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SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J2178/2

Issued 1993-06-29

CLASS B DATA COMMUNICATION NETWORK MESSAGES
PART 2: DATA PARAMETER DEFINITIONS

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1. **Scope**—This SAE Recommended Practice defines the information contained in the header and data fields of non-diagnostic 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 non-diagnostic 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 data fields. The description of the network interface hardware, basic protocol definition, the electrical specifications, and the CRC byte are given in SAE J1850.

```
              <----- SAE J2178 ----->

   |       |              |            |            |       |
   |  SOF  | Header Field | Data Field |  CRC byte  |  EOF  |
   |       |              |            |            |       |
```
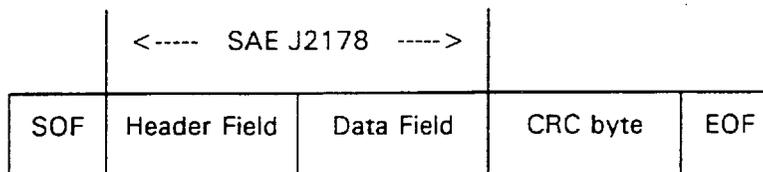
FIGURE 1—SCOPE OF SAE J2178 FOR A SAE J1850
FRAME WITHOUT IN-FRAME RESPONSE (IFR)

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	<----- SAE J2178 ----->				<-- SAE J2178 -->	
SOF	Header Field	Data Field	CRC byte	EOD	IFR	EOF

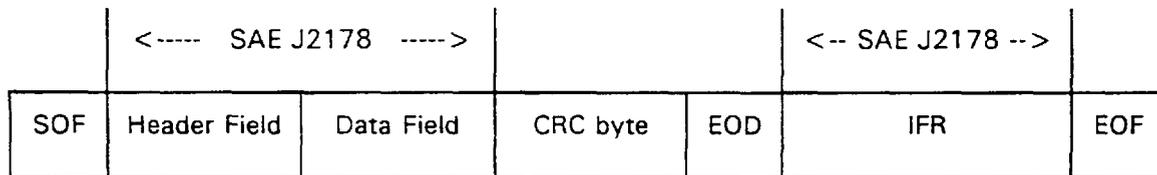FIGURE 2—SCOPE OF SAE J2178 FOR A SAE J1850
FRAME WITH IN-FRAME RESPONSE (IFR)

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 (this part, 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.

Part 3 of SAE J2178 (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: Message Definition for Three Byte Headers) defines the message assignments for 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 non-diagnostic 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 non-diagnostic 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.

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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.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1850—Class B Data Communication Network Interface
SAE J1979—E/E Diagnostic Test Modes
SAE J2190—Enhanced E/E Diagnostic Test Modes

2.1.2 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI/IEEE Std 754-1985, August 12, 1985—IEEE Standard for Binary Floating-Point Arithmetic

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

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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.

2.3.2 EXTENDED ADDRESS—The extended address is a means to allow a message to be addressed to a specific geographical location or zone of the vehicle, independent of any node's physical address.

2.3.3 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" definition).

2.3.4 FRAME ID—The Frame ID is the header byte for the Single Byte Header format and the one byte form of the consolidated header format. The definition of the frame ID is found in SAE J2178, Part 3. This header byte defines the target and source and content of the frame.

2.3.5 FUNCTIONAL ADDRESSING—Functional addressing allows a message to be addressed or sent to one or more nodes on the network interested in that function. Functional addressing is intended for messages that may be of interest to more than a single node. For example, an exterior lamp "off" message could be sent to all nodes controlling the vehicle exterior lamps by using a functional address. The functional address consists of a primary ID and may include a secondary ID and may also include an extended address.

2.3.6 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.

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

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2.3.8 LOAD—The load command indicates the operation of directly replacing the current/existing value of a parameter with the parameter value(s) contained in the message.

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

2.3.10 MODIFY—The modify command indicates the operation of using the message data parameter value to change (e.g., increment, decrement, or toggle) the current/existing value.

2.3.11 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.)

2.3.12 PHYSICAL ADDRESSING—Physical addressing allows a message to be addressed to a specific node or to all nodes or to a non-existent, null node. The information in this message is only of relevance to a particular node, so the other nodes on the bus should ignore the message, except for the case of the "all nodes" address.

2.3.13 PRIMARY ID—The primary ID identifies the target for this functional message. This is the primary discriminator used to group functions into main categories.

2.3.14 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.

2.3.15 REPORT—A report indicates the transmission of parametric data values, based on: a change of state; a change of value; on a periodic rate basis; or as a response to a specific request.

2.3.16 REQUEST—A request is a command to, or a query for data, or action from another node on the network.

2.3.17 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.

2.3.18 SECONDARY ID—The secondary ID (along with the primary ID or Frame ID) identifies the functional target node for a message. The purpose of the secondary ID field within the frame is to further define the function or action being identified by the primary ID.

2.4 Abbreviations and Acronyms

A/C   - Air Conditioning
ASC   - ASCII Encoded SLOT
BCD   - Binary Coded Decimal (BCD) SLOT
BMM   - Bit Mapped with Mask SLOT
BMP   - Bit Mapped without Mask SLOT
CRC   - Cyclic Redundancy Check
CS   - Checksum
DTC   - Diagnostic Trouble Code
EOD   - End of Data
EOF   - End of Frame
ERR   - Error Detection
HVAC - Heating, Ventilation, Air Conditioning
ID   - Identifier
IFR   - In-Frame Response
LSB   - Least Significant Bit/Byte

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MSB - Most Significant Bit/Byte
NB   - Normalization Bit
PID - Parameter IDentification (number, NOT the primary ID, See Section 6)
PKT - Multiple Parameter Packet SLOT
PRN - Parameter Reference Number
SED - State Encoded SLOT
SFP - Signed Floating Point (Scientific Notation) SLOT
SLOT - Scaling, Limit, Offset, and Transfer Function (See Section 7)
SNM - 2's Complement Signed Numeric SLOT
SOF - Start of Frame
UNM - Unsigned Numeric SLOT
VIN - Vehicle Identification Number

3. General Information

3.1 Part 2 Overview—Section 4 provides a description of the parameter reference number (PRN) number groupings used for assigning PRN numbers to individual parameters. Section 5 defines the formats used to define all standard parameters to be used in SAE J2178 messages. Section 6 defines the specific parameter assignments in terms of names, units, and scale factor reference. Section 7 defines the actual parameter specifications (SLOT), in terms of the length, bit resolution, range, scale factor details, etc. Section 8 describes the case of very long parameters which cannot be transmitted in a single message. Appendix A provides a numerical cross reference to assist in finding the correct name of a parameter if the parameter identification number is known. Appendix B is an alphabetical cross reference to assist in finding the correct parameter identification number if the parameter name is known.

The messages contain header fields and data fields, described in Part 1 of SAE J2178. The header field contains target, source, priority, and message type information, while the data field contains optional additional addressing and parametric information. This document defines the parametric information.

For some applications, it is desirable to include multiple parameters in a single message. The multiple parameter format is called a packet in this document. For example, some diagnostic messages consist of combinations of these parameters to improve information density or to insure simultaneous readings of different variables. A very limited set of these combinations are defined here as industry standards but individual manufacturers are free to use this form in manufacturer specific messages, as needed.

3.2 How To Use This Document—This part (Part 2 of SAE J2178) provides the definition of parameters which are commonly found, or could be expected in vehicle Electrical/Electronic Systems today. These parameters have been defined to allow messages on a Class B communication system to have consistent meaning between manufacturers and over time. The parameter definition consists of two parts, the "PRN" and the "SLOT." The "PRN" (Parameter Reference Number) is a number used to identify a specific parameter by name, unit of measure, and its associated "SLOT." The "SLOT" defines the mathematical characteristics of parameters in terms of its representation (Binary, Unsigned Numeric, ASCII, BCD, etc.), its scaling (1 Bit =), its limits and offsets, and its transfer function.

To find a parameter by name or PRN number, Appendices A and B provide cross references to the page of this document where the PRN can be found. The PRN numbers have also been grouped by subsystem to enable the reader to look for parameters if the name is not known.

If the parameter has not as yet been included in the list of PRNs, users can define new parameters in terms of the SLOTs which have been defined.

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4. *Parameter Reference Number (PRN) Structure*—Parameter Reference Numbers (PRNs) are used to simplify documentation. They do not, in themselves, have particular significance. PRNs do allow simplification of reference, particularly for diagnostic purposes. To this end, a structure for PRN number assignments has been developed. The structure is described in the following paragraphs. Some of the PRN numbers are assigned or reserved for SAE definitions but the majority are reserved for individual motor vehicle manufacturers to coordinate and assign.

All PRN addresses are two bytes long, with the first byte identifying a grouping or classification reference (refer to Tables 1 and 2). The second byte is then a sequence number pointing to the specific parameter used (refer to Tables 4 through 19). There has not been any attempt made to group or commonize the meaning in the second byte. The specific assignments are found in Section 6. Note that all PRN addresses are listed as hexidecimal numbers throughout this document.

SAE J1979 refers to PID numbers which are a single byte reference number. The first 256 PRNs defined here (first byte = 00), are identical with the SAE J1979 PID definitions.

