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BATTERY, MOUNTING AND CABLES - VEHICLES WITH: NON-ELECTRIC VEHICLES (G2409487)

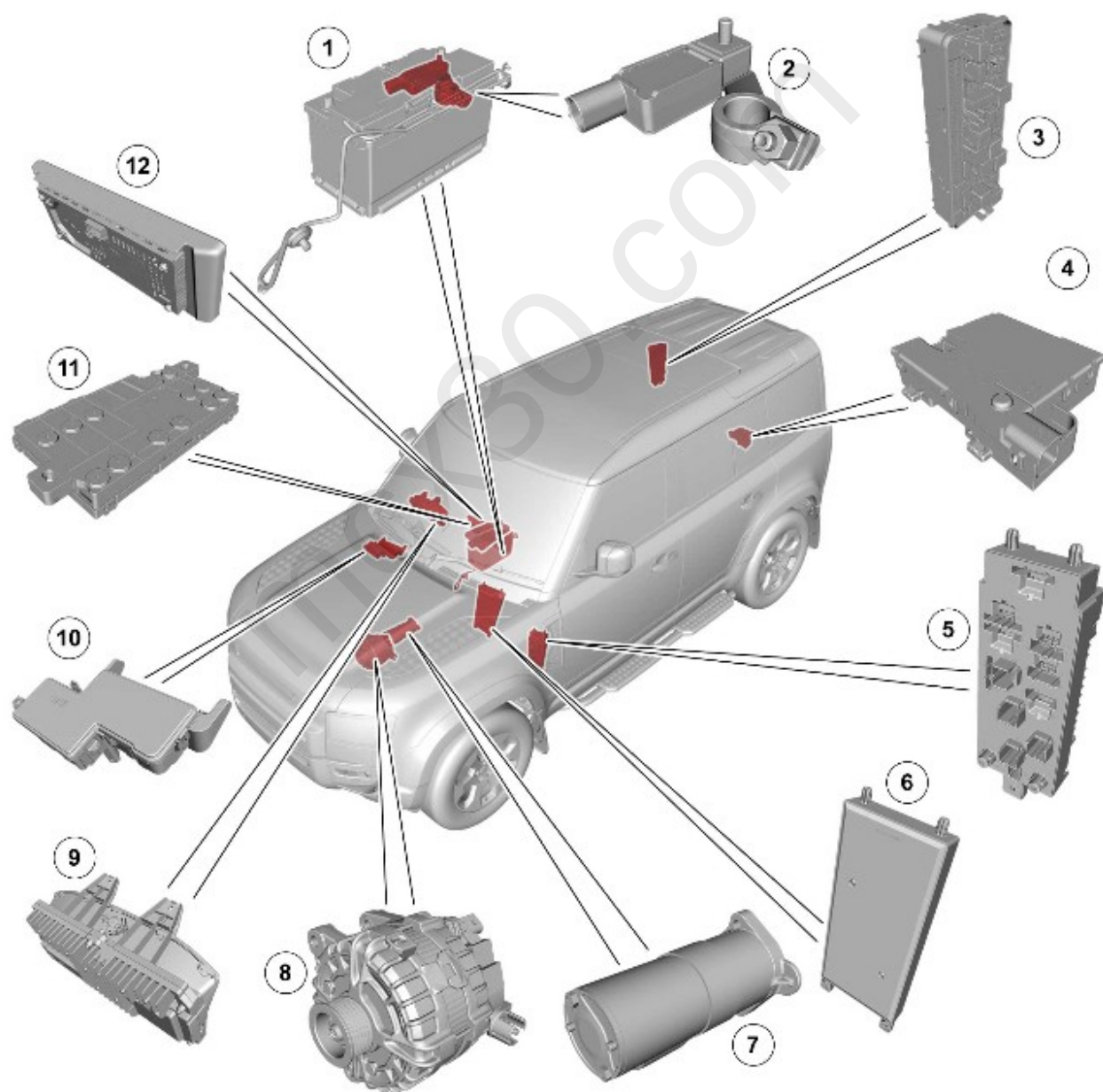
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COMPONENT LOCATION

COMPONENT LOCATION - 1 OF 1

 NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



ITEM	DESCRIPTION
1	Startup battery
2	Battery Monitoring System (BMS) control module
3	Rear Junction Box (BCMB)
4	Auxiliary Junction box (AJB)
5	Passenger Junction Box (PJB)
6	Body Control Module (BCM)/ Gateway Control Module (GWM)
7	Starter motor
8	Generator
9	Instrument Panel Cluster (IPC)
10	Engine Junction Box (EJB)
11	Battery Junction Box (BJB)
12	Touch Screen (FCDIM)

OVERVIEW

⚠ CAUTION:

When connecting another startup battery to jump start the vehicle, always use the jump start posts which locate under the hood. Never connect directly to the vehicle startup battery ground terminal, because the BMS control module can be damaged.

