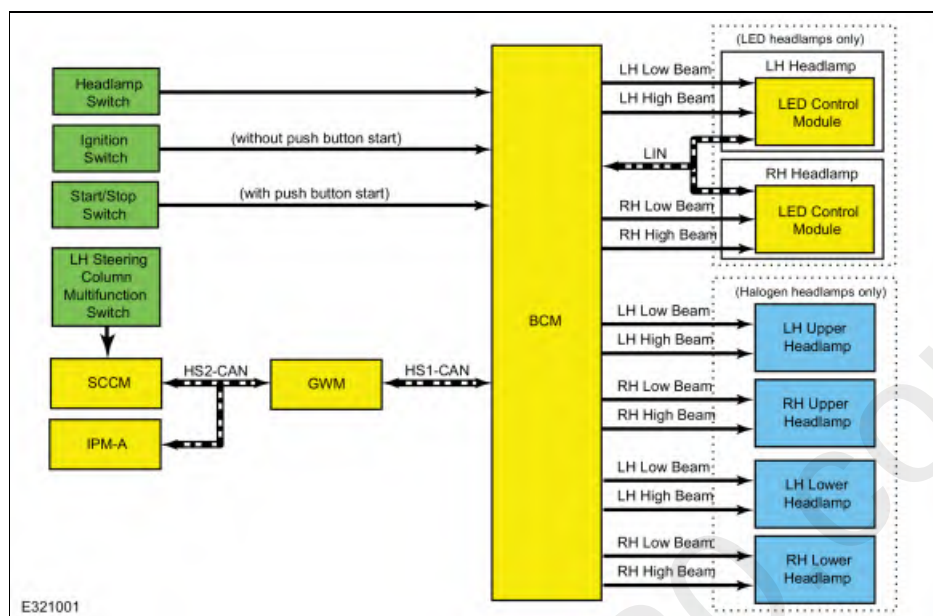


Exterior Lighting - System Operation and Component Description

System Operation

Headlamps

System Diagram



Item	Description
1	RH low beam
2	RH high beam
3	(without push button start)
4	(with push button start)
5	LH low beam
6	LH high beam
7	HS-CAN2
8	BCM
9	LH Upper headlamp
10	SCCM
11	Headlamp switch
12	LH steering column multifunction switch
13	IPMA
14	GWM
15	Ignition switch
16	HS-CAN1
17	Start/Stop switch
18	RH upper headlamp
19	LED control module
20	LH headlamp

21	LED control module
22	RH headlamp
23	RH low beam
24	RH high beam
25	LH low beam
26	LH high beam
27	(LED headlamps only)
28	(Halogen headlamps only)
29	RH low beam
30	RH high beam
31	LH low beam
32	LH high beam
33	LH lower headlamp
34	RH lower headlamp
35	LIN

Network Message Chart

BCM Network Input Messages

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

GWM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Headlamp flash to pass status	SCCM	Indicates to the GWM 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 - Halogen Headlamps

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 reads a request for the headlamps on, it supplies voltage to the all both headlamp bulbs low beam circuit within each headlamp assembly.

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

Refer to: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Low Beams - LED Headlamps

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.

The BCM supplies voltage to the LED control module mounted on each headlamp assembly when the ignition is on. The LED control module then provides the proper voltage to the low beam LED in each headlamp assembly.

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

Refer to: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

High Beams - Halogen Headlamps

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 BCM receives a request for high beams, it supplies voltage to the both headlamp bulbs high beam circuit within each headlamp assembly.

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: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

High Beams - LED Headlamps

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.

The BCM supplies voltage to the LED control module mounted on each headlamp assembly when the ignition is on. .

When the BCM reads a request for the headlamps on, it sends a message through the headlamp LIN circuit to the LED control module mounted on each headlamp assembly. The LED control module then provides the proper voltage to the high beam LED in each headlamp assembly.

