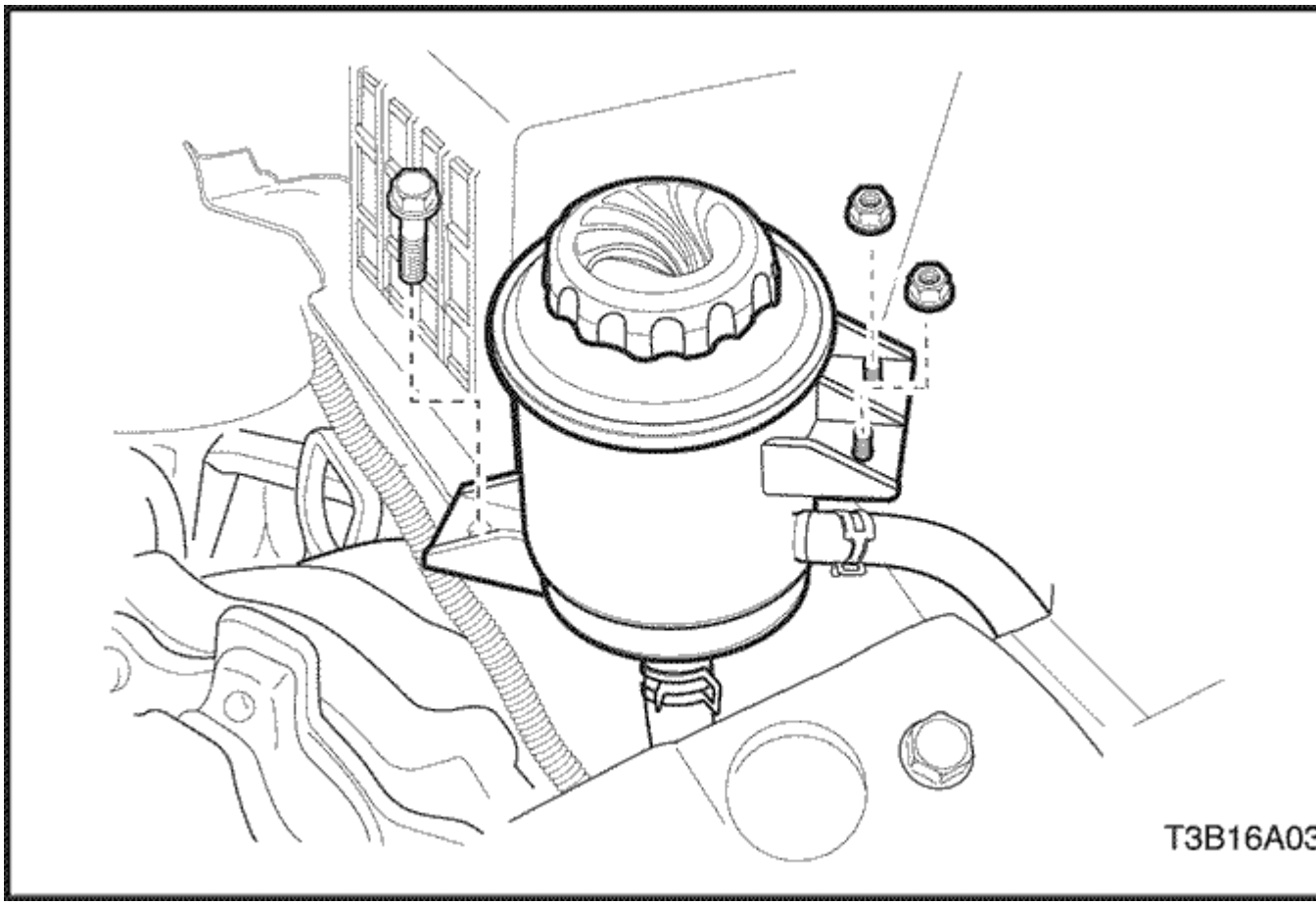
7. Fill the fluid reservoir with power steering fluid.

8. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to "Bleeding the Power Steering System" in this section.

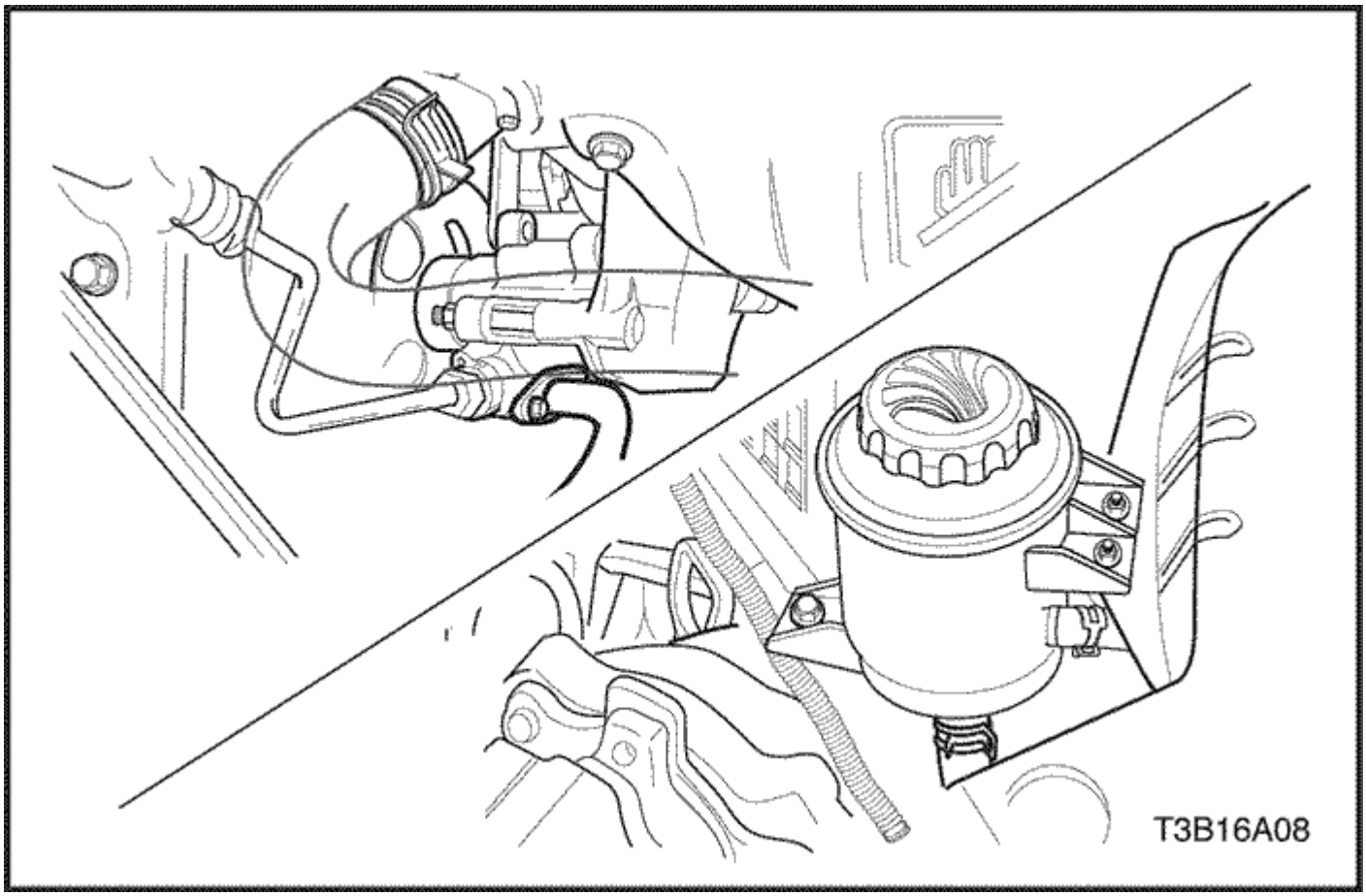


Power Steering Fluid Reservoir Hose
Removal Procedure

1. Siphon the power steering fluid fromthe fluid reservoir.
2. Disconnect the return line pipe from the outlet connection at the steering gear.



3. Disconnect the fluid reservoir hose from the fluid reservoir.
4. Remove the fluid reservoir hose.



Installation Procedure

1. Connect the fluid reservoir hose at the fluid reservoir.
2. Connect the fluid reservoir pipe to the outlet connection at the steering gear.

   Tighten
   Tighten the steering gear outlet pipe fittings to 28 N•m (21 lb-ft).

   Notice : When adding fluid or making a complete fluid change, always use DEXRON ® III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

3. Fill the fluid reservoir with power steering fluid.

4. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to "Bleeding the Power Steering System in this Section

GENERAL DESCRIPTION AND SYSTEM OPERATION

Power Steering System

General Description

The power steering system consists of three components: the power steering pump, the power steering fluid reservoir and the the power steering rack and pinion gear. The power steering pump is a vane-type pump providing hydraulic pressure for the system and is powered by the engine. It draws on the power steering fluid reservoir, which in turn is connected to the power steering gear. A pressure-relief valve inside the flow control valve limits the pump pressure. The power steering rack and pinion gear has a rotary control valve which directs hydraulic fluid coming from the power steering pump to one side or the other side of the rack piston. The integral rack piston is attached to the rack. The rack piston converts hydraulic pressure to a linear force which moves the rack to the left or the right. The force is then transmitted through the inner and the outer tie rods to the steering knuckles, which turn the wheels.

SECTION 6B

POWER STEERING PUMP

SPECIFICATIONS

General Specifications

Application	Description
Lubricant	DEXRON® II-D
Capacity	1.1 Liter (1.16 qt)

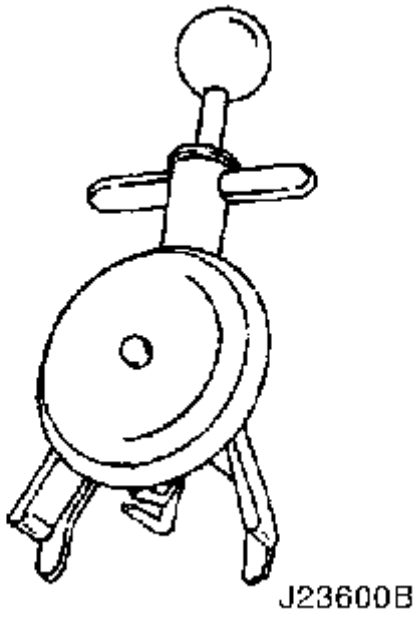
Application	Description
Type	Vane

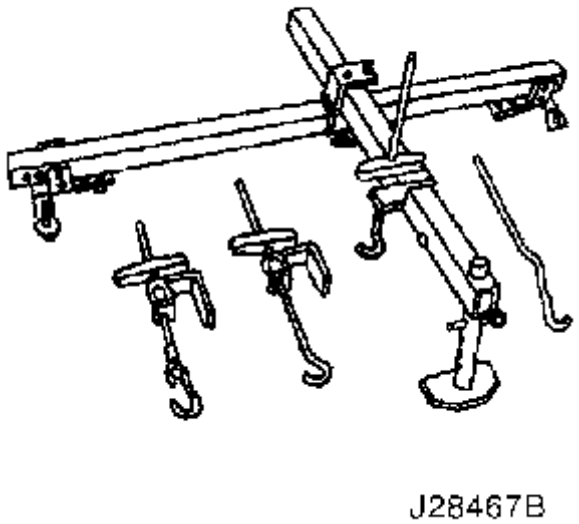
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Air Cleaner Housing Bolts	12	-	106
Alternator Adjusting Bolt	20	15	-
Power Steering Pump Pulley Bolts	25	18	-
Power Steering Pump Retaining Bolts	25	18	-
Tension Pulley Securing Bolt	25	18	-

SPECIAL TOOLS

Special Tools Table

	J-23600-B Belt Tension Gauge
	J-28467-B Engine Support Fixture



DIAGNOSIS

Power Steering Pump Diagnosis

Foaming, Milky Power Steering Fluid, Low Fluid Level, and Possible Low Pressure

Checks	Action
Check the power steering fluid level.	Fill the power steering fluid reservoir.
Check for air contamination in the power steering fluid.	Bleed the power steering system.
Check the power steering pump for internal leaks and overflow.	Replace the power steering pump.
Check the power steering pump housing and the soft plug for leaks.	Replace the power steering pump.

Low Pressure Due to Steering Pump

Checks	Action
Check the power steering pump flow control valve for sticking and improper operation.	Replace the power steering pump.
Check the power steering pump seals for wear.	Replace the power steering pump.
Check the pressure plate, the pump ring, the thrust plate, and the rotor for scores, cracks, or breaks.	Replace the power steering pump.
Check the vanes for sticking in the rotor slots.	Replace the power steering pump.
Check the power steering pump for internal	Replace the power steering pump.

Checks	Action
leaks and overflow.	

Growling Noise in Steering Pump

Checks	Action
Check the pump hoses and the steering gear pipes for restricted flow.	Clean out the pipes and the hoses. Replace the pipes and the hoses as needed.
Check the pressure plate, the pump ring, the thrust plate, and the rotor for scores, cracks, or breaks.	Replace the power steering pump.
Check the power steering hose for contact with the body.	Secure the pump hose in a clamp away from the body.
Check the power steering fluid level.	Fill the power steering pump reservoir.

Rattling Noise in the Steering Pump

Checks	Action
Check for air contamination in the power steering fluid.	Bleed the power steering system.
Check the power steering hose for contact with the body.	Secure the pump hose in a clamp away from the body.
Check the power steering fluid level.	Fill the power steering pump reservoir.
Check the pump mounting for improper installation.	Tighten the power steering pump attachment bolts.

Swishing Noise in the Steering Pump

Checks	Action
Check the power steering pump flow control valve for damage.	Replace the power steering pump.

Whining Noise in the Steering Pump

Checks	Action
Check the pressure plate and the vanes for scores.	Replace the power steering pump.
Check the pump shaft bearing for scores.	Replace the power steering pump.

MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

Pump Drive Belt

Tools Required

J-23600-B Belt Tension Gauge

Checking Belt Tension

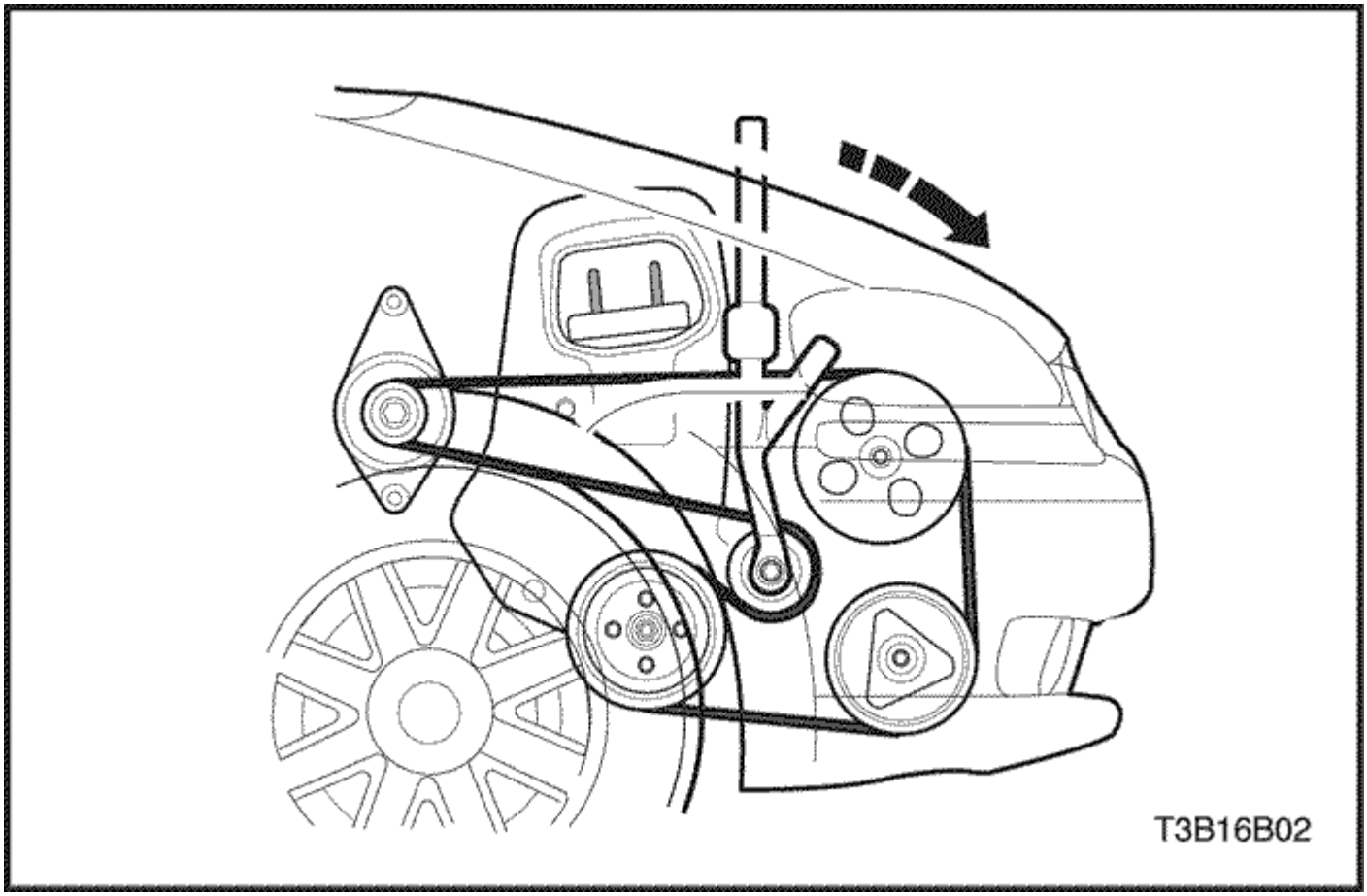
1. Using belt tension gauge J-23600-B, check the tension on the pump drive belt.

2. If belt tension gauge J-23600-B does not indicate the proper tension, adjust the belt.

Adjusting Belt Tension

1. With belt tension gauge J-23600-B on the pump drive belt, loosen the alternator adjusting bolt and move the alternator until the gauge indicates the proper tension.
2. Tighten the alternator adjusting bolt.

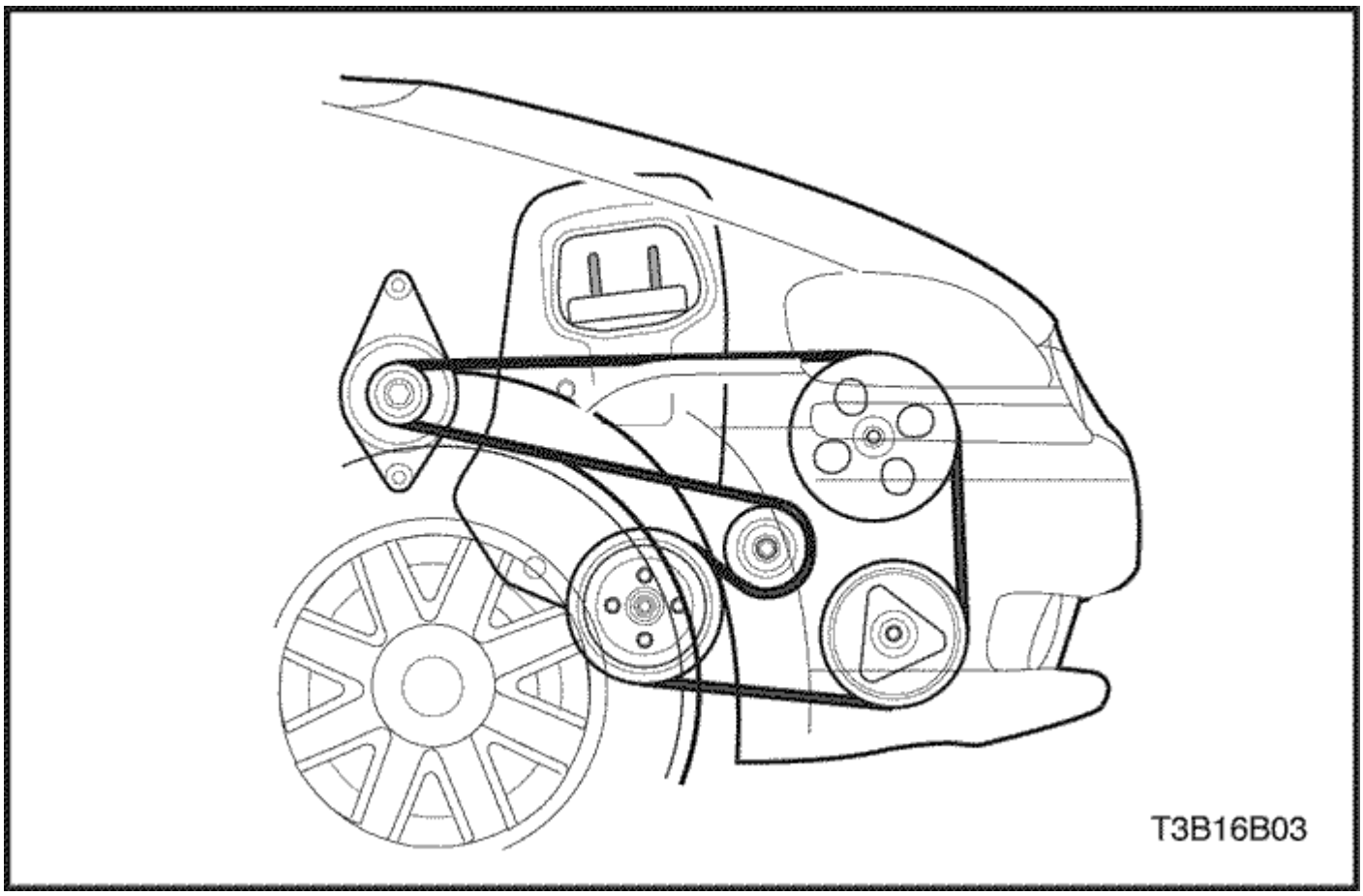
   Tighten
   Tighten the alternator adjusting bolt to 20 N•m(15 lb-ft).



SOHC Pump Drive Pulley

Removal Procedure

1. Loosen the steering pump pulley bolt.
2. Remove the pump drive belt from the pulley by moving the autotensioner.
3. Remove the steering pump pulley bolt that connect the pulley to the pump.
4. Remove the pulley from the pump.



Installation Procedure

1. Replace the pump on the engine if the pump was previously removed. Refer to "Pump Assembly" in this section.
2. Install the pulley on the pump. Install the steering pump pulley bolt.

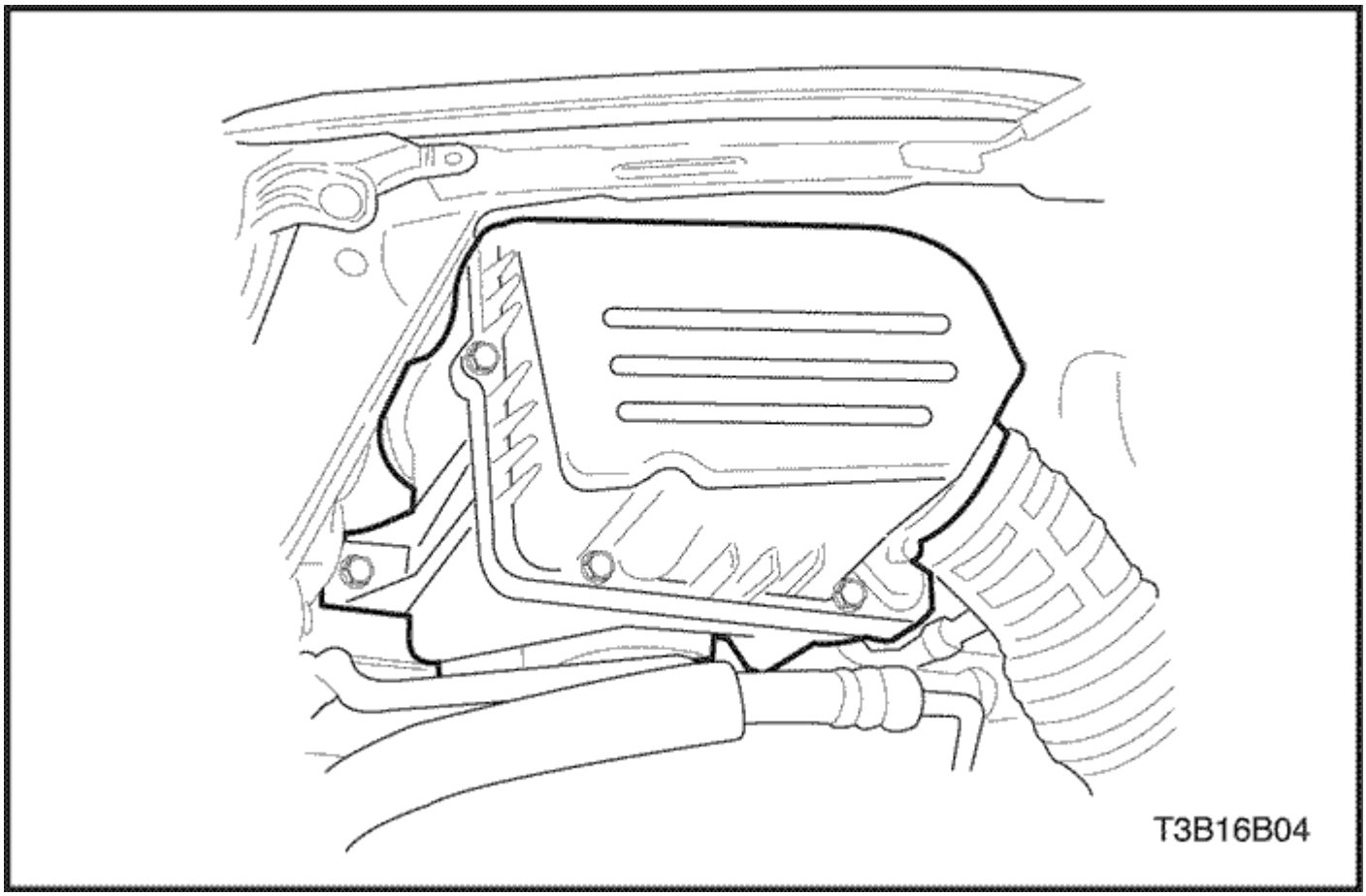
3. Install the pump drive belt.
4. Tighten the steering pump pulley bolt to fasten the pulley to the pump.

   Tighten
   Tighten the steering pump pulley bolts to 25 N•m (18 lb-ft).

5. Adjust the belt tension. Refer to "Pump Drive Belt" in this section.
6. If the pump was removed from the engine, bleed the power steering system. Refer to Section 6A, Power Steering System.

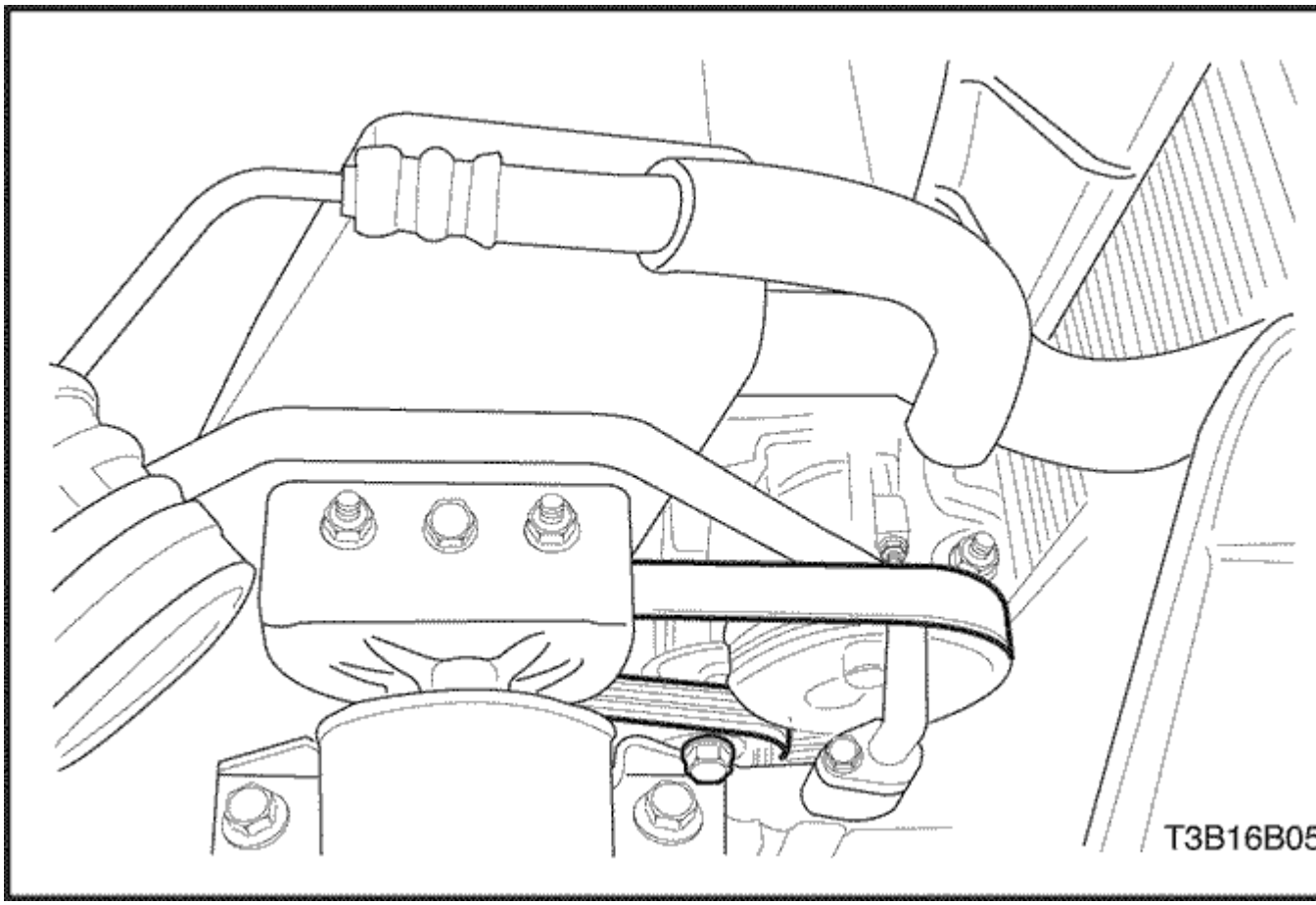
   Notice : When adding fluid or making a complete fluid change, always use DEXRON ®-III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

7. Inspect for leaks. If leaks are found, correct the cause of the leak and bleed the system.

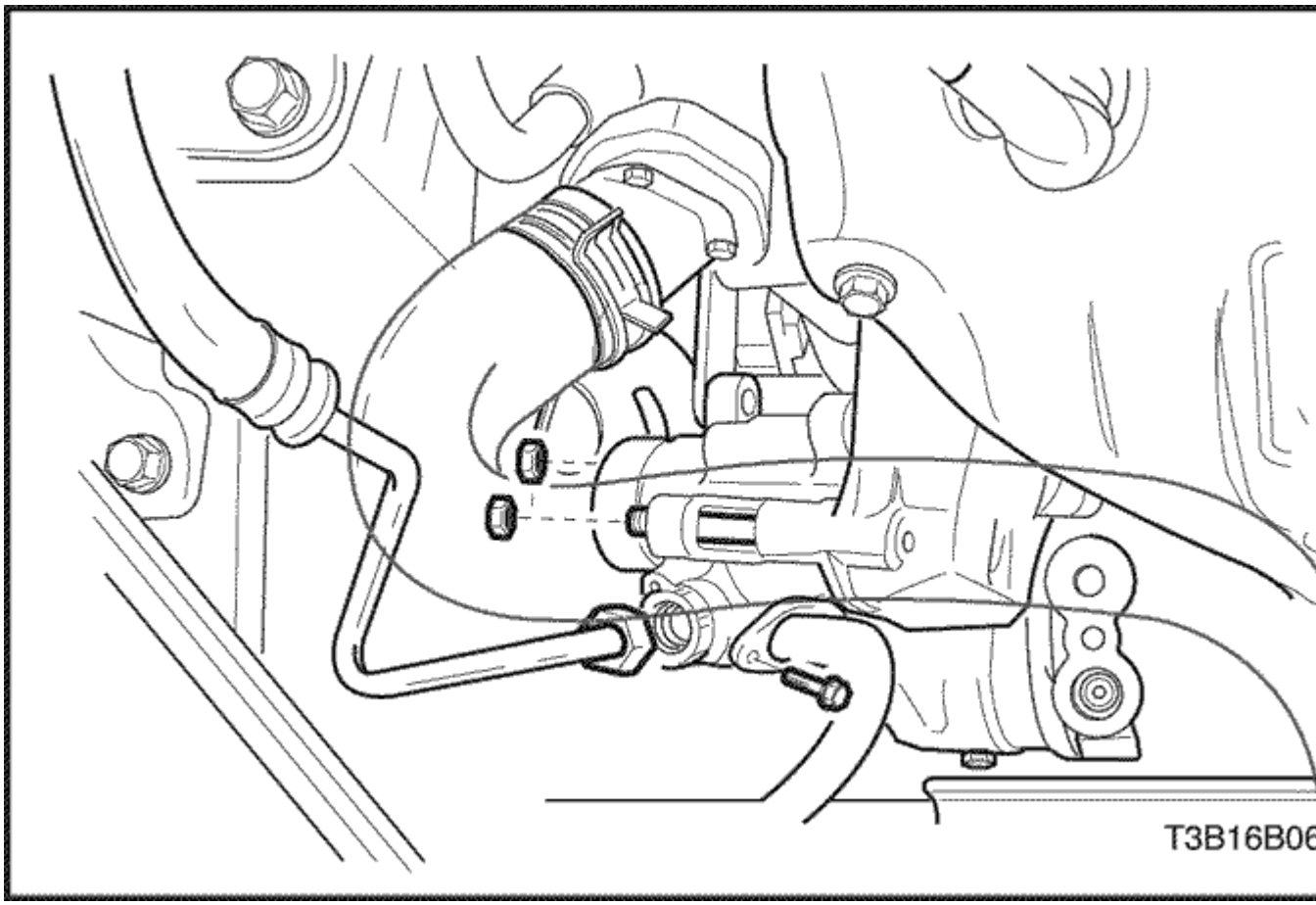


DOHC Pump Drive Pulley
Removal Procedure

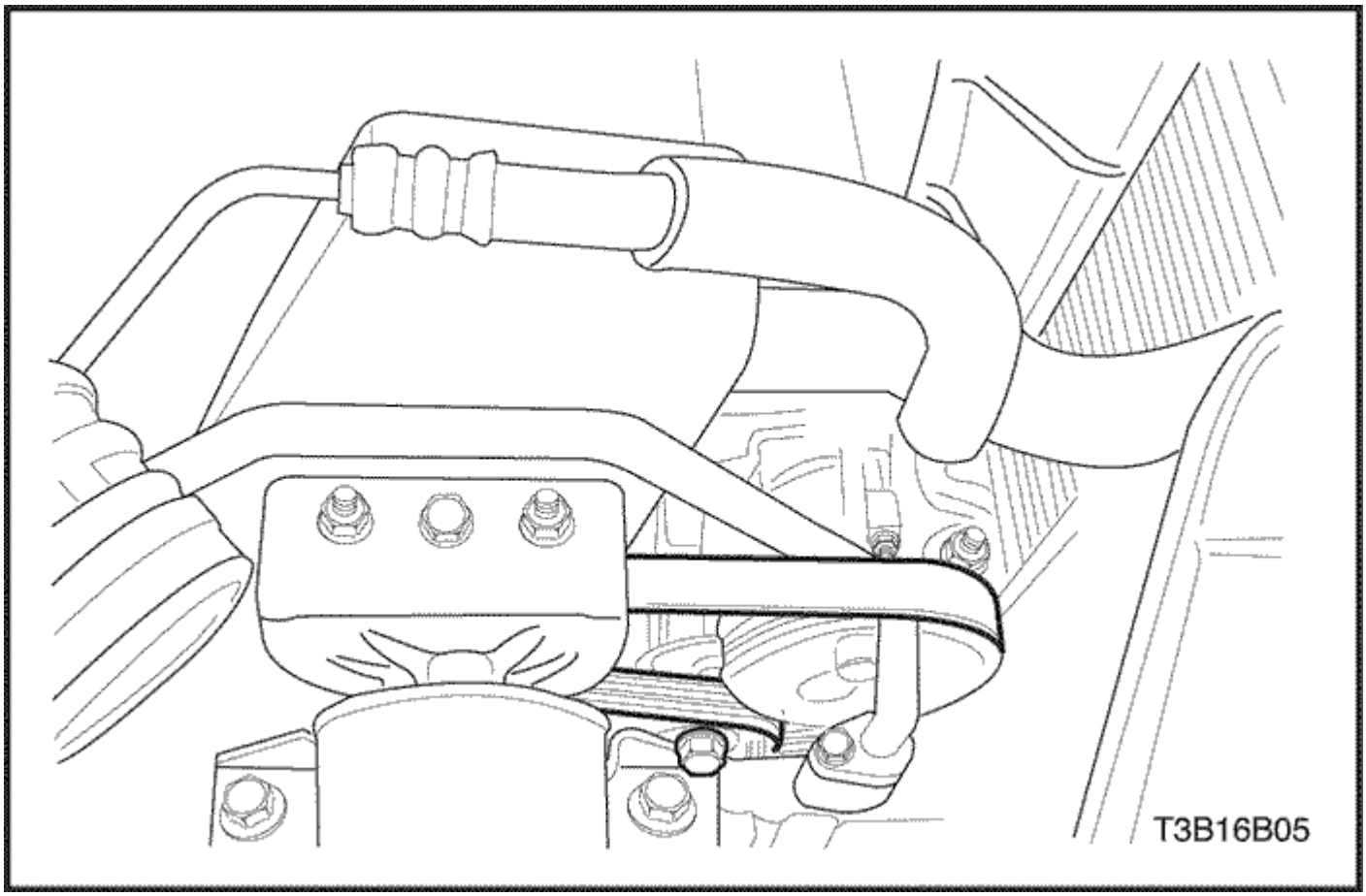
1. Remove the air cleaner housing by removing the housing bolts and loosening the clamp.



2. Loosen the steering pump pulley bolt.
3. Remove the pump drive belt from the pulley by moving the autotensioner.

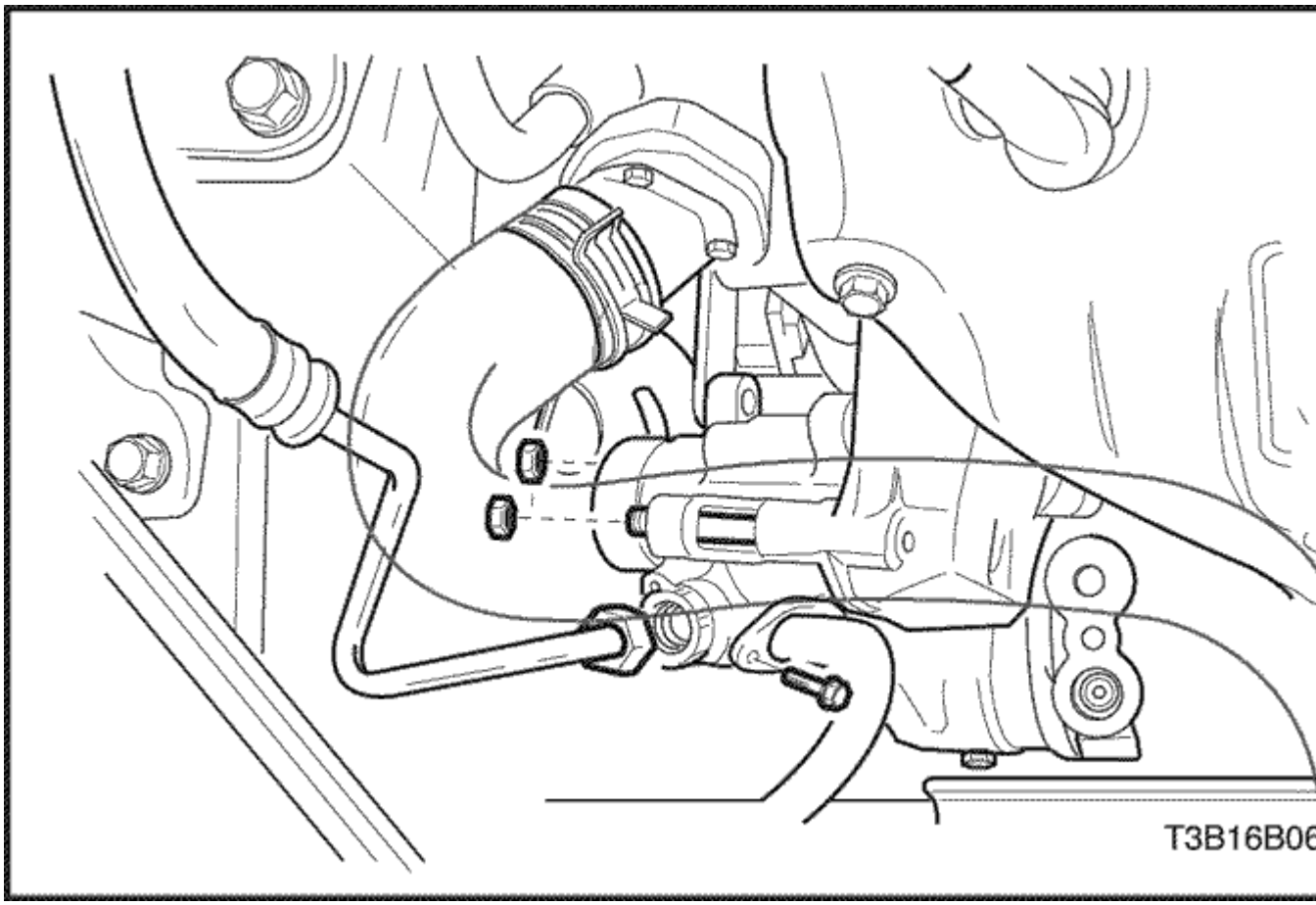


4. Remove the steering pump pulley bolt that connect the pulley to the pump.
5. Remove the pulley from the pump.



Installation Procedure

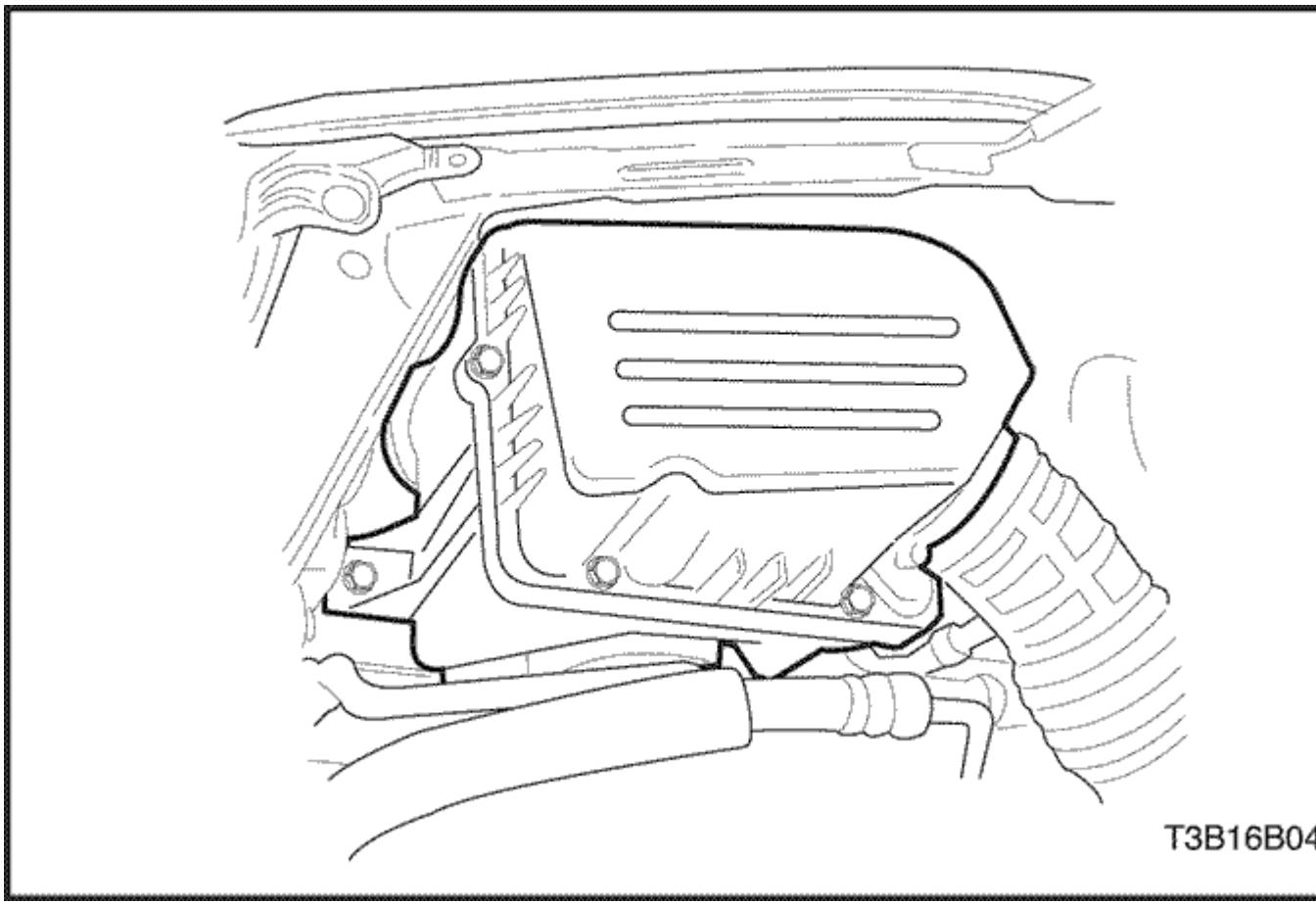
1. Replace the pump on the engine if the pump was previously removed. Refer to "Pump Assembly" in this section.
2. Install the pulley onto the pump. Install the steering pump pulley bolt.
3. Install the pump drive belt.



4. Tighten the steering pump pulley bolt to fasten the pulley to the pump.

   Tighten
   Tighten the steering pump pulley bolt to 25 N•m (18 lb-ft).

5. Adjust the belt tension. Refer to "Pump Drive Belt"in this section.



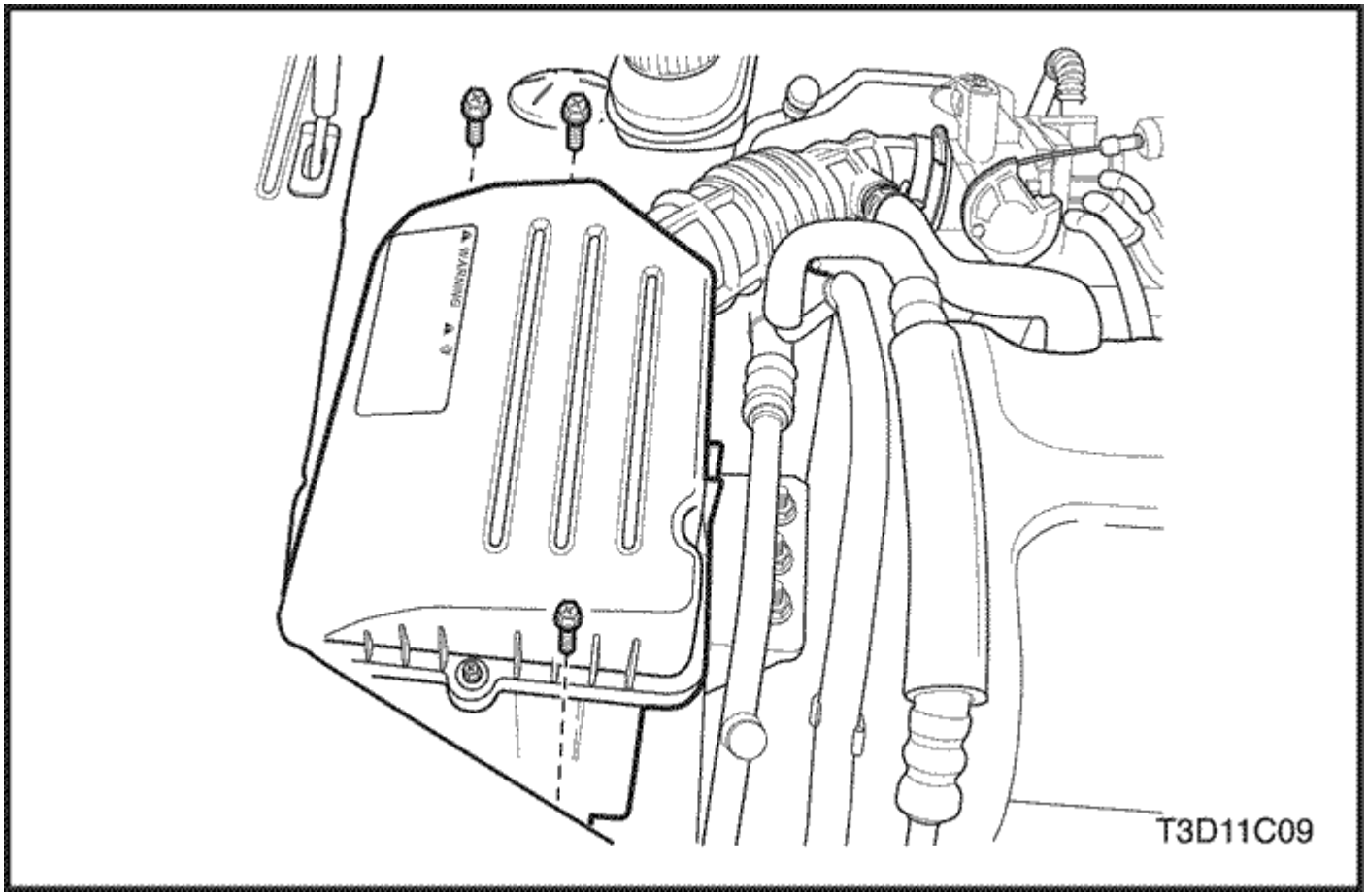
6. Install the air cleaner housing with the housing bolts and the clamp.

   Tighten
   Tighten the air cleaner housing bolts to 12 N•m (106 lb-in).

7. If the pump was removed from the engine, bleed the power steering system. Refer to Section 6A, Power Steering System.

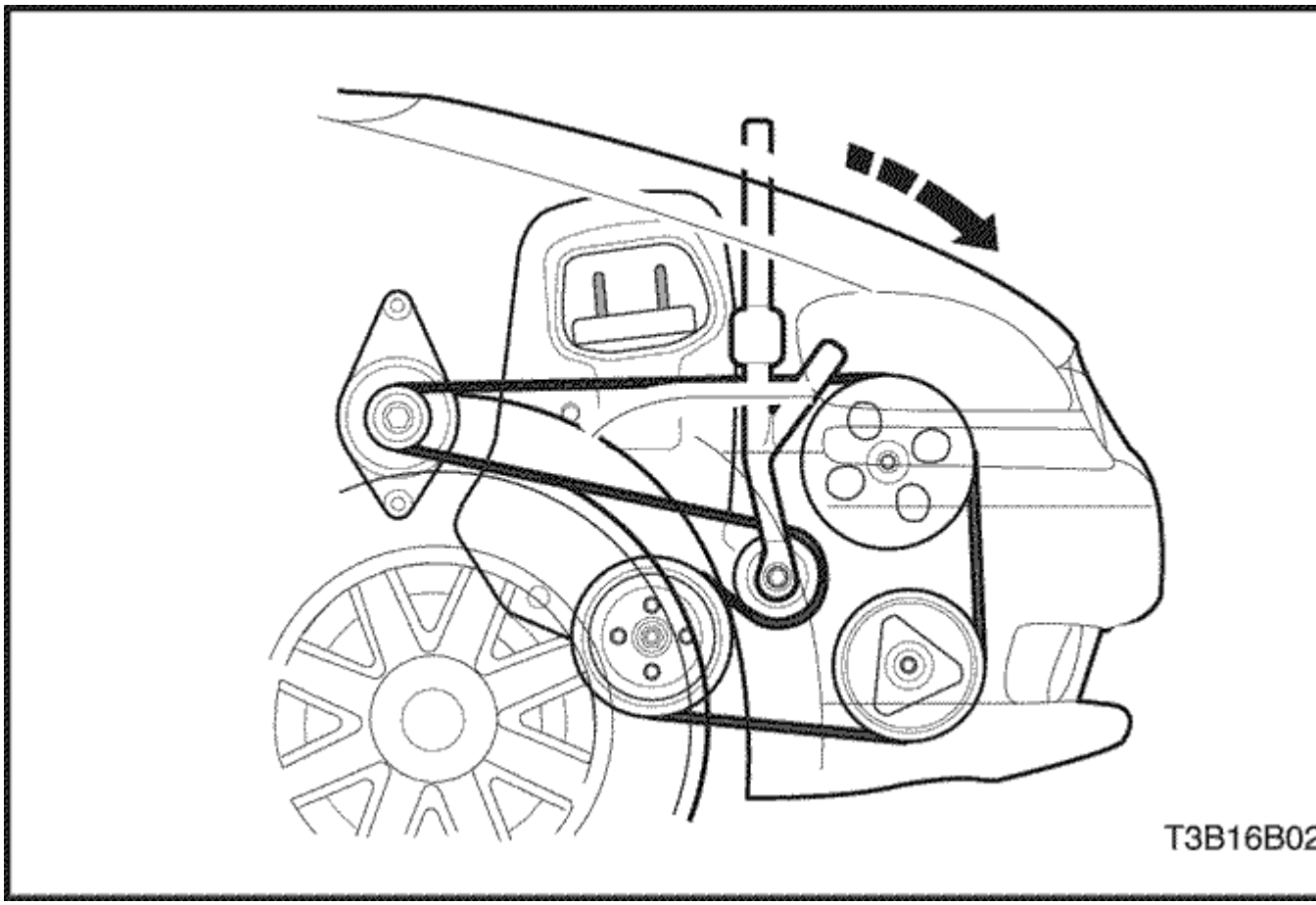
   Notice : When adding fluid or making a complete fluid change, always use DEXRON ®-III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

8. Inspect for leaks. If leaks are found, correct the cause of the leak and bleed the system.

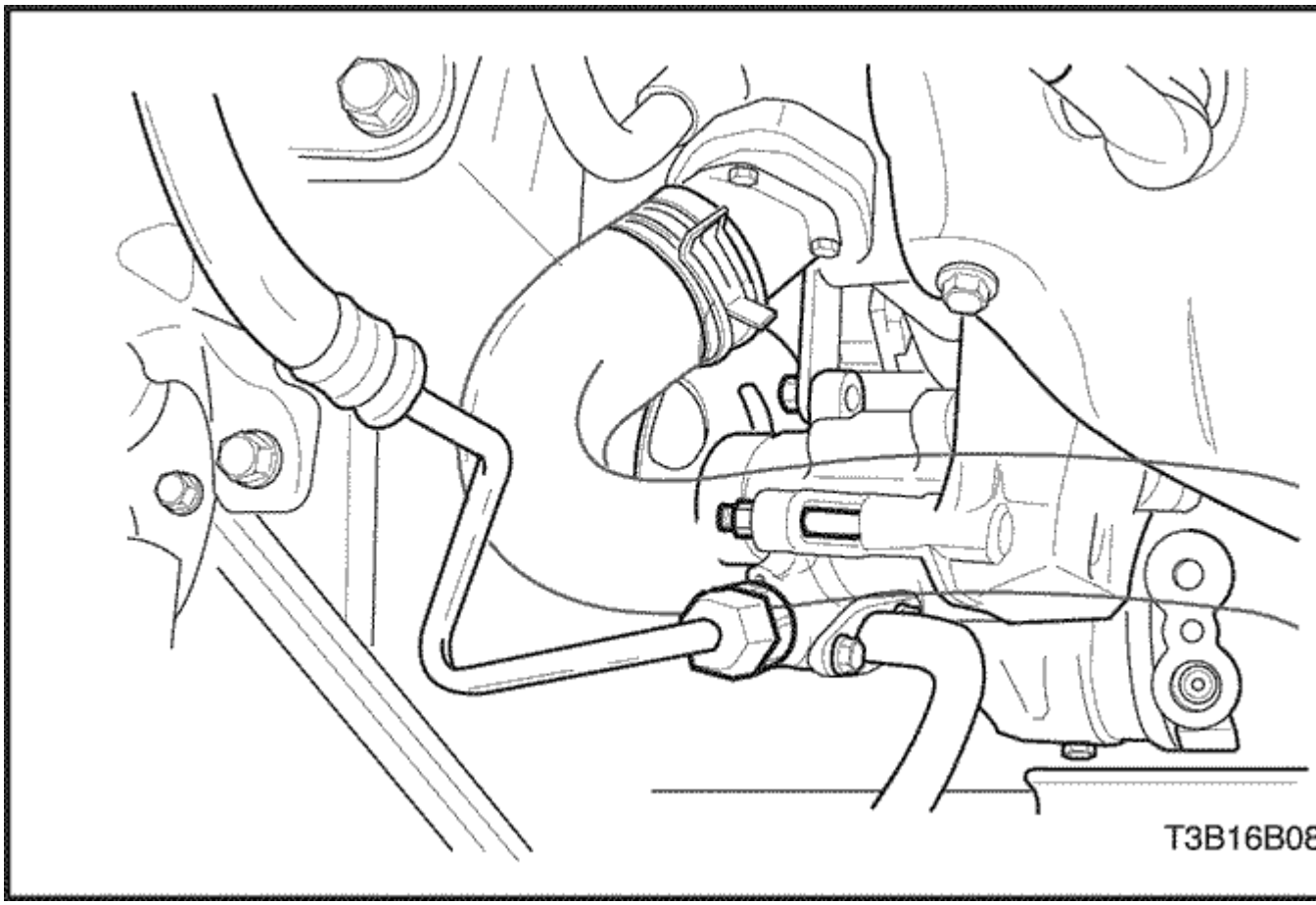


SOHC/DOHC Pump Assembly
Removal Procedure

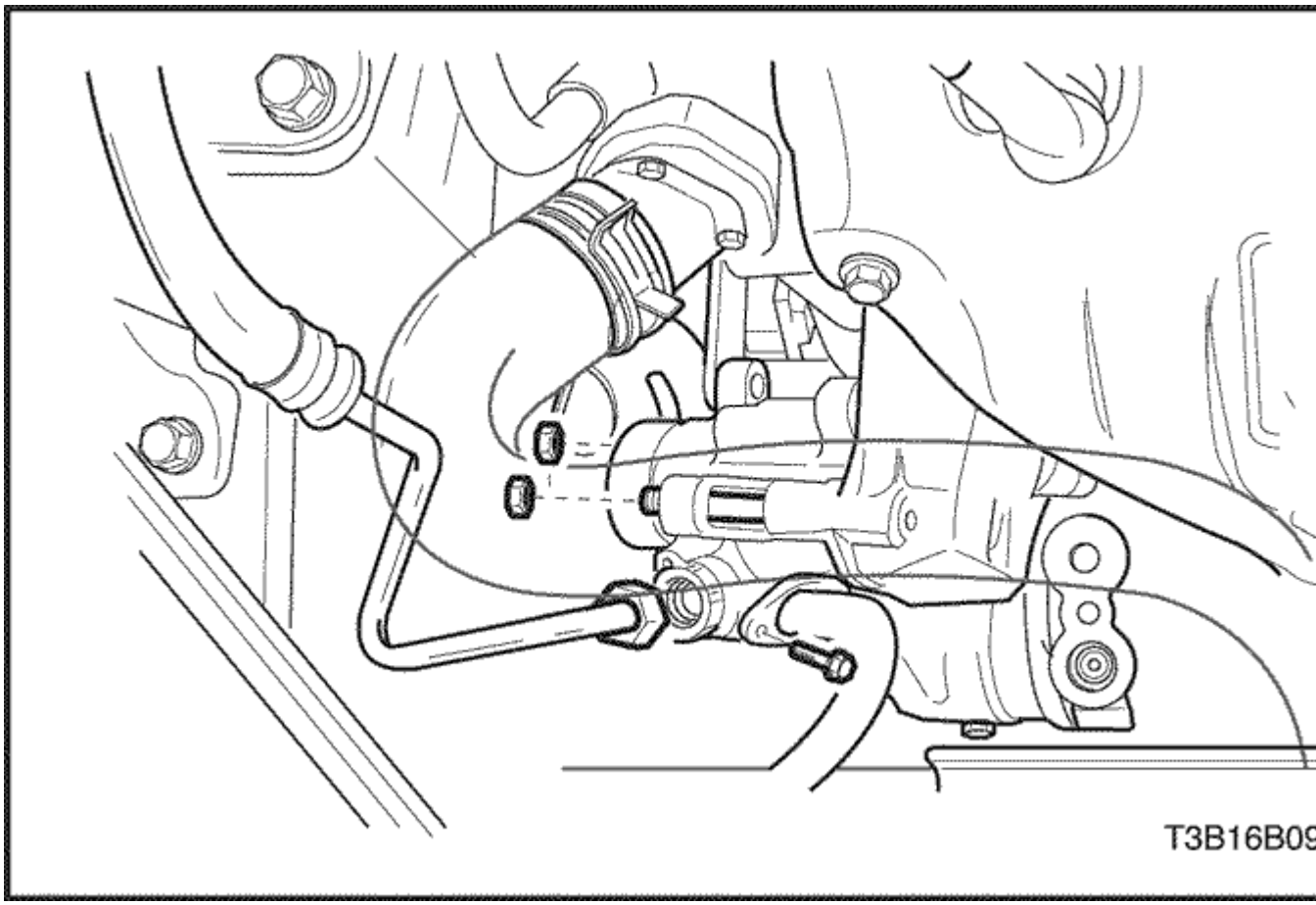
1. Remove the air cleaner housing by removing the housing bolts and loosening the clamp.



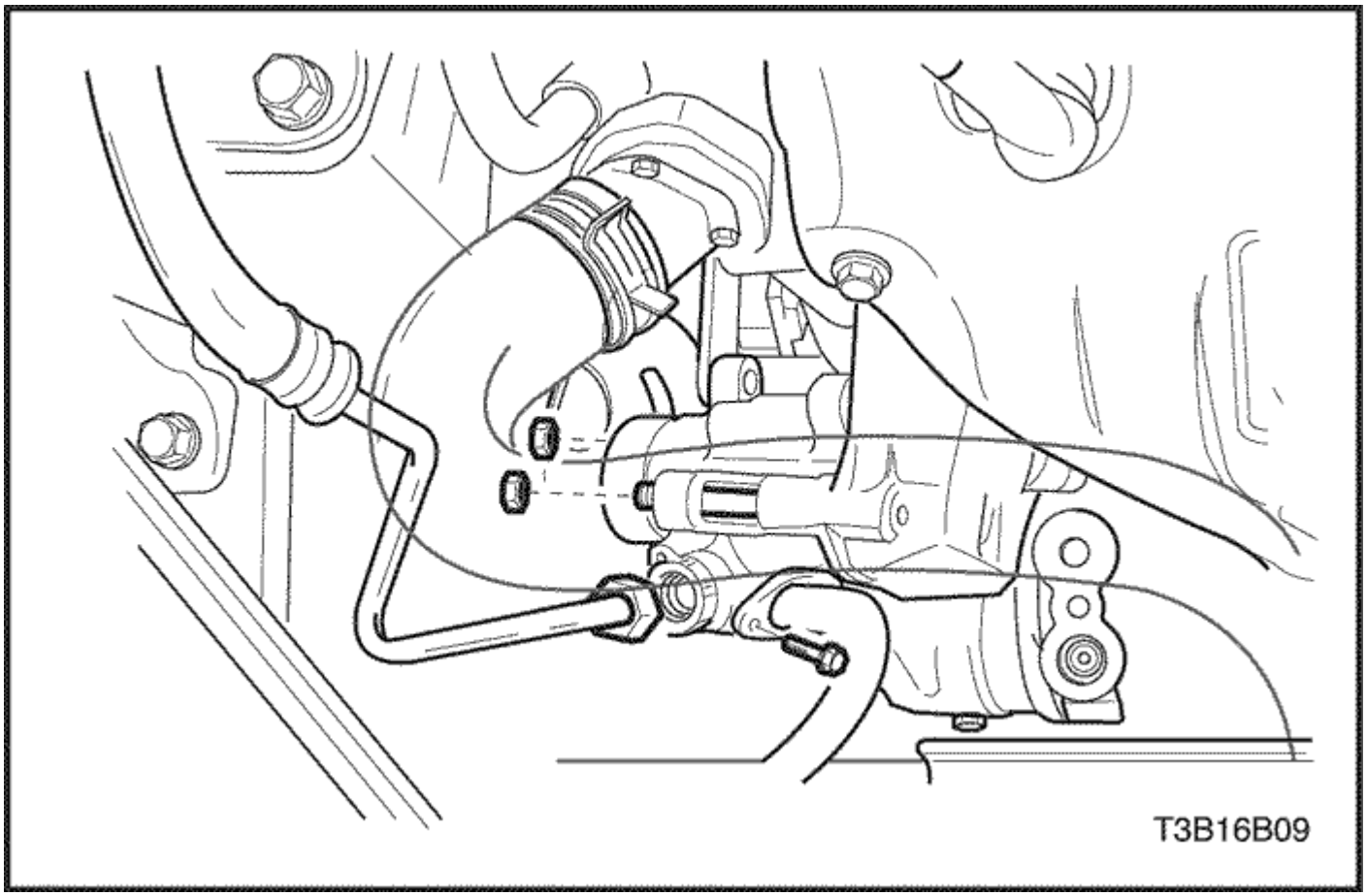
2. Remove the pump drive belt from the pulley by moving the autotensioner.



3. Drain the power steering fluid by disconnecting the pressure and supply lines from the pump.
4. Remove the A/C compressor and bracket. Refer to *Section 7B, Manual Control Heating, Ventilation and Air Conditioning System.*



5. Remove the pump assembly by removing the steering pump retaining nuts.

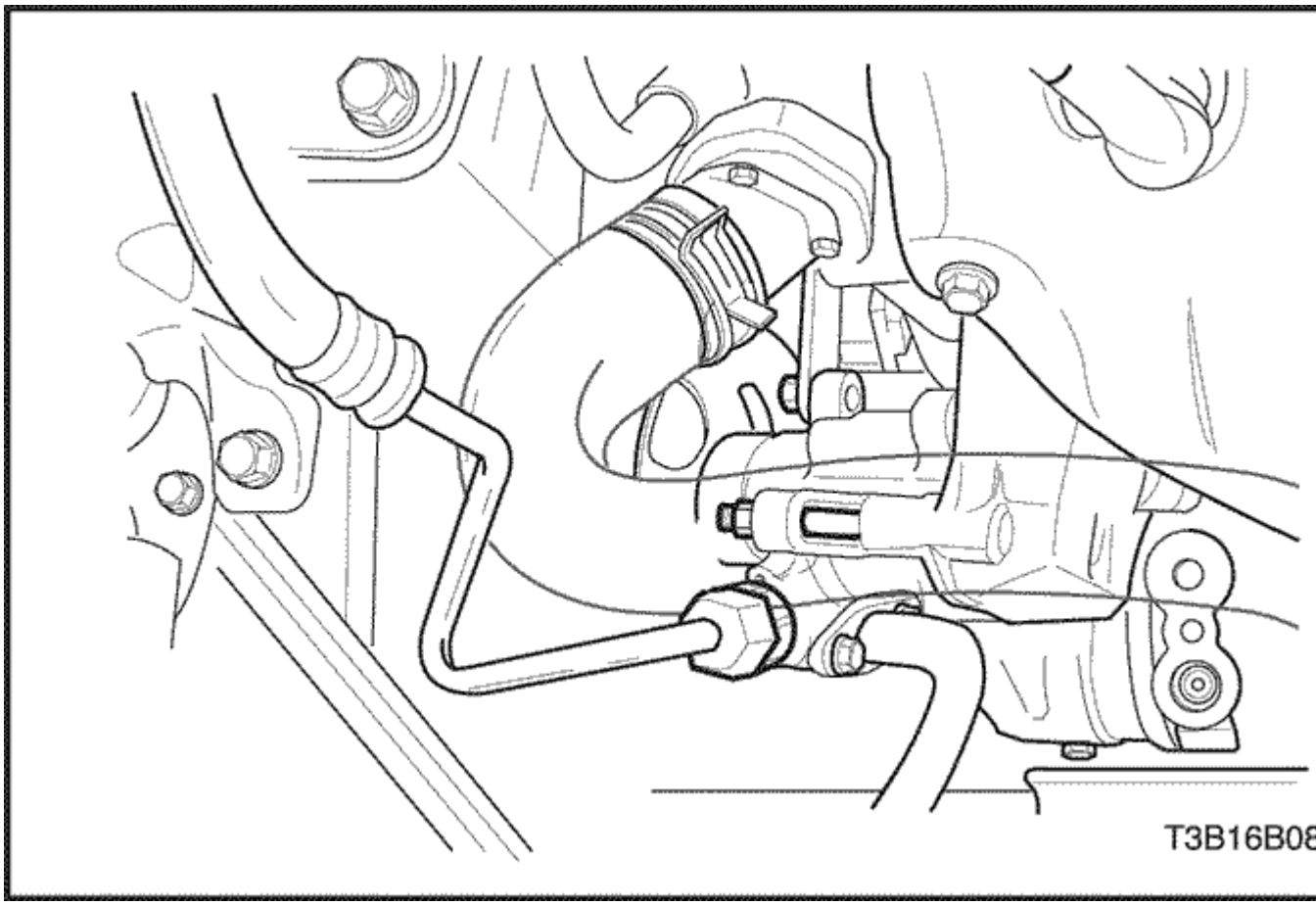


Installation Procedure

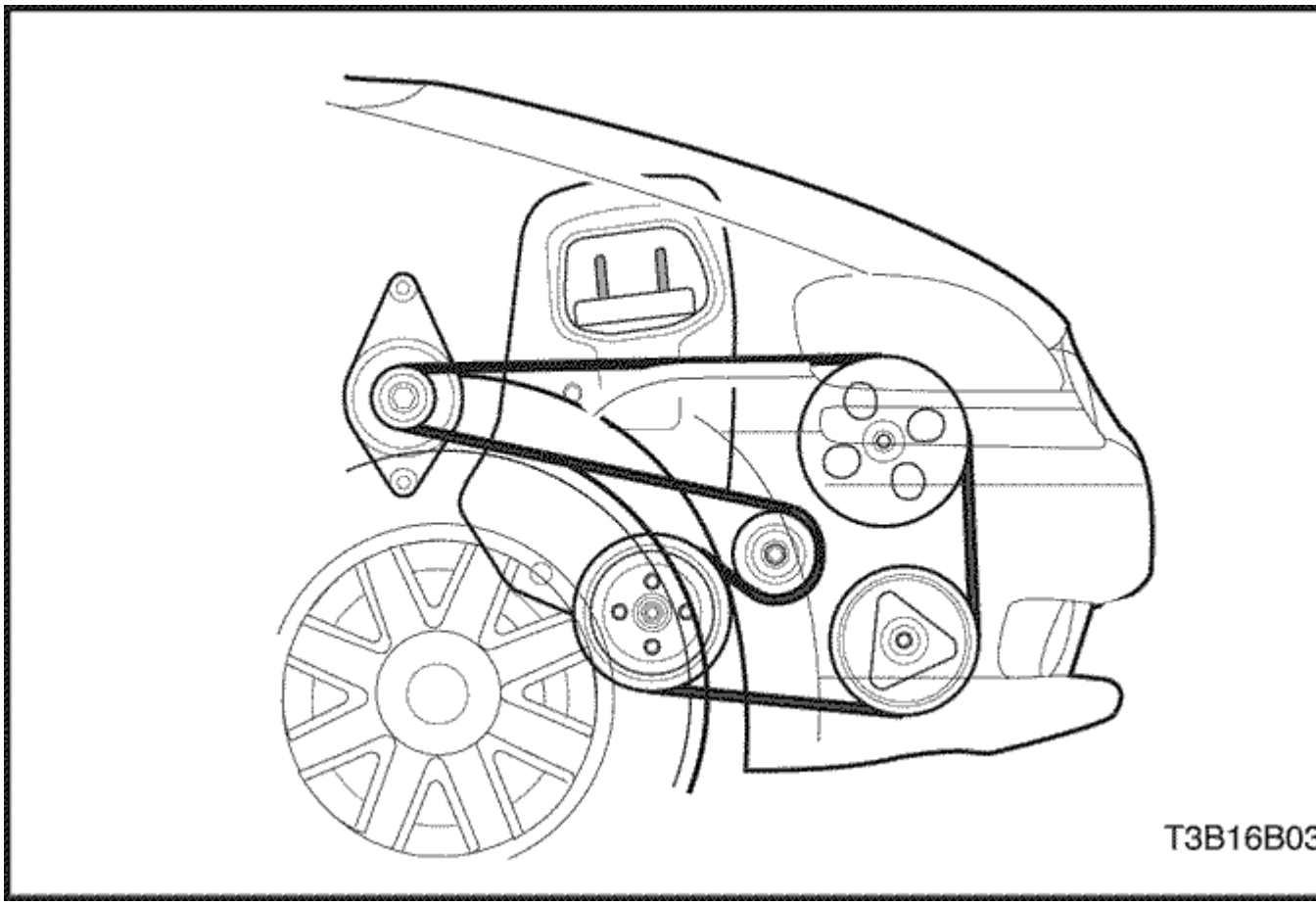
1. Install the pump to the A/C compressor bracket and tighten the steering pump retaining nuts.

   Tighten
   Tighten the steering pump retaining nuts to 25 N•m (18 lb-ft).

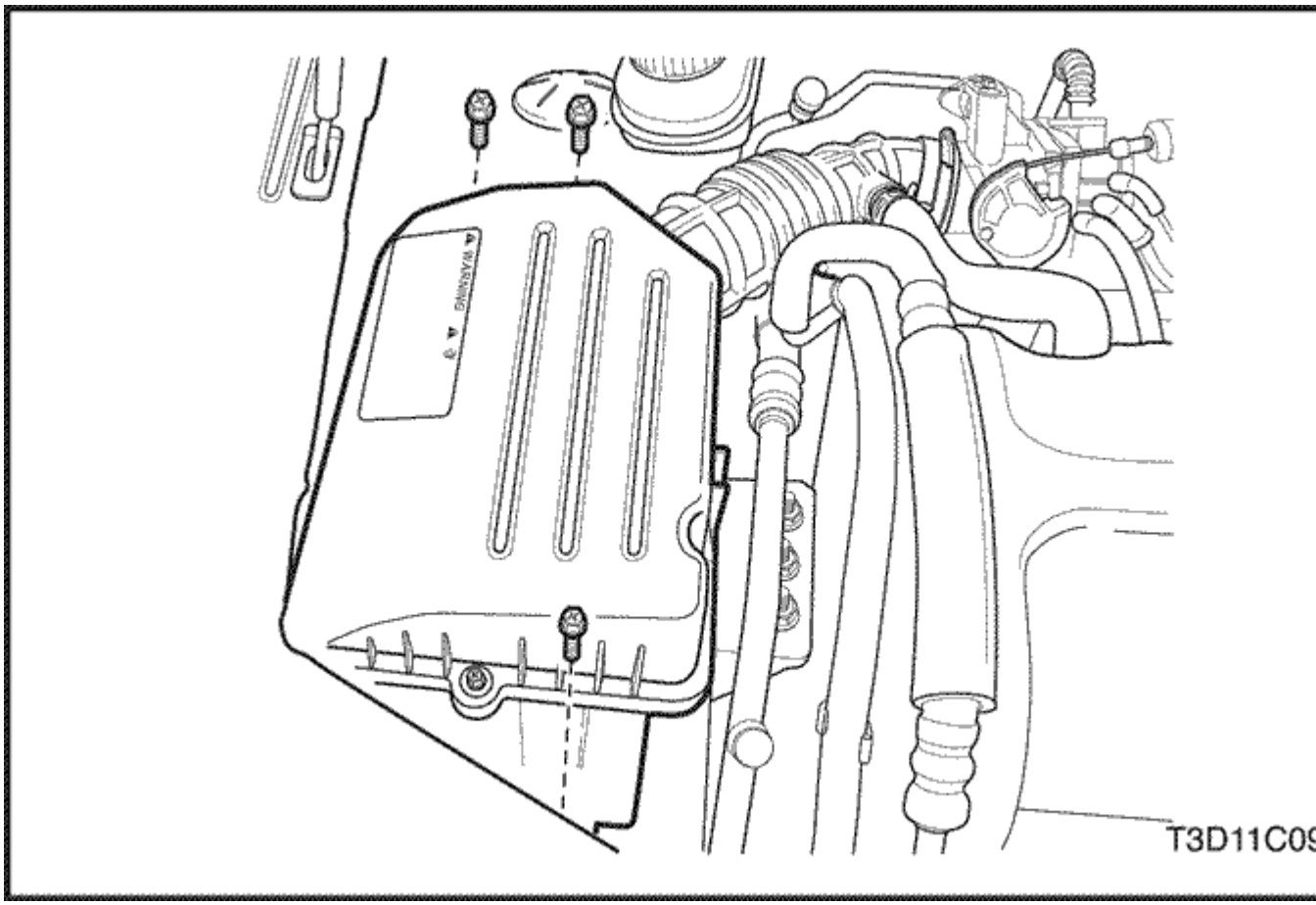
2. Install the A/C compressor bracket on the vehicle. Refer to *Section 7B, Manual Control Heating, Ventilation and Air Conditioning System.*



3. Connect the pressure and supply lines to the power steering pump.
4. Install the A/C compressor on the bracket. Refer to *Section 7B, Manual Control Heating, Ventilation and Air Conditioning System.*



5. Install the pump drive belt onto the pulley by moving the autotensioner.



6. Install the air cleaner housing with the housing bolts and the clamp.

   Tighten
   Tighten the air cleaner housing bolts to 12 N•m (106 lb-in).

   Notice : When adding fluid or making a complete fluid change, always use DEXRON ®-III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

7. Refill the pump with new fluid and bleed the air from the system. Refer to *Section 6A, Bleeding the Power Steering System.*
8. Inspect for leaks. If leaks are found, correct the cause of the leak and bleed the system.

UNIT REPAIR

Pump

The power steering pump in this vehicle is not serviceable. A faulty pump must be replaced.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Power Steering Pump

General Description

The pump has a remote fluid reservoir. A pressure-relief valve inside the flow control valve limits pump pressure.

Seals

Seal Replacement

Lip seals, which seal the rotating shafts, are used on the driveshaft of the pump. This type of seal requires special treatment. When leakage occurs in this area, always replace the seal after inspecting and thoroughly cleaning the sealing surfaces. If the corrosion in the lip seal contact zone is slight, clean the surface of the shaft with a crocus cloth. Replace the shaft only if the leakage cannot be stopped by first smoothing the shaft with the crocus cloth.

SECTION 6C

POWER STEERING GEAR

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

General Specifications

Application	Description

Application			Description
Power Steering Fluid			DEXRON® II-D
Capacity			1.1 Liter (1.16 qt)
Type			Rack & Pinion
Overall Gear Ratio			16:1
Power Steering Angle	(155)Tire	Inside	39.5°
		Outside	33°
	(175)Tire	Inside	39.5°
		Outside	33°
	(185)Tire	Inside	39.5°
		Outside	33°
Grease	Rack		Polyureas
	Ball Joint		Synthetics Oils & Li Soaps

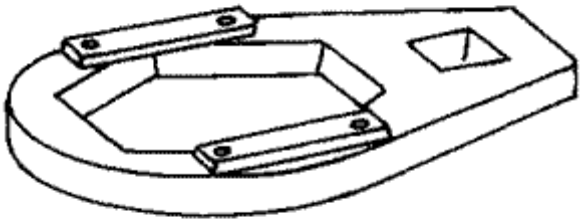
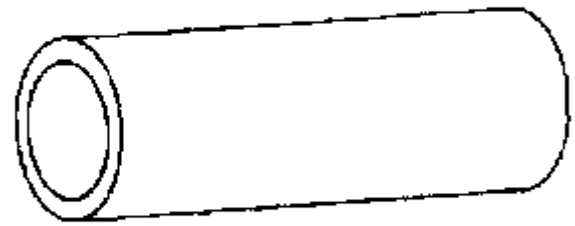
Fastener Tightening Specifications

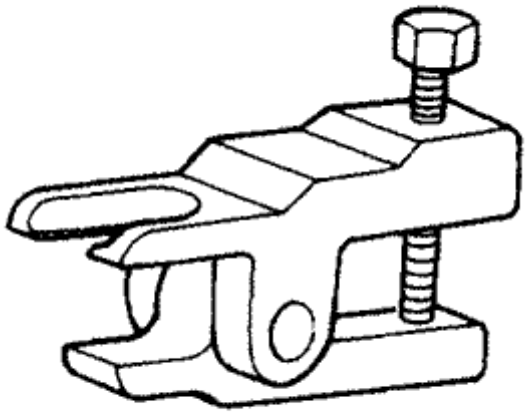
Application	N•m	Lb-Ft	Lb-In
Adjuster Plug Locknut	70	52	-
Coolant Surge Tank Attaching Nuts	4	-	35
Coupling Flange Pinch Bolt	22	16	-
Inner Tie Rod Bolts	90	66	-
Outer Tie Rod Hex Nut	60	44	-
Pinion Locknut	30	22	-
Pinion Preload	0.9 to 1.7	-	8 to 15
Power Steering Line Fittings-Cylinder End	27	20	-
Power Steering Line Fittings-Valve End	18	13	-
Steering Gear Inlet and Outlet Pipe Fittings	27	20	-
Steering Gear Retaining Bracket Nuts	22	16	-
Steering Gear Retaining Bracket Studs	22	16	-

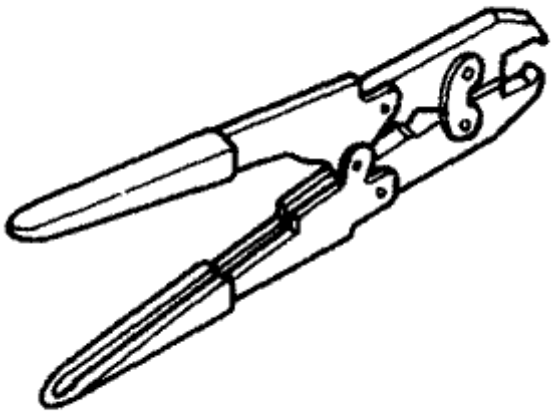
SPECIAL TOOLS

Special Tools Table

	KM-472 Wrench

 KM472	
 J36545	J-36545 Installing Tube
	KM-507-B Ball Joint Remover

 KM507B	
 J29810	J-29810 Stub Shaft Protector
	KM-J-26610 Installer



KMJ26610

DIAGNOSIS

Power Rack and Pinion Steering Gear

Hissing Noise

Checks	Action
Check the steering coupling joints for looseness.	Tighten the steering coupling joints.
Check the power steering hose for contact with other components.	Be sure the power steering hose is correctly fitted into the hose clips.

Rattling Noise in Steering Gear

Checks	Action
Check the power steering hose for contact with the body.	Be sure the power steering hose is correctly fitted into the hose clips.
Check the steering gear for insufficient lubrication.	Lubricate the steering gear.
Check the steering gear mounting for looseness.	Tighten the steering gear mounting bracket nuts.
Check the outer tie rods for improper installation.	Tighten the outer tie rod joints. Replace the outer tie rods as needed.

Poor Return of Steering Wheel to Center

Checks	Action
Check the steering wheel for contact with the turn signal housing.	Adjust the turn signal housing.

Checks	Action
Check the steering coupling for binding or looseness.	Replace the steering coupling flange.
Check the power steering pump flow control valve for sticking and improper alignment.	Replace the power steering pump.
Check the wheel alignment.	Adjust the wheel alignment.
Check the wheel bearings for wear or damage.	Replace the wheel bearings.
Check the steering gear-to-column joints for improper installation.	Adjust the steering coupling flange on the steering gear and the steering column. Replace the coupling flange as needed.
Check the outer tie rods and the ball joints for binding or looseness.	Tighten the tie rods and the ball joints. Replace the tie rods and the ball joints as needed.
Check the steering gear adjustments.	Perform a straight-ahead check.
Check the steering column shaft seal for rubbing on the shaft.	Replace the shaft seal.
Check the steering shaft bearings for binding.	Replace the steering shaft bearings.

Momentary Increase in Effort When Turning the Wheel Quickly

Checks	Action
Check the power steering pump for internal leaks.	Replace the power steering pump.
Check the hoses for damage or restricted flow.	Replace the power steering hoses and pipes.
Check the power steering fluid level.	Fill the power steering fluid reservoir.
Check the power steering pump flow control valve for sticking and improper operation.	Replace the power steering pump.

Steering Surges or Jerks When Turning with Engine Running

Checks	Action
Check the power steering pump for insufficient pressure.	Replace the power steering pump.
Check the power steering pump flow control valve for sticking and improper operation.	Replace the power steering pump.
Check the pump drive belt for slippage.	Tighten the pump drive belt.
Check for air contamination in the power steering system.	Bleed the power steering system.

Steering Vibrates During Low Speed or Static Steering

Checks	Action
Check for air contamination in the power steering system.	Bleed the power steering system.
Check the pump drive belt for looseness.	Tighten the pump drive belt.

Excessive Wheel Kickback or Loose Steering

Checks	Action

Checks	Action
Check for air contamination in the power steering system.	Bleed the power steering system.
Check the wheel bearings for wear or damage.	Replace the wheel bearings.
Check the steering gear mounting for looseness.	Tighten the steering gear mounting bracket nuts.
Check the steering gear-to-column joints for improper installation.	Adjust the steering coupling flange on the steering gear and the steering column. Replace the coupling flange as needed.
Check the outer tie rods and ball joints for looseness.	Tighten the tie rods and the ball joints. Replace the tie rods and the ball joints as needed.

Hard Steering or Lack of Assist (Especially During Parking)

Checks	Action
Check the steering gear-to column joints for improper installation.	Adjust the steering coupling flange on the steering gear and the steering column. Replace the coupling flange as needed.
Check the power steering pump flow control valve for sticking and improper installation.	Replace the power steering pump.
Check the power steering pump for insufficient pressure.	Replace the power steering pump.
Check the power steering pump for internal leaks.	Replace the power steering pump.
Check for a loose or a worn steering coupling.	Tighten the steering coupling flange. Replace the steering coupling flange as needed.
Check the pump drive belt tension.	Adjust the pump drive belt tension.

Power Rack and Pinion Steering Gear Bench Testing

Removal, Setup and Testing Procedure

Notice : Pressure checks or pressure and flow checks may also be conducted using this setup.

1. Disconnect and remove the power steering gear. Refer to "Rack and Pinion Assembly" in this section.
2. Place the power steering gear on a bench next to the vehicle.
3. Disconnect the pressure line at the point where the hose connects to the pipe. Extend this line in order to reach the power steering gear on the bench.
4. Disconnect the return line from the the power steering fluid reservoir. Extend this line in order to reach the power steering gear on the bench.
5. Connect the power steering pipes to the power steering gear.
6. Start the engine and allow it to idle for 10 seconds.

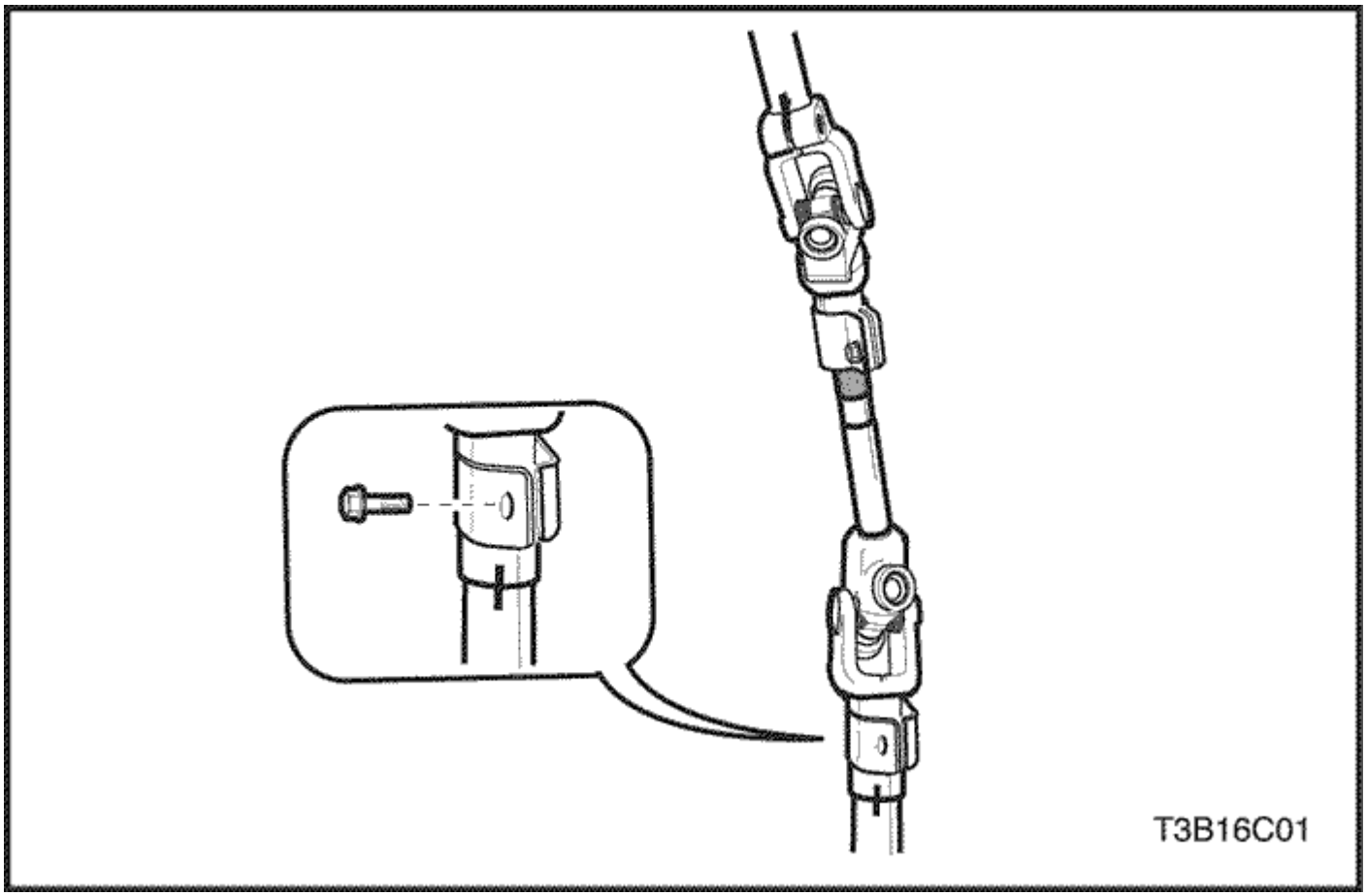
7. Check the power steering fluid level. Refer to *Section 6A, Power Steering System.*
8. Start the engine and turn the rack and pinion stub shaft to a full turn in each direction. Hold the shaft against each stop for 5 seconds.
9. Inspect for possible leak points. Refer to *Section 6A, Power Steering System.*

Installation Procedure

1. Stop the engine.
2. Disconnect the power steering pipes from the power steering gear.
3. Remove the extensions and reconnect the pressure and return lines.
4. Install and connect the power steering gear. Refer to "Rack and Pinion Assembly"in this section.
5. Start the engine and allow it to idle for 10 seconds.
6. Check the power steering fluid level. Refer to *Section 6A, Power Steering System.*

MAINTENANCE AND REPAIR

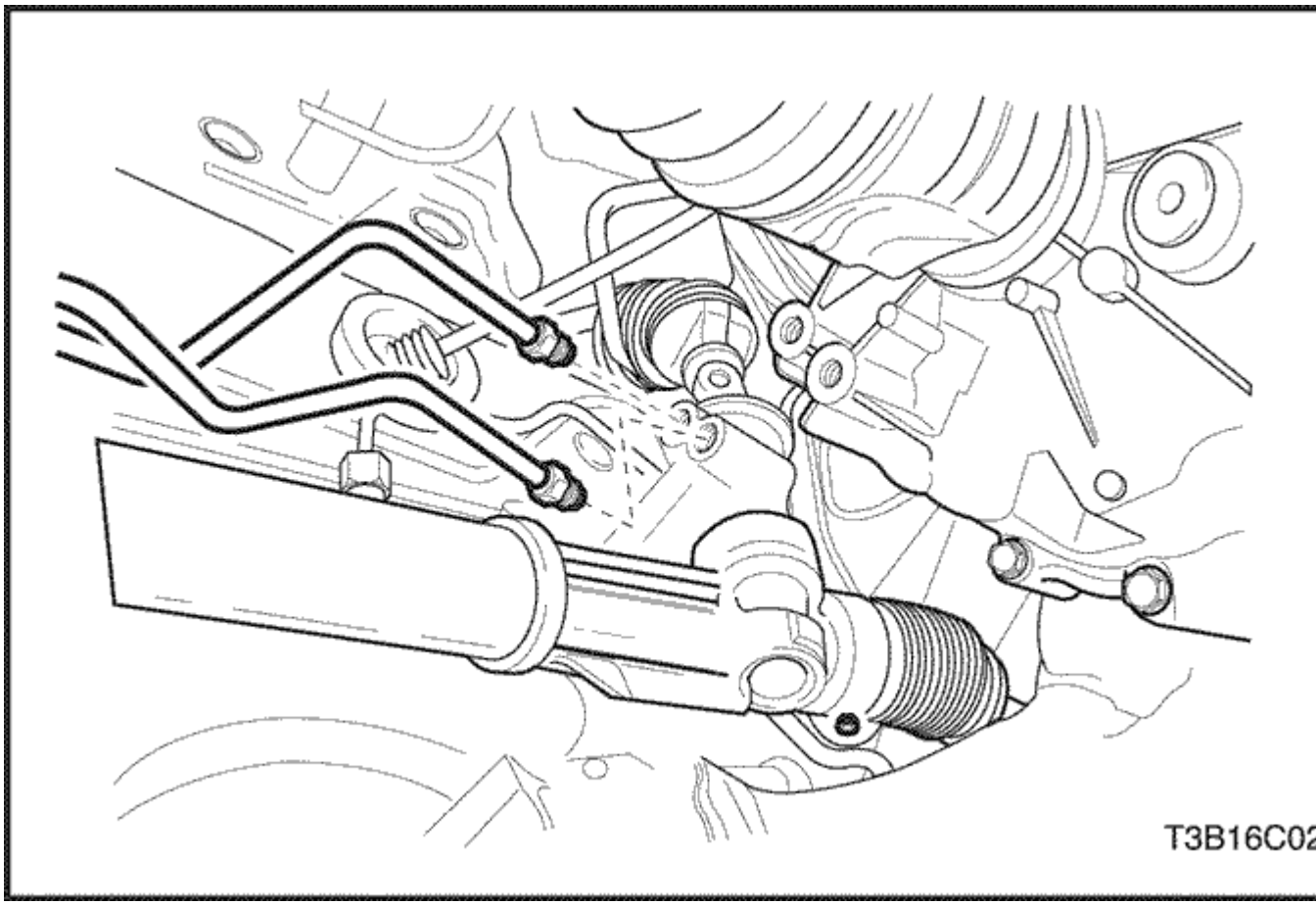
ON-VEHICLE SERVICE



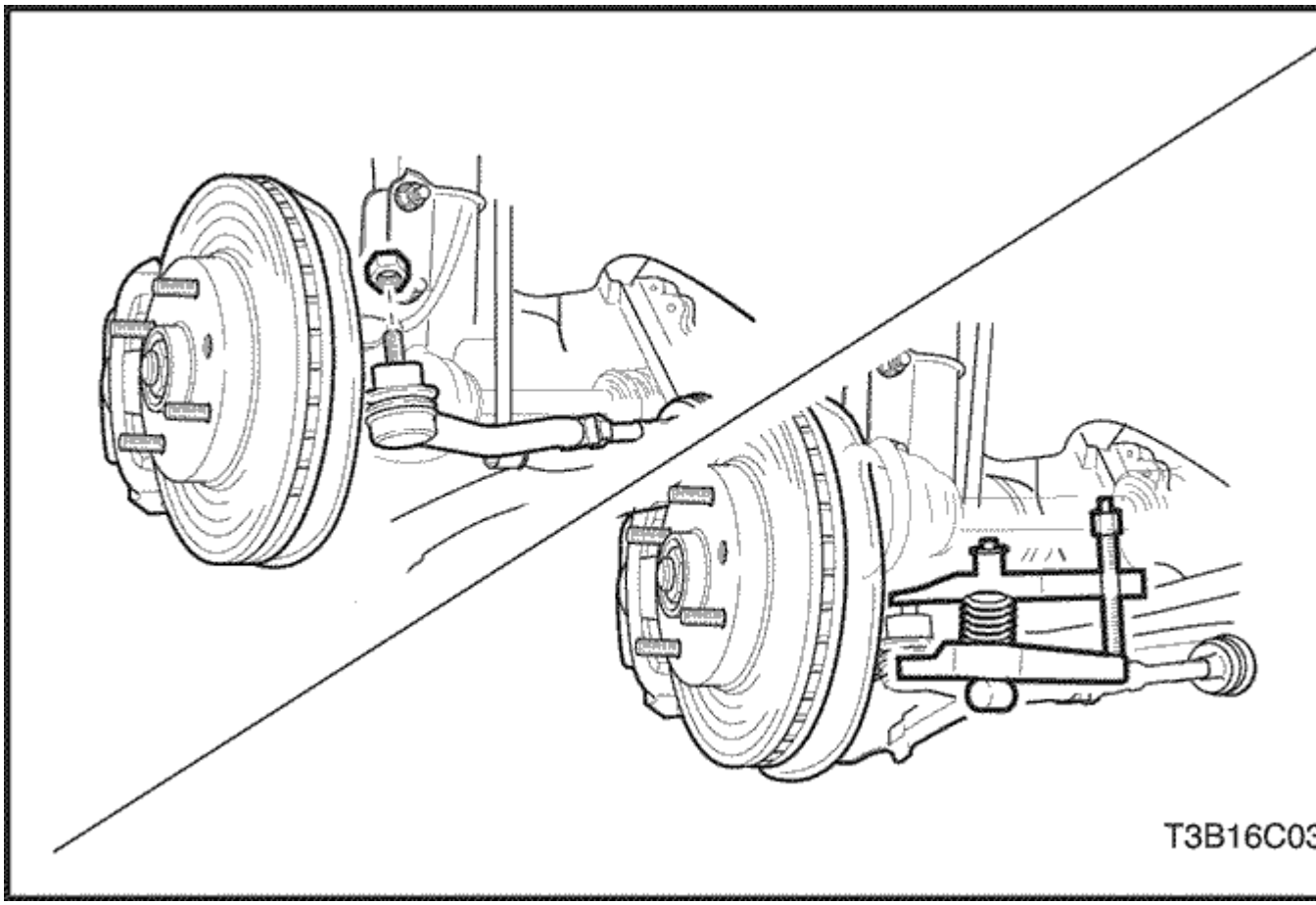
Rack and Pinion Assembly
Tools Required

KM-507-B Ball Joint Remover
Removal Procedure

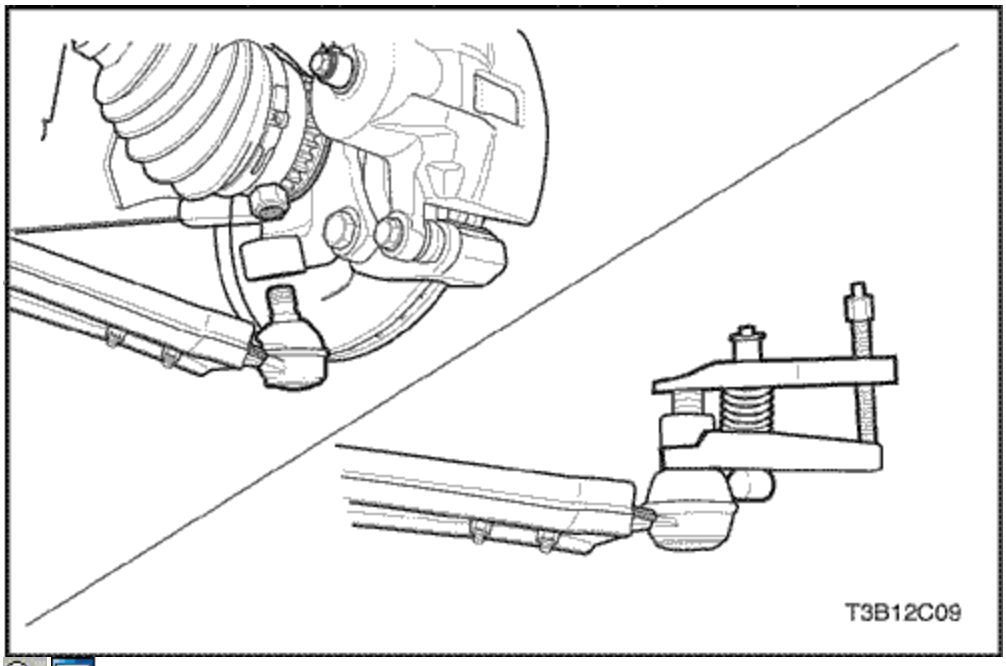
1. Disconnect the negative battery cable.
2. Position the tires straight ahead by turning the steering wheel.
3. Remove the Interm Shaft.Refer to *Section 6E, Steering Wheel And Column.*



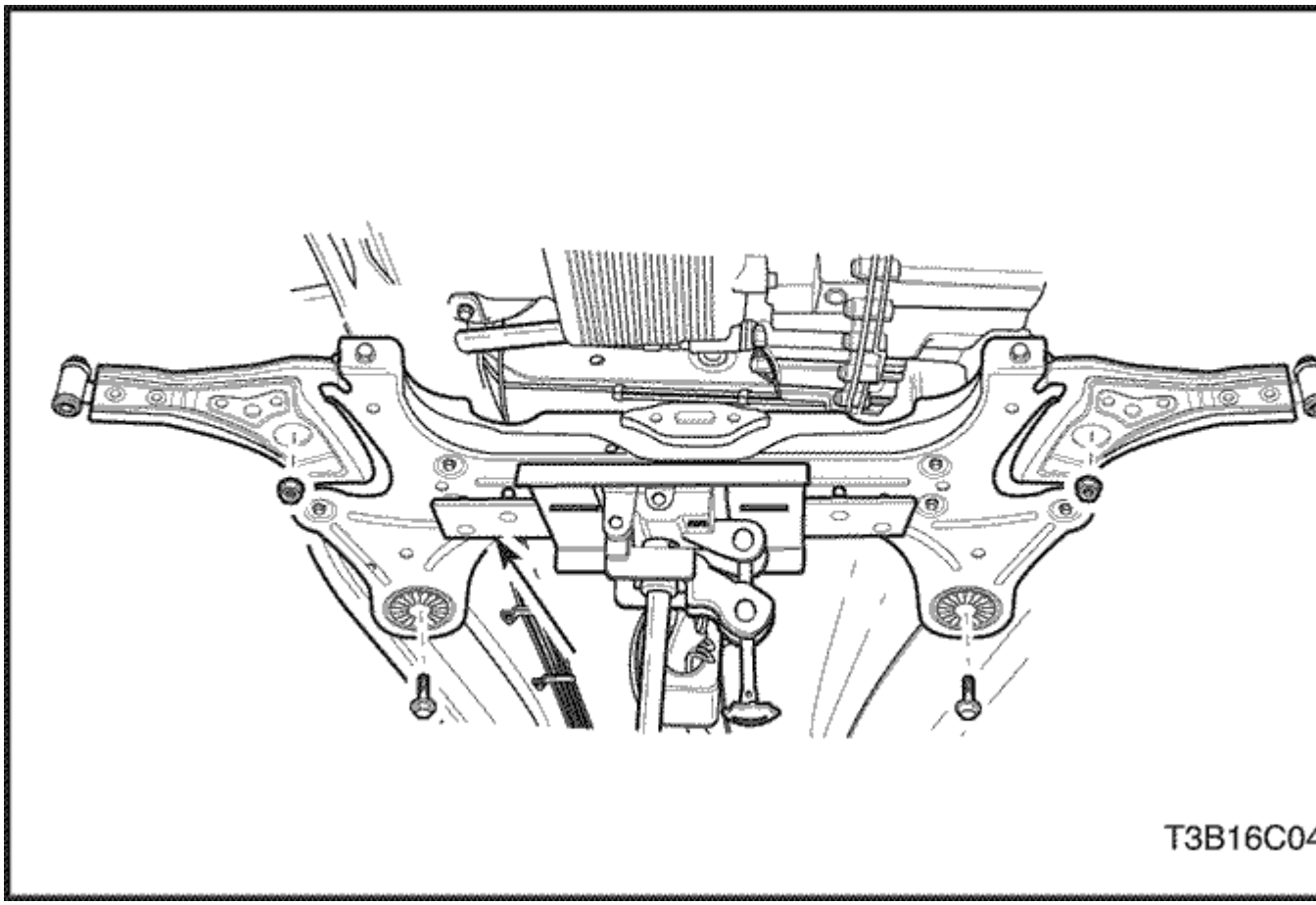
4. Remove the Front Tires.
5. Drain the Power Steering fluid from the Rack And Pinion.
6. Disconnect the Steering Gear Inlet and Outlet pipe fittings.



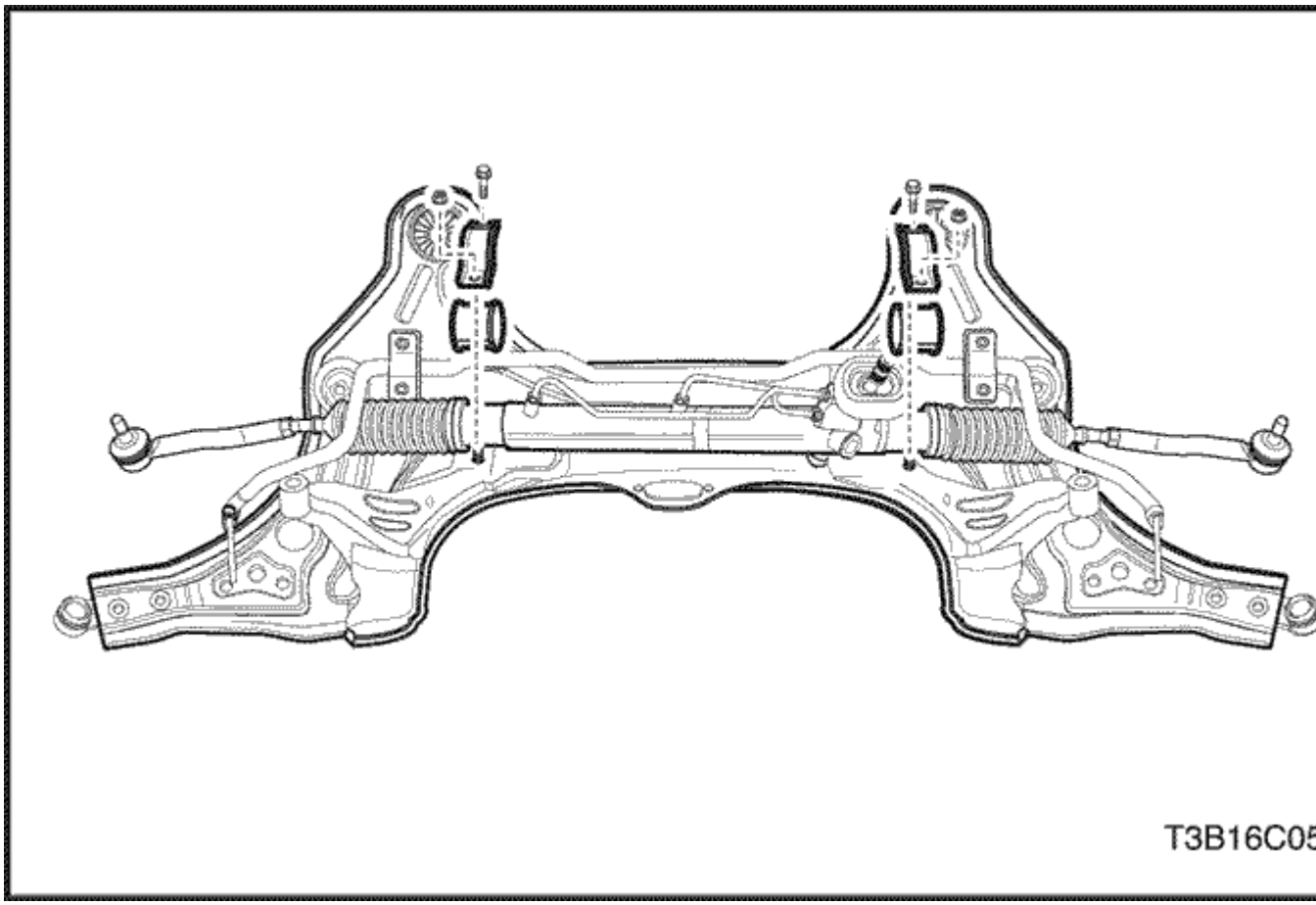
7. Remove the outer tie rod hex nuts. Refer to "outer tie rod" in this section.



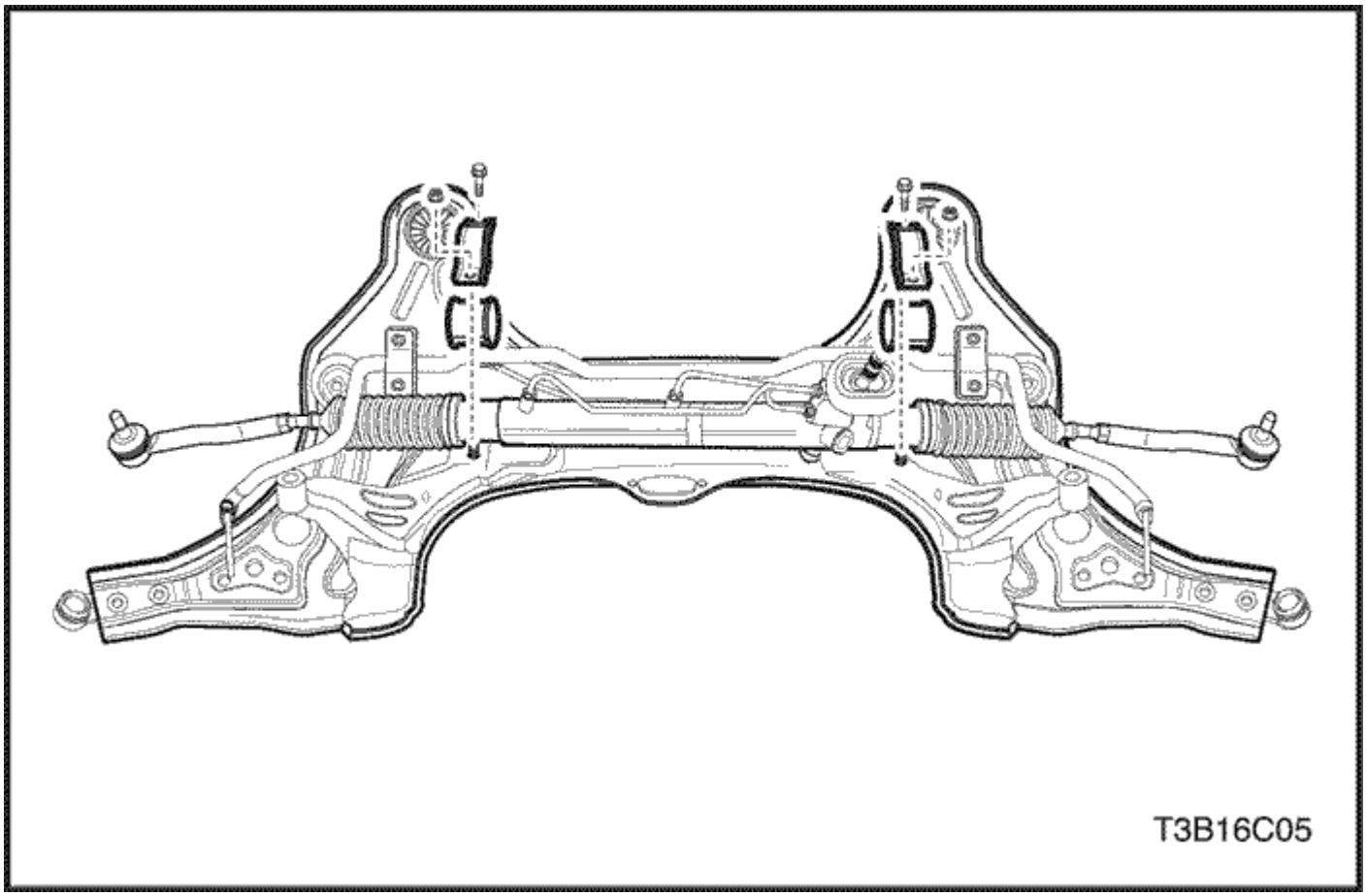
8. Remove the ball joint hex nuts and disconnect the stabilizer shaft from the knuckle by removing the stabilizer shaft link assembly. Refer to *Section 2C, Front Suspension.*



9. Remove the cross member by removing the nuts and bolts to the underbody.



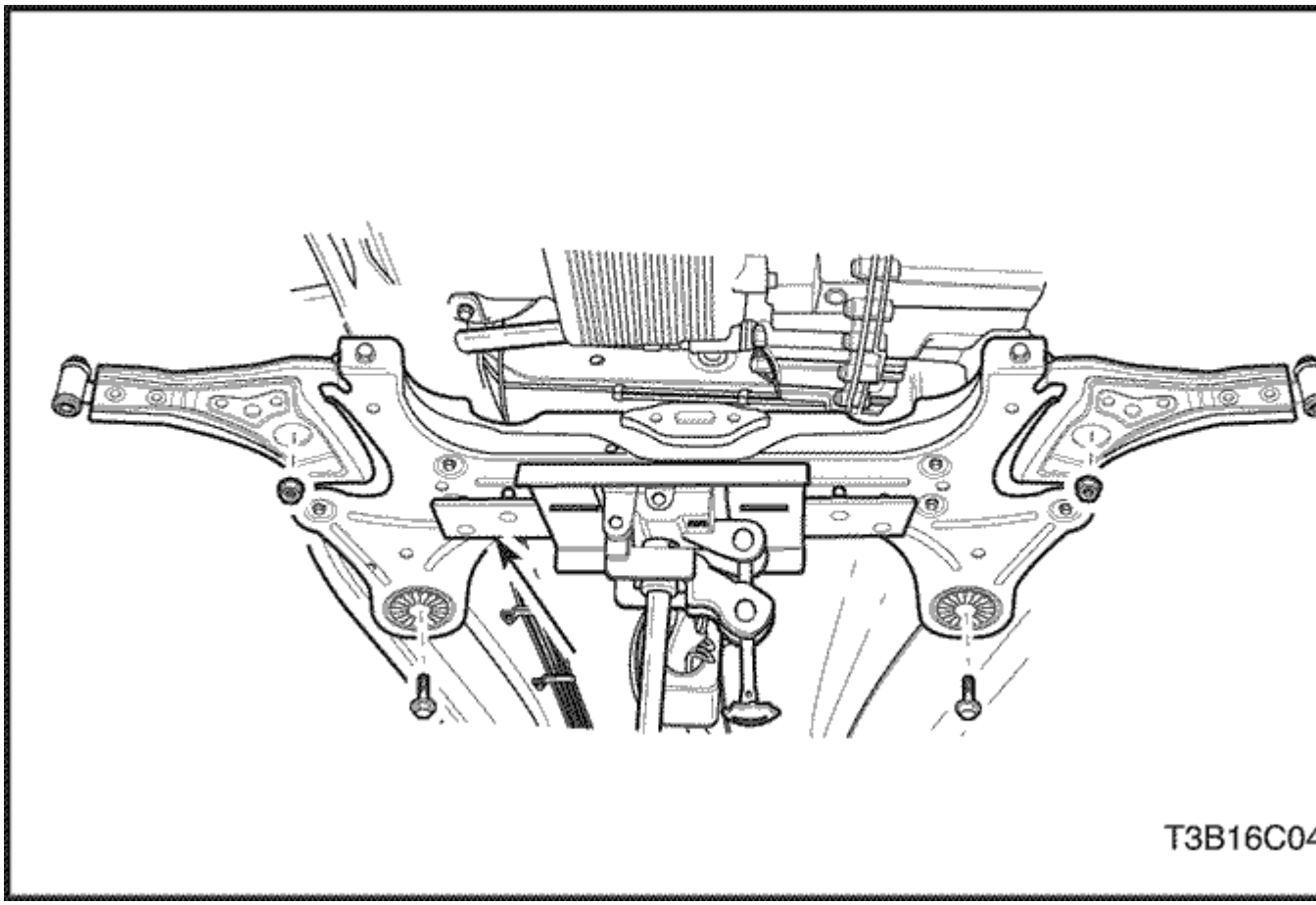
10. Remove the Rack and Pinion assembly by disconnecting the steering gear retaining bracket nuts.



Installation Procedure

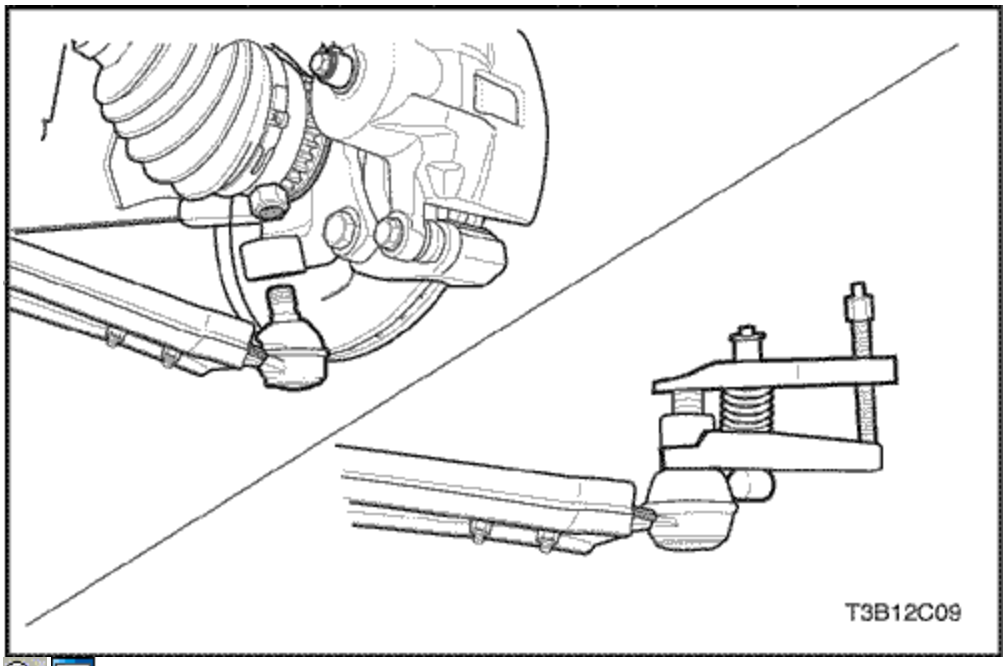
1. Install the Rack and Pinion assembly by connecting the steering gear retaining bracket nuts.

   Tighten
   Tighten the steering gear retaining bracket nuts to 50 N•m(37 lb-ft).



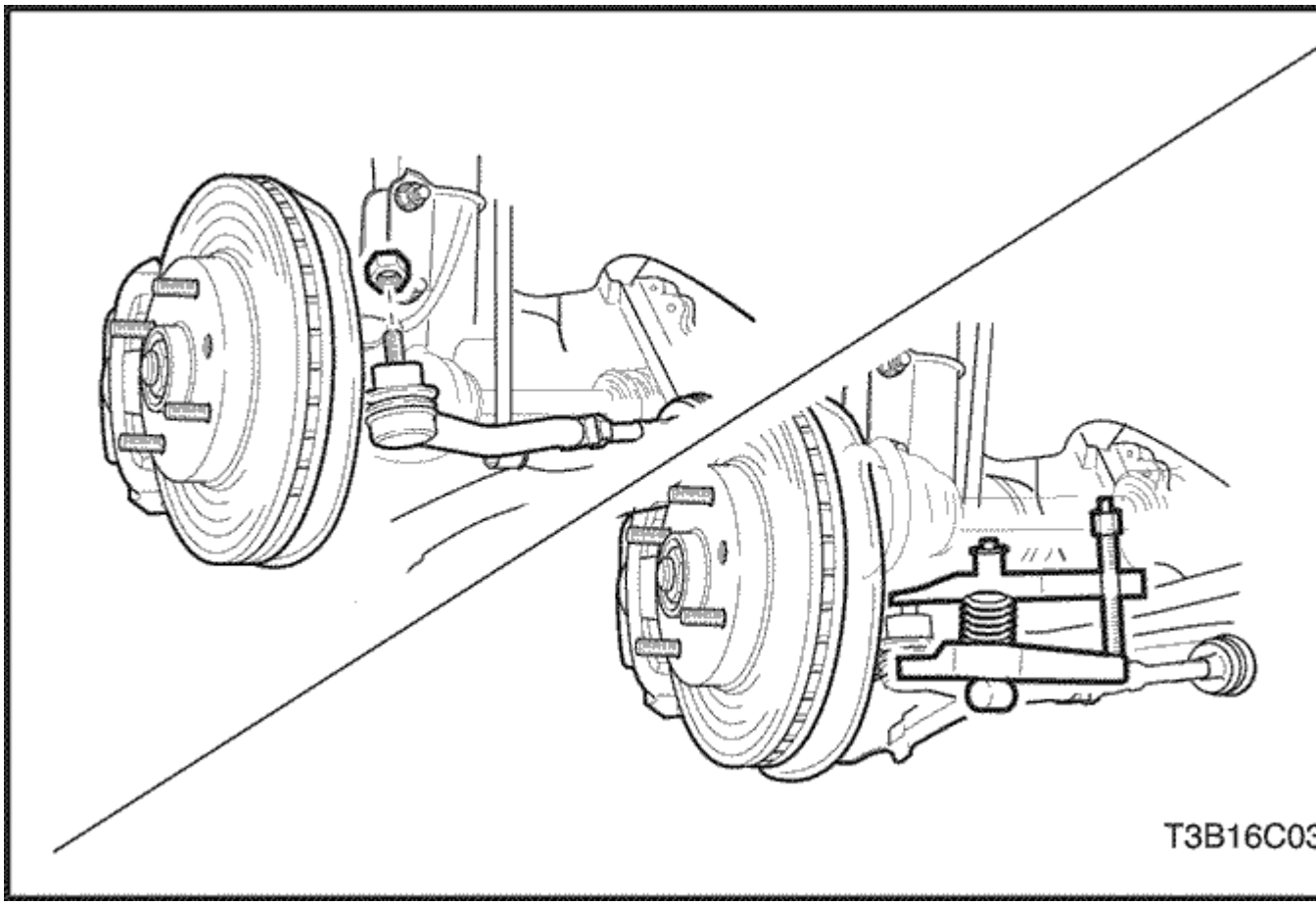
2. Install the cross member by tightening the nuts and bolts to the underbody.

   Tighten
   Tighten the cross member by tightening the nuts and bolts to the underbody to 150 N•m (111 lb-ft).



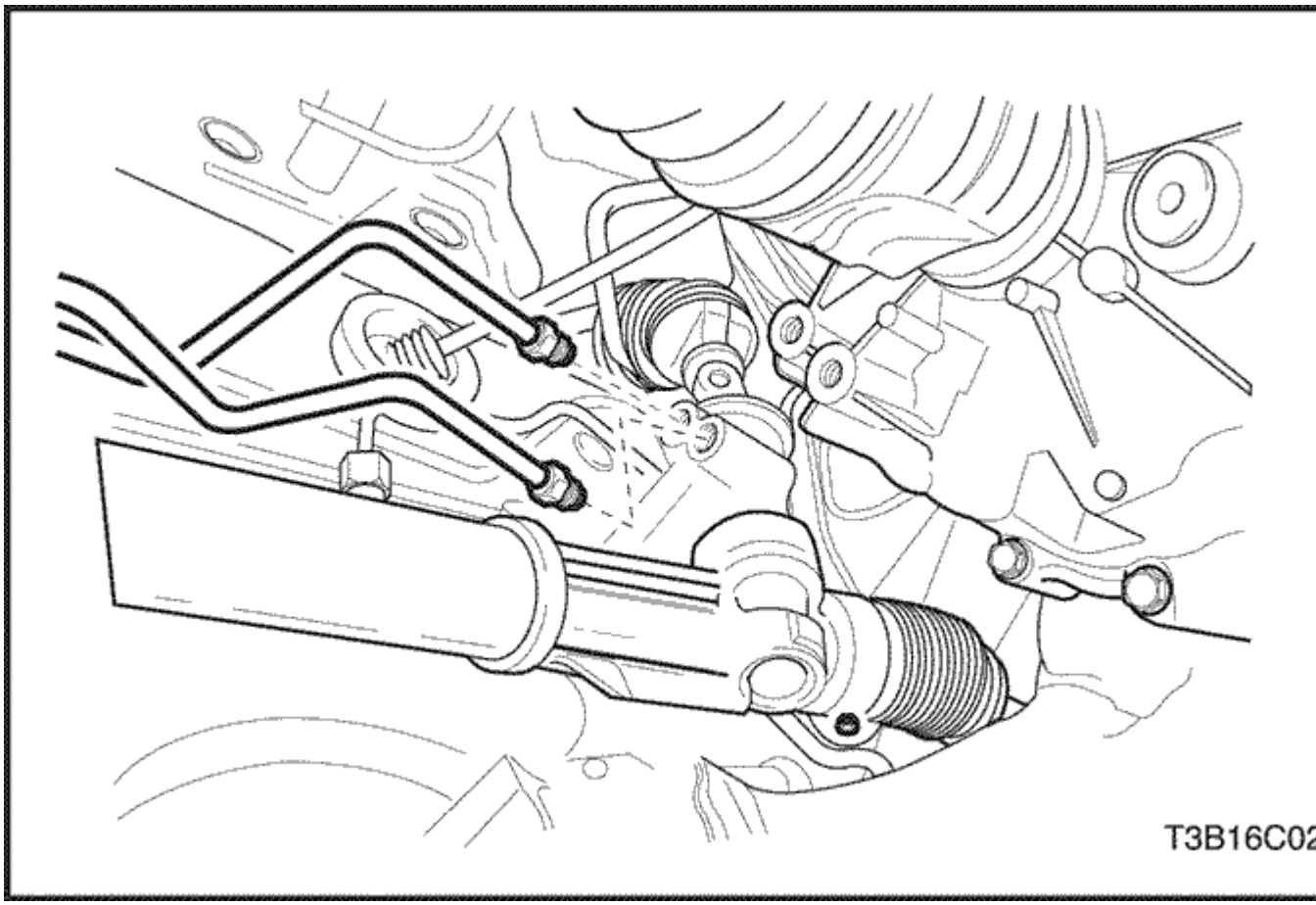
3. Install the ball joint hex nuts and connect the stabilizer shaft to the knuckle by tightening the the bolt with stabilizer shaft link assembly. Refer to *Section 2C, Front Suspension.*

   Tighten
   Tighten the ball joint hex nuts to knuckle to 45 N•m(33 lb-ft). Tighten the bolts of stabilizer shaft to the knuckle to 45 N•m (33 lb-ft).



4. Install the outer tie rod hex nuts.

   Tighten
   Tighten the outer tie rod hex nuts to 45 N•m (33 lb-ft).

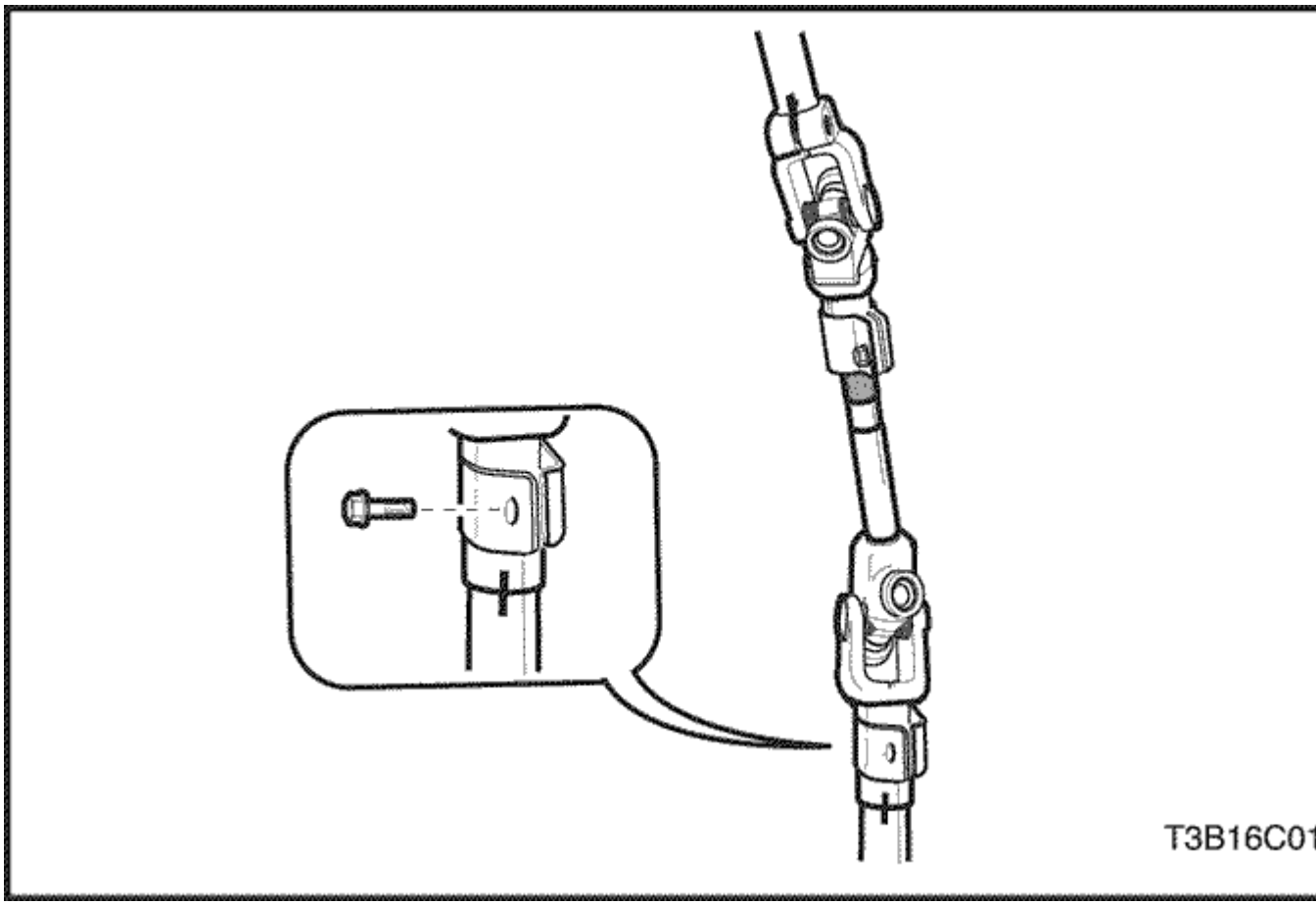


5. Connect the Steering Gear Inlet and Outlet pipe fittings.

   Tighten
   Tighten the nuts of Steering Gear Inlet and Outlet pipe fittings to 22 N•m (16 lb-ft).

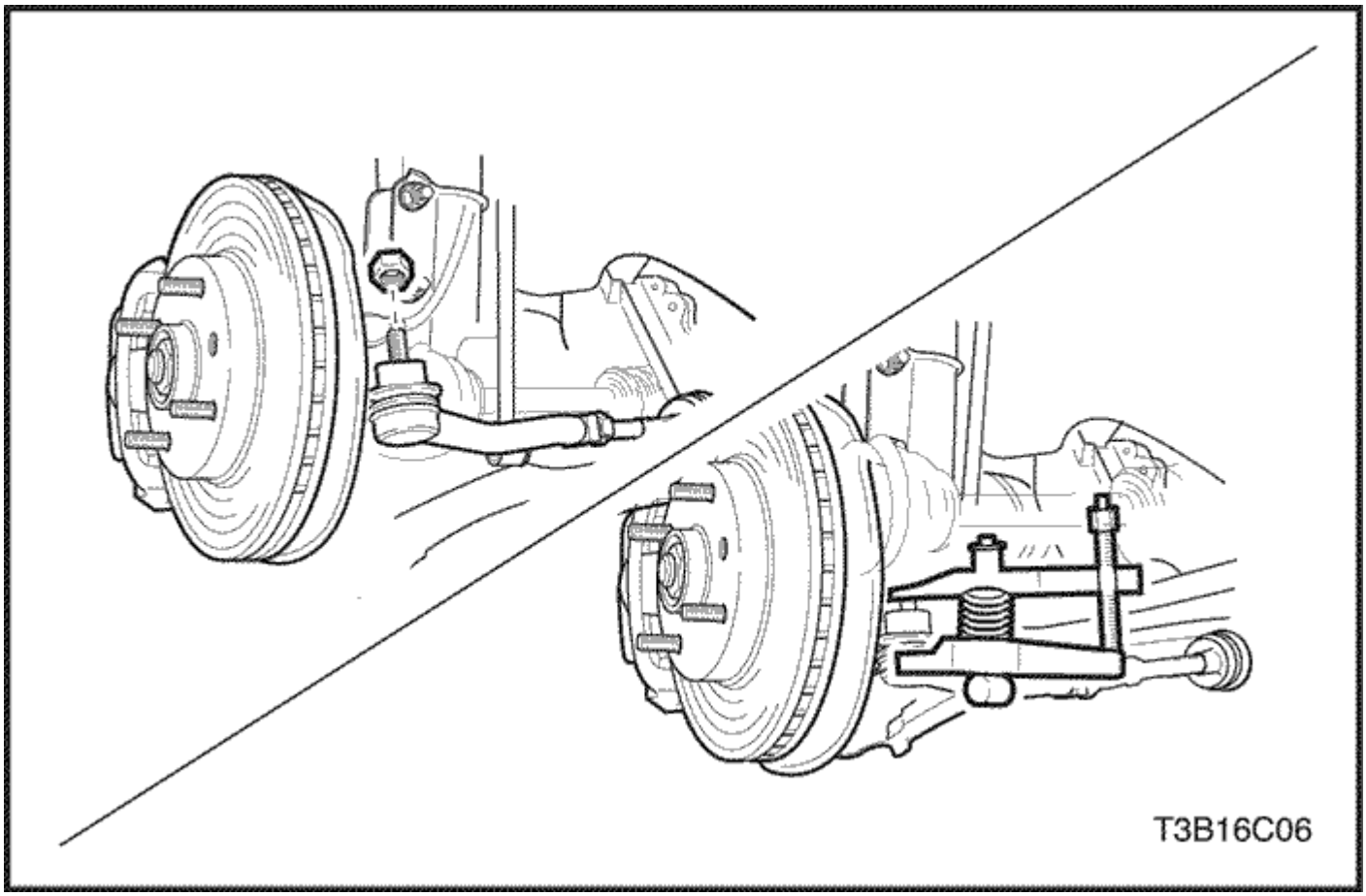
6. Install the Front Tires.Refer to *Section 2E, Tires and Wheels.*
7. Refill the Power Steering fluid.

   Notice : When adding fluid or making a complete fluid change, always use DEXRON-III power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.



8. Install the Interm Shaft.Refer to *Section 6E, Steering Wheel And Column.*
9. Install the steering wheel and column.
10. Connect the negative battery cable.

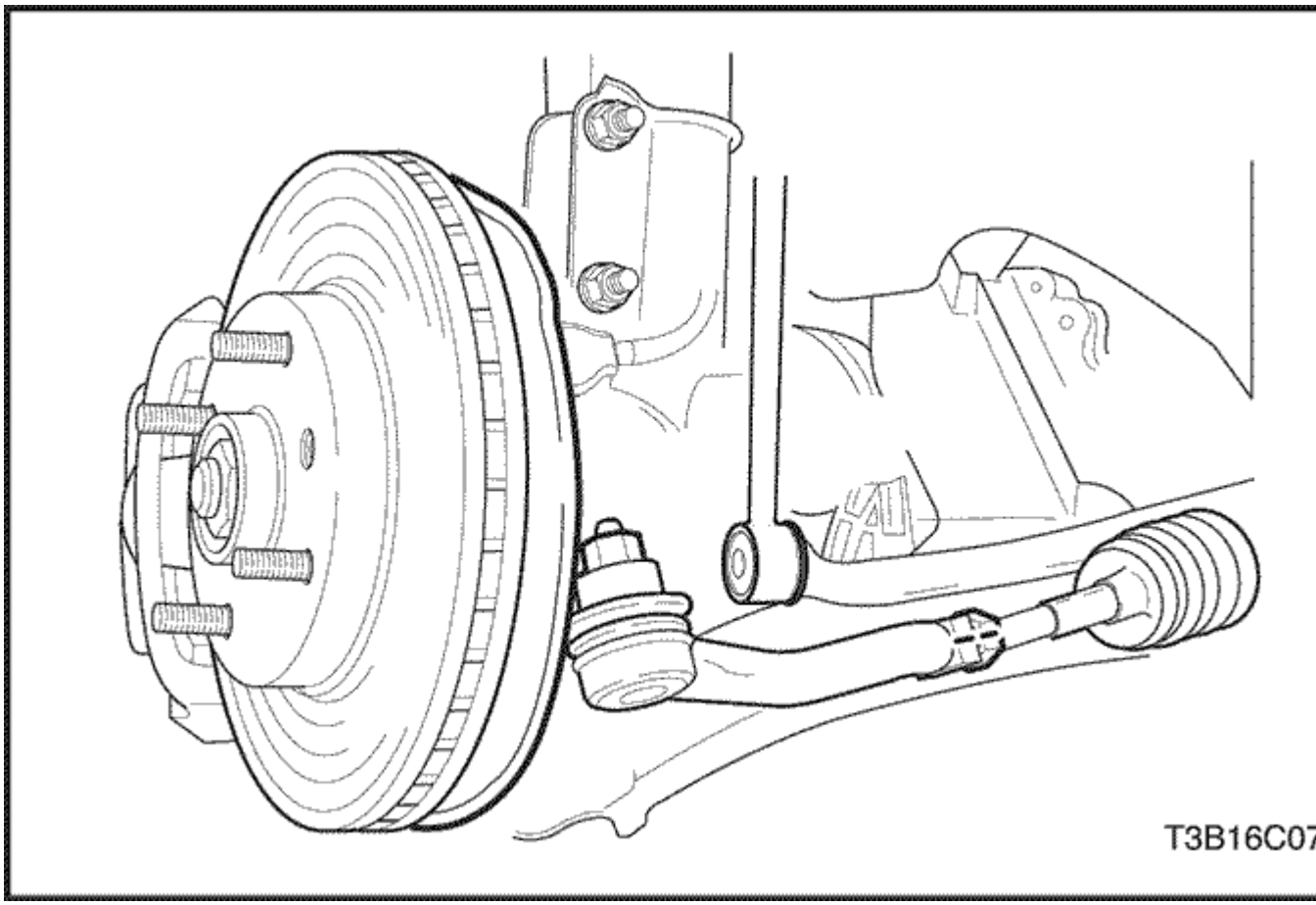
Important : After all the operations with the steering gear, be sure to check the exact straight-ahead position of the steering in each case.Refer to "Straight-ahead check" in this section.



Outer Tie Rod
Tools Required

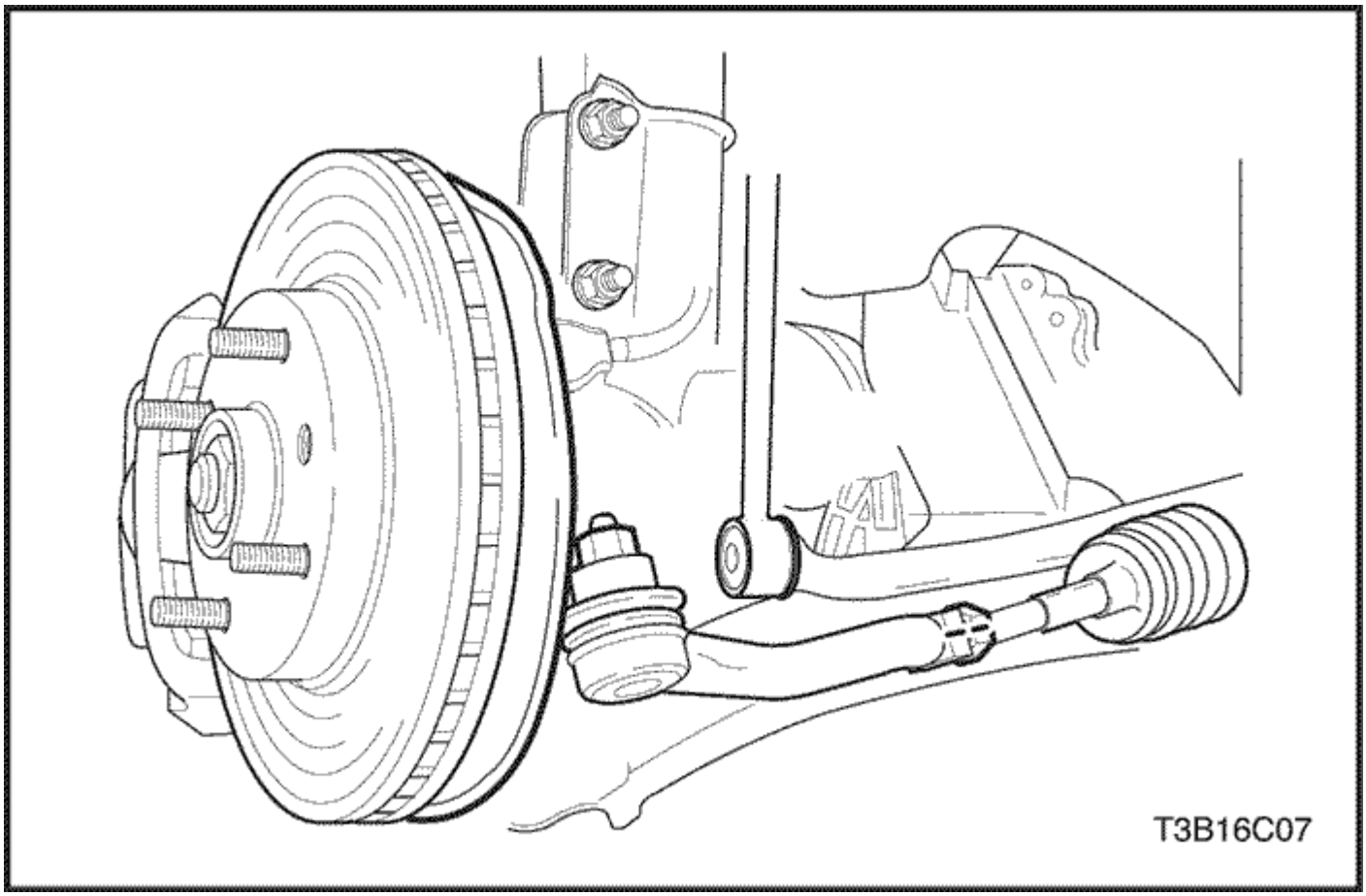
KM-507-B Ball Joint Remover
Removal Procedure

1. Remove the outer tie rod hex nut and disconnect the outer tie rod from the steering knuckle using the special tool KM-507-B.



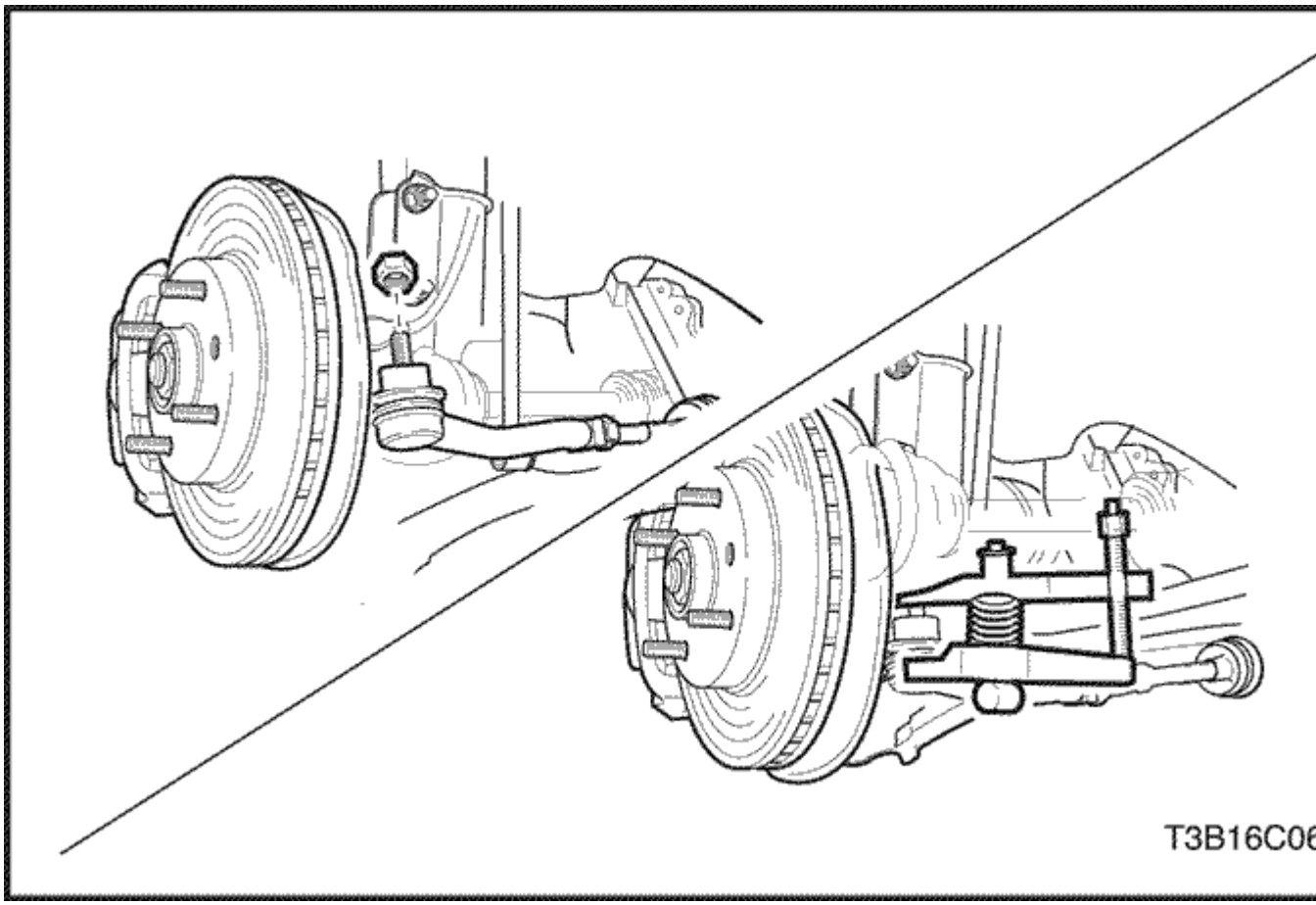
2. Loose the tie rod lock nuts and remove the outer tie rod.

   Important : Before loose the tie rod lock nut, mark the position of the lock nut for easy alignment after installation procedure.



Installation Procedure

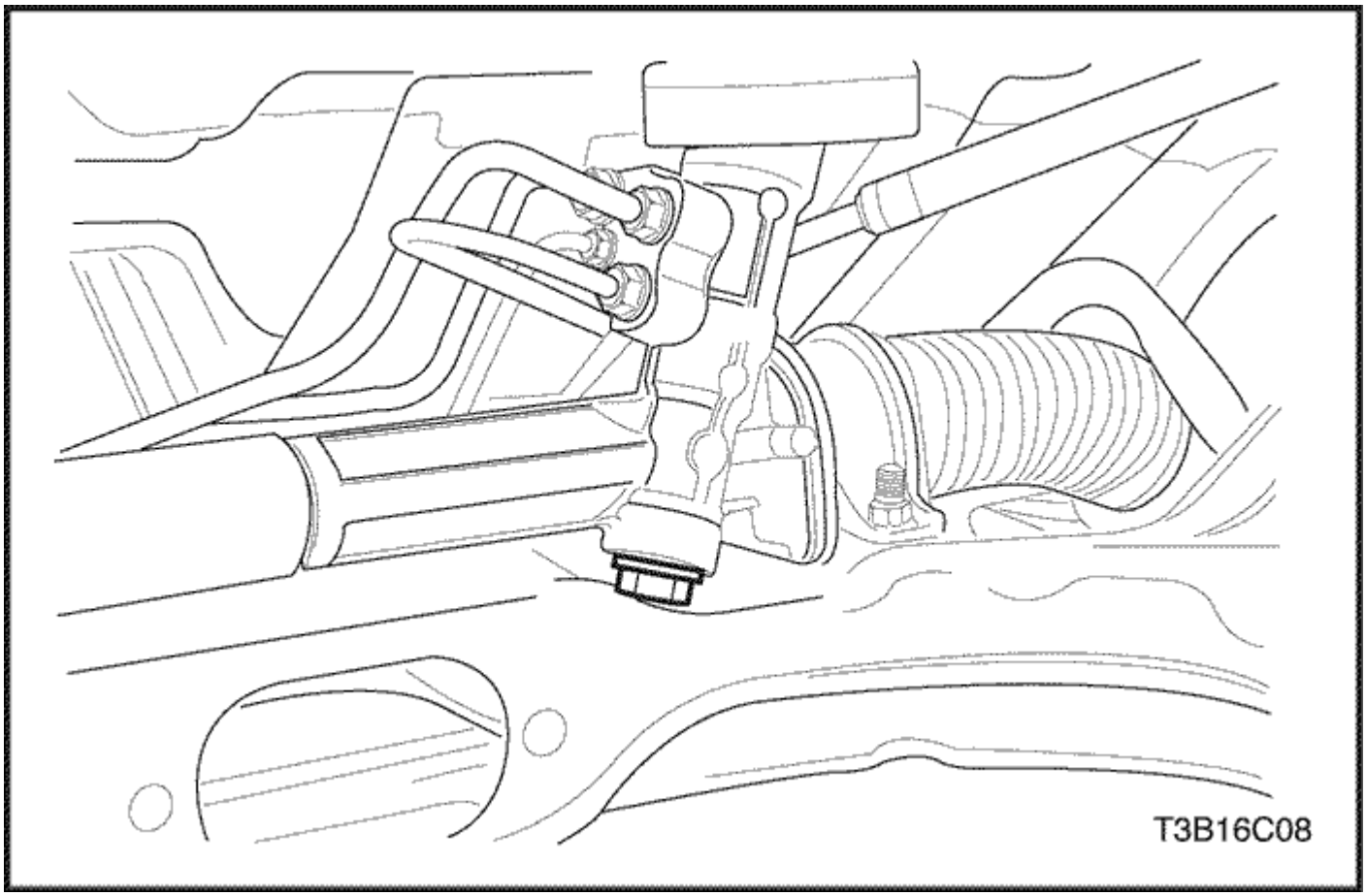
1. Install the outer tie rod by tightening the lock nuts to 54 N•m(40 lb-ft).



2. Install the outer tie rod by tightening the hex nut to 45 N•m(33 lb-ft).

Inner Tie Rod
Removal Procedure

1. Refer to the unit repair of power steering gear in this section.

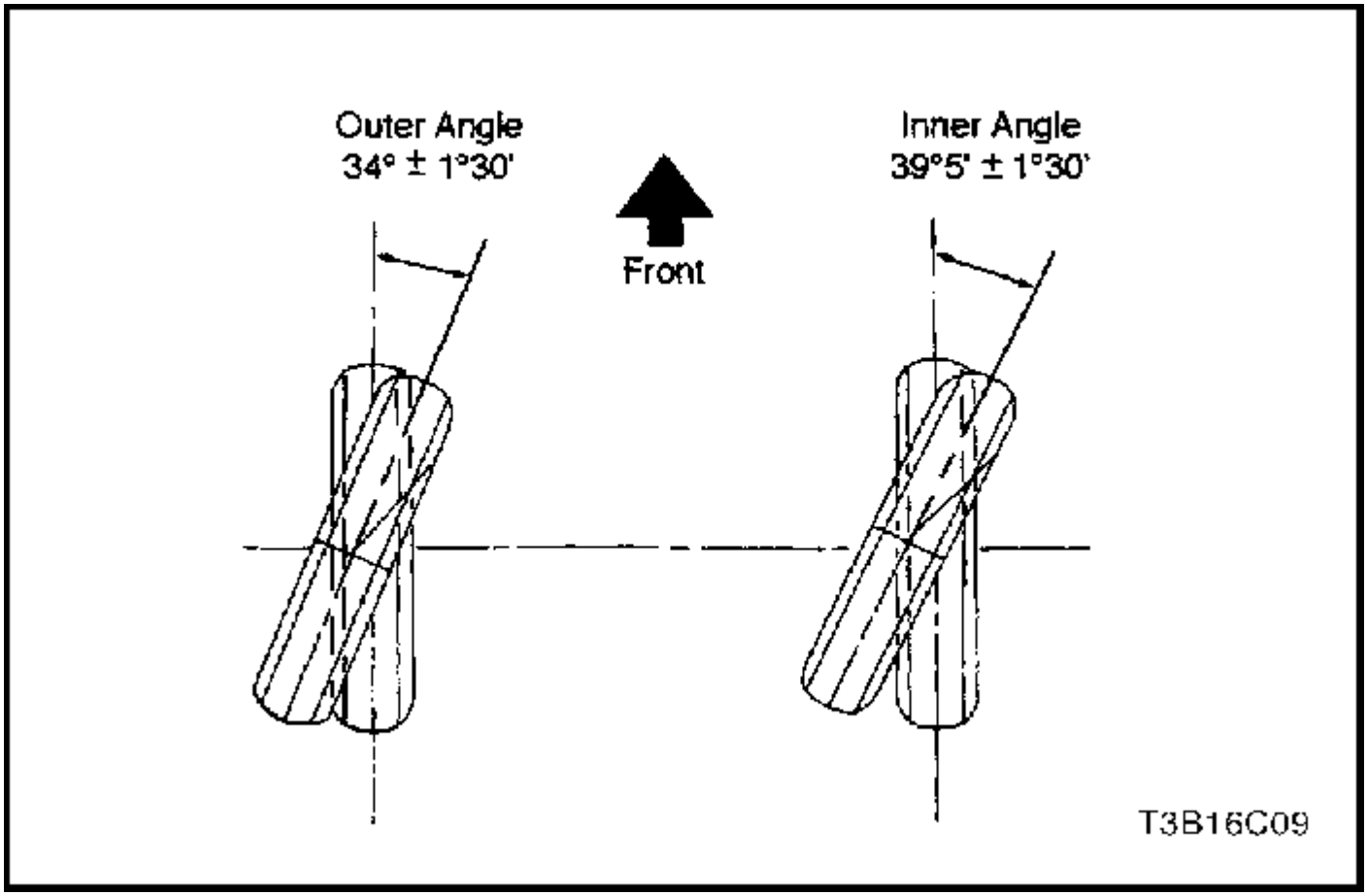


Rack Bearing Preload On-Vehicle Adjustment
Adjustment Procedure

Make the rack bearing adjustment with the front wheel raised and the steering wheel centered. Be sure to check the returnability of the steering wheel to center after the adjustment.

1. Loosen the locknut and turn the adjuster plug clockwise until a torque of 10 N•m (88 lb-in) is obtained.
2. Back the adjuster plug off by 55 to 65 degrees. Check the pinion preloaded torque is within the range 0.9 to 1.7 N•m (8 to 15 lb-in).
3. Tighten the adjuster plug locknut while holding the adjuster plug stationary.

Tighten
Tighten the adjuster plug locknut to 70 N•m (52 lb-ft).



Straight-Ahead Check

After all the necessary operations on the steering gear are completed, check the exact straight-ahead position of the steering in each case.

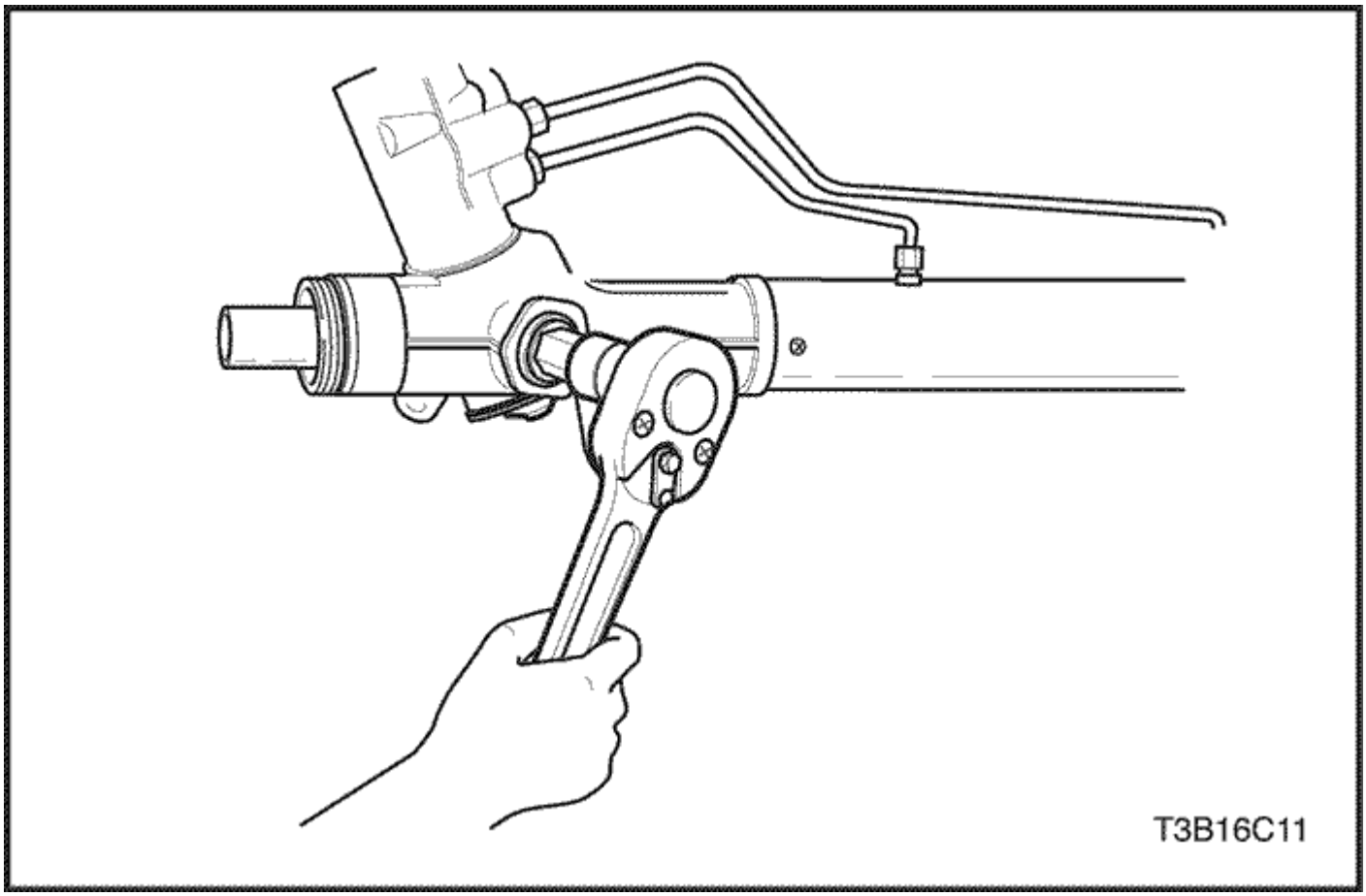
With the vehicle on the floor, place the steering wheel in the straight-ahead position. Mark the centerline of both tires on the floor. Turn the steering wheel all the way to the right and mark the new centerline of both tires on the floor.

Straight-Ahead Check Table

Step	Action	Value(s)	Yes	No
1	Place the steering wheel in the straight-ahead position. Is the wheel in the correct position?	-	Go to *Step 2*	-
2	Is the steering coupling flange pinch bolt lying horizontally?	-	Go to *Step 3*	Go to *Step 4*
3	Is the steering wheel off center by more than 5	-	Go to *Step 5*	Go to *Step 6*

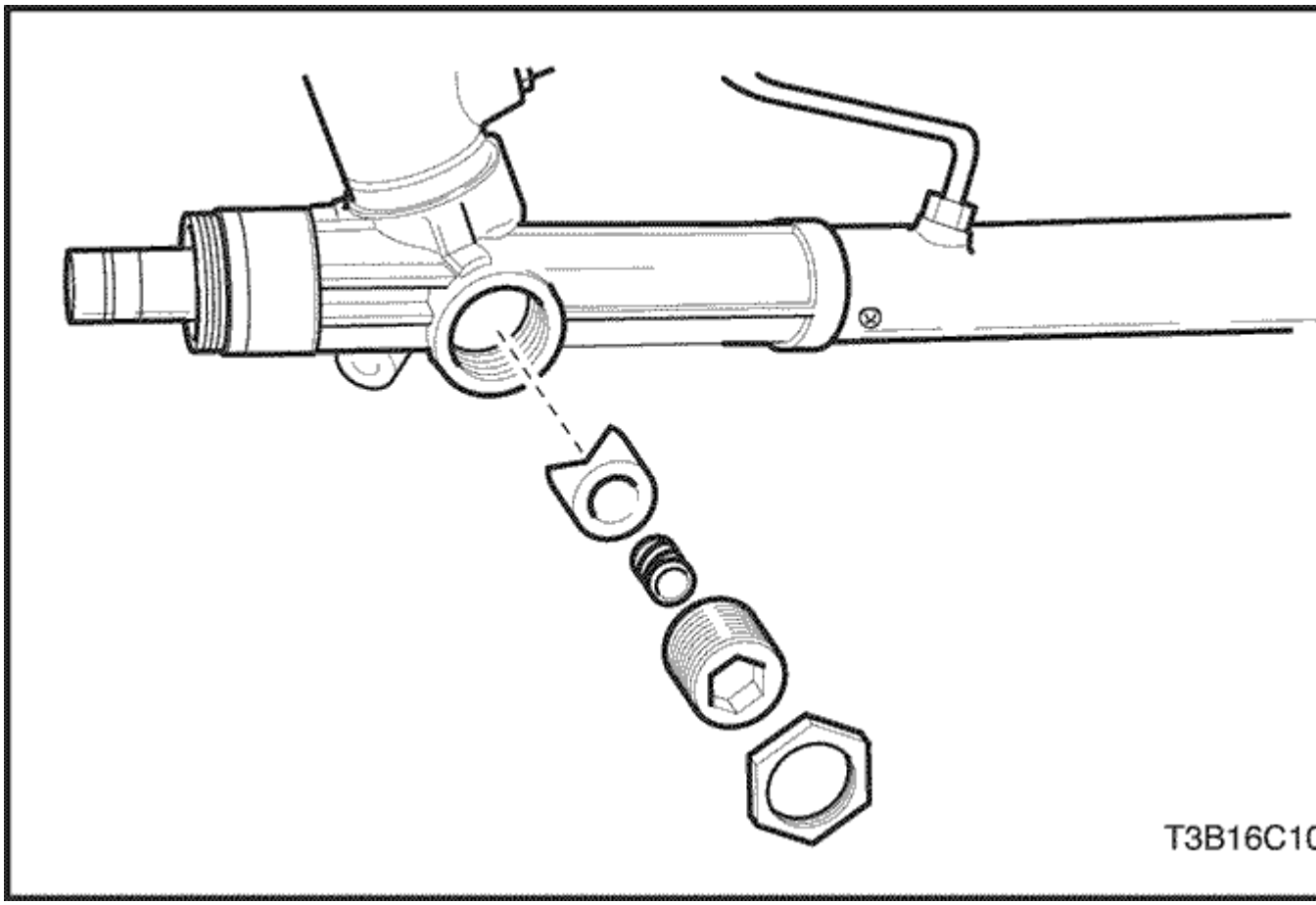
Step	Action	Value(s)	Yes	No
	degrees?			
4	The pinion is displaced on the rack. The steering pinion position must be corrected. Is the repair complete?	-	Go to *Step 2*	-
5	Remove steering wheel and center on the spindle splines. Is the repair complete?	-	Go to *Step 3*	-
6	Turn the steering wheel all the way to the right. Measure the inner and the outer angles of the tire centerline compared to the straight-ahead centerline. Do the angles match the value specified?	Inner angle: 39° 5'± 1° 30' Outer angle: 34° ± 1° 30'	System OK	Go to *Step 7*
7	The rack assembly was not assembled correctly. Repair, as needed. Is the repair complete?	-	Go to *Step 6*	-

UNIT REPAIR



Rack Bearing
There is no provision for overhaul or disassembly of the rack and pinion power steering gear. The power steering gear is served only as an assembly.
Removal Procedure

1. Remove the rack and pinion steering assembly from the vehicle. Refer to "Rack and Pinion Assembly" in this section.
2. Remove the adjuster plug locknut from the adjuster plug, and remove the adjuster plug from the housing with the rack guide spring cap wrench(22mm).

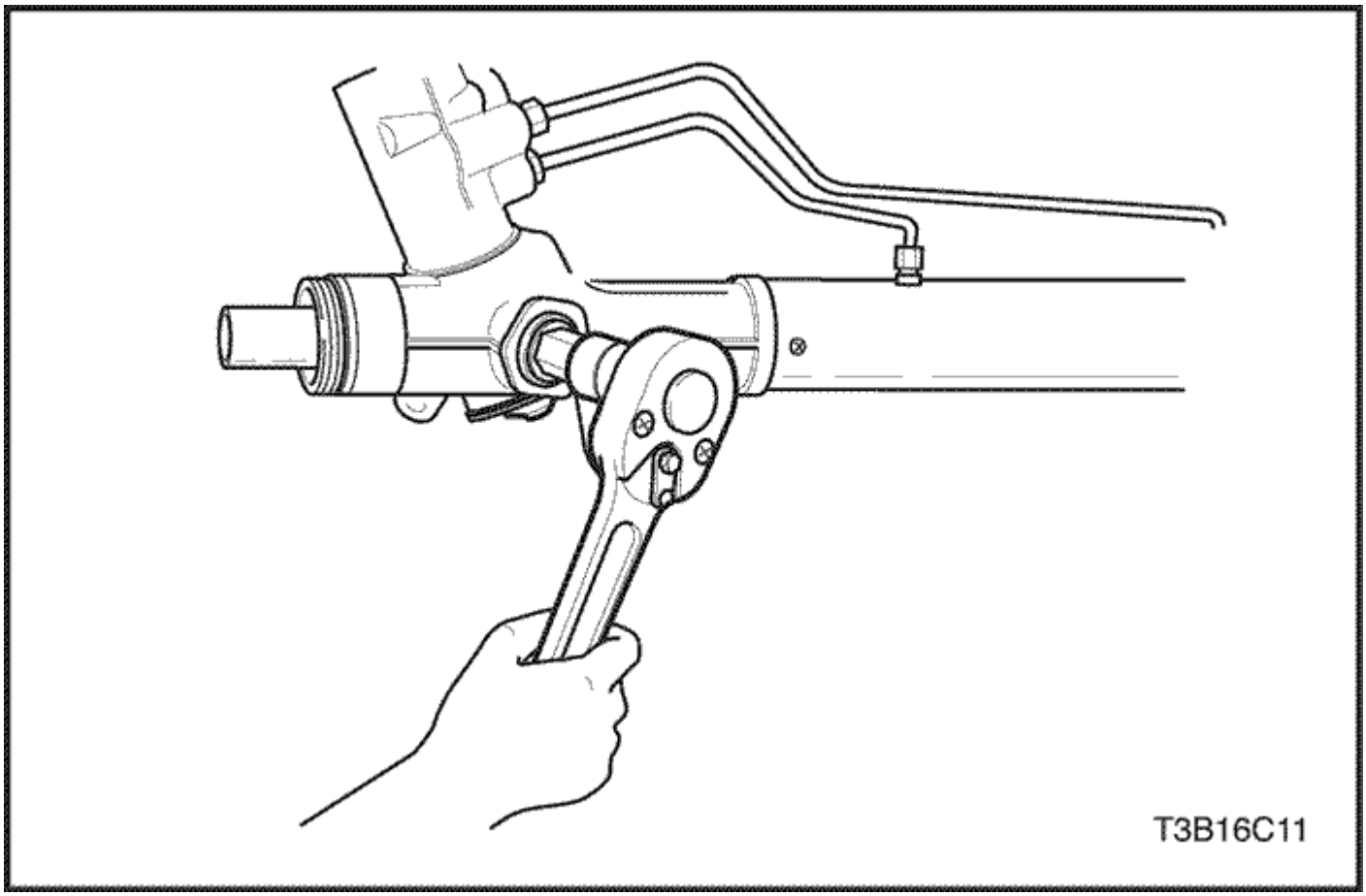


3. Remove the adjuster spring and rack bearing.

Installation Procedure

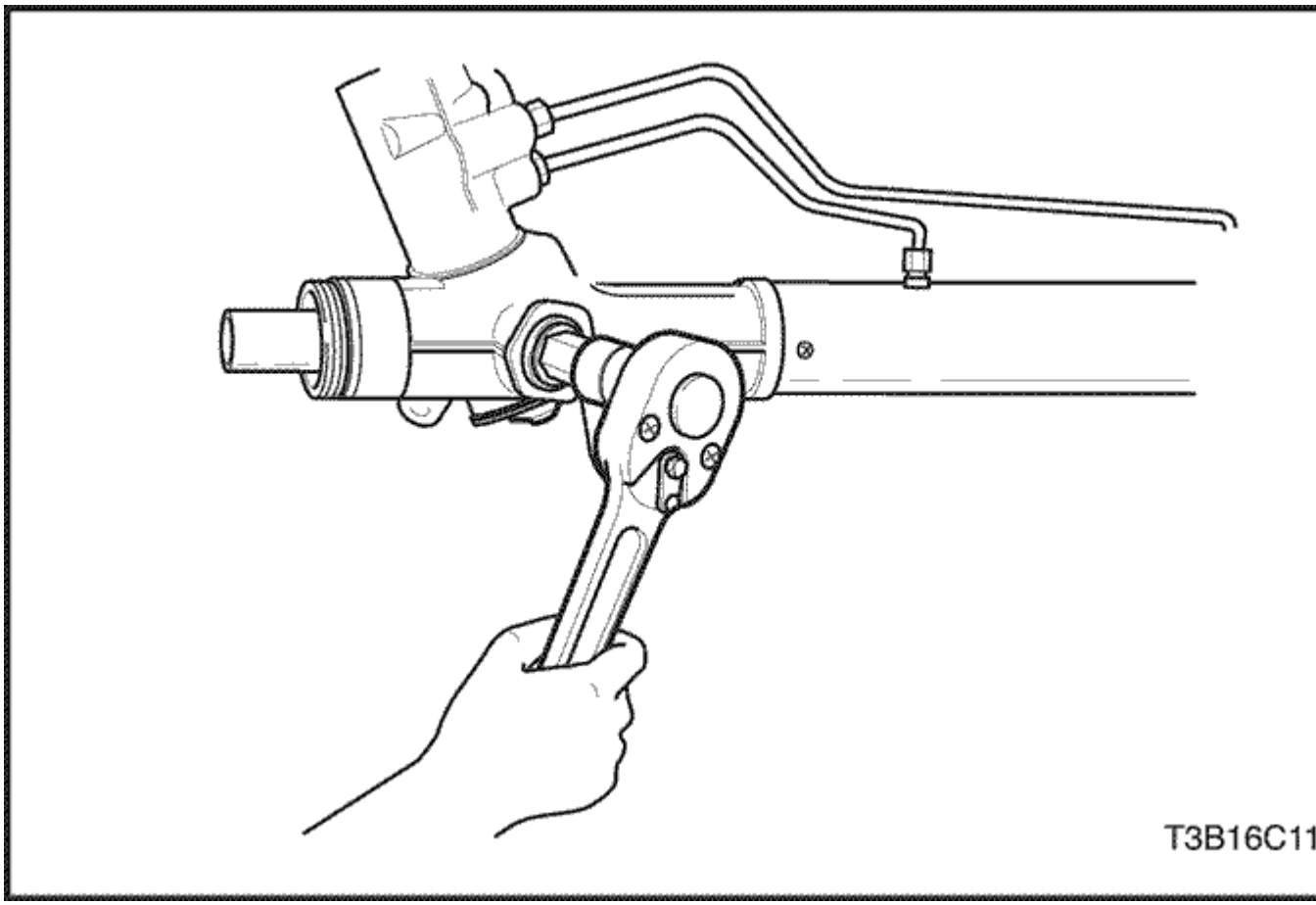
- Coat the rack bearing, the adjuster spring and the adjuster plug with lithium-based grease.
- With the rack centered, turn the adjuster plug clockwise until a torque of 12 N•m(9 lb-ft) is obtained, then back it off by 50 to 70 degress.

Tighten
Tighten the adjuster plug to 12N•m(9 lb-ft).



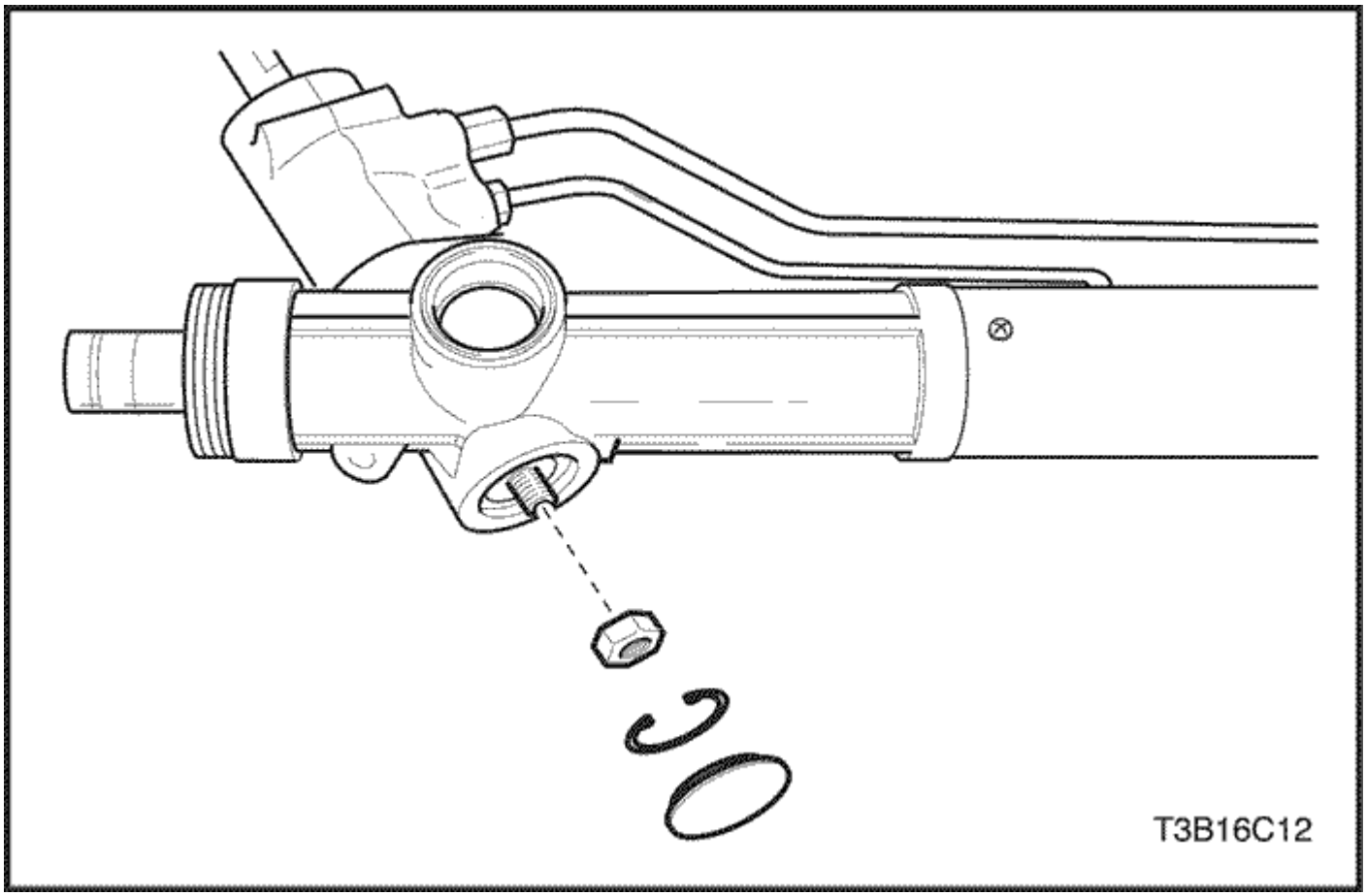
Rack Bearing Preload Adjustment
Adjustment Procedure

1. Raise and suitably support the vehicle.
2. Center the steering wheel.
3. Remove the power steering gear. Refer to "Rack and Pinion Assembly" in this section.
4. Loosen the locknut and the adjuster plug clockwise until a torque of 12N.m(9lb-ft) is obtained, then loosen it by 50 to 70 degrees.



5. Tighten the locknut on the adjuster plug while holding the adjuster plug stationary.
6. Install the power steering gear. Refer to "Rack and Pinion Assembly" in this section.
7. Be sure to check the return ability of the steering wheel to center position after adjustment.

Tighten
Tighten the adjuster plug to 12 N•m (9 lb-ft) and the adjuster plug lock nut to 30 N•m (22 lb-ft).

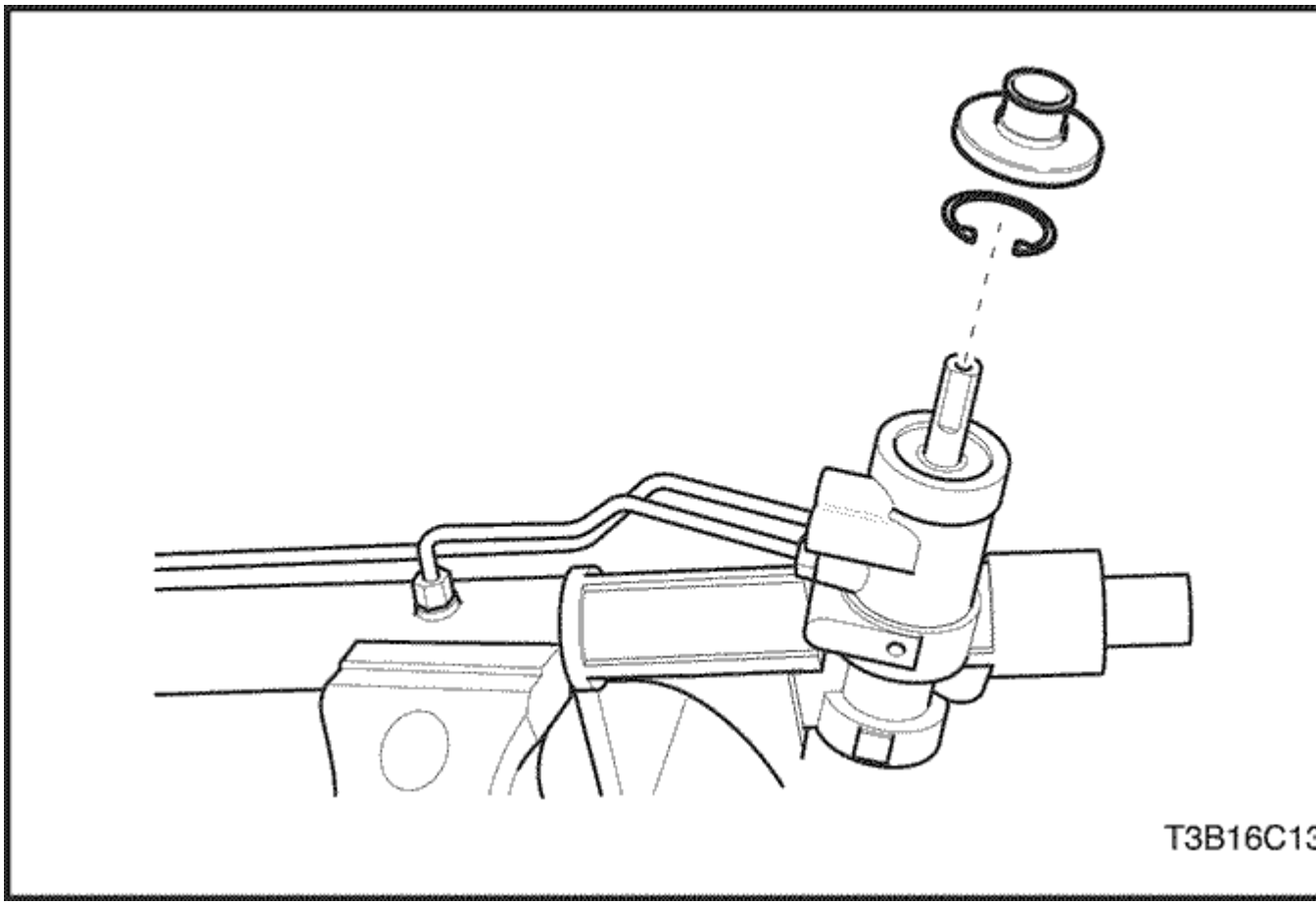


Valve and Pinion Assembly
Disassembly Procedure

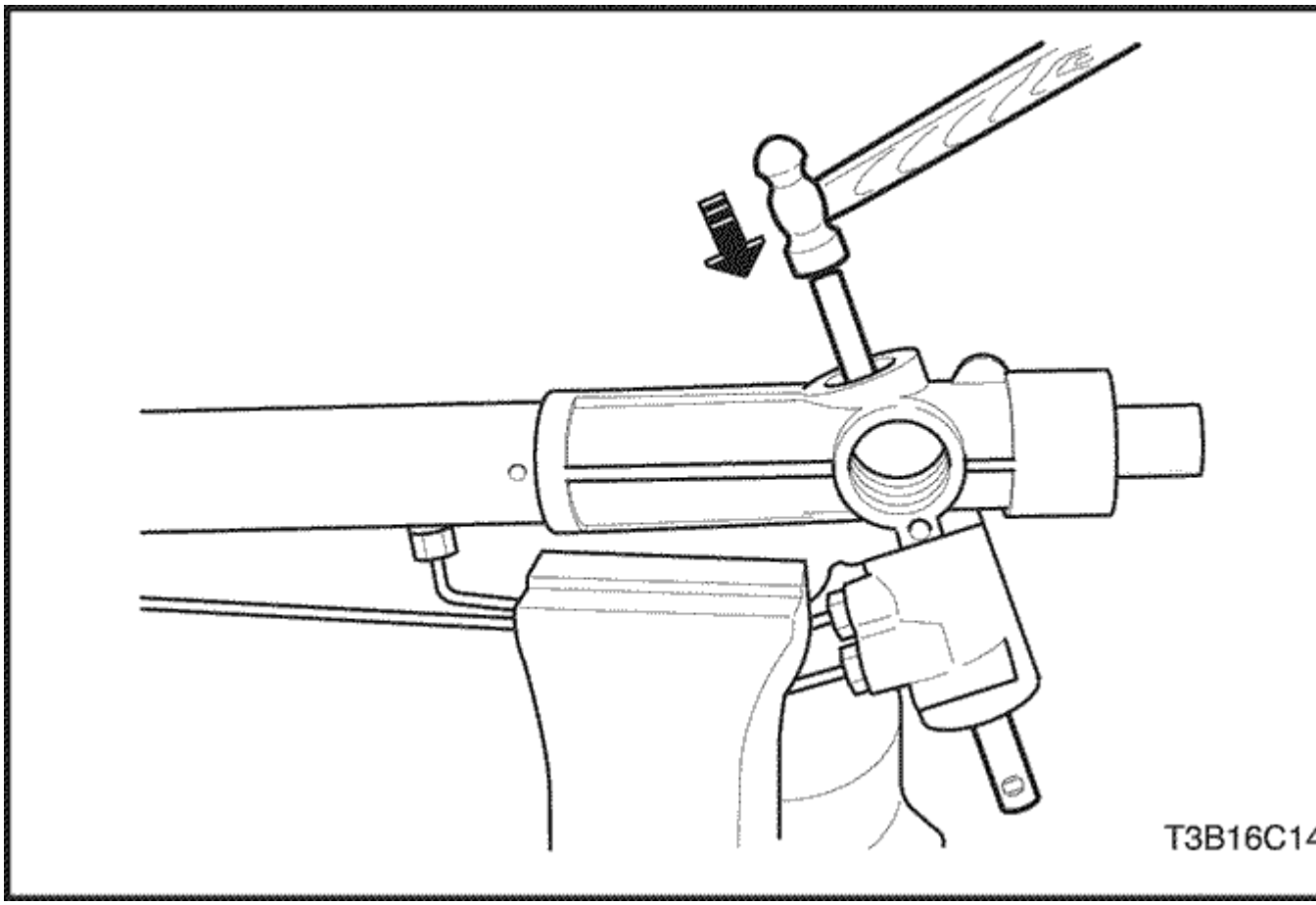
1. Remove the rack and pinion steering assembly from the vehicle. Refer to "Rack and Pinion Assembly" in this section.
2. Remove the dust cover from the lower end of the housing.

   Notice : If the stud shaft is not held, damage to the pinion teeth will occur.

3. While holding the stub shaft with a wrench, remove the locknut from the pinion.

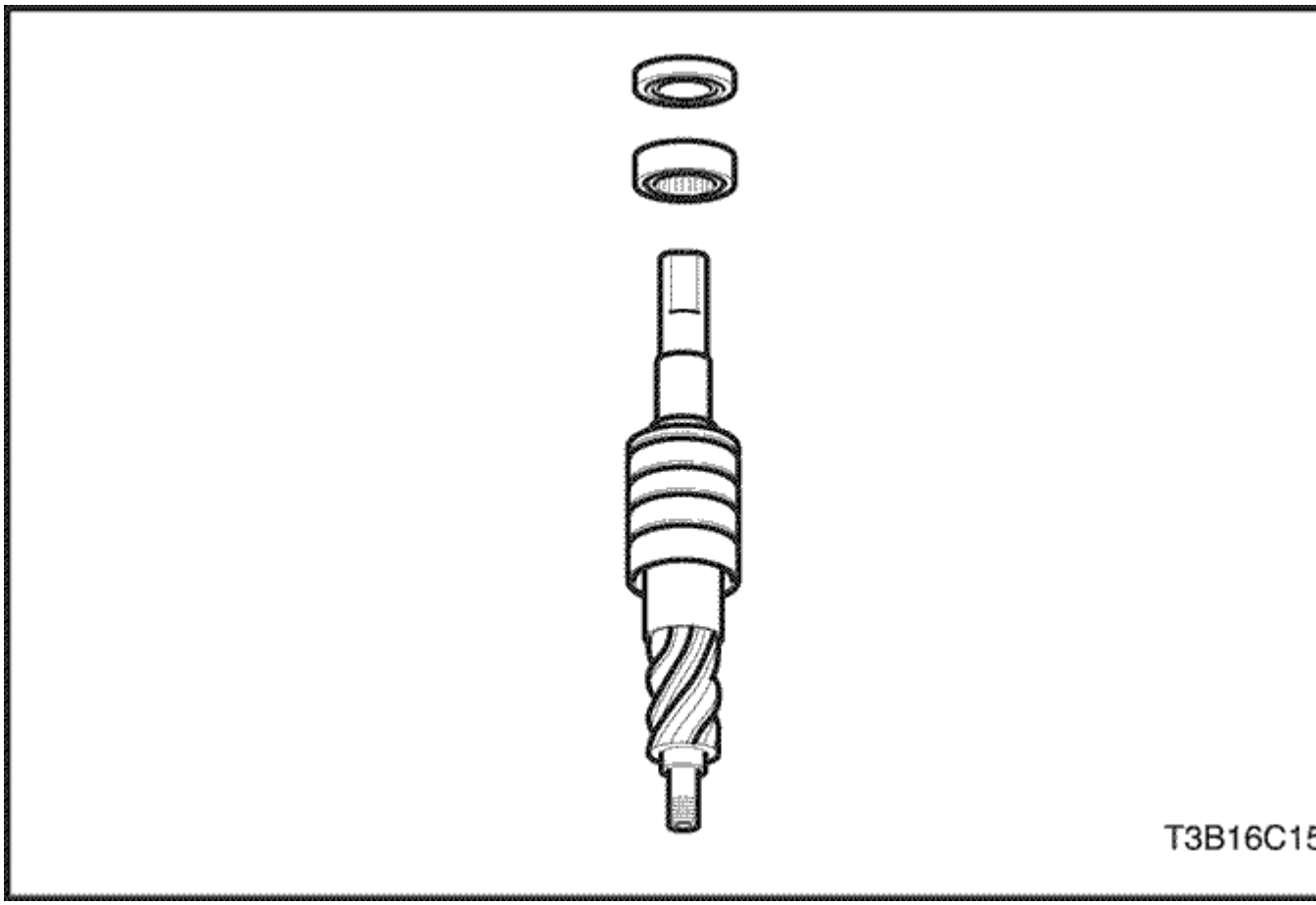


4. With the gear centered, mark the location of the stub shaft notch on the housing to aid in properly installing the pinion and valve assembly.
5. Remove the upper housing retaining ring.

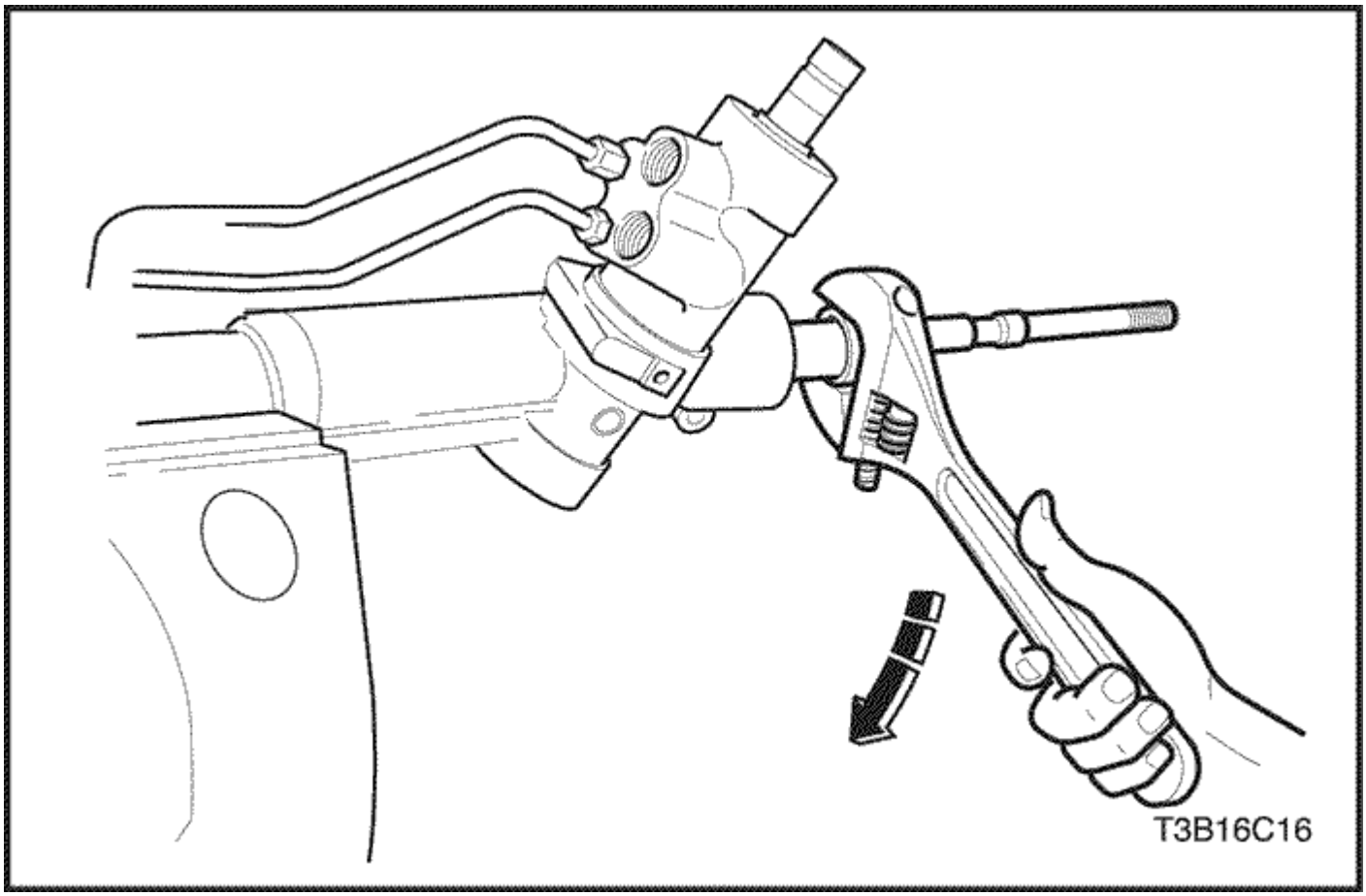


6. Remove the valve and pinion assembly from the stub shaft housing.

Notice : Be sure to remove the stub shaft from the housing with caution, otherwise the shaft, bearing and seal could be damaged.



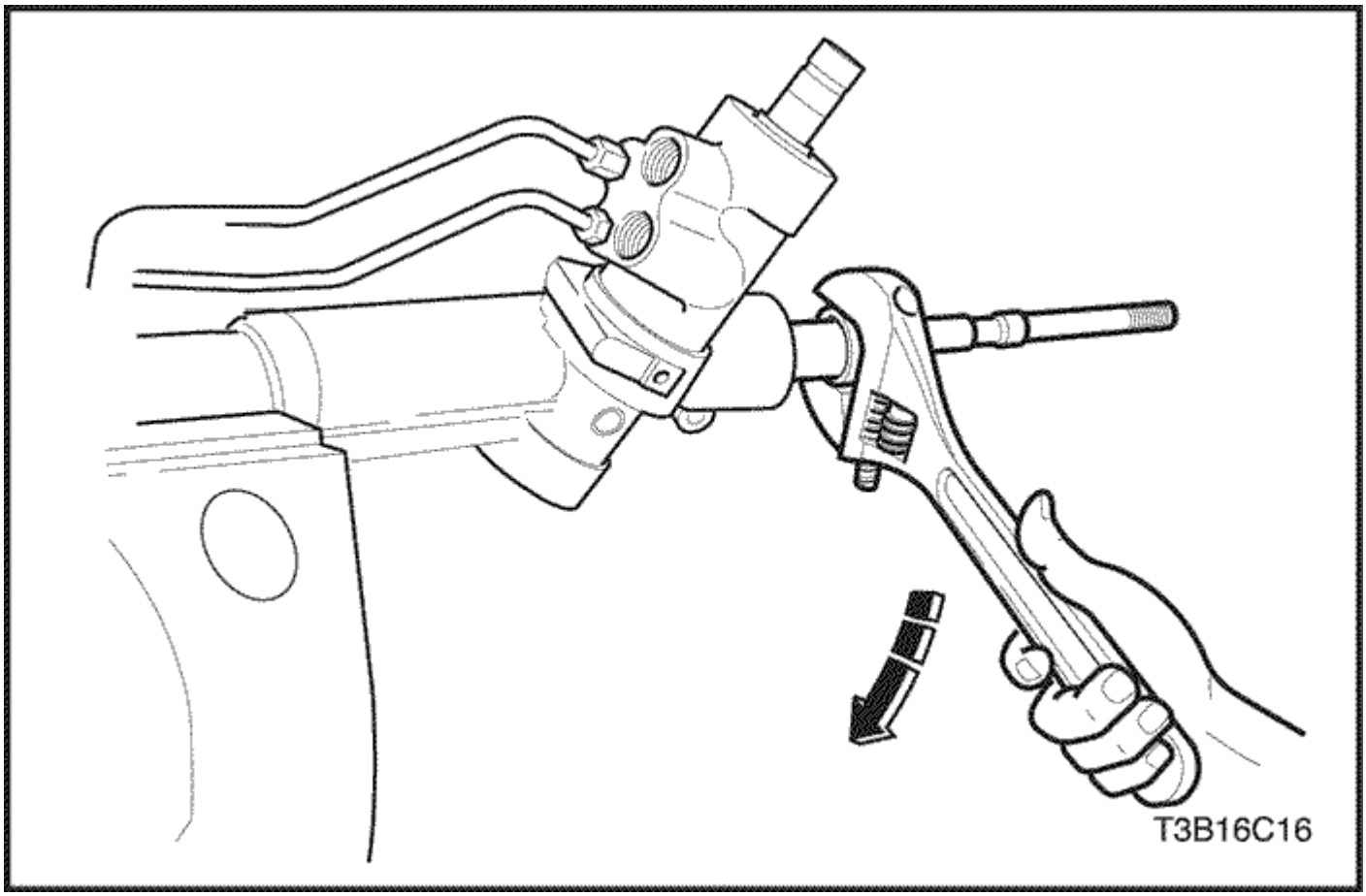
7. Remove the stub shaft dust seal, the stub shaft bearing annulus assemly.



Installation Notice

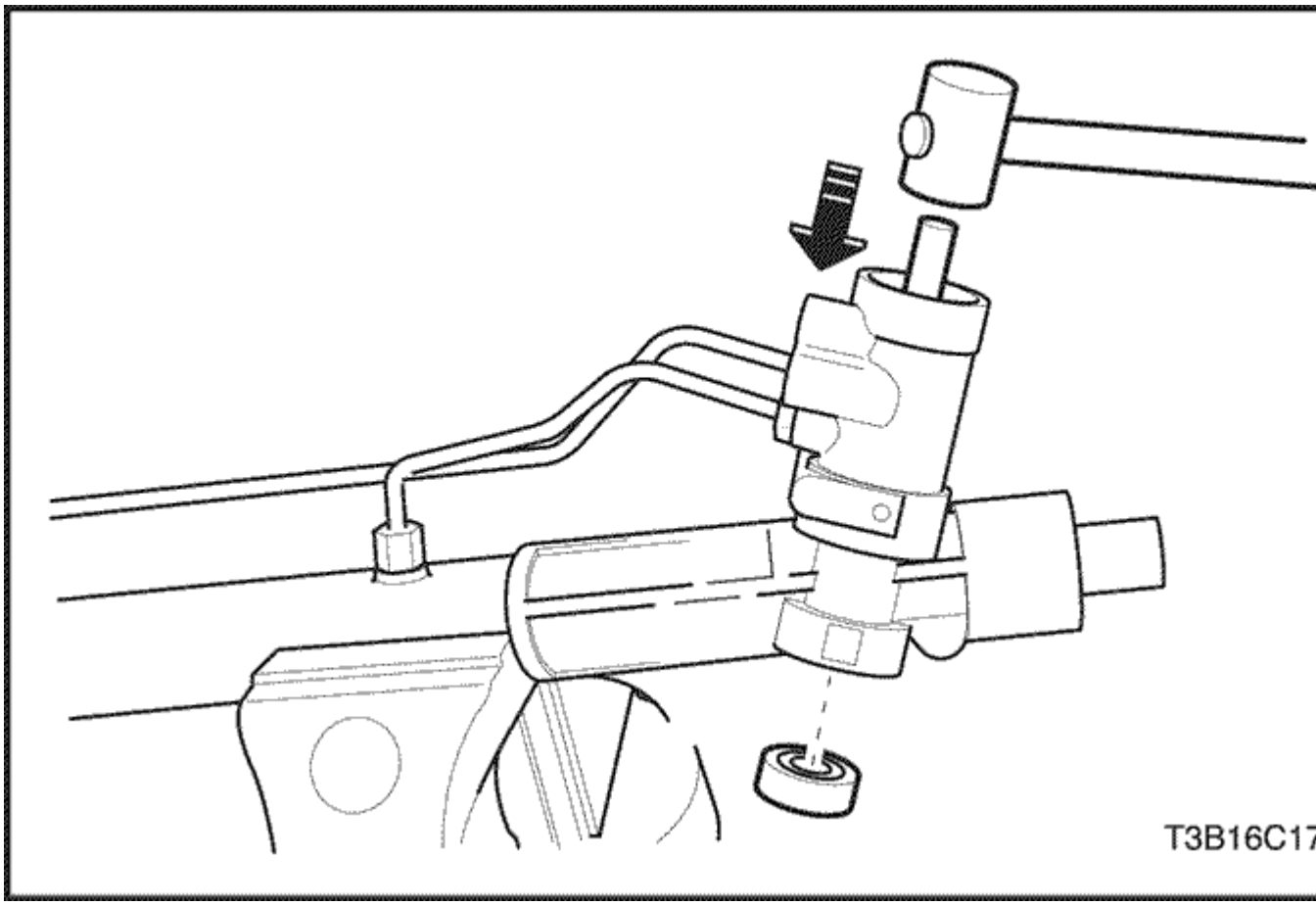
- Install the bushing and a new lower pinion valve seal.
- Coat all the seals with power steering fluid to ensure proper sealing.
- When the valve and pinion assembly is fully seated in the housing, be sure the notch in the stub shaft and the mark on the housing line up. If this is not done the vehicle will not pass the straight-ahead check and will have poor steering performance.

Notice : Be sure to install the stub shaft to the housing with caution, otherwise the shaft, bearing and seal could be damaged.



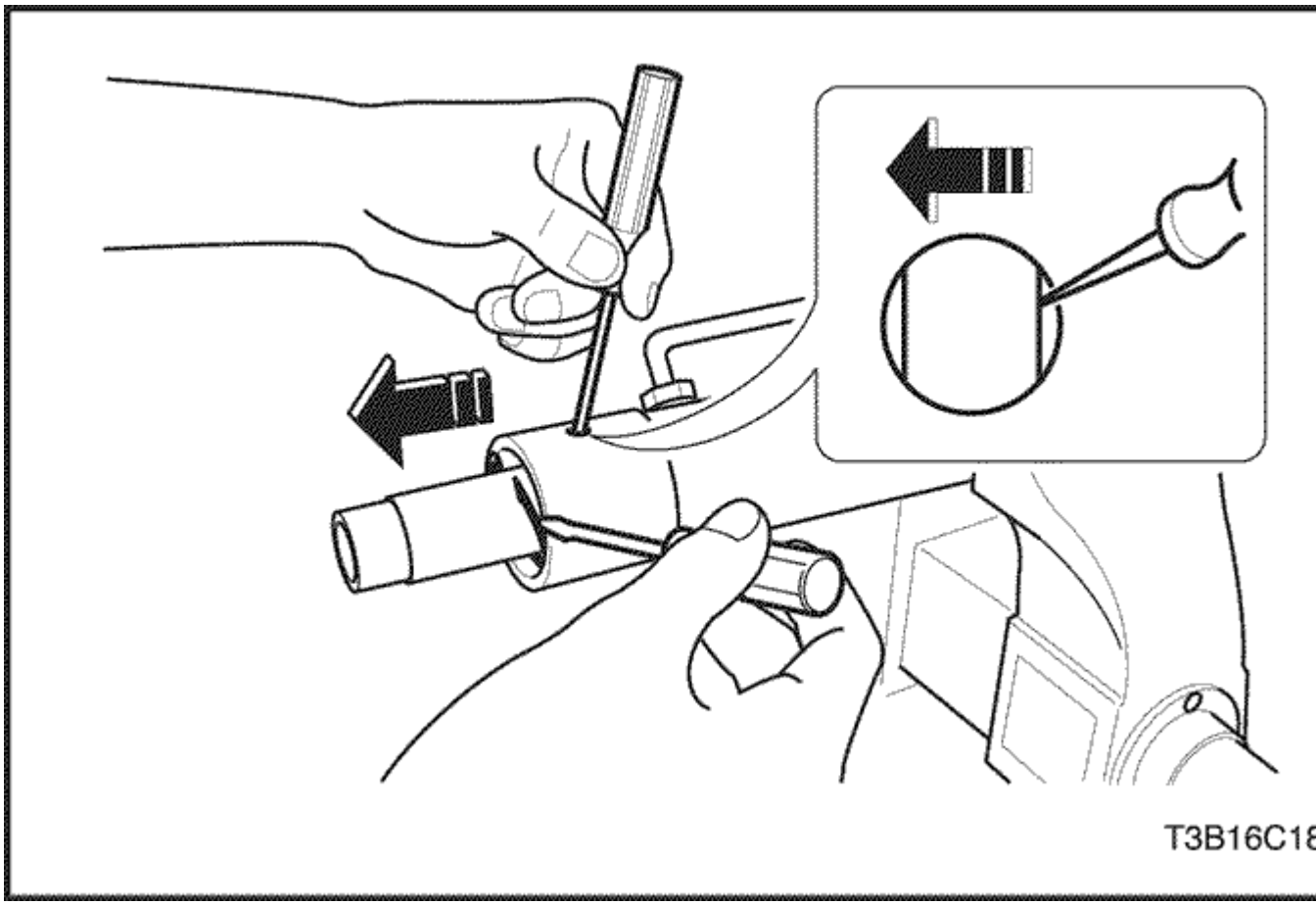
Rack and Pinion
Removal Procedure

1. Remove the tie rod.
2. Remove the rack bearing. Refer to "Valve and Pinion Assembly" in this section.

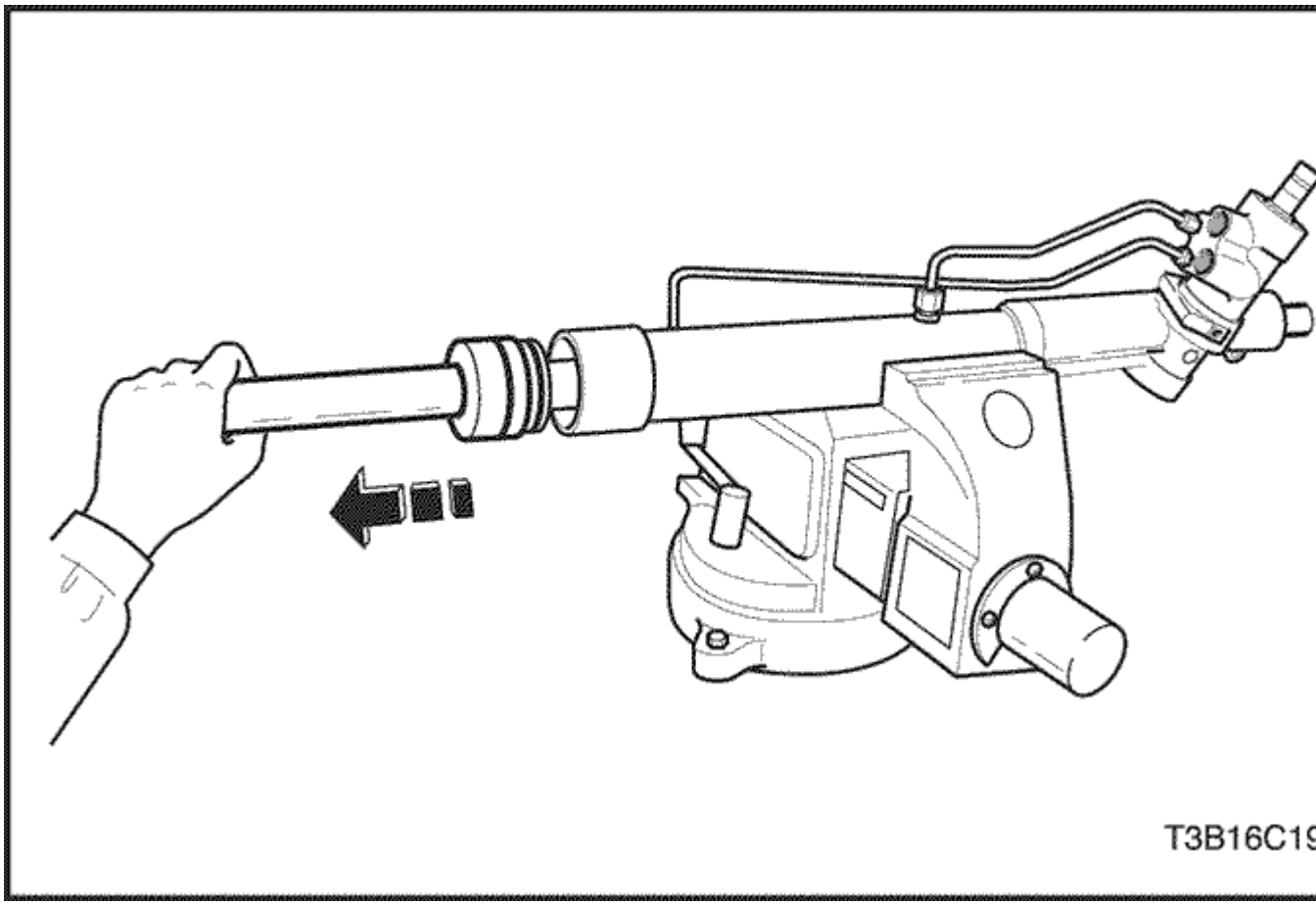


3. Remove the pinion shaft ball bearing.

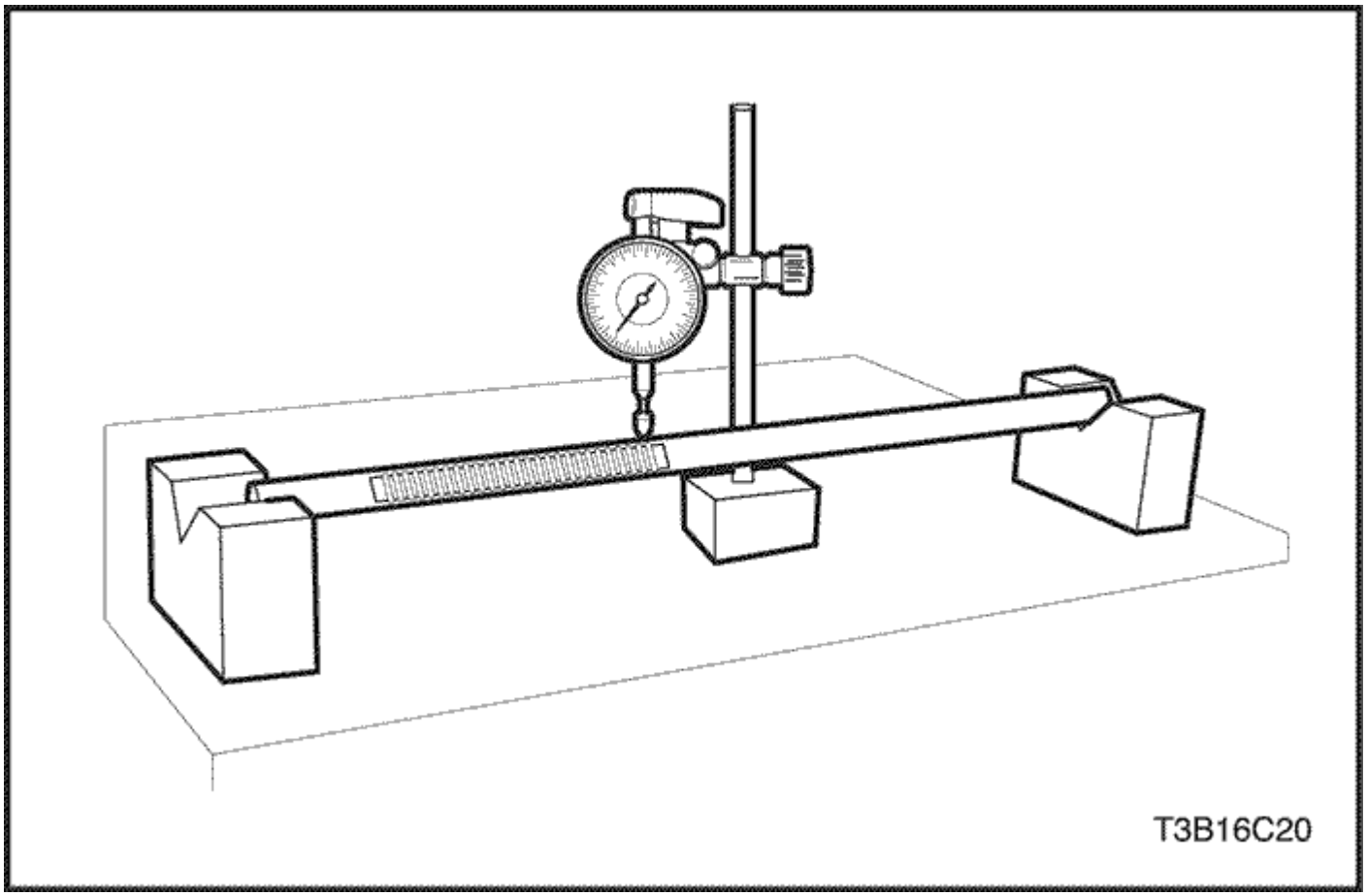
   Notice : The Pinion shaft ball bearing should be removed with caution by tapping the shaft gently.



4. Remove the sir clip from the rack gear housing.

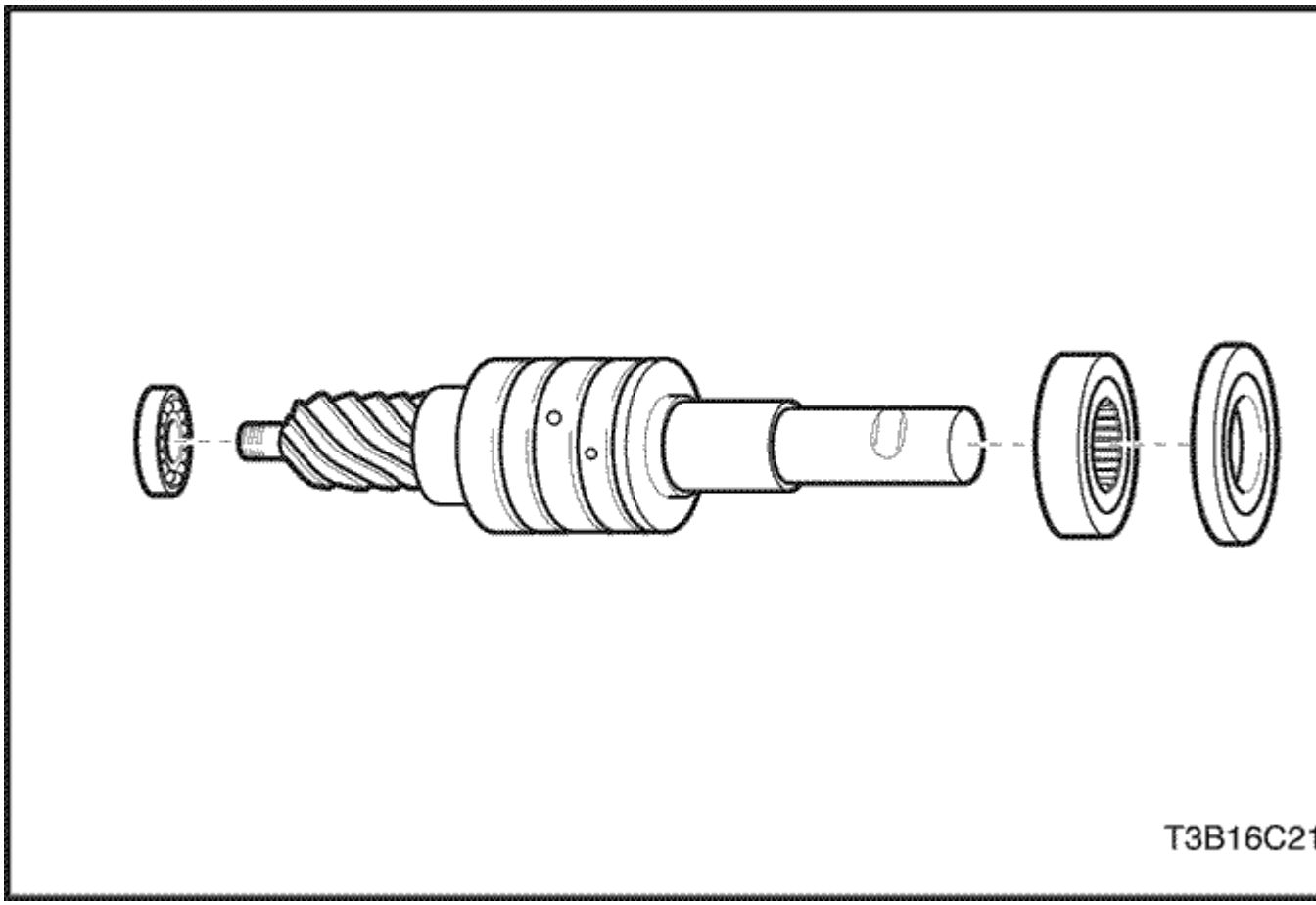


5. Remove the rack gear and stopper by pulling them.
6. Remove the rack gear stopper.

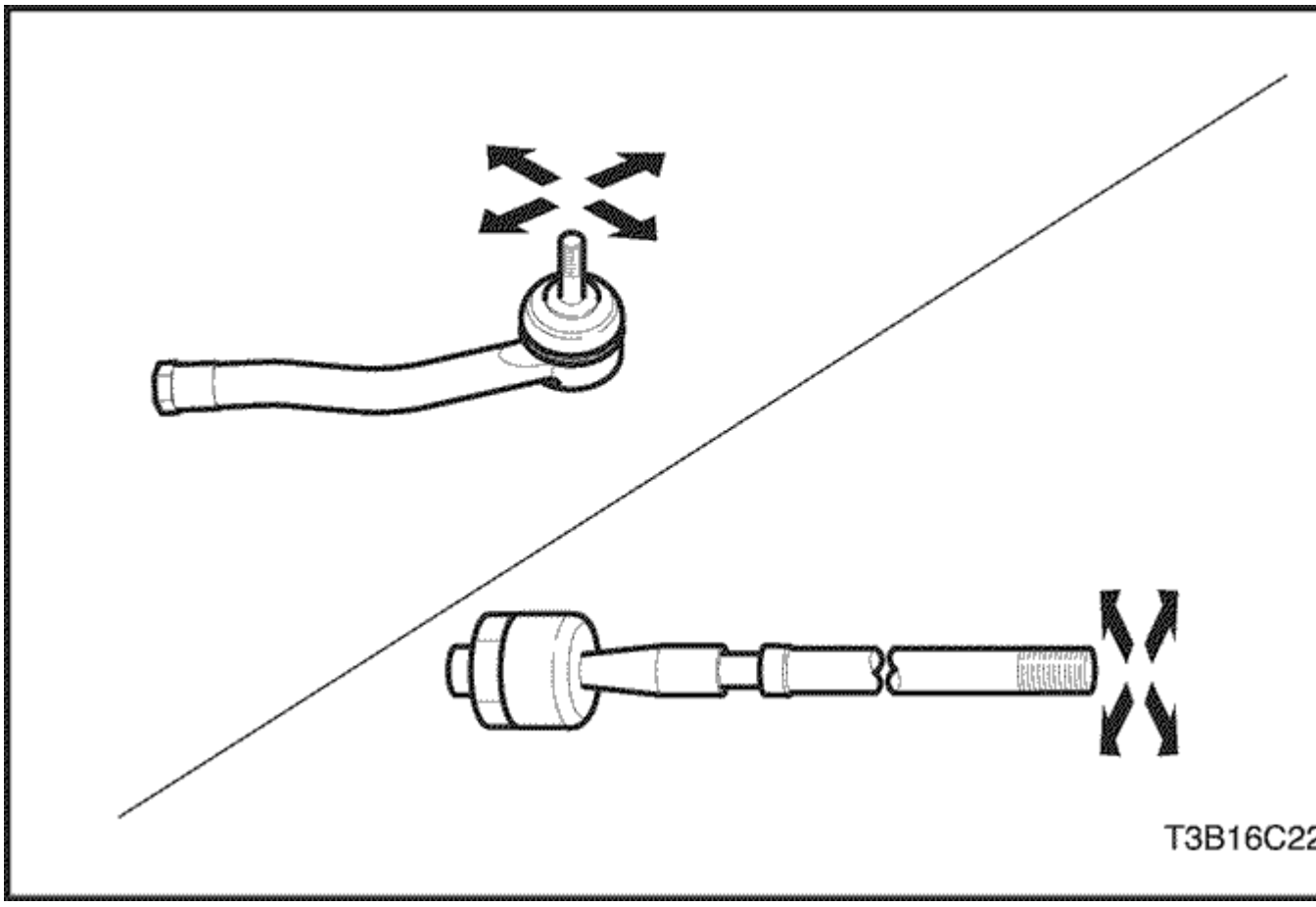


Inspection Procedure

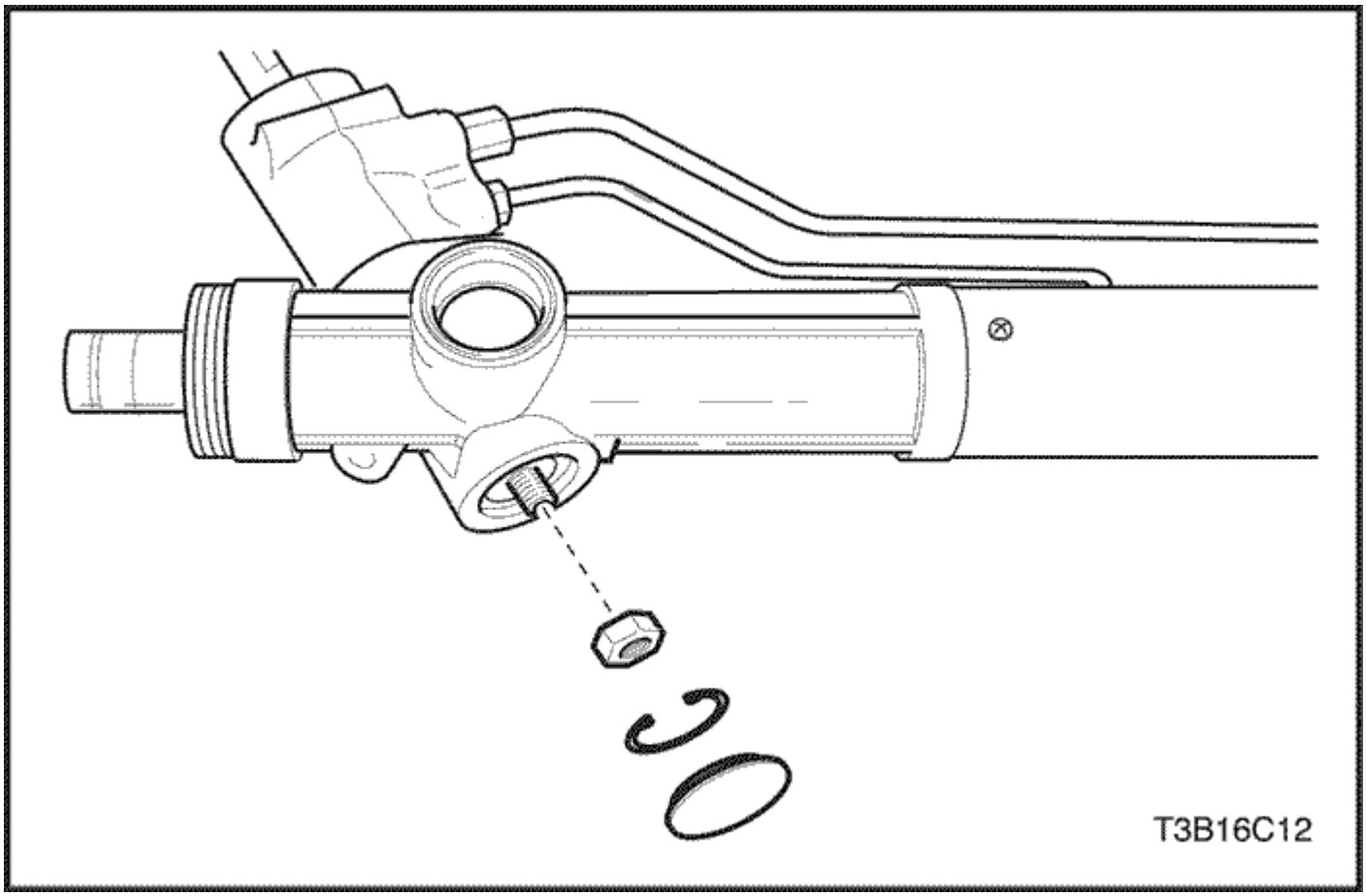
1. Check any damage on the rack gear.



2. Check and damage on the pinion gear and valve assembly.



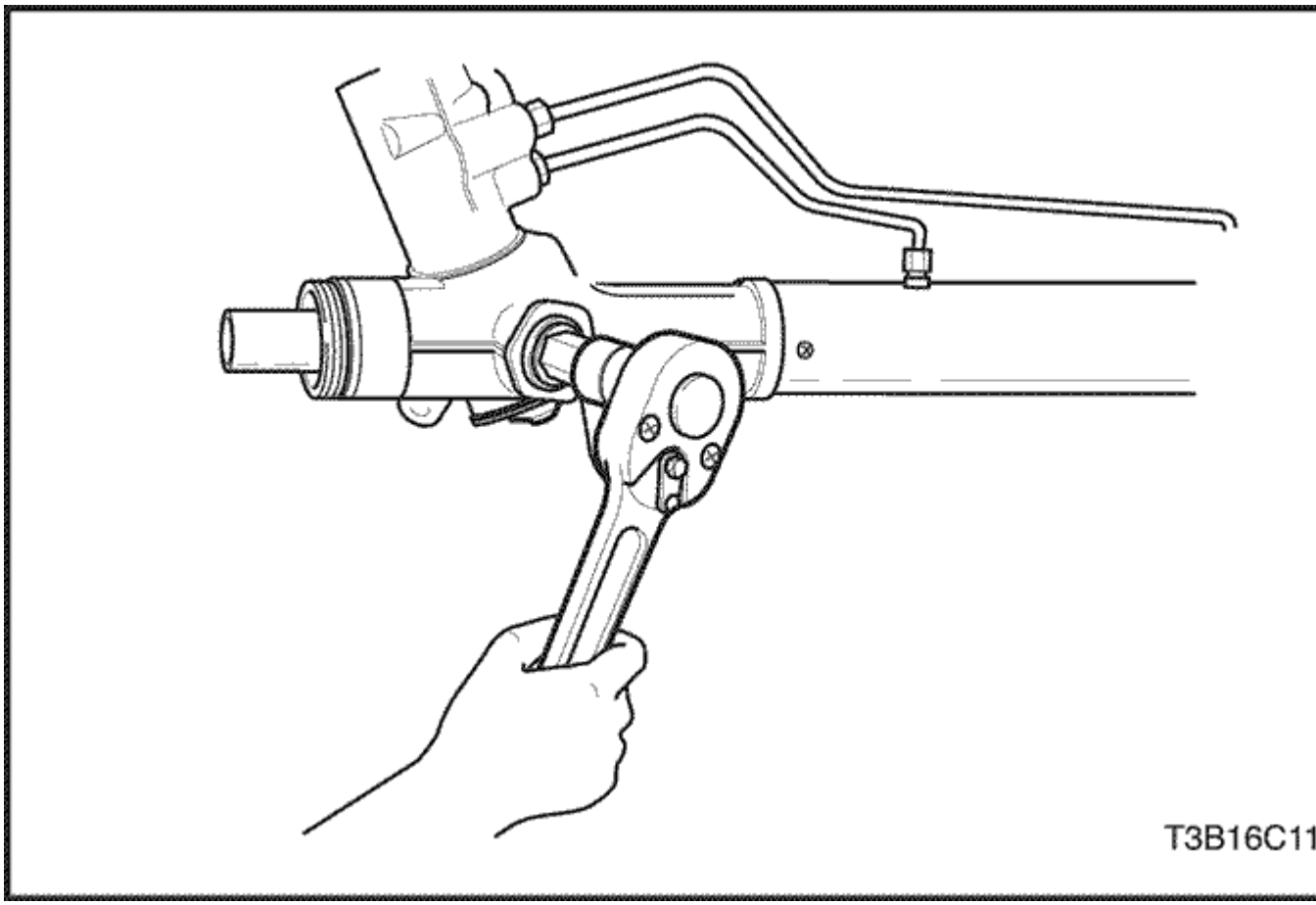
3. Check and tie rod and ball joint.



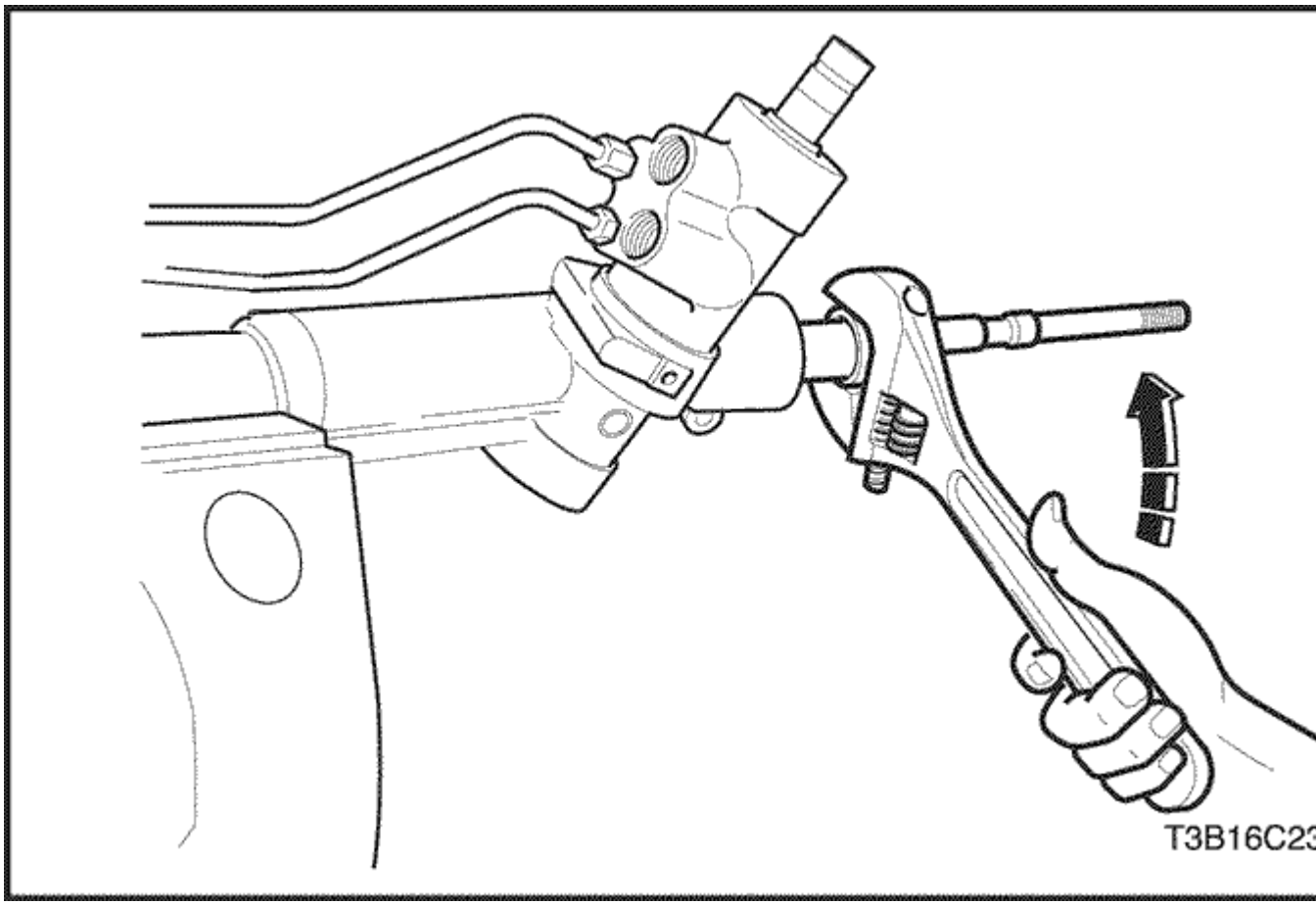
Installation Procedure

1. Install the pinion lock nut.

   Tighten
   Tighten the pinion lock nut to 30 N•m (22 lb-ft).



2. Install the adjust nut and its lock nut. Refer to "Rack Bearing Preload Adjustment" in this section.



3. Install the tie rod.

   Tighten
   Tighten the tie rod to 100 N•m (75 lb-ft).

GENERAL DESCRIPTION AND SYSTEM OPERATION

Power Rack and Pinion

General Description

The power rack and pinion steering system has a rotary control valve which directs the hydraulic fluid coming from the hydraulic pump to one side or the other side of the rack piston. The integral rack piston is attached to the rack. The rack piston converts hydraulic pressure to a linear force which moves the rack left or right. The force is then transmitted through the inner and the outer tie rods to the steering knuckles, which turn the wheels.

If hydraulic assist is not available, manual control is maintained. However, under these conditions, more steering effort is required. The movement of the steering wheel is transferred to the pinion. The movement of the pinion is then transferred through the pinion teeth, which mesh with the teeth on the rack, causing the rack to move.
A vane-type pump provides hydraulic pressure for the system.
The boot and rack guide, the rack bearings, and the valve and pinion assembly are no longer serviceable on this vehicle. They must be replaced as whole units.

SECTION 6D

MANUAL STEERING GEAR

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

General Specifications

Application			Description
Type			Rack & Pinion
Overall Gear Ratio			26.4:1
Steering Angle	(155)Tire	Inside	39.5°
		Outside	33°
	(175)Tire	Inside	39.5°
		Outside	33°
Grease	Rack		Grease No.2 Li
	Ball Joint		Nerita 0460 & Retinax or

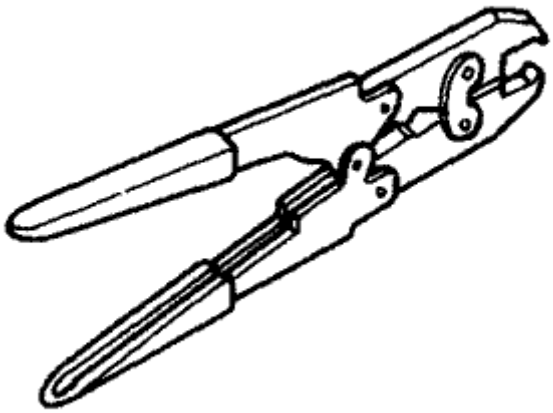
Application		Description
		Crown #2

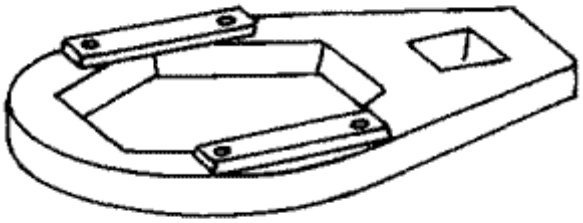
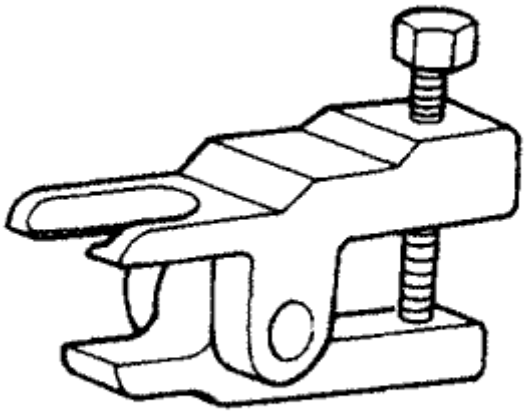
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Adjuster Plug Locknut	70	52	-
Coolant Surge Tank Attaching Nuts	4	-	35
Coupling Flange Pinch Bolt	22	16	-
Inner Tie Rod Bolts	90	66	-
Outer Tie Rod Hex Nut	60	44	-
Pinion Preload	0.7 to 1.5	-	6 to 13
Steering Gear Retaining Bracket Nuts or Bolts	38	28	-
Steering Gear Retaining Bracket Studs	20	15	-

SPECIAL TOOLS

Special Tools Table

	KM-J-26610 Installer
	KM-472 Wrench

 KM472	
 KM507B	KM-507-B Ball Joint Remover

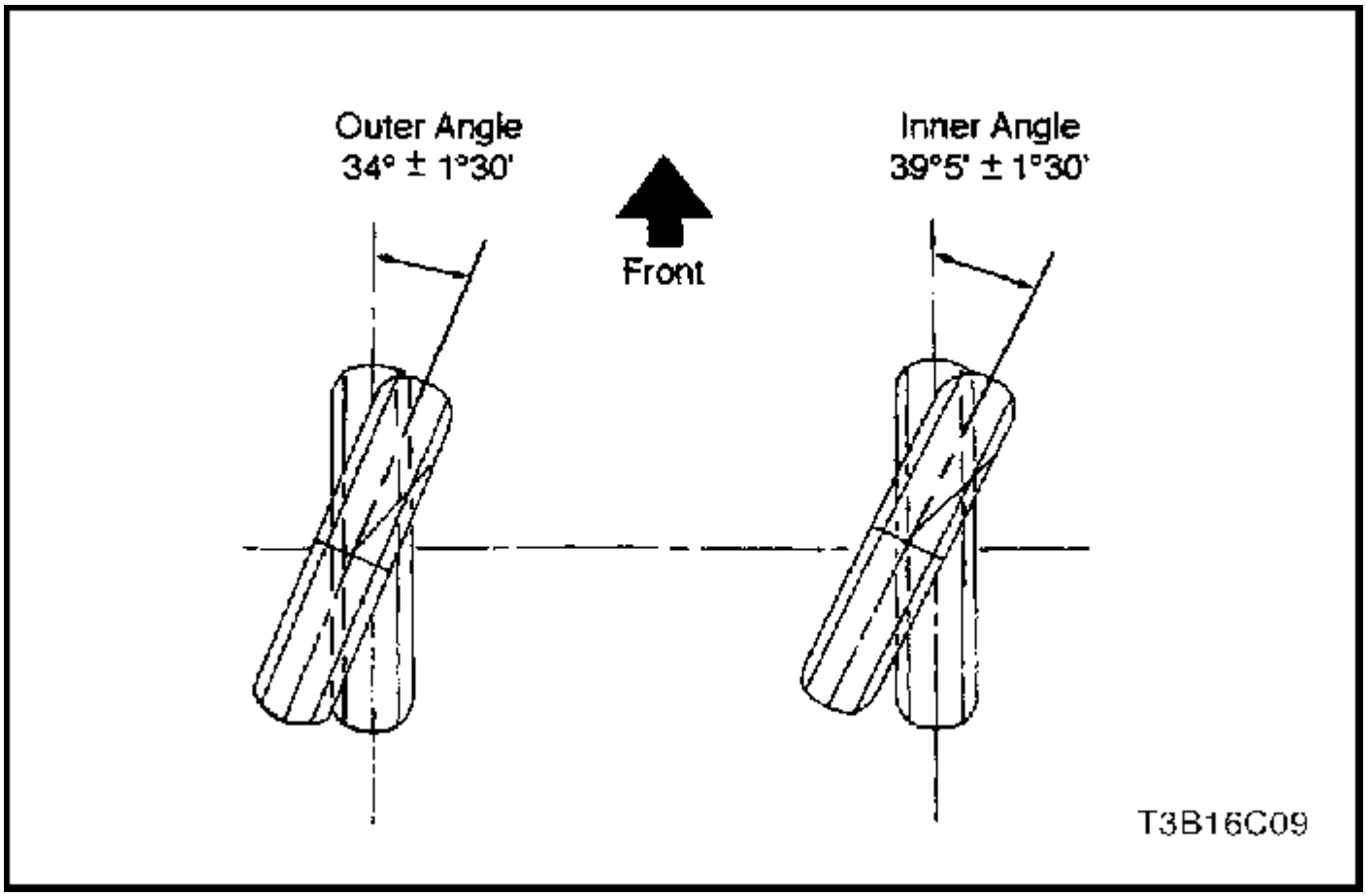
DIAGNOSIS

Manual Rack and Pinion Steering Gear
Excessive Play or Looseness in the Steering System

Checks	Action
Check the steering gear adjustment.	Perform straight-ahead check.
Check the wheel bearing for wear or damage.	Replace the wheel bearing.
Check the outer tie rods for improper installation.	Tighten the tie rods.

Rattling Noise in the Steering Gear

Checks	Action
Check the steering gear for improper and insufficient lubrication.	Lubricate the rack assembly. Lubricate the pinion assembly.
Check the steering gear mounting for improper installation.	Tighten the steering gear mounting bolts and the nuts.
Check the outer tie rods for improper installation.	Tighten the tie rods.



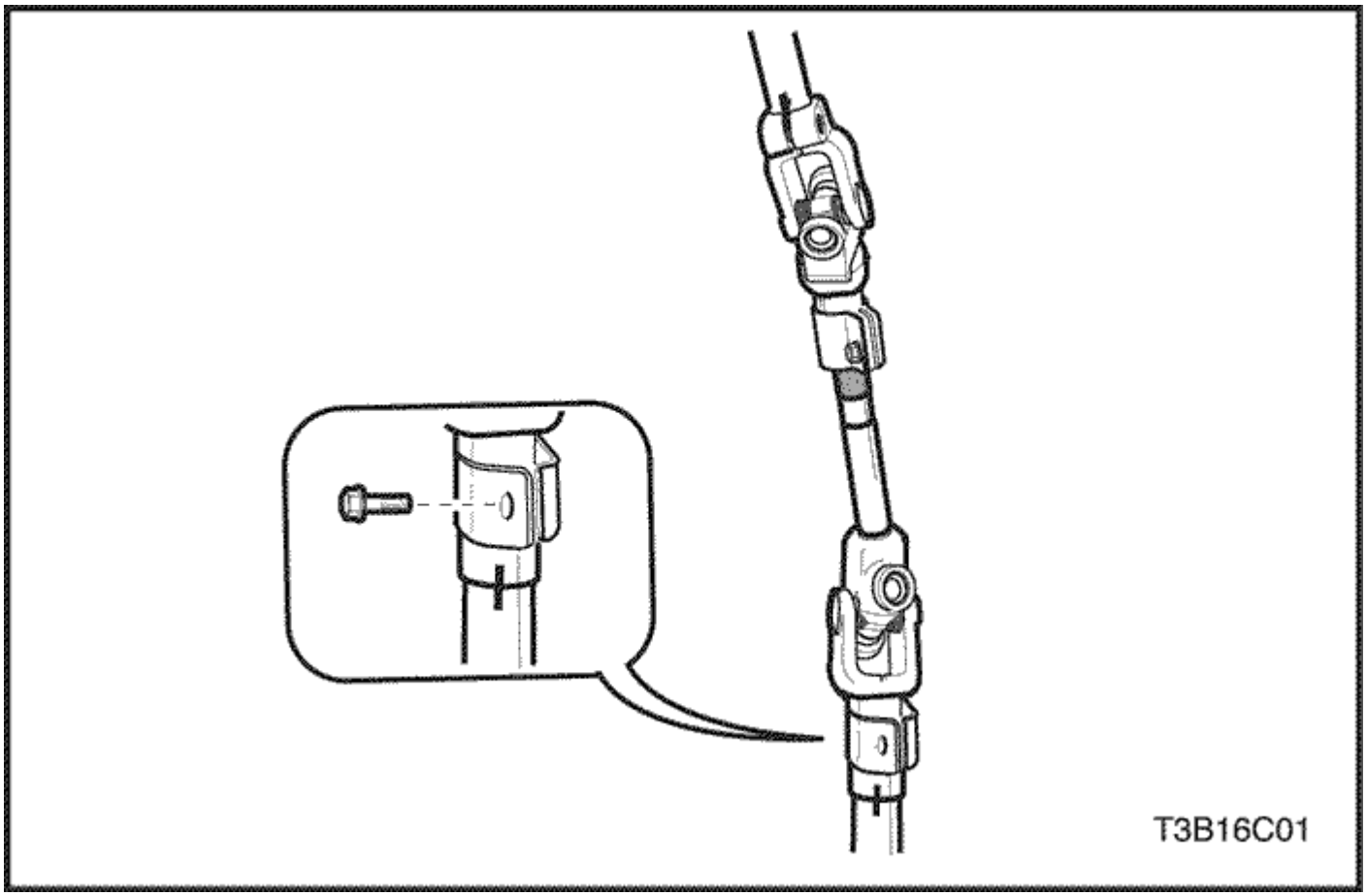
Straight-Ahead check

After all the necessary operations on the steering gear are completed, check the exact straight-ahead position of the steering in each case.
With the vehicle on the floor, place the steering wheel in the straight-ahead position. Mark the centerline of both tires on the floor. Turn the steering wheel all the way to the right and mark the new centerline of both tires on the floor.

Straight Ahead Check Table

Step	Action	Value(s)	Yes	No
1	Place the steering wheel in the straight-ahead position Is the wheel in the correct position?	-	Go to *Step 2*	-
2	Is the steering coupling flange pinch bolt lying horizontally?	-	Go to *Step 3*	Go to *Step 4*
3	Is the steering wheel off center by more than 5 degrees?	-	Go to *Step 5*	Go to *Step 6*
4	The pinion is displaced on the rack. The steering pinion position must be corrected. Is the repair complete?	-	Go to *Step 2*	-
5	Remove steering wheel and center on the spindle splines. Is the repair complete?	-	Go to *Step 3*	-
6	Turn the steering wheel all the way to the right. Measure the inner and the outer angles of the tire centerline compared to the straight-ahead centerline. Do the angles match the value specified?	Inner angle: 39°5' ± 1°30' Outer angle: 34° ± 1°30'	System OK	Go to *Step 7*
7	The rack assembly was not assembled correctly. Repair as needed. Is the repair complete?	-	Go to *Step 6*	-

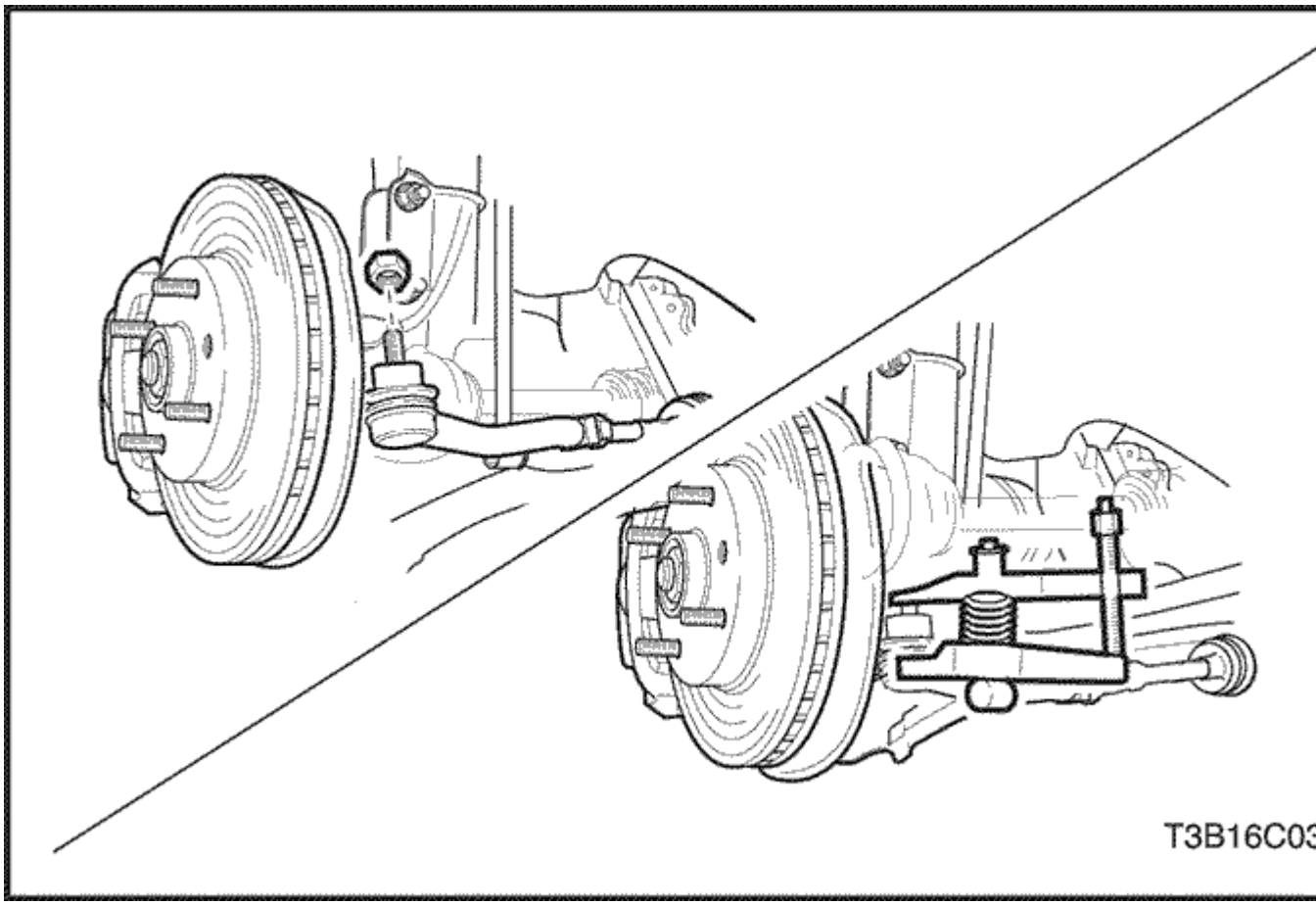
MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



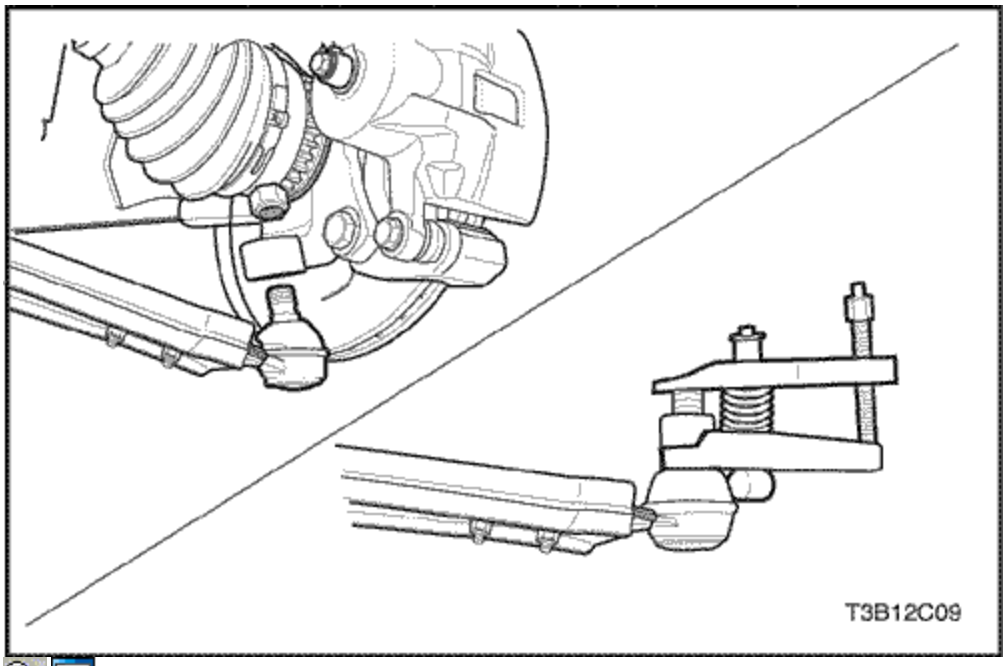
Rack and Pinion assembly
Tools Required

KM-507-B Ball Joint Remover
Removal Procedure

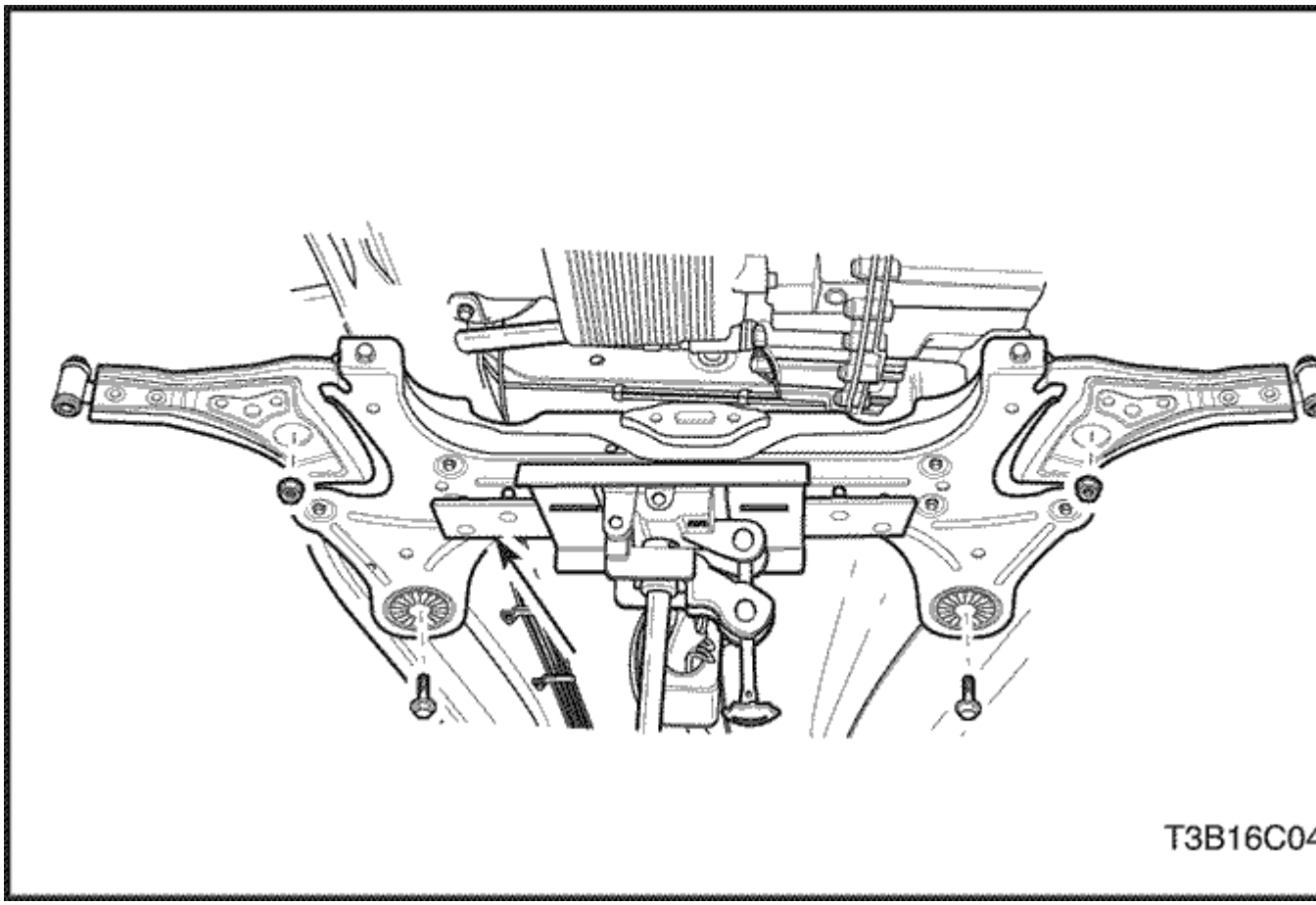
1. Disconnect the negative battery cable.
2. Position the tires straight ahead by turning the steering wheel.
3. Remove the Interm Shaft. Refer to *Section 6E, Steering Wheel And Column.*
4. Remove the Front Tires.



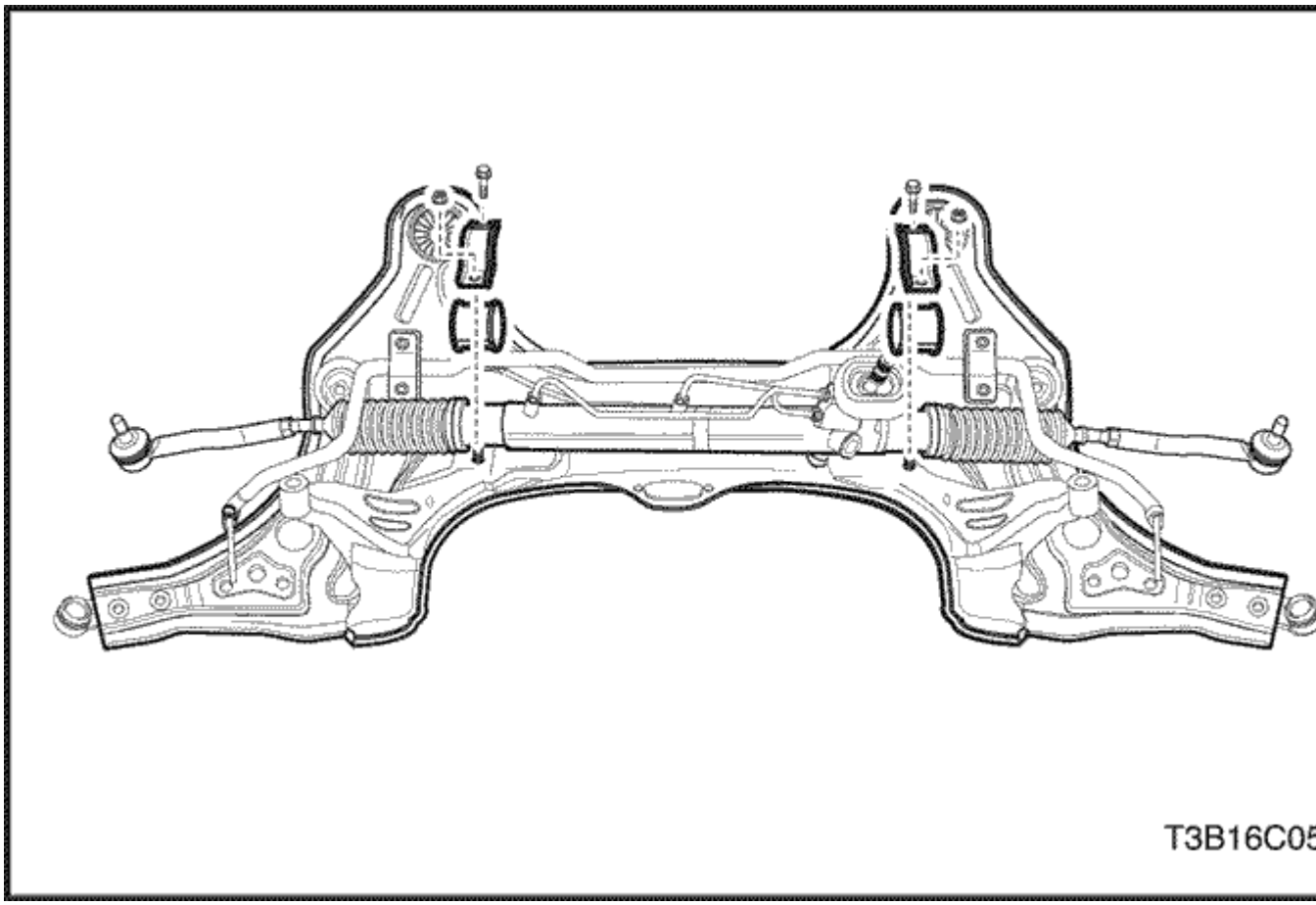
5. Remove the outer tie rod hex nuts. Refer to "Outer Tie Rod" in this section.



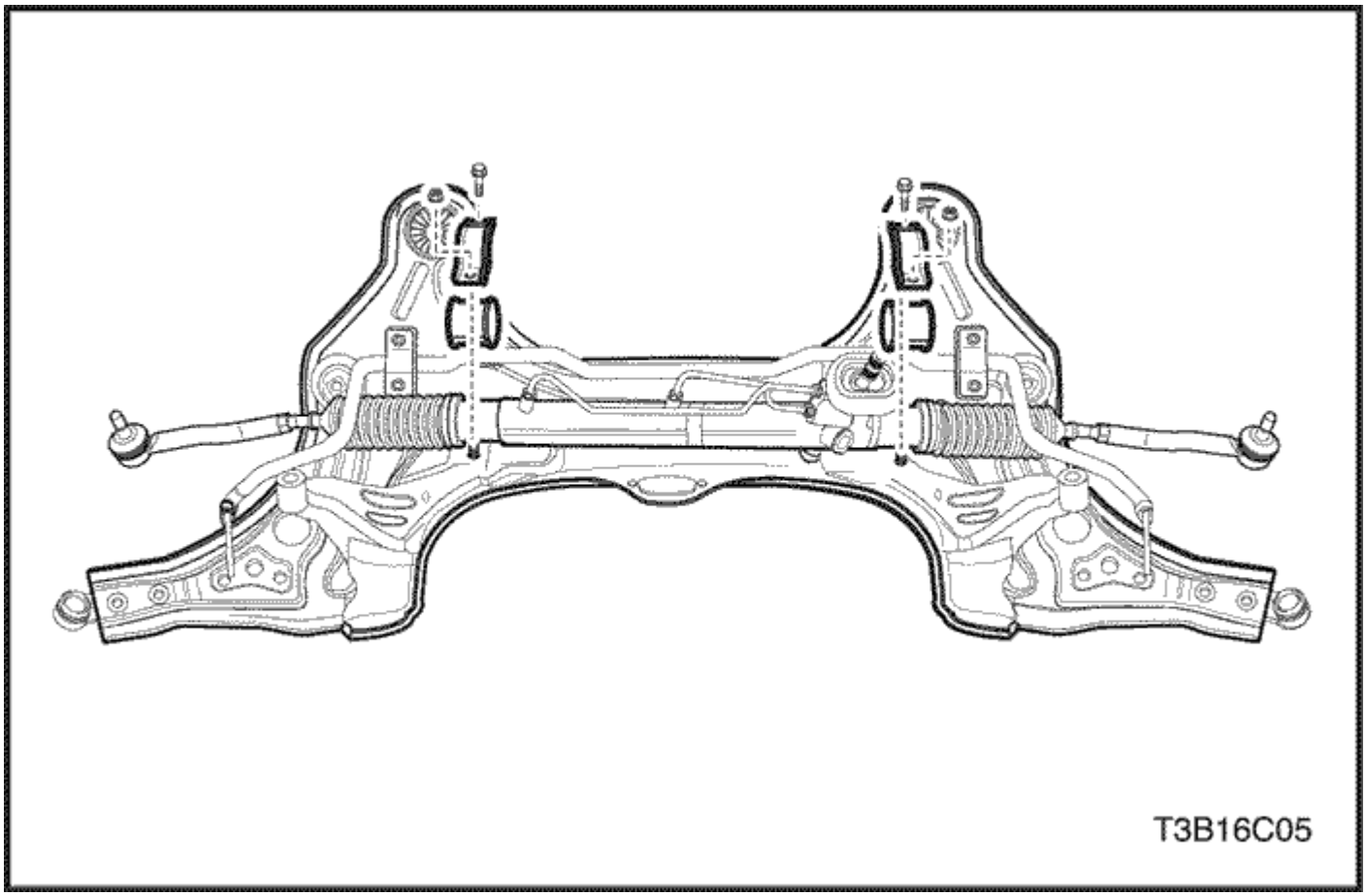
6. Remove the ball joint hex nuts and disconnect the stabilizer shaft from the knuckle by removing the stabilizer shaft link assembly.Refer to *Section 2C, Front Suspension.*



7. Remove the cross member by removing the nuts and bolts to the underbody.



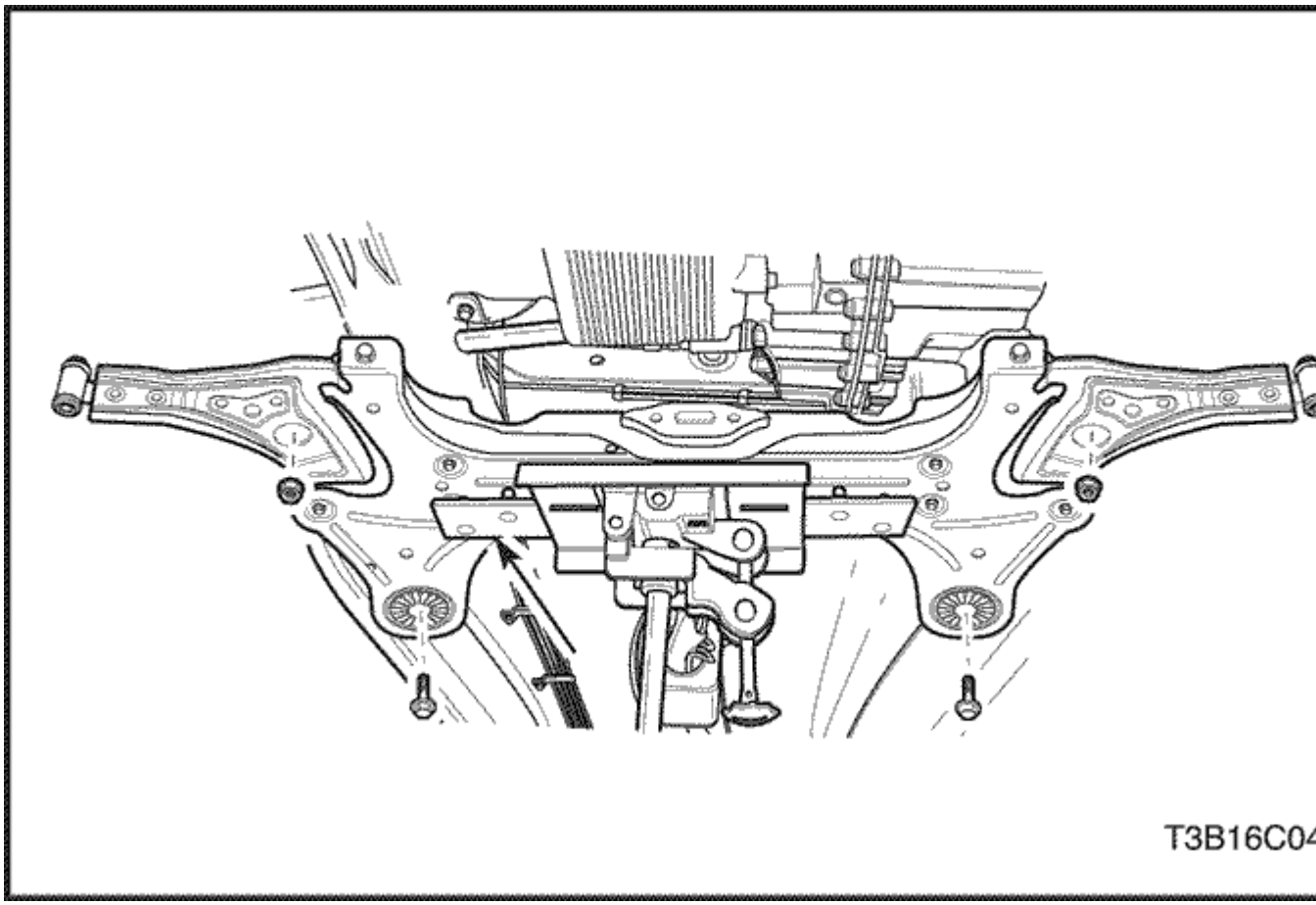
8. Remove the Rack and Pinion assembly by disconnecting the steering gear retaining bracket nuts.



Installation Procedure

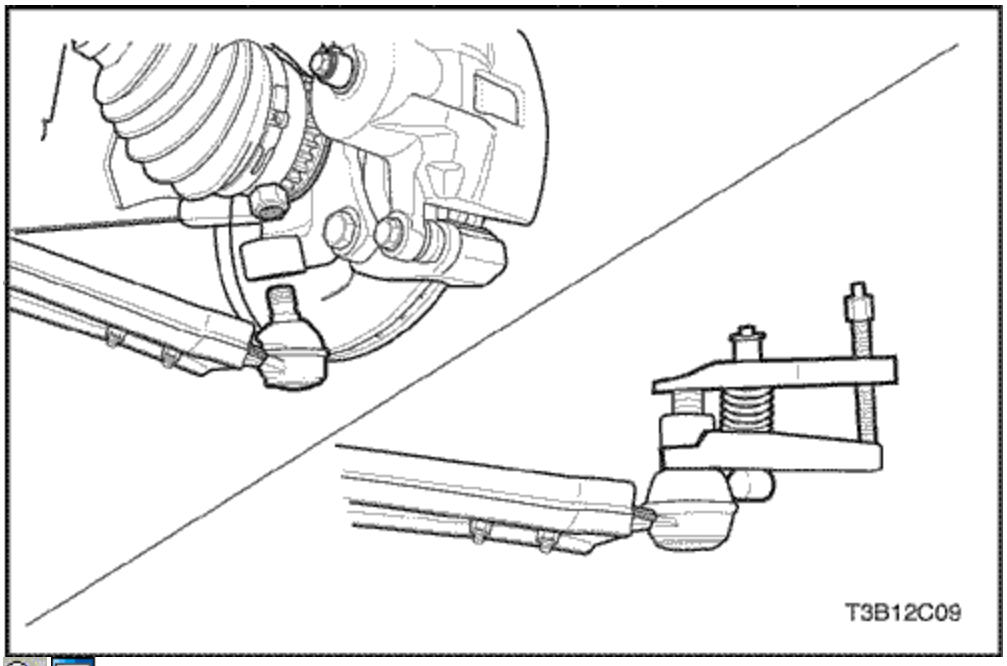
1. Install the Rack and Pinion assembly by connecting the steering gear retaining bracket nuts.

   Tighten
   Tighten the steering gear retaining bracket nuts to 50 N•m(37 lb-ft).



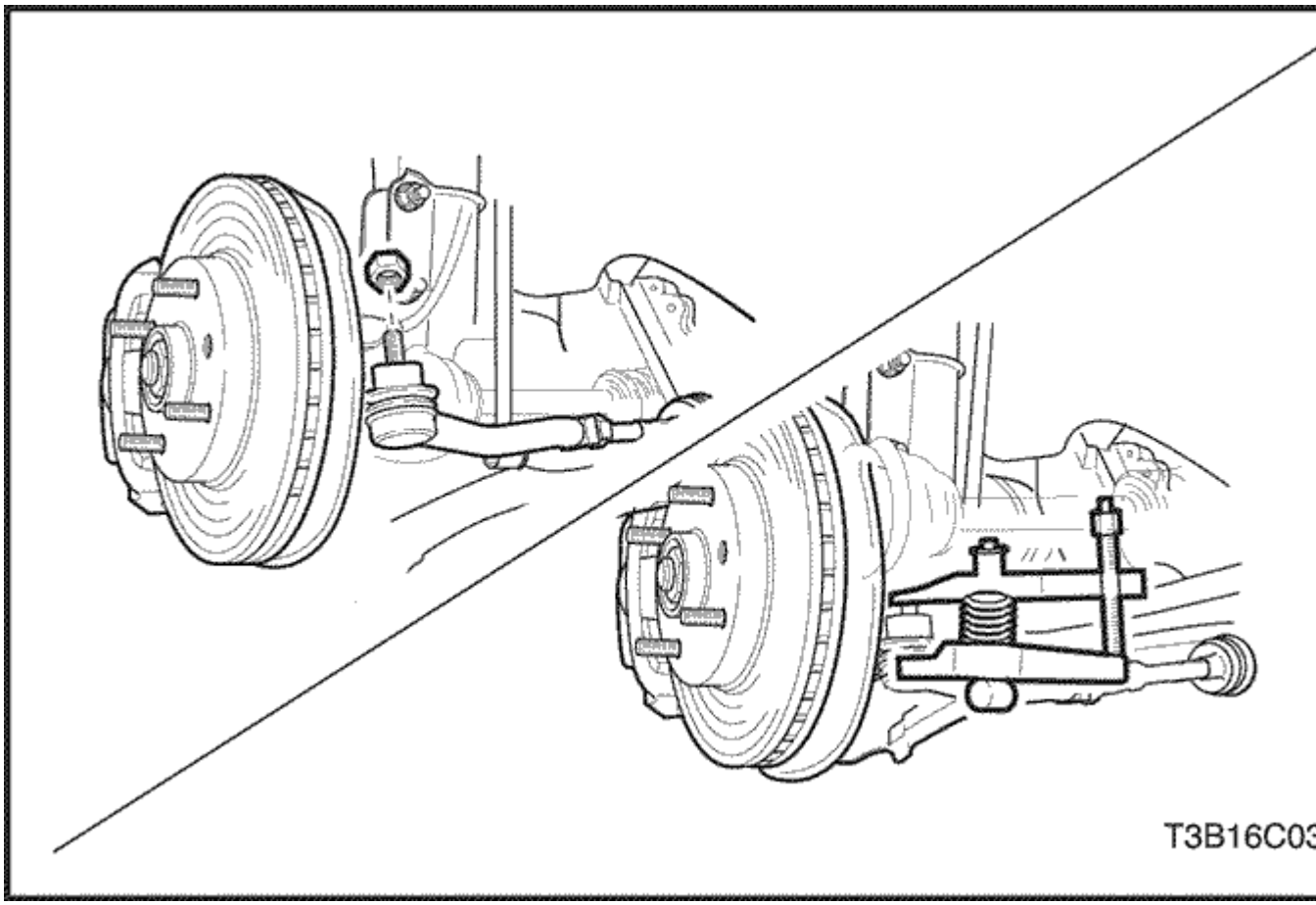
2. Install the cross member by tightening the nuts and bolts to the underbody.

   Tighten
   Tighten the cross member by tightening the nuts and bolts to the underbody to 150 N•m (111 lb-ft).



3. Install the ball joint hex nuts and connect the stabilizer shaft to the knuckle by tightening the the bolt with stabilizer shaft link assembly. Refer to *Section 2C, Front Suspension.*

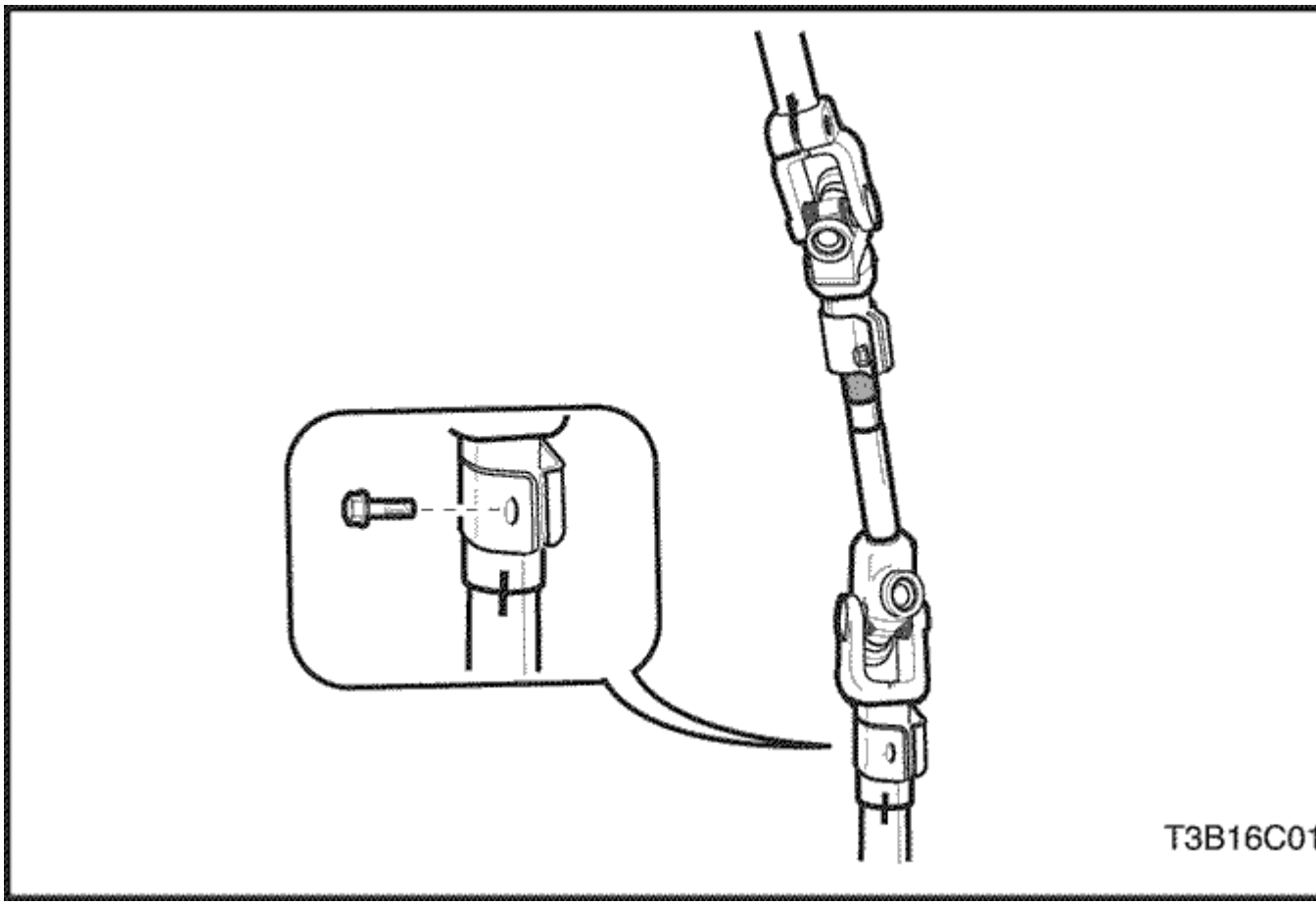
   Tighten
   Tighten the ball joint hex nuts to knuckle to 45 N•m(33 lb-ft). Tighten the bolts of stabilizer shaft to the knuckle to 45 N•m(33 lb-ft).



4. Install the outer tie rod hex nuts.

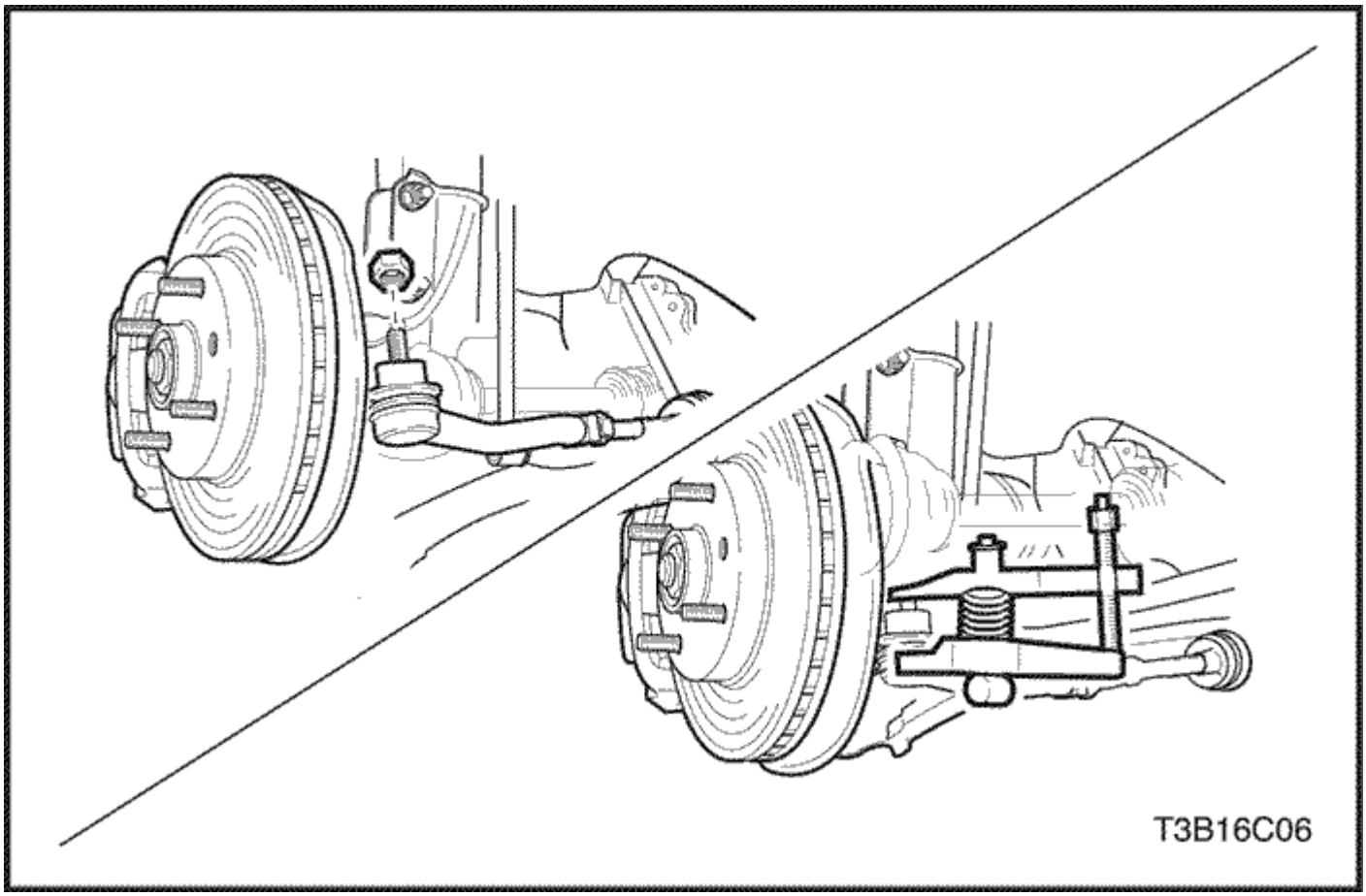
   Tighten
   Tighten the outer tie rod hex nuts to 45 N•m (33 lb-ft).

5. Install the Front Tires. Refer to *Section 2E, Tires and Wheels.*



6. Install the Interm Shaft. Refer to *Section 6E, Steering Wheel And Column.*
7. Install the steering wheel and column.
8. Connect the negative battery cable.

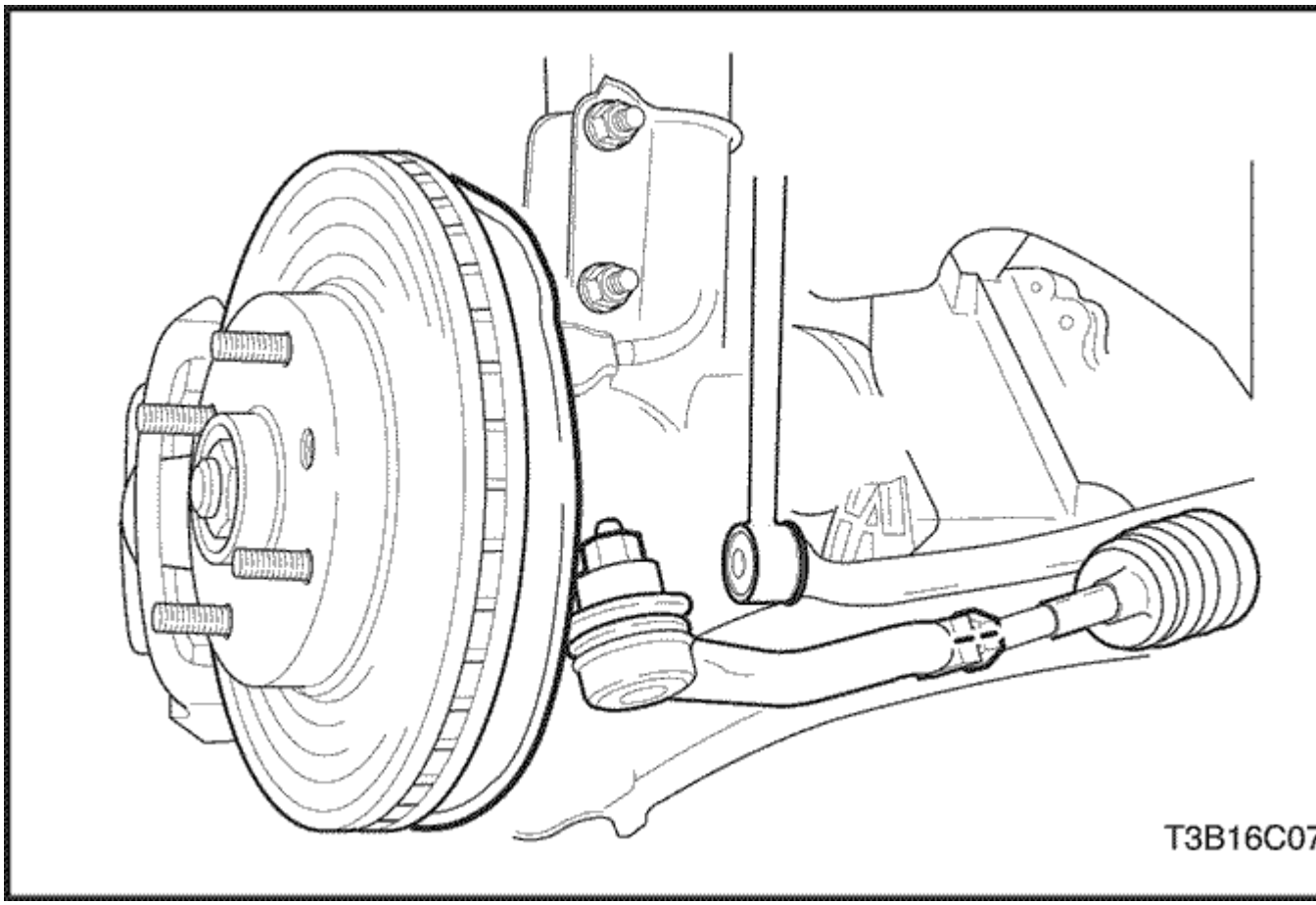
Important : After all the operations with the steering gear, be sure to check the exact straight-ahead position of the steering in each case.Refer to "Straight-ahead check" in this section.



Outer Tie Rod
Tools Required

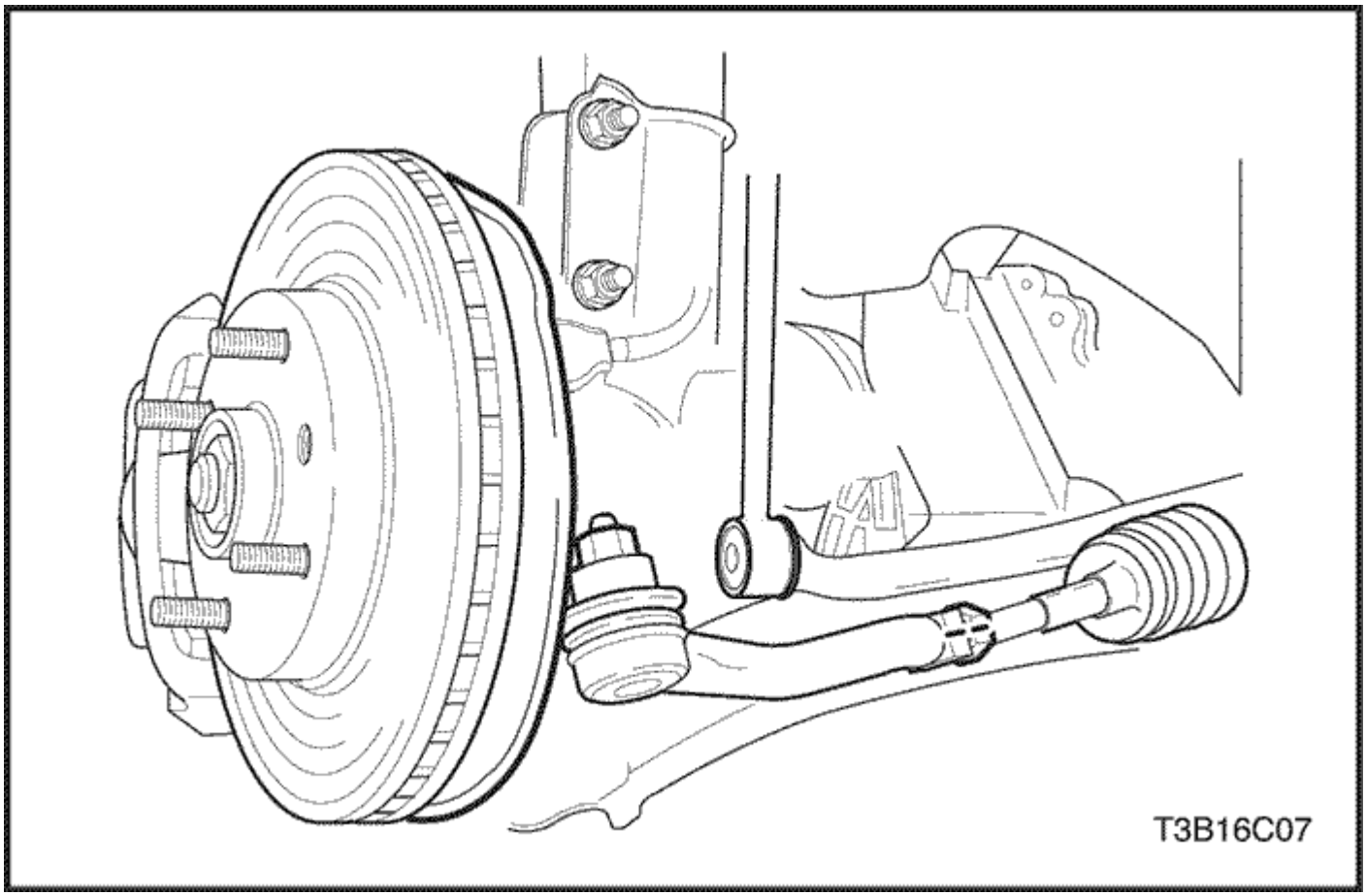
KM-507-B Ball Joint Remover
Removal Procedure

1. Remove the outer tie rod hex nut and disconnect the outer tie rod from the steering knuckle using the special tool KM-507-B.



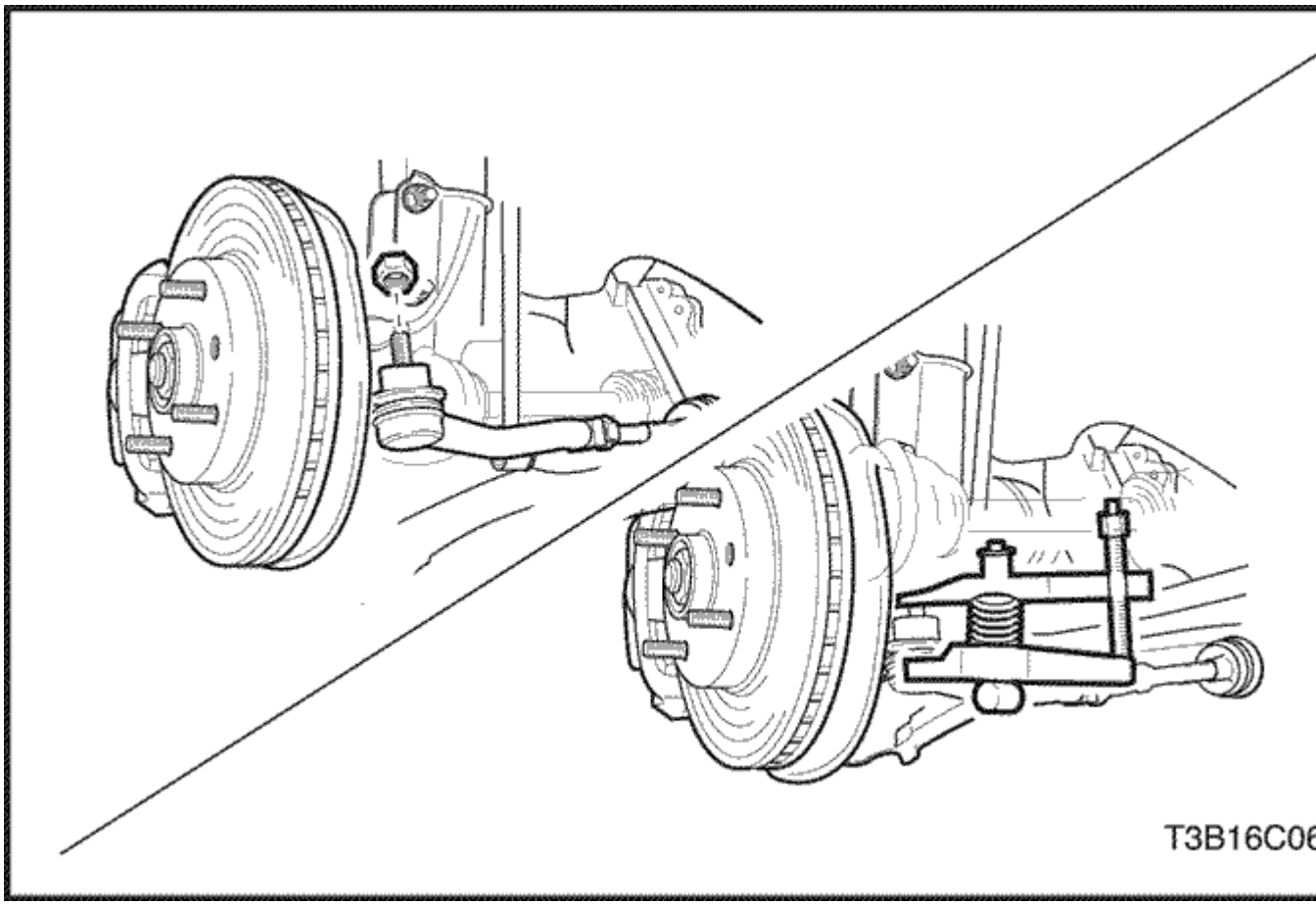
2. Loose the tie rod lock nuts and remove the outer tie rod.

   Important : Before loose the tie rod lock nut, mark the position of the lock nut for easy alignment after installation procedure.



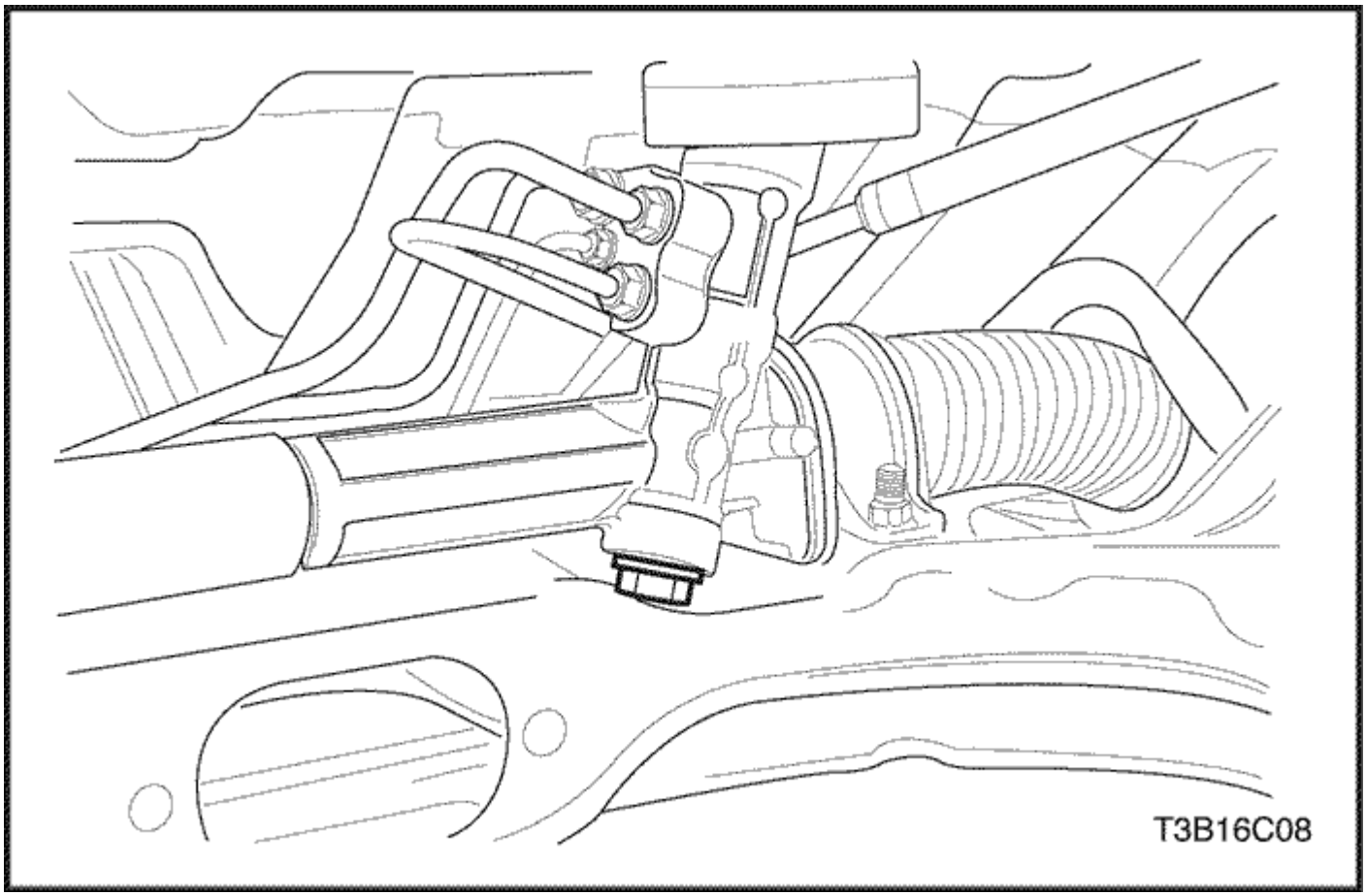
Installation Procedure

1. Install the outer tie rod by tightening the lock nuts to 54 N•m(40 lb-ft).



2. Install the outer tie rod by tightening the hex nut to 45 N•m(33 lb-ft).

Inner Tie Rod
Removal/Installation Procedure
Refer to the unit repair of manual steering gear in this section.

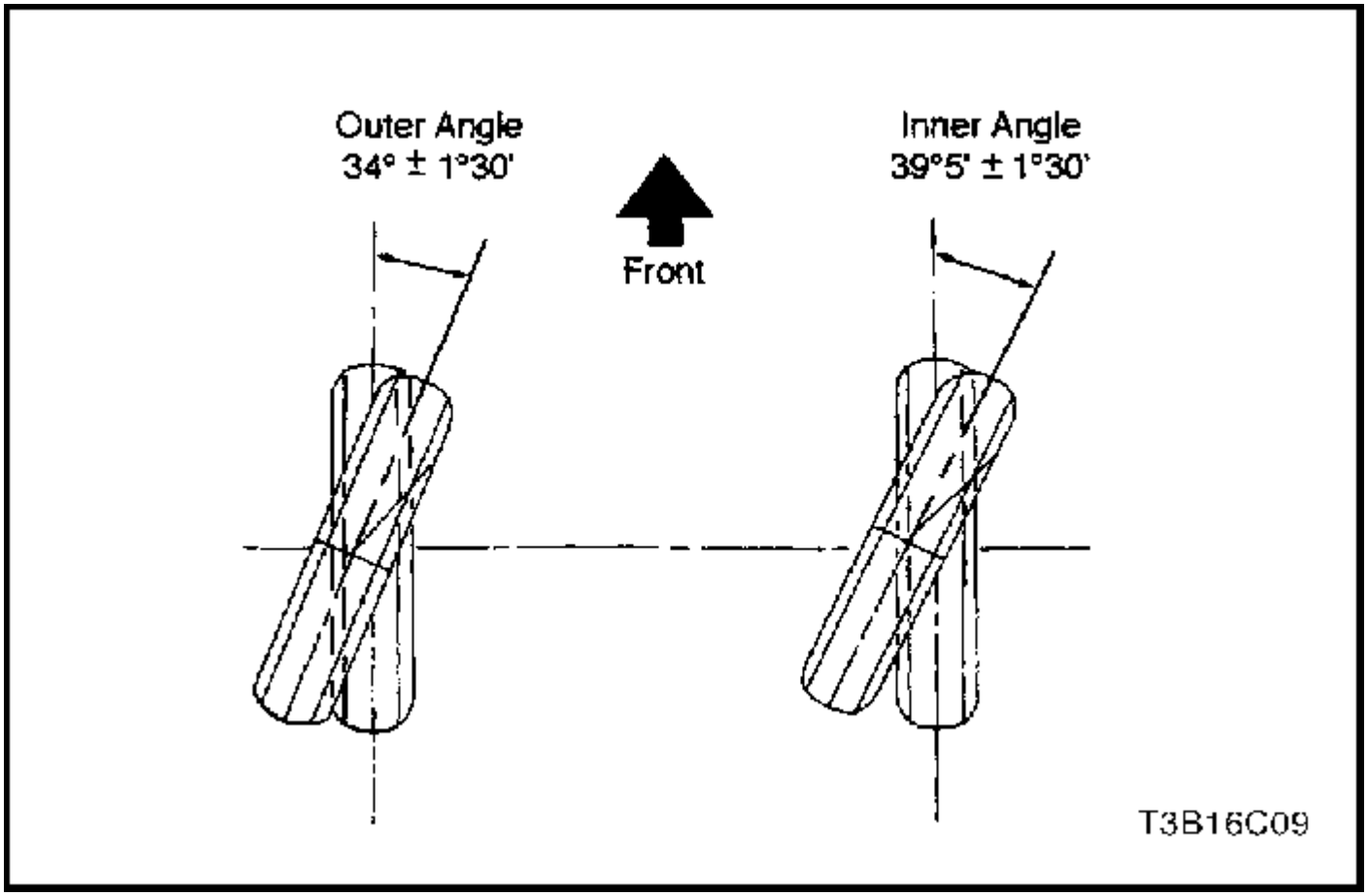


Rack Bearing Preload On-Vehicle Adjustment
Adjustment Procedure

Make the rack bearing adjustment with the front wheel raised and the steering wheel centered. Be sure to check the returnability of the steering wheel to center after the adjustment.

1. Loosen the locknut and turn the adjuster plug clockwise until a torque of 10 N•m (88 lb-in) is obtained.
2. Back the adjuster plug off by 55 to 65 degrees. Check the pinion preloaded torque is within the range 0.9 to 1.7 N•m (8 to 15 lb-in).
3. Tighten the adjuster plug locknut while holding the adjuster plug stationary.

Tighten
Tighten the adjuster plug locknut to 70 N•m (52 lb-ft).



Straight-Ahead check

After all the necessary operations on the steering gear are completed, check the exact straight-ahead position of the steering in each case.

With the vehicle on the floor, place the steering wheel in the straight-ahead position. Mark the centerline of both tires on the floor. Turn the steering wheel all the way to the right and mark the new centerline of both tires on the floor.

Straight-Ahead Check Table

Step	Action	Value(s)	Yes	No
1	Place the steering wheel in the straight-ahead position. Is the wheel in the correct position?	-	Go to *Step 2*	-
2	Is the steering coupling flange pinch bolt lying horizontally?	-	Go to *Step 3*	Go to *Step 4*
3	Is the steering wheel off center by more than 5	-	Go to *Step 5*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
	degrees?			
4	The pinion is displaced on the rack. The steering pinion position must be corrected. Is the repair complete?	-	Go to *Step 2*	-
5	Remove steering wheel and center on the spindle splines. Is the repair complete?	-	Go to *Step 3*	-
6	Turn the steering wheel all the way to the right. Measure the inner and the outer angles of the tire centerline compared to the straight-ahead centerline. Do the angles match the value specified?	Inner angle: 39°5' ± 1°30' Outer angle: 34° ± 1°30'	System OK	Go to *Step 7*
7	The rack assembly was not assembled correctly. Repair, as needed. Is the repair complete?	-	Go to *Step 6*	-

UNIT REPAIR

The unit repair of this section is similar to the unit repair of power Steering gear. Refer to *Section 6C, Power Steering Gear.*

GENERAL DESCRIPTION AND SYSTEM OPERATION

Manual Rack and Pinion

The manual rack and pinion steering system consists of two main components: the rack and the pinion. The motion of the pinion is transferred through the pinion teeth that mesh with the teeth on the rack, which moves the rack. The force is then transmitted through the arms on the struts, which turn the wheels.

STEERING WHEEL AND COLUMN

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

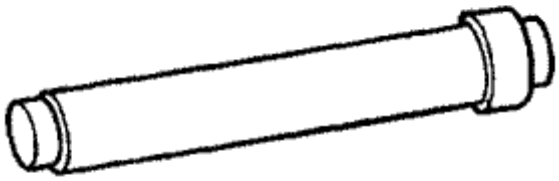
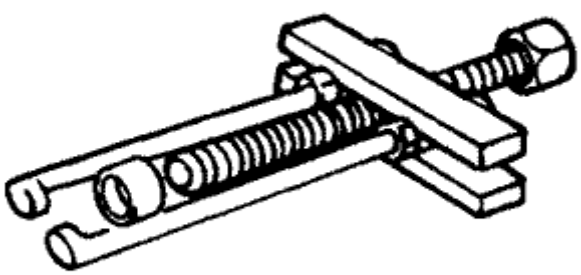
Fastener Tightening Specifications

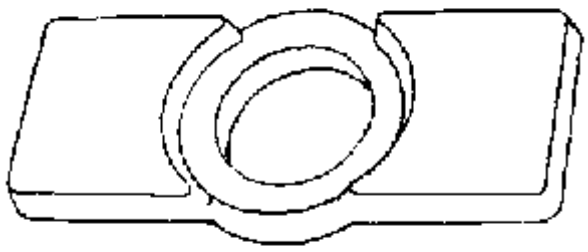
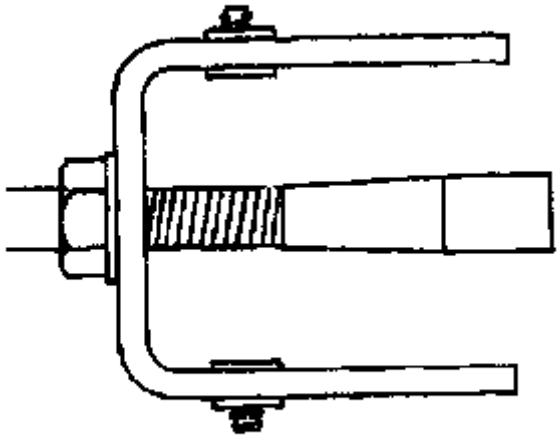
Application	N•m	Lb-Ft	Lb-In
Coupling Flange Pinch Bolt	22	16	-
Support Housing Screws	16	12	-
Ignition Switch Housing Shear Bolts	11	-	97
Ignition Switch Retaining Screw	2	-	18
Key Interlock Solenoid Screws	2	-	18
Key Reminder Switch Screws	2	-	18
Lower Instrument Trim Panel Screws	3	-	27
Lower Steering Column Cover Panel Screws	3	-	27
Steering Column Jacket Assembly Bracket Nuts	22	16	-
Steering Wheel Nut	38	28	-
Tilt Steering Lever Cap Screw	4	-	35
Turn Signal Switch Housing Screws	3	-	27
Upper and Lower Steering Column Cover Panel Screws	3	-	27

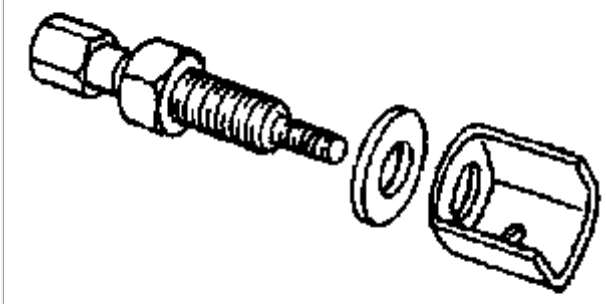
SPECIAL TOOLS

Special Tools Table

	KM-108 Remover/Installer

 KM108	
 KM210A	KM-210-A Steering Wheel Puller
	J-36667 Lock Plate Adapter

 J36667	
 J23653D	J-23653-D Lock Plate Compressor
	J-21854-01 Pivot Pin Remover



DIAGNOSIS

Steering Column Diagnosis

Lock System

Lock System Will Not Unlock

Checks	Action
Check the lock cylinder for damage.	Replace the lock cylinder.
Check the ignition switch for lack of free movement.	Lubricate the ignition switch.
Check the steering column housing for binding or damage.	Remove the steering shaft and clear the steering column housing. Replace the steering column housing as needed.

Lock System Will Not Lock

Checks	Action
Check the lock cylinder for damage.	Replace the lock cylinder.
Check the ignition switch for a lack of free movement.	Lubricate the ignition switch.
Check the steering column housing for binding or damage.	Remove the steering shaft and clear the steering column housing. Replace the steering column housing as needed.

High Lock Effort

Checks	Action
Check the lock cylinder for damage.	Replace the lock cylinder.

Checks	Action
Check the ignition switch for lack of free movement.	Lubricate the ignition switch.
Check for extreme misalignment of the housing to the cover.	Realign the cover on the housing. Replace the cover as needed.
Check for a bent ignition switch mounting bracket.	Replace the ignition switch mounting bracket.

Key Cannot Be Removed in the LOCK Position

Checks	Action
Check to see that the ignition switch is set correctly.	Reset the ignition switch.
Check the lock cylinder for damage.	Replace the lock cylinder.

Column

Noise in the Column

Checks	Action
Check the steering gear-to-column joints for improper installation.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Check for column misalignment.	Replace the alignment spacer.
Check the steering shaft bearing for wear or damage.	Replace the steering shaft bearing.
Check the spherical joint for lack of lubrication.	Lubricate the spherical joint.
Check the steering shaft for lack of lubrication.	Lubricate the steering shaft bearing.
Check the shaft lock snap ring for improper seating.	Adjust the shaft lock snap ring. Replace the shaft lock snap ring as needed.

High Steering Shaft Effort

Checks	Action
Check the steering shaft bearing for wear or damage.	Replace the steering shaft bearing.
Check for column misalignment.	Replace the alignment spacer.
Check for an improperly installed or deformed dust seal.	Replace the dust seal.
Check for a damaged upper or lower bearing.	Replace the upper or the lower bearing.
Check the steering shaft universal joints for a lack of free movement.	Lubricate the steering shaft universal joint. Replace the steering shaft universal joint as needed.

Lash in the Steering Column

Checks	Action
Check the steering column bracket mounting bolts for improper installation.	Tighten the steering column bracket mounting bolts.
Check for broken weld nuts on the steering	Replace the steering column jacket.

Checks	Action
column jacket.	
Check for loose steering column housing-to-steering column jacket support screws.	Tighten the support screws.

Loose Steering Wheel

Checks	Action
Check for excessive clearance between the holes in the steering wheel support or the housing and the pivot-pin diameters.	Replace the pivot pins with pivot pins of the correct size.
Check to see if the upper bearing is seated correctly in the housing.	Correctly seat the upper bearing. Replace the upper bearing as needed.
Check for loose steering column housing support screws.	Tighten the steering column housing support screws.

Noise When Tilting the Column

Checks	Action
Check for worn upper tilt bumpers.	Replace the upper tilt bumpers.
Check for tilt spring binding.	Adjust the tilt spring. Replace the tilt spring as needed.

Turn Signal/Dimmer Switch

Turn Signal Will Not Stay in the Turn Position

Checks	Action
Check the turn signal switch for an improper installation.	Remove and inspect the turn signal switch. Reinstall the switch.
Check the cancelling mechanism for broken or missing components.	Replace the cancelling mechanism.
Check the turn signal switch housing for foreign material.	Remove any foreign material.

Turn Signal Will Not Cancel

Checks	Action
Check the cancelling mechanism for broken or missing components.	Replace the cancelling mechanism.

Turn Signal/Dimmer Switch Difficult to Operate

Checks	Action
Check the turn signal/dimmer switch and turn signal/dimmer switch lever for improper installation.	Remove and inspect the turn signal/dimmer switch and signal/dimmer switch lever. Reinstall the signal/dimmer switch and signal/dimmer switch lever.
Check the signal/dimmer switch housing for foreign material.	Remove any foreign material.

Turn Signal Will Not Indicate Lane Change

Checks	Action
Check for a broken lane change pressure pad or a broken spring hanger.	Replace the lane change pressure pad or the spring hanger.
Check for improper functioning of the lane change spring.	Replace the lane change spring.
Check the turn signal switch for improper installation.	Replace the turn signal switch.

No Turn Signal Lights

Checks	Action
Check for an inoperative turn signal flasher.	Replace the turn signal flasher.
Check for a faulty turn signal switch.	Replace the turn signal switch.
Check the chassis-to-column connector for an improper connection.	Reconnect the chassis-to-column connector.

Turn Indicator Lights On, but Not Flashing

Checks	Action
Check for an inoperative turn signal flasher.	Replace the turn signal flasher.
Check for a faulty turn signal switch.	Replace the turn signal switch.
Check the chassis-to-column connector for an improper connection.	Reconnect the chassis-to-column connector.

Front or Rear Turn Signal Lights Not Flashing

Checks	Action
Check for a faulty turn signal switch.	Replace the turn signal switch.
Check the chassis-to-column connector for an improper connection.	Reconnect the chassis-to-column connector.

Turn Signal Lights Flash Very Slowly

Checks	Action
Check the chassis-to-column connector for an improper connection.	Reconnect the chassis-to-column connector.

Ignition Switch

Electrical System Will Not Function

Checks	Action
Check the ignition switch for damage.	Replace the ignition switch.
Check the ignition switch for improper installation.	Remove and inspect the ignition switch. Reinstall the ignition switch.
Check the ignition switch electrical connector for improper installation.	Reconnect the ignition switch electrical connector. Replace the ignition switch electrical connector.

