

MAINTENANCE OF BRAKE SYSTEM

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General Description of Brake System

ZXAUTO Power brake system adopts hydro-vacuum booster structure, including front disk brake and rear drum brake. Disk brake adopts single piston caliper and ventilated brake disk. Drum brake is leading trailing shoe brake drum, increased the stability of braking efficiency. Parking brake is attached to rear wheel drum brake. Brake pedal is of suspended type, provided with vacuum booster. Brake system is in T-shaped layout and ABS controlled. Parking brake system is of mechanical-type manual structure and Control lever is located at the Left rear side of variable-speed control lever.

Composition of Brake Booster System

Vacuum booster:

It is 8.5'+8.5' double diaphragm vacuum booster. It is composed of booster, brake master cylinder and oil cup. Boosting effect is as high as 6 times. It reduced brake pedal force and increased braking effect.

Brake warning lamp:

If there is leakage in brake system, which causes reduction of fluid level in brake master cylinder, brake lamp would turn on, reminding the driver to check the brake system immediately, so as to prevent happening of any accident.

Brake driving system:

Brake pedal:

Brake pedal is control assembly, through which, vehicle brake can be realized.

Brake line system:

It is used to contain brake fluid, connect brake pump front and rear wheel cylinders, and transfer the hydraulic pressure generated by brake pump.

Brake wheel cylinder:

It is installed at the location of front and rear wheels, receives pressure transferred by oil pipe and drives friction disk (block) to act upon the brake drum or disk of front and rear wheels, causing them to generate frictional resistance.

Friction disk:

It is a vital part producing frictional force in order to obtain required braking efficiency. Its quality directly affects the magnitude and persistence of frictional force.

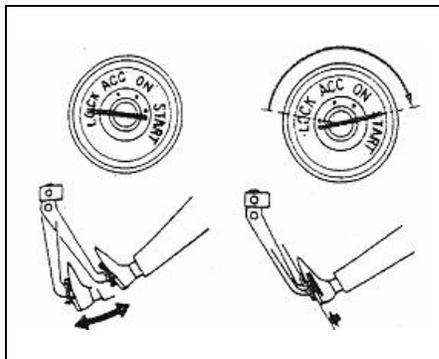
Brake fluid:

We recommend that you use HZY4 (or DOT4) synthetic brake fluid as per GB 12981-2003. Never use mineral oil or other type fluid. Never use mixtures of different types of brake fluids. Gas or liquid in brake fluid would reduce the thickness brake fluid. Therefore, the condition of brake fluid must be checked periodically. Immediately replace it if necessary.

Maintenance and Adjustment of Brake System

1 Inspection and Repair of Vacuum Booster Assembly with Brake Master Cylinder

If vacuum booster leaks or vacuum is insufficient, repair should be made before testing. (We recommend you to replace the entire vacuum booster.)

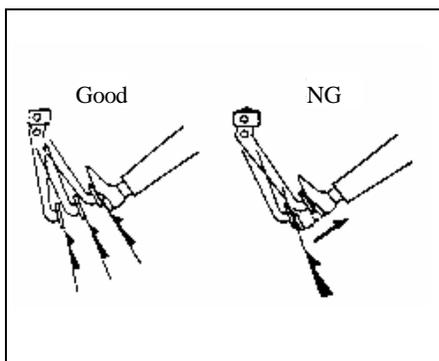


Operation of Brake Vacuum

Caution: If vacuum booster leaks or vacuum is insufficient, repair should be made before testing.

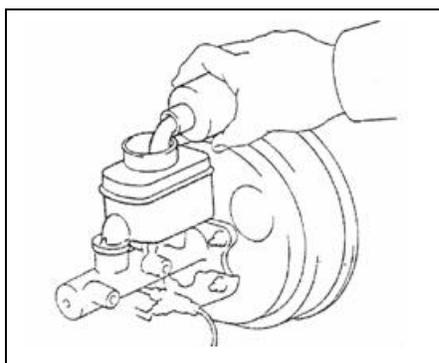
(1) Test of operation

- A. With engine shutdown, step brake pedal several times, and check that the pedal reserved distance should not change.
- B. step brake pedal and start the engine. If pedal automatically moves down for some distance, it indicates that the operation is normal.



(2) Check of vacuum sealing performance

- A. Start the engine and shut it down after 1-2min, and slowly step brake pedal several times. If pedal position is getting higher after each stepping, it indicates that vacuum sealing is good.
- B. While the engine is running, and step and hold brake pedal for 30 seconds. If the pedal does not move, it indicates that vacuum sealing is normal.



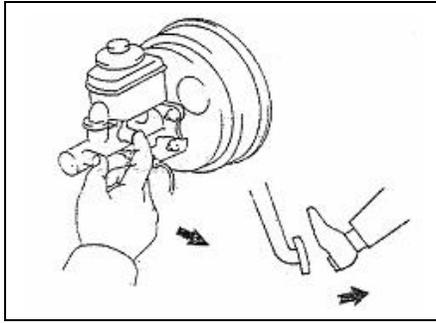
Measurement of brake system oil pressure

If some parts of brake system have been replaced, or there is air in the pipeline, please bleed air. Do not let brake fluid flow to paint surface. Otherwise, wipe off immediately.

(1) Filling brake fluid into reservoir

After air is bled, replenish brake fluid as necessary.

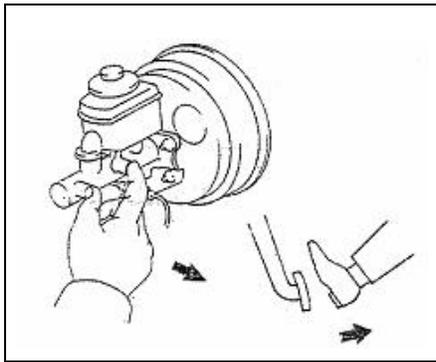
Type of brake fluid: HZY4 (or DOT4) synthetic brake fluid as per GB 12981-2003.



(2) Bleeding of brake master cylinder

Caution: If brake master cylinder is replaced or reservoir is empty, bleeding should be made from brake master cylinder.

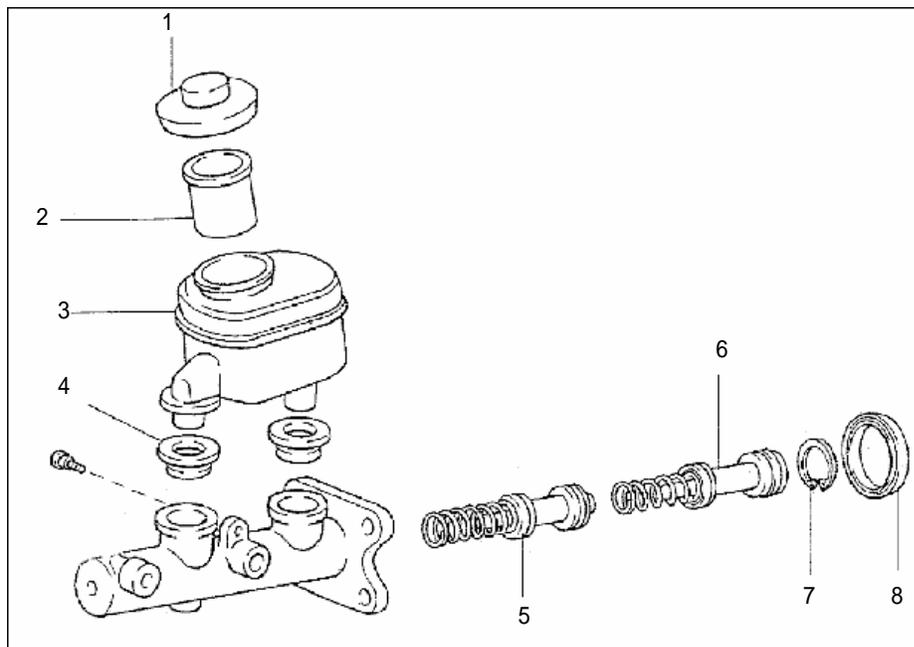
- A. Remove brake master cylinder connecting oil pipe, and use a container to catch brake fluid.
- B. Slowly step and hold brake pedal.
- C. Use your hand to block master cylinder fluid outlet, and release pedal.
- D. Repeat the above procedures 3-4 times.
- E. Reconnect master cylinder brake oil pipe.



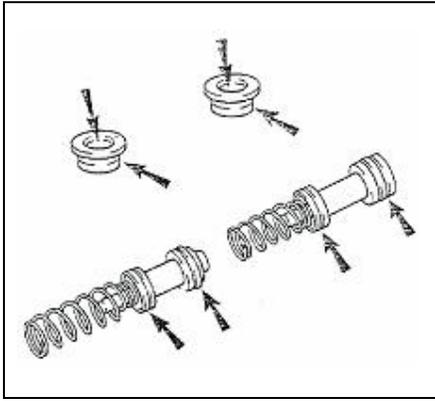
(3) Brake line bleeding

- A. Slowly step and release pedal several times.
- B. With pedal held, loosen pipeline fitting until brake fluid flows out, and then, tighten the fitting.
- C. Repeat the above procedures until no air bubbles appear at the fitting. The tightening torque of tube fitting is $18 \pm 2 \text{ N.m}$.
- D. Bleed all wheel cylinders.
- E. Bleed brake adjusting mechanism

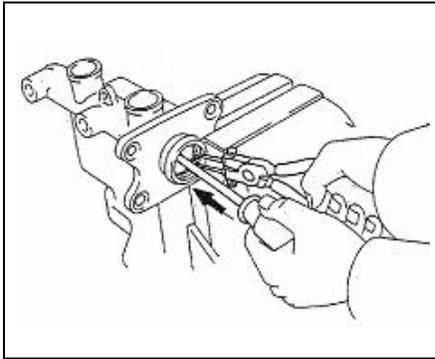
Brake master cylinder assembly (for reference only)



- (1) Cap
- (2) Strainer
- (3) Oil bowl
- (4) Sealing washer
- (5) Piston 2 and spring
- (6) Piston 1 and spring
- (7) Circlip
- (8) Bushing



(1) Use lithium base glycol to lubricate various parts, as shown in the diagram.



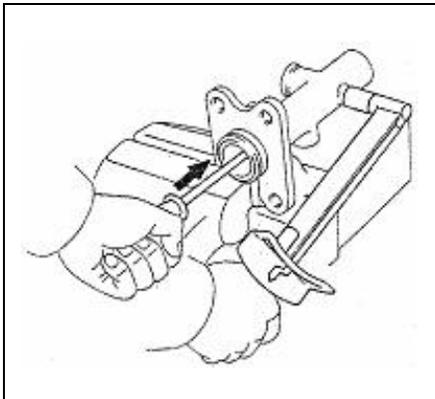
(2) Install spring and piston

Be careful not to damage rubber cup on the piston.

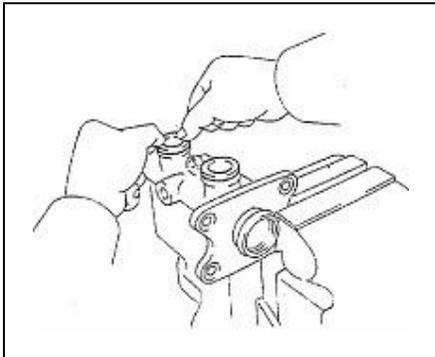
A. Install spring and piston vertically. Otherwise, brake master cylinder might be damaged.

