

UNIT 1. ENGINE

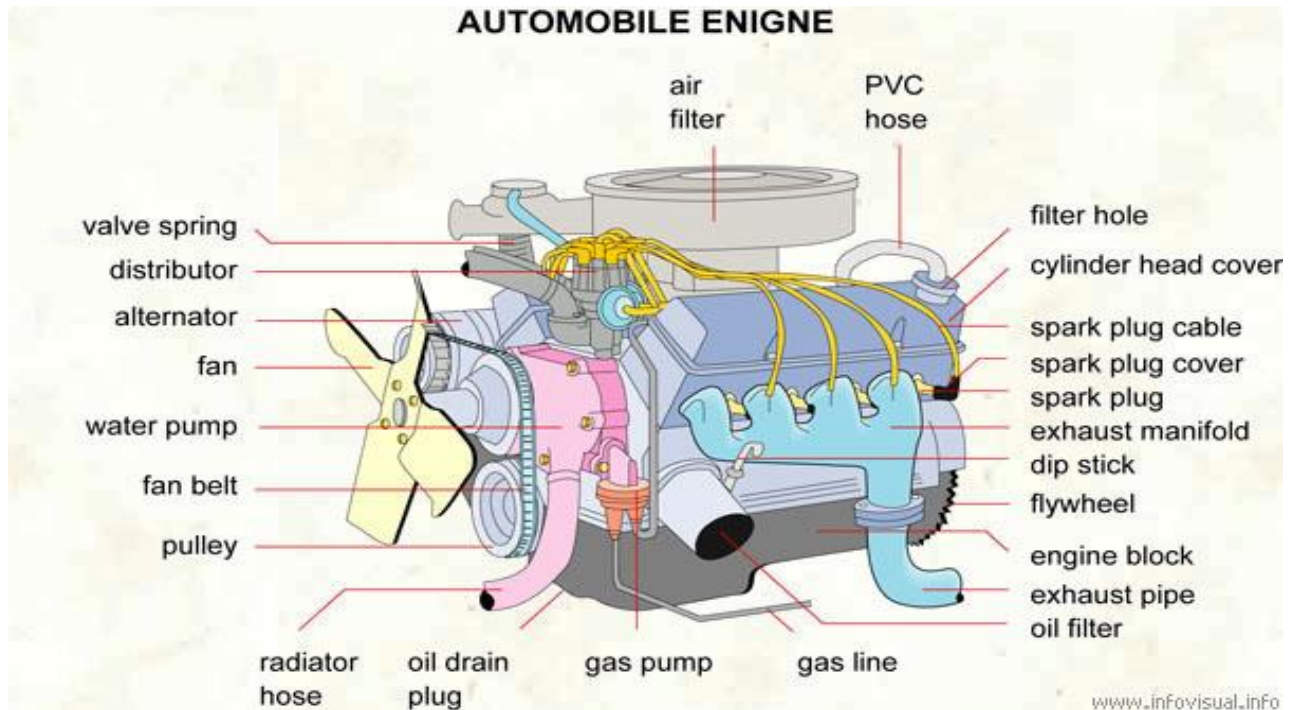


Figure 1.1: Engine

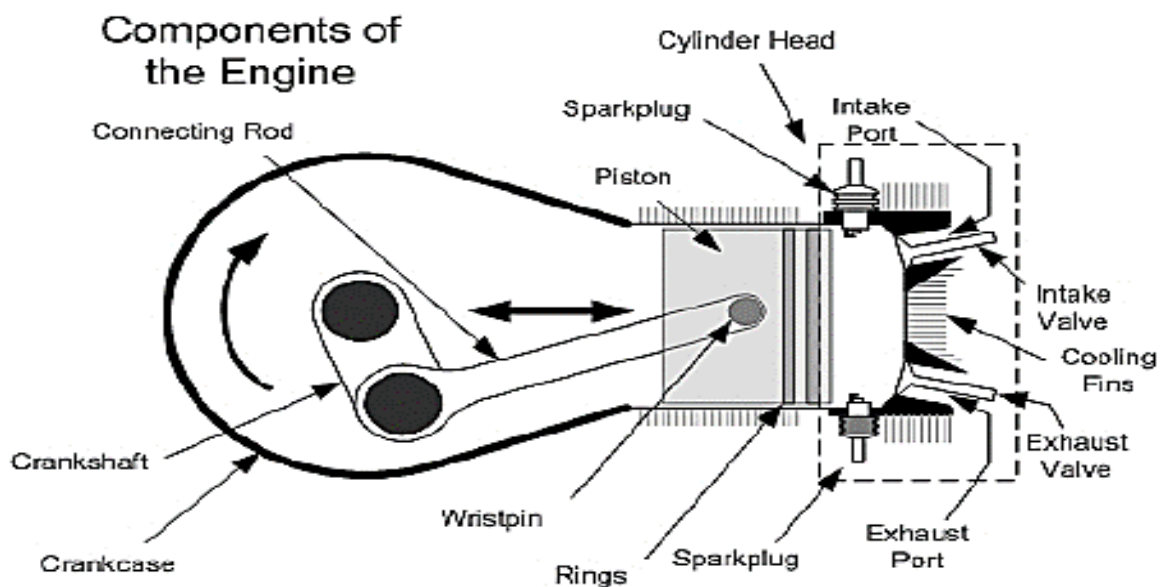


Figure 1.2: Four strock engine

Nowadays, the gasoline engine (spark ignition engine) is used widely as the power source of automobiles. As the principle of this engine, a mixture gas of the fuel and the air is compressed in the cylinder at the first. And the gas explodes by use of an ignition plug, and generates the output power. As good characteristics of the engine, it can be realized a smaller and light weight engine and has a possibility of the high engine speed and high power. Also, the maintenance of the engine is very simple.

UNIT 2: FUEL SYSTEM

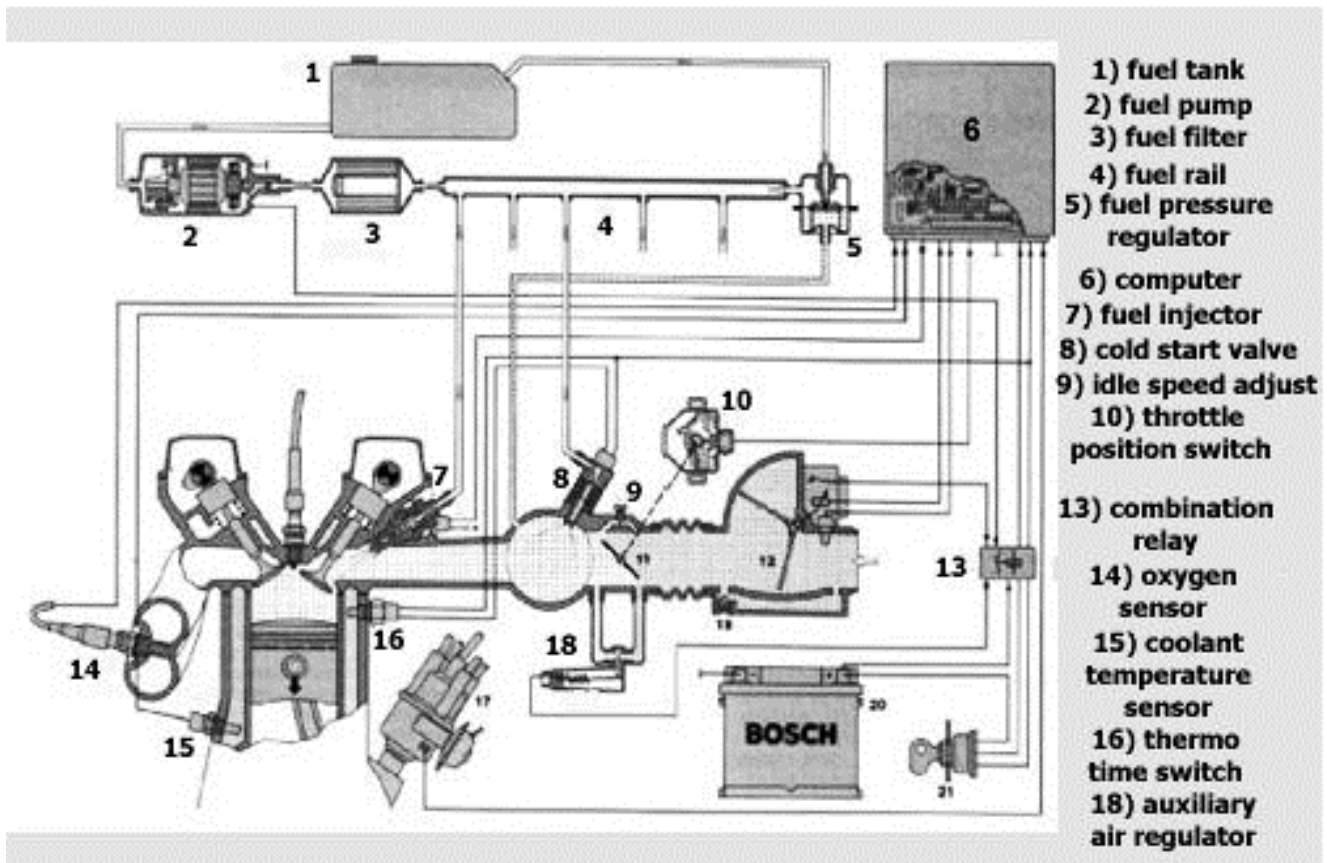


Figure 2.1: Fuel system

Fuel injection is a system for admitting fuel into an internal combustion engine. It has become the primary fuel delivery system used in automotive engines, having replaced carburetors during the 1980s and 1990s. A variety of injection systems have existed since the earliest usage of the internal combustion engine.

The primary difference between carburetors and fuel injection is that fuel injection atomizes the fuel by forcibly pumping it through a small nozzle under high pressure, while a carburetor relies on suction created by intake air rushing through a venturi to draw the fuel into the airstream.

Modern fuel injection systems are designed specifically for the type of fuel being used. Some systems are designed for multiple grades of fuel (using sensors to adapt the tuning for the fuel currently used). Most fuel injection systems are for gasoline or diesel applications.

