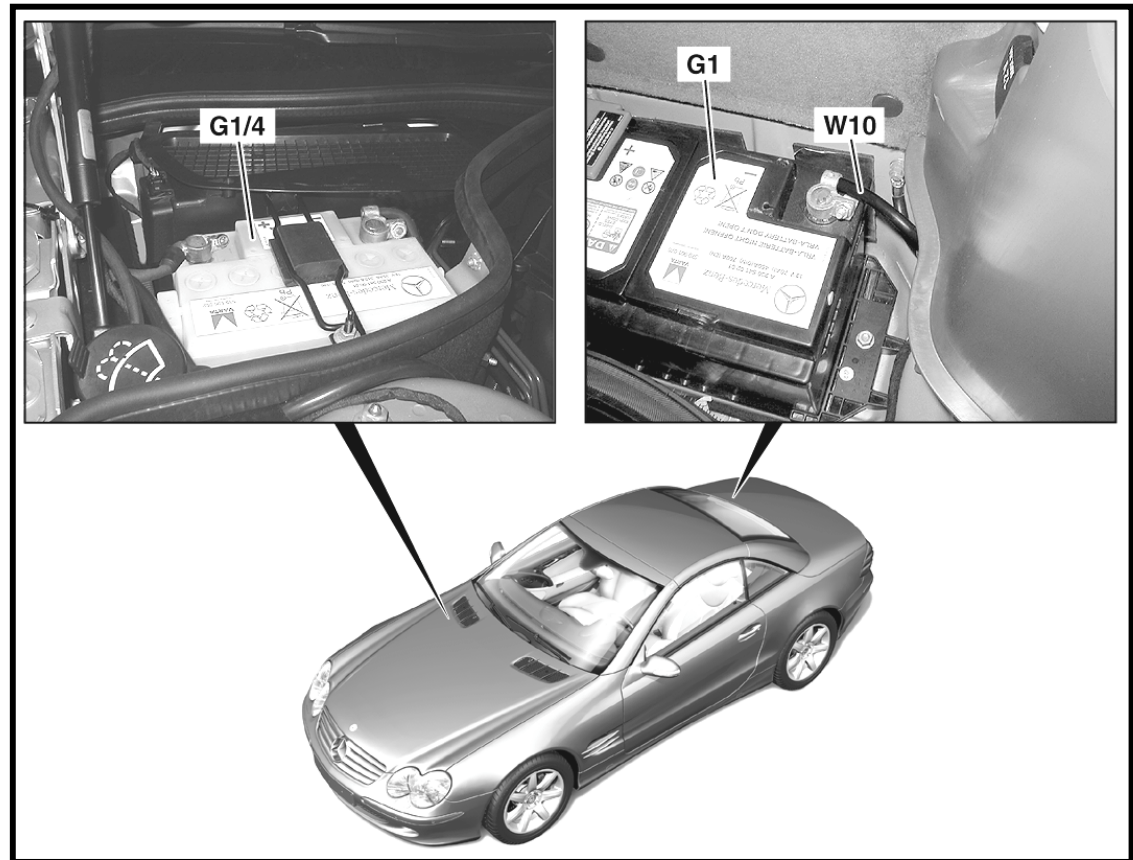




Mercedes-Benz

# R230 Dual Battery On-board Electrical System



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To help avoid personal injury to you or others, and to avoid damage to the vehicle on which you are working, you must always refer to the latest Mercedes-Benz Technical Publication and follow all pertinent instructions when testing, diagnosing or making repair. Illustrations and descriptions in this training reference are based on preliminary information and may not correspond to the final US version vehicles. Refer to the official introduction manual and WIS when available.

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# Dual Battery System Tasks

- Extends vehicle's driving time for safety

Manage electrical power consumption by temporarily disabling convenience consumers if vehicle power falls below a certain voltage.

- Guarantees vehicle will start with a dead systems battery

To provide a back-up power supply to the systems circuit if the system battery cannot provide sufficient power to the vehicle.

# Program Highlights

- Dual battery on-board electrical system components
  - starter battery
  - systems battery
  - vehicle power supply control module
  - battery cut-off relay
  - isolation relay
- Power distribution
  - prefuse diagram
  - prefuse locations
- Dual battery functional description
  - normal modes
  - failure modes

# Starter Battery (G1/4)



**Note: when jump starting, ONLY USE THIS BATTERY!**



- Starter battery: 12V 35Ah 315A (DIN) 520A (EN)
- Construction: standard automotive lead acid (maintenance required)
- Function: i) supplies electrical power for starter motor armature only  
ii) provides back up power to the system circuit

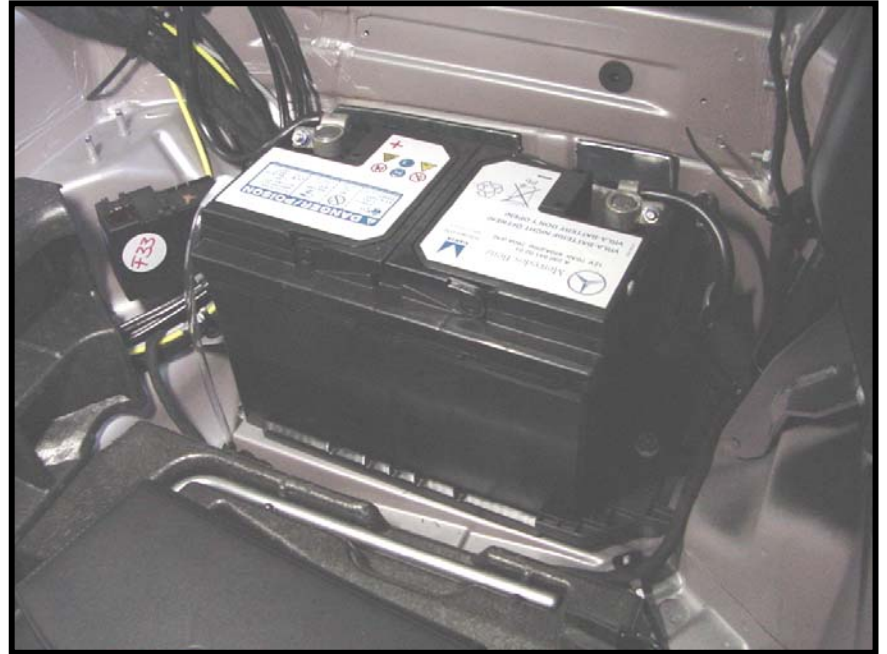
# Starter Battery Failure Display



- Multi-function display red (category 1 malfunction)
- DTC's will be set in the vehicle power supply control module (N82/1)
- Cannot be erased by customer (can only be erased using SDS / DAS)

# Systems Battery (G1)

Note: when jump starting,  
NEVER USE THIS BATTERY!



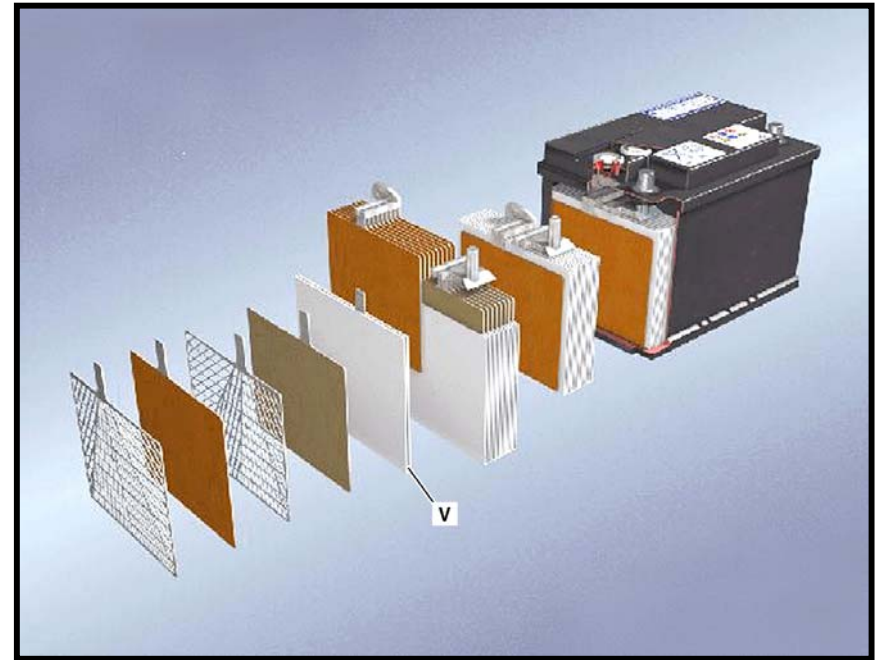
Location: in trunk - right side

- Systems battery: 12V 70Ah 450A (DIN) 798A (EN)
- Construction: Valve Regulated Lead Acid (VRLA) type, using Absorbent Glass Mat (AGM) design
- Function: supplies electrical power for entire vehicle (incl. the starter solenoid) with the exception of the starter motor armature

# AGM / VRLA Battery Construction

The major differences in construction between a AGM battery and standard lead acid automotive battery are:

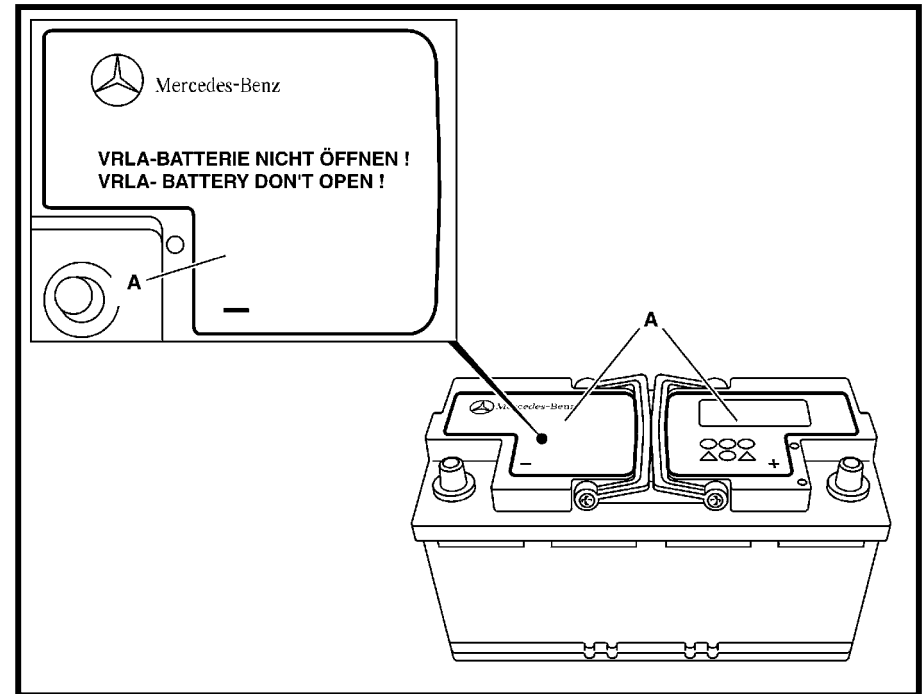
- Completely sealed case construction
- No liquid electrolyte in solution
- Absorbent glass mat (V) holds electrolyte in contact with positive and negative plates
- Vent valve is normally sealed no gases can escape during normal charging
- Vent valve is only opened if internal pressure exceeds predetermined level





