20171024092801453

20171025111230992

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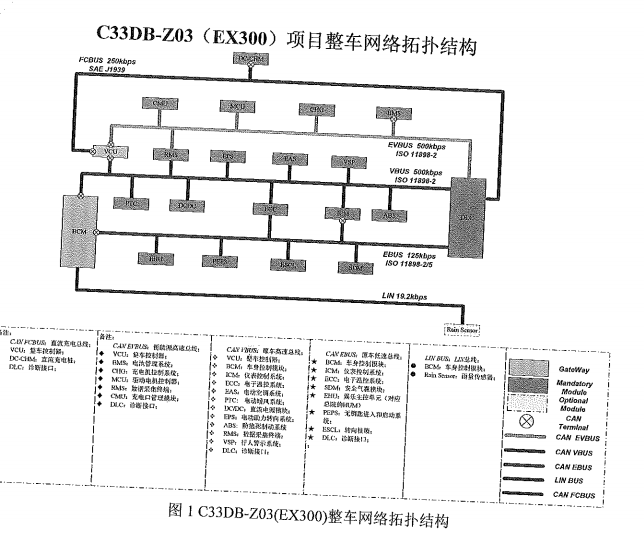
# 术语

|  |  |
| --- | --- |
| DTC | 故障诊断码 |
| BS | Block size |
| STmin | Minimum Separation Time |
| C | 有条件的 |
| M | 强制性执行 |
| U | 用户选用 |
| TBD | 待定义 |
| SID | 服务标识符 |
| DID | 数据标识符 |
| NRC | 负响应码 |
| UDS | 统一的诊断服务 |
| Server | 服务器 |
| Client | 客户端 |
| ECU | 电控单元 |

# 参考文献

|  |  |  |
| --- | --- | --- |
| NO. | 参考文档 | 题目 |
| [1] | ISO11898-1: 2003 | Road vehicles - Controller area network (CAN)  Part 1:Data link layer and physical signaling |
| [2] | ISO11898-2: 2003 | Road vehicles - Controller area network (CAN)  Part 2: High-speed medium access unit |
| [3] | ISO11898-5: 2007 | Road vehicles - Controller area network (CAN)  Part 5: High-speed medium access unit with low-power mode |
| [4] | ISO15765-2: 2004 | Road Vehicle - Diagnostic on CAN  Part 2: Networking Layer Services |
| [5] | ISO15765-3: 2004 | Road Vehicle - Diagnostic on CAN  Part 3: Application Layer Services |
| [6] | ISO14229-1: 2006 | Road Vehicle - Diagnostic Systems Diagnostic Services Specification |
| [7] | ISO15031-6: 2005 | Road vehicles - Communication between vehicle and external equipment for emission-related diagnostic  Part 6: Diagnostic trouble code definitions |

# 网络拓扑



1. C33DB-Z03整车网络拓扑结构

# 诊断接口

# 微信截图_20170807102406微信截图_20170807102426

# 需求

## 诊断协议

### 物理层

物理层应满足ISO11898-2要求及北京新能源汽车股份有限公司企业标准《新能源汽车高速 CAN 网络节点级电子控制单元（ ECU）技术要求》(Q/BMEV 02.124-2014)要求。

### 数据链路层

数据链路层应满足ISO11898-1要求。

所有诊断请求和应答帧的数据长度应为8字节，否则电控单元将忽略该诊断帧。当诊断请求长度不足8字节时，空余的字节应用0xAA填充。

### 网络层

网络层应满足ISO15765-2要求和下述要求：

#### 寻址方式

可以支持物理寻址和功能寻址。

诊断消息ID描述见下表：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 控制器名称 | 简称 | 物理寻址诊断请求ID(Hex) | 诊断响应ID(Hex) | 功能寻址诊断请求ID(Hex) | 实施网段 |
| 驱动电机控制器 | MCU | 0x7E0 | 0x7E8 | 0x7DF | *EVBUS* |

1. 诊断 ID列表

#### 网络层时间参数

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Unit |
| BS | 8 | - |
| STmin | 20 | ms |

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Timeout | Performance Requirement | Unit |
| N\_As/N\_Ar | 70 | n/a | ms |
| N\_Br | n/a | <70 | ms |
| N\_Bs | 150 | n/a | ms |
| N\_Cs | n/a | <70 | ms |
| N\_Cr | 150 | n/a | ms |

1. 网络层时间参数需求

### 应用层时间参数

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Min | Max | Timeout | Unit |
| P2server | 0 | 50 | n/a | ms |
| P2client | n/a | n/a | 150 | ms |
| P2\*server | 0 | 2000 | n/a | ms |
| P2\* client | n/a | n/a | 5000 | ms |
| P3client\_phys2 | P2server | n/a | n/a | ms |
| P3client\_func | P2server\_max | n/a | n/a | ms |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Min | Nominal | Timeout | Unit |
| S3server | n/a | n/a | 5000 | ms |
| S3client | 0 | 2000 | 4000 | ms |

1. 应用层时间参数需求

## Diagnostic Services（ISO14229-1）

Services shall be implemented according to ISO14229-1. Additional details are specified in this section.

### Supported Diagnostic Services

The overview of ECU supported diagnostic services is described in the following table.

Table 5 Supported diagnostic services of ECU

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Diagnostic Services List | | Session | | | Security  Access | Addressing | |
| SID (Hex) | Service Name | Default | Extended | Programming | Physical Address | Function Address |
| 10 | DiagnosticSession  Control | √ | √ | √ |  | √ | √ |
| 11 | EcuReset | √ | √ | √ |  | √ | √ |
| 27 | SecurityAccess |  | √ | √ |  | √ |  |
| 28 | CommunicationControl |  | √ |  |  | √ | √ |
| 3E | TesterPresent | √ | √ | √ |  | √ | √ |
| 85 | ControlDTCSetting |  | √ |  |  | √ | √ |
| 22 | ReadDataByIdentifier | √ | √ | √ |  | √ |  |
| 2E | WriteDataByIdentifier |  | √ | √ | √1  √3 | √ |  |
| 2F | InputOutputControlByIdentifier |  | √ |  | √1 | √ |  |
| 14 | ClearDiagnosticInformation | √ | √ |  |  | √ |  |
| 19 | ReadDTCInformation | √ | √ |  |  | √ |  |
| 31 | RoutineControl |  | √ | √ | √1  √3 | √ |  |
| 34 | RequestDownLoad |  |  | √ | √3 | √ |  |
| 36 | TransferData |  |  | √ | √3 | √ |  |
| 37 | RequestTransferExit |  |  | √ | √3 | √ |  |

说明：访问权限√1表示需要扩展安全级权限，√3表示需要编程安全级权限。

The services need to support suppressPositveResponseBit (SPRS) are showed in following table.

1. Services supported SPRS bit

| Diagnostic Services List | | Support  SPRS bit |
| --- | --- | --- |
| SID  (Hex) | Service Name |
| 10 | DiagnosticSessionControl | √ |
| 11 | EcuReset | √ |
| 27 | SecurityAccess |  |
| 28 | CommunicationControl | √ |
| 3E | TesterPresent | √ |
| 85 | ControlDTCSetting | √ |
| 22 | ReadDataByIdentifier |  |
| 2E | WriteDataByIdentifier |  |
| 14 | ClearDiagnosticInformation |  |
| 19 | ReadDTCInformation |  |
| 2F | InputOutputContorlByIdentifier |  |
| 31 | RoutineControl |  |
| 34 | RequestDownload |  |
| 36 | TransferData |  |
| 37 | RequestTransferExit |  |

The negativeResponseCodes (NRC) used by ECU are defined as follows:

1. Negative Response Codes

| NRC(Hex) | Description |
| --- | --- |
| 11H | serviceNotSupported |
| 12H | subFunctionNotSupported |
| 13H | incorrectMessageLengthOrInvalidFormat |
| 22H | conditionsNotCorrect |
| 24H | requestSequenceError |
| 36H | exceededNumberOfAttempts |
| 31H | requestOutOfRange |
| 33H | securityAccessDenied |
| 37H | requiredTimeDelayNotExpired |
| 35H | InvalidKey |
| 72H | generalProgrammingFailure |
| 78H | responsePending |
| 7FH | serviceNotSupportedInActiveSession |
| 92H/93H | VoltageTooHigh / voltageTooLow |
| 7EH | subFunctionNotSupportedInActiveSession |

If two or more NRCs are reasonable, the ECU could send the negative response message according to the following priority rules：

1. The 7Fh NRC have the highest priority;
2. For others, the NRC with smaller number has higher priority.

### DiagnosticSessionControl（10H）

This service is used by the client to enable different diagnostic sessions in the server(s). A diagnostic session enables a specific set of diagnostic services in the server(s).

