

2017 ACCESSORIES & EQUIPMENT

Lighting - Description and Operation - Encore, Trax

DESCRIPTION AND OPERATION

EXTERIOR LIGHTING SYSTEMS DESCRIPTION AND OPERATION

Exterior Lamps

The exterior lighting system consist of the following lamps if equipped:

- Automatic high beam assist
- Backup lamps
- Daytime running lamps
- Front fog lamps
- Hazard warning lamps
- Headlamps
- Park, tail and license lamps
- Stop lamps
- Turn signal lamps

Low Beam Headlamps

The body control module (BCM) monitors three signal circuits from the headlamp switch. When the headlamp switch is in the AUTO position, all three signal circuits are open. When placed in the AUTO position, the BCM monitors inputs from the ambient light sensor to determine if headlamps are required or if daytime running lamps will be activated based on outside lighting conditions. When the headlamp switch is placed in the OFF position, the headlamp switch headlamps OFF signal circuit is grounded, indicating to the BCM that the exterior lamps should be turned OFF. With the headlamp switch in the PARK position, the headlamp switch park lamps ON signal circuit is grounded, indicating that the park lamps have been requested. When the headlamp switch is placed in the HEADLAMP position, both the headlamp switch park lamps ON signal circuit and the headlamp switch headlamps ON signal circuit are grounded. The BCM responds to the inputs by illuminating the park lamps and headlamps. When the low beam headlamps are requested, the BCM applies B+ to both low beam headlamp control circuits illuminating the low beam headlamps.

The BCM will also command the low beam headlamps ON during daylight conditions when the following conditions are met:

- Headlamp switch in the AUTO position
- Windshield wipers ON
- Vehicle in any gear but PARK - automatic transmission
- Vehicle in motion - manual transmission

When the BCM commands the low beam headlamps ON, the operator will notice the interior backlighting for the instrument cluster and the various other switches dim to the level of brightness selected by the instrument panel dimmer switch.

High Beam Headlamps

When the low beam headlamps are ON and the turn signal/multifunction switch is placed in the high beam position, ground is applied to the BCM through the high beam signal circuit. The BCM responds to the high beam request by applying ground to the high beam relay control circuit which energizes the high beam relay. With the high beam relay energized, the switch contacts close allowing battery voltage to flow through the left and right high beam fuses to the high beam control circuits illuminating the left and right high beam headlamps.

Automatic High Beam Assist (AHBA)

The automatic high beam assist (AHBA) system operates the high beam headlamps ON and OFF automatically when the system is activated and certain conditions are met. The AHBA system consists of a front camera module that detects light and is able to identify approaching vehicles on an even, straight road at a distance of greater than 0.4 km (0.25 mi). The front camera module analyzes light color, intensity, and movement. The AHBA system will turn OFF the high beam headlamps when approaching vehicle headlamps or preceding vehicle taillights are detected by the front camera module. AHBA can be deactivated when the headlamp dimmer switch is moved from the neutral position to the high beam or flash to pass (FTP) positions. AHBA can be reactivated by operating the high beam select switch from the neutral position to the high beam position twice within 2 seconds.

AHBA System Activation

- Vehicle ON
- Headlamp switch placed in the AUTO position
- Headlamp dimmer switch must be in the neutral position
- Outside lighting conditions must be dark
- Vehicle speed greater than 25 mph (40 km/h)

AHBA System Operation

The following are conditions that the AHBA system will turn the high beam headlamps off during operation:

- The system detects approaching traffic headlamps
- The system detects preceding traffic tail lamps
- Ambient light level too high due to towns or twilight situations
- The vehicle's speed drops below 13 mph (22 km/h)
- Delay

NOTE: AHBA may not operate properly if any of the following conditions exist:

- Approaching and preceding vehicles lamps are undetectable due to dirt, snow, road spray, smoke, fog, or any other airborne conditions.
- The front camera module is covered with ice, dirt, snow, haze, or is obstructed.
- The vehicle is being driven on winding or hilly road conditions which would make any on coming vehicle headlamps undetectable by the AHBA.