B. Use screwdriver to support the piston, and then use pliers to install the circlip.

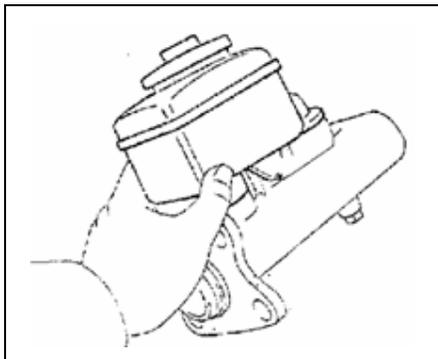
Caution: The tip of screwdriver should be ground flat.



(3) Install new boot.



(4) Install sealing washer.



(5) Install reservoir.

- A. Install strainer and cap into reservoir.
- B. Install reservoir on to master cylinder.

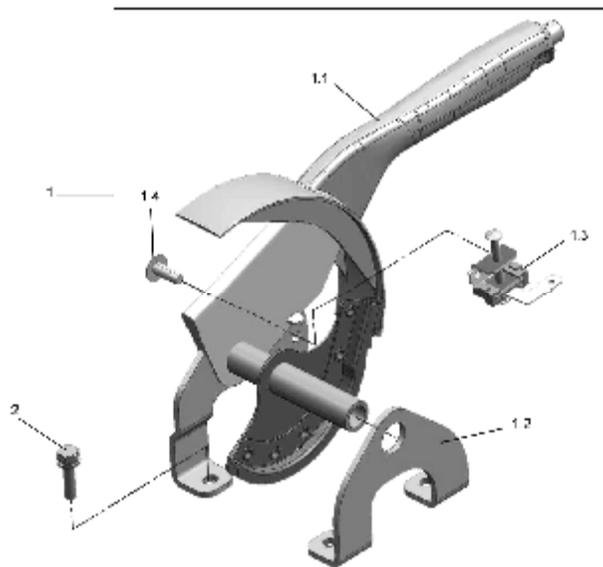
2 Parking Brake System

Parking brake system adopts console parking control mechanism, and is connected to the left and right sides of rear wheel through hand-brake cables. Parking brake and service brake system is one system, which simplified the parking mechanism.

The adjustment of parking brake is mainly made at parking lever.

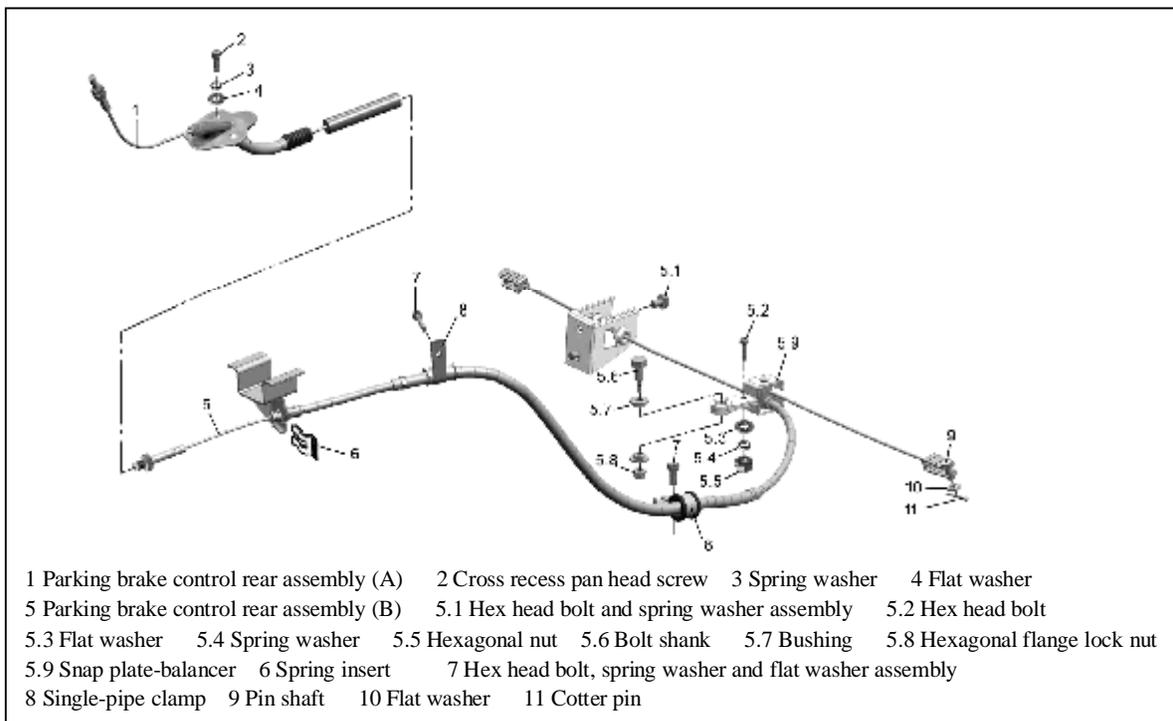
The structure of parking brake system:

Front

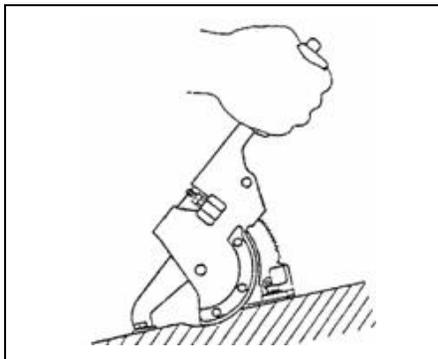


1. Parking brake control mechanism assembly
- 1.1 Parking brake lever assembly
- 1.2 Parking brake lever support plate
- 1.3 Parking brake switch assembly
- 1.4 Parking brake switch fixing screw
2. Hex-head bolt, flat washer, spring washer assembly

Rear



- | | | | |
|---|--|---|----------------|
| 1 Parking brake control rear assembly (A) | 2 Cross recess pan head screw | 3 Spring washer | 4 Flat washer |
| 5 Parking brake control rear assembly (B) | 5.1 Hex head bolt and spring washer assembly | 5.2 Hex head bolt | |
| 5.3 Flat washer | 5.4 Spring washer | 5.5 Hexagonal nut | 5.6 Bolt shank |
| 5.7 Bushing | 5.8 Hexagonal flange lock nut | | |
| 5.9 Snap plate-balancer | 6 Spring insert | 7 Hex head bolt, spring washer and flat washer assembly | |
| 8 Single-pipe clamp | 9 Pin shaft | 10 Flat washer | 11 Cotter pin |



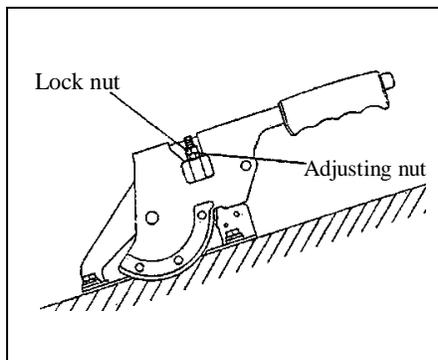
Adjustment of parking brake:

- (1) Check for correct installation of parking control mechanism

Pull parking lever, and note down the number of teeth. Under a pulling force of 196N, you should be able to pull 7-9 teeth (3/4 of the total number of teeth).

- (2) Adjust parking control mechanism when necessary

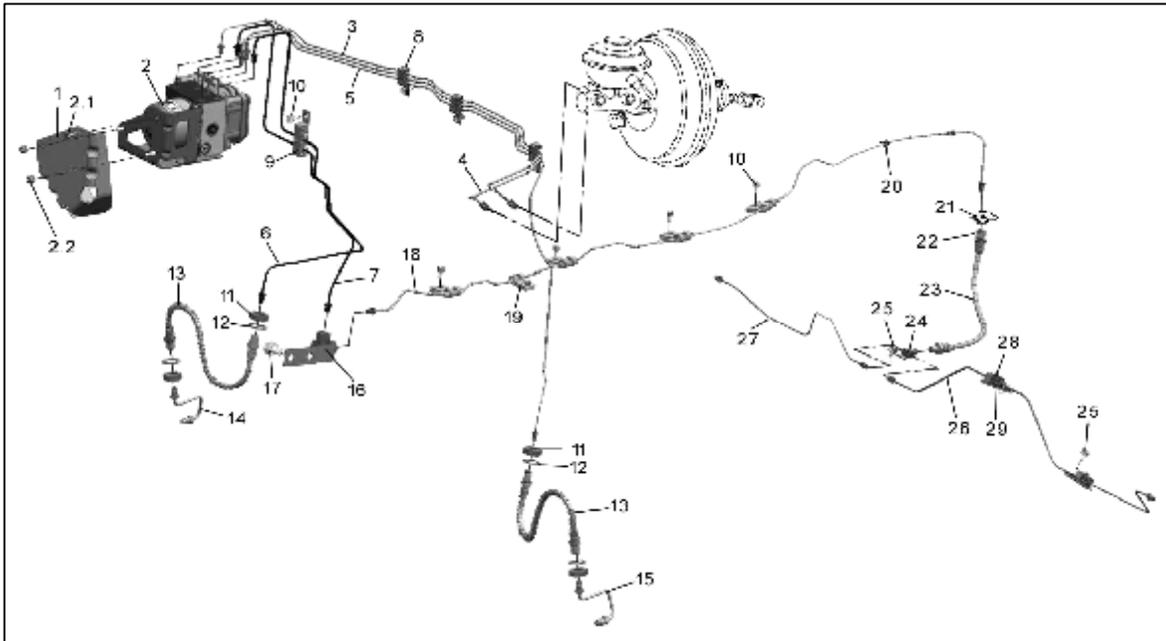
Caution: Before adjusting parking mechanism, brake clearance of rear wheel must be adjusted.



- (a) Remove boot of parking control mechanism.
- (b) Loosen nut, rotate and adjust nut until brake travel is correct.
- (c) Tighten nut.
- (d) Install control mechanism protective cover.