Figure 3 shows the basic structure of PRNs and Tables 1 and 2 show bit assignments and address ranges based on these assignments.
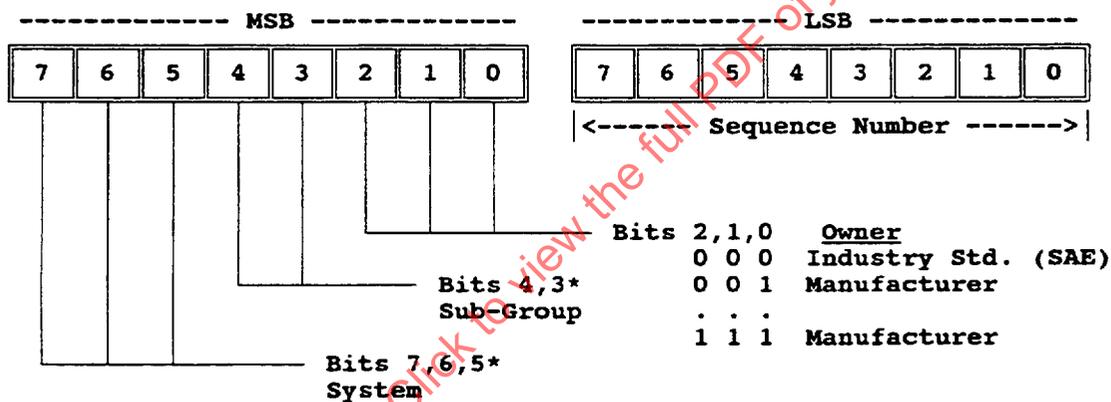
FIGURE 3—PRN STRUCTURE

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TABLE 1 — PRN GROUPINGS

7 6 5	System	4 3	Subgroup	Address (Hex)
0 0 0	Powertrain	0 0	J1979 Compatible	0000-00FF
		0 0	Reserved	0100-07FF
		0 1	Reserved	0800-0FFF
		1 0	Engine	1000-17FF
		1 1	Transmission	1800-1FFF
0 0 1	Chassis	0 0	Reserved	2000-27FF
		0 1	Brakes/Tires/Wheels	2800-2FFF
		1 0	Steering	3000-37FF
		1 1	Suspension	3800-3FFF
0 1 0	Body 1	0 0	Reserved	4000-47FF
		0 1	Reserved	4800-4FFF
		1 0	Reserved	5000-57FF
		1 1	Restraints	5800-5FFF
0 1 1	Body 2	0 0	Driver Info.	6000-67FF
		0 1	Reserved	6800-6FFF
		1 0	Lighting	7000-77FF
		1 1	Reserved	7800-7FFF
1 0 0	Body 3	0 0	Audio	8000-87FF
		0 1	Reserved	8800-8FFF
		1 0	Pers. Comm.	9000-97FF
		1 1	HVAC	9800-9FFF
1 0 1	Body 4	0 0	Convenience	A000-A7FF
		0 1	Reserved	A800-AFFF
		1 0	Reserved	B000-B7FF
		1 1	Reserved	B800-BFFF
1 1 0	Other 1	0 0	Security	C000-C7FF
		0 1	Reserved	C800-CFFF
		1 0	Reserved	D000-D7FF
		1 1	Reserved	D800-DFFF
1 1 1	Other 2	0 0	Config. Codes	E000-E7FF
		0 1	Reserved	E800-EFFF
		1 0	Tester/Diag.	F000-F7FF
		1 1	Miscellaneous	F800-FFFF

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TABLE 2—SAE/MFG PRN RANGES

System	Subgroup	Address Map	Size
Powertrain	J1979 Compatible - SAE	0000 - 00FF	0.25K
	Reserved - MFG	0100 - 07FF	1.75K
	Reserved - SAE	0800 - 08FF	0.25K
	Reserved - MFG	0900 - 0FFF	1.75K
	Engine - SAE	1000 - 10FF	0.25K
	Engine - MFG	1100 - 17FF	1.75K
	Transmission - SAE	1800 - 18FF	0.25K
	Transmission - MFG	1900 - 1FFF	1.75K
Chassis	Reserved - SAE	2000 - 20FF	0.25K
	Reserved - MFG	2100 - 27FF	1.75K
	Brakes/Tires/Wheels - SAE	2800 - 28FF	0.25K
	Brakes/Tires/Wheels - MFG	2900 - 2FFF	1.75K
	Steering - SAE	3000 - 30FF	0.25K
	Steering - MFG	3100 - 37FF	1.75K
	Suspension - SAE	3800 - 38FF	0.25K
	Suspension - MFG	3900 - 3FFF	1.75K
Body 1	Reserved - SAE	4000 - 40FF	0.25K
	Reserved - MFG	4100 - 47FF	1.75K
	Reserved - SAE	4800 - 48FF	0.25K
	Reserved - MFG	4900 - 4FFF	1.75K
	Reserved - SAE	5000 - 50FF	0.25K
	Reserved - MFG	5100 - 57FF	1.75K
	Restraints - SAE	5800 - 5800	0.25K
	Restraints - MFG	5900 - 5FFF	1.75K
Body 2	Driver Information - SAE	6000 - 60FF	0.25K
	Driver Information - MFG	6100 - 67FF	1.75K
	Reserved - SAE	6800 - 68FF	0.25K
	Reserved - MFG	6900 - 6FFF	1.75K
	Lighting - SAE	7000 - 70FF	0.25K
	Lighting - MFG	7100 - 77FF	1.75K
	Reserved - SAE	7800 - 78FF	0.25K
	Reserved - MFG	7900 - 7FFF	1.75K

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TABLE 2—SAE/MFG PRN RANGES (CONTINUED)

System	Subgroup	Address Map	Size
Body 3	Audio - SAE	8000 - 80FF	0.25K
	Audio - MFG	8100 - 87FF	1.75K
	Reserved - SAE	8800 - 88FF	0.25K
	Reserved - MFG	8900 - 8FFF	1.75K
	Personal Communications - SAE	9000 - 90FF	0.25K
	Personal Communications - MFG	9100 - 97FF	1.75K
	HVAC - SAE	9800 - 98FF	0.25K
	HVAC - MFG	9900 - 9FFF	1.75K
Body 4	Convenience - SAE	A000 - A0FF	0.25K
	Convenience - MFG	A100 - A7FF	1.75K
	Reserved - SAE	A800 - A8FF	0.25K
	Reserved - MFG	A900 - AFFF	1.75K
	Reserved - SAE	B000 - B0FF	0.25K
	Reserved - MFG	B100 - B7FF	1.75K
	Reserved - SAE	B800 - B8FF	0.25K
	Reserved - MFG	B900 - BFFF	1.75K
Other 1	Security - SAE	C000 - C0FF	0.25K
	Security - MFG	C100 - C7FF	1.75K
	Reserved - SAE	C800 - C8FF	0.25K
	Reserved - MFG	C900 - CFFF	1.75K
	Reserved - SAE	D000 - D0FF	0.25K
	Reserved - MFG	D100 - D7FF	1.75K
	Reserved - SAE	D800 - D8FF	0.25K
	Reserved - MFG	D900 - DFFF	1.75K
Other 2	Configuration Codes - SAE	E000 - E0FF	0.25K
	Configuration Codes - MFG	E100 - E7FF	1.75K
	Reserved - SAE	E800 - E8FF	0.25K
	Reserved - MFG	E900 - EFFF	1.75K
	Tester/Diagnostics - SAE	F000 - F0FF	0.25K
	Tester/Diagnostics - MFG	F100 - F7FF	1.75K
	Miscellaneous - SAE	F800 - F8FF	0.25K
	Miscellaneous - MFG	F900 - FFFF	1.75K

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5. *Parameter Formats*—Parameter values are represented in bit, byte, word, and multi-byte forms. The length of the parameter is uniquely associated with the message header and any included secondary ID field. These parameter definitions are referenced by one or more messages. The parameters allow a wide variety of variables, data definitions,and representations to provide the ability to use this definition for all messages, even when the industry standard messages are not useful for particular applications.

5.1 **Bit Mapped Parameters**—The bit mapped parameters, that is, those which have only two logical values (for example: True/False), are handled in one of two ways. The "Q" bit described in Section 6 of Part 1 of SAE J2178, is used if there is only one bit of information. In many cases, however, the bit values are associated together and form byte groupings, generally around common functional characteristics. Bit mapped data are transmitted either with or without corresponding mask bytes as described as follows.

5.1.1 BIT MAPPED DATA WITHOUT MASK BYTE(S)—In some cases, such as configuration identification, there is information which can be grouped as binary bits which represent whether, for example, a function or test is supported in a system. This form does not allow the bits to be supplied from different nodes in the network. If the bits potentially come from more than one node, the form with mask bytes described in 5.1.2, is used. The general form of the bit data bytes without mask is shown in Figure 4.

....	Data Byte 1	...	Data Byte N	....
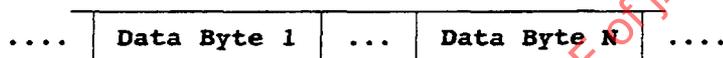
FIGURE 4—BIT DATA FIELD WITHOUT MASK FORMAT

For these bit data cases, the bit names (that is: items) are somewhat different to emphasize the difference in format. These names are shown in Figure 5. If there is more than one byte of data of this form, the item numbers are incremented by one, sequentially, beginning at one from the MSB of the first byte.

MSB   LSB

...	Bit 7 Item 1	Bit 6 Item 2	Bit 5 Item 3	Bit 4 Item 4	Bit 3 Item 5	Bit 2 Item 6	Bit 1 Item 7	Bit 0 Item 8	...
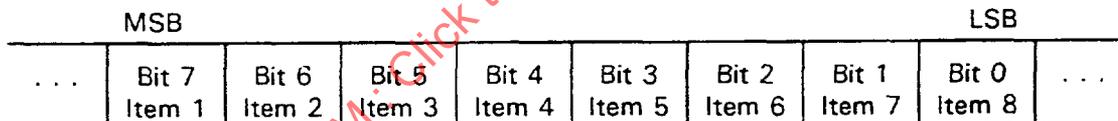
FIGURE 5—BITS WITHOUT MASK BYTE

For definition purposes, it is also possible to describe a single or multiple bit group which is smaller than a byte but which are combined into a byte or multiple bytes when the complete message is defined. This is a convenience used in this document to define some parameters. This definition notation applies equally to byte(s) with or without masks.

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5.1.2 BIT MAPPED DATA WITH MASK BYTE(S)—For bit mapped data value groups that may come from several nodes or may not be valid for an application, a special format has been defined. Figures 6 and 7 show the data byte formats used. The data format allows two options in the number of bits in a group; 8 or 16. Since the defined bits for such groupings may not always come from a single network node, the format includes mask bytes indicating if an individual bit is valid for this message or if it should be ignored. The mask bytes map directly to the data bits with which they are associated. Figures 8 and 9 show how these bits are mapped within each byte. Table 3 shows the bit value for the mask bits.

. . .	Data Byte	Mask Byte	. . .

FIGURE 6—FORMAT FOR 8-BIT DATA WITH MASK

. . .	Data Byte 1	Mask Byte 1	Data Byte 2	Mask Byte 2	. . .

FIGURE 7—FORMAT FOR 16-BIT DATA WITH MASK

MSB   LSB

. . .	Bit 7 Item 1	Bit 6 Item 2	Bit 5 Item 3	Bit 4 Item 4	Bit 3 Item 5	Bit 2 Item 6	Bit 1 Item 7	Bit 0 Item 8	. . .

