General function requirements

- Circuit 30

2-battery on-board electrical system, general

The 2-battery on-board electrical system comprises the following subfunctions:
- Determination of battery state function sequence
- Control of battery cutoff relay function sequence
- Consumer shutoff function sequence
- Display of fault messages function sequence
- Battery charging function sequence

Determination of battery state function sequence

The state of the on-board electrical system battery and starter battery is defined by the voltage available in the on-board electrical system. The vehicle power supply control unit records the current and voltage values of the on-board electrical system battery and starter battery and calculates the respective battery states based on this.

Control of battery cutoff relay function sequence

The battery cutoff relay is controlled depending on the state of the on-board electrical system. Depending on the state of the on-board electrical system, the on-board electrical system battery and the starter battery remain separated by the battery cutoff relay or are connected in parallel.

A distinction is made between the following on-board electrical system states:
- Normal starting mode
- Normal mode
- Emergency starting mode
- Emergency mode
- Shutoff phase

If there is no undervoltage, the on-board electrical system battery and starter battery are separated (normal and normal starting mode). If undervoltage is detected, the system switches to emergency and emergency starting mode. The on-board electrical system battery and starter battery are connected in parallel by the battery cutoff relay.

- Rear SAM control unit (N10/8)
- Driver-side SAM control unit (N10/10)
- Passenger-side SAM control unit
- AAC [KLA] control and operating unit (N22)

The 2-battery on-board electrical system is subdivided into the following battery circuits:
- Starter battery circuit
- Supply battery circuit

The starter (M1) and starter battery are assigned to the starter battery circuit.

All other electrical consumers are assigned to the supply battery circuit. Power is supplied by the on-board electrical system battery and alternator (G2).

With the fuse through-plating (F52), the starter battery circuit is protected against overload by fuse 1 (F52f1) and the supply battery circuit by fuse 2 (F52f2).

The central gateway control unit makes the signal available on the engine compartment CAN. The following control unit receives the signal over the engine compartment CAN:
- ESP, SPS [PML] and BAS control unit (N47-5)

In addition, the vehicle power supply control unit reads in the following information via interior CAN (CAN B):
- Engine speed from ME-SFI [ME] control unit (N3/10) over engine compartment CAN (CAN C) to EIS (EZS) control unit (N73))
- Vehicle speed from instrument cluster (A1)
- Interior temperature from overhead control panel control unit (N70)
- PSE controller unit with combined functions (A37)

The following control units receive the signal over the interior CAN:
- Instrument cluster
- PSE controller unit with combined functions (A37)
- COMAND operating, display and control unit (A40/3)

The following functions are activated depending on the state of the on-board electrical system battery and starter battery:
- Consumer shutoff
- Idle speed increase
- Cut-in of starter battery

The starter battery supports the on-board electrical system power supply until undervoltage is no longer present. An entry is also made in the fault memory and a warning indicator appears in the on-board electrical system. Depending on the state of the on-board electrical system battery and starter battery are separated.

Consumer shutoff function sequence

To prevent the battery from discharging under all driving conditions, the state of charge of the on-board electrical system is monitored and evaluated continuously. If the required levels of power can no longer be supplied, the vehicle power supply control unit transmits appropriate signals requesting a reduction in power output or consumer shutoff in a defined sequence.

The following control units receive the signal over the instrument cluster:
- PSE controller unit
- AAC [KLA] control and operating unit (N22)

© Daimler AG, 2/10/18, G/07/10 / gf54.10-p-0001ri / 2-battery on-board electrical system, function
MODEL 230.4 except CODE (P99) Special model "AMG Black Series" as of Model Year 2009 / CY 08 model refinement package
- Left front seat adjustment control unit with memory (N32/1)
- Right front seat adjustment control unit with memory (N32/2)
- RVC control unit (N52)
- PTS control unit (N62) (with code (220) PARKTRONIC)
- Left door control unit (N69/1)
- Right door control unit (N69/2)
- KEYLESS-GO control unit (N69/5) (with code (889) Keyless Go)
- Overhead control panel control unit (N70)
- EIS [EZS] control unit
- Central gateway control unit (N93)

The EIS [EZS] control unit sends the signal to the engine compartment CAN. The following control unit receives the signal over the engine compartment CAN:
- ME-SFI [ME] control unit

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Consumer shutoff with engine running function sequence (emergency mode)
Consumer shutoff in emergency mode is subdivided into the following three stages:
- Shutoff stage 1 with U < 10.6 V in on-board electrical system battery
- Shutoff stage 2 with U < 10.2 V in on-board electrical system battery
- Emergency mode stage 3 with U < 9.8 V in on-board electrical system battery

In shutoff stage 1, the following functions are shut off depending on the vehicle equipment:
- Washer fluid heater (with code (875) Heated windshield washer system)
- Wiper park position heater (R2/10)
- Steering column tube adjustment
- Heated rear window (R1)
- Seat heater stage 1 (with code (873) Seat heater for left and right front seats)
- Seat heater stage 2 (with code (873) Seat heater for left and right front seats)

The following consumers are additionally switched off during shutoff stage 2:
- Mirror heater (M21/1r1 and M21/2r1)
- Inside rearview mirror unit (A67)

The following components are actuated at reduced power output in shutoff stage 2:
- Blower motor with P < 53 %

The fault messages in the multifunction displays of the instrument cluster remain the same.

In emergency mode stage 3, the on-board electrical system battery and starter battery are connected following the consumer shutoff operations from shutoff stages 1 and 2. This is intended to increase the on-board power supply voltage or at least stabilize it. The fault messages in the multifunction displays of the instrument cluster remain the same.

