Exterior Lighting - Overview

Headlamps

The headlamp system consists of:

- Headlamp assemblies
- Ballasts (LED and High Intensity Discharge (HID) headlamps)
- Headlamp switch
- LH steering column multifunction switch
- BCM
- SCCM
- IPMA

For halogen headlamps, the headlamp system is a quad-beam pattern system. It consists of replaceable low and high beam bulbs in each headlamp assembly. The side marker lamp and front turn/parking lamps are integrated into the headlamp assembly.

For LED headlamps, the headlamp system is a quad-beam pattern system. It consists of non-replaceable low and high beam Light Emitting Diodes (LEDs) in each headlamp assembly. The front park/turn surround Light Emitting Diodes (LEDs) and front turn Light Emitting Diodes (LEDs) are integrated into the headlamp assembly.

For High Intensity Discharge (HID) headlamp, the headlamp system consists of a replaceable High Intensity Discharge (HID) bulb in each headlamp assembly and an electronic shutter to change the beam pattern. The turn lamp is integrated into the headlamp assembly and the bulb is individually replaceable. The parking lamp Light Emitting Diodes (LEDs) are integrated into the headlamp assembly and are not replaceable.

The High Intensity Discharge (HID) headlamp system is also equipped with manual headlamp leveling.

DRL

The DRL system consists of:

- Low beams
- BCM

The DRL system operates the operates the low beam headlamps at a reduced intensity.

Autolamps

The autolamp system consists of:

- Light sensor
- Headlamp switch
- BCM

The autolamp system provides light sensitive automatic on/off control of the exterior lamps. The autolamp system keeps the exterior lamps on for a preselected period of time after the ignition is turned OFF (20 seconds is the factory default setting). The preselected time is adjustable up to approximately 3 minutes by using the message center controls.

Stoplamps

The stoplamp system consists of:

- Stoplamp switch
- Rear lamp assemblies
- High mounted stoplamp
- BCM

The stoplamp switch is located on the brake pedal assembly. Voltage is supplied to the rear lamps and high mounted stoplamp when the brake pedal is applied.

Turn Signal and Hazard Lamps

The turn lamp system consists of:

- Front turn lamps (part of the headlamp assembly)
- Rear lamp assemblies
- Outside rear view mirrors
- LH steering column multifunction switch
- Hazard flasher lamp switch
- BCM
- SCCM
- DDM

- PDM

When the LH steering column multifunction switch is placed in the LH TURN or RH TURN position, the corresponding turn lamps flash on and off.

When the hazard function is active, all the turn lamps flash on and off.

Parking, Rear and License Plate Lamps

The parking, rear and license plate lamp system consists of:

- Front side marker lamps (halogen headlamps)
- Front park/turn surround Light Emitting Diodes (LEDs) (part of the LED headlamp assembly)
- Front parking Light Emitting Diodes (LEDs) (part of the High Intensity Discharge (HID) headlamp assembly)
- Rear lamp assemblies
- License plate lamps
- Exterior mirror parking lamps, if equipped
- High-mounted stoplamp parking lamp, if equipped
- Roof marker lamps, if equipped
- Front side fender marker lamps, if equipped
- Rear bed marker lamps, if equipped
- Grille marker lamps, if equipped
- Headlamp switch
- BCM

For halogen headlamps, the front park/turn and side marker lamps are integrated into the headlamp assemblies

For LED headlamps, the front park/turn surround Light Emitting Diodes (LEDs) are used as parking lamps and illuminated at a reduced intensity when the parking lamps or headlamps are activated.

For High Intensity Discharge (HID) headlamp, the parking lamp Light Emitting Diodes (LEDs) are integrated into the headlamp assembly and are not replaceable.

Fog Lamps

The front fog lamp system consists of:

- Front fog lamps
- Rear fog lamp
- Front fog lamps switch (integrated into the headlamp switch)

- Rear fog lamp switch (integrated into the headlamp switch)
- BCM

The front fog lamp can be turned on when the ignition is in RUN, the parking lamps are on, and the high beams are off.

Spot Lamps

The spot lamps system consists of:

- Spot lamp switch
- Spot lamp module
- Spot lamps (integrated into the exterior mirror turn lamps)

The spot lamps can be turned on when the parking lamps are on.

Reversing Lamps

The reverse lamp system consists of:

- Reverse lamps
- PCM
- BCM

When the transmission is placed in REVERSE, the reversing lamps are illuminated.

Trailer Lamps

The trailer tow system consists of the following components:

- Trailer tow connector
- TRM, if equipped
- BJB
- BCM

The trailer tow parking lamps relay supplies voltage to the trailer parking lamps.

The BJB supplies voltage to the trailer reversing lamps.

If not equipped with a TRM, the BJB supplies voltage to the trailer stop/turn lamps

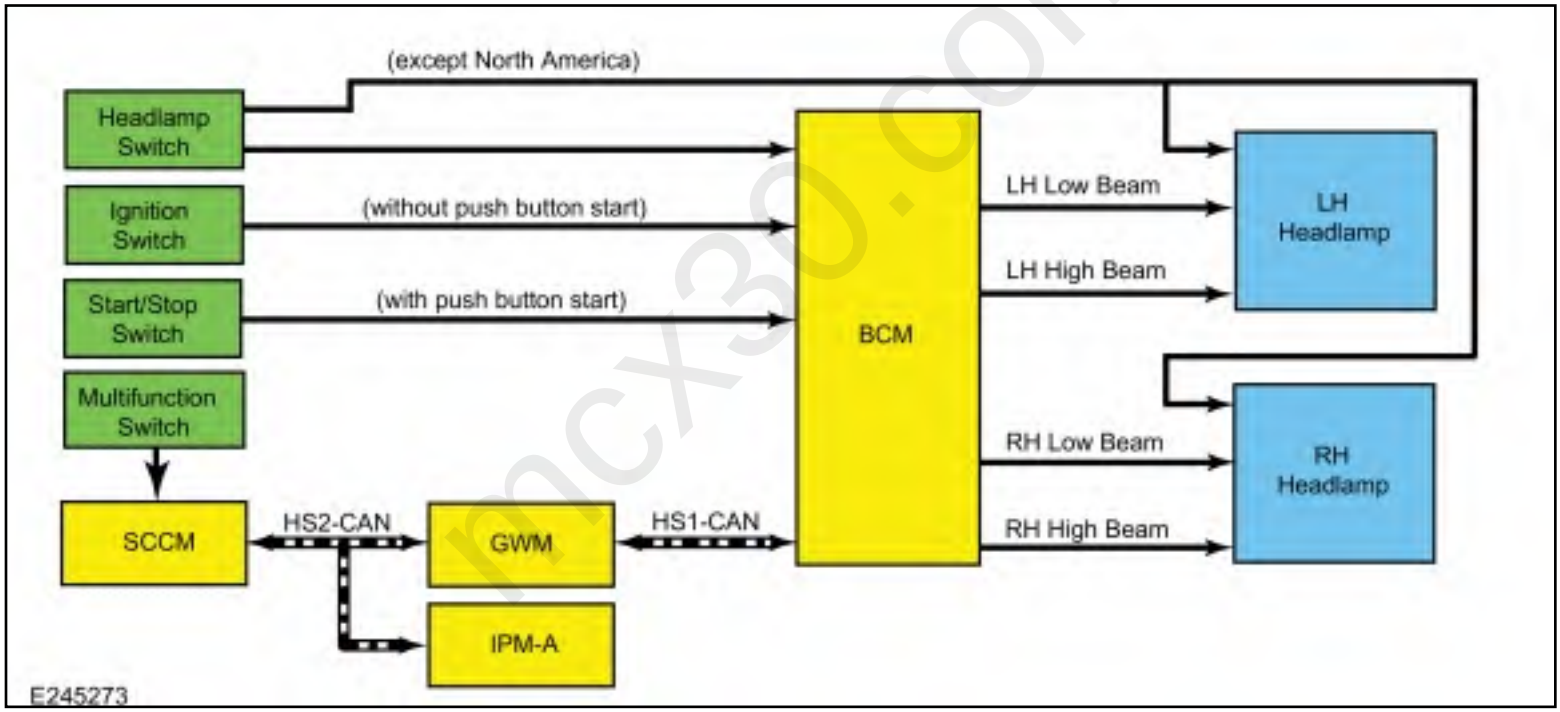
If equipped, the TRM supplies voltage to the trailer stop/turn lamps and trailer battery charging.