FIGURE 8—BIT MAPPED DATA BYTE

MSB   LSB

. . .	Mask Bit 7 Item 1	Mask Bit 6 Item 2	Mask Bit 5 Item 3	Mask Bit 4 Item 4	Mask Bit 3 Item 5	Mask Bit 2 Item 6	Mask Bit 1 Item 7	Mask Bit 0 Item 8	. . .

FIGURE 9—BIT MAPPED MASK BYTE

TABLE 3—MASK BIT ASSIGNMENT

Mask Bit	Bit Mapped Masking
0	Not A Valid Bit
1	Valid Bit

5.1.3 BIT VALUES—The general form of binary data is that 1 = true and 0 = false. One bit can carry a wide variety of interpretations, depending on the subject that it describes.

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5.2 Byte (8 Bit) Parameters—Data parameters which can be expressed in 8 bits or less are expressed in a byte format. Byte parameters are the most common format. Figure 10 shows this format.

```
      +-----------+
 . . .| Data Byte | . . .
      +-----------+
```

FIGURE 10—BYTE PARAMETERS

5.3 Word (16 Bit) Parameters—Data parameters which can be expressed in 9 to 16 bits are expressed in word format with the most significant byte transmitted first (high byte/low byte). Figure 11 shows this format.

```
      +-------------+-------------+
 . . .| Data Byte 1 | Data Byte 2 | . . .
      +-------------+-------------+
```
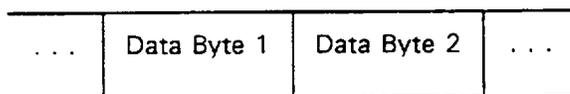
FIGURE 11—WORD PARAMETERS

5.4 Multi-Byte (>16 Bit) Parameters—Data parameters which can be expressed in more than 16 bits are expressed in multi-byte format with the most significant byte transmitted first (highest byte /.../ lowest byte). Figure 12 shows this format.

```
      +-------------+-------+-------------+
 . . .| Data Byte 1 | . . . | Data Byte N | . . .
      +-------------+-------+-------------+
```

FIGURE 12—MULTI-BYTE PARAMETERS

5.5 Multiple Parameter Packets—It is often useful to group parameters together into a packet to increase the information density of messages. For example, sending a fluid level and maximum capacity value in the same message, or a packet of single bit(s) or multiple bit definitions that may be smaller than a full byte, can be combined in this way. Parameter packets will be defined in this document in the same way as any other parameter, having a packet PRN number and SLOT reference assignment. If bit mapped parameters are included in a packet, the bit mapped byte(s) and the associated mask byte(s) are grouped together as a set representing a parameter. Thus, the data bytes and mask bytes for each parameter are together within the packet. Note that packets may be made of other packets, but each will be uniquely defined by combining each subpart into a message. Figure 13 shows the general form of a parameter packet.

```
      +-------------+-------+-------------+
 . . .| Parameter 1 | . . . | Parameter N | . . .
      +-------------+-------+-------------+
```
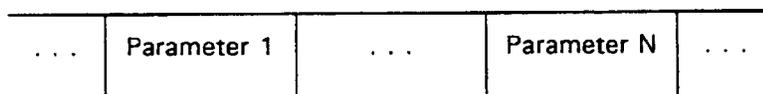
FIGURE 13—MULTIPLE PARAMETER PACKETS

A few examples, such as some of the SAE J1979 compatible PRN definitions in Section 6 will make this format clear.

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6. *Specific Parameter (PRN) Assignments*—This section defines industry standard parameters used in messages found in parts 3 and 4. These parameters have been listed in random order based on when they were defined. Note that any PRN address in the SAE range that is not currently defined is reserved for SAE use. Cross references are provided in Appendices A and B of this part of SAE J2178 to assist the reader in finding the specific definition for each parameter.

6.1 **Specific Parameters**—The following definitions include the Parameter Reference Number (PRN), parameter name, units of measure, and associated SLOT number. The SLOT number is a reference to the Scaling, Limit, Offset, and Transfer function (SLOT) definition found in Section 7 as follows. The SLOT reference numbers have a format of: F-N-#, where F is a three-letter mnemonic indicating the format code type (see Section 7), N is the number of bits in the parameter, and # is the sequence number for that type of SLOT. There is no relationship between sequence numbers for different format codes or number of bytes. Note that the sequence number is randomly assigned. Decimal sequence numbers of 1000 and above are available for manufacturers to assign. All SAE-assigned sequence numbers will be in the range from 1 to 999 exclusively and are not to be used by manufacturers. The sequence number ZERO (0) has the special purpose of a fill sequence which is used in packet definitions. The ZERO sequence number is all zeros, for the number of bits specified. The Parameter Reference Numbers (PRNs) are the index reference used by the message definitions found in Parts 3 and 4 of this document. The specific parameters are grouped as follows:

- Table 4 - SAE J1979 Compatible PRN Assignments
- Table 5 - Engine PRN Assignments
- Table 6 - Transmission PRN Assignments
- Table 7 - Brakes/Tires/Wheels PRN Assignments
- Table 8 - Steering PRN Assignments
- Table 9 - Suspension PRN Assignments
- Table 10 - Restraints PRN Assignments
- Table 11 - Driver Information PRN Assignments
- Table 12 - Lighting PRN Assignments
- Table 13 - Audio PRN Assignments
- Table 14 - Personal Communication PRN Assignments
- Table 15 - HVAC PRN Assignments
- Table 16 - Convenience PRN Assignments
- Table 17 - Security PRN Assignments
- Table 18 - Configuration Codes PRN Assignments
- Table 19 - Tester/Diagnostics PRN Assignments
- Table 20 - Miscellaneous PRN Assignments

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TABLE 4—SAE J1979 COMPATIBLE PRN ASSIGNMENTS
(PRNs 0000 - 00FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
0000	PIDs Supported (01h - 20h)	-	Bit Mapped	BMP-32-1
0001	Number of Emission-Related Trouble Codes & MIL Status	-	Packeted	PKT-32-1
0002	Trouble Code That Caused Freeze Frame Storage	-	Packeted	PKT-16-1
0003	Fuel System Status	-	Packeted	PKT-16-2
0004	Calculated Load Value	100/255	% Full Load	UNM-08-61
0005	Engine Coolant Temperature	1	Degrees Centigrade	UNM-08-102
0006	Short Term Fuel Trim - Bank 1	100/128	% Enrichment	UNM-08-92
0007	Long Term Fuel Trim - Bank 1	100/128	% Enrichment	UNM-08-92
0008	Short Term Fuel Trim - Bank 2	100/128	% Enrichment	UNM-08-92
0009	Long Term Fuel Trim - Bank 2	100/128	% Enrichment	UNM-08-92
000A	Fuel Pressure (Gage)	3	kPaG	UNM-08-131
000B	Intake Manifold Absolute Pressure	1	kPaA	UNM-08-101
000C	Engine RPM - High Resolution	1/4	RPM	UNM-16-31
000D	Vehicle Speed - Low Resolution - Metric	1	km/h	UNM-08-101
000E	Ignition Timing Advance (#1)	1/2	Degrees before TDC	UNM-08-72
000F	Intake Air Temperature	1	Degrees Centigrade	UNM-08-102
0010	Air Flow Rate from MAF	1/100	grams/sec	UNM-16-11
0011	Absolute Throttle #1 Position	100/255	% Full Throttle	UNM-08-61
0012	Commanded Secondary Air	-	Bit Mapped	BMP-08-5
0013	Oxygen Sensor Location	-	Bit Mapped	BMP-08-6
0014	Oxygen Sensor - BANK 1 - Sensor 1	-	Packeted	PKT-16-3
0015	Oxygen Sensor - BANK 1 - Sensor 2	-	Packeted	PKT-16-3
0016	Oxygen Sensor - BANK 1 - Sensor 3	-	Packeted	PKT-16-3
0017	Oxygen Sensor - BANK 1 - Sensor 4	-	Packeted	PKT-16-3
0018	Oxygen Sensor - BANK 2 - Sensor 1	-	Packeted	PKT-16-3
0019	Oxygen Sensor - BANK 2 - Sensor 2	-	Packeted	PKT-16-3
001A	Oxygen Sensor - BANK 2 - Sensor 3	-	Packeted	PKT-16-3
001B	Oxygen Sensor - BANK 2 - Sensor 4	-	Packeted	PKT-16-3

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TABLE 4—SAE J1979 COMPATIBLE PRN ASSIGNMENTS
(PRNs 0000 - 00FF)
(CONTINUED)

PRN	Parameter Name	Resolution (1 BIT =)	Units of Measure	SLOT # (F-N-#)
001C	Reserved SAE	-	-	-
001D	Reserved SAE	-	-	-
001E	Reserved SAE	-	-	-
001F	Reserved SAE	-	-	-
0020	PIDs Supported (21h - 40h)	-	Bit Mapped	BMP-32-2
0021-003F	Reserved SAE	-	-	-
0040	PIDs Supported (41h - 60h)	-	Bit Mapped	BMP-32-3
0041-00FF	Reserved SAE	-	-	-

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TABLE 5—ENGINE PRN ASSIGNMENTS
(PRNs 1000 - 10FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
1000	MIL Status	-	Bit Mapped	BMP-01-1
1001	Number of Emissions Related DTCs	1	Quantity	UNM-07-1
1002	Continuous Evaluation Supported	-	Bit Mapped	BMP-08-1
1003	Trip Evaluation Supported	-	Bit Mapped	BMP-08-2
1004	Trip Evaluation Complete	-	Bit Mapped	BMP-08-3
1005	Sub-System Category of DTC	-	State Encoded	SED-02-1
1006	Most Significant Digit of DTC	-	State Encoded	SED-02-2
1007	Lower 3 Digits of DTC	-	BCD	BCD-12-1
1008	Fuel System Status - Bank 1	-	Bit Mapped	BMP-08-4
1009	Fuel System Status - Bank 2	-	Bit Mapped	BMP-08-4
100A	Oxygen Sensor Voltage	1/200	volts	UNM-08-11
100B	Short Term Fuel Trim	100/128	% Enrichment	UNM-08-92
100D	Most Significant Digit of VIN Number	-	ASCII	ASC-08-01
100E	A/C Clutch Load	25	Watts	UNM-08-165
1015	Injector On Time	2048	microseconds	UNM-08-231
1019	Crankshaft Torque - Absolute	4	N·m Torque	UNM-08-141
1020	Crankshaft Torque - Percent	100/255	% Maximum Torque	UNM-08-61
1021	Engine Boost	100/255	% Full Boost	UNM-08-61
1022	Engine RPM - Low Resolution	32	RPM	UNM-08-171
1023	Engine Idle RPM	16	RPM	UNM-08-161
1024	Engine Revolutions	2	Quantity	UNM-08-121
1025	Barometric Pressure	1	kPaA	UNM-08-101
1026	Engine Coolant Level - Percent	1/2	% Full	UNM-08-71
1027	Engine Coolant Level - Volume	1/10	liters	UNM-08-41
1028	Engine Coolant Capacity	1/10	liters	UNM-08-41
1029	Engine Coolant Pressure	4	kPaG	UNM-08-141
102A	Engine Coolant Fan #1 Speed	100/255	% Full On	UNM-08-61
102B	Engine Oil Temperature	1	Degrees Centigrade	UNM-08-102
102C	Engine Oil Level - Percent	1/2	% Full	UNM-08-71

