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Submitted for recognition as an American National Standard

SAE J2178/3

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CLASS B DATA COMMUNICATION NETWORK MESSAGES—PART 3 FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS

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1. ***Scope***—This SAE Recommended Practice defines the information contained in the header and data fields of nondiagnostic messages for automotive serial communications based on SAE J1850 Class B networks. This document describes and specifies the header fields, data fields, field sizes, scaling, representations, and data positions used within messages.

   The general structure of a SAE J1850 message frame without in-frame response is shown in Figure 1. The structure of a SAE J1850 message with in-frame response is shown in Figure 2. Figures 1 and 2 also show the scope of frame fields defined by this document for nondiagnostic messages. Refer to SAE J1979 for specifications of emissions-related diagnostic message header and data fields. Refer to SAE J2190 for the definition of other diagnostic message header and data fields. The description of the network interface hardware, basic protocol definition, the electrical specifications, and the CRC field are given in SAE J1850.

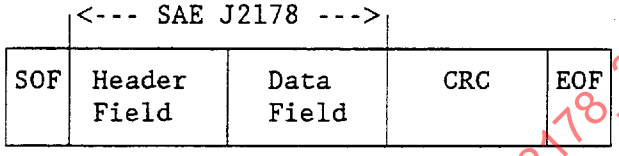

FIGURE 1—SCOPE OF SAE J2178 FOR A SAE J1850 FRAME WITHOUT IN-FRAME RESPONSE

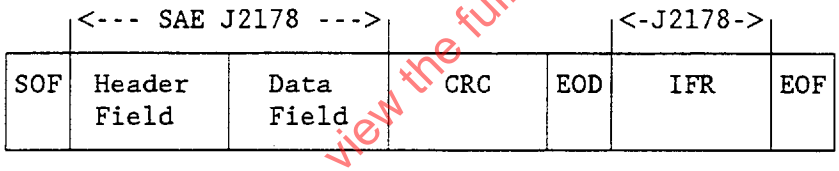

FIGURE 2—SCOPE OF SAE J2178 FOR A SAE J1850 FRAME WITH IN-FRAME RESPONSE (IFR)

SAE J1850 defines two and only two formats of message headers. They are the Single Byte header format and the Consolidated header format. The consolidated header format has two forms: a single byte form and a three byte form. This document covers all of these formats and forms to identify the contents of messages which could be sent on a SAE J1850 network.

This document consists of four parts, each published separately.

Part 1 of SAE J2178 (Titled: Detailed Header Formats and Physical Address Assignments) describes the two allowed forms of message header formats: single byte and consolidated. It also contains the physical node address range assignments for the typical subsystems of an automobile.

Part 2 of SAE J2178 (Titled: Data Parameter Definitions) defines the standard parametric data which may be exchanged on SAE J1850 (Class B) networks. The parameter scaling, ranges, and transfer functions are specified. Messages which refer to these parametric definitions shall always adhere to these parametric definitions. It is intended that at least one of the definitions for each parameter in this part match the SAE J1979 definition. The details of this part are fully described in 3.1.

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Part 3 of SAE J2178 (this part, Titled: Frame IDs for Single Byte Forms of Headers) defines the message assignments for the single byte header format and the one byte form of the consolidated header format.

Part 4 of SAE J2178 (Titled: Target Address (Second Byte) for Three Byte Headers) defines the message assignments for the second byte in the three byte form of the consolidated header format.

1.1 **Standardized Parameter Definitions**—The parameters used to describe data variables are one of the most important functions of this document. To achieve commonality of messages in Class B networks, the data parameters must become standardized. This applies to data parameter definitions for use during normal vehicle operations as well as during diagnostic operations. By using common parameter definitions for nondiagnostic and diagnostic functions on the network, the modules which form the network can maintain one image or description of a data parameter.

Where parameters have been defined in the Diagnostic Test Modes documents (SAE J1979 and J2190), such as Parameter Identifiers for diagnostic purposes, the definitions in Part 2 of this document match the diagnostic definition.

SAE J2178, Part 2 defines the parameters to be used for nondiagnostic and diagnostic data format definitions. For new parameter definitions which are needed in the future, the new definitions, if they are expected to become widely used, must be integrated into this document for commonality across these types of applications. Of course, manufacturers are free to assign their own definitions to data parameters which are unique or proprietary to their products. They are, however, restricted to using the "Manufacturer Reserved" message header assignments in Parts 3 and 4 of this document when using these unique or proprietary data parameter definitions.

2. References

2.1 **Applicable Documents**—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

SAE J1850—Class B Data Communication Network Interface
SAE J1979—E/E Diagnostic Test Modes
SAE J2178/1—Detailed Header Formats and Physical Address Assignments
SAE J2178/2—Data Parameter Definitions
SAE J2178/4—Target Address (Second Byte) for Three Byte Headers (Draft)
SAE J2190—Enhanced E/E Diagnostic Test Modes

2.2 **Related Publications**—The following publications are provided for information purposes only and are not a required part of this document.