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 10 |
| #2 | Sub-function = [  DefaultSession  ProgrammingSession  ExtendedDiagnosticSession ] | M | 01  02  03 |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 50 |
| #2 | Sub-Function=[  DefaultSession  ProgrammingSession  ExtendedDiagnosticSession ] | M | 01  02  03 |
|  | P2server[ ] =[ |  |  |
| #3 | byte#1 | M | 00-FF |
| #4 | byte#2] | M | 00-FF |
|  | P2\*server[ ] =[ |  |  |
| #5 | byte#1 | M | 00-FF |
| #6 | byte#2] | M | 00-FF |

Timing P2server value is provided in 1ms resolution.

Timing P2\*server value is provided in 10ms resolution.

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 10 |
| #3 | NegativeResponseCode | M | NRC |

Sub-function Parameter Definition

|  |  |  |
| --- | --- | --- |
| HEX | Description | Cvt |
| 01 | DefaultSession  This diagnostic session enables the default diagnostic session in the server(s) and does not support any diagnostic application timeout handling provisions. (e.g. no TesterPresent service is necessary to keep the session active). | M |
| 02 | ProgrammingSession  This diagnostic session enables all diagnostic services required to supported the memory programming of a server. | M |
| 03 | ExtendedDiagnosticSession  This diagnostic session can e.g. be used to enable all diagnostic services required to support the adjustment of functions like “Idle Speed, CO Value, etc.” in the server’s memory. It can also be used to enable diagnostic services, which are not specifically tied to the adjustment of functions. | M |

Negative Response Codes (NRC)

|  |  |  |
| --- | --- | --- |
| NRC(Hex) | Description | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | The sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |
| 22 | The ECU current conditions do not allow the change of diagnostic Session. | M |

#### Implementation Rules

This service is used by the diagnostic tool to enable different types of diagnostic sessions in a server. In order to execute a diagnostic service the appropriate session has to be started first. There shall be only one diagnostic session active at a time.

Normal/Default Session (01h) shall be enabled automatically by the ECU if no diagnostic session has been requested at power up.

The ECU shall return to Normal/Default Session (01h) after timeout of Extended Diagnostic Session.

The ECU shall be capable of providing all diagnostic functionality defined for the default diagnostic session under normal operating conditions.

The ECU shall first send a DiagnosticSessionControl Positive Response (50h xx) message before the new session becomes active in the ECU.

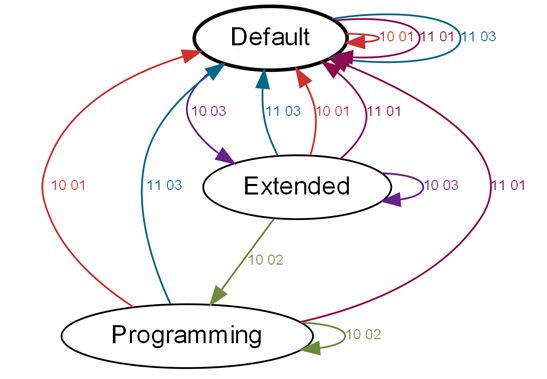
A DiagnosticSessionControl Positive Response (50h xx) message shall be returned by an ECU if the diagnostic tool requests a session that is already running. If the ECU has already received the same request message previously and performed the requested operation, the ECU shall continue to perform the current operation (i.e. it is not a change of the session).

The ECU shall remain in its current diagnostic session if it is not able to switch into the requested diagnostic session.

The TesterPresent (3Eh) service shall be used to keep the non-default diagnostic sessions active by retriggering S3server. Also any other service request shall retrigger S3server.

A functional TesterPresent (3Eh) request without response may be sent at any time, even regardless of any other service in progress.

When receiving or transmitting any diagnostic messages, including 3Eh service, the S3server timer will reset.



1. Session transition diagram

### ECUReset (11H)

This service requests the server to effectively perform an ECU reset based on the content of the ResetType parameter value (suppressPosRspMsgIndicationBit (bit 7) not shown).

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 11 |
| #2 | Sub-Function= [  ResetType: HardReset  SoftReset ] | M | 01  03 |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 51 |
| #2 | Sub-Function=[  ResetType: HardReset  SoftReset ] | M | 01  03 |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 11 |
| #3 | NegativeResponseCode | M | NRC |

Sub-function Parameter Definition

|  |  |  |
| --- | --- | --- |
| Option (Hex) | Description | Cvt |
| 01 | HardReset  This value identifies a “hard reset” condition which simulates the power-on / start-up sequence typically performed after a server has been previously disconnected from its power supply (i.e. battery). | U |
| 03 | SoftReset  This value identifies a “soft reset” condition, which causes the server to immediately restart the application program if applicable. The performed action is implementation specific and not defined by the standard. A typical action is to restart the application without reinitializing of previously learned configuration data, adaptive factors and other long-term adjustments. | U |

Negative Response Codes (NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 22 | The criteria for the ECUReset request are not met. | M |

#### Implementation Rules

The positive response shall be sent before performing the ECU reset.

The execution of reset will take <TBD> ms, which means the ECU can’t respond to any new request sent within this time.

### CommunicationControl（28H）

The service is used to “switch on/off” the transmission and/or the reception of certain messages of (a) server(s).

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 28 |
| #2 | Sub-Function = [  EnableRxAndTx  EnableRxAndDisableTx  DisableRxAndEnableTx  DisableRxAndTx ] | M | 00  01  02  03 |
| #3 | CommunicationType= [  NormalCommunicationMessages NetworkManagementCommunicationMessages NetworkManagementCommunicationMessages AndNormalCommunicationMessages ] | M | 01  02  03 |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 68 |
| #2 | Sub-Function = [  EnableRxAndTx  EnableRxAndDisableTx  DisableRxAndEnableTx  DisableRxAndTx ] | M | 00  01  02  03 |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 28 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 22 | The operating conditions of the server are not met to perform the required action. | M |
| 31 | None of the requested CommunicationType values are supported by the device. | M |

Sub-function Parameter Definition：

|  |  |  |
| --- | --- | --- |
| Option(hex) | Description | Cvt |
| 00 | EnableRxAndTx  This value indicates that the reception and transmission of messages shall be enabled for the specified CommunicationType. | M |
| 01 | EnableRxAndDisableTx  This value indicates that the reception of messages shall be enabled and the transmis-sion shall be disabled for the specified communicationType. | U |
| 02 | DisableRxAndEnableTx  This value indicates that the reception of messages shall be disabled and the trans-mission shall be enabled for the specified communicationType. | U |
| 03 | DisableRxAndTx  This value indicates that the reception and transmission of messages shall be disabled for the specified CommunicationType. | M |

Data Parameter Definition：

|  |  |  |
| --- | --- | --- |
| Option(hex) | Description | Cvt |
| 01 | NormalCommunicationMessages  This value references all application-related communication (inter-application signal exchange between multiple in-vehicle servers). | M |
| 02 | NetworkManagementCommunicationMessages  This value references all network management related communication. | U |
| 03 | NetworkManagementCommunicationMessagesAndNormalCommunicationMessages  This value references all network management and application-related communication | U |

#### Implementation Rules

There are no special general implementation rules for this service.

### SecurityAccess（27H）

The purpose of this service is to provide a means to access data and/or diagnostic services, which have restricted access for security or safety reasons. Diagnostic services for downloading/uploading routines or data into a server and reading specific memory locations from a server are situations where security access may be required. Improper routines or data downloaded into a server could potentially damage the electronics or other vehicle components or risk the vehicle’s compliance to safety, or security standards. The security concept uses a seed and key relationship.

The client shall request the server to unlock by sending the service SecurityAccess-RequestSeed message. The server shall respond by sending a seed. The seed is the input parameter for the key calculation algorithm. It is used by the client to calculate the corresponding key value.

In a second step, the client shall request the key comparison by sending the calculated key to the server using the appropriate service SecurityAccess-SendKey. The server shall compare this key to one internally stored/calculated. If the two numbers match, then the server shall enable (unlock) the client’s access to specific services/data and indicate that with the service SecurityAccess-SendKey. If the two numbers do not match, this shall be considered as a false access attempt. If access is rejected for any other reason, it shall not be considered as a false access attempt. An invalid key requires the client to start over from the beginning with a SecurityAccess-RequestSeed message.