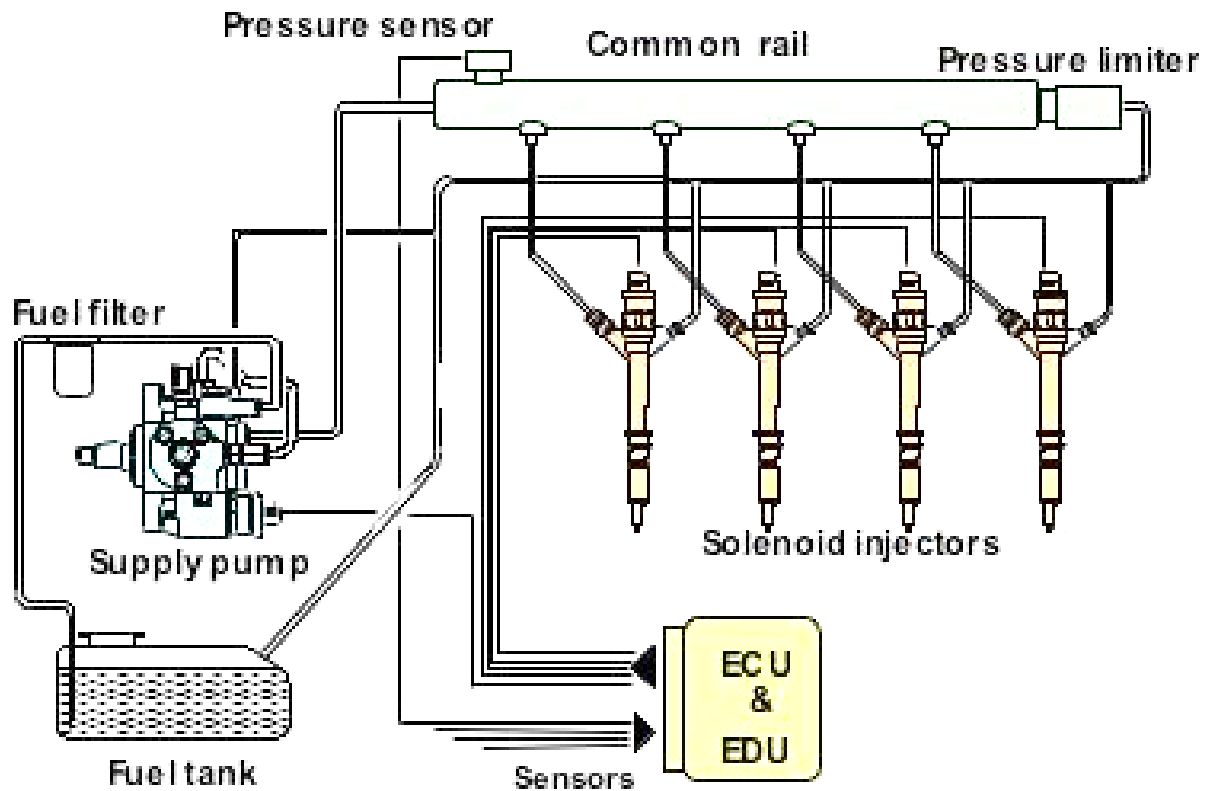


Figure 2.2: Components of the common rail

The common rail is situated at the rear of the engine and steel pipes supply fuel to each of the injectors. The common rail stores the high pressure fuel supplied from the pump. The Rail Pressure Sensor and Pressure limiter are located on the common rail and these cannot be replaced as separate items. High pressure pipes which have been removed must be replaced.

UNIT 3: CLUTCH

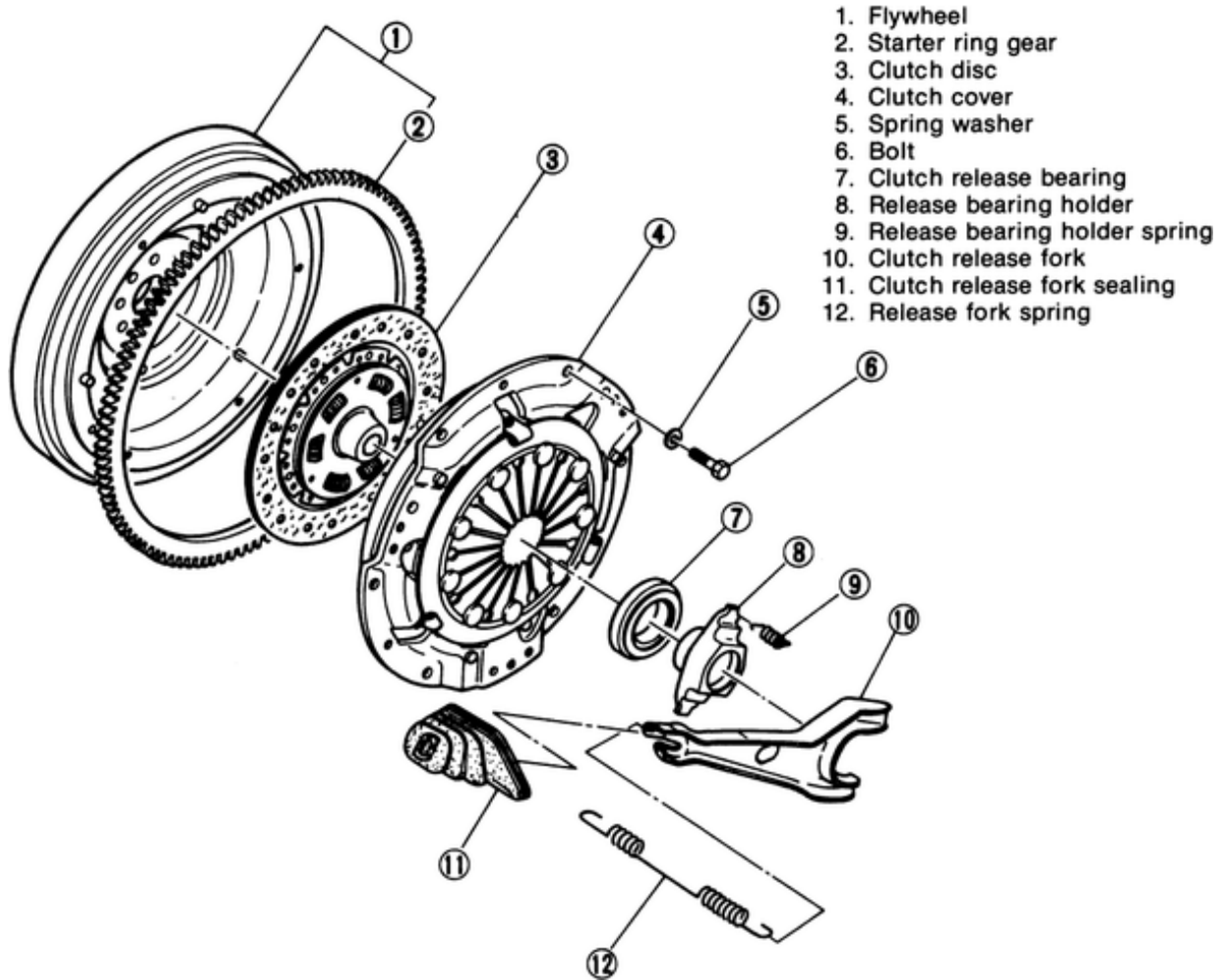


Figure 3.1: Clutch System

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward. The disc, carrying four torsional coil springs, is positioned on the transmission input shaft with an involute spline fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch is engaged. Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.

UNIT 4: TRANSMISSION

4.1. Gear Shift Shaft and Fork Components

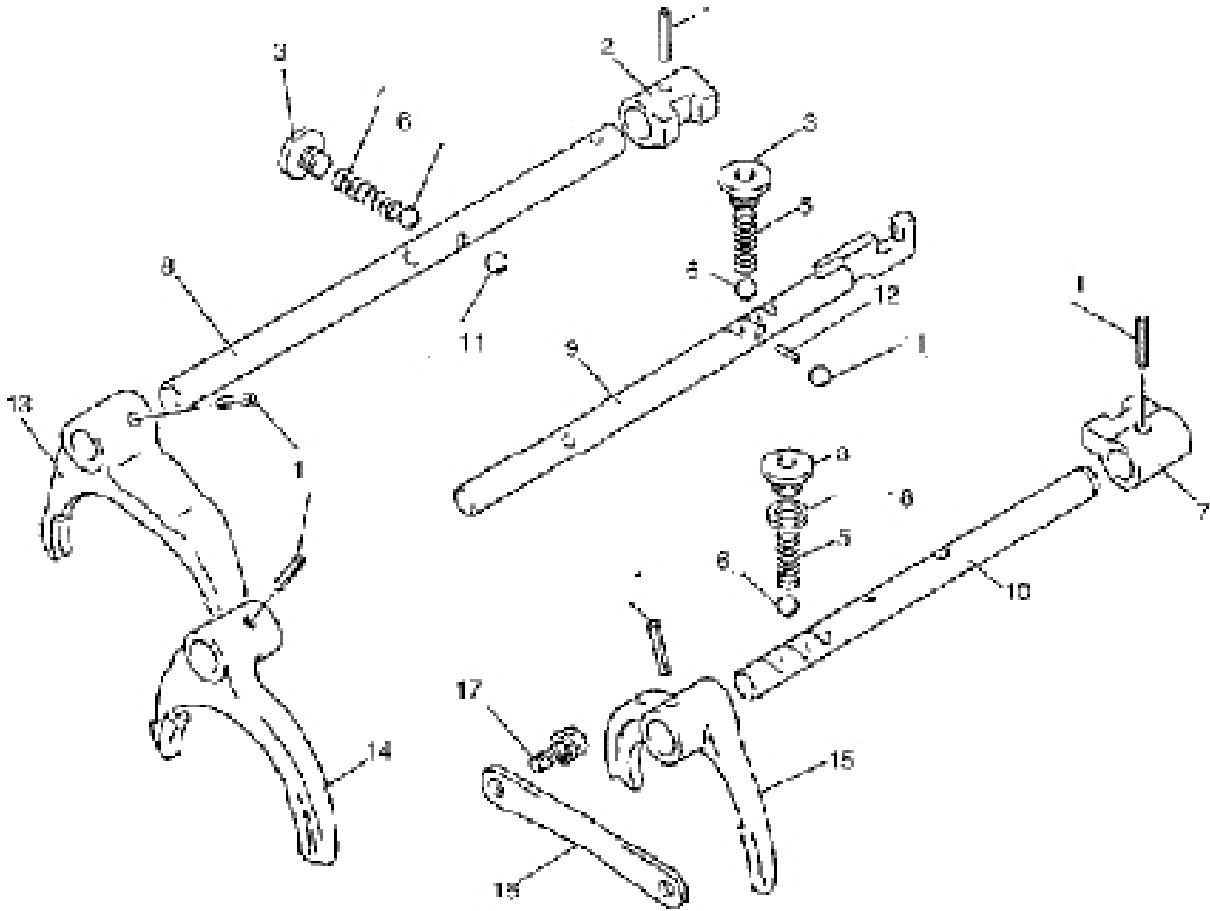


Figure 4.1: Gear Shift Shaft and Fork Components

1- Spring pin	2- Low speed gear shift yoke	3- Locating plug
4- Locating spring (long)	5- Locating spring (short)	6- Locating ball
7- Reverse & 5th gear shift yoke	8- Low speed gear shift shaft	9- High speed gear shift shaft
10 - Reverse & 5th gear shift shaft	11- Interlock ball	12- Interlock pin
13- Low speed gear shift fork	14- High speed gear shift fork	15 - Reverse & 5th gear fork
16- Shaft stop plate	17- Stop plate bolt	18- Locating washer