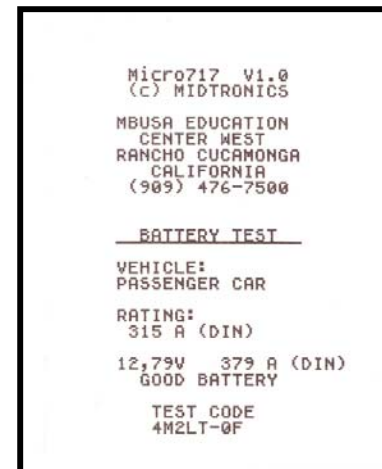
# AGM / VRLA Battery Properties

- Longer service life
- Improved deep cycle performance
- No liquid acid spills or leaks
- Fast recharge time
- Completely maintenance free

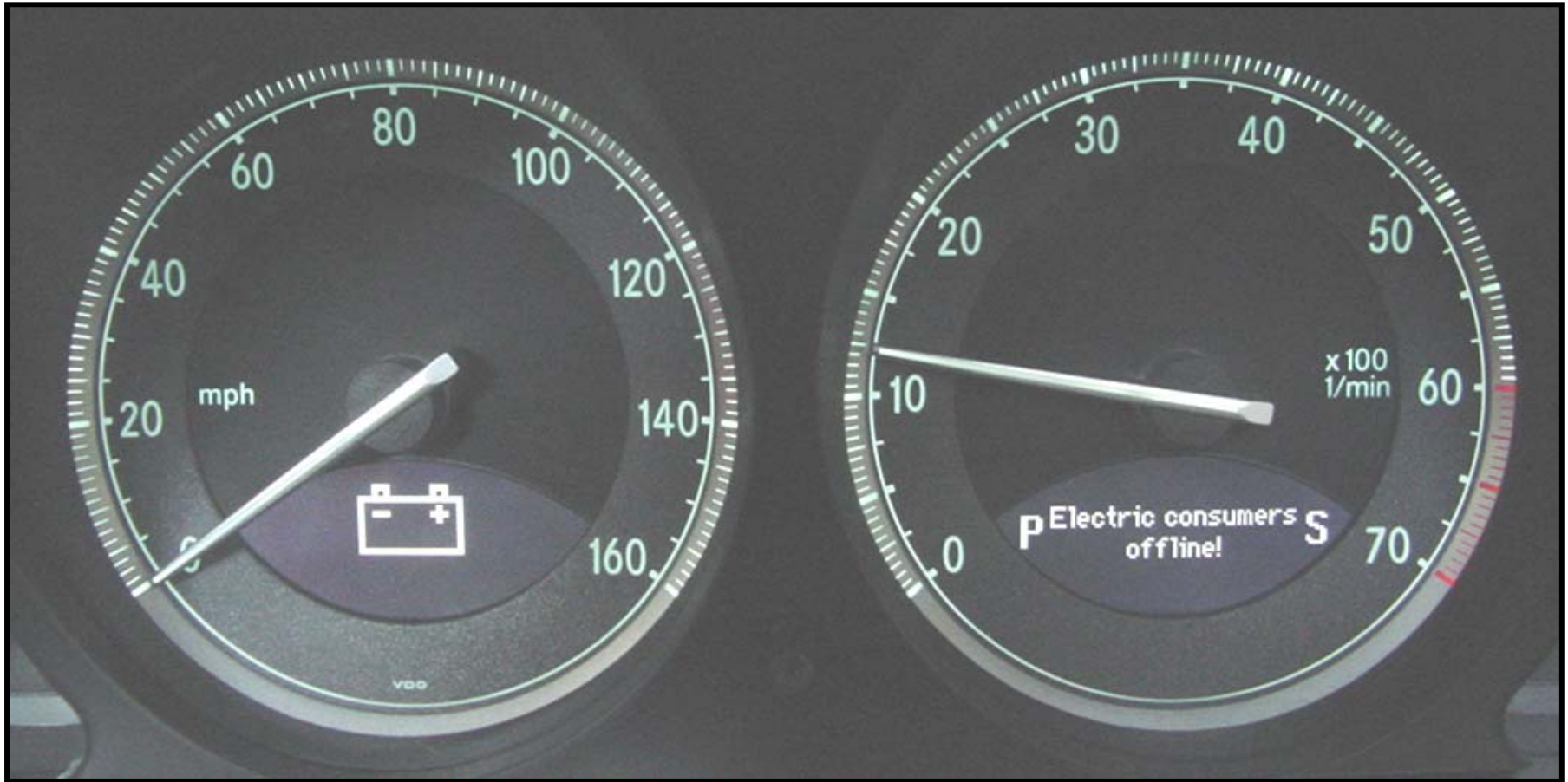


# AGM / VRLA Battery Testing

- AGM batteries cannot be tested using previous methods (load and acid density tests)
- Requires the new Midtronics MCR 717 tester and printer
- Tester measures battery conductance by inducing A/C voltage of a given frequency and amplitude on the battery posts and monitoring the current flow in response to it
- Discard the acid density sheet, and enter test code (recorded by tester) on warranty claim forms
- Battery replaced under warranty must have a test printout attached to the R.O.
- Detailed information about testing, and using the MCR717 can be found in WIS SI54.10-P-0003-01

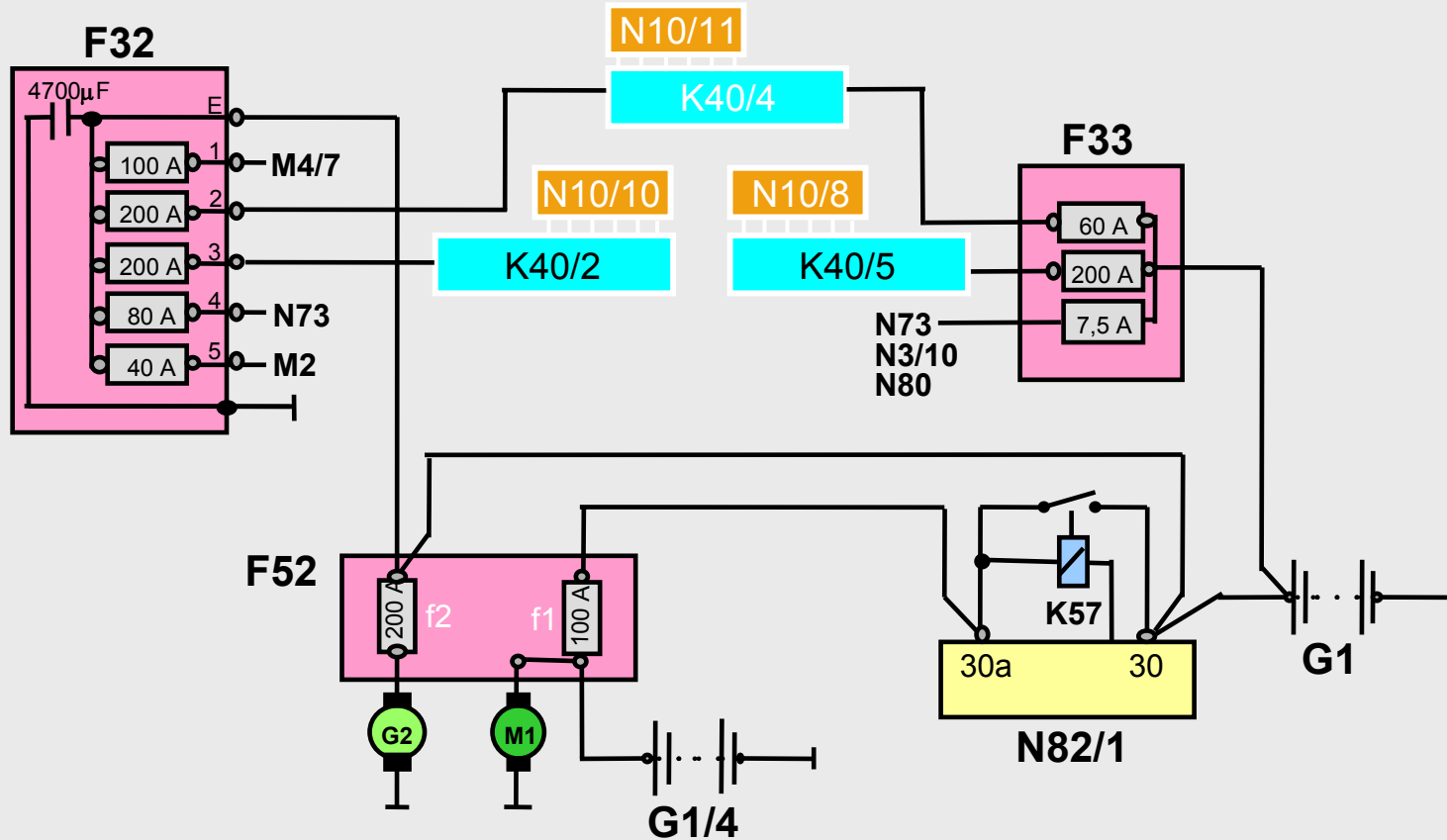


# Systems Battery Failure Display



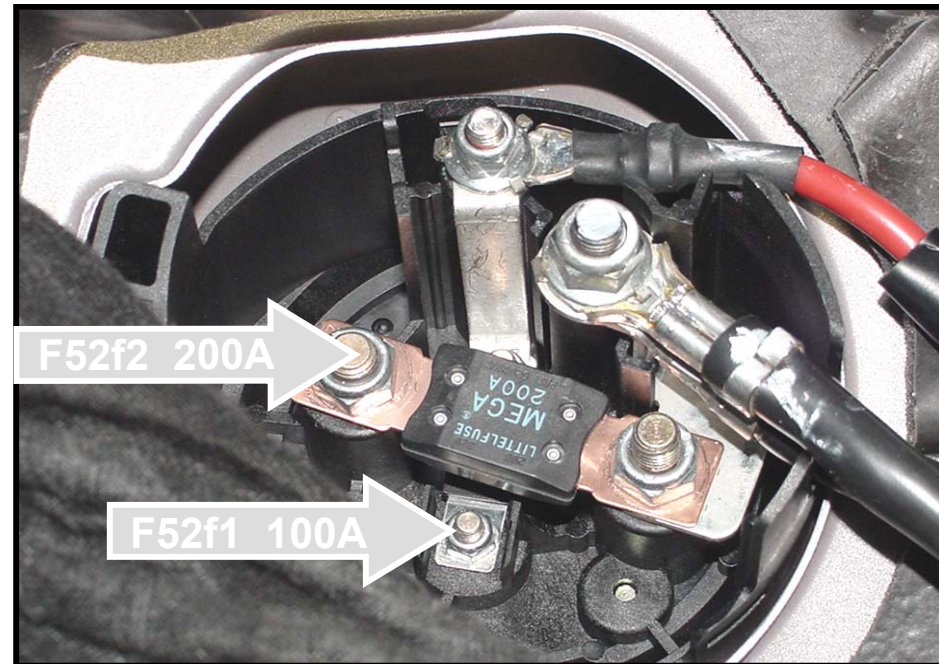
- DTC's will be set in N82/1
- High current consumers are shut down (prioritization feature)