Brake Line Layout Schematic Diagram and Relevant Torque Requirements

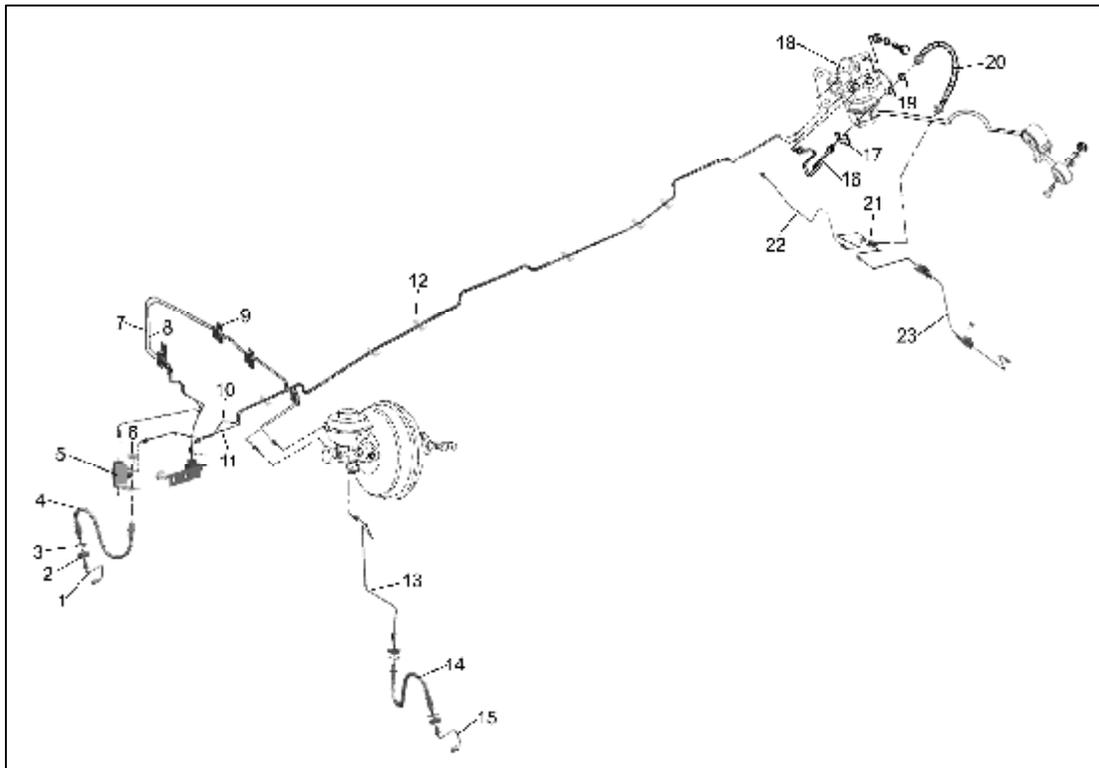
Brake line layout (4×2)



Parts List:

- | | | | |
|-----|---|----|---|
| 1 | ABS bracket | 15 | Brake caliper oil pipe (left) |
| 2 | ABS functional module | 16 | rear brake two-way assembly |
| 2.1 | Hex head bolt | 17 | Hex head bolt, spring washer and flat washer assembly |
| 2.2 | Hexagonal nut spring washer flat washer | 18 | Rear brake oil pipe assembly 2 |
| 3 | Master brake cylinder to ABS oil pipe assembly 1 | 19 | Single-pipe clamp assembly $\Phi 6.5$ |
| 4 | Master brake cylinder to ABS oil pipe assembly 2 | 20 | Single-pipe clamp ring |
| 5 | Left front brake oil pipe assembly | 21 | Spring insert |
| 6 | Right front brake oil pipe assembly | 22 | Open retainer |
| 7 | Rear brake oil pipe assembly 1 | 23 | Rear brake hose assembly |
| 8 | Three-pipe pipe clamp assembly (6.5) | 24 | Rear brake three-way assembly |
| 9 | Five-pipe pipe clamp assembly | 25 | Hex head bolt, spring washer and flat washer assembly |
| 10 | Hex head bolt, spring washer and flat washer assembly | 26 | Left rear brake oil pipe assembly |
| 11 | Hexagonal thin nut | 27 | Rear right brake oil pipe assembly |
| 12 | External tooth lock washer | 28 | Three-pipe pipe clamp assembly (8.5) |
| 13 | Front brake hose assembly | 29 | Brake oil pipe fixing bracket |
| 14 | Brake caliper oil pipe (right) | | |

Brake line layout (4×4)

**Parts List:**

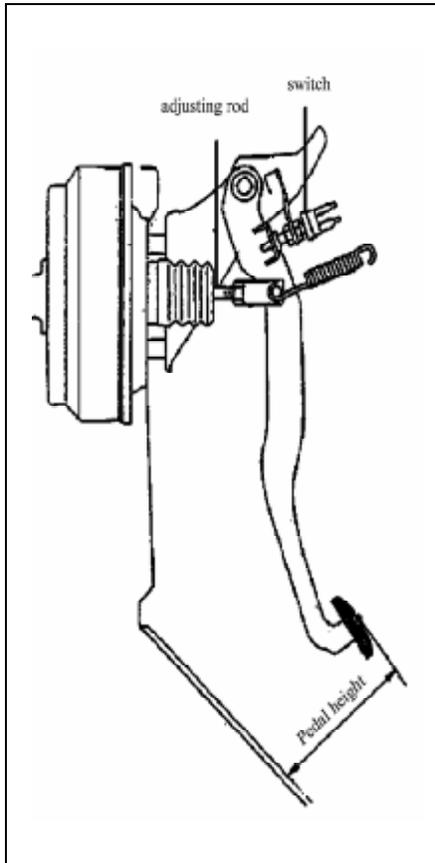
- | | |
|---|--|
| 1. Oil pipe assembly (right) | 14. Front brake hose assembly |
| 2. Hexagonal thin nut | 15. Oil pipe assembly (left) |
| 3. External tooth lock washer | 16. Load sensing valve transitional oil pipe assembly |
| 4. Right front brake hose assembly | 17. Spring insert |
| 5. Right three-way assembly | 18. Load sensing proportioning valve with bracket assembly |
| 6. Hex head bolt, spring washer and flat washer assembly | 19. Open retainer |
| 7. Right front brake oil pipe assembly | 20. Rear brake hose assembly |
| 8. Master cylinder to two-way brake oil pipe assembly | 21. Rear brake three-way assembly |
| 9. Three-pipe pipe clamp assembly (6.5) | 22. Rear right brake oil pipe assembly |
| 10. Right three-way to load sensing valve brake oil pipe assembly | 23. Left rear brake oil pipe assembly |
| 11. Two-way to load sensing valve brake oil pipe assembly | 24. Three-pipe pipe clamp assembly (8.5) |
| 12. Two-pipe pipe clamp assembly | 25. Rear brake two-way assembly |
| 13. Left front brake oil pipe assembly | |

The tightening torque of brake tube fitting should be $18 \pm 2 \text{ N.m}$.

Over-tightening would result in serious deformation of the fitting and damage of sealing face.

Re-assembled pipeline or brake system pipeline having air inside must be bled, so as to prevent air in the pipeline from affecting the braking effect. After air in all wheel brake cylinders are removed, check fluid level height in oil cup. If necessary, replenish brake fluid, and maintain the engine at idle speed.

Principle of bleeding: Bleeding should be carried out in the principle from far to near, i.e., rear right wheel — Left rear wheel — Right front wheel — Left front wheel.



Inspection and Adjustment of Brake Pedal

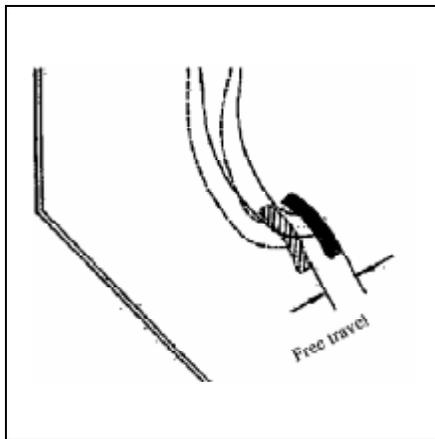
Inspection and adjustment of brake pedal

- (1) Check if brake pedal height is correct

Distance of pedal to floor: 160-170mm. If incorrect, adjust.

- (2) Adjust pedal height when necessary

- (a) Fully turn on brake lamp switch
- (b) Loosen control fork nut
- (c) Rotate control fork to adjust pedal height
- (d) Reverse brake switch until it comes into contact with its stop plate
- (e) After adjusting pedal height, adjust the free travel of the pedal
- (f) Lock control fork nut (37N.m)



- (3) Check free travel of pedal

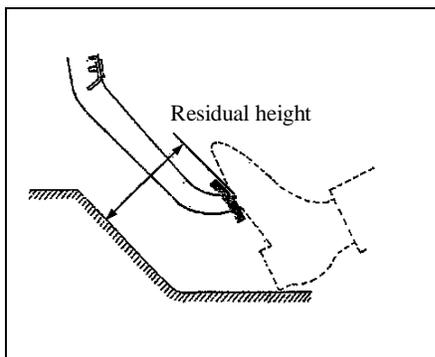
- (a) Shut down the engine, step the pedal several times until booster is free from vacuum.
- (b) Use your hand to press the pedal until no reaction force can be felt. Measure the space as specified in the diagram.

Pedal free travel: 3-6mm

Caution: Free travel is the clearance between the pin and the control fork.

- (4) Adjust pedal free travel when necessary.

- (a) If incorrect, rotate the control fork to adjust the pedal free travel.
- (b) Start the engine to confirm that there exist pedal free travel.
- (c) After adjusting free travel, check pedal height.



- (5) Check if pedal residual height is correct

Release parking brake, and with the engine running, step the pedal by 490N force, and measure the pedal residual height (as shown in the Fig.). The height should be greater than 59mm. If incorrect, check and repair the brake system.

Faults and Repair of Brake System

Initial inspection	Causes	Maintenance and repair and adjustment
Vehicle deviation	<ol style="list-style-type: none"> 1. Wheels are different in pressure. 2. Tyre is worn. 3. Left/right wheel brake. 4. Left/right wheel friction disk is worn. 5. Brake caliper piston is stuck. 6. Brake caliper piston is stuck. 7. Brake caliper is seized. 8. Brake caliper guide pin is loose or corroded. 9. Brake shoe is unsuitable. 10. Brake disk is worn. 11. Brake disk is damaged. 	<ol style="list-style-type: none"> 1. Charge as per specification, left/right tyres are the same in pressure. 2. Maintain even wear for left/right tyres. 3. Re-adjust. 4. Check, repair or replace. 5. Clean or replace. 6. Repair or replace. 7. Repair. 8. Tighten or replace. 9. Replace or repair. 10. Replace. 11. Replace.
Brake noise	<ol style="list-style-type: none"> 1. Friction lining is wet or contaminated with brake fluid or other grease. 2. Friction lining is worn seriously (sharp noise). 	<ol style="list-style-type: none"> 1. Check, air dry or replace. <p>Acceptable noise produced in emergency braking is friction disk normal noise.</p> <ol style="list-style-type: none"> 2. Replace friction lining.
Brake drum is too hot	<ol style="list-style-type: none"> 1. Wheel hub bearing is loose or damaged. 2. Brake caliper or wheel cylinder piston is stuck or seized. 3. Brake caliper is stuck on bushing or slide rail. 4. Brake caliper mounting bracket is loose. 5. Brake drum or brake shoe is deformed. 6. Parts are assembled incorrectly. 7. Master cylinder compensating orifice is blocked 	<ol style="list-style-type: none"> 1. Tighten or replace as per requirements. 2. Check and repair, and replace if necessary. 3. Check and repair, or replace if necessary. 4. Check and tighten. 5. Repair or replace. 6. Re-install correctly. 7. Check and clean, or replace.
Brake pedal is soft	There is air in the pipeline.	Re-bleed.
Brake pedal sinks (pedal force unchanged)	<ol style="list-style-type: none"> 1. Pipeline leaks. 2. Wheel cylinder leaks. 3. Master cylinder leather cup is worn or damaged. 	<ol style="list-style-type: none"> 1. Check fitting is tight, and replace if necessary. 2. Check and replace if necessary. 3. Replace.
Brake pedal is hard	<ol style="list-style-type: none"> 1. Friction lining is wet, contaminated or worn. 2. Vacuum booster non-valve failed. 	<ol style="list-style-type: none"> 1. Check, air dry, or replace if necessary. 2. Check and repair, or replace if necessary.
Brake pedal pulsates	<ol style="list-style-type: none"> 1. Brake disk end play is too big or thickness is changed. 2. Brake drum is out of roundness 3. Wheel hub bearing is loose. 4. Brake caliper is loose. 	<ol style="list-style-type: none"> 1. Check and repair, or replace if necessary. 2. Check and repair, or replace if necessary. 3. Tighten to specified torque. 4. Re-tighten.