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TABLE 5—ENGINE PRN ASSIGNMENTS
(PRNs 1000 - 10FF)
(CONTINUED)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
102D	Engine Oil Level - Volume	1/10	liters	UNM-08-41
102E	Engine Oil Capacity	1/10	liters	UNM-08-41
102F	Engine Oil Pressure	4	kPaG	UNM-08-141
1030	Engine Oil Remaining Life	100/255	% Remaining Life	UNM-08-61
1031	Hydraulic Fan Speed	100/255	% Full On	UNM-08-61
1032	Methanol Content	100/255	% Methanol	UNM-08-61
1033	Maximum Crankshaft Torque	4	N·m Torque	UNM-08-141
1034	Accelerator Pedal Position	100/255	% Pressed Down	UNM-08-61
1035	Absolute Throttle #2 Position	100/255	% Full Throttle	UNM-08-61
1036	Absolute Throttle #3 Position	100/255	% Full Throttle	UNM-08-61
1037	Bank #1 - Converter #1 Temperature	8	Degrees Centigrade	UNM-08-151
1038	Bank #1 - Converter #2 Temperature	8	Degrees Centigrade	UNM-08-151
1039	Bank #2 - Converter #1 Temperature	8	Degrees Centigrade	UNM-08-151
103A	Bank #2 - Converter #2 Temperature	8	Degrees Centigrade	UNM-08-151
103B	Engine Coolant #2 Fan Speed	100/255	% Full On	UNM-08-61
103C	Engine Coolant Temperature - Low Range	1	Degrees Centigrade	UNM-08-104
103D	Engine Coolant Remaining Life	100/255	% Remaining Life	UNM-08-61
103F	Engine Oil Viscosity	1/10	Centistokes (cSt)	UNM-08-41
1040	Number of Engine Cylinders	1	Quantity	UNM-08-101
1041	Number of Valves per Cylinder	1	Quantity	UNM-08-101
1043	Engine Displacement	1/10	liters	UNM-08-41
1044	Fuel Temperature	1	Degrees Centigrade	UNM-08-102
1047	Ignition Switch Position	-	State Encoded	SED-08-5
1048	Engine Redline - Low Resolution	32	RPM	UNM-08-171
1049	Engine Redline - High Resolution	1/4	RPM	UNM-16-31

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TABLE 6—TRANSMISSION PRN ASSIGNMENTS
(PRNs 1800 - 18FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
1801	Transmission Fluid Level - Percent	1/2	% Full	UNM-08-71
1802	Transmission Fluid Level - Volume	1/10	liters	UNM-08-41
1803	Transmission Fluid Capacity	1/10	liters	UNM-08-41
1804	Transmission Oil Life	100/255	% Remaining Life	UNM-08-61
1805	Transmission Gear & Lockup Status	-	Packeted	PKT-08-1
1806	Transmission Range Actual (PRNDL)	-	State Encoded	SED-08-4
1807	Transmission Lockup Status	-	State Encoded	SED-02-3
1808	Transmission Actual Gear	-	State Encoded	SED-06-1
1809	Transmission Range Selected (PRNDL)	-	State Encoded	SED-08-4
180A	Transmission Transfer Case (4WD)	-	State Encoded	SED-08-6
180B	Transmission Fluid Temperature	1	Degrees Centigrade	UNM-08-102
180C	Transmission Fluid Pressure	8	kPaG	UNM-08-151
180D	Transmission Commanded Gear	-	State Encoded	SED-08-4
180E	Transmission Actual Gear	-	State Encoded	SED-08-4

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TABLE 7—BRAKES/TIRES/WHEELS PRN ASSIGNMENTS
(PRNs 2800 - 28FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
2801	Wheel Speed - Low Resolution	1	km/h	UNM-08-101
2802	Wheel Speed - High Resolution	1/128	km/h	UNM-16-5
2809	Wheel Slip	1/255	Dimensionless	UNM-08-6
2819	Hydraulic Brake Fluid Supply Pump Pressure	32	kPaG	UNM-08-171
281A	Hydraulic Brake Fluid Temperature	1	Degrees Centigrade	UNM-08-102
281B	Hydraulic Brake Fluid Recirculation Pump Pressure	1	kPaG	UNM-08-101
2821	Wheel Rate		SAE Reserved	SAE Reserved
2829	Wheel Angular Velocity		SAE Reserved	SAE Reserved
2831	Wheel Angular Acceleration		SAE Reserved	SAE Reserved
2839	Wheel Load	100/255	% Full Load	UNM-08-61
2841	Brake Fluid Level - Percent	1/2	% Full	UNM-08-71
2842	Brake Fluid Level - Volume	1/100	liters	UNM-08-15
2843	Brake Fluid Remaining Life	100/255	% Remaining Life	UNM-08-61
2844	Brake Fluid Capacity	1/100	liters	UNM-08-15
2849	Tire Temperature	1	Degrees Centigrade	UNM-08-102
2851	Tire Pressure	4	kPaG	UNM-08-141
2859	Tire Type		SAE Reserved	SAE Reserved
2861	Tire Tread Wear Level	100/255	% tread remaining	UNM-08-61

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TABLE 8—STEERING PRN ASSIGNMENTS
(PRNs 3000 - 30FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
3001	Steering Wheel Angle	6	Degrees CW from center	SNM-08-61
3005	Power Steering Fluid Temperature	1	Degrees Centigrade	UNM-08-102
3006	Power Steering Fluid Pressure	100	kPaG	UNM-08-185
3007	Power Steering Fluid Level - Percent	1/2	% Full	UNM-08-71
3008	Power Steering Fluid Level - Volume	1/100	liters	UNM-08-15
3009	Power Steering Fluid Remaining Life	100/255	% Remaining Life	UNM-08-61
300B	Power Steering Fluid Capacity	1/100	liters	UNM-08-15
300C	Steering Wheel Rate	1	RPM	UNM-08-101
300D	Steering Wheel Torque	1	N·m Torque	UNM-08-101
300E	Wheel Steer Angle	1/2	Degrees CW from Center	SNM-08-11

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TABLE 9—SUSPENSION PRN ASSIGNMENTS
(PRNs 3800 - 38FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
3801	Lateral Acceleration		SAE Reserved	SAE Reserved
3802	Longitudinal Acceleration		SAE Reserved	SAE Reserved
3803	Yaw Acceleration		SAE Reserved	SAE Reserved
3804	Suspension Ride Setting	100/255	% Stiff Setting	UNM-08-61
3805	Suspension Fluid Temperature	1	Degrees Centigrade	UNM-08-102
3806	Suspension Fluid Pressure	100	kPaG	UNM-08-185
3807	Suspension Fluid Level - Percent	1/2	% Full	UNM-08-71
3808	Suspension Fluid Level - Volume	1/32	liters	UNM-08-26
3809	Suspension Fluid Remaining Life	100/255	% Remaining Life	UNM-08-61
380A	Suspension Fluid Capacity	1/32	liters	UNM-08-26
380B	Vehicle Lateral Velocity		SAE Reserved	SAE Reserved
380C	Vehicle Longitudinal Velocity		SAE Reserved	SAE Reserved
380D	Vehicle Yaw Velocity		SAE Reserved	SAE Reserved

TABLE 10—RESTRAINTS PRN ASSIGNMENTS
(PRNs 5800 - 58FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
5801	Shoulder Belt Position	1	Unscaled A/D Counts	UNM-08-101

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TABLE 11—DRIVER INFORMATION PRN ASSIGNMENTS
(PRNs 6000 - 60FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
6001	Vehicle Speed - High Resolution - Metric	1/128	km/h	UNM-16-5
6002	Vehicle Speed - High Resolution - English	1/128	mph	UNM-16-5
6003	Compass Direction	3/2	Degrees CW from North	SNM-08-51
6004	Odometer - Vehicle - Metric	1/64	kilometers	UNM-32-31
6005	Fuel Level - Percent	100/255	% Full	UNM-08-61
6006	Fuel Level - Volume	1/100	liters	UNM-16-11
6007	Fuel Capacity	1/100	liters	UNM-16-11
600A	Battery Voltage - Low Resolution	1/16	volts	UNM-08-32
600B	Battery Temperature	1	Degrees Centigrade	UNM-08-102
600C	Electrical Energy Load	1	amps	UNM-08-101
600D	Date (Dw$_8$:DD:MM:YY)	-	Packeted	PKT-32-3
600E	Year (YY)	-	BCD	BCD-08-1
600F	Year (Yr)	1	year	UNM-08-103
6010	Month (Mn)	-	State Encoded	SED-04-2
6011	Month (MM)	-	BCD	BCD-08-1
6012	Day of Week (Dw$_4$)	-	State Encoded	SED-04-1
6013	Day of Week (Dw$_8$)	-	State Encoded	SED-08-2
6014	Day of Month (Dm)	-	State Encoded	SED-08-3
6015	Day of Month (DD)	-	BCD	BCD-08-1
6016	Time of Day (HH:MM:SS)	-	Packeted	PKT-24-1
6017	Hours (HH)	-	BCD	BCD-08-1
6018	Minutes (MM)	-	BCD	BCD-08-1
6019	Seconds (SS)	-	BCD	BCD-08-1
601A	Battery Voltage - High Resolution	1/128	volts	UNM-16-5
601B	Distance Traveled - English	1/8000	miles	UNM-08-1
601C	Fuel Used - Metric	1/64	liters	UNM-16-8
601D	Distance To Empty - English	1/10	miles	UNM-16-21
601E	Vehicle Speed - Low Resolution - English	1	MPH	UNM-08-101