For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

The startup battery supplies electrical power to the following components:

- Starter motor
 - For additional information, refer to: [Starting System](#) (303-06A Starting System - INGENIUM I4 2.0L Diesel, Description and Operation).
 - For additional information, refer to: [Starting System - INGENIUM I4 2.0L Petrol](#) (303-06B Starting System - INGENIUM I4 2.0L Petrol/INGENIUM I4 2.0L Petrol - PHEV, Description and Operation).
- Generator
 - For additional information, refer to: [Generator](#) (414-02A Generator and Regulator - INGENIUM I4 2.0L Diesel, Description and Operation).

- For additional information, refer to: [Generator](#) (414-02B Generator and Regulator - INGENIUM I4 2.0L Petrol, Description and Operation).

- BJB
- EJB
- BCM/GWM
- PJB
- AJB
- BCMB.

The BMS control module is mounted on the startup battery negative terminal. The BMS control module is connected to the vehicle body ground by 1 cable from the BMS plate mounted on the BMS control module. The BMS control module sends startup battery data to the BCM/GWM. When a new startup battery is installed on the vehicle, the BMS control module requires re-calibrating using a Jaguar Land Rover (JLR) approved diagnostic equipment.

The BCM/GWM is the main controller of the vehicle body systems. The BCM/GWM contains the whole charging system software required to control the startup battery charging system and components. The BCM/GWM monitors the components and can store fault related Diagnostic Trouble Code(s) (DTC)s.

The BJB is mounted under the front row right seat, beside the startup battery. The EJB is mounted in the engine compartment. The PJB is mounted behind the glovebox next to the BCM/GWM. The BCMB is located on the right side of the loadspace behind the trim panel. The AJB is mounted under the loadspace compartment floor. The EJB, PJB and BCMB contain fuses and relays to distribute electrical power to various vehicle systems. The BJB contains the megafuses.

TRANSIT MODE

All new vehicles are delivered from the factory in transit mode. Transit mode inhibits some electrical systems and features to eliminate quiescent drain from the startup battery during delivery. Transit mode also inhibits some electrical loads when in the Power Mode 7 (engine running). This makes sure that the startup battery is never discharged while in the Power Mode 7 (engine running).

To remove the vehicle from transit mode, use the JLR approved diagnostic equipment at Pre-Delivery Inspection (PDI).

For additional information, refer to: [Preliminary](#) (101-01 Pre-Delivery Inspection Manual, Description and Operation).

POWER MODES

The BCM/GWM controls the power supplies for the vehicle functions. There are 9 Power Modes available which are used by various systems to determine the operating condition of the vehicle.

Only 5 of these modes can be recognized by the driver and technicians as the following statuses:

- Power Mode 0 - Vehicle locked and security system armed.
- Power Mode 4 - Accessory (vehicle unlocked and Smart Key present).

- Power Mode 6 - Ignition ON.
- Power Mode 7 - Engine Running.
- Power Mode 9 - Engine Cranking.

