



When it detects that 1 or more wheels is starting to lock, coupled with the brake switch input signal, the ABS ECU will pulse the appropriate solenoid (*Figure 6*) for a split second. This causes the high pressure fluid to push the piston up, blocking master cylinder fluid pressure and increasing the volume on the brake line to the respective channel which reduces pressure to the caliper, releasing the respective wheel. The regular brake circuit fluid is returned to the master cylinder and is felt as kickback in the brake pedal. This causes the brake pedal to pulsate and the wheel to release. Braking pressure is maintained to the other wheels as long as pedal pressure is maintained.

When the wheel comes to grip, the ECU signals to close the solenoid valve, stopping pressurized fluid and allowing the slide piston valve spring to return the piston to its normally closed position and restoring

the master cylinder fluid pressure to the caliper line. This all happens in milliseconds.

This system was only used on cars with 4 wheel disc brakes. Quite a few of the systems have proportioning valve functions that are controlled from within the modulator assembly also.

Self-Diagnosing Feature - Fault Codes

If for some reason something goes wrong in the system either with the wheel sensors, the solenoids or their circuits, the pump runs too long, or too short in newer models, the emergency brake is left on more than 30 seconds while driving, then the ABS ECU will turn on the ABS light and shut down the ABS system. We've also seen the light come on if the car was driven hard on an extremely rough road, Causing a code 4 or 5.

*Note from what we've seen when the ABS light is on, the brake system will function as a normal car without ABS.

Failure circuit codes should be stored in the ECU and can be read from the single blinking LED located on the ECU, or on the newer models you connect the shorting connector (same as engine) to read the code directly from the ABS light. You can also read the code (or clear it) with a scan tool on 96 and up models, providing the car has a data link connector and the scan tool is equipped with the appropriate software.

To read the early style ALB ECU code, locate the ECU LED, and position yourself to count the blinks. Have a helper turn on the key the light will go on then out, at about 10 seconds the code should start to flash.

The ECU will store only up to 3 separate codes. Multiple codes will be separated by a 4-5 second pause. Write down the codes, and match the code to the chart in the respective service manual to diagnose the respective circuit. Follow the flow chart to isolate the failure. If multiple codes are present do troubleshooting for the one that appears first.

Also be aware that ABS codes usually have a main & a sub-code, which will point to a more probable failure area. Don't confuse the sub-code as another code by itself. The main & sub-codes are usually only separated by a 1-2 second pause.

To reset the ECU for most models remove ABS fuse #2 or #B2 for 20 seconds. Reset only after repairs or after writing the stored codes down. Some of the newer models can only be erased with the service check connector installed using a special procedure, or with a scan tool. Check the manual for the correct way of resetting the ECU on the car you are working on just to be sure.

Now lets see what goes on when the key is turned on !

When you initially turn on the key the system does a self test just to make sure codeable components are present. The light will come on for several seconds, then if everything is normal, will go out. If the light stays on there is a solid problem in the system either in the system pressure, wiring, relays, or a sensor could be at fault.

On the early systems, when the vehicle starts rolling and hits about 6 mph the pump may run for up to 2 minutes to