If a server supports security, but is already unlocked when a SecurityAccess-RequestSeed message is received, that server shall respond with a SecurityAccess-RequestSeed positive response message service with a seed value equal to zero (0). The client shall use this method to determine if a server is locked by checking for a non-zero seed.

The Seed-Key algorithm for SecurityAccess：

Key = ((((seed>>4) XOR seed)<<3) XOR seed)。



1. Security Access procedure

#### Message Format

##### Request Seed

This service requests a seed from the server. Based on this seed, the client is able to calculate the corresponding key to be sent for unlocking the server.

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 27 |
| #2 | SecurityAccessType = RequestSeed | M | 01，03，11 |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 67 |
| #2 | SecurityAccessType = RequestSeed | M | 01，03，11 |
|  | SecuritySeed [ ] = [ | M |  |
| #3 | seed#1 (high byte) | M | 00-FF |
|  | … | … | … |
| #n | seed#m (low byte) ] | M | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 27 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |
| 22 | The criteria for the SecurityAccess request are not met. | M |
| 37 | requiredTimeDelayNotExpired | M |

##### Send Key

This service sends a key calculated by the client to the server. The server shall compare this key to one internally stored/calculated. If the two numbers match, then the server shall enable (“unlock”) the client’s access to specific services/data.

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 27 |
| #2 | SecurityAccessType = SendKey | M | 02，04，12 |
|  | SecurityKey [ ] = [ | M |  |
| #3 | key#1 (high byte) | M | 00-FF |
|  | … | … | … |
| #n | key#m (low byte) ] | U | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 67 |
| #2 | SecurityAccessType = SendKey | M | 02，04，12 |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 27 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |
| 22 | The criteria for the SecurityAccess request are not met. | M |
| 24 | requestSequenceError  The “sendKey” sub-function is received without first receiving a “requestSeed” request message. | M |
| 35 | invalidKey | M |
| 36 | exceededNumberOfAttempts  Send if the delay timer is active due to exceeding the maximum number of allowed false access attempts. | M |

Sub-function Parameter Definition

|  |  |  |
| --- | --- | --- |
| HEX | Description | Cvt |
| 01 | requestSeed（level 1） | M |
| 02 | sendKey（level 1） | M |
| 03 | requestSeed（level 2） | U |
| 04 | sendKey（level 2） | U |
| 11 | requestSeed（level 3 flash） | M |
| 12 | sendKey（level 3 flash） | M |

#### Implementation Rules

After PowerOn/Reset the ECU is in locked state. The security access failure counter is set to 0.

The ECU shall wait 10 s before accepting the first RequestSeed message after EcuReset/PowerOn.

After the third failure attempt the ECU shall wait 10s before accepting the next “Request Seed” message. A flag is stored in the EEPROM of the ECU. On every PowerOn/Reset, the ECU checks for this flag, then waits again 10s before accepting the next “Request Seed” message (It is allowed to implement the Security Access requirement without based on the Flag )

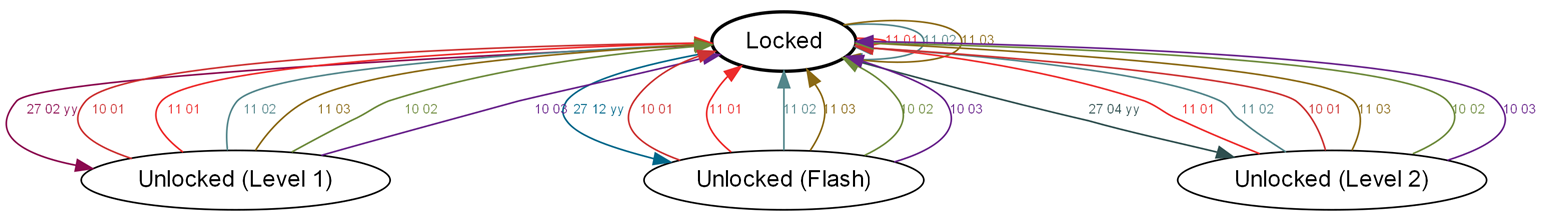
Any SecurityAccess request during this time will be rejected with the negative response code “Required time delay not expired” (37h).

If the tester requests a seed, it has to send the corresponding key to the ECU. This sequence is mandatory. If the tester sends a consecutive “Request Seed”, the request is accepted and the same seed is returned, but the security access failure counter is incremented.

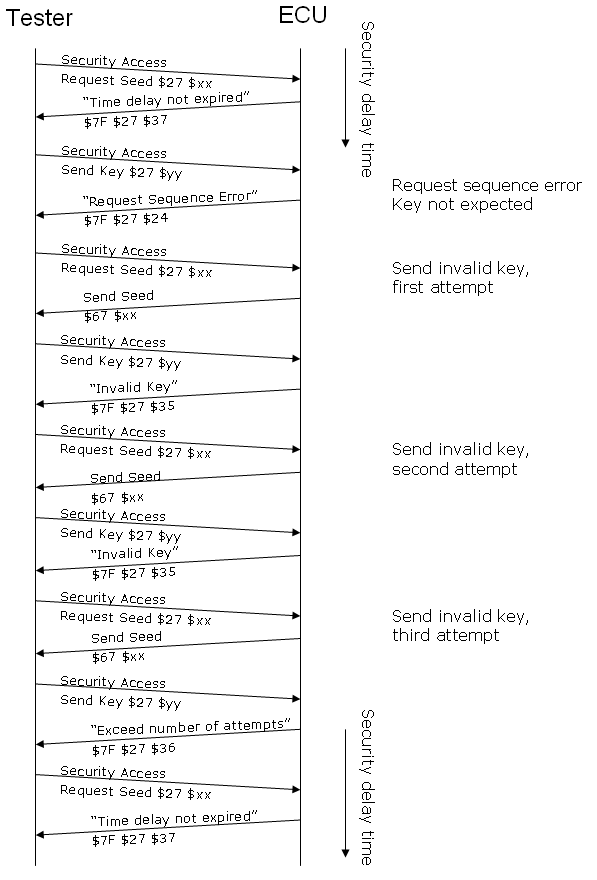
If the tester sends an invalid key, the request is rejected with negative response code “InvalidKey”, the sequence shall be reset (any current seed becomes invalid) and the security access failure counter is incremented.

When the security counter reaches the value of 3 (i.e. 3 failed tries), the ECU shall wait 10s before accepting another “Request Seed” message. Any such request during this time will be rejected with the negative response code “Required time delay not expired” (37h). When the 10s wait time is elapsed the security access failure counter is decremented by one and another try is allowed. When during this try the security access failure counter is incremented again (due to an invalid key), the ECU shall wait again 10s before accepting another “Request Seed” message. When this try is valid, the security access failure counter is not changed.

BJEV uses four states (three different levels): Locked, Unlocked (Level 1), Unlock (Level 2) and Unlocked (Flash). The ECU could support some of them according to the requirement.



1. SecurityAccess



1. SecurityAccess NRC requirements

### TesterPresent（3EH）

This service shall be used to indicate to a server that the client is present. This service is required in the absence of other UDS services to prevent servers from automatically returning to normal operation and stop communication.

#### Message Format

Request:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 3E |
| #2 | zeroSubFunction | M | 00 |

Positive Response:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 7E |
| #2 | zeroSubFunction | M | 00 |

Negative Response:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 3E |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |

Sub-function Parameter Definition

|  |  |  |
| --- | --- | --- |
| HEX | Description | Cvt |
| 00 | ZeroSubFunction  This parameter value is used to indicate that no sub-function value beside the suppressPosRspMsgIndicationBit is supported by this service. | M |

#### Implementation Rules

There are no special general implementation rules for this service.

### ControlDTCSetting(85H)

This service is used to enable and disable the setting of Diagnostic Trouble Codes, DTCs, in the ECU(s).

The ControlDTCSetting request message can be used to stop the setting of diagnostic trouble codes in an individual server or a group of servers. If the server being addressed is not able to stop the setting of diagnostic trouble codes, it shall respond with a ControlDTCSetting negative response message indicating the reason for the reject.