Exterior Lighting - System Operation and Component Description

System Operation

Headlamps

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Headlamp flash to pass status	SCCM	Indicates to the BCM a request for the high beams or flash-to-pass.

Auto high beam request	IPMA	Indicates to the GWM a request for the high beams based on the IPMA camera input.

Low Beams

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

The BCM turns the parking lamps and headlamps on when the ignition is in RUN and the BCM detects a fault from the headlamp switch or wiring. This is normal behavior of the BCM when a fault has been detected with the inputs from the headlamp switch.

When the BCM receives a message requesting the headlamps on, it supplies voltage to the headlamp bulbs (halogen headlamps) or the ballasts (LED and High Intensity Discharge (HID) headlamps) within each headlamp assembly.

Vehicles with LED headlamps utilize a module, mounted to each headlamp assembly, that controls the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

Vehicles with High Intensity Discharge (HID) headlamps utilize a ballast, mounted to each headlamp assembly, to provide the necessary voltage to illuminate the High Intensity Discharge (HID) bulbs.

The BCM also provides Field Effect Transistor (FET) protection of the exterior lamps switched voltage and low beam output circuits. When an excessive current draw is detected, the BCM disables the affected circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

High Beams

The SCCM monitors the LH steering column multifunction switch for a high beam request. When the LH steering column multifunction switch is in the HIGH BEAMS position, the SCCM sends a message over the HS-CAN2 to the GWM, then the GWM sends the message to the BCM over the HS-CAN1.

When the low beams are on and the BCM receives a request for high beams, the low beam bulbs (halogen headlamps) or low beam Light Emitting Diodes (LEDs) (LED headlamps) remains powered on and the high beam bulbs (halogen headlamps) or high beam Light Emitting Diodes (LEDs) (LED

headlamps) are also illuminated. This changes the headlamp beam pattern to illuminate a greater distance.

For vehicles with High Intensity Discharge (HID) headlamps, when the low beams are on and the BCM receives a request for high beams, the High Intensity Discharge (HID) bulbs remains powered on and the shutter within each headlamp are activated. This changes the headlamp beam pattern to illuminate a greater distance.

The BCM also provides Field Effect Transistor (FET) protection of the exterior lamps switched voltage and high beam output circuits. When an excessive current draw is detected, the BCM disables the affected circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Automatic High Beams

The automatic high beam system uses an interior rear view mirror mounted camera to monitor surrounding traffic conditions and high beam usage. The camera is hardwired to the IPMA and serviced with the interior rear view mirror assembly. The IPMA communicates light information over the HS-CAN2 to the GWM then the GWM sends the information to the BCM over the HS-CAN1.

The automatic high beam feature is active only when the headlamp switch is in the AUTOLAMPS position.

During nighttime driving, the automatic high beam system automatically turns the high beams on if it is dark enough and no other traffic is present. When the system detects an approaching vehicle's headlamps or a preceding vehicle's rear lamps, the system turns off the high beams. When the approaching vehicle's headlamps or the preceding vehicle's rear lamps are no longer detected, the high beams automatically turn back on.

Flash-To-Pass

The SCCM monitors the LH steering column multifunction switch for a flash-to-pass request. When the LH steering column multifunction switch is in the FLASH-TO-PASS position, the SCCM sends a message over the HS-CAN2 to the GWM then the GWM sends the message to the BCM over the HS-CAN1.

When the ignition is in RUN and the flash-to-pass is requested, the high beams are activated as long as the LH steering column multifunction switch is held in the flash-to-pass position.

Headlamp Exit Delay

When the ignition is OFF and the LH steering column multifunction switch is placed in the FLASH-TO-PASS position and released, the parking lamps and low beams are illuminated. They remain illuminated until:

- 3 minutes have elapsed with a door open.
- 30 seconds have elapsed after all doors are closed.
- the LH steering column multifunction switch is placed in the flash-to-pass position again.
- the ignition switches to RUN.

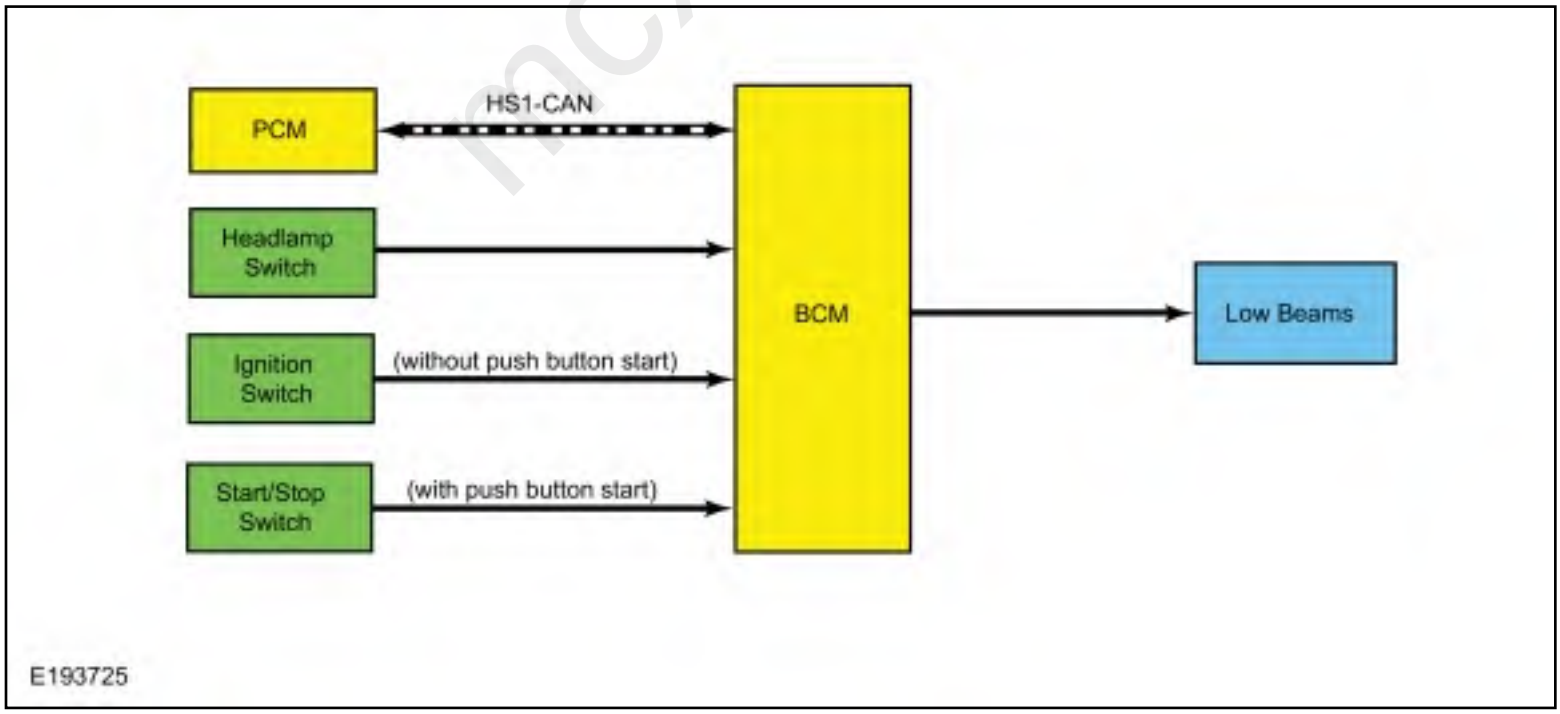
Within the 30 second delay and all the doors closed, opening any door results in the 3 minute timer restarting.

Manual Headlamp Leveling - High Intensity Discharge (HID) Headlamps

By pressing the headlamp button and releasing it into the popped out position, the switch can be rotated into one of 4 headlamp level positions. This allows headlamp beam height to be adjusted according to vehicle load. Once the beam is adjusted, the button can be pressed again to lock in the headlamp beam height.

