Jeep 2014 GC Bi_Xenon HID Headlights

The headlamp system includes the Steering Control Module (SCM), the Electro-mechanical Instrument Cluster (EMIC) and the Body Control Module (BCM), the headlamp switch on the instrument panel and the multi-function switch on the steering column. On vehicles with the optional High Intensity Discharge (HID) headlamps, the HID electronic ballast module of each front lamp unit is also part of the headlamp system. Each halogen headlamp bulb and the HID electronic ballast module has a path to ground at all times through their connection to the FEM wire harness. The FEM wire harness has takeouts with eyelet terminals that are secured by ground screws to the front end sheet metal within the engine compartment. The BCM will store a Diagnostic Trouble Code (DTC) for any shorts or opens in the headlamp circuits.

The EMIC monitors a hard wired multiplex input from the headlamp switch to determine the status of the headlamp switch. The SCM monitors a hard wired multiplex input to determine the status of the multi-function switch and whether the headlamp high or low beams are selected. The SCM then sends the appropriate electronic headlamp beam select switch status messages to the BCM over the CAN data bus. The EMIC then sends the appropriate electronic headlamp request messages to the BCM over the CAN data bus. The BCM responds to these messages by providing a Pulse Width Modulated (PWM) voltage output to the proper halogen headlamp bulbs or a control voltage to the HID electronic ballast modules through high side drivers on the right and left low and high beam feed circuits to illuminate the selected headlamp beams. The BCM also sends the appropriate electronic messages to the EMIC to control the illumination of the high beam indicator.

On vehicles with the optional HID headlamps, the HID electronic ballast module uses a high voltage Alternating Current (AC) output to activate the HID igniter integral to the lighting element to provide a high voltage surge, which creates a light arc between the lighting element electrodes. Once the electronic ballast module detects a suitably stable light arc, it switches over to a power-limiting mode to sustain the light arc. Also an

electric motor drives a shutter within each HID lamp unit and the position of the shutter controls whether the low beams (shutter closed) or high beams (shutter open) are illuminated.

When the optical horn feature is selected, the low beams will shut OFF about 200 milliseconds after the high beams are activated. The BCM also remembers which beams (LOW or HIGH) were selected when the headlamps were last turned OFF, and energizes those beams again the next time the headlamps are turned ON.

The BCM provides a battery saver (load shedding) feature for the headlamps, which will turn these lamps OFF if they are left ON for more than about eight minutes after the electronic ignition switch status messages from the WIN transition to LOCK. The EMIC and the BCM each provide a fail-safe feature for the headlamps, which will cause the BCM to turn the low beam headlamps ON automatically if there is no input available from the headlamp switch. The BCM also provides a fail-safe feature for the headlamps that will turn the headlamps ON automatically whenever a loss of CAN bus communication is detected while the electronic ignition switch status messages from the WIN indicate the ignition ON position is selected.
Each headlamp includes an integral reflector adjustment screw to be used for static aiming of the headlamps.

SMARTBEAM® SYSTEM

The optional SmartBeam® (auto high beam) system includes the SmartBeam® module with digital imager camera and electronic circuitry integral to the electrochromic inside rear view mirror, the SCM, the BCM, the EMIC, the EVIC, the headlamp switch and the multi-function switch. First, the Auto High Beams option must be enabled using the customer programmable features function of the EVIC. Then the A (Automatic) position must be selected using the rotary knob of the headlamp switch, the headlamp beam selector switch must be in the high beam position and the appropriate ambient light conditions must be present. Finally, the vehicle speed must be greater than 32 kilometers-per-hour (20 miles-per-hour).

Once all of these prerequisites have been met, the SmartBeam® camera and its circuitry within the electrochromic mirror automatically sends the appropriate electronic headlamp beam select switch status messages to the BCM over the CAN data bus. The BCM then responds to these messages by providing a pulse width modulated voltage output to the proper headlamp bulbs or the headlamp ballasts through the right and left low and high beam feed circuits to illuminate the headlamps. The BCM also sends the appropriate electronic messages back to the EMIC to control the illumination of the high beam indicator.