Ignition Switch Will Not Turn

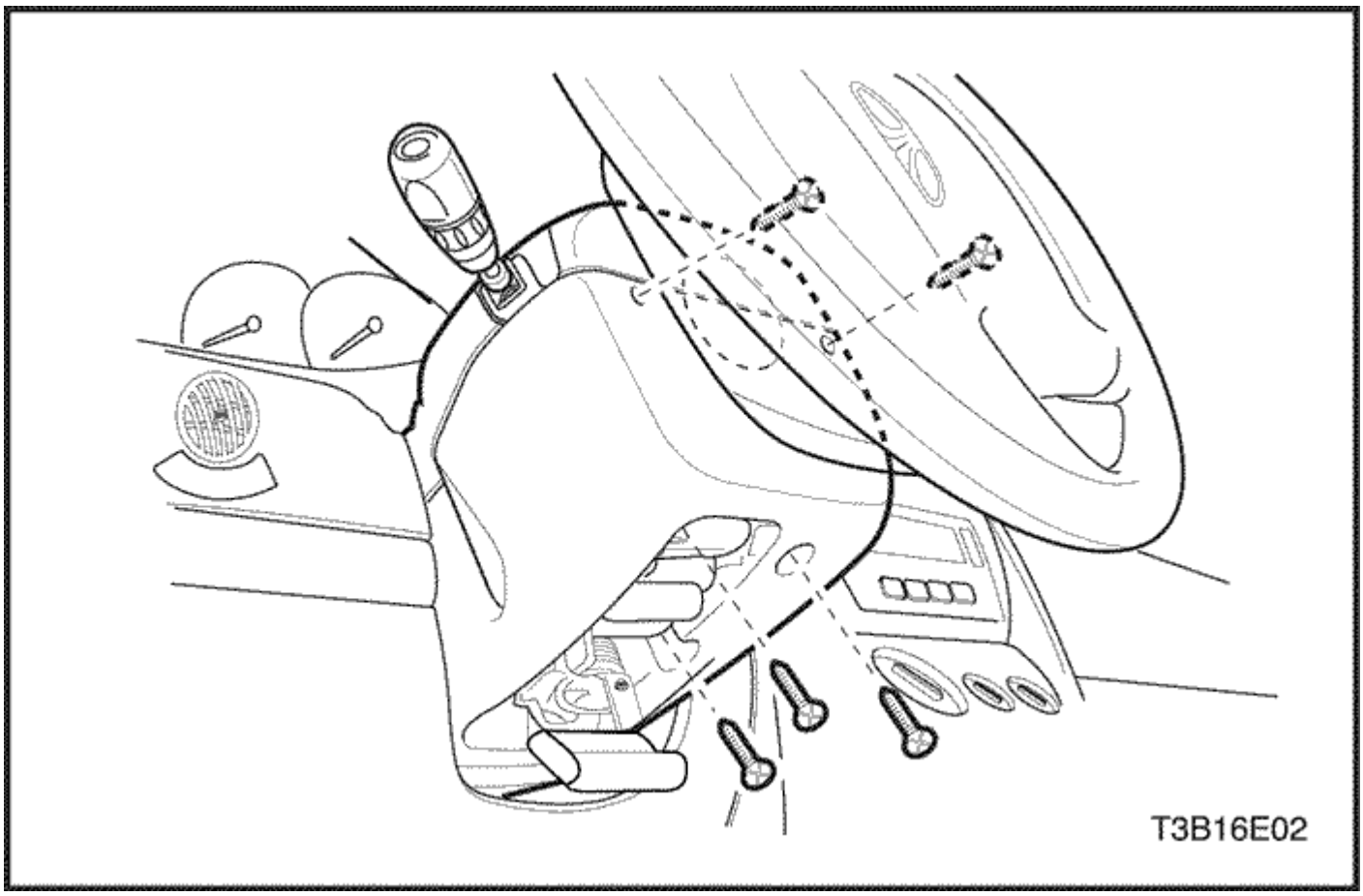
Checks	Action
Check the ignition switch for damage.	Replace the ignition switch.

Checks	Action
Check the ignition switch for improper installation.	Remove and inspect the ignition switch. Reinstall the ignition switch.

Wiper Switch Lever
Switch Inoperative: No LO, HI, INT, or Wash

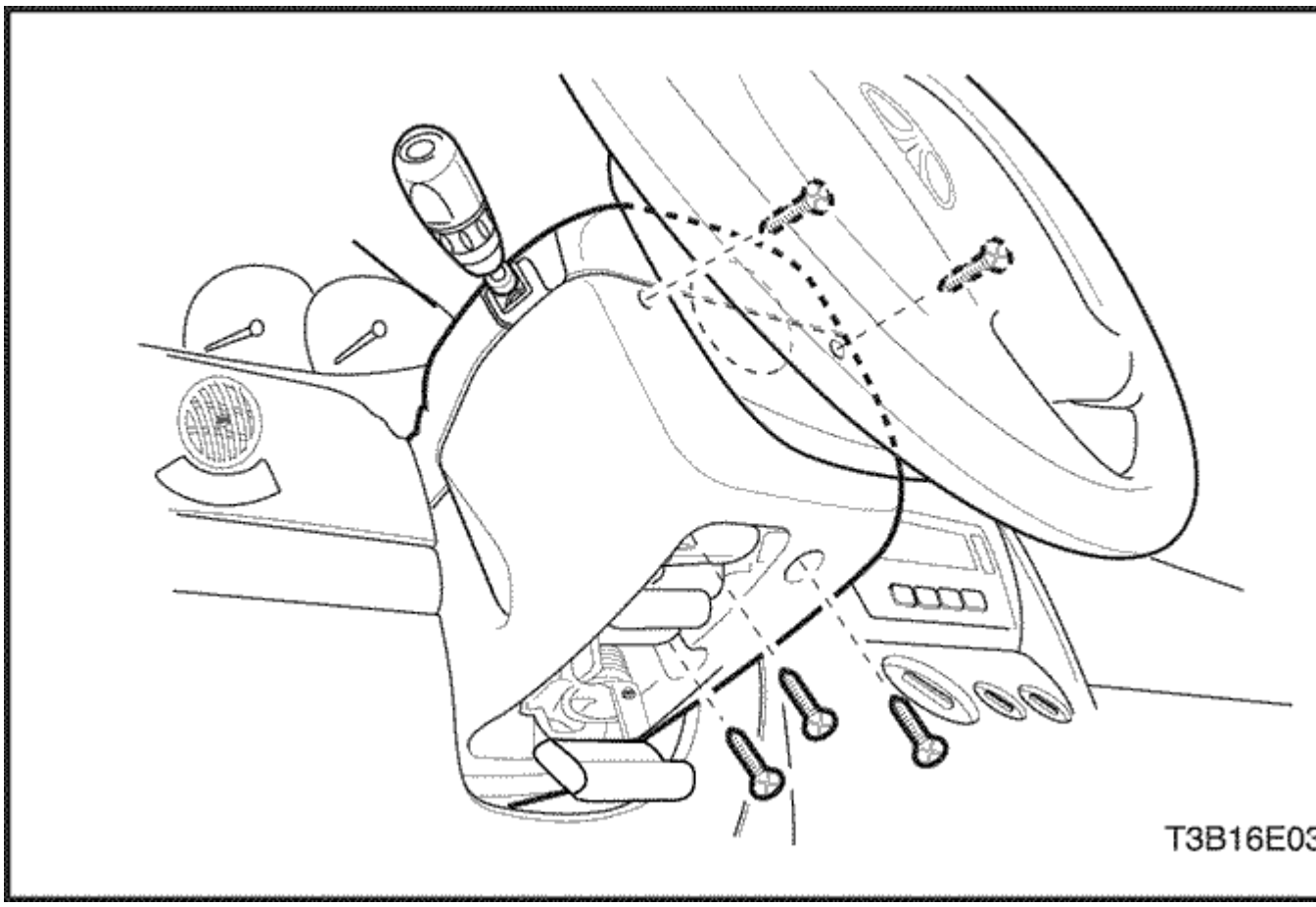
Checks	Action
Check the wiper switch for damage.	Replace the wiper switch.
Check the wiper switch for improper installation.	Remove and inspect the wiper switch. Reinstall the wiper switch.

MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE

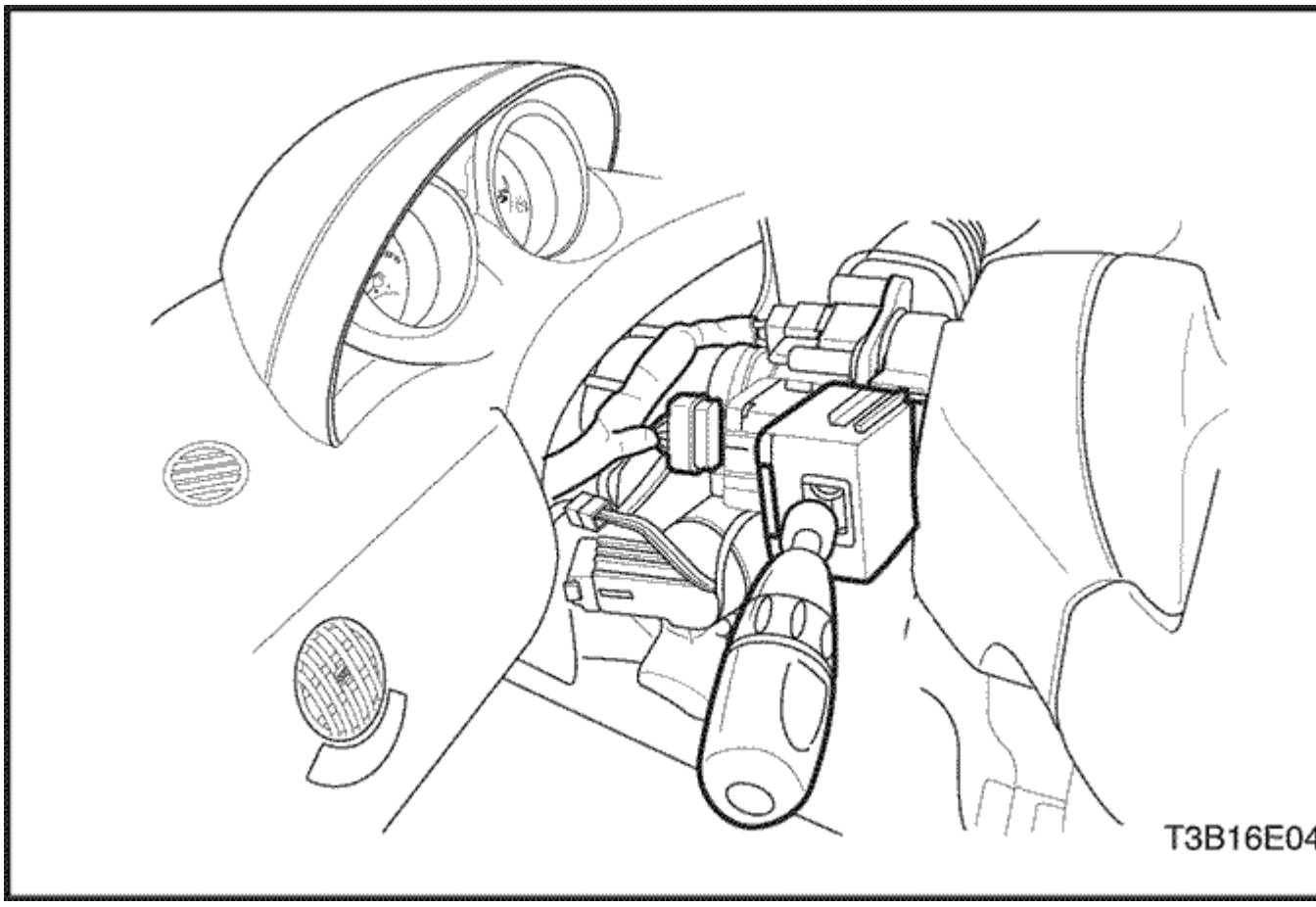


Turn Signal Switch and Lever
Removal Procedure

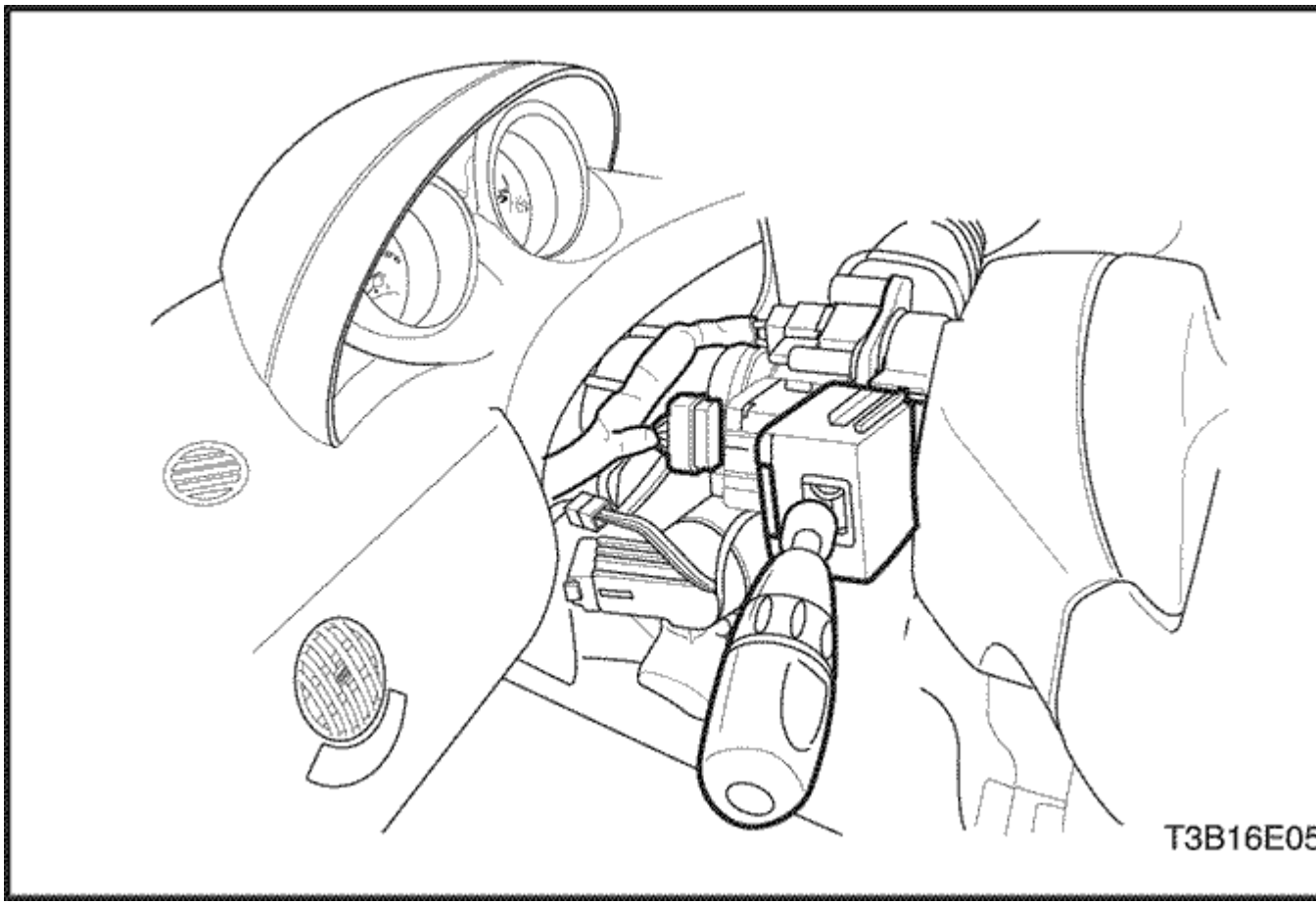
1. Disconnect the negative battery cable.
2. Remove the lower steering column cover panel screws and remove the lower steering column cover panel.



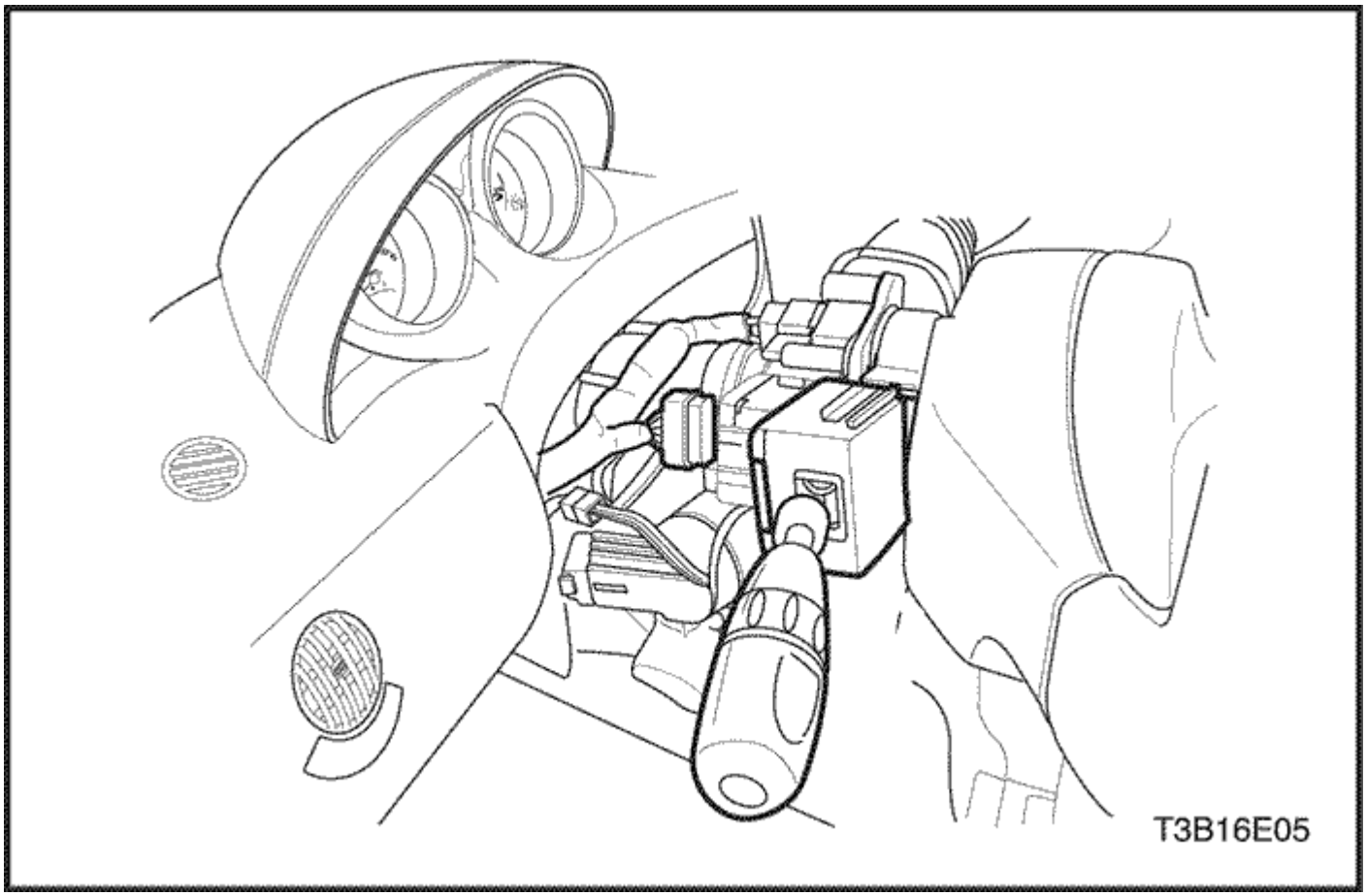
3. Turn the steering wheel to expose the upper steering column cover panel screws. Remove the upper steering column cover panel screws and remove the upper steering column cover panel.



4. Remove the turn signal switch by pushing in on the tabs on either side of the switch housing.

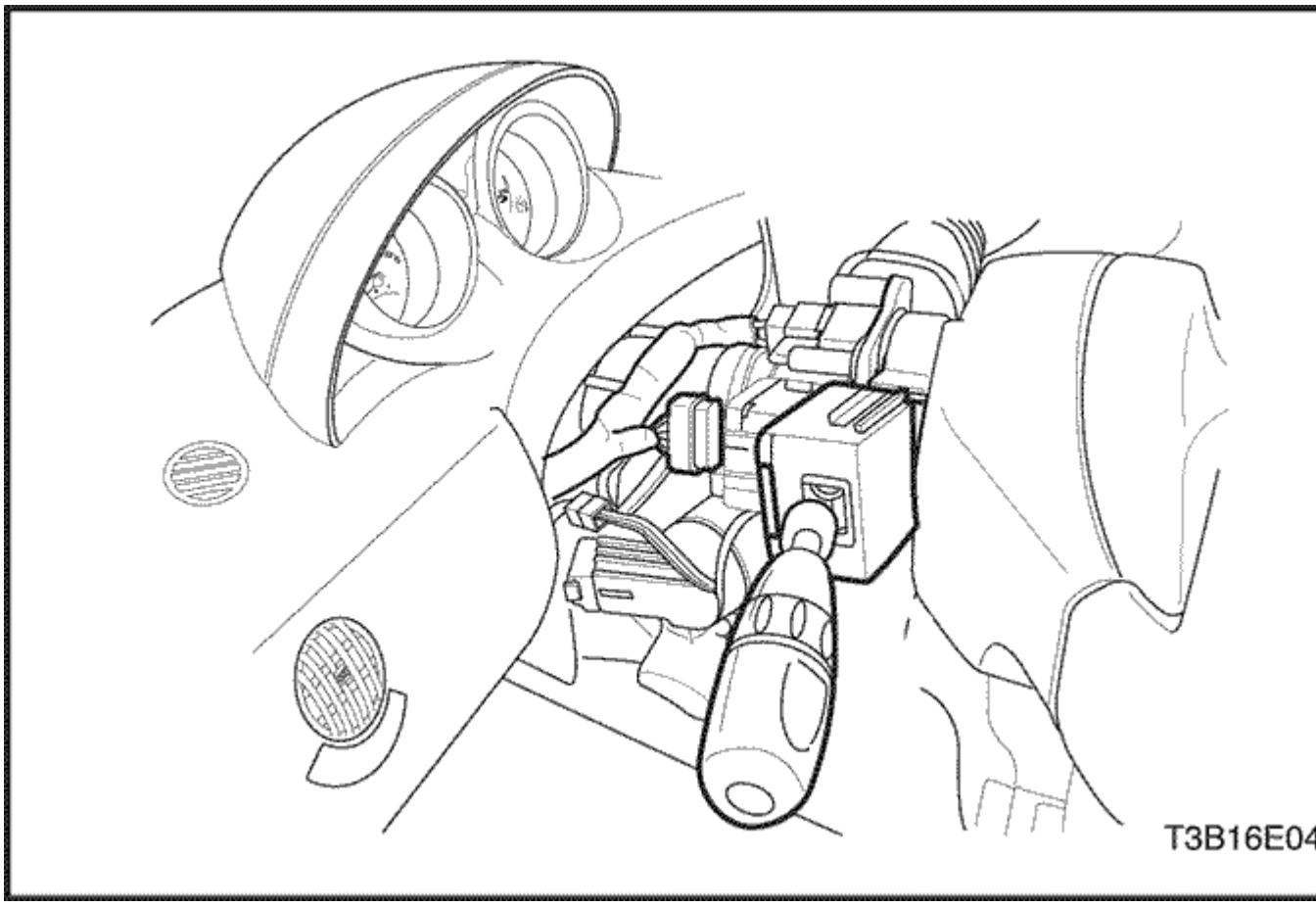


5. Disconnect the electrical connections from the turn signal switch.

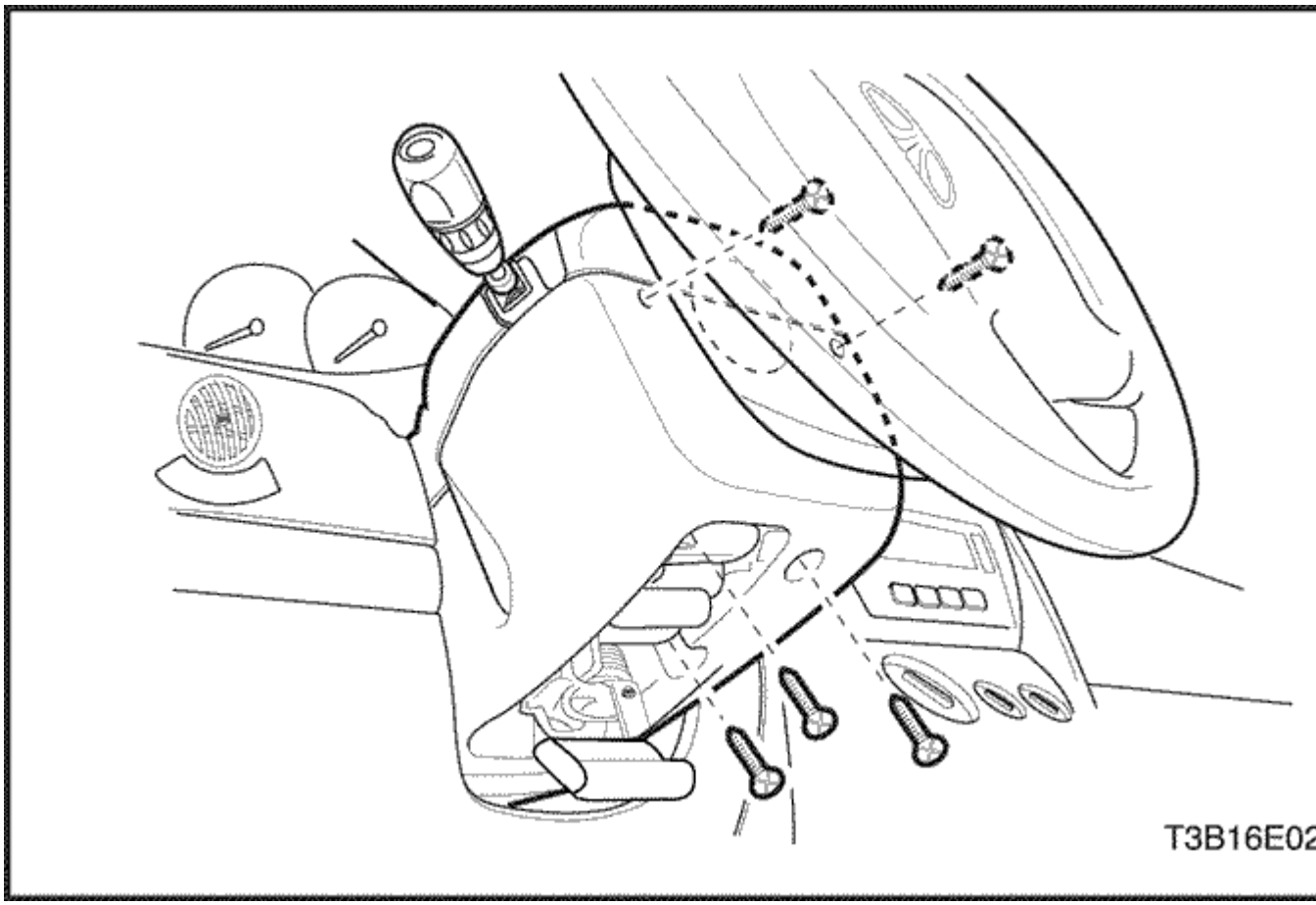


Installation Procedure

1. Connect the electrical connections to the turn signal switch.

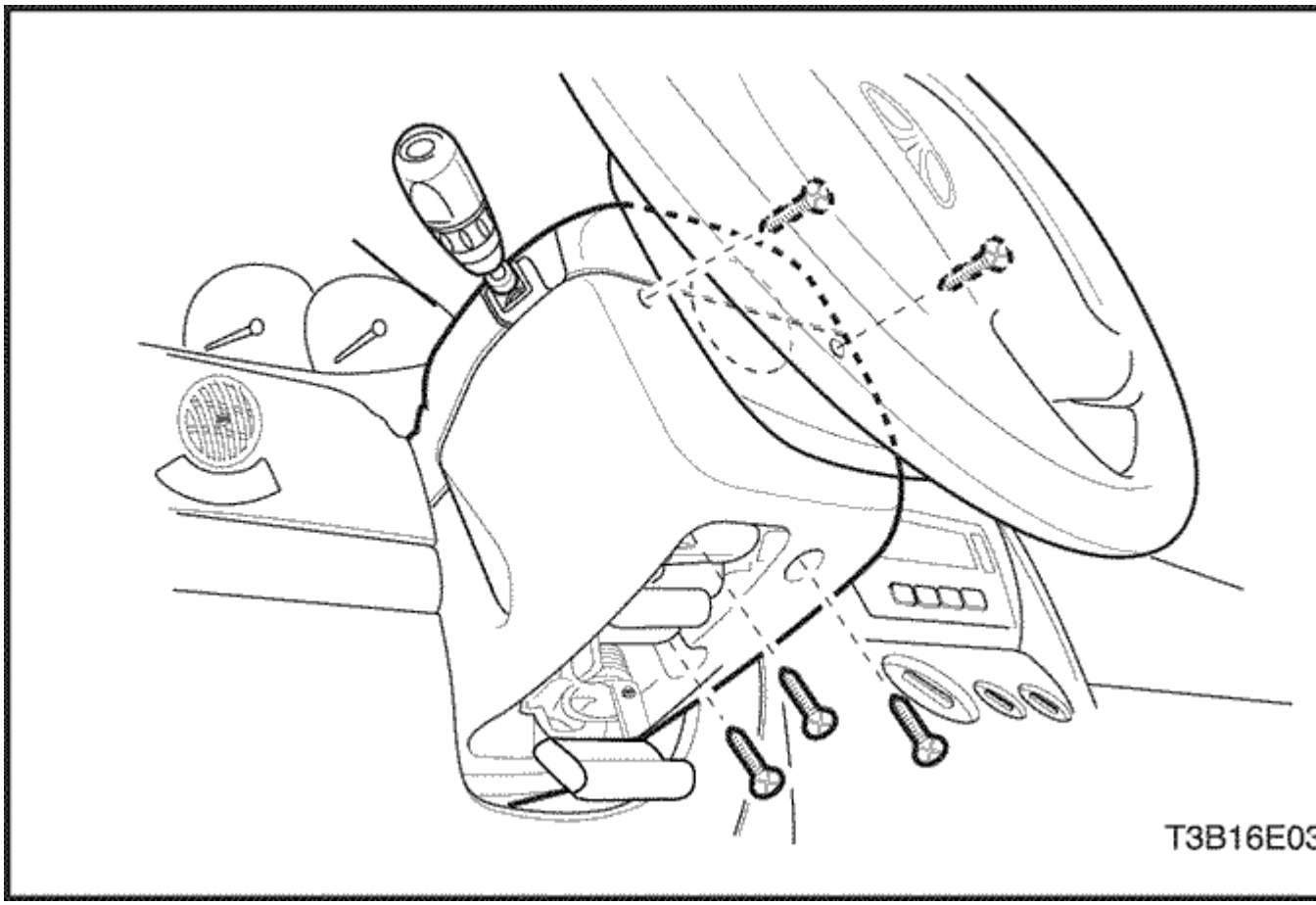


2. Install the turn signal switch by snapping it into the switch housing.



3. Install the lower steering column cover panel. Install the lower steering column cover panel screws.

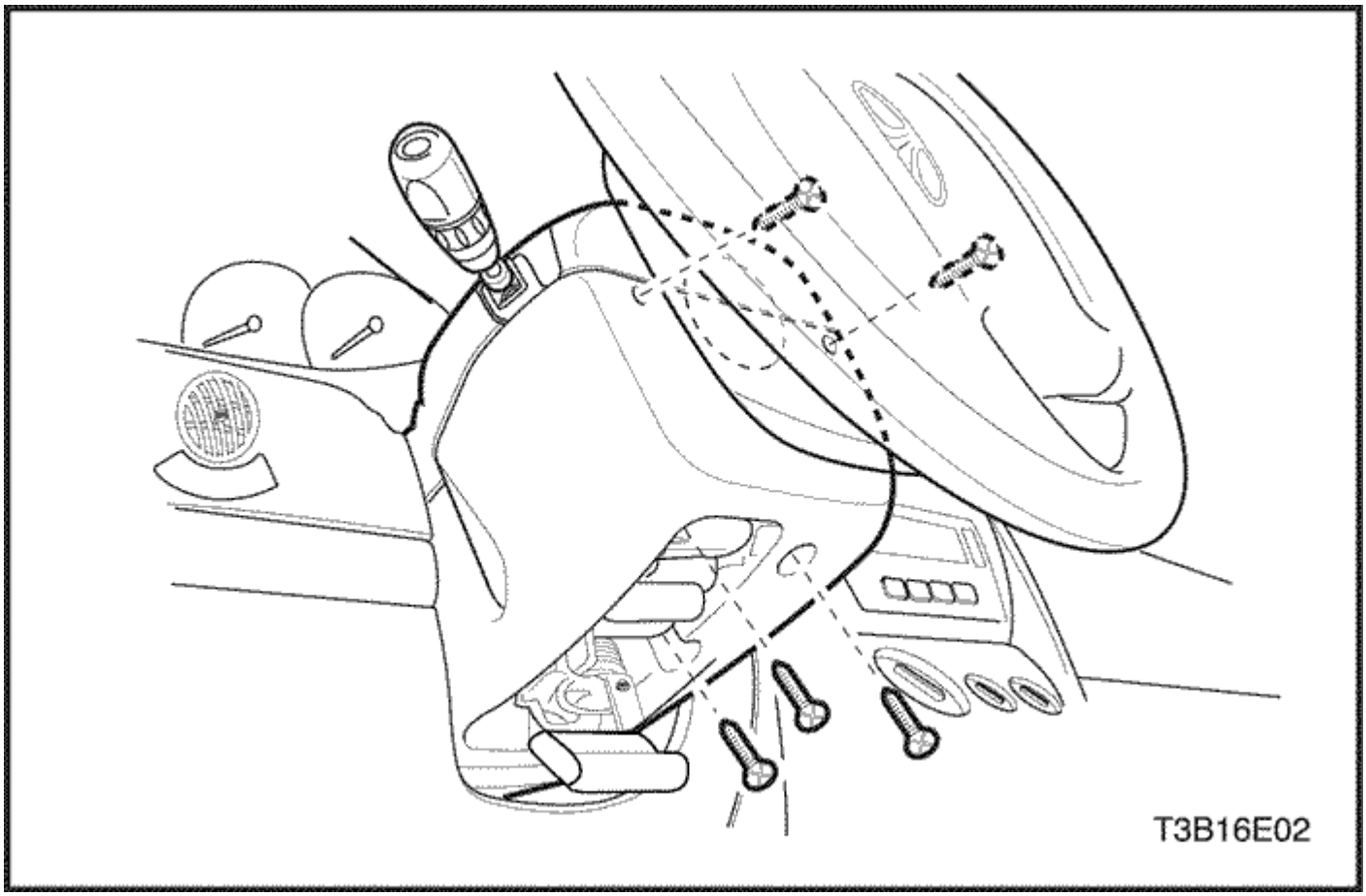
   Tighten
   Tighten the lower steering column cover panel screws to 3 N•m (27 lb-in).



4. Install the upper steering column cover panel. Install the upper steering column cover panel screws.

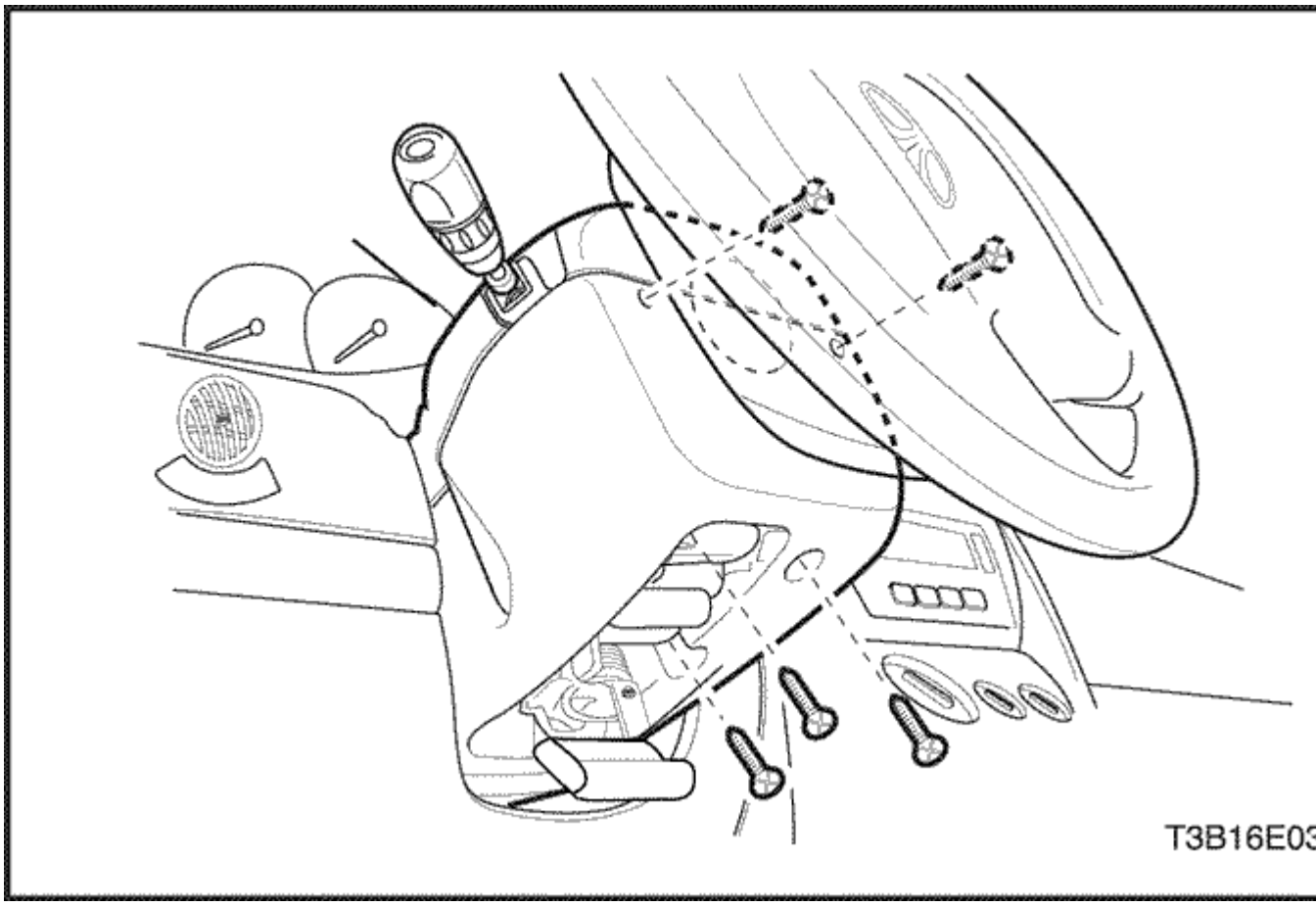
   Tighten
   Tighten the upper steering column cover panel screws to 3 N•m (27 lb-in).

5. Connect the negative battery cable.

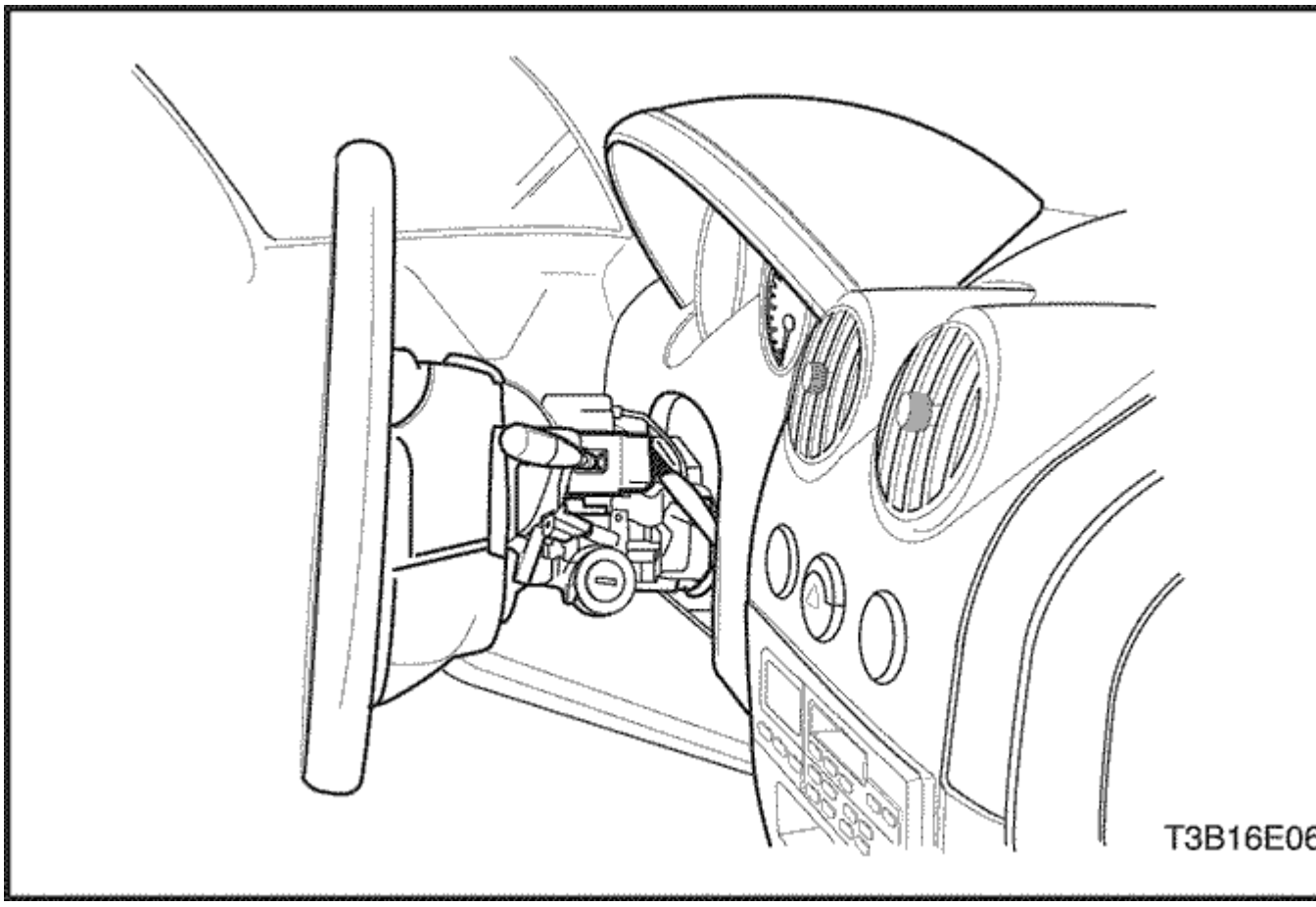


Wiper Switch and Lever
Removal Procedure

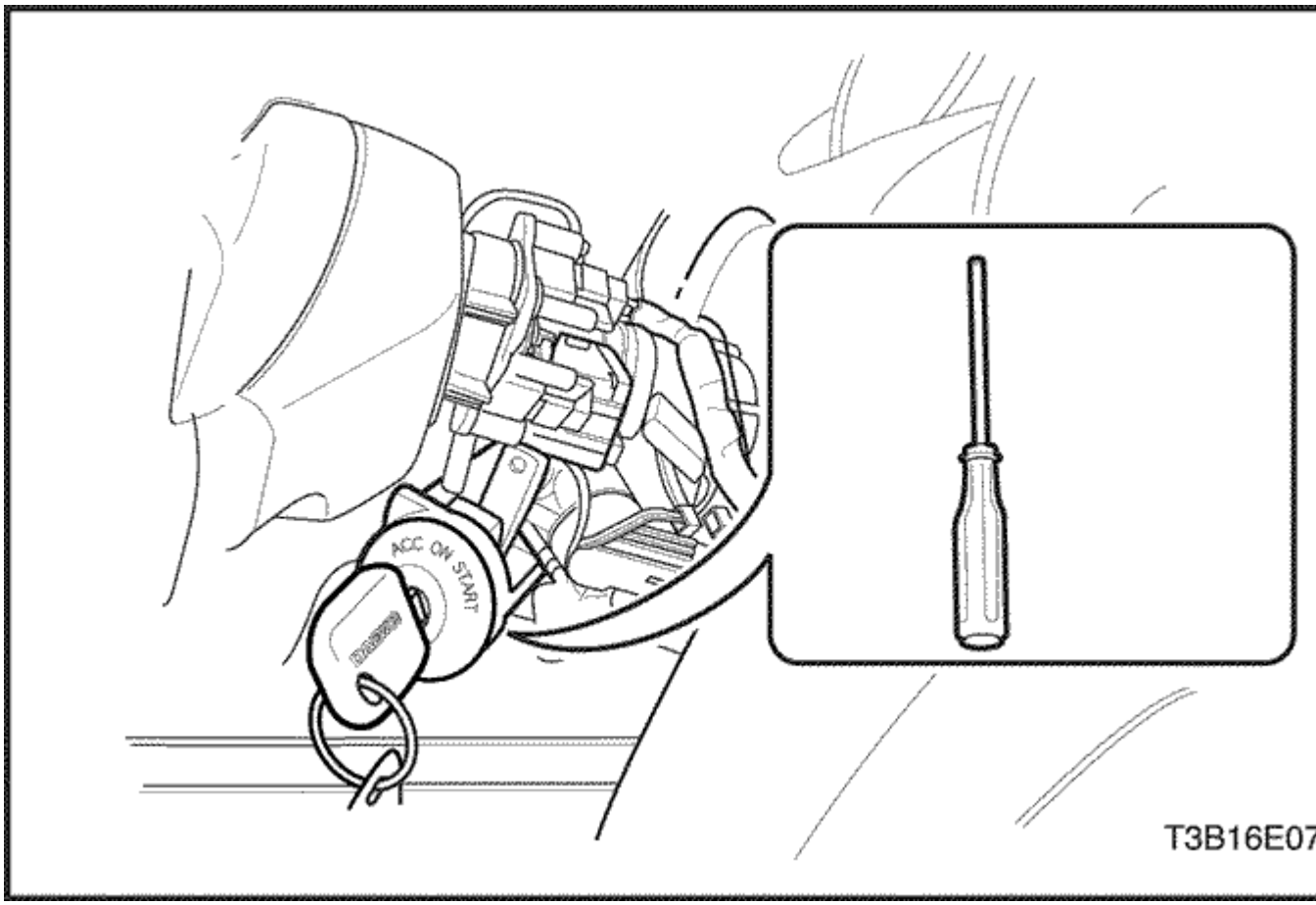
1. Disconnect the negative battery cable.
2. Remove the lower steering column cover panel screws and remove the lower steering column cover panel.



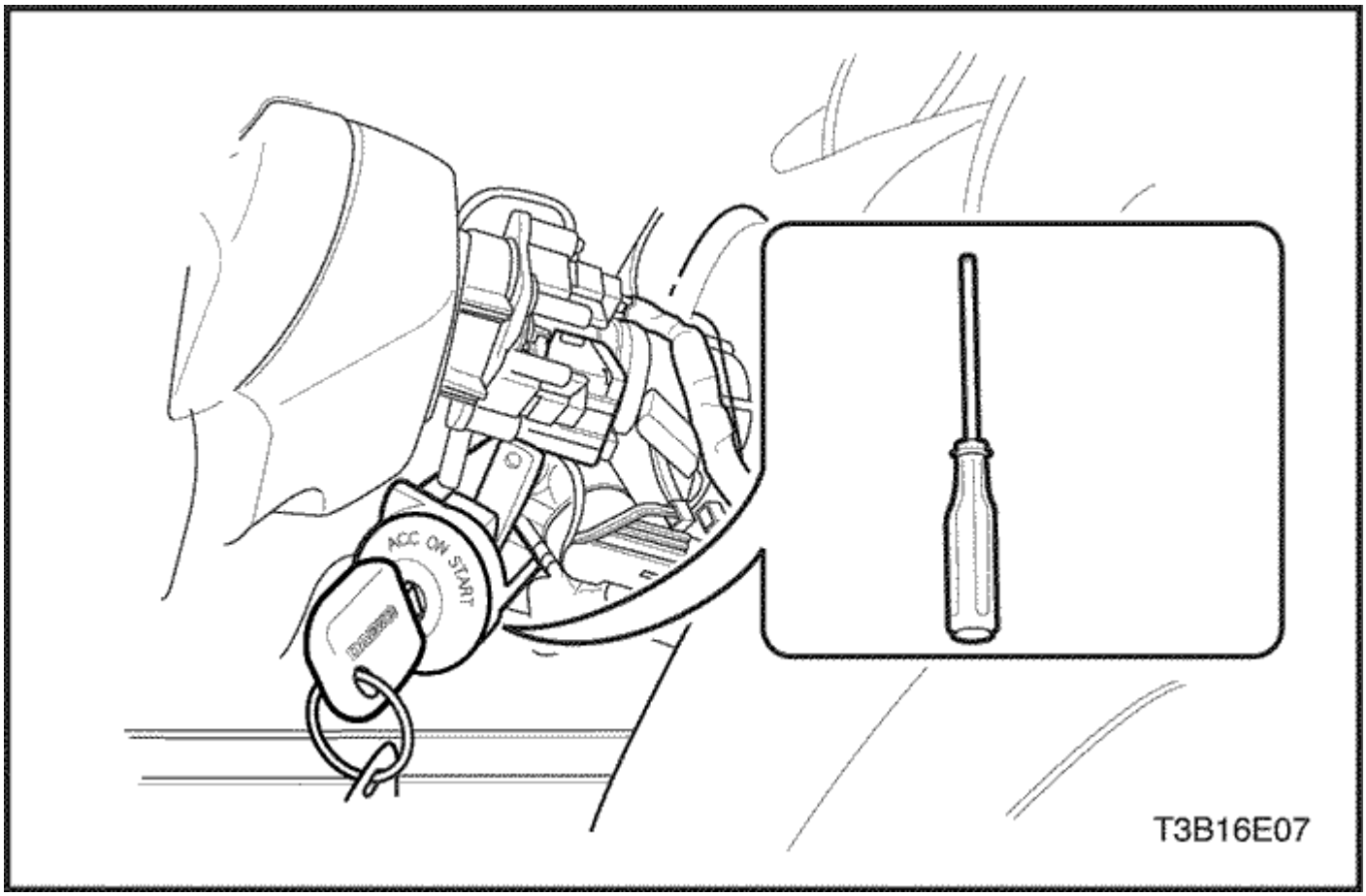
3. Turn the steering wheel to expose the upper steering column cover panel connecting screws. Remove the upper steering column cover panel screws and remove the upper steering column cover panel.



4. Remove the wiper switch by pushing in on the tabs on either side of the switch housing.

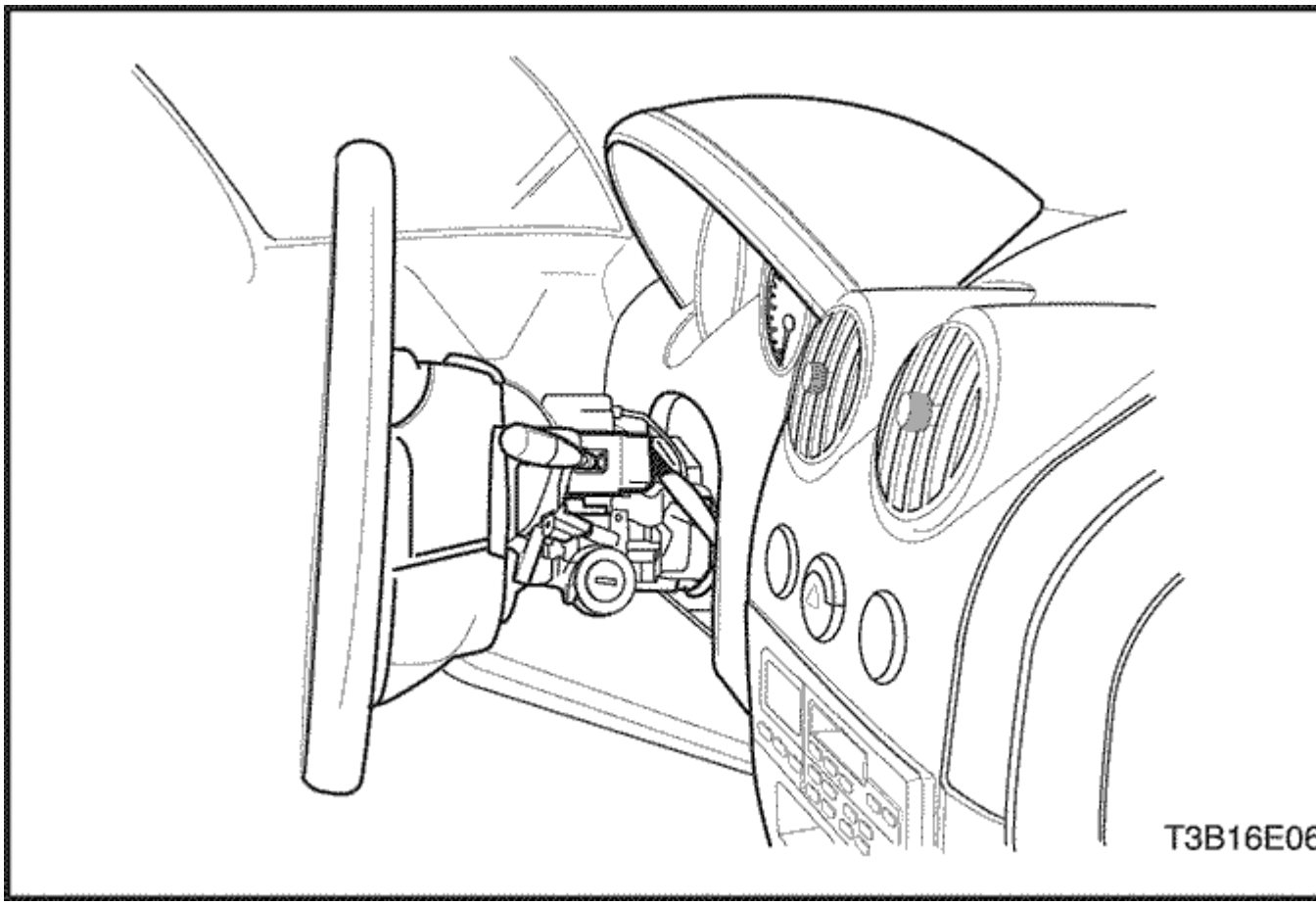


5. Disconnect the electrical connections from the wiper switch.

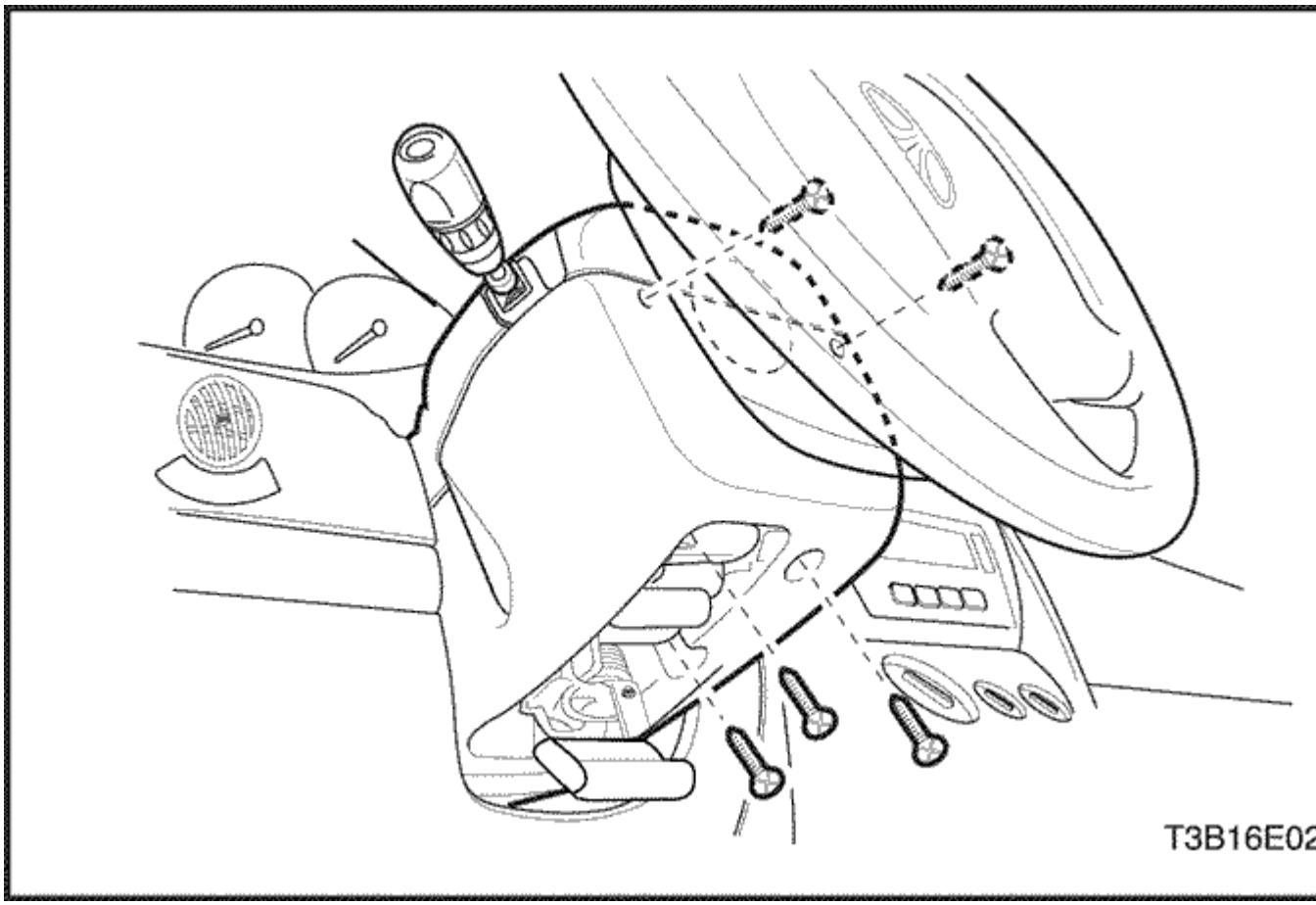


Installation Procedure

1. Connect the electrical connections to the wiper switch.

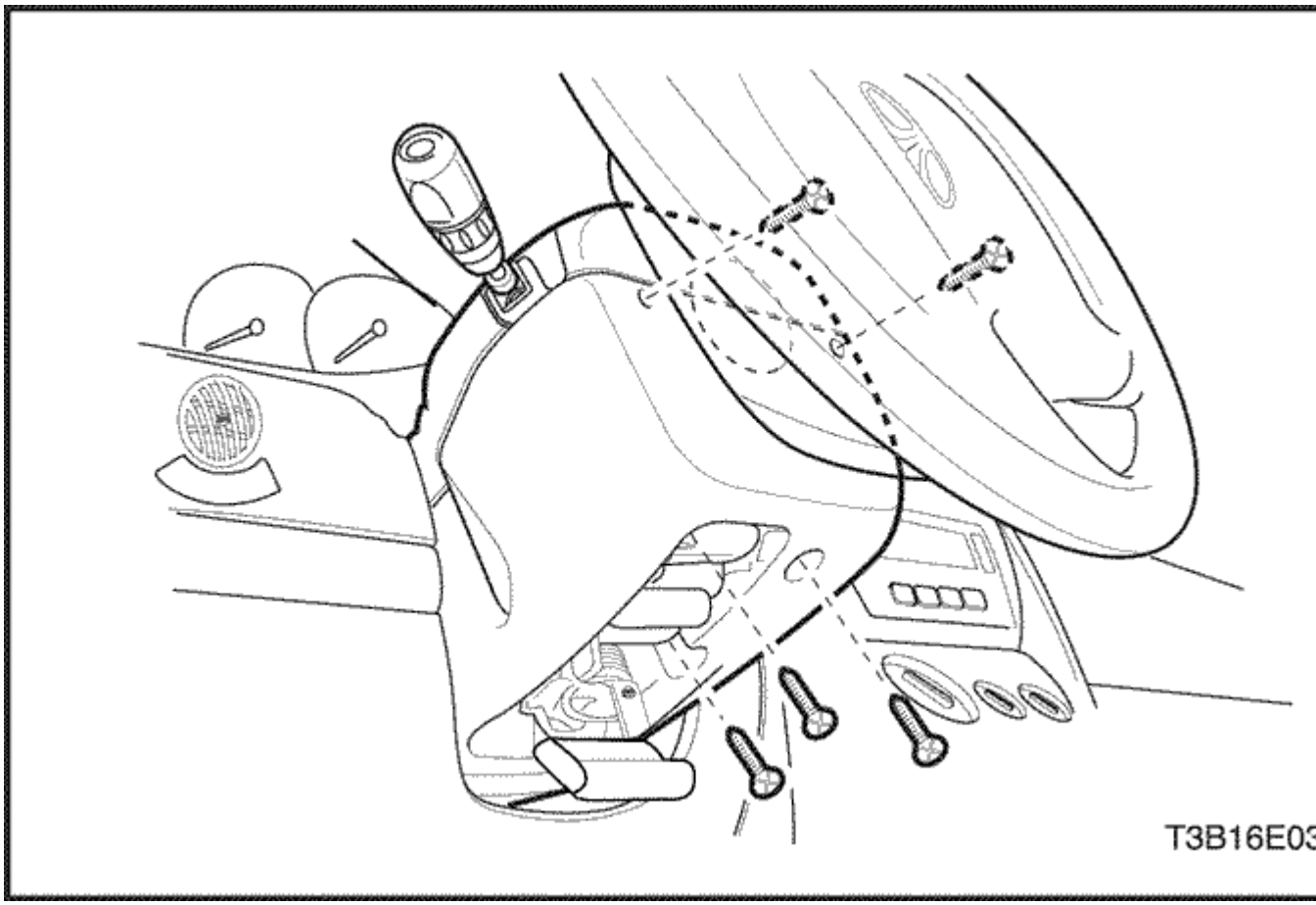


2. Install the wiper switch by snapping it into the switch housing.



3. Install the lower steering column cover panel. Install the lower steering column cover panel screws.

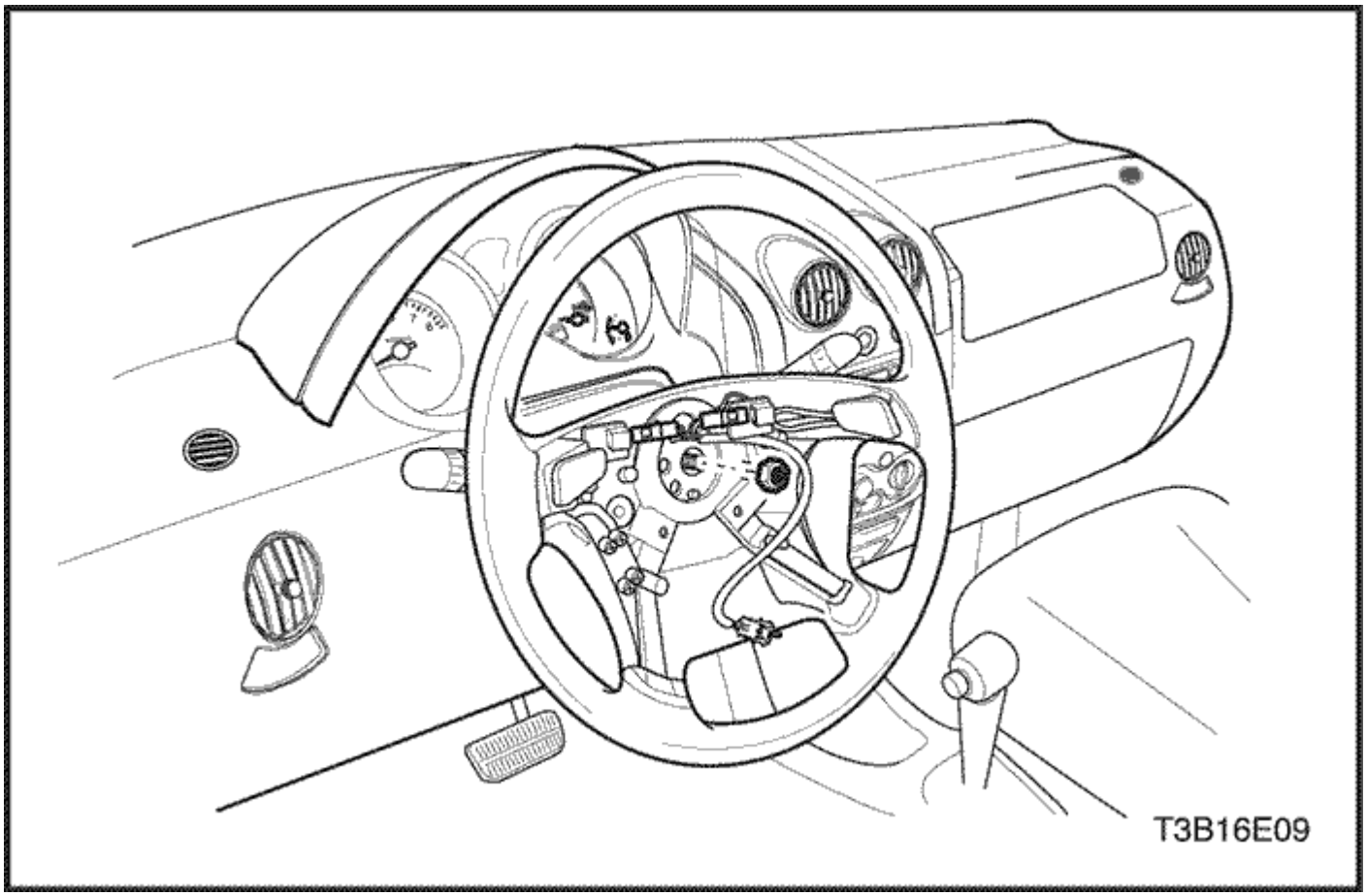
   Tighten
   Tighten the lower steering column cover panel screws to 3 N•m (27 lb-in).



4. Install the upper steering column cover panel. Install the upper steering column cover panel screws.

   Tighten
   Tighten the upper steering column cover panel screws to 3 N•m (27 lb-in).

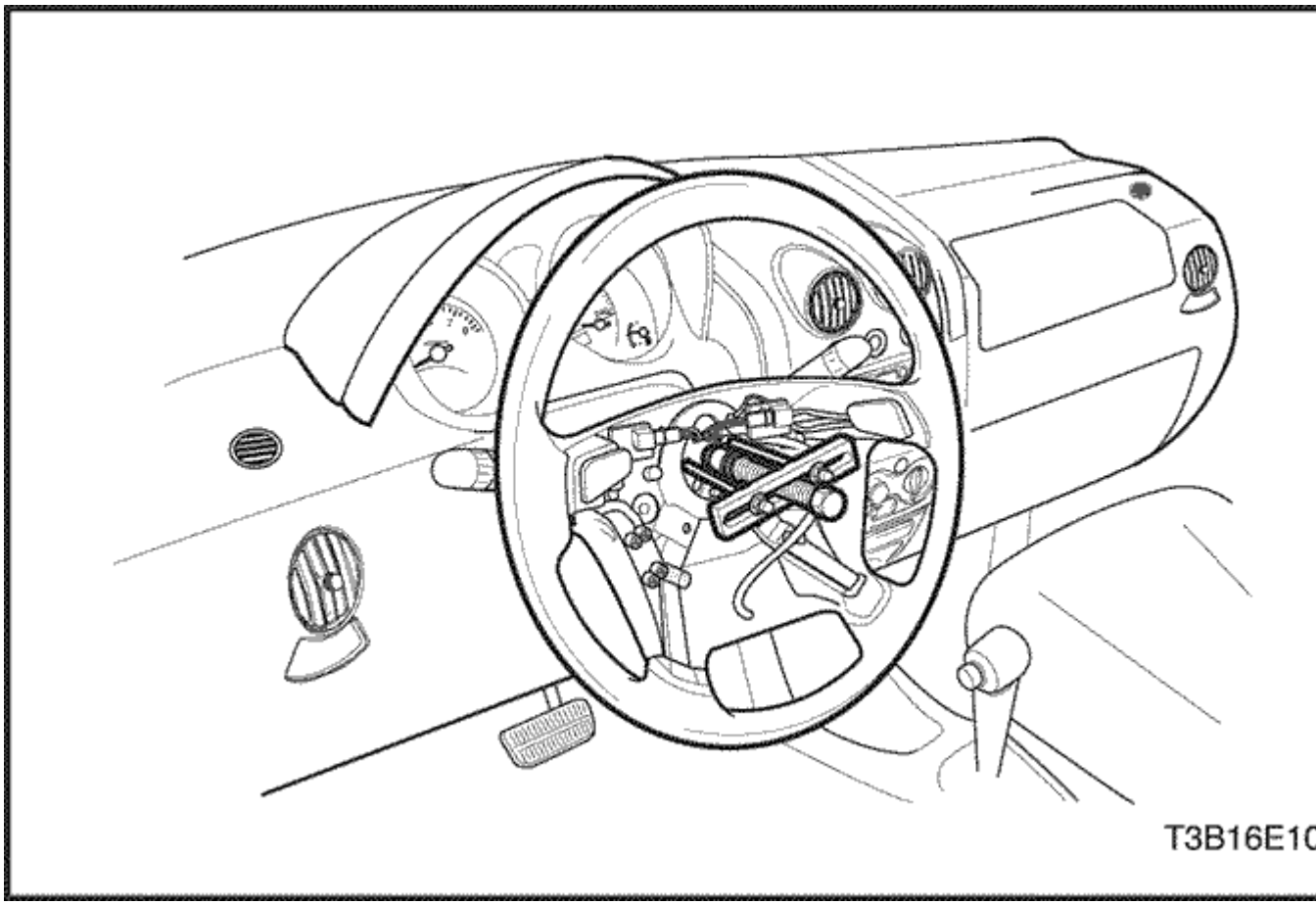
5. Connect the negative battery cable.



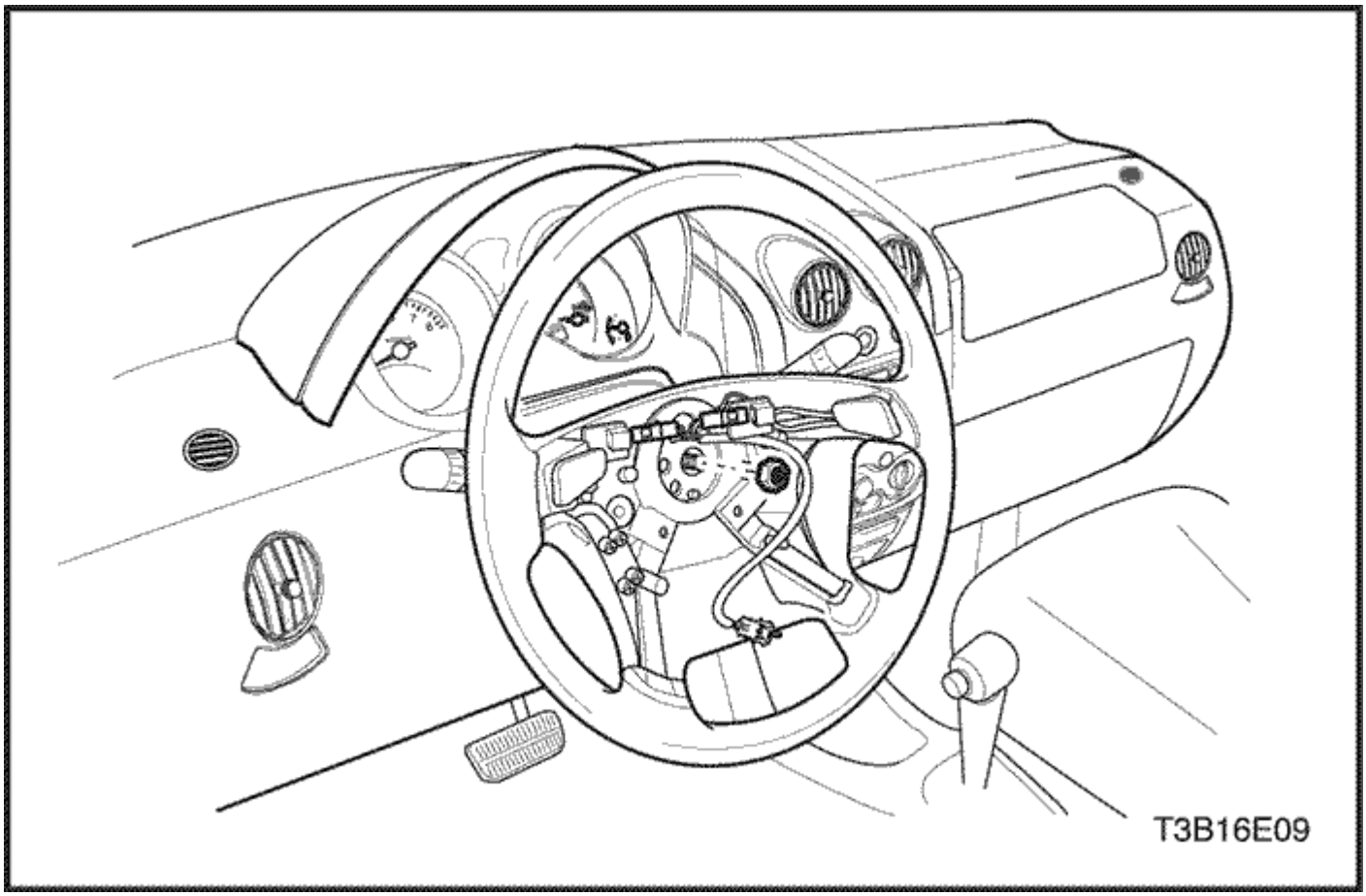
Steering Wheel With SIR
Tools Required

KM-210-A Steering Wheel Puller
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the SIR module. Refer to *Section 8B, Supplemental Inflatable Restraints.*
3. Remove the steering wheel nut and the retaining clip.



4. Remove the steering wheel using the steering wheel puller KM-210-A.
5. Unclip the contact ring from the steering wheel, if necessary.



Installation Procedure

1. Clip the contact ring on the steering wheel, if necessary.

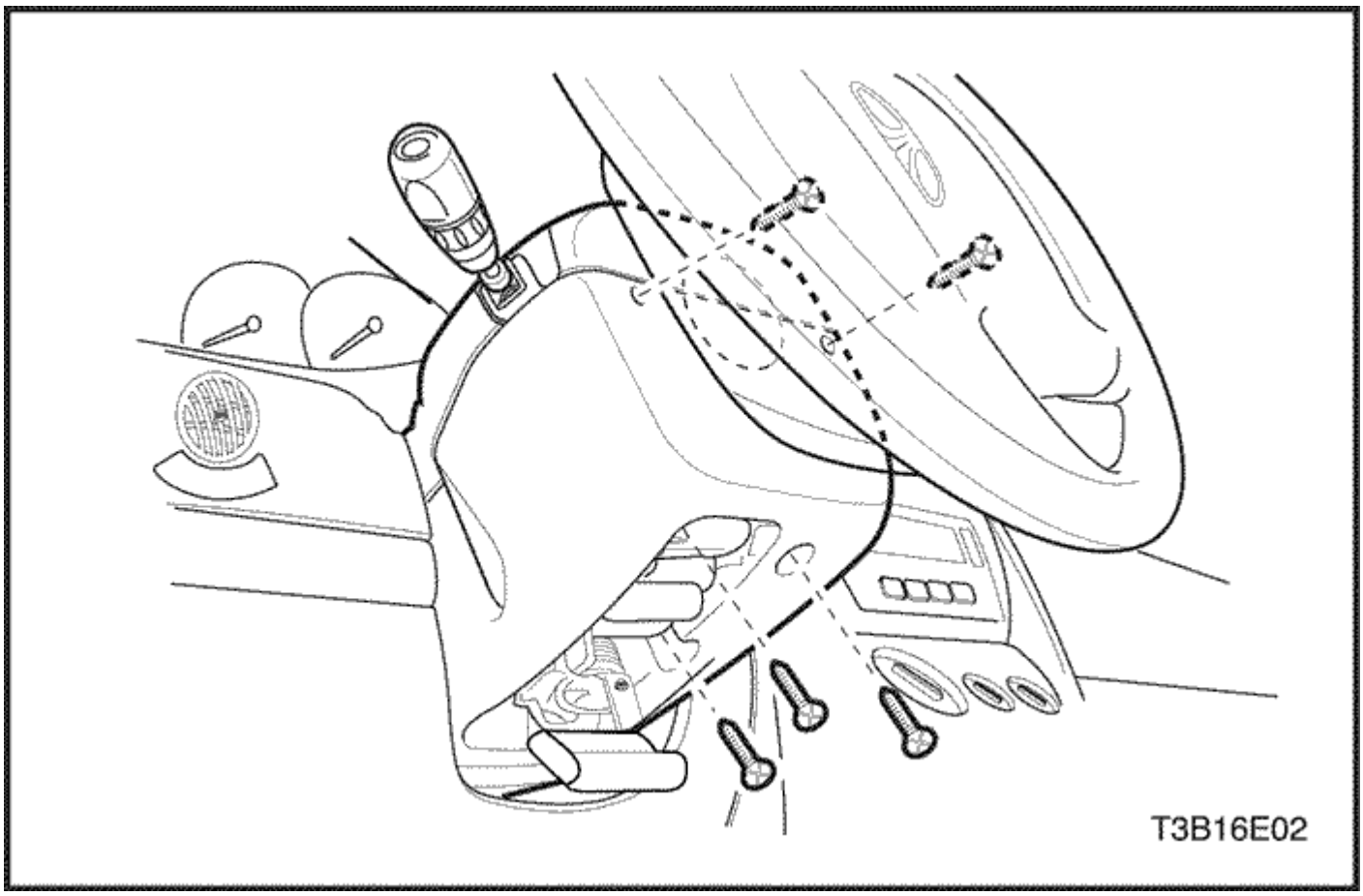
   Important : In order to install the steering wheel correctly, match-mark the steering column shaft to the steering wheel.

2. Align the match marks on the steering wheel and the steering column shaft. Turn the signal-canceling cam on the wheel to the left.
3. Install the retaining clip and the steering wheel nut.

   Tighten
   Tighten the steering wheel nut to 38 N•m (28 lb-ft).

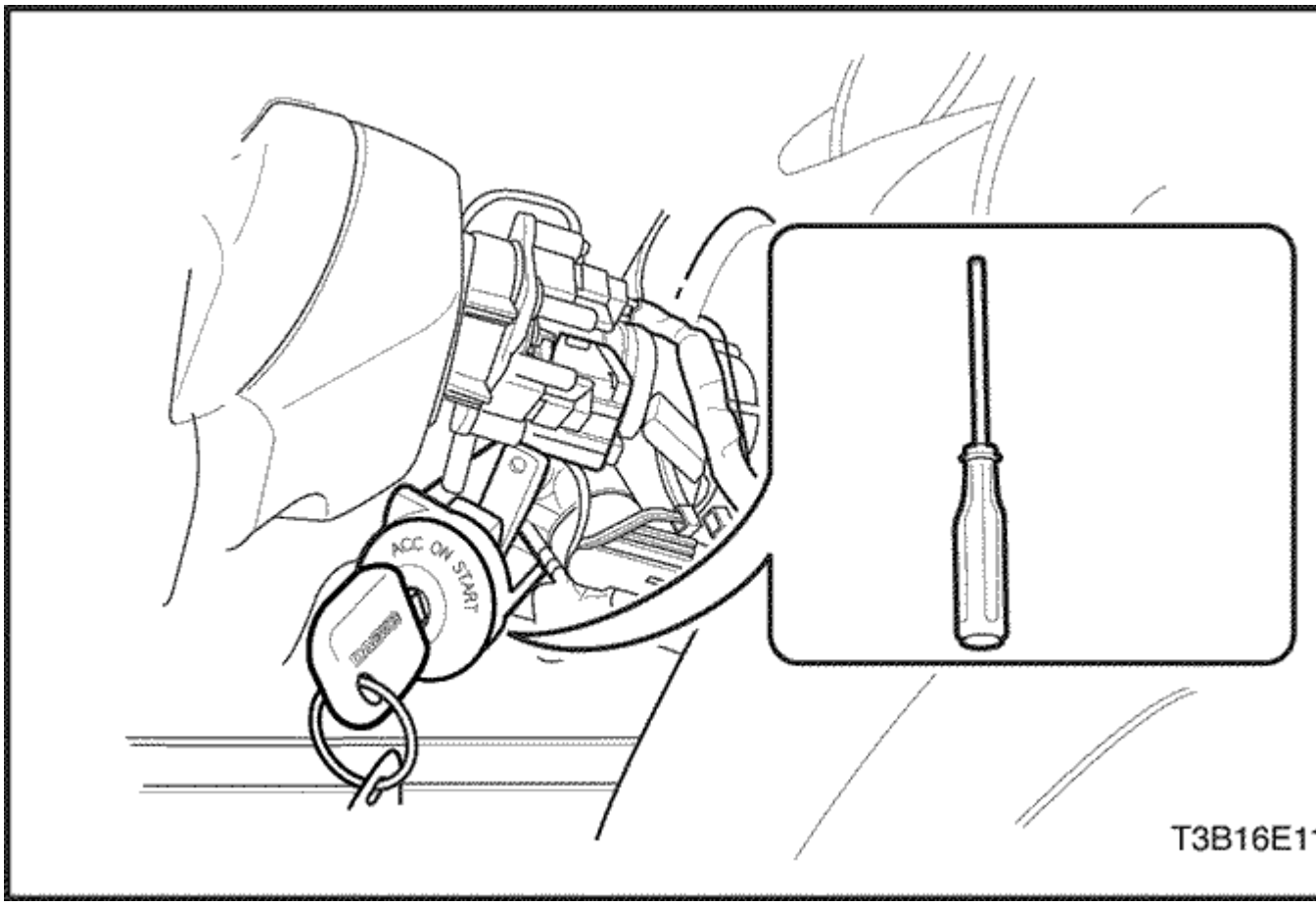
4. Bend the tabs to secure the retaining clip.

5. Install the SIR module. Refer to *Section 8B, Supplemental Inflatable Restraints.*
6. Connect the negative battery cable.



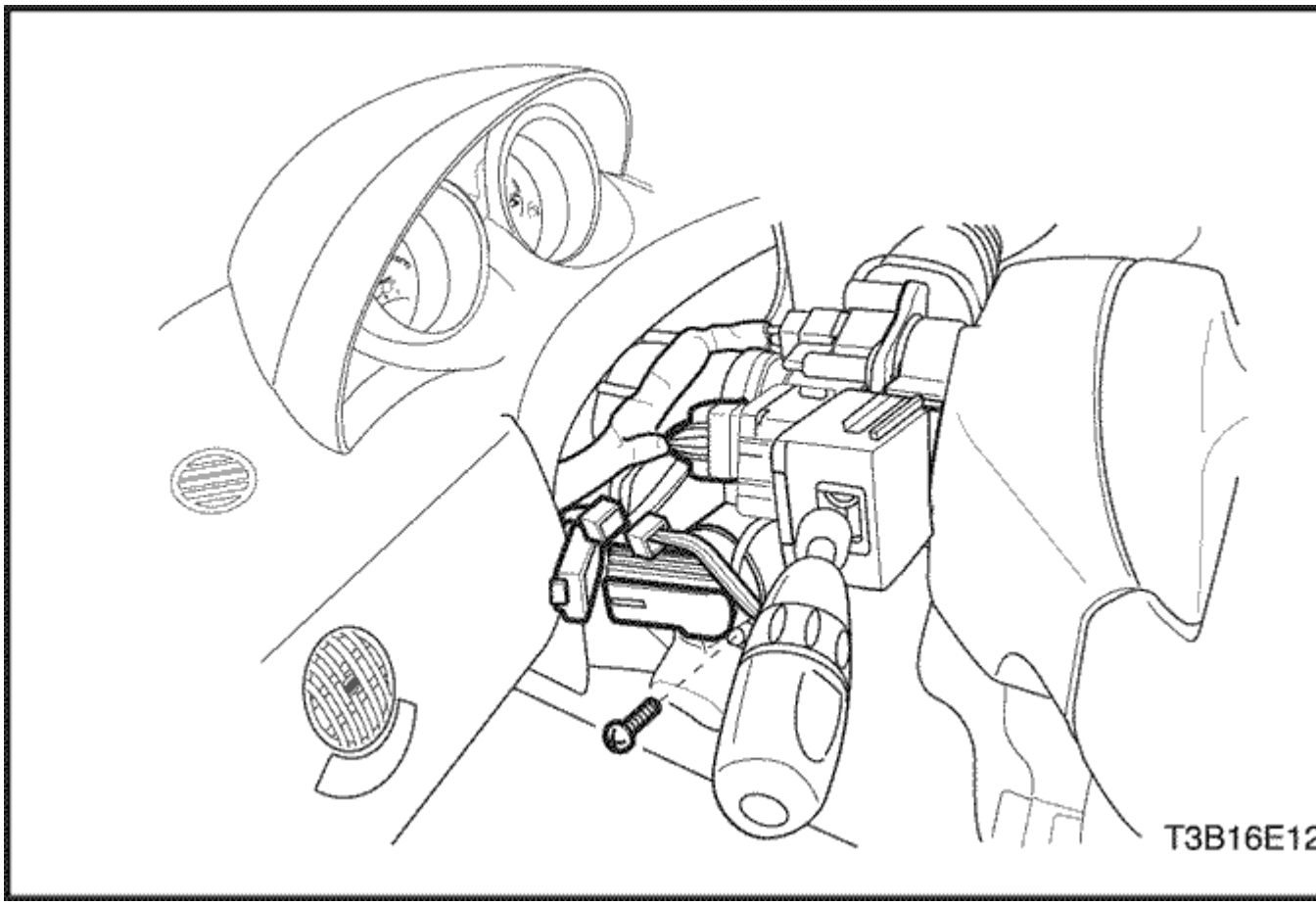
Ignition Lock Cylinder and Switch
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the lower steering column cover panel by removing the screws.

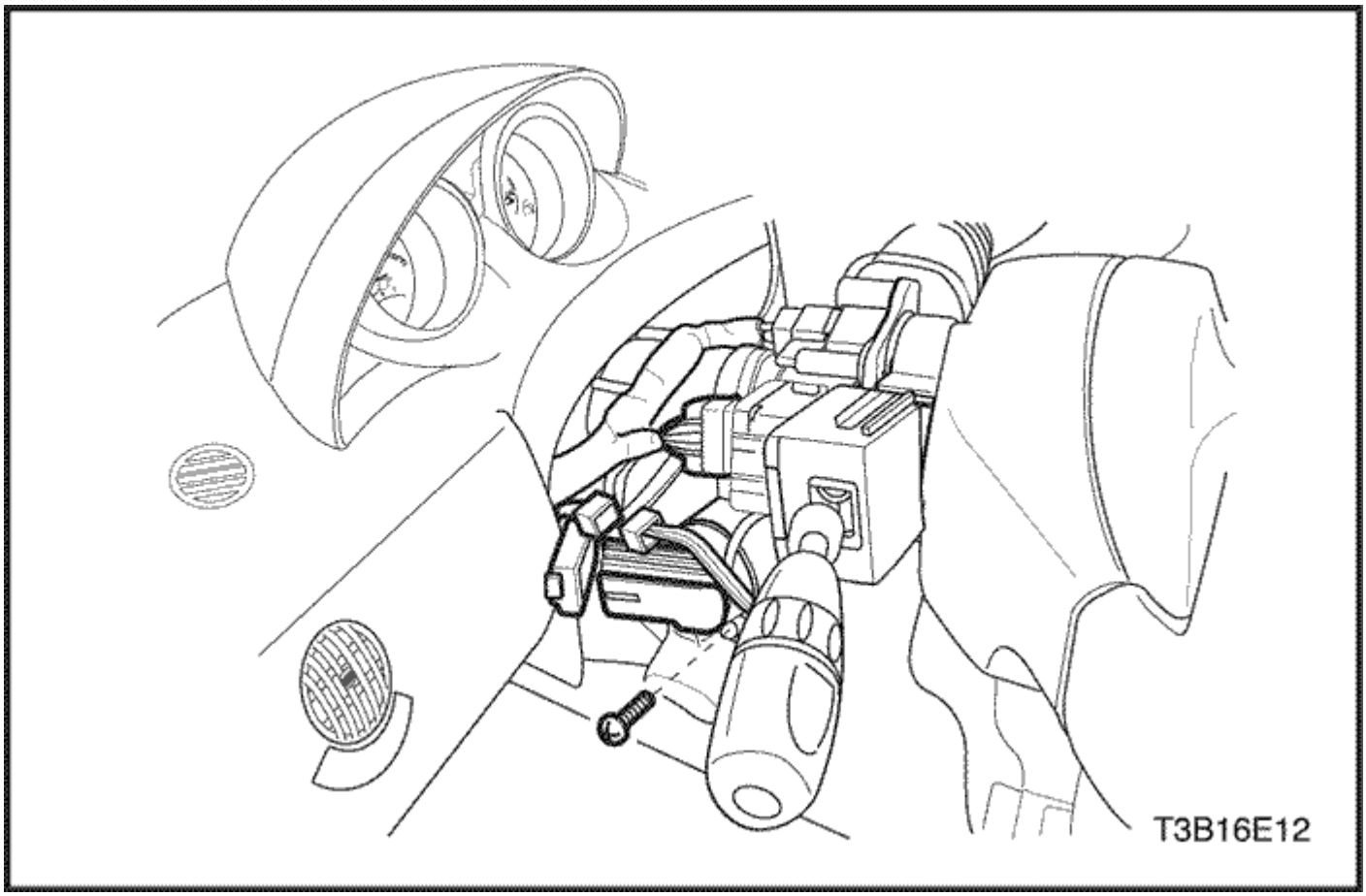


3. With the key in the ignition, turn to ACC and remove the lock cylilnder.

   To remove the lock cylinder of the switch cylinder housing, press down the detent spring with a 2.5 allen wrench, or other suitable tool, and pull out the lock cylinder.



4. Remove the ignition switch retaining screw.
5. Disconnect the wiring and remove the ignition switch.

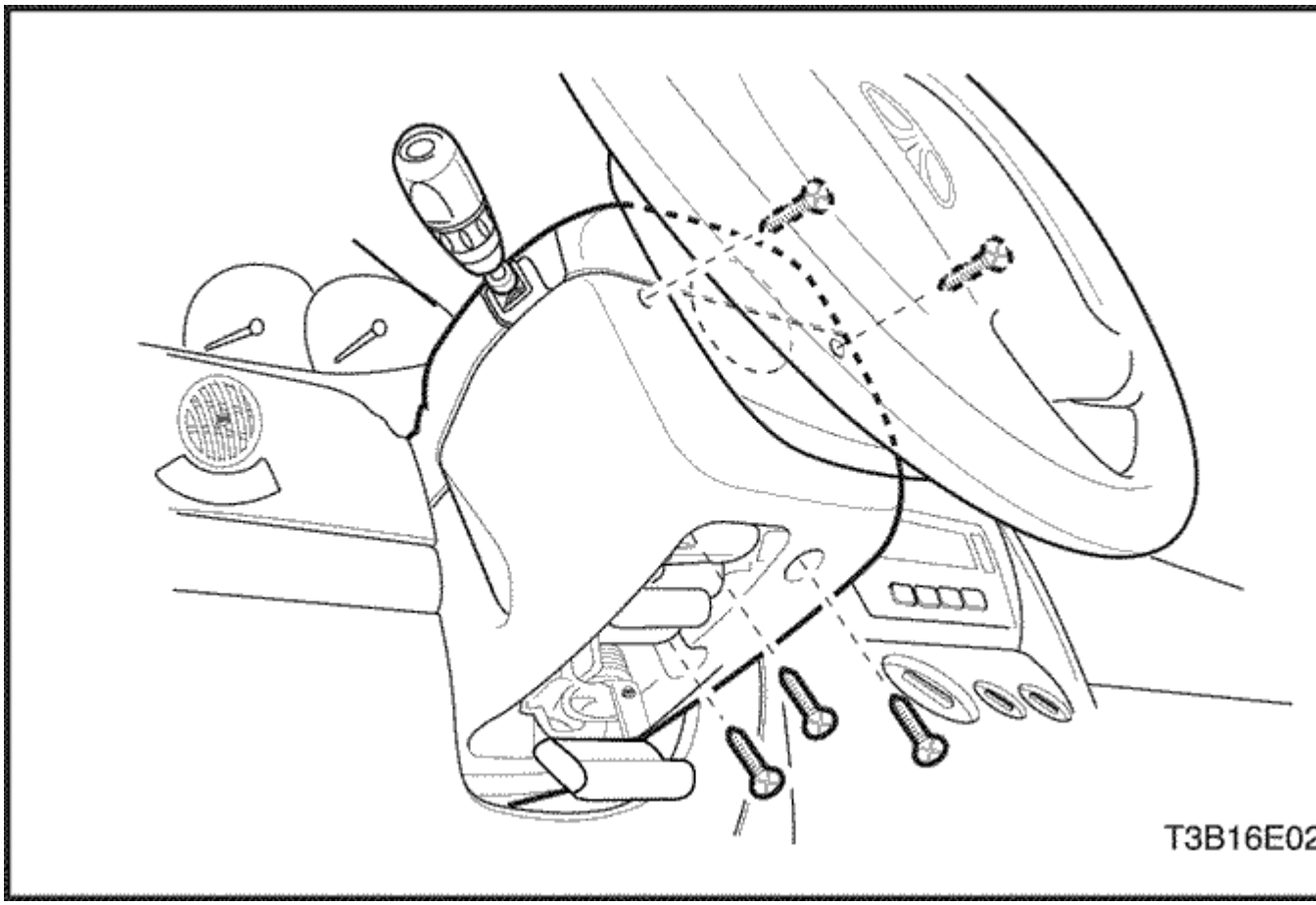


Installation Procedure

1. Install the ignition switch with the ignition switch retaining screw.

   Tighten
   Tighten the ignition switch retaining screw to 2 N•m(18 lb-in).

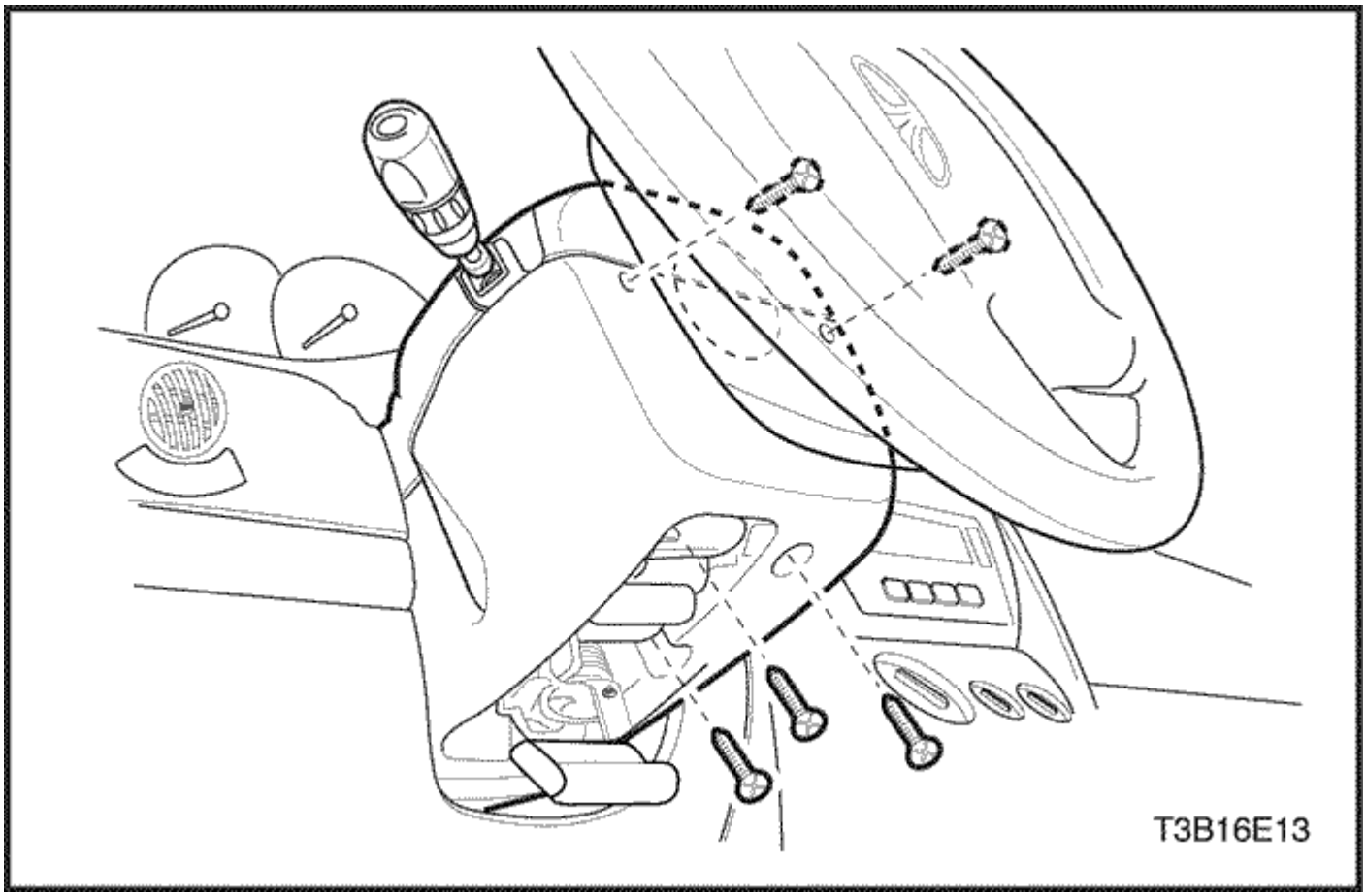
2. Connect the wiring to the ignition switch.



3. Install the lock cylinder.
4. Install the lower steering column cover panel with the screws.

   Tighten
   Tighten the lower steering column cover panel screws to 3 N•m (27 lb-in).

5. Connect the negative battery cable.



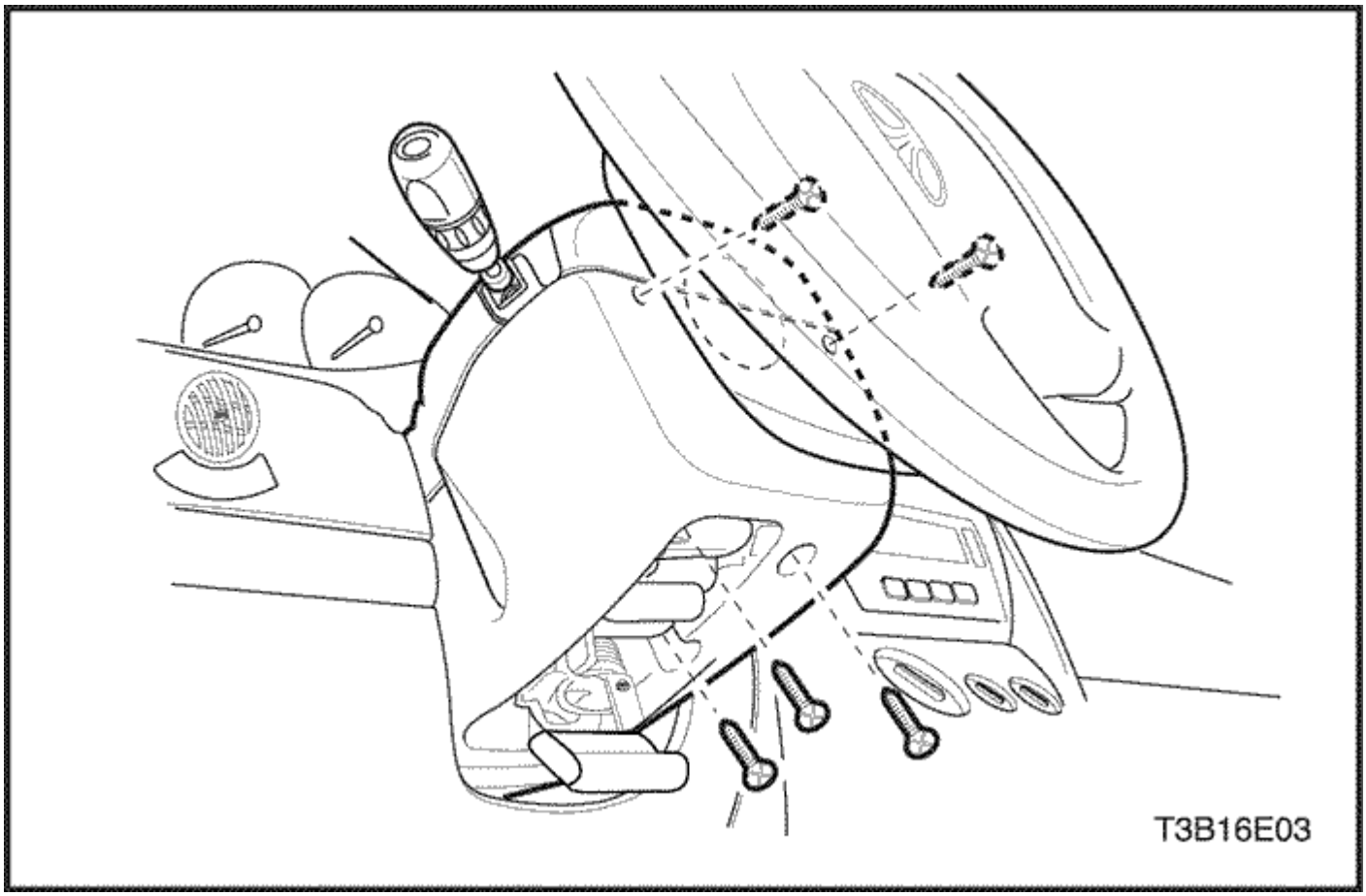
Flexible Coupling
Refer to *Section 6C, Power Steering Gear.*
Steering Column

Important : Remove the steering column only if:

- The steering column requires replacement.
- The steering and the ignition lock housing require replacement.
- Another operation requires the removal of the steering column.

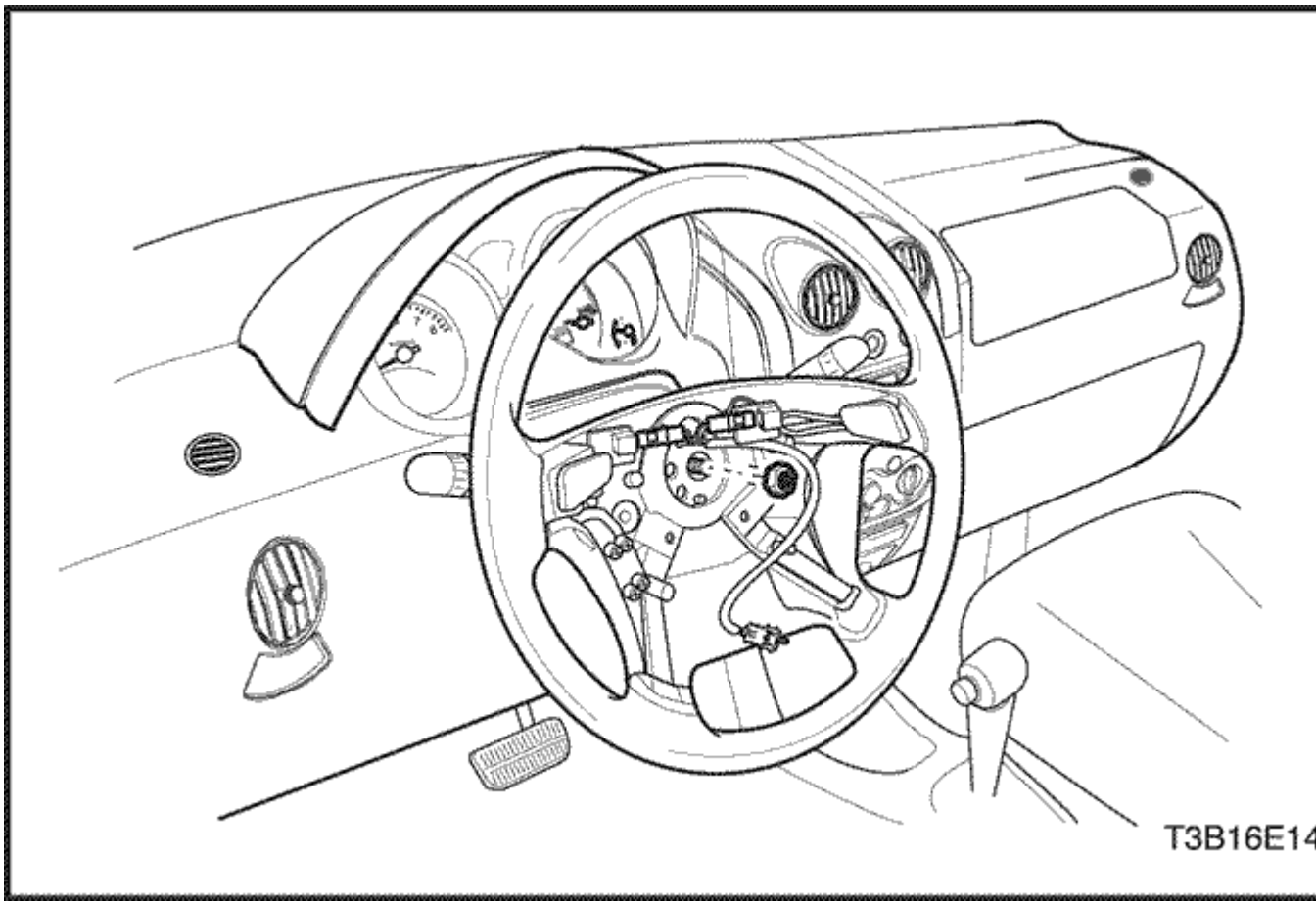
Notice : The steering column is extremely susceptible to damage after it has been removed from the vehicle. Dropping the column assembly on its end or hammering the end of the steering shaft can collapse the steering shaft or loosen plastic injections which maintain column rigidity. Leaning on the column can cause it to bend or deform. Any of the above damage can impair the column's

collapsible design. If it is necessary to remove the steering wheel, use only the specified steering wheel puller.

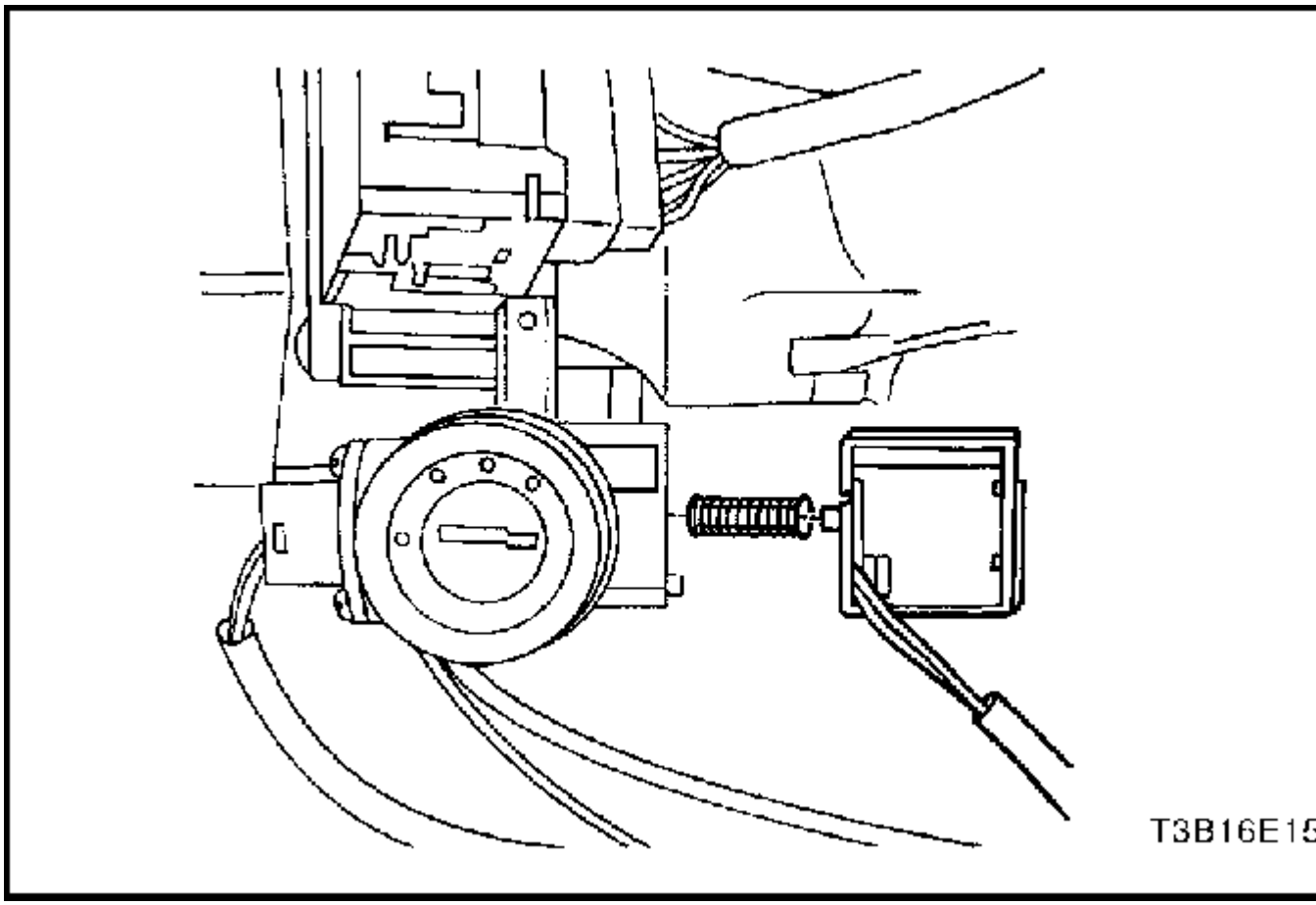


Removal Procedure

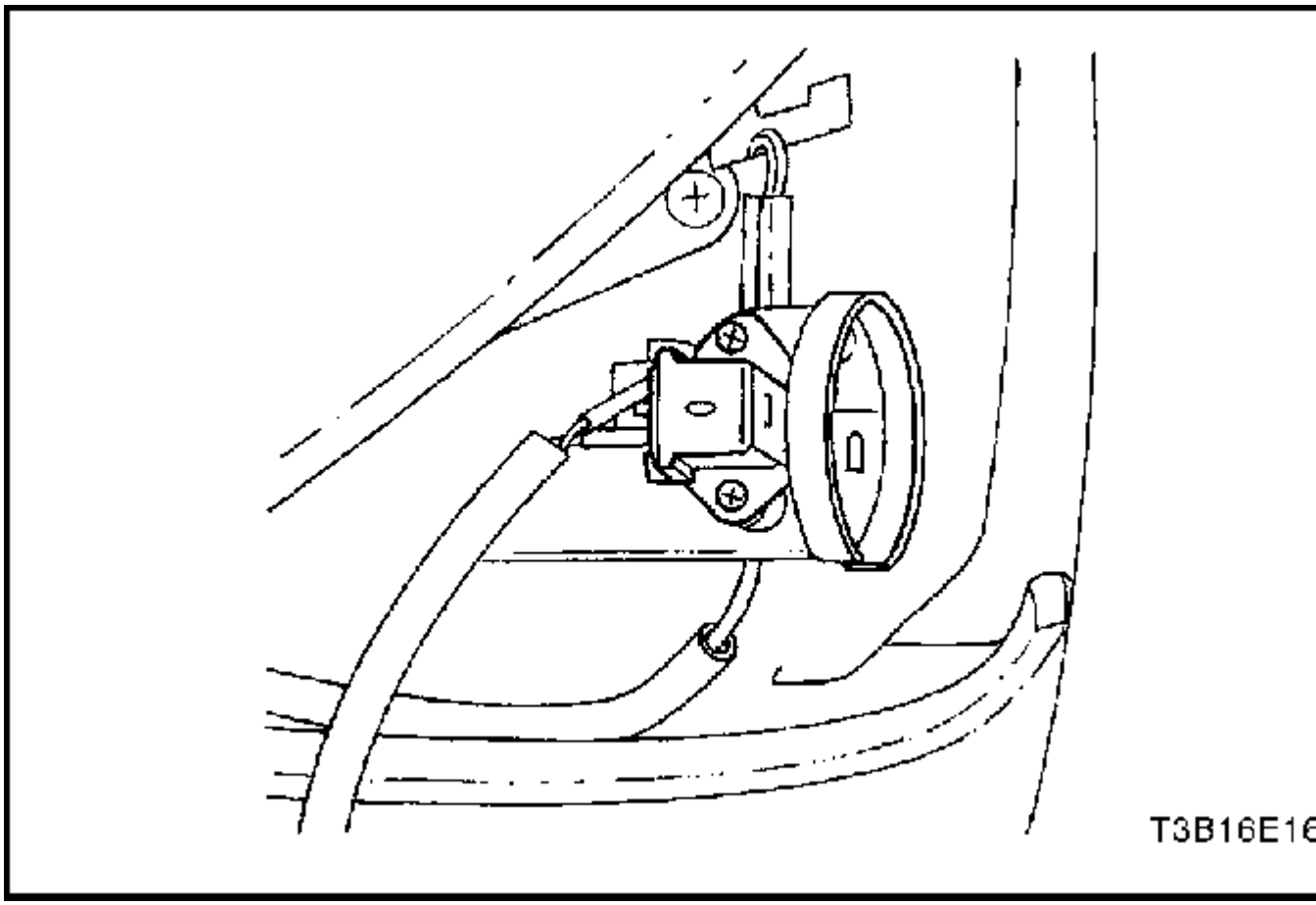
1. Disconnect the negative battery cable and let the vehicle sit for 1 minute to deactivate the airbag.
2. Remove the switch levers. Refer to "Turn Signal Switch and Lever" and "Wiper Switch and Lever" in his section.
3. Remove the lower instrument trim panel by removing the screws.
4. Remove the upper and the lower steering column cover panels.



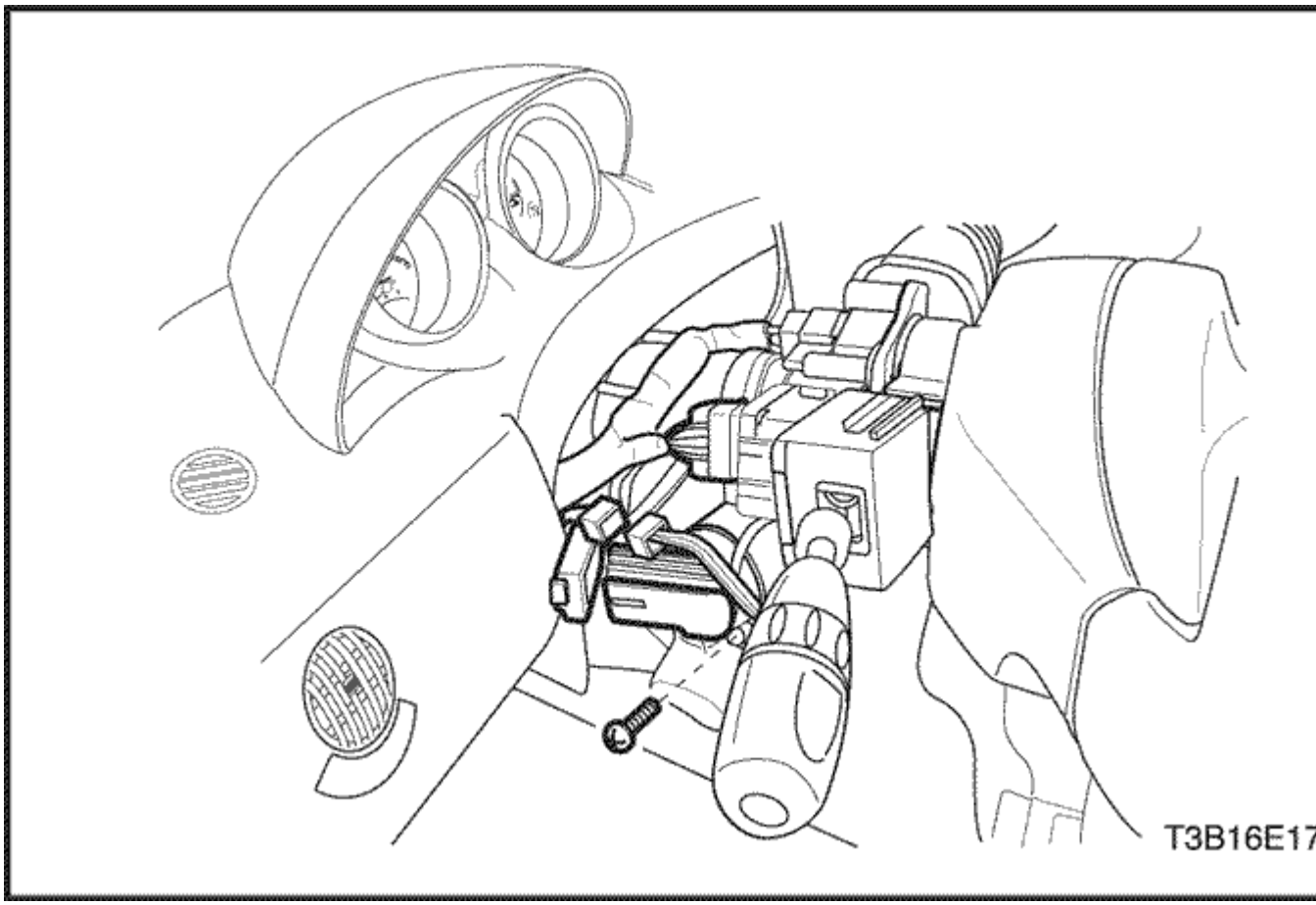
5. Disconnect the airbag electrical connections.



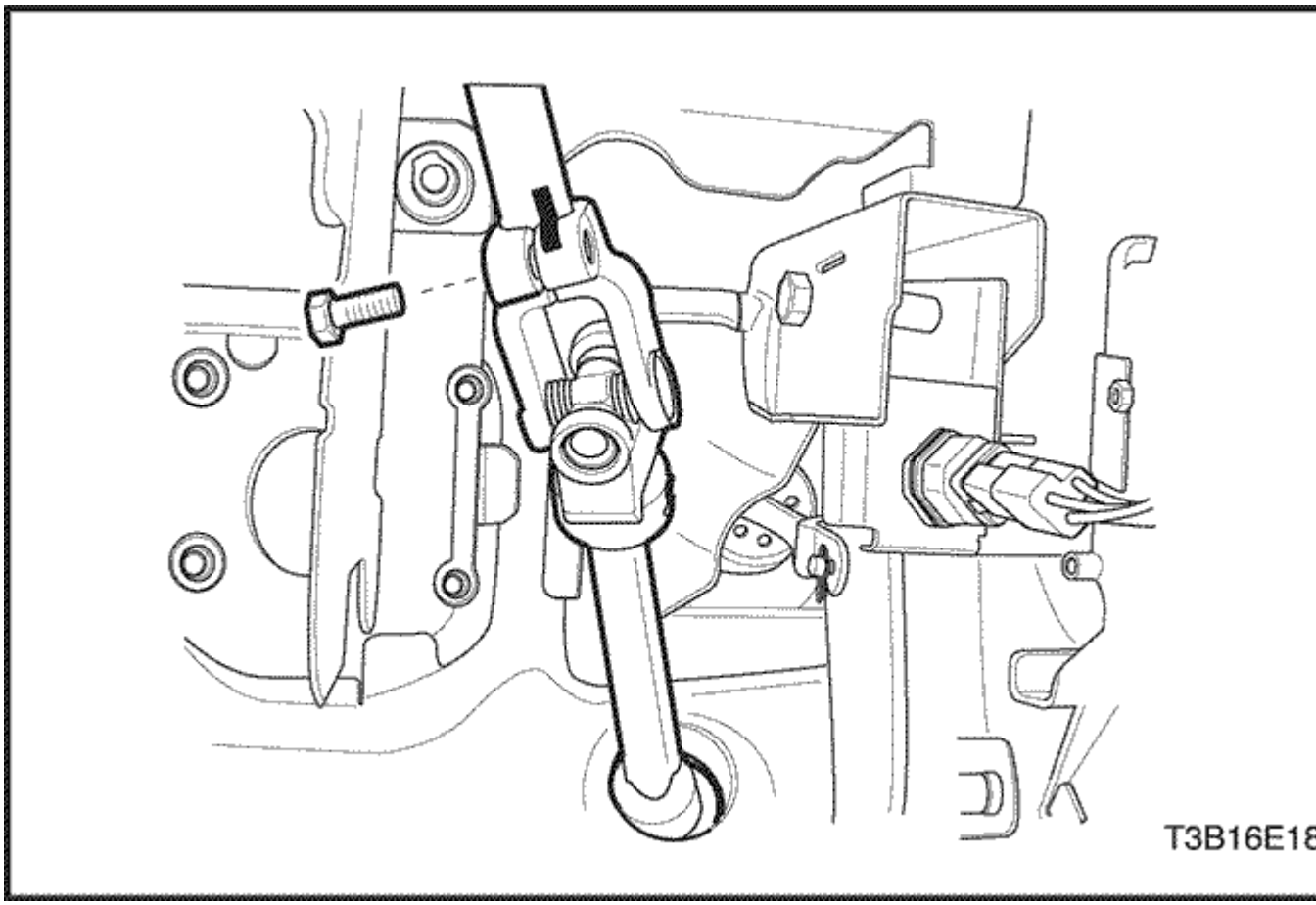
6. Remove the key interlock solenoid screws and the key interlock solenoid. Be careful not to drop the key interlock solenoid spring.



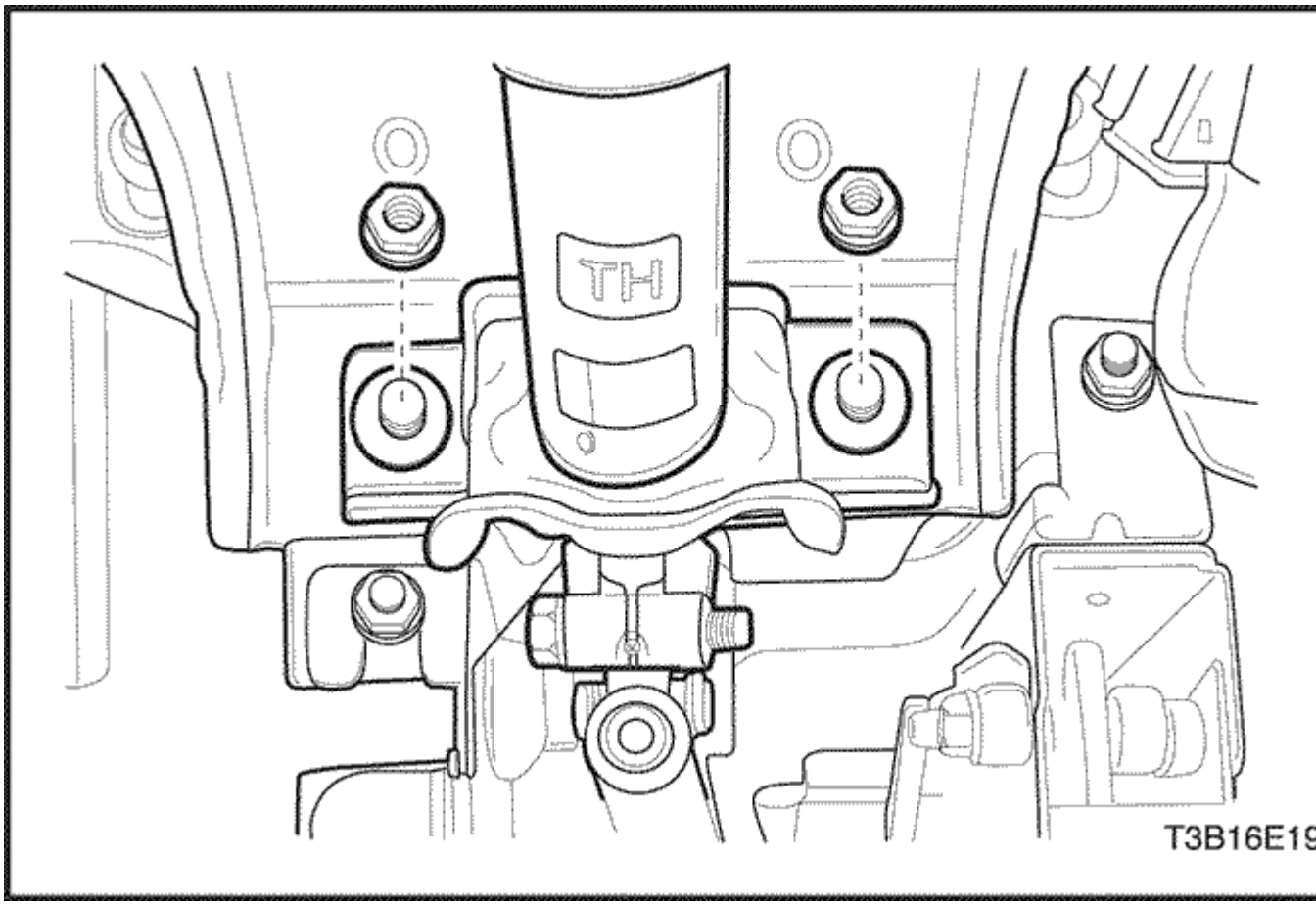
7. Remove the key reminder switch screws and the key reminder switch.



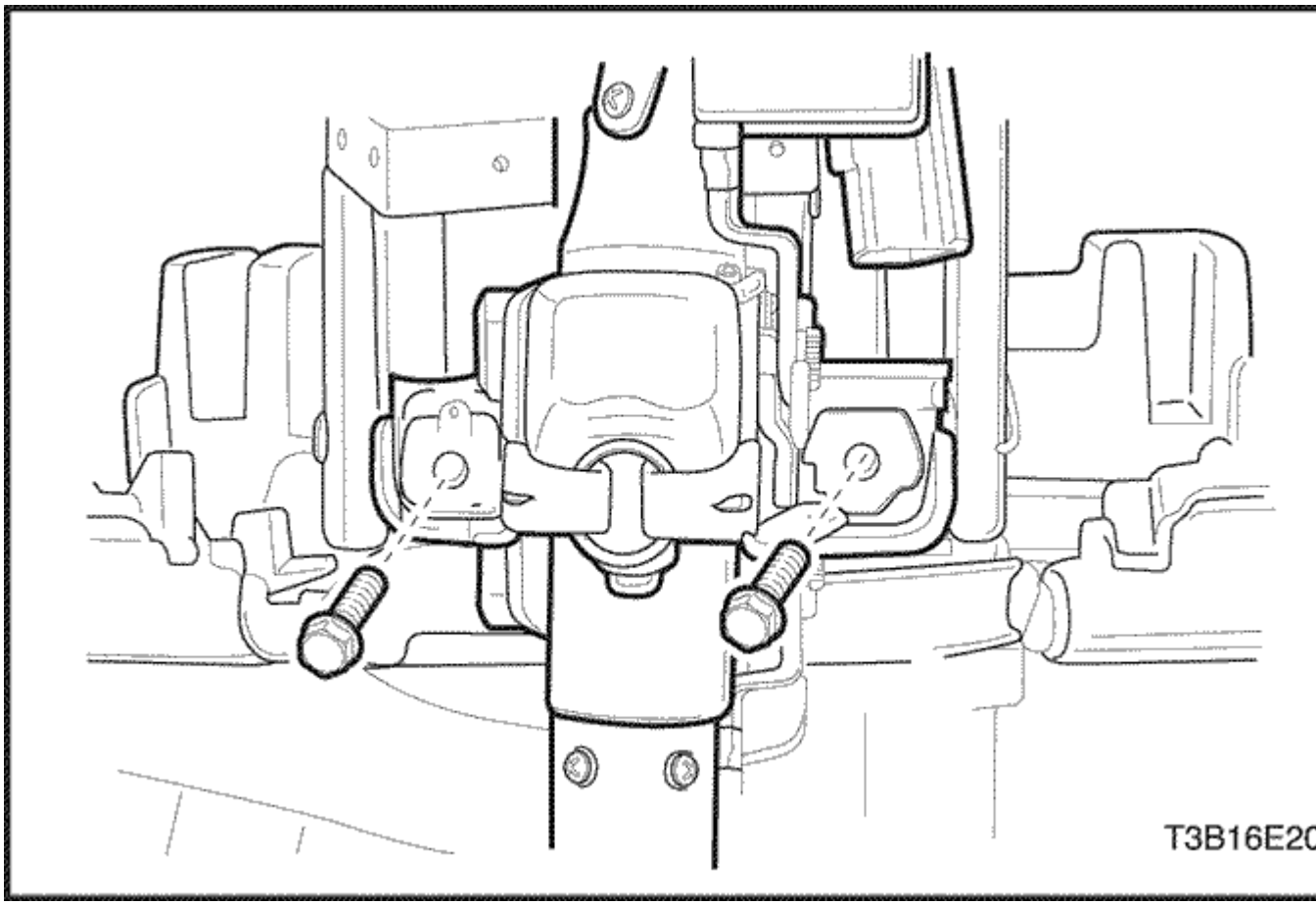
8. Disconnect the ignition switch electrical connection.



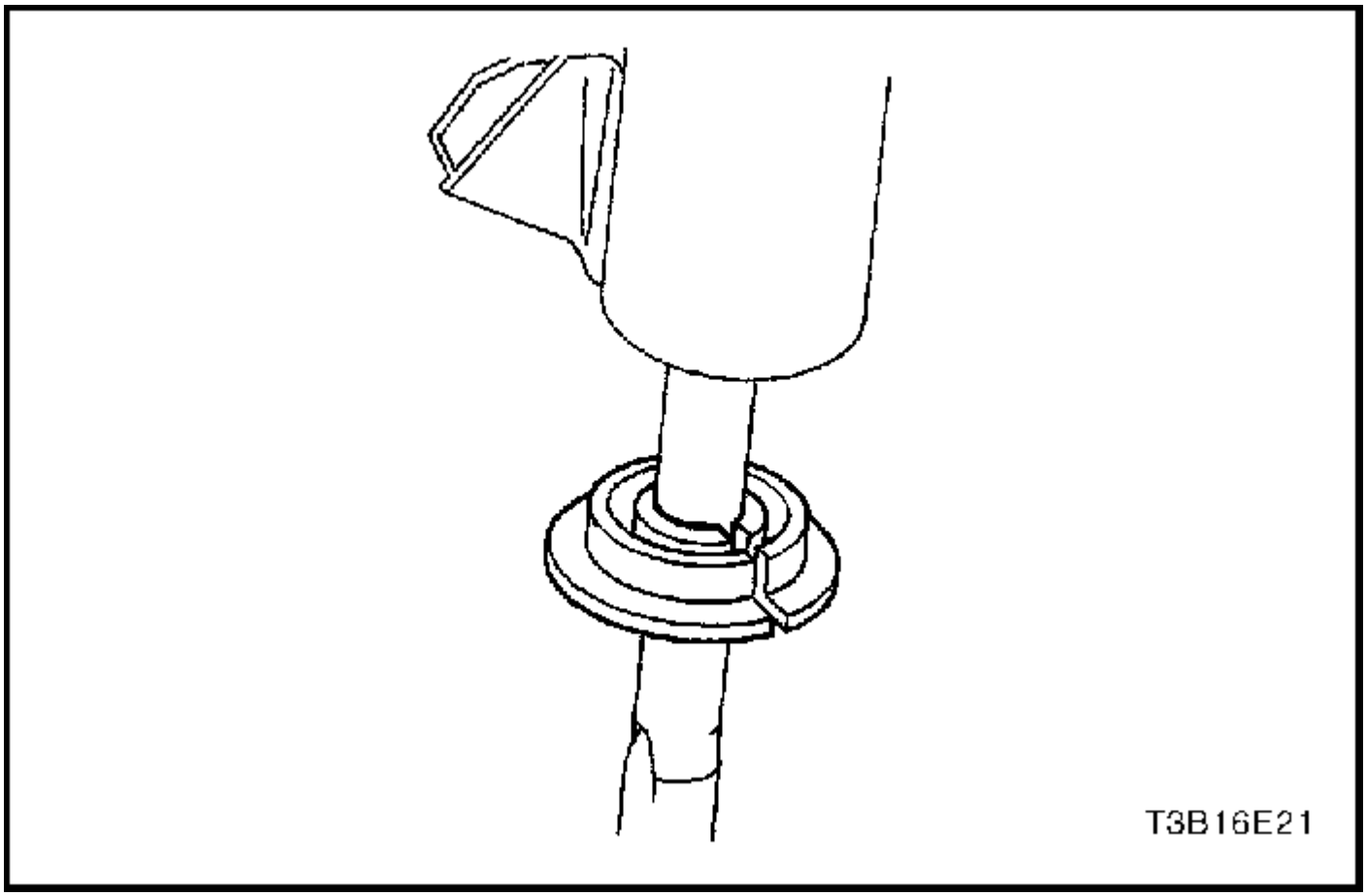
9. Adjust the steering to the straight-ahead position.
10. Remove the pinch bolt from the upper steering shaft coupling flange.



11. Remove the nut holding the steering column jacket assembly rear bracket.



12. Remove the nuts holding the steering column jacket assembly front bracket.
13. Guide the steering column assembly out of the steering shaft flange and carefully lay down the assembly.



Installation Procedure

Important : For proper installation of the steering column, be sure the steering wheel spokes are centered diagonally and pointed downward, and that the front wheels are in the straight-ahead position.

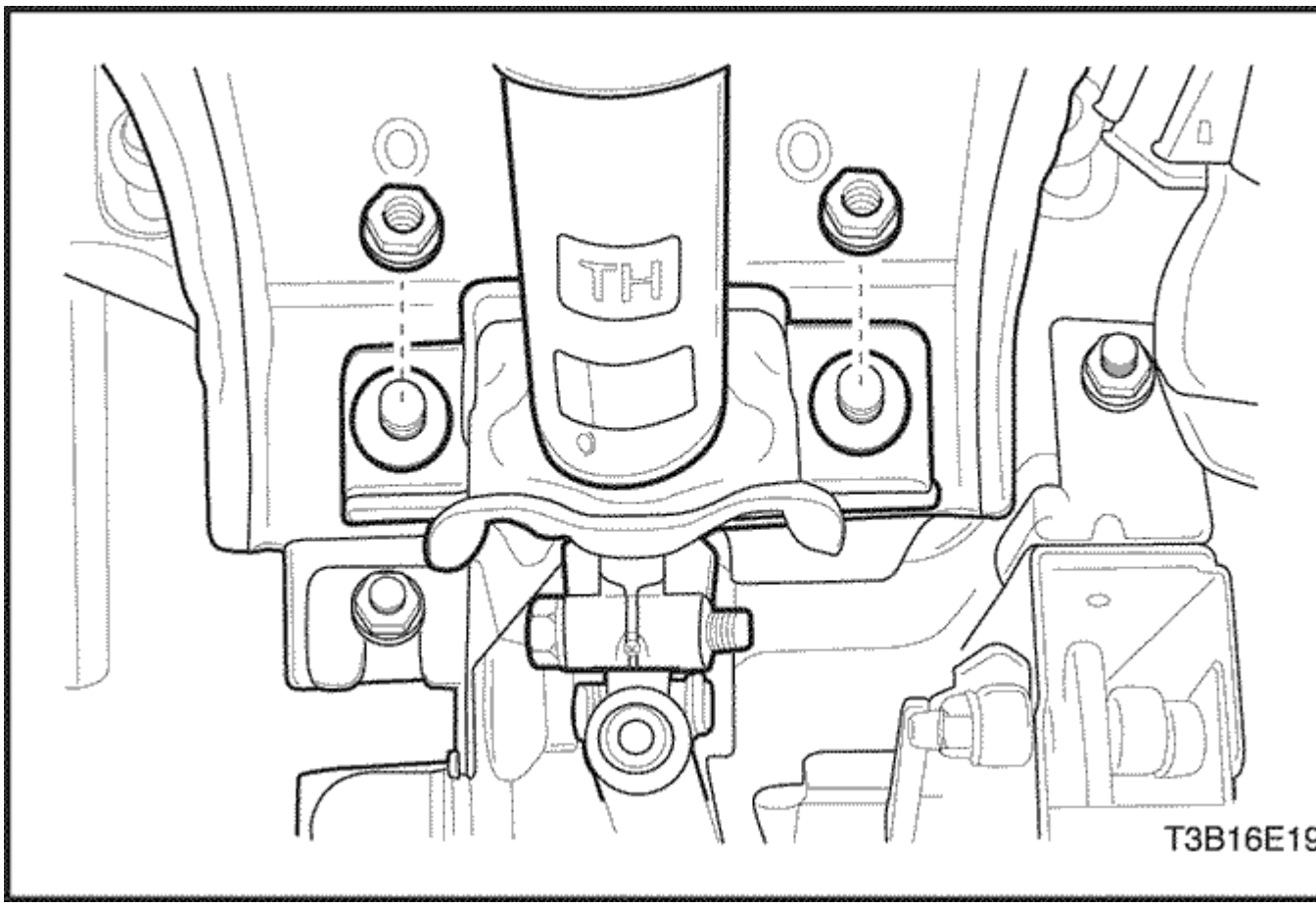
1. Place the alignment bushing onto the end of the steering column shaft.
2. Carefully guide the steering shaft into the steering shaft coupling flange.

   Important : Provide support for the steering column assembly until the mounting nuts are fastened. Do not let the steering column assembly hang unsupported.

3. Install the pinch bolt into the non-threaded hole of the flange.

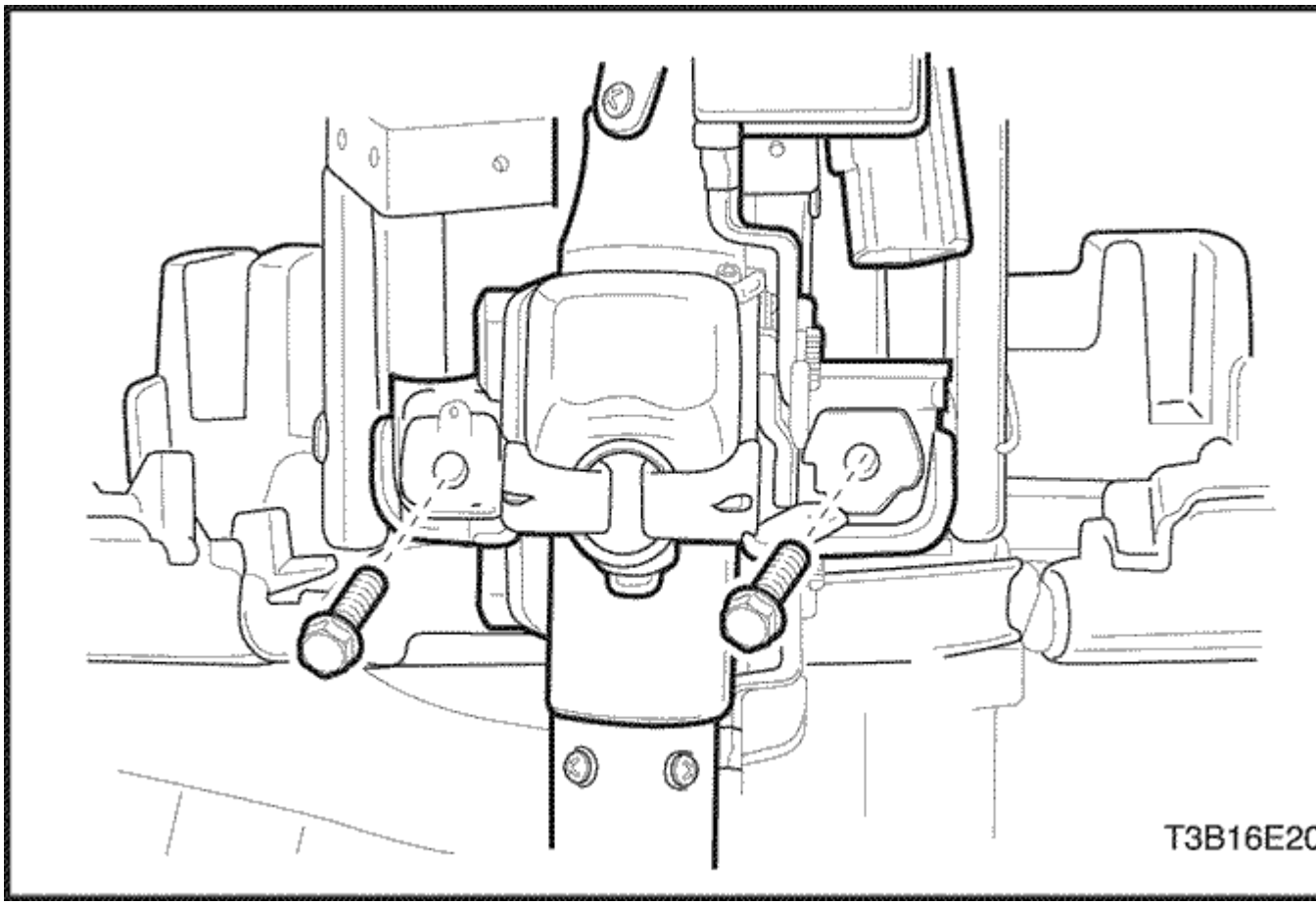
   Tighten
   Tighten the coupling flange pinch bolt to 22 N•m(16 lb-ft).

4. Slide the alignment bushing into the steering column housing.



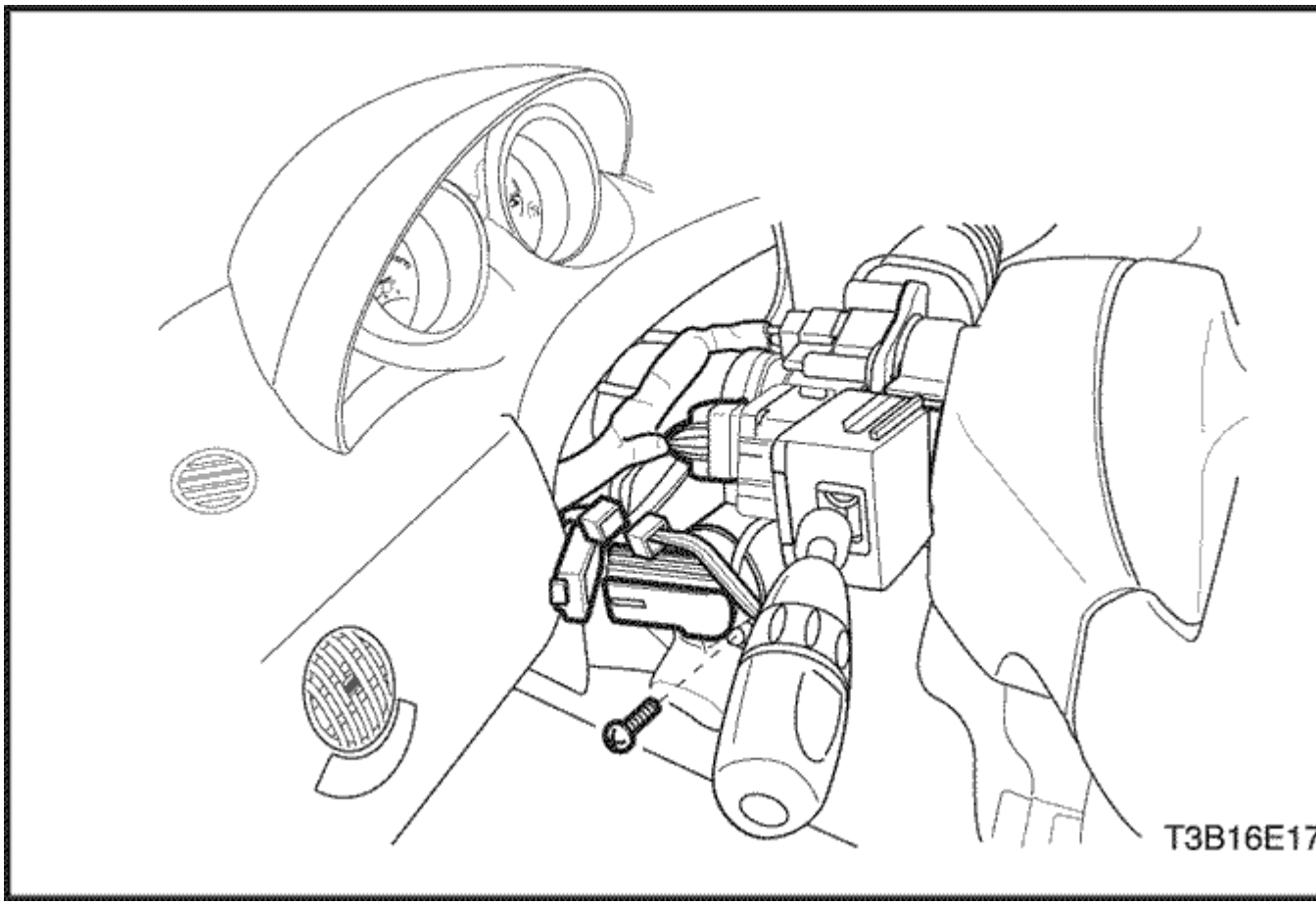
5. Install the nut for the rear bracket of the steering column jacket assembly.

   Tighten
   Tighten the steering column jacket assembly rear bracket nut to 22 N•m (16 lb-ft).



6. Install the nuts for the steering column jacket assembly front bracket.

   Tighten
   Tighten the steering column jacket assembly front bracket nuts to 22 N•m (16 lb-ft).

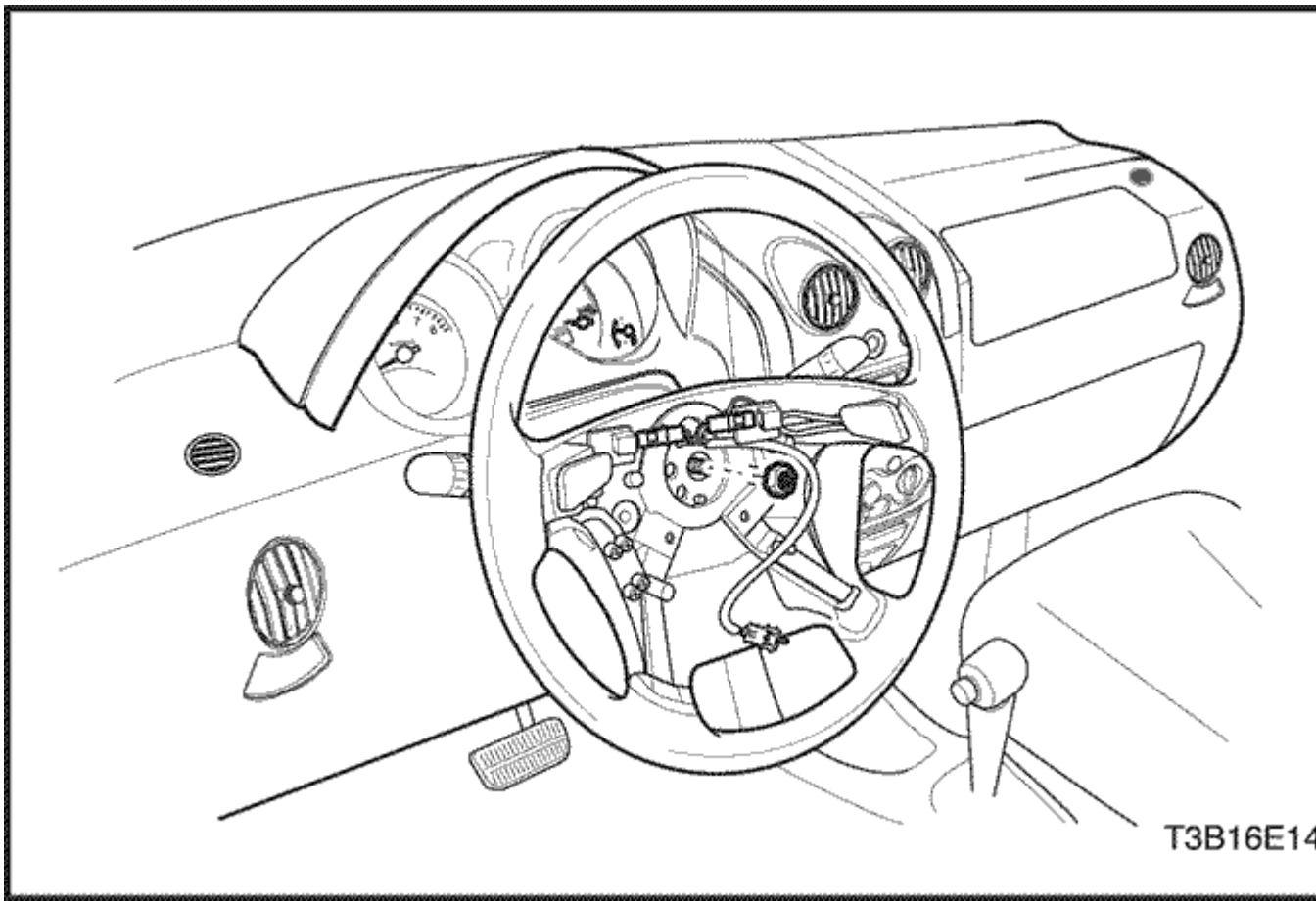


7. Connect the ignition switch electrical connection.
8. Install the key reminder switch and the key reminder switch screws.

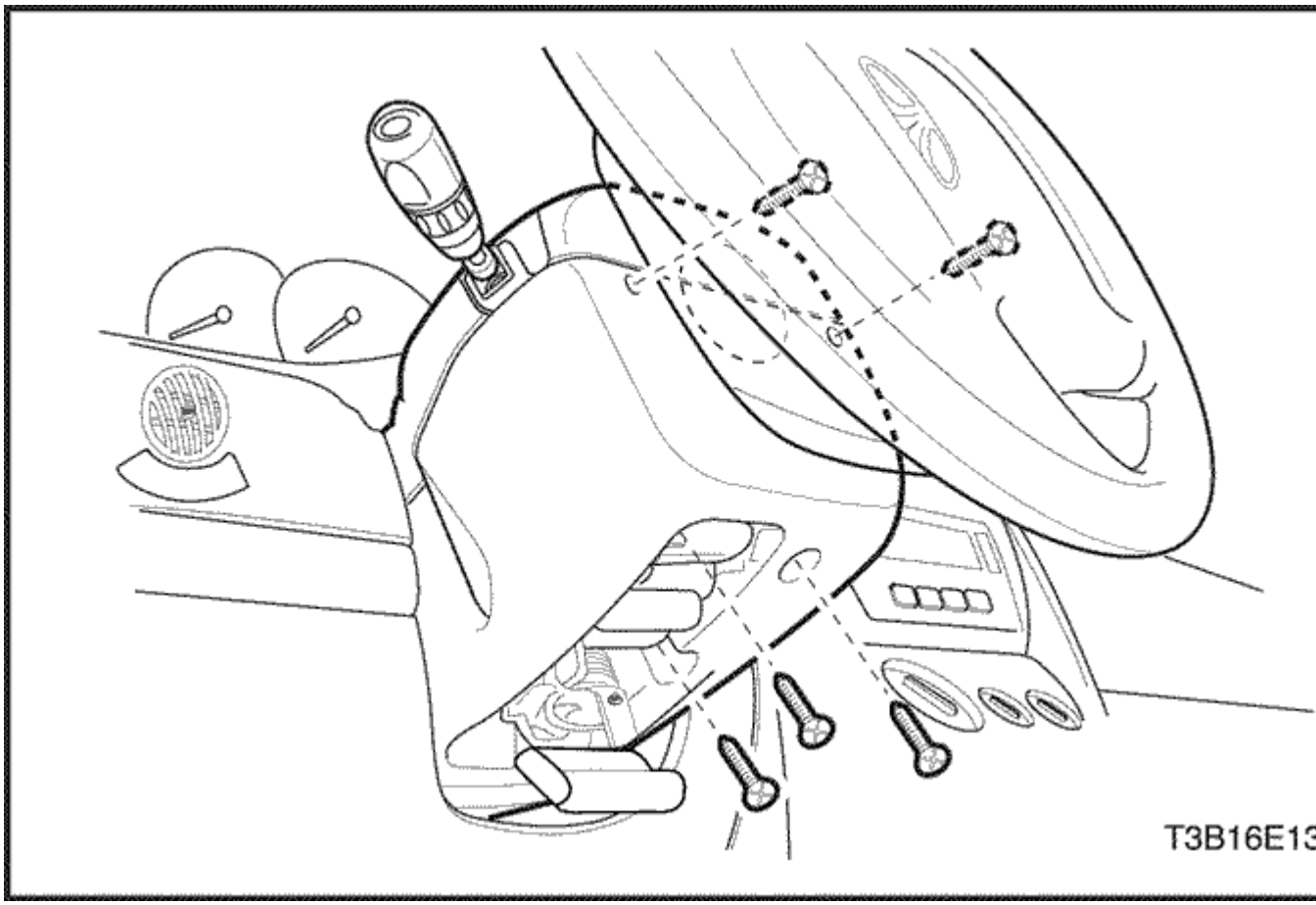
   Tighten
   Tighten the key reminder switch screws to 2 N•m(18 lb-in).

9. Install the key interlock solenoid and the key interlock solenoid screws.

   Tighten
   Tighten the key interlock solenoid screws to 2 N•m(18 lb-in).



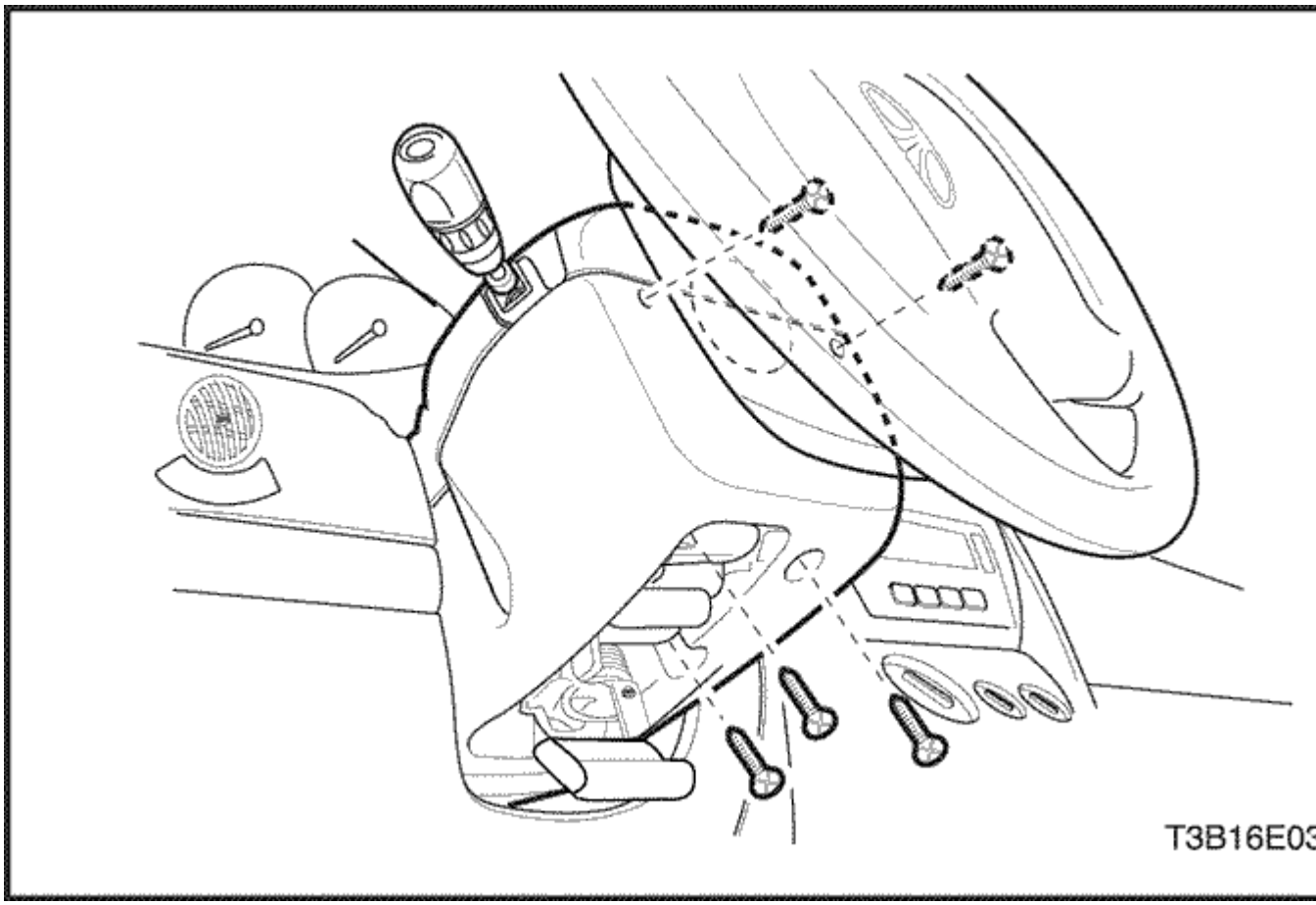
10. Connect the airbag electrical connections.



11. Install the lower instrument trim panel screws.

Tighten
Tighten the lower instrument trim panel screws to 3 N•m (27 lb-in).

12. Install the switch levers. Refer to "Turn Signal Switch and Lever"and "Wiper Switch and Lever" in his section.
13. Inspect the steering wheel in a straight-ahead position. Refer to *Section 6C, Power Steering Gear.*
14. Connect the negative battery cable.



15. Install the upper and the lower steering column cover panels and the screws.

Tighten
Tighten the upper and the lower steering column cover panel screws to 3 N•m (27 lb-in).

UNIT REPAIR

The(tilt) steering column is not unit repair serviceable. If the(tilt) steering column is defective, you have to replace the(tilt) steering column assembly.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Steering Wheel and Column

In addition to the steering function, the steering column provides safety and security.

Caution : To ensure energy-absorbing action, it is important to use only the specified screws, bolts, and nuts, tightened to the specified torque.
The energy-absorbing column is designed to compress in a front-end collision to lessen the chance of driver injury.
The ignition switch and the lock are mounted on the column, allowing the ignition and steering operations to be locked to prevent theft of the car.
The column levers trigger the turn signals, the headlight beams, and the windshield washer and wipers.
A tilt steering column uses a spherical joint to allow the steering wheel to tilt up and down. This enables the driver to adjust the steering wheel to a comfortable driving position.
Notice : Apply a thin coat of lithium grease to all friction points when reassembling to ensure proper operation.
The column may be easily disassembled and assembled.

SECTION 7A

HEATING AND VENTILATION SYSTEM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Heater Temperature Specifications

Ambient Air Temperature	Heater Outlet Air Temperature
-18°C (0°F)	54°C (129°F)
- 4°C (25°F)	59°C (138°F)

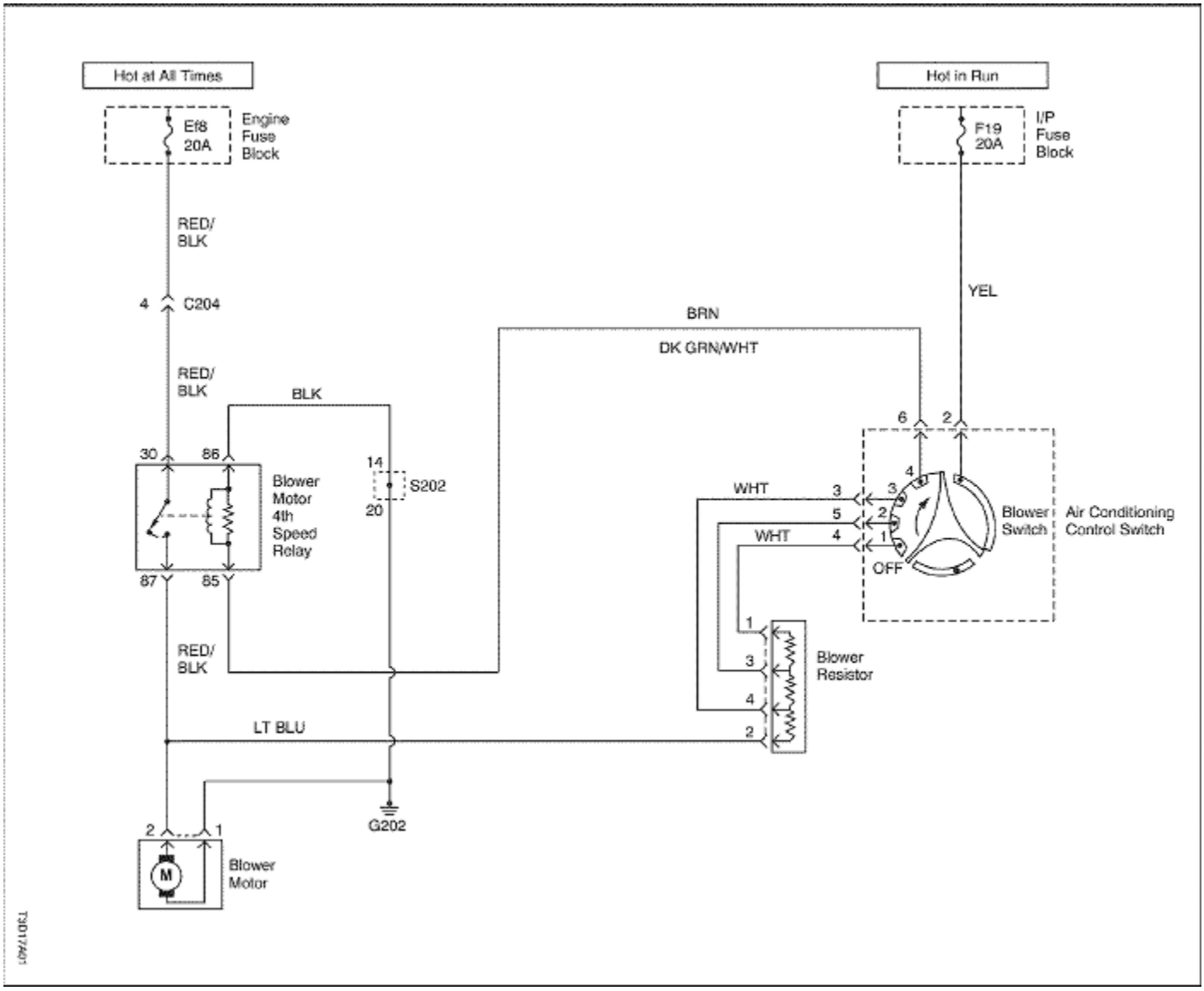
Ambient Air Temperature	Heater Outlet Air Temperature
10°C (50°F)	64°C (147°F)

Fastener Tightening Specifications

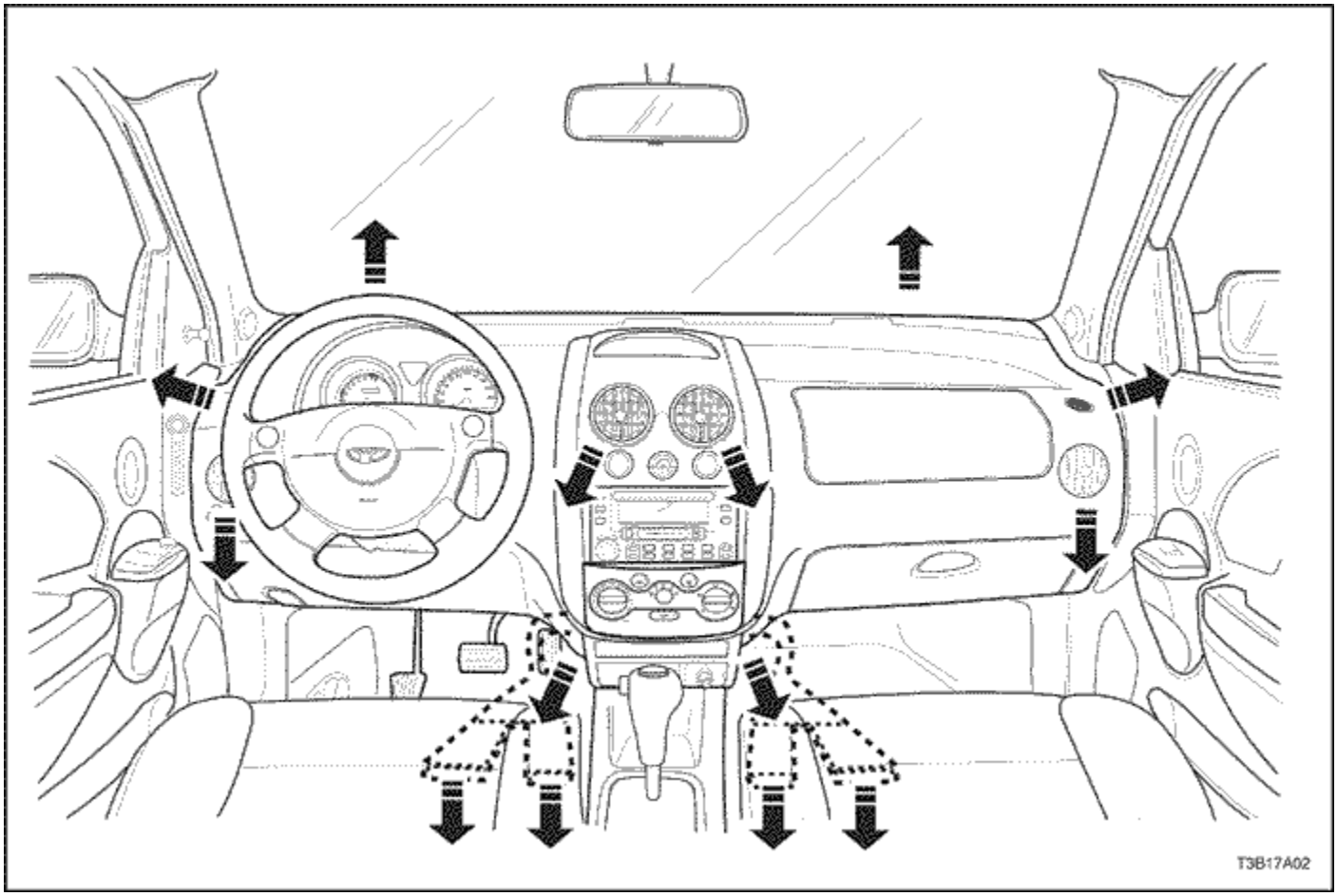
Application	N•m	Lb-Ft	Lb-In
Blower Motor Resistor Screws	6	-	53
Blower Resistor Retaining Screws	6	-	53
HVAC Controller Retaining Screws	4	-	35

SCHEMATIC AND ROUTING DIAGRAMS

Non-A/C Diagrams



Airflow Through Vents With Rear Heating Duct*



*Rear heating duct available on vehicles in cold climate countries.

DIAGNOSIS

HEATER SYSTEM

Insufficient Heating or Defrosting

Caution : The cooling system is pressurized when hot. Injury can result from removing the surge tank cap before the engine is sufficiently cool.

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?	-	Go to *Step 2*	System OK
2	Check the coolant level. Is the coolant level correct?	-	Go to *Step 4*	Go to *Step 3*
3	Add coolant, as needed.	-	System OK	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	Is the repair complete?			
4	Check the timing belt for tension or damage. Is the timing belt OK?	-	Go to *Step 6*	Go to *Step 5*
5	Correct any problem with the timing belt. Is the repair complete?	-	System OK	Go to *Step 6*
6	Check the coolant hoses for leaks or kinks. Are the coolant hoses OK?	-	Go to *Step 8*	Go to *Step 7*
7	Repair any problem with the coolant hoses. Is the repair complete?	-	System OK	Go to *Step 8*
8	Check the surge tank cap. Refer to *Section 1D, Engine Cooling.* Is the surge tank cap OK?	-	Go to *Step 10*	Go to *Step 9*
9	Repair or replace the surge tank cap as needed. Is the repair complete?	-	System OK	Go to *Step 10*
10	1. Set the A/C switch to OFF on vehicles equipped with air conditioning. 2. Set the blower motor switch on 4. 3. Set the heater control to full hot. 4. Turn the ignition ON. 5. Check for airflow from the heater outlet. Is there heavy airflow from the heater outlet?	-	Go to *Step 11*	Go to *Step 26*
11	Check for a change in the airflow at various blower speeds. Does the blower speed increase as the switch is turned from 1 to 4?	-	Go to *Step 12*	Go to "Blower Electrical"
12	1. Set the A/C switch to OFF on vehicles equipped with air conditioning. 2. Set the temperature lever to full hot. 3. Set the blower motor switch on 4. 4. With the engine sufficiently cool, remove the surge tank cap. 5. Start the vehicle and idle the engine. 6. Watch for the flow of the coolant. Is the coolant flow visible?	-	Go to *Step 14*	Go to *Step 13*
13	1. Check for the following problems: o Restriction in the cooling system. o Failed water pump impeller. o Faulty thermostat. 2. Make repairs to the cooling system, as	-	System OK	Go to *Step 14*

Step	Action	Value(s)	Yes	No
	needed. Are the repairs complete?			
14	1. Install the surge tank cap. 2. With the ignition ON, allow the engine to warm up for about 20 minutes. Drive the vehicle at 48 km/h (30 mph). 3. Use a thermometer to measure the ambient air temperature and the discharge air temperature at the heater outlet. Does the heater output meet the minimum values given?	Refer to "Temperature Specifications"	Go to *Step 15*	Go to *Step 16*
15	1. Check the vehicle for cold air leaks at the following locations: o Dash. o Heater cases. o Vents. 2. Check under the seat for obstructions. 3. Repair any leaks or obstructions. Are the repairs complete?	-	System OK	-
16	1. Turn the ignition OFF. 2. Turn the temperature control knob to full cold, then rapidly to full hot. 3. Listen for the sound of the temperature door slam just before it reaches the end of the travel range of the control knob. Does the door slam?	-	Go to *Step 18*	Go to *Step 17*
17	1. Check the temperature door for the following: o Travel. o Cables. o Linkage. 2. Verify the accuracy of the temperature controls at full hot. 3. Verify the accuracy of the temperature controls at full cold. Is the repair complete?	-	System OK	-
18	1. Set the temperature door to full hot. 2. Start the vehicle.	-	Go to *Step 19*	Go to *Step 22*

Step	Action	Value(s)	Yes	No
	3. Check the temperature of the heater inlet hose and the heater outlet hose by feel. The air temperature around the hoses should be at least 29°C (84°F). Is the heater inlet hose hot and the heater outlet hose warm?			
19	Check the thermostat. Refer to *1D, Engine Cooling.* Is the thermostat installed and seated properly?	-	Go to *Step 20*	Go to *Step 21*
20	Replace the thermostat. Refer to *Section 1D, Engine Cooling.* Is the repair complete?	-	System OK	-
21	Reinstall the thermostat. Is the repair complete?	-	System OK	-
22	Inspect the heater hoses for proper installation. Are the heater hoses reversed?	-	Go to *Step 23*	Go to *Step 24*
23	Reinstall the heater hoses properly. Is the repair complete?	-	System OK	-
24	1. Back flush the heater core. 2. Drain the cooling system. 3. Replace the coolant. 4. Warm the engine to an average operating temperature. 5. Feel the heater inlet hose and the heater outlet hose. Is the heater inlet hose hot and the heater outlet hose warm?	-	System OK	Go to *Step 25*
25	Replace the heater core. Is the repair complete?	-	System OK	-
26	Recheck the system using the "Control Settings/Correct Results" tests. Refer to "Improper Air Delivery or No Mode Shift" in this section. Is the repair complete?	-	System OK	Go to *Step 27*
27	Check for airflow from the defroster or the vent outlets. Is there high airflow from the defroster or vent outlets?	-	Go to *Step 28*	Go to *Step 29*
28	Adjust the heater door at the floor and the vent door to get the proper airflow. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
29	Switch the mode knob to defrost. Is the defroster airflow OK?	-	Go to *Step 30*	Go to *Step 31*
30	1. Remove the heater outlet and check for obstructions. 2. Remove any obstructions in the heater outlet. Is the repair complete?	-	System OK	-
31	Check for airflow change at various blower speeds. Does the blower speed increase as the control is turned from 1 to 4?	-	Go to *Step 32*	Go to "Blower Electrical"
32	Check for obstructions in the system at the blower inlet. Are there any obstructions?	-	Go to *Step 33*	Go to *Step 34*
33	Remove the obstructions in the system at the blower inlet. Are the repairs complete?	-	System OK	-
34	1. Set the blower on 4. 2. Rotate the temperature control from full hot to full cold. 3. Listen for an airflow change. Does the airflow change?	-	Go to *Step 35*	Go to *Step 36*
35	1. Check The Temperature door for the following: o Travel. o Cables. o Linkage. o Control. 2. Verify the accuracy of the temperature control at full hot. Is the repair complete?	-	System OK	-
36	1. Check the system for any obstruction between the blower and the system outlets. 2. Remove any obstruction. Is the repair complete?	-	System OK	-

Blower Electrical

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint.	-	Go to *Step 2*	System OK

Step	Action	Value(s)	Yes	No
	Are the customer's concerns verified?			
2	Check the blower. Does the blower run at any speed?	-	Go to *Step 14*	Go to *Step 3*
3	1. Disconnect the power connector from the blower motor under the dashboard on the passenger side of the vehicle. 2. Turn the ignition ON. 3. Turn the blower ON. 4. Test for 12 volts on the connector. The terminal connected to the violet wire is positive and the terminal connected to the black wire is negative. Is this voltage present?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the blower motor. Is the repair complete?	-	System OK	-
5	Check fuse F19 in the passenger compartment fuse block. Is the fuse blown?	-	Go to *Step 6*	Go to *Step 7*
6	1. Turn the ignition ON. 2. Use a short detector to locate a possible short in the following locations: o From the fuse panel to the blower speed switch. o From the blower speed switch to the heater resistor block. o From the heater resistor block to the blower motor. o From the blower speed switch to the blower HI relay. 3. Repair any short. 4. Replace any blown fuse. Is the repair complete?	-	System OK	-
7	1. Turn the ignition ON. 2. Set the blower switch on 4. 3. Check the blower motor ground. Is ground OK?	-	Go to *Step 9*	Go to *Step 8*
8	Repair the blower motor ground. Is the repair complete?	-	System OK	-
9	Check the motor connector with a 12-volt test light.	-	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
	Does the test light come on?			
10	Repair the open in the feed wire from the resistor block to the blower motor. Is the repair complete?	-	System OK	-
11	Use the 12-volt test light to check the power feed terminal on the blower speed switch. Does the light come on?	-	Go to *Step 12*	Go to *Step 13*
12	Replace the blower speed switch. Is the repair complete?	-	System OK	-
13	Repair the open in the power wire from the blower speed switch to the fuse panel. Is the repair complete?	-	System OK	-
14	Check the blower operation at speed 4. Does the blower fail to operate at speed 4?	-	Go to *Step 15*	Go to *Step 21*
15	Check fuse EF8 in the engine fuse compartment. Is the fuse blown?	-	Go to *Step 16*	Go to *Step 17*
16	1. Turn the ignition ON. 2. Turn the blower motor switch to 4. 3. Use a short detector to locate a possible short in the following locations: o From the engine fuse panel to the blower HI relay. o From the blower HI relay to the blower motor. 4. Repair any short. 5. Replace the EF8 fuse. Is the repair complete?	-	System OK	-
17	1. Turn the ignition switch ON. 2. Turn the blower motor switch to 4. 3. Check for 12 volts on the blower HI relay coil terminal from the blower speed switch terminal B3. Is this voltage present?	-	Go to *Step 18*	Go to *Step 19*
18	Replace the blower speed switch. Is the repair complete?	-	System OK	-
19	1. Turn the ignition OFF. 2. Check for opens in the following locations: o EF8 to the blower HI relay. o Blower speed switch to the	-	System OK	Go to *Step 20*

Step	Action	Value(s)	Yes	No
	blower HI relay. o Blower HI relay to ground. o Blower HI relay to the blower motor. 3. Repair any opens. Is the repair complete?			
20	Replace the blower HI relay. Is the repair complete?	-	System OK	-
21	1. Disconnect the resistor block connector. 2. Connect one lead of a self-powered test light to any single lead on the resistor block. Use the other lead to probe each of the other two terminals. Does the test light illuminate on all terminals?	-	Go to *Step 23*	Go to *Step 22*
22	Replace the resistor block. Is the repair complete?	-	System OK	-
23	1. Turn the ignition to LOCK. 2. Disconnect the connector from the resistor block. 3. Connect a jumper lead from the positive terminal on the battery to any wire terminal in the connector. 4. Use a 12-volt test light to check for voltage from the corresponding wire on the blower speed switch. 5. Repeat the same test on the other wires. Does the lamp light on all three wires?	-	Go to *Step 25*	Go to *Step 24*
24	Replace the blower speed switch. Is the repair complete?	-	System OK	-
25	Repair the open in the affected wire. Is the repair complete?	-	System OK	-

Improper Air delivery or No Mode Shift

This procedure provides a test of all functions of the heater/defroster unit.

1. Warm up the vehicle.
2. Keep the engine running.
3. Perform the tests outlined in the table below and look for the results indicated.

CONTROL SETTINGS			CORRECT RESULTS				
Mode Knob	**Temp. Control**	**Blower Motor Swtch**	**Blower Speed**	**Power Vent Outlet**	**Floor Outlet**	**Defrost Outlet**	**Side Window Outlet**
Vent	Cold	Off	Off	No Airflow	No Airflow	No Airflow	No Airflow
Vent	Cold	4	High	Ambient Airflow	No Airflow	No Airflow	No Airflow
Floor	Cold to Hot	4	High	No Airflow	Cold to Hot Airflow	Minimum Cold to Hot Airflow	Minimum Cold to Hot Airflow
Defroster	Cold to Hot	4	High	No Airflow	Minimum Cold to Hot Airflow	Cold to Hot Airflow	Minimum Cold to Hot Airflow

If any of these settings does not produce the correct results, perform the following diagnostic procedure.

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?	-	Go to *Step 2*	System OK
2	Examine the affected door in the unit for proper cable attachment. • Check the cable connection to the door. • Confirm that the cable sheath is properly retained. Is everything connected properly?	-	Go to *Step 4*	Go to *Step 3*
3	Repair, as necessary. Is the repair complete?	-	System OK	-
4	1. Disconnect the cable at the door. 2. Check the range of the door travel and the effort required to move it. Does the door move freely through its entire range of travel so that it can close at both ends of the range?	-	Go to *Step 5*	Go to *Step 3*
5	Check the travel of the Bowden cable by turning the control knob. Is the actuator travel OK?	-	Go to *Step 6*	Go to *Step 7*
6	1. Reinstall the cable. 2. Recheck the system using the "Control	-	System OK	Go to *Step 9*

Step	Action	Value(s)	Yes	No
	Settings/Correct Results" tests in this procedure. Does the system perform properly?			
7	1. Check the cable attachment at the control. 2. Check for a broken control. Is there a problem with the cable attachment or the control?	-	Go to *Step 8*	Go to *Step 9*
8	Repair the cable attachment or the control as necessary. Is the repair complete?	-	System OK	Go to *Step 9*
9	Recheck the system using the "Control Settings/Correct Results" tests in this procedure. Is the repair complete?	-	System OK	Go to *Step 10*
10	Check for airflow from the defroster or the vent outlets. Is there high airflow from the defroster or the vent outlets?	-	Go to *Step 11*	Go to *Step 12*
11	Adjust the heater door at the floor and the vent door to get the proper airflow. Is the repair complete?	-	System OK	-
12	Switch the mode knob to defrost. Is the defroster airflow OK?	-	Go to *Step 13*	Go to *Step 14*
13	1. Remove the heater outlet. 2. Check the heater outlet for obstructions. 3. Remove any obstructions in the heater outlet. Is the repair complete?	-	System OK	-
14	Check the blower speeds for change in the airflow. Does the blower speed increase as the control is turned from 1 to 4?	-	Go to *Step 15*	Go to "Blower Electrical"
15	1. Check for obstructions in the system at the blower inlet. 2. Remove any obstructions at the blower inlet. Is the repair complete?	-	System OK	Go to *Step 16*

Step	Action	Value(s)	Yes	No
16	1. Set the blower on 4. 2. Rotate the temperature control from full hot to full cold. 3. Listen for an airflow change. Does the airflow change?	-	Go to *Step 17*	Go to *Step 18*
17	1. Check the temperature door adjustment, the cables, the linkage, and the control. 2. Adjust the temperature control to full hot. Is the repair complete?	-	System OK	-
18	1. Check the system for any obstruction between the blower and the system outlets. 2. Remove any obstruction between the blower and the system outlets. Is the repair complete?	-	System OK	-

Too Much Heat

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?	-	Go to *Step 2*	System OK
2	Set the mode switch to the floor position. Is there too much heat when the mode switch is in the floor position?	-	Go to *Step 3*	Go to *Step 9*
3	Check for defroster bleed. Is there objectionable defroster bleed?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check the door travel, the cables, the controls, and the linkage for the heater and the defroster. 2. Adjust or repair, as required. Is the repair complete?	-	System OK	-
5	1. In vehicles equipped with A/C, set the A/C switch OFF. 2. In all vehicles, set the blower speed to 4. 3. Set the temperature to full hot. 4. Turn the ignition switch to ON. 5. Check for airflow from the floor outlets.	-	Go to *Step 7*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	6. Check the floor outlet attachment. Is the airflow high?			
6	Check for a change in the airflow at different blower speeds. Does the airflow change as the setting for the blower-speed switch is changed?	-	System OK	Go to "Blower Electrical"
7	1. Check the temperature door travel, the cables, and the linkage. 2. Adjust to full cold. 3. Check for full hot. Is the repair complete?	-	System OK	-
8	Adjust or repair the floor/defroster and/or the vent/floor mode. Is the repair complete?	-	System OK	-
9	Set the mode switch to the vent position. In the vent position, is the problem objectionable bleed?	-	Go to *Step 10*	Go to *Step 15*
10	1. Check the system case for leaks. 2. Check the floor outlet attachment. Are any problems found?	-	Go to *Step 11*	Go to *Step 12*
11	Repair the system case or the floor outlet attachment as required. Is the repair complete?	-	System OK	Go to *Step 12*
12	1. Turn the ignition switch OFF. 2. Turn the temperature control knob to full hot, then rapidly to full cold. Do you hear the door slam just before you reach the end of the control travel?	-	Go to *Step 13*	Go to *Step 14*
13	Adjust the vent door to vent more. Is the repair complete?	-	System OK	-
14	1. Check the temperature door travel, the cables, and the linkage. 2. Verify that the temperature door goes to full cold. 3. Check the temperature door for full hot. Is the temperature door travel correct?	-	System OK	-
15	1. Set the fresh air/recirculating air control to fresh air.	-	Go to *Step 16*	System OK

Step	Action	Value(s)	Yes	No
	2. Set the temperature control to full cold. 3. Start the vehicle and allow the engine to warm up. 4. Measure the air temperature at the blower inlet, or cowl, and at the vent air outlet inside the vehicle. Is the outlet air more than 5°C (9°F) warmer than the inlet air?			
16	1. Check for hot air leaks from the engine compartment to the blower inlet. 2. Repair, as needed. Is the repair complete?	-	System OK	-

Controls

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?	-	Go to *Step 2*	System OK
2	Is excessive effort required to move the controls?	-	Go to *Step 5*	Go to *Step 3*
3	Does a door move too easily on a high-blower setting?	-	Go to *Step 4*	System OK
4	1. Replace the Bowden cable with a longer cable. 2. Add a loop to the cable routing to increase the effort required to move a control. 3. Check for instrument panel interference with the new cable routing. Does the control operate properly?	-	System OK	Go to *Step 5*
5	Check the cables for improper routing, kinks, wiring interference, or other instrument panel interference. Is any cable problem found?	-	Go to *Step 6*	Go to *Step 7*
6	Repair as needed. Is the repair complete?	-	System OK	-
7	1. Remove the cable from any door that binds on the cable. 2. Cycle the door manually. 3. Check for door binding. Is there any door binding?	-	Go to *Step 8*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
8	Check the door seal for proper installation. Is the door seal OK?	-	Go to *Step 9*	Go to *Step 10*
9	1. Check a binding door for shaft alignment, a bent shaft, a bent door, or a warped case. 2. Repair, as needed. Is the repair complete?	-	System OK	-
10	Repair the door seal, as needed. Is the repair complete?	-	System OK	-
11	Check for control binding. Does the control bind?	-	Go to *Step 13*	Go to *Step 12*
12	1. Reinstall the cable to the door. 2. Check the cable-to-dash components' clearances. 3. Repair any interference. Is the repair complete?	-	System OK	-
13	1. Remove the cable from the control. 2. Check the control for binding. Does the control bind?	-	Go to *Step 14*	Go to *Step 15*
14	Replace the control. Is the repair complete?	-	System OK	-
15	Replace the cable. Is the repair complete?	-	System OK	-

Blower Noise

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?	-	Go to *Step 2*	System OK
2	1. Sit inside the vehicle. 2. Close the doors and the windows. 3. Turn the ignition ON. 4. Set the blower speed to 4. 5. Set the temperature to full cold. 6. Cycle through the blower speeds, the modes, and the temperature settings in order to find the noise. Is the blower noise constant at high blower speeds or certain modes, but absent at lower speeds or in other modes?	-	Go to *Step 11*	Go to *Step 3*

Step	Action	Value(s)	Yes	No
3	Check for vibrations from the blower motor and fan assembly at each blower speed by feeling the blower motor housing. Did you find excessive vibration?	-	Go to *Step 6*	Go to *Step 4*
4	1. Remove the blower motor and the fan assembly. Refer to "Blower Motor"in this section. 2. Check for foreign material at the opening of the blower inlet. Do you find any foreign material at the blower inlet?	-	Go to *Step 5*	Go to *Step 6*
5	Remove all foreign material. Is the repair complete?	-	System OK	Go to *Step 6*
6	1. Examine the blower fan for wear spots, cracked blades, a cracked hub, a loose fan retaining nut, or bad alignment. 2. Examine the blower case for wear spots. Did you find any problem?	-	Go to *Step 7*	Go to *Step 9*
7	Lubricate the motor. Is the repair complete?	-	System OK	Go to *Step 8*
8	Replace the motor and the fan assembly. Is the repair complete?	-	System OK	Go to *Step 9*
9	If the noise is a click, tick or whine, replace the motor. Is the repair complete?	-	System OK	Go to *Step 10*
10	Reinstall the original motor. Is the problem still present?	-	Go to *Step 11*	System OK
11	1. Set the blower speed on 4. 2. Check full-hot to full-cold temperature positions in the defrost, floor, and vent modes. Is the noise present in the defrost mode only?	-	Go to *Step 12*	Go to *Step 13*
12	1. Check the ducts for obstructions or foreign materials. 2. Remove any obstructions or foreign materials. 3. Check the floor/defroster door seals. 4. Repair or replace the components, as	-	System OK	-

Step	Action	Value(s)	Yes	No
	needed. Is the repair complete?			
13	Is the noise present in the floor mode only?	-	Go to *Step 12*	Go to *Step 14*
14	Is the noise present in the vent mode only?	-	Go to *Step 15*	Go to *Step 16*
15	1. Check the ducts for obstructions or foreign materials. 2. Remove any obstructions or foreign materials. 3. Check the vent door seals. 4. Repair or replace the components, as needed. Is the repair complete?	-	System OK	-
16	Is the noise present in all modes, but not all temperature positions?	-	Go to *Step 17*	Go to *Step 18*
17	1. Check the temperature door seals. 2. Repair or replace the seals, as needed. Is the repair complete?	-	System OK	-
18	1. Check the system for obstructions or foreign materials between the fan and the temperature door. 2. Repair or replace the components, as needed. Is the repair complete?	-	System OK	Go to *Step 2*

MAINTENANCE AND REPAIR

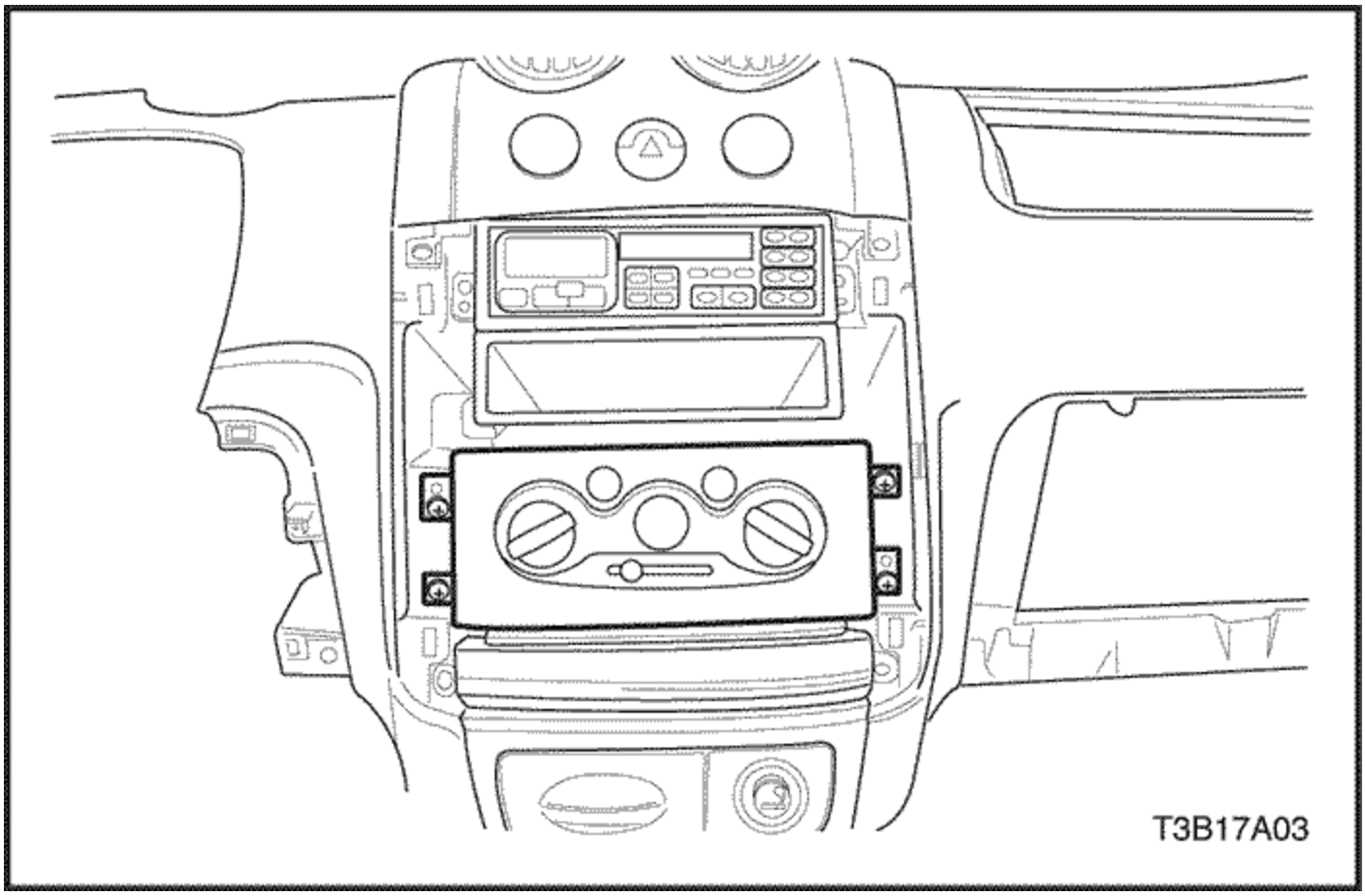
ON-VEHICLE SERVICE

Temperature Cable Adjustment

Because the cable and the cable housings have fixed lengths, it is impossible to make a temperature cable adjustment.

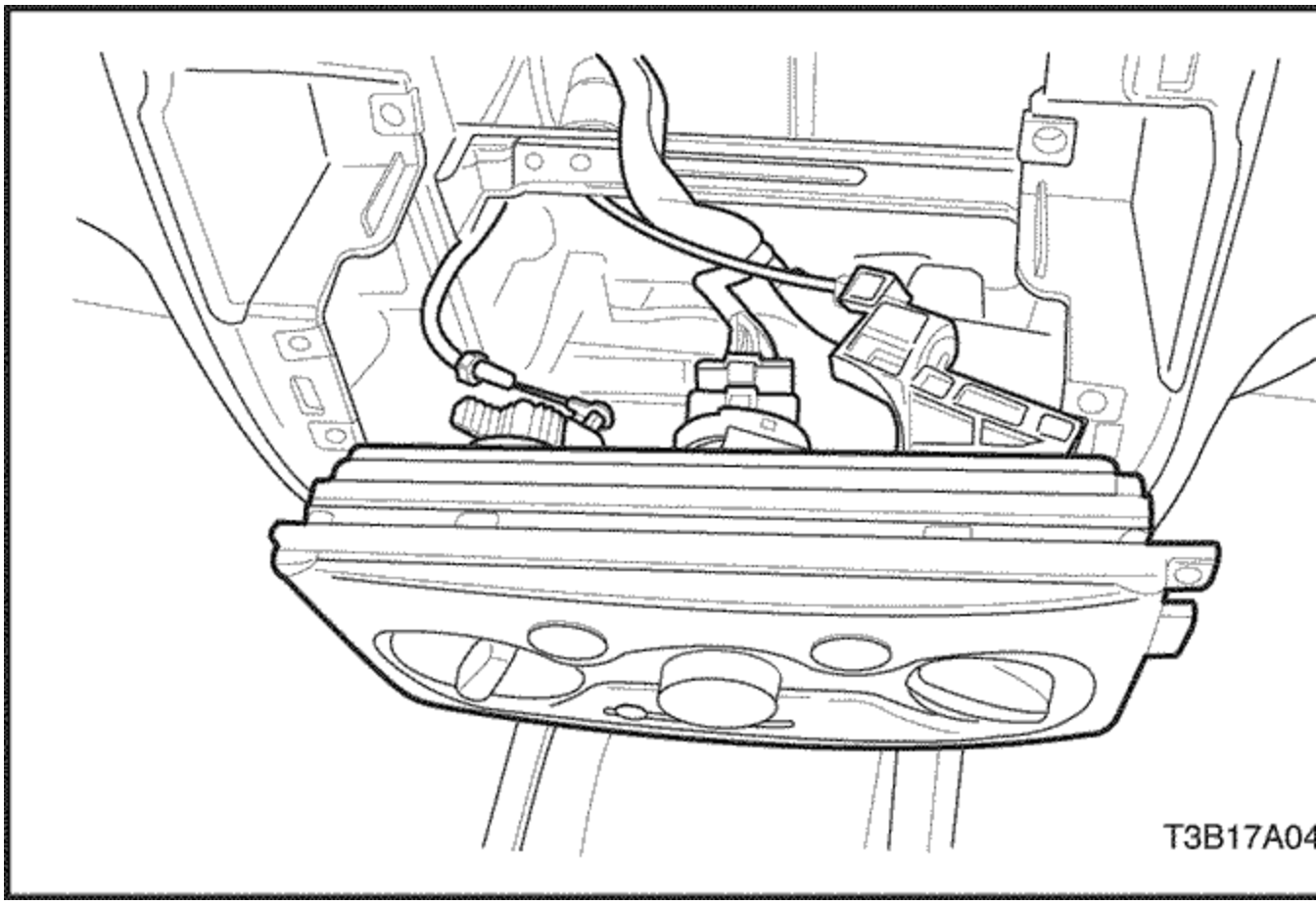
The heater/air distribution case linkage also cannot be adjusted.

If a malfunction is suspected, verify the proper operation of the controller and the mechanical doors for the heater/air distributor case assembly.



Control Assembly
Removal Procedure

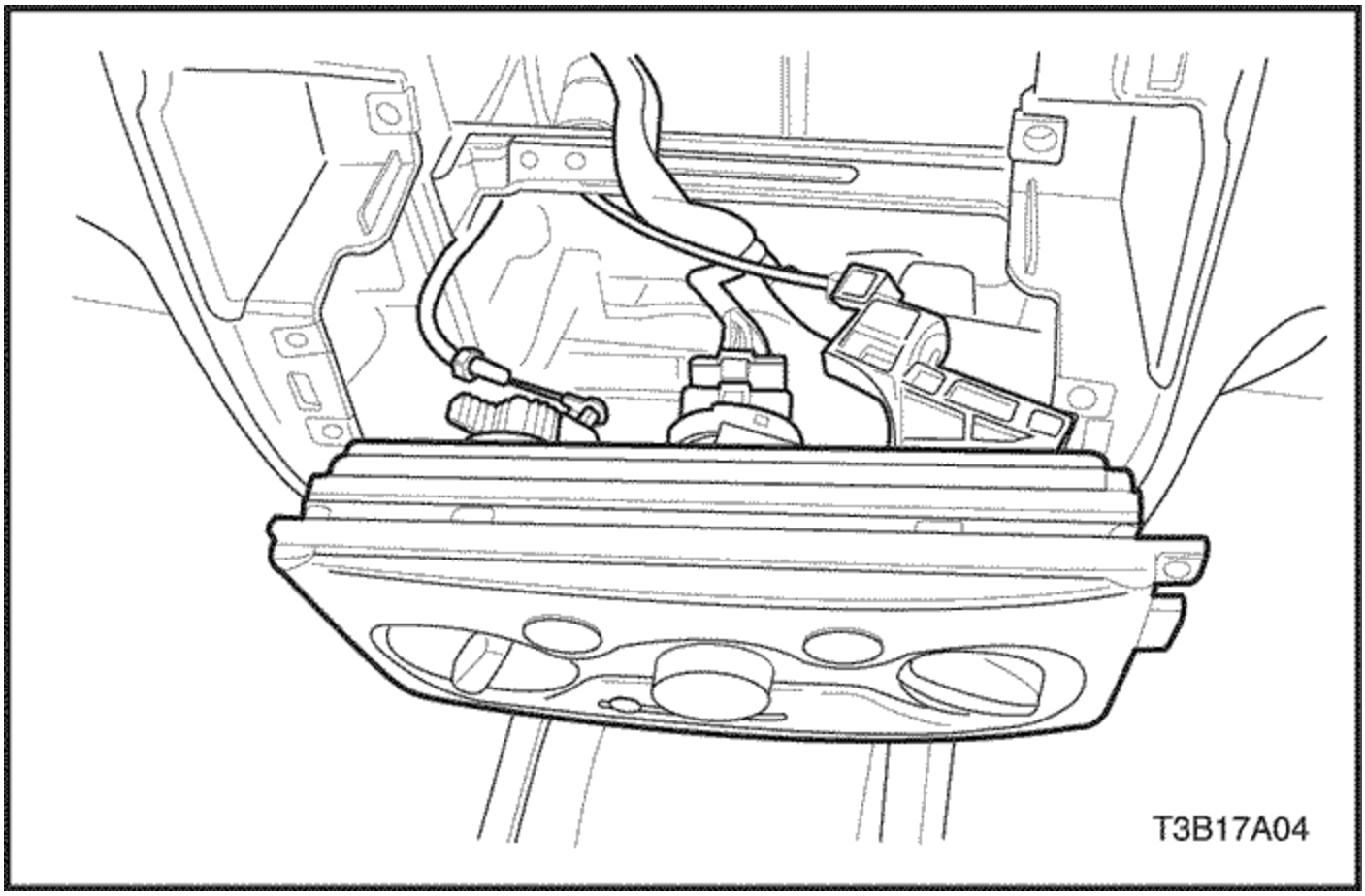
1. Disconnect the negative battery cable.
2. Remove the Instrument panel lower cover. Refer to *Section 9E, Instrumentation/Driver Information.*
3. Remove the audio system. Refer to *Section 9F, Audio Systems.*
4. Remove the HVAC controller retaining screws.
5. Remove the controller by pulling it out to provide clearance for the removal of the cable.



6. Disconnect the mechanical control cables by gently prying off the cable eyelet and unsnapping the cable housing from the mechanical slide.

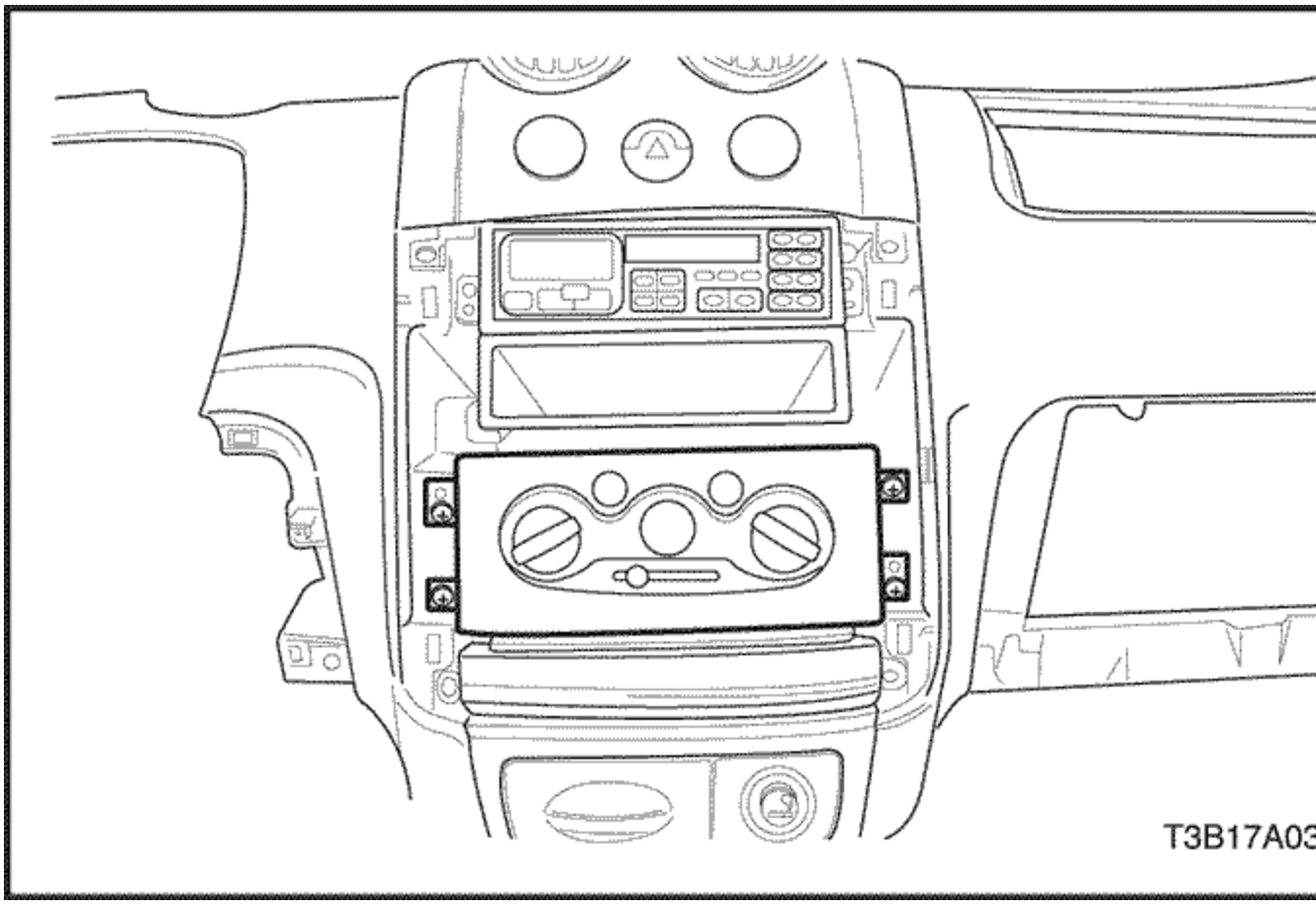
   Important : Note the location of the cables and the housings to facilitate their reinstallation.

7. Disconnect the electrical connectors.



Installation Procedure

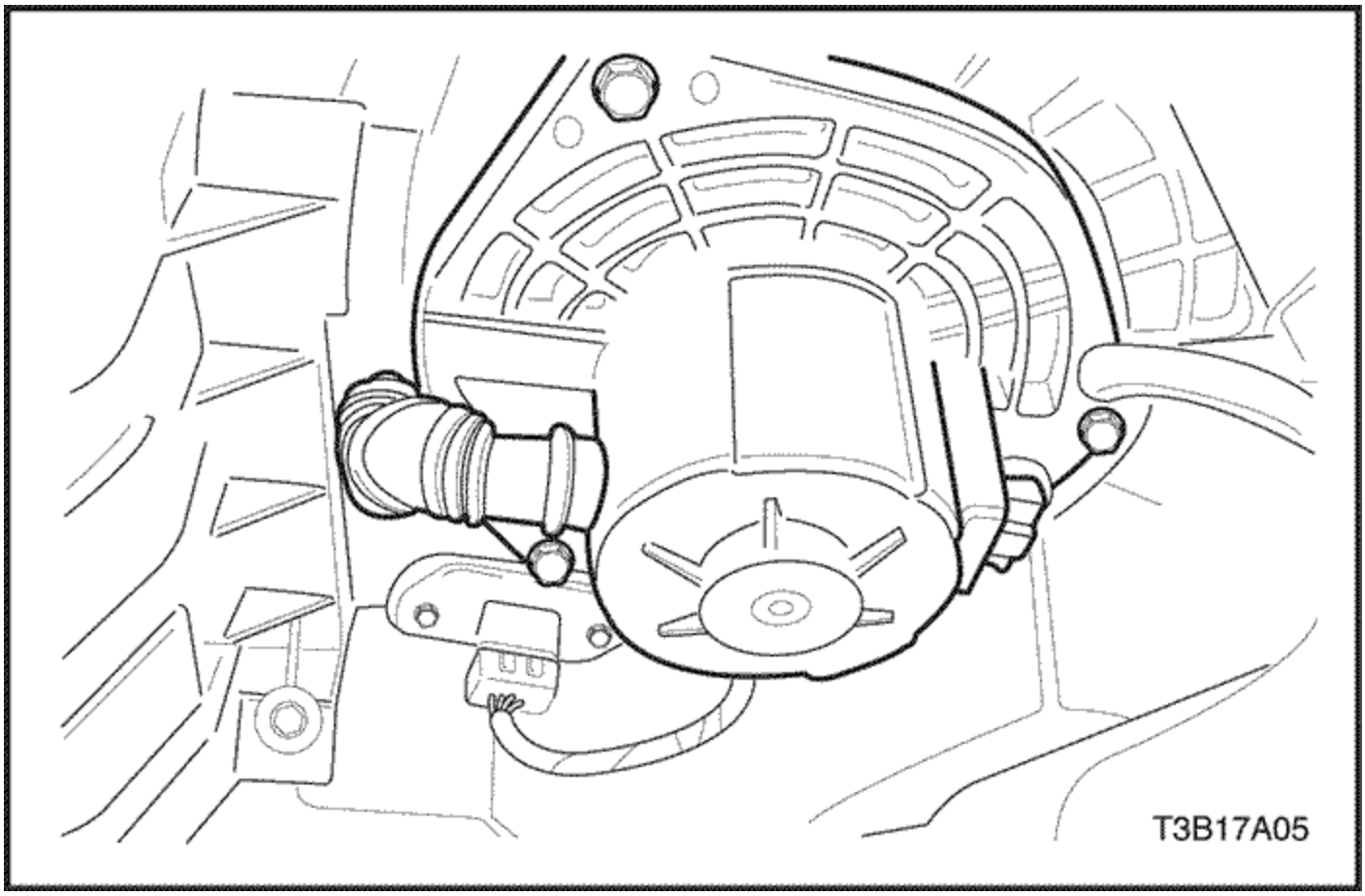
1. Connect the electrical connectors to the proper sockets on the back of the controller.
2. Install the mechanical cable housings to the proper control positions.
3. Install the eyelets on the end of each cable, pressing each onto the proper post.
4. Install the controller by gently inserting the controller into the proper position on the center console.



5. Install the lower left and the lower right controller retaining screws.

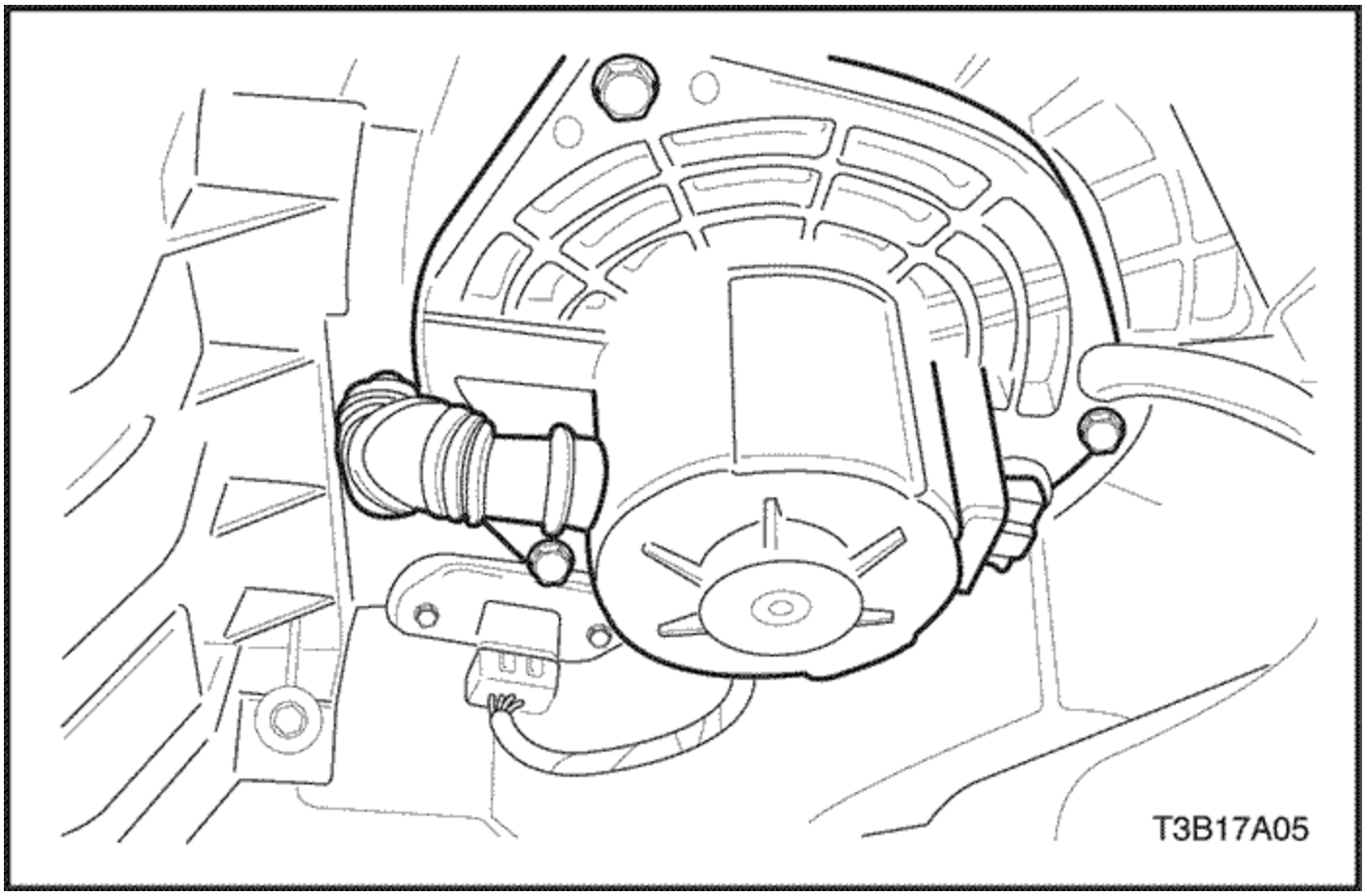
   Tighten
   Tighten the HVAC controller retaining screws to 3 N•m (27 lb-in).

6. Install the audio system. Refer to *Section 9F, Audio Systems.*
7. Connect the negative battery cable.
8. Confirm the proper operation of the controller by moving it through all of the controller's possible functioning positions.



Blower Motor
Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the blower motor electrical connector.
3. Remove the blower cooling hose.
4. Remove the screws that secure the motor to the heater/air distribution case.
5. Remove the motor and the seal from the heater/air distribution case by gently pulling the motor straight down and out.

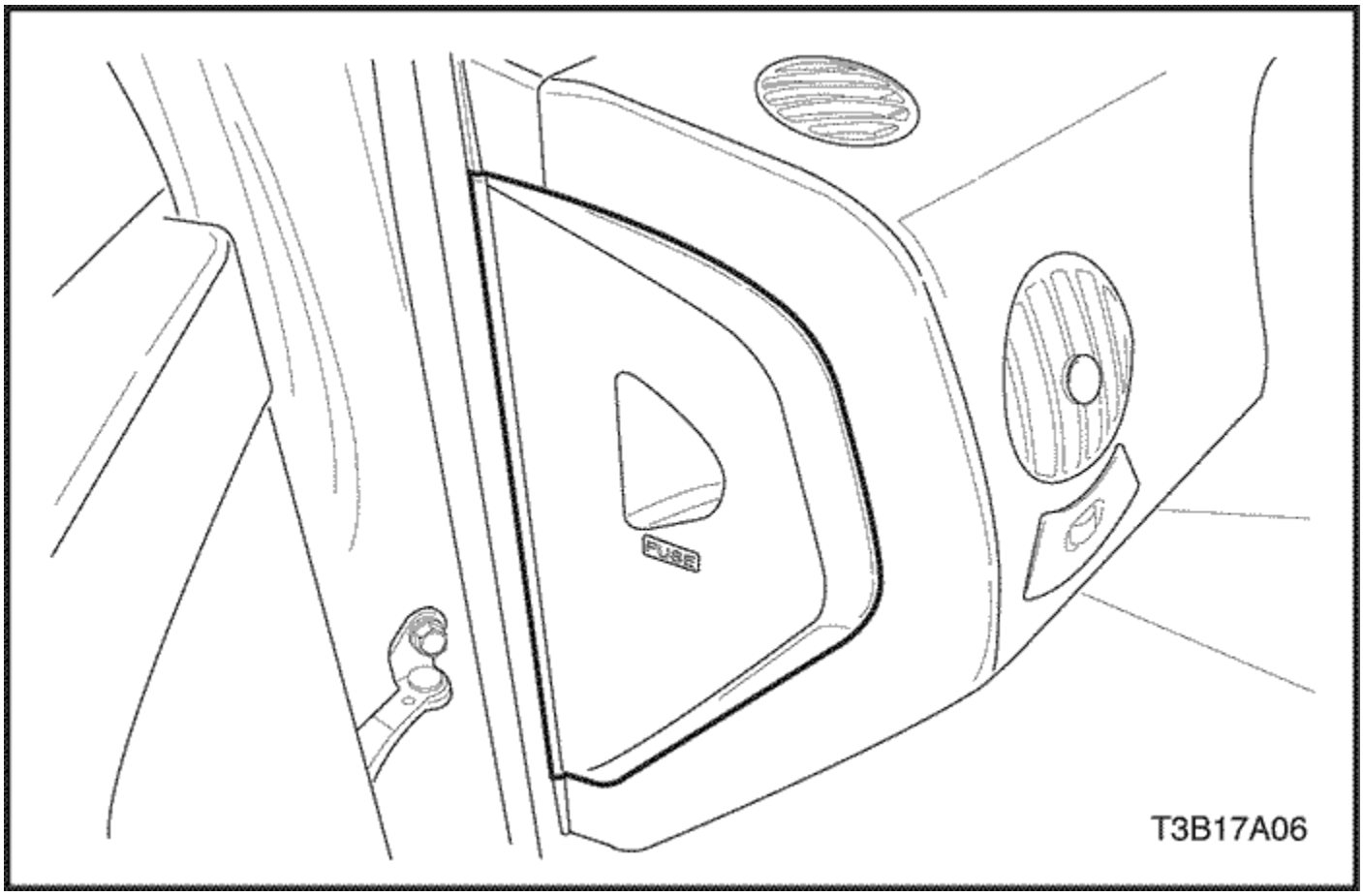


Installation Procedure

1. Install the blower motor and seal, with the shock mount pads, in the heater/air distribution case. Hold the blower motor in position.
2. Install the screws to secure the blower motor to the heater/air distribution case.

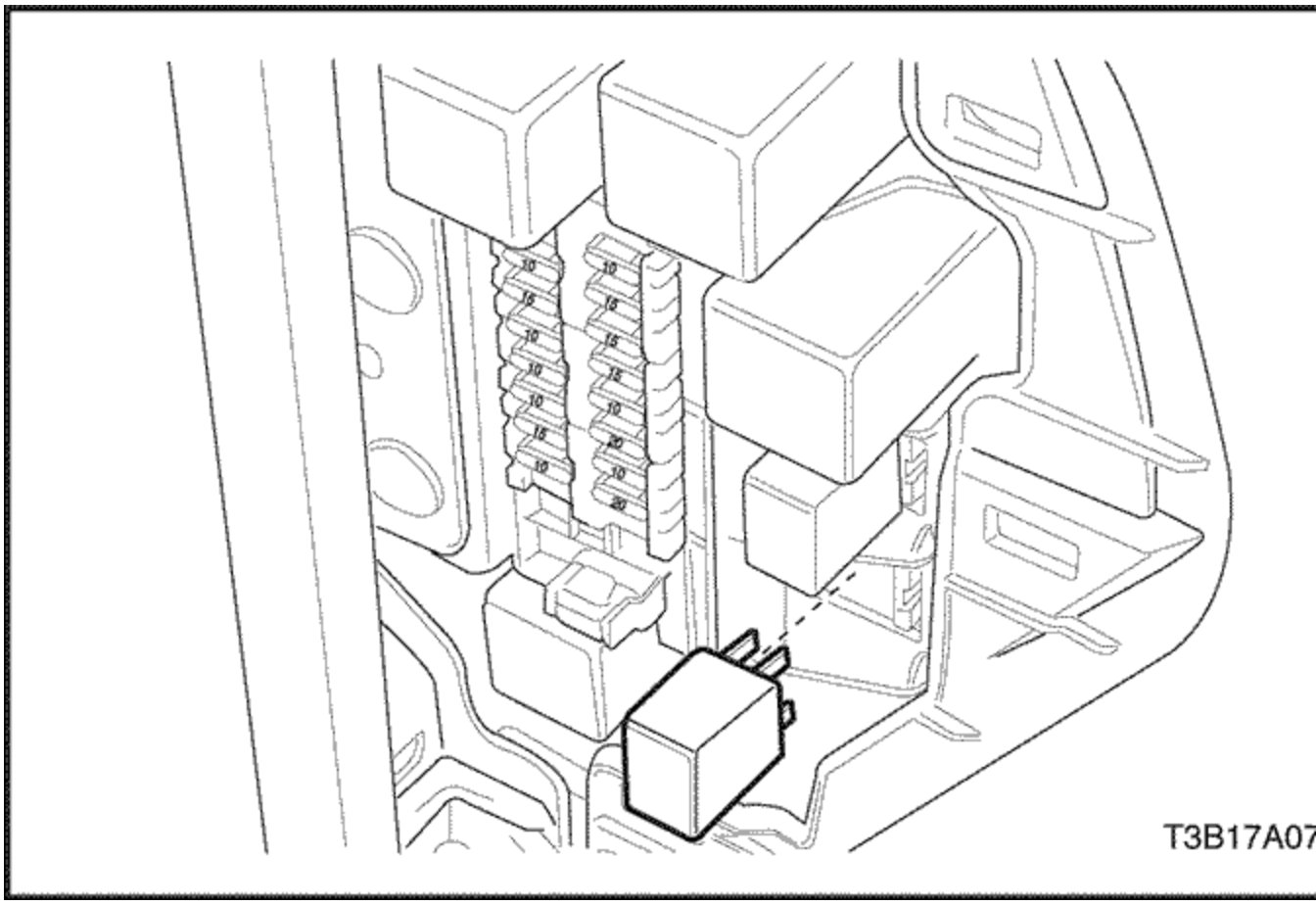
   Tighten
   Tighten the blower motor retaining screws to 6 N•m (53 lb-in).

3. Install the blower motor cooling hose.
4. Connect the electrical connector.
5. Connect the negative battery cable.
6. Confirm that the blower motor operates properly.

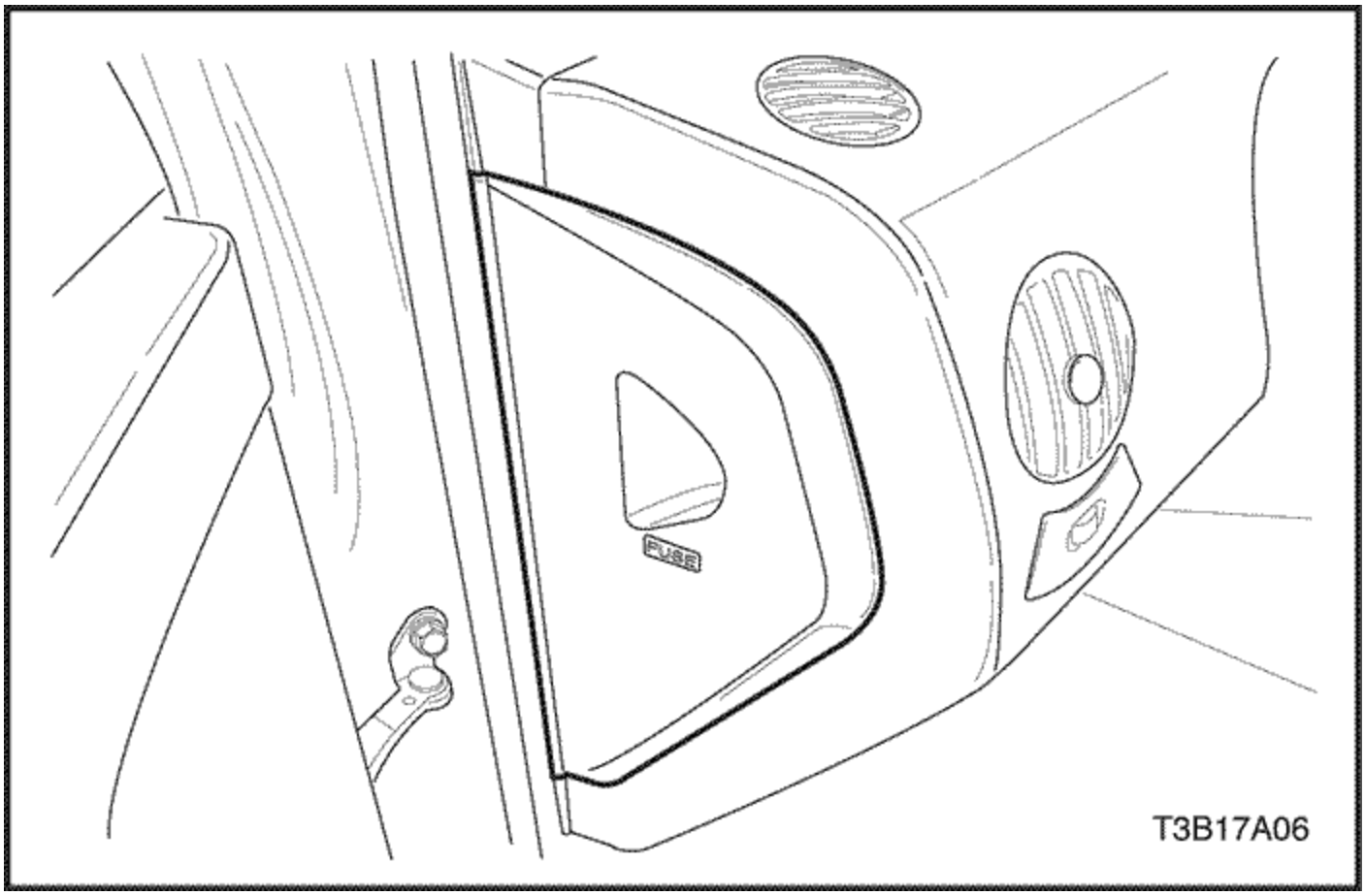


High-Blower Relay
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the instrument panel fuse cover.

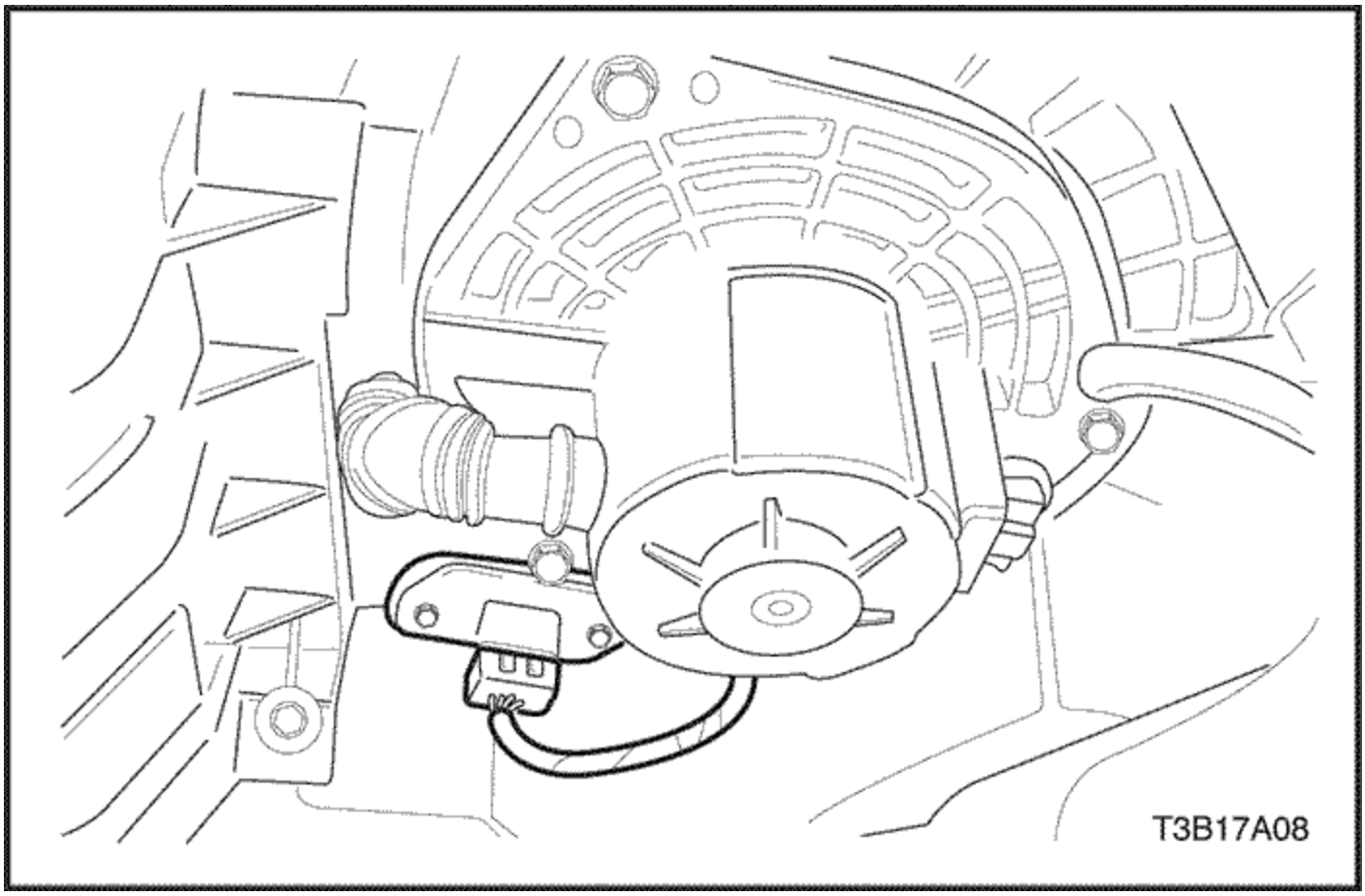


3. Pull out the relay at front of the relay box.



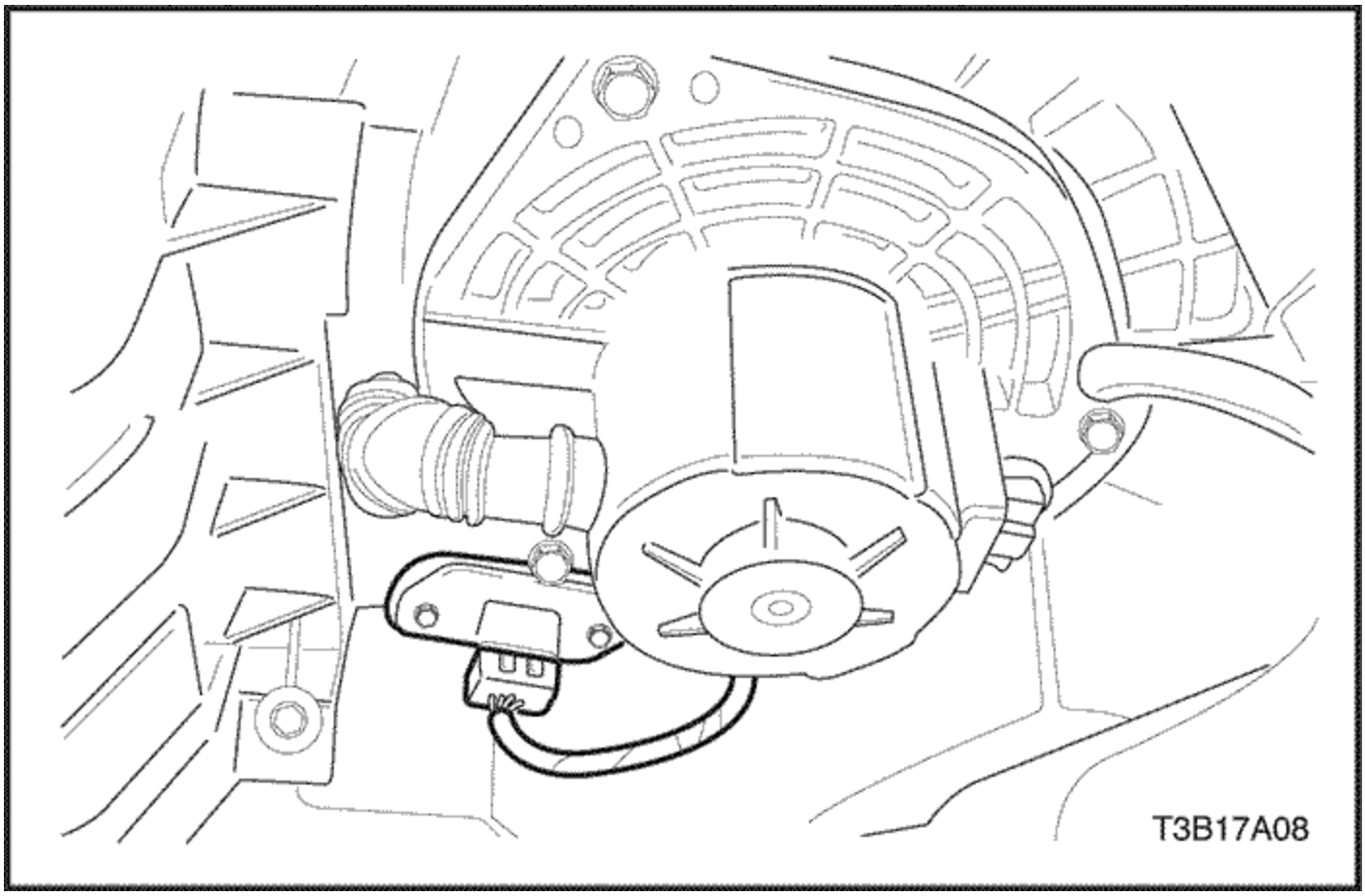
Installation Procedure

1. Align the relay contacts with the relay terminal slots.
2. Push the relay firmly into the base. The relay must be seated and flush with the base edge.
3. Replace the instrument panel access panel.
4. Replace the remote mirror/lighting control panel.
5. Connect the negative battery cable



Blower Resistor
Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electrical connector at the resistor.
3. Remove the retaining screws from the resistor.
4. Remove the resistor by gently pulling it downward.

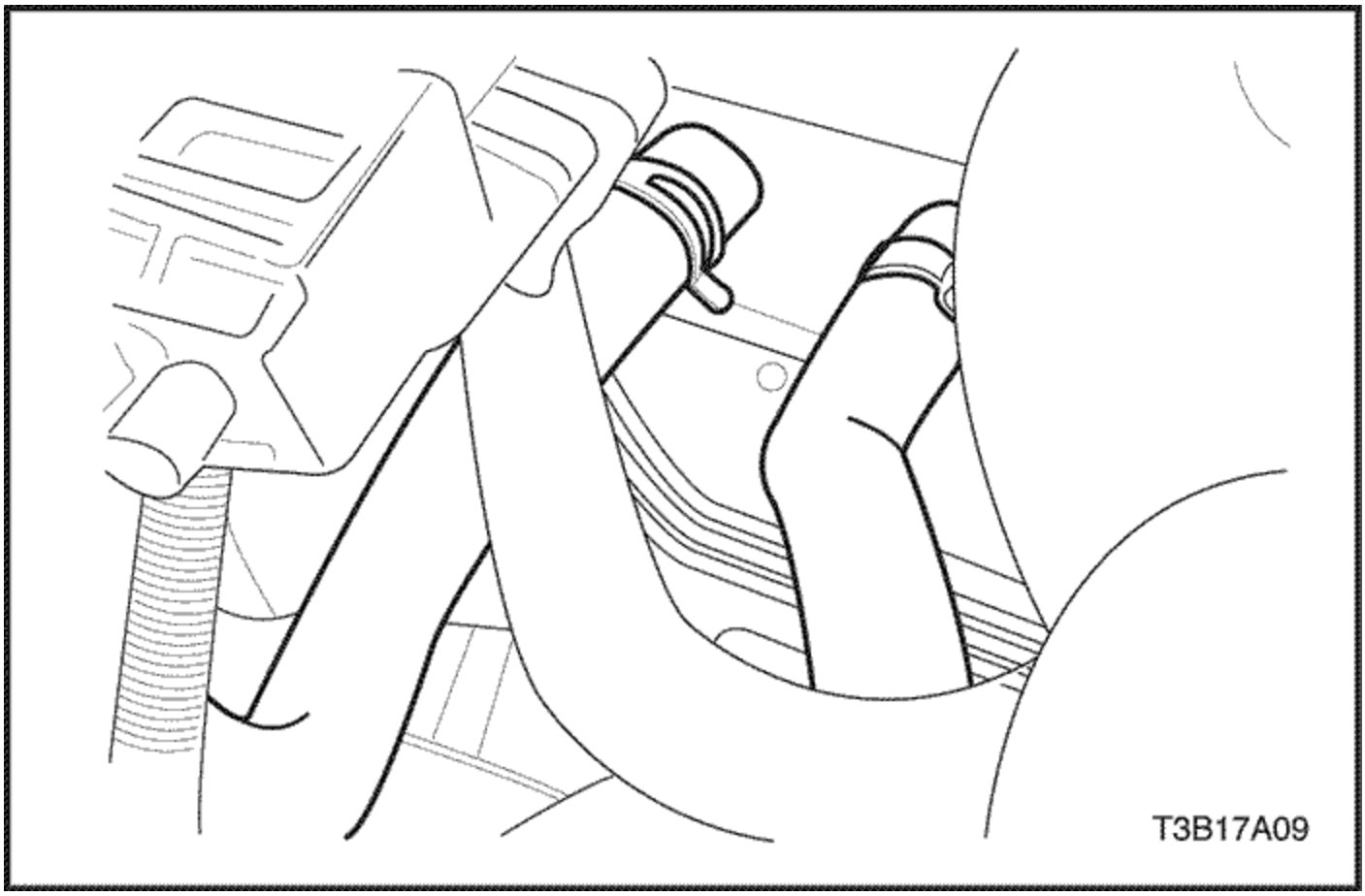


Installation Procedure

1. Install the new resistor into the heater/air distribution case with the screws.

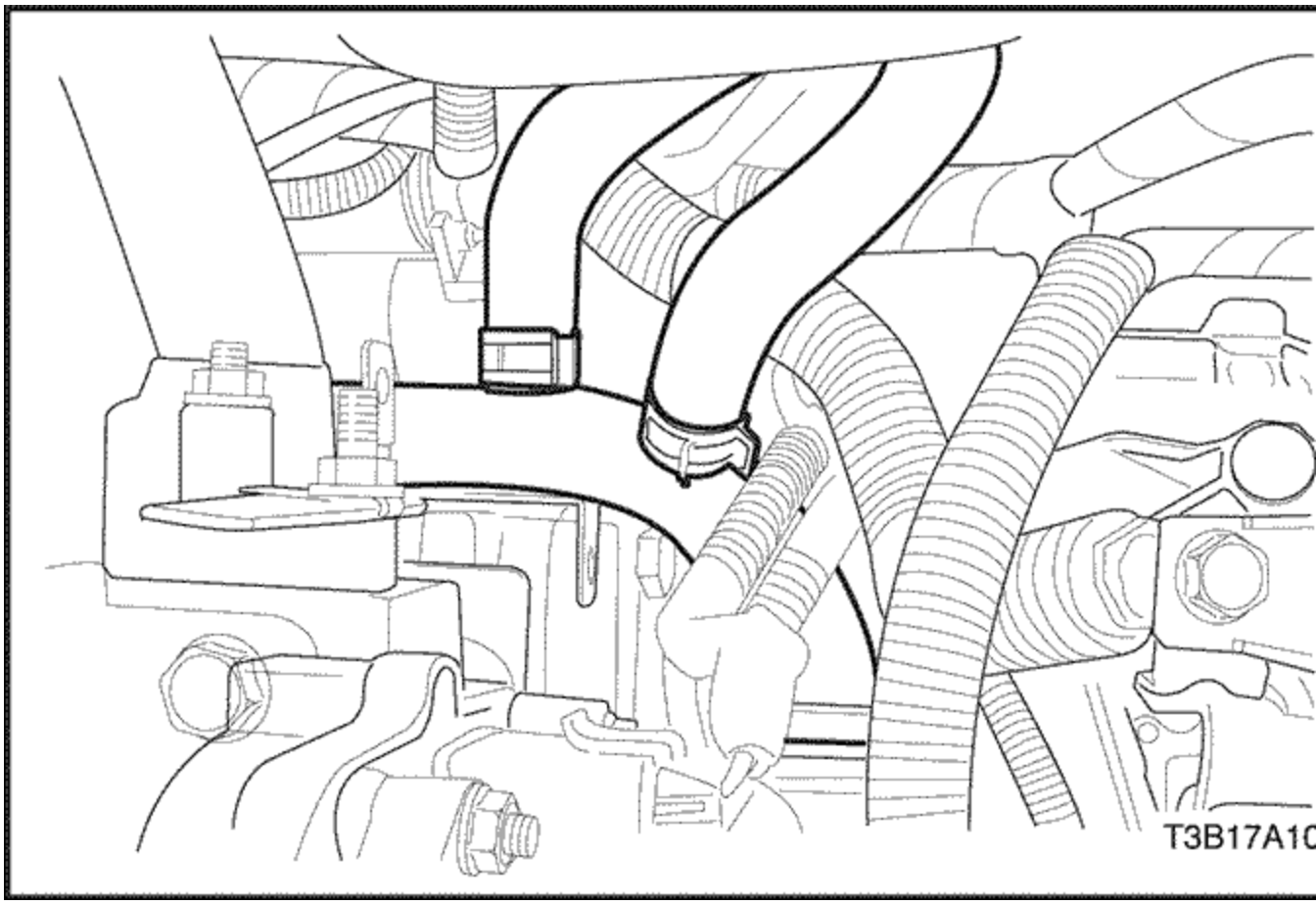
   Tighten
   Tighten the blower resistor retaining screws to 6 N•m (53 lb-in).

2. Connect the electrical connector at the resistor.
3. Connect the negative battery cable.
4. Confirm the proper performance of the blower.

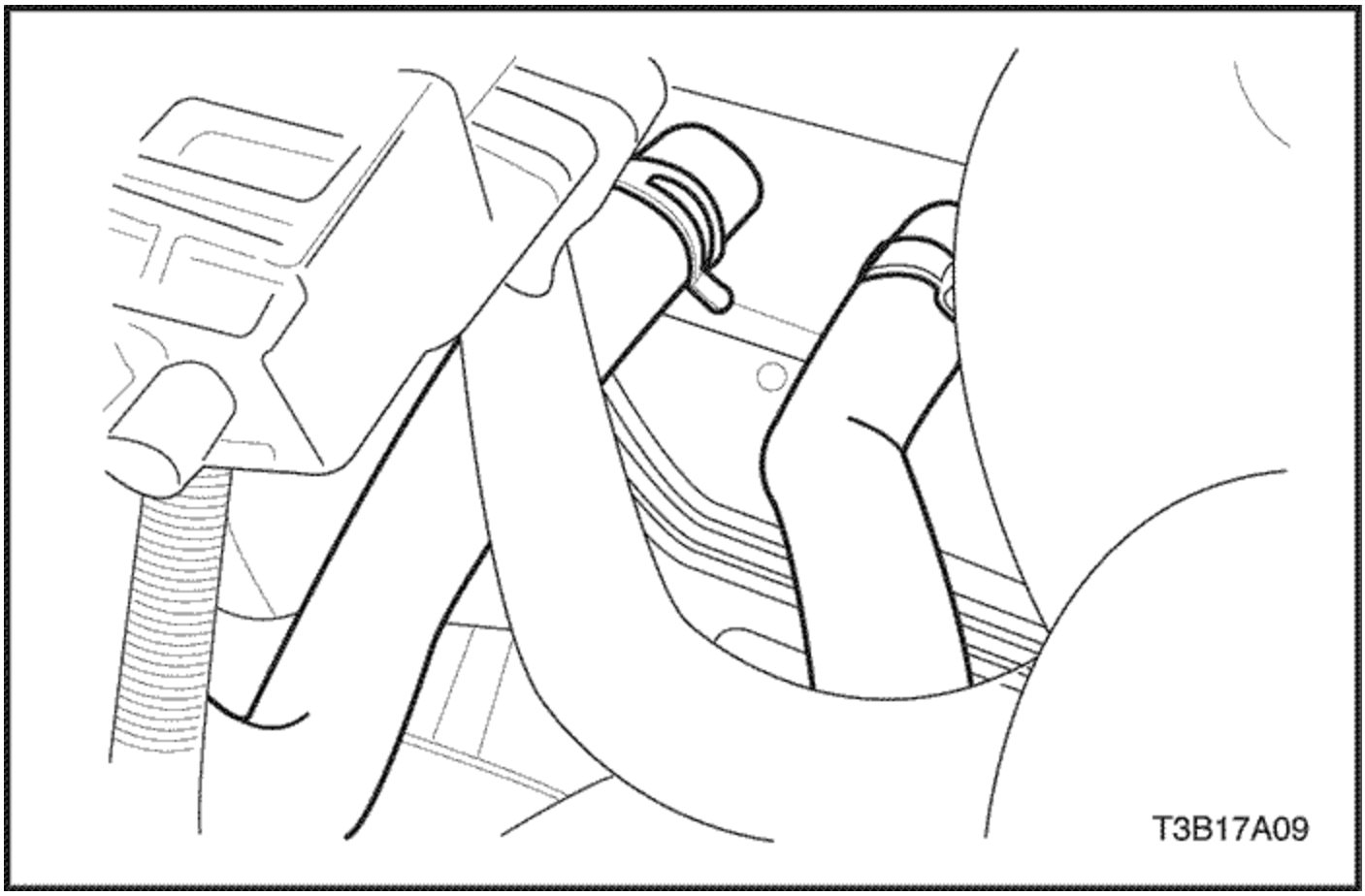


Heater Hoses
Removal Procedure

1. Partially drain the cooling system.
2. Compress and slide rearward the two heater hose spring clamps at the fire wall.

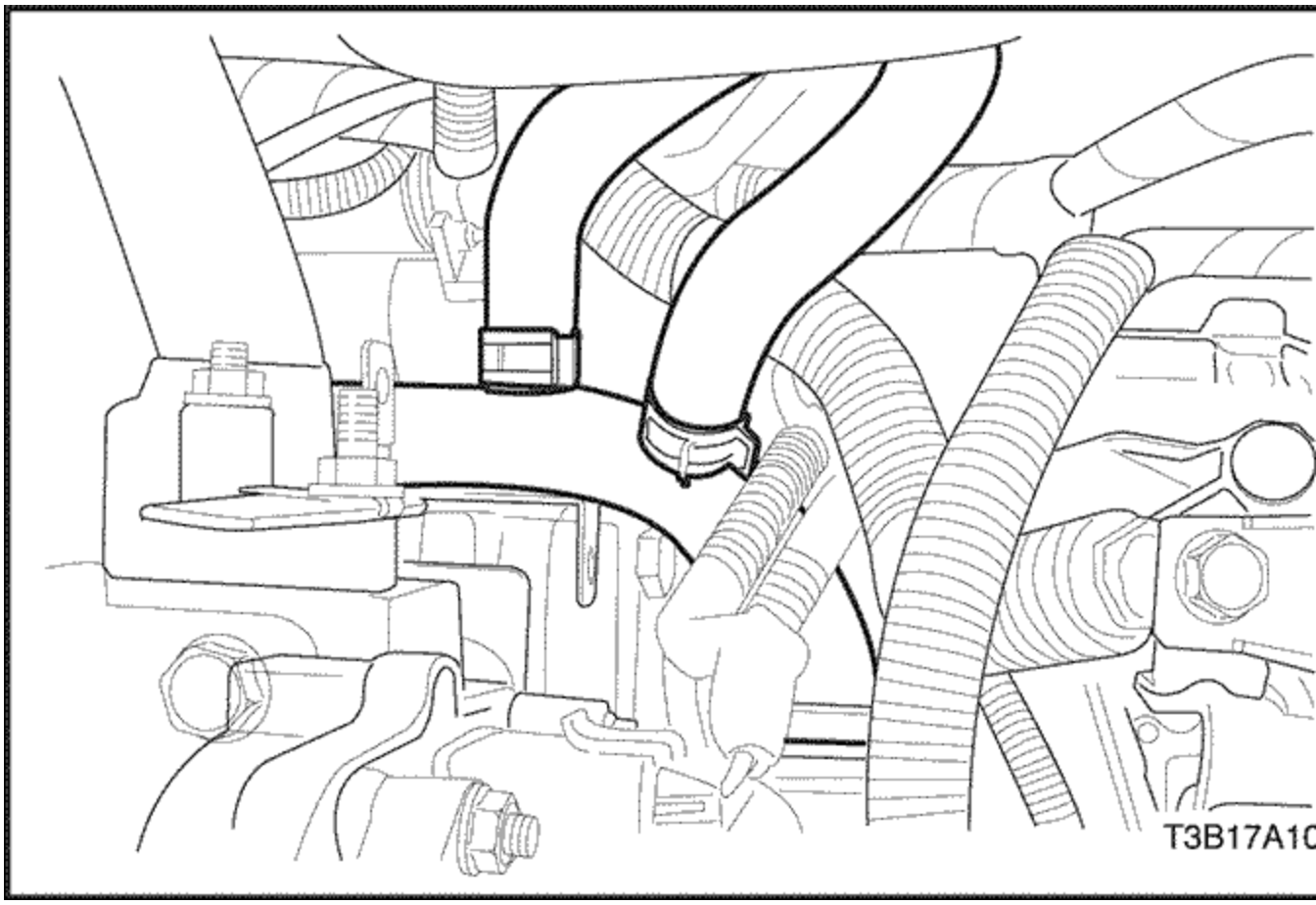


3. Gently twist the hose from the left to the right and back again to loosen the bond between the hose and the tube.
4. Remove the end of the hose from the tube.
5. Repeat Steps 3 and 4 with the other hose.
6. Compress the heater hose spring clamp on the inlet coolant line and slide the clamp rearward.
7. Remove the hose from the vehicle.
8. Compress the heater hose spring clamp at the connection below the intake manifold and slide the clamp rearward.
9. Remove hose from the vehicle.

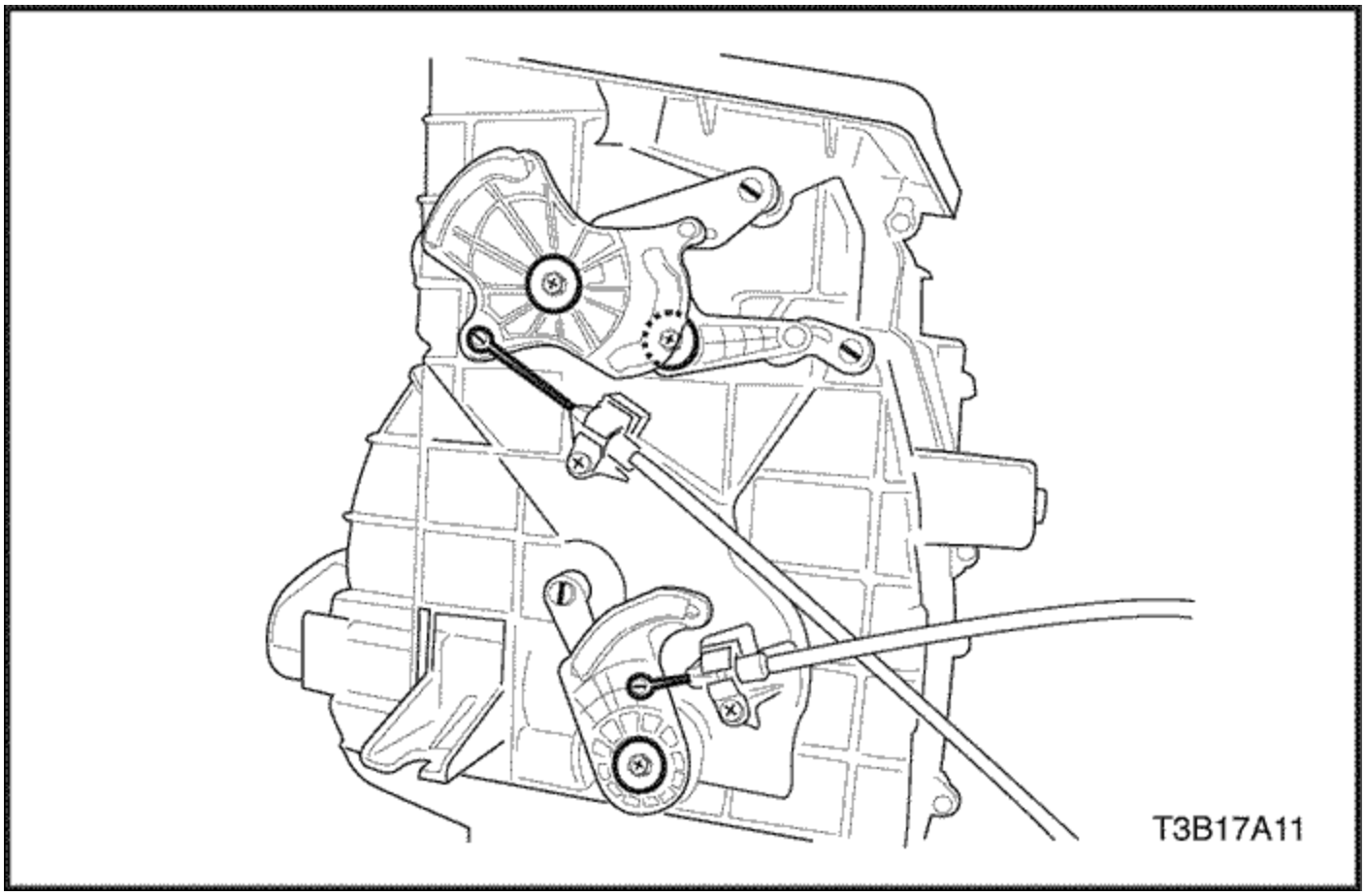


Installation Procedure

1. Install the left heater hose to the coolant inlet line fitting. Slide the end of the heater hose over the coolant fitting until the hose is seated.
2. Install the right heater hose to the fitting below the intake manifold. Slide the end of the heater hose over the fitting until it is seated.
3. Install and seat the other end of each heater hose.
4. Compress and slide the spring clamps into position on the heater hoses and release the tension on the spring clamps.

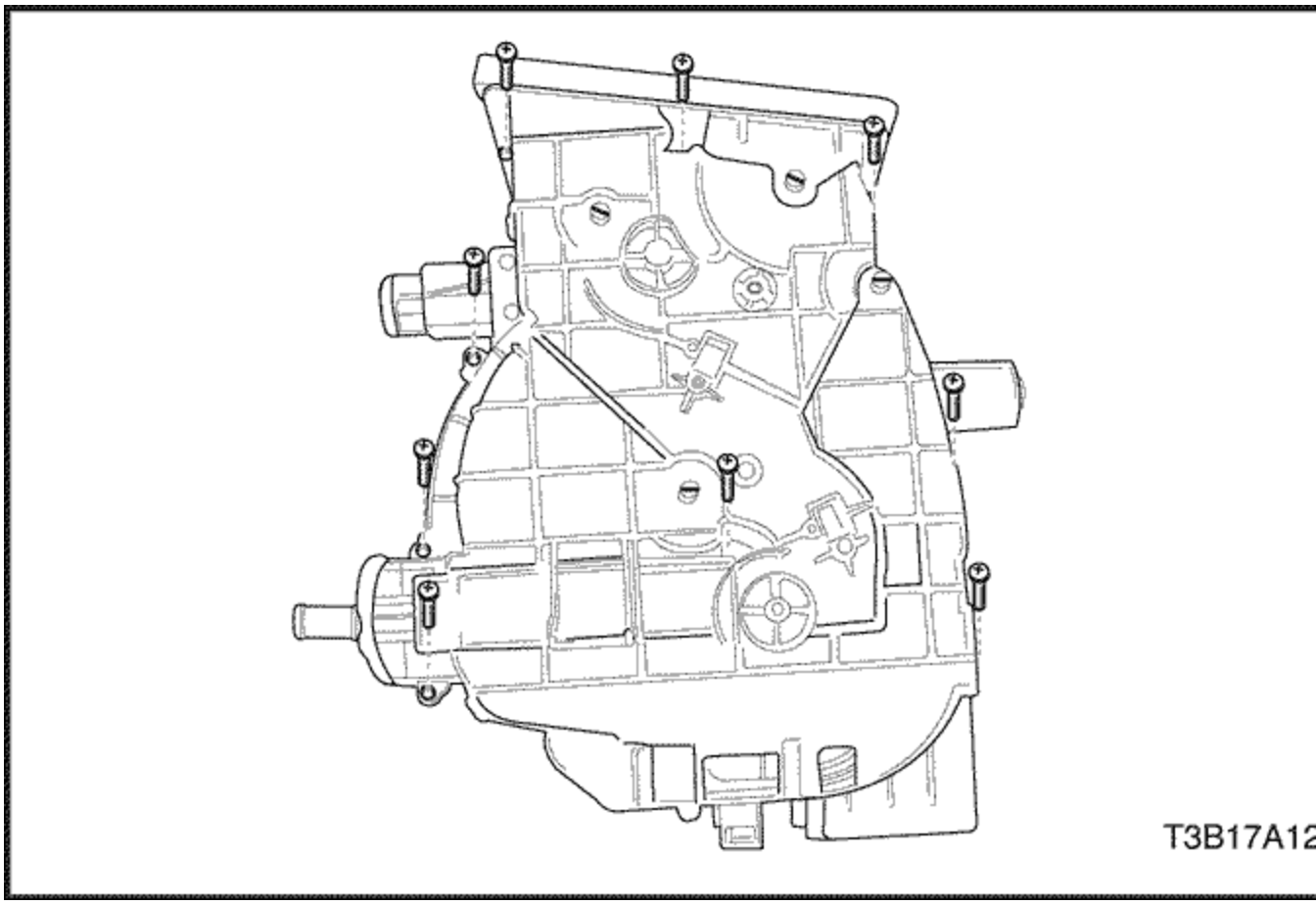


5. Fill the cooling system.
6. Check the hoses for leaks.



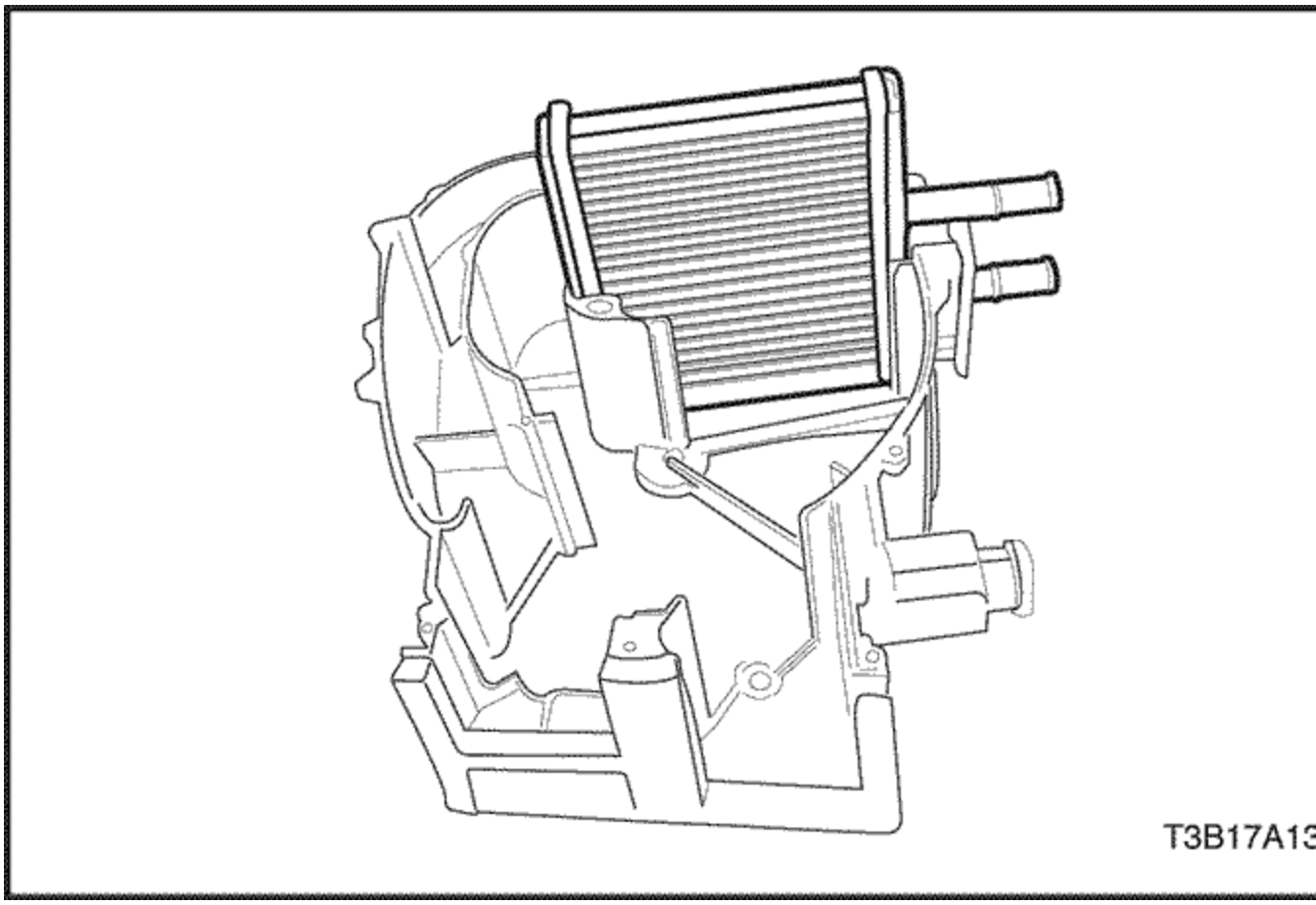
Heater Core
Removal Procedure

1. Raise the hood.
2. Disconnect the negative battery cable.
3. Remove the instrument panel carrier assembly from the vehicle. Refer to *Section 9E, Instrumentation/ Driver Information.*
4. Remove the heater/air distribution case from the vehicle. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System.*
5. Remove the linkage screw from the lower heater core cover post.
6. Remove the linkage lever. Note the position of all the levers to facilitate reassembly.

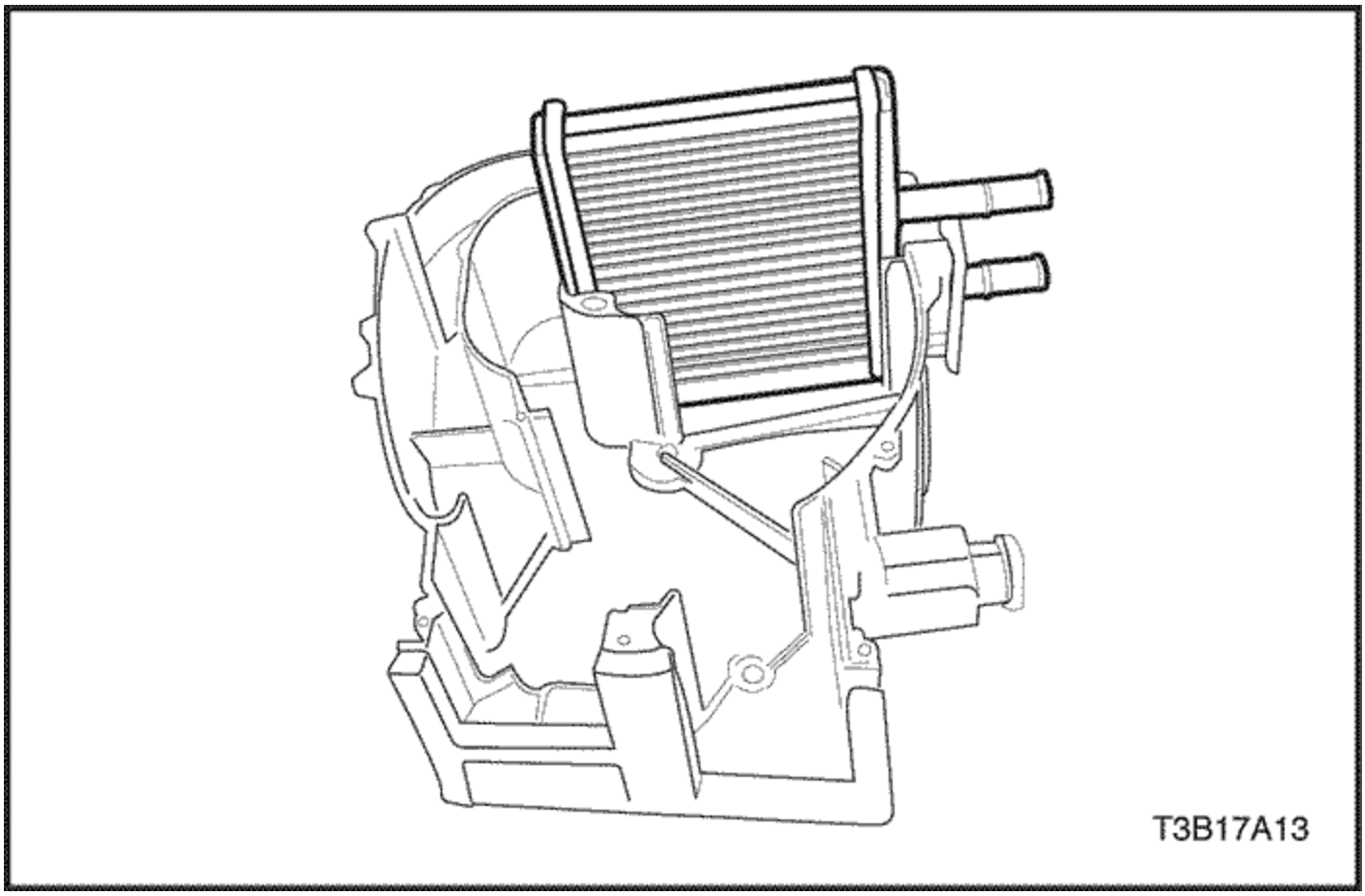


Notice : Handle the case carefully to avoid damaging the linkage levers.

7. Remove the screws that secure the heater core cover.

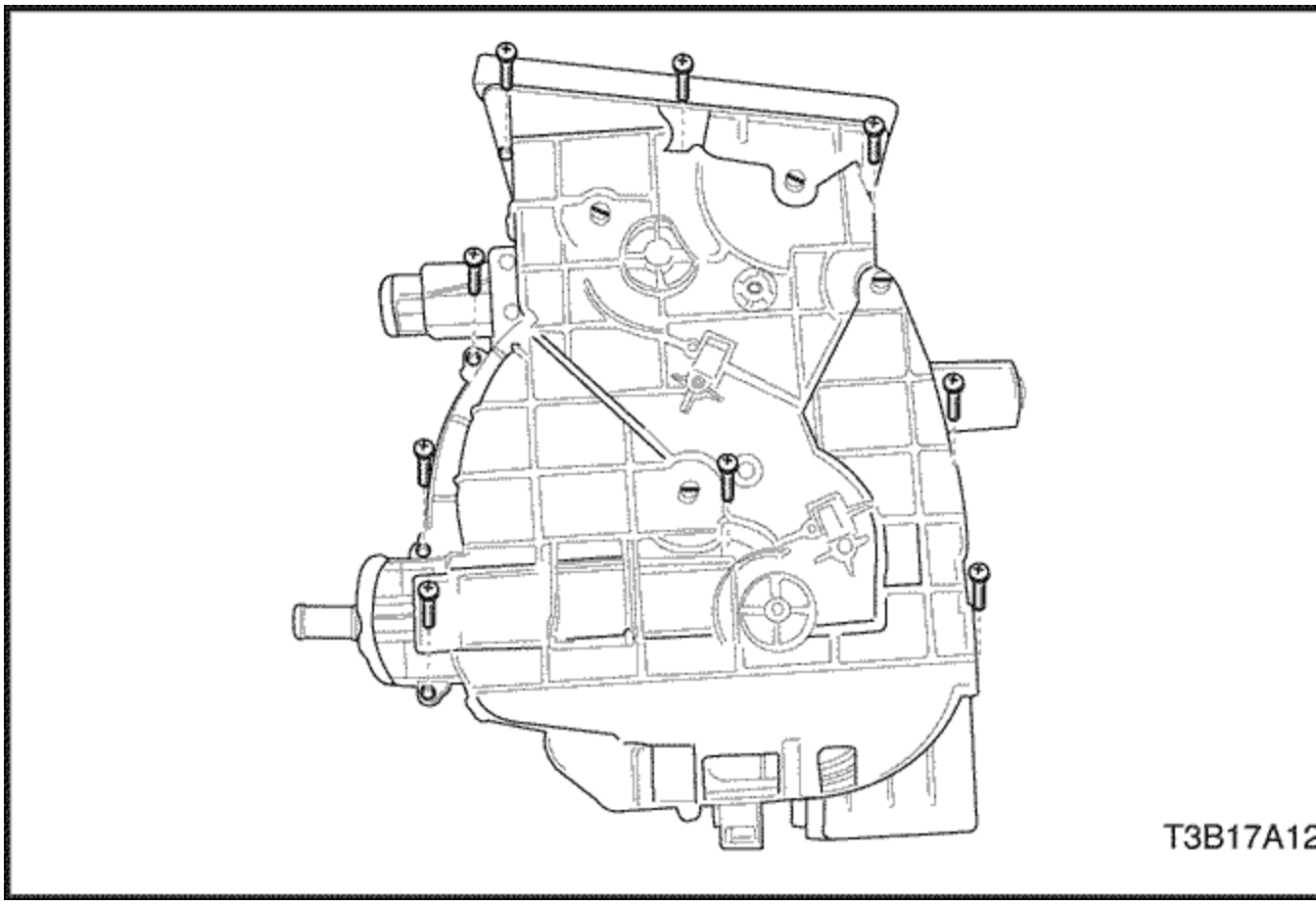


8. Slowly separate the lower heater core cover from the rest of the assembly. Retain the sealant.
9. Remove the screw and the bracket clamp that secure the heater core lines to the case.
10. Remove the spring clamp that secures the heater core body to the case.
11. Remove the heater core from the case.

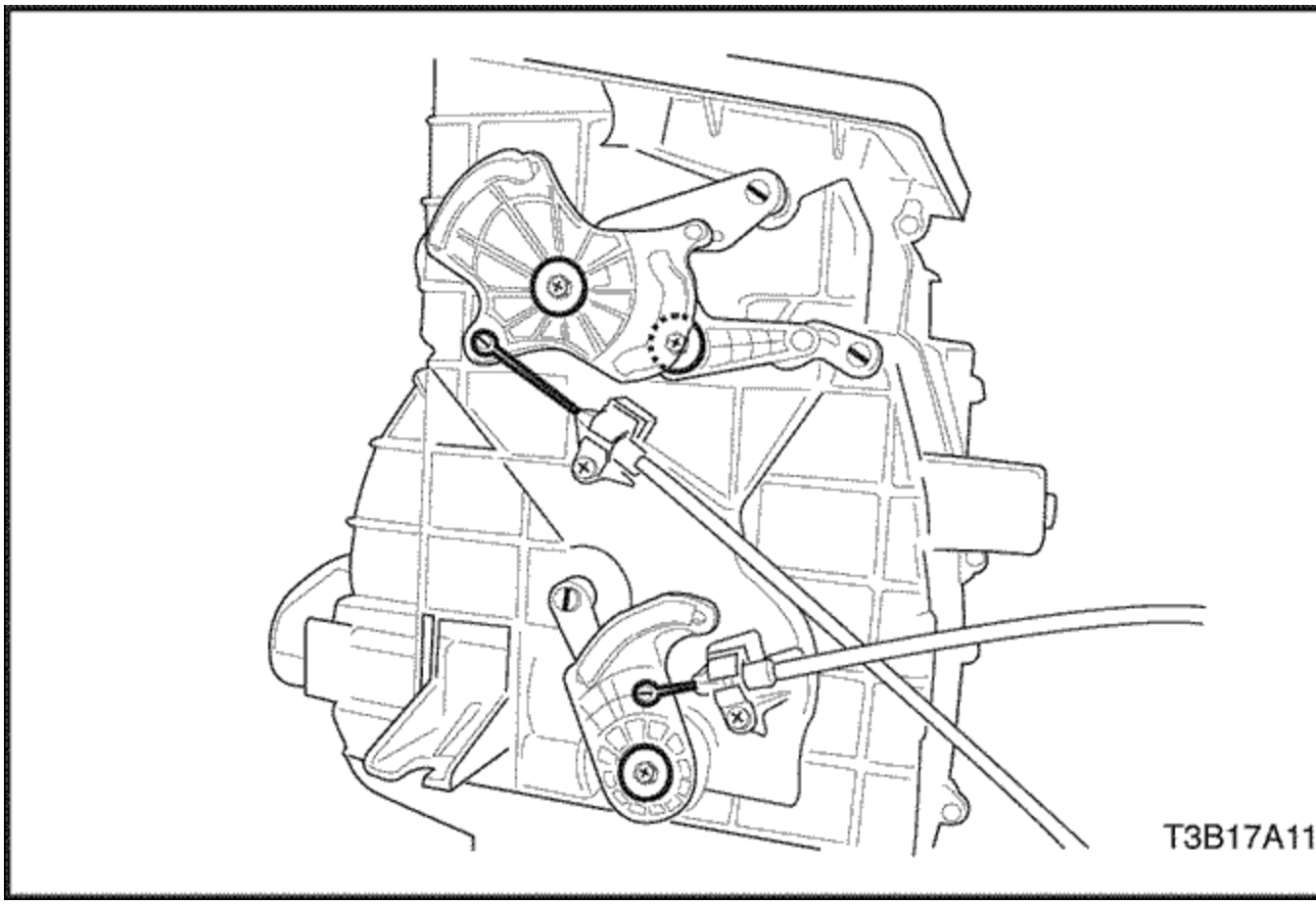


Installation Procedure

1. Install the heater core into the case.
2. Secure the heater core lines to the case with the retaining bracket clamp and the screw.
3. Install the heater core body with the retaining spring clamp.
4. Reapply the sealant to the heater core cover mounting channel flange as removed.



5. Install the heater core cover.
6. Install the retaining screws.
7. Install the linkage lever onto the cover post with the screw.
8. Confirm proper operation of the actuating levers for the heater/air distribution case doors.



9. Install the heater/air distribution case. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System.*
10. Install the instrument panel carrier assembly. Refer to *Section 9E, Instrumentation/Driver Information.*
11. Fill the cooling system.
12. Connect the negative battery cable.

Rear Heating

Some vehicles are equipped with rear seat heater ducts. Should there be no airflow to the rear, look for any obstructions, such as items on the floor under the front seats. Also check for air leaks between the heater/air distributor assembly and the rear ducts.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Heating and Ventilation Systems

The base heater system is designed to provide heating, ventilation, windshield defrosting, side window defogging, and on some vehicles, heating directly to the rear seat area.
The heater and fan assembly blower regulates the airflow from the air inlet for further processing and distribution.
The heater core transfers the heat from the engine coolant to the inlet air.
The temperature door regulates the amount of the air that passes through the heater core. The temperature door also controls the temperature of the air by controlling the mix of the heated air and the ambient air.
The mode door regulates the flow and the distribution of the processed air to the heater ducts and to the defroster ducts.
This console-mounted heating and ventilation panel contains the following:

The Rotary Temperature Control Knob

1. The Rotary Temperature Control Knob
    - Actuates by cable.
    - Raises the temperature of the air entering the vehicle by rotation toward the right, or the red portion of the knob.

2. The Rotary Blower Control Knob
3. The Rotary Blower Control Knob
    - Turns on to operate the blower motor at four speeds.
    - Turns OFF to stop the blower.
    - Operates completely independently both from the mode control that regulates the defroster door and from the temperature control knob.
    - Changes the fan speed in any mode and at any temperature setting.

3. The Rotary Mode Control Knob
4. The Rotary Mode Control Knob
    - Actuates by cable.
    - Regulates the air distribution between the windshield, the instrument panel, and the floor vents.

Two Push Knobs

1. The Rear Window Defogger Push Knob
    - Controls the rear window defogger.
    - Turns ON the rear window defogger when the push knob is pressed and the indicator lamp is illuminated.

2. The A/C Push Knob (if the vehicle is equipped with air conditioning)
3. The A/C Push Knob (if the vehicle is equipped with air conditioning)
    - Controls the A/C.
    - Turns the A/C ON when the push knob is down. However, if the blower control knob is OFF, the A/C system is OFF, regardless of the position of the A/C knob.

Fresh Air Control Lever Or Push Knob

1. The Fresh Air Control Lever
    - Operates by cable.
    - Switches between recirculating passenger compartment air and bringing outside air into the passenger compartment.
    - Draws in outside air when the lever is moved to the right.
    - Recirculates inside air when the lever is moved to the left.

2. The Fresh Air Control Push Knob
    - Operates by actuator.
    - Switches between recirculating passenger compartment air and bringing outside air into the passenger compartment.
    - Draws in outside air when knob is off.
    - Recirculates inside air when the knob is down with the indicator lamp iluminated.

SECTION 7B

MANUAL CONTROL HEATING, VENTILATION AND AIR CONDITIONING SYSTEM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

General Specifications (V5 System)

Application		Unit	Description
Compressor		-	V5
Receiver-Dryer		-	AL R/DRIER
Refrigerant	Type	-	R-134a System
	Capacity	g	600±20 (RHD : 650±20)
Refrigerant Oil in A/C System	Type	-	Union Carbide 488 PAG OIL
	Capacity	cc (ml)	220
A/C Cooling Capacity (Airflow rate 150 kg/h)		Kcal/h	4400±5%

General Specifications (SP10 System)

Application		Unit	Description
Compressor		-	SP-10.4PK
Receiver-Dryer		-	AL R/DRIER
Refrigerant	Type	-	R-134a System
	Capacity	g	600±20 (RHD : 650±20)
Refrigerant Oil in A/C System	Type	-	RL 105 PAG OIL
	Capacity	cc (ml)	150
A/C Cooling Capacity (Airflow rate 150 kg/h)		Kcal/h	4400±5%
A/C Compressor ON/OFF Condition	Evaporator Thermistor Temperature	°C (°F)	Down below 2.0 °C (35.6 °F) : OFF Go over 4.0 °C (39.2 °F) : ON

Fastener Tightening Specifications

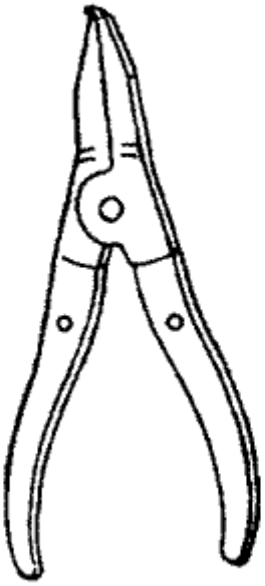
Application	N•m	lb-ft	lb-in
Air Cleaner Housing Assembly Retaining Bolts	12	-	106
Compressor Bracket Bolt	27	20	-
Control Assembly Retaining Screws	3	-	27
Expansion Valve Retaining Bolt	12	-	106
Heater/Air Distribution Case Assembly Retaining	8	-	71

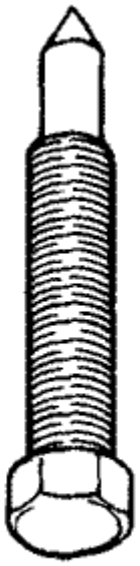
Application	N•m	lb-ft	lb-in
Screws			
Liquid Evaporator Pipe Connector Block Retaining Nut	15	11	-
Liquid Pipe Connector Block to Condenser	14	-	124
Pressure Transducer	8	-	71
Receiver Dryer Bolts	14	10	-
Refrigerant Discharge Hose Connector Block Bolt	16	12	-
Refrigerant Discharge Hose Support Clamp Bolt	8	-	71
Refrigerant Suction Hose and the Refrigerant Discharge hose to Compressor Connector Block Retaining Nut (V5 Compressor Only)	33	24	-
Refrigerant Suction Hose to Compressor Connector Block Retaining Nut (SP10 Compressor Only)	33	24	-
Refrigerant Discharge Hose to Compressor Connector Block Retaining Nut (SP10 Compressor Only)	33	24	-
Refrigerant Suction Hose Connector Block Retaining Nut	14	-	124
Upper Condenser Mount Nut	3	-	27

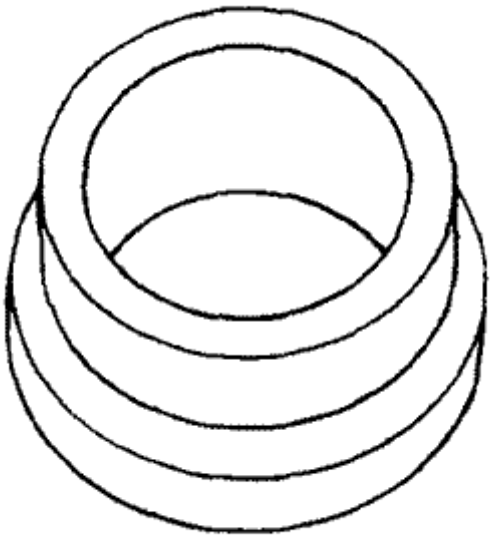
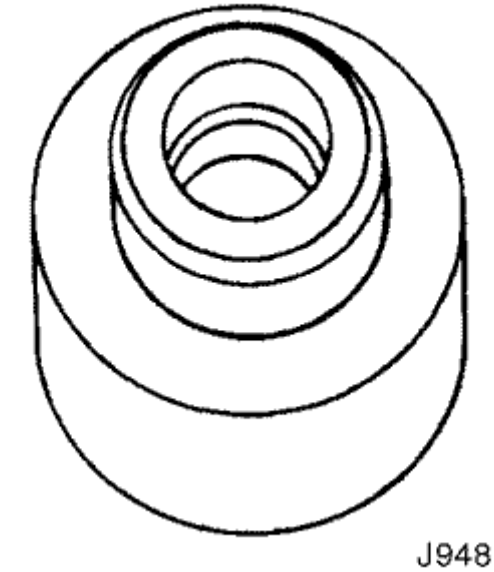
SPECIAL TOOLS

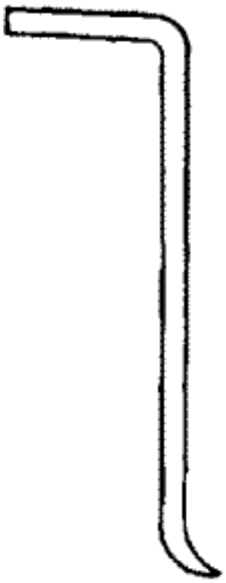
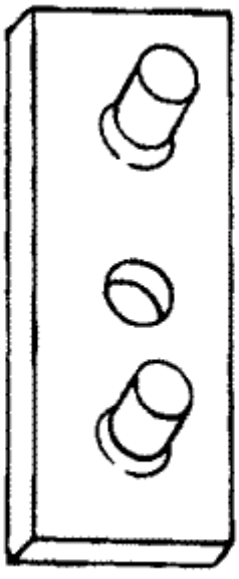
Special Tools Table

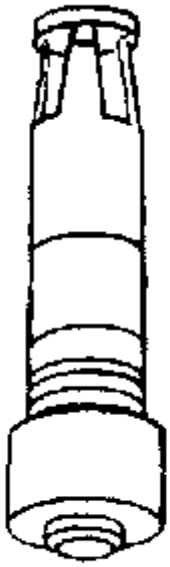
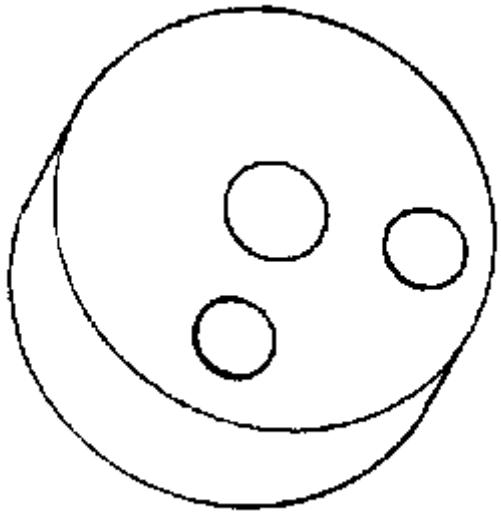
 J5403	J-5403 Snap Ring Pliers

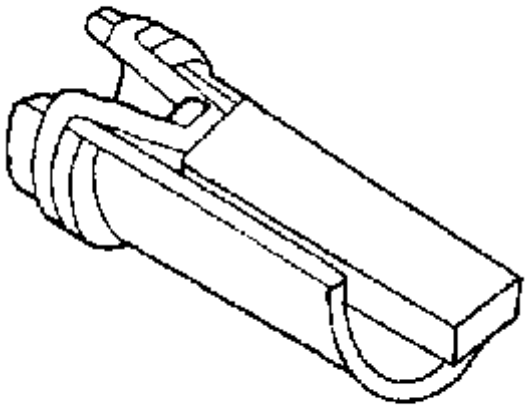
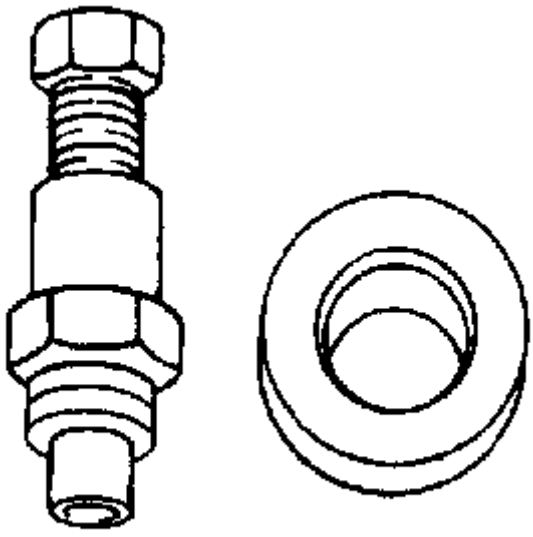
 J6083	J-6083 Snap Ring Pliers
 J8092	J-8092 Driver Handle
	J-8433-1 Puller Crossbar

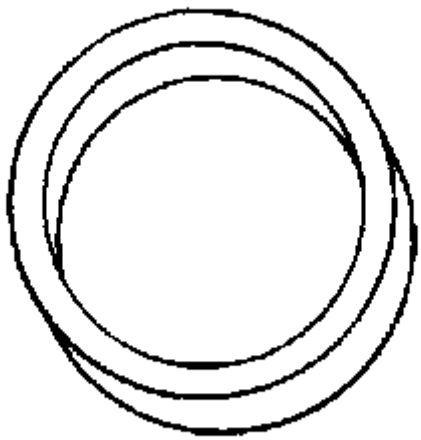
 J84331	
 J84333	J-8433-3 Forcing Screw
	J-9398-A Bearing Remover

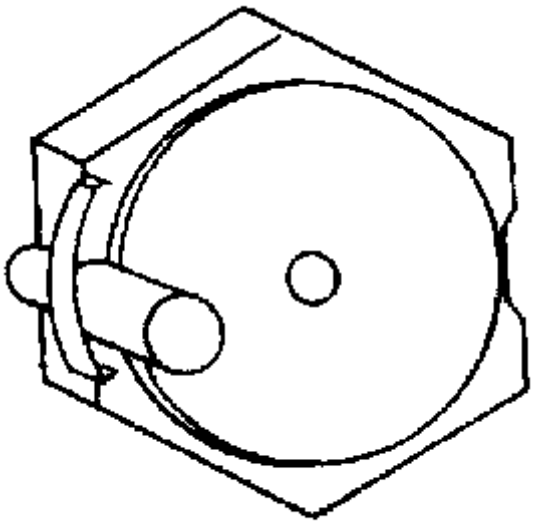
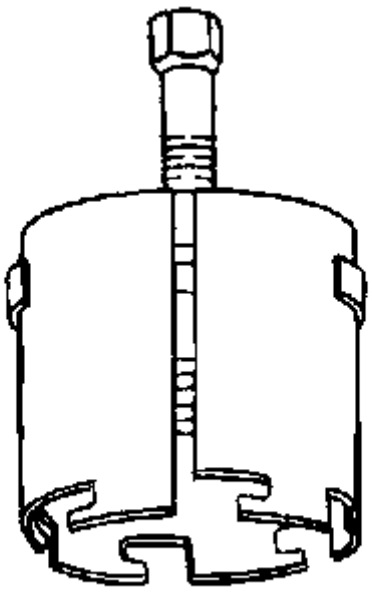
 J9398A	
 J9481	J-9481 Bearing Installer
	J-9553-1 O-Ring Remover

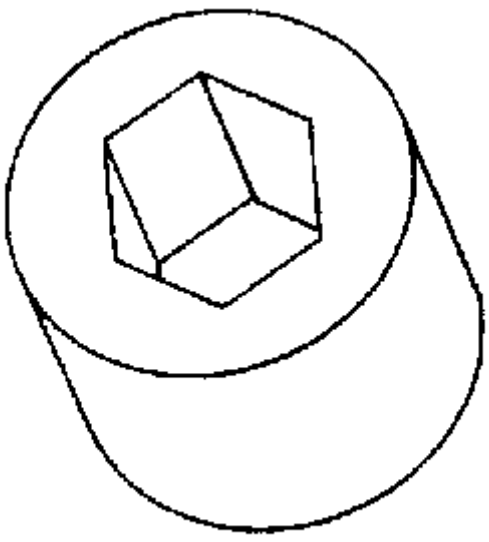
 J95531	
 J9625A	J-9625-A Pressure Test Set
	J-23128-A Seal Seat Remover and Installer

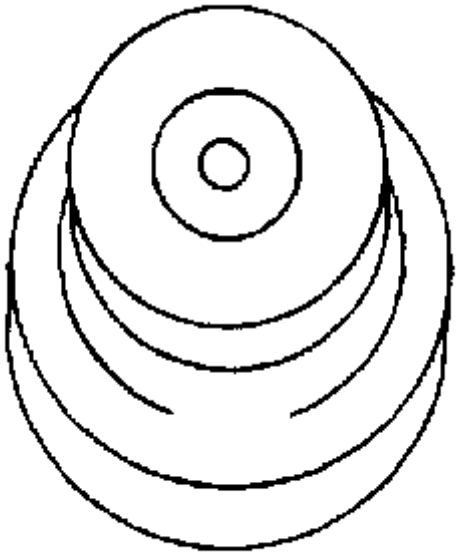
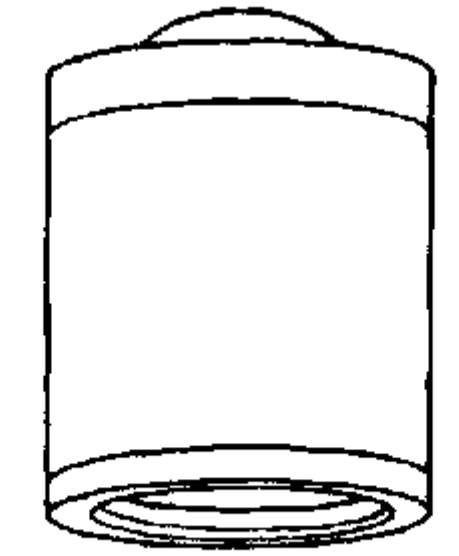
 J23128A	
 J35372	J-35372 Support Block
	J-33011 O-Ring Installer

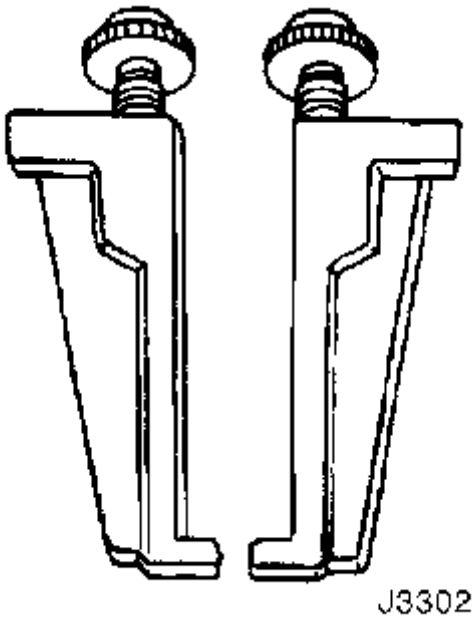
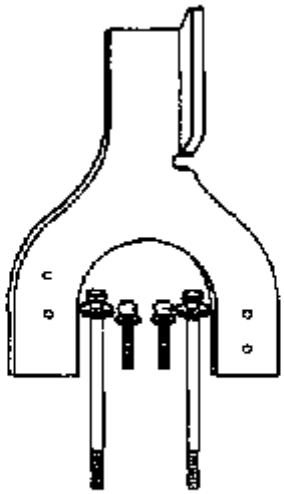
 J33011	
 J33013B	J-33013-B Hub and Drive Plate Remover and Installer
	J-34993 Cylinder Alignment Rods

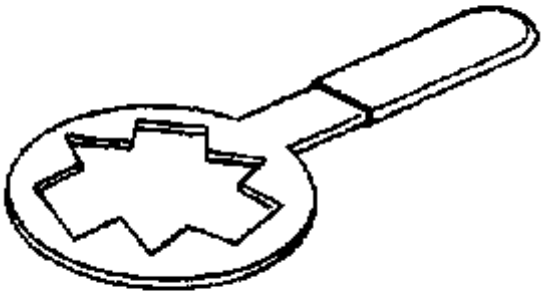
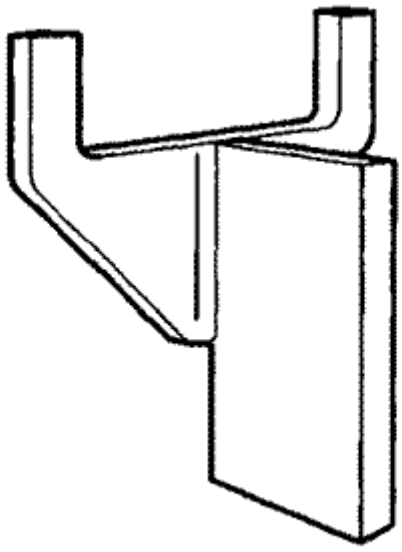
 J34993	
 J33017	J-33017 Pulley Rotor and Bearing Assembly Installer
	J-33019 Bearing Staking Tool Set Includes:

 J33019	J-33019-1 Bearing Staking Guide J-33019-2 Bearing Staking Pin
 J33020	J-33020 Pulley Puller
	J-34614 Shaft Seal Protector

 J34614	
 J33022	J-33022 Shaft Nut Socket
	J-33023-A Puller Pilot

 J33023A	
 J33024	J-33024 Clutch Coil Installer Adapter
	J-33025 Clutch Coil Puller Legs

	
	J-34992 Compressor Holding Fixture
	J-33027 Clutch Hub Holding Tool

 J33027	
 J42428	J-42428 Compressor Holding Fixture
	DW-610-010 Clutch Hub Holding Tool (for SP10 compressor)

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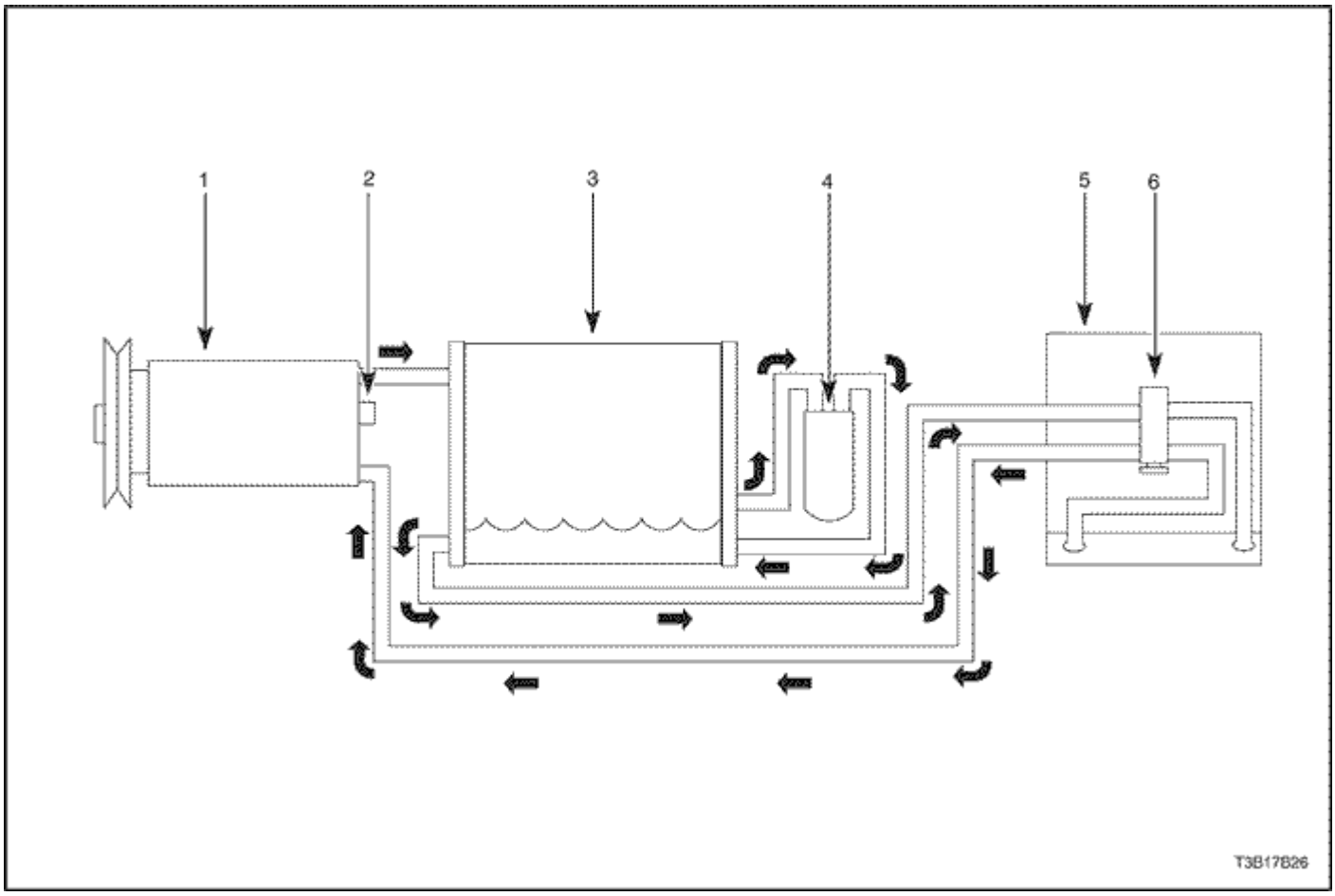
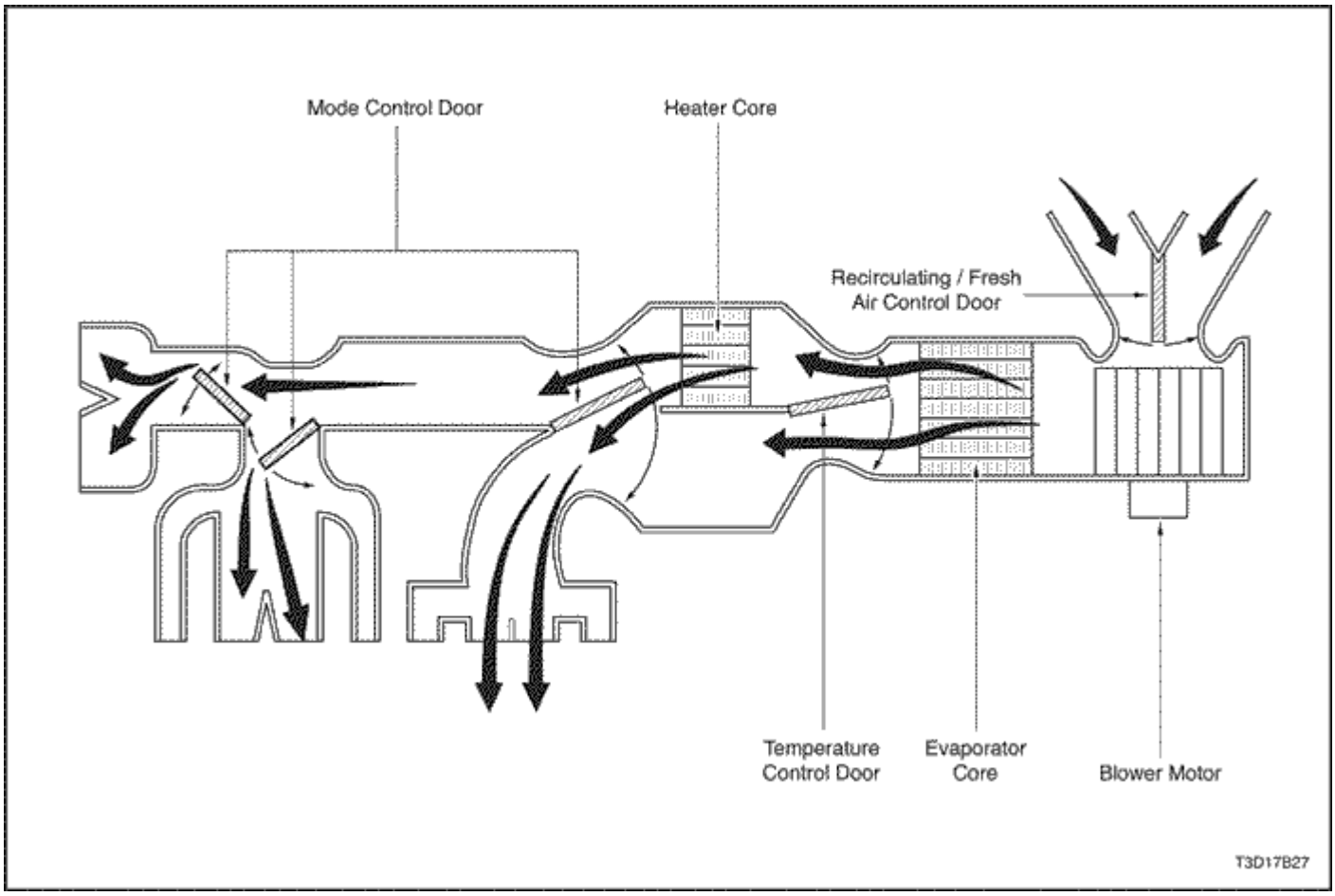
SCHEMATIC AND ROUTING DIAGRAMS

A/C Refrigerant System (Typical)

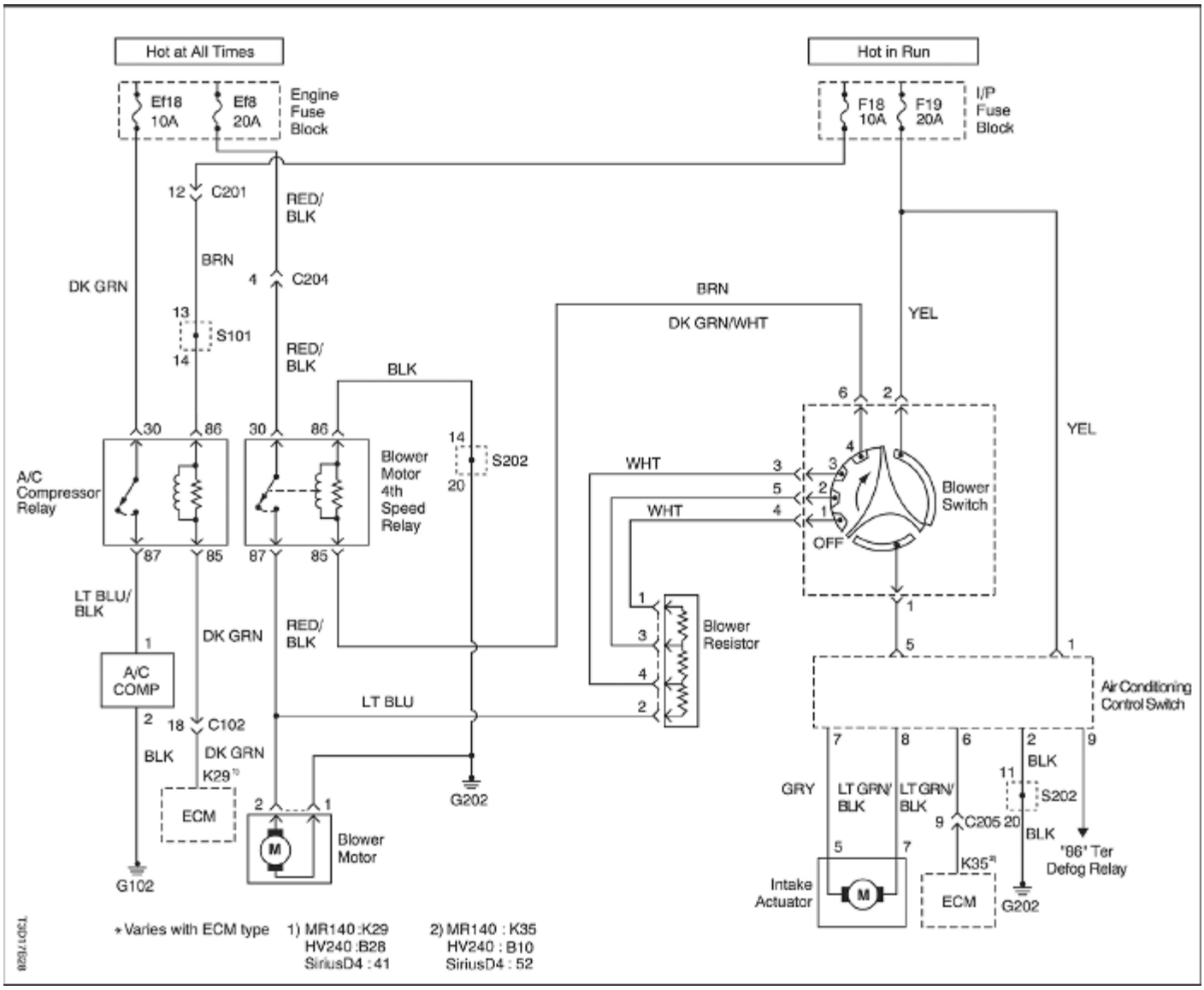


1. Compressor
2. Pressure Relief Valve
3. Condenser
4. Receiver-Dryer
5. Evaporator
6. Expansion Valve

A/C Airflow (Typical)



A/C Schematic



DIAGNOSIS

GENERAL DIAGNOSIS

Testing the Refrigerant System

If you suspect a problem in the refrigerant system, check for the following conditions:

1. Check the outer surfaces of the radiator and the condenser cores to be sure that the airflow is not blocked by dirt, leaves, or other foreign material. Check between the condenser and the radiator, as well as all outer surfaces.

2. Check for restrictions or kinks in the condenser core, the hoses, and the tubes.
3. Check the operation of the blower fan.
4. Check all the air ducts for leaks or restrictions. A low airflow rate may indicate a restricted evaporator core.
5. Check for slippage of the compressor clutch.
6. Check the drive belt tension.

Insufficient cooling "Quick Check" Procedure

Perform the following "hand-feel" procedure to get a quick idea of whether the air conditioning (A/C) system has the proper charge of Refrigerant-134a. The air temperature must be above 21°C (70°F) for most models.

1. Warm up engine. Run the engine at idle.
2. Open the hood and all the doors.
3. Turn the A/C switch ON.
4. Set the temperature control to the full cold position.
5. Set the blower speed switch on 4.
6. "Hand-feel" the temperature of the evaporator outlet pipe. The pipe should be cold.
7. Check for other problems. Refer to "Testing the Refrigerant System" in this section.
8. Leak check the system. Refer to "Leak Testing the Refrigerant System" in this section. If you find a leak, discharge the system and repair the leak as required. After completing the repair, evacuate and charge the system.
9. If there is no leak, refer to "Insufficient Cooling Diagnosis" in this section.

A/C Performance Test (V5 System)

RELATIVE HUMIDITY (%)	AMBIENT AIR TEMPERATURE		LOW SIDE PRESSURE		ENGINE SPEED (RPM)	CENTER DUCT AIR TEMPERATURE		HIGH SIDE PRESSURE	
	°C	°F	Psi	Kpa		°C	°F	Psi	Kpa
	21	70	25	170		4	39	162	1117
20	27	81	26	180	2000	6	43	210	1448
	32	90	30	210		8	46	263	1810
	38	100	36	250		12	54	325	2240
	21	70	25	170		5	41	165	1138
30	27	81	26	180	2000	7	45	225	1551
	32	90	32	220		10	50	278	1920

RELATIVE HUMIDITY (%)	AMBIENT AIR TEMPERATURE		LOW SIDE PRESSURE		ENGINE SPEED (RPM)	CENTER DUCT AIR TEMPERATURE		HIGH SIDE PRESSURE	
	°C	°F	Psi	Kpa		°C	°F	Psi	Kpa
	38	100	39	270		15	59	336	2320
	21	70	25	170		6	43	176	1214
40	27	81	28	190	2000	8	46	235	1620
	32	90	33	230		11	52	286	1970
	38	100	42	290		16	61	342	2360
	21	70	25	170		7	45	190	1310
50	27	81	29	200	2000	9	48	238	1640
	32	90	36	250		13	55	292	2010
	38	100	46	320		18	64	364	2510
	21	70	25	170		8	46	195	1345
60	27	81	29	200	2000	9	48	244	1680
	32	90	39	270		14	57	312	2150
	38	100	52	360		21	70	380	2620
	21	70	26	180		8	46	200	1379
70	27	81	33	230	2000	10	50	249	1720
	32	90	42	290		15	59	318	2190
	38	100	54	370		21	70	384	2650
	21	70	26	180		9	48	213	1469
80	27	81	33	230	2000	12	54	254	1750
	32	90	46	320		17	63	325	2240
	21	70	26	180		9	48	225	1551
90	27	81	35	240	2000	13	55	261	1800
	32	90	49	340		19	66	341	2350

* Test Conditions : Doors & hood opened, A/C ON, Recirculation mode, Full Cool with maximum Blower speed, No Sunlight, Wind velocity at 8km/h (5 mph).

A/C Performance Test (SP10 System)

Air Mode	Ambient Air Temperature °C (°F)	Low Side Pressure kPa (psi)	Engine Speed (RPM)	Center Duct Air Temperature °C (°F)	High Side Pressure kPa (psi)
Recirculation Mode		270 (39)	880	15.7 (60.3)	1924 (279)
	38 (100)	116 (17)	1900	4.2~4.9 (39.6~40.8)	1238 (180)
		131 (19)	2400	4.2~7.1 (39.6~44.8)	1170 (170)

Air Mode	Ambient Air Temperature °C (°F)	Low Side Pressure kPa (psi)	Engine Speed (RPM)	Center Duct Air Temperature °C (°F)	High Side Pressure kPa (psi)
		108 (16)	3300	6.4~7.1 (43.5~44.8)	1072 (155)
Outside Air Mode		441 (64)	880	26.3 (79.3)	2138 (310)
	38 (100)	253 (37)	1900	16.7 (62.1)	1436 (208)
		229 (33)	2400	15.4 (59.7)	1376 (200)
		200 (29)	3300	14.6 (58.3)	1390 (202)

Pressure-Temperature Relationship of R-134A

Temperature °C (°F)*	Pressure kPa (psi)*	Temperature °C (°F)*	Pressure kPa (psi)*
-8.89 (16)	105.70 (15.33)	37.78 (100)	856.84 (124.27)
-7.78 (18)	114.87 (16.66)	38.89 (102)	886.56 (128.58)
-6.67 (20)	124.32 (18.03)	40.00 (104)	916.35 (132.98)
-5.56 (22)	134.11 (19.45)	41.11 (106)	947.92 (137.48)
-4.44 (24)	144.24 (20.92)	42.22 (108)	979.64 (142.08)
-3.33 (26)	154.65 (22.43)	43.33 (110)	1012.11 (146.79)
-2.22 (28)	165.48 (24.00)	44.44 (112)	1045.21 (151.59)
-1.11 (30)	176.65 (25.62)	45.56 (114)	1079.14 (156.51)
0.00 (32)	188.16 (27.29)	46.67 (116)	1113.75 (161.53)
1.11 (34)	200.02 (29.01)	47.78 (118)	1149.12 (166.66)
2.22 (36)	212.30 (30.79)	48.89 (120)	1185.18 (171.89)
3.33 (38)	224.98 (32.63)	50.00 (122)	1222.07 (177.24)
4.44 (40)	238.08 (34.53)	51.11 (124)	1259.72 (182.70)
7.22 (45)	272.49 (39.52)	52.22 (126)	1298.12 (188.27)
10.00 (50)	309.58 (44.90)	53.33 (128)	1337.35 (193.96)
12.77 (55)	349.51 (50.69)	54.44 (130)	1377.35 (199.76)
15.56 (60)	392.33 (56.90)	57.22 (135)	1480.91 (214.78)
18.33 (65)	438.18 (63.55)	60.00 (140)	1589.57 (230.54)
21.11 (70)	487.27 (70.67)	62.78 (145)	1703.62 (247.08)
23.89 (75)	539.67 (78.27)	65.56 (150)	1823.04 (264.40)
26.67 (80)	609.38 (88.38)	68.33 (155)	1948.04 (282.53)
29.44 (85)	655.09 (95.01)	71.11 (160)	2078.77 (301.49)
32.22 (90)	718.39 (104.19)	73.89 (165)	2215.29 (321.29)
35.00 (95)	785.61 (113.94)	76.67 (170)	2357.81 (341.96)

* All values rounded to two decimal places.

EVAPORATOR RANGE: From -6.67 to 7.22°C (20 to 45°F), the temperatures represent the gas temperatures inside the coil and not on the coil surfaces.

Add 1.67 to 5.56°C (3 to10°F) the temperature for coil and air-off temperatures.
CONDENSER RANGE: From 110 to 160°F, temperatures are not ambient. Add 19.4 to 22.2°C (35 to 40°F) for proper heat transfer, then refer to the pressure chart.
Example:

32°C (90°F) ambient temperature + 22°C (40°F) = 54°C (130°F)
Condenser temperature = 1379 kPa (200 psi)
Based on 48.3 km/h (30 mph) airflow.

Leak Testing The Refrigerant System
Test for leaks whenever you suspect a refrigerant leak in the system. You should also test for leaks whenever you perform a service operation which results in disturbing the lines or the connections. Leaks are commonly found at the refrigerant fittings or at the connections. Leaks are commonly caused by the following problems:

- Improper torque.
- Damaged O-ring seals.
- Dirt or lint on the O-ring seals.

Liquid Leak Detectors
Use a liquid leak detector solution on locations such as fittings. Apply the solution to the area in question with the swab that is supplied with the solution. Look for bubbles to appear. This will indicate the existence and location of any leak.
For areas where this is not practical, such as sections of the evaporator and the condenser, an electronic leak detector is more useful.
Electronic Leak Detectors
Follow the manufacturer's instructions for calibration, operation, and maintenance of an electronic leak detector. Battery condition is especially important to the accuracy of a portable model. Set the detector to R-134a before beginning the test.
Important : Electronic leak detectors are sensitive to windshield washing solutions, solvents and cleaners, and certain vehicle adhesives.
Surfaces must be clean to prevent false readings. Make sure that all surfaces are dry to prevent damage to the detector.
General Testing Instructions

- Follow the entire path of the refrigerant system.
- Completely circle each joint at 25 to 50 mm (1 to 2 inches) per second.
- Hold the probe tip within 6 mm (1/4 inch) of the surface.
- Do not block the air intake.

The audible tone changes from one to two clicks per second into a solid alarm if there is a leak. Adjust the balance control to maintain one to two clicks per second.
Test all of the following areas, even after one leak has been confirmed:

- Evaporator inlet and outlet.
- Receiver-drier inlet and outlet.
- Condenser inlet and outlet.
- Brazed and welded areas.
- Damaged areas.
- Hose couplings.
- Compressor rear head.
- All fittings and joints.

Testing Service Ports/Access Valves
The sealing cap is the primary seal for the service ports. This cap contains a special leak-free O-ring. Make sure that this cap is not missing or loose. Always use the correct cap.
Testing the Evaporator Core
Leaks in the evaporator core are difficult to find. Test the evaporator core using the following procedure:

1. Run the blower fan at speed setting 4 for at least 15 minutes.
2. Turn the blower to the OFF position.
3. Wait for 10 minutes.
4. Remove the blower motor resistor. Refer to "Blower Motor Resistor" in this section.
5. Insert the leak detector probe as close as possible to the evaporator core. The detector will indicate a leak with a solid alarm.
6. Use a flashlight to search for refrigerant oil in the core surface.

Testing the Compressor Shaft Seal

1. Blow shop air behind and in front of the compressor clutch/pulley for at least 15 seconds.
2. Wait 1 to 2 minutes.
3. Probe the area in front of the pulley. If the detector emits a solid alarm, there is a leak.