DRL

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Gear position	PCM	Indicates the GSM request to the BCM. When the GSM has selected any position other than park, the BCM activates the DRL.

DRL

The DRL system utilizes the existing circuitry (halogen headlamps) and components from the headlamp low beam system.

The DRL system operates the low beam headlamps at a reduced intensity.

The BCM monitors the ignition status, the headlamp switch and autolamp status.

There are two types of DRL. Conventional (where it is required) and configurable.

When equipped with conventional DRL, the DRL are active in any headlamp switch position except the HEADLAMPS position.

When equipped with configurable DRL, the DRL may be enabled through the IPC message center. When enabled, the DRL are active only in the AUTOLAMPS headlamp position. When autolamps request the headlamps on, the DRL are de-activated.

The DRL are activated when the following conditions are met:

- the ignition is in run
- the headlamps have not been turned on by the autolamp system or the headlamp switch
- the transmission is not in park

When the transmission is in not in PARK, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is not in PARK.

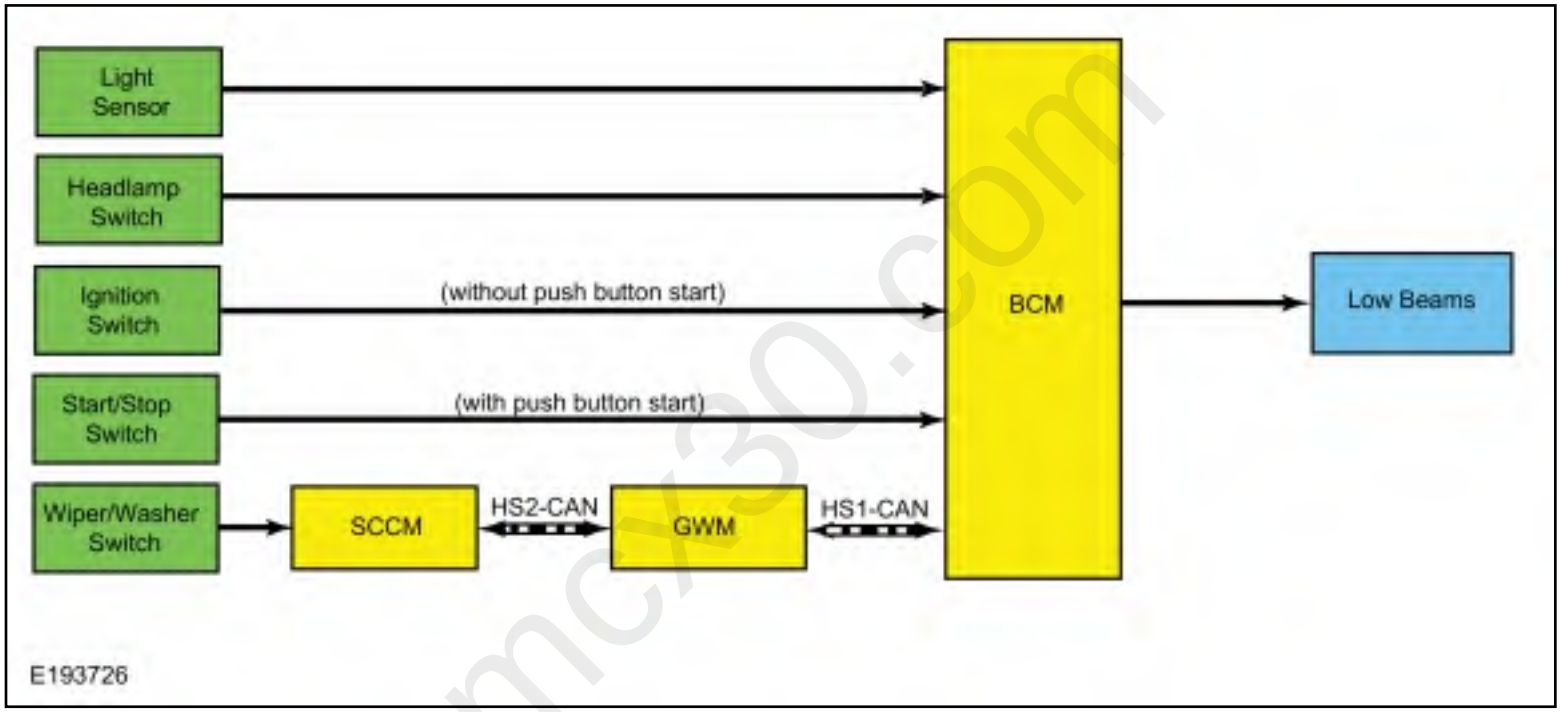
Vehicles with LED headlamps utilize a ballast, mounted to each headlamp assembly, that controls the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

The BCM also provides Field Effect Transistor (FET) protection of the exterior lamps switched voltage and DRL output circuits. When an excessive current draw is detected, the BCM disables the affected circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Autolamps

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Front wiper status	SCCM	The BCM uses the wiper status information for the operation of the wiper activated headlamps feature.

Autolamps

The BCM monitors the light sensor with a voltage signal. The light sensor input to the BCM varies with the ambient light conditions.

The BCM monitors the headlamp switch circuits to indicate the headlamp switch position.

When the BCM receives a headlamp switch status indicating a request for the autolamps, the BCM monitors the light sensor for the ambient light condition. If the BCM determines the ambient light level is dark, the BCM supplies voltage to the exterior lamps.

