

# Car Radio

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I am a power supply...I'm the most important part of the radio. It's my job to take the crazy voltage from the Mr. Battery and regulate it. Between Mr. Battery, Mr. Alternator and the neighborhood called the Wiring Harness, it's very difficult to supply precise amount of current to my customers. When Mr. Alternator speeds up, he whines. When Mr. High-Intensity Headlights blinks to warn a slow driver that we're about to pass, the voltage drops due to the eye-squared-are formula. And I hate to complain, but the wiring system picks up radar impulses from the local airport. And if I blow a circuit breaker because the driver cranks up the volume too much, then everyone gets pissed while I reset. I have to maintain a constant 13.8 volts @ 10 amps (with surges up to 50 amps), else nobody is happy. This is the toughest job in the world.

I am a drive mechanism...I turn Mr. Servo Motor and get feedback from him. It's critically important to maintain 360 revolutions per minute speed, plus or minus nothing, nada, zip. I have a very nicely calibrated quartz crystal that helps me think about time – very small pieces of time. As the clock ticks a small bit, Mr. Servo Motor is flying around a small bit of an endless circle. I look at the current from my Hall-effect sensor, and try to keep it in balance with the world. Sometimes, that's harder than necessary because of Mr. Power Supply – I hate to say it publicly, but sometimes he's just inadequate to my needs, and then I feel woozy, and my owner flips the SAT button, and I'm out of a job, and he blames me, but I'm not to blame – Mr. Power Supply is.

I am an electronics module...antenna....tuner...DSP...amp...display. Mr. Antenna feeds me a billion signals, and I'm supposed to make sense of them. Check it out: If my owner wants to tune in Sirius XM Radio, it's coming in at frequency 2.3 Giga Hertz from Mr. Satellite, who is parked in geo-synchronous orbit (about 25,000 miles overhead). My owner doesn't care about signal propagation or Doppler Effect at all. Mr. DSP and Mr. Tuner work together to de-modulate the signals and make low-power audio out of the signals. Some great mathematicians and electronics engineers figured out how to manipulate weak signals, and they called it digital signal processing, but I don't understand it at all – they just gave me a chip that's like a crib sheet (it solves the complex math automatically). Mr. Amplifier makes those tiny signals very powerful – very, very powerful. My owner sees my display screen on the dashboard, and uses the virtual push buttons to tune in, change volume and increase the bass. Clearly, I'm the brains of this outfit, and don't let anyone tell you otherwise.

I am a speaker system...hear me Roar! I have a big responsibility to make my owner and his special friends happy: and mostly, he's happy when I Roar! Mr. Amplifier sends me a stream of varying voltage, and Mr. Power Supply sends me the current I need (usually), and then I Roar! I have some Big Fat Capacitors to help Mr. Power Supply when he's feeling low. I have some safety diodes that limit the current to my coils, but sometimes my owner gets too enthusiastic, so the diodes throw themselves across my coils – almost like tossing a crowbar across a live electric line – you can imagine how that sounds...click...pop...crack! If my owner wouldn't play some of that crappy new 'angry' music, we'd all be better off.

My name is Mr. Car Radio...I have subassemblies that my owner never thinks about. He dials in the tunes and just cranks me up and blasts away. I play *Problem* and *Am I Wrong* and *Stay With Me* and *Summer*. I play the Top-40 real loud. And dude, I love it when my owner drops the top and tunes me in and cranks me up – I love Rock and Roll, don't you?

There are a few other things that I need to tell you about me. I've got a built-in camera and microphone. While you're in the car, I'm capturing video and audio. If you have a wreck, any law enforcement agency can get the video of your last ride. Information from Mr. Monitor, *aka*. The "Black Box" is synchronized to the video. I'm pretty sure that you don't know that part of the required collision-avoidance system that was mandated last year includes fiber-optic feeds from the area of the headlights and taillights – it gives the video real "context" in case of an accident. Of course the rear view mirror contains a hi-def camera, too. The in-cabin air filtration system is capable of detecting and recording various drugs, including *Cannabis*, alcohol and 1,735 other substances that may impair driving ability. And yes, Mr. Monitor is recording your cell phone calls. Maybe you thought that if you didn't enable the *OnStar* system, none of this would happen, but hey – laws are laws.

