

Translated English of Chinese Standard: GB/T27930-2011

www.ChineseStandard.net

Sales@ChineseStandard.net

GB

ICS 29.200

K 81

GB/T 27930-2011

**Communication Protocols between Off-board
Conductive Charger and Battery Management System
for Electric Vehicle**

电动汽车非车载传导式充电机与电池管理系统之间的通信协议

GB/T 27930-2011 How to BUY & immediately GET a full-copy of this standard?

1. www.ChineseStandard.net;
2. Search --> Add to Cart --> Checkout (3-steps);
3. No action is required - Full-copy of this standard will be automatically & immediately delivered to your EMAIL address in 0~25 minutes.
4. Support: Sales@ChineseStandard.net. Wayne, Sales manager

Issued on: December 22, 2011

Implemented on: March 1, 2012

**Jointly Issued by: General Administration of Quality Supervision,
Inspection and Quarantine (AQSIQ);
Standardization Administration (SAC) of the People's
Republic of China.**

Table of Contents

Foreword	3
1 Scope	4
2 Normative References	4
3 Terms and Definitions	4
4 General Provisions	6
5 Physical Layer	7
6 Data Link Layer	7
6.1 Frame Format	7
6.2 Protocol Data Unit (PDU)	7
6.3 Format of Protocol Data Unit (PDU)	8
6.4 Parameter Group Number (PGN)	8
6.5 Transport Protocol Function	8
6.6 Address Allocation	8
6.7 Message Type	8
7 Application Layer	8
8 Overall Charging Process	9
9 Message Classification	10
9.1 Charging Handshake Stage	10
9.2 Charging Parameter Configuration Stage	11
9.3 Charging Stage	11
9.4 End-of-charging Stage	12
9.5 Error Messages	13
10 Format and Content of Message	13
10.1 Messages during Handshake Stage	13
10.2 Messages during Parameter Configuration Stage	14
10.3 Messages during Charging Stage	17
10.4 Messages during End-of-charging Stage	25
10.5 Error Message	26
Appendix A (Informative) Charging Process	28
Appendix B (Informative) Charger and BMS Fault Diagnosis Messages	32

Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard was proposed by the National Energy Administration and the Ministry of Industry and Information Technology of the People's Republic of China.

This Standard shall be under the jurisdiction of Technical Committee on Electric Vehicle Charging Infrastructure of Standardization Administration of Energy Industry.

Chief drafting organizations of this Standard: China Southern Power Grid, Guangdong Electric Power Design Institute, China Electric Power Research Institute, State Grid Electric Power Research Institute, XJ Group Corporation, and Tianjin Qingyuan Electric Vehicle Co., Ltd..

Chief drafting staffs of this Standard: Li Tao, Huangfu Xuezhen, Wu Guangjian, Huang Zhiwei, Liao Yi, You Fusheng, Guo Jinchuan, Hu Yufeng, Wu Shangjie, Yan Hui, Zhao Mingyu, Zhou Rong, Meng Xiangfeng, Zhao Chunming, and Yu Wenbin.

Communication Protocols between Off-board Conductive Charger and Battery Management System for Electric Vehicle

1 Scope

This Standard specifies the definitions of physical layer, data link layer and application layer of the control-area-network (CAN)-based communication between off-board conductive charger (hereinafter referred to as "charger") and battery management system (hereinafter referred to as "BMS") for electric vehicle.

This Standard is applicable to the communication protocols between off-board charger and BMS (or other vehicle control units that have charging control function) of electric vehicles that adopt conductive charging mode.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the dated edition applies. For undated references, the latest edition of the referenced document (including all amendments) applies.