# Prefuse Diagram



F32	prefuse front	K40/4	fuse and relay module (FR)	N10/8	SAM (rear)
F33	prefuse rear	K40/5	fuse and relay module (rear)	N10/10	SAM (FL)
F52	prefuse block	K57	battery cut-off relay	N10/11	SAM (FR)
G1	systems battery	M1	starter	<b>N73</b>	<b>Electronic ignition switch (EIS)</b>
G1/4	starter battery	M2	blower motor	N80	Steering column module (SCM)
G2	alternator	M4/7	engine fan	N82/1	Vehicle power supply control module
K40/2	fuse and relay module (FL)	N3/10	engine control module (ME)		

# Front Prefuse Block (F52)

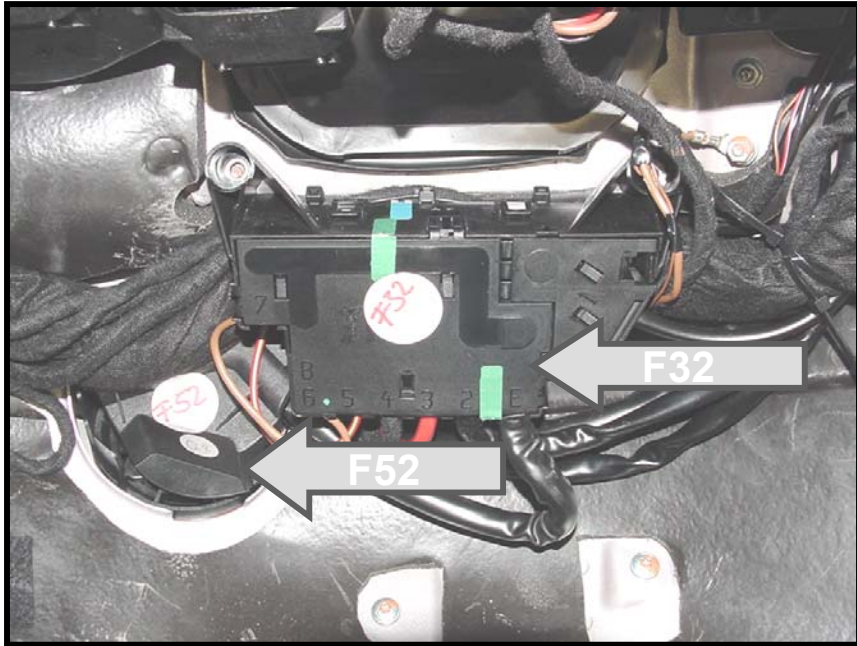


Location: passenger footwell (upper left)

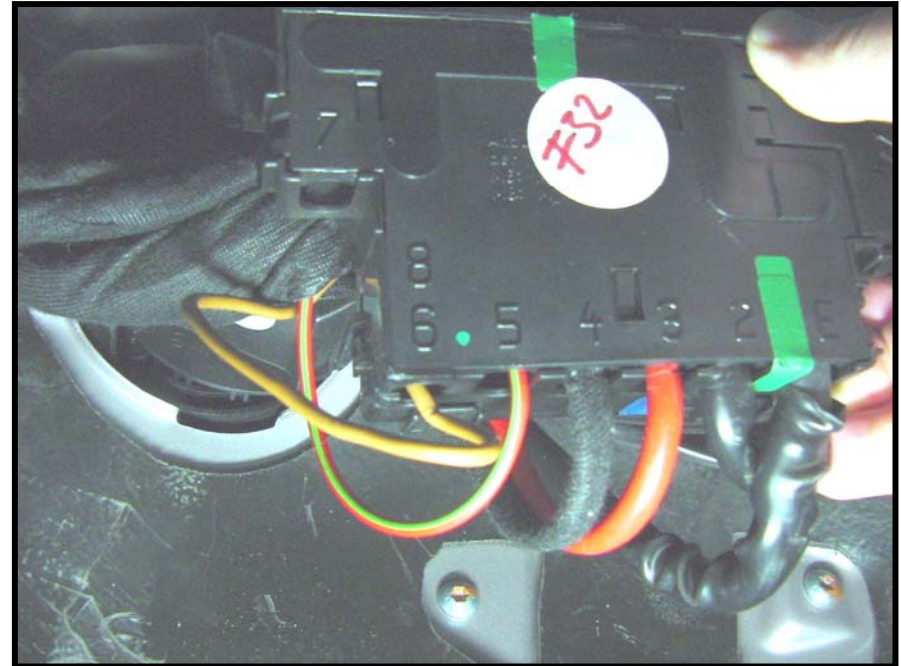
F52f1- Circuit 30a protection for supply wires to K57, K75, and N82/1

F52f2- Alternator (G2) short circuit protection

# Front Prefuse Block (F32)



Location: passenger footwell



Function: over current protection for the following (see next page)

# Front Prefuse Block (F32)

E - Power input

1 - F32f1, 100A to suction fan (M4/7)

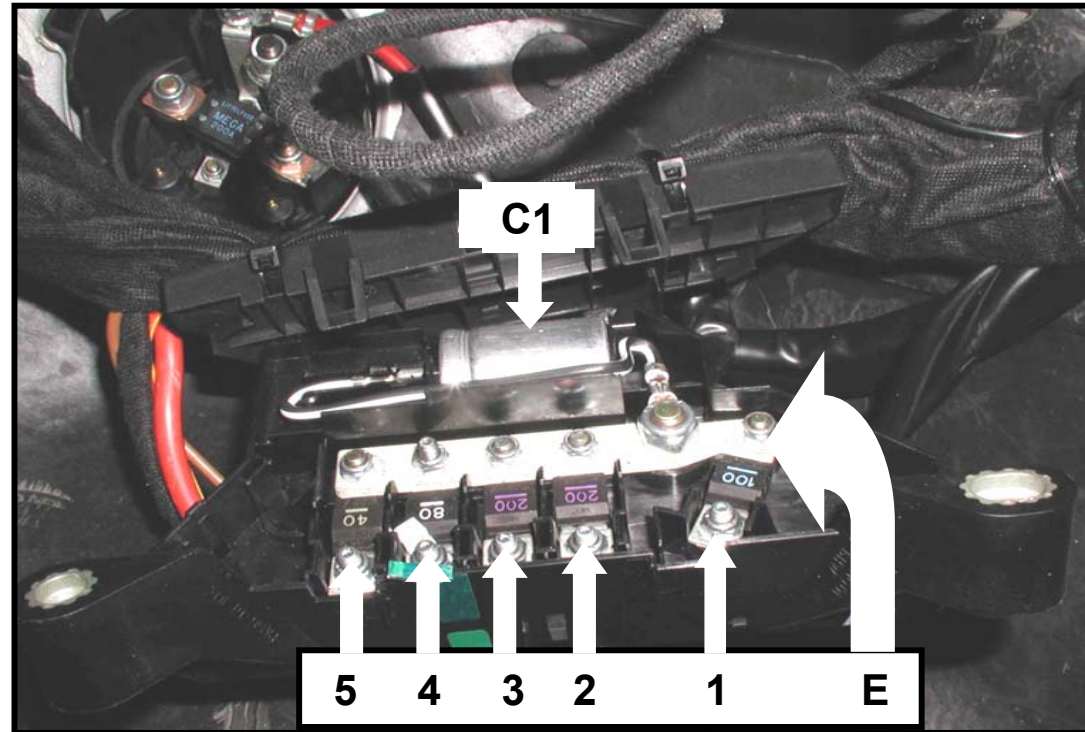
2 - F32f2, 200A to SAM FR (K40/4)

3 - F32f3, 200A to SAM FL (K40/2)

4 - F32f4, 80A to EIS (N73)

5 - F32f5, 40A to HVAC blower (M2)

C1 - Capacitor 4700  $\mu$  f (Filter)



# Rear Prefuse Block (F33)

F33 f3 - External fuse 7.5A  
Used for Emergency Engine Stop

- Feeds Z4/4 (30z)
  - EIS (N73) power supply
  - SCM (N80) power supply
  - ME (N3/10) power supply