The SCM continues to monitor the multi-function switch, and will send the appropriate electronic messages to the EMIC, which relays these messages to the SmartBeam® circuitry in the inside rear view mirror and to the BCM to manually invoke the beam select switch momentary optical horn (flash-to-pass) feature or, when a detent switch position is selected to override SmartBeam® operation

Headlamps - Two headlamp systems are available on this vehicle for domestic markets. The standard halogen headlamp system includes two single filament halogen bulbs in each front lamp unit, one low beam and one high beam. The optional HID headlamp system includes a single HID lighting element/igniter unit for low or high beam headlamps. An electric motor and mechanism internal to the HID lamp unit closes a shutter for low beams and opens the shutter for high beams. The HID front lamp units each include an electronic ballast module, while an Automatic Headlamp Leveling Module (AHLM) that serves both front lamp units levelling motor. Both headlamp systems also include an adjustable reflector and clear lens integral to each front lamp unit.

Headlamp Leveling - On all vehicles equipped with optional HID headlamps, an Automatic Headlamp Leveling Module (AHLM) controls a headlamp leveling actuator motor on each front lamp unit to automatically perform headlamp adjustments using inputs from front and rear axle sensors to monitor changes in the vehicle suspension height. On vehicles equipped with manual headlamp levelling, the BCM directly drives both of the headlamp motors

OPERATION

The electronic ballast module operates on battery current and ground received directly from the Body control Module (BCM). Each module controls operation of the High Intensity Discharge (HID) igniter and lighting element for the front lamp unit on which it is installed. The BCM monitors electronic message inputs received from the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cabin Compartment Node/CCN) over the Controller Area Network (CAN) data bus to determine the proper control outputs to the electronic ballast module, which then provides a controlled voltage to operate the HID lamp igniter as appropriate.

The EMIC monitors hard wired multiplexed inputs received from the headlamp switch and electronic message inputs received from the Steering Control Module (SCM) over the Controller Area Network (CAN) Interior High Speed (IHS) data bus based upon multi-function switch inputs and, if the vehicle is so equipped, from the SmartBeam® (also known as the Automatic High Beam Module/AHBM) and the Light/Rain Sensor Module (LRSM) (also known as the Rain Sensor Module/RSM or Rain/Light Sensor Module/RLSM) to determine the proper lighting request message outputs to send to the BCM.

When a proper 12 volt Direct Current (DC) control output is received from the BCM, the HID electronic ballast module activates the HID igniter integral to the lighting element through a high-tension cable to provide a high voltage (up to about 800 volts Alternating Current/AC) surge. The igniter further steps up this AC voltage to up to about 25,000 volts, which creates a light arc between the lighting element electrodes. Once the igniter and electronic ballast module detect a suitably stable light arc, they switch over to a power-limiting mode to sustain the light arc, which requires only about 85 volts to sustain proper lighting element output. The hard wired electronic ballast module circuits may be diagnosed using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the electronic ballast module or the electronic controls and communication that provide some features of the HID lamp system. Proper diagnosis of

the electronic ballast module, the BCM, the EMIC, the SCM, the SmartBeam®, the LRSM, the CAN data bus and the electronic communication related to electronic ballast module operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

12 Pin Headlight Connector

Pin	Wire Colour	Function
A1	WT/DB	Headlamp leveling sensor rear signal
A2	WT	leveling sensor 5 volt supply
A3	BK/LG	Right headlamp return signal
A4	WT/LG	Can C Bus (+)
A5	WT/TN	Right low beam driver
A6	WT/VT	Lin bus lighting sig rt
A7	WT/DG	Headlamp leveling sensor front signal
A8	WT/BR	Headlamp leveling sensor return
A9	WT/GY	Right high beam driver (Shutter)
A10	WT/LB	Can C Bus (-)
A11	PK/YL	Fused ignition run control output
A12	WT/OR	Lin lighting