JH-ACU-4 S2.0

Diagnostic Communication Specification

For KWP2000

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Version History

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1.0	Dec.20,2012	Initial draft	Cao Tianyi
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Company(car maker) name		
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Contents

1. Introduction

This standard specifies the requirements for setting up the interchange of digital information between JH-ACU-4 ACU (airbag control unit) of the vehicle and the diagnostic tester.

The contents to be not defined in this specification refer to the Appendix A.

2. Serial Diagnostic Communication Link

2.1. Scope

This chapter describes the technical requirements with reference to on-board workshop diagnostics for the ACU (Airbag Control Unit) subsystem. The main purpose of on board diagnostic is to determine failures in the electronic system or its periphery in a simple, reliable and effective way.

2.2. General Configuration

Communication between the ACU and the tester takes place on a serial data link which shall be implemented as a half-duplex Universal Asynchronous Receiver/Transmitter (UART) bus. The ACU shall support a one wire communication connection to the diagnostic tester in accordance with ISO 9141-2, with line K only and without line L (see diagram below). Line K is a bidirectional data line used to convey request messages from the diagnostic tester to the ACU and response messages from the ACU to the diagnostic tester.

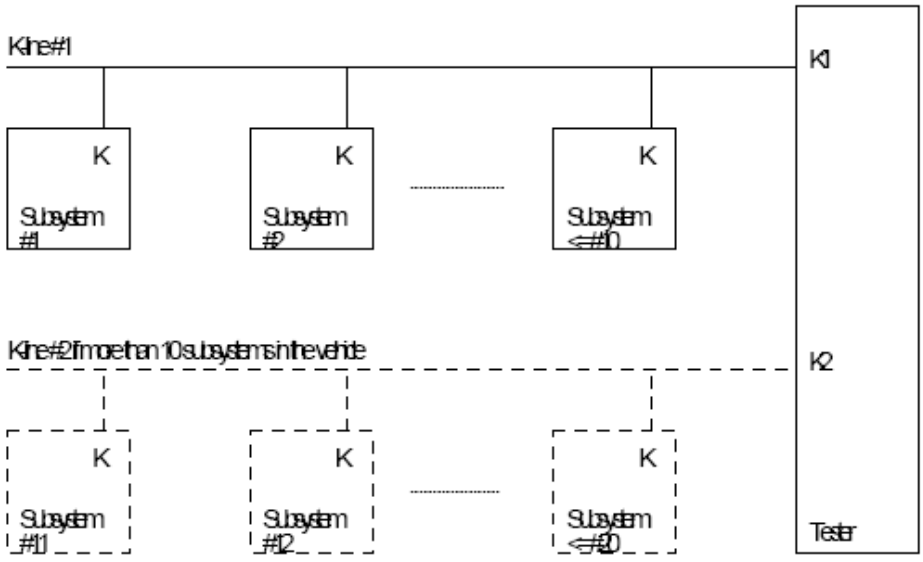


Figure 1-Subsystem – Tester Configuration

2.3. Signal Specification

Coding type

NRZ (non return zero)

Transmission rate (Initialization & Subsequent communication)

10.4kbps ± 1.7% (ECU)
10.4kbps ± 1% (diagnostic tester)

Bit transmission

LSB first
1 start bit - logic '0' for one bit duration
8 data bits - the LSB being sent first
1 stop bit - logic '1' for one bit duration

Normal state

Logic '1'

Signal voltage level

Logic ‘1’		Logic ‘0’	
Transmitter	Receiver	Transmitter	Receiver
Greater than 80% Vbatt	Greater than 70% Vbatt	Less than 20% Vbatt	Less than 30% Vbatt