When the low beams are on and the BCM receives a request for high beams, low beam Light Emitting Diodes (LEDs) remains powered on and the high beam Light Emitting Diodes (LEDs) are also illuminated. 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: Body Control Module (BCM) - System Operation and Component Description (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

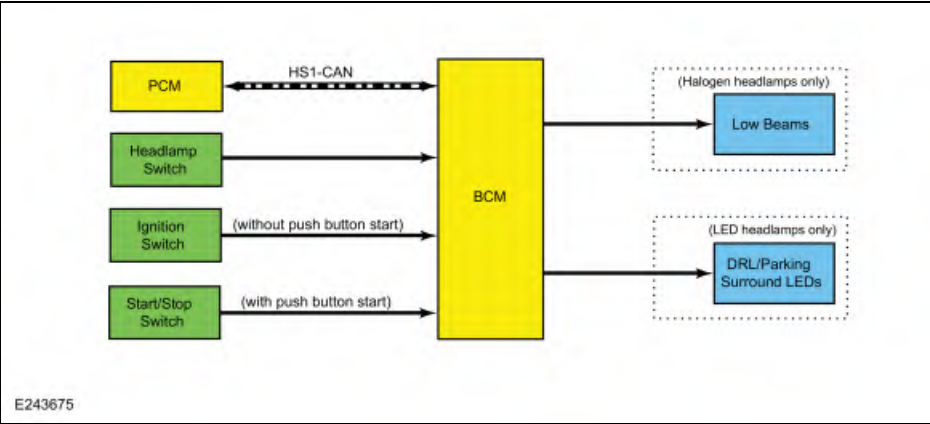
When the ignition is OFF and the LH steering column multifunction switch is placed in the FLASH-TO-PASS position and released, the parking lamps and low beams are illuminated. They remain illuminated until:

- 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.

DRL

System Diagram



Item	Description
1	BCM
2	Low beams
3	Ignition switch
4	Headlamp switch
5	PCM
6	HS-CAN1
7	Start/Stop switch
8	(without push button start)
9	(with push button start)
10	DRL/parking surround Light Emitting Diodes (LEDs)
11	(LED headlamps only)
12	(Halogen headlamps only)

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

For halogen headlamps, the DRL system utilizes the existing circuitry and components from the headlamp low beam system. The DRL system operates the low beam headlamps at a reduced intensity.

For LED headlamps, the DRL system operates the DRL/parking surround Light Emitting Diodes (LEDs) at full intensity using a PWM voltage circuit.

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

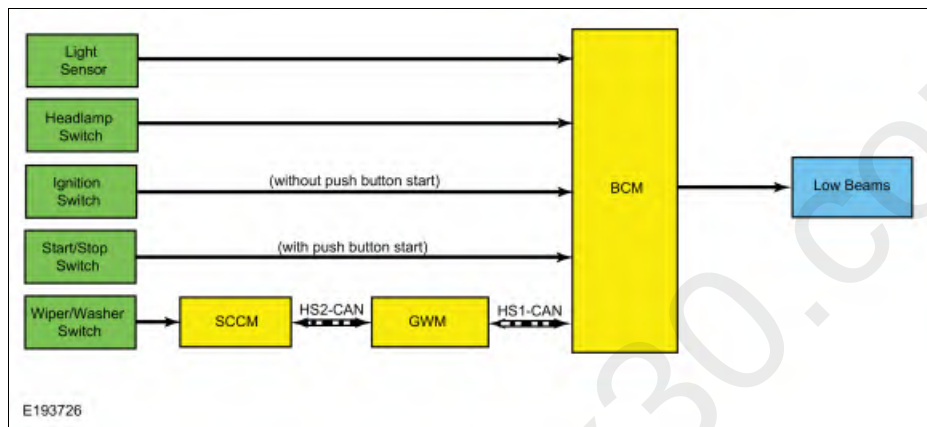
When the transmission is in not in PARK, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is not in PARK.

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

Refer to: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Autolamps

System Diagram



Item	Description
1	BCM
2	Ignition switch
3	Headlamp switch
4	Light Sensor
5	Low beams
6	Start/Stop switch
7	(without push button start)
8	(with push button start)
9	SCCM
10	GWM
11	HS-CAN1
12	HS-CAN2
13	Wiper/Washer switch

Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
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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.