#### Message Format

Request:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 85 |
| #2 | DTCSettingType = [  On  Off ] | M | 01  02 |

Positive Response:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | C5 |
| #2 | DTCSettingType [  On  Off ] | M | 01  02 |

Negative Response:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 85 |
| #3 | NegativeResponseCode | M | NRC |

Sub-function Parameter Definition

|  |  |  |
| --- | --- | --- |
| HEX | Description | Cvt |
| 01 | On  The server(s) shall resume the setting of diagnostic trouble codes according to normal operating conditions | M |
| 02 | Off  The server(s) shall stop the setting of diagnostic trouble codes. | M |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 22 | The operating conditions of the server are not met to perform the required action. | U |

#### Implementation Rules

The setting of DTCs in the ECU shall be switched off directly after the request ControlDTCSetting with setting mode 2 (switch off) is received (Option: Suppress positive response message indication bit is set) or after successful transmission of the positive response (Option: Suppress positive response message indication bit is not set).

The setting of DTCs in the ECU shall be switched on again, when one of the following events occurs:

The request ControlDTCSetting with setting mode 1 (switch on) is received (Option: Suppress positive response message indication bit is set) or after successful transmission of the positive response (Option: Suppress positive response message indication bit is not set).

The ECU power supply voltage is down (reset or ECU power down event).

The diagnostic session changes from Extended Diagnostic Session to Default Session.

The services ReadDTCInformation - ReportDTCByStatusMask, ReadDTCInformation - ReportSupportedDTC and ClearDiagnosticInformation shall not be affected by this service.

### ReadDataByIdentifier（22H）

The request message requests data record values from the server by one or more dataIdentifier(s).

When receiving a ReadDataByIdentifier request, the server will access the data elements of the records specified by the dataIdentifier parameter(s) and transmit their value in ReadDataByIdentifier positive response containing the associated dataRecord parameter(s).

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 22 |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |
| … | … | .. | … |
|  | DataIdentifier[ ] #m = [ |  |  |
| #n-1 | byte#1 (MSB) | U | 00-FF |
| #n | byte#2 ] | U | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 62 |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |
|  | DataRecord[ ] #1 = [ |  |  |
| #4 | data#1 | M | 00-FF |
| … | … | … | … |
| #(k-1)+4 | data#k] | U | 00-FF |
| … | … | .. | … |
|  | DataIdentifier[ ] #m = [ |  |  |
| #n-(o-1)-2 | byte#1 (MSB) | U | 00-FF |
| #n-(o-1)-1 | byte#2 ] | U | 00-FF |
|  | DataRecord[ ] #m = [ |  |  |
| #n-(o-1) | data#1 | U | 00-FF |
|  | … | … | … |
| #n | data#o] | U | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 22 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |
| 22 | The operating conditions of the server are not met to perform the required action. | U |
| 31 | None of the requested dataIdentifier values are supported by the device. | M |

Data Parameter Definition:

For dataIdentifier supported by the ECU, please refer to appendix B.

#### Implementation Rules

The maximum number of dataIdentifiers to be read within a single request is limited to **1**.

### WriteDataByIdentifier (2EH)

The WriteDataByIdentifier service is used by the client to write a dataRecord to a server. The data is identified by a dataIdentifier.

#### Message Format

Request:

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 2E |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |
|  | DataRecord [ ] = [ |  |  |
| #4 | data#1 | U | 00-FF |
| … | … | … | … |
| #m+3 | data#m] | U | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 6E |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 2E |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. |  |
| 13 | The length of the message is wrong. | M |
| 22 | 1. The operating conditions of the ECU are such that it can’t perform the required action (e.g., the data for a DataIdentifier is stored in EEPROM and an EEPROM failure has occurred).  2. The ECU internal conditions do not allow the writing of any DataIdentifier/ IdentificationOption.  1) The system is currently in initialization.  2) The system is currently in InputOutputControlByIdentifier service active stage.  3) The system is currently busy at modifying memory.  4) The vehicle is moving. | U |
| 31 | 1. The dataIdentifier in the request message is not supported in the server or the dataIdentifier is supported for read only purpose (via ReadDataByIdentifier service).  2. Any data transmitted in the request message after the dataIdentifier is invalid (if applicable to the node). | M |
| 33 | The dataIdentifier, which reference a specific address, is secured and the server is not in an unlocked state. | M |
| 72 | The server detects an error when writing to a memory location. | M |

Data Parameter Definition:

For dataIdentifier supported by the ECU, please refer to appendix B.

#### Implementation Rules

It is the system supplier’s responsibility that the server conditions are met when performing any action request by this service, including but not limited to the following:

1) The high and low voltage current fault does not exist in the system.

*Please specify other rules in your module.*

### InputOutputControlByIdentifier (2FH)

This service is used by the tester to substitute a value for an input signal, internal ECU function and/or control an output of an electronic system referenced by an inputOutputDataIdentifier .

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 2F |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |
|  | ControlOptionRecord#1[ ] = [ |  |  |
| #4 | ControlState#1/InputOutputControlParameter | M/U | 00-FF |
| … | … | … | … |
| #4+(m-1) | ControlState #m] | C | 00-FF |
|  | ControlEnableMaskRecord#1[ ] = [ |  |  |
| #4+m | ControlMask #1 | C | 00-FF |
| … | … | … | … |
| #4+m+(r-1) | ControlMask #r] | C | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 6F |
|  | DataIdentifier[ ] #1 = [ |  |  |
| #2 | byte#1 (MSB) | M | 00-FF |
| #3 | byte#2 ] | M | 00-FF |
|  | ControlStatusRecord#1[ ] = [ |  |  |
| #4 | ControlState#1/InputOutputControlParameter | C | 00-FF |
| … | … | … | … |
| #4+(m-1) | ControlState #m] | C | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 2F |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 13 | The length of the message is wrong. | M |
| 22 | ConditionsNotCorrect | M |
| 24 | The “returnControlToECU” sub-function is received without first receiving a “ShortTermAdjustment” request message. | M |
| 31 | 1. The server does not support the requested dataIdentifier.  2. The user optional inputOutputControlParameter contains invalid data.  3. One or multiple of the controlState are invalid. | M |
| 33 | The corresponding security is not yet granted to perform the required service. | M |

Data Parameter Definition

|  |  |
| --- | --- |
| Option (Hex) | Description |
| 00 | returnControlToECU  This parameter specifies that the ECU shall take control of the value of dataIdentifier. |
| 01 | ResetToDefault  The value shall indicate to the server that it is requested to reset the input signal, in-ternal parameter or output signal referenced by the inputOutputLocalIdentifier to its default state.  Number of controlState bytes in request: 0  Number of controlState bytes in pos. response: depends on the dataIdentifier |
| 02 | FreezeCurrentState  This value shall indicate to the server that it is requested to freeze the current state of the input signal, internal parameter or output signal referenced by the inputOutputLo-calIdentifier.  Number of controlState bytes in request: 0  Number of controlState bytes in pos. response: depends on the dataIdentifier |
| 03 | ShortTermAdjustment  This parameter specifies that the ECU shall set the value of dataIdentifier to request value of the controlStateParamter. If the diagnostic communication with the tester is broken, the control shall be given back to the ECU. |

#### Implementation Rule

It is the system supplier’s responsibility that the server conditions are met when performing any action request by this service, including but not limited to the following:

1) The high and low voltage current fault does not exist in the system.

2) The controlled system, including the actuator, has no fault.

***Please specify other rules in your module.***

### ClearDiagnosticInformation (14H)

This service is used by the client to clear diagnostic information in the server’s memory.

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 14 |
|  | GroupOfDTC [ ]=[ |  |  |
| #2 | groupOfDTCHighByte | M | 00-FF |
| #3 | groupOfDTCMiddleByte | M | 00-FF |
| #4 | groupOfDTCLowByte] | M | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 54 |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 14 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC)

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 22 | The ECU internal conditions do not allow deletion of the diagnostic information stored in the node. These are:  1) The vehicle is moving.  2) The system is currently in initialization or shutdown process.  3) The system is currently in I/O Control.  4) The system is in the process of changing some Memory content. | M |
| 31 | Wrong groupOfDTC values in request. | M |

Data Parameter Definition：

|  |  |
| --- | --- |
| Option (Hex) | Description |
| FFFFFF | All Groups (all DTC’s) |
| xxxxxx | A particular DTC |

#### Implementation Rule

The implementation of clearing diagnostic information will take the time of <TBD> seconds.

The DTCs stored in RAM and non-volatile memory shall be cleared before the positive response is sent.

With the parameter groupOfDTC it is also possible to clear only a specific group of DTCs or a specific DTC.

