

## ACTIVE GRILLE SHUTTER SYSTEM

### Active Grille Shutter System

#### Overview

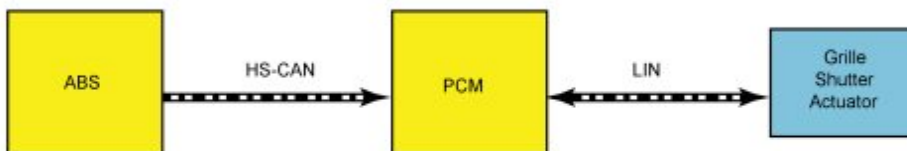
The grille shutter system (when equipped) is comprised of the grille shutter assembly and the grille shutter actuator. The grille shutter system is primarily used to maximize fuel economy by reducing aerodynamic drag on the vehicle. The grille shutter system is also used to shorten engine warm-up time, increasing engine efficiency and providing heat to the vehicle occupants in a timely manner. The grille shutter actuator receives position commands from the PCM. The grille shutter system carries out a calibration sequence whenever the engine is started, fully opening and closing the shutters before being positioned in the programmed position as requested by the PCM.

PCM inputs/outputs used for controlling of grille shutters are the:

- ECT (Engine Coolant Temperature) sensor
- IAT (Intake Air Temperature) sensor
- A/C pressure transducer
- APP (Accelerator Pedal Position) sensor
- ABS module (through the HS-CAN (High Speed Controller Area Network))
- Engine cooling fan motor
- Engine oil temperature

#### System Operation

#### System Diagram



## Network Message Chart

### Module Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Vehicle speed	ABS module	Vehicle speed is used to determine positioning of the grille shutters.

### Grille Shutter

The grille shutter actuator positions the grille shutters based on commands from the PCM. The grille shutter moves 90 degrees from fully closed to fully open and, based on the position commanded by the PCM, is set in 1 of 16 positions (approximately 6 degrees between positions).

During normal operation, the grille shutter may be partially to fully open when the engine is off. When the engine is started and ambient temperature is above 1° C (34° F), a calibration of the grille shutter system occurs, which typically takes 15-20 seconds. The grille shutter system performs the calibration sequence by detecting the end positions, open and closed. The calibration sequence can begin in either direction, open or closed, and continues until it is successful or a fault is sensed. A long pause may occur between the 2 portions (open/close) of the calibration sequence. Calibration of the grille shutter system cannot be manually requested, it only occurs as determined by the grille shutter actuator. If certain faults are present (shutter blocked or actuator error), a recalibration is initiated in an attempt to resolve the problem. If the problem is not resolved after a calibrated number of attempts (usually 3 or 4), a timer starts and sets a DTC when the timer reaches a predetermined limit. Other faults also trigger a recalibration request, but not until a grille shutter DTC is set in the PCM.

The PCM communicates the desired position (open or closed) of the grille shutter based on various PCM inputs (vehicle speed, coolant temperature, ambient temperature, A/C system pressure, etc.). The PCM communicates to the grille shutter actuator via a LIN (Local Interconnect Network). The LIN (Local Interconnect Network) supports bi-directional communication between the grille shutter actuator and PCM, allowing the grille shutter actuator to communicate position and fault information to the PCM.

The PCM sets grille shutter DTCs when the fault information is communicated by the grille shutter actuator for a predetermined amount of time. Any failures of the LIN (Local Interconnect Network) for over 10 seconds continuously results in the grille shutter actuator positioning the grille shutter fully open. There is no indication to the driver of the vehicle when a fault with the grilled shutter system is present or a grille shutter DTC is set in the PCM.

### Component Description

#### Grille Shutter Actuator

The grille shutter actuator is a smart motor which receives position requests from the PCM via the LIN (Local Interconnect Network). One of the grille shutter blinds connects to the grille shutter actuator using a retainer. The grille shutter actuator can be serviced individually or as an entire assembly, which includes the grille shutter, grille shutter actuator, retainer, housing and jumper harness.

#### Grille Shutter

The grille shutter is comprised of shutter blinds which are linked to each other. One of the individual shutter blinds is fixed to the

grille shutter actuator. When the grille shutter actuator moves, it moves the attached shutter which causes the other linked shutters to move. The grille shutter is serviced as an assembly (individual shutter blinds are not serviceable) or as an entire assembly, which includes the grille shutter, grille shutter actuator, retainer, housing and jumper harness.