

## CHAPTER 12



# ELECTROMOTIVE



*Electromotive fuel-injection systems have been around for quite some time, but what has really set the company apart is the fact that it was the originator of the multiple-coil-pack waste-spark systems like the one shown here.*



*In a waste-spark ignition system like this one, cylinders are paired together and one coil fires the two cylinders that oppose each other in the firing order. This way on each revolution of the engine, one cylinder would be at top dead center on the compression stroke, and the other would be at top dead center on the exhaust stroke.*

### Electromotive

**COST:** Approximately \$1,500 to \$2,500

**FEATURES:** Electromotive offers coil-on-plug configurations for any engine, but packaging the system is sometimes more of an issue.

**EASE OF INSTALLATION AND TUNING:** The installation is quite straightforward, but the tuning theory is quite different and can be difficult to grasp for many tuners.

Electromotive has been a leader in fuel-injection system development since it opened in 1987. Not only have they been building universal fuel-injection systems that can be fitted to any make or model of engine, they essentially pioneered the DFI (direct fire ignition) technology. This revolutionary system enabled them to eliminate the spark distributor on an engine and replace it with individual ignition coils that could directly fire each cylinder.

Normally, two cylinders opposing each other in the firing order are paired together, and one coil would provide their spark. This way, on each revolu-



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tion of the engine, one cylinder would be at top dead center on the compression stroke, and the other would be at top dead center on the exhaust stroke. Only the cylinder that actually required the ignition event actually uses the spark. This is typically known as a waste-spark configuration.

When Electromotive paired their fuel-injection system with their direct-fire ignition system, they created what they call the Total Engine Control unit, or TEC. The TEC was capable of controlling all functions of engine management from idle control, fuel injection, ignition timing control, and most auxil-

ary functions such as boost, nitrous, and torque-converter lock-up control.

Since the first Total Engine Control system was introduced to the public, Electromotive has had a very dynamic calibration software program. As new needs arose, Electromotive was quick to provide the software fit those needs.

The earlier software was DOS based, and the currently supported software written for Windows operating systems. The first program was called CAL. This software could control all of the basic functions of the TEC unit.

Second, came Super, which was an updated version of CAL that supported a few more options for basic tuning. Super was available up through 1997.

At that time, Electromotive again raised the bar in technology for aftermarket engine control systems by introducing the first software calibration tool that would allow users the ability to perform full closed-loop tuning.

This software, called PAF (performance air and fuel), gave the tuner the option to define target air/fuel ratios from 10:1 to 21:1 throughout the base calibration tables in order to give the TEC unit control over the fuel correction under all load and speed conditions. A user could now reap the benefits of good power under a load, while maintaining economy at cruise, all

in one easy calibration.

Briefly, the TEC units were supplied with an optional software package called PAFZ, which contained algorithms for using mass airflow sensing for calibration to automatically compensate for changes in an engine's volumetric efficiency, rather than the required re-tuning necessary with MAP-based speed-density systems.

Next came the Super Blend software package. This program was introduced to allow easy tuning of engines with individual intake runners and large lift/duration cam profiles used in all-out racing applications. This was achieved by blending TPS voltage and MAP sensor signal voltage, rather than using only TPS as a load input, which proved to be inadequate. The system was also capable of using mass airflow sensors, but did not allow tuning to different air-fuel ratios throughout the load/RPM range.

The last of Electromotive's software offerings to use the DOS-based operating system was PAFBlend. This software calibration tool recognized the street racer's desire to run large lift/duration cams and individual intake runner manifolds, yet not forgo the advantages of PAF air-to-fuel ratio tuning.

Mass airflow sensors pose a limitation to the ultimate power that an engine can produce because of their restriction



**Early TEC systems were popular in drag racing segments such as the early to mid 1990s Mustang 5.0-liter crowd.**



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