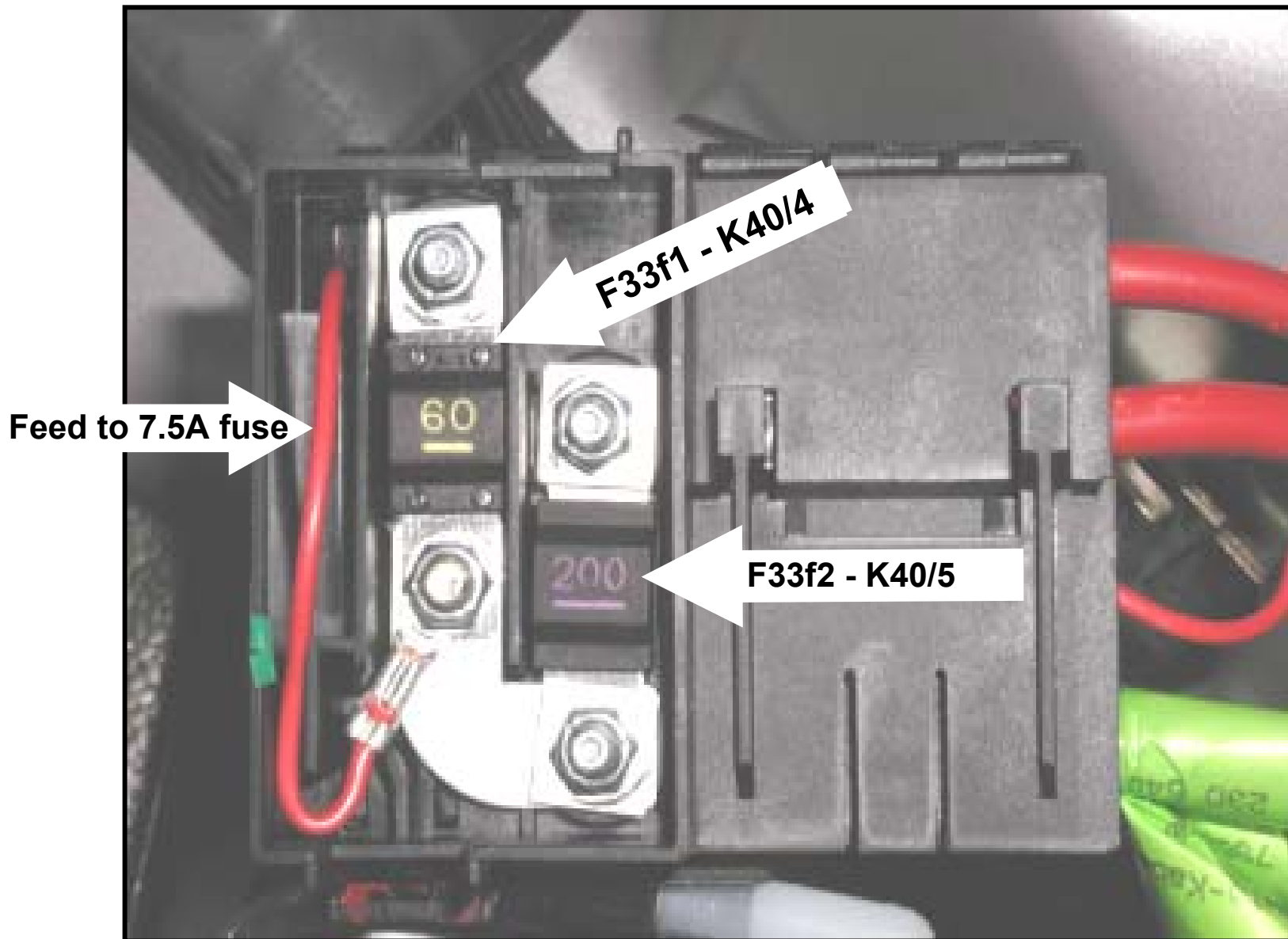


Location: right side of trunk

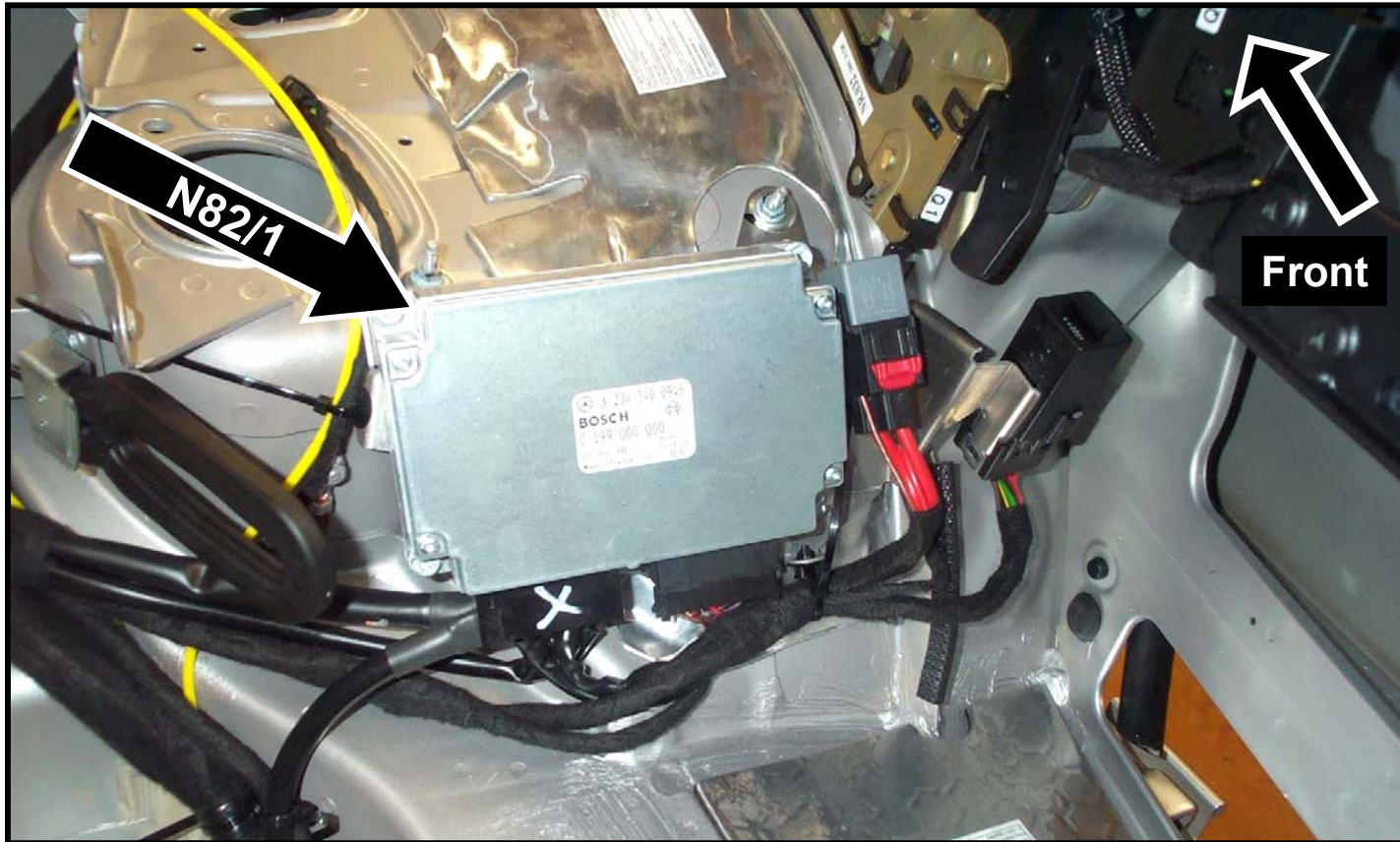
Note: vehicle fuse chart refers to this fuse as #78



# Internal Fuses (F33)



# Vehicle Power Supply Control Module (N82/1)



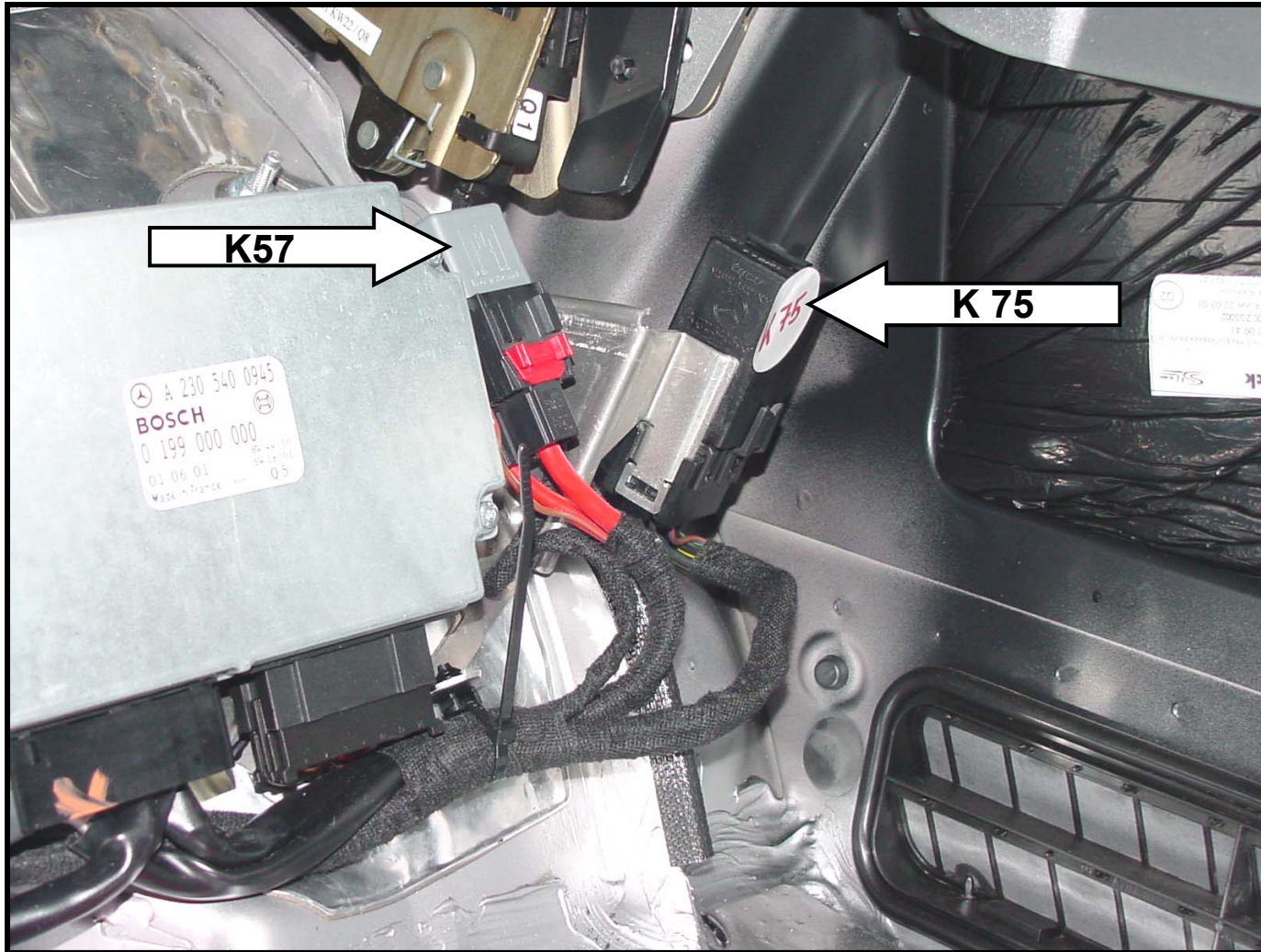
Location: right side of trunk

Note: SDS / DAS Acronym BNS (Board Net System)

# N82/1 Function as Described in WIS

1. Monitors the voltages of (G1) and (G1/4)
2. Controls battery cut-off relay (K57)
3. Protects vehicle electrical systems from voltage surges
4. Protects vehicle electrical systems from short circuits
5. Controls consumer prioritization function
6. Optimizes charging of starter battery (G1/4)
7. Notes emergency operation and sets fault codes  
(CAN communication / DTC's)

# Cut-off (K57) and Isolation (K75) Relays



Location: right side of trunk

# Function of Relays (K57) and (K75)



## Cut-off relay (K57):

- Controlled by N82/1
- De-energized during normal operation (N.O.)
  - Isolates (G1) from (G1/4) during normal operation
- Energized during emergency operation
  - Connects (G1/4) to (G1) during emergency operation



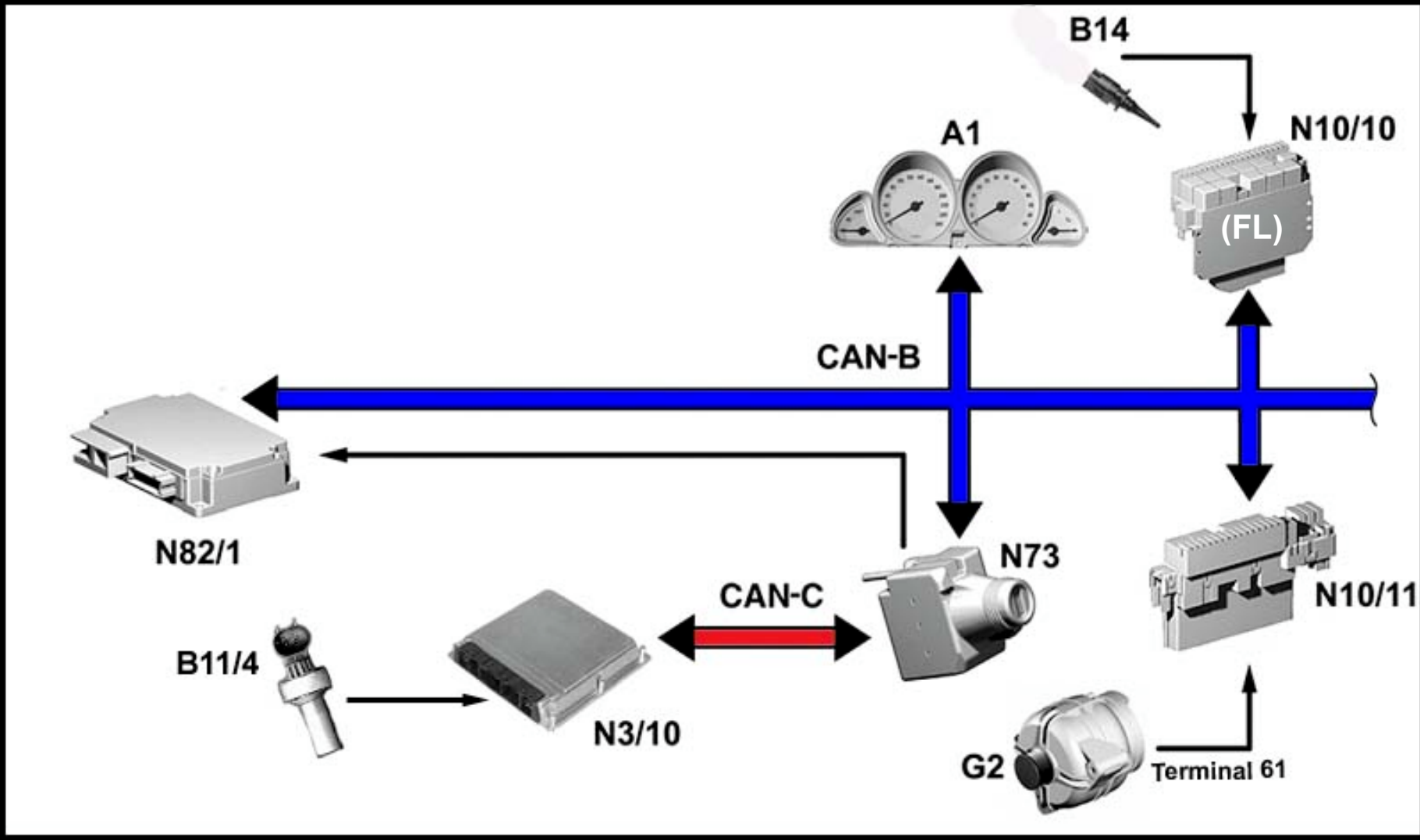
## Isolation relay (K75):