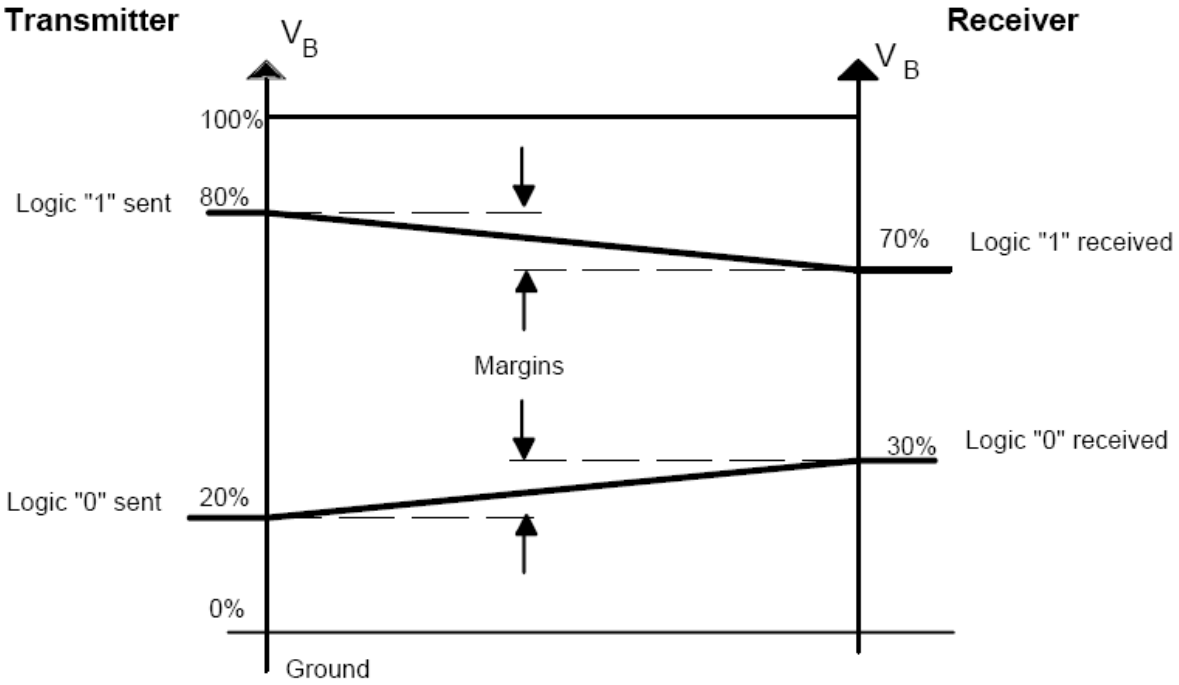


Figure 2 - Signal voltage levels, Worst case

- Slope time shall be less than 10% of the bit time.
- Slope times are defined as the time taken for the voltage change from 20% to 80% Vb, and from 80% to 20% Vb for transmitter.
- Bit time is defined as half of the time between the 50% Vb. levels of successive rising or falling edges of alternating '1' and '0' bits.

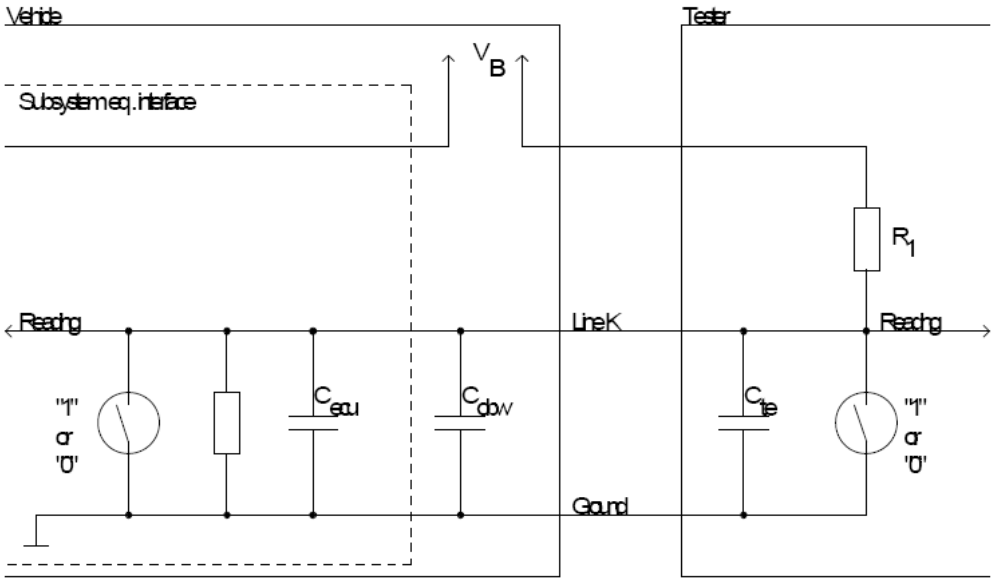
2.4. Electrical Specification

2.4.1. General

The following electrical specification is taken directly from ISO 9141-2 (i.e. there are no additional electrical requirements in this document other than those in ISO 9141-2.)