SAE J1213/1—Glossary of Vehicle Networks for Multiplex and Data Communication
SAE J1930—Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms

2.3 Terms and Definitions

2.3.1 DATA [DATA FIELD]—Data and data field are used interchangeably in this document and they both refer to a field within a frame that may include bytes with parameters pertaining to the message and/or secondary ID and/or extended addresses and/or test modes which further defines a particular message content being exchanged over the network.

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2.3.2 FRAME—A frame is one complete transmission of information which may or may not include an In-Frame Response. The frame is enclosed by the start of frame and end of frame symbols. For Class B networks, each frame contains one and only one message (see "message" 2.3.5).

2.3.3 HEADER [HEADER FIELD]—The header (or header field, used interchangeably) is a one or three byte field within a frame which contains information about the message priority, message source and target addressing, message type, and in-frame response type.

2.3.4 IN-FRAME RESPONSE (IFR) TYPE—The IFR type identifies the form of the in-frame response which is expected within that message.

2.3.5 MESSAGE—A message consists of all of the bytes of a frame excluding the delimiter symbols (SOF, EOD, EOF, NB).

2.3.6 PARAMETER—A parameter is the variable quantity included in some messages. The parameter value, scaling, offset, units, transfer function, etc., are unique to each particular message. (The assigned parameters are contained herein.)

2.3.7 PRIORITY—The priority describes the rank order and precedence of a message. Based upon the SAE J1850, Class B arbitration process, the message with the highest priority will win arbitration.

2.3.8 RESPONSE DATA—The response data is the information from a node on the network in response to a request from another node on the network. This may be an in-frame response or a report type of message.

2.4 Abbreviations and Acronyms

CRC - Cyclic Redundancy Check
EOD - End of Data
EOF - End of Frame
ID - Identifier
IFR - In-Frame Response
LSB - Least Significant Bit / Byte
MSB - Most Significant Bit / Byte
NB - Normalization Bit
PKT - Multiple Parameter Packet SLOT
PRN - Parameter Reference Number
SLOT - Scaling, Limit, Offset, and Transfer Function
SOF - Start of Frame

3. General Information

3.1 Document Overview—The messages defined by this document are specified for networks using one byte headers or the single byte form of the consolidated header as specified in SAE J1850. This document focuses on the Frame ID which is the first byte of the message. The first byte of the one byte header is defined in Section 4 under Frame ID as an 8 Bit hexadecimal number and the first byte of the single byte form of the consolidated header is defined under 7 Bit as a hexadecimal number. Bit four (H bit) of the 7 Bit header is always a logic "1" (see Section 5 of SAE J2178 Part 1). The information in the header field implicitly defines the target, source, priority and message type information, while the data field contains additional addressing and parametric information (see Section 4 of SAE J2178 Part 1). The header defines the Message Identifier or Frame ID and becomes the name that is broadcast normally periodically to all the nodes on the network.

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This document describes the overall structure of messages and is expected to have wide application. Designers are required to use the defined messages on SAE J1850 networks in the exact way that they are defined here. There are a large number of message codes which are reserved for each manufacturer to define. If the user cannot find a needed message, he or she is expected to define a manufacturer-specific message in these reserved codes. Therefore, messages on different manufacturer's products using these "Manufacturer Reserved" codes will only have meaning for that manufacturer or specific vehicle. These will most likely be different between manufacturers. The codes that are defined here, however, shall always carry the same meaning from one manufacturer to another and from one model and year to the next.

3.2 Parameter Reference Number (PRN)—With the Single Byte form of header, the Frame ID corresponds with a particular Parameter Reference Number (PRN) or a grouping of PRNs (see Section 6 of SAE J2178 Part 2). The PRN is an arbitrarily assigned number and defines the following:

a. Length of data in number of bits
b. Units
c. Scaling, Limit, Offset, and Transfer Function, i.e., SLOT (see Section 7 of SAE J2178 Part 2)
d. Type or category of data

SAE J2178 Part 2, Section 7 defines the following data Types:

(1) BMP Bit Mapped
(2) UNM Unsigned Numeric
(3) SNM 2's Complement Signed Numeric
(4) SED State Encoded
(5) ASC ASCII Encoded
(6) BCD Binary Coded Decimal
(7) SFP Signed Floating Point (Scientific Notation)

3.3 Message Identification (FRAME ID)—The FRAME ID of the single byte header implicitly and uniquely defines the following characteristics of the message:

a. The message priority
b. The data content of the message specified by a PRN or packet of PRNs
c. The length of message
d. Source of the message
e. Type of the message
f. The event or repetition rate for transmission
g. CRC byte requirements

3.3.1 PRN ASSIGNMENTS—A FRAME ID shall have one or more PRNs assigned to it. Some PRNs may be composed of a packet (PKT) of PRNs (see paragraph 7.1 of SAE J2178 Part 2). The bytes of the data field shall be composed of the parameter given in the "PRNs" column of the figure defined in Section 4. When more than one PRN is shown, the data field shall contain the PRNs in the order given left to right.