AHBA System Deactivation

- Manually operating the headlamp dimmer switch from neutral to high beam position
- AHBA is deactivated automatically when the front or rear fog lamps are turned ON

AHBA System Indicator

The status of the AHBA system is shown by a green indicator located on the instrument panel cluster. When AHBA is active, the indicator will be illuminated continuously. If the operator deactivates the AHBA system, the indicator will turn off.

Daytime Running Lamps (DRL)

The DRLs will operate when the following conditions are met:

- The ignition is in the RUN or CRANK position
- The shift lever is out of the PARK position for vehicles equipped with automatic transmissions or the parking brake is released for vehicles with manual transmissions
- The low and high beam headlamps are OFF

Daytime Running Lamps - with TR6

The ambient light sensor is used to monitor outside lighting conditions. The ambient light sensor provides a voltage signal that will vary between 0.2 and 4.9 volts depending on outside lighting conditions. The body control module (BCM) provides a 5-volt reference signal to the ambient light sensor which is permanently grounded. The BCM monitors the ambient light sensor signal circuit to determine if outside lighting conditions are correct for either daytime running lights (DRL) or automatic lamp control (ALC) when the headlamp switch is in the AUTO position. In daylight conditions the BCM will command the low beam headlamps ON. During low light conditions the BCM will command the low beam headlamps ON. Any function or condition that turns on the headlamps will cancel DRL operation.

Daytime Running Lamps - with T4A

The ambient light sensor is used to monitor outside lighting conditions. The body control module (BCM) provides a low reference ground and 5-volt reference signal to the ambient light sensor. Depending on outside lighting conditions, the ambient light sensor provides a voltage signal to the BCM that will vary between 0.2 and 4.9 volts. The BCM monitors the ambient light sensor signal circuit to determine if outside lighting conditions are correct for either daytime running lights (DRL) or automatic headlamp system control when the headlamp switch is in the AUTO position. In daylight conditions, the BCM responds by applying battery voltage to the left and right daytime running lamp relay control circuits which energizes both daytime running lamp relays. With the daytime running lamp relays energized, the switch contacts close allowing battery voltage to flow to the daytime running lamp control circuits illuminating the left and right daytime running lamp.

Flash to Pass (FTP)

When the turn signal/multifunction switch is momentarily placed in the flash to pass (FTP) position, ground is applied to the turn signal/multifunction switch. The turn signal/multifunction switch applies ground to the body control module (BCM) through the FTP switch signal circuit. The BCM then applies ground to the high beam relay control circuit. This energizes the high beam relay, closing the switch side contacts of the high beam relay, applying battery voltage to the left and right high beam fuses. Battery voltage is applied from the high beam fuses through the high beam control circuit to the high beam headlamp assemblies. This causes the high beam headlamps to illuminate at full brightness momentarily.

Front Fog Lamps

The front fog lamp switch is an input to the body control module (BCM) and is contained in the headlamp switch assembly. The BCM supplies voltage to the front fog lamp switch via the front fog lamp and instrument panel dimmer switch B+ circuit. When the front fog lamp switch is pressed, voltage from the B+ circuit is pulled down through the front fog lamp switch resistor. The front fog lamp resistor is part of the resistor ladder that also provides the dimming signals for the instrument panel dimmer switches. The BCM receives the voltage signal through the front fog lamp and instrument panel dimmer switch signal circuit.

The front fog lamp relay is supplied with battery voltage at all times. The front fog lamp switch signal circuit is grounded momentarily by pressing the front fog lamp switch. The body control module (BCM) energizes the front fog lamp relay by applying ground to the front fog lamp relay control circuit. When the front fog lamp relay is energized, the relay switch contacts close and battery voltage is applied through the front fog lamp fuse to the front fog lamp control circuit which illuminates the front fog lamps.

Hazard Lamps

The hazard flashers may be activated in any power mode. The hazard warning switch signal circuit is momentarily grounded when the hazard warning switch is pressed. The body control module (BCM) responds to the hazard warning switch signal input by supplying battery voltage to all four turn signal lamps in an ON and OFF duty cycle. When the hazard warning switch is activated, the BCM sends a serial data message to the instrument cluster requesting both turn signal indicators to be cycled ON and OFF.