The electrical specification shall apply:

- over a working temperature range of 0ˆC and +50ˆC
- to a nominal 12 V system for which the serial communication shall operate correctly within the normal operating voltage range of the ACU. V_{BATT} is defined as battery voltage.



Communication Schematics

2.4.2. ACU Interface

At logic "1", or in receiving state, the ACU will look like a resistance to ground of at least 50 kΩ. At logic "0" the ACU will have an equivalent sink resistance not more than 110 Ω between K-line and Ground.

When the serial communication is not in operation and the ACU is connected to the tester, the K-line shall not be at logic "0".

Maximum allowed capacitance C_{ACU} between line K and ground is 500 pF.

The serial communication input/output circuitry of the ACU shall withstand transients and overvoltage present on the K-line via the tester source resistance, limited to -1 V to +40 V.

The serial communication input/output circuitry of the ACU shall withstand permanent short-circuit (also during communication) on K-line to battery voltage V_{BATT} and to Ground.

2.4.3. Tester Interface

The K-line shall be connected to V_{BATT} via nominal 510 Ω, R1, internally in the tester.

Transmission state:

- At logic "1", without any ACU's coupled to the K-line, the tester shall have an equivalent voltage source greater than 90% of V_{BATT} sourced from the vehicle positive voltage VBATT, and an equivalent resistance R1 of 510 Ω ‰5%.
- At logic "0", the tester shall have an equivalent voltage of less than 10% of VBATT, at a maximum sink current of 2A.

Receiving state:

- The equivalent resistance of the line K of the tester shall be 510 Ω ‰5%.

The total capacitance of the diagnostic tester, its cable and connector, C_{Te}, shall not exceed 2nF. The tester shall expect a resistance of 5 KΩ or higher to ground when connected to the vehicle.

2.4.4. Wiring

The capacitance C_{OBW} of the serial communication line built into the vehicle shall not exceed 2 nF, when measured without any ACU connected. Battery voltage and ground shall also be made available to the diagnostic tester, but need not come directly from an ACU.

3. Data Link Layer

3.1. Message structure

3.1.1. Message format

Header				Data bytes				Checksum
Fmt	Tgt	Src	Len	SID	Data1	Data2	…….	CS
4 Bytes header				Max 255 bytes				1 byte

Header with address information, with additional length byte

Fmt: Format Byte
Tgt: Target Address Byte
Src: Source Address Byte
Len: Length Byte Information of Data bytes

3.1.2. Format byte

The format byte contains 6 bit length information and 2 bit address mode information.

A1	A0	L5	L4	L3	L2	L1	L0

A1	A0	Mode
1	0	Physical addressing with address information

L5 ~ L0	Remark
0	Length information bit is not used

3.1.3. Target and Source address byte

Request	Header				Data bytes	Checksum
	Fmt	ACh	F1h	Length		CS
Response	Header				Data bytes	Checksum
	Fmt	F1h	ACh	Length		CS

ACU supports F0hex ~ FDhex as Tester Address. (Normally, Tester Address is F1hex)

Default ACU Address is AChex.

3.1.4. Length byte

				Length				
Fmt	Tgt	Src	Length	SID	Data	…	…	CS
4 Bytes				Max 255 bytes				1 byte

The ACU expects a 4 Byte Header.

The ACU response is always with a 4 Byte Header, i.e. with a length byte.

3.1.5. Data Bytes

The data field may contain up to 255 bytes of information. The first byte of the data field is the Service Identification Byte. It may be followed by parameters and data depending on the selected service.

3.1.6. Checksum Byte

Fmt	Tgt	Src	Length	SID	Data	…	…	CS
4 bytes				Max 255 bytes				1 byte
Checksum calculation								