3.3.2 IN-FRAME RESPONSE (IFR) TYPE—The IFR Type shall be given under "IFR Type" column of the figure defined in Section 4. The different IFR Types are defined in Section 3 of J2178 Part 1.

3.3.3 REPETITION RATE—The vehicle manufacturer shall choose which message frames are event driven or defined by a repetition rate. Refer to SAE J2178 Part 1 Appendix A for further information on event- or time-based message frames.

3.3.4 CRC BYTE REQUIREMENTS—The CRC byte requirements shall be defined by the manufacturer as specified by SAE J1850.

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4. ***Frame IDs for Single Byte Forms of Headers***—Figure 3 defines the Frame ID for one byte headers and the first byte of the single byte form of the consolidated header.

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MULTIPLEXING AND DATA COMMUNICATIONS STANDARDS COMMITTEE

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
10	00		Reserved - SAE	
	01		Reserved - SAE	
11	02		Reserved - Mfg.	
	03		Reserved - Mfg.	
12	04		Reserved - Mfg.	
	05		Reserved - Mfg.	
13	06		Reserved - Mfg.	
	07		Reserved - Mfg.	
14	08		Reserved - SAE	
	09		Reserved - SAE	
15	0A		Reserved - Mfg.	
	0B		Reserved - Mfg.	
16	0C		Reserved - Mfg.	
	0D		Reserved - Mfg.	
17	0E		Reserved - Mfg.	
	0F		Reserved - Mfg.	
18	10		Reserved - SAE	
	11		Reserved - SAE	
19	12		Reserved - Mfg.	
	13		Reserved - Mfg.	
1A	14		Reserved - Mfg.	
	15		Reserved - Mfg.	
1B	16		Reserved - Mfg.	
	17		Reserved - Mfg.	
1C	18		Reserved - SAE	
	19		Reserved - SAE	
1D	1A		Reserved - Mfg.	
	1B		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
1E	1C		Reserved - SAE	
	1D		Reserved - SAE	
1F	1E		Reserved - Mfg.	
	1F		Reserved - Mfg.	
30	20	0	Injector Time & Dist.	1015, 601B
	21		Reserved - SAE	
31	22		Reserved - Mfg.	
	23		Reserved - Mfg.	
32	24	0	Vehicle Speed	601E, 000D
	25		Reserved - Mfg.	
33	26	0	Engine RPM & MAP	1022, 000B
	27		Reserved - Mfg.	
34	28		Reserved - SAE	
	29		Reserved - SAE	
35	2A	0	Barometric Pressure	1025
	2B		Reserved - Mfg.	
36	2C	0	Sys. Volts & Coolant Temperature	600A, 103C
	2D		Reserved - Mfg.	
37	2E		Reserved - Mfg.	
	2F		Reserved - Mfg.	
38	30		Reserved - SAE	
	31		Reserved - SAE	
39	32		Reserved - Mfg.	
	33		Reserved - Mfg.	
3A	34		Reserved - Mfg.	
	35		Reserved - Mfg.	
3B	36		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
	37		Reserved - Mfg.	
3C	38		Reserved - SAE	
	39		Reserved - SAE	
3D	3A	0	Transmission Gear & Lock-up Status	1805
	3B		Reserved - Mfg.	
3E	3C	0	Throttle Position	0011
	3D		Reserved - Mfg.	
3F	3E		Reserved - Mfg.	
	3F		Reserved - Mfg.	
50	40	0	Transmission Range	1809
	41		Reserved Diagnostic Report	
51	42		Reserved - SAE	
	43		Reserved - SAE	
52	44		Reserved - Mfg.	
	45		Reserved - Mfg.	
53	46		Reserved - Mfg.	
	47		Reserved - Mfg.	
54	48	0	Leg. Diagnostic Report	Per SAE J1979
	49		Reserved - SAE	
55	4A		Reserved - SAE	
	4B		Reserved - SAE	
56	4C		Reserved - Mfg.	
	4D		Reserved - Mfg.	
57	4E		Reserved - Mfg.	
	4F		Reserved - Mfg.	
58	50		Reserved - SAE	
	51		Reserved - SAE	
59	52		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
