

The Basics

Let's cover some basic information on AH, TC, and ABS. In simple terms, these three systems combine data from wheel speed sensors, yaw rate sensors, steering wheel position sensors, along with brake and throttle inputs to determine what the driver wants to do and detects any lose of traction and take corrective action by pulling back on the throttle, activating brakes on individual wheels, or releasing brake pressure as needed to maintain traction.

What goes wrong?

When there is a problem anywhere in the system, the computer does not know what's going on with the car or cannot respond correctly. Rather than risking the wrong response, which could potentially wreck you car, the whole system is simply disabled for the remainder of the ignition cycle. At this time you will see the ABS and Traction Control warning indicators illuminated on the instrument cluster along with the following messages on the Driver Information Center (DIC):

- Service ABS
- Service Traction System
- Service Active Handling

At this point, you can safely continue to drive your car, just remember that your electronic driving aids are no longer functioning so you should adjust your driving habits accordingly.

Troubleshooting

As I said before, when there is a problem the system is deactivated for the remainder of the ignition cycle, so sometimes everything will go back to normal if you just turn off the car and restart it. If that corrects the problem, it was either a glitch in the system, a lose connection that's going to come back soon or an early sign of a future failure that is coming. Even though the system is now functional it is still beneficial to continue to trouble shoot. The history code should give you a good idea of what to check

The next step is to see where the fault is. If you have several different codes write them down, clear them, and see which ones come back the next time you start the car. At this point, I'm betting that the codes point to either the EBCM or the wheel speed sensors. We'll get to the wheel speed sensors later, for now, let's get to the EBCM.

THE SYSTEM

The "system" that provides functions such as Anti-lock Braking and Traction Control is made up of two major parts ... the EBCM (Electronic Brake Control Module) and the BPMV (Brake Pressure Modulation Valve).

EBCM - This is the computer that receives input from sensors such as the wheel speed sensors (one sensor per wheel) and then decides when and how to "intervene" to unlock a wheel that has stopped spinning under heavy braking, for example. The most common code for the EBCM is C1214 - Sol Valve relay Contact or coil CKT Open. This code is set when the system voltage is less than 8 volts for 0.23 seconds.

BPMV - This unit has a pump and a series of valves. It is connected to the brake lines from the Master Cylinder and is then connected to the four brake calipers.

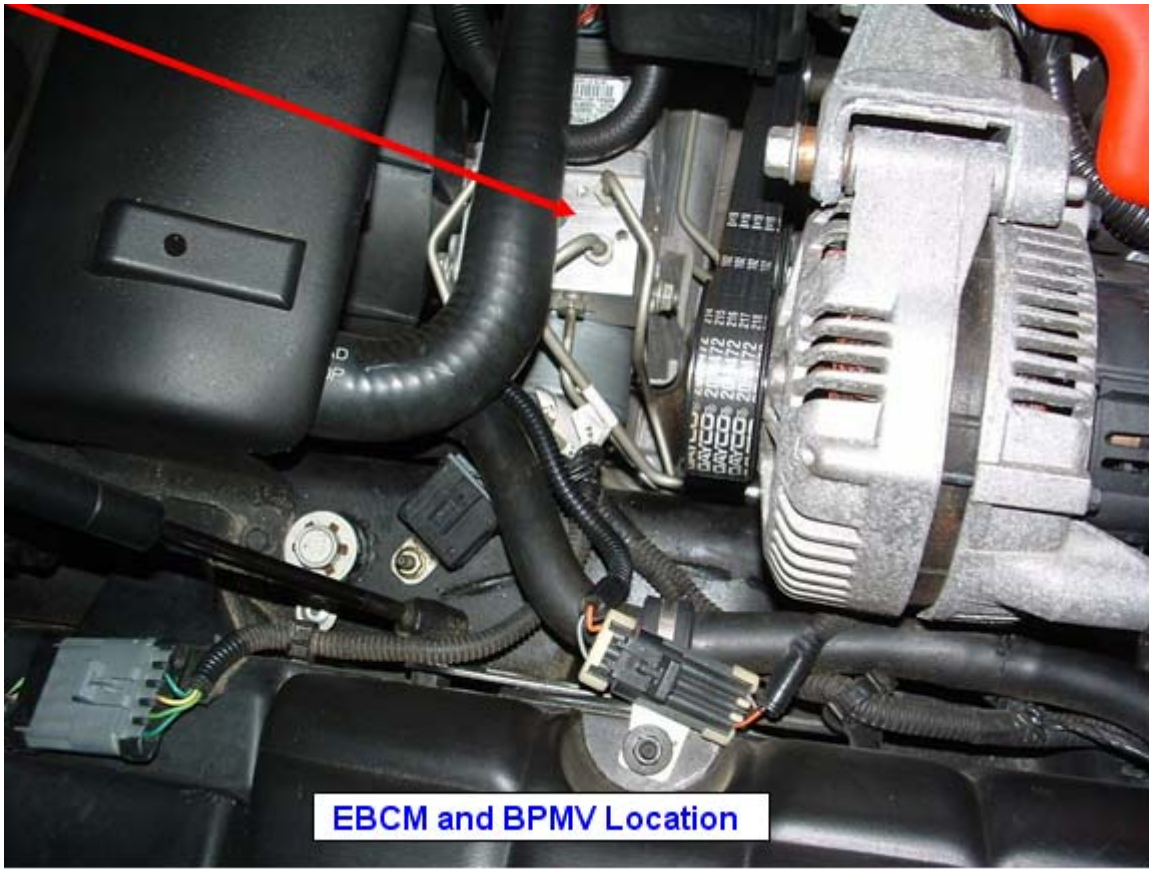
Under normal braking the BPMV valves are "open" so that brake fluid just passes straight through it and the calipers respond to your foot pressure on the brake pedal.