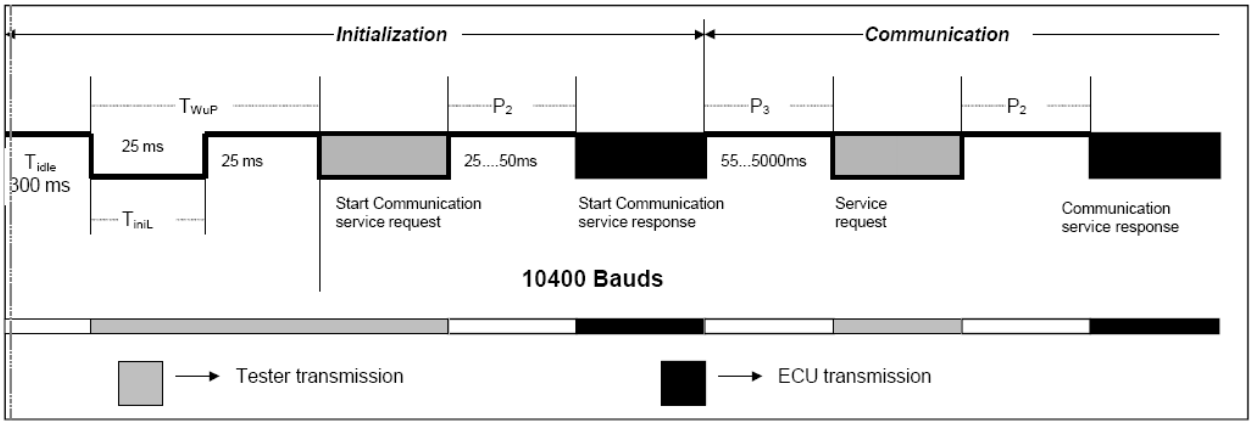
The checksum byte (CS) inserted at the end of the message block is defined as the simple 8-bit sum series of all bytes in the message, excluding the checksum.

If the message is **<1> <2> <3> ... <N> , <CS>**

Then, **<CS> = <1> + <2> + <3> + … + <N>**

3.2. Fast Initialization

The tester shall send a Wake-up Pattern (WuP) on "K-Line", the pattern begins after an idle time on "K-line" with a low time of T_{iniL}. The tester transmits the first bit of the Start Communication service after a time of T_{WuP} following the first falling edge.



3.3. Timing

During normal operation the following timing parameters are relevant:

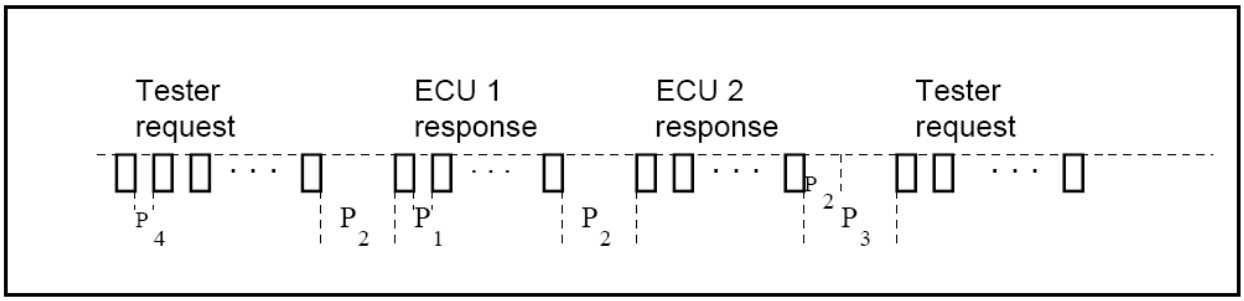


Figure 4 - Message flow, timing

3.3.1. Timing parameters definition

Value	Description
P1	Inter byte time for ECU response
P2	Time between tester request and ECU response or two ECU responses
P3	Time between end of ECU responses and start of new tester request
P4	Inter byte time for tester request
T_{WuP}	High low sequence of the Wake-up-Pattern
T_{iniL}	Low sequence of the Wake-up-Pattern
T_{idle}	Idle time

3.3.2. Timing parameter set

Timing Parameter	minimum values [ms]			maximum values [ms]		
	lower limit	default	Resolution	default	upper limit	Resolution
P1	0	0	---	20	20	---
P2	0	25	0.5	50	50	25
P3	0	55	0.5	5000	5000	250
P4	0	5	0.5	20	20	---
T_{WuP}	49	50	---	50	51	---
T_{iniL}	24	25	---	25	26	---
T_{idle}	---	300	---	---	---	---

3.4. Error Handling

3.4.1. Start Communication service

If the tester detects an error during the "Start Communication Service" either by timing or by the bit stream, then the tester will wait for a period of T_{idle} before beginning the process again (starting with the wake up pattern). If an ECU detects an error in the sequence from the tester then it shall be immediately prepared to recognize another "Start Communication Service". Both tester and ACU are required to recognize failure to comply with maximum timing values. Minimum timing value transgressions need not be detected but are likely to cause bit stream errors.