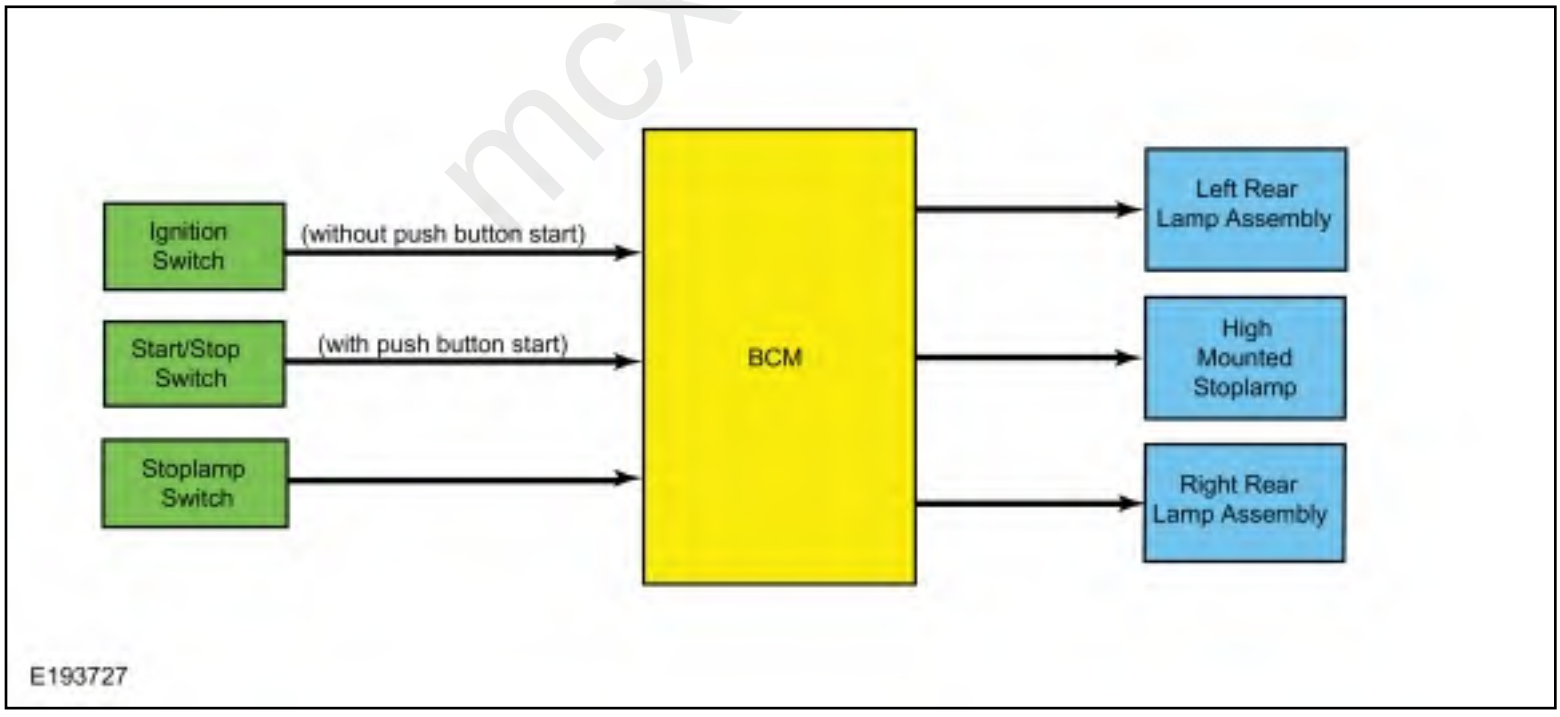
Headlamps On With Wipers On Function

When the headlamp switch is in the autolamps position, the exterior lamps turn on when the front wipers are in low or high. This feature does not activate the exterior lamps during a mist wipe, while the wipers are on to clear washer fluid during a wash condition or if the wipers are in automatic or intermittent modes.

The exterior lamps turn off when the ignition switches OFF or to ACC mode, the headlamp switch is placed in the off position, or the front wipers are turned off. The exception to this is when the exterior lights are on because of darkness determined by the autolamp system.

Stoplamps

System Diagram



Stoplamps

The BCM monitors the input from the stoplamp switch. When the brake pedal is applied, voltage is routed to the BCM, indicating a request for the stoplamps. The BCM then supplies voltage to the stoplamps.

The BCM does not activate the stoplamps when the ignition is in OFF or ACC.

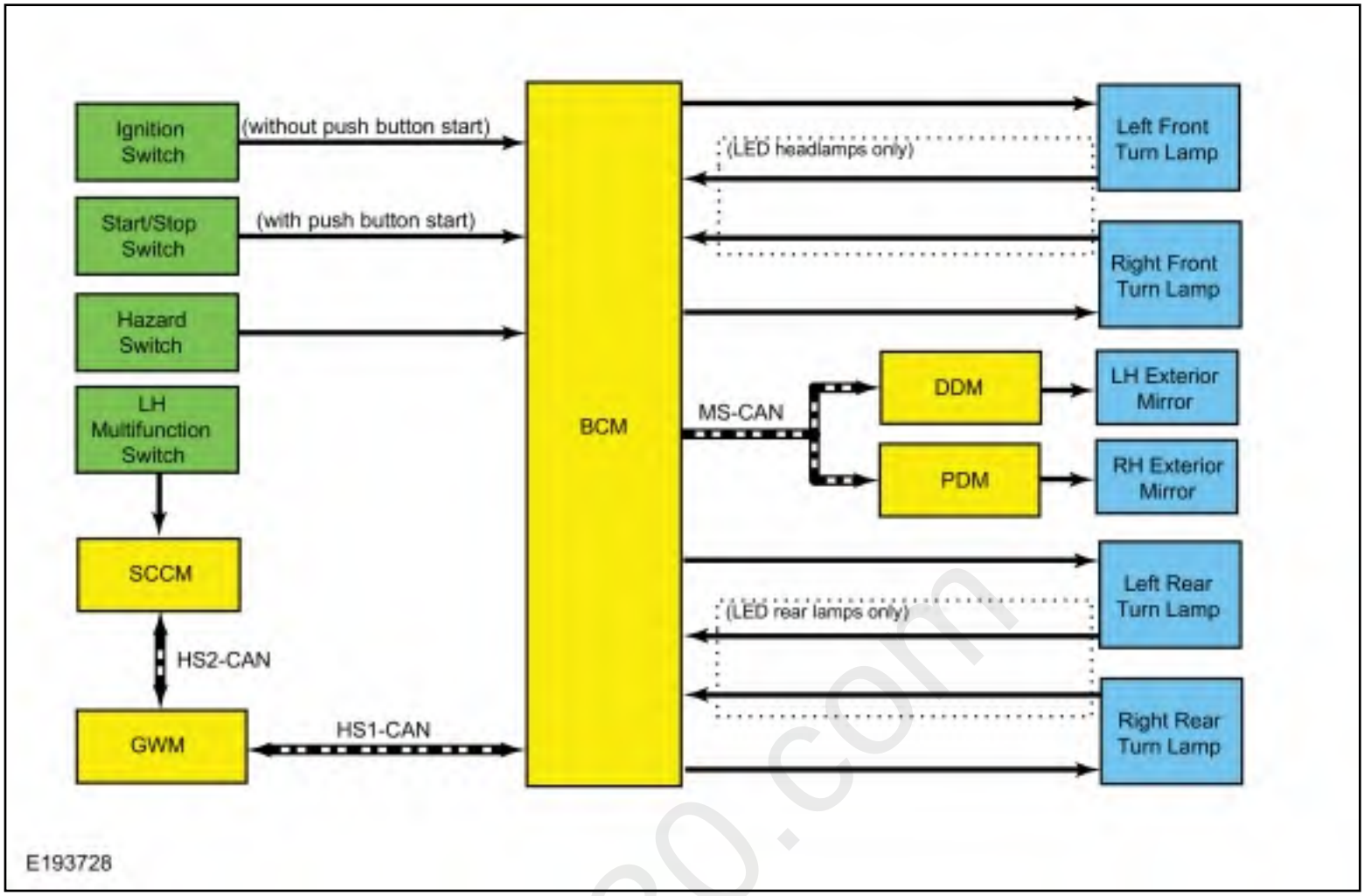
The BCM uses 3 separate output circuits. The LH stop lamp output circuit, RH stop lamp output circuit and high-mounted stoplamp output circuit.

The BCM also provides Field Effect Transistor (FET) protection of the stoplamp output circuits. When an excessive current draw is detected, the BCM disables the affected stoplamp circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Turn Signal and Hazard Lamps

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Turn signal switch status	SCCM	Indicates the turn signal stalk position on the LH steering column multifunction switch (left/right lane change or turn signal on or off). The BCM activates the left/right turn signals based on this input.

DDM and PDM Network Input Messages

Broadcast Message	Originating Module	Message Purpose

Turn indication request	BCM	A command to the DDM or PDM to activate/ deactivate the exterior mirror turn indicator.

Turn Signals

The SCCM monitors the LH steering column multifunction switch position. When the LH steering column multifunction switch is in the left or right turn position, the SCCM sends a message over the HS-CAN2 to the GWM then the GWM sends the message to the BCM over the HS-CAN1 indicating a request for the LH or RH turn signal.

When the BCM receives a request for a turn signal, the BCM supplies on/off voltage to the appropriate turn lamps. The BCM sends a turn indicator command message over the MS-CAN to the door modules for the exterior mirror turn lamps.

The timed on/off cycle for turn lamps is determined by the BCM and is set to flash approximately 70 times per minute if both the front and rear turn signal lamps operate correctly.

When equipped with LED headlamps or rear lamps, the turn lamps are Light Emitting Diodes (LEDs) and have an outage circuit that tells the BCM when the Light Emitting Diodes (LEDs) are inoperative. During normal operation, when voltage is applied to the rear turn Light Emitting Diodes (LEDs), the feedback circuit sends the same voltage back to the BCM through the outage circuit. If the Light Emitting Diodes (LEDs) are inoperative the BCM will not receive this voltage feedback through the outage circuit.

If a front or rear turn signal lamp is inoperative, the BCM fast flashes the remaining turn lamp(s) approximately 150 times per minute to indicate a bulb outage to the driver.

The LH steering column multifunction switch has 2 detents for the left turn position and 2 detents for the right turn position. When placed in the first detent and released, the corresponding turn signals flash 3 times and turn off. When the LH steering column multifunction switch is moved to the second detent, the turn signal flashes until the steering wheel is turned in the opposite direction.

Vehicles with LED headlamps utilize a ballast, mounted to each headlamp assembly, that controls the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

The BCM also provides Field Effect Transistor (FET) protection of the turn lamp output circuits. When an excessive current draw is detected, the BCM disables the affected turn lamp circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules,

Description and Operation).