Should the EBCM decide it wants to take control of a caliper, say for ABS, the EBCM starts the pump in the BPMV and using solenoids it can change the valve layout so the EBCM can control brake pressure to that caliper. Using the pump and valves the EBCM can use the BPMV to decrease and increase brake line pressure to that caliper.

The C1214 indicates that the relay inside the EBCM that powers up the BPMV pump and the solenoids in the BPMV has failed. Without this relay the EBCM cannot power up the BPMV components when needed. That is why the C1214 causes the loss of all the systems that require control of brake line pressure. You have lost ABS, Traction Control, and Active Handling. You have also lost Dynamic Rear Proportioning and Rear Stability Control if your car is a 2001 or newer, though you won't see warning messages for those systems.

Since our goal is to fix this for the lowest price possible, we'll start checking things we can fix for free.

The EBCM sits between the engine and radiator.



You can see it in the picture on the below. The EBCM is on the left with the large wire harness coming into it and the sticker on top. The Brake Pressure Modulator Valve (BPMV) is on the right with the brake lines coming out. The EBCM is a dry module, meaning that you can change it out without having to worry about bleeding the ABS system. All of the brake fluid is contained within the BPMV (**Figure 1 – EBCM (Left) and BPMV (right)**). The coils (seen in the picture on the below, (**Figure 2 – Coils**)) fit over small spools that have valves inside them. The valves are operated by an electromagnetic field supplied by the coils.

