

## Delphi Multec<sup>®</sup> Electronic Fuel Injection

Delphi Multec<sup>®</sup> Electronic Fuel Injection (EFI) provides a complete engine management system (EMS) for small gasoline- and flexible fuel-powered engines. It is designed to help manufacturers meet exhaust and evaporative emissions requirements for small engines while also achieving targets for engine performance and fuel consumption. Delphi's Multec EFI provides manufacturers with a single, easy-to-manage, cost-competitive package of components that can be tailored to individual program requirements and price points. Delphi's Multec EFI can include:

- Engine control unit (ECU) with software and algorithms
- Electronic fuel injection
- Throttle control (including electronic governor control)
- Air control
- Ignition coil
- Sensors and actuators
- Fuel pump
- Evaporative emissions canister

### ► Benefits

- Components are optimized within a complete, cost-effective package to meet the manufacturer's performance objectives and price points
- Delphi's Multec EFI helps provide reduced fuel consumption — up to 10-15% depending on the application
- Assists in reducing exhaust emissions to help meet regulatory standards and reduces carbon monoxide emissions for better product safety versus conventionally carbureted systems
- Compared to carbureted systems, Delphi's Multec EFI provides improved starting and overall performance over a wide range of environmental conditions (e.g. temperature and altitude), and better reliability
- Electronic governor control provides improved speed control and reduced governor droop and hunt versus a mechanical governor
- Delphi provides a complete software package and calibration tools
- Delphi's single point of contact for the EMS makes it easy for the manufacturer to manage and implement the program
- Delphi's experienced and knowledgeable EMS engineering support teams — with their systems development, calibration, and validation expertise — can provide fast response and enable the manufacturer to achieve fast time-to-market
- Delphi's Multec EFI technology offers product image development and marketing opportunities for the manufacturer



The Delphi Multec<sup>®</sup> Electronic Fuel Injection for small engine commercial products includes: (from top right, clockwise) evaporative emissions canister, mini-switching oxygen sensor, ignition coil, manifold absolute pressure sensor, engine temperature sensor, intake air temperature sensor, fuel injector, engine control module, throttle body, fuel module and T-11 Fuel Pump (center).

► **Delphi Multec® Electronic Fuel Injection Portfolio Summary**

	<b>Features and Benefits</b>
Engine Control Unit (ECU)	16 bit Small package size Flexible mounting options Manifold absolute pressure (MAP) or throttle position sensor (TPS) load Electronic spark timing Flexible fuel algorithms Communication link for diagnostics and operator information display Other features: immobilizer, rollover switches, altitude compensation and more
Electronic Fuel Injector	With anti-plugging features Ethanol-blend fuel compatibility (e.g. E85, E100) Hot fuel handling
Mechanical Throttle Body	Low cost option Idle speed control option Sealed shaft option Integrated sensors Throttle bore portfolio to match engine sizes
Electronic Throttle Controls	Enhanced responsiveness to load change Fewer components Integrated sensors Throttle bore portfolio to match engine sizes
Fuel Module	Compact top- and bottom-mount in-tank design In-line modules Designed with low current consumption
Electronic Ignition	More reliable combustion versus magnetos Enables electronic spark timing Electronic protection and diagnosis for the coil
Sensors and Actuators <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Engine and Air Temperature</li> <li>• Engine Crank Position</li> </ul>	Compact designs Multiple options available for packaging flexibility
Exhaust Oxygen Sensor	Isolated ground for added robustness Enables closed-loop control for better emissions control Allows gasoline-ethanol blended flexible fuel operation Fast light-off
Evaporative Emissions Canister	Compact design Flexible mounting options Reduces evaporative emissions

► **Typical Applications**

A Delphi Multec Electronic Fuel Injection engine management system is available for one- or two-cylinder gasoline and flexible fuel engines. Delphi Multec EFI enables engines to operate on gasoline-ethanol blended fuels. Typical product applications include:

- Motorcycles and scooters
- All-terrain vehicles
- Utility vehicles
- Snowmobiles
- Personal watercraft
- Outboard marine engines
- Power generators
- Commercial lawn tractors and mowers
- Outdoor power equipment

**▶ Performance Advantages**

Delphi's Multec Electronic Fuel Injection offers an easy and convenient way for a manufacturer of small engine products to implement a complete engine management system that can help meet exhaust and evaporative emissions standards, while enhancing engine performance and reducing fuel consumption. Delphi's unique understanding of the complete engine management system and its portfolio of major component development capabilities contribute to superior component design and a cost-competitive system. Delphi's engine management system products are recognized for high quality and superior performance.