	53		Reserved - Mfg.	
5A	54		Reserved - Mfg.	
	55		Reserved - Mfg.	
5B	56		Reserved - Mfg.	
	57		Reserved - Mfg.	
5C	58		Reserved - SAE	
	59		Reserved - SAE	
5D	5A		Reserved - Mfg.	
	5B		Reserved - Mfg.	
5E	5C		Reserved - Mfg.	
	5D		Reserved - Mfg.	
5F	5E	0	Set Time	6030
	5F		Reserved - Mfg.	
70	60	0	Set Date	6023
	61		Reserved Diagnostic Request	
71	62		Reserved - Mfg.	
	63		Reserved - Mfg.	
72	64		Reserved - Mfg.	
	65		Reserved - Mfg.	
73	66		Reserved - SAE	
	67		Reserved - SAE	
74	68	0	Leg. Diagnostic Req.	Per SAE J1979
	69		Reserved - SAE	
75	6A		Reserved - Mfg.	
	6B		Reserved - Mfg.	
76	6C		Reserved - Mfg.	
	6D		Reserved - Mfg.	
77	6E		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
	6F		Reserved - Mfg.	
78	70		Reserved - SAE	
	71		Reserved - SAE	
79	72	0	Vehicle Odometer	6031
	73		Reserved - Mfg.	
7A	74	0	Trip Odometer 1	6032
	75		Reserved - Mfg.	
7B	76	0	Trip Odometer 2	6032
	77		Reserved - Mfg.	
7C	78	0	Trip Odometer 3	6032
	79		Reserved - SAE	
7D	7A		Reserved - Mfg.	
	7B		Reserved - Mfg.	
7E	7C		Reserved - Mfg.	
	7D		Reserved - Mfg.	
7F	7E	0	Display Brightness Level	602B
	7F		Reserved - Mfg.	
90	80	0	Current Time	6030
	81		Reserved - SAE	
91	82	0	Oil Pressure	102F
	83		Reserved - Mfg.	
92	84		Reserved - SAE	
	85		Reserved - Mfg.	
93	86		Reserved - Mfg.	
	87		Reserved - Mfg.	
94	88		Reserved - Mfg.	
	89		Reserved - SAE	
95	8A		Reserved - SAE	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
	8B		Reserved - Mfg	
96	8C		Reserved - Mfg.	
	8D		Reserved - Mfg.	
97	8E		Reserved - Mfg.	
	8F		Reserved - Mfg.	
98	90	0	Fuel Economy, Present	6021, 6020
	91		Reserved - Mfg.	
99	92	0	Current Date	6023
	93		Reserved - Mfg.	
9A	94	0	Ign. Off Time	602C
	95		Reserved - -Mfg.	
9B	96		Reserved - SAE	
	97		Reserved - SAE	
9C	98		Reserved - Mfg.	
	99		Reserved - Mfg.	
9D	9A	0	Accum. Ign. On Time	6025
	9B		Reserved - Mfg.	
9E	9C		Reserved - SAE	
	9D		Reserved - Mfg.	
9F	9E	0	Fuel Consumed	6026
	9F		Reserved - Mfg.	
B0	A0	0	Distance to Empty	6027
	A1		Reserved - SAE	
B1	A2	0	Fuel Economy, Average	6029, 6028
	A3		Reserved - Mfg.	
B2	A4	0	Fuel Tank Level	6005
	A5		Reserved - Mfg.	
B3	A6		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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FRAME ID				
7 Bit	8 Bit	IFR Type	Function	PRNs
	A7		Reserved - Mfg.	
B4	A8		Reserved - SAE	
	A9		Reserved - SAE	
B5	AA		Reserved - Mfg.	
	AB		Reserved - Mfg.	
B6	AC		Reserved - Mfg.	
	AD		Reserved - Mfg.	
B7	AE		Reserved - Mfg.	
	AF		Reserved - Mfg.	
B8	B0		Reserved - Mfg.	
	B1		Reserved - Mfg.	
B9	B2		Reserved - SAE	
	B3		Reserved - SAE	
BA	B4		Reserved - Mfg.	
	B5		Reserved - Mfg.	
BB	B6		Reserved - Mfg.	
	B7		Reserved - Mfg.	
BC	B8		Reserved - Mfg.	
	B9		Reserved - Mfg.	
BD	BA		Reserved - Mfg.	
	BB		Reserved - Mfg.	
BE	BC		Reserved - Mfg.	
	BD		Reserved - Mfg.	
BF	BE		Reserved - Mfg.	
	BF		Reserved - Mfg.	
D0	C0		Reserved - SAE	
	C1		Reserved - SAE	
D1	C2		Reserved - Mfg.	

FIGURE 3—FRAME IDs FOR SINGLE BYTE FORMS OF HEADERS (CONTINUED)

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