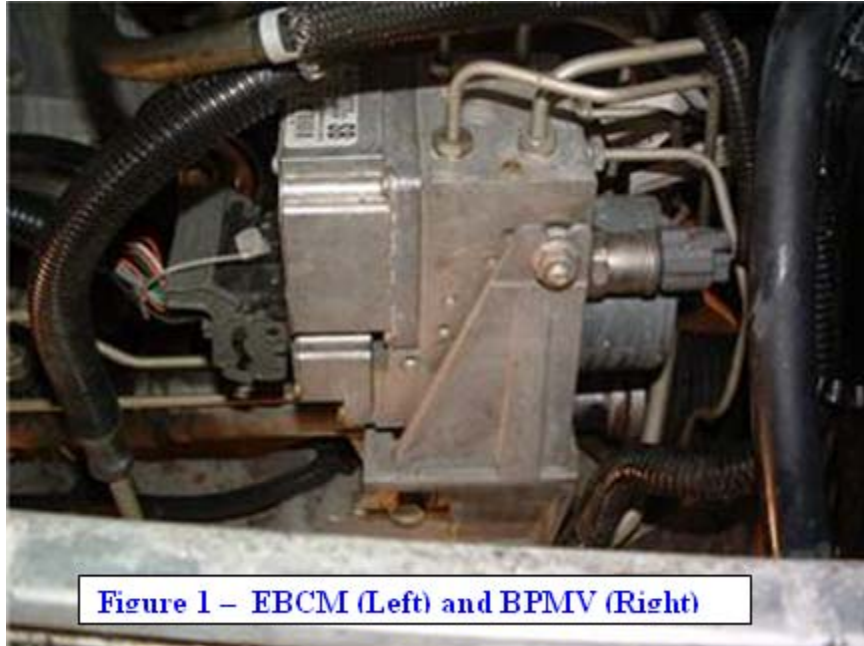


Figure 1 - EBCM (Left) and BPMV (Right)



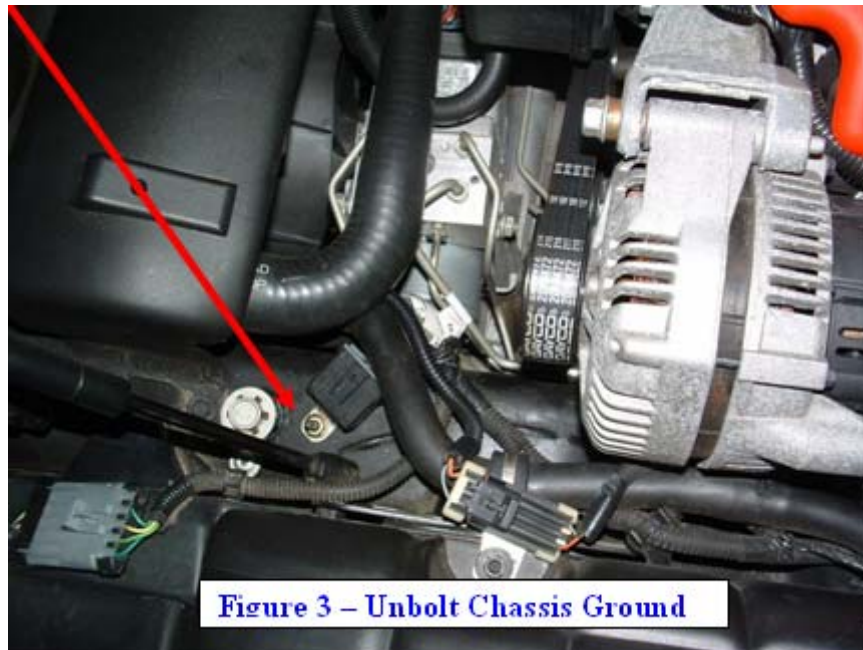
Figure 2 - Coils

Start by doing a quick visual inspection of the wires. If there are any obvious signs of damage, you've likely found the problem. One member had a problem with the wires rubbing the serpentine belt

Also check to make sure the wire harness has a good connection. If the connection appears solid disconnect it (see step 3 in the replacement instructions below) check the pins to ensure that they have not been bent or damaged in any way. If there is any sign of corrosion, clean it off. Once everything looks good, reseat the harness.

Next, let's move on to the grounds. The EBCM is grounded to the chassis on the left frame rail, just forward of the engine. It's the Black box right in the middle of the picture. As you can see, it's real easy for dirt and moisture to get in that area which isn't exactly good for electronic components. Even if you never drive your car in the rain, it'll still get wet when you wash it, and that could be enough

Start by unbolting the chassis ground (**Figure 3 – Unbolt Chassis Ground**), and then take the chassis ground connector apart.