Air Conditioning System Diagnosis
Insufficient Cooling Diagnosis (1.4S/1.4D/1.5S V5 System)

Step	Action	Value(s)	Yes	No

Step	Action	Value(s)	Yes	No
1	Can you verify the customer complaint?	-	Go to *Step 2*	System OK
2	1. Check the A/C fuse. 2. Check the blower fan operation. 3. Check the engine cooling fan operation. 4. Check the A/C compressor belt. 5. Check the A/C condenser for restricted airflow. 6. Check the clutch coil connection. 7. Repair or replace any components as needed. 8. Check the discharge air temperature with the A/C turned on. Is the discharge air temperature normal?	At least 7°C (13°F) below ambient air temperature	System OK	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Connect the high and the low pressure gauges. Are both pressures within the value specified?	69-345 kPa (10-50 psi)	Go to *Step 4*	Go to *Step 5*
4	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks as needed. 3. Recover, evacuate, and recharge the A/C system. Are both pressures above the value specified?	345 kPa (50 psi)	Go to *Step 7*	-
5	Observe the two pressure gauges. Are both pressures below the value specified?	69 kPa (10 psi)	Go to *Step 6*	Go to *Step 7*
6	1. Add 0.45 kg (1 pound) of refrigerant R-134a. 2. Check the A/C system for leaks. 3. Repair any refrigerant leaks as needed. 4. Recover, evacuate, and recharge the A/C system. Are both pressures above the value specified?	345 kPa (50 psi)	Go to *Step 7*	-
7	1. Start the engine and allow it to run at idle. 2. Set the A/C controls to the following positions: o The A/C switch to the ON position. o The fresh air control switch to fresh air (indicator lamp OFF).	-	Go to *Step 8*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
	○ The blower motor to 4. ○ The temperature to full cold. Does the A/C compressor clutch engage?			
8	1. Check for a knocking noise from the A/C compressor. 2. Cycle the A/C compressor ON and OFF in order to verify the source of the noise. Do you hear a loud knocking noise?	-	Go to *Step 9*	Go to *Step 13*
9	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the compressor running normally?	-	Go to *Step 13*	-
10	1. Turn the ignition switch to LOCK. 2. Disconnect the A/C compressor clutch coil connector. 3. Connect a jumper wire from ground to one A/C compressor clutch coil terminal. 4. Connect a fused jumper wire from the positive battery terminal to the other A/C compressor clutch coil terminal. Does the A/C clutch engage?	-	Go to *Step 11*	Go to *Step 12*
11	Repair the electrical circuit to the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to *Step 8*	-
12	Replace the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to *Step 8*	-
13	**Important : Perform this test under garage conditions; 21-32°C (70-90°F) and no sun load. Follow this test carefully for accurate results.** 1. Close all of the windows and the doors of the vehicle. 2. Close all of the windows and the doors of the vehicle. 3. Set the A/C controls to the following positions:	-	Go to *Step 15*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
	○ The A/C switch to the ON position. ○ The fresh air control switch to fresh air. ○ The blower motor to 4. ○ The temperature to full cold. 4. Start the engine and allow it to run at idle for 5 minutes. 5. Feel the evaporator inlet and outlet pipes. Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?			
14	1. Turn the ignition switch to LOCK. 2. Recover the A/C system refrigerant. 3. Examine the high-pressure pipe for an obstruction. 4. Examine the expansion valve for a malfunction if there is no obstruction. 5. Repair the obstruction or replace the expansion valve as needed. 6. Evacuate and recharge the A/C system. 7. Check the A/C system for leaks. 8. Note the discharge air temperature with the A/C ON. Is the discharge temperature normal?	At least 7°C (13°F) below ambient air temperature	Go to *Step 15*	Go to *Step 13*
15	1. Record the low and the high side pressures after the A/C system has been operating for 5 minutes or more and the engine cooling fan is ON. 2. Locate the intersection of the low and the high side pressures. Refer to"Low- and High-Side Pressure Relationship Chart" in this section. Do the low and the high side pressures intersect in the white area of the chart?	-	System OK	Go to *Step 16*
16	Check the high-side and low-side pressures. Do the low- and the high-side pressures intersect in the gray area of the chart?	-	Go to *Step 17*	Go to *Step 20*
17	Feel the liquid pipe between the condenser and the expansion valve.	-	Go to *Step 18*	Go to *Step 19*

Step	Action	Value(s)	Yes	No
	Is the pipe cold?			
18	1. Examine the condenser for any restriction of the airflow. 2. Check the cooling fans for proper operation. 3. Remove the restriction or repair the fan(s) as required. Is the pipe temperature normal now?	-	Go to *Step 13*	-
19	1. Recover, evacuate, and recharge the A/C system. 2. Check the A/C system for leaks. Is the system leak tight?	-	Go to *Step 13*	-
20	Observe the readings on the pressure gauges. Are the A/C compressor high- and the low-side pressures within the specified value of each other?	207 kPa (30 psi)	Go to *Step 21*	Go to *Step 26*
21	1. Run the engine at 3,000 rpm. 2. Set the A/C controls to the following positions: o The A/C switch to the ON position. o The fresh air control switch to fresh air. o The blower motor to 4. o The temperature to full cold. 3. Close all of the windows and the doors of the vehicle. 4. Turn the A/C switch ON and OFF every 20 seconds for 3 minutes. Are the A/C compressor high- and the low-side pressures within the specified value of each other?	207 kPa (30 psi)	Go to *Step 22*	Go to *Step 13*
22	Observe the pressure rise on both gauges and the temperatures of both the compressor suction pipe and the discharge pipe. Is the pressure rise on both gauges slow and the suction pipe warm with the discharge pipe very hot?	-	Go to *Step 25*	Go to *Step 23*
23	1. Turn the ignition switch to LOCK. 2. Confirm that the compressor clutch is disengaged.	-	Go to *Step 25*	Go to *Step 24*

Step	Action	Value(s)	Yes	No
	3. Attempt to turn the clutch driver (not the pulley). Can you turn the clutch driver freely by hand?			
24	1. Start the engine. 2. Observe the low-side pressure gauge while running the engine between 3,000 and 3,800 rpm. Does the low-side pressure rise rapidly?	-	Go to *Step 32*	Go to *Step 25*
25	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. Is the compressor functioning normally?	-	Go to *Step 13*	-
26	Check the low-side pressure. Is the low-side pressure within the specified value?	172-241 kPa (25-35 psi)	Go to *Step 27*	Go to *Step 32*
27	Feel the high-side pipe leading up to the expansion valve connecting block. Is the pipe cold before the connecting block?	-	Go to *Step 28*	Go to *Step 29*
28	1. Check for a restriction in the high-side pipe before the expansion valve. 2. Repair or replace the high-side pipe. Is the pipe performing normally?	-	Go to *Step 13*	-
29	Add the specified amount of refrigerant to the A/C system. Does the cooling performance improve?	0.40 kg (14 ounces)	Go to *Step 30*	Go to *Step 31*
30	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks, as needed. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system leak free?	-	Go to *Step 13*	-
31	1. Recover the refrigerant. 2. Check the expansion valve for obstructions. 3. Repair or replace the expansion valve, as required. 4. Evacuate and recharge the system. 5. Leak check the system.	-	Go to *Step 13*	-

Step	Action	Value(s)	Yes	No
	Is the system leak free?			
32	**Important : Perform this test exactly as described to obtain accurate results.** 1. Run the engine for 5 minutes at 2,000 rpm. 2. Set the A/C controls to the following positions: The A/C switch to the ON position. The fresh air control switch to recirculate (indicator lamp ON). The blower motor to 1. The temperature to full cold. 3. Close all of the windows and the doors of the vehicle. 4. Open the vehicle hood. Is the low-side pressure within the specified value?	172-241 kPa (25-35 psi)	Go to *Step 13*	Go to *Step 33*
33	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor control valve. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system free from leaks?	-	Go to *Step 13*	-

Insufficient Cooling Diagnosis (1.2 SOHC SP10 System)

Step	Action	Value(s)	Yes	No
1	Can you verify the customer complaint?	-	Go to *Step 2*	System OK
2	1. Check the A/C fuse. 2. Check the blower fan operation. 3. Check the engine cooling fan operation. 4. Check the A/C compressor belt. 5. Check the A/C condenser for restricted airflow. 6. Check the slippage of the compressor clutch. 7. Repair or replace any components as needed. 8. Check the A/C system operation.	-	System OK	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	Is the A/C system operation normal?			
3	1. Turn the ignition switch to LOCK. 2. Connect the high and the low pressure gauges. Are both pressures within the value specified?	Low Side Pressure: 200 kPa (29 Psi) High Side Pressure: 1,500 kPa (217.5 Psi)	Go to *Step 8*	Go to *Step 6*
4	Are both pressures above the specified value?	↑	Go to *Step 5*	-
5	Are both pressures within the specified value?	↑	Go to *Step 8*	Go to -
6	Are both pressures below the specified value?	↑	Go to *Step 7*	Go to *Step 4*
7	1. Add the refrigerant R-134a. 2. Check the A/C system for leaks. 3. Repair any refrigerant leaks as needed. 4. Recover, evacuate, and recharge the A/C system. Are both pressure within the specified value?	↑	Go to *Step 8*	-
8	1. Start the engine and allow it to run at idle. 2. Set the A/C controls to following positions. o The A/C switch to the ON position. o The fresh air control switch to fresh air. o The blower motor to 4. o The temperature to full cold. Does the A/C compressor clutch engage?	-	Go to *Step 9*	Go to *Step 11*
9	1. Check for a knocking noise from the A/C compressor. 2. Cycle the A/C compressor ON and OFF in order to verify the source of the noise. Do you hear a loud knocking noise?	-	Go to *Step 10*	Go to *Step 14*
10	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the repair complete?	-	Go to *Step 14*	-

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition switch to Lock. 2. Disconnect the A/C compressor clutch coil connector. 3. Connect a jumper wire from ground to one A/C compressor clutch coil terminal. 4. Connect a fused jumper wire from the positive battery terminal to the other A/C compressor clutch coil terminal. Does the A/C clutch engage?	-	Go to *Step 12*	Go to *Step 13*
12	Repair the electrical circuit to the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to *Step 20*	Go to *Step 13*
13	Replace the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to *Step 9*	Go to *Step 10*
14	**Important : Perform this test under garage conditions; 21-32°C (70-90°F) and no sun load. Follow this test carefully for accurate results.** 1. Close all of the windows and the doors of the vehicle. 2. Close all of the windows and the doors of the vehicle. 3. Set the A/C controls to the following positions: o The A/C switch to the ON position. o The fresh air control switch to fresh air. o The blower motor to 4. o The temperature to full cold. 4. Start the engine and follow it to run at idle for 5 minutes. 5. Feel the evaporator inlet and outlet pipes. Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?	-	Go to *Step 16*	Go to *Step 15*
15	1. Recover the A/C system refrigerant. 2. Replace the expansion valve as needed. 3. Evacuate and recharge the A/C system.	-	Go to *Step 16*	Go to *Step 18*

Step	Action	Value(s)	Yes	No
	4. Check the A/C system for leaks. 5. Note the discharge air temperature with the A/C ON. Is the discharge temperature normal?			
16	Feel the liquid pipe between the condenser and the expansion valve. Is the pipe cold?	-	Go to *Step 19*	Go to *Step 17*
17	1. Remove the restriction of the high pressure side. 2. Check the A/C system for leaks. Is the repair complete?	-	System OK	-
18	1. Recover the A/C system refrigerant. 2. Evacuate and recharge the A/C system. 3. Check the A/C system for leaks. Is the repair complete?	-	System OK	-
19	1. Run the engine at 3,000 rpm. 2. Run the engine at 3,000 rpm. 3. Close all of the windows and doors of the vehicle. 4. Set the A/C controls to the following positions: o The A/C switch to the ON position. o The fresh air control switch to fresh air. o The blower motor to 4. o The temperature to full cold. 5. Turn the A/C switch ON and OFF every 20 seconds for 3 minutes. Are the A/C compressor high and the low side pressures within the specified value of each other?	Low Side Pressure: 200 kPa (29 psi) High Side Pressure: 1,500 kPa (217.5 psi)	System OK	Go to *Step 22*
20	1. Turn the ignition switch to LOCK. 2. Turn the ignition switch to LOCK. 3. Turn the A/C switch to the OFF position. 4. Attempt to turn the clutch driver (not the pulley). Can you turn the clutch driver freely by hand?	-	Go to *Step 23*	Go to *Step 21*

Step	Action	Value(s)	Yes	No
21	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. Is the repair complete?	-	System OK	-
22	1. Add the refrigerant R-134a. Does the cooling performance improve?	-	System OK	Go to *Step 23*
23	1. Recover the A/C system refrigerant. 2. Replace the compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the repair complete?	-	System OK	-

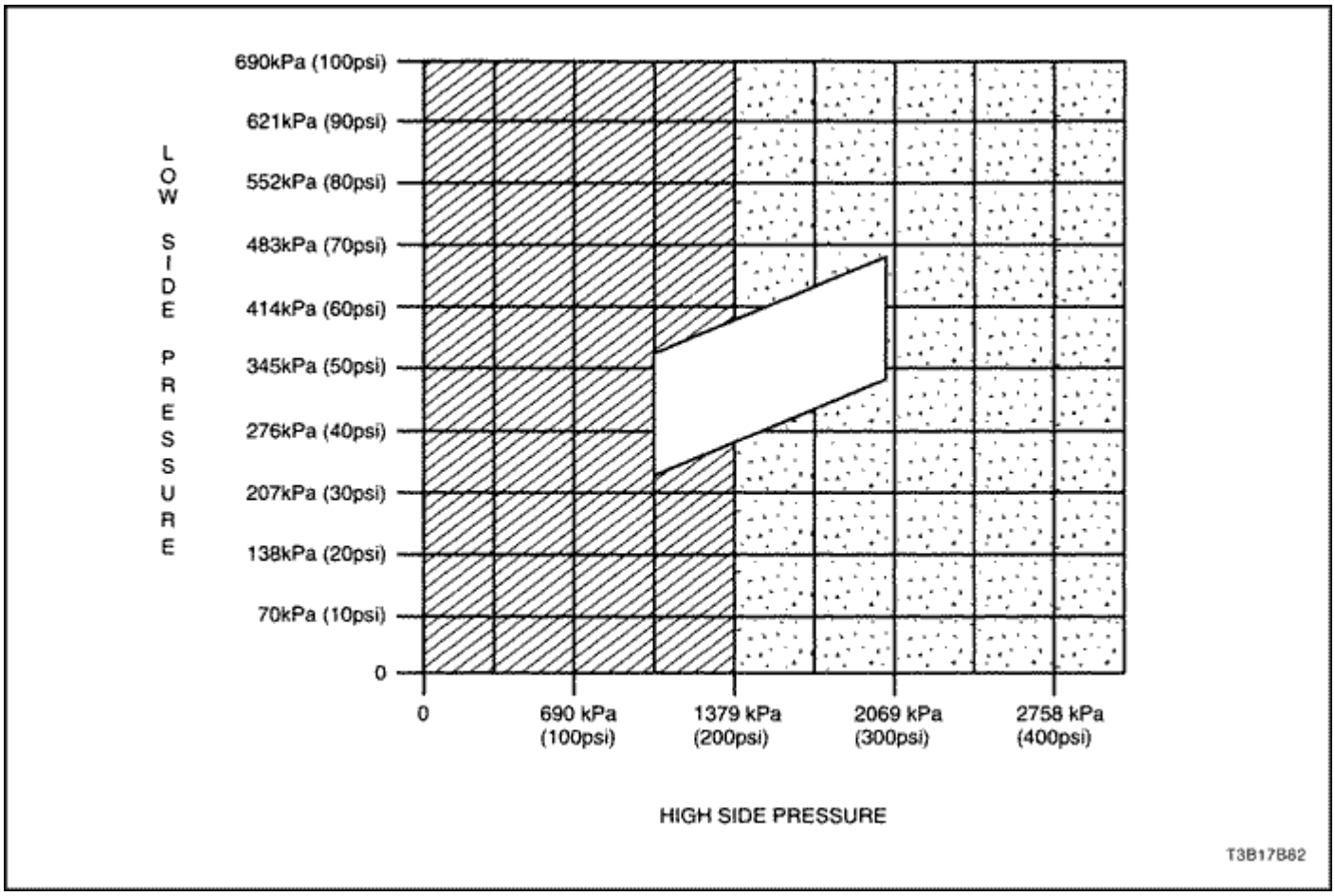
SYMPTOM DIAGNOSIS
Pressure Test Chart (R-134A System)

Test Results	Related Symptioms	Probable Cause	Remedy
Discharge (high) pressure abnormally high	After stopping the compressor, the pressure drops about 299 kPa (28 psig) quickly, then falls gradually.	Air in the system.	Recover, evacuate and recharge the system with the specified amount of refrigerant.
	The condenser is excessively hot.	Excessive refrigerant in the system.	Recover, evacuate and recharge the system with the specified amount of refrigerant.
	Reduced or no airflow through the condenser.	Condenser or the radiator fins are clogged.	Clean the condenser or the radiator fins.
		Condenser or the radiator fan is not working properly.	Check the voltage and the fan rpm. Check the fan direction.
	Line to the condenser is excessively hot.	Restricted flow of refrigerant in the system.	Locate and repair the restriction.
Discharge pressure abnormally low	The condenser is not hot.	Insufficient refrigerant in the system.	Check the system for a leak. Charge the system.
	High and low pressures are balanced soon after stopping the compressor.	Faulty compressor pressure relief valve.	Repair or replace the compressor.

Test Results	Related Symptioms	Probable Cause	Remedy
	Low-side pressure is higher than normal.	Faulty compressor seal.	
	The outlet of the expansion valve is not frosted.	Faulty expansion valve.	Replace the expansion valve.
	Low pressure gauge indicates vacuum.	Moisture in the system.	Recover, evacuate, and recharge the system.
Suction (low) pressure abnormally low	Condenser is not hot.	Insufficient refrigerant in the system.	Repair the leaks. Recover, evacuate, and recharge the system.
	The expansion valve is not frosted and the lowpressure line is not cold.	Faulty expansion valve.	Replace the expansion valve.
	Low-Pressure gauge indicates a vacuum.	Frozen expansion valve.	
	Discharge temperature is low and the airflow from the vents is restricted.	Evaporator is frozen.	Clear the restricted evaporator case drain.
	The expansion valve is frosted.	Expansion valve is clogged.	Clean or replace the expansion valve.
	The receiver-dryer outlet is cool and the inlet is warm.	Receiver-dryer is clogged.	Replace the receiver-dryer.
Suction pressure abnormally high	Low-pressure hose and check joint are cooler than the temperature around the evaporator.	Expansion valve is opened for too long.	Replace the expansion valve.
		Capillary tube is loose.	
Suction pressure abnormally high	Suction pressure is lowered when the condenser is cooled by water.	Excessive refrigerant in the system.	Recover, evacuate, and recharge the system.
	High and low pressure are equalized as soon as the compressor is stopped and both gauges fluctuate while the compressor is running.	Faulty gasket.	Repair or replace the compressor.
		Faulty high-pressure valve.	

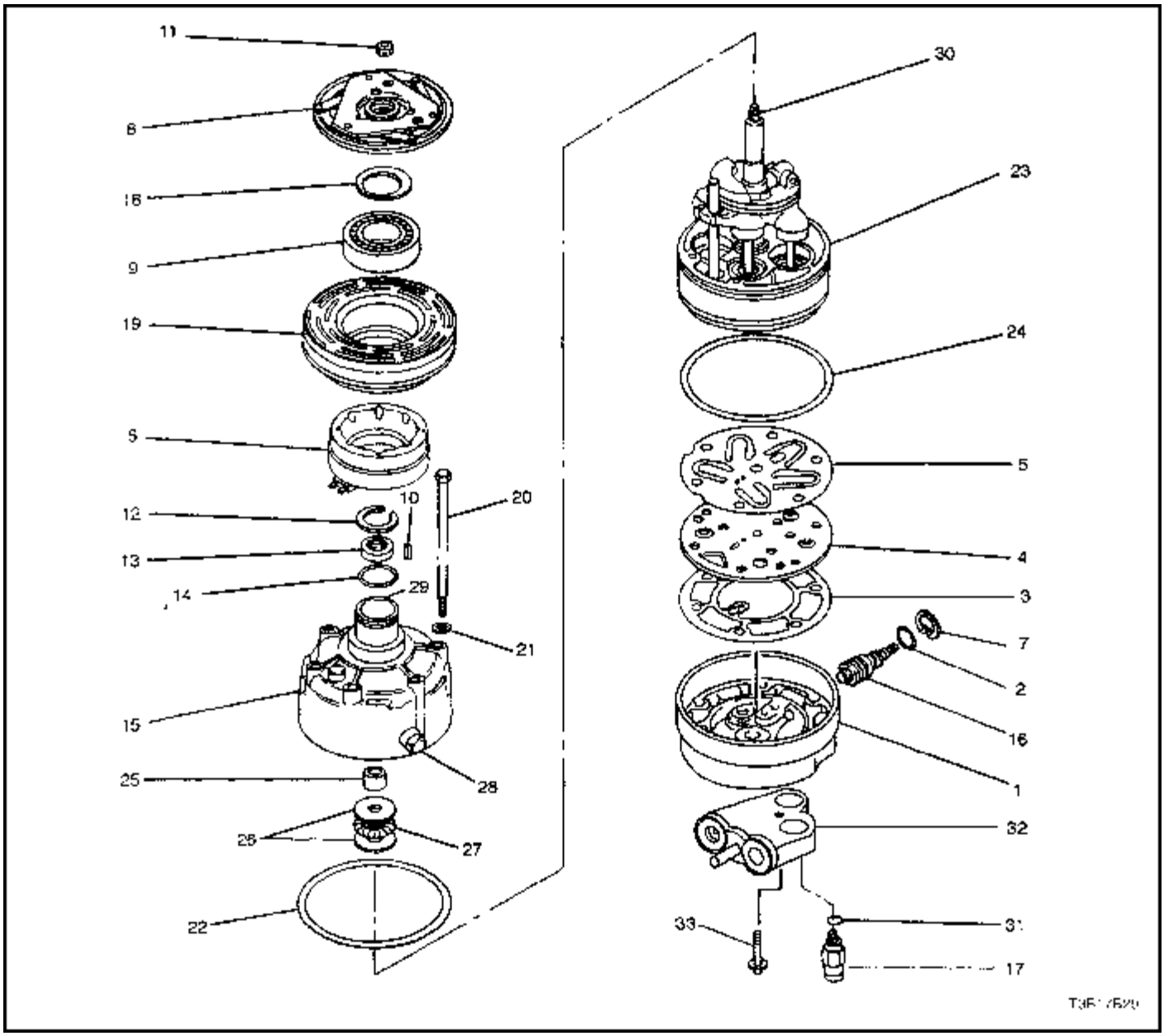
Test Results	Related Symptioms	Probable Cause	Remedy
		(V5 compressor only)	
		Foreign particles stuck in the high-pressure valve. (V5 compressor only)	
Suction and discharge pressure abnormally high	Reduced airflow through the condenser.	Clogged condenser or radiator fins.	Clean the condenser and the radiator.
		Radiator cooling fans working improperly.	Check the voltage and the radiator cooling fan rpm. Check the fan direction.
	Condenser is excessively hot.	Excessive refrigerant in the system.	Recover, evacuate, and recharge the system.
Suction and discharge pressure abnormally low	Low-pressure hose and metal end areas are cooler than the evaporator.	Clogged or kinked low-pressure hose.	Repair or replace the low-pressure hose.
	Temperature around the expansion valve is low compared to that around the receiver-dryer.	Clogged high-pressure line.	Repair or replace the high-pressure line.
Refrigerant leaks	The compressor clutch is dirty.	Leaking compressor shaft seal.	Repair or replace the compressor.
	The compressor bolts are dirty.	Leaking around a compressor housing bolt.	Tighten the bolt(s) or replace the compressor.
	The compressor gasket is wet with oil.	Leaking compressor gasket.	Repair or replace the compressor.

Low and High Side Pressure Relationship Chart



COMPONENT LOCATOR

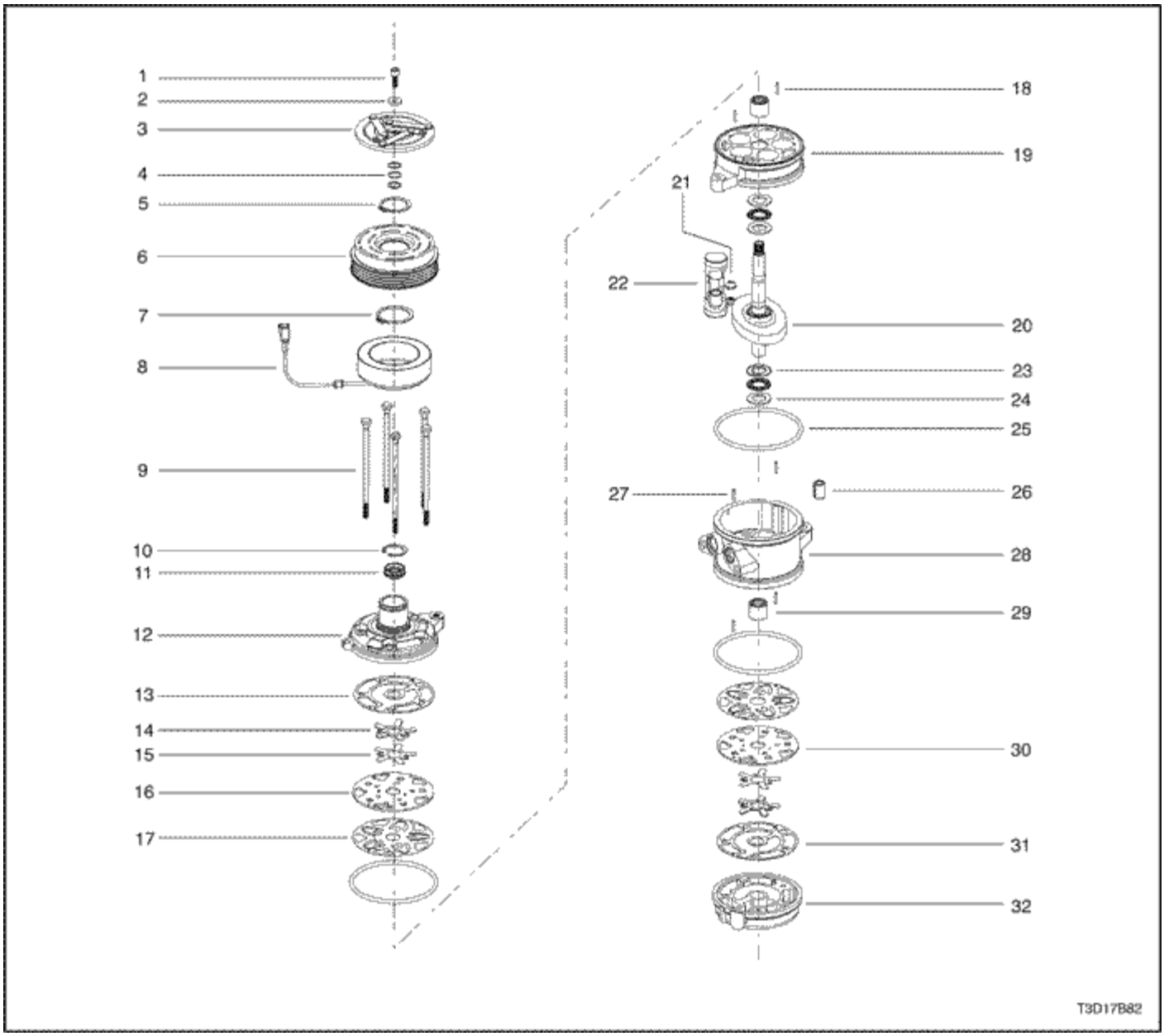
V5 Compressor



1. Rear Head Compressor
2. Control Valve O-Ring
3. Rear Head Gasket
4. Valve Plate
5. Suction Reed
6. Clutch Coil
7. Retaining Ring

8. Drive Plate Clutch
9. Pulley Bearing
10. Clutch Hub Key
11. Shaft Nut
12. Seal Retaining Ring
13. Shaft Lip Seal
14. Shaft Seal O-Ring
15. Compressor Housing
16. Compressor Control Valve
17. Pressure Relief Valve
18. Pulley Bearing to Head Retaining Ring
19. Rotor Pulley
20. Through-Bolt
21. Through-Gasket
22. Compressor Housing-to-Cylinder O-Ring
23. Shaft and Guide Pin Assembly Cylinder
24. Rear Head O-Ring
25. Thrust Washer
26. Race
27. Bearing
28. Oil Drain Plug
29. Clutch and Hub Keyway
30. Compressor Shaft
31. Pressure Relief Valve O-ring
32. Adaptor Compressor
33. Adaptor Bolt

SP10 Compressor



1. Shaft Bolt
2. Shaft Bolt Washer
3. Clutch & Drive Assembly
4. Air Gap Shim
5. Retaining Ring
6. Pulley & Bearing Assembly
7. Retaining Ring

8. Coil & Housing Assembly
9. Through Bolt
10. Retaining Ring
11. Lip Seal Assembly
12. Front Head
13. Front Head Gasket
14. Discharge Reed Retainer
15. Discharge Reed
16. Front Valve Plate
17. Suction Reed
18. Parallel Locating Pin
19. Front Compressor Cylinder
20. Swash Plate & Shaft Assembly
21. Piston Shoe
22. Piston Assembly
23. Thrust Bearing
24. Thrust Bearing
25. Cylinder O-Ring
26. Bushing
27. Roll Locating Pin
28. Rear Compressor Cylinder
29. Main Shaft Bearing
30. Rear Valve Plate
31. Rear Head Gasket
32. Rear Head

SECTION 8A

SEAT BELTS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

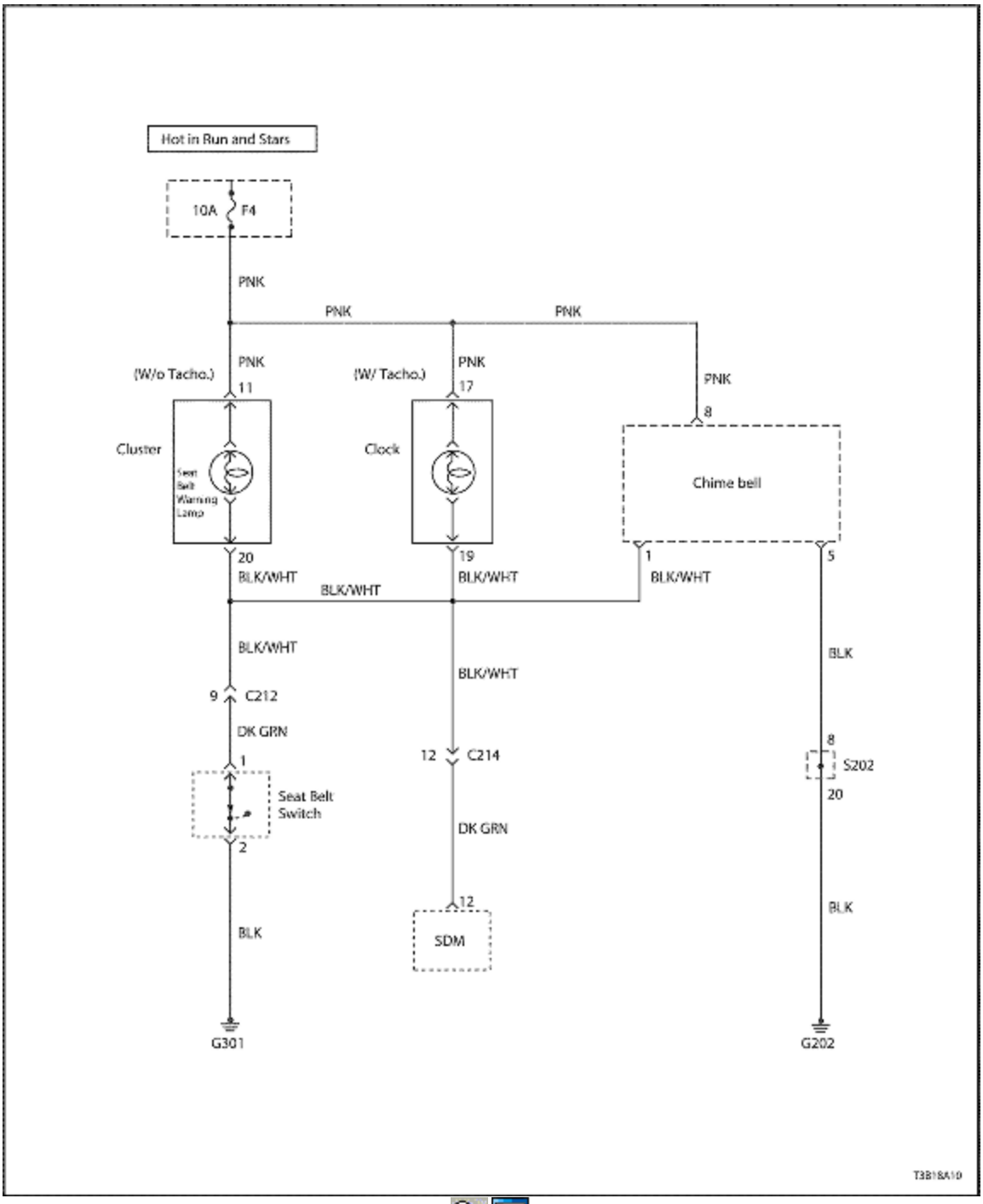
SPECIFICATIONS

Fastener Tightening Specifications

Application	N·m	Lb-Ft	Lb-In
Seat Belt Anchor Bolt	38	28	-
Seat Belt Bracket Screws	10	-	89
Seat Belt Height Adjuster Bolts	23	17	-
Seat Belt Retractor Bolt	38	28	-

SCHEMATIC AND ROUTING DIAGRAMS

Driver Seat Belt Warning



DIAGNOSIS

Seat Belt Warning Lamp is Inoperative

Diagnostic Aids

The chime module is located above the I/P fuse block.

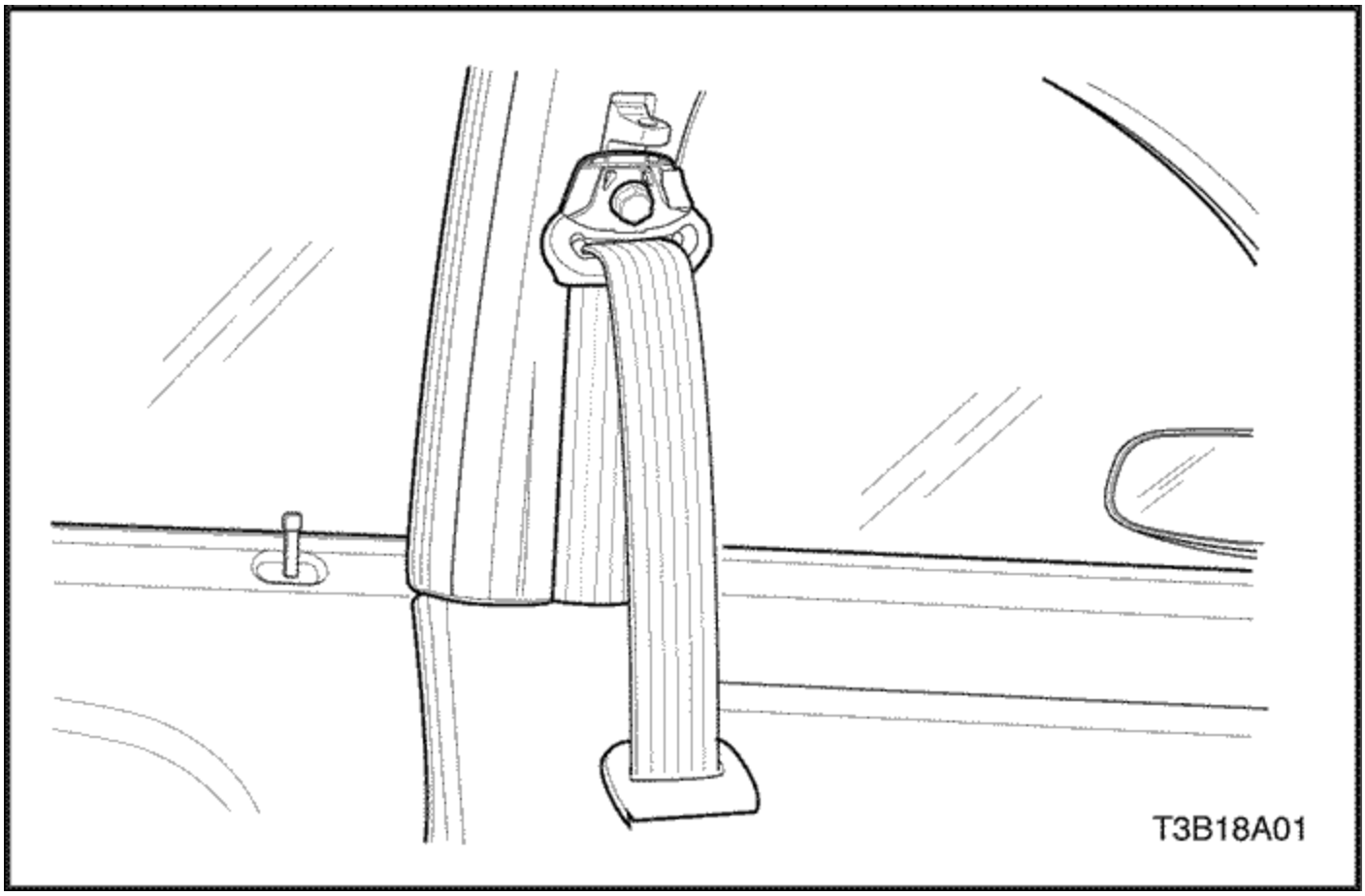
Seat Belt Warning Lamp Is Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuse F4. Is fuse F4 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Use a multimeter to check the voltage at fuse F4. Does the voltmeter show the specified value?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open power supply circuit for fuse F4. Is the repair complete?	-	System OK	-
5	1. Disconnect the chime module connector. 2. Turn the ignition ON. 3. Check the voltage at terminal 8 of the chime module connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between fuse F4 and the chime module. Is the repair complete?	-	System OK	-
7	1. Make sure the seat belt is unfastened. 2. With the chime module connector disconnected, use an ohmmeter to measure continuity between terminal 1 of the chime module and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 8*
8	1. Make sure the seat belt is unfastened. 2. Disconnect the seat belt connector under the driver's seat. 3. Use an ohmmeter to measure between the two terminals at the switch side of the connector. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 9*	Go to *Step 12*
9	While the seat belt connector is disconnected,	≈ 0 Ω	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
	measure the continuity between the terminal for the BLK wire and ground. Does the ohmmeter indicate the specified value?			
10	Repair the open circuit between the seat belt connector and ground. Is the repair complete?	-	System OK	-
11	Repair the open circuit between terminal 1 of the chime module and the seat belt switch. Is the repair complete?	-	System OK	-
12	Replace the seat belt switch. Is the repair complete?	-	System OK	-
13	With the chime module disconnected, use an ohmmeter to measure continuity between terminal 5 of the chime module and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 15*	Go to *Step 14*
14	Repair the open circuit between terminal 5 of the chime module and ground. Is the repair complete?	-	System OK	-
15	Check the seat belt warning lamp. Is the warning lamp OK?	-	Go to *Step 17*	Go to *Step 16*
16	Replace the seat belt warning lamp. Is the repair complete?	-	System OK	-
17	Replace the chime module. Is the repair complete?	-	System OK	-

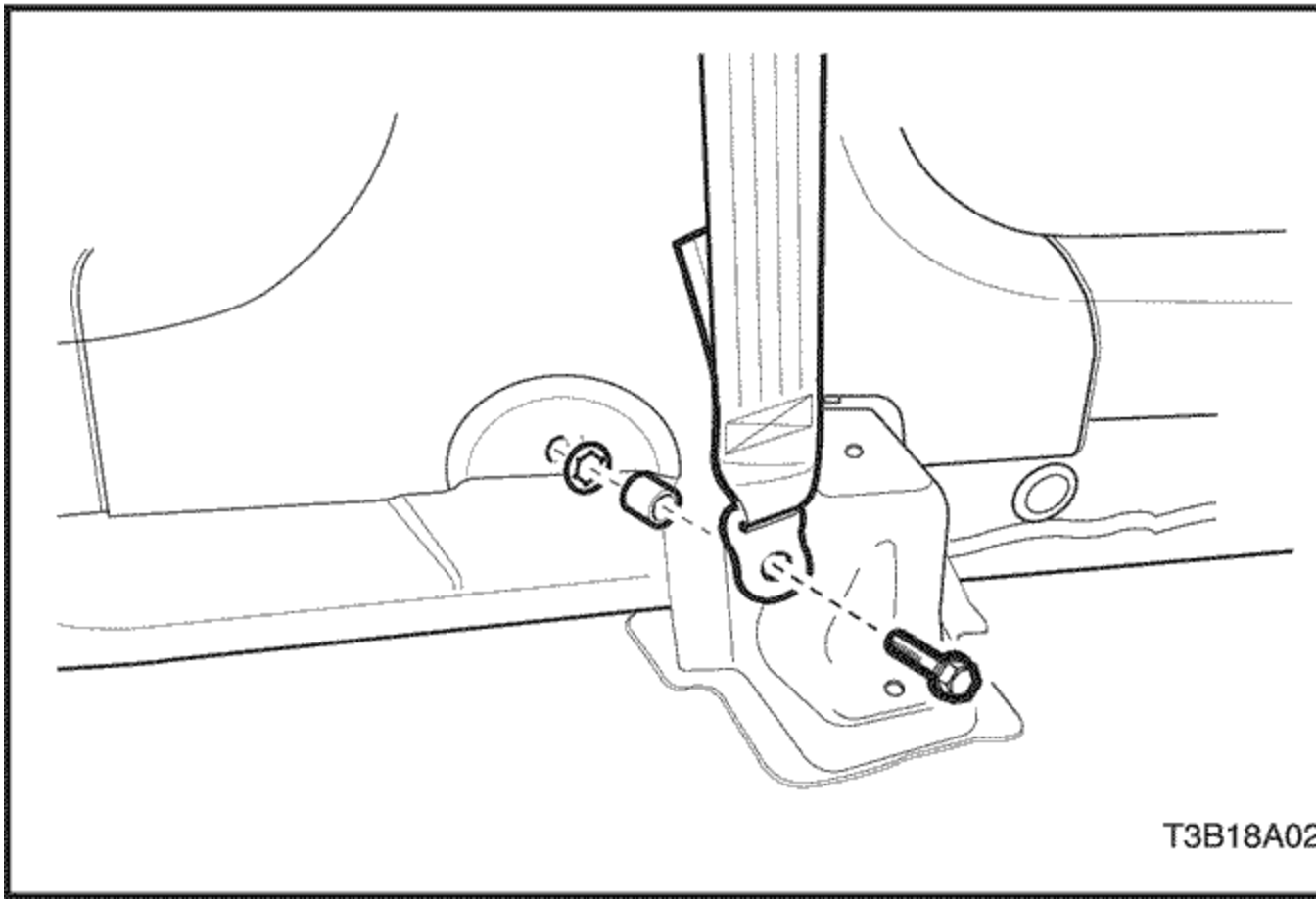
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

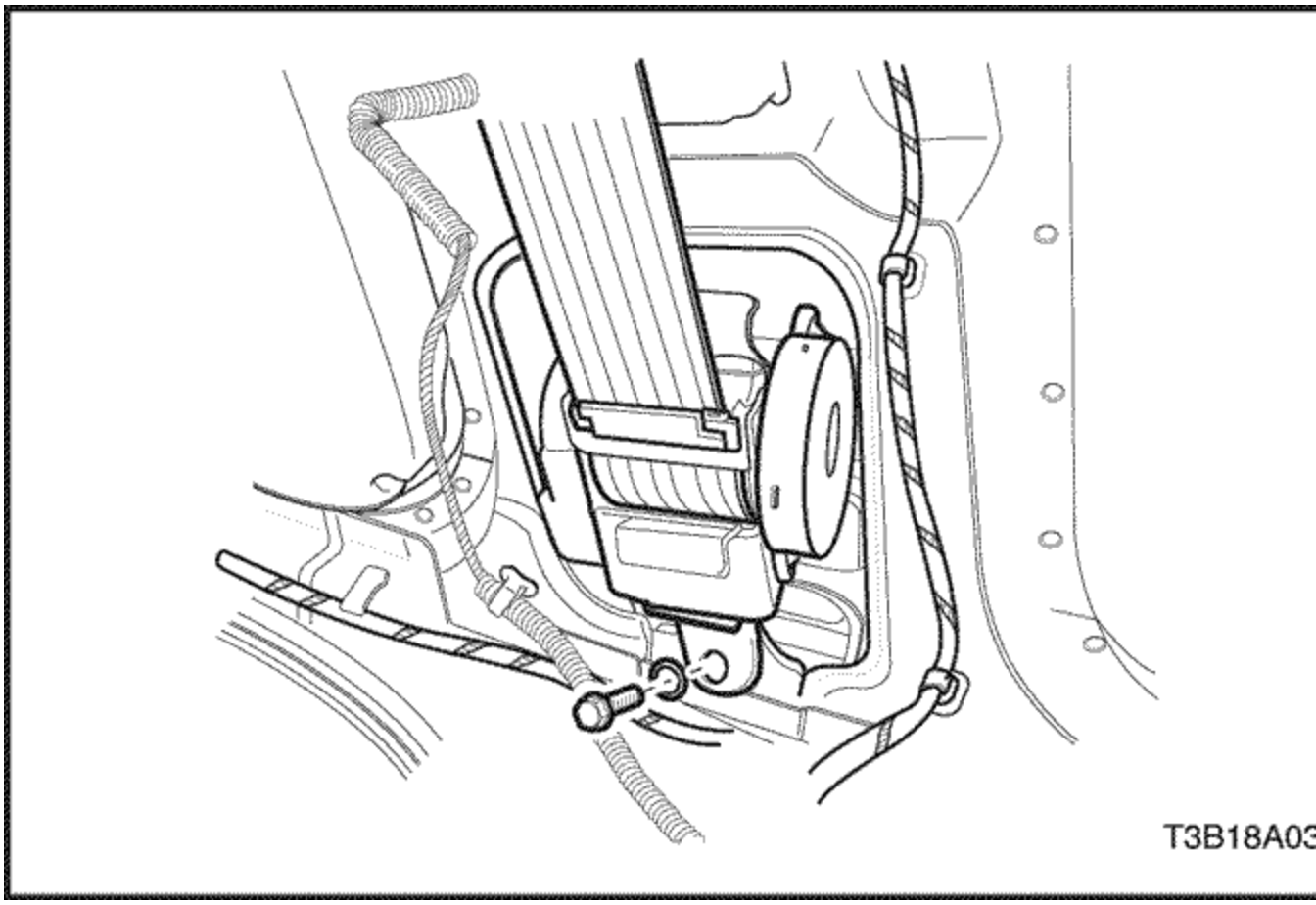


Three-Point Front Seat Belt
Removal Procedure

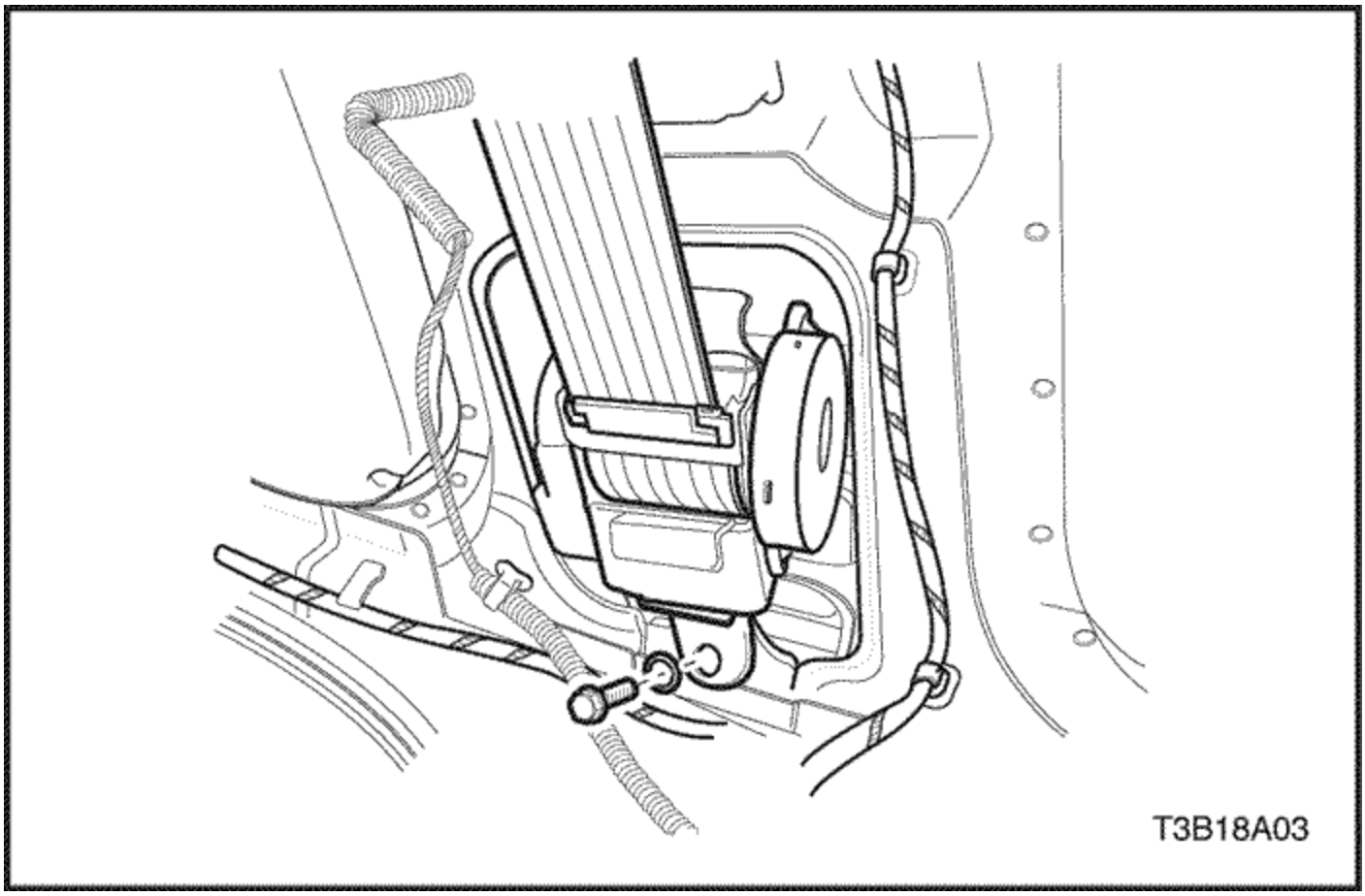
1. Remove the bolt and the seat belt anchor on the upper B-pillar.



2. Remove the lower B-pillar trim panel. Refer to *Section 9G, InteriorTrim.*
3. Remove the bolt and the seat belt anchor on the lower B-pillar.



4. Remove the bolt and the seat belt retractor.

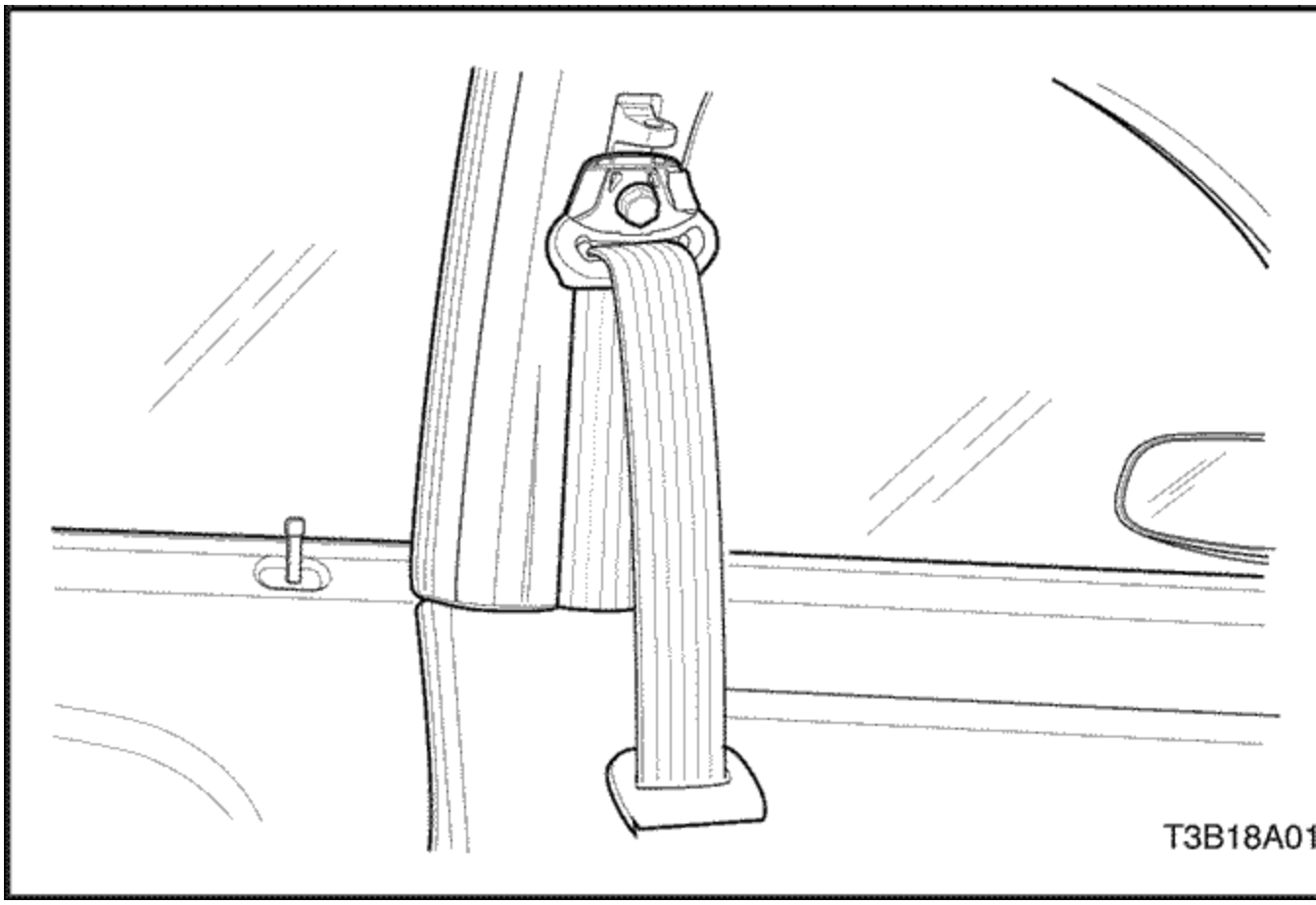


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

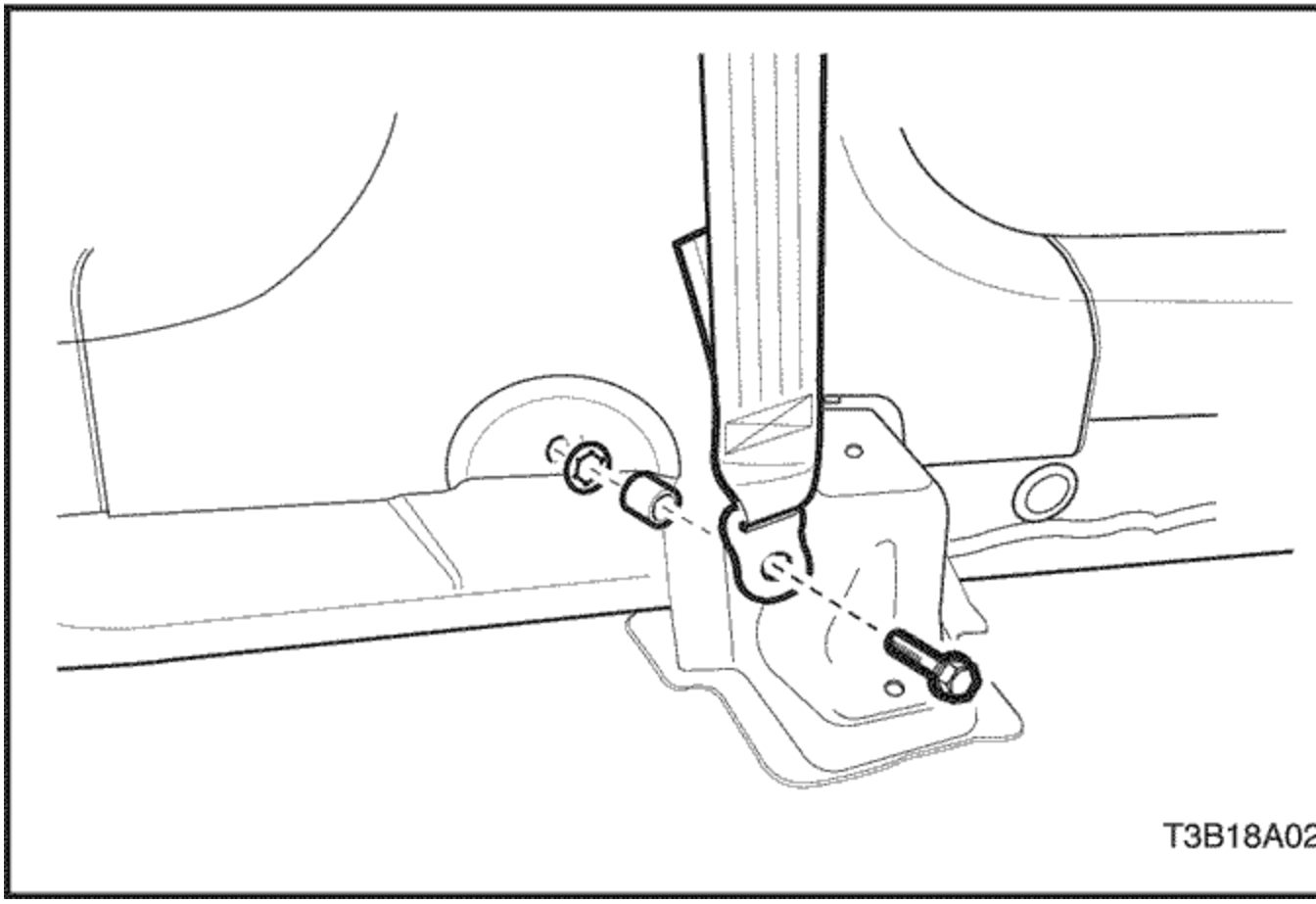
1. Install the seat belt retractor with the bolt.

   Tighten
   Tighten the seat belt retractor bolt to 38 N•m (28 lb-ft).



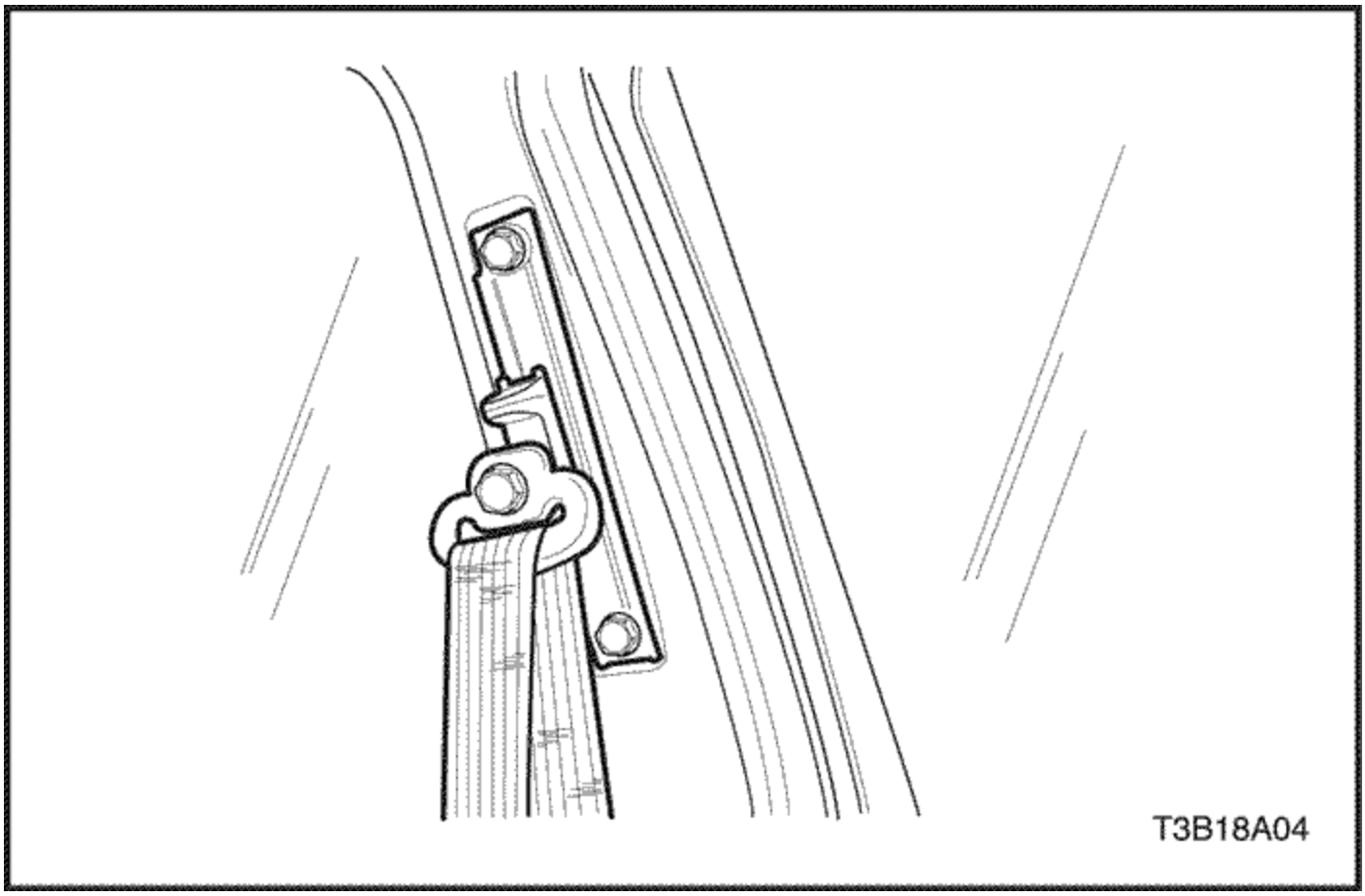
2. Install the seat belt anchor to the upper B-pillar with the bolt.

   Tighten
   Tighten the seat belt anchor bolt to 38 N•m (28 lb-ft).



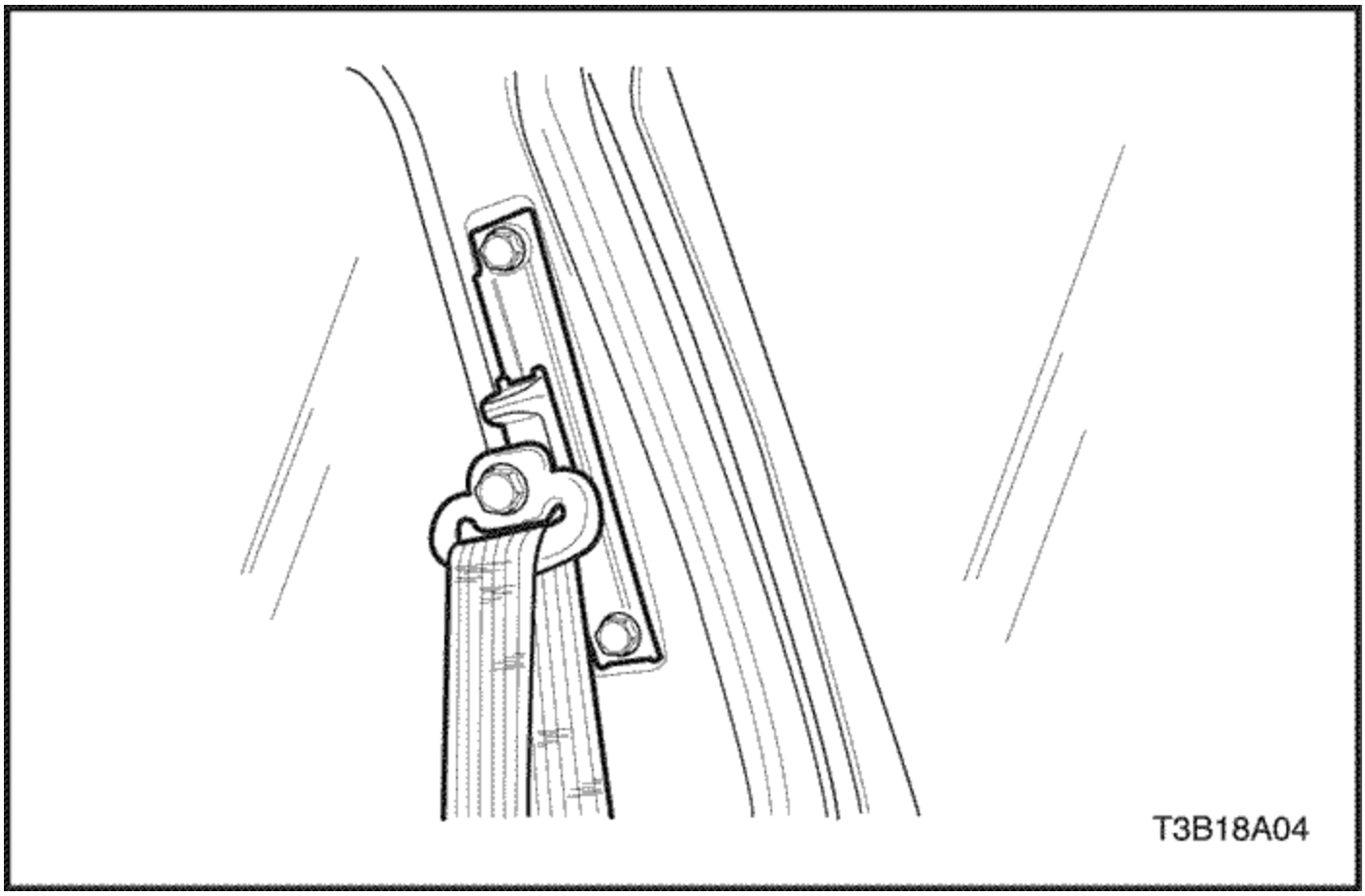
3. Install the lower B-pillar trim panel. Refer to *Section 9G, InteriorTrim.*
4. Install the seat belt anchor to the lower B-pillar with the bolt.

   Tighten
   Tighten the seat belt anchor bolt to 38 N•m (28 lb-ft).



Front Seat Belt Height Adjuster
Removal Procedure

1. Remove the upper B-pillar trim panel. Refer to *Section 9G, InteriorTrim.*
2. Remove the bolts and the seat belt height adjuster.



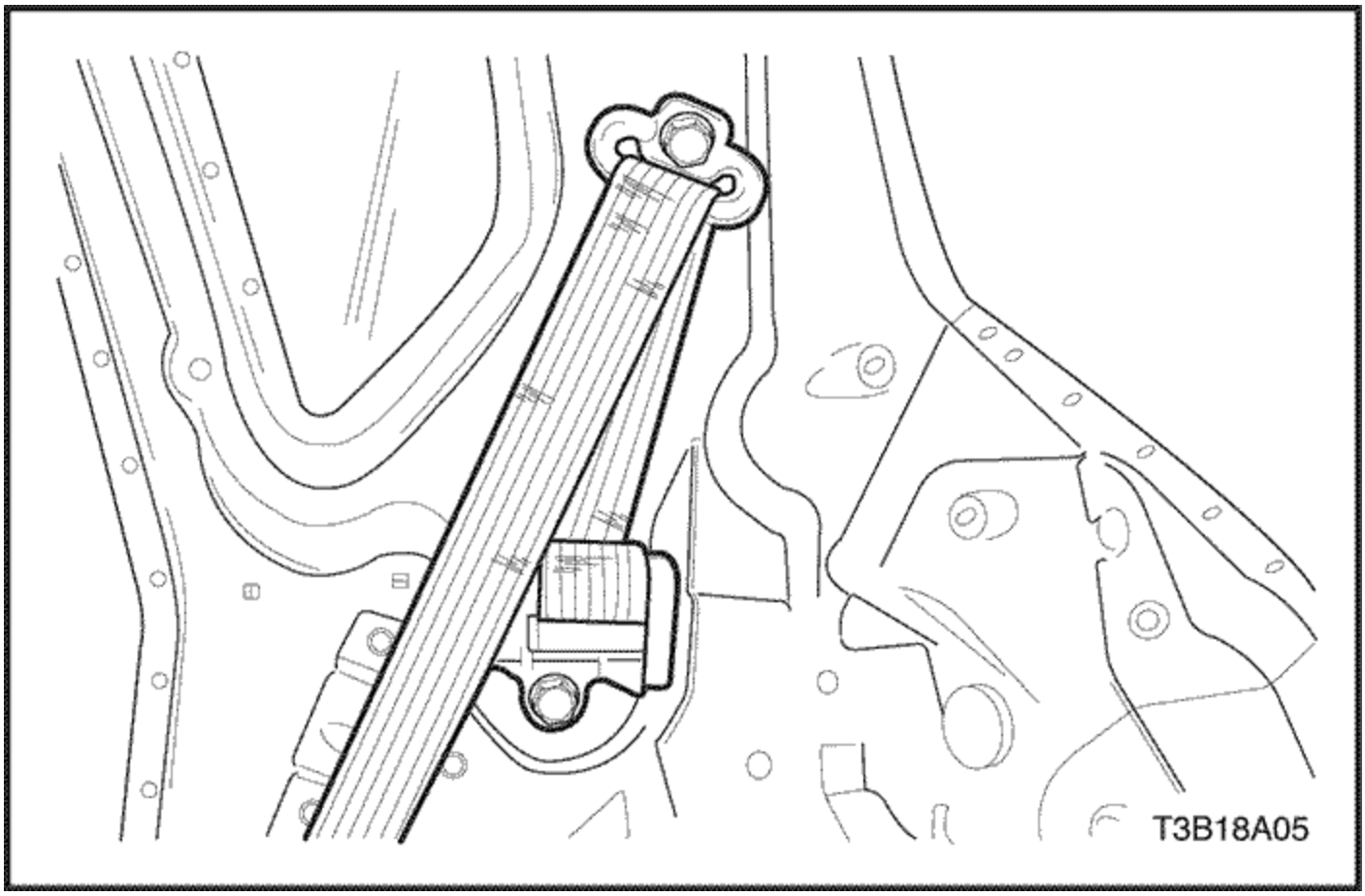
Installation Procedure

Note : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the seat belt height adjuster with the bolts.

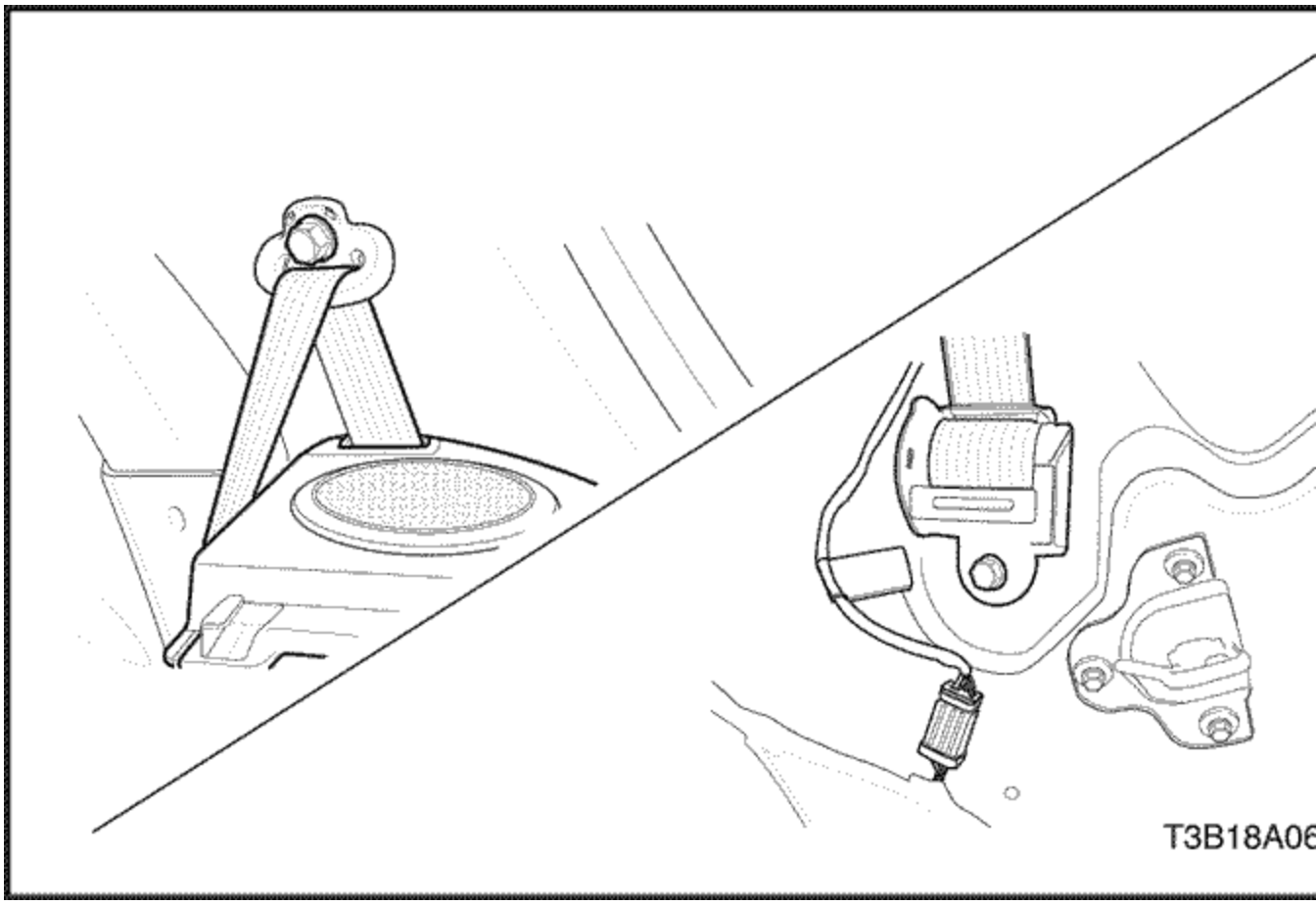
   Tighten
   Tighten the seat belt height adjuster bolts to 23 N•m (17 lb-ft).

2. Install the upper B-pillar trim panel. Refer to *Section 9G, InteriorTrim.*

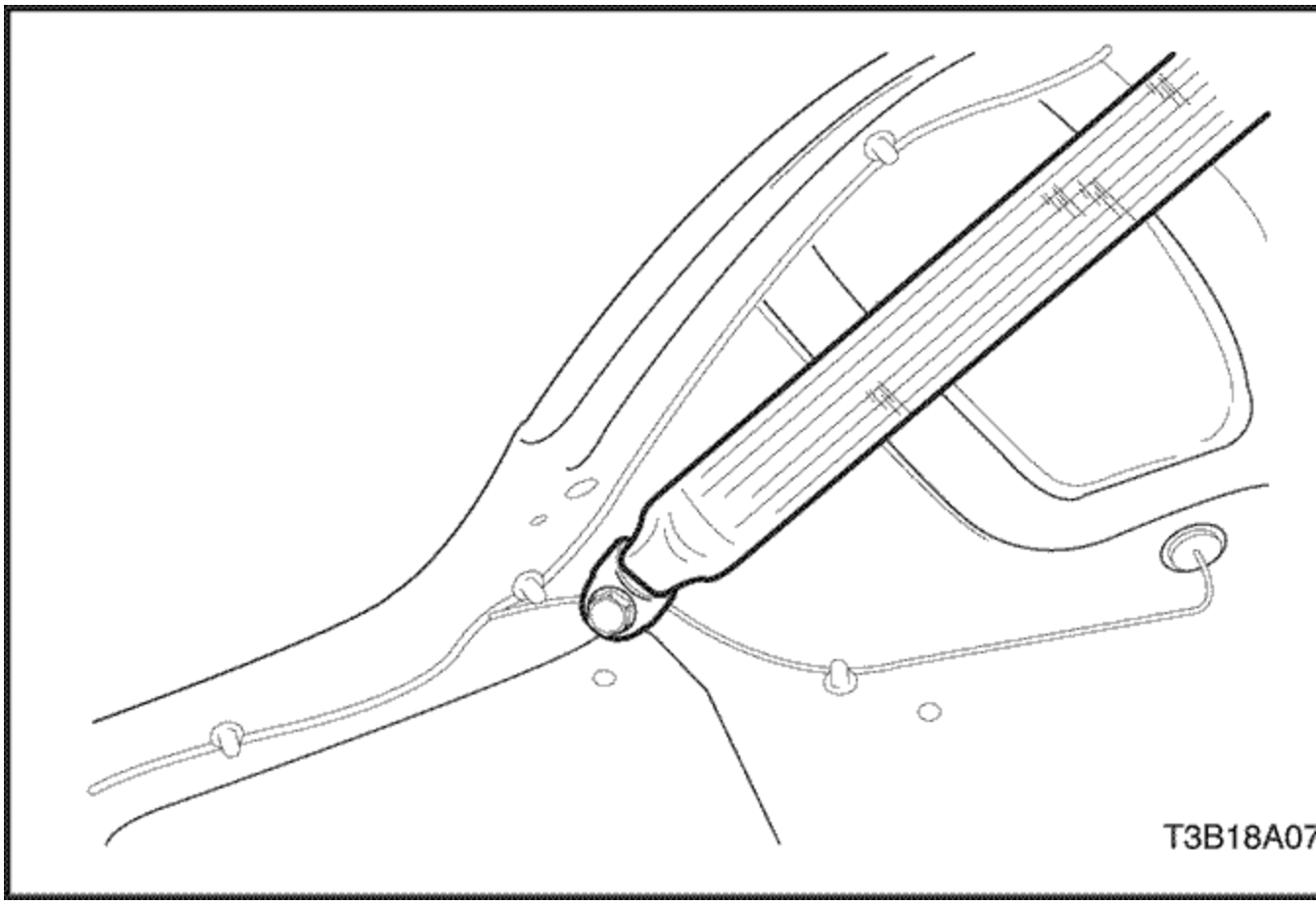


Three-Point Rear Outboard Seat Belt
(Hatchback Shown, Notchback Similar)
Removal Procedure

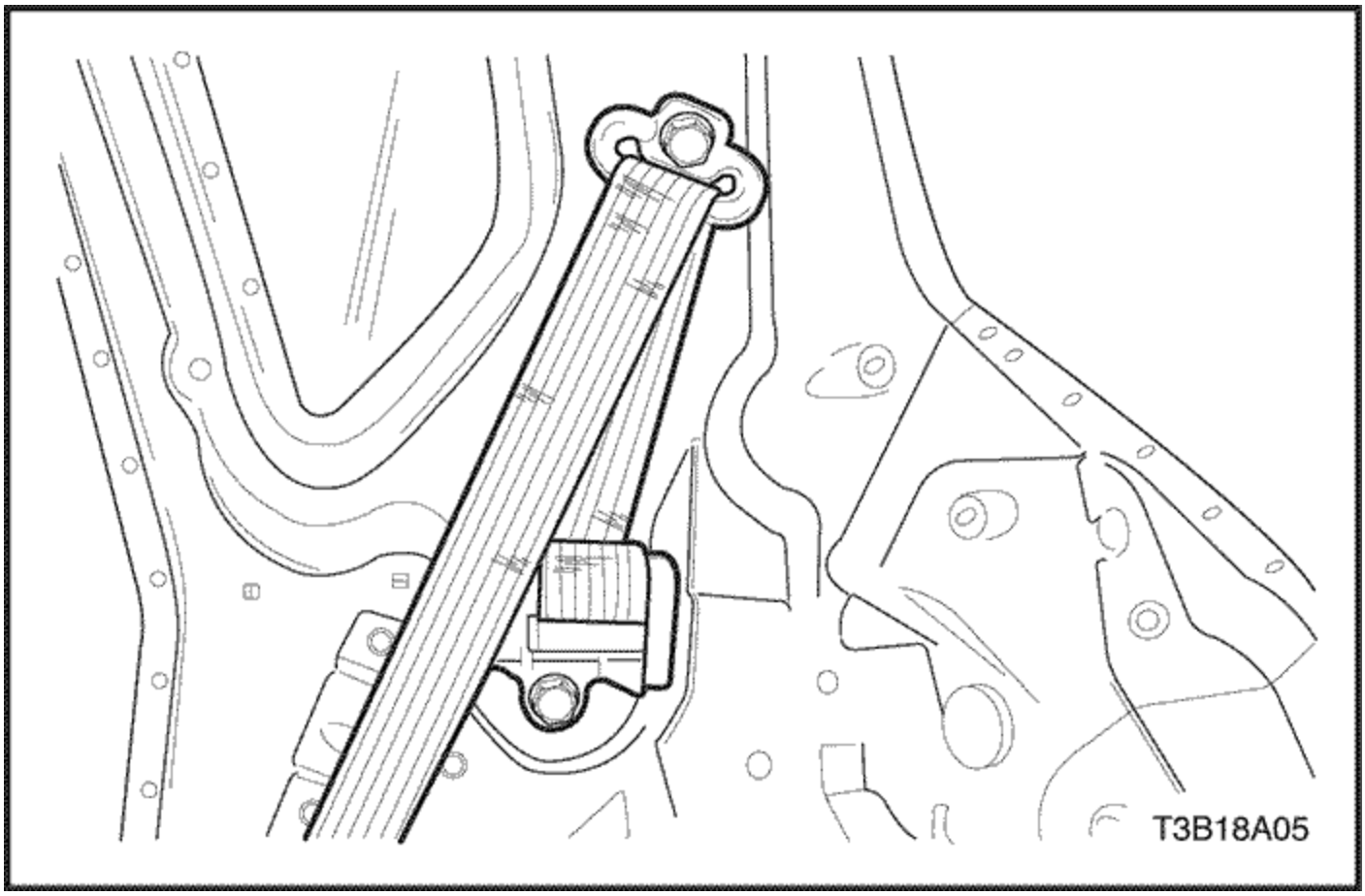
1. Open the luggage compartment.
2. For hatchback model, remove the luggage compartment wheelhouse trim panel. Refer to *Section 9G, Interior Trim.* For notchback model, remove the backshelf panel. Refer to *Section 9G, Interior Trim.*
3. Remove the bolt and the seat belt retractor in the luggage compartment.



4. Remove the bolt and the seat belt anchor on the C-pillar.



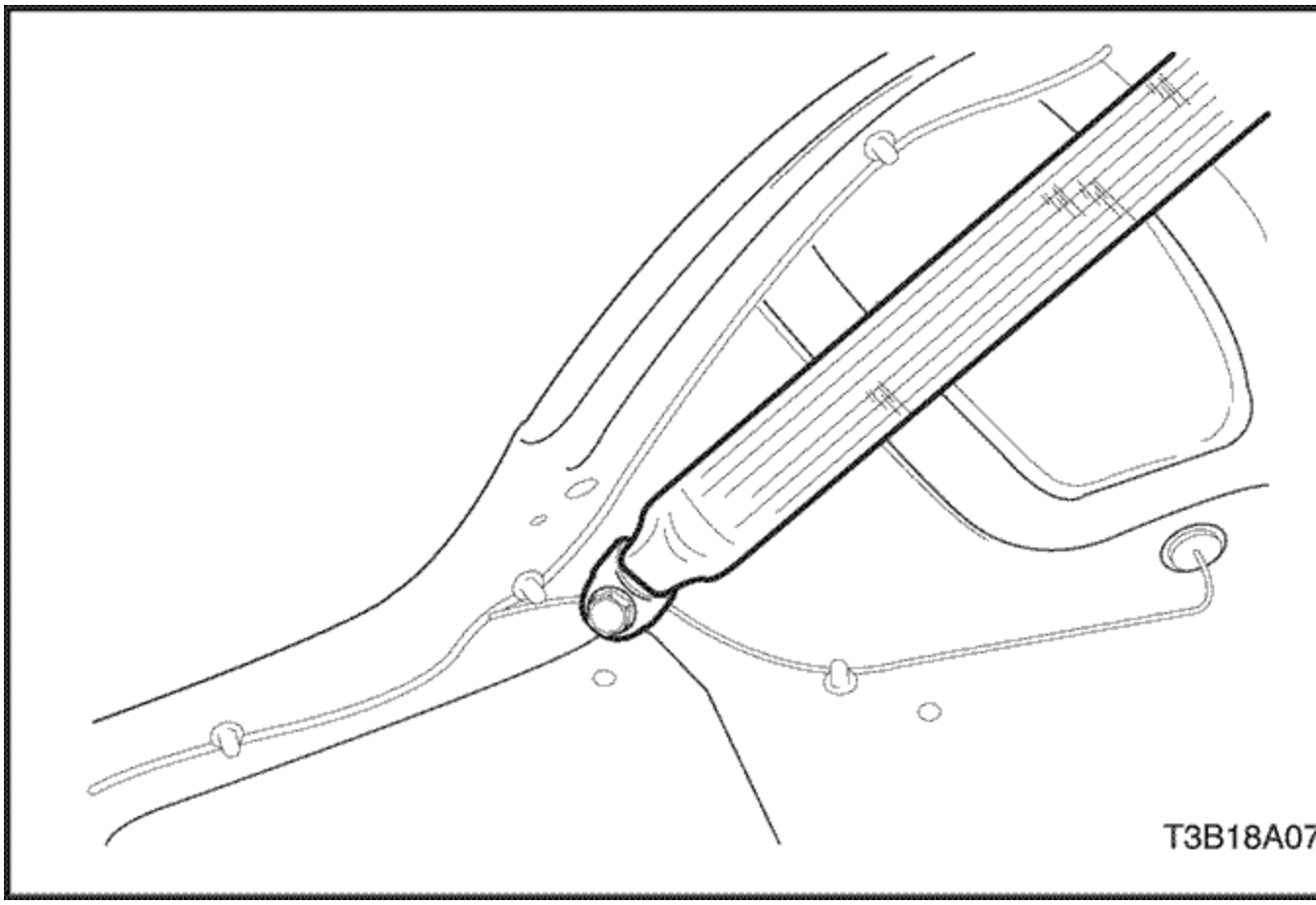
5. Pull the rear seat knob and fold the rear seat cushion.
6. Remove the seat belt with bolt.



Installation Procedure

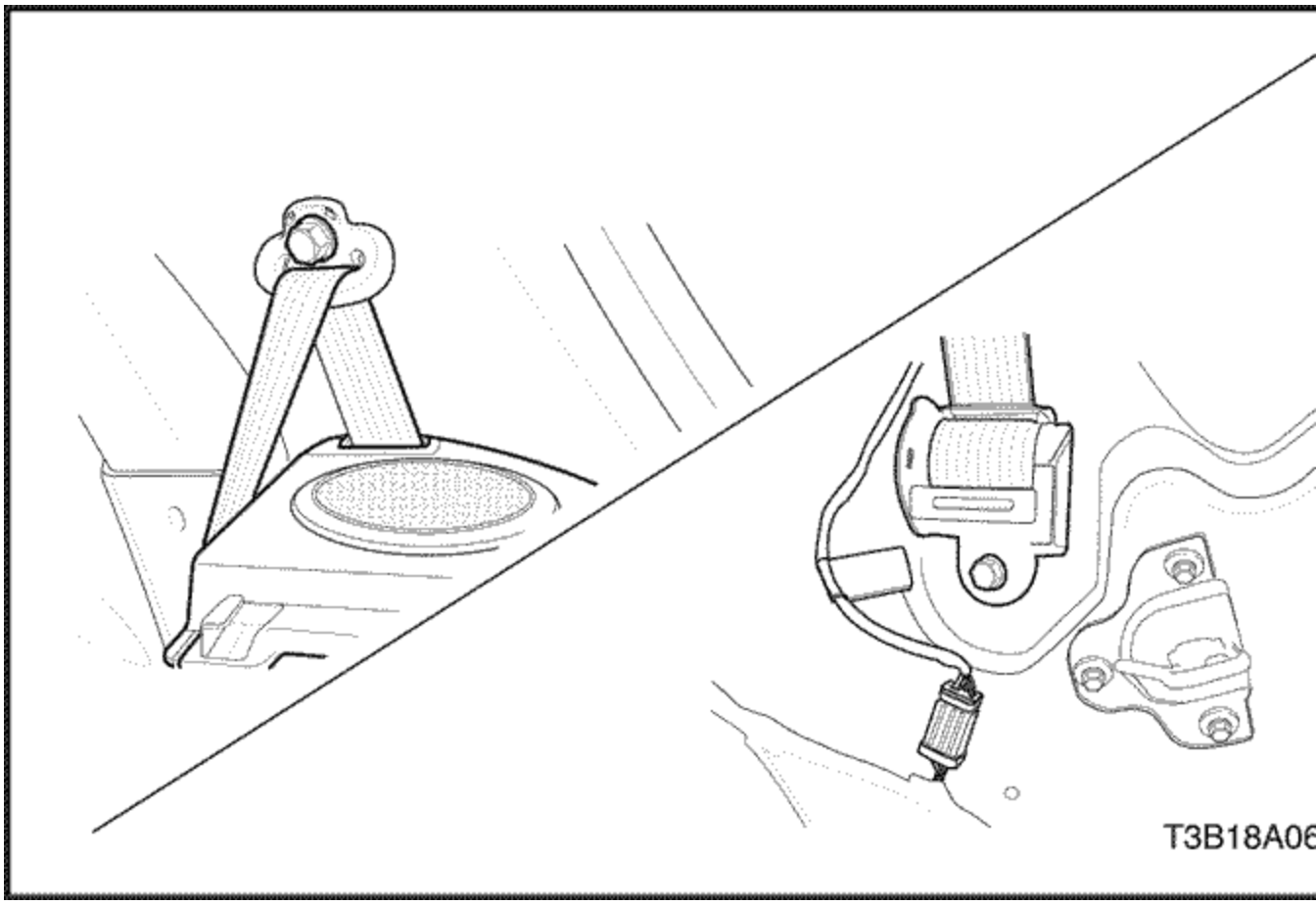
1. Install the seat belt retractor in the luggage compartment with the bolt.

   Tighten
   Tighten the seat belt retractor bolt to 38 N•m (28 lb-ft).



2. Install the seat belt with bolt.

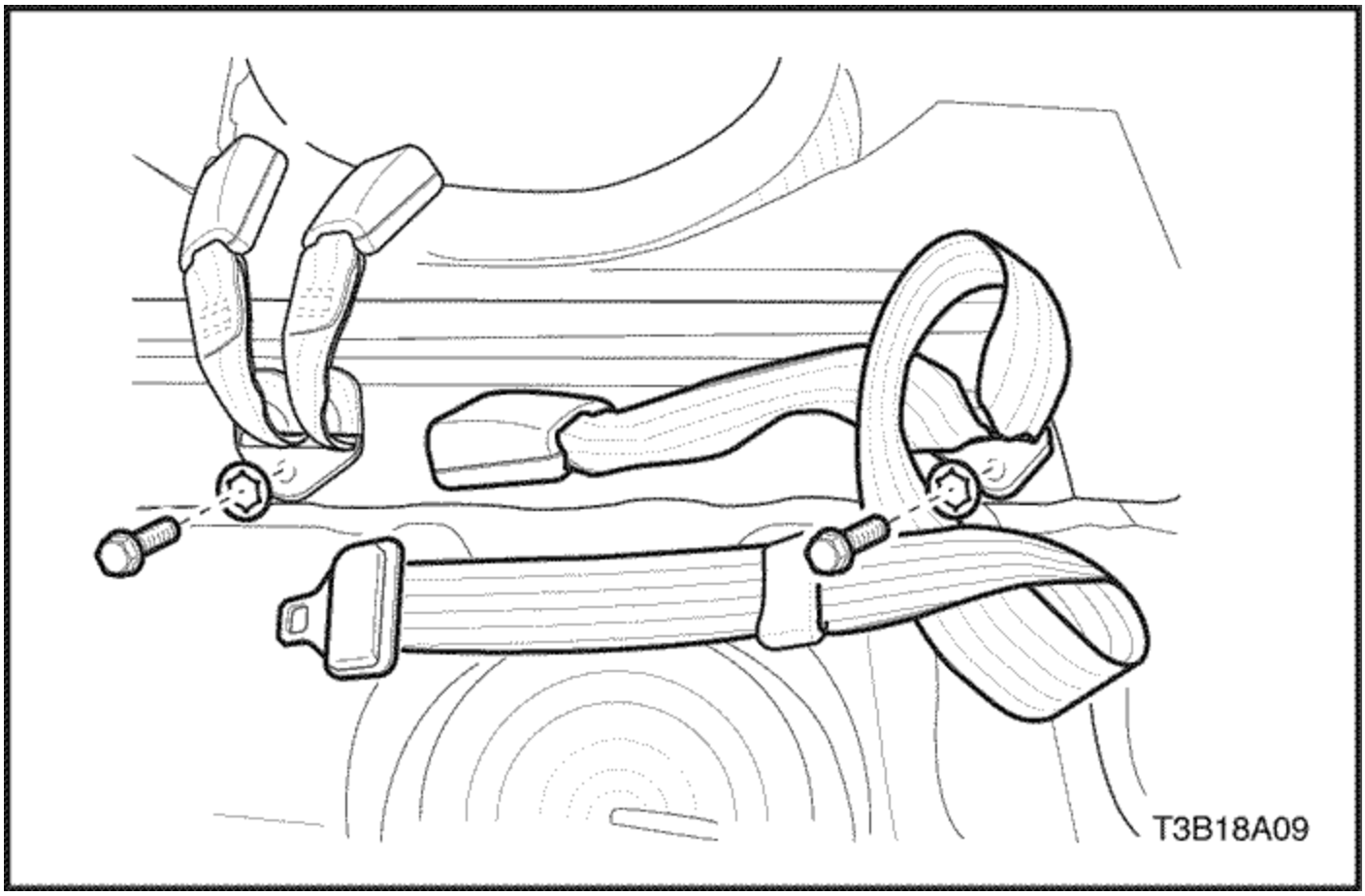
Tighten
Tighten the seat belt bolt to 38 N•m (28 lb-ft).



3. Install the seat belt anchor to the C-pillar with the bolt.

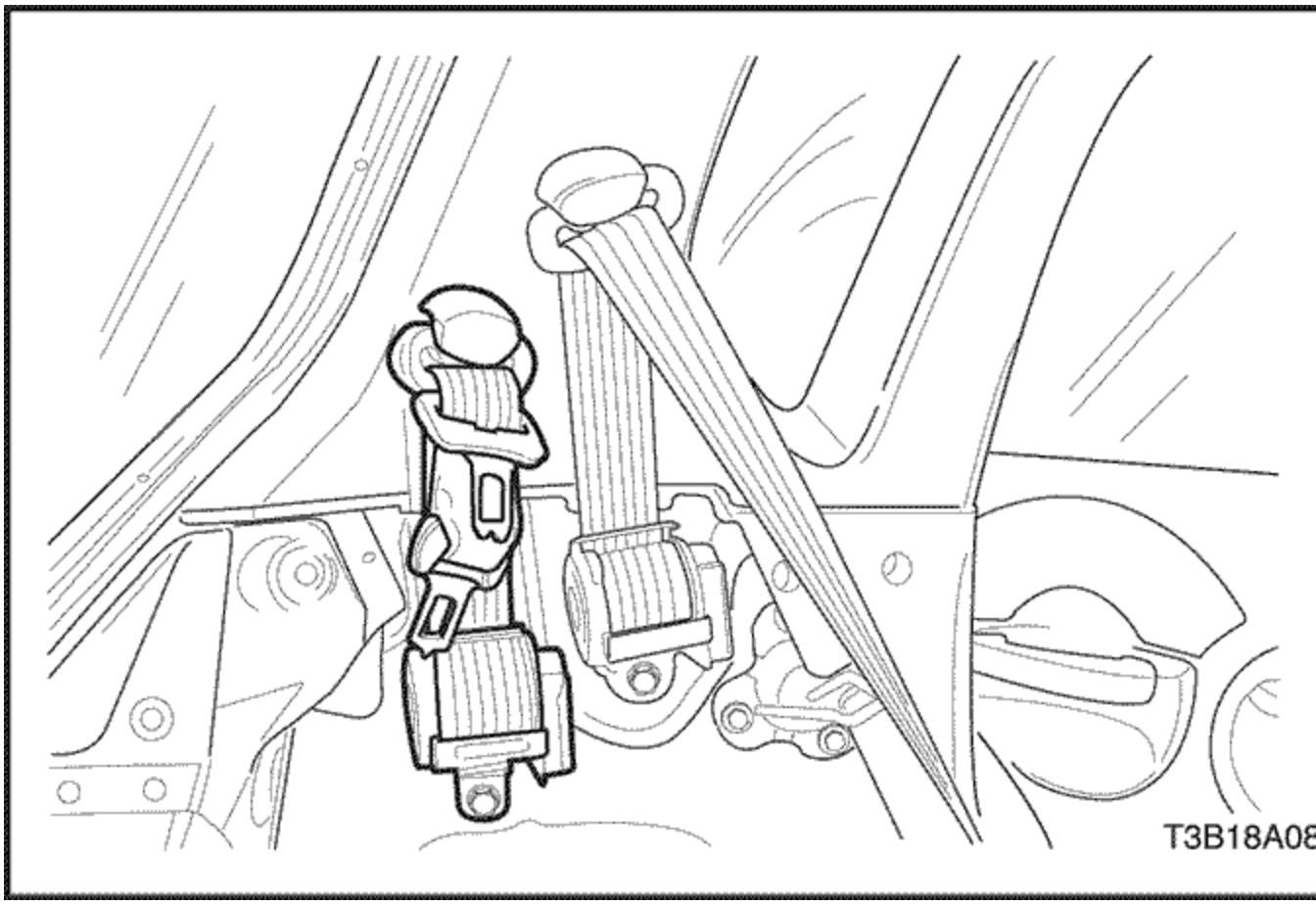
   Tighten
   Tighten the seat belt anchor bolt to 38 N•m (28 lb-ft).

4. For hatchback model, install the luggage compartment wheelhouse trim panel. Refer to *Section 9G, Interior Trim.* For notchback model, install the backshelf panel. Refer to *Section 9G, Interior Trim.*
5. Install the lrear seat cushion and unfold the seatback. Refer to *Section 9H, Seats.*

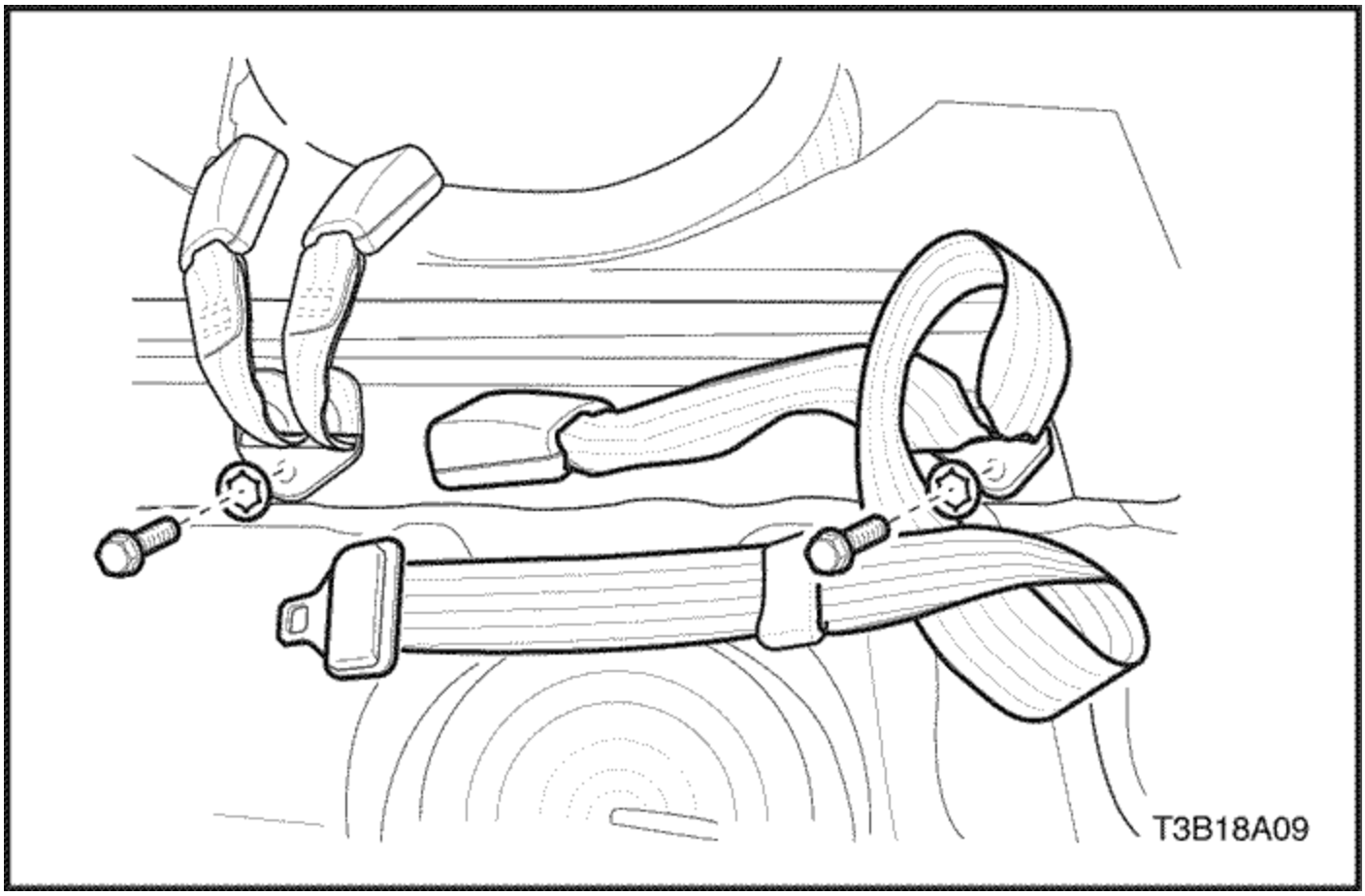


Three-Point Rear Center Seat Belt
Removal Procedure

1. Pull the rear seatknob and fold the rear seat cushion.
2. Remove the bolts and the seat belt anchors.



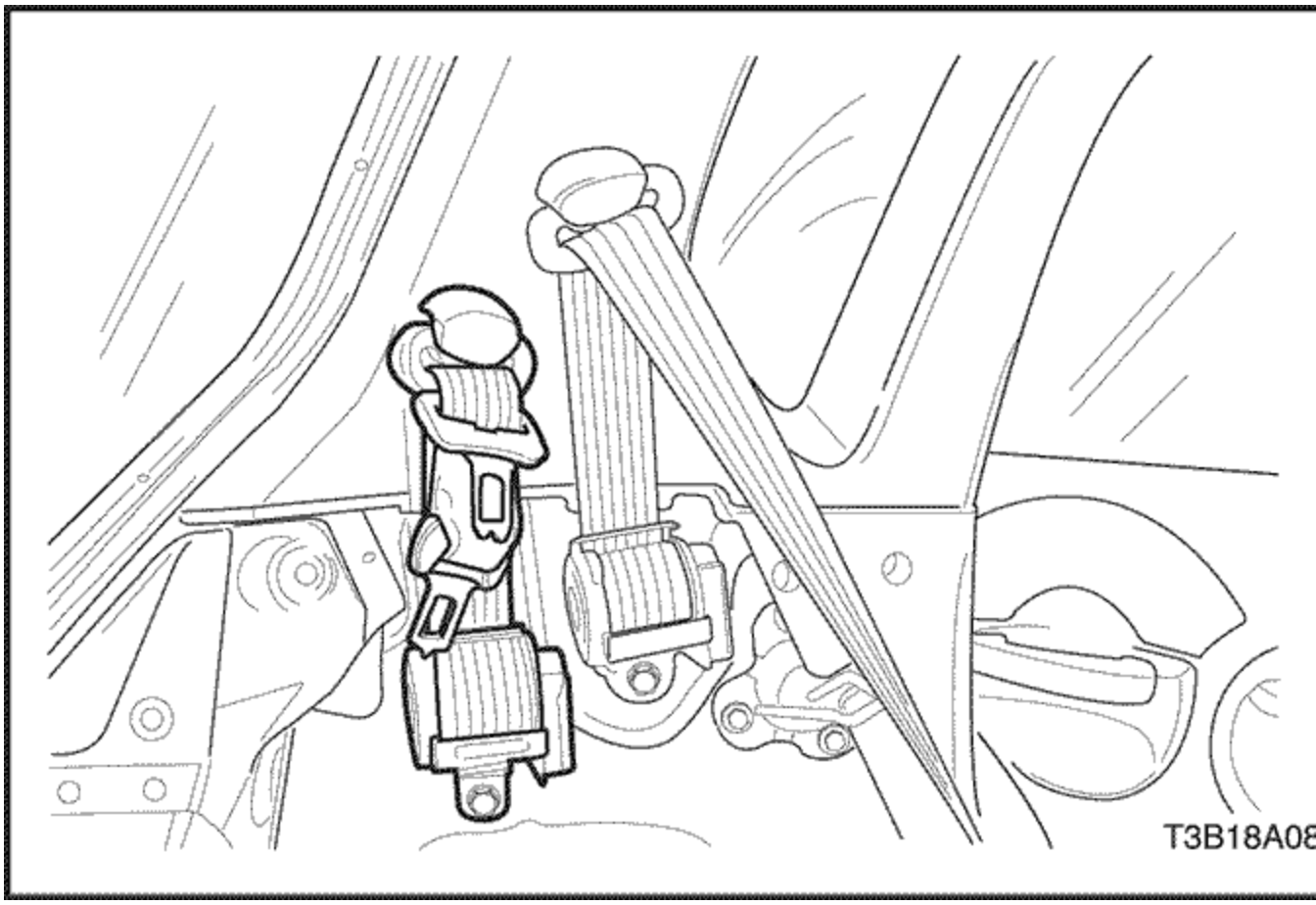
3. Remove the luggage compartment side panel(LH) and remove the bolt from the rear center seat belt retrector.



Installation Procedure

1. Install the seat belt anchors with the bolts.

   Tighten
   Tighten the seat belt anchor bolts to 38 N•m (28 lb-ft).



2. Install the rear center seat belt retractor with bolt.

   Tighten
   Tighten the rear center seat belt retractor bolt to 38 N•m (28 lb-ft).

3. Install the luggage compartment side panel and unfold the rear seat.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Driver Seat Belt Warning

The driver's seat belt incorporates a seat belt reminder light in the instrument cluster to remind the driver if the seat belt is not fastened when the ignition is turned ON.

Three-Point ELR Front Seat Belt

The three-point emergency locking retractor (ELR) driver seat belt is always unlocked, allowing the passenger freedom of movement, except in emergencies (rapid deceleration, rapid acceleration, or hard cornering maneuvers).

Three-Point CLR Seat Belt

Three-point CLR seat belts are standard for the front seat passenger and the rear seat outboard passenger positions. The CLR seat belt has two operation modes. Normally, the seat belt operates in the ELR mode, which allows the passenger freedom of movement, except in emergency situations. However, when the belt is fully extended and released, the seat belt operates in the ALR (auto-locking) mode. The ALR mode does not allow movement and is designed to hold a child seat firmly to the seat.

Two-Point LAP Rear Center Seat Belt

The two-point lap rear center seat belt is a single continuous length of webbing. The webbing is routed from the anchor through a latch plate and into a single retractor.

Operational and Functional Checks

Caution :

- ***Keep sharp objects and potentially damaging objects away from the seat belts.***
- ***Avoid bending or damaging any portion of the buckle or the latch plate.***
- ***Do not bleach or dye the belt webbing. Use only mild soap and water in order to clean the belts.***
- ***When installing the seat belt anchor bolts and the screws, start the bolts and the screws by hand in order to prevent crossthreading.***
- ***Do not attempt any repairs on the retractor mechanisms or the covers. Replace any defective assemblies with new assemblies.***
- ***Replace any belts that are cut or damaged in any way.***

1. Inspect all seat belt anchor bolts and the screws in order to verify that they are secure.
2. Inspect the seat belt buckle. The buckle must lock and unlock easily.
3. After inserting the latch into the buckle, tug sharply on the belt. The buckle must remain locked.
4. Fully extend the shoulder belt portion to make sure that there is no twisting or tears in the belt.
5. Let the shoulder belt retract fully. The belt should retract easily.

SECTION 8B

SUPPLEMENTAL INFLATABLE RESTRAINTS (SIR)

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition mujst be also be in LOCK unless otherwise noted

SPECIFICATIONS

General Specifications

Application	Description
Airbag System Deployment Time	<20ms
Detection Time	<5ms
Operating Temperature	-40°C~+85°C
Storage Temperature	-40°C~+90°C
Voltage Range	9~16 V
Current consumption	5ms after ignition switch ON <1A 5ms – 5sec<300Ma, after 5sec.<100Ma
Acceleration Range	+/- 50g
Maximum Acceleration	+/- 600g pulse
Voltage Ramp	0.2~2.0 V/s
Energy Reservation	150ms after battery disconnection
Inflator Ignition Energy	4.3mj
Squib Resistance	2.15 +/- 0.35Ω

Application	Description
Airbag Warning Lamp ON Time(When Ignition ON)	6sec

Fastener Tightening Specifications

Application	N·m	Lb-Ft	Lb-In
Clock Spring Retaining Screws	3	-	27
Driver Airbag Module Mounting Bolts	11	-	97
Passenger Airbag Module Mounting Bolts	8	-	71
Sensing and Diagnostic Module(SDM) Mounting Bolts	10	-	89

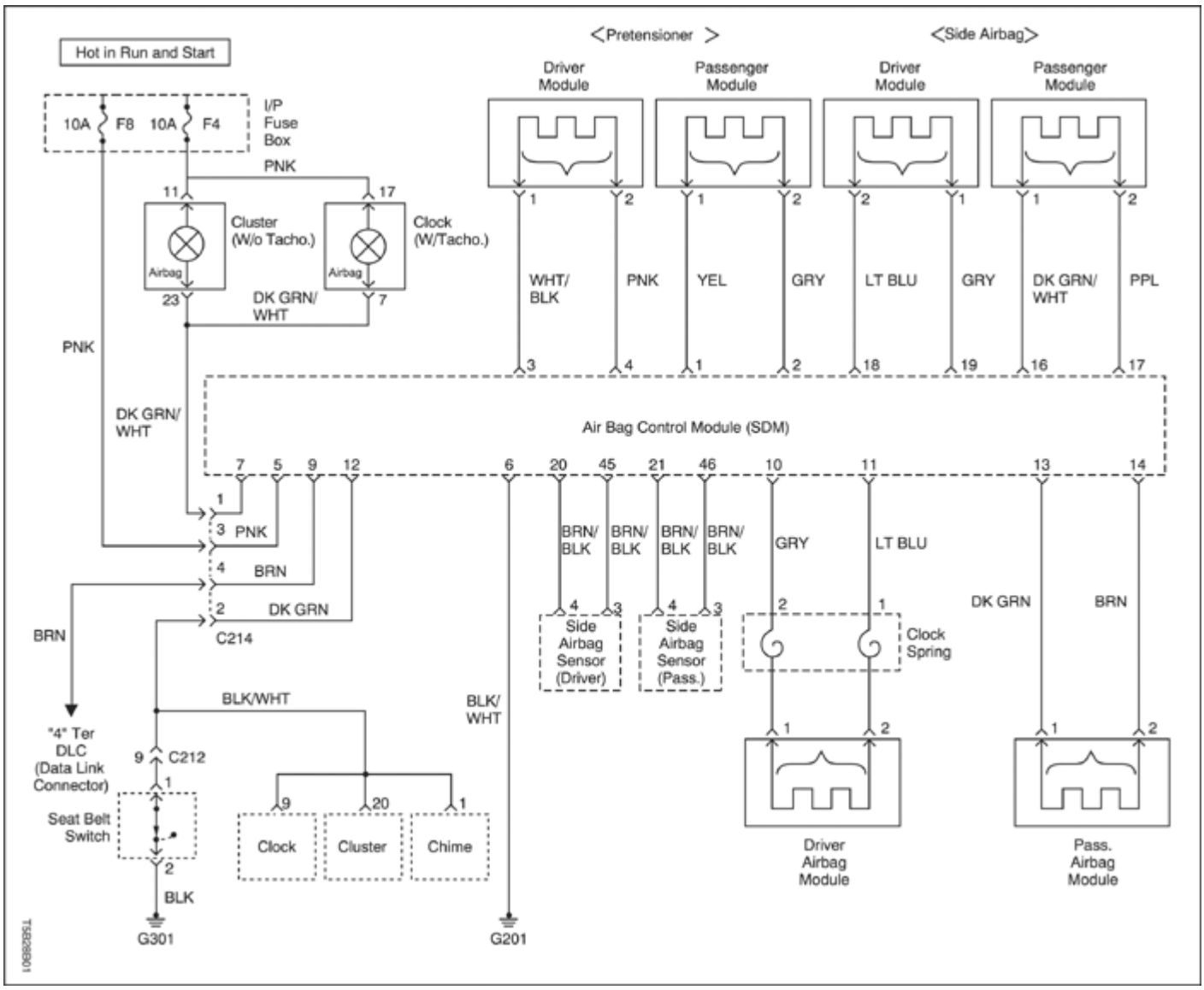
SPECIAL TOOLS

SPECIAL TOOLS TABLE

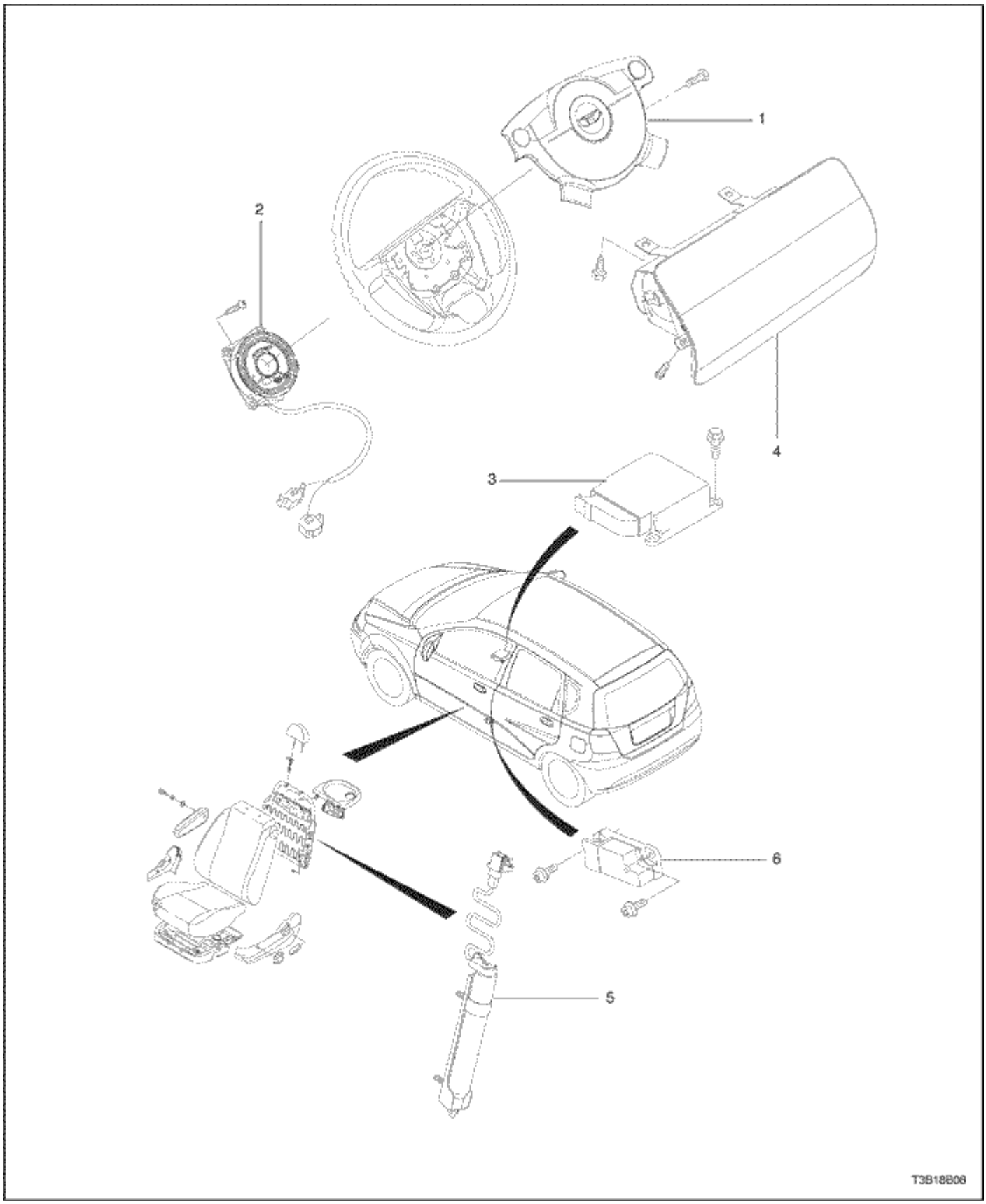
 SCANTOOL	Scan Tool

SCHEMATIC AND ROUTING DIAGRAMS

Supplemental Inflatable Restraints(SIR) Electronical Schematic



SIR Component Locator


1
2
3
4
5
6
T3B18B08

1. Driver Airbag Module
2. Clock Spring
3. Sensing And Diagnostic Module(SDM)
4. Passenger Airbag Module
5. Side Airbag Module
6. Side Airbag Sensor

DIAGNOSIS

Diagnostic Trouble Code(DTC)

When the sensing and diagnostic module(SDM) detects any problem it illuminates the airbag warning indicator and stores the diagnostic trouble codes(DTCs).
The supplemental inflatable restraints(SIR) diagnostic system check must be always the starting point for any SIR diagnosis. The diagnostic system check reveals diagnostic trouble codes(DTCs) through the use of scan tool. It also checks for proper airbag warning lamp operation.
The two types of DTCs that may be recorded are as follows :

1. Active DTCs represent malfunction being detected during the current ignition cycle. Active DTCs are stored in random access memory(RAM).
2. Historic DTCs represent malfunctions detected sincethe last time the historic memory was cleared. Historic DTCs are stored in the electrically erasable programmable read-only memory(EPROM).

Diagnostic Trouble Code Table

DTC	Description
1	Driver Airbag Deployment Loop Resistance Is High
2	Driver Airbag Deployment Loop Resistance Is Low
3	Driver Airbag Deployment Loop Is Shorted To Ground
4	Driver Airbag Deployment Loop Is Shorted To Power
5	Passenger Airbag Deployment Loop Resistance Is High
6	Passenger Airbag Deployment Loop Resistance Is Low
7	Passenger Airbag Deployment Loop Is Shorted To Ground
8	Passenger Airbag Deployment Loop Is Shorted To Power
9	Driver Belt Pretensioner Deployment Loop Resistance Is High
10	Driver Belt Pretensioner Deployment Loop Resistance Is Low

DTC	Description
11	Driver Belt Pretensioner Deployment Loop Is Shorted To Ground
12	Driver Belt Pretensioner Deployment Loop Is Shorted To Power
13	Passenger Belt Pretensioner Deployment Loop Resistance Is High
14	Passenger Belt Pretensioner Deployment Loop Resistance Is Low
15	Passenger Belt Pretensioner Deployment Loop Is Shorted To Ground
16	Passenger Belt Pretensioner Deployment Loop Is Shorted To Power
23	Battery Voltage High
24	Battery Voltage Low
25	Airbag Warning Lamp Failure
31	Internal Sensing Diagnostic Module(SDM) Failure
32	Airbag Inflation Record By Frontal Collision
33	Driver Side Airbag Inflation Record By Side Impact
34	Passenger Side Airbag Inflation Record By Side Impact
35	Belt Pretensioner Explosion Record
38	Side Airbag And Belt Pretensioner Explosion Count Over 5
52	Driver Side Airbag Deployment Loop Resistance Is High
53	Driver Side Airbag Deployment Loop Resistance Is Low
54	Driver Side Airbag Deployment Loop Is Shorted To Ground
55	Driver Side Airbag Deployment Loop Is Shorted To Power
56	Passenger Side Airbag Deployment Loop Resistance Is High
57	Passenger Side Airbag Deployment Loop Resistance Is Low
58	Passenger Side Airbag Deployment Loop Is Shorted To Ground
59	Passenger Airbag Deployment Loop Is Shorted To Power
80	Driver Side Airbag Sensor Loop Is Shorted To Power
81	Driver Side Airbag Sensor Loop Is Shorted To Ground
82	Driver Side Airbag Sensor Communication Error
83	Driver Side Airbag Sensor Failure
84	Passenger Side Airbag Sensor Loop Is Shorted To Power
85	Passenger Side Airbag Sensor Loop Is Shorted To Ground
86	Passenger Side Airbag Sensor Communication Error
87	Passenger Side Airbag Sensor Failure

Scan Tool Diagnostics

A scan tool can read serial data from terminal 9 of the data link connector(DLC). The scan tool is used to read diagnostic trouble codes(DTCs), and to clear some DTCs after a repair is completed.

To use the scan tool, turn the ignition OFF, connect the scan tool to the DLC, and turn the ignition switch to ON.

Follow the instructions in the scan tool manual. The SDM sends serial data from terminal A4 of the SDM to terminal 9 of the DLC.

SIR Diagnostic System Check

Notice : If the vehicle interior has been exposed to extensive water intrusion such as water leaks, driving through high water, flooding, or other causes, the sensing and diagnostic module(SDM) and SDM connector may need to be replaced. With ignition OFF, inspect the area around the SDM, including the carpet. If any significant soaking or evidence of previous soaking is detected, the water must be removed, water damage repaired, and the SDM and the SDM connector must be replaced. Before attempting any of these repairs, the supplemental inflatable restraints(SIR) must be disabled. Refer to "Disabling the SIR" and "Sensing and Diagnostic Module(SDM)" in this section for instructions on how to disable the SIR and replace the SDM.

The SIR Diagnostic System Check must always be the starting point for any SIR diagnosis. The Diagnostic System Check reveals diagnostic trouble codes(DTCs) through the use of scan tool. The diagnostic procedures used in this section are designed to find any repair SIR conditions. To get the best results, it is important to use the diagnostic charts and follow the sequence listed below.

1. Perform the SIR Diagnostic System Check, which reveal diagnostic trouble codes(DTCs) through the use of scan tool.. It also checks for proper airbag indicator operation.
2. Refer to the proper diagnostic chart as directed by SIR Diagnostic System Check. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.
3. Repeat the SIR Diagnostic System Check after any repair or diagnostic procedures have been performed to ensure that the repair has been made correctly and that no other malfunction exists.

Circiut Description

When the ignition switch is first turned to ON, ignition voltage is supplied from airbag fuse to find the SDM at input terminal A1. The SDM responds by flashing the airbag indicator seven times and then turning it off while the SDM performs tests on the SIR.

Diagnostic Aids

The order in which DTCs are diagnosed is very important. Failure to diagnose the DTCs in the order specified may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.

SIR Diagnostic System Check

Caution : The sensing and the diagnosis module (SDM) can maintain surfficient voltage to deploy the airbags and pretensioners for 1 minute after the ignition is OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Otherwise, injury could result.
Caution : During service procedure, be very careful when handling the SDM. Never strike or jar the SDM. Never power the supplemental inflatable restraints(SIR) when the SDM is not rigidly attached to the vehicle. All SDM mounting bolts must be carefully tightened , and the arrow on the SDM must be point toward the front of the vehicle to ensure proper operation of the SIR. The SDM could be activated if it is powered when it is not rigidly attached to the vehicle, resulting in unexpected deployment and possible injury.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch ON. 2. Observe the airbag indicator as the ignition is being turned ON. Does the indicator flash seven times?	-	System OK	Go to *Step 2*
2	1. Turn the ignition to LOCK and remove the key. 2. Connect the scan tool to the data link connector(DLC). Follow the directions given in the scan tool manual. 3. Are any DTCs displayed on the scan tool?	-	Go to the *DTC check procedure*	Go to *Step 3*
3	Check the fuse F8 in the interior fuse box. Is the fuse F8 blown?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the fuse F8	-	-	-
5	1. Disconnect the connector C214. 2. Check the wiring shortage between the fuse F8 and the terminal3 of the connector C214. 3. Is the wiring shorted? Then, repair the wiring.	-	-	Go to *Step 6*
6	1. Disconnect the connector from the SDM.2. Check the wiring shortage between the terminal5 of the SDM connector and the terminal3 of the	-	-	Go to *Step 7*

Step	Action	Value(s)	Yes	No
	connector C214. 2. Disconnect the connector from the SDM.2. Check the wiring shortage between the terminal5 of the SDM connector and the terminal3 of the connector C214. 3. Is the wiring shorted? Then, replace the airbag wiring. 4. Is the wiring shorted? Then, replace the airbag wiring.			
7	1. Check the wiring shortage between the terminal4,5 of the DLC and the ground G202. 2. Is the wiring shorted? Then, repair the wiring.	-	-	Go to *Step 8*
8	1. Confirm the ignition switch ON. 2. Check the voltage from the cigar lighter socket. Is the voltage in the range of 11~14 voltages?	-	Go to *Step 10*	-
9	1. Repair the wiring of cigar lighter socket	-	-	-
10	2. Check the wiring shortage or loop open between the terminal4 of the connector C214 and the terminal 4 of the data link connector(DLC). 3. Check the wiring shortage or loop open between the terminal4 of the connector C214 and the terminal 4 of the data link connector(DLC). 3. Is the wiring opened or shorted? 4. Is the wiring opened or shorted?	-	Go to *Step 11*	Go to *Step 12*
11	Repair the wiring	-	-	-
12	1. Check the wiring shortage or loop open between the terminal4 of the connector C214 and the terminal 9 of the SDM wiring connector.	-	Replace the airbag wiring.	Replace the SDM.

Step	Action	Value(s)	Yes	No
	2. Is the wiring opened or shorted?			

Sensing and Diagnostic Module(SDM) Integrity check

The following diagnostic chart must be used when all circuitry outside the sensing and diagnostic module(SDM) has been found to operate properly, as indicated by following the appropriate diagnostic trouble code(DTC) chart. The chart verifies the need for SDM replacement.

Circuit Description

When the SDM recognizes ignition voltage greater than 9 volts at terminal A1 of the SDM, the airbag indicator flashes seven times to verify operation. At this time the SDM performs turn-on tests followed by resistance measurement tests and continuous monitoring tests.

When malfunction is detected, the SDM sets current DTC and illuminates the airbag indicator.

When the malfuncation is no longer detected and/or the ignition switch is cycled, the SDM will clear current DTCs and move them to a history file, except for the DTCs 51, 53 and sometimes 71. DTCs 51 and 53 will not be cleared by scan tool because these codes require replacement of SDM. The SDM must be replaced only after the malfunction that set the DTC has been repaired.

Sensing and Diagnostic Module(SDM) Integrity Check

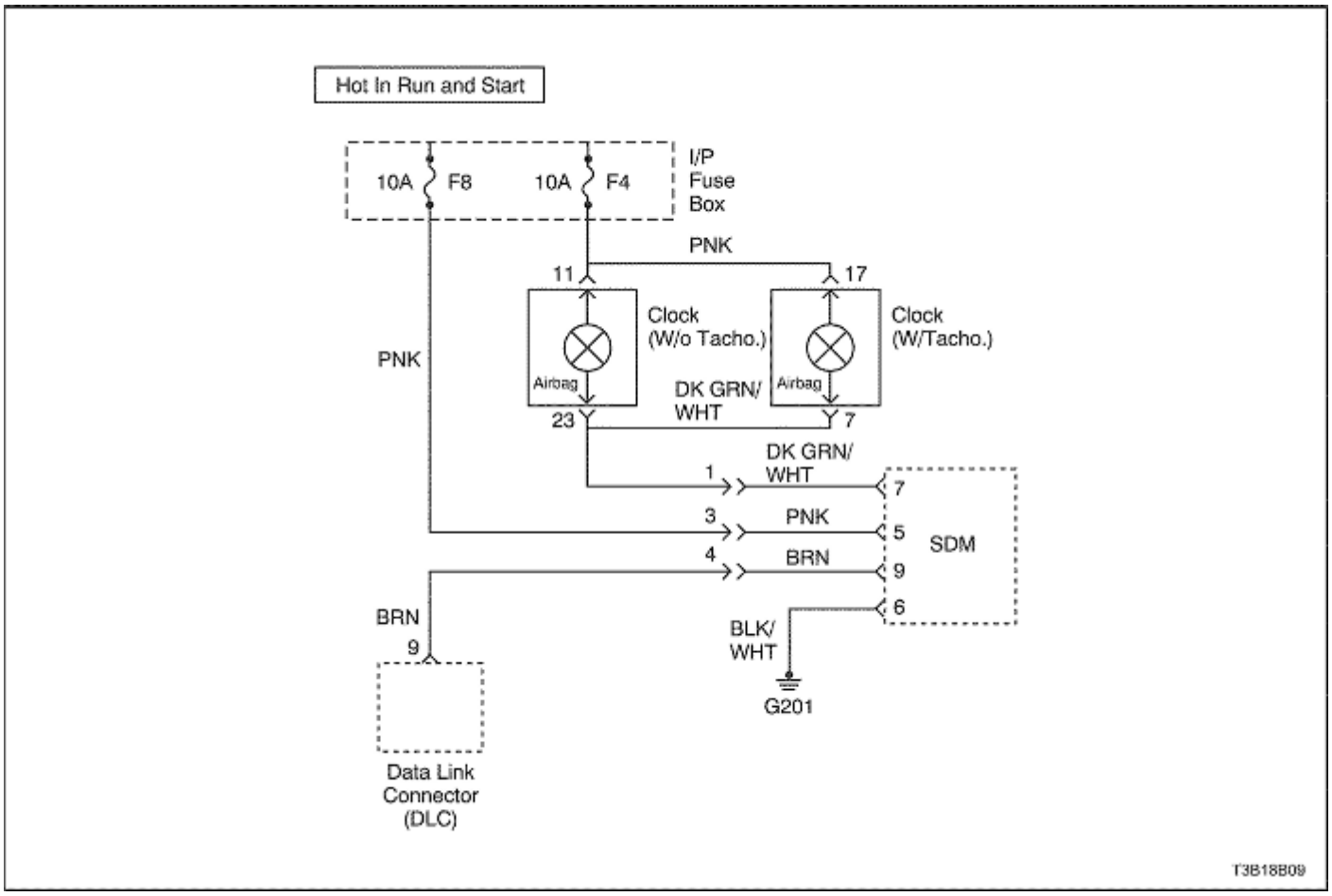
Caution : The sensing and diagnostic module(SDM) can maimtain sufficient voltage to deploy the airbags and pretensioners for 1 minute after the ignition is OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has passed after disconnecting the power to the SDM. Otherwise, injury could result.

Caution : During service procedure, be very careful when handling the SDM. Never strike or jar the SDM. Never power the supplemental inflatable restraints(SIR) when the SDM is not rigidlyattached to the vehile. All SDM mounting bolts must be carefully tightened , and the arrow on the SDM must be point toward the front of the vehicle to ensure proper operation of the SIR. The SDM could be activated if it is powered when it is not rigidly attached to the vehicle, resulting in unexpected deployment and possible injury.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition to LOCK and remove the key 2. Connect all SIR components and ensure that all the components are	-	Clear the SIR DTCs and go to "Diagnostic	Go to *Step 2*

Step	Action	Value(s)	Yes	No
	properly mounted. 3. Ensure that the ignition switch has been OFF for at least 30 seconds. 4. Observe the airbag indicator as the ignition is turned ON. Does the indicator lamp flashes seven times ?		System Check"	
2	1. Turn the ignition to LOCK and remove the key. 2. Connect the scan tool to DLC. Follow the directions given in the scan tool manual. 3. Turn the ignition to ON. 4. Request SIR DTC display with the scan tool. Is the same DTC displayed that was previous occurred when the SIR Diagnostic System Check was previously performed?	-	Go to *Step3*.	Go to the table for the DTC indicated.
3	1. Clear SIR DTCs. 2. Turn the ignition OFF for at least 30 seconds. 3. Observe the airbag indicator as the ignition is turned ON. Does the indicator lamp flashes seven times ?	-	System OK	Go to *Step4*
4	1. Turn the ignition to LOCK and remove the key. 2. Disconnect the SDM connector. 3. Replace the SDM. 4. Connect the SDM connector and ensure that all components are properly mounted. Is the repair complete?	-	Go to "Diagnostic System Check".	-

Hot In Run and Start



KALOS	

SECTION 9A

BODY WIRING SYSTEM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SCHEMATIC AND ROUTING DIAGRAMS

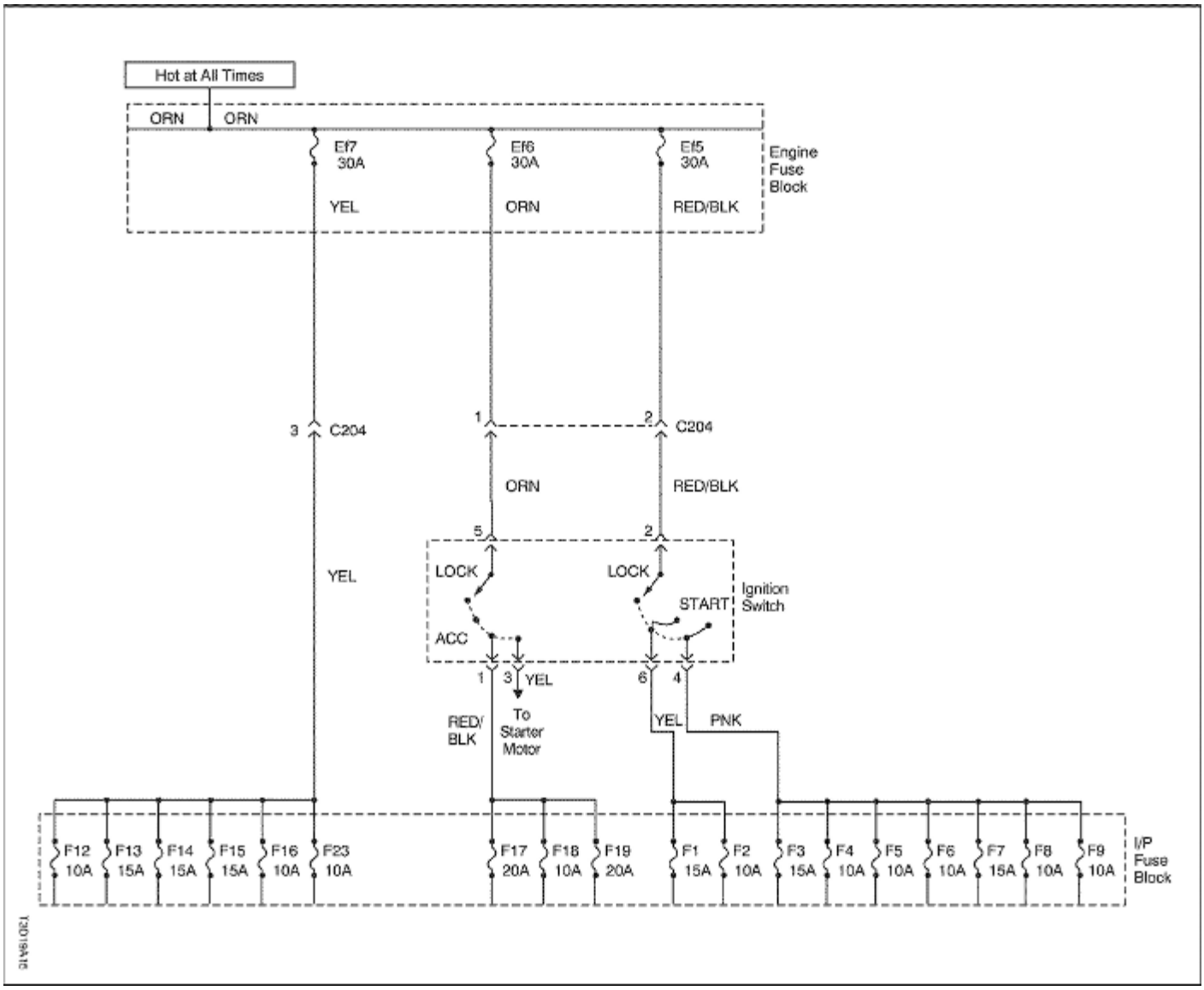
Wire Color Chart

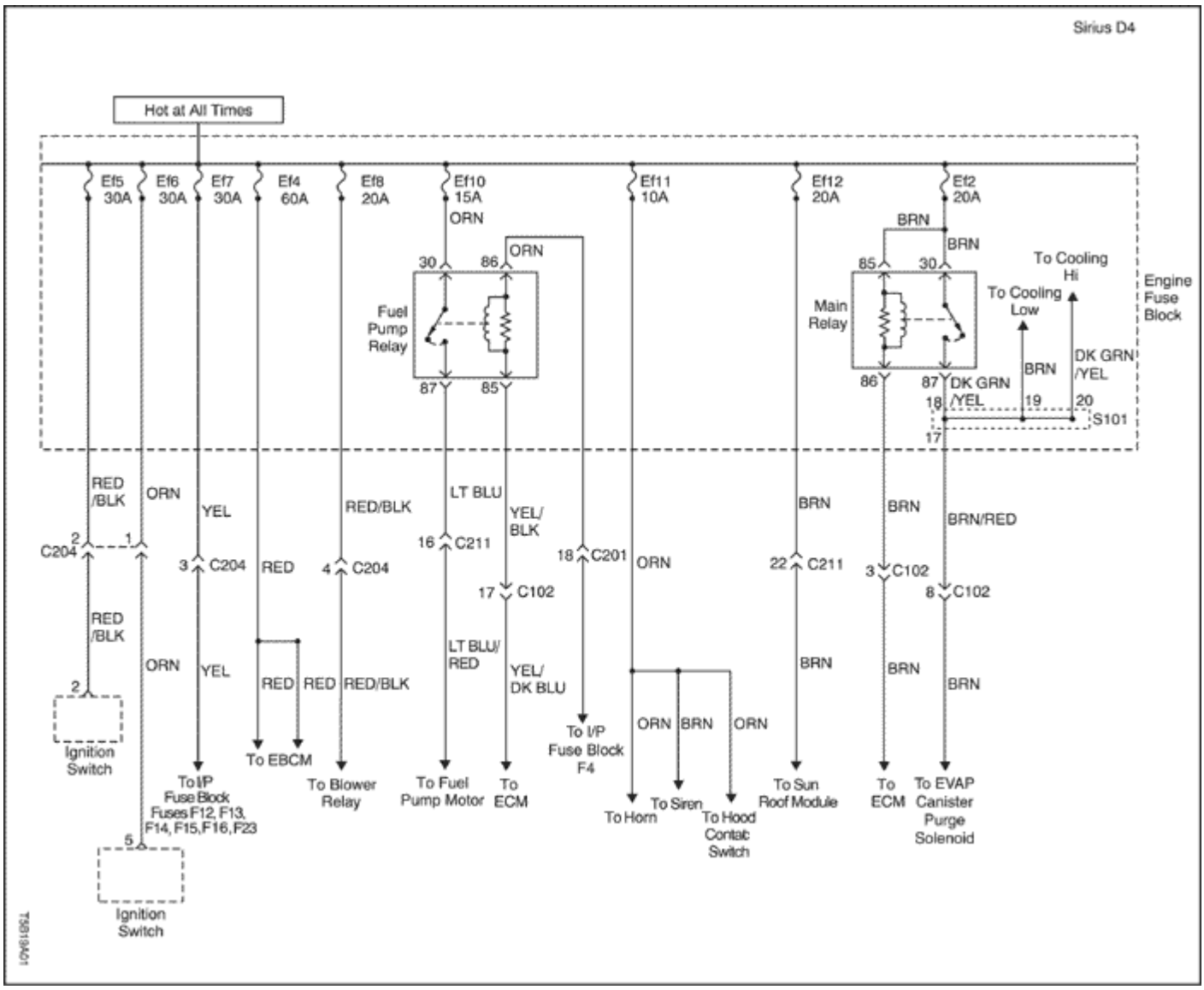
Wire Color	Abbreviation On Schematic
Green	DK GRN
Light Green	LT GRN
Blue	DK BLU
Brown	BRN
Orange	ORN
Yellow	YEL
Grey	GRY
Sky Blue	LT BLU
Red	RED
Black	BLK
Pink	PNK
White	WHT
Purple	PPL

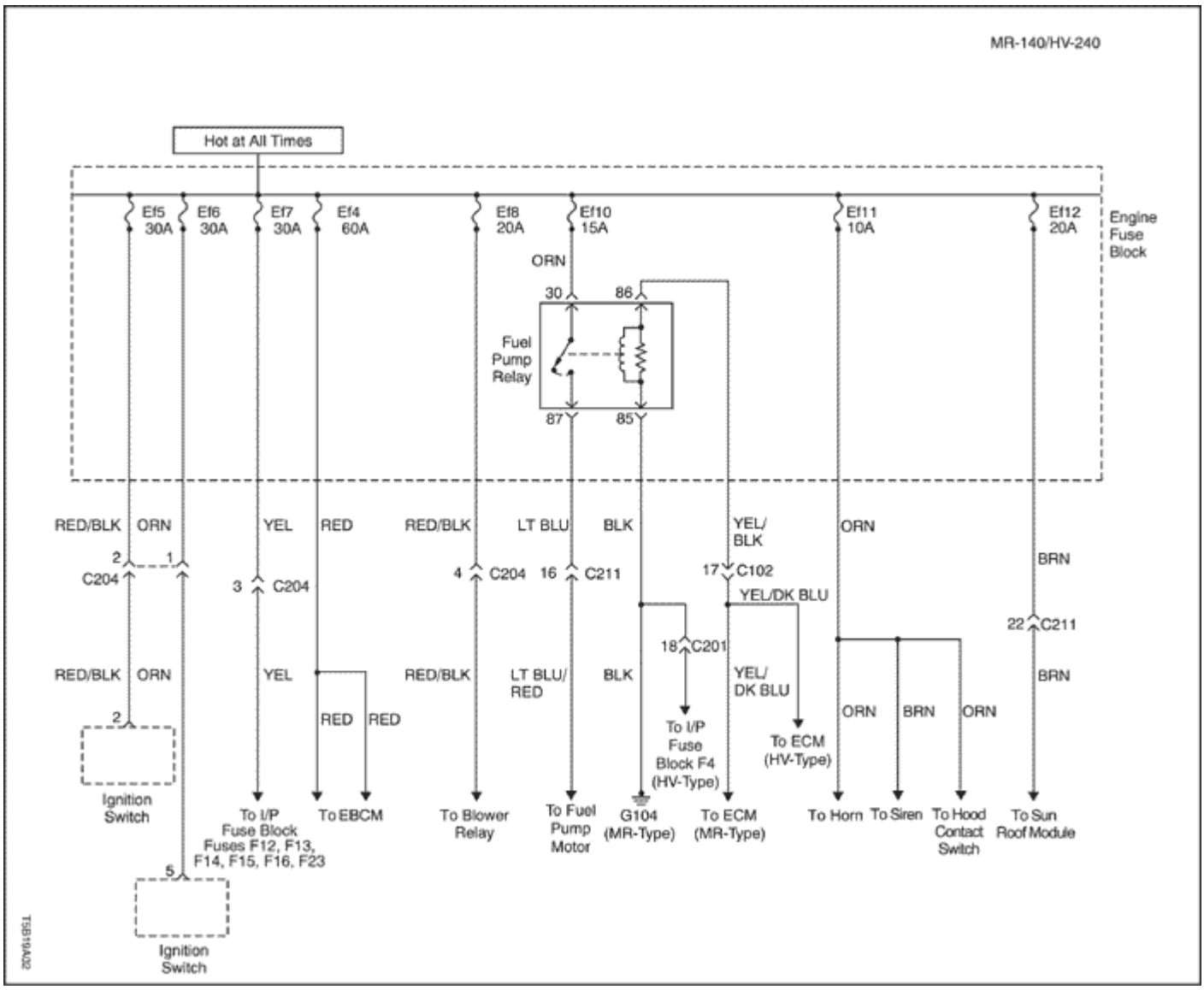
Wires With Tracers

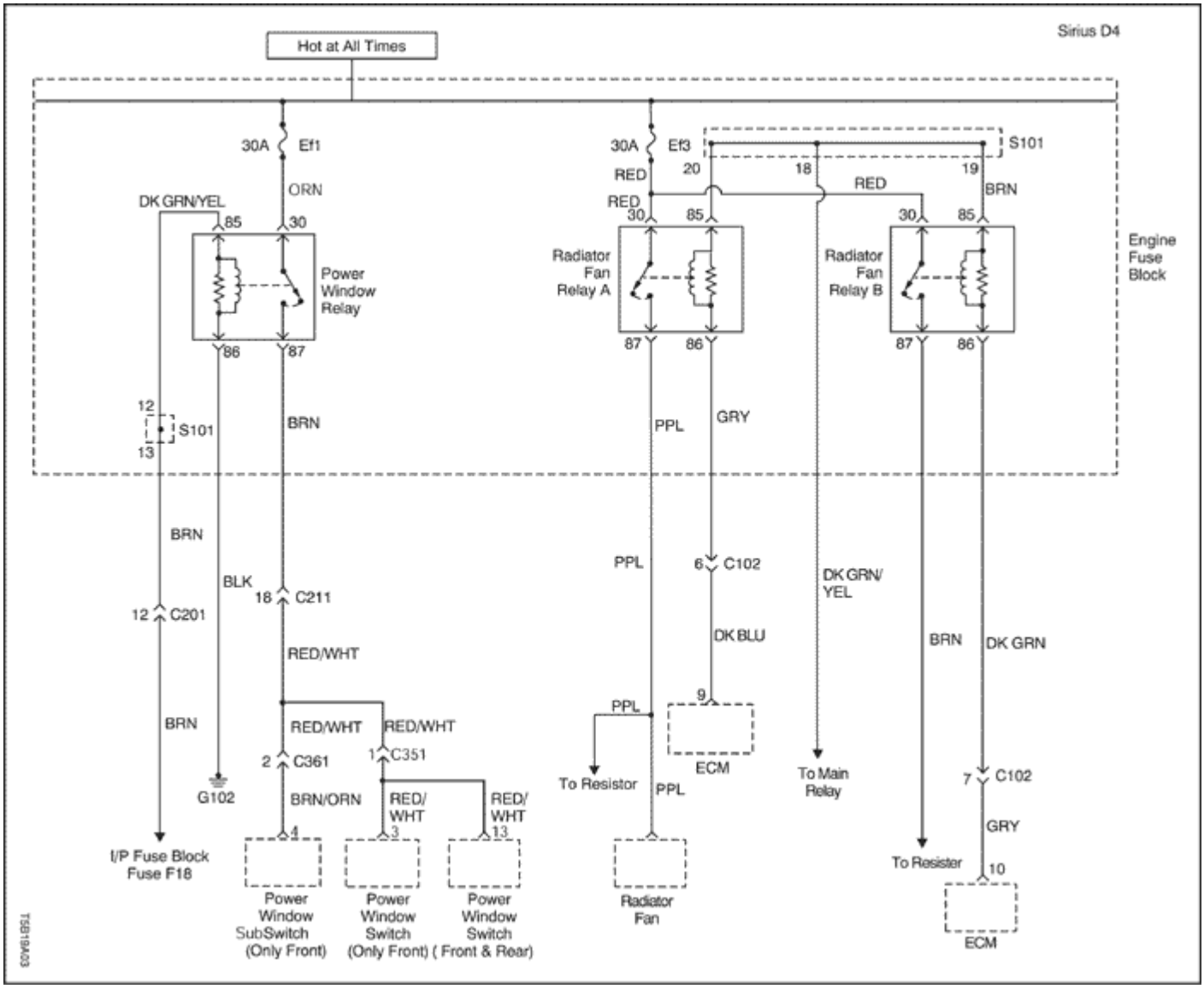
Wire Color	Abbreviation On Schematic
Red with White Tracer	RED/WHT
Red with Black Tracer	RED/BLK
Brown with White Tracer	BRN/WHT
Black with White Tracer	BLK/WHT
Black with Yellow Tracer	BLK/YEL
Green with Black Tracer	DK GRN/BLK
Green with White Tracer	DK GRN/WHT
Light Green with Black Tracer	LT GRN/BLK
Red with Yellow Tracer	RED/YEL
Red with Blue Tracer	RED/DK BLU
Black with Brown Tracer	BLK/BRN

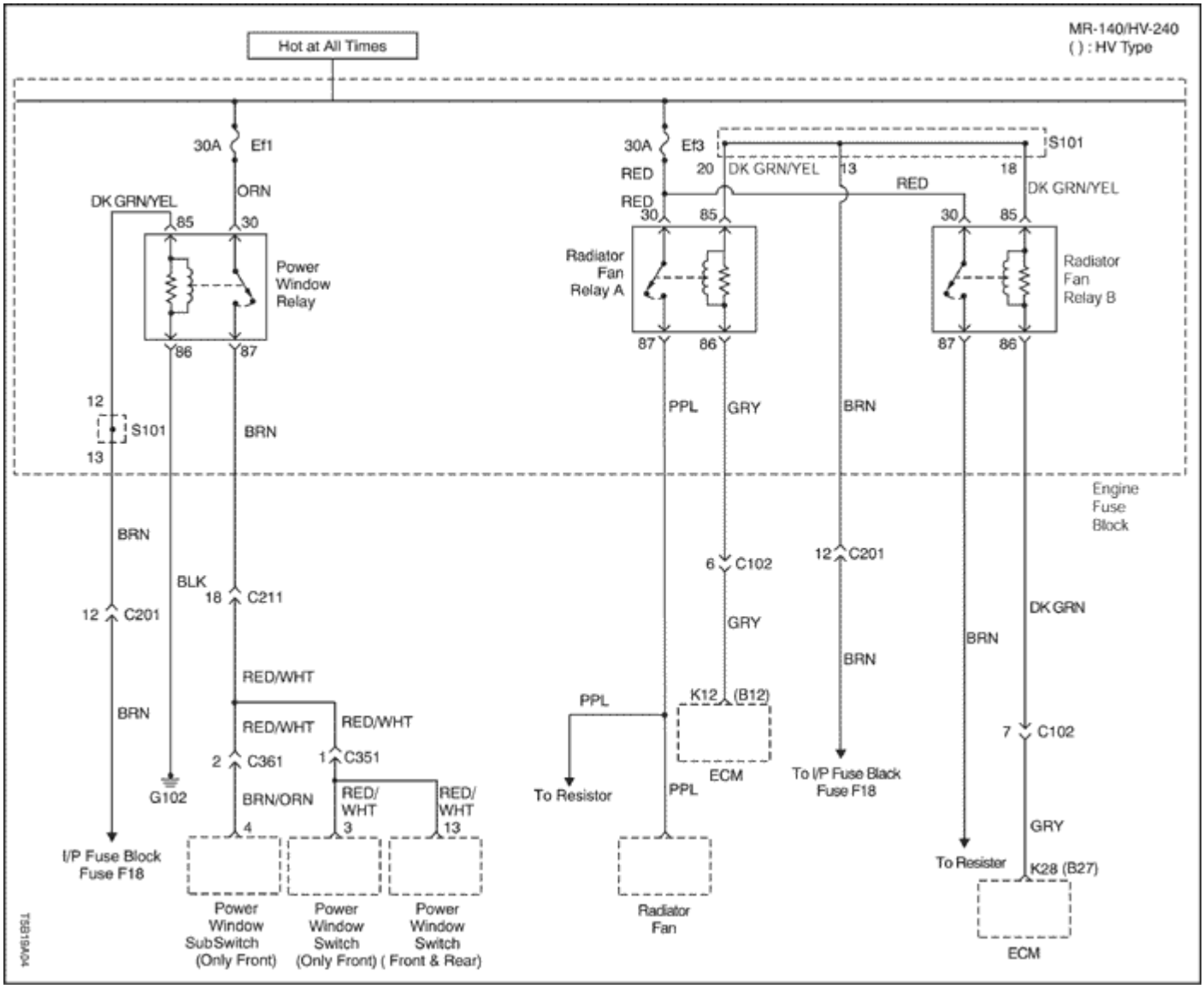
Power Distribution Schematic

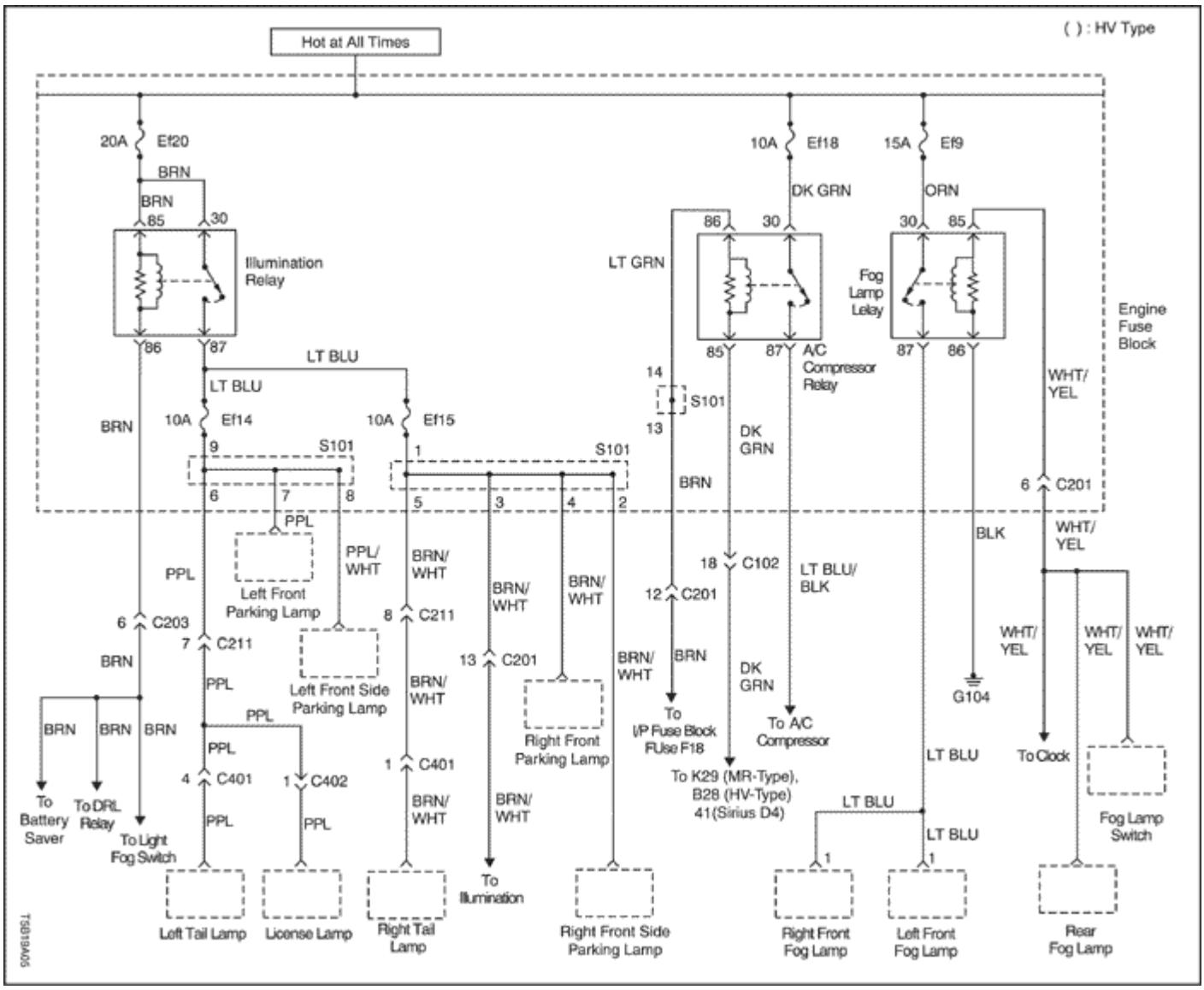

Hot at All Times
ORN
ORN
Ef7
30A
Ef6
30A
Ef5
30A
Engine
Fuse
Block
YEL
ORN
RED/BLK
3
C204
1
2
C204
ORN
RED/BLK
5
2
YEL
LOCK
LOCK
START
Ignition
Switch
ACC
1
3
YEL
6
4
RED/
BLK
To
Starter
Motor
YEL
PNK
F12
10A
F13
15A
F14
15A
F15
15A
F16
10A
F23
10A
F17
20A
F18
10A
F19
20A
F1
15A
F2
10A
F3
15A
F4
10A
F5
10A
F6
10A
F7
15A
F8
10A
F9
10A
I/P
Fuse
Block
13D19A10

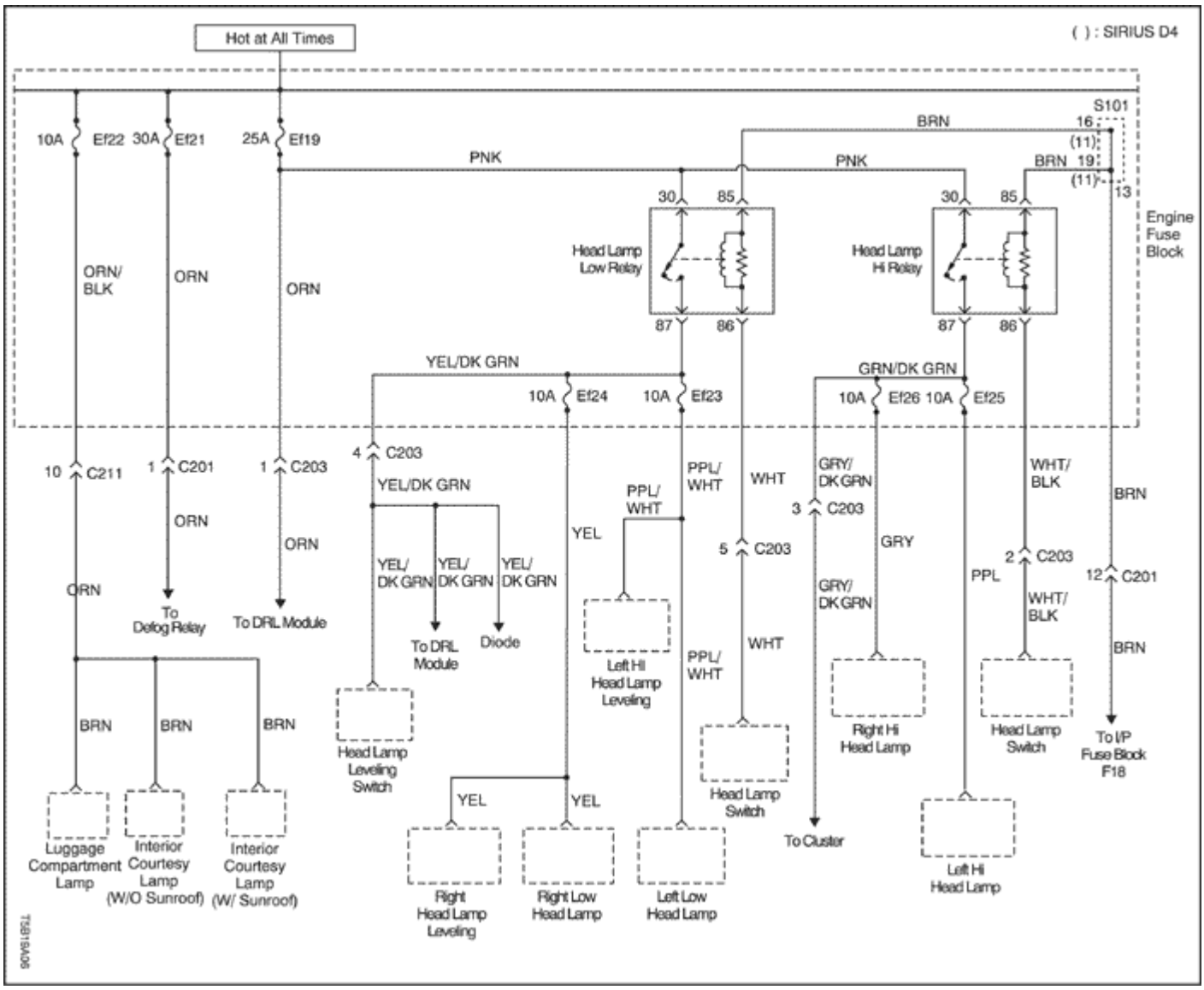

Sirius D4
Hot at All Times
Ef5 30A
Ef6 30A
Ef7 30A
Ef4 60A
Ef8 20A
Ef10 15A
Ef11 10A
Ef12 20A
Ef2 20A
Engine Fuse Block
Fuel Pump Relay
Main Relay
To Cooling Hi
To Cooling Low
S101
C204
C211
C102
C201
Ignition Switch
To I/P Fuse Block Fuses F12, F13, F14, F15, F16, F23
To EBCM
To Blower Relay
To Fuel Pump Motor
To ECM
To I/P Fuse Block F4
To Horn
To Siren
To Hood Contact Switch
To Sun Roof Module
To ECM
To EVAP Canister Purge Solenoid
RED /BLK
ORN
YEL
RED/BLK
LT BLU
YEL/ BLK
BRN
BRN/RED
RED
LT BLU/ RED
YEL/ DK BLU
DK GRN /YEL
T5819A01


MR-140/HV-240
Hot at All Times
Ef5 30A
Ef6 30A
Ef7 30A
Ef4 60A
Ef8 20A
Ef10 15A
Ef11 10A
Ef12 20A
Engine Fuse Block
ORN
30
86
Fuel Pump Relay
87
85
RED/BLK
ORN
YEL
RED
RED/BLK
LT BLU
BLK
YEL/ BLK
ORN
BRN
2
1
C204
3
C204
4
C204
16
C211
17
C102
YEL/DK BLU
22
C211
18
C201
RED/BLK
ORN
YEL
RED/BLK
LT BLU/ RED
BLK
YEL/ DK BLU
BRN
2
RED
RED
ORN
BRN
ORN
Ignition Switch
To I/P Fuse Block Fuses F12, F13, F14, F15, F16, F23
To EBCM
To Blower Relay
To Fuel Pump Motor
G104 (MR-Type)
To I/P Fuse Block F4 (HV-Type)
To ECM (MR-Type)
To ECM (HV-Type)
To Horn
To Siren
To Hood Contact Switch
To Sun Roof Module
5
Ignition Switch
TS19402

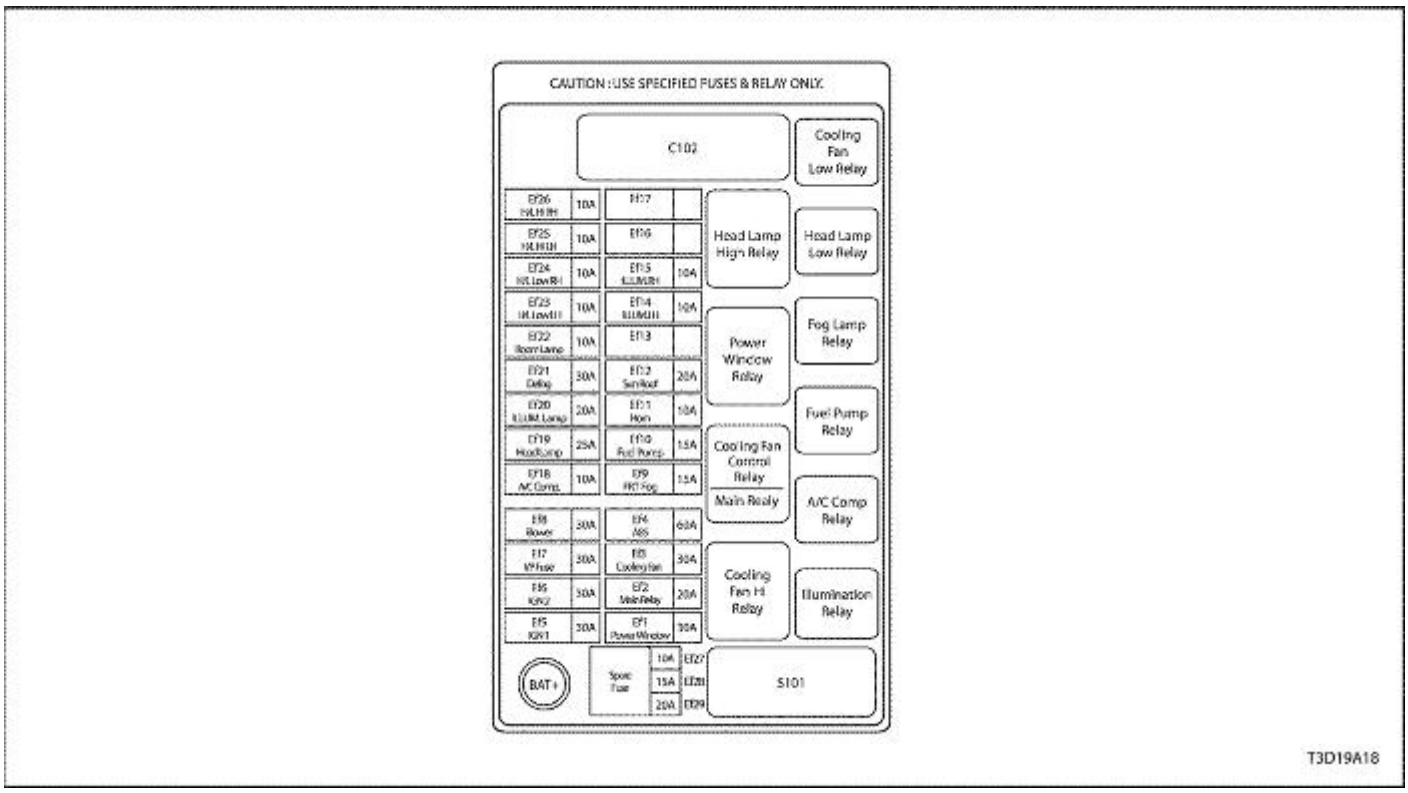

Sirius D4
Hot at All Times
30A
Ef1
ORN
DK GRN/YEL
85
30
Power Window Relay
86
87
12
S101
13
BRN
BRN
BLK
18
C211
12
C201
RED/WHT
BRN
RED/WHT
RED/WHT
2
C361
1
C351
G102
BRN/ORN
RED/ WHT
RED/ WHT
4
3
13
I/P Fuse Block Fuse F18
Power Window SubSwitch (Only Front)
Power Window Switch (Only Front) (Front & Rear)
30A
Ef3
RED
RED
20
18
RED
19
S101
BRN
30
85
30
85
Radiator Fan Relay A
Radiator Fan Relay B
87
86
87
86
Engine Fuse Block
PPL
GRY
PPL
6
C102
DK BLU
9
PPL
To Resistor
PPL
ECM
Radiator Fan
DK GRN/ YEL
To Main Relay
BRN
DK GRN
7
C102
GRY
To Resister
10
ECM
T5B19A03


MR-140/HV-240
( ) : HV Type
Hot at All Times
30A
Ef1
ORN
DK GRN/YEL
85
30
Power Window Relay
86
87
12
S101
13
BRN
BRN
12
C201
BRN
I/P Fuse Block Fuse F18
BLK
18
C211
RED/WHT
RED/WHT
RED/WHT
2
C361
1
C351
G102
BRN/ORN
4
RED/ WHT
3
RED/ WHT
13
Power Window SubSwitch (Only Front)
Power Window Switch (Only Front)
Power Window Switch (Front & Rear)
30A
Ef3
S101
RED
20
DK GRN/YEL
13
RED
18
DK GRN/YEL
RED
30
85
Radiator Fan Relay A
Radiator Fan Relay B
87
86
PPL
GRY
BRN
6
C102
12
C201
GRY
BRN
PPL
K12
(B12)
ECM
To Resistor
PPL
To I/P Fuse Black Fuse F18
Radiator Fan
BRN
DK GRN
7
C102
GRY
To Resister
K28 (B27)
ECM
Engine Fuse Block
T5B19A04

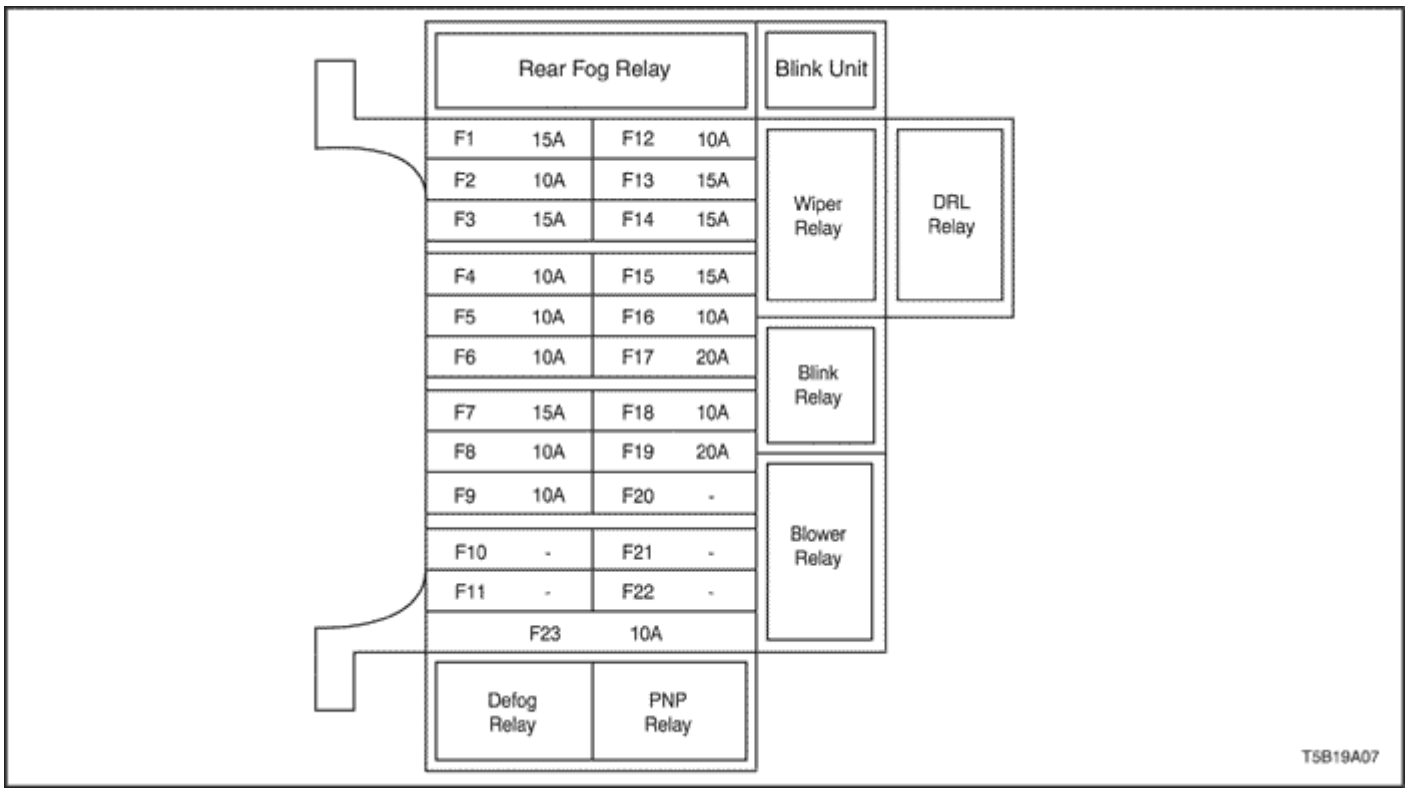

( ) : HV Type
Hot at All Times
20A Ef20
BRN
BRN
85
30
Illumination Relay
86
87
LT BLU
LT BLU
BRN
10A Ef14
10A Ef15
9
S101
6
7
8
1
S101
5
3
4
2
PPL
Left Front Parking Lamp
PPL/ WHT
BRN/ WHT
PPL
6 C203
7 C211
8 C211
BRN
PPL
Left Front Side Parking Lamp
BRN/ WHT
13 C201
BRN/ WHT
BRN
BRN
BRN
PPL
PPL
4 C401
1 C402
1 C401
BRN/ WHT
BRN/ WHT
PPL
PPL
To Battery Saver
To DRL Relay
To Light Fog Switch
Left Tail Lamp
License Lamp
Right Tail Lamp
To Illumination
Right Front Parking Lamp
Right Front Side Parking Lamp
10A Ef18
DK GRN
86
30
LT GRN
14
S101
13
DK GRN
BRN
12 C201
BRN/ WHT
To I/P Fuse Block FUse F18
85
87
A/C Compressor Relay
18 C102
LT BLU/ BLK
DK GRN
To A/C Compressor
To K29 (MR-Type), B28 (HV-Type) 41(Sirius D4)
15A Ef9
ORN
30
85
Fog Lamp Lelay
87
86
BLK
G104
LT BLU
LT BLU
1
LT BLU
1
Right Front Fog Lamp
Left Front Fog Lamp
Engine Fuse Block
WHT/ YEL
6 C201
WHT/ YEL
WHT/ YEL
WHT/ YEL
WHT/ YEL
To Clock
Fog Lamp Switch
Rear Fog Lamp
T5819A05



Fuse Block Locator (Engine)



Fuse Block Locator (Passenger Compartment)



Fuse Chart

Engine Room Fuse Block

Fuse	Rating/Source		Circuit
EF1	30A	B+	Power Window Relay
EF2	20A	Spare	Main Relay (Sirius D4)
EF3	30A	B+	Cooling Fan Relay
EF4	60A	B+	EBCM
EF5	30A	B+	Ignition-1 (Key)
EF6	30A	B+	Ignition-2 (Key)
EF7	30A	B+	Bettary Main (F12~16,23)
EF8	20A	B+	Blower Relay
EF9	15A	B+	Front Fog lamp Relay
EF10	15A	B+	Fuel Pump Relay
EF11	10A	B+	Horn, Siren, Hood Contact Switch
EF12	20A	B+	Sun Roof Module
EF13	-	Spare	Not Used
EF14	10A	Illumination	License Lamp, Tail Lamp, Position Lamp
EF15	10A	Illumination	Tail Lamp, Position Lamp, Illumination Lamp

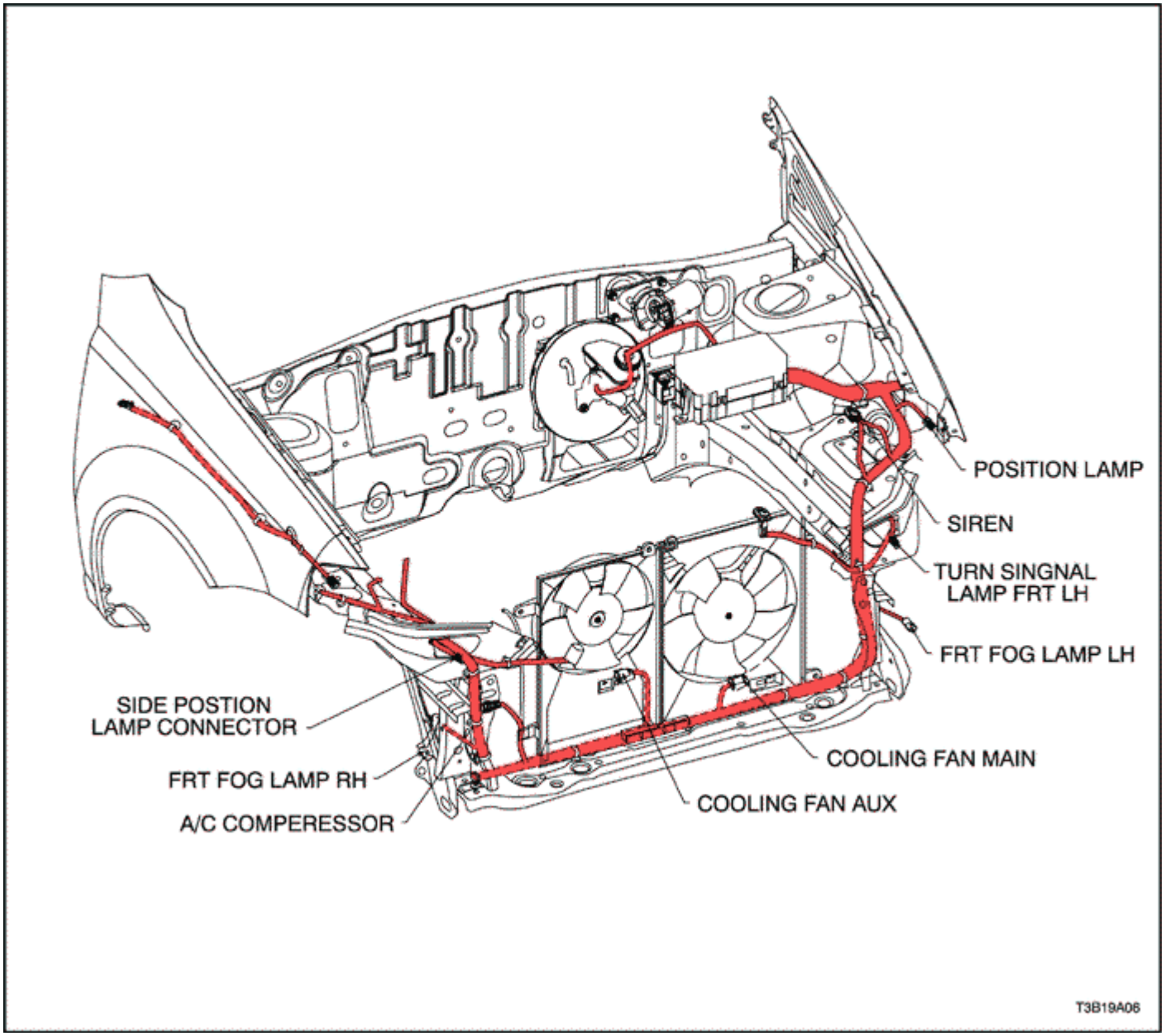
Fuse	Rating/Source		Circuit
EF16	-	Spare	Not Used
EF17	-	Spare	Not Used
EF18	10A	B+	A/C Compressor Relay
EF19	25A	B+	DRL Module, Head Lamp Relay
EF20	20A	B+	Illumination Relay
EF21	30A	B+	Defog Lamp
EF22	10A	B+	Room Lamp, Trunk Lamp
EF23	10A	Light	Head Lamp Low
EF24	10A	Light	Head Lamp Low
EF25	10A	Light	Head Lamp Hi
EF26	10A	Light	Head Lamp Hi
EF27	10A	Spare	Not Used
EF28	15A	Spare	Not Used
EF29	20A	Spare	Not Used

I/P Fuse Block

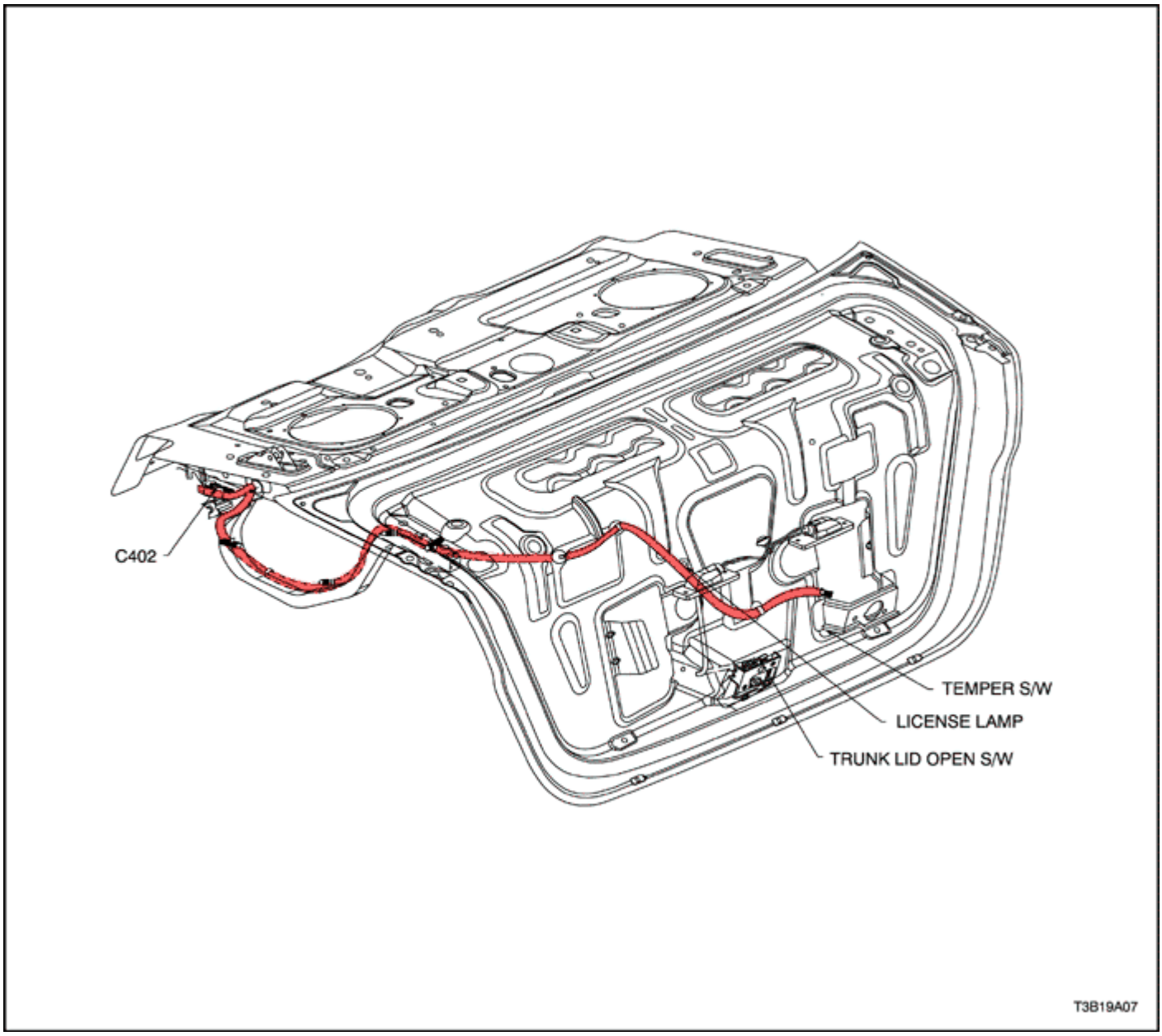
Fuse	Rating/Source		Circuit
F1	15A	ACC	Cigar Lighter, Extra Power Jack
F2	10A	ACC	Clock, Audio
F3	15A	IGN 1	Hazard Switch
F4	10A	IGN 1	DRL, Clock, Cluster, Chime Bell, Immobilizer
F5	10A	IGN 1	Back Up Switch
F6	10A	IGN 1	VSS, ECM, TCM, PNP Switch
F7	15A	IGN 1	ABS Warning Lamp Module, EI System
F8	10A	IGN 1	SDM
F9	10A	IGN1	EBCM
F10	-	Spare	Not Used
F11	-	Spare	Not Used
F12	10A	B+	Horn Relay, Key Remind Switch, DRL Relay
F13	15A	B+	Brake Switch
F14	15A	B+	Cluster, Blink relay, Hazard Switch
F15	15A	B+	Central Door Lock Unit, Anti theft Module
F16	10A	B+	Immobilizer, DLC, TCM, ECM
F17	20A	IGN 2	Windshield Wiper, Wiper Relay, Wiper Switch, Room Lamp
F18	10A	IGN 2	Power Window Relay, A/C Switch, Defog Switch, Head Lamp Relay, ABS Oil Feeding Connector
F19	20A	IGN 2	Blower Switch, A/C Switch, Defog Switch

Fuse	Rating/Source		Circuit
F20	-	Spare	Not Used
F21	-	Spare	Not Used
F22	-	Spare	Not Used
F23	10A	B+	Audio, Clock

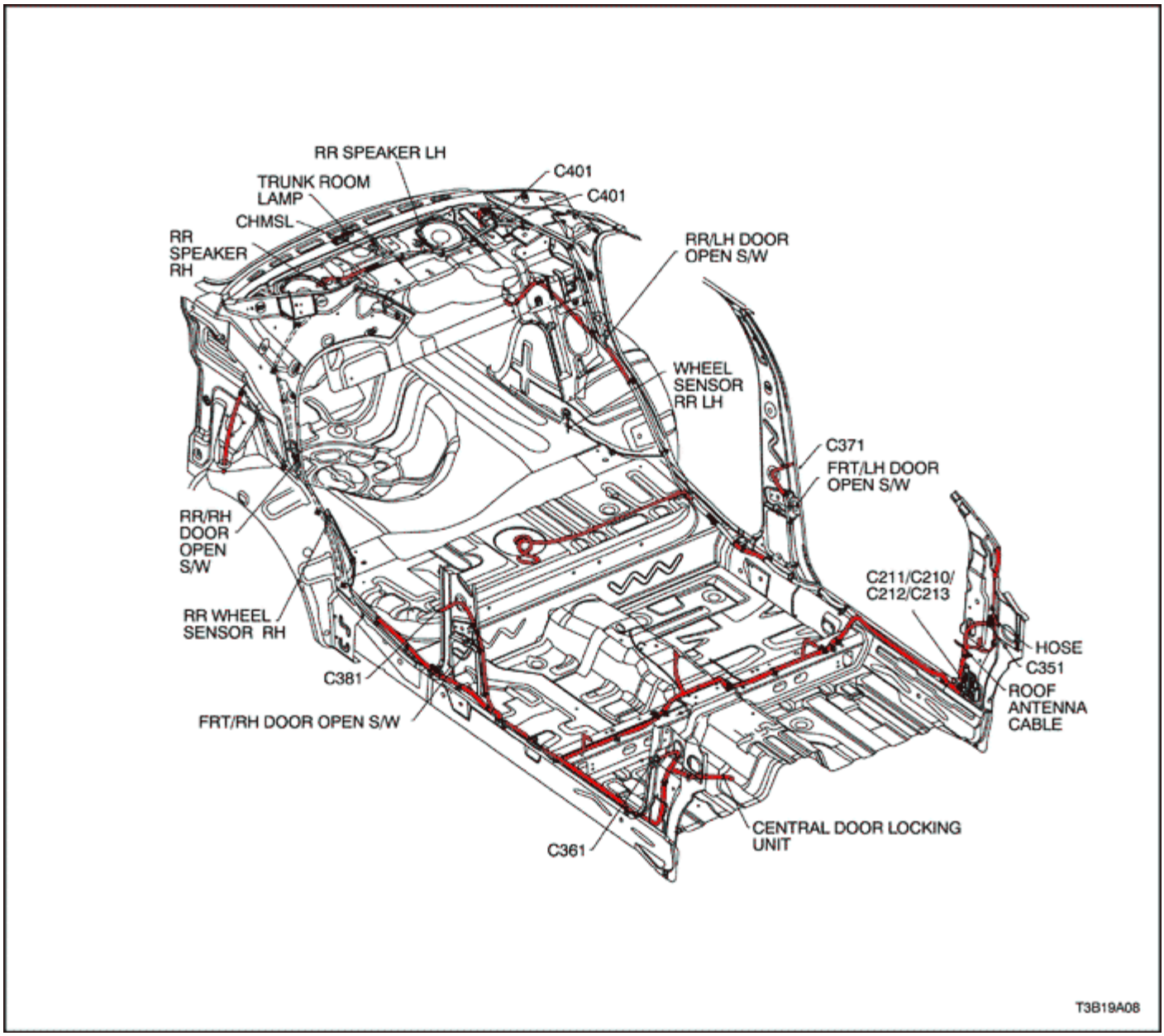
Front Harness Routing



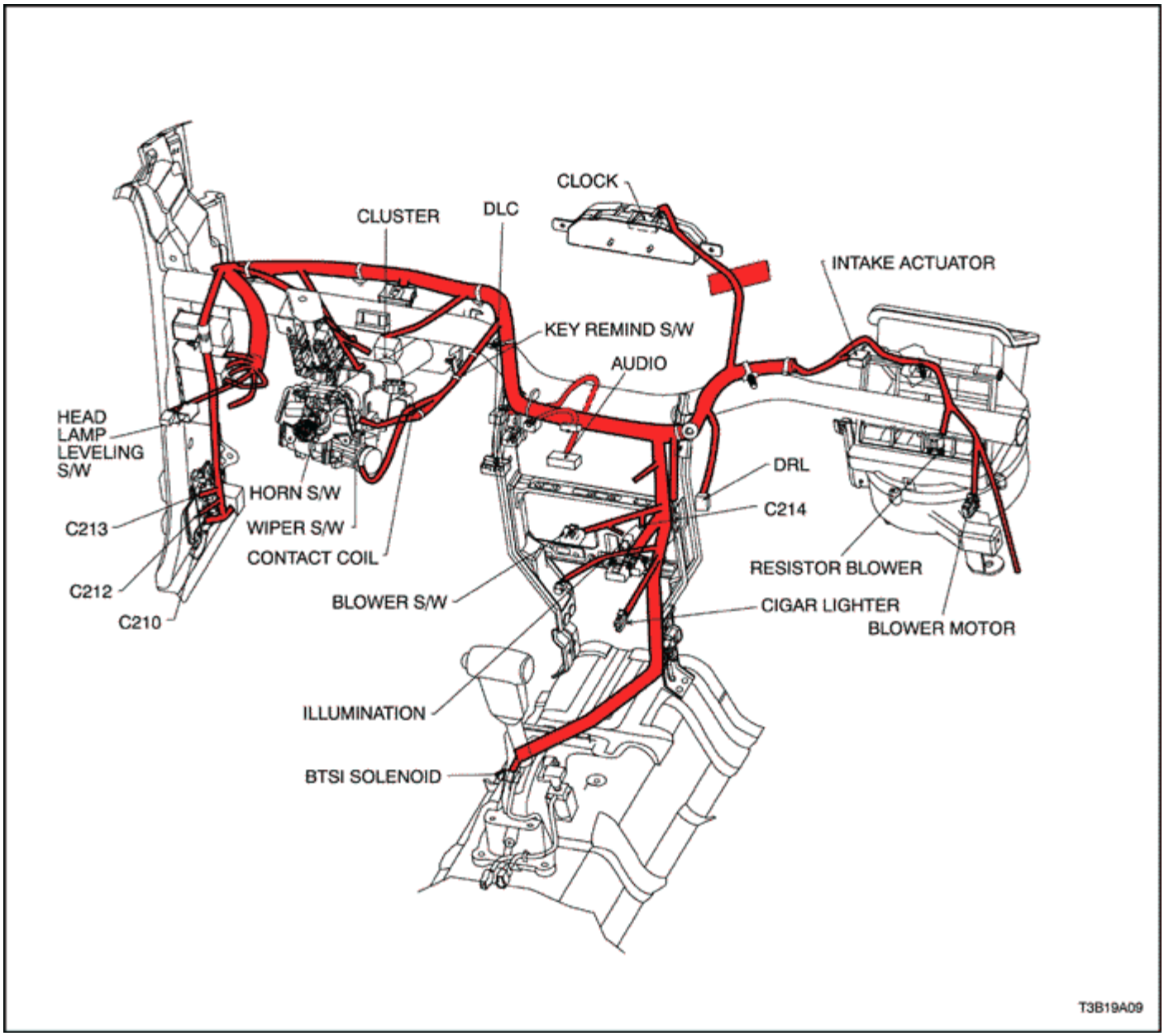
Rear Harness Routing



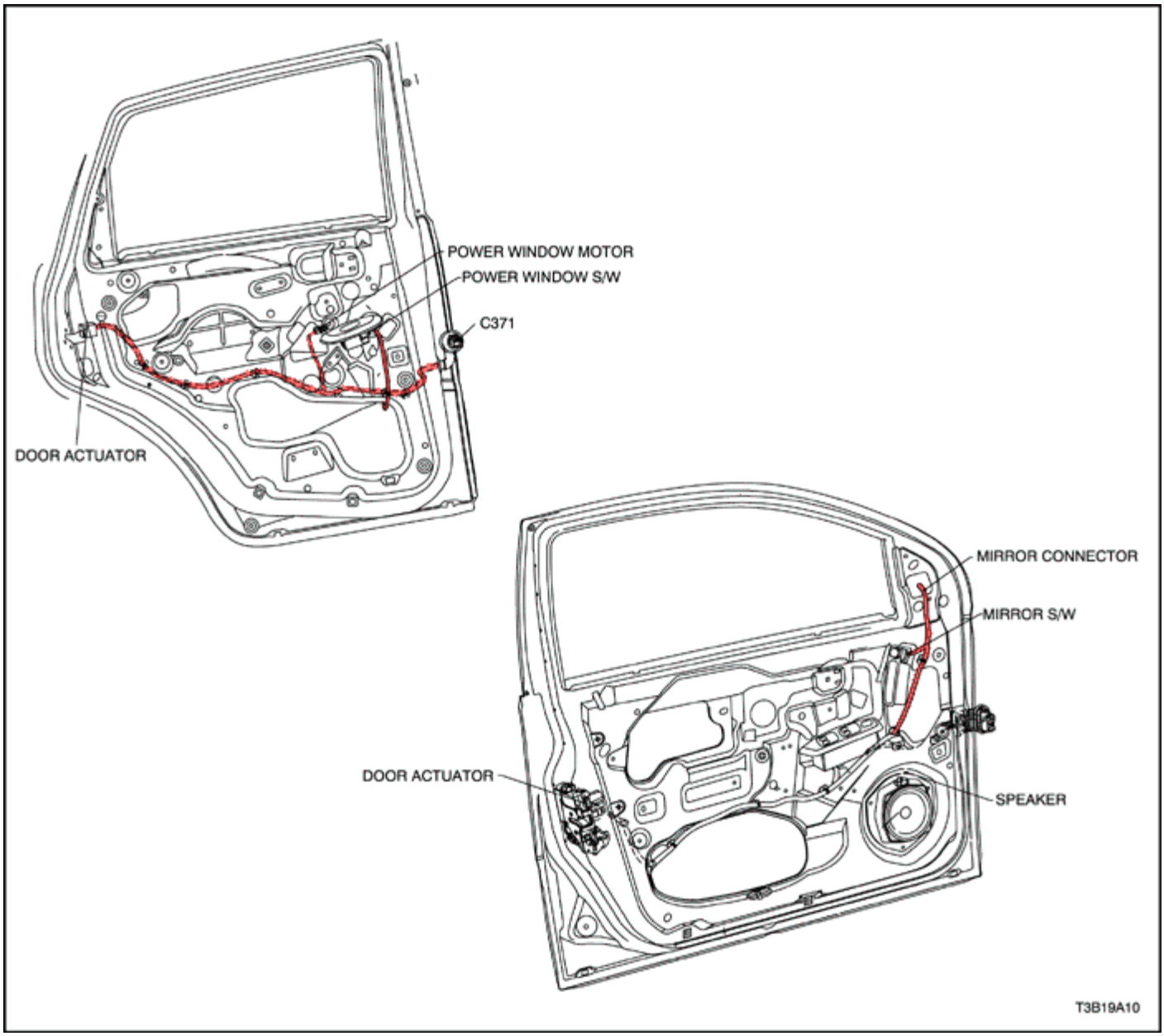
Floor Harness Routing



Instrument Harness Routing



Door Harness Routing



SECTION 9B

LIGHTING SYSTEMS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Bulb Usage Chart

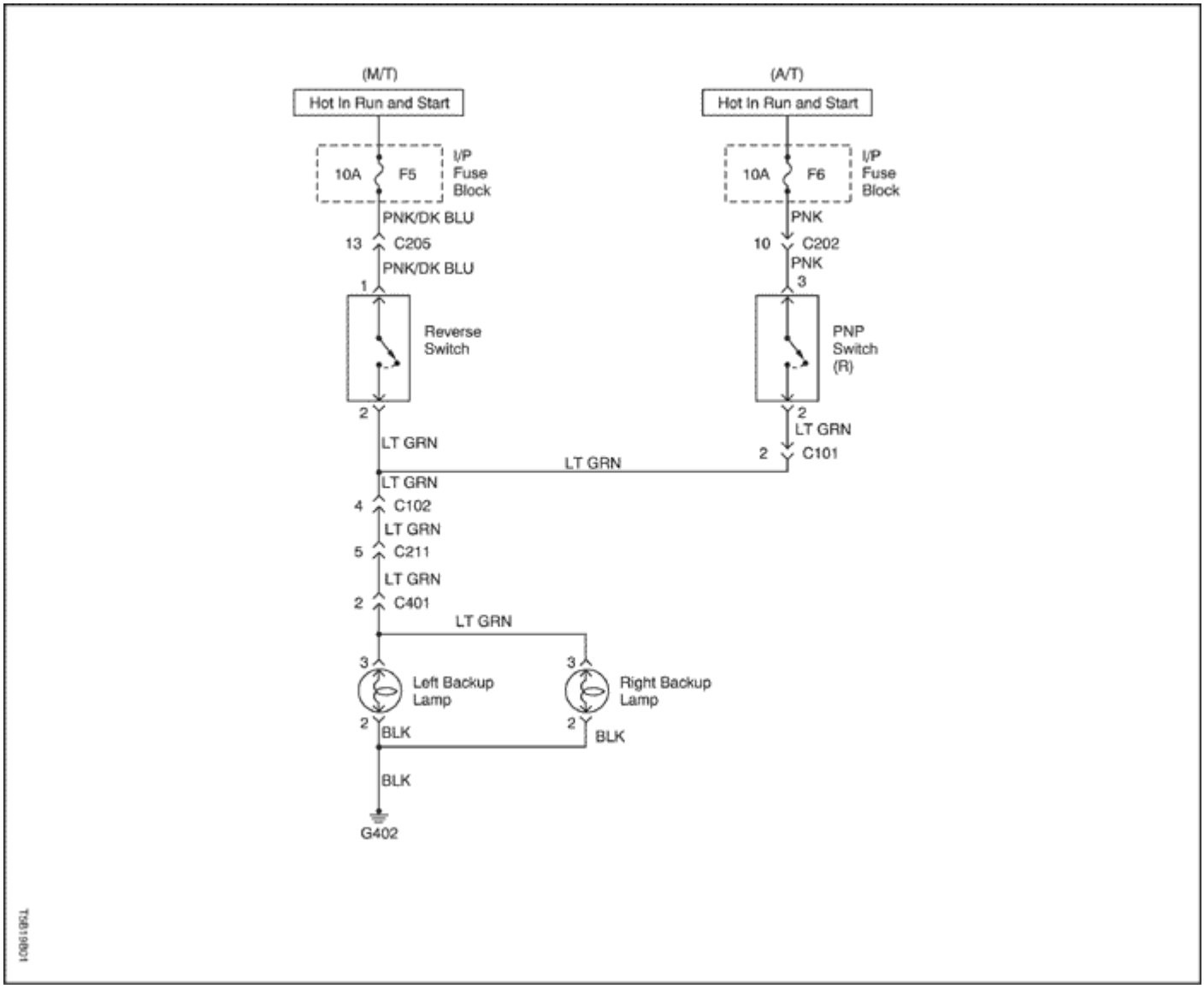
Bulb	Replacement Bulb Number
Backup Lamp	27W
Center High-Mounted Stoplamp	27W
Front Fog Lamp	55W
Headlamp	Double 65/55W
Interior Courtesy Lamp	10W
License Plate Lamp	5W
Luggage Compartment Lamp	10W
Park and Front Turn Signal Lamp	Double 27W/8W
Rear Turn Signal Lamp	Single 27W
Side Turn Signal Lamps	5W
Tail and Stoplamp	Double 27/8W

Fastener Tightening Specifications

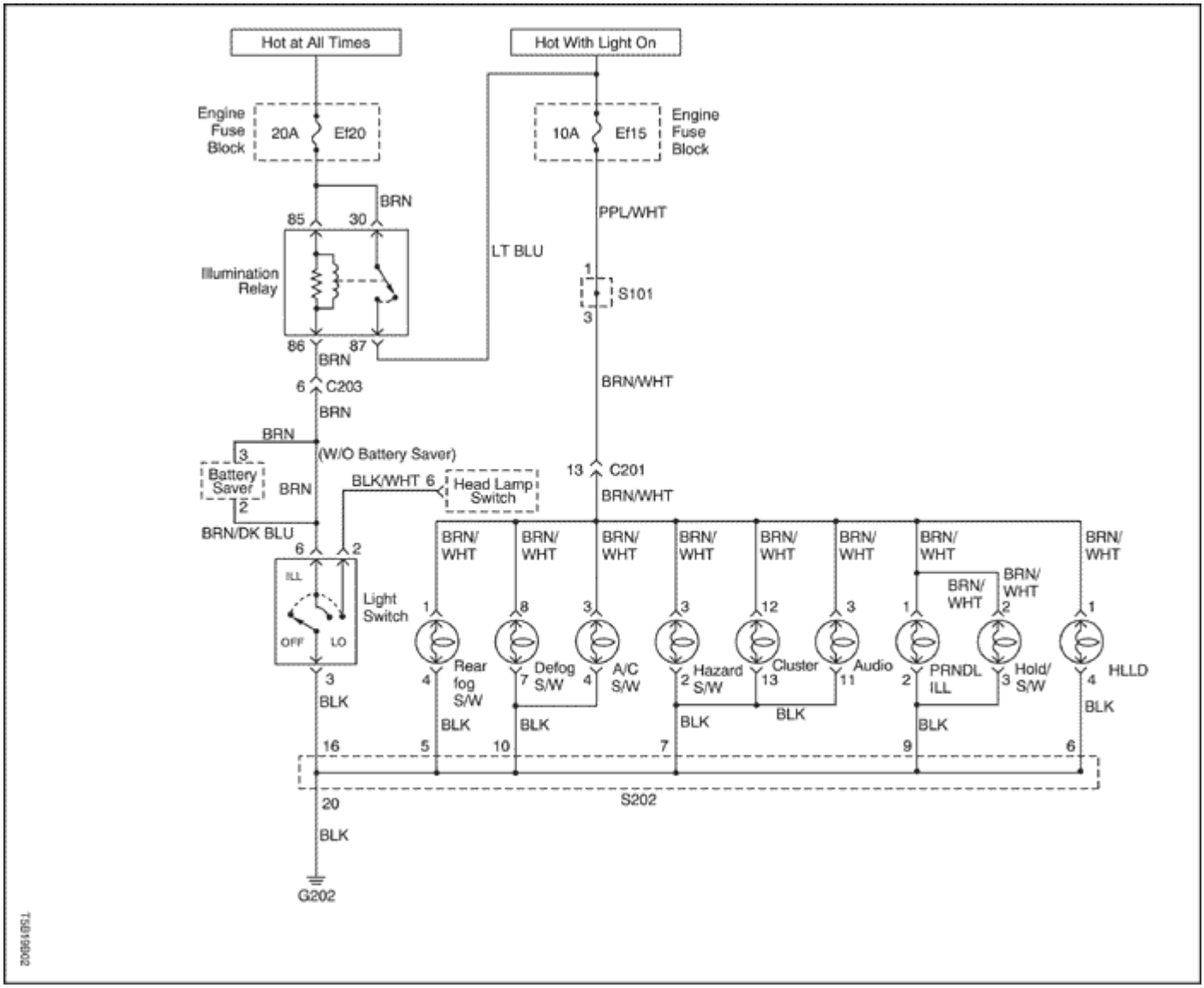
Application	N•m	Lb-Ft	Lb-In
CHMSL Mounting Screws	3	-	27
Cupholder Screws	2	-	18
Daytime Running Lamp Module Screws	2.5	-	22
Door Jamb Switch Screw	4.5	-	40
Headlamp Assembly Bolts	6	-	53
Interior Courtesy Lamp Housing Screws	2	-	18
License Plate Lamp Screws	1.5	-	13
Taillamp Assembly Screws	3	-	27

SCHEMATIC AND ROUTING DIAGRAMS

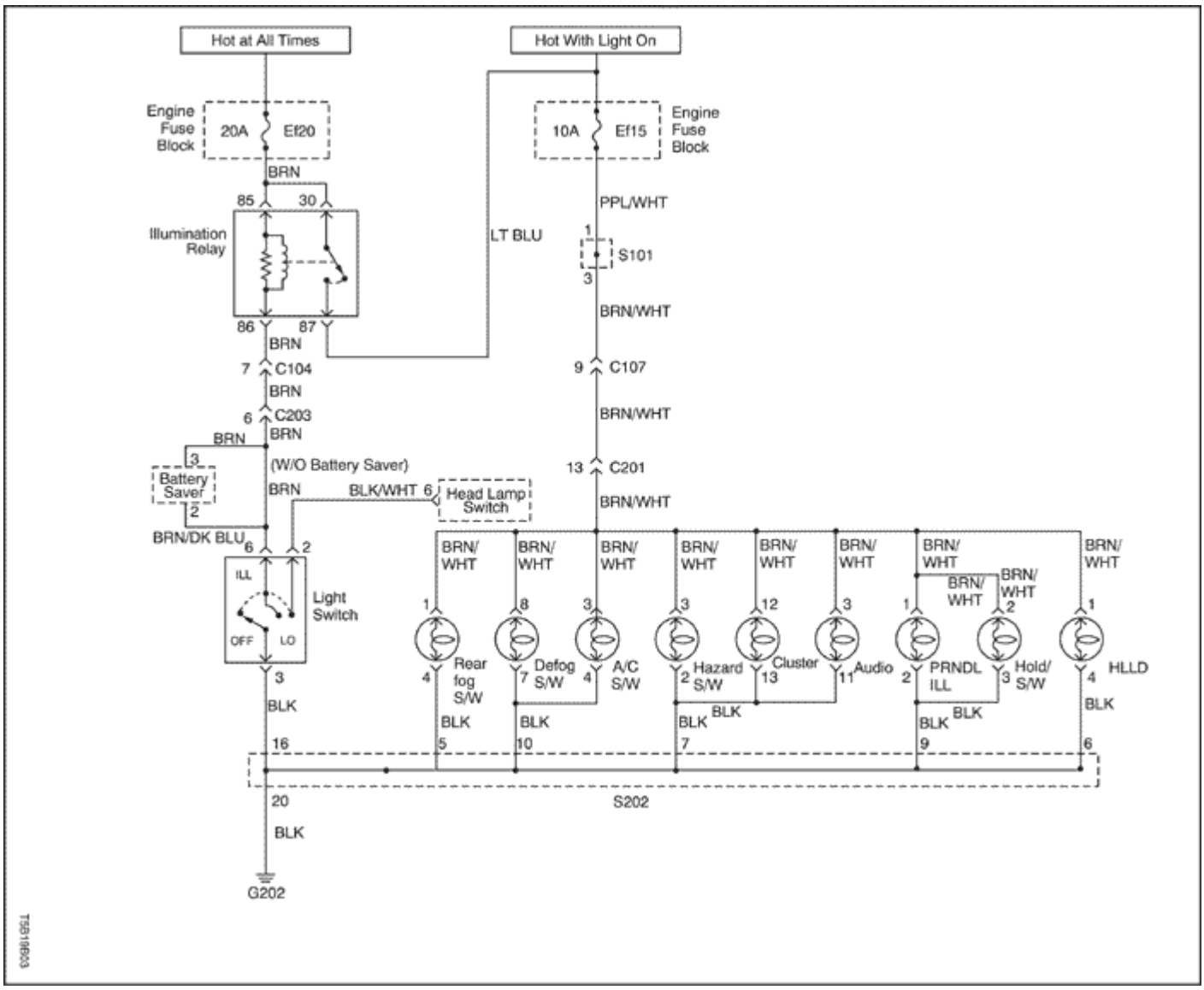
Backup Lamps Circuit



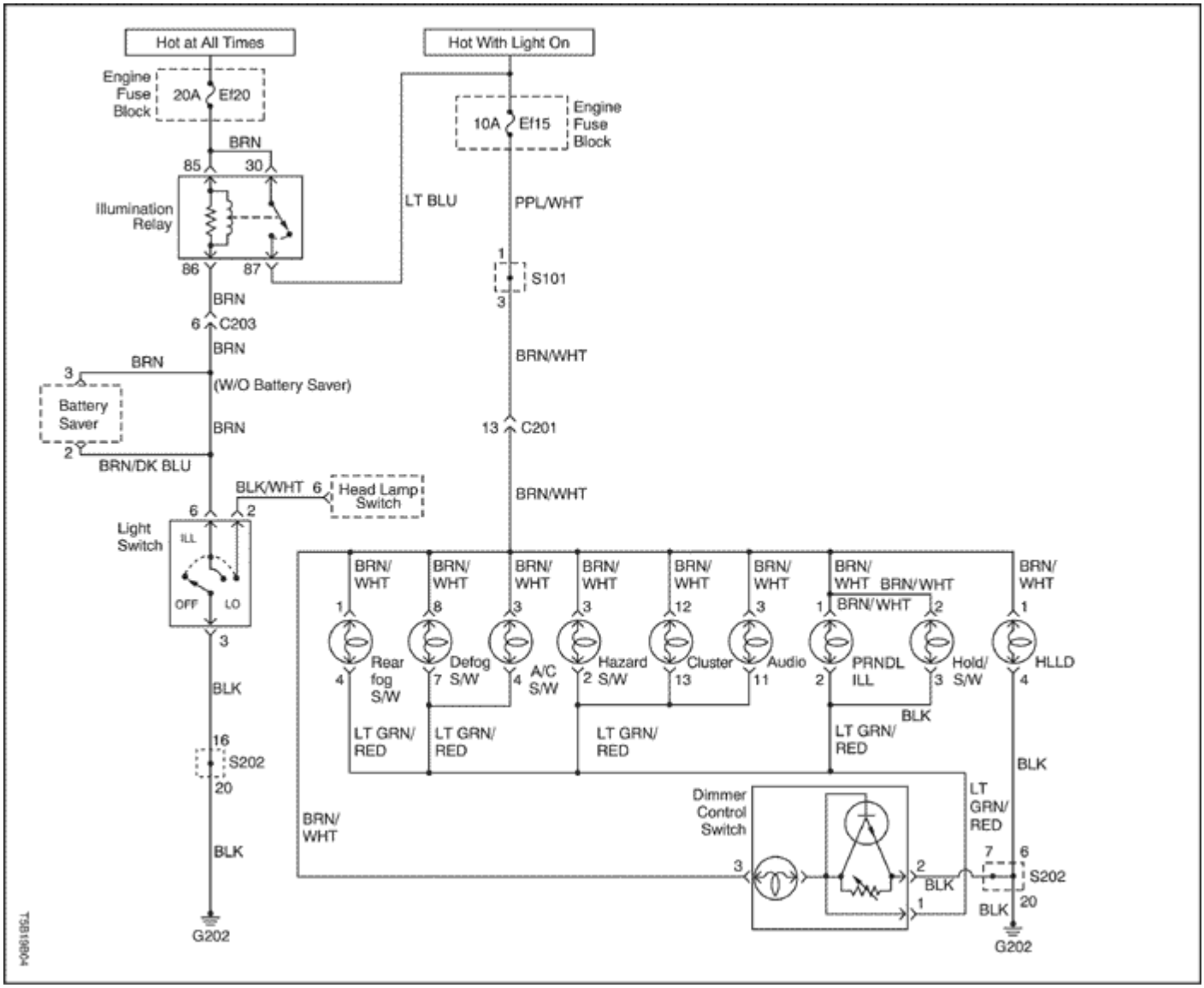
Instruments Circuit (W/O Dimmer Control)



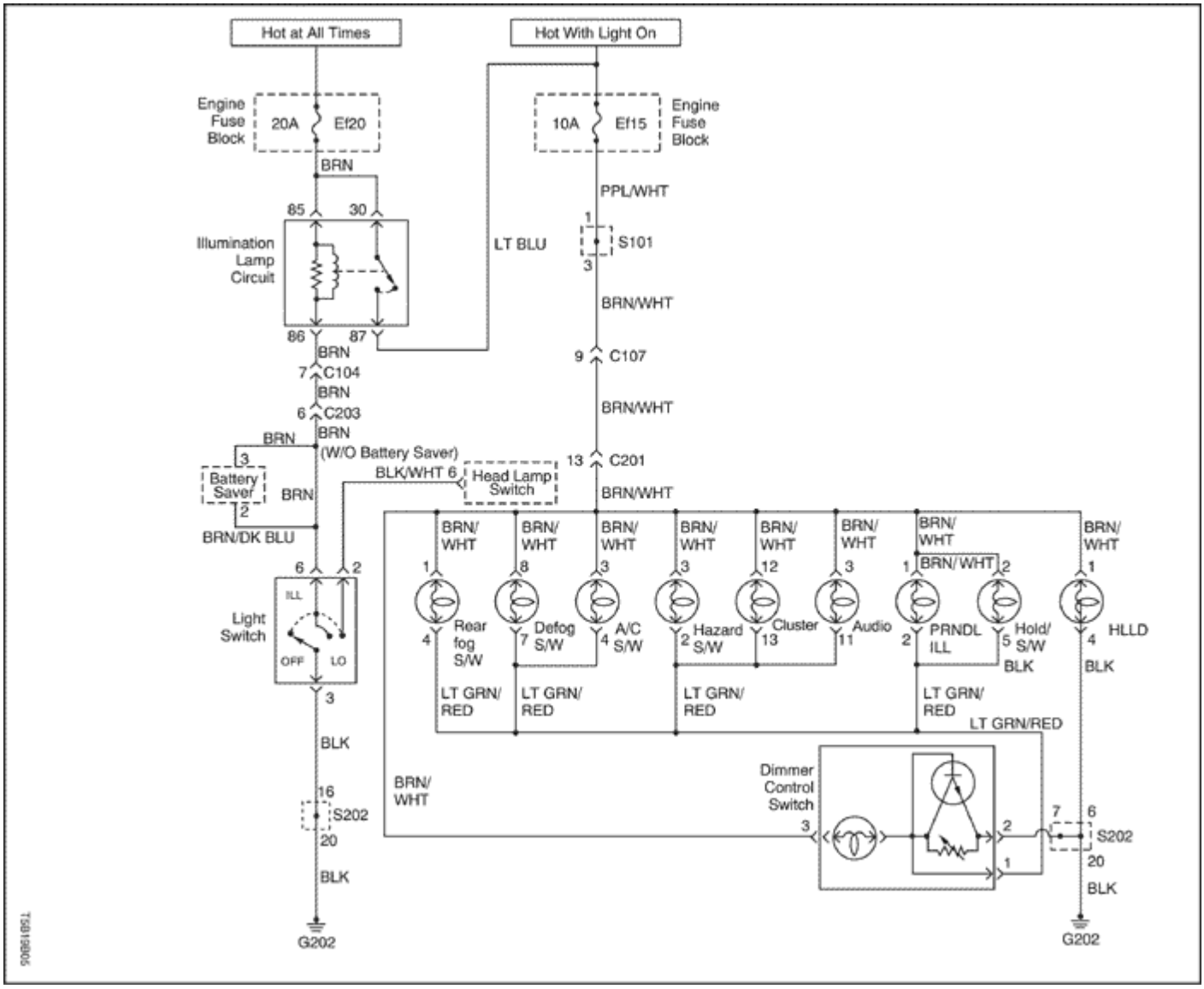
Instruments Circuit (W/O Dimmer Control) (RHD)



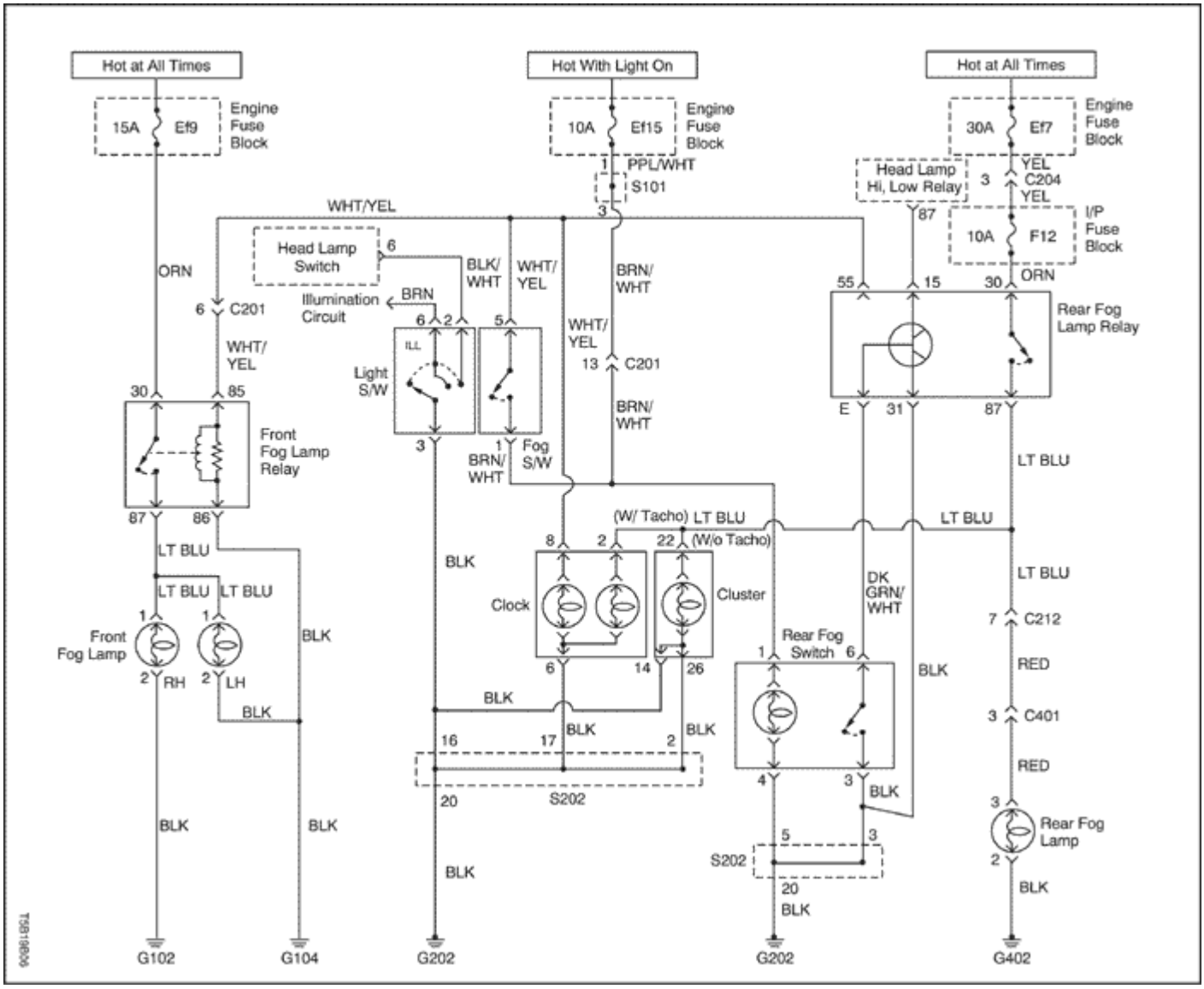
Instruments Circuit (W/ Dimmer Control)



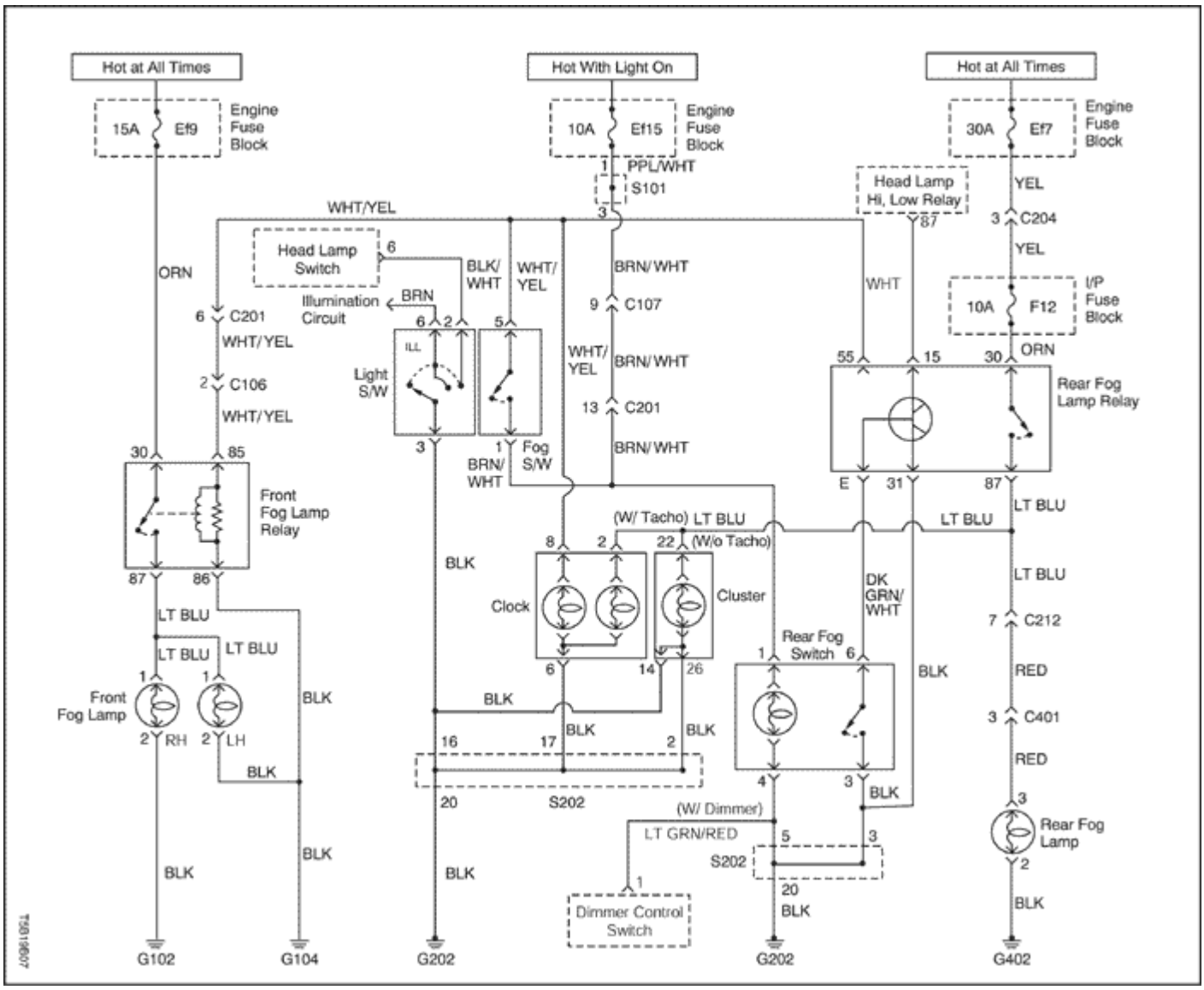
Instruments Circuit (W/ Dimmer Control) (RHD)



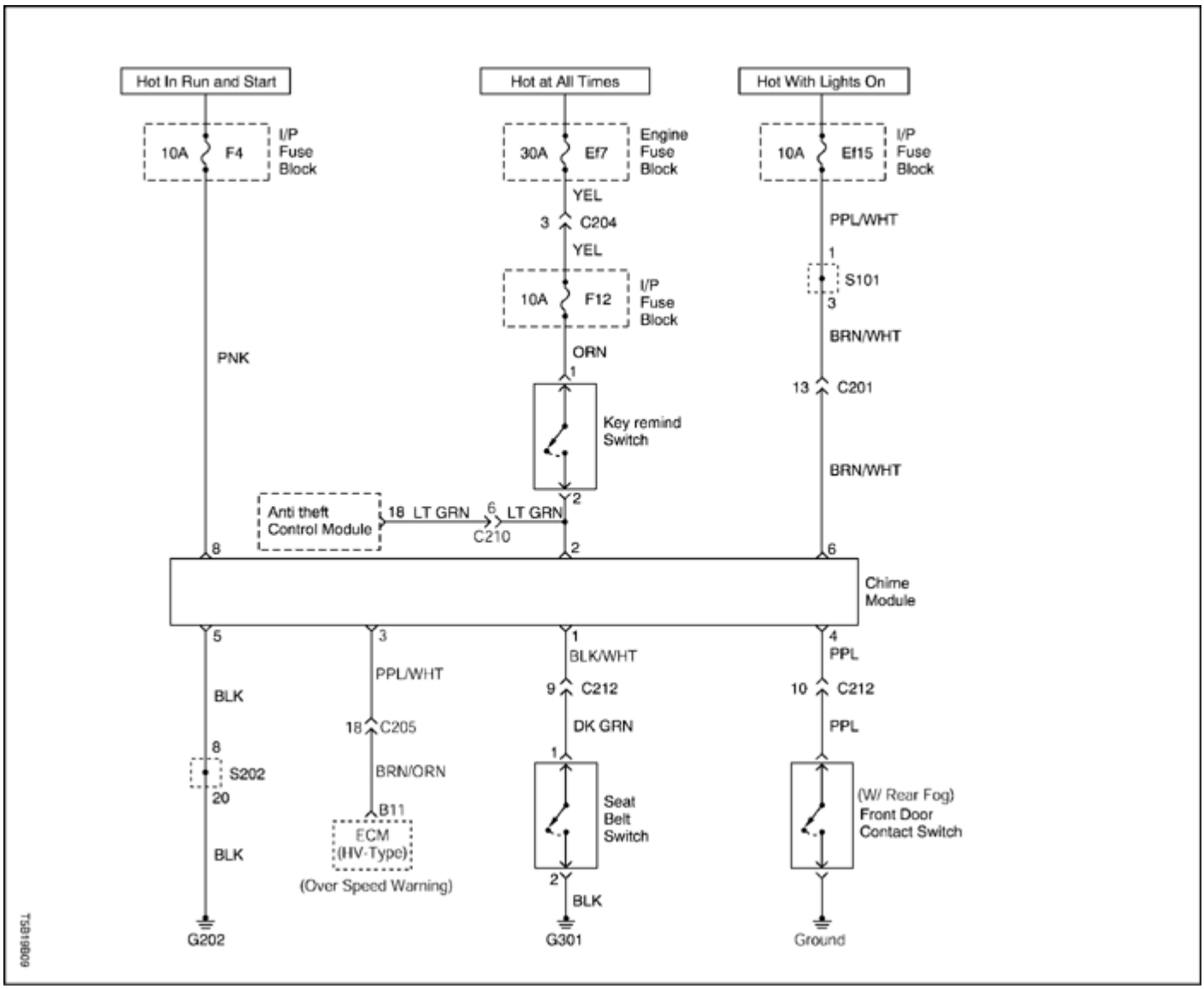
Front and Rear Fog Lamps Circuit



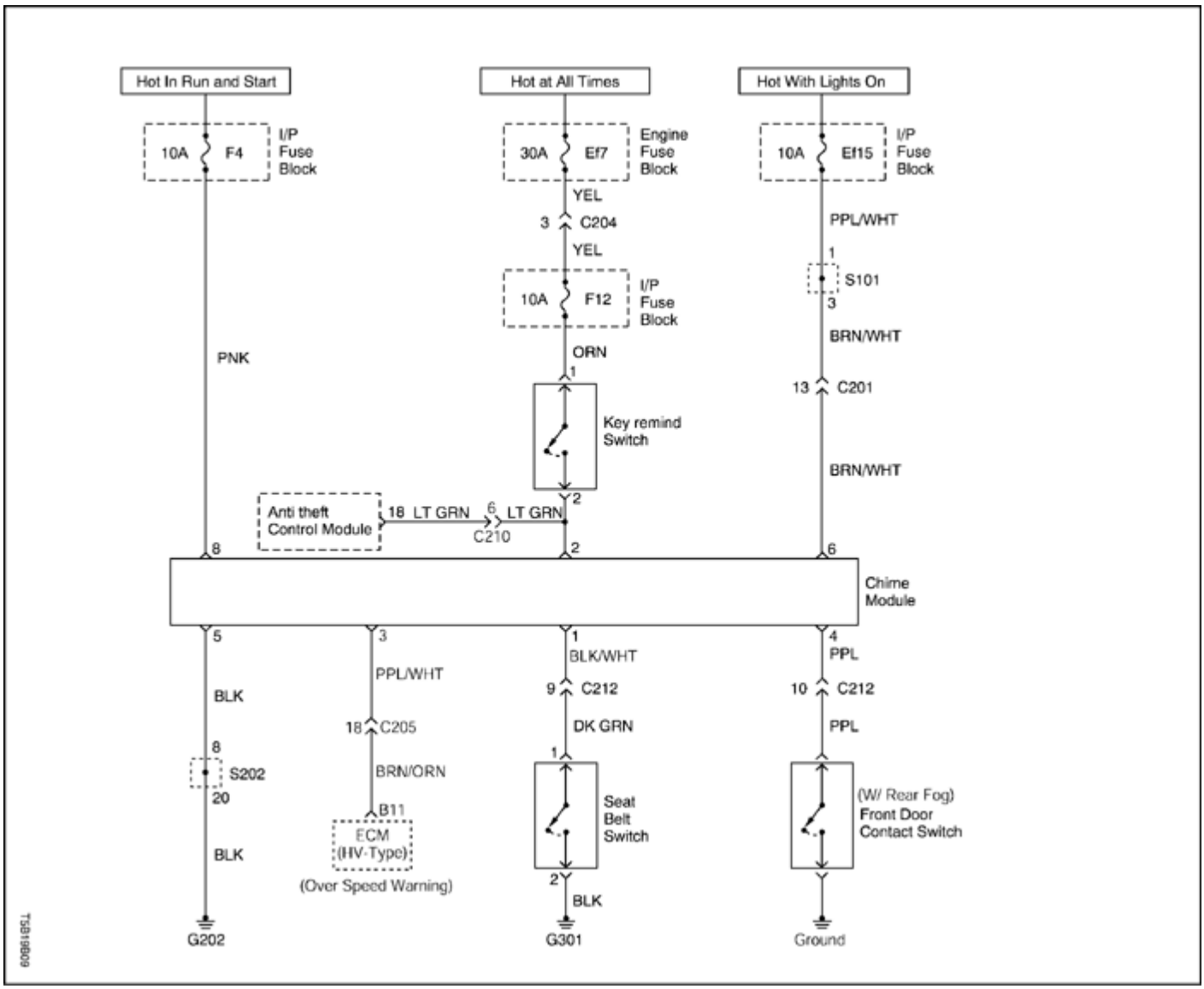
Front and Rear Fog Lamps Circuit (RHD)



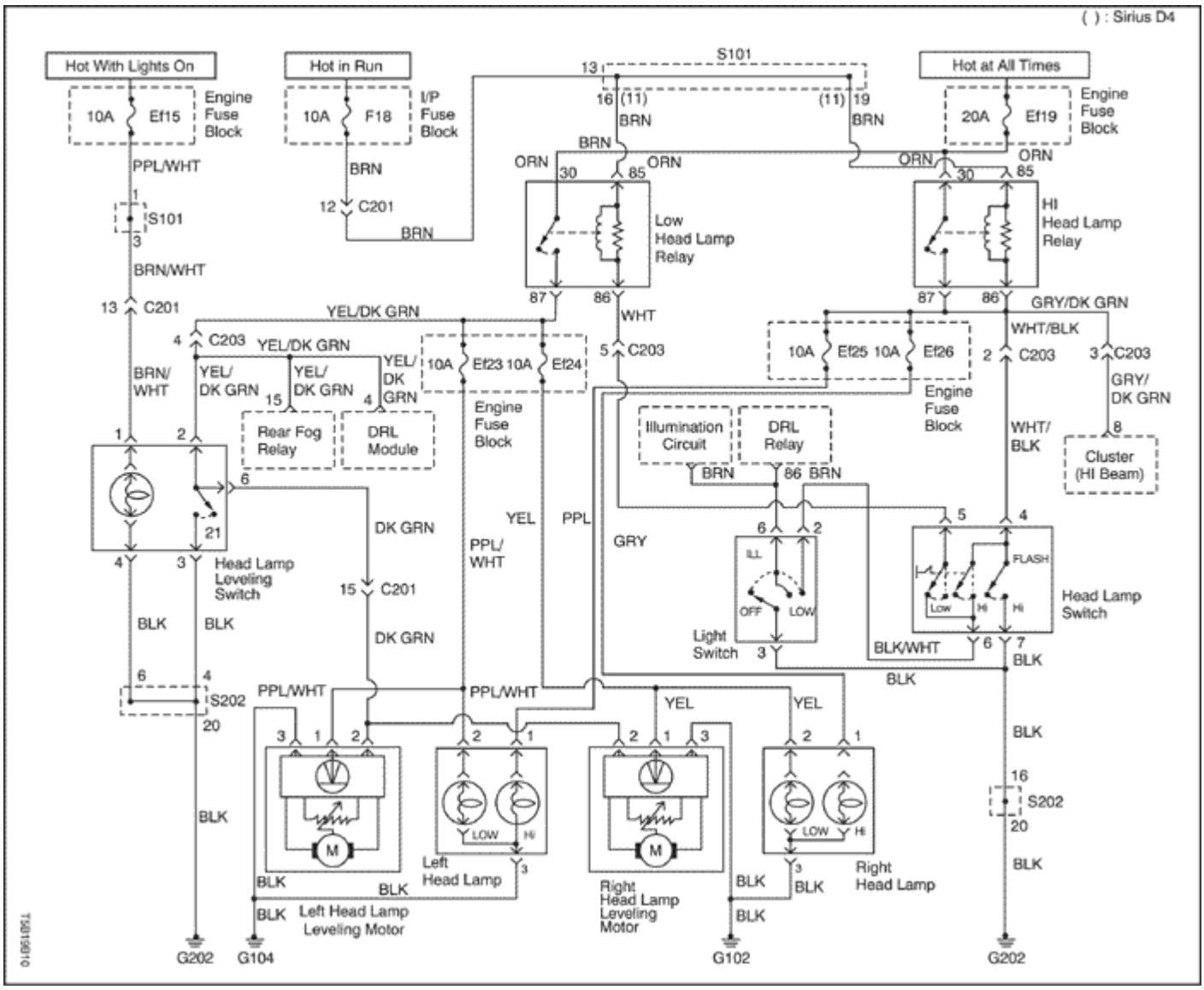
Headlamps-On Reminder Chime Circuit



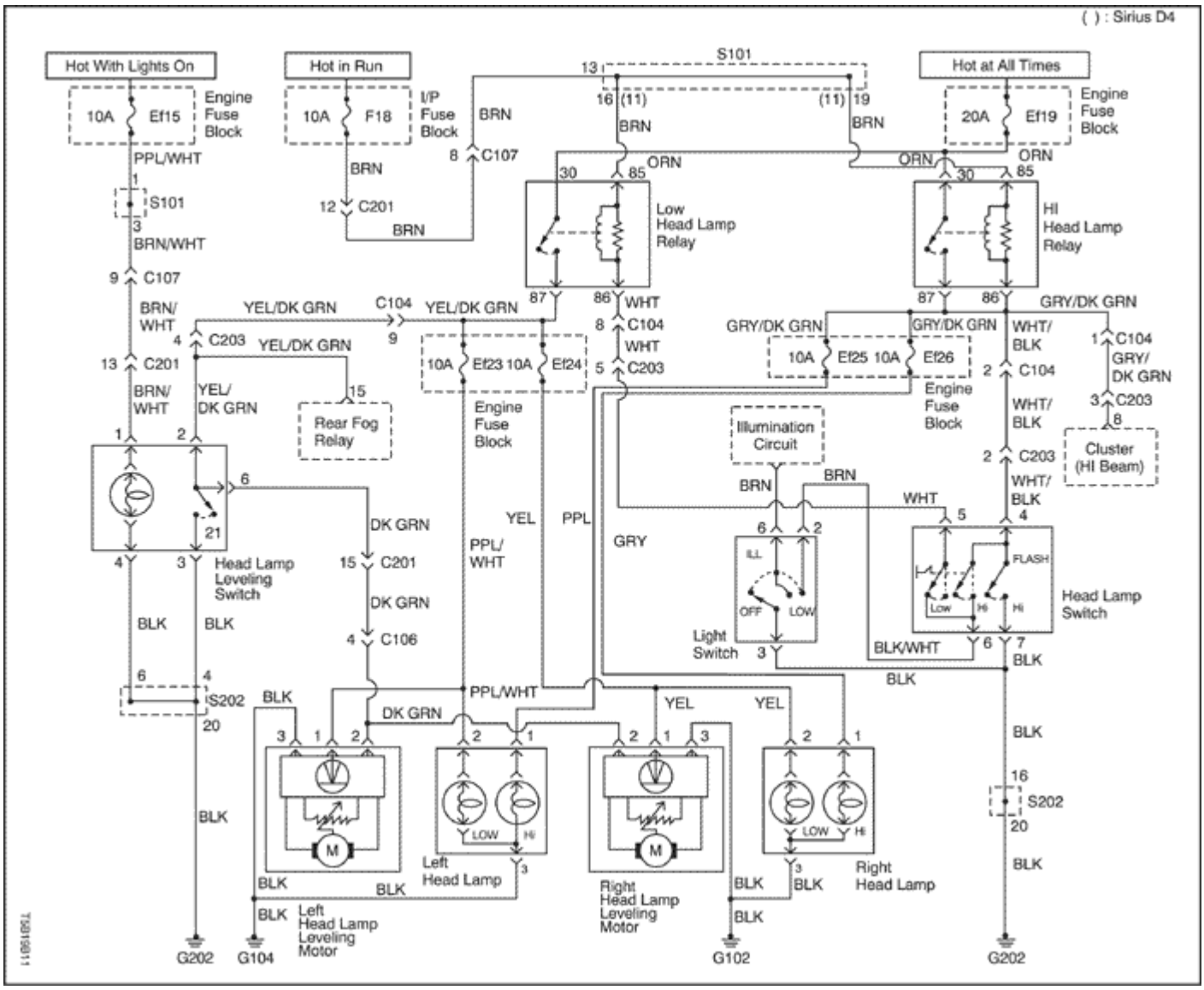
Headlamps-On Reminder Chime Circuit (RHD)



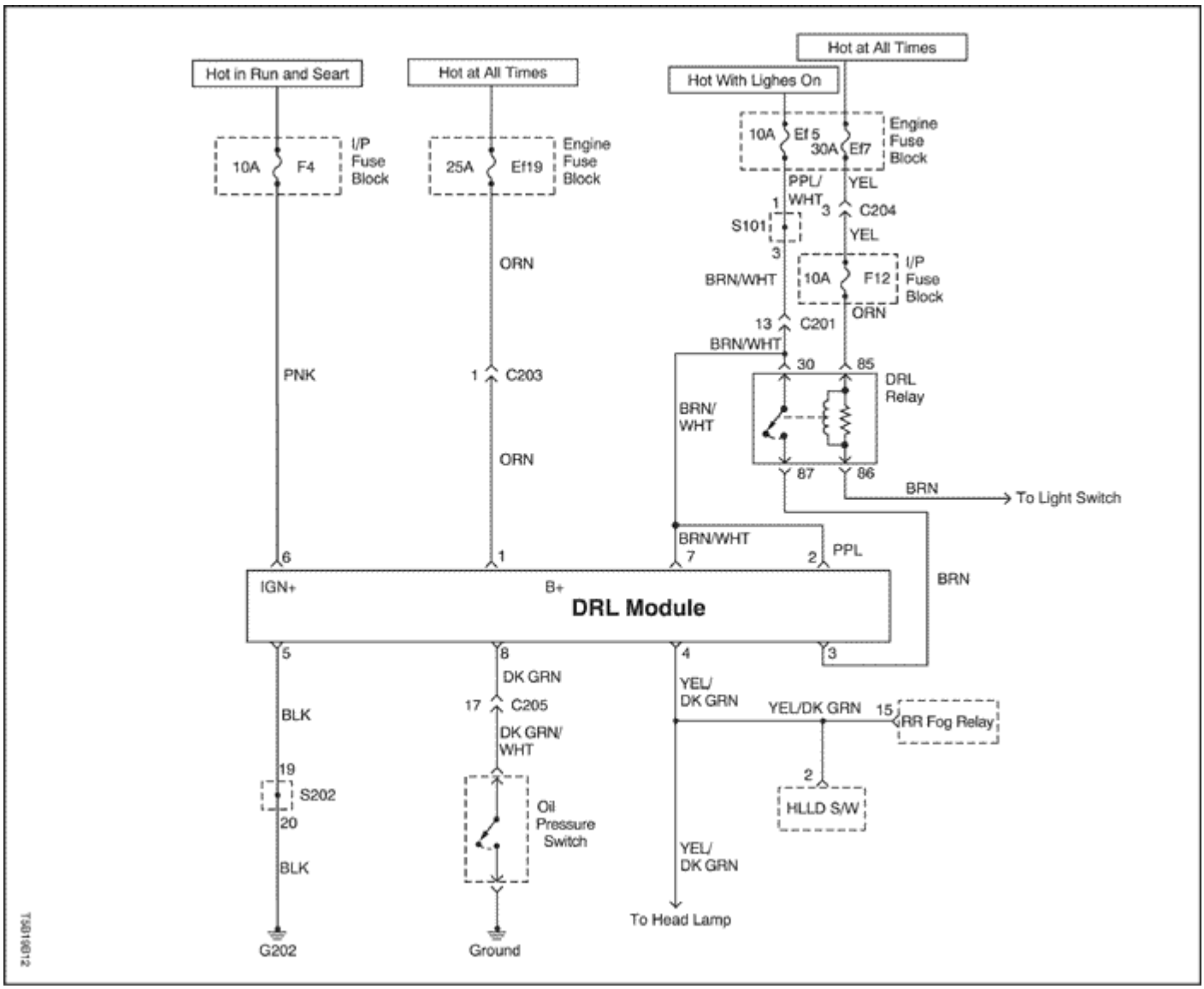
Headlamps and Headlamp Leveling Circuit



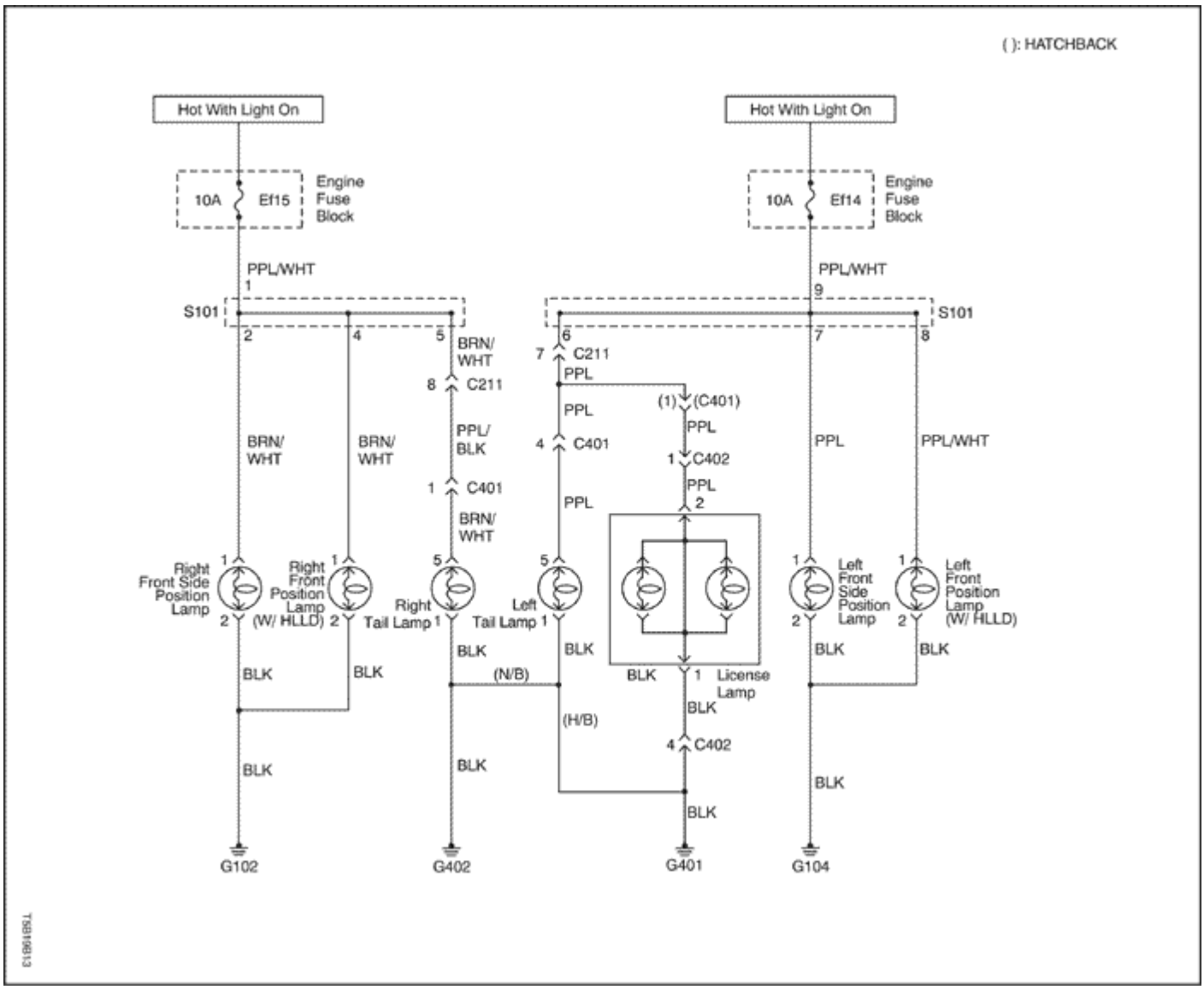
Headlamps and Headlamp Leveling Circuit (RHD)



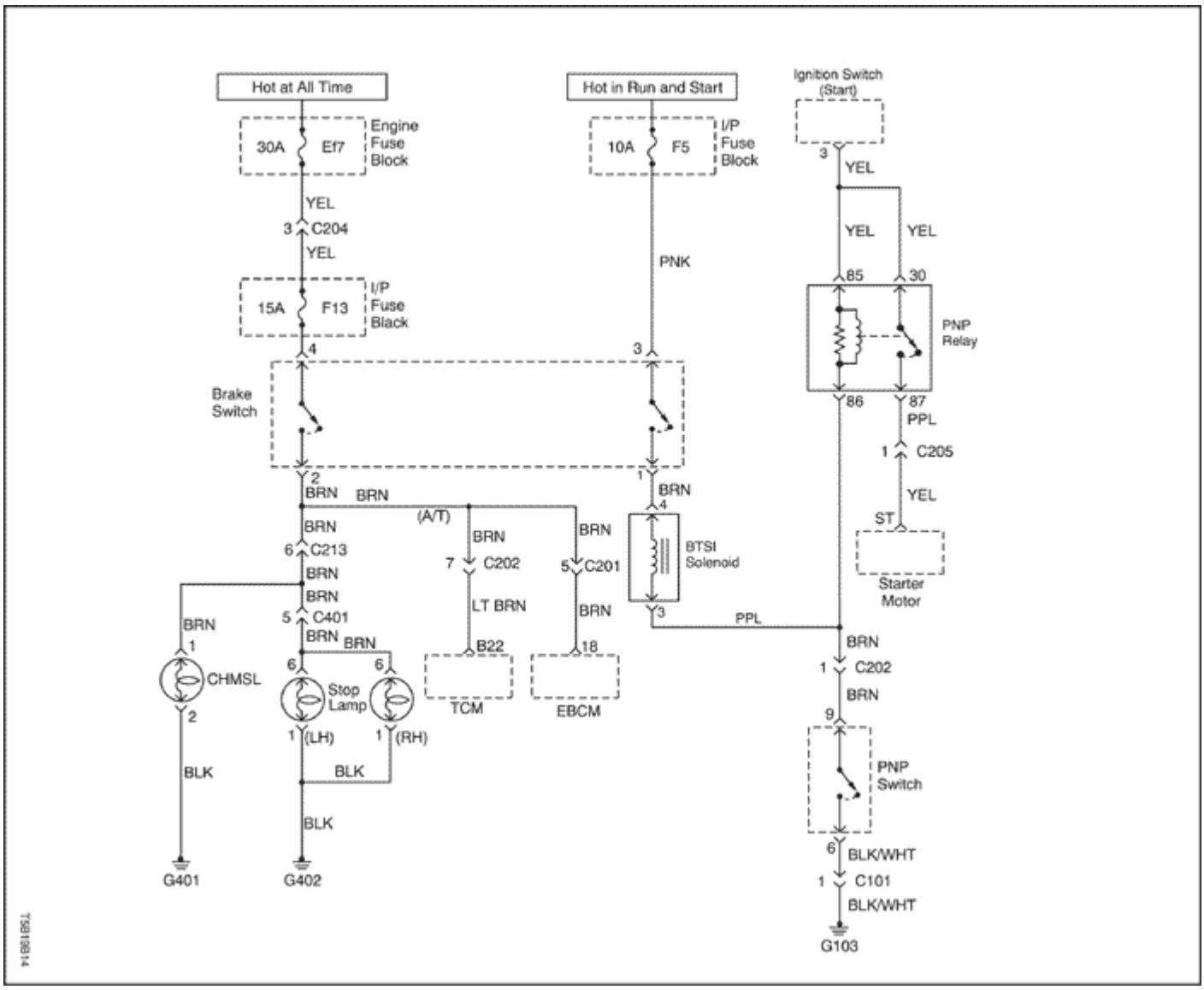
Daytime Running Lamps Circuit



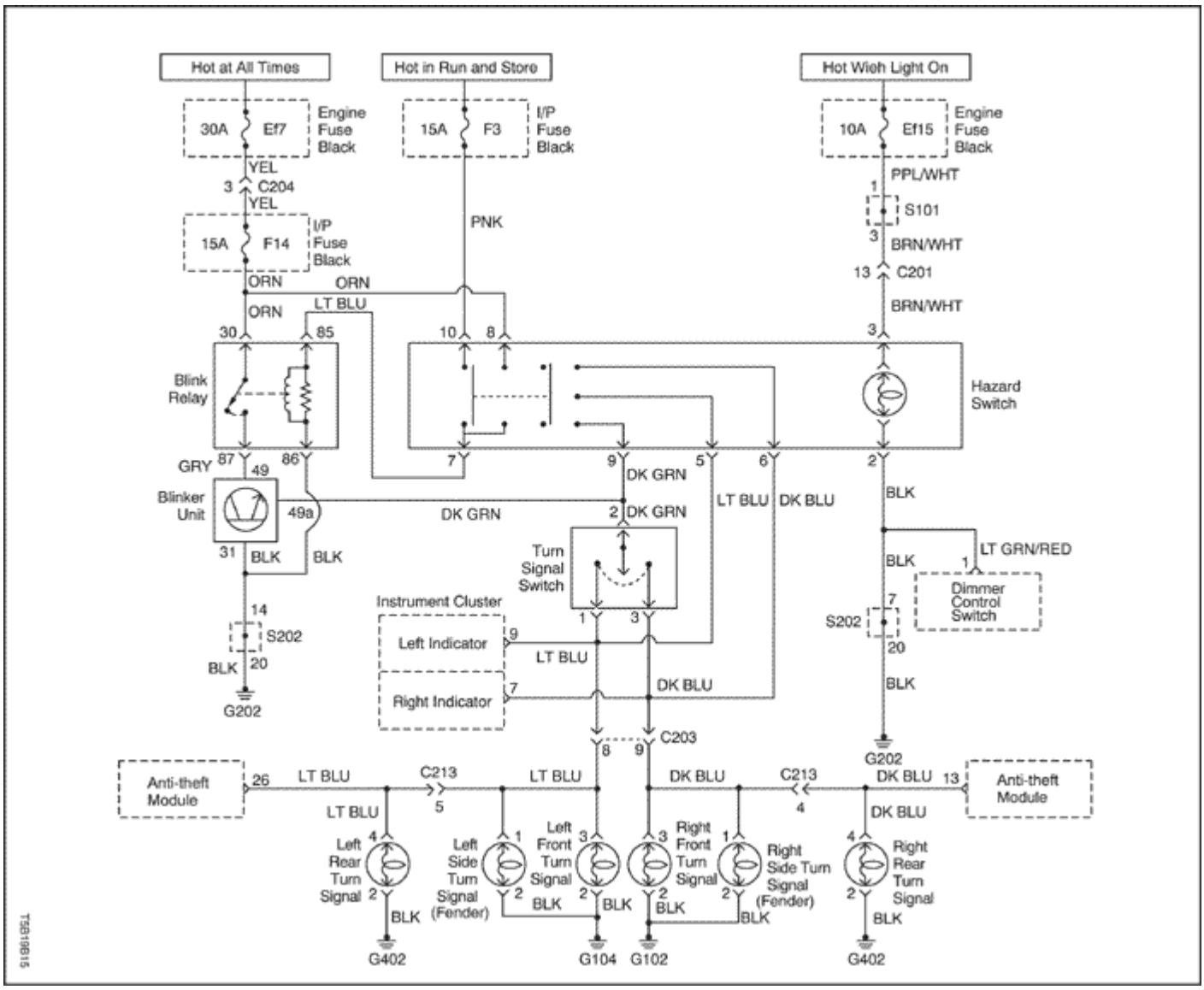
Parking, Tail, and License Lamps Circuit



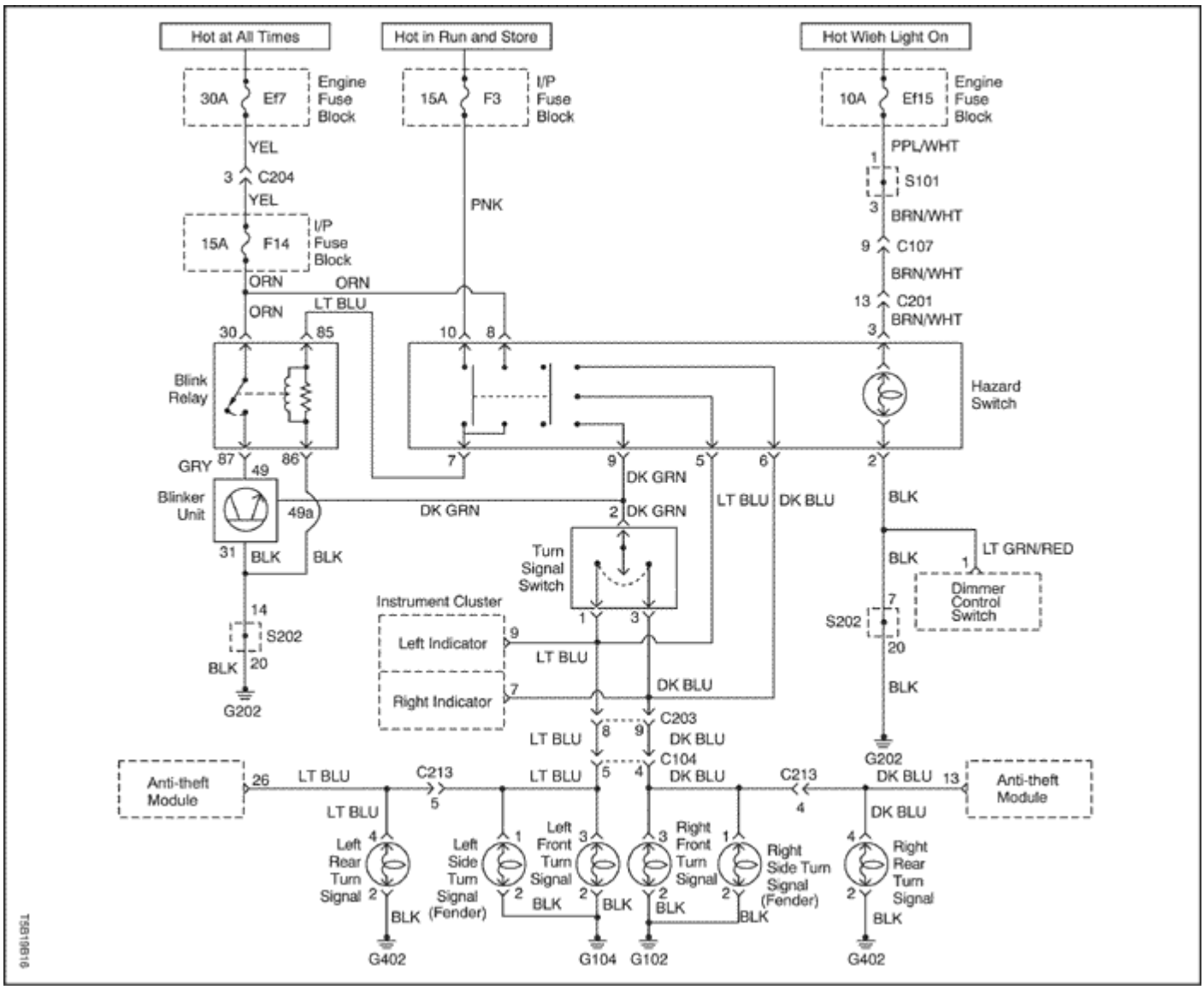
Stoplamps Circuit



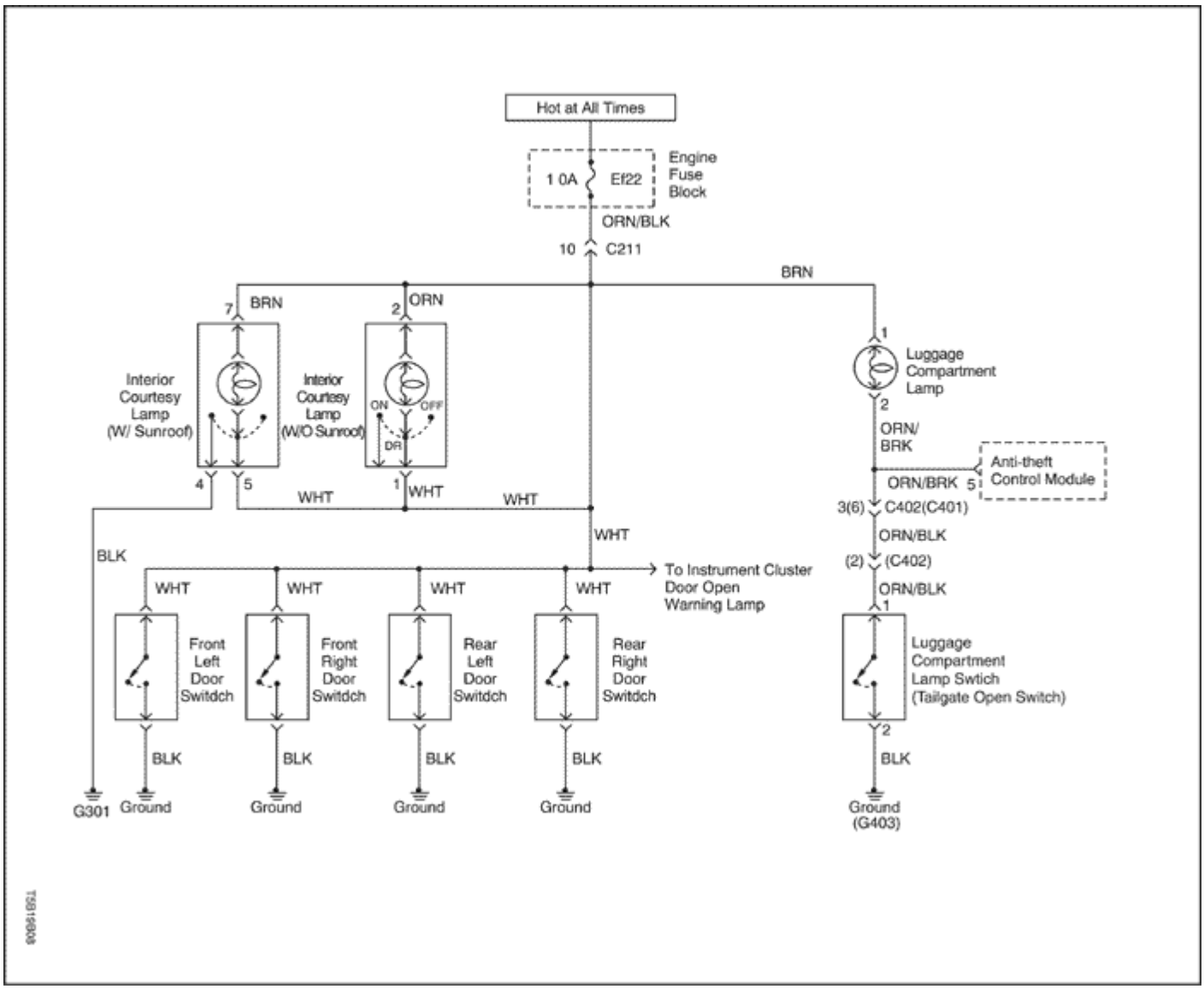
Turn and Hazard Lamps Circuit



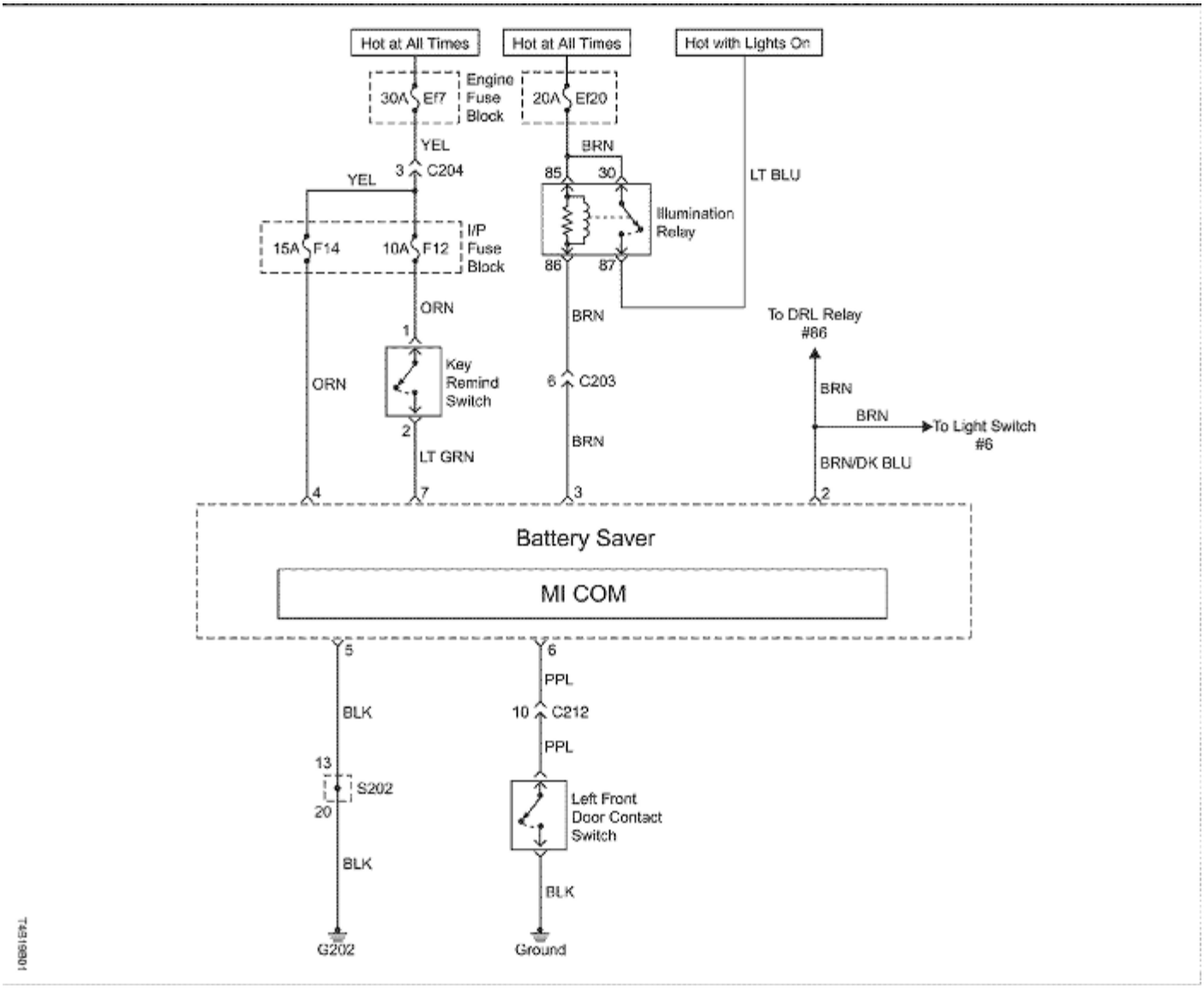
Turn and Hazard Lamps Circuit (RHD)



Interior Courtesy and Luggage Compartment Lamp Circuit



Battery Saver Circuit



DIAGNOSIS

Headlamps-On Reminder Chime

Diagnostic Aids :

The fuse for the left-side taillamps is also part of the headlamps-on reminder chime circuit. The headlamps-on reminder chime should operate when the ignition is OFF, the headlamps or parking lamps are on, and the driver door is open.

Headlamps-On Reminder Chime Does Not Work

Step	Action	Value(s)	Yes	No
1	Turn the parking lamps on, and observe the	-	Go to *Step 3*	Go to *Step 2*

Step	Action	Value(s)	Yes	No
	taillamps. Are the taillamps operating correctly?			
2	Repair the left-side taillamps before completing this diagnostic table. After the taillamps have been repaired, does the headlamps-on reminder chime work?	-	System OK	Go to *Step 3*
3	1. Disconnect the chime module electrical connector. 2. Turn the headlamps on. 3. Check the voltage at terminal 6 of the chime module connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open circuit between fuse EF15 and terminal 6 of the chime module connector. Is the repair complete?	-	System OK	-
5	Use an ohmmeter to check the resistance between ground and terminal 5 of the chime module. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between ground and terminal 5 of the chime module. Is the repair complete?	-	System OK	-
7	1. Remove the driver door contact switch. 2. Remove the electrical connector from the driver door contact switch. 3. Use an ohmmeter to measure the resistance between the driver door contact switch connector and the chime module terminal 4. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between the driver door contact switch connector and the chime module terminal 4. Is the repair complete?	-	System OK	-
9	1. Connect the electrical connector to the chime module. 2. Connect a jumper wire between ground and the connector for the driver door contact switch. 3. Turn the ignition OFF.	-	Go to *Step 11*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
	4. Turn the lights on. Does the headlamps-on reminder chime operate?			
10	Replace the chime module. Is the repair complete?	-	System OK	-
11	Replace the driver door contact switch. Is the repair complete?	-	System OK	-

Headlamps

Low Beam Headlamps Are Inoperative, High Beam Headlamps Are OK

Step	Action	Value(s)	Yes	No
1	Check fuses Ef23 (left-side headlamps) and Ef24 (right-side headlamps). Is fuse Ef23 or Ef24 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	Check the voltage at fuses Ef23 and Ef24. Does the voltage available at fuses Ef23 and Ef24 equal the value specified?	11-14 v	Go to *Step 14*	Go to *Step 4*
4	Temporarily substitute the illumination lamp relay in place of the headlamp low relay. Do the headlamps operate with the substituted relay?	-	Go to *Step 5*	Go to *Step 6*
5	Reinstall the illumination lamp relay in its orginal position, and install a new headlamp relay. Is the repair complete?	-	System OK	-
6	1. Install the headlamp low relay. 2. Check the voltage at headlamp switch connector terminal 5. Does the voltage equal the value specified?	11-14 v	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between low headlamp relay terminal 86 and headlamp switch connector terminal 5. Is the repair complete?	-	System OK	-
8	1. Disconnect the headlamp switch connector. 2. Select the low beams.	0 Ω	Go to *Step 10*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
	3. Use an ohmmeter to check the continuity between terminals 6 and 5 of the headlamp switch. Does the ohmmeter indicate the value specified?			
9	Replace the headlamp switch. Is the repair complete?	-	System OK	-
10	1. Connect the headlamp switch connector. 2. Check the voltage at the light switch connector terminal 2. Does the voltage equal the value specified?	11-14 v	Go to *Step 12*	Go to *Step 11*
11	Repair the open circuit between the headlamp switch connector terminal 6 and light switch connector terminal 2. Is the repair complete?	-	System OK	-
12	1. Disconnect the light switch connector. 2. Turn the light switch to the low-beam position. 3. Use an ohmmeter to check the continuity between terminals 2 and 3 of the light switch. Does the ohmmeter indicate the value specified?	≈ 0 Ω	Go to *Step 13*	Go to *Step 9*
13	Repair the open circuit between ground and light switch connector terminal 3. Is the repair complete?	-	System OK	-
14	1. Disconnect both headlamp connectors. 2. Turn the headlamps on. 3. Select the low beams. Does the voltage at each headlamp connector terminal 2 equal the value specified?	11-14 v	Go to *Step 16*	Go to *Step 15*
15	Repair the open circuit between fuses Ef23 or Ef24 and the low beam headlamps. Is the repair complete?	-	System OK	-
16	1. Disconnect the headlamp connectors. 2. Connect an ohmmeter between the ground and the headlamp connector	0 Ω	Go to *Step 18*	Go to *Step 17*

Step	Action	Value(s)	Yes	No
	terminal 3. Is the resistance equal to the value specified?			
17	Repair the open circuit between the ground and the headlamp connector terminal 3. Is the repair complete?	-	System OK	-
18	Replace the faulty headlamps. Is the repair complete?	-	System OK	-

High Beam Headlamps Are Inoperative, Low Beam Headlamps Are OK

Step	Action	Value(s)	Yes	No
1	Check the high beam headlamps in the "flash-topass" mode. Do the high beam headlamps work in the "flash-topass" mode?	-	Go to *Step 2*	Go to *Step 3*
2	Replace the headlamp combination switch. Is the repair complete?	-	System OK	-
3	Check fuse Ef25 and Ef26. Is fuse Ef25 and Ef26 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit. Repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
5	1. Turn the high beam headlamps on. 2. Check the voltage at fuse Ef25 and Ef26. Does the voltage available at fuse Ef25 and Ef26 equal the value specified?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Temporarily substitute the illumination lamp relay in place of the headlamp high relay. Do the headlamps operate with the substituted relay?	-	Go to *Step 7*	Go to *Step 8*
7	Reinstall the illumination lamp relay in its orginal position, and install a new headlamp relay. Is the repair complete?	-	System OK	-
8	1. Install the headlamp high relay. 2. Check the voltage at headlamp switch connector terminal 4. Does the voltage equal the value specified?	11-14 v	Go to *Step 10*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Repair the open circuit between headlamp high relay terminal 86 and headlamp switch connector terminal 4. Is the repair complete?	-	System OK	-
10	1. Disconnect the headlamp connector. 2. Turn the headlamp switch to the high-beam position. 3. Use an ohmmeter to check the continuity between terminals 6 and 4 of the headlamp switch. Does the ohmmeter indicate the value specified?	≈ 0 Ω	Go to *Step 11*	Go to *Step 2*
11	1. Connect the headlamp switch connector. 2. Turn the headlamp switch to the high-beam position. 3. Check the voltage at the light switch connector terminal 2. Does the voltage equal the value specified?	11-14 v	Go to *Step 13*	Go to *Step 12*
12	Repair the open circuit between the headlamp switch connector terminal 6 and light switch connector terminal 2. Is the repair complete?	-	System OK	-
13	1. Disconnect the light switch connector. 2. Turn the headlamp switch to the high-beam position. 3. Use an ohmmeter to check the continuity between terminals 2 and 3 of the light switch. Does the ohmmeter indicate the value specified?	≈ 0 Ω	Go to *Step 14*	Go to *Step 2*
14	Repair the open circuit between ground and the light switch connector terminal 3. Is the repair complete?	-	System OK	-
15	1. Turn the high beam headlamps on. 2. Check the voltage at headlamp terminal 1 with the high beams selected. Does the voltage available at the headlamp connector terminal 1 equal the value specified?	11-14 v	Go to *Step 17*	Go to *Step 16*

Step	Action	Value(s)	Yes	No
16	Repair the open circuit between fuse Ef19 and the high beam headlamps. Is the repair complete?	-	System OK	-
17	1. Disconnect the headlamp connectors. 2. Connect an ohmmeter between the ground adn the headlamp connector terminal 3. Is the resistance equal to the value specified?	≈ 0 Ω	Go to *Step 19*	Go to *Step 18*
18	Repair the open circuit between the ground and the headlamp connector terminal 3. Is the repair complete?	-	System OK	-
19	Replace the faulty headlamps. Is the repair complete?	-	System OK	-

High Beam and Low Beam Headlamps Are Inoperative on Both Left and Right Sides

Diagnostic Aids:

If there are several other symptoms, including an inoperative radiator fan, the windshield washer pump, or the turn signal lamps, check ground G102 and G104.

Step	Action	Value(s)	Yes	No
1	Check fuses Ef23, Ef24, Ef25, Ef26, Ef19 and F18. Are any fuses blown?	-	Go to *Step 2*	Go to *Step 4*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	Go to *Step 3*	-
3	Turn the low beam headlamps on. Does the low beam headlamps work?	-	Go to *Step 6*	Go to *Step 4*
4	Check the low beam headlamps system. Refer to the "Low Beam Headlamps Are Inoperative, High Beam Headlamps As Ok" in this section. Is any problem found?	-	Go to *Step 5*	-
5	Repair the problem. Is the repair complete?	-	Go to *Step 6*	-
6	Turn the high beam headlamps on. Do the high beam headlamps work?	-	System OK	Go to *Step 7*
7	Check the high beam headlamps system. Refer to the "High Beam Headlamps Are Inoperative, Low Beam Headlamps Are Ok" in	-	Go to *Step 8*	-

Step	Action	Value(s)	Yes	No
	this section. Is any problem found?			
8	Repair the problem. Is the repair complete?	-	System OK	-

Daytime Running Lamps

Diagnostic Aids

The daytime running lamp (DRL) system will not work if the parking brake is applied. The system is designed to work only when the engine is running and the parking brake is released. If the parking brake circuit is shorted to ground or the switch stays closed when the engine is running, the DRL system will not work.

Daytime Running Lamps (DRL) Do Not Turn ON

Step	Action	Value(s)	Yes	No
1	Turn the headlamps ON with the headlamp switch. Do the headlamps work?	-	Go to *Step 3*	Go to *Step 2*
2	Repair the regular headlamp system before completing this diagnostic table. Does the DRL system work after the headlamps have been repaired?	-	System OK	Go to *Step 3*
3	Check fuse Ef19. Is fuse Ef19 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit and repair if necessary. 2. Replace fuse Ef19. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Check the voltage at fuse Ef19. Does the voltage equal the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the power supply circuit for fuse Ef19. Is the repair complete?	-	System OK	-
7	1. Disconnect the electrical connector from the DRL module. 2. Turn the ignition ON. 3. Check the voltage at terminal 1 of the DRL module. Is the voltage equal to the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between fuse EF19 and terminal 1 of the DRL module connector.	-	System OK	-

Step	Action	Value(s)	Yes	No
	Is the repair complete?			
9	With the DRL module still disconnected, use an ohmmeter to check the resistance between ground and terminal 5 of the DRL module connector. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 11*	Go to *Step 10*
10	Repair the circuit between ground and terminal 5 of the DRL module connector. Is the repair complete?	-	System OK	-
11	1. Release the parking brake. 2. Turn the ignition switch ON. 3. Observe the parking brake indicator lamp. Is the parking brake indicator lamp ON?	-	Go to *Step 12*	Go to *Step 15*
12	Disconnect the electrical connector to the parking brake lever switch. Is the parking brake indicator lamp still ON?	-	Go to *Step 13*	Go to *Step 14*
13	Repair the short to ground in the parking brake circuit. Is the repair complete?	-	System OK	-
14	Replace the parking brake lever switch. Is the repair complete?	-	System OK	-
15	1. Make sure the headlamps are turned OFF. 2. With the DRL module disconnected, turn the ignition ON. 3. Check the voltage at terminal 6 of the DRL module. Is the voltage equal to the specified value?	0 v	Go to *Step 17*	Go to *Step 16*
16	Repair the open between fuse F4 and terminal 6 of the DRL module. Is the repair complete?	-	System OK	-
17	Replace the DRL module. Is the repair complete?	-	System OK	-

Parking lamps and Taillamps

Parking Lamps and Taillamps Do Not Work

Step	Action	Value(s)	Yes	No
1	Check the headlamps. Do the headlamps work?	-	Go to *Step 3*	Go to *Step 2*
2	Repair the headlamps before continuing with	-	Go to *Step 3*	System OK

Step	Action	Value(s)	Yes	No
	this chart. After the headlamps have been repaired, are the parking lamps and taillamps still inoperative?			
3	1. Turn the parking lamps on. 2. Use a voltmeter to check voltage at the bulb socket positive terminal. Does voltage at the bulb socket equal the specified value?	11-14 v	Go to *Step 4*	Go to *Step 7*
4	Connect an ohmmeter between ground and the lamp socket negative terminal. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 6*	Go to *Step 5*
5	Repair the ground circuit for the lamps. Is the repair complete?	-	System OK	-
6	Replace the faulty bulbs. Is the repair complete?	-	System OK	-
7	Check fuses Ef15 and Ef14. Are any of the fuses blown?	-	Go to *Step 8*	Go to *Step 9*
8	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
9	1. Turn the headlamps on. 2. Check the voltage at fuses Ef14 (left-side illumination lamp) and Ef15 (right-side illumination lamp). Does the voltage at the fuses equal the specified value?	11-14 v	Go to *Step 10*	-
10	Repair the open circuit between the fuses Ef14 and Ef15 and the illumination lamps. Is the repair complete?	-	System OK	-

Stoplamps Do Not Work

Notice : When probing a bulb socket with a voltmeter or a test lamp, do not contact the side of the socket (ground) when you are testing the positive contact at the bottom of the socket. If the voltage and the ground are both available at the bulb socket, contacting both at the same time with a test probe will cause a blown fuse.

Step	Action	Value(s)	Yes	No
1	Check fuse F13.	-	Go to *Step 2*	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	Is fuse F13 blown?			
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	Use a voltmeter to check the voltage at fuse F13. Is the voltage at F13 equal to the specified value?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the power supply circuit for fuse F13. Is the repair complete?	-	System OK	-
5	1. Press the brake pedal. 2. Check the positive terminals of the bulb sockets with a test lamp. Does the test lamp illuminate?	-	Go to *Step 6*	Go to *Step 8*
6	Connect an ohmmeter between ground and the stoplamp ground terminal. Is the resistance equal to the specified value?	0 Ω	Go to *Step 8*	Go to *Step 7*
7	Repair the ground circuit. Is the repair complete?	-	System OK	-
8	1. Disconnect the wiring connector from the brake switch. 2. Press the brake pedal. 3. Use an ohmmeter to check continuity between terminals 2 and 4. Is the resistance equal to the specified value?	0 Ω	Go to *Step 10*	Go to *Step 9*
9	Replace the stoplamp switch. Is the repair complete?	-	System OK	-
10	1. Disconnect the stoplamp switch electrical connector. 2. Check the voltage at terminal 4. Does the voltmeter show the specified value?	11-14 v	Go to *Step 12*	Go to *Step 11*
11	Repair the open circuit between the fuse F13 and the brake switch. Is the repair complete?	-	System OK	-
12	Repair the open circuit between the brake switch and the stoplamps. Is the repair complete?	-	System OK	-

Center High-Mounted Stoplamp (CHMSL) Does Not Work

Step	Action	Value(s)	Yes	No
1	1. Turn the lights on. 2. Observe the taillamps. Are the taillamps on?	-	Go to *Step 3*	Go to *Step 2*
2	Repair the taillamps before completing this diagnostic table. Does the CHMSL work after the taillamps are repaired?	-	System OK	Go to *Step 3*
3	1. Remove the CHMSL bulb. 2. Check the CHMSL bulb. Is the lamp bulb defective?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the CHMSL bulb. Is the repair complete?	-	System OK	-
5	1. Disconnect the CHMSL connector. 2. Use an ohmmeter to measure the resistance between ground and the BLK wire in the CHMSL connector. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between ground and the BLK wire in the CHMSL connector. Is the repair complete?	-	System OK	-
7	Repair the open circuit between the brake switch and the CHMSL. Is the repair complete?	-	System OK	-

Backup Lamps Inoperative

Step	Action	Value(s)	Yes	No
1	1. Block the wheels. 2. Apply the parking brake to prevent the vehicle from moving. 3. Turn the ignition on. 4. Put the transaxle in reverse (R). 5. Remove one of the backup lamps from its socket. 6. Test the lamp socket positive terminal with a voltmeter. Does the battery voltage available at the backup lamp socket positive terminal equal the specified value?	11-14 v	Go to *Step 3*	Go to *Step 2*
2	Repair the open circuit between fuse F5 and	-	System OK	-

Step	Action	Value(s)	Yes	No
	the backup lamps. Is the repair complete?			
3	Connect an ohmmeter between ground and the negative terminal at the bulb socket. Is the resistance equal to the specified value?	0 Ω	Go to *Step 4*	Go to *Step 5*
4	Replace the faulty backup lamps. Is the repair complete?	-	System OK	-
5	1. Reinstall the backup lamps. 2. Disconnect the electrical connector at the reverse switch. (On automatic transaxle (A/T) vehicles, disconnect the neutral safety/backup switch.) 3. Turn the ignition on. 4. Put the transaxle in R. 5. Use a voltmeter to check for the reverse switch terminal 1. (On A/T vehicles, test terminal 3 of the neutral safety/backup switch). Does the battery voltage available at terminal 1 (or terminal 3, if equipped with A/T) equal the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between the backup lamps and the, reverse switch (or the neutral safety/backup switch if equipped with A/T). Is the repair complete?	-	System OK	-
7	1. Put the transaxle in R. 2. Use an ohmmeter to check the continuity between reverse switch terminal 1 and terminal 2 (terminals 3 and 2 on the neutral safety/backup switch, if equipped with A/T). Does the continuity between terminals 1 and 2 (terminals 3 and 2, if equipped with A/T) equal the specified value?	0 Ω	Go to *Step 9*	Go to *Step 8*
8	Replace the reverse switch (neutral safety/backup switch, if equipped with A/T). Is the repair complete?	-	System OK	-
9	Repair the ground circuit between the reverse switch (neutral safety/backup switch, if equipped with A/T) and ground G402. Is the repair complete?	-	System OK	-

Turn Signal Lamps and Hazard Lamps Do Not Work

Step	Action	Value(s)	Yes	No
1	Check fuses F3 and F14. Is either fuse blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Check the voltage at fuses F3 and F14. Does the battery voltage available at both fuses F3 and F14 equal the specified value?	11-14 v	Go to *Step 4*	Go to *Step 7*
4	1. Turn the hazard switch on. 2. Remove each of the inoperative lamps from its socket. 3. Test each lamp socket positive terminal with a voltmeter. Does the battery voltage pulsing at the turn signal hazard lamp socket positive terminal equal the specified value?	11-14 v	Go to *Step 5*	Go to *Step 9*
5	At each bulb socket, use an ohmmeter to check the ground circuit. Is the resistance equal to the specified value?	$\approx 0\ \Omega$	Go to *Step 6*	Go to *Step 8*
6	Replace any faulty turn signal/hazard bulbs. Is the repair complete?	-	System OK	-
7	Repair the power supply circuit to fuses. Is the repair complete?	-	System OK	-
8	Repair the open ground wires. Is the repair complete?	-	System OK	-
9	1. Turn on the hazard lamp switch. 2. Test the blinker unit connector terminal 49a with a voltmeter. Does the battery voltage pulsing at the blinker unit terminal 49a equal the specified value?	11-14	Go to *Step 15*	Go to *Step 10*
10	1. Turn on the hazard lamp switch. 2. Test the blinker unit connector terminal 49 with a voltmeter. Does the battery voltage available at the blinker unit terminal 49 equal the specified	11-14	Go to *Step 11*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
	value?			
11	1. Disconnect the blinker unit from the connector. 2. Use an ohmmeter to check between ground and the connector for terminal 31 of the blinker unit. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 12*
12	Repair the blinker unit ground connection. Is the repair complete?	-	System OK	-
13	Replace the faulty blinker unit. Is the repair complete?	-	System OK	-
14	1. Disconnect the hazard lamp switch connector. 2. Check for voltage at terminal 8. 3. Turn the ignition ON. 4. Check for voltage at terminal 10. Does the battery voltage available at both terminals equal the specified value?	11-14 v	Go to *Step 15*	Go to *Step 20*
15	1. Remove the hazard lamp switch. 2. Turn the hazard lamp switch off. 3. Check for continuity between terminals 7 and 10. 4. Turn the hazard lamp switch on. 5. Check for continuity between terminals 7 and 8. Do both tests show the specified value?	0 Ω	Go to *Step 18*	Go to *Step 17*
16	1. Remove the hazard lamp switch. 2. Turn the hazard lamp switch on. 3. Use an ohmmeter to check for continuity between terminals 5, 6, and 9. Does the continuity between terminals 5, 6, and 9 equal the specified value?	0 Ω	Go to *Step 19*	Go to *Step 17*
17	Replace the faulty hazard lamp switch. Is the repair complete?	-	System OK	-
18	Repair the open circuit between the hazard lamp switch terminal 7 and the blinker unit terminal 49. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
19	Repair the open circuit between the hazard lamp switch and the fuses F3 or F14. Is the repair complete?	-	System OK	-

Hazard Lamps Do Not Operate, Turn Signals Are OK

Step	Action	Value(s)	Yes	No
1	Check fuse F14. Is fuse F14 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	Use a voltmeter to check for power to fuse F14. Does the battery voltage available at fuse F14 equal the value specified?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the power supply circuit to fuse F14. Is the repair complete?	-	System OK	-
5	1. Disconnect the hazard switch connector. 2. Use a voltmeter to check power to the hazard switch terminal 8. Does the battery voltage available at connector terminal 8 equal the value specified?	11-14 v	Go to *Step 6*	Go to *Step 9*
6	1. Remove the hazard switch and disconnect it for testing. 2. Turn the hazard switch on. 3. Test with an ohmmeter between terminals 7 and 8. Is the resistance equal to the specified value?	0 Ω	Go to *Step 7*	Go to *Step 10*
7	1. With the hazard switch still removed and disconnected for testing, turn the hazard switch on. 2. Use an ohmmeter to check between terminals 5, 6, and 9. Is the resistance equal to the specified value?	0 Ω	Go to *Step 8*	Go to *Step 9*
8	Repair the open circuit between the hazard switch connector terminal 8 and fuse F14. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
9	Replace the faulty hazard switch. Is the repair complete?	-	System OK	-

Interior Courtesy and Luggage Compartment Lamps

Interior Courtesy Lamp Inoperative

Caution : Always make sure there is an electrical load (lamp bulb, etc.) in any circuit between battery terminals. Do not make a short circuit between battery terminals with a jumper wire. Hazardous sparking would result and could cause injury.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. Bulb test. Clip one end of a jumper wire to the negative battery terminal. Clip the other end of the jumper wire onto one end of the bulb. Take the free end of the bulb (the end without the jumper attached) and touch it to the positive battery terminal.
2. Bulb test. Clip one end of a jumper wire to the negative battery terminal. Clip the other end of the jumper wire onto one end of the bulb. Take the free end of the bulb (the end without the jumper attached) and touch it to the positive battery terminal.

Step	Action	Value(s)	Yes	No
1	1. Remove the interior courtesy lamp bulb and inspect the filament. 2. If the filament is not broken, test the bulb using the vehicle's battery and a jumper wire. Does the bulb pass the visual and physical checks?	-	Go to *Step 3*	Go to *Step 2*
2	Replace the bulb. Is the repair complete?	-	System OK	-
3	1. Reinstall the interior courtesy lamp bulb. 2. Check fuse EF22. Is fuse EF22 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
5	Check fuse EF22. Does the voltage at fuse EF22 equal the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open power supply circuit for fuse EF22. Is the repair complete?	-	System OK	-
7	1. Disconnect the interior courtesy lamp electrical connector. 2. Check the voltage at connector terminal 2 (7; W/ Sunroof). Does the voltage at connector terminal 2 (7; W/ Sunroof) equal the value specified?	11-14 v	Go to *Step 8*	Go to *Step 9*
8	Repair the open circuit between fuse EF22 and the interior courtesy lamp terminal 2 (7; W/ Sunroof). Is the repair complete?	-	System OK	-
9	1. With the interior courtesy lamp disconnected, turn it to the on position. 2. Use an ohmmeter to check the resistance between ground and terminal 1 (5; W/ Sunroof) of the interior courtesy lamp connector (harness side). Is the resistance equal to the specified value?	0Ω	Go to *Step 10*	Go to *Step 11*
10	Replace the interior courtesy lamp switch assembly. Is the repair complete?	-	System OK	-
11	Repair the ground circuit for the interior courtesy lamp. Is the repair complete?	-	System OK	-

Luggage Compartment Lamp (Tailgate Open Lamp) Inoperative

Caution : Always make sure there is an electrical load (lamp bulb, etc.) in any circuit between battery terminals. Do not make a short circuit between battery terminals with a jumper wire. Hazardous sparking would result and could cause injury.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. Bulb test. Clip one end of a jumper wire to the negative battery terminal. Clip the other end of the jumper wire onto one end of the bulb. Take the

free end of the bulb (the end without the jumper attached) and touch it to the positive battery terminal.

2. Bulb test. Clip one end of a jumper wire to the negative battery terminal. Clip the other end of the jumper wire onto one end of the bulb. Take the free end of the bulb (the end without the jumper attached) and touch it to the positive battery terminal.

Step	Action	Value(s)	Yes	No
1	1. Remove the luggage compartment lamp bulb and inspect the filament. 2. If the filament is not broken, test the bulb using the vehicle's battery and a jumper wire. Does the bulb pass the visual and physical check?	-	Go to *Step 3*	Go to *Step 2*
2	Replace the bulb. Is the repair complete?	-	System OK	-
3	1. Reinstall the luggage compartment lamp bulb. 2. Check fuse EF22. Is fuse EF22 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
5	Check fuse EF22. Does the voltage at fuse EF22 equal the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open power supply circuit for fuse EF22. Is the repair complete?	-	System OK	-
7	1. Disconnect the luggage compartment lamp electrical connector. 2. Check the voltage at the brown wire. Does the voltage at the BRN wire equal the specified value?	11-14 v	Go to *Step 8*	Go to *Step 9*
8	Repair the open circuit between fuse EF22 and the luggage compartment lamp. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
9	1. Reconnect the luggage compartment lamp. 2. Remove the luggage compartment lamp switch. 3. With a voltmeter (or test lamp), test the ORN/BLK wire at the luggage compartment lamp switch. Does the voltage at the luggage compartment lamp switch equal the specified value?	11-14 v	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the luggage compartment lamp and the luggage compartment lamp switch. Is the repair complete?	-	System OK	-
11	Use an ohmmeter to check the resistance between ground and the BLK wire at the luggage compartment lamp switch connector (harness side). Is the resistance equal to the specified value?	0Ω	Go to *Step 12*	Go to *Step 13*
12	Replace the luggage compartment lamp switch. Is the repair complete?	-	System OK	-
13	Repair the ground circuit for the interior courtesy lamp. Is the repair complete?	-	System OK	-

Fog Lamps

Diagnostic Aids

The front fog lamps will not operate unless the illumination lamps or daytime running lamps are on. If the illumination lamps or daytime running lamps are not operating, repair that problem before attempting to diagnose the fog lamps.

Front Fog Lamps Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuse EF9. Is fuse EF9 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	Use a voltmeter to check fuse EF9. Does the battery voltage available at fuse EF9	11-14 v	Go to *Step 5*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	equal the specified value?			
4	Repair the open circuit from the battery to fuse EF9. Is the repair complete?	-	System OK	-
5	Remove the fog lamp relay and temporarily substitute a known good relay, such as the headlamp relay. (Do not substitute the illumination lamp relay.) Do the fog lamps work with the substituted relay?	-	Go to *Step 6*	Go to *Step 7*
6	1. Return the substituted relay to its original position. 2. Replace the inoperative fog lamp relay. Is the repair complete?	-	System OK	-
7	1. Return the substituted relay to its original position, but do not reinstall the fog lamp relay. 2. Turn on the exterior lamps and the front fog lamps. 3. Using a voltmeter, check the fog lamp relay socket at the connector for fog lamp relay terminal 30. Does the voltage available at the fog lamp relay socket equal the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between fuse EF9 and the fog lamp relay. Is the repair complete?	-	System OK	-
9	At the fog lamp relay socket, use an ohmmeter to verify that the connector for relay terminal 86 is connected to ground. Does the resistance equal the specified value?	0 Ω	Go to *Step 11*	Go to *Step 10*
10	Repair the ground circuit for the fog lamp relay. Is the repair complete?	-	System OK	-
11	1. Reinstall the fog lamp relay. 2. Turn ON the exterior lamps and the front fog lamps. 3. Test for voltage at terminal 1 of the fog lamp connector. Does the battery voltage available at terminal 1	11-14 v	Go to *Step 13*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
	of the fog lamp connector equal the specified value?			
12	Repair the open circuit between the fog lamp relay terminal 87 and the fog lamps. Is the repair complete?	-	System OK	-
13	Use an ohmmeter (or test lamp) to check the ground at terminal 2 of the fog lamp connector. Does the resistance equal the specified value?	0 Ω	Go to *Step 15*	Go to *Step 14*
14	Repair the fog lamp ground circuit. Is the repair complete?	-	System OK	-
15	Replace the faulty fog lamp bulbs. Is the repair complete?	-	System OK	-

SECTION 9C

HORN

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

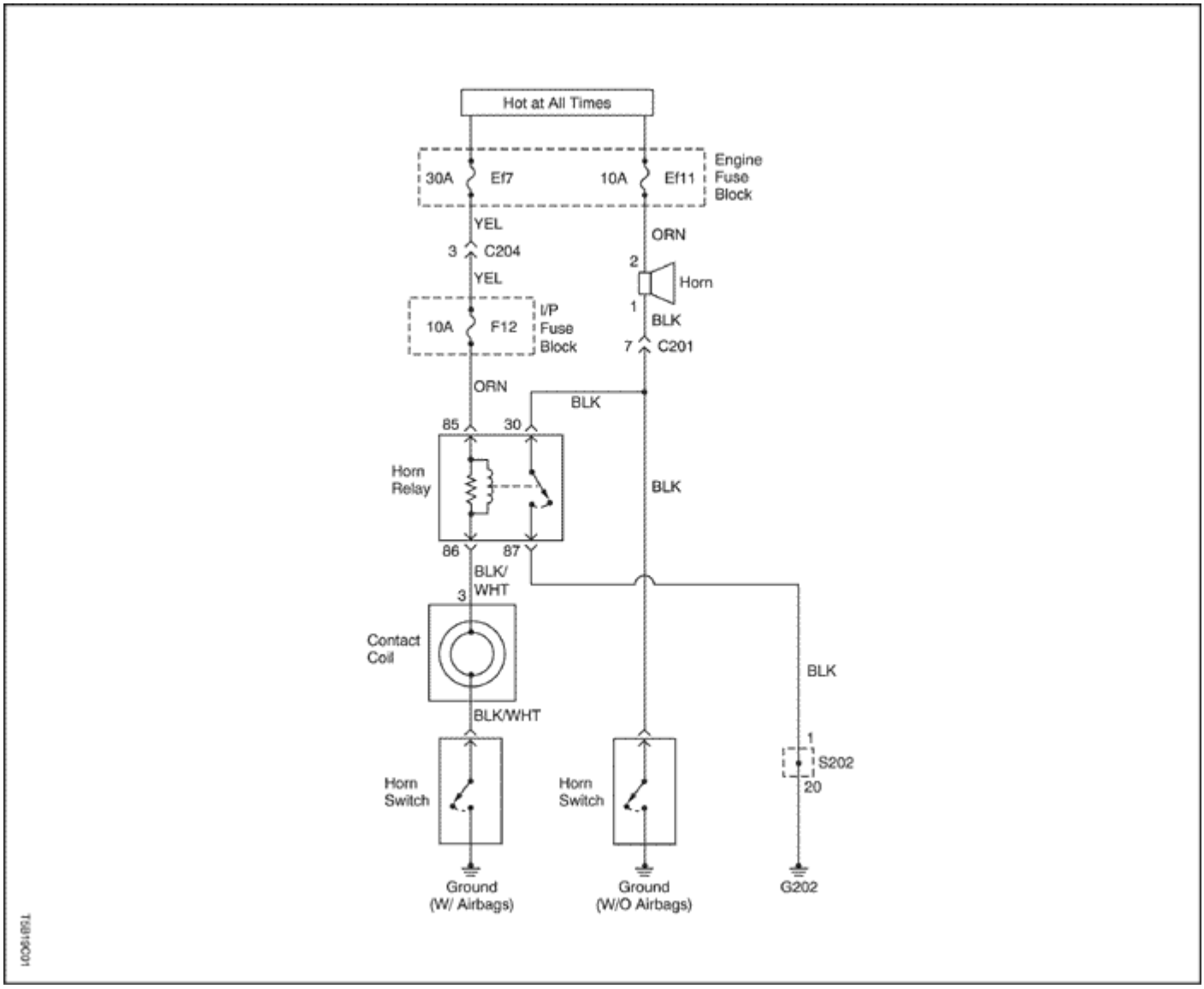
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Horn Bolt	21	16	-

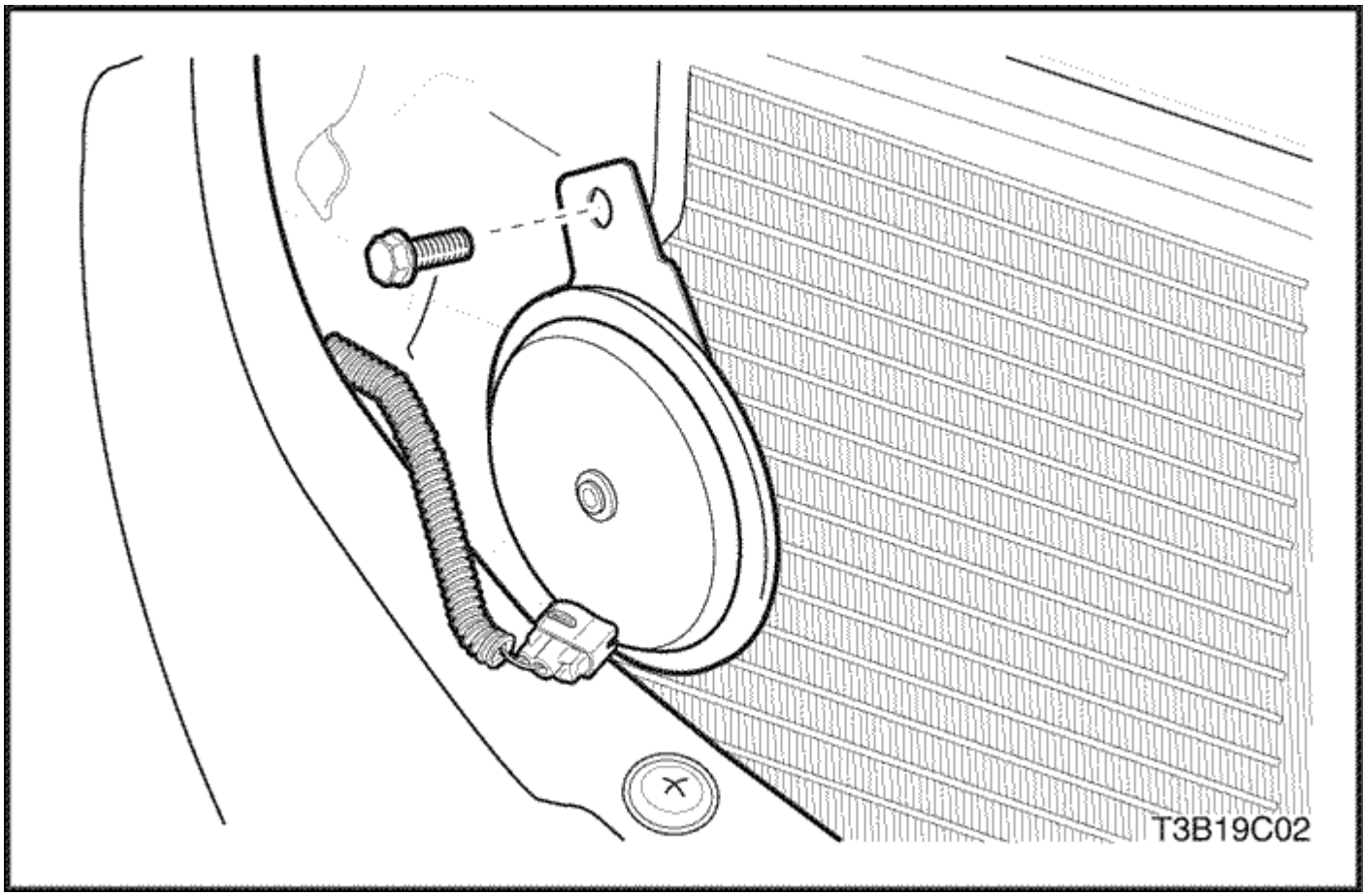
SCHEMATIC AND ROUTING DIAGRAMS

Horn Wiring System



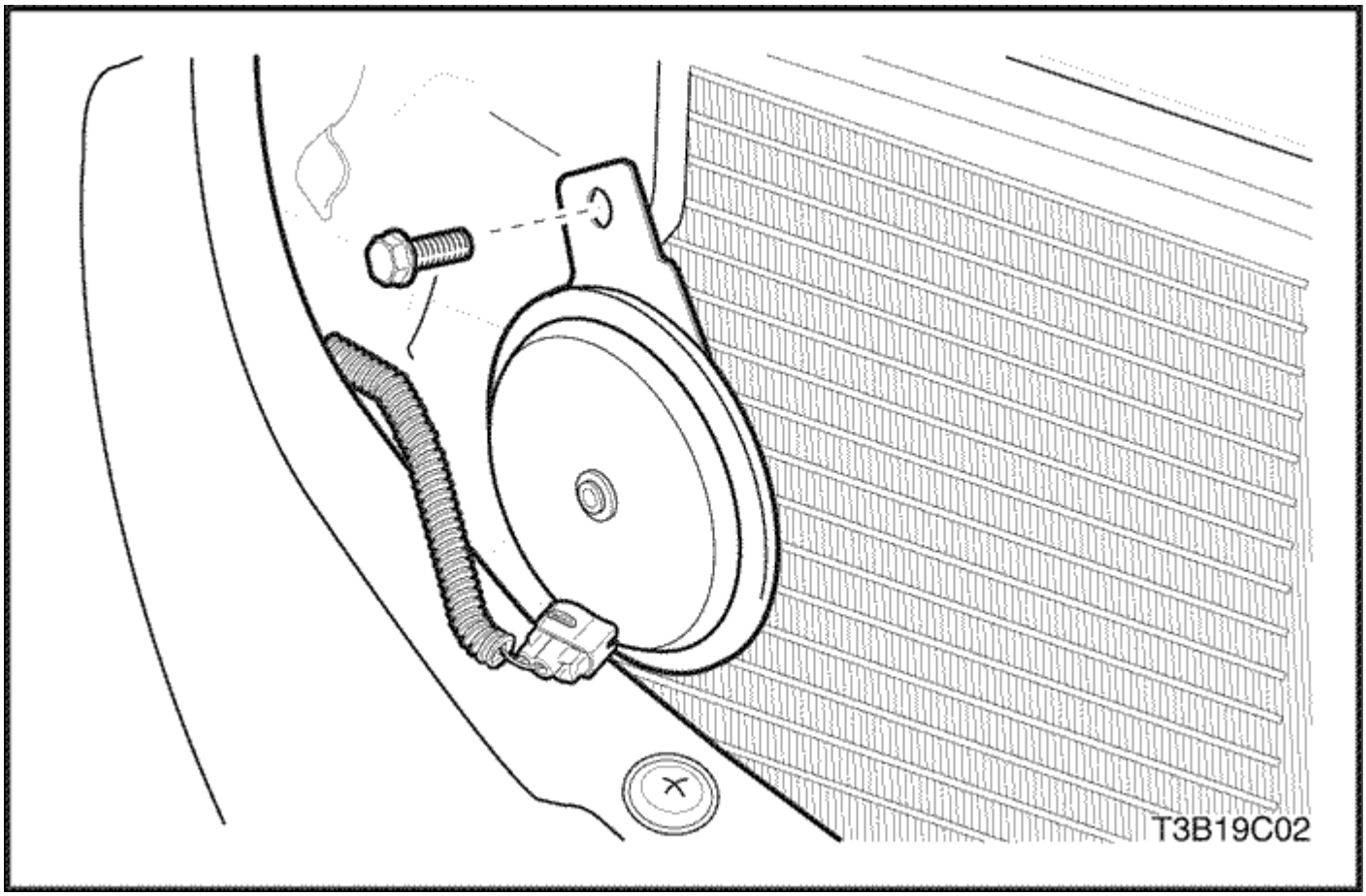
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



Horn
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the screws and radiator grille.
3. Remove the bolt from the horn.
4. Disconnect the electrical connector.
5. Remove the horn.



Installation Procedure

1. Connect the electrical connector.
2. Install the horn with the bolt.

   Tighten
   Tighten the horn bolt to 21 N•m (16 lb-ft).

3. Install the radiator grille with the screws.
4. Connect the negative battery cable.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Horn

The horn is located under the hood. It is attached near the radiator at the front of the vehicle. The horn is actuated by pressing the steering wheel pad, which grounds the horn's electrical circuit.

SECTION 9D

WIPERS/WASHER SYSTEMS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

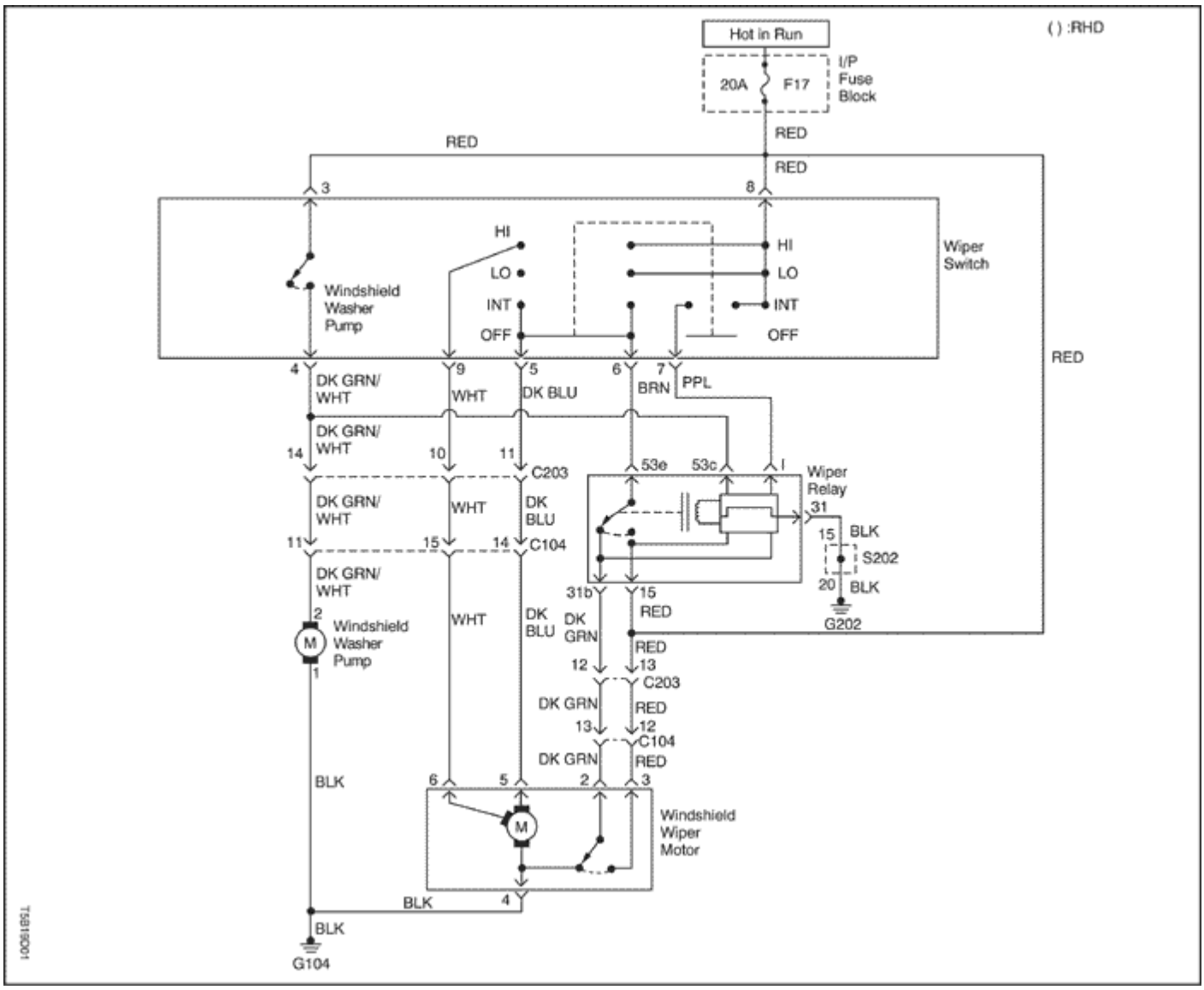
SPECIFICATIONS

Fastener Tightening Specifications

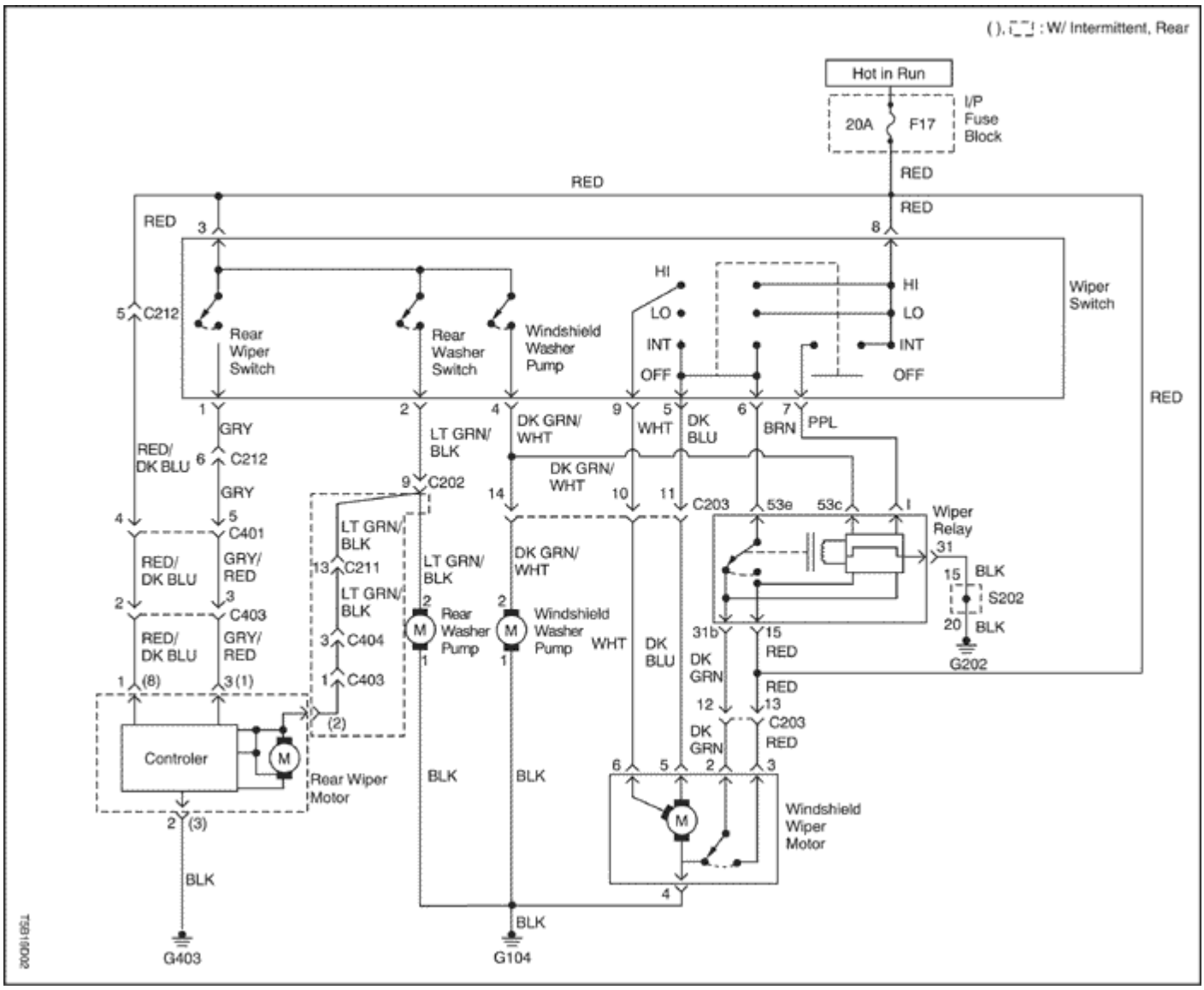
Application	N•m	Lb-Ft	Lb-In
Front Wheel Well Splash Shield Screws	1.5	-	13
Washer Fluid Reservoir Bolts and Nuts	9	-	80
Wiper Arm Linkage Nut	8.5	-	75
Wiper Arm Nut	15	-	133
Wiper Motor Bolts	9	-	80

SCHEMATIC AND ROUTING DIAGRAMS

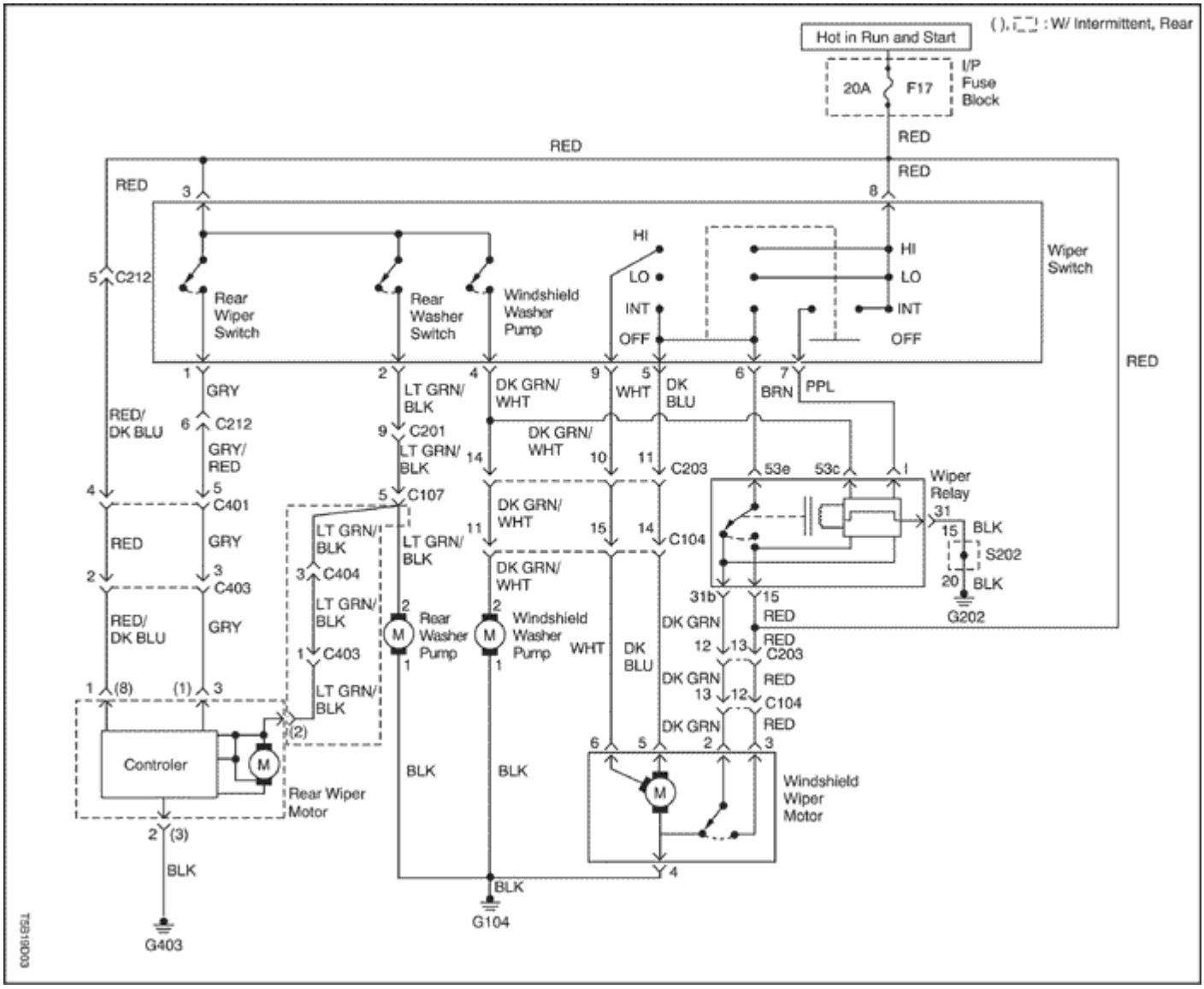
Windshield Window Wipers and Washer System (Notchback)



Windshield Window Wipers and Washer System (Hatchback)



Windshield & Rear Window Wipers and Washer System (RHD)



DIAGNOSIS

Intermittent Windshield Wipers
Windshield Wipers Do Not Work At Any Speed

Step	Action	Value(s)	Yes	No
1	Check fuse F17. Is fuse F17 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse.	-	System OK	-

Step	Action	Value(s)	Yes	No
	Is the repair complete?			
3	Check the battery voltage at fuse F17. Is battery voltage available at fuse F17?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open in the power supply circuit to fuse F17. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Turn the wiper switch to HI. Is battery voltage available at wiper motor connector terminal 6?	11-14 v	Go to *Step 6*	Go to *Step 7*
6	Replace the faulty wiper motor. Is the repair complete?	-	System OK	-
7	1. Disconnect the wiper switch connector. 2. Turn the ignition ON. 3. With a voltmeter, check for battery voltage at connector terminal 8. Is battery voltage available at the wiper switch connector terminal 8?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between wiper switch connector terminal 8 and fuse F17. Is the repair complete?	-	System OK	-
9	1. Use an ohmmeter to test the continuity of the wiper switch. 2. Turn the wiper switch to HI. Check for continuity between wiper switch terminal 8 and 9. Is there continuity between terminals 8 and 9?	0 Ω	Go to *Step 11*	Go to *Step 10*
10	Replace the faulty wiper switch. Is the repair complete?	-	System OK	-
11	Repair the open circuit between the wiper switch and the wiper motor. Is the repair complete?	-	System OK	-

Wipers Do Not Work On HI Speed, LO Speed OK

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Turn the wiper switch to HI. Is battery voltage available at wiper motor connector terminal 6?	11-14 v	Go to *Step 2*	Go to *Step 3*

Step	Action	Value(s)	Yes	No
2	Replace the faulty wiper motor. Is the repair complete?	-	System OK	-
3	1. Use an ohmmeter to test the continuity of the wiper switch. 2. Turn the wiper switch to HI. Check for continuity between the wiper switch terminal 8 and 9. Is there continuity between terminals 8 and 9?	0 Ω	Go to *Step 5*	Go to *Step 4*
4	Replace the faulty wiper switch. Is the repair complete?	-	System OK	-
5	Repair the open circuit between wiper switch connector terminal 9 and wiper motor connector terminal 6. Is the repair complete?	-	System OK	-

Wipers Do Not Work On LO Speed, HI Speed OK

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Turn the wiper switch to LO. Is battery voltage available at wiper motor connector terminal 5?	11-14 v	Go to *Step 2*	Go to *Step 3*
2	Replace the faulty wiper motor. Is the repair complete?	-	System OK	-
3	1. Use an ohmmeter to test the continuity of the wiper switch. 2. Turn the wiper switch to LO. Check for continuity between the wiper switch terminal 8 and 5. Is there continuity between terminals 8 and 5?	0 Ω	Go to *Step 5*	Go to *Step 4*
4	Replace the faulty wiper switch. Is the repair complete?	-	System OK	-
5	Repair the open circuit between the wiper switch connector terminal 5 and the wiper motor connector terminal 5. Is the repair complete?	-	System OK	-

Wipers Do Not Work On Intermittent, Other Speeds OK

Diagnostic Aids

The wiper relay is located behind the instrument panel, below the cluster dimmer switch. Remove the cluster dimmer switch and the instrument panel side cover to access the wiper relay.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Use a voltmeter to test for battery voltage at the wiper relay connector terminal 15. Is battery voltage available at connector terminal 15?	11-14 v	Go to *Step 3*	Go to *Step 2*
2	Repair the open circuit between the wiper relay connector terminal 15 and fuse F17. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Turn the wiper switch to INT. Using a voltmeter, is battery voltage available at the wiper relay connector terminal I?	11-14 v	Go to *Step 7*	Go to *Step 4*
4	1. Turn the ignition ON. 2. Turn the wiper switch to INT. Using a voltmeter, is battery voltage available at wiper switch connector terminal 7?	11-14 v	Go to *Step 6*	Go to *Step 5*
5	Replace the wiper switch. Is the repair complete?	-	System OK	-
6	Repair the open circuit between the wiper switch connector terminal 7 and the wiper relay connector terminal I. Is the repair complete?	-	System OK	-
7	1. Turn the ignition ON. 2. Turn the wiper switch to INT. Using a voltmeter, is battery voltage pulsing at wiper relay connector terminal 53e?	11-14 v	Go to *Step 11*	Go to *Step 8*
8	Using an ohmmeter, check the wiper relay ground circuit (connector terminal 31). Is the ground circuit OK?	0 Ω	Go to *Step 10*	Go to *Step 9*
9	Repair the open ground circuit. Is the repair complete?	-	System OK	-
10	Replace the wiper relay. Is the repair complete?	-	System OK	-
11	1. Disconnect the wiper switch connector. 2. Turn the wiper switch to INT. 3. Using an ohmmeter, check the wiper switch.	0 Ω	Go to *Step 13*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
	Is there continuity between terminals 5 and 6?			
12	Replace the faulty wiper switch. Is the repair complete?	-	System OK	-
13	Repair the open circuit between the wiper switch and the wiper relay. Is the repair complete?	-	System OK	-

Windshield Wipers Do Not Return To Park Position

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Use a voltmeter to test the battery voltage at the wiper motor. Is battery voltage available at wiper motor connector terminal 3?	11-14 v	Go to *Step 3*	Go to *Step 2*
2	Repair the open circuit between the wiper motor and fuse F17.	-	System OK	-
3	1. Turn the ignition ON 2. Turn the wiper switch to HI. 3. Use a voltmeter to test for a pulse of battery power at the wiper motor when turning the wiper switch OFF. Is a pulse of battery voltage available at the wiper motor connector terminal 2 when the wiper switch is turned OFF?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Replace the faulty wiper motor. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Turn the wiper switch to HI. 3. Use a voltmeter to test for a pulse of battery power at the wiper relay when turning the wiper switch OFF. Is a pulse of battery voltage available at the wiper relay connector terminal 31b when the wiper switch is turned OFF?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between the wiper motor and the wiper relay. Is the repair complete?	-	System OK	-
7	1. Disconnect the wiper relay from the connector. 2. Use an ohmmeter to test the continuity	0 Ω	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	of the relay. Is there continuity between wiper relay connector terminals 31b and 53e?			
8	Replace the faulty wiper relay. Is the repair complete?	-	System OK	-
9	Replace the faulty wiper switch. Is the repair complete?	-	System OK	-

Windshield Washer System

Windshield Washer Does Not Work, Wipers Are OK

Step	Action	Value(s)	Yes	No
1	Do the windshield wipers operate when the washer switch is activated?	-	Go to *Step 4*	Go to *Step 2*
2	1. Turn the ignition ON. 2. While activating the washer switch, use a voltmeter to test for battery voltage at the windshield wiper switch. Is battery voltage available at the windshield wiper switch connector terminal 4?	11-14 v	Go to *Step 8*	Go to *Step 3*
3	Replace the windshield wiper switch. Is the repair complete?	-	System OK	-
4	Is there washer fluid in the windshield washer fluid reservoir?	-	Go to *Step 6*	Go to *Step 5*
5	Fill the windshield washer fluid reservoir. Is the repair complete?	-	System OK	-
6	Are the windshield washer hoses or the nozzles clogged or damaged?	-	Go to *Step 7*	Go to *Step 8*
7	Repair the washer hoses and the nozzles. Is the repair complete?	-	System OK	-
8	1. Turn the ignition ON. 2. With the windshield washer activated, use a voltmeter to test for battery voltage at the windshield washer pump. Is battery voltage available at the windshield washer pump ?	11-14 v	Go to *Step 10*	Go to *Step 9*
9	Repair the open circuit between the windshield washer pump and the windshield wiper switch. Is the repair complete?	-	System OK	-
10	Use an ohmmeter to check the ground circuit at the windshield washer pump.	0 Ω	Go to *Step 12*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
	Is the ground circuit OK?			
11	Repair the windshield washer pump ground circuit. Is the repair complete?	-	System OK	-
12	Replace the windshield washer pump. Is the repair complete?	-	System OK	-

Rear Window Wiper (Hatchback)

Diagnostic Aids

If the front wiper is operating correctly, begin the diagnostic table at Step 5. It would not be necessary to check the fuse or power supply circuit.