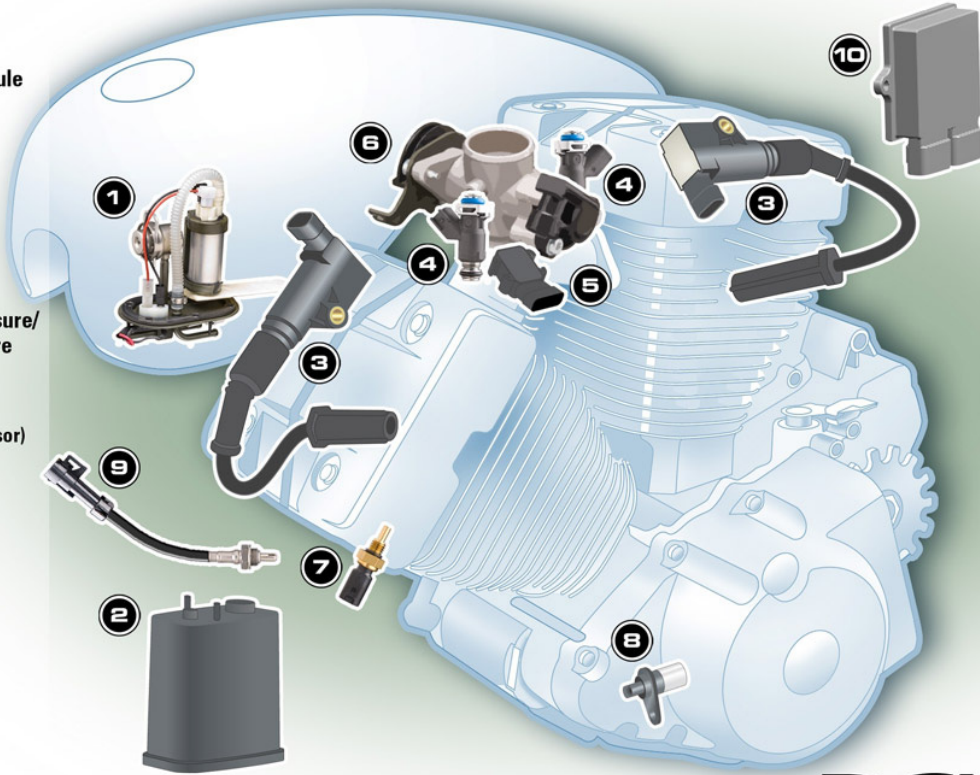
**▶ The Delphi Advantage**

Delphi has a long history of supplying gasoline engine management systems and components that have for many years helped global automotive manufacturers overcome market and regulatory challenges. Delphi's extensive experience in fuel injection systems development provides manufacturers of small engine products with a unique systems-level knowledge and analysis resource.