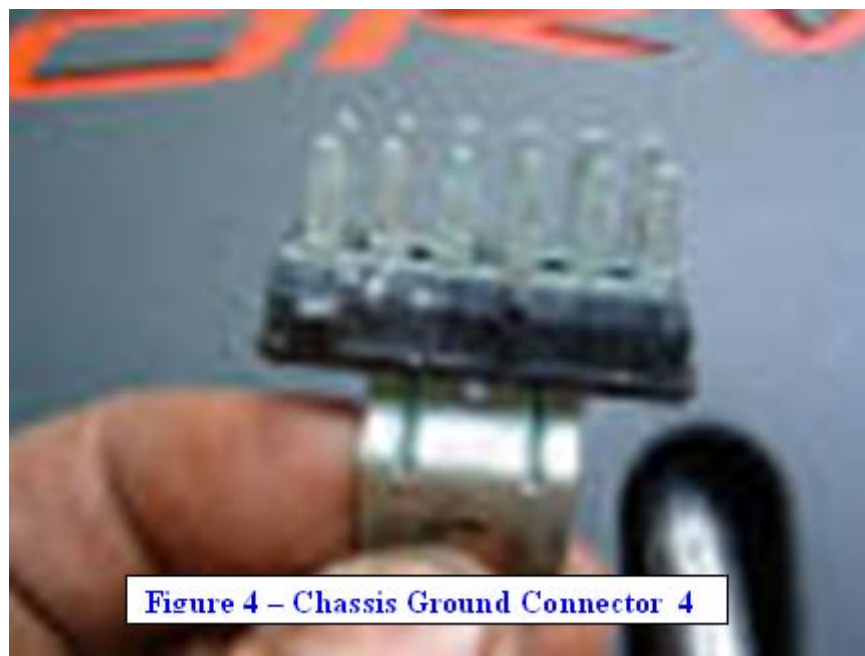
The next set of pictures (**Figure 4 – Chassis Ground Connector 1, 2, 3 and 4**) show the corrosion that can build up in the ground connector. If your chassis grounds look like this one, you've probably found the problem. Even if they don't, go ahead and clean it up with a wire brush before putting it back together. Also clean off the chassis and bolt to make sure you've got a good clean ground.