3.4.2. JH-ACU-4 ACU detected Tester transmission error

JH-ACU-4 checks each message by its checksum and number of bytes received before P2max elapses. If either is in error then JH-ACU-4 send no response and will internally ignore the whole message. When JH-ACU-4 detects other errors in the format or content of messages, but which satisfy the checksum and length requirements, in order that the tester be aware that there is not a simple communications problem, JH-ACU-4 will respond with the appropriate negative response.

3.4.3. JH-ACU-4 ACU detected error in ACU response

JH-ACU-4 can not detect a difference between what it transmitted and what was detected on the "K-Line".

4. Communication Services

4.1. Implemented KWP2000 Diagnostic Service

Diagnostic Service Name	Request Value	Positive Response	Negative Response	Rem-arks
Start Communication	81h	C1h	NO	
Stop Communication	82h	C2h	7Fh	
Tester Present	3Eh	7Eh	7Fh	
Read ACU Identification	1Ah	5Ah	7Fh	
Read Diagnostic Trouble Codes	18h	58h	7Fh	
Clear Diagnostic Information	14h	54h	7Fh	
Read Data by Local Identifier[1]	21h	61h	7Fh	

4.2. Start Communication Service

4.2.1. Request Message

Byte	Parameter Name	Hex Value
#1	Start Communication Request Service Id	**81h**

4.2.2. Positive Response

Byte	Parameter Name	Hex Value
#1	Start Communication Positive Response Service Id	**C1h**
#2	Key byte #1	**7Eh**
#3	Key byte #2	**ACh**

4.3. Stop Communication Service

4.3.1. Request Message

Byte	Parameter Name	Hex Value
#1	Stop Communication Request Service Id	**82h**

[1] This service is separated to detail services by request service identifier 2.

4.3.2. Positive Response

Byte	Parameter Name	Hex Value
#1	Stop Communication Positive Response Service Id	**C2h**

4.3.3. Negative Response

Byte	Parameter Name	Hex Value
#1	negative Response Service Id	**7Fh**
#2	Stop Communication Request Service Id	**82h**
#3	Response Code[2]	**xxh**

4.4. Tester Present service

4.4.1. Request Message

Data Byte	Parameter Name	Hex Value
#1	Tester Present Request Service Id	**3Eh**

4.4.2. Positive Response

Data Byte	Parameter Name	Hex Value
#1	Tester Present Positive Response Service Id	**7Eh**

4.4.3. Negative Response

Data Byte	Parameter Name	Hex Value
#1	Negative Response Service Id	**7Fh**
#2	Tester Present Request Service Id	**3Eh**
#3	Response Code	**xxh**

[2] Refer the response codes to following Appendix B.

4.5. Read ACU Identification service

4.5.1. Request Message

This Command allows the diagnostic tester to read out the ACU identification.

Data Byte	Parameter Name	Hex Value
#1	Read ACU Identification Request Service Id	**1Ah**
#2	Identification Option	**80h**

4.5.2. Positive Response

The ACU responds by transmitting a message containing the following information:

Data Byte	Parameter Name	Hex Value
#1	Read ACU Identification Positive Response Service ID	**5Ah**
#2 : #5	ACU Serial No. (BCD,4bytes)	**xxh** **:** **xxh**
#6 : #10	Manufacturing Information (Label version 2bytes, MLFB 3bytes)(ASCII)	**xxh** **:** **xxh**
#11 : #12	Parameter version (BCD,2bytes)	**xxh** **:** **xxh**

4.5.3. Negative Response

Data Byte	Parameter Name	Hex Value
#1	Negative Response Service ID	**7Fh**
#2	Read ACU Identification Request Service ID	**1Ah**
#3	Response Code	**xxh**

4.6. Read Diagnostic Trouble Codes[3] Service

4.6.1. Request Message

This command allows the diagnostic tester to read out the fault codes and status of faults. The

[3] Refer the diagnostic trouble codes to following Appendix C.

tester initiates the request by transmitting the following message.

Data Byte	Parameter Name	Hex Value
#1	Read Diagnostic Trouble Codes Request Service ID	**18h**
#2	Status of DTC = [Active Fault Historic Fault]	 **00h** **01h**
#3	Body Group (High byte)	**80h**
#4	Body Group (Low byte)	**00h**

4.6.2. Positive Response

The fault codes from the ACU will be taken and sent in fault recognized order. According to the number, the fault codes that can be stored in the ACU up to a maximum of 16 fault codes are transmitted to the tester. If the DTC 8611 (Crash record) or 8610（Internal Fault）was entered, the fault memory can't be cleared by Diagnostic Service any more.