4.2. Input Shaft, Main Shaft, Countershaft and Reverse Idle Gear Shaft Components

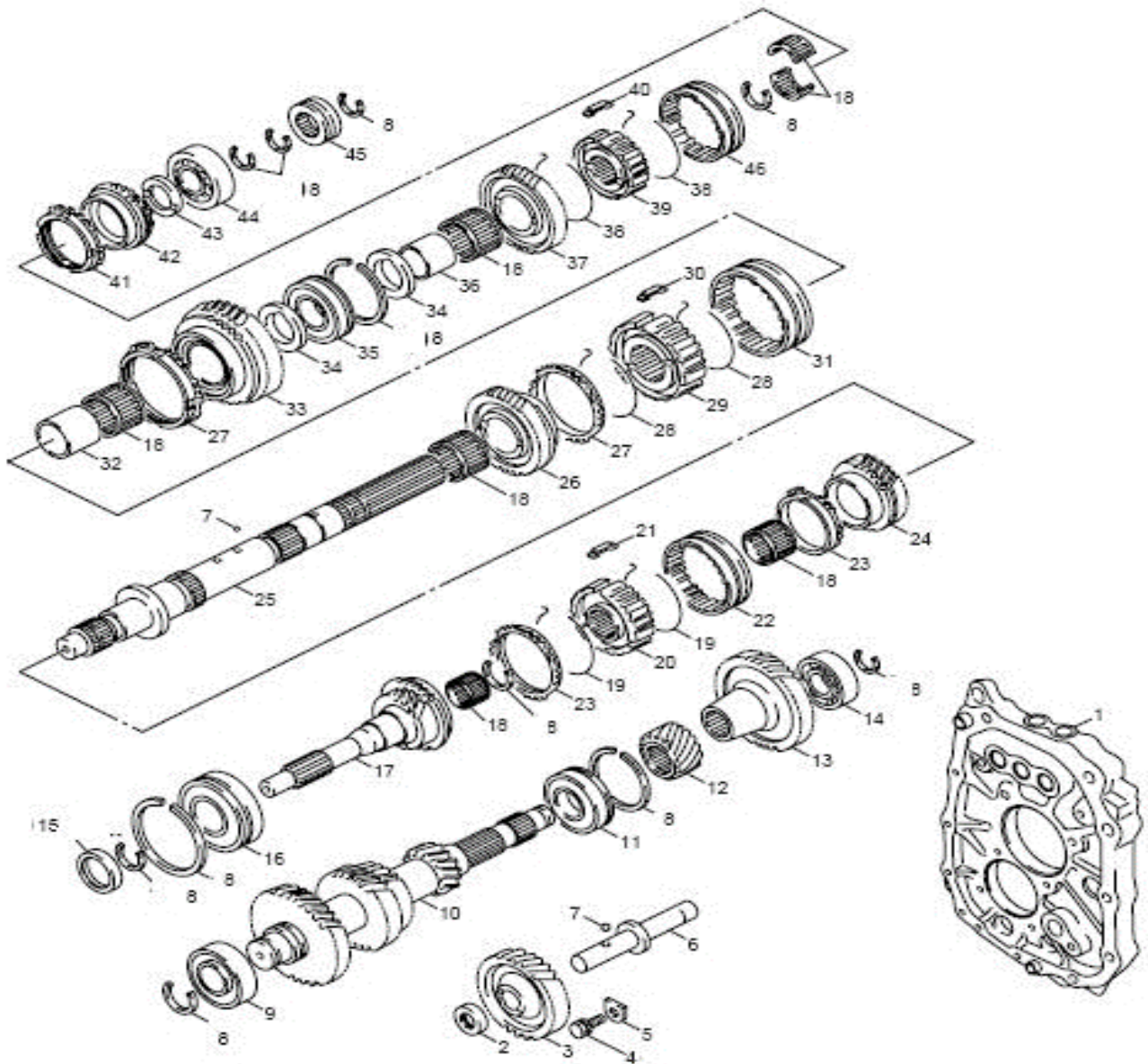


Figure 4.2: Input Shaft, Main Shaft, Countershaft and Reverse Idle Gear Shaft

<i>1. Intermediate plate</i>	<i>2. Reverse idle gear washer</i>
<i>3. Reverse idle gear</i>	<i>4. Reverse idle</i>
<i>5. Stop plate</i>	<i>6. Reverse idle gear shaft</i>
<i>7. Ball</i>	<i>8. Circlip</i>
<i>9. Countershaft front bearing</i>	<i>10. Countershaft</i>
<i>11. Countershaft center bearing</i>	<i>12. Reverse gear</i>
<i>13. Countershaft 5th gear</i>	<i>14. Countershaft rear bearing</i>
<i>15. Input shaft oil seal</i>	<i>16. Input shaft bearing</i>
<i>17. Input shaft</i>	<i>18. Needle bearing</i>
<i>19. High speed synchronizer spring</i>	<i>20. High speed synchronizer hub</i>

<i>21. High speed synchronizer key</i>	<i>22. High speed synchronizer sleeve</i>
<i>23. High speed synchronizer ring</i>	<i>24. 3rd gear</i>
<i>25. Main shaft</i>	<i>26. 2nd gear</i>
<i>27. Low speed synchronizer ring</i>	<i>28. Low speed synchronizer spring</i>
<i>29. Low speed synchronizer hub</i>	<i>30. Low speed synchronizer key</i>
<i>31. Low speed synchronizer sleeve</i>	<i>32. Low gear bush Do not reuse</i>
<i>33. Low gear</i>	<i>34. Bearing washer</i>
<i>35. Main shaft center bearing</i>	<i>36. Reverse gear bush</i>
<i>37. Main shaft reverse gear</i>	<i>38. Reverse synchronizer spring</i>
<i>39. Reverse synchronizer hub</i>	<i>40. Reverse synchronizer key</i>
<i>41. Reverse synchronizer ring</i>	<i>42. Main shaft 5th gear</i>
<i>43. Main shaft 5th washer</i>	<i>44. Main shaft rear bearing</i>
<i>45. VSS excited ring</i>	<i>46. . Reverse synchronizer sleeve</i>

UNIT 5: AUTOMATIC TRANSMISSION

This automatic transmission is a full automatic type with 3-speed plus overdrive (O/D).

The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an electronically controlled lock-up mechanism. The gear shift device consists of 3 sets of planetary gear units, 3 disc type clutches, 4 disc type brakes and 3 one-way clutches. The gear shift is done by selecting one of 6 positions (“P”, “R”, “N”, “D”, “2” and “L”) by means of the select lever installed on the floor. On the shift knob, there is an overdrive (O/D) off switch which allows shift-up to the overdrive mode and shift-down from the overdrive mode.

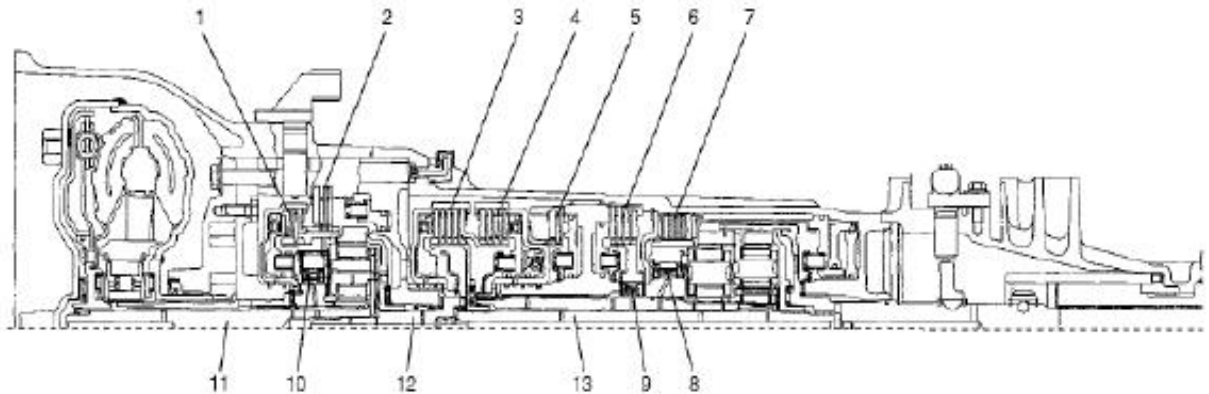


Figure 5.1:Automatic transmission

<i>1- Overdrive clutch</i>	<i>2- Overdrive brake</i>	<i>3- Forward clutch</i>
<i>4- Direct clutch</i>	<i>5- Second coast brake</i>	<i>6- Second brake</i>
<i>7- Reverse brake</i>	<i>8- One-way clutch No.2</i>	<i>9- One-way clutch No.1</i>
<i>10- Overdrive one-way clutch</i>	<i>11- Overdrive input shaft</i>	<i>12- Forward clutch input shaft</i>
<i>13- Intermediate shaft</i>		

UNIT 6: PROPELLER SHAFT & REAR DIFFERENTIAL

6.1. Propeller shaft

The universal joints require no maintenance. They are lubricated for life and can not be lubricated on the vehicle. If universal joints becomes noisy or worn, it must be replaced.

The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.

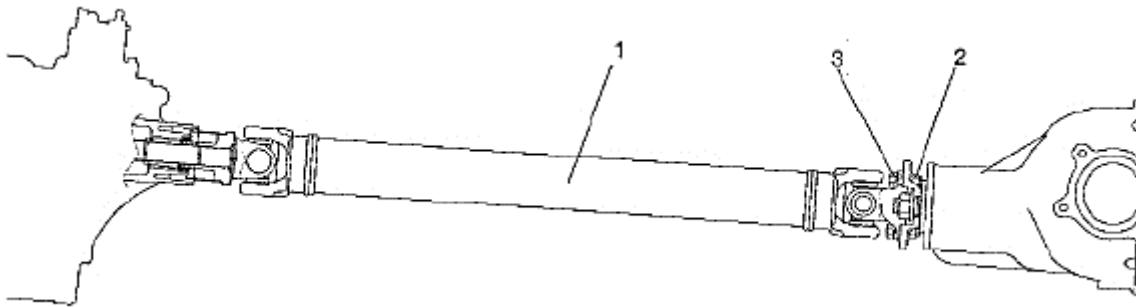


Figure 6.1: Propeller Shaft

1. Propeller shaft

2. Propeller Shaft nut

3. Propeller shaft bolt

6.2. Rear differential

The differential assembly uses a hypoid bevel pinion and gear. The differential assembly is decisive in that the drive power is concentrated there. Therefore, use of genuine parts and specified torque is compulsory. Further, because of sliding tooth meshing with high pressure between bevel pinion and gear, it is mandatory to lubricate them by hypoid gear oil. The hypoid gears have an advantage of preventing gear noise, at the same time, they require accurate adjustment of tooth contact and backlash.