- Controlled by N82/1
- De-energized during normal operation (N.C.)
- Energized during emergency operation
  - Opens 30/15R to cigar lighter (R3r1), and 12V trunk socket (X58/1) during emergency operation

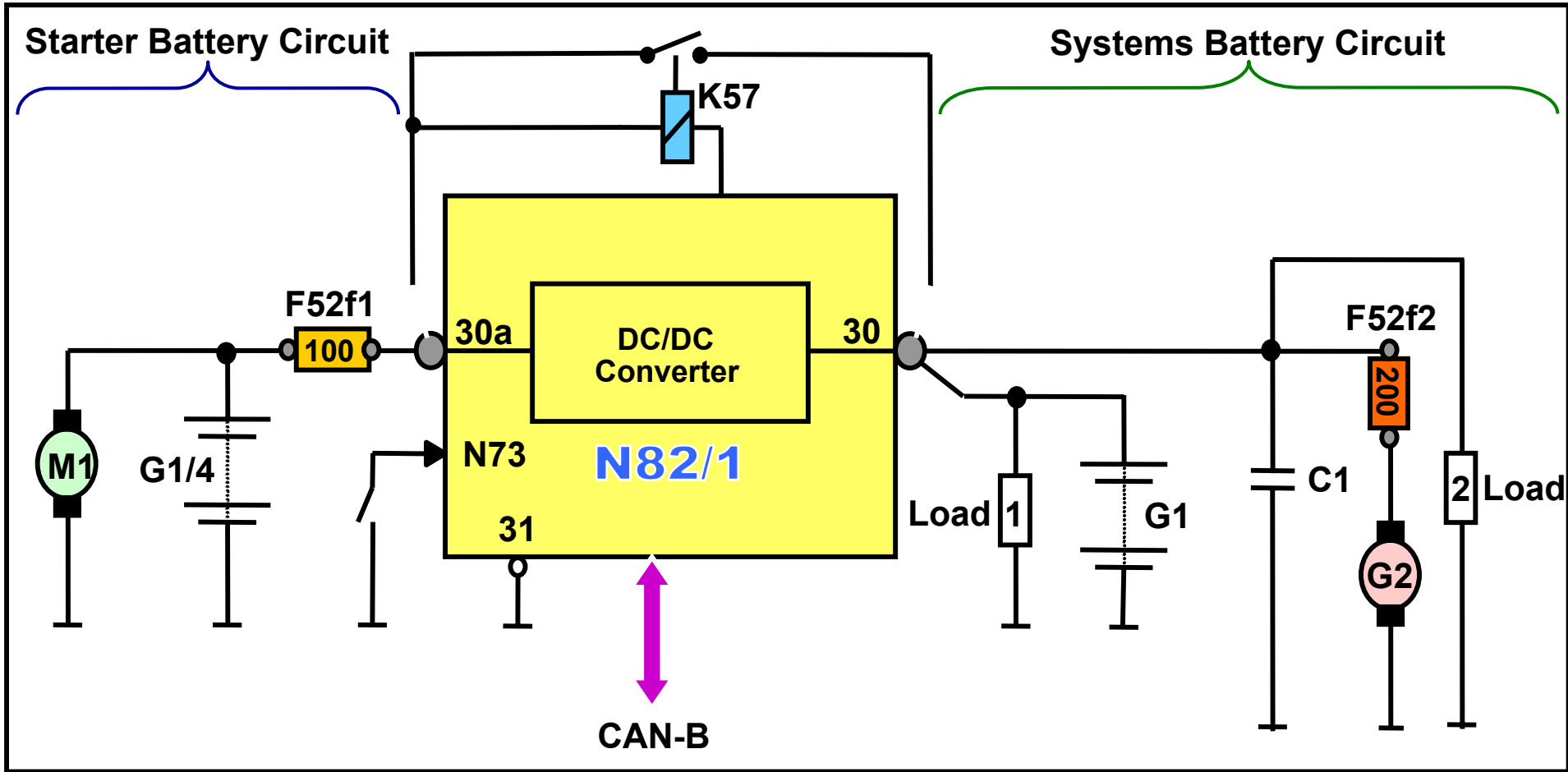
# Dual Battery On-board Electrical System