Maintenance of ABS

Section I Description and Operation

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Section I Description and Operation

Precautions for Maintenance

When servicing and repair ABS brake system, the following precautions must be taken, otherwise, ABS brake system might be damaged.

- Before engaging soldering operation, disconnect wire bundle from electronic brake control module.
- ABS brake system parts and assemblies are very sensitive to EMI (electromagnetic interference). Care should be taken for wiring, locating, positioning and installation of all ABS brake system parts and assemblies, including fittings, clamps and brackets.
- Do not use quick charger to start the engine or the battery still in connection, as this might damage the battery or parts and assemblies of ABS brake system.
- Disconnect the battery by turning off the ignition
- Disconnect ECU wire bundle from the ECU used for turning off ignition.
- Do not modify any ABS brake system parts and assemblies. All ABS parts and assemblies can only be serviced by replacing.
- Do not hang suspension parts and assemblies on wheel speed sensor cable, or the cable would be damaged.
- Do not place ECU in an environment of over 105°C.
- Do not use fluid with petroleum base in brake master cylinder, and do not re-use a container containing petroleum base fluid previously. Petroleum causes rubber parts and assemblies hydraulic brake system to expand and deform, that would allowing water getting the system and reducing the boiling point of the fluid.。

Description of General System

The function of DBC 7.4 ABS brake system is to minimize wheel slipping in emergency braking. Its principle is to monitor the speed of each wheel and control the brake fluid pressure applied to each wheel when braking is made. It would make it easy for the driver to maintain the driving direction stable and improve the steer ability of the vehicle.

Abbreviations and Definitions

ABS:	Antilock Brake System
B+:	Battery Voltage
HCU:	Hydraulic Control Unit
CKT:	Circuit
DRP:	Dynamic Rear Proportioning
DLC:	Data Link Connector
DMM:	Digital Multi Meter
ECU:	Electronic Control Unit
EMI:	Electromagnetic Interference
HCU:	Hydraulic Control Unit
IP:	Instrument Panel (Dash)
LDM:	Lamp Driver Module
PCM:	Powertrain Control Module
TCS:	Traction Control System
WSS:	Wheel Speed Sensor

ABS System Description

Hydraulic Control Unit

Hydraulic control unit (HCU) is installed inside engine compartment, and used to control brake fluid in each wheel hydraulic circuit when ABS braking is made. During the process of normal braking, Hydraulic control unit maintains or reduces the brake fluid pressure of each wheel, irrespective of the magnitude of pressure in the brake master cylinder.

Hydraulic control unit (HCU) is an assembly that can not be repaired, so do not disassemble it. It should be replaced if it becomes faulty.

HCU adopts a four-circuit configuration, including circuits for Left front, Right front, Left rear and rear right wheels.

HCU also includes some other parts, which will be introduced as follows:

Pump Motor

HCU includes a recirculation pump driven by a motor. During the process of ABS braking, it reduces the pressure, and delivers brake fluid from brake caliper into master cylinder.

ABS Brake System (ABS) Valves

ABS valves reduce or maintain brake fluid pressure in each wheel circuit. They are four apply valves and four release valves. When making ABS braking, electronic brake control module (ECU) instructs these valves to reach their correct positions. In ABS braking mode, the pressure in each hydraulic circuit may maintain pressure or bleed by activating corresponding valves. In normal state, apply valves are open, and release valves are closed. It thus makes the pressure in master cylinder directly reach braking value when normal braking is made. ABS valves are indispensable for integral parts of HCU, and can not be serviced independently.

Electronic Control Unit (ECU)

The main functions of ECU are as follows:

- Monitor input of wheel speed sensor
- Detect wheel slipping tendency
- Control the brake system in ABS mode

Monitor system is to ensure normal electrical operation.

ECU continuously checks the speed of each wheel, so as to determine if wheel begins slipping. If wheel slipping tendency is detected, ECU adjusts valves to corresponding positions to regulate brake fluid pressure in some or all circuits, so as to prevent wheels from slipping and provide optimum braking. ECU continues to the pressure in various hydraulic circuits until slipping tendency disappears. The electronic brake control module can also continuously monitors ABS for normal operation. If ECU detected a fault, it will cutoff ABS function, and illuminates an ABS system warning lamp on instrument panel. ECU also controls the display of diagnosis fault codes in diagnosis mode.

Following parts and assemblies of ECU can not be repaired:

- ABS valve coil
- Electromagnetic power relay
- Motor relay

Wheel Speed Sensor and Ring Gear

Wheel speed sensor uses a small AC voltage to transmit wheel speed information to ECU. Each wheel is equipped with one wheel speed sensor. This voltage is generated by ring gear through magnetic induction of static sensor. The strength and frequency of this AC voltage is proportional to wheel speed, and both of them increase as the speed increases.

**Separated wheel speed sensor and
ring gear**

Four wheel speed sensors are installed respectively on the vehicle at location adjacent to wheel ring gears. The sensor and ring gear can be serviced separately.

ABS Warning Lamp

ABS brake warning lamp (ABS) is located in instrument panel. If ECU detected an ABS fault, the lamp would come on. ABS brake warning lamp notifies the driver that the braking function of ABS is turned off. If only ABS brake warning lamp comes on, normal braking can be made. The conditions for ECU to control ABS brake warning lamp are as follows:

1. When ABS system functions normally, ECU will turn off ABS brake warning lamp.
2. When ECU detected an ABS fault, ECU will illuminate ABS warning lamp.
3. In ignition operation, ECU will turn on ABS brake warning lamp for about 3 sec, and then, turn it off.

Brake Warning Lamp

The illumination of red brake warning lamp in instrument panel indicates that there is a fault in driver brake system, which might result in decrease of braking ability. When parking brake is used and not yet fully released, the lamp would come on. If brake fluid level switch is turned off (the switch is turned off when brake fluid in master cylinder oil reservoir is comparatively low), brake warning lamp would remain on all the time until the fault is removed. Failure of some modes of DBC 7.4 system might also illuminate this lamp, informing the driver that DRP is out of use.

Brake Switch

Brake switch feeds signal to ECU.

ECU judges if brake pedal is stepped according to the state of the brake switch.

Operation of ABS System

ABS Brake Mode

If wheel slipping is detected while braking, ABS enters into ABS brake mode. During the process of ABS braking, the pressure of each wheel hydraulic circuit is under control, so as to prevent wheel from slipping. Each wheel is equipped with an independent hydraulic pipeline and specific valves, or each pair of front wheel and rear wheel equipped with an independent hydraulic pipeline and specific valves. ABS may decrease, maintain or increase hydraulic pressure of various wheel brakes. However, ABS is unable to increase the hydraulic pressure to over the pressure value delivered by master cylinder during the process of braking. During the period of ABS braking, a series of pulsations can be felt on the brake pedal. The pulsation is induced by fast change of the position of each valve as required by the wheel speed. The pulsation of pedal occurred in ABS braking will disappear when normal braking is made or vehicle is stopped fully. In quick circulative operation of solenoid valve, sound of ticks or blaster can be heard. When ABS braking is initiated on dry road surface, tyres may produce interrupted sharp sound when slipping is about to happen. These sounds and pedal pulsation are normal during the operation of ABS brake. The operation of brake pedal in normal braking should be the same as that of the system without ABS. While maintaining the vehicle stability, even pedal force can ensure a minimum vehicle stopping distance.

Maintenance of Pressure

When ECU senses wheel slipping, it will close the inlet valve and the outlet valve in HCU, so as to isolate the system. In this way, it is able to

maintain the pressure on the brake stable, without increasing or decreasing the hydraulic pressure.

Release of Pressure

If in the pressure maintaining mode, ECU still senses wheel slipping, it will decrease the pressure of the wheels affected. The inlet valve remains closed, and outlet valve opens. Excessive fluid/pressure will be stored in the accumulator of HCU until pump is able to pump brake fluid back into master cylinder reservoir.

Application of Pressure

If in the pressure maintaining or release modes, ECU detected that wheel slipping is reducing, ECU will use master cylinder pressure to increase the pressure of the wheels affected. The inlet valve opens and the outlet valve closes. Part or all pressure coming from brake master cylinder will be applied on to the wheels.

Tyre and ABS**Spare Tyre**

The use of spare tyre would not affect the operation of ABS. ECU software may make compensations for this smaller tyre. However, vehicle stopping distance might be increased as the groove of the spare tyre is shallow.

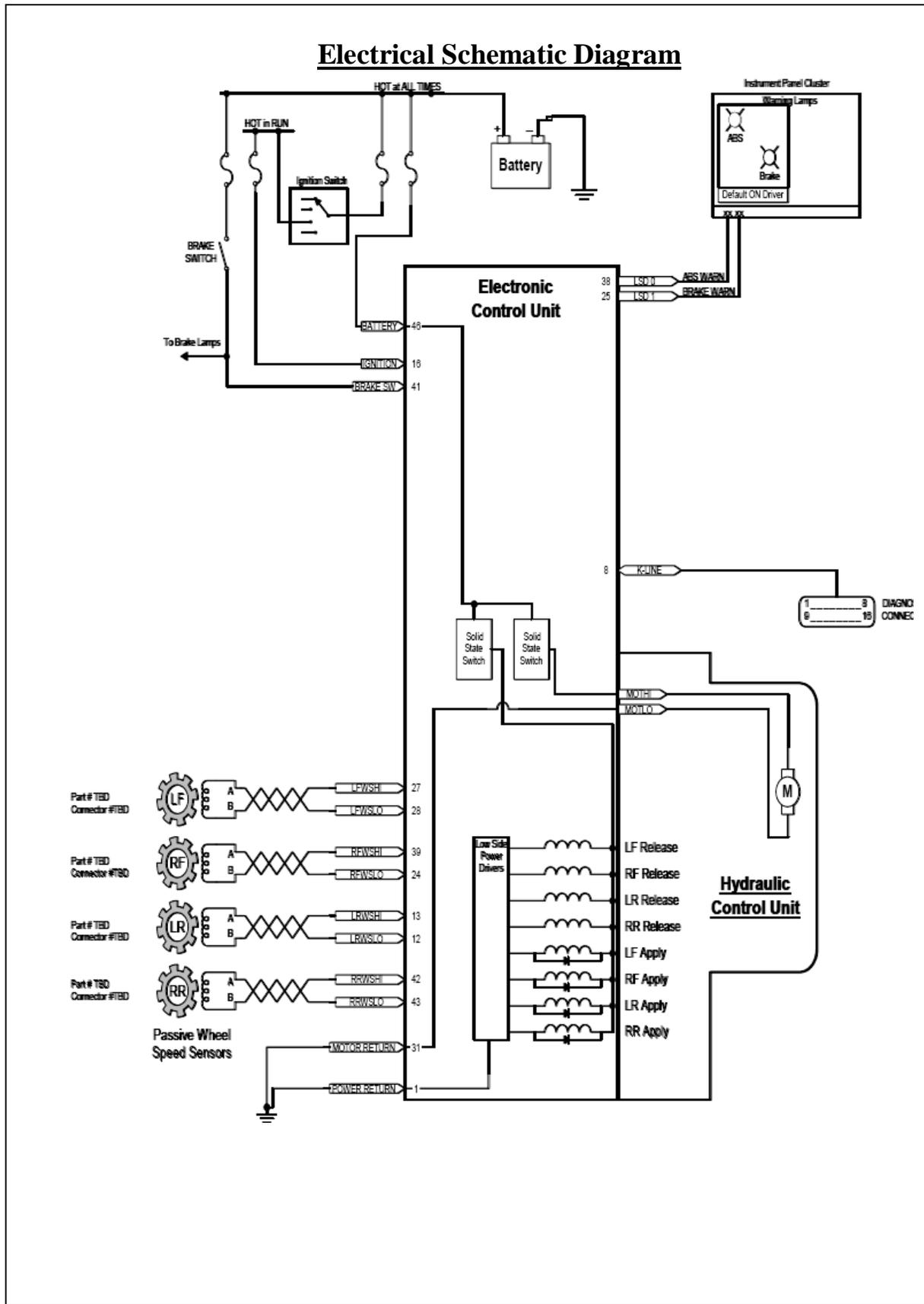
Replacement of Tyre

The size of tyre has comparatively great influence on the performance of ABS. The tyre to be replaced must be same as the original one in size, load range and shrinkage. Using any other tyres of different size or type might seriously influence the operation of ABS.