Hazard Lamps

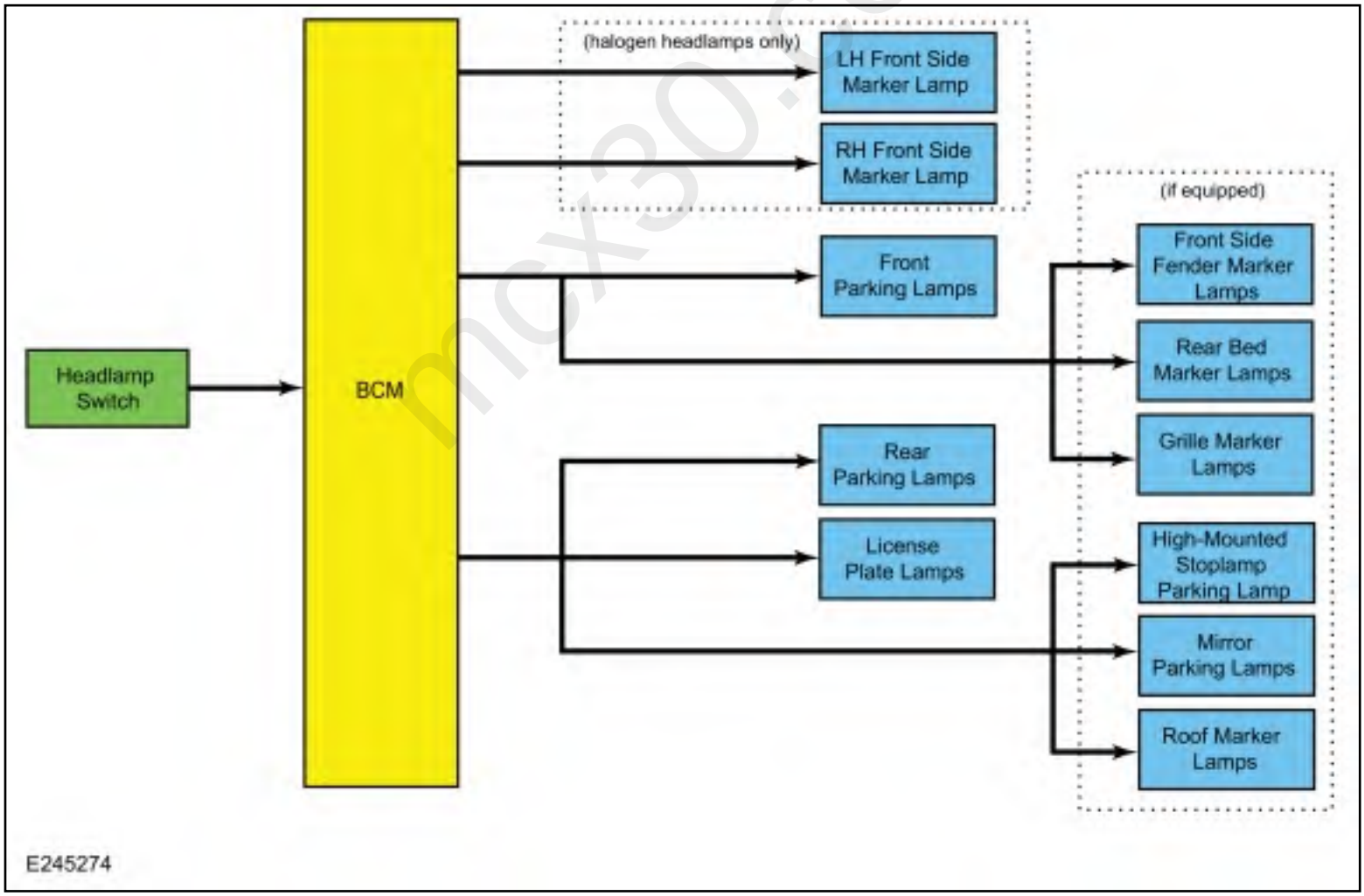
The BCM sends a voltage signal to the hazard flasher lamp switch to monitor for a hazard lamp function request. When the hazard flasher lamp switch is pressed, the voltage signal is routed to ground, indicating a request to activate or deactivate the hazard lamp function.

When the BCM receives a request for the hazard lamps, the BCM supplies on/off voltage to all the turn lamps.

The timed on/off cycle for the hazard lamps is approximately 70 times per minute, regardless of bulb outage.

Parking, Rear, and License Plate Lamps

System Diagram



Parking Lamps

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

If the BCM detects a fault from the headlamp switch or loses communication with the headlamp switch, the BCM turns the parking and headlamps on. This is normal behavior of the BCM when a fault has been detected with the inputs from the headlamp switch.

When the BCM receives an input requesting the parking lamps on, it provides voltage to the parking lamps.

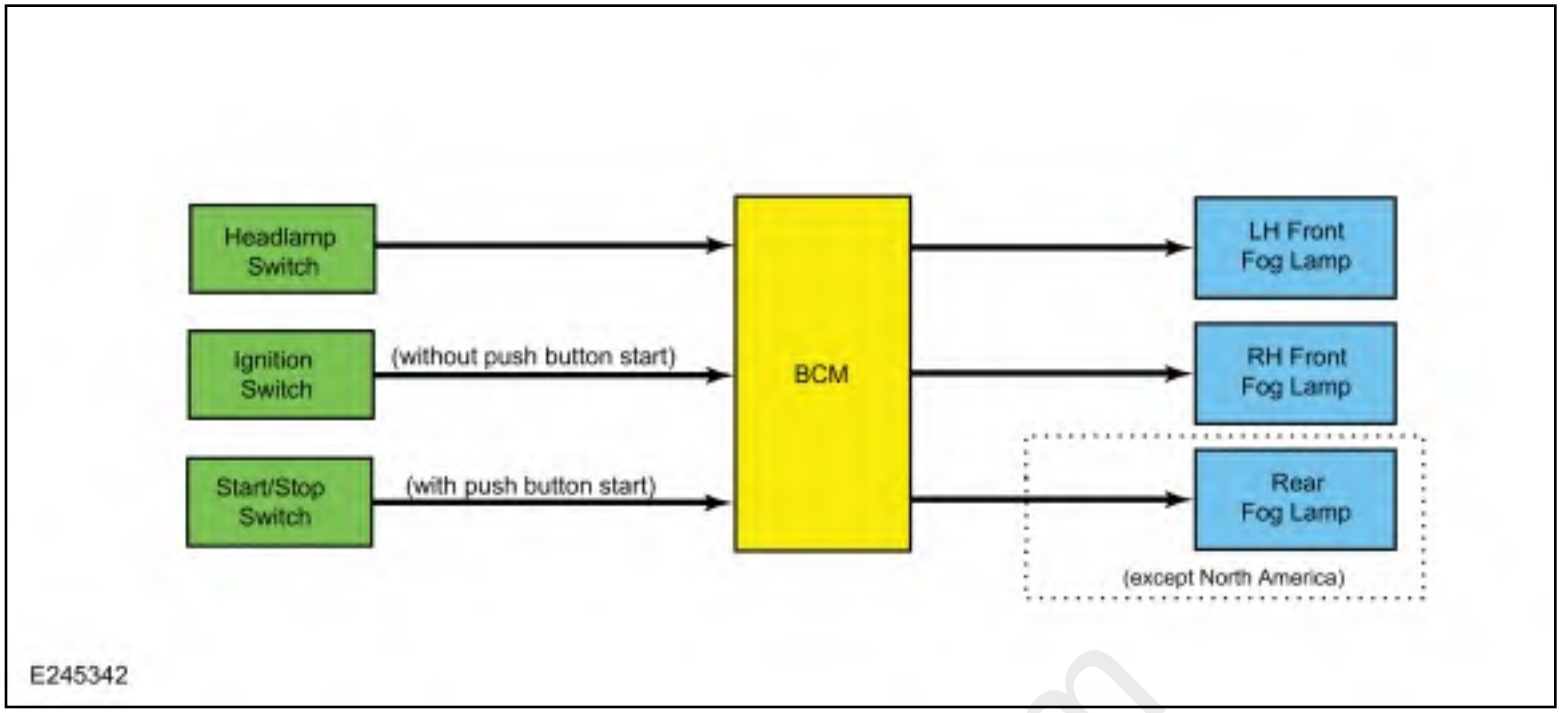
Vehicles with LED headlamps utilize a ballast, mounted to each headlamp assembly, that controls the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

The BCM also provides Field Effect Transistor (FET) protection of the parking lamps output circuits. When an excessive current draw is detected, the BCM disables the affected parking lamps circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Fog Lamps

System Diagram



Fog Lamps

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

When the BCM receives input from the headlamp switch indicating a request for the fog lamps, the BCM provides voltage to the fog lamps.