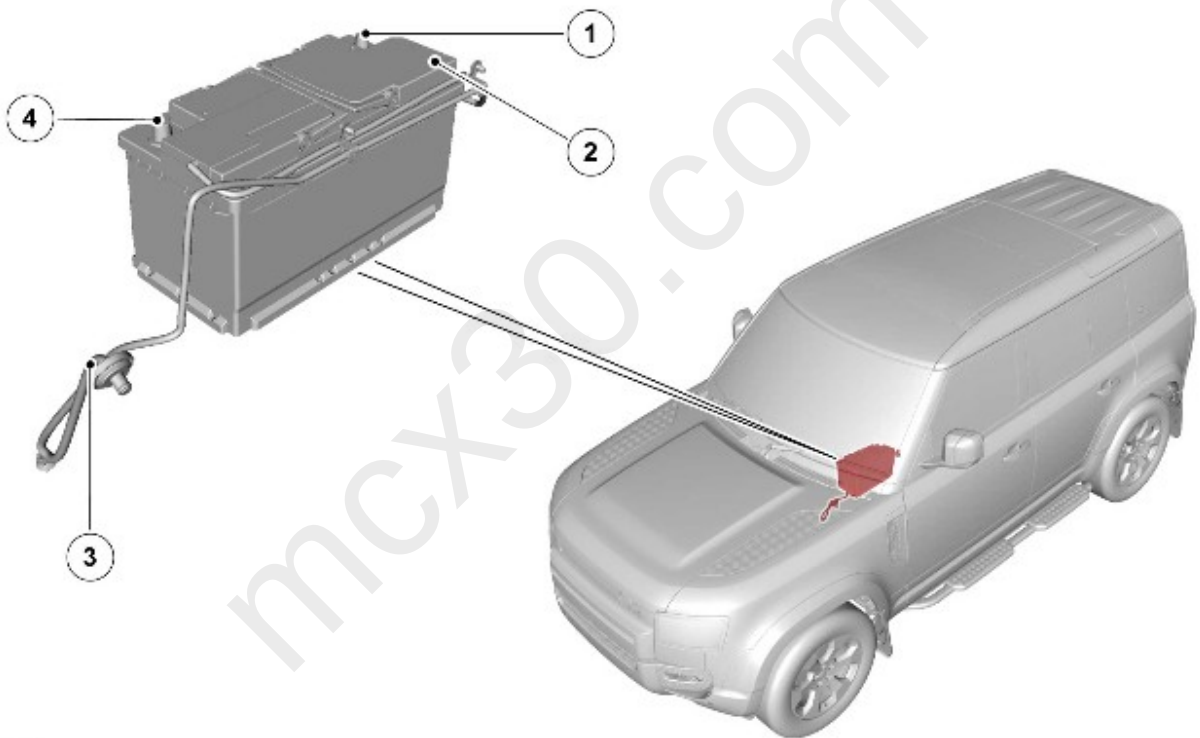
DESCRIPTION

STARTUP BATTERY



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



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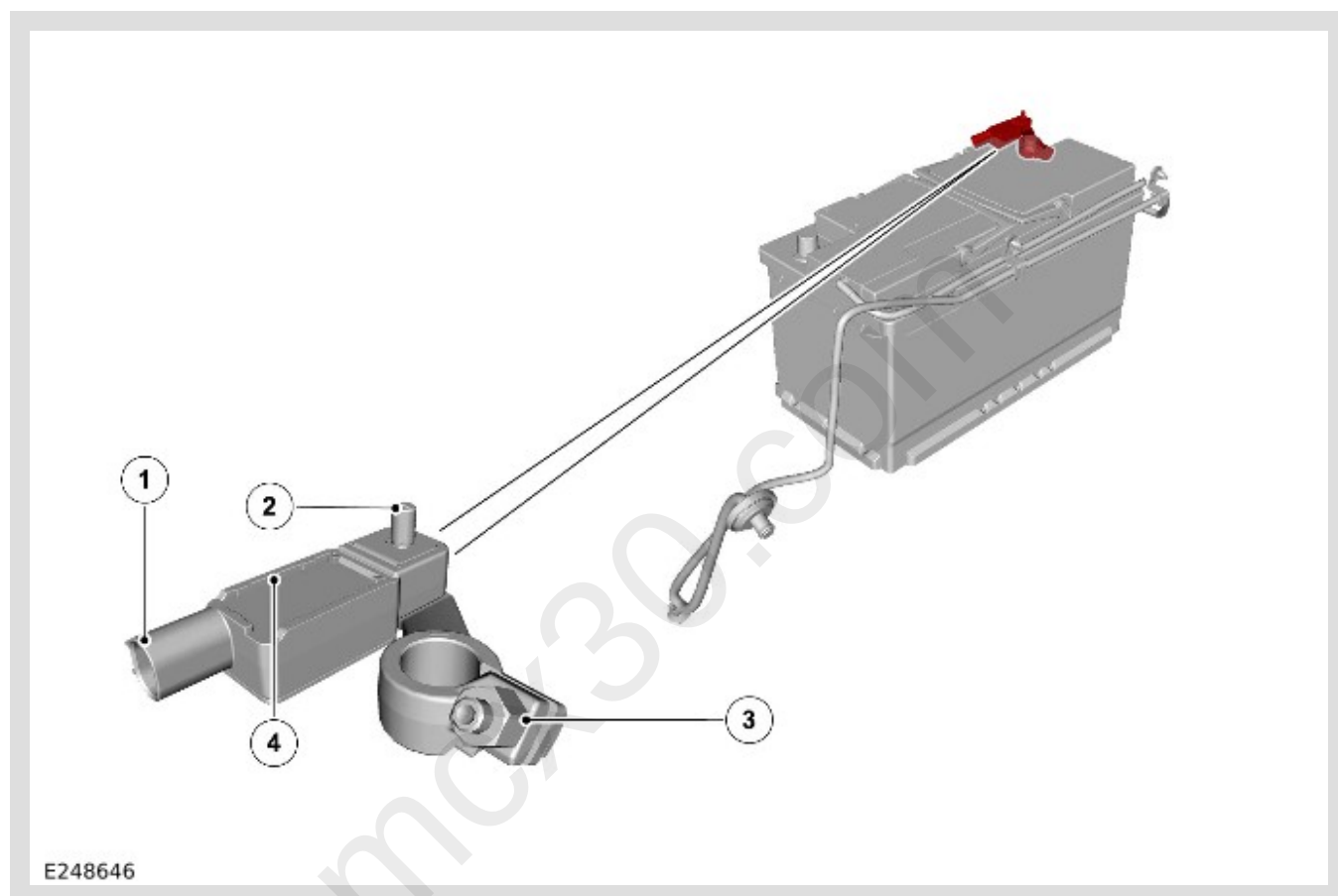
ITEM	DESCRIPTION
1	Startup battery negative terminal
2	Startup battery
3	Startup battery breather pipe
4	Startup battery positive terminal