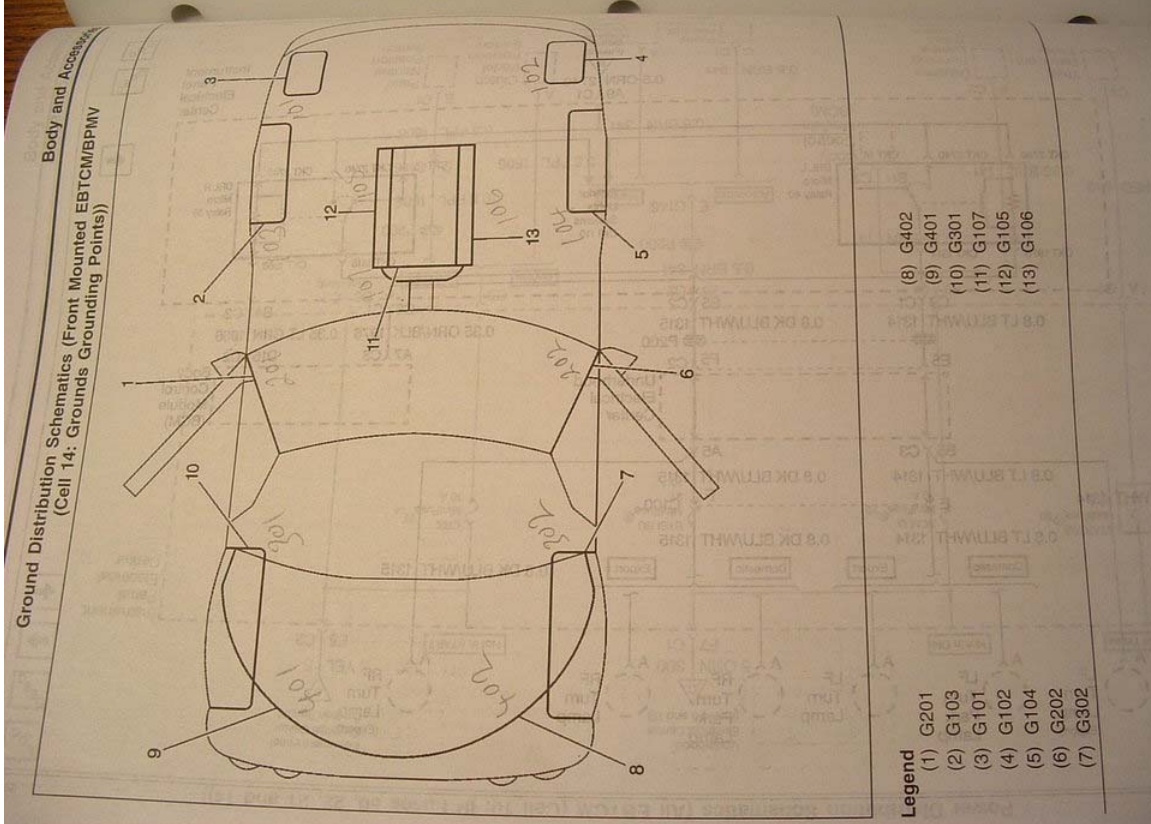
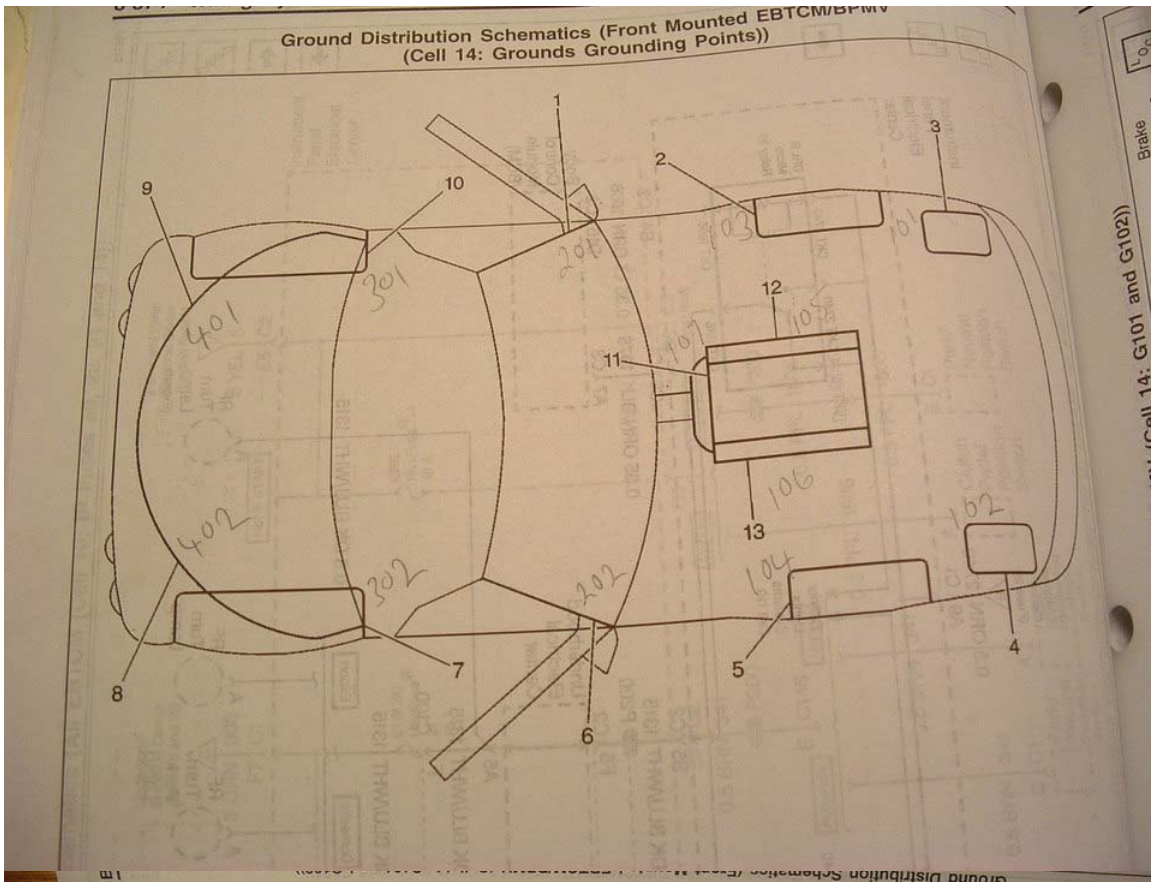
Figure 4 – Chassis Ground Connector 1