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TABLE 11—DRIVER INFORMATION PRN ASSIGNMENTS
(PRNs 6000 - 60FF)
(CONTINUED)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
601F	Hours (Hr) - 0 to 23 numeric	1	hour	UNM-08-101
6020	Average Fuel Economy - Low Resolution - Metric	1	liters/100 kilometers	UNM-08-101
6021	Average Fuel Economy - Low Resolution - English	1	MPG	UNM-08-101
6022	Elapsed Time - Seconds	1	Seconds	UNM-08-101
6023	Date (Dw$_4$\Mn:Dm)	-	Packeted	PKT-16-6
6024	Elapsed Time - Minutes	1	Minutes	UNM-08-101
6025	Accumulated Ignition On Time	-	Packeted	PKT-24-2
6026	Fuel Used - English	1/64	gallons	UNM-16-8
6027	Distance To Empty - Metric	1/10	kilometers	UNM-16-21
6028	Average Fuel Economy - High Resolution - Metric	1/10	liters/100 kilometers	UNM-16-21
6029	Average Fuel Economy - High Resolution - English	1/10	MPG	UNM-16-21
602A	Elapsed Time - Hours	1	Hours	UNM-08-101
602B	Display Brightness	100/255	% Full On	UNM-08-61
602C	Ignition Off Duration	1	Minutes	UNM-08-101
602D	Outside Air Temperature - High Resolution	1/256	Degrees Centigrade	UNM-16-3
602E	Outside Air Temperature Display	1/2	Degrees Centigrade	UNM-08-73
602F	Minutes (Mn) 0 - 59 numeric	1	minute	UNM-08-101
6030	Time (Hr:Mn)	-	Packeted	PKT-16-5
6031	Odometer - Vehicle - High Resolution - English	1/8000	miles	UNM-32-11
6032	Odometer - Trip - High Resolution - English	128/8000	miles	UNM-24-21
6033	Odometer - Vehicle - Low Resolution - English	1/10	miles	UNM-24-11
6034	Odometer - Trip - Low Resolution - English	1/10	miles	UNM-16-21
6035	Charging Voltage - Low Resolution	1/16	volts	UNM-08-32

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TABLE 11—DRIVER INFORMATION PRN ASSIGNMENTS
(PRNs 6000 - 60FF)
(CONTINUED)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
6036	Charging Voltage - High Resolution	1/128	volts	UNM-16-5
6037	Charging Current	1	amps	UNM-08-101
6038	Battery Current	1	amps	SNM-08-21
6039	Odometer - Trip - Metric	1/64	kilometers	UNM-24-41
603A	Instantaneous Fuel Economy - Low Resolution - Metric	1	liters/100 kilometers	UNM-08-101
603B	Fuel Used - Percent	100/255	% Used	UNM-08-61
603C	Fuel Used - Volume	1/100	liters	UNM-16-11
603D	Audible Signal Volume	100/255	% Full Volume	UNM-08-61
603E	Audible Signal Type		SAE Reserved	SAE Reserved
603F	Instantaneous Fuel Economy - High Resolution - Metric	1/10	liters/100 kilometers	UNM-16-21
6040	Instantaneous Fuel Economy - Low Resolution - English	1	MPG	UNM-08-101
6041	Instantaneous Fuel Economy - High Resolution - English	1/10	MPG	UNM-16-21
6042	Seconds (Sc) 0 - 59 numeric	1	seconds	UNM-08-101
6047	Alarm Time (HH:MM:SS)	-	Packeted	PKT-24-1
6049	Elapsed Years	1	years	UNM-08-101
604A	Elapsed Months	1	months	UNM-08-101
604B	Elapsed Days	1	days	UNM-08-101

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TABLE 12—LIGHTING PRN ASSIGNMENTS
(PRNs 7000 - 70FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)

TABLE 13—AUDIO PRN ASSIGNMENTS
(PRNs 8000 - 80FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)

TABLE 14—PERSONAL COMMUNICATION PRN ASSIGNMENTS
(PRNs 9000 - 90FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)

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TABLE 15—HVAC PRN ASSIGNMENTS
(PRNs 9800 - 98FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
9801	HVAC Fan Speed	100/255	% Full On	UNM-08-61
9803	HVAC Door Position	100/255	% Open	UNM-08-61
9804	Electric Defrost Temperature	1	Degrees Centigrade	UNM-08-102
9808	HVAC High-Side Fluid Temperature	1	Degrees Centigrade	UNM-08-102
9809	HVAC Low-Side Fluid Temperature	1	Degrees Centigrade	UNM-08-102
980A	HVAC Low-Side Pressure	5/2	kPaG	UNM-08-125
980B	HVAC Fluid Charge - % Full Charge	100/255	% Full	UNM-08-61
980C	HVAC Fluid Charge - Absolute Weight	10	grams	UNM-08-155
980D	HVAC Fluid Charge Remaining Life	100/255	% Remaining Life	UNM-08-61
980E	HVAC Fluid Charge Capacity	10	grams	UNM-08-155
9810	HVAC Intake Temperature	1/2	Degrees Centigrade	UNM-08-73
9813	HVAC High-Side Pressure	14	kPaG	UNM-08-159
9815	Interior Humidity Level	100/255	% Relative Humidity	UNM-08-61
9816	Interior Air Filter Remaining Life	100/255	% Remaining Life	UNM-08-61
9817	Heat Load Sensor	1/2	mW/cm^2	UNM-08-71
9820	Interior Set Temperature	1/2	Degrees Centigrade	UNM-08-73
9830	HVAC Zone Temperature	1/2	Degrees Centigrade	UNM-08-73

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TABLE 16—CONVENIENCE PRN ASSIGNMENTS
(PRNs A000 - A0FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
A001	Seat Temperature	1/2	Degrees Centigrade	UNM-08-73
A003	Wiper Mode	-	State Encoded	SED-08-1
A004	Wiper Delay	1/4	seconds	UNM-08-51
A006	Washer Fluid Temperature	1	Degrees Centigrade	UNM-08-102
A007	Washer Fluid Pressure	4	kPaG	UNM-08-141
A008	Washer Fluid Level - Percent	100/255	% Full	UNM-08-61
A009	Washer Fluid Level - Volume	1/10	liters	UNM-08-41
A00A	Washer Fluid Capacity	1/10	liters	UNM-08-41
A00C	Mirror Dimming Level	100/255	% Full Dim	UNM-08-61
A00D	Mirror Horizontal Position	1	Unscaled A/D Counts	UNM-08-101
A00E	Mirror Vertical Position	1	Unscaled A/D Counts	UNM-08-101
A00F	Window Position	1	Unscaled A/D Counts	UNM-08-101
A010	Door Lock Cylinder State	-	State Encoded	SED-08-7
A011	Steering Column Horizontal Position	1	Unscaled A/D Counts	UNM-08-101
A012	Steering Column Vertical Position	1	Unscaled A/D Counts	UNM-08-101
A014	Autolamp Off Delay Time	1	Seconds	UNM-08-101
A015	Vehicle Speed Setting - Low Resolution - Metric	1	km/h	UNM-08-101
A016	Vehicle Speed Setting - High Resolution - Metric	1/128	km/h	UNM-16-5
A017	Vehicle Speed Setting - Low Resolution - English	1	MPH	UNM-08-101
A018	Vehicle Speed Setting - High Resolution - English	1/128	MPH	UNM-16-5

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TABLE 17—SECURITY PRN ASSIGNMENTS
(PRNs C000 - C0FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
C001	Remote Transmitter ID	1	ID Number	UNM-08-101

TABLE 18—CONFIGURATION CODES PRN ASSIGNMENTS
(PRNs E000 - E0FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
E021	Vehicle Id Number (VIN) #1	-	VIN character 1	PKT-32-2
E022	Vehicle Id Number (VIN) #2	-	VIN characters 2 - 5	ASC-32-1
E023	Vehicle Id Number (VIN) #3	-	VIN characters 6 - 9	ASC-32-1
E024	Vehicle Id Number (VIN) #4	-	VIN characters 10 - 13	ASC-32-1
E025	Vehicle Id Number (VIN) #5	-	VIN characters 14 - 17	ASC-32-1
E026	Vehicle Id Number (VIN) #6 (reserved for future use)	-	Reserved - SAE	Reserved - SAE
E027	Vehicle Id Number (VIN) #7 (reserved for future use)	-	Reserved - SAE	Reserved - SAE

TABLE 19—TESTER/DIAGNOSTICS PRN ASSIGNMENTS
(PRNs F000 - F0FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)

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TABLE 20—MISCELLANEOUS PRN ASSIGNMENTS
(PRNs F800 - F8FF)

PRN	Parameter Name	Resolution (1 Bit =)	Units of Measure	SLOT # (F-N-#)
F801	One Byte Zero Fill	0	Zero	UNM-08-0
F802	Two Byte Zero Fill	0	Zero	UNM-16-0
F803	Three Byte Zero Fill	0	Zero	UNM-24-0
F804	Four Byte Zero Fill	0	Zero	UNM-32-0
F805	Five Byte Zero Fill	0	Zero	UNM-40-0
F806	Six Byte Zero Fill	0	Zero	UNM-48-0
F807	Seven Byte Zero Fill	0	Zero	UNM-56-0

7. **Scaling, Limit, Offset, and Transfer Function (SLOT) Definitions** — This section defines the parameter scaling, limit(s), offset value, and transfer function for bit, byte, or larger variables. These SLOT definitions have been grouped together to avoid duplication in this document and to offer a common list of definitions for use in assigning new parameter definitions. The wide range of these definitions are expected to cover a large number of applications, and should be used for most new definitions as well. Each of these definitions has been assigned a SLOT number for reference purposes but are formatted to include a three-letter mnemonic representing the format, the parameter length in bits, followed by a random sequence number.

The transfer function is shown in two forms to allow use in implementing messages in modules and in interpreting messages found on a network. The two forms are identical but are solved for each of the two variables. The transfer function defines the relationship between computer units (N) in decimal, and engineering units (E) of the data.

The format of the SLOT, identified by the three-letter mnemonic, indicates the category of bit representation. These formats include:

- Multiple Parameter Packeted   PKT
- Bit Mapped with Mask   BMM
- Bit Mapped without Mask   BMP
- Unsigned Numeric   UNM
- 2's Complement Signed Numeric   SNM
- State Encoded   SED
- ASCII Encoded   ASC
- Binary Coded Decimal (BCD)   BCD
- Signed Floating Point (Scientific Notation)   SFP

These formats for each are described in the following paragraphs.