The startup battery is located in a tray under the front row right seat. The startup battery is secured in position with a clamp plate and a bolt.

The startup battery is an H8 90 Ampere hour, 850 Cold Cranking Amps (CCA) Absorbed Glass Mat (AGM) battery on all vehicles.

The startup battery negative terminal has the BMS control module located on it. The startup battery positive terminal is connected to the BJB.

BATTERY MONITORING SYSTEM CONTROL MODULE



ITEM	DESCRIPTION
1	Wiring harness connector
2	BMS control module terminal for the BMS plate
3	BMS control module - Startup battery Negative clamp
4	BMS control module

ⓘ CAUTIONS:

- Always make sure the battery clamps are installed correctly as this can cause miscalculations on BMS.
- Due to the self-calibration routine, it is recommended that all power supply diagnostic testing is done using the JLR approved diagnostic equipment.

The BMS control module is located on the startup battery negative terminal. The BMS control module is clamped to the startup battery negative terminal with a bolt and nut. The BMS control module has the BMS plate mounted onto it to provide the negative ground connection for the vehicle wiring harness.

There is 1 ground cable connected to the BMS plate and onto the vehicle body.

The BMS control module has a single 2-pin connector to the wiring harness. The 2-pin connector has the following electrical connections:

- Positive startup battery feed directly from the startup battery positive terminal.
- Local Interconnect Network (LIN) connection to the BCM/GWM.

The BCM/GWM controls the startup battery current drain and State of Charge. The BMS control module measures the startup battery current and voltage, which it communicates to the BCM/GWM on the LIN. The BCM/GWM also receives generator output information on another LIN connection. The BCM/GWM transmits the startup battery and generator information over the Controller Area Network (CAN) systems buses to other vehicle systems. Based on the information received from the BMS control module, the BCM/GWM assembly controls the output from the generator. The BCM/GWM requests that specific modules are switched OFF to decrease electrical loads when necessary.

The BMS control module contains software maps that provide a mathematical model of startup battery State of Charge. The BMS control module constantly receives information from the BCM/GWM regarding the vehicle state and electrical loading.

When a new startup battery is installed to the vehicle, the BMS control module requires re-calibrating using a JLR approved diagnostic equipment.

When an error occurs, the BMS control module sends a message to the BCM/GWM through the LIN. The DTC is stored in the BCM/GWM. This DTC is read using the JLR approved diagnostic equipment.

The JLR approved diagnostic equipment has a process for an automated power supply diagnostic procedure. The procedure provides a menu driven process to locate a fault in a logical sequence. The procedure provides the current flow information and uses data from the LIN controlled functions of the BMS control module and the generator. The procedure allows the JLR approved diagnostic equipment to detect when the BMS control module or generator are not functioning correctly.