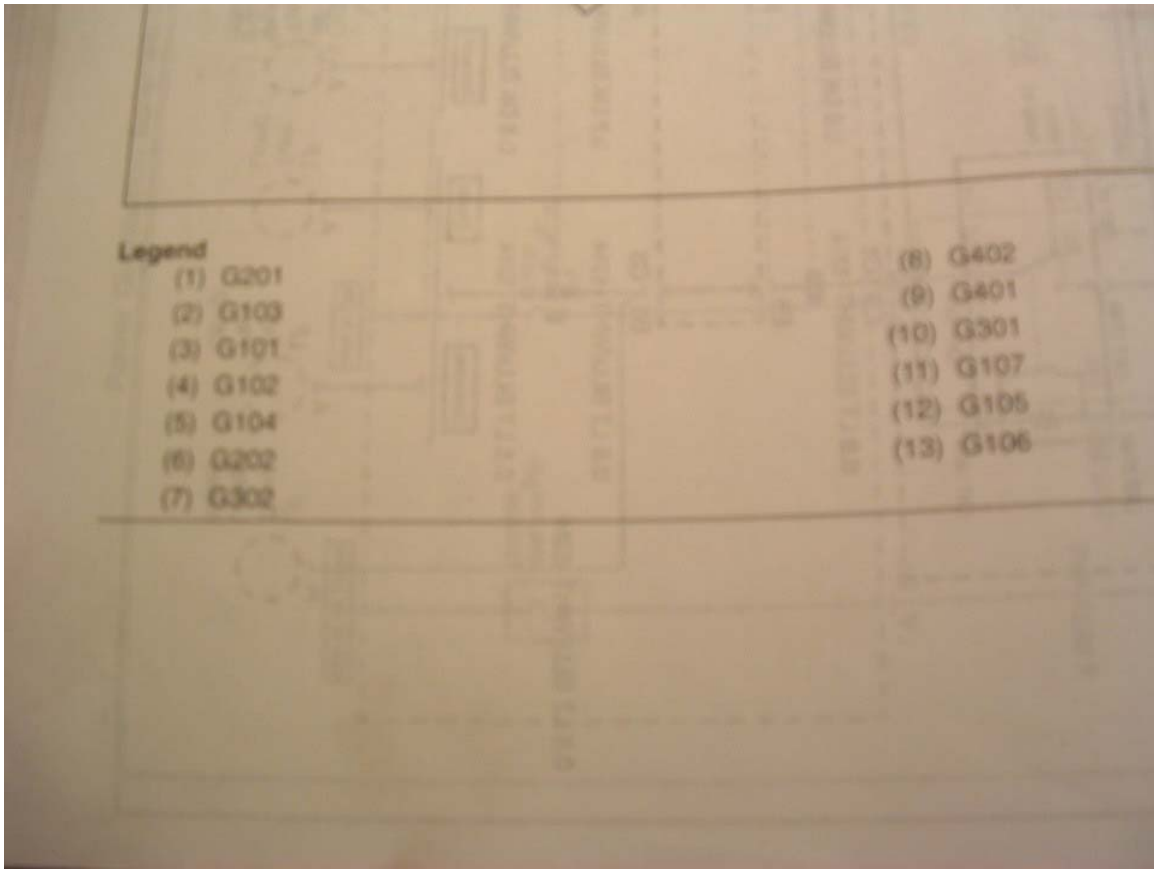


Figure 4 – Chassis Ground Connector 2



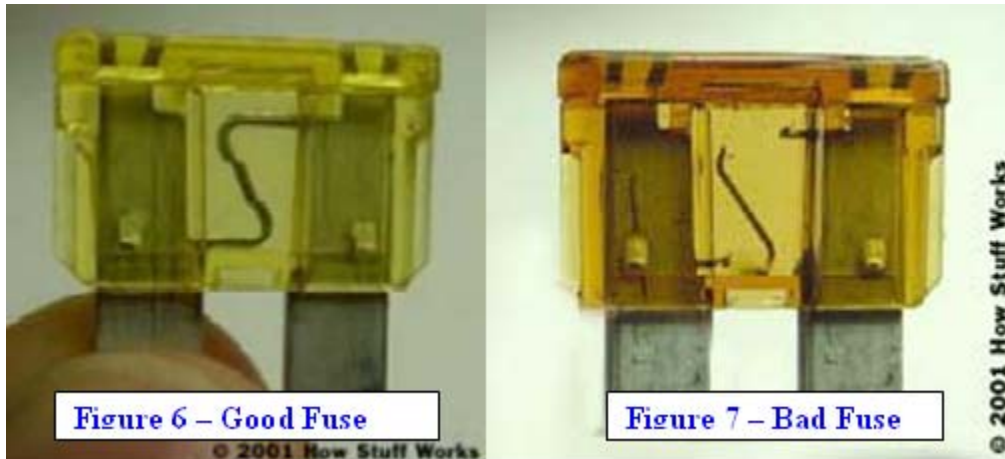
*If you are having any other electrical issues, it's a good idea to check the grounds. These pictures show where the other grounds are. (Figure 5 - Chassis Ground Locations)





It's unlikely, but before you break out your credit card and forking over your hard earned money, it's a good idea to check the fuses. One fuse box is located under the hood beside the battery; the second one is under the passenger side of the dash. Remove the floor mat and you will see the access panel. Just pull the fuses out and do a quick visual check.

On the left, you see a good fuse (**Figure 6 – Good Fuse**); on the right is a bad fuse (**Figure 7 – Bad Fuse**)



At this point, we know all of the wires are good, but for some reason enough voltage is not getting to the system. It is possible that your battery is not functioning properly. If your battery is a couple of years old, has been drained and recharged a couple of times it might be a good idea to go ahead and replace your battery. This is a long shot for EBCM issues, but I think it's worth a shot before spending several hundred dollars for a new EBCM and you're going to have to replace it eventually anyways. Old batteries can cause a variety of minor electrical issues and you likely have a bunch of history codes for minor issues if the battery is causing the problem.

Electronic Brake Control Module

Now on the EBCM itself, if the electrical contacts (**Figure 8 – Electronic Brake Control Module**) inside the relay are dirty or burnt, the vibration from striking the module may change the symptoms or may clear them up for a while. This is by no means a fix or a cure all, in fact it could make it worse or it may not do anything, it's just something to try. Use a small plastic hammer or something similar; lightly tap the front of the EBCM on the lower right corner of the module. The area will be on the right hand side of the lower electrical connection seen in the picture below.