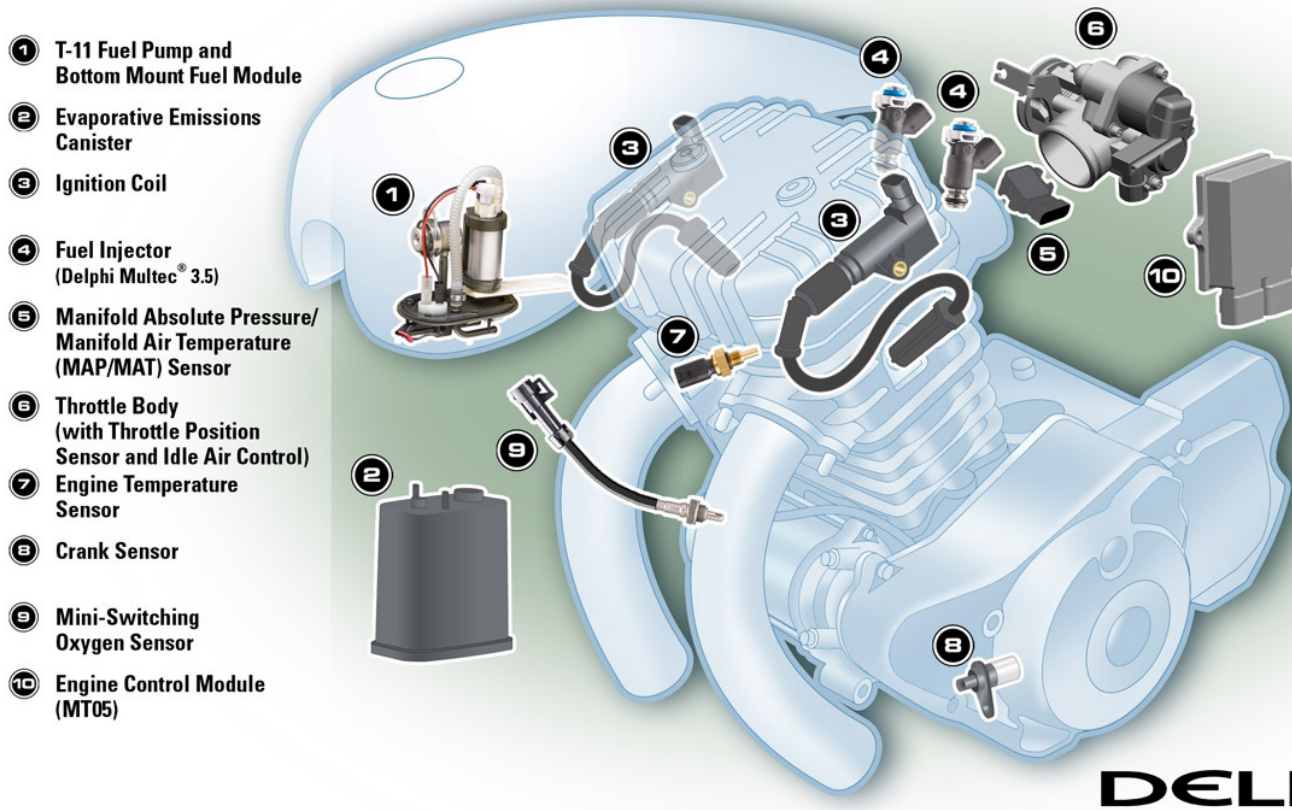
As a global leader in engine management systems technology, Delphi can help manufacturers around the world meet engine emissions requirements, improve fuel economy and enhance performance. Delphi is a source for high value solutions and our expertise is built into every product. Delphi's flexible engineering approach encourages collaboration. And, Delphi has a thorough understanding of markets around the world and a global network of resources.