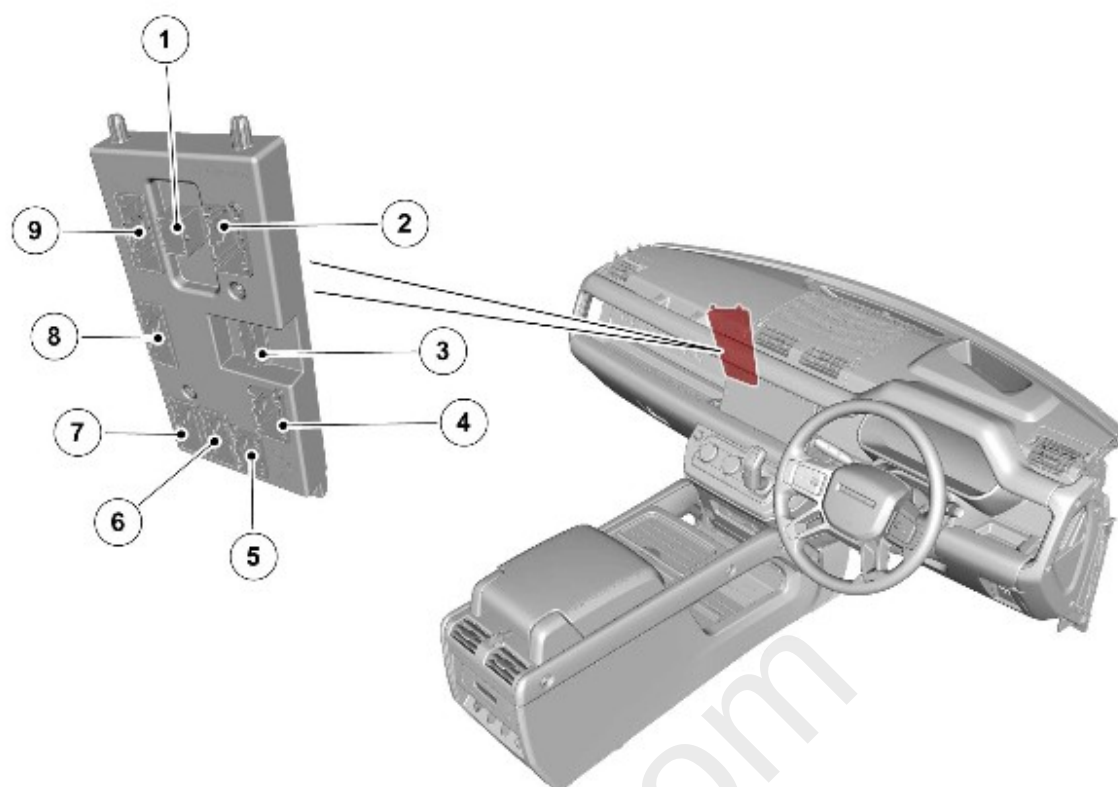
For additional information, refer to: [Battery](#) (414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles, Diagnosis and Testing).

BODY CONTROL MODULE/GATEWAY MODULE



NOTE:

Right Hand Drive (RHD) is shown, Left Hand Drive (LHD) is similar.



E248648

ITEM	DESCRIPTION
1	Main wiring harness connector
2	Main wiring harness connector
3	Main wiring harness connector
4	Main wiring harness connector
5	Instrument panel wiring harness connector
6	Instrument panel wiring harness connector
7	Main wiring harness connector
8	Main wiring harness connector
9	Main wiring harness connector

The BCM/GWM is attached to a bracket, bolted to the cross-car beam, behind the glovebox.

The BCM/GWM is located adjacent to the Passenger Junction Box (PJB), and it is the main controller of the vehicle body systems.

The BCM/GWM contains software to control the following functions:

- Determine the condition of the startup battery.

- Generator output: Control the generator output to reach a desired system voltage or target startup battery State of Charge.
- Load management: Load management controls the 12V power system to make sure that the charging system is not overloaded. In certain events, for example, during engine stop/start, some systems can be switched OFF.
- Control stop/start system functionality:
 - For additional information, refer to: [Starting System](#) (303-06A Starting System - INGENIUM I4 2.0L Diesel, Description and Operation).
 - For additional information, refer to: [Starting System - INGENIUM I4 2.0L Petrol](#) (303-06B Starting System - INGENIUM I4 2.0L Petrol/INGENIUM I4 2.0L Petrol - PHEV, Description and Operation).

The BCM/GWM communicates with other system control modules on the following:

- FlexRay
- High Speed (HS) CAN powertrain systems bus
- HS CAN Isolated (ISL) systems bus
- HS CAN Underbody (UN) systems bus
- HS CAN Human Machine Interface (HMI) systems bus
- HS CAN body systems bus.

The BCM/GWM communicates with the BMS control module and the generator through LINs.