Data Byte	Parameter Name	Hex Value
#1	Read Diagnostic Trouble Codes Positive Response Service ID	**58h**
#2	Number of DTC	**xxh**
#3	DTC#1 (High byte)	**xxh**
#4	DTC#1 (Low byte)	**xxh**
#5	Status of DTC#1	**xxh**
#6	Number of DTC#1(0~255)	**xxh**
#7~8	DTC#1 lasting time(0 ~ FFF0 with a resolution of 5 minutes)	**xxxxh**
:	:	**:**
:	:	**:**
#6n-5	DTC#n (High byte)	**xxh**
#6n-4	DTC#n (Low byte)	**xxh**
#6n-3	Status of DTC#n	**xxh**
#6n-2	Number of DTC#1(0~255)	**xxh**
#6n-1~6n	DTC#1 lasting time(0 ~ FFF0 with a resolution of 5 minutes)	**xxxxh**

4.6.3. Negative Response

Data Byte	Parameter Name	Hex Value
#1	Negative Response Service ID	**7Fh**
#2	Read Diagnostic Trouble Codes Request Service ID	**18h**
#3	Response Code	**xxh**

4.7. Clear Diagnostic Information Service

4.7.1. Request Message

This command allows the diagnostic tester to clear the fault memory in the ACU. The ACU responds by transmitting either a Positive or a Negative response message back to the diagnostic tester. If the ACU cannot clear its fault memory (in case of an internal fault or if a crash is recorded), a Negative Response code $10 (General Reject) will be transmitted. The message Positive Response will be transmitted immediately after the fault memory was cleared

Data Byte	Parameter Name	Hex Value
#1	Clear Diagnostic Information Request Service ID	**14h**
#2	Body Group (High byte)	**80h**
#3	Body Group (Low byte)	**00h**

4.7.2. Positive Response

Data Byte	Parameter Name	Hex Value
#1	Clear Diagnostic Information Positive Response Service ID	**54h**
#2	Body Group (High byte)	**80h**
#3	Body Group (Low byte)	**00h**

4.7.3. Negative Response

Data Byte	Parameter Name	Hex Value
#1	Negative Response Service ID	**7Fh**
#2	Clear Diagnostic Information Request Service ID	**14h**
#3	Response Code	**xxh**

4.8. Read Data by Local Identifier Service

4.8.1. Request Message

The ACU should send all data of record value specified in this specification via the read Data by Local Identifier response message. The information includes the crash information and Real time data, Deployment data, Crash pulse data. If the crash information and deployment data is not recorded, a Negative Response code $10 (General Reject) will be transmitted.

Data Byte	Parameter Name	Hex Value
#1	Read Data by Local Identifier Request Service ID	**21h**
#2	Record Local Identifier	**xxh**

4.8.1.1. Overview of Record Local Identifier

Record Local Identifier	Hex Value
Real Time data	**08h**
Front Deployment data	**D1h**
Front Near Deployment data	**D2h**

4.8.2. Positive Response

Data Byte	Parameter Name	Hex Value
#1	Read Data by Local Identifier Positive Response Service ID	**61h**
#2	Record Local Identifier	**xxh**
#3	Record value #1	**xxh**
:	:	**:**
#n	Record value #m	**xxh**

4.8.2.1. Record Value – Real Time data(08h)

Byte	Bit #	Description	Record Value
#1	---	Battery Voltage	$((xxh * 0.0192) * 59/12 + 0.7)V$
#2	---	Energy reserve Voltage for DAB	$(xxh * 0.0192 * 8)V$
#3	---	Energy reserve Voltage for PAB	
#4	---	Energy reserve Voltage for DRPT	
#5	---	Energy reserve Voltage for PRPT	
#6	---	NOT USED	
#7	---	NOT USED	

#8	---	NOT USED	
#9	---	NOT USED	
#10	---	NOT USED	
#11	---	NOT USED	
#12	---	DAB resistance	(xxh∗10/255)Ω
#13	---	PAB resistance	
#14	---	Retractor DPT resistance	
#15	---	Retractor PPT resistance	
#16	---	NOT USED	
#17	---	NOT USED	
#18	---	NOT USED	
#19	---	NOT USED	
#20	---	NOT USED	
#21	---	NOT USED	
#22	1,0	Driver Buckle Switch state	00 = Unbuckled 01 = Buckled 10 = Failure 11 = Not supported
	3,2	Passenger Buckle Switch state	
	5,4	PADS state	