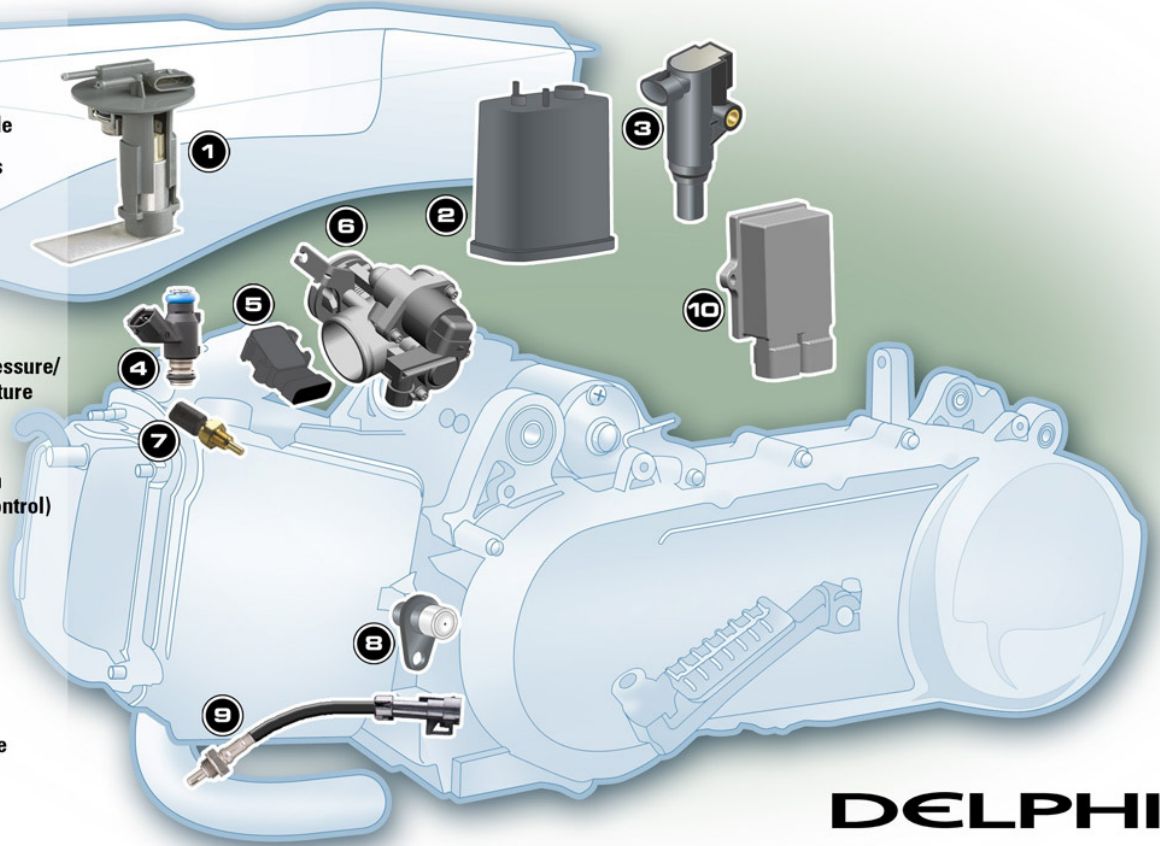
**2-Cylinder V Motorcycle Engine EMS Portfolio**

- ① T-11 Fuel Pump and Bottom Mount Fuel Module
- ② Evaporative Emissions Canister
- ③ Ignition Coil
- ④ Fuel Injector (Delphi Multec<sup>®</sup> 3.5)
- ⑤ Manifold Absolute Pressure/Manifold Air Temperature (MAP/MAT) Sensor
- ⑥ Throttle Body (with Throttle Position Sensor)
- ⑦ Engine Temperature Sensor
- ⑧ Crank Sensor
- ⑨ Mini-Switching Oxygen Sensor
- ⑩ Engine Control Module (MT05)