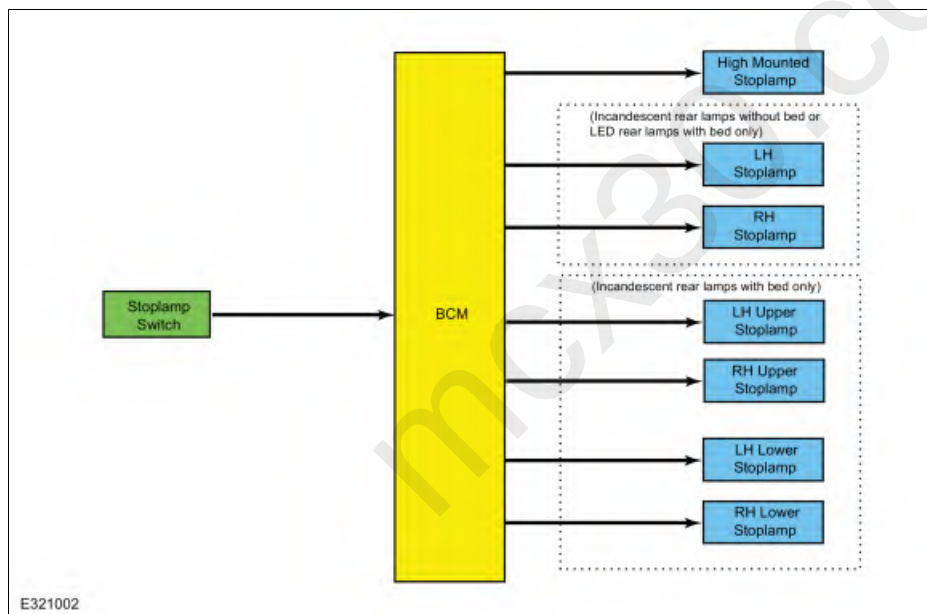
Headlamps On With Wipers On Function

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, 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



Item	Description
1	BCM
2	LH upper stoplamp
3	Stoplamp switch
4	RH upper stoplamp
5	LH lower stoplamp
6	RH lower stoplamp
7	LH stoplamp
8	RH stoplamp
9	(Incandescent rear lamps without bed or LED rear lamps with bed only)
10	(Incandescent rear lamps with bed only)

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.

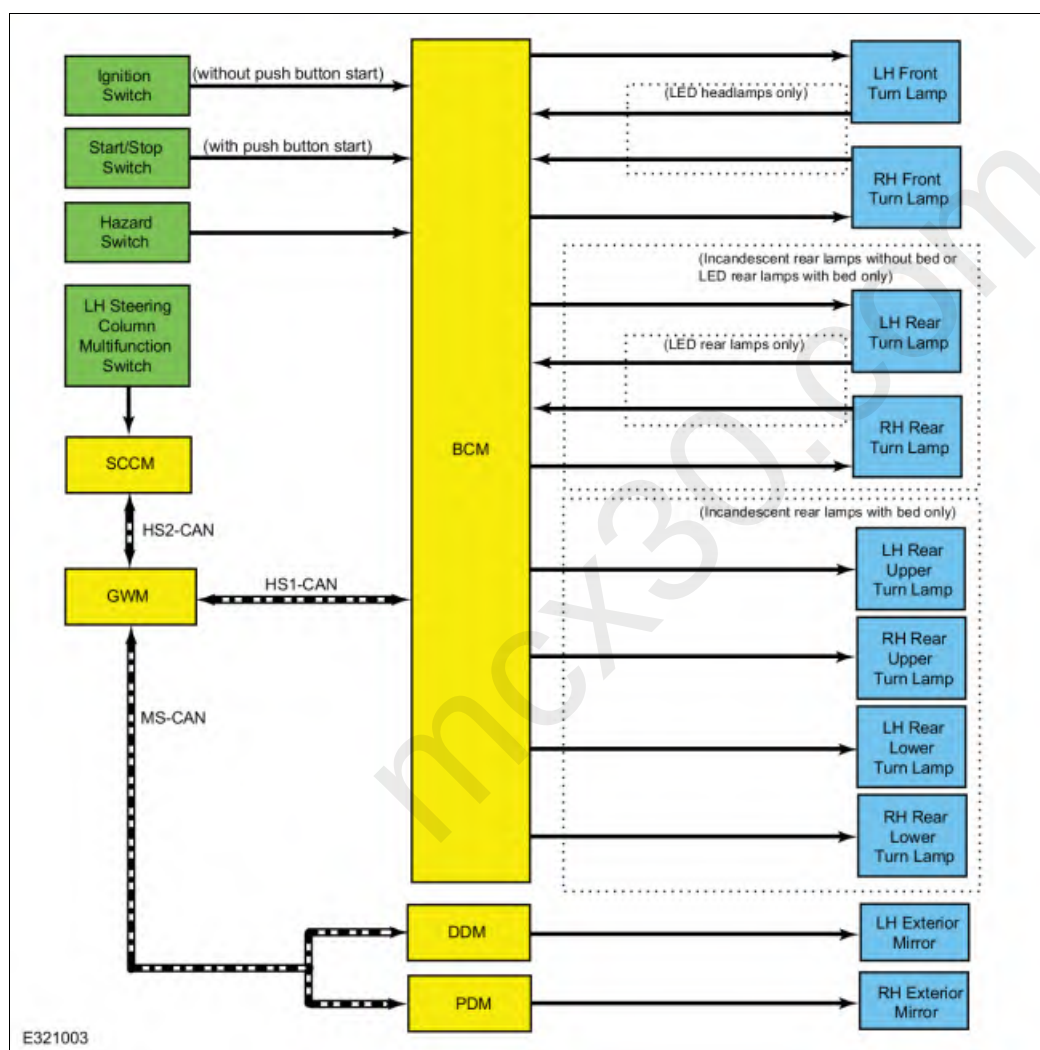
When the BCM receives voltage from the stoplamp switch input, the BCM then supplies voltage to the stoplamps.