At this point, you've got to additional possibilities. Replace the EBCM or replace both the EBCM and the BPMV. The service manual calls for you to measure the resistance between each pump motor control circuit and the housing of the BPMV, if that checks out okay; you replace the EBCM if not you replace them both. Since most people do not have the equipment to do this the best we can do is to replace the EBCM. If that doesn't work, you'll have to go back and replace the BPMV. The procedure for replacing the EBCM is very simple. The only special tool you need is a T-20 Torx screwdriver.

I have a Craftsman tool set that has a 1/4" drive screwdriver with an adapter for many different size bit. Unfortunately, the adapter was too long to fit between the EBCM and water pump, so I purchased a set of Craftsman 5 pc. Torx screwdriver set that worked fine. A flathead screwdriver may also be needed to pry apart the EBCM from the BPMV

1 - make sure the car is off.

2 - You will probably need to remove the air bridge to get to the EBCM.

3 - Remove the wire harness by first removing the white plastic clip that locks it in place (I cut it off and replaced it with a zip-tie) (**Figure 9 EBCM (Left) and BPMV (Right)**), then lift gray handle and pull back on the wire harness (**Figure 10 – EBCM Disconnected (Front View)**). At this point, you will be able to see the second wire connection that is removed by pulling down EBCM. (**Figure 10 – EBCM Disconnected (Front View)**)



The EBCM is on the left with the large wire harness coming into it and the sticker on top. The Brake Pressure Modulator Valve (BPMV) is on the right with the brake lines coming out.



