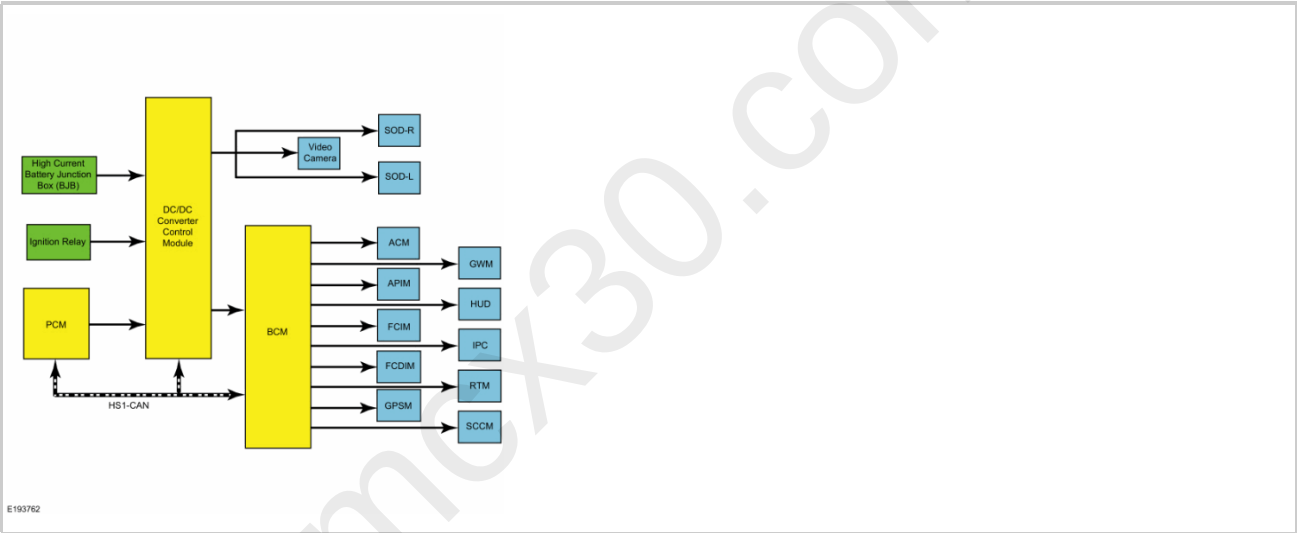


releases the brake pedal, the engine automatically restarts. The end of the auto-start-stop event occurs after the engine has restarted.

During these auto-start-stop events, voltage variations occur resulting from changes in electrical system loads. The function of the Direct Current/Direct Current (DC/DC) converter control module is to boost the voltage level for a select few components during an auto-start event. Once the starter engages, it draws a large amount of current and the entire vehicle voltage drops. There are some components that cannot experience that large of a voltage drop, such as the audio system and instrument cluster. The Direct Current/Direct Current (DC/DC) converter control module keeps the voltage boosted to those components for a short time while the starter is cranking to prevent the components from resetting or shutting down.

For more information on the operation of the auto-start-stop system, refer to the Owner's Literature or Refer to: STARTING SYSTEM - SYSTEM OPERATION AND COMPONENT DESCRIPTION - 2.7L EcoBoost (238kW/324PS).

DESCRIPTION AND OPERATION > DIRECT CURRENT DIRECT CURRENT (DC DC) CONVERTER CONTROL MODULE - SYSTEM OPERATION AND COMPONENT DESCRIPTION



System Operation

Network Message Chart

Broadcast Message	Originating Module	Message Purpose
Engine status	PCM	Used to indicate the type of cranking event occurring. If the signal is state 2, Engine Auto Stopped, then the next commanded crank is to be supported. If the signal is state 0, Engine Off, the next crank will be a key crank and the Direct Current/Direct Current (DC/DC) converter control module will not support.

The Direct Current/Direct Current (DC/DC) converter control module, also known as the Voltage Quality Module (VQM), is responsible for boosting battery voltage to specific components on vehicles equipped with the auto-start-stop system. When the ignition is turned on the Direct Current/Direct Current (DC/DC) converter control module initializes after receiving the Run/Start power feed from the BCM controlled run/start relay.

While in stand-by mode the Direct Current/Direct Current (DC/DC) converter control module performs self-diagnostics and is not producing any boost output voltage. The Direct Current/Direct Current (DC/DC) converter control module is simply passing battery voltage straight through to downstream loads when it is in stand-by mode.

The Direct Current/Direct Current (DC/DC) converter control module continuously communicates its status to the PCM via High Speed Controller Area Network (HS1-CAN). If the Direct Current/Direct Current (DC/DC) converter control module is overloaded, overheated, or other faults are present the PCM disables the auto-start-stop system. If a fault is detected, the PCM may restart the engine if an auto-start-stop event is already in progress. During an auto-start-stop event the engine shuts down automatically after vehicle speed is zero. As the engine begins shutting down, there is an initial battery voltage drop due to the engine shutting off and the alternator no longer providing output current.

Once the engine is no longer spinning, the electrical system is fully supported by the vehicle battery. The electrical load present in the engine off phase of the auto-start-stop event causes a gradual decline in battery voltage. This gradual decline of battery voltage is the second voltage transition. The third voltage transition occurs during the engine restart. The system voltage drops, followed by the system voltage increasing to the regulation voltage point determined by the alternator output.

Prior to the engine restart, the Direct Current/Direct Current (DC/DC) converter control module is commanded to stabilize/boost its output until the engine has started and system voltage regulation is established by the alternator. This command signal is sent from the PCM via a hardwired circuit that is grounded by a low side driver. The Direct Current/Direct Current (DC/DC) converter control module is switched into Boost mode and the converter provides the stabilized or boost output voltage until one of the following occurs:

- Eng_D_Stat High Speed Controller Area Network (HS1-CAN) message transitions from EngAutoStopped (2) to EngOn (1)
- Boost time exceeds 5.2 seconds
- System input voltage exceeds targeted output

The Direct Current/Direct Current (DC/DC) converter control module has full bypass or stand-by mode functionality within an input of 6V-16V. The Direct Current/Direct Current (DC/DC) converter control module must be able to provide the boosted voltage with a minimum 6V power net input voltage. If the supply voltage goes outside the voltage range, the Direct Current/Direct Current (DC/DC) converter control module recovers without user intervention when the supply voltage returns to the normal operating range. The Direct Current/Direct Current (DC/DC) converter control module determines the stabilized output voltage to be targeted by continuously measuring the Direct Current/Direct Current (DC/DC) converter control module input voltage. Prior to the restart event, the Direct Current/Direct Current (DC/DC) converter control module receives the RE-CRANK signal and sets the boosted output voltage target to be equivalent to the measured input voltage. This makes sure the output voltage to the supported loads does not change.

Malfunction of the system does not lead to non-function of other vehicle systems. The system enters bypass mode if:

- a thermal overload condition exists.
- there is a Direct Current/Direct Current (DC/DC) converter control module failure.