



FUEL



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A Motorola Low-Level Driver Component

The Fuel device driver, one of the low-level driver components, is designed to generate fuel timing output pulses. The pulses control the injector's fuel delivery rate and quantity to an automotive engine. The driver supports engine designs that include two to eight cylinders. The driver can start, change, stop, or shift fuel delivery for any or all cylinders at any time in the fuel cycle upon request.

The Fuel driver executes in cooperation with the Engine Position driver, which measures the crankshaft's angular position and speed. Based on information provided by the Engine Position driver, the Fuel driver can deliver fuel accurately in relation to the angular position of the crankshaft.

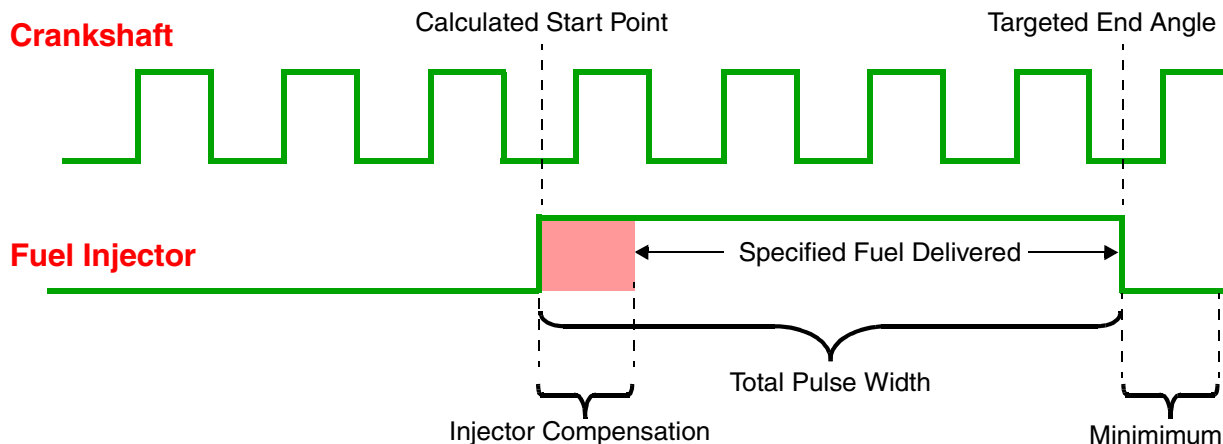
The Fuel driver uses a boundary angle for each injector channel as a termination point for the channel's fuel cycle. The Fuel driver begins delivering fuel with the fuel channel whose boundary will be the first to arrive, and, thereafter, cycles through all assigned channels in

ascending order. When the driver reaches a channel's boundary angle, it terminates any pulses in progress and then proceeds to search for the next channel's boundary.

The application software provides basic information to the driver, such as the lowest channel number to use and the number of injectors in the engine. The driver uses this information to calculate the boundary angle for each channel.

During a fuel cycle, the application software specifies the normal or "default" amount of fuel delivered to a particular injector. The Fuel driver delivers this fuel to the injector in a single pulse, scheduled to end at a specified angle.

The application also specifies an injector compensation value, which is added to the fuel pulse delivery time to determine the actual width of the fuel pulse. After the normal pulse has ended, the fuel driver can deliver multiple additional pulses upon request. After each pulse, the driver ensures that a minimum off time elapses before delivering another pulse.



Fuel Modes

The Fuel driver provides two operating modes: simultaneous and sequential. In simultaneous mode, the driver delivers fuel immediately upon request. In sequential mode, the driver delivers fuel to all injector channels in sequential order.

The application software can disable and re-enable the fuel output at any time. In sequential mode, if a pulse is already in progress, the driver will buffer a disable request until the end of the current boundary.

Fuel Delivery Options

The Fuel driver provides a set of C function calls that the application software uses to control fuel delivery. These calls provide capabilities such as:

- Triggering an immediate fuel pulse for a particular injector channel
- Updating the amount of fuel to be delivered for a particular injector channel
- Updating the targeted position of the end of the normal fuel pulse for a particular injector channel
- Updating the minimum off time value for all injector channels
- Updating the fuel boundary angle for all injector channels
- Updating the injector compensation value for all injector channels
- Disabling an injector

Retrieving Information

The Fuel driver also provides function calls that allow the application software to retrieve information about the state of the fuel delivery cycle. For example, the application software may request:

- The injector number of a disabled injector
- The tooth count at which a fuel pulse in simultaneous mode ends
- The total fuel delivered during the most recent fuel cycle

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The Low Level Driver System

The Low Level Driver system includes a set of drivers with an API that interfaces to and controls the hardware for a microcontroller unit (such as the Motorola MPC555)

Engine Position

Tracks the angular position in the engine cycle based on input from an automobile's crankshaft and camshaft sensors

Spark & DTS

Generates pulses defined by duration and end angle; can be used to time the firing of spark plugs

Fuel

Generates pulses immediately upon request or defined by duration and end angle; can be used to control fuel injection duration and frequency

Speed Measurement

Determines the speed of a rotating shaft

Synchronous PWM

Synchronizes an output pulse width modulation (PWM) signal to an input PWM signal

Synchronous Output

Transmits a clock signal and serial data, following a specific protocol

Angle Toggle

Toggles an output pin and generates interrupts on selected crank angles

QADC Trigger

Generates pulses defined by a start angle and duration

Knock Window

Generates pulses defined by a start and end angle

Discrete Input/Output (DIO)

Operates as a general-purpose digital input or output pin



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