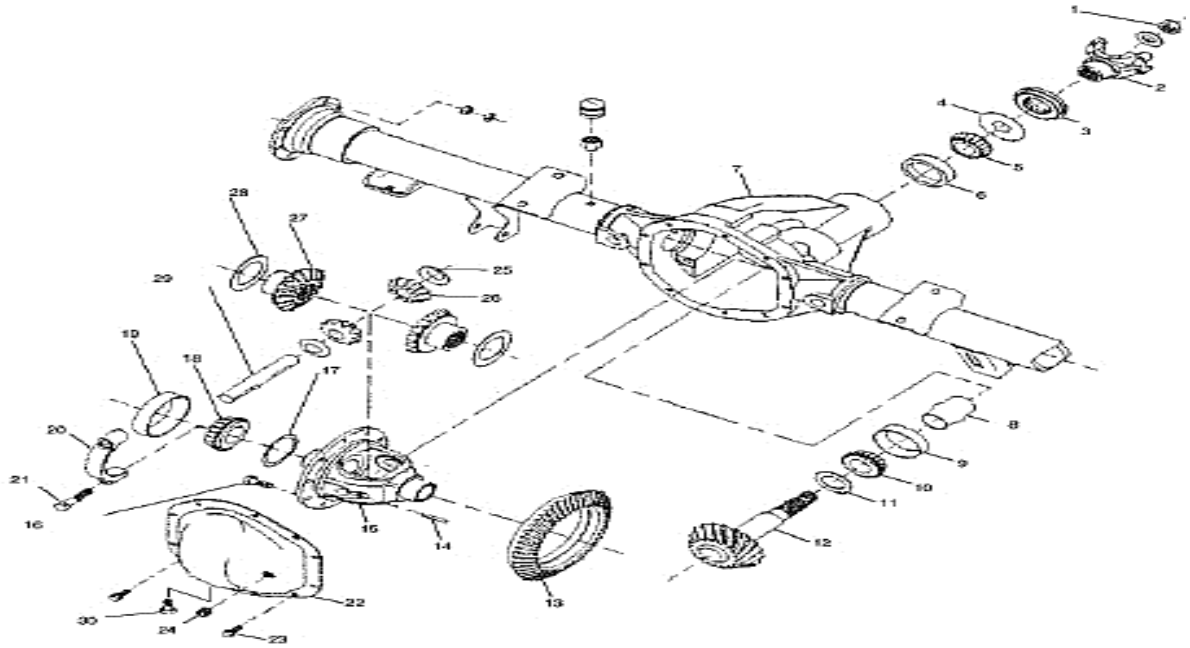


Figure 6.2: Rear differential

<i>1- Drive bevel pinion nut</i>	<i>2- Companion flange</i>
<i>3- Oil seal</i>	<i>4- Plate</i>
<i>5- Drive bevel pinion front bearing</i>	<i>6- Drive bevel pinion front bearing outer race</i>
<i>7- Axle housing</i>	<i>8- Pinion spacer</i>
<i>9- Drive bevel pinion rear bearing outer race</i>	<i>10- Drive bevel pinion rear bearing</i>
<i>11- Bevel pinion shim(s)</i>	<i>12- Drive bevel pinion (hypoid gear)</i>
<i>13- Drive bevel gear (hypoid gear)</i>	<i>14- Spring pin</i>
<i>15- Differential case</i>	<i>16- Drive bevel gear bolt</i>
<i>17- Side bearing shim(s)</i>	<i>18- Differential side bearing</i>
<i>19- Differential side bearing outer race</i>	<i>20- Differential side bearing cap</i>
<i>21- Differential side bearing cap bolt</i>	<i>22- Differential cover</i>
<i>23- Differential cover bolt</i>	<i>24- Level / filler plug</i>
<i>25- Differential pinion washer</i>	<i>26- Differential pinion</i>
<i>27- Differential side gear</i>	<i>28- Differential side washer</i>
<i>29- Differential pinion shaft</i>	<i>30- Drain plug</i>

UNIT 7: REAR SUSPENSION

The rear suspension is a leaf spring type, consisting of leaf springs, axle housing, axle shafts and bump stopper. Both front and rear ends of the leaf spring are connected to the body through bushings. The axle housing is installed on the right and left leaf springs by means of spring seats and U bolts. The two shock absorbers (right & left) are installed with their lower ends attached to the spring seats and the upper ends to the vehicle body, all through rubber bushings.

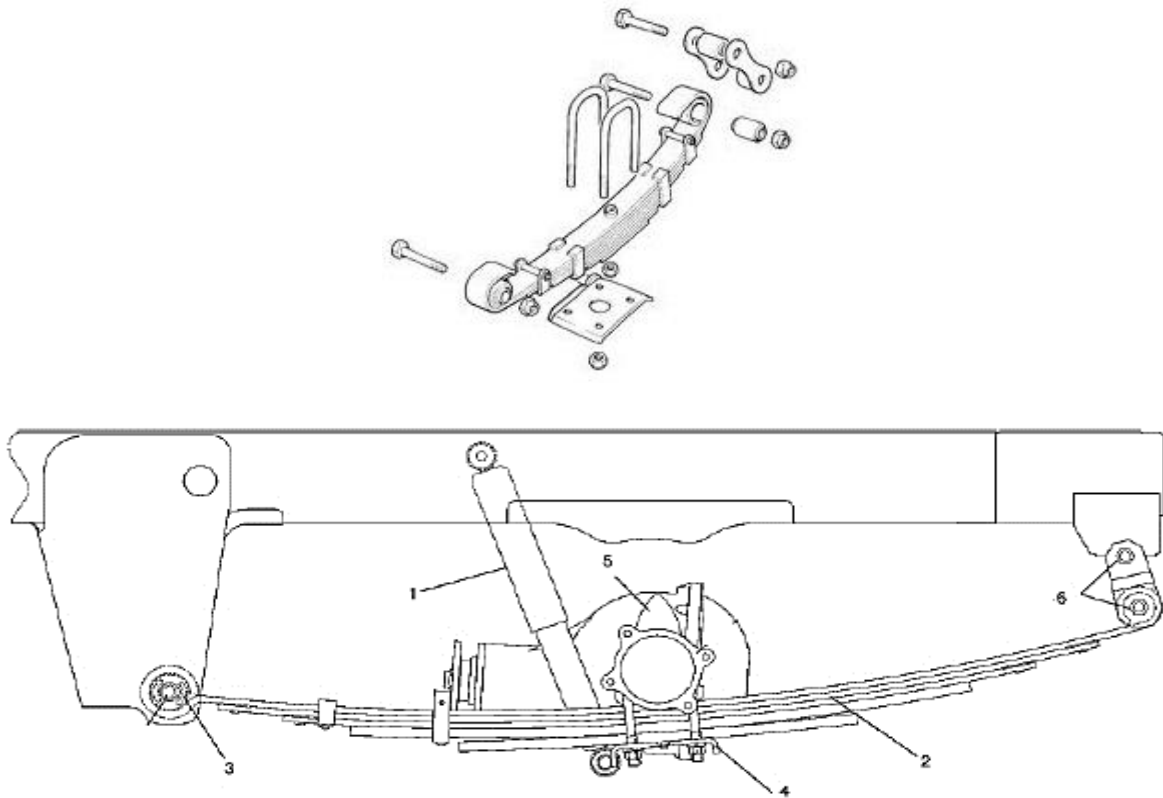
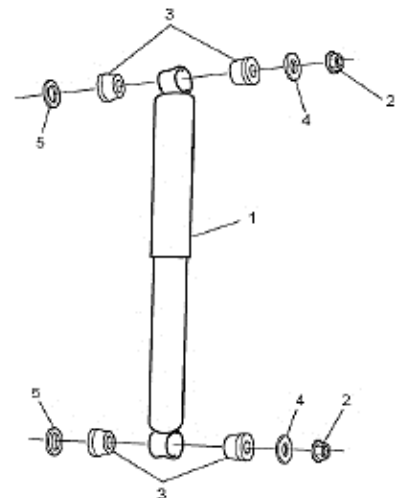


Figure 7.1: Rear suspension

<i>1. Rear shock absorber</i>	<i>2. Leaf spring</i>	<i>3. Leaf spring front bushing</i>
<i>4. Leaf spring seat</i>	<i>5. Rear bump stopper</i>	<i>6. Pin</i>

7.1 Rear Shock Absorber Components

- 1. Rear shock absorber*
- 2. Rear shock absorber nut*
- 3. Rear shock absorber bush*
- 4. Rear shock absorber No.1 washer*
- 5. Rear shock absorber No.2 washer*



7.2 Leaf Spring Components (For left-side leaf spring)

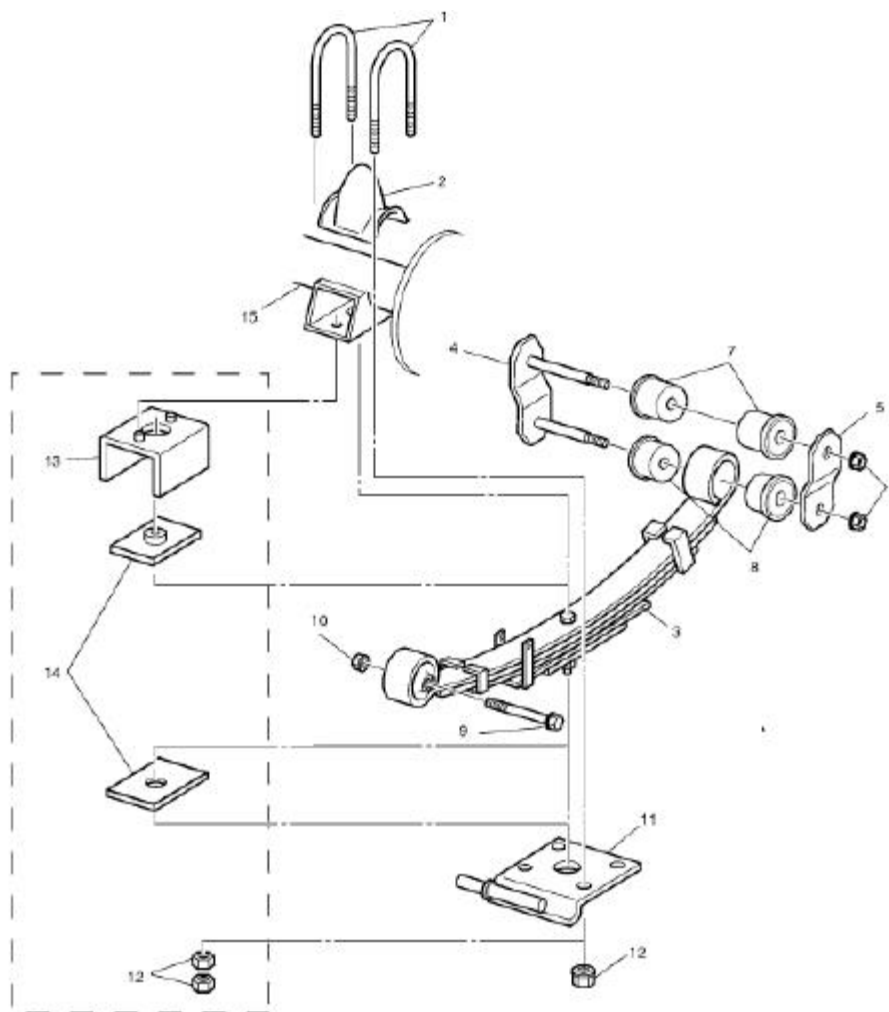


Figure 7.2: Leaf Spring

1. U-bolt	2. Rear bump stopper
3. Leaf spring	4. Shackle pin
5. Shackle plate	6. Shackle nut
7. Shackle pin No.1 bushing	8. Shackle pin No.2 bushing
9. Leaf spring front bolt	10. Leaf spring front nut
11. Leaf spring seat 50 N·m (5.0 kg-m, 36.5 lb-ft)	12. U-bolt nut 80 N·m (8.0 kg-m, 58.0 lb-ft)
13. Leaf spring clamp plate	14. Leaf spring pad F Vehicle front side
15. Axle housing	