A subsequent call to read out the fault memory shall not retrieve any DTC which has been set before the last execution of ClearDiagnosticInformation.

Even if no DTC was stored, the ECU shall return with a positive response.

There shall be no sequence dependency to any other service. Even if the fault memory was not read, it may be cleared.

A DTC can just be cleared by tester with service 14h.

### ReadDTCInformation (19H)

This service allows a client to read the status of server-resident Diagnostic Trouble Code (DTC) information from any server, or group of servers within a vehicle.

#### Message Format

##### ReadDTCInformation-ReportNumberOfDTCByStatusMask(0x19 0x01)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | ReportNumberOfDTCByStatusMask |  | 01 |
| #3 | DTCStatusMask | M | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | ReportNumberOfDTCByStatusMask |  | 01 |
| #3 | DTCStatusAvailabilityMask | M | 01-FF |
|  | DTCFormatIdentifier = |  |  |
| #4 | ISO15031-6DTCFormat | M | 00 |
|  | DTCCount[]=[ |  |  |
| #5 | DTCCountHighByte | M | 00-FF |
| #6 | DTCCountLowByte] | M | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

##### ReadDTCInformation- ReportDTCByStatusMask (0x19 0x02)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCByStatusMask |  | 02 |
| #3 | DTCStatusMask | M | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCByStatusMask |  | 02 |
| #3 | DTCStatusAvailabilityMask | M | 01-FF |
|  | DTCAndStatusRecord[] ＝[ | C |  |
| #4 | DTCHighByte#1 | 00-FF |
| … | DTCMiddleByte#1 | 00-FF |
| DTCLowByte#1 | 00-FF |
| statusOfDTC#1 | 00-FF |
| DTCHighByte#2 | 00-FF |
| DTCMiddleByte #2 | 00-FF |
| DTCLowByte#2 | 00-FF |
| statusOfDTC#2 | 00-FF |
| …… | 00-FF |
| DTCHighByte#m | 00-FF |
| DTCMiddleByte#m | 00-FF |
| DTCLowByte#m | 00-FF |
| #N | statusOfDTC#m ] | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

##### ReadDTCInformation- reportDTCSnapshotIdentification (0x19 0x03)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | reportDTCSnapshotIdentification |  | 03 |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | reportDTCSnapshotIdentification |  | 03 |
|  | DTCRecord[] ＝[ | C |  |
| #3 | DTCHighByte#1 | 00-FF |
| #4 | DTCMiddleByte#1 | 00-FF |
| #5 | DTCLowByte#1] | 00-FF |
| #6 | DTCSnapshotRecordNumber #1 | 00-FF |
|  | … |  |  |
|  | DTCRecord[] #m＝[ | C |  |
| #n-3 | DTCHighByte#m | 00-FF |
| #n-2 | DTCMiddleByte#m | 00-FF |
| #n-1 | DTCLowByte#m] | 00-FF |
| #n | DTCSnapshotRecordNumber #m | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

##### ReadDTCInformation-reportDTCSnapshotRecordByDTCNumber (0x19 0x04)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCSnapshotRecordByDTCNumber |  | 04 |
|  | DTCMaskRecord [ ]=[ |  |  |
| #3 | DTCHighByte | M | 00-FF |
| #4 | DTCMiddleByte | M | 00-FF |
| #5 | DTCLowByte] | M | 00-FF |
| #6 | DTCSnapshotRecordNumber | M | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCSnapshotRecordByDTCNumber |  | 04 |
|  | DTCAndStatusRecord[] ＝[ | C |  |
| #3 | DTCHighByte | 00-FF |
| #4 | DTCMiddleByte | 00-FF |
| #5 | DTCLowByte | 00-FF |
| #6 | statusOfDTC] | 00-FF |
| #7 | DTCSnapshotRecordNumber#1 | 00-FE |
| #8 | DTCSnapshotRecordNumberOfIdentifiers #1 | 00-FF |
|  | DTCSnapshotRecord[] #1 = [ |  |
| #9 | dataIdentifier#1 byte (MSB) | 00-FF |
| #10 | dataIdentifier#1 byte (LSB) | 00-FF |
| #11 | snapshotData#1 byte #1 | 00-FF |
| … | … | … |
| #11+(p-1) | snapshotData#1 byte #p | 00-FF |
| … | … | … |
| #11+(p-1)  +(p+2)\*(w-2)+1 | dataIdentifier#w byte (MSB) | 00-FF |
| #11+(p-1)  +(p+2)\*(w-2)+2 | dataIdentifier#w byte (LSB) | 00-FF |
| #11+(p-1)  +(p+2)\*(w-2)+3 | snapshotData#w byte #1 | 00-FF |
|  | … | … |
| #11+(p-1)  +(p+2)\*(w-2)  +3+(p-1) | snapshotData#wbyte #p] | … |
| .. | … |  |
| #t | DTCSnapshotRecordNumber#x | 00-FE |
| #t+1 | DTCSnapshotRecordNumberOfIdentifiers#x | 00-FF |
|  | DTCSnapshotRecord[]#x= [ |  |
| # t+2 | dataIdentifier#1 byte (MSB) | 00-FF |
| # t+3 | dataIdentifier#1 byte (LSB) | 00-FF |
| # t+4 | snapshotData#1 byte #1 | 00-FF |
| … | … | … |
| # t+4+(p-1) | snapshotData#1 byte #p | 00-FF |
| … | … | … |
| # t+4+(p-1)  +(p+2)\*(w-2)+1 | dataIdentifier#w byte (MSB) | 00-FF |
| # t+4+(p-1)  +(p+2)\*(w-2)+2 | dataIdentifier#w byte (LSB) | 00-FF |
| # t+4+(p-1)  +(p+2)\*(w-2)+3 | snapshotData#w byte #1 | 00-FF |
|  | … | … |
| # t+4+(p-1)  +(p+2)\*(w-2)+3  +(p-1) | snapshotData#w byte #p] | … |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

##### ReadDTCInformation- reportDTCExtendedDataRecordByDTCNumber (0x19 0x06)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCExtendedDataRecordByDTCNumber |  | 06 |
|  | DTCMaskRecord [ ]=[ |  |  |
| #3 | DTCHighByte | M | 00-FF |
| #4 | DTCMiddleByte | M | 00-FF |
| #5 | DTCLowByte] | M | 00-FF |
| #6 | DTCExtendedDataRecordNumber | M | 00-FF |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | ReportDTCExtendedDataRecordByDTCNumber |  | 06 |
|  | DTCAndStatusRecord[] ＝[ | C |  |
| #3 | DTCHighByte | 00-FF |
| #4 | DTCMiddleByte | 00-FF |
| #5 | DTCLowByte | 00-FF |
| #6 | statusOfDTC] | 00-FF |
| #7 | DTCExtendedDataRecordNumber#1 | 00-EF |
|  | DTCExtendedDataRecord[] #1 = [ |  |
| #8 | ExtendedData #1 byte #1 | 00-FF |
| … | … | 00-FF |
| #8+(p-1) | ExtendedData #1 byte #p ] | 00-FF |
| … | … | 00-FF |
| #t | DTCExtendedDataRecordNumber #x | 00-EF |
|  | DTCExtendedDataRecord[] #x = [ | 00-FF |
| #t +1 | ExtendedData #x byte #1 | 00-FF |
| … | … | 00-FF |
| #t+1+(q-1) | ExtendedData #x byte #q ] | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

##### ReadDTCInformation- ReportSupportedDTC (0x19 0x0A)

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 19 |
|  | Sub-Function= | M |  |
| #2 | ReportSupportedDTC |  | 0A |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 59 |
|  | Sub-Function= | M |  |
| #2 | ReportSupportedDTC |  | 0A |
| #3 | DTCStatusAvailabilityMask | M | 01-FF |
|  | DTCAndStatusRecord[] = [ |  |  |
| #4 | DTCHighByte #1 | M | 00 |
| #5 | DTCMiddleByte #1 |  |  |
| #6 | DTCLowByte #1 | M | 00-FF |
| #7 | statusOfDTC #1 | M | 00-FF |
| … | … |  |  |
| #7+4\*(m-2)+1 | DTCHighByte #m | M | 00-FF |
| #7+4\*(m-2)+2 | DTCMiddleByte #m | M | 00-FF |
| #7+4\*(m-2)+3 | DTCLowByte #m | M | 00-FF |
| #7+4\*(m-2)+4 | statusOfDTC #m] | M | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 19 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |  |
| --- | --- | --- |
| NRC (Hex) | Conditions | Cvt |
| 11 | The service identifier in the request message is not supported. | M |
| 12 | Sub-function parameter in the request message is not supported. | M |
| 13 | The length of the message is wrong | M |
| 31 | requestOutOfRange | M |

