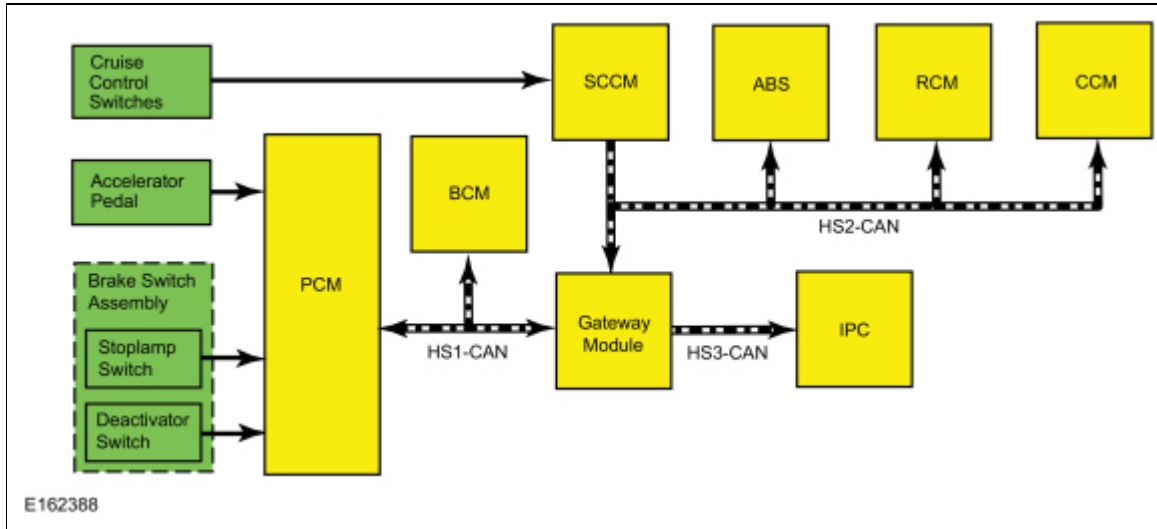


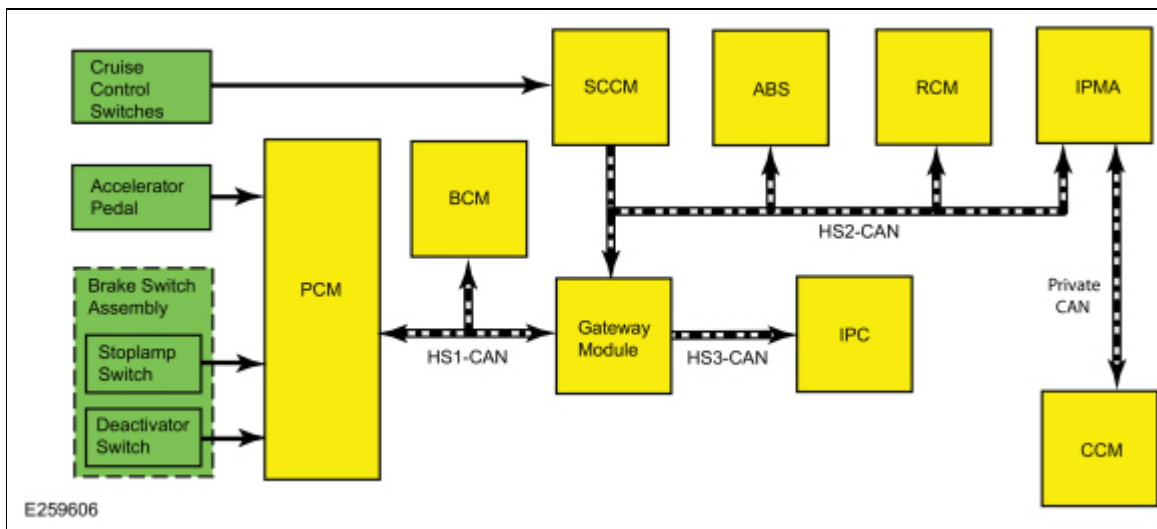
**Cruise Control - System Operation and Component Description**

**System Operation**

**Adaptive Cruise Control Without Pre-Collision Assist**



**Adaptive Cruise Control With Pre-Collision Assist**



**Network Message Chart**

**Network Input Messages - ABS Module**

Broadcast Message	Originating	Message Purpose
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	Module	
<u>ACC</u> brake deceleration request	<u>CCM</u>	Used for <u>ACC</u> automatic braking.
<u>ACC</u> stop mode request	<u>PCM</u>	Used for <u>ACC</u> automatic braking.
Brake pedal applied	<u>PCM</u>	Used for brake switch input.
Cruise control override	<u>PCM</u>	Driver overriding cruise control with accelerator pedal.