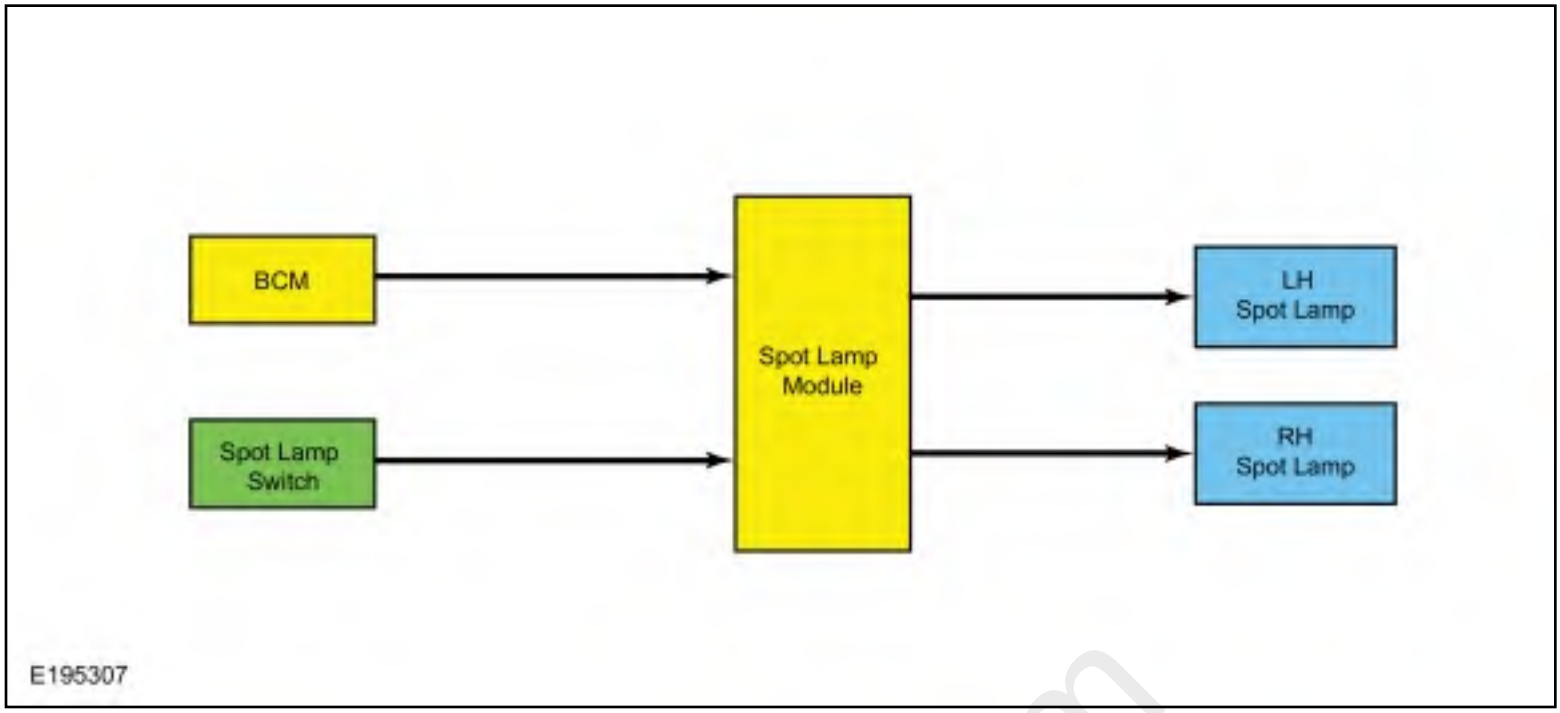
If equipped, when the vehicle is in snow plow mode, the front fog lamps are disabled.

The BCM also provides Field Effect Transistor (FET) protection of the rear fog lamp output circuit. When an excessive current draw is detected, the BCM disables the front fog lamp output circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Spot Lamps

System Diagram



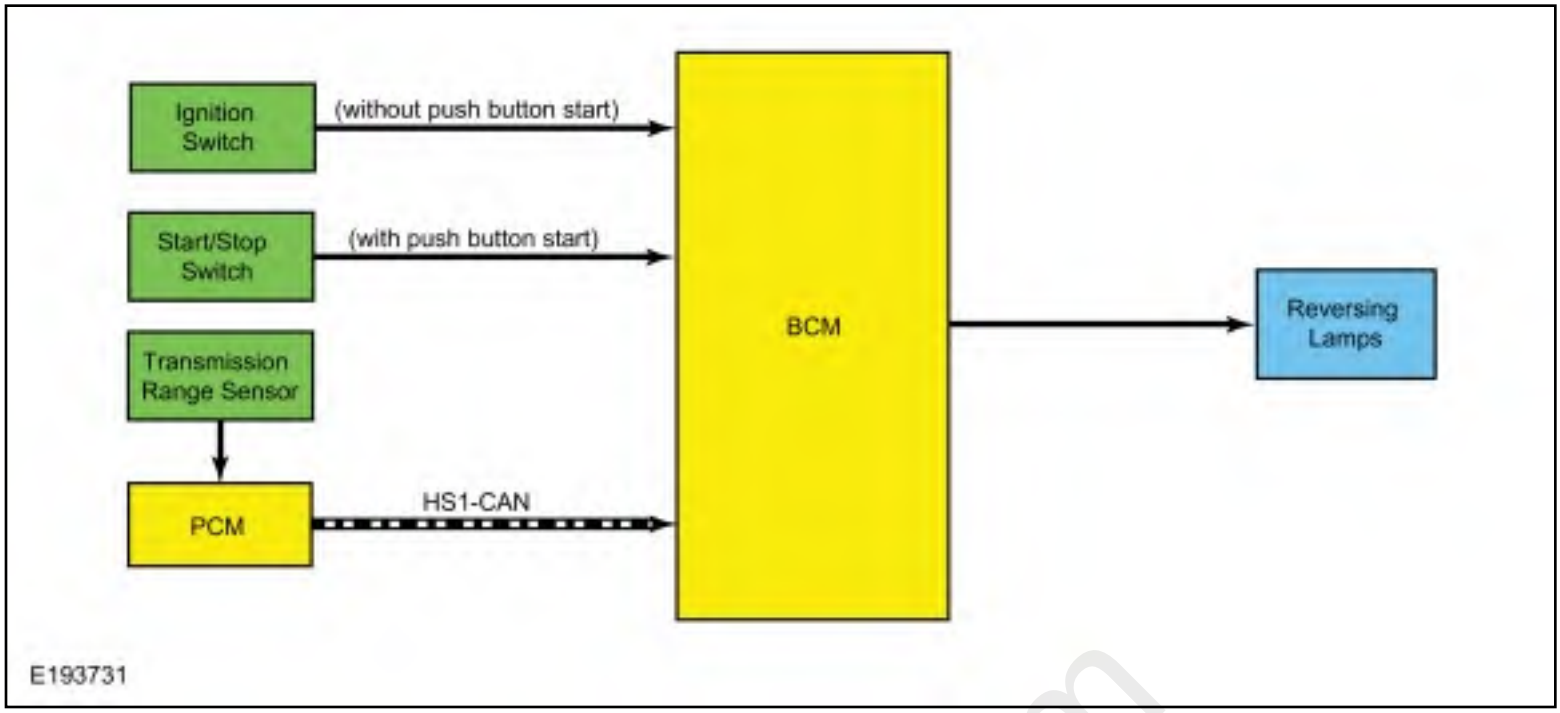
Spot Lamps

When a spot lamp switch is pressed, a ground is provided to the spot lamp module. When the spot lamp module detects that the spot lamp switch has been pressed, it sends voltage to the spot lamp (integrated into the exterior mirror turn lamp) and to the spot lamp switch indicator.