7.1 **Multiple Parameter Packeted (PKT) SLOTs**—The multiple parameter packet is used to define PRNs which refer to more than one parameter as a group that are related. By grouping multiple parameters, the network bandwidth can be improved, if the groupings are done such that the individual parameters need to be associated such that the each need to be transmitted together. These packets are defined as a sequence of other PRN numbers, in the order that they appear in the message (MSB first). In some cases, a PRN may be assigned to fill bits or bytes with zeros. Each zero fill PRN is an unsigned numeric SLOT with zero as the sequence number.

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7.1.1 MULTIPLE PARAMETER PACKETED ASSIGNMENTS

PKT-08-1   Transmission Gear & Lockup Status (PRN 1805)

MSB	PRN 1807	Transmission Lockup Status	2 bits
LSB	PRN 1808	Transmission Gear Engaged	6 bits

PKT-16-1   Trouble Code That Caused Freeze Frame Storage (PRN 0002)

MSB	PRN 1005	Sub-System Category	2 bits
	PRN 1006	MSB of Trouble Code	2 bits
LSB	PRN 1007	Lower Bytes of Trouble Code - BCD	12 bits

PKT-16-2   Fuel System Status (PRN 0003)

MSB	PRN 1008	Fuel System Status - Bank 1	8 bits
LSB	PRN 1009	Fuel System Status - Bank 2	8 bits

PKT-16-3   Oxygen BANK 1, 2 - Sensor 1, 2, 3, or 4 (PRN 0014 - 001B)

MSB	PRN 100A	Oxygen Sensor Voltage	8 bits
LSB	PRN 100B	Short Term Fuel Trim	8 bits

PKT-16-5   Time (Hr:Mn) (PRN 6030)

MSB	PRN 601F	Hours (0 - 23)	8 bits
LSB	PRN 602F	Minutes (0 - 59)	8 bits

PKT-16-6   Date (Dw$_4$/Mn:Dm) (PRN 6023)

MSB	PRN 6012	Day of Week (1 - 7)	4 bits
	PRN 6010	Month (1 - 12)	4 bits
LSB	PRN 6014	Day of Month (1 - 31)	8 bits

PKT-24-1   Time of Day (HH:MM:SS) (PRN 6016)

MSB	PRN 6017	Hours (HH) - BCD	8 bits
	PRN 6018	Minutes (MM) - BCD	8 bits
LSB	PRN 6019	Seconds (SS) - BCD	8 bits

PKT-24-2   Accumulated Ignition On Time (PRN 6025)

MSB	PRN 602A	Elapsed Time - Hours (0 - 99)	8 bits
	PRN 6024	Elapsed Time - Minutes (0 - 59)	8 bits
LSB	PRN 6022	Elapsed Time - Seconds (0 - 59)	8 bits

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PKT-32-1   Number of Emission-Related Trouble Codes & MIL Status (PRN 0001)

MSB	PRN 1000	MIL Status	1 bit
	PRN 1001	Number of Emission-Related Trouble Codes	7 bits
	PRN 1002	Continuous Evaluation Supported	8 bits
	PRN 1003	Trip Evaluation Supported	8 bits
LSB	PRN 1004	Trip Evaluation Complete	8 bits

PKT-32-2   Vehicle Id Number (VIN) #1 (PRN 0021)

MSB	PRN F803	Three Byte - Zero Fill	24 bits
LSB	PRN 100D	MSB of VIN Number	8 bits

PKT-32-3   Date (Dw$_8$:DD:MM:YY) (PRN 600D)

MSB	PRN 6013	Day of Week (1 - 7)	8 bits
	PRN 6015	Day of Month (DD) - BCD	8 bits
	PRN 6011	Month (MM) - BCD	8 bits
LSB	PRN 600E	Year (YY) - BCD	8 bits

7.2 Bit Mapped Without Mask (BMP) SLOTs—Bit mapped (BMP) SLOTs are used to encode data that typically contains several binary parameters, such as status bits or flags, grouped into a single byte or several bytes. Bit mapped SLOTs can also be used for discrete output control such as warning lamps where each bit would indicate the state of a particular lamp. The data in these bit mapped SLOTs is not followed by a MASK byte. There can be up to 4 bytes of data without a mask.

7.2.1 BIT MAPPED WITHOUT MASK PARAMETER ASSIGNMENTS

BMP-01-1   MIL Status (PRN 1000)

Length:	1 bit	0	1
Item 1:	Malfunction Indicator Lamp (MIL)	Not Commanded On	Commanded On

BMP-08-1   Continuous Evaluation Supported (PRN 1002)

Length:	8 bits	0	1
Item 1:	Not Used		
Item 2:	Not Used		
Item 3:	Not Used		
Item 4:	Not Used		
Item 5:	Not Used		
Item 6:	Comprehensive Component Monitoring	Not Supported	Supported
Item 7:	Fuel System Monitoring	Not Supported	Supported
Item 8:	Misfire Monitoring	Not Supported	Supported

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BMP-08-2   Trip Evaluation Supported (PRN 1002)

		0	1
Length:	8 bits		
Item 1:	EGR System	Not Supported	Supported
Item 2:	Oxygen Sensor Heater	Not Supported	Supported
Item 3:	Oxygen Sensor	Not Supported	Supported
Item 4:	A/C System Refrigerant	Not Supported	Supported
Item 5:	Secondary Air System	Not Supported	Supported
Item 6:	Evaporative Purge System	Not Supported	Supported
Item 7:	Heated Catalyst	Not Supported	Supported
Item 8:	Catalyst	Not Supported	Supported

BMP-08-3   Trip Evaluation Complete (PRN 1004)

		0	1
Length:	8 bits		
Item 1:	EGR System	Test Complete	Test Not Complete
Item 2:	Oxygen Sensor Heater	Test Complete	Test Not Complete
Item 3:	Oxygen Sensor	Test Complete	Test Not Complete
Item 4:	A/C System Refrigerant	Test Complete	Test Not Complete
Item 5:	Secondary Air System	Test Complete	Test Not Complete
Item 6:	Evaporative Purge System	Test Complete	Test Not Complete
Item 7:	Heated Catalyst	Test Complete	Test Not Complete
Item 8:	Catalyst	Test Complete	Test Not Complete

BMP-08-4   Fuel System Status (PRN 1008 & 1009)

		0	1
Length:	8 bits		
Item 1:	Reserved		
Item 2:	Reserved		
Item 3:	Reserved		
Item 4:	Closed Loop, Faulty O_2 Sensor	False	True
Item 5:	Open Loop, Detected Fault	False	True
Item 6:	Open Loop, Driving Conditions	False	True
Item 7:	Closed Loop, Using O_2 Sensor	False	True
Item 8:	Open Loop, Not Ready for Closed	False	True

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BMP-08-5   Commanded Secondary Air Status (PRN 0012)

	0	1
Length: 8 bits		
Item 1: Reserved		
Item 2: Reserved		
Item 3: Reserved		
Item 4: Reserved		
Item 5: Reserved		
Item 6: Atmosphere/Off	Not Supported	Supported
Item 7: Downstream - First Catalyst	Not Supported	Supported
Item 8: Upstream - First Catalyst	Not Supported	Supported

BMP-08-6 O_2 Sensor Location (PRN 0013)

	0	1
Length: 8 bits		
Item 1: Bank 2 - Sensor 4 (B4 - S2)	Not Present	Present
Item 2: Bank 2 - Sensor 3 (B4 - S1)	Not Present	Present
Item 3: Bank 2 - Sensor 2 (B3 - S2)	Not Present	Present
Item 4: Bank 2 - Sensor 1 (B3 - S1)	Not Present	Present
Item 5: Bank 1 - Sensor 4 (B2 - S2)	Not Present	Present
Item 6: Bank 1 - Sensor 3 (B2 - S1)	Not Present	Present
Item 7: Bank 1 - Sensor 2	Not Present	Present
Item 8: Bank 1 - Sensor 1	Not Present	Present

BMP-32-1   PIDs Supported 01h - 20h (PRN 0000)

	0	1
Length: 32 bits		
Byte 1:		
Item 1 - 8: PID 01h - 08h Supported	Not Supported	Supported
Byte 2:		
Item 9 - 16: PID 09h - 10h Supported	Not Supported	Supported
Byte 3:		
Item 17 - 24: PID 11h - 18h Supported	Not Supported	Supported
Byte 4:		
Item 25 - 32: PID 19h - 20h Supported	Not Supported	Supported

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BMP-32-2   PIDs Supported 21h - 40h (PRN 0020)

		0	1
Length:	32 bits		
Byte 1:			
Item 1 - 8: PID 21h - 28h Supported		Not Supported	Supported
Byte 2:			
Item 9 - 16: PID 29h - 30h Supported		Not Supported	Supported
Byte 3:			
Item 17 - 24: PID 31h - 38h Supported		Not Supported	Supported
Byte 4:			
Item 25 - 32: PID 39h - 40h Supported		Not Supported	Supported

BMP-32-3   PIDs Supported 41h - 60h (PRN 0040)

		0	1
Length:	32 bits		
Byte 1:			
Item 1 - 8: PID 41h - 48h Supported		Not Supported	Supported
Byte 2:			
Item 9 - 16: PID 49h - 50h Supported		Not Supported	Supported
Byte 3:			
Item 17 - 24: PID 51h - 58h Supported		Not Supported	Supported
Byte 4:			
Item 25 - 32: PID 59h - 60h Supported		Not Supported	Supported

7.3 Bit Mapped With Mask Bytes (BMM) SLOTs—Bit mapped with mask (BMM) SLOTs are used to encode data that typically contains several binary parameters, such as status bits or flags, grouped into a single byte or several bytes. Bit mapped SLOTs can also be used for discrete output control such as warning lamps where each bit would indicate the state of a particular lamp. The data in these bit mapped SLOTs are always followed by a MASK byte which is used to indicate which bits of the data byte are valid. There can be up to 4 bytes of data including the mask bytes. Valid combinations include up to 2 data bytes each with mask.