#### Data Parameter Definition

The following data parameters are defined for this service.

|  |  |
| --- | --- |
| Parameter | Description |
| DTCStatusMask | The DTCStatusMask contains 8 DTC status bits. This byte is used in the request message to allow an external test tool to request DTC information for the DTCs whose status matches the DTC Status Mask. A DTC’s status matches the DTC Status Mask if any one of the DTC’s actual status bits is set to “1” and the corresponding status bit in the DTCStatusMask is also set to “1”. (i.e., if the DTC Status Mask is bit-wise logically ANDed with the DTC’s actual status and the result is non-zero, then a match has occurred). If the external test tool specifies a status mask that contains bits that the ECU does not support, then the ECU shall process the DTC information using only the bits that it does support. |

The ECU supported DTC statuses are described in the following table.

|  |  |  |
| --- | --- | --- |
| Bit Field | Bit Field Description | Cvt |
| 0 | test failed  0x00 – false  0x01 – true  This bit shall indicate the result of the most recently performed test. A logical ‘1’ shall indicate that the last test failed meaning that the failure is completely matured (Active). A logical ‘0’ shall indicate that the result of the most recently performed test returns a “pass” result. Reset to 0 after a call of Clear Diagnostic Information. | M |
| 1 | Test failed this operation cycle  0x00 – false  0x01 – true  This bit shall indicate that a diagnostic test has reported a Test Failed result at any time during the current operation cycle.Reset to 0 when a new operation cycle is initiated or after a call to Clear Diagnostic Information.Once this bit is set to 1, it shall remain a 1 until a new operation cycle is started. | M |
| 2 | pending DTC  0x00 – false  0x01 – true  This bit shall indicate whether or not a diagnostic test has reported a Test Failed result at any time during the current or last completed operation cycle. The status shall only be updated if the test runs and completes. The criteria to set the Pending DTC bit and the Test Failed This Operation Cycle bit are the same. The difference is that the Test Failed This Operation Cycle is cleared at the end of the current operation cycle and the Pending DTC bit is not cleared until an operation cycle has completed where the test has passed at least  once and never failed. Reset to 0 after a call of ClearDiagnosticInformation. | N/A |
| 3 | confirmed DTC  0x00 – false  0x01 – true  This bit shall indicate whether a malfunction was detected enough times to warrant that the DTC is stored in long-term memory (Pending DTC has been set = ‘1’ one or more times for emission relevant electronic control units). This information can be used by the external  test tool to request additional diagnostic information such as Extended Data Records or Snapshot Records. A Confirmed DTC does not indicate that the malfunction is present at the time of the request (Pending DTC or Test Failed can be used to determine if a malfunction is present at the time of the request.). Reset to logical ‘0’ after a call to Clear Diagnostic Information or after self-healing criteria has been satisfied or after discarding this DTC due to Fault Memory overflow. | M |
| 4 | Test not complete since last clear  0x00 – false  0x01 – true  This bit shall indicate whether a DTC test has run to completion since the last time a call was made to Clear Diagnostic Information. One (1) shall indicate that the DTC test has not run to completion. If the test runs and passes or fails (Test Failed This Operation Cycle = 1) then the bit shall be set to a Zero (0) and latched. Reset to One (1) after a call to Clear Diagnostic Information. | N/A |
| 5 | Test failed since last clear  0x00 – false  0x01 – true  This bit shall indicate whether a DTC test has ever returned a Test Failed = 1 result since the last time a call was made to Clear Diagnostic Information (latched Test Failed This Operation Cycle =1).Zero (0) shall indicate that the test has not run or that the DTC test ran and passed (but never failed). If the test runs and fails then the bit shall remain latched at a 1. Reset to Zero(0) after a call to Clear Diagnostic Information. In contradiction to the Confirmed DTC this bit is not reset by self-healing criteria or when it was overwritten due to an overflow of the fault memory. | M |
| 6 | Test not complete this operation cycle  0x00 – false  0x01 – true  This bit shall indicate whether a DTC test has ever run and completed during the current operation cycle. One (1) shall indicate that the DTC test has not run to completion during the current operation cycle. If the test runs and passes or fails then the bit shall be set (and latched) to 0 until a new operation cycle is started. Reset to 1 after a call to Clear Diagnostic Information. | N/A |
| 7 | Warming indicator requested  Warning indicator requested  0x00 – false  0x01 – true  This bit shall report the status of any warning indicators associated with a particular DTC. Warning outputs may consist of indicator lamp(s), displayed text information, etc. If no warning indicators exist for a given system or particular DTC, this status shall default to a logic”0” state.The bit is set to 1 when the performed test results ‘failed’.Reset to a logical ‘0’ after a call to Clear Diagnostic Information. | C |

冻结帧具体信息参见附录A。

### RoutineControl (31H)

This service is used by the client to start/stop a routine and request routine results in the server’s memory. The routine is identified by a 2-byte RoutineIdentifier.

#### Message Format

Request：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value(hex) |
| #1 | RequestServiceIdentifier | M | 31 |
| #2 | RoutineControlType | M | 00-FF |
|  | RoutineIdentifier [ ] = [ |  |  |
| #3 | byte#1 (MSB) | M | 00-FF |
| #4 | byte#2 (LSB) ] | M | 00-FF |
|  | RoutineControlOptionRecord [ ] = [ | .. | … |
| #5 | routineControlOption#1 | C/U | 00-FF |
| … | … | … | … |
| #n | routineControlOption#m ] | C/U | 00-FF |
| C: This parameter is user optional to be present for sub-function parameter startRoutine and stopRoutine. | | | |

Positive Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | PositiveResponseServiceIdentifier | M | 71 |
| #2 | RoutineControlType | M | 00-7F |
|  | RoutineIdentifier [ ] = [ |  |  |
| #3 | byte#1 (MSB) | M | 00-FF |
| #4 | byte#2(LSB) ] | M | 00-FF |
| … | RoutineStatusRecord [ ] = [ | .. | … |
| #5 | routineStatus#1 | U | 00-FF |
| … | … | … | … |
| #n | routineStatus#m] | U | 00-FF |

Negative Response：

|  |  |  |  |
| --- | --- | --- | --- |
| Byte | Name | Cvt | Value |
| #1 | NegativeResponseServiceIdentifier | M | 7F |
| #2 | RequestServiceIdentifier | M | 31 |
| #3 | NegativeResponseCode | M | NRC |

Negative Response Codes(NRC):

|  |  |
| --- | --- |
| NRC (Hex) | Conditions |
| 11 | The service identifier in the request message is not supported. |
| 12 | The sub-function parameter in the request message is not supported. |
| 13 | The length of the message is wrong. |
| 22 | The criteria for the request RoutineControl are not met. |
| 24 | This code shall be returned if the “stopRoutine” or “requestRoutineResults” Sub-function is received without first receiving a “startRoutine” for the requested routineIdentifier. |
| 31 | This code shall be returned if:  1) the server does not support the requested routineIdentifier;  2) the user optional Routine Control Option Record contains invalid data for the requested routineIdentifier. |
| 33 | The corresponding security is not yet granted to perform the required service. |

Sub-function Parameter Definition：

|  |  |  |
| --- | --- | --- |
| Option (Hex) | Description | Cvt |
| 01 | StartRoutine  This parameter specifies that the server shall start the routine specified by the routineIdentifier. | M |
| 02 | StopRoutine  This parameter specifies that the server shall stop the routine specified by the routineIdentifier. | M |
| 03 | RequestRoutineResults  This parameter specifies that the server shall return result values of the routine specified by the routineIdentifier. | M |

Data Parameter Definition：

|  |  |
| --- | --- |
| RoutineIdentifier (Hex) | Description |
| 0203 | CheckPreprogramConditon  This value shall be used to check the server’s preprogram condition before reprogramming the ECU. |
| FF00 | eraseMemory  This value shall be used to start the server's memory erase routine. |
| FF01 | checkProgrammingDependencies  This value shall be used to check the server’s memory programming dependencies. |
| 0202 | CheckDataIntegrity  This value shall be used to check the server’s memory data integrity, it is recommended to use CRC32 algorithms. |

#### Implementation Rule

It is the system supplier’s responsibility that the server conditions are met when performing any action request by this service.