The instrument panel dimmer switch controls are located on the headlamp switch assembly and are used to increase and decrease the brightness of the interior backlighting components. When the instrument panel dimmer switch is placed in a desired brightness position, the body control module (BCM) receives a signal from the instrument panel dimmer switch and responds by applying a pulse width modulated

(PWM) voltage to the hazard switch LED backlighting control circuit illuminating the LED to the desired level of brightness.

Park, Tail, and License Lamps

When the headlamp switch is placed in the HEAD or PARK position, ground is applied to the park lamp switch ON signal circuit to the body control module (BCM). The BCM responds by applying voltage to the park lamps, tail lamps, and license lamps control circuits illuminating the park, tail, and license lamps.

Stop Lamps

The brake pedal position (BPP) sensor is used to sense the action of the driver application of the brake pedal. The BPP sensor provides an analog voltage signal that will increase as the brake pedal is applied. The body control module (BCM) provides a low reference signal and a 5-volt reference voltage to the BPP sensor. When the variable signal reaches a voltage threshold indicating the brakes have been applied, the BCM will apply battery voltage to the left and right stop lamp control circuits as well as the center high mounted stop lamp (CHMSL) control circuit illuminating the left and right stop lamps and the CHMSL.

Turn Signal Lamps

Ground is applied at all times to the turn signal/multifunction switch. The turn signal lamps may only be activated with the ignition switch in the ON or START positions. When the turn signal/multifunction switch is placed in either the turn right or turn left position, ground is applied to the body control module (BCM) through either the right turn or left turn signal switch signal circuit. The BCM responds to the turn signal switch input by applying a pulsating voltage to the front and rear turn signal lamps through their respective control circuits. When a turn signal request is received by the BCM, a serial data message is sent to the instrument cluster requesting the respective turn signal indicator be pulsed ON and OFF.

Backup Lamps

Automatic Transmission

With the engine ON and the transmission in the reverse position, the transmission control module (TCM) sends a serial data message to the body control module (BCM). The message indicates that the gear selector is in the reverse position. The BCM applies battery voltage to the backup lamps control circuit illuminating the backup lamps. Once the driver moves the gear selector out of the reverse position, a message is sent by the TCM via serial data requesting the BCM to remove battery voltage from the backup lamps control circuit. The engine must be running for the backup lamps to operate.

Manual Transmission

The engine control module (ECM) provides a signal circuit to the backup lamp switch which is permanently grounded. With the engine ON and the transmission in the reverse position, the backup lamp switch signal circuit is pulled low and the ECM responds by sending a serial data message to the body control module (BCM). The message indicates that the gear selector is in the reverse position. The BCM applies battery voltage to the backup lamps control circuit illuminating the backup lamps. Once the driver moves the gear selector out of the reverse position, a message is sent by the ECM via serial data requesting the BCM to remove battery voltage from the backup lamps control circuit. The engine must be running for the backup lamps to operate.

Battery Run Down Protection/Inadvertent Power

To provide battery run down protection, the exterior lamps will be deactivated automatically under certain conditions. The BCM monitors the state of the headlamp switch. If the park or headlamp switch is ON when the ignition switch is placed in either the CRANK or RUN position and then placed in the OFF position, the BCM initiates a 10 min timer. At the end of the 10 min, the BCM will turn off the control power output to the park lamp controls as well as the headlamp relay coils, deactivating the exterior lamps. This feature will be cancelled if any power mode other than OFF becomes active. The BCM will disable battery run down protection if any of the following conditions exist. The park or headlamp switch is placed in the ON to OFF position, and back to the ON position during battery run

down protection. The BCM determined that the park or headlamp switch was not active when the ignition was turned OFF.

INTERIOR LIGHTING SYSTEMS DESCRIPTION AND OPERATION

Interior Lamps

The interior lighting consist of two groups. This first group includes lamps that may not be dimmed.