GB/T 19596 Terminology of Electric Vehicles

ISO 11898-1:2003 Road Vehicle - Control Area Network (CAN) - Part 1: Data Link Layer and Physical Signaling

SAE J1939-11:2006 Recommended Practice for Serial Control and Communication Vehicle Network - Part 11: Physical Layer - 250K bits/s, Twisted Shielded Pair

SAE J1939-21:2006 Recommended Practice for Serial Control and Communication Vehicle Network - Part 21: Data Link Layer

SAE J1939-73:2006 Recommended Practice for Serial Control and Communication Vehicle Network - Part 73: Application Layer - Diagnostics

3 Terms and Definitions

The terms and definitions established in GB/T 19596 as well as the following terms and definitions are applicable to this document.

3.1

Frame

A series of data bits that constitute a complete message.

3.2

CAN data frame

The orderly bit field that constitutes the CAN protocol for data transport, starting from the Start of Frame (SOF); and stopping at the End of Frame (EOF).

3.3

Messages

One or multiple "CAN data frame" that have the same parameter group number.

3.4

Identifier

The identification division of CAN arbitration field.

3.5

Standard frame

The CAN data frame that uses 11-bit identifier and that is defined in CAN-bus.

3.6

Extended frame

The CAN data frame that uses 29-bit identifier and that is defined in CAN-bus.

3.7

Priority

A 3-bit field in identifier. It sets the arbitration priority during transport process, with Grade 0 as the highest priority and Grade 7 as the lowest priority.

3.8

Parameter group; PG

The assembly of parameters sent in a message. The parameter group includes command, data, request, response and negative acknowledge, etc.

7.1 In this Standard, the application layer is defined in manner of parameters and parameter group.

7.2 Parameter group is numbered by adopting PGN, and each node identifies the content of data packet according to PGN.

7.3 "Request PGN" is used to initiatively obtain the parameter groups of other nodes.

7.4 Data are sent by adopting with periodical sending and event-driven modes.

7.5 In case that multiple PGN data need to be sent in order to realize one function, it requires receiving multiple PGN messages of this definition to judge the successful sending of this function.

7.6 When defining new parameter group, the parameters of one function, the parameters of the same or similar refresh frequency and the parameters belonging to one subsystem shall be put into one parameter group as much as possible; meanwhile, on one hand the new parameter group shall make best use of the data width of 8 bytes and the relevant parameters shall be put into one group as much as possible, and on the other hand the expansibility of the new parameter group shall be fully considered, one byte or bit shall be reserved for future modification.

7.7 When modifying the defined parameter group as given in Chapter 9, the definition of defined byte or bit shall not be modified; the newly-added parameters shall be relevant to the original parameters in parameter group and the irrelevant parameters shall not be added into the defined PGN for purpose of saving the number of PGNs.

7.8 During charging process, the definition of various fault diagnosis for charger and BMS shall comply with the requirements for CAN-bus diagnostic system as stated in 5.1 of SAE J1939-73:2006. The specification for definition of fault diagnosis messages is detailed in Appendix B.

7.9 The message sending options during charging stage are divided into mandatory and optional sending items, and the message of mandatory sending item shall be sent in strict accordance with the message format and content; if there is no need to send invalid message unit or optional sending item, the single-byte parameters shall be set to 0xFF, the double-byte parameters shall be set to 0xFFFF, and the four-byte parameters shall be set to 0xFFFFFFFF.

7.10 As for the multi-byte message unit, the invalid or reserved bytes shall be filled with 0xFF, and all the invalid or reserved bits shall be set as 1.

8 Overall Charging Process

5	2 bytes	2818	Total nominal energy of power storage battery	Mandatory
7	2 bytes	2819	Total maximum permissible charging voltage	Mandatory
9	1 byte	2820	Maximum permissible temperature	Mandatory
10	2 bytes	2821	Status-of-charge of power storage battery for complete vehicle	Mandatory
12	2 bytes	2822	Total voltage of power storage battery for complete vehicle	Mandatory

Hereinto,

- 1) SPN2816: maximum permissible charging voltage of single power storage battery

Data resolution: 0.01 V/bit, 0 V offset; data scope: 0 V ~ 24 V;

- 2) SPN2817: maximum permissible charging current

Data resolution: 0.1 A/bit, -400 A offset; data scope: -400 A ~ 0 A;