***Please specify other rules in your module.***

### RequestDownLoad(34H)

参见北汽新能源Bootloader刷新规范。

### TransferData (36H)

参见北汽新能源Bootloader刷新规范。

### RequestTransferExit (37H)

参见北汽新能源Bootloader刷新规范。

# 故障定义

|  |  |  |  |
| --- | --- | --- | --- |
| 序号 | 故障名称 | 故障码DTC | 备注 |
| 1 | MCU IGBT驱动电路过流故障（A相） | P116016 |  |
| MCU IGBT驱动电路过流故障（B相） | P116116 |  |
| MCU IGBT驱动电路过流故障（C相） | P116216 |  |
| 2 | MCU相电流过流故障 | P113519 |  |
| 3 | 电机超速故障 | P0A4400 |  |
| 4 | MCU直流母线过压故障 | P114017 |  |
| 5 | MCU直流母线欠压故障 | P114016 |  |
| 6 | MCU IGBT过温故障（A相） | P117098 |  |
| MCU IGBT过温故障（B相） | P117198 |  |
| MCU IGBT过温故障（C相） | P117298 |  |
| 7 | MCU 过温故障 | P117F98 | 不支持 |
| 8 | 电机过温故障 | P0A2F98 |  |
| 9 | 电机三相电流校验故障 | P112164 |  |
| 10 | MCU相电流采样回路故障（A相） | P118A12 |  |
| MCU相电流采样回路故障（B相） | P118B12 |  |
| MCU相电流采样回路故障（C相） | P118C12 |  |
| 11 | MCU位置信号检测回路故障 | P0A3F00 |  |
| 12 | MCU IGBT温度检测回路故障（A相） | P11801C |  |
| MCU IGBT温度检测回路故障（B相） | P11811C |  |
| MCU IGBT温度检测回路故障（C相） | P11821C |  |
| 13 | MCU温度检测回路故障 | P11881C | 不支持 |
| 14 | 电机温度检测回路故障 | P0A001C |  |
| 15 | MCU直流母线电压采样回路故障 | P11841C |  |
| 16 | MCU直流母线电流采样回路故障 | P0A5101 | 不支持 |
| 17 | MCU反馈转矩与转矩命令校验错误故障 | P113064 | 不支持 |
| 18 | 转矩命令超限故障 | U040186 |  |
| 19 | 与VCU通讯丢失故障 | U010087 |  |
| 20 | 电机系统高压暴露故障 | P0A0A94 |  |
| 21 | MCU低压电源过压故障 | U300317 |  |
| 22 | MCU低压电源欠压故障 | U300316 |  |
| 23 | MCU电源模块故障 | P11A01C | 不支持 |
| 24 | MCU相电流传感器零漂故障（A相） | P118A28 |  |
| MCU相电流传感器零漂故障（B相） | P118B28 |  |
| MCU相电流传感器零漂故障（C相） | P118C28 |  |
| 25 | MCU直流母线电流传感器零漂故障 | P118D28 | 不支持 |
| 26 | MCU RAM故障 | P060444 | 不支持 |
| 27 | MCU ROM故障 | P060545 | 不支持 |
| 28 | MCU EEPROM故障 | P062F46 |  |

具体参见北汽新能源C33DB-Z03项目电机系统故障定义。

# 附录 A: 冻结帧信息

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **编号** | **故障码**  **DTC** | **是否冻结** | **DID组合** | | | | | | | | | | | | | | | | | | | | | | | | **冻结帧**  **编号** | **备注** |
| 0202 | 0212 | 0203 | 0213 | 0200 | 0201 | 0204 | 0206 | 0205 | 0207 | 0214 | 0215 | 0216 | 0208 | 0209 | 020C | 020E | 020D | 020F | 020A | 020B | 0217 | 0218 | 0210 |
| 1 | P116016 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| P116116 |
| P116216 |
| 2 | P113519 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 3 | P0A4400 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 4 | P114017 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 5 | P114016 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 6 | P117098 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| P117198 |
| P117298 |
| 7 | P117F98 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 | 不支持 |
| 8 | P0A2F98 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 9 | P112164 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 10 | P118A12 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| P118B12 |
| P118C12 |
| 11 | P0A3F00 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 12 | P11801C | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| P11811C |
| P11821C |
| 13 | P11881C | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 | 不支持 |
| 14 | P0A001C | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 15 | P11841C | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 16 | P0A5101 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 | 不支持 |
| 17 | P113064 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 | 不支持 |
| 18 | U040186 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 19 | U010087 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 20 | P0A0A94 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 21 | U300317 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 22 | U300316 | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 |  |
| 23 | P11A01C | 是 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | 01 | 不支持 |
| 24 | P118A28 | 否 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| P118B28 |
| P118C28 |
| 25 | P118D28 | 否 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 不支持 |
| 26 | P060444 | 否 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 不支持 |
| 27 | P060545 | 否 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 不支持 |
| 28 | P062F46 | 否 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# 附录 B: 参数定义

## B.1 版本信息参数列表：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **编号** | **名称** | **DID(Hex)** | **Read** | **Write** | **备注** |
| 1 | VIN | F190 | √ | √ |  |
| 2 | 零件号 | F187 | √ |  |  |
| 3 | 应用软件指纹 | F184 | √ | √ |  |
| 4 | 供应商代码 | F18A | √ |  |  |
| 5 | ECU硬件版本号 | F191 | √ |  |  |
| 6 | ECU软件版本号 | F195 | √ |  |  |
| 7 | Bootloader软件版本号 | F183 | √ |  |  |
| 8 | 电机编码（只适用MCU） | 02FF | √ | √1 |  |
| 9 | 车型配置 | 02FE | √ | √ |  |

## B.2 数据流参数列表：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **编号** | **名称** | **DID(Hex)** | **Read** | **Write** | **备注** |
| 1 | 驱动电机工作模式命令 | 0202 | √ |  |  |
| 2 | 整车行驶状态命令 | 0212 | √ |  |  |
| 3 | 驱动电机控制器工作状态 | 0203 | √ |  |  |
| 4 | 整车State状态 | 0213 | √ |  |  |
| 5 | 直流母线电压 | 0200 | √ |  |  |
| 6 | 直流母线电流 | 0201 | √ |  |  |
| 7 | 驱动电机目标转矩命令 | 0204 | √ |  |  |
| 8 | 驱动电机目标转速命令 | 0206 | √ |  |  |
| 9 | 驱动电机当前转矩 | 0205 | √ |  |  |
| 10 | 驱动电机当前转速 | 0207 | √ |  |  |
| 11 | MCU IGBT温度（A相） | 0214 | √ |  |  |
| 12 | MCU IGBT温度（B相） | 0215 | √ |  |  |
| 13 | MCU IGBT温度（C相） | 0216 | √ |  |  |
| 14 | MCU温度 | 0208 | √ |  |  |
| 15 | 驱动电机温度 | 0209 | √ |  |  |
| 16 | Id给定值 | 020C | √ |  |  |
| 17 | Id反馈值 | 020E | √ |  |  |
| 18 | Iq给定值 | 020D | √ |  |  |
| 19 | Iq反馈值 | 020F | √ |  |  |
| 20 | Ud | 020A | √ |  |  |
| 21 | Uq | 020B | √ |  |  |
| 22 | 转子位置电角度 | 0217 | √ |  |  |
| 23 | 转子位置初始角度 | 0218 | √ |  |  |
| 24 | MCU低压电源电压 | 0210 | √ |  |  |