7.3.1 BIT MAPPED WITH MASK PARAMETER ASSIGNMENTS—None Defined

7.4 Unsigned Numeric (UNM) SLOTs—Unsigned numeric (UNM) SLOTs are used to encode data that is typically associated with information such as temperature, speed, or percent. The SLOT can be 8, 16, 24, ... 56 bits in length (1 to 7 bytes) and may or may not have an offset. Unsigned numeric SLOTs can also be used for sequential data such as month (1 - 12) or day of month (1 - 31). Each SLOT definition contains a field for: resolution per bit; minimum and maximum value; and transfer function. The transfer function defines the relationship between computer units (N) in decimal, and engineering units (E) of the data.

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7.4.1 UNSIGNED NUMERIC VARIABLE ASSIGNMENTS—The unsigned numeric variables have been grouped as follows:

- Table 21 - ZEROs SLOT Assignments
- Table 22 - UNM-xx, Short (< 8 Bit) SLOTs
- Table 23 - UNM-08, 8 Bit SLOTs
- Table 24 - UNM-16, 16 Bit SLOTs
- Table 25 - UNM-24, 24 Bit SLOTs
- Table 26 - UNM-32, 32 Bit SLOTs Assignments

TABLE 21—ZEROs SLOT ASSIGNMENTS

SLOT #	Description	Length
UNM-01-0	Zero (0)	1 Bit
UNM-02-0	Zero (0)	2 Bits
UNM-03-0	Zero (0)	3 Bits
UNM-04-0	Zero (0)	4 Bits
UNM-05-0	Zero (0)	5 Bits
UNM-06-0	Zero (0)	6 Bits
UNM-07-0	Zero (0)	7 Bits
UNM-08-0	Zero (0)	8 Bits
UNM-16-0	Zero (0)	16 Bits
UNM-24-0	Zero (0)	24 Bits
UNM-32-0	Zero (0)	32 Bits
UNM-40-0	Zero (0)	40 Bits
UNM-48-0	Zero (0)	48 Bits
UNM-56-0	Zero (0)	56 Bits

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TABLE 22 - UNM-xx, SHORT (<8 BIT) SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
01-1	1	0	1	-	E	N	
02-1	1	0	3	-	E	N	
03-1	1	0	7	-	E	N	
04-1	1	0	15	-	E	N	
05-1	1	0	31	-	E	N	
06-1	1	0	63	-	E	N	
07-1	1	0	127	-	E	N	

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TABLE 23 - UNM-08, 8 BIT SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
1	1/8000	0	0.031875	-	E * 8000	N / 8000	=0.000125
2	1/4000	0	0.06375	-	E * 4000	N / 4000	=0.00025
3	1/2000	0	0.1275	-	E * 2000	N / 2000	=0.0005
4	1/1000	0	0.255	-	E * 1000	N / 1000	=0.001
5	1/511	0	0.499	-	E * 511	N / 511	=0.001957
6	1/255	0	1	-	E * 255	N / 255	=0.003922
7	1/100	-1.28	+1.27	-	(E+1.28) * 100	(N / 100) -1.28	=0.01 w/ offset
11	1/200	0	1.275	-	E * 200	N / 200	=0.005
15	1/100	0	2.55	-	E * 100	N / 100	=0.01
21	1/64	0	3.98	-	E * 64	N / 64	=0.0156
26	1/32	0	7.969	-	E * 32	N / 32	=0.03125
31	1/25	0	10.2	-	E * 25	N / 25	=0.04
32	1/16	0	15.94	-	E * 16	N / 16	=0.0625
41	1/10	0	25.5	-	E * 10	N / 10	=0.1
51	1/4	0	63.75	-	E * 4	N / 4	=0.25
55	1/3	0	85	-	E * 3	N / 3	=0.333333
61	100/255	0	100	-	E * 2.55	N / 2.55	=0.39215
71	1/2	0	127.5	-	E * 2	N / 2	=0.5
72	1/2	-64	+63.5	-	(E+64) * 2	(N / 2) -64	=0.5 w/ offset
73	1/2	-40	+87.5	-	(E+40) * 2	(N / 2) -40	=0.5 w/ offset
76	2/3	0	170	-	E * 1.5	N / 1.5	=0.666667
77	2/3	0	100	100.3 to 170	E * 1.5	N / 1.5	=0.666667 w/ limits
81	3/4	0	191.25	-	E / 0.75	N * 0.75	=0.75
82	3/4	-90 (00h)	+90 (F0h)	90.75 (F1h - FFh)	(E+90) /0.75	(N*0.75) -90	=0.75 w/ offset
91	100/128	0	199.22	-	E * 1.28	N / 1.28	=0.78125

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TABLE 23—UNM-08, 8 BIT SLOTs (CONTINUED)

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
92	100/128	-100	+99.22	-	(E+100) * 1.28	(N/1.28) -100	=0.78125 w/ Offset
101	1	0	255	-	E	N	=1
102	1	-40	+215	-	E + 40	N - 40	=1 w/ Offset
104	1	-128	+127	-	E + 128	N - 128	=1 w/ Offset
111	3/2	0 (00h)	360 (F0h)	361.5 (F1h - FFh)	E / 1.5	N * 1.5	-
121	2	0	510	-	E / 2	N * 2	-
125	5/2	0	637.5	-	E * 2 / 5	N * 5 / 2	-
131	3	0	765	-	E / 3	N * 3	-
141	4	0	1020	-	E / 4	N * 4	-
151	8	0	2040	-	E / 8	N * 8	-
155	10	0	2550	-	E / 10	N * 10	-
159	14	0	3570	-	E / 14	N * 14	-
161	16	0	4080	-	E / 16	N * 16	-
165	25	0	6375	-	E / 25	N * 25	-
171	32	0	8160	-	E / 32	N * 32	-
181	64	0	16320	-	E / 64	N * 64	-
185	100	0	25500	-	E / 100	N * 100	-
191	128	0	32640	-	E / 128	N * 128	-
201	256	0	65280	-	E / 256	N * 256	-
211	512	0	130560	-	E / 512	N * 512	-
221	1024	0	261120	-	E / 1024	N * 1024	-
231	2048	0	522240	-	E / 2048	N * 2048	-
241	4096	0	1044480	-	E / 4096	N * 4096	-

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TABLE 24—UNM-16, 16 BIT SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
2	1/256	0	255.99	-	E * 256	N / 256	=0.003906
3	1/256	-70	185.99	-	(E + 70) * 256	(N / 256) - 70	=0.003906 w/ offset
5	1/128	0	511.99	-	E * 128	N / 128	=0.007813
8	1/64	0	1023.984	-	E * 64	N / 64	=0.015625
11	1/100	0	655.35	-	E * 100	N / 100	=0.01
21	1/10	0	6553.5	-	E * 10	N / 10	=0.1
31	1/4	0	16383.75	-	E * 4	N / 4	=0.25
41	1	0	65535	-	E	N	-

TABLE 25—UNM-24, 24 BIT SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
11	1/10	0	1677721.5	-	E * 10	N / 10	=0.1
21	128/8000	0	268435.44	-	(E/128) * 8000	(N * 128) / 8000	=0.016
31	128/4000	0	536870.88	-	(E/128) * 4000	(N * 128) / 4000	=0.032
41	1/64	0	262143.98	-	E * 64	N / 64	=0.01563

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TABLE 26—UNM-32, 32 BIT SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
11	1/8000	0	536870.9	-	E * 8000	N / 8000	=0.000125
21	1/4000	0	1073741.8	-	E * 4000	N / 4000	=0.00025
31	1/64	0	67108864	-	E * 64	N / 64	=0.01563

7.5 2's Complement Signed Numeric (SNM) SLOTs—Signed numeric (SNM) SLOTs are represented in 2's complement notation. If the most significant bit of the number is set (one, 1), then the number is negative and the absolute value of the number is found by taking the 2's complement of the number. The 2's complement is found by inverting each bit of the number and then adding a binary one (1) to the result. For example, the number FFh, which has its most significant bit set, corresponds to -1.

7.5.1 2's COMPLEMENT SIGNED NUMERIC VARIABLE ASSIGNMENTS—The 2's complement signed numeric variables are grouped as follows:

- Table 27 - SNM-08, 8 Bit SLOTs

TABLE 27—SNM-08, 8 BIT SLOTs

SLOT #	Scaling (Resolution; 1 Bit =)	Minimum Limit	Maximum Limit	Invalid Range	Transfer Function N =	Transfer Function E =	Comment
11	1/2	-64	+63.5	-	E * 2	N / 2	=0.5
21	1	-128	+127	-	E	N	-
41	4	-512	+508	-	E / 4	N * 4	-
51	3/2	-192	+190.5	-	E * 2/3	N * 3/2	-
61	6	-768	+762	-	E / 6	N * 6	-

7.6 State Encoded (SED) SLOTs—State encoded (SED) SLOTs are used for data that can take one of several states such as Day of Week or Wiper Mode. Each SLOT definition contains a field for describing each state within the SLOT. There can be between 1 and 8 bits in any given SLOT with 2^n possible states where n is the number of bits in the SLOT.

7.6.1 STATE ENCODED VARIABLE ASSIGNMENTS

SED-02-1   Sub-System Category Reference Letter (PRN 1005)

    Length: 2 bits (0 - 3)

    0   "P" = Powertrain
    1   "C" = Chassis
    2   "B" = Body
    3   "U" = Undefined

SED-02-2   Most Significant Digit of Trouble Code (PRN 1006)

    Length: 2 bits (0 - 3)

    0   "0"
    1   "1"
    2   "2"
    3   "3"

SED-02-3   Transmission Lock-up Status (PRN 1807)

    Length: 2 bits (0 - 3)

    0   Unlock
    1   Partial Lock
    2   Full Lock
    3   Invalid

SED-04-1   Day of the Week (PRN 6012)

    Length: 4 bits (0 - F)

    0   Unknown
    1   Sunday
    2   Monday
    3   Tuesday
    4   Wednesday
    5   Thursday
    6   Friday
    7   Saturday
    8 - F   Invalid

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SED-04-2   Month (PRN 6010)

Length: 4 bits (0 - F)

0	Unknown
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
A	October
B	November
C	December
D - F	Invalid

SED-06-1   Transmission Gear Engaged (PRN 1808)

Length: 6 bits (00 - 3F)

00	Neutral
01	Reverse
02	Forward 1
04	Forward 2
08	Forward 3
10	Forward 4
20	Forward 5
Others	Invalid

SED-08-1   Wiper Mode (PRN A003)

Length: 8 bits (00 - FF)

00	Invalid
01	Off
02	Intermittent
03	Low Speed
04	Medium Speed
05	High Speed
06	Pulse
07 - FF	Invalid

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SED-08-2   Day of the Week (PRN 6013)