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: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Turn Signal and Hazard Lamps - Incandescent Rear Lamps

System Diagram



Item	Description
1	(with push button start)
2	(without push button start)
3	HS-CAN2
4	SCCM
5	GWM
6	HS-CAN1
7	Start/Stop switch
8	Hazard switch

9	BCM
10	LH exterior mirror
11	RH exterior mirror
12	DDM
13	PDM
14	LH front turn lamp
15	Ignition switch
16	RH front turn lamp
17	LH rear turn lamp
18	RH rear turn lamp
19	(LED rear lamps only)
20	LH steering column multifunction switch
21	(Incandescent rear lamps without bed or LED rear lamps with bed only)
22	(LED headlamps only)
23	LH rear upper turn lamp
24	RH rear upper turn lamp
25	LH rear lower turn lamp
26	RH rear lower turn lamp
27	(Incandescent rear lamps with bed only)
28	MS-CAN

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 - Halogen Headlamps And Incandescent Rear 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 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.

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 and the clockspring (vehicles without adaptive steering) or SCCM (vehicles with adaptive steering) mechanically returns the LH steering column multifunction switch to the neutral position and cancels the turn signal.

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

Refer to: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Turn Signals - LED Headlamps and LED Rear 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 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 and the clockspring (vehicles without adaptive steering) or SCCM (vehicles with adaptive steering) mechanically returns the LH steering column multifunction switch to the neutral position and cancels the turn signal.

Vehicles with LED headlamps utilize a LED control 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.

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: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Hazard Lamps

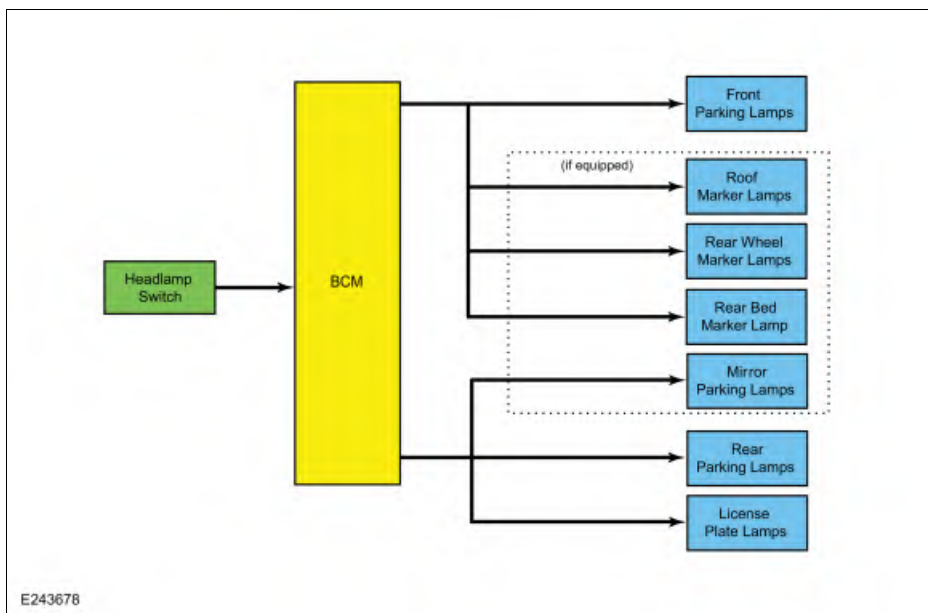
The BCM sends a voltage signal to the hazard flasher lamp switch to monitor for a hazard lamp function request. When the hazard flasher lamp switch is pressed, the voltage signal is routed to ground, indicating a request to activate or deactivate the hazard lamp function.