UNIT 8: BRAKES SYSTEM

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear). The load sensing proportioning valve (LSPV) or the blend proportioning valve (BPV) is included in these circuits between the master cylinder and rear brakes. In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading / trailing shoes) for the rear brake. The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

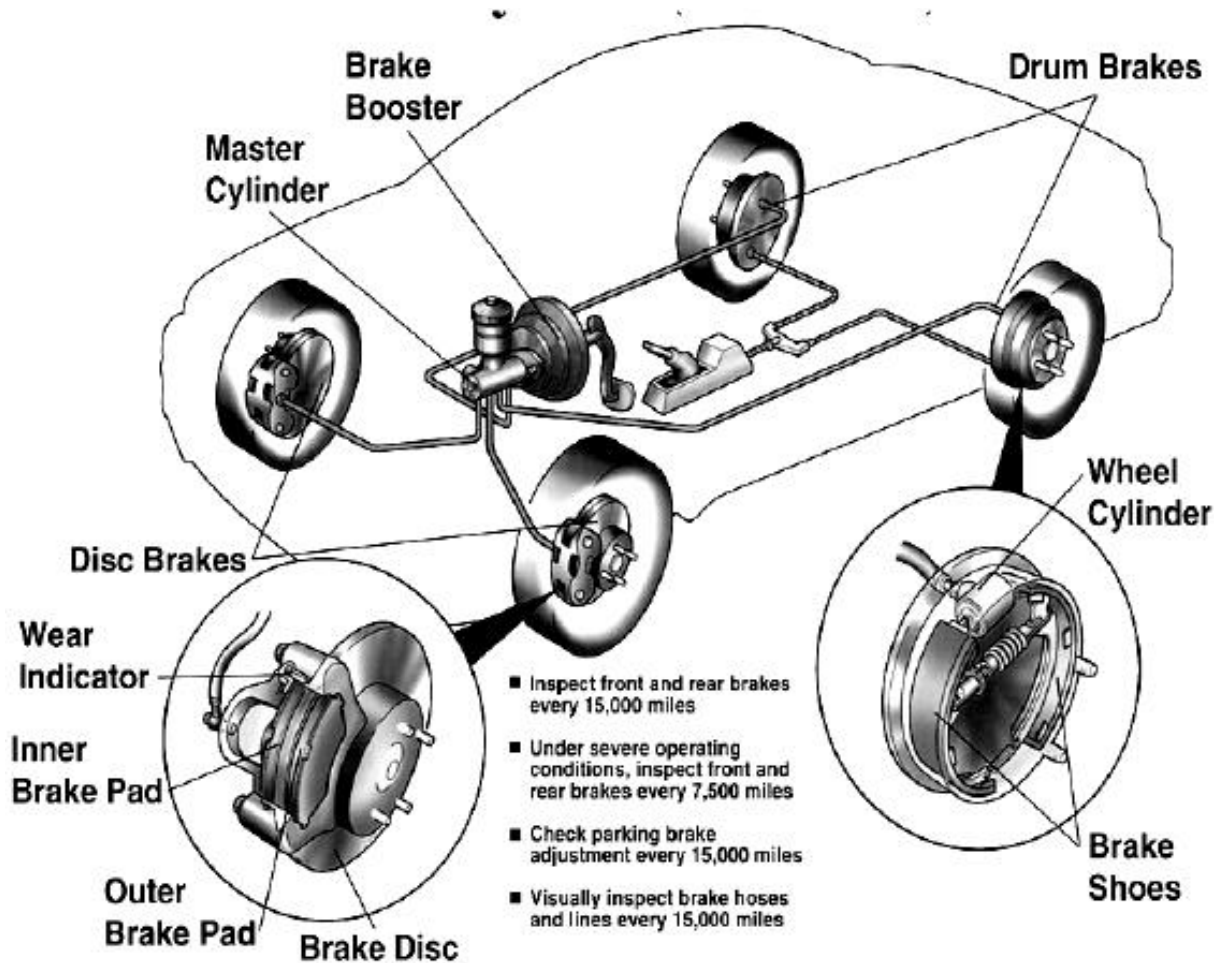


Figure 8.1: Break system

8.1 Master Cylinder Components

1. Reservoir
2. Reservoir bolt
3. Grommet
4. Master cylinder body
5. Secondary piston assembly
6. Primary piston assembly
7. Piston guide
8. Circlip Do not reuse.
9. Master cylinder mounting nut

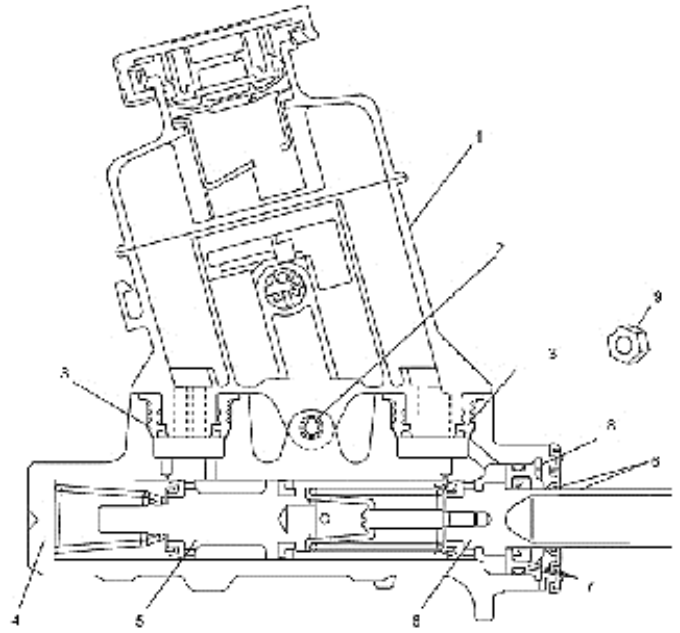


Figure 8.1: Master Cylinder

8.2 Brake Pedal and Brake Pedal Bracket Components Location

1. Brake pedal bracket
2. Brake pedal bolt
3. Brake pedal nut
4. Stop light switch
5. Pedal bush
6. Pedal shaft spacer
7. Brake pedal
8. Pedal pad

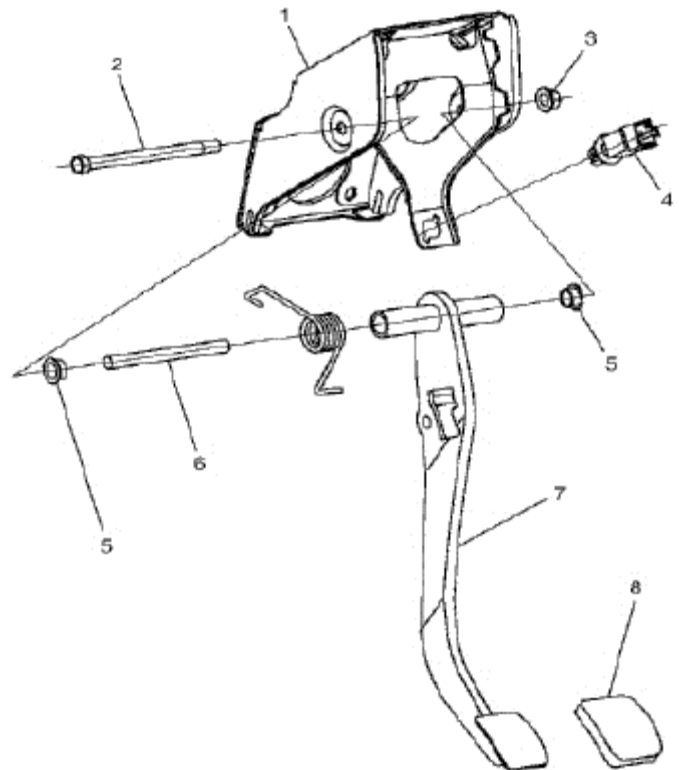
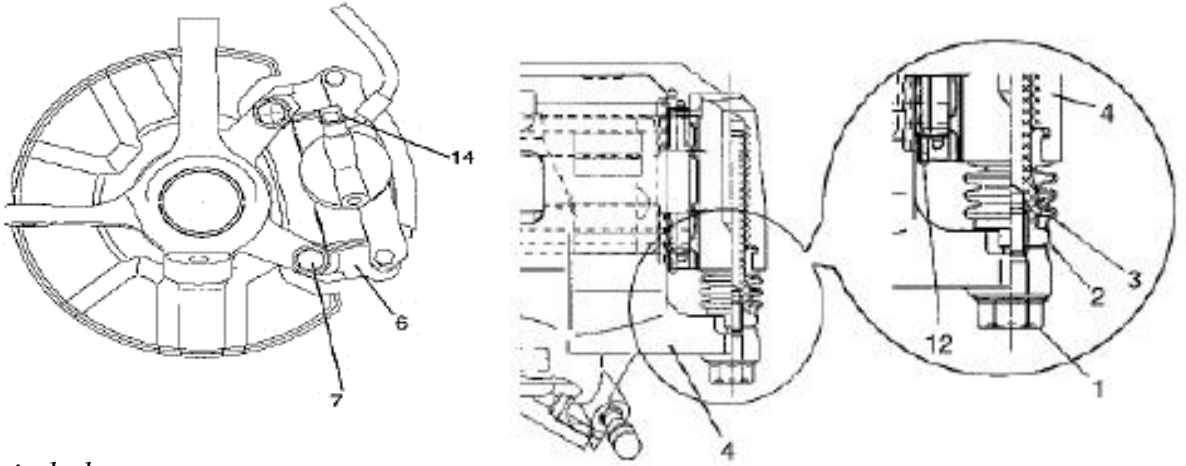


