

Troubleshooting Antilock Braking



Use your trusty multimeter to check continuity through wheel speed sensors. This sensor has a value of about 1.5 K ohms.

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Photography by James Westman

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Over the river and through the woods was more dangerous back when cars had crummy bias-ply tires, rear-wheel drive and ordinary brakes. So, tonight you feel confident driving home

DEGREE OF DIFFICULTY



MODERATE

through several inches of freshly fallen snow after a sumptuous holiday dinner. Your front-drive car has excellent all-season tires and ABS (antilock braking system)--although the ABS light has been on since you banzai'd the berm at the end of the driveway an hour ago. This may explain the loss of steering control when you're slowing down for a corner. Like this downhill turn, right ... there, as you blow straight past it with the wheels skidding and the steering cranked over hard against the stop.

ABS has become pretty much standard equipment on most vehicles. Sensors tell a computer when a wheel stops rotating, which indicates--at least when the vehicle still has forward speed--that the brakes have overpowered the available traction at that particular wheel. The computer then directs a hydraulic valve to release some brake fluid pressure to the wheel to let it rotate again. This process repeats many times per second until the vehicle stops or you lift your foot off the brake pedal. The ABS computer does a power-on self test every time you cycle the ignition. If it finds it's lacking data, or a hydraulic pump or valve isn't responding, it illuminates the ABS warning light on the dash. ABS relies on a properly operating conventional brake system. If the ABS packs up, you should still have normal, unassisted braking, so it's safe to continue your journey.

[For background information on how anti-lock brakes work, click here.](#)

LIGHTS OUT

Your ABS light is on. Now what? First, be sure it really is the ABS light and not the light that indicates an issue with your normal service brakes. If you do have a conventional brake issue, like low pedal or grinding noises, this is the wrong Saturday Mechanic for you. Be sure your brakes have adequate lining life, aren't frozen up and are completely free of air. By the way, if you ever need to replace your brake fluid, try as hard as you can to avoid getting air into the ABS controller. It's difficult to bleed, and many require the use of a scan tool to bleed at all. (The scan tool has a function that cycles the pump and valves to move air out of internal passages that can't be bled properly otherwise.)

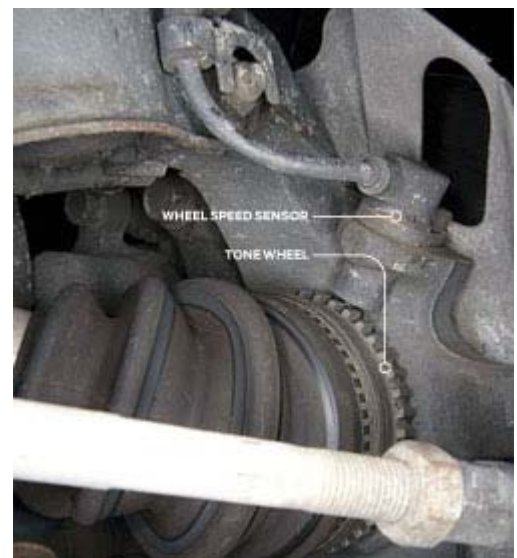
If the light really is the ABS warning, the first thing to try is to cycle the ignition key off and back on. It's like rebooting your computer--and just maybe whatever transient glitch confused the ABS controller has passed and all is well. If the condition repeats, you need to do some poking and prodding.

You have two options when your ABS light stays on. The first one is to find a shop with a scan tool that will talk to your ABS controller. The dealer will have one, as will some aftermarket



CLICK TO ENLARGE

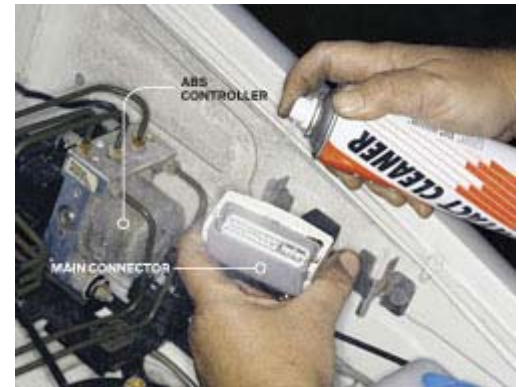
Broken or corroded wires to the sensor are a common ABS problem. A piece of rope on the street got wound around the hub to pull these apart.



CLICK TO ENLARGE

Inspect the tone wheel and speed sensor for damage from foreign objects. The gap between them is crucial.

shops. For a modest service fee (\$50 to \$100), a technician will interrogate your ABS controller and look for a trouble code stored in memory. This code will at least give you some idea of where to look.



CLICK TO ENLARGE

Spray contact cleaner into the connection to the ABS computer if there's any evidence of corrosion or dirt.

But if you'd like to tear into it yourself and maybe find something simple, you'll need a service manual specific to your car or truck, and simple shop tools, including a high-impedance multimeter. The service manual is extremely important--if you can't get a paper manual, try subscribing to alldatadiy.com for service data you can download.