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



Item	Description
1	BCM
2	Headlamp switch
3	License plate lamps
4	Mirror parking lamps
5	Rear parking lamps
6	Front parking lamps
7	Rear wheel marker lamps
8	(if equipped)
9	Roof marker lamps
10	Rear bed marker lamp

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.

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

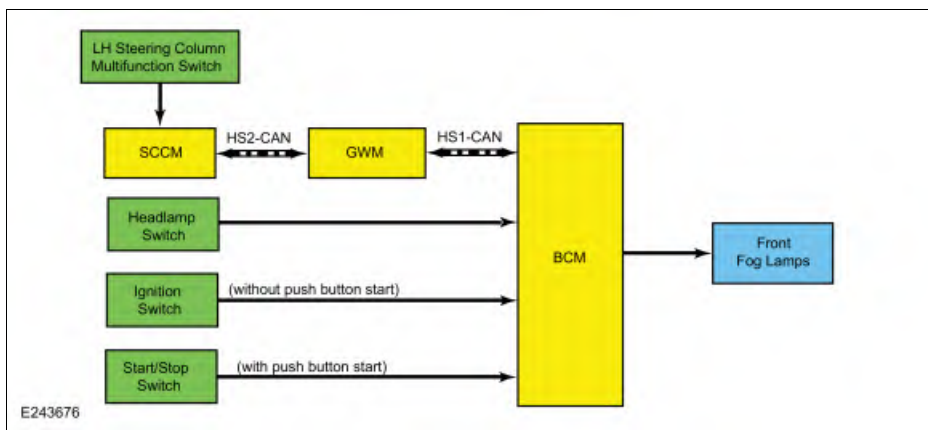
For LED headlamps, the parking lamps system operates the DRL/parking surround Light Emitting Diodes (LEDs) at a reduced intensity using a PWM voltage circuit.

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: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Fog Lamps

System Diagram



Item	Description
1	BCM
2	Headlamp Switch
3	Headlamp switch
4	Ignition switch
5	Start/Stop switch
6	(without push button start)
7	(with push button start)
8	SCCM
9	GWM
10	LH steering column multifunction switch
11	HS-CAN1
12	HS-CAN2

Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Headlamp high beam status	SCCM	Indicates to the BCM a request for the high beams and then disables the BCM fog lamp output while in high beams mode.
Headlamp flash to pass status	SCCM	Indicates to the BCM a request for the flash-to-pass and then disables the BCM fog lamp output while in flash-to-pass mode.

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 front fog lamps, the BCM provides voltage to the front fog lamps.

When the SCCM reads a flash-to-pass or high beam request from the LH steering column multifunction switch, 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. The BCM disables the fog lamp output while in flash-to-pass or high beams mode.