4 - The service manual calls for you to remove the 2 insulator nuts that hold the BPMV to the brackets and lift the EBCM/BPMV out of the bracket. I do not think this step is necessary because there is plenty of room while it is still in the bracket and you do not gain much additional clearance since the brake lines restrict the movement.

5 - Remove the 6 T-20 Torx screws connecting the EBCM and BPMV - 1 on each corner and 2 on the sides (Figure 11 - Remove 6, T-20 Torx screws EBCM and BPMV).



6 - "Separate the EBCM from the BPMV by gently pulling apart until separated" - I should start laughing here, but it's not that funny. It's been my experience that anytime the instructions call for you to do something gently, nothing gentle is going to work. In this case, I had to use a flathead screwdriver to break the seal. Once it moved a little, the rest was easy. In addition to the rubber seal, each of the 12 holes you see in (Figure 10 – EBCM Disconnected (Front View)) has a peg in them from the BPMV. Don't go crazy, but be prepared to force them apart.

7 - At this point, all you've got to do is put it all back together. Push the new EBCM onto the BPMV.

8 - Replace the 6 T-20 torx screws

9 - Reconnect the wire harness

10 - Put the intake back on



At this point, the AH/TC/ABS should work normally. If not, you've also got a problem with the BPMV. Although you could replace the BPMV yourself, you have to bleed the ABS system, which requires Tech II. For those of you like me that don't have access to Tech II, you've got 2 options. Replace the BPMV yourself and tow the car to a shop with Tech II to have it bled, or just take it in to have the BPMV replaced. The advantage is that you've already done all of the trouble shooting so you want have to pay the mechanic to diagnose the problem for you.

Wheel Speed Sensors

Back to the wheel speed sensors (**Figure 12 – Wheel Speed Sensors**) Code C1221 - 1228 indicate that one of the wheel speed sensors is either sending a bad signal or no signal. Start by checking the connections. The wheel speed sensors are integrated into the wheel bearing/hub assembly pictured below. The wire coming out of the back is the connection for the wheel speed sensors. Verify that the connector are not broken, damaged, or corroded in any way. Pay particular attention to the female end.



Figure 12 – Wheel Speed Sensors

The wire coming out of the wheel speed sensor connects to an 18" jumper harness, then to the main harness. It is very common for people to have a weak female pin in one of those connections. If all of that checks out good, swap the jumper harness from side to side. For example if the left front is bad, swap it over to the right front. And install the good one from the right front to the left

side. Then clear the trouble code. If the trouble code is now on the right side, you know the wire harness is the problem. If the code is still on the left side after swapping the jumper harnesses, you know the problem is inside the wheel speed sensors.

If all the wires check out good, it's time to take a trip to Auto Zone for a new set of bearings. You can buy replacement AC Delco bearing from your dealer if you want to, or get the exact same bearing in a different box for half the price (~\$150) from Auto Zone, you decide. The bearings should be replaced in axel sets, so if your left front is bad, you have to replace the right front too. While you're at it, this is a good time to upgrade the lug studs and add spindle ducts.

Replacement part sources

New EBCM's ... below is a list of part #s. Check with Fred Beans for actual price & availability (\$650 to \$1000)

Part Number: 10343433 All 2003-2004

Part Number: 12216561 All 2001-2002

Part Number: 9367071 All 1999-2000 w/o Control Active Brakes

An alternative to buying a new one is to have your original rebuilt.

For EBCM repair/replace

Call Brandon

877-648-7530 at ABS FIXER

or: www.absfixer.com

\$150. plus UPS....warranted as long as you own it

OR.... get a REBUILT EBCM from these folks:

<http://stores.shop.ebay.com/Digital-Speedometer-Repair-Service/Homepage.html>

<http://www.autoecu.com/?gclid=CO-ozv...FR4UagodWwilqQ>

<http://www.speedometerrepairguy.com/>

The best place to get replacement wheel bearing/hub assemblies is Auto Zone. You're looking for the Timken brand ones. They are exactly the same as the OEM AC Delco bearings, but sold for about half the price (~\$150 vs. \$300+ from Chevy).

Fuses are available at any auto parts store for; a set of various sizes should cost no more than a few dollars and should last a while.