Rear Window Wiper (Hatchback)

Step	Action	Value(s)	Yes	No
1	Check fuse F17. Is fuse F17 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair, if necessary. 2. Replace fuse F17. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Check the voltage at fuse F17. Does the voltage equal the specified value?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open power supply circuit for fuse F17. Is the repair complete?	-	System OK	-
5	1. Disconnect the rear wiper motor electrical connector. 2. Turn the ignition ON. 3. Check the voltage at the RED/DK BLU wire of the rear wiper motor electrical connector. Does the voltage equal the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit for the RED wire between fuse F17 and connector at the rear wiper motor. Is the repair complete?	-	System OK	-
7	With the rear wiper motor still disconnected, use an ohmmeter to check continuity between ground and the BLK wire of the rear wiper motor connector.	≈ 0 Ω	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	Does the ohmmeter indicate the specified value?			
8	Repair the open ground circuit for the rear wiper motor. Is the repair complete?	-	System OK	-
9	1. Turn the ignition ON. 2. Turn the rear wiper ON. 3. Check the voltage at the GRY/RED wire at the rear wiper motor connector. Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 10*	Go to *Step 11*
10	Replace the rear wiper motor. Is the repair complete?	-	System OK	-
11	1. Disconnect the wiper switch electrical connector. 2. Turn the ignition ON. 3. Check the voltage at terminal 3 (GRY/RED) or 1 (W/ Rear Intermittent). Is the voltage equal to the specified value?	11-14 v	Go to *Step 13*	Go to *Step 12*
12	Repair the open circuit between fuse F17 and the wiper switch connector terminal 3(1). Is the repair complete?	-	System OK	-
13	1. Connect an ohmmeter between terminals 1 and 3 of the wiper switch. 2. Observe the ohmmeter when the rear wiper switch is moved to the WIPE position. Does the ohmmeter indicate the specified value?	$\approx 0\ \Omega$	Go to *Step 14*	Go to *Step 15*
14	Repair the open circuit between terminal 1 of the wiper connector (GRY wire) and the rear wiper motor. Is the repair complete?	-	System OK	-
15	Replace the wiper switch. Is the repair complete?	-	System OK	-

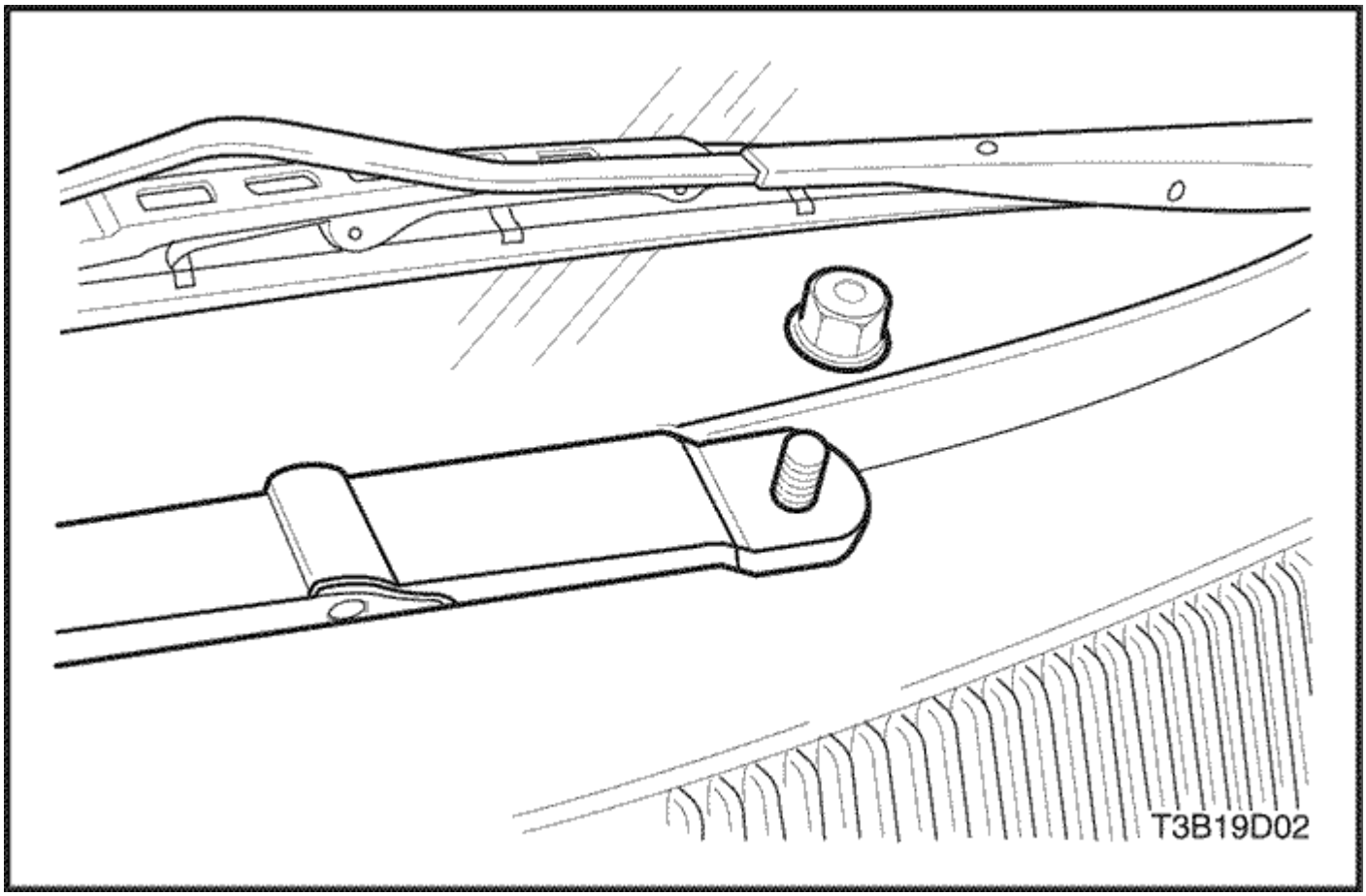
Rear Window Washer System (Hatchback)

Step	Action	Value(s)	Yes	No
1	Check the washer fluid level.	-	Go to *Step 3*	Go to *Step 2*

Step	Action	Value(s)	Yes	No
	Is there fluid in the washer reservoir?			
2	Fill the washer reservoir. Is the repair complete?	-	System OK	-
3	Verify that the hoses are not obstructed or leaking by disconnecting the washer hose and blowing through it toward the reservoir and also toward the nozzle. Are the hoses obstructed or leaking?	-	Go to *Step 4*	Go to *Step 5*
4	Repair or replace the hoses. Is the repair complete?	-	System OK	-
5	Check the function of the rear wiper. Does the rear wiper function correctly?	-	Go to *Step 7*	Go to *Step 6*
6	Repair the rear wiper. Is the rear wiper repair complete?	-	Go to *Step 7*	-
7	1. Disconnect the electrical connector at the rear washer pump. 2. Use an ohmmeter to check continuity between the BLK wire of the rear washer pump connector and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 9*	Go to *Step 8*
8	Repair the open or the high-resistance ground connection. Is the repair complete?	-	System OK	-
9	Check the voltage at the rear washer pump connector (LT GRN/BLK wire) when the rear washer is turned ON. Is the voltage equal to the specified value?	11-14 v	Go to *Step 10*	Go to *Step 11*
10	Replace the rear washer pump. Is the repair complete?	-	System OK	-
11	1. Disconnect the wiper switch. 2. Connect an ohmmeter between terminal 2 and terminal 3 of the wiper switch. 3. Observe the ohmmeter when the switch is moved to the rear WASH position. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 12*	Go to *Step 13*
12	Repair the open circuit between terminal 2 of the wiper switch connector and the rear washer	-	System OK	-

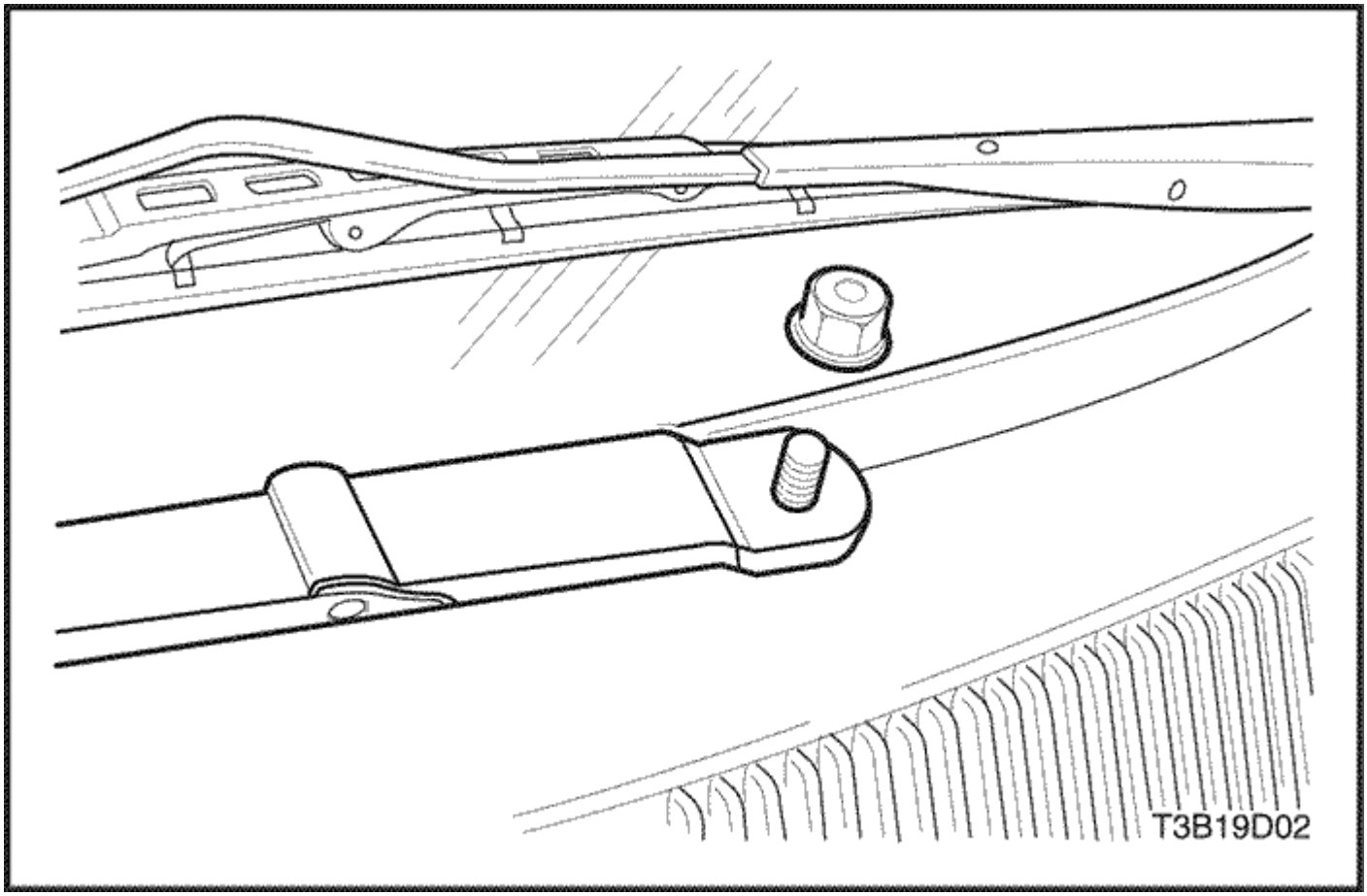
Step	Action	Value(s)	Yes	No
	pump. Is the repair complete?			
13	Replace the wiper switch. Is the repair complete?	-	System OK	-

MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



Windshield Wiper Arm (Typical)
Removal Procedure

1. Open the hood.
2. Remove the nut from the wiper arm.
3. Pull the wiper arm off.



Installation Procedure

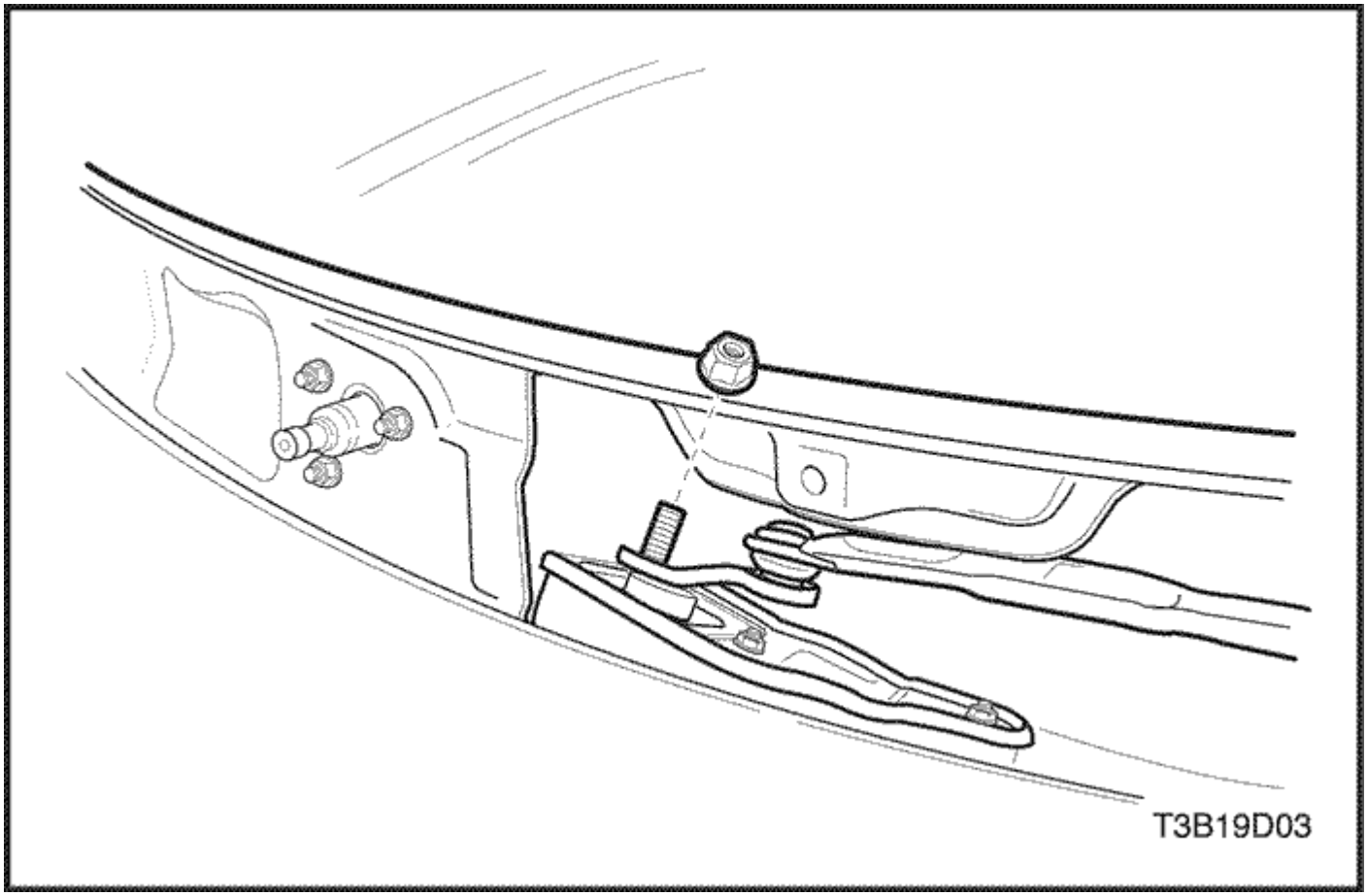
1. Install the wiper arm.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Secure the wiper arm with the nut.

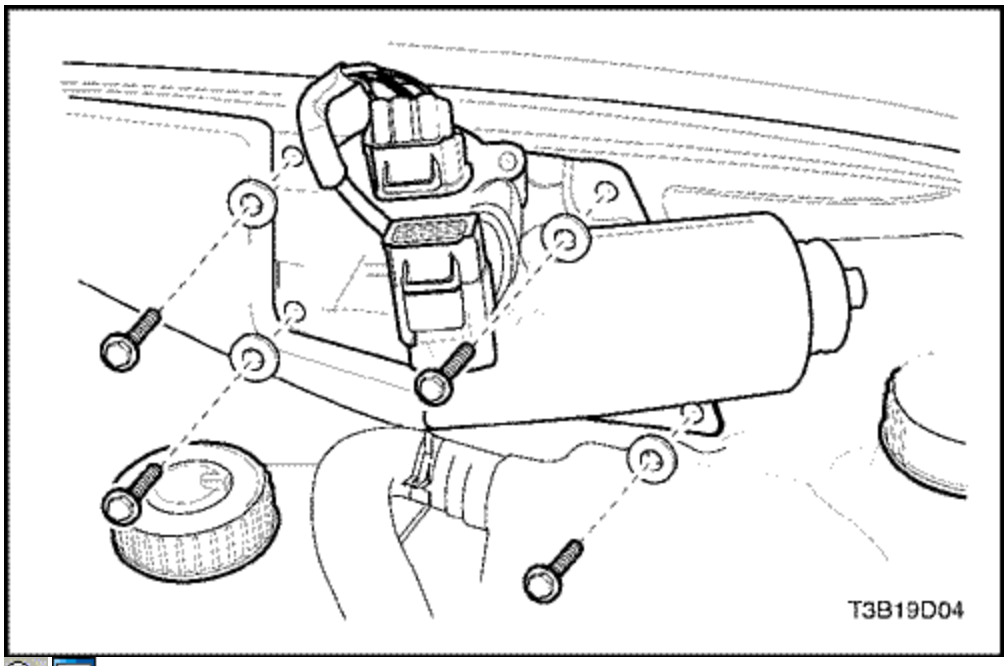
   Tighten
   Tighten the wiper arm nut to 15 N•m (11 lb-ft).

3. Close the hood.

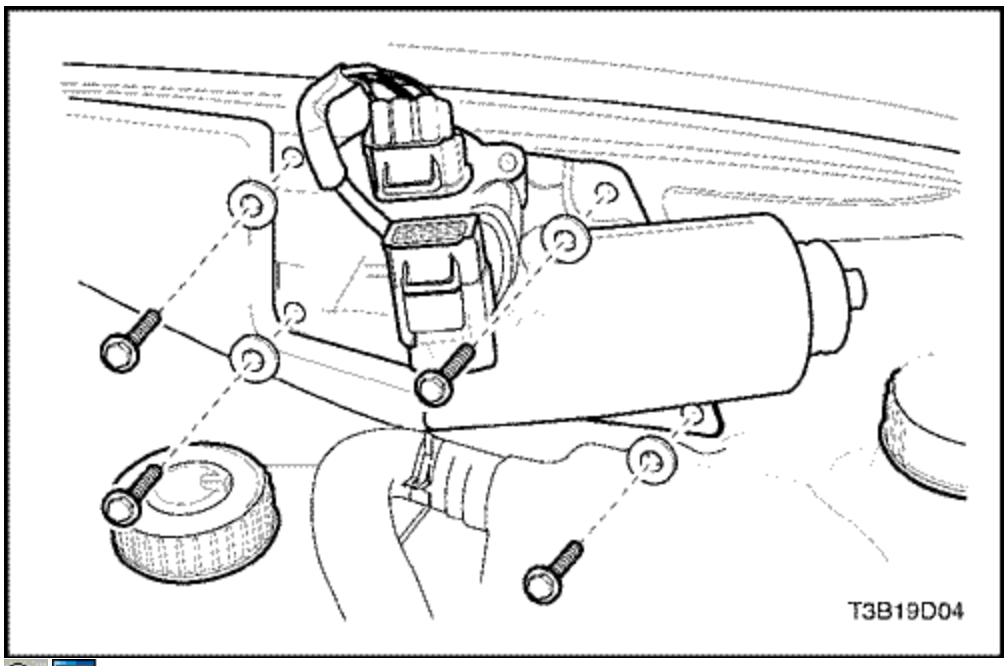


Windshield Wiper Motor (Typical)
Removal Procedure

1. Disconnect the negative battery cable.
2. Put the wiper arms in the upright position.
3. Remove the left side portion of the cowl vent grille. Refer to *Section 9R, Body Front End.*
4. Remove the nut securing the wiper arm linkage to the motor drive shaft.



5. Pry the wiper arm linkage off the motor drive shaft.
6. Disconnect the electrical connectors.
7. Remove the bolts and the wiper motor.



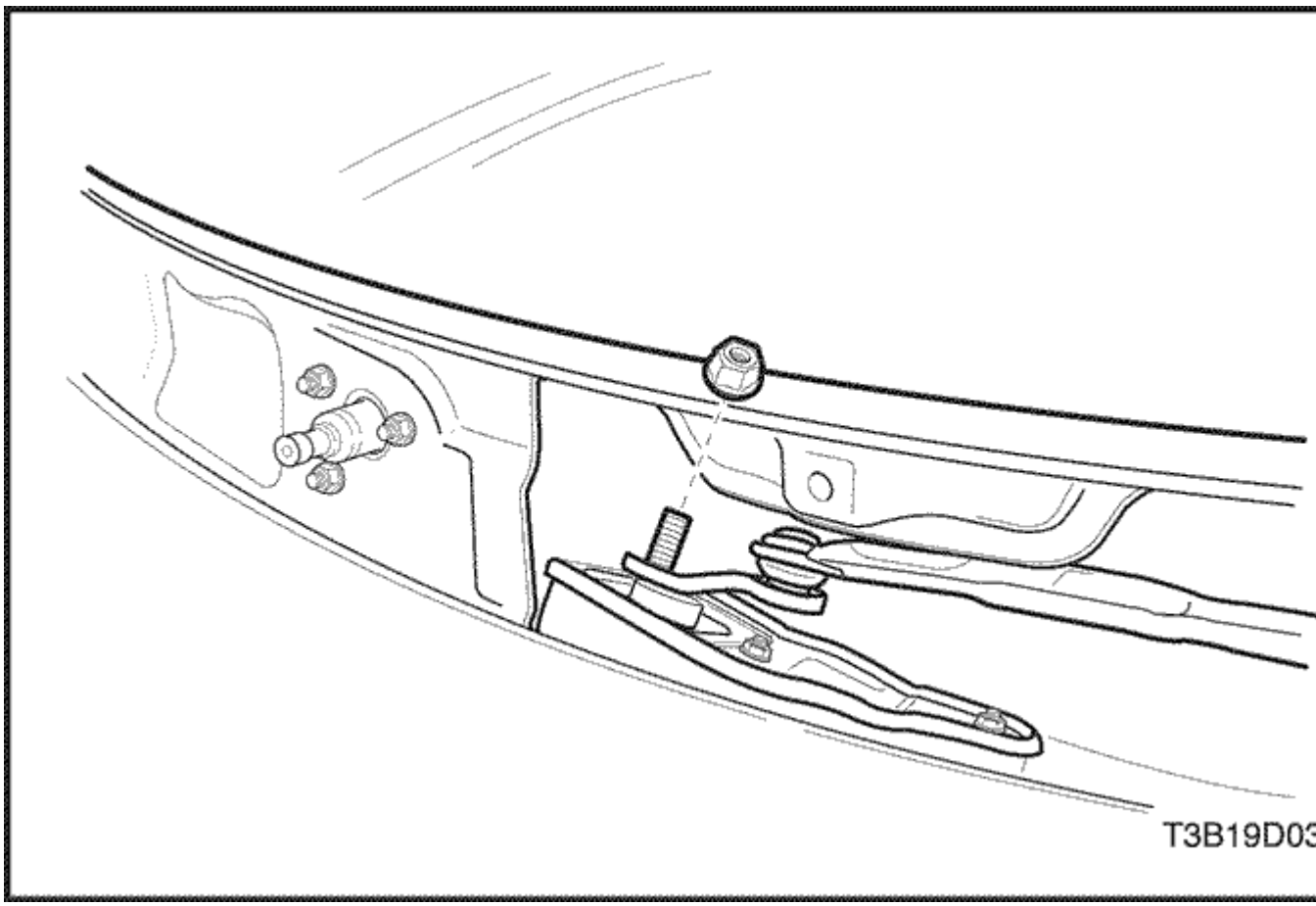
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the wiper motor with the bolts.

   Tighten
   Tighten the wiper motor bolts to 9 N•m (80 lb-in).

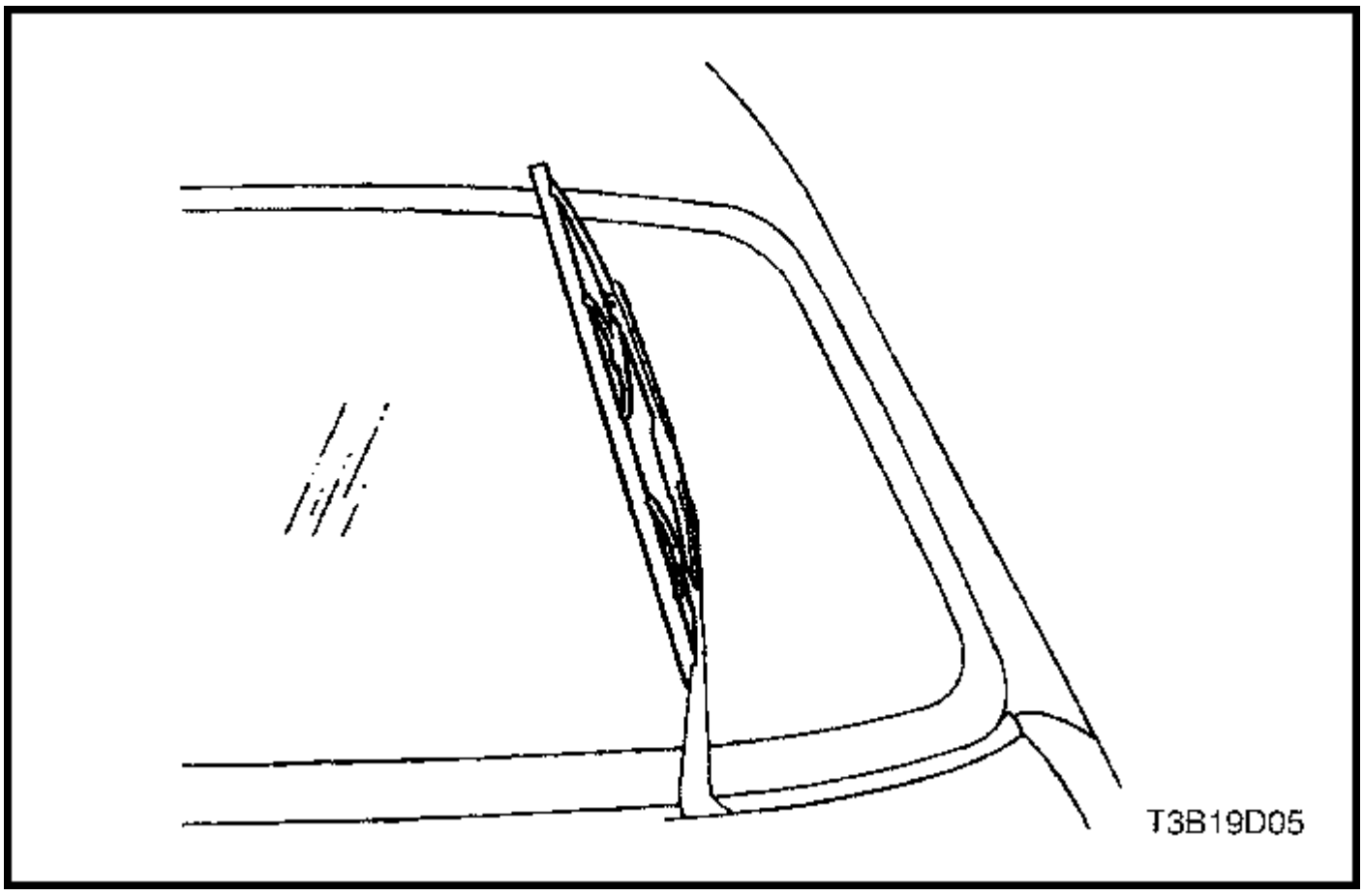
2. Connect the electrical connector.



3. Press the wiper arm linkage onto the motor drive shaft.
4. Install the wiper arm linkage to the motor drive shaft with the nut.

   Tighten
   Tighten the wiper arm linkage nut to 8.5 N•m (75 lb-in).

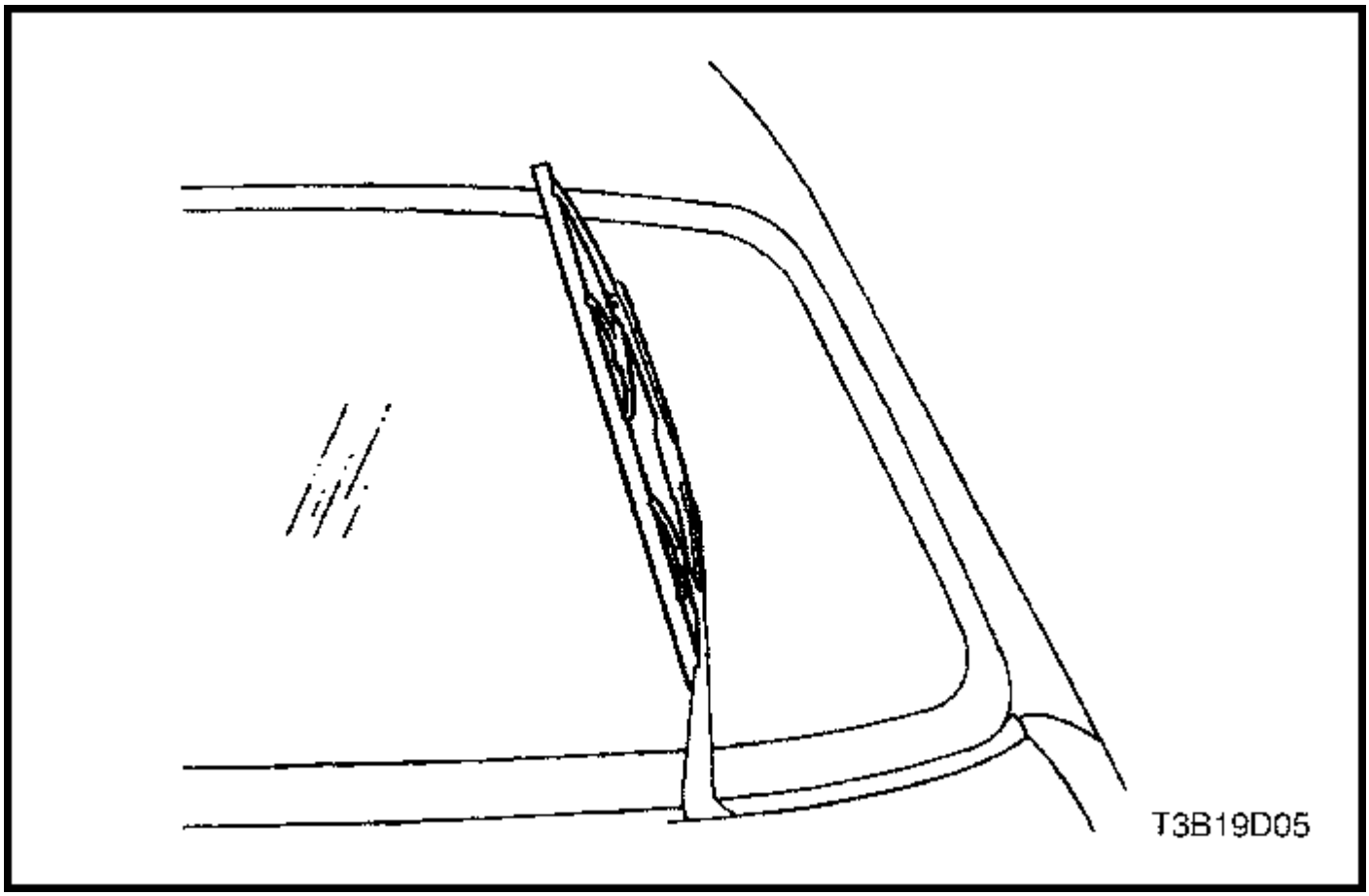
5. Install the left side portion of the cowl vent grille. Refer to *Section 9R, Body Front End.*
6. Connect the negative battery cable.



Windshield Wiper Blade (Typical)
Removal Procedure

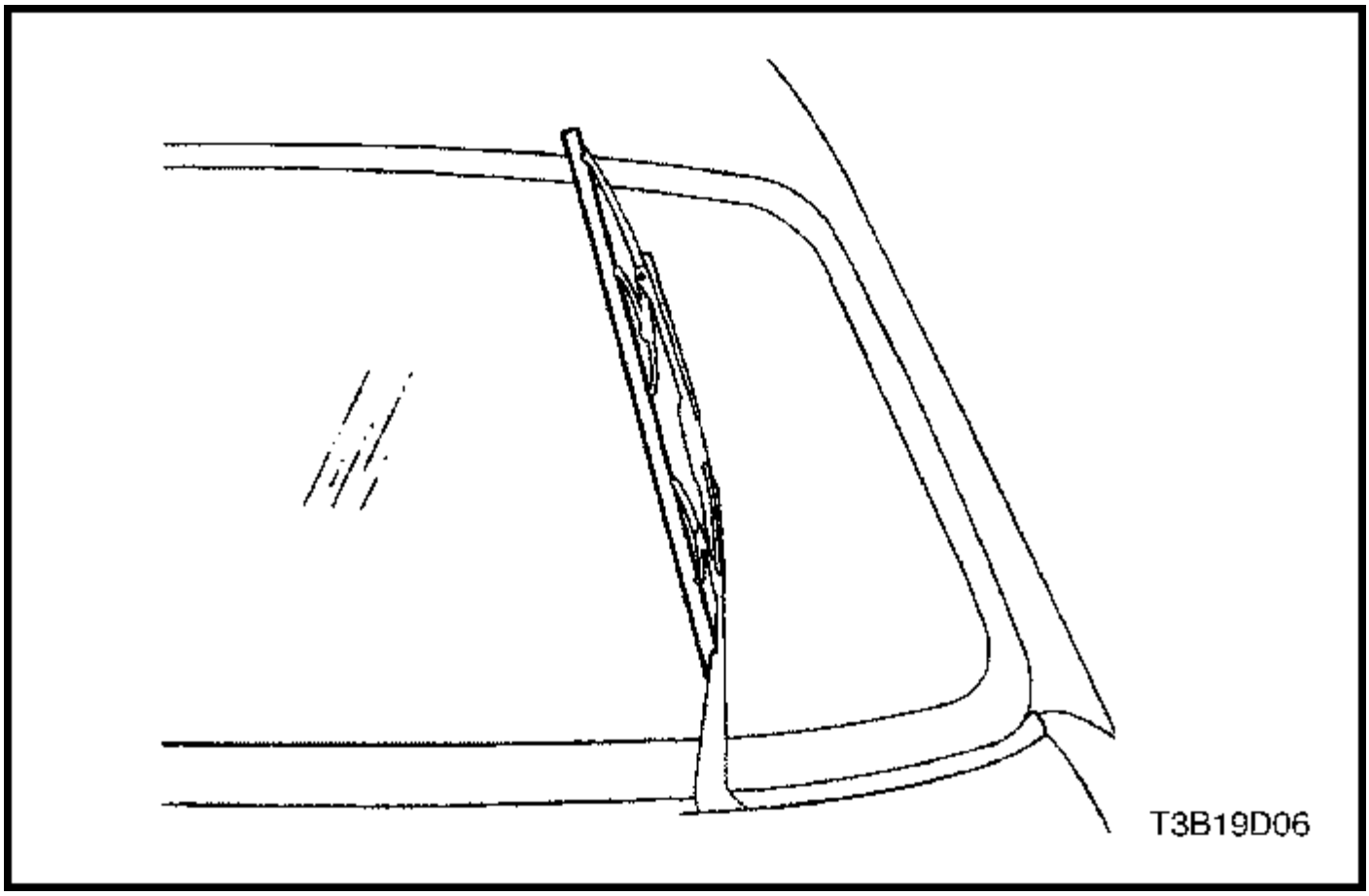
1. Rotate the wiper blade on the arm.

2. Pull the wiper blade off the arm.



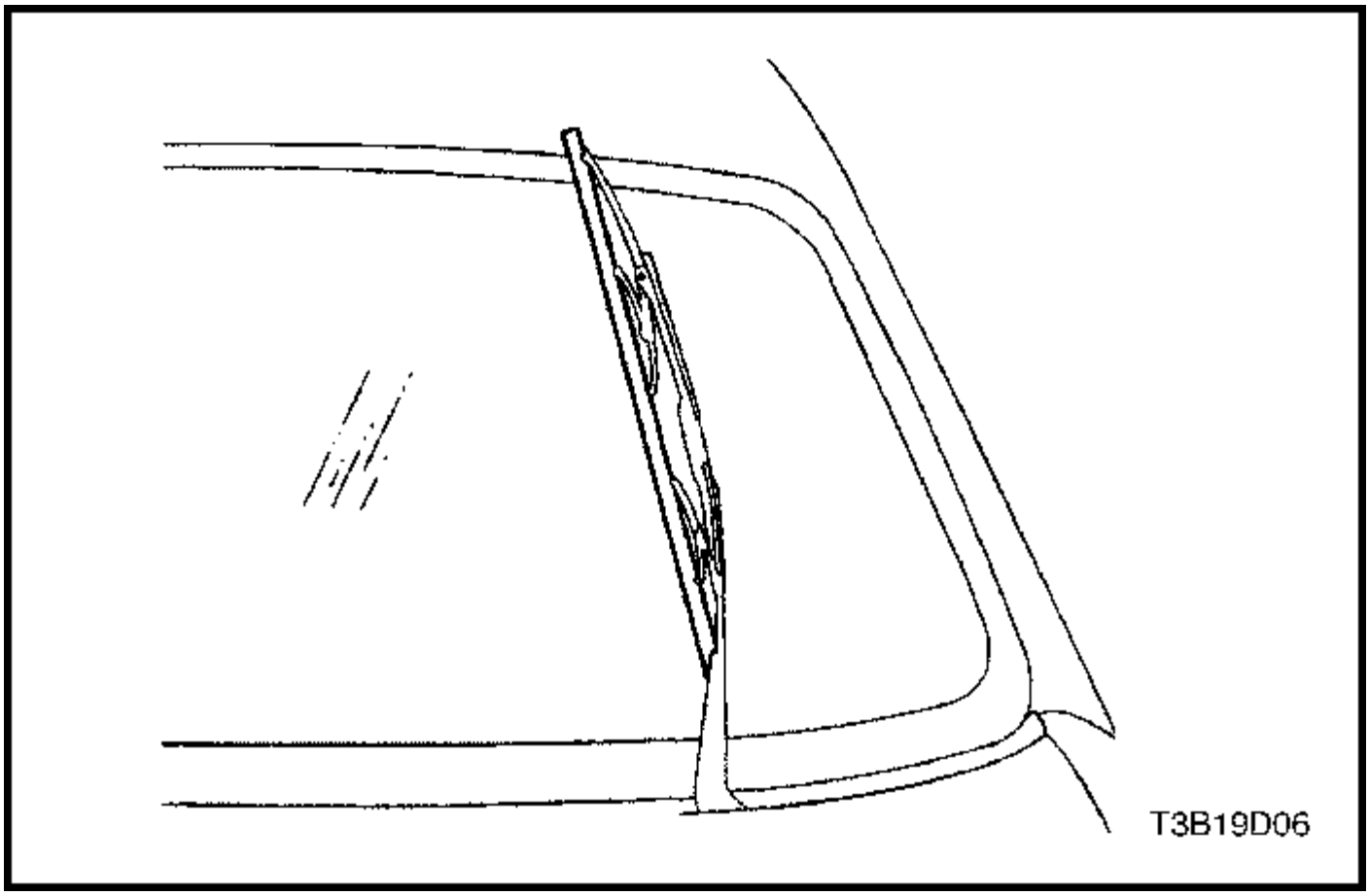
Installation Procedure

1. Push the wiper blade onto the arm.



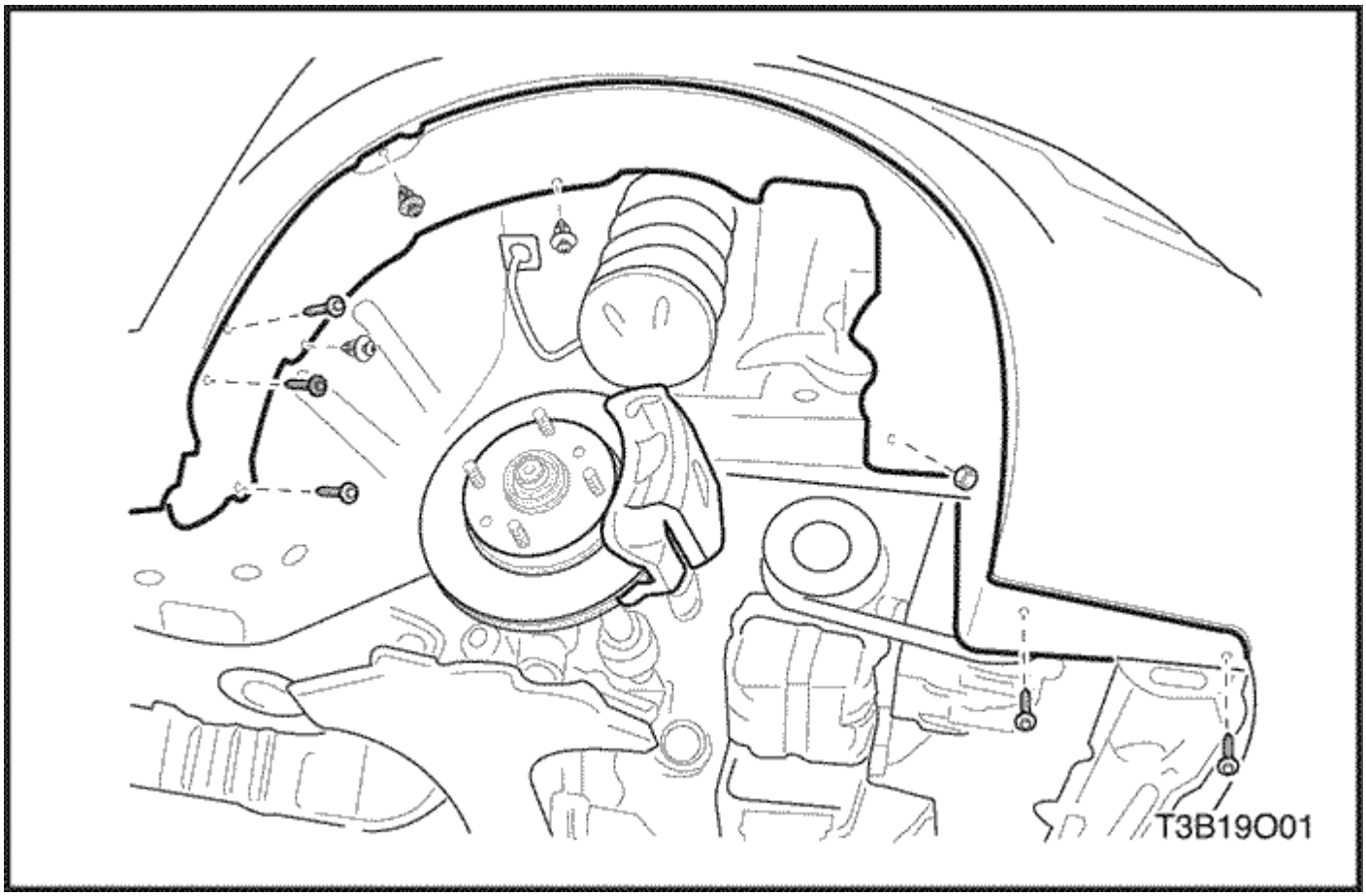
Windshield Wiper Blade Insert (Typical)
Removal Procedure

1. Slide the insert out of the wiper blade.



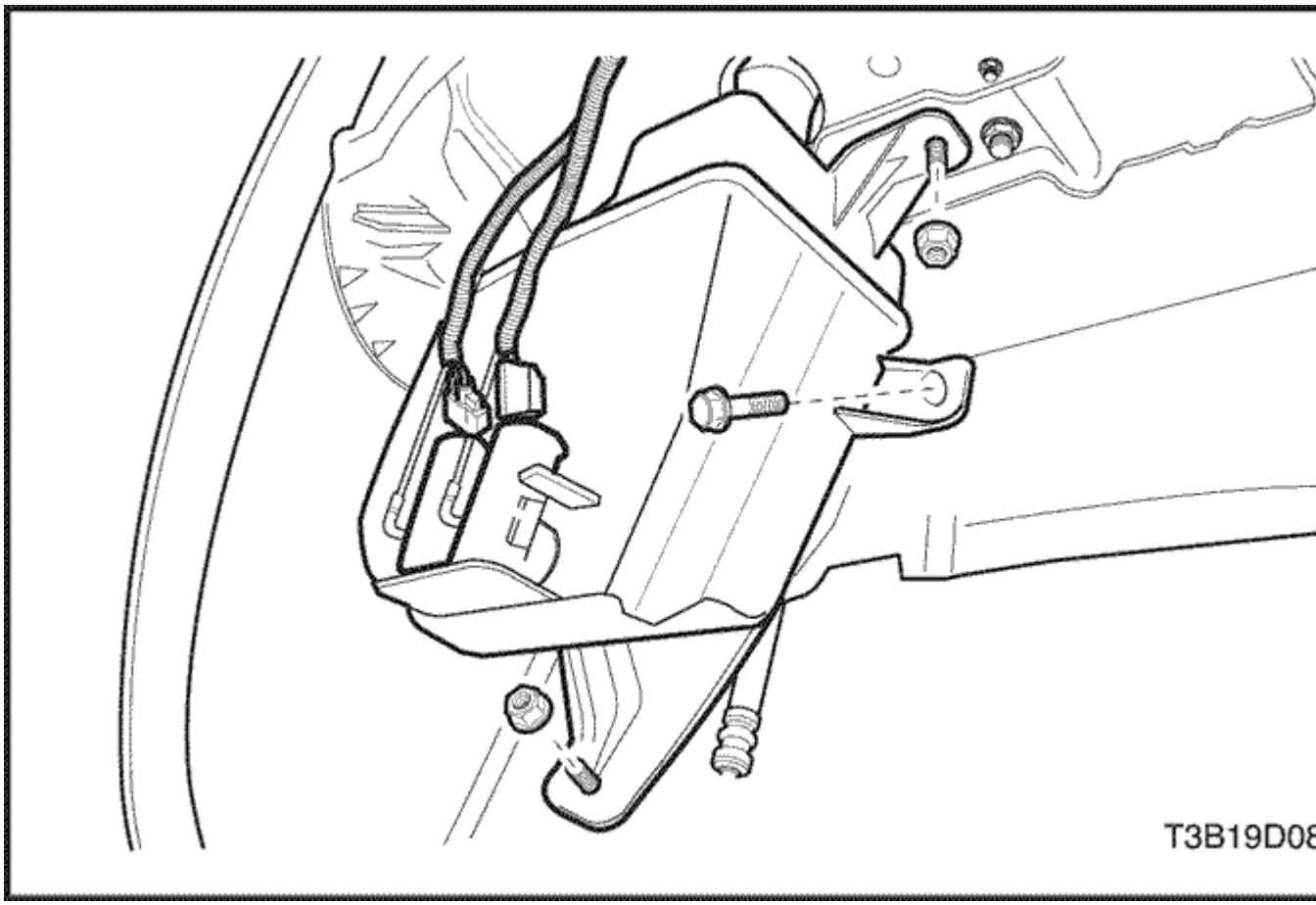
Installation Procedure

1. Slide the insert into the wiper blade.

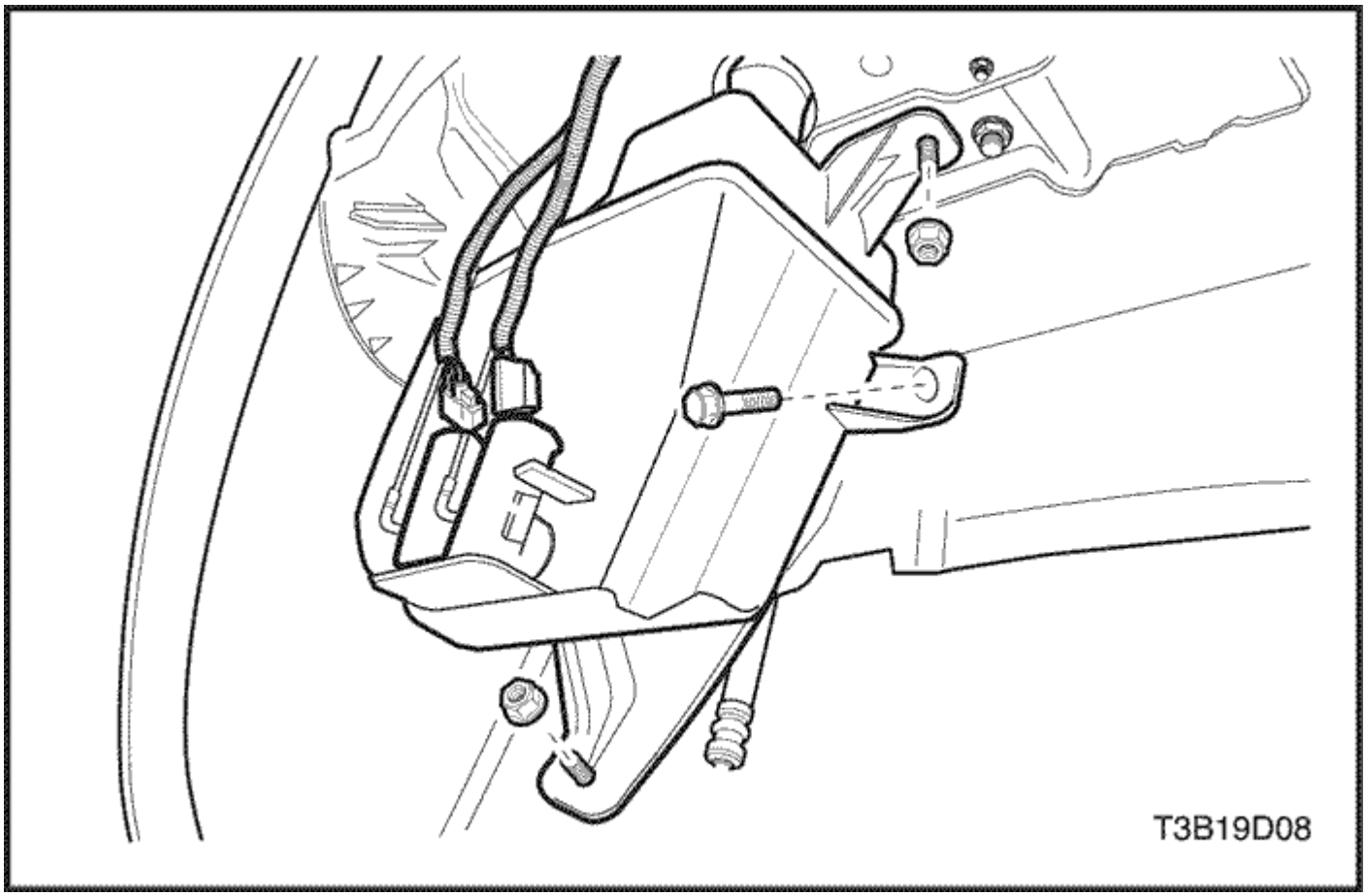


Windshield Washer Reservoir (Typical)
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the front left wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the screws and the front wheel well splash shield.



4. Disconnect the washer hose(s) from the reservoir.
5. Disconnect the reservoir pump electrical connector(s).
6. Remove the bolts, the nuts and the reservoir.



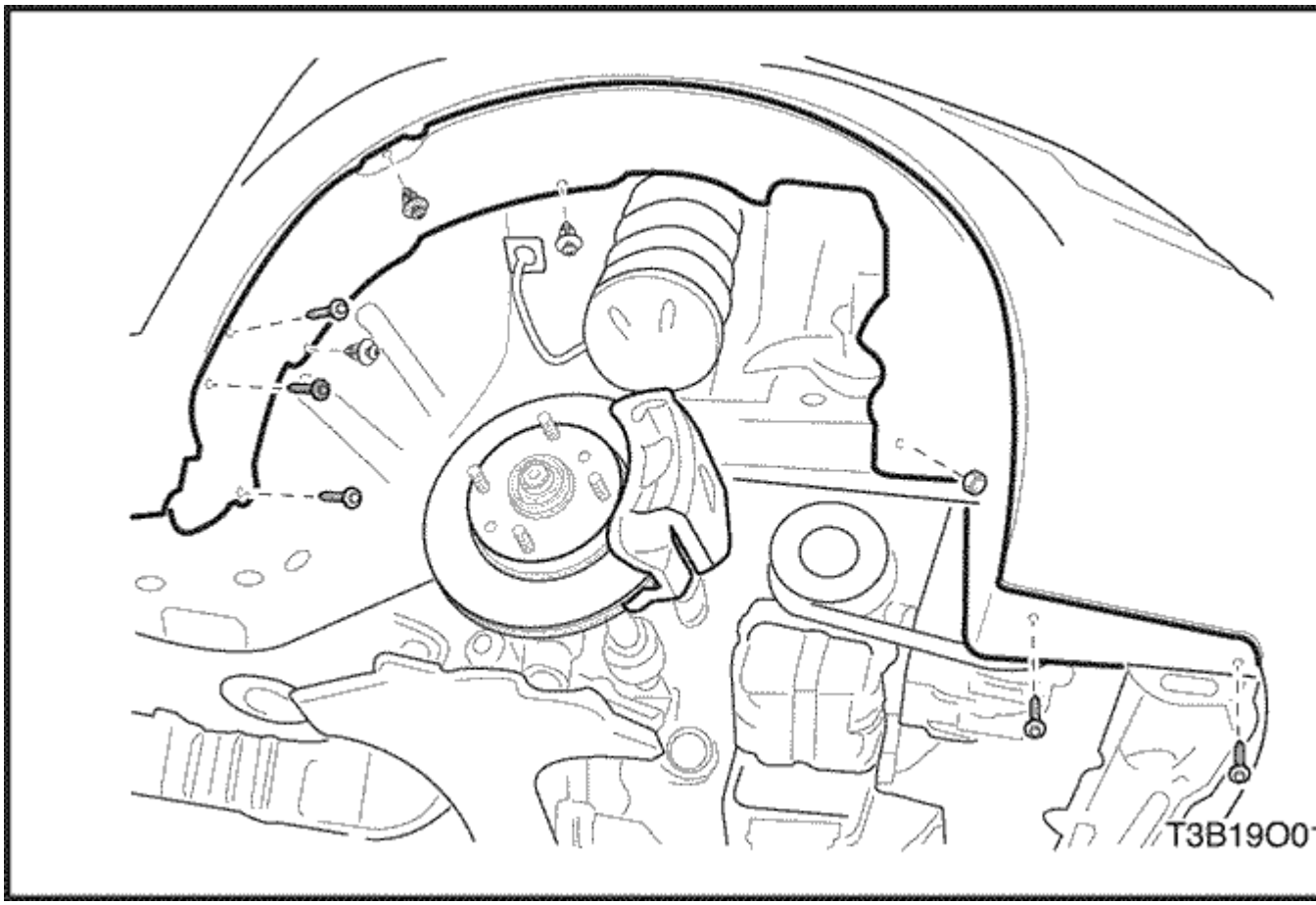
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the reservoir with the nuts and the bolts.

   Tighten
   Tighten the washer fluid reservoir nuts to 9 N•m (80 lb-in).
   Tighten the washer fluid reservoir bolts to 9 N•m (80 lb-in).

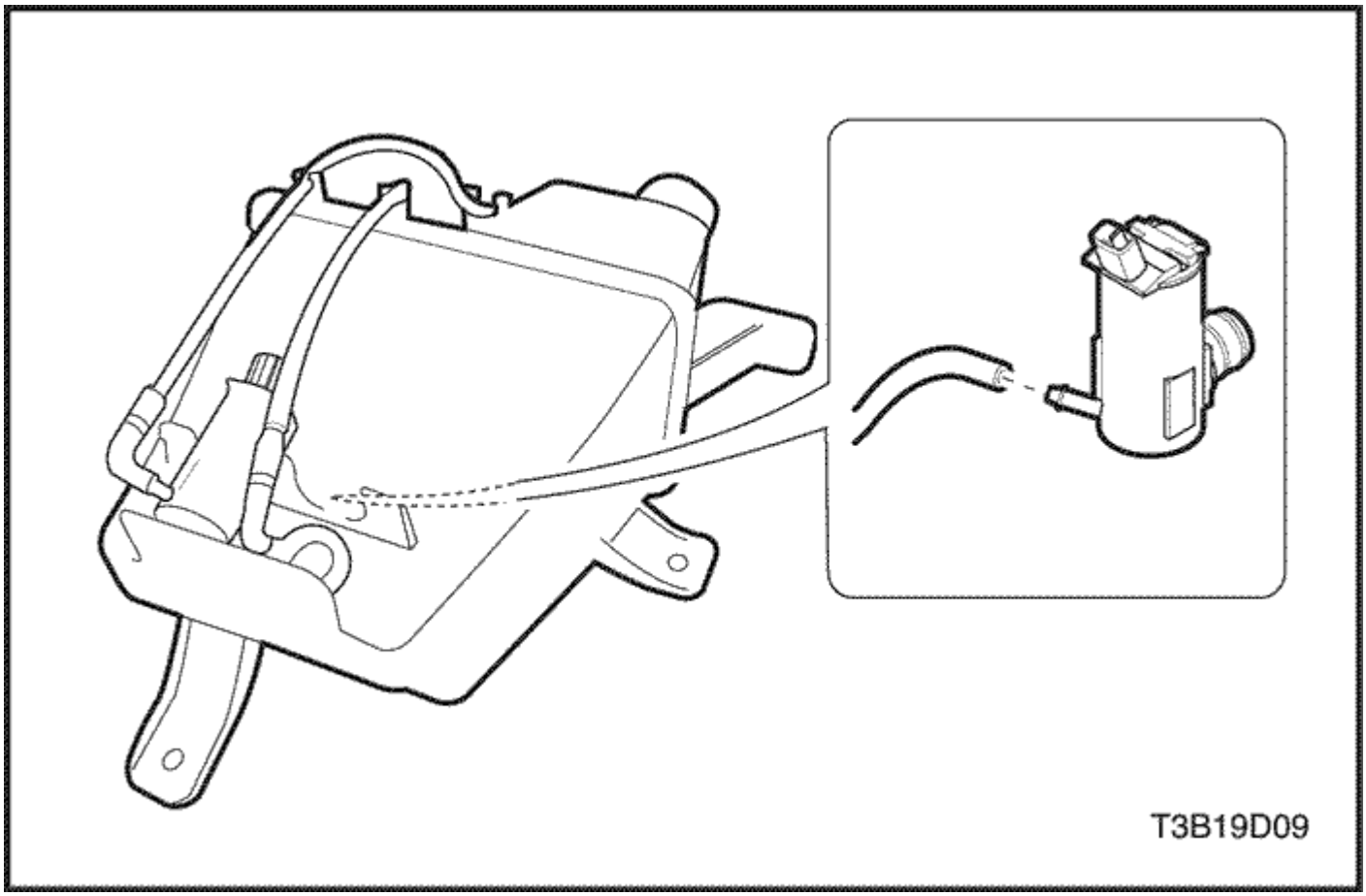
2. Connect the reservoir pump electrical connector(s).
3. Connect the washer hose(s) to the reservoir.



4. Install the front wheel well splash shield with the screws.

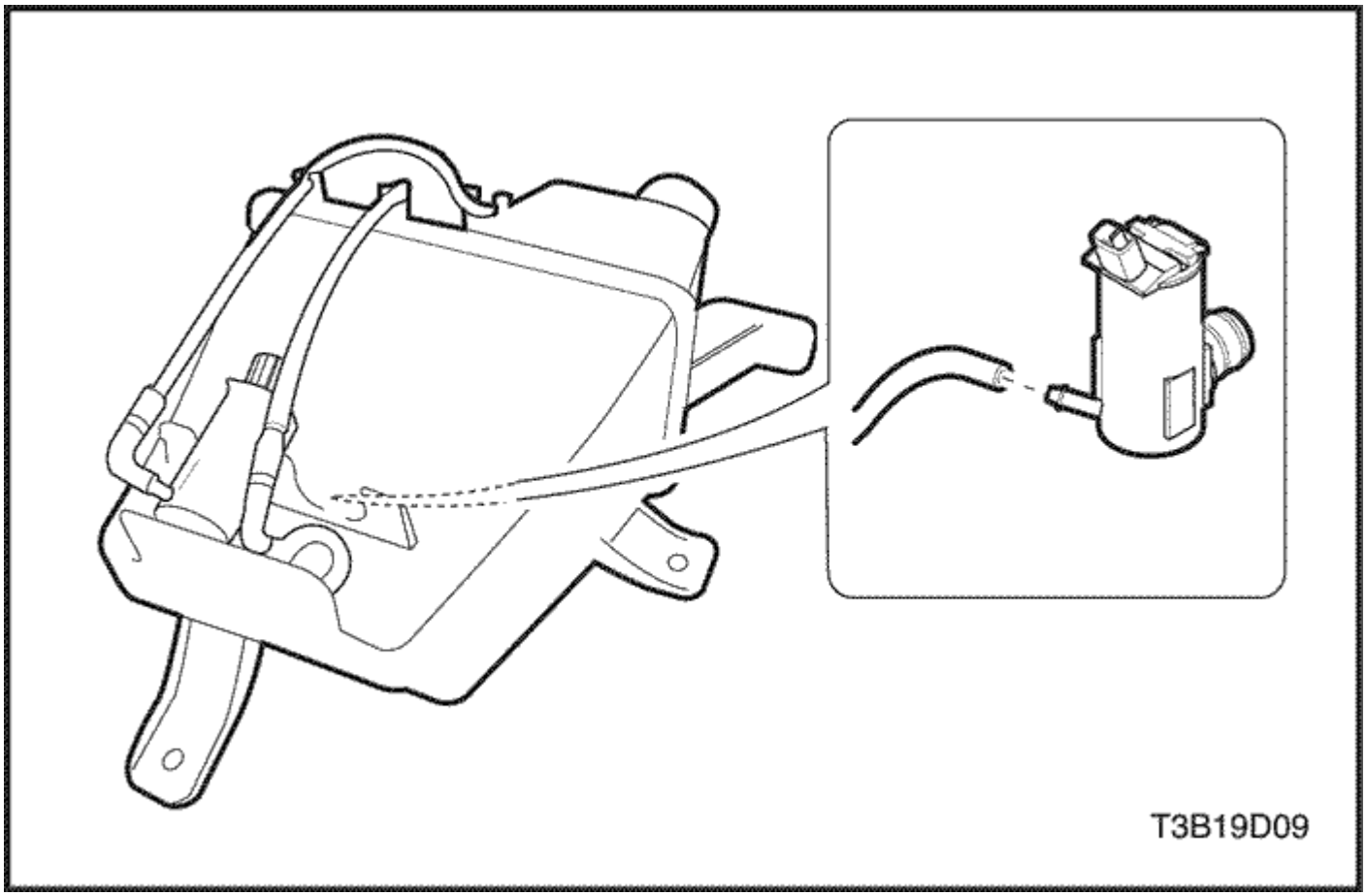
   Tighten
   Tighten the front wheel well splash shield screws to 1.5 N•m (13 lb-in).

5. Install the front left wheel. Refer to *Section 2E, Tires and Wheels.*
6. Connect the negative battery cable.



Windshield Washer Pump(s) (Typical)
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the left front left wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the screws and the front wheel well splash shield.
4. Disconnect the electrical connector.
5. Disconnect the washer hose.
6. Remove the washer pump.



Installation Procedure

1. Install the washer pump.
2. Connect the washer hose.
3. Connect the electrical connector.

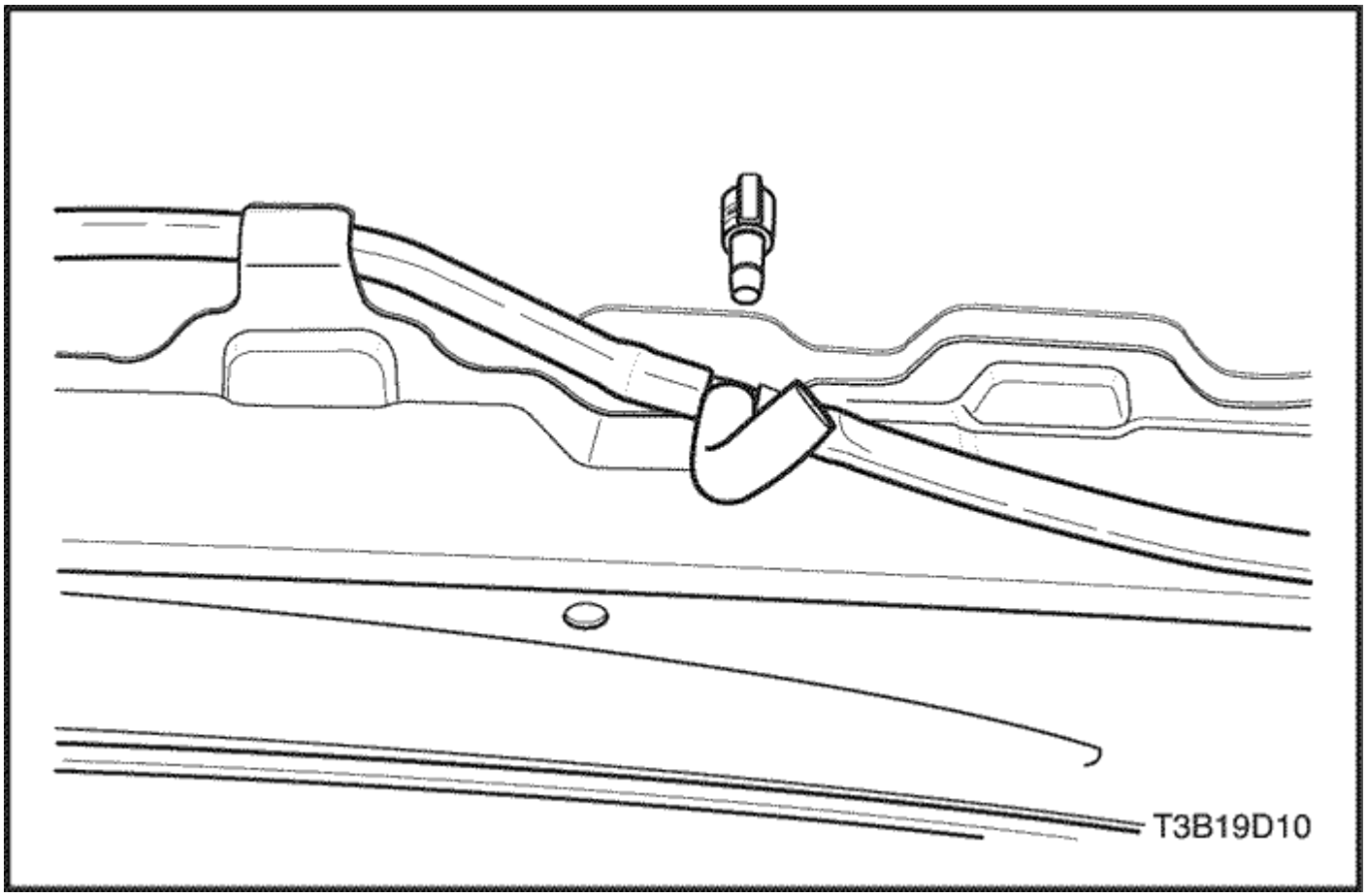
   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

4. Install the front wheel well splash shield with the screws.

   Tighten
   Tighten the front wheel well splash shield screws to 1.5 N•m (13 lb-in).

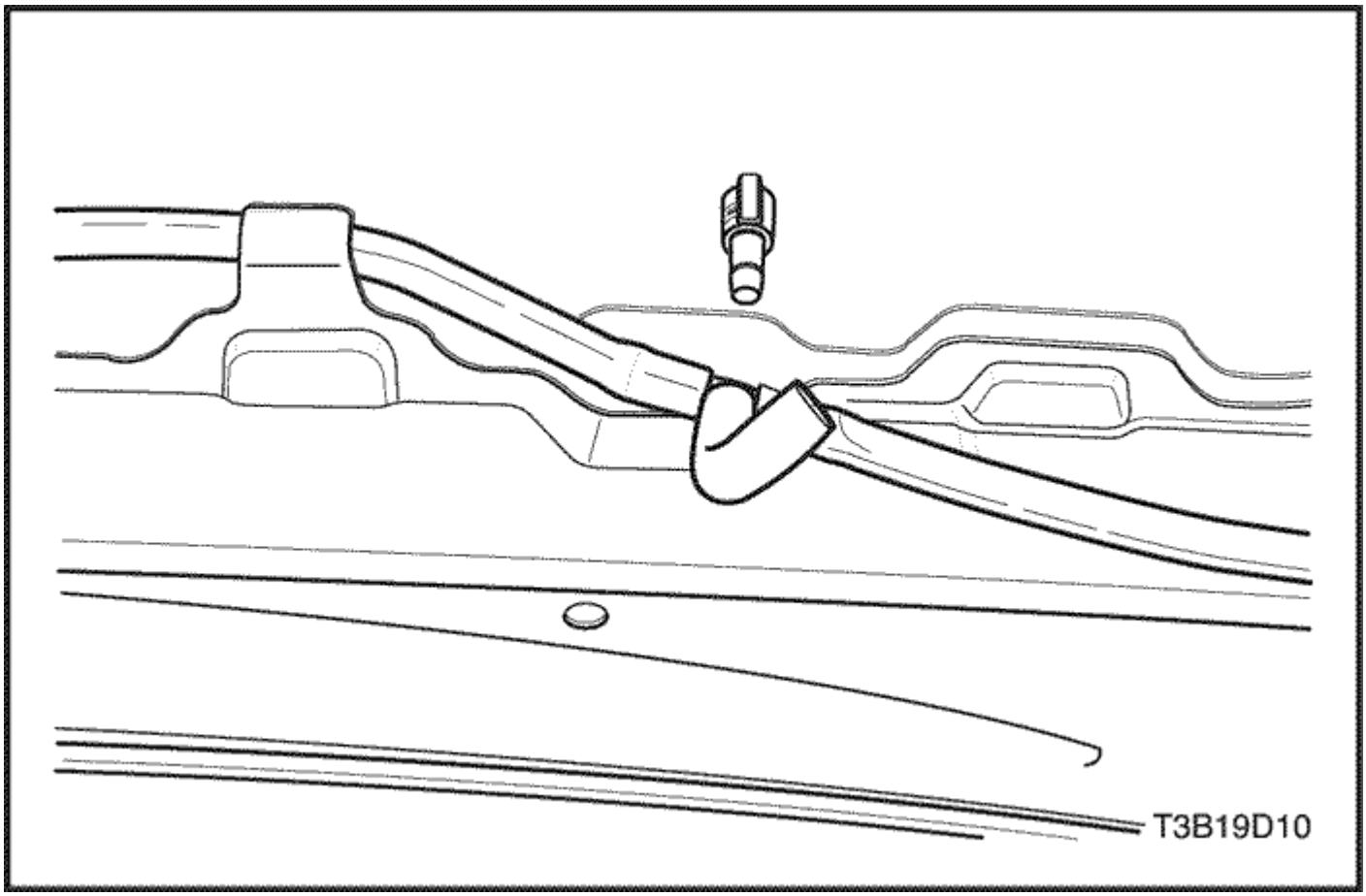
5. Install the front left wheel. Refer to *Section 2E, Tires and Wheels.*

6. Connect the negative battery cable.



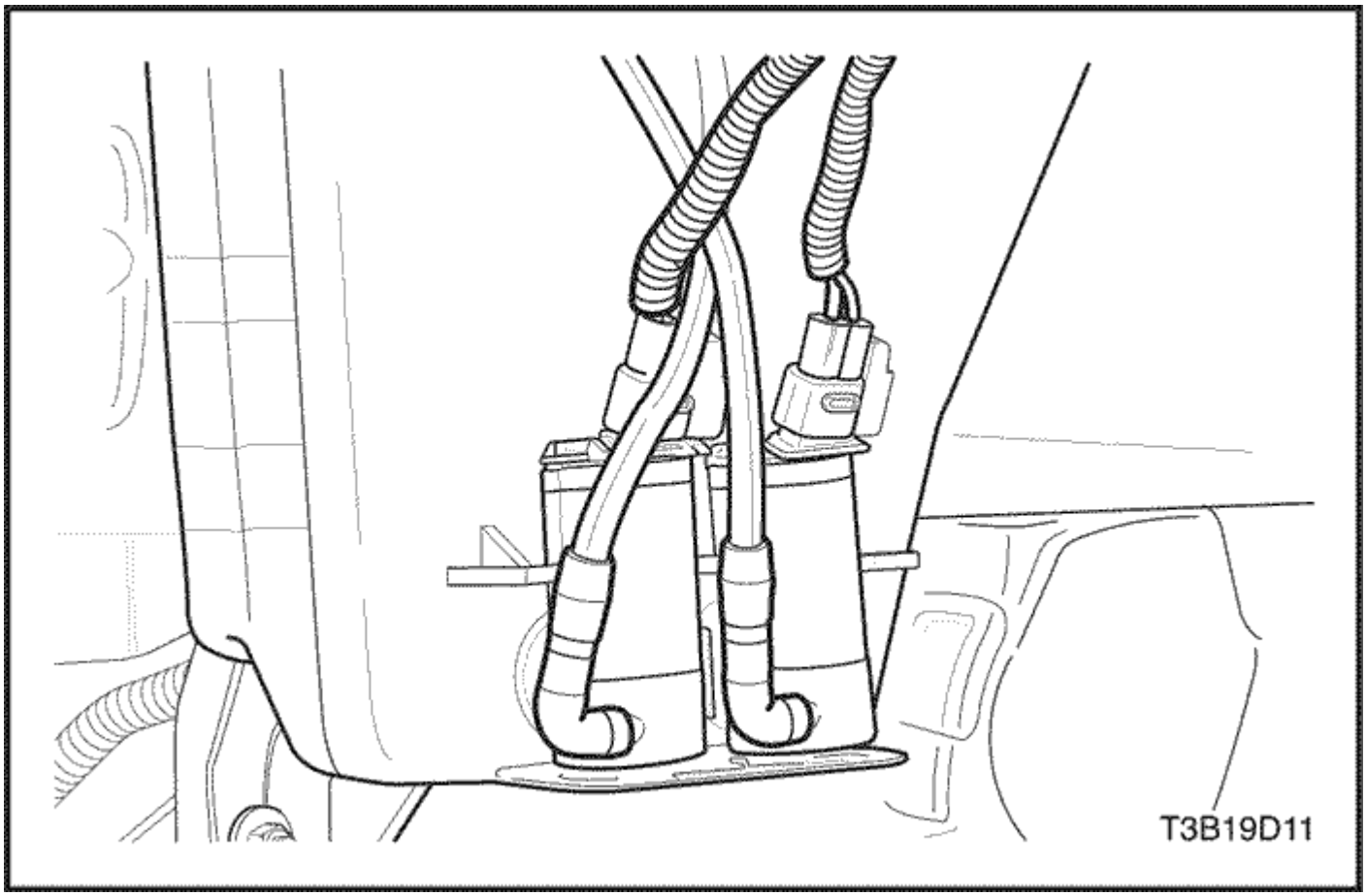
Windshield Washer Nozzles
Removal Procedure

1. Open the hood.
2. Disconnect the washer hose from the nozzle.
3. Remove the nozzle from the hood.



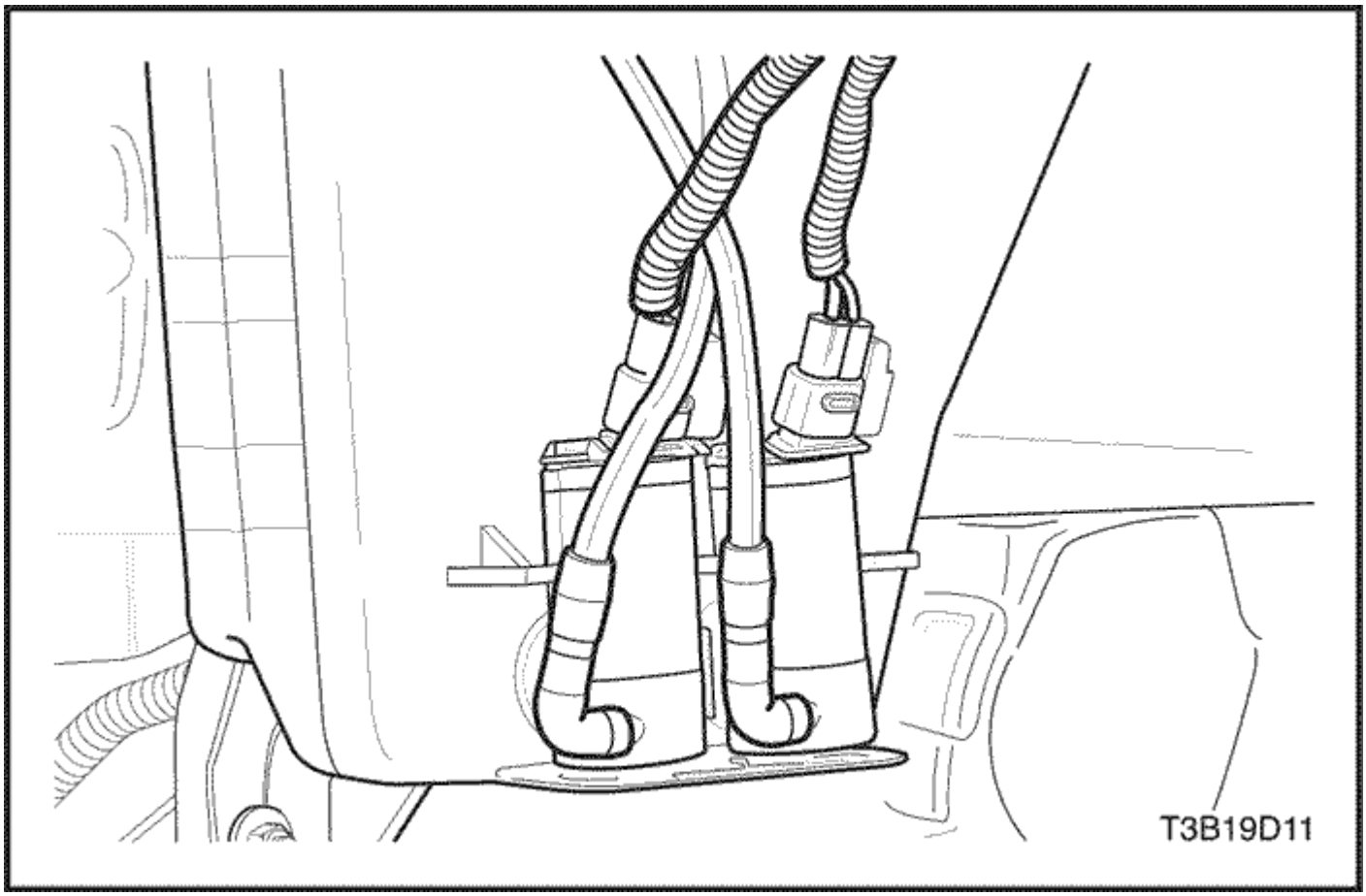
Installation Procedure

1. Install the nozzle onto the hood.
2. Connect the washer hose to the nozzle.
3. Close the hood.



Windshield Washer Hoses
Removal Procedure

1. Open the hood.
2. Disconnect the windshield washer hose from the washer nozzles on the hood.
3. Remove the front left wheel. Refer to *Section 2E, Tires and Wheels.*
4. Remove the screws and the front wheel well splash shield.
5. Disconnect the washer hose from the washer reservoir.



Installation Procedure

1. Connect the washer hose to the washer reservoir.

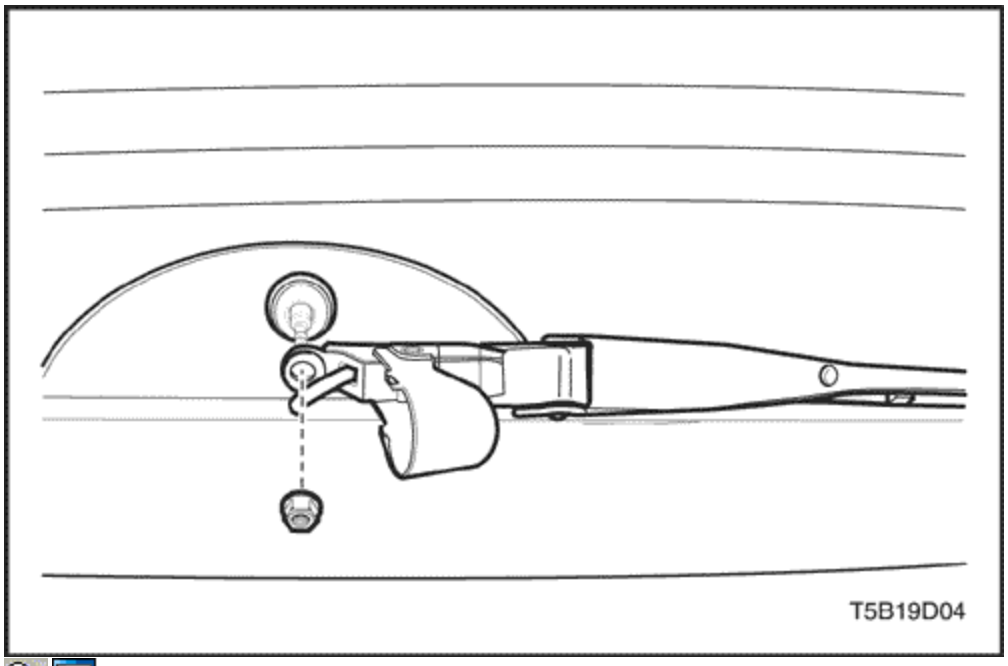
   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the front wheel well splash shield with the screws.

   Tighten
   Tighten the front wheel well splash shield screws to 1.5 N•m (13 lb-in).

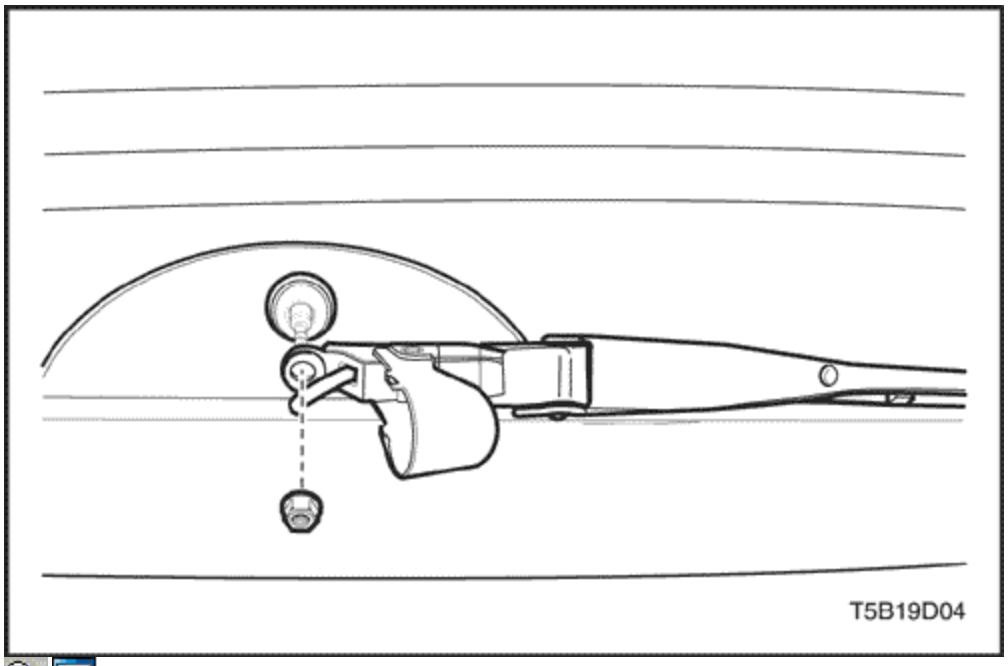
3. Install the front left wheel. Refer to *Section 2E, Tires and Wheels.*
4. Connect the windshield washer hose to the washer nozzles on the hood.

5. Close the hood.



Rear Window Wiper Arm
Removal Procedure

1. Open the wiper arm access cap.
2. Remove the nut and the rear wiper arm.



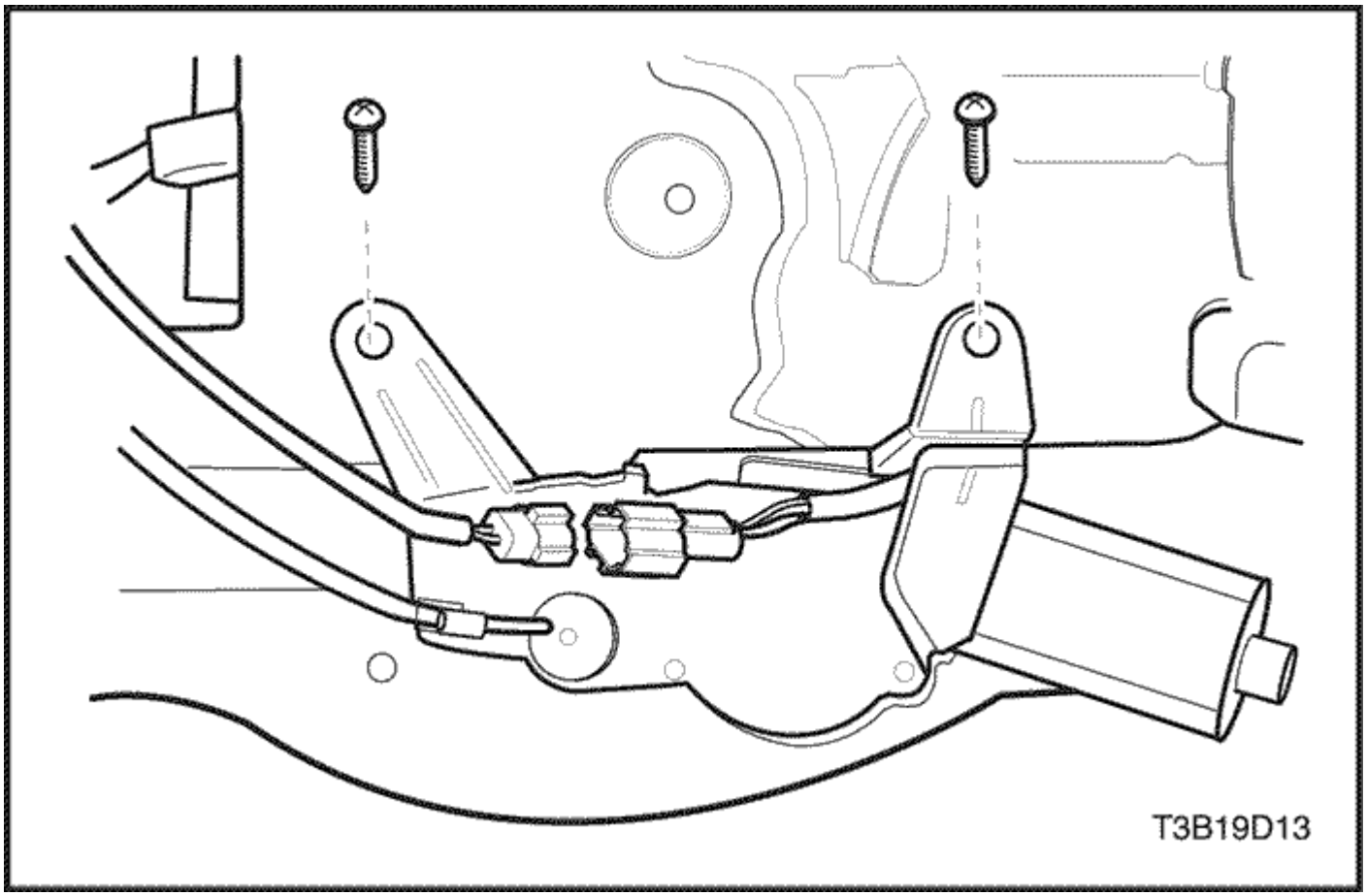
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the rear wiper arm with the nut.

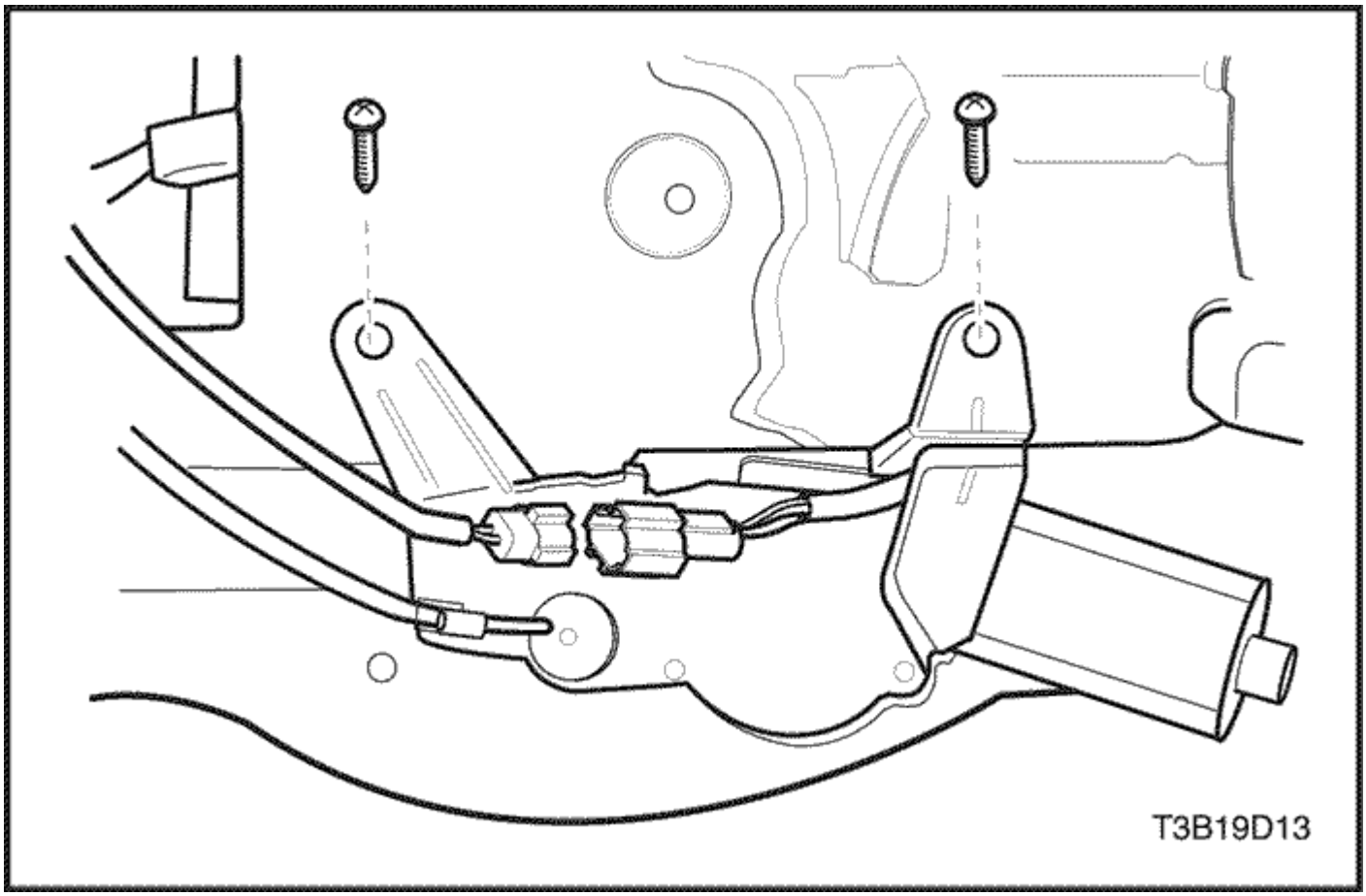
   Tighten
   Tighten the wiper arm nut to 11 N•m (97 lb-in).

2. Close the wiper arm access cap.



Rear Window Wiper Motor
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the rear window wiper arm. Refer to "Rear Window Wiper Arm" in this section.
3. Remove the hatchback door lower garnish molding. Refer to *Section 9G, Interior Trim.*
4. Remove the bolts and the rear wiper motor.
5. Disconnect the electrical connector.



Installation Procedure

1. Connect the electrical connector.

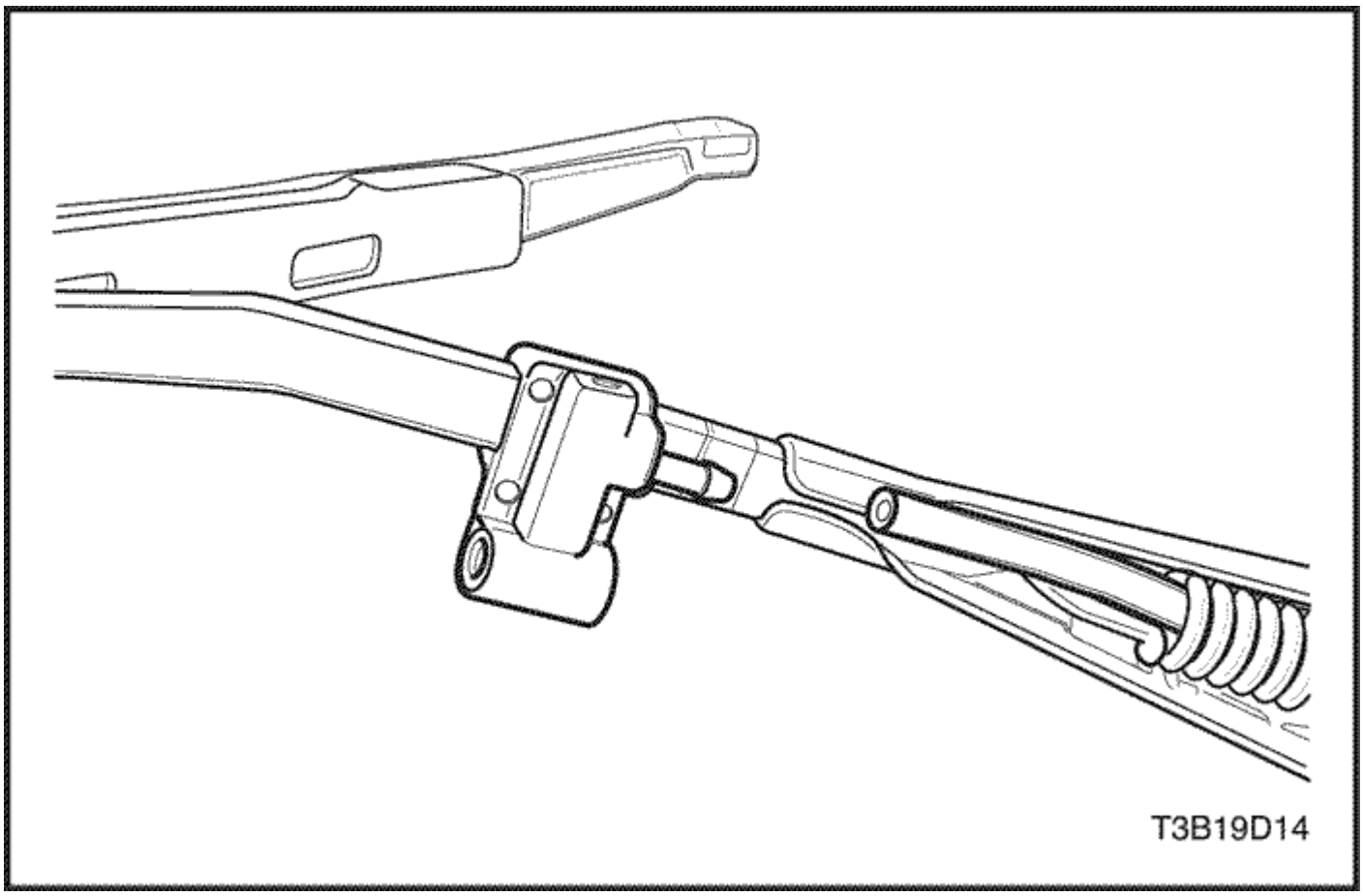
   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the rear wiper motor with the bolts.

   Tighten
   Tighten the wiper motor bolts to 9 N•m (80 lb-in).

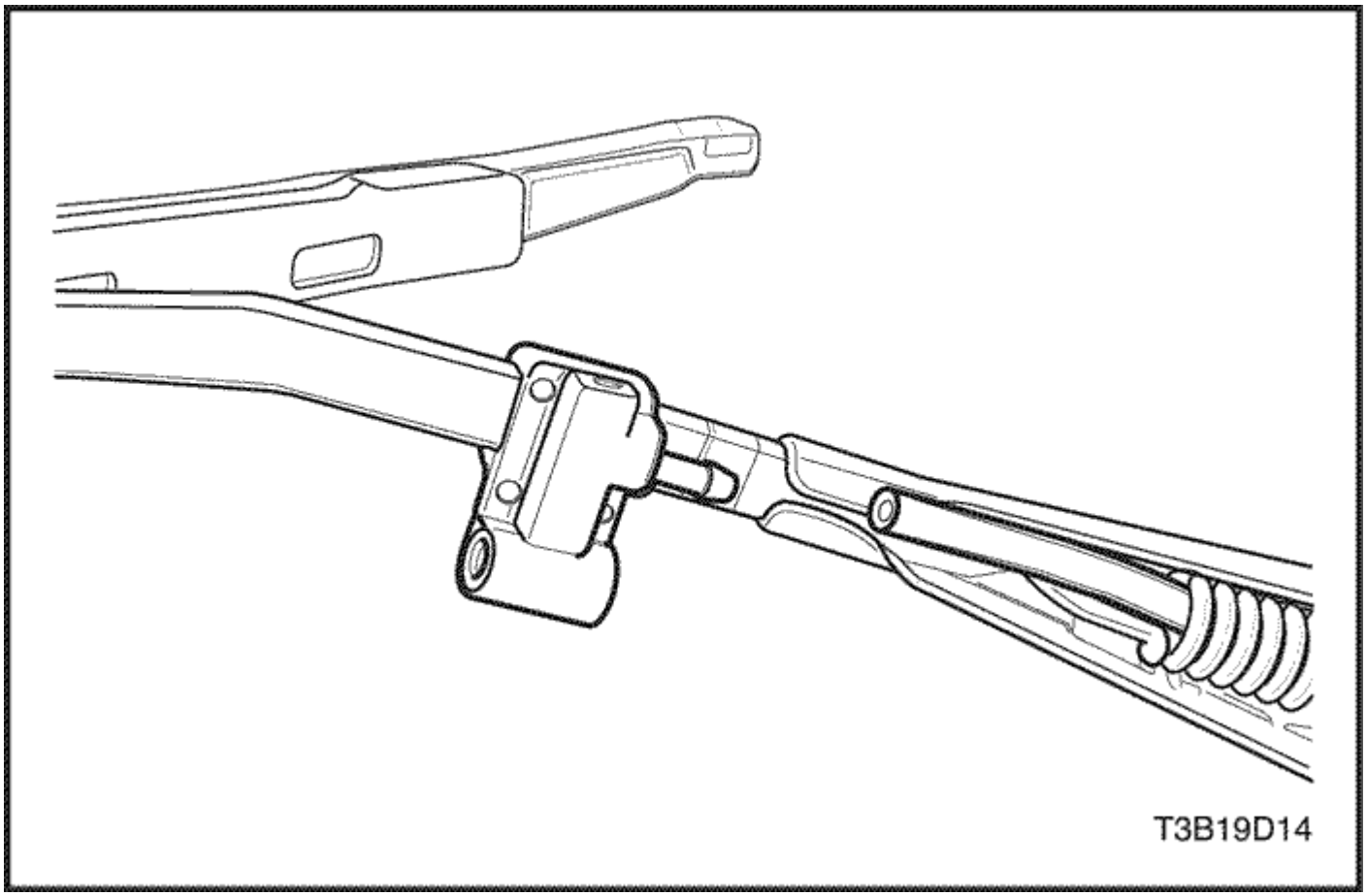
3. Install the hatchback door lower garnish molding. Refer to *Section 9G, Interior Trim.*

4. Install the rear window wiper arm. Refer to "Rear Window Wiper Arm" in this section.
5. Connect the negative battery cable.



Rear Window Washer Nozzle
Removal Procedure

1. Remove the washer hose from the nozzle.
2. Remove the washer nozzle.



Installation Procedure

1. Install the washer nozzle.
2. Install the washer hose to the nozzle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Windshield Wiper System

The windshield wiper system consists of a wiper motor, a linkage, a wiper arm and a blade, and a wiper/washer switch. The windshield wiper circuit incorporates a elfparking device which consists of a worm gear and a cam plate in order to keep the circuit complete temporarily when the switch is turned off. The wiper system is driven by a permanent magnet-type motor. The windshield wiper motor is mounted on the dash panel and is directly connected to the windshield wiper linkage.

The windshield wiper motor has two speeds, LO and HI, and intermittent wiper capability. The wiper switch is an integral part of the wiper/washer switch.

Windshield wiper operation is actuated through the lever on the right side of the steering column.

Windshield Washer System

The windshield washer system is equipped with a washer fluid reservoir, a washer fluid pump, hoses, nozzles, and a wiper/washer switch. The windshield washer reservoir is mounted behind the front left wheel well splash shield. Attached to the reservoir is a washer pump, which pumps fluid through the hoses to the two nozzles mounted on the hood. The washer switch is an integral part of the wiper/washer switch. Windshield washer operation is actuated through the lever on the right side of the steering column.

Rear Window Wiper/Washer System

The hatchback rear window wiper system consists of a wiper motor, a wiper arm, and a blade. The rear window wiper motor is located inside the hatchback door and is directly connected to the rear window wiper. The hatchback rear window washer systemis equipped with a separate washer fluid pump, hose, and nozzle. The rear window washer reservoir is mounted behind the front left wheel well splash shield. Attached to the reservoir is a washer pump, which pumps fluid through a hose to the nozzle mounted on the hatch.

SECTION 9E

INSTRUMENTATION/DRIVER INFORMATION

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this

cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Air Deflector Screws	2	-	18
Chime Module Screws	3.5	-	31
Clock Screws	2	-	18
Cupholder Screws	2.5	-	22
Deposit Box Screws	2.5	-	22
Driver Knee Bolster Bolts	10	-	89
Floor Console Brace Bolts	4	-	35
Floor Console Brace Nuts	4	-	35
HVAC Controls Screws	4	-	35
Instrument Cluster Screws	4	-	35
Instrument Cluster Trim Panel Screws	4	-	35
Instrument Panel End Bolts	20	15	-
Instrument Panel End Screws	4	-	35
Instrument Panel Nuts Above the Steering Column	20	15	-
Instrument Panel Bolts Behind the HVAC Controls	4	-	35
Steering Column Bracket Nut	22	16	-
Steering Column Lower Trim Cover Screws	2.5	-	22
Steering Column U-Clamp Nuts	22	16	-
Steering Column Upper Trim Cover Screws	3	-	27

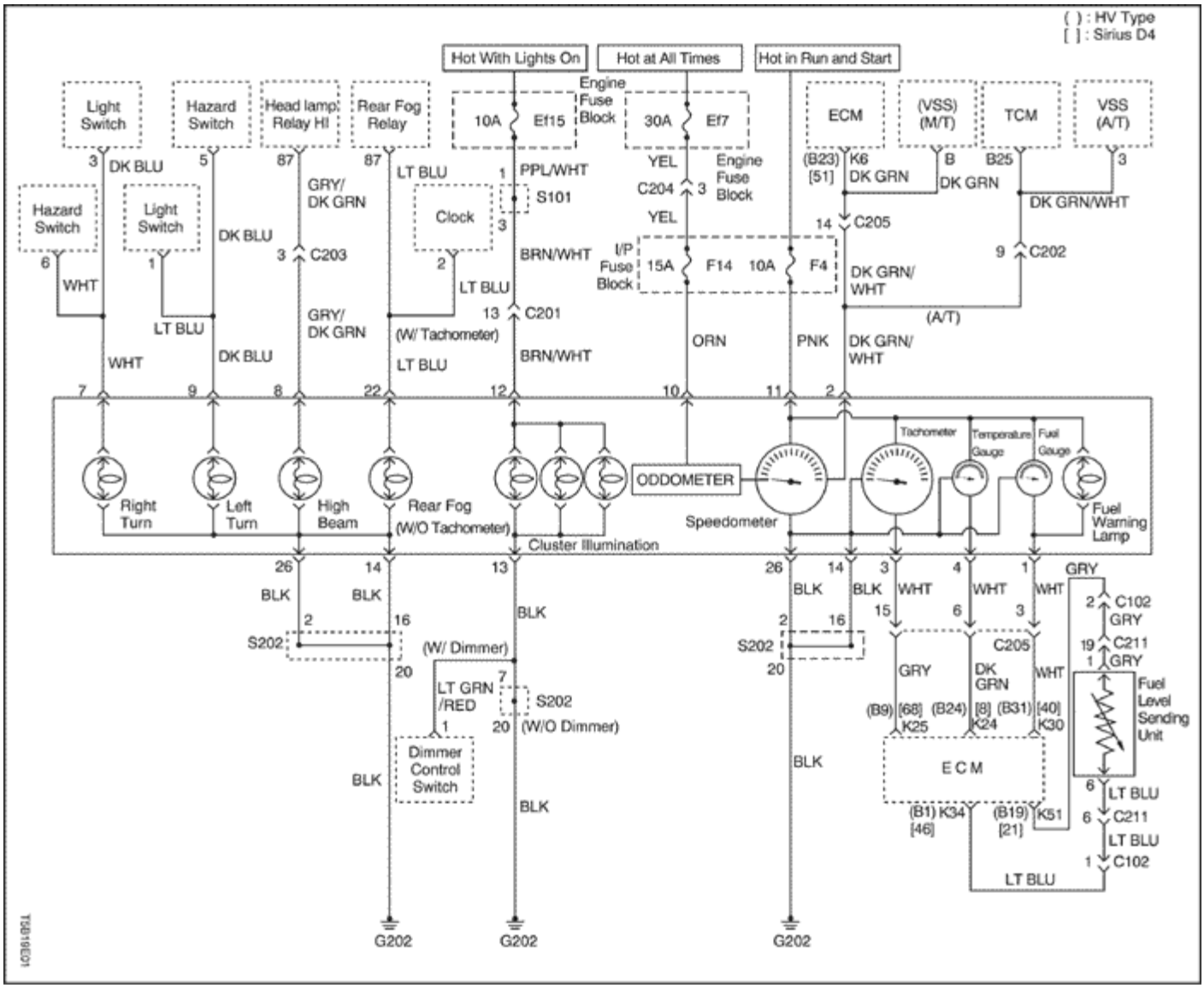
Instrument Cluster Indicator Lamps Specifications

Indicator Lamp	Color	Bulb
ABS Warning	Amber	14 v 1.4 W
Airbag Warning	Red	14 v 1.4 W
Battery Charge Indicator	Red	14 v 1.4 W
Check Engine	Amber	14 v 1.4 W
Door Open Warning	Red	14 v 1.4 W
Engine Overheat	Red	14 v 1.4 W
Fasten Seat Belt Warning	Red	14 v 1.4 W
High Beam Indicator	Blue	14 v 1.4 W
Low Fuel Level Warning	Amber	14 v 1.4 W
Oil Pressure Warning	Red	14 v 1.4 W
Parking Brake Indicator and Brake Fluid Warning	Red	14 v 1.4 W

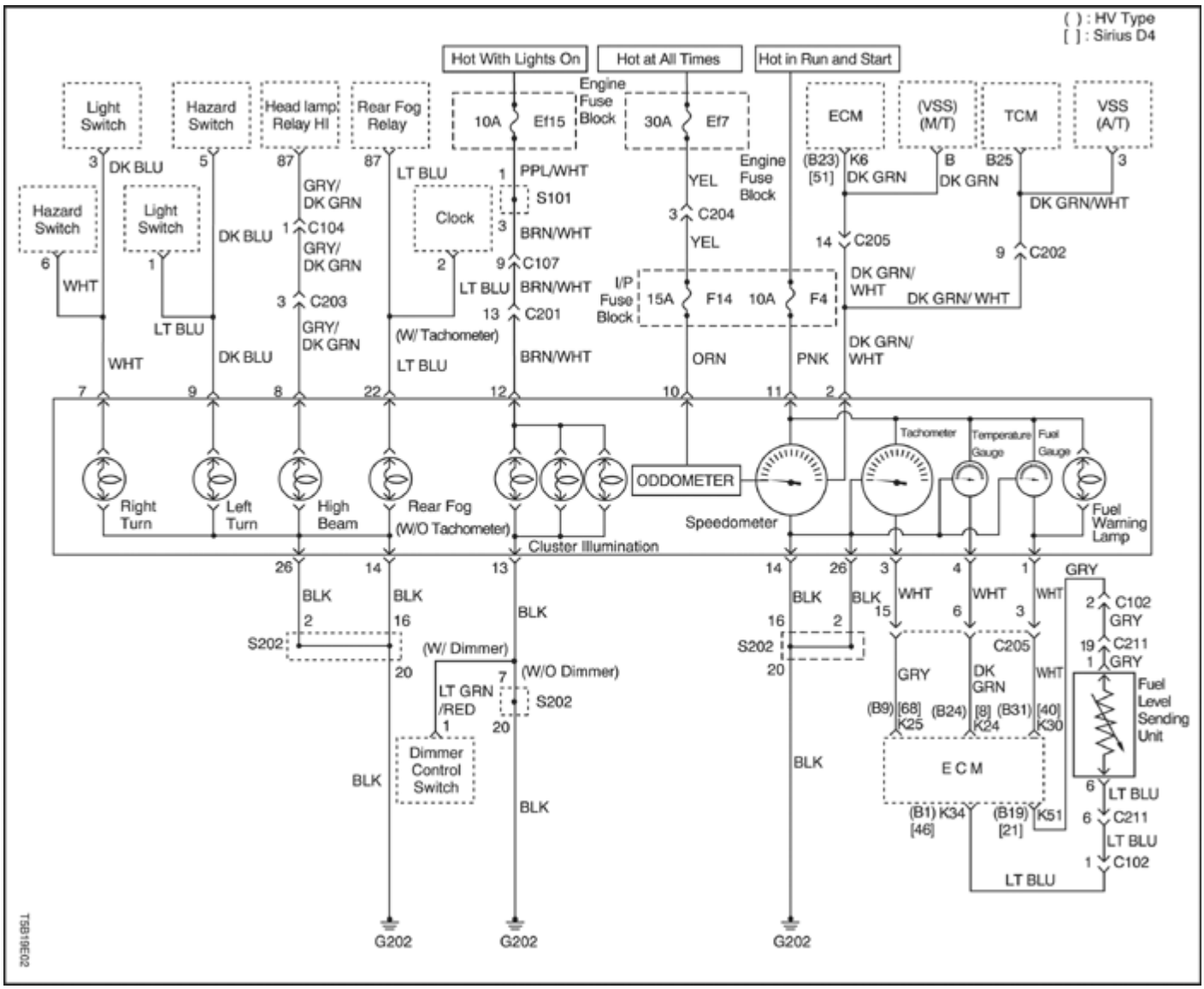
Indicator Lamp	Color	Bulb
Service Engine Soon Warning	Amber	14 v 1.4 W
Transaxle Power Mode Indicator	Amber	14 v 1.4 W
Turn Signal Indicators	Green	14 v 1.4 W

SCHEMATIC AND ROUTING DIAGRAMS

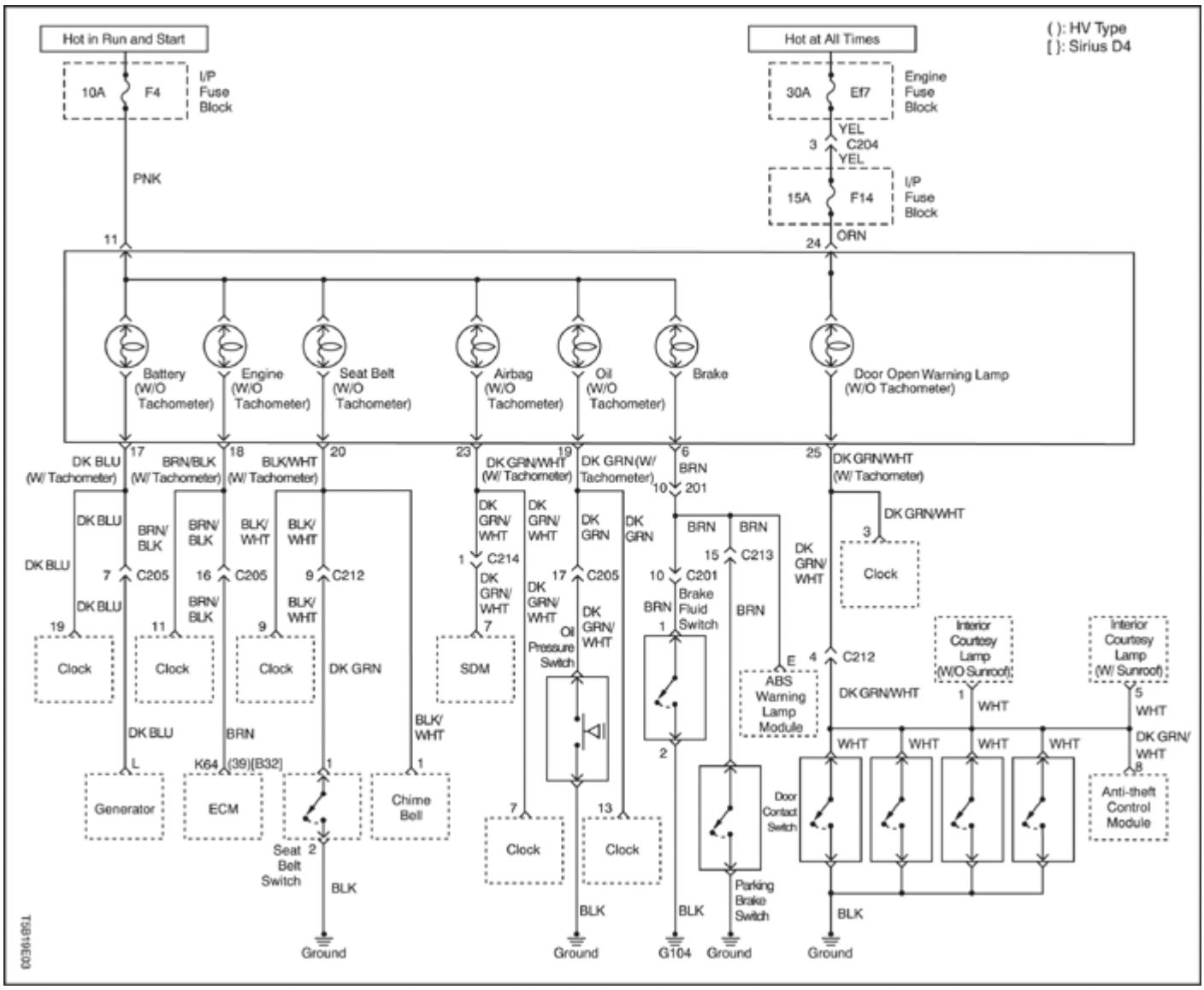
Instrument Cluster Circuit (1 of 2)



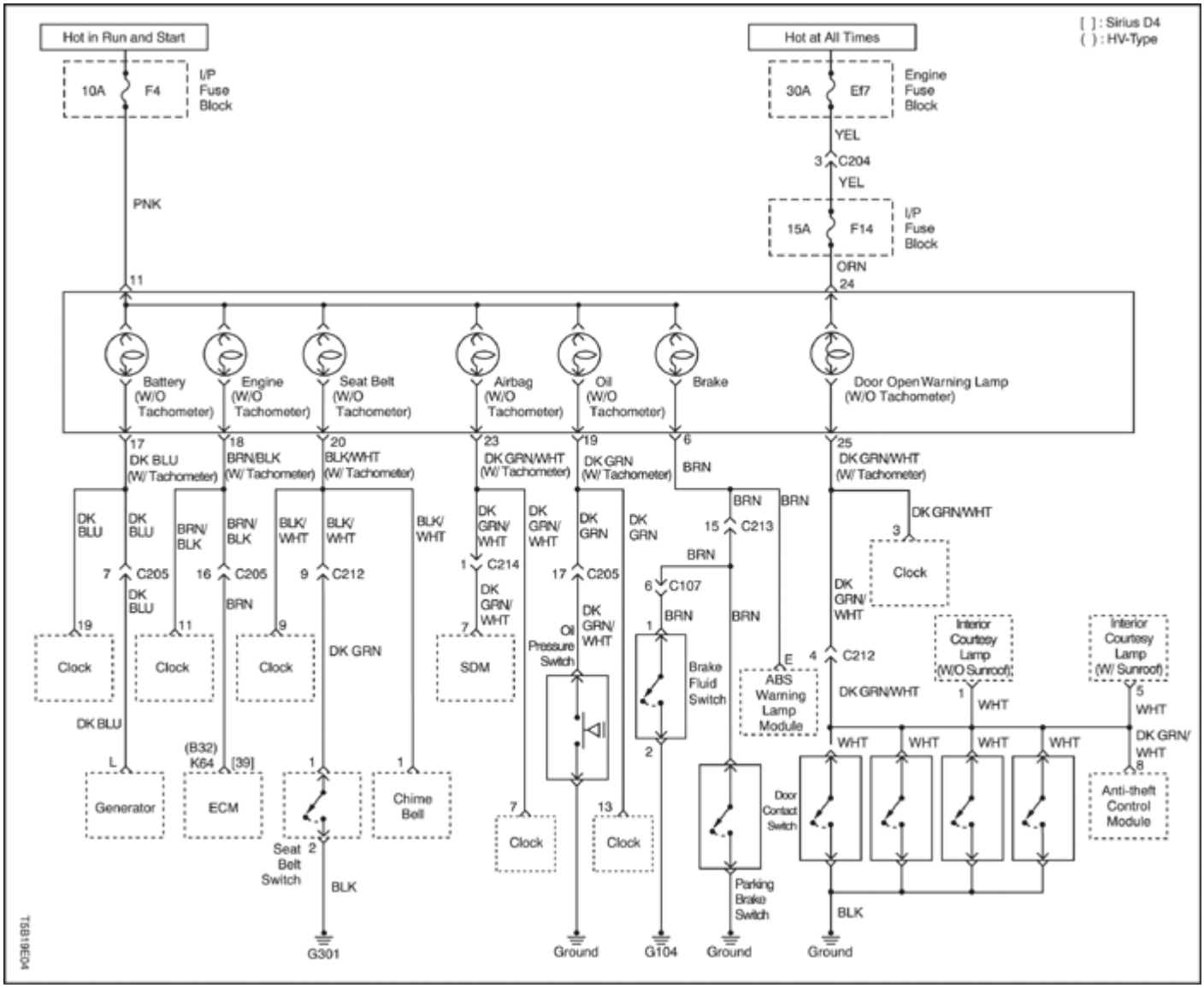
Instrument Cluster Circuit (RHD) (1 of 2)



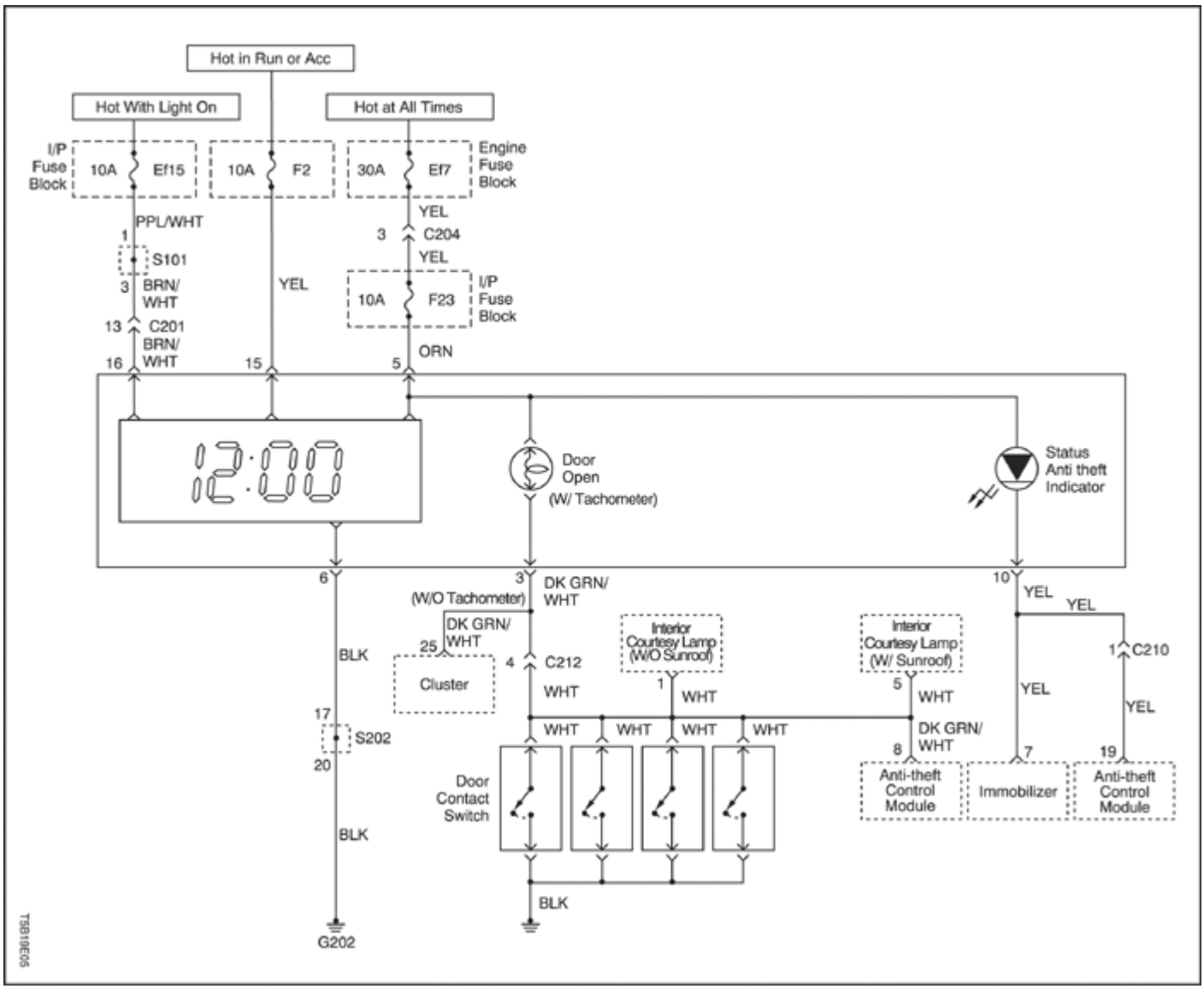
Instrument Cluster Circuit (2 of 2)



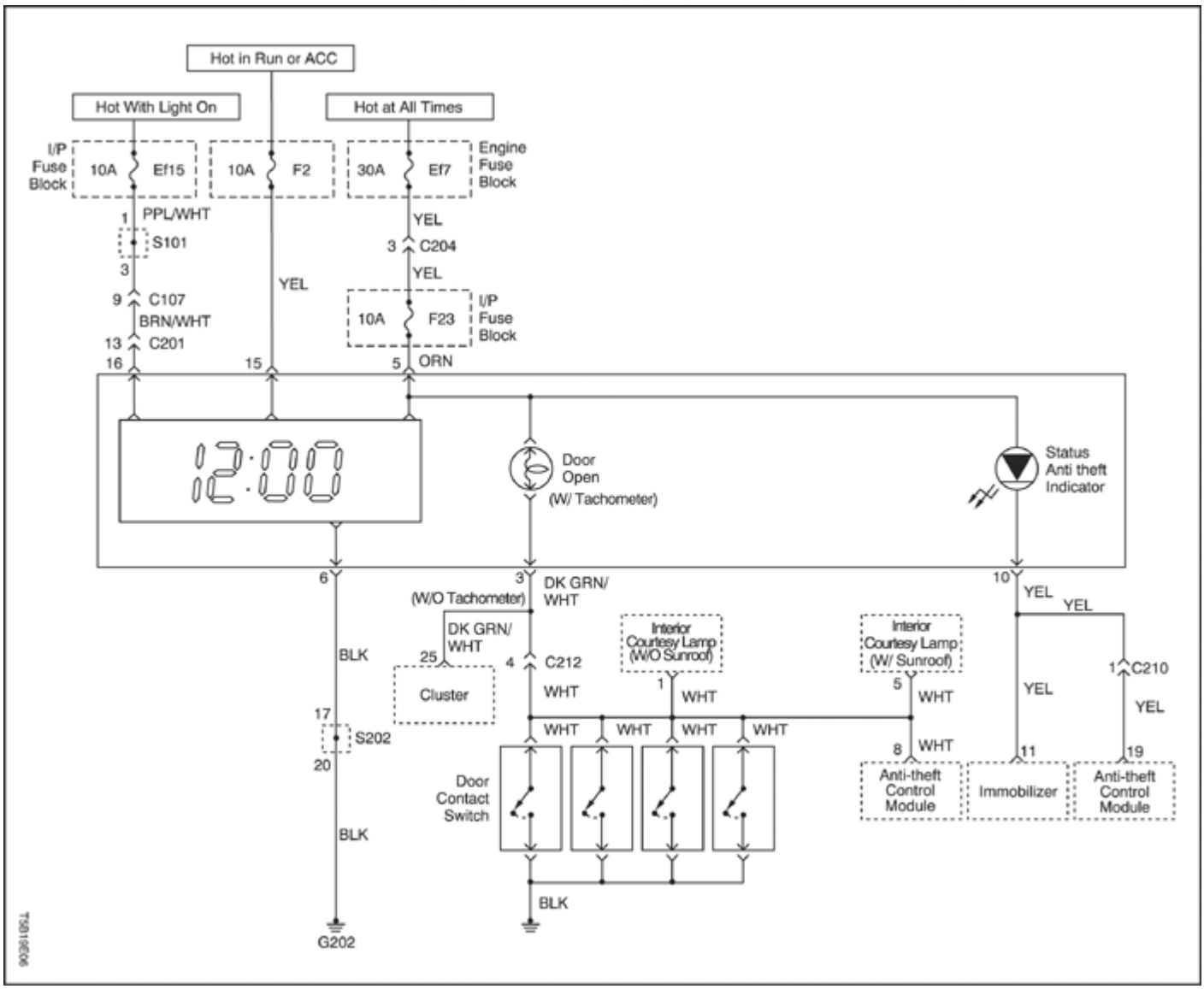
Instrument Cluster Circuit (RHD) (2 of 2)



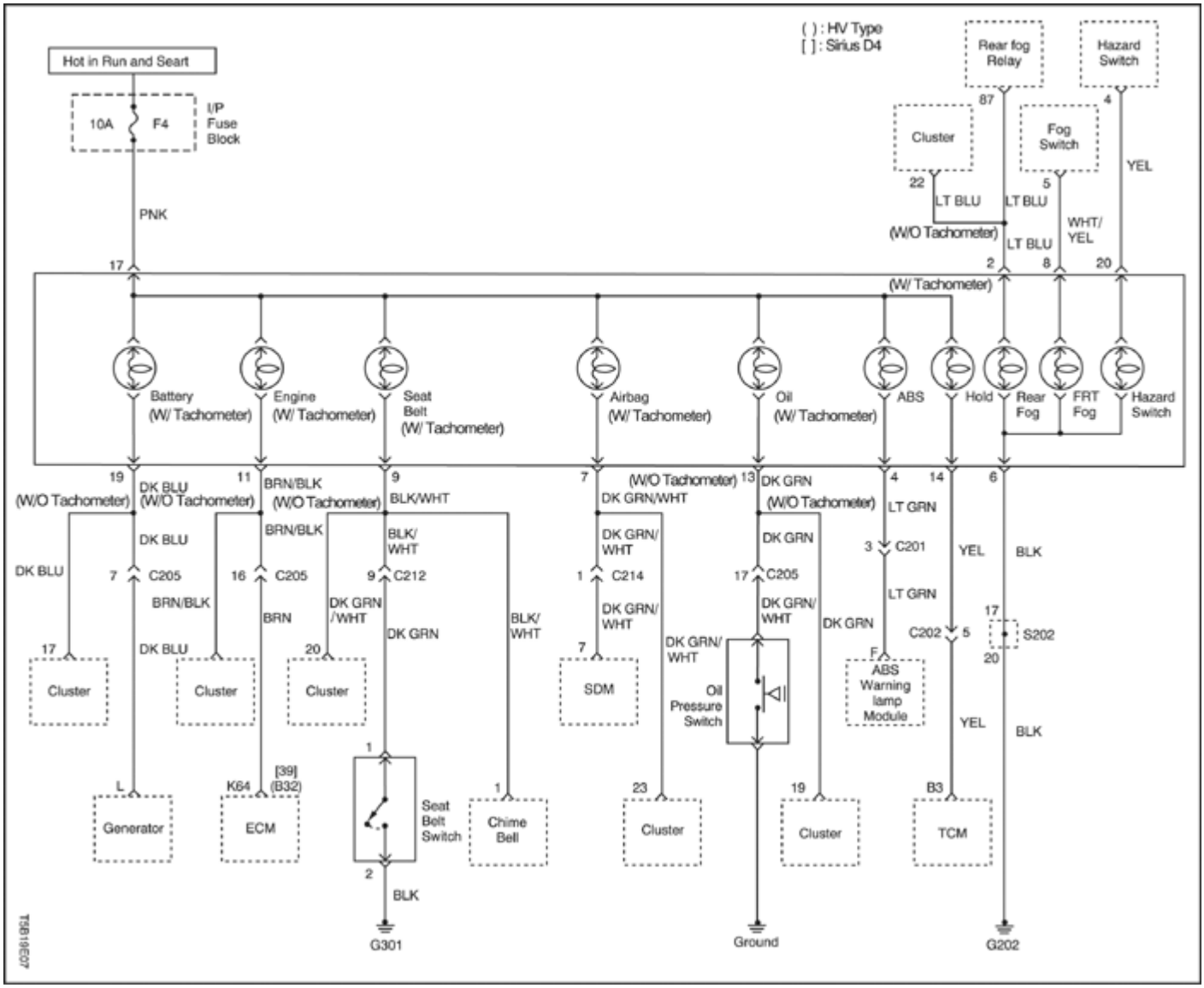
Clock Circuit (1 of 2)



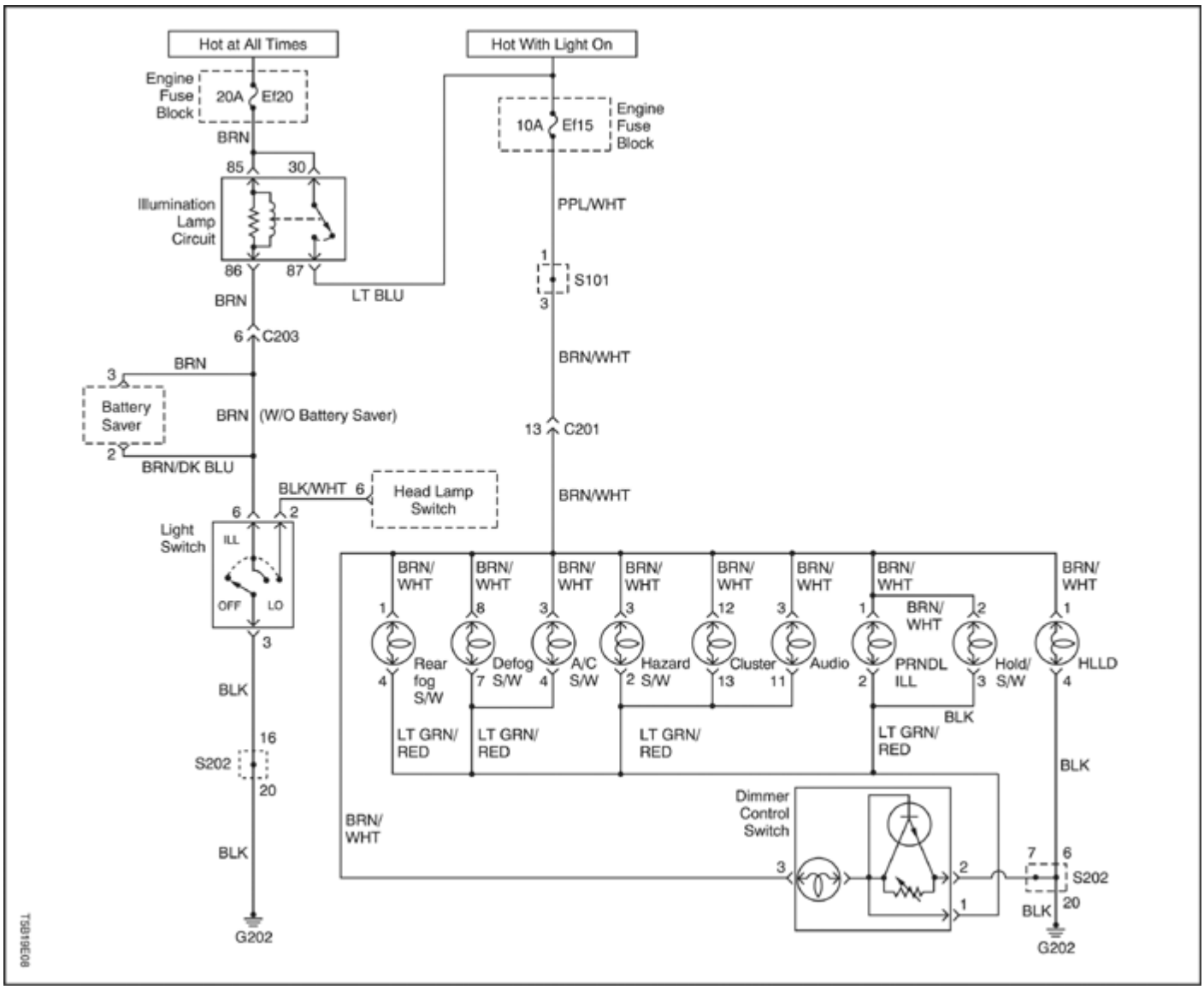
Clock Circuit (RHD) (1 of 2)



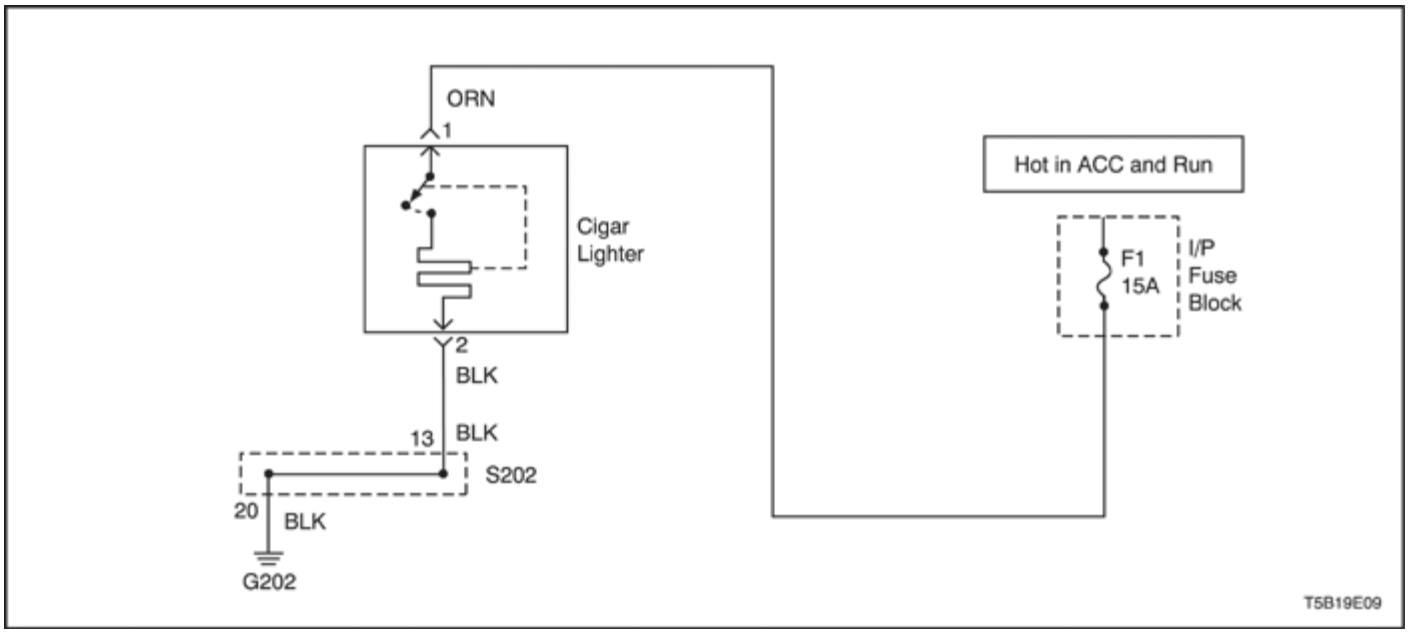
Clock Circuit (2 of 2)



Instrument Panel Illumination Circuit


Hot at All Times
Hot With Light On
Engine Fuse Block
20A Ef20
10A Ef15
Engine Fuse Block
BRN
PPL/WHT
85
30
Illumination Lamp Circuit
86
87
LT BLU
S101
BRN
BRN/WHT
6 C203
13 C201
3
BRN
Battery Saver
BRN (W/O Battery Saver)
2
BRN/DK BLU
BLK/WHT 6
Head Lamp Switch
BRN/WHT
6
2
Light Switch
ILL
OFF
LO
3
BRN/ WHT
Rear fog S/W
Defog S/W
A/C S/W
Hazard S/W
Cluster
Audio
PRNDL ILL
Hold/ S/W
HLLD
BLK
LT GRN/ RED
BLK
16
S202
20
Dimmer Control Switch
BRN/ WHT
7
6
S202
BLK
20
G202
G202
TS819E08

DIAGNOSIS



Cigar Lighter
Cigar Lighter Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuse F1. Is the fuse blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
3	1. Turn the ignition key to ACC. 2. Use a voltmeter to check for voltage at fuse F1. Does the battery voltage available at the fuse F1 match the value specified?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open power supply circuit for fuse F1. Is the repair complete?	-	System OK	-
5	1. Remove the electrical connector from the back of the cigar lighter. 2. Turn the ignition key to ACC. 3. Use a voltmeter to check the voltage at	11-14 v	Go to *Step 7*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
	the ORN wire. Does the battery voltage available at the ORN wire match the value specified?			
6	Repair the open circuit between fuse F1 and the cigar lighter. Is the repair complete?	-	System OK	-
7	With the ignition key still in the ACC position, connect the voltmeter between the ORN and the BLK wires at the cigar lighter connector. Does the battery voltage match the value specified?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open ground circuit. Is the repair complete?	-	System OK	-
9	Replace the cigar lighter. Is the repair complete?	-	System OK	-

Digital Clock

Digital Clock Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuses F2, F23 and Ef7. Is either fuse F2, F23 and Ef7 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuses. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Use a voltmeter to check battery voltage available at fuses F2, F23 and Ef7. Does the voltmeter indicate the value specified?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open power supply circuit for the fuse. Is the repair complete?	-	System OK	-
5	Use a voltmeter to check the battery voltage available at the clock connector terminal 5. Does the voltmeter indicate the value specified?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between the clock connector terminal 5 and the fuse F23.	-	System OK	-

Step	Action	Value(s)	Yes	No
	Is the repair complete?			
7	Turn the ignition ON. Is battery voltage available at the clock connector terminal 15?	-	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between terminal 15 of the clock connector and fuse F2. Is the repair complete?	-	System OK	-
9	Check continuity between terminal 6 of the clock connector and ground. Does the multimeter indicate the value specified?	0 Ω	Go to *Step 10*	Go to *Step 11*
10	Replace the clock. Is the repair complete?	-	System OK	-
11	Repair the open ground circuit between terminal 6 the clock connector and ground G202. Is the repair complete?	-	System OK	-

Instrument Panel Illumination

Instrument Panel Illumination Lamps Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuse Ef15. Is fuse Ef15 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuse. Is the repair complete?	-	System OK	-
3	1. Turn the lamp switch on. 2. Use a voltmeter to check battery voltage at fuse Ef15. Does the battery voltage match the value specified?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the open power supply circuit to fuse Ef15. Is the repair complete?	-	System OK	-
5	Use an ohmmeter to check the resistance between ground and the BLK wire of the dimmer control switch connector. Is the resistance equal to the specified value?	0	Go to *Step 7*	Go to *Step 6*
6	Repair the open ground circuit. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
7	1. Turn the lamp switch on. 2. Use a voltmeter to check for battery voltage at the BRN/WHT wire of the dimmer control switch connector. Does the battery voltage match the value specified?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between the BRN/WHT wire of the dimmer control switch connector and fuse Ef15. Is the repair complete?	-	System OK	-
9	1. Disconnect the dimmer control switch. 2. Turn the lamp switch on. 3. Use a voltmeter to check for battery voltage at the LT GRN/RED wire of the dimmer control switch connector. Does the battery voltage match the value specified?	11-14 v	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the LT GRN/RED wire of the dimmer control switch connector and each lamps. Is the repair complete?	-	System OK	-
11	Replace the dimmer control switch.	-	System OK	-

Automatic Transaxle Gear Position Illumination Lamp Inoperative, All Other Instrument Lamps OK

Notice : When probing a bulb socket with a voltmeter or a test lamp, do not allow the probe to touch both the positive and the negative contacts at the same time. This will cause a blown fuse.

Step	Action	Value(s)	Yes	No
1	Check fuse Ef15. Is fuse Ef15 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuse. Is the repair complete?	-	System OK	-
3	1. Turn the lamp switch on. 2. Use a voltmeter to check battery voltage available at fuse Ef15. Does the battery voltage match the value	11-14 v	Go to *Step 5*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	specified?			
4	Repair the open circuit power supply circuit to fuse Ef15. Is the repair complete?	-	System OK	-
5	1. Turn the lamp switch on. 2. Remove the automatic transaxle position lamp. 3. Use a voltmeter to check battery voltage available at the lamp socket. Does the battery voltage match the value specified?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between the automatic transaxle position lamp socket and fuse Ef15. Is the repair complete?	-	System OK	-
7	1. Turn the lamp switch on. 2. Remove the automatic transaxle position lamp. 3. Use an ohmmeter to check the resistance between the ground circuit and the lamp socket. Is the resistance equal to the value specified?	≈ 0 Ω	Go to *Step 9*	Go to *Step 8*
8	Repair the open ground circuit between the automatic transaxle position lamp socket and ground. Is the repair complete?	-	System OK	-
9	Replace the automatic transaxle position lamp. Is the repair complete?	-	System OK	-

Speedometer

Speedometer Inoperative, Other Gauges and Warning Lamps Are OK

Step	Action	Value(s)	Yes	No
1	1. Connect a scan tool. 2. Check for engine control diagnostic trouble codes (DTCs). Is the vehicle speed sensor DTC set?	-	Go to *Section 1F, Engine Controls*	Go to *Step 2*
2	1. Turn the ignition OFF. 2. Disconnect the engine control module (ECM) connector. 3. Remove the instrument cluster. 4. Check continuity between ECM terminal K6 (HV Type: B23, Sirius D4:	0 Ω	Go to *Step 4*	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	51) and the instrument cluster connector terminal 2. Does the ohmmeter indicate the specified value?			
3	Repair the open circuit between the instrument cluster connector terminal 2 and the ECM. Is the repair complete?	-	System OK	-
4	Replace the speedometer. Is the repair complete?	-	System OK	-

Fuel Gauge

Fuel Gauge Inoperative, Other Gauges and Warning Lamps are OK

Step	Action	Value(s)	Yes	No
1	1. Connect a scan tool. 2. Check for engine control diagnostic trouble codes (DTCs). Is the vehicle speed sensor DTC set?	-	Go to *Section 1F, Engine Controls*	Go to *Step 2*
2	1. Turn the ignition OFF. 2. Disconnect engine control module (ECM) connector. 3. Remove the instrument cluster. 4. Check continuity between ECM terminal K30 (HV Type: B31, Sirius D4: 40) and the instrument cluster terminal 1. Does the ohmmeter indicate the specified value?	0 Ω	Go to *Step 4*	Go to *Step 3*
3	Repair the open circuit between the instrument cluster connector terminal 1 and the ECM terminal K30 (HV Type: B31, Sirius D4: 40). Is the repair complete?	-	System OK	-
4	Replace the fuel gauge. Is the repair complete?	-	System OK	-

Temperature Gauge

Temperature Gauge Inoperative, Other Gauges and Warning Lamps are OK

Step	Action	Value(s)	Yes	No
1	Allow the engine to cool to room temperature. With the ignition ON, does the temperature gauge always read at the high end of the scale?	-	Go to *Step 7*	Go to *Step 2*

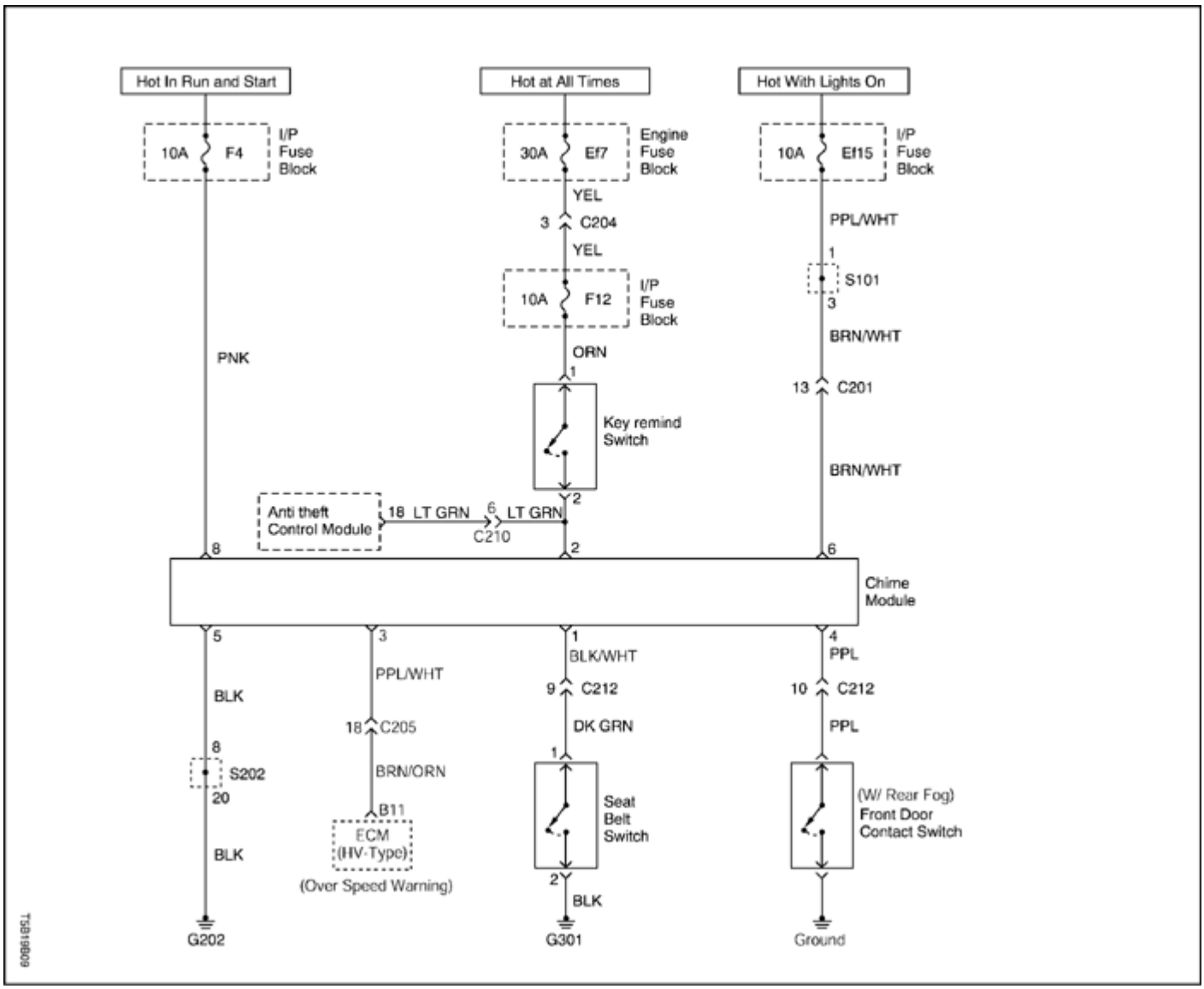
Step	Action	Value(s)	Yes	No
2	Disconnect ECM electrical connector. Does the temperature gauge indicator drop to the low end of the scale?	-	Go to *Section 1F, Engine Controls*	Go to *Step 3*
3	Check for a short to ground between the ECM and the temperature gauge. Is there a short to ground?	-	Go to *Step 4*	Go to *Step 5*
4	Repair the short to ground. Is the repair complete?	-	System OK	-
5	Replace the temperature gauge. Is the repair complete?	-	System OK	-
6	1. Disconnect the ECM. 2. Turn the ignition ON. 3. Check the voltage at the ECM. Does the the voltage equal the value specified?	11-14 v	Go to *Step 9*	Go to *Step 7*
7	Check for an open circuit between the ECM and the temperature gauge. Is there an open circuit?	-	Go to *Step 8*	Go to *Step 5*
8	Repair the open circuit between the ECM and the temperature gauge. Is the repair complete?	-	System OK	-
9	1. Disconnect the ECM. 2. Connect a jumper wire between the ECM connector and ground. 3. Turn the ignition ON. Does the temperature gauge move to the high end of the scale?	-	Go to *Section 1F, Engine Controls*	Go to *Step 5*

Instrument Cluster Indicator Lamps
Instrument Panel Indicator Lamps Do Not Operate

Step	Action	Value(s)	Yes	No
1	Check fuse F4. Is fuse F4 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuse. Is the repair complete?	-	System OK	-
3	1. Turn the ignition ON. 2. Check the voltage at fuse F4.	11-14 v	Go to *Step 5*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
	Does the battery voltage match the value specified?			
4	Repair the open power supply circuit to fuse F4. Is the repair complete?	-	System OK	Go to *Step 3*
5	1. Remove the instrument cluster. 2. Disconnect the instrument cluster connector. 3. Turn the ignition ON. 4. Check the voltage at terminals 11. Does the battery voltage match the value specified?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between fuse F4 and the instrument cluster connector 11. Is the repair complete?	-	System OK	-
7	Check the instrument cluster indicator lamp bulbs. Are the bulbs OK?	-	Go to *Step 9*	Go to *Step 8*
8	1. Replace any bulbs that are defective. 2. Check the charging system to make sure the alternator is not overcharging. 3. Repair the charging system, if necessary. Is the repair complete?	-	System OK	-
9	Replace the instrument cluster. Is the repair complete?	-	System OK	-

Chime Module



Chime Module
Seat Belt Warning Chime Inoperative

Step	Action	Value(s)	Yes	No
1	Check the chime module connector to make sure it is connected properly. Is the connector disconnected or partially disconnected?	-	Go to *Step 2*	Go to *Step 3*
2	Connect the electrical connector for the chime module. Is the repair complete?	-	System OK	-
3	Check fuse F4.	-	Go to *Step 4*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
	Is fuse F4 blown?			
4	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Check the voltage at fuse F4. Is the specified voltage available at fuse F4?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the power supply circuit for fuse F4. Is the repair complete?	-	System OK	-
7	1. Disconnect the chime module. 2. Turn the ignition ON. 3. Check the voltage at terminal 8 of the chime module connector. Does the voltage equal the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between fuse F4 and the chime module connector. Is the repair complete?	-	System OK	-
9	With the chime module disconnected, use an ohmmeter to check continuity between terminal 5 of the chime module connector and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between terminal 5 of the chime module connector and ground. Is the repair complete?	-	System OK	-
11	1. Disconnect the chime module connector. 2. Make sure the driver's side seat belt is unfastened. 3. Use an ohmmeter to check the continuity between terminal 1 of the chime module and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 12*	Go to *Step 13*
12	Replace the chime module. Is the repair complete?	-	System OK	-
13	1. Disconnect the seat belt switch.	≈ 0 Ω	Go to *Step 15*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
	2. Make sure the driver's side seat belt is unfastened. 3. Use an ohmmeter to check the continuity of the switch. Does the ohmmeter indicate the specified value?			
14	Replace the seat belt switch. Is the repair complete?	-	System OK	-
15	Use an ohmmeter to check the continuity of the wire between terminal 1 of the chime module and the seat belt switch. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 17*	Go to *Step 16*
16	Repair the open circuit between terminal 1 of the chime module and the seat belt switch. Is the repair complete?	-	System OK	-
17	Repair the open circuit between the seat belt switch connector and ground. Is the repair complete?	-	System OK	-

Door-Open Warning Chime Inoperative

Step	Action	Value(s)	Yes	No
1	Check the chime module connector to make sure it is connected properly. Is the connector disconnected or partially disconnected?	-	Go to *Step 2*	Go to *Step 3*
2	Connect the electrical connector for the chime module. Is the repair complete?	-	System OK	-
3	Check fuse F4. Is fuse F4 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Check the voltage at fuse F4. Is the specified voltage available at fuse F4?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the power supply circuit for fuse F4. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
7	1. Disconnect the chime module. 2. Turn the ignition ON. 3. Check the voltage at terminal 8 of the chime module connector. Does the voltage equal the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the open circuit between fuse F4 and the chime module connector. Is the repair complete?	-	System OK	-
9	With the chime module disconnected, use an ohmmeter to check the continuity between terminal 5 of the chime module connector and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between terminal 5 of the chime module connector and ground. Is the repair complete?	-	System OK	-
11	1. Disconnect the chime module connector. 2. Make sure the driver's side door is open. 3. Use an ohmmeter to check the continuity between terminal 4 of the chime module and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 12*	Go to *Step 13*
12	Replace the chime module. Is the repair complete?	-	System OK	-
13	1. Disconnect the front door contact switch. 2. Use an ohmmeter to check the continuity between the door contact switch and terminal 4 of the chime module. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 15*	Go to *Step 14*
14	Repair the open circuit between the door contact switch and terminal 4 of the chime module.	-	System OK	-
15	Replace the door contact switch.	-	System OK	-

Step	Action	Value(s)	Yes	No
	Is the repair complete?			

Key Reminder Chime Inoperative

Step	Action	Value(s)	Yes	No
1	Check the chime module connector to make sure it is connected properly. Is the connector disconnected or partially disconnected?	-	Go to *Step 2*	Go to *Step 3*
2	Connect the electrical connector for the chime module. Is the repair complete?	-	System OK	-
3	Check fuse EF7 and F12. Is fuse EF7 and F12 blown?	-	Go to *Step 4*	Go to *Step 5*
4	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
5	1. Turn the ignition ON. 2. Check the voltage at fuse EF7 and F12. Is the specified voltage available at fuse EF7 and F12?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the power supply circuit for fuse EF7 and F12. Is the repair complete?	-	System OK	-
7	1. Disconnect the chime module. 2. Check the voltage at terminal 2 of the chime module connector. Does the voltage equal the specified value?	11-14 v	Go to *Step 13*	Go to *Step 8*
8	1. Disconnect the key reminder switch. 2. Use an ohmmeter to check the continuity between the key reminder switch and fuse EF7 and F12. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 10*	Go to *Step 9*
9	Repair the open circuit between the key reminder switch and fuse EF7 and F12.	-	System OK	-
10	With the key reminder switch and the chime module disconnected, check the continuity between the key reminder switch and terminal	≈ 0 Ω	Go to *Step 12*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
	2 of the chime module connector . Does the ohmmeter indicate the specified value?			
11	Repair the open circuit between the key reminder switch and terminal 2 of the chime module connector.	-	System OK	-
12	Replace the key reminder switch. Is the repair complete?	-	System OK	-
13	With the chime module disconnected, use an ohmmeter to check continuity between terminal 5 of the chime module connector and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 15*	Go to *Step 14*
14	Repair the open circuit between terminal 5 of the chime module connector and ground. Is the repair complete?	-	System OK	-
15	Replace the chime module. Is the repair complete?	-	System OK	-

SECTION 9F

AUDIO SYSTEMS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

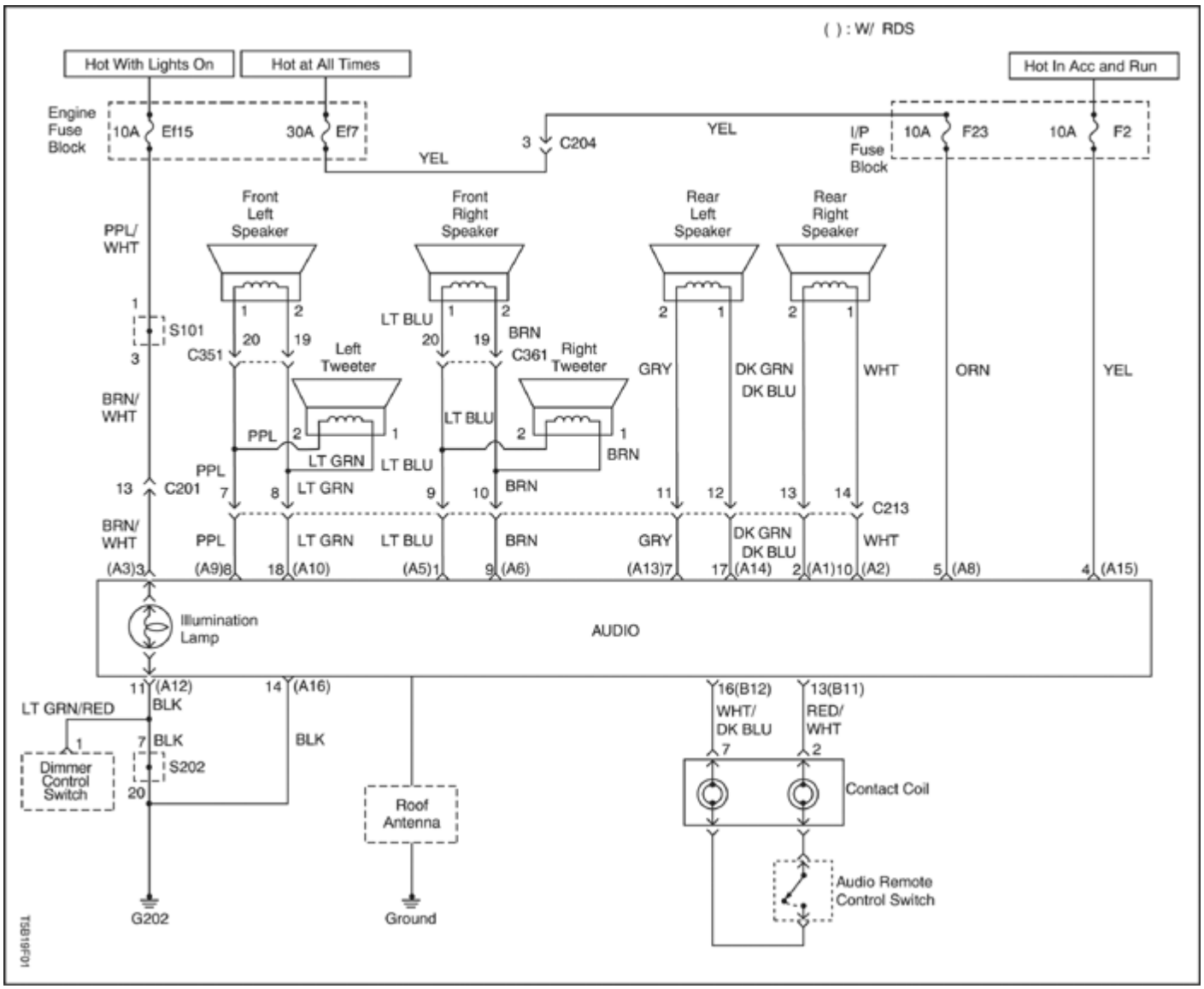
SPECIFICATION

Fastener Tightening Specifications

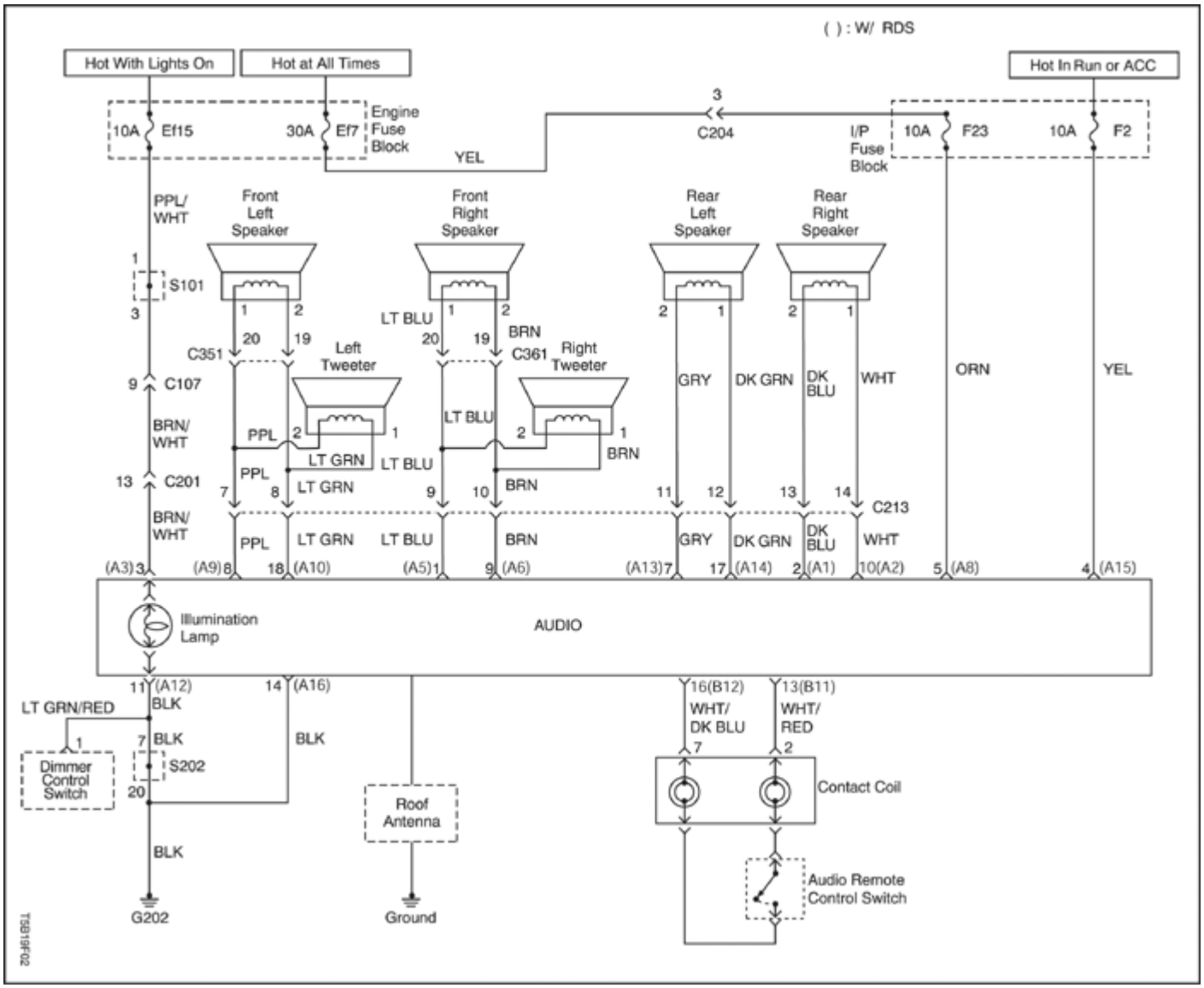
Application	N•m	Lb-Ft	Lb-In
Audio System Screws	6	-	53
Front Speaker Screws	3.5	-	31
Rear Speaker Screws	3	-	27
Roof Antenna Retaining Screw	3	-	27

SCHEMATIC AND ROUTING DIAGRAMS

Audio System Circuit



Audio System Circuit (RHD)



DIAGNOSIS

Stereo Cassette AM/FM Radio

CD Player Inoperative, AM/FM Functions OK

Step	Action	Value(s)	Yes	No
1	Using a good-quality CD, determine if the CD player performs poorly or is inoperative. Does the CD player function correctly?	-	Go to *Step 2*	Go to *Step 3*
2	Inform the customer that the problem is with the CD, not the CD player.	-	System OK	-

Step	Action	Value(s)	Yes	No
	Has the customer been informed?			
3	Check the CD player for obstructions behind the tape door. Is an obstruction found?	-	Go to *Step 4*	Go to *Step 6*
4	Check to see if the obstruction can be removed. Can the obstruction be removed?	-	Go to *Step 5*	Go to *Step 6*
5	Remove the obstruction. Is the repair complete?	-	System OK	-
6	Replace the CD player. Is the repair complete?	-	System OK	-

AM/FM Cassette Radio Inoperative

Step	Action	Value(s)	Yes	No
1	Check fuses F23 and F2. Are fuses F23 and F2 blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuses. Is the repair complete?	-	System OK	-
3	1. Use a voltmeter to test for battery voltage at fuse F23. 2. Turn the ignition ON and test for battery voltage at fuse F2. Does the battery voltagematch the specified value at fuses F23 and F2?	11-14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the power supply circuit to the fuses. Is the repair complete?	-	System OK	-
5	1. Remove the cassette radio. 2. Turn the ignition ON. 3. Use a voltmeter to test for battery voltage at the audio system connector terminals 4 and 5 (W/ RDS: A15 and A8). Does the battery voltage match the specified value at both terminals?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between the audio system connector and the fuse. Is the repair complete?	-	System OK	-
7	Use an ohmmeter to test the ground circuit at	≈ 0 Ω	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	the audio system connector terminal 14 (W/ RDS: A16). Does the resistancematch the specified value?			
8	Repair the open ground circuit between the audio system connector and ground G202. Is the repair complete?	-	System OK	-
9	Replace the cassette radio. Is the repair complete?	-	System OK	-

Cassette Player Inoperative, AM/FM Functions OK

Step	Action	Value(s)	Yes	No
1	Verify the customer complaint. Does the cassette player destroy tapes?	-	Go to *Step 5*	Go to *Step 2*
2	Using a good-quality tape, determine whether the cassette player performs poorly or is inoperative. Does the cassette player perform poorly?	-	Go to *Step 5*	Go to *Step 3*
3	Check the cassette player for obstructions behind the tape door. Is an obstruction found?	-	Go to *Step 4*	Go to *Step 8*
4	Check to see if the obstruction can be removed using gentle force. Is the obstruction removed?	-	Go to *Step 5*	Go to *Step 6*
5	Clean the cassette player head, the capstan, and the drive system. Does the tape play properly?	-	Go to *Step 7*	Go to *Step 6*
6	Replace the cassette radio. Is the repair complete?	-	System OK	-
7	Check the cassette player for normal operation. Is the repair complete?	-	System OK	-
8	Advise the owner of a defective or worn tape. Is the repair complete?	-	System OK	-

AM Does Not Work, FM and Cassette OK

Step	Action	Value(s)	Yes	No
1	Check the audio system for normal operation. Is AM inoperative and the rest of the system operating properly?	-	Go to *Step 2*	System OK
2	Replace the radio. Is the repair complete?	-	System OK	-

FM Radio Does Not Work, AM and Cassette OK

Step	Action	Value(s)	Yes	No
1	1. Unplug the antenna cable from the	-	Go to *Step 2*	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	antenna. 2. Connect the test antenna to the antenna cable. 3. Check the FM radio reception. Is the FM radio operating properly?			
2	Replace the antenna. Is the repair complete?	-	System OK	-
3	1. Remove the cassette radio from the instrument panel. 2. Unplug the antenna cable from the audio system. 3. Plug the test cable into the audio system. 4. Check the FM radio reception. Is the FM radio operating properly?	-	Go to *Step 4*	Go to *Step 5*
4	Replace the antenna cable between the audio system and the antenna. Is the repair complete?	-	System OK	-
5	Replace the cassette radio. Is the repair complete?	-	System OK	-

Speakers

Front Speakers Distorted or Inoperative, Rest of Audio System OK

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition and the radio ON. 2. Check for distorted or inoperative front speakers using the fader and the balance controls with all of the sources (AM, FM, tape, CD). Are the front speakers distorted?	-	Go to *Step 2*	Go to *Step 4*
2	Check the speaker and the door area for damage, rattles, or vibration. Is there anything loose or in the way of the speaker causing the distortion?	-	Go to *Step 3*	Go to *Step 4*
3	Make the necessary repairs to secure the component causing the distortion. Is the repair complete?	-	System OK	-
4	1. Remove the front speakers and disconnect the speaker connector. 2. Using an ohmmeter, test the speaker	∞	Go to *Step 6*	Go to *Step 5*

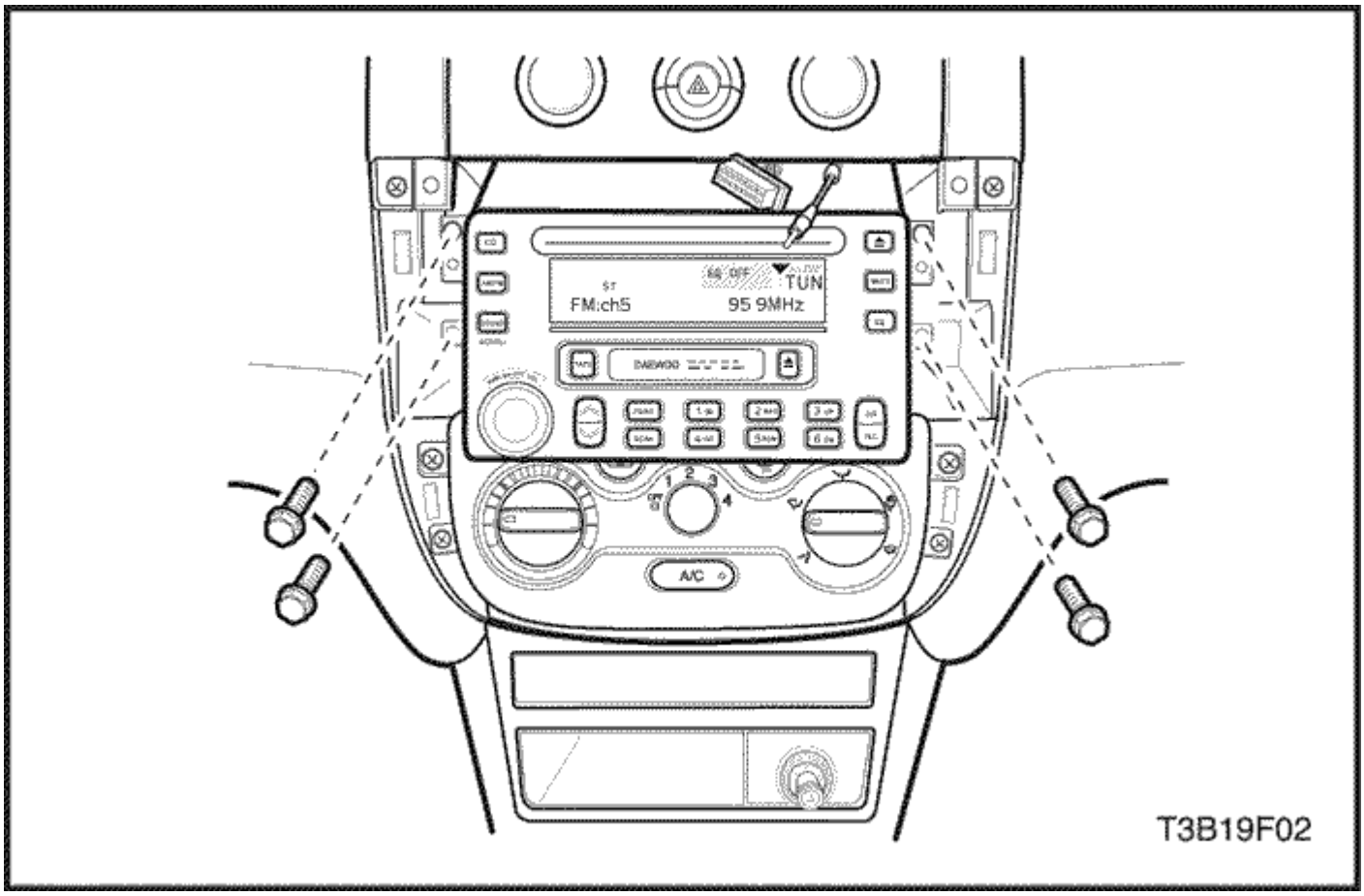
Step	Action	Value(s)	Yes	No
	wires for a short to ground. Does the ohmmeter show the specified value?			
5	Repair the short circuit between the front speaker connector and the radio connector. Is the repair complete?	-	System OK	-
6	Substitute a known good speaker for the speaker causing the distortion. Is the distortion eliminated?	-	Go to *Step 7*	Go to *Step 8*
7	Replace the speaker. Is the repair complete?	-	System OK	-
8	Replace the cassette radio. Is the repair complete?	-	System OK	-

Rear Speakers Distorted or Inoperative, Rest of Audio System OK

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition and the radio on. 2. Check for distorted or inoperative rear speakers using the fader and the balance controls with all the of the sources (AM, FM, tape, CD). Are the rear speakers distorted?	-	Go to *Step 2*	Go to *Step 4*
2	Check the speakers, the rear deck, and the trunk area for damage, rattles, or vibration. Is there anything loose or in the way of the speaker causing the distortion?	-	Go to *Step 3*	Go to *Step 4*
3	Make the necessary repairs to secure the component causing the distortion. Is the repair complete?	-	System OK	-
4	1. Disconnect the rear speakers. 2. Using an ohmmeter, test the speaker wires for a short to ground. Does the ohmmeter show the specified value?	∞	Go to *Step 6*	Go to *Step 5*
5	Repair the short circuit between the rear speaker connector and the radio connector. Is the repair complete?	-	System OK	-
6	Substitute a known good speaker for the speaker causing the distortion. Is the distortion eliminated?	-	Go to *Step 7*	Go to *Step 8*
7	Replace the speaker. Is the repair complete?	-	System OK	-

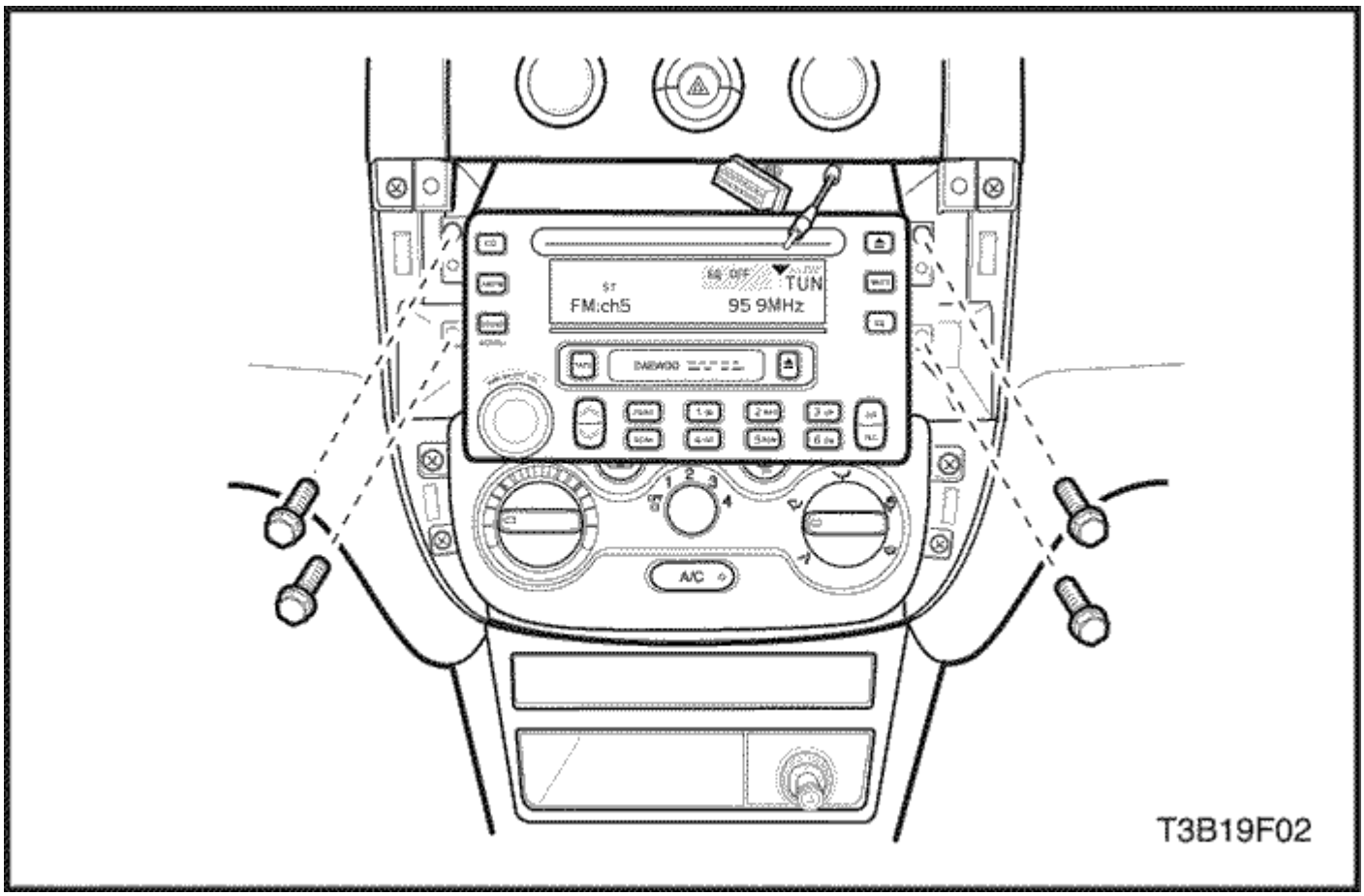
Step	Action	Value(s)	Yes	No
8	Replace the audio system. Is the repair complete?	-	System OK	-

MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



Audio System
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the audio system trim plate.
3. Remove the screws and the audio system.
4. Disconnect the audio system electrical connector and the antenna cable.

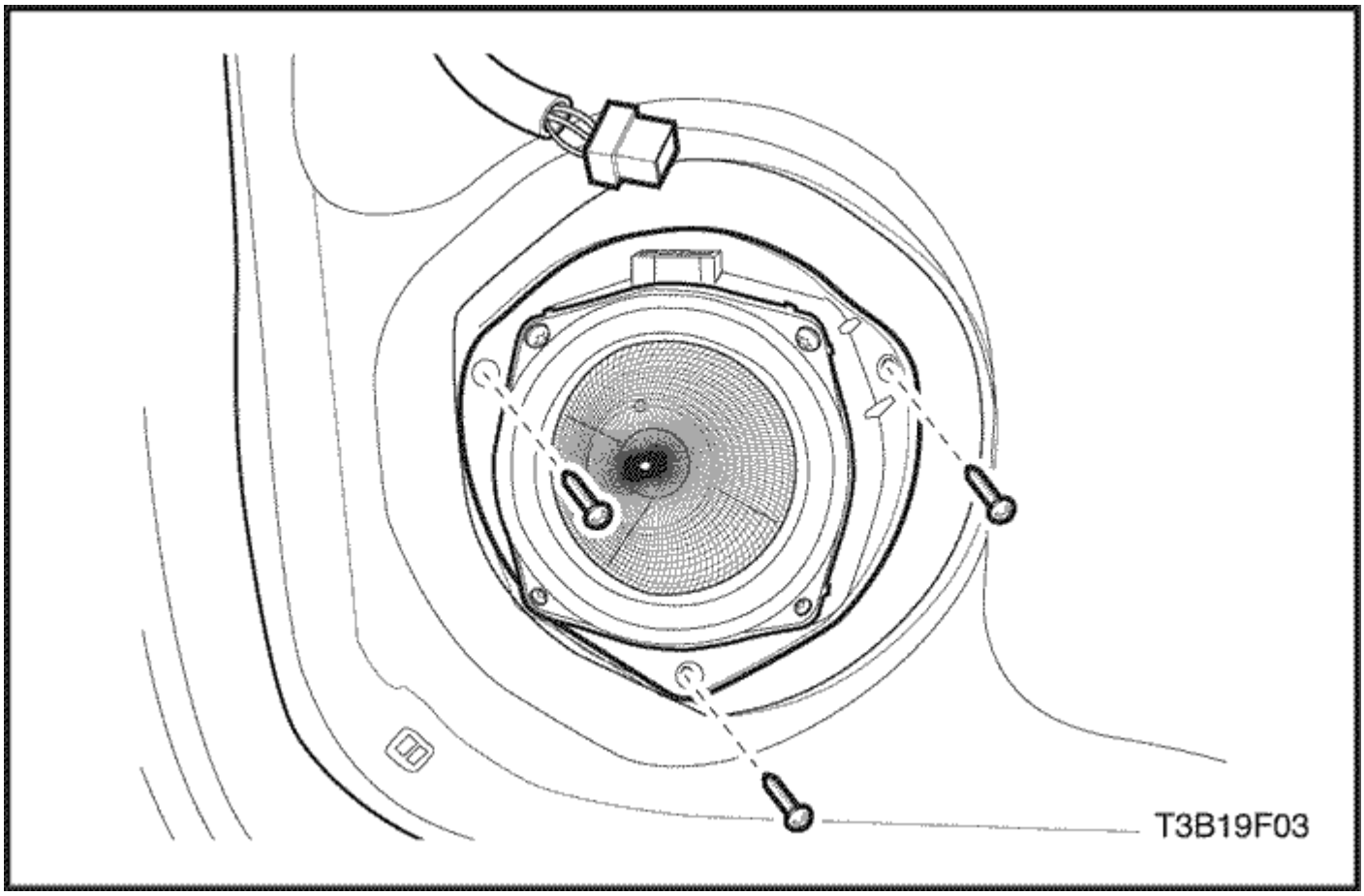


Installation Procedure

1. Connect the audio system electrical connector and the antenna cable.
2. Install the audio system with the screws.

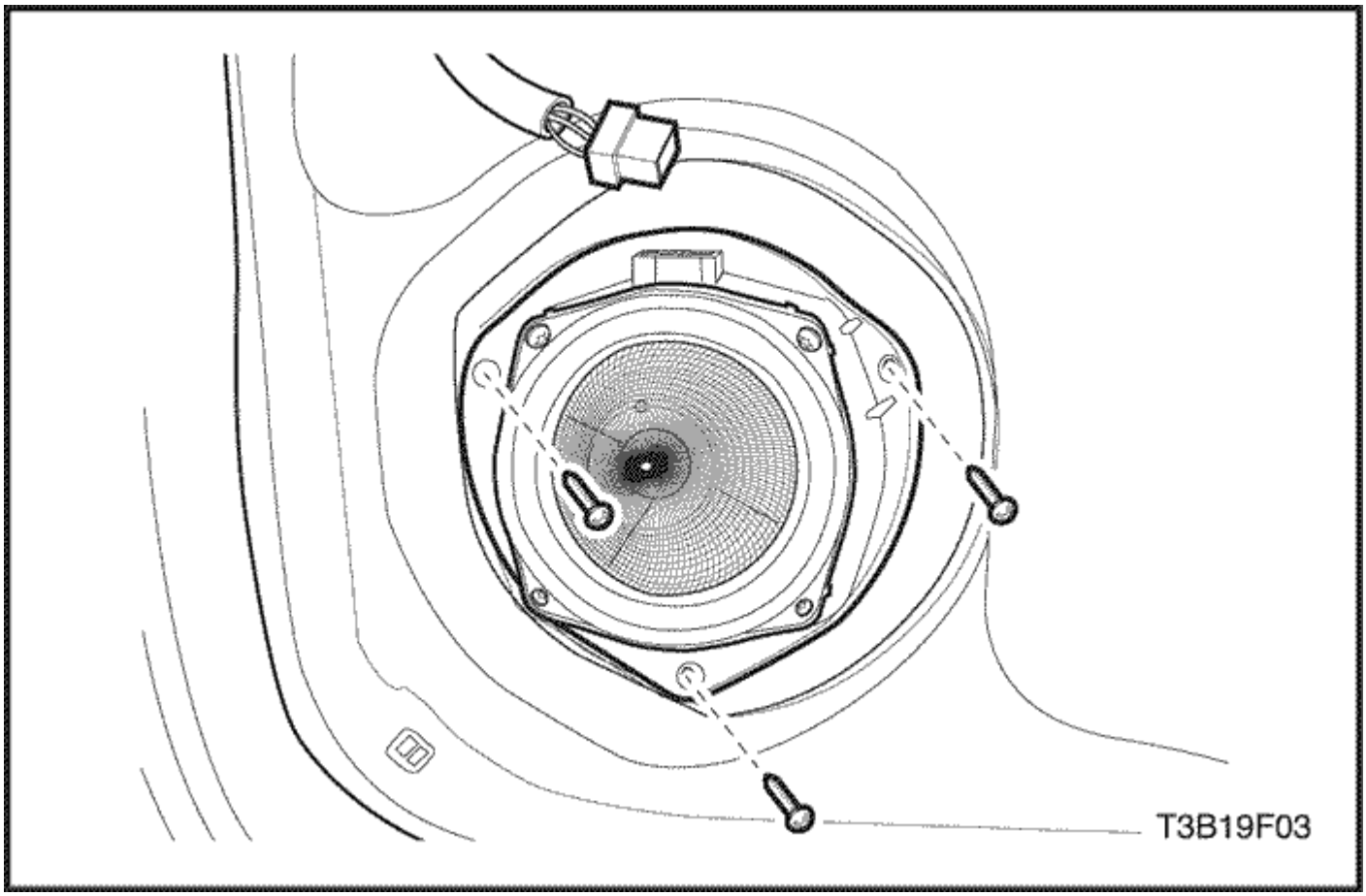
   Tighten
   Tighten the audio system screws to 6 N•m (53 lb-in).

3. Install the audio system trim plate.
4. Connect the negative battery cable.
5. Enter the audio security system four-digit code. Refer to "Audio Security System" in this section.



Front Speakers
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the front door trim panel. Refer to *Section 9G, Interior Trim.*
3. Remove the screws and the front speaker.
4. Disconnect the electrical connector.

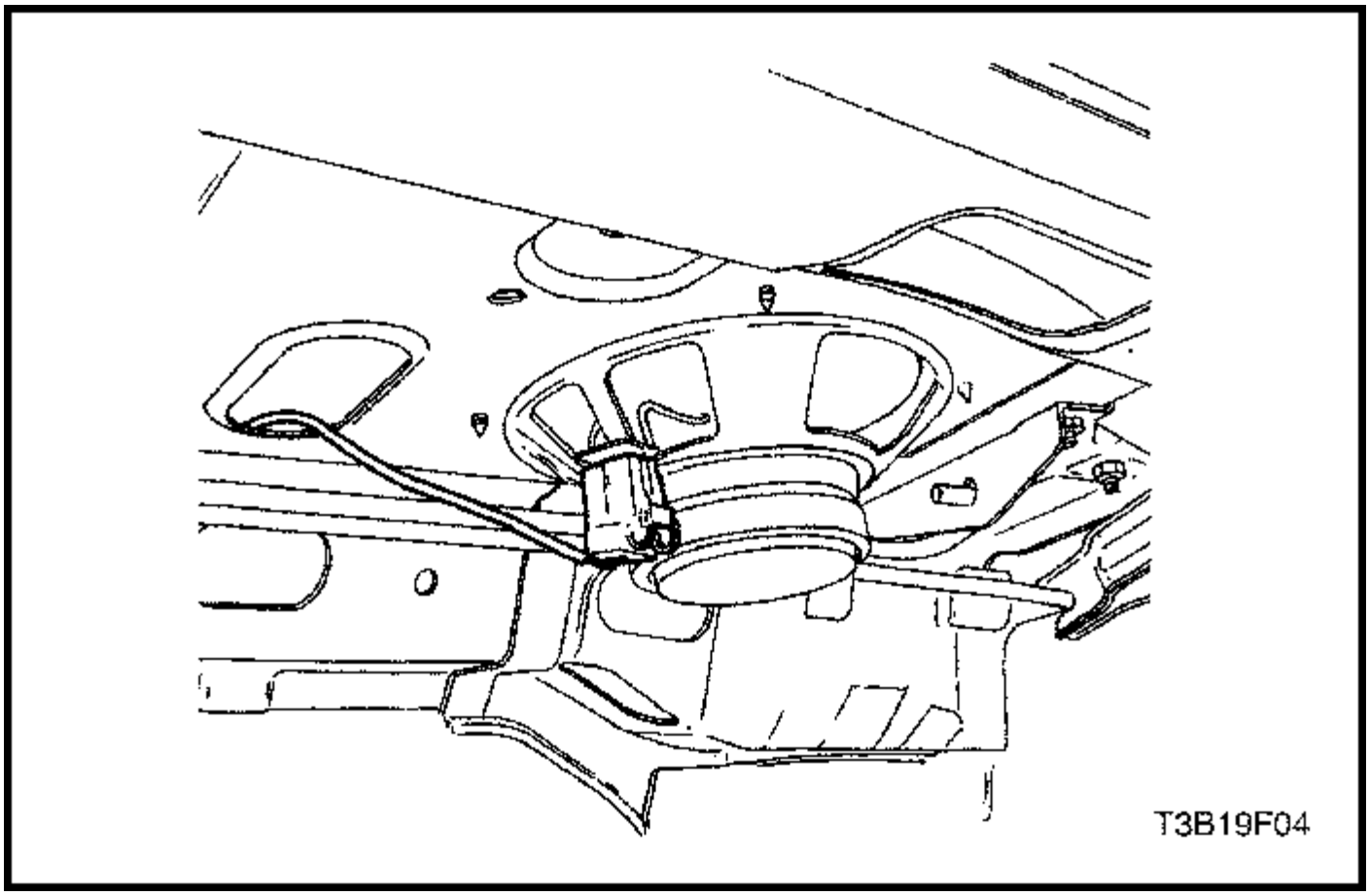


Installation Procedure

1. Connect the electrical connector.
2. Install the front speaker with the screws.

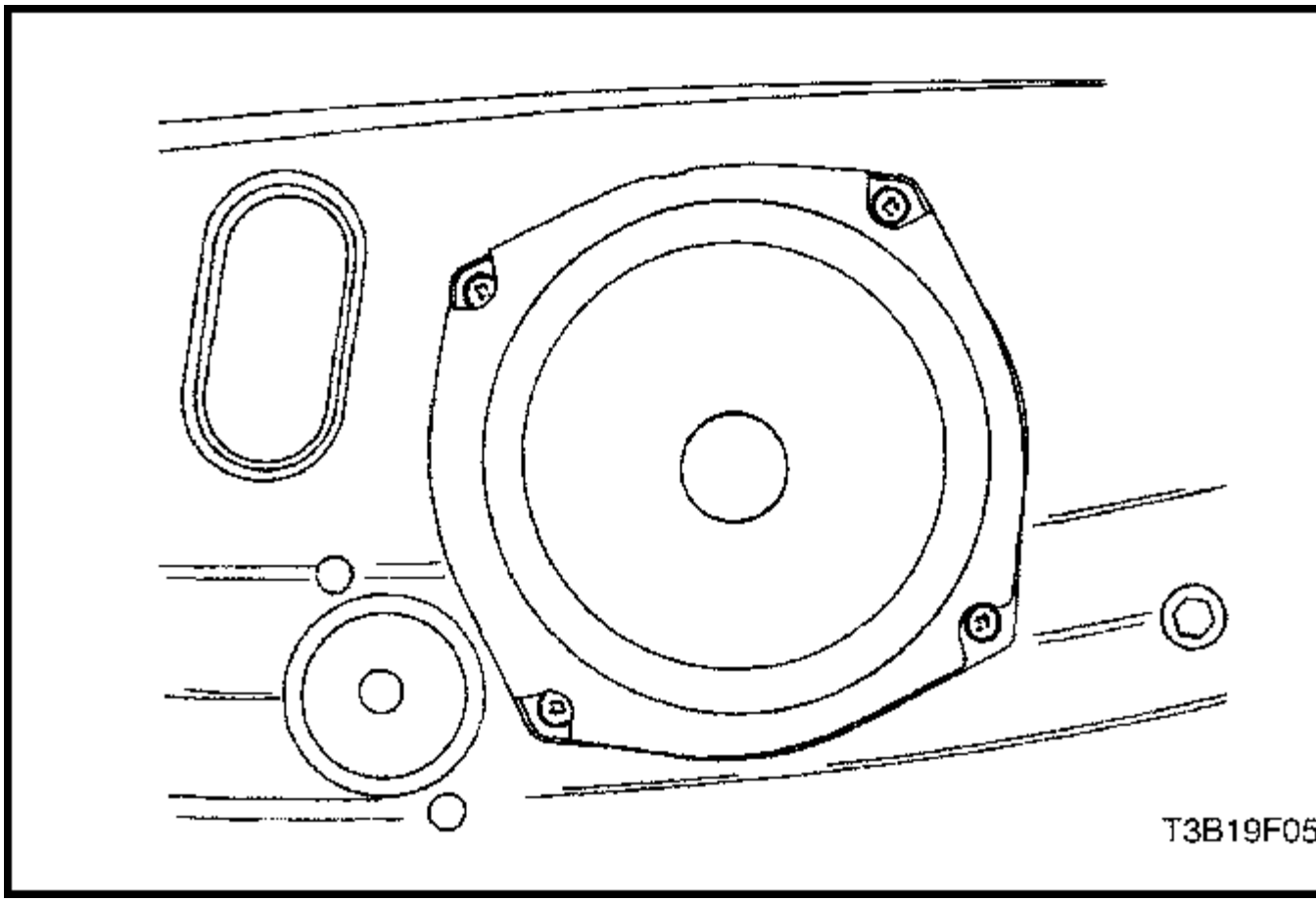
   Tighten
   Tighten the front speaker screws to 3.5 N•m (31 lb-in).

3. Install the front door trim panel. Refer to *Section 9G, Interior Trim.*
4. Connect the negative battery cable.

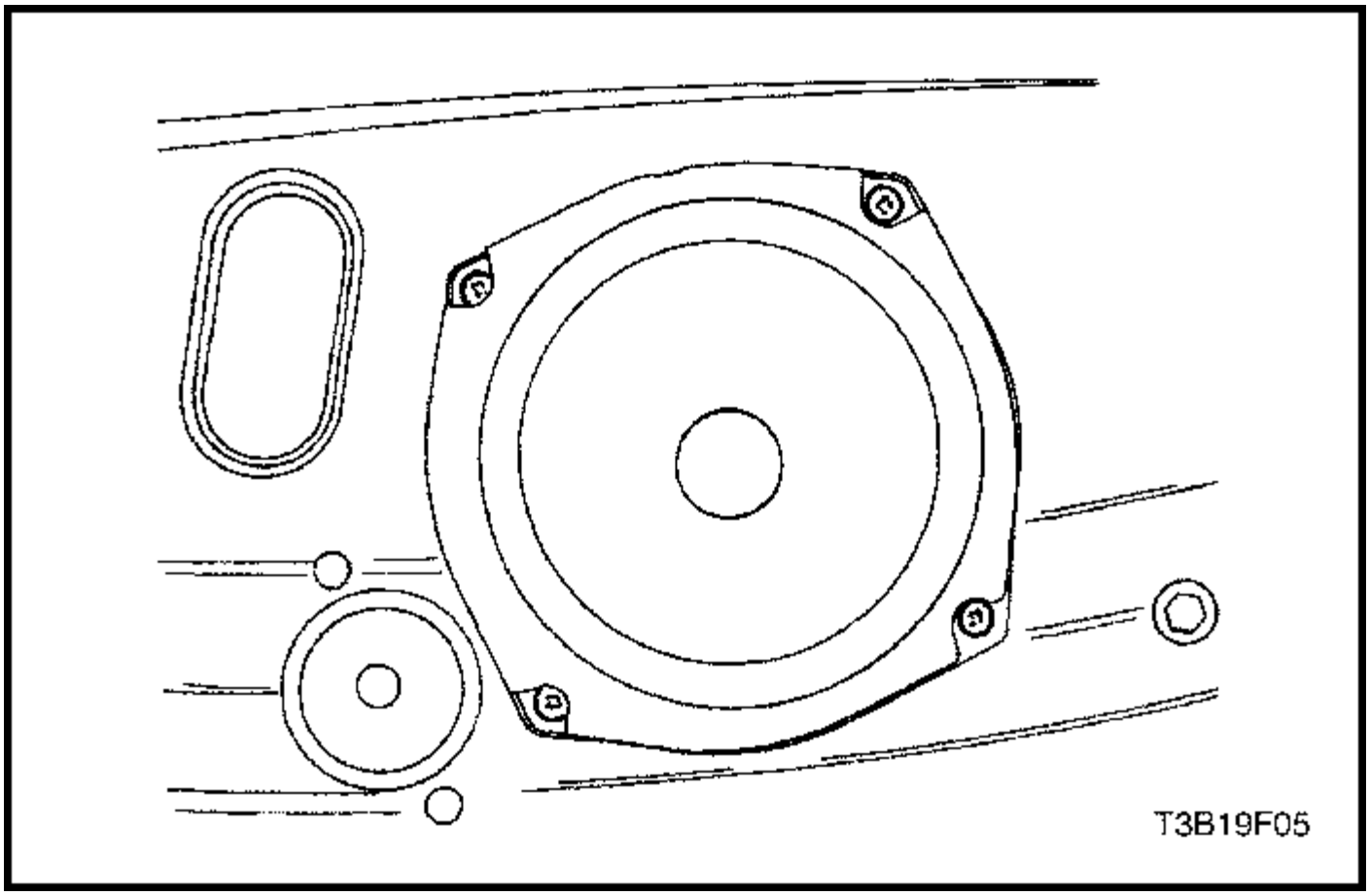


Rear Speakers (Notchback)
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the deck lid sill plate trim cover. Refer to *Section 9G, Interior Trim.*
3. Disconnect the electrical connector.



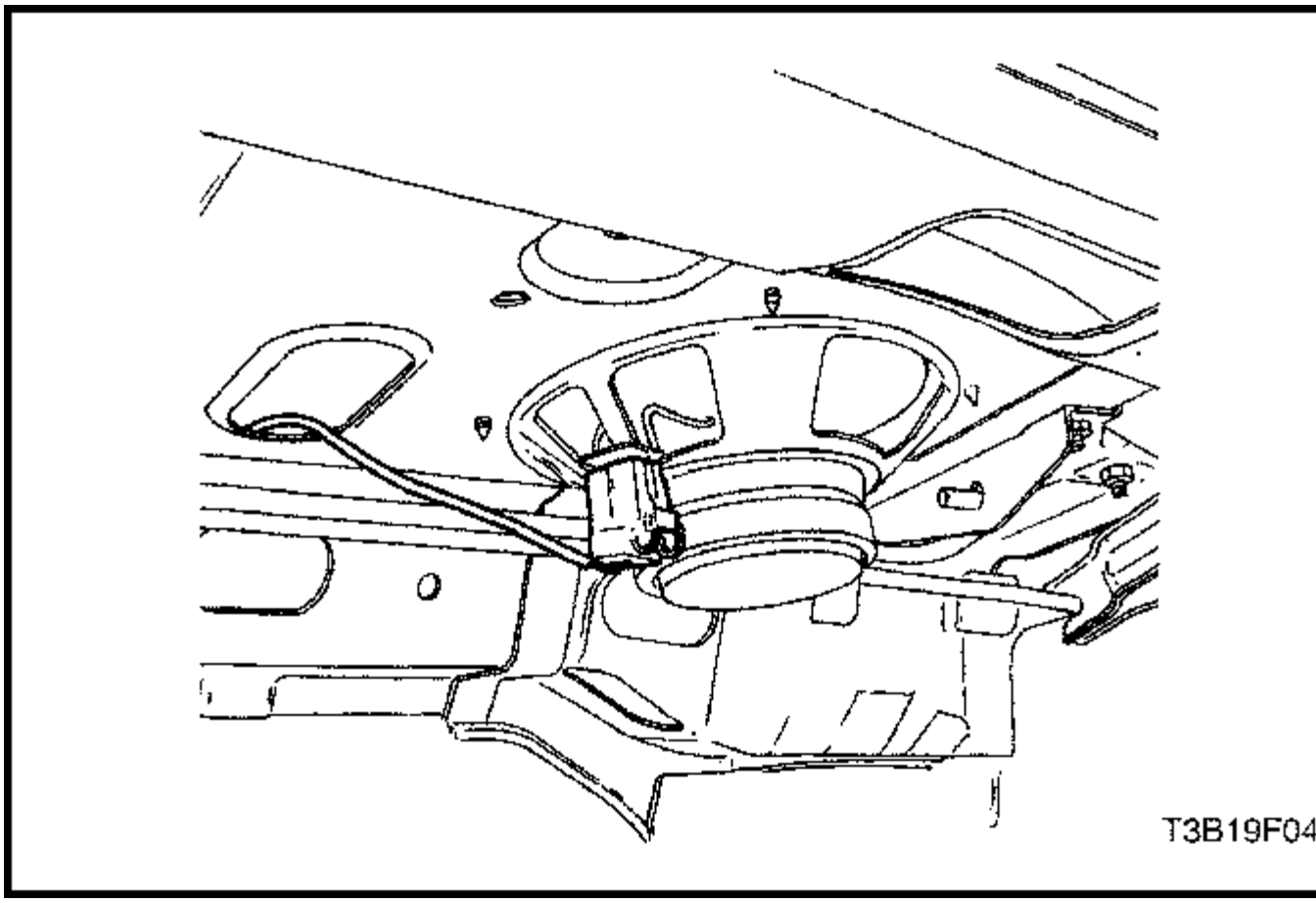
4. Remove the screws and the rear speakers.



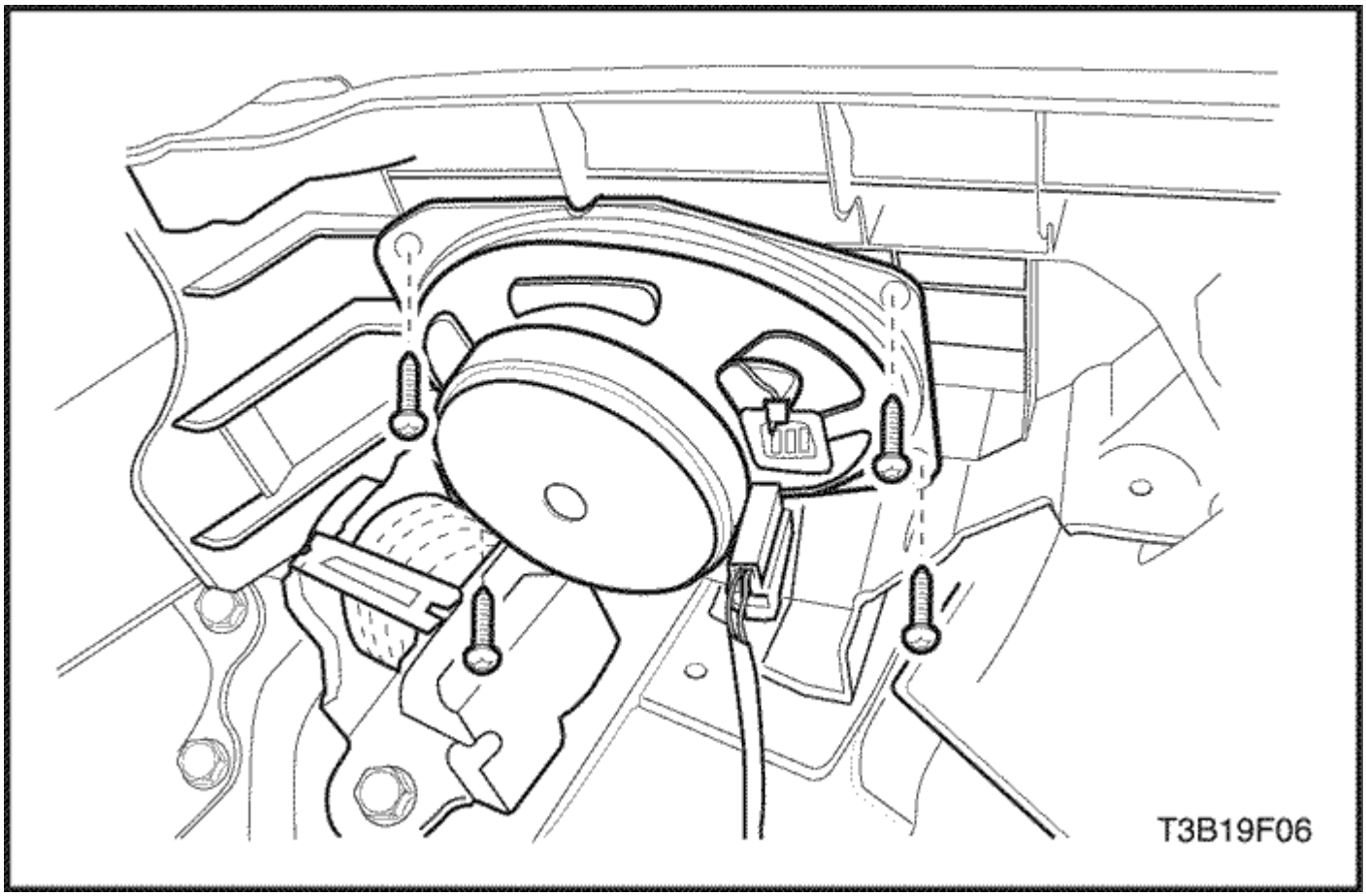
Installation Procedure

1. Install the rear speakers with the screws.

   Tighten
   Tighten the rear speaker screws to 3 N•m (27 lb-in).

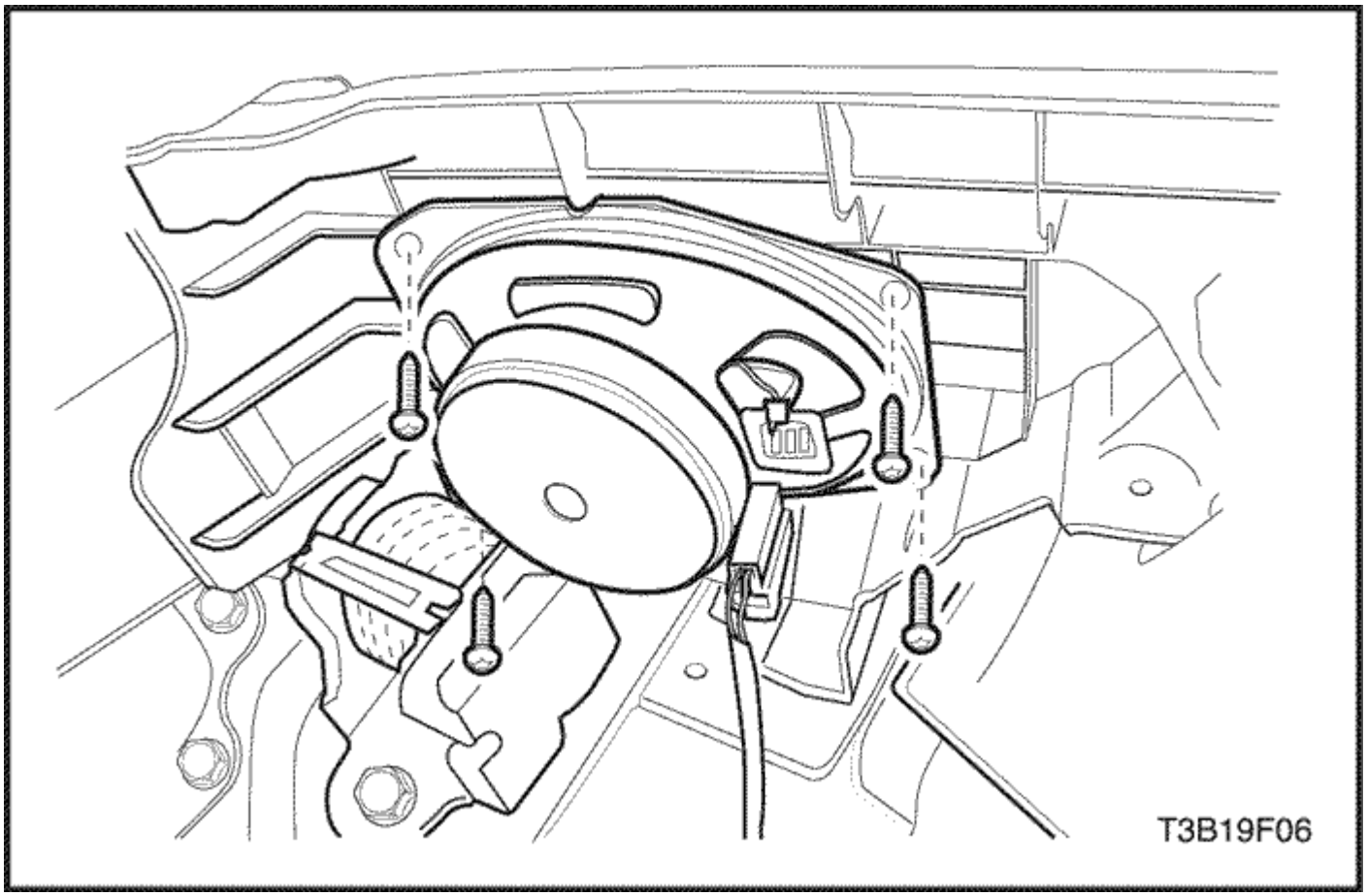


2. Connect the electrical connector.
3. Install the rear seatback and the rear seat cushion. Refer to *Section 9H, Seats.*
4. Connect the negative battery cable.



Rear Speakers (Hatchback)
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the luggage compartment wheelhouse trim panel (hatchback). Refer to *Section 9G, Interior Trim.*
3. Disconnect the electrical connector.
4. Remove the screws and the rear speaker.



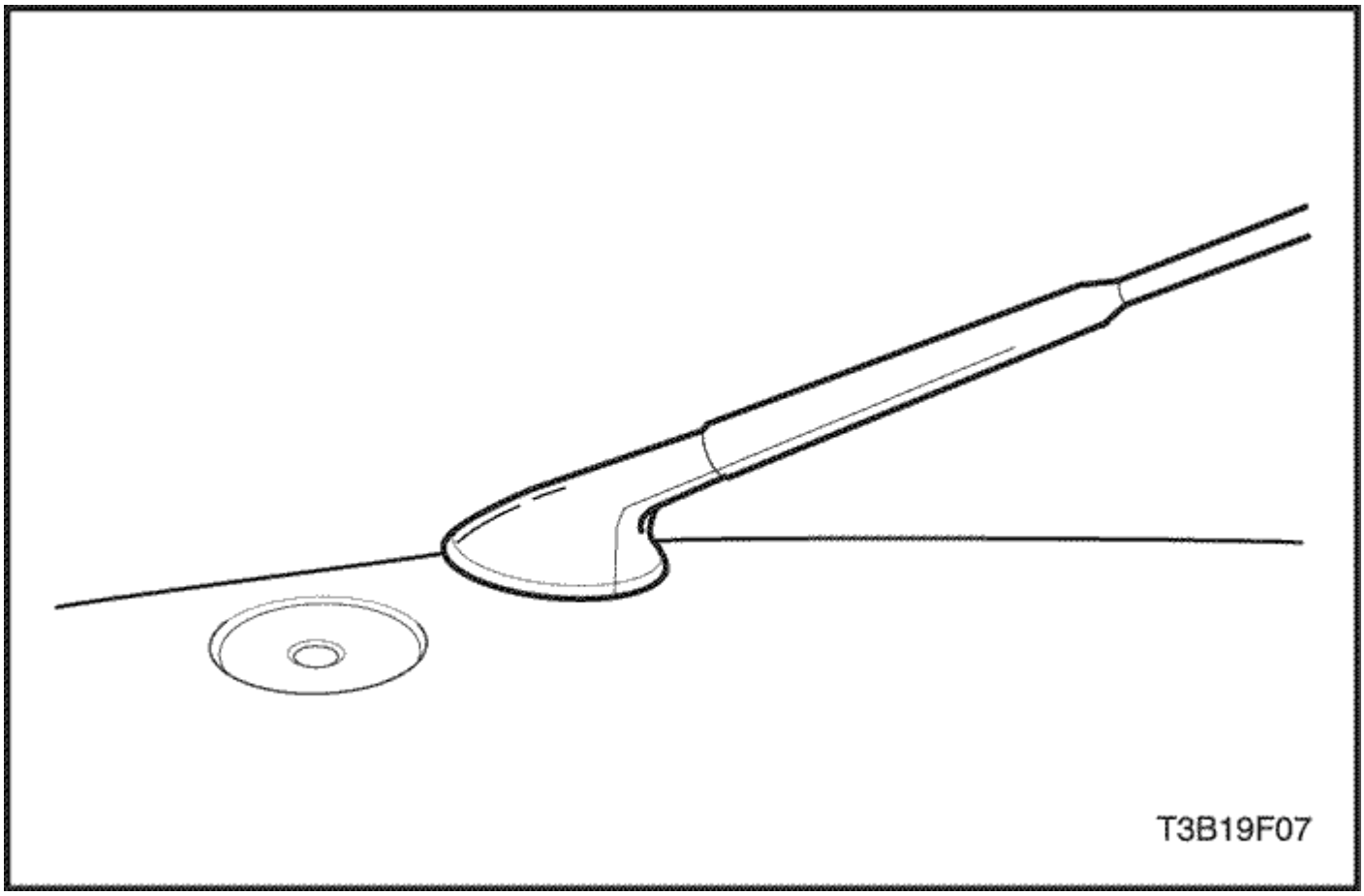
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the rear speaker with the screws.

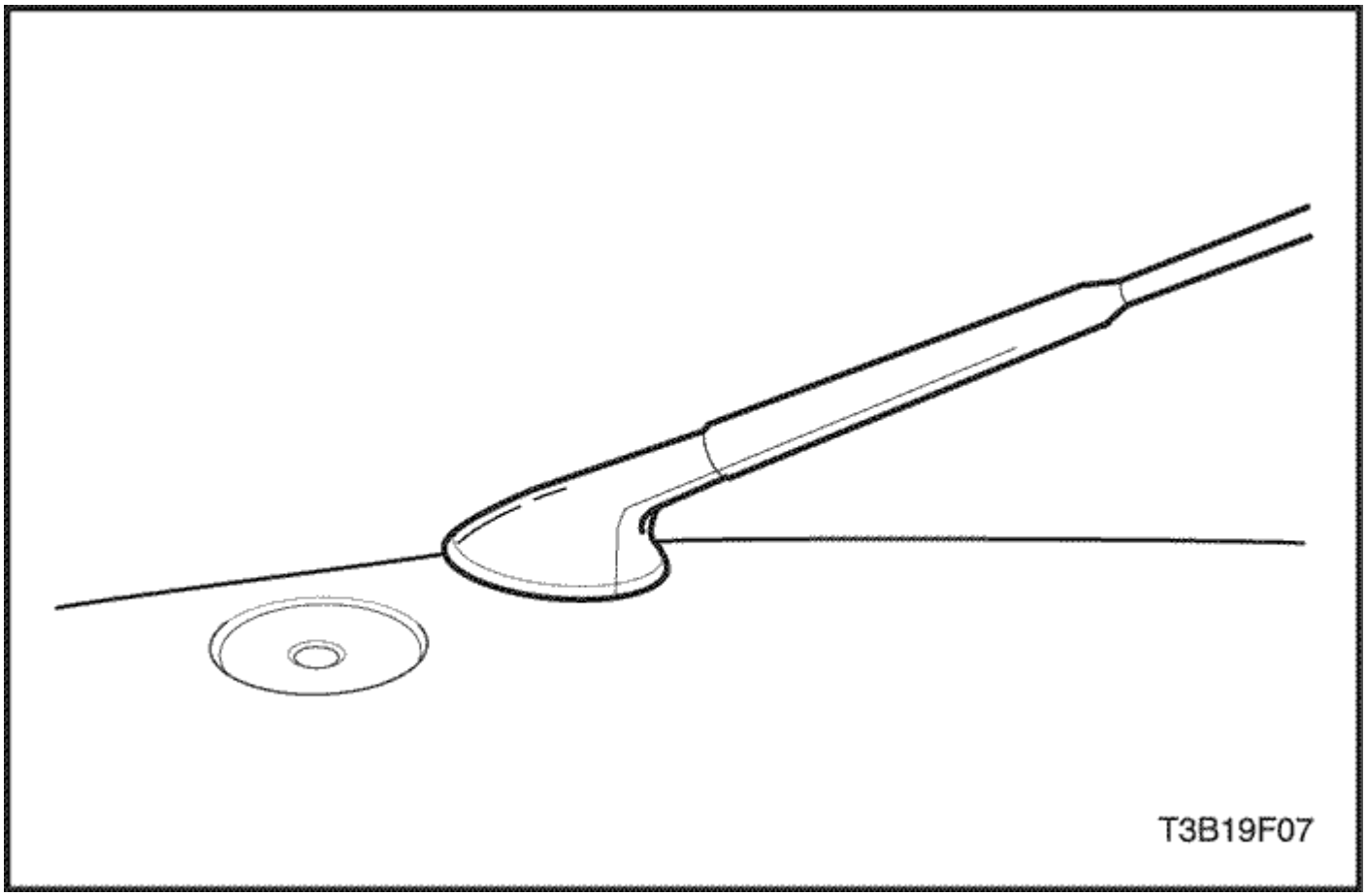
   Tighten
   Tighten the rear speaker screws to 3 N•m (27 lb-in).

2. Connect the electrical connector.
3. Install the luggage compartment wheelhouse trim panel (hatchback). Refer to *Section 9G, Interior Trim.*
4. Connect the negative battery cable.



Roof Antenna
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the interior courtesy lamp.Refer to *Section 9B, Lighting Systems.*
3. Remove the serew from the vehicle inside.
4. Remove the roof antenna.

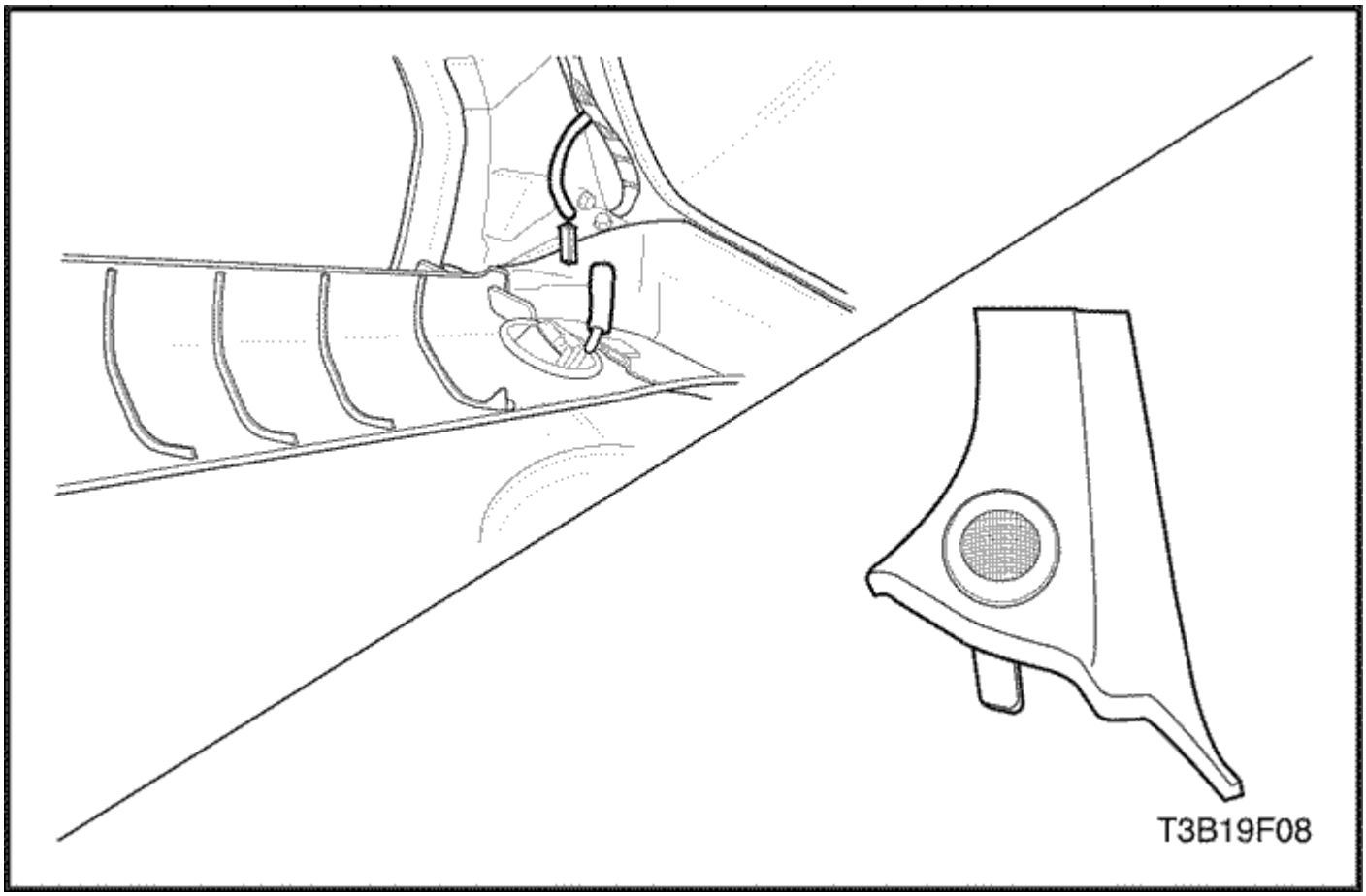


Installation Procedure

1. Install the roof antenna with the screw.

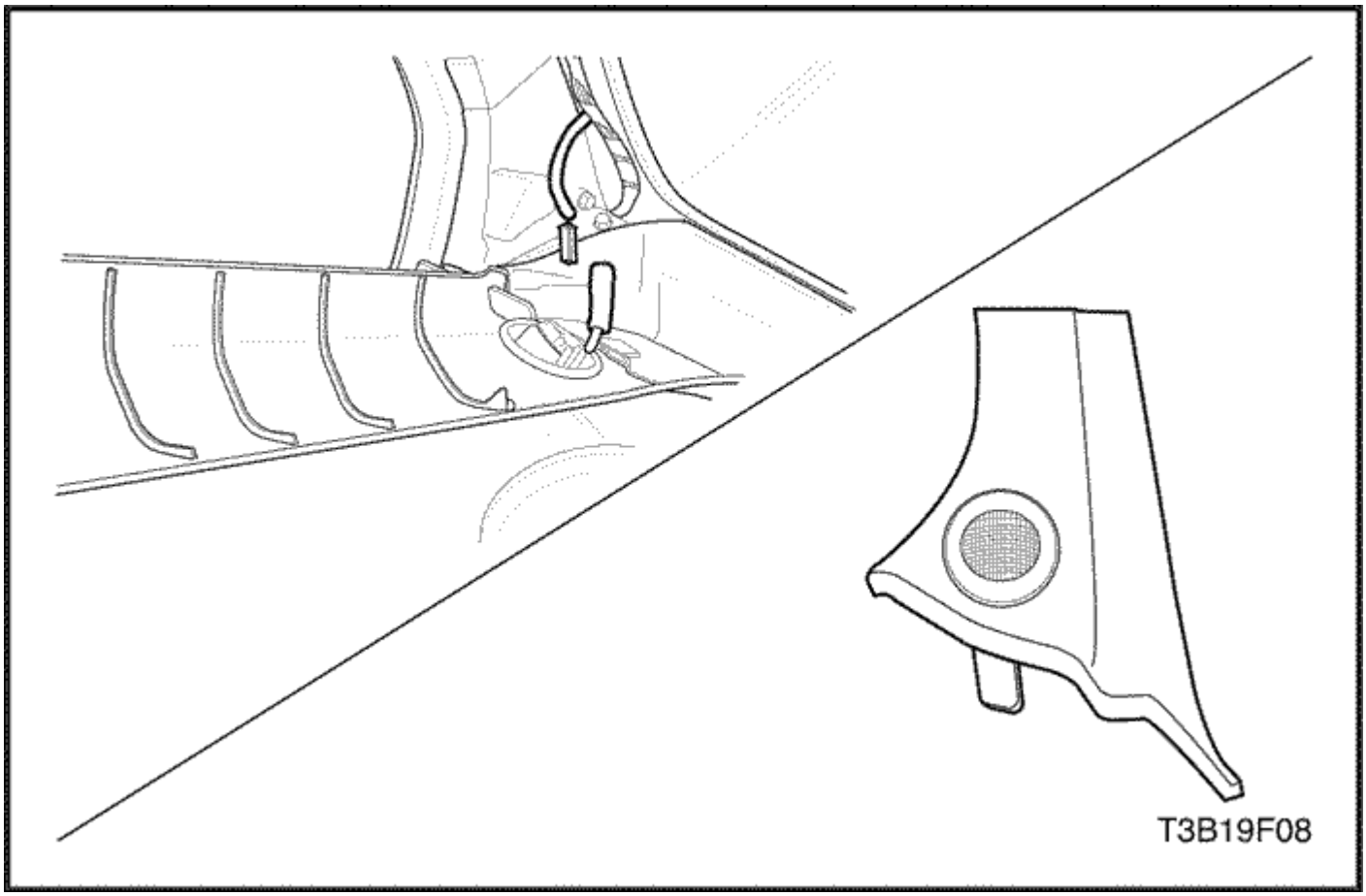
   Tighten
   Tighten the rroof antenna retaining screws to 3 N•m (27 lb-in).

2. Install the interior courtesy lamp. Refer to *Section 9B, Lighting Systems.*
3. Connect the negative battery cable.



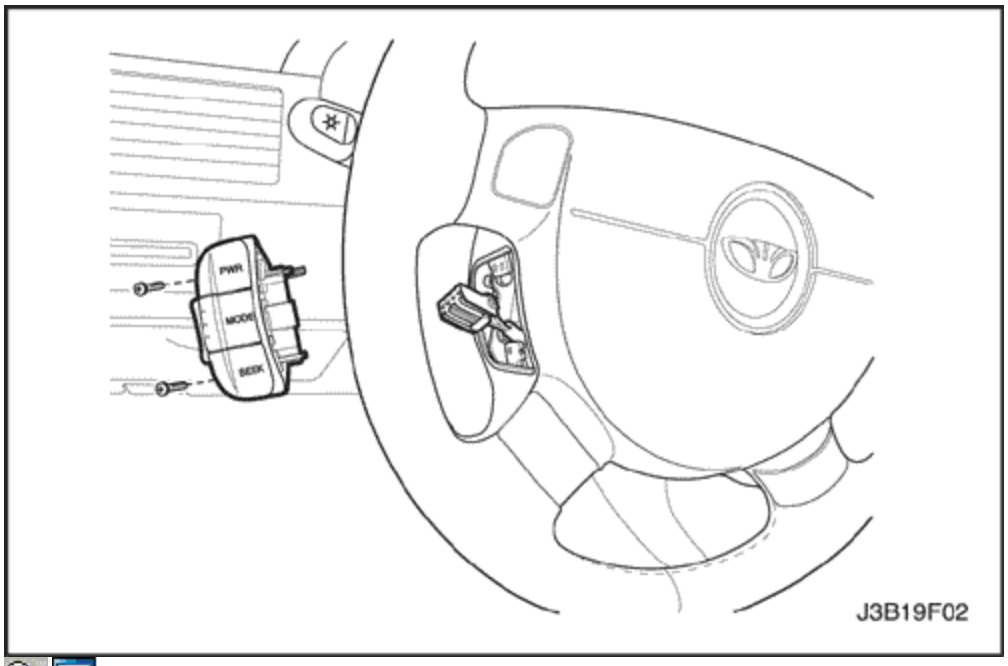
Tweeter Speakers
Removal Procedure

1. Disconnect the negative battery cable.
2. Pry off the A-pillar trim panel.
3. Disconnect the electrical connector.
4. Remove the tweeter.



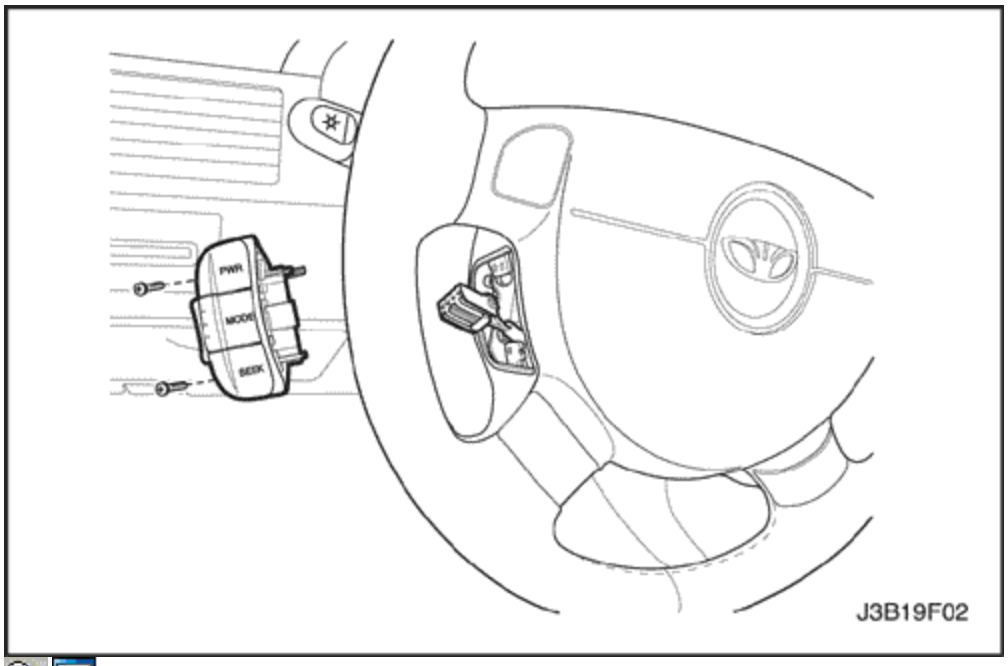
Installation Procedure

1. Install the tweeter.
2. Connect the electrical connector.
3. Install the A-pillar trim panel.
4. Connect the negative battery cable.



Audio Remote Controller
Removal Procedure

3. Disconnect the negative battery cable.
4. Disconnect the negative battery cable.
5. Remove the screws and the audio remote controller.



Installation Procedure

3. Install the audio remote controller with the screws.
4. Install the audio remote controller with the screws.
5. Connect the negative battery cable.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Stereo Cassette AM/FM Radio

The stereo cassette AM/FM radio is standard and the compact disc player is offered as optional equipment. All audio systems use four speakers: two speakers mounted in the front doors and two speakers mounted behind the rear seats.

Audio Security System (General Only)

The audio security system is activated whenever the audio system circuit is disconnected from the battery. A four-digit security code must be entered for the audio system to resume functioning. The security code is stamped on a card located in the vehicle (usually in the glove box). The following security code entering procedure must be used to deactivate the audio security system:

1. With the ignition switch in the ACC or psition.turn the radio on. At this time, "CODE" will be shown on the radio display, accompanied by chime sounds.

2. Enter the four-digit security number using the radio preset buttons 1 through 6,(or 1 through 8 if equipped).
3. After all four digits are entered, the digits will blink three times, and the radio will be functional.

Wrong Code:
If the wrong code is entered, "ERR" will briefly appear on the display. After this "CODE" will appear, and the code entering procedure can be performed once again. If the correct code is not entered within 10 minutes, the radio should be disconnected from the battery to reset the audio system. After connecting the battery, repeat the code entering procedure.

Roof Antenna
Roof antenna is located on the roof and is designed to separate the antenna pole from the antenna base. The antenna pole should be removed to prevent the painting damage before washing the vehicle. The roof antenna cannot be adjusted.

Front and Rear Speakers
All audio systems use four speakers: two speakers mounted in the front doors and two speakers mounted in the rear deck lid sill plate, on the notchback. On the hatchback, the rear speakers are mounted in the luggage compartment wheelhouse trim panel. A coaxial two-way rear speaker is offered as an option.

Tape Player and Cassette Care
The head and the capstan are the two parts of the tape player that should be cleaned. This service should be performed every 100 hours of cassette operation.
In order to clean the head and the capstan, use a cotton swab dipped in rubbing alcohol.
A cassette cleaning kit may also be used to clean the head and the capstan. Follow the cleaning kit instructions to clean the tape player.
Do not touch the tape head with magnetized tools. If the head becomes magnetized, it will degrade cassettes played in the player. No service is performed on the cassettes. The cassette manufacturer handles warranties of the cassettes. Store cassettes away from extreme heat and direct sunlight.

Compact Disc Care
Handle discs carefully. Store the discs in protective cases away from the sun, heat, and dust. If the surface is soiled, dampen a clean, soft cloth in a solution of mild neutral detergent and wipe the disc clean.

Setting the Area Code (General Only)
When you turn on the 'Power' button, 'AF' will be displayed.
The cunsumer must select the area code as per map in the owner's manual.

If you select wrong area code, you must re-install the audio connector. (or can be possible to take off Audio fuse.)
The area code refer to the audio owner's manual.

SECTION 9G

INTERIOR TRIM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

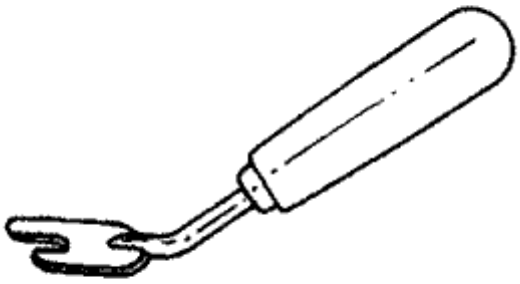
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Door Pull Screw	3.5	-	31
Floor Console Screws	4	-	35
Gearshift Housing Bolts	5	-	44
Rear Seat Belt Anchor Bolts	38	28	-
Rear Seatback Bolt	25	18	-
Seat Belt Anchor Bolts	38	28	-
Seat Belt Bracket Screws	10	-	89
Trim Panel Screws	3.5	-	31

SPECIAL TOOLS

Special Tools Table

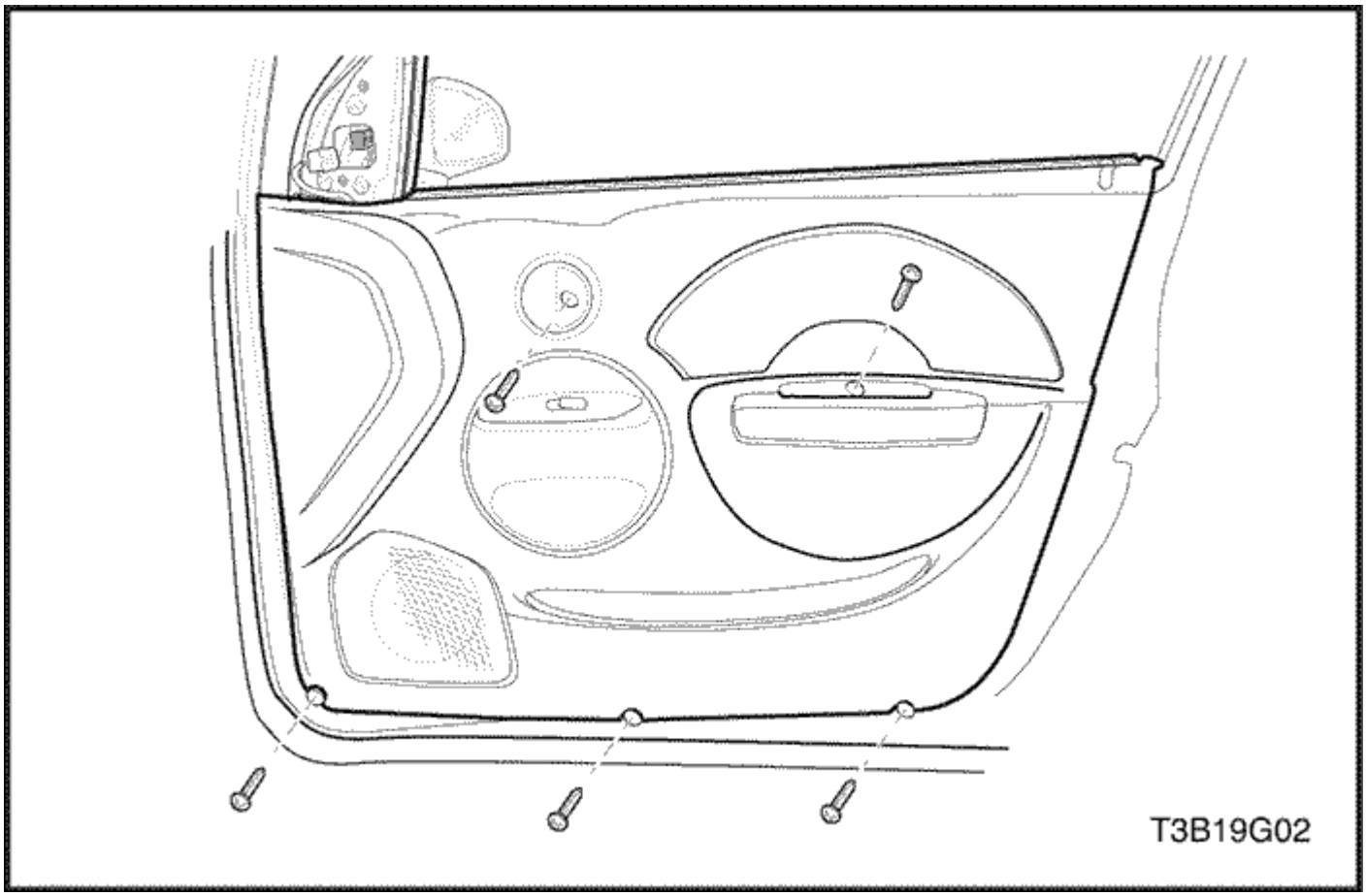
	KM-475-B Trim Remover



KM475B

MAINTENANCE AND REPAIR

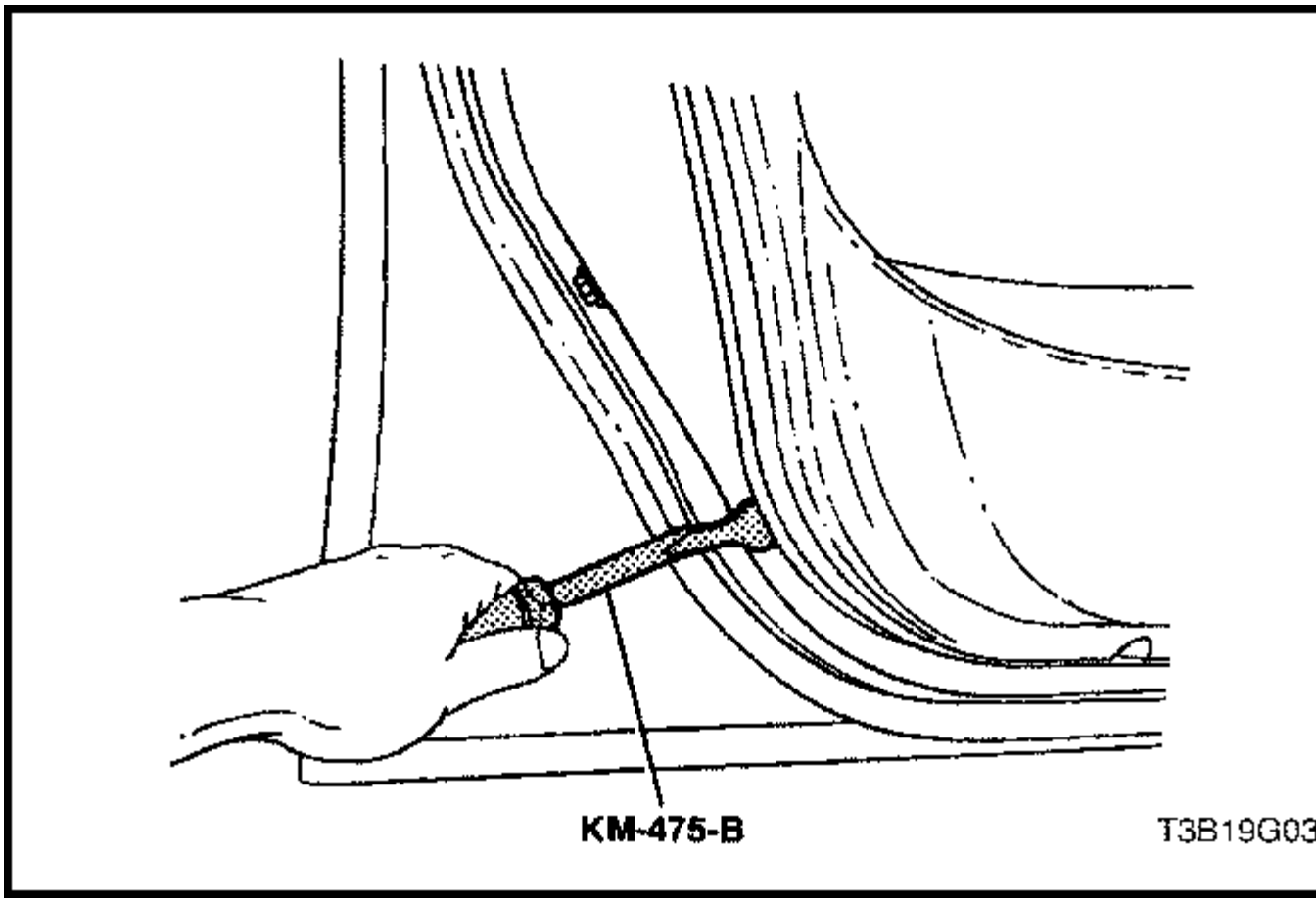
ON-VEHICLE SERVICE



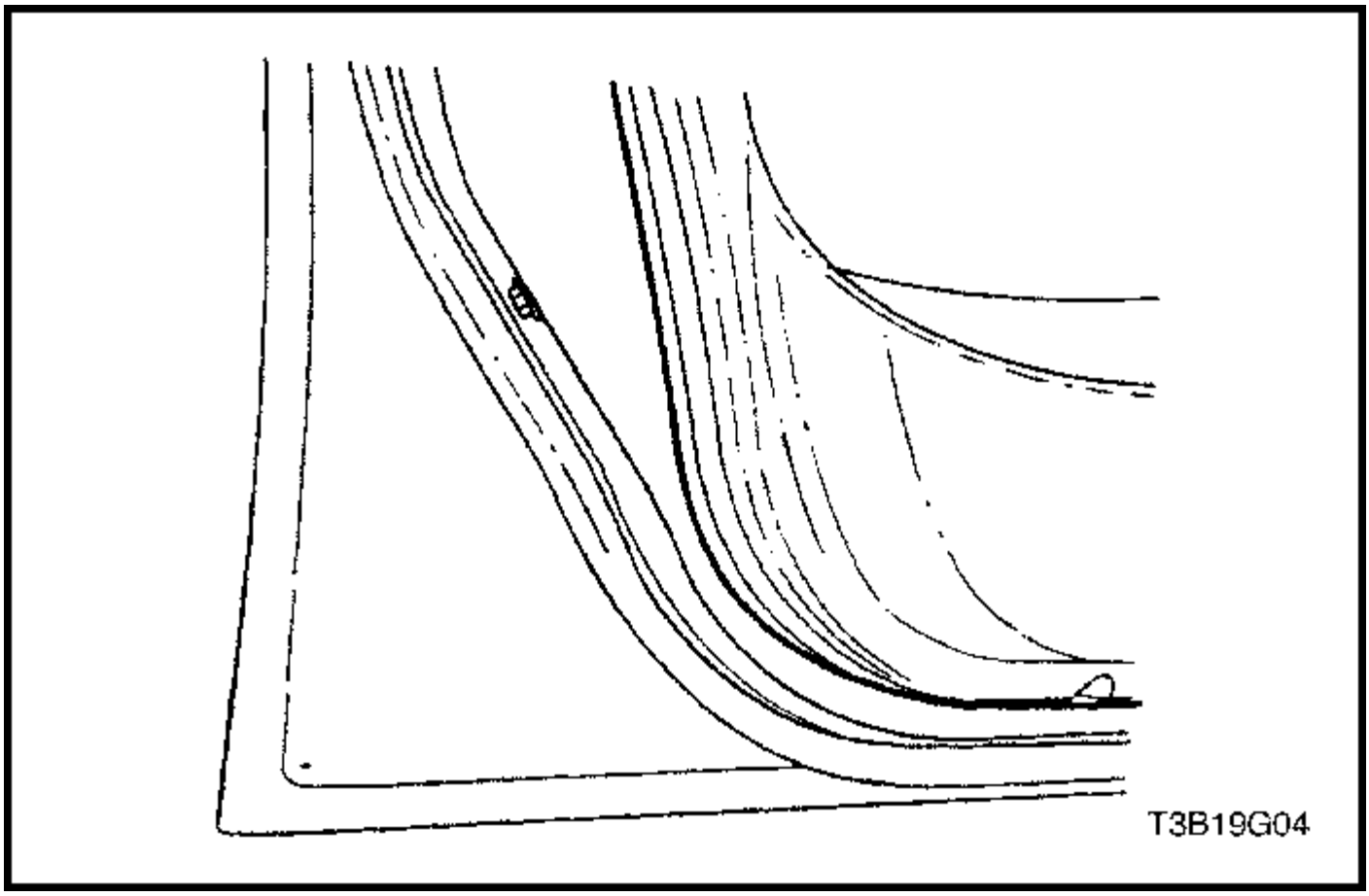
Front Door Trim Panel
Tools Required

KM-475-B Trim Remover
Removal Procedure

1. Lower the front window.
2. Remove the door pull screw.
3. Remove the inside door handle.



4. Remove the screws at the base of the trim panel.
5. Pry off the trim panel using the trim remover KM-475-B.

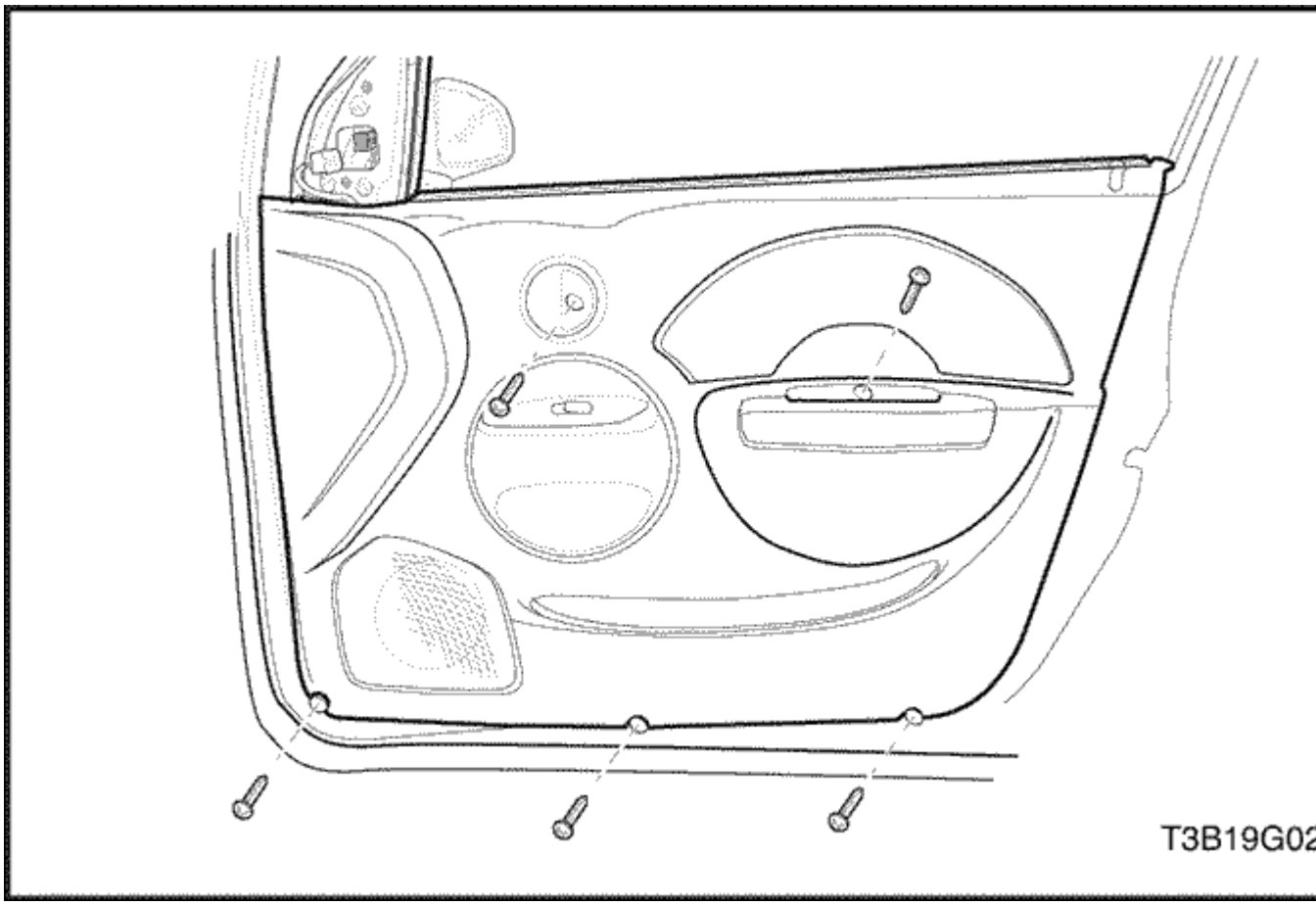


Installation Procedure

1. Install the trim panel.
2. Install the screws at the base of the trim panel.

   Tighten
   Tighten the trim panel screws to 3.5 N•m (31 lb-in).

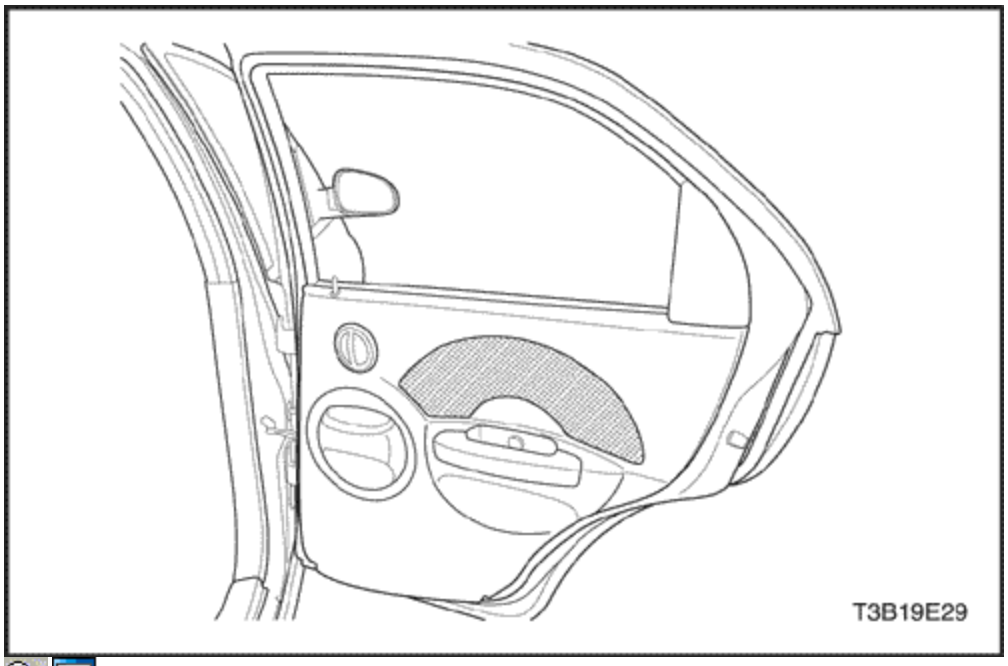
3. Install the inside door handle.



4. Install the door pull screw.

   Tighten
   Tighten the door pull screw to 3.5 N•m (31 lb-in).

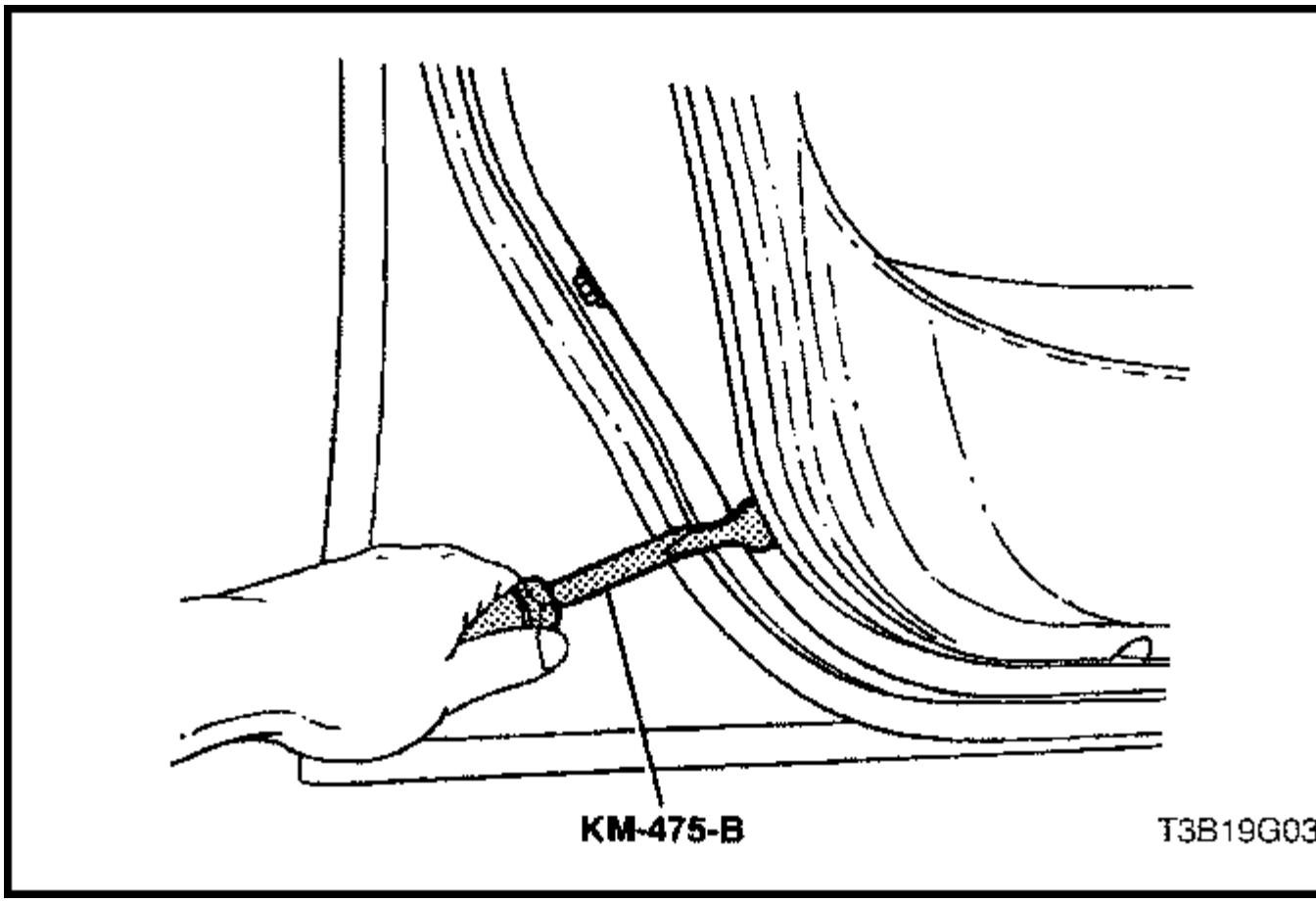
5. Raise the window.



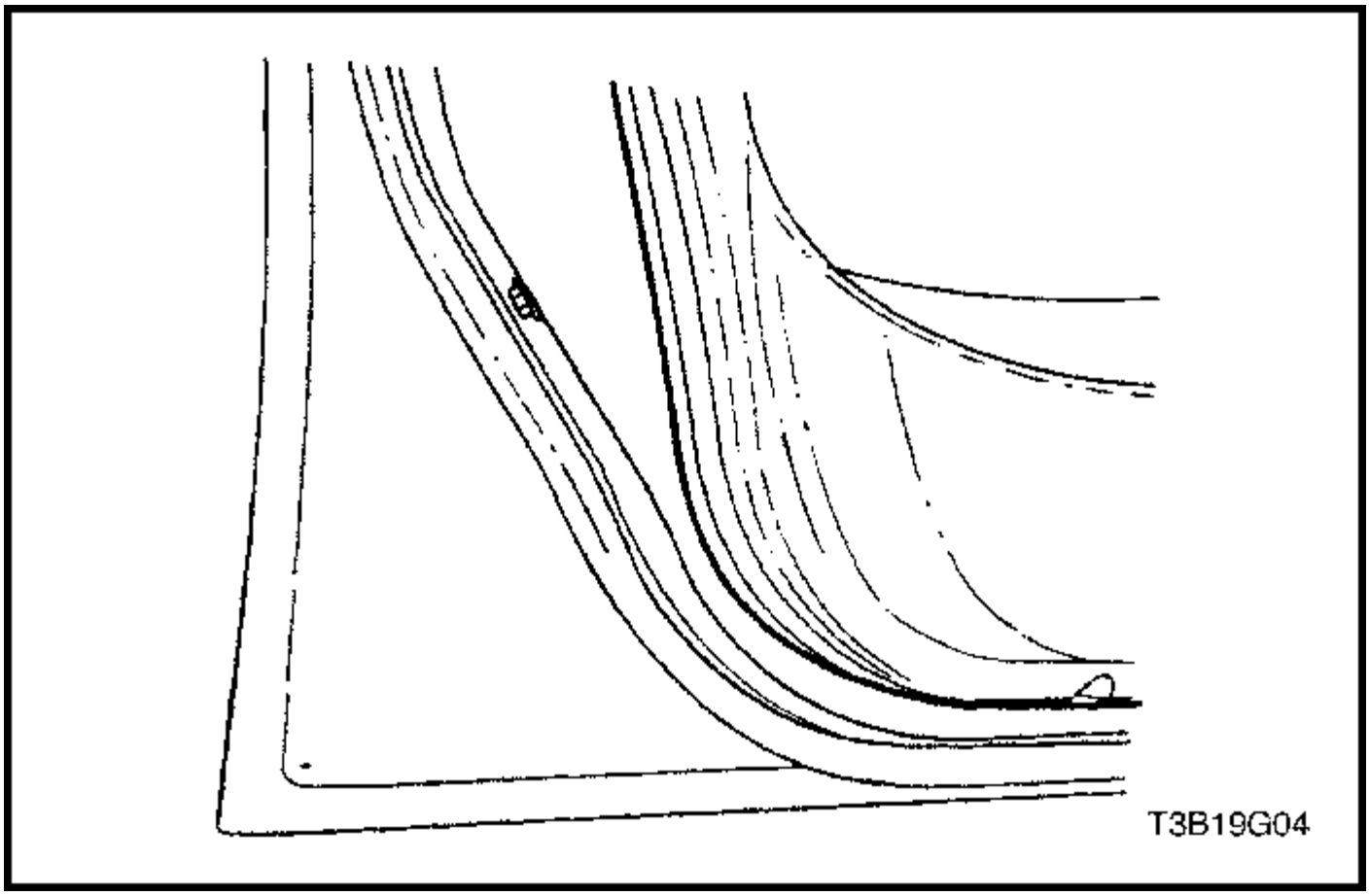
Rear Door Trim Panel
Tools Required

KM-475-B Trim Remover
Removal Procedure

1. Lower the rear window.
2. Remove the rear window regulator handle. Refer to *Section 9P, Doors.*
3. Remove the door pull screw.
4. Remove the inside door handle.



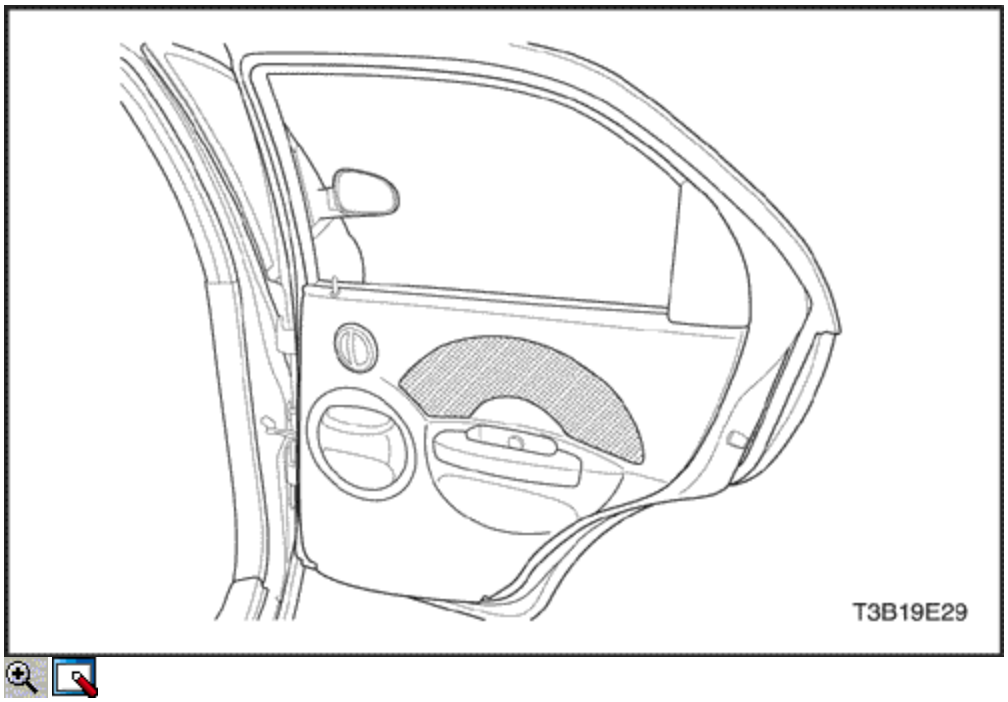
5. Remove the rear door interior garnish molding.
6. Remove the screws at the base of the trim panel.
7. Pry off the trim panel using the trim remover KM-475-B.



Installation Procedure

1. Install the trim panel.
2. Install the screws at the base of the trim panel.

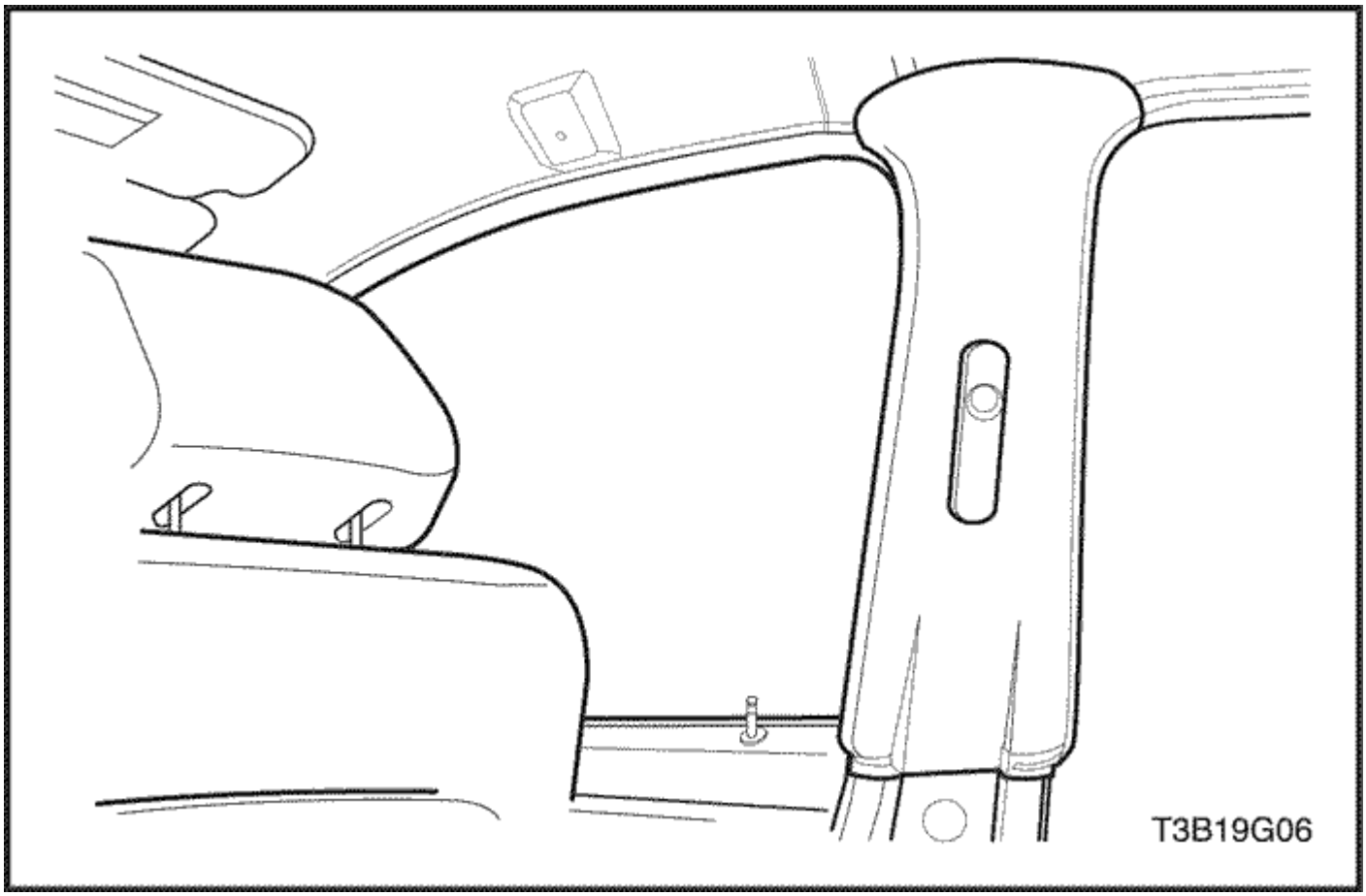
   Tighten
   Tighten the trim panel screws to 3.5 N•m (31 lb-in).



3. Install the rear door interior garnish molding.
4. Install the inside door handle.
5. Install the door pull screw.

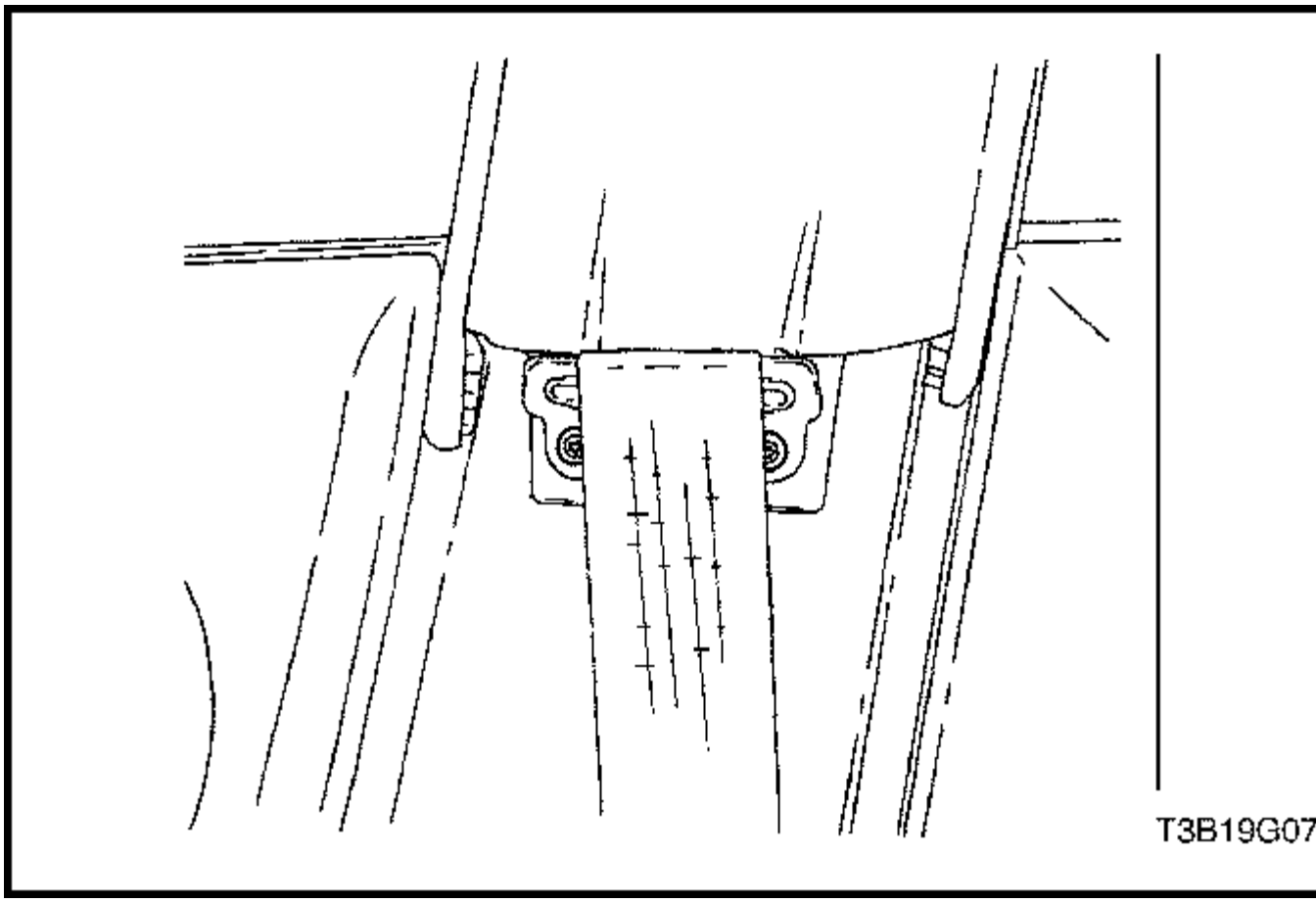
   Tighten
   Tighten the door pull screw to 3.5 N•m (31 lb-in).

6. Install the rear window regulator handle. Refer to *Section 9P, Doors.*
7. Raise the window.

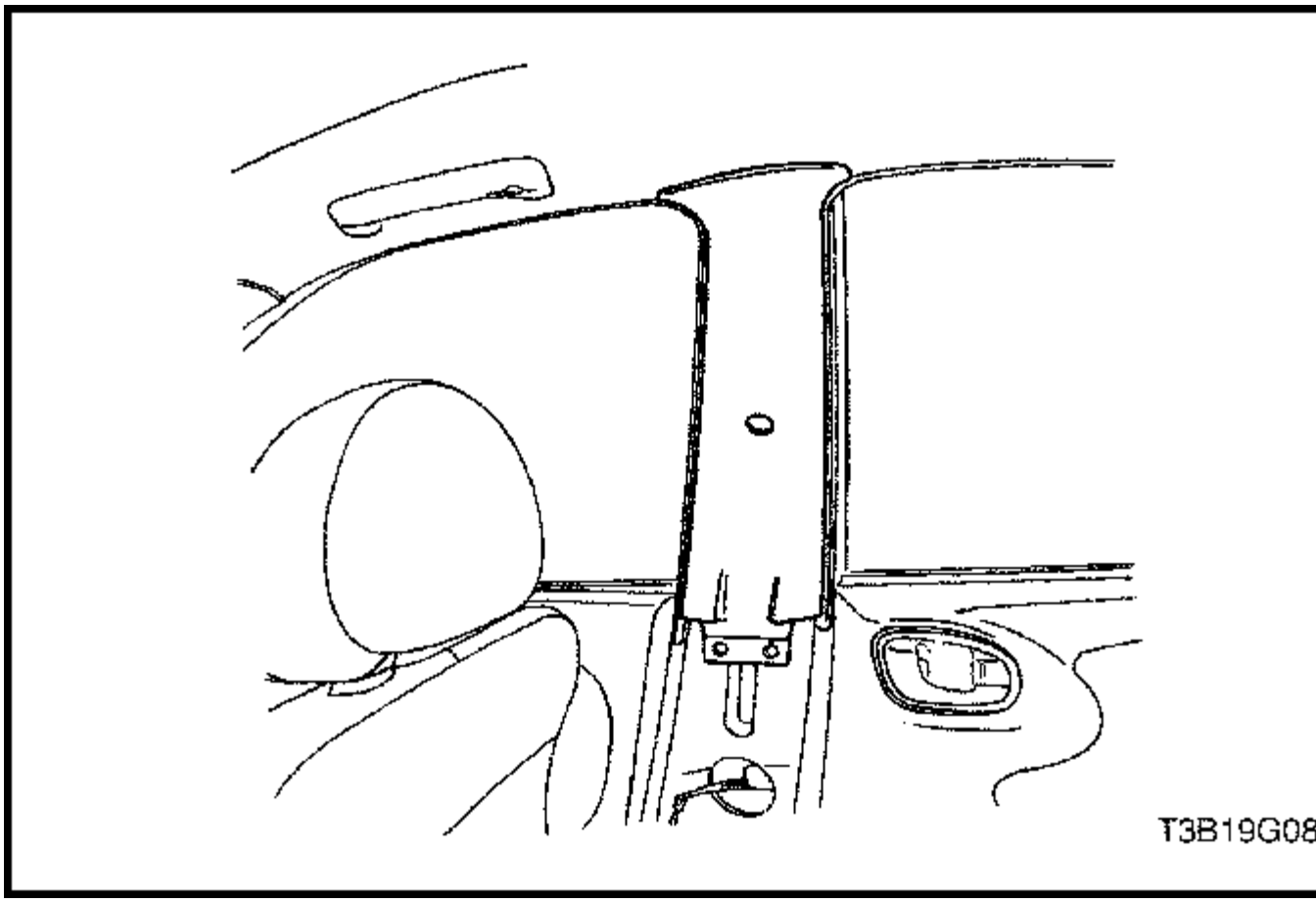


Upper B-Pillar Trim Panel
Removal Procedure

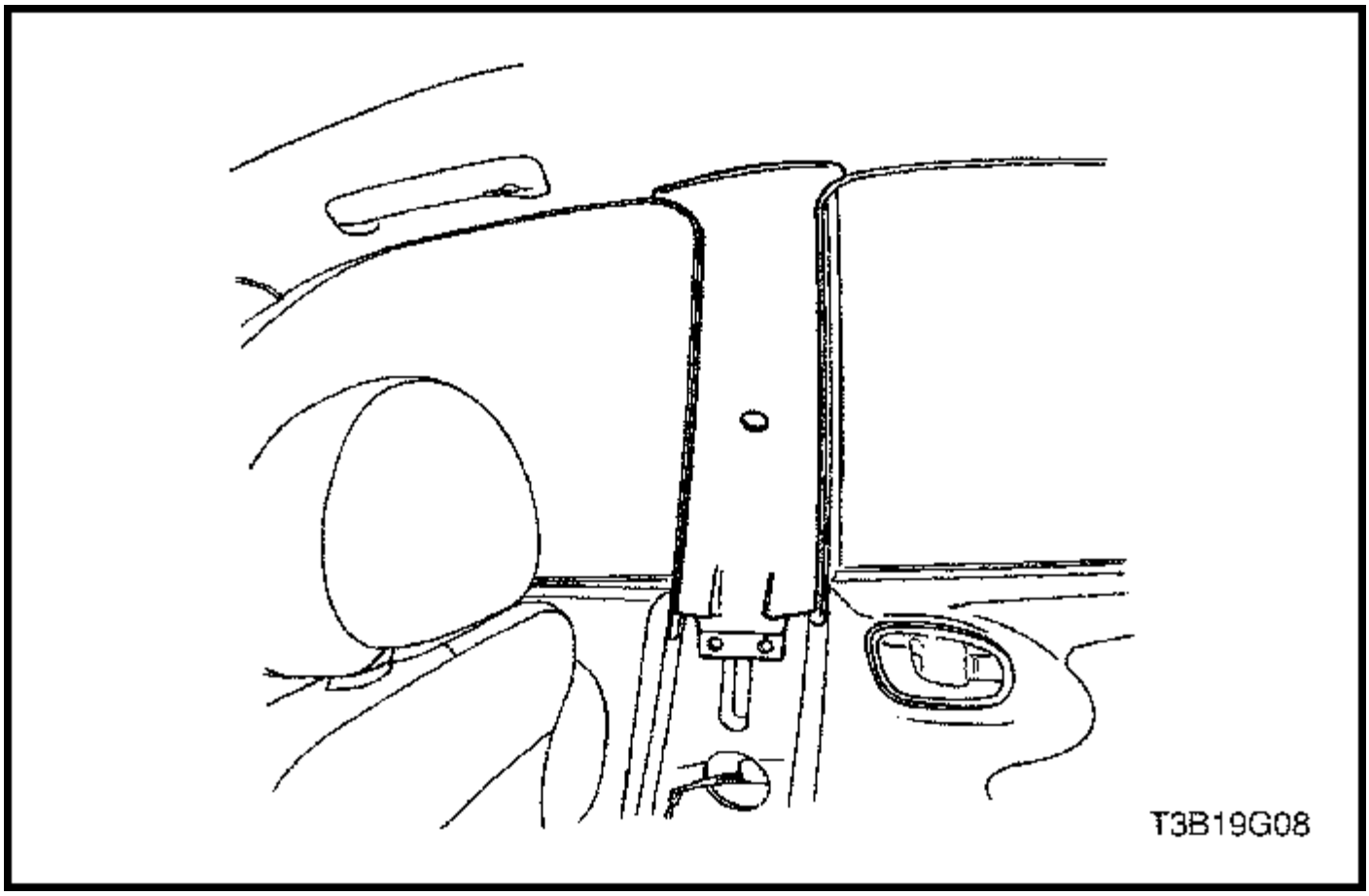
1. Remove the bolt and the upper front seat belt anchor.



2. Remove the lower B-pillar trim panel. Refer to "Lower B-Pillar Trim Panel (Notchback)" in this section.
3. Remove the screws and the seat belt bracket.

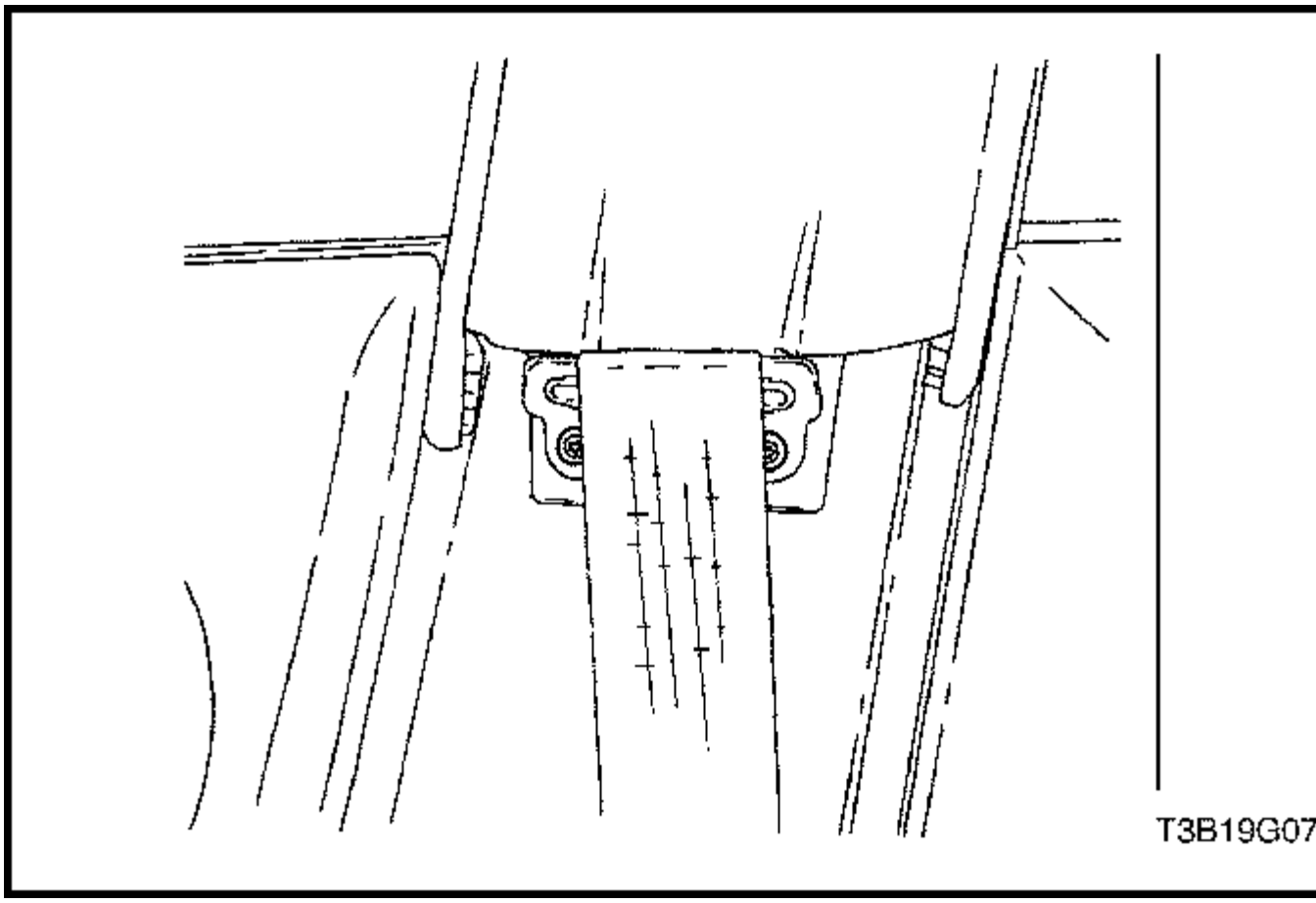


4. Pry off the upper B-pillar trim panel.



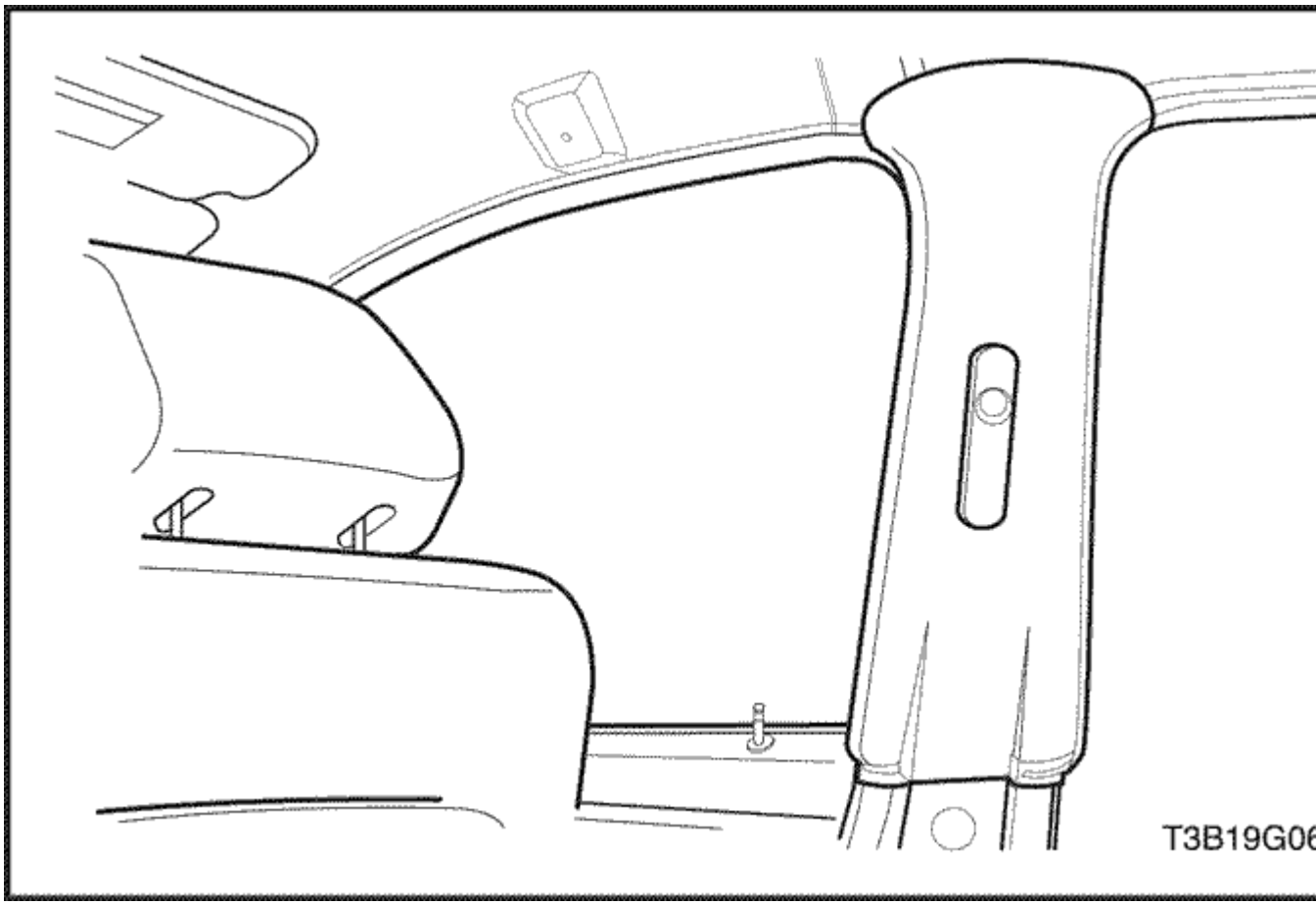
Installation Procedure

1. Install the upper B-pillar trim panel.



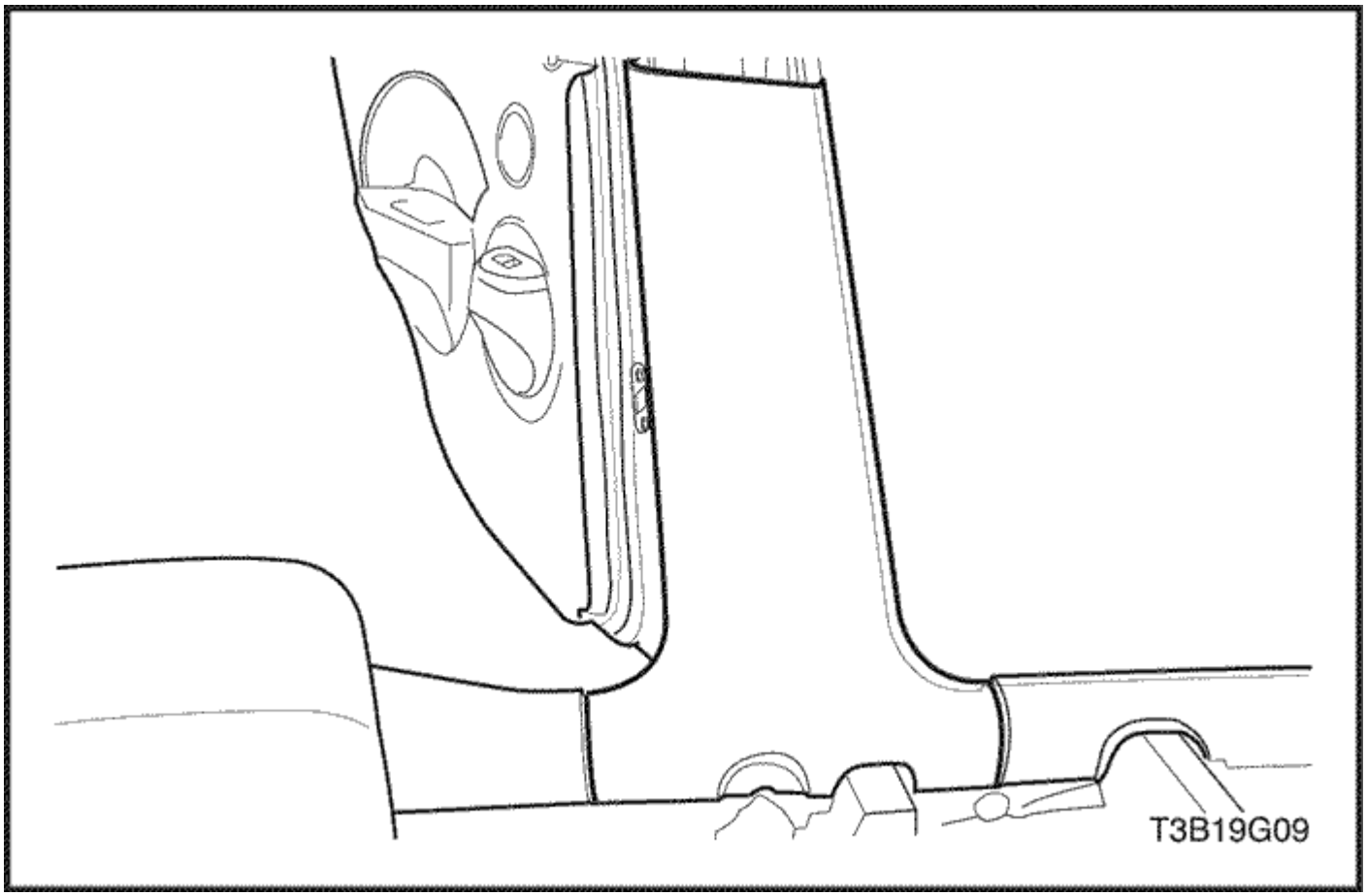
2. Install the seat belt bracket with the screws.

   Tighten
   Tighten the seat belt bracket screws to 10 N•m (89 lb-in).



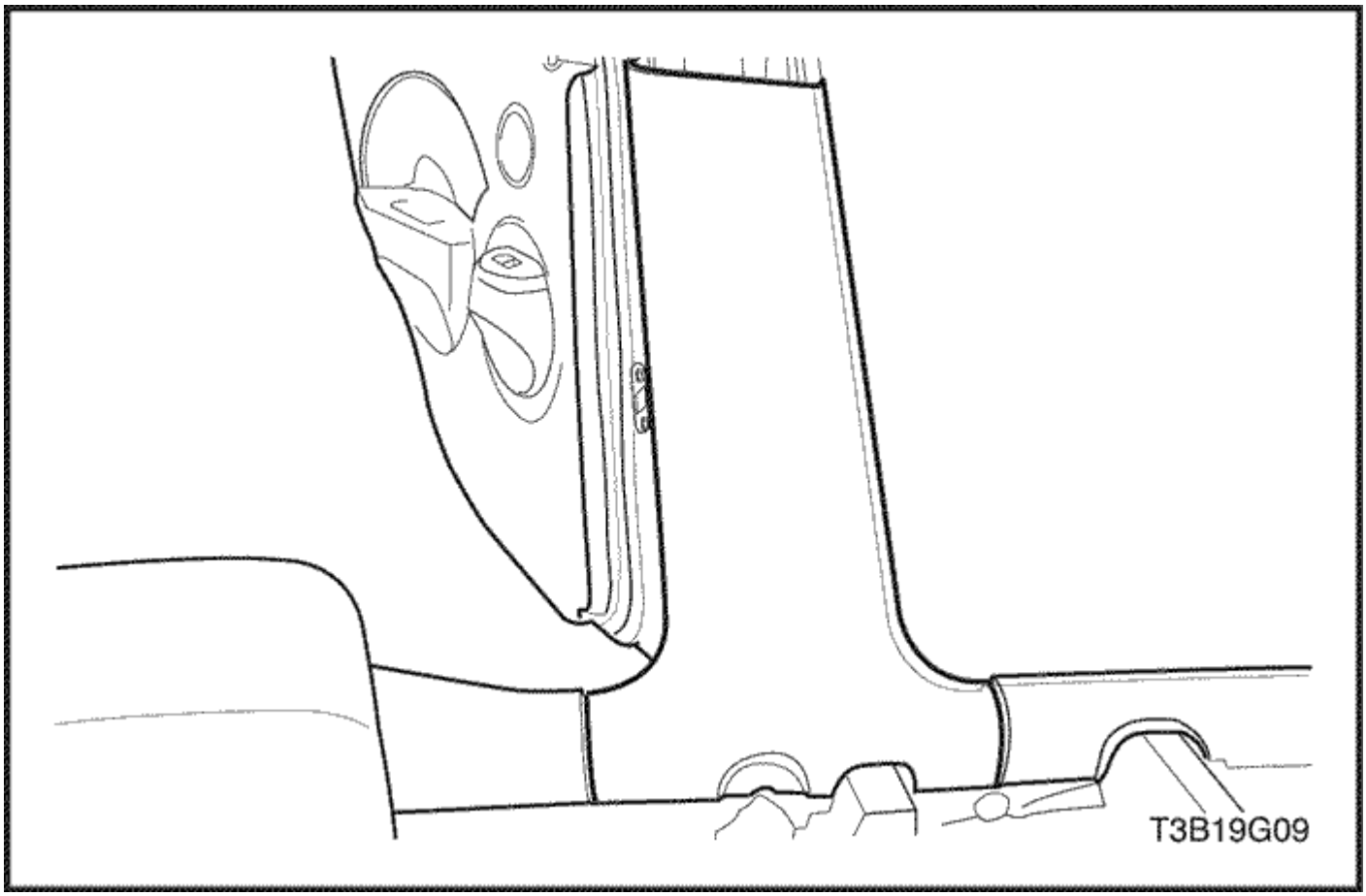
3. Install the lower B-pillar trim panel. Refer to "Lower B-Pillar Trim Panel (Notchback)" in this section.
4. Install the upper front seat belt anchor with the bolt.

   Tighten
   Tighten the seat belt anchor bolt to 38 N•m (28 lb-ft).



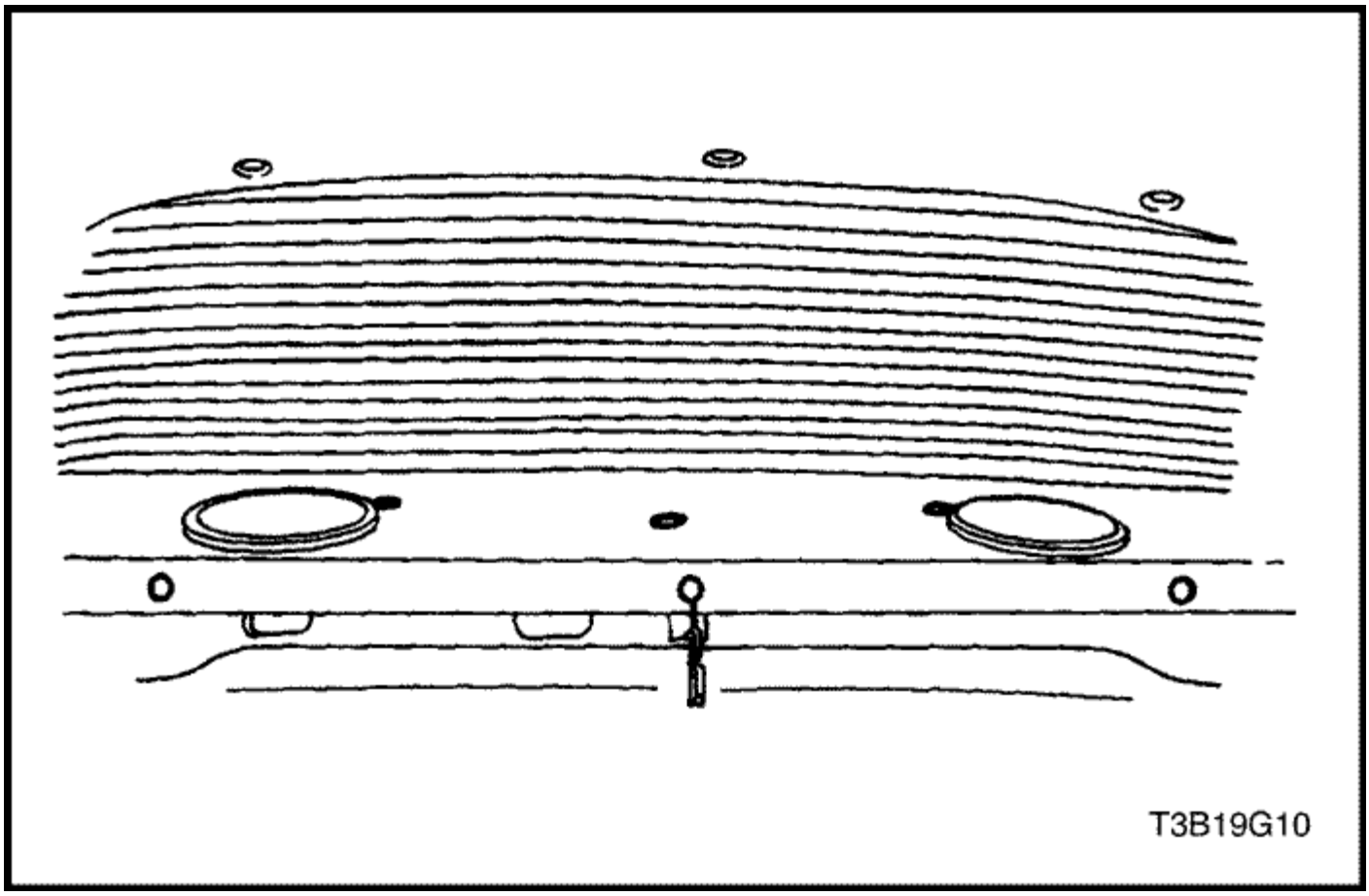
Lower B-Pillar Trim Panel
Removal Procedure

1. Reposition the rear portion of the front rocker trim panel and the front portion of the rear rocker trim panel.
2. Pry off the lower B-pillar trim panel.



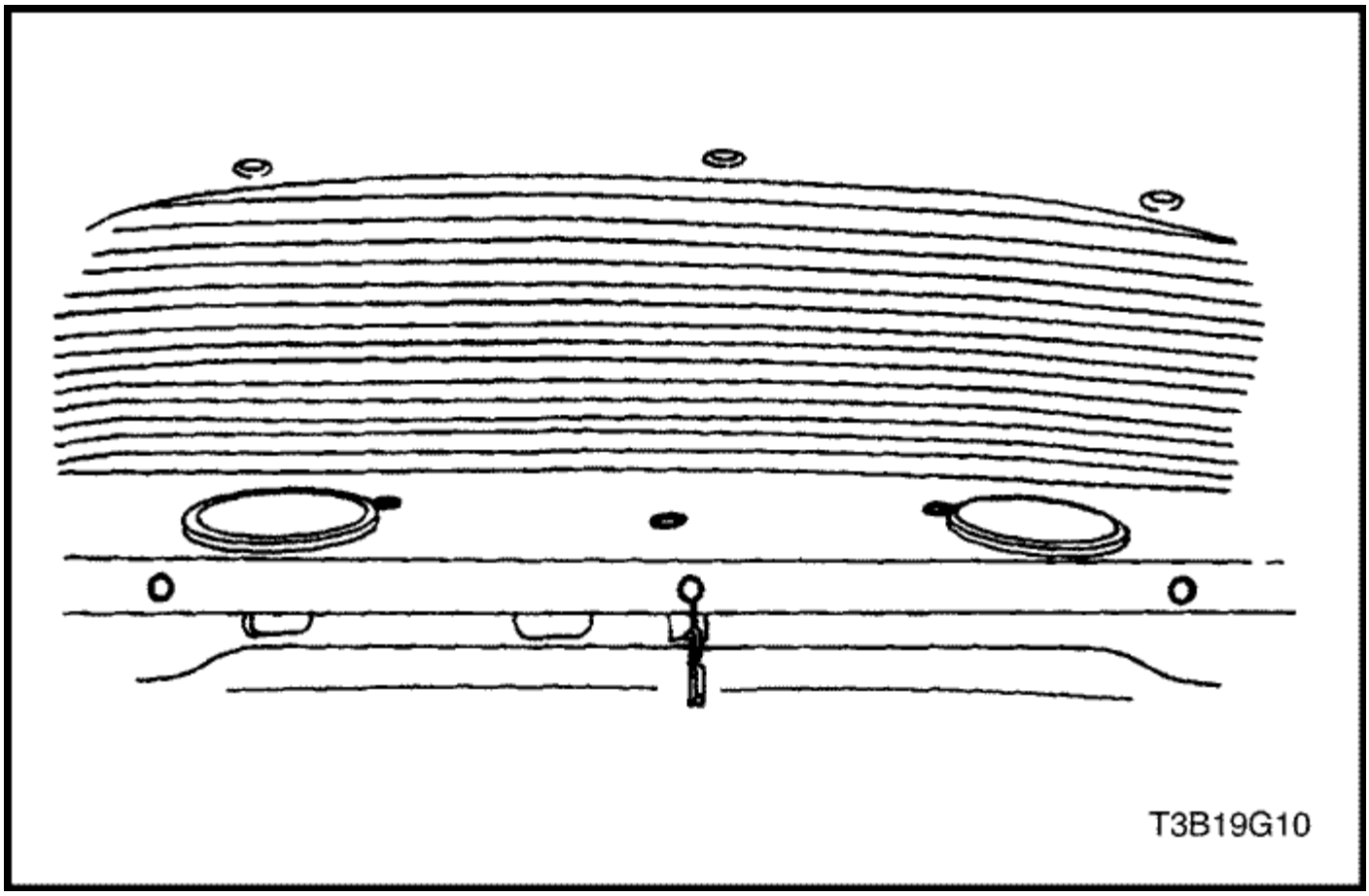
Installation Procedure

1. Install the lower B-pillar trim panel.
2. Install the front rocker trim panel.
3. Install the rear rocker trim panel to its original position.



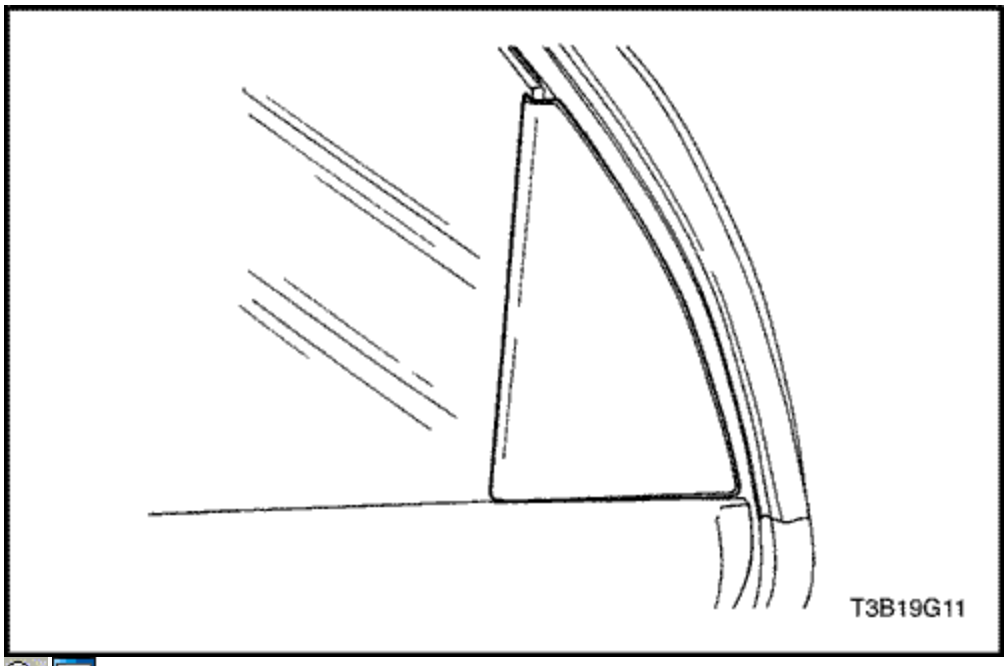
Deck Lid Sill Plate Cover (Notchback)
Removal Procedure

1. Remove the rear seatback. Refer to *Section 9H, Seats.*
2. Remove the plastic retaining clips and the deck lid sill plate cover.