The consumer shutoff function sequence consists of the following subfunctions:
- Consumer shutoff with engine running function sequence (emergency mode)
- Consumer shutoff with engine OFF function sequence (emergency starting mode)
- Consumer cut-in function sequence

Additional function requirements for consumer shutoff with engine running (emergency mode)
- Circuit 61 ON

The status of circuit 61 is placed on the interior CAN by the passenger-side SAM control unit.

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Consumer shutoff with engine OFF function sequence (emergency starting mode)

- Seat ventilation stage 1 (with code (401) Front comfort seats, incl. seat heating and seat ventilation)
- Seat ventilation stage 2 and 3 (with code (401) Front comfort seats, incl. seat heating and seat ventilation)
- Interior illumination
- Ventilation control of air conditioning system
- Vario roof control (closing procedure cannot be shut off)

The following components are actuated at reduced power output:
- Blower motor (A32m1) with P < 69 %
- Telematics (current limited to I = 11 A)

Corresponding fault messages are issued by the battery symbol lighting up in the left multifunction display (A1p13) and by display of the text "Electrical consumers shut off!" in the right multifunction display (A1p15).

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Consumer cut-in function sequence

However, if the on-board power supply voltage drops below a voltage value of \( U = 11.5 \text{ V} \) for \( t > 5 \text{ s} \), the fault message "Battery/alternator, stop vehicle!" is output. If the so-called "final brake message" is shown, this means that for a period of \( t = 15 \text{ s} \) a current of \( I = 100 \text{ A} \) can be made available without the on-board electrical system voltage dropping below \( U = 9.3 \text{ V} \).

After circuit 61 OFF, the connection of the starter battery with the on-board electrical system battery is maintained for \( t = 5 \text{ min} \).

Additional function requirements for consumer shutoff with engine OFF (emergency starting mode)
- Circuit 15C ON
- Circuit 61 OFF

The circuit status of circuit 15 is made available by the EIS [EZS] control unit on the interior CAN.

The status of circuit 61 is placed on the interior CAN by the passenger-side SAM control unit.

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Model 230.4 except CODE (P99) Special model "AMG Black Series" as of Model Year 2009 / CY 08 model refinement package
If the on-board electrical system voltage drops to a value of $U < 10.8$ V, then when the circuit 15C On status changes to circuit 15R On, the consumer shutoff doesn't take place until after a waiting time of $t = 30$ s in each case. In emergency starting mode the consumers for shutdown stages 1 and 2 are shut off and the on-board electrical system battery is connected to the starter battery. The connection request is transmitted by the passenger-side SAM control unit to the vehicle power supply control unit over the interior CAN. If the engine is not started within $t = 30$ s, the on-board electrical system battery and starter battery are disconnected from each other again. The consumer shutoff from shutoff stages 1 and 2 is maintained. When the engine is started from emergency starting mode, the system switches to emergency starting mode stage 3. The consumer shutoff from shutoff stages 1 and 2 is maintained and the on-board electrical system battery and starter battery remain connected.

The messages are displayed as soon as shutoff stage 1 becomes active and are displayed until the state of the on-board electrical system has stabilized. Display of the battery symbol and the fault message “Service Required” in red is an instruction and takes place under the following conditions:
- Signal from circuit 61 not present although engine running detected
- Vehicle power supply control unit defective
- Battery cutoff relay defective or wiring harness to battery cutoff relay defective
- Power supply to EZS control unit (circuit 30z) interrupted
- Front prefuse box fuse (F32) defective

**Additional function requirements for battery charging**
- Circuit 61 ON
- $U > 11$ V in on-board electrical system battery

The status of circuit 61 is placed on the interior CAN by the passenger-side SAM control unit.

The EZS control unit sends the signal via the engine compartment CAN to the ME-SFI [ME] control unit. The central gateway control unit forwards it over the engine compartment CAN to the ESP, SPS [PML] and BAS control unit. When the final charge condition is reached, the starter battery is disconnected from the on-board electrical system battery.

When the voltage of the on-board electrical system battery has stabilized at $U > 12.5$ V, the consumer shutoff is canceled with a delay:
- Emergency mode stage 3 after approx. $t = 7$ min
- Shutoff stage 2 after approx. $t = 3$ min
- Shutoff stage 1 after approx. $t = 3$ min

**Display of fault messages function sequence**
If faults are detected in the 2-battery on-board electrical system, the vehicle power supply control unit transmits corresponding messages to the instrument cluster over interior CAN. These fault messages are either displayed in the form of symbols on the left multifunction display or as plain text on the right multifunction display in the instrument cluster. Fault messages displayed in white are of an informative nature only. They inform the driver about consumer shutoff operations that do not affect driving safety.

**Battery charging function sequence**
During normal operation, the starter battery is charged according to a characteristic stored in the vehicle power supply control unit. The vehicle power supply control unit records the current and voltage values of the starter battery and uses these to calculate the temperature of the starter battery to ensure optimal charging. If necessary, the interior temperature can be drawn on as a reference value. The interior temperature is recorded by the in-car temperature sensor (N70b1) in the overhead control panel control unit. The signal from the in-car temperature sensor is made available on the interior CAN by the overhead control panel control unit. When the starter battery is being charged, the vehicle power supply control unit transmits a corresponding signal to the following control units via interior CAN:
- Instrument cluster
- EIS [EZS] control unit
- Central gateway control unit

The system then switches to maintenance charging mode. The on-board electrical system battery is charged directly by the alternator.

Starting assistance can only be provided by the starter battery to protect the electrical consumers of the on-board electrical system.

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