On some vehicles, you can access diagnostic trouble codes stored in the computer without using a scan tool. Usually this means pulling a connector and shorting two pins with a small jumper. The ABS warning light will blink on and off in a pattern, corresponding to a trouble code or lack thereof. Obviously, you'll need a shop manual to attempt this. Odds are you won't be able to talk the service manager at the dealer into letting you photocopy his manual--but it's worth a try. Much of this data is available online--check popularmechanics.com/autodata for suggestions on where to look for service manuals.

Let's say you don't have the trouble code and no information to go on other than an illuminated ABS light. You did check the fuse for the ABS unit, right? This fuse may be in the fuse panel inside the passenger compartment or underhood. Let's not skip the obvious.

Fuse okay? Check the service manual for the voltage and resistance values on various pins and sensors. The main harness to the ABS controller is one place you'll be checking, so while it's apart, give it a shot of aerosol contact cleaner. Inspect carefully for any signs of corrosion--remember that the signals traveling down some of these wires are only millivolts and almost any resistance is a major impediment. If you can, check the resistance across the wheel speed sensors.

If the ABS controller looks A-Okay, and unplugging and reinserting the main harness didn't help, it's time to eyeball the wheel speed sensors--especially if your ABS issue started right after a trip through that snowbank at the mall or after a high-speed trip down a gravel road. You may have damaged the wiring leading to the ABS sensors or even the tone wheels or sensors themselves. Tone wheel? The ABS controller needs to know how fast each wheel is rotating. Somewhere on each wheel bearing assembly or axle is a toothed wheel, and there's a magnetic pickup positioned immediately next to it. (Exception: Some rwd vehicles use a three-channel system with the tone wheel built into the rear differential.) Because this assembly is out in the open, it's prone to damage from foreign objects.

Loosen the lug nuts or bolts, block the opposite wheel and jack up the car. (You pickup truck owners may be able to crawl under and check.) Inspect the wheel speed sensor's wiring harness and the sensor itself. Some sensors are integrated fairly well into the hub and aren't prone to damage. Others are simply bolted to

stamped brackets. If the sensor is loose or missing, or the wires are damaged, you've found your problem. Check the air gap between the sensor and the tone wheel if it's adjustable--the shop manual will give you a specific distance the sensor is supposed to be spaced from the tone wheel and directions on how to properly set it. On rare occasions, the tone wheel itself will show damage, such as missing teeth or teeth damaged by road debris. On front-wheel-drive cars, this usually means replacing the stub axle, because the tone wheel is machined directly onto the axle. If the harness to the sensor has a connector in the wheel well, pull it apart and check the sensor for continuity with an ohmmeter. The resistance value can be found in the shop manual. Check for shorts to ground as well. Repair any bad wiring, remembering that there's plenty of mud, snow and salt water flying around in the wheel well.

TIME'S UP

If you've checked all the sensors and wiring and the ABS light still glows, it's time to throw in the towel and start looking seriously at the ABS controller, an amalgam of hydraulics and electronics that has, as they say, no user-serviceable parts inside. It is, predictably, expensive. Replace it as a last resort.

Consult your service manual for a chart of specific values and pinouts to check against, which should help you narrow down the problem to a specific wire or sensor. This chart is typical.

Antilock Quick Test Check Sheet Using Rotunda 60-pin EEC-IV Breakout Box 0 14-00322 or equivalent

Item To Be Tested	Ignition Mode	Measure Between Pins	Tester Scale/Range	Specification	Pinpoint Test
Power Feed					
Battery Check	off	batt. Terminals	volts	10 minimum	
ABS ECU Power	on	14 + 1	volts	10 minimum	DTC B 1318
Pump Motor Power	off	2 + 1	volts	10 minimum	DTC C 1095
Valve Power	off	13 + 1	volts	10 minimum	DTC C 1266
Sensor Resistance					
LF Sensor Resistance	off	15 + 16	K ohms	1.28-1.92 K ohms	A
RF Sensor Resistance	off	20 + 7	K ohms	1.28-1.92 K ohms	B
LR Sensor Resistance	off	17 + 18	K ohms	1.28-1.92 K ohms	C
RR Sensor Resistance	off	4 + 19	K ohms	1.28-1.92 K ohms	D
Sensor Continuity to Ground					

LF to Ground	off	15 + 1	continuity	no continuity	A
RF to Ground	off	20 + 1	continuity	no continuity	B
LR to Ground	off	17 + 1	continuity	no continuity	C
RR to Ground	off	4 + 1	continuity	no continuity	D

Sensor Output Voltage

Rotate Wheels at One Revolution Per Second

LF Sensor Output	off	15 + 16	AC mV	>100 mV	A
RF Sensor Output	off	20 + 7	AC mV	>100 mV	B
LR Sensor Output	off	17 + 18	AC mV	>100 mV	C
RR Sensor Output	off	4 + 19	AC mV	>100 mV	D

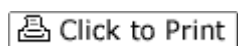
ABS Warning Lamp Check	on	22 + 1	volts	10V minimum	E
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Stoplamp Switch Check

Brake Pedal Applied	off	9 + 1	volts	10 minimum	
Brake Pedal Released	off	9 + 1	continuity	no continuity	

Links referenced within this article

For background information on how anti-lock brakes work, click here.

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