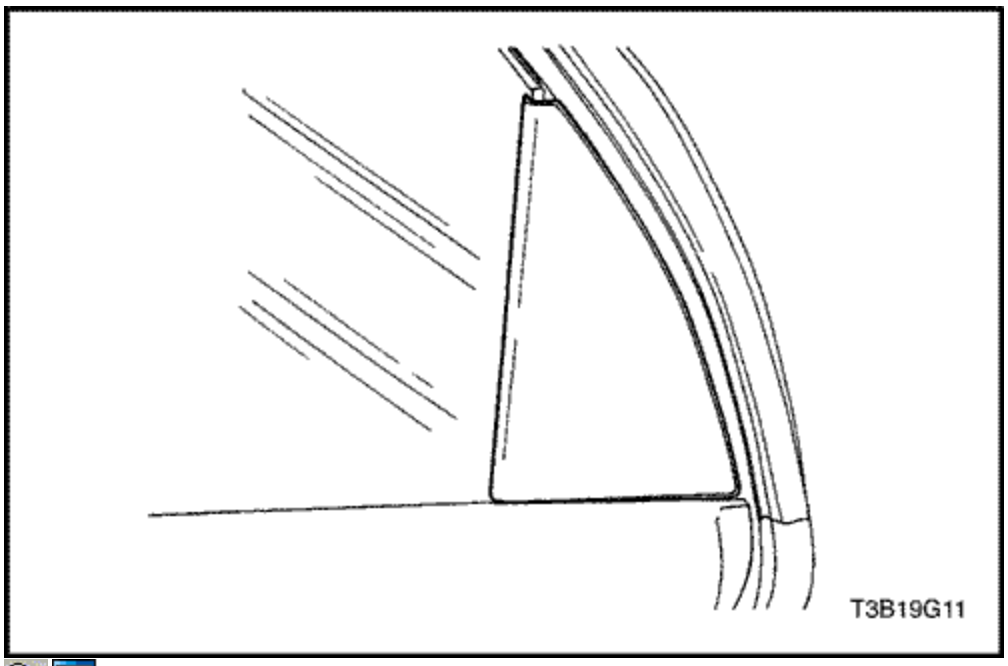
Installation Procedure

1. Install the rear deck lid sill plate cover with the plastic retaining clips.
2. Install the rear seatback. Refer to *Section 9H, Seats.*



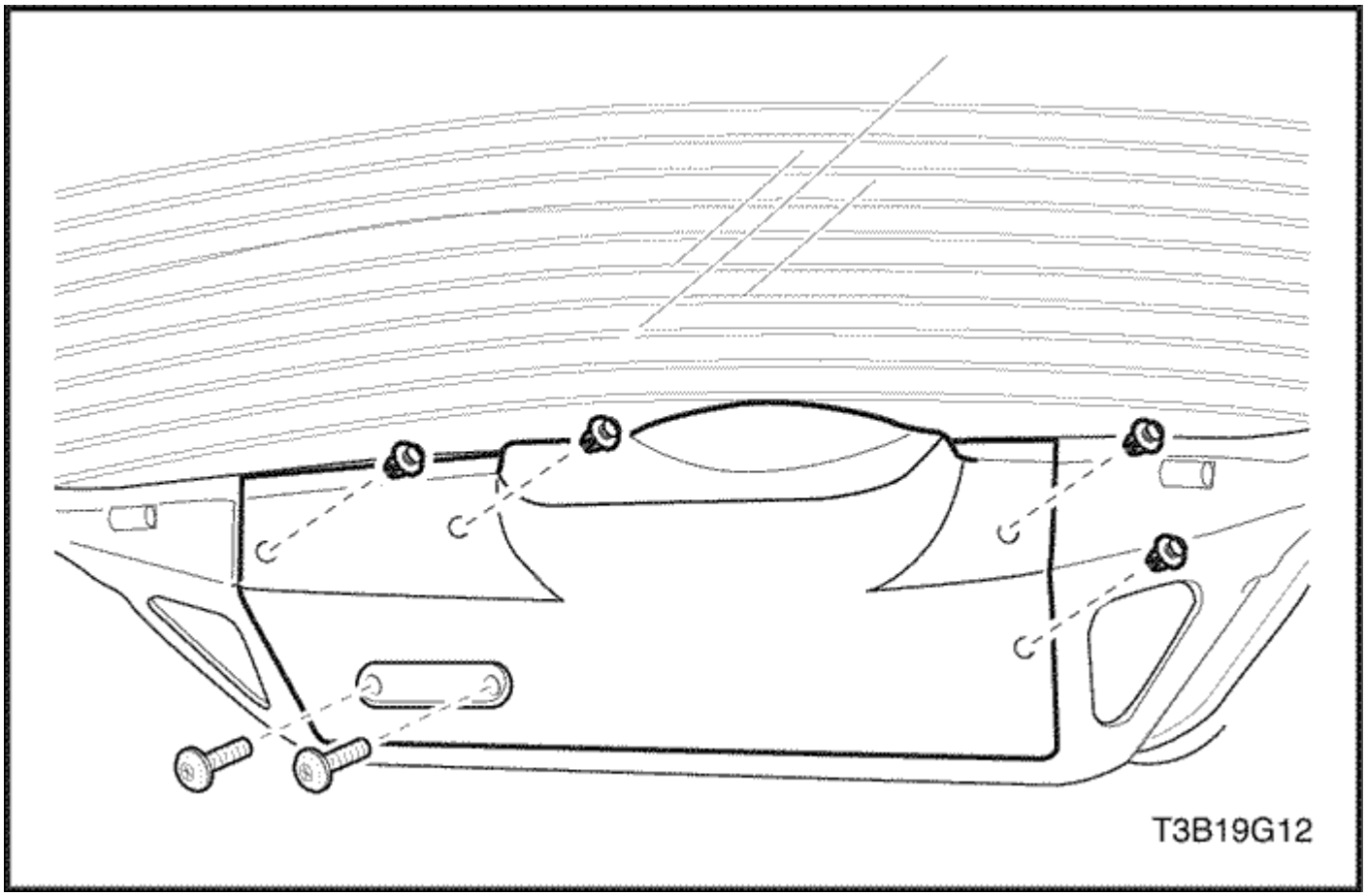
Rear Door Interior Garnish Molding
Removal Procedure

1. Pry off the rear door interior garnish molding.



Installation Procedure

1. Install the rear door interior garnish molding.

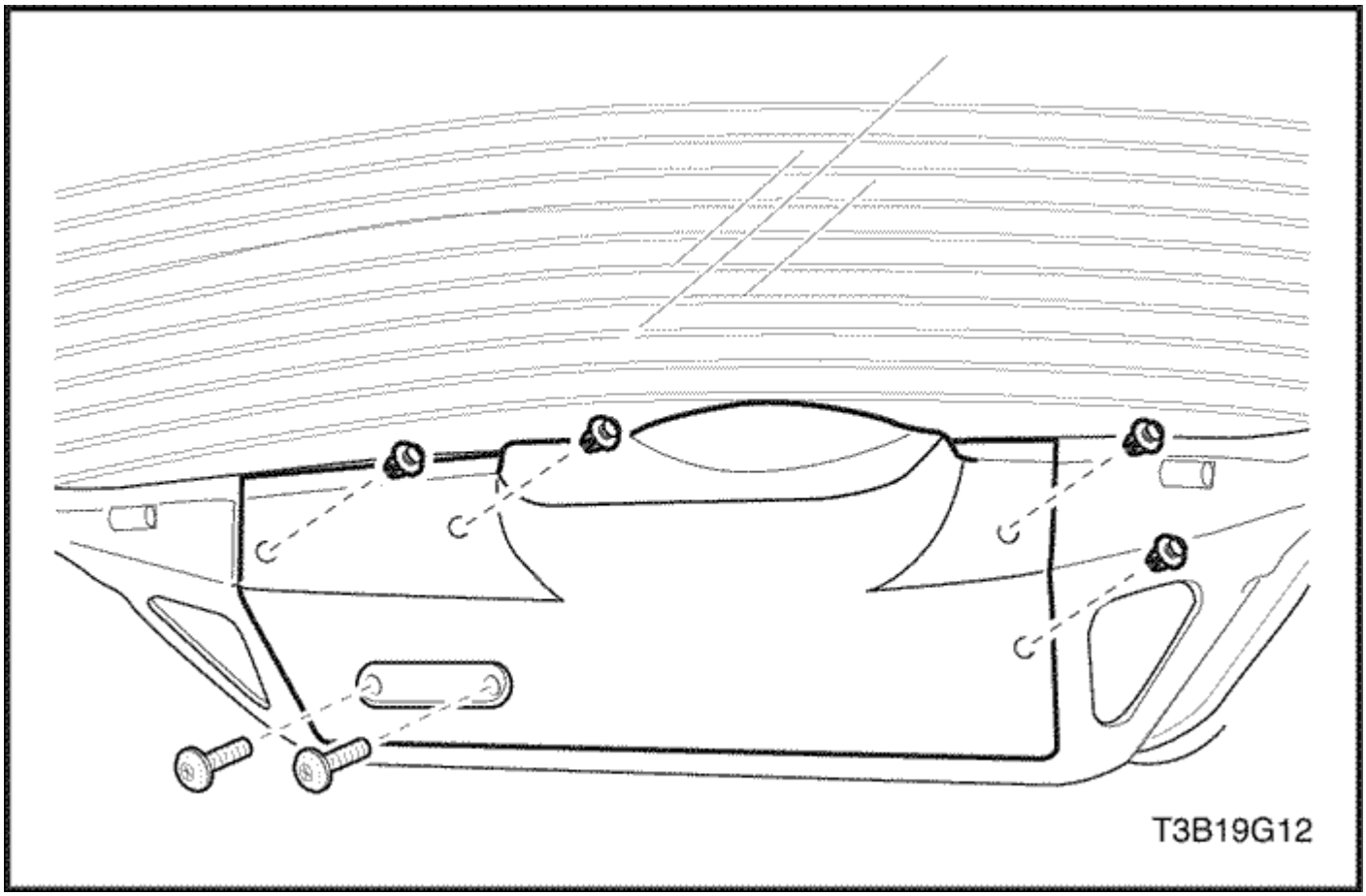


Hatchback Door Lower Garnish Molding
Tools Required

KM-475-B Trim Remover
Removal Procedure

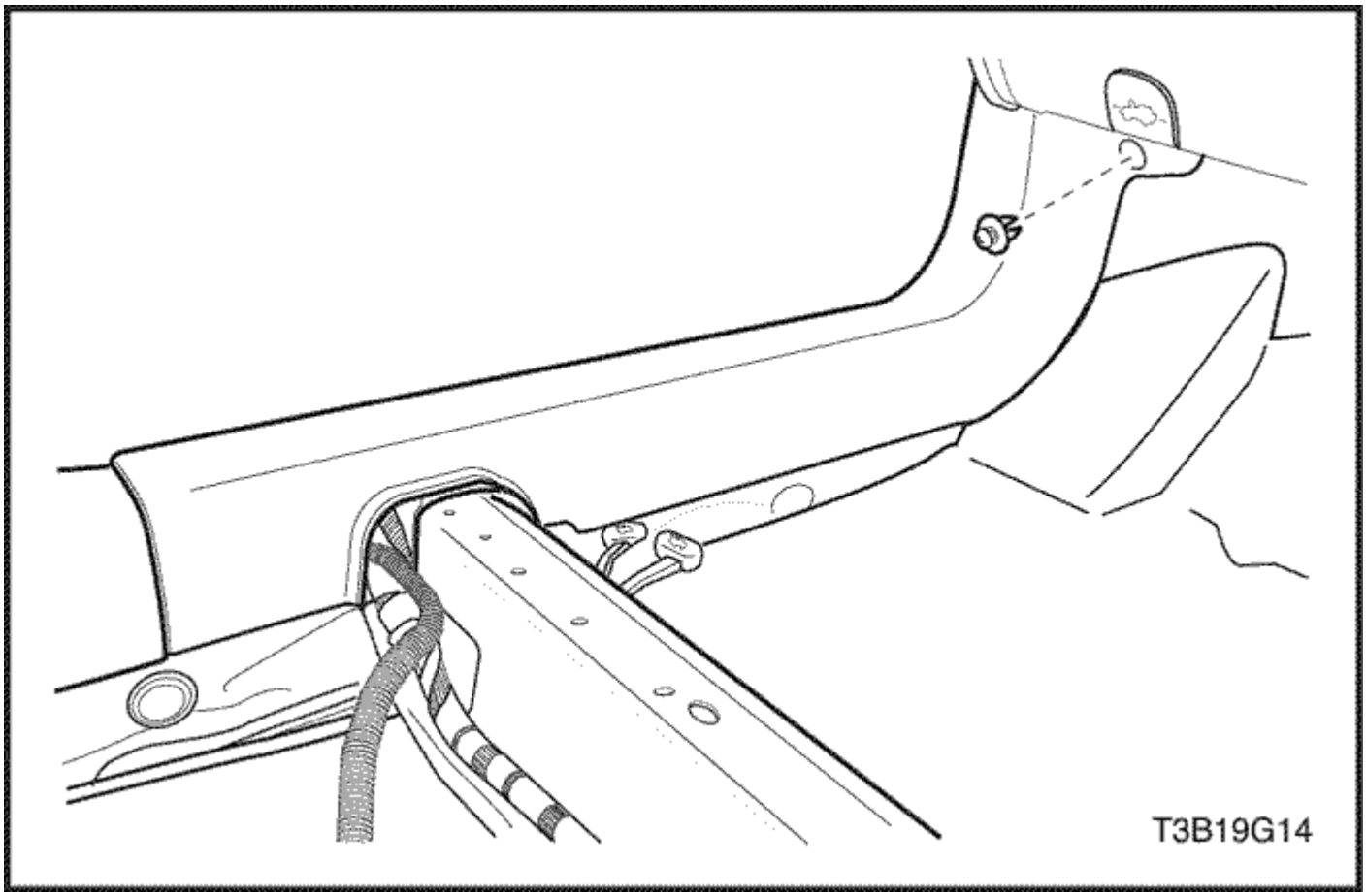
1. Open the hatchback door.
2. Remove the lower garnish molding clips using the trim remover KM-475-B.

3. Remove the lower garnish molding.



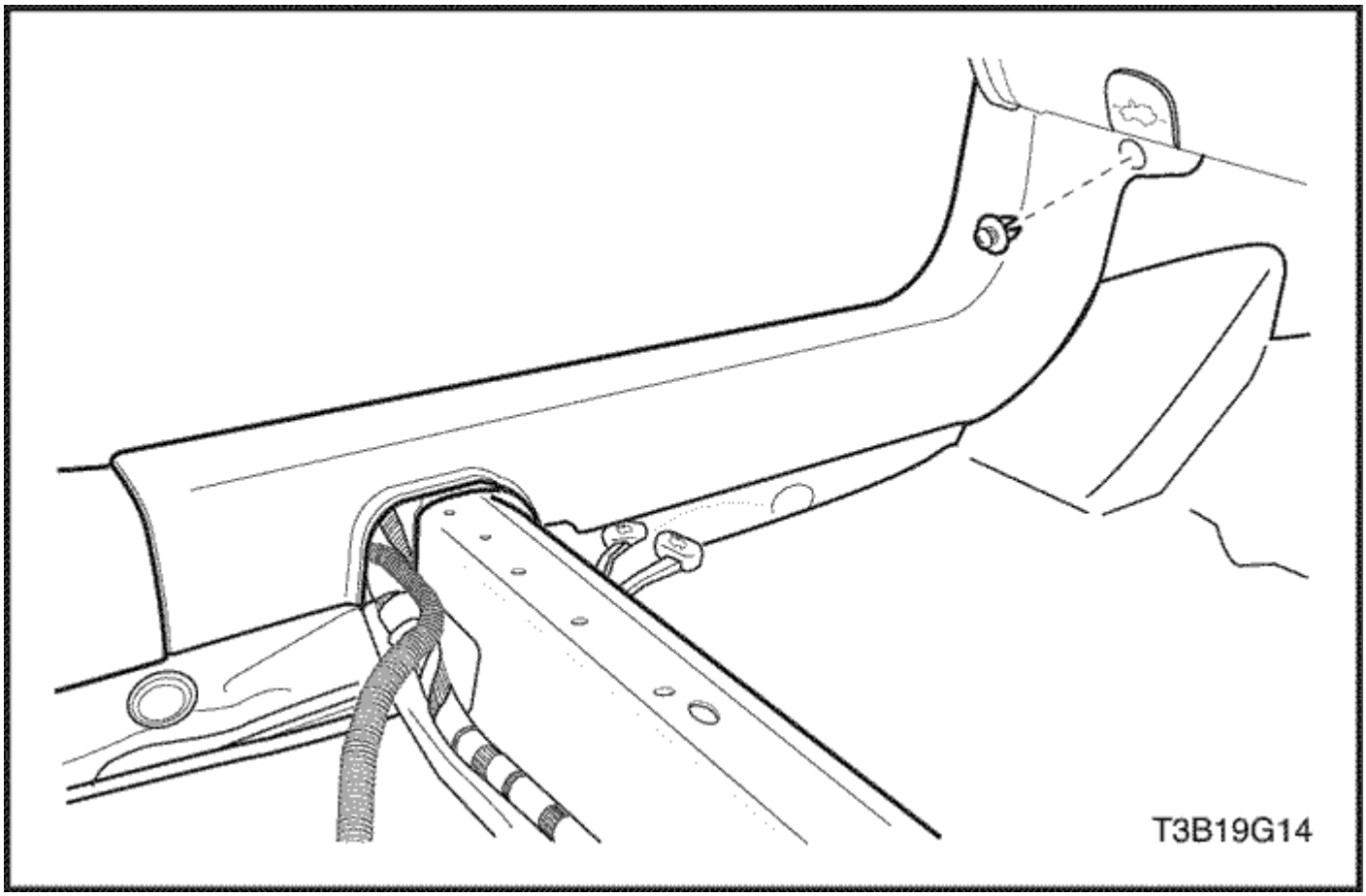
Installation Procedure

1. Install the lower garnish molding with the clips.
2. Close the hatchback door.



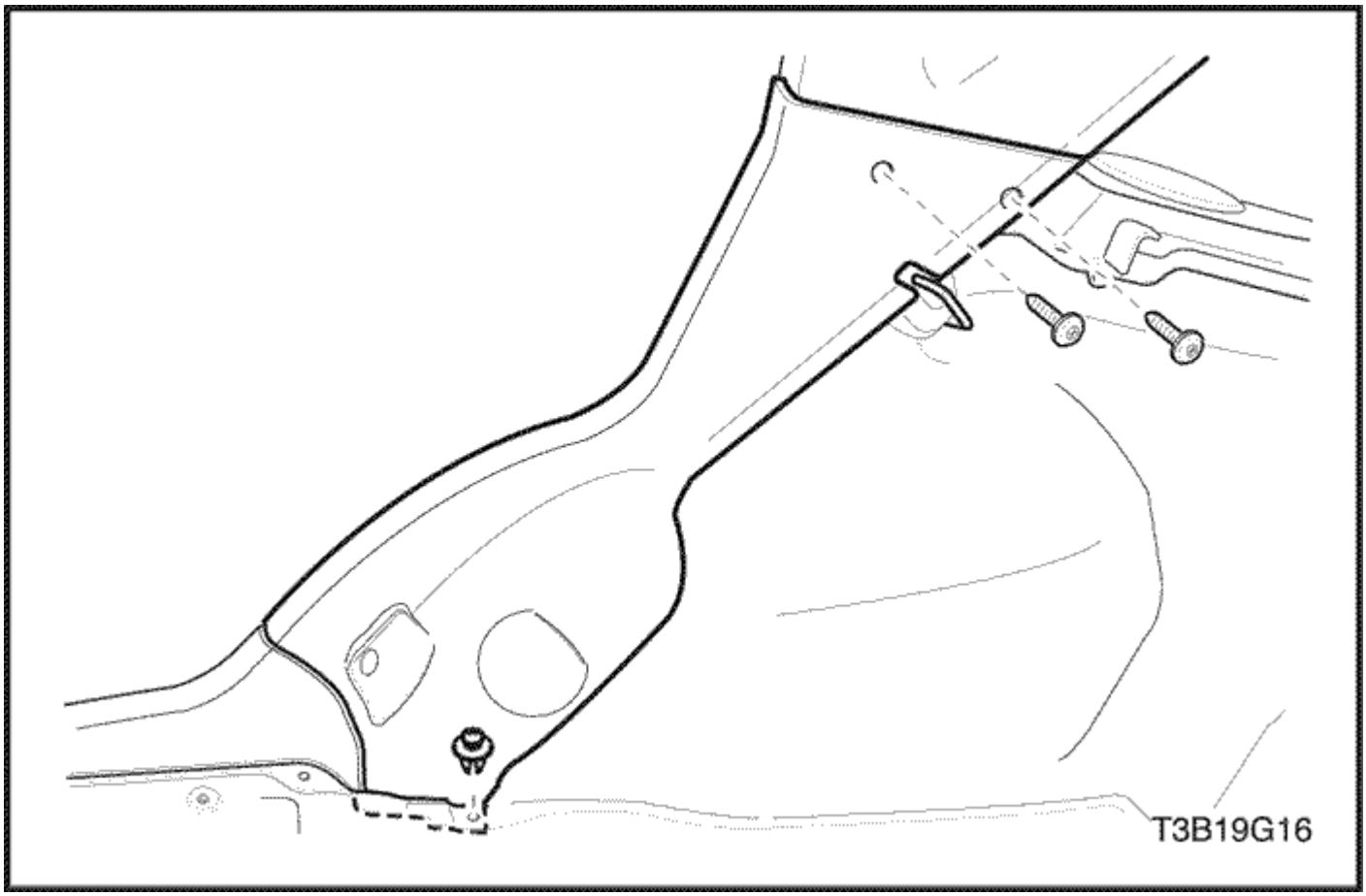
Front Rocker Trim Panel
Removal Procedure

1. Remove the screw securing the front rocker trim panel.
2. Pry off the front rocker trim panel.



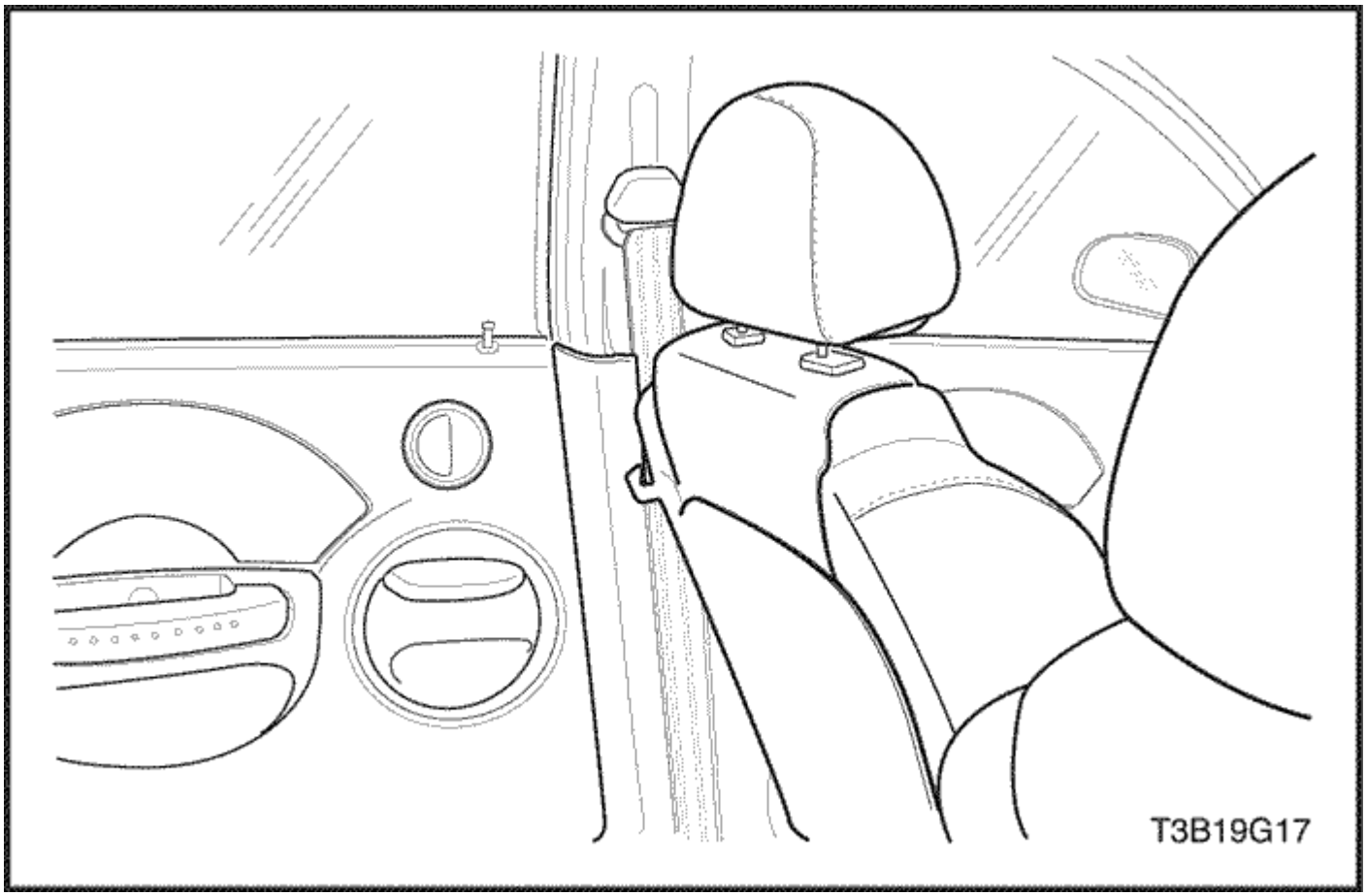
Installation Procedure

1. Install the front rocker trim panel with the screw.



Rear Rocker Trim Panel
Removal Procedure

1. Remove the rear seat cushion and rear seatback. Refer to *Section 9H, Seats.*
2. Remove the screw securing the rear rocker trim panel.
3. Pry off the rear rocker trim panel.

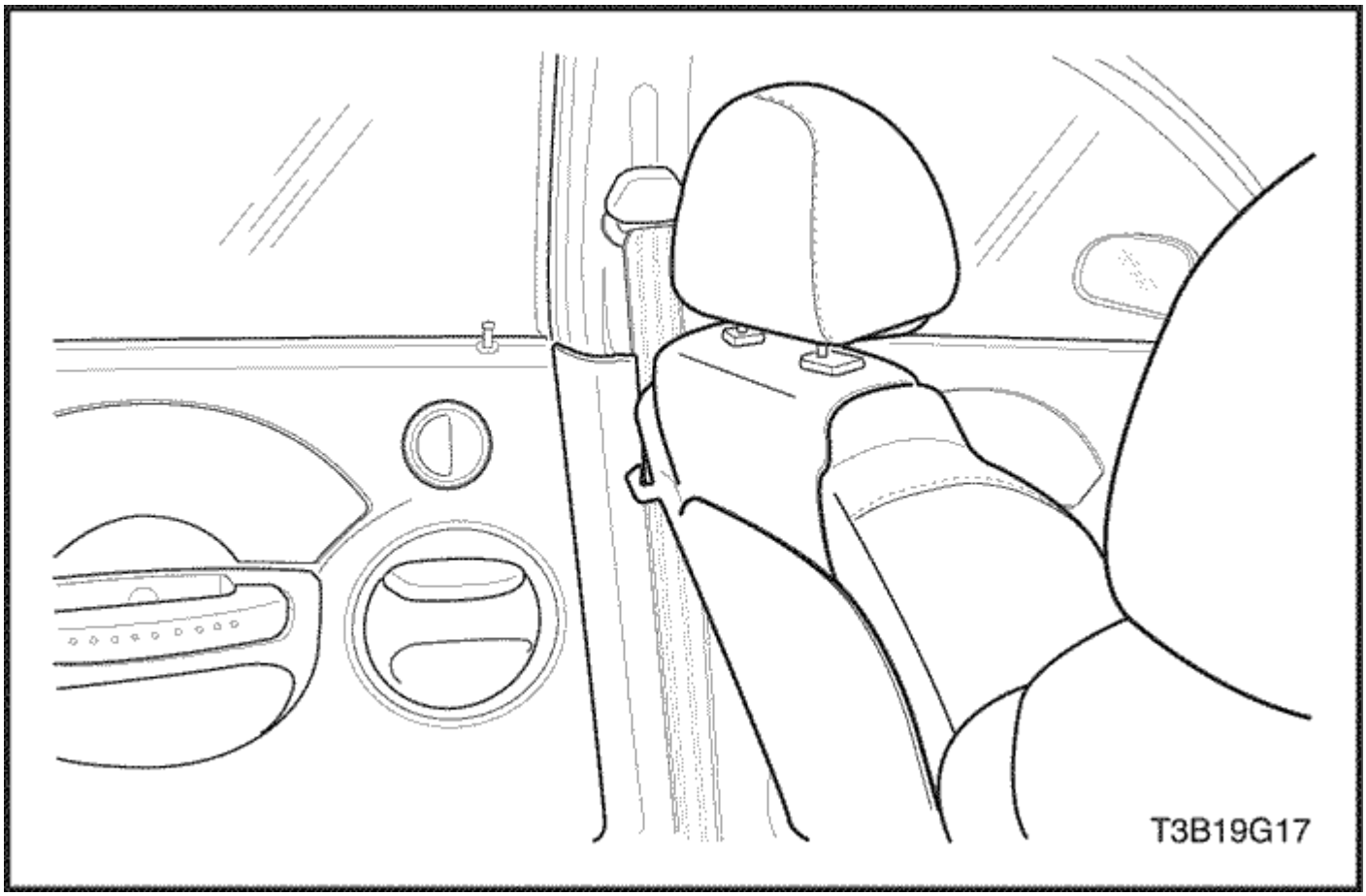


Installation Procedure

1. Install the rear rocker trim panel.
2. Install the rear rocker trim panel with the screw.
3. Install the rear seatback with the bolt.

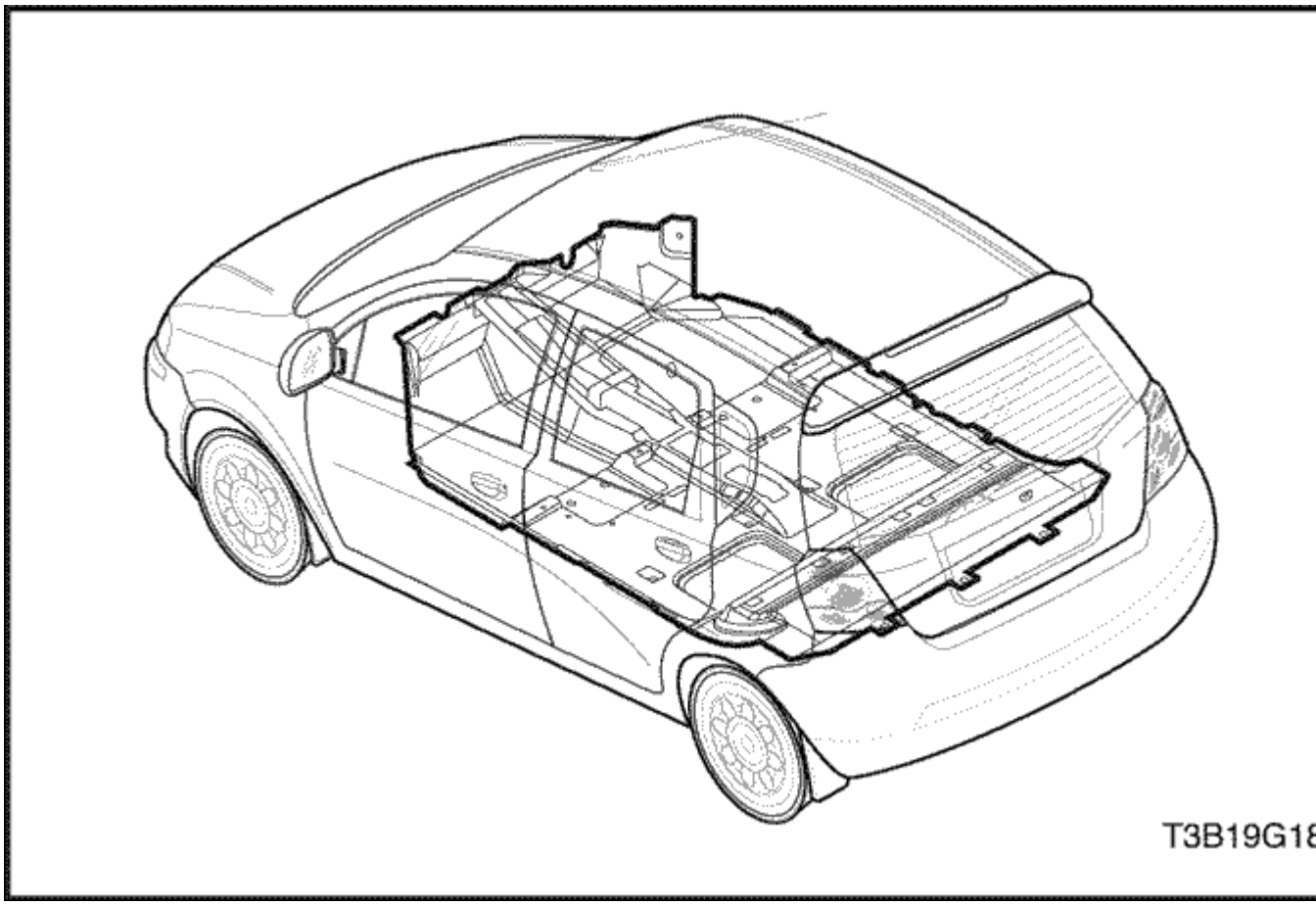
   Tighten
   Tighten the rear seatback bolt to 25 N•m (18 lb-ft).

4. Install the rear seat cushion. Refer to *Section 9H, Seats.*

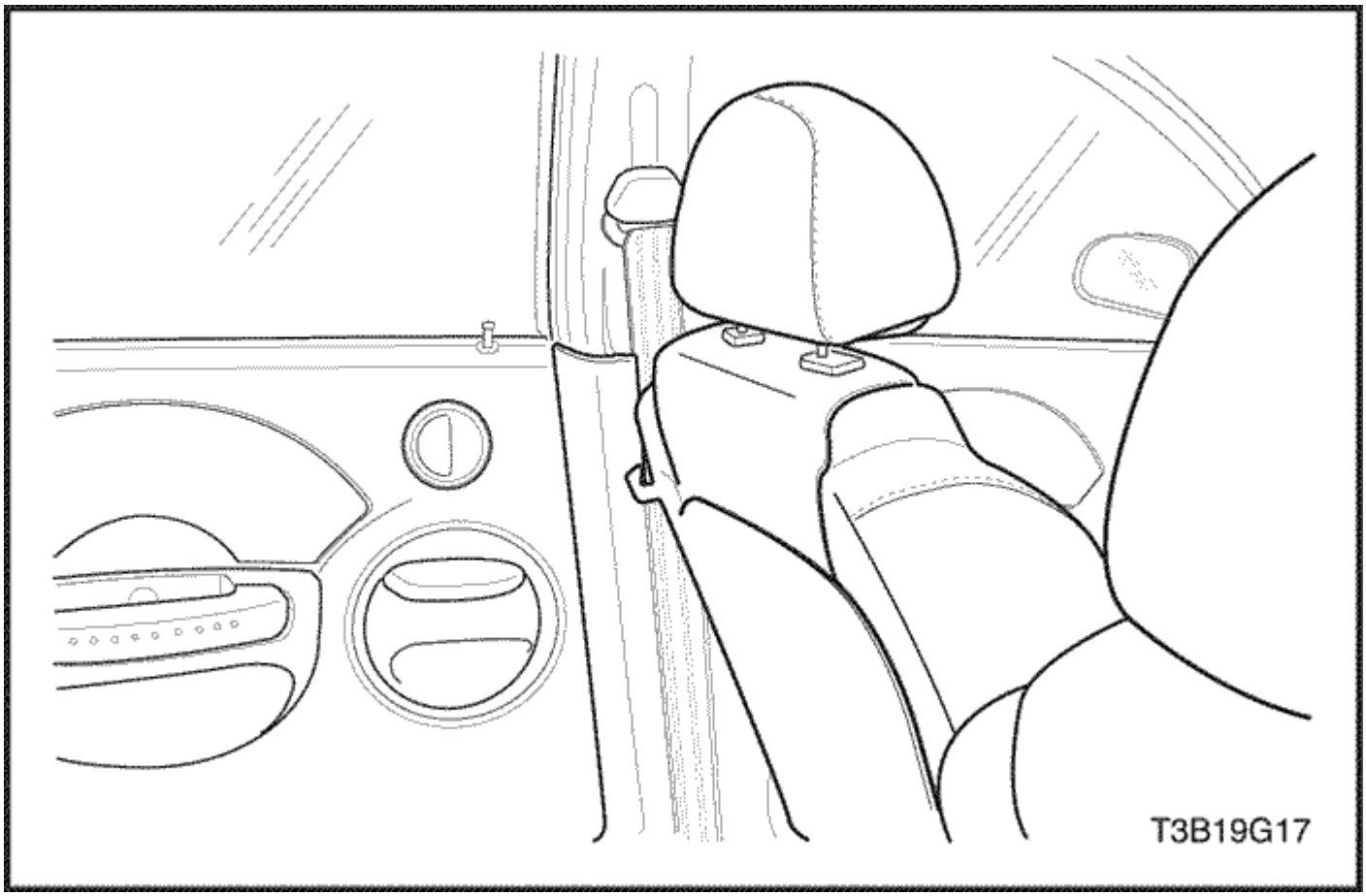


Floor Carpet
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the left and the right rear rocker trim panels. Refer to "Rear Rocker Trim Panel" in this section.
3. Remove the bolts and the left and the right lower front seat belt anchors from the B-pillar.
4. Remove the left and the right lower B-pillar trim panels. Refer to "Lower B-Pillar Trim Panel" in this section.



5. Remove the front seats. Refer to *Section 9H, Seats.*
6. Pry off the left and the right front rocker trim panels.
7. Remove the floor console. Refer to "Floor Console" in this section.
8. Remove the floor carpet.



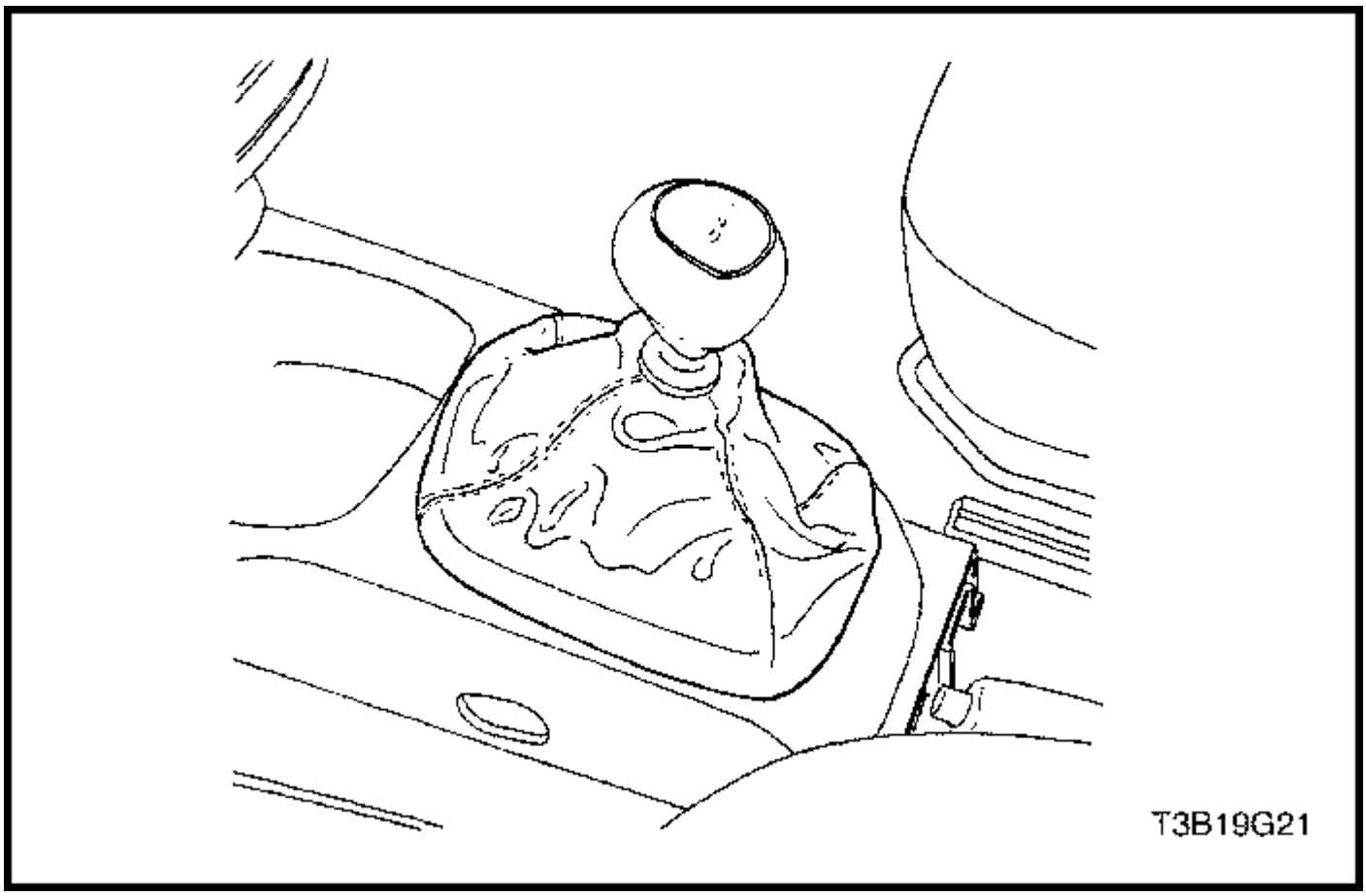
Installation Procedure

1. Install the floor carpet.
2. Install the floor console. Refer to "Floor Console" in this section
3. Install the left and the right front rocker trim panels.
4. Install the front seats. Refer to *Section 9H, Seats.*
5. Install the left and the right lower B-pillar trim panels. Refer to "Lower B-Pillar Trim Panel" in this section
6. Install the left and the right lower front seat belt anchors to the B-pillar with the bolts.

   Tighten
   Tighten the seat belt anchor bolts to 38 N•m (28 lb-ft).

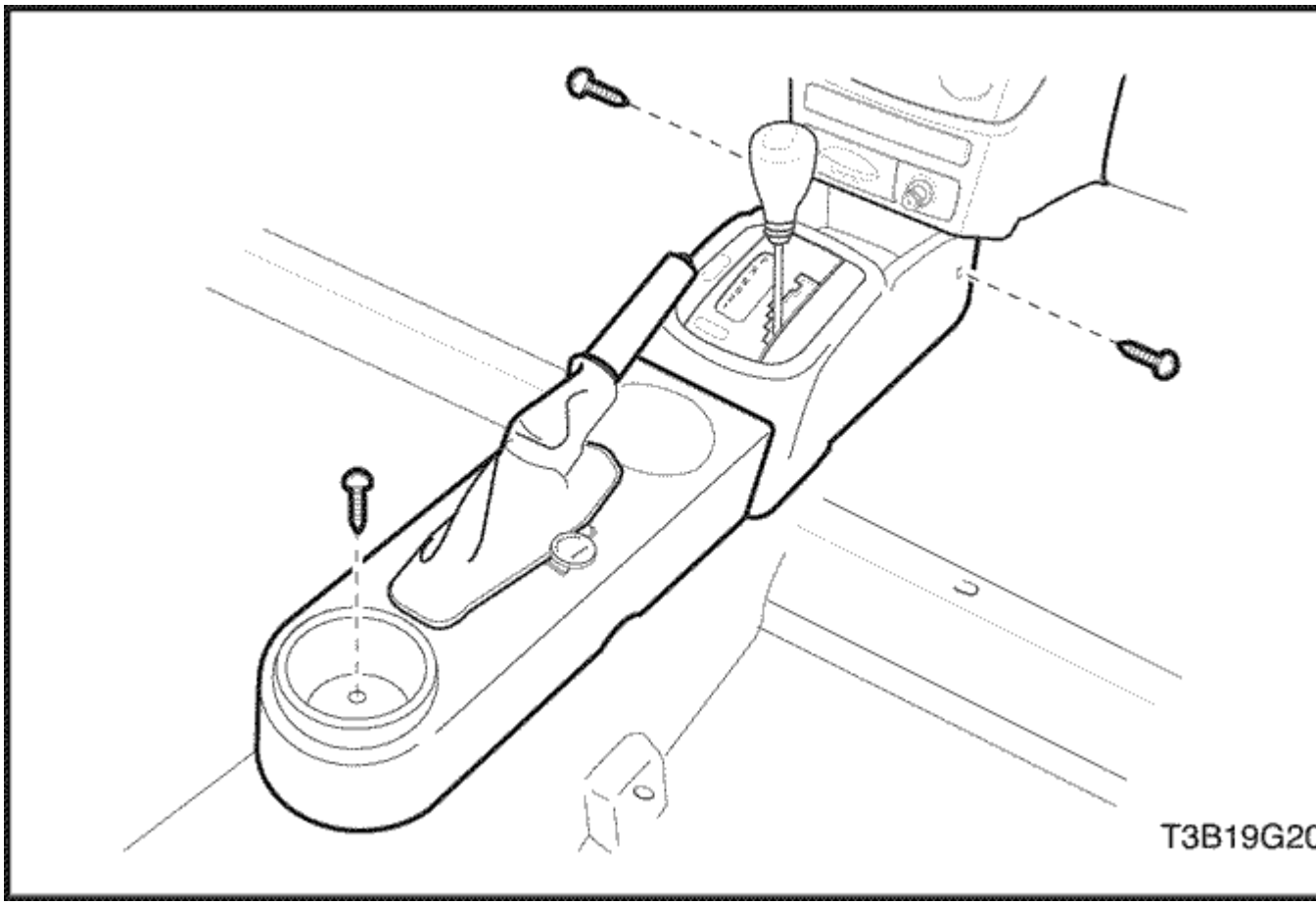
7. Install the rear seatback. Refer to *Section 9H, Seats.*

8. Install the left and the right rear rocker trim panels. Refer to "Rear Rocker Trim Panel" in this section
9. Connect the negative battery cable.

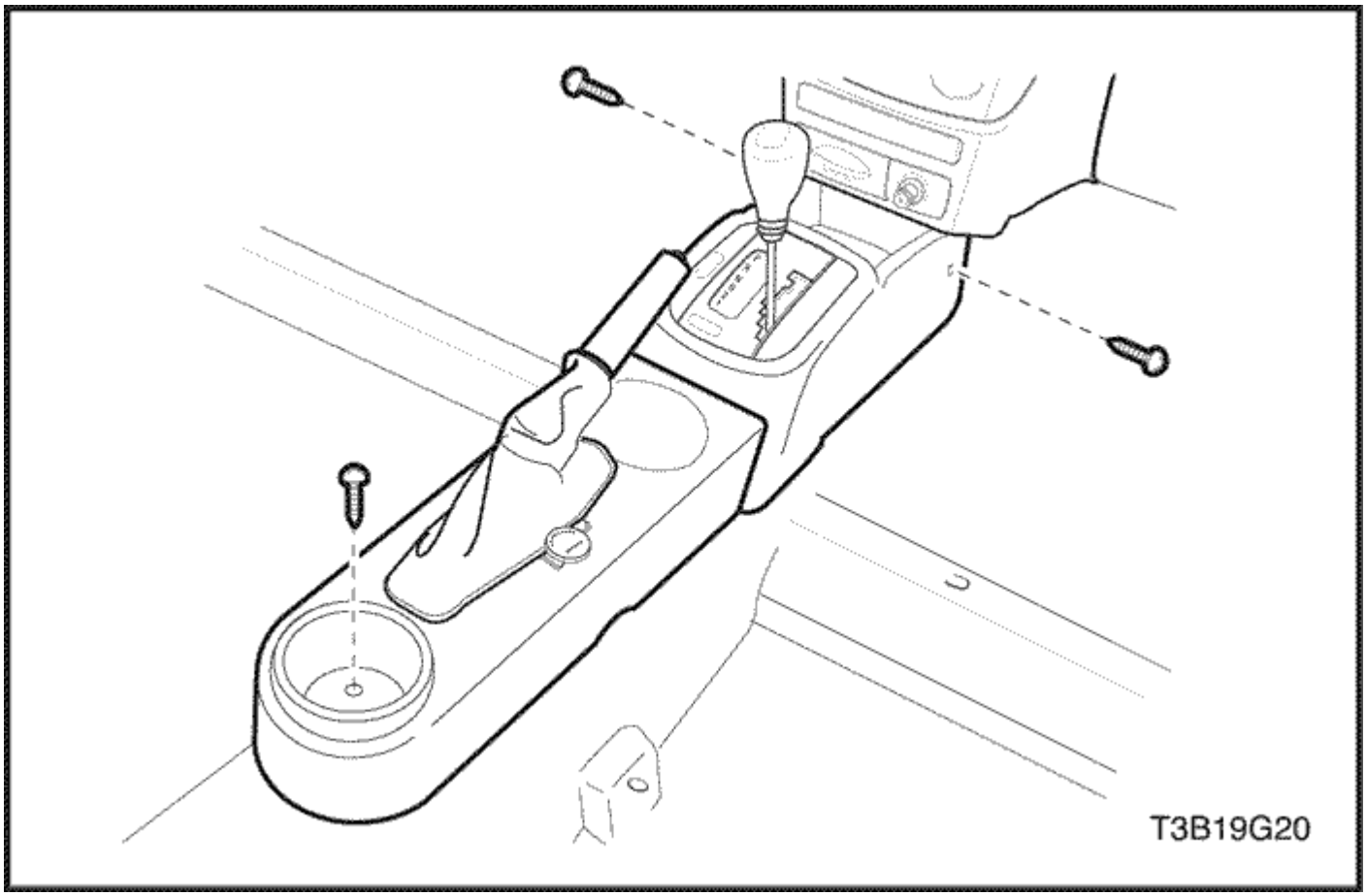


Floor Console
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the gearshift lever boot.



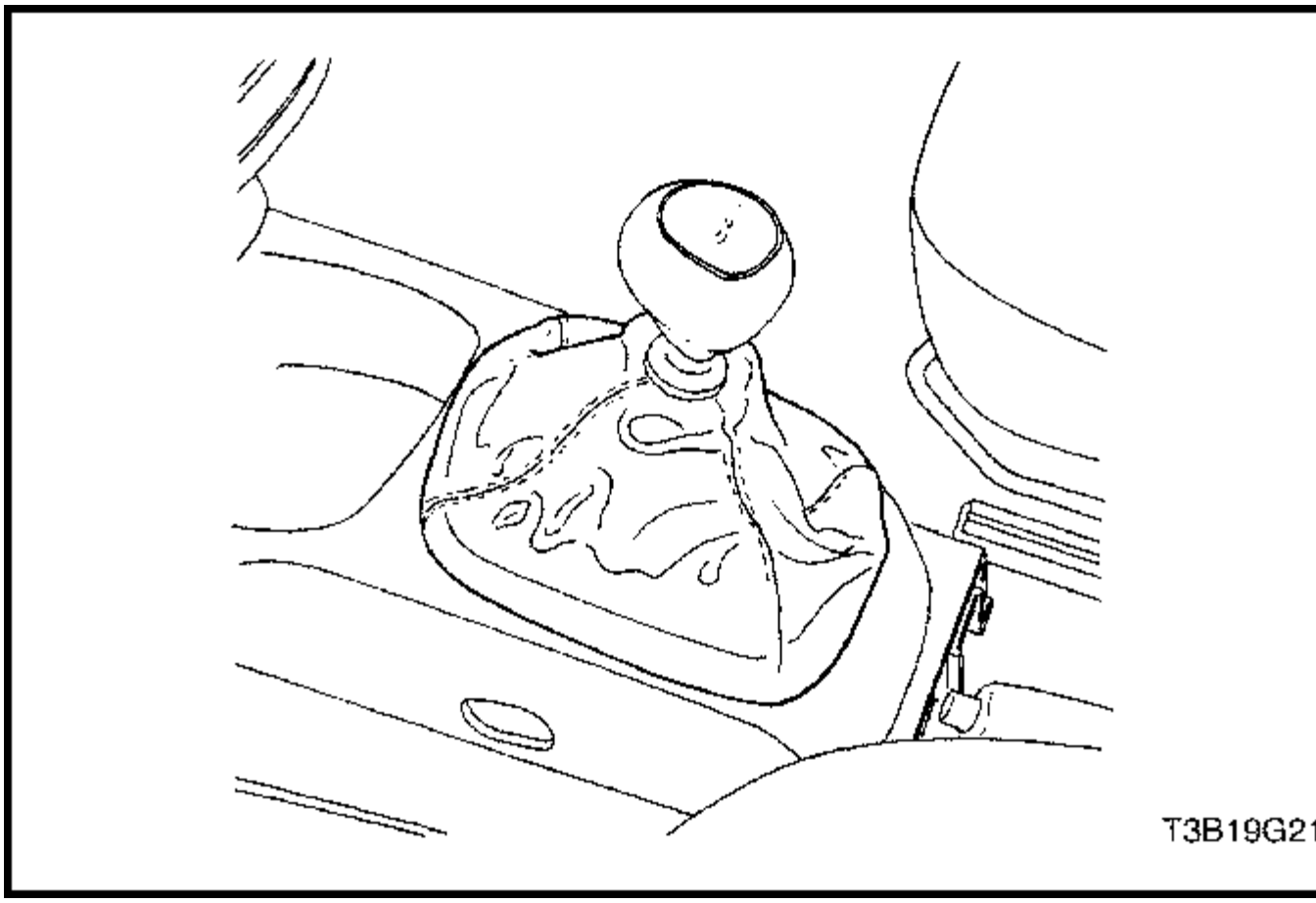
3. Remove the screws from the floor console.
4. Disconnect the electrical connector.
5. Remove the floor console.



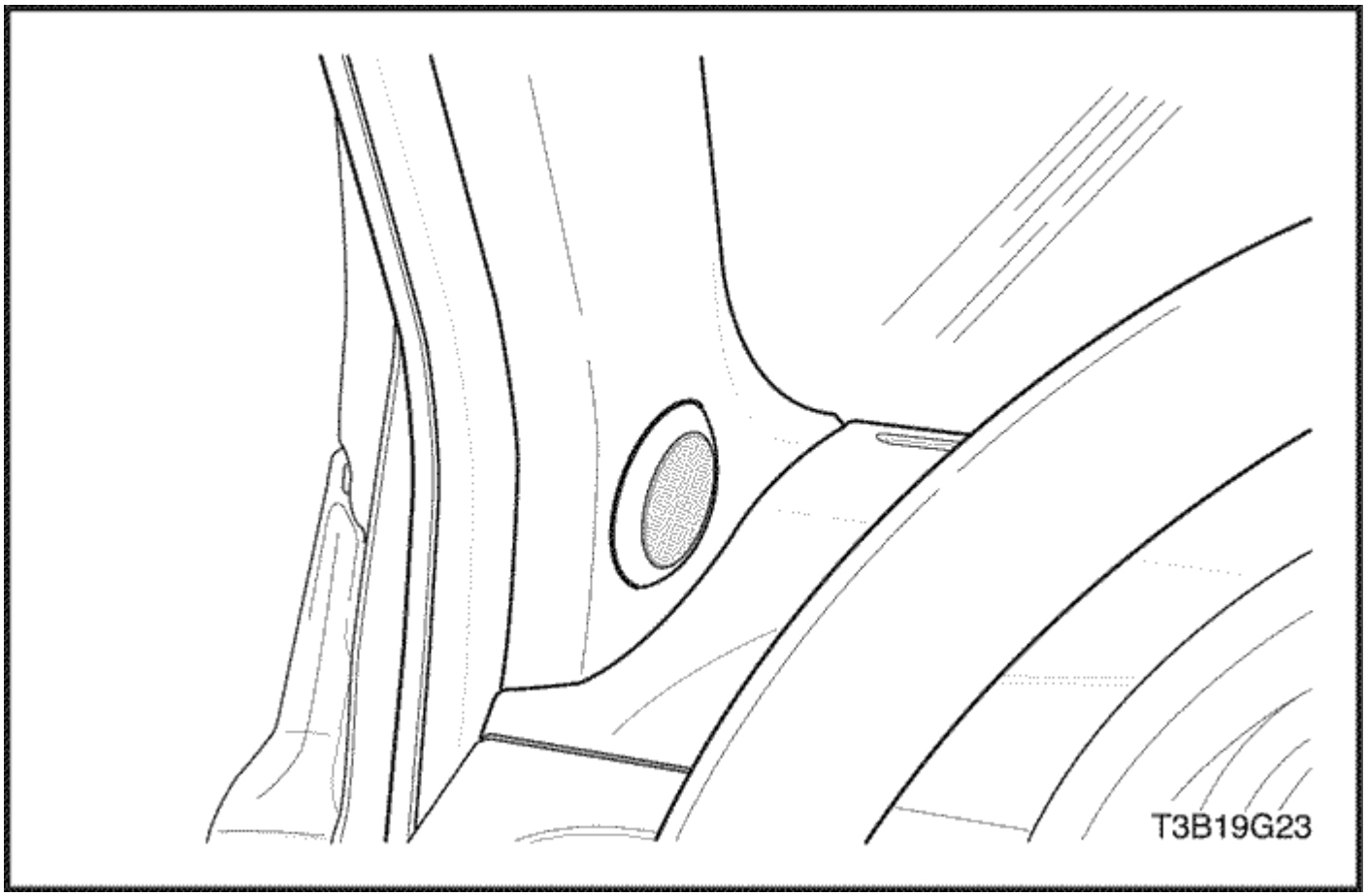
Installation Procedure

1. Connect the electrical connector.
2. Install the floor console with the screws.

   Tighten
   Tighten the floor console screws to 4 N•m (35 lb-in).

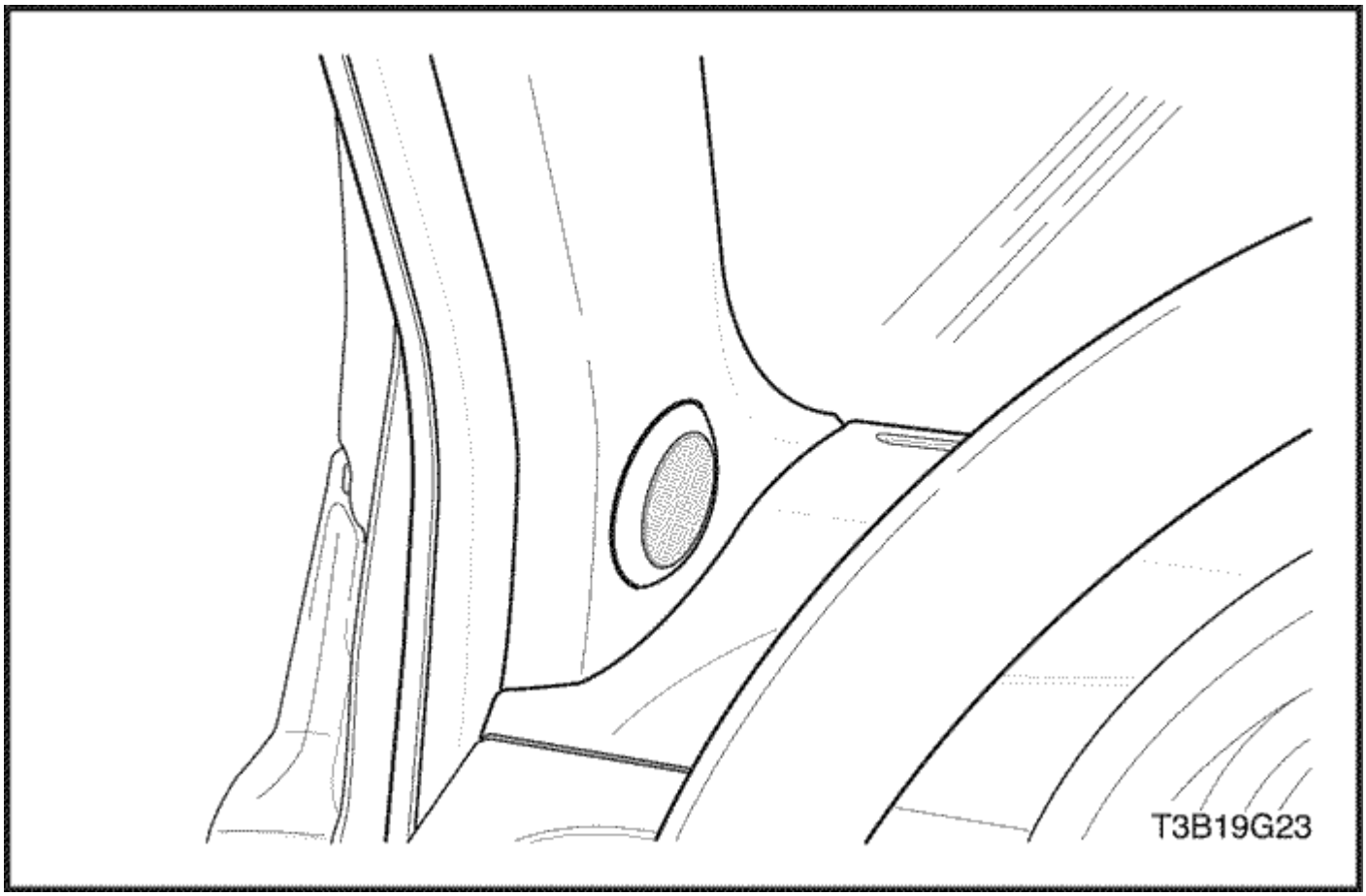


3. Install the gearshift lever boot.
4. Connect the negative battery cable.



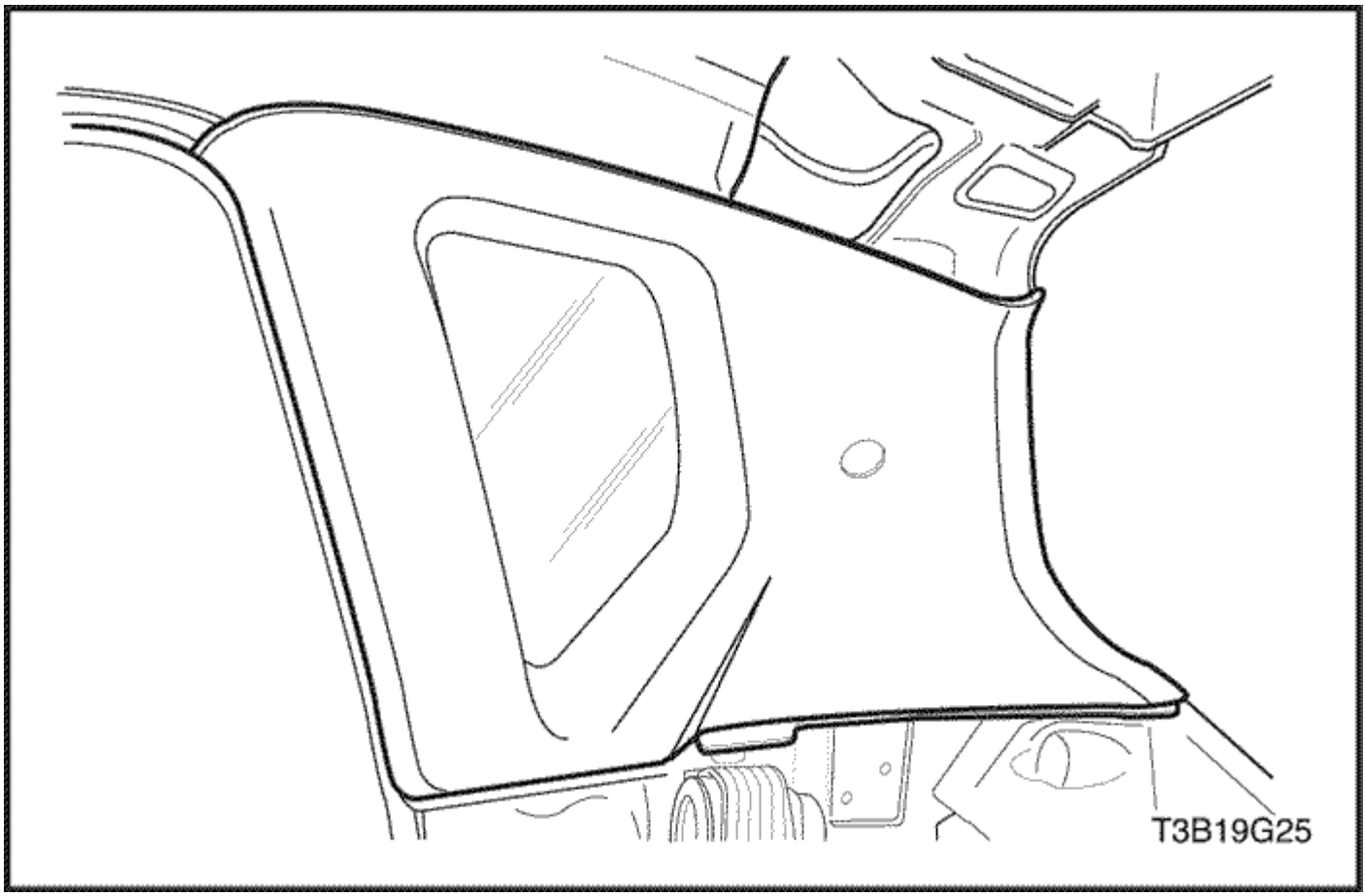
A-Pillar Trim Panel
Removal Procedure

1. Pry off the A-pillar trim panel.
2. Disconnect the electrical connector.



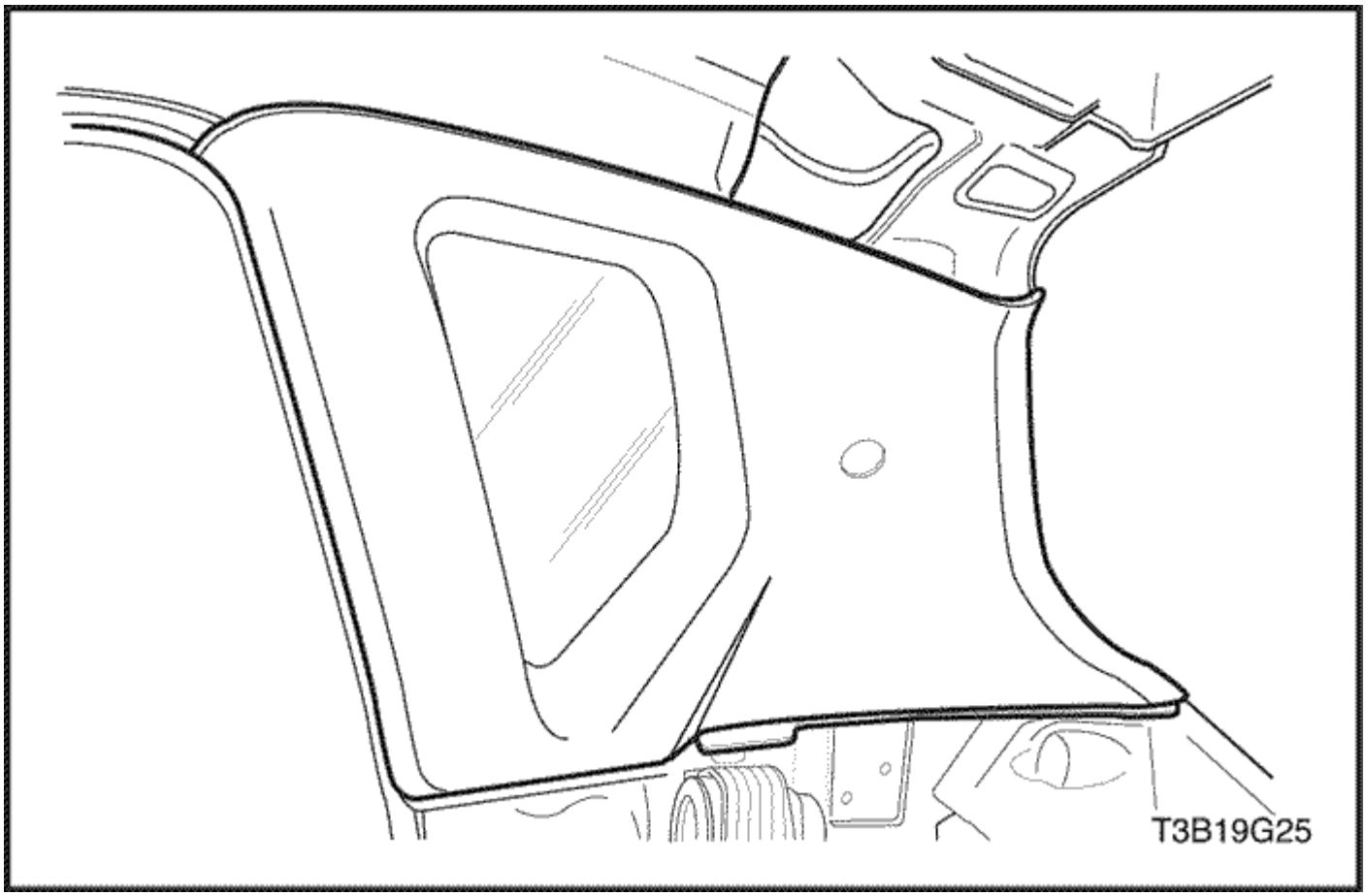
Installation Procedure

1. Connect the electical connector.
2. Install the A-pillar trim panel.



C-Pillar Trim Panel
Removal Procedure

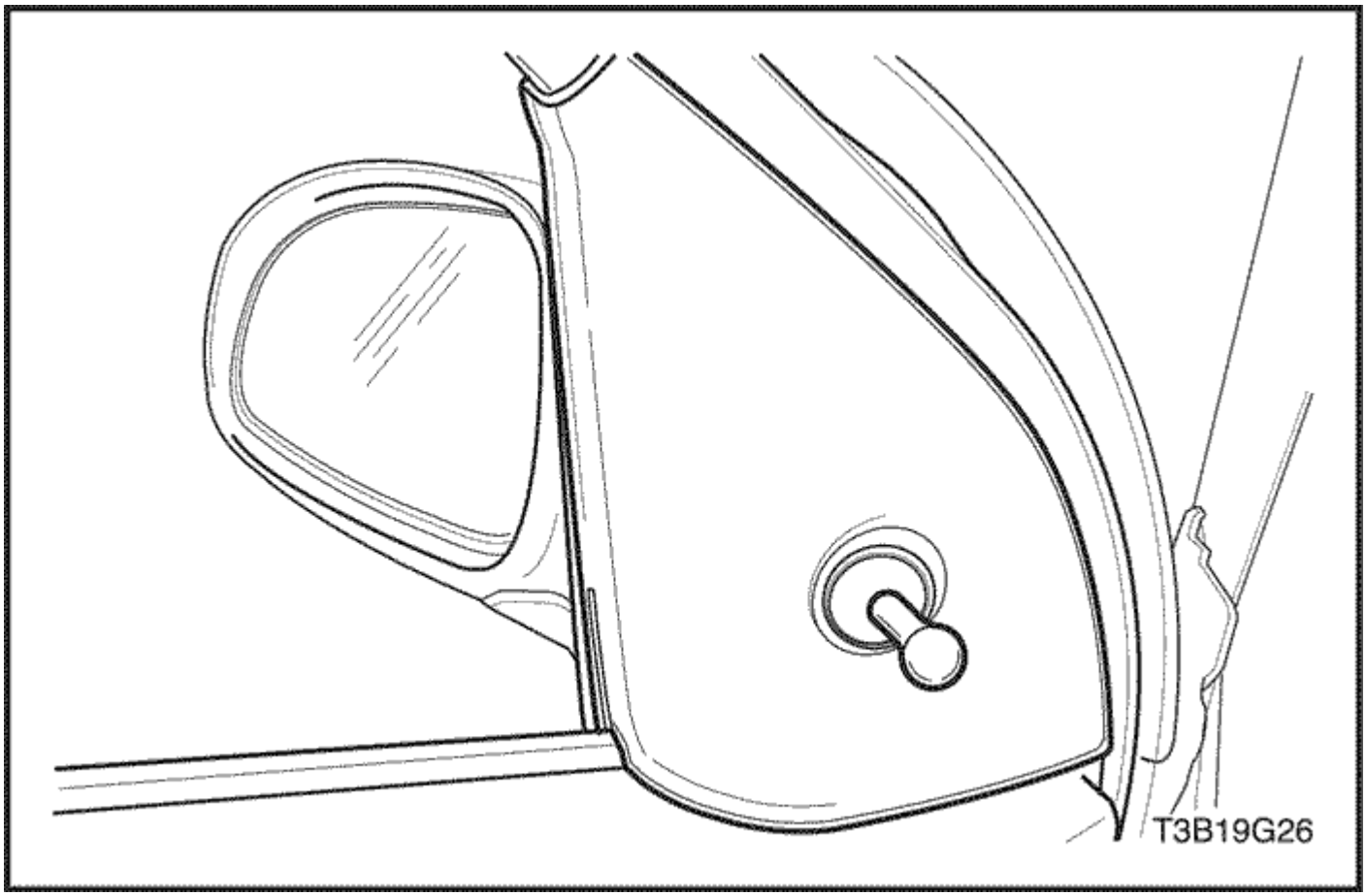
1. Remove the seat selt from the C-pillar trim panel.
2. Remove the rear rocker trim panel. Refer to "Rear Rocker Trim Panal" in this section.
3. Remove the C-pillar trim panel.



Installation Procedure

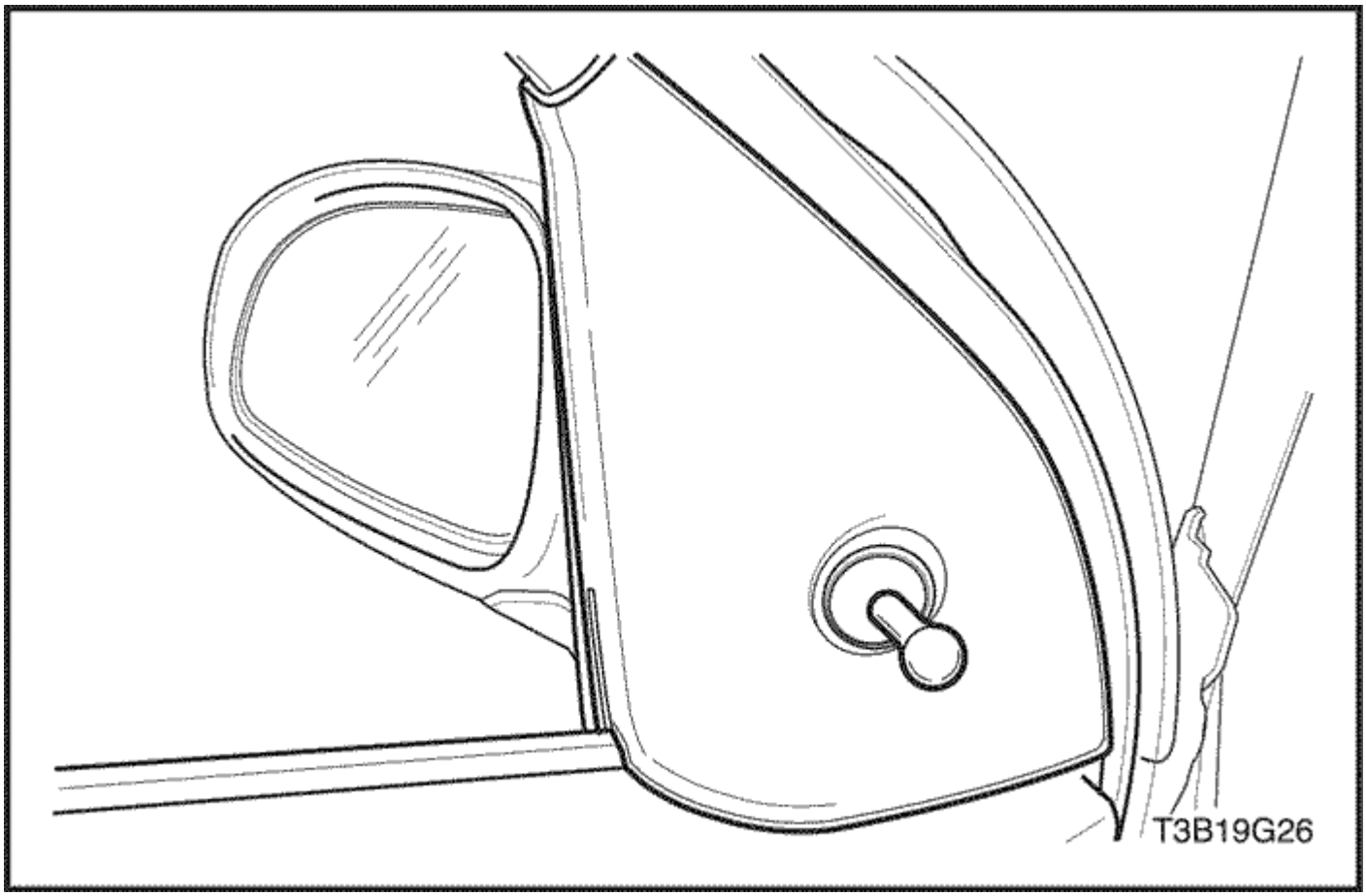
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the C-pillar trim panel.
2. Install the rear rocker trim panel. Refer to "Rear Rocker Trim Panal" in this section.
3. Install the seat belt from the C-pillar trim panel.



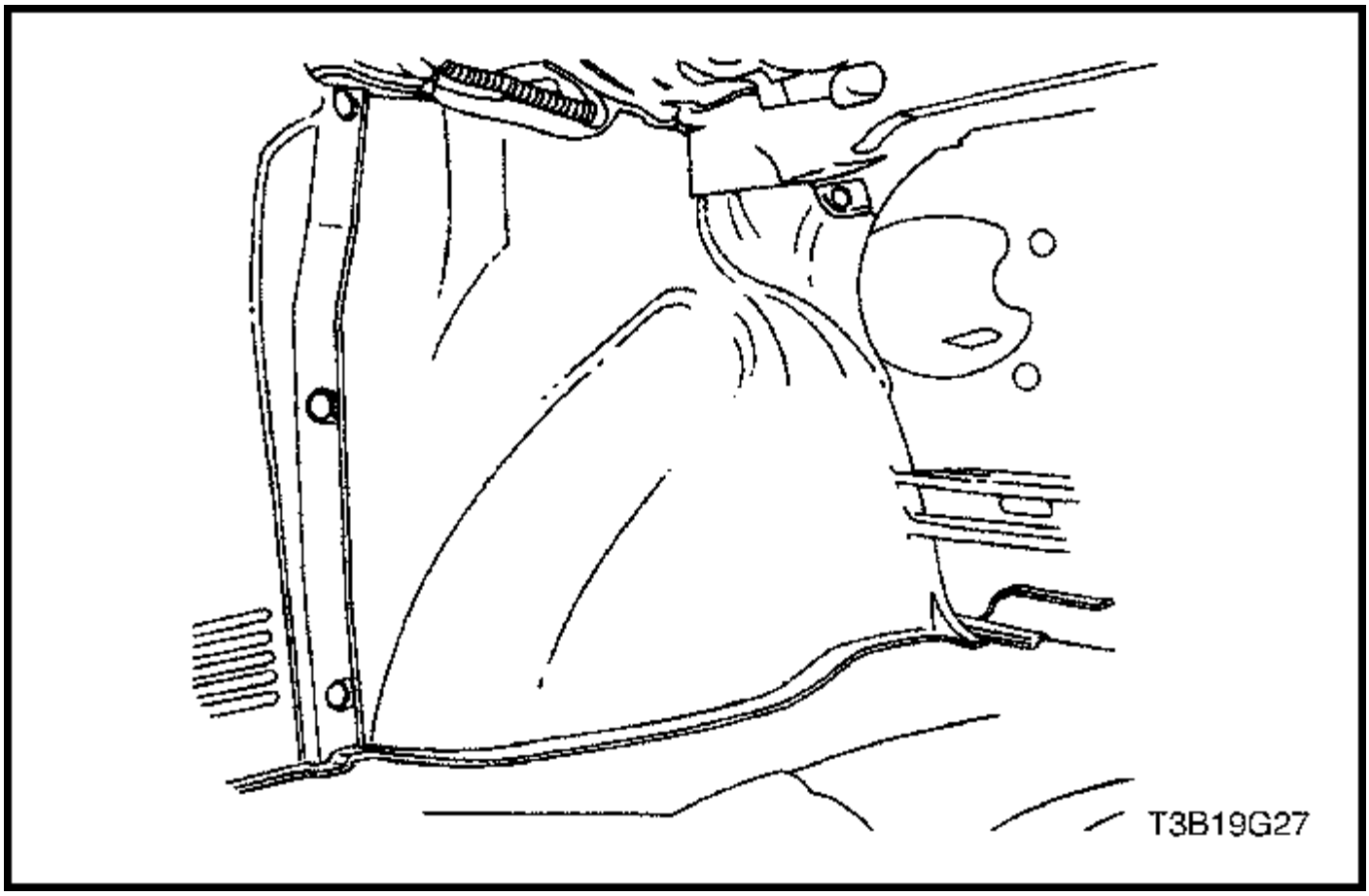
Front Door Escutcheon
Removal Procedure

1. Pry off the escutcheon.



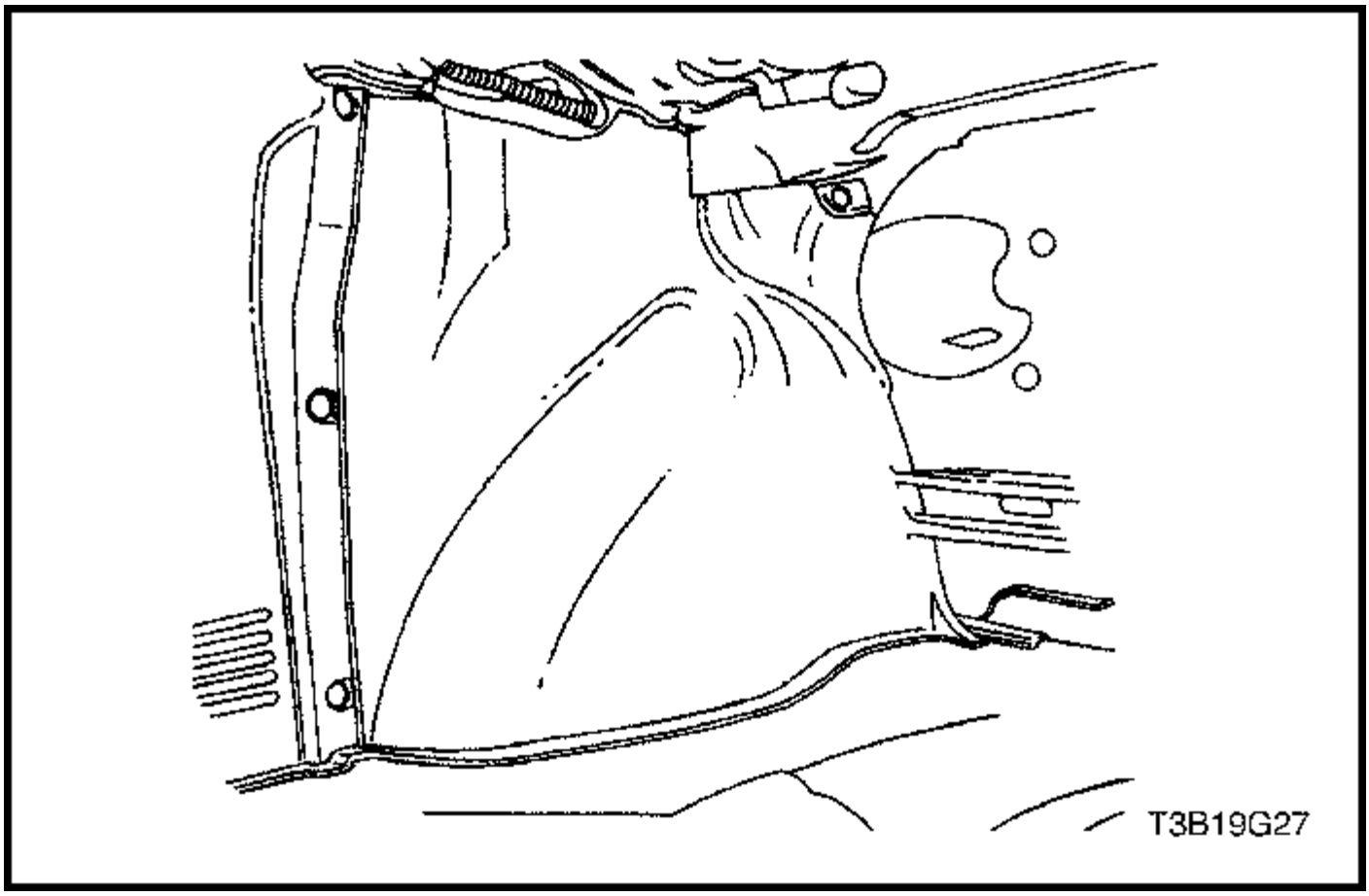
Installation Procedure

1. Install the escutcheon.



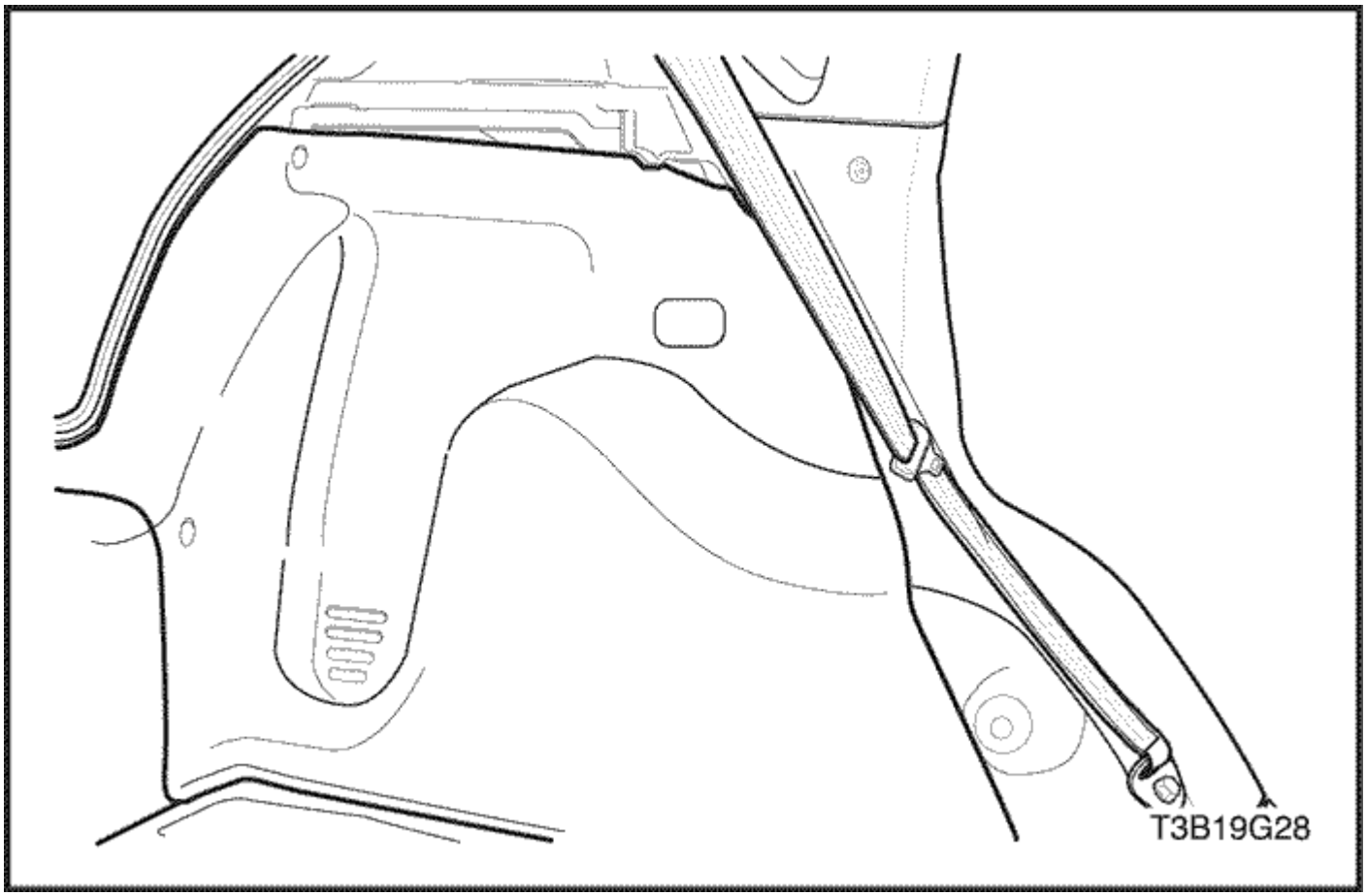
Luggage Compartment Wheelhouse Trim Panel (Notchback)
Removal Procedure

1. Remove the rear seatback. Refer to *Section 9H, Seats.*
2. Remove the plastic retaining clips and the rear seatback panel.
3. Remove the plastic retaining clips and the wheelhouse trim panel.



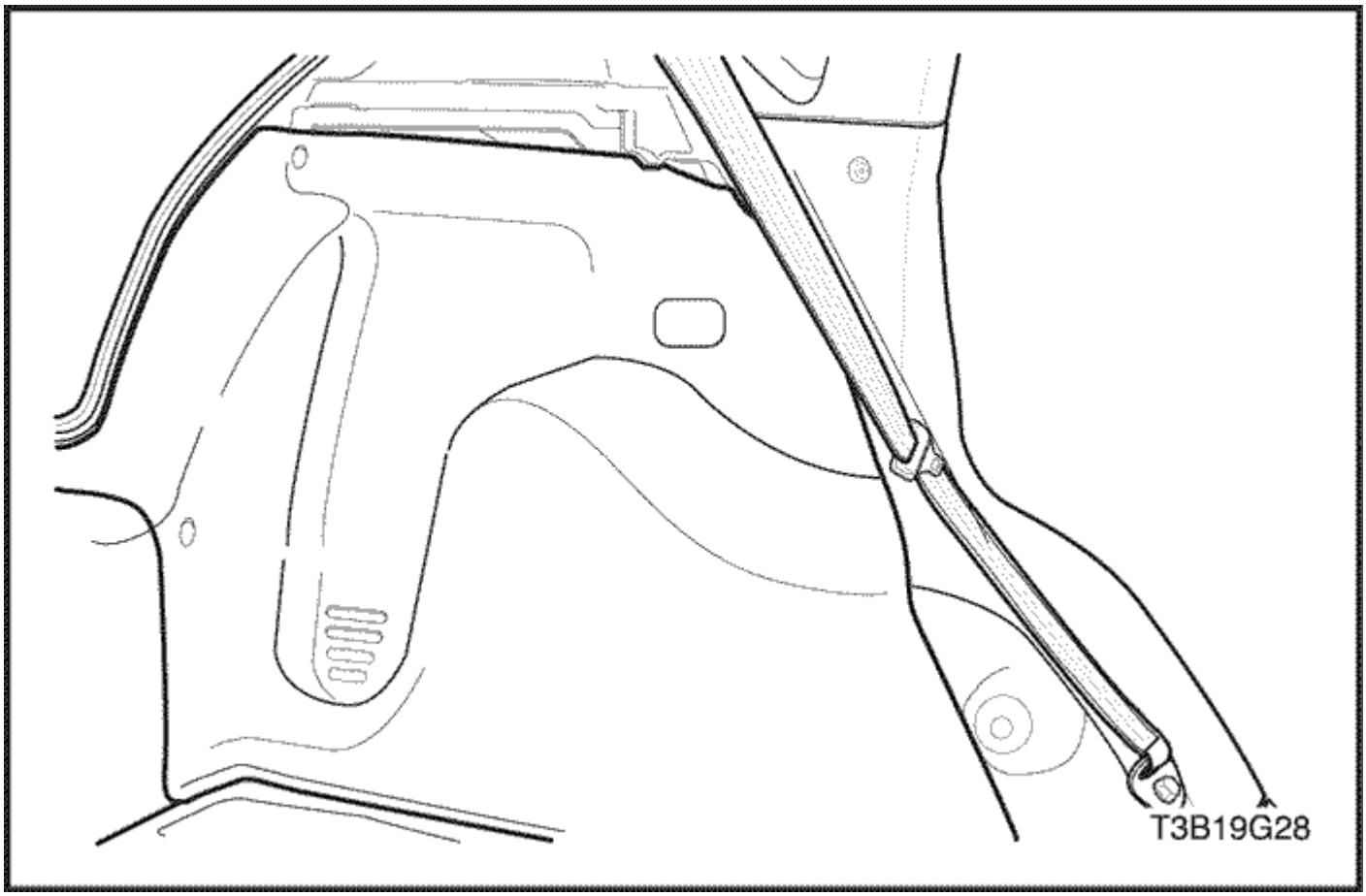
Installation Procedure

1. Install the wheelhouse trim panel with the plastic retaining clips.
2. Install the rear seatback panel with the plastic retaining clips.
3. Install the rear seatback. Refer to *Section 9H, Seats.*



Luggage Compartment Wheelhouse Trim Panel (Hatchback)
Removal Procedure

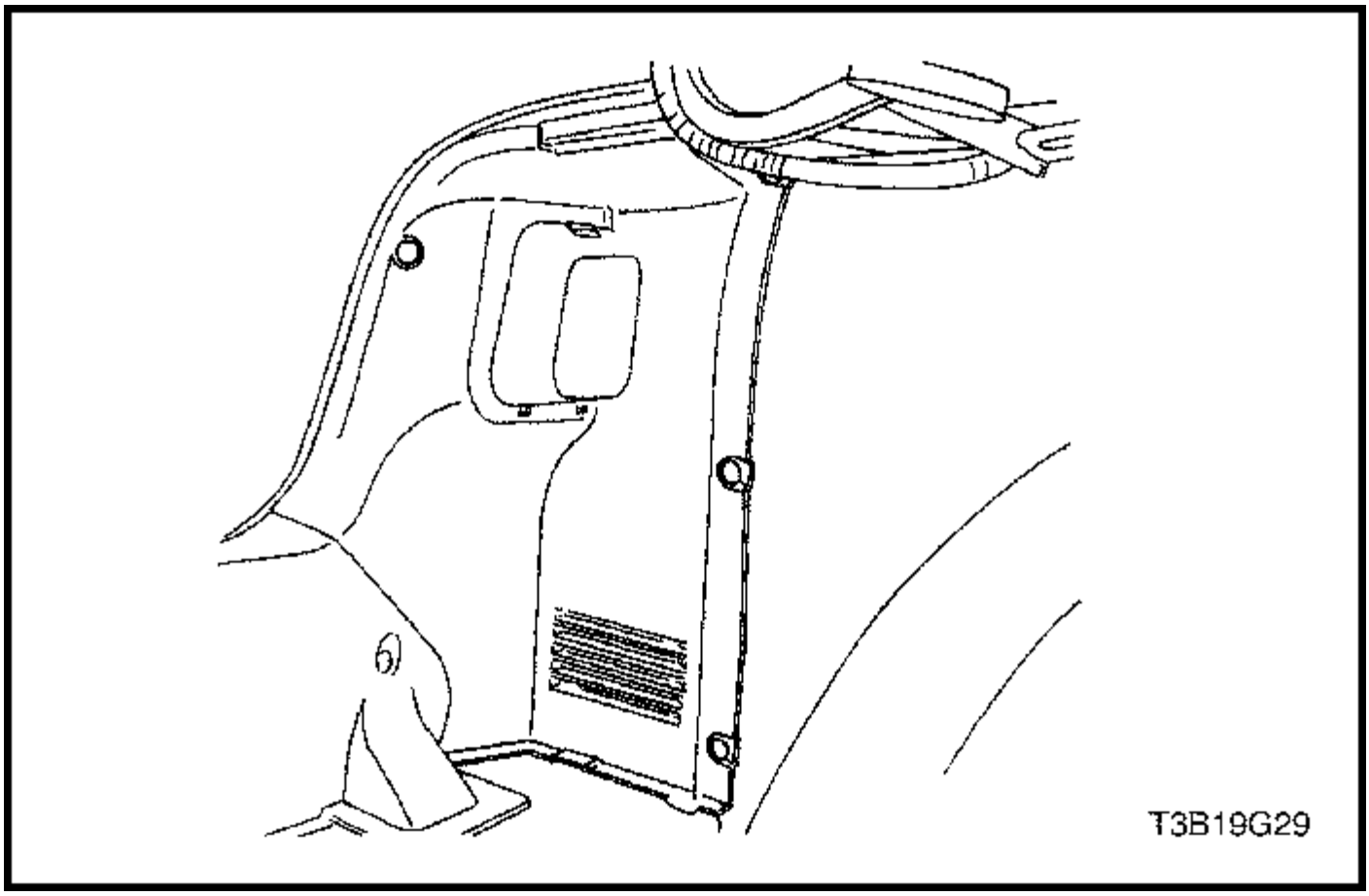
1. Remove the luggage compartment rear trim panel. Refer to "Luggage Compartment Rear Trim Panel" in this section.
2. Remove the clips and the wheelhouse trim panel.



Installation Procedure

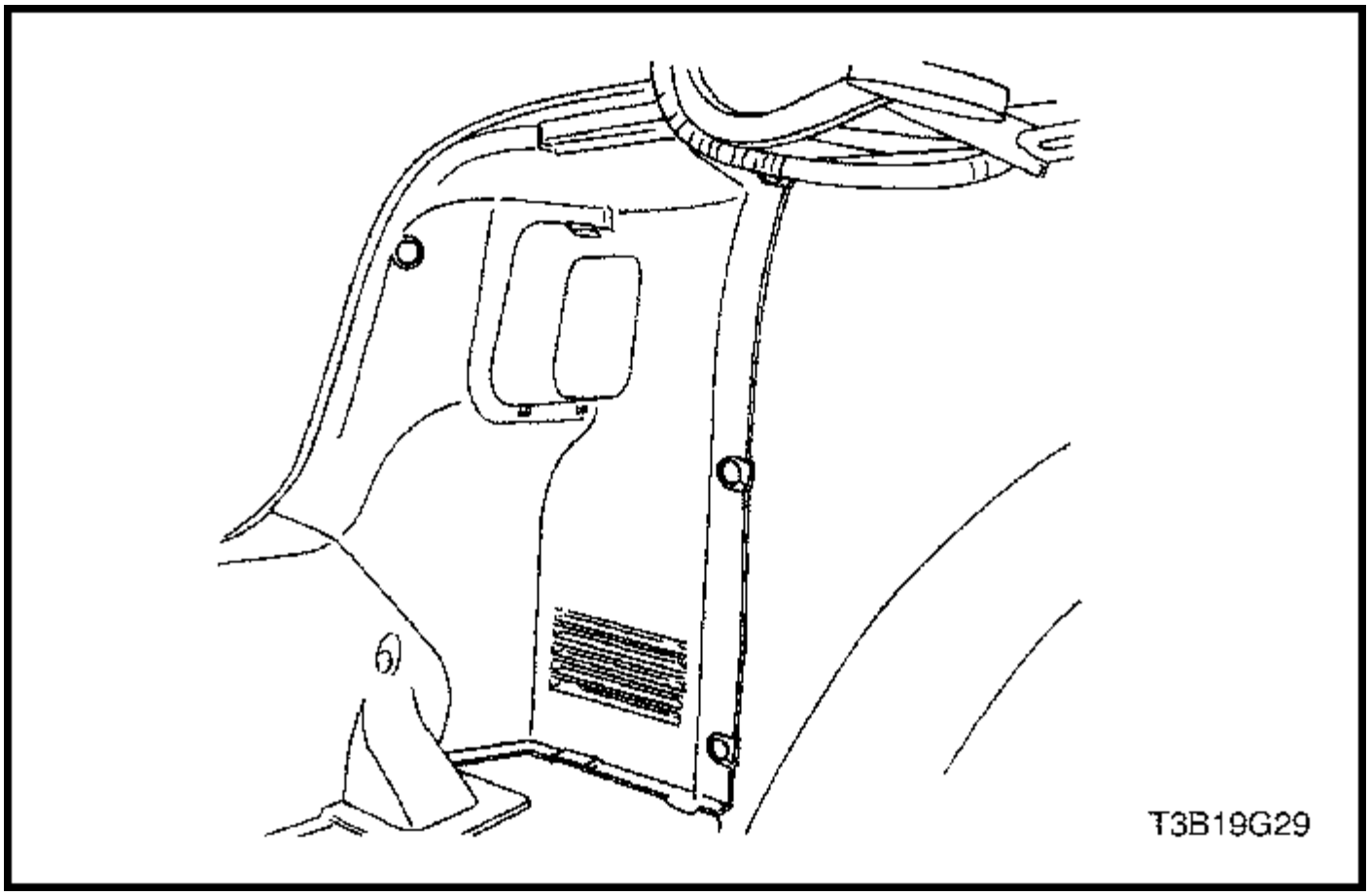
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the wheelhouse trim panel with the clips.
2. Install the luggage compartment rear trim panel. Refer to "Luggage Compartment Rear Trim Panel" in this section.



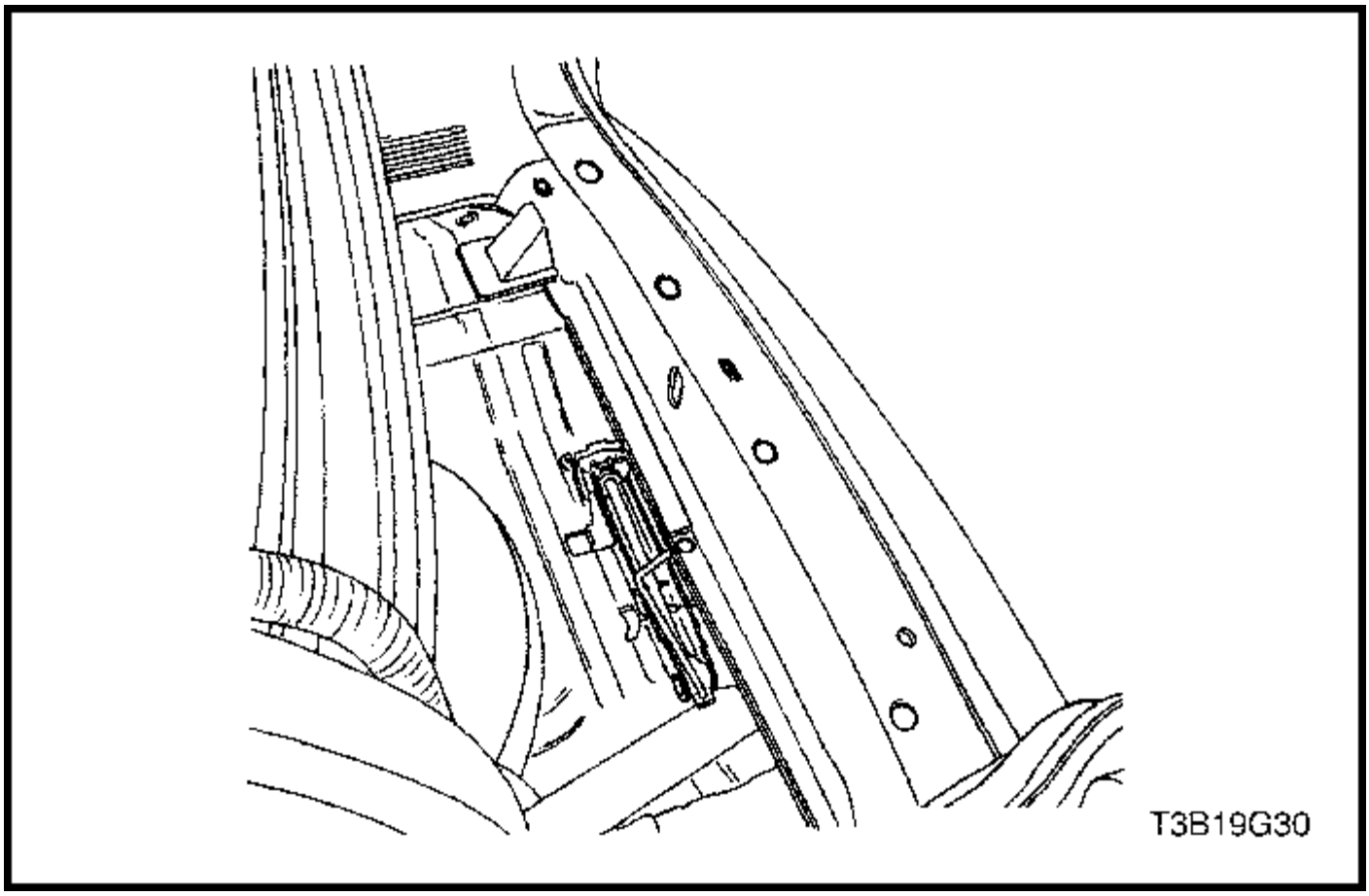
Luggage Compartment Rear Quarter Trim Panel (Notchback)
Removal Procedure

1. Remove the plastic retaining clips and the rear quarter trim panel.



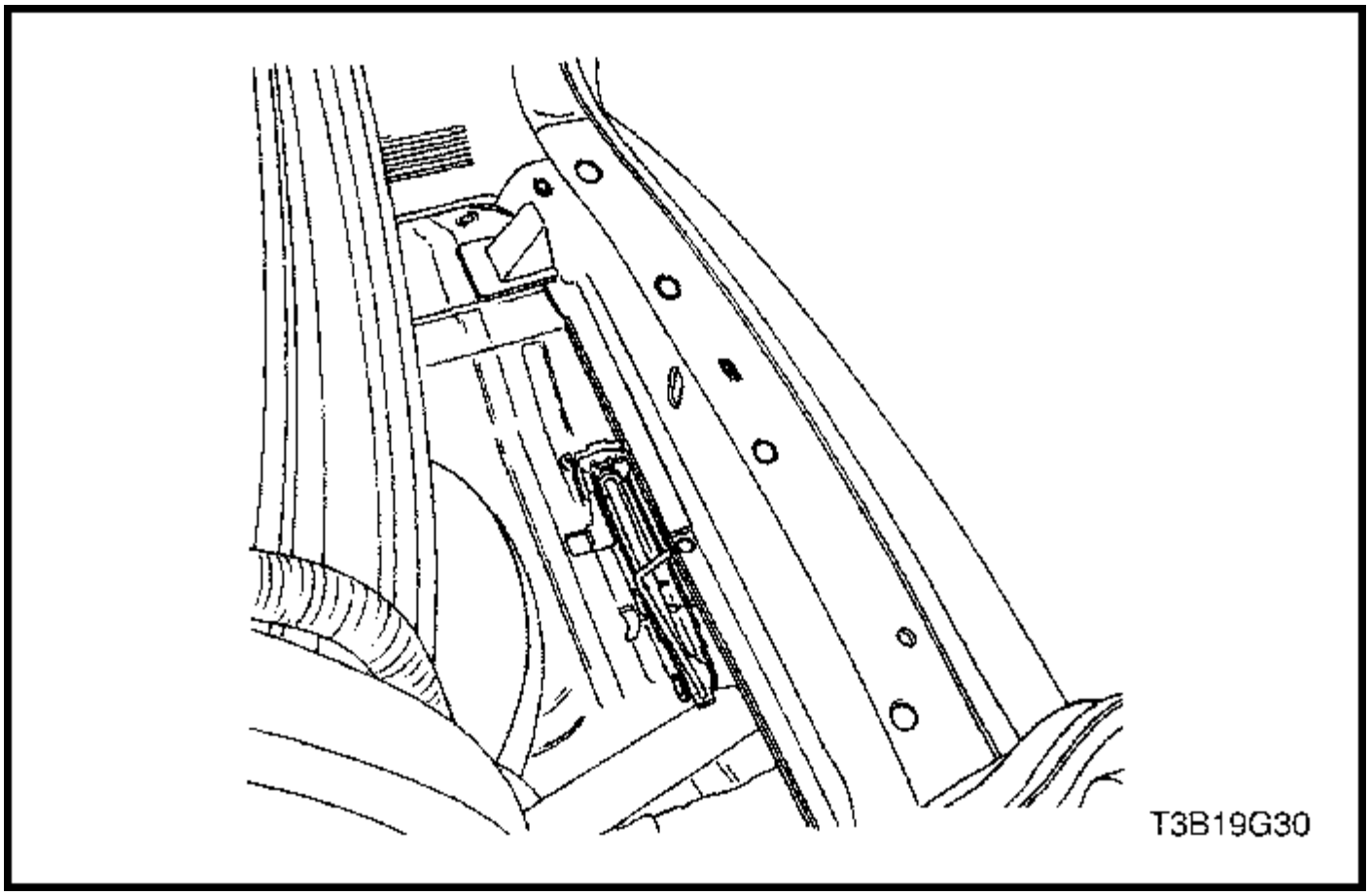
Installation Procedure

1. Install the rear quarter trim panel with the plastic retaining clips.



Luggage Compartment Rear Trim Panel
Removal Procedure

1. Remove the plastic retaining clips and the rear trim panel.



Installation Procedure

1. Install the rear trim panel with the plastic retaining clips.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Interior Trim Panels

The interior trim panels are molded plastic and fasten with screws or plastic clips.

Pressure Relief Vent

When all the windows are closed and the ventilation system is on, the addition of outside air to the interior of the vehicle causes a positive pressure within the vehicle. In order to relieve the pressure, air is released through two pressure relief vents. The pressure relief vents are located at the rear quarter of the vehicle, behind the bumper fascia.

Floor Console

The floor console fits over the tunnel in the floor of the vehicle and extends from under the center of the instrument panel to the rear seat area. The front portion of the console contains the cigar lighter and the transaxle shift lever. The rear portion of the console contains the parking brake lever, the power window switches, (if equipped), and a cupholder.
The sensing and diagnostic module (SDM) for the airbag system is located under the front part of the console.

Floor Carpet

The molded one-piece floor carpet goes over both the front and the rear floor pans.

Rear Compartment Security Cover (Hatchback)

A rear compartment security cover is provided on the hatchback model. The security cover is attached to the hatch and can be easily removed if more cargo space is needed.

SECTION 9H

SEATS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

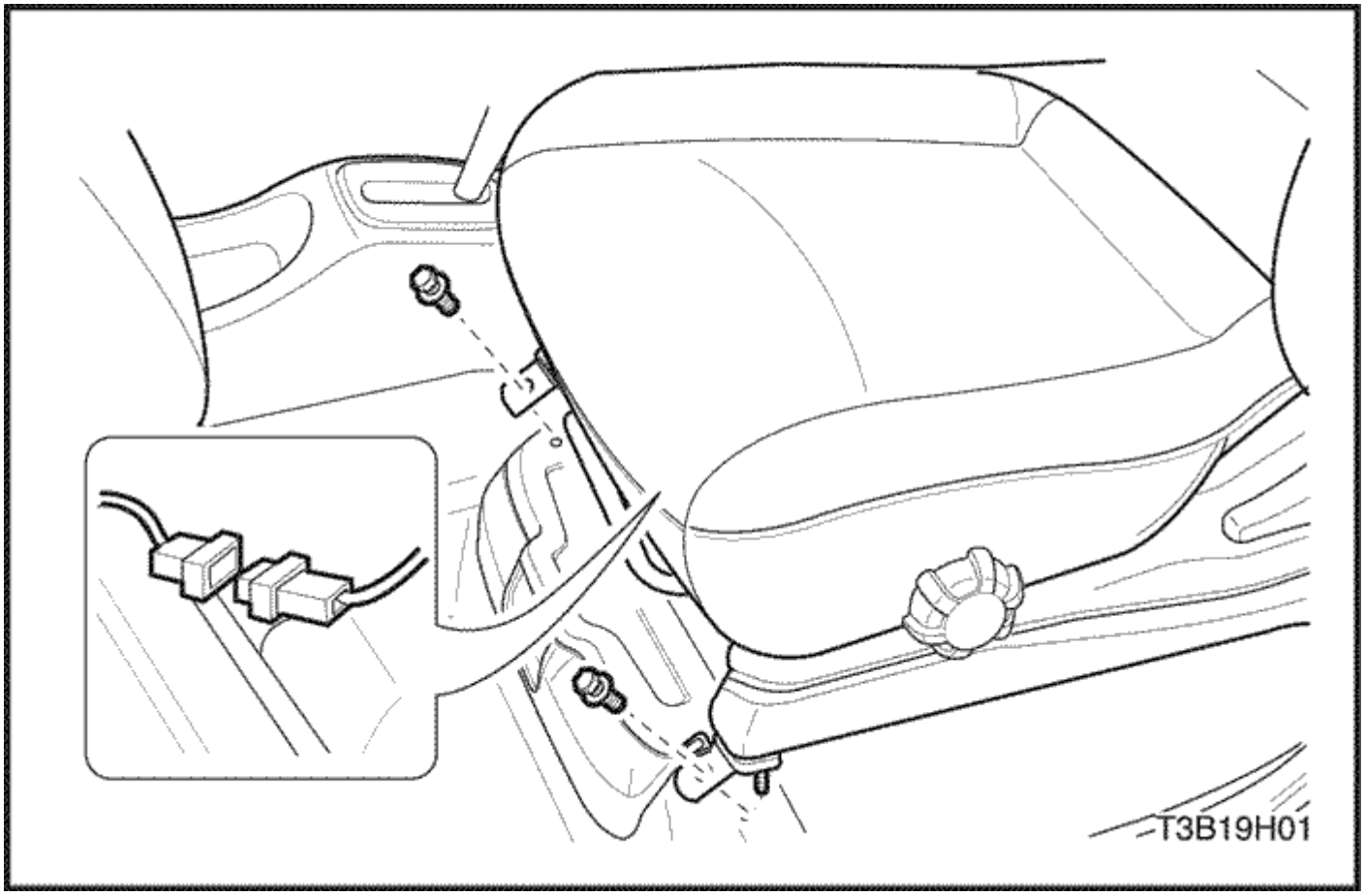
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Height Adjustment Knob Screw	12	-	106

Application	N•m	Lb-Ft	Lb-In
Front Bucket Seat Bolts	25	18	-
Front Seat Belt Buckle Bolt	38	28	-
Front Seat Cover Screw	12	-	106
Front Seat Cushion Bolts	17	13	-
Front Seatback Bolts	25	18	-
Lock Assembly Screws	20	15	-
Lock Striker Bolts	24	18	-
Lower Rear Seat Belt Anchor Bolt	38	28	-
Rear Seat Cushion Bolt	25	18	-
Rear Seatback Bolts	25	18	-
Child Seat Anchorage	25	18	-

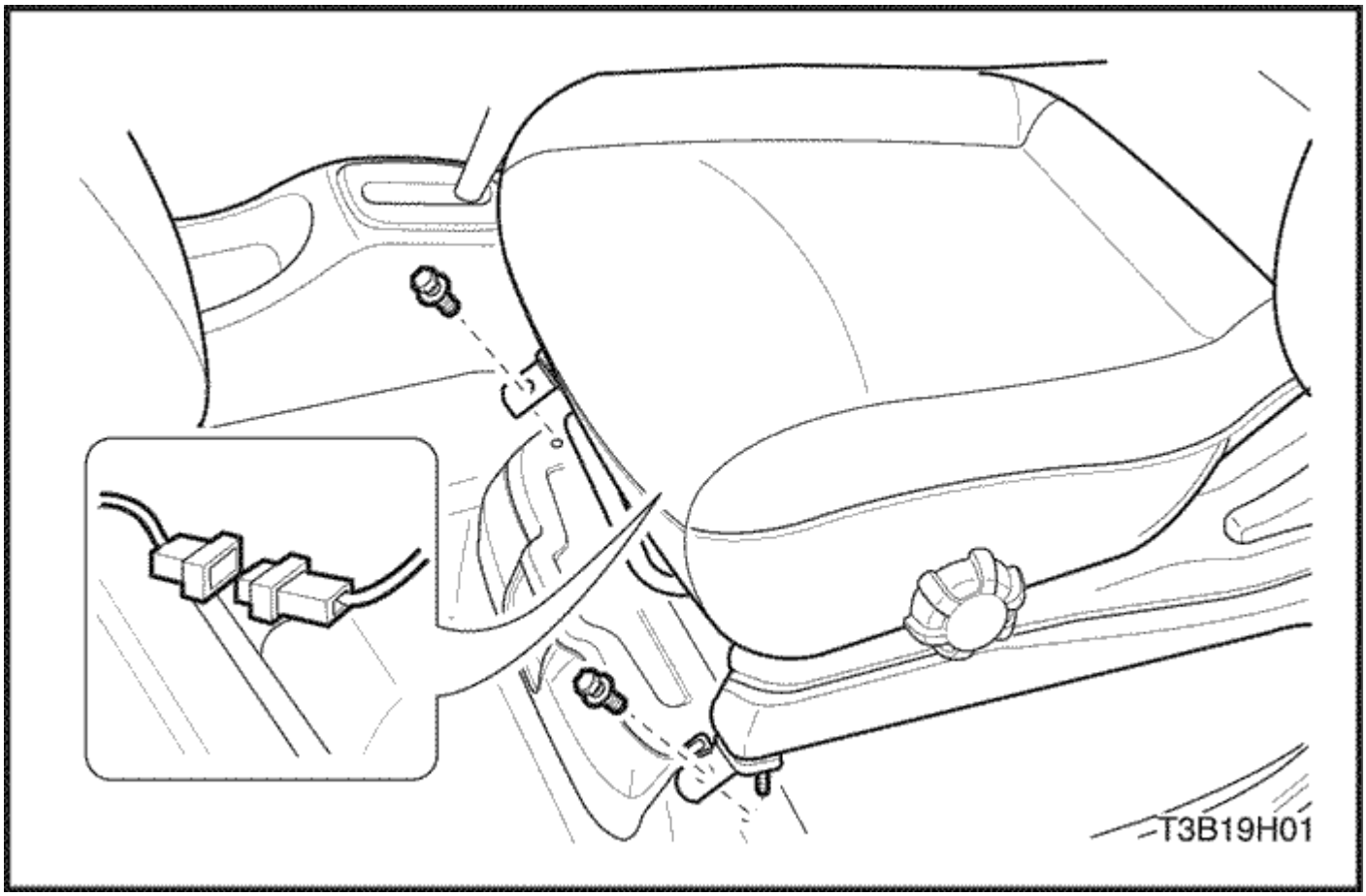
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



Front Bucket Seats
Removal Procedure

1. Remove the bolts that secure the rear portion of the seat to the floor.
2. Remove the bolts that secure the front portion of the front seat to the floor.
3. Disconnect the electrical connector from the driver's seat.
4. Remove the seat.



Installation Procedure

1. Install the seat.
2. Connect the electrical connector to the driver's seat.

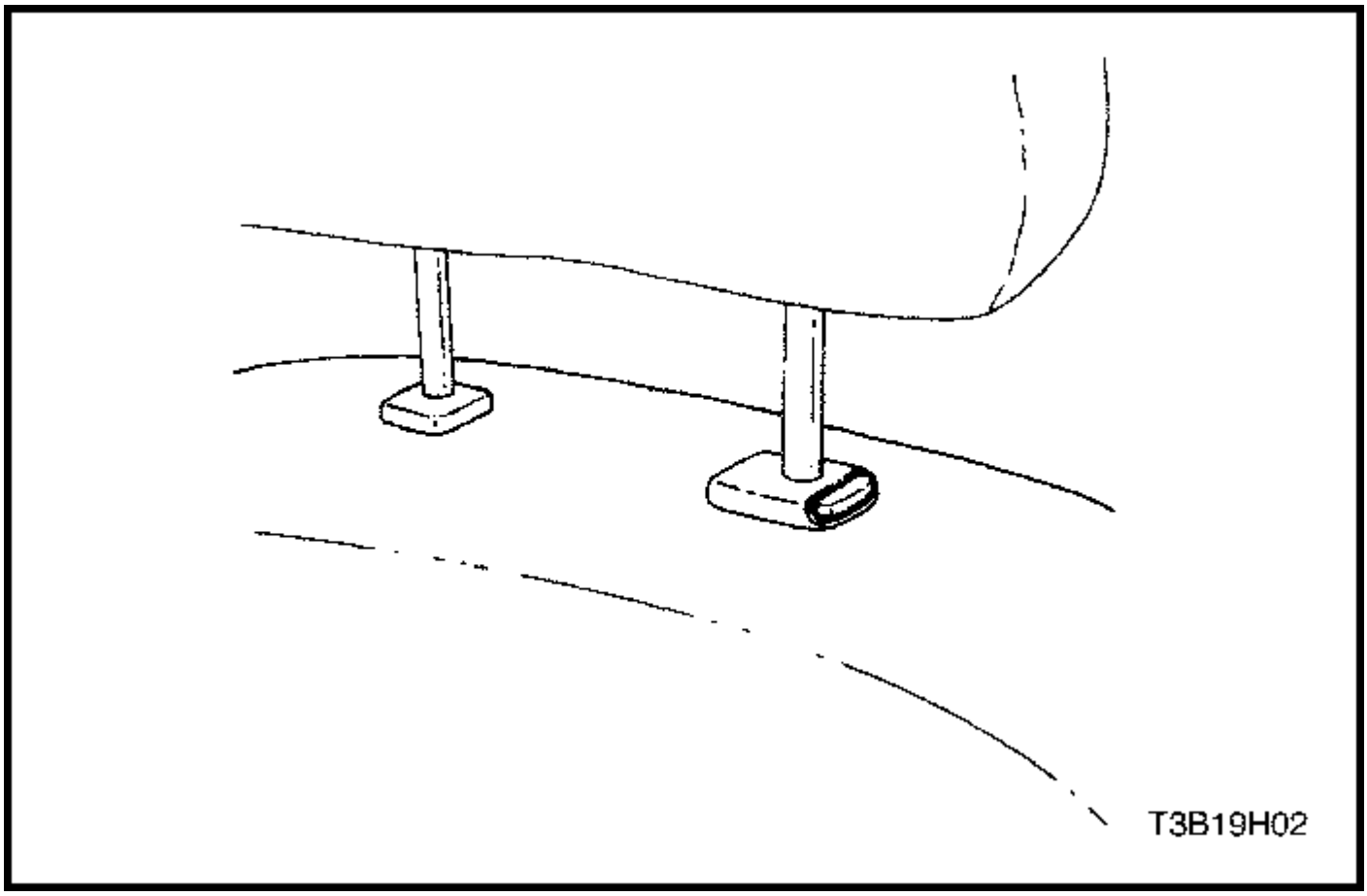
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

3. Install the bolts into the front portion of the front seat.

   Tighten
   Tighten the front bucket seat bolts to 25 N•m (18 lb-ft).

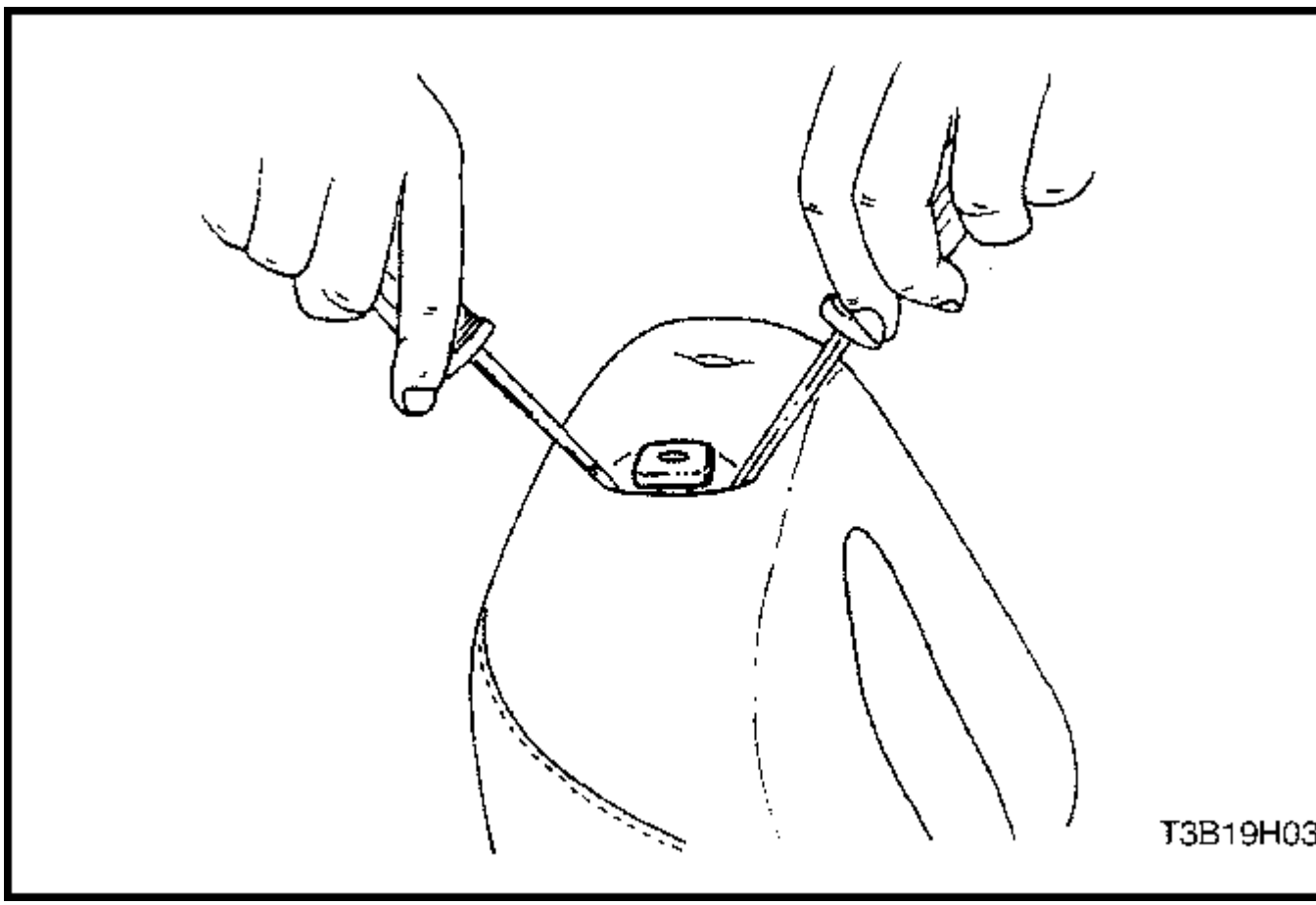
4. Install the bolts into the rear portion of the front seat.

   Tighten
   Tighten the front bucket seat bolts to 25 N•m (18 lb-ft).

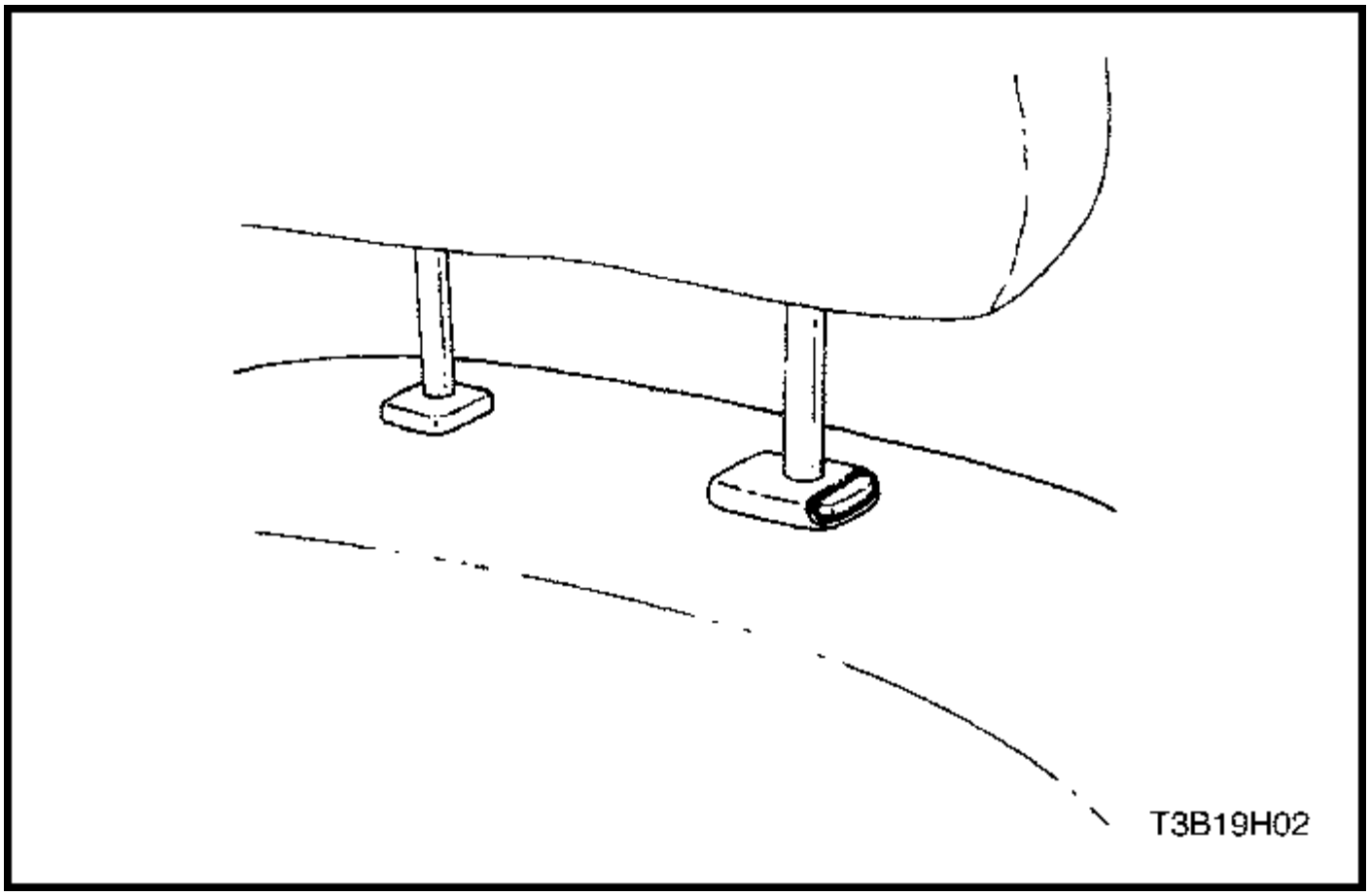


Head Restraint
Removal Procedure

1. Press the head restraint adjust button and remove the head restraint from the seatback.

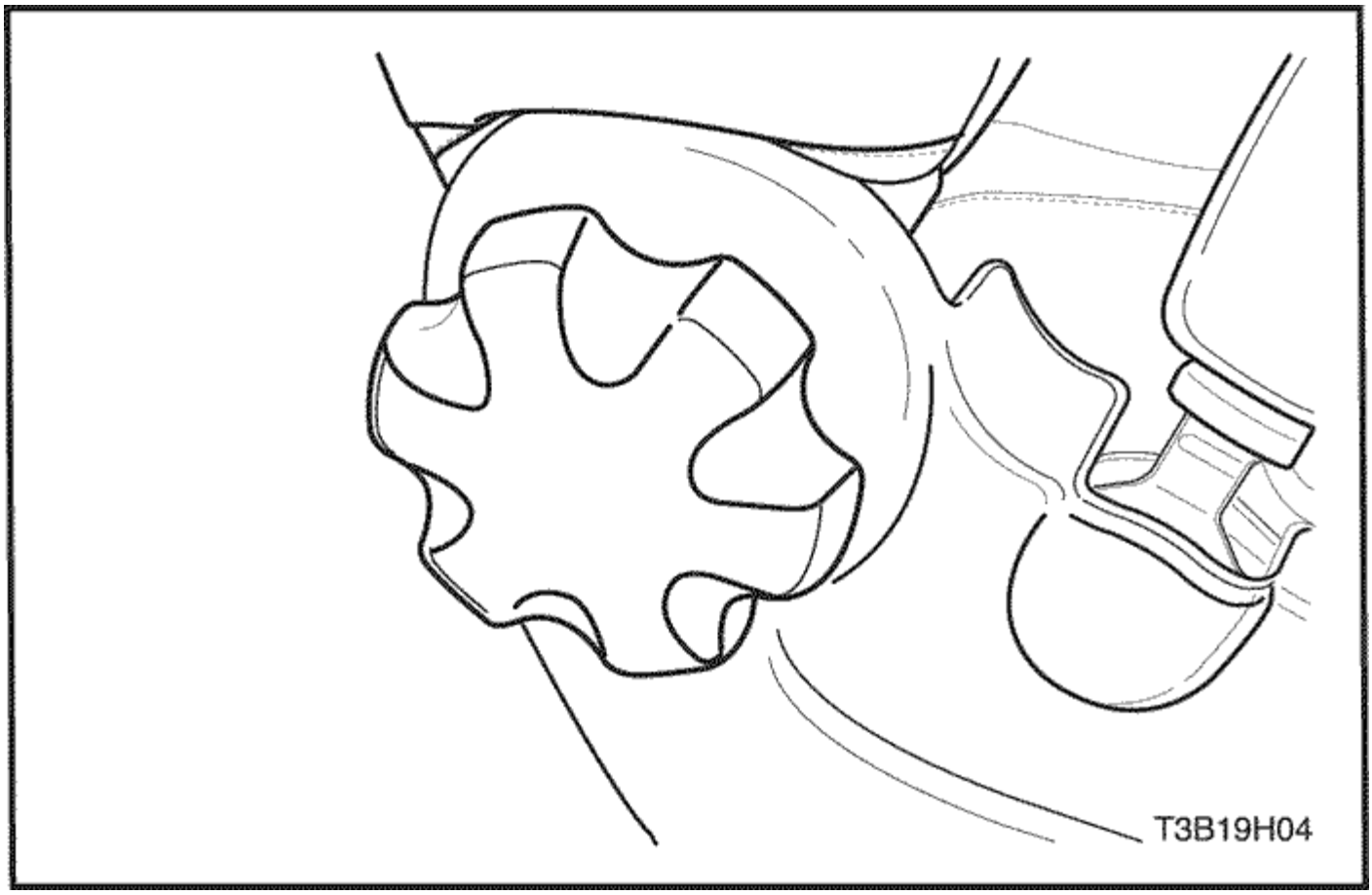


2. Insert two flathead screwdrivers down the front and the back side of the guide sleeves.
3. With the screwdrivers, press in the retaining latches and remove the guide sleeves.



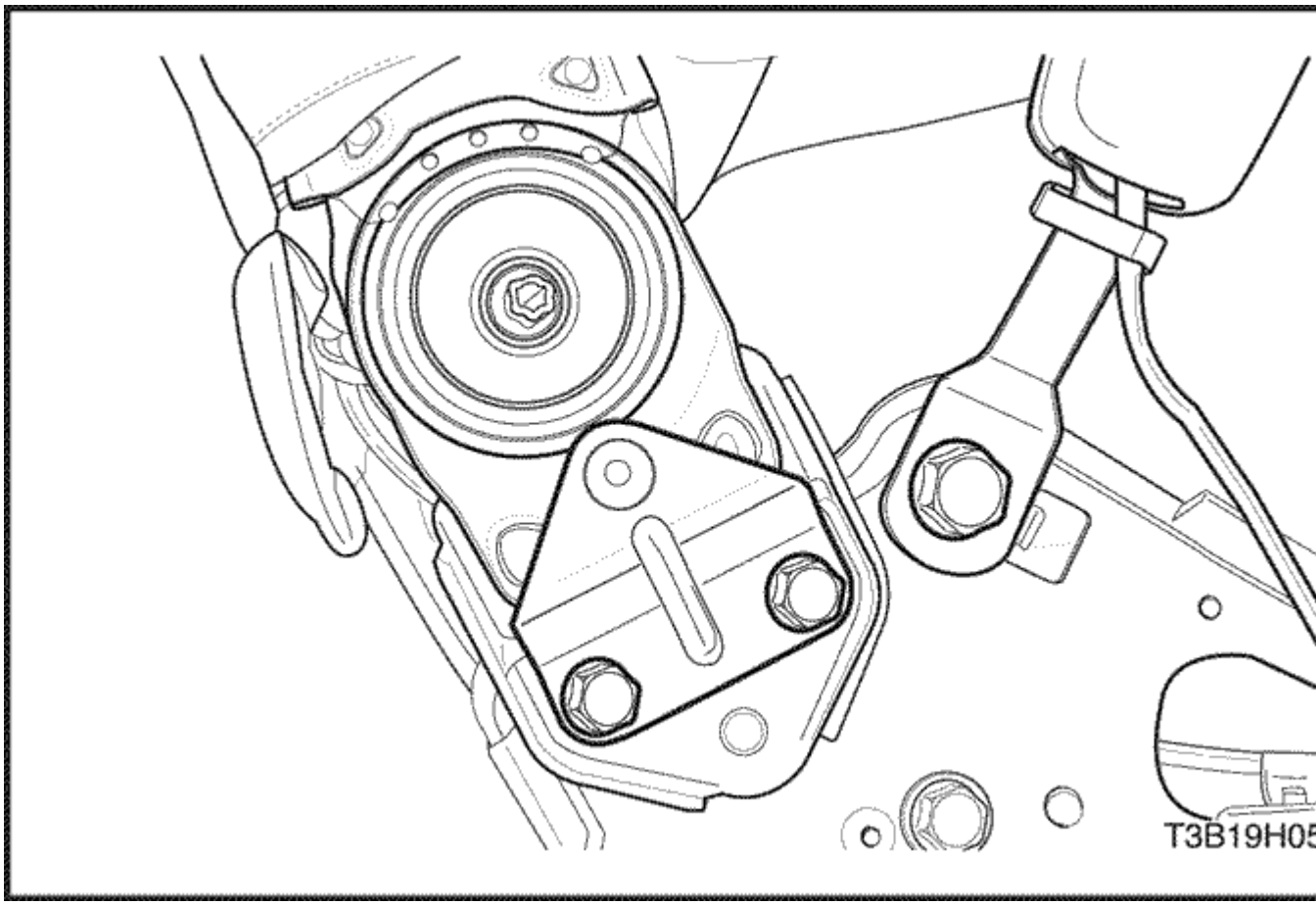
Installation Procedure

1. Install the guide sleeves into the seatback, making sure the angle of the guide sleeves is parallel to the seatback. Press down in order to engage the guide sleeve retaining latches.
2. Install the head restraint into the guide sleeves. Press down in order to engage the stop pin.

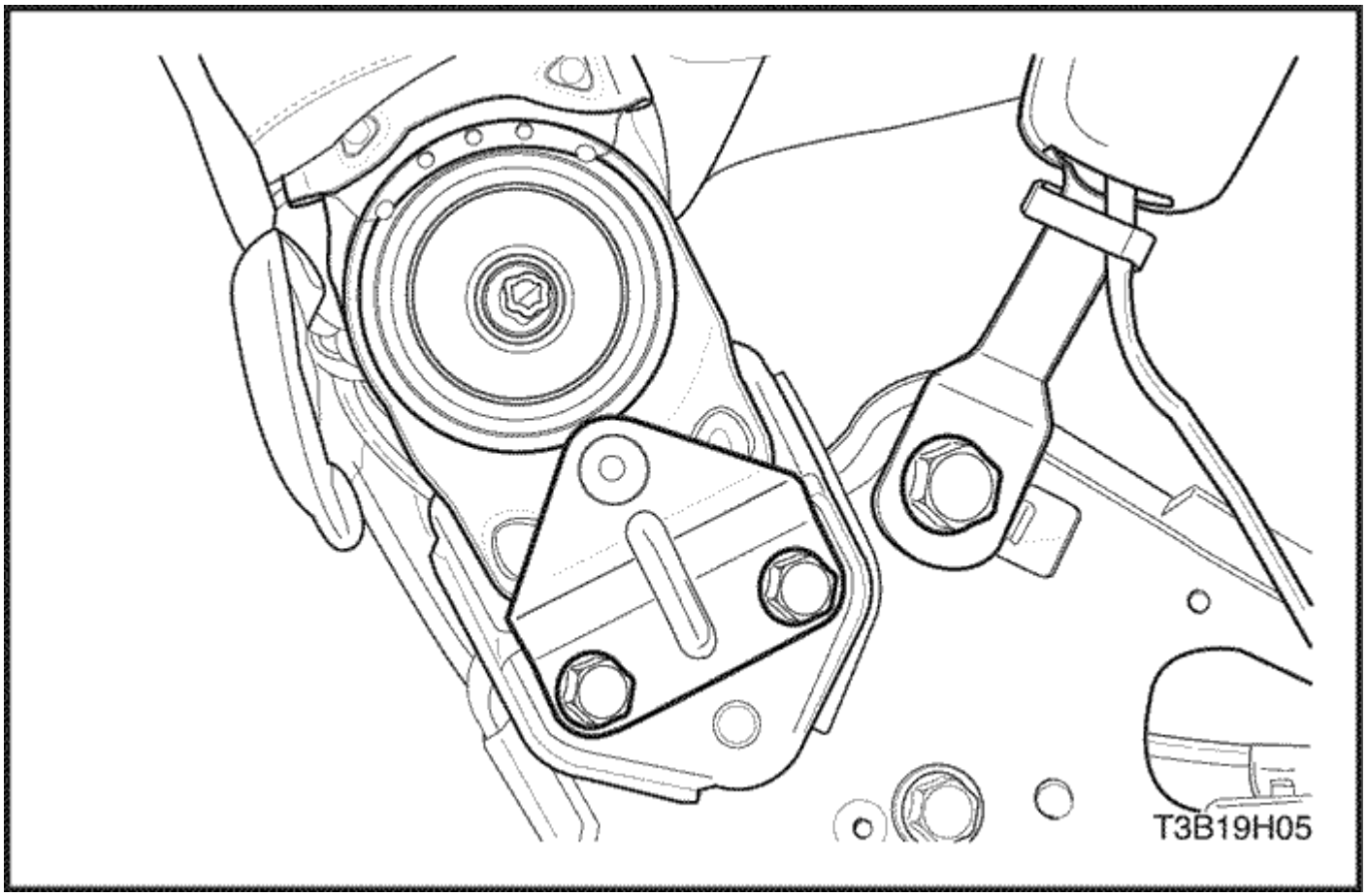


Front Seatback
Removal Procedure

1. Remove the front bucket seat from the vehicle. Refer to "Front Bucket Seats" in this section.
2. Remove the recliner adjustment knob.



3. Remove the recliner cover from the front seat.
4. Remove the seatback bolts from the seat cushion.
5. Remove the seatback.



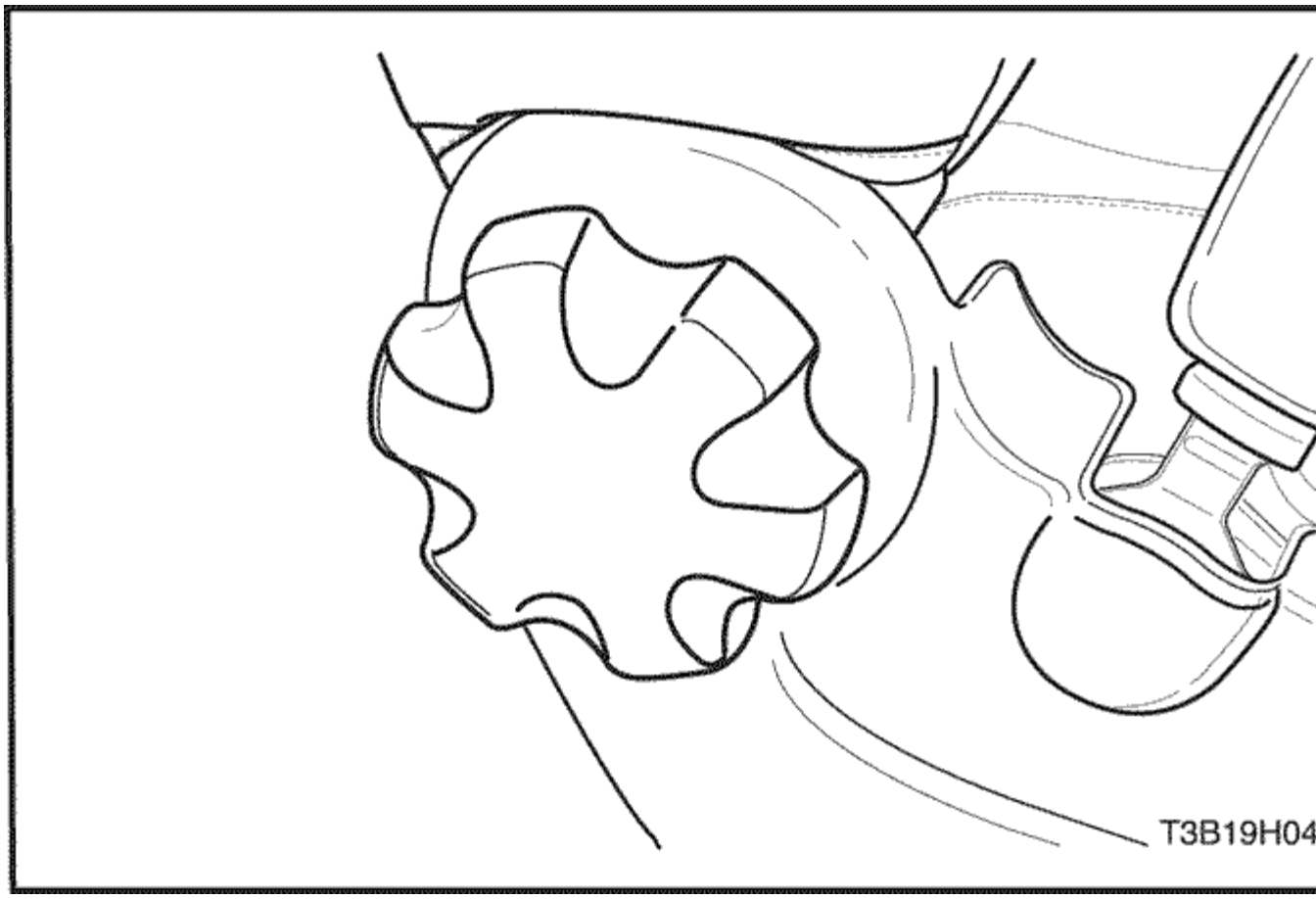
Installation Procedure

1. Install the seatback onto the seat cushion.

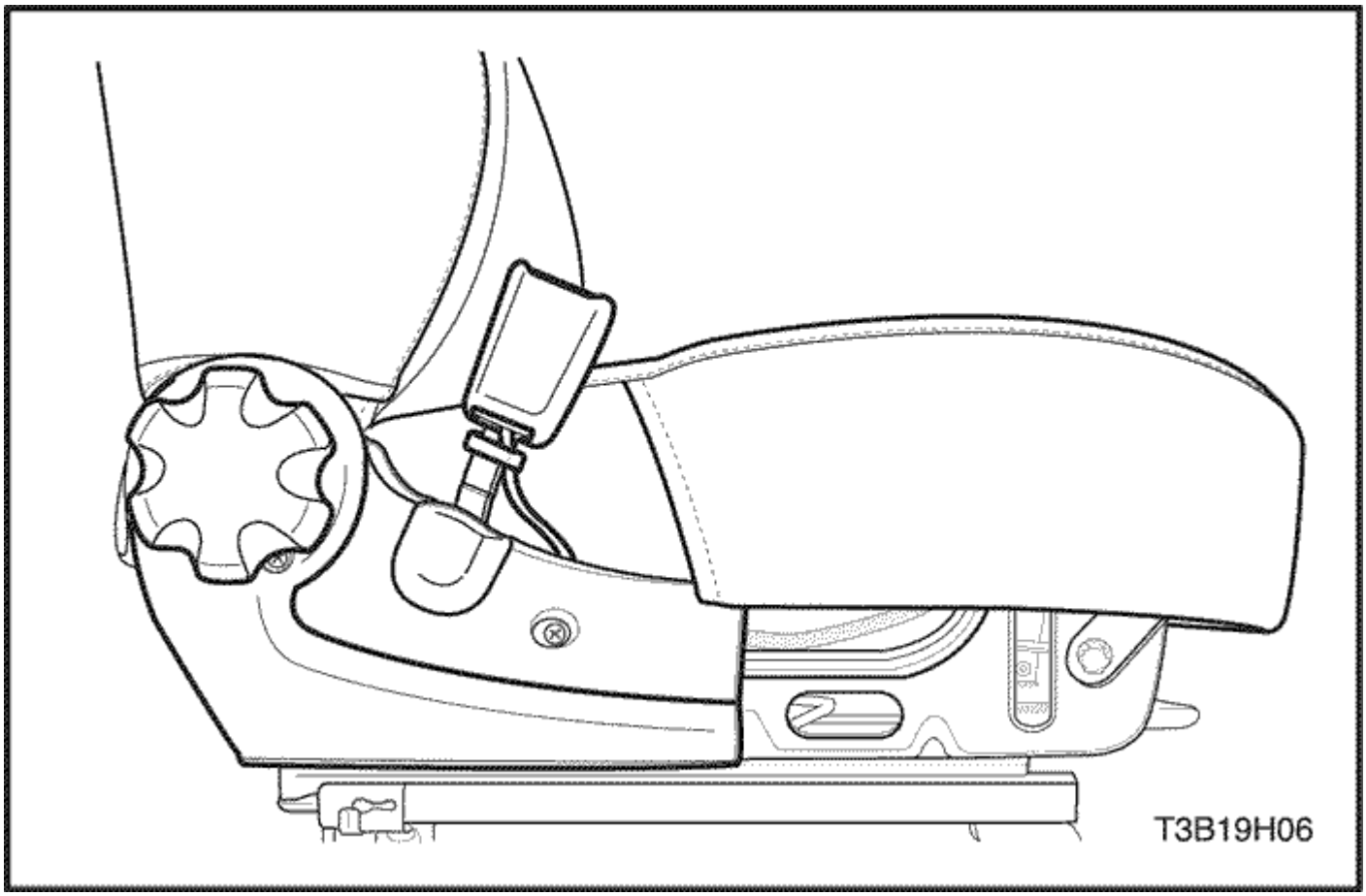
   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the seatback bolts from the seat cushion.

   Tighten
   Tighten the front seatback bolts to 25 N•m (18 lb-ft).

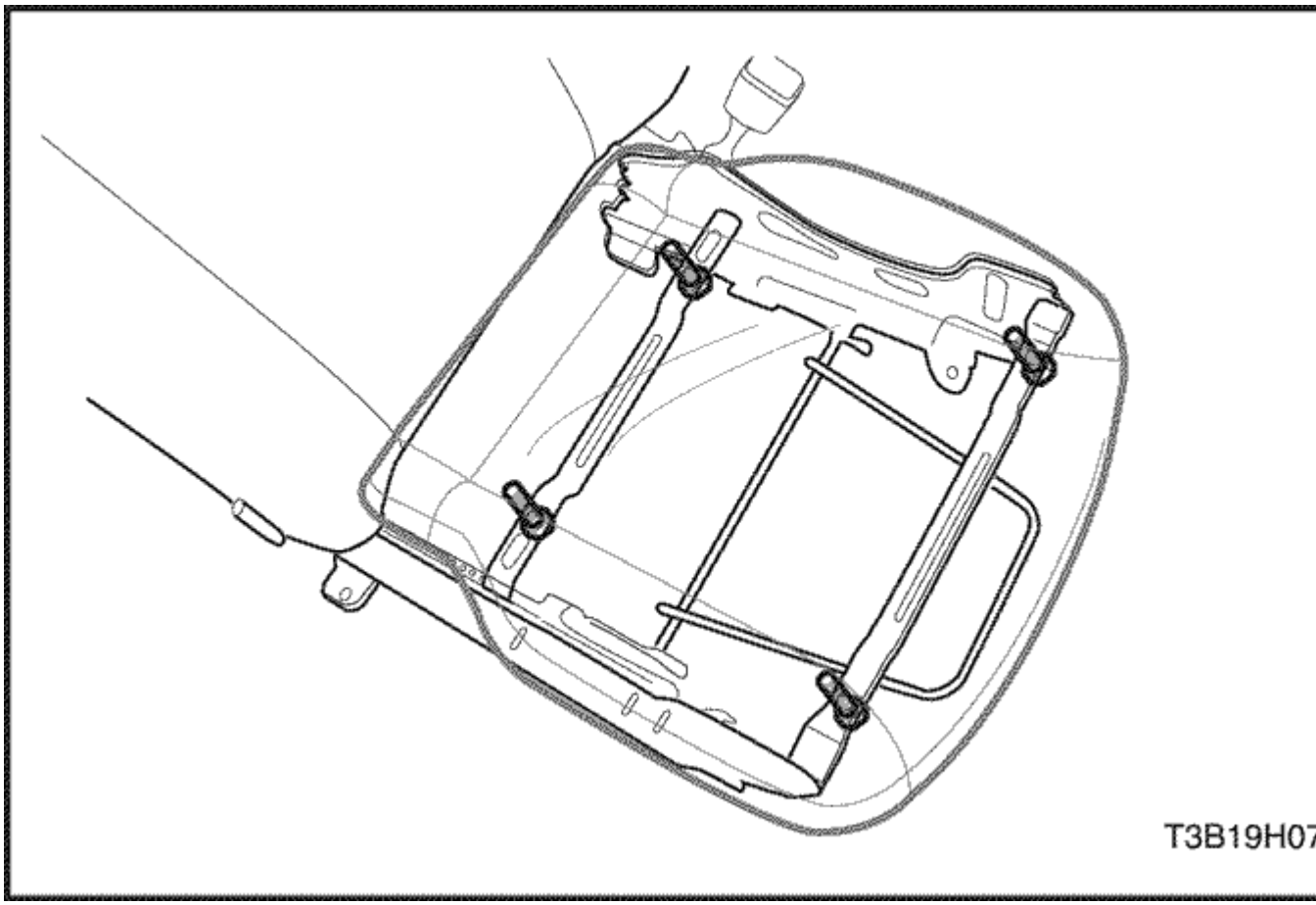


3. Install the recliner cover.
4. Install the recliner adjustment knob.
5. Install the front bucket seat in the vehicle. Refer to "Front Bucket Seats" in this section.

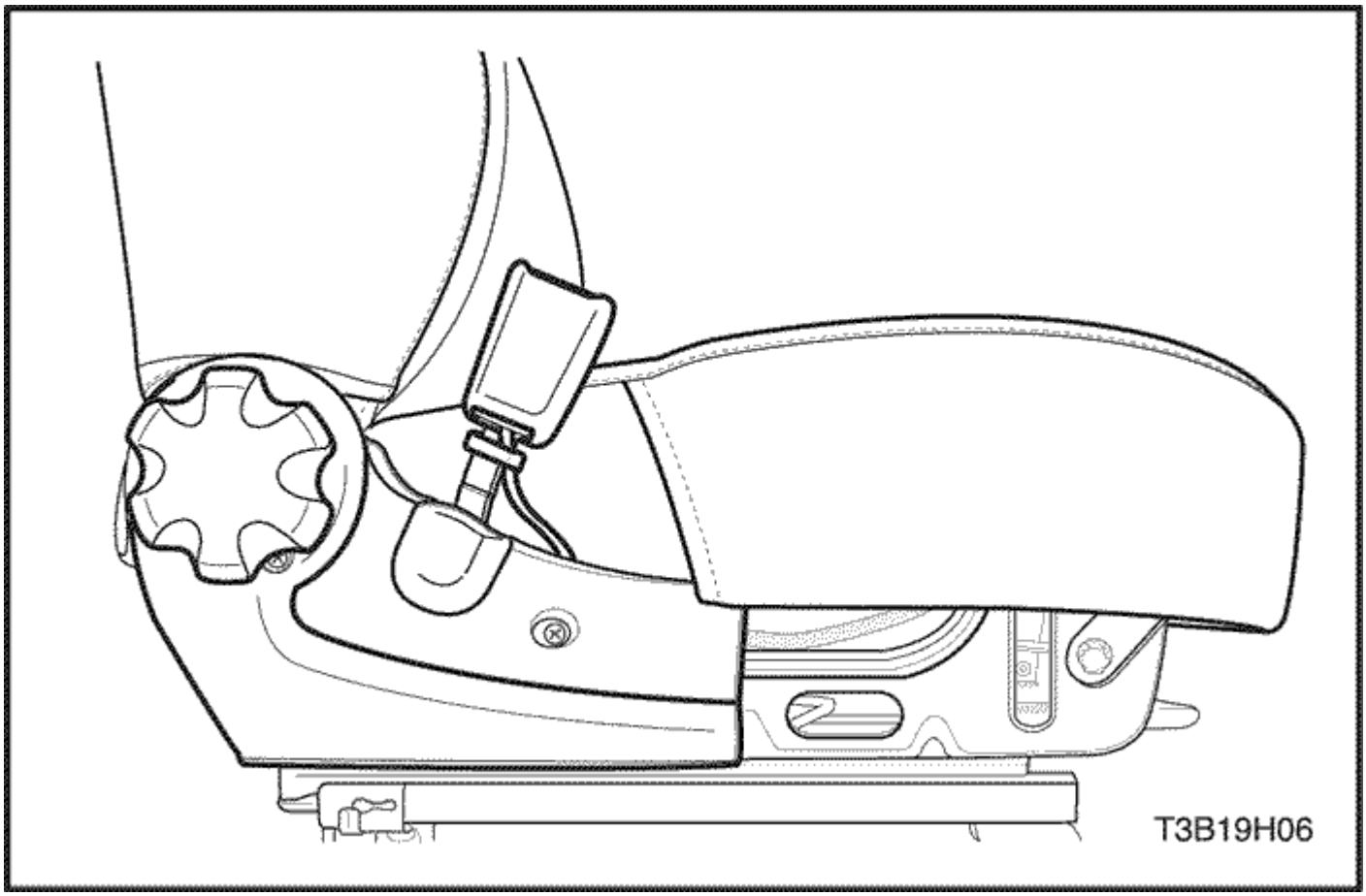


Front Seat Cushion
Removal Procedure

1. Remove the seatback. Refer to "Front Seatback" in this section.



2. Remove the seat cushion bolts.
3. Remove the cushion from the seat adjuster.



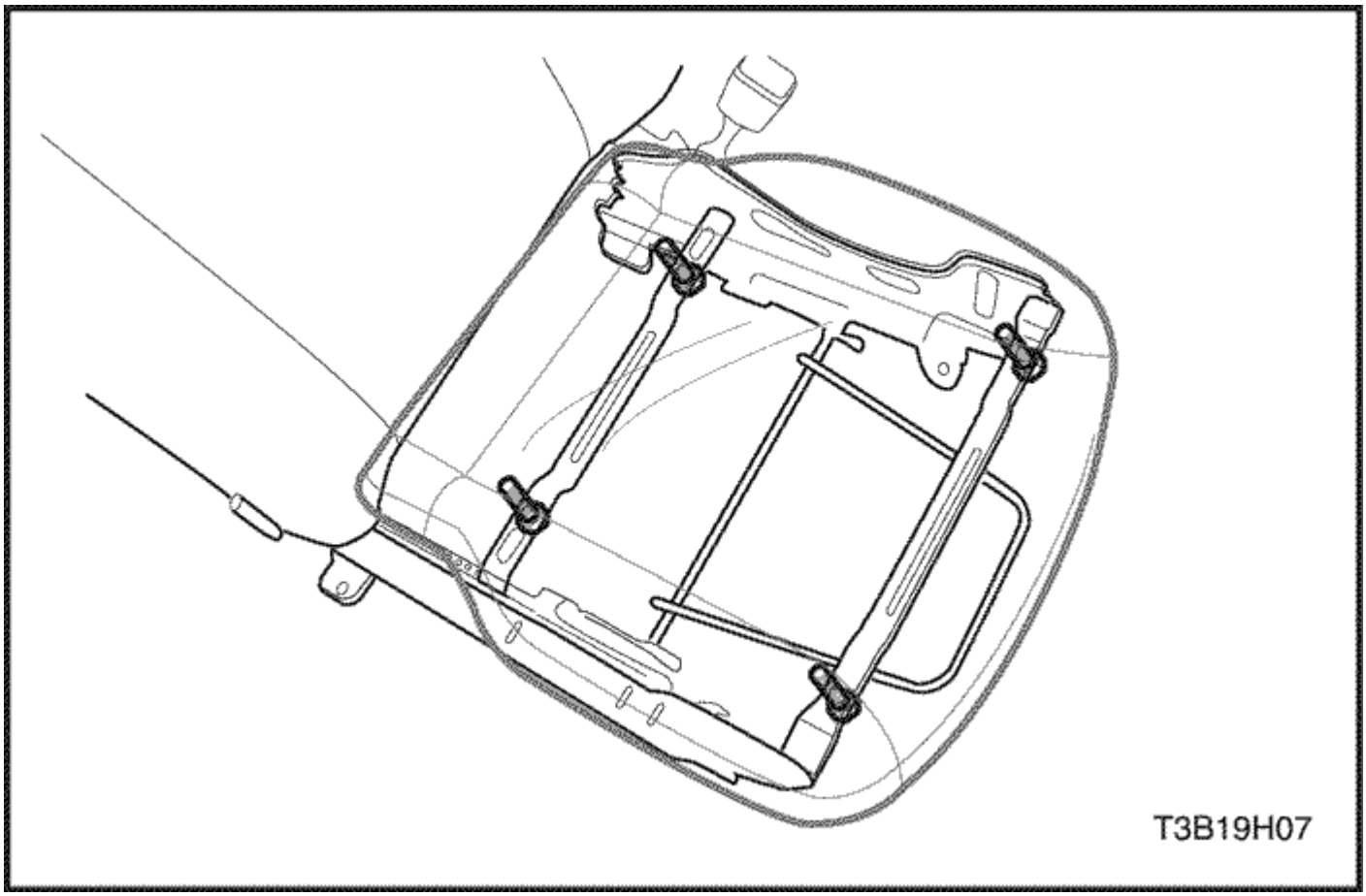
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the seat cushion to the seat adjuster with the bolts.

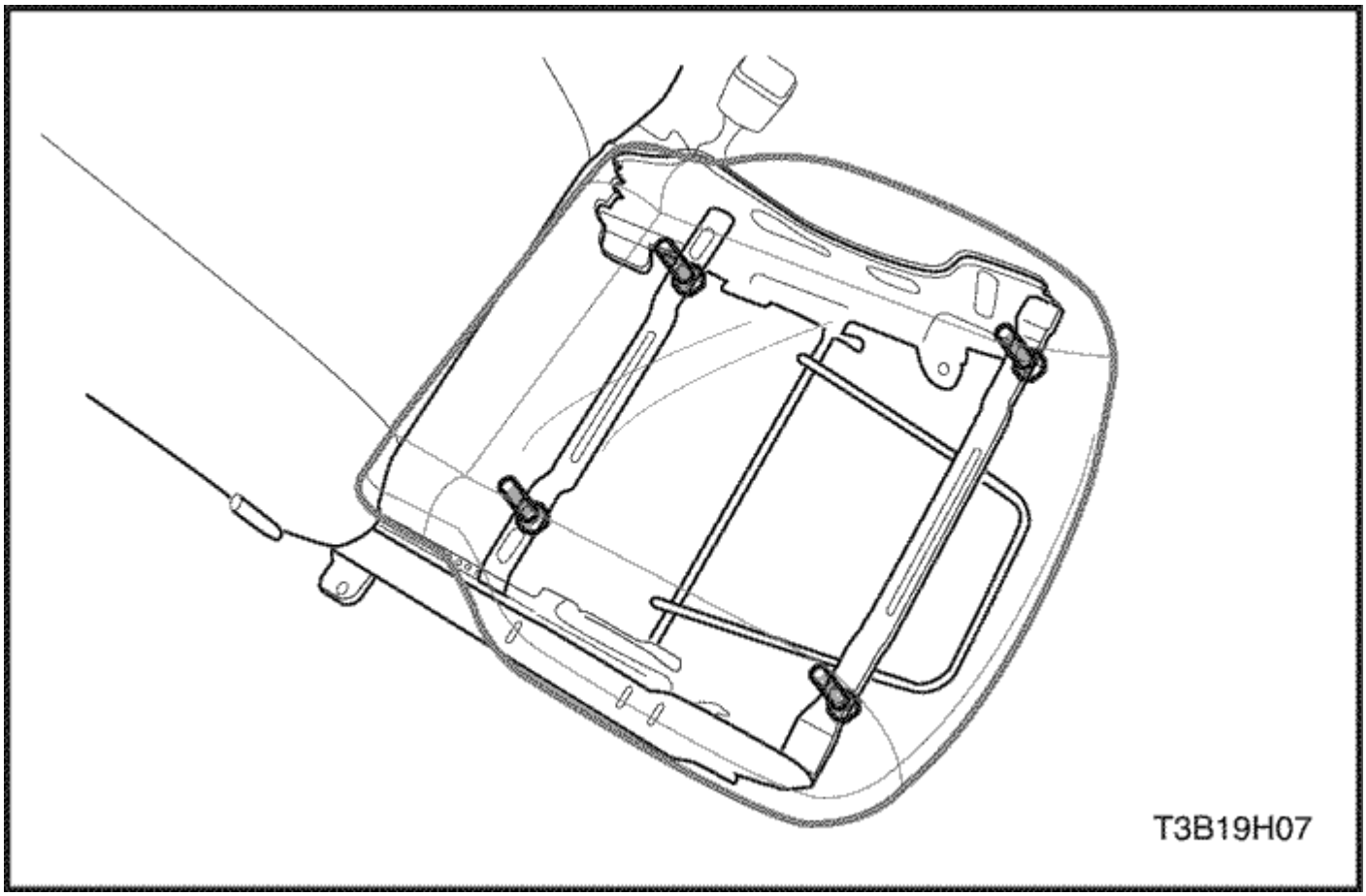
   Tighten
   Tighten the front seat cushion bolts to 25 N•m (18 lb-ft).

2. Install the seatback. Refer to "Front Seatback" in this section.



Front Seat Adjusters
Removal Procedure

1. Remove the seatback. Refer to "Front Seatback" in this section.
2. Remove the seat cushion bolts and the front seat adjusters from the seat cushion.



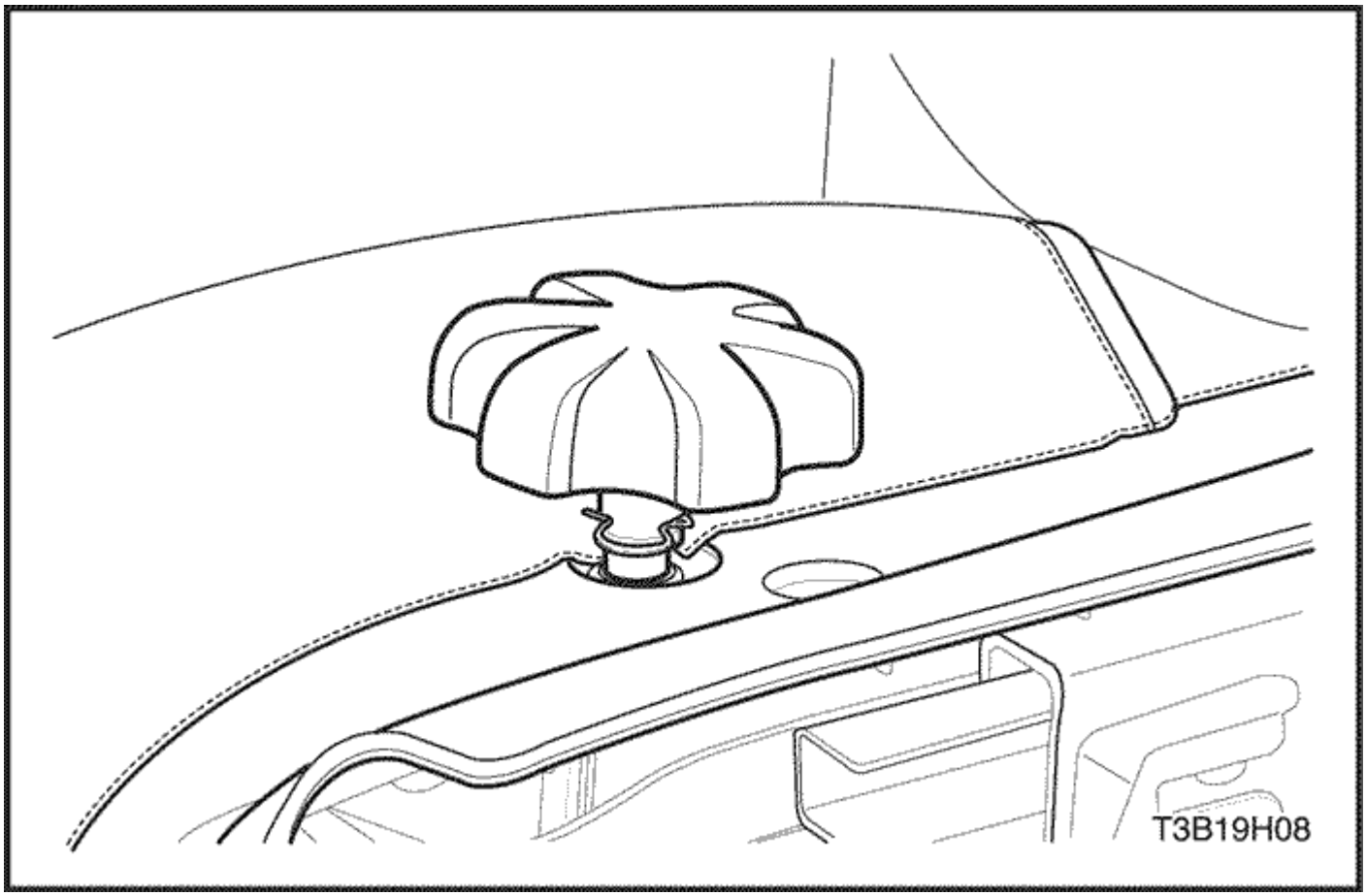
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the front seat adjusters to the seat cushion with the bolts.

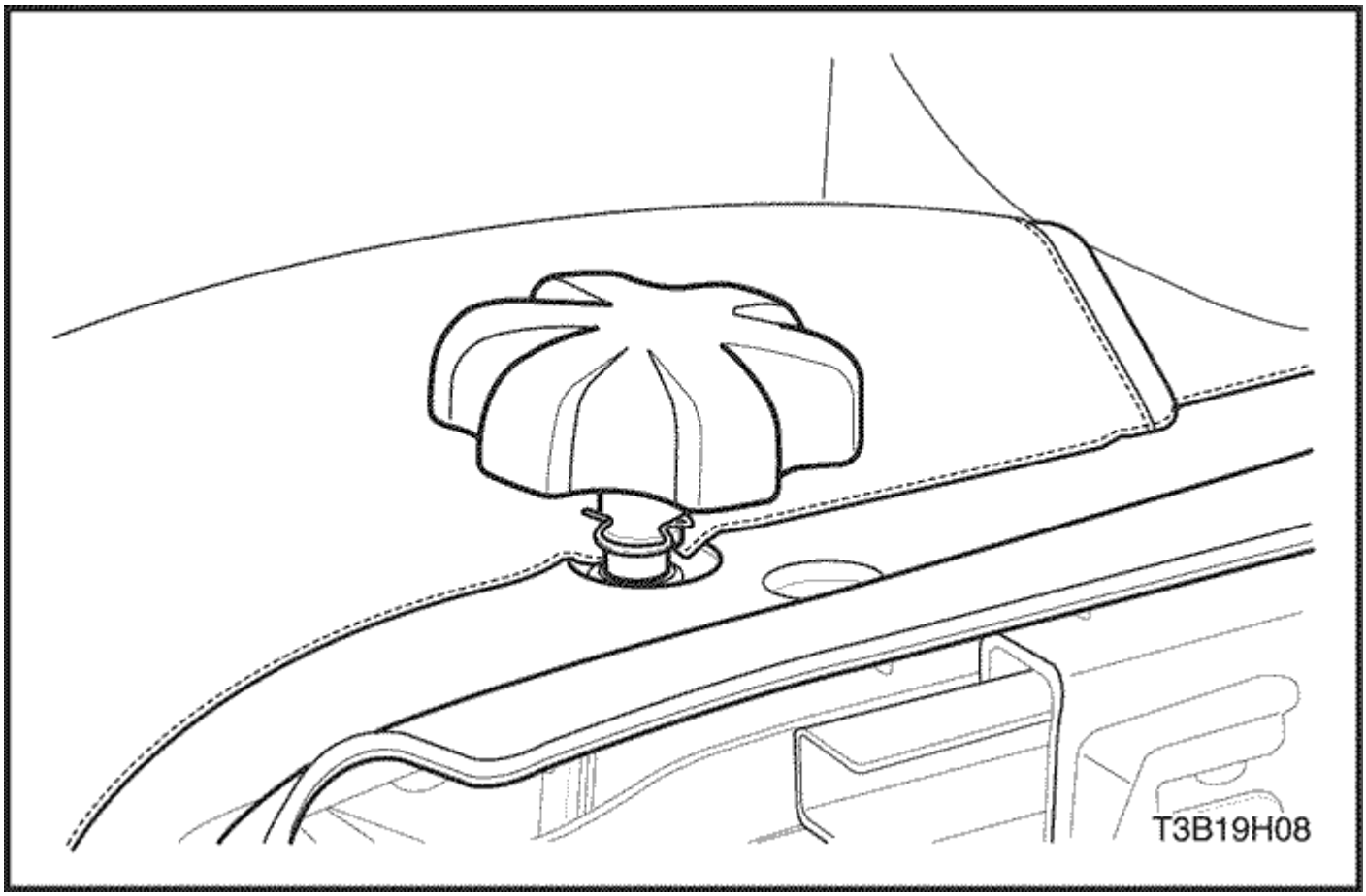
   Tighten
   Tighten the front seat cushion bolts to 25 N•m (18 lb-ft).

2. Install the seatback. Refer to "Front Seatback" in this section.



Height Adjustment Knobs
Removal Procedure

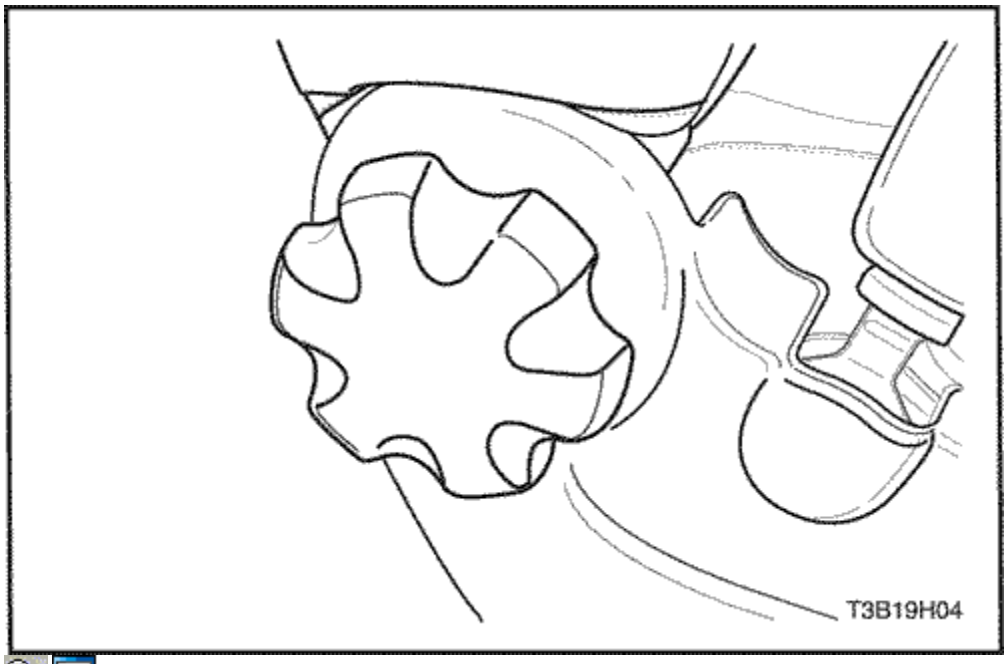
1. Pry off the metal clip.
2. Remove the height adjustment knob.



Installation Procedure

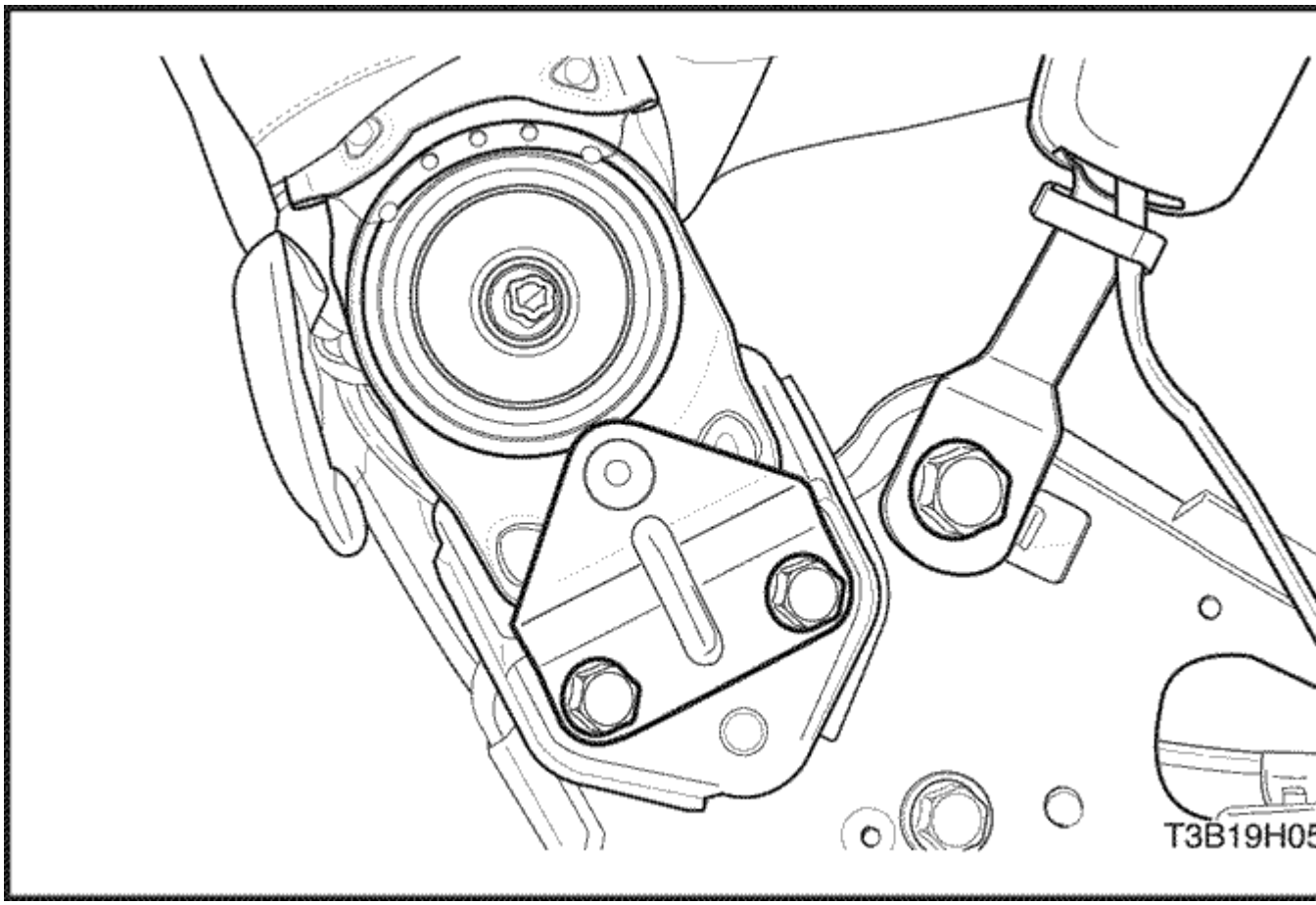
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the height adjustment knob.
2. Install the metal clip.

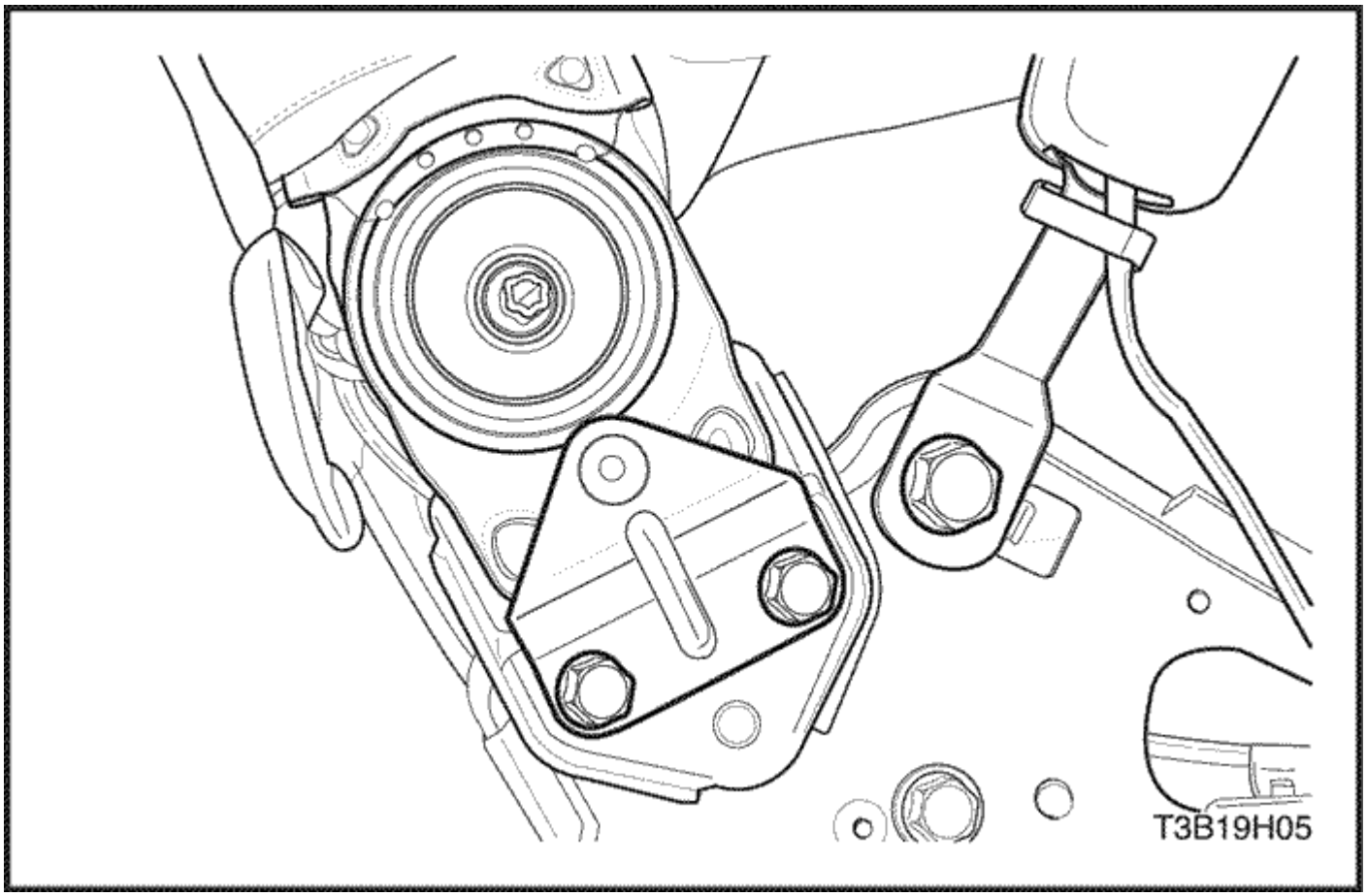


Front Seat Cover
Removal Procedure

1. Remove the front bucket seat from the vehicle. Refer to "Front Bucket Seats" in this section.
2. Remove the recliner adjustment knob.
3. Remove the upper seat cover.



4. Remove the screw and the lower seat cover.

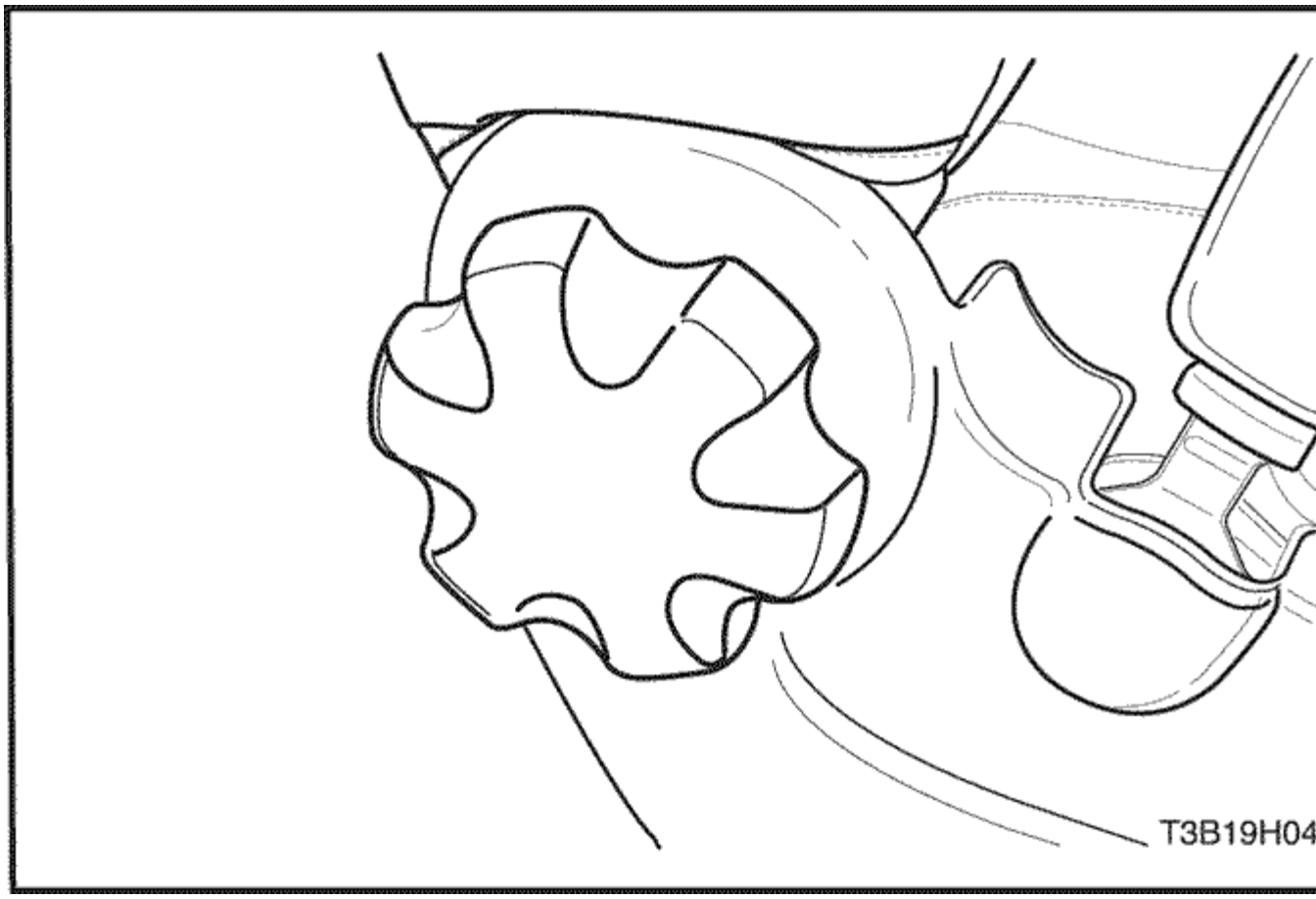


Installation Procedure

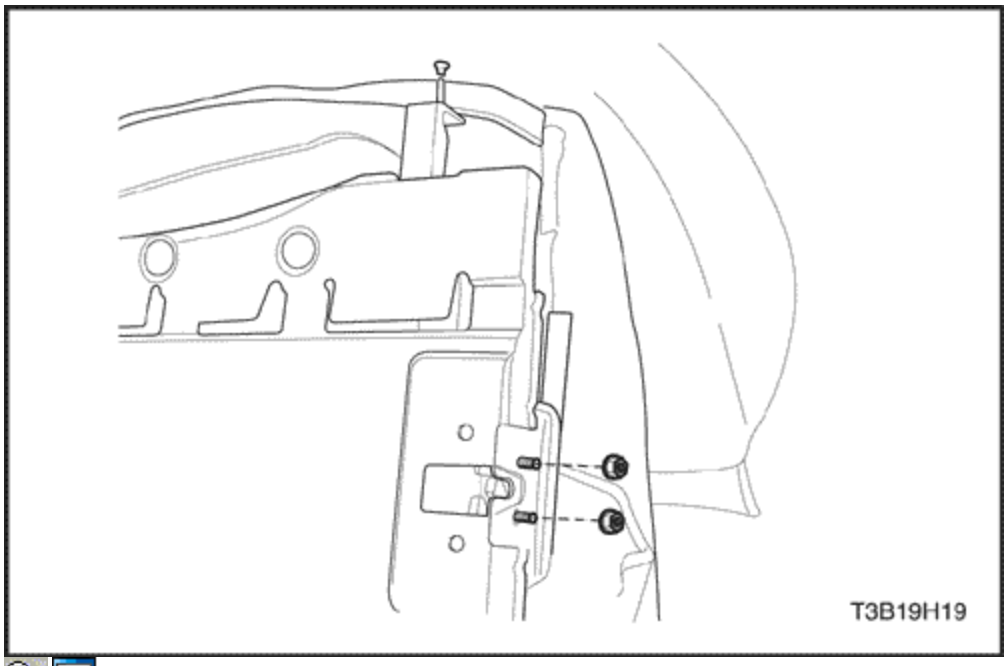
Notice : Dissimilar metals in direct contact with each other may corrode repidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the lower seat cover with the screw.

   Tighten
   Tighten the front seat cover screw to 12 N•m (106 lbin).

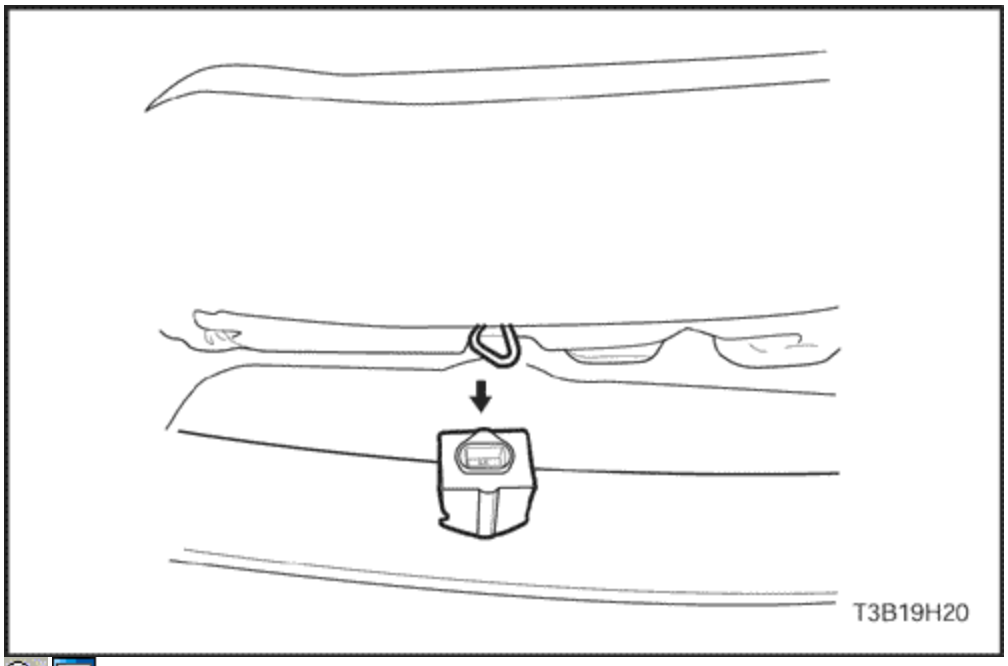


2. Install the upper seat cover with new pin.
3. Install the recliner adjustment knob.
4. Install the front bucket seat in the vehicle. Refer to "Front Bucket Seats" in this section.



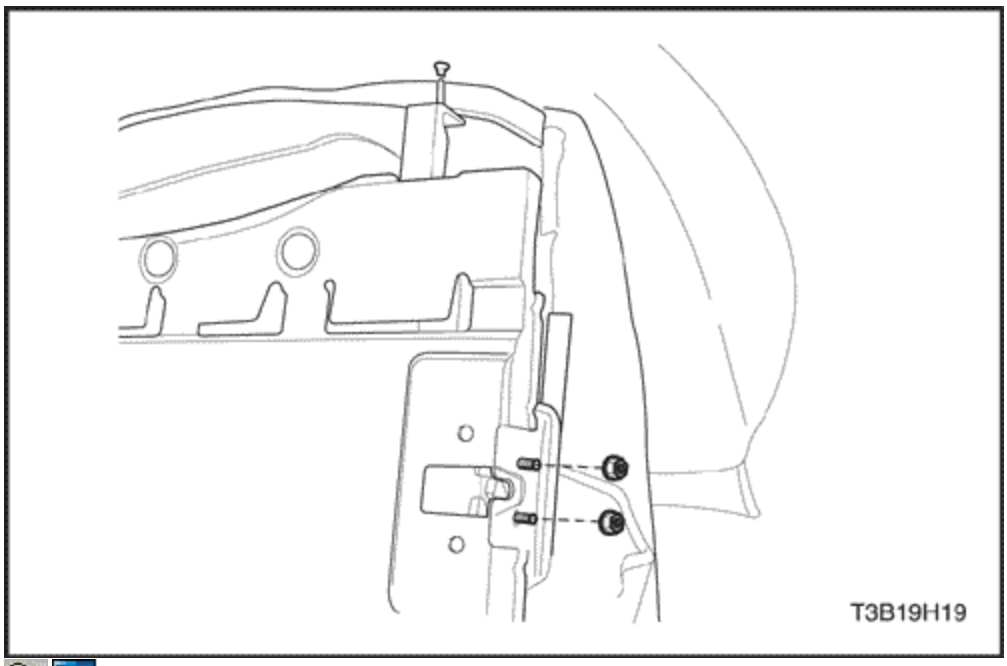
Rear Seat Cushion
Removal Procedure

1. Remove the bolt at the base of the rear seatback.
2. Lift and remove the rear seat cushion.



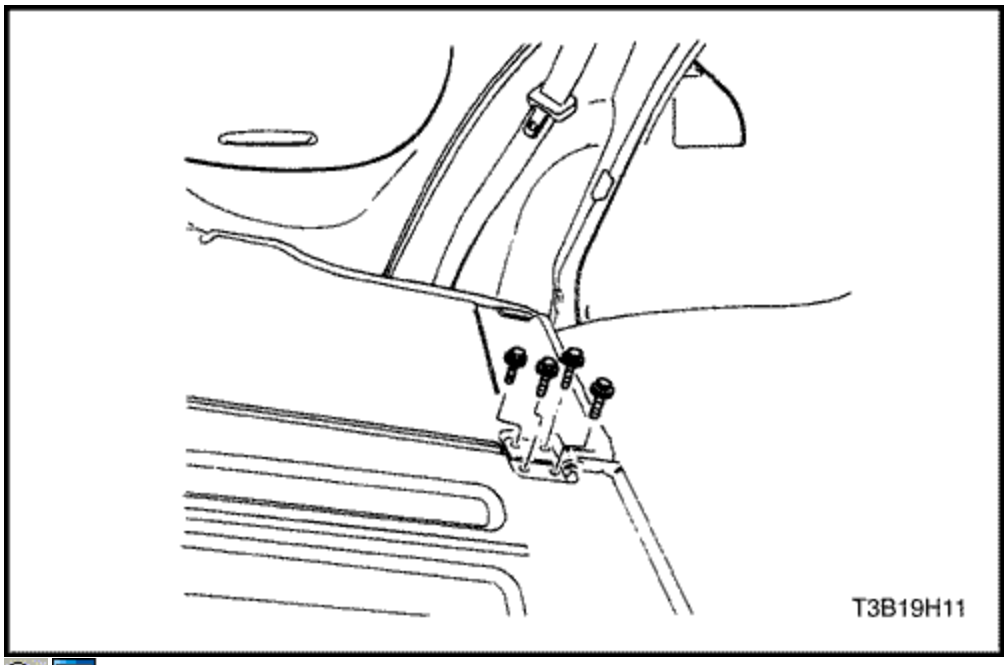
Installation Procedure

1. Insert the wire loops along the front edge of the rear seat cushion into the recesses in the floor pan.



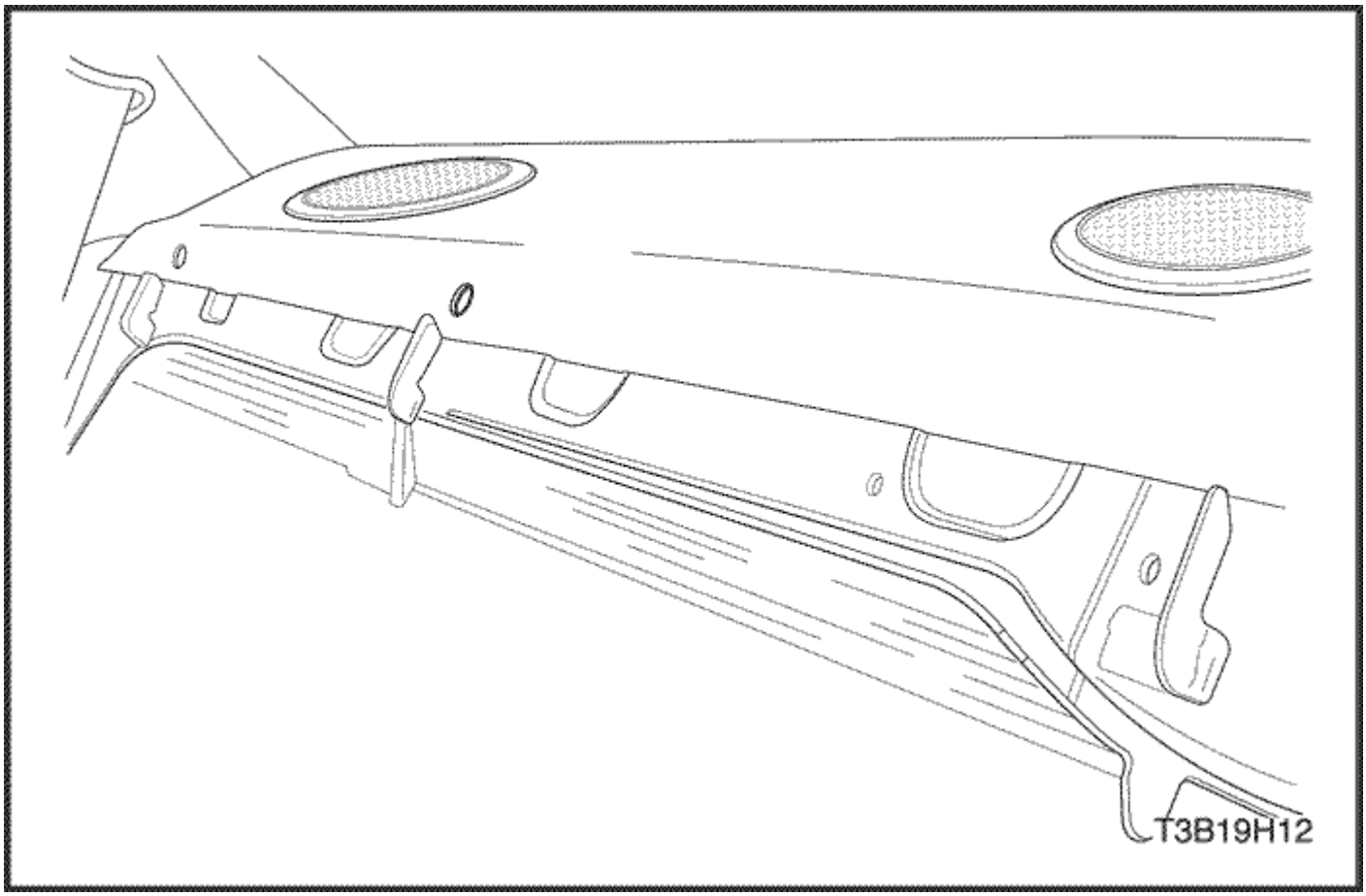
2. Install the rear seat cushion with the bolt.

   Tighten
   Tighten the rear seat cushion bolt to 25 N•m (18 lb-ft).



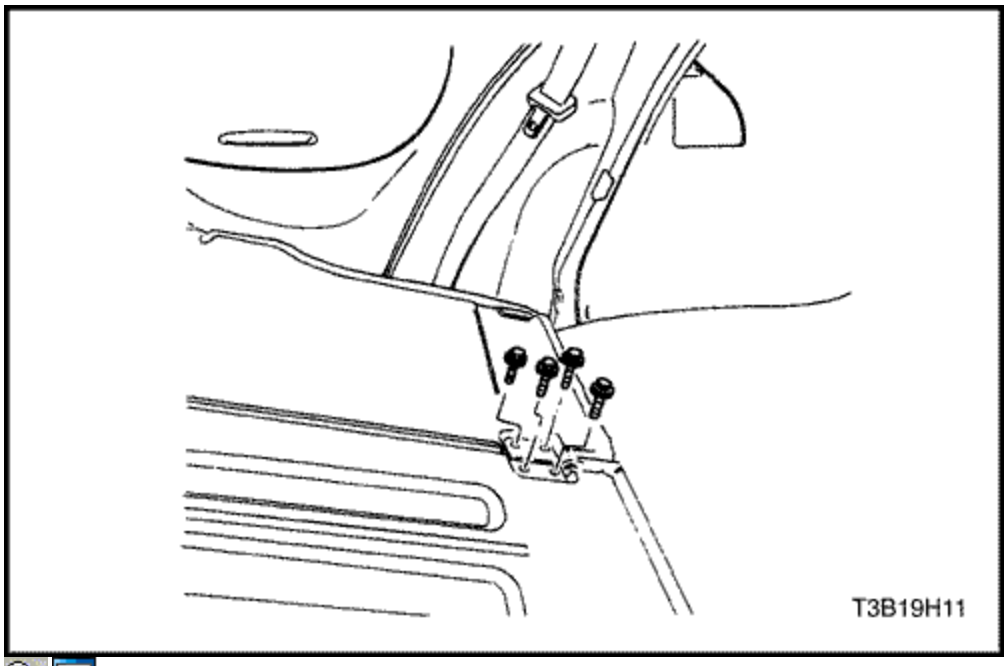
Rear Seatback
Removal Procedure

1. Remove the rear cushion. Refer to "Rear Seat Cushion" in this section.
2. Remove the bolts that seatback.
3. Remove the rear seatback by pulling the base of the seatback out and sliding the seatback up.



Installation Procedure

1. Insert the rear seatback by inserting the metal loops over the hooks.

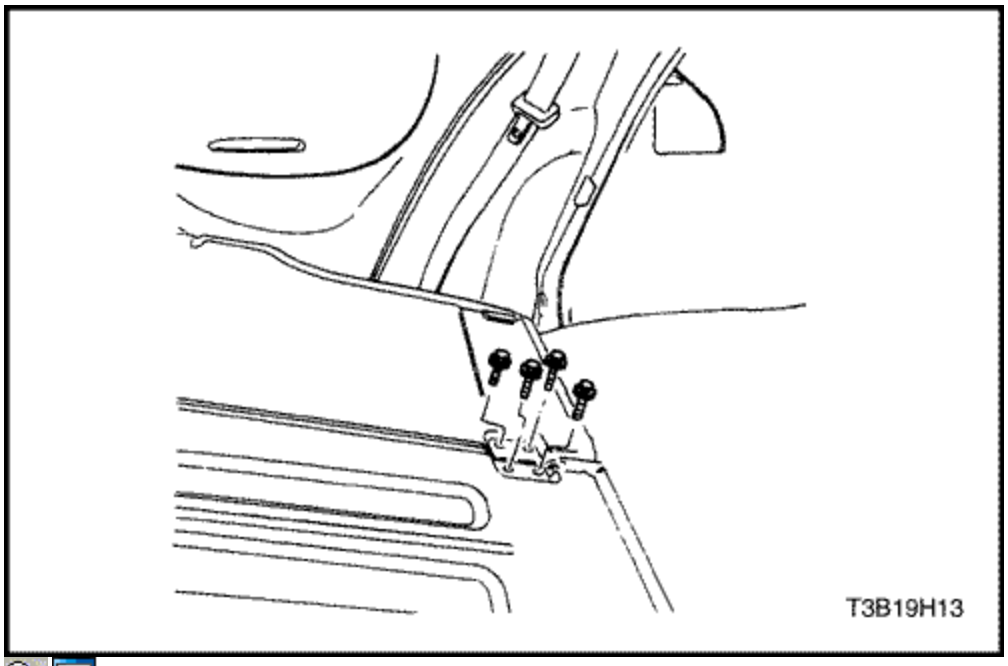


Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the rear seatback with the bolts.

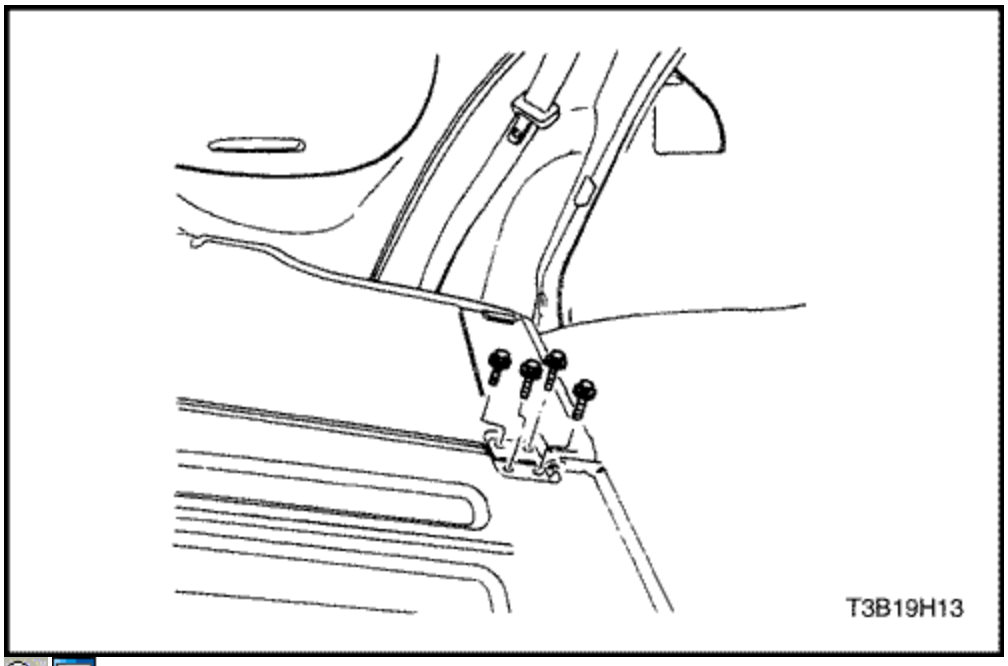
   Tighten
   Tighten the rear seatback bolt to 25 N•m (18 lb-ft).

3. Install the rear seat cushion. Refer to "Rear Seat Cushion" in this section.



Split Rear Seatback
Removal Procedure

1. Lower the rear seatbacks.
2. Remove the bolts that secure the rear seatbacks to the hinges.
3. Remove the rear seatbacks by pulling the seat hinge posts out of the lower C-pillars.

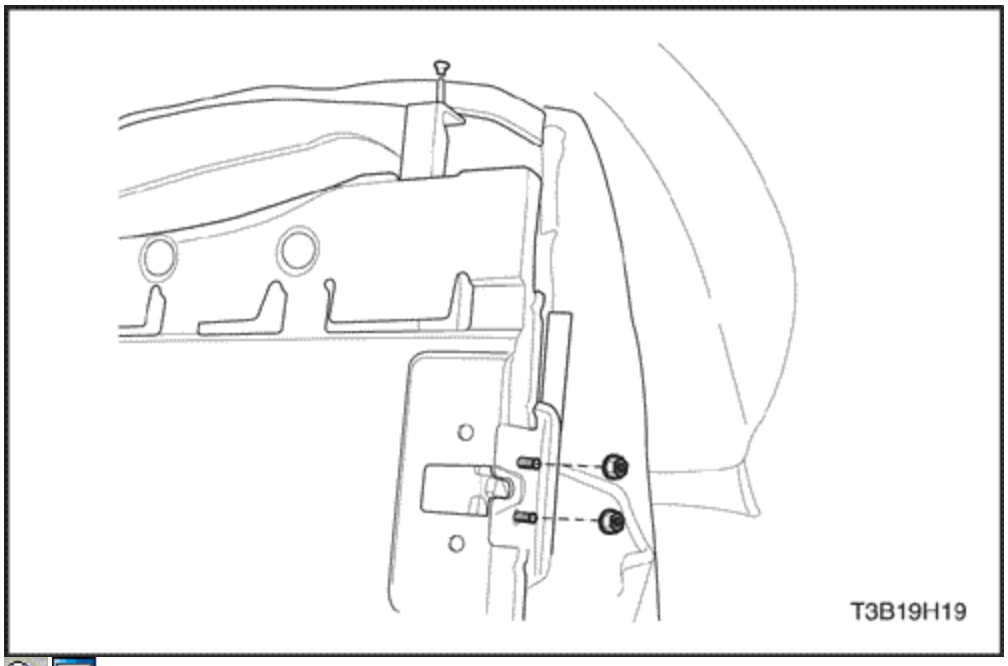


Installation Procedure

1. Install the rear seatback by inserting the seat hinge posts into the lower C-pillars.
2. Install the seatbacks to the hinges with the bolts.

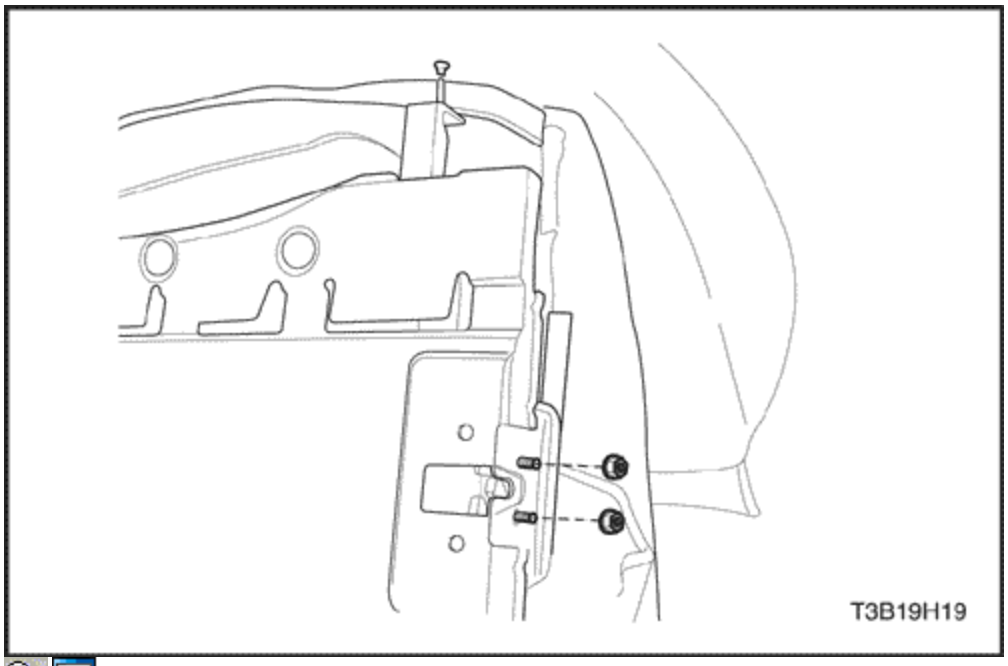
   Tighten
   Tighten the rear seatback bolts to 25 N•m (18 lb-ft).

3. Raise the rear seatbacks in the upright position.



Rear Seatback Lock Assembly
Removal Procedure

1. Remove the rear seatback lock release knob.
2. Reposition the rear seatback cover.
3. Remove the screws and the lock assembly.



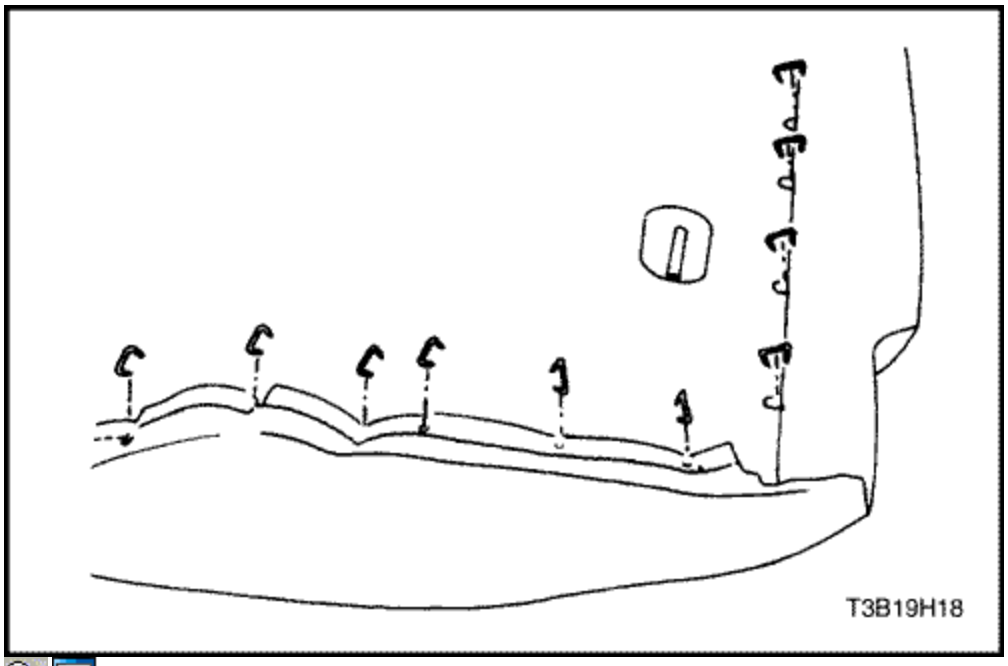
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the rear seatback lock assembly with the screws.

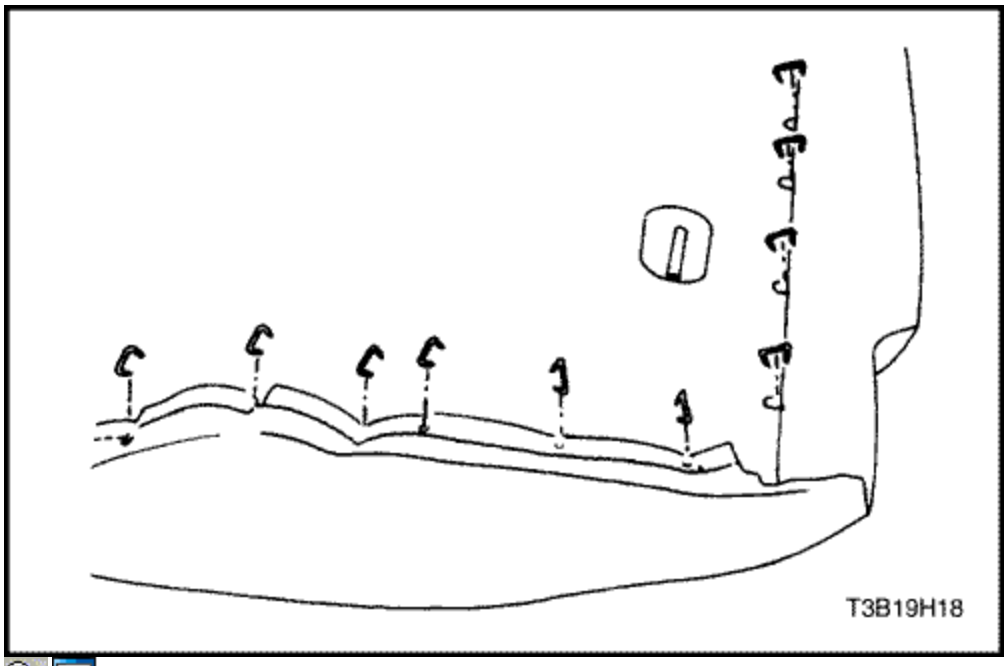
   Tighten
   Tighten the lock assembly screws to 20 N•m (15 lb-ft).

2. Install the rear seatback cover to its original position.
3. Install the rear seatback lock release knob.



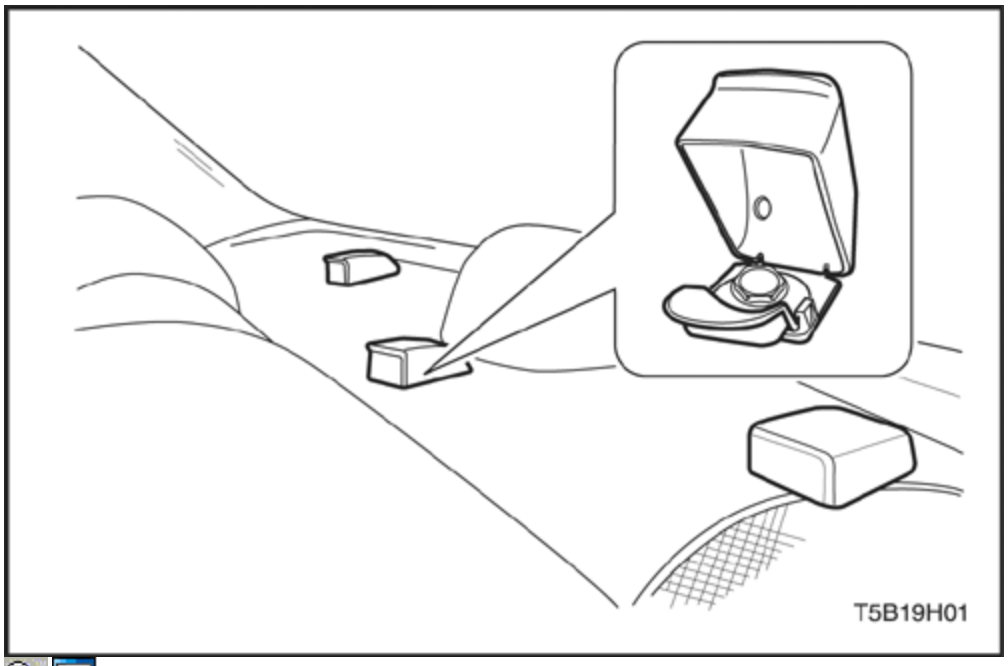
Seat Covers
(Rear Seatback Cover Shown, Other Seat Covers Similar)
Removal Procedure

1. Remove the seatback and/or the seat cushion. Refer to "Front Seatback," "Front Seat Cushion," "Split Rear Seatback," and/or "Rear Seat Cushion" in this section.
2. Remove the hog rings or the retaining clips from the seatback and/or the seat cushion.
3. Remove the seat cover from the seatback and/or the seat cushion.



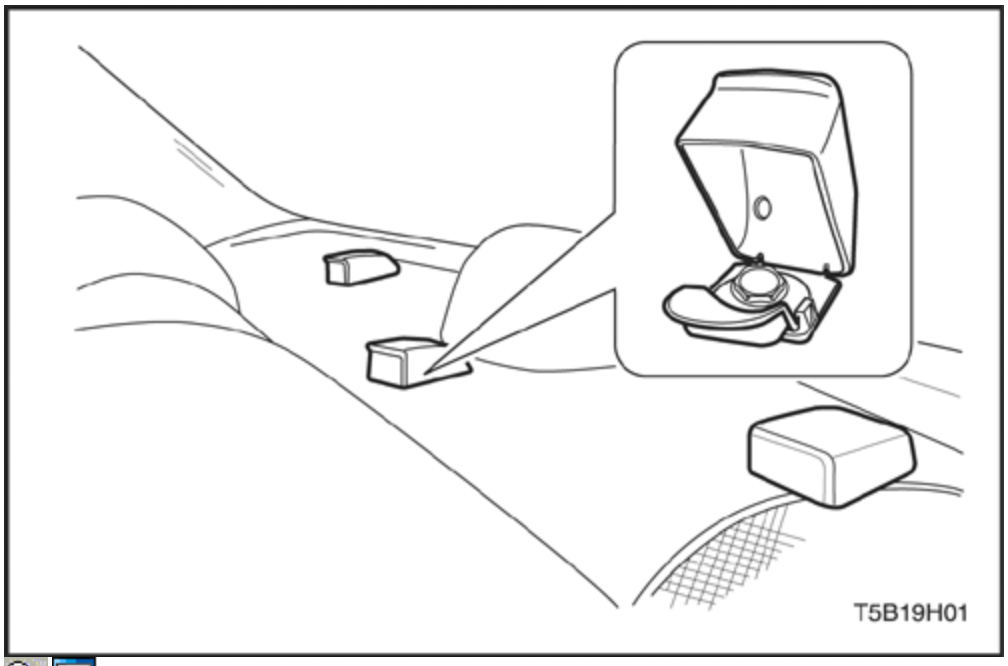
Installation Procedure

1. Install the seat cover onto the seatback and/or the seat cushion with the retaining clips or the new hog rings.
2. Install the seatback and/or the seat cushion. Refer to "Front Seatback," "Front Seat Cushion," "Split Rear Seatback," and/or "Rear Seat Cushion" in this section.



Child Seat Anchorage (NOTCHBACK)
Removal Procedure

1. Remove child seat anchorage cover.
2. Remove bolt and the child seat anchorage.

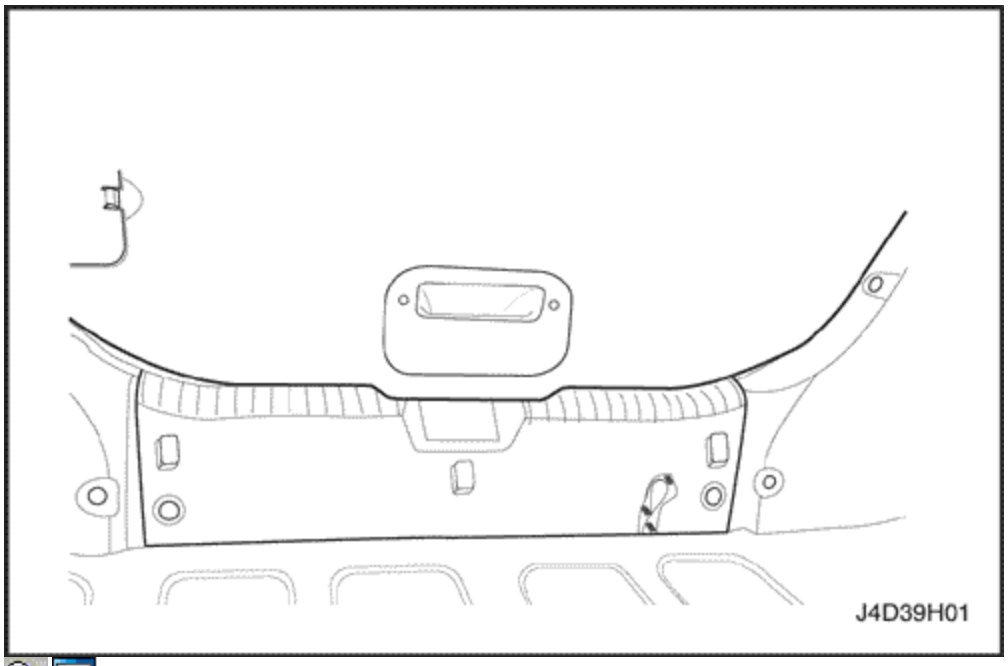


Installation Procedure

1. Install the child seat anchorage wiht the bolt.

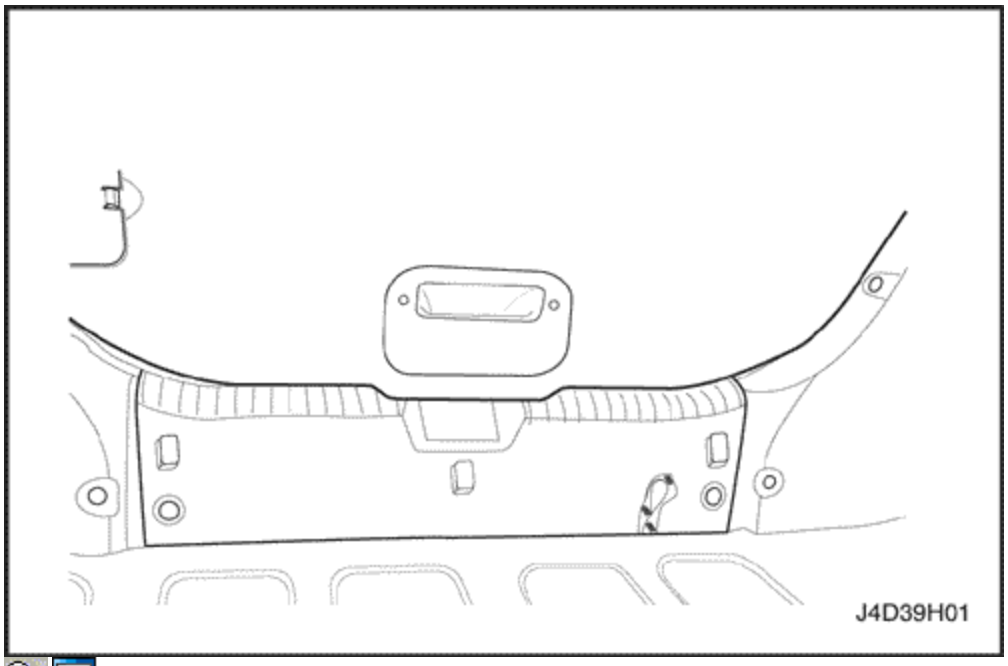
   Tighten
   Tighten the child seat anchorage bolt to 25 N•m (18 lb-ft).

2. Install the child seat anchorage cover.



Child Seat Anchorage (HATCHBACK)
Removal Procedure

1. Remove child seat anchorage cover.
2. Remove bolt and the child seat anchorage.



Installation Procedure

1. Install the child seat anchorage with the bolt.

   Tighten
   Tighten the child seat anchorage bolt to 25 N•m (18 lb-ft).

2. Install the child seat anchorage cover.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Seats

Important : Do not attempt to change the designed seat position by altering the designed seat adjuster-to-floor pan anchor provisions or the seat adjuster-to-seat frame anchor provisions. Changing the seat position could affect the performance of the seat system.

This vehicle is equipped with low-backed front bucket seats with separate head restraints and a three-passenger split folding rear seat. Seat cushions and seatbacks have formed foam pads, which fit the contours of the full-panel seatback frame assembly and the designed contour of the seat cushion frame. There are no front seat forward or rearward relocation provisions provided at either the seat adjuster-to-seat frame or the seat adjuster- to-floor pan anchor attachments.

Child Seat Anchorage

There are three child seat anchorage located aon the back upper panel(NOTCHBACK) and lower cover-back panel(HATCHBACK). There is one anchorage for each rear seat position.

SECTION 9I

WATERLEAKS

SPECIFICATIONS

Recommended Materials for Waterleak Repairs

Leak Areas	Repair Materials
Windshield, back window	Urethane adhesive, caulking kit, or the equivalent
Metal joints	Brushable seam sealer which can be painted
Ventilation ducts	3M™ Auto Bedding and Glazing Compound or the equivalent
Small cracks and pin holes	3M™ Drip-Check Sealer or the equivalent
Large holes	3M™ Automotive Joint and Seam Sealert
Weatherstrips	3M™ 08011 Weatherstrip Adhesive or the equivalent
Bolts, studs, and screws	Strip caulk

Watertest Stand Specifications

Application	Description
Nozzle Type	Full jet spray nozzle #1/2 GG-25 or equivalent with a 60° included angle
Nozzle Height	Approximately 1,600 mm (63.0 in.) from the floor
Volume of Flow	14L (3.7 gal) per minute
Pressure	155 kPa (22.5 psi) measured at the nozzle
Windshield and A-Pillar Test Stand Position	Approximately 30° down, 45° toward the rear,

Application	Description
	and aimed at the corner of the windshield
B-Pillar Test Stand Position	Approximately 30° down, 45° toward the rear, and aimed at the center of the rear door
Back Window and Rear Deck Lid Test Stand Position	Approximately 30° down, 30° toward the front and aimed approximately 610 mm (24.0 in.) from the corner of the back window

DIAGNOSIS

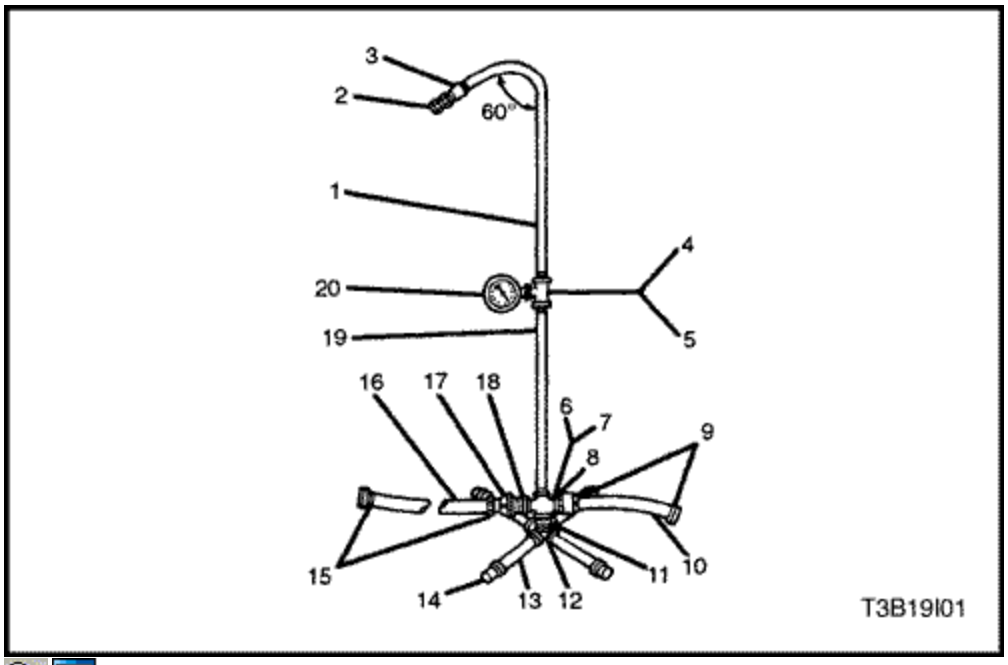
Waterleak Diagnosis

The repair of waterleaks in the body requires proper testing and diagnosis. Repair waterleaks by adjusting the misaligned parts and using the proper repair materials. First, determine what conditions cause the leak. For example, the leak may occur only when the vehicle is parked on an incline, or water may appear only in the spare tire compartment. Second, test the area for the source of the leak using the following testing methods. If the general leak area is found, determine the exact entry point of the leak by using a water hose or an air hose. If the general leak area is not obvious, use the watertest stands to determine the area of the leak. It may be necessary to remove some interior trim panels or some parts in order to locate the leaks.

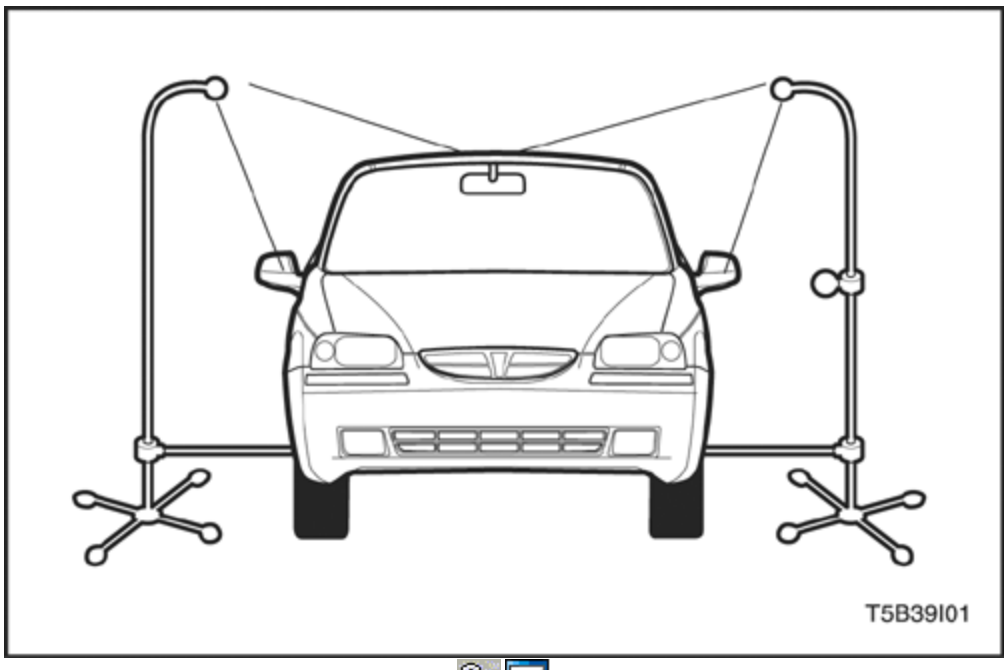
Important : It is necessary to find the origin of all the leaks before making any repairs. Random repairs may stop the leak only temporarily and may make future repairs more difficult. Continue localized testing in the general area in order to ensure that all leaks are found.

Generalized Testing

1. Set up the watertest stands.

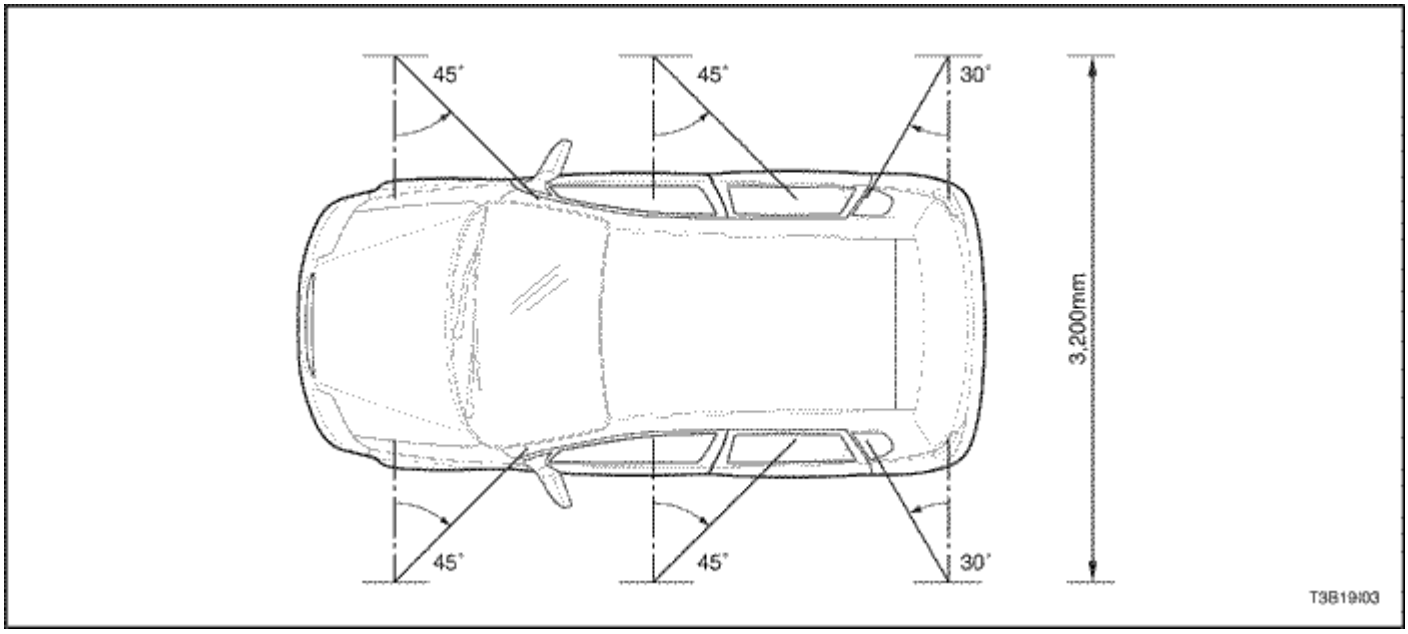


1. 1/2-inch by 36-inch Pipe
2. Set up the watertest stand leak test.



3. Perform the watertest stand leak test. Refer to "Watertest Stand Specifications" in this section.

4. If the local water pressure does not allow the required water pressure of 155 kPa (22.5 psi), move both stands closer to the vehicle so that the water spray overlaps.



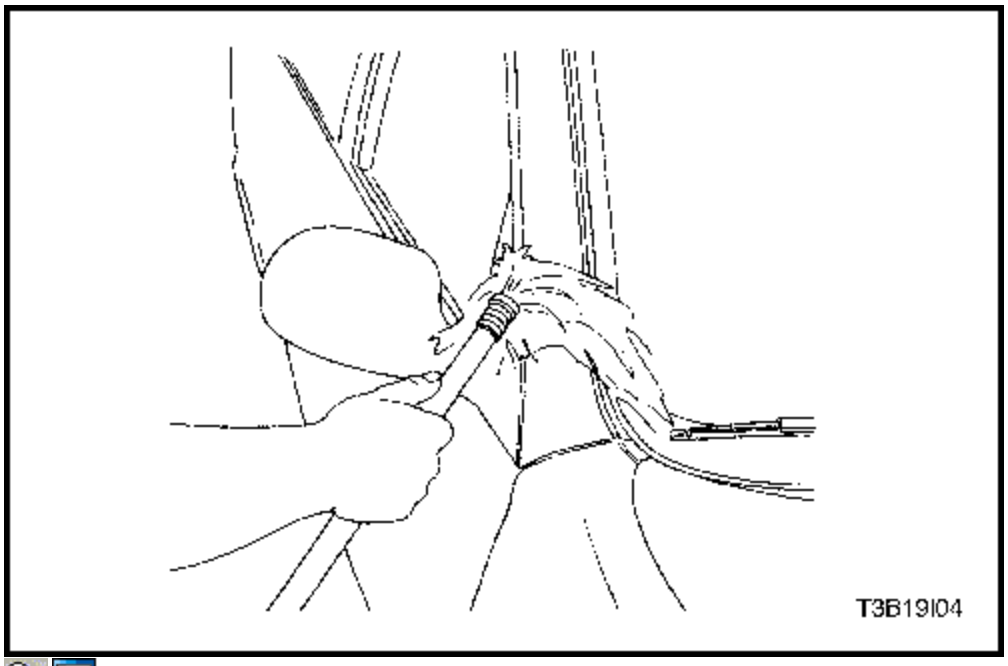
Localized Testing (Spot Test)

1. Do localized testing with a water hose or an air hose.
2. Do localized testing with a water hose or an air hose.
3. Begin testing by spraying the air or the water at the base of the suspected leak area. Continue spraying the air or the water upward until the leak is found.

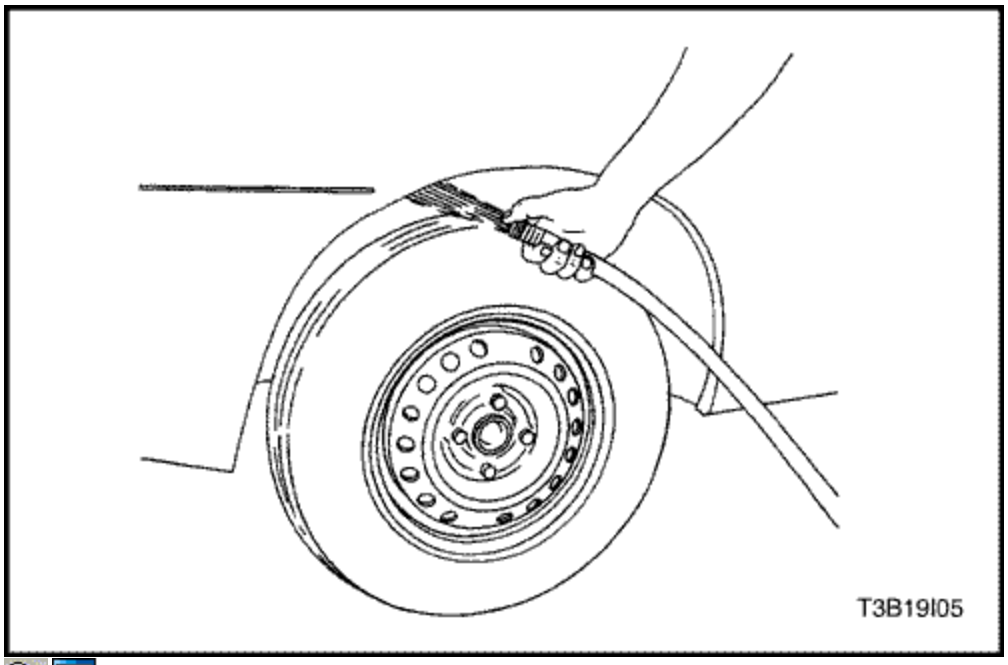
Water Hose Test

1. Place another person inside the vehicle in order to detect the location of the leak.
2. Place another person inside the vehicle in order to detect the location of the leak.

2. Use a water hose without a nozzle.
3. Use a water hose without a nozzle.

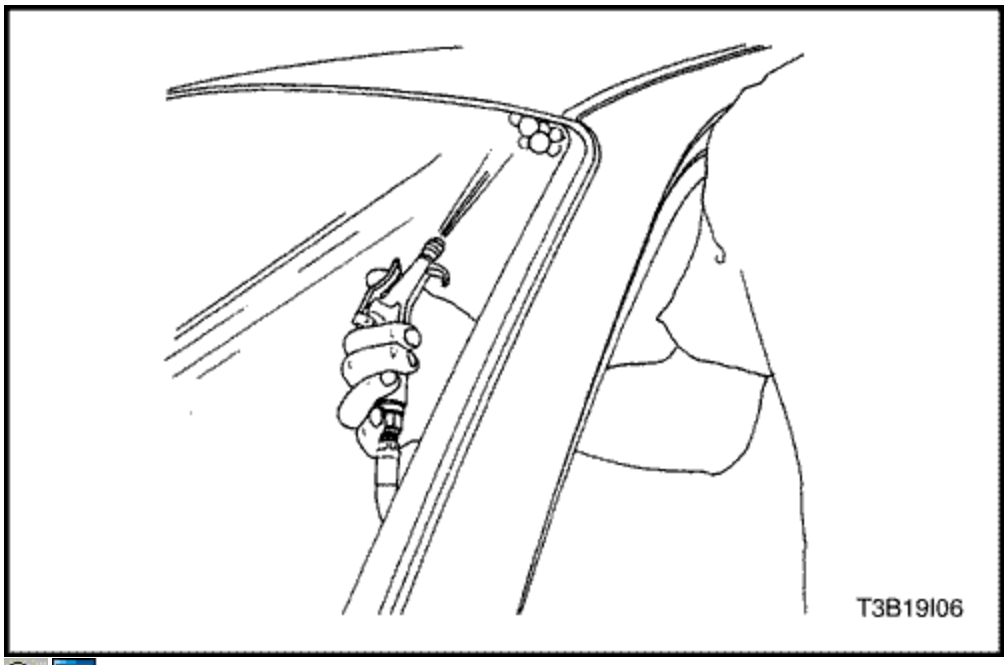


3. Begin spraying the water at the base of the suspected leak area. Continue spraying the water upward until the leak is found.



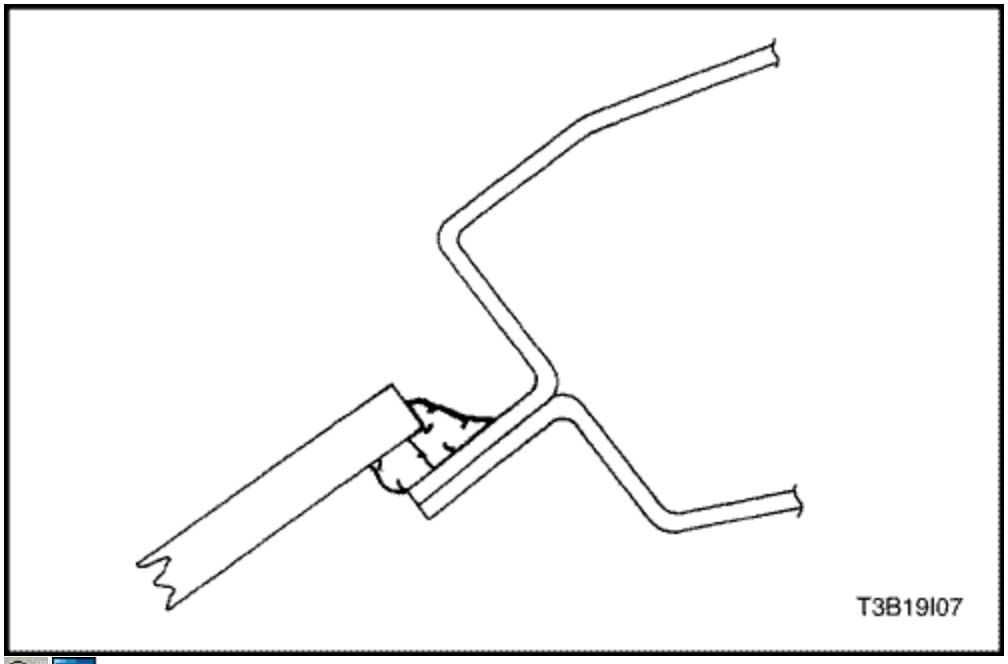
Air Hose Test

1. Apply soapy water to the outside of the vehicle in the suspected leak area.
2. Apply soapy water to the outside of the vehicle in the suspected leak area.
3. Blow air from inside the vehicle. The air pressure should not exceed 205 kPa (29.7 psi).
4. Determine the location of the leaks from the bubbles formed in the soapy water.



MAINTENANCE AND REPAIR

On-Vehicle Service

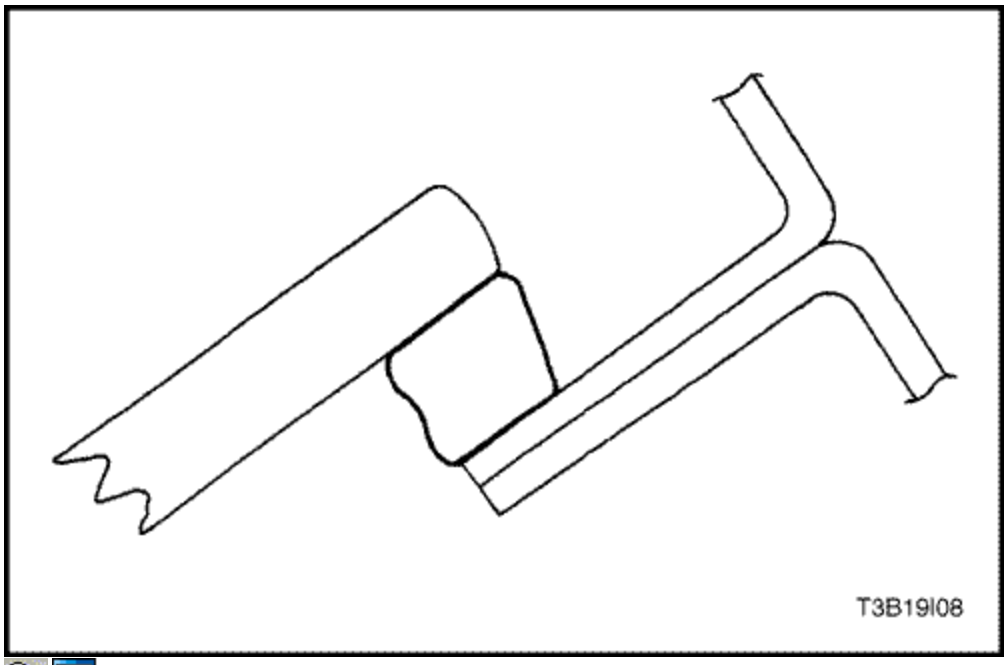


Waterleak Repair

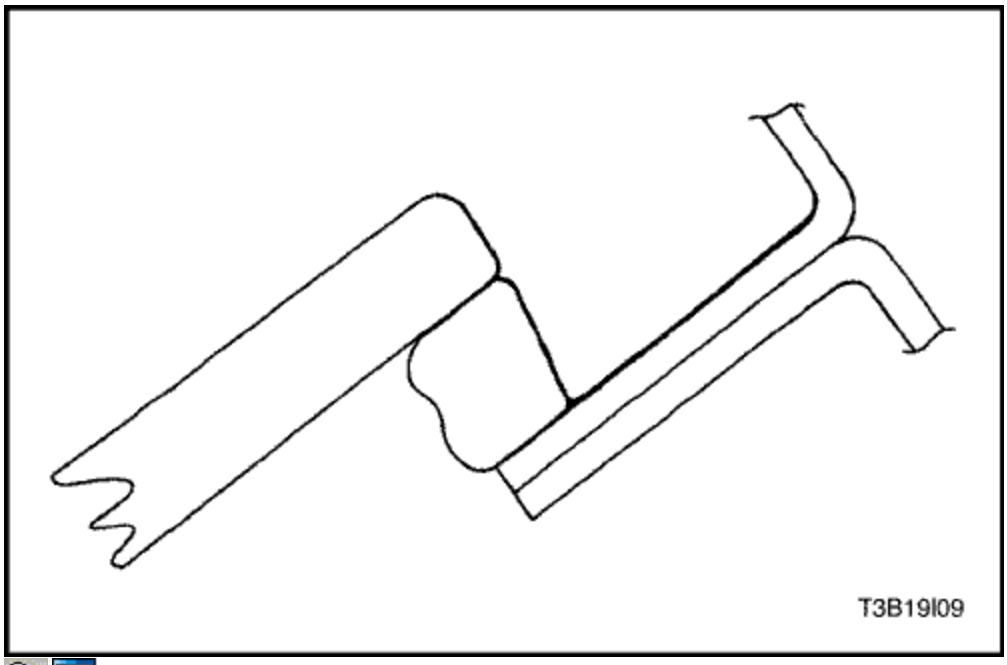
Some waterleaks around the glass can be repaired without removing the glass.

Important : This type of repair may be used only for urethane-installed glass.

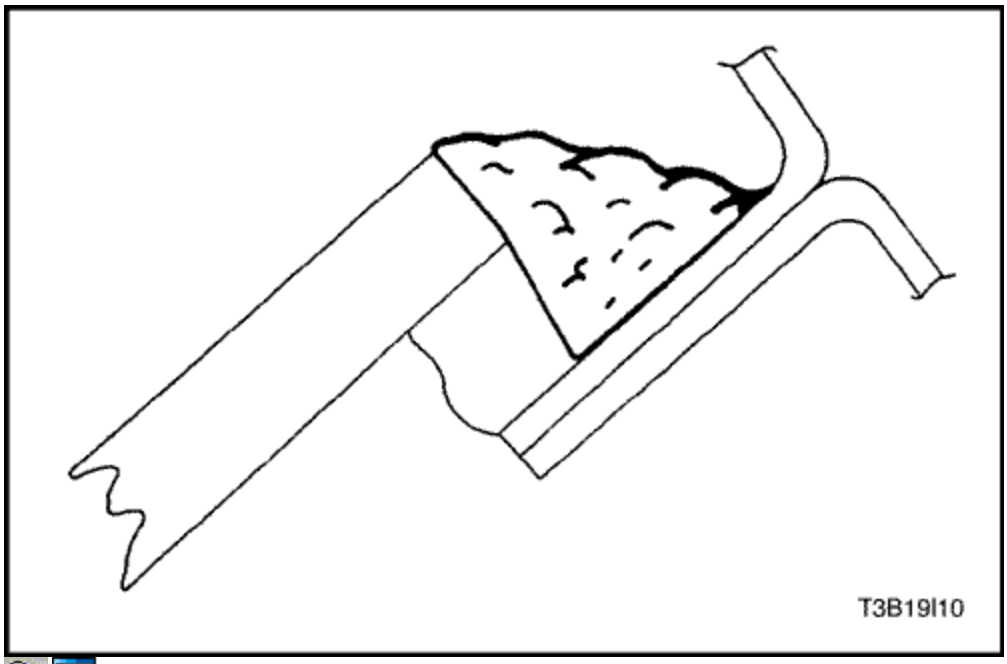
1. Remove the reveal molding in the area of the leak. It may be necessary to remove the garnish molding or the trim strip lace in order to locate the leak.
2. While spraying water over the leak area, carefully push the glass outward in order to determine the size of the leak.
3. Mark the location of the leak.
4. Use water to clean any dirt from the area. Dry the area with an air hose.
5. Using a sharp knife, trim off the uneven edges of the adhesive caulking material around the leak for a distance of 75 to 100 mm (3 to 4 inches) on both sides of the leak.



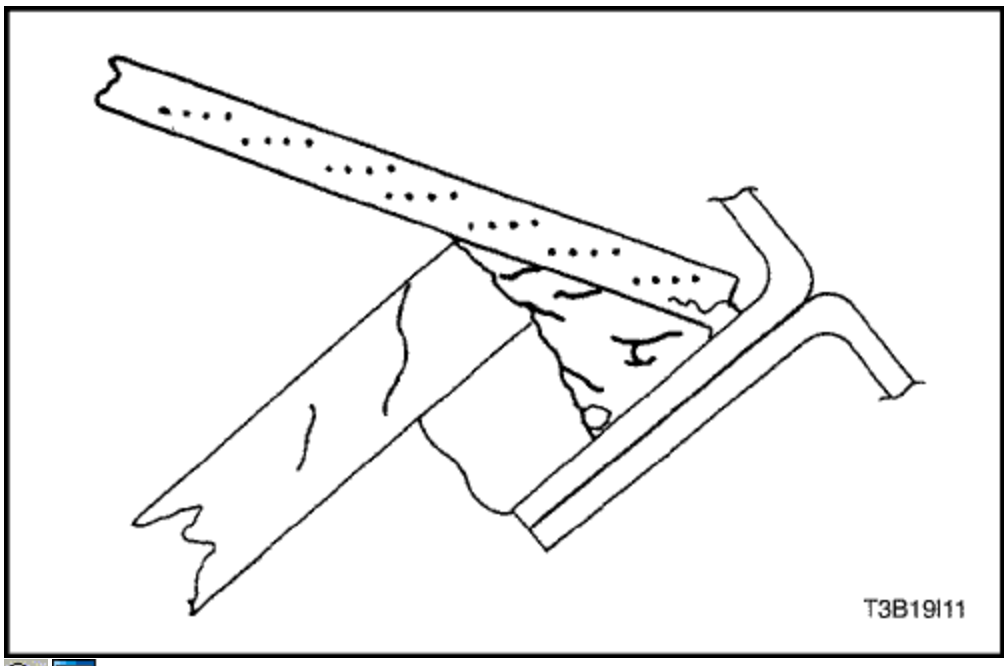
6. Using a sharp knife, trim off the uneven edges of the adhesive material around the leak 75 to 100 mm (3 to 4 inches) on both sides of the leak.



7. Prime the trimmed area with the primer.



8. Allow the primer to dry for 5 minutes.
9. Apply the adhesive over the leak and for a distance of 75 to 100 mm (3 to 4 inches) on both sides of the leak.



10. Immediately after applying the adhesive, use a flat stick or a similar tool to work the adhesive into the leak area and into the joint between the original material and the vehicle body in order to ensure a watertight seal.
11. Spray warm or hot water over the repaired area in order to determine if the leak was repaired. Do not run a heavy stream of water directly on the freshlyapplied adhesive.
12. Install the trim strip lace if it was removed.
13. Install the garnish molding if it was removed.
14. Install the reveal molding.

Important : After the completion of any waterleak repair, re-test the area using the watertest stands. Do not use localized testing procedures on the newly-repaired areas, as the repair material may dislodge under abnormal pressure.

SECTION 9J

WINDNOISE
DIAGNOSIS

Windnoise Diagnosis

Caution : An assistant should drive the vehicle while the technician checks for the location of the windnoise, in order to prevent personal injury or vehicle damage.

A test drive in the vehicle is necessary to accurately determine the location of the windnoise. Often there is a primary leak and secondary leaks. Failure to repair all leaks will only reduce the windnoise, not eliminate it.
During the test drive the technician should bring the following items to aid in determining the location of the windnoise.

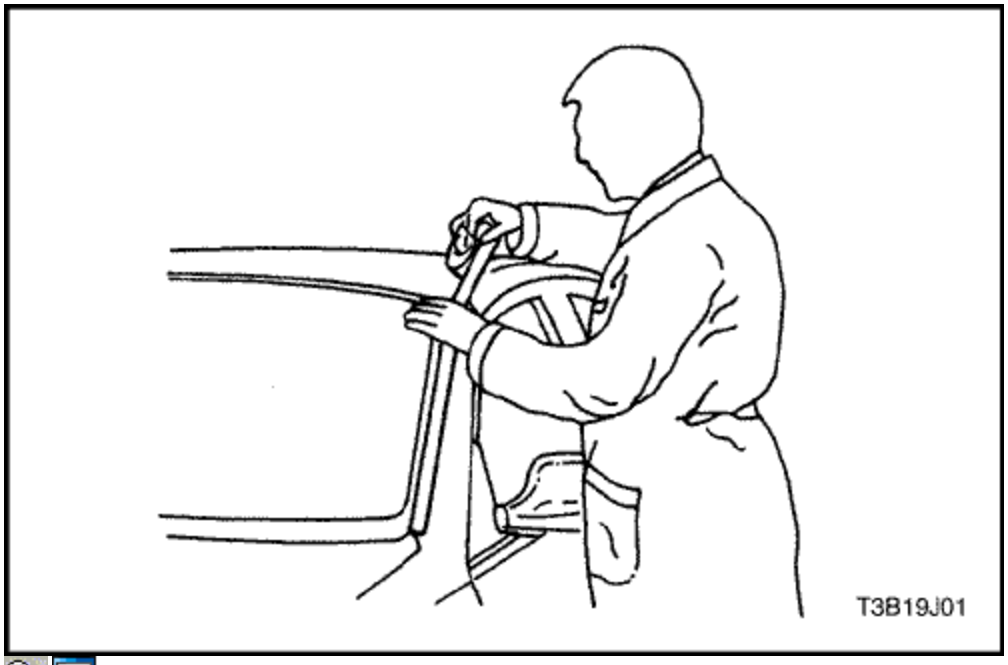
- A mechanics stethoscope or vacuum hose
- Masking tape
- Strip caulk
- A china marking pencil
- A screwdriver

Perform the following steps in order to conduct the road test:

1. Choose a route that includes smooth straight streets that run in all four directions (north, south, east, and west).
2. Choose a route that includes smooth straight streets that run in all four directions (north, south, east, and west).
3. Choose streets with little traffic or noise that would interfere with the test.
4. Drive the vehicle at the speeds at which the noise was noticed by the customer or until the noise is produced. Do not exceed legal speed limits.

5. The windnoise is external if any of the following conditions occur:
    - The windnoise is caused by the wind.
    - The windnoise can be heard with the door glass lowered and while the vehicle is being driven.
    - The windnoise is eliminated when tape is placed over various moldings and gaps.

5. Internal windnoise is air leaving the vehicle and should be repaired in the following manner.
6. Internal windnoise is air leaving the vehicle and should be repaired in the following manner.
    - In order to locate the leak, tape off the body lock pillar pressure relief valves. This will cause air pressure to build up inside the vehicle and enhance the windnoise.
    - Use a stethoscope or a vacuum hose to locate the leak.
    - Temporarily repair the leak with masking tape.



    - Continue testing in order to determine if the noise has been eliminated or if other leaks exist.
    - When all leaks have been found, return to the shop and make permanent repairs with the proper alignment techniques and sealing materials.

MAINTENANCE AND REPAIR

On-Vehicle Service

Windnoise Repair

Windnoise leak repairs are very similar to waterleak repairs. Refer to *Section 9I, Waterleaks.* The actual procedure depends on the type of seal being repaired.

Leaks around the door opening weatherstrips do not always indicate a faulty weatherstrip. A door or window adjustment may resolve the condition. Refer to *Section 9P, Doors* or *Section 9L, Glass and Mirrors.*

SECTION 9K

SQUEAKS AND RATTLES

DIAGNOSIS

Squeak and Rattle Diagnosis

Rattle Coming From the Side Rail

Checks	Action
Check the brake lines.	• Tap lightly on the brake lines and listen for a rattle. • Install plastic tie straps to secure the brake lines tightly together.

Rattle Under Vehicle at Higher RPM

Checks	Action
Check for heat shield contact with the underbody.	• Raise the vehicle and perform a visual inspection. • Bend the heat shield slightly to gain

Checks	Action
	clearance from the underbody.

Squeak From the Front of the Vehicle in Cold Weather

Checks	Action
Check the front stabilizer shaft insulators.	• While the vehicle is cold, perform a test drive and achieve full front suspension travel by driving through a dip in the road. • Remove the insulators and wrap teflon tape around the stabilizer shaft. Reinstall the insulators over the tape.

Thump From Rear of Vehicle on Bumps

Checks	Action
Check for a properly secured spare tire in the rear compartment.	• Open the rear compartment and perform a visual inspection of the spare tire and the tools. • Tightly secure the spare tire and all tools. • Perform a road test to verify that the noise is eliminated.

Glass Knock Coming From the Rear of the Vehicle When Driving Over Bumps

Checks	Action
Check for an out-of-adjustment hatchback latch.	• Test drive the vehicle in order to verify this condition. • Loosen the latch nuts and adjust the latch downward.

Rattle Coming From Door

Checks	Action
Check the door lock solenoid.	• Remove the door trim panel and check if the solenoid is loose. • Tighten the solenoid bolts.
Check for rattling electrical connectors inside the door trim panel.	• Tap on the trim panel and listen for a rattle. • Remove the trim panel and wrap foam padding around the connectors as required.

Squeak When Operating Doors

Checks	Action
Check for a lack of lubrication of the door hinge pins.	• Operate the doors and listen for squeaks. • Lubricate the door hinge pins with light oil and coat with lithium grease.

Squeak Coming From Console When Shifting Manual Transaxle (Condition Occurs In Cold Weather with a Cold Engine)

Checks	Action
Check the manual transaxle control lever lower boot.	• Move the control lever between gears and listen for squeaks. • Remove the floor console and replace the lower shift boot or apply talcum powder to the lower shift boot.

Buzz From the Left Side of Instrument Panel

Checks	Action
Check for vibration of the fuse box cover against the instrument panel side trim.	• Tap on the cover with a finger and listen for a buzz. • Apply 6.35 mm (0.250 inch) by 25.4 mm (1.00 inch) felt pads to the side trim where the cover makes contact.

Squeak Coming From Instrument Cluster Trim Plate

Checks	Action
Check for rubbing of the cluster trim plate on the instrument panel.	• Test drive the vehicle in order to verify this condition. • Remove the instrument cluster trim plate and install felt tape to the edges.

MAINTENANCE AND REPAIR

On-Vehicle Service

Squeak and Rattle Repair

Squeaks and rattles are caused by the unwanted movement between parts of a vehicle. There are threemeans to prevent squeaks or rattles.

- Attach the parts securely so that there is no relative motion during the operation of the vehicle.
- Separate the parts so that there is no contact during operation.
- Insulate the parts so that no squeaks or rattles occur with the movement of the parts. Low uniform friction surfaces can be used to eliminate "stick-slip" motion.

SECTION 9L

GLASS AND MIRRORS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical erminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SPECIFICATIONS

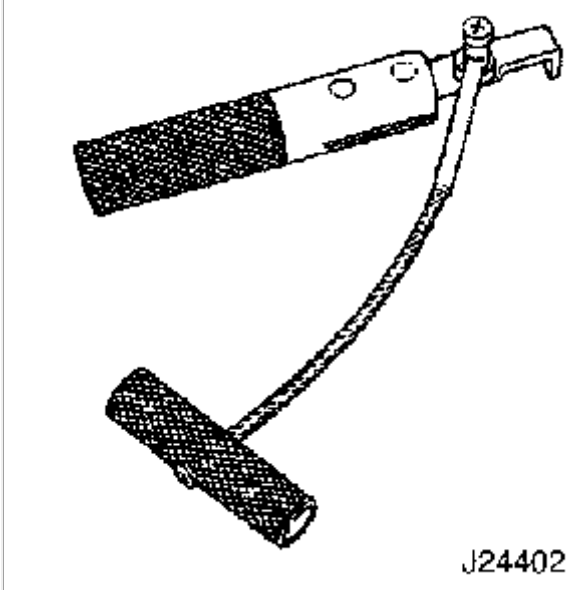
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Exterior Rear Door Garnish Molding Screws	1.5	-	13
Door Glass Screws	7	-	62
Guide Rail Bolts	7	-	62
Outside Rearview Mirror Assembly Screws	4.5	-	40
Rearview Mirror Mounting Screw	1.2	-	11

SPECIAL TOOLS

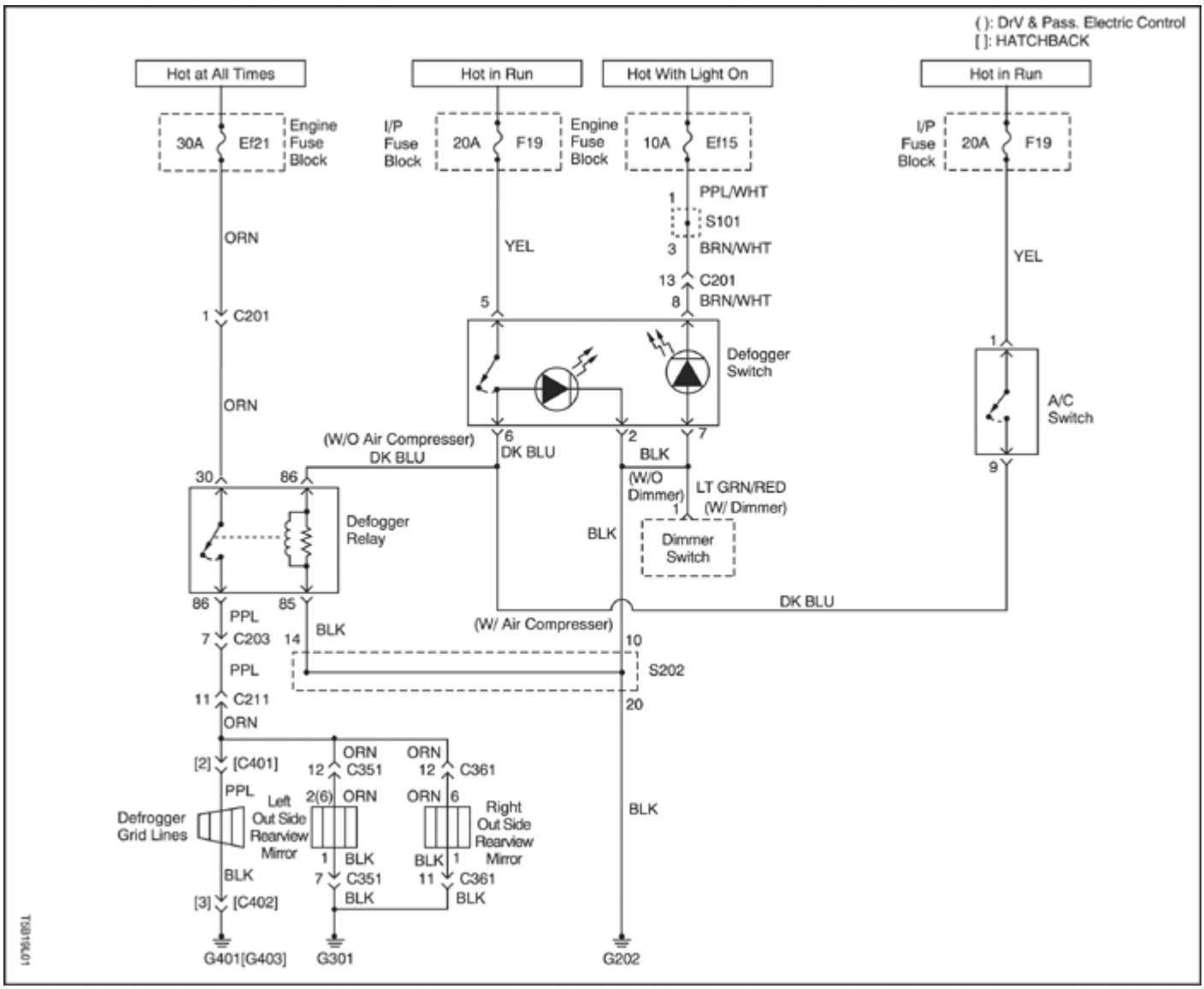
Special Tools Table

	J-24402 Glass Sealant Remover

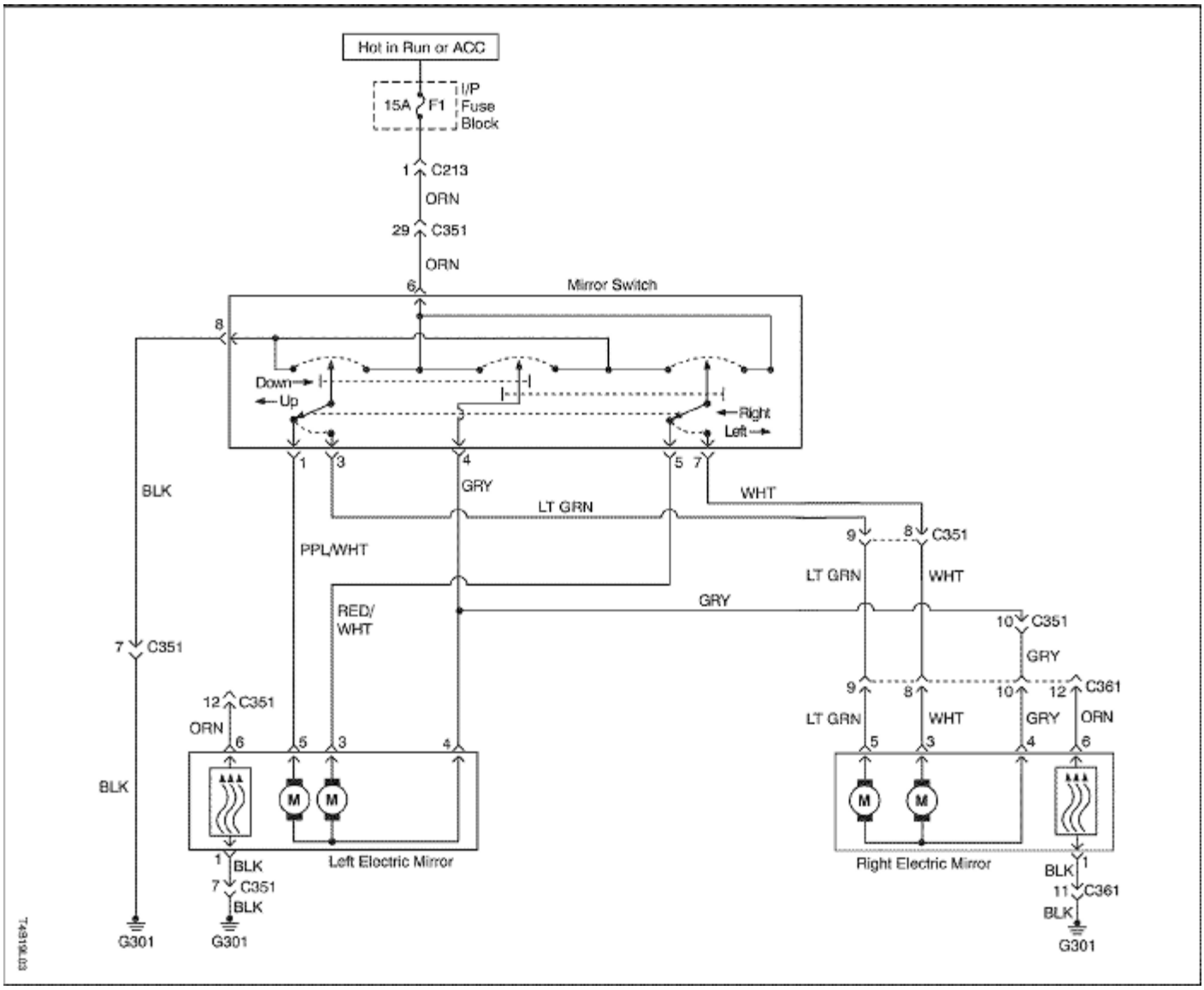


SCHEMATIC AND ROUTING DIAGRAMS

Rear Window and Outside Rear View Mirror Defogger



Electric Control Outside Rearview Mirror



DIAGNOSIS

Testing Rear Window Defogger Grid Line

If it has been observed during use that a grid line is inoperative, the following procedure can be used to find the break. If none of the grid lines is operating, a full system diagnosis should be completed before attempting to repair the grid lines.

1. Turn the ignition ON.
2. Turn the ignition ON.

2. Turn on the rear window defogger.
3. Turn on the rear window defogger.

Notice : Use care when touching the voltmeter terminals to a grid line. If the terminals are roughly applied, the grid line may be scratched, resulting in an open circuit.

1. From the inside of the vehicle, connect a voltmeter to each end of a grid line. The voltmeter will indicate battery voltage if the grid line is open.
2. If a grid line is found to be open, move a voltmeter terminal from one side of the grid line and retest at a point nearer to the other side of the window. Continue to retest, each time bringing one of the voltmeter terminals closer to the opposite side of the window from where it was originally connected. The break in the grid line is at the point where the voltmeter begins reading 0 volts instead of battery voltage.
3. Use a marking crayon to lightly mark the break point on the rear window. Mark the glass instead of marking directly on the grid line, and make the mark far enough from the grid line so that the mark can easily be removed without disturbing the repair.
4. Use a grid line repair kit to fix the break in the grid line. Refer to "Rear Window Defogger Grid Line Repair" in this section.

Outside Rearview Mirror Defoggers

Step	Action	Value(s)	Yes	No
1	Check the rear window defogger. Does the rear window defogger work?	-	Go to *Step 4*	Go to *Step 2*
2	Repair the rear window defogger before proceeding with the outside rearview mirror diagnosis. Is the repair complete?	-	Go to *Step 3*	-
3	Test the outside rearview mirror defoggers. Does the repair of the rear window defogger system also fix the problem with the outside rearview mirror defoggers?	-	System OK	Go to *Step 4*
4	Check fuse Ef21, F19. Is fuse Ef21, F19 blown?	-	Go to *Step 5*	Go to *Step 6*
5	1. Check for a short circuit and repair it, if necessary. 2. Replace the fuse. Is the repair complete?	-	System OK	-
6	1. On the side of the vehicle which has	11-14 v	Go to *Step 9*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
	the malfunctioning outside rearview mirror defogger, remove the black plastic escutcheon from the trim panel side of the door. 2. Disconnect the outside rearview mirror electrical connector. 3. Turn the ignition ON. 4. Turn on the defogger. 5. Use a voltmeter to backprobe terminal 2 (ORN) at the outside rearview mirror electrical connector. Does the voltmeter indicate the specified value?			
7	Repair the open circuit between fuse Ef21 and the defogger relay. Is the repair complete?	-	System OK	Go to *Step 8*
8	1. Turn the ignition ON. 2. Turn on the defogger. 3. use a voltmeter to fuse F19 and the defogger relay terminal 86. Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 10*	Go to *Step 9*
9	Replace the defogger switch. Is the repair complete?	-	System OK	Go to *Step 10*
10	Replace the defogger relay with other relay. Does the outside rear view mirror work?	-	System OK	Go to *Step 11*
11	1. Turn the ignition OFF. 2. Disconnect the outside rearview mirror electrical connector. 3. Use an ohmmeter to measure the resistance between terminal 1 (BLK) of the outside rearview mirror connector and ground. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 12*
12	Repair the open ground circuit for the outside rearview mirror. Is the repair complete?	-	System OK	-
13	Replace the defective outside rearview mirror. Is the repair complete?	-	System OK	-

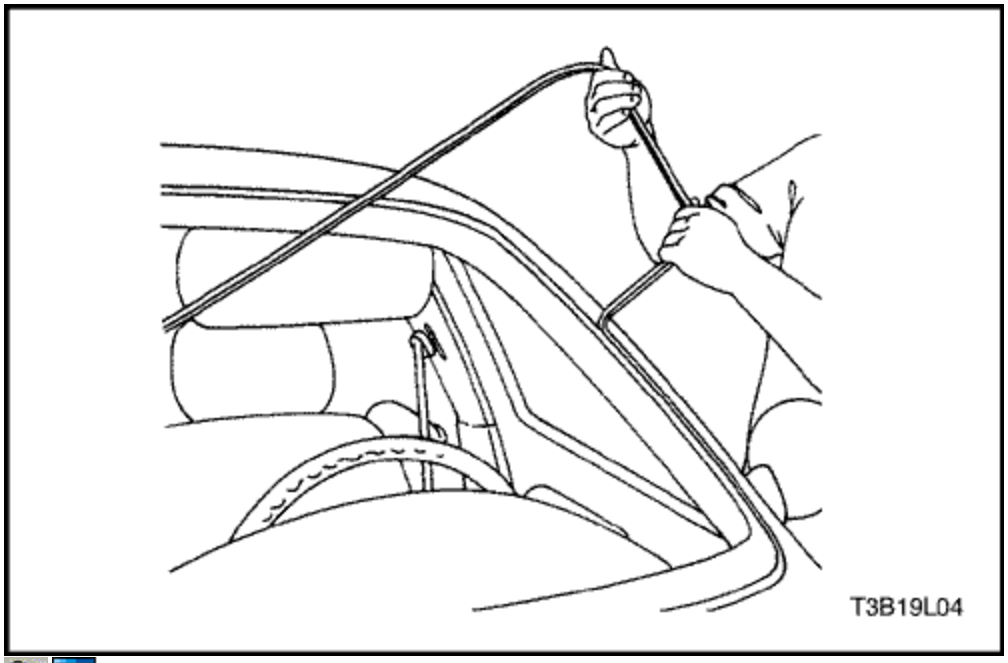
Electric Control Outside Rearview Mirror
Outside Rearview Mirror Does Not Adjust

Step	Action	Value(s)	Yes	No
1	Check the electric control mirror's left-and-right and up-and-down adjustments. Is the mirror operating for either the left-and-right or up-and-down adjustments?	-	Go to *Step 12*	Go to *Step 2*
2	Check fuse F1. Is fuse F1 blown?	-	Go to *Step 3*	Go to *Step 4*
3	1. Check for a short circuit and repair it, if necessary. 2. Replace fuse F1. Is the repair complete?	-	System OK	-
4	1. Turn the ignitionON. 2. Check the voltage at fuse F1. Is the voltage at fuse F1 equal to the specified value?	11-14 v	Go to *Step 6*	Go to *Step 5*
5	Repair the open power supply circuit for fuse F1. Is the repair complete?	-	System OK	-
6	1. From below the instrument panel, reach up and press one of the retaining tabs for the electric control mirror switch trim panel. 2. While pressing one of the retaining tabs, pull the switch assembly away from the instrument panel so that the connector is visible. Is the connector properly connected to the electric control mirror switch?	-	Go to *Step 8*	Go to *Step 7*
7	Connect the connector to the electric control mirror switch. Is the repair complete?	-	System OK	-
8	1. Disconnect the electric control mirror switch connector. 2. Turn the ignition ON. 3. Connect a voltmeter between terminal 6 (ORN) and terminal 8 (BLK). Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 13*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition ON. 2. Check the voltage at terminal 6 (ORN). Does the voltage equal the specified value?	11-14 v	Go to *Step 10*	Go to *Step 11*
10	Repair the open circuit between ground and terminal 8 (BLK). Is the repair complete?	-	System OK	-
11	Repair the open circuit between the power window relay and the electric control mirror switch. Is the repair complete?	-	System OK	-
12	Check the left-and-right adjustment for the electric control mirror. Is the left-and-right adjustment working for the electric control mirror?	-	Go to *Step 18*	Go to *Step 13*
13	1. Make sure the electric control mirror switch has been reconnected. 2. On the passenger door, remove the black plastic escutcheon to expose the electric control mirror connector. 3. Disconnect the connector at the passenger door electric control mirror. 4. Connect a voltmeter between terminal 4 (GRY) and terminal 3 (LT GRN). 5. Observe the voltmeter while operating the electric control mirror switch to select the left-and-right adjustment. Does the voltmeter indicate the specified voltage in one direction, and the same voltage with reverse polarity when operated in the opposite direction?	11-14 v	Go to *Step 17*	Go to *Step 14*
14	1. Disconnect the electric control mirror switch connector. 2. Use an ohmmeter to measure the continuity between terminal 5 (RED/WHT) at the electric control mirror switch and terminal 3 (LT GRN) at the power mirror connector. 3. Use an ohmmeter to measure the continuity between terminal 4 (GRY) at the electric control mirror switch and terminal 4 (GRY) at the power mirror	≈ 0 Ω	Go to *Step 16*	Go to *Step 15*

Step	Action	Value(s)	Yes	No
	connector. Does the ohmmeter indicate the specified value for both measurements?			
15	Repair the open circuit between the electric control mirror switch and the electric control mirror connector. Is the repair complete?	-	System OK	-
16	Replace the electric control mirror switch. Is the repair complete?	-	System OK	-
17	Replace the electric control mirror. Is the repair complete?	-	System OK	-
18	1. If the electric control mirror switch was previously disconnected for testing, make sure it is reconnected. 2. Disconnect the electric control mirror connector at the passenger door power mirror. 3. Connect a voltmeter between terminal 4 (GRY) and terminal 5 (RED/WHT). 4. Observe the voltmeter while operating the power mirror switch to select the up-and-down adjustment. Does the voltmeter indicate the specified voltage in one direction, and the same voltage with reverse polarity when operated in the opposite direction?	11-14 v	Go to *Step 17*	Go to *Step 19*
19	1. Disconnect the electric control mirror switch connector. 2. Use an ohmmeter to measure the continuity between terminal 1 (PPL/WHT) at the electric control mirror switch and terminal 5 (RED/WHT) at the electric control mirror connector. 3. Use an ohmmeter to measure the continuity between terminal 4 (GRY) at the electric control mirror switch and terminal 4 (GRY) at the electric control mirror connector. Does the ohmmeter indicate the specified value for both measurements?	≈ 0 Ω	Go to *Step 16*	Go to *Step 15*

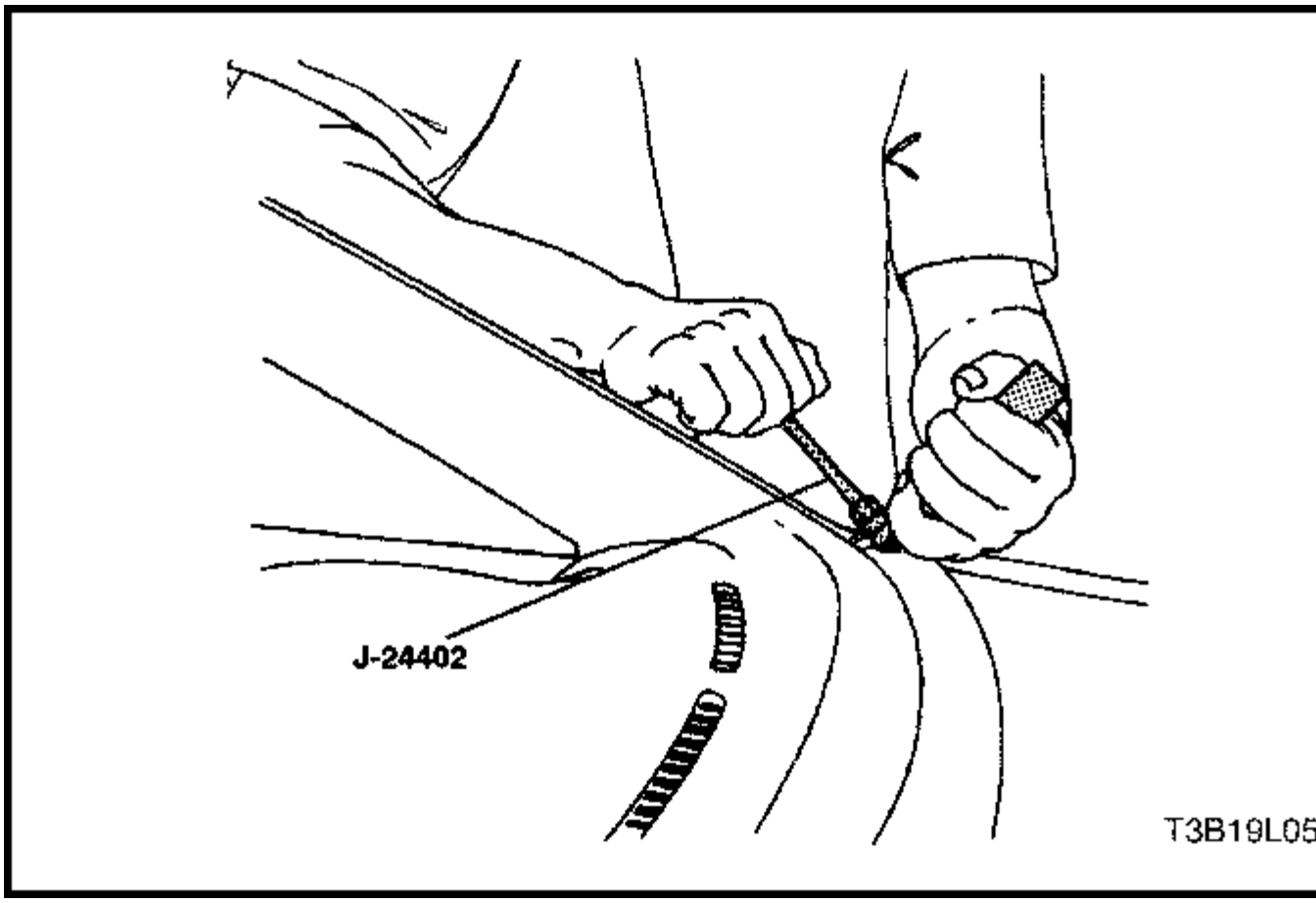
MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



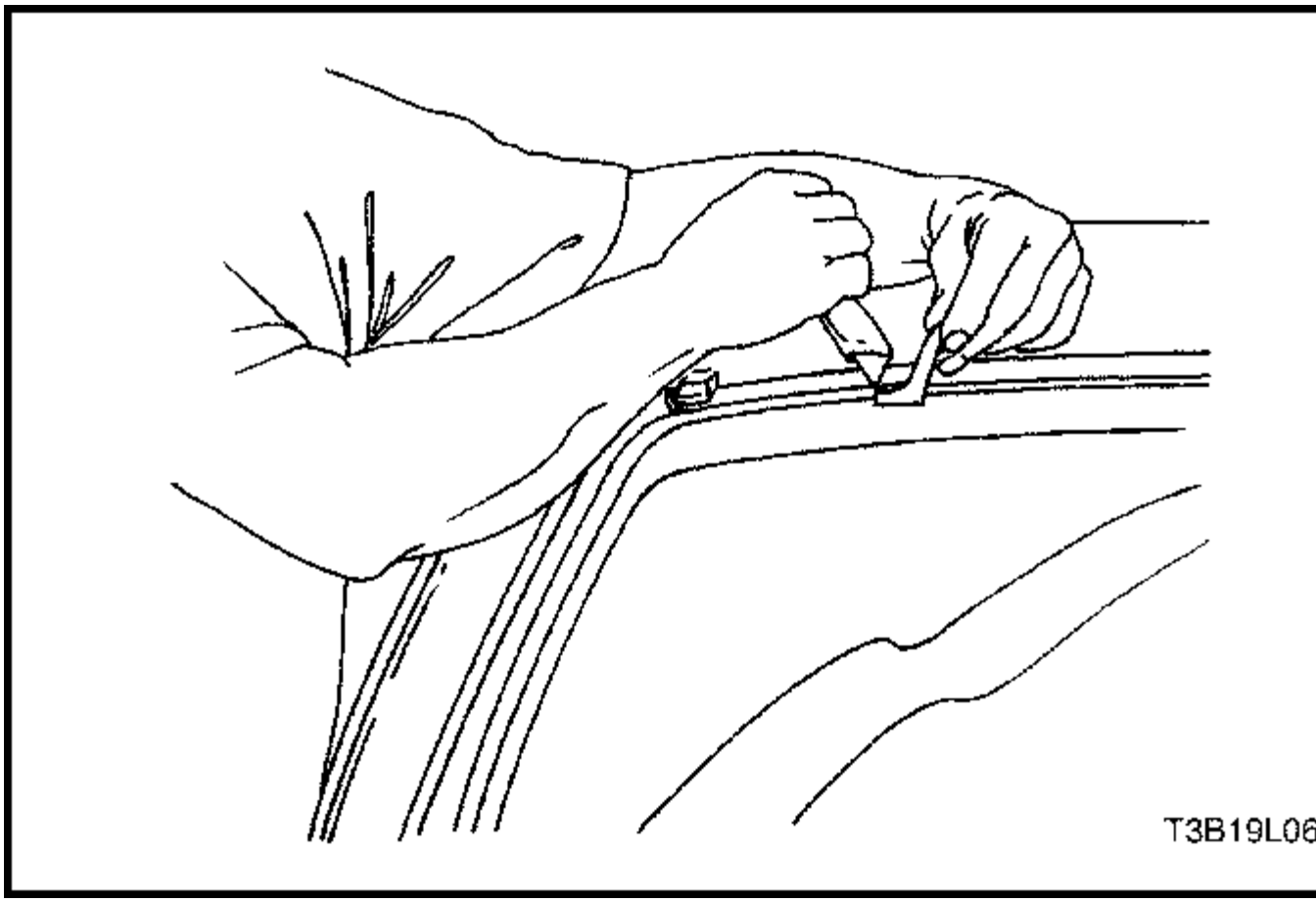
Windshield
Tools Required

J-24402 Glass Sealant Remover
Removal Procedure

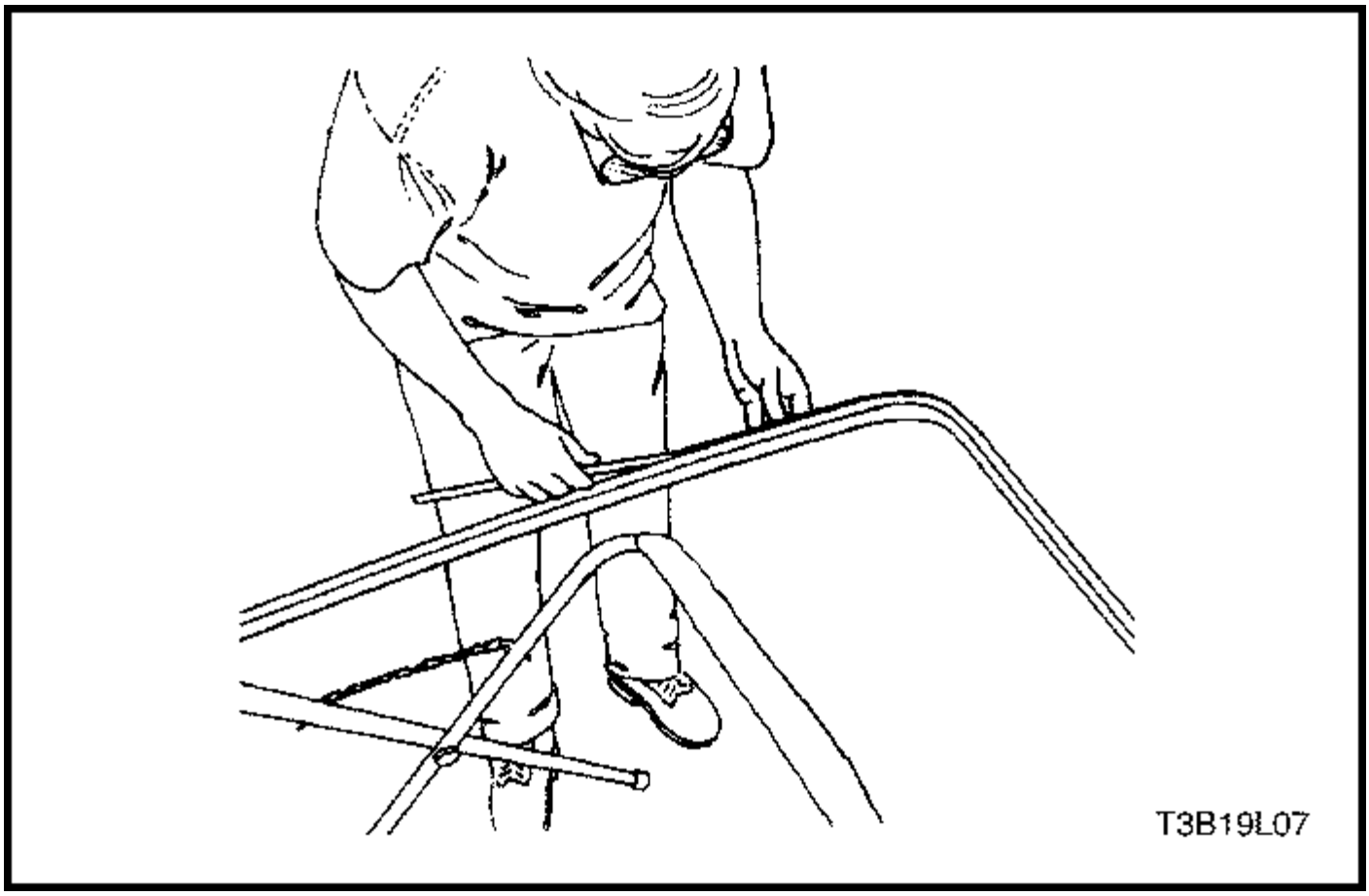
1. Remove the cowl vent grille. Refer to *Section 9R, Body Front End.*
2. Remove the inside rearview mirror. Refer to "Inside Rearview Mirror" in this section.
3. Remove the weatherstrip around the windshield.



4. Using the glass sealant remover J-24402, cut the adhesive around the windshield.

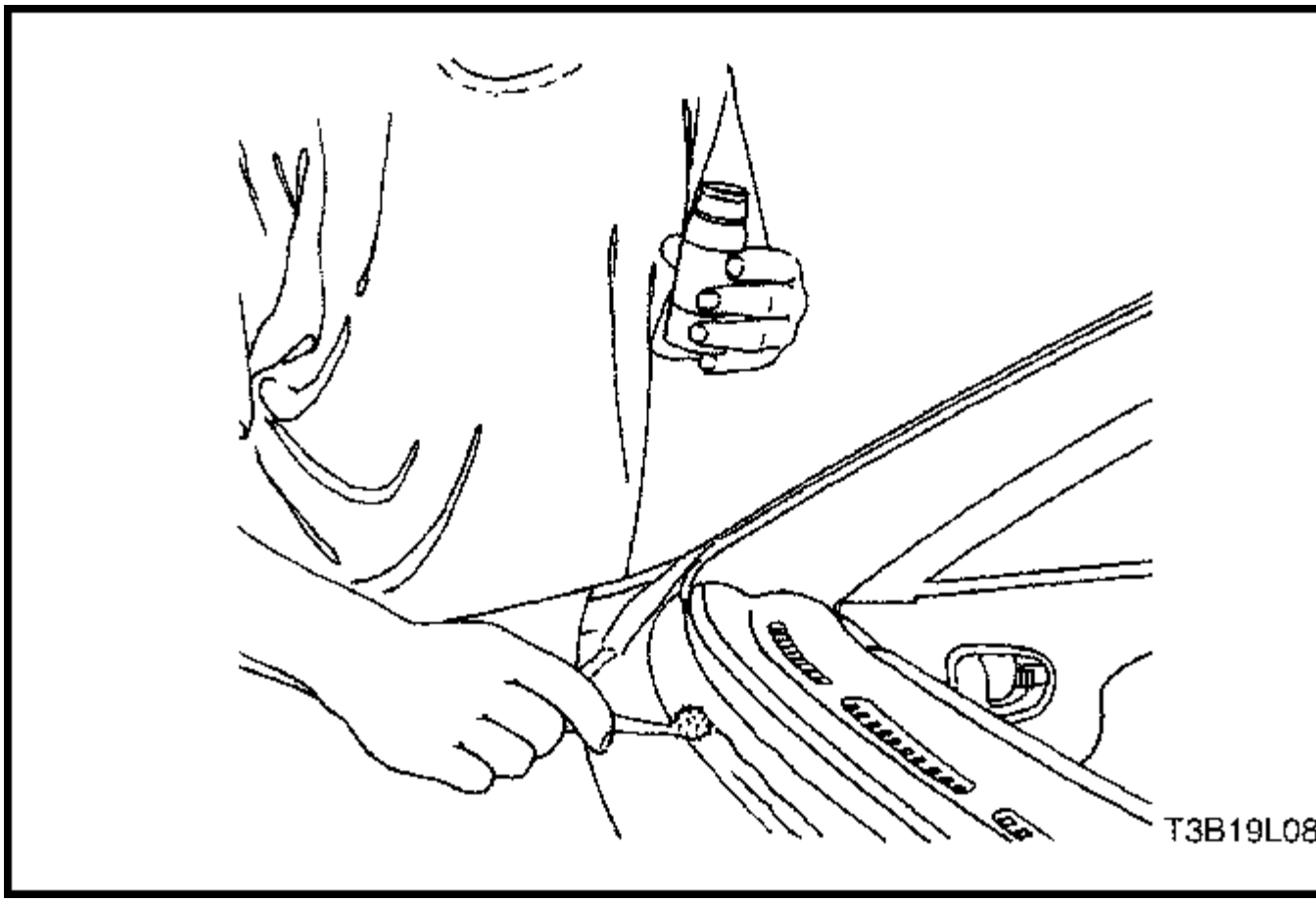


5. Remove the windshield from the vehicle.
6. Using a knife, remove the adhesive from the windshield.
7. Using a knife, remove the adhesive from the windshield frame.

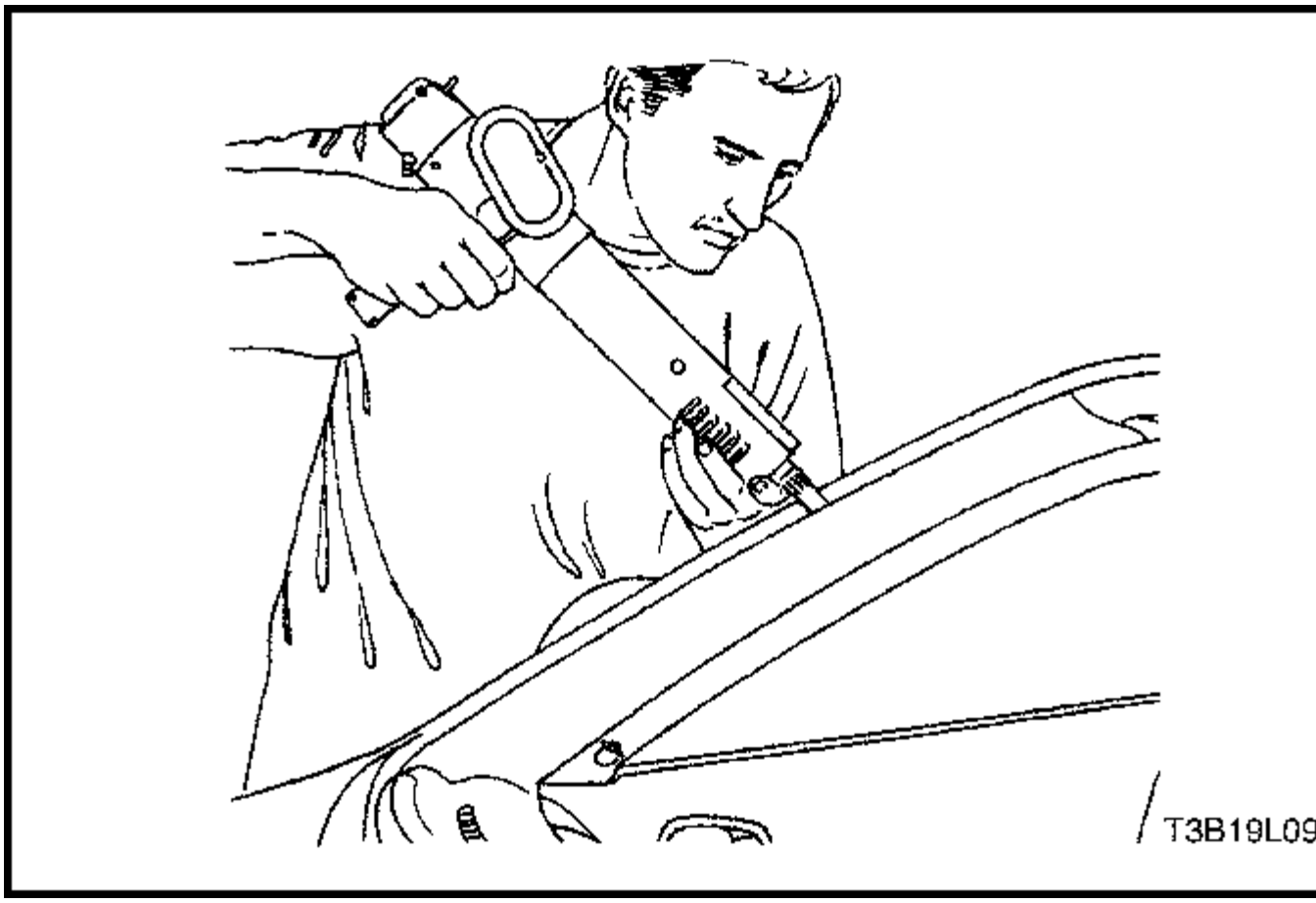


Installation Procedure

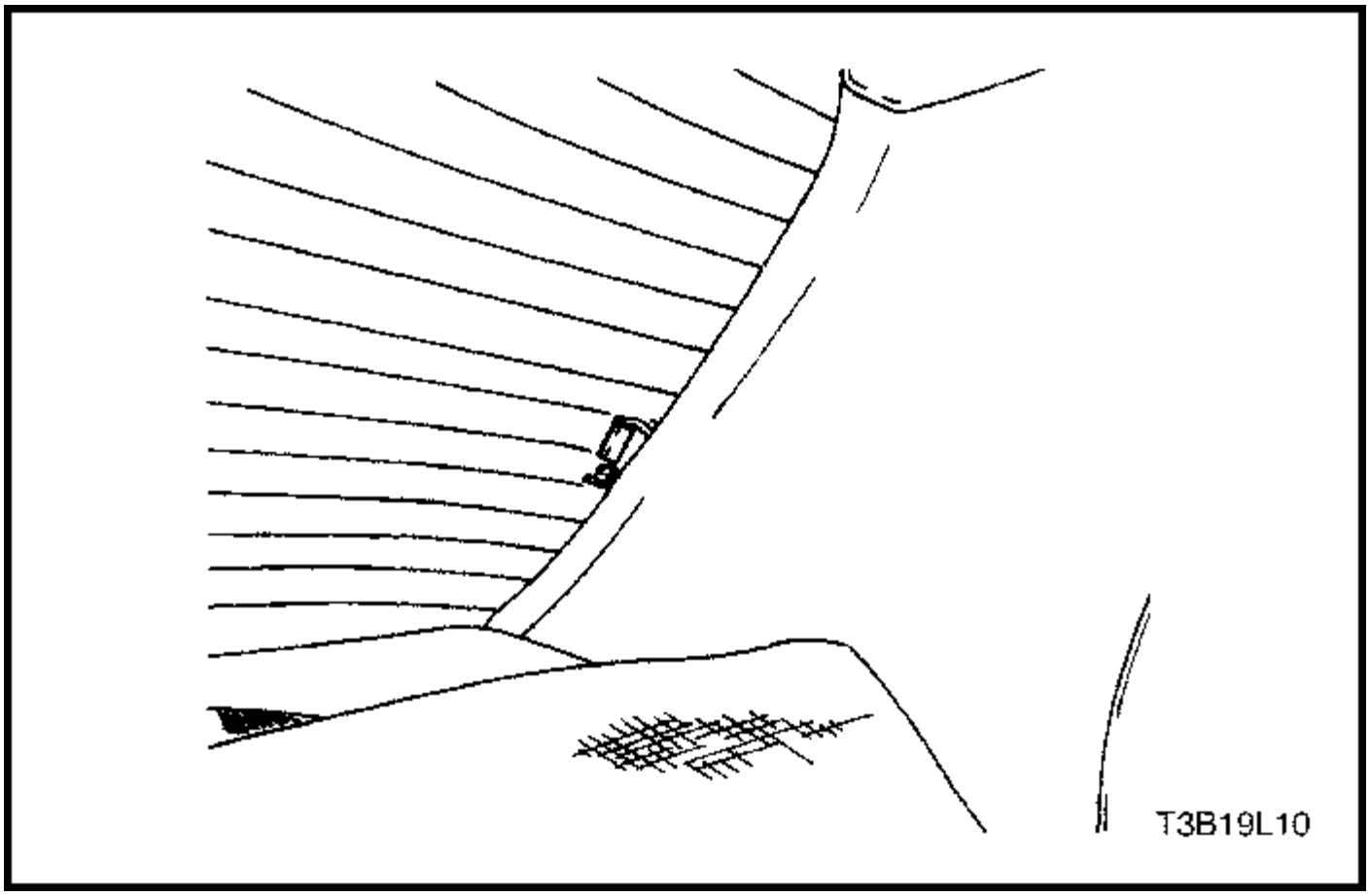
1. Install the new weatherstrip to the windshield.



2. Apply tape to the new weatherstrip and the windshield to hold the weatherstrip in place.
3. Apply adhesive primer to the windshield frame and the perimeter of the windshield.



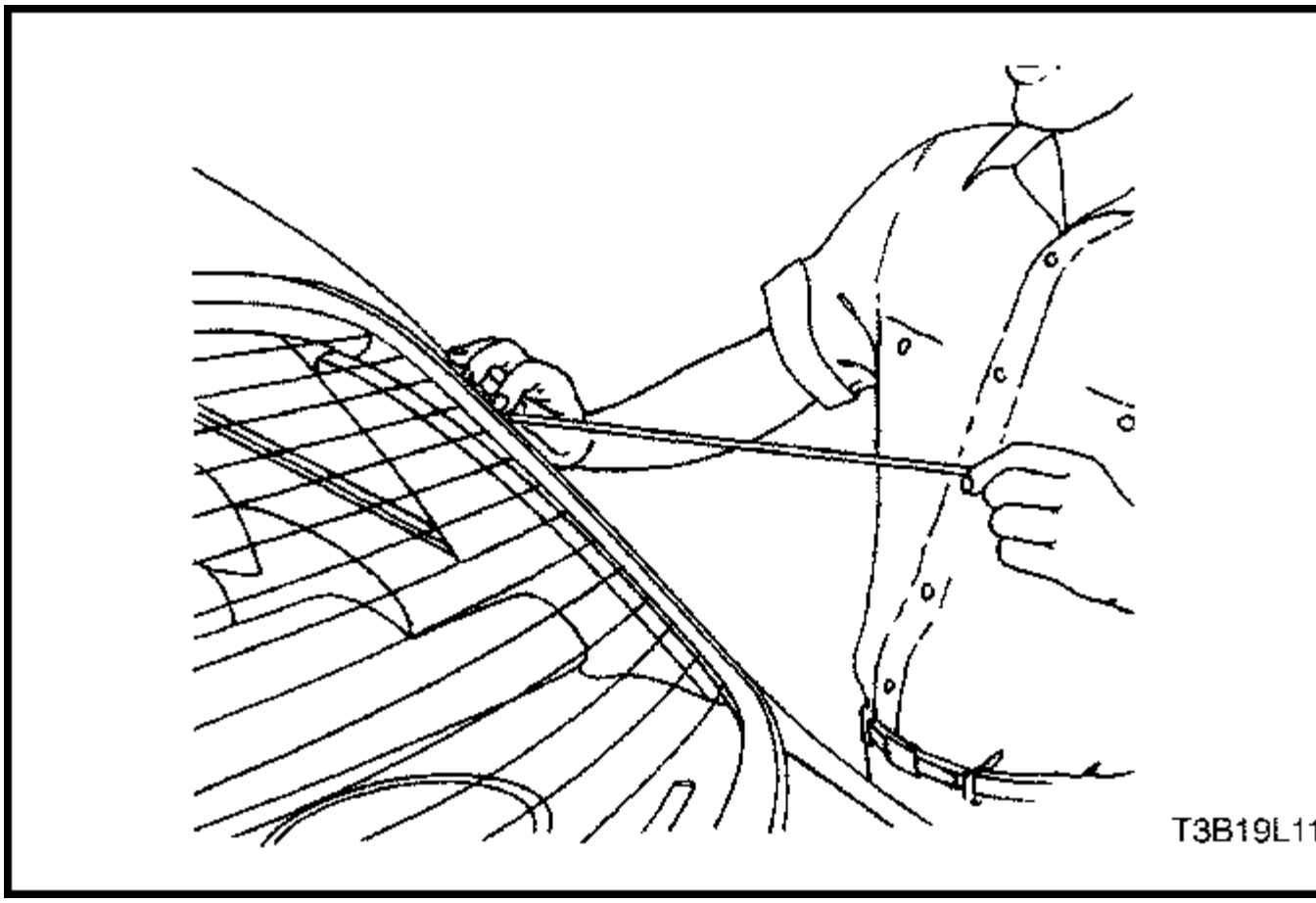
4. Apply glass adhesive to the windshield frame.
5. Install the windshield into the windshield frame.
6. Reposition the tape over the weatherstrip, the windshield, and the windshield frame to hold the windshield in place.
7. Let the adhesive dry for 24 hours.
8. Remove the tape.
9. Check for waterleaks by pouring water on the windshield. If a leak is found, dry the windshield and fill the area that leaks with adhesive. If the leak persists, remove the windshield and repeat the entire procedure.
10. Install the inside rearview mirror. Refer to "Inside Rearview Mirror" in this section.
11. Install the cowl vent grille. Refer to *Section 9R, Body Front End.*



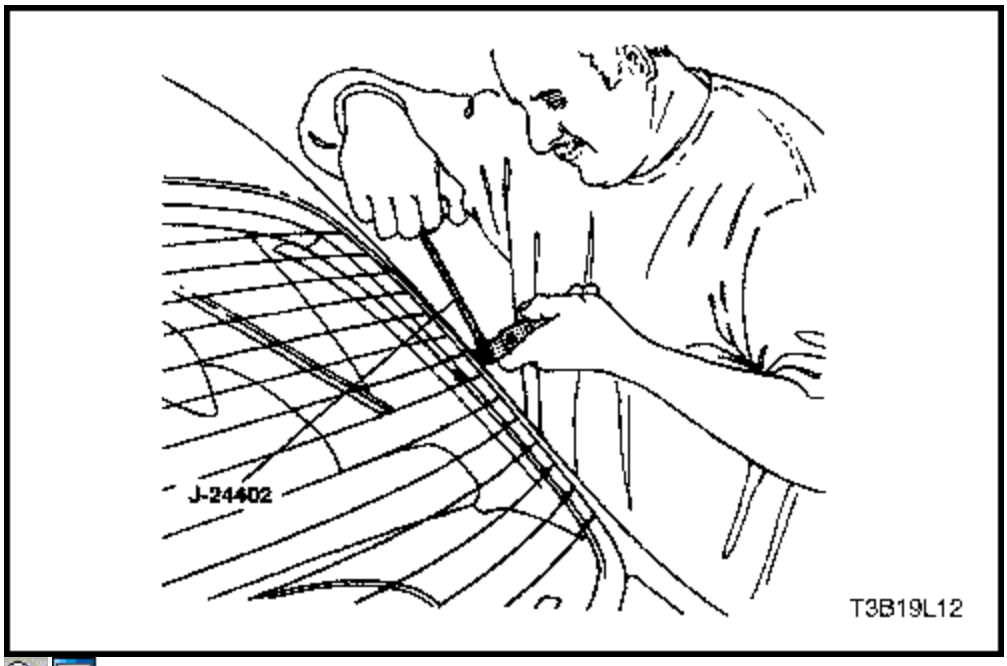
Rear Window Glass (Notchback Shown, Hatchback Similar)
Tools Required

J-24402 Glass Sealant Remover
Removal Procedure

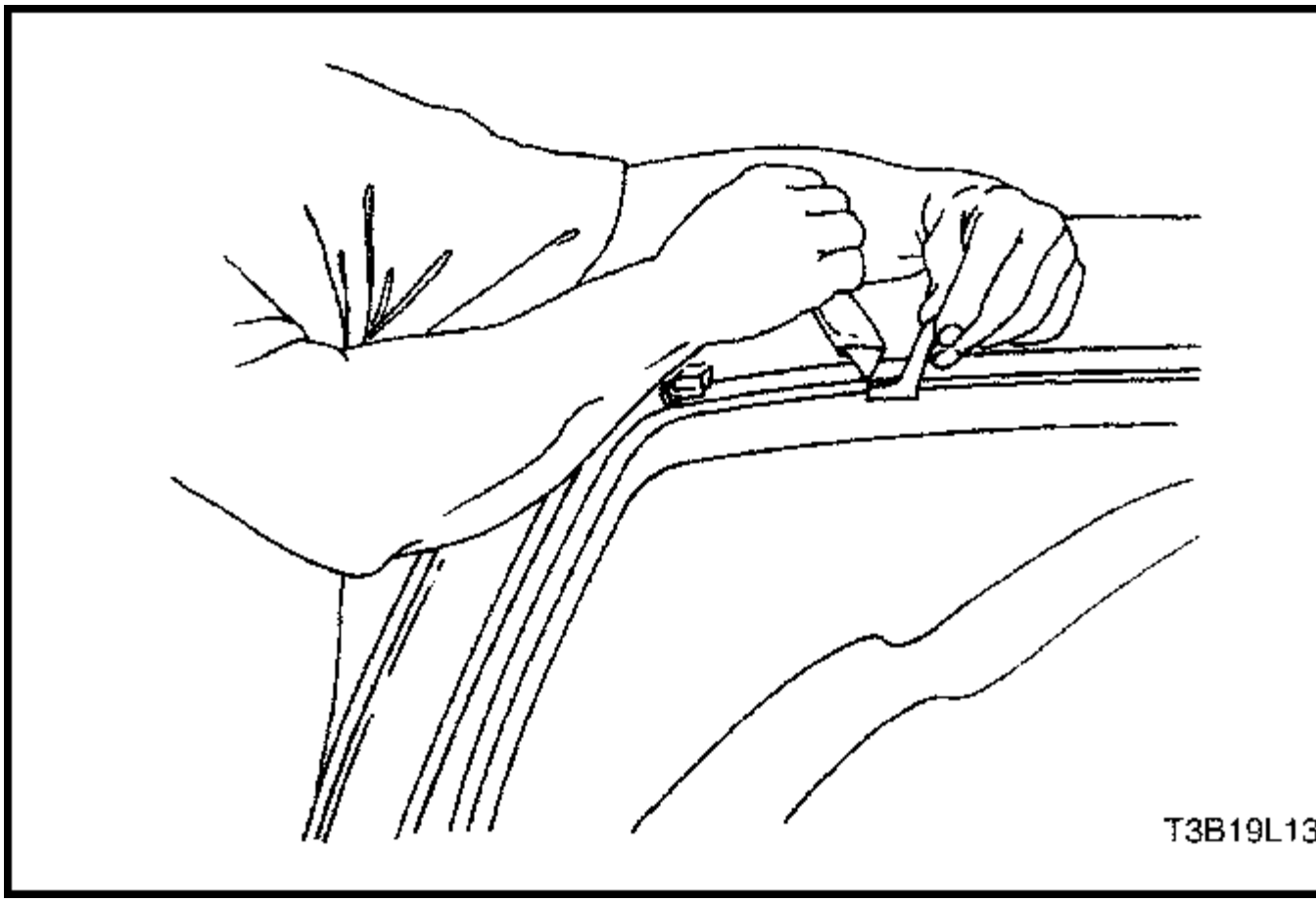
1. Disconnect the negative battery cable.
2. Disconnect the rear window defogger electrical connectors (left side electrical connector shown, right side electrical connector similar).