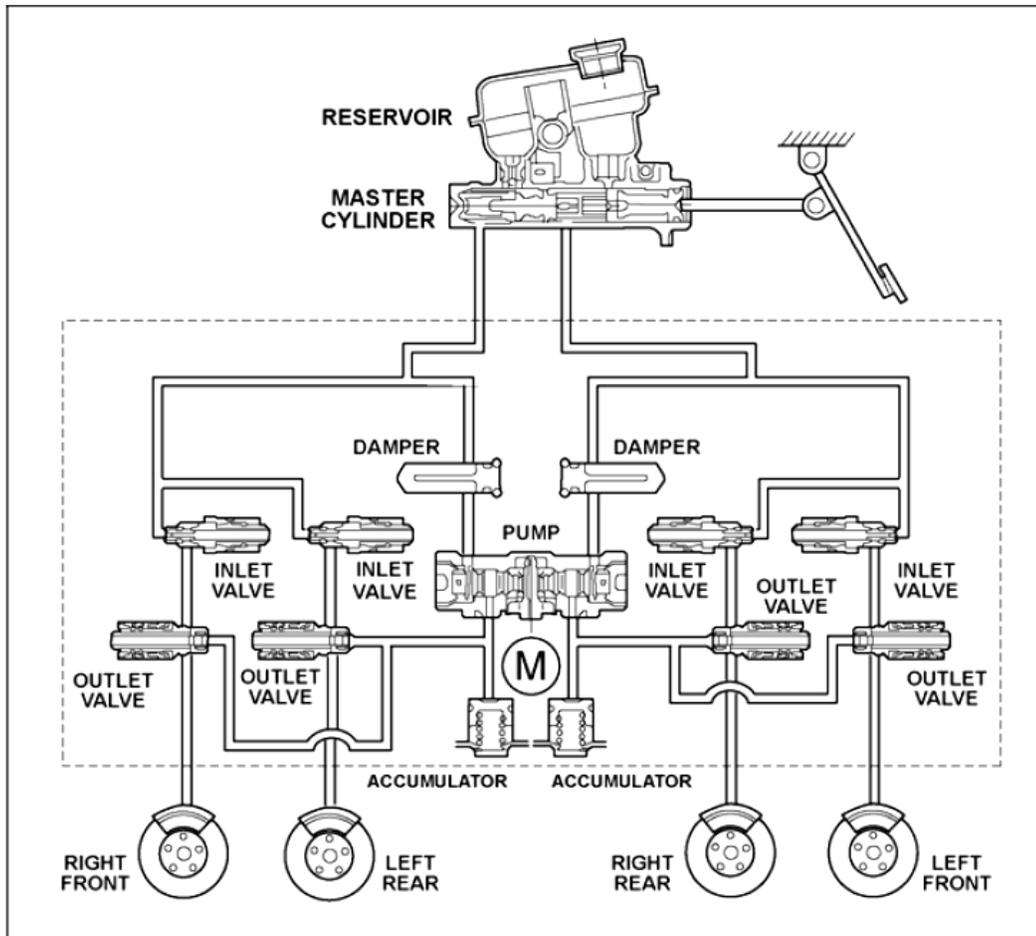
Dynamic Rear Proportioning (DRP)

Dynamic rear proportioning (DRP) is a proportioning system used to maintain vehicle stability while braking. Under normal braking conditions, effective balancing of brake needs even wheel speed. In case of difficult braking, as the weight of vehicle is shifted on to front wheel, the braking force required by rear wheel is comparatively smaller. DRP uses ABS rear apply valves and release valves to maintain the brake pressure required by rear wheels, so as to provide effective braking and vehicle stability. The red brake warning lamp will come on if the following faults occur:

- Both wheel speed sensors on the same shaft are out of function.
- Any one solenoid valve is faulty.
- Battery is open circuit or shorted to ground.
- ECU is grounded or open or shorted to the battery.
- Ignition circuit is open or shorted to ground.
- ECU failed internally.
- Electromagnetic power relay is faulty.