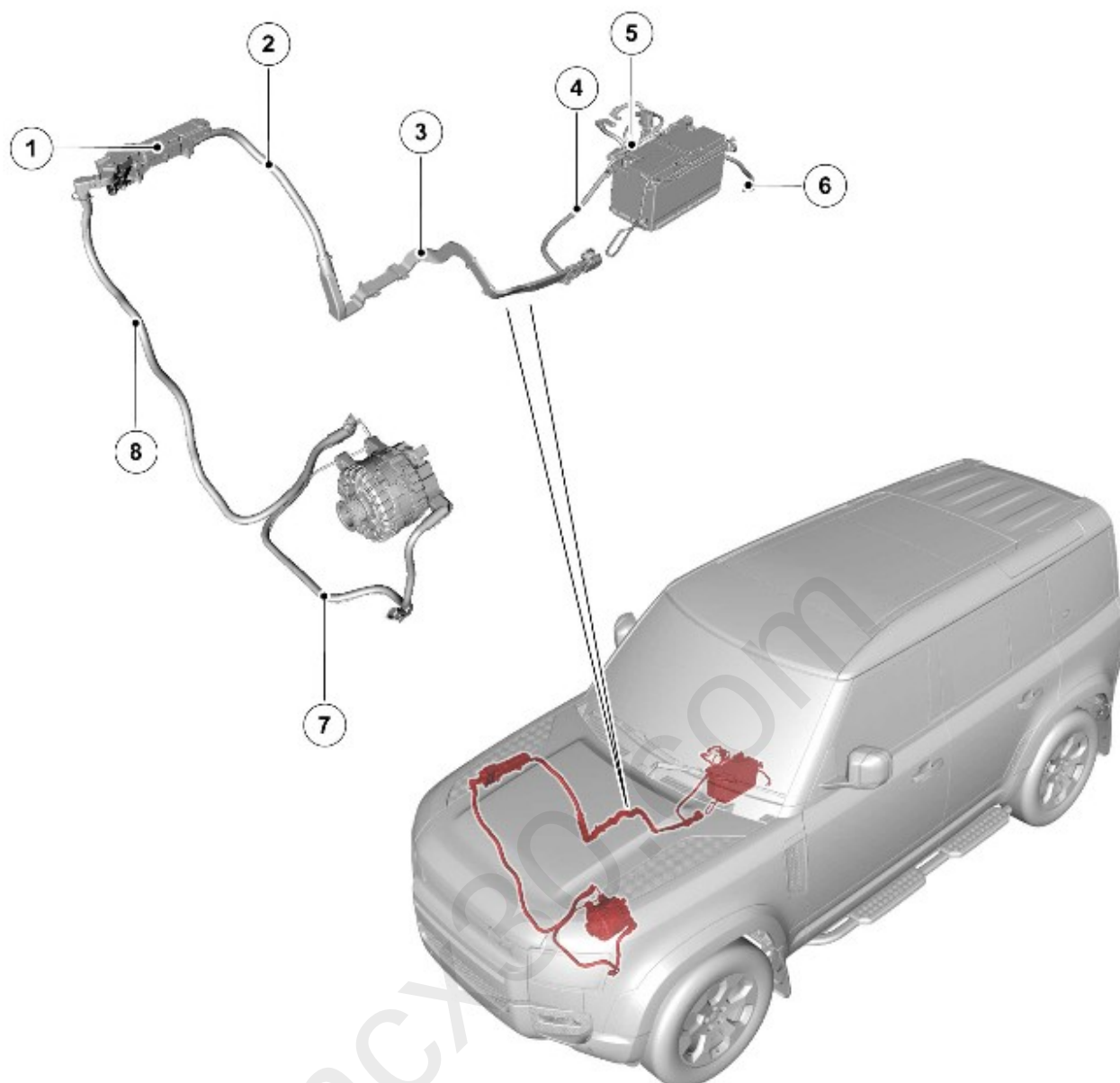
The BCM/GWM monitors the components and can store fault related DTCs. The DTCs and relevant data can be read using the JLR approved diagnostic equipment.

STARTUP BATTERY CABLES



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E248649

ITEM	DESCRIPTION
1	Positive jump start terminal
2	Startup battery cable (positive) - engine compartment
3	Startup battery cable (positive) - underbody
4	Startup battery cable (positive) to BJB
5	BMS control module terminal for the BMS plate
6	Ground cable from the BMS to the vehicle body ground connection
7	Startup battery cable (positive) for the generator
8	Startup battery cable (positive) for the starter motor

 NOTE:

A negative jump start terminal is provided in the engine compartment.