4.8.2.2. Record Value – Front crash information(D1h)

Byte	Bit #	Description	Record Value
#1~#200	---	X sensor acceleration value[4]	1ms filtered data if xxh >=128, xxh=xxh-256
#201	1,0	Driver airbag stage-1st stage	00 = no fire 01 = fire 11 = not supported
	3,2	Passenger airbag stage-1st stage	
	5,4	Driver pretensioner stage	
	7,6	Passenger pretensioner stage	
#202	2,1,0	Driver pretensioner ignition times	xxh
	5,4,3	Passenger pretensioner ignition times	
#203	1,0	Seat buckle status at the time of crash – front Driver	00 = unbuckle 01 = buckled 10 = fault 11 = not supported
	3,2	Seat buckle status at the time of crash – front Passenger	

[4] Acceleration value is total 200ms(20ms before algorithm start and 180ms after algorithm start)
If TTF of the airbag is bigger than 180, the time window for recorded acceleration value shall be shifted.

	4	Warning lamp status at the time of crash	0 = on 1 = off
	5	Crash output	0 = not sent 1 = sent
	6	Crash recording completion status	0 = not completed 1 = completed
#204	1,0	Driver airbag-1st stage status	00 = good 01 = fault 11 = not supported
	3,2	Passenger airbag-1st stage status	
	5,4	Driver pretensioner status	
	7,6	Passenger pretensioner status	
#205	1,0	Passenger Airbag disable switch status at the time of crash	00 = off 01 = on 10 = fault 11 = not supported
	3,2	Passenger Airbag disable indicator status at the time of crash	
#206	---	Warning lamp continuous on / off time	0 ~ FFF0 with a resolution of 5 min. (max. 5460 hours or 227.5 days)
#207			
#208	---	Continuously ignition cycle count when warning lamp is on	00 ~ FF
#209	---	NOT USED	
#210	---	Driver airbag Firing Current time	xxh(Resolution : 100us)
#211	---	Passenger airbag Firing Current time	xxh(Resolution : 100us)
#212	---	Operation Counter High byte	xxh
#213	---	Operation Counter Mid byte	xxh
#214	---	Operation Counter Low byte	xxh
#215~ 216	---	Operation Counter	xxxxh (Resolution : 100ms)
#217	---	ACU Ignition Times High byte	xxh
#218	---	ACU Ignition Times Mid byte	xxh
#219	---	ACU Ignition Times Low byte	xxh
#220	---	DAB ignition time	ms
#221	---	PAB ignition time	ms
#222	---	pretensioner ignition time	ms

4.8.2.3. Record Value – Front Near Deployment Data (D2h)

Byte	Bit #	Description	Record Value

#1~#200	---	X sensor acceleration value[5]	1ms filtered data if xxh >=128, xxh=xxh-256
#201	1,0	Driver airbag-1st stage	00 = no fire 01 = fire 11 = not supported
	3,2	Passenger airbag-1st stage	
	5,4	Driver pretensioner stage	
	7,6	Passenger pretensioner stage	
#202	2,1,0	Driver pretensioner ignition times	xxh
	5,4,3	Passenger pretensioner ignition times	
#203	1,0	Seat buckle status at the time of crash – front Driver	00 = unbuckle 01 = buckled 10 = fault 11 = not supported
	3,2	Seat buckle status at the time of crash – front Passenger	
	4	Warning lamp status at the time of crash	0 = on 1 = off
	5	Crash output	0 = not sent 1 = sent
	6	Crash recording completion status	0 = not completed 1 = completed
#204	1,0	Driver airbag -1st stage status	00 = good 01 = fault 11 = not supported
	3,2	Passenger airbag-1st stage status	
	5,4	Driver pretensioner status	
	7,6	Passenger pretensioner status	
#205	1,0	Passenger Airbag disable switch status at the time of crash	00 = off 01 = on 10 = fault 11=not supported
	3,2	Passenger Airbag disable indicator status at the time of crash	
#206	---	Warning lamp continuous on / off time	0 ~ FFF0 with a resolution of 5 min. (max. 5460 hours or 227.5 days)
#207			
#208	---	Continuously ignition cycle count when warning lamp is on	00 ~ FF
#209	---	NOT USED	
#210	---	Driver airbag Firing Current time	xxh (Resolution : 100us)
#211	---	Passenger airbag Firing Current time	xxh (Resolution : 100us)
#212	---	Operation Counter High byte	xxh
#213	---	Operation Counter Mid byte	xxh

[5] Acceleration value is total 200ms(20ms before algorithm start and 180ms after algorithm start)
If TTF of the airbag is bigger than 180, the time window for recorded acceleration value shall be shifted.