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

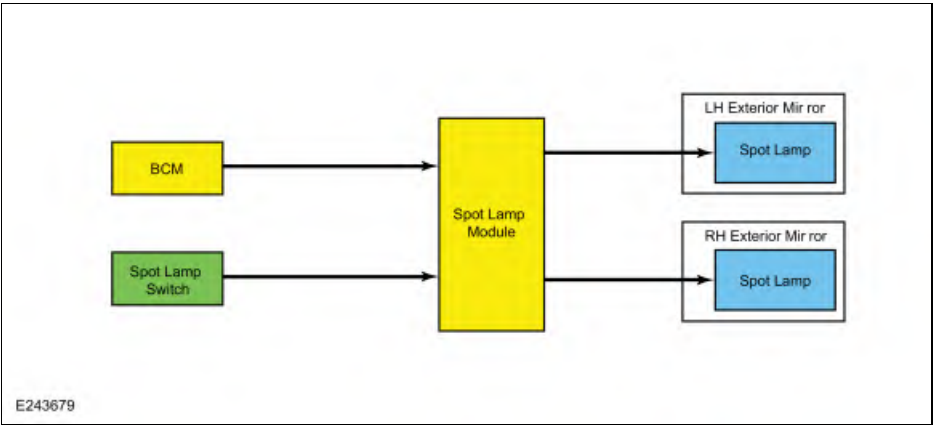
The BCM also provides Field Effect Transistor (FET) protection of the rear fog lamp output circuit. When an excessive current draw is detected, the BCM disables the front fog lamp output circuit driver.

Refer to: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description

and Operation).

Spot Lamps

System Diagram



Item	Description
1	Spot lamp module
2	Spot lamp switch
3	Spot lamp
4	Spot lamp
5	BCM
6	LH exterior mirror
7	RH exterior mirror

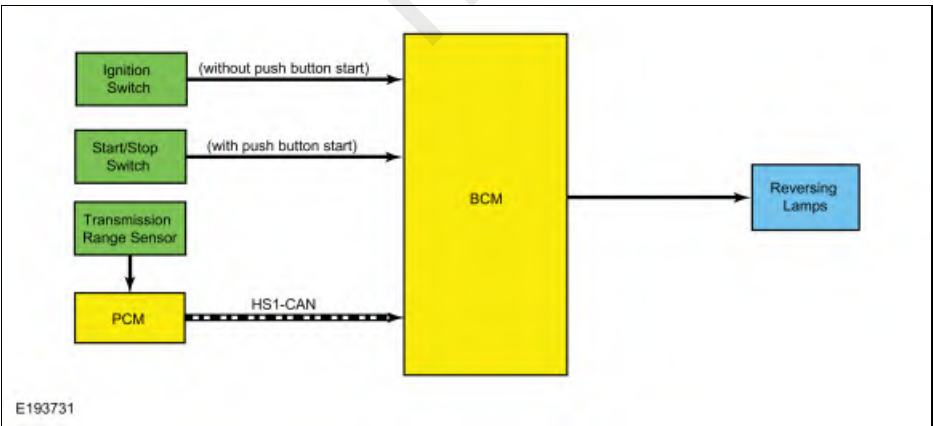
Spot Lamps

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



Item	Description
1	HS-CAN1
2	Transmission range sensor
3	PCM
4	BCM

5	Reversing lamps
6	Ignition switch
7	Start/Stop switch
8	(without push button start)
9	(with push button start)

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

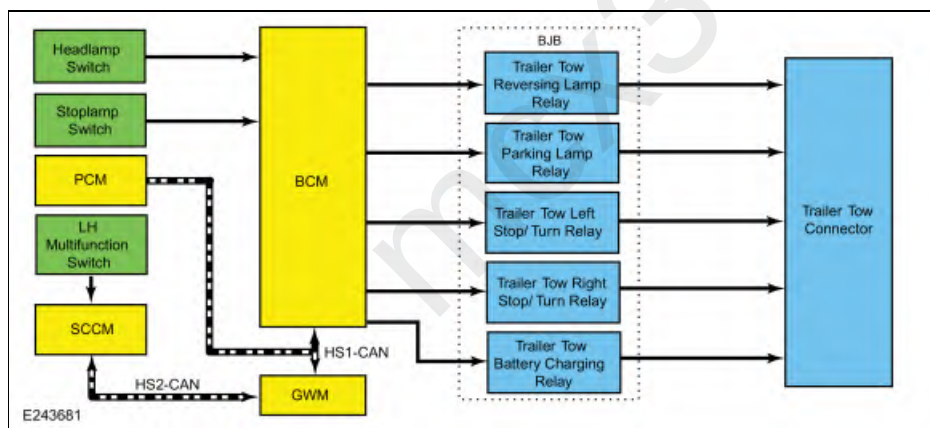
When the transmission is in REVERSE, the PCM sends a message over the HS-CAN1 to the BCM indicating the transmission is in REVERSE. The BCM provides voltage to the reversing lamps when it receives the message that the transmission is in REVERSE and the ignition is in RUN.