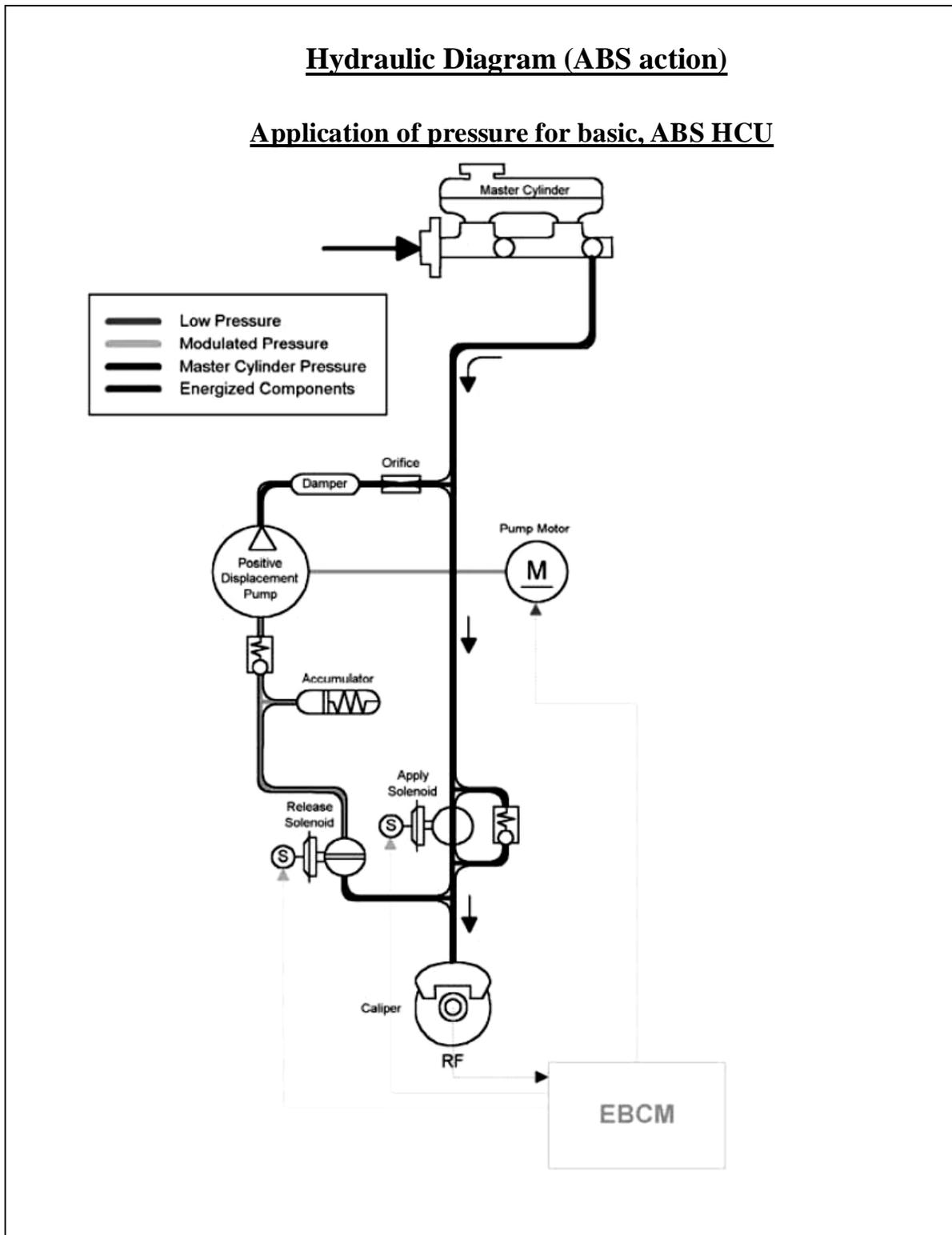


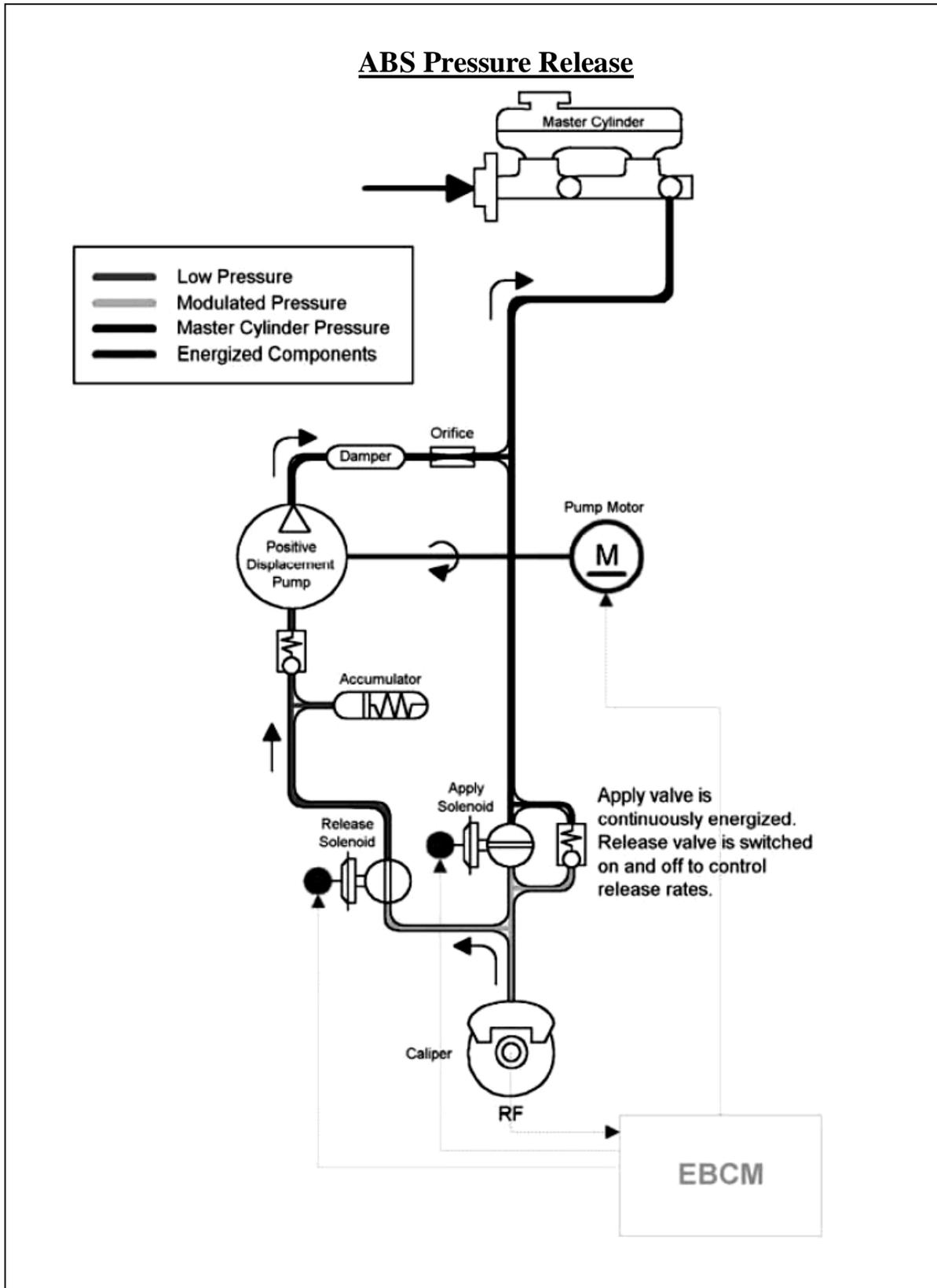
System and Hydraulic Diagram

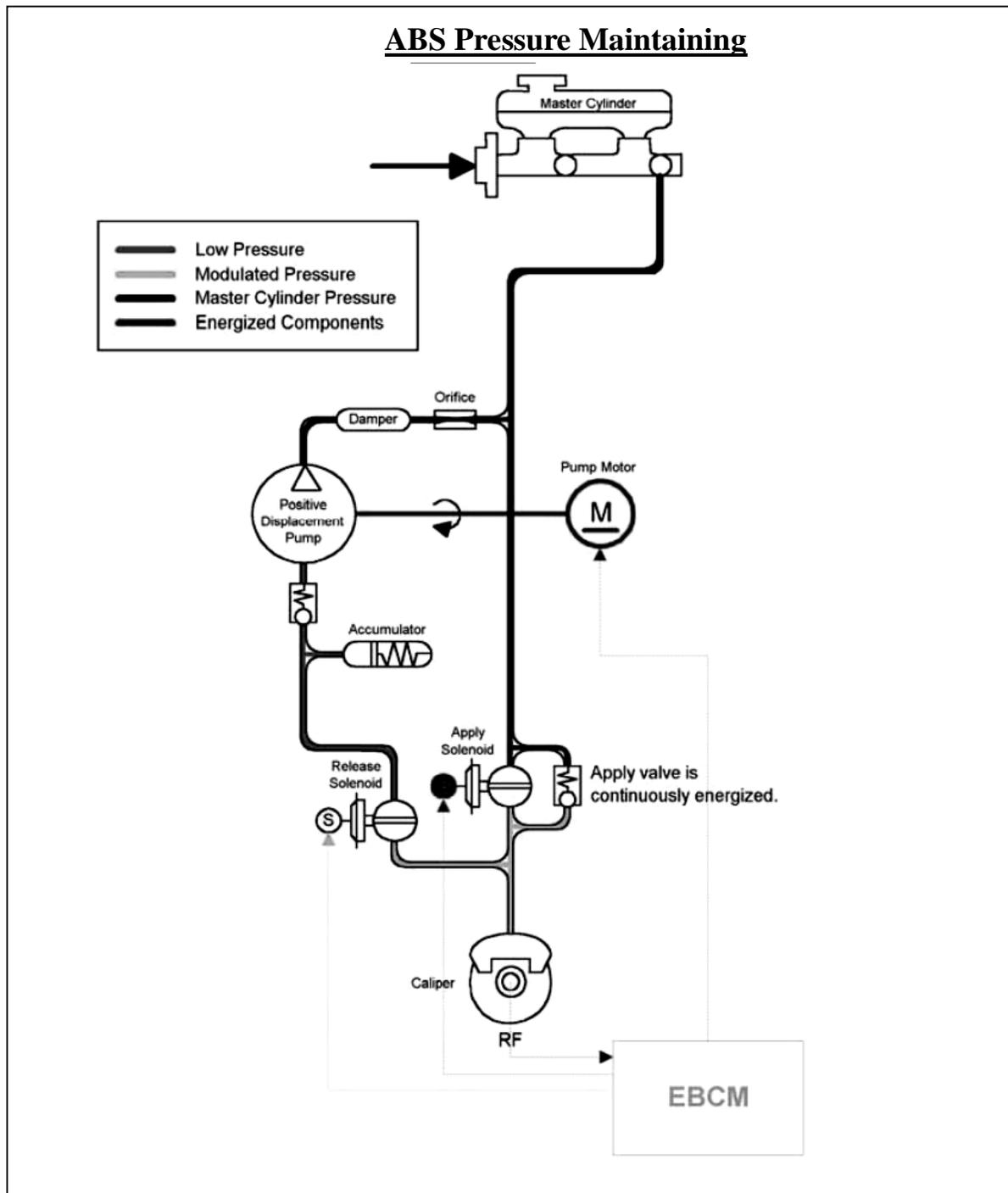


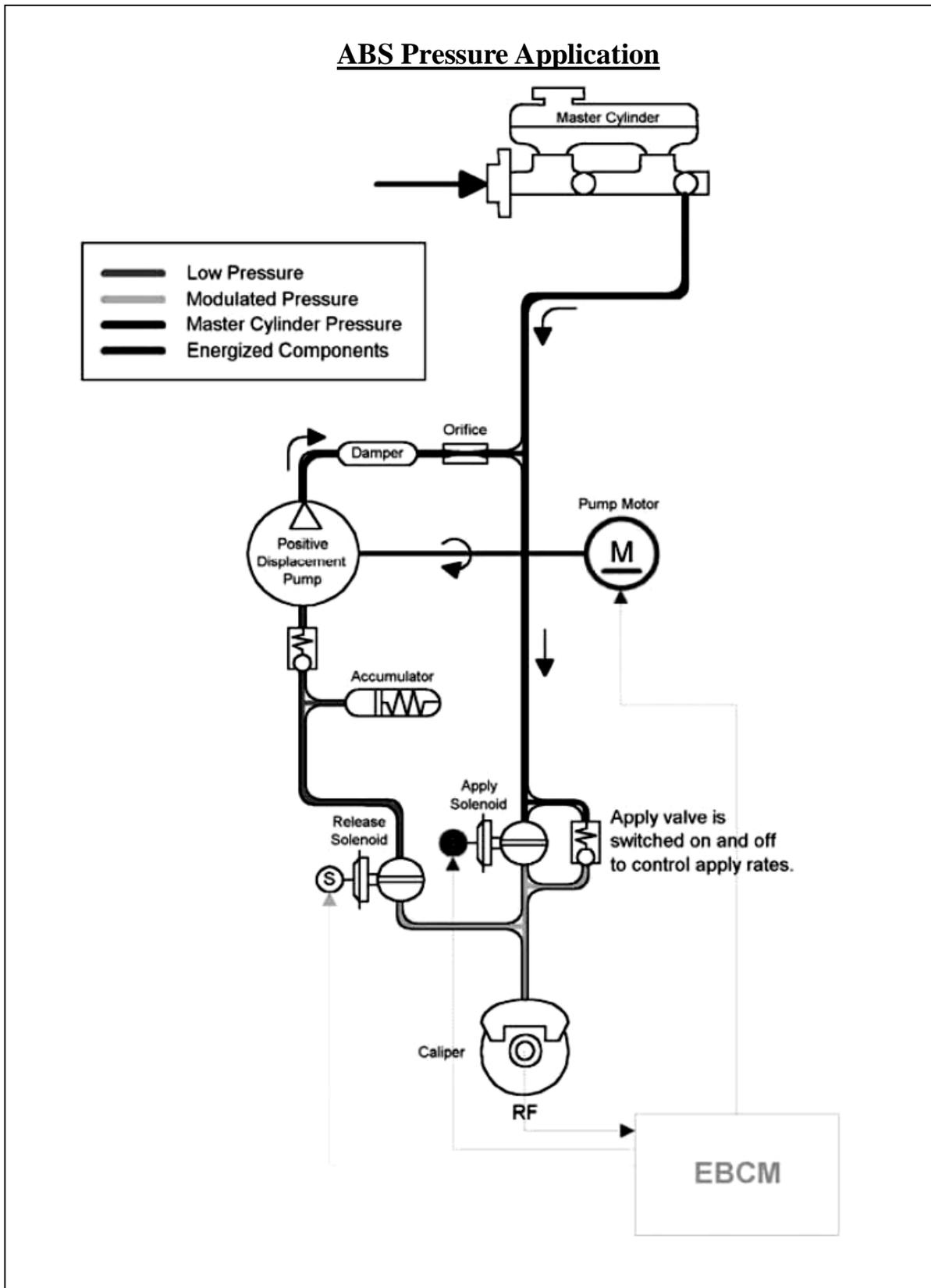
Hydraulic Diagram (ABS action)

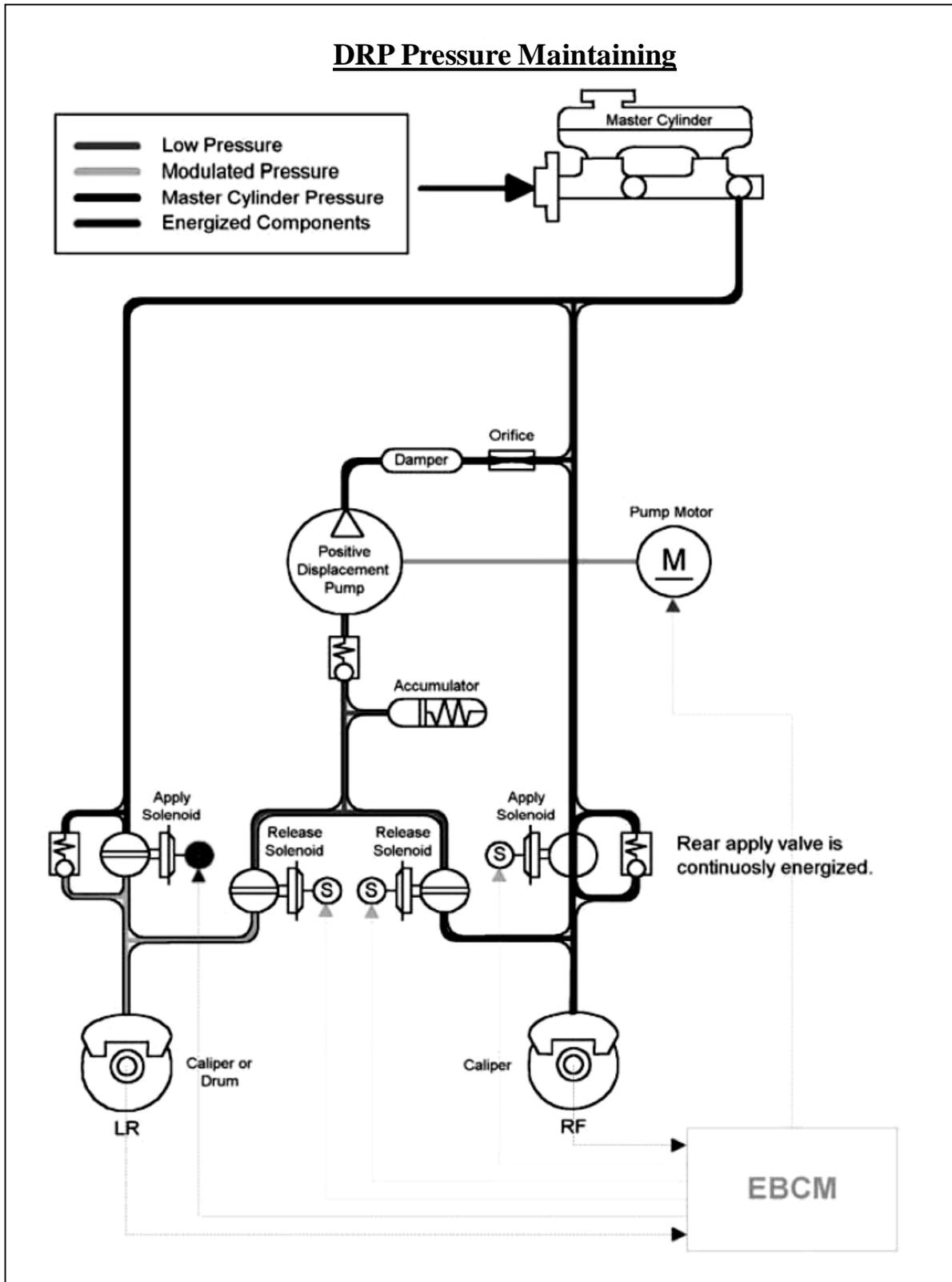
Application of pressure for basic, ABS HCU