### Network Input Messages - CCM

Broadcast Message	Originating Module	Message Purpose
<u>APP</u>	<u>PCM</u>	Used for accelerator pedal status.
<u>ACC</u> enabled	<u>IPC</u>	Activates <u>ACC</u> .
<u>ACC</u> stop mode request	<u>PCM</u>	Used for <u>ACC</u> automatic braking.
<u>ACC</u> switch commands	<u>SCCM</u>	Used for speed control enable/disable, gap settings and operating mode request.
Brake pedal applied	<u>PCM</u>	Used for brake switch input.
Cruise control override	<u>PCM</u>	Driver overriding cruise control with accelerator pedal.
Ignition status	<u>BCM</u>	Used for ignition switch position input.
Stability-traction control event in progress	<u>ABS</u> module	Deactivates cruise control when requested.
Vehicle configuration data	<u>BCM</u>	Used for comparison checking adaptive cruise control configuration.
Vehicle yaw rate	<u>RCM</u>	Deactivates cruise control when requested.

### Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
<u>ACC</u> gap distance display	<u>CCM</u>	Data used to generate message center display indicating adaptive cruise control gap setting.
<u>ACC</u> follow mode display	<u>CCM</u>	Data used to activate the follow vehicle indicator.
<u>ACC</u> stop mode display	<u>CCM</u>	Data used to activate the stop and go auto mode indicator.
<u>ACC</u> resume display	<u>CCM</u>	Data used to activate the stop and go auto resume mode indicator.
Cruise control set speed display	<u>PCM</u>	Data used to activate the select cruise control speed display.

Cruise control override	<u>PCM</u>	Driver overriding cruise control with accelerator pedal.
Cruise control status	<u>PCM</u>	Data used for speed control indicator status.

### Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Steering wheel switch speed control	<u>SCCM</u>	Used for speed control enable/disable and operating mode request.
Stability control event in progress	<u>ABS</u> module	Deactivates speed control when requested.
Traction control event in progress		
Vehicle lateral acceleration	<u>RCM</u>	Deactivates speed control when requested.
Vehicle longitudinal acceleration		
Vehicle yaw rate		

### Network Input Messages - IPMA

Broadcast Message	Originating Module	Message Purpose
Collision avoidance and driver support radar status	<u>CCM</u>	Data used to communicate the function status of the radar in the <u>CCM</u> .

### ACC Operation

**NOTE:** For a complete illustration of the ACC indicators and graphic displays, refer to the Owner's Literature.

The ACC system functions much like a standard cruise control system. The ACC system automatically adjusts the vehicle speed to maintain a set distance gap from the front of the vehicle and the vehicle in the same path of travel. When the ACC system is on and is following a vehicle or a vehicle enters the same driving lane, a follow vehicle graphic is displayed in the message center.

The ACC system does not function if the vehicle speed is below 20 km/h (12 mph). As the vehicle slows down during automatic braking, the ACC system discontinues braking at 20 km/h (12 mph) and an audible alarm sounds as the automatic braking from the ABS module is released. The driver must take over vehicle braking control.

The cruise control deactivator switch (which is integral to the BPP switch) is an additional safety feature. When the brake pedal is applied, an electrical signal is sent to the PCM deactivating the cruise control system. Under increased brake pedal effort, the cruise control system deactivator switch opens and

removes the ground signal from the PCM input circuit, releasing the throttle and immediately deactivating the system.

The ABS monitors the yaw rate signal and compares it to the wheel speed and steering wheel angle signals. If the ABS module determines the yaw rate is invalid, the CCM disables the ACC. The message center displays the message COLLISION WARNING MALFUNCTION and/or ADAPTIVE CRUISE MALFUNCTION.

The CCM monitors the environment in front of the vehicle while active. If the radar beam is obstructed by a buildup of snow, ice, rain or other debris or the vehicle is driven in a desert environment with no traffic for extended periods of time, the sensor triggers an ADAPTIVE CRUISE NOT AVAILABLE SENSOR BLOCKED SEE MANUAL message and the ACC is disabled. The ACC resumes once the obstruction is cleared and the radar is able to detect targets or upon an ignition cycle.

If aftermarket equipment, such as a snow plow, is installed on the front of the vehicle, obstructing the radar, the ACC may function erratically. The ACC needs to be disengaged using the menu option and the operator has non-adaptive cruise control functionality only. Other aftermarket equipment such as bumpers, brushguards and lights mounted in front of the radar module also impedes system performance.

The ABS module estimates brake temperature by monitoring applied brake pressure over a period of time and sends a message to the CCM when the estimated temperature is above a given threshold. An alarm sounds and the ACC system is deactivated until the estimated brake temperature returns to cooler operating conditions. This condition happens in hilly or mountainous driving terrain.

### **Cruise Control Indicator**

The ACC indicator located in the IPC illuminates in gray and the previous gap setting and SET graphic is displayed indicating the system is in standby mode. This notifies the driver the system is ready and the vehicle can be accelerated to the desired speed. When the vehicle reaches the desired speed and the SET+ is pressed, the ACC indicator illuminates in green.