Length: 8 bits (00 - FF)

00	Unknown
01	Sunday
02	Monday
03	Tuesday
04	Wednesday
05	Thursday
06	Friday
07	Saturday
08 - FF	Invalid

SED-08-3   Day of Month (PRN 6014)

Length: 8 bits (00 - FF)

00	Invalid
01	1st
02	2nd
03	3rd
04	4th
05	5th
06	6th
07	7th
08	8th
09	9th
0A	10th
0B	11th
0C	12th
0D	13th
0E	14th
0F	15th
10	16th
11	17th
12	18th
13	19th
14	20th
15	21th
16	22nd
17	23rd
18	24th
19	25th
1A	26th
1B	27th
1C	28th
1D	29th
1E	30th
1F	31st
20 - FF	Invalid

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SED-08-4   Transmission Range (PRN 1806, 1809, 180D, & 180E)

     Length: 8 bits (00 - FF)

00	Invalid
01	Reverse
02	Forward 1
04	Forward 2
08	Forward 3
10	Forward 4
20	Forward 5
40	Forward 6/Park
80	Neutral
Others	Invalid

SED-08-5   Ignition Switch Position (PRN 1047)

     Length: 8 bits (00 - FF)

00	Invalid
01	ACC
02	OFF/LOCK
04	OFF/UNLOCK
08	RUN
10	START
Others	Invalid

SED-08-6   Transmission Transfer Case (4WD) (PRN 180A)

     Length: 8 bits (00 - FF)

00	Invalid
01	Neutral
02	Two Wheel Drive
03	Four Wheel Drive - Low
04	Four Wheel Drive - High
05 - FF	Invalid

SED-08-07   Door Lock Cylinder State (PRN C002)

     Length: 8 bits (00 - FF)

00	Key Out
01	Key In Lock Position
02	Key In Unlock Position
03 - FF	Invalid

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7.7 ASCII Encoded (ASC) SLOTs—ASCII (ASC) SLOTs are used to encode ASCII data. The least significant 7 bits represent the standard ASCII codes from 0 to 127. The most significant bit is reserved at this time but may be assigned a special function in the future. Several ASCII characters can be included in a single message by placing up to 7 ASCII characters sequentially in the data field. This allows a character string of up to 7 characters to be sent in a single message.

The ASCII character set is included in Table 27.

7.7.1 ASCII ENCODED VARIABLE ASSIGNMENTS

ASC-08-1   One ASCII Character

  Length: 8 bits

  Byte 1:   One ASCII Character

ASC-16-1   Two ASCII Characters

  Length: 16 bits

  Byte 1:   Left Most Character
  Byte 2:   Right Most Character

ASC-24-1   Three ASCII Characters

  Length: 24 bits

  Byte 1:   Left Most Character
  Byte 2:   Middle Character
  Byte 3:   Right Most Character

ASC-32-1   Four ASCII Characters

  Length: 32 bits

  Byte 1:   Left Most Character
  Byte 2:   Middle Left Character
  Byte 3:   Middle Right Character
  Byte 4:   Right Most Character

ASC-40-1   Five ASCII Characters

  Length: 40 bits

  Byte 1:   Left Most Character
  Byte 2:   Middle Left Character
  Byte 3:   Middle Character
  Byte 4:   Middle Right Character
  Byte 5:   Right Most Character

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ASC-48-1   Six ASCII Characters

Length: 48 bits

Byte 1:   Left Most Character
Byte 2:   Middle Left Character
Byte 3:   Middle Middle Left Character
Byte 4:   Middle Middle Right Character
Byte 5:   Middle Right Character
Byte 6:   Right Most Character

ASC-56-1   Seven ASCII Characters

Length: 56 bits

Byte 1:   Left Most Character
Byte 2:   Middle Left Character
Byte 3:   Middle Middle Left Character
Byte 4:   Middle Character
Byte 5:   Middle Middle Right Character
Byte 6:   Middle Right Character
Byte 7:   Right Most Character

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7.7.2 ASCII CHARACTER SET—The conversion chart, Table 28, can be used to convert from a two-digit (one byte) hexadecimal number to an ASCII character or from an ASCII character to a two-digit hexadecimal number.

TABLE 28—ASCII CONVERSION CHART

Bits 4 to 6
First Hex Digit (MSB)

Bits 0 to 3 (LSB)	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	p	
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL

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7.8 Binary Coded Decimal (BCD) SLOTs — BCD SLOTs are similar to ASCII SLOTs and are used to encode BCD data. The upper nibble is used to represent the most significant digit in a two-digit number and the lower nibble the least significant digit. For example, the data value 38h would represent 38 decimal. Invalid data ranges include any value that has either nibble greater than 9 (i.e., A, B, ..., F in either nibble). Therefore, a valid value can represent a number from 0 to 9. Several BCD numbers can be included in a single message by placing up to 14 BCD digits sequentially in the data field. This allows any number from 0 to 99,999,999,999,999 to be sent in a single message.

7.8.1 BINARY CODED DECIMAL (BCD) VARIABLE ASSIGNMENTS

BCD-04-1   1 digit

    Length: 4 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 0
        Maximum: 9

BCD-08-1   2 digits

    Length: 8 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 00
        Maximum: 99

BCD-12-1   3 digits

    Length: 12 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 000
        Maximum: 999

BCD-16-1   4 digits

    Length: 16 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 0000
        Maximum: 9999

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BCD-20-1   5 digits

    Length: 20 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 00000
        Maximum: 99999

BCD-24-1   6 digits

    Length: 24 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 000000
        Maximum: 999999

BCD-28-1   7 digits

    Length: 28 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 0000000
        Maximum: 9999999

BCD-32-1   8 digits

    Length: 32 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 00000000
        Maximum: 99999999

BCD-36-1   9 digits

    Length: 36 bits

    Scaling (Resolution):   1 bit = 1 (BCD)

    Limit:
        Minimum: 000000000
        Maximum: 999999999

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BCD-40-1   10 digits

        Length: 40 bits

        Scaling (Resolution):   1 bit = 1 (BCD)

        Limit:
              Minimum: 0000000000
              Maximum: 9999999999

BCD-44-1   11 digits

        Length: 44 bits

        Scaling (Resolution):   1 bit = 1 (BCD)

        Limit:
              Minimum: 00000000000
              Maximum: 99999999999

BCD-48-1   12 digits

        Length: 48 bits

        Scaling (Resolution):   1 bit = 1 (BCD)

        Limit:
              Minimum: 000000000000
              Maximum: 999999999999

BCD-52-1   13 digits

        Length: 52 bits

        Scaling (Resolution):   1 bit = 1 (BCD)

        Limit:
              Minimum: 0000000000000
              Maximum: 9999999999999

BCD-56-1   14 digits

        Length: 56 bits

        Scaling (Resolution):   1 bit = 1 (BCD)

        Limit:
              Minimum: 0000000000000
              Maximum: 9999999999999

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7.9 Signed Floating Point [Scientific Notation] (SFP) SLOT—The Signed Floating Point (SFP) SLOT is used to encode data that needs to be represented in floating point arithmetic, and always includes a leading sign character. The format exactly follows the ANSI/IEEE Standard (Std 754-1985) Single format. Please note that the data byte boundaries of the transmitted frame do not align with the boundaries of this format. The floating point parameter is sent as a 32 bit (4 byte) variable. The bit order is shown in Figure 15.

7.9.1 SIGNED FLOATING POINT VARIABLE ASSIGNMENT

SFP-32-1   Floating Point

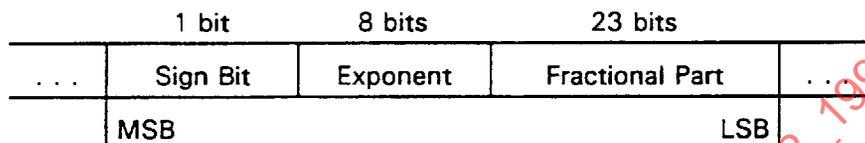|	1 bit	8 bits	23 bits	
. . .	Sign Bit	Exponent	Fractional Part	. . .
	MSB		LSB	

FIGURE 15—SIGNED FLOATING POINT (SCIENTIFIC NOTATION) (SFP) SLOT

8. Multiple Frame, Single Parameter Format—This section defines the method of encoding long parameters that require more than one frame to complete. The first data byte for this format is a sequence number as shown in Figure 16. The sequence byte consists of an upper nibble that identifies this frame by number in the sequence. The lower nibble is the total number of frames that make up this grouping. The sequence byte is followed by up to the maximum number of data bytes allowed by SAE J1850, for each frame. The entire parameter is thus built up from the total number of frames shown in the sequence tracking byte, in the order carried in that byte. The data field format will thus have an order indicated by Figure 17.
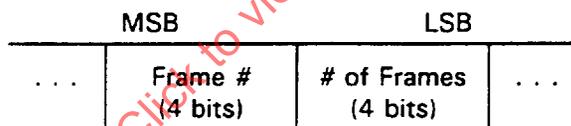
	MSB	LSB	
. . .	Frame # (4 bits)	# of Frames (4 bits)	. . .

FIGURE 16—SEQUENCE TRACKING BYTE

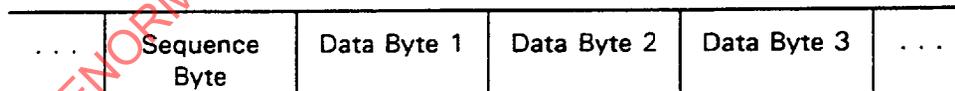|	Sequence Byte	Data Byte 1	Data Byte 2	Data Byte 3	
. . .					. . .

FIGURE 17—MULTIPLE FRAME, SINGLE PARAMETER FIELD

A simple example of this format is shown in Figures 18, 19, and 20, sending an ASCII string of characters.

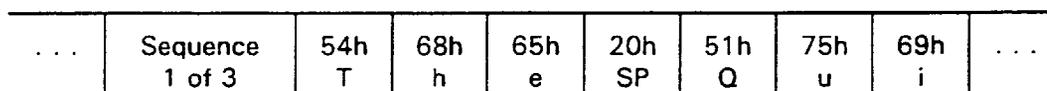|	Sequence 1 of 3	54h T	68h h	65h e	20h SP	51h Q	75h u	69h i	
. . .									. . .

FIGURE 18—FIRST SEQUENCE FRAME

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