

DME/ECU

By Pedro Bonilla

One of the most-asked questions in Porschedom is:

“How can I get more HP out of my car?”

In many instances people spend a ton of money purchasing expensive and exotic intake or exhaust systems and other aftermarket add-ons, only to find out that they’ve lost, not gained horsepower.

Why does this happen, you may ask? Because of a little box called the DME. You’ve probably heard of it, but maybe you don’t know exactly what it is and what it does. Let me try to explain. DME stands for Digital Motronic Electronics, or actually, Digitale Motronic Elektronik, in German. It was originally designed by and is still manufactured by Porsche’s electronic supplier: Bosch GmbH. It is also known as the ECU which stands for Engine Control Unit or Electronic Control Unit.



Simply put, the DME or ECU is the engine's management computer, which is programmed at the factory to provide the best combination of power and fuel economy for a myriad of driving conditions. This engine management system will actually work against any changes you make to the engine's systems and will try to bring the parameters back to standard. That's why you may lose power with some aftermarket parts or products, but there's a way around that ... later.

How and why was the DME developed?

The first Porsches of the very late 40s through the early 70s used carburetors and distributors for their engine management, and it worked well until we needed better emission controls, which forced manufacturers, including Porsche, to develop fuel injection. This new management system now needed an analog computer to control the amount of fuel the engine would receive by varying the time the injectors were open.

These systems were much more precise. Gas mileage and performance were dramatically increased while emissions dramatically decreased. Today, our DME's do much more than just control the fuel injection.

The actual term generally used in English is the ECU (Engine Control Unit) or ECM (Engine Control Module) and it controls everything related to the engine, from measuring the incoming air temperature and ambient air pressure, to the amount of fuel injected, to the throttle position, to the amount of air flowing into the engine, and many other parameters. Then, based on its memory's maps, it makes a decision as to what's the best combination of air, gas and spark timing for that particular situation, and maintains it for maximum performance and fuel savings.

Using the information about how much air is flowing through the engine (sensed by the Mass Airflow Sensor - MAF) and how fast the engine is turning (RPMs), the DME uses a fuel map to determine how long each injector should stay open during each cycle to inject the correct amount of fuel.

During partial-throttle operation, the injector pulse-width is also modified by the readings from the oxygen sensors, devices that sit in the exhaust collectors and determine how much oxygen is left over in the exhaust. Each cylinder is constantly adjusted to obtain maximum operating efficiency under virtually all conditions.

In the event of an electrical or electronic fault, the DME can even reconfigure itself to bypass the problem and it can self-diagnose for quick and efficient troubleshooting. That's why, even with a failed MAF, for instance, the DME goes into a "safe mode" and keeps the engine running safely and efficiently. If this happens, it will also alert the driver via the check engine light (CEL) so that it can be corrected by a service provider.

At the core of a DME there are multiple microprocessors, and in a modern Porsche, they execute nearly twenty million instructions per second (20 MIPS). Microprocessors also have a reputation for being extremely reliable. They are designed for a lifespan of at least 150,000 active hours. A car, by comparison, is expected to survive around 4,000 hours of use.





The Porsche ECU is typically located under one of the front seats (911) or in the rear trunk (Boxster or Cayman).

The Porsche DME is a very reliable and rugged piece of engineering. It is quite durable and trouble-free. Nevertheless, having said that, the number one cause of a Porsche's DME unit failing can be caused by jump-starting the car using cheap jumper cables which may cause the electrical system to surge after the vehicle is started. Another common failure can occur when an enthusiast, or a shop, uses an electric welder, and fails to previously disconnect the ground cable on the battery thereby causing a high voltage surge through the ECU.

ECUs are very complex computing systems and can be very expensive, costing as much as \$5,000 or more to replace. Luckily, many failed ECUs can be repaired quickly and affordably by a few highly-specialized repair facilities around the country.

Now let's get back to how to make more horsepower on your Porsche. When Porsche manufactures a vehicle, they don't generally know where the car will end up and under which conditions it will

be driven, so they "de-tune" the engine through the ECU maps to allow for a multitude of adverse driving conditions, such as using low octane fuel, driving at high-altitudes, under very hot ambient temperatures, etc...

But you can narrow the parameters dramatically by having your ECU reprogrammed to the conditions you will drive under, such as: Street, Spirited Driving, AX, Track, full-blown Racing, etc. For instance, if you only use 93 octane gasoline, the ECU can be reprogrammed for that.

If you've installed aftermarket intake and or exhaust systems, the ECU can be reprogrammed for that.

If you've increased the throttle body's size, the ECU can be reprogrammed for that.

If you'd like to raise the rev-limiter, the ECU can be reprogrammed for that.

If you've ... you get the idea.

All of this collected information is optimized, converted into data and maps and can be reprogrammed into the ECU's memory during the Chip tuning or Flashing process. Once the ECU is "Flashed" with it's new maps, the engine's data is now processed with the new parameters and significant gains in torque and HP can be achieved. engine's data is now processed with the new parameters and significant gains in torque and HP can be achieved.

The recommendation though, is to make all the changes to the hardware (engine intake through exhaust) first, and as a final step flash (reprogram) the ECU so that it knows which changes to consider and incorporate. If you don't follow this plan, you'll have to flash every time you modify any physical engine component(s) in order to obtain significant gains from that particular mod.

You may also hear the process of Flashing a DME referred to as "Chip" or "Chipping", and that's because the first generations of DME used ROM (Read Only Memory) chips that could not be re-programmed. Many "tuners" today still have to crack open the DME's case and remove, re-flash, and re-solder the physical chip in Porsche models up to 2001.

Today, some very exclusive "tuners" with state-of-the-art computing hardware and software can now read and reprogram your car's ECU without opening its case. It's all done through the DME's existing 88-pin connector, even on the first generation 986 (Boxster) and 996 (Carrera).

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ECUs are very complex computing systems and can be very expensive, costing as much as \$5,000 or more to replace. Luckily, many failed ECUs can be repaired quickly and affordably by a few highly-specialized repair facilities around the country. We have had great advances in ECU reprogramming in the last couple of years. Some services which were considered impossible on a Porsche's DME, are now available to the general public.