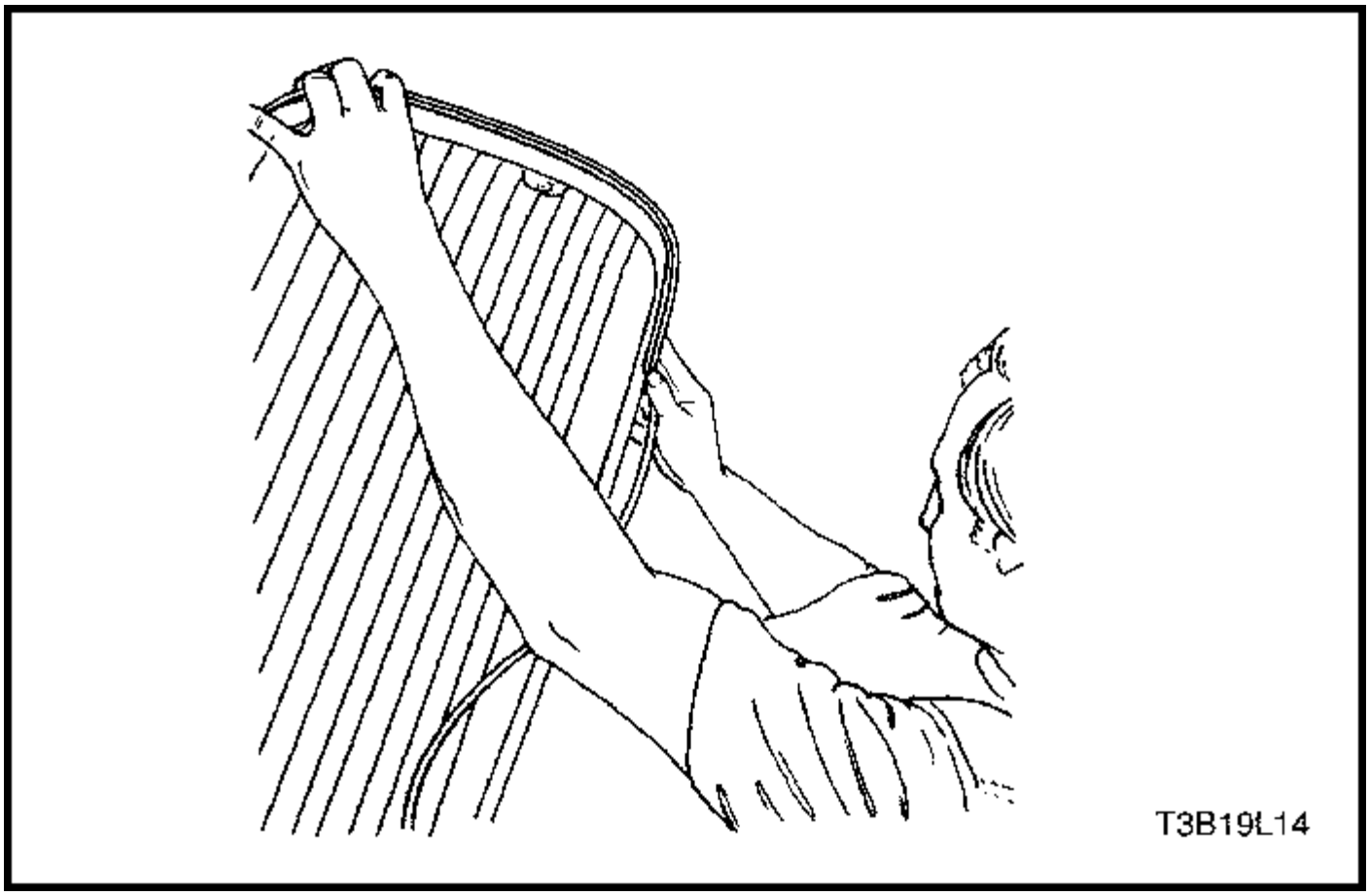
3. Remove the weatherstrip around the rear window.



4. Using the glass sealant remover J-24402, cut the adhesive around the rear window.

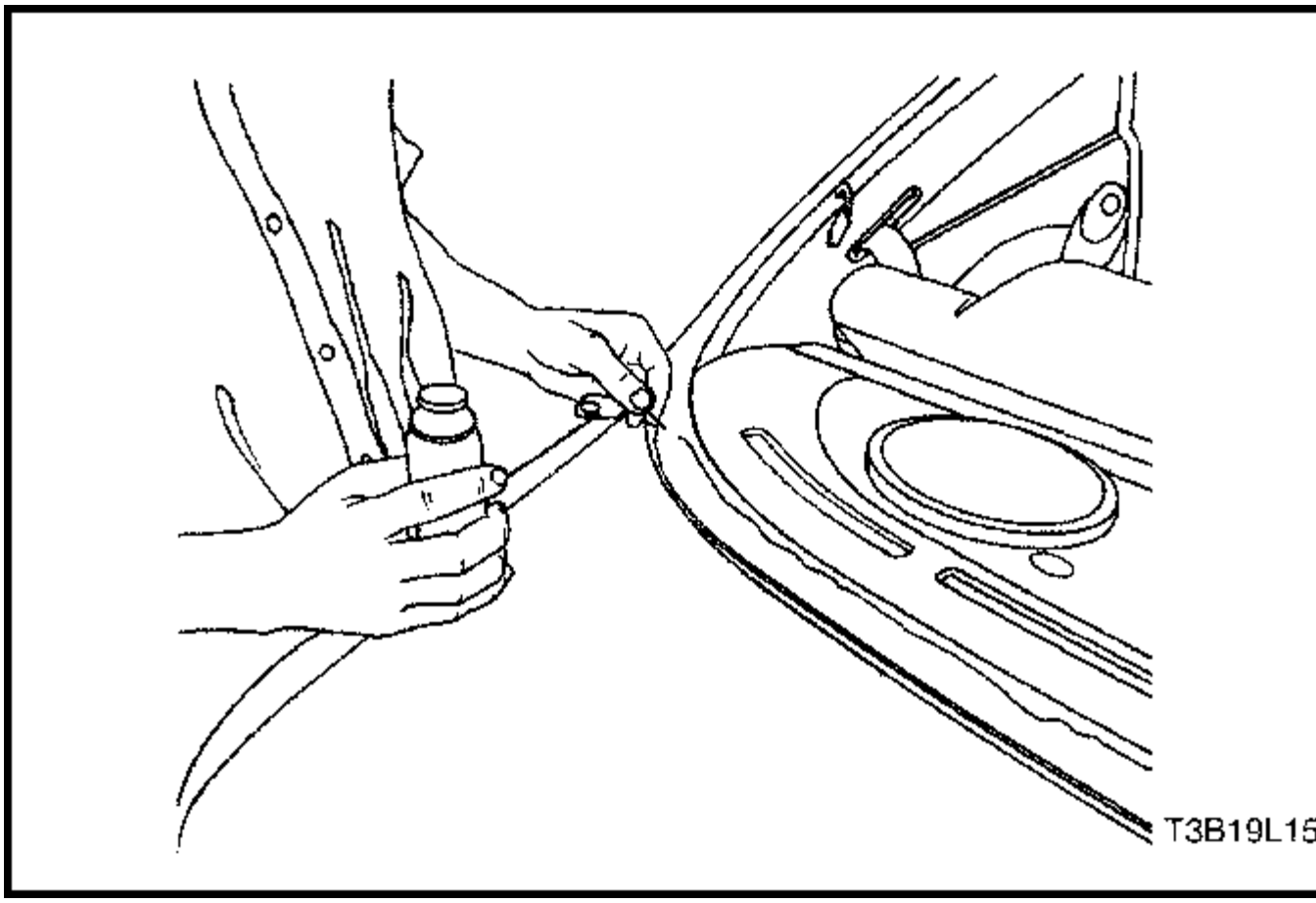


5. Remove the rear window from the vehicle.
6. Using a knife, remove the adhesive from the rear window.
7. Using a knife, remove the adhesive from the rear window frame.

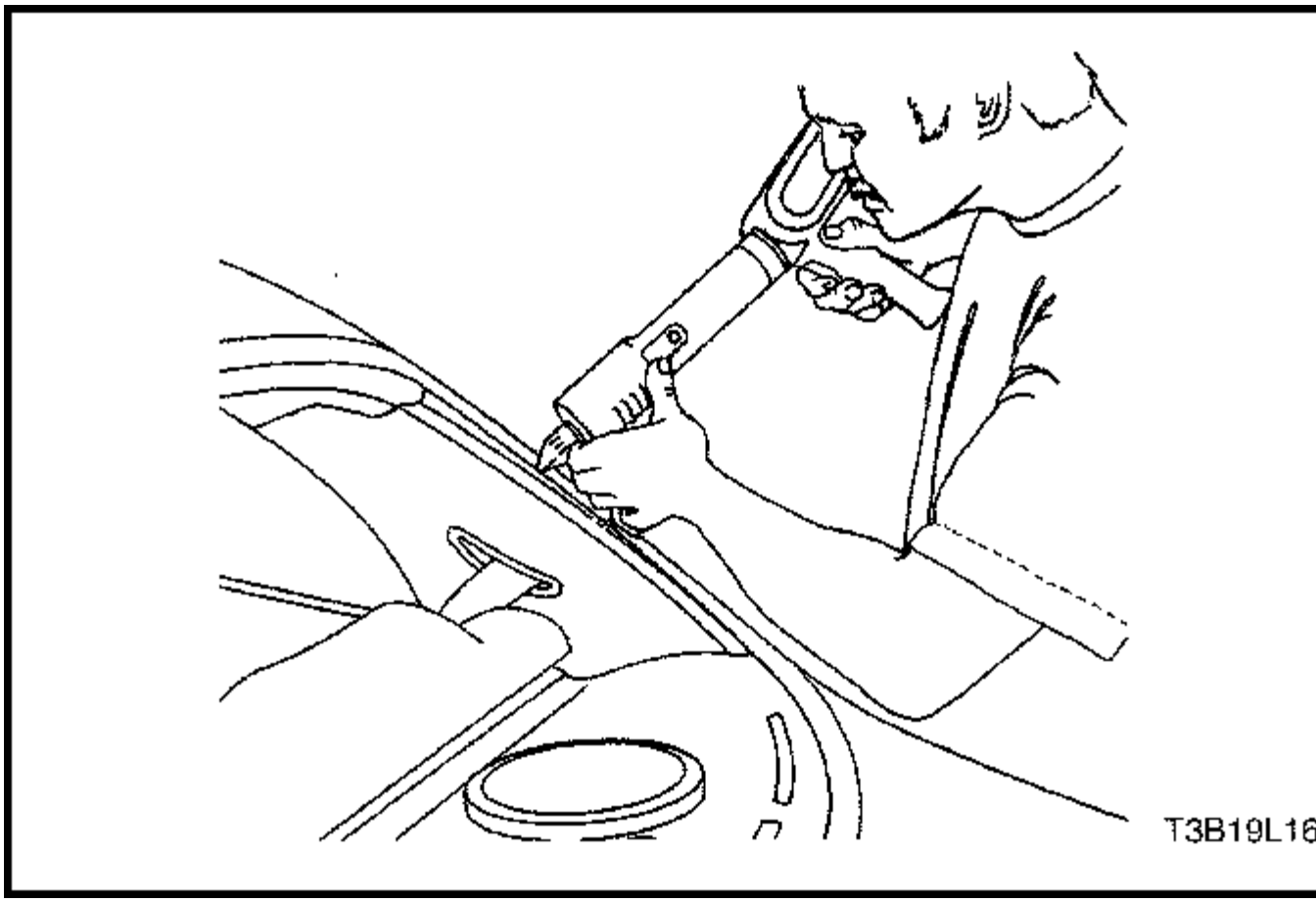


Installation Procedure

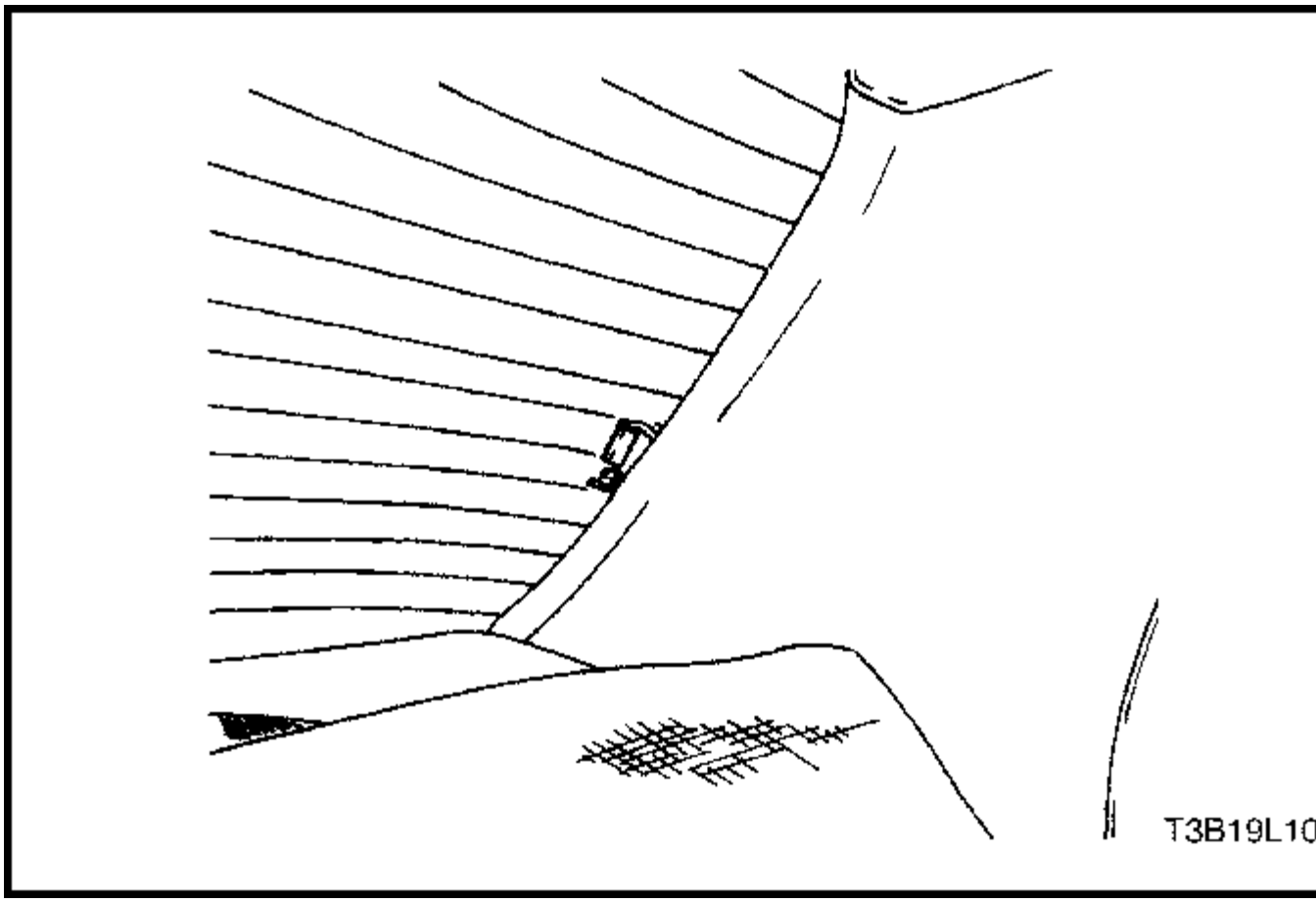
1. Install the new weatherstrip to the rear window.



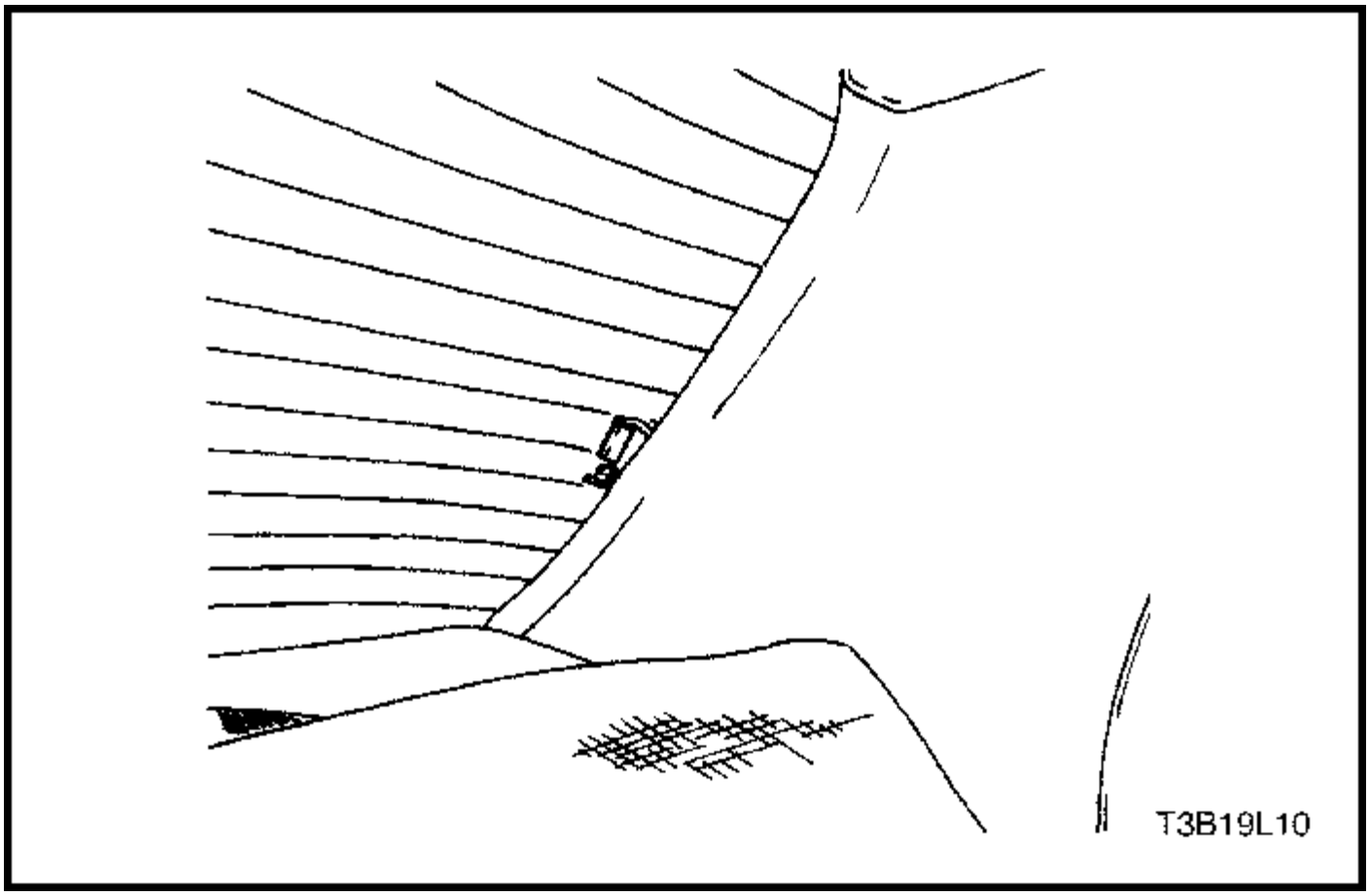
2. Apply tape to the new weatherstrip and the rear window to hold the weatherstrip in place.
3. Apply adhesive primer to the rear window frame and the perimeter of the rear window.



4. Apply glass adhesive to the rear window frame.

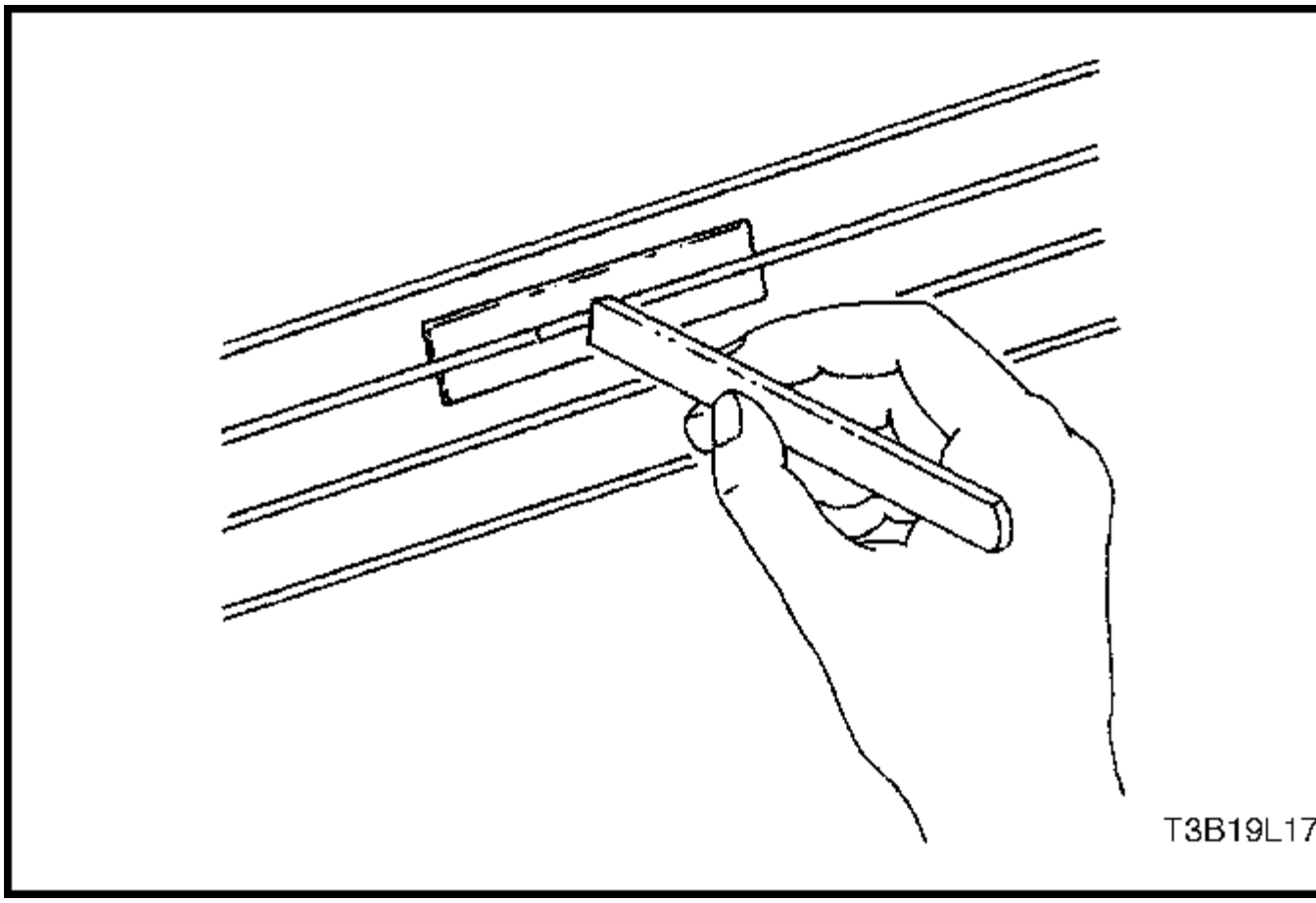


5. Install the rear window into the rear window frame.
6. Reposition the tape over the weatherstrip, the rear window, and the rear window frame to hold the rear window in place.
7. Let the adhesive dry for 24 hours.
8. Remove the tape.
9. Check for waterleaks by pouring water on the rear window. If a leak is found, dry the window and fill the area that leaks with adhesive. If the leak persists, remove the rear window and repeat the entire procedure.
10. Connect the rear window defogger electrical connectors (left side electrical connector shown, right side electrical connector similar).
11. Connect the negative battery cable.

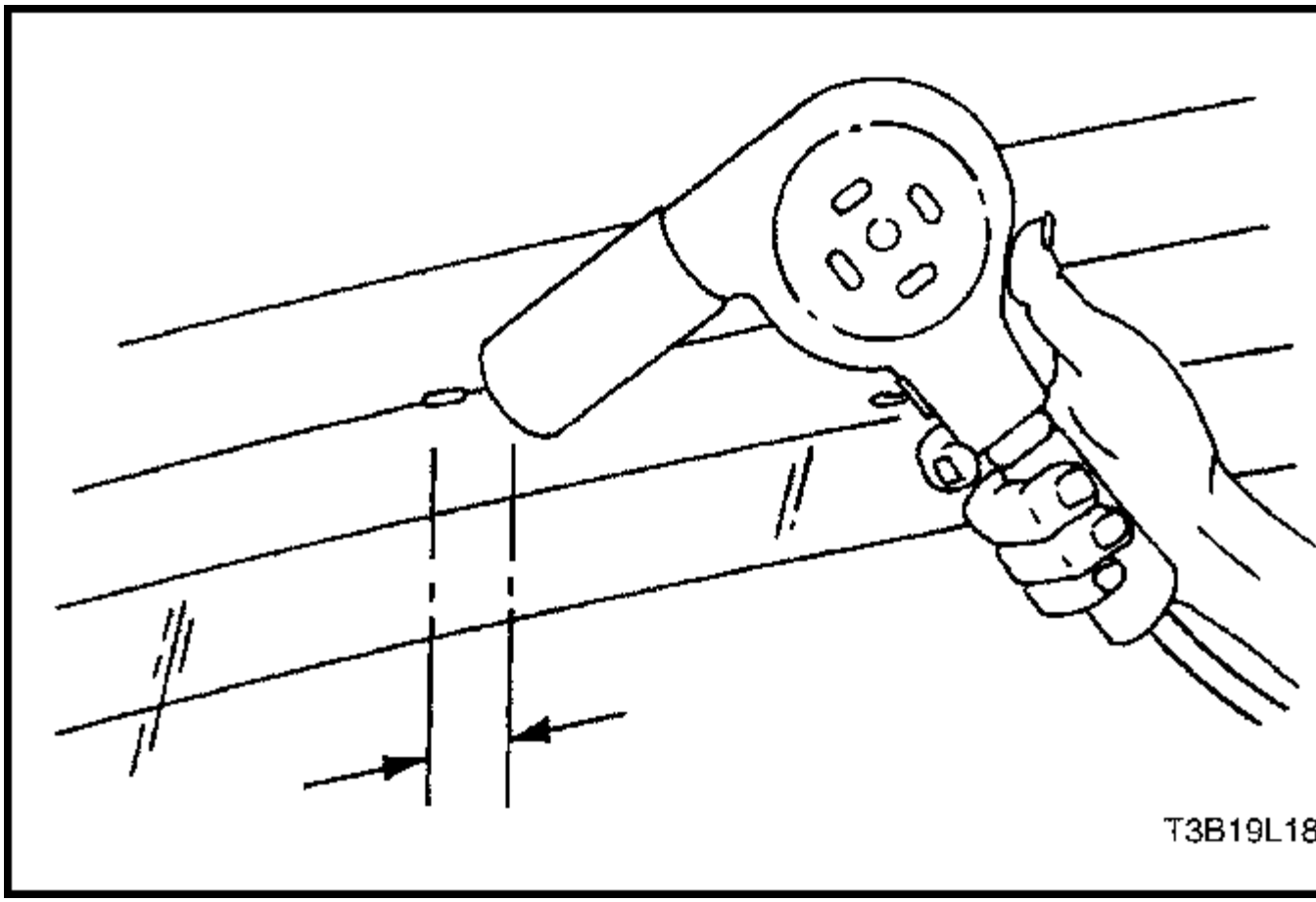


Rear Window Defogger Grid Line Repair

1. Disconnect the negative battery cable.
2. Disconnect the rear window defogger electrical connectors (left side electrical connector shown, right side electrical connector similar).
3. Inspect the rear window defogger grid lines.
4. Mark the grid line break on the outside of the glass with a wax pencil or a crayon.
5. Use steel wool to buff the grid lines that are to be repaired. Wipe the lines clean using a cloth dampened with alcohol. Buff and clean about 6 mm (0.25 inch) beyond each side of the break in the grid line.



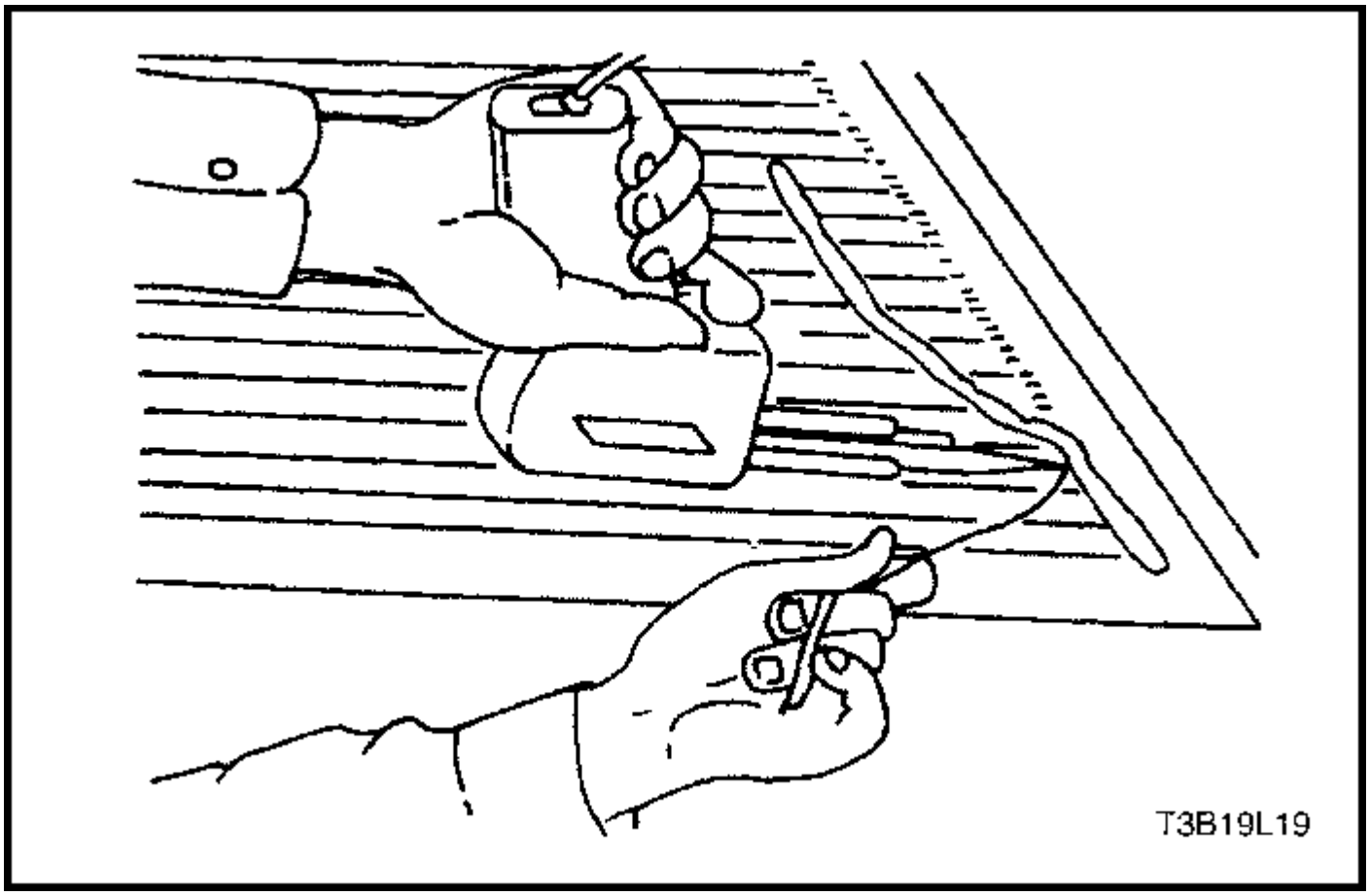
6. Attach a grid line repair decal or two strips of tape above and below the repair areas.
    - A repair decal or tapemust be used in order to control the width of the repair areas.
    - If a decal is used, the die-cut metered slot must be the same width as the grid line.
7. Apply the grid repair material to the repair area using a small wooden stick or a spatula. The grid repair material should be at room temperature.
8. Carefully remove the decal or the tape.



Notice : The grid line repair material must be cured with heat. In order to avoid heat damage to the interior trim, protect the trim near the repair area where heat will be applied.

9. Heat the repair area for 1 to 2 minutes.
10. Hold the heat gun nozzle 25 mm (1 inch) from the surface. A minimum temperature of 149°C (300°F) is required.
11. Inspect the grid line repair area. If the repair appears discolored, apply a coating of tincture of iodine to the area using a pipe cleaner or a line brush. Allow the iodine to dry for about 30 seconds. Carefully wipe off the excess iodine with a lint-free cloth.
12. Connect the rear window defogger electrical connectors.
13. Test the operation of the rear window defogger in order to verify that the repair was successful.

Important : At least 24 hours is required for complete curing of the repair materials. The repair area should not be physically disturbed until after that time.

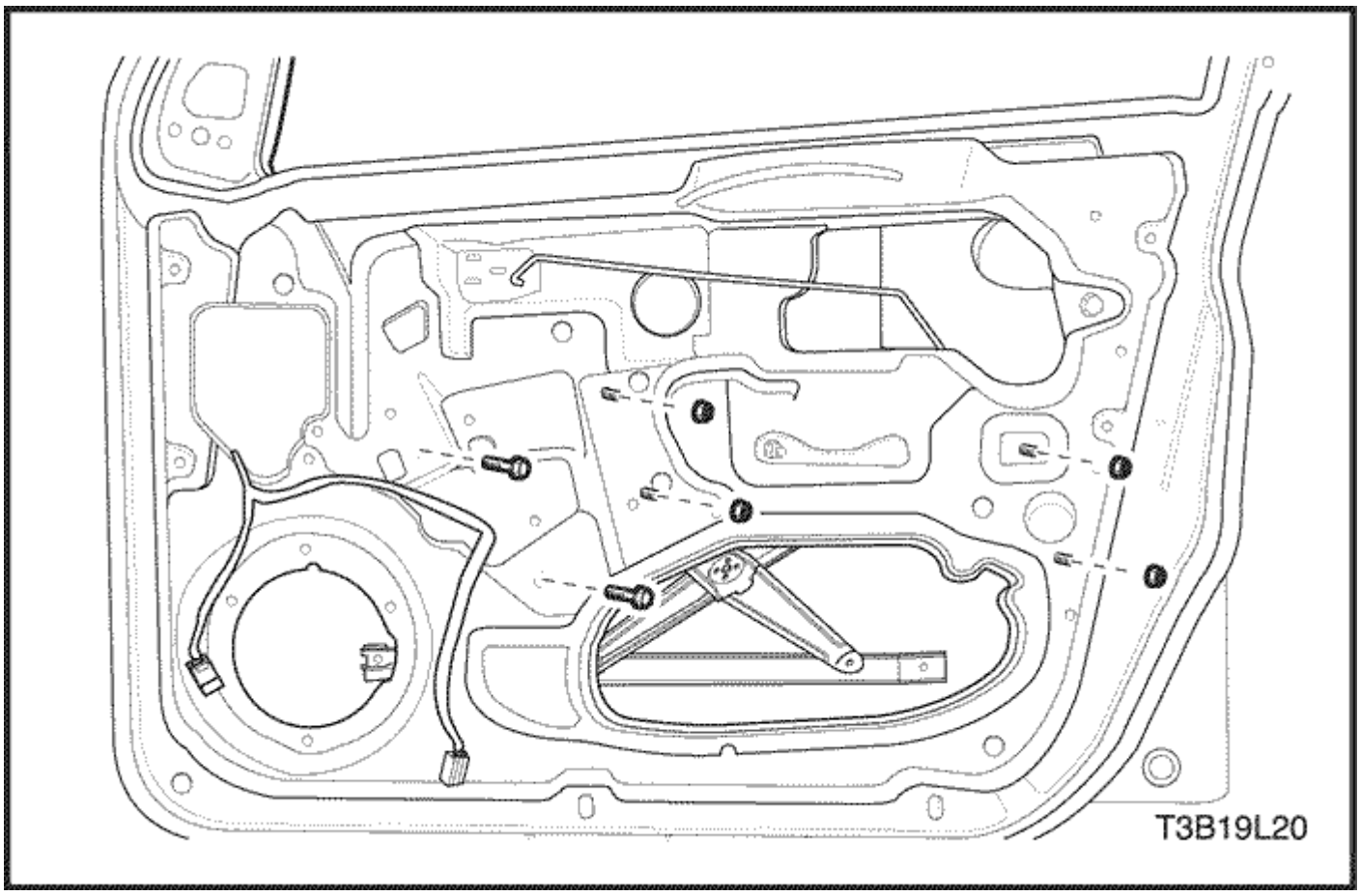


Rear window Defogger Braided Lead Wire Repair

The rear window defogger bus lead wire or the terminal can be reattached by resoldering. Use a solder containing 3 percent silver and a rosin flux paste.

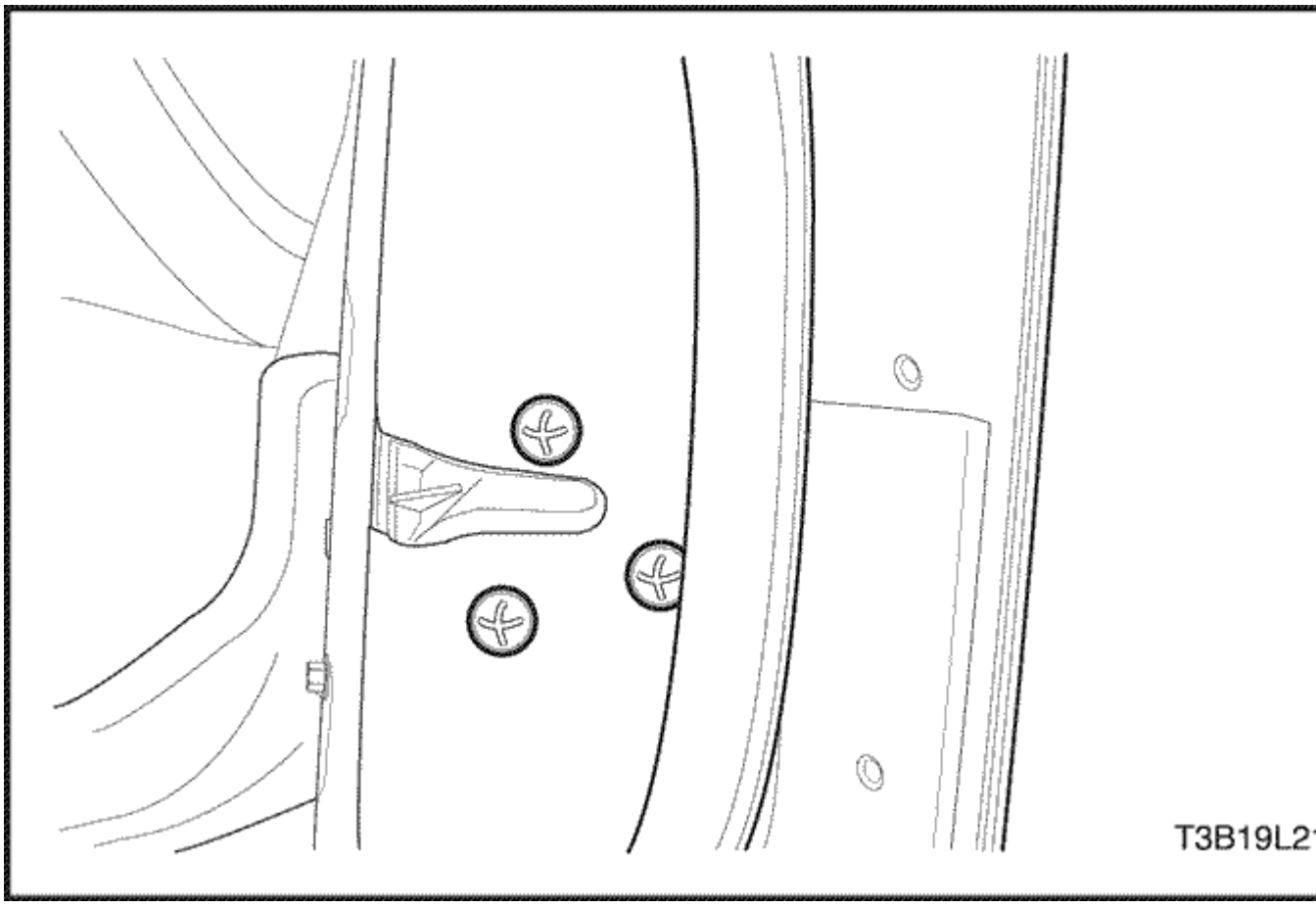
1. The repair area should be buffed with fine steel wool before soldering the bus lead wire.
2. Apply the paste-type rosin flux in small quantities to the wire lead and the bus lead wire repair area using a brush.
3. Coat the soldering iron tip with solder. Use only enough solder to ensure a complete repair.

4. Use only enough heat to melt the solder. Do not overheat the wire when resoldering to the bus lead wire.

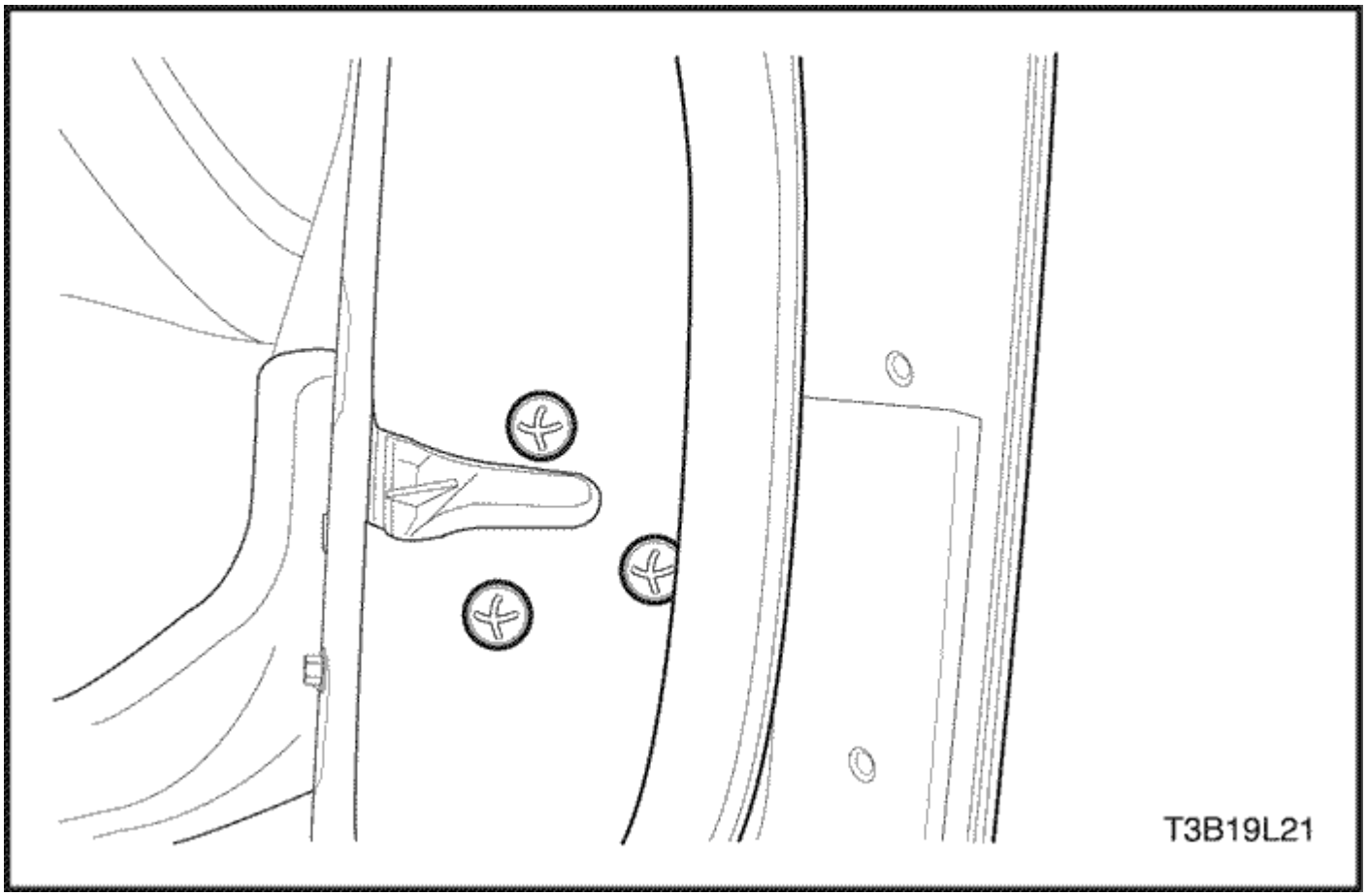


Front Door Glass
Removal Procedure

1. Remove the front door trim panel. Refer to *Section 9G, Interior Trim.*
2. Remove the door seal trim. Refer to *Section 9P, Doors.*
3. Remove the outside channel molding. Refer to *Section 9P, Doors.*
4. Remove the screws that secure the glass to the window regulator.



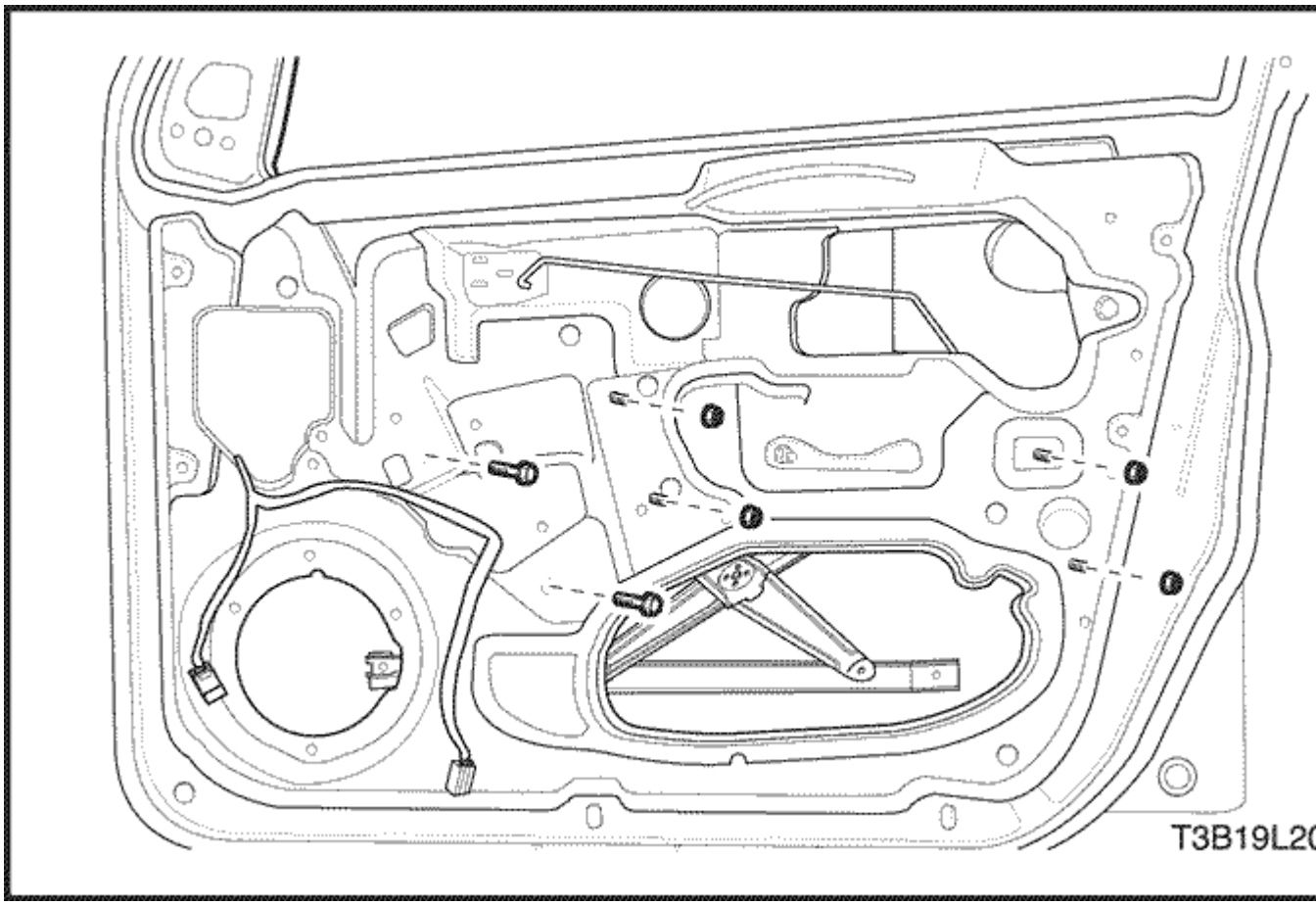
5. Remove the bolts and the guide rail.
6. Remove the glass from the door.



Installation Procedure

1. Install the glass in the door.
2. Install the guide rail and the bolts.

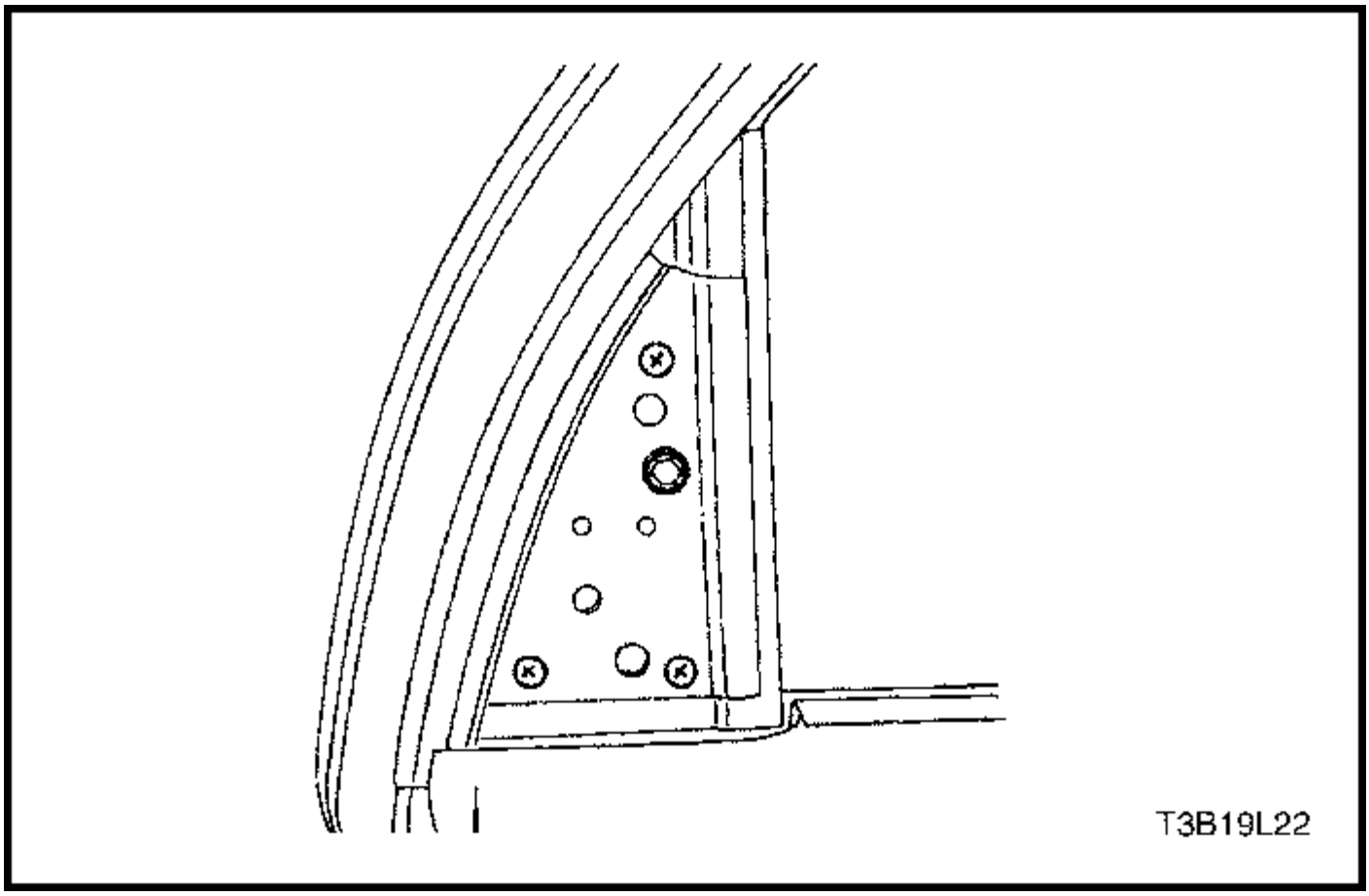
   Tighten
   Tighten the guide rail bolts to 7 N•m (62 lb-in).



3. Install the glass to the window regulator with the screws.

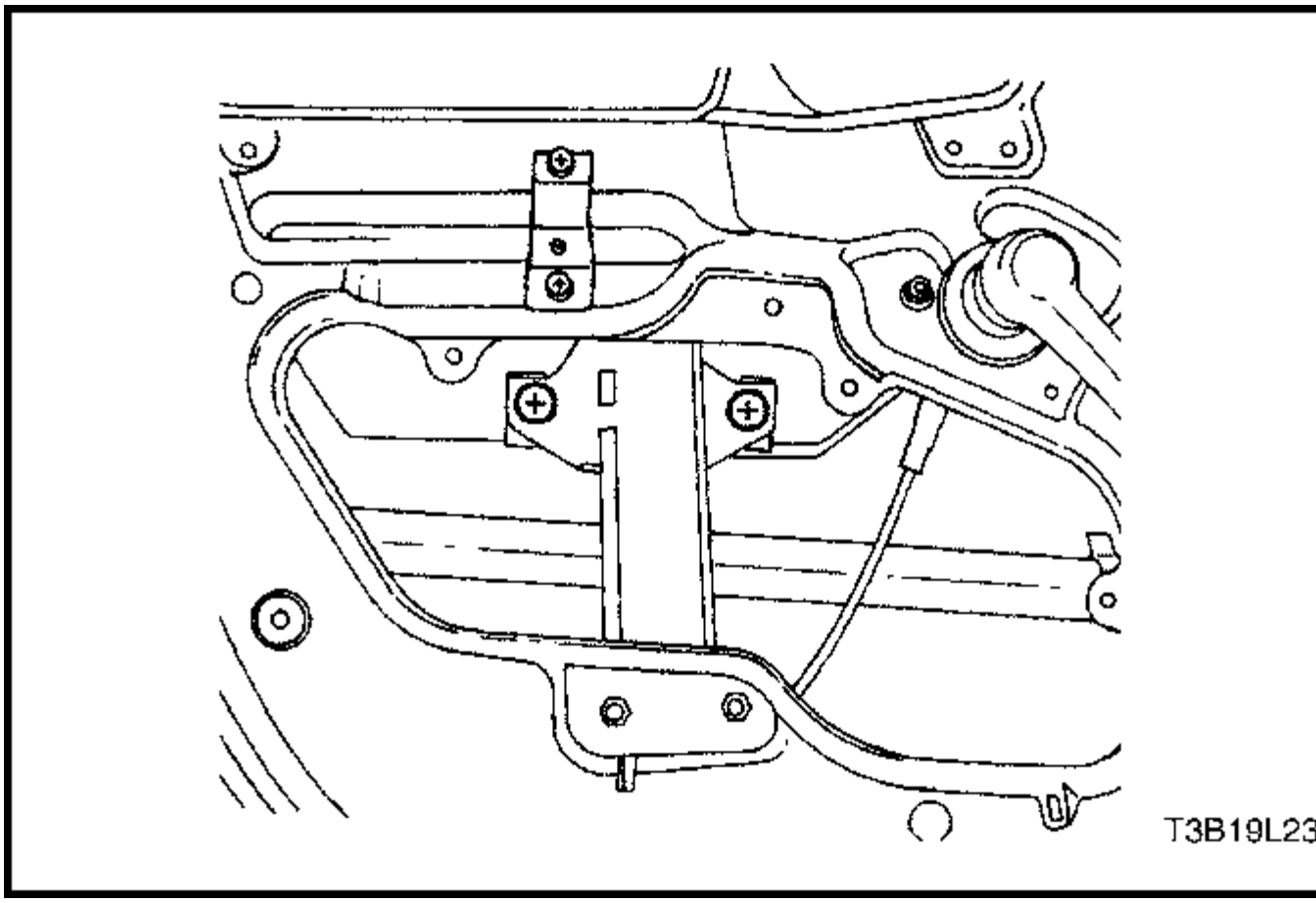
   Tighten
   Tighten the door glass screws to 7 N•m (62 lb-in).

4. Install the outside channel molding. Refer to *Section 9P, Doors.*
5. Install the door seal trim. Refer to *Section 9P, Doors.*
6. Install the front door trim panel. Refer to *Section 9G, Interior Trim.*

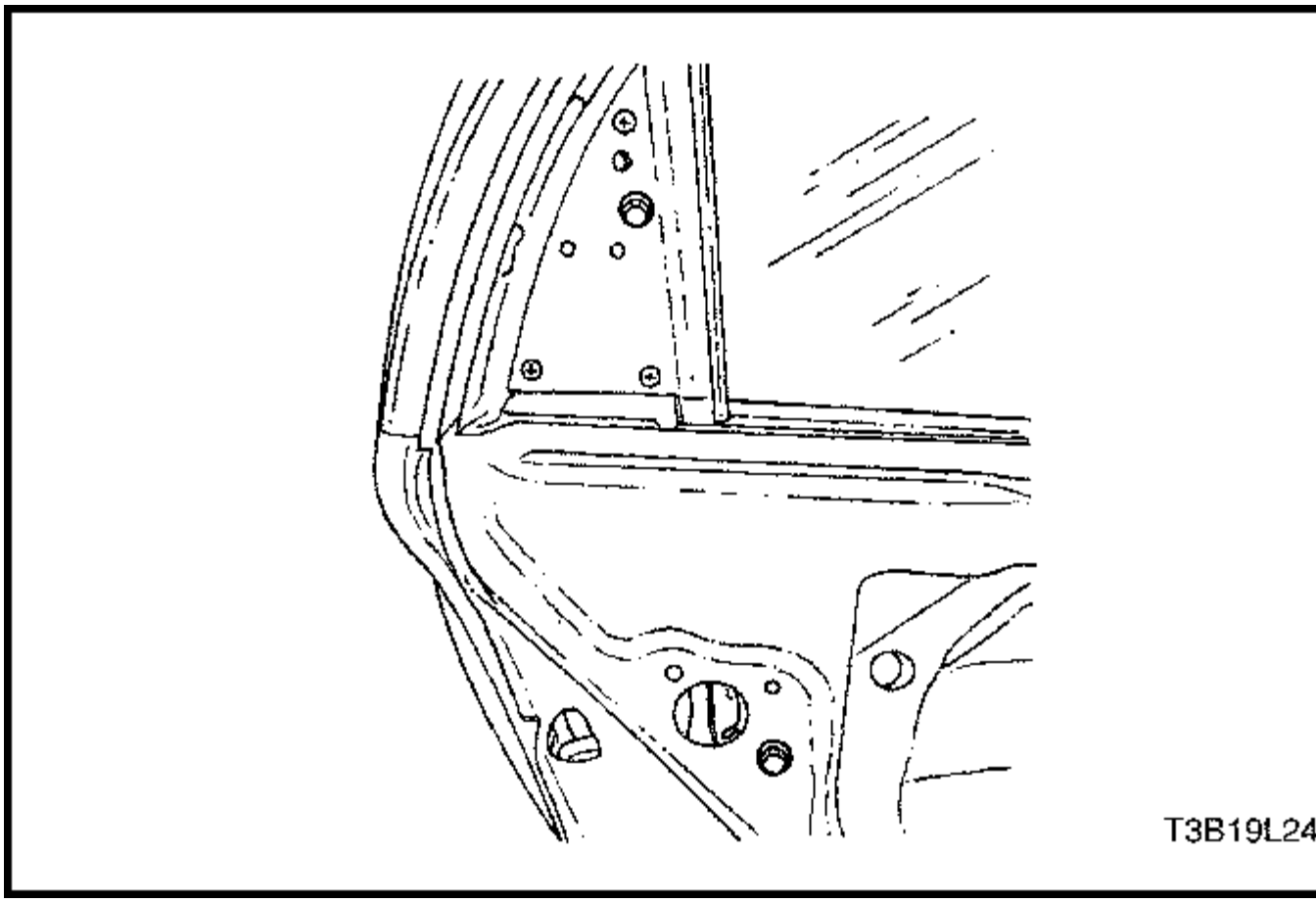


Rear Door Glass
Removal Procedure

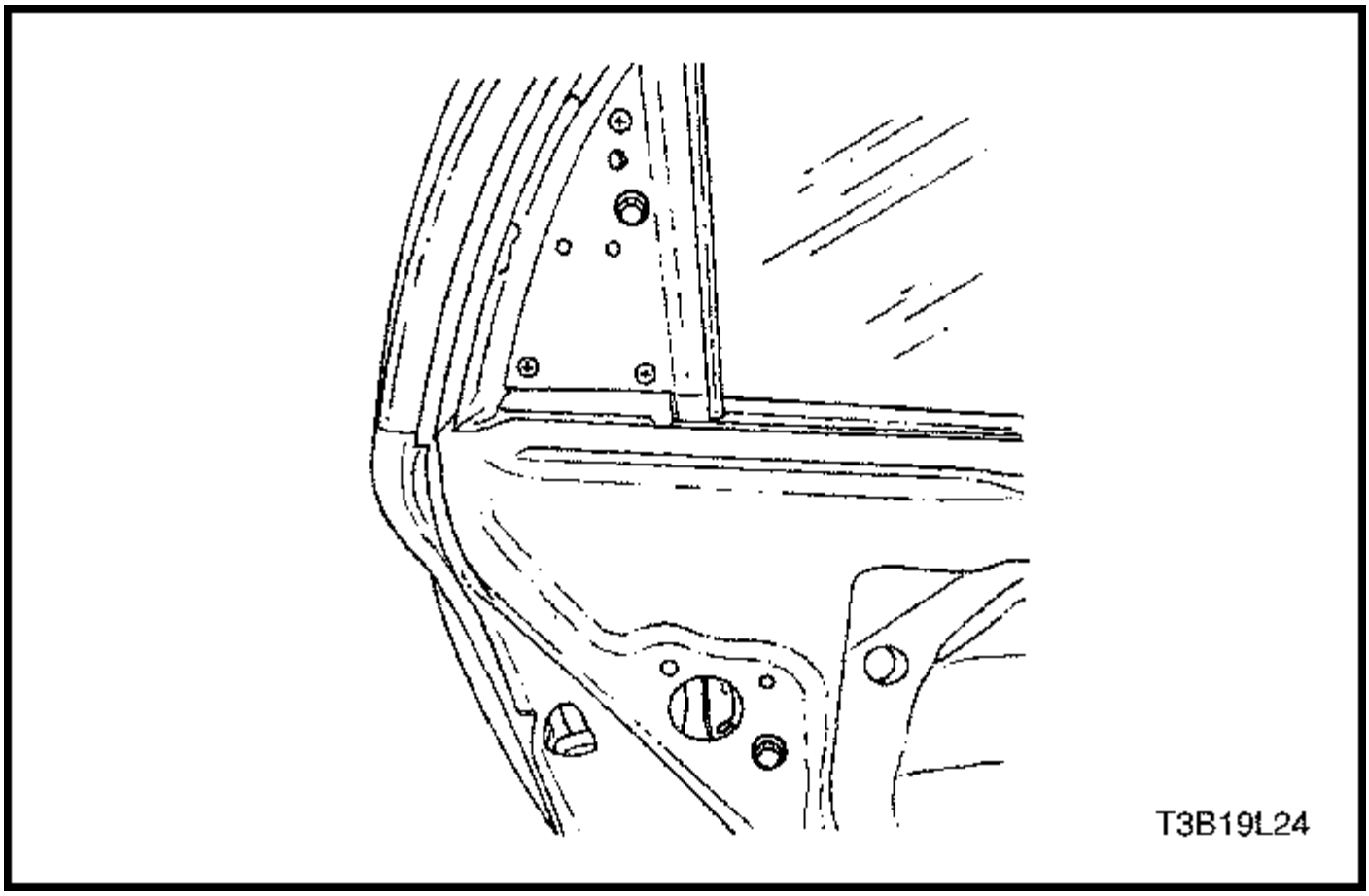
1. Remove the rear door trim panel. Refer to *Section 9G, Interior Trim.*
2. Remove the outside channel molding. Refer to *Section 9P, Doors.*
3. Remove the interior rear door garnish molding.
4. Remove the screws and the exterior rear door garnish molding.



5. Remove the door seal trim. Refer to *Section 9P, Doors.*
6. Remove the screws that secure the glass to the window regulator.



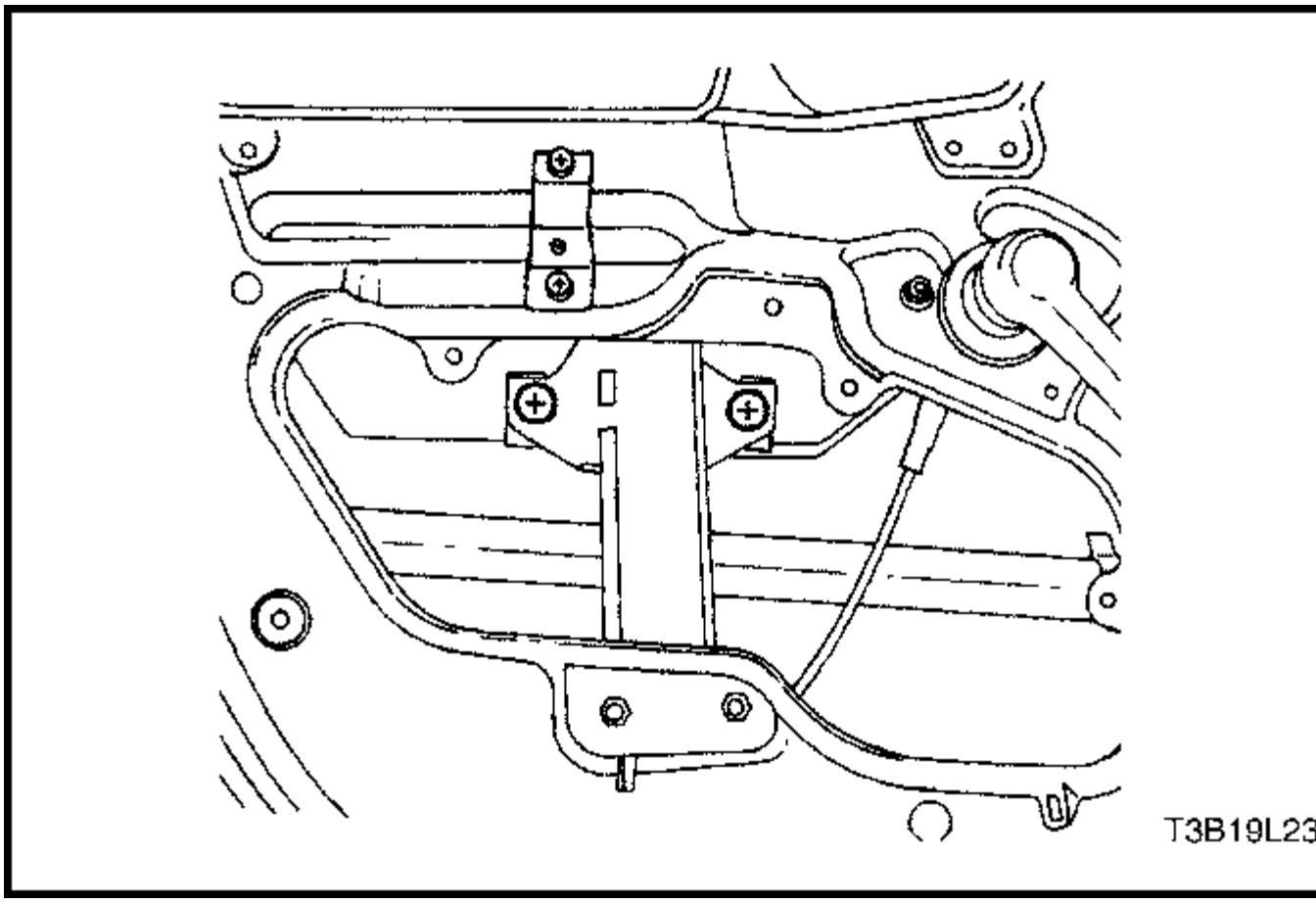
7. Remove the bolts and the guide rail.
8. Remove the glass from the door.



Installation Procedure

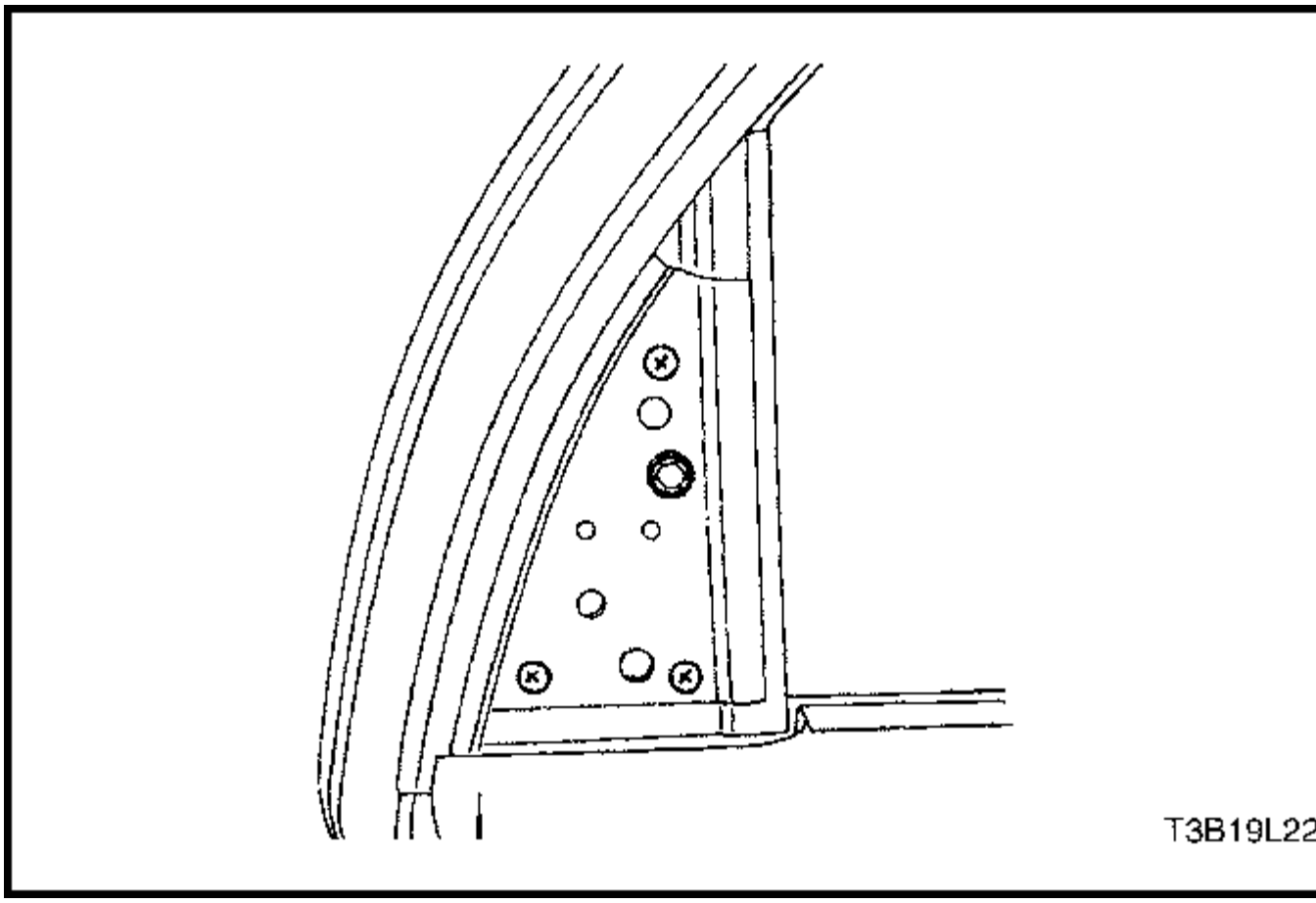
1. Install the glass in the door.
2. Install the guide rail and the bolts.

   Tighten
   Tighten the guide rail bolts to 7 N•m (62 lb-in).



3. Position the glass within the window regulator.
4. Install the glass screws.

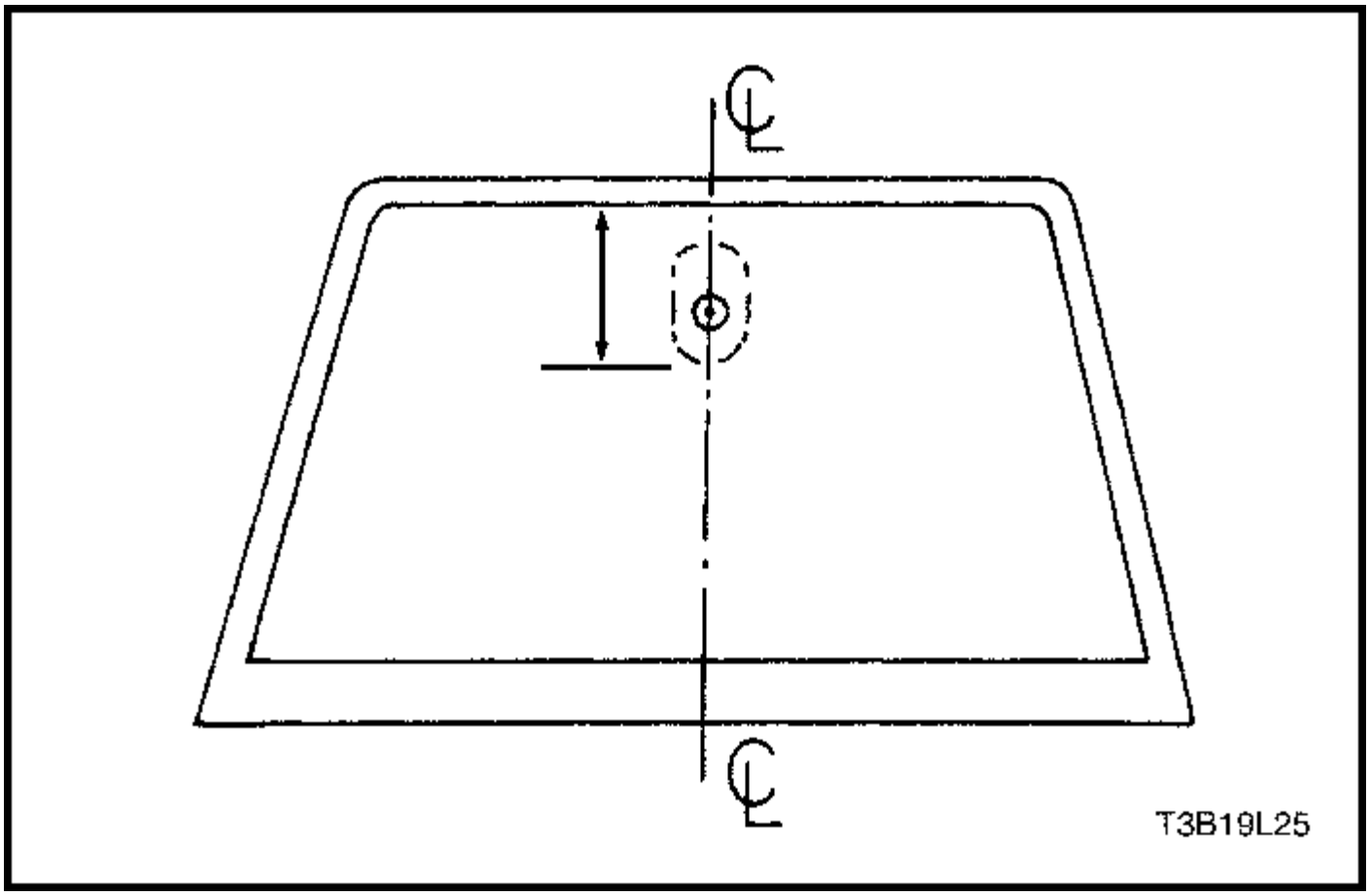
Tighten
Tighten the door glass screws to 7 N•m (62 lb-in).



5. Install the door seal trim. Refer to *Section 9P, Doors.*
6. Install the exterior rear door garnish molding with the screws.

   Tighten
   Tighten the exterior rear door garnish molding screws to 1.5 N•m (13 lb-in).

7. Install the interior rear door garnish molding.
8. Install the outside channel molding. Refer to *Section 9P, Doors.*
9. Install the rear door trim panel. Refer to *Section 9G, Interior Trim.*



Inside Rearview Mirror

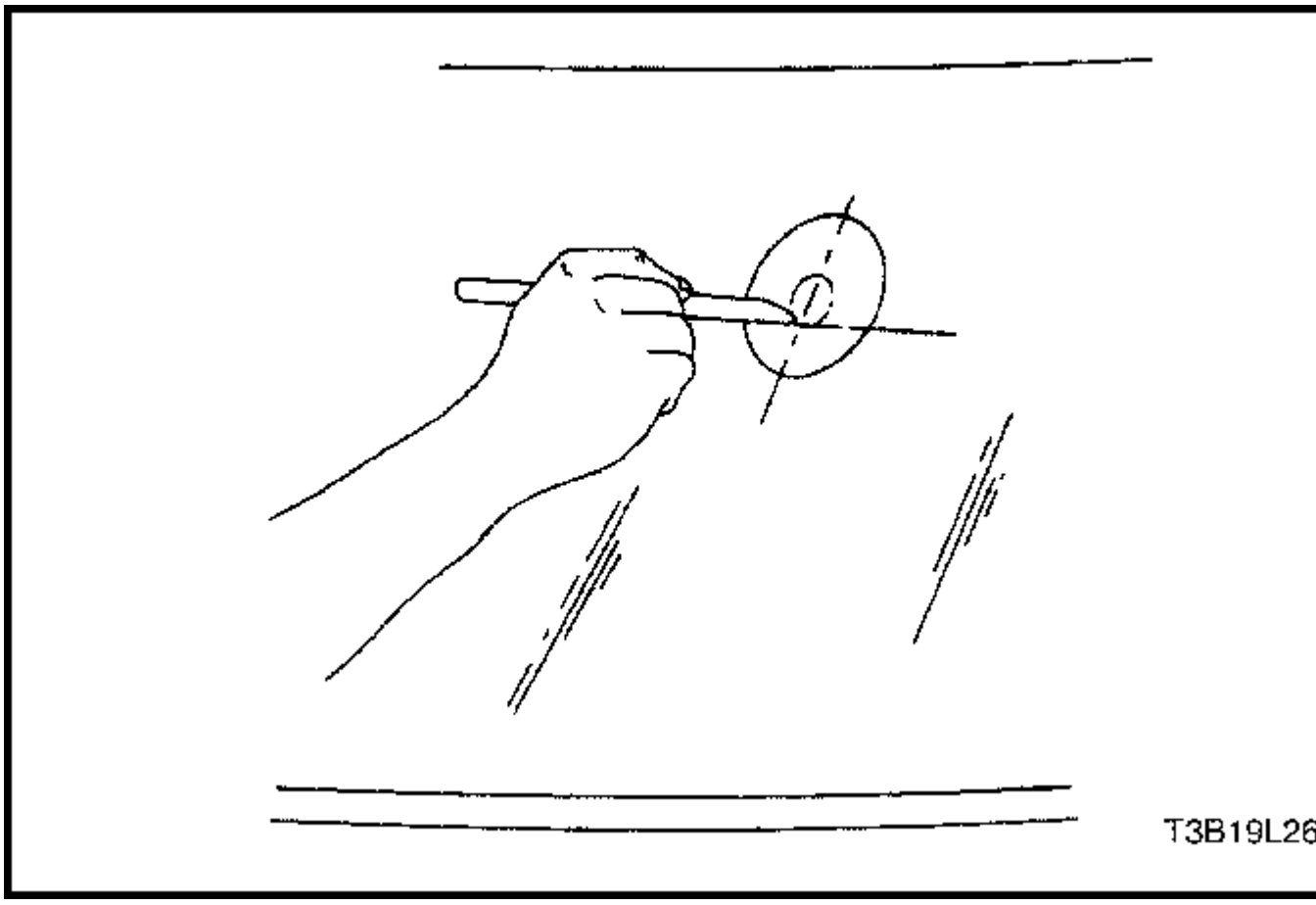
The inside rearview mirror is attached to a support which is secured to the windshield glass. The support is installed by the glass supplier using a plastic-polyvinyl butyl adhesive.

Service replacement windshield glass has the mirror support bonded to the glass assembly. In order to install a detached mirror support or install a new part, the following items will be needed:

- Loctite® Minute-Bond Adhesive.
- Original or replacement mirror support.
- Wax marking pencil or crayon.
- Rubbing alcohol.
- Clean paper towel.
- Fine grit sandpaper (grit #320 or #360).
- 2 mm allen wrench.

Installation Procedure

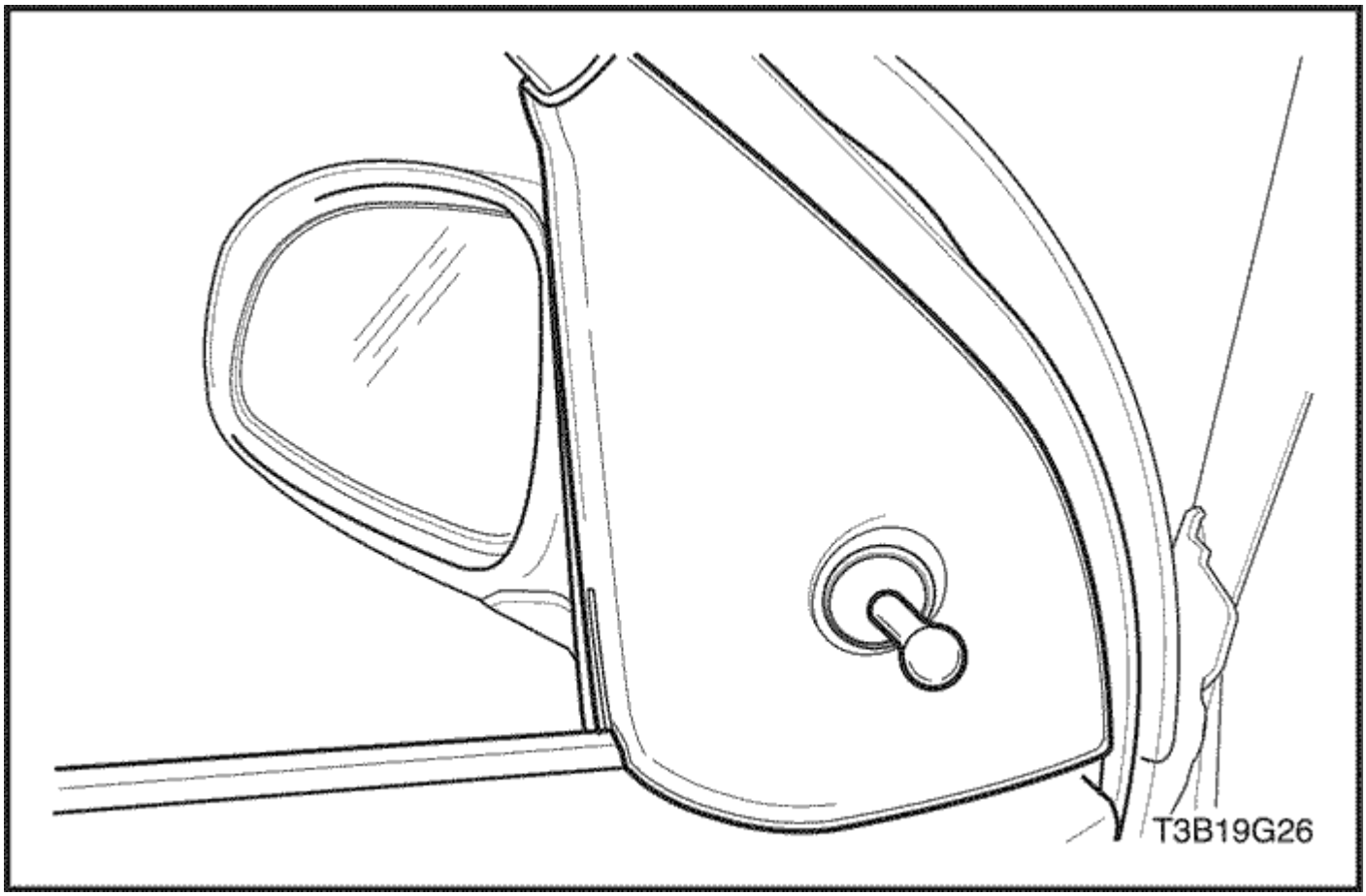
1. Measure the distance from the headliner to the bottom of where the mirror support will be mounted on the windshield.



2. Mark this position on the outside of the glass with a wax pencil or crayon. Draw a large diameter circle on the outside of the glass around the mirror support location.
3. Clean the inside surface of the glass with paper towels and a domestic scouring cleanser, a glass cleaning solution, or a polishing compound. Rub the glass until the area is completely dry. When the area is dry, clean the area with an alcohol-saturated paper towel in order to remove any traces of scouring powder or glass cleaning solution.

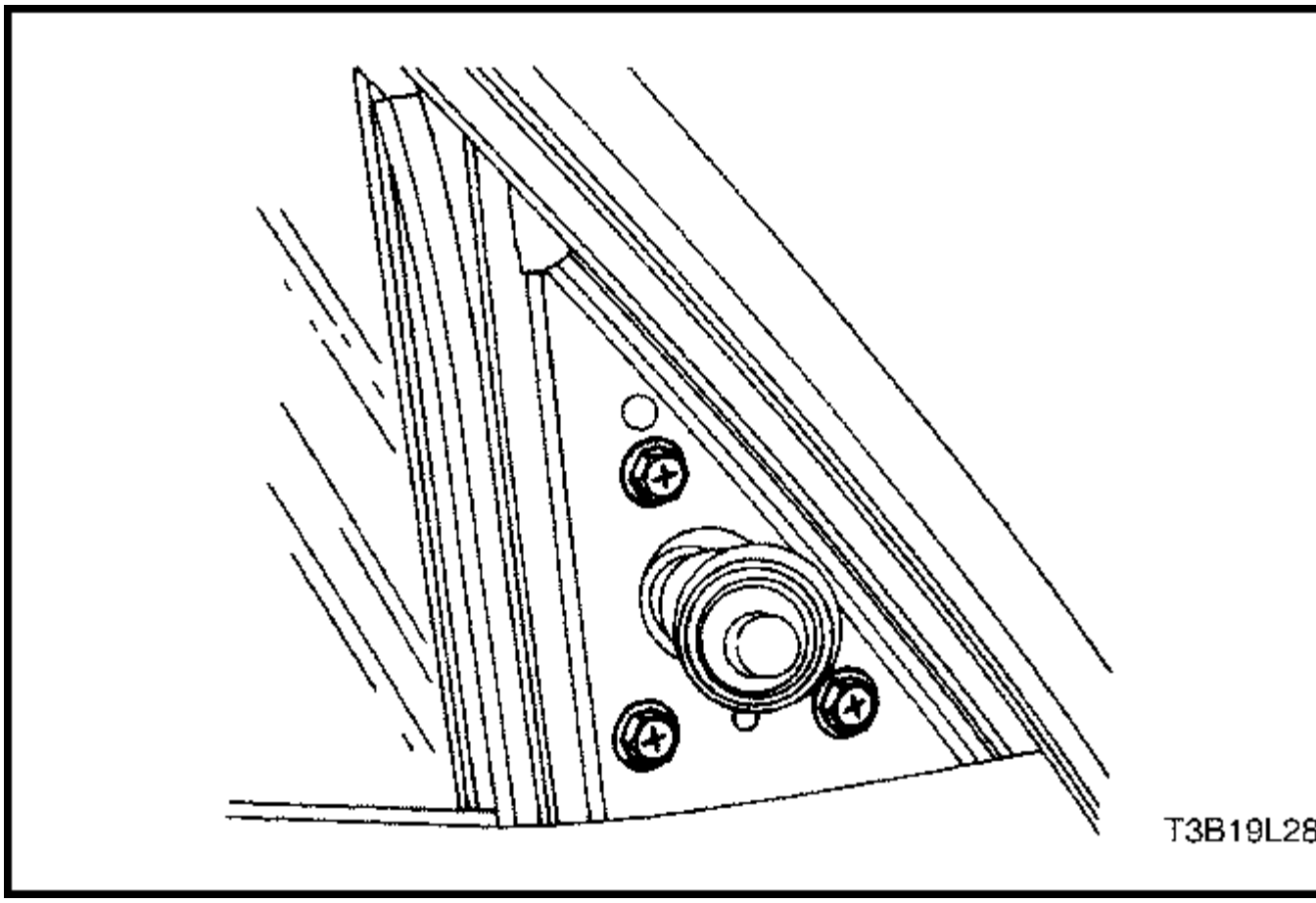
4. If the mirror support is new, clean the bonding surface with fine grit sandpaper #320 or #360. If the original mirror support is being used, all traces of factoryinstalled adhesive must be removed prior to reinstallation.
5. Wipe the sanded mirror support with a clean paper towel saturated with rubbing alcohol. Allow the support to dry.
6. Follow the adhesive kit manufacturer's directions for adhesive application and mirror support preparation before installing the mirror support to the glass.
7. Position the mirror support to its premarked position. Use steady pressure and press the support against the glass for 30 to 60 seconds.
8. After 5 minutes, remove the excess adhesive with an alcohol-moistened towel or a glass cleaning solution.
9. Install the inside rearview mirror to the mirror support with the mounting screw.

   Tighten
   Tighten the rearview mirror mounting screw to 1.2 N•m(11 lb-in).

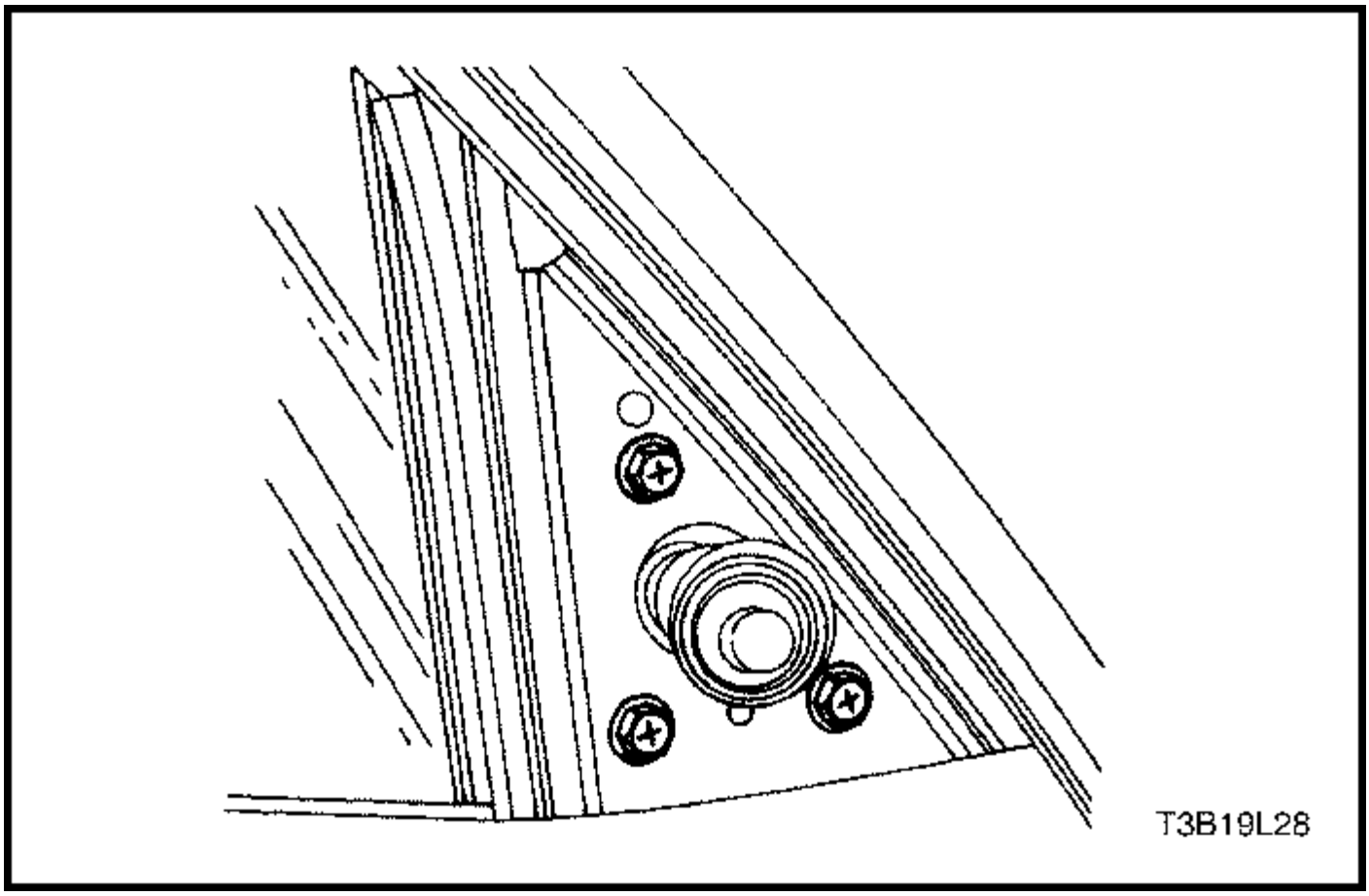


Outside Rearview Mirrors
Removal Procedure

1. Remove the front door escutcheon. (Manual remote control mirror shown.)



2. Disconnect the electric control rearview mirror electrical connector, if equipped.
3. Remove the screws and the outside rearview mirror assembly from the door. (Manual remote control mirror shown.)

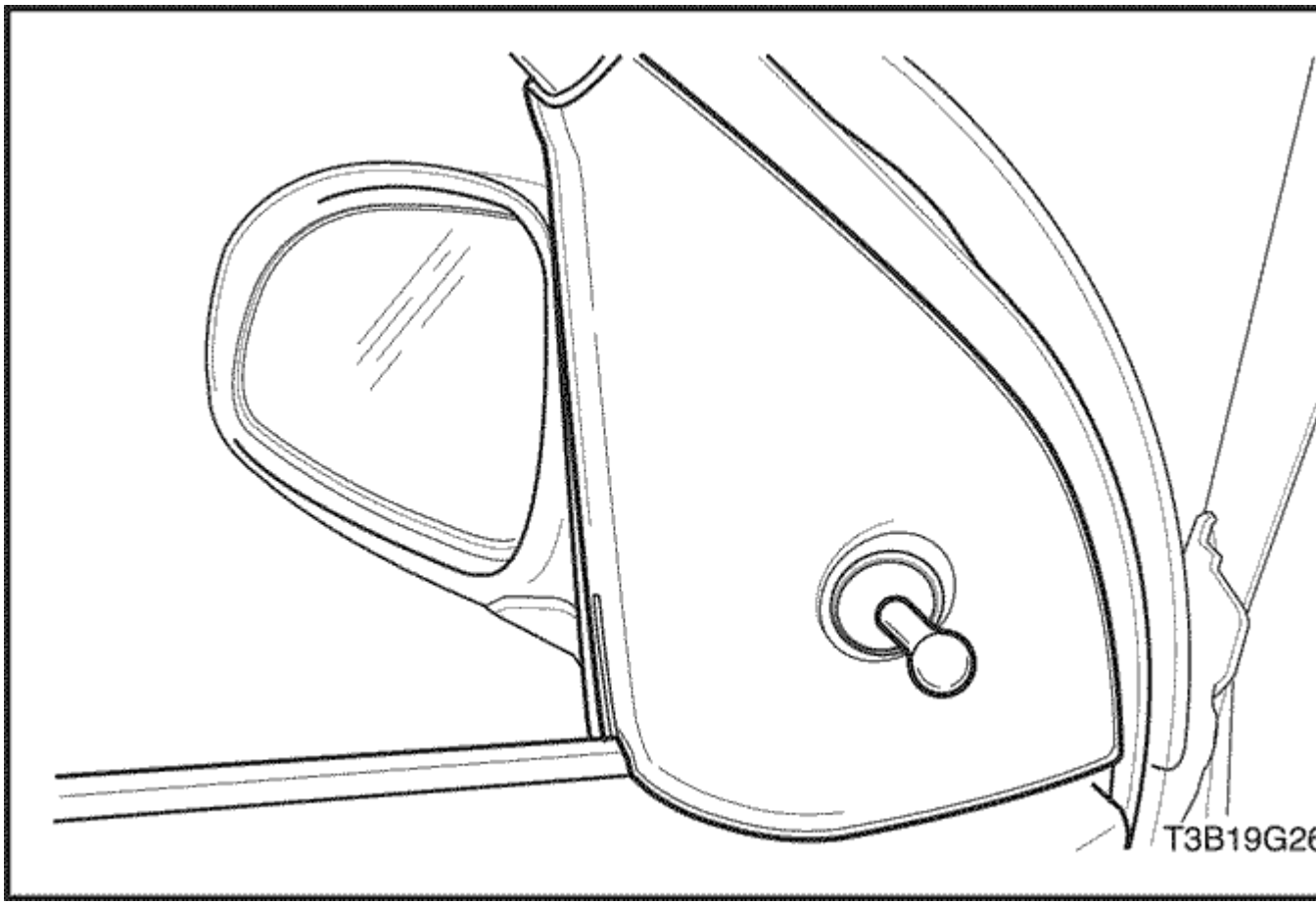


Installation Procedure

1. Install the outside rearview mirror assembly to the door with the screws.

   Tighten
   Tighten the outside rearview mirror assembly screws to 4.5 N•m (40 lb-in). (Manual remote control mirror shown.)

2. Connect the electric control rearview mirror electrical connector, if equipped.



3. Install the escutcheon. (Manual remote control mirror shown.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Stationary Glass

Stationary glass consists of all the glass on the vehicle which is immovable within its frame, such as the windshield glass, the back glass, and the inside rearview mirror.

Inside Rearview Mirror

The inside rearview mirror can be manually adjusted up/ down, fore/aft, and left/right. The rearview mirror pivots in two places: the ball-and-socket mirror pivot and the up/down hinge lever at the mirror support.

Outside Rearview Mirrors

Two types of outside rearview mirrors are available. The driver side is equipped with a remote control mirror. On the passenger side, a remote control mirror is standard, and an electric remote control mirror is optional.

The electric control outside rearview mirror can be adjusted by an electric control switch on the instrument panel.

SECTION 9M

EXTERIOR TRIM

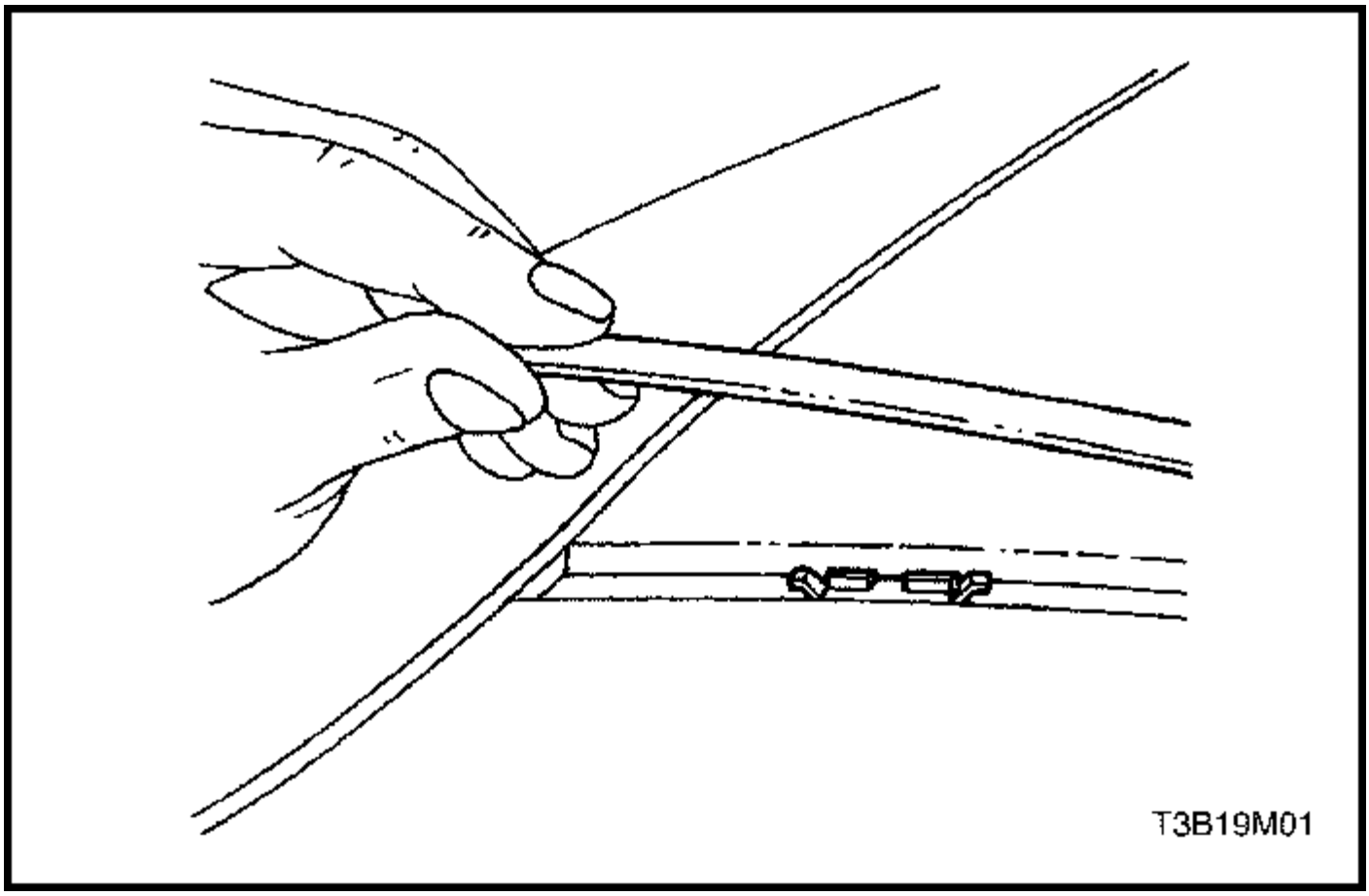
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Mud Guard Screw	1.5	-	13

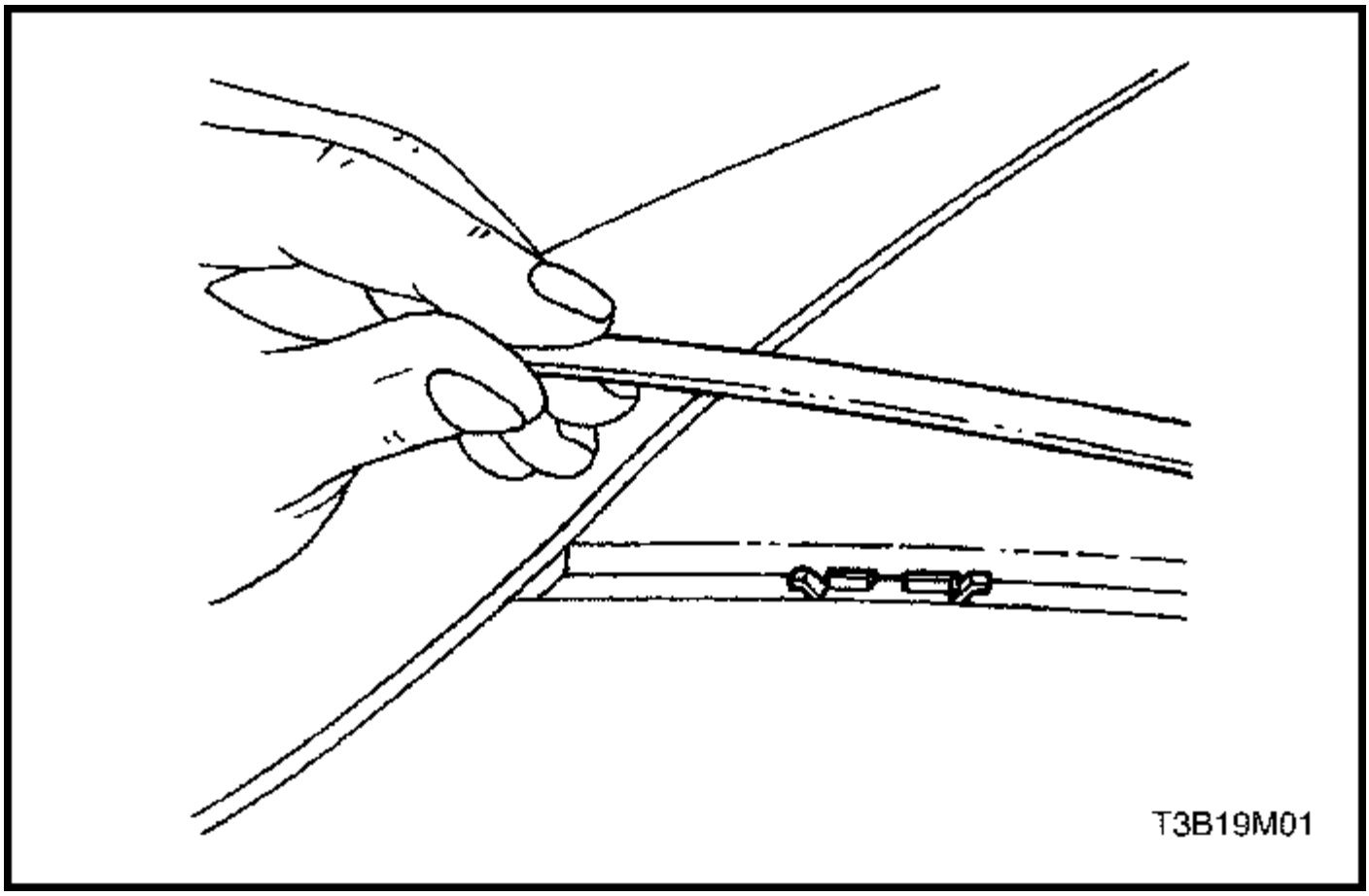
MAINTENANCE AND REPAIR

On-Vehicle Service



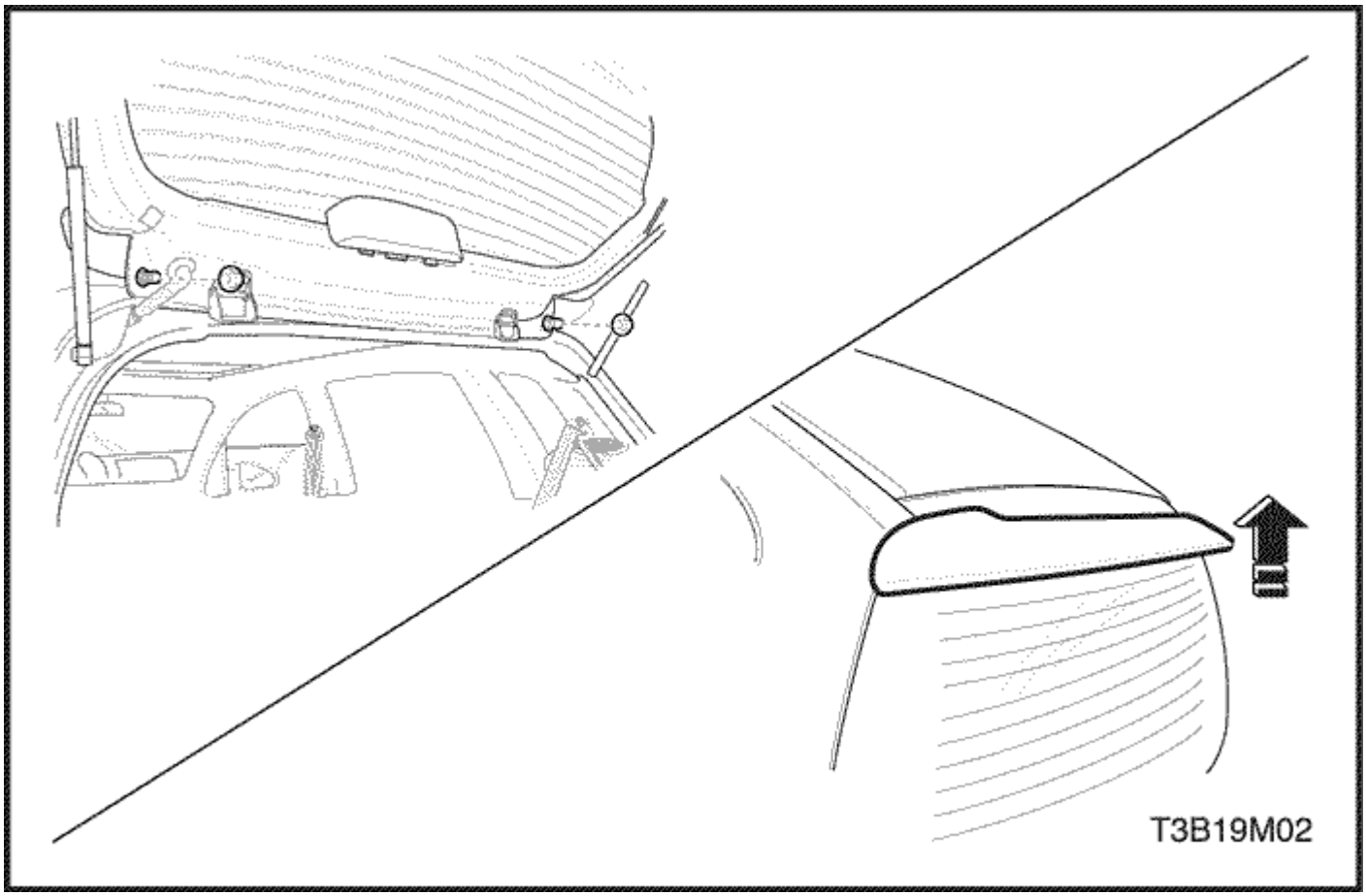
Roof Molding
Removal Procedure

1. Remove the roof molding from the plastic clips.



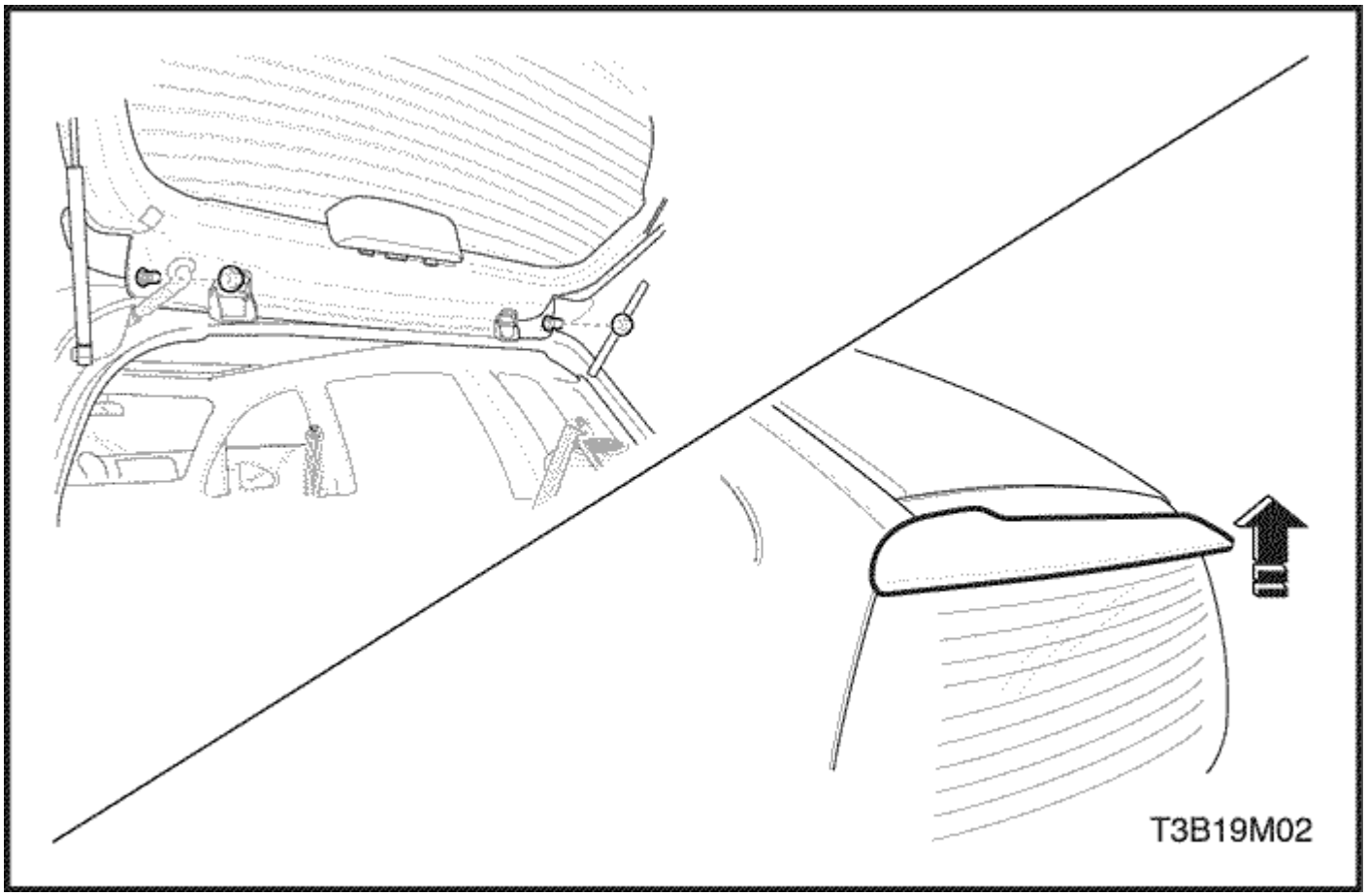
Installation Procedure

1. Press the roof molding onto the plastic clips.



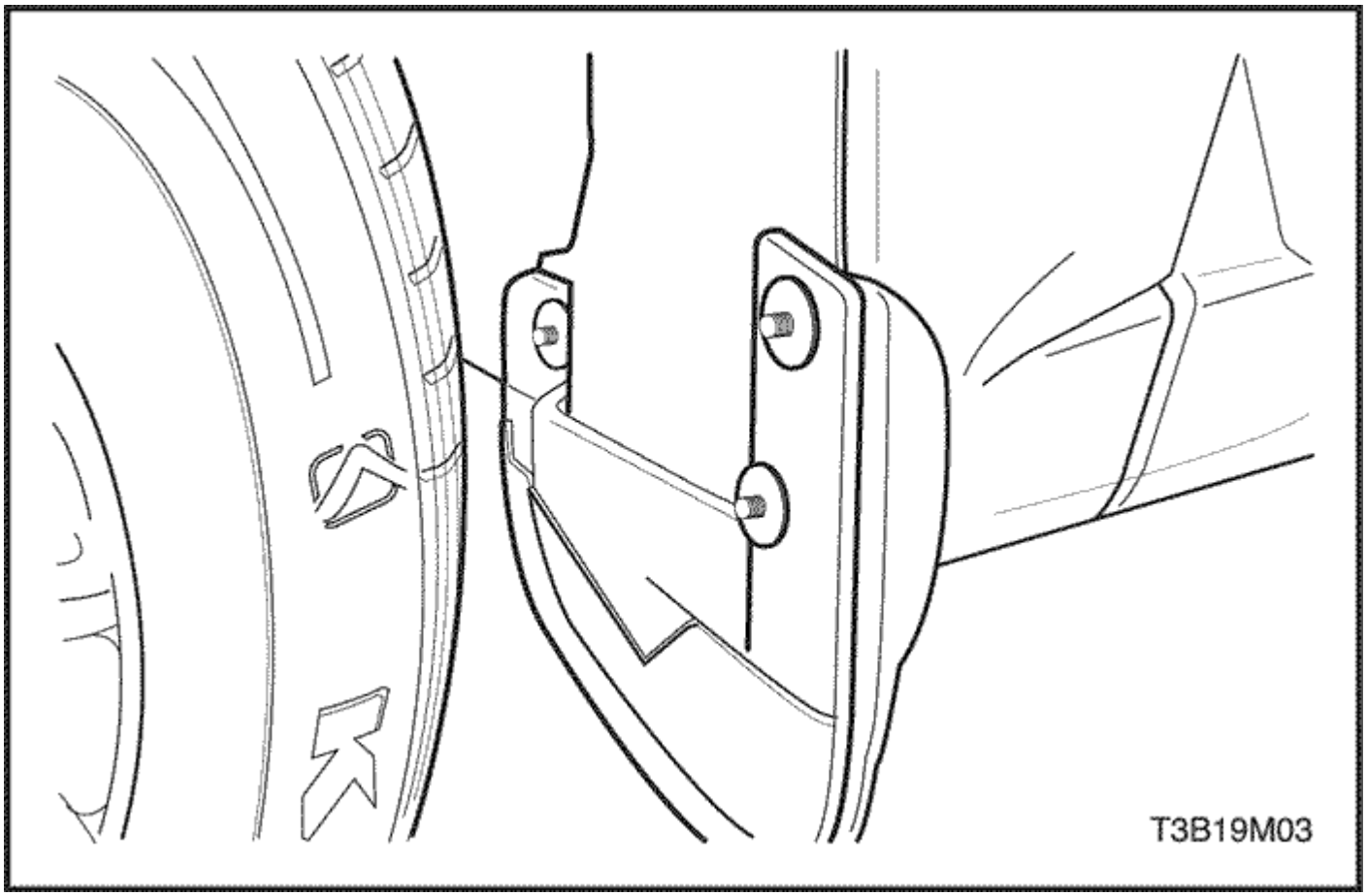
Rear Spoiler
Removal Procedure

1. Open the tailgate
2. Remove the rear spoiler from the tailgate



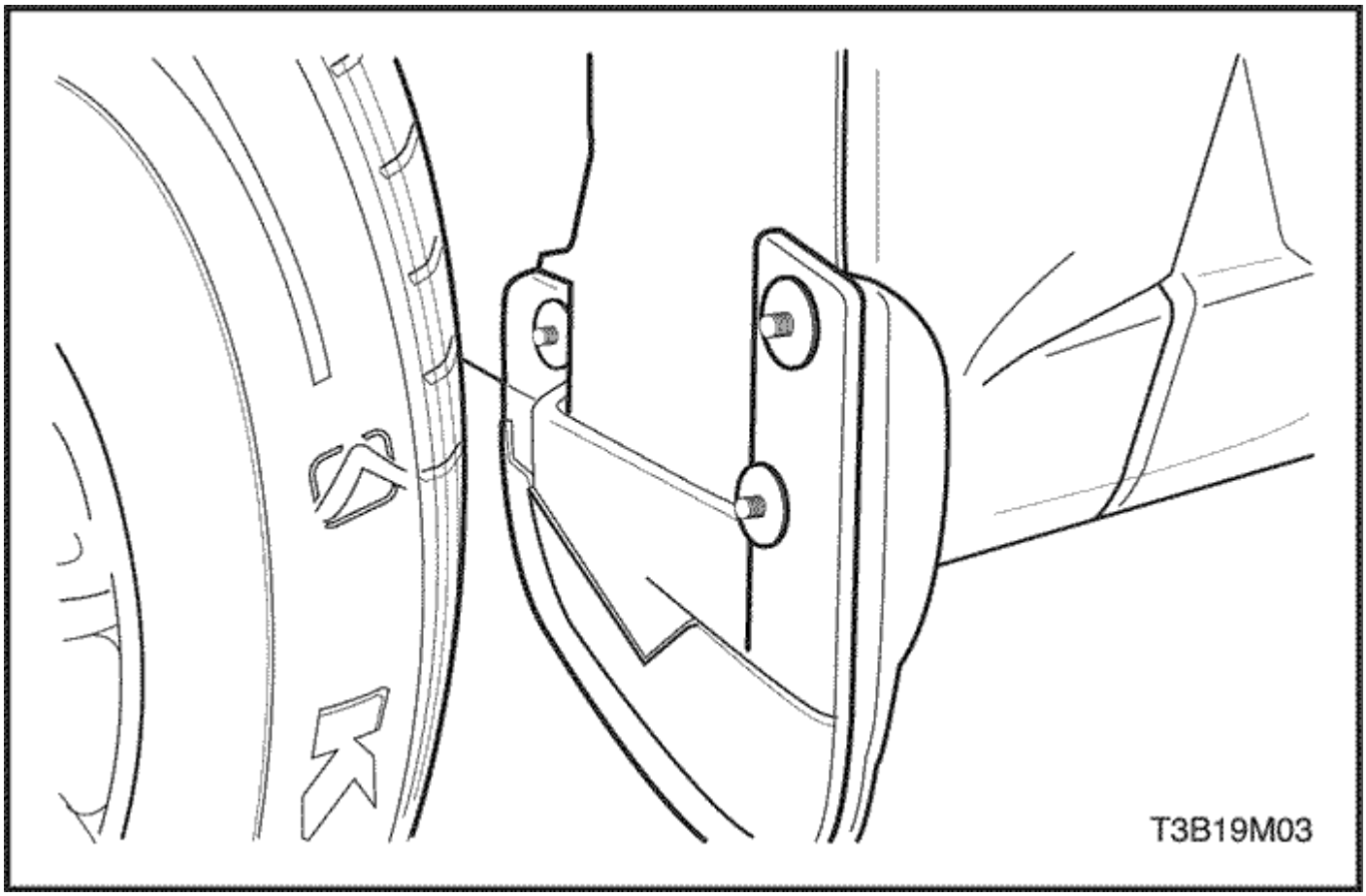
Installation Procedure

1. Install the rear spoiler on the tailgate with the nuts.



Mud Guards
Removal Procedure

1. Remove the screws and the mud guard.



Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the screws and the mud guard.

   Tighten
   Tighten the mud guard screws to 1.5 N•m (13 lb-in).

GENERAL DESCRIPTION AND SYSTEM OPERATION

Emblems and Lettering

The emblems and lettering on the vehicle are attached by adhesive. The company emblem appears on the hood. The lettering, which appears in several places on the body of the vehicle, features the model, the grade, and the company name.

Mud Guards
Front and rear mud guards are optional equipment on all models. Mud guards will help prevent an excessive buildup of mud on the body.

SECTION 9N

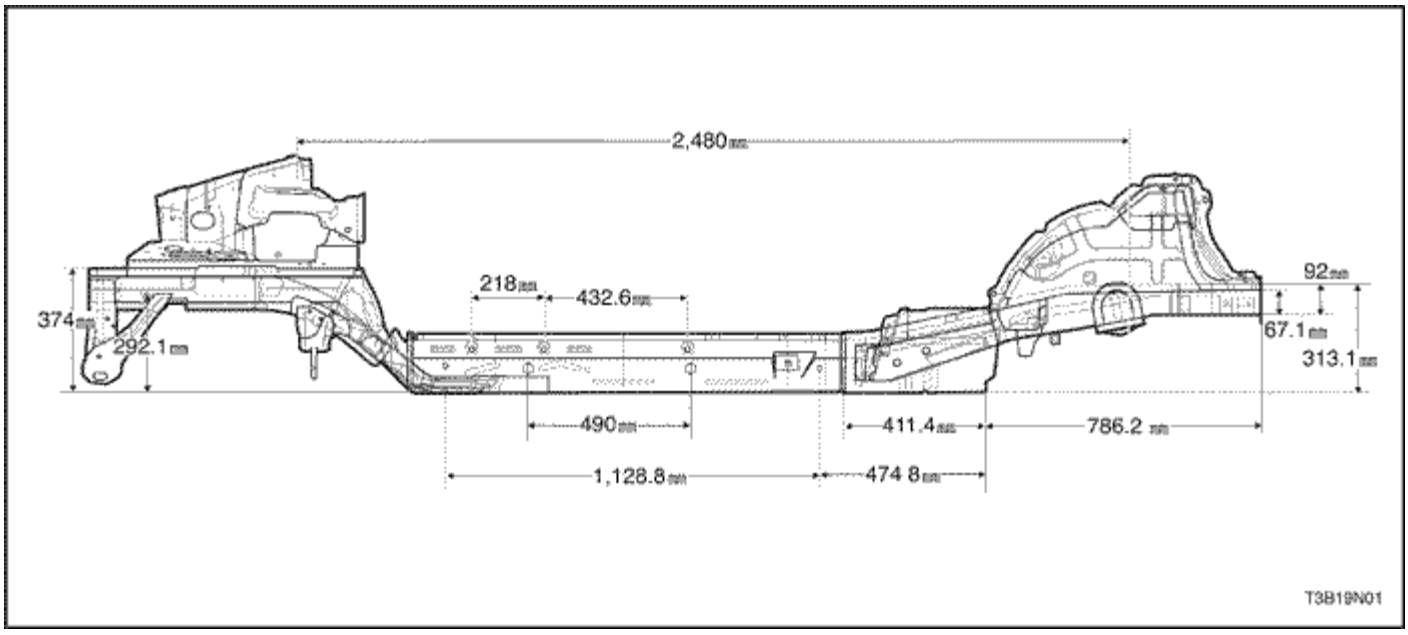
FRAME AND UNDERBODY

SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Engine Under Cover Bolts	3.5	-	31
Engine Under Cover Nuts	3.5	-	31

Underbody Dimensions (HatchBack)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432.6㎜
92㎜
374㎜
292.1㎜
67.1㎜
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490㎜
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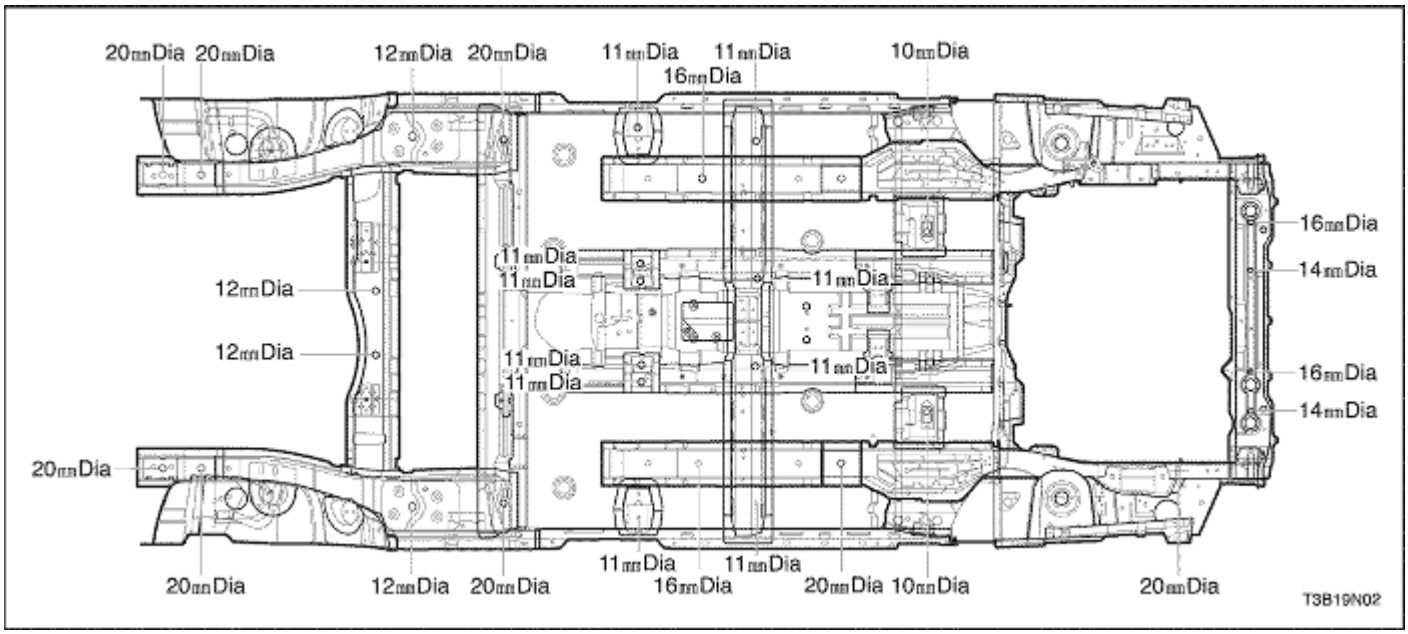
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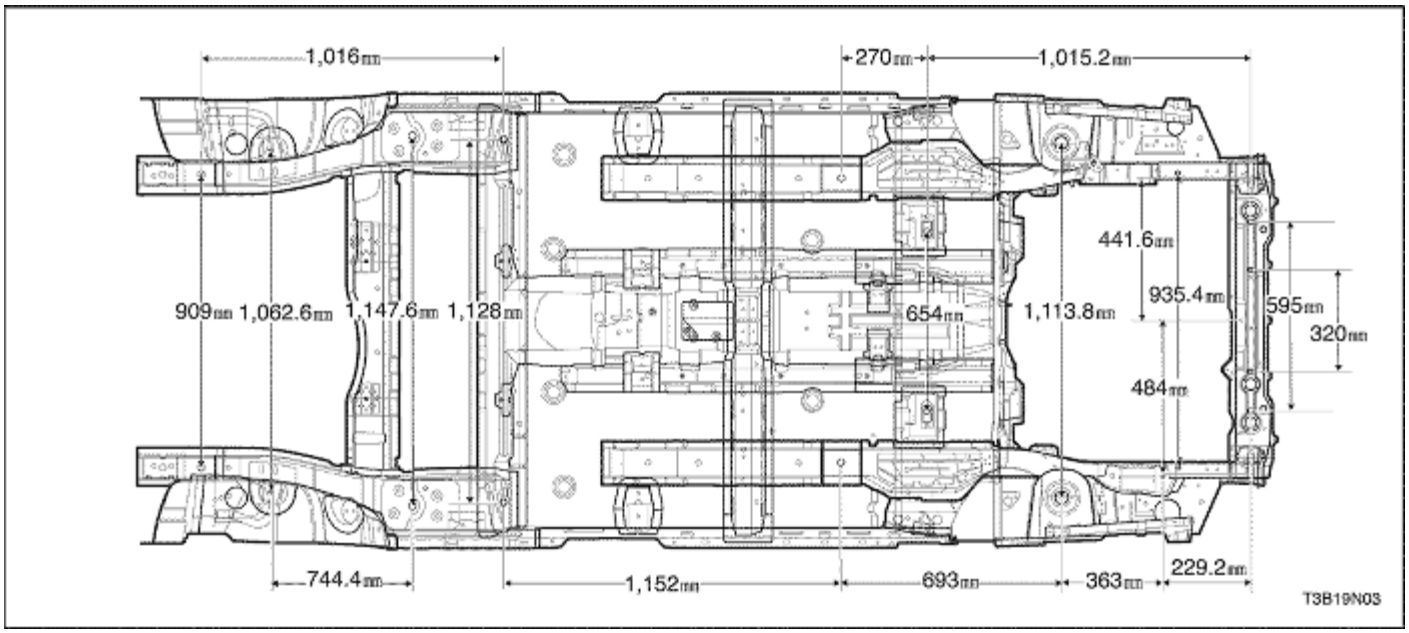
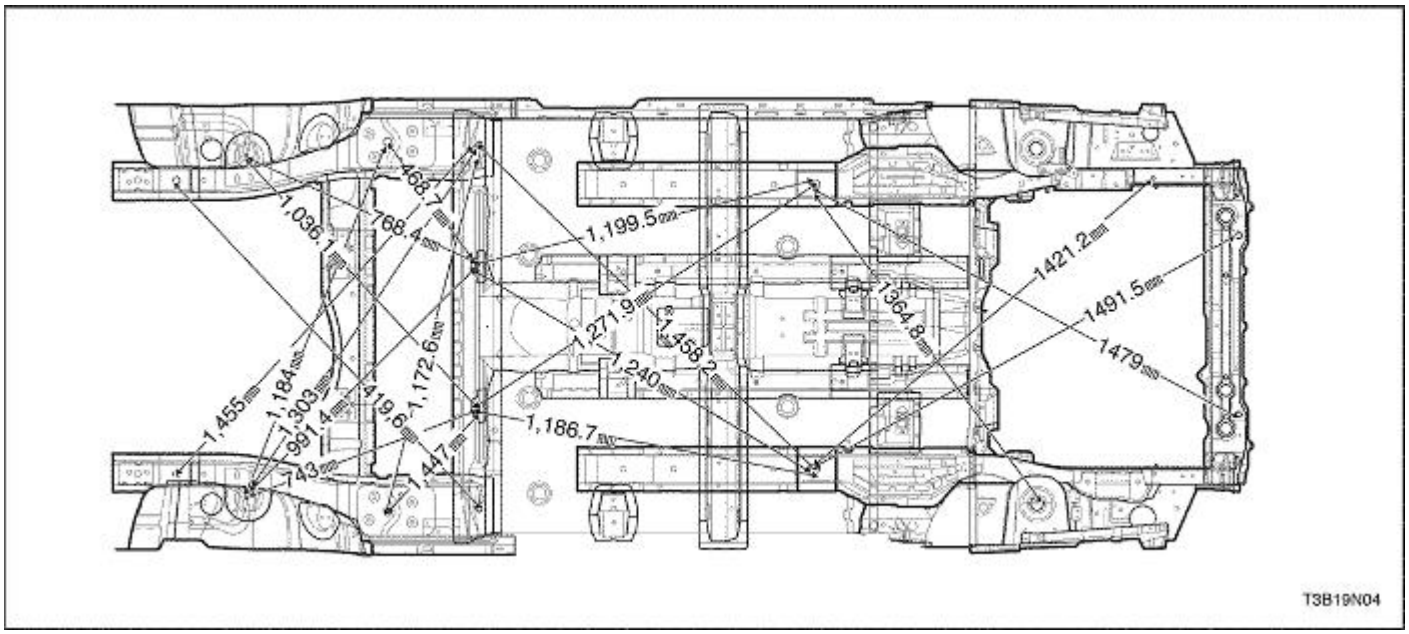
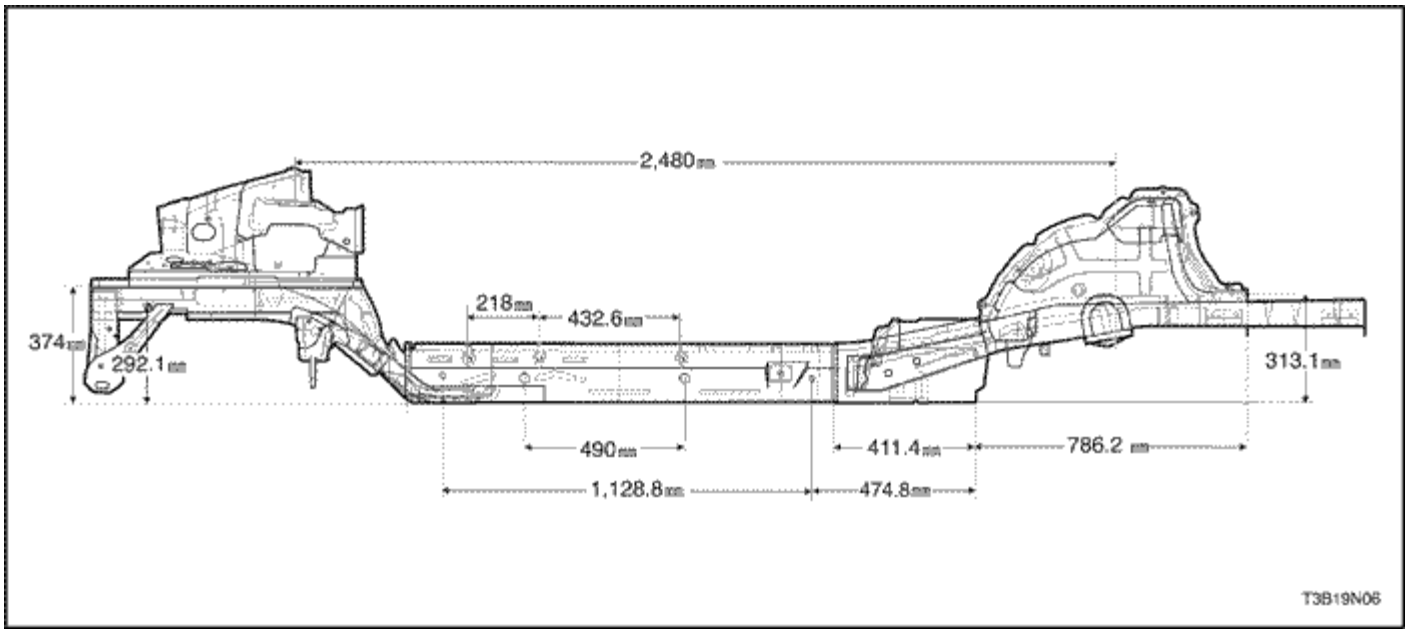




Underbody Dimensions (NotchBack)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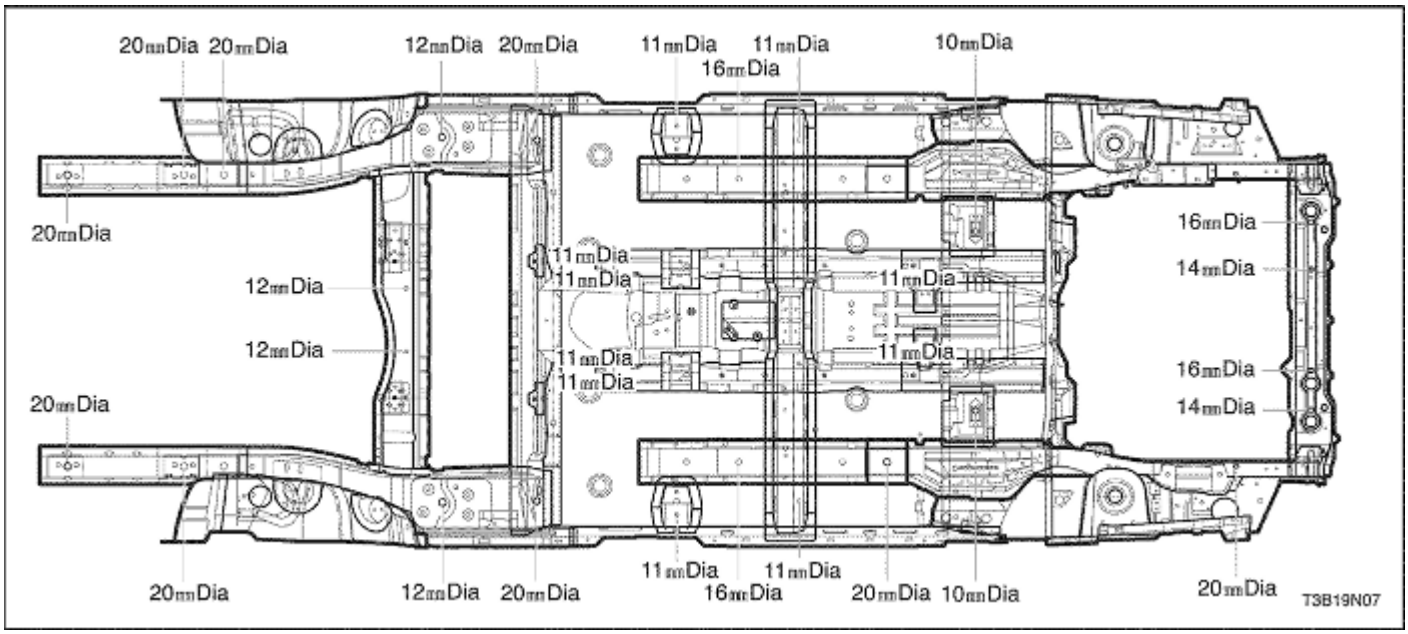
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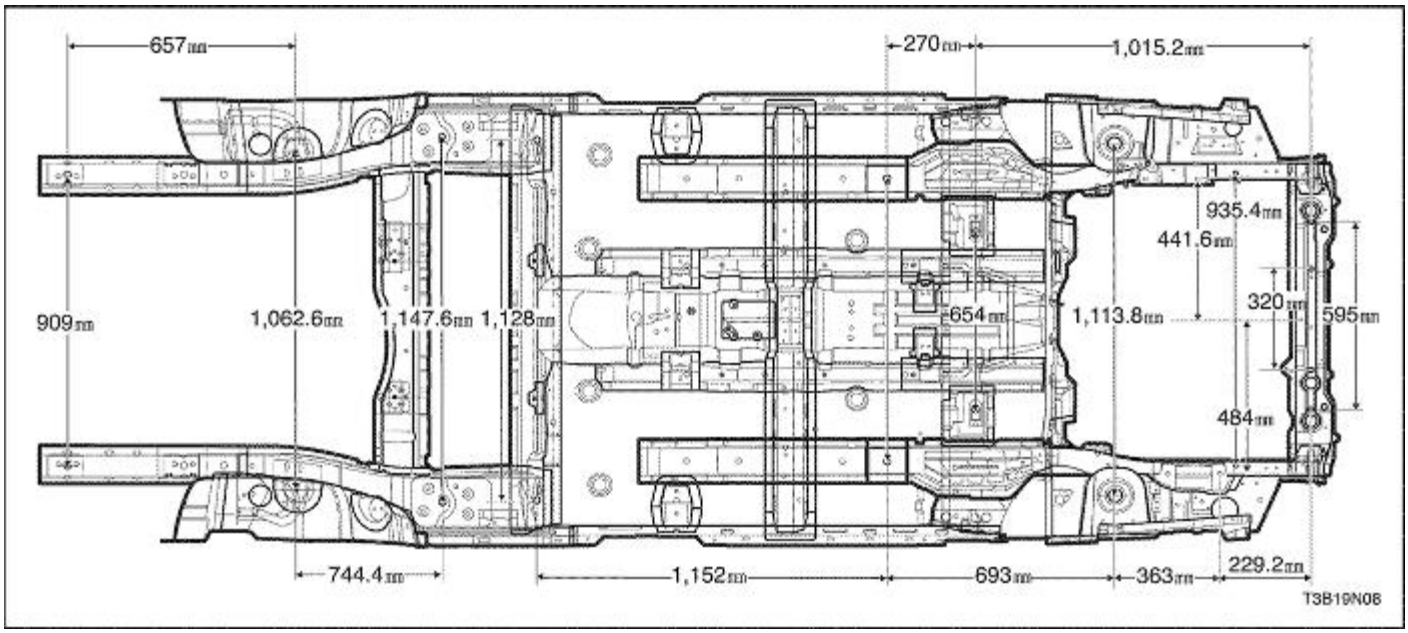
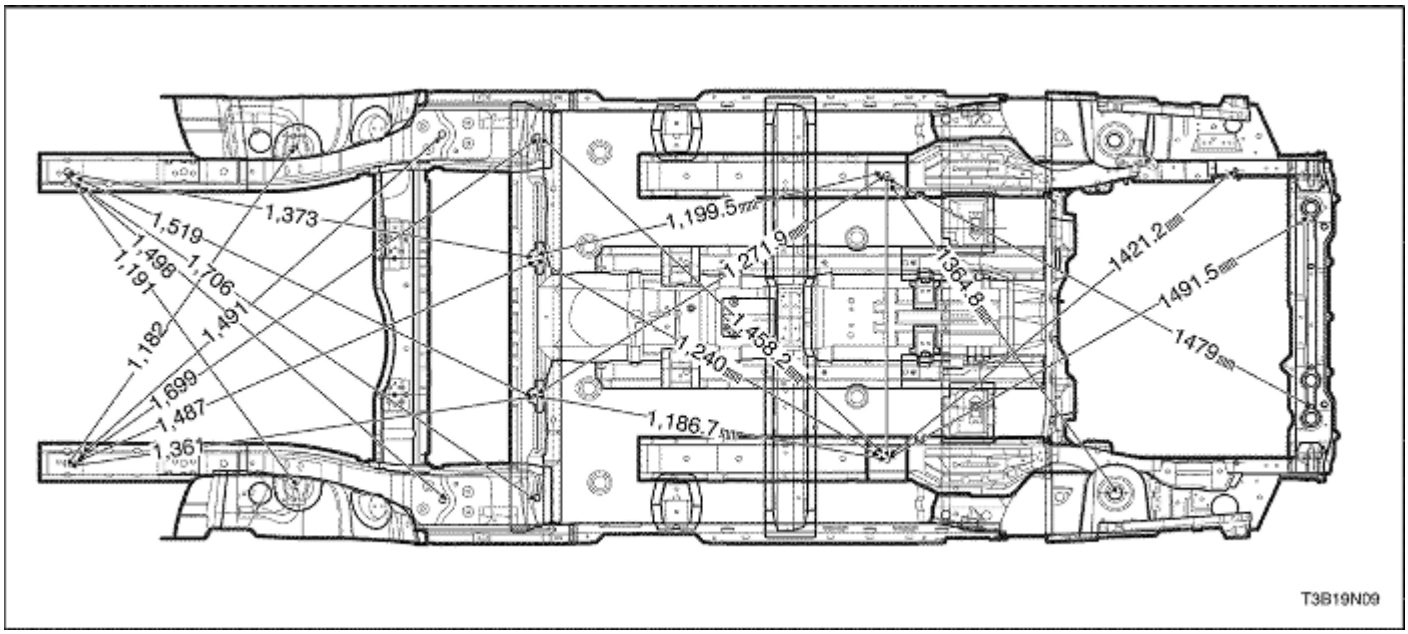




MAINTENANCE AND REPAIR

ON-Vehicle Service

Alignment Checking

An accurate method of determining the alignment of the underbody uses a measuring tram gauge. The tram gauge set used to perform the recommended measuring checks must include a vertical pointer able to reach 457 mm (18 inches).
Two types of measurements can be made with a tram gauge: direct point-to-point measurements and easurements calculated on a horizontal plane (datum line) parallel to the underbody. Point-to-point measurements are generally taken on steering and suspension engine compartment parts and simply require the vertical pointers to be set equally.
For horizontal plane measurements, the vertical pointers must be set as specified for each point to be measured.
Dimensions-to-gauge holes are measured to the center of the holes and flush to the adjacent surface metal unless otherwise specified. It is recommended that the diagonal dimensions to the cross-body be checked on both sides in order to verify the dimensional accuracy of the vehicle underbody.

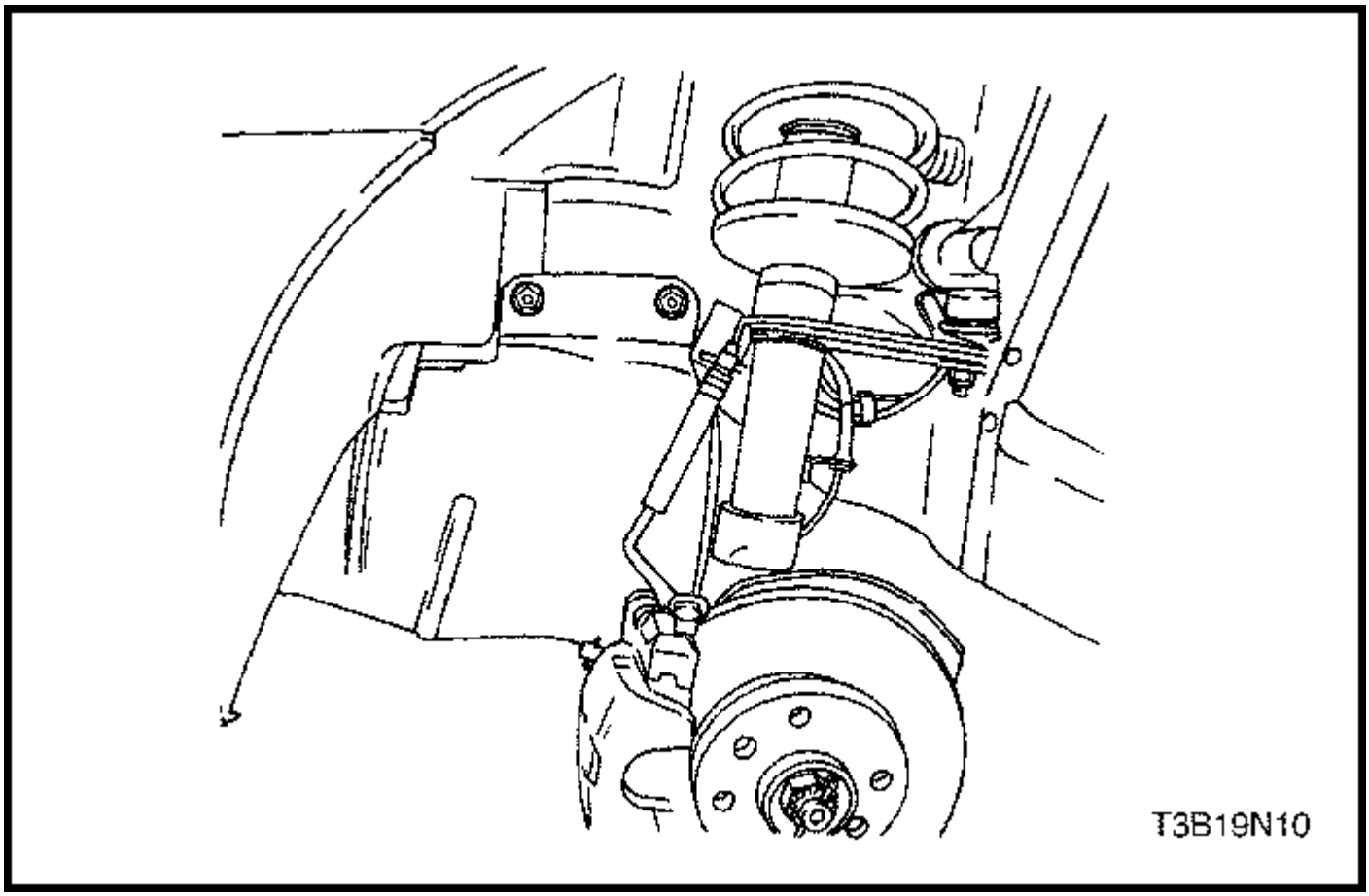
Floor Pan Insulators

The floor pan insulators have been designed for the higher floor pan temperatures that result from the use of the catalytic converter in the exhaust system. Therefore, when servicing a vehicle, it is essential that any insulators that may have been disturbed or removed be reinstalled in the original sequence and location. Also, an insulator needs to be replaced, use only the insulation specified for that location on the floor pan.

When servicing or replacing interior insulators, observe the following instructions.

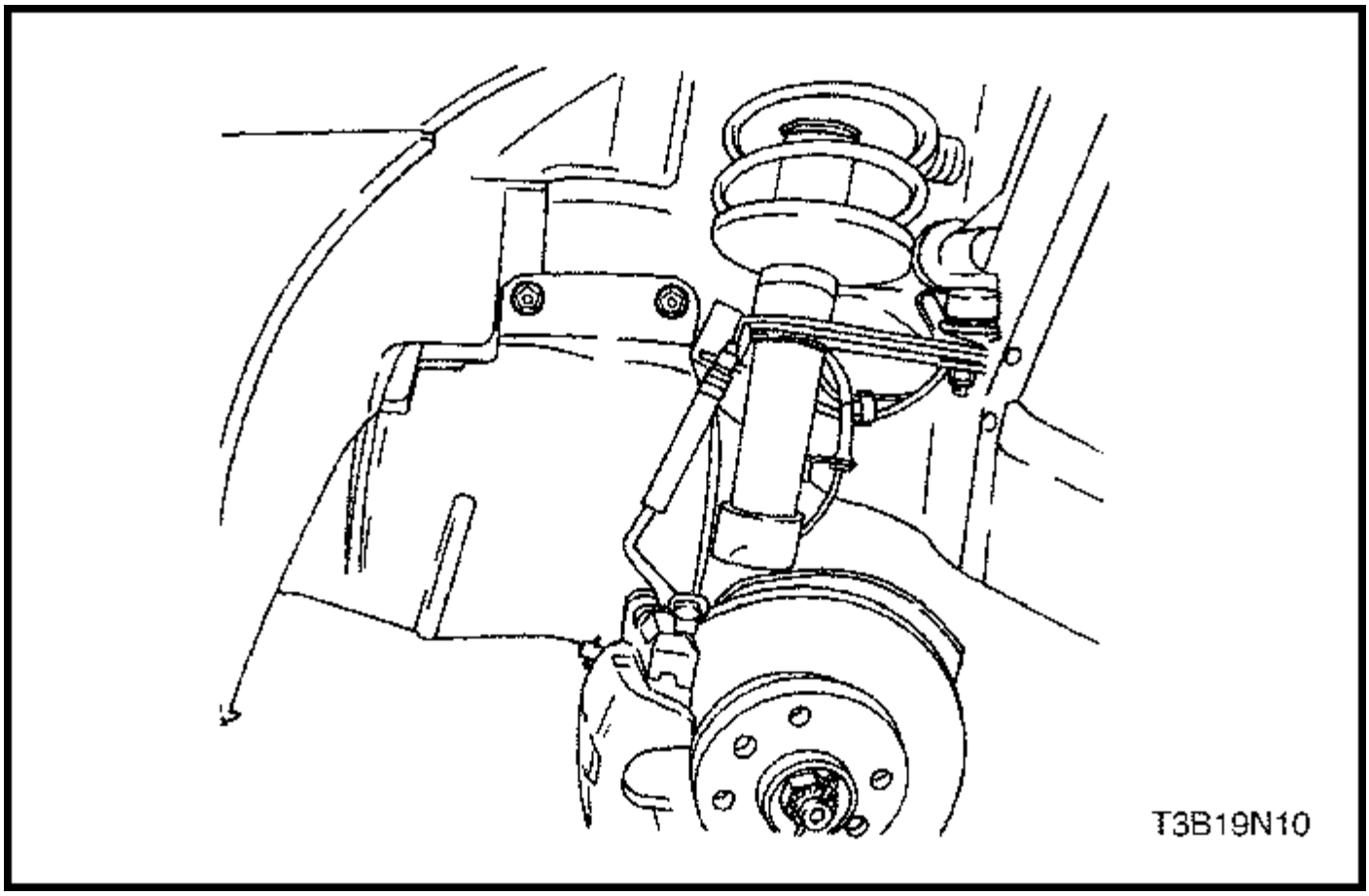
- Install the insulators in the original position and sequence. Butt the pieces together in order to avoid gapping or overlapping.
- If it is necessary to replace an insulator, use only the specified insulation.
- Use the original part to determine the amount of replacement material required and as a template for cutting and fitting the new piece to the floor pan.
- When installing the insulator, do not enlarge any cutouts or holes that are used for the attachment of interior parts such as the instrument panel or the floor console.
- Route the cross-body harness for interior parts over the floor pan insulators. Clip it in the original location.
- Do not apply spray-on deadeners or trim adhesives to the top of the floor pan at the area directly over the catalytic converter or the muffler.

Any insulator service repair or replacement should be the same thickness, size, and location as the original installation in the vehicle.



Engine Under Covers
Removal Procedure

1. Raise and suitably support the vehicle.
2. Remove the front wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the nuts and the bolts and the engine under cover.



Installation Procedure

1. Install the engine under cover with the bolts and nuts.

   Tighten
   Tighten the engine under cover bolts to 3.5 N•m (31 lb-in).
   Tighten the engine under cover nuts to 3.5 N•m (31 lb-in).

2. Install the front wheel. Refer to *Section 2E, Tires and Wheels.*
3. Install the front wheel. Refer to *Section 2E, Tires and Wheels.*

3. Lower the vehicle.
4. Lower the vehicle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

General Body Construction
This vehicle is constructed with a unitized body which incorporates integral front and rear frame side rails.
The front suspension lower control arms are bolted to and retained by supports, one each on the right and left sides. The front suspension lower control arm supports are attached to the underbody with three bolts at two locations. The engine is bolted to the integral front side rails. The suspension strut towers must be dimensionally correct in relation to the remainder of the underbody in order to maintain specified suspension strut and caster/ camber angles.
Since the individual underbody parts contribute directly to the overall strength of the body, it is essential to observe proper welding techniques during service repair operations. The underbody parts should be properly sealed and rustproofed whenever body repair operations destroy or damage the original sealing and rustproofing. When rustproofing critical underbody parts, use a good-quality type of air-dry primer, such as a corrosionresistant chromate or an equivalent material. Combination- type primer/surfacers are not recommended.
Engine Under Covers
The engine under covers are molded pieces of plastic that serve as shields for the underside of the engine. The covers help protect the engine from small rocks, gravel and other objects that would otherwise come into contact with the engine during normal driving conditions.

SECTION 9O

BUMPERS AND FASCIAS

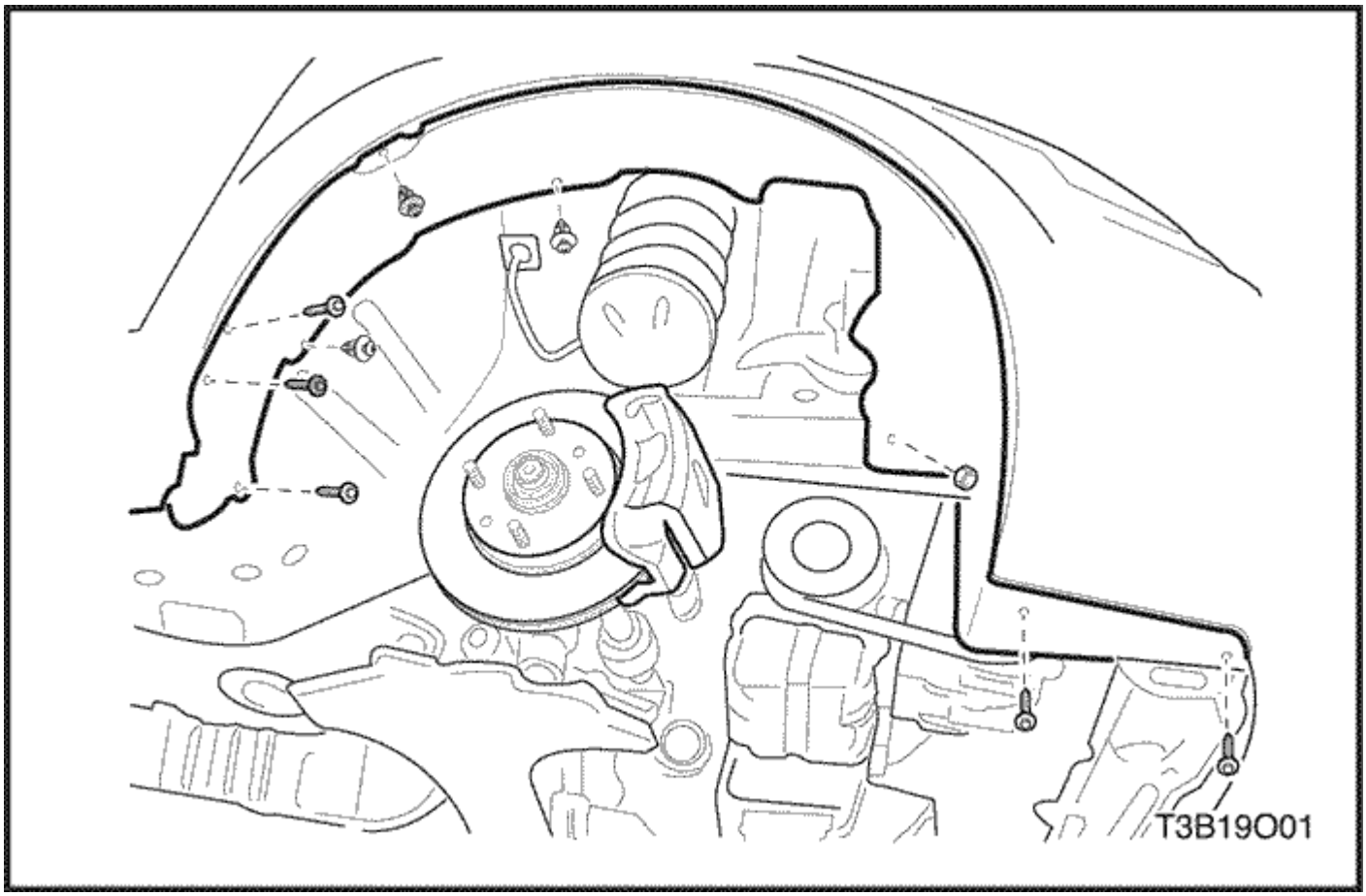
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Behind Fascia Screws	5.5	-	49
Front Bumper Impact Bar Nuts	27	20	-
Front Wheel Well Screws	1.5	-	13
Luggage Compartment Fascia Bolts	5.5	-	49
Mud Guard Screws	1.5	-	13
Rear Bumper Energy Absorber Nuts	27	20	-
Rear Upper Fascia Screws	1.5	-	13
Splash Shield Bolts	1.5	-	13
Splash Shield Nuts	1.5	-	13
Splash Shield Screws	1.5	-	13
Trim Panel Bolts	10	-	89

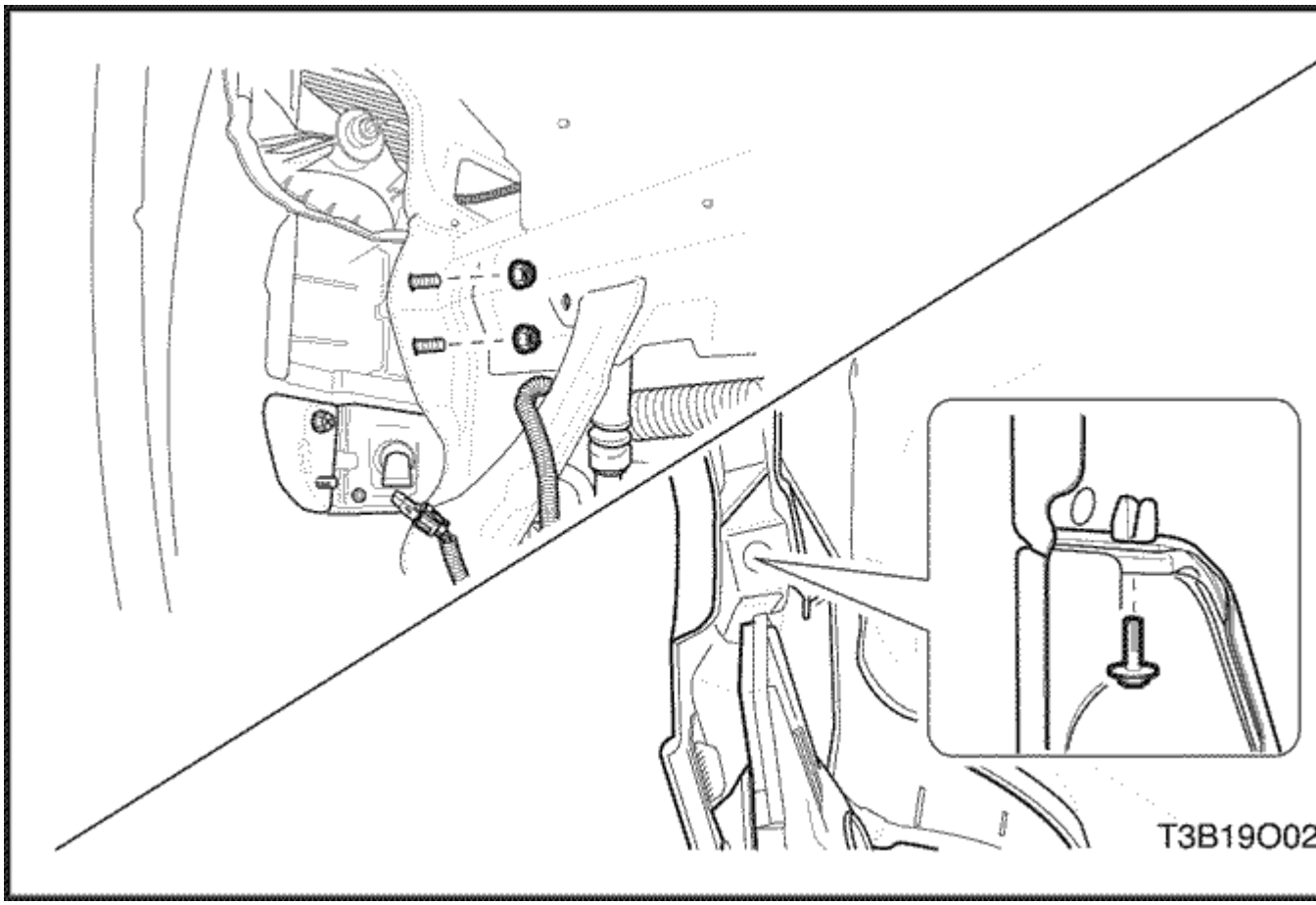
MAINTENANCE AND REPAIR

On-Vehicle service

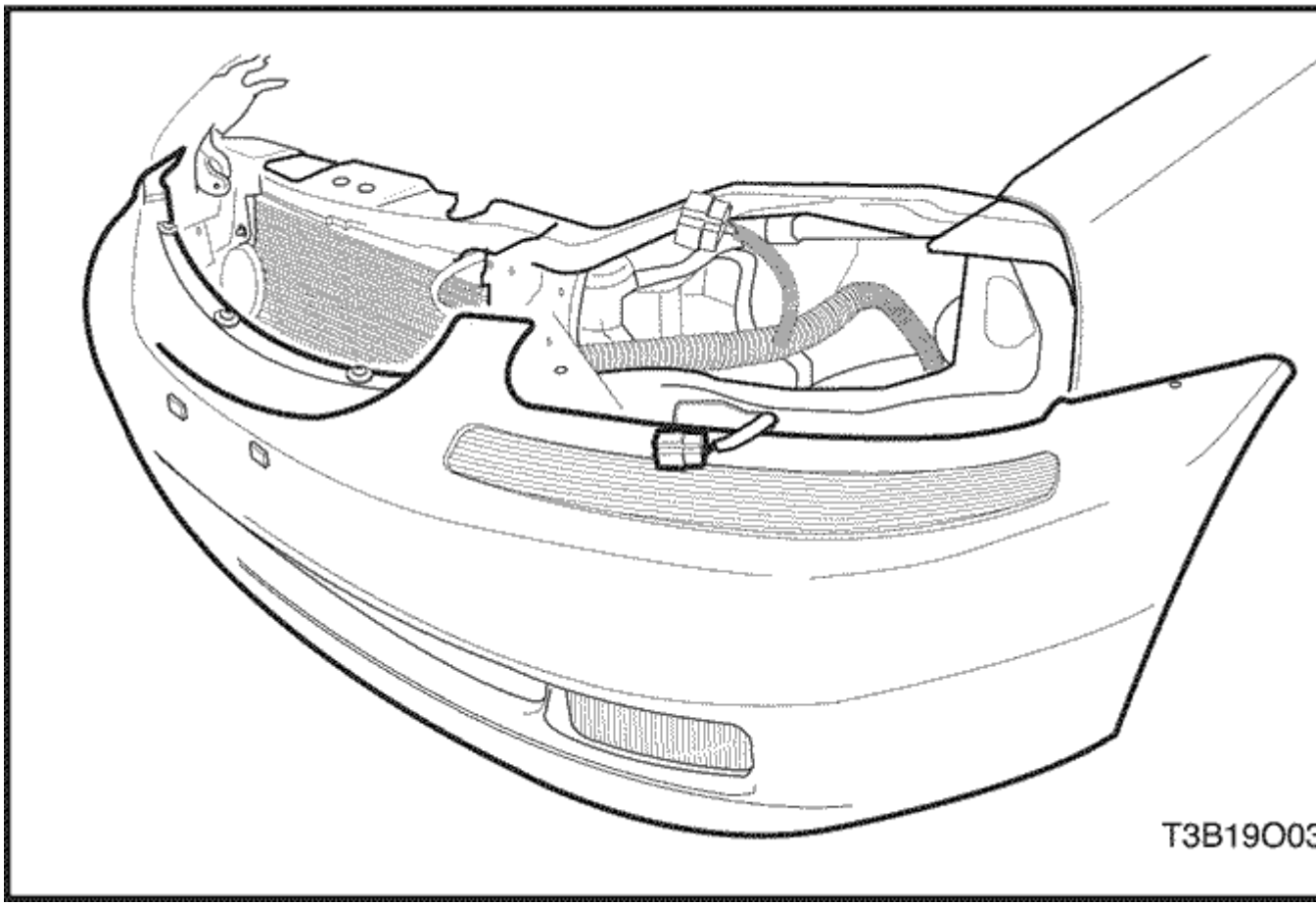


Front Bumper Fascia
Removal Procedure

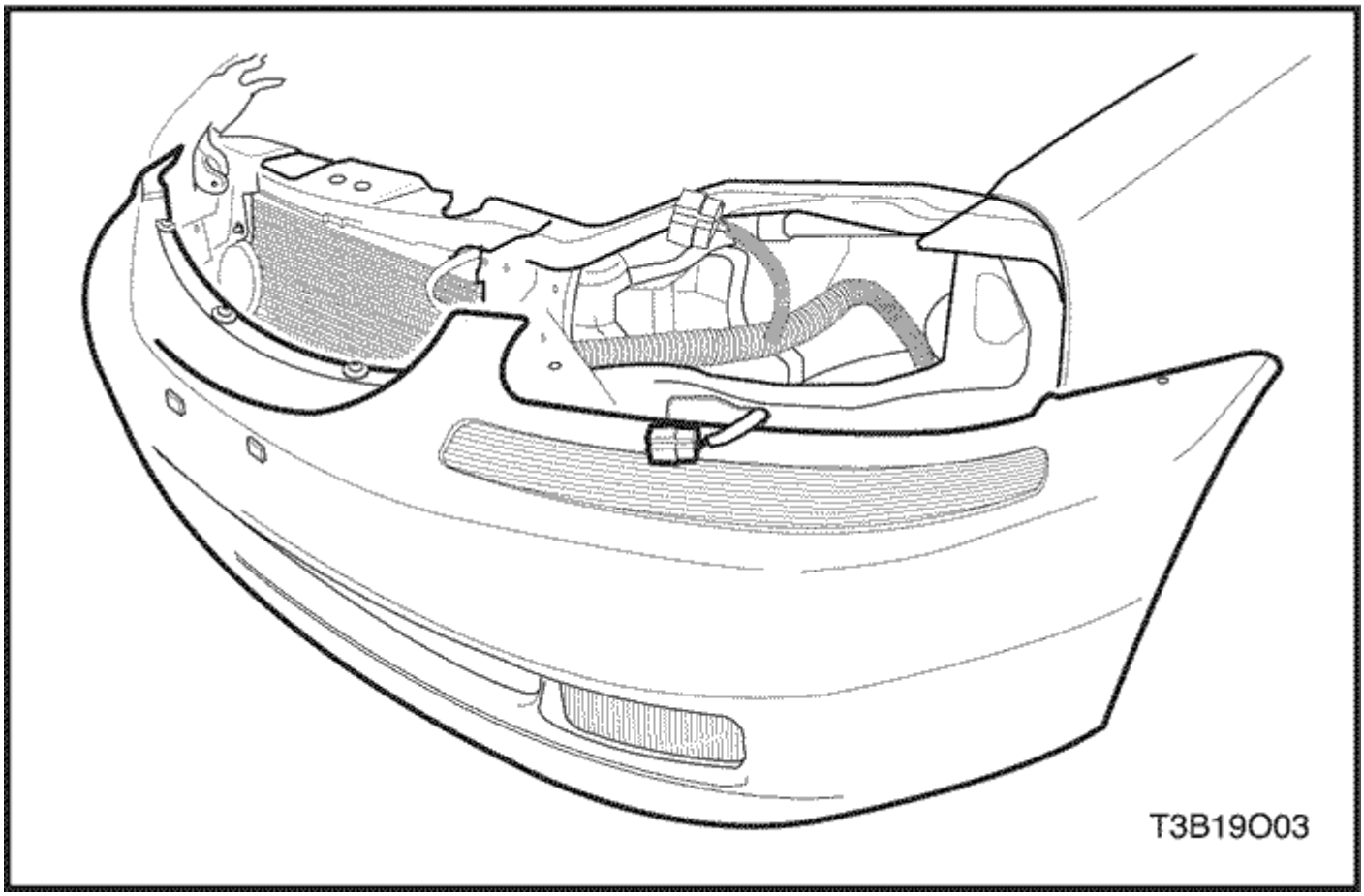
1. Disconnect the negative battery cable.
2. Remove the front wheels. Refer to *Section 2E, Tires and Wheels.*
3. Remove the screws, the bolts, the nuts, and the front wheel well splash shields.



4. Remove the headlamps, the turn signal lamps, the side turn signal lamps and the front fog lamps. Refer to *Section 9B, Lighting Systems.*
5. Remove the screws from the wheel wells.
6. Remove the nuts from the fascia
7. Remove the screws from underneath the fascia.



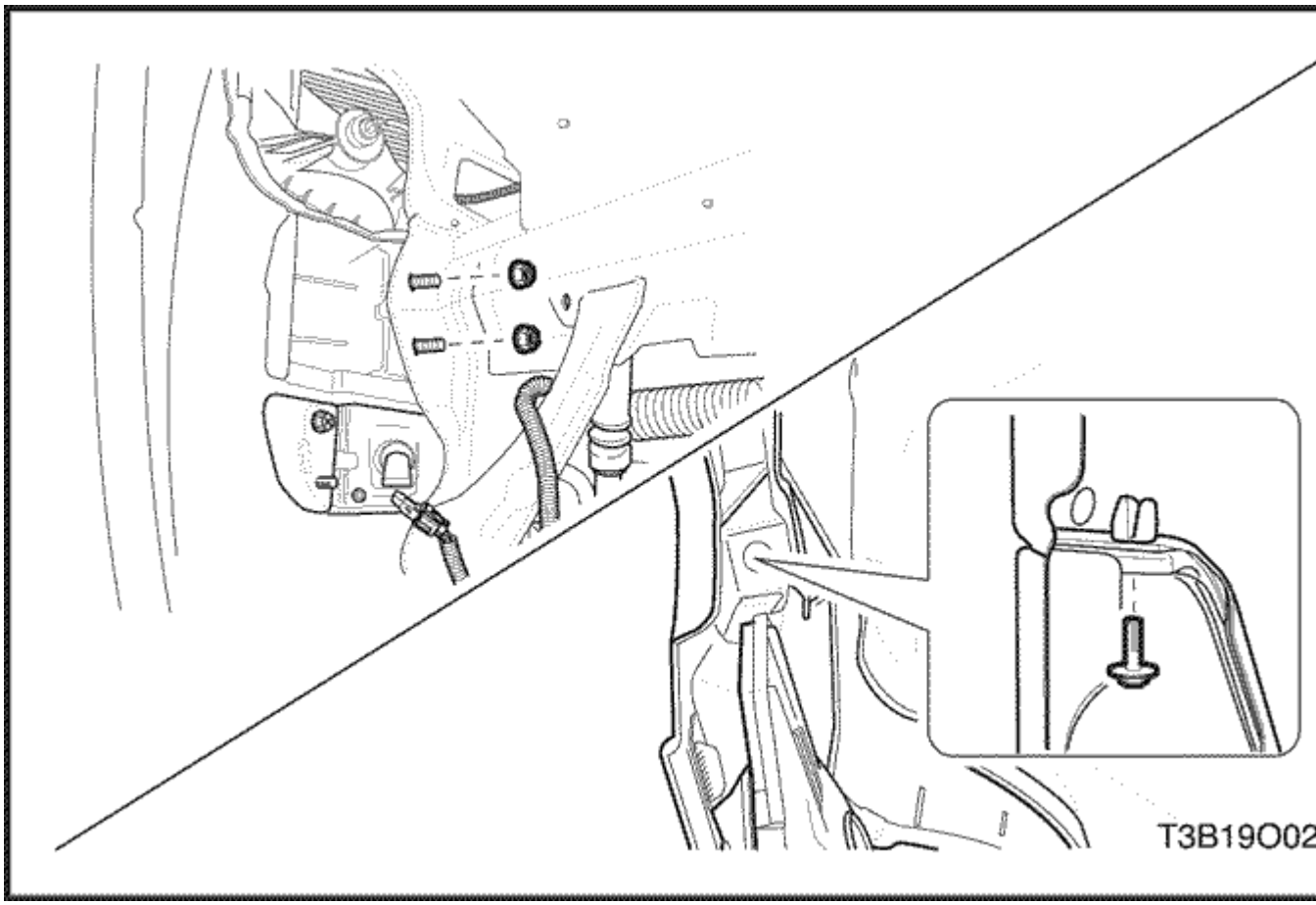
8. Remove the screws on the top of the fascia.
9. Remove the front bumper fascia.



Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the bumper fascia.
2. Install the screws on the top of the fascia.



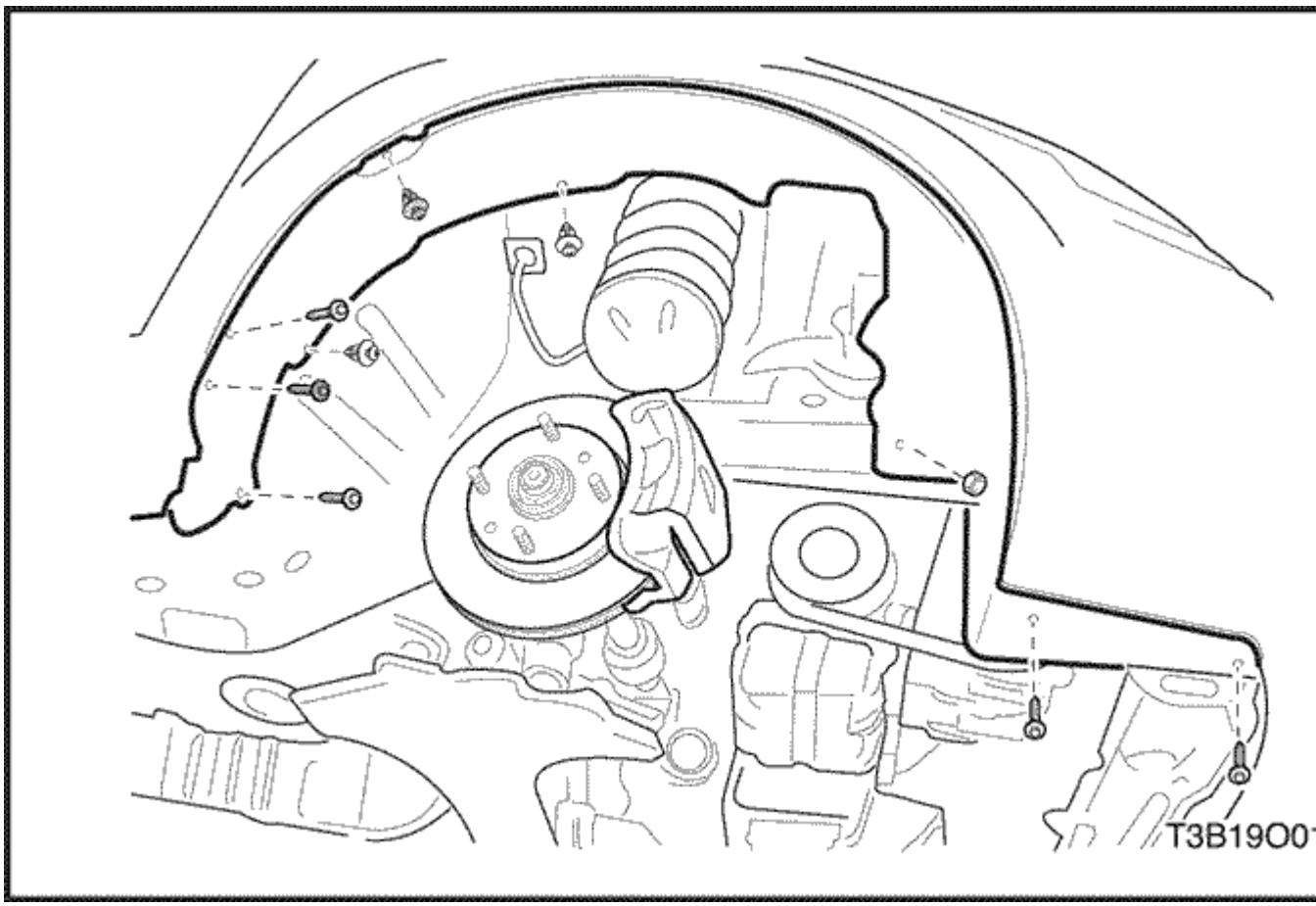
3. Install the screws underneath the fascia.
4. Install the nuts behind the fascia.

   Tighten
   Tighten the front bumper impact beam nuts to 27 N•m (20 lb-ft).

5. Install the screws in the wheel wells.

   Tighten
   Tighten the frontwheelwell screws to 1.5 N•m(13 lb-in).

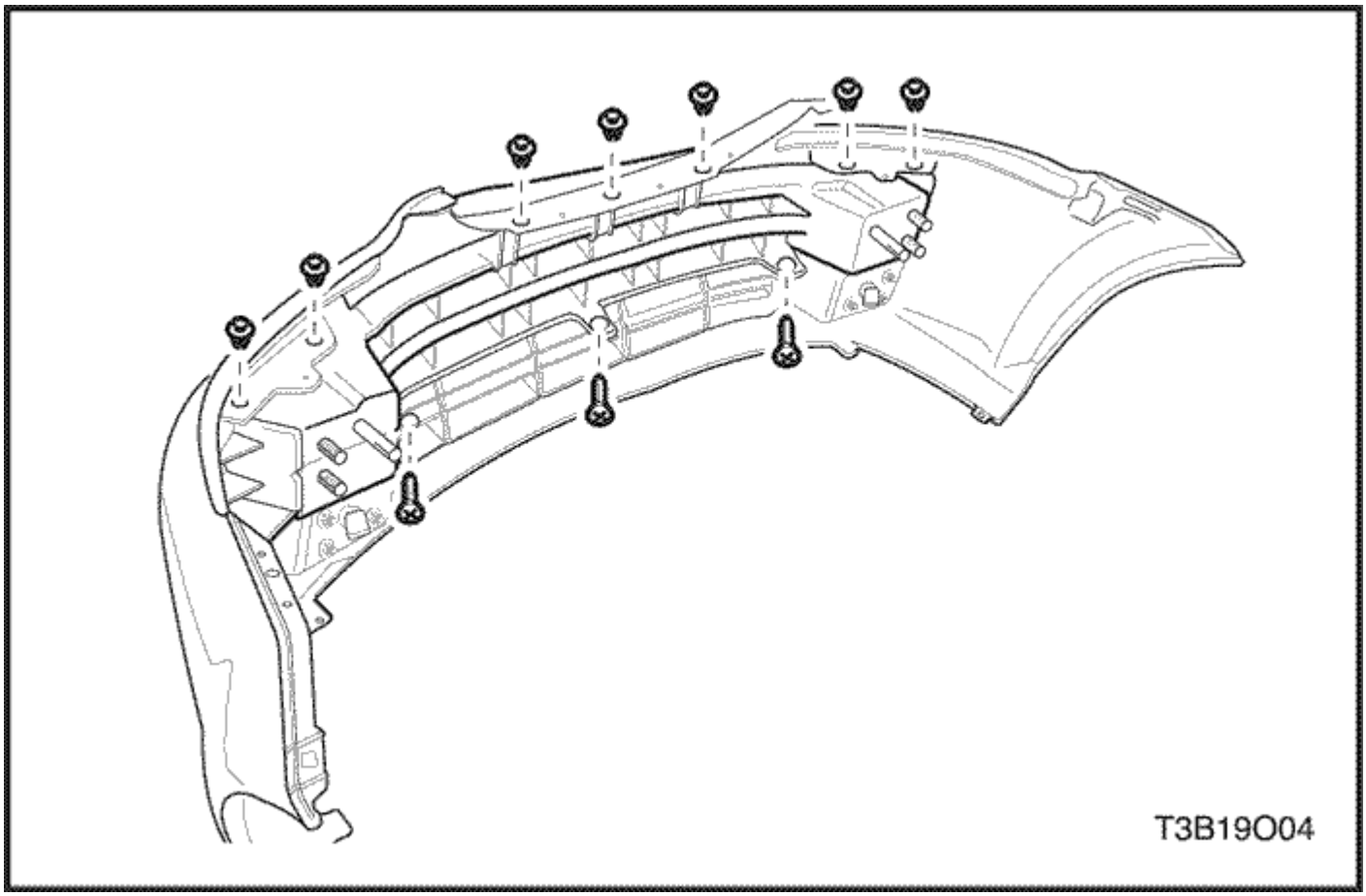
6. Install the headlamps, the turn signal lamp, the side turn signal lamps, and the front fog lamps. Refer to *Section 9B, Lighting Systems.*



7. Install the front wheel well splash shields with the screws, the bolts, and the nuts.
8. Install the front wheels. Refer to *Section 2E, Tires and Wheels.*

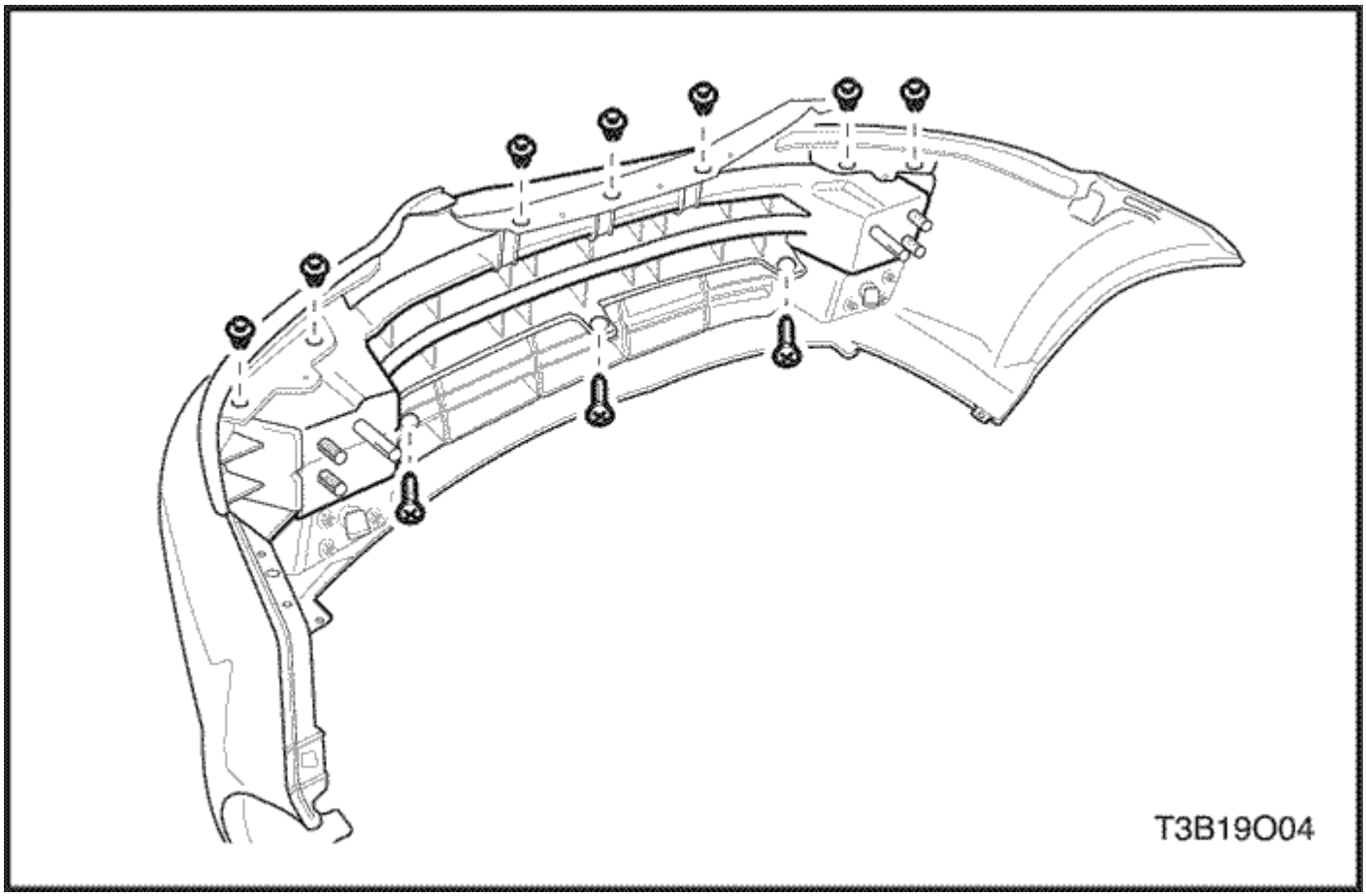
   Tighten
   Tighten the splash shield screws to 1.5 N•m(13 lb-in).
   Tighten the splash shield bolts to 1.5 N•m (13 lb-in).
   Tighten the splash shield nuts to 1.5 N•m (13 lb-in).

9. Connect the negative battery cable.



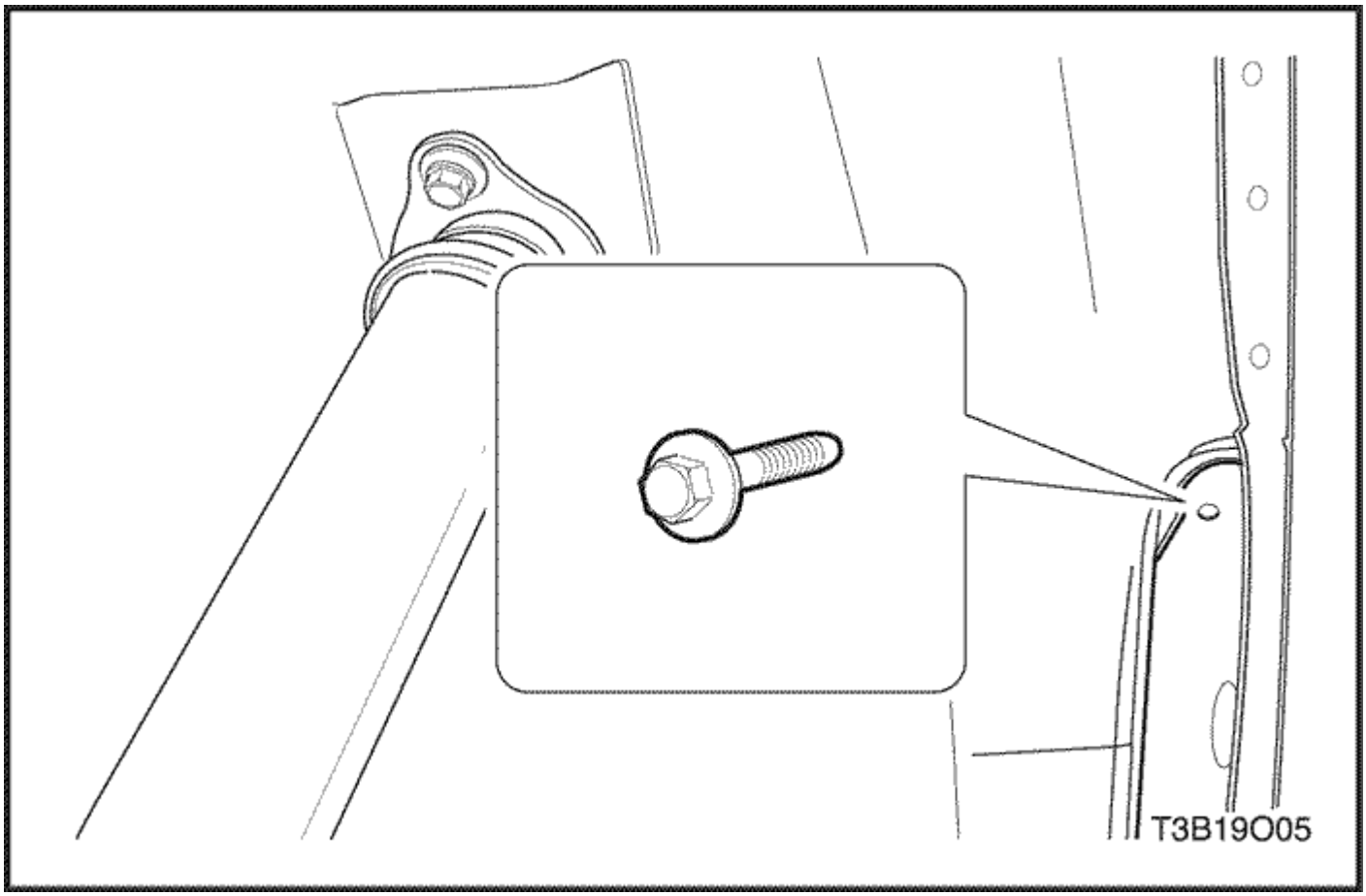
Front Bumper Impact Beam
Removal Procedure

1. Remove the front bumper fascia. Refer to "Front Bumper Fascia" in this section.
2. Remove the front bumper impact beam.



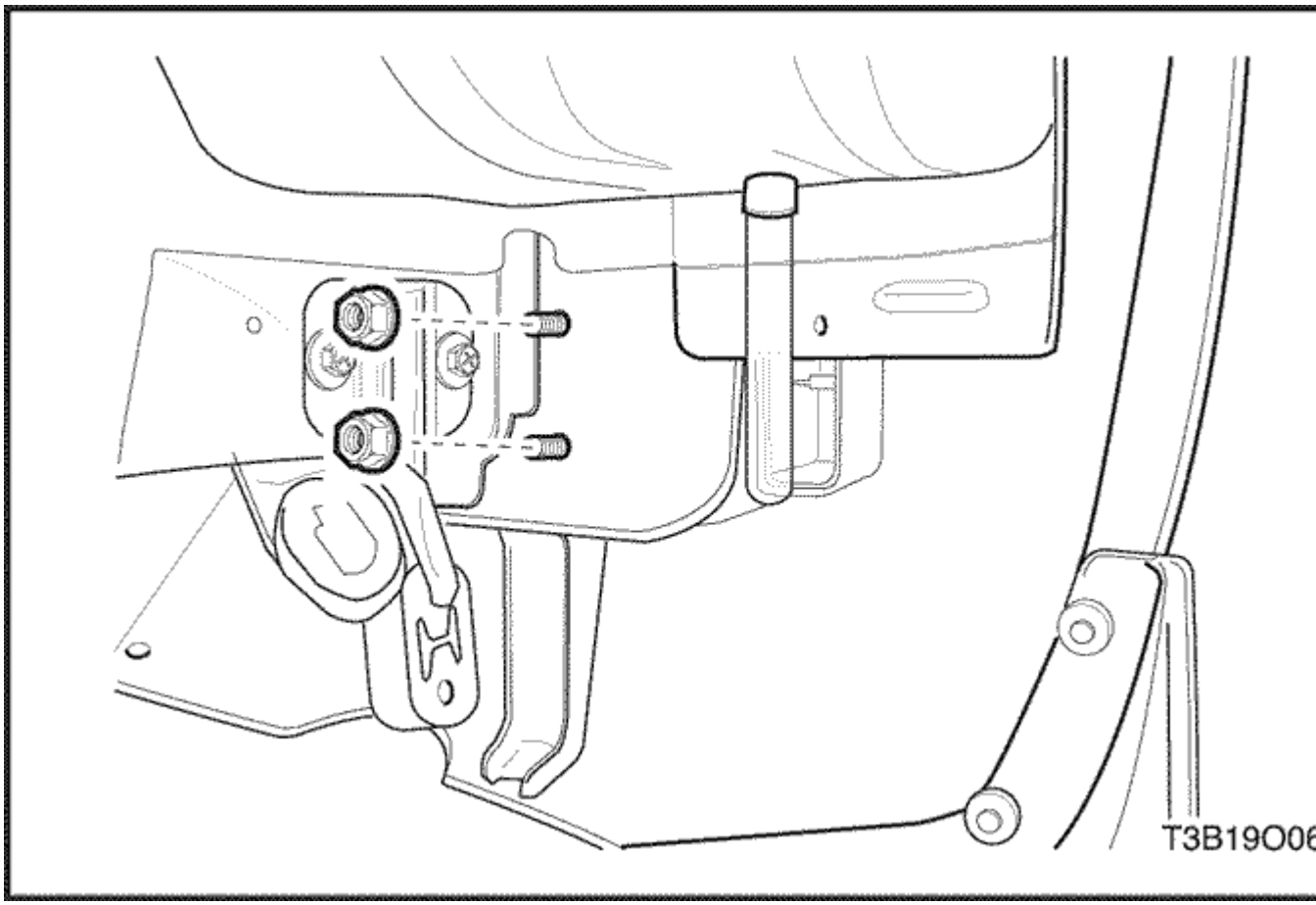
Installation Procedure

1. Install the front bumper impact beam.
2. Install the front bumper fascia. Refer to "Front Bumper Fascia" in this section.

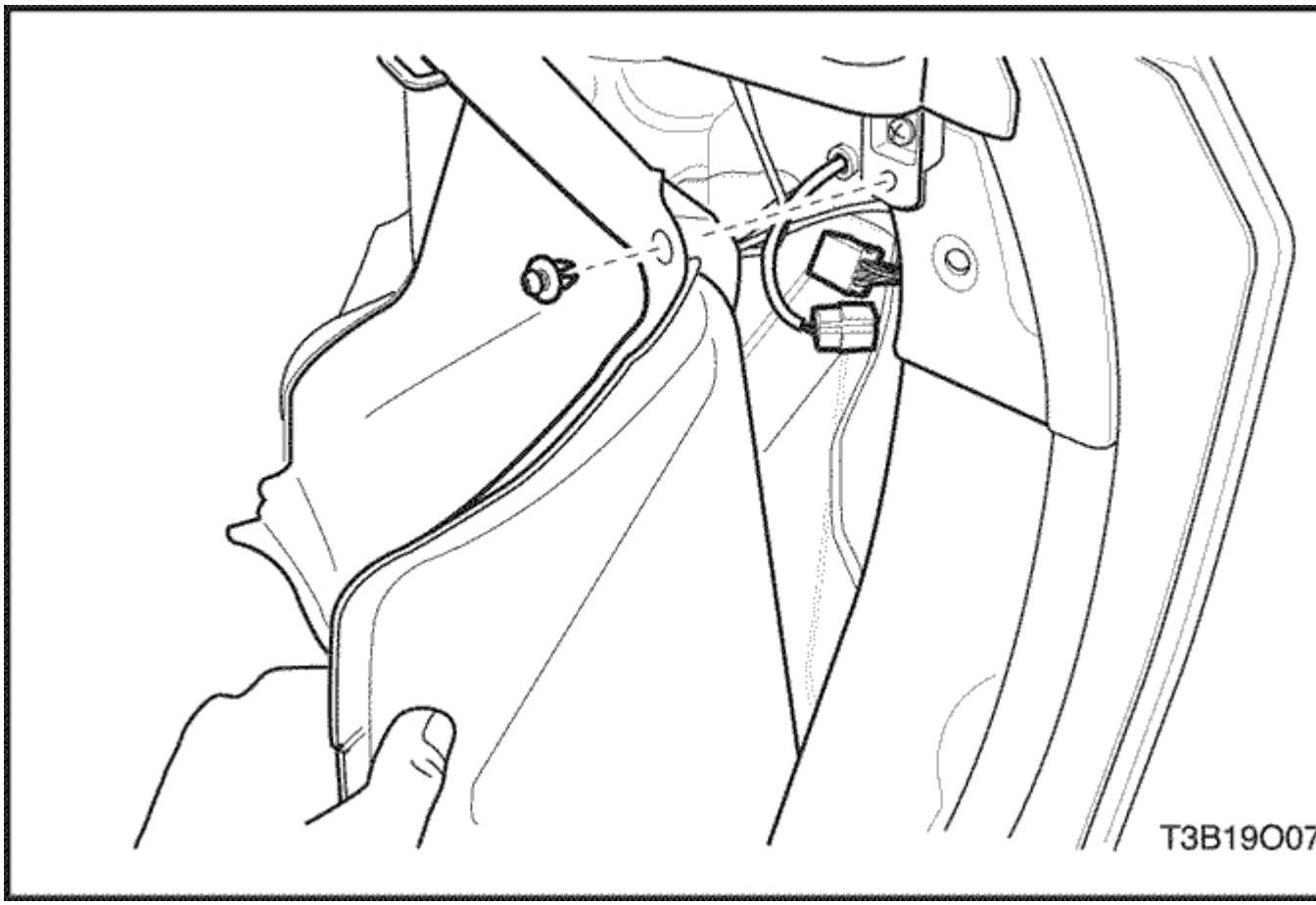


Rear Bumper Fascia
Removal Procedure

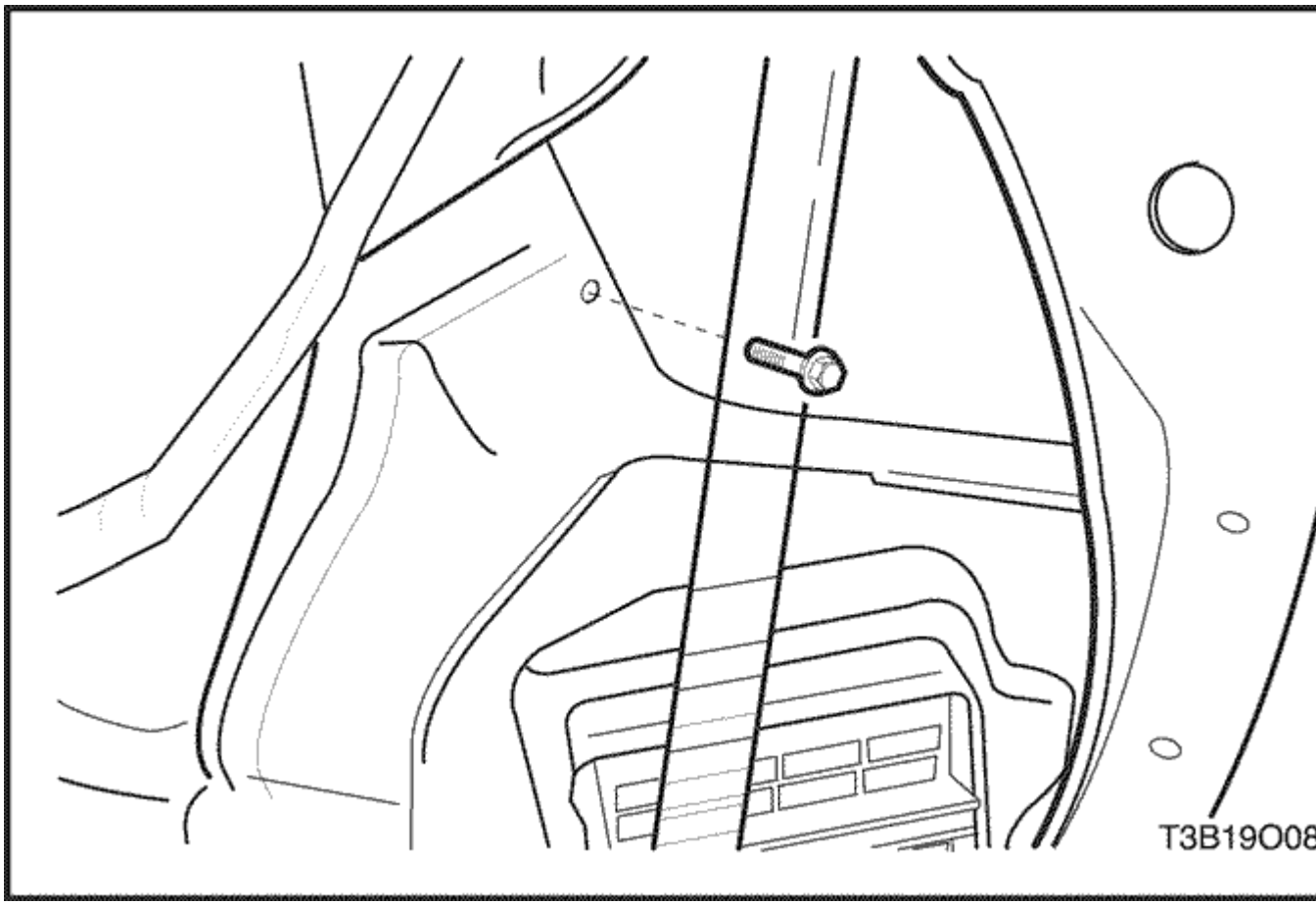
1. Remove the rear wheels. Refer to *Section 2E, Tires and Wheels.*
2. Remove the screws and the mud guards.
3. Remove the screws and the splash shields.
4. Remove the screws behind the fascia.



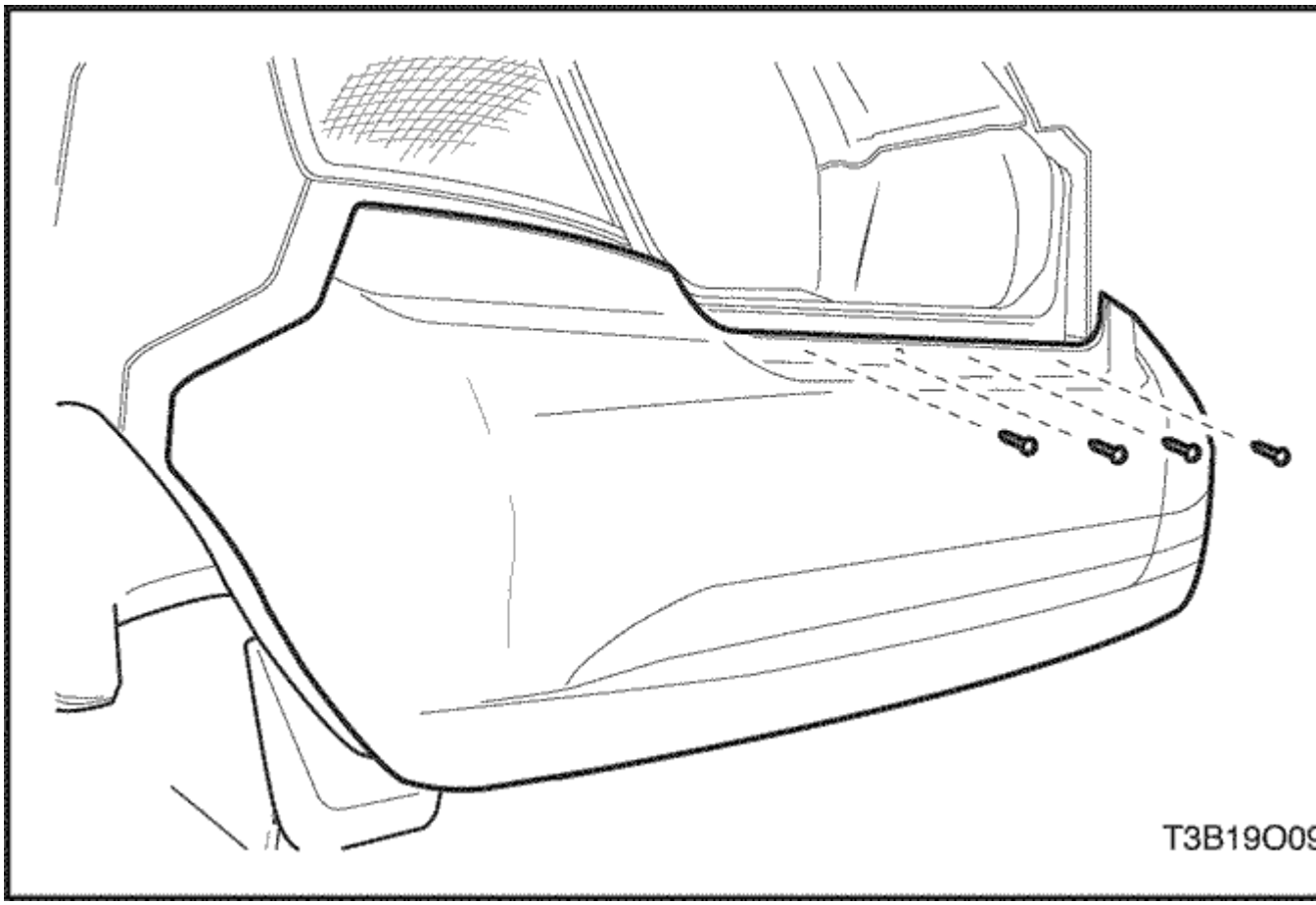
5. Remove the nuts behind the rear bumper energy absorber.



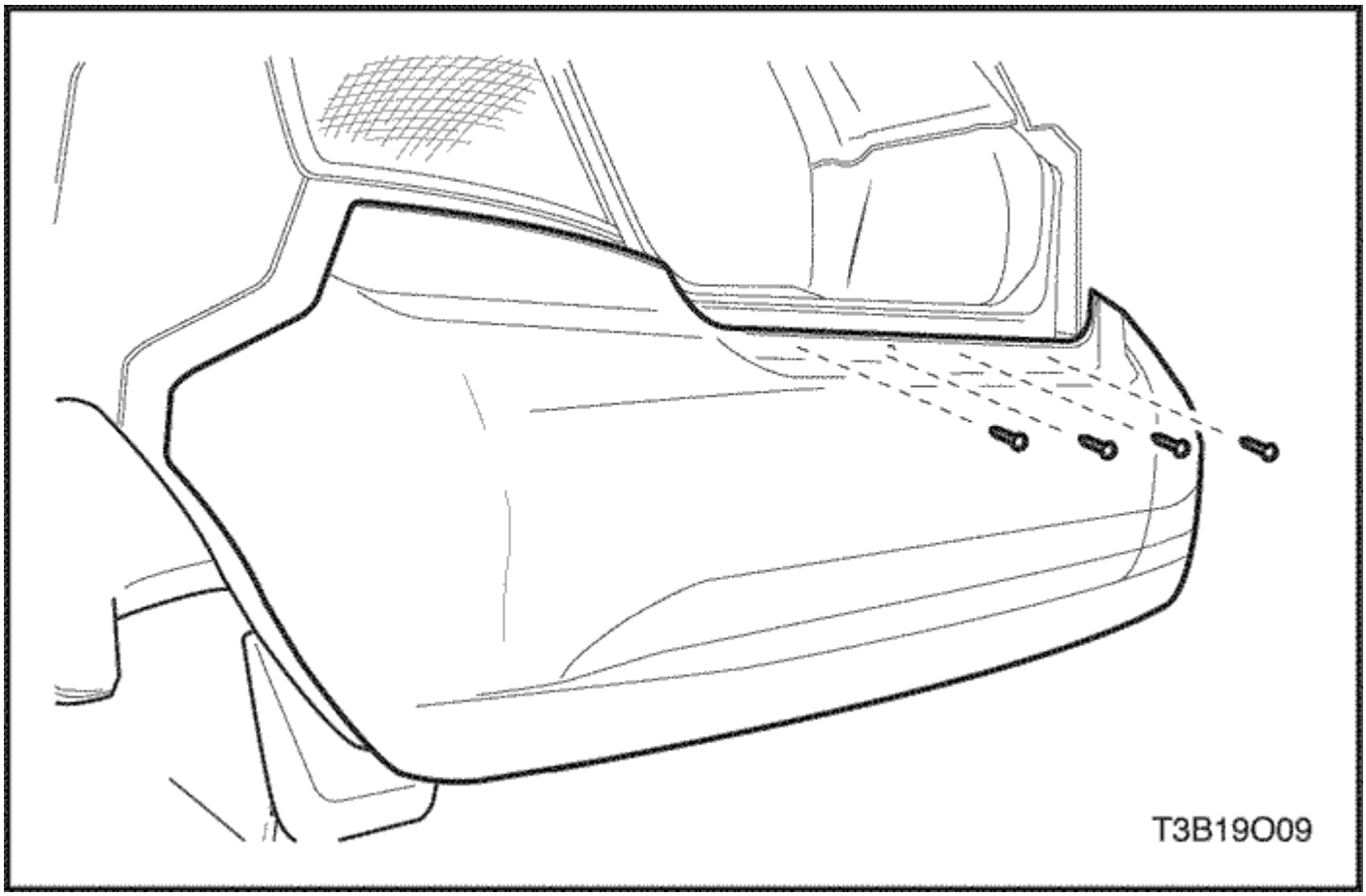
6. Remove the luggage compartment rear quarter trim panels. Refer to *Section 9G, Interior Trim.*
7. Remove the bolts in the luggage compartment.



8. Remove the bolts and the exterior trim panels beneath the taillamps.
9. Remove the fascia screws beneath the taillamps.



10. Remove the rear upper fascia screws.
11. Remove the fascia.

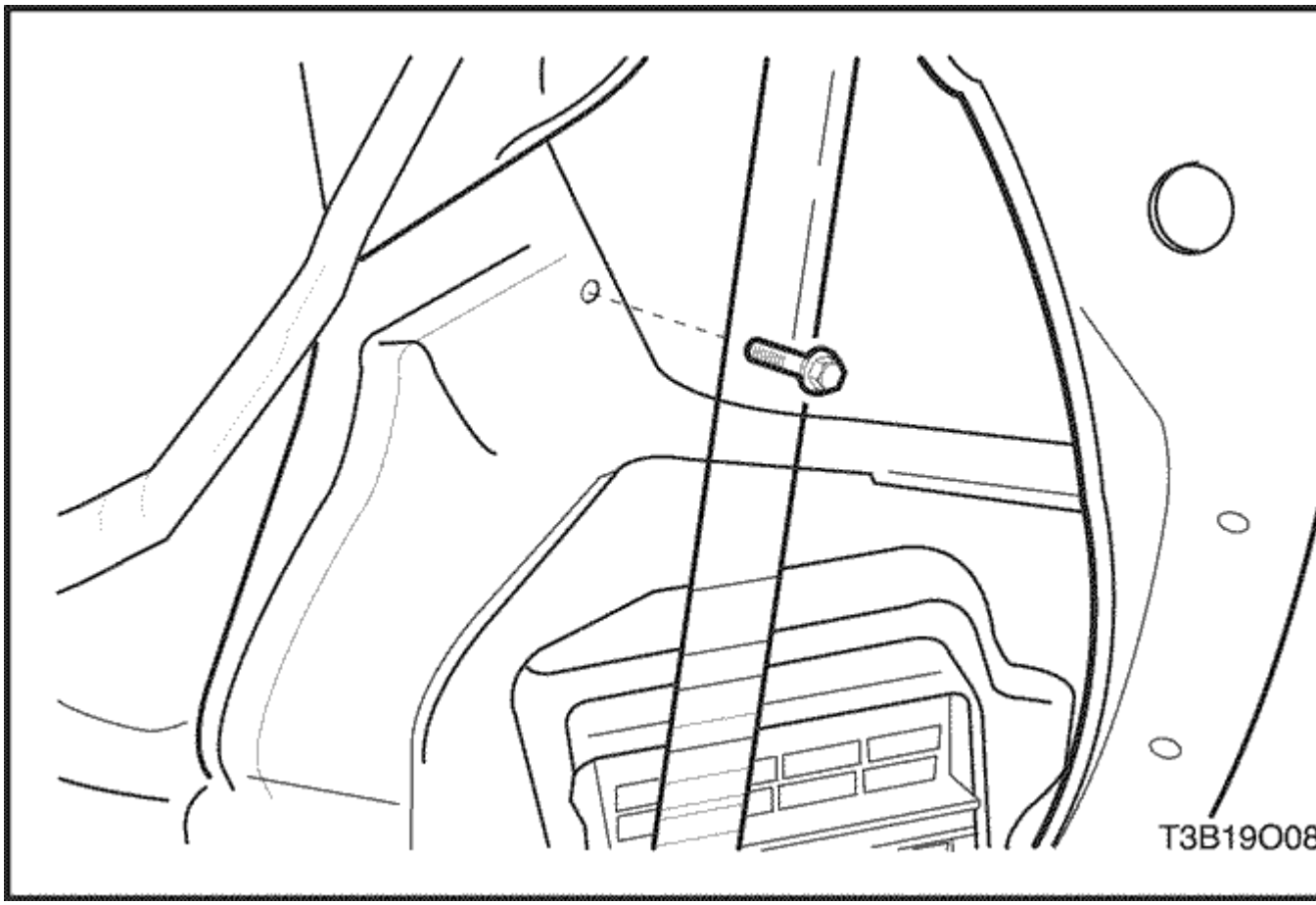


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

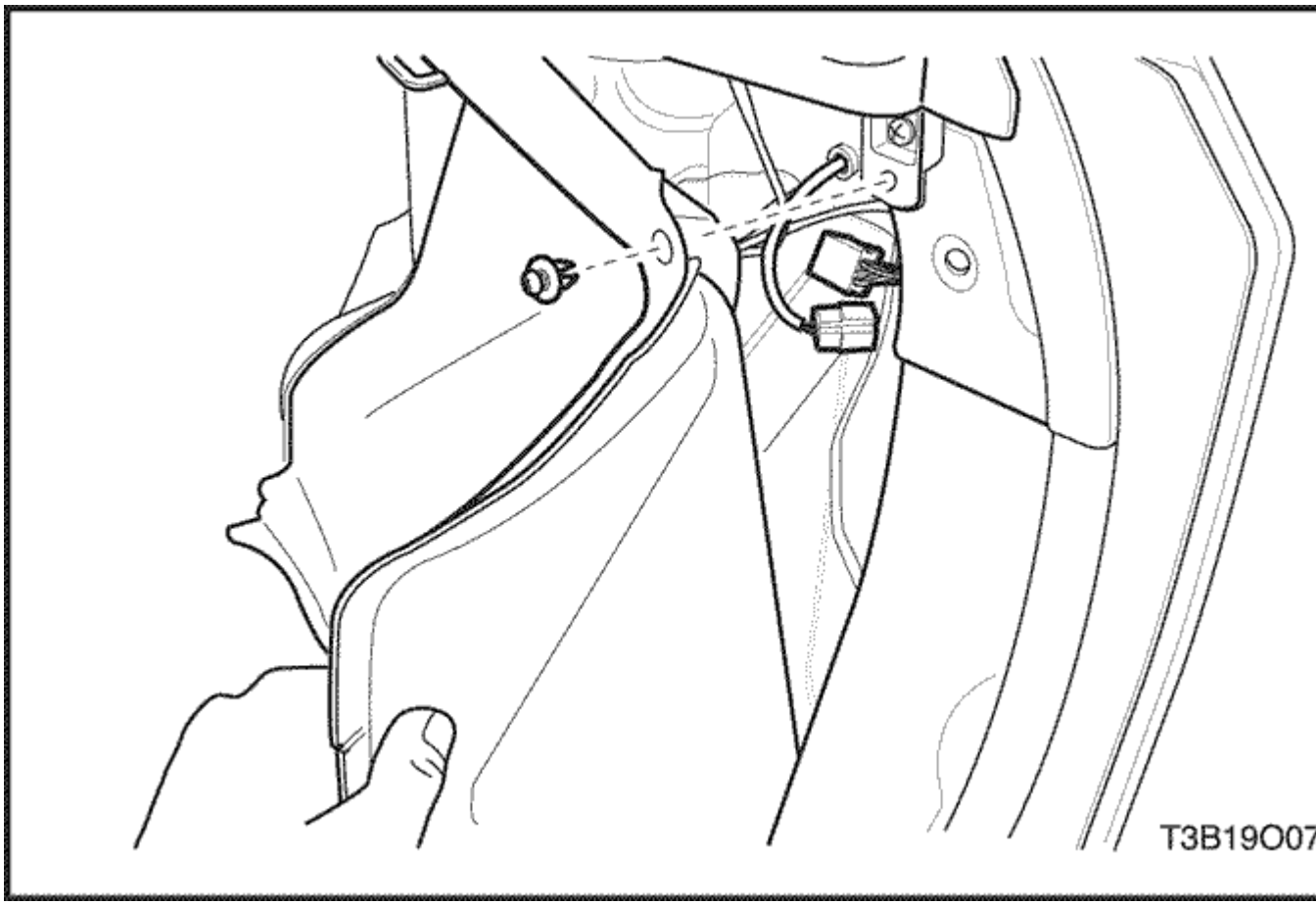
1. Install the fascia with the rear upper fascia screws.

   Tighten
   Tighten the rear upper fascia screws to 1.5 N•m (13 lb-in).



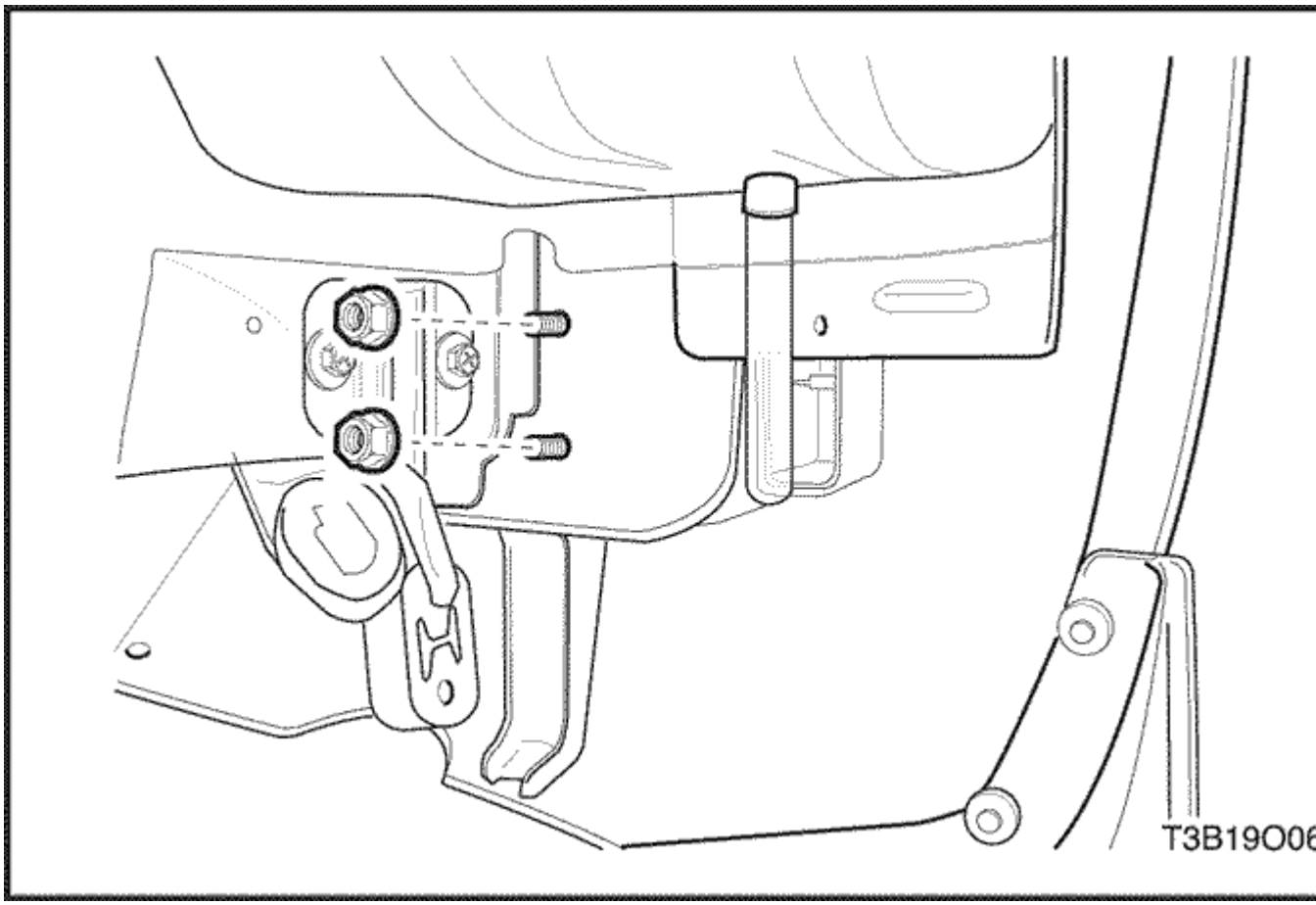
2. Install the fascia screws beneath the taillamps.
3. Install the exterior trim panels beneath the taillamps with the bolts.

Tighten
Tighten the trim panel bolts to 10 N•m (89 lb-in).



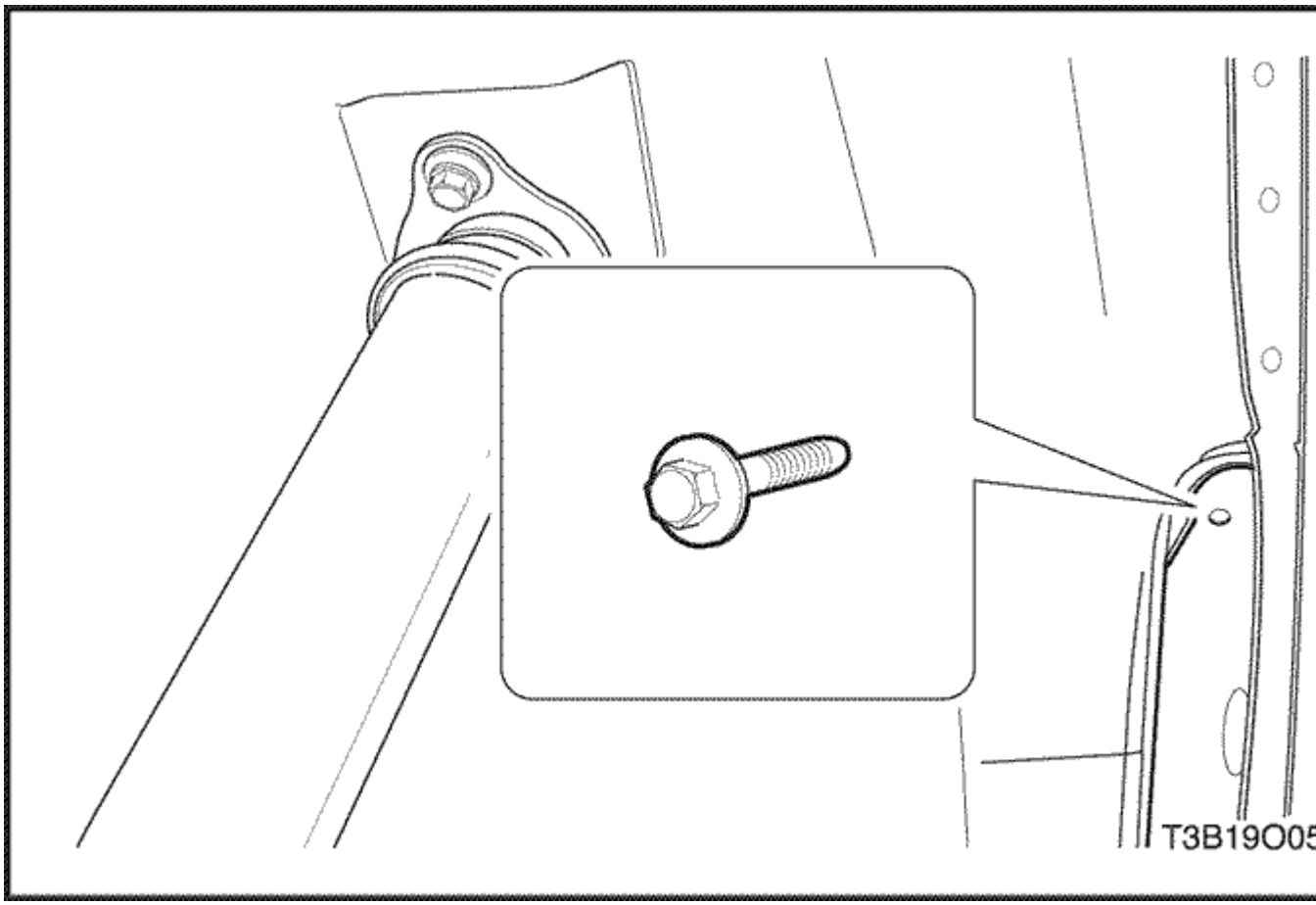
4. Install the bolts in the luggage compartment.

   Tighten
   Tighten the luggage compartment fascia bolts to 5.5 N•m (49 lb-in).



5. Install the luggage compartment rear quarter trim panels.Refer to *Section 9G, Interior Trim.*
6. Install the nuts behind the rear bumper energy absorber.

   Tighten
   Tighten the rear bumper energy absorber nuts to 27 N•m (20 lb-ft).



7. Install the screws behind the fascia.

   Tighten
   Tighten the behind fascia screws to 5.5 N•m (49 lb-in).

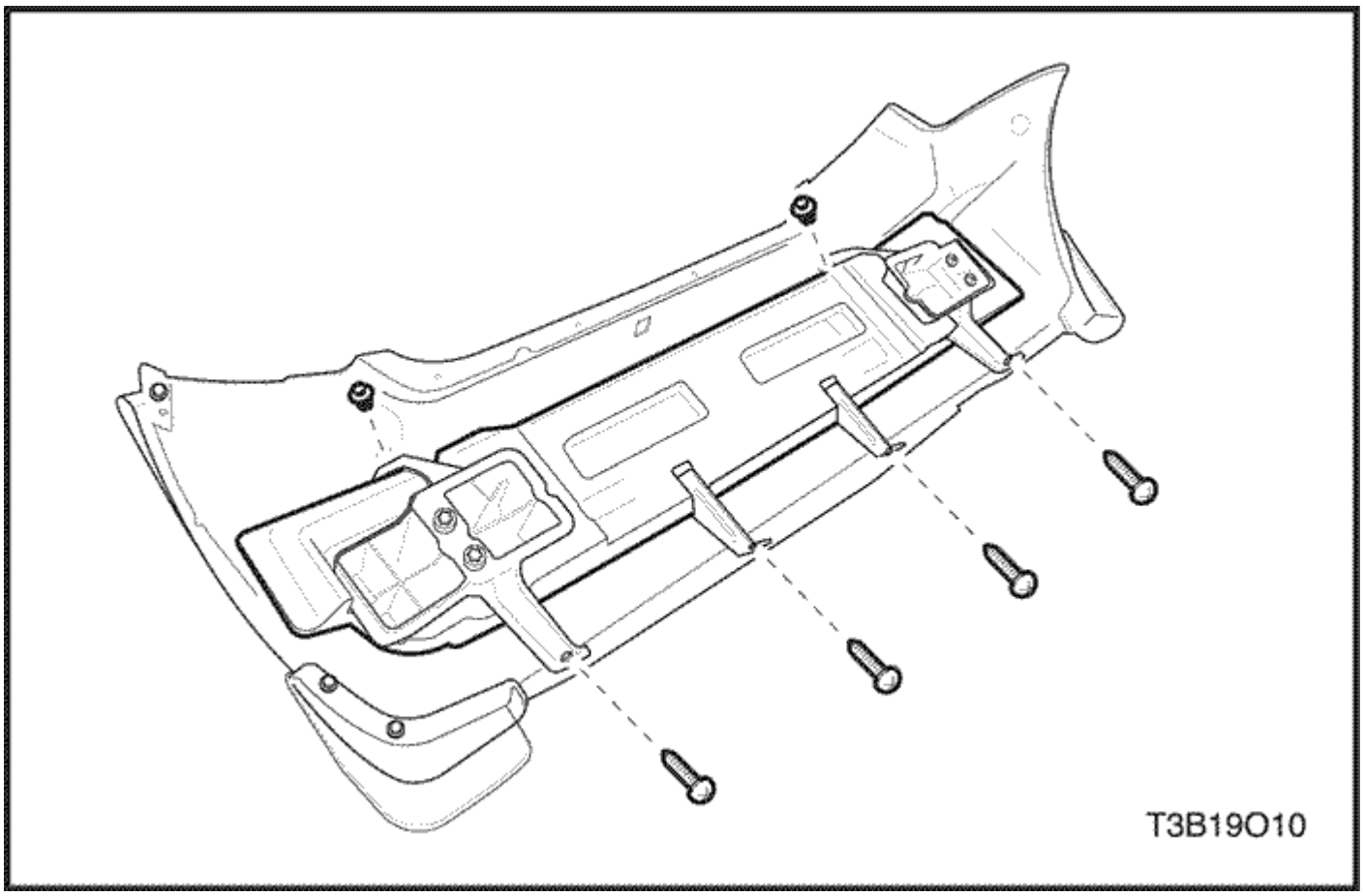
8. Install the splash shields with the screws.

   Tighten
   Tighten the splash shield screws to 1.5 N•m(13 lb-in).

9. Install the mud guards with the screws.

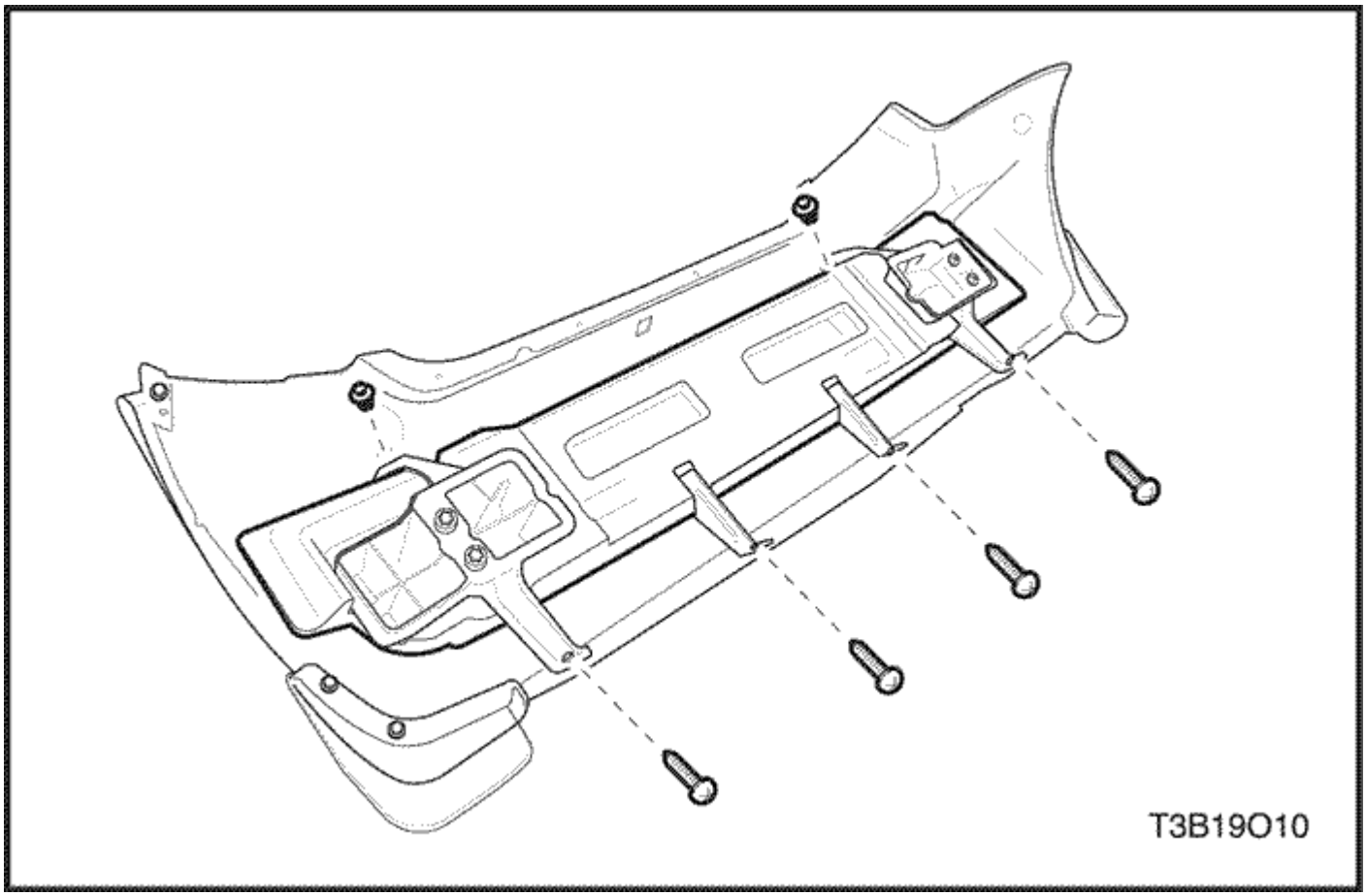
   Tighten
   Tighten the mud guard screws to 1.5 N•m(13 lb-in).

10. Install the rear wheels. Refer to *Section 2E, Tires and Wheels.*



Rear Bumper Energy Absorber
Removal Procedure

1. Remove the rear bumper fascia. Refer to "Rear Bumper Fascia" in this section.
2. Remove the energy absorber.



Installation Procedure

1. Install the energy absorber.
2. Install the rear bumper fascia. Refer to "Rear Bumper Fascia" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Bumpers

The bumper systems are designed to sustain a collision into a fixed barrier at either 8km/h (5 mph) or 4km/h (2.5 mph) without damage.
After bsorbing the energy of a collision, these bumper systems restore themselves to their original position. Both the front and the rear bumpers feature an internal foam energy absorber and a polymer fascia cover. The rear bumper fascia must be removed before access can be gained to the energy absorber and the bumper. The front bumper assembly can be removed as a whole unit or the fascia cover can be removed separately.

SECTION 9P

DOORS

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

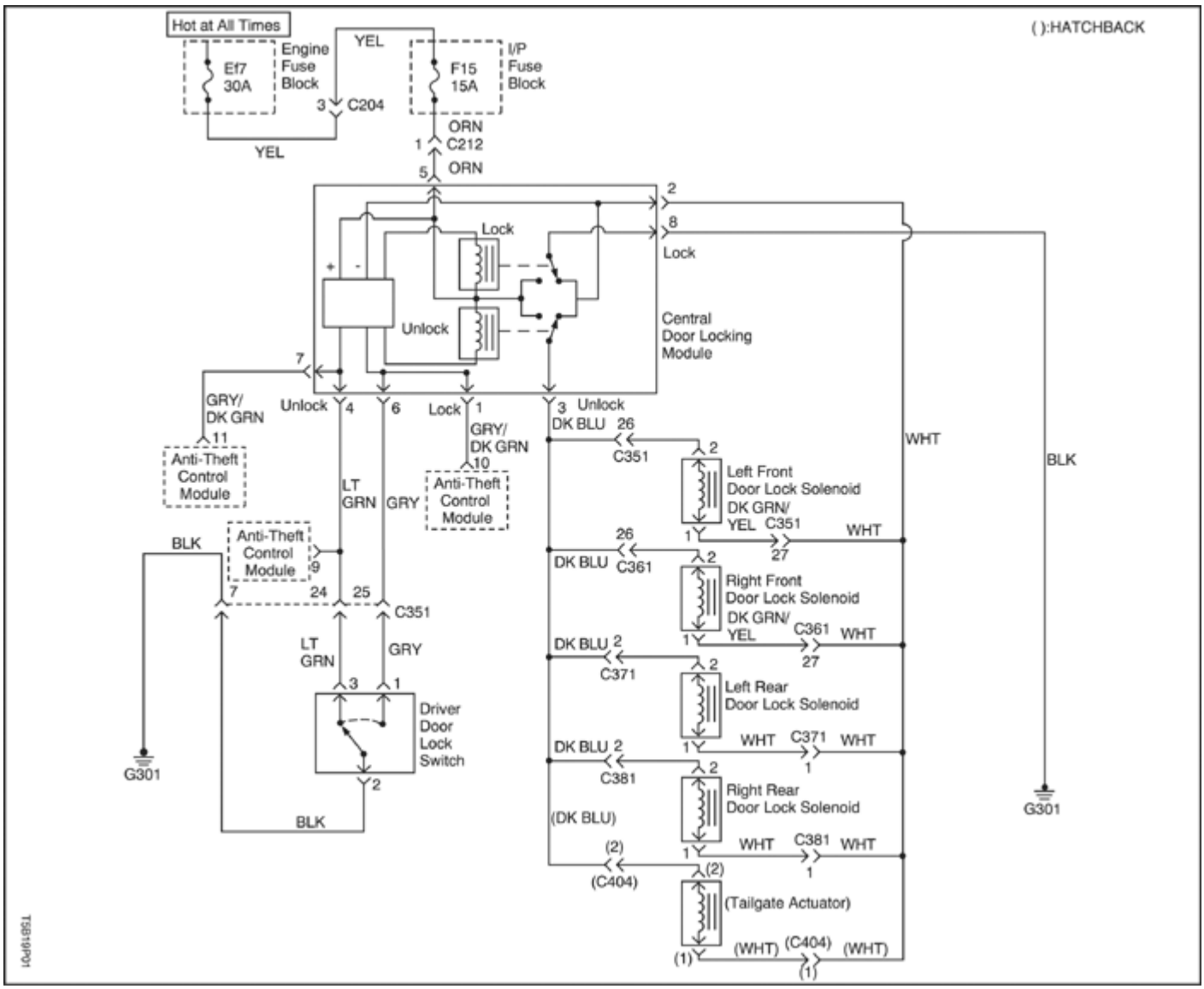
SPECIFICATIONS

Fastener Tightening Specifications

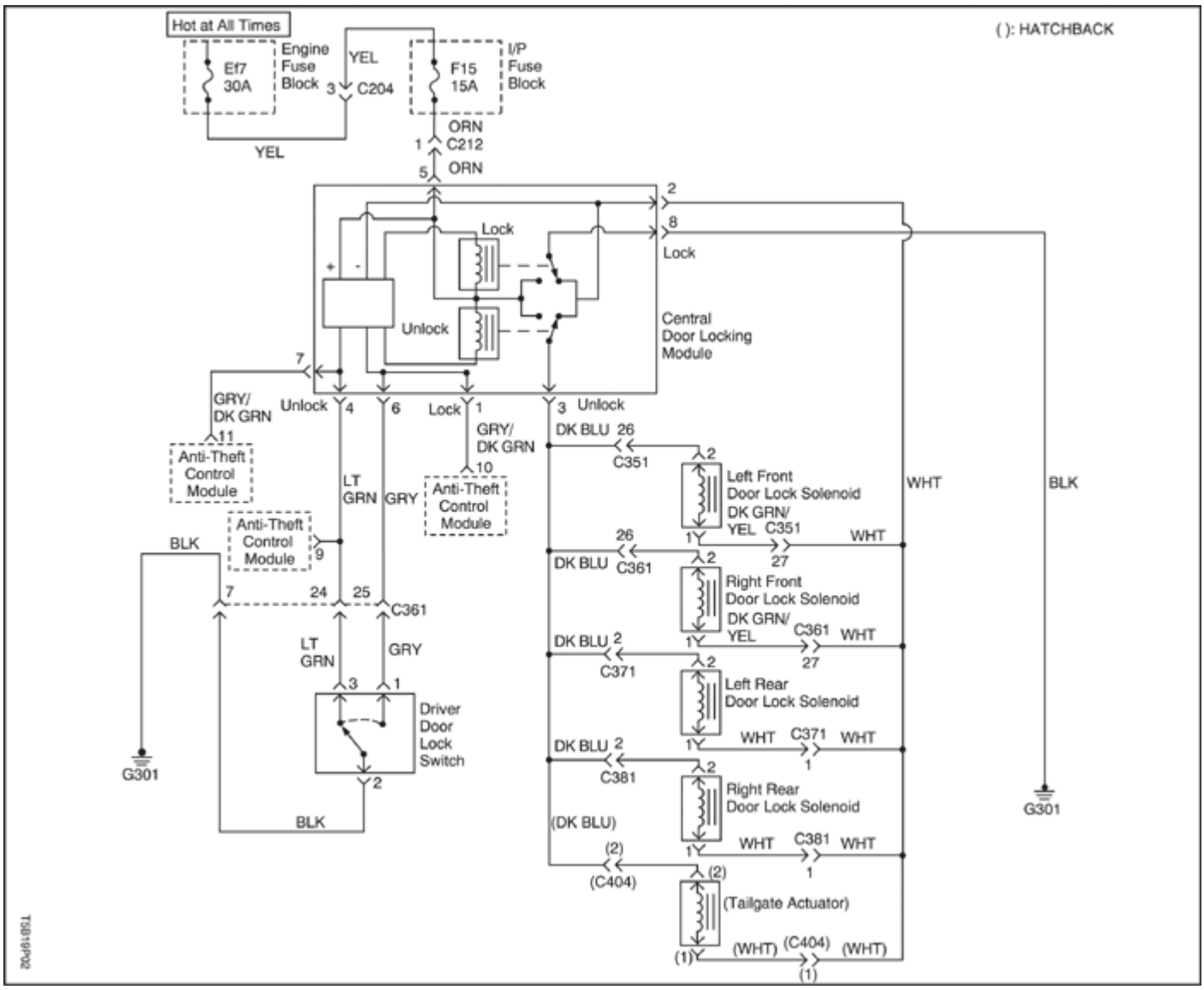
Application	N•m	Lb-Ft	Lb-In
Door Hinge-to-Body Bolts	35	26	-
Door Hinge-to-Door Bolts	15	11	-
Door Hold Open Link-to-Body Bolts	35	26	-
Door Hold Open Link-to-Door Bolts	5	-	44
Door Lock Screws	8	-	71
Door Lock Striker Screws	24	18	-
Door Pull Bracket Screws	3.5	-	31
Guide Rail Bolts	7	-	62
Inside Door Handle Screw	3	-	27
Outside Door Handle Bolts	4.5	-	40
Window Regulator Nuts	7	-	62

SCHEMATIC AND ROUTING DIAGRAMS

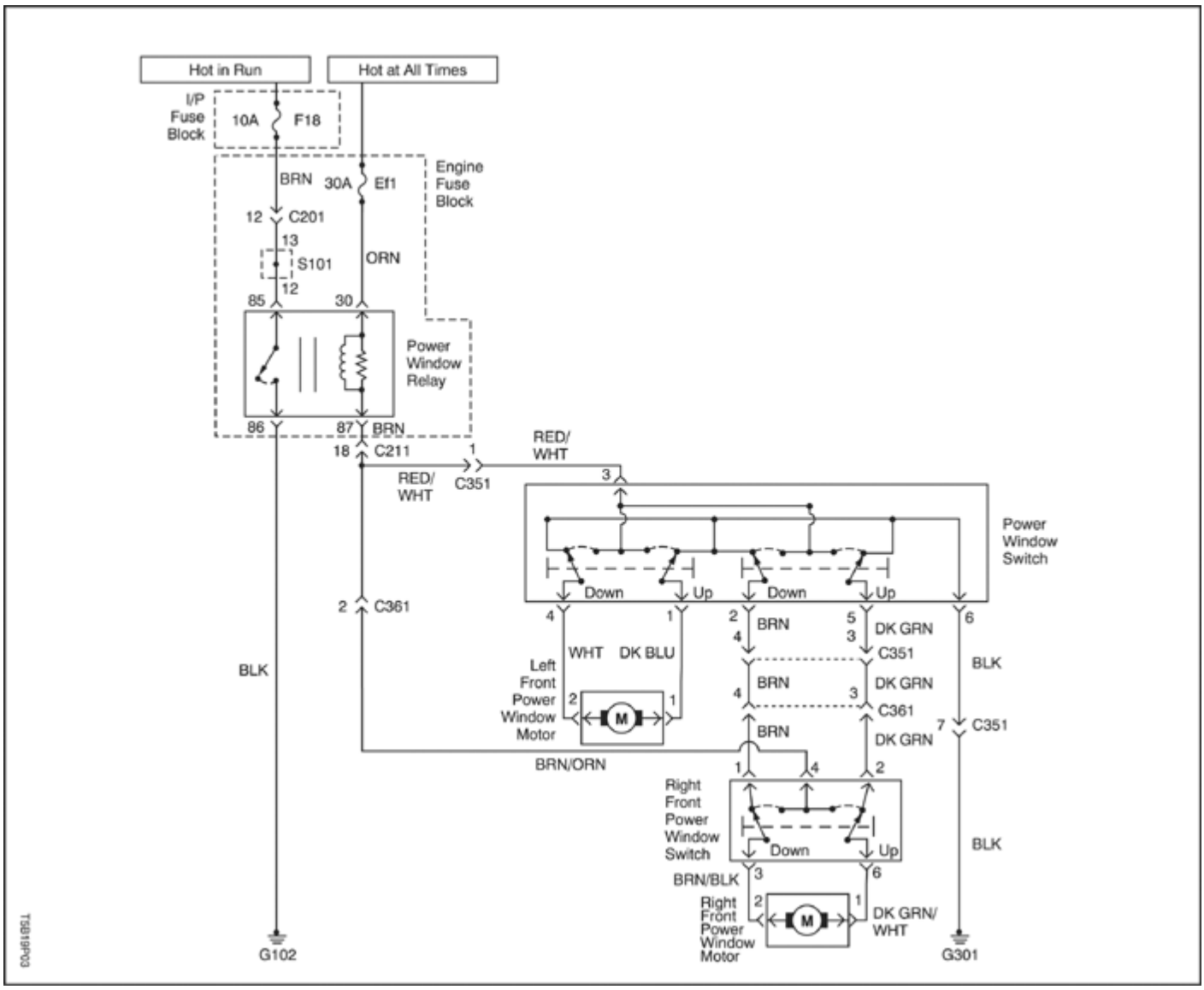
Power Door Locks Circuit



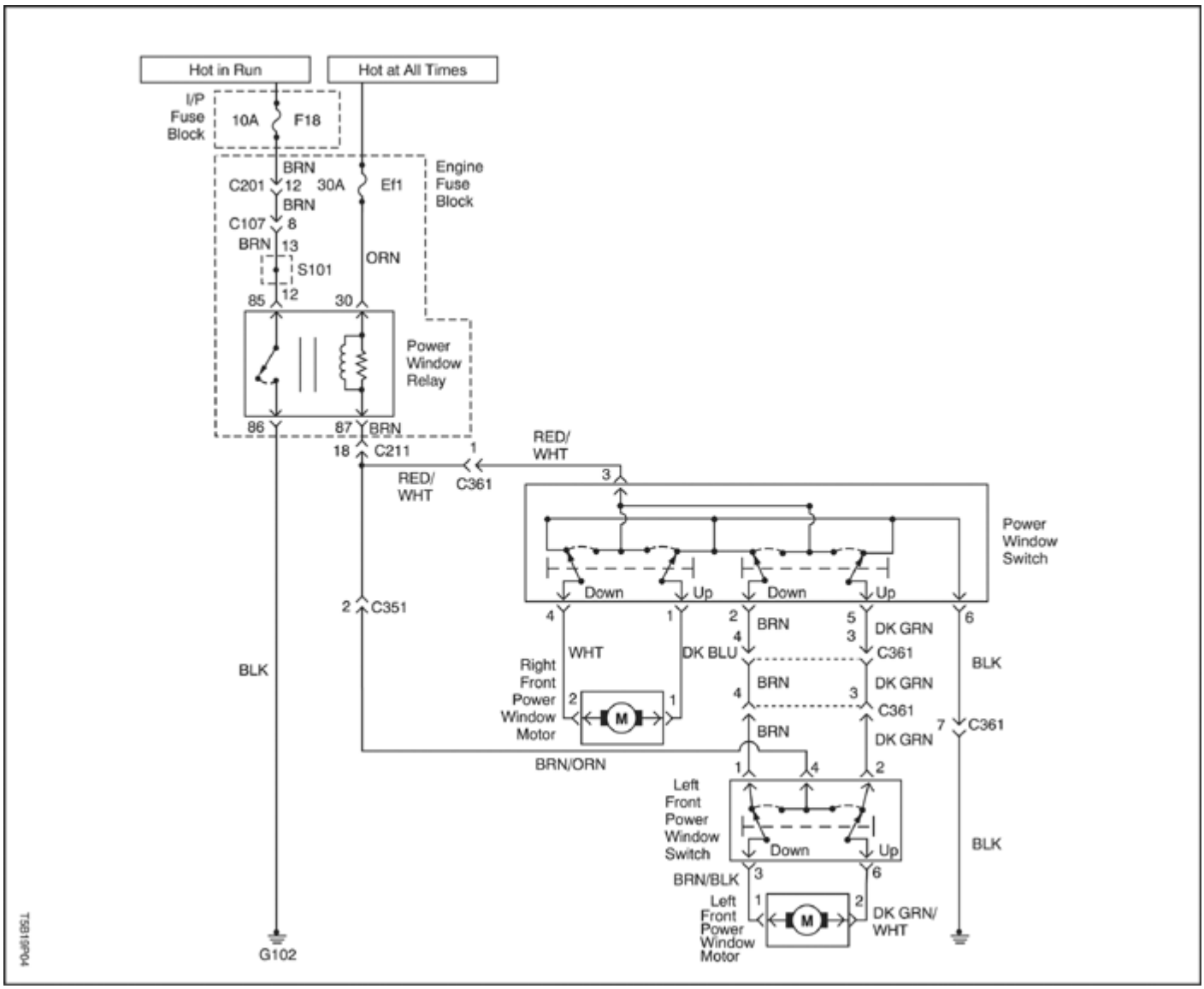
Power Door Locks Circuit (RHD)



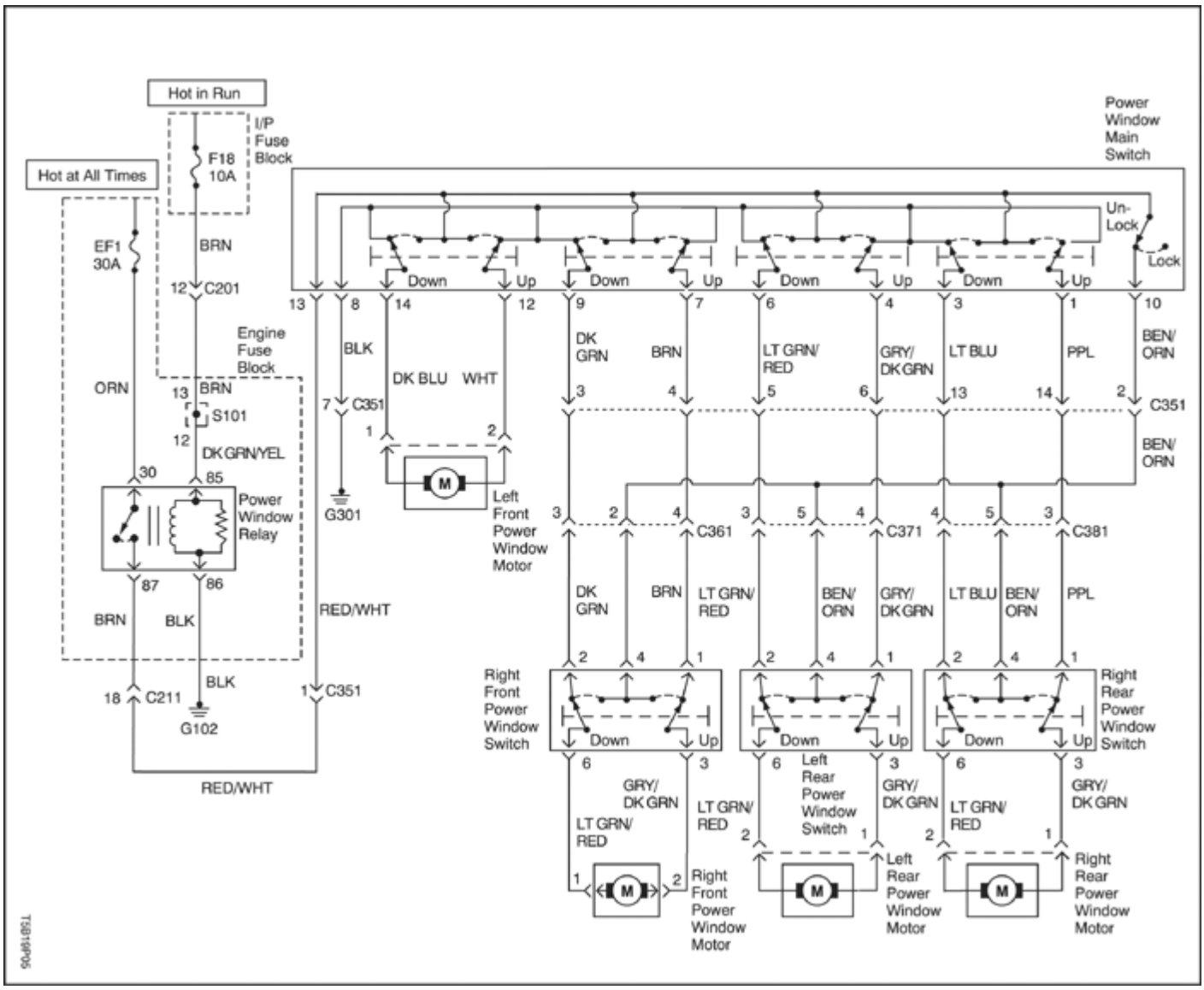
Power Windows Circuit (Front Only)



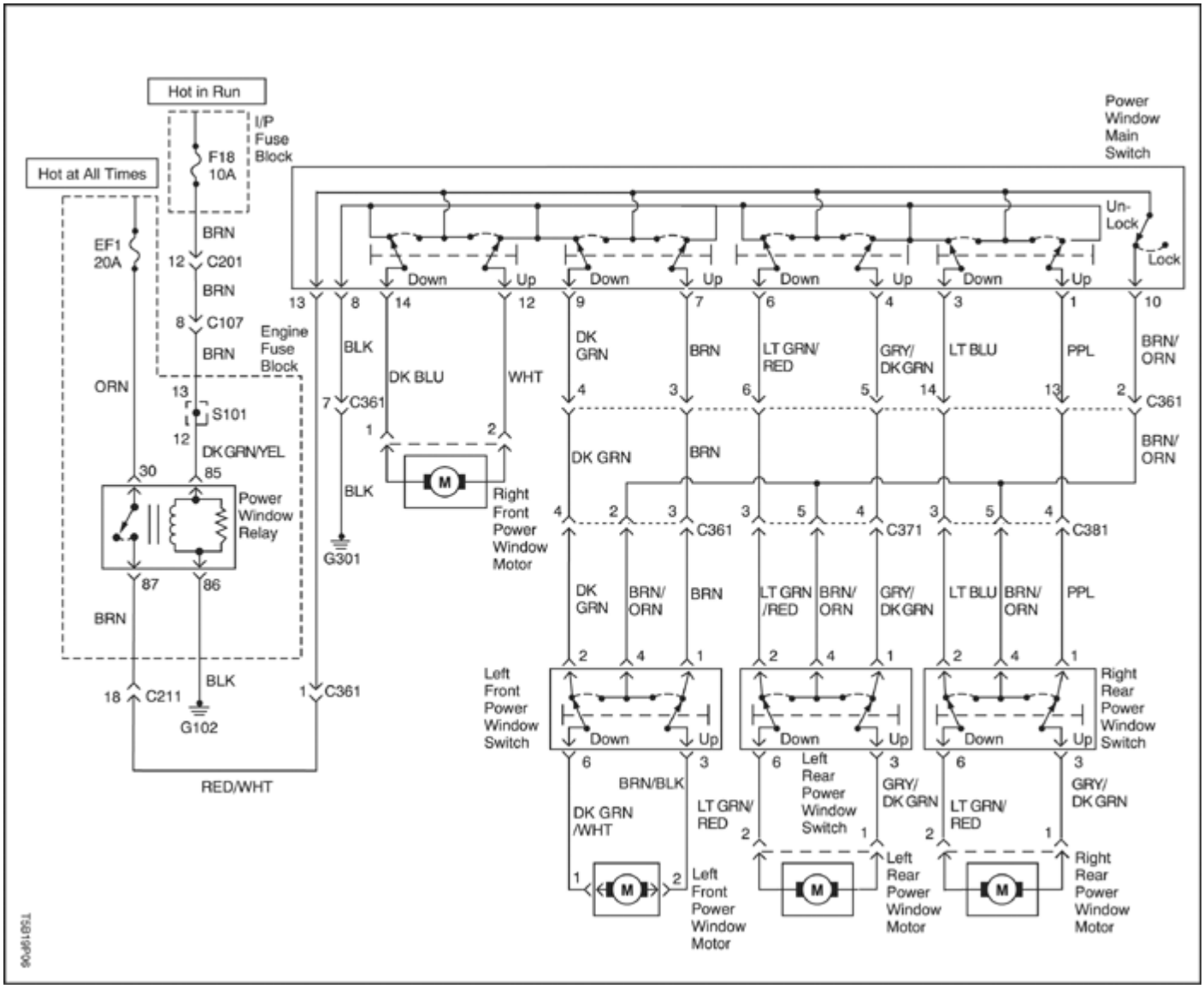
Power Windows Circuit (Front Only) (RHD)



Power Windows Circuit (Front and Rear)



Power Windows Circuit (Front and Rear) (RDH)



DIAGNOSIS

Power Windows

System With Only Front Power Windows, One or Both Windows are Inoperative

Caution : When powering the window motors directly from a battery with jumper wires, make sure one of the jumper wires contains a fuse. If the jumpers are accidentally touched together, the fuse will prevent sparking and burns from sudden terminal heating.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON.	-	Go to *Step 18*	Go to *Step 2*

Step	Action	Value(s)	Yes	No
	2. Attempt to operate both power windows. Is either window working?			
2	Visually inspect the connection at the dual power window switch. Is the electrical connector correctly attached to the switch?	-	Go to *Step 4*	Go to *Step 3*
3	Correctly attach the electrical connector to the dual power window switch. Is the repair complete?	-	System OK	-
4	1. Disconnect the electrical connector from the dual power window switch. 2. Turn the ignition ON. 3. Check the voltage at terminal 3 of the power window main switch connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 16*	Go to *Step 5*
5	Check fuses F18 and EF1. Is either fuse blown?	-	Go to *Step 6*	Go to *Step 7*
6	1. Check for a short circuit and repair if necessary. 2. Replace the blown fuse(s). Is the repair complete?	-	System OK	-
7	1. Turn the ignition ON. 2. Check the voltages at fuses F18 and EF1. Are both voltages equal to the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the power supply to the fuse which did not indicate battery voltage with the ignition on. Is the repair complete?	-	System OK	-
9	1. Remove the power window relay. 2. Turn the ignition ON. 3. Check the voltage at terminal 85 and terminal 30 of the power window relay socket. (Terminals of the relay socket can be identified by the markings on the bottom of the relay.) Does the voltmeter indicate the specified value	11-14 v	Go to *Step 11*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
	at terminals 85 and 30?			
10	Repair the open circuit between the fuses and the power window relay. Is the repair complete?	-	System OK	-
11	With the power window relay still removed, use an ohmmeter to check the resistance between ground and terminal 86 of the power window relay socket. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 12*
12	Repair the open circuit between ground and terminal 86 of the power window relay socket. Is the repair complete?	-	System OK	-
13	1. Temporarily substitute a known good relay in place of the power window relay. 2. Attempt to operate the power windows. Do the power windows operate with the substituted relay?	-	Go to *Step 14*	Go to *Step 15*
14	1. Return the substituted relay to its original position. 2. Replace the original power window relay. Is the repair complete?	-	System OK	-
15	Repair the open circuit between the power window relay socket terminal 87 and the dual power window switch terminal 3. Is the repair complete?	-	System OK	-
16	With the dual power window switch disconnected, use an ohmmeter to check the resistance between ground and terminal 6 of the dual power window switch connector. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 18*	Go to *Step 17*
17	Repair the open circuit between ground and terminal 6 of the dual power window switch connector. Is the repair complete?	-	System OK	-
18	1. Remove the trim panel from a door which has an inoperative power window. 2. Move a vehicle battery close enough to	-	Go to *Step 20*	Go to *Step 19*

Step	Action	Value(s)	Yes	No
	the door so that the window motor can be powered directly from the battery with jumper wires. 3. Disconnect the the two-pin window motor connector in the door. **Important : To prevent the fuse in the jumper wire from blowing, do not touch the jumper wires together.** 1. Attach a jumper wire between the battery negative terminal and one of the terminals in the two-pin window motor connector. 2. Attach a fused jumper wire between the battery positive terminal and the remaining terminal in the two-pin window motor connector. Unless the motor is at the end of its travel, the window should move with the jumpers attached. 3. To move the window in the opposite direction, reverse the jumper wire connections at the window motor connector. Does the power window operate in both directions when the motor is operated directly from a battery?			
19	Replace the window motor. Is the repair complete?	-	System OK	-
20	1. Before reconnecting the two-pin window motor connector, connect an ohmmeter between the terminals to check the resistance of the motor. 2. Record the ohmmeter reading for motor resistance. 3. Reconnect the motor connector and reinstall the door trim panel. 4. Disconnect the electrical connector from the dual power window switch. 5. At the dual power window switch connector, use an ohmmeter to check the resistance between the terminals	-	Go to *Step 22*	Go to *Step 21*

Step	Action	Value(s)	Yes	No
	which lead to the motor that was tested in *Step 15* Is the resistance at the switch connector approximately equal to the resistance that was previously measured at the motor connector?			
21	Repair the open circuit between the window motor and the window switch. Is the repair complete?	-	System OK	-
22	Replace the power window switch. Is the repair complete?	-	System OK	-

System With Front and Rear Power Windows, One or Both Front Windows are Inoperative

Caution : When powering the window motors directly from a battery with jumper wires, make sure one of the jumper wires contains a fuse. If the jumpers are accidentally touched together, the fuse will prevent sparking and burns from sudden terminal heating.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Attempt to operate each front power window. Is either window working?	-	Go to *Step 18*	Go to *Step 2*
2	Visually inspect the connection at the power window main switch. Is the electrical connector correctly attached to the main switch?	-	Go to *Step 4*	Go to *Step 3*
3	Correctly attach the electrical connector to the power window main switch. Is the repair complete?	-	System OK	-
4	1. Disconnect the electrical connector from the power window main switch. 2. Turn the ignition ON. 3. Check the voltage at terminal 13 of the power window main switch connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 16*	Go to *Step 5*
5	Check fuses F18 and EF1. Is either fuse blown?	-	Go to *Step 6*	Go to *Step 7*
6	1. Check for a short circuit and repair, if necessary.	-	System OK	-

Step	Action	Value(s)	Yes	No
	2. Replace the blown fuse(s). Is the repair complete?			
7	1. Turn the ignition ON. 2. Check the voltages at fuses F18 and EF1. Are both voltages equal to the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the power supply to the fuse which did not indicate battery voltage with the ignition on. Is the repair complete?	-	System OK	-
9	1. Remove the power window relay. 2. Turn the ignition ON. 3. Check the voltage at terminal 30 and terminal 85 of the power window relay socket. (Terminals of the relay socket can be identified by the markings on the bottom of the relay.) Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the fuses and the power window relay. Is the repair complete?	-	System OK	-
11	With the power window relay still removed, use an ohmmeter to check the resistance between ground and terminal 86 of the power window relay socket. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 12*
12	Repair the open circuit between ground and terminal 86 of the power window relay socket. Is the repair complete?	-	System OK	-
13	1. Temporarily substitute a known good relay in place of the power window relay. 2. Attempt to operate the power windows. Do the power windows operate with the substituted relay?	-	Go to *Step 14*	Go to *Step 15*
14	1. Return the substituted relay to its original position.	-	System OK	-

Step	Action	Value(s)	Yes	No
	2. Replace the original power window relay. Is the repair complete?			
15	Repair the open circuit between the power window relay socket terminal 87 and the power window switch terminal 13. Is the repair complete?	-	System OK	-
16	With the power window main switch disconnected, use an ohmmeter to check the resistance between ground and terminal 8 of the power window switch connector. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 18*	Go to *Step 17*
17	Repair the open circuit between ground and terminal 8 of the power window main switch connector. Is the repair complete?	-	System OK	-
18	1. Remove the trim panel from the front door which has an inoperative power window. 2. Move a vehicle battery close enough to the door so that the window motor can be powered directly from the battery with jumper wires. 3. Disconnect the the two-pin window motor connector in the door. 4. Attach a jumper wire between the battery negative terminal and one of the terminals in the two-pin window motor connector. 5. Attach a fused jumper wire between the battery positive terminal and the remaining terminal in the two-pin window motor connector. Unless the motor is at the end of its travel, the window should move with the jumpers attached. 6. To move the window in the opposite direction, reverse the jumper wire connections at the window motor connector. Does the power window operate in both directions when the motor is operated directly	-	Go to *Step 20*	Go to *Step 19*

Step	Action	Value(s)	Yes	No
	from a battery? **Important : To prevent the fuse in the jumper wire from blowing, do not touch the jumper wires together.**			
19	Replace the window motor. Is the repair complete?	-	System OK	-
20	1. Before reconnecting the two-pin window motor connector, connect an ohmmeter between the terminals to check the resistance of the motor. 2. Record the ohmmeter reading for motor resistance. 3. Reconnect the motor connector and reinstall the door trim panel. 4. Disconnect the electrical connector from the power window switch. 5. At the power window main switch connector, use an ohmmeter to check the resistance between the terminals which lead to the motor that was tested in *Step 15*. Is the resistance at the main switch connector approximately equal to the resistance that was previously measured at the motor connector?	-	Go to *Step 22*	Go to *Step 21*
21	Repair the open circuit between the window motor and the window switch. Is the repair complete?	-	System OK	-
22	Replace the power window switch. Is the repair complete?	-	System OK	-

System With Front and Rear Power Windows, One or Both Rear Windows are Inoperative

Caution : When powering the window motors directly from a battery with jumper wires, make sure one of the jumper wires contains a fuse. If the jumpers are accidentally touched together, the fuse will prevent sparking and burns from sudden terminal heating.

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON. 2. Make sure that the window lock position has not been selected on the power window main switch. Is either rear power window working?	-	Go to *Step 18*	Go to *Step 2*

Step	Action	Value(s)	Yes	No
2	Visually inspect the connection at the power window main switch. Is the electrical connector correctly attached to the main switch?	-	Go to *Step 4*	Go to *Step 3*
3	Correctly attach the electrical connector to the power window main switch. Is the repair complete?	-	System OK	-
4	1. Disconnect the electrical connector from the power window main switch. 2. Turn the ignition ON. 3. Check the voltage at terminal 13 of the power window main switch connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 16*	Go to *Step 5*
5	Check fuses F18 and EF1. Is either fuse blown?	-	Go to *Step 6*	Go to *Step 7*
6	1. Check for a short circuit and repair, if necessary. 2. Replace the blown fuse(s). Is the repair complete?	-	System OK	-
7	1. Turn the ignition ON. 2. Check the voltages at fuses F18 and EF1. Are both voltages equal to the specified value?	11-14 v	Go to *Step 9*	Go to *Step 8*
8	Repair the power supply to the fuse which did not indicate battery voltage with the ignition on. Is the repair complete?	-	System OK	-
9	1. Turn the ignition ON. 2. Remove the power window relay. 3. Check the voltage at terminal 30 and terminal 85 of the power window relay socket. (Terminals of the relay socket can be identified by the markings on the bottom of the relay.) Does the voltmeter indicate the specified value?	11-14 v	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the fuses and the power window relay. Is the repair complete?	-	System OK	-

Step	Action	Value(s)	Yes	No
11	With the power window relay still removed, use an ohmmeter to check the resistance between ground and terminal 86 of the power window relay socket. Does the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 13*	Go to *Step 12*
12	Repair the open circuit between ground and terminal 86 of the power window relay socket. Is the repair complete?	-	System OK	-
13	1. Temporarily substitute a known good relay in place of the power window relay. 2. Attempt to operate the power windows. Do the power windows operate with the substituted relay?	-	Go to *Step 14*	Go to *Step 15*
14	1. Return the substituted relay to its original position. 2. Replace the original power window relay. Is the repair complete?	-	System OK	-
15	Repair the open circuit between the power window relay socket terminal 87 and the power window main switch terminal 13. Is the repair complete?	-	System OK	-
16	With the power window main switch disconnected, use an ohmmeter to check the resistance between ground and terminal 8 of the power window main switch connector. Is the resistance equal to the specified value?	≈ 0 Ω	Go to *Step 18*	Go to *Step 17*
17	Repair the open circuit between ground and terminal 8 of the power window switch connector. Is the repair complete?	-	System OK	-
18	1. Remove the trim panel from the rear door which has an inoperative power window. 2. Move a vehicle battery close enough to the door so that the window motor can be powered directly from the battery with jumper wires. 3. Disconnect the the two-pin window	-	Go to *Step 20*	Go to *Step 19*

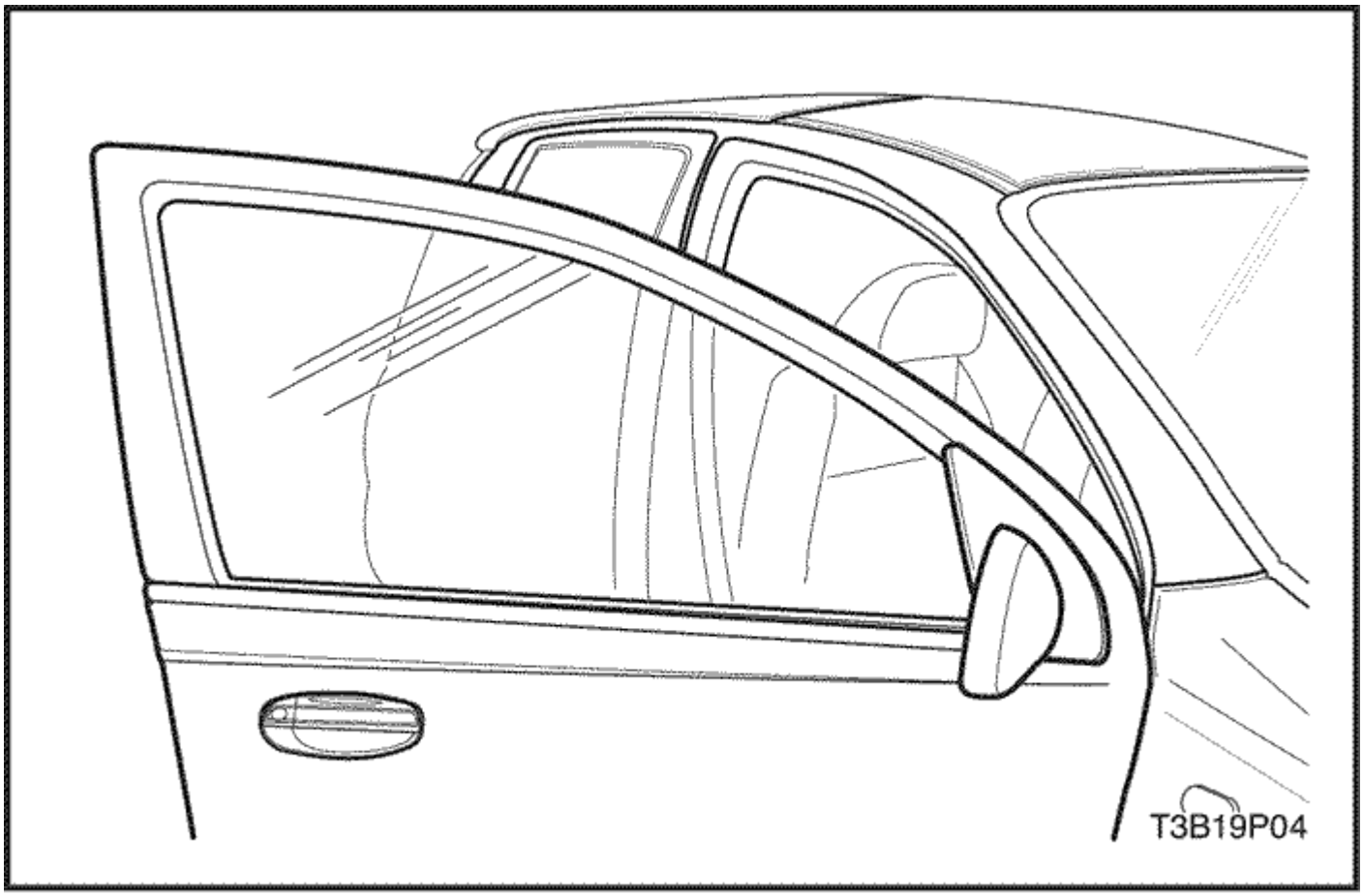
Step	Action	Value(s)	Yes	No
	motor connector in the door. 4. Attach a jumper wire between the negative battery terminal and one of the terminals in the two-pin window motor connector. 5. Attach a fused jumper wire between the positive battery terminal and the remaining terminal in the two-pin power window motor connector. Unless the motor is at the end of its travel, the power window should move with the jumpers attached. 6. To move the power window in the opposite direction, reverse the jumper wire connections at the power window motor connector. Does the power window operate in both directions when the motor is operated directly from a battery? **Important : To prevent the fuse in the jumper wire from blowing, do not touch the jumper wires together.**			
19	Replace the power window motor. Is the repair complete?	-	System OK	-
20	1. Make sure the window lock on the main switch is off. 2. Turn the ignition ON. 3. At the rear power window switch connector, check the voltage at terminal 14. Is the voltage equal to the specified value?	11-14v	Go to *Step 21*	Go to *Step 29*
21	1. At the power window motor two-pin connector, use an ohmmeter to measure the resistance of the power window motor. Record the resistance. 2. Re-connect the two-pin power window motor connector. 3. Disconnect the rear power window switch connector. 4. Use an ohmmeter to measure between terminals 12 and 7 of the rear power	-	Go to *Step 23*	Go to *Step 22*

Step	Action	Value(s)	Yes	No
	window switch connector. Is the resistance measured at the rear power window switch connector equal to the resistance previously measured at the rear power window motor connector?			
22	Repair the open circuit between the rear power window switch and the rear power window motor connector. Is the repair complete?	-	System OK	-
23	1. Remove the rear power window switch for testing. 2. Connect an ohmmeter between terminals 9 and 12 of the rear power window switch, and observe the ohmmeter. 3. Connect the ohmmeter between terminals 8 and 7 of the rear power window switch, and observe the ohmmeter. For both tests, did the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 25*	Go to *Step 24*
24	Replace the rear power window switch. Is the repair complete?	-	System OK	-
25	1. With the rear power window switch removed for testing, connect an ohmmeter between terminals 14 and 12, and put the switch in the DOWN position. Observe the ohmmeter. 2. Connect the ohmmeter between terminals 14 and 7, and put the switch in the UP position and observe the ohmmeter. For both tests, did the ohmmeter indicate the specified value?	≈ 0 Ω	Go to *Step 26*	Go to *Step 24*
26	1. Reconnect the rear power window switch connector. 2. Disconnect the electrical connector from the power window main switch. 3. Use an ohmmeter to measure the resistance at the power window main switch between between terminals 6	-	Go to *Step 28*	Go to *Step 27*

Step	Action	Value(s)	Yes	No
	and 4 if you are testing the left rear window, or terminals 3 and 1 if you are testing the right rear window. Is the resistance equal to the resistance previously measured at the motor connector?			
27	Repair the open circuit between the power window main switch and the rear power window switch. Is the repair complete?	-	System OK	-
28	Replace the power window main switch. Is the repair complete?	-	System OK	-
29	1. Remove the power window main switch, but do not disconnect the electrical connector. 2. Make sure the window lock is off. 3. Turn the ignition ON. 4. Check the voltage at terminal 10 of the power window main switch. Is the voltage equal to the specified value?	11-14 v	Go to *Step 27*	Go to *Step 28*

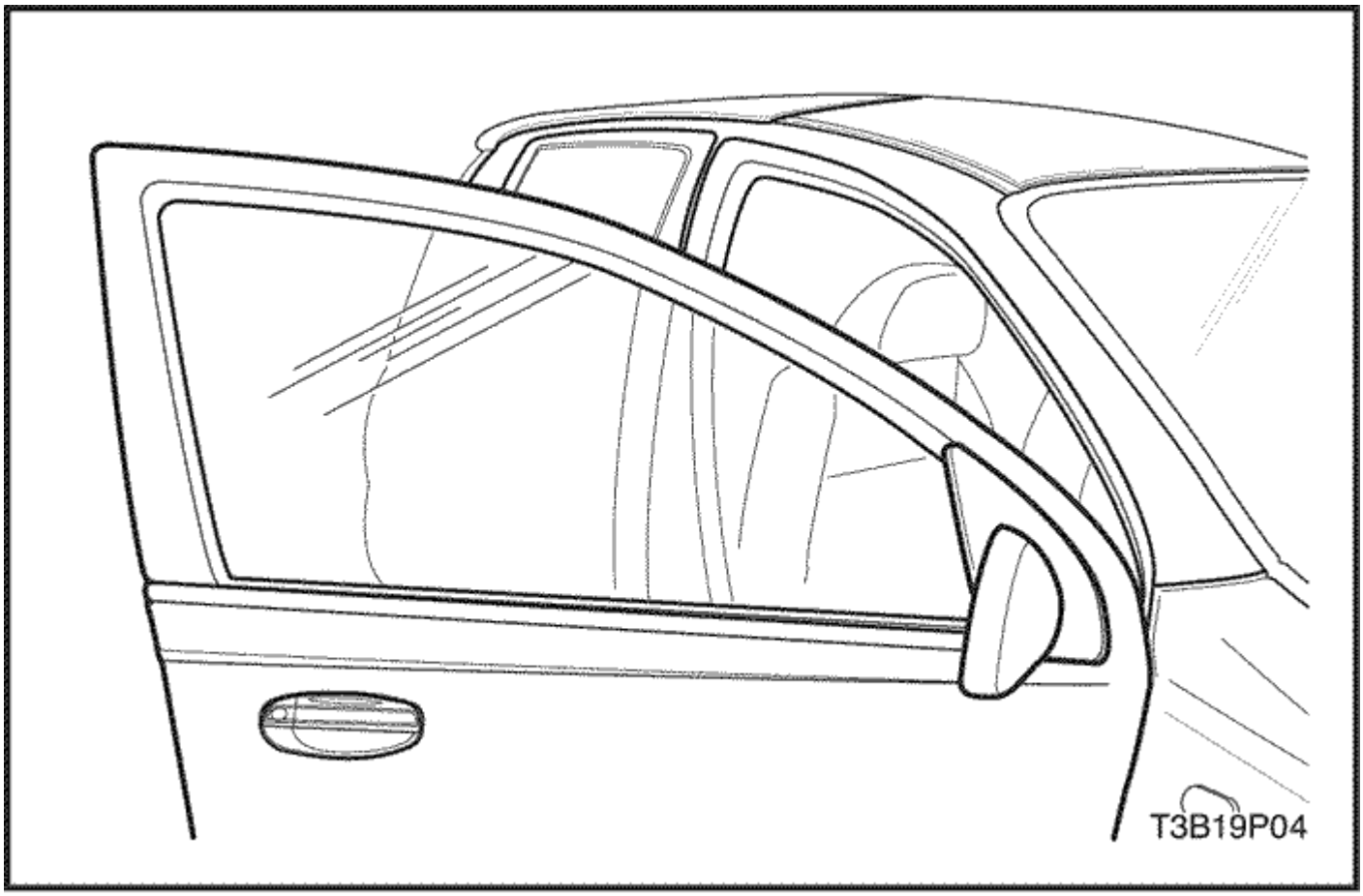
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE



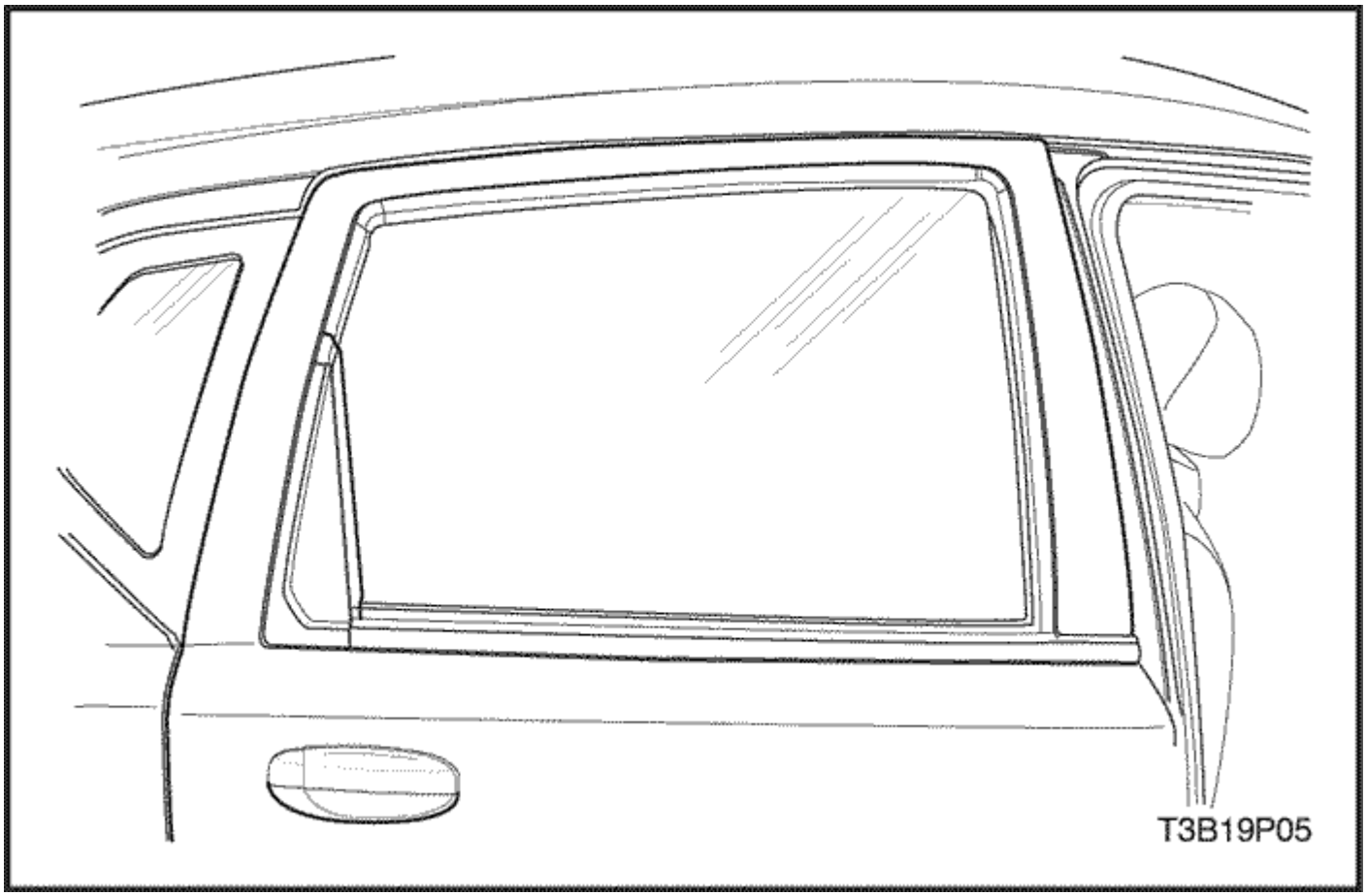
Front Door Glass Run
Removal Procedure

1. Remove the outside rearview mirror. Refer to *Section 9L, Glass and Mirrors.*
2. Remove the front door glass. Refer to *Section 9L, Glass and Mirrors.*
3. Remove the glass run.



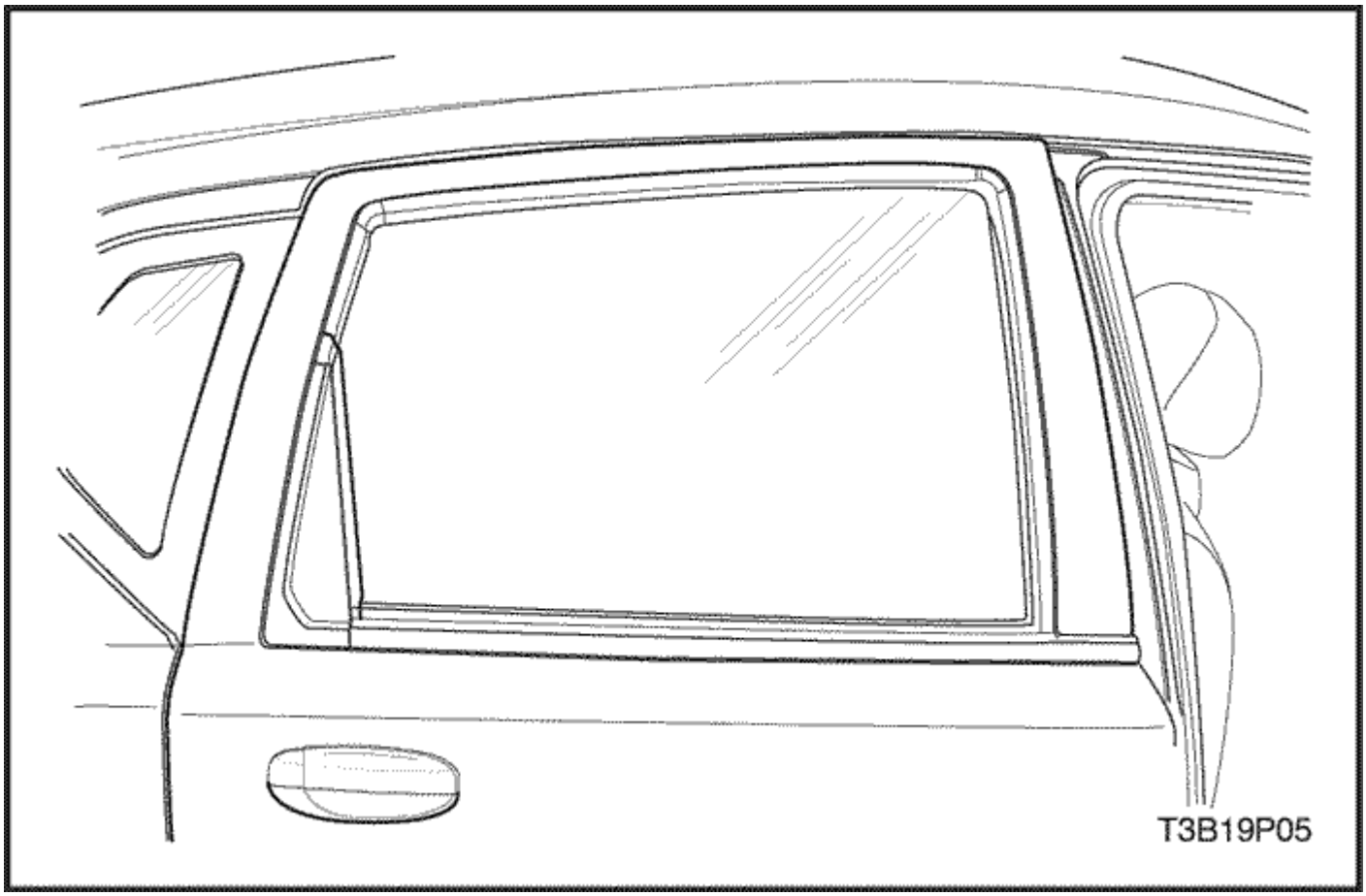
Installation Procedure

1. Install the glass run.
2. Install the front door glass. Refer to *Section 9L, Glass and Mirrors.*
3. Install the outside rearview mirror. Refer to *Section 9L, Glass and Mirrors.*



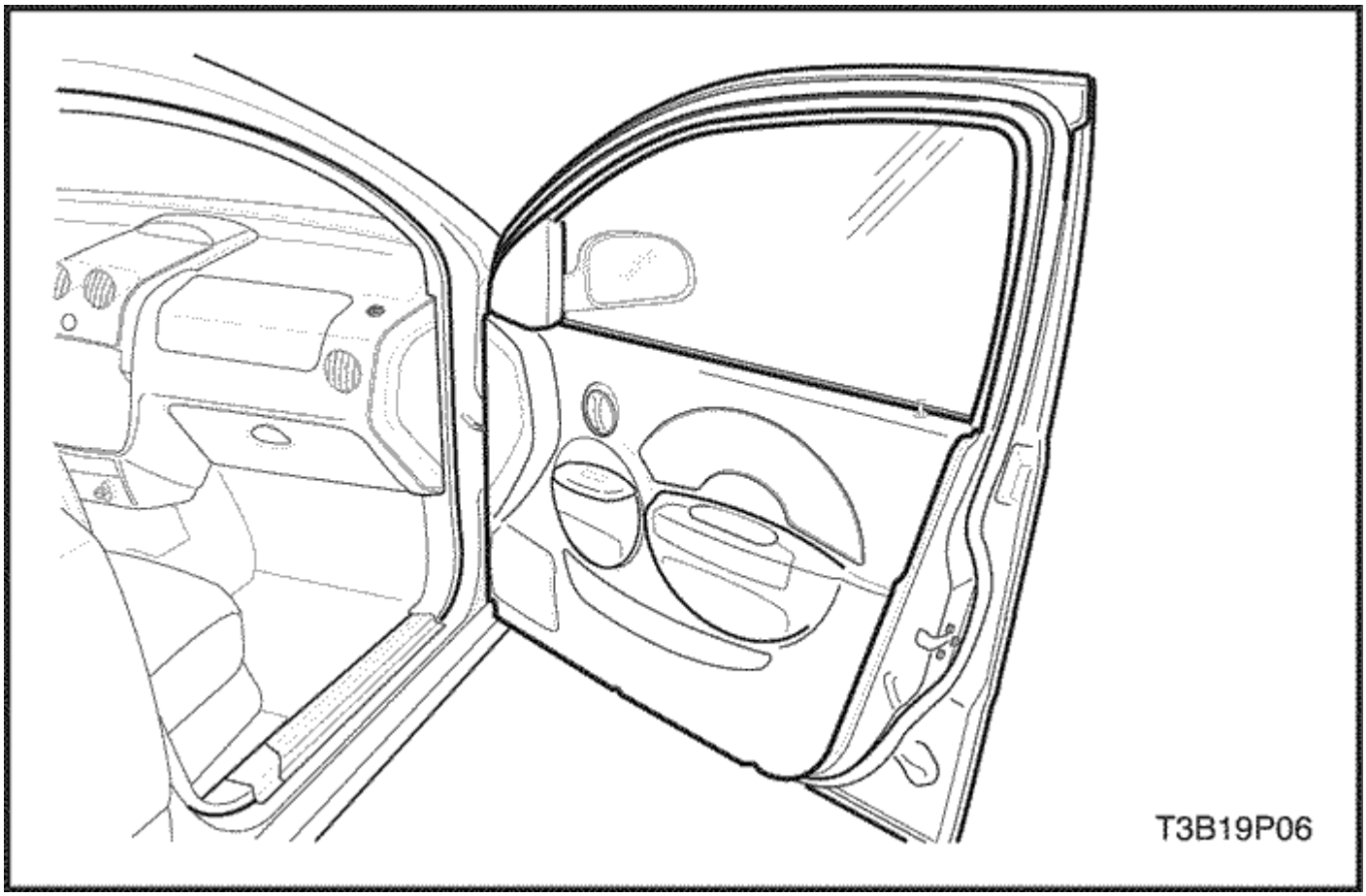
Rear Door Glass Run
Removal Procedure

1. Remove the rear door glass. Refer to *Section 9L, Glass and Mirrors.*
2. Remove the rear door interior and exterior garnish trim.
3. Remove the glass run.



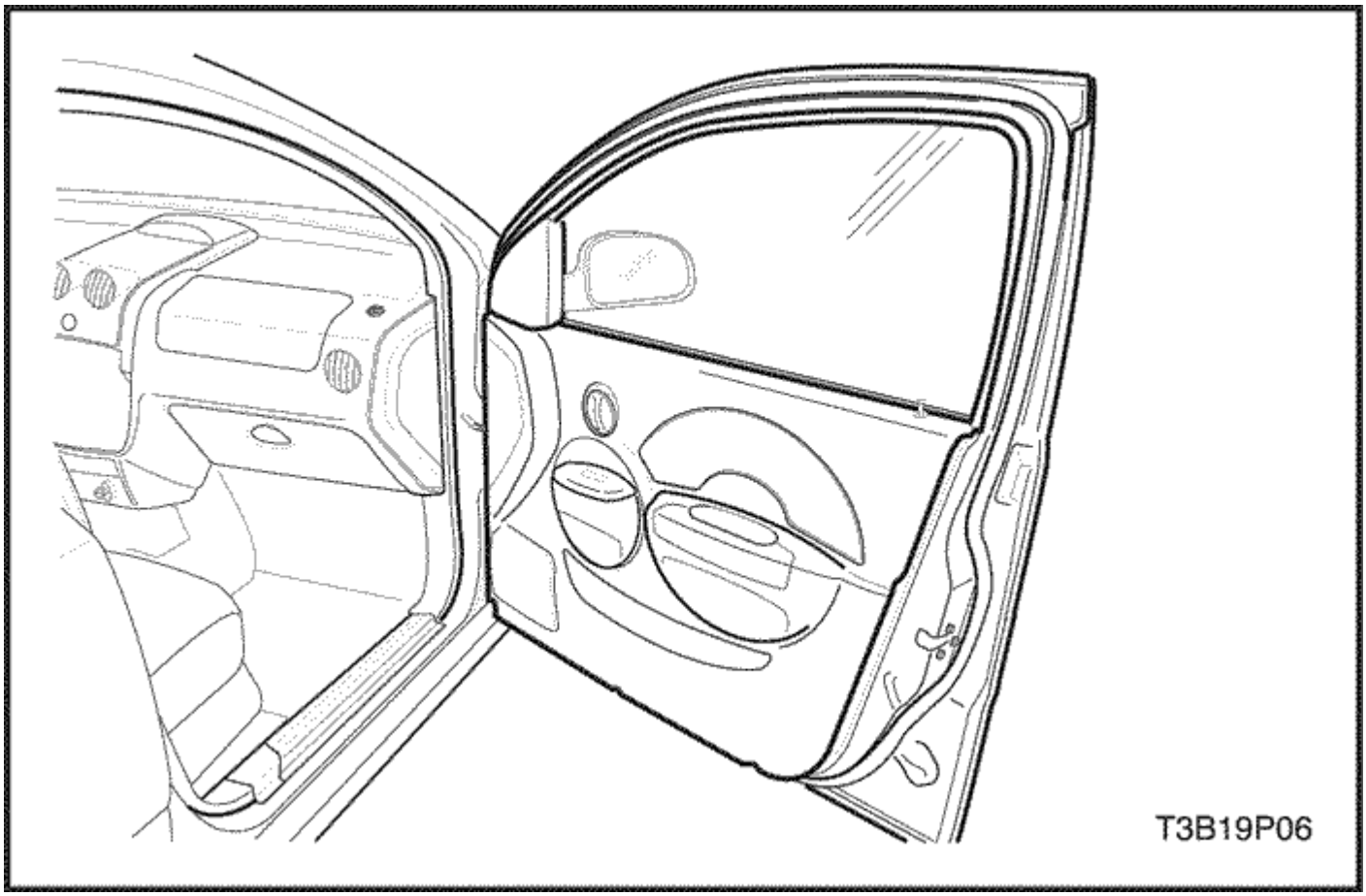
Installation Procedure

1. Install the glass run.
2. Install the rear door interior and exterior garnish trim.
3. Install the rear door glass. Refer to *Section 9L, Glass and Mirrors.*



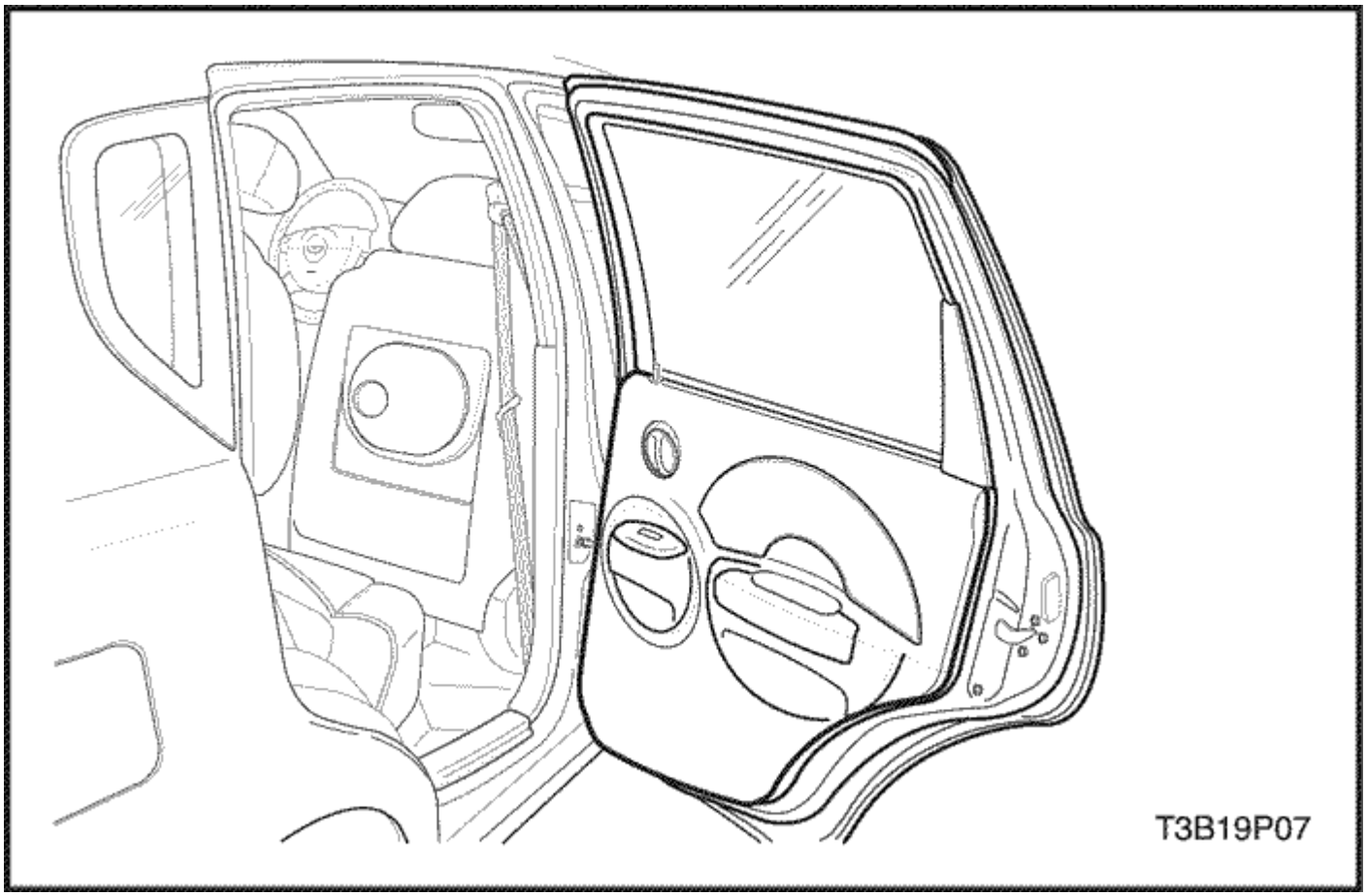
Front Door Secondary Weatherstrip
Removal Procedure

1. Remove the outside rearview mirror. Refer to *Section 9L, Glass and Mirrors.*
2. Remove the front door secondary weatherstrip.



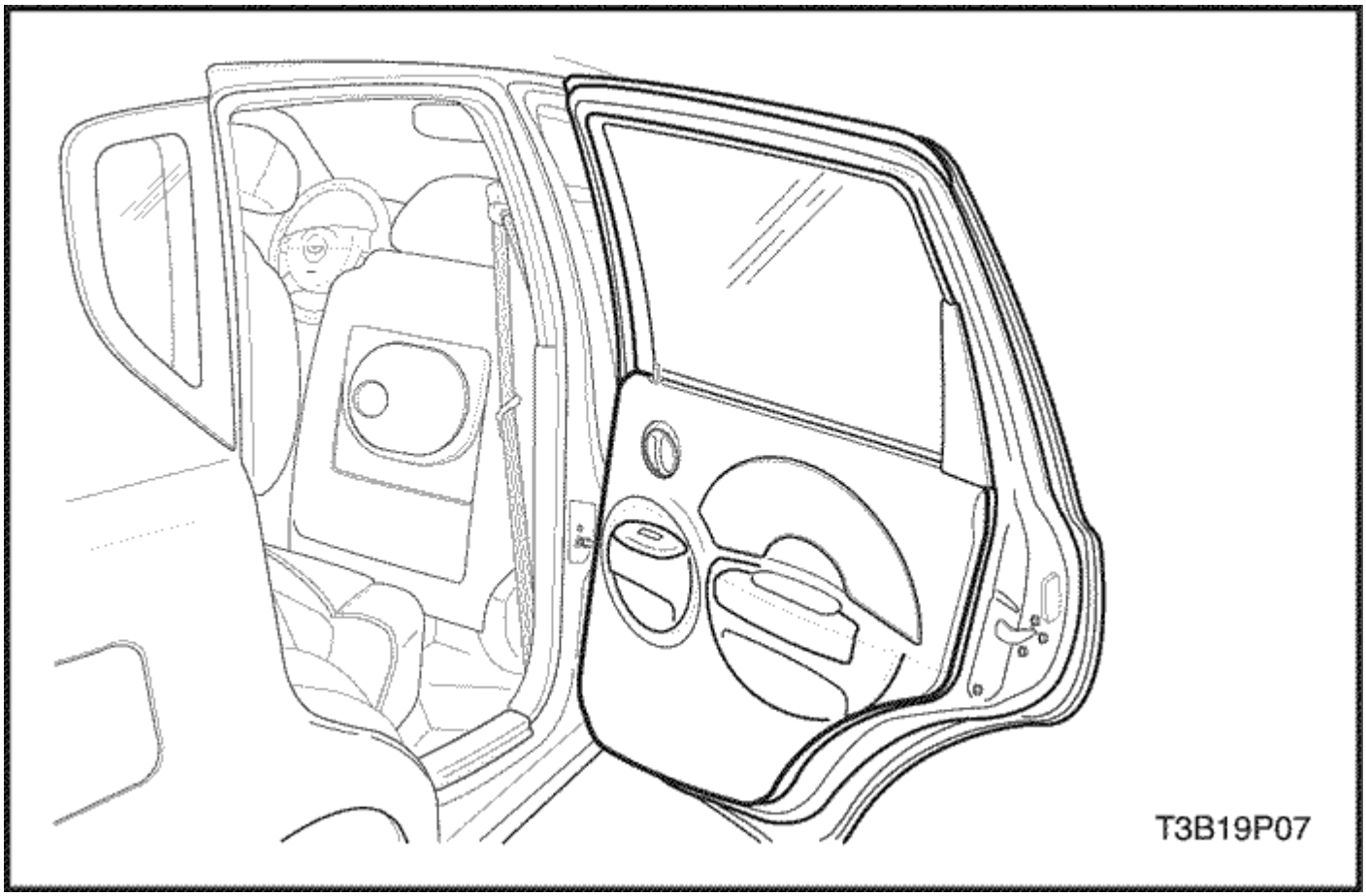
Installation Procedure

1. Install the front door secondary weatherstrip.
2. Install the outside rearview mirror. Refer to *Section 9L, Glass and Mirrors.*



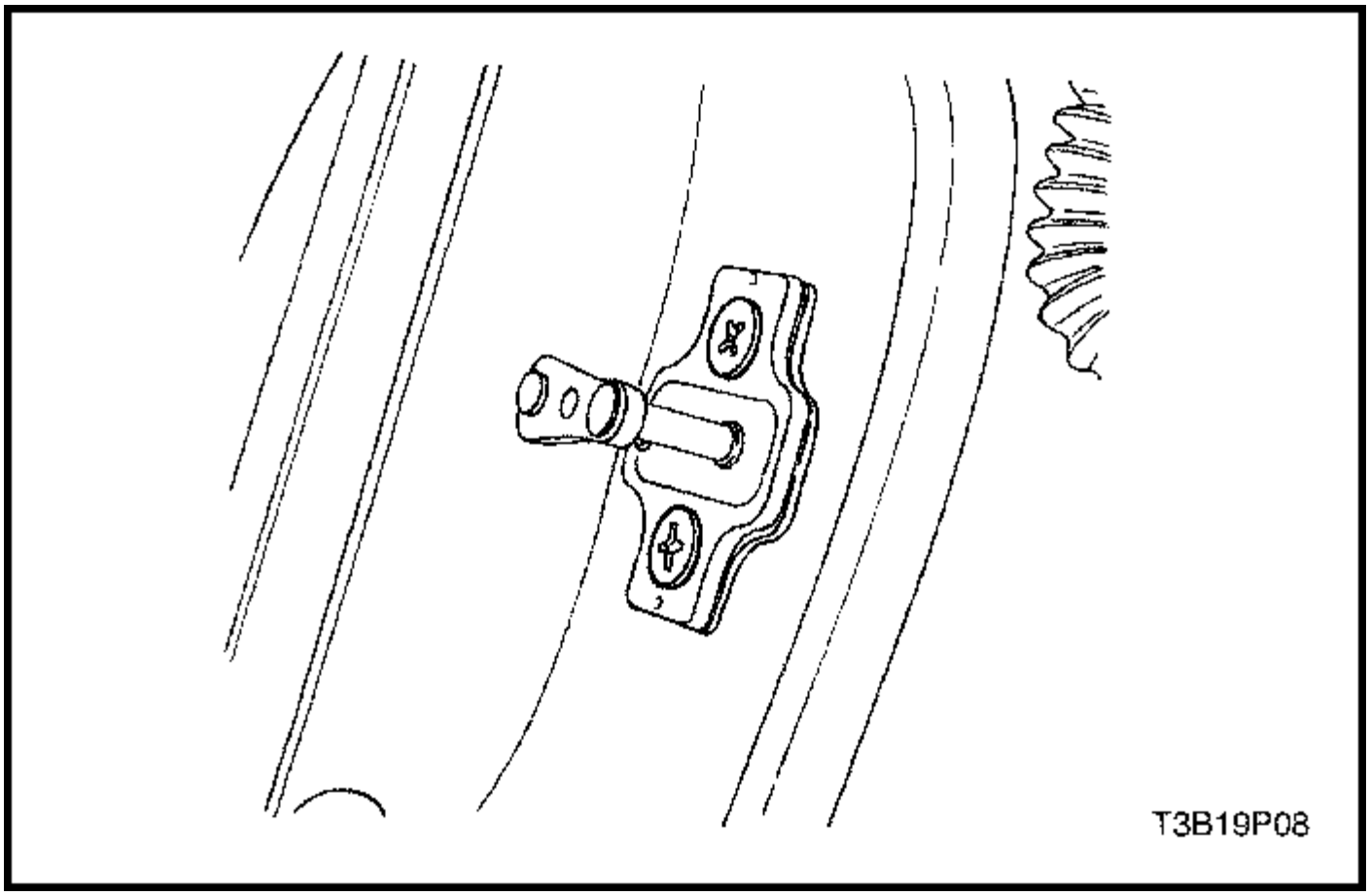
Rear Door Secondary Weatherstrip
Removal Procedure

1. Remove the rear door interior and exterior garnish trim.
2. Remove the rear door secondary weatherstrip.



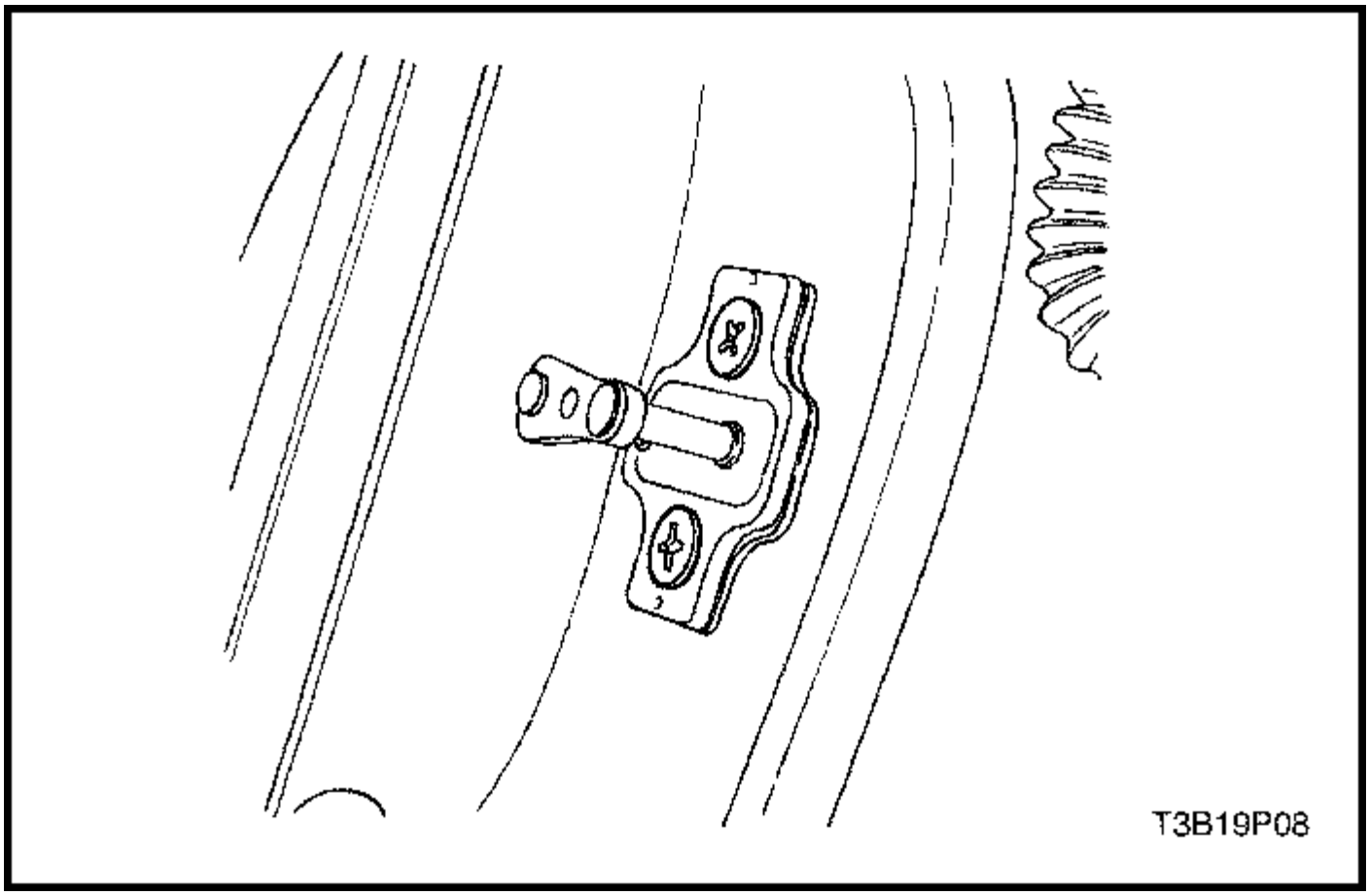
Installation Procedure

1. Install the rear door secondary weatherstrip.
2. Install the rear door interior and exterior garnish trim.



Door Lock Striker
Removal Procedure

1. Remove the screws and the door lock striker.



Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

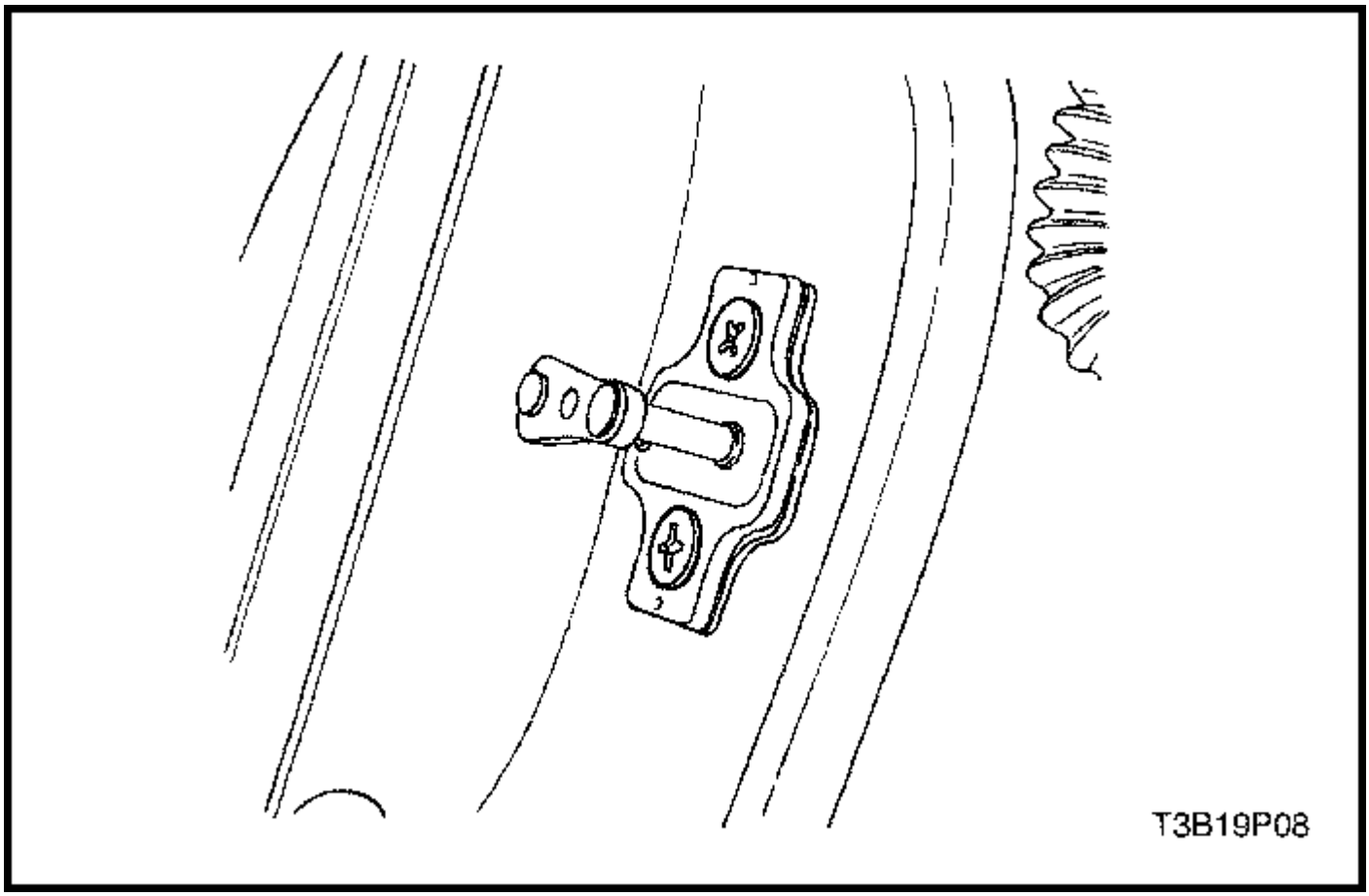
1. Install the screws and the door lock striker.