## Functional Description

# CAN Communication N82/1

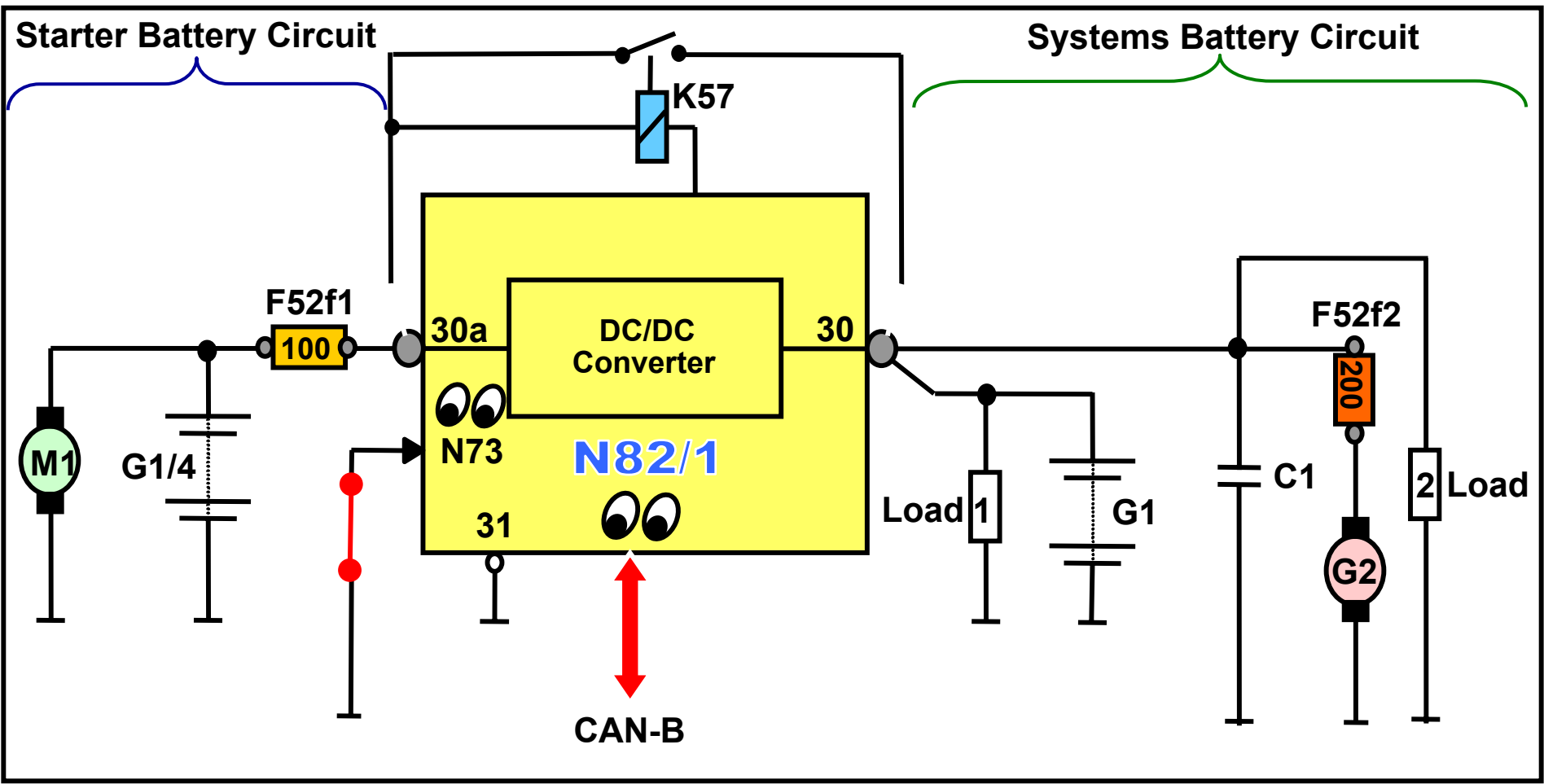


# Dual Battery Circuit Diagram



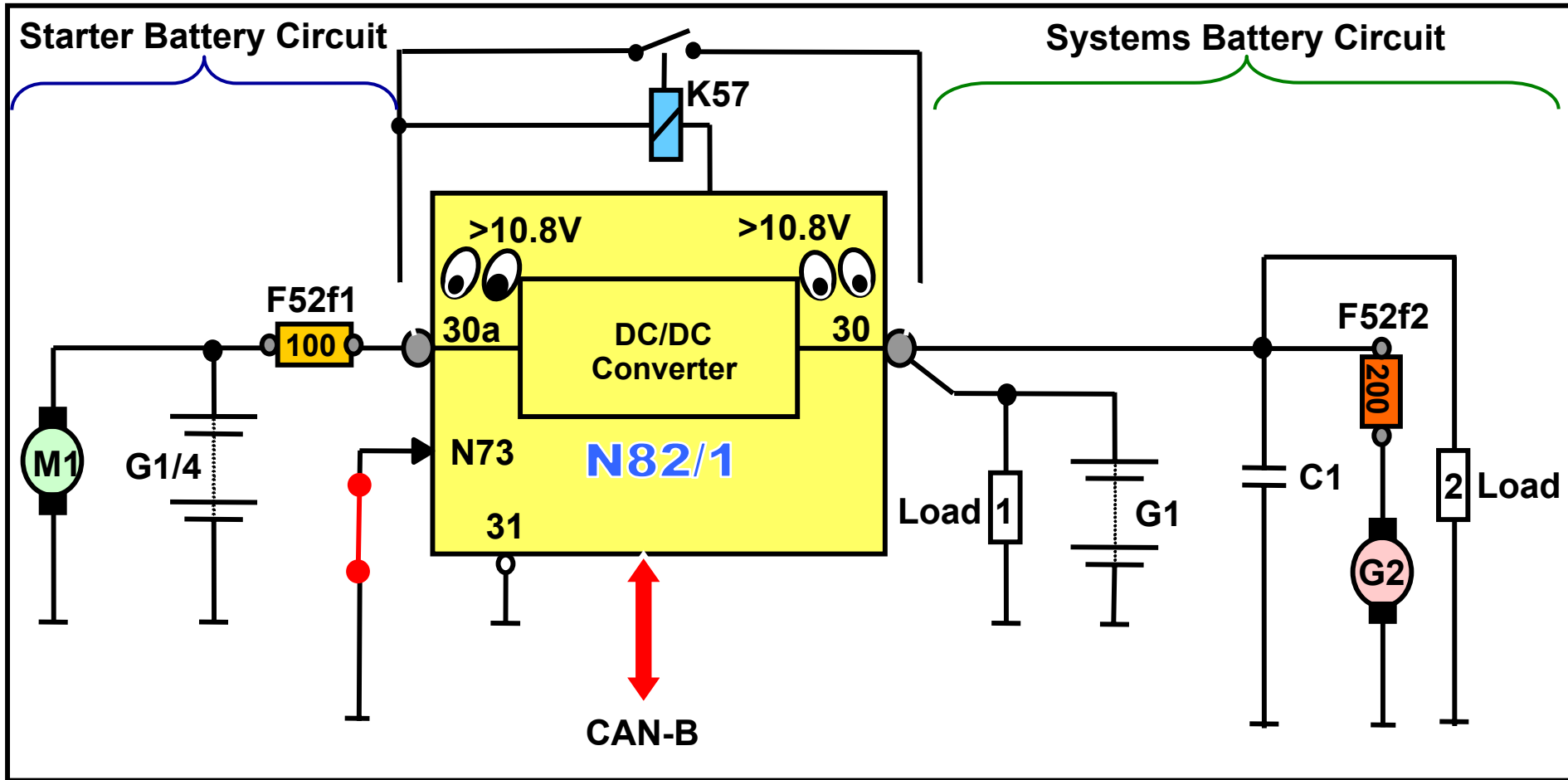


# Normal Operation (Wake-up)



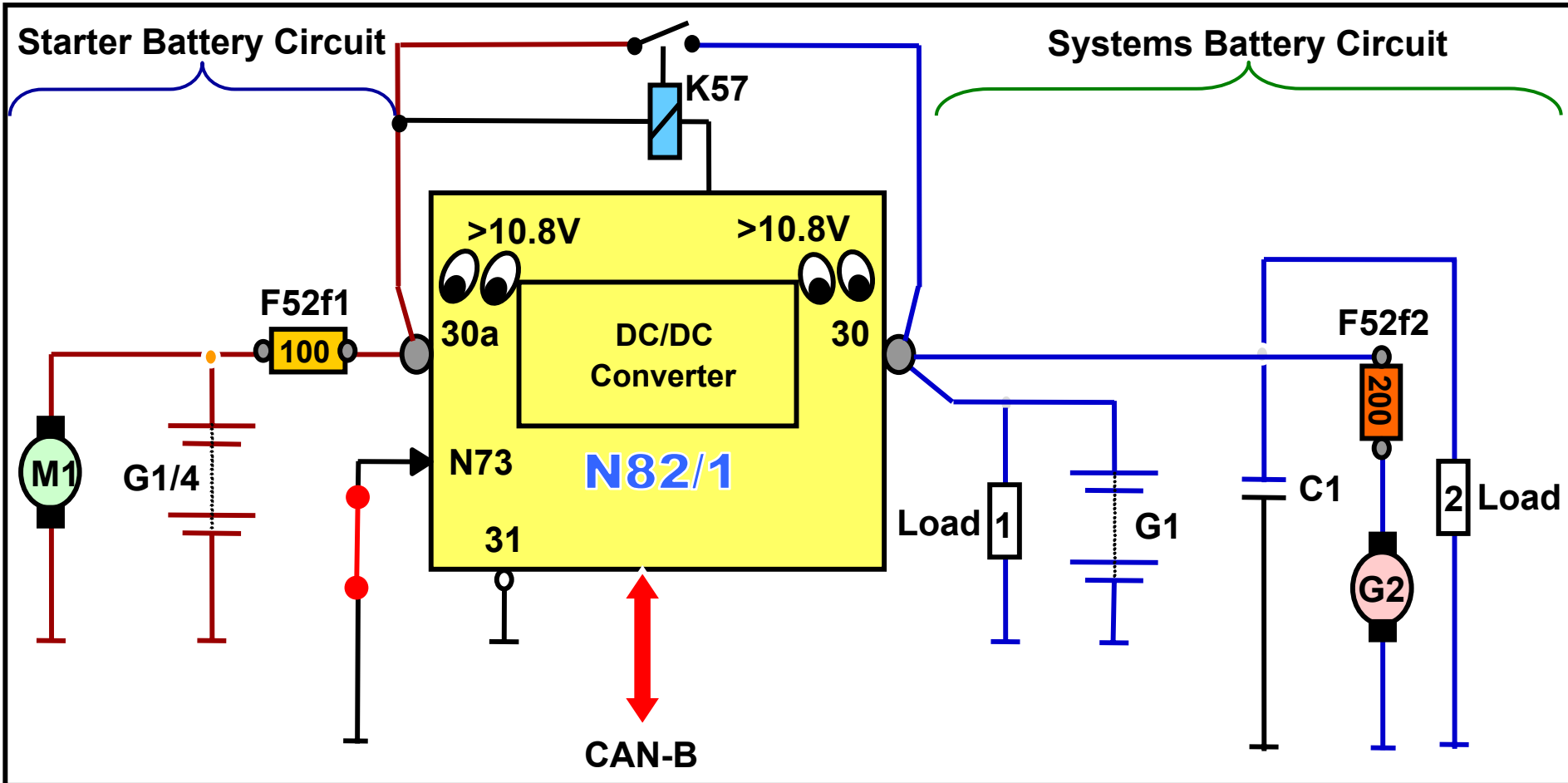
N82/1 control module is activated by: CAN-B or microswitch in EIS

# Normal Operation (Voltage Monitoring)



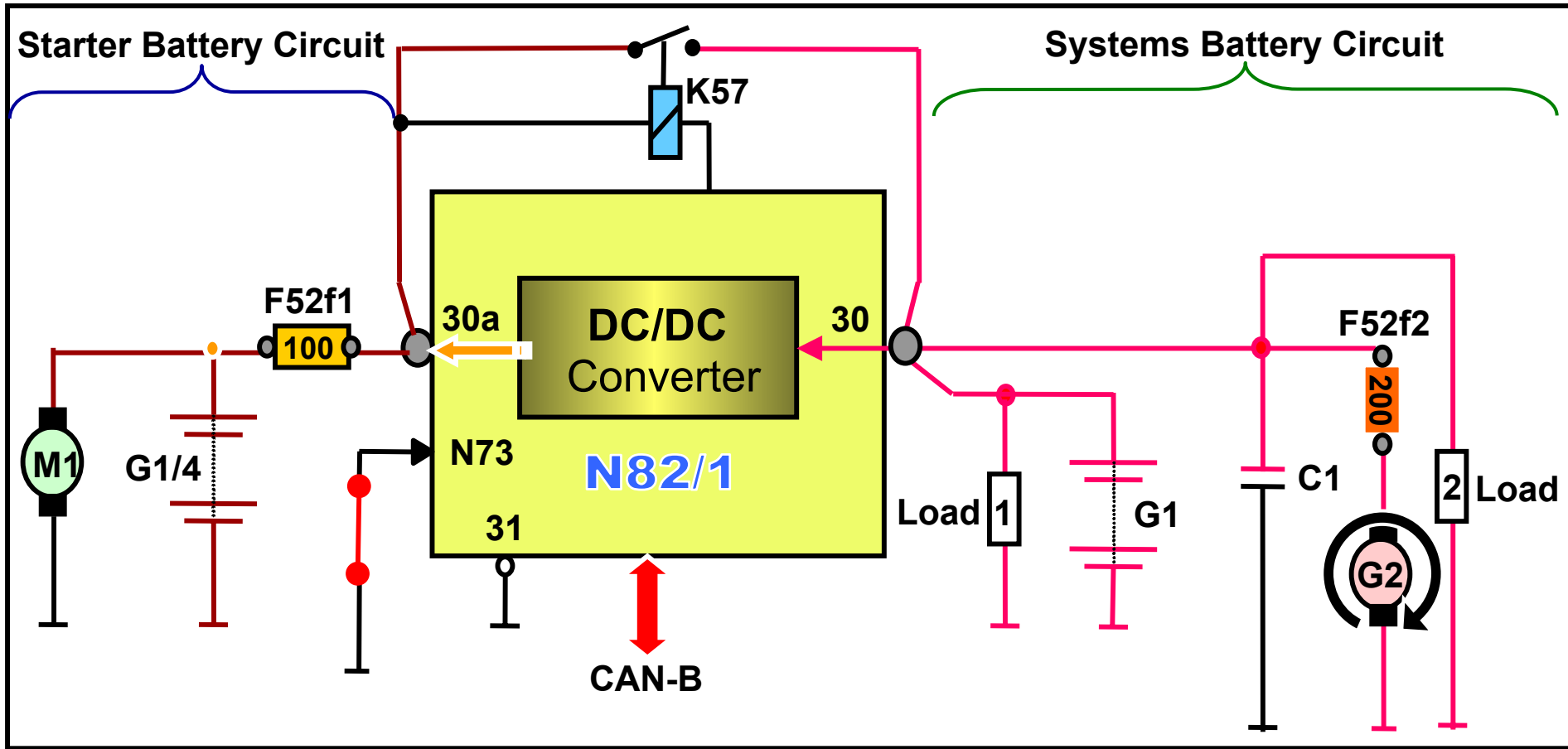
N82/1 control module checks battery voltages