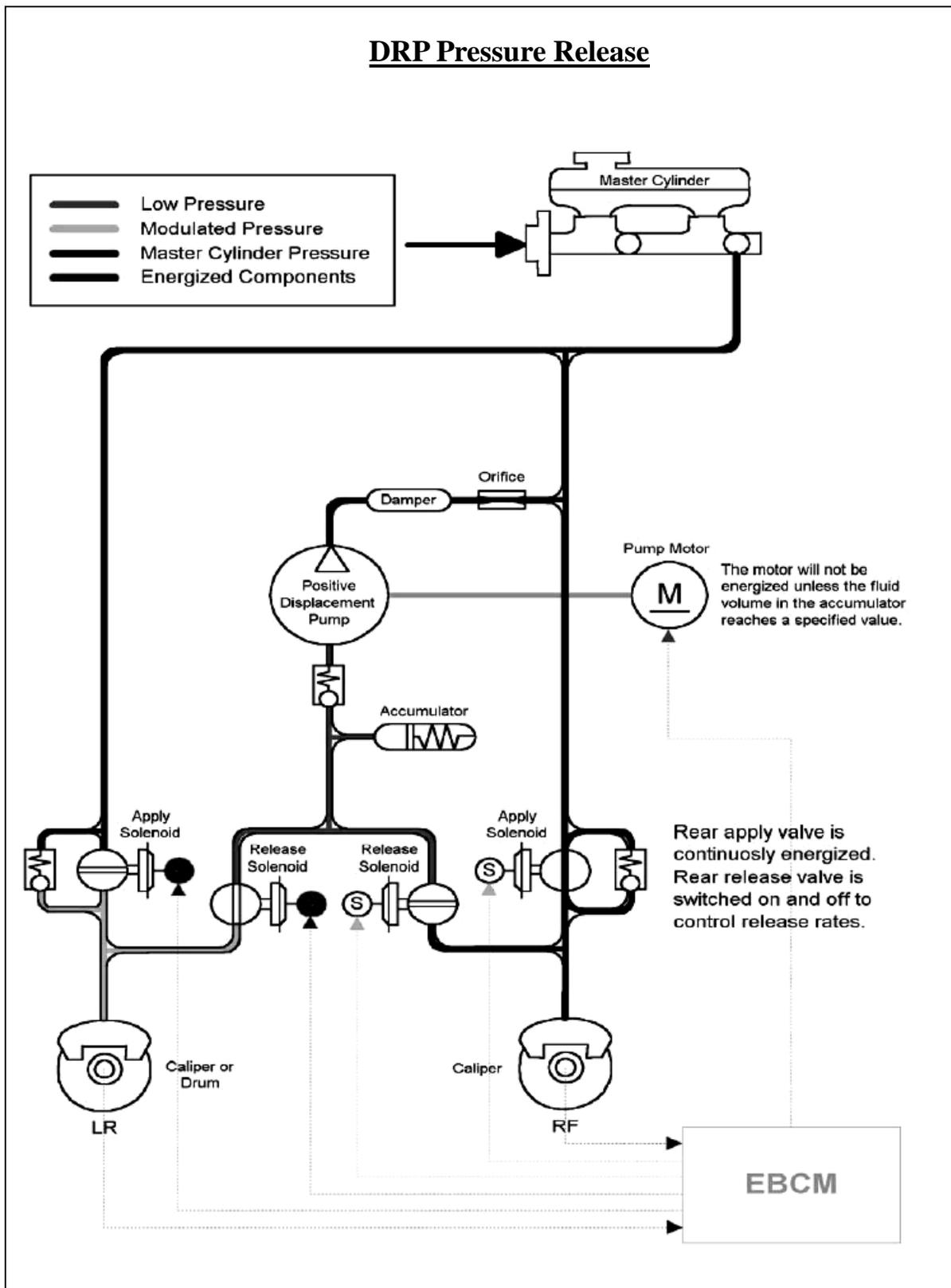


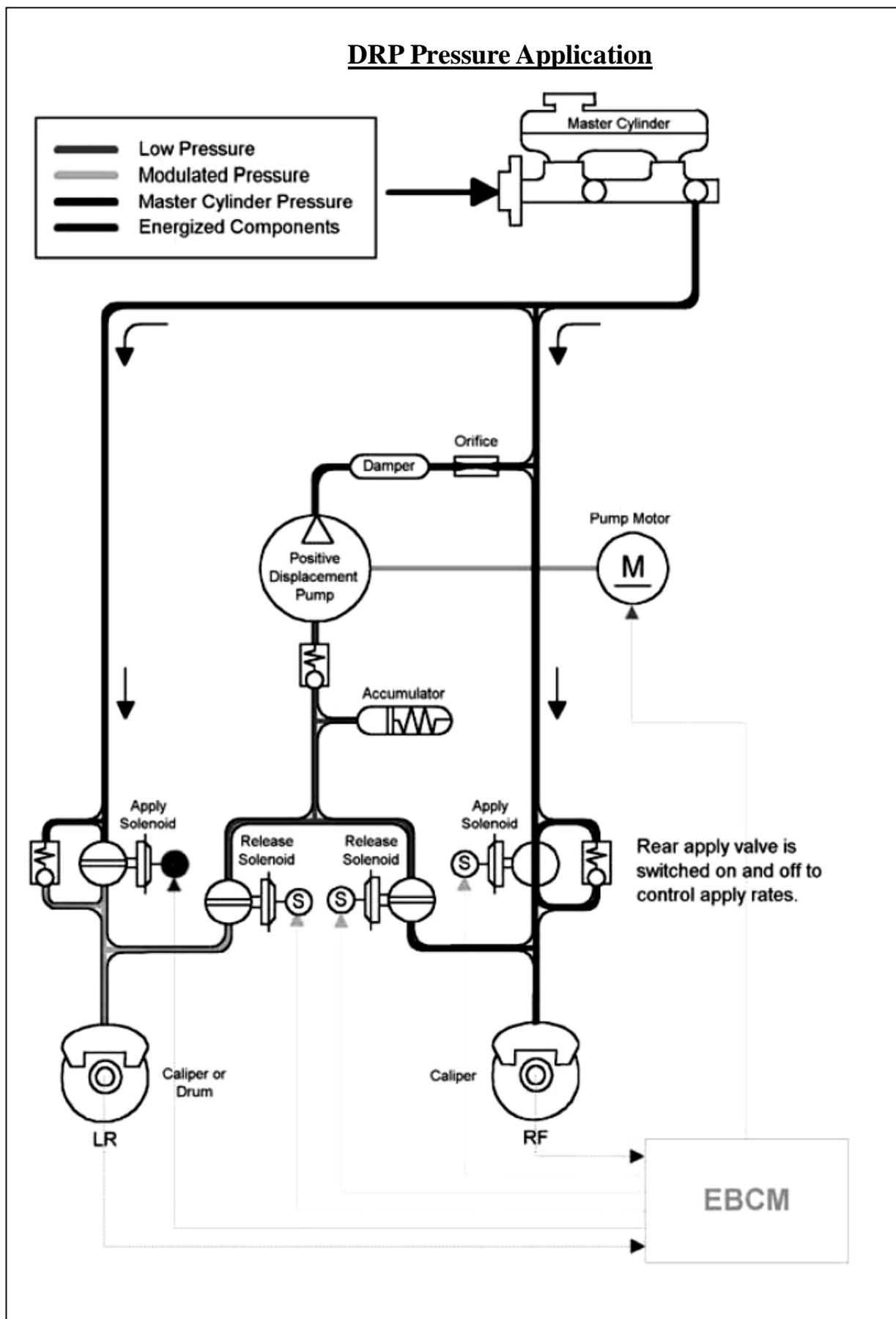


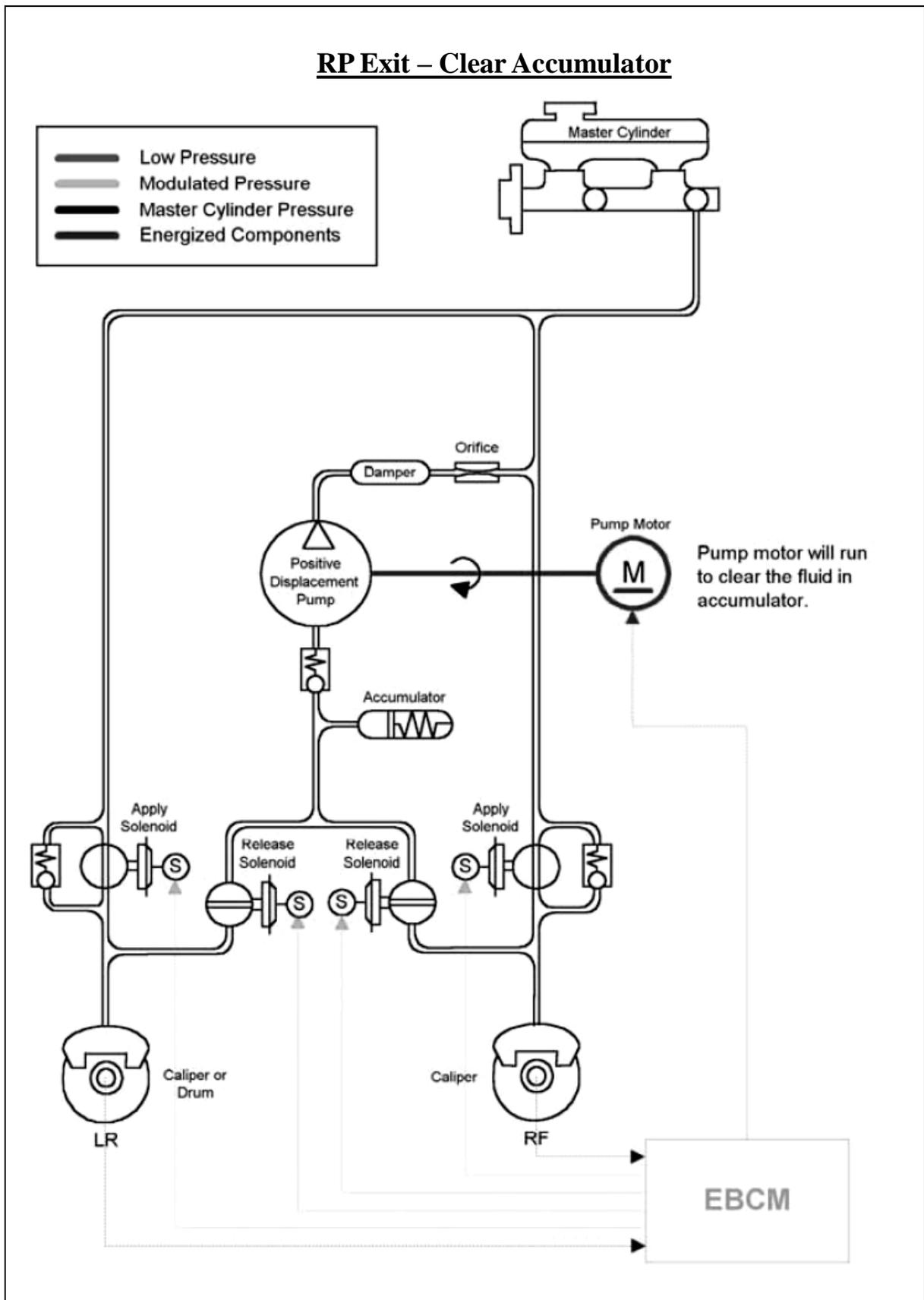




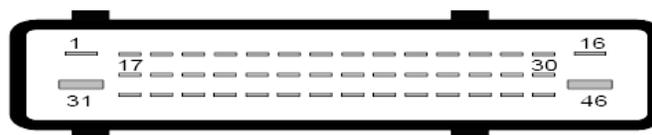








Cable terminals and distribution of pins of ECU (ABS)



DBC7.4 CONNECTOR

(View looking into header cavity)

Pin layout		
Pin No.	Description of signals	Abbreviations
1	Ground	POWERRTN
8	Keyword 2000 (K-line) communication	KW2000
12	Left rear wheel speed low	LRWSLO
13	Left rear wheel speed high	LRWSHI
16	Ignition	IGN
24	Right front wheel speed low	RFWSL
25	Brake warning lamp	LSD1
27	Left front wheel speed high	LFWSHI
28	Left front wheel speed low	LFWSLO
31	Motor ground	MOTORRTN
38	ABS warning lamp	LSD0
39	Right front wheel speed high	RFWSHI
41	Brake switch	BRAKESW
42	Right rear wheel speed high	RRWSHI
43	Right rear wheel speed low	RRWSLO
46	Battery	BATT

Fault Diagnosis

Self Diagnosis

ECU carries out self diagnosis for the system. ECU may detect and isolate system faults. Once a fault is detected, it sets a diagnostic trouble code (DCT) representing that fault, illuminates ABS warning lamp, and turns off ABS in a certain ignition cycle if necessary.

1 Display of Diagnostic Trouble Code

ECU uses X-431 electronic detector equipment to display diagnostic trouble code.

2 Clear of Diagnostic Trouble Code

Diagnostic trouble codes in ECU memory can be cleared by the following two methods:

1. By using diagnosis equipment.

2. By ignition cycle default.

No matter which method is used, one must check and make sure that the system is operating normally and diagnostic trouble code does not reappear after trouble codes are cleared.

Never attempt to clear diagnostic trouble codes by unplugging ECU connector, disconnecting battery cable or shutting down the engine (except setting as a default the trouble that does not appear after 100 ignitions).

3 Intermittent Fault or Poor Contact

Most intermittent faults occur in following conditions:

- Incorrect wiring
- Incorrect connection of cables
- Relay or solenoid valve sticking

As for how to locate and repair intermittent faults, refer to the Chapter “Troubleshooting in Electrical Diagnosis of Maintenance Manual”.

4 Check of Diagnostic Circuit

Diagnostic circuit may detect any problem due to ABS/DRP system failure.

After diagnostic circuit issues an information, maintenance and repair personnel should diagnose ABS/DRP fault following the instruction of diagnostic circuit.

ECU transmits and receives series data via terminal 8, receives battery voltage via terminal 46, and converts it to ignition voltage via terminal 16. ECU is grounded via terminal 1.

Items to be diagnosed for ABS/DRP system include:

- 1) Check if there is mechanical fault relevant to the brake system of the vehicle.
 - Fluid level in brake fluid reservoir is correct
 - Check and make sure that oil in master cylinder is free from contamination.
 - Check and make sure that brake master cylinder/HCU is free from leakage.
 - Check brake parts and assemblies of all wheels.
 - Confirm if there is brake drag (brake switch adjustment).
 - Confirm if brake is smooth (without drawback or leaning forward).
 - Check and make sure that brake shoes are not worn or damaged.
 - Check and make sure that wheel bearings are not worn or damaged.
 - Check wheel speed sensor and wiring.
 - Check and make sure that CV fitting/ring gear are not damaged.
 - Check groove depth and wear of tyres.
 - Road test vehicle, and correct any abnormalities.
- 2) Check diagnostic circuit, and proceed as per diagram of trouble diagnosis.

After removal of all system faults, clear ABS diagnostic trouble codes.

Procedures to Diagnose ABS/DRP system:

Step	Operation	Expected Value	Yes	No
1	1. If it is possible, connect or install all parts and assemblies disconnected or removed. 2. Ignite, shutdown engine. 3. Install suitable diagnosis equipment on to DLC, and make it communicate with ECU. Can diagnosis equipment communicate with ECU?		To Step 2	To Step 4
2	Are there any diagnostic trouble codes?		To step 3	To Step 7
3	1. Record current diagnostic trouble code. 2. Record past diagnostic trouble code. 3. Record intensified historical data, such as <ul style="list-style-type: none"> • Times of setting of each diagnostic trouble code • Times of setting of each diagnostic trouble code after initial setting • Times of setting of each diagnostic trouble code after last setting • Speed when diagnostic trouble code is set • Other intensified historical data that might be helpful for diagnosis 4. Do not clear diagnostic trouble code before information on diagnosis equipment are recorded.			