   Tighten
   Tighten the door lock striker screws to 24 N•m (18 lbft).

Door Lock Striker Adjustment

Notice : The door lock striker is an important attaching part that can affect the performance of vital components and systems and can cause major repair expenses. If replacement becomes necessary, the door lock striker must be replaced by one with the same part number or with an equivalent part. Do not use a replacement part of lesser quality or of a

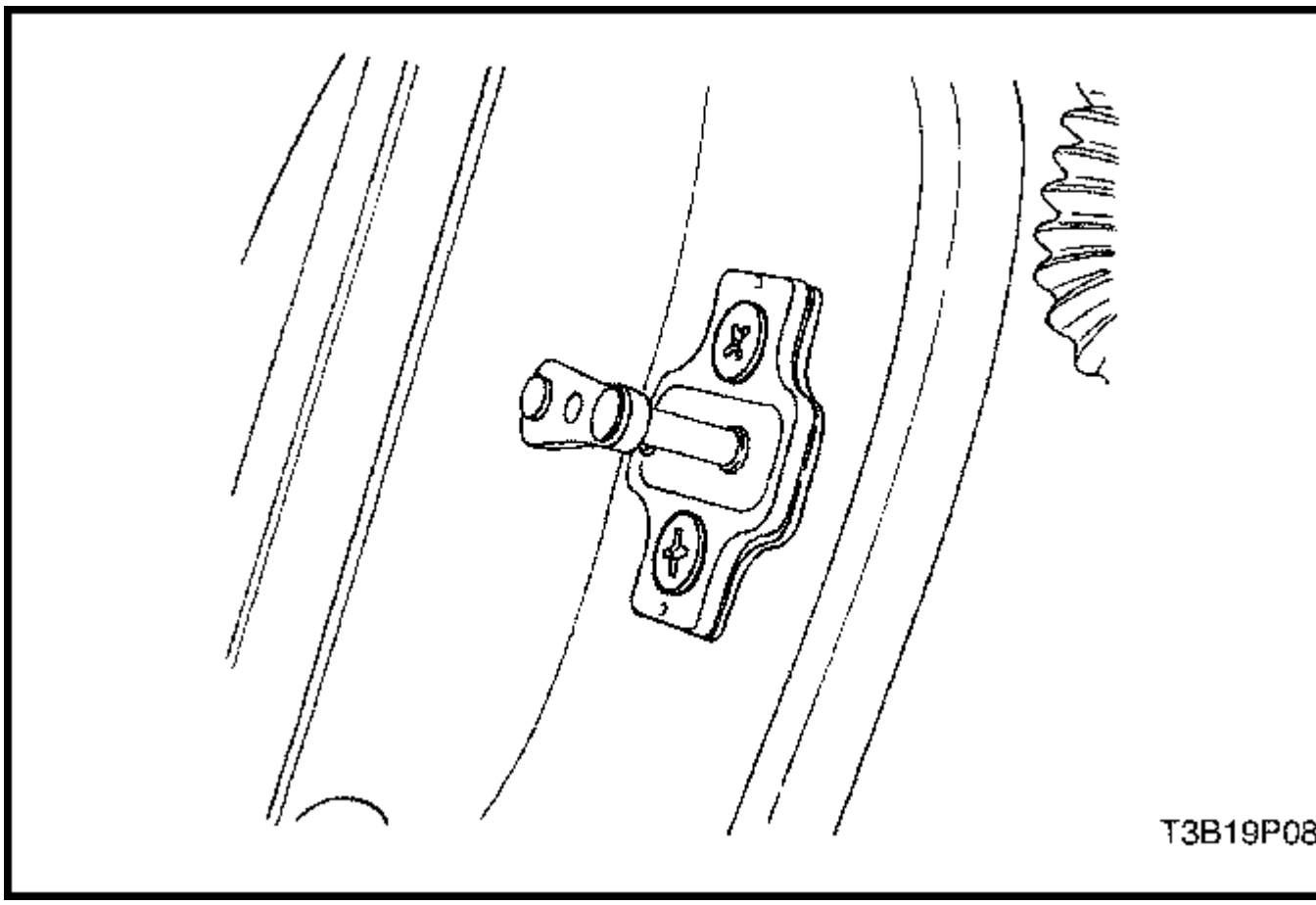
substitute design. The specified torque values must be used during reassembly in order to ensure the proper retention of the part.
The door lock striker consists of a striker with two screws that are threaded into a tapped, floating cage plate located in the appropriate body pillar. This floating cage plate allows the striker to be easily adjusted in or out and up or down. The door is secured in the closed position when the door lock fork snaps over and engages the striker.



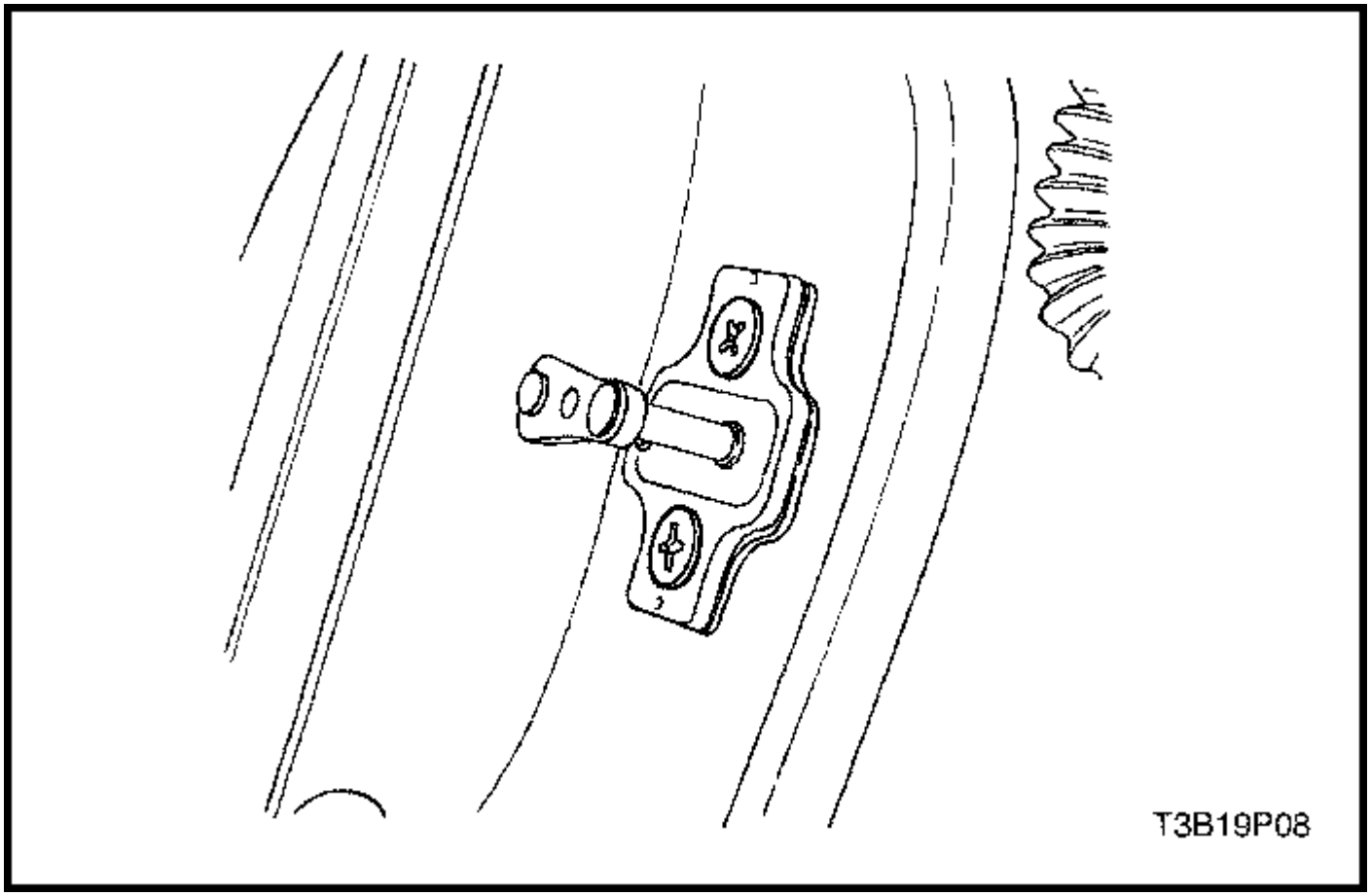
Fore/Aft Adjustment

1. The door must be properly aligned.
2. Close the door until the lock fork contacts the striker.
3. Stand next to the door opening and move the door slowly in and out, just touching the striker each time.

4. The alignment of the lock fork and the striker can be easily seen. The lock fork should be perpendicular to and fall near the middle of the striker between the B-pillar and the end of the striker.



5. If a fore or aft adjustment is required, use the following steps:
    1. Remove the striker screws.
    2. Remove the spacer in order to move the striker toward the rear of the vehicle.
    3. Add a 2 mm (0.08 inch) spacer in order to move the striker toward the front of the vehicle.
    4. Install the striker screws.
6. Perform the up/down or the in/out adjustment. Refer to "Up/Down or In/Out Adjustment" in this section.



Up/Down or In/Out Adjustment

An adjustment of the striker in the up/down or in/out directions may be necessary for a number of reasons:

- Vehicle frame damage as the result of a collision.
- Installation of new door weatherstripping.
- Customer complaints of excessive windnoise.
- Difficulty in opening or closing the door.

In order to adjust the door striker in an up/down or in/out direction, perform the following procedure:

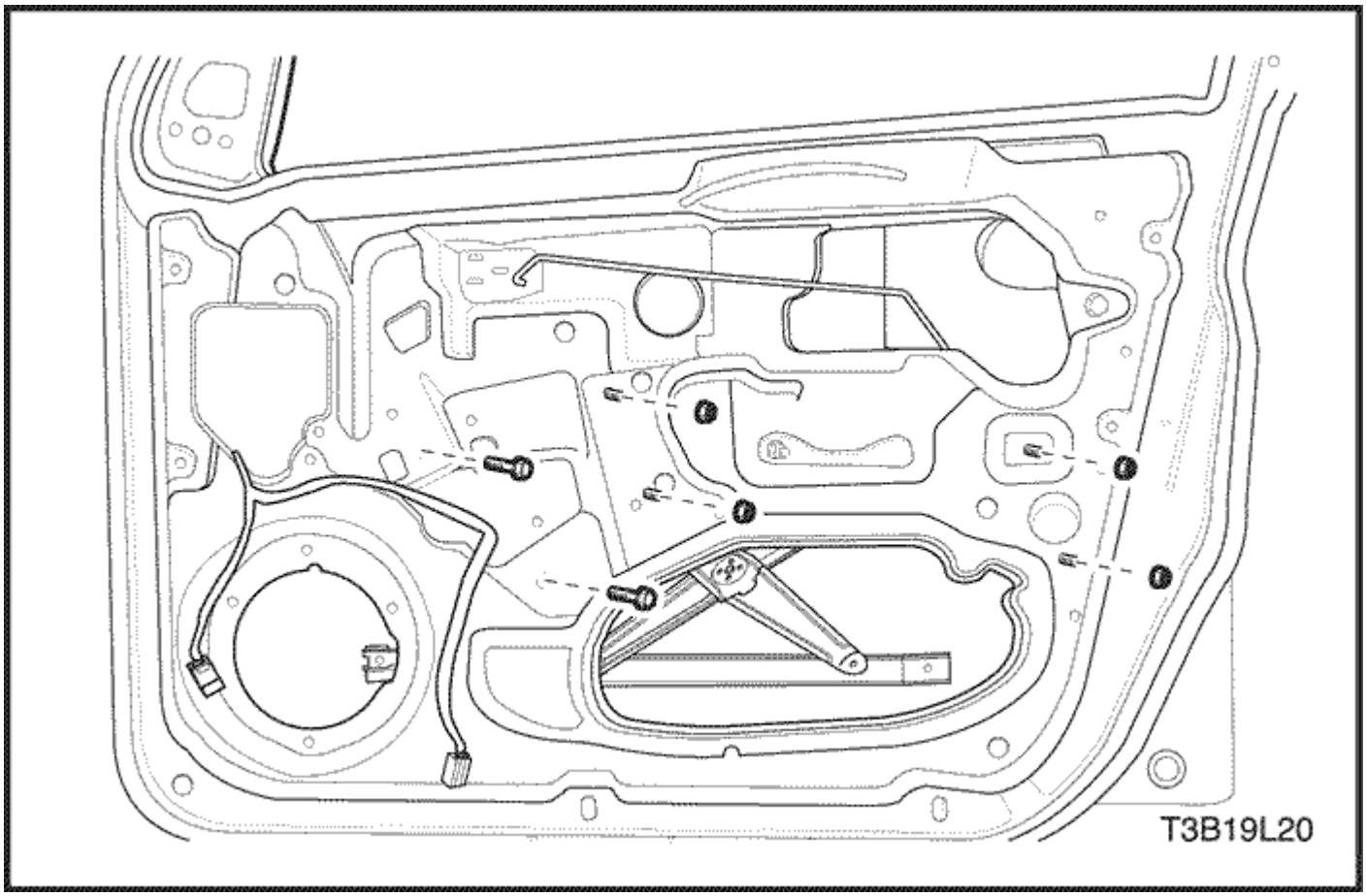
1. The door must be properly aligned.
2. The door must be properly aligned.
3. Loosen the striker screws.

4. The floating cage plate can be moved slightly using the ends of the striker screws. Move the floating cage plate to the desired position.

   Notice : It is important to use a flat-end rotary file in order not to damage the tapped floating cage plate. The striker screws and the tapped floating cage plate are important attaching parts that could affect the performance of vital components and systems.

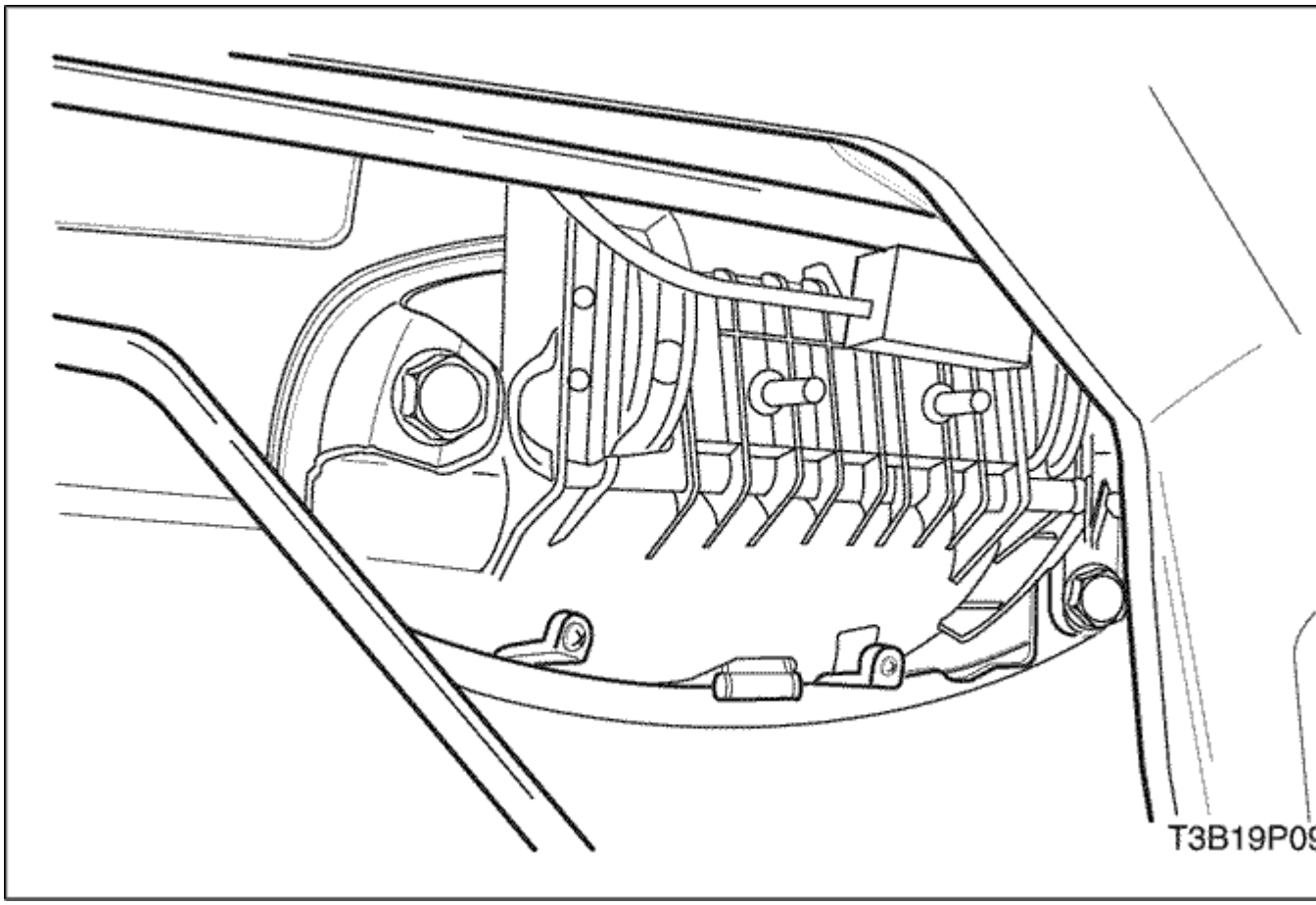
5. If proper adjustment requires that the floating cage plate be moved more than is possible, use an electric hand drill and a 3/8-inch rotary file with a flat head in order to enlarge the body opening in the direction required.
6. Tighten the striker screws to the correct position.

   Tighten
   Tighten the door lock striker screws to 20 N•m (15 lbft).

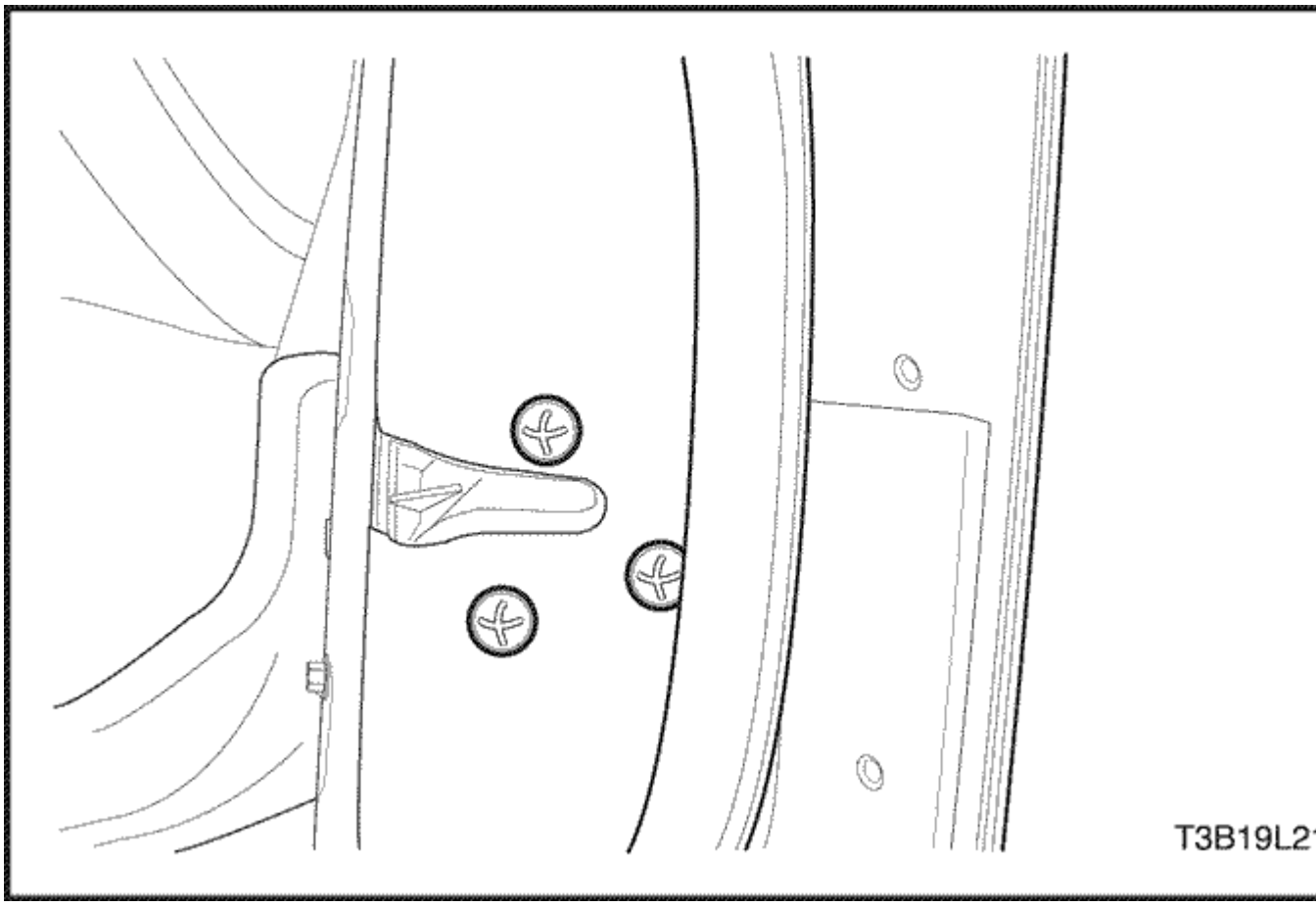


Front Door Lock
Removal Procedure

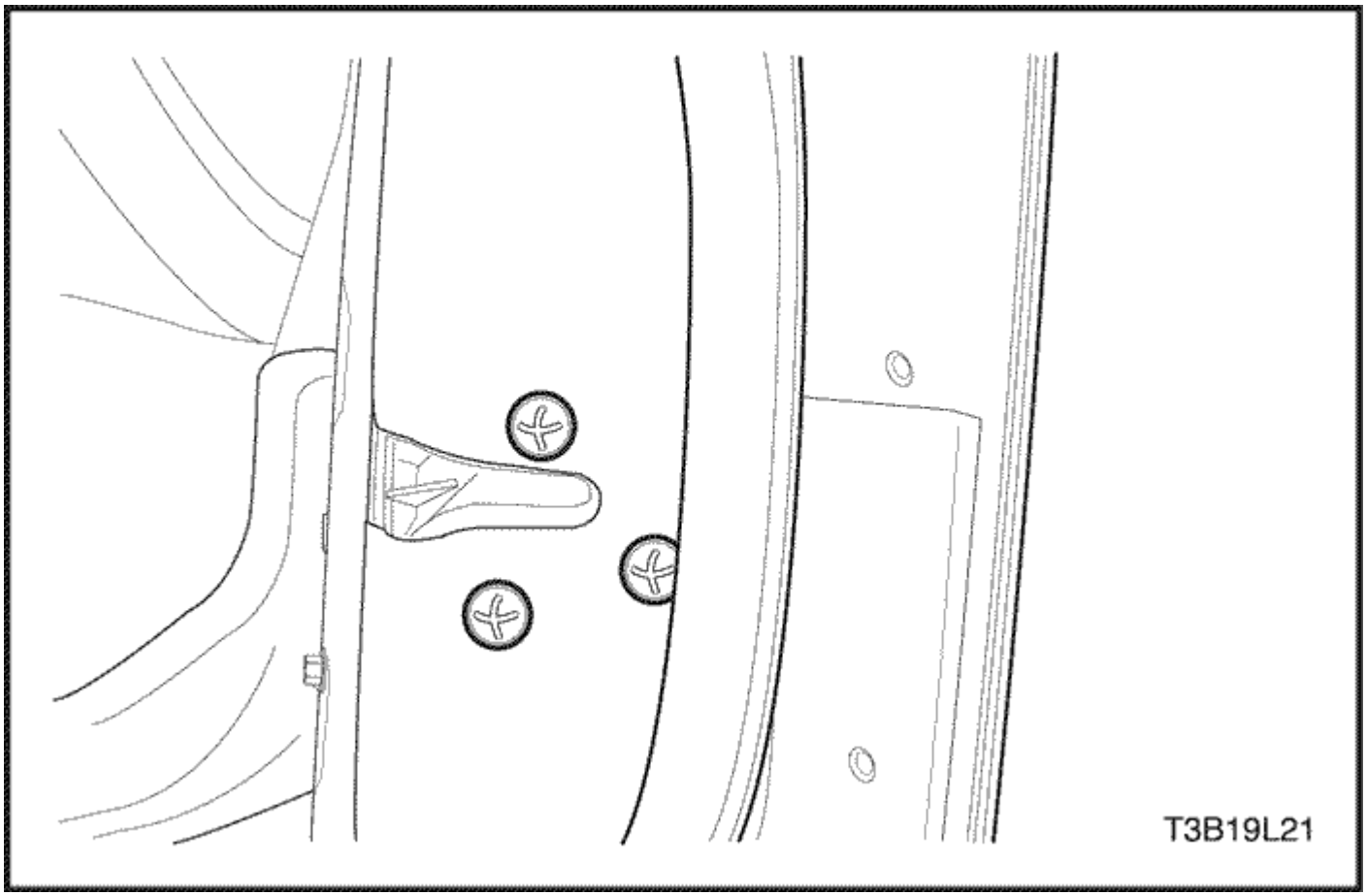
1. Disconnect the negative battery cable.
2. Remove the seal trim. Refer to "Door Seal Trim" in this section.
3. Disconnect the inside door handle and the lock rods.



4. Disconnect the outside door handle and the lock rods.



5. Remove the bolts and the guide rail.
6. Remove the screws and the front door lock.
7. Disconnect the electrical connector.



Installation Procedure

1. Connect the electrical connector.
2. Connect the inside door handle and the lock rods.
3. Connect the outside door handle and the lock rods.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

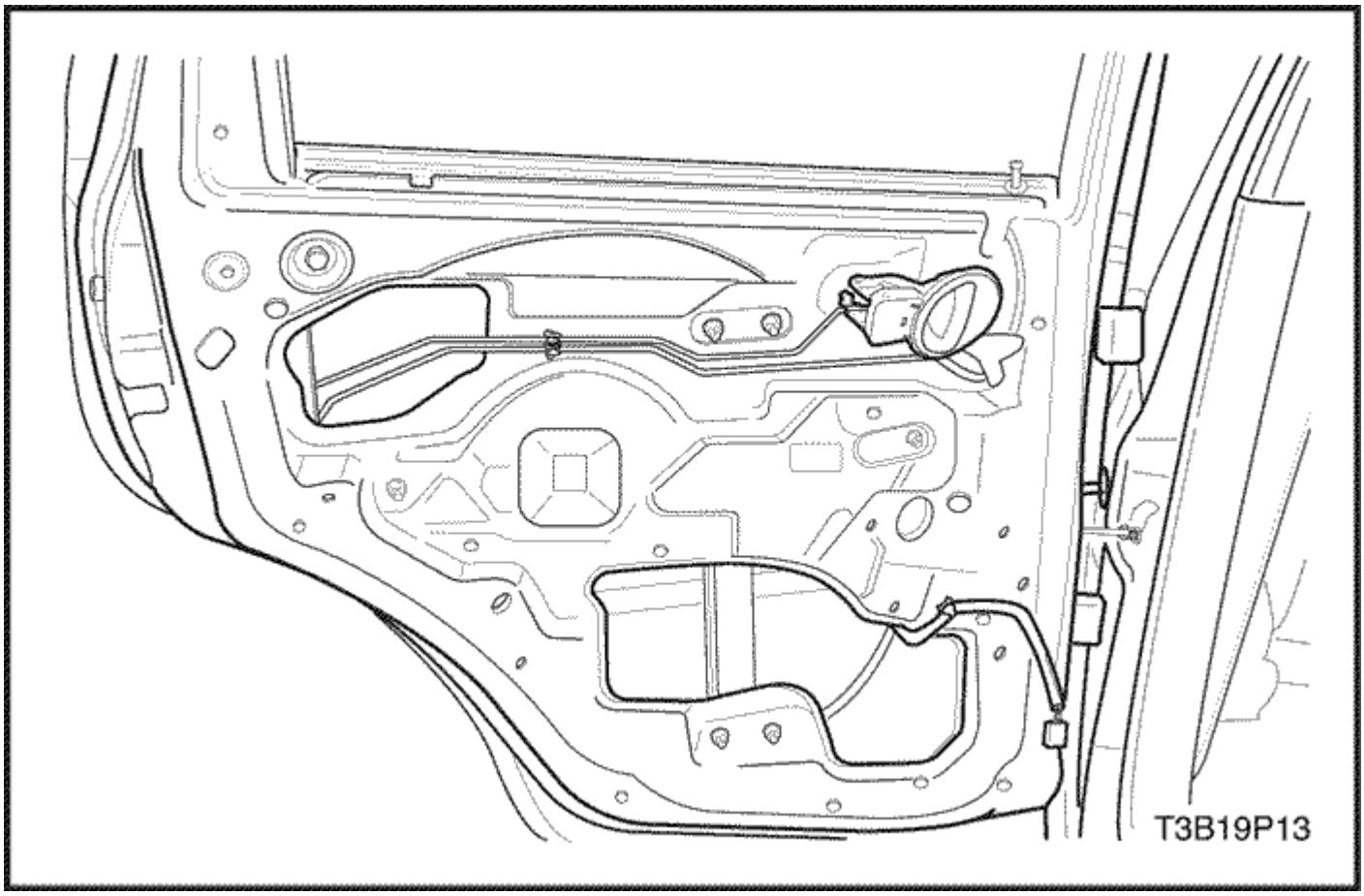
4. Install the front door lock with the screws.

   Tighten
   Tighten the front door lock screws to 8 N•m (71 lb-in).

5. Install the guide rail with the bolts.

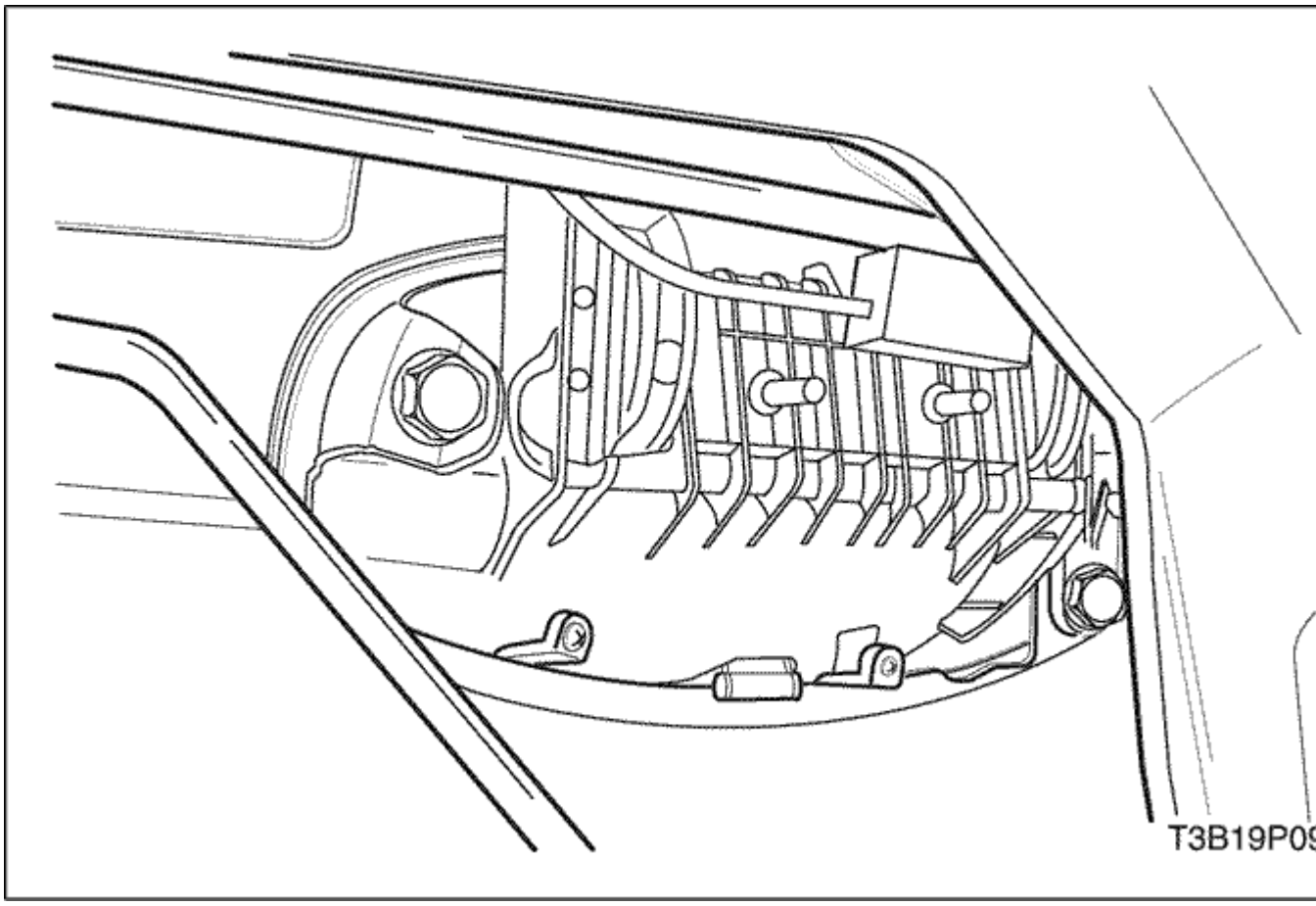
Tighten
Tighten the guide rail bolts to 7 N•m (62 lb-in).

6. Install the seal trim. Refer to "Door Seal Trim" in this section.
7. Connect the negative battery cable.

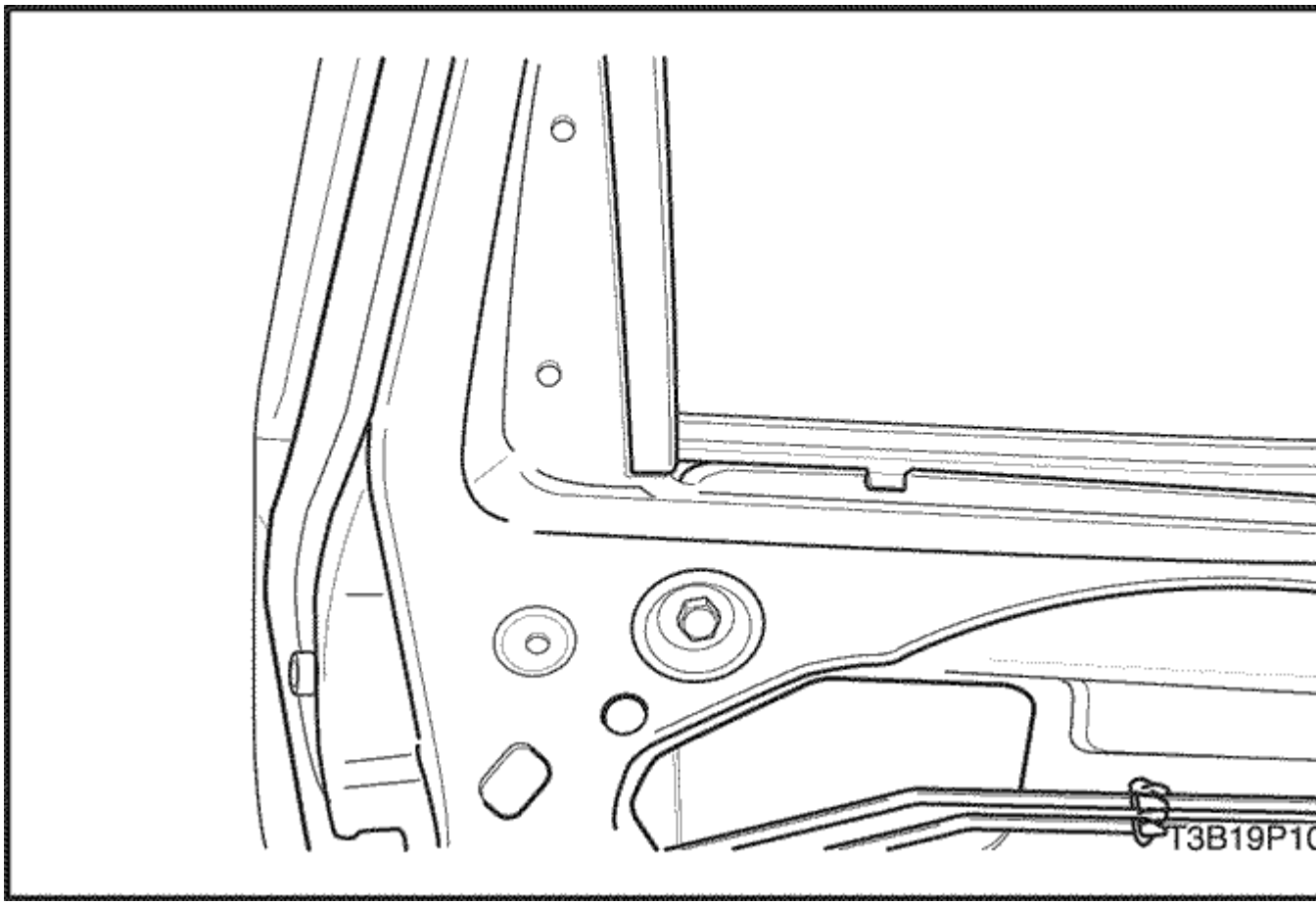


Childproof Rear Door Lock
Removal Procedure

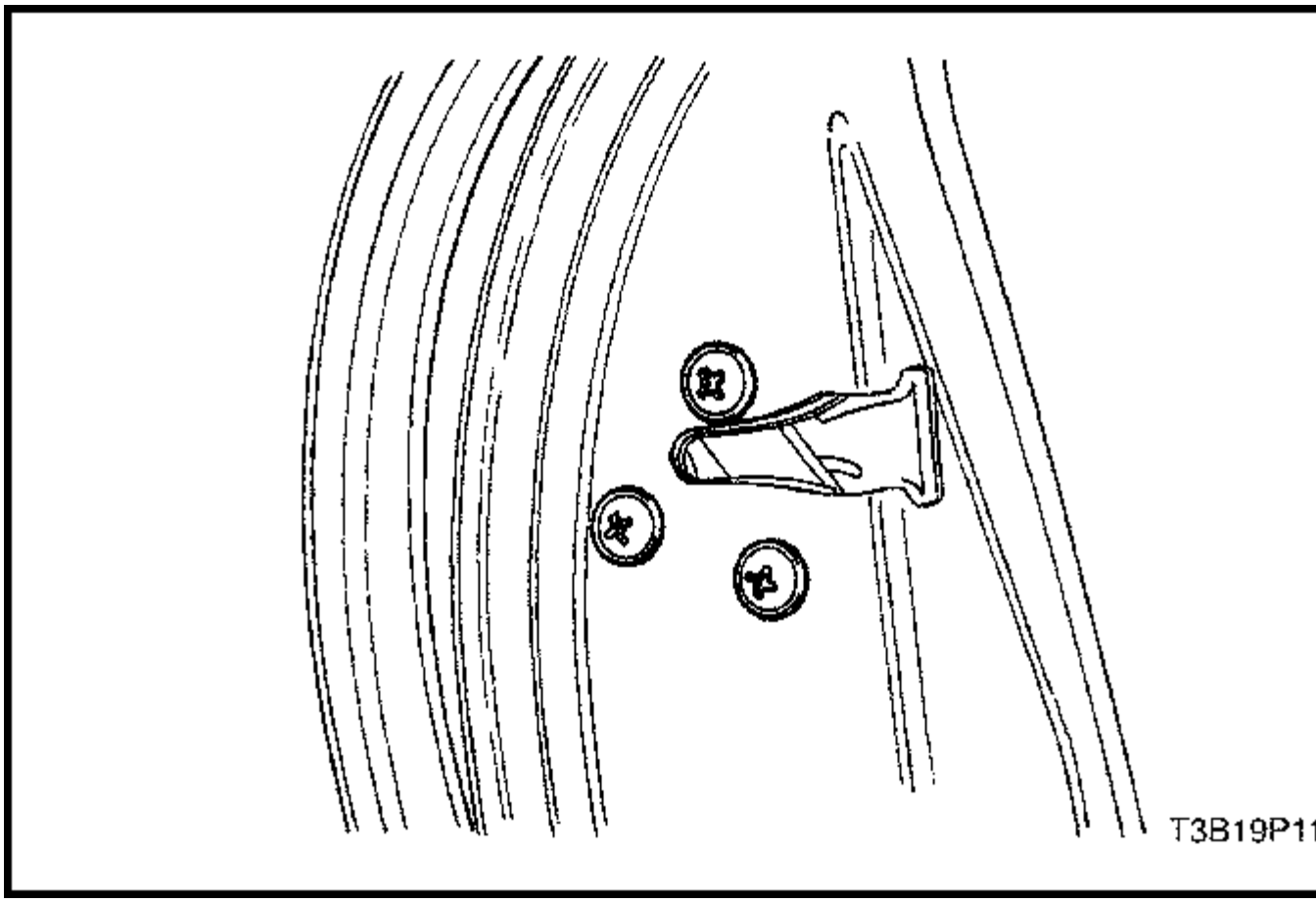
1. Disconnect the negative battery cable.
2. Remove the door seal trim. Refer to "Door Seal Trim" in this section.
3. Disconnect the inside door handle and the lock rods.



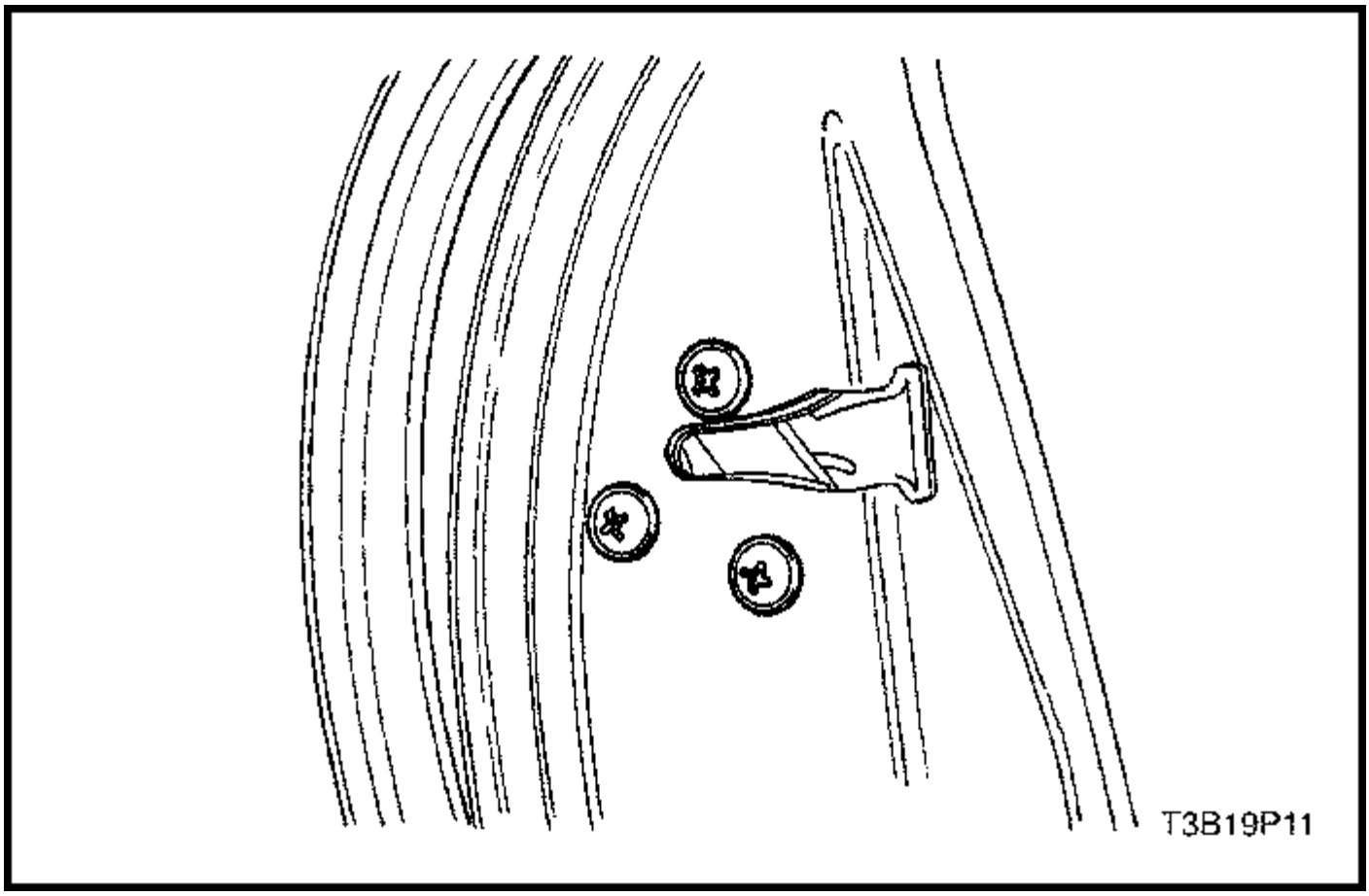
4. Disconnect the outside door handle and the lock rods.



5. Remove the bolts and the guide rail.



6. Remove the screws and the lock.
7. Disconnect the electrical connector.
8. Disconnect the lock rods at the lock.

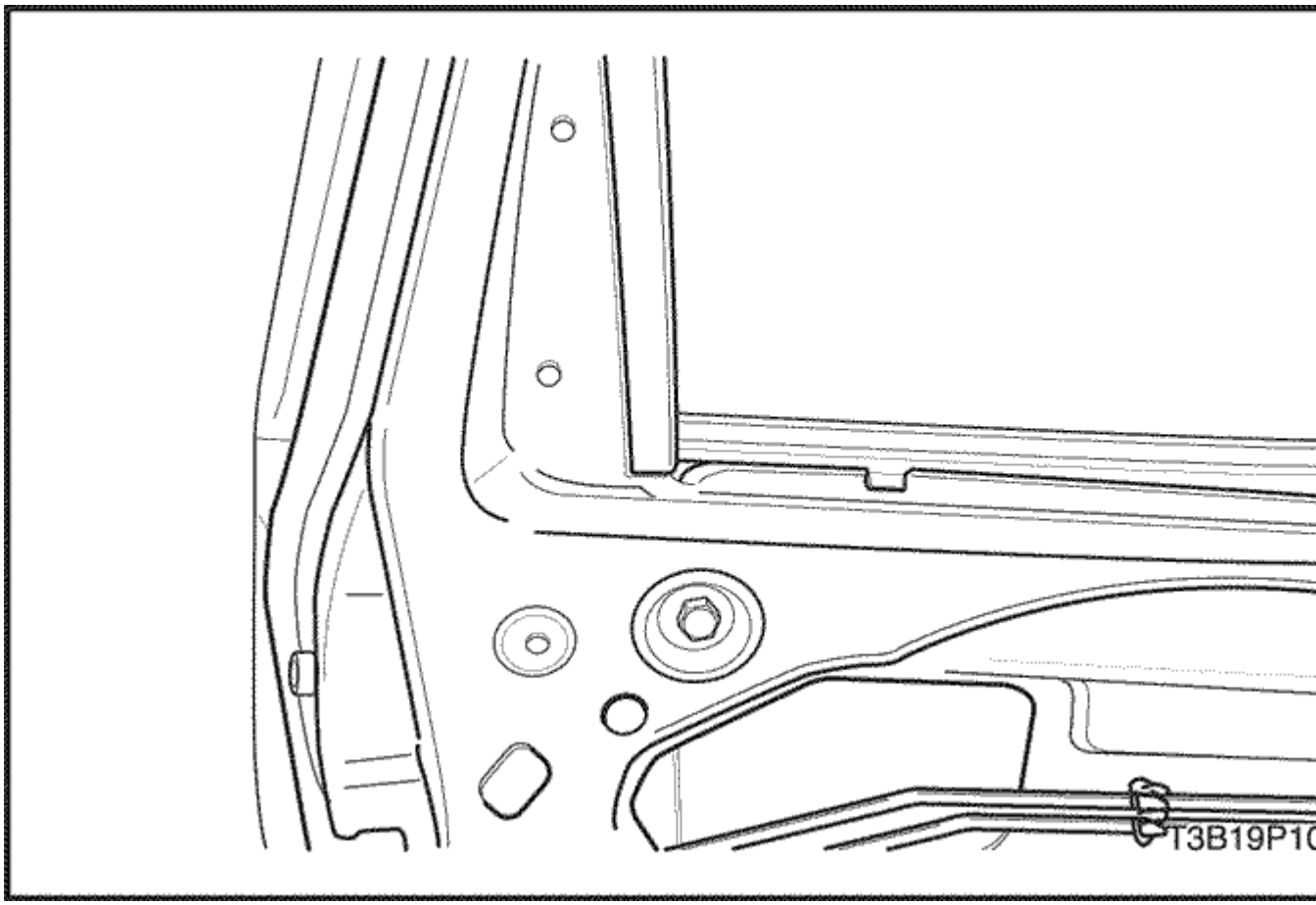


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

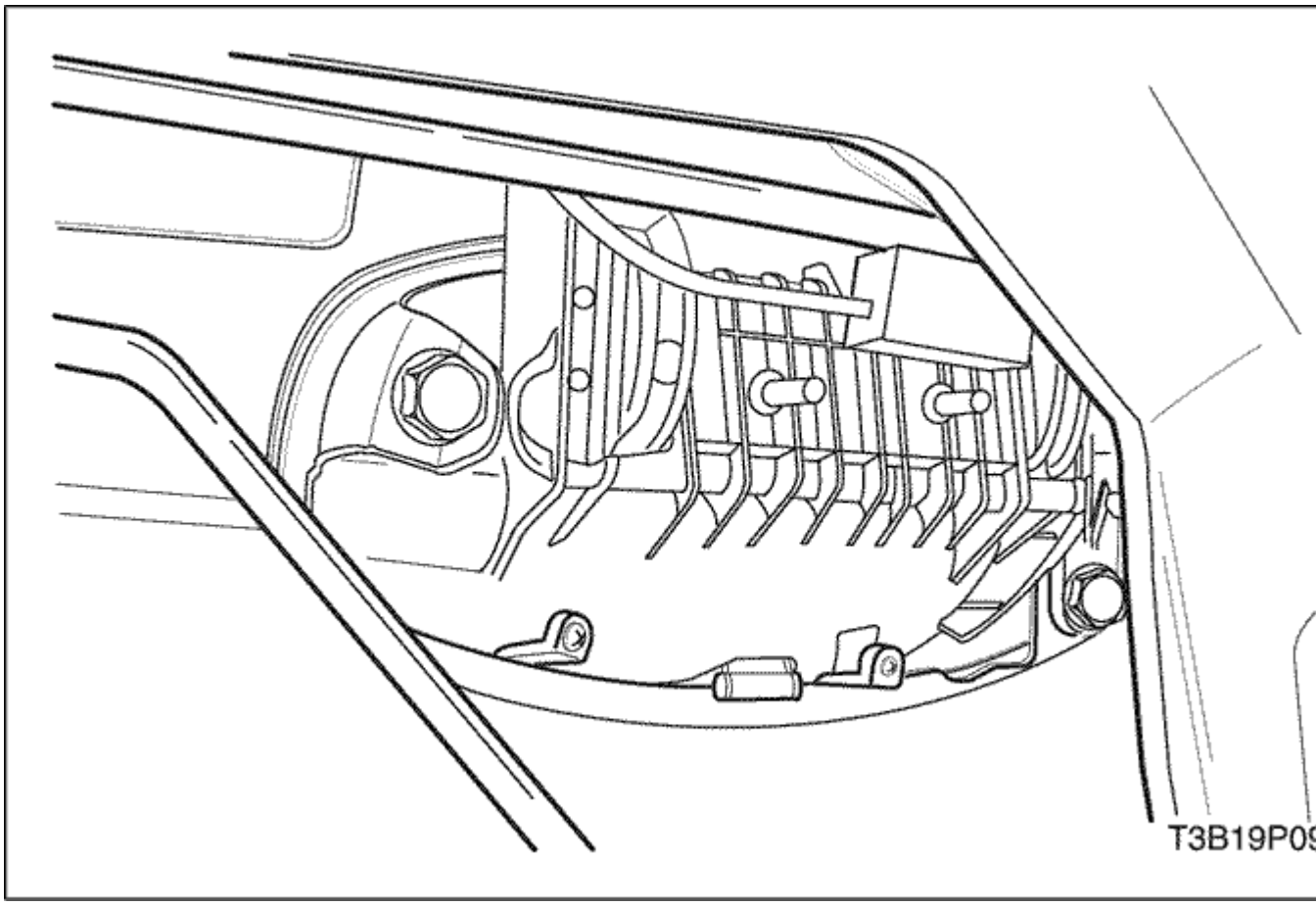
1. Install the rear door lock with the screws.

   Tighten
   Tighten the rear door lock screws to 8 N•m (71 lb-in).

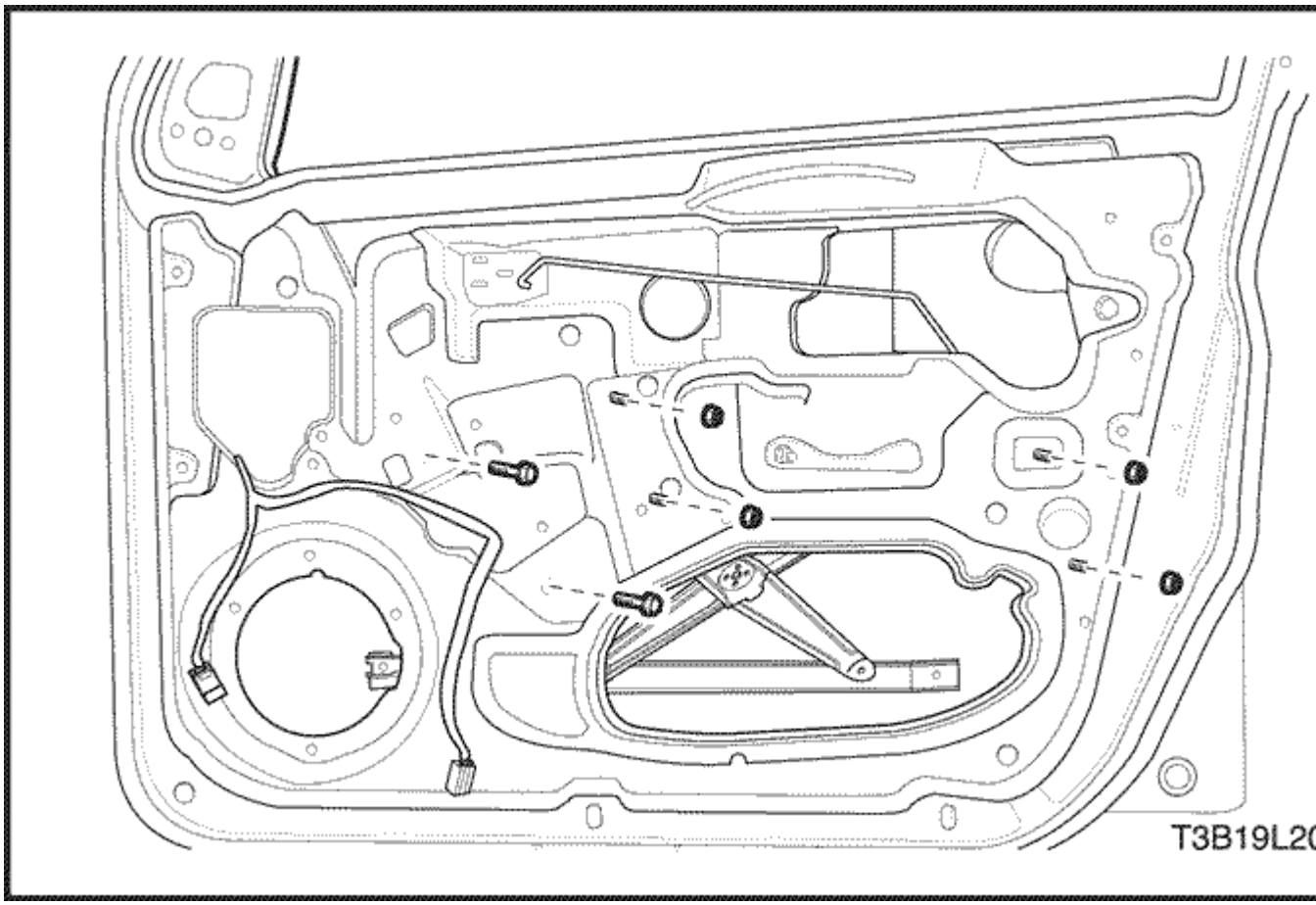


2. Connect the electrical connector.
3. Install the guide rail with the bolts.

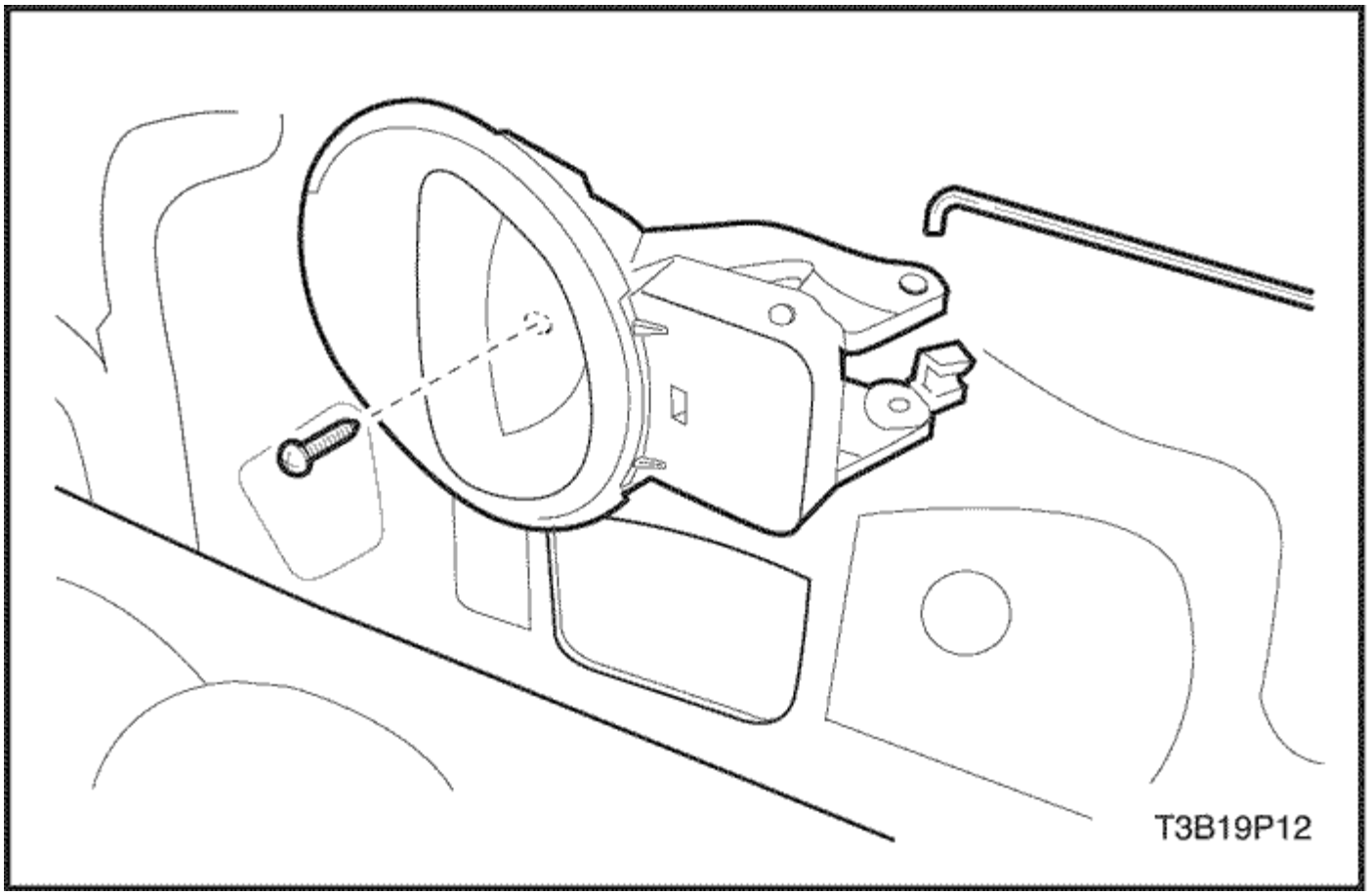
Tighten
Tighten the guide rail bolts to 7 N•m (62 lb-in).



4. Connect the outside door handle and the lock rods.

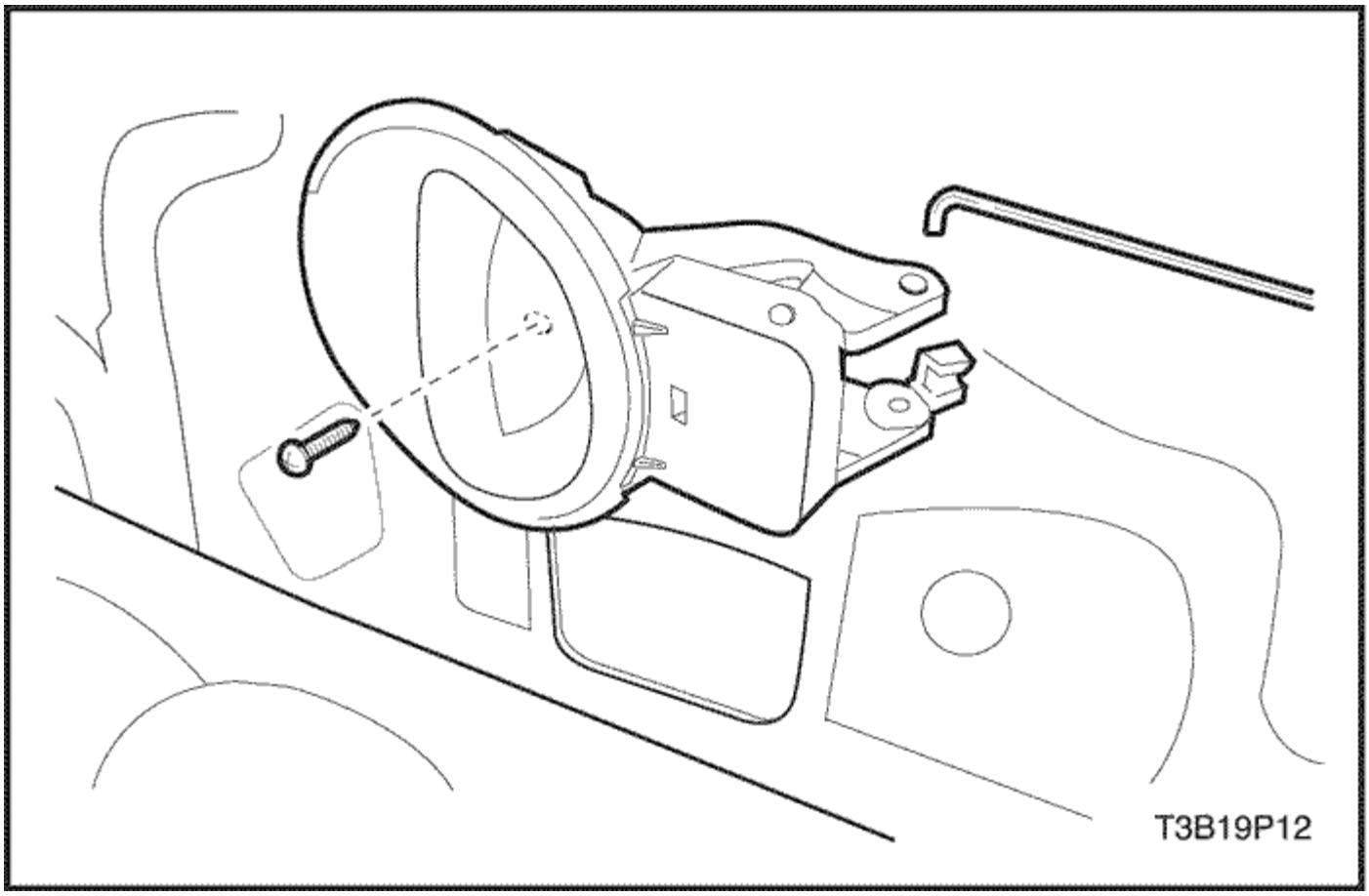


5. Connect the inside door handle and the lock rods.
6. Install the door seal trim. Refer to "Door Seal Trim" in this section.
7. Connect the negative battery cable.



Inside Door Handle
Removal Procedure

1. Remove the door seal trim. Refer to "Door Seal Trim" in this section.
2. Remove the screw securing the door handle to the door.
3. Disconnect the inside door handle and the lock rods.



Installation Procedure

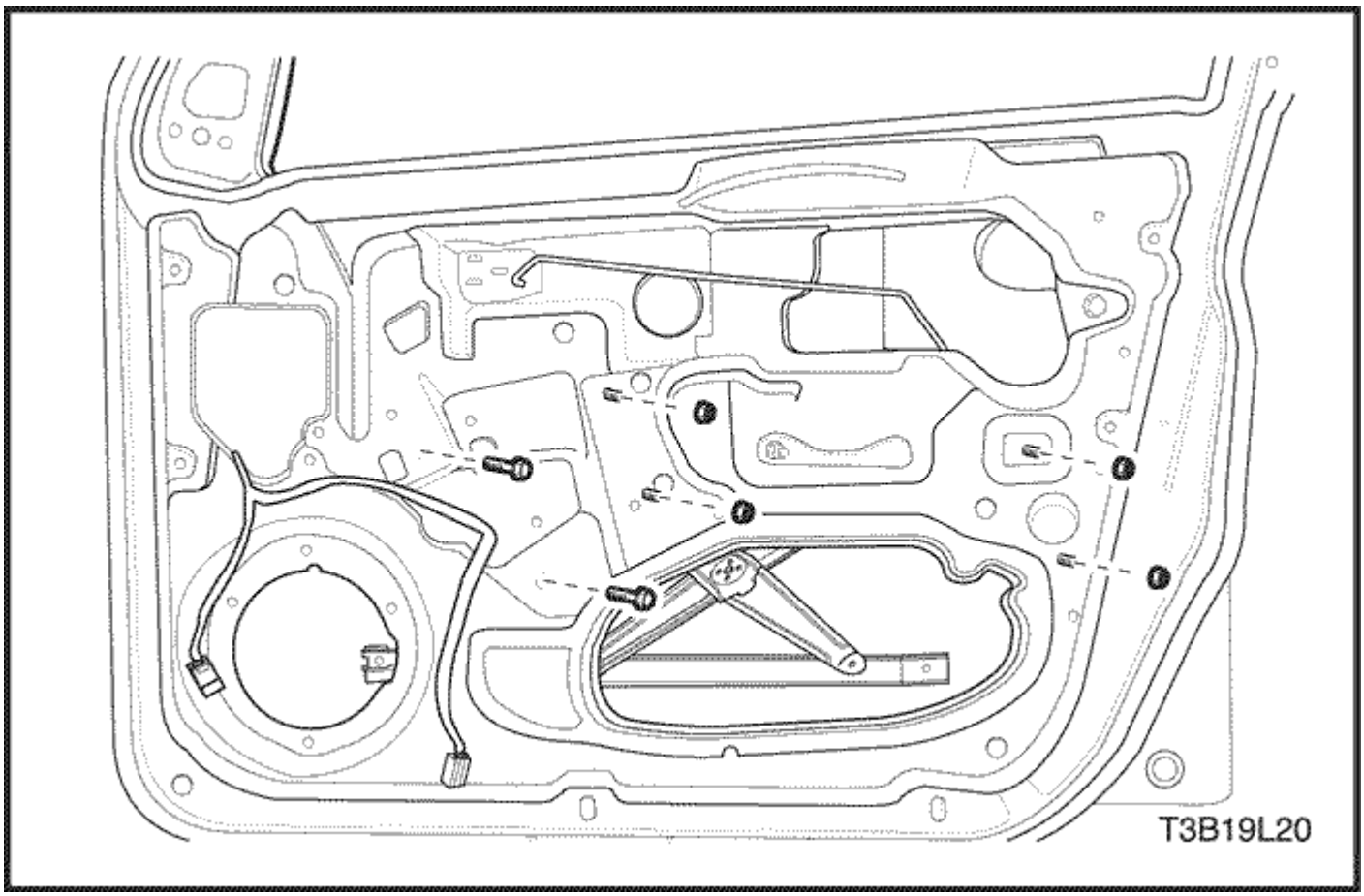
1. Connect the inside door handle and the lock rods.
2. Insert the inside door handle into the slots in the door.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

3. Install the inside door handle screw.

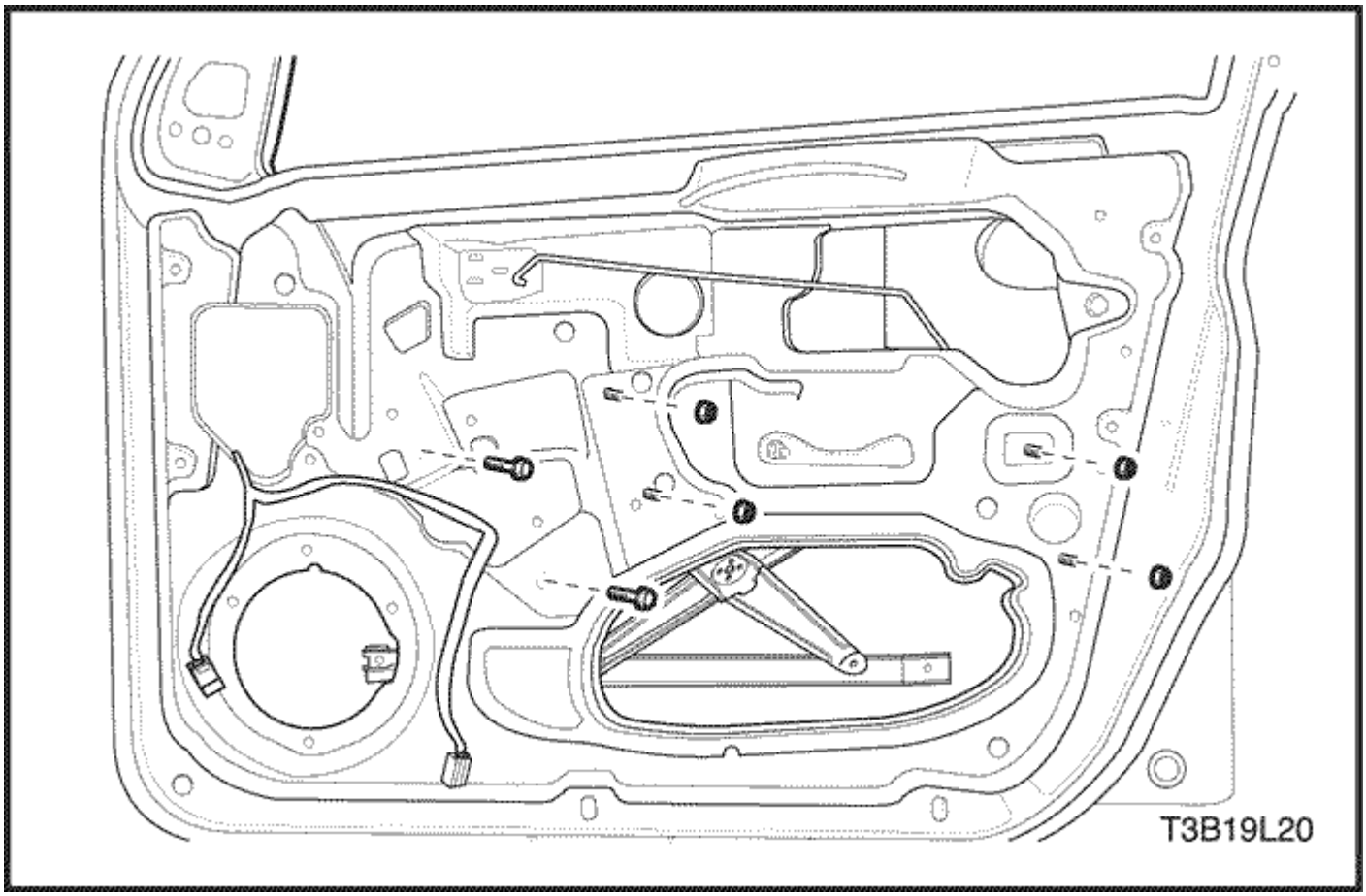
   Tighten
   Tighten the inside door handle screw to 3 N•m (27 lbin).

4. Install the door seal trim. Refer to "Door Seal Trim" in this section.



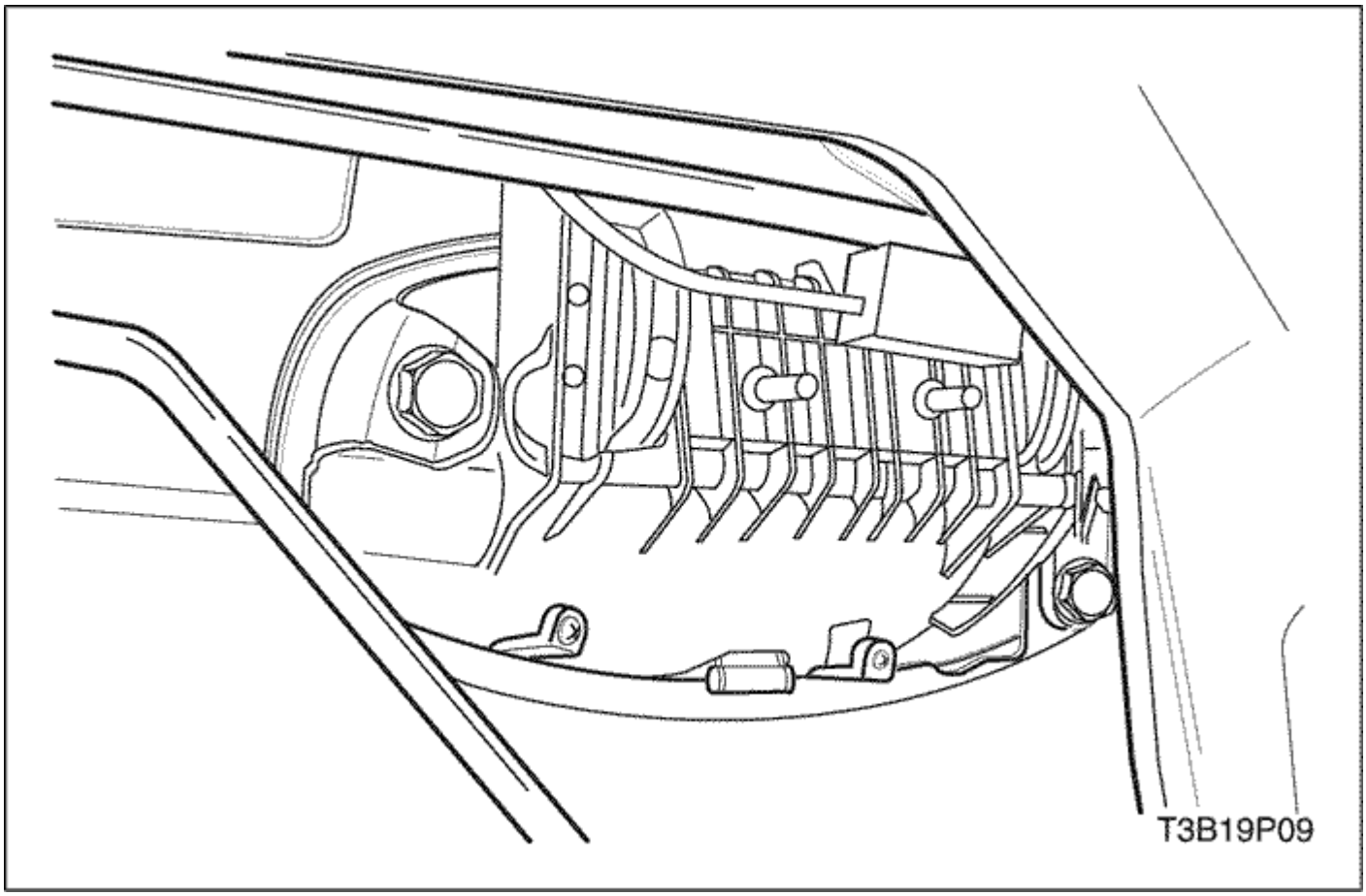
Inside Lock Rod
Removal Procedure

1. Remove the inside door handle. Refer to "Inside Door Handle" in this section.
2. Disconnect the inside lock rods from the door handle and the lock.



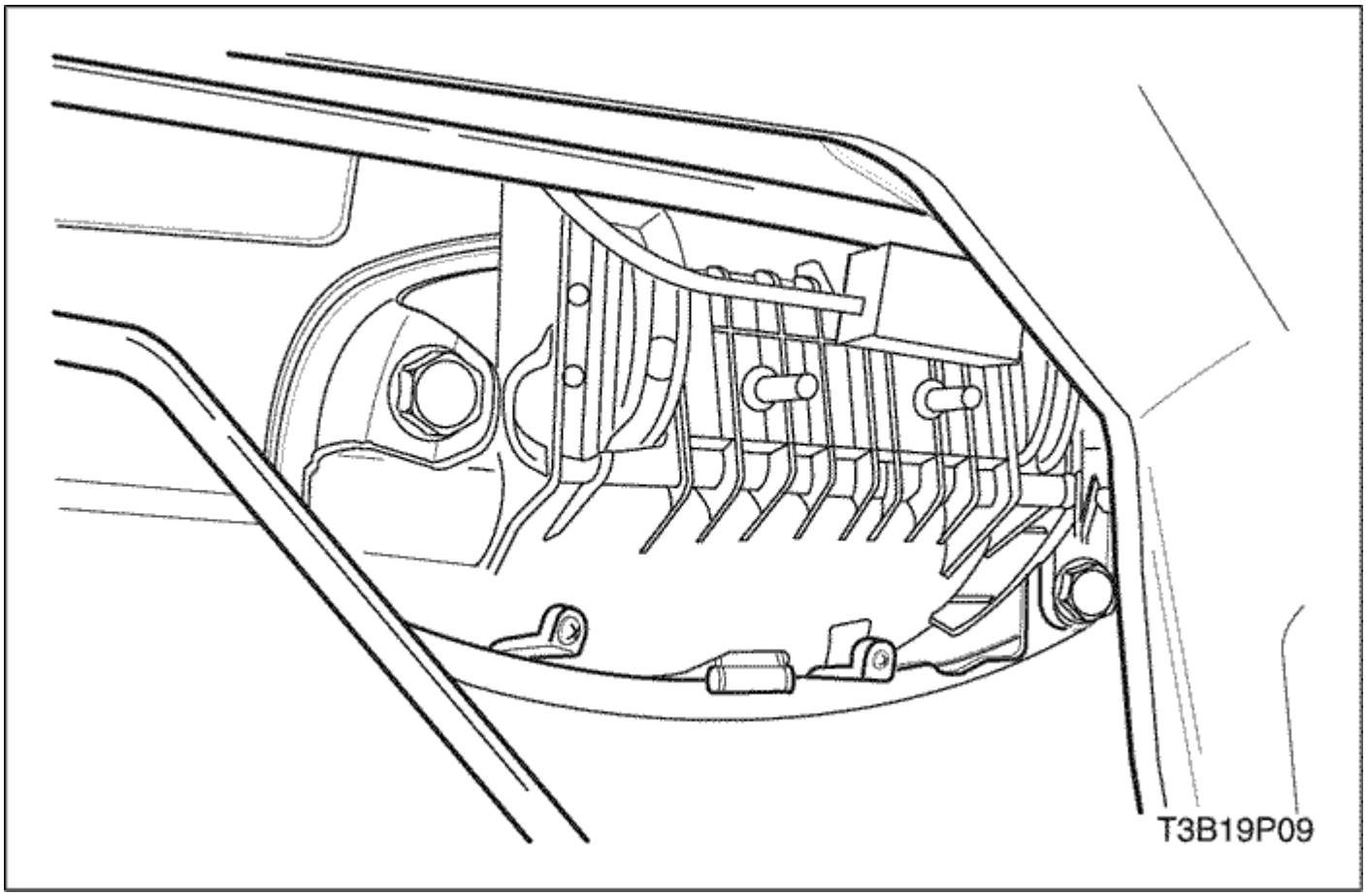
Installation Procedure

1. Connect the inside lock rods to the door handle and the lock.
2. Install the inside door handle. Refer to "Inside Door Handle" in this section.



Outside Door Handle
Removal Procedure

1. Remove the door seal trim. Refer to "Door Seal Trim" in this section.
2. Disconnect the outside door handle and the lock rods.
3. Remove the bolts and the door handle.



Installation Procedure

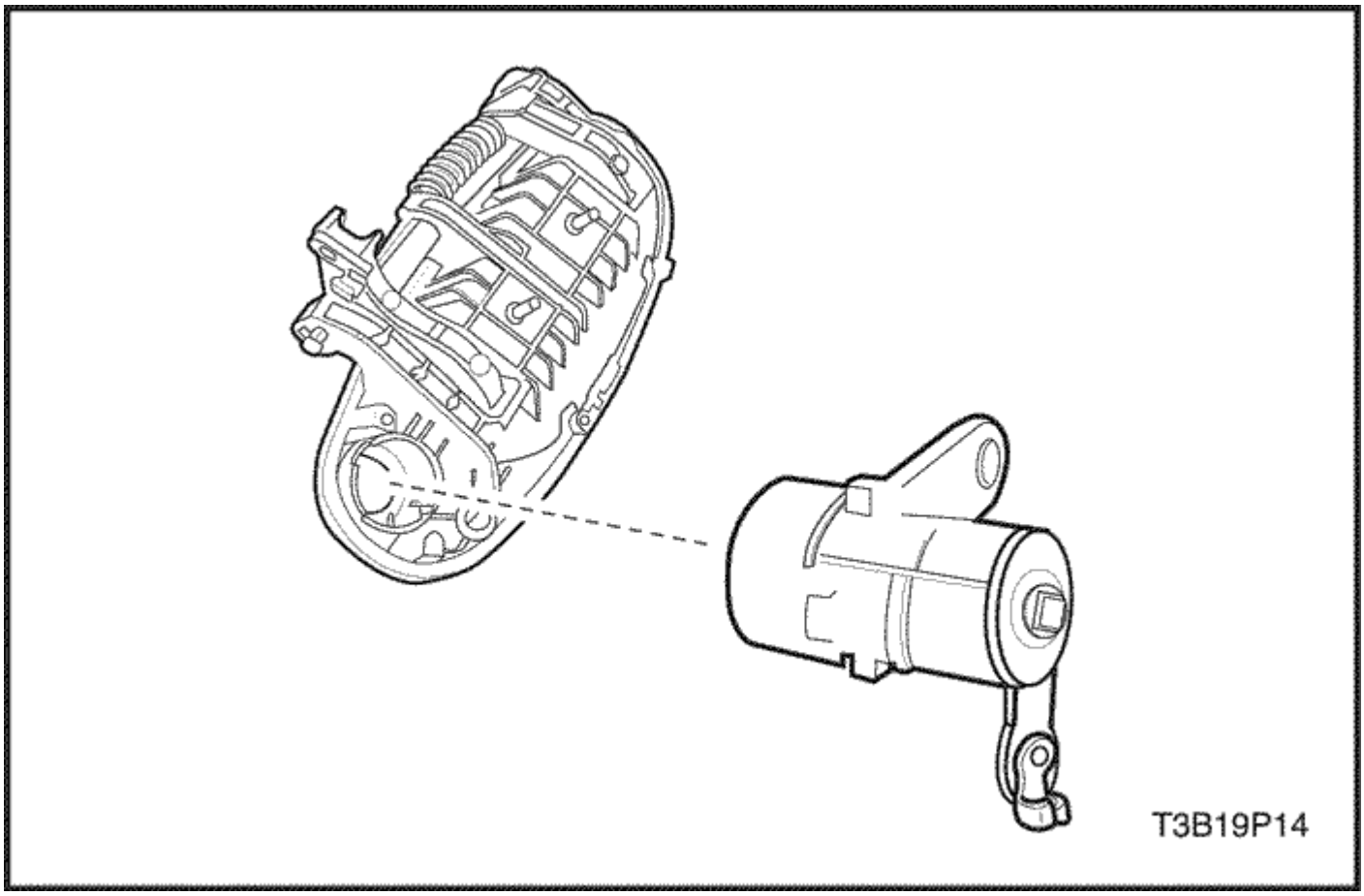
1. Connect the outside door handle and the lock rods.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the door handle with the bolts.

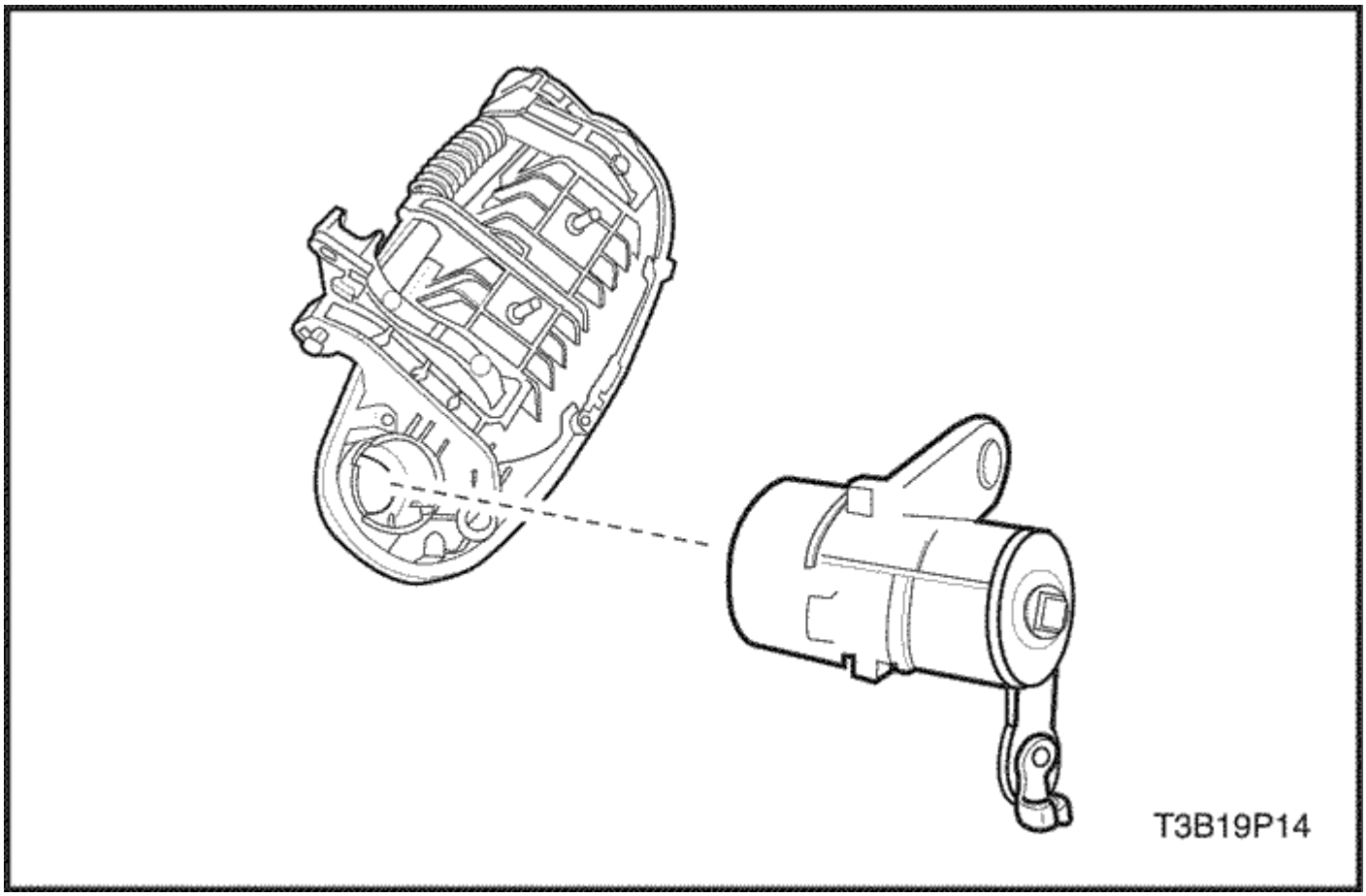
   Tighten
   Tighten the outside door handle bolts to 4.5 N•m (40 lb-in).

3. Install the door seal trim. Refer to "Door Seal Trim" in this section.



Door Lock Cylinder
Removal Procedure

1. Remove the door seal trim. Refer to "Door Seal Trim" in this section.
2. Disconnect the outside door handle and the lock rods.
3. Remove the retaining clip and the lock cylinder.

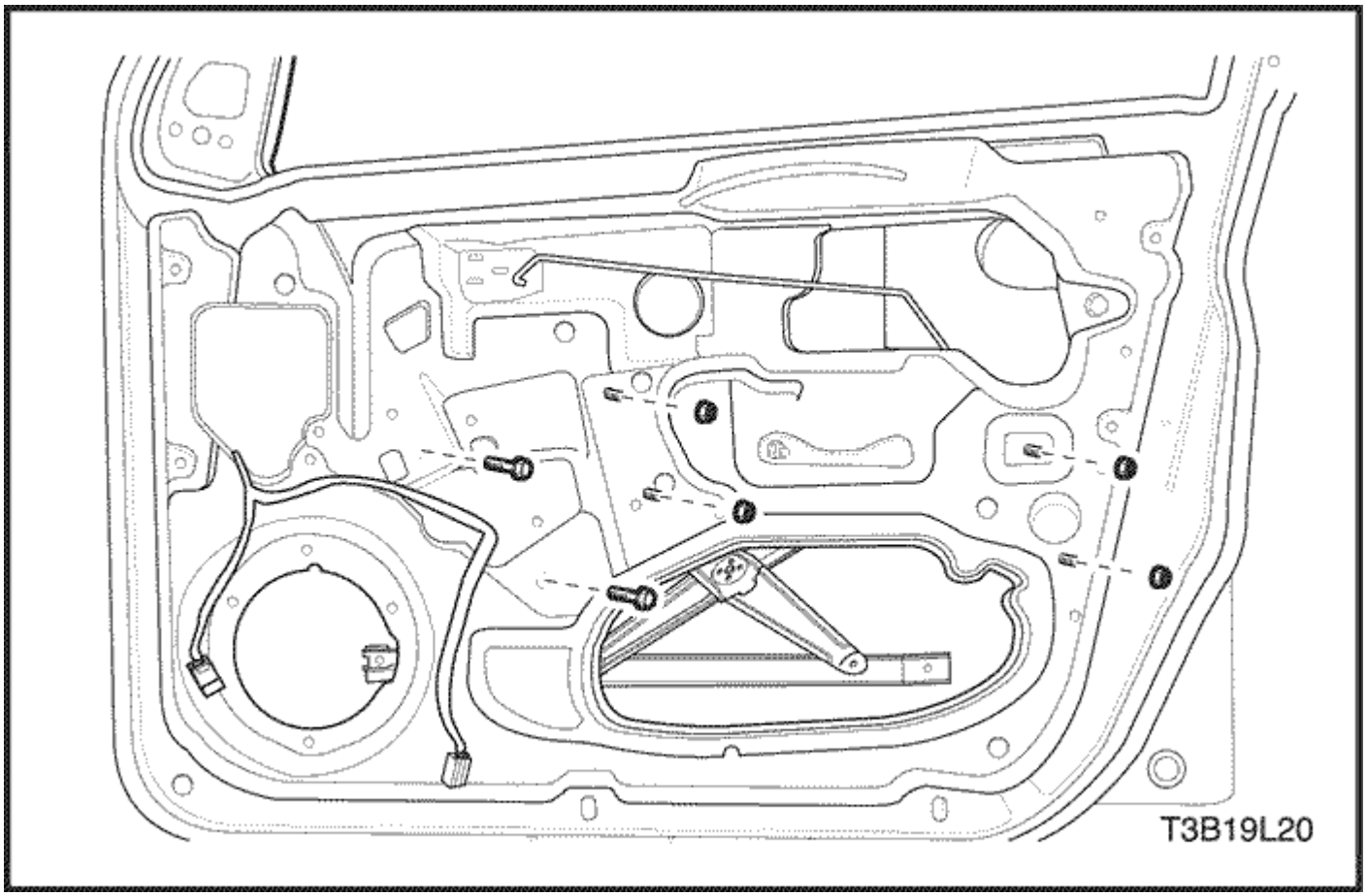


Installation Procedure

1. Install the lock cylinder with the retaining clip.
2. Connect the outside door handle and the lock rods.

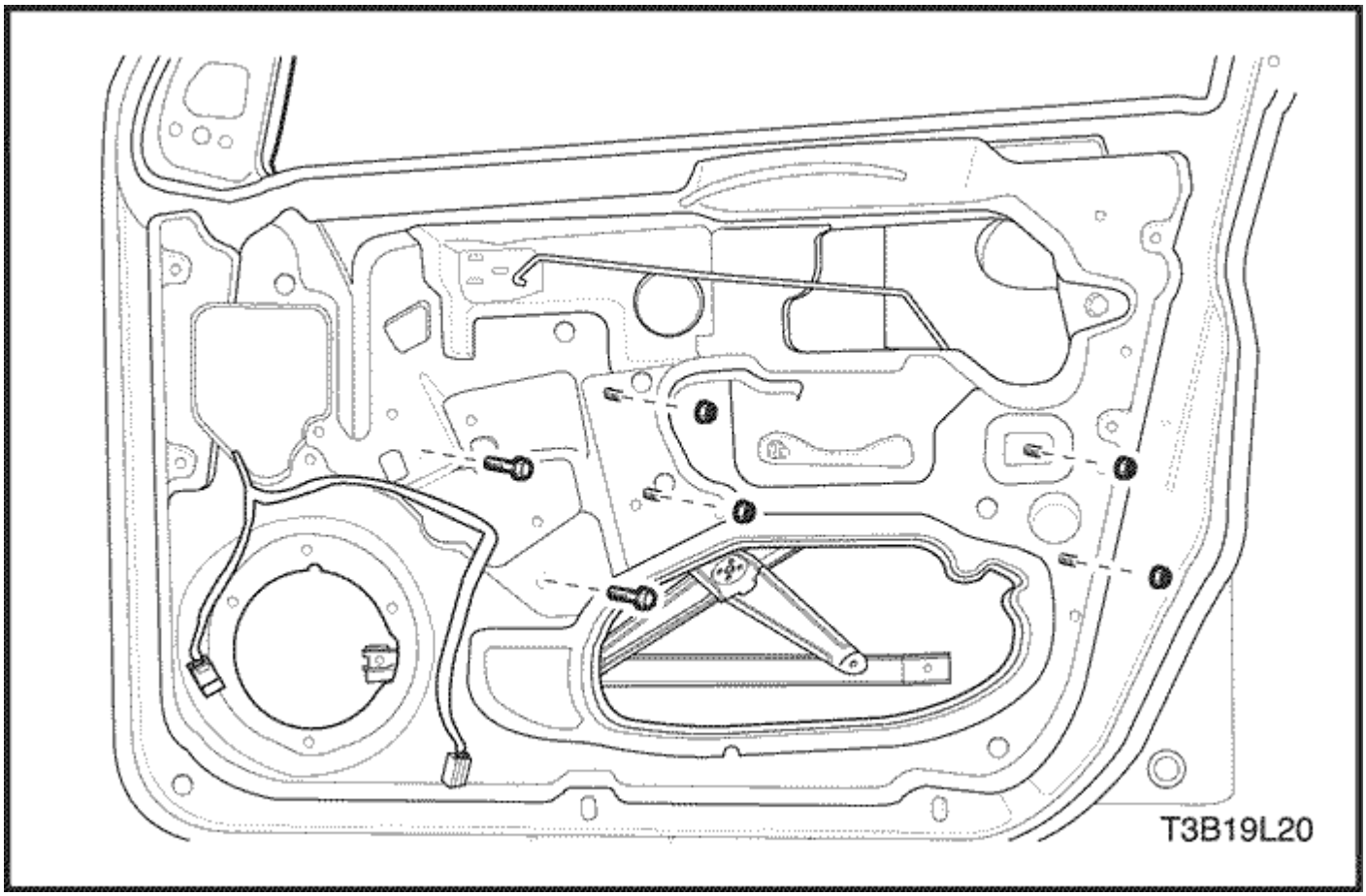
   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

3. Install the door seal trim. Refer to "Door Seal Trim" in this section.



Power Window Regulator
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the door glass. Refer to *Section 9L, Glass and Mirrors.*
3. Remove the nuts and the regulator.
4. Disconnect the electrical connector.



Installation Procedure

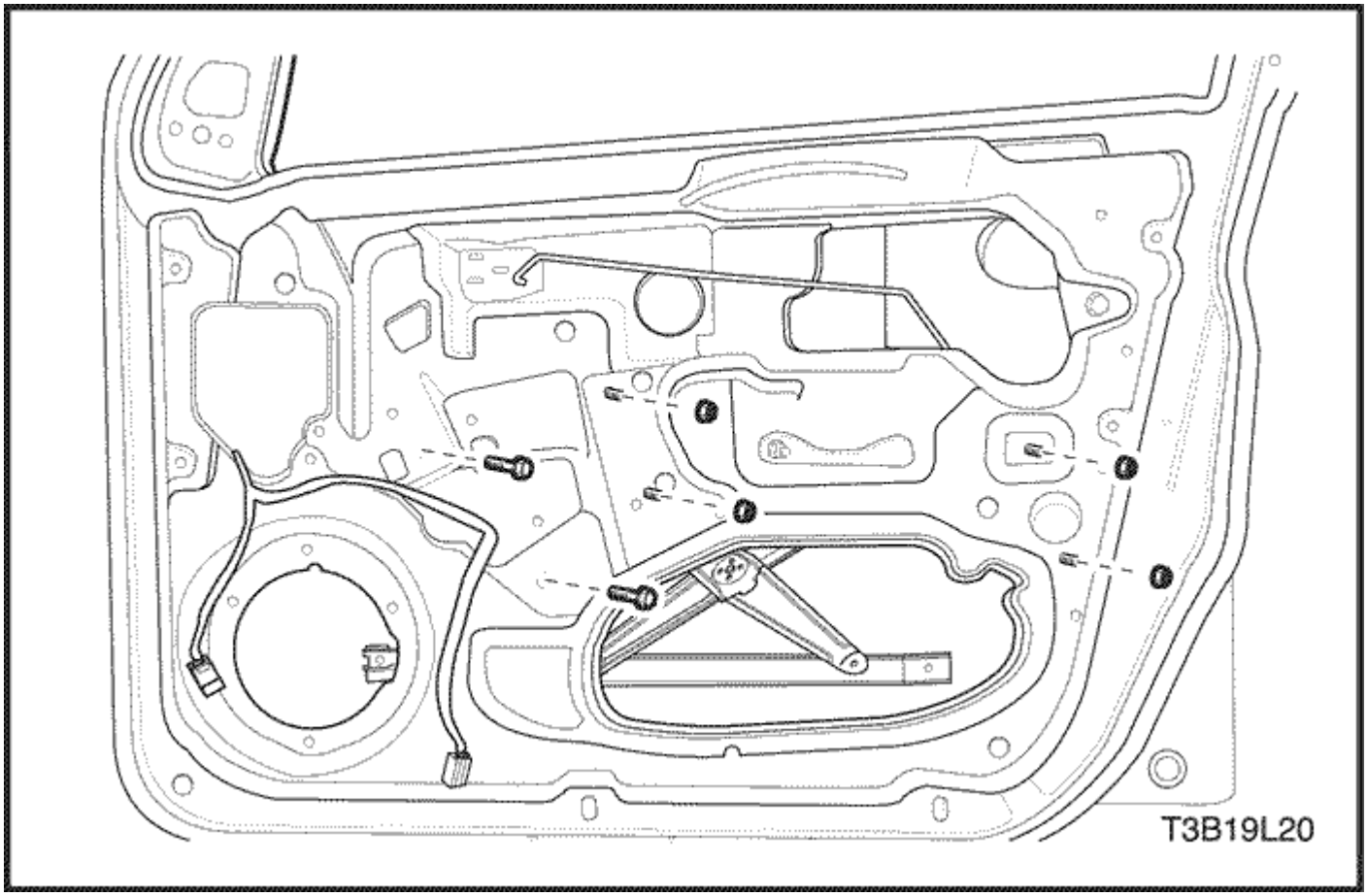
1. Connect the electrical connector.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the window regulator with the nuts.

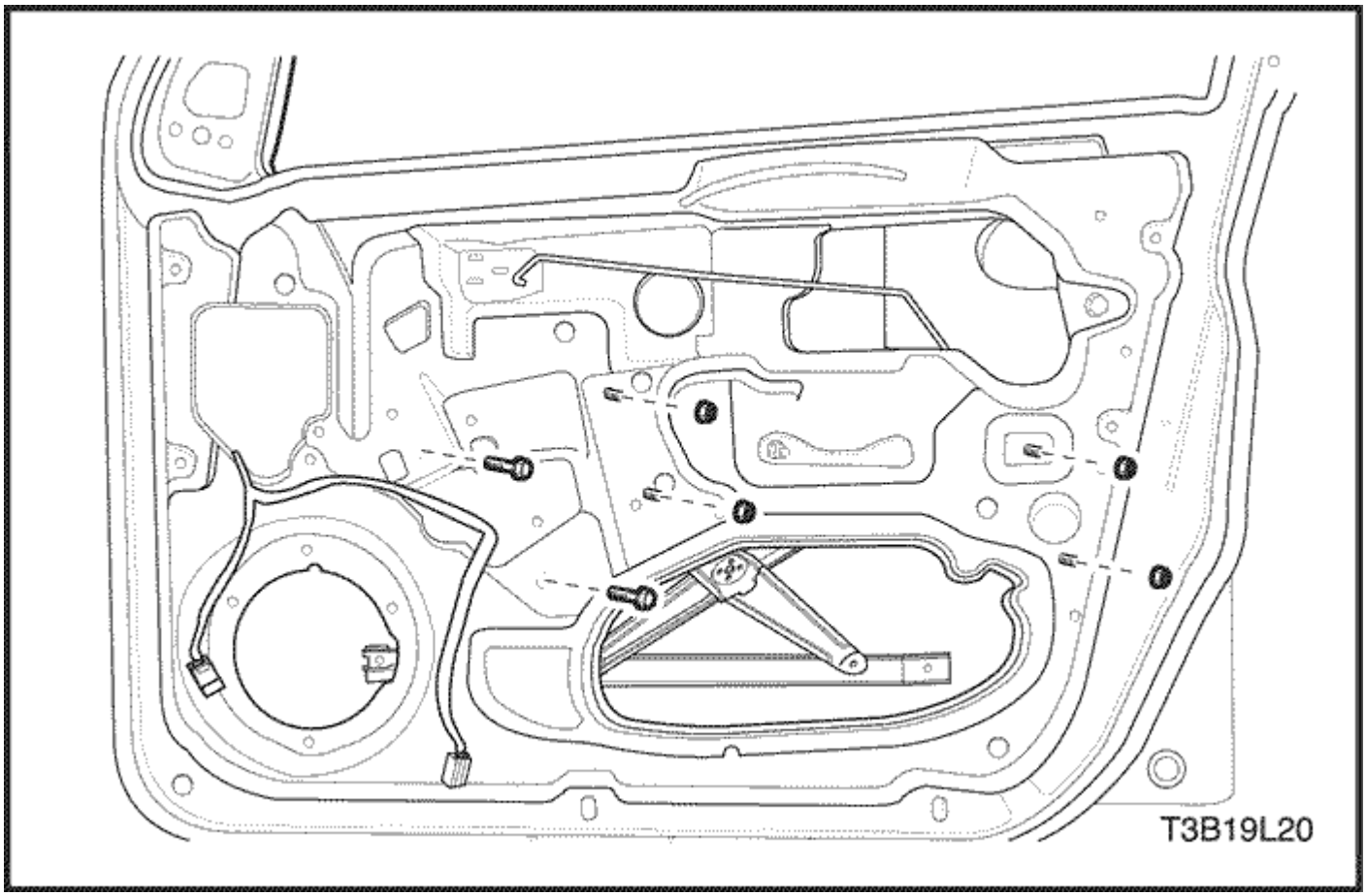
   Tighten
   Tighten the window regulator nuts to 7 N•m (62 lb-in).

3. Install the front door glass. Refer to *Section 9L, Glass and Mirrors.*
4. Connect the negative battery cable.



Manual Front Window Regulator
Removal Procedure

1. Remove the front door glass. Refer to *Section 9L, Glass and Mirrors.*
2. Remove the nuts and the window regulator.



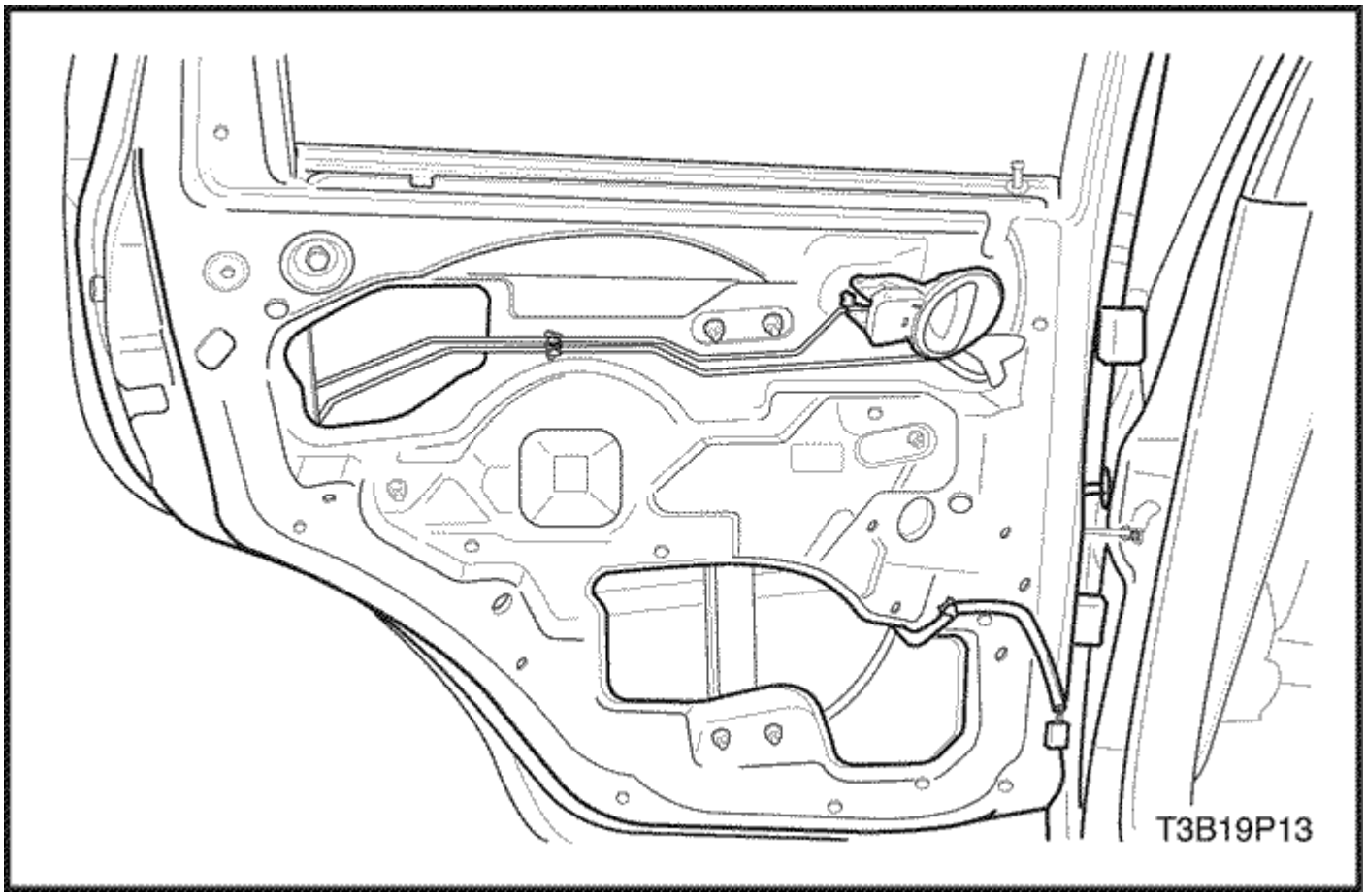
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the window regulator and the nuts.

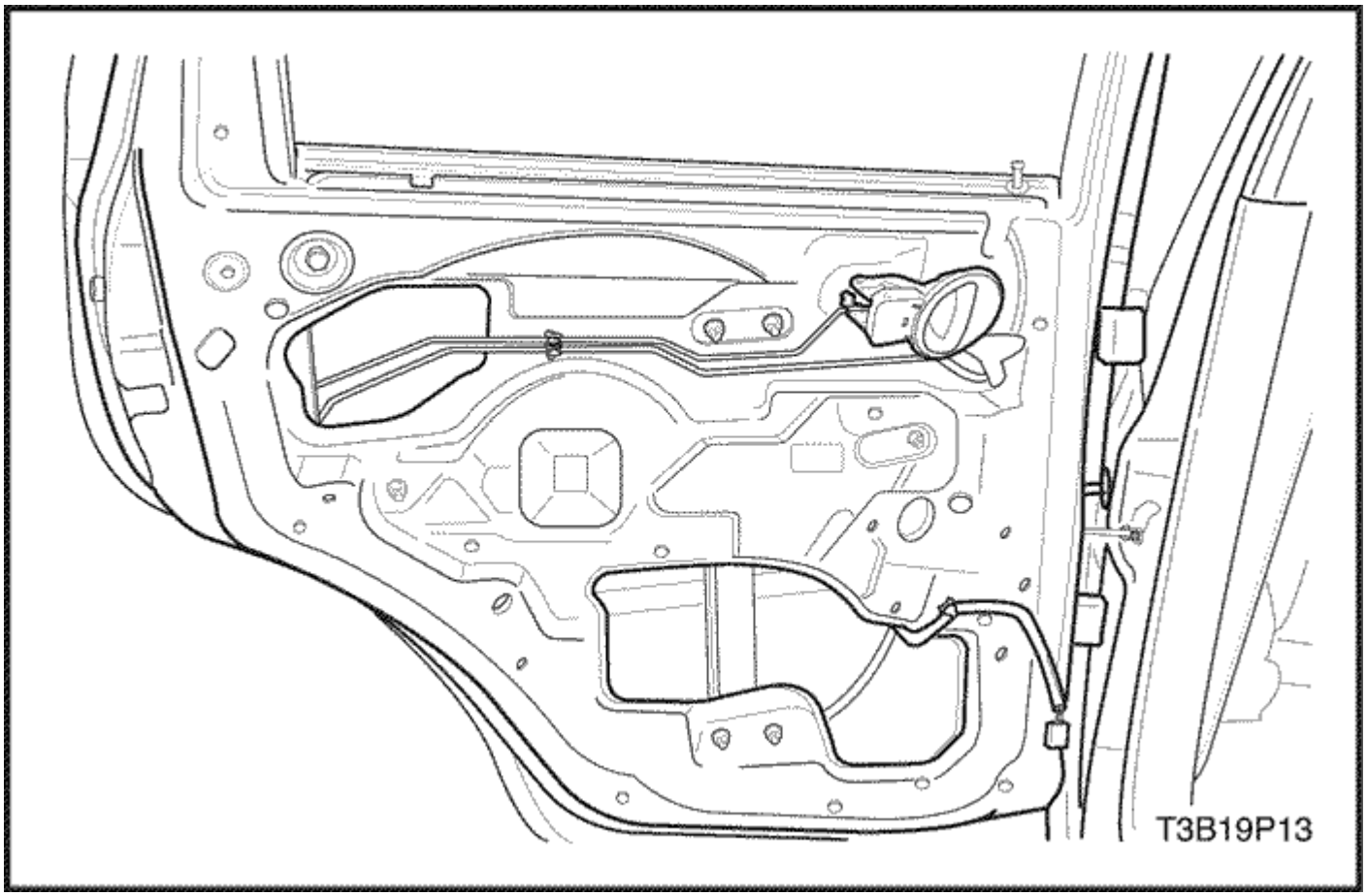
   Tighten
   Tighten the window regulator nuts to 7 N•m (62 lb-in).

2. Install the front door glass. Refer to *Section 9L, Glass and Mirrors.*



Manual Rear Window Regulator
Removal Procedure

1. Remove the rear door glass. Refer to *Section 9L, Glass and Mirrors.*
2. Remove the nuts and the window regulator.



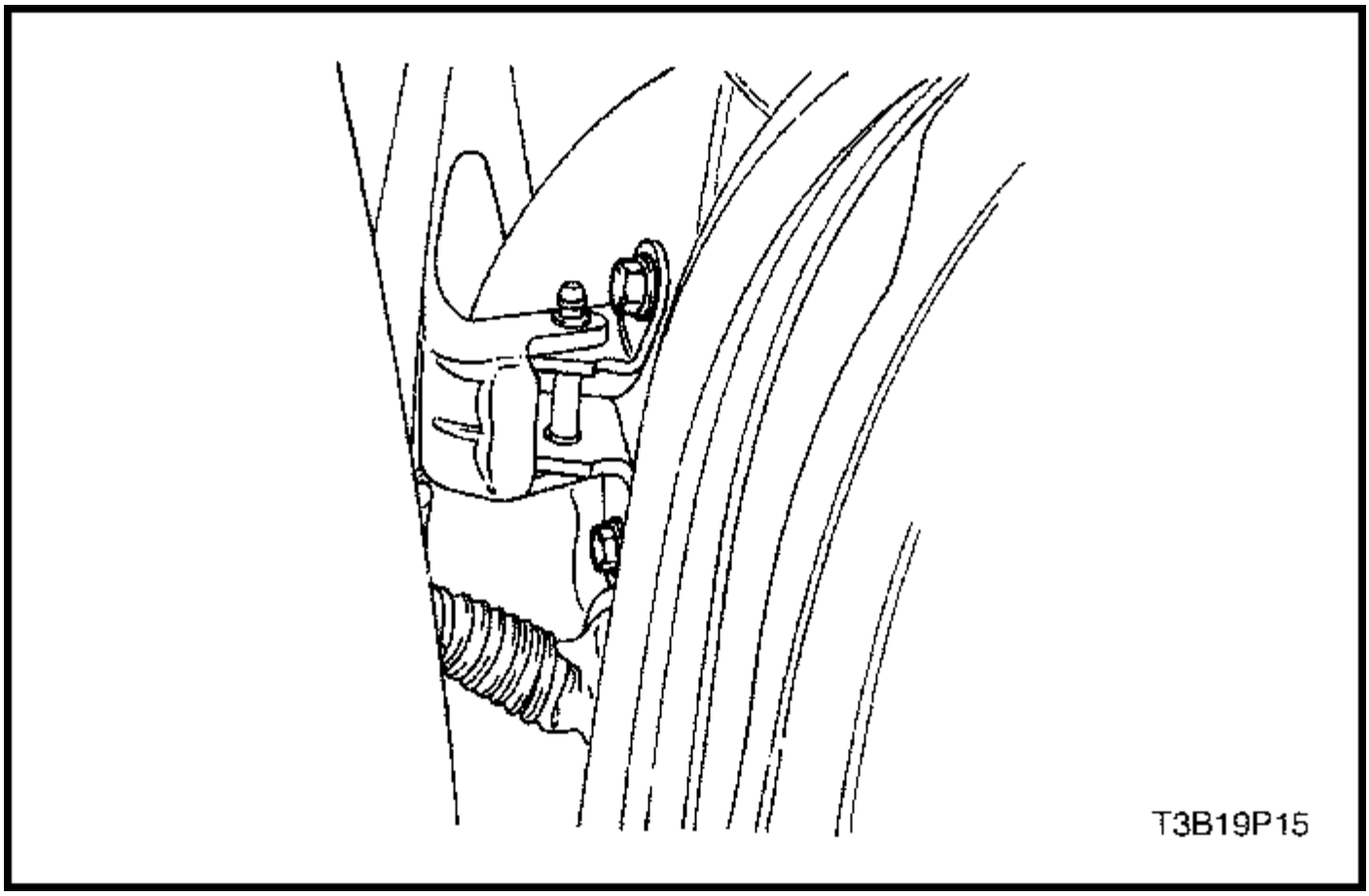
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the window regulator with the nuts.

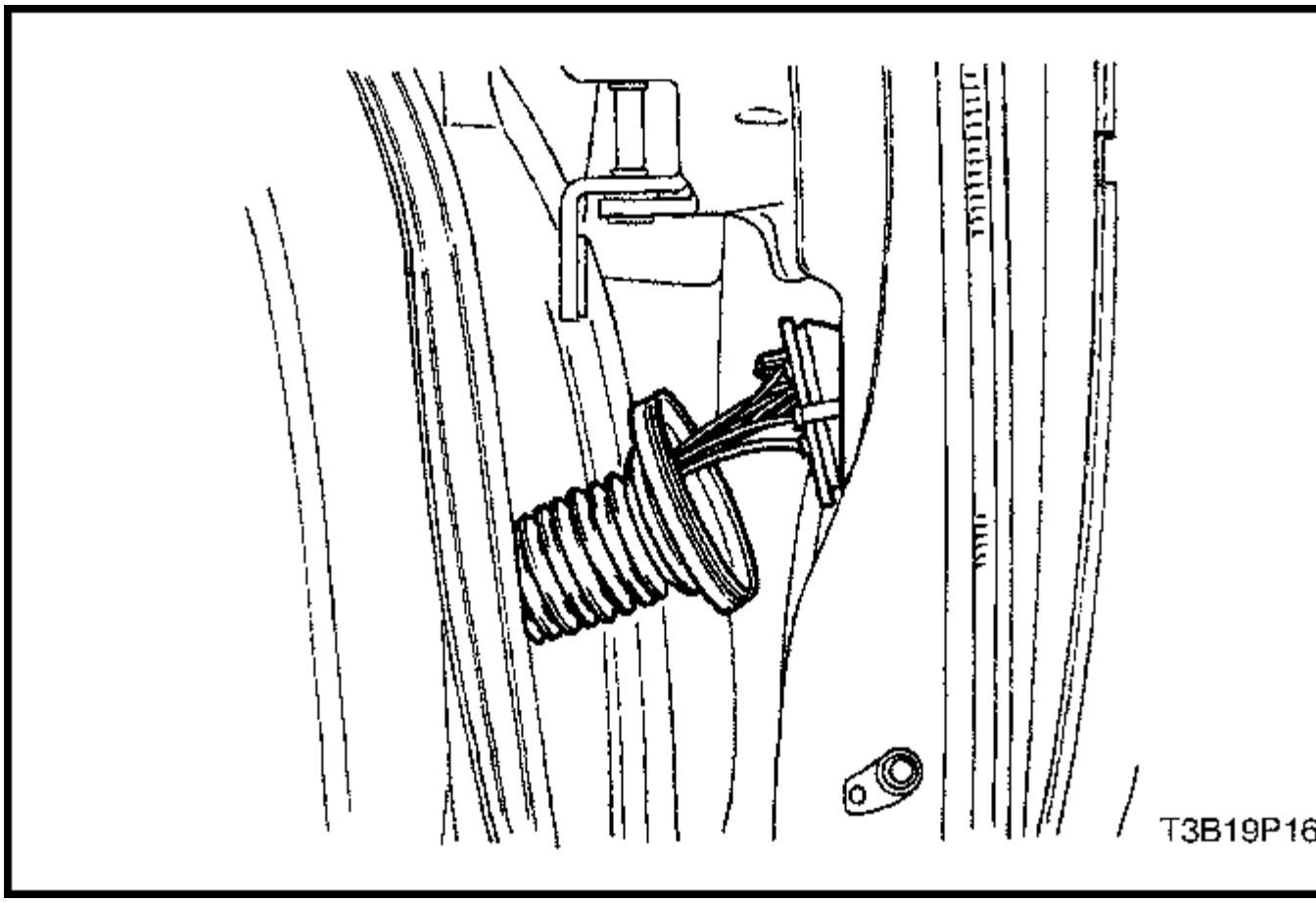
   Tighten
   Tighten the window regulator nuts to 7 N•m (62 lb-in).

2. Install the rear door glass. Refer to *Section 9L, Glass and Mirrors.*

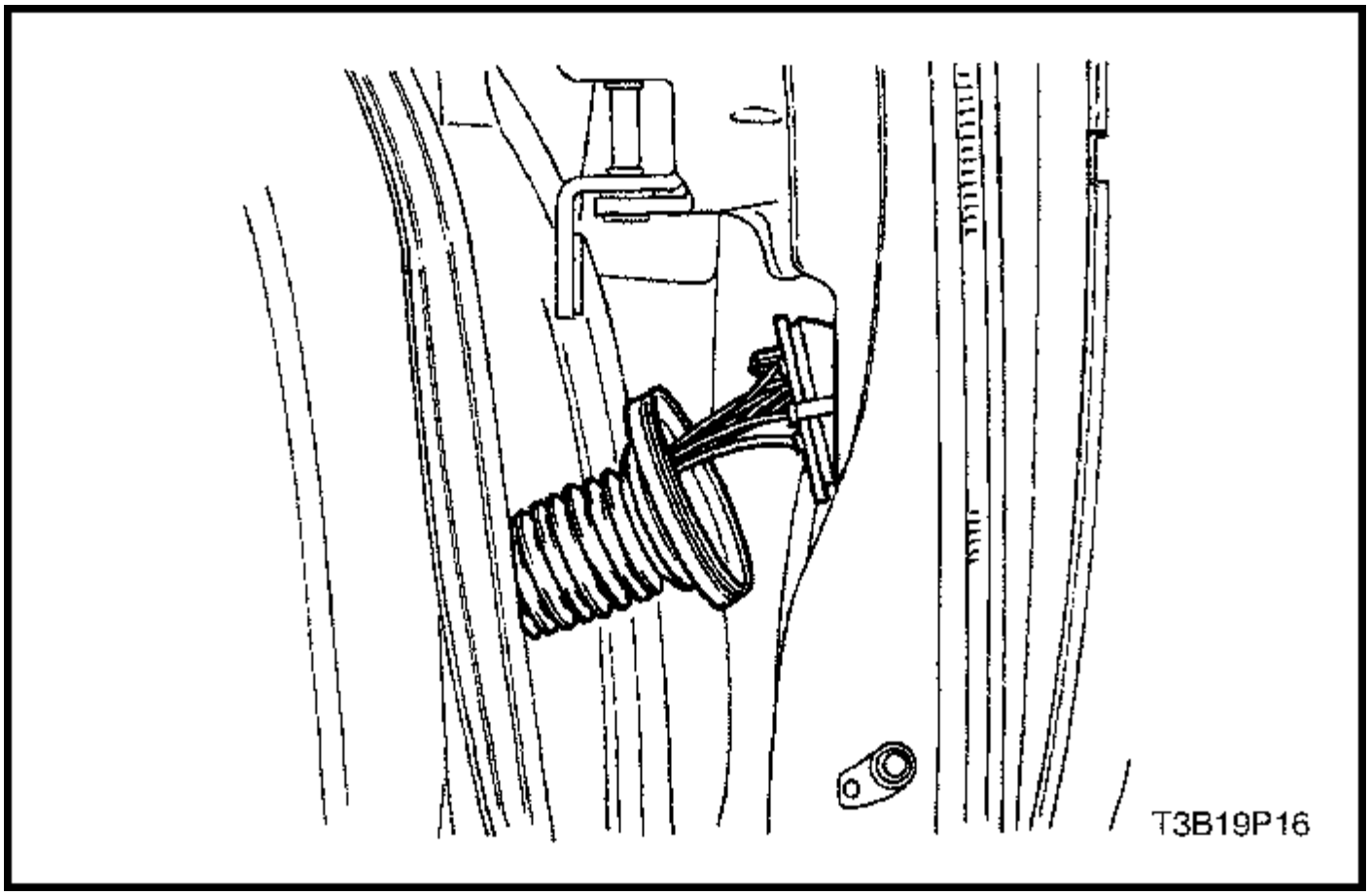


Front Door Assembly
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the door hold open link. Refer to "Door Hold Open Link" in this section.
3. Remove the body-to-door rubber grommet and the electrical wires.
4. With the aid of another technician, remove the bolts and the front door.

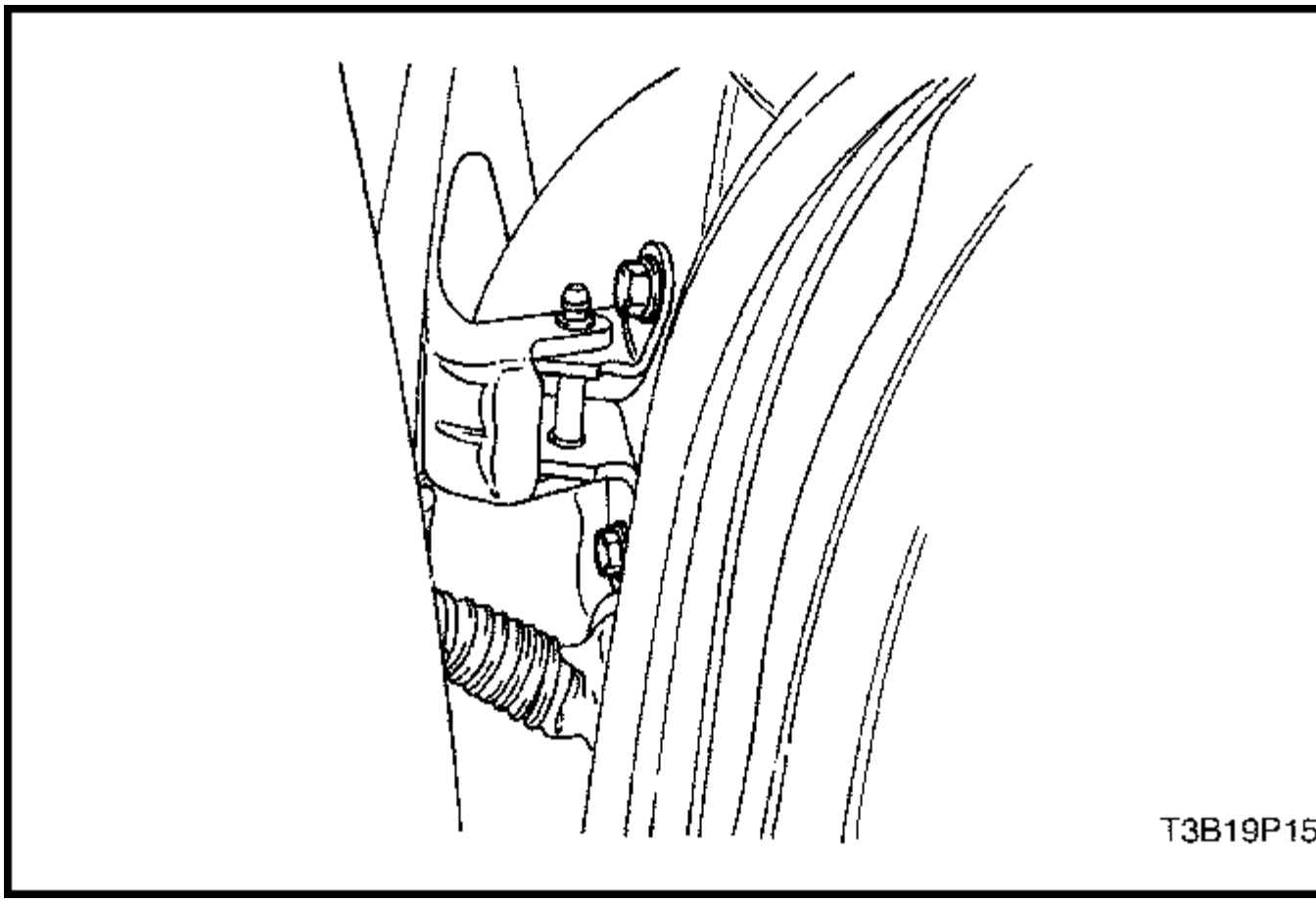


5. Disconnect the body-to-door rubber grommet and the electrical connector.



Installation Procedure

1. Connect the electrical connector and the body-to-door rubber grommet.



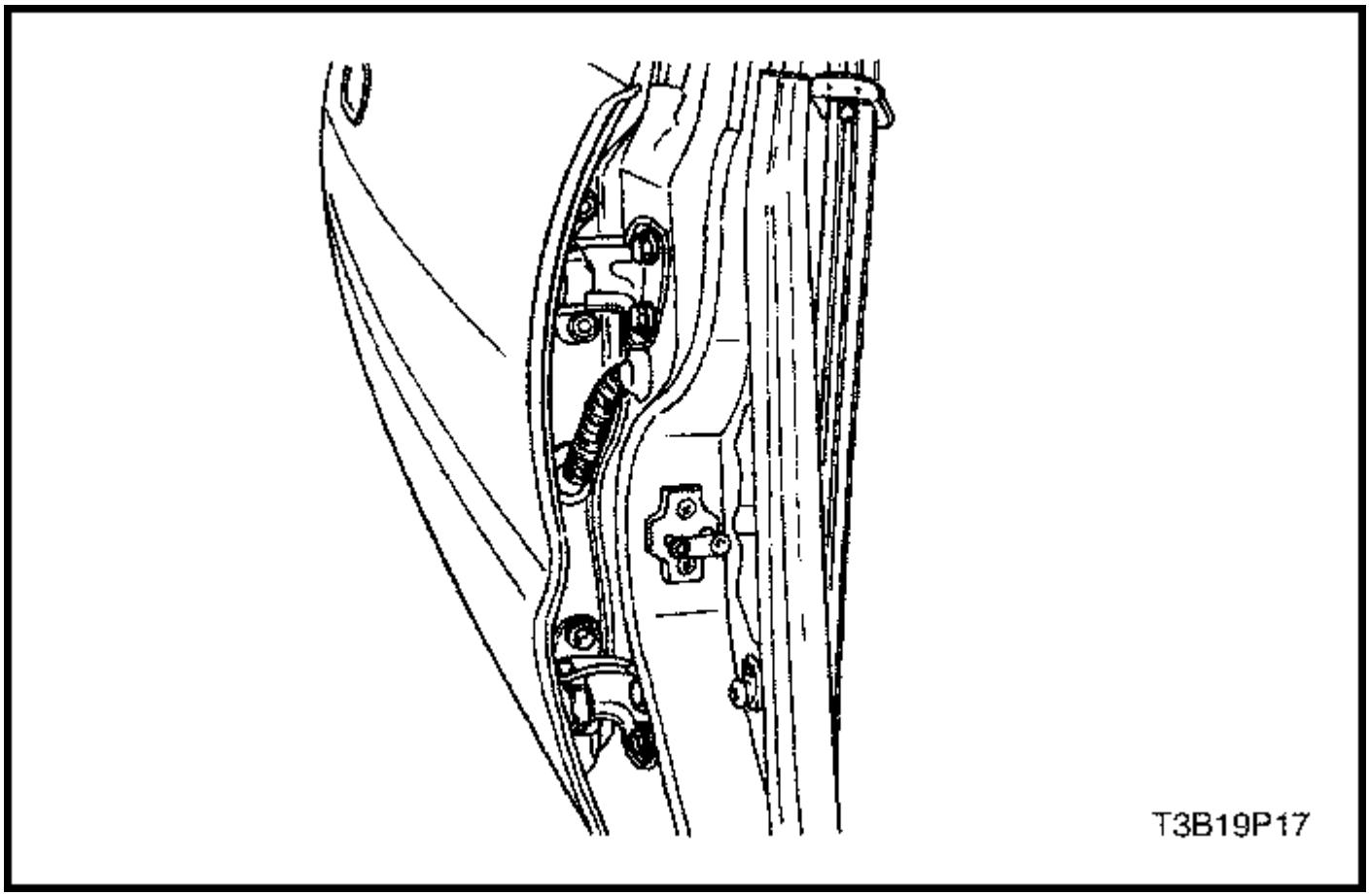
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. With the aid of another technician, lightly secure the front door with the bolts.
3. Adjust the door for proper fit.

   Tighten
   Tighten the door hinge-to-body bolts to 35 N•m (26 lb-ft).
   Tighten the door hinge-to-door bolts to 15 N•m (11 lb-ft).

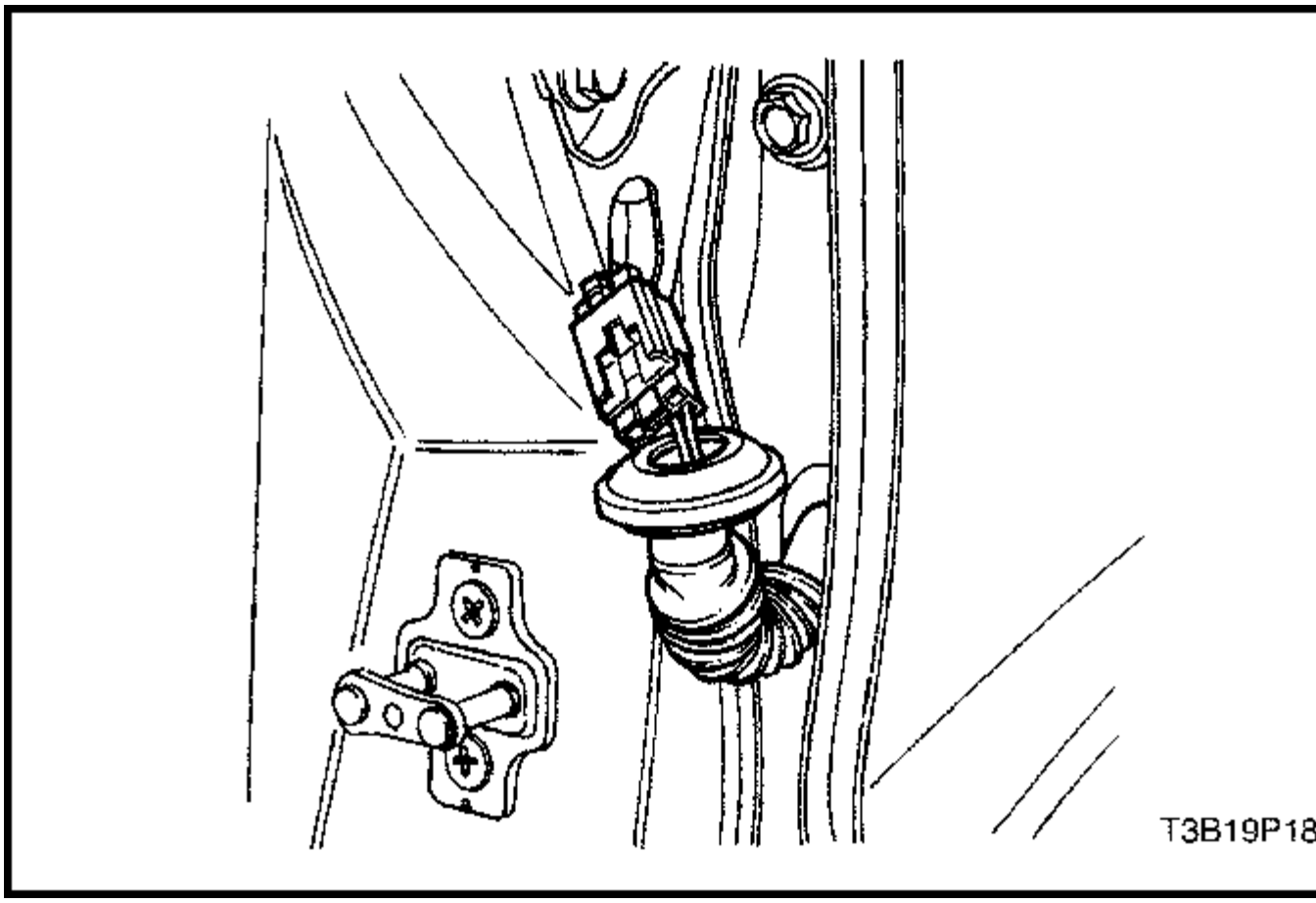
4. Install the door hold open link. Refer to "Door Hold Open Link" in this section.
5. Connect the negative battery cable.
6. Perform the waterleak test. Refer to *Section 9I, Waterleaks.*

7. Check for windnoise. Refer to *Section 9J, Windnoise.*

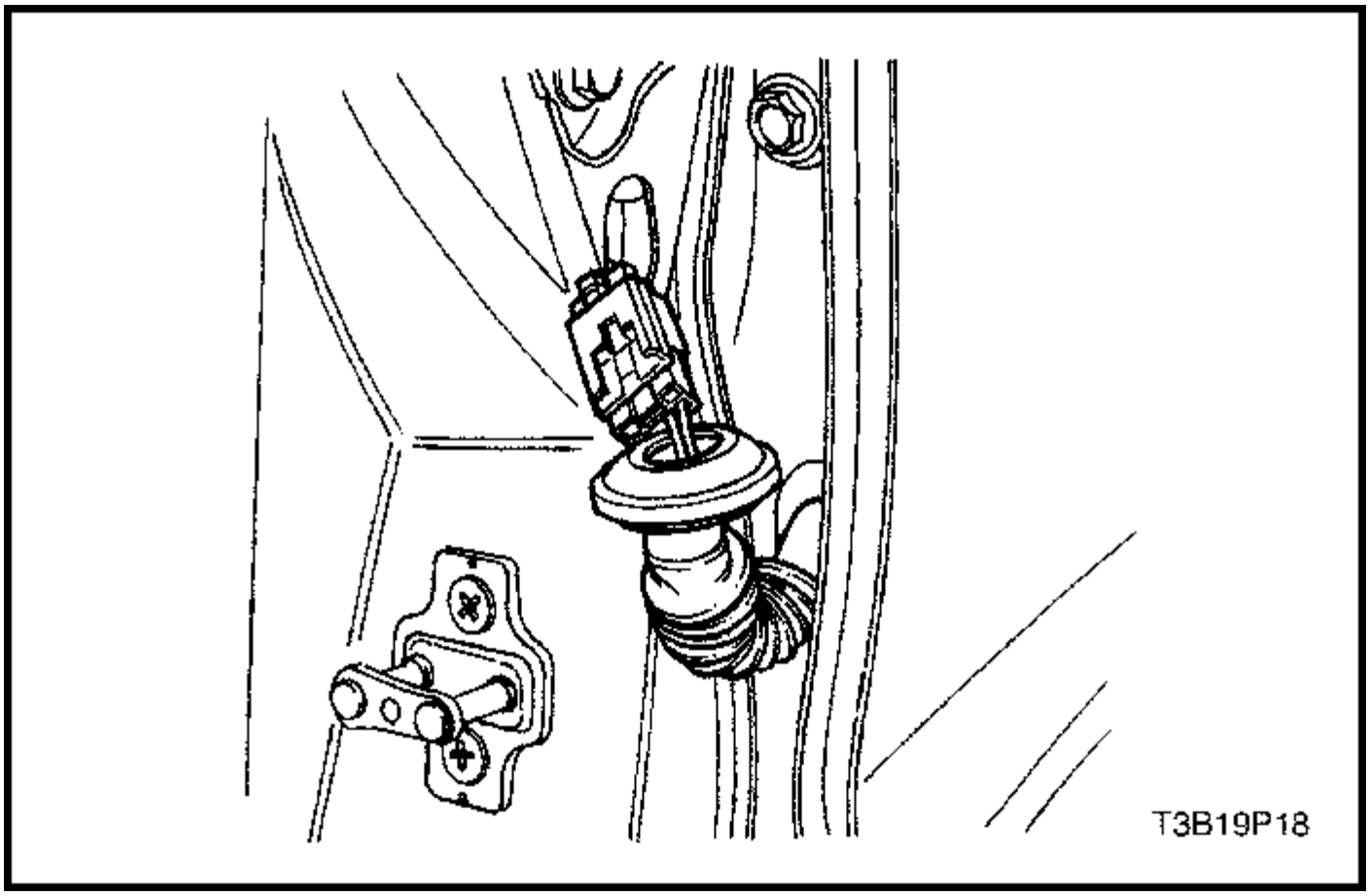


Rear Door Assembly
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the door hold open link. Refer to "Door Hold Open Link" in this section.
3. With the aid of another technician, remove the bolts and the rear door.

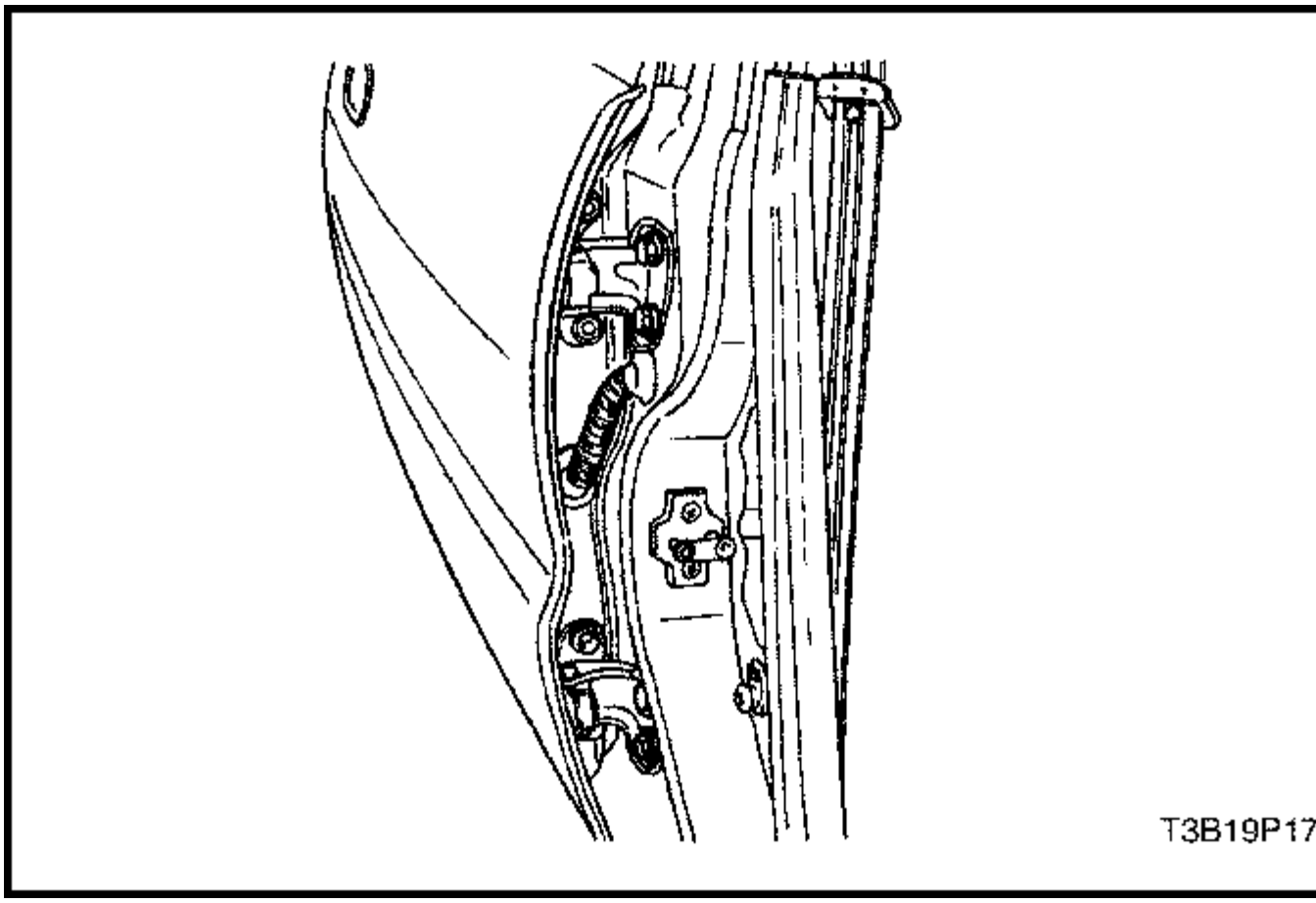


4. Disconnect the body-to-door rubber grommet and the electrical connector.



Installation Procedure

1. Connect the body-to-door rubber grommet and the electrical connector.



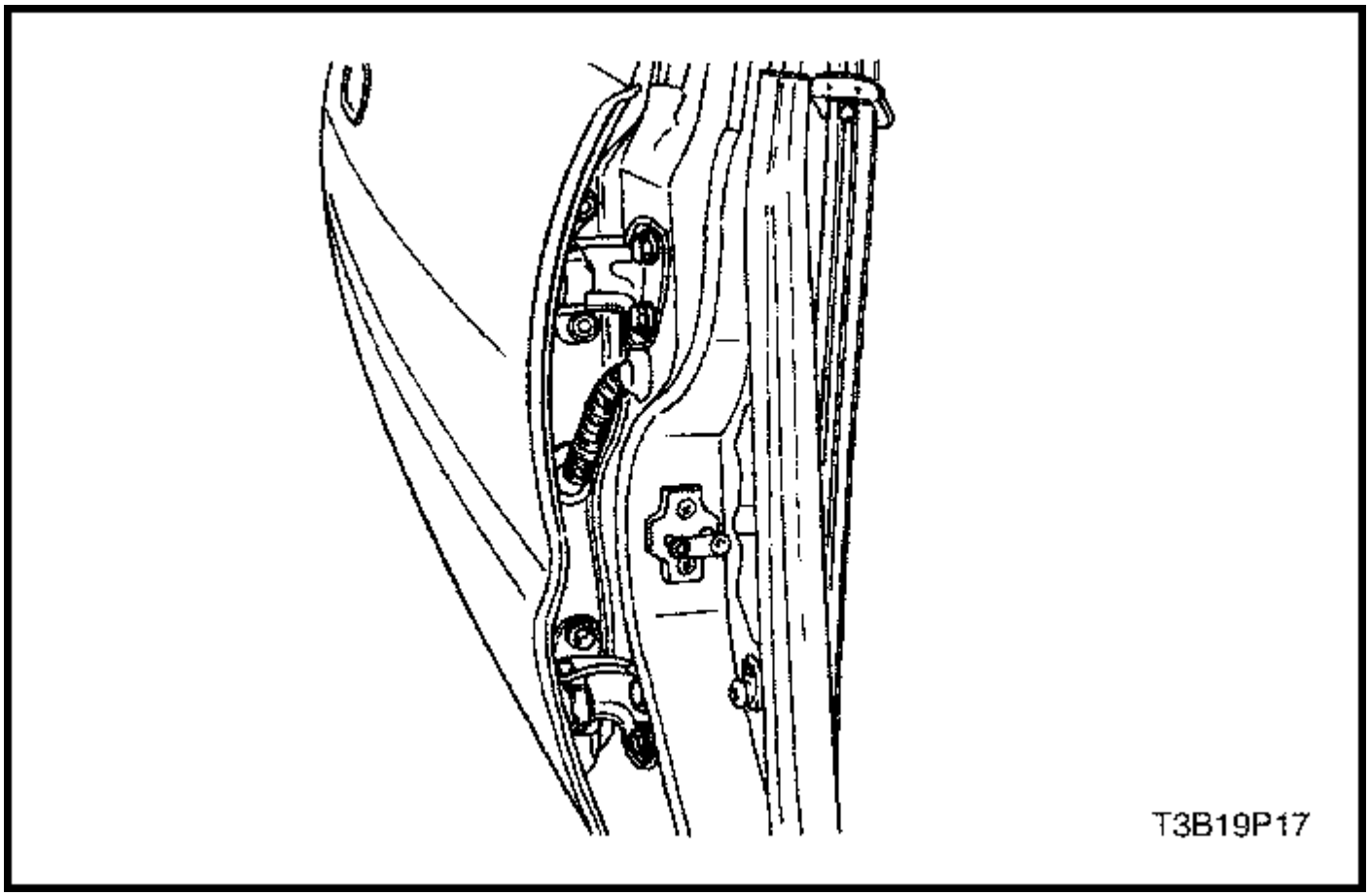
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. With the aid of another technician, lightly secure the rear door with the bolts.
3. Adjust the door for proper fit.

   Tighten
   Tighten the door hinge-to-body bolts to 35 N•m (26 lb-ft).
   Tighten the door hinge-to-door bolts to 15 N•m (11 lb-ft).

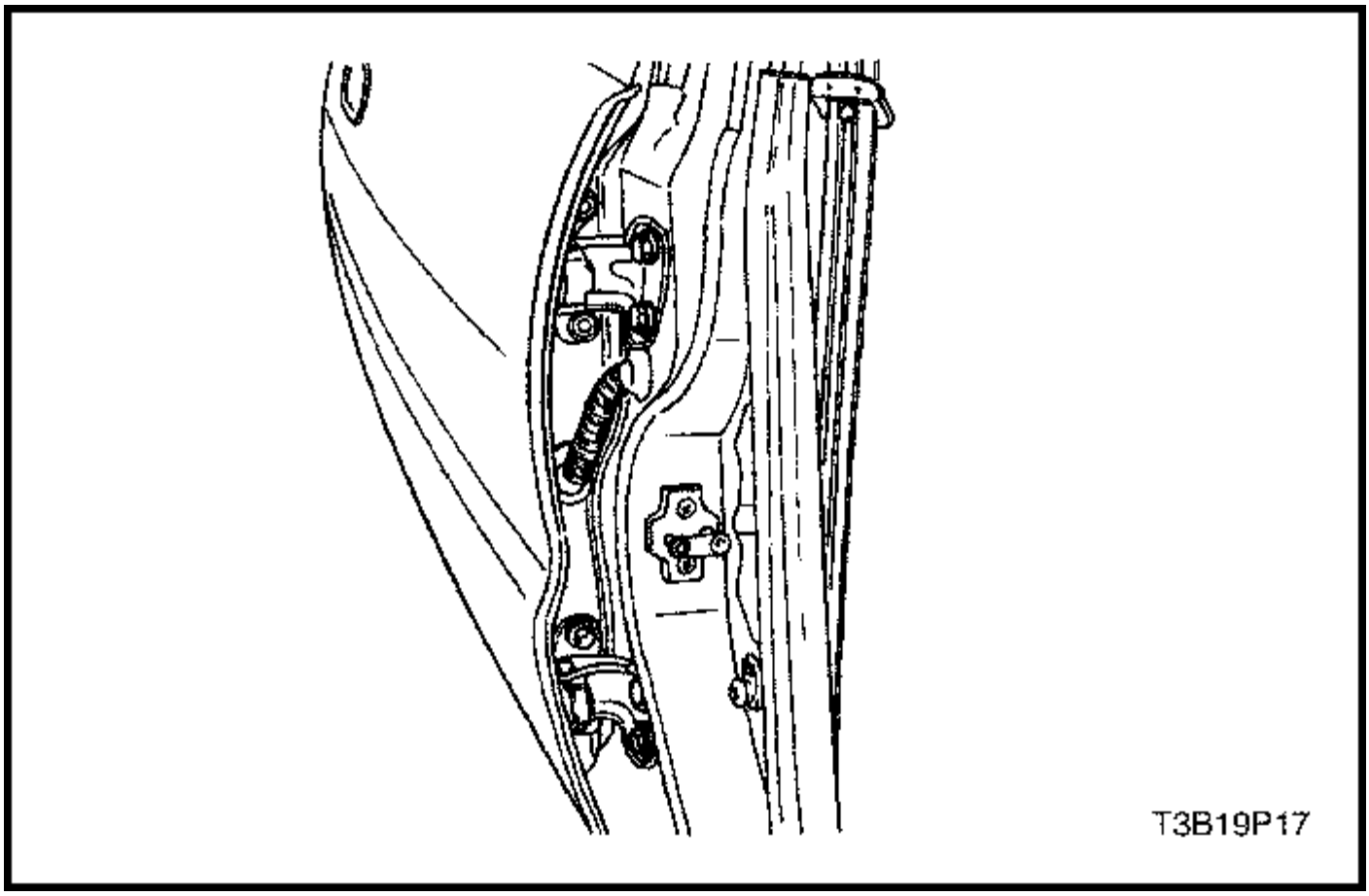
4. Install the rear door hold open link. Refer to "Door Hold Open Link" in this section.
5. Connect the negative battery cable.
6. Perform the waterleak test. Refer to *Section 9I, Waterleaks.*

7. Check for windnoise. Refer to *Section 9J, Windnoise.*



Door Hinge
Removal Procedure

1. With the aid of another technician, remove the bolts and the hinge from the door and the body.

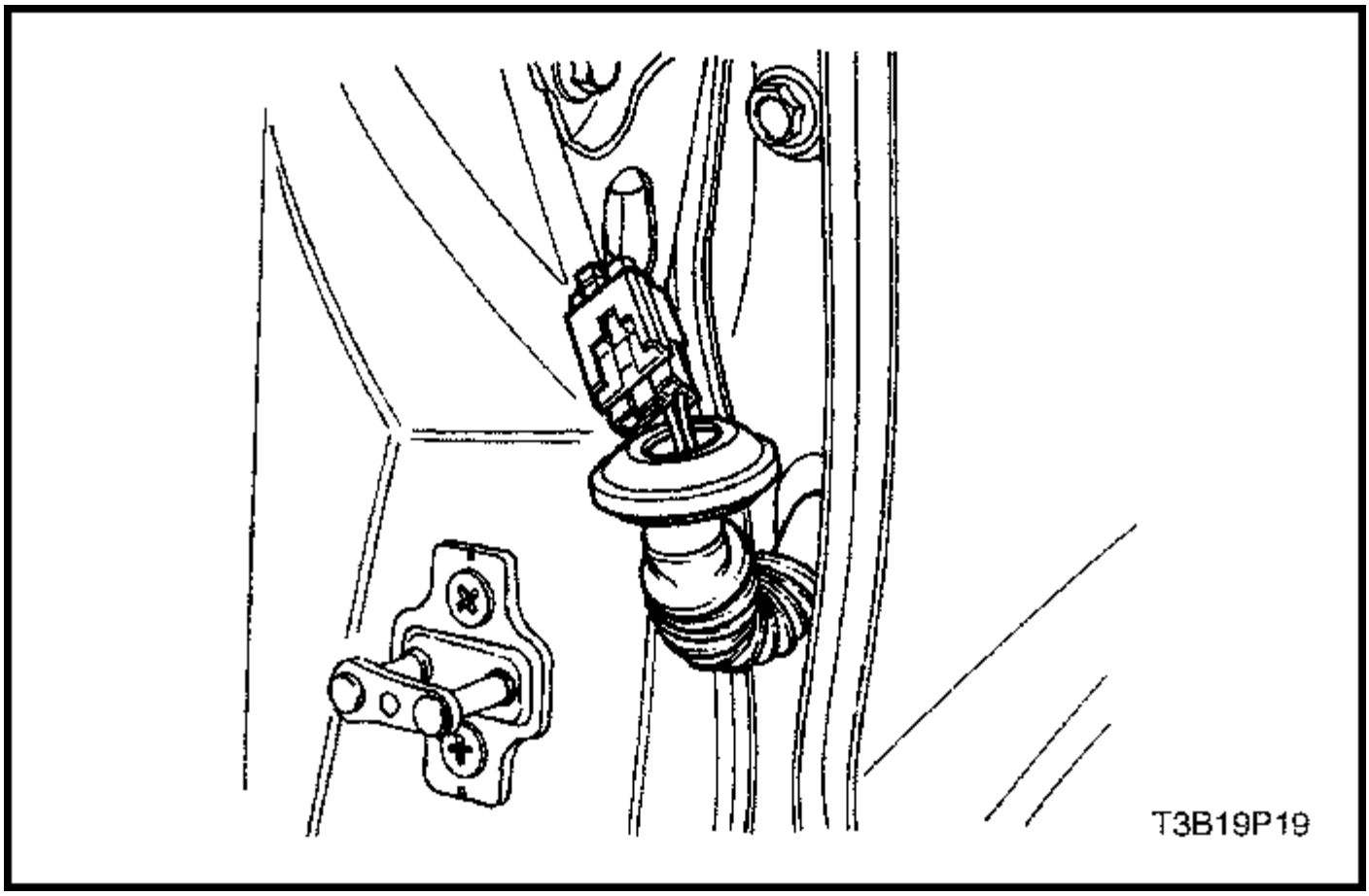


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

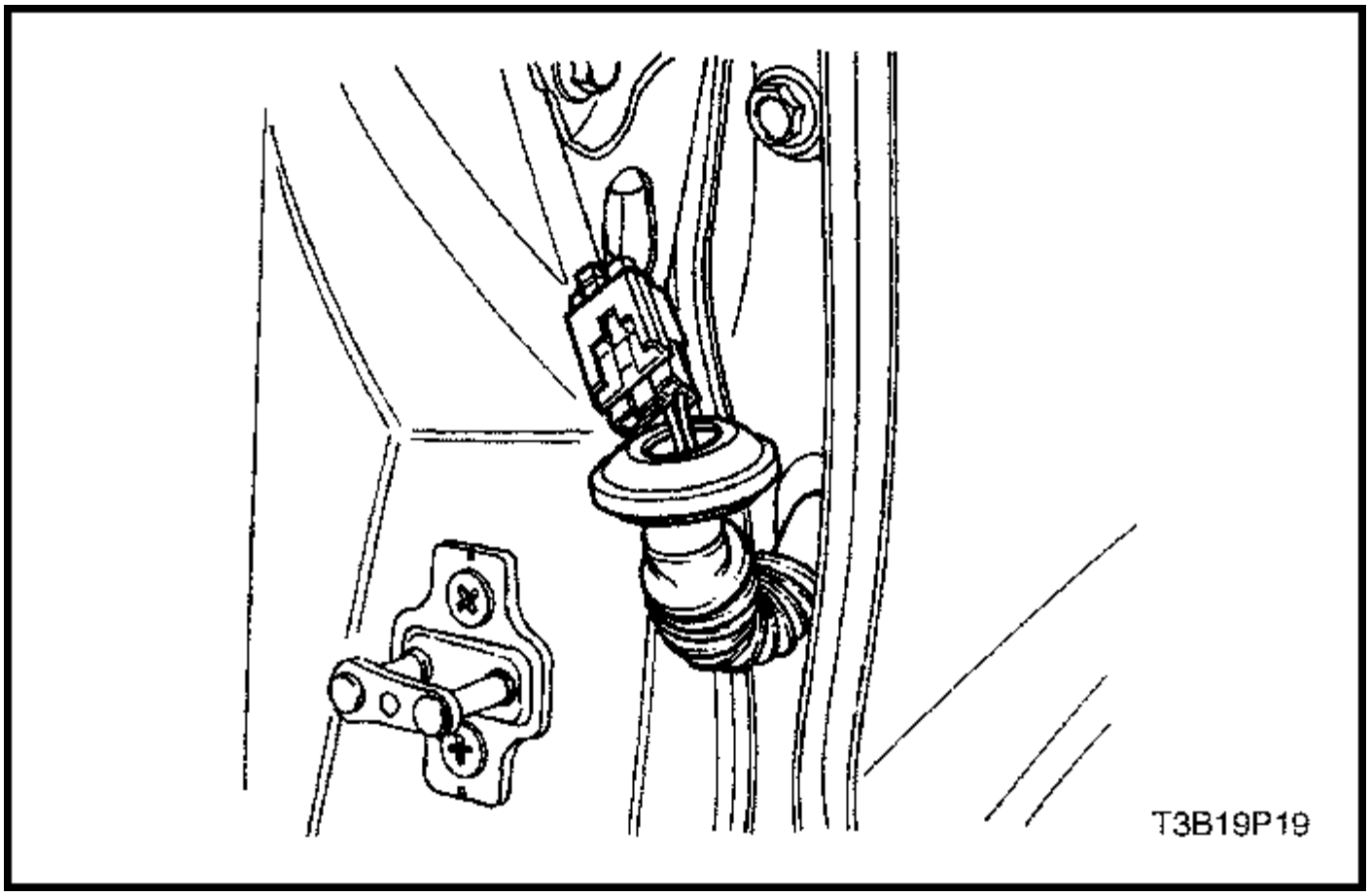
1. With the aid of another technician, install the hinge to the door and the body with the bolts.

   Tighten
   Tighten the door hinge-to-body bolts to 35 N•m (26 lb-ft).
   Tighten the door hinge-to-door bolts to 15 N•m (11 lb-ft).



Door Hold Open Link
Removal Procedure

1. Remove the door trim panel. Refer to *Section 9G, Interior Trim.*
2. Reposition the door seal trim.
3. Remove the bolts on the door and on the body.
4. Remove the door hold open link.



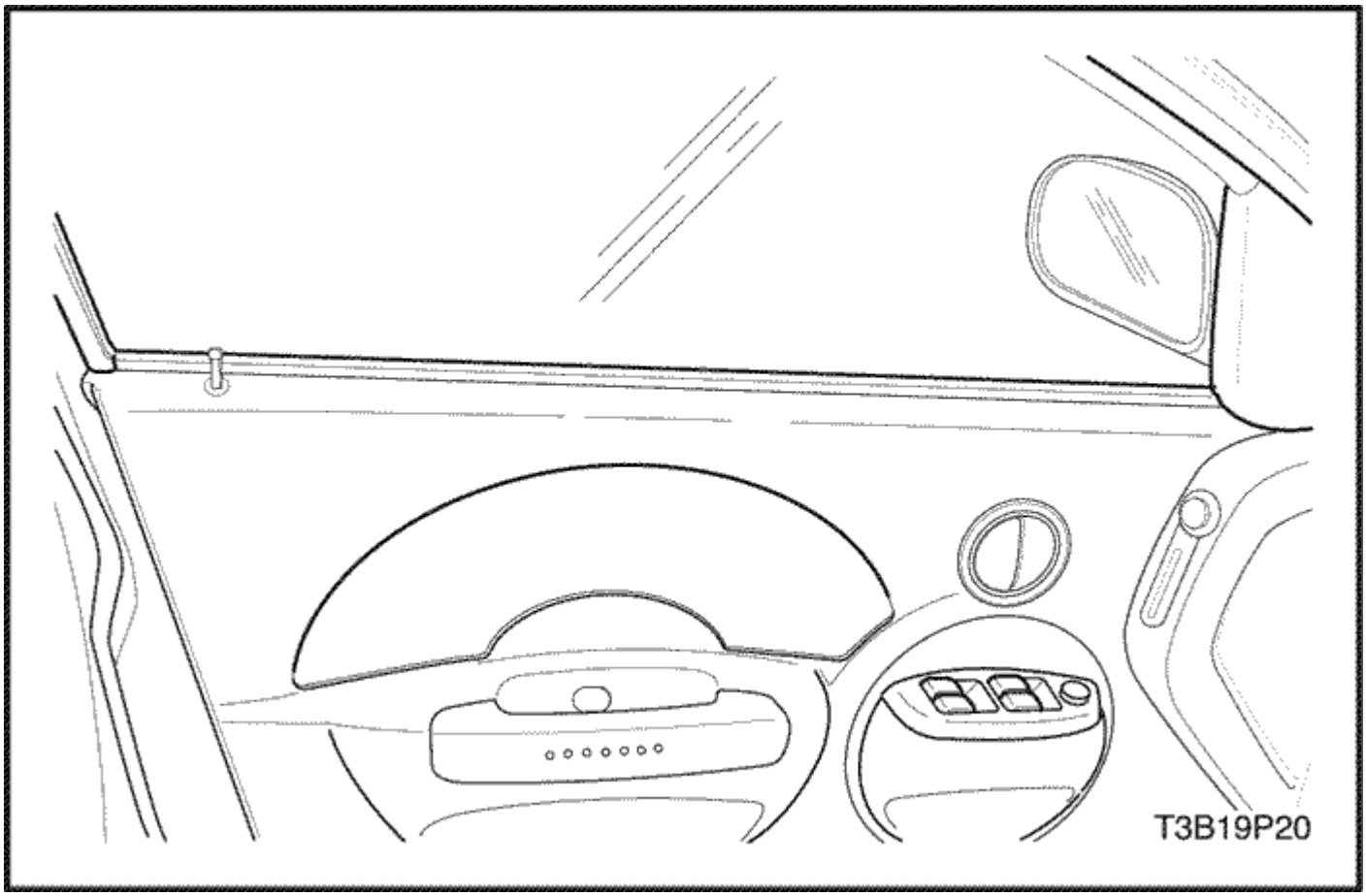
Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the door hold open link to the door and the body with the bolts.

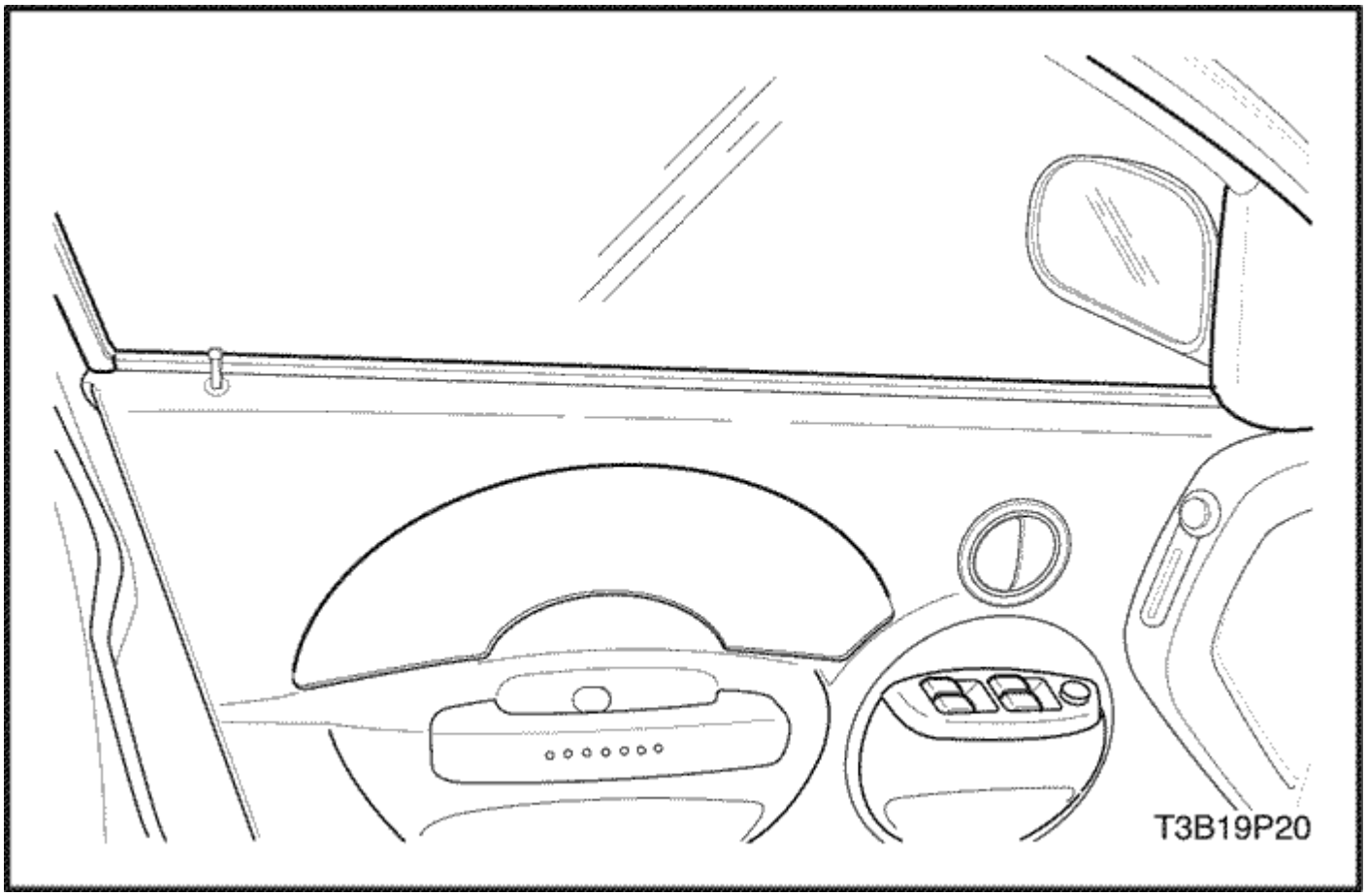
   Tighten
   Tighten the door hold open link-to-body bolts to 35 N•m (26 lb-ft).
   Tighten the door hold open link-to-door bolts to 5 N•m (44 lb-in).

2. Reposition the door seal trim.
3. Install the door trim panel. Refer to *Section 9G, Interior Trim.*



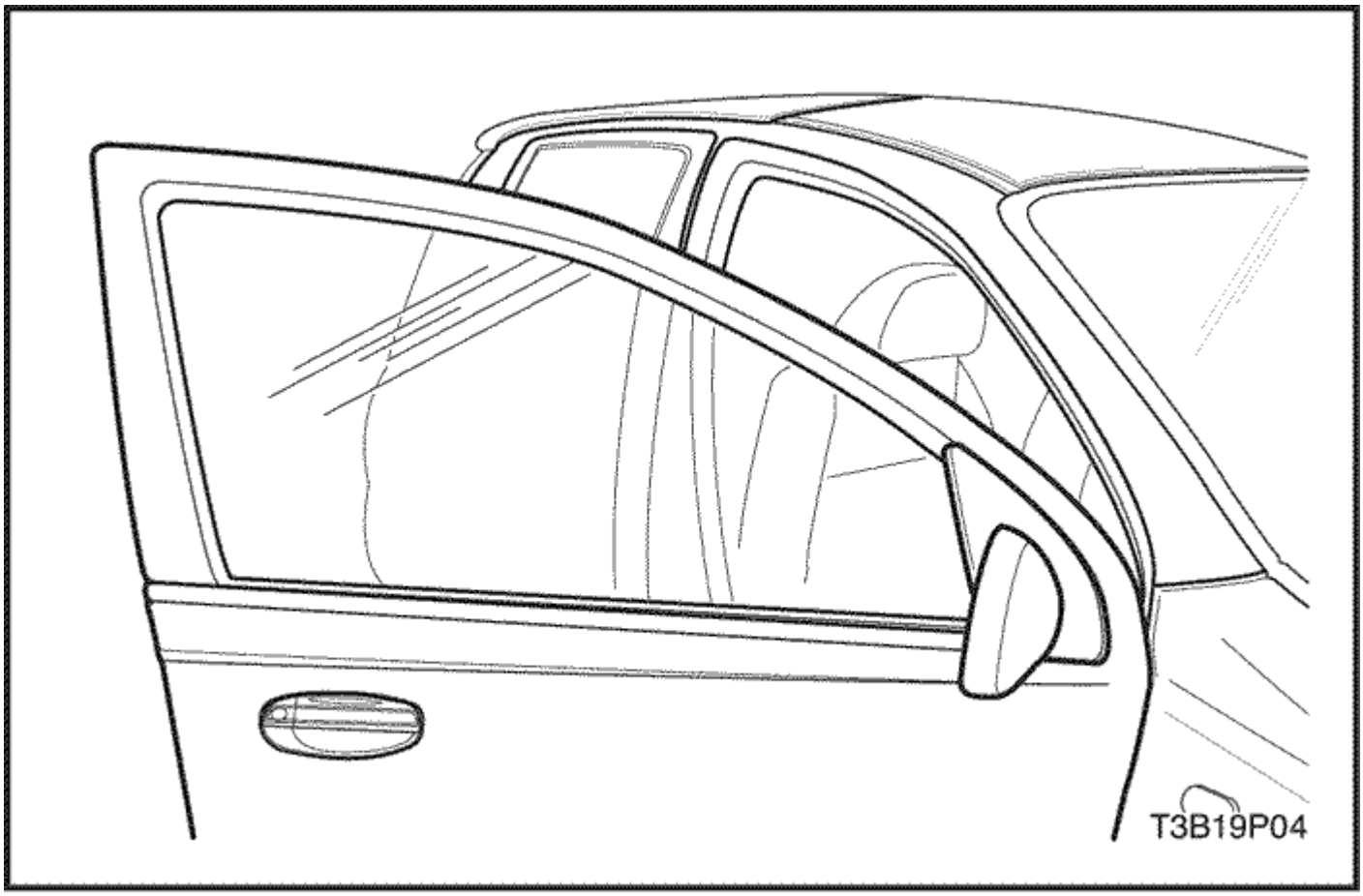
Inside Channel Molding
Removal Procedure

1. Remove the door trim panel. Refer to *Section 9G, Interior Trim.*
2. Straighten the retaining tabs in order to release the channel molding from the door trim panel.
3. Remove the channel molding.



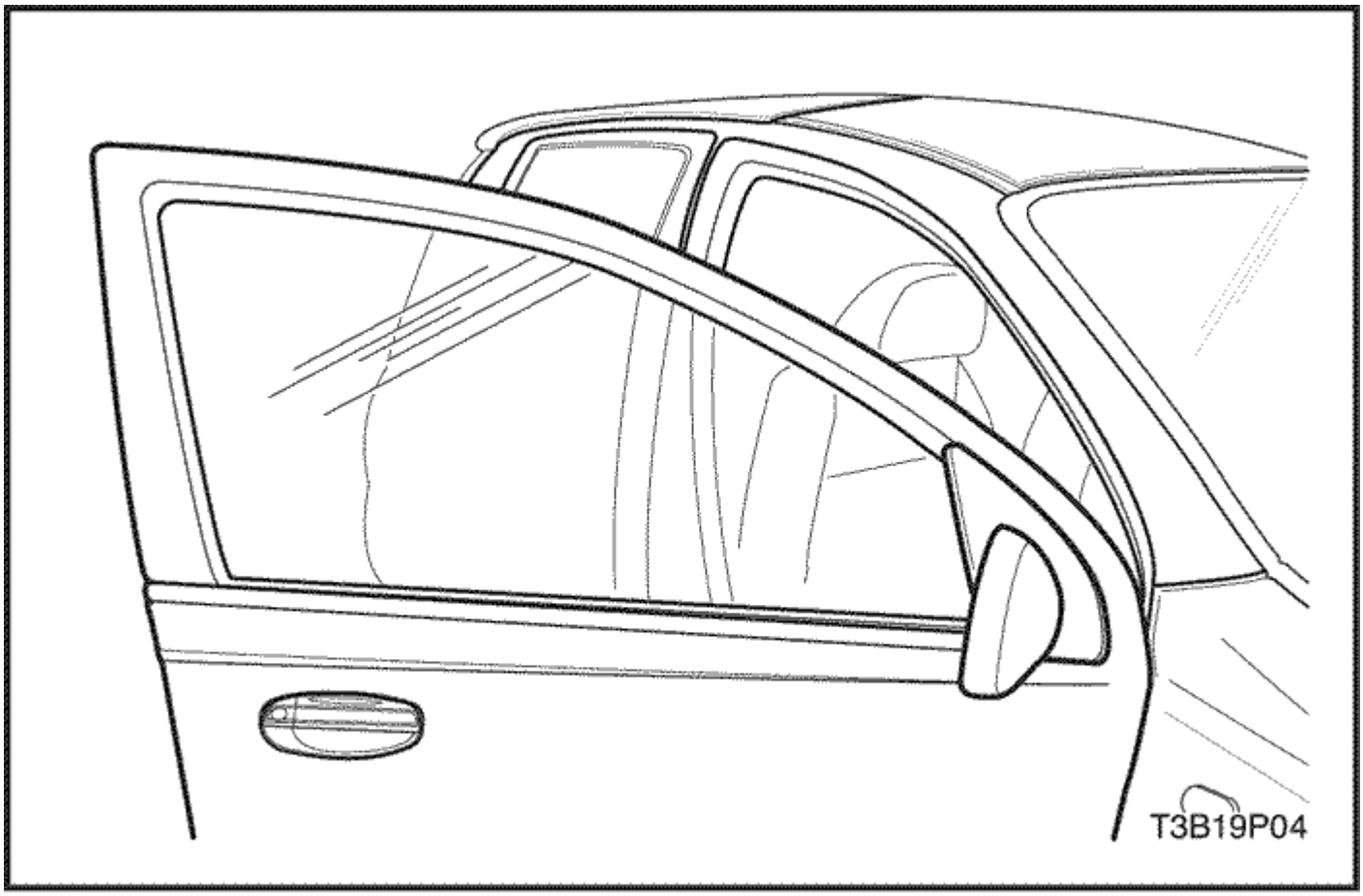
Installation Procedure

1. Install the channel molding onto the door trim panel.
2. Bend the retaining tabs to secure the channel molding to the door trim panel.
3. Install the door trim panel. Refer to *Section 9G, Interior Trim.*



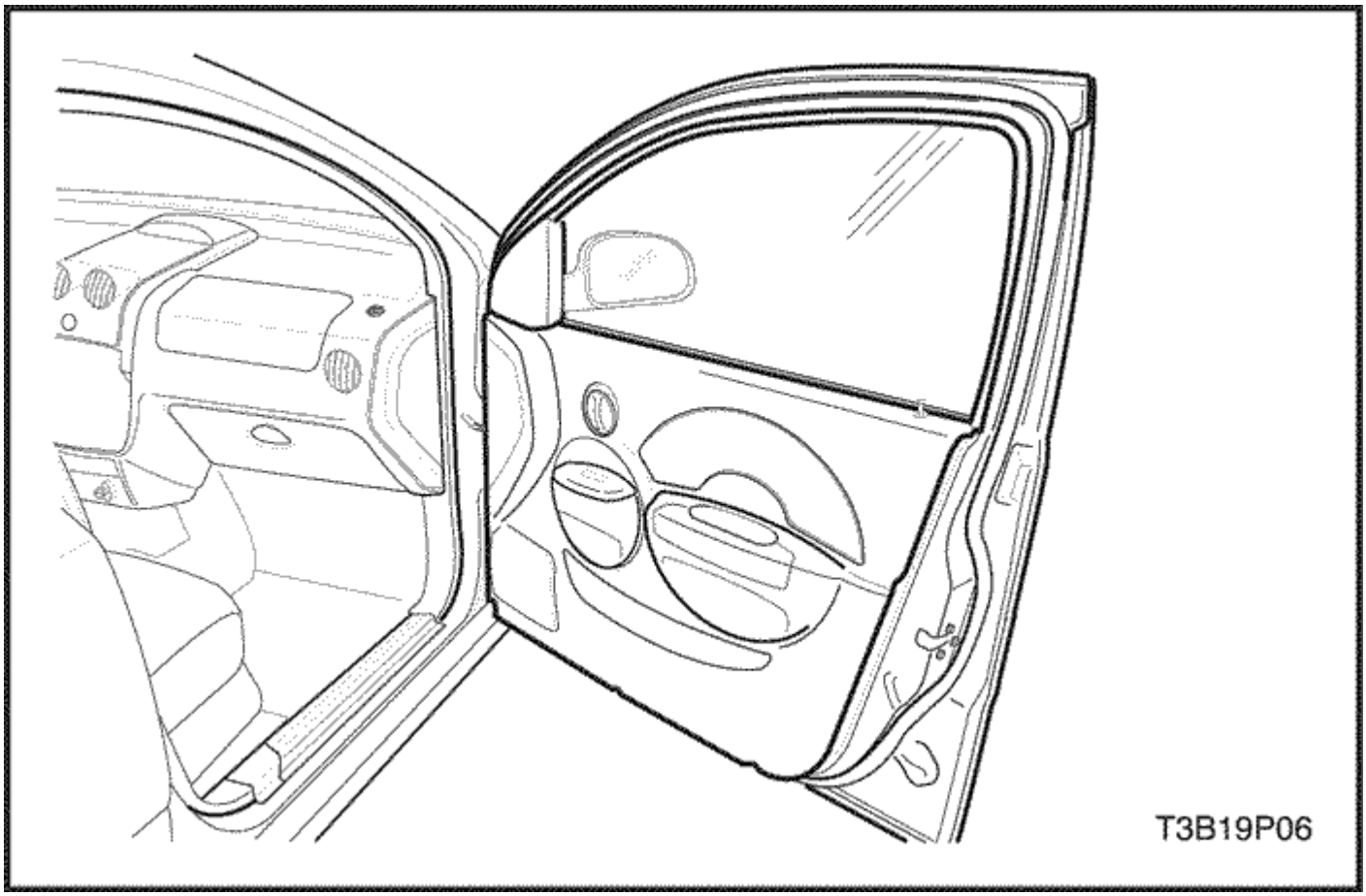
Outside Channel Molding
Removal Procedure

1. Lower the window completely.
2. Lift the outside channel molding off the door.



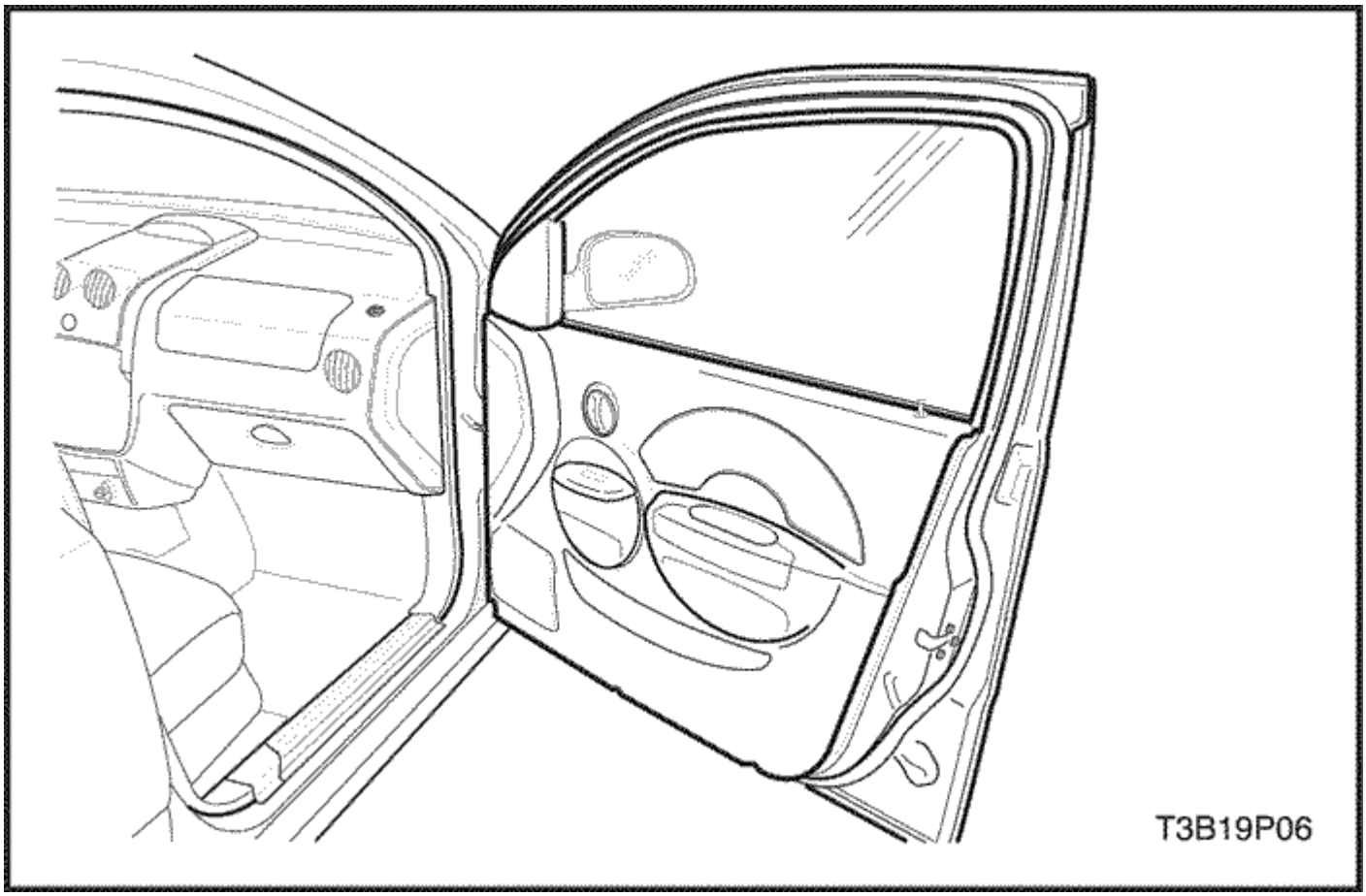
Installation Procedure

1. Press the outside channel molding onto the door.
2. Raise the window.



Door Weatherstrip
Removal Procedure

1. Remove the door hold open link-to-body bolt.
2. Remove the door weatherstrip.



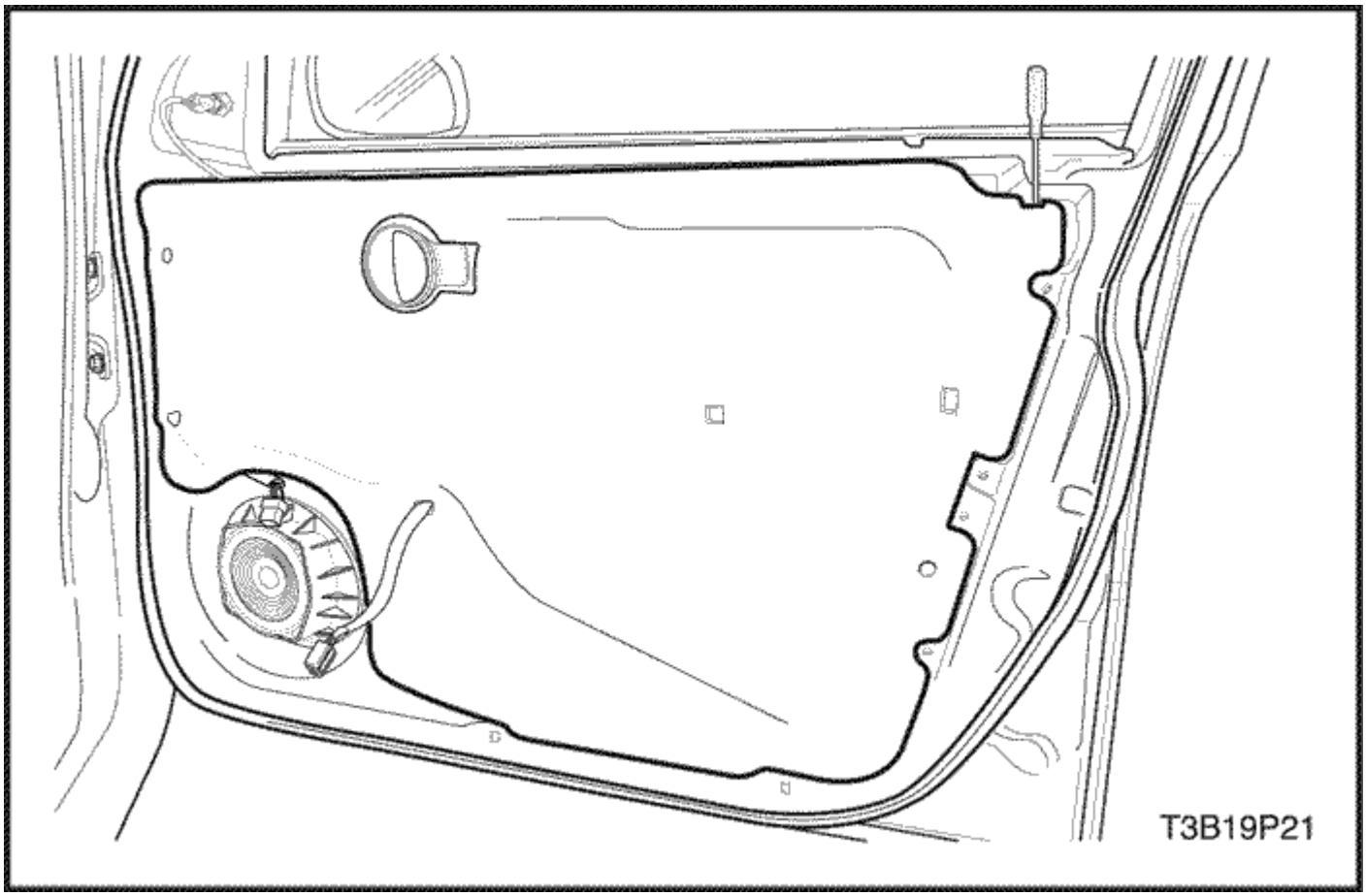
Installation Procedure

1. Install the door weatherstrip.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

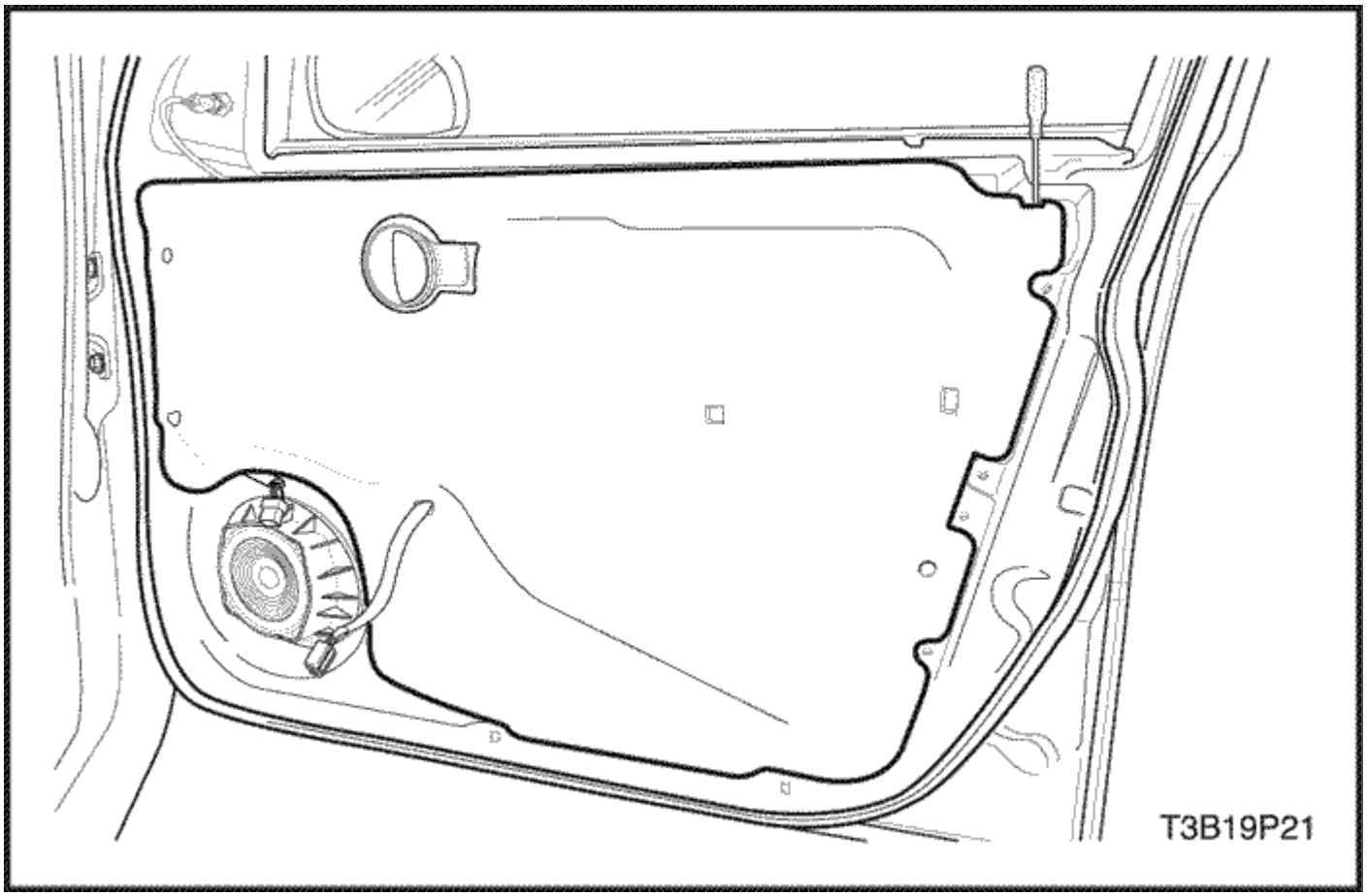
2. Install the door hold open link to the body with the bolt.

   Tighten
   Tighten the door hold open link-to-body bolt to 35 N•m (26 lb-ft).



Door Seal Trim
Removal Procedure

1. Remove the door trim panel. Refer to *Section 9G, Interior Trim.*
2. Remove the screws and the door pull bracket.
3. Remove the door seal trim.



Installation Procedure

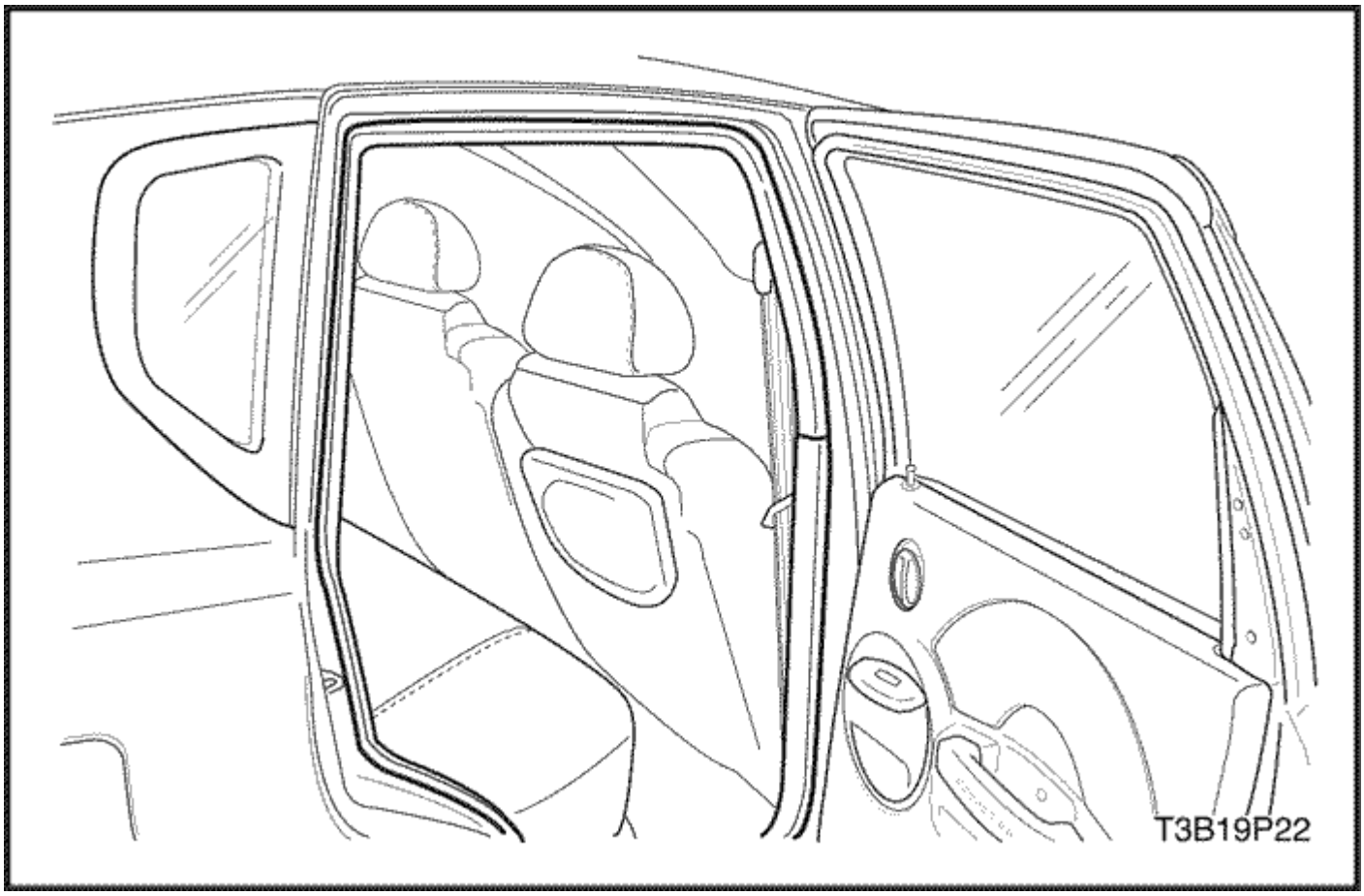
1. Install the door seal trim.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the door pull braket with the screws.

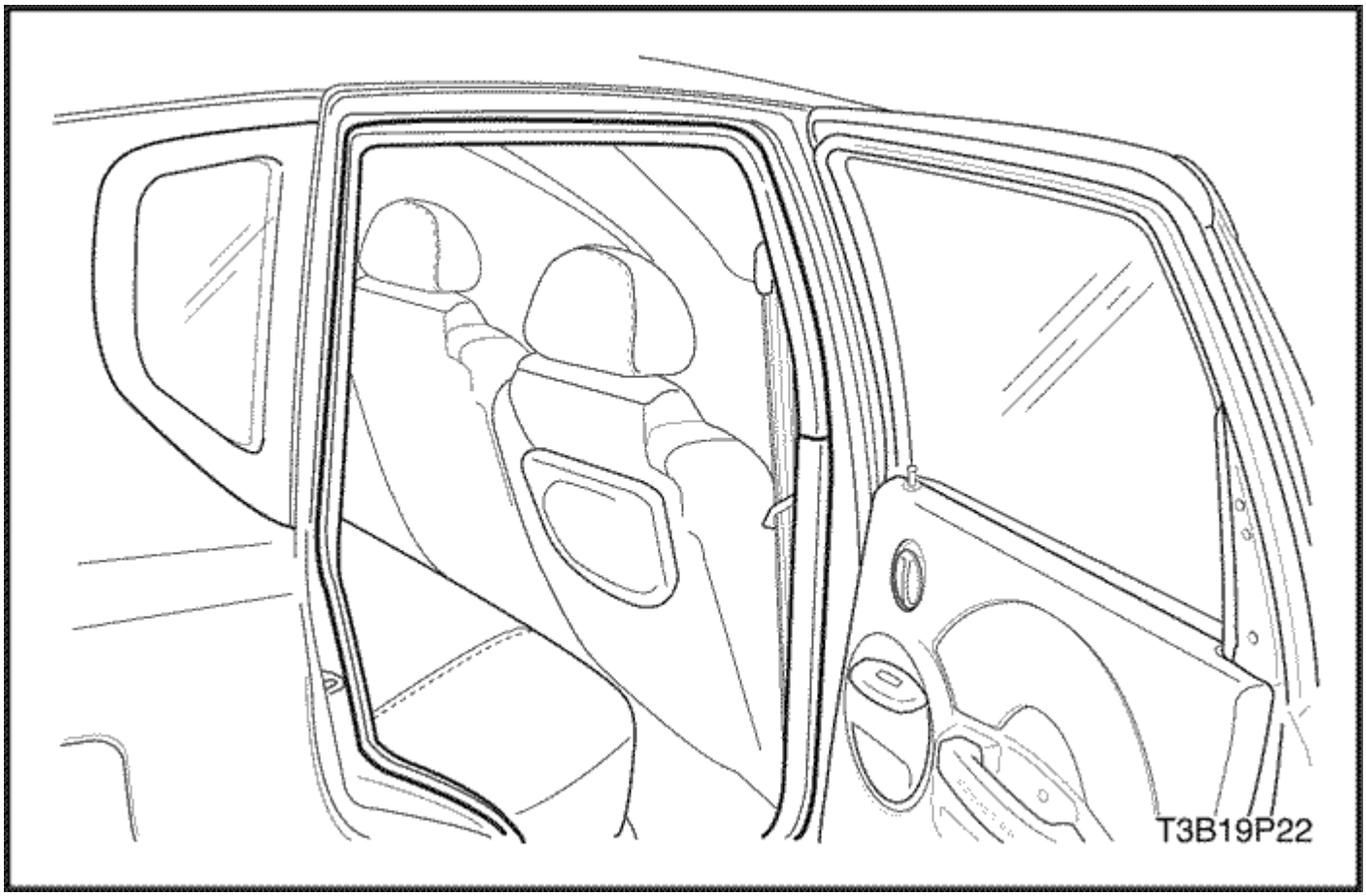
   Tighten
   Tighten the door pull bracket screws to 3.5 N•m (31 lb-in).

3. Install the door trim panel. Refer to *Section 9G, Interior Trim.*



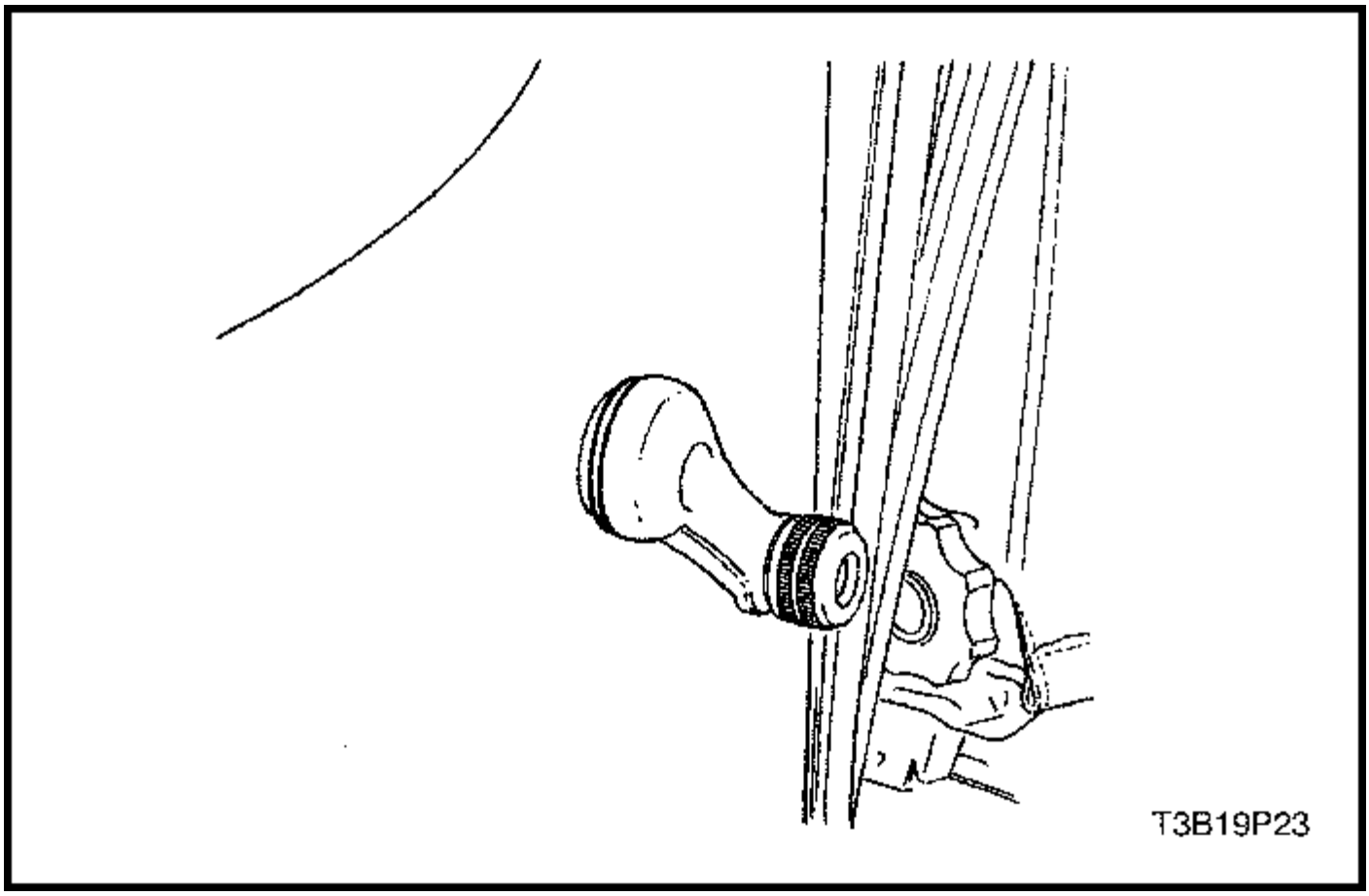
Door Opening Weatherstrip
Removal Procedure

1. Remove the door opening weatherstrip.



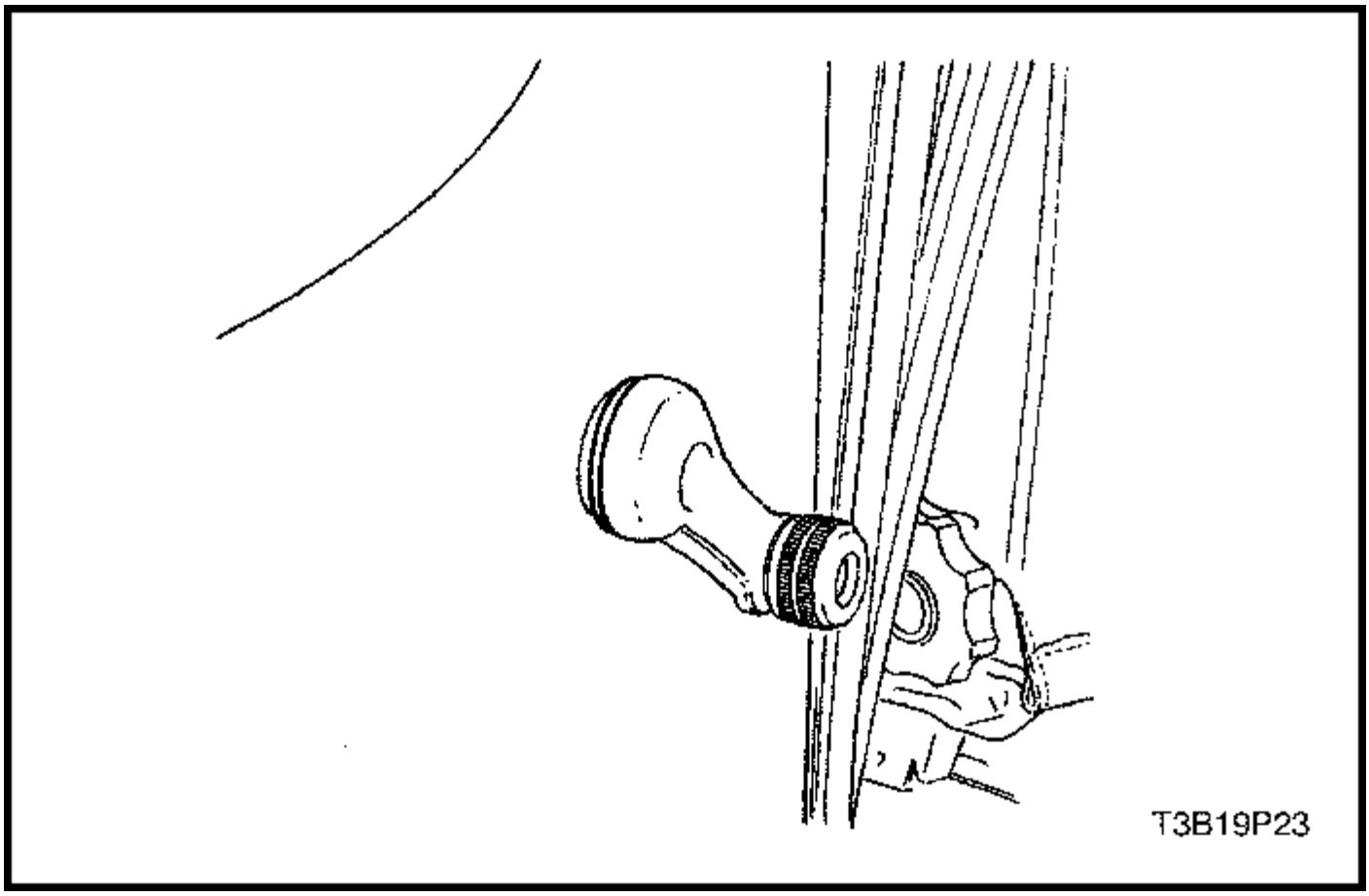
Installation Procedure

1. Install the door opening weatherstrip.



Manual Window Regulator Handle
Removal Procedure

1. Push the plastic ring behind the window regulator handle toward the door to reveal the metal clip.
2. Pry off the metal clip.
3. Remove the window regulator handle and the plastic ring.



Installation Procedure

1. Install the plastic ring.
2. Install the window regulator handle.
3. Insert the metal clip.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Door Lock Striker

The front and the rear door lock strikers each consist of a striker with two screws threaded into a floating cage plate in the B-pillars and the C-pillars. The door is secured in the closed position when the door lock fork snaps over and engages the striker.

Childproof Rear Door Lock

The childproof rear door locks help prevent passengers, especially children, from opening the rear doors of the vehicle from the inside.

To activate the door locks, move the levers of both rear doors to the lock position and close both doors. Now the rear passengers will be unable to open the doors from inside of the vehicle.
To deactivate the door locks, unlock the doors from the inside of the vehicle and open the doors from the outside. Move the lever to the unlock position. The rear doors will now work normally.

Power Door Locks

The power door locks use a solenoid that is contained in each door lock assembly. The door locks are activated by the actuator on the inside door handle or by the lock cylinder on the driver's side door only. When the driver's side door is locked or unlocked by the actuator or lock cylinder, all doors are locked or unlocked accordingly.

Power Windows

The power windows are controlled by electrical switches on the console and are operated by a motor at each window regulator. The windows are lowered by pressing the switch and are raised by pulling up on the switch. The window will stop movement when the switch is released or when the window is completely open or closed.

SECTION 9Q

ROOF

SPECIFICATIONS

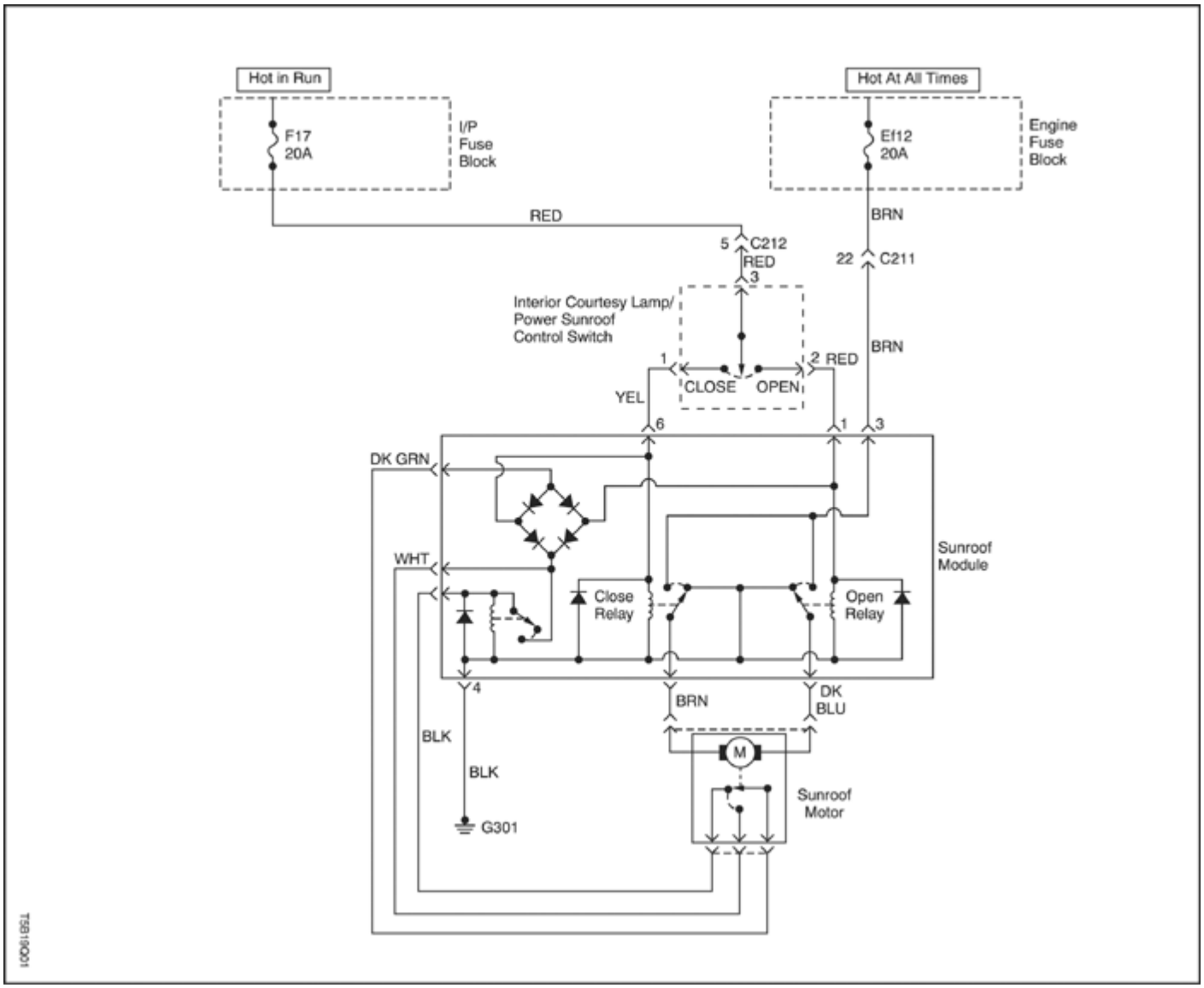
Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
B-Pillar Seat Belt Bolts	38	28	-
Interior Courtesy Lamp/Power Sunroof Control Switch Screws	4	-	35

Application	N•m	Lb-Ft	Lb-In
Passenger Assist Handle Screws	3.5	-	31
Sunroof Glass Screws	7	-	62
Sunroof Housing Bolts	7	-	62
Sunroof Motor Screws	5	-	44
Sun Visor Screws	1.5	-	13
Sun Visor Support Screw	1.5	-	13

SCHEMATIC AND ROUTING DIAGRAMS

Power Sunroof System



DIAGNOSIS

Power Sunroof

Power Sunroof Does Not Work

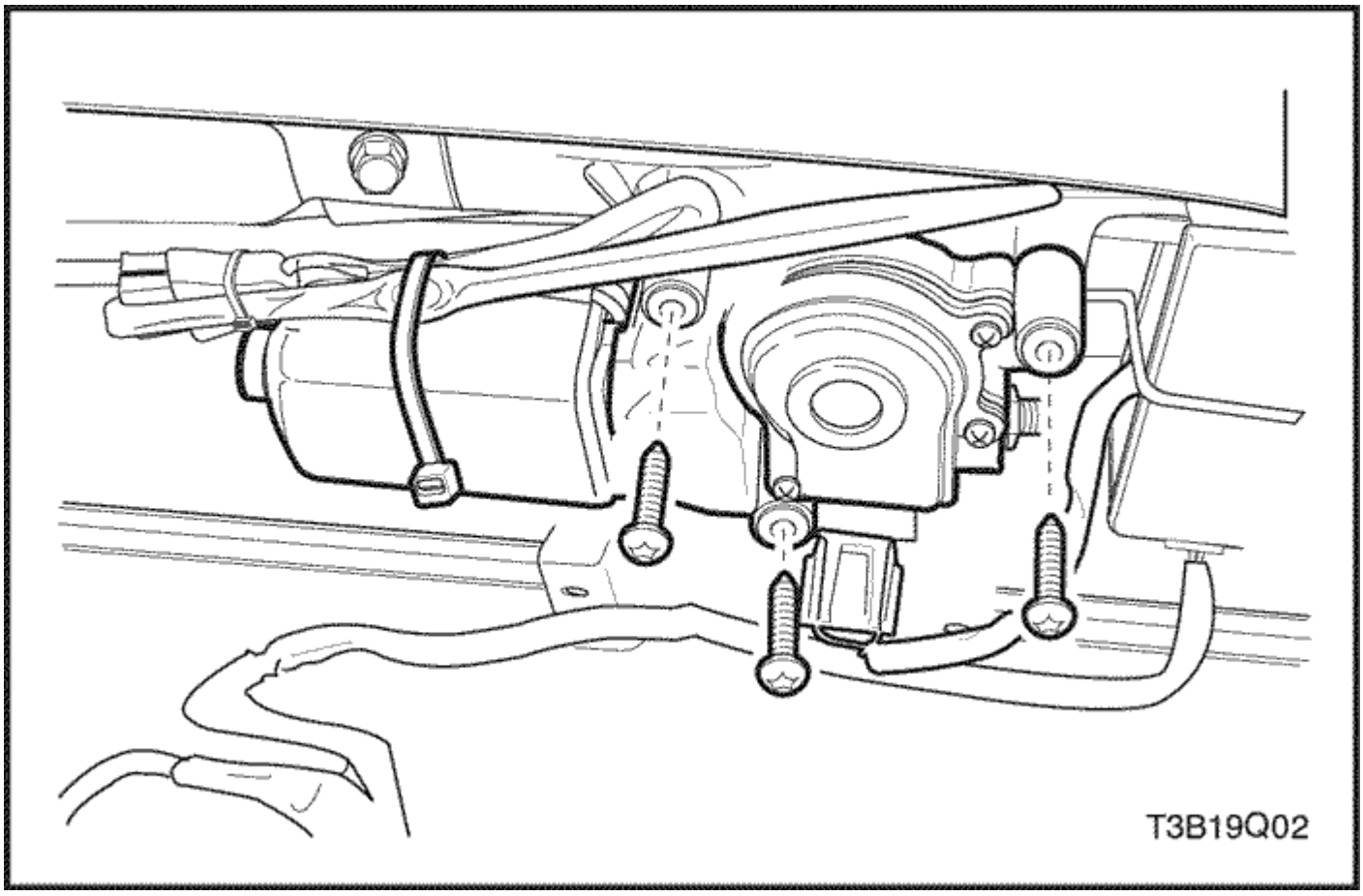
Step	Action	Value(s)	Yes	No
1	Check fuses F17 and EF12. Is either fuse blown?	-	Go to *Step 2*	Go to *Step 3*
2	1. Check for a short circuit and repair it, if necessary. 2. Replace the blown fuse(s). Is the repair complete?	-	System OK	-
3	1. Turn the ignition on. 2. Check the voltages at fuses F17 and EF12. Are both voltages equal to the specified value?	11 - 14 v	Go to *Step 5*	Go to *Step 4*
4	Repair the power supply to the fuse which did not indicate battery voltage with the ignition on. Is the repair complete?	-	System OK	-
5	1. Disconnect the interior courtesy lamp/power sunroof control switch connector. 2. Turn the ignition on. 3. Check the voltage at terminal 3 of the interior courtesy lamp/power sunroof control switch connector. Is the voltage equal to the specified value?	11-14 v	Go to *Step 7*	Go to *Step 6*
6	Repair the open circuit between fuse F17 and the interior courtesy lamp/power sunroof control switch connector. Is the repair complete?	-	System OK	-
7	1. Reconnect the interior courtesy lamp/power sunroof control switch connector. 2. With the sunroof switch in the OPEN position, check the voltage at terminal 2 of the interior courtesy lamp/power sunroof control switch connector. 3. With the sunroof switch in the CLOSE position, check the voltage at terminal 1 of the interior courtesy lamp/power	11 - 14 v	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
	sunroof control switch connector. Do both voltages equal the specified value?			
8	Replace the interior courtesy lamp/power sunroof control switch. Is the repair complete?	-	System OK	-
9	1. Disconnect the 6-pin sunroof module connector. 2. With the sunroof switch in the OPEN position, check the voltage at terminal 4 of the sunroof module connector. 3. With the sunroof switch in the CLOSE position, check the voltage at terminal 6 of the sunroof module connector. Are the voltages equal to the specified value?	11-14 v	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the interior courtesy lamp/power sunroof control switch and the sunroof module connector. Is the repair complete?	-	System OK	-
11	1. Reconnect the sunroof module. 2. Remove the sunroof motor, but leave the connectors attached. 3. Turn the ignition on. 4. Use the sunroof switch to attempt to operate the motor in both directions. Does the motor operate?	-	Go to *Step 12*	Go to *Step 13*
12	Repair the jammed sunroof mechanism. Is the repair complete?	-	System OK	-
13	1. Disconnect both of the one-wire connectors at the sunroof motor. 2. Connect a voltmeter between the one-wire connectors, on the module side of the connectors. 3. Turn the ignition on. 4. Turn the sunroof switch to the OPEN position and observe the voltmeter reading. 5. Turn the sunroof switch to the CLOSE position and observe the voltmeter reading. Does the voltmeter indicate the specified	11-14v	Go to *Step 15*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
	voltage when the switch is in either the OPEN or the CLOSE position (one of the switch positions should show reverse polarity)?			
14	Replace the sunroof module. Is the repair complete?	-	System OK	-
15	Replace the sunroof motor. Does the sunroof operate with the new motor?	-	System OK	Go to *Step 14*

MAINTENANCE AND REPAIR

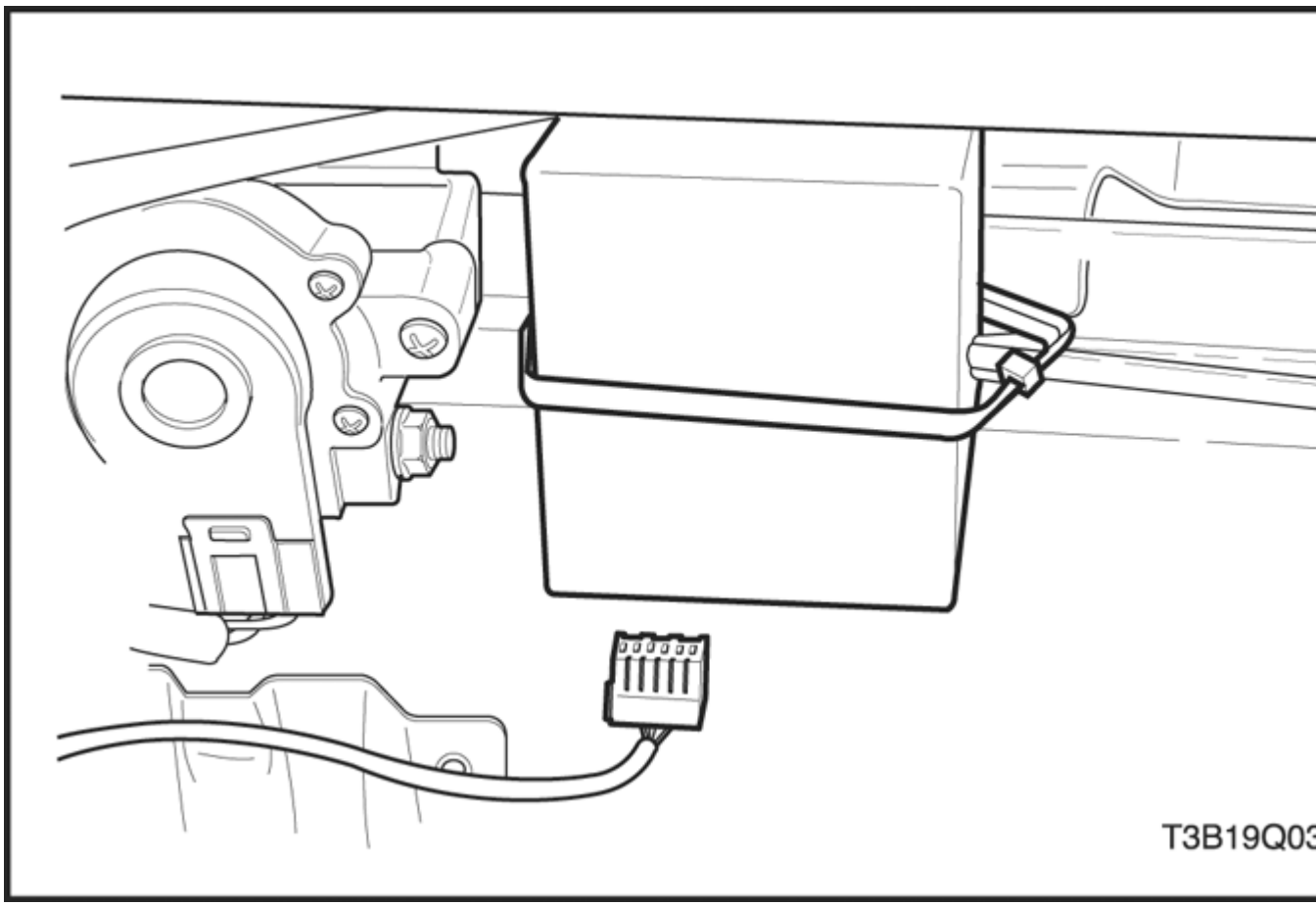
On-Vehicle Service



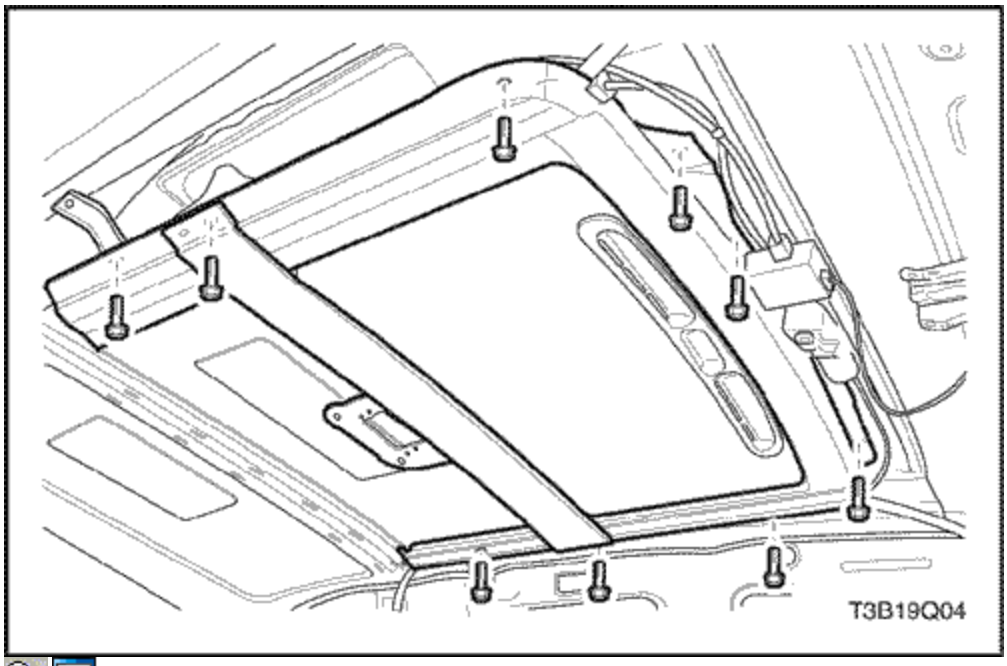
Power Sunroof
Removal Procedure

1. Disconnect the negative battery cable.

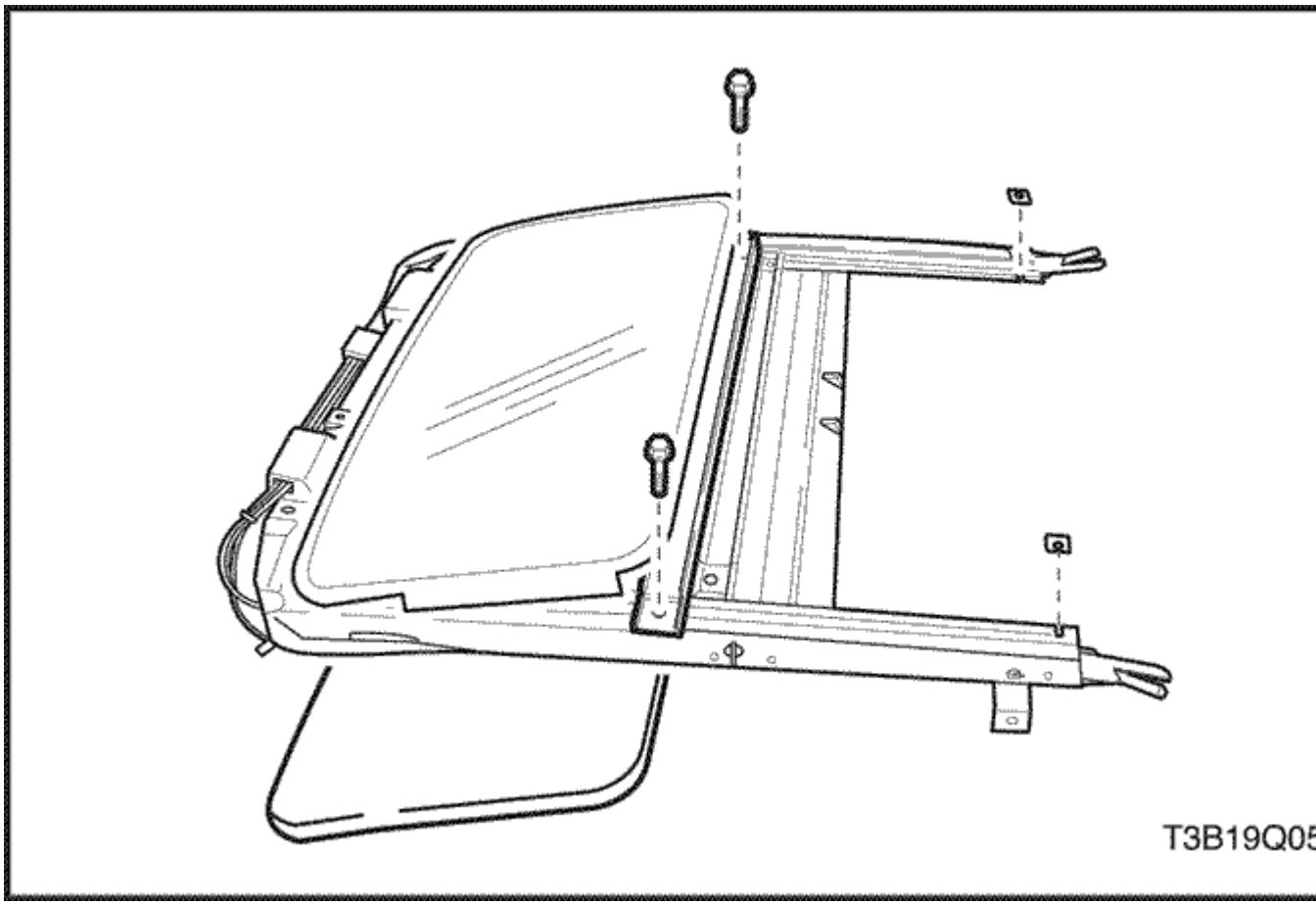
2. Remove the headliner. Refer to "Formed Headliner" in this section.
3. Remove the drain hoses.
4. Remove the strap.
5. Disconnect the electrical connector.
6. Remove the bolts and the motor.



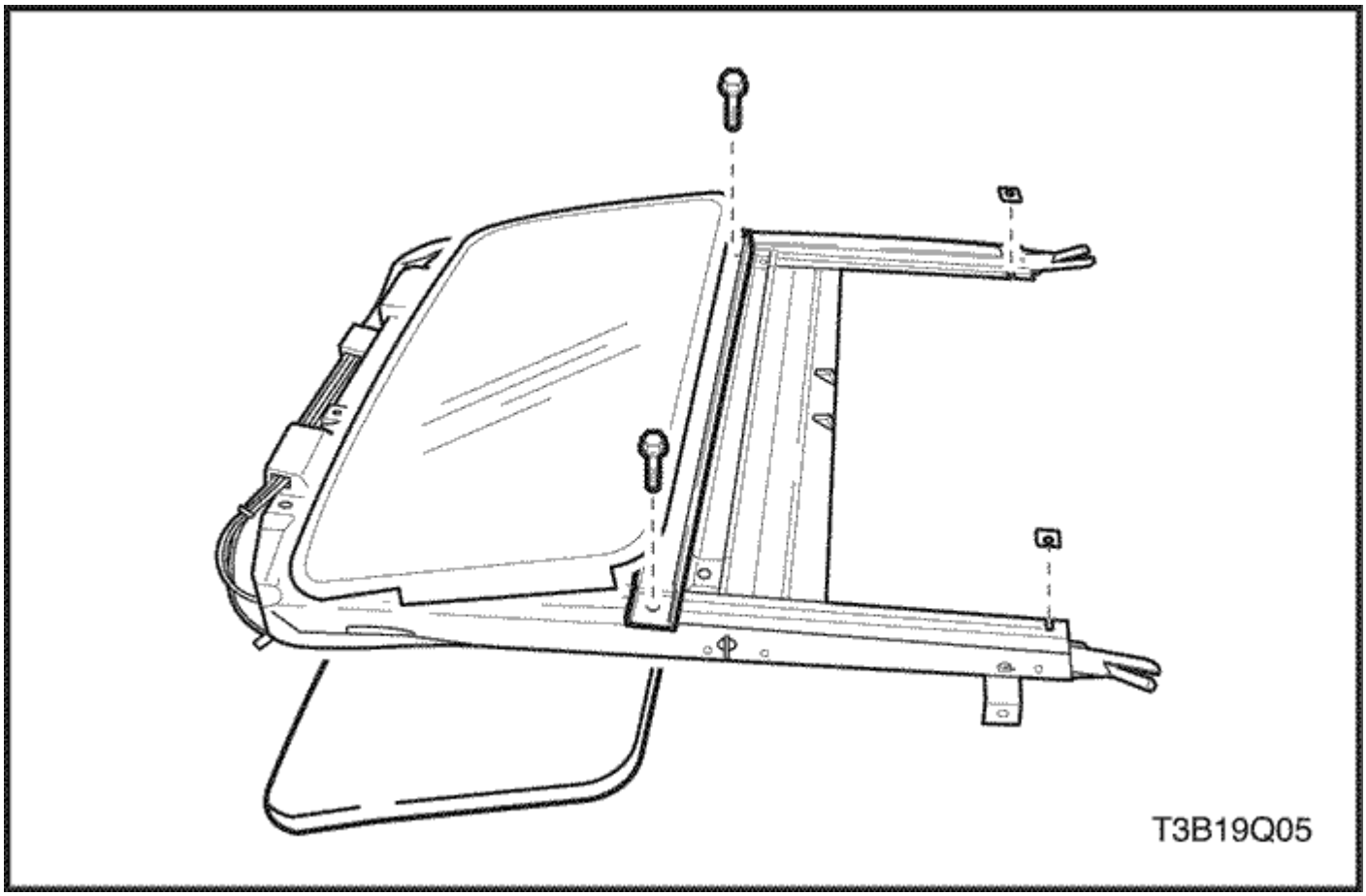
7. Disconnect the electrical connector.
8. Remove the strap
9. Remove the motor cntrol module.



10. Remove the bolts and the sunroof housing from the vehicle.



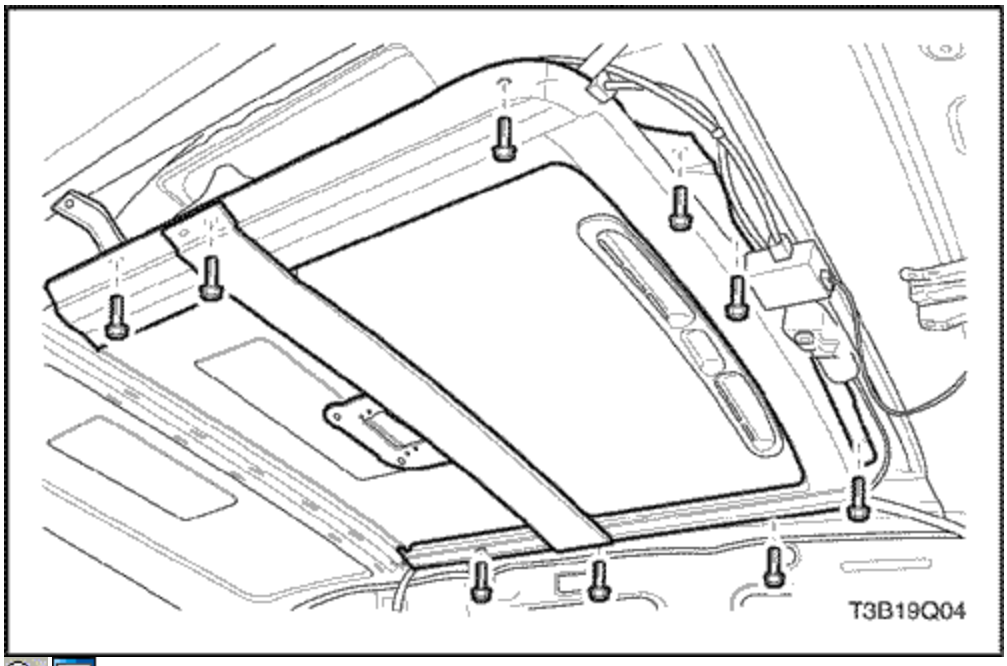
11. Remove the drain channel.
12. Remove the sunshade.



Installation Procedure

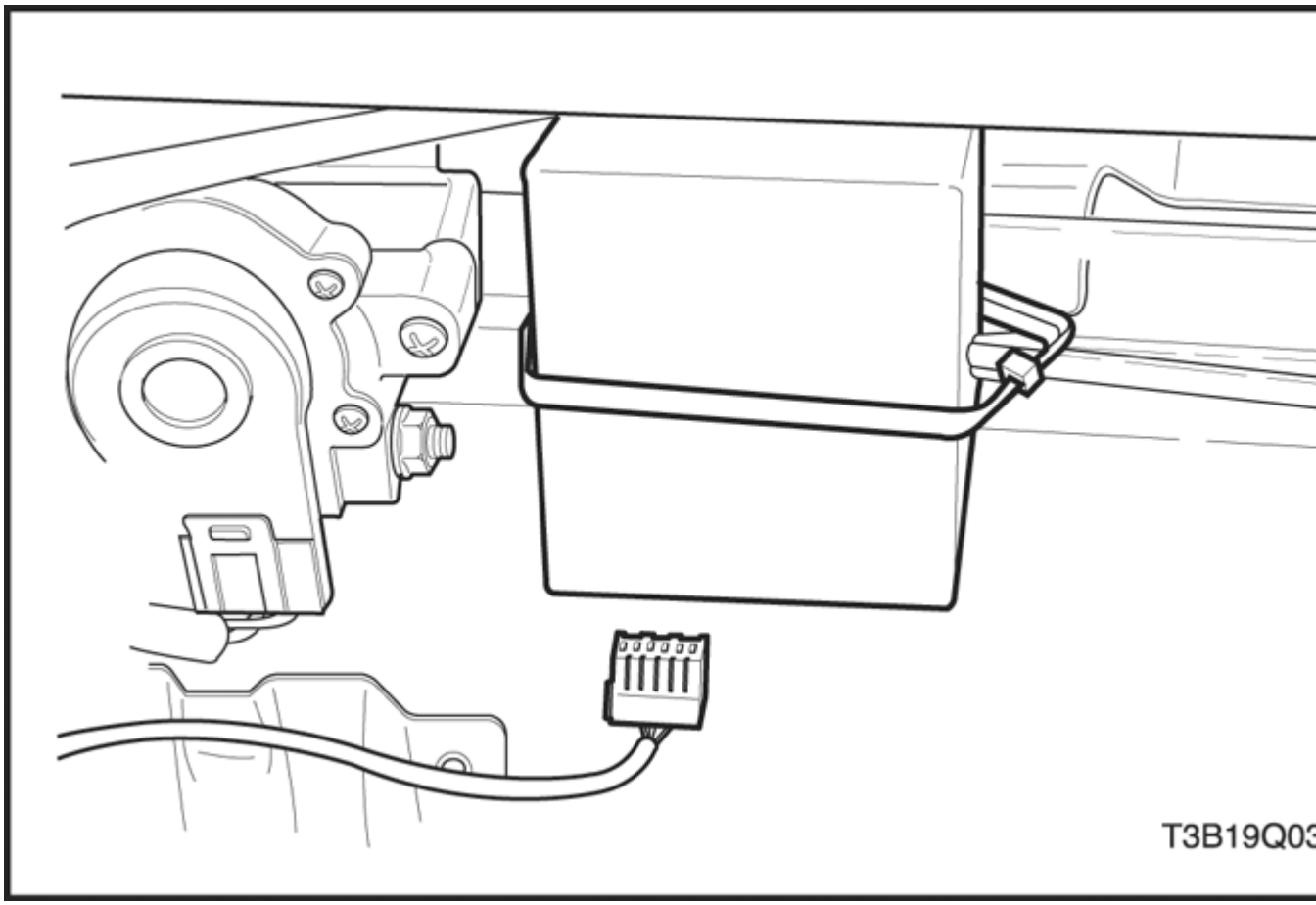
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the sunshade.

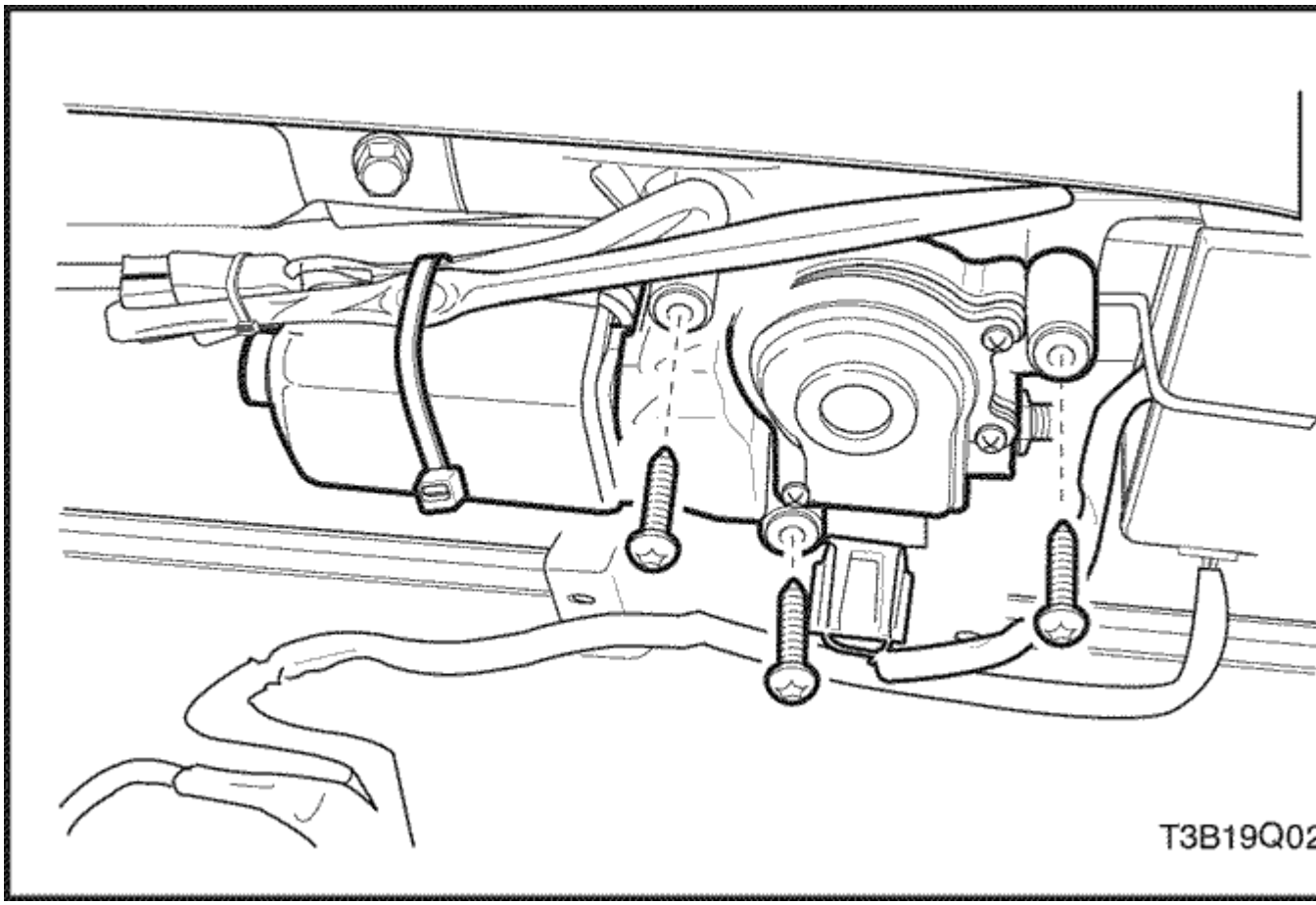


2. Install the sunroof housing.

   Tighten
   Tighten the sunroof housing bolts to 7 N•m (62 lb-in).



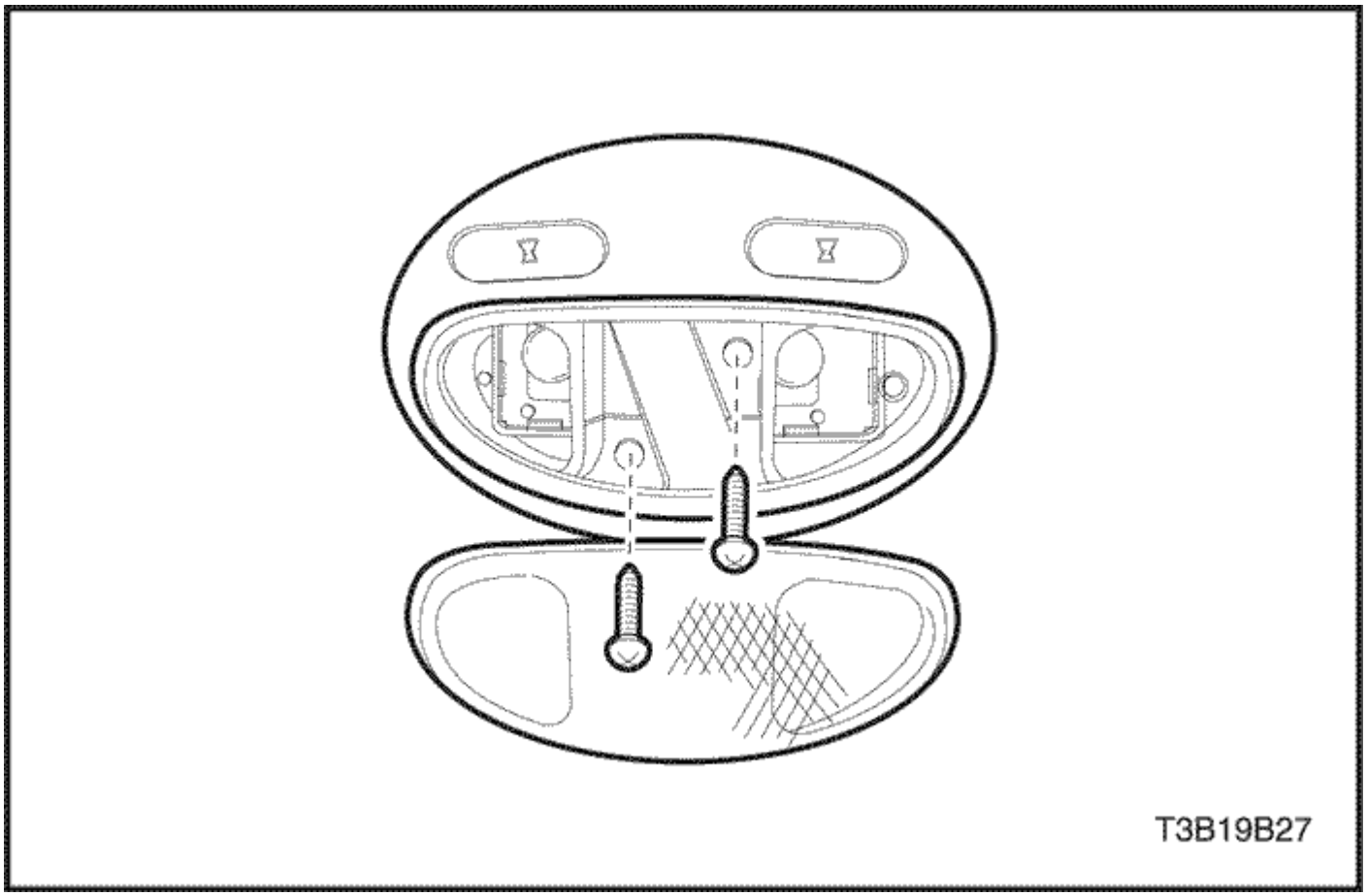
3. Install the motor control module.



4. Install the motor.

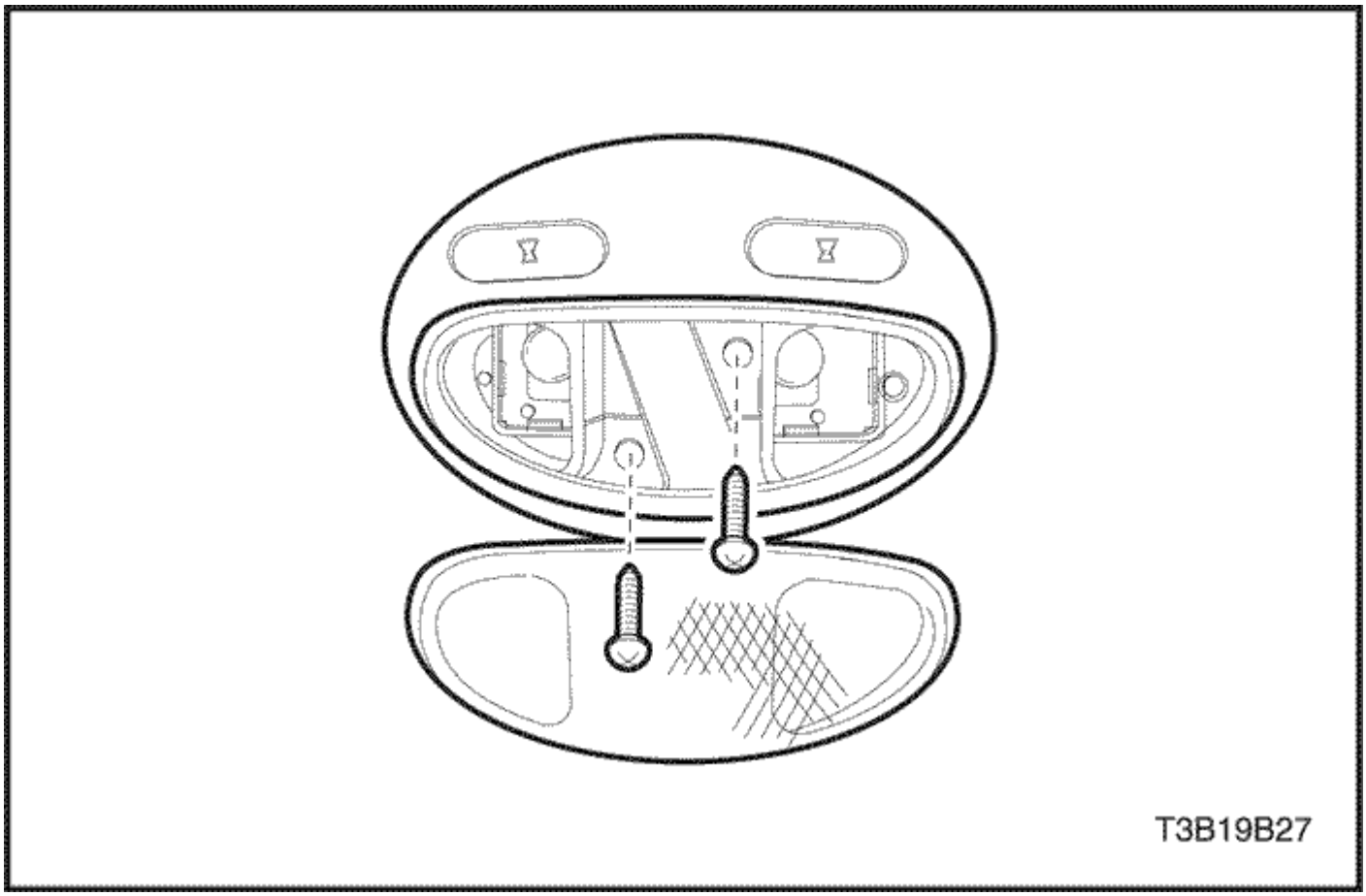
   Tighten
   Tighten the sunroof motor screws to 5 N•m (44 lb-in).

5. Install the drain hoses.
6. Install the headliner. Refer to "Formed Headliner" in this section.
7. Connect the negative battery cable



Interior Courtesy Lamp/Power Sunroof Control Switch
Removal Procedure

1. Disconnect the negative battery cable.
2. Pry off the interior courtesy lamp lens.
3. Remove the screws and the lamp/power sunroof control switch.
4. Disconnect the electrical connector.



Installation Procedure

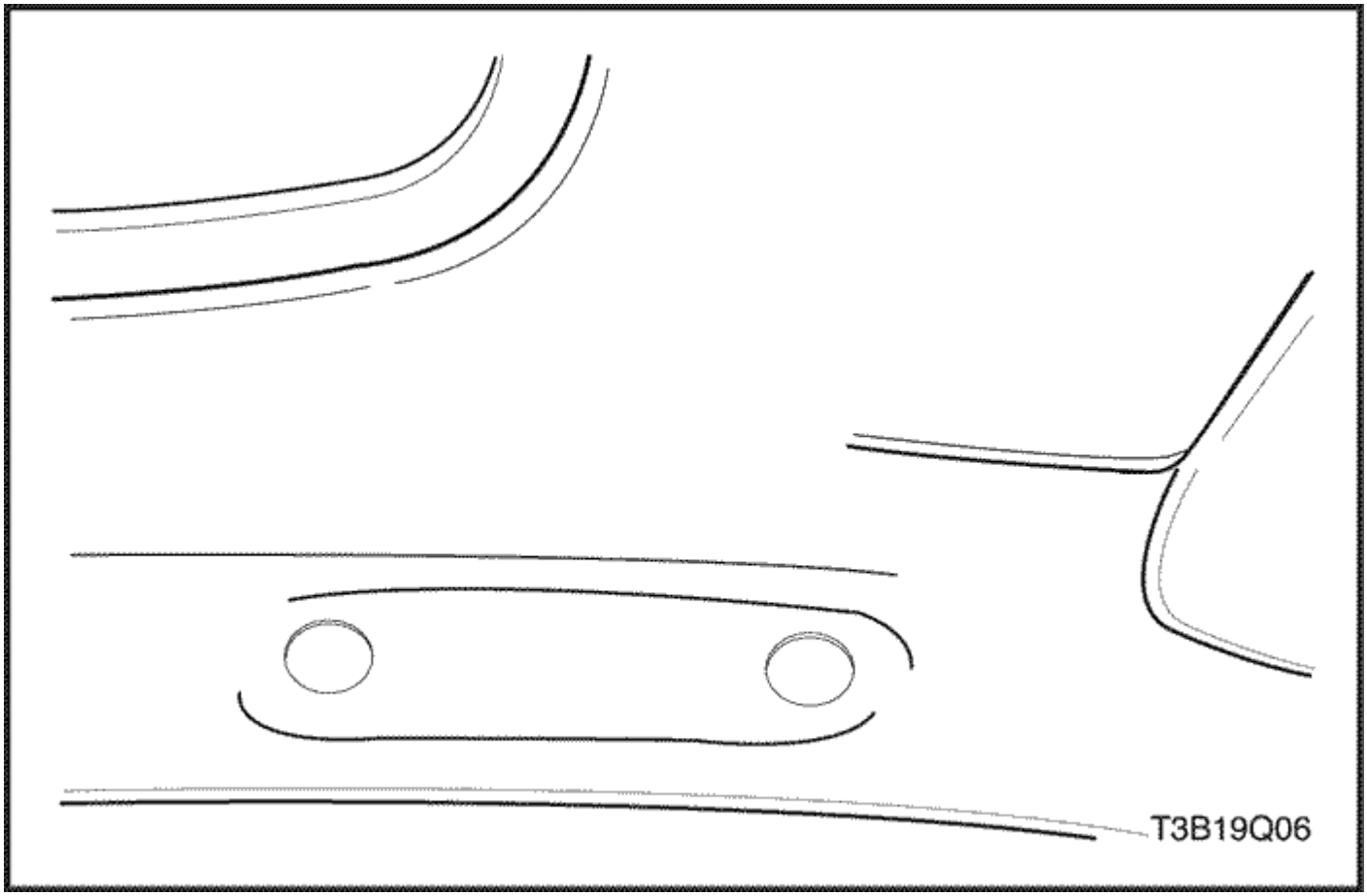
1. Connect the electrical connector.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the lamp/power sunroof control switch with the screws.

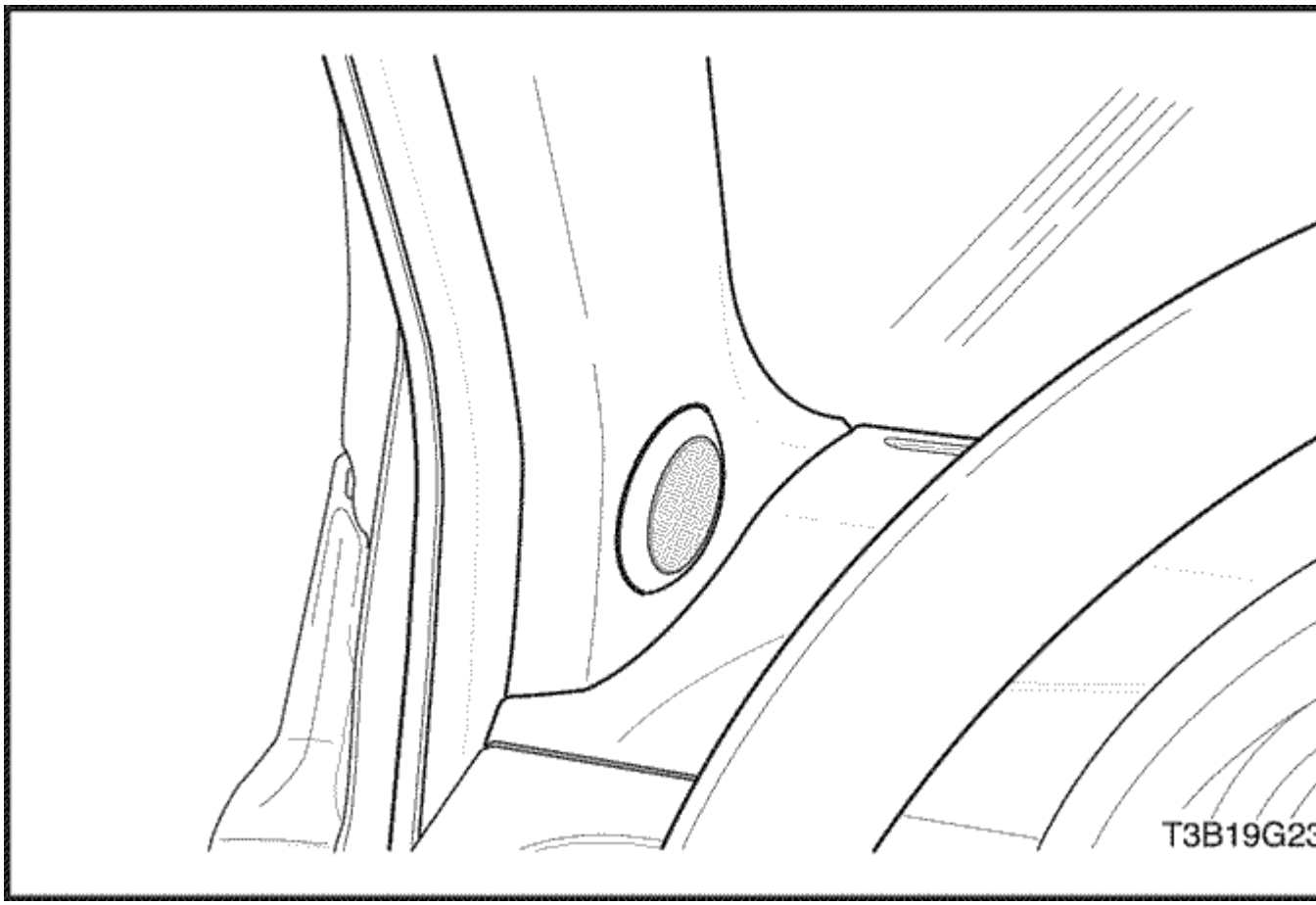
   Tighten
   Tighten the interior courtesy lamp/power sunroof control switch screws to 4 N•m (35 lb-in).

3. Install the interior courtesy lamp lens.
4. Connect the negative battery cable.

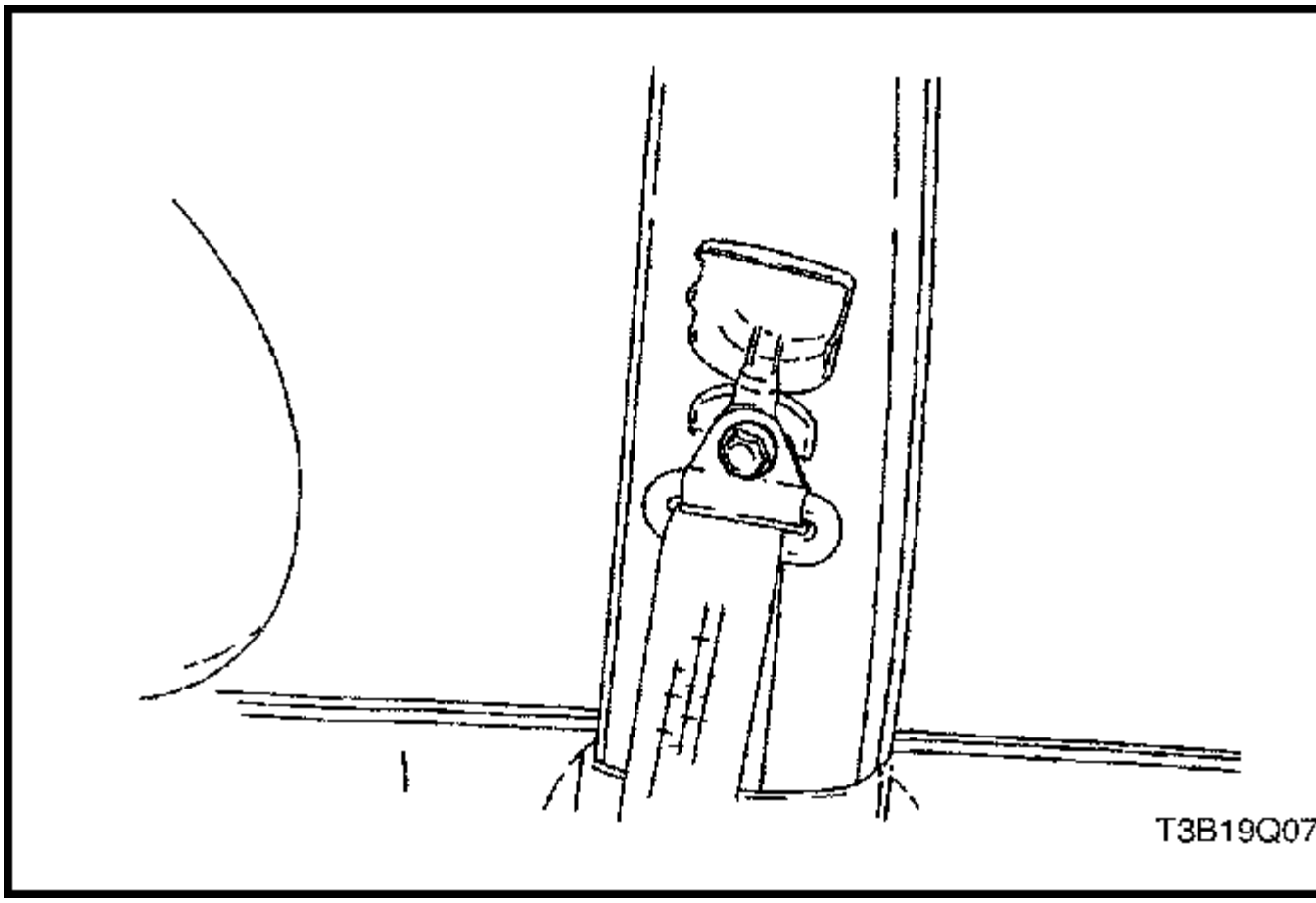


Formed Headliner
Removal Procedure

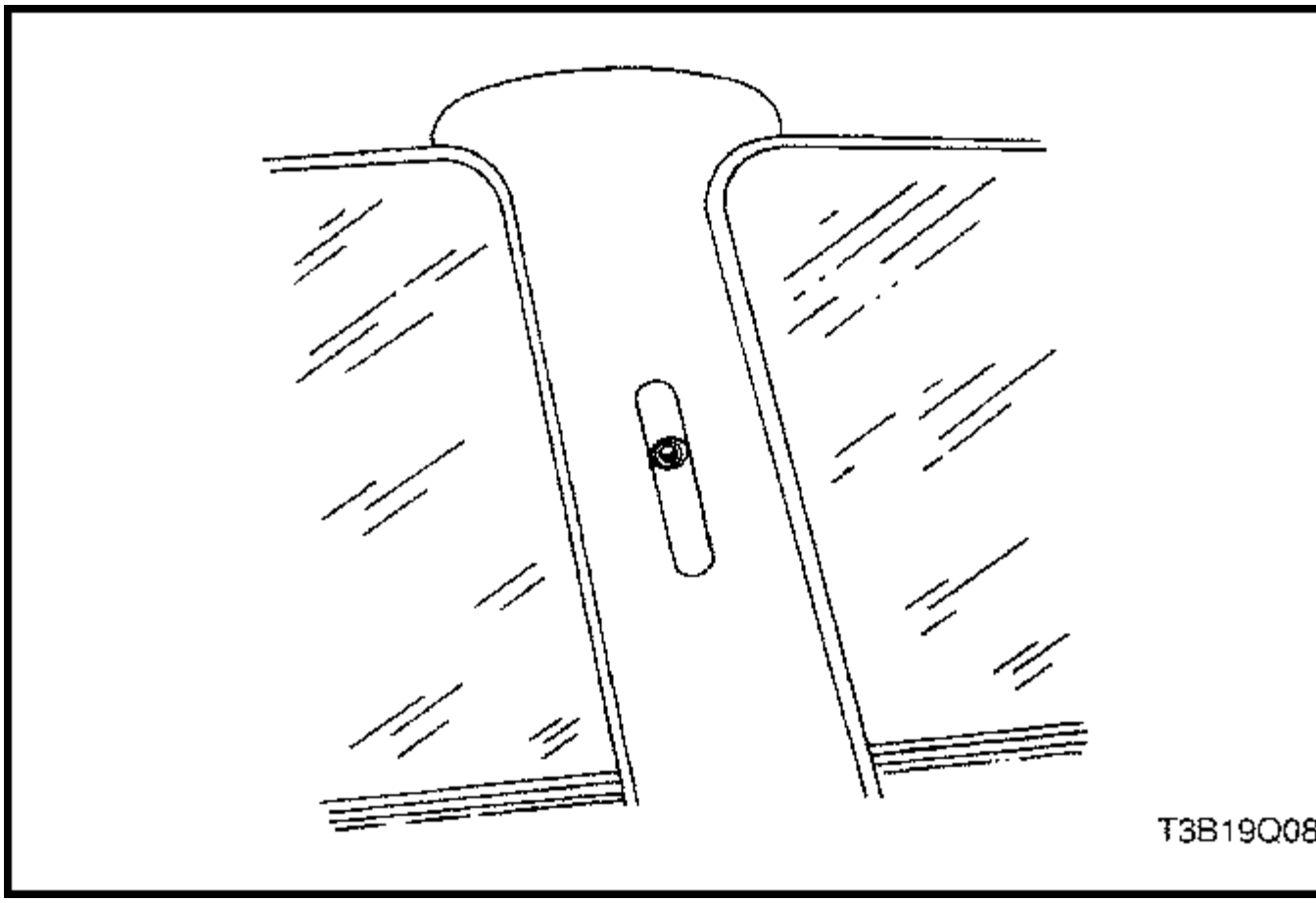
1. Remove the passenger assist handles. Refer to "Passenger Assist Handles" in this section.
2. Remove the coat hook. Refer to "Coat Hook" in this section.
3. Remove the plastic retainers in the headliner on the driver's side.



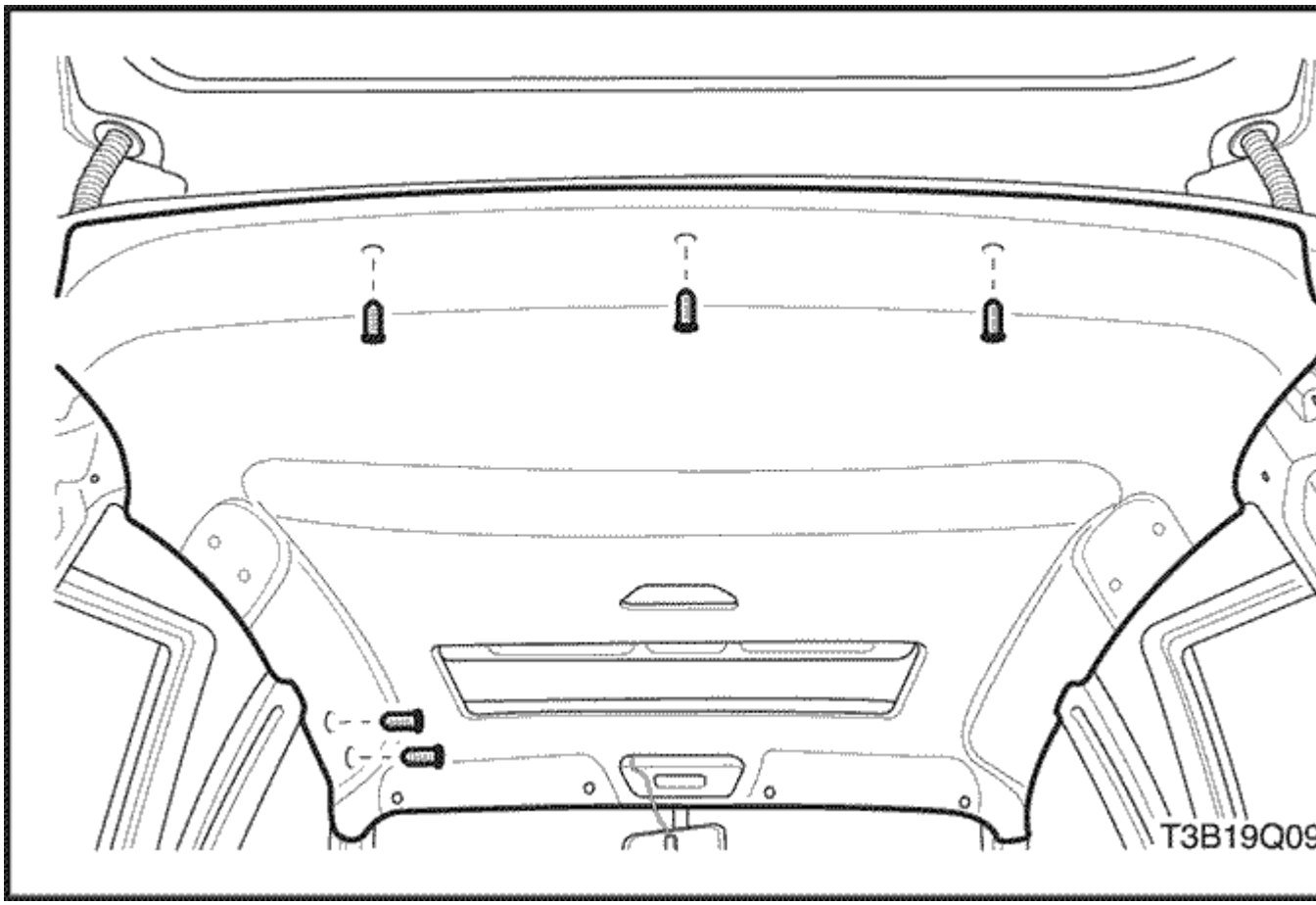
4. Remove the sun visors. Refer to "Sun Visors" in this section.
5. Remove the interior courtesy lamp. Refer to Section 9B, Lighting Systems.
6. Remove the left and the right A-pillar trim panels.



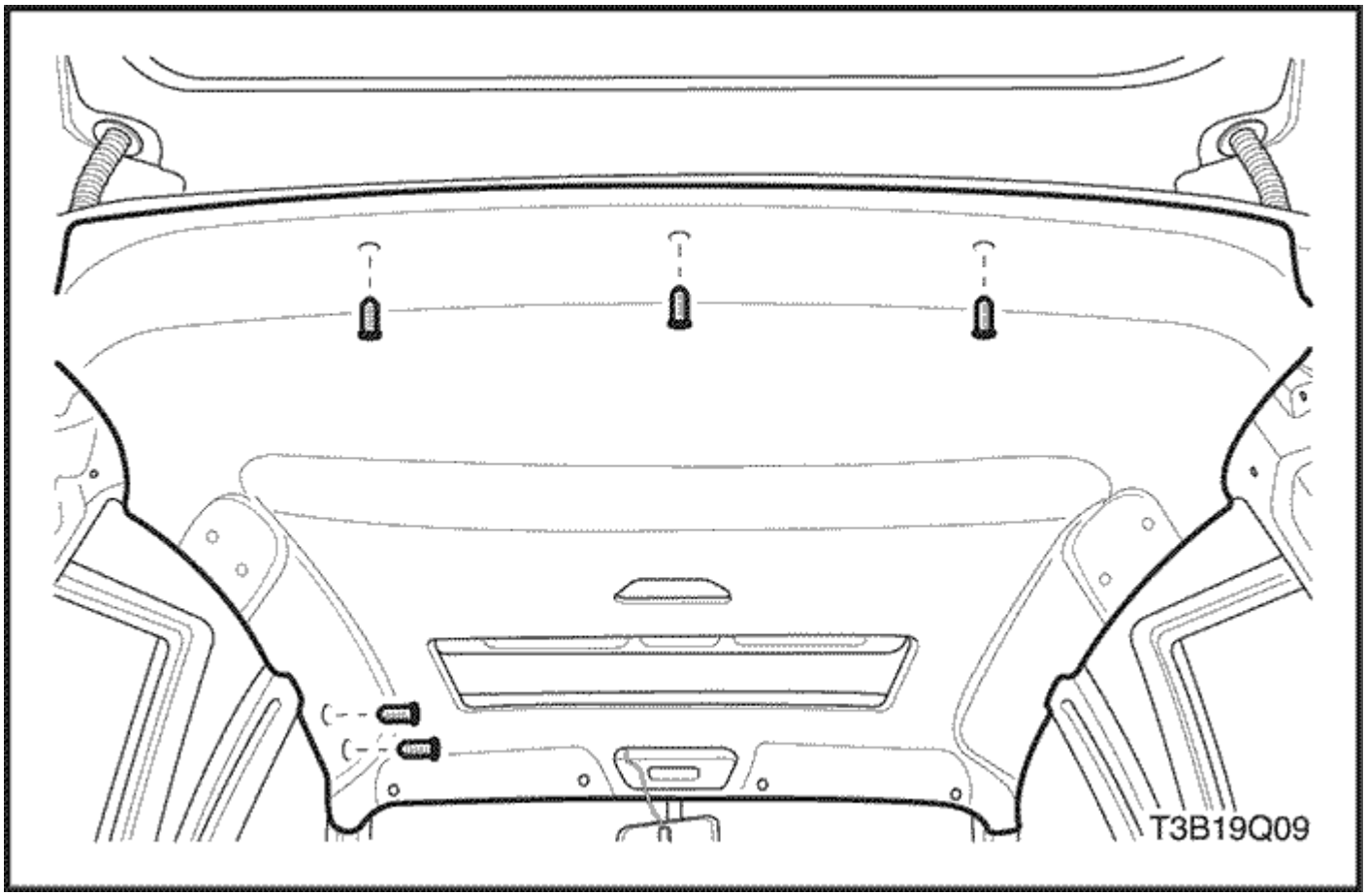
7. Remove the bolts and the seat belt anchors from the left and the right B-pillars.



8. Reposition the top of the left and the right B-pillar trim panels.

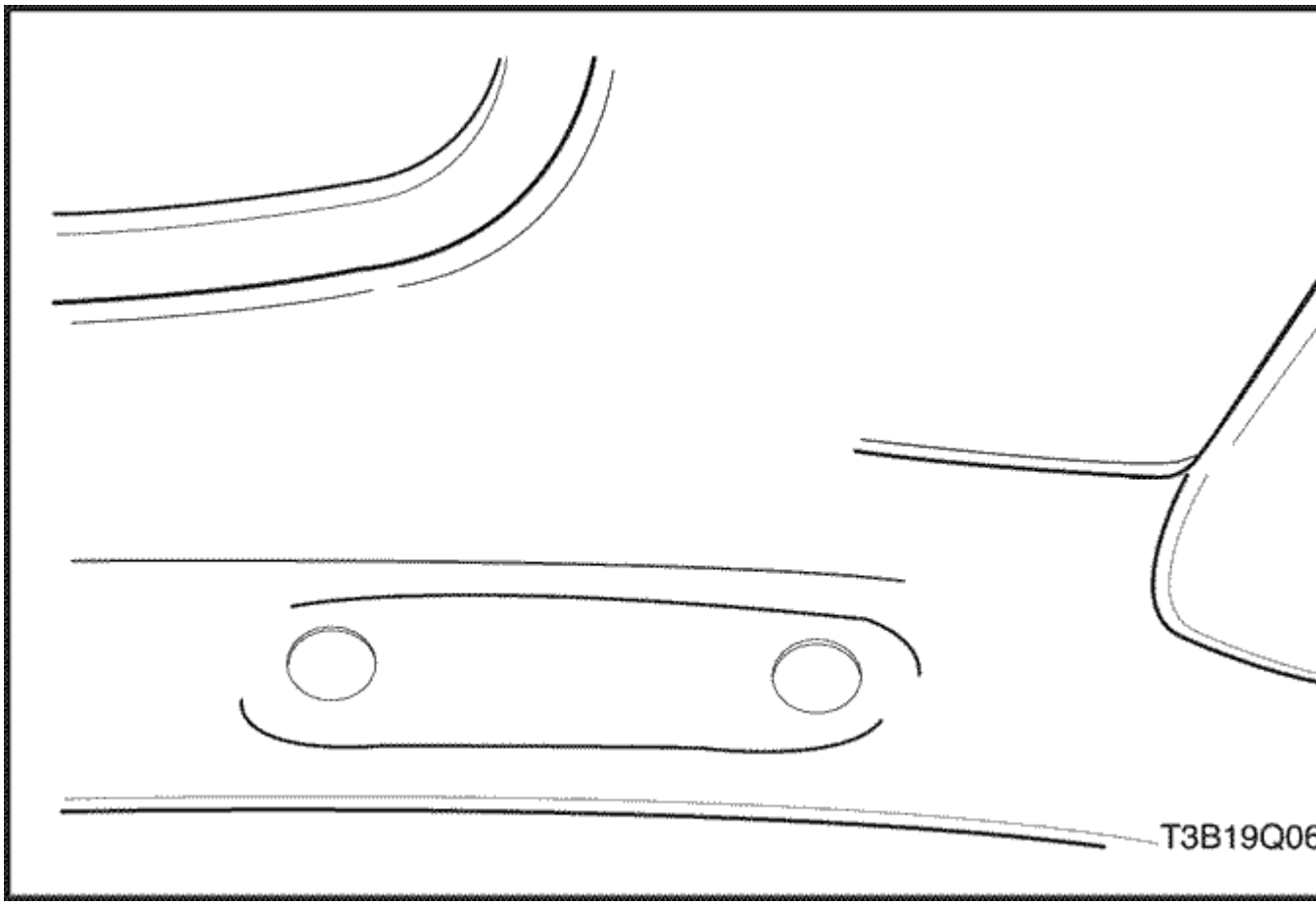


9. Remove the left and the right C-pillar trim panels.
10. Remove the sunroof molding, if equipped.
11. Remove the plastic retainers in the headliner along the rear window.
12. Slide and tilt both front seats forward.
13. Pull the headliner down and turn it 45 degrees.
14. Remove the headliner through a rear door.

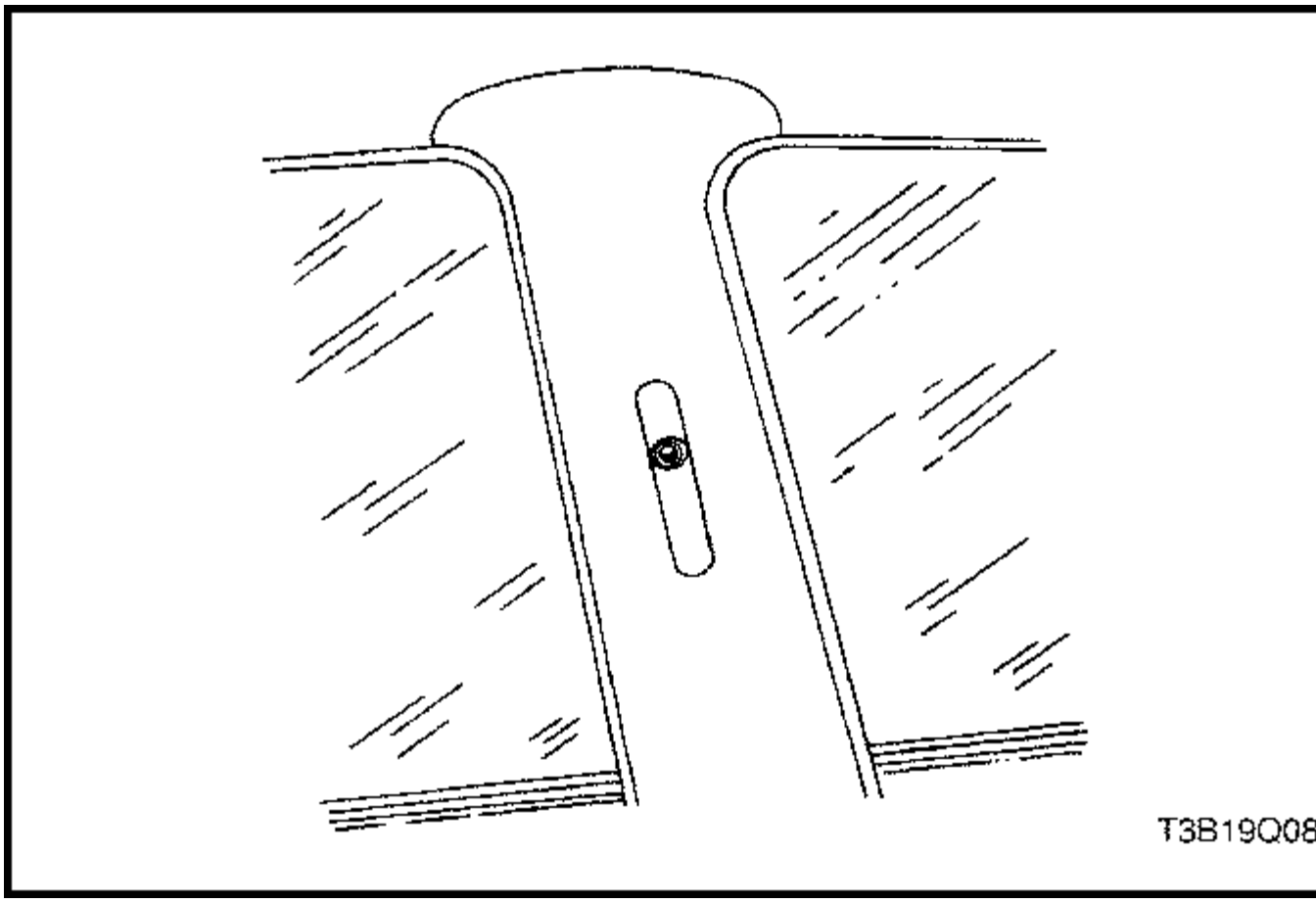


Installation Procedure

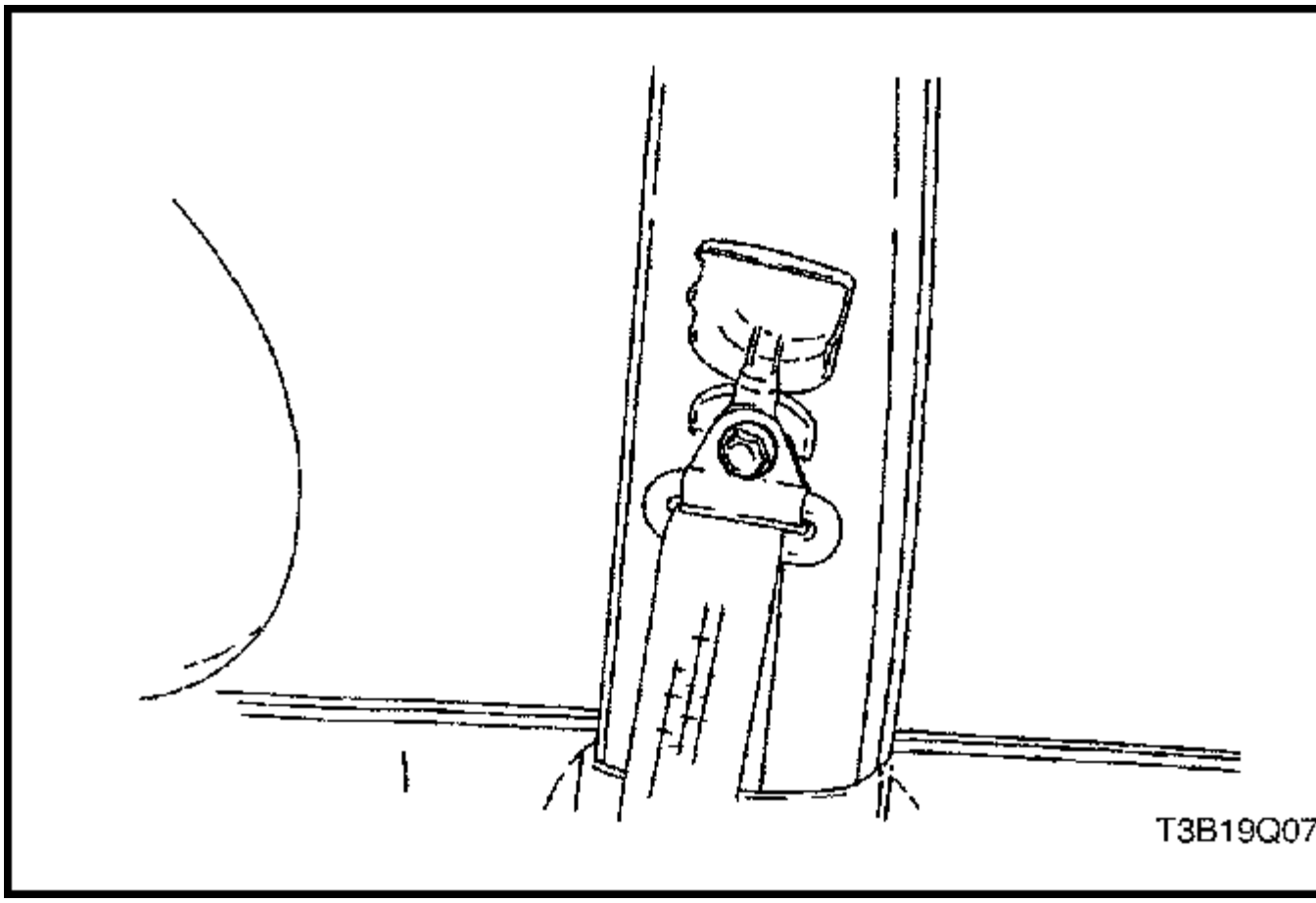
1. Recline both front seats.
2. Tilt the headliner on its side and slide it through a rear door.
3. Tilt and rotate the headliner until it is in position. Push it in place until the seals around the doors cover the edges of the headliner.
4. Install the plastic retainers along the rear window.



5. Install the plastic retainers in the headliner on the driver's side.



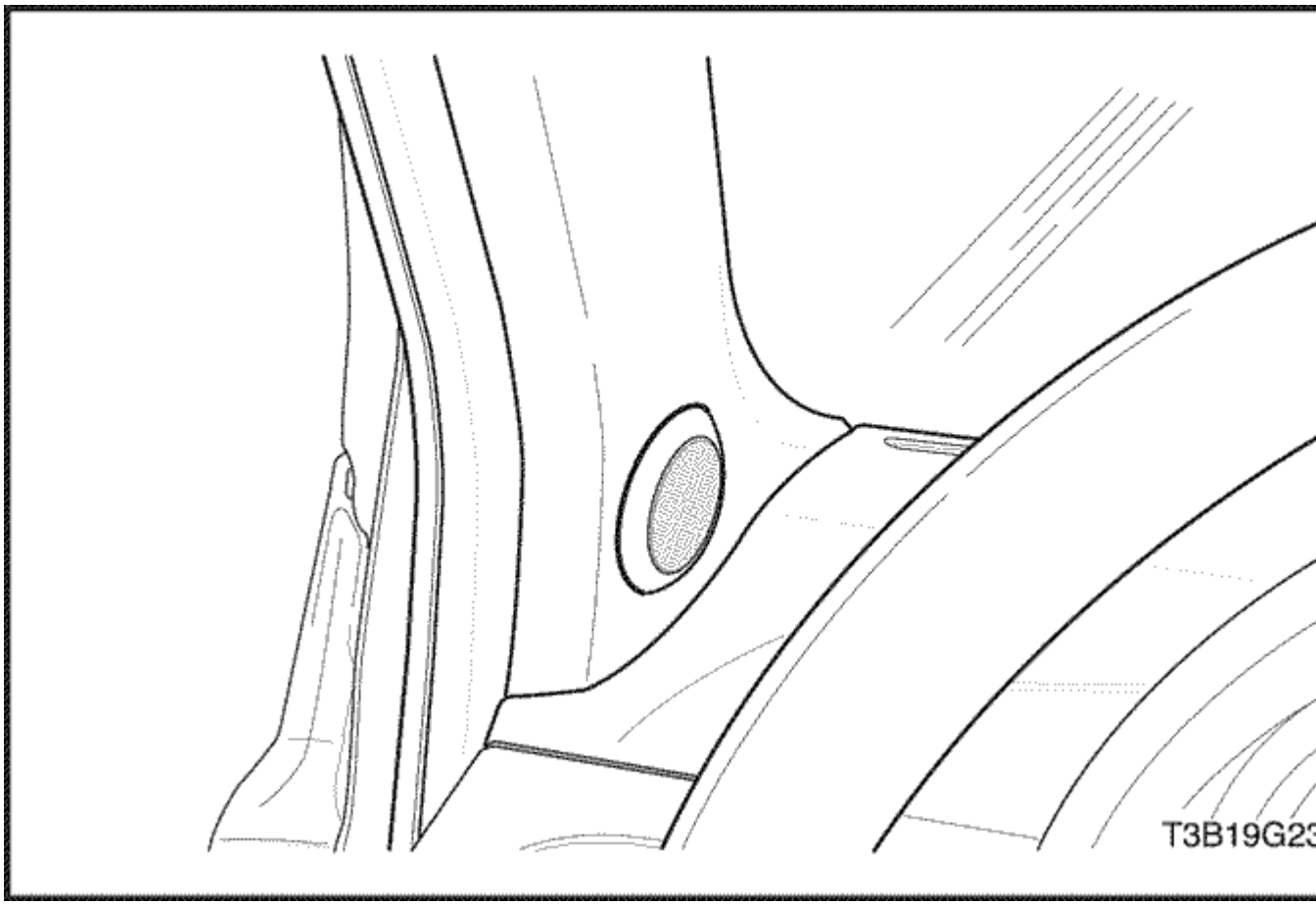
6. Install the sunroof molding, if equipped.
7. Install the left and the right C-pillar trim panels.
8. Install the top of the left and the right B-pillar trim panels to the original position.



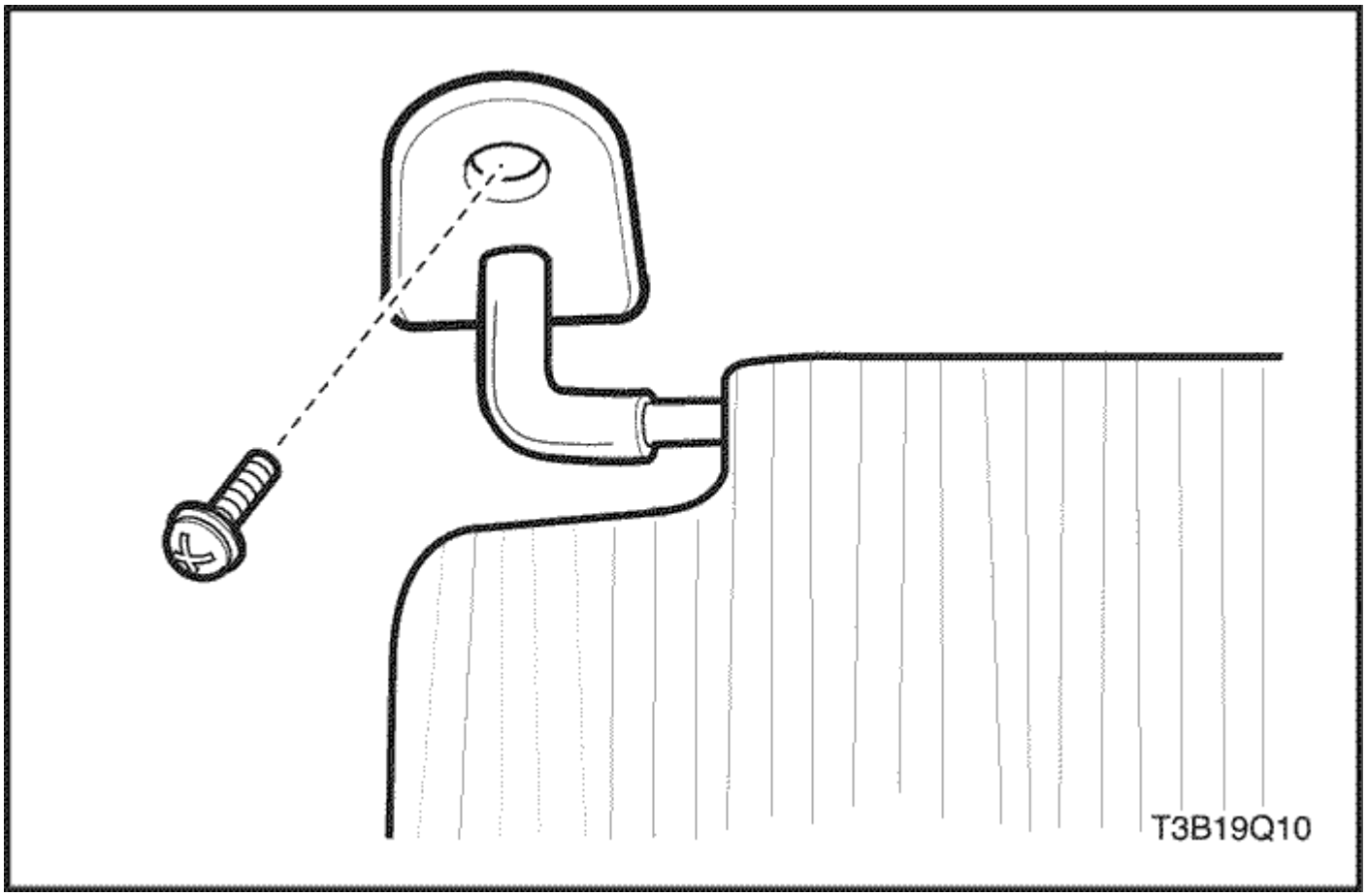
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

9. Install the seat belt anchors with the bolts in the left and the right B-pillar panels.

   Tighten
   Tighten the B-pillar seat belt bolts to 38 N•m (28 lb-ft).

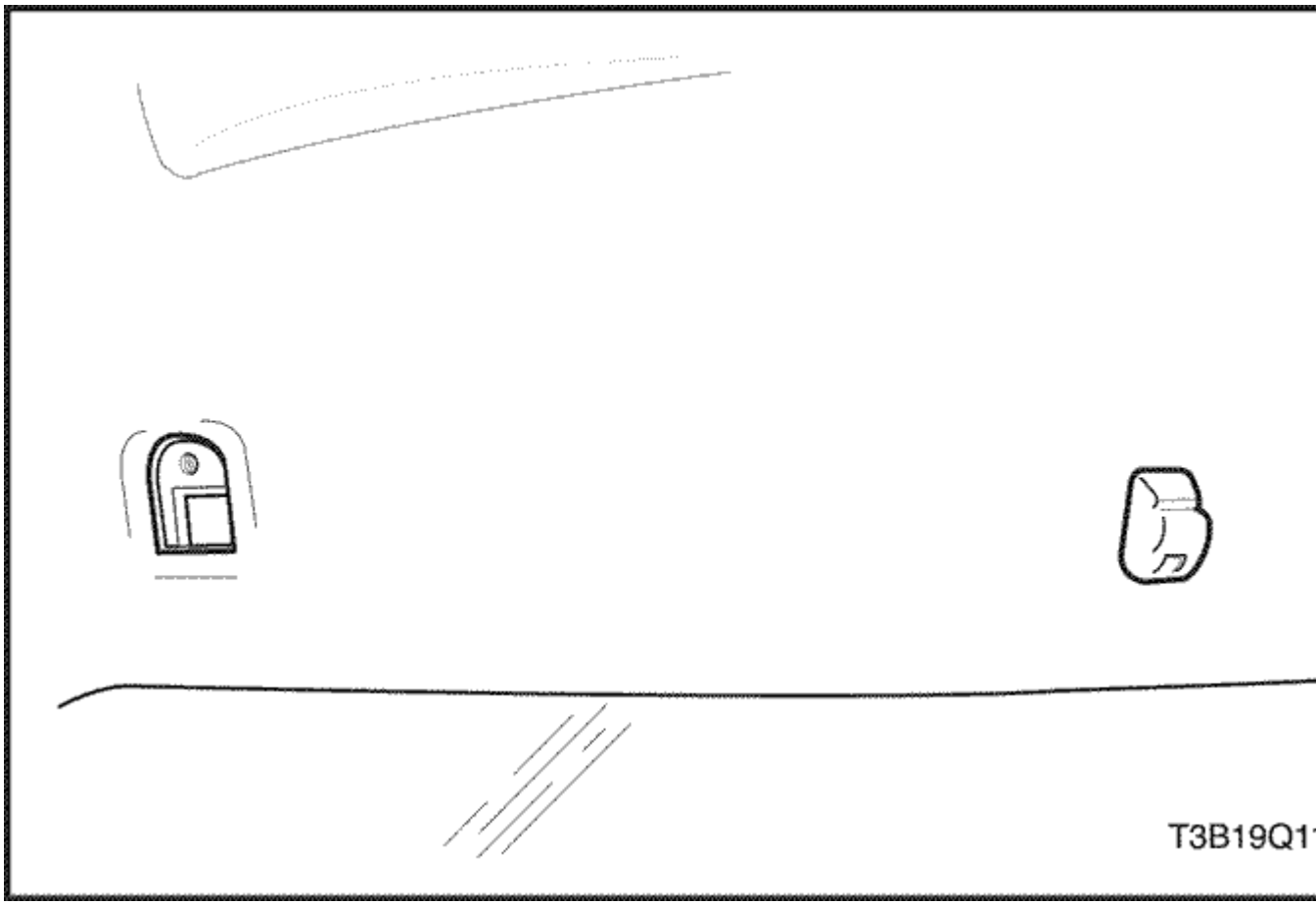


10. Install the left and the right A-pillar trim panels.
11. Install the interior courtesy lamp. Refer to *Section 9B, Lighting Systems.*
12. Install the sun visors. Refer to *"Sun Visors"* in this section.
13. Install the coat hook. Refer to *"Coat Hook"* in this section.
14. Install the passenger assist handles. Refer to *"Passenger Assist Handles"* in this section.

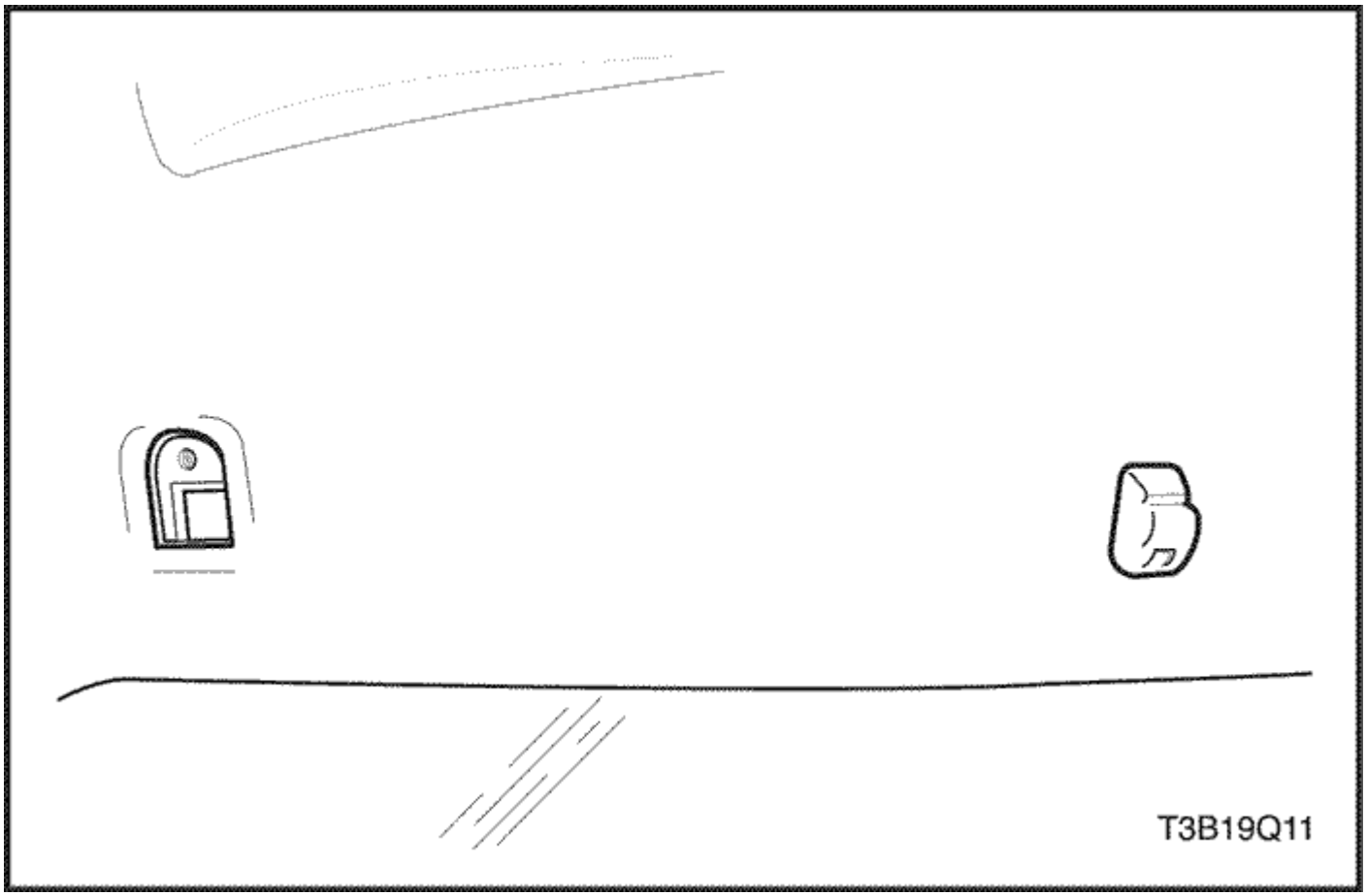


Sun Visors
Removal Procedure

1. Remove the screws and the sun visor from the headliner.



2. Remove the screw and the sun visor support from the headliner.

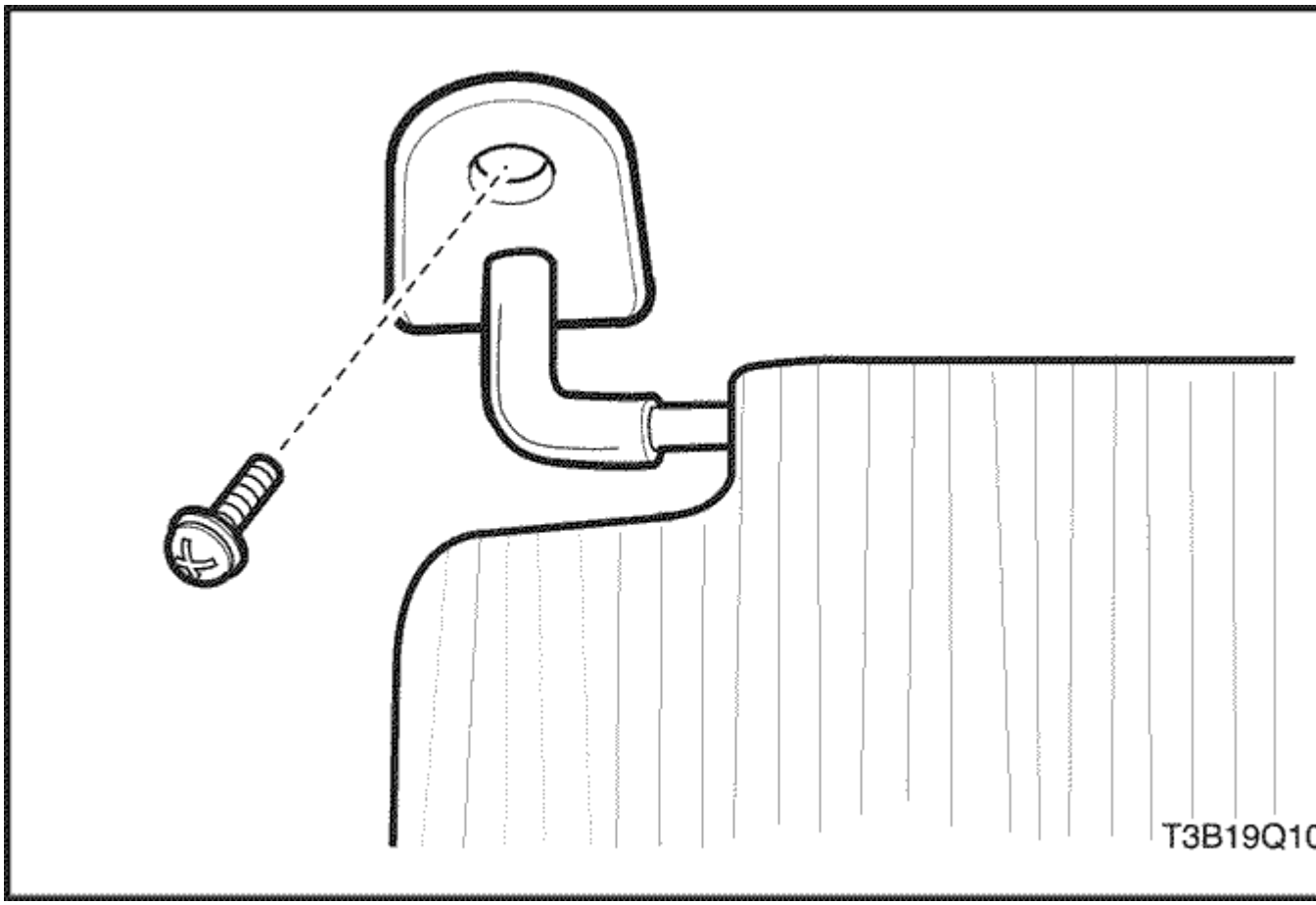


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

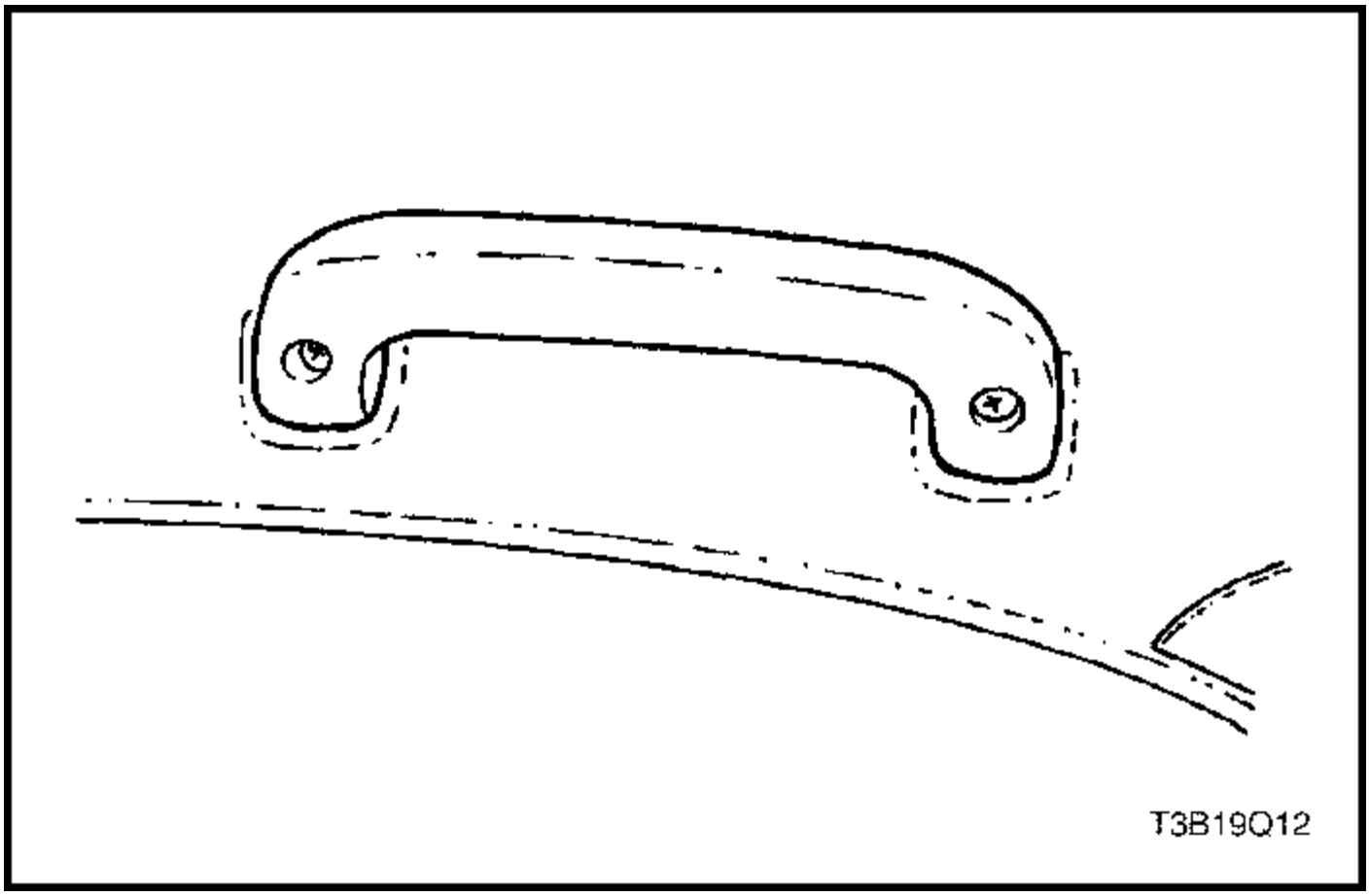
1. Install the sun visor support to the headliner with the screw.