# Normal Operation



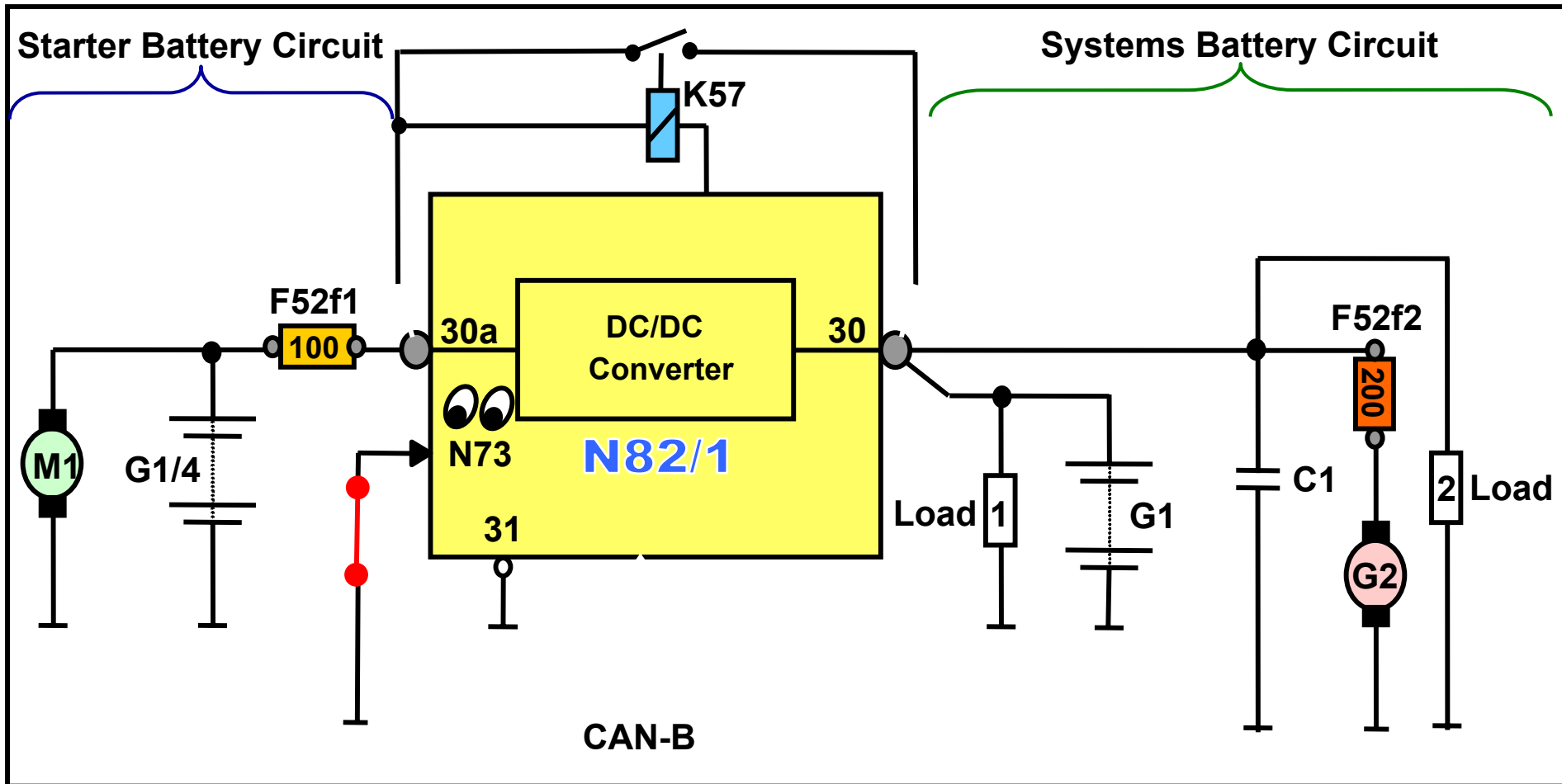
N82/1 control module isolates starter battery from systems battery via open relay K57 (not energized)

# Normal Operation (Charging)



- Engine running, alternator charges the systems battery directly
- Starter battery charged via the DC / DC converter (15A max), based on:
  - Starter battery voltage
  - Starter battery temperature calculated by N82/1 using:
    - Ambient temperature (B14)
    - Engine coolant temperature (B11/4)

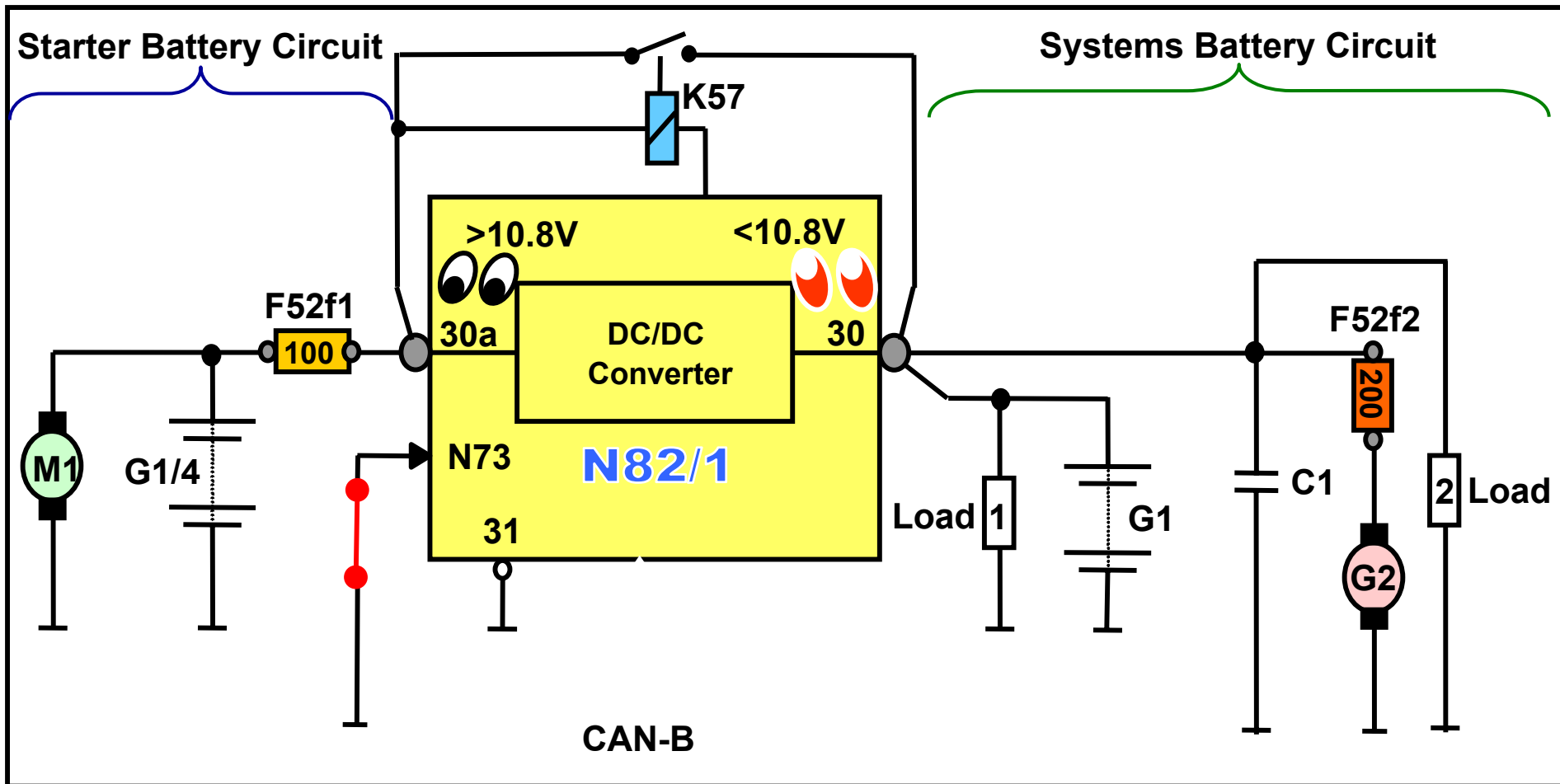
# Emergency Start (Wake-up)



Scenario - Systems battery weak:

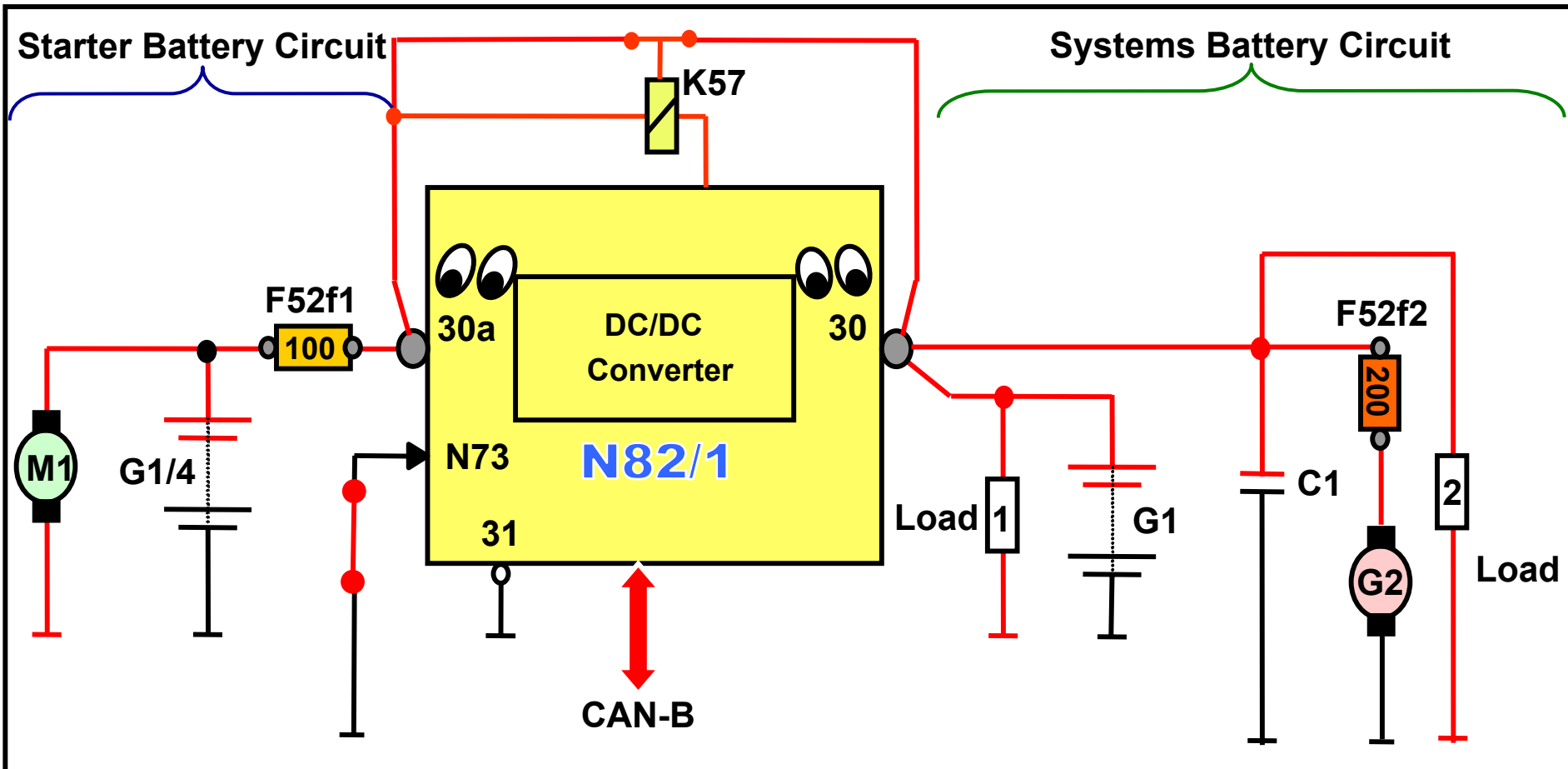
N82/1 control module is activated by the ground microswitch in EIS (N73)