Figure 8.2: Brake Pedal

8.3 Front Brake Component Location



1. Slide pin bolt

2. Slide pin

3. Pin boot

4. Brake caliper

5. Bleeder plug

6. Caliper carrier

7. Caliper carrier bolt

8. Piston

9. Piston seal

10. Piston boot

11. Brake pad

12. Pad spring

13. Brake disc

14. Flexible hose bolt

15. Boot set ring

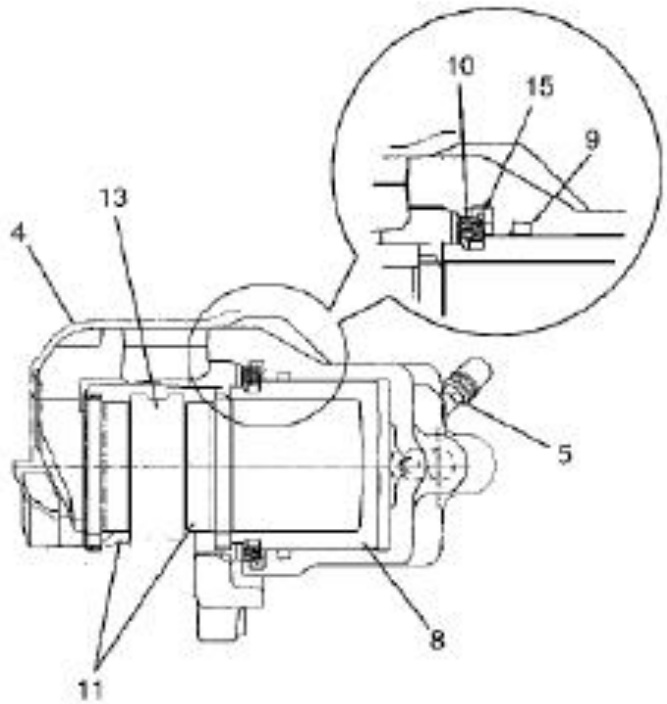


Figure 8.3: Front Brake

UNIT 9: STEERING SYSTEM

9.1 Steering wheel and column

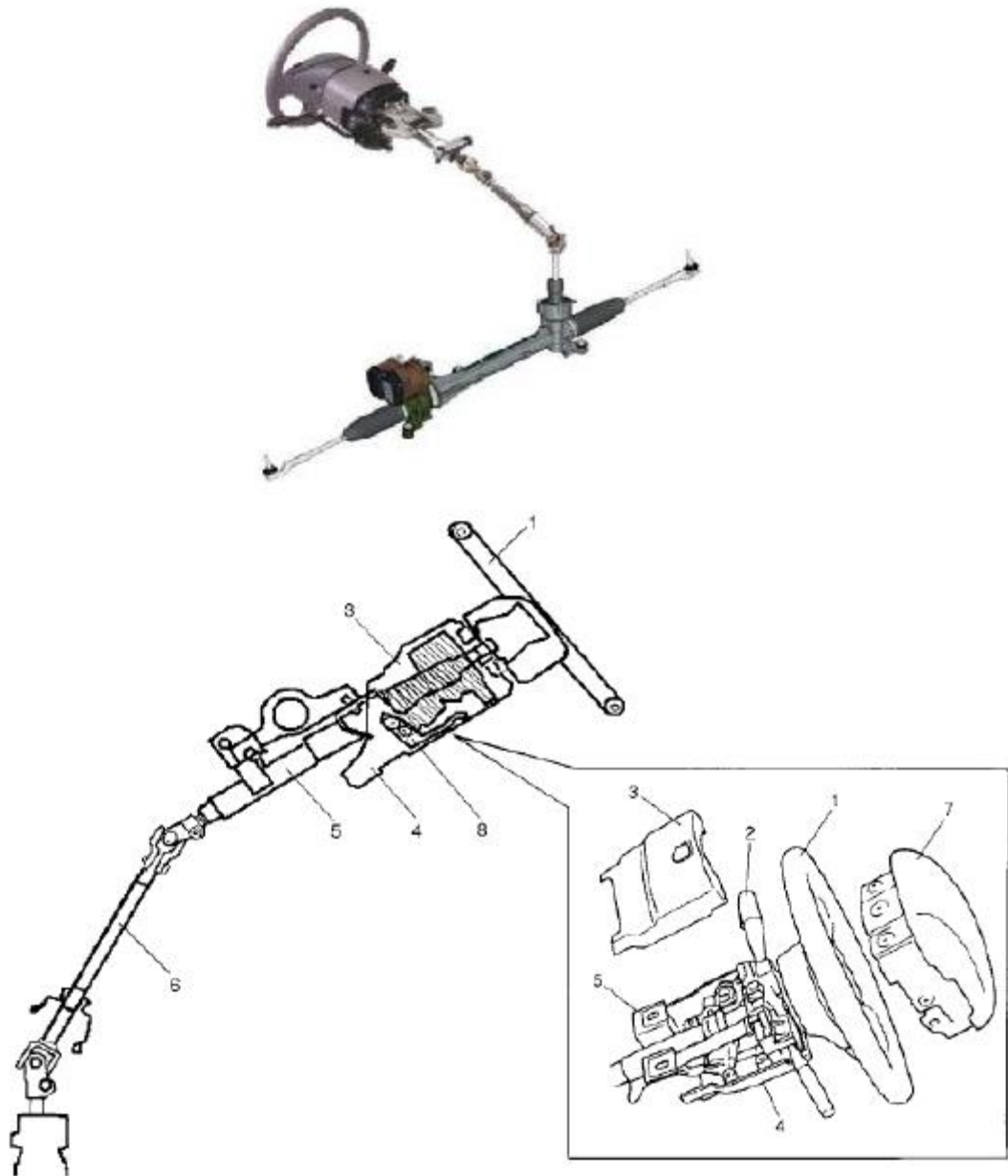


Figure 9.1: Column components

1. <i>Steering wheel</i>	2. <i>Contact coil cable assembly (if equipped with air bag system)</i>
3. <i>Steering column upper cover</i>	4. <i>Steering column lower cover</i>
5. <i>Steering column assembly</i>	6. <i>Steering lower shaft</i>
7. <i>Driver air bag (inflator) module (if equipped with air bag system)</i>	8. <i>Tilt steering</i>

9.2 Power Steering System

9.2.1 P/S Gear Box Assembly Components

1. Steering gear box assembly

2. Dust cover

3. Mounting bush

4. Bolt

5. Mounting bracket

6. Clamp

7. Steering boot

8. Steering tie rod

9. Lock washer

10. Steel band

11. Pipe assy, RH

12. Pipe assy, LH

13. Return gear pipe

14. Bolt

15. Washer Do not reuse

16. Bolt 43 N-m
(4.3 kg-m, 31.0 lb-ft)

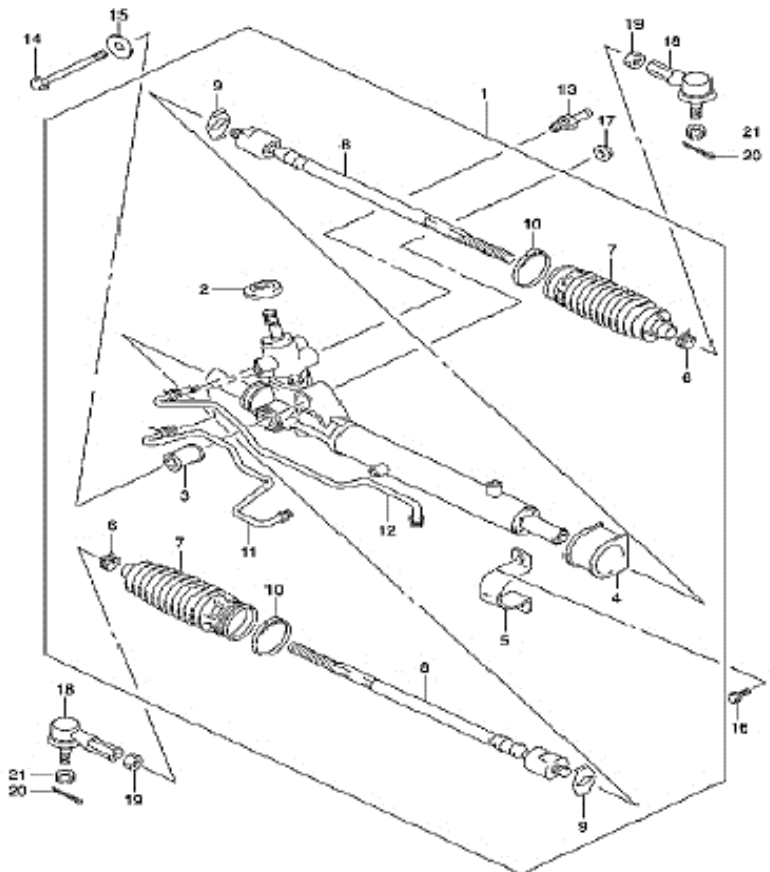
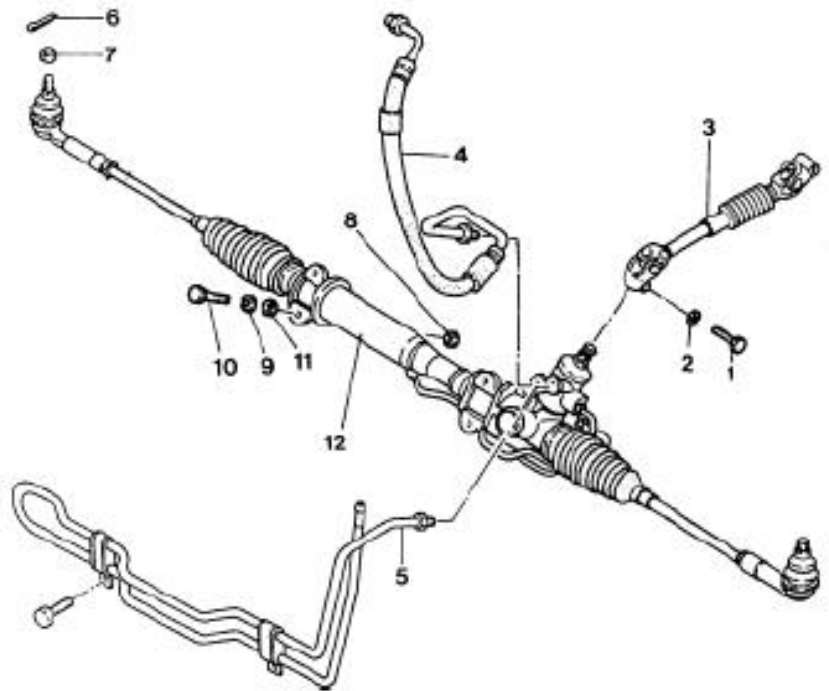
17. Nut