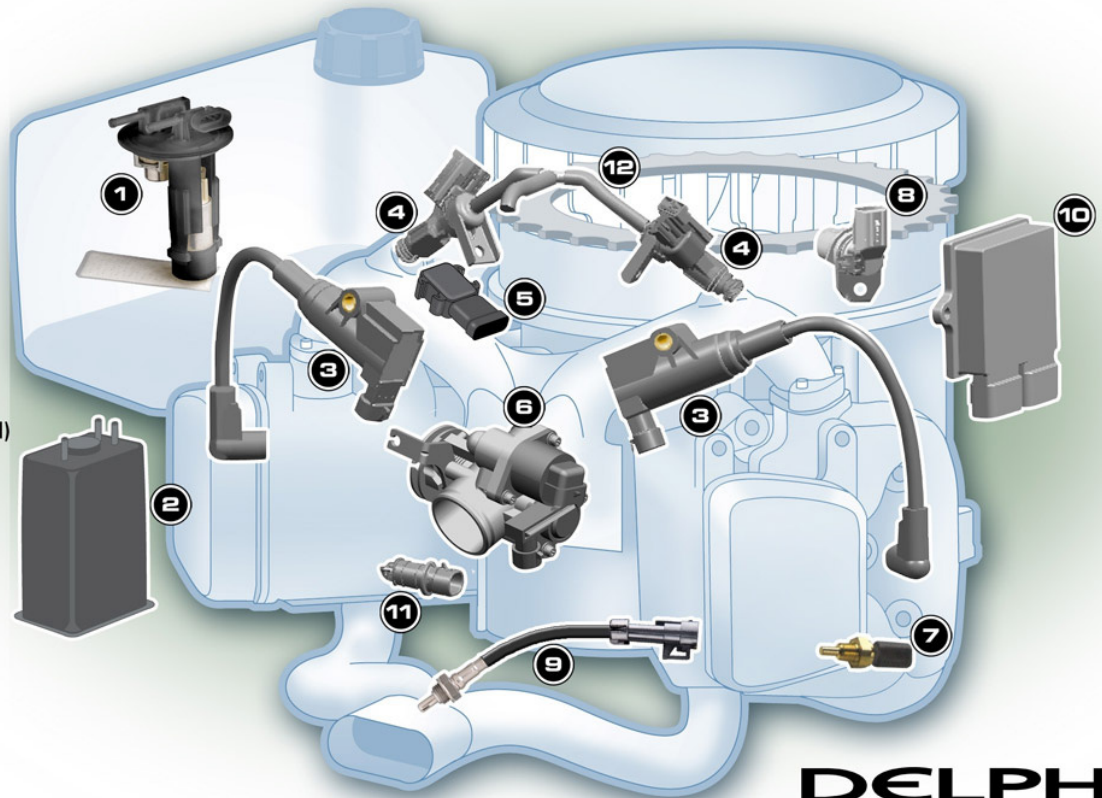
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**2-Cylinder In-Line Motorcycle Engine EMS Portfolio**

**1-Cylinder Motor Scooter Engine EMS Portfolio****1** T-11 Fuel Pump and Top Mount Fuel Module**2** Evaporative Emissions Canister**3** Ignition Coil**4** Fuel Injector (Delphi Multec® 3.5)**5** Manifold Absolute Pressure/Manifold Air Temperature (MAP/MAT) Sensor**6** Throttle Body (with Throttle Position Sensor and Idle Air Control)**7** Engine Temperature Sensor**8** Crank Sensor**9** Mini-Switching Oxygen Sensor**10** Engine Control Module (MT05)

2-Cylinder Vertical Crank Commercial Products Engine EMS Portfolio

- ① T-11 Fuel Pump and Top Mount Fuel Module
- ② Evaporative Emissions Canister
- ③ Ignition Coil
- ④ Fuel Injector (Delphi Multec<sup>®</sup> 3.5)
- ⑤ Manifold Absolute Pressure (MAP) Sensor
- ⑥ Throttle Body (with Throttle Position Sensor and Idle Air Control)
- ⑦ Engine Temperature Sensor
- ⑧ Crank Sensor
- ⑨ Mini-Switching Oxygen Sensor
- ⑩ Engine Control Module (MT05)
- ⑪ Intake Air Temperature Sensor
- ⑫ Fuel Rail



**2-Cylinder Horizontal Crank "Power Sports" Engine EMS Portfolio**

- ① T-11 Fuel Pump and Top Mount Fuel Module
- ② Evaporative Emissions Canister
- ③ Ignition Coil
- ④ Fuel Injector (Delphi Multec<sup>®</sup> 3.5)
- ⑤ Manifold Absolute Pressure (MAP) Sensor
- ⑥ Throttle Body (with Throttle Position Sensor and Idle Air Control)
- ⑦ Intake Air Temperature Sensor
- ⑧ Engine Temperature Sensor
- ⑨ Crank Sensor
- ⑩ Mini-Switching Oxygen Sensor
- ⑪ Engine Control Module (MT05)
- ⑫ Fuel Rail