4	Can diagnosis equipment communicate with other modules in the same data line?		To Step 5	To Step 6
5	To "no communication with ECU" in Fault Diagram.			
6	To data link connector unit 50 of Electrical Diagnosis.			
7	1. Shut off. 2. Wait for 10 minutes. 3. Ignite, shutdown engine. 4. Observe orange ABS lamp after ignition. Do ABS warning lamp and brake warning lamp illuminate for 3 seconds and then go off? (bulb test)		To Step 8	To Step 9
8	System functions conform to those designed.			
9	Any lamp remains on?		To step10	To step11
10	To Fault Diagram of "Illumination" of corresponding lamp.			
11	To Fault Diagram of "Does not function" of corresponding lamp.			

Section II Maintenance

ABS Bleeding Program

Automatic ABS bleeding program is required to be executed after one of the following conditions occurs:

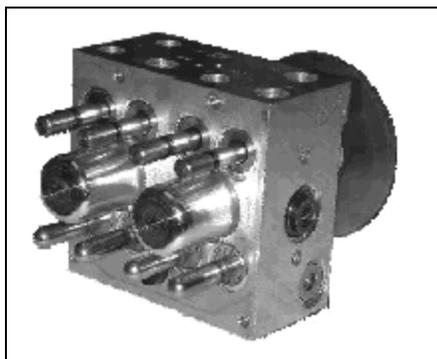
1. Traditional bleeding method of wheel cylinder body failed to realize the required pedal height or feel.
2. Replace HCU (hydraulic control unit).
3. Serious fluid loss occurred.
4. There is air sucked in.

Use X-431 diagnosis equipment to execute detection program. Rotate system valve, run the pump, and remove air from the second-stage circuit. These second-stage circuits are normally closed and open only in the initialization process at vehicle start and during the operation of ABS. Automatic bleeding program opens these second-stage circuits, permitting all air to flow into wheel cylinders, from where the air will be bled from the system.

Bleeding on Vehicle

Caution: Depressing the EXIT key on diagnosis equipment may terminate automatic bleeding program.

1. Select “Automatic bleeding program” on diagnosis equipment and carry on following the instructions.
2. During the process of basic and automatic bleeding, it is necessary to step the brake pedal and maintain the level of the fluid in the brake master cylinder.
3. Adjust pedal height and pedal feel properly, and guarantee the optimum ABS performance.
4. The first step of automatic bleeding program is to run pump and pressure release valve for about 30 seconds. Now, do not open or close bleeding bolt. Apply or release pressure to the brake pedal during the entire process.
5. Switch on the diagnosis equipment and loosen one bleeding bolt. Then, use the diagnosis equipment to cyclically check the apply valve and pump motor for about 30 seconds. During the whole process, brake pedal is applied with pressure or released.
6. Repeat Step 5 to bleed by using the rest of bleeding bolts.
7. When automatic bleeding program is completed, the diagnosis equipment will display corresponding information.
8. Step brake pedal to measure pedal height and feel. Repeat Steps 1 to 8 until the pedal is qualified. When operations are repeated, automatic bleeding program might stop temporarily and enter into “cool down hold” mode. The automatic bleeding mode will continue after the timer runs overtime, and this process can not be skipped.



Replacement of Electronic Control Module (ECU)

Removal (ECU)

Caution: Do not pry up ECU. Do not damage the sealing of ECU. If sealing is damaged while removing ECU, use silicone sealant to repair. If the damage of sealing is too serious to repair, replace ECU.

1. Shut off.
2. Remove any parts necessary to get access to ECU.
3. Disconnect wire bundle from ECU.
4. Remove four bolts securing ECU onto HCU.
5. Pull ECU backward and separate it from HCU until internal pump motor connector and all solenoids are separated from HCU, and remove ECU. During the process of removal, do not twist ECU, as this would damage the parts inside ECU.

Installation (ECU)

1. Use alcohol to clean ECU sealing and the surface of seal ring of HCU.
2. Align the solenoids of the two units with pump motor terminals.
3. Push ECU onto HCU, until ECU sealing washer surface comes into contact with the sealing surface of HCU.
4. Install the four bolts securing ECU onto HCU, and tighten them to 4-6N•m (33-55lb-in).
5. Connect ECU wire bundle to ECU.
6. Install all parts removed for getting access to ECU.
7. Turn on ignition switch with engine off.
8. Conduct diagnostic circuit check.

Tightening Torque of Fasteners

Application	N•m	Lb-ft	Lb-in
Brake tube fittings on HCU	16 - 22	12 - 16	
Bolts connecting ECU and ECU	4 - 5.1		35 - 55
HCU to adapter (accumulator) plate	4.5 - 6.8		40 - 60