18. Tie rod end

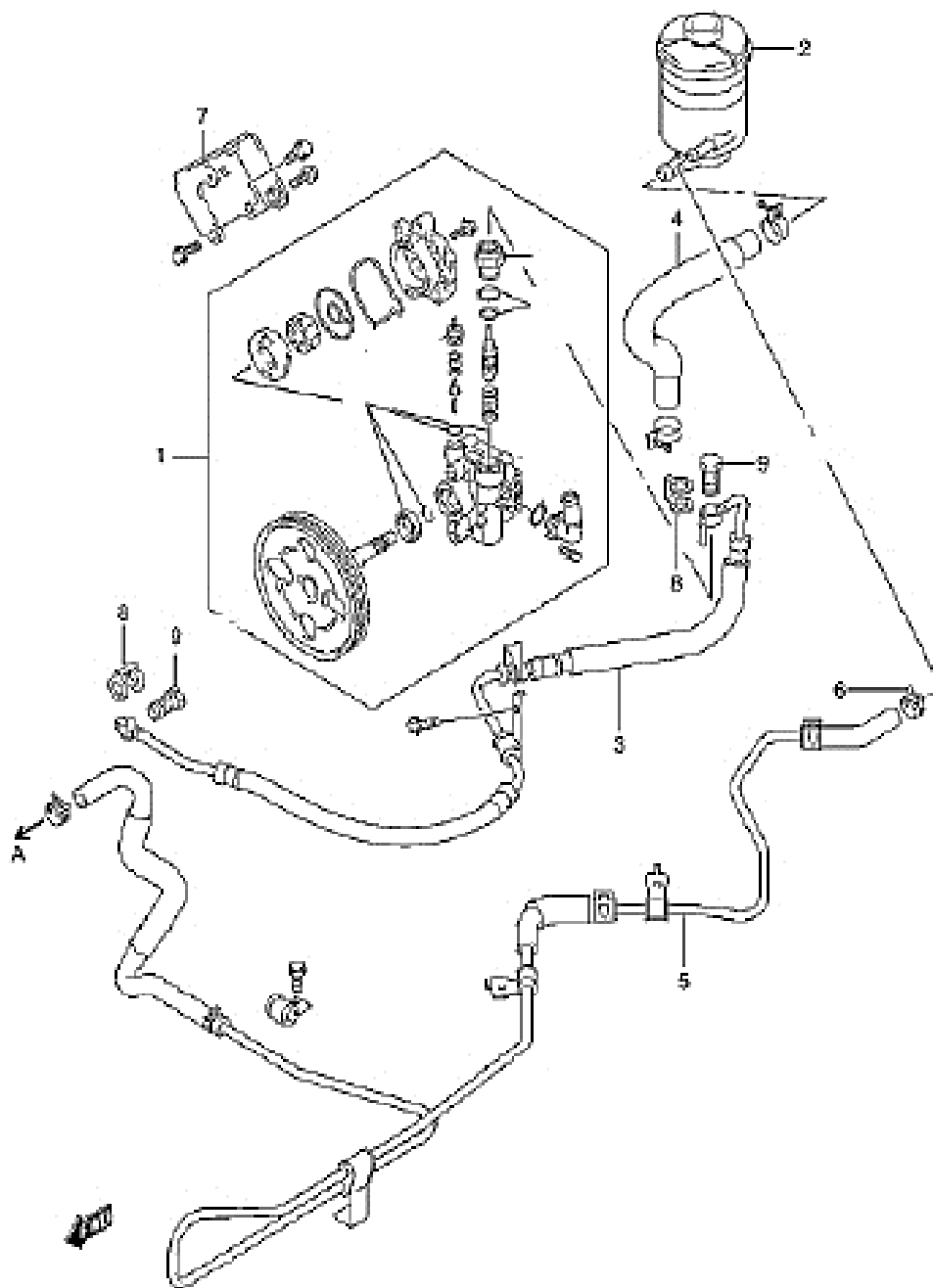
19. Nut

20. Cotter pin

21. Nut



9.2.2.



P/S Pump Components

1. *P/S pump assembly*
2. *Fluid reservoir tank*
3. *High pressure hoses & pipe*
4. *Suction hose*
5. *Low pressure return hose and pipe*
6. *Clamp*
7. *Bracket*
8. *Washer*
9. *Union bolt*

UNIT 10: IGNITION SYSTEM (ELECTRONIC IGNITION SYSTEM)

10.1. Ignition System Construction

The ignition system is an electronic ignition system (distributorless). It consists of the parts described below.

- ECM

It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.

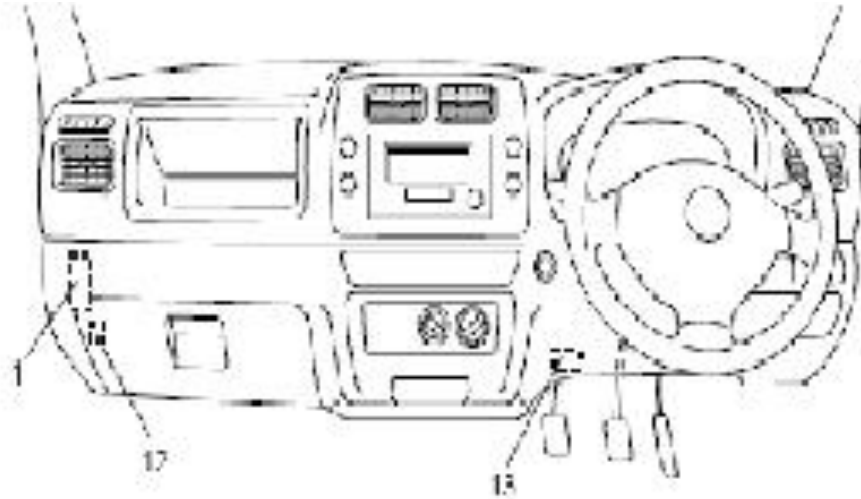
- Ignition coil assembly (including an igniter)

The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM.

When the current flow to the primary coil is turned OFF, a high voltage is included in the secondary coil.

- High tension cords and spark plugs.
- CMP sensor and CKP sensor

Using signals from these sensors, ECM identifies the specific cylinder whose piston is



in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.

- TP sensor, ECT sensor, MAP sensor and other sensors/switches

Refer to “Electronic Control System” in Section 6E1 for details. Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is included in the secondary coil and No.1 and No.4 spark plugs spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

10.2. Ignition System Components Locator Diagram

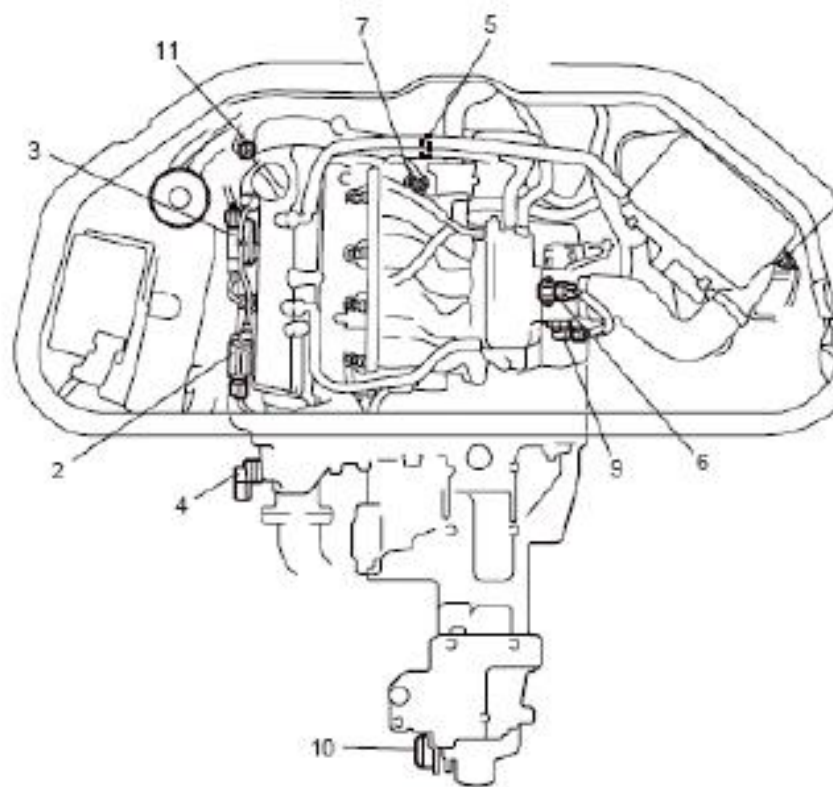


Figure 2.26: Ignition System

- | | |
|--|---|
| 1. ECM | 7. ECT sensor |
| 2. Ignition coil assembly for No.1
and No.4 spark plugs | 8. IAT sensor |
| 3. Ignition coil assembly for No.2
and No.3 spark plugs | 9. TP sensor |
| 4. CMP sensor | 10. VSS |
| 5. CKP sensor | 12. Diagnosis connector (if equipped) |
| 6. MAP sensor | 11. Power steering pressure switch
(if equipped) |
| | 13. Data link connector (DLC) |

UNIT 11: LIGHTING SYSTEM

11.1. Description

Switch Description for Lighting System

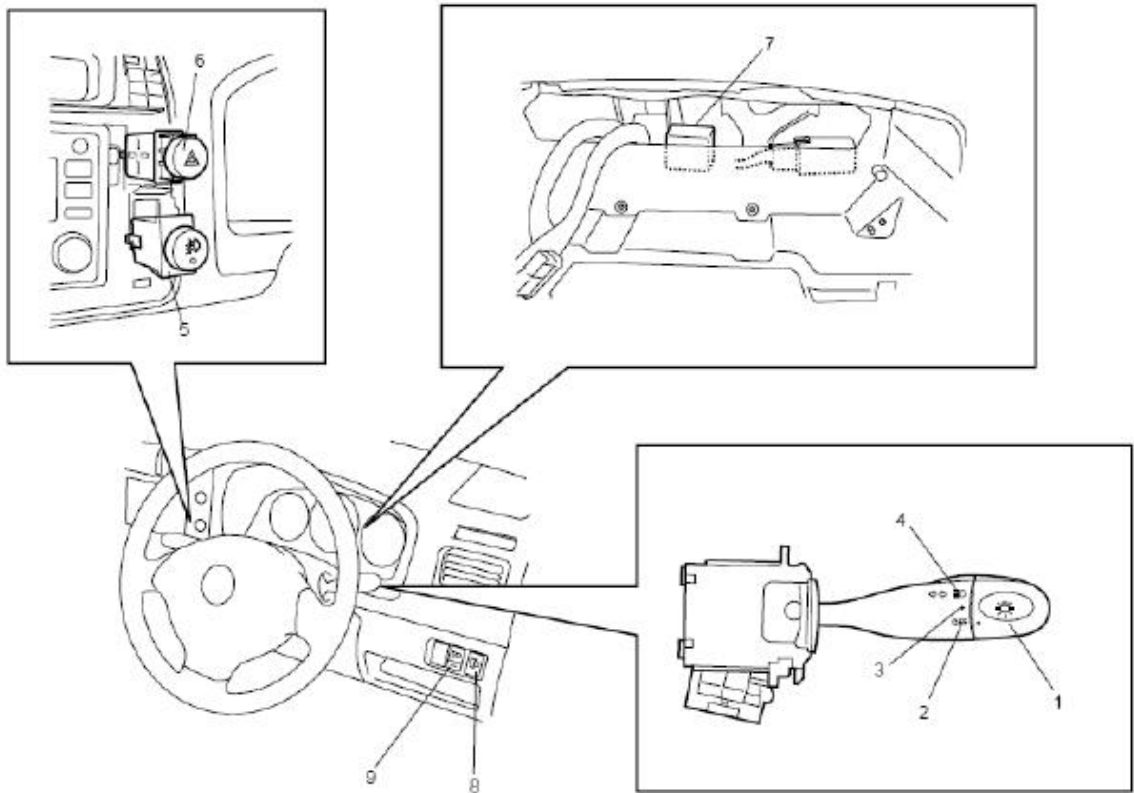


Figure 2.27: Switch for Lighting System

1. Lighting switch	2. Lighting switch "OFF" position
3. Lighting switch "SMALL" position	4. Lighting switch "HEAD" position
5. Front fog light switch	6. Hazard warning light switch
7. Turn signal and hazard warning light relay	8. Head light leveling switch (if equipped)
9. Rear fog light switch (if equipped)	