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: Body Control Module (BCM) - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Trailer Lamps - Without TRM and Without TBM

System Diagram



Item	Description
1	HS-CAN1
2	BCM
3	Headlamp switch
4	Stoplamp switch
5	GWM
6	SCCM
7	LH steering column multifunction switch
8	Trailer tow LH stop/turn relay
9	Trailer tow RH stop/turn relay
10	HS-CAN2

11	Trailer tow connector
12	BJB
13	Trailer tow reversing lamp relay
14	Trailer tow parking lamp relay
15	PCM
16	Trailer tow battery charging relay

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 is 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 (integral to the BJB). 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 voltage to 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

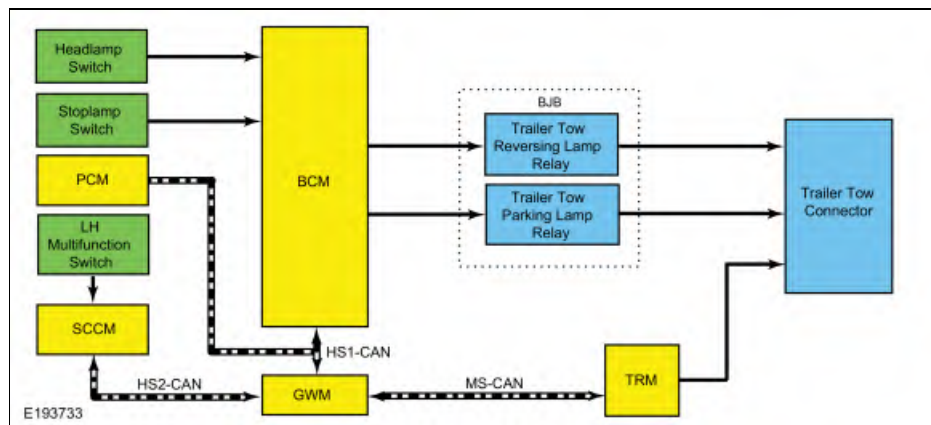
The trailer battery relay is energized when the BCM provides ground when both of the following are true:

- the ignition is on
- the BCM load shed strategy is not active (a message will be displayed in the instrument cluster, such as "Low Battery Features Temporarily Turned Off" or "Turn Power Off To Save Battery", to indicate that BCM load shed strategy is active)

When the BCM energizes the trailer battery relay (integral to the BJB), the relay provides fused protected voltage directly to the trailer tow connector.

Trailer Lamps - With TRM and With TBM

System Diagram



Item	Description
1	MS-CAN
2	TRM
3	Trailer tow connector
4	BJB
5	Trailer tow reversing lamp relay
6	Trailer tow parking lamp relay
7	HS-CAN1
8	BCM
9	Headlamp switch
10	Stoplamp switch
11	GWM
12	SCCM
13	LH steering column multifunction switch
14	HS-CAN2
15	PCM

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.

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.

Broadcast Message	Originating Module	Message Purpose
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-CAN to 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 (integral to the BJB). 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 voltage to 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 all the Following are true:

- the TRM detects that a trailer is connected
- the ignition is on and engine is running
- a brake pedal application has been detected for at least 2 seconds in the present ignition cycle
- the BCM load shed strategy is not active (a message will be displayed in the instrument cluster, such as "Low Battery Features Temporarily Turned Off" or "Turn Power Off To Save Battery", to indicate that BCM load shed strategy is active)

The TRM directly (no relay) supplies fuse protected voltage for trailer battery charging.

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

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.

LED Control Module

A LED control module is mounted to each LED headlamp assembly. The LED control module controls the voltage to the high beam and low beam headlamp Light Emitting Diodes (LEDs) within the headlamp assembly.

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 BCM to control voltage to the trailer tow connector for the LH stop/turn, RH stop/turn lamps and trailer battery charging.