And about that adaptive cruise control/collision mitigation system: it goes way beyond just maintaining a constant speed. There is a small radar system in my nose, and I use it to keep a safe distance from the vehicle in front of me. You know how I slow down when a slowpoke cuts in front of me? Well, I can brake hard and tighten the seatbelts, instantly to avoid hitting him. And yes, I send an instantaneous video clip to the Web storage vault for later analysis of that driver by the State Police.

The blind-spot detection/side assist/collision warning system that alerts you to cars or objects in your blind spot during driving or parking works when you signal a lane change. But it's working whether you signal or not, and recording the fact that you don't seem to signal most of the time.

The lane-departure warning/wake-you-up safety system judges an approaching vehicle's speed and distance to warn you of potential danger if you change lanes. It also warns you if you're drifting out of your lane, which may indicate that you're distracted or stoned. In either case, the local State Police get an immediate ping of your GPS location and identification – just in case they want to learn a little more about your behavior.

My rollover prevention/mitigation system, which is mostly called the electronic stability control system is used to tighten seatbelts and extend your rollbars (if you were smart enough to order them). But the system actually knows if you're driving erratically, like whipping around a corner too fast, or if you swerve sharply. It applies the brakes and modulates the throttle to help you maintain control. It also sends a notification to the local State Police about your erratic driving.

The occupant-sensitive/dual-stage airbags know if you're big or small, or very small. They try to mitigate the damage that can be done by an airbag deployment to a small person or an infant. But they also record whether you put your infant into the front seat, which is contrary to the law. They also know who doesn't buckle up. They are always complaining to the State Police.

Brake technology has improved since simple antilock braking systems were created. My braking system recognizes when you make a panic stop and wakes up the smart cruise control, the stability control system and other systems to get ready for a crash. It also notifies the State Police of your erratic driving.

The adaptive headlights and night-vision system use infrared and thermal-imaging cameras to see farther down the road. If animals or people are in your way, you want to know, right? Well, the video analysis software knows how you react, and weighs that against how a normal person would act. If you're not really very good at slamming on the brakes or steering around the obstacle, that fact is recorded and sent to the Driver's License office so that you will be tagged for a road test next time your license is up for renewal.

The rearview camera protects children and animals from accidental back-overs. Of course I keep the camera rolling all the time. It helps record the following car, so his behavior can be analyzed too.

I have a nice emergency response system that turns on the interior lights, unlocks the doors and shuts off the fuel when the airbags deploy. I also turn on the hazard flashers and disconnect the battery terminals from the alternator. Then the *OnStar* system calls for the appropriate response and uploads the black box info and video to the State Police database.

My neural network is just some algorithms and architectures that have been applied for your safety. I don't really "think," at least like you do. My domain is safe vehicle operation. I think about that all the time. I have 16 million neurons connected in a haptic network. In case you don't know, that means of or relating to the sense of touch, in particular relating to the perception and manipulation of objects using the senses of touch and proprioception. Here's what I'm good at: interacting with noisy data or data from the environment; massive parallelism; fault tolerance; adapting to circumstances. That makes me really good at protecting my owner.

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**Sun/Snap-on Diagnostic complete.**

**Vehicle passes with 0 faults, but front left tire needs 1.5 psi of air within 7 days.**

**Driver #1 Labner, John M. is required to re-take defensive driver's course.**

**Driver #2 Labner, Joanne E. is to report to the State Police office within 10 days for blood test.**

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*"Okay, Sam, the Caddy's annual inspection is done. Mrs. Labner's going to get a ticket. I'm out to lunch."*

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