- Dome/reading lamps
- Rear compartment courtesy lamp

Dome Lamps

When any door is opened, the associated door jamb switch closes providing a door open input to the body control module (BCM). The BCM responds by applying battery positive voltage to the dome lamp control circuit illuminating the dome lamp. The dome lamp will turn OFF immediately if the ignition switch is turned to the ON position or approximately 20 seconds after all doors are closed. The dome lamp will normally turn OFF using the theater dimming feature when controlled by the BCM. If the operator inadvertently leaves any interior lamp ON, the BCM will turn all interior lamps OFF after 10 minutes has passed since any switch activation has been detected by the BCM.

Keyless Entry Interior Illumination

When the operator uses the keyless entry transmitter in order to unlock the doors, the BCM receives a door-unlock signal. The BCM must receive inputs from various systems that indicate that the ignition switch is OFF, the courtesy lamp switch is OFF, and all doors are closed before the BCM will activate the interior lamps. The courtesy lamps will remain ON for 20 seconds after the door is closed. The BCM will turn off the courtesy lamps OFF through the theater dimming feature. If the door locks are activated to the LOCK position, or if the ignition switch is turned to either the RUN or CRANK position, the courtesy lamps will turn OFF immediately.

Rear Compartment Courtesy Lamp

The BCM provides battery positive voltage to the rear compartment courtesy lamp. When the rear compartment is opened, the rear compartment latch opens providing a rear compartment open input to the BCM. The BCM responds by applying battery positive voltage to the rear compartment lamp control circuit illuminating the rear compartment lamp.

Reading Lamps

The inadvertent power supply voltage circuit from the BCM provides battery positive voltage the reading lamp. When the reading lamp switch is activated, the switch contacts close providing a path to ground and the reading lamp illuminates. If the operator inadvertently leaves a reading lamp ON, the BCM will turn all interior lamps OFF after 10 minutes has passed since any switch activation has been detected by the BCM.

Interior Lamps Dimming

The second group includes lamps which may be dimmed.

- Door lock switch - driver
- Door lock switch - passenger
- Fuel economy mode switch
- Hazard warning switch
- Headlamp switch
- HVAC control head assembly
- Instrument cluster
- Multifunction switch - center console
- Multifunction switch - instrument panel
- Outside rearview mirror switch

- Radio
- Sunroof switch
- Sunroof tilt switch
- Steering wheel control switch - left
- Steering wheel control switch - right
- Traction control switch
- Transmission shift lever position indicator
- Window switch - driver
- Window switch - passenger
- Window switch - left rear
- Window switch - right rear

When the headlamp switch is placed in the PARK or HEAD position, the park lamp switch signal circuit provides an input to the body control module (BCM). The BCM responds by applying voltage to the park lamps as well as the dimming control circuits illuminating all components with interior backlighting. All LED and incandescent backlighting turns ON at the dimming level indicated by the instrument panel dimmer switch. The instrument panel dimmer switch is a momentary type switch and utilizes a resistor ladder to accomplish dimming controls. The instrument panel dimmer switch contains a battery positive voltage reference circuit and a signal circuit from the BCM. When the instrument panel dimmer switch is held in the decrease brightness position, the BCM receives a low voltage signal via the instrument panel dimmer switch signal circuit. The BCM responds by decreasing the brightness of all interior backlighting by decreasing the voltage supplied to the backlighting components via the dimming control circuits. When the instrument panel dimmer switch is held in the increase brightness position, the BCM receives a high voltage signal via the instrument panel dimmer switch signal circuit. The BCM responds by increasing the brightness of all interior backlighting by increasing the voltage supplied to the backlighting components via the dimming control circuits.

Battery Rundown Protection/Inadvertent Power

The BCM inadvertent power supply voltage circuit provides battery positive voltage to all of the interior lamps. In the event that any of these lamps were to remain illuminated for a period of more than 10 minutes with the ignition switch in the OFF position, the BCM will deactivate the inadvertent power supply voltage circuit to prevent total battery discharge.