### **Steering Wheel Switch Function**

The ACC steering wheel mounted switches are momentary contact switches that toggle up and down for the cruise control switch state. Pressing and releasing the steering wheel cruise control ON/OFF switch turns the cruise control system on. Pressing up (SET+) and releasing the SET switch sets the vehicle's speed and stores the set speed in memory. The ACC indicator illuminates and the message center displays the set speed and gap setting graphic.

There are two ways to change the set speed. The first way is to accelerate or brake to the desired speed and press and release the SET cruise control switch until the desired set speed is shown on the message center. The second way is by tapping the SET+ or the SET- switch while in the set mode, increasing or decreasing the displayed set speed by 1.6 km/h (1 mph) per tap. If the respective button is pressed and held, the displayed set speed continues to increase or decrease until the button is released. The ACC system may apply the brakes to slow the vehicle down to the new set speed. The set speed displays continuously in the message center while the ACC system is active.

Pressing and releasing the OFF switch or switching the ignition to OFF, turns the adaptive cruise control system off. The adaptive cruise control set speed memory is erased.

Applying the brake pedal or pressing the CNCL switch puts the ACC system in standby mode and the last set speed is displayed in the message center with a strike through. Pressing the RES button when the ACC system is in standby mode causes the vehicle to accelerate to the last set speed. The set speed continuously displays in the message center while the ACC system is active. The RES button does not function if the OFF button is pressed, the ignition is cycled OFF or the current vehicle speed is below the minimum operational speed.

The ACC system has the capability for the driver to change from ACC to standard cruise control. The LH 5-way steering wheel switch is used to switch from the ACC system to standard cruise control within the message center. For information on selecting the standard cruise control in the message center, refer to Owner's Literature. Once the driver has selected the standard cruise control in the message center, the ACC indicator is replaced by the standard cruise control indicator. The vehicle no longer responds to lead vehicles or automatic braking. Upon the next vehicle ignition cycle, the vehicle defaults back to ACC.

### Gap Setting

When a vehicle enters the same lane or a slower vehicle is ahead in the same lane, the vehicle speed adjusts automatically to maintain a preset distance gap. A bar graph with four preset distance gap settings are displayed in the message center. Pressing up (decrease) or down (increase) on the steering wheel cruise control gap switch increases or decreases the distance from the vehicle ahead. If all of the bars are illuminated, this is the longest gap setting. If only one bar is illuminated, that is the shortest gap setting.

The vehicle maintains the distance gap to the vehicle ahead until:

- the vehicle ahead accelerates to a speed above the set speed.
- the vehicle ahead moves out of the lane or out of view.
- the vehicle speed falls below 20 km/h (12 mph).
- a new gap distance is set.

After each ignition cycle, the previous gap setting is remembered and the system is set to that gap setting.

The distance gap can be overridden by pressing the accelerator pedal. The follow vehicle graphic is not displayed in the message center and the green indicator illuminates. When the accelerator pedal is released, the ACC system returns to normal operation and the vehicle speed decreases to the set speed or a lower speed if following a vehicle ahead.

### Deceleration Control

The CCM sends a signal to the ABS module, which controls the brakes, to automatically apply the brakes to slow the vehicle and to maintain a safe distance to the vehicle in front.

### Pre-Collision Assist System Operation

The pre-collision assist system is an additional safety feature on vehicles equipped with ACC. The system is active whether the ACC system is on or off. If the system detects a vehicle, pedestrian or other object in the vehicle path of travel, the system provides three levels of functionality:

- Visual and audible alert
- Brake support
- Active braking

The system uses object detection information from the radar sensor integrated in the CCM and the forward-looking camera in the IPMA mounted on the windshield below the interior rear view mirror. The CCM and the IPMA scan a designated area in front of the vehicle. Messages are sent between the CCM and the IPMA on dedicated CAN circuit, which determine whether an object, vehicle or pedestrian is in the path of travel, the approximate distance to the object and how fast the vehicle is approaching it. For additional information, Refer to: [Collision Warning and Collision Avoidance System - System Operation and Component Description](#) (419-03C Collision Warning and Collision Avoidance System, Description and Operation).

## Component Description

## **Steering Wheel Switches**

The cruise control steering wheel mounted switches are momentary contact switches that toggle up and down for the switch state. The switches are an input to the SCCM.

## **Brake Switch**

When the brake pedal is applied, the cruise control deactivator switch, integrated in the BPP switch, opens and removes the ground signal from the PCM input circuit, immediately deactivating the cruise control system.

## **CCM**

The CCM contains a radar sensing unit that determines the distance and relative speed of the vehicle that is in the path of travel.

## **IPMA With Pre-Collision Assist**

The IPMA is integral to the interior rear view mirror. The IPMA contains a forward-looking camera with a designated sight line in front of the moving vehicle. The camera detects and differentiates between an approaching object, vehicle or pedestrian in the path of travel. This information is shared with the CCM on a dedicated private CAN circuit.

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