- 3) SPN2818: total nominal energy of power storage battery

Data resolution: 0.1 kW·h/bit, 0 kW·h offset; data scope: 0 ~ 1, 000 kW·h;

- 4) SPN2819: total maximum permissible charging voltage

Data resolution: 0.1 V/bit, 0 V offset; data scope: 0 V ~ 750 V;

- 5) SPN2820: maximum permissible temperature of power storage battery

Data resolution: 1°C/bit, -50°C offset; data scope: -50°C ~ +200°C;

- 6) SPN2821: status-of-charge (SOC) of power storage battery for complete vehicle

Data resolution: 0.1%/bit, 0% offset; data scope: 0 ~ 100%;

- 7) SPN2822: total voltage of power storage battery for complete vehicle

Data resolution: 0.1 V/bit, 0 V offset; data scope: 0 V ~ 750 V.

10.2.2 PGN1792 message for charger sending time synchronization information (CTS)

The purpose of message: time synchronization information sent by the charger to BMS during charging parameter configuration stage. See Table 11 for the PGN1792 message format.

Table 11 PGN1792 Message Format

Start byte or bit	Length	SPN	SPN definition	Sending item
1	7 bytes	2823	Year/month/day/hour/minute/second	Optional

Data resolution: 0.1 A/bit, -400 A offset; data scope: -400 A ~ 0 A.

10.3.2 PGN4352 overall battery charging status messages (BCS)

The purpose of message: allow the charger to monitor the charging status (such as charging voltage and charging current) of battery set in the charging process. See Table 16 for the PGN4352 message format.

Table 16 PGN4352 Message Format

Start byte or bit	Length	SPN	SPN definition	Sending item
1	2 bytes	3075	Measured value of charging voltage (V)	Mandatory
3	2 bytes	3076	Measured value of charging current (A)	Mandatory
5	2 bytes	3077	Maximum voltage of single power storage battery and its group number	Mandatory
7	1 byte	3078	Current status-of-charge SOC (%)	Mandatory
8	2 bytes	3079	Estimated remaining charging time (min)	Mandatory

Hereinto,

- 1) SPN3075: measured value of charging voltage

Data resolution: 0.1 V/bit, 0 V offset; data scope: 0 V ~ 750 V;

- 2) SPN3076: measured value of charging current

Data resolution: 0.1 A/bit, -400 A offset; data scope: -400 A ~ 0 A;

- 3) SPN3077: maximum voltage of single power storage battery and its group number

1~ 12 bits: the maximum voltage of single power storage battery, data resolution: 0.01 V/bit; 0 V offset; data scope: 0 V ~ 24V;

13~ 16 bits: group number in which the maximum voltage of single power storage battery is located, data resolution: 1/bit; 1 offset; data scope: 1~16;

- 4) SPN3078: current status-of-charge SOC

Data resolution: 1%/bit, 0% offset; data scope: 0 ~ 100%;

- 5) SPN3079: estimated remaining charging time which shall be sent as 600 min when the remaining time measured and calculated by BMS according to the actual current exceeds 600 min.

Data resolution: 1 min/bit, 0 min offset; data scope: 0 min ~ 600 min.

10.3.3 PGN4608 charger charging status messages (CCS)

<00>: = normal; <01>: = suspend due to reaching the condition set by charger; <10>: = untrusted status;

No. 3~4 bits: suspend artificially

<00>: = normal; <01>: = suspend artificially; <10>: = untrusted status;

No. 5~6 bits: suspend due to fault

<00>: = normal; <01>: = suspend due to fault; <10>: = untrusted status.