#214	---	Operation Counter Low byte	xxh
#215~216	---	Operation Counter	xxxxh(Resolution: 100ms)
#217	---	ACU Ignition Times High byte	xxh
#218	---	ACU Ignition Times Mid byte	xxh
#219	---	ACU Ignition Times Low byte	xxh

4.8.3. Negative Response

Data Byte	Parameter Name	Hex Value
#1	Negative Response Service ID	**7Fh**
#2	Read Data by Local Identifier Request Service ID	**21h**
#3	Response Code	**xxh**

Appendix A

- Normative Reference -

ISO 9141-2	Road vehicle-Diagnostic systems-Requirements for interchange of digital information
ISO 14230-1:1996	Road Vehicles - Diagnostic systems - Keyword Protocol 2000- Part 1: Physical Layer
ISO 14230-2:1996	Road Vehicles - Diagnostic systems - Keyword Protocol 2000- Part 2: Data link layer
ISO 14230-3:1996	Road Vehicles - Diagnostic systems - Keyword Protocol 2000- Part 3: Implementation
ISO 14230-4:1996	Road Vehicles - Diagnostic systems - Keyword Protocol 2000- Part 4: Requirements for Emission Related Systems
SAE J1930	E/E Systems Diagnostic Terms, Definitions, Abbreviations & Acronyms
SAE J1962	Diagnostic Connector
SAE J1978	OBD-II Scan Tool
SAE J1979	E/E Diagnostic Test Modes
SAE J2012	Diagnostic Trouble Code Definitions
SAE J2186	E/E Diagnostic Data Link Security
SAE J2190	Enhanced Diagnostic Test Modes

Appendix B

- Communication fault response codes -

Hex Value	Response Code
10h	General Reject
11h	Service Not Supported
12h	subFunction Not Supported-invalid Format
21h	busy-Repeat Request
22h	Conditions Not Correct or request Sequence Error
23h	Routine Not Complete
78h	Request Correctly Received-Response Pending

Appendix C

- Diagnostic Fault Codes -

8101	Battery voltage high
8102	Battery voltage low
8201	Driver airbag resistance too High (1st stage)
8202	Driver airbag resistance too Low (1st stage)
8203	Driver airbag resistance circuit short to Ground (1st stage)
8204	Driver airbag resistance circuit short to Battery (1st stage)
8211	Passenger airbag resistance too High (1st stage)
8212	Passenger airbag resistance too Low (1st stage)
8213	Passenger airbag resistance circuit short to Ground (1st stage)
8214	Passenger airbag resistance circuit short to Battery (1st stage)
8221	Pretensioner front-Driver resistance too High
8222	Pretensioner front-Driver resistance too Low
8223	Pretensioner front-Driver resistance circuit short to Ground
8224	Pretensioner front-Driver resistance circuit short to Battery
8226	Pretensioner front-Passenger resistance too High
8227	Pretensioner front-Passenger resistance too Low
8228	Pretensioner front-Passenger resistance circuit short to Ground
8229	Pretensioner front-Passenger resistance circuit short to Battery
8710	Buckle Switch Driver open or short to Battery
8711	Buckle Switch Driver short or short to Ground
8712	Buckle Switch Passenger open or short to Battery
8713	Buckle Switch Passenger short or short to Ground
8714	Buckle Switch Driver defect
8715	Buckle Switch Passenger defect
8725	Passenger airbag deactivation switch open or short to Battery
8726	Passenger airbag deactivation switch short or short to Ground
8727	Passenger airbag deactivation switch defect
8616	Crash Output Short to Ground
8617	Crash Output Short to Battery
8611	Crash recorded in 1st stage only(Frontal – Replace ECU)
8614	Crash recorded in Belt pretensioner only
8615	Belt pretensioner 6 times deployment
8610	Internal fault – Replace ECU

8300	Warning lamp Fault – Open
8301	Warning lamp Fault – Short to GND
8302	Warning lamp Fault – Short to Battery
8305	Passenger airbag off warning lamp Fault - Short to GND
8306	Passenger airbag off warning lamp Fault - Short to Battery
8750	Vehicle Option Not Matched