# Emergency Start (Voltage Monitoring)



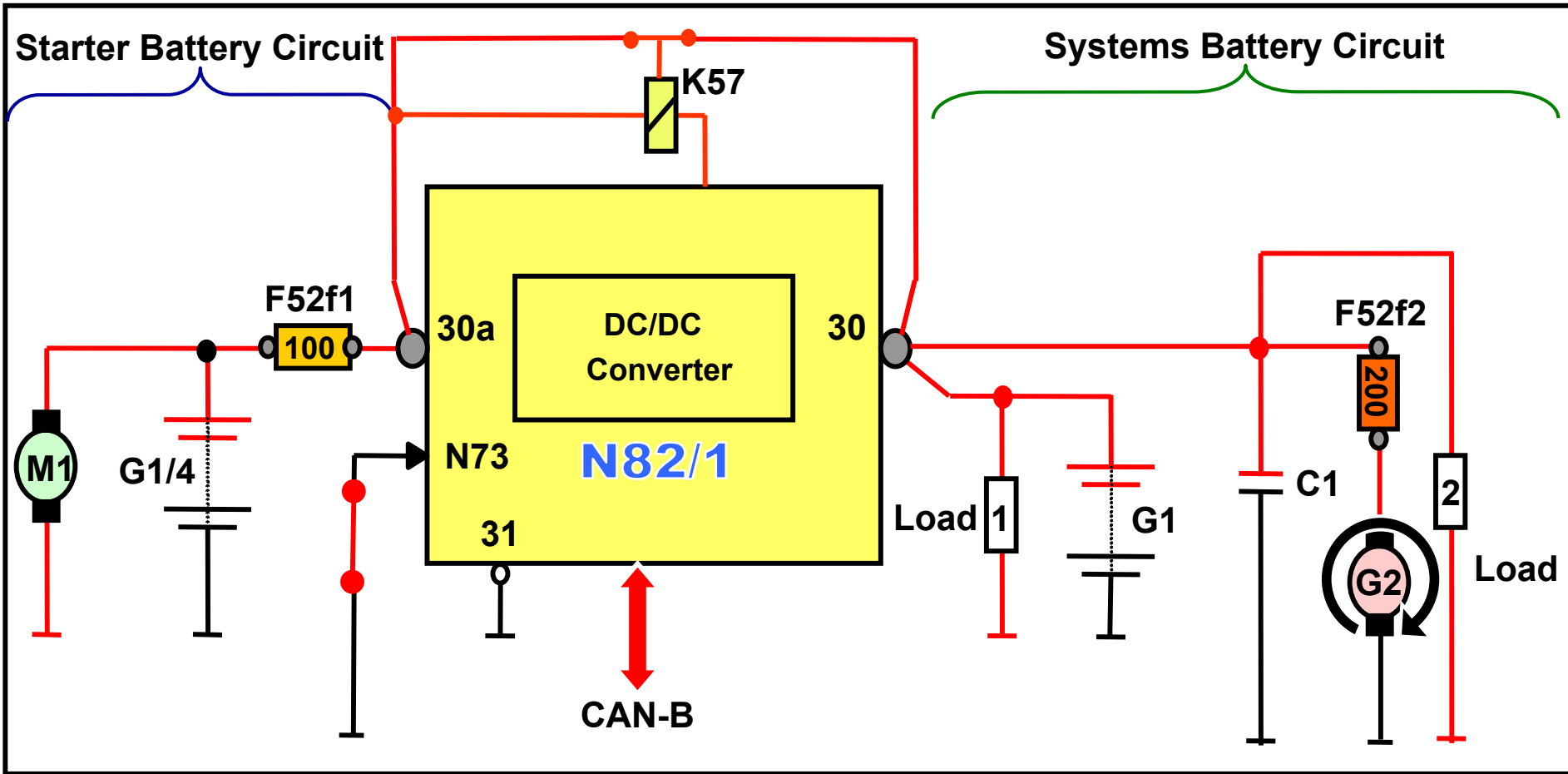
- N82/1 control module checks battery voltages (for up to 30 seconds)
- Terminal 30 less than 10.8 volts
- N82/1 control module initiates emergency start operation

# Emergency Start



- N82/1 activates relay (K57), starter battery supplies power to systems circuit
- N82/1 control module sends emergency operation message via CAN B
- DTC's stored in N82/1

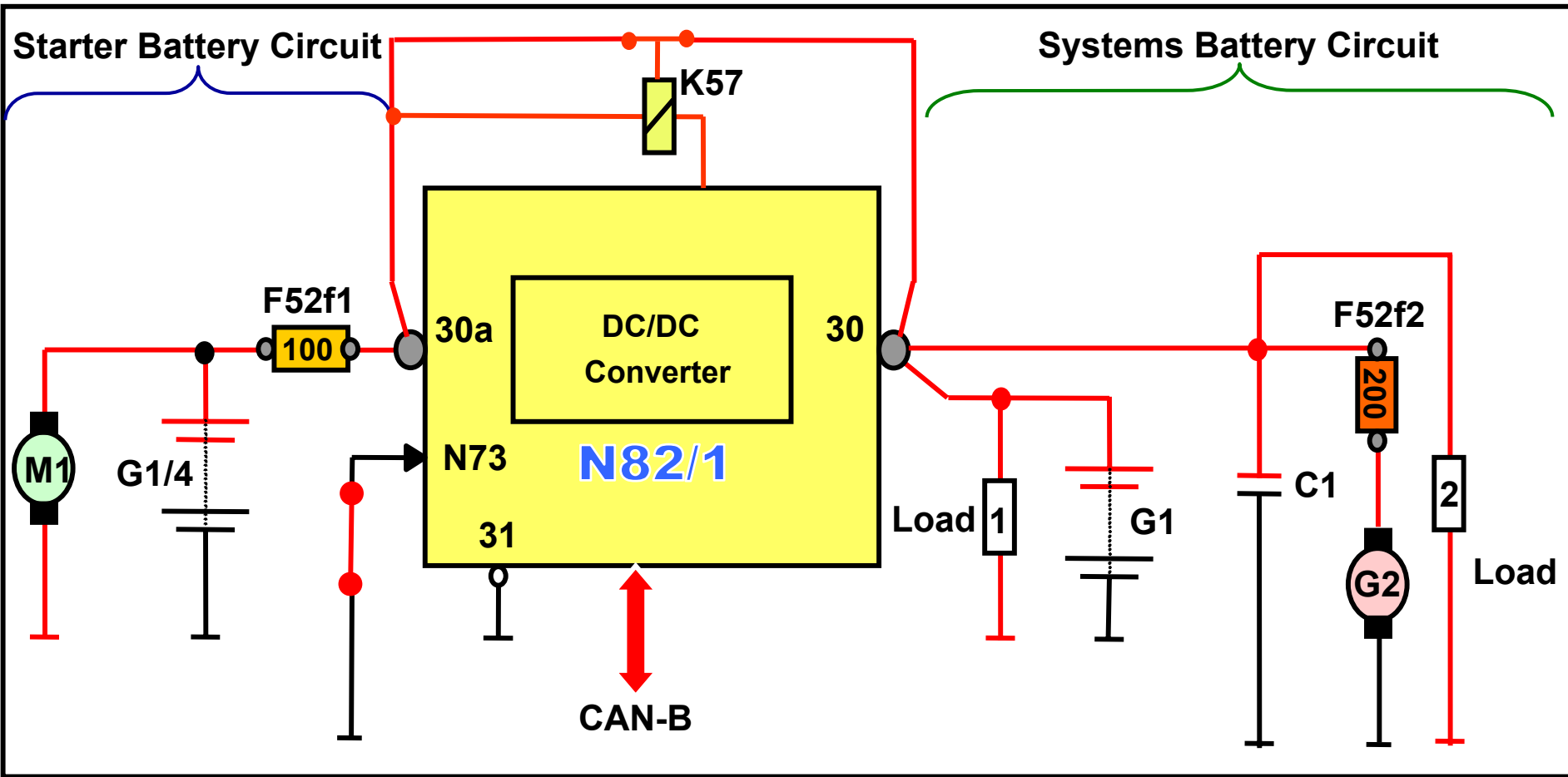
# Emergency Operation (Limp Home)



- Engine running alternator charges G1 and G1/4
- Relay (K57) remains activated ~5 minutes after engine is started to quick charge G1/4
- Prioritization function active for ~8 to 18 minutes (if voltage at t30 > ~10.8V)



# Ending / Switch Off Phase



- Engine off after an emergency start
- Cut-off relay (K57) re-activates for ~5 minutes after engine is switched off

# Emergency Mode Summary

- N82/1 activates cut-off relay (K57) and isolation relay (K75)
- Starter battery (G1/4) supplies power to systems circuit
- N82/1 sends emergency operation message via CAN B
- N82/1 stores DTC's
- Instrument cluster multi-function display "Electric consumers offline!"
- Prioritization function active:
  - seat heaters inoperative
  - seat fans inoperative
  - Vario roof can only be raised
  - AAC blower is regulated up to a maximum of 50%
  - rear window defroster inoperative
  - parktronic switched off
  - radio volume limited

# Emergency Mode Summary (cont.)

- Engine switched off, SmartKey in pos. 0 or removed:
  - K57 remains energized for ~5 min. (e.g. windows, CTEL, or TeleAid call)
- SmartKey reinserted in pos. 0:
  - K57 will re-energize for 30 seconds
- SmartKey reinserted to pos. 1 or 2:
  - K57 will re-energize for ~5 min.
- If voltage at N82/1 terminal 30 increases to >10.8v:
  - prioritization function cancelled after ~8 to 18 min. of engine running

# Dual Battery Service Tips

## Normalization:

If batteries are disconnected or dead, the following systems should be checked for normal operation. If systems are inoperative or erratic then normalization will have to be performed.

Potential systems requiring normalizing are:

- ESP - electronic stability program
- AAC - automatic air conditioning (2 items)
- Left front seat (7 items)
- Right front seat (7 items)
- Steering wheel and mirrors
- Windows
- Tire pressure monitoring

# Dual Battery Service Tips

- When reconnecting batteries you must follow an appropriate sequence to avoid setting fault codes and / or activating prioritization feature
  - Key removed from EIS
  - Connect starter battery (G1/4) - FIRST
  - Connect systems battery (G1) - LAST
- Charging batteries may not be possible if  $< 7$  volts. Follow procedure for using parallel battery method of charging (WIS AF 54.10-P-6005A)
- To start a Keyless Go equipped vehicle with a dead systems battery (G1) when using only the KG chip card:
  - Activate N82/1 ground contact by opening the EIS door
  - Start vehicle as normal

# Appendix

WIS doc.#

Topic

AR51.10-P-1129-01A	Checking battery with Midtronics MCR717
OF58.40-P-3000-04A	Order form for Midtronics MCR717
GF54.10-P-6005A	Problems with charging batteries
GF54.10-P-4200R	Battery cut-off relay, location, and function
GF54.10-P-1001R	Two-battery vehicle power supply, function
GF54.21-P-4118R	Vehicle power supply control module, function
GF54.21-P-4118-01R	Vehicle power supply control module, task
PE54.10-U-2101-99KA	Wiring diagram of N82/1

Internet Site

Topic

[www.midtronics.com](http://www.midtronics.com)

Total battery management (AGM) charging, testing

# Legend

Load 1	Consumers	K40/5	Rear fuse and relay module
Load 2	Consumers	K57	Battery cut-off relay
C1	F32, 4700 $\mu$ f capacitor	K75	Circuit 15R / 30 cut-off relay
F32	Prefuse block front	N10/8	SAM (rear)
F33	Prefuse block rear	N10/10	SAM (FL)
F52	Prefuse block through panel	N10/11	SAM (FR)
F52f1	Fuse panel 100A	N73	Electronic ignition switch
F52f2	Fuse panel 200A	N80	Steering column module (SCM)
G1	Systems battery	N82/1	Vehicle power supply control module
G1/4	Starter battery	M1	Starter
G2	Alternator	M2	HVAC blower
K40/2	Fuse and relay module (FL)		
K40/4	Fuse and relay module (FR)		