The BCM enables the spot lamps for use when the vehicle speed is less than 6 mph (10 km/h) and the parking lamps are on.

Reversing Lamps

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Gear position	PCM	Indicates the transmission is in reverse gear to the BCM. When the transmission is in REVERSE and the ignition in RUN, the BCM provides voltage to the reversing lamps.

Reversing Lamps

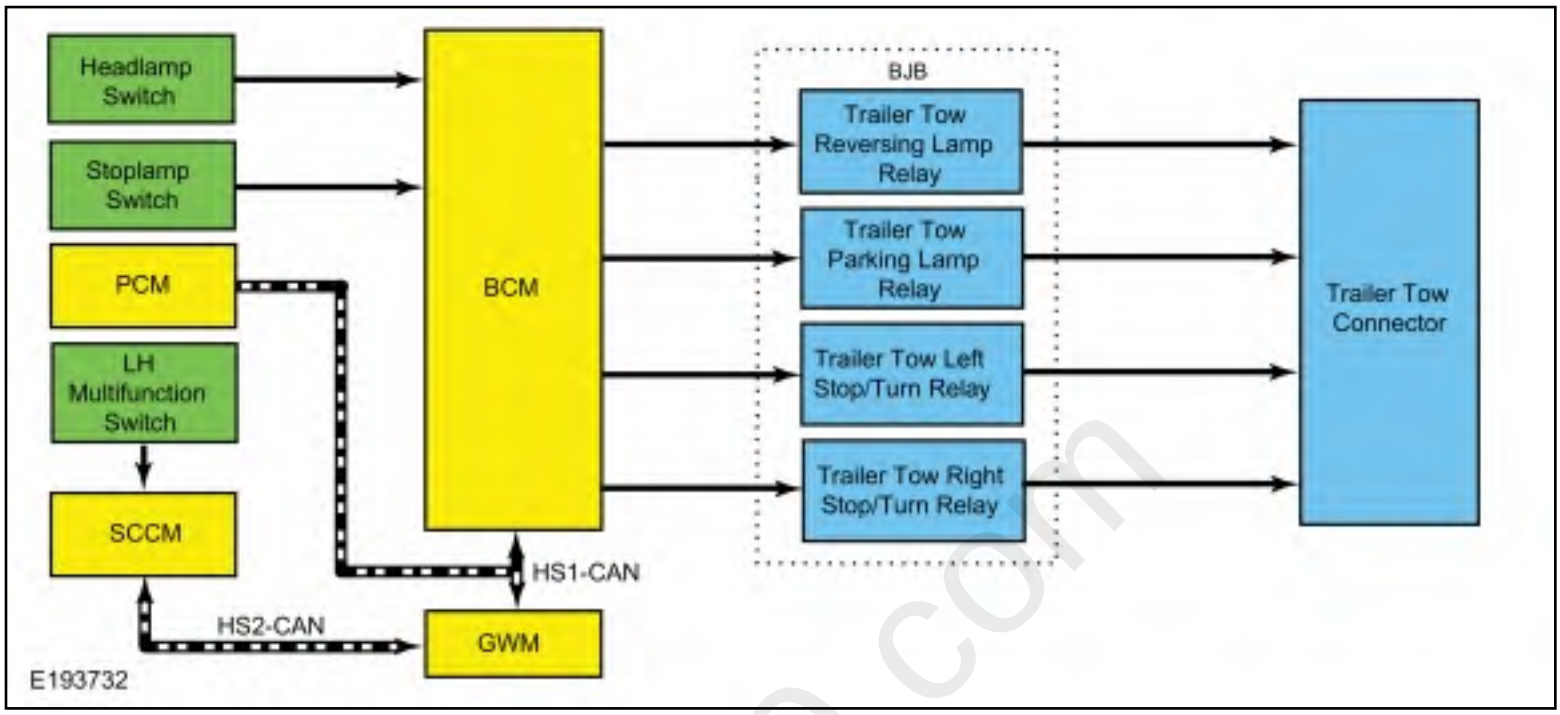
When the transmission is in REVERSE, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is in REVERSE. The BCM provides voltage to the reversing lamps when it receives the message that the transmission is in REVERSE and the ignition is in RUN.

The BCM also provides Field Effect Transistor (FET) protection of the reversing lamps output circuit. When an excessive current draw is detected, the BCM disables the affected reversing lamps circuit driver.

Refer to: Module Controlled Functions - Overview (419-10 Multifunction Electronic Modules, Description and Operation).

Trailer Lamps - Without TRM

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Gear position	PCM	Indicates the transmission is in reverse gear to the BCM. When the transmission is in REVERSE and the ignition in RUN, the BCM provides voltage to the reversing lamps.
Turn signal switch status	SCCM	Indicates the turn signal stalk position on the LH steering column multifunction switch (left/right lane change or turn signal on or off). The BCM activates the left/right turn signals based on this input.

Trailer Stop-Turn Lamps

The SCCM monitors the LH steering column multifunction switch position. When the LH steering

column multifunction switch is in the left or right turn position, the SCCM sends a message over the HS-CAN2 to the GWM then the GWM sends the message to the BCM over the HS-CAN1 indicating a request for the LH or RH turn signal.

When the BCM receives a request for a turn signal, the BCM provides a switched ground path to the LH or RH stop/turn trailer tow relay (integral to the BJB). When the BCM provides ground the LH or RH stop/turn trailer tow relay, the relay is energized and the relay provides turn lamp voltage to the trailer tow connector.

When the BCM receives input from the stoplamp switch indicating that the brake pedal is being pressed, the BCM provides a ground path to the LH and RH stop/turn trailer tow relay (integral to the BJB). When the BCM provides ground the LH and RH stop/turn trailer tow relay, the relay is energized and the relay provides stop lamp voltage to the trailer tow connector.