The startup battery cables are for the high current connections between the following:

- Startup battery
- Generator
- Starter motor
- BJB
- EJB
- PJB
- BCMB
- AJB
- Ground.

The startup battery cables from the BJB to the other junction boxes and modules are all in the main wiring harness.

OPERATION

The startup battery State of Charge is monitored by the BCM/GWM with the BMS control module. In Power Mode 7 (engine running) the startup battery State of Charge is maintained by the BCM/GWM with the generator. The BCM /GWM communicates with the generator through a LIN.

- For additional information, refer to: [Generator](#) (414-02A Generator and Regulator - INGENIUM I4 2.0L Diesel, Description and Operation).
- For additional information, refer to: [Generator](#) (414-02B Generator and Regulator - INGENIUM I4 2.0L Petrol, Description and Operation).

BATTERY MONITORING SYSTEM

The BMS control module monitors the condition of the startup battery in all Power Modes. The BMS control module communicates with the BCM/GWM through a LIN.

When the State of Charge falls close to the minimum level needed to start the engine, the BMS sends a message to the BCM/GWM.

The BMS control module determines that other control modules are still active if the startup battery State of Charge continuously decreased to less than 50%. When this occurs the BMS control module sends a request on LIN to the BCM/GWM. In Power Mode 0 (ignition OFF) the BCM/GWM sends sleep request on CAN systems buses to all control modules.

In the Power Mode 0 (ignition OFF) the BMS control module monitors the startup battery State of Charge for a further 15 minutes. The BMS control module determines when the startup battery State of Charge is still dropping due to the quiescent drain current. The BMS control module sends a power disconnect signal to the BCM/GWM on the LIN. The BCM/GWM then sends a signal to the PJB on the hardwired connections to open its internal relays. When the PJB relays are open, the power supply from the startup battery to non-critical control modules is switched OFF. The non-critical control modules are any modules which are part of the infotainment or climate control systems.

The use of the LIN communication makes sure that no other control modules are 'woken' during this process. When CAN systems bus communication is used, all modules on the CAN systems bus are woken by the message.

BATTERY MONITORING SYSTEM CONTROL MODULE LOW BATTERY WARNING AND ENERGY MANAGEMENT MESSAGES

The BMS control module continuously monitors the State of Charge. When State of Charge falls below a specific threshold, the system begins to start the engine.

The FCDIM or IPC displays warning messages to inform the driver:

- The startup battery is at a low level of charge.
- The engine OFF power consumption limit has been exceeded.

DISPLAY SCREEN	MESSAGE
FCDIM	'Energy Management'
IPC	Low Battery - 'Please start engine'

'Energy Management'

This message is displayed as a warning on the FCDIM when the engine is not running. This indicates that the startup battery State of Charge is less than a specific threshold. The message is removed after a minimum of 10 minutes in Power Mode 7 (engine running) and the State of Charge is greater than the threshold.

Low battery - 'Please start engine'

This message is displayed on the IPC and FCDIM when the engine is not running. This indicates that the startup battery charge is less than a specific threshold. As soon as the startup battery is charged above this threshold, the message is removed. The message can be manually removed by pressing the 'Menu/Ok' switch on the left steering wheel switchpack.

BATTERY MONITORING SYSTEM CONTROL MODULE SELF-CALIBRATION



NOTE:

When the vehicle is only driven for short periods the charging process could take a number of days to complete.

The BMS control module periodically initiates a self-calibration routine. The self-calibration requires that the startup battery is fully charged.

To self-calibrate, the BMS control module sends a signal to the BCM/GWM.

When the startup battery is fully charged, the system then resumes normal charging control. The optimum level of charging voltage is between 12.3V to 15.2V, depending on startup battery condition, ambient temperature and loading.

The BMS control module also monitors the startup battery condition with the engine switched OFF. When a low voltage condition is detected, the BMS control module can request the infotainment system is switched OFF to protect startup battery voltage.

ELECTRICAL LOAD MANAGEMENT

The BCM/GWM contains the electrical load management. The BCM/GWM monitors the vehicle system power loads before and during an auto engine stop.

ENGINE STOP/START OPERATION

Engine Stop/Start Operation:

- For additional information, refer to: [Starting System](#) (303-06A Starting System - INGENIUM I4 2.0L Diesel, Description and Operation).
- For additional information, refer to: [Starting System - INGENIUM I4 2.0L Petrol](#) (303-06B Starting System - INGENIUM I4 2.0L Petrol/INGENIUM I4 2.0L Petrol - PHEV, Description and Operation).