2) SPN3522: cause for charger suspending charging fault

No. 1~2 bits: excess temperature fault for charger

<00>: = temperature of charger is normal; <01>: = temperature of charger is excessive; <10>: = untrusted status;

No. 3~ 4 bits: charging connector fault

<00>: = charging connector is normal; <01>: = charging connector is fault; <10>: = untrusted status;

No. 5~6 bits: fault for the internal temperature of charger is excessive

<00>: = internal temperature of charger is normal; <01>: = internal temperature of charger is excessive; <10>: = untrusted status;

No. 7~8 bits: the required electric quantity cannot be sent

<00>: = electric quantity is sent normally; <01>: electric quantity cannot be sent; <10>: = untrusted status;

No. 9~10 bits: emergency stop fault for charger

<00>: = normal; <01>: = emergency stop of charger; <10>: = untrusted status;

No. 11~12 bits: other faults

<00>: = normal; <01>: = fault; <10>: = untrusted status.

3) SPN3523: cause for charger suspending charging error

No. 1 ~ 2 bits: current is mismatching

<00>: = current is matching; <01>: = current is mismatching; <10>: = untrusted status;

<9~31>:= reserved.

Occurrence (OC) defines the change frequency of a fault from previous active status to the active status, and the maximum value is 126; when the count spills upwardly, the counter value shall be reserved as 126. If the occurrence is unknown, all values at each bit in this field shall be set as 1.

If the conversion method (CM) of suspect parameter number is set to 0, it represents that all SPN bits adopt Intel format.

B.2 Classification of fault diagnosis messages

See Table B.2 for the classification of fault diagnosis messages.

Table B.2 Classification of Fault Diagnosis Messages

Message code	Message description	PGN	PGN (Hex)	Priority	Data length	Message period
DM1	Current fault code	8192	002000H	6	Indefinite	Event response
DM2	Historic fault code	8448	002100H	6	Indefinite	Event response
DM3	Diagnosis ready	8704	002200H	6	2 bytes	Event response
DM4	Clear/reset of current fault code	8960	002300H	6	0	Event response
DM5	Clear/reset of historic fault code	9216	002400H	6	0	Event response
DM6	Freeze frame parameter	9472	002500H	6	Indefinite	Event response

B.3 Format and content of fault diagnosis message

a) PGN8192 diagnostic message 1, current fault code message (DM1)

The purpose of message: send the current fault code in case of fault. Each fault code consists of 4 bytes. The excessive 8 bytes in data segment are transmitted by transport protocol function and the format is detailed in 6.5. See Table 8.3 for the PGN8192 message format.

Table B.3 PGN8192 Message Format

Start byte or bit	Length	Definition
1	1 byte	Low-order 8 significance bits of the first current fault code SPN
2	1 byte	The second byte of the first current fault code SPN
3.1	3 bits	High-order 3 bits of the first current fault code SPN
3.4	5 bits	Fault mode identification; see B.1 for the details

The purpose of message: when a certain control module receives the request command from this parameter group, all diagnostic messages regarding the historic fault code shall be cleared off, and the diagnostic data related to the current fault code will not be affected. If there is no historic fault code, positive response must be sent. If the control module fails to implement the request command of this parameter group for some reasons, negative response must be sent. All messages regarding the historic fault code include: the quantity of historic fault codes, the diagnosis ready status message and the historic fault code.

f) PGN9472 diagnostic message 6, freeze frame parameter message (DM6)

The purpose of message: this parameter includes a series of parameters which have been recorded when the diagnostic trouble code is received. Each fault code consists of 4 bytes. The excessive 8 bytes in data segment are transmitted by transport protocol function and the format is detailed in 6.5. See Table 8.6 for the PGN9472 message format.

Table B.6 PGN9472 Message Format

Start byte or bit	Length	Definition
1	1 byte	Freeze frame length of the first fault diagnosis code
2	1 byte	Low-order 8 significance bits of the first fault diagnosis code SPN
3	1 byte	The second byte of the first fault diagnosis code SPN
4.1	3 bits	High-order 3 bits of the first fault diagnosis code SPN
4.4	5 bits	Fault mode identification; see B.1 for the details
5.1	7 bits	Occurrence
5.8	1 bit	Conversion method of suspect parameter number, set to 0
...		

_____ **END** _____

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----