Trailer Parking Lamps

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

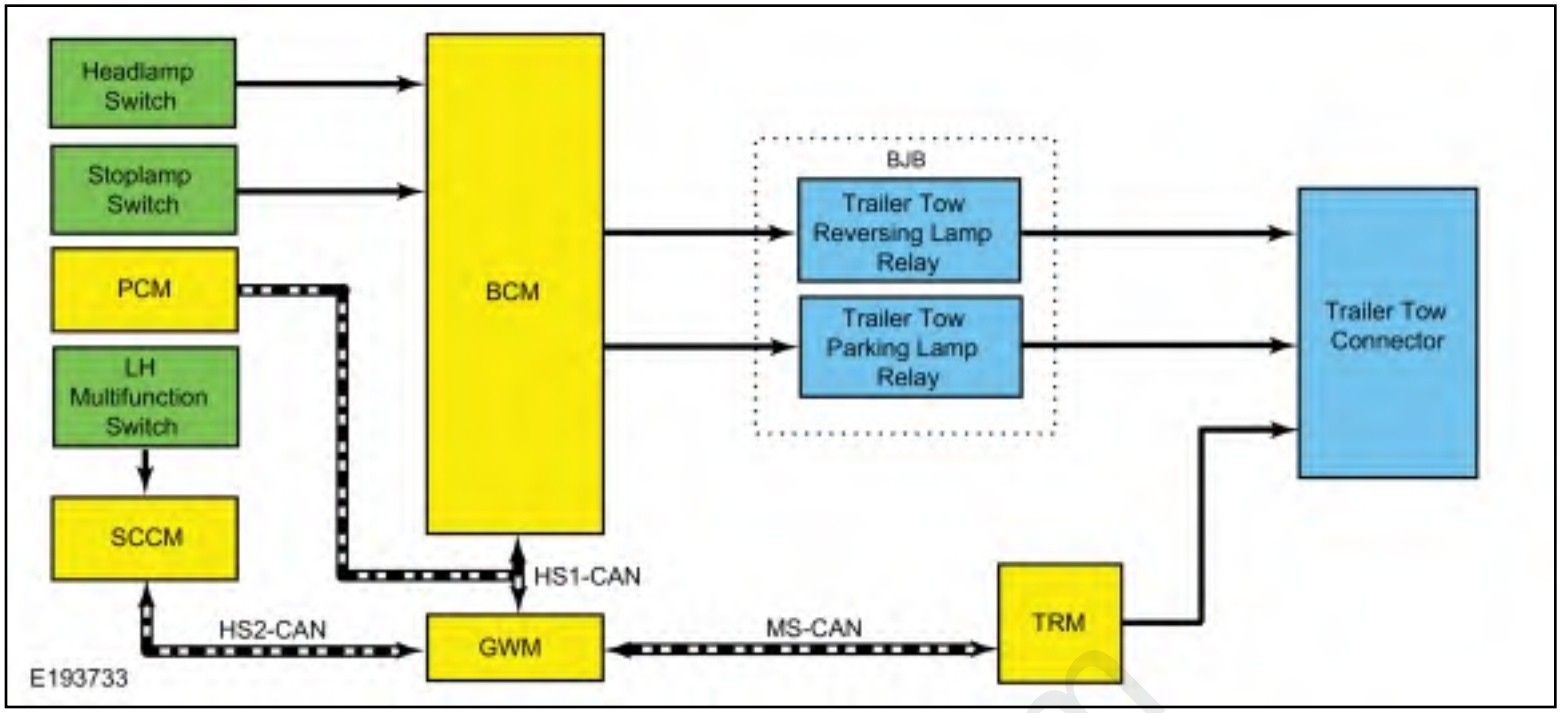
When the parking lamps or headlamps position is selected, the BCM provides a ground path to the parking lamps trailer tow relay. When the BCM provides ground the parking lamps trailer tow relay, the relay is energized and the relay provides parking lamp voltage to the trailer tow connector.

Trailer Reversing Lamps

When the transmission is in REVERSE, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is in REVERSE. The BCM provides ground to the reversing lamps trailer tow relay (integral to the BJB) when it receives the message that the transmission is in REVERSE and the ignition is in RUN. When the BCM provides ground the reversing lamps trailer tow relay, the relay is energized and the relay provides reversing lamp voltage to the trailer tow connector.

Trailer Lamps - With TRM

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Gear position	PCM	Indicates the transmission is in reverse gear to the BCM. When the transmission is in REVERSE and the ignition in RUN, the BCM provides voltage to the reversing lamps.
Turn signal switch status	SCCM	Indicates the turn signal stalk position on the LH steering column multifunction switch (left/right lane change or turn signal on or off).

TRM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Turn indication request	BCM	A command to the TRM to activate/deactivate the turn indicator output to the trailer tow connector.

Stoplamp request	BCM	A command to the TRM to activate/deactivate the stop lamps output to the trailer tow connector.

Trailer Stop-Turn Lamps

The SCCM monitors the LH steering column multifunction switch position. When the LH steering column multifunction switch is in the left or right turn position, the SCCM sends a message over the HS-CAN2 to the GWM then the GWM sends the message to the BCM over the HS-CAN1 indicating a request for the LH or RH turn signal.

When the BCM receives a request for a turn signal, the BCM sends a turn indicator command message over the MS-CAN to the TRM to activate the requested stop/turn indicator output to the trailer tow connector.

When the BCM receives input from the stoplamp switch indicating that the brake pedal is being pressed, the TRM receives a stoplamp activation message over the MS-CANto activate the requested stop/turn indicator output to the trailer tow connector.

Trailer Parking Lamps

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

When the parking lamps or headlamps position is selected, the BCM provides a ground path to the BJB parking lamps trailer tow relay. When the BCM provides ground the parking lamps trailer tow relay, the relay is energized and the relay provides parking lamp voltage to the trailer tow connector.

Trailer Reversing Lamps

When the transmission is in REVERSE, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is in REVERSE. The BCM provides ground to the reversing lamps trailer tow relay (integral to the BJB) when it receives the message that the transmission is in REVERSE and the ignition is in RUN. When the BCM provides ground the reversing lamps trailer tow relay, the relay is energized and the relay provides reversing lamp voltage to the trailer tow connector.

Trailer Battery Charging

The TRM provides voltage to the trailer tow connector for trailer battery charging when the ignition switch is in the RUN position.

The TRM is supplied voltage for trailer battery charging from the BJB.

Field Effect Transistor (FET) Protection

The TRM utilizes a Field Effect Transistor (FET) protective circuit strategy for its lamp output circuits. Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down (turns off the voltage or ground provided by the module) when a fault event is detected.

A Field Effect Transistor (FET) is a type of transistor that the control module software uses to control and monitor current flow on module outputs. The Field Effect Transistor (FET) protection strategy prevents module damage in the event of excessive current flow.

Output loads (current level) are monitored for excessive current draw (typically short circuits). When a fault event is detected the Field Effect Transistor (FET) turns off and a short circuit DTC sets. The module resets the Field Effect Transistor (FET) protection and allows the circuit to function when the fault is corrected or the ignition state is cycled off and then back on.

When the excessive circuit load occurs often enough, the module shuts down the output until a repair procedure is carried out. Each Field Effect Transistor (FET) protected circuit has 3 predefined levels of short circuit tolerance based on a module lifetime level of fault events based upon the durability of the Field Effect Transistor (FET).

When each level is reached, the DTC associated with the short circuit sets along with DTC U1000:00. These Diagnostic Trouble Codes (DTCs) can be cleared using the module on-demand self-test, then the Clear DTC operation on the scan tool (if the on-demand test shows the fault corrected). The module never resets the fault event counter to zero and continues to advance the fault event counter as short circuit fault events occur.

If the number of short circuit fault events reach the third level, then Diagnostic Trouble Codes (DTCs) U1000:00 and U3000:49 set along with the associated short circuit DTC. DTC**U3000:49 cannot be cleared** and the module **must** be replaced after the repair.

Component Description

Headlamp Assembly

Vehicles with LED headlamps utilize a ballast, mounted to each headlamp assembly, that controls the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

Exterior lamps are vented to accommodate normal changes in pressure. Condensation can be a natural

by-product of this design. When moist air enters the lamp assembly through the vents, there is a possibility that condensation can occur if the temperature is cold. When normal condensation occurs, a thin mist forms on the interior of the lens. The thin mist eventually clears and exits through the vents during normal operation. The amount of time it takes to clear the lens of acceptable mist varies with ambient humidity and lamp types. Normal condensation clears from any lamp in 48 hours under dry conditions.

Do not replace a lamp assembly with acceptable levels of condensation such as:

- presence of thin mist (no streaks, drip marks or droplets are present)
- fine mist covers less than 50% of the lens

Examples of unacceptable moisture (usually caused by a lamp housing leak):

- water puddling inside the lamp
- large water droplets, drip marks or streaks present on the interior of the lens

Headlamp Switch

The BCM monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

Ballast

For LED headlamps, a ballast is mounted to each LED headlamp assembly. The ballasts control the voltage to the high beam, low beam, parking and turn Light Emitting Diodes (LEDs) within the headlamp assembly and the low beam DRL function.

For High Intensity Discharge (HID) headlamps, a ballast is mounted to each High Intensity Discharge (HID) headlamp assembly. The ballasts provide high voltage to the High Intensity Discharge (HID) bulbs when voltage from the BCM (low beam outputs) is detected.

Light Sensor

The BCM sends a voltage signal to the light sensor. The light sensor provides resistance between the voltage signal and ground. The resistance varies depending on the amount of ambient light detected by the light sensor. The brighter the ambient light, the lower the resistance. By varying the resistance, the BCM can determine the amount of ambient light.

Stoplamp Switch

The stoplamp switch is a normally open switch and is provided voltage at all times. When the brake pedal is applied, the switch closes and routes voltage to the BCM.

TRM

The TRM receives inputs from the BCMto control voltage to the trailer tow connector for the LH stop/turn, RH stop/turn lamps and trailer battery charging.