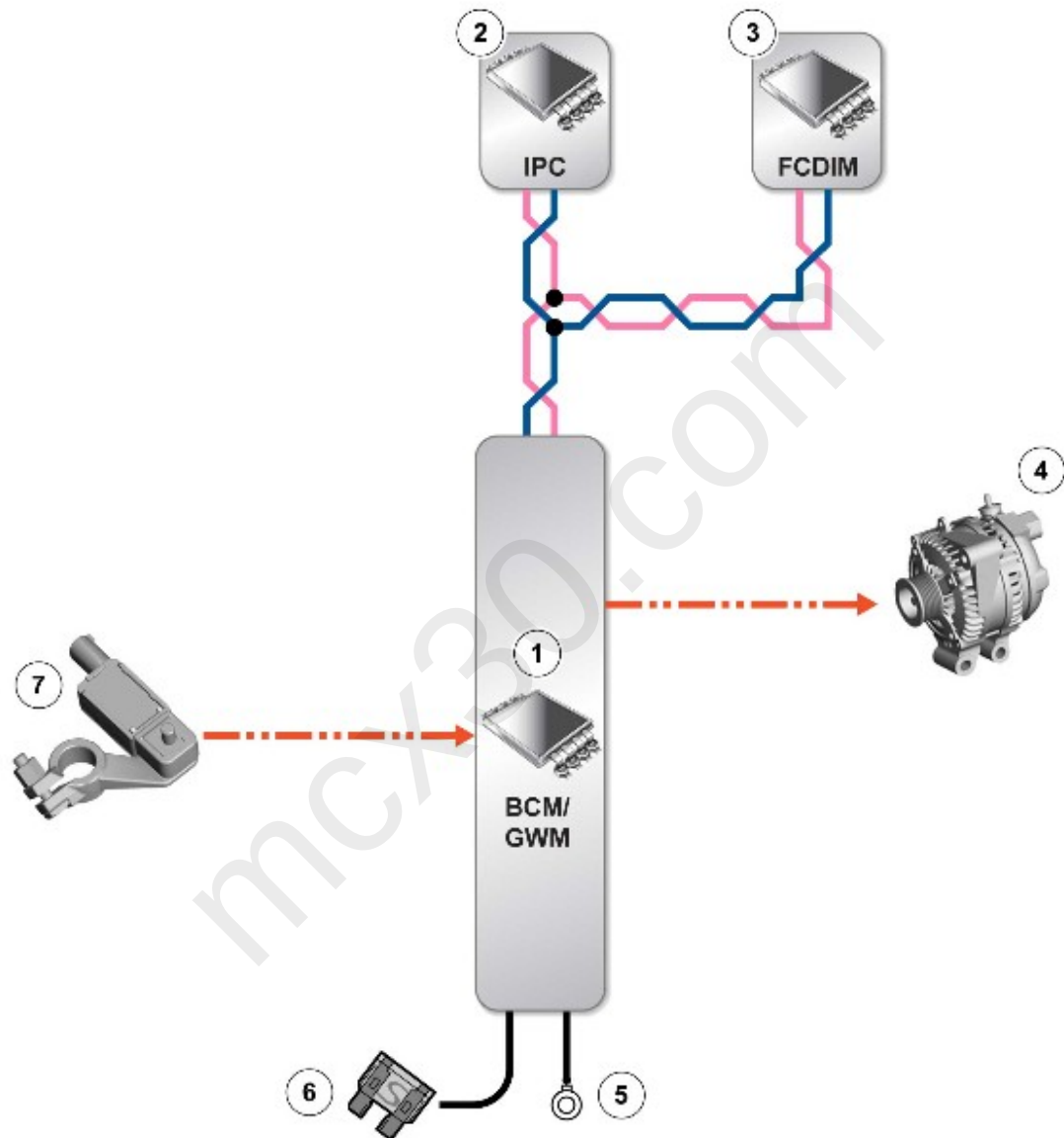
DIAGNOSTICS

The BCM/GWM records any DTCs and related data. The DTCs and related data are read using the JLR approved diagnostic equipment.

The JLR approved diagnostic equipment enables certain components to be activated and also read live data.

CONTROL DIAGRAM

CONTROL DIAGRAM - 1 OF 1 - BATTERY SYSTEM



A = HARDWIRED: O = LOCAL INTERCONNECT NETWORK (LIN): BA = HS CAN HMI SYSTEMS BUS.

ITEM	DESCRIPTION
1	BCM/GWM
2	IPC
3	FCDIM
4	Generator
5	Ground
6	Power supply
7	BMS control module

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