   Tighten
   Tighten the sun visor support screw to 1.5 N•m (13 lb-in).



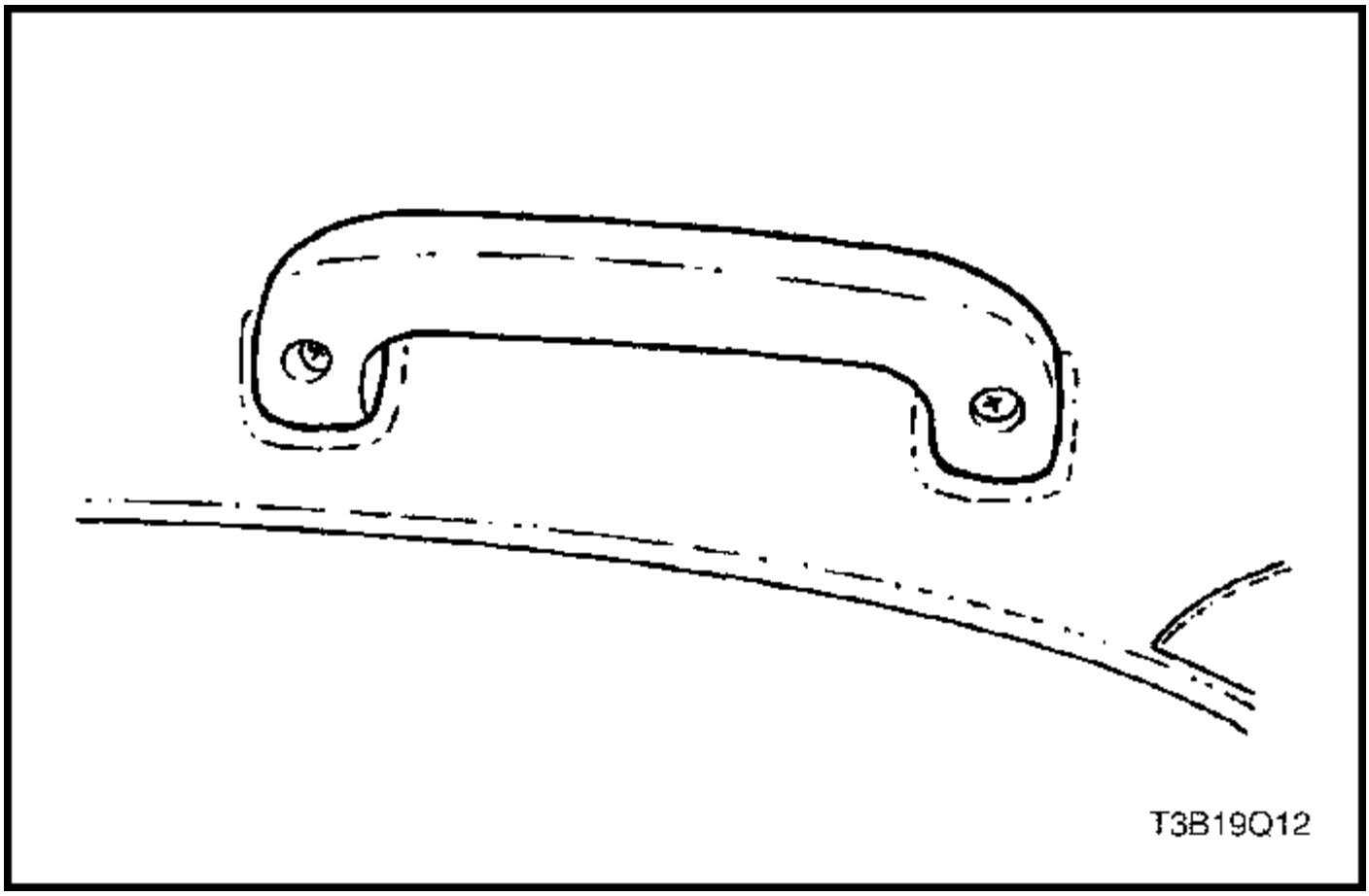
2. Install the sun visor to the headliner with the screws.

   Tighten
   Tighten the sun visor screws to 1.5 N•m (13 lb-in).



Passenger Assist Handles
Removal Procedure

1. Remove the screws and the assist handle from the headliner.

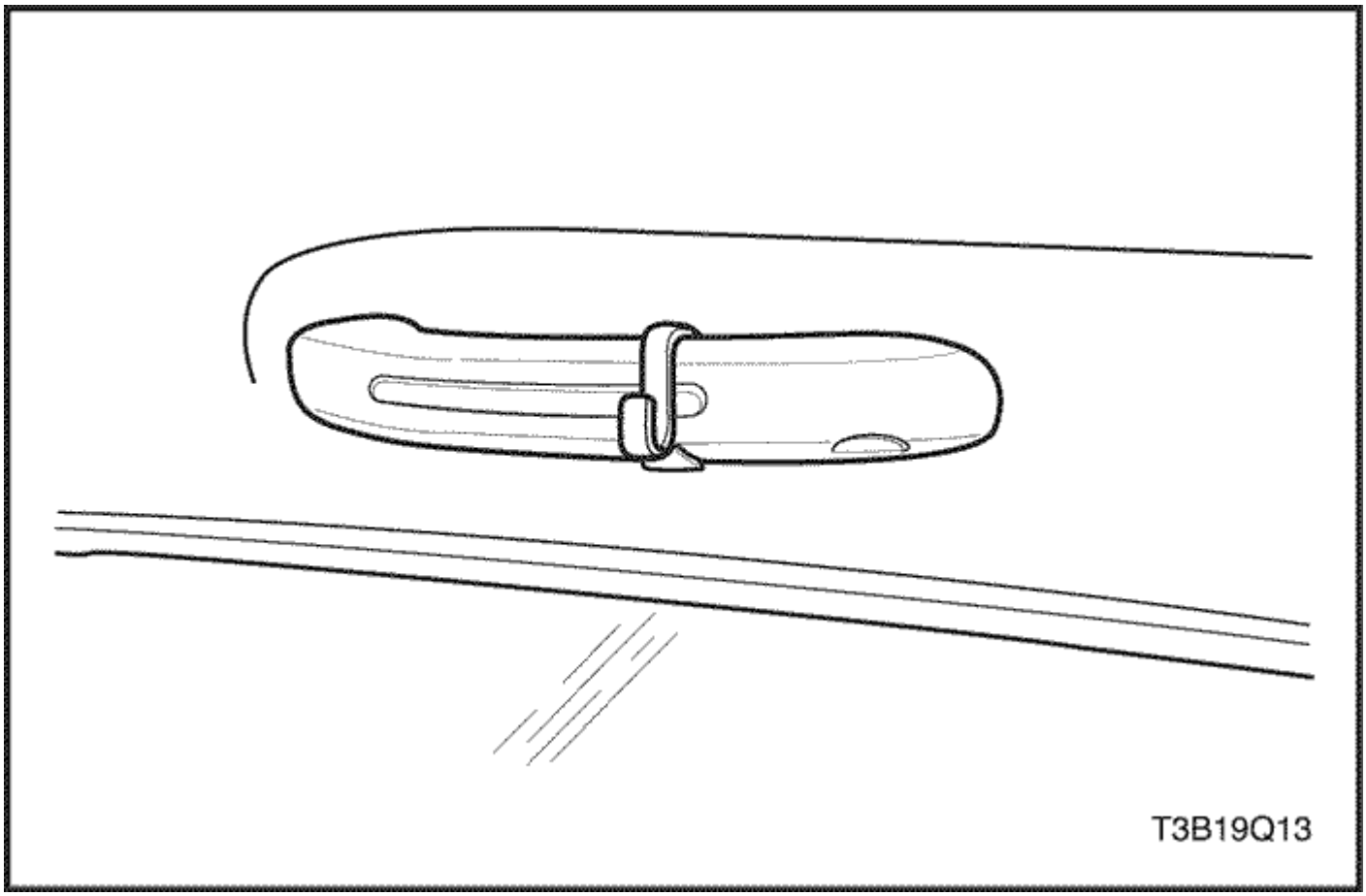


Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

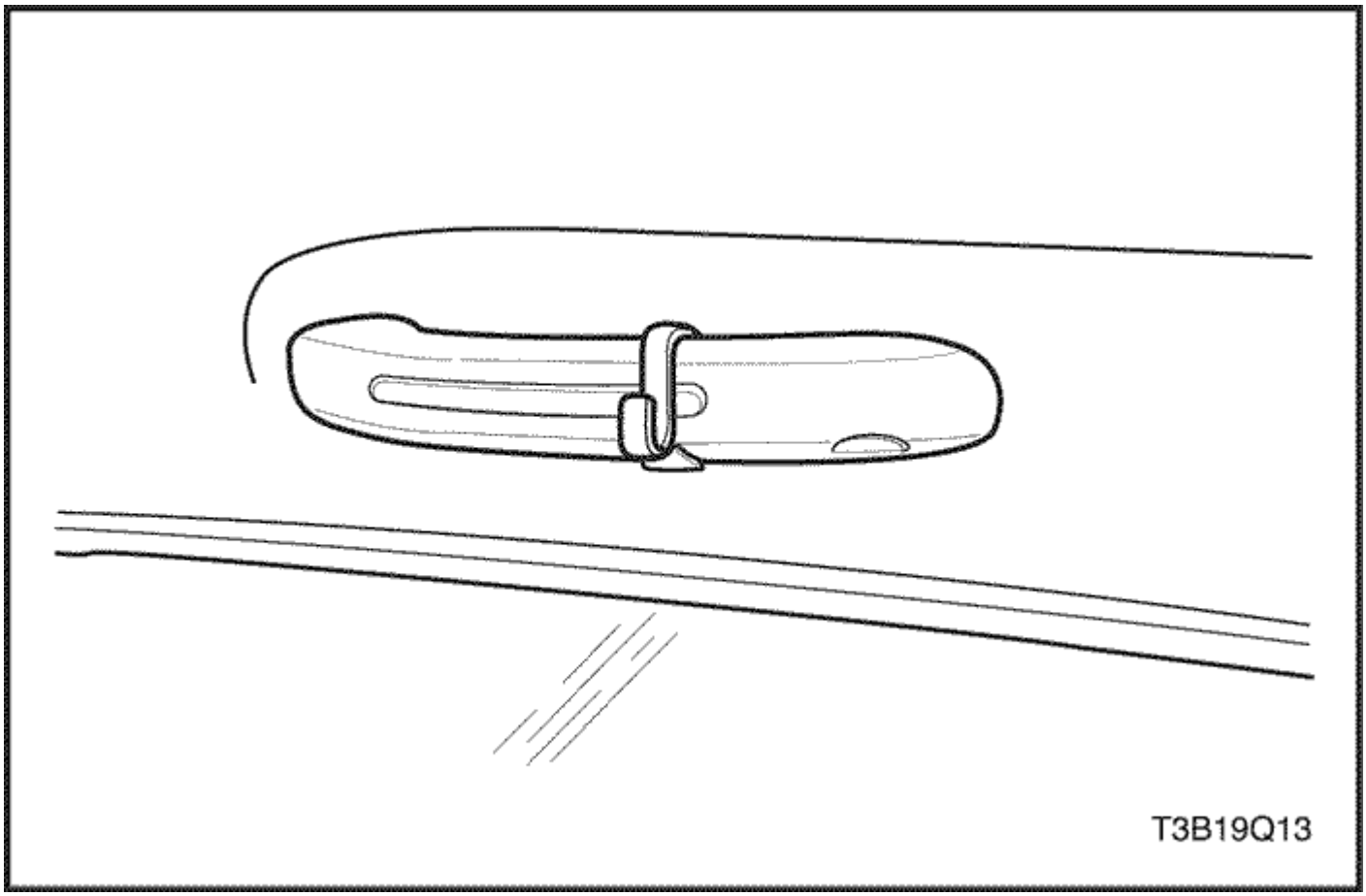
1. Install the assist handle to the headliner with the screws.

   Tighten
   Tighten the passenger assist handle screws to 3.5 N•m (31 lb-in).



Coat Hook
Removal Procedure

1. Remove the coat hook from the passenger assist handle.



Installation Procedure

1. Install the coat hook to the passenger assist handle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Roof

The roof is a one-piece painted metal unit which incorporates a single, solid headliner and two moldings with one on each side of the vehicle's roof.
The moldings, which enclose and hide the roof rail seams, are serviceable as individual units.
The one-piece formed headliner, common to both the notchback and the hatchback, consists of a molded substrate covered with a foam-backed cloth facing. The one-piece construction requires servicing the headliner as a complete assembly.

Power Sunroof

The sunroof is built into the roof and is made of glass. It is intended to provide light and air through the roof of the vehicle. The sunroof is powered by an electric motor and controlled by a toggle switch built into the interior courtesy lamp assembly. The sunroof is also equipped with a sunshade that opens and closes manually.

Power Sunroof Control Switch

The power sunroof control switch is a toggle button located on the right side of the interior courtesy lamp/power sunroof control switch assembly.

Operating the Power Sunroof

The ignition must be ON in order to operate the power sunroof.

Tilting the Power Sunroof Open and Closed

To tilt open the rear end of the power sunroof, press and hold the forward portion of the toggle button until the power sunroof tilts open.

To close the power sunroof from a tilted-open position, press and hold the rear portion of the toggle button until the sunroof tilts closed.

Sliding the Power Sunroof Open and Closed

To slide open the power sunroof, press the rear portion of the toggle button until the sunroof slides. If the sunshade is closed, the power sunroof will pull the sunshade open as the sunroof slides open.

To close the power sunroof from a slid-open position, press the forward portion of the toggle button until the sunroof slides closed.

Sun Visors

The sun visors swing down in order to block out glare. They also swing to the side when they are released from the support. Each sun visor has a vanity mirror.

Passenger Assist Handles

There is a passenger assist handle for the right, rear outboard seat and for the front passenger seat. Passengers can use these handles to assist in keeping their balance over rough roads or during sharp turns.

Coat Hook

The coat hook is fastened to the headliner above the left-hand rear passenger's seat.

SECTION 9R

BODY FRONT END

SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Cowl Vent Grille Screws	2	-	18
Fender Screws (Rear of Fascia)	4	-	35
Fender-to-A-Pillar Bolt	8	-	71
Front Bumper Fascia-to-Fender Screw	1.5	-	13
Hinge Bolts	20	15	-
Hood Latch Screws	8	-	71
Hood Release Handle Screws	1.5	-	13
Hood-to-Hinge Bolts	20	15	-
Lower Fender Bolts	10	-	89
Splash Shield Screws	1.5	-	13
Upper Fender Bolts	10	-	89

MAINTENANCE AND REPAIR

On-Vehicle Service

Lubrication

The hood hinges and the locking mechanisms require periodic lubrication for proper operation. Refer to *Section 0B, General Information* for the specific types and intervals of lubrication.

Fasteners

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

Many aluminum components are used on current models. Aluminum in contact with steel may corrode rapidly if it is not protected by special finishes or isolators.

The fasteners used have a special finish which provides adequate protection from corrosion. These special fasteners differ in color in order to easily identify them from the standard metric fasteners, which are medium blue in color.

When replacing fasteners, avoid substituting otherwise similar fasteners in the same location.

Anticorrosion Materials

In order to provide rust resistance, anticorrosion materials have been applied to the interior surfaces of most of the metal panels. When servicing these panels, properly re-coat them with a service-type anticorrosion material if any of the original material has been disturbed.

Front End Sealing

All locations where waterleaks may occur are sealed during production with high quality, durable sealers. If it becomes necessary to reseal specific areas, use a high quality sealer of medium-bodied consistency which will retain its flexible characteristics after drying and can be painted, if necessary.

Cowl Vent Grille
Removal Procedure

1. Raise the hood and support it with the hood prop.
2. Remove the nuts and the wiper arms.
3. Remove the cowl vent grille screws and the two-piece grille.

Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the two-piece grille and the cowl vent grille screws.

   Tighten
   Tighten the cowl vent grille screws to 2 N•m (18 lb-in).

2. Install the nuts and the wiper arms.

Hood
Removal Procedure

Important : Install protective coverings over the fenders and the windshield in order to prevent damage to the paint, the glass, and the moldings when removing and installing the hood.

1. Raise and support the hood.
2. Remove the washer hose.
3. Mark the position of the hinge to the hood in order to aid in alignment during installation.
4. Remove the bolts retaining the hood to both hinges.
5. With the aid of another technician, remove the hood from the hinges.

Installation Procedure

1. With the aid of another technician, position the hood in the location marked during removal.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

2. Install the two bolts securing the hood to each hinge.

   Tighten
   Tighten the hood-to-hinge bolts to 20 N•m (15 lb-ft).

3. Install the washer hose.
4. Inspect the hood for proper alignment.

Hood Hinges
Removal Procedure

1. Remove the hood. Refer to "Hood" in this section.
2. Remove the bolts and the hinge.

Installation Procedure

Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the hinge with the bolts.

   Tighten
   Tighten the hinge bolts to 20 N•m (15 lb-ft).

2. Install the hood. Refer to "Hood" in this section.

Hood Prop Rod
Removal Procedure

1. Support the hood in the open position.
2. Remove the hood prop rod by gently prying the base from the radiator support.

Installation Procedure

1. Install the hood prop rod by snapping the base back into the radiator support.

Hood Secondary Latch
Removal Procedure

1. Open the hood.
2. Remove the screws and the hood latch.
3. Disconnect the hood release cable.

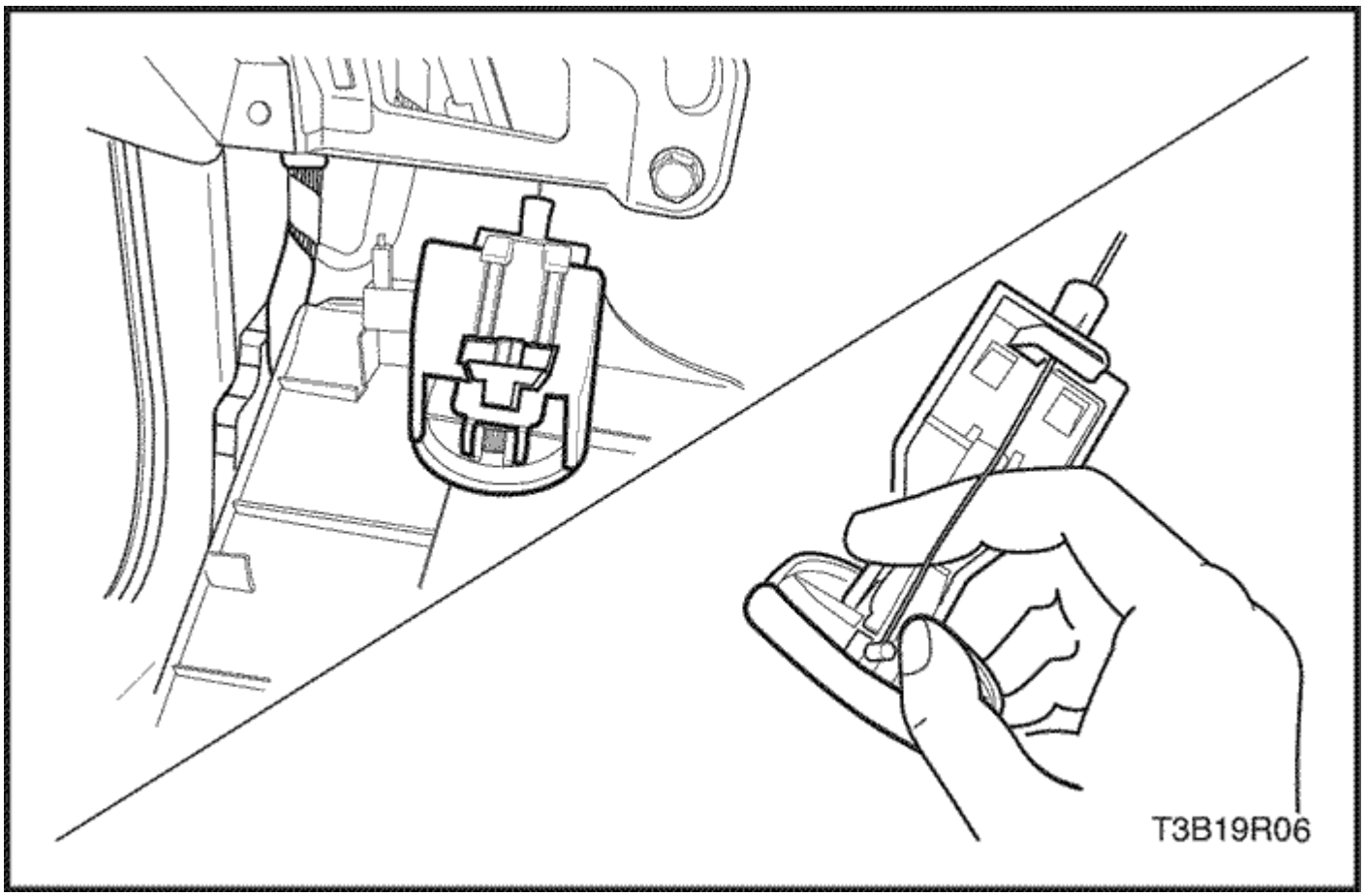
Installation Procedure

1. Connect the hood release cable to the latch.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

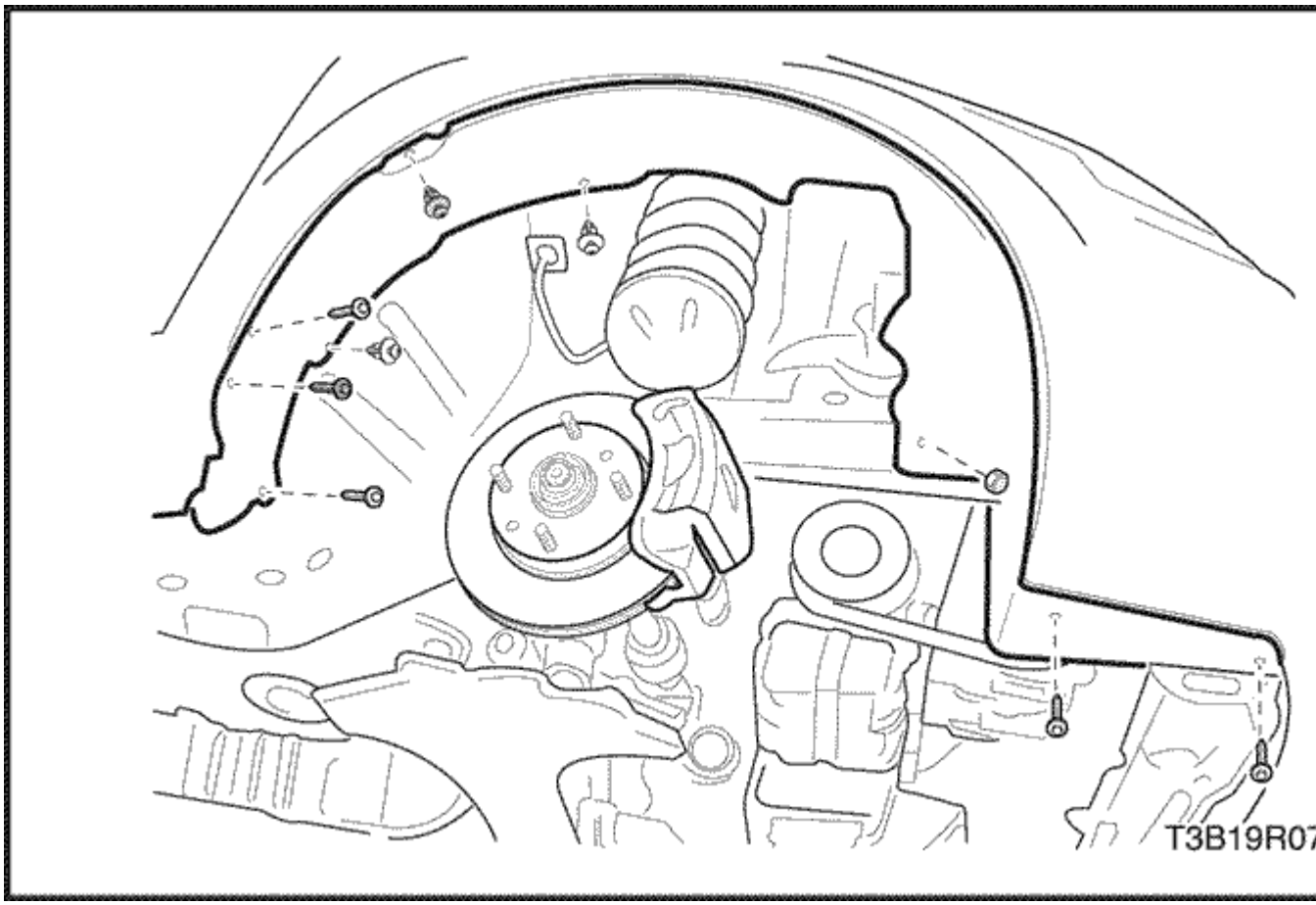
2. Install the hood latch with the screws.

   Tighten
   Tighten the hood latch screws to 8 N•m (71 lb-in).

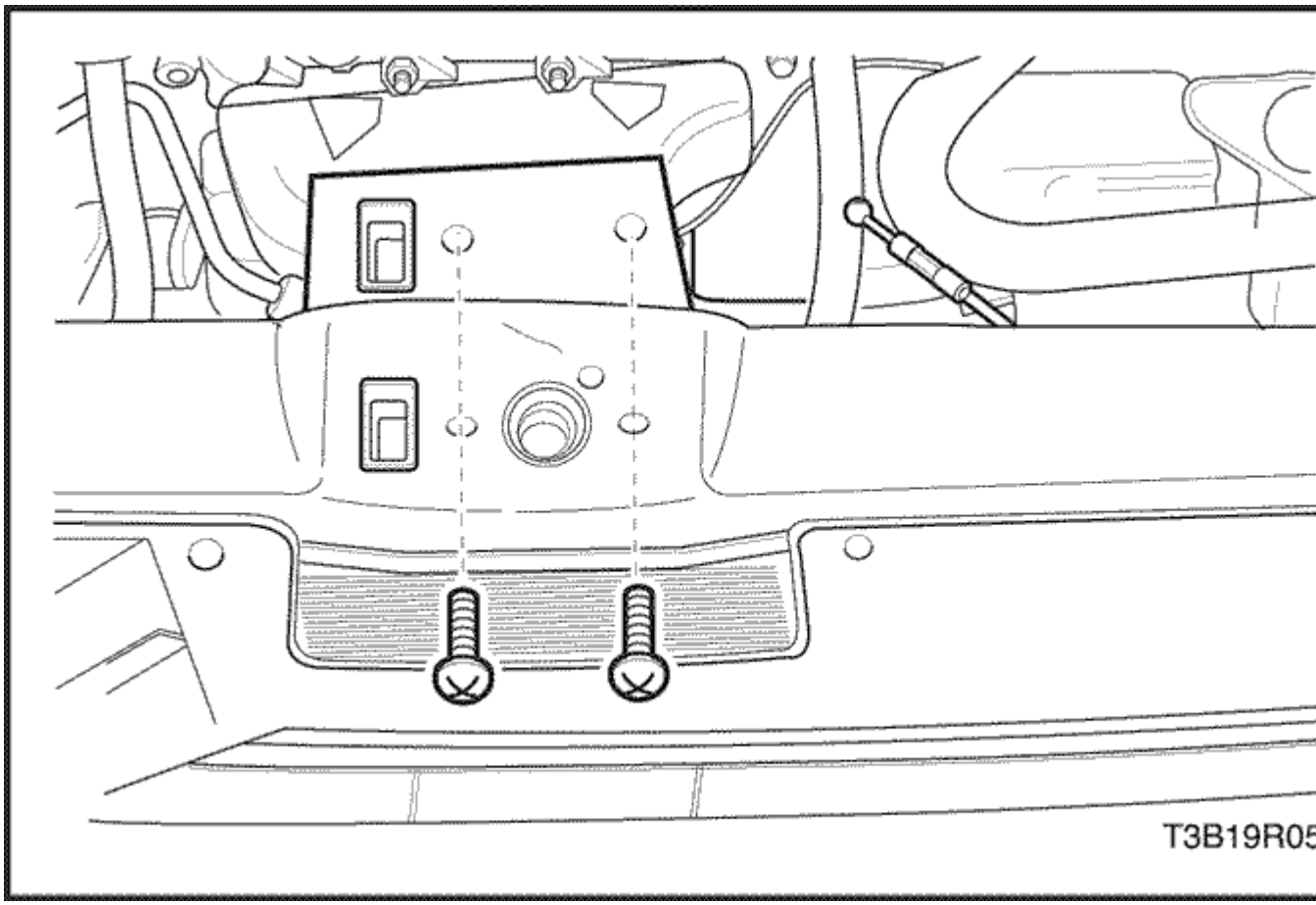


Hood Latch Release Cable
Removal Procedure

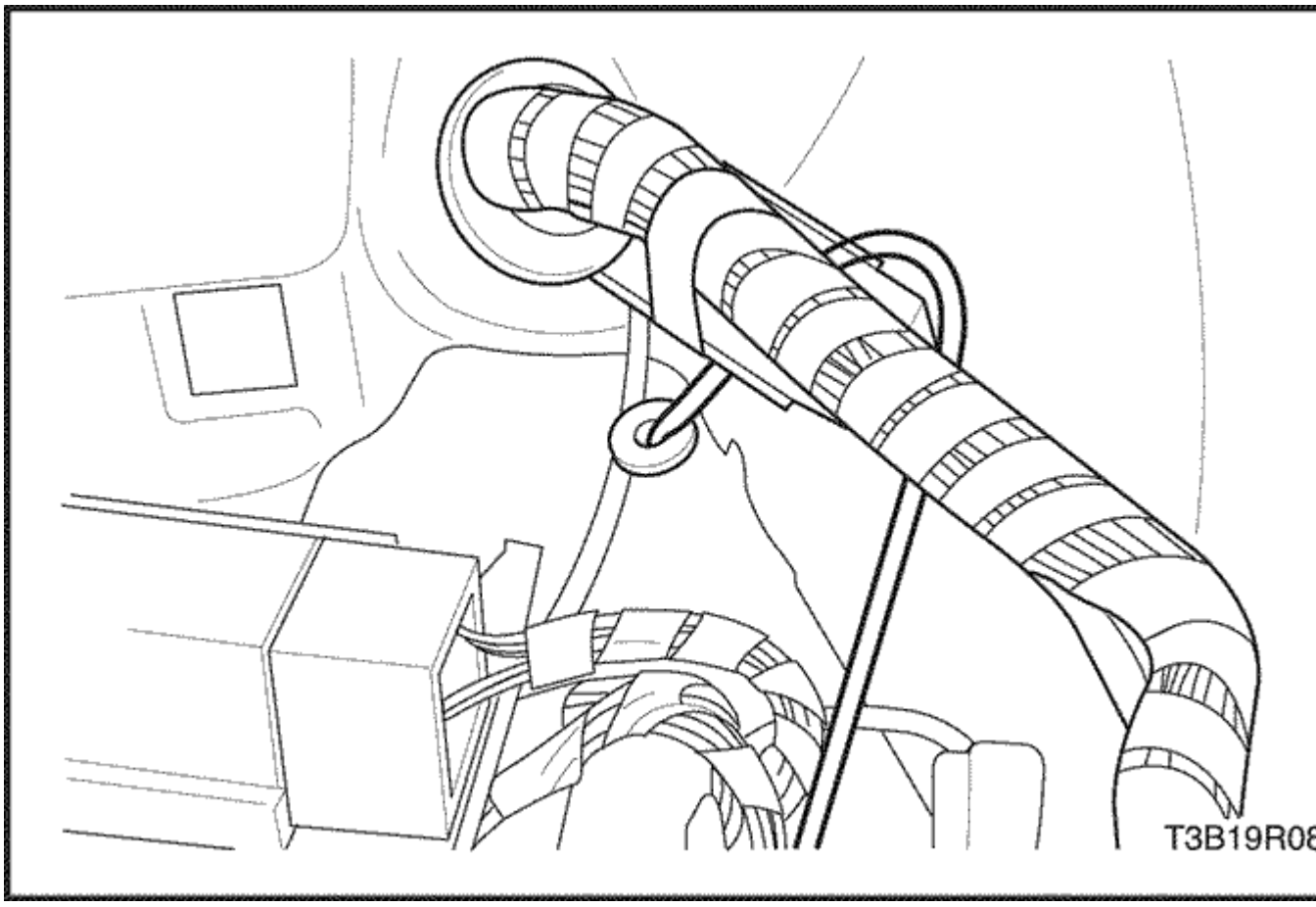
1. Pull out the hood release handle in order to access the screws.
2. Remove the screws and the hood release handle from the instrument panel.



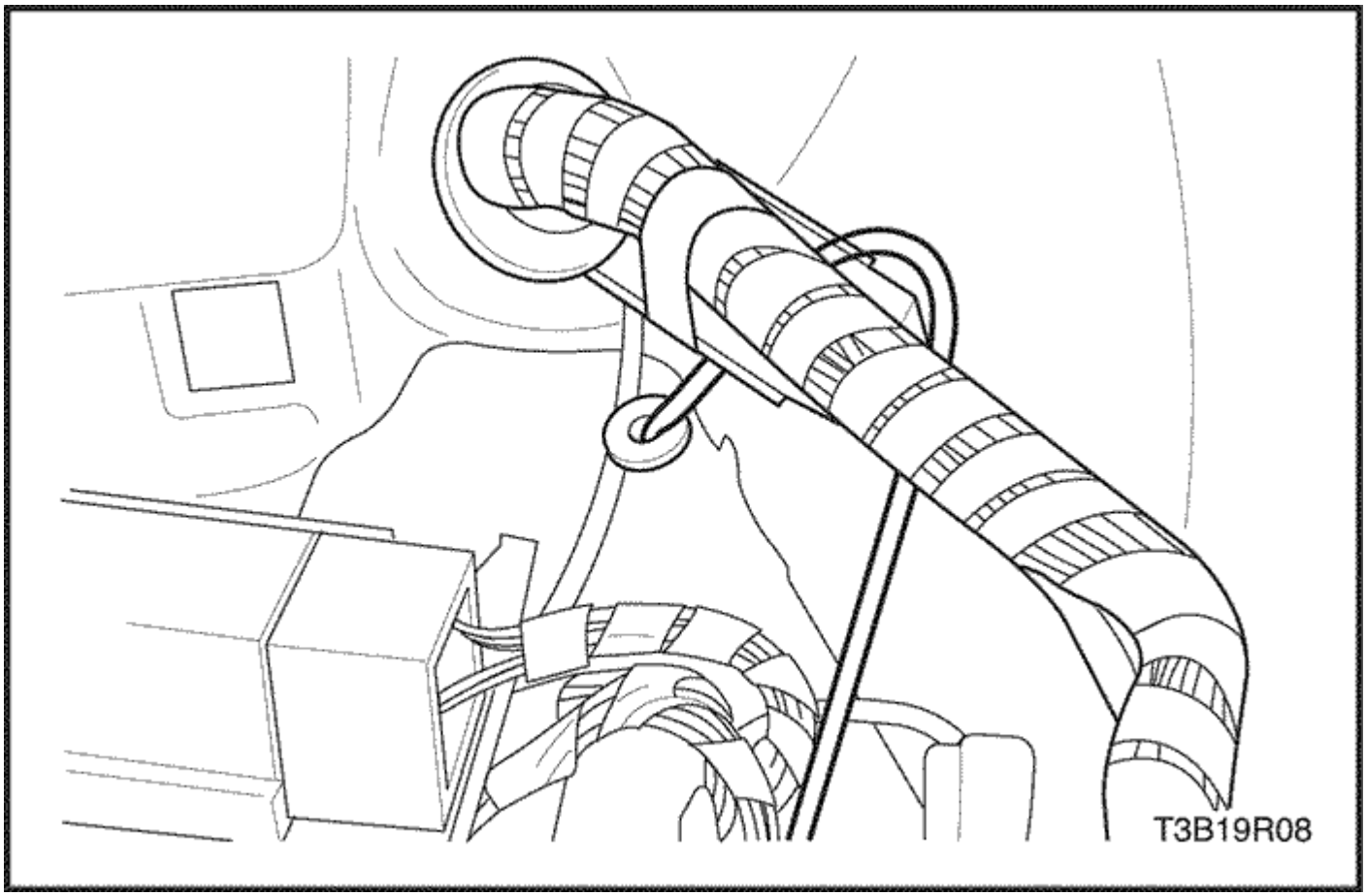
3. Raise and suitably support the vehicle.
4. Remove the front wheel. Refer to *Section 2E, Tires and Wheels.*
5. Remove the screws and the splash shield.



6. Open the hood.
7. Remove the screws and the hood secondary latch.

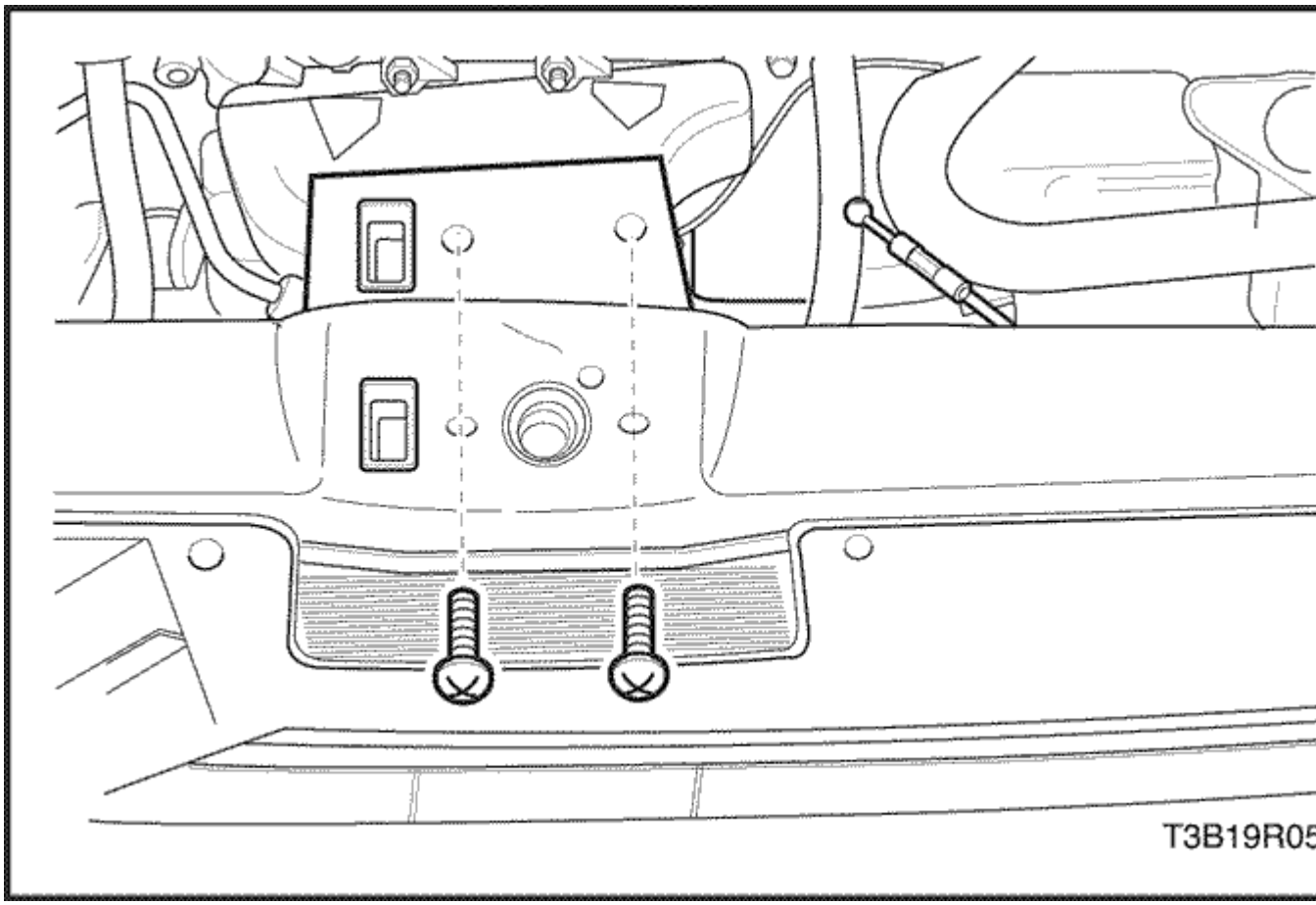


8. Remove the cable from the hood release handle.
9. Remove the cable from inside the vehicle.



Installation Procedure

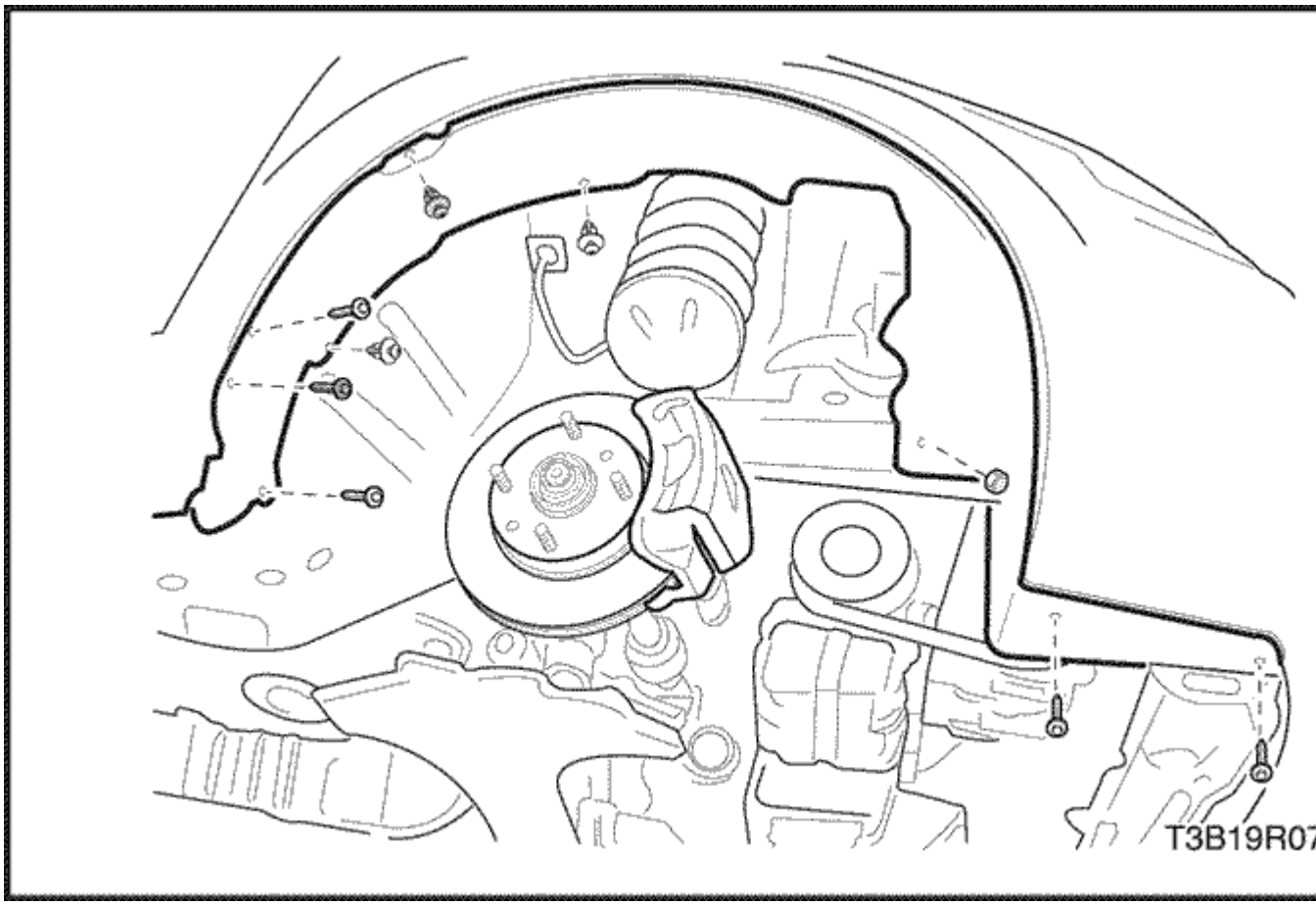
1. Install the cable from inside the vehicle.
2. Install the cable to the hood release handle.



Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

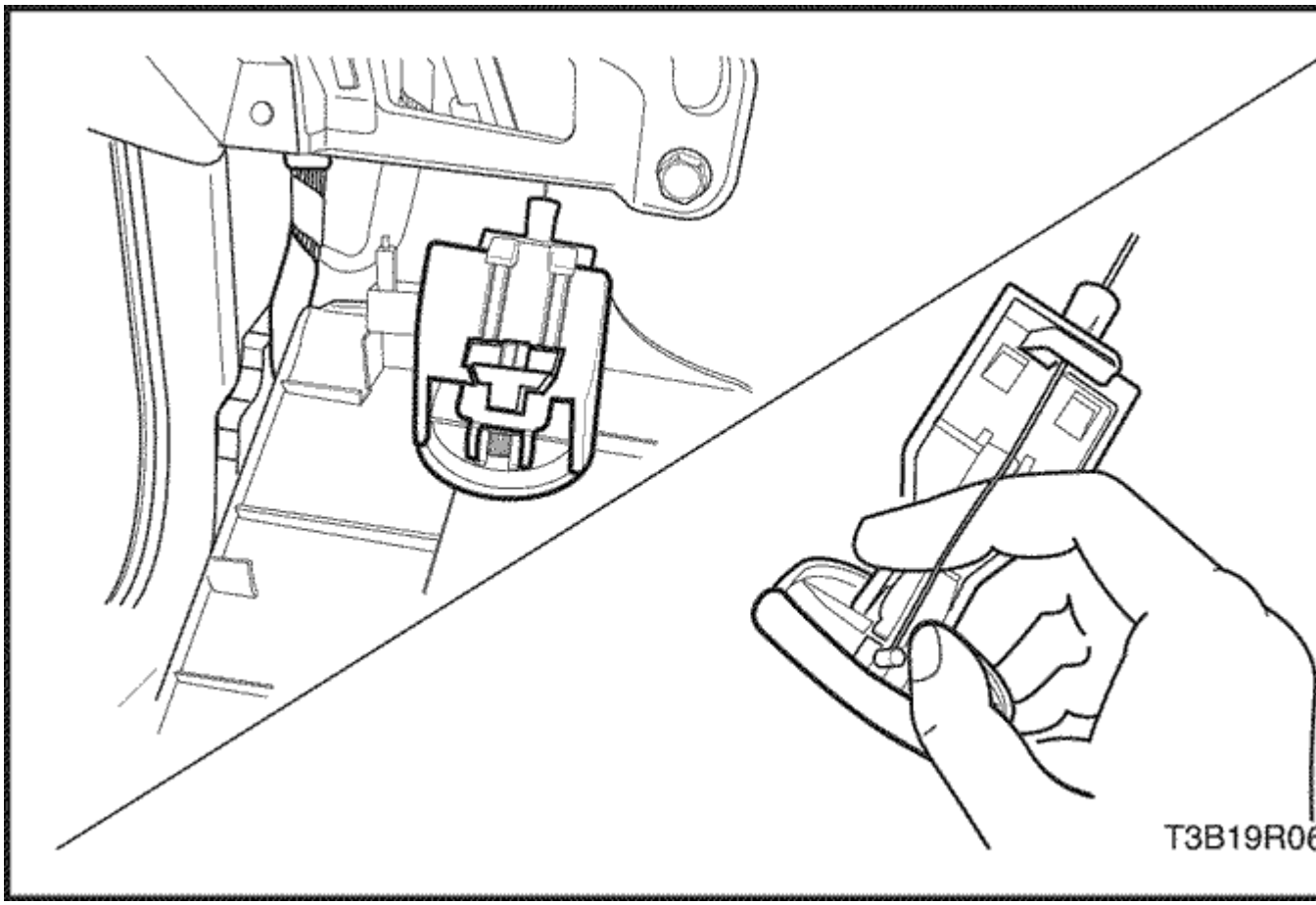
3. Install the screws and the hood secondary latch.

   Tighten
   Tighten the hood latch screws to 8 N•m (71 lb-in).



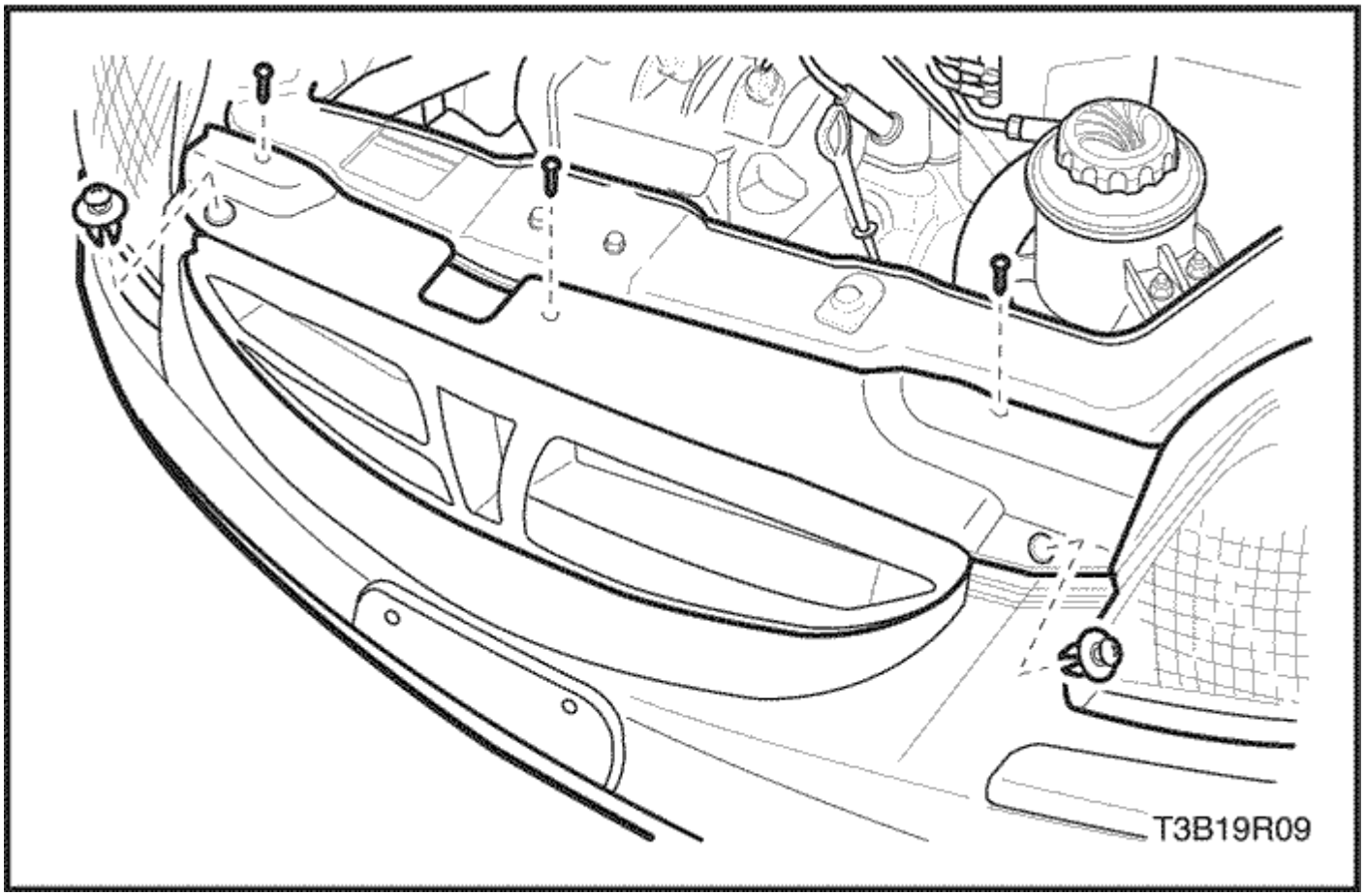
4. Install the splash shield with the screws.

Tighten
Tighten the splash shield screws to 1.5 N•m(13 lb-in).



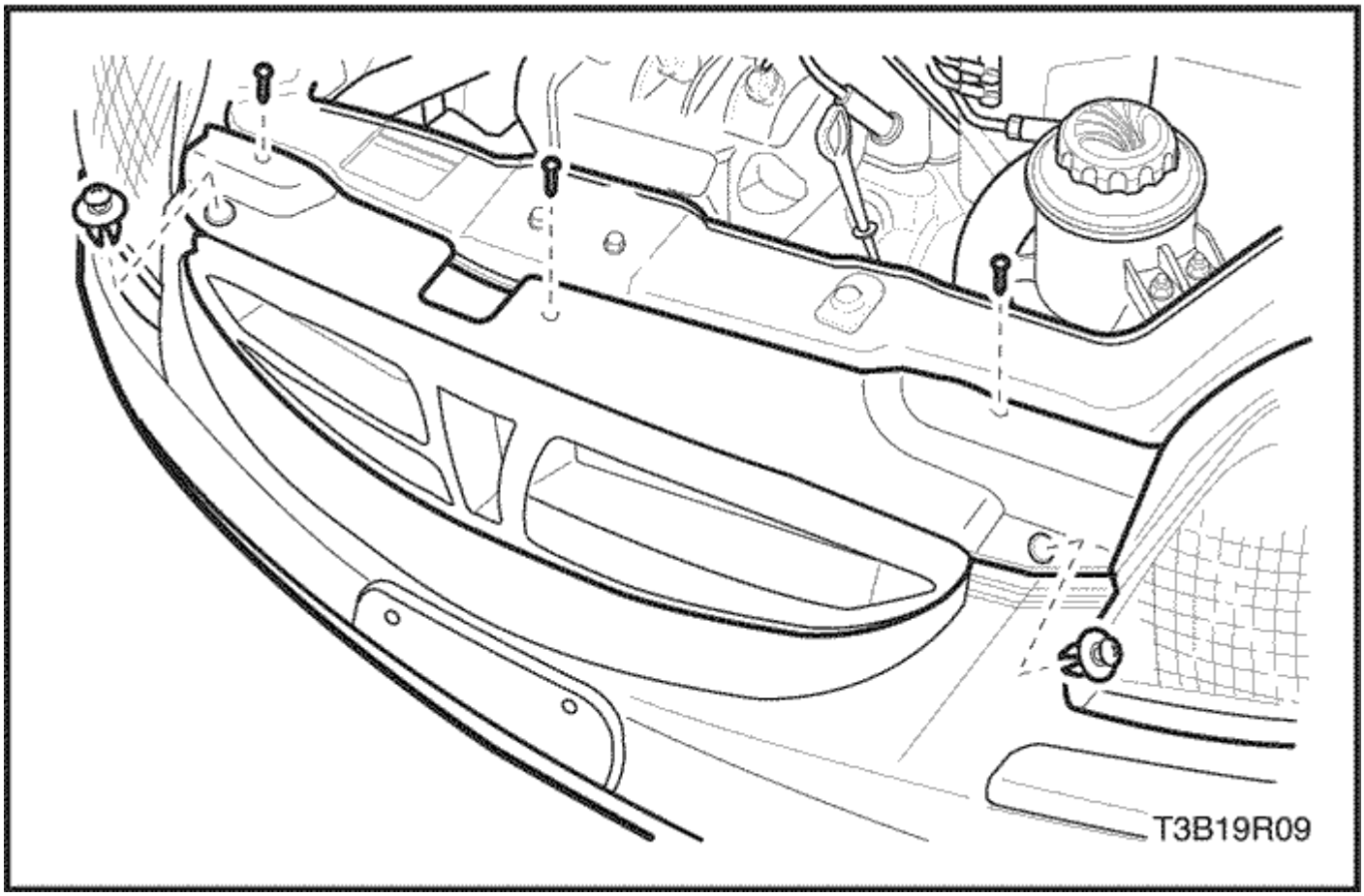
5. Install the front wheel. Refer to *Section 2E, Tires and Wheels.*
6. Lower the vehicle.
7. Install the hood release handle on the instrument panel with the screws.

   Tighten
   Tighten the hood release handle screws to 1.5 N•m (13 lb-in).



Radiator Grille
Removal Procedure

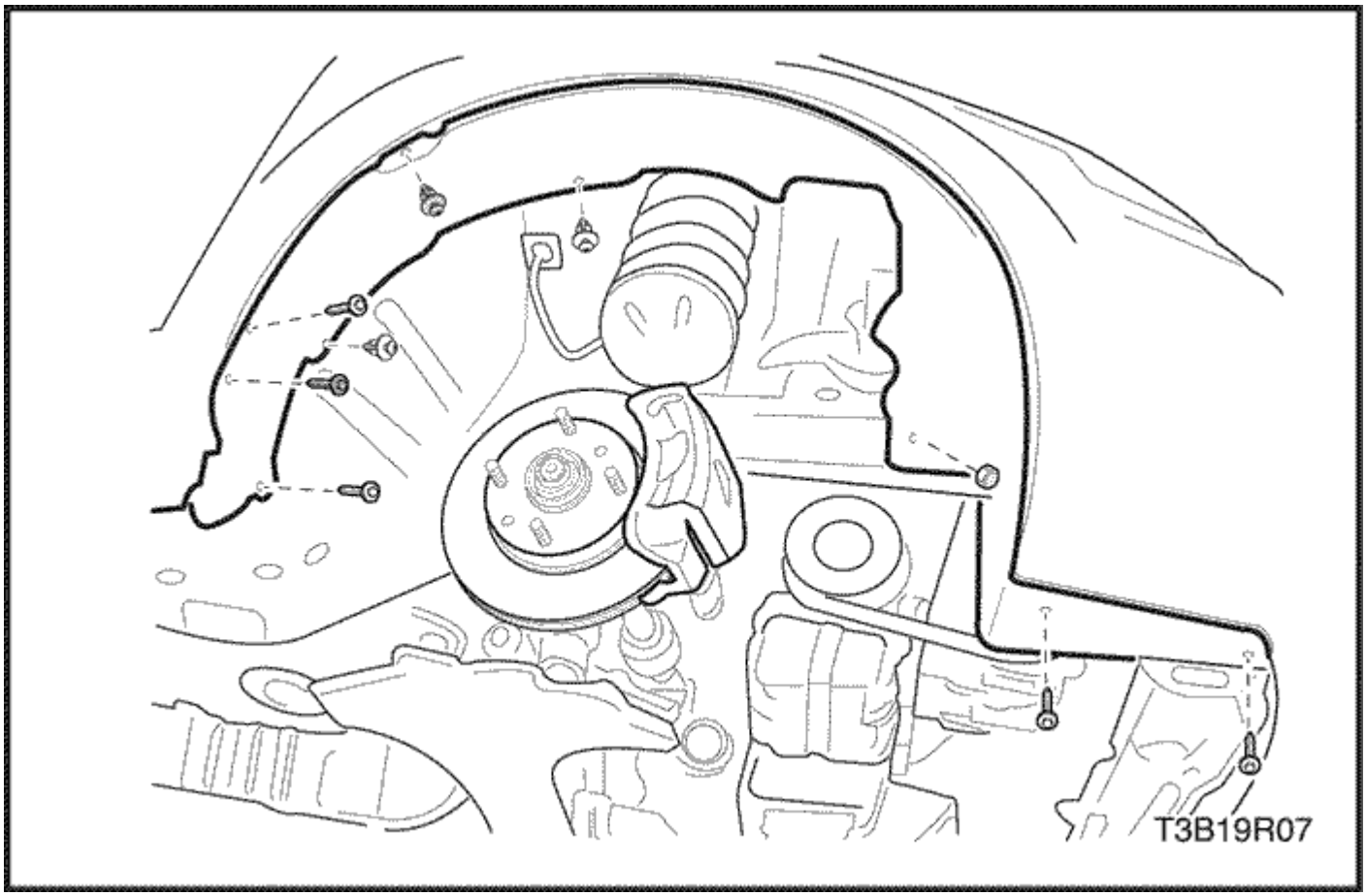
1. Open the hood.
2. Remove the screws and the radiator grille.



Installation Procedure

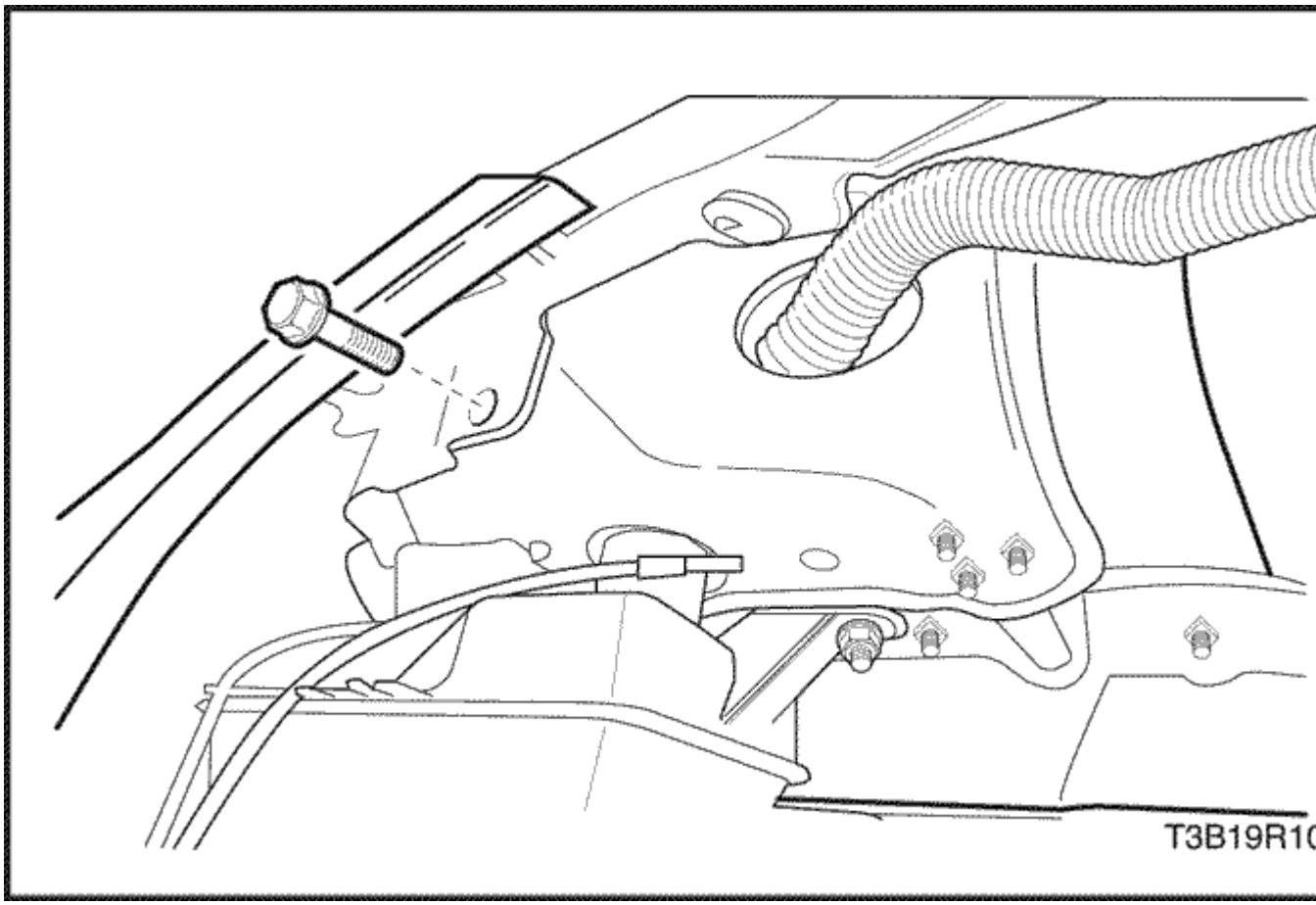
Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

1. Install the radiator grille with the screw.

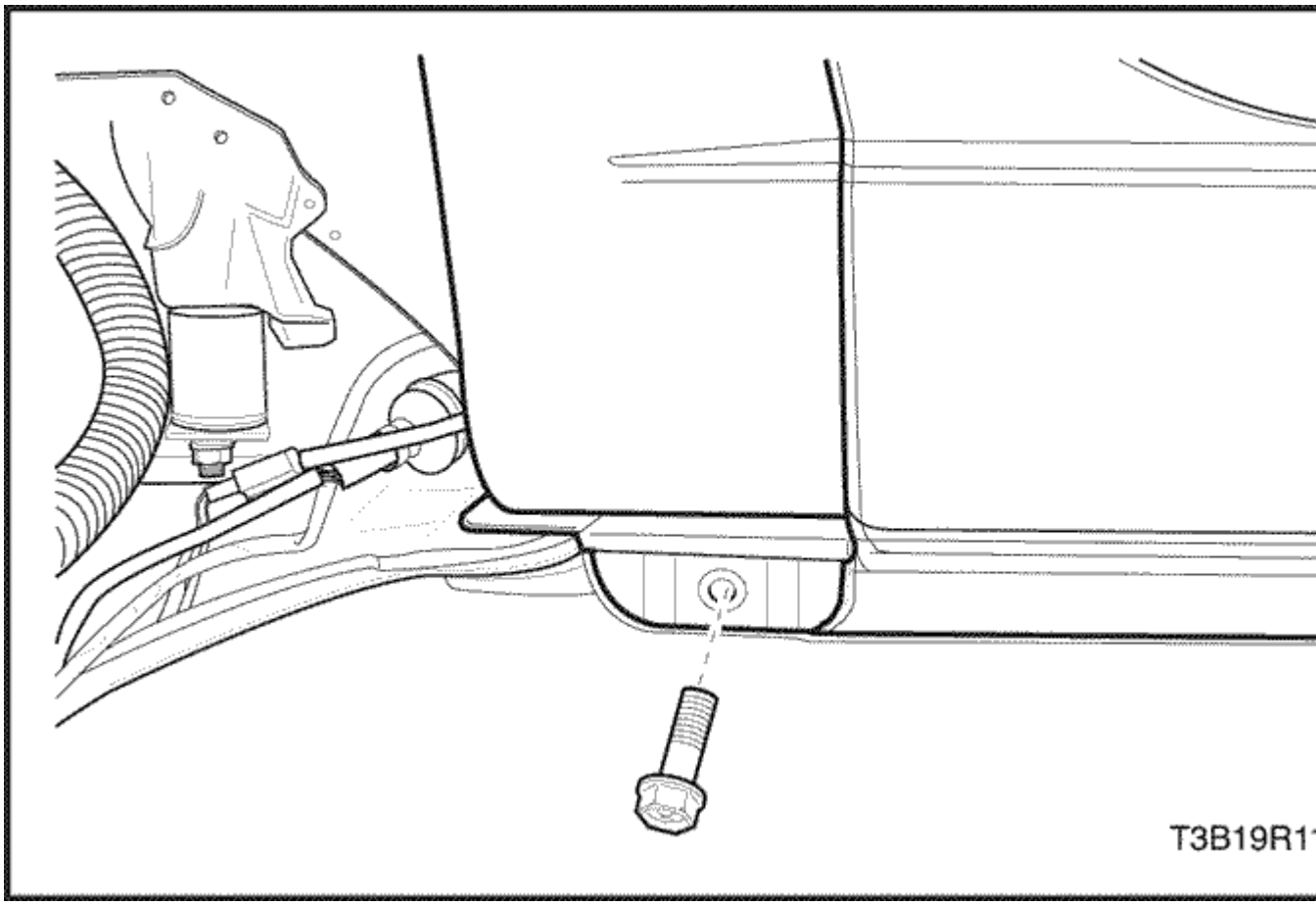


Fender
Removal Procedure

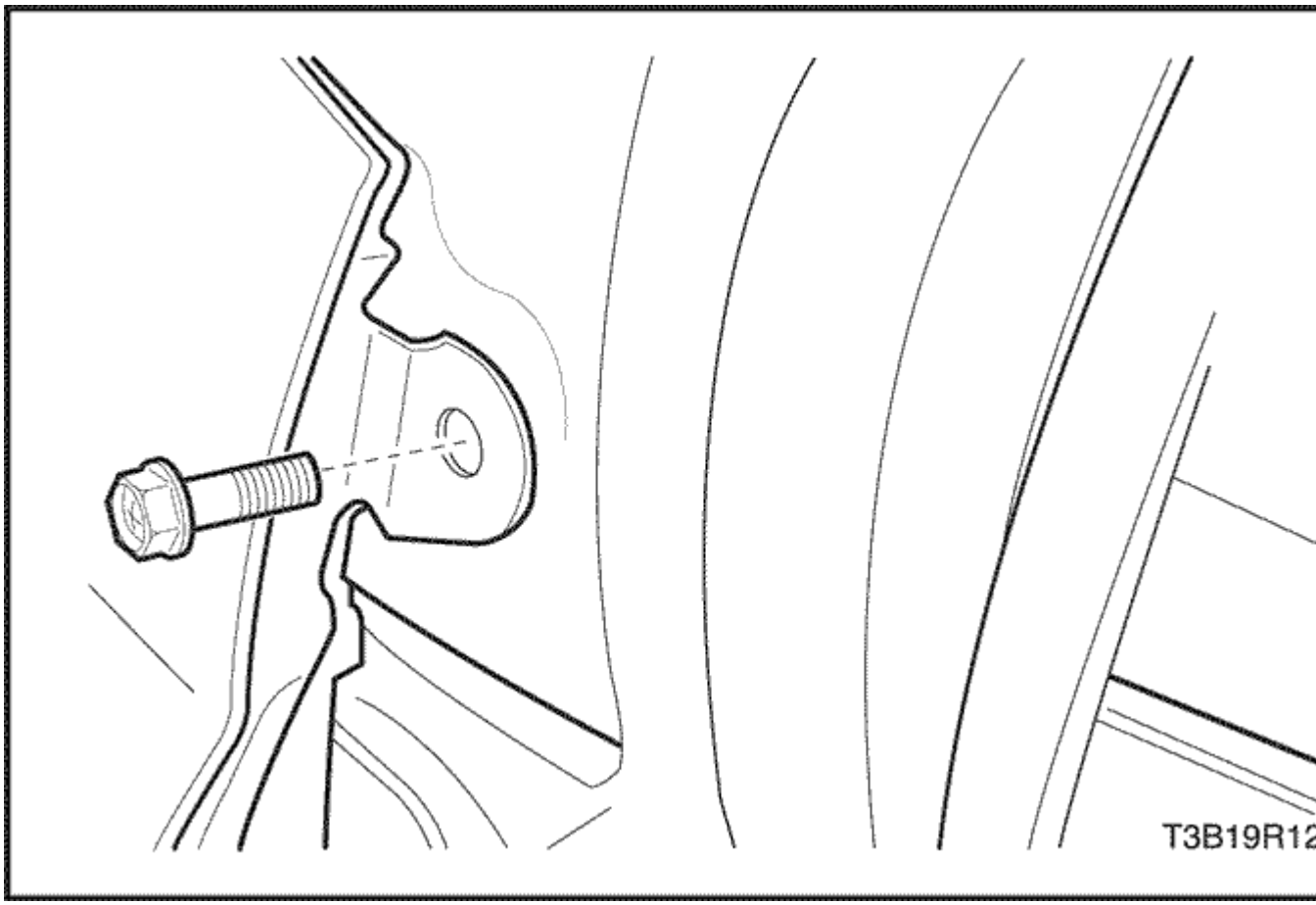
1. Raise and suitably support the vehicle.
2. Remove the front wheel. Refer to *Section 2E, Tires and Wheels.*
3. Remove the bolts and the splash shield.



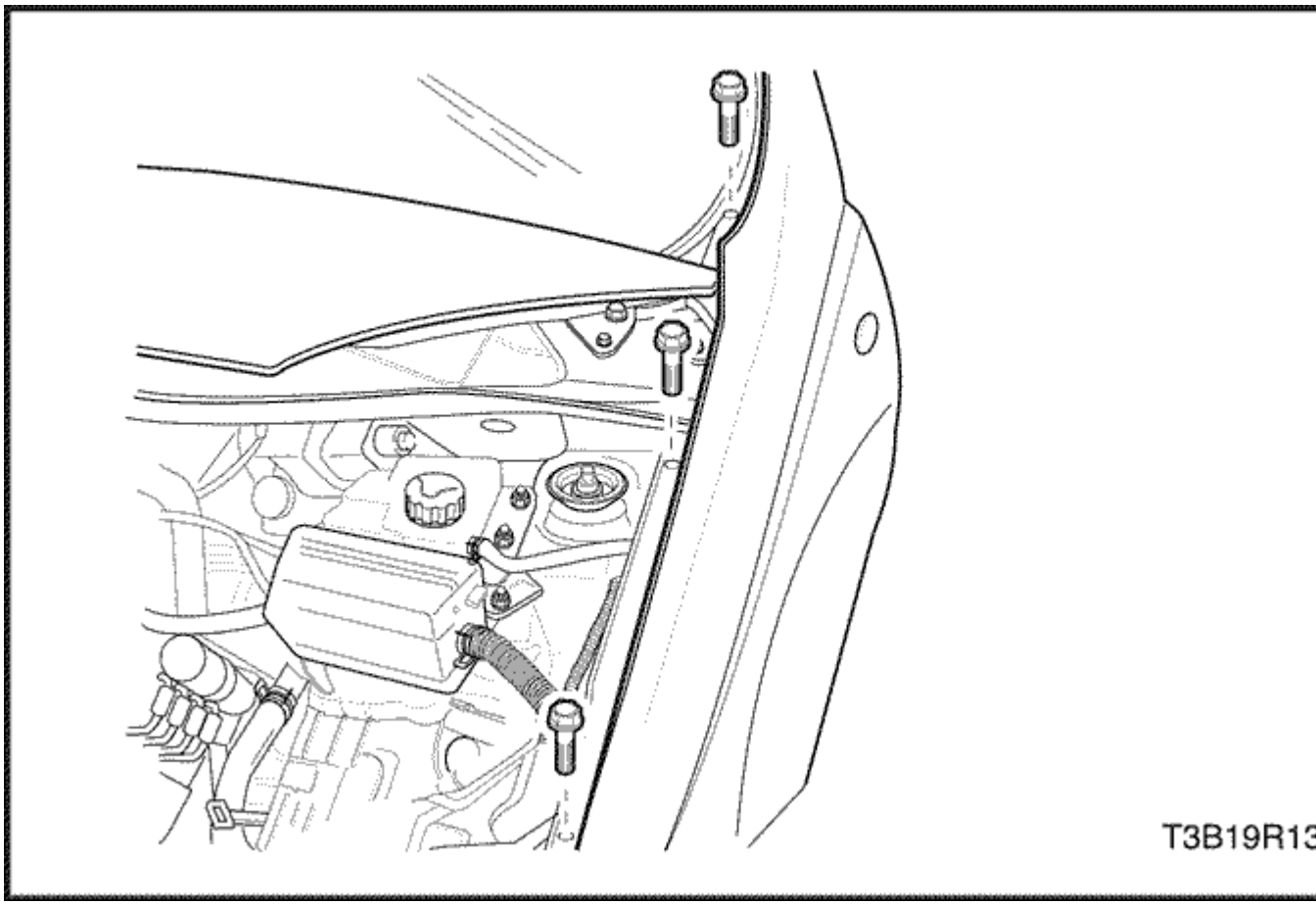
4. Remove the screws underneath the front bumper fascia.



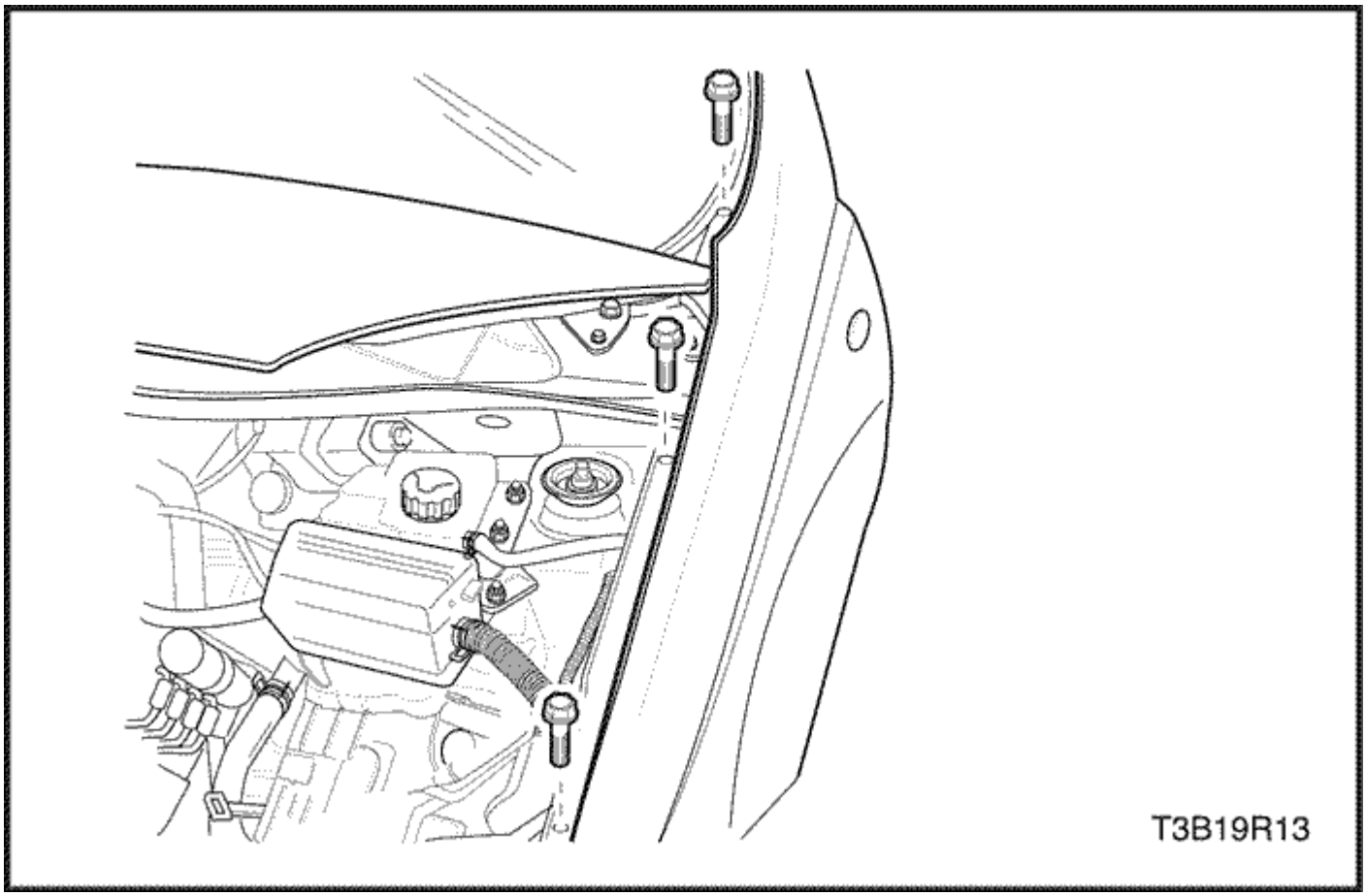
5. Remove the screw securing the front bumper fascia to the fender.
6. Remove the bolts at the base of the fender.



7. Open the front door. Remove the bolt at the base of the A-pillar.



8. Open the hood.
9. Remove the headlamp. Refer to *Section 9B, Lighting Systems.*
10. Remove the bolts along the top of the fender.
11. Remove the fender.



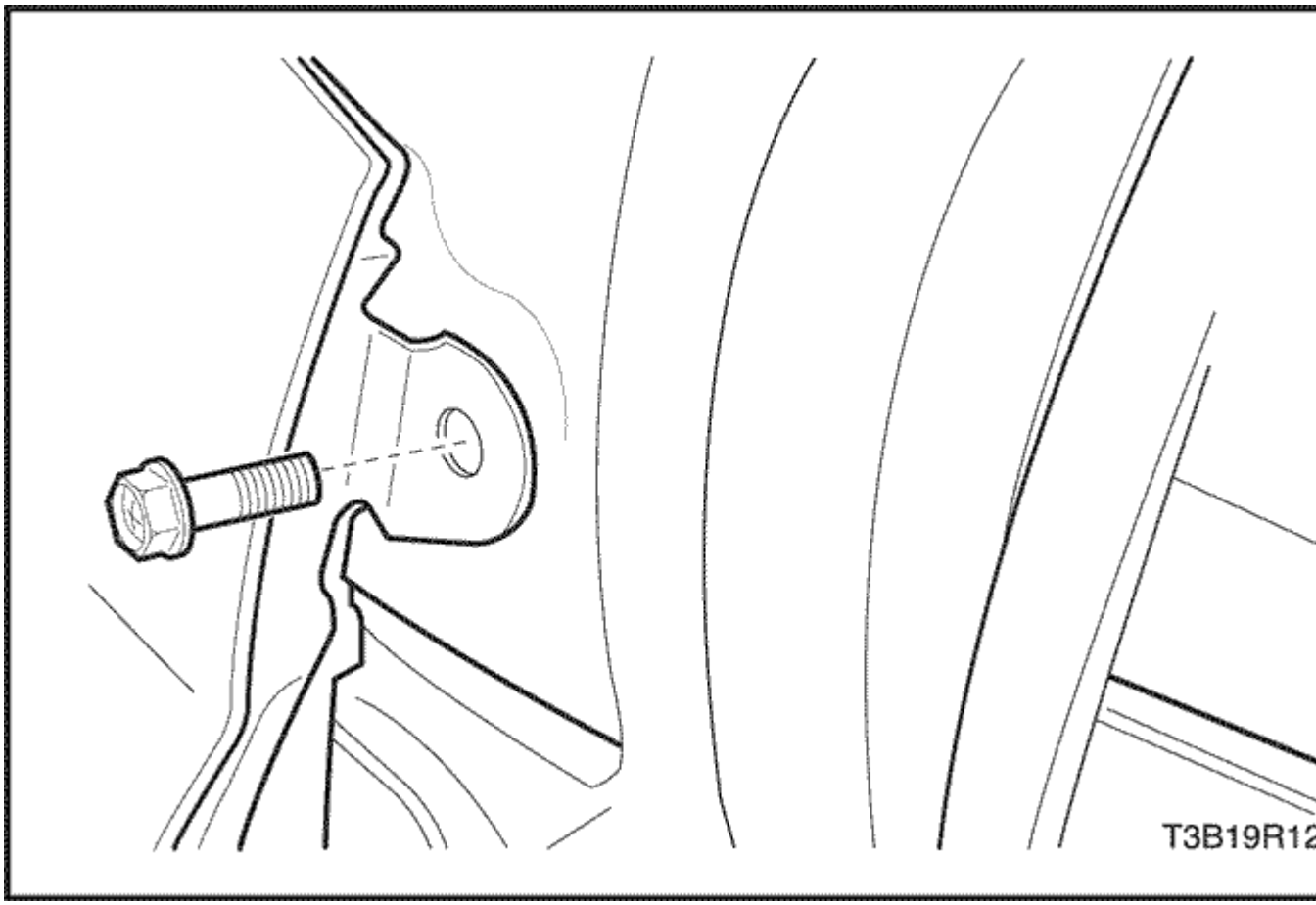
Installation Procedure

1. Install the headlamp. Refer to *Section 9B, Lighting Systems.*
2. Install the fender.

   Notice : Dissimilar metals in direct contact with each other may corrode rapidly. Make sure to use the correct fasteners to prevent premature corrosion.

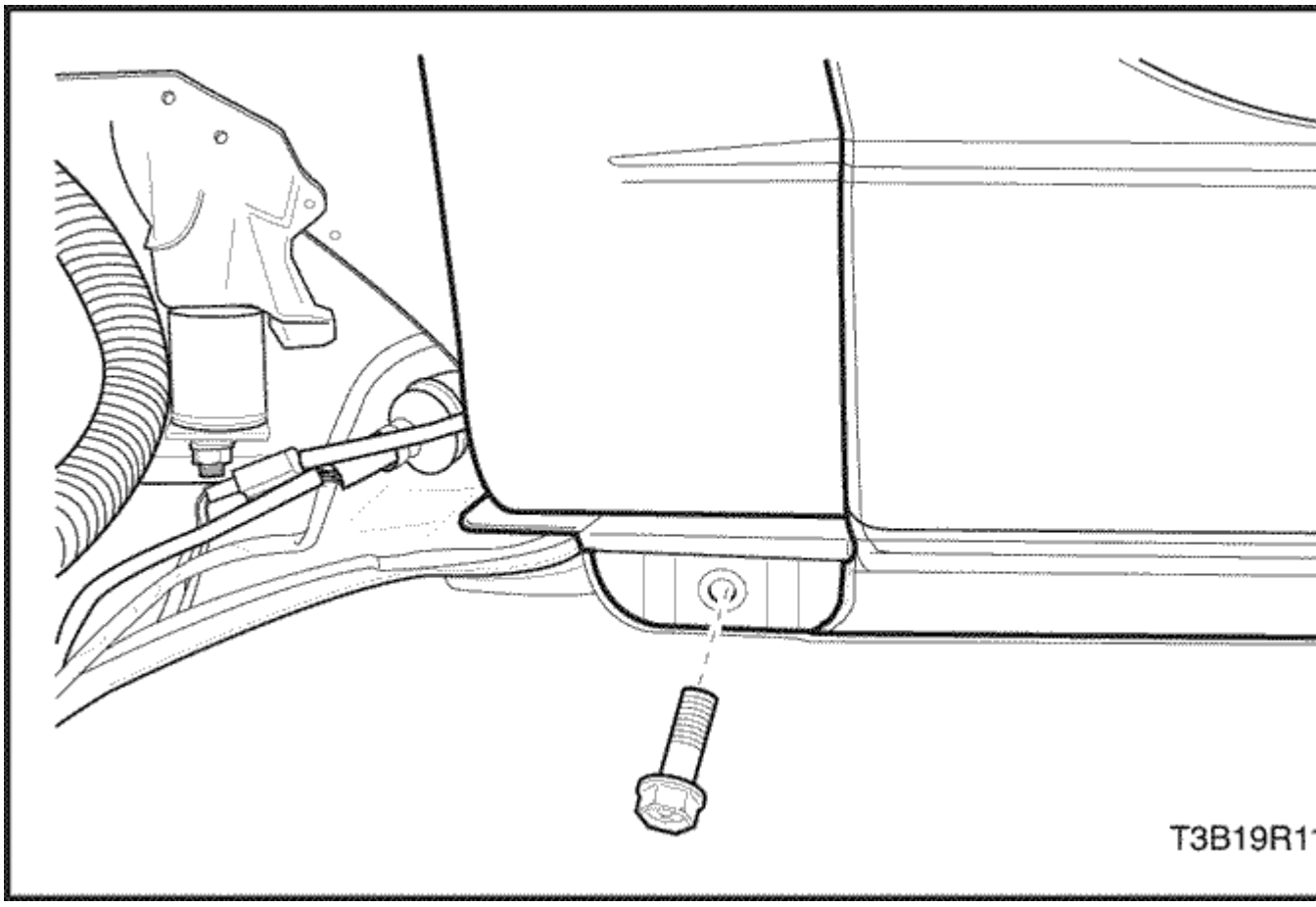
3. Install the bolts along the top of the fender.

   Tighten
   Tighten the upper fender bolts to 8 N•m (71 lb-in).



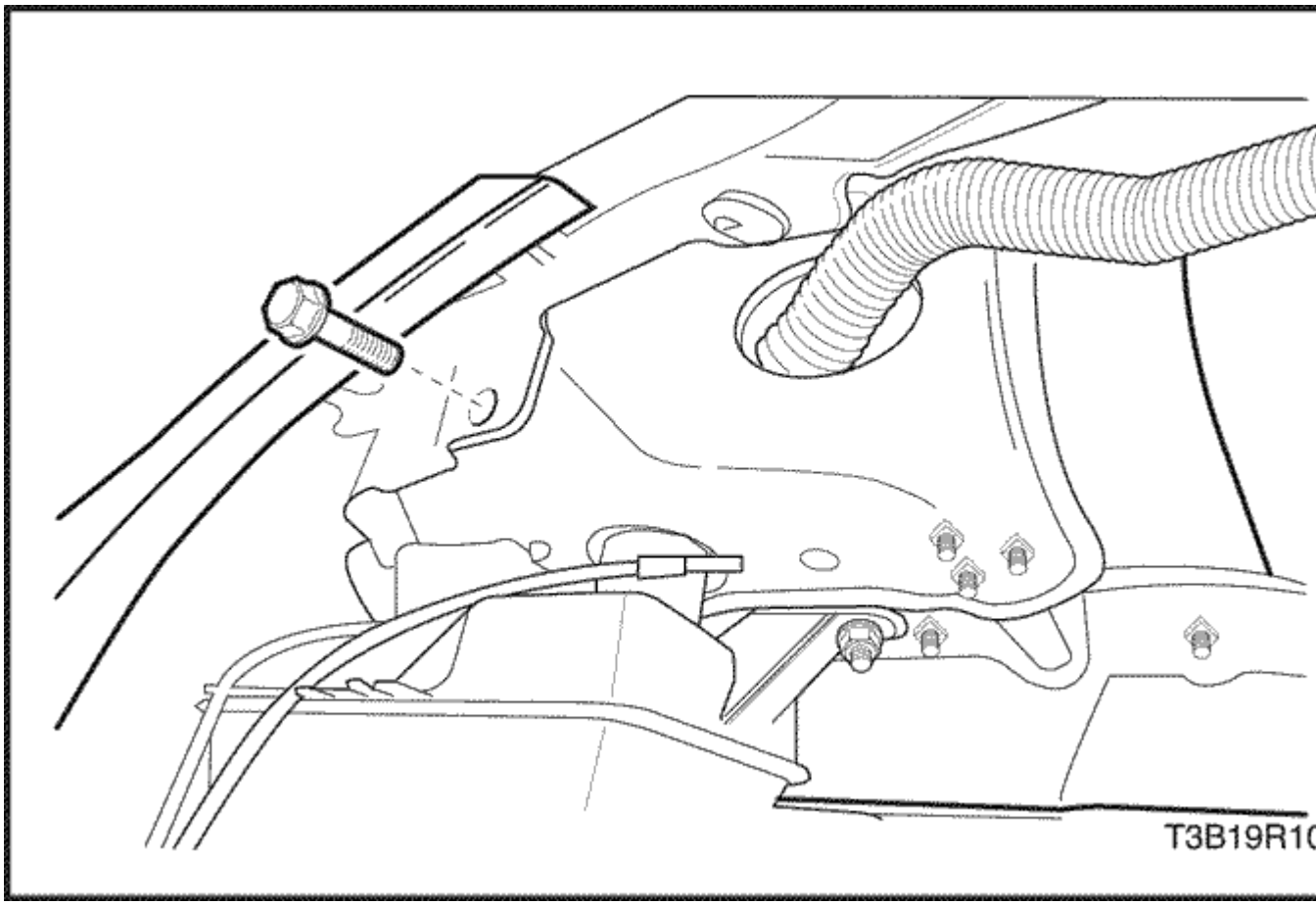
4. Install the bolt at the base of the A-pillar.

   Tighten
   Tighten the fender-to-A-pillar bolt to 8 N•m (71 lb-in).



5. Install the bolts at the base of the fender.

Tighten
Tighten the lower fender bolts to 8 N•m (71 lb-in).

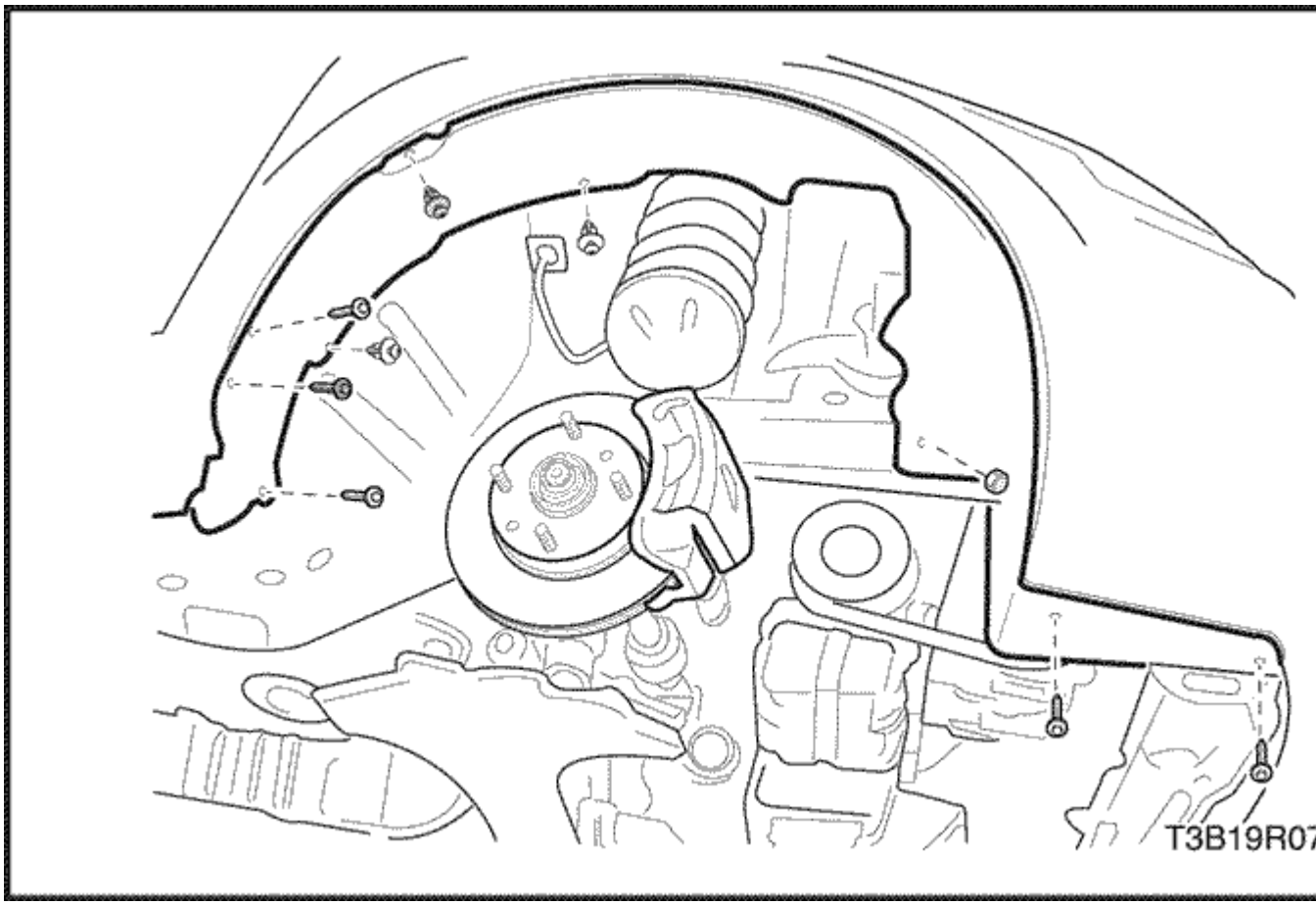


6. Secure the fender to the front bumper fascia with the screw.

   Tighten
   Tighten the front bumper fascia screw to 1.5 N•m (13 lb-in).

7. Secure the fender behind the front bumper fascia with the screws.

   Tighten
   Tighten the fender screws to 4 N•m (35 lb-in).



8. Install the splash shield with the screws.

   Tighten
   Tighten the splash shield screws to 1.5 N•m(13 lb-in).

9. Install the front wheel. Refer to *Section 2E, Tires and Wheels.*
10. Lower the vehicle.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Body Front End

This vehicle has a unitized body with a frame assembly supporting the engine and the transaxle. The fender panels and the radiator support are also integral parts of the body.

SECTION 9S

BODY REAR END

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

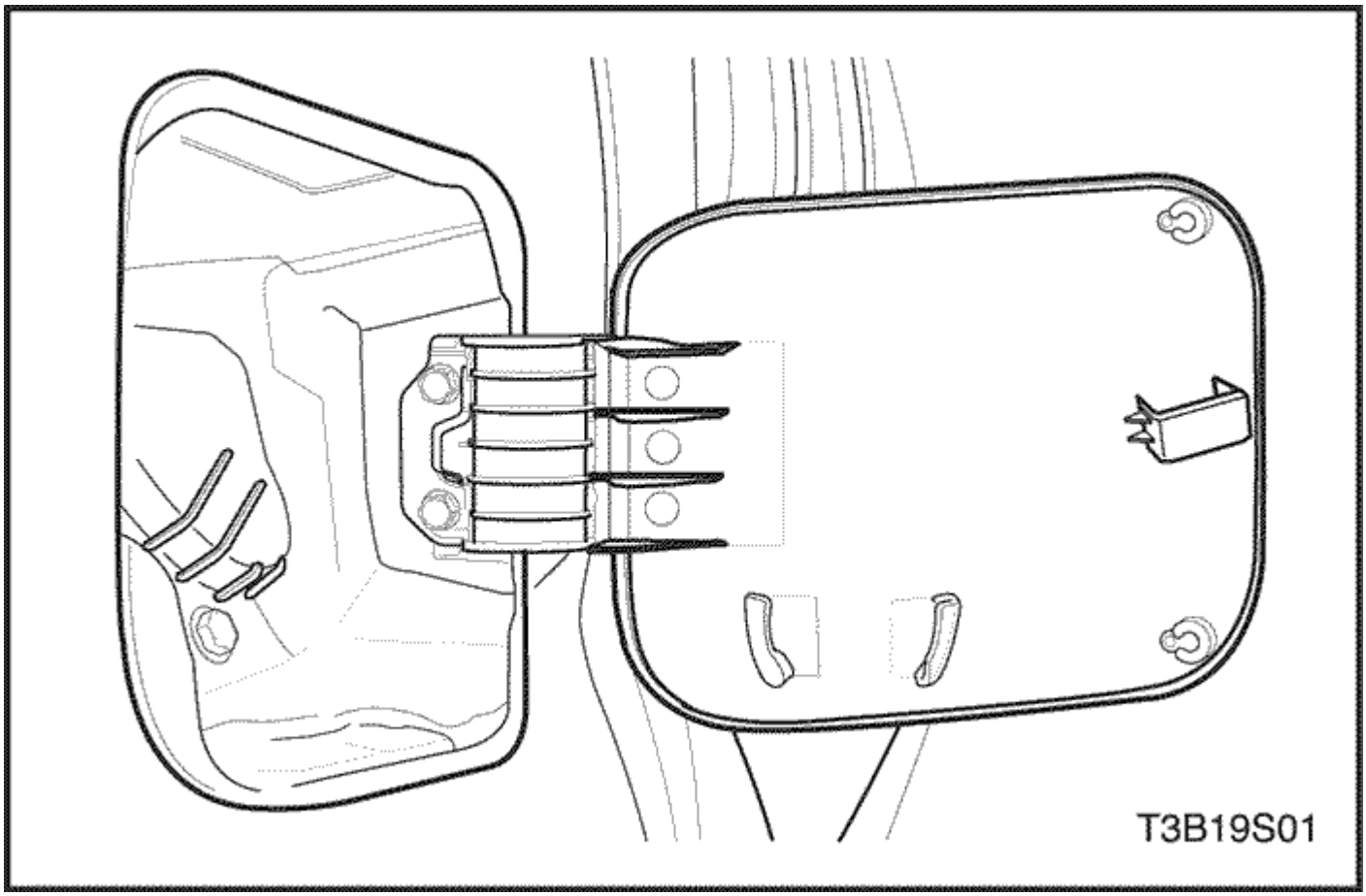
SPECIFICATIONS

Fastener Tightening Specifications

Application	N•m	Lb-Ft	Lb-In
Fuel Filler Door Screws	2	-	18
Gas Support Assembly Studs	8	-	71
Hatchback Door Hinge Bolts	20	15	-
Hatchback Door Lock Screws	6	-	53
Hatchback Door Lock Striker Screws	20	15	-
Luggage Compartment Lock Cylinder Nuts	3	-	27
Luggage Compartment Lock Screws	6	-	53
Luggage Compartment Lock Striker Bolts	8	-	71
Rear Deck Lid Bolts	10	-	89
Remote Cable Handle Bolt	8	-	71

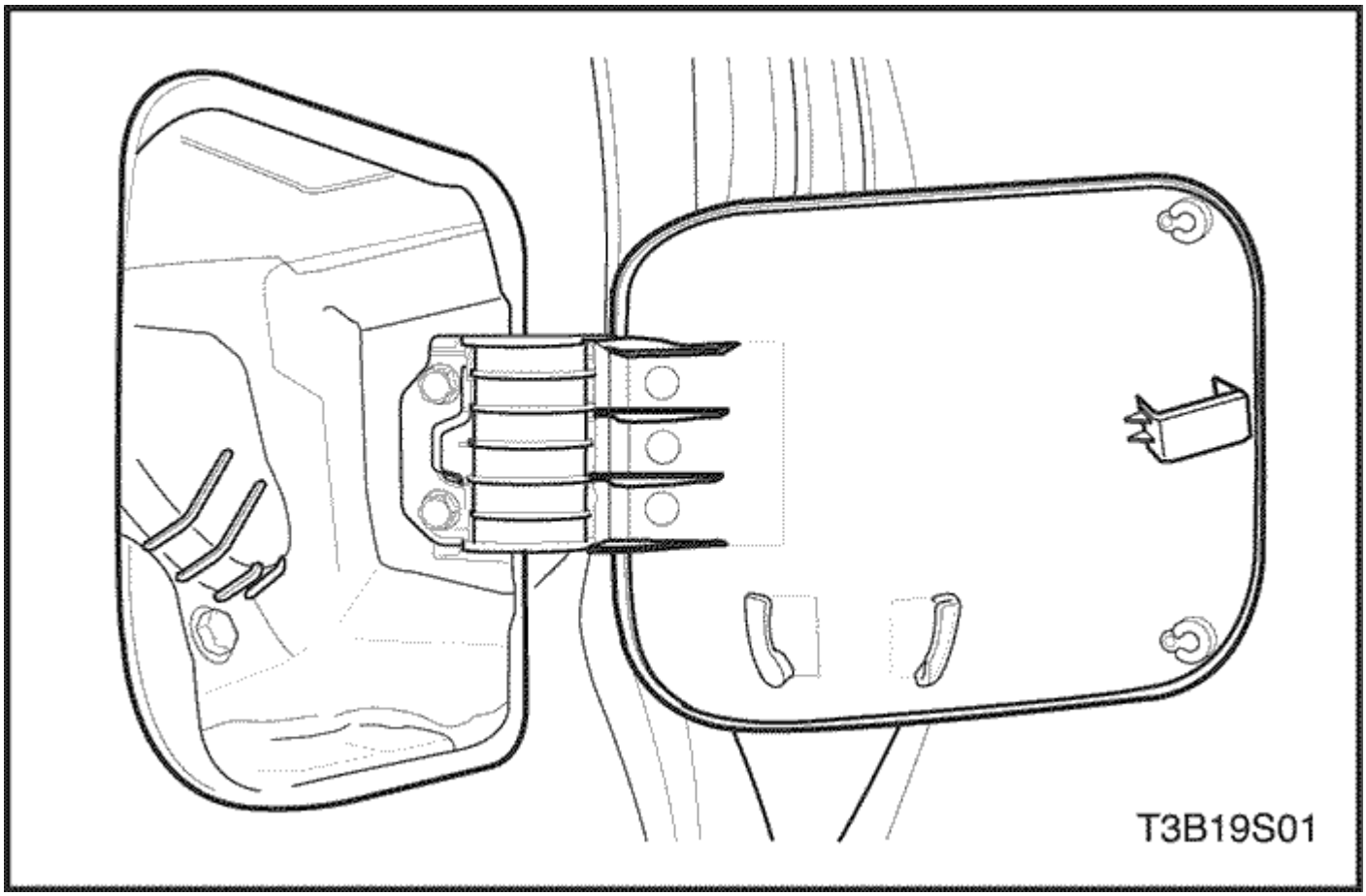
MAINTENANCE AND REPAIR

On-Vehicle Service



Fuel Filler Door
Removal Procedure

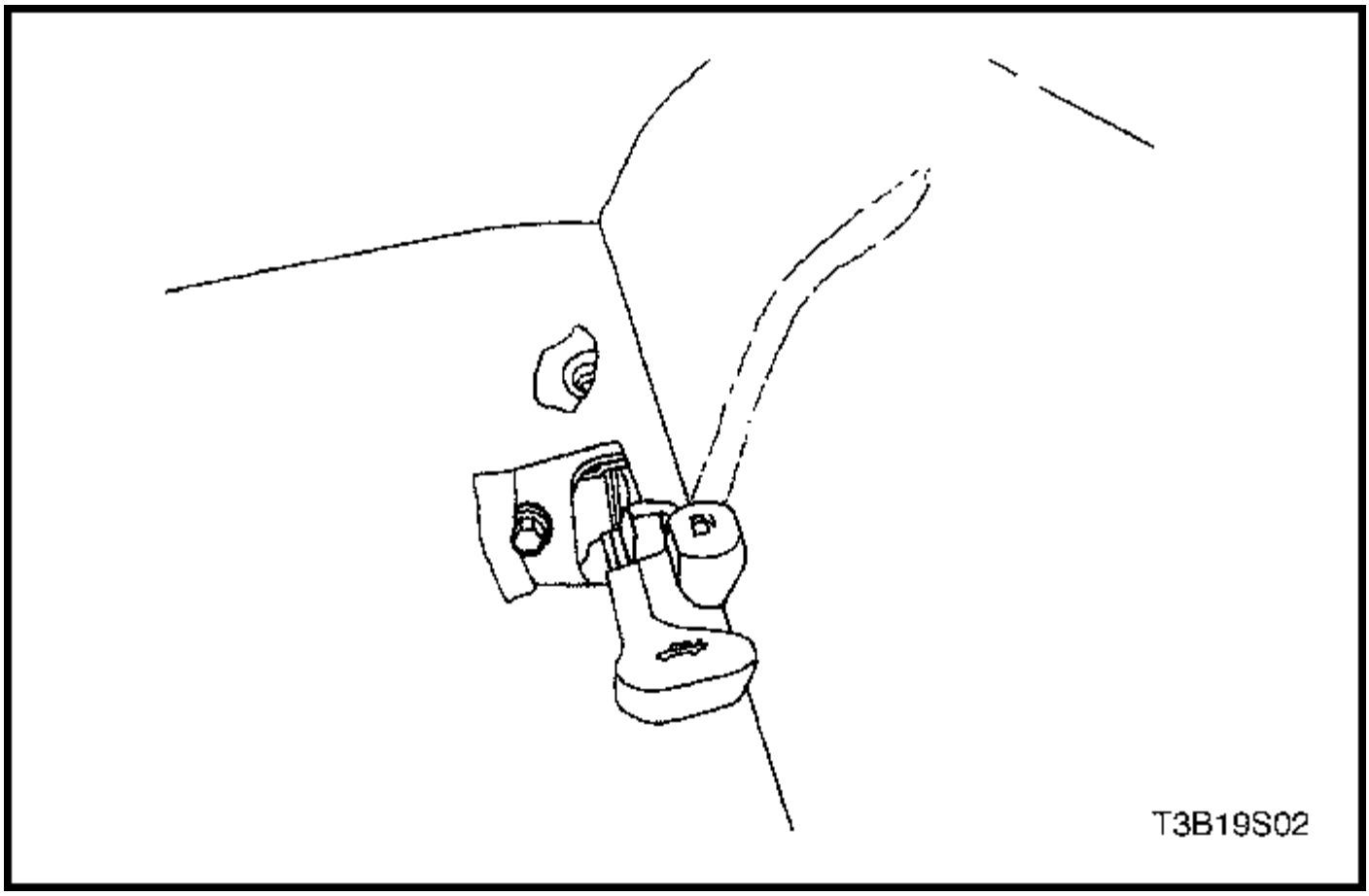
1. Remove the screws and the fuel filler door.



Installation Procedure

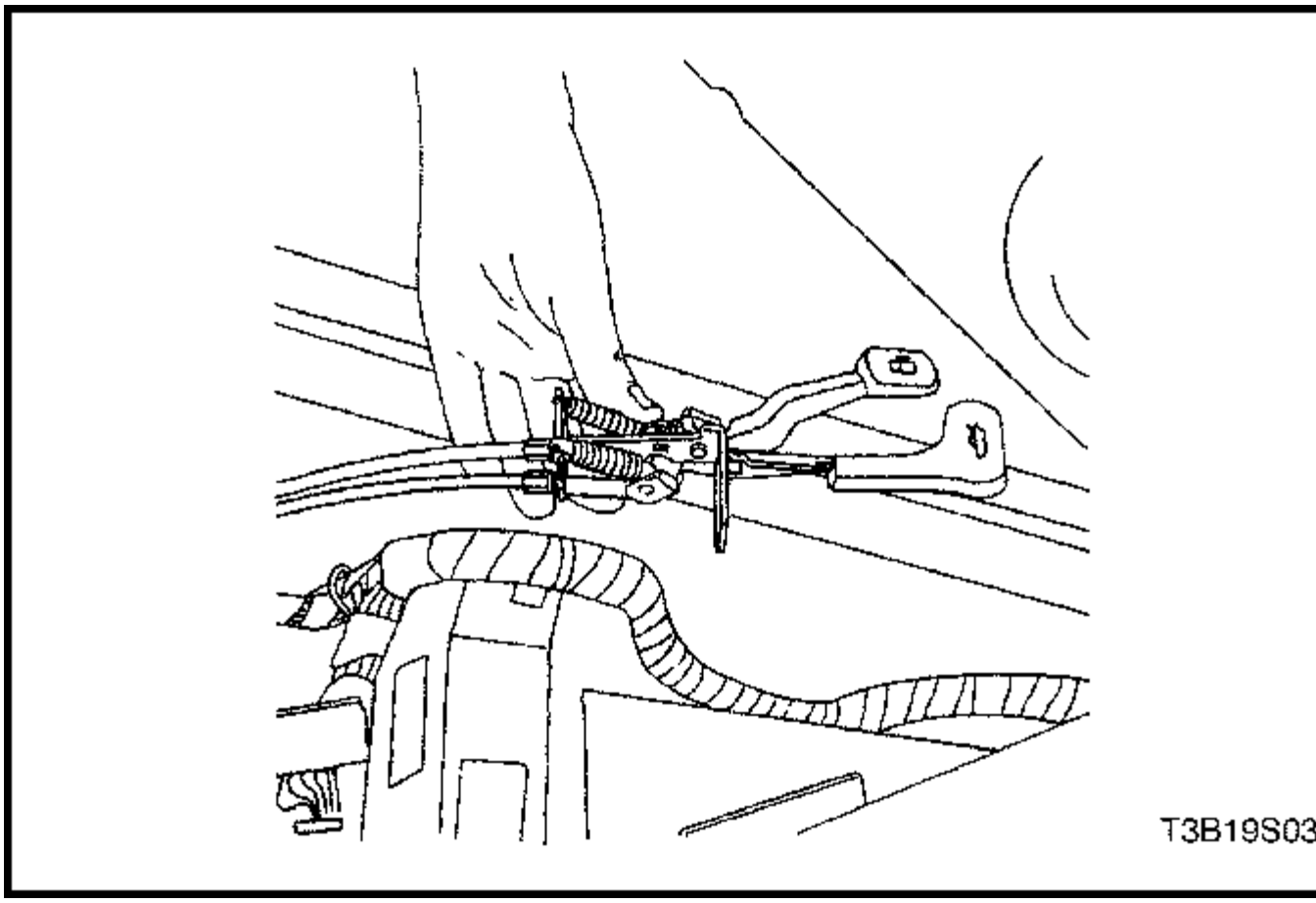
1. Install the fuel filler door with the screws.

   Tighten
   Tighten the fuel filler door screws to 2 N•m (18 lb-in).

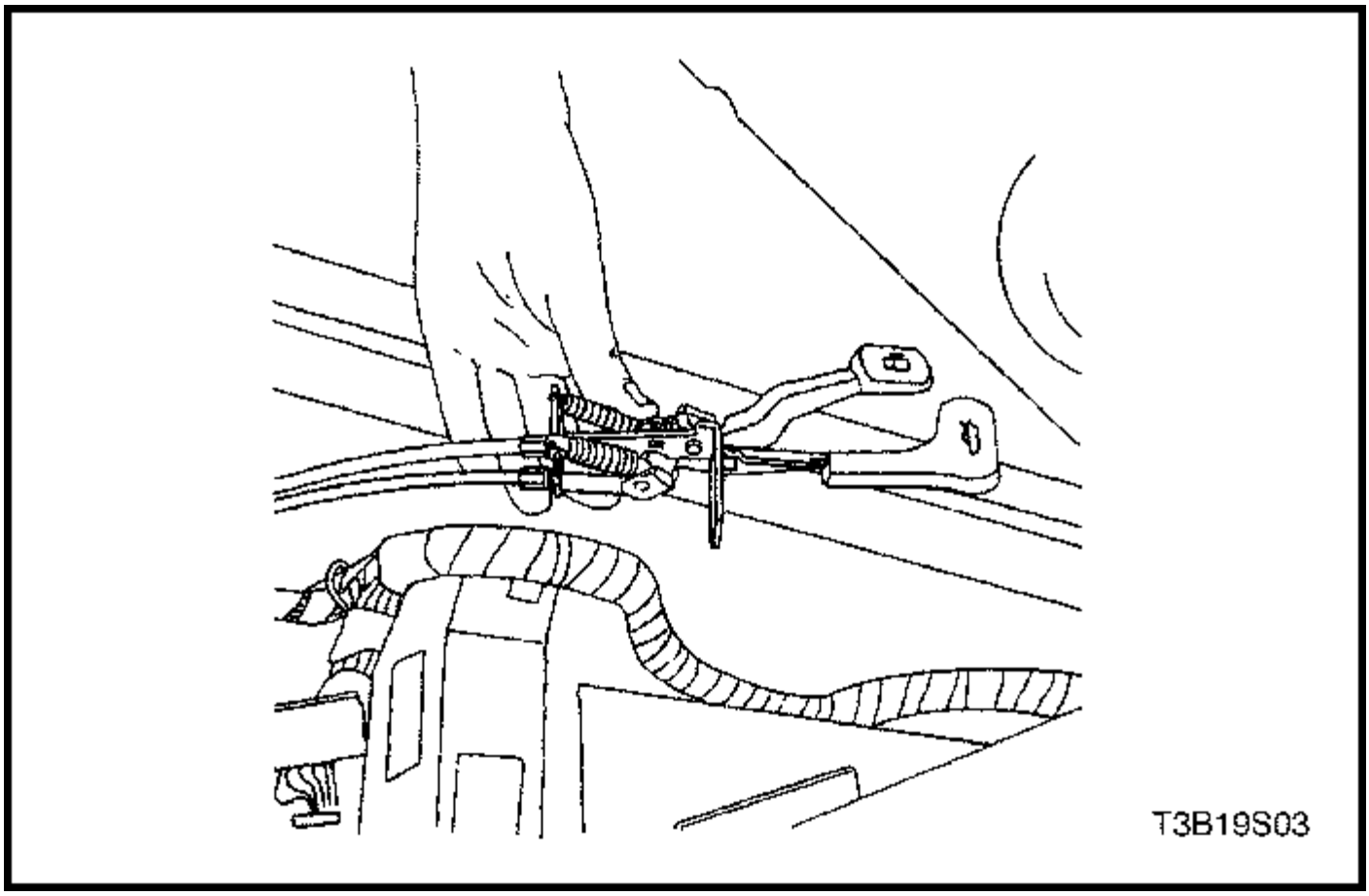


Fuel Filler Door Remote Cable and Handle
Removal Procedure

1. Open the luggage compartment.
2. Remove the left luggage compartment wheelhouse trim panel, both luggage compartment rear quarter trim panels, and the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*
3. Disconnect the cable from the fuel filler door.
4. Remove the driver front and the rear seats. Refer to *Section 9H, Seats.*
5. Reposition the floor carpet on the left side of the vehicle.
6. Remove the bolt and the handle.

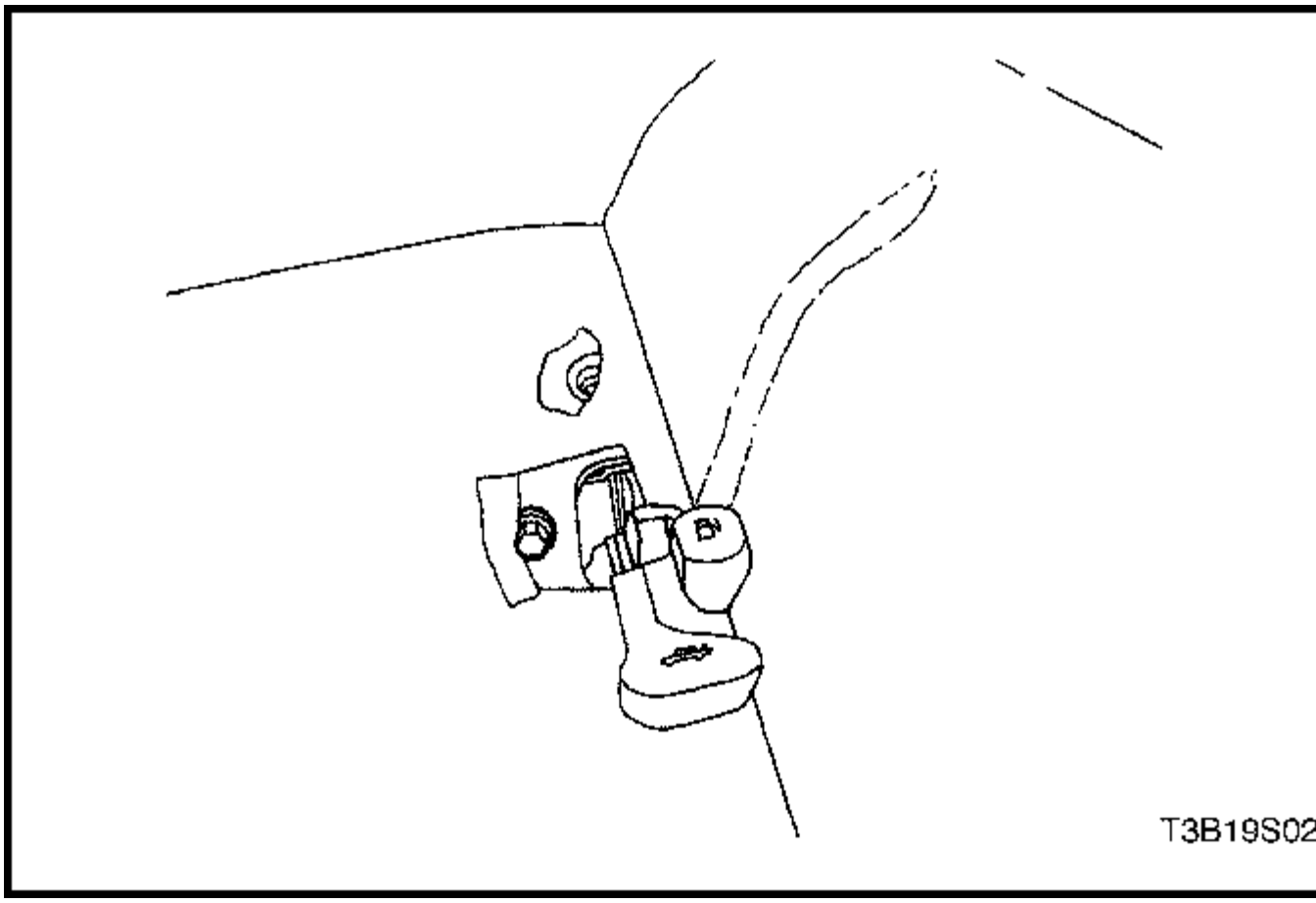


7. Disconnect the cable from the handle.
8. Remove the cable



Installation Procedure

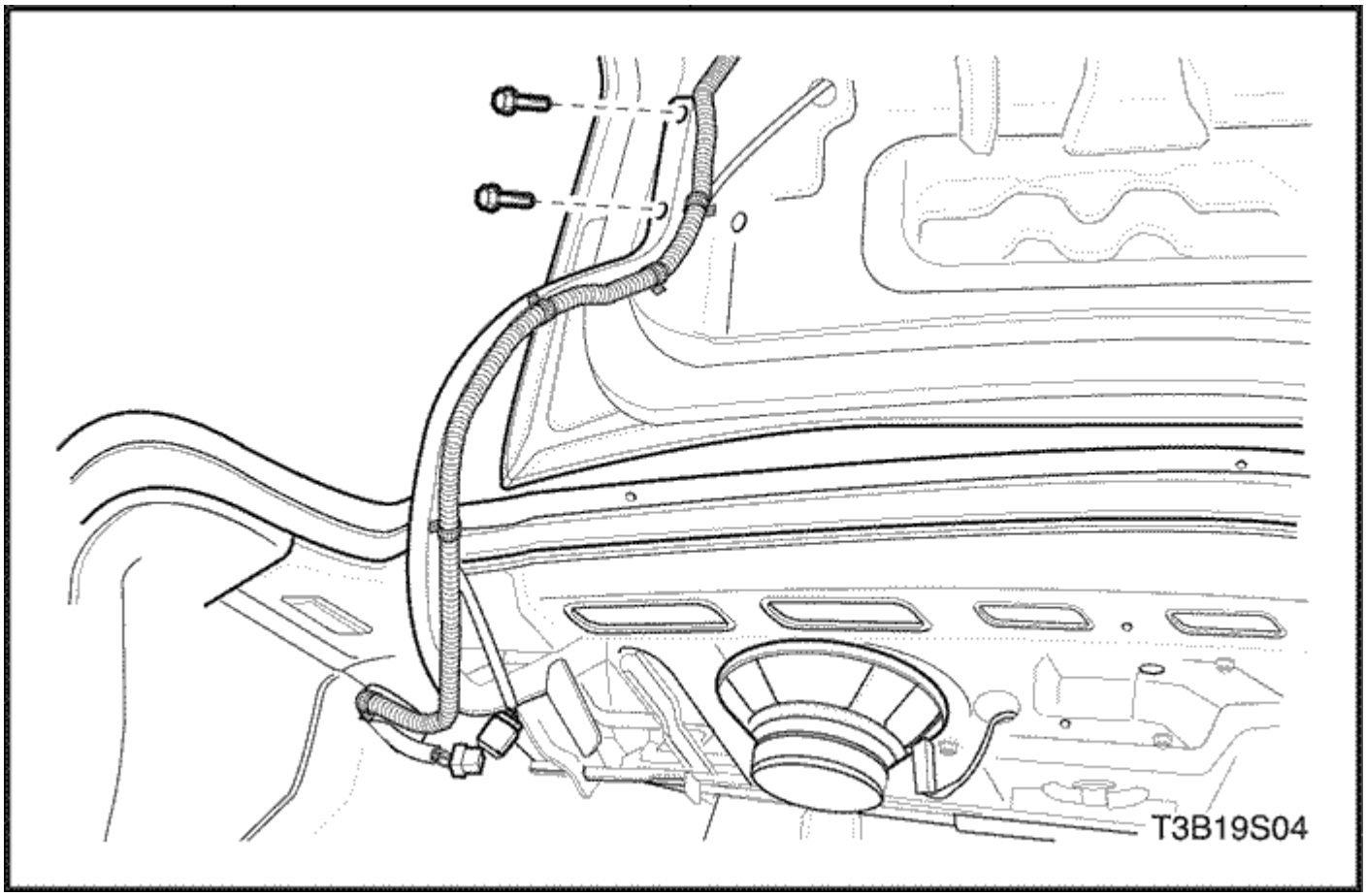
1. Feed the cable from the luggage compartment to the passenger compartment.
2. Connect the cable to the handle.



3. Install the handle with the bolt.

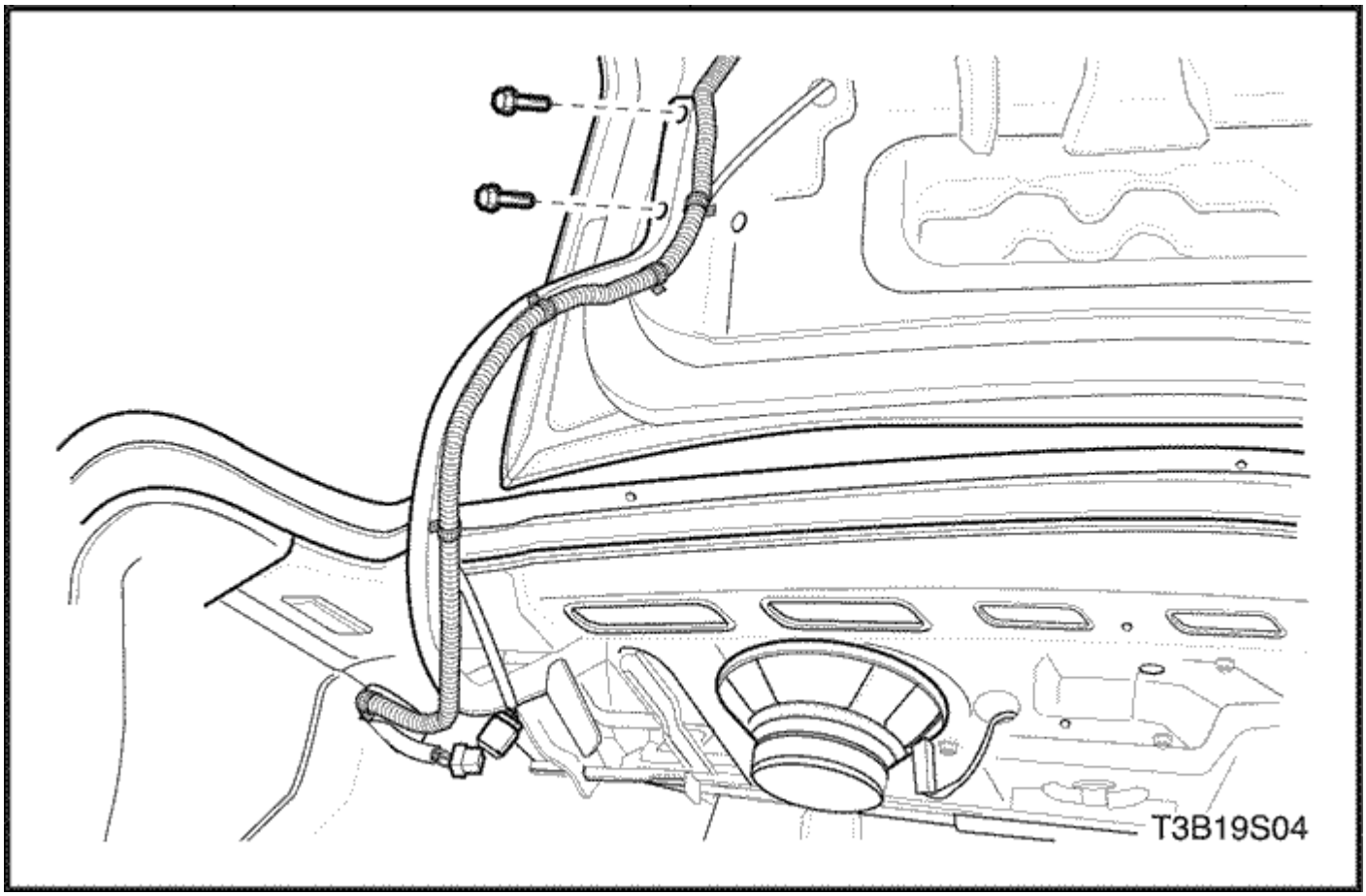
   Tighten
   Tighten the remote cable handle bolt to 8 N•m (71 lb-in).

4. Install the floor carpet to its original position.
5. Install the front and the rear seats. Refer to *Section 9H, Seats.*
6. Connect the cable to the fuel filler door.
7. Install the left luggage compartment wheelhouse trim panel, both luggage compartment rear quarter trim panels, and the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*



Rear Deck Lid (Notchback)
Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electrical connector.
3. Disconnect the electrical harness from the rear deck lid hinge arm.
4. Remove the bolts and the rear deck lid.

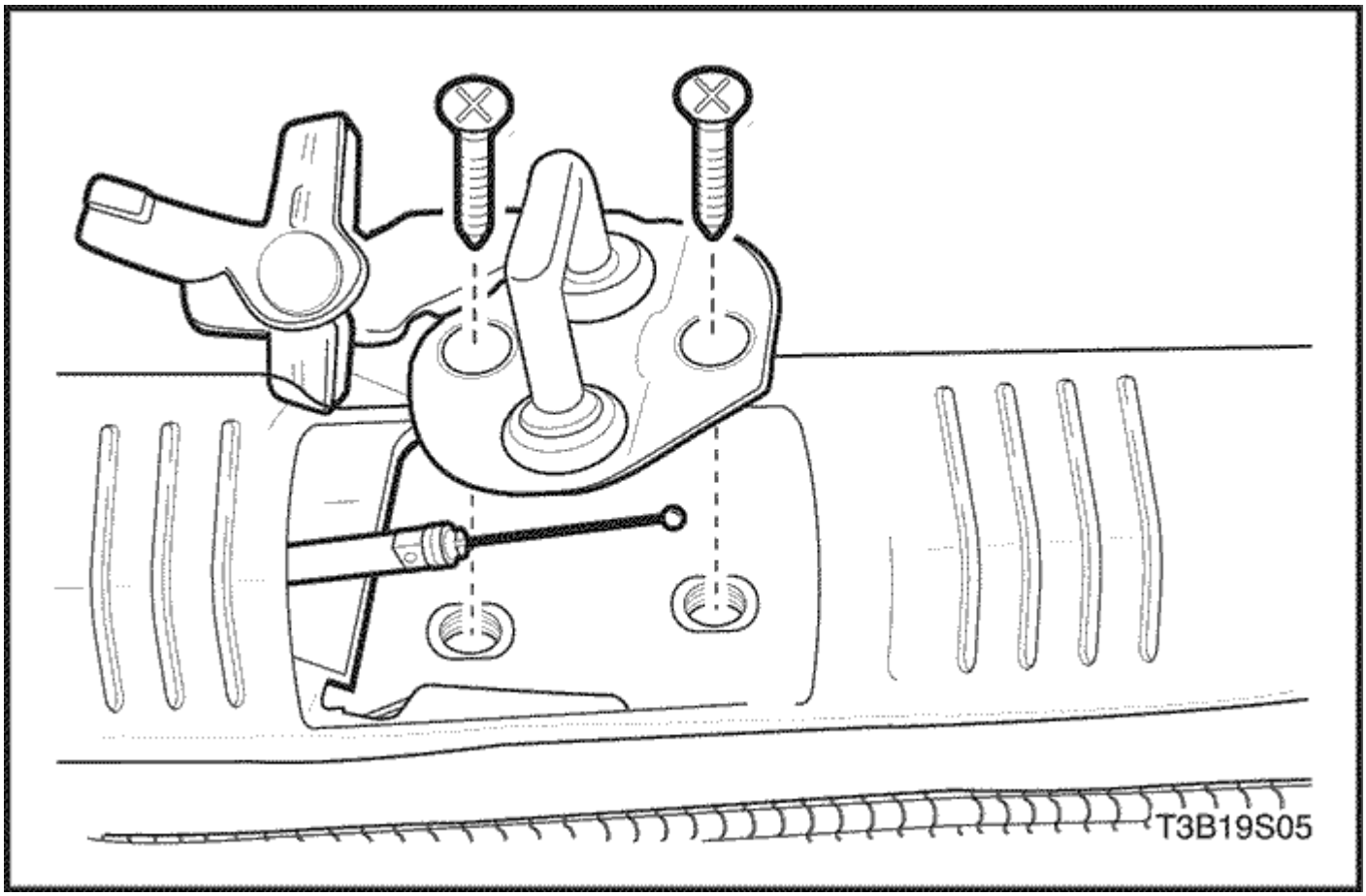


Installation Procedure

1. Install the rear deck lid with the bolts.

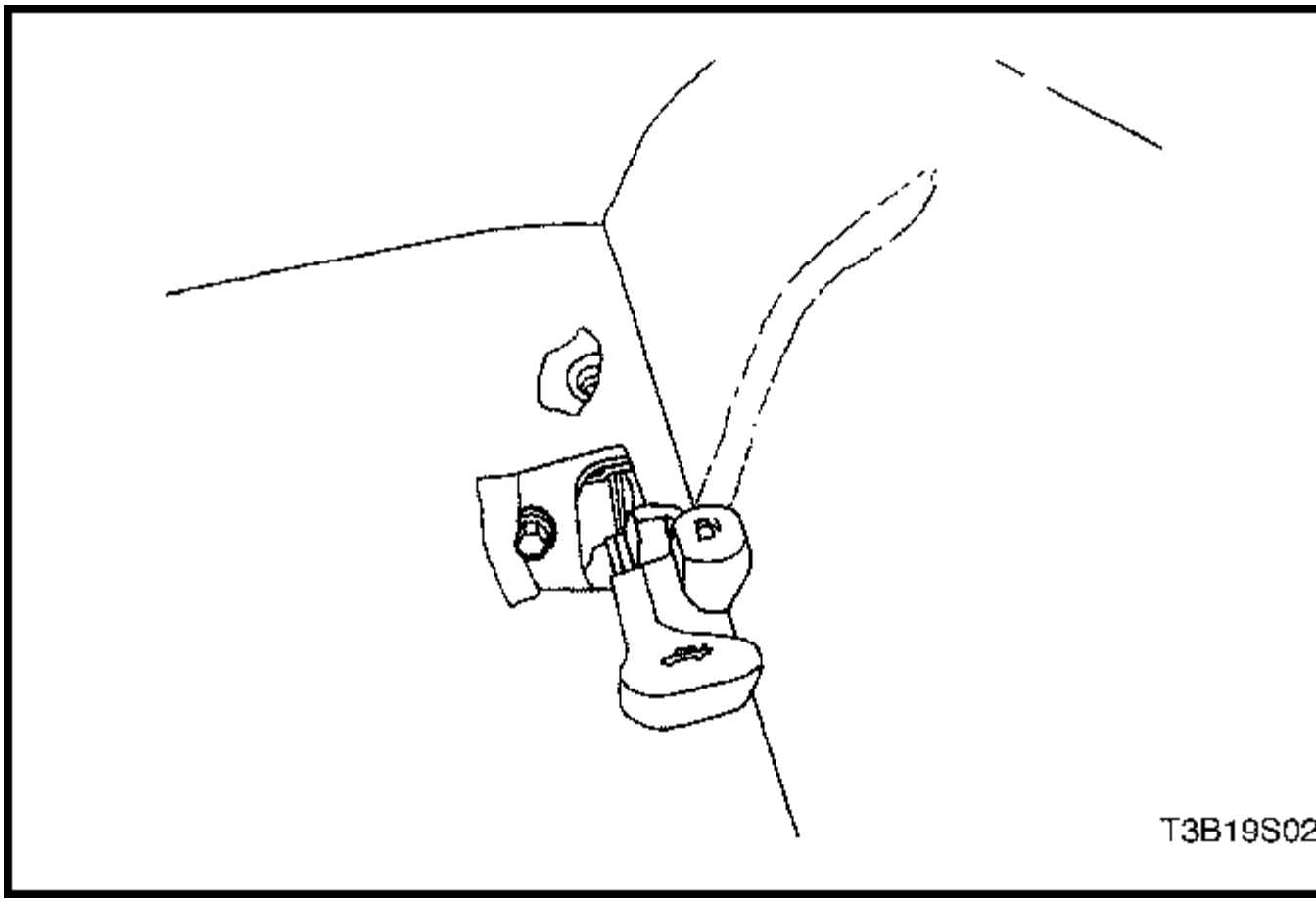
   Tighten
   Tighten the rear deck lid bolts to 10 N•m (89 lb-in).

2. Connect the electrical harness to the rear deck lid hinge arm.
3. Connect the electrical connector.
4. Connect the negative battery cable.

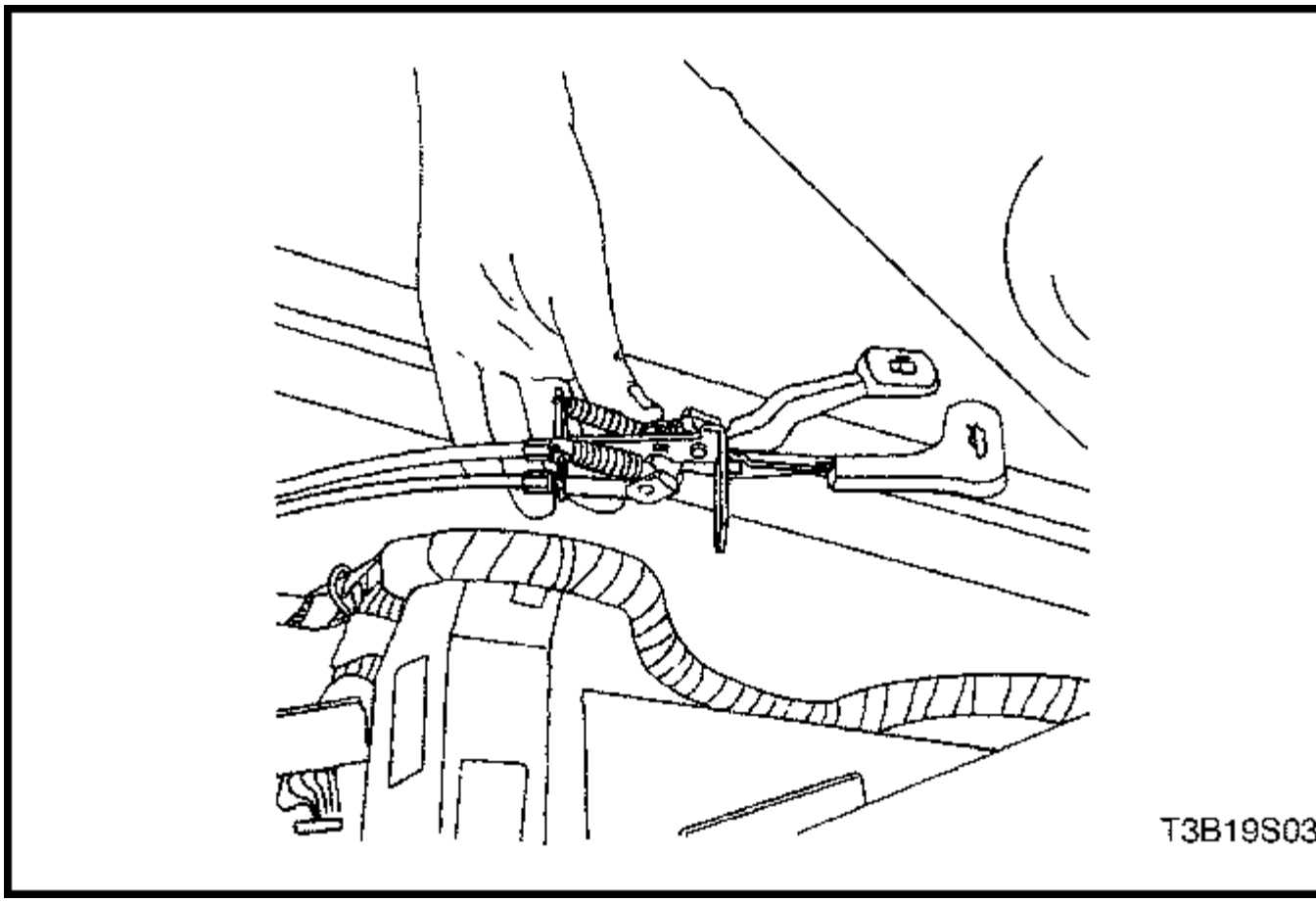


Rear Deck Lid Remote Cable and Handle
Removal Procedure

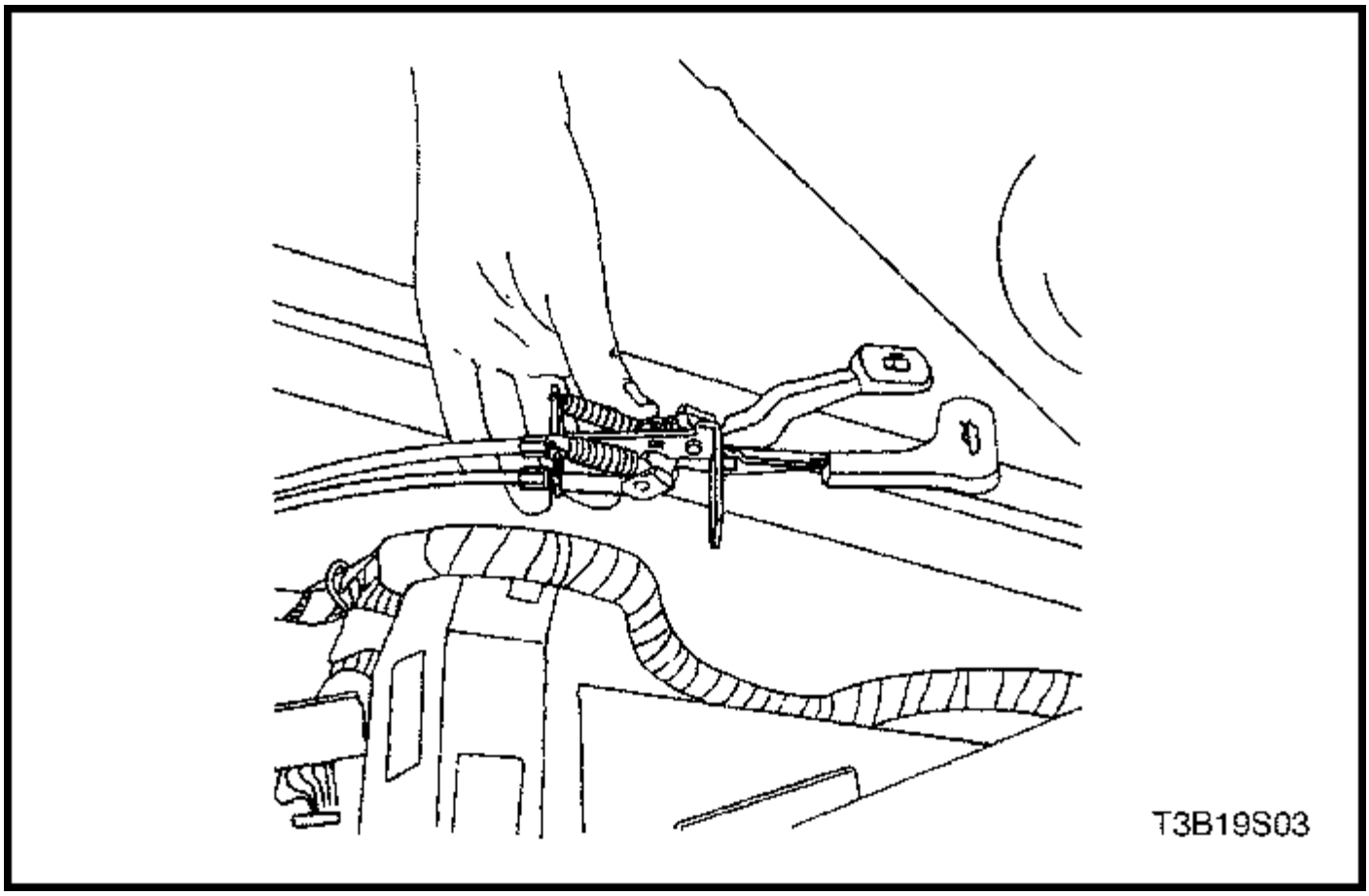
1. Open the luggage compartment.
2. Remove the luggage compartment left side wheel house, the rear quarter, and the rear trim panels. Refer to *Section 9G, Interior Trim.*
3. Remove the lock striker. Refer to "Luggage Compartment Lock Striker (Notchback)" in this section.
4. Disconnect the cable from the lock striker.



5. Remove the driver front and the rear seats. Refer to *Section 9H, Seats.*
6. Reposition the floor carpet on the left side of the vehicle.
7. Remove the bolt and the handle.

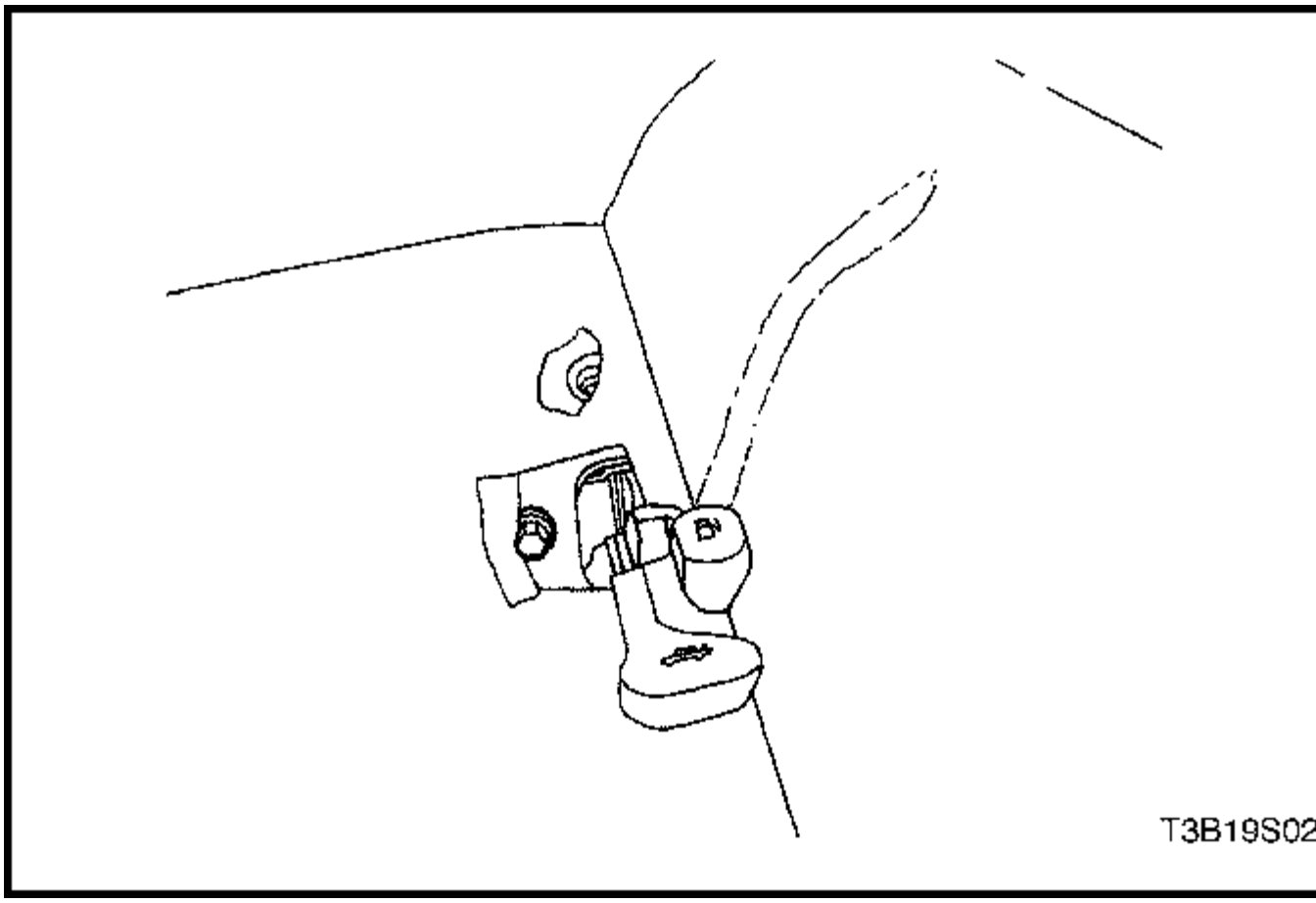


8. Disconnect the cable from the handle.
9. Remove the cable.



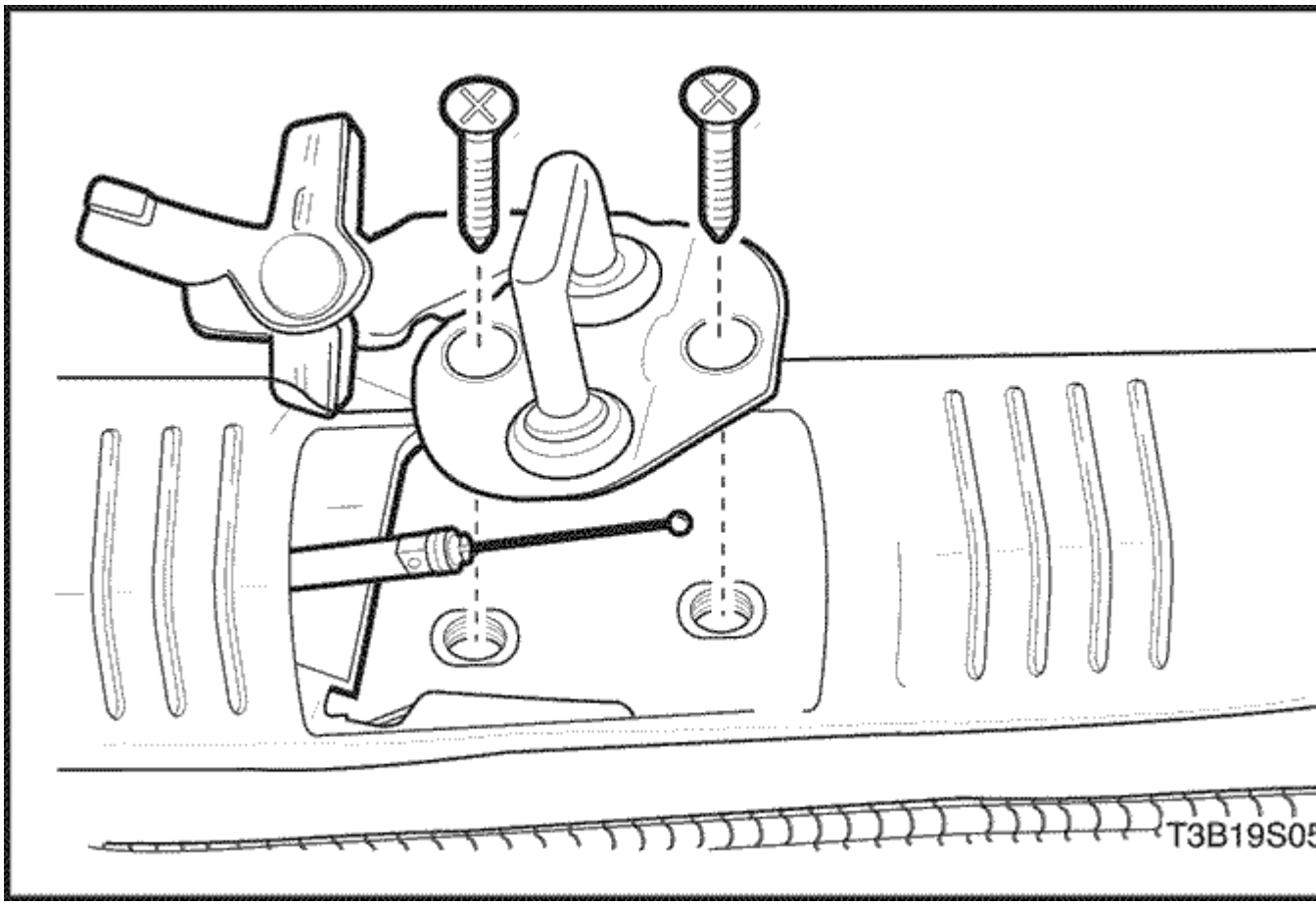
Installation Procedure

1. Feed the cable from the luggage compartment to the passenger compartment.
2. Connect the cable to the handle.

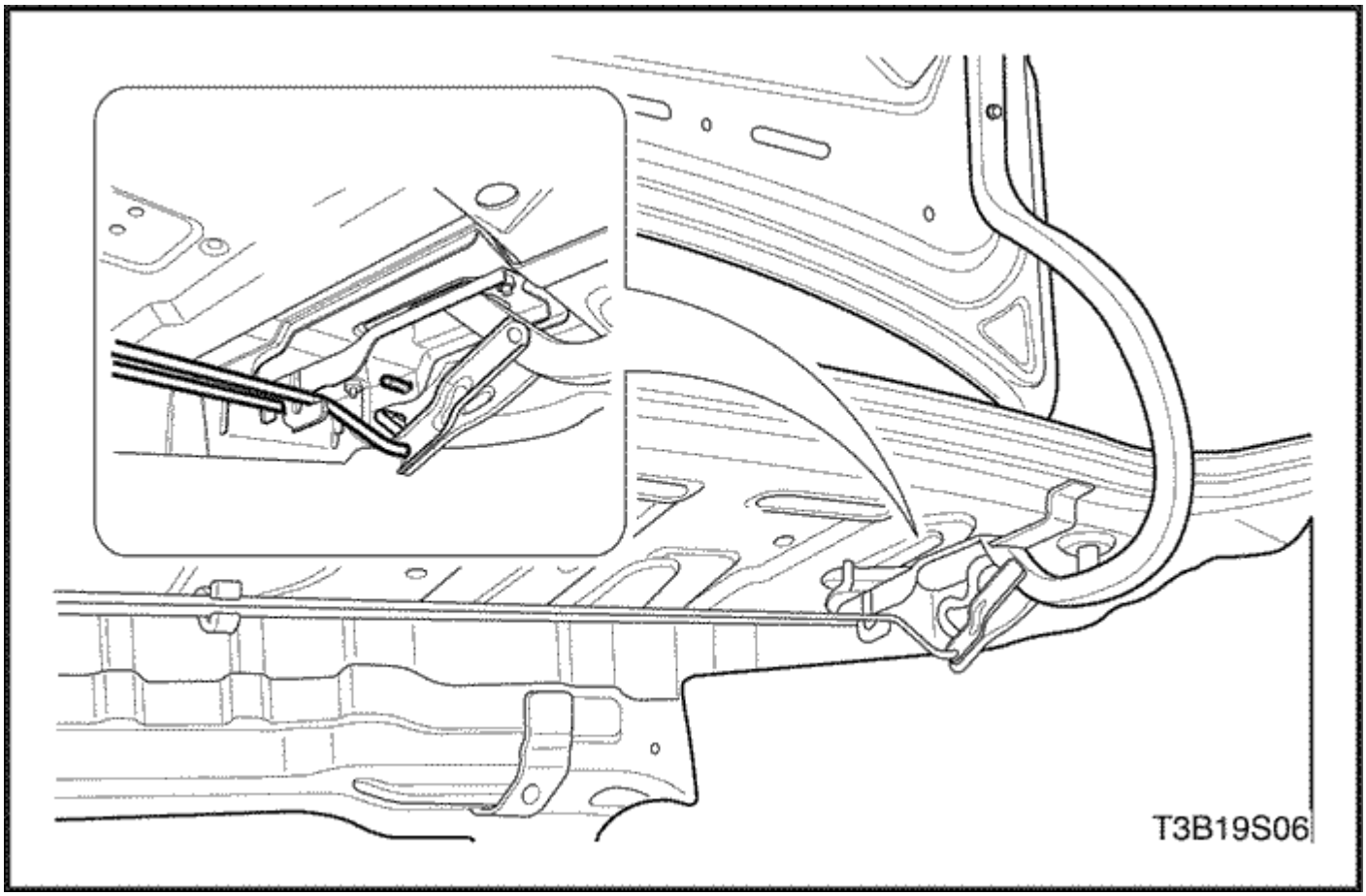


3. Install the handle with the bolt.

   Tighten
   Tighten the remote cable handle bolt to 8 N•m (71 lb-in).

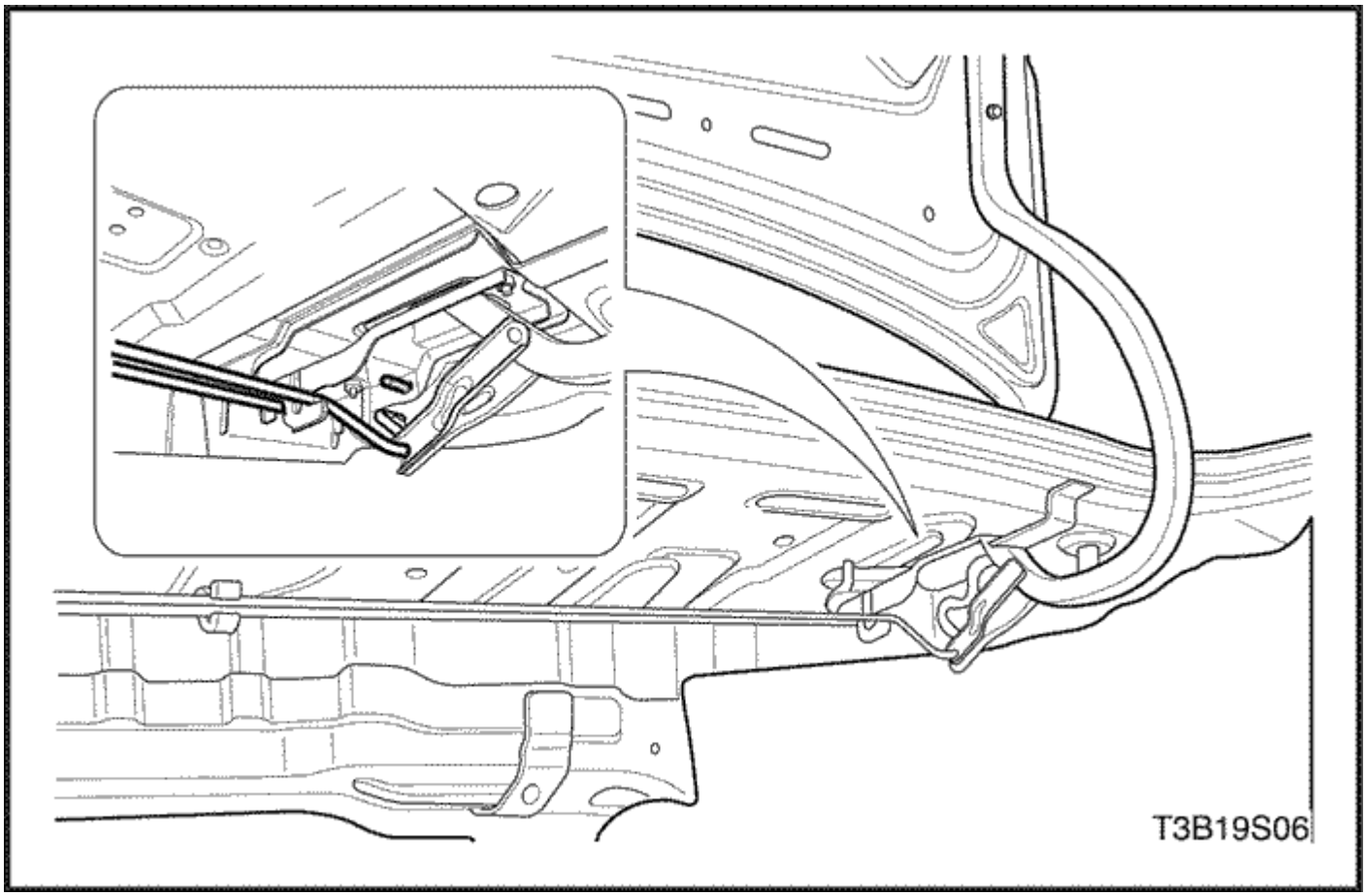


4. Install the floor carpet to its original position.
5. Install the front and the rear seats. Refer to *Section 9H, Seats.*
6. Connect the cable to the lock striker.
7. Install the lock striker. Refer to "Luggage Compartment Lock Striker (Notchback)" in this section.
8. Install the luggage compartment left side wheel house, the rear quarter, and the rear trim panels. Refer to *Section 9G, Interior Trim.*



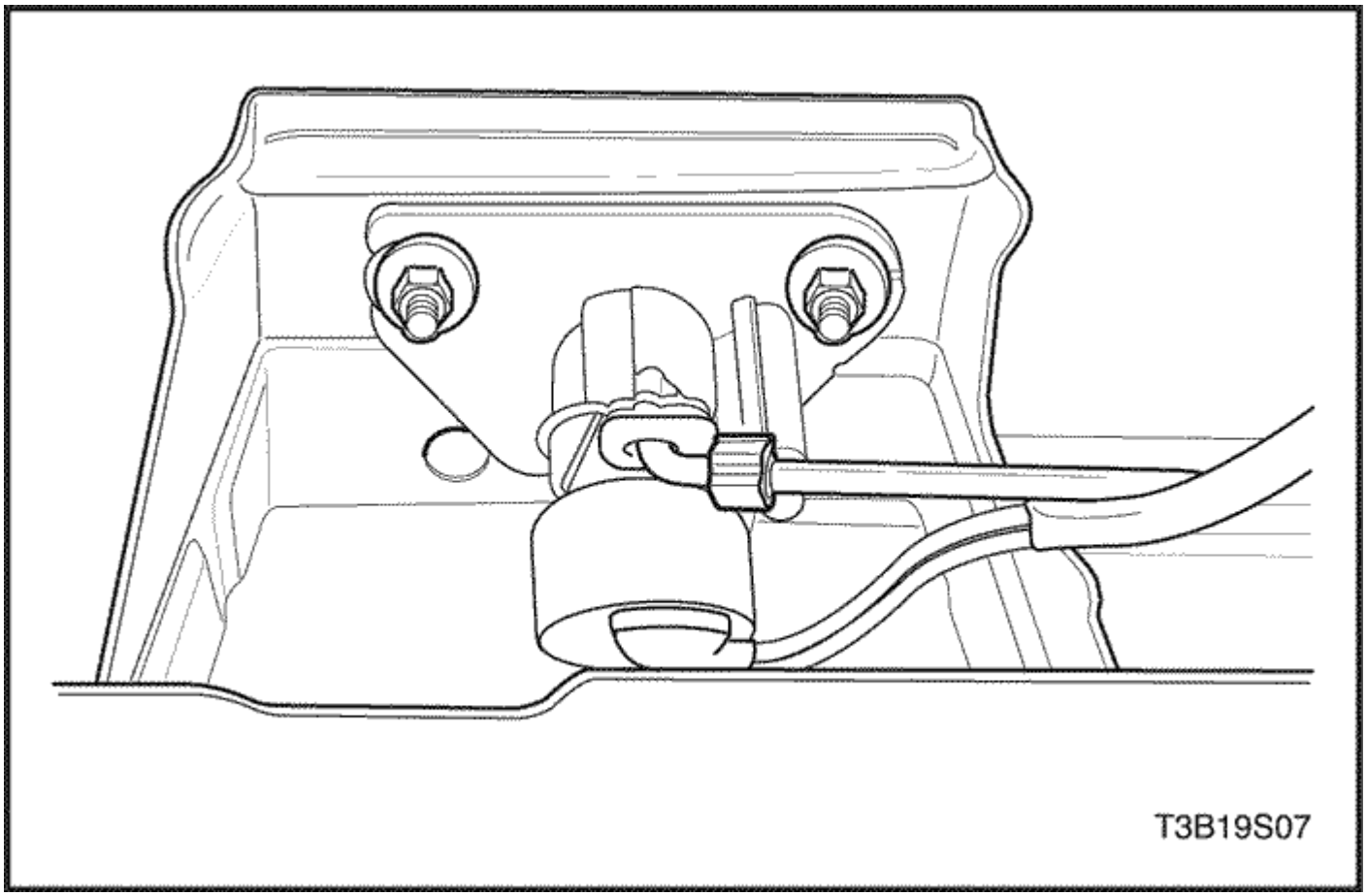
Torque Rod
Removal Procedure

1. Remove the torque rod from the rear deck lid hinge arm.
2. Remove the torque rod from the hinges.



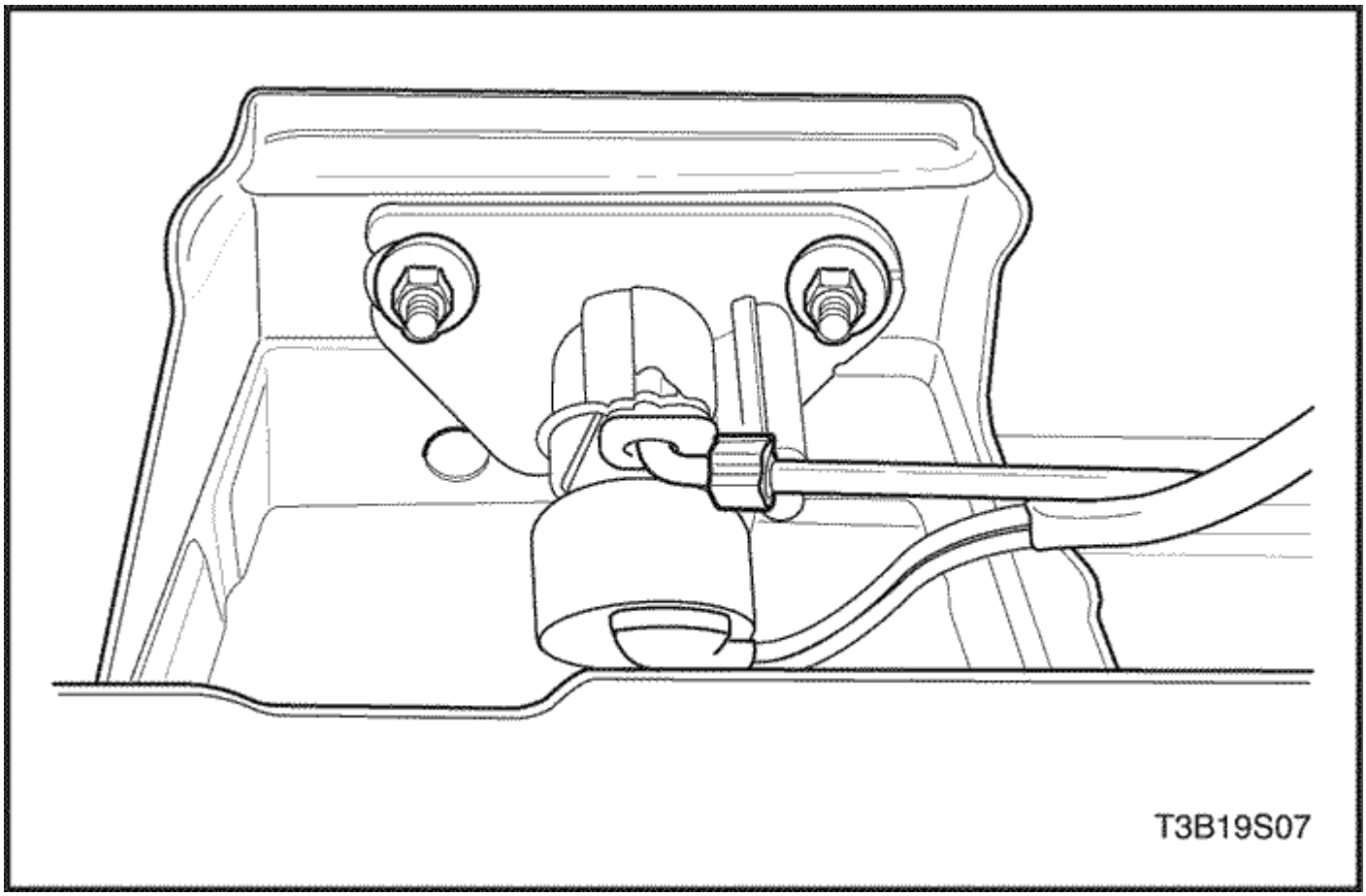
Installation Procedure

1. Install the torque rod onto the hinges.
2. Install the torque rod onto the rear deck lid hinge arm.



Luggage Compartment Lock Cylinder
Removal Procedure

1. Remove the hatchback door lower garnish molding (if equipped). Refer to *Section 9G, Interior Trim.*
2. Disconnect the lock rod.
3. Remove the nuts and the lock cylinder.

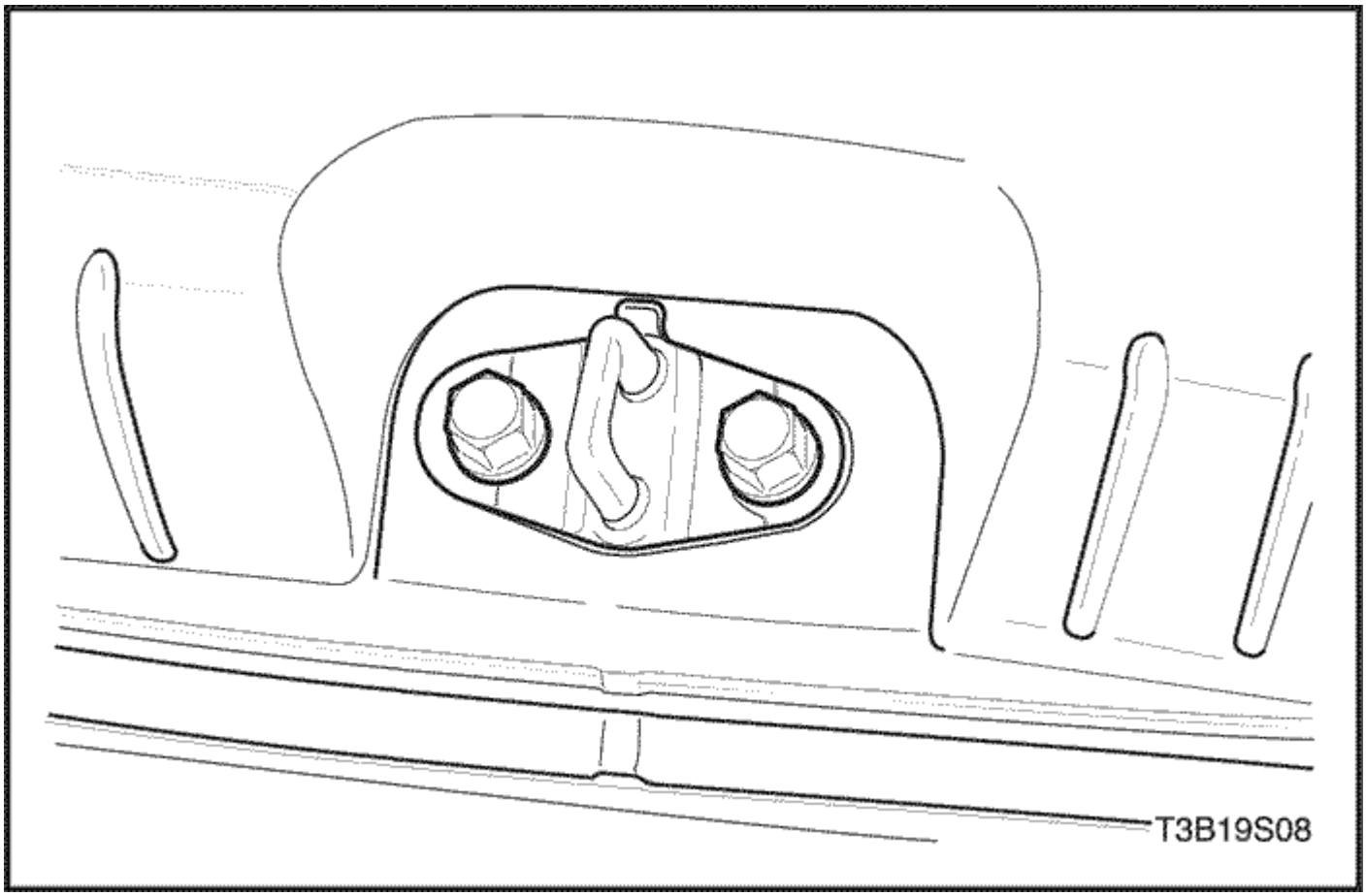


Installation Procedure

1. Install the lock cylinder with the nuts.

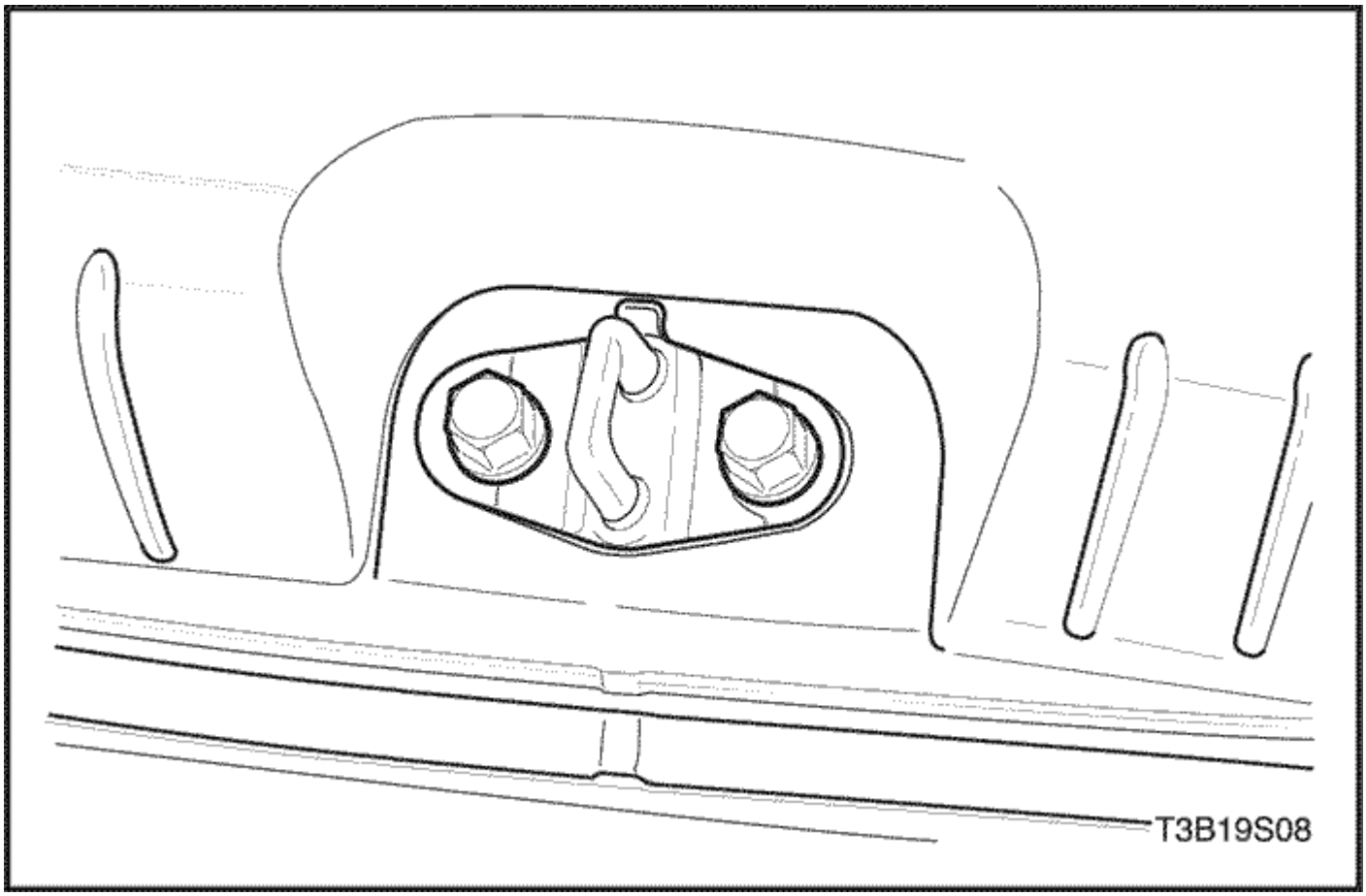
   Tighten
   Tighten the luggage compartment lock cylinder nuts to 3 N•m (27 lb-in).

2. Connect the lock rod.
3. Install the hatchback door lower garnish molding (if equipped). Refer to *Section 9G, Interior Trim.*



Luggage Compartment Lock Striker (Notchback)
Removal Procedure

1. Open the luggage compartment.
2. Remove the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*
3. Remove the bolts that secure the lock striker.
4. Pull the lock striker out.

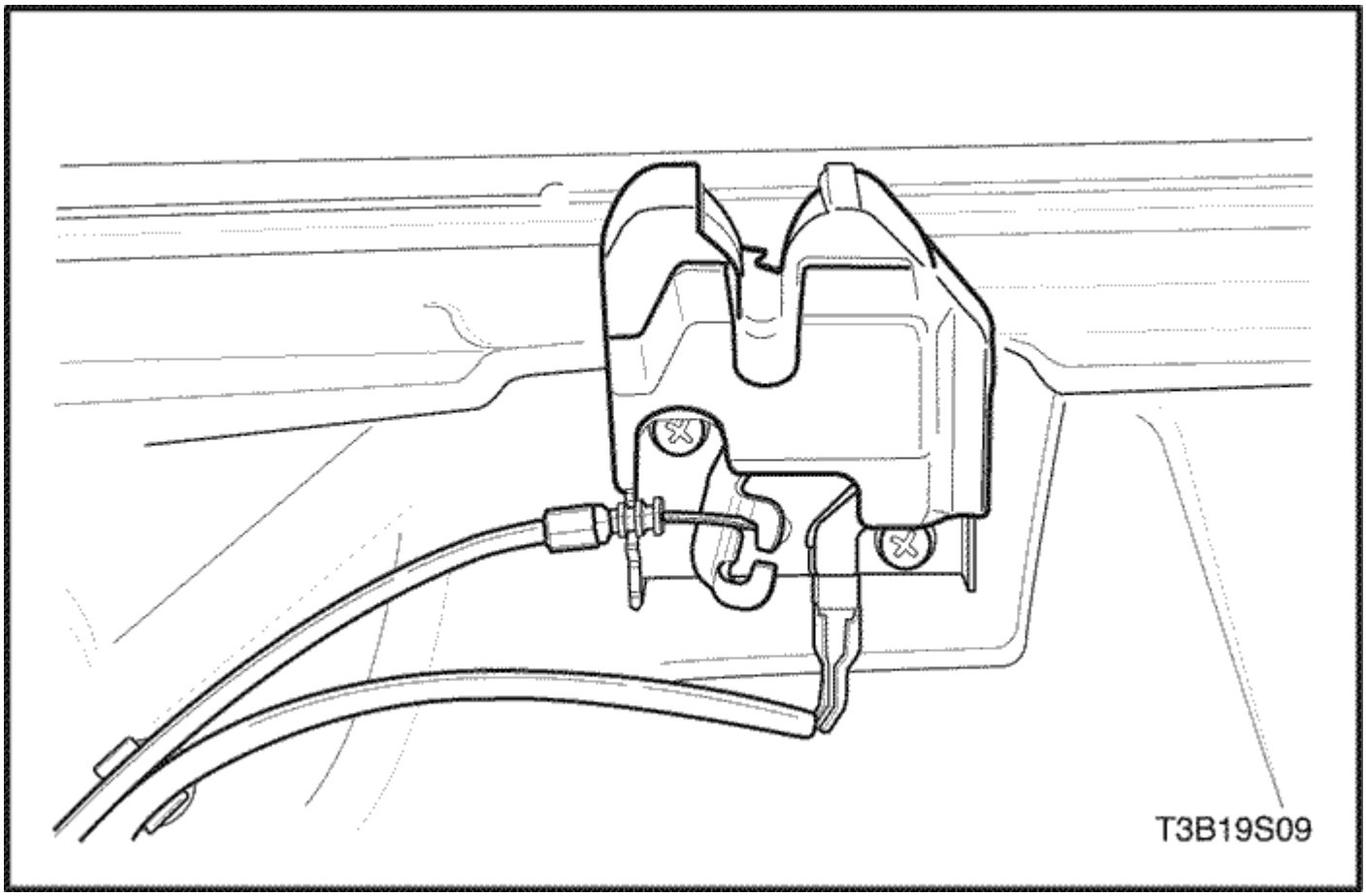


Installation Procedure

1. Install the lock striker with the bolts.

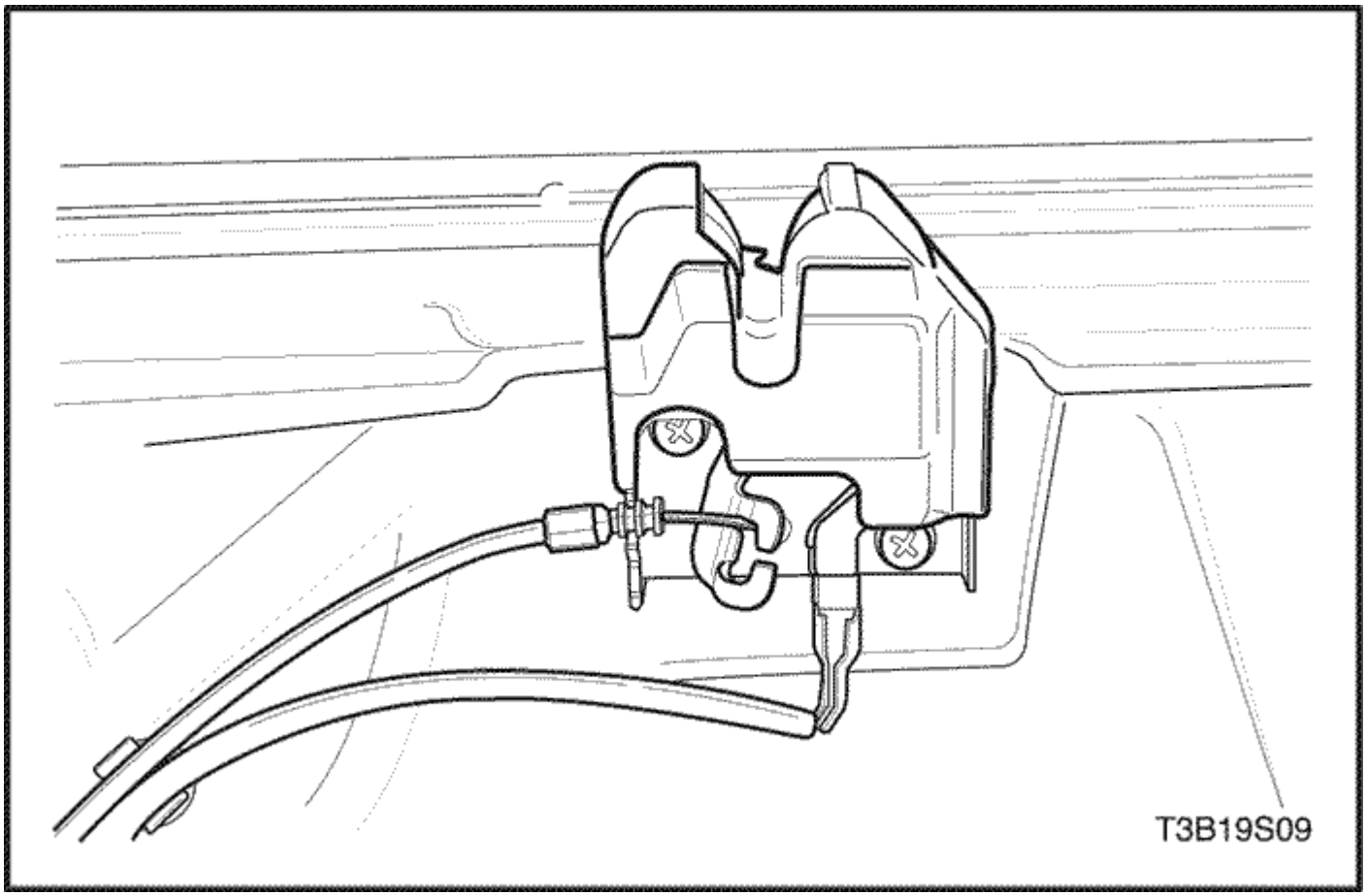
   Tighten
   Tighten the luggage compartment lock striker bolts to 8 N•m (71 lb-in).

2. Install the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*



Luggage Compartment Lock (Notchback)
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the screws and the luggage compartment lock.
3. Disconnect the electrical connector.
4. Disconnect the lock rod.
5. Disconnect the cable from the lock.

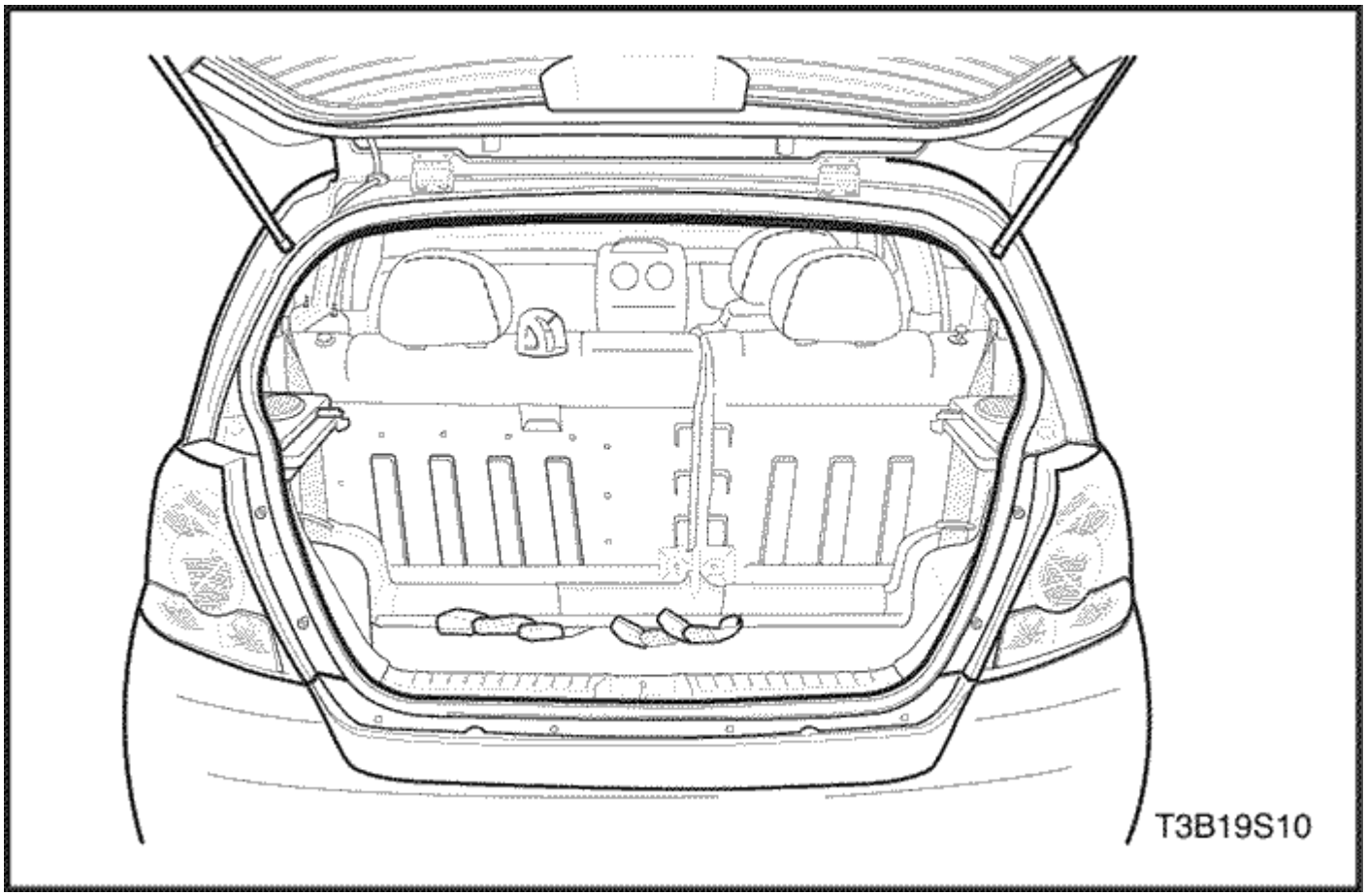


Installation Procedure

1. Connect the cable to the lock.
2. Connect the lock rod.
3. Connect the electrical connector.
4. Install the luggage compartment lock with the screws.

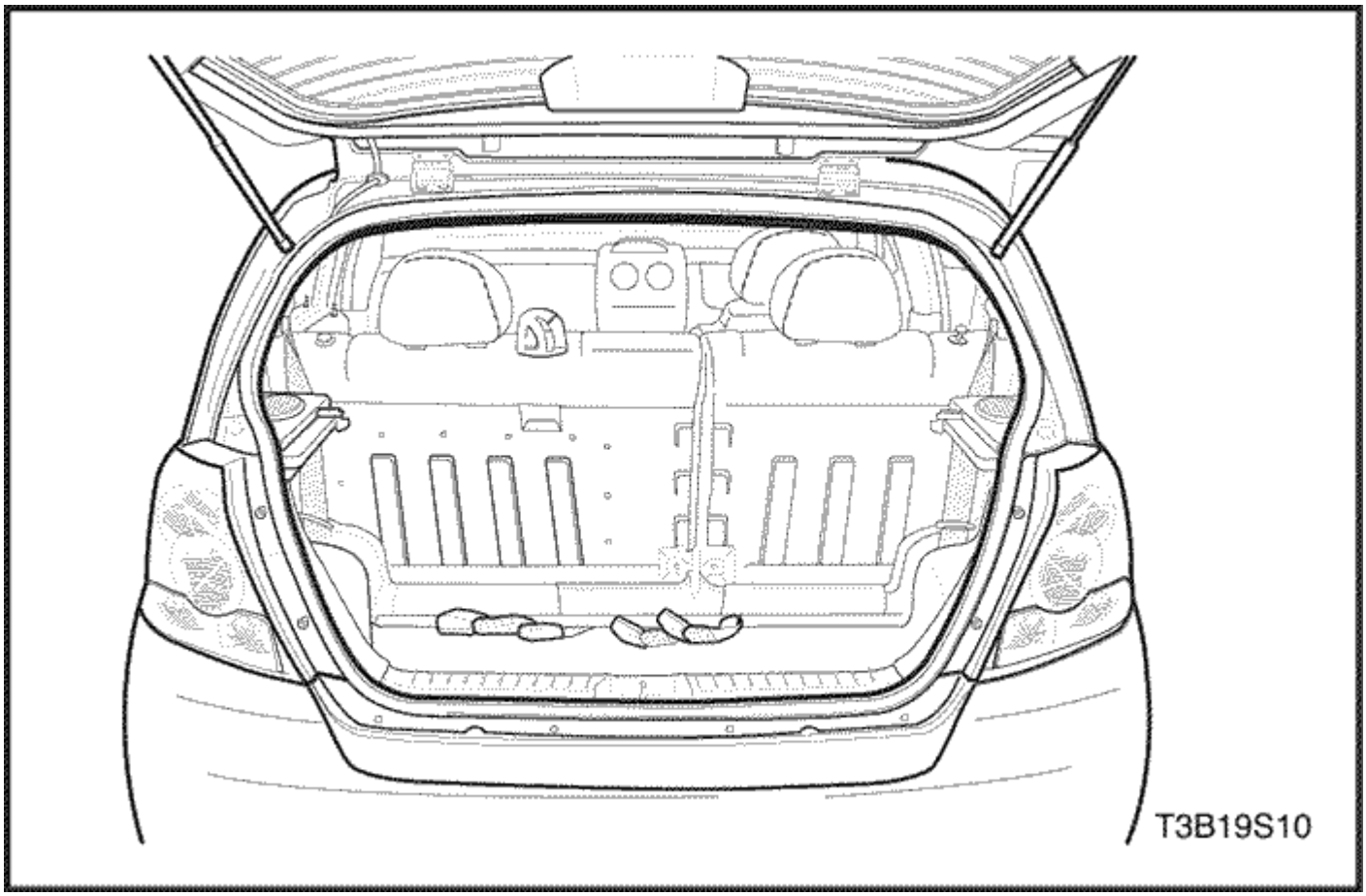
   Tighten
   Tighten the luggage compartment lock screws to 6 N•m (53 lb-in).

5. Connect the negative battery cable.



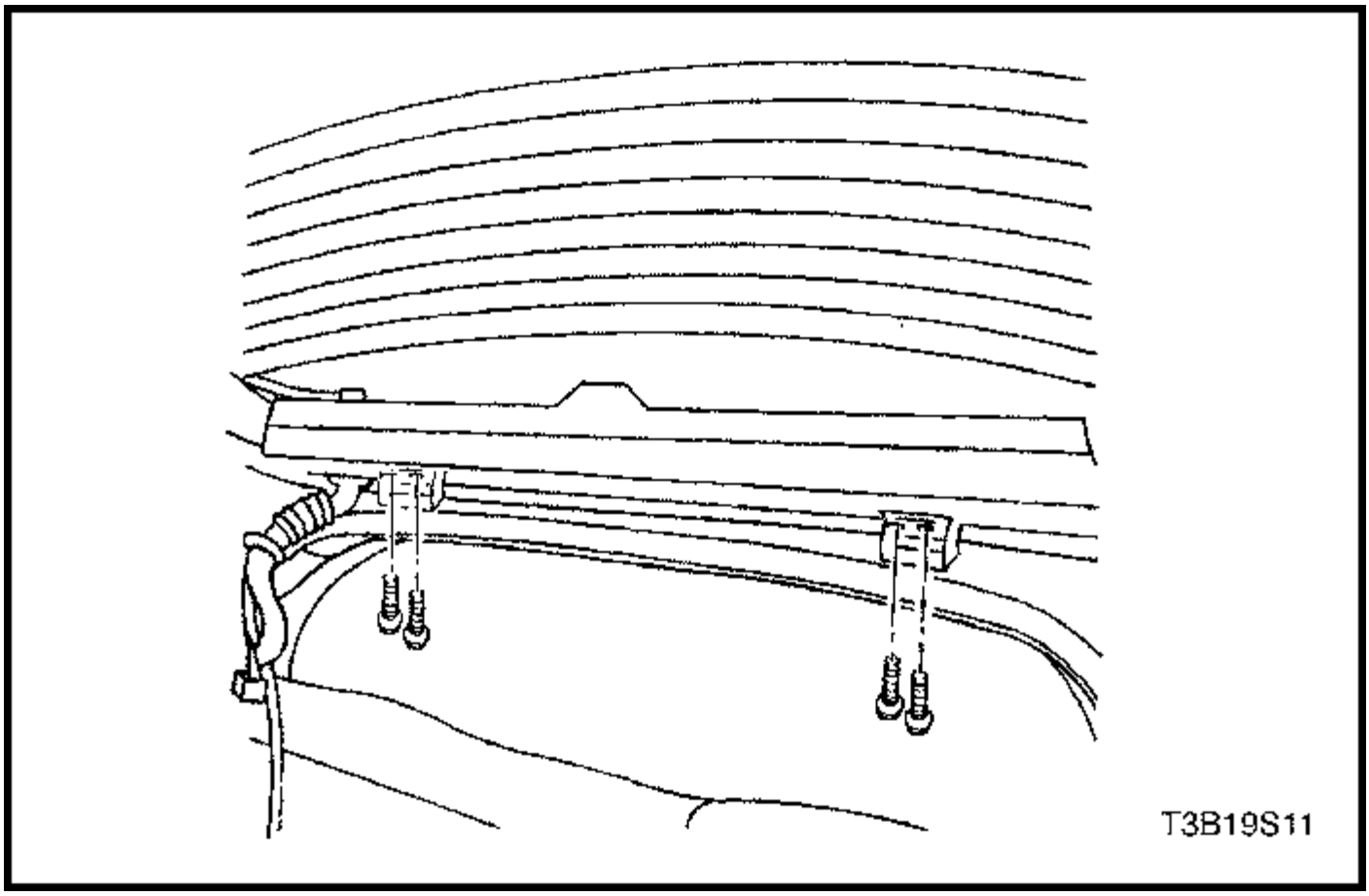
Weatherstrip
Removal Procedure

1. Open the luggage compartment lid.
2. Remove the luggage compartment rear quarter and rear trim panels. Refer to *Section 9G, Interior Trim.*
3. Remove the weatherstrip from around the gutter.



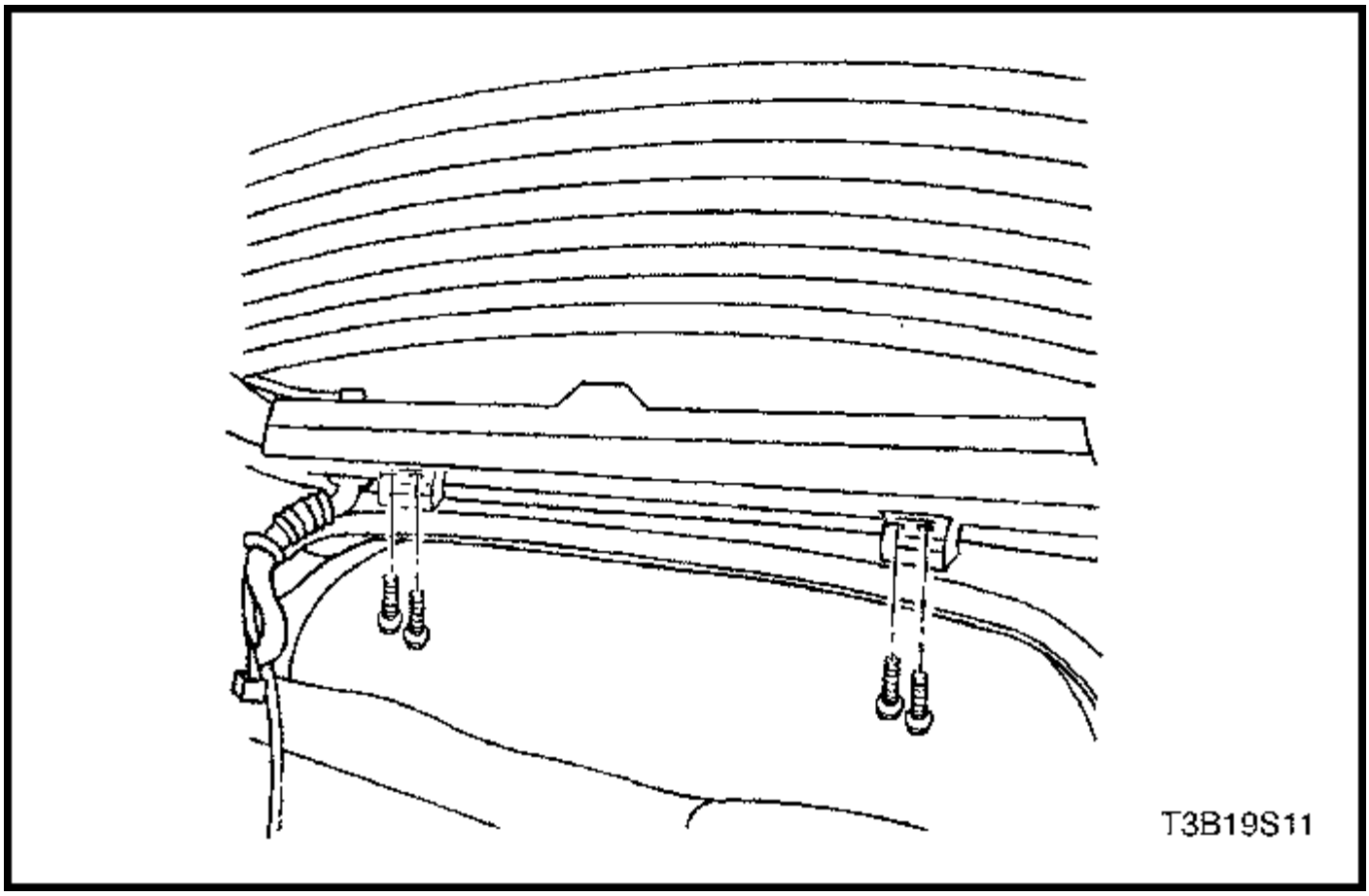
Installation Procedure

1. Install the weatherstrip onto the gutter flange.
2. Inspect the weatherstrip. Make sure that the clinch is completely seated onto the flange.
3. Using a water hose without a nozzle, test the rear deck lid to make sure that no leaks are present.
4. Install the luggage compartment rear quarter and rear trim panels. Refer to *Section 9G, Interior Trim.*



Hatchback Door
Removal Procedure

1. Open and suitably support the hatchback door.
2. Disconnect the hatchback door grommet, the electrical connector, and the washer hose.
3. Remove the gas support assemblies from the hatchback door and the body. Refer to "Gas Support Assemblies" in this section.
4. With the aid of another technician, remove the bolts and the hatchback door from the hinges.

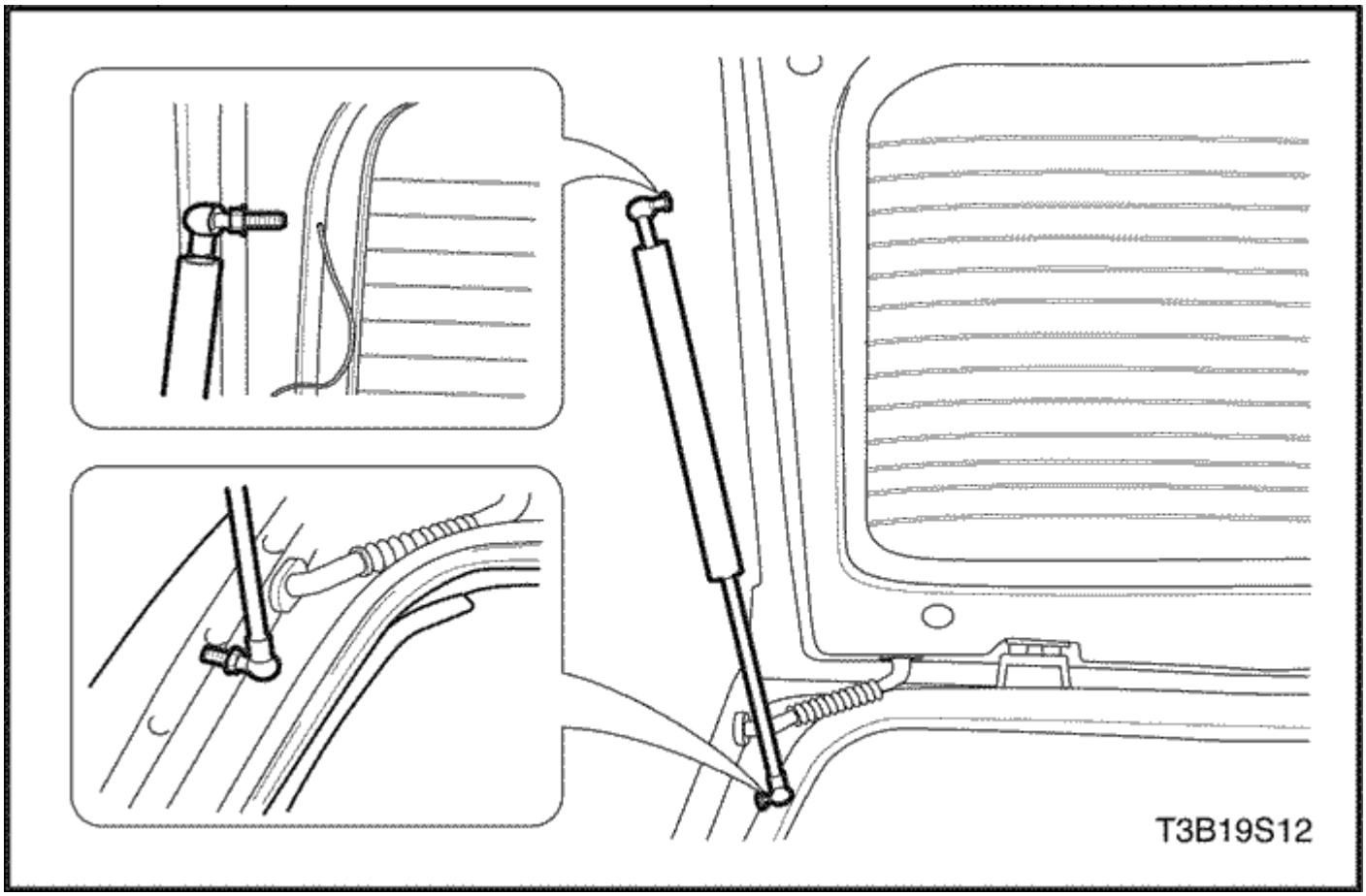


Installation Procedure

1. With the aid of another technician, install the hatchback door to the hinges with the bolts.

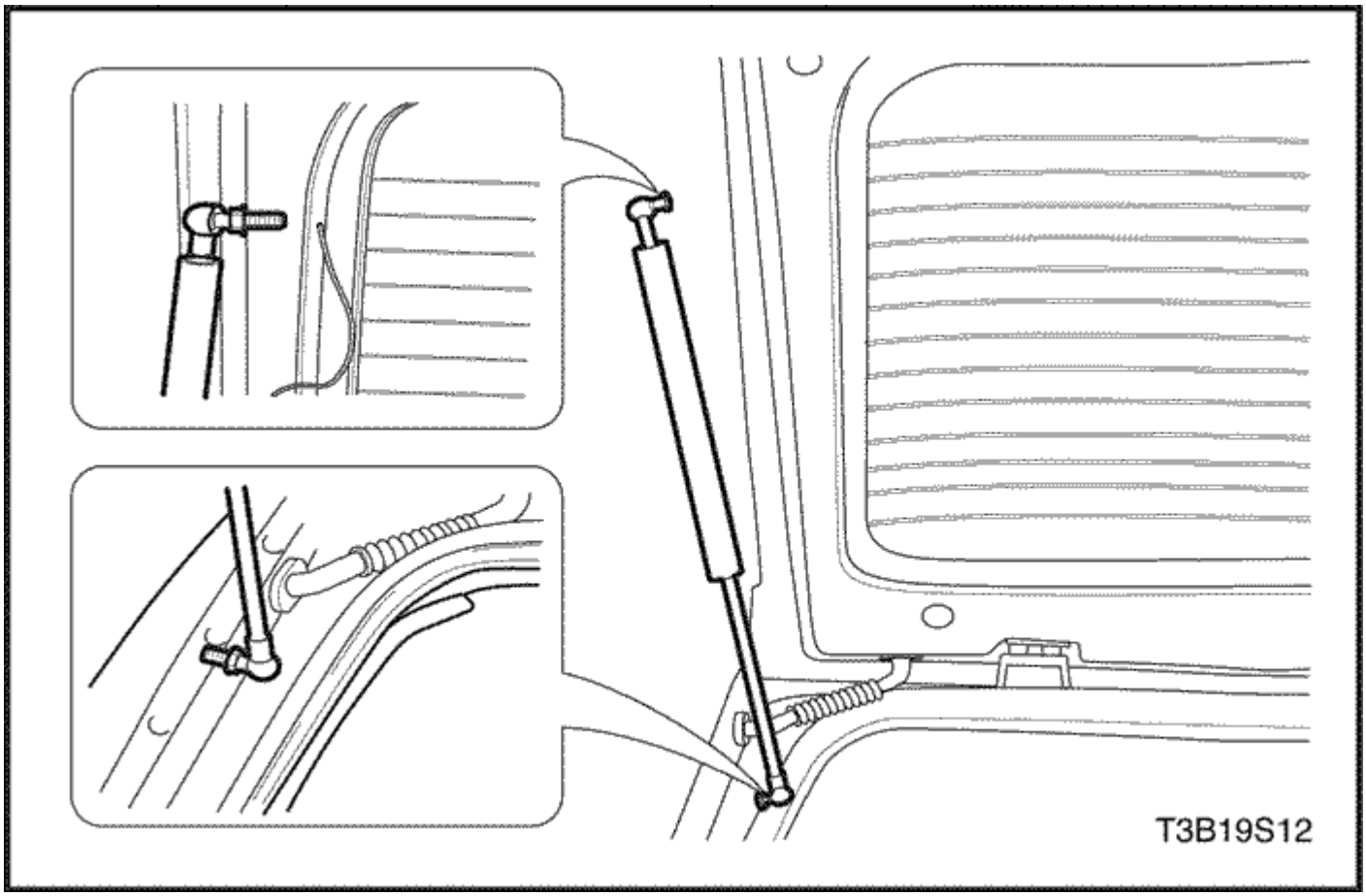
   Tighten
   Tighten the hatchback door hinge bolts to 20 N•m (15 lb-ft).

2. Install the gas support assemblies to the hatchback door and the body. Refer to "Gas Support Assemblies" in this section.
3. Connect the hatchback door electrical connector, the washer hose, and the grommet.
4. Close the hatchback door.



Gas Support Assemblies
Removal Procedure

1. Open and suitably support the hatchback door.
2. Unscrew and remove the gas support assembly from the hatchback door and the body.

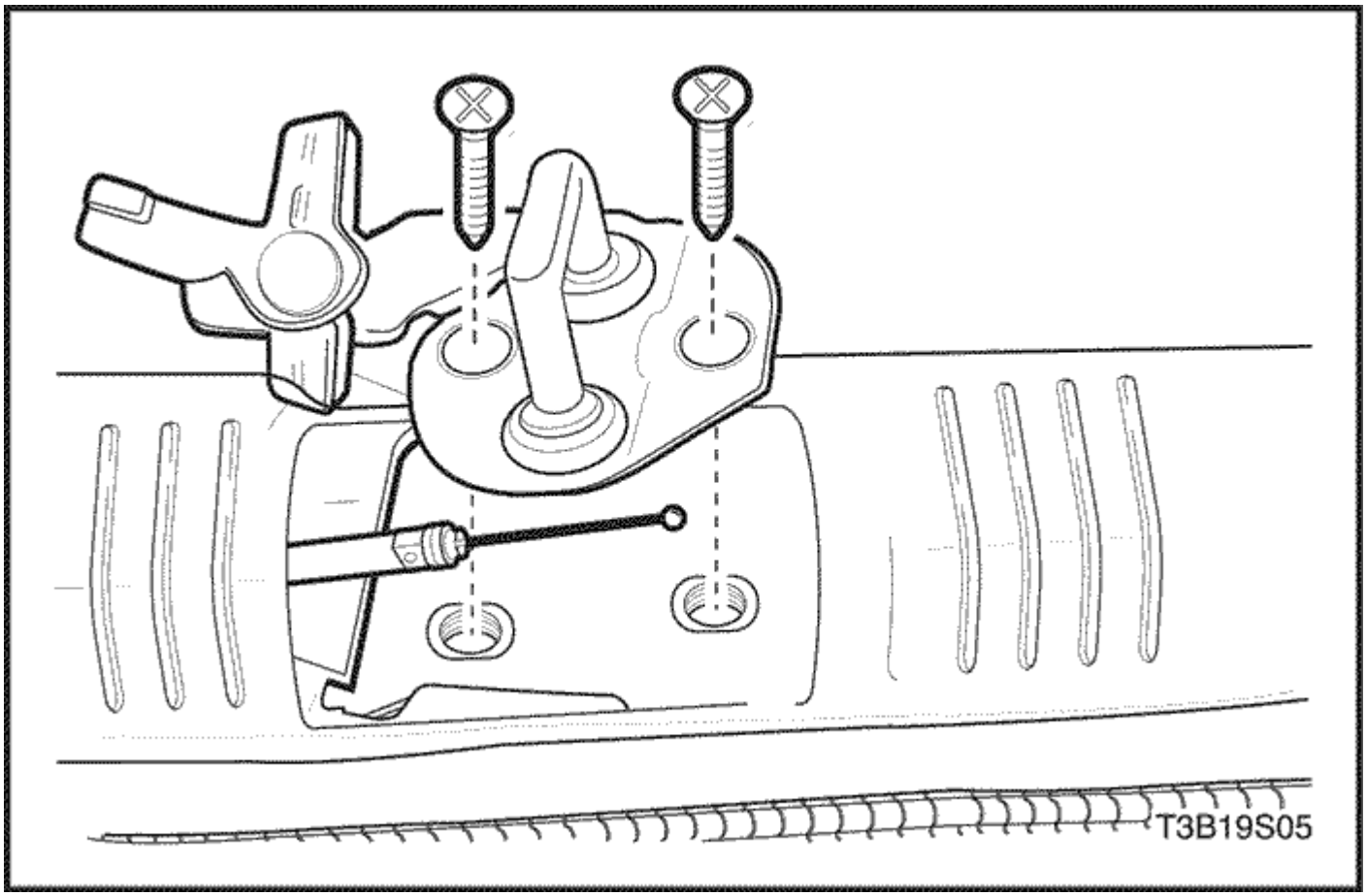


Installation Procedure

1. Install the gas support assembly onto the hatchback door and the body.

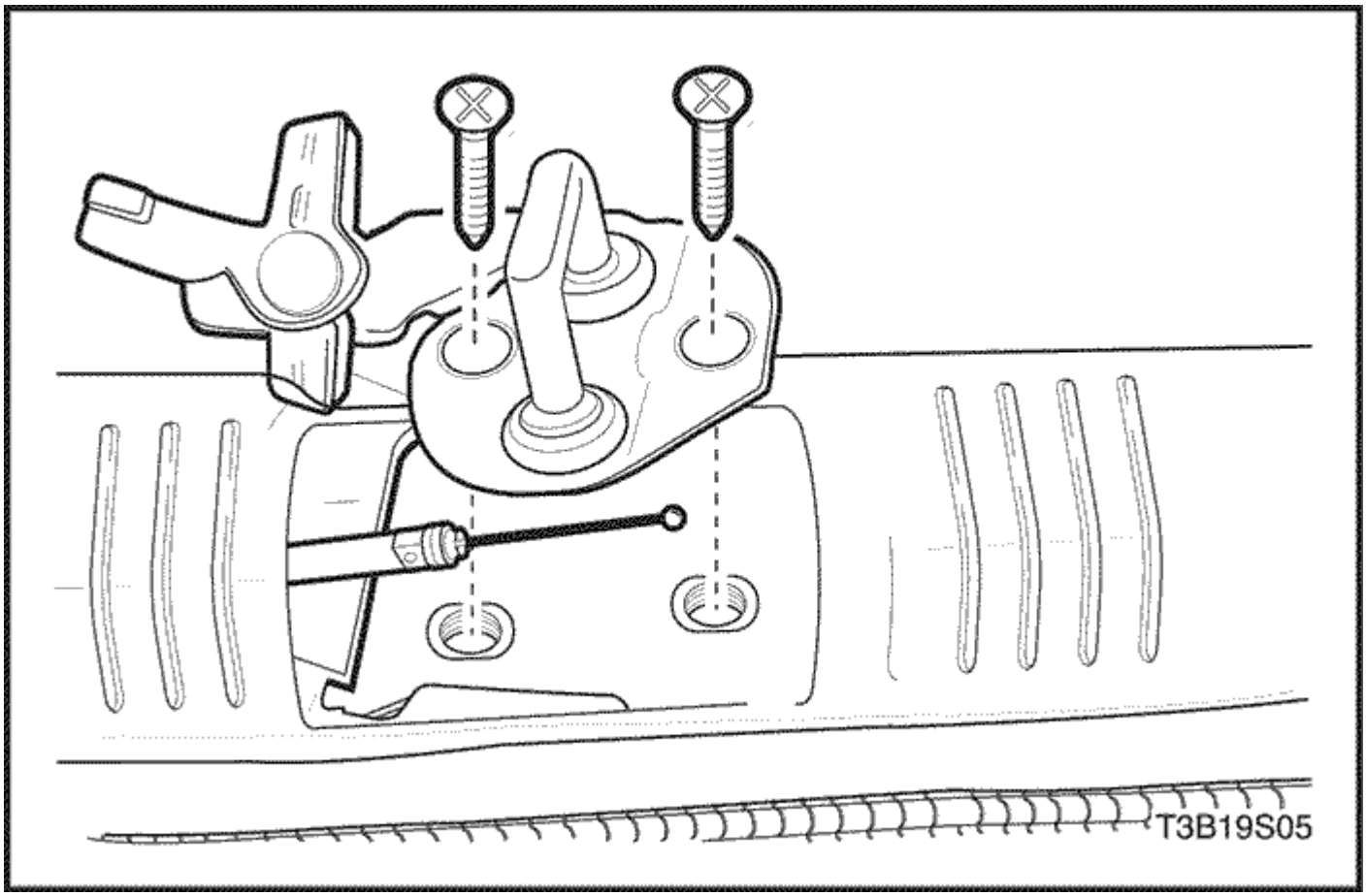
   Tighten
   Tighten the gas support assembly studs to 8 N•m (71 lb-in).

2. Close the hatchback door.



Hatchback Door Lock Striker
Removal Procedure

1. Open the hatchback door.
2. Remove the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*
3. Remove the screws that secure the lock striker.
4. Disconnect the cable from the lock striker.

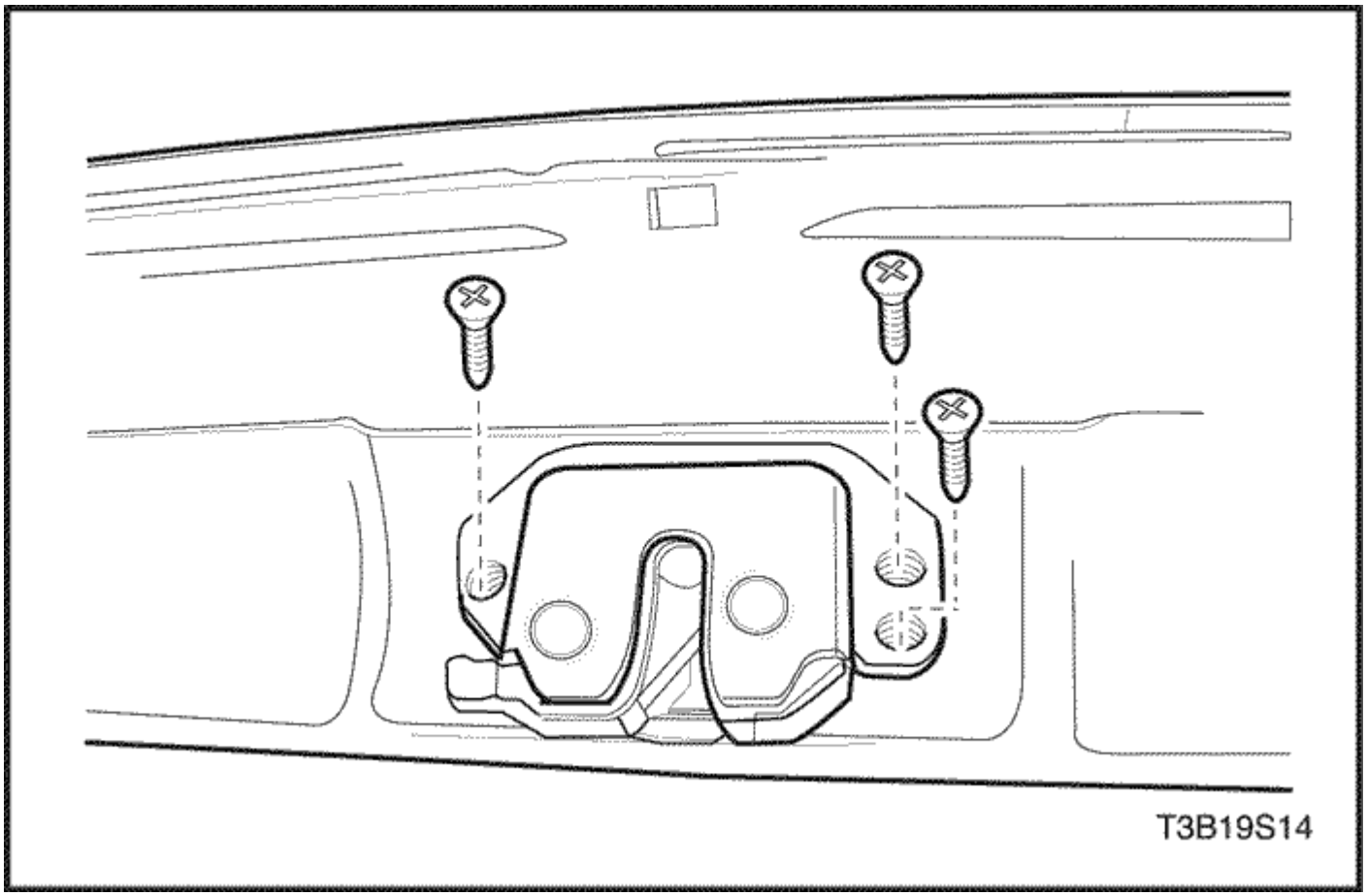


Installation Procedure

1. Connect the cable to the lock striker.
2. Install the lock striker with the screws.

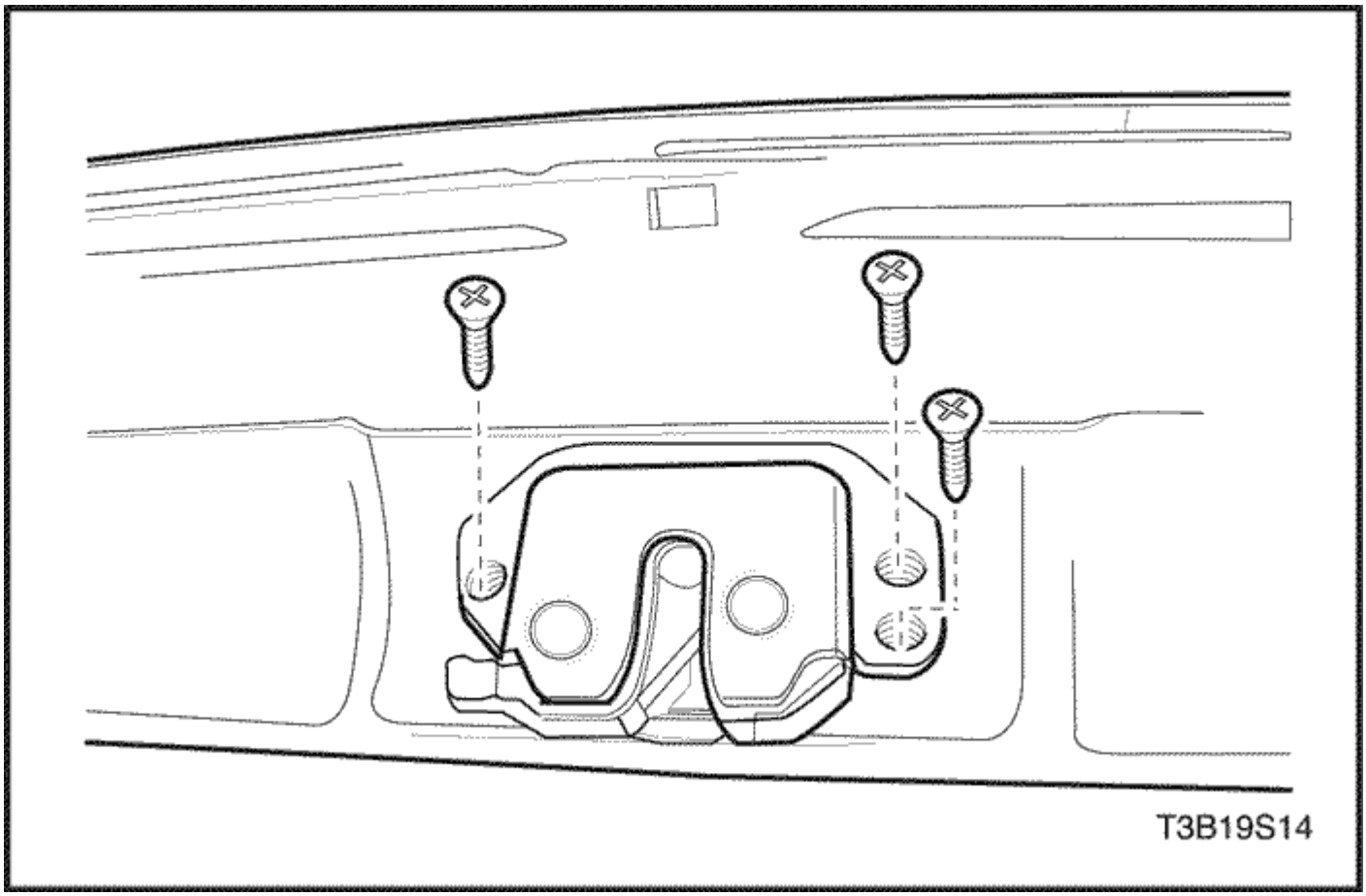
   Tighten
   Tighten the hatchback door lock striker screws to 20 N•m (15 lb-ft).

3. Install the luggage compartment rear trim panel. Refer to *Section 9G, Interior Trim.*
4. Close the hatchback door.



Hatchback Door Lock
Removal Procedure

1. Open the hatchback door.
2. Remove the hatchback door lower garnish molding. Refer to *Section 9G, Interior Trim.*
3. Remove the screws and the hatchback lock.
4. Disconnect the lock rods and the electrical connector.



Installation Procedure

1. Connect the lock rods and the electrical connector.
2. Install the hatchback lock with the screws.

   Tighten
   Tighten the hatchback door lock screws to 6 N•m (53 lb-in).

3. Install the hatchback door lower garnish molding. Refer to *Section 9G, Interior Trim.*
4. Close the hatchback door.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Fuel Filler Door

The fuel filler door attaches to the fuel tank pocket on the right side of the vehicle.

Rear Deck Lid (Notchback)

The rear deck lid consists of an inner and an outer panel hemmed around the perimeter and bonded together with structural adhesive. The torque rods assist in the opening of the rear deck lid and hold it in the open position.

Hatchback Door

The hatchback door consists of the rear hatch glass within a steel frame. The steel frame is made of an inner and an outer panel hemmed around the perimeter, and bonded together with structural adhesive. The gas support assemblies assist in the opening of the hatchback door, and can hold the door open.

SECTION 9T1

REMOTE KEYLESS ENTRY AND ANTI-THEFT SYSTEM

Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

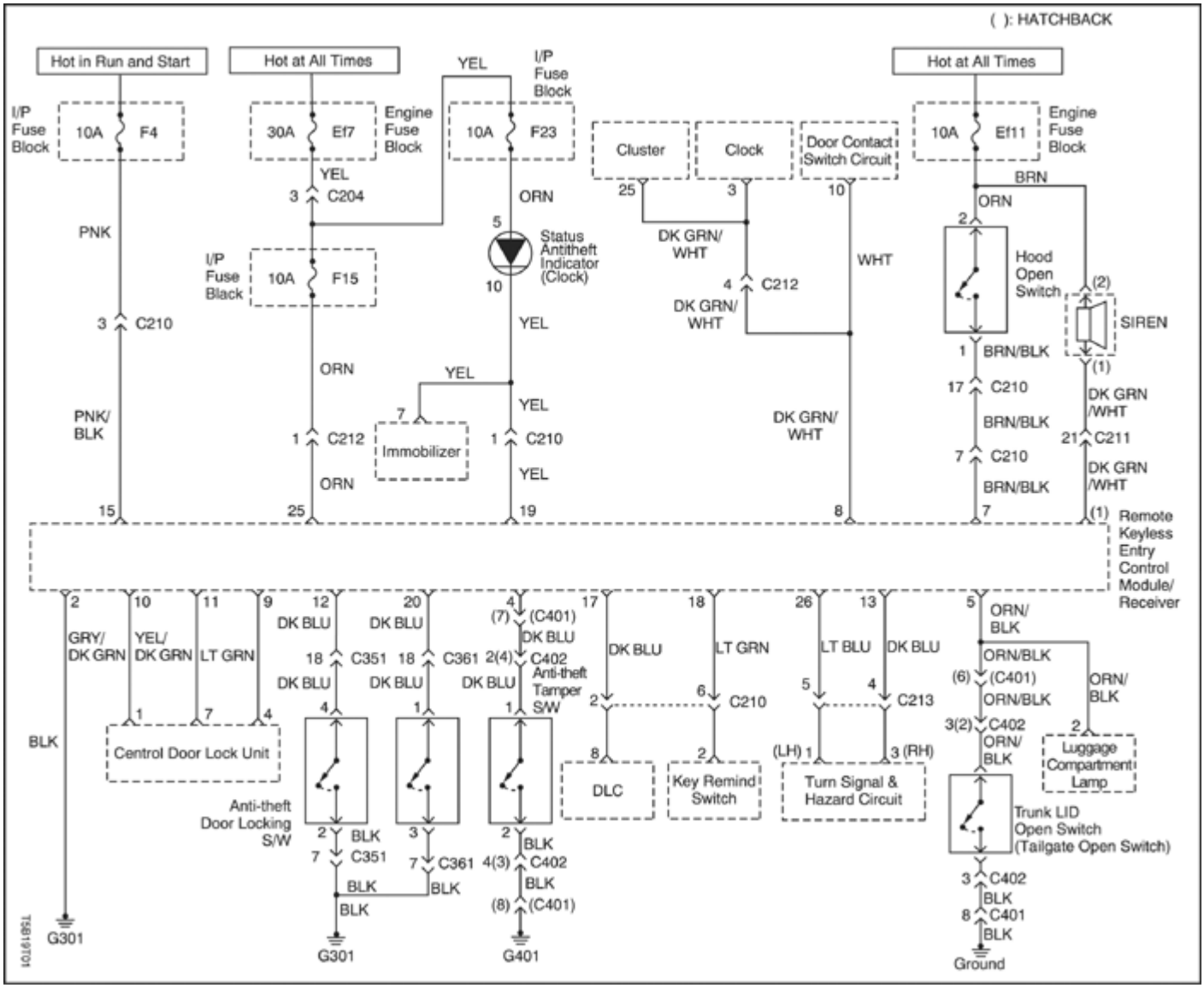
SPECIFICATIONS

Fastener Tightening Specifications

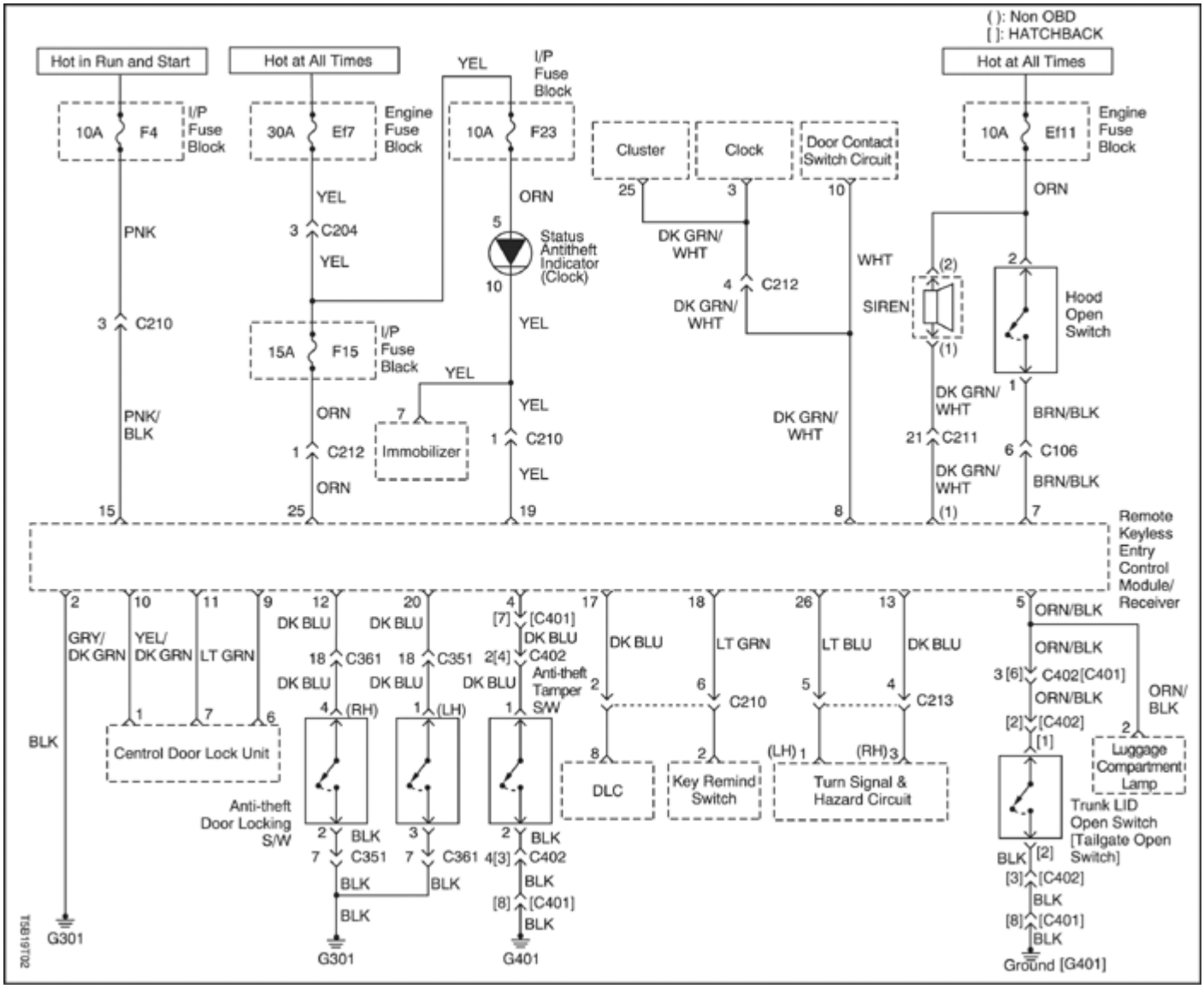
Application	N•m	Lb-Ft	Lb-In
Siren Braket Mounting Bolts.	11	-	97

SCHEMATIC AND ROUTING DIAGRAMS

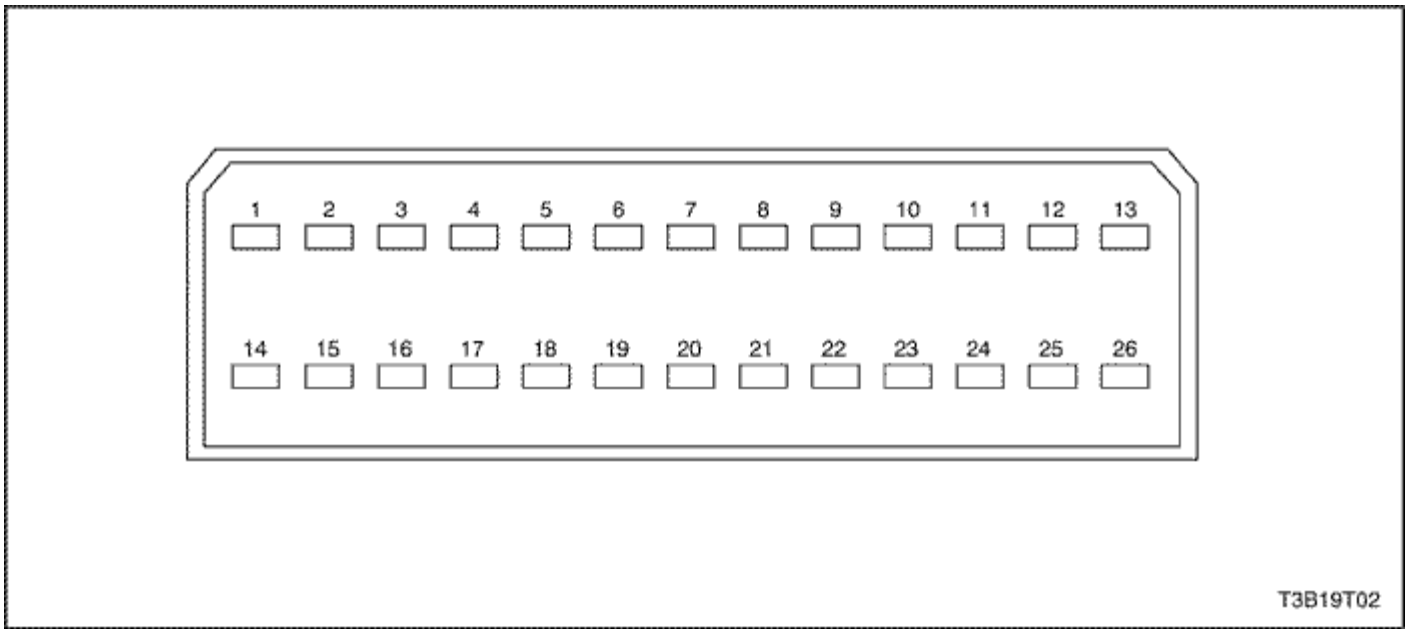
Remote Keyless Entry and Anti-Theft System



Remote Keyless Entry and Anti-Theft System (RHD)



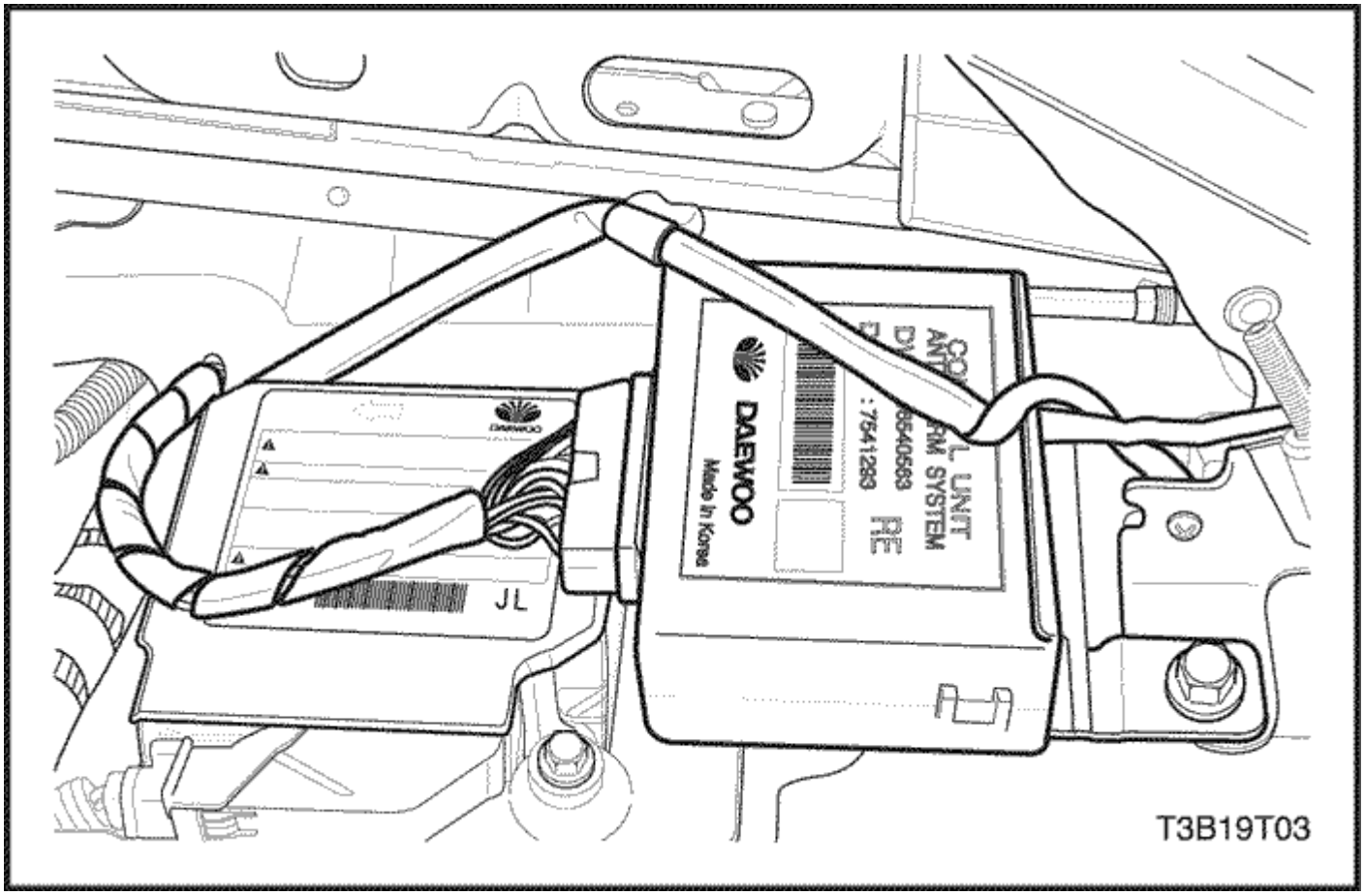
Control Module/Receiver Connector



Terminal	Color	Description
1	DK GRN/WHT	Siren
2	BLK	Ground
3	-	-
4	DK BLU	Door and Trunk Tamper Switch
5	ORN/BLK	Trunk Open Switch
6	-	-
7	BRN/BLK	Hood Open Switch
8	DK GRN/WHT	Door contact Switch
9	LT GRN	Unlock
10	GRY/DK GRN	Lock
11	YEL/DK GRN	Unlock
12	DK BLU	Anti-Theft Door Locking Switch
13	DK BLU	Right Turn Signal Bulb
14	-	-
15	PNK/BLK	Ignition+
16	-	-
17	DK BLU	Diagnostic Communication
18	LT GRN	Key Reminder Switch
19	YEL	Security Indicator
20	DK BLU	Anti-Theft Door Locking Switch

Terminal	Color	Description
21	-	-
22	-	-
23	-	-
24	-	-
25	ORN	Battery+
26	LT BLU	Left Turn Signal Bulb

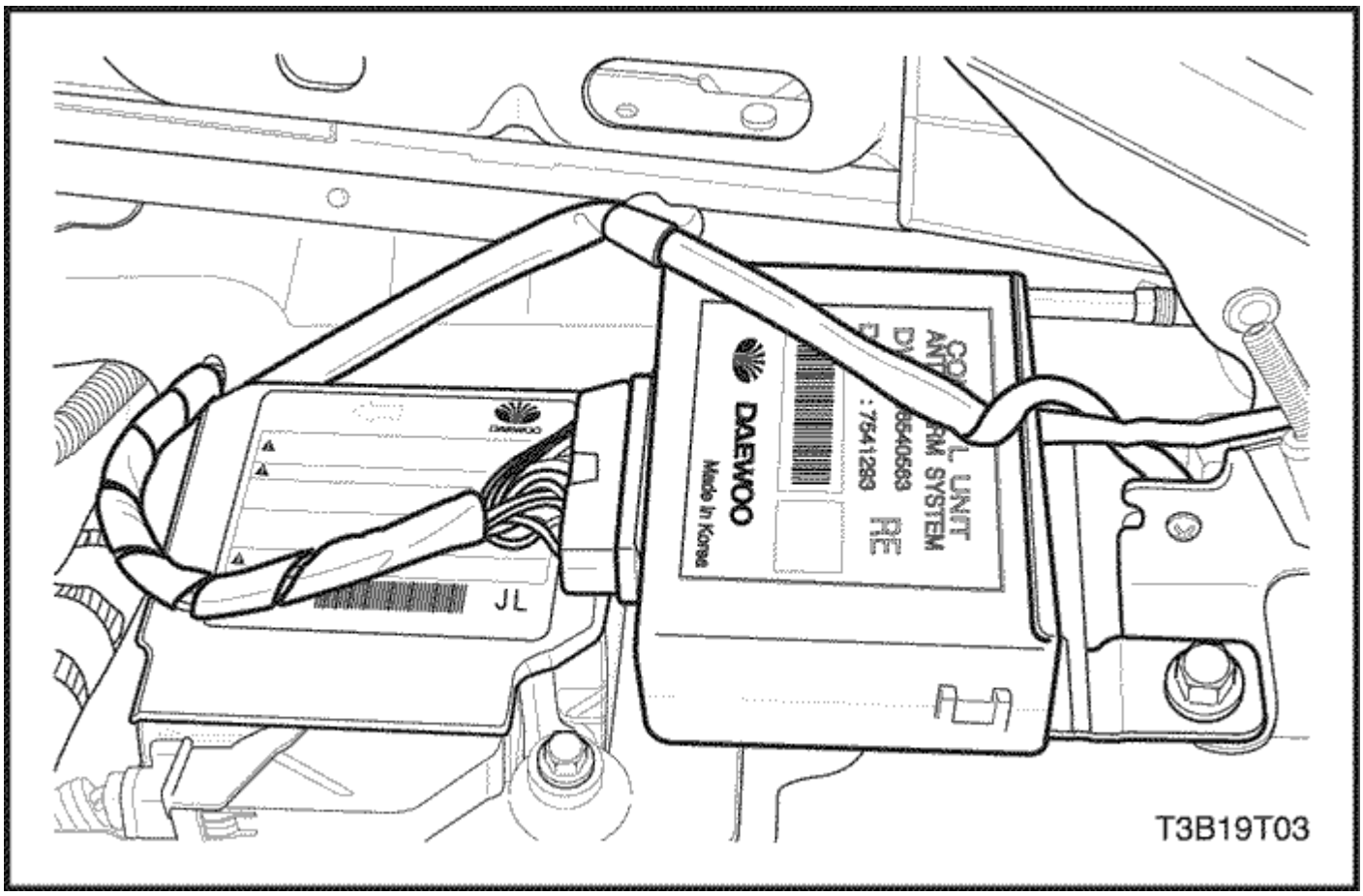
MAINTENANCE AND REPAIR
ON-VEHICLE SERVICE



Control Module/Receiver
Removal Procedure

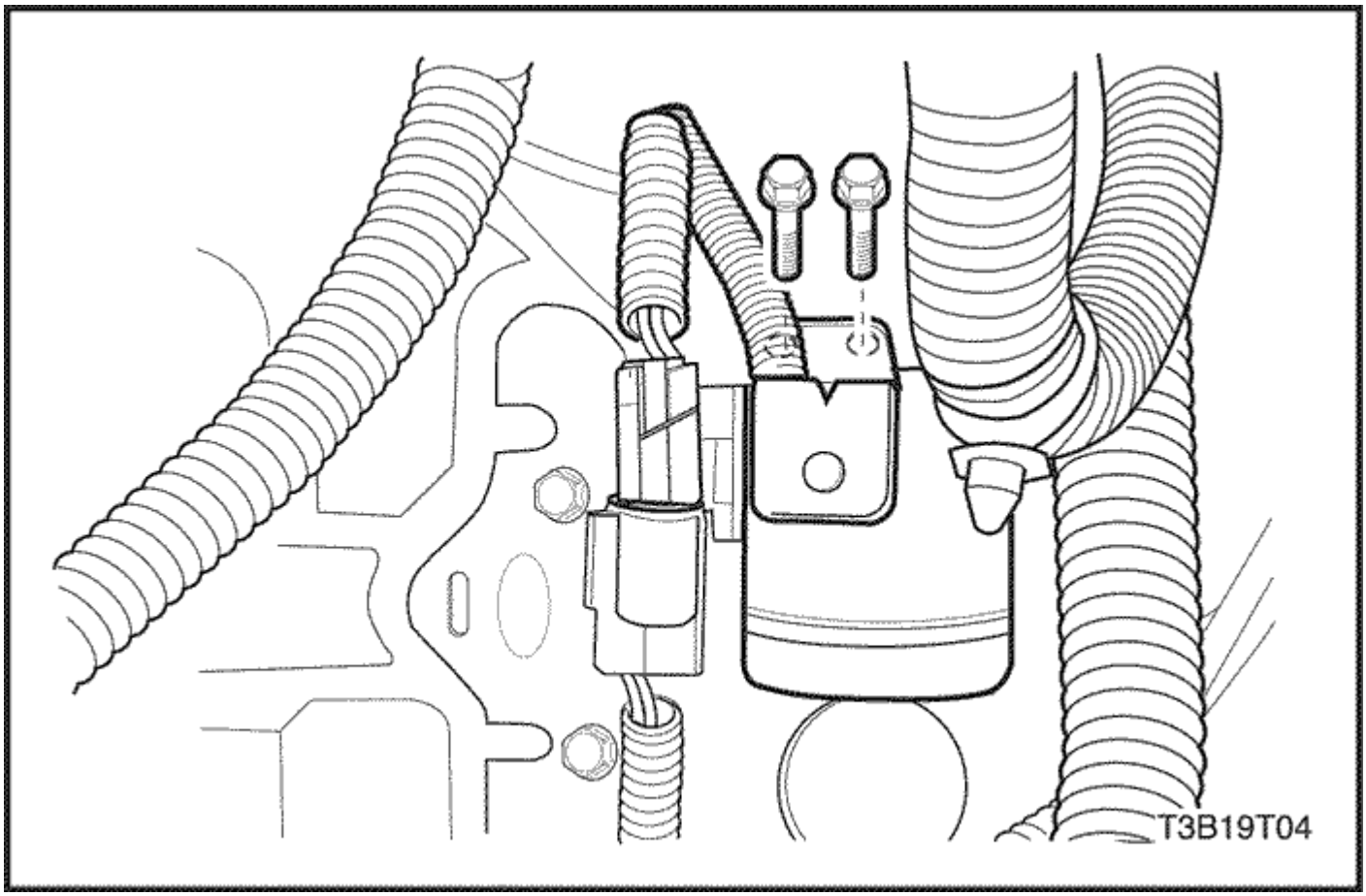
1. Disconnect the negative battery cable.

2. Remove the floor console. Refer to *Section 9G, Interior Trim.*
3. Disconnect the control module/receiver electrical connector.
4. Slide the control module/receiver away from its mounting bracket.



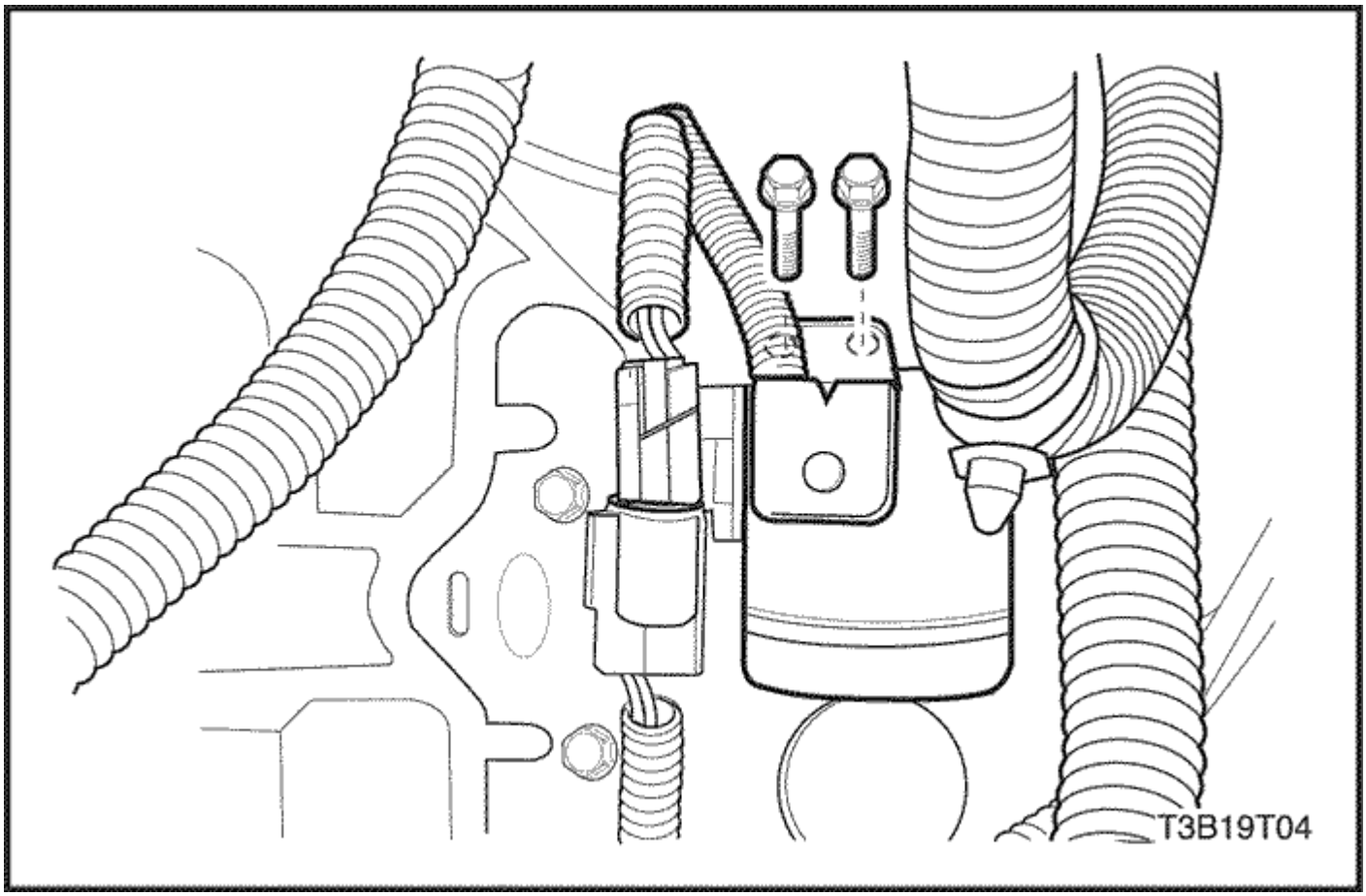
Installation Procedure

1. Install the control module/receiver on its mounting bracket.
2. Connect the control module/receiver electrical connector.
3. Install the floor console. Refer to *Section 9G, Interior Trim.*
4. Connect the negative battery cable.



Siren
Removal Procedure

1. Remove the siren electrical connector.
2. Remove the siren bracket mounting bolts and siren.



Installation Procedure

1. Install the siren with the mounting bolts.

   Tighten
   Tighten the siren braket mounting bolts to 11 N•m (97 lb-in).

2. Connect the siren electrical connector.

Remote Keyless Entry Transmitter Programming

The Remote Keyless Entry System allows for the use of as many as five(5) transmitters for each vehicle. Replacement Remote Keyless Entry System Transmitters must first be programmend to specific vehicle using the Scan100 Secan tool.

This process is completed using serial data communication between the Scan 100 Scan tool and the Remote Keyless Entry Control Unit and is the only method available for programming Transmitters.

Notice : All Transmitters for a specific vehicle must be programmed at same time.

Notice : Once the programming function of the Remote Keyless Entry System is activated, any Transmitter(existing or new) that is not programmed(or reprogrammed) during the programming procedure will no longer operate the Remote Keyless Entry System of that vehicle.

Notice : Ensure that the doors, hood and trunk/rear hatch are closed prior to starting the programming procedure.

1. Connect the Scan 100 Scan Tool to the Data Link Connector(DLC)
2. Turn the Scan 100 Scan Tool "ON" by pressing the "Power" Button, then wait for the MAIN MENU screen to be displayed.
3. From the MAIN MENU screen, select "Diagnostics" by pressing #1 on the Key Pad.
4. From the MODEL YEAR screen, select the appropriate model year of the specific vehicle by either scrolling down to the year and pressing "ENTER", or by pressing the respective item number on the Key Pad.
5. From the VEHICLE TYPE screen, select the specific vehicle model by either scrolling down to the model name and pressing "ENTER", or by pressing the respective item number on the Key Pad.
6. From the SYSTEM SELECTION MENU screen, select "Body" by pressing #2 on the Key Pad.
7. From the BODY SELECTION MENU screen, select "Coding" by pressing #2 on the Key Pad.
8. From the CODY SELECTION MENU screen, select "Coding" by pressing #1 on the Key Pad.
9. From the SECRET NUMBER OF CODINGS screen, enter for(4) zero's (0-0-0-0) in the for(4) boxes labeled "1-2-3-4-".
10. From the CODING SYSTEM SELECT screen, select "Keyless Entry" by pressing #2 on the Key Pad.

Notice : A slight delay may occur and "PLEASE WAIT" may be displayed before the next screen appears.

11. From the KEYLESS ENTRY CODING SYSTEM screen, select "Coding Transmitter" by pressing #1 on the Key Pad.
12. When directed by the Scan 100 Scan Tool, press any Button on the first Transmitter to be programmed.

Caution : Ensure that Transmitters from other vehicles in the immediate area are not activated during this procedure.

13. Continue programming Transmitters when directed by the Scan 100 Scan Tool until all Transmitters have been programmed.

    Notice : A maximum of five(5) Transmitters may be programmed to a vehicle.

14. Once all Transmitters have been programmed, press the "ESC" Button on the Key Pad. The display will confirm the number of Transmitters programmed. If the number displayed does not match the number of Transmitters programmed, repeat the procedure.
15. Turn the Scan 100 Scan Tool "OFF" by pressing the "POWER" Button, then disconnect it from the Data Link Connector.
16. Wait approximately 10 seconds, then test the operation of each programmed Transmitter to ensure it operates properly.

    The control module/receiver leaves the programming mode automatically and switches to the normal operating mode when either of the following conditions occurs:

    - the scan tool is disconnected from the ALDL.
    - Five passwords are recorded in the control module/receiver.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Remote Keyless Entry and Anti-Theft System

The remote keyless entry and anti-theft system can perform the following functions:

- Remotely lock and unlock the vehicle doors by means of a hand-held, high-frequency transmitter.
- Sense intrusion into the vehicle.
- Activate a warning in the event of an intrusion.
- Help the driver find the vehicle in a parking area.
- Automatically re-lock the doors if the door or the trunk is not opened within 30 seconds after the vehicle has been unlocked by the remote keyless entry.
- Communicate serial data to a scan tool to help diagnose system faults.

The remote keyless entry and anti-theft system consists of the following components:

- Keyless entry and anti-theft control module/receiver.
- Security indicator.
- Trunk open switch.
- Trunk tamper switch.
- Front door tamper switches.
- Door contact switches.
- Central door lock relay.
- Turn signal bulbs.
- Siren.
- Hood open switch.

Remote Locking and Unlocking

The hand-held transmitter locks and unlocks the vehicle doors by sending radio waves to the control module/receiver in the vehicle. The effective range of the transmitter varies between 5 and 10 meters, (approximately 16 to 32 feet), depending on whether or not objects, such as other vehicles are blocking the path of the radio waves.

The transmitter has a LOCK button and an UNLOCK button which only function when the ignition is OFF. Pressing the UNLOCK button has the following effects:

- The doors are unlocked.
- The turn signal bulbs flash twice.
- The control module is disarmed.

Pressing the LOCK button has the following effects:

- The doors are locked.
- The turn signal bulbs flash once.
- The control module is armed.

The transmitter has a replaceable battery. The battery is designed to last at least two years before replacement is necessary.

Security Indicator

There is a security indicator on the instrument panel. After the LOCK button of the transmitter is pressed, the module is placed in the armed mode, and the security indicator flashes. The security indicator turns ON for 0.1 second and OFF for 0.7 second. It then flashes at that frequency until the control module/receiver is disarmed.

Intrusion Sensing

The anti-theft function is armed if the transmitter sends the LOCK message to the control module/receiver when the ignition is OFF. When the hood, door, or

trunk is opened, the hood open, door contact, or trunk open switch sends a "ground" signal to the control module/receiver. Unless the control module/receiver is disarmed, the siren will be activated when the "ground" signal is received from the trunk open, hood open, or door contact switches. The following actions disarm the anti-theft system:

- An UNLOCK message is received from the transmitter.
- Key operation is detected by the tamper switches. (The tamper switches are operated by the lock cylinders in the front doors and trunk.)

The alarm will also be activated if the control module/receiver detects voltage from the ignition before either of the following conditions occur:

- An UNLOCK message is received from the transmitter.
- Key operation is indicated by the tamper switches.

Siren
The remote keyless entry system is armed when the LOCK message is received from the transmitter when the ignition is OFF. When the system is armed, it will activate the siren and flash the turn signals for 28 seconds if any of the following conditions occur:

- Close all the windows.
- Turn the ignition key to LOCK and remove the key.
- Have all passengers get out of the vehicle.
- Close all doors, the hood and the turnk lid.
- The control module/receiver detects ignition voltage while the system is armed.

The siren will not operate if any of the following conditions occur after the system has been armed:

- The door is opened with the key.
- The trunk is opened with the key.
- The UNLOCK or LOCK button on the remote transmitter is pressed within 2 seconds after the siren is activated.

Vehicle Locator
The remote keyless entry system assists the driver in locating the vehicle. When the vehicle is unlocked with the remote control, the turn signals flash twice to indicate the location of the vehicle. The duration of the flashes and

the length of time between flashes is used to indicate certain vehicle conditions. Refer to "Fault or Alarm Indication" in this section.

Autolocking (Safety Lock)

The remote keyless entry system features an autolocking feature. If the doors are unlocked with the remote transmitter when the control module/receiver is in the armed mode, the doors are automatically re-locked after 30 seconds unless any of the following events occur:

- A door is opened.
- The ignition is ON.
- The trunk is opened.
- The hood is opened.

Control Module/Receiver

The remote keyless entry control module/receiver is contained in the floor console. The module/receiver processes signals from the remote transmitter and various switches. It activates the alarm if an intrusion is detected. The control module/receiver also has a self-diagnostic function which will display trouble codes. In order to display trouble codes, a scan tool must be connected to the data link connector (DLC).

The control module/receiver will not communicate with transmitters from other vehicles because there are over four billion possible electronic password combinations. It is highly unlikely that any transmitters will use the same password. The control module/receiver has an attached antenna to detect signals from the transmitter.

Fault or Alarm Indication

When the UNLOCK button on the remote transmitter is pressed, the control module/receiver will flash the parking lights to indicate information about the remote keyless entry and anti-theft system.

Normal Condition: If there has not been an intrusion, and no fault has been detected, the control module/receiver will signal a normal condition when the UNLOCK button is pressed. The parking lights will flash twice for 0.5 second, with a 0.5 second pause between flashes.

Fault Indication: If there is a fault in the remote keyless entry and anti-theft system, the control module/receiver will signal the fault when the UNLOCK button is pressed. The parking lights will flash twice for 1 second, with a 0.5 second pause between flashes.

Alarm Indication: If there has been an intrusion since the last time the LOCK button was pressed, the control module/receiver will signal that there has been an intrusion when the UNLOCK button is pressed. The parking lights will flash twice for 0.5 second, with a 1.5 second pause between flashes.

Alarm and fault information will be erased the next time the transmitter arms the control module/receiver by transmitting a LOCK message.

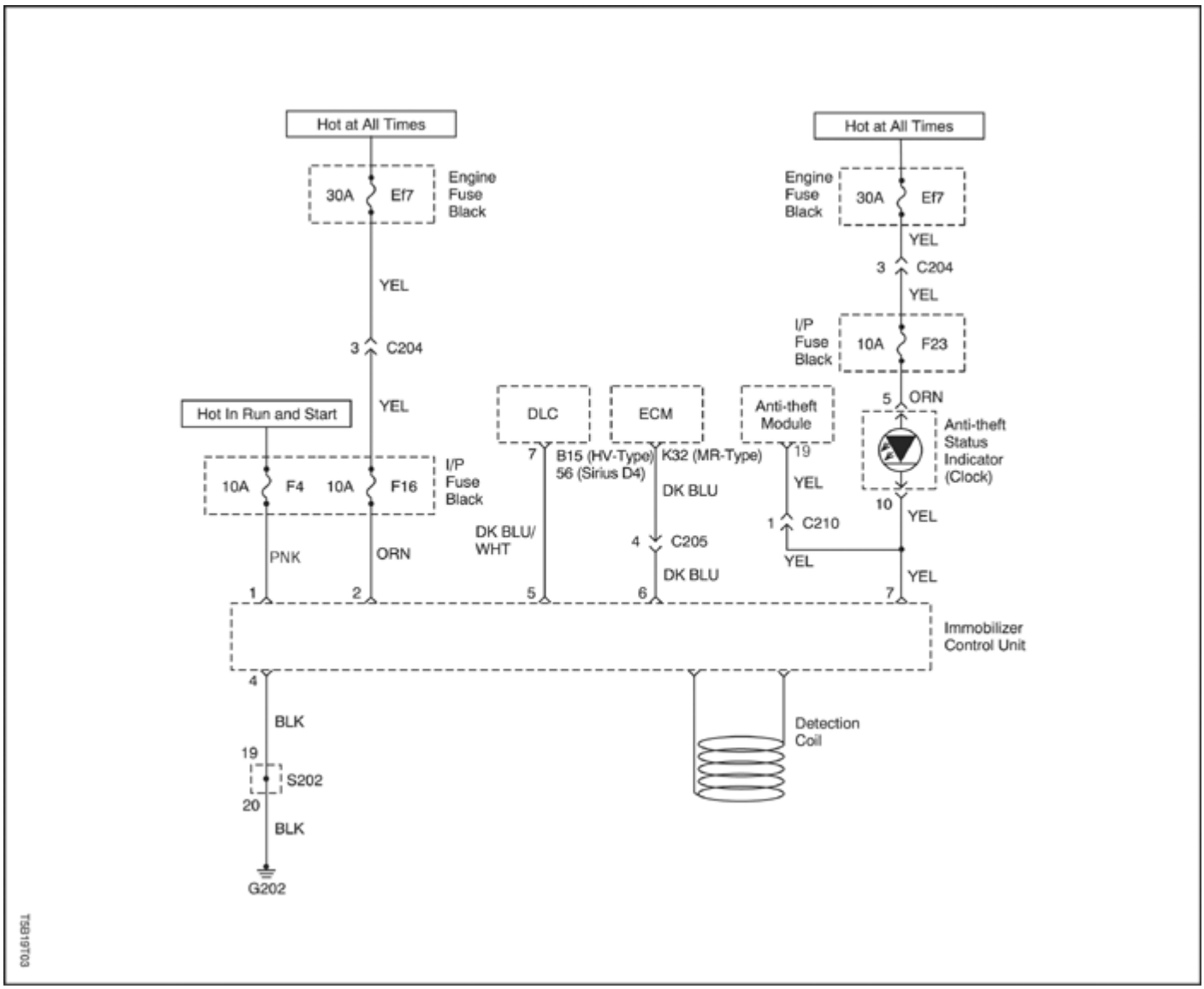
SECTION 9T2

IMMOBILIZER ANTI-THEFT SYSTEM

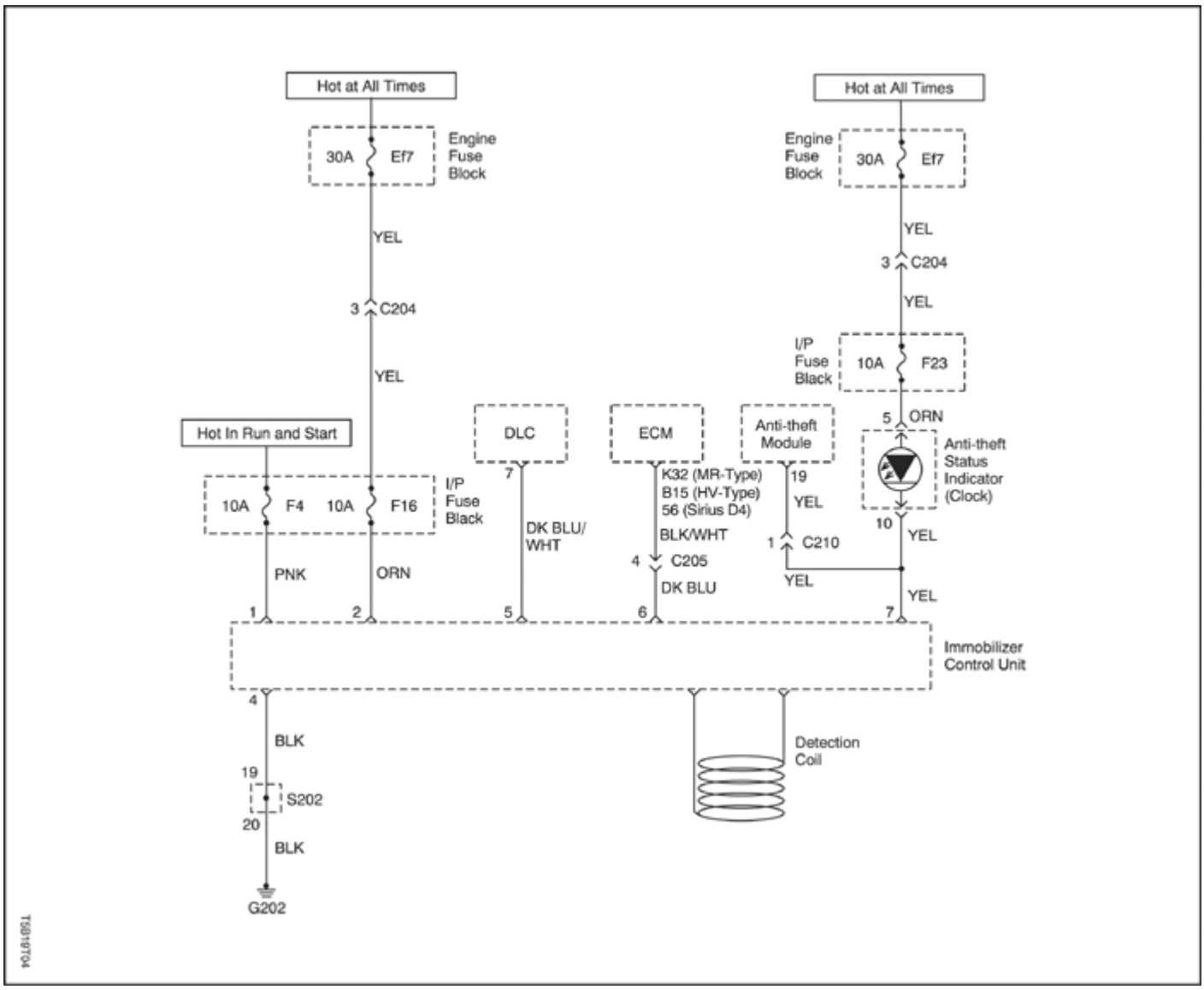
Caution : Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

SCHEMATIC AND ROUTING DIAGRAMS

Immobilizer Anti-Theft System



Immobilizer Anti-Theft System (RHD)



DIAGNOSTIC INFORMATION AND PROCEDURES

Immobilizer System (MR-140, SIRIUS D4)

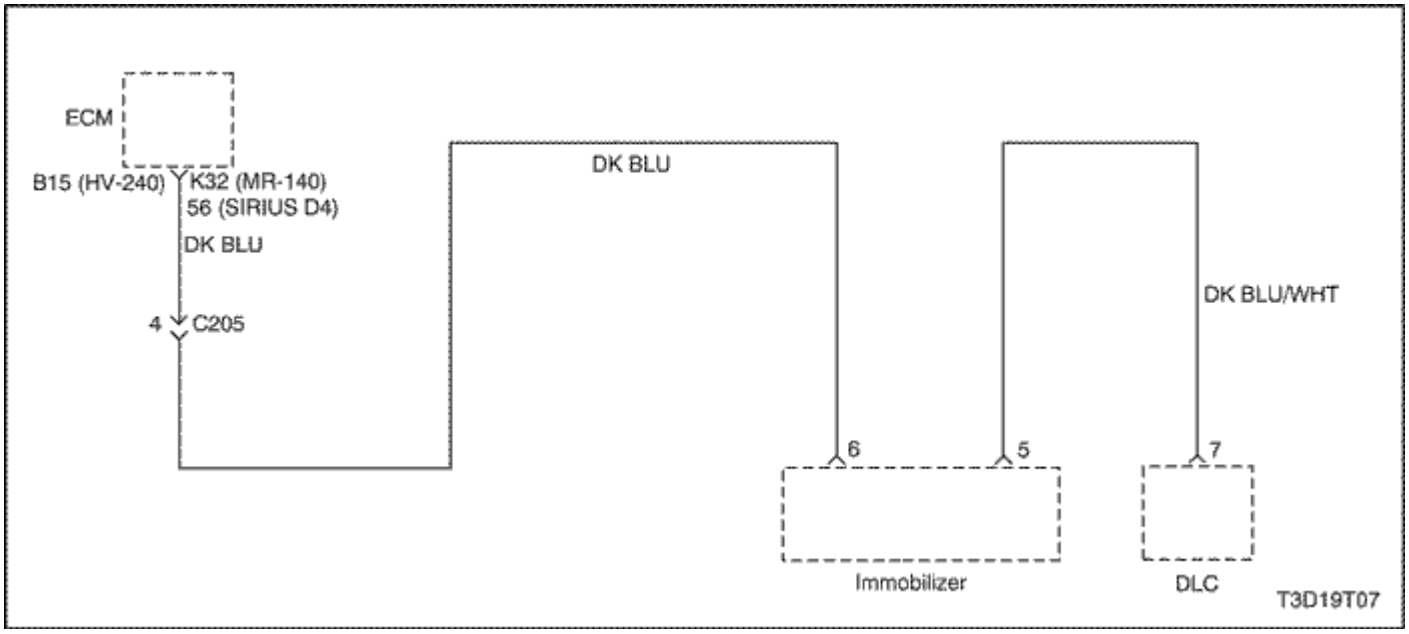
The immobilizer anti-theft system requires diagnosis when it is not possible to start the engine. If the no-start condition occurs because of the immobilizer system, a diagnostic trouble code (P) 1626, 1628, 1629, 1631 should be set. The immobilizer control unit monitors the detection and the reading of the ignition key. The self-test capacity is limited to those functions. Faults are communicated to a scan tool during diagnosis, but they are not stored in the immobilizer control unit's memory.

Unauthorized use of a scan tool could be a method of defeating the immobilizer anti-theft system, so certain scan tool procedures require the use of a password. The following functions are password protected:

- Coding of an additional key.
- Deleting all key codes.

The following functions do not require a password:

- Reading an ignition key to determine if the transponder is working or if a key is authorized.
- Reading the immobilizer ID code to verify that it matches the ECM ID code.



Diagnostic Trouble Code (DTC) P1626 (MR-140), P1628 (SIRIUS D4)
ECM Immobilizer error (No Successful Communication)

Circuit Description

When the ignition is turned ON, the key is tested by the immobilizer anti-theft system. While the key code is being read by the immobilizer control unit, the engine can start and run with any key that will turn the lock cylinder. The key code is read and compared with key codes that have been stored in the memory of the immobilizer control unit. If a valid key is detected, the immobilizer control unit sends a serial data release message to the electronic

control module (ECM). Included in the release message is an identification (ID) code which assures that neither the immobilizer control unit nor the ECM has been substituted to defeat the system. If the ECM receives an invalid release message, the ECM performs the following actions:

- Disables the fuel injector circuit.

P1626, 1628 Will Set When

- The ECM does not receive the signal from the immobilizer control module within 1.260 seconds after the ignition is turned on.
- The above conditions are maintained until the ignition is switched OFF.

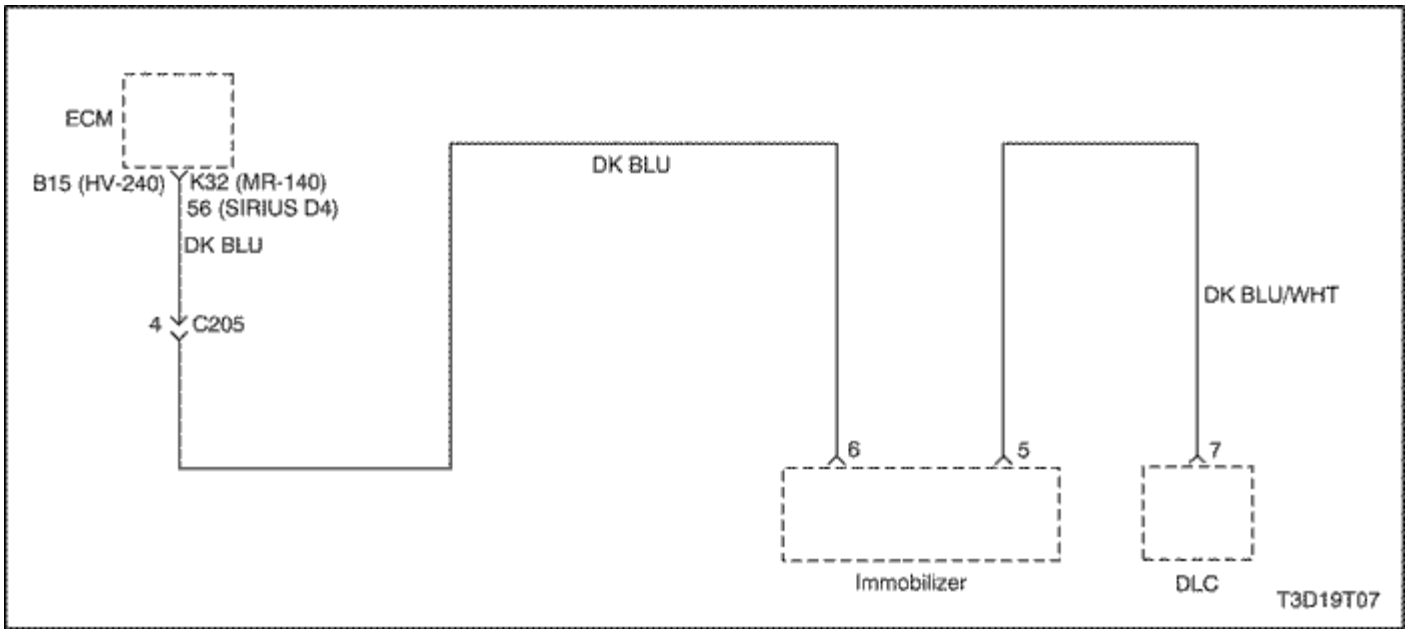
P1626, 1628 Will Clear When

- The ignition switch is turned OFF or the scan tool TROUBLE CODE CLEAR command is issued.

P1626, 1628 - ECM Immobilizer Error (No Successful Communication)

Step	Action	Value(s)	Yes	No
1	Connect the scan tool using the following procedure: 1. Insert the cartridge into the scan tool. 2. Turn the ignition switch to the OFF position. 3. Connect the scan tool to the data link connector (DLC). 4. Connect the scan tool's power cord to the cigar lighter socket. 5. Select immobilizer mode on the scan tool. 6. Turn the ignition ON, but do not start the engine. Is communication established between the scan tool and the immobilizer control unit?	-	Go to *Step 2*	Go to "Communication Between Immobilizer and Test Equipment"
2	Read the IMMO & ECM ID CODE message that was displayed after requesting DIAGNOSIS. Did the message differ from normal message? Normal Message - ECM MODE: LEARNT	-	Go to "Identification (ID) Code Repro-gramming"	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	IMMO. MODE: LEARNT VIN CODE: SAME			
3	Check for an open serial data wire between the immobilizer control unit and the ECM. Was the circuit open?	-	Go to *Step 4*	Go to *Step 5*
4	Repair the open serial data wire between the ECM and the immobilizer control unit. Is the repair complete?	-	System OK	-
5	1. Replace the immobilizer. 2. Reprogram the identification (ID) code. Refer to "Identification (ID) Code Reprogramming" in this section. Is the repair complete?	-	System OK	Go to *Step 6*
6	1. Replace the ECM. 2. Turn the ignition ON, OFF for more than 4 seconds. 3. Turn the ignition ON. Is the repair complete?	-	System OK	-



Diagnostic Trouble Code (DTC) P1631 (MR-140), P1629 (SIRIUS D4)

ECM Immobilizer error (Incorrect Answer)

Circuit Description

When the ignition is turned ON, the key is tested by the immobilizer anti-theft system. While the key code is being read by the immobilizer control unit, the engine can start and run with any key that will turn the lock cylinder. The key code is read and compared with key codes that have been stored in the memory of the immobilizer control unit. If a valid key is detected, the immobilizer control unit sends a serial data release message to the electronic control module (ECM). Included in the release message is an identification (ID) code which assures that neither the immobilizer control unit nor the ECM has been substituted to defeat the system. If the ECM receives an invalid release message, the ECM performs the following actions:

- Disables the fuel injector circuit.

P1631, 1629 Will Set When

- The ECM receives an incorrect release message from the immobilizer control unit more than five times.

P1631, 1629 Will Clear When

- The ignition switch is turned OFF or the scan tool TROUBLE CODE CLEAR command is issued.

P1631, 1629 - ECM Immobilizer Error (Incorrect Answer)

Step	Action	Value(s)	Yes	No
1	Connect the scan tool using the following procedure: 1. Insert the cartridge into the scan tool. 2. Turn the ignition switch to the OFF. 3. Connect the scan tool to the data link connector (DLC). 4. Connect the scan tool's power cord to the cigar lighter socket. 5. Turn the ignition ON, but do not start the engine. Is communication established between the scan tool and the immobilizer control unit?	-	Go to *Step 2*	Go to "Communication Between Immobilizer and Test Equipment"
2	1. Select DIAGNOSIS from the scan	-	Go to	Go to *Step 3*

Step	Action	Value(s)	Yes	No
	tool menu. 2. Read the IMMO & ECM ID CODE (immobilization and electronic control module identification code) message. Did the message differ from normal message? Normal Message - ECM MODE:LEARNT IMMO. MODE: LEARNT VIN CODE: SAME		"Identification (ID) Code Repro-gramming"	
3	1. Replace the ECM. 2. Reprogram the ID code. Is the repair complete?	-	System OK	Go to *Step 4*
5	1. Replace the ECM. 2. Turn the ignition ON, OFF for more than 4 seconds. 3. Turn the ignition ON. Is the repair complete?	-	System OK	-

Key Status Errors (MR-140, SIRIUS D4)

The following KEY STATUS messages may be shown on the scan tool after commanding FIRST KEY CODING and KEY ADD:

- IGNITION OFF STATUS. This message informs the technician that the ignition is off during the key coding process. Turn the ignition ON during key coding, but do not start the engine.
- KEY IS OCCUPIED. Only five keys may be coded. If a new key is desired, the previous key codes must be deleted. Up to five keys may then be authorized.
- ALREADY AUTHORIZED. Key coding is being attempted with a key that is already authorized.
- ERROR NO. A3, A4, A5. There is no communication between the transponder in the ignition key and the detection coil. Follow the steps below to diagnose the problem:
    1. Try a different key. If a different key works, the problem was in the original key.
    2. If trying a different key resulted in the same error message, replace the detection coil.

- INVALID KEY. The communication between the immobilizer control unit and the key transponder has not validated the key. Follow the steps below to diagnose the problem:
    1. Code the key. Refer to "Key Coding Procedure" in this section.
    2. If the same message is received after key coding, check the connection of the detection coil.
    3. If the detection coil is okay, replace the immobilizer. Refer to "Immobilizer Control Unit" in this section.

- NO TRANSPONDER DETECTED. The fault may be in ignition key transponder, the detection coil, or the Immobilizer. Follow the steps below to diagnose the problem:
    1. Try a different key. If a different key works, the problem was in the original key.
    2. If trying a different key resulted in the same error message, check the connection of the detection coil.
    3. If the connection of the detection coil is okay, disconnect the detection coil and use an ohmmeter to check for an open detection coil.
    4. If the detection coil was not open, replace the immobilizer control unit. Refer to "Immobilizer Control Unit" in this section.

Communication Between Immobilizer Control Unit and Test Equipment (MR-140, SIRIUS D4)

1. Connect the test equipment as described in the *Scan Tool Equipment Manual.*
2. If communication between the scan tool and the test equipment was unsuccessful, wait 30 seconds and try again.
3. If communication was not successful on the second try, turn the ignition OFF and check the wire and connectors between the immobilizer control unit terminal 7 and the data link connector (DLC) terminal 7.
4. If the wire and connectors between the DLC and the immobilizer control unit are okay, replace the immobilizer control unit. Refer to "Immobilizer Control Unit"in this section.

MAINTENANCE AND REPAIR

On-Vehicle Service

Key Coding Procedure

1. Install the immobilizer control unit cartridge in the scan tool.

2. Turn the ignition off
3. Connect the scan tool
4. Turn the ignition on with the key to be coded
5. Enter the four-digit password that enables service personnel to use the scan tool for key coding.
6. Use the scan tool command.
7. Verify that the key coding was successful by starting the engine with each of the authorized keys.

ID Code Reprogramming

Reprogram the identification (ID) code in the following situations:

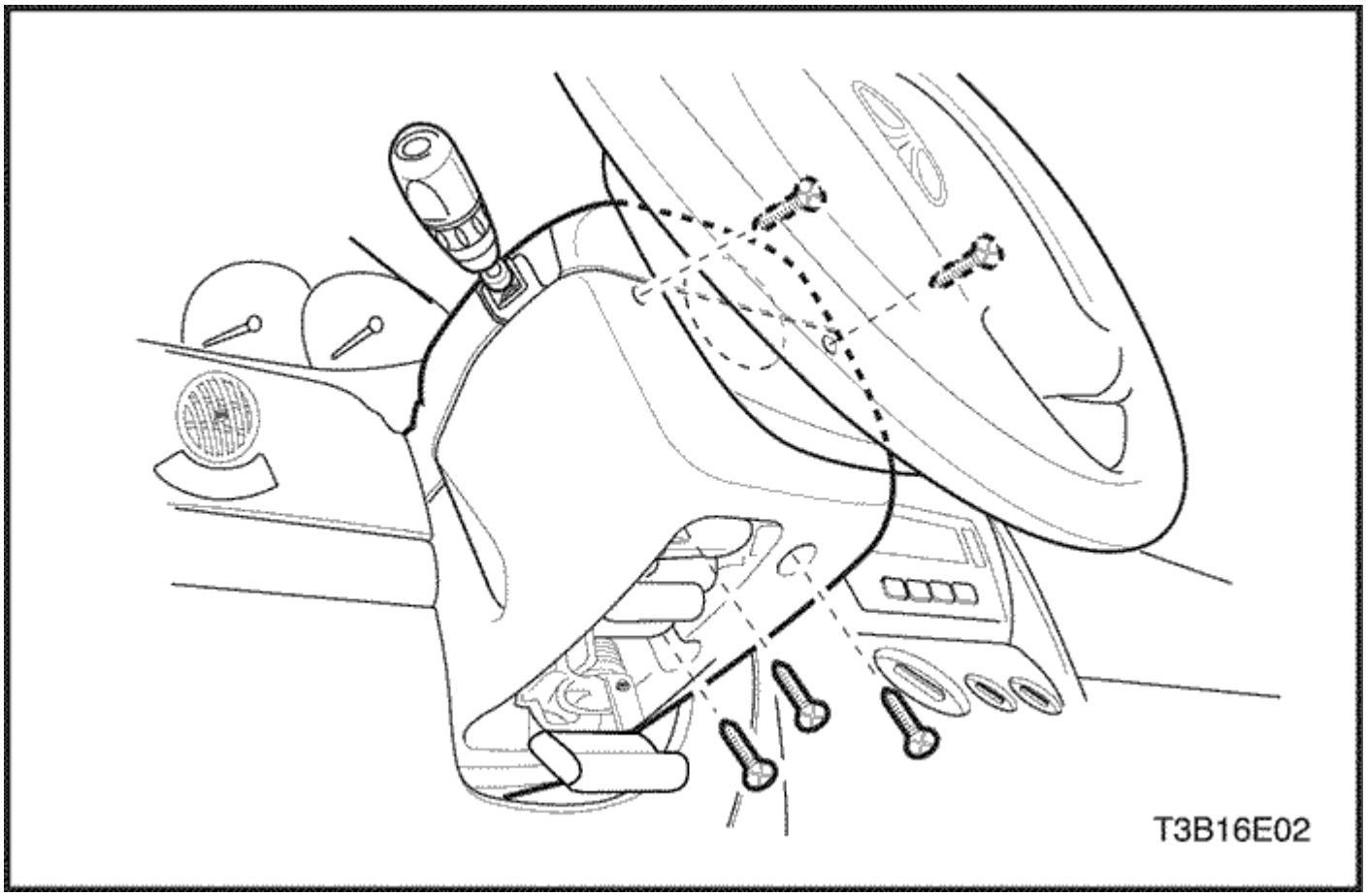
- An immobilizer control unit has been replaced.
- An electronic control module (ECM) has been replaced.

If a valid key has been lost, refer to "Key Coding Procedure" in this section.

Transponder

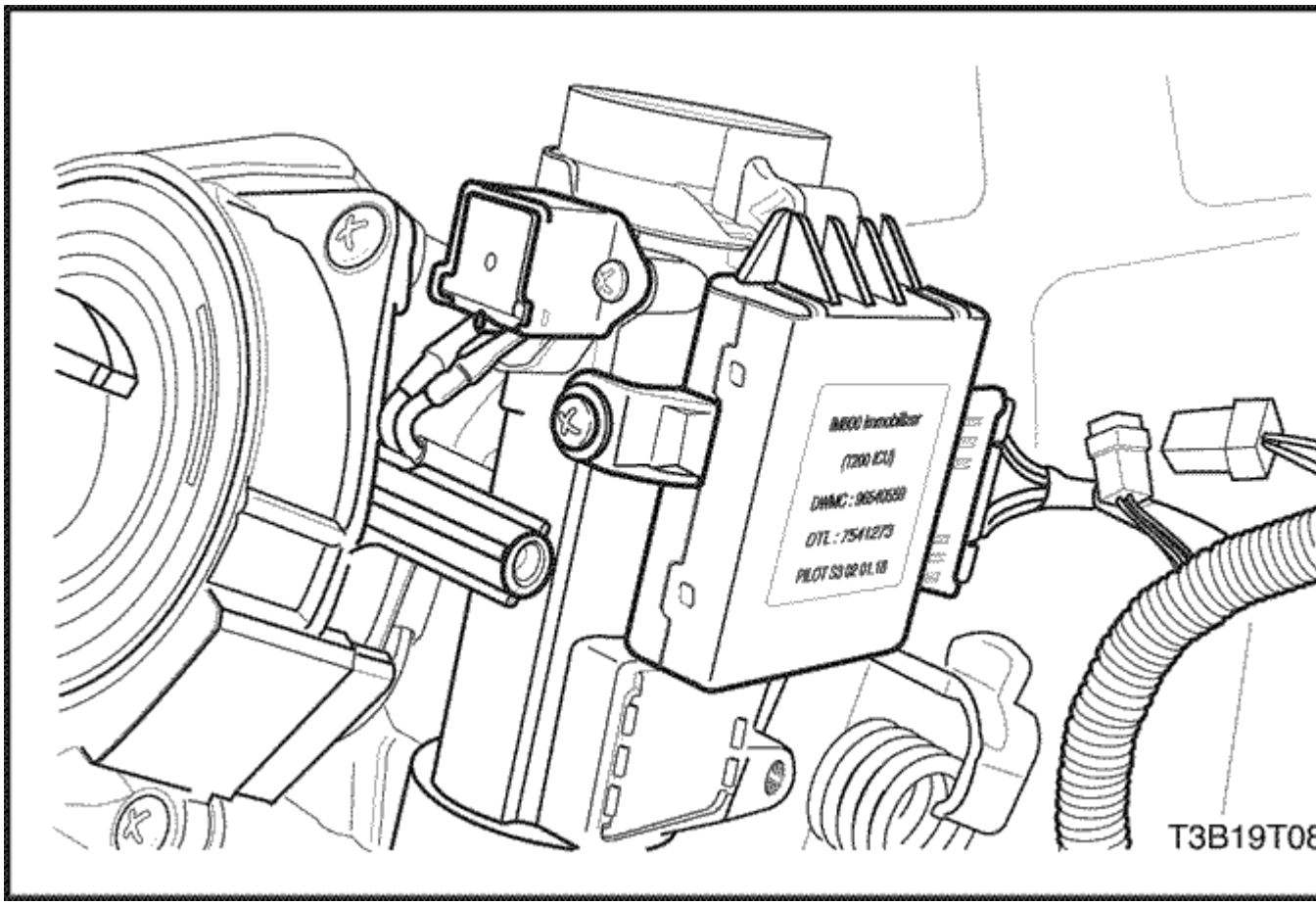
Each valid ignition key has an internal transponder which is a read /write transponder.

The transponder contains an implementation of a crypto-algorithm with 96 bits of user configurable secret-key contained in EEPROM and transmits data to the ICU by modulating the amplitude of the electromagnetic field, and receives data and commands in a similar way.

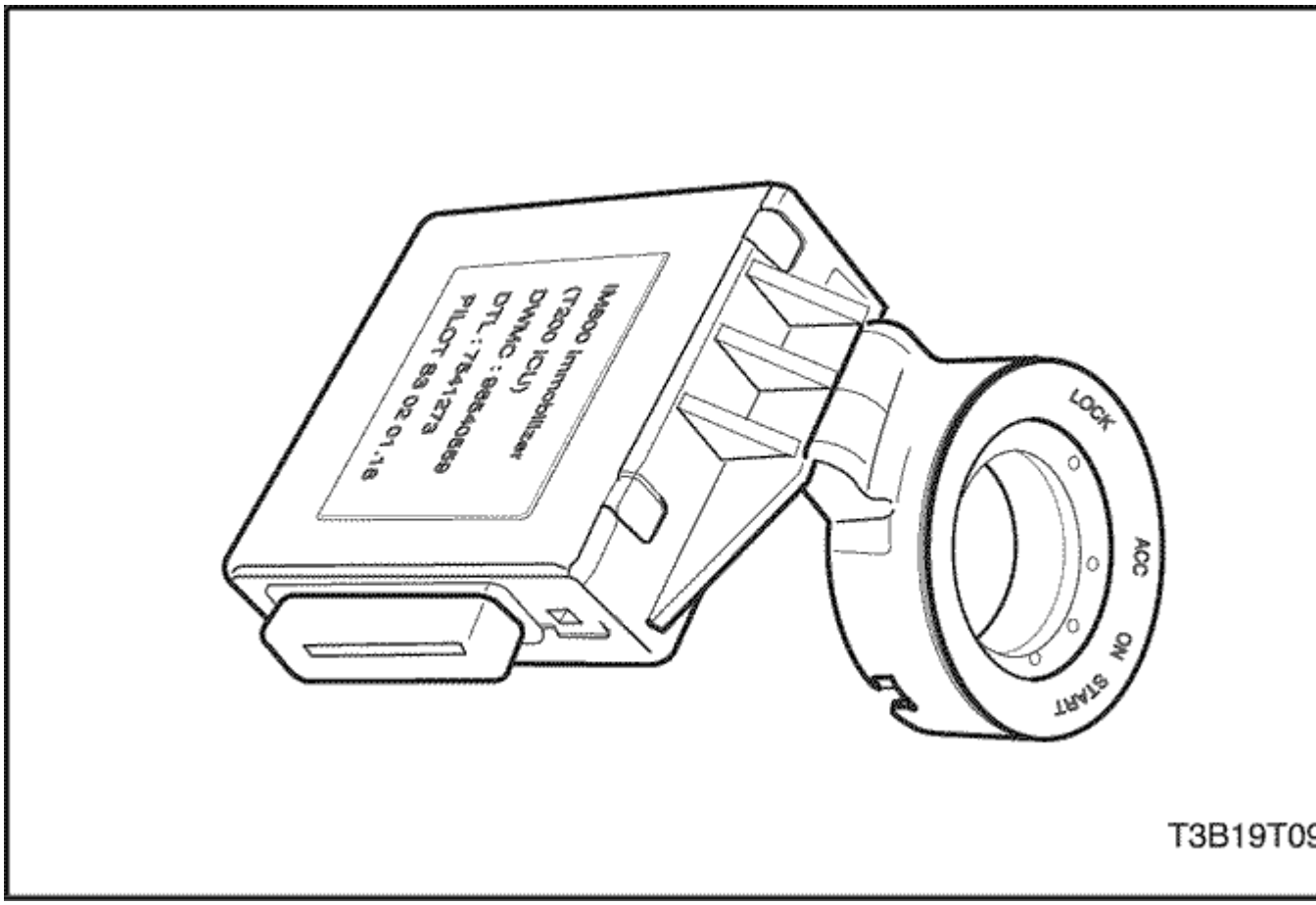


Immobilizer Control Unit
Removal Procedure

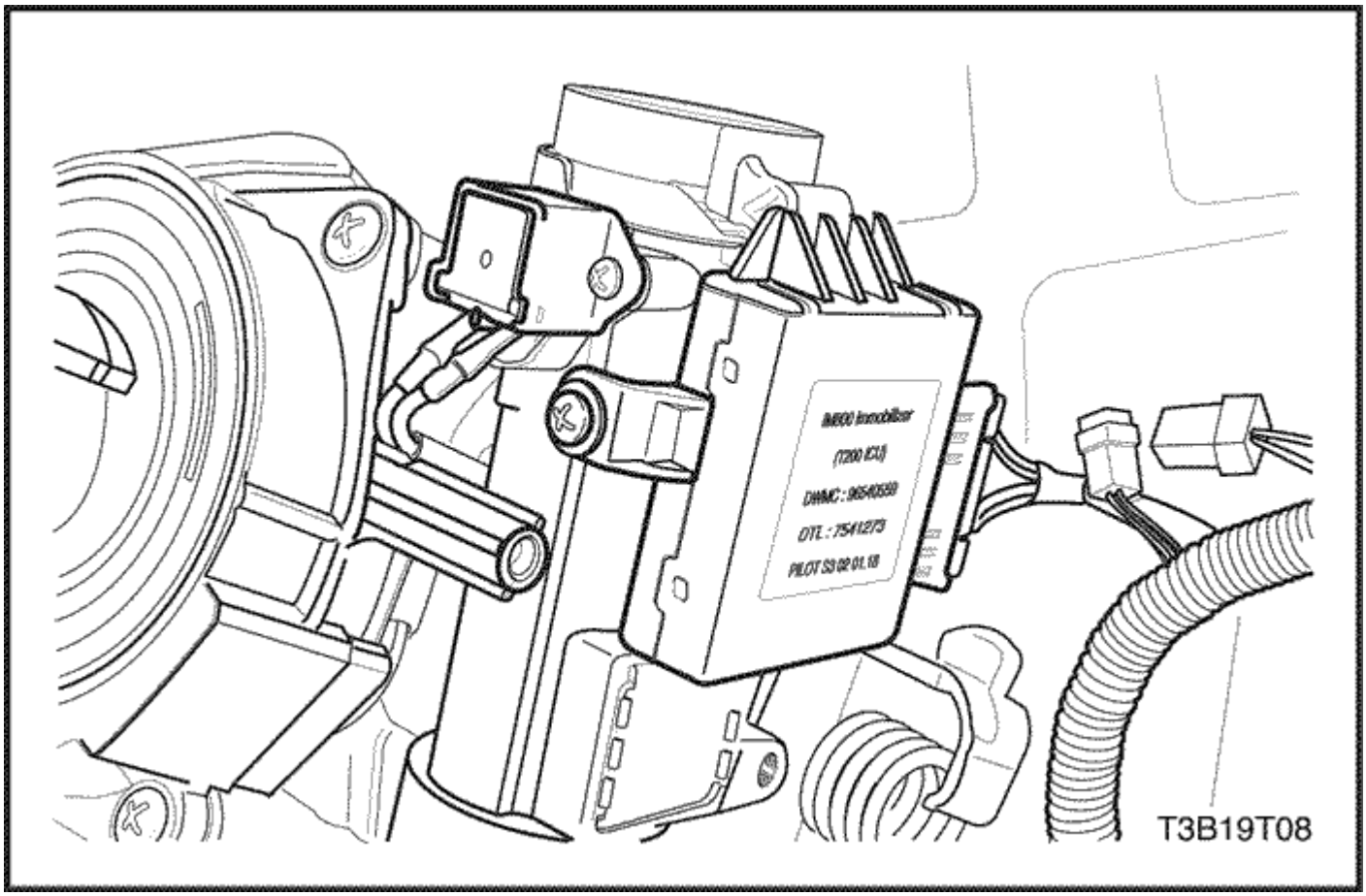
1. Remove the imstrument panel lower cover.



2. Disconnect the electrical connector from the immobilizer control unit.

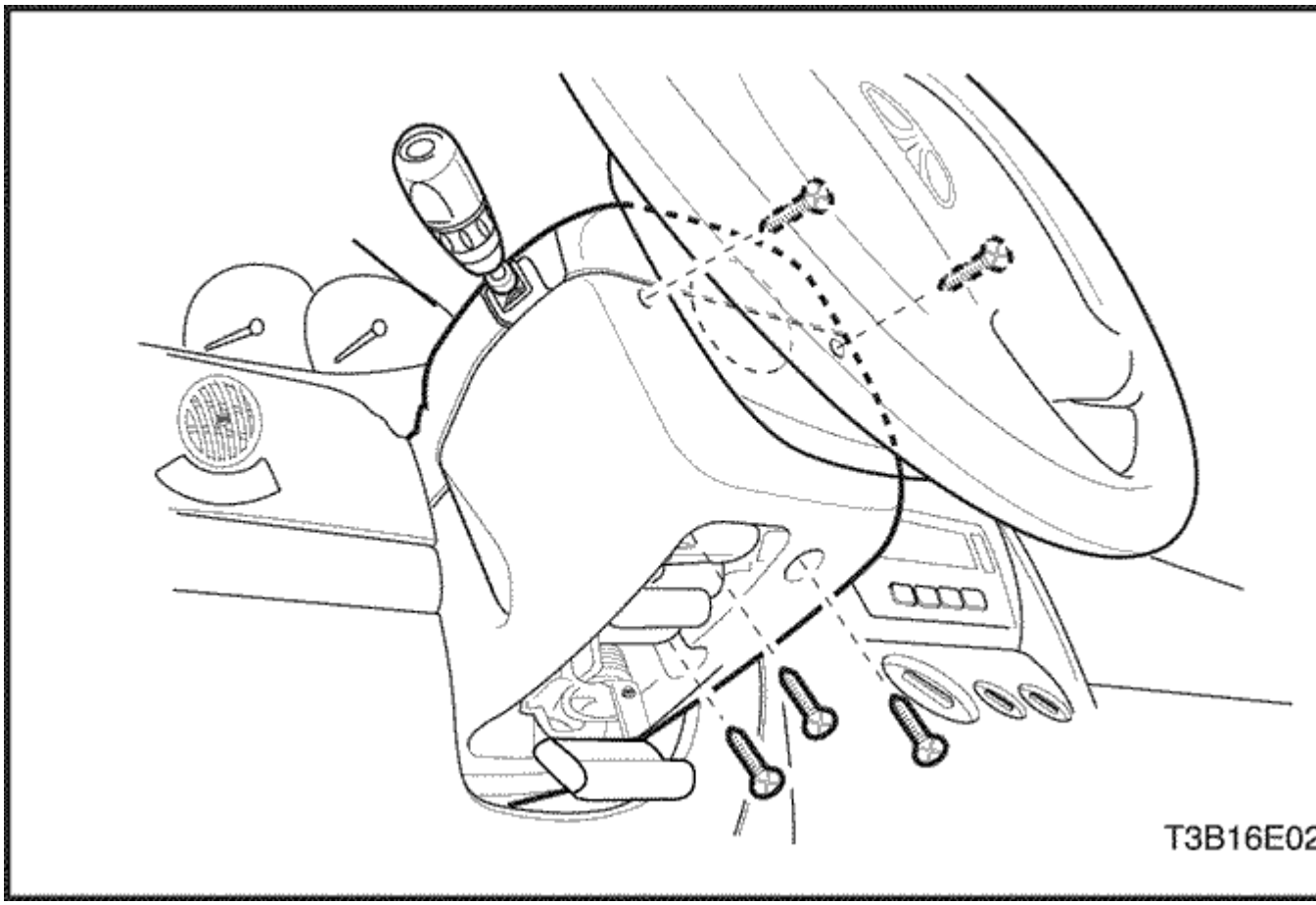


3. Remove the immobilizer control unit.



Installation Procedure

1. Install the immobilizer control unit.
2. Connect the electrical connector to the immobilizer control unit.



3. Install the instrument panel lower cover Important: After replacing the immobilizer, the keys must be re-authorized using the key coding procedure. Refer to"Key Coding Procedure" in this section.

GENERAL DESCRIPTION AND SYSTEM OPERATION

Immobilizer System

The purpose of the Immobilizer system is to provide additional theft deterrence to the vehicle in which it is installed and to prevent it from being stolen or driven by unauthorized users.

The verification of the user authorization is done by an ignition key with integrated transponder.

The external LED displays the Immobilizer status and has an additional theft deterrence function.

To secure the communication, the status is exchanged between the Immobilizer and the ECM in a 5 byte of encoded data.

These 5 bytes are composed by a mixture of random data and two types of fixed code

- a vehicle model identification number : MIN
- a vehicle specific identification : VIN

The MIN is known from the first supply of the system.
The VIN is realized by ICU on the special order from the key coding (reading of transponder code and storing it as valid key code in Immobilizer EEPROM).
A different random data is computed at each key transition.
All the immobilization communication between the ECM and ICU is made on K-line (K line : Serial data line '7').
Due to the learning of the Vehicle specific identification Number, both ICU and ECM can stay in 3 stable modes

- Virgin mode (VIN not learnt)
- Learnt mode (VIN learnt)
- Neutral mode (for a new VIN learning)

In case of using valid key, the release message communication with the ECM take place and the LED displays the Immobilizer status valid key In case of using invalid key, the ECM disables the fuel injector circuit with coded intervention and sets DTC(Diagnostic Trouble Code)
The above conditions are maintained until the ignition is switched off.
An ECM without an immobilizer control unit cannot be interchanged for an ECM that is used with an immobilizer control unit system. The Immobilizer control unit and ECM must have a matching ID code. ID coding and key coding are accomplished by using Scanner-100
The Immobilizer system consists of

- a maximum or 5 ignition keys with integrated transponder
- the toroidal coil (Detection coil) for energizing and reading the transponder mounted at the ignition lock.
- the Immobilizer control unit(ICU) with :

  - power supply
  - ignition input circuit
  - transponder modulation and demodulation unit
  - EEPROM
  - driver electronic for the external status LED
  - serial data link hardware

- the external status LED for displaying the Immobilizer status
- the serial data link between Immobilizer and ECM

Electronically Coded Keys

Each valid ignition key has an internal transponder which is a read /write transponder.

The transponder contains an implementation of a crypto-algorithm with 96 bits of user configurable secret-key contained in EEPROM and transmits data to the ICU by modulating the amplitude of the ele tromagnetic field, and receives data and commands in a similar way.

Detection Coil

The toroidal coil is mounted at the ignition lock in front of the key barrel.

It is connected to the ICU with a four terminal connector fixed at the body of the coil.

The length of the connection between coil and Immobilizer is restricted to 50cm. The correct placement on the ignition lock and the exact electrical data is very important for the reading distance of transponder.

he toroidal coil and receiving coil inside the transponder built a transformer. During the readingprocess the coil induces energy into the transponder. The transponder charges the field and generates an amplitude modulated signal with the manchester coded data. This charge of the field is demodulated inside the Immobilizer.

The Immobilizer contains the coil driver hardware for direct connection of the toroidal coil.

Immobilizer Control Unit

The function of the Immobilizer System is shared between the ICU and the ECM.

The task of the Immobilizer Electronic Control unit (ICU) are:

- Reading of the input information "ignition ON/OFF"
- Controlling the states LED
- Controlling the transponder read/write process (modulation, demodulation, decoding, comparison of the read code with the code of the valid keys).
- Communication with the ECM after ignition ON (receiving of the ECM-request and transmission of release message).
- Special functions for calculation and handling of the VIN-code.

The VIN code is calculated by the Immobilizer using a random generator.

The VIN code is transmitted from the Immobilizer in the release message communication only incase of using an authorized key. Without an authorized key it is not possible to getthe system VIN code.In case of ECM internal state

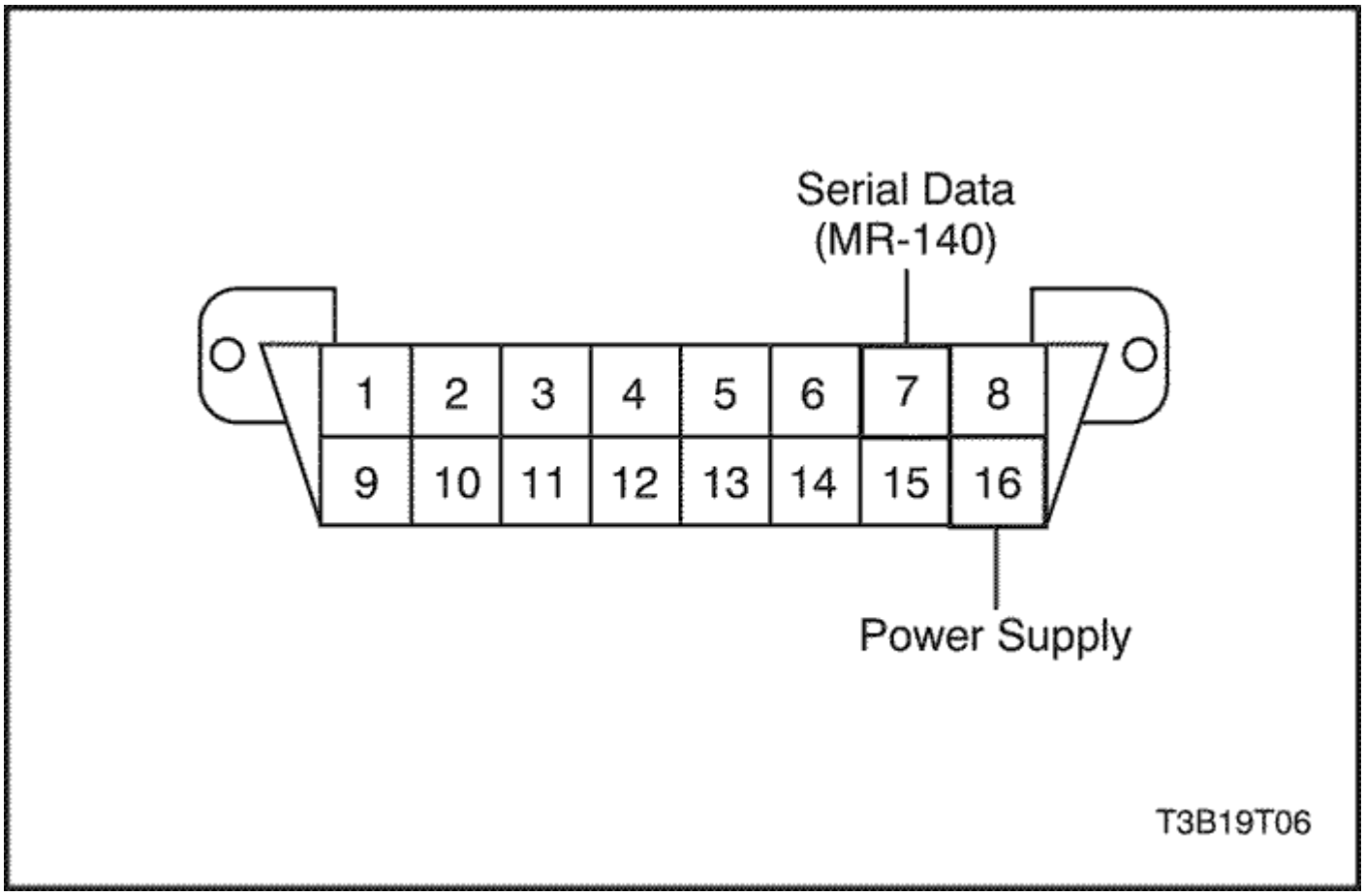
is in Virgin mode or neutral mode the ECM learns the system VIN code automatically after receiving the first release response message.
To get a synchronized Immobilizer system (same VIN-code in Immobilizer and ECM,authorized key) the DLC test equipment has to be used for authorization of the keys(first key coding). The usage of this test equipment is restricted to authorized persons.

- Communication with the DLC-test equipment. Main functions are the key coding procedure, the VIN-code handling and the support for system test functions.
- Handling of the software watchdog

Operation
In the active mode of immobilizer (engine OFF, IG key OFF) the status LED isblinking as mode A. When ignition is turned ON, the system wakes up and tries to read out the transponder.
In case of the detection of a valid key , The release message communication with the ECM takes place. The status LED displays the Immobilizer state "valid key".
After turning off the ignition(ignition OFF detection similar to the ECM ignition OFF detection), the Immobilizer changes to the active mode. The status LED is blinking as Mode A.
Data Link Connector (DLC) Mode
When the ignition is on, a scan tool can switch the immobilizer control unit to the DLC mode for diagnostics, key coding and ID coding.

- The status LED is turned off during DLC-mode
- The Immobilizer will answer all correct messages, which are defined as Immobilizer messages.

ID Code Handling
One of 65,535 VIN codes is stored in the immobilizer EEPROM.
The VIN code can be erased by using "Reset VIN code" command of the scan tool.
When the immobilizer control unit calculates a new VIN code, ECM VIN code should be reset to get identical with the immobilizer control unit's.
During diagnostic procedures, the VIN code can be read for comparison with the ECM VIN code by using the scan tool's "Read immobilizer control unit VIN code" command.
Serial Data Link
Serial data can be exchanged between a scan tool and the ECM and the Immobilizer control unit.



Electronic Control Moudle (ECM)

- ECM in Virgin mode

  In this mode, the ECM knows only the model vehicle identifier code.
  The engine can be locked/unlocked.
  ECM requests to ICU the VIN number. As soon as the ECM receives two correct consecutive communication frames with the same VIN code the ECM learns it.
  The VIN code will be stored in non-volatile memory at the end of power latch phase. ECM enters in Learnt mode.

- ECM in Learnt mode

  In such a state, ECM checks on every communication, the correct encoding of the ICU.

If the code received is not correct, then the vehicle is immobilized.

The coded 5 bytes of data emitted by ECM are a mixture of MIN code and random.
The coded 5 bytes of data emitted by ICU are a mixture of VIN code and random.

- ECM in Neutral mode

  This mode is a special intermediate mode, used for ICU replacement or immobilizer option installation.
  ECM request to ICU the VIN number. As soon as the ECM receives two correct consecutive communication frames with the same VIN code the ECM learns it. The VIN code will be stored in non-volatile memory at the end of power latch phase. ECM enters in Learnt mode.

- After turning on the ignition the ECM will control the engine in a normal way for starting and running while waiting for a valid release response message from the Immobilizer.

1. After receiving a response message including the information "ICU in learnt mode" and the correct system VIN-code

   → the ECM enters the release state, which allows to continue the running of the engine.

2. After receiving a response message including the information "ICU in learnt mode" and a wrong system VIN-code

   → the ECM does not send a new request and enters the blocked state, which causes the activation of the immobilization actions of the engine.

3. If the ECM doesn't receive a response message within a defined time from beginning of the release time period or the ECM receives a no release answer

   → the ECM enters the blocked state, which causes the activation of the immobilization actions of the engine.

   - The inactive state of the Immobilizer (valid key/invalid key) ends with turning off the ignition.

Security Indicator

There is a security indicator on the instrument panel.

Status LED

An external LED displays the immobilizer system status. The immobilizer contains the LED driver hardware for direct connection of one LED.

Status LED Modes

Status LED	Immobilizer System Status	Note
OFF	Active	- Ignition OFF
Blinking	Active	- Invalid key detected - Ignition ON
OFF	Inactive	- Valid key detected - Ignition ON
Blinking	Active	- VIN-code is different between ICU and ECM in learnt state - Ignition ON
ON	Active	- Transponder reading error - Ignition ON
Blinking	Active	- Reader exciter ASIC error - Ignition ON