11.1.1. Headlight switch (in lighting switch) specification

Switch Position	Terminal	B	T	RF	EL	HL	HU
OFF	LO						
	PASS				○	○	○
	HI						
SMALL	LO	○	○				
	PASS				○	○	○
	HI						
HEAD	LO	○	○	○	○	○	○
	PASS			○	○	○	○
	HI			○	○	○	○

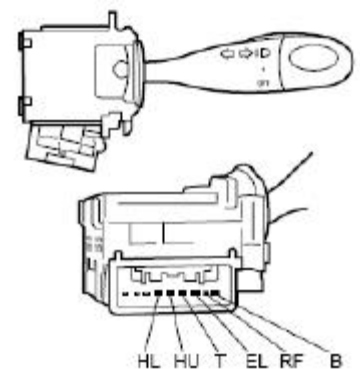


Figure 11.1.1: Headlight switch specification

11.1.2. Front fog light switch specification

Terminal \ Switch Position	IG	LOAD	E	IL	ILE
OFF		○ — (T) — ○		○ — (T) — ○	
ON	○ —	○ — (T) — ○		○ — (T) — ○	

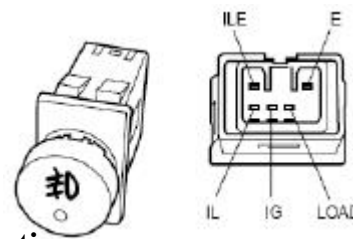


Figure 11.1.2: Front fog light switch specification

11.1.3. Rear Fog Light Switch (If Equipped) Inspection

TERMINAL \ FOG SW (1)	IG	E1	E2	L	IL	ILE
FREE		○ —	○ — (T) — ○	○ — (T) — ○		
PUSH	○ — (T) — ○	○ —			○ — (T) — ○	

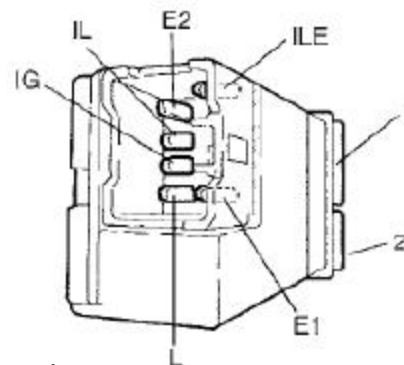


Figure 11.1.3: Rear Fog Light Switch Inspection

11.1.4. Turn Signal Switch Inspection

Terminal \ Switch Position	TL	TB	TR
L	○ — ○		
N			
R		○ — ○	

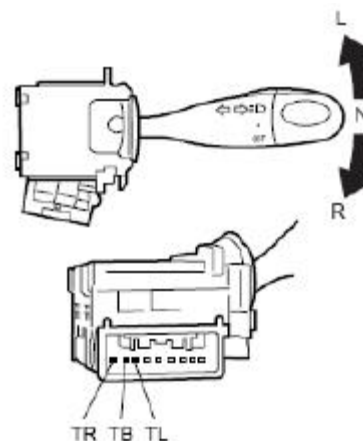


Figure 11.1.4: Turn Signal Switch Inspection

11.1.5. Hazard Warning Light Switch Inspection

Terminal \ Switch Position	a	b	c	d	e	f	g	h	i	j
OFF					○ — (T) — ○	○ —			○ —	○ —
ON	○ —	○ —	○ —	○ —	○ — (T) — ○				○ —	○ —

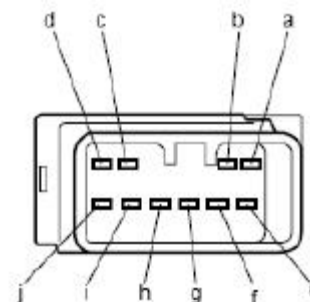


Figure 11.1.5: Hazard Warning Light Switch Inspection

11.2 Turn signal and hazard warning lights system circuit check

Terminal	Wire	Circuit	Specification	Condition
E36-1	BRN	Ignition switch circuit	10 – 14 V Ignition switch is	ON position.
			0 – 1 V Ignition switch is	OFF position.
E36-4	WHT/BLU	Power supply for turn signal and hazard warning lights	10 – 14 V	–
E36-5	BLU	Right side turn signal light switch circuit	Continuity	Turn signal switch is L position.
			No continuity	Turn signal switch is N or R position.
E36-6	RED/BLK	Left side turn signal light switch circuit	Continuity	Turn signal switch is R position.
			No continuity	Turn signal switch is N or L position.
E36-7	BLK	Ground	0–1 Ω	–
E36-8	WHT	Hazard warning switch and keyless entry system circuits	Continuity	Hazard warning switch is ON position.
				Approx. 1.3 sec. After pushing
				UNLOCK button on transmitter.
				Approx. 0.5 sec. After pushing
			LOCK button on transmitter.	
No continuity	Hazard warning switch is OFF position.			

UNIT 12: SEAT BELT & AIR BAG

12.1 Seat belt

12.1.11. Front Seat Belt Components

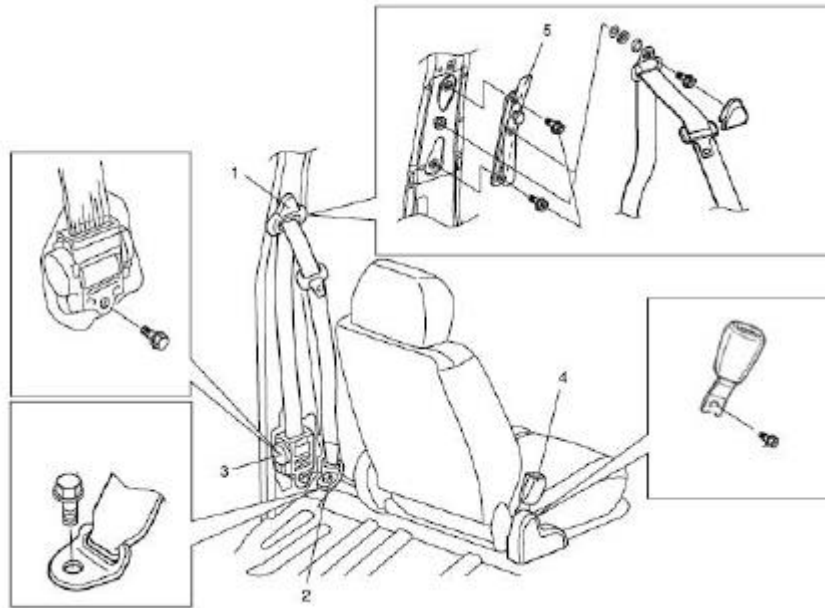


Figure 12.1: Front Seat Belt

1. Upper anchor	2. Lower anchor
3. Retractor assembly	4. Buckle
5. Shoulder adjuster (if equipped)	

Front Seat Belt Inspection

Seat belts and attaching parts can affect the vital components and systems of a vehicle. Therefore, they should be inspected carefully and replaced with genuine parts only.

- Seat belt

Its webbing or strap should be free from damage.

- Retractor assembly

It should lock webbing when pulled quickly. The front seat belt retractor assembly (1) should pass the above inspection and should lock webbing even when tilted (approx. 15°) toward to fore and aft or right and left directions. Check retractor assembly (1) with seat belt pretensioner appearance visually for following symptoms and if any one of them is applicable, replace it with a new one as an assembly.

- Pretensioner has activated.

- There is a crack in seat belt pretensioner (retractor assembly).

- Wire harness or connector is damaged.

- Seat belt pretensioner (retractor assembly) is damaged or a strong impact (e.g. dropping) was applied to it.

Anchor bolts should be torqued to specification.

- Belt latch

It should be secure when latched

12.2 Air bag

General Description

With the air bag system which includes air bags for both the driver's and passenger's sides as well as the seat belt pretensioners (3), the sag of the seat belt is taken up (for seat belt with pretensioner), the driver air bag (inflator) module (1) is deployed from the center of the steering column and the passenger air bag (inflator) module (2) from the top of the instrument panel in front of the front passenger seat in occurrence of a front collision with an impact larger than a certain set value to supplement protection offered by the driver and front passenger seat belts. The air bag system is designed to activate only in severe frontal collisions. It is not designed to activate in rear impacts, side impacts, rollovers, or minor frontal and sideward collisions, since it would offer no protection in those types of accidents.

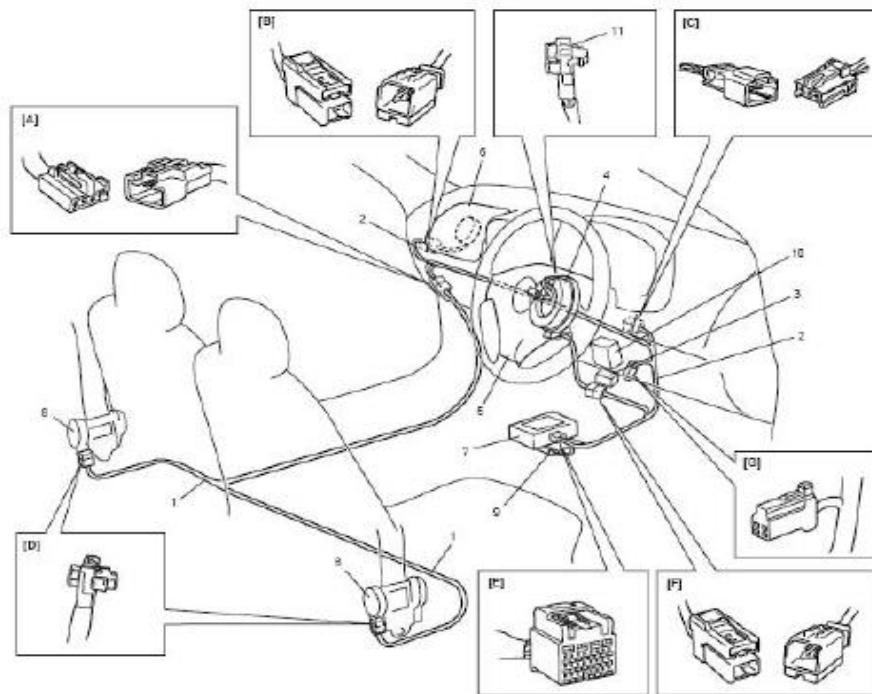


Figure 12.2: Air bag

1. Air bag harness in floor harness	2. Air bag harness in main harness
3. Data link connector (DLC)	4. Contact coil assembly
5. Driver air bag (inflator) module	6. Passenger air bag (inflator) module
7. SDM	8. Seat belt pretensioner (retractor assembly)
9. Ground for air bag system	10. Air bag fuse in circuit fuse box
11. Contact coil connector	