## 

## B.3 版本信息参数定义

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DID** | **信号/变量名称** | **访问权限** | | | **数据宽度/字节** | **描述** | **分辨率** | | **偏移量** | **最小值** | **最大值** |
| **22** | **2e** | **2f** |
| F190 | VIN | √0 | √1 |  | 17 | VIN | 字符#1：“L”  字符#2：“N”  字符#3：“B”  字符#4：“S”  字符#5：“C”  字符#6：“B”  字符#7：“3”  字符#8：“F”  字符#9：“x”（随机）  字符#10：“E”  字符#11：“D”  字符#12-字符#17：Serial Number “000001-999999” | | | | |
| F187 | 零件号 | √0 |  |  | 9 | 零件号 | 字符#1-字符#9：Serial Number”E00090318”(大洋)，”E00090319”(大郡)  参见Q-BJEV 01.6-2012 产品零部件号和图样号编制及要求 | | | | |
| F184 | 应用软件指纹 | √0 | √3 |  | 9 | 应用软件指纹 | 字符#1：年（BCD编码）  字符#2：月（BCD编码）  字符#3：日（BCD编码）  字符#4：诊断仪串号（0-FF）  字符#5：诊断仪串号（0-FF）  字符#6：诊断仪串号（0-FF）  字符#7诊断仪串号（0-FF）  字符#8诊断仪串号（0-FF）  字符#9诊断仪串号（0-FF） | | | | |
| F18A | 供应商代码 | √0 |  |  | 10 | 供应商代码 | 字符#1-字符#10：  A755E01782 深圳市麦格米特驱动技术有限公司 | | | | |
| F191 | ECU硬件版本号 | √0 |  |  | 9 | ECU硬件版本号 | 字符#1-字符#9：Serial Number”E10000001”  参见Q-BJEV 01.12-2012 控制器版本和刷新管理规定 | | | | |
| F195 | ECU软件版本号 | √0 |  |  | 9 | ECU软件版本号 | 字符#1-字符#9：Serial Number”E10000051”  参见Q-BJEV 01.12-2012 控制器版本和刷新管理规定 | | | | |
| F199 | 编程日期 | √0 | √3 |  | 3 | 编程日期 | 字符#1：年（BCD编码）  字符#2：月（BCD编码）  字符#3：日（BCD编码） | | | | |
| 02FF | 电机编码 | √0 |  | √1 | 30 | 电机编码 | Byte0-Byte9 | 字符#1~#10：供应商编码 举例：北汽大洋电机科技有限公司 D010E01018 | | | |
| Byte10-Byte14 | 字符#11~#15： 生产日期 举例：G0422 | | | |
| Byte15-Byte19 | 字符#6~#20： 流水号 举例：1179 | | | |
| Byte20 | 字符#21： 平台号 举例：D | | | |
| Byte21-Byte9 | 字符#22~#30： 零部件号 举例：E00015947 | | | |
| 02FE | 车型配置 | √0 | √1 |  | 2 | 车型配置 | 02 ： ABS车型  04 ： ESP 车型  其他：非法配置字，车辆不能运行 | | | | |

说明：访问权限√0表示不需要安全级权限，√1表示需要扩展安全级权限，√3表示需要编程安全级权限，表示不支持相应服务。

## B.4 数据流参数定义

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DID** | **信号/变量名称** | **单位** | **访问权限** | | | **数据宽度/位** | **描述** | **分辨率** | **偏移量** | **最小值** | **最大值** |
| **22** | **2e** | **2f** |
| 0202 | 驱动电机工作模式命令 | N/A | √0 |  |  | Byte 0 | | | | | |
| 0 | MCU使能命令 | 0-使能关（Disable）  1-使能（Enable） | | | |
| 1-3 | 驱动电机工作模式命令 | 0-待机模式  1-转矩模式  2-转速模式  3~7-保留（Reserved） | | | |
| 4-5 | 驱动电机转矩、转速指令方向命令 | 0-保留（Reserved）  1-正指令  2-负指令  3-保留（Reserved） | | | |
| 6-7 | 保留 | 0~3-保留（Reserved） | | | |
| 0212 | 整车行驶状态命令 | N/A | √0 |  |  | Byte 0 | | | | | |
| 0-1 | 保留 | 0~3-保留（Reserved） | | | |
| 2-4 | 档位信号 | 0-Void  1-P档  2-N档  3-R档  4-D档  5-E档  6~7-保留（Reserved） | | | |
| 5 | 制动信号 | 0-未踩制动踏板  1-已踩制动踏板 | | | |
| 6 | 保留 | 0~1-保留（Reserved） | | | |
| 7 | 防溜坡功能使能命令 | 0~1-保留（Reserved） | | | |
| 0203 | 驱动电机控制器工作状态 | N/A | 0 |  |  | Byte 0 | | | | | |
| 0 | MCU初始化状态 | 0-初始化未完成  1-初始化已完成 | | | |
| 1-2 | 驱动电机当前状态 | 0-待机状态  1-电动状态  2-发电状态  3-保留（Reserved） | | | |
| 3-5 | 驱动电机当前工作模式 | 0-待机模式  1-转矩模式  2-转速模式  3~7-保留（Reserved） | | | |
| 6-7 | 驱动电机当前旋转方向 | 0-待机状态  1-正转（前进）  2-反转（倒车）  3-保留（Reserved） | | | |
| Byte 1 | | | | | |
| 0 | 驱动电机控制器高压检测完成标志 | 0-未完成  1-已完成 | | | |
| 1 | EEPROM写数据完成标志位 | 0-未完成  1-已完成 | | | |
| 2 | 驱动电机控制器高压放电完成标志位 | 0-未完成  1-已完成 | | | |
| 3 | 驱动电机控制器低压下电请求标志位 | 0-未完成  1-已完成 | | | |
| 4 | 驱动电机系统降功率请求标志位 | 0-全功率运行  1-降功率运行 | | | |
| 5 | 驱动电机控制器关闭使能请求标志位 | 0-不关使能  1-关使能 | | | |
| 6-7 | 保留 | 0~3-Void | | | |
| 0213 | 整车State状态 | N/A | 0 |  |  | 16 | 整车状态机编码 | 1 | 0 | 0 | 65534 |
| 0200 | 直流母线电压 | V | √0 |  |  | 16 | 直流母线电压实际值 | 0.02 | 0 | 0 | 1310 |
| 0201 | 直流母线电流 | A | √0 |  |  | 16 | 直流母线电流实际值 | 0.04 | -1310 | -1310 | 1310 |
| 0204 | 驱动电机目标转矩命令 | Nm | √0 |  |  | 16 | MCU接收到的转矩指令 | 0.04 | -1310 | -1310 | 1310 |
| 0206 | 驱动电机目标转速命令 | rpm | √0 |  |  | 16 | MCU接收到的转速指令 | 0.6 | -19660 | -19660 | 19660 |
| 0205 | 驱动电机当前转矩 | Nm | √0 |  |  | 16 | 电机当前转矩实际值 | 0.04 | -1310 | -1310 | 1310 |
| 0207 | 驱动电机当前转速 | rpm | √0 |  |  | 16 | 电机当前转速实际值 | 0.6 | -19660 | -19660 | 19660 |
| 0214 | MCU IGBT温度（A相） | ℃ | √0 |  |  | 8 | A相IGBT模块当前内部温度 | 1 | -48 | -48 | 206 |
| 0215 | MCU IGBT温度（B相） | ℃ | √0 |  |  | 8 | B相IGBT模块当前内部温度 | 1 | -48 | -48 | 206 |
| 0216 | MCU IGBT温度（C相） | ℃ | √0 |  |  | 8 | C相IGBT模块当前内部温度 | 1 | -48 | -48 | 206 |
| 0208 | MCU温度 | ℃ | √0 |  |  | 8 | MCU当前散热底板温度 | 1 | -48 | -48 | 206 |
| 0209 | 驱动电机温度 | ℃ | √0 |  |  | 8 | 驱动电机当前温度 | 1 | -48 | -48 | 206 |
| 020C | Id给定值 | A | √0 |  |  | 16 | D轴电流给定值 | 0.04 | -1310 | -1310 | 1310 |
| 020E | Id反馈值 | A | √0 |  |  | 16 | D轴电流反馈值 | 0.04 | -1310 | -1310 | 1310 |
| 020D | Iq给定值 | A | √0 |  |  | 16 | Q轴电流给定值 | 0.04 | -1310 | -1310 | 1310 |
| 020F | Iq反馈值 | A | √0 |  |  | 16 | Q轴电流反馈值 | 0.04 | -1310 | -1310 | 1310 |
| 020A | Ud | V | √0 |  |  | 16 | D轴电压 | 0.04 | -1310 | -1310 | 1310 |
| 020B | Uq | V | √0 |  |  | 16 | Q轴电压 | 0.04 | -1310 | -1310 | 1310 |
| 0217 | 转子位置电角度 | ° | √0 |  |  | 8 | 转子位置电角度 | 1.5 | 0 | 0 | 382 |
| 0218 | 转子位置初始角度 | ° | √0 |  |  | 8 | 转子位置初始角度 | 1.5 | 0 | 0 | 382 |
| 0210 | MCU低压电源电压 | V | √0 |  |  | 8 | MCU低压供电电源电压 | 0.12 | 0 | 0 | 30 |