Off-Board Diagnostic Message Formats

Foreword—This SAE Information Report is an example of how J1850 might be used to implement diagnostics in a vehicle. Related SAE Information Reports are J2054, "E/E Diagnostic Data Communication," J2062 "A Class B Serial Bus Diagnostic Protocol," and J2086 "An Applied Layered Protocol for a Generic Scan Tool."

1. **Scope**—The utilities defined for J2037 are designed to facilitate manufacturing and service diagnosis requirements.

Definition of the capability includes definition of standard messages and the dialogue necessary to provide the capability. The standard messages will be distinguished by the contents of the first data byte which specifies the diagnostic operation. Note that some vehicle applications will not require the implementation of all the defined diagnostic capabilities, and consequently, these applications will not support all message modes.

2. **References**

2.1 Applicable Publications—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 J2054—E/E Diagnostic Data Communication
SAE J2062—A Class B Serial Bus Diagnostic Protocol
SAE J2086—An Applied Layer Protocol for a Generic Scan Tool

3. J1850 has been advanced by the SAE as a Recommended Practice for vehicle multiplex applications. Government emissions regulatory agencies have indicated that adoption of the J1850 format may be an acceptable step forward toward standardization of vehicle diagnostics.

Further definition beyond J1850 is necessary in order to accomplish the desired standardization. The specifications contained in J1850 address only the lower layers of the seven layer ISO Open System model. Agreement in the content of the message fields defined by J1850 needs to be established. This document proposes a set of message definitions which are both compatible with J1850 and suitable for accomplishing the general requirements of off-board diagnostics.

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The messages use physical addressing. The off-board unit sends messages to a specific physically addressed module; and the module may send return messages directly to the off-board. No broadcast or functionally addressed messages are included.

The general format of the J1850 message is shown as follows:

SOM   Start of Message
DATA   Data Byte(s) Field
ERR   CRC Error Detection Byte
EOD   End of Data
RSP   Response Bytes
EOM   End of Message

The proposed Diagnostic Message adheres to this general format and provides special definition for the contents of the Data Bytes Field. The format for the proposed Diagnostic Message expands the J1850 definition as shown as follows:

SOM   Start of Message
DATA BYTE 1   Four Bits: Priority Four Bits: Code 4 hex
DATA BYTE 2   Target Module Physical Address
DATA BYTE 3   Source Module Physical Address
DATA BYTE 4   Diagnostic Operation Code
DATA BYTES   Additional Data Bytes as needed
ERR   CRC Error Detection Byte
EOD   End of Data
RSP   Physical Address of Receiving Module
EOM   End of Message

The first three data bytes are used to specify priority, target, and source in all Diagnostic messages. Additionally, the lower four bits of the first data byte must be 0100 to indicate that the message is a Diagnostic Type. The fourth byte indicates the operation code. Seven bits (128 codes) are reserved for specification of the diagnostic operation. The MSB is always zero for this standard set of diagnostic Messages. Setting the MSB to logic one can define another set 128 operation which could be proprietary to each manufacturer.

3.1   Off-Board Diagnostic requirements can be categorized as follows:

    a.   Messages which request and report module I.D. and status.
    b.   Messages which invoke and report results for on-board diagnostic routines.
    c.   Messages which request and report parametric information.
    d.   Messages which transfer blocks of data.

The Diagnostics Message contains from 1 to 7 data bytes. The message always used the first data byte as an operation code as shown in Figure 1.

b7	b6	b5	b4	b3	b2	b1	b0
0 - DIAG	ENCODED (00 TO FF hex) AS 1 OF 128 DIAGNOSTIC OPERATIONS						
0	?	?	?	?	?	?	?

FIGURE 1—DIAGNOSTICS MESSAGE OPERATION CODE

This allows for definition of 256 distinct operations. The First 128 Codes (00 to 7F hex) are dedicated to diagnostic operations. The other 128 codes (80 to FF) hex are reserved for future assignment. A list of current diagnostic operation code assignments is contained in Table 1.

TABLE 1—DIAGNOSTIC OPERATION CODE ASSIGNMENTS

OPERATION CODE	FUNCTION	ADDITIONAL DESCRIPTION
0000 0000 = 00 hex	Request Module Identification	Version, Revision etc.
0000 0001 = 01 hex	Request Module Status	Go/No 00 hex = OK
0000 0010 = 02 hex	NOT ASSIGNED	
0000 0011 = 03 hex	NOT ASSIGNED	
0000 0100 = 04 hex	NOT ASSIGNED	
0000 0101 = 05 hex	NOT ASSIGNED	
0000 0110 = 06 hex	NOT ASSIGNED	
0000 0111 = 07 hex	NOT ASSIGNED	
0000 1000 = 08 hex	NOT ASSIGNED	
0000 1001 = 09 hex	Request Module to Off-Line	
0000 1010 = 0A hex	NOT ASSIGNED	
0000 1011 = 0B hex	NOT ASSIGNED	
0000 1100 = 0C hex	NOT ASSIGNED	
0000 1101 = 0D hex	NOT ASSIGNED	
0000 1110 = 0E hex	NOT ASSIGNED	
0000 1111 = 0F hex	NOT ASSIGNED	
0001 0000 = 10 hex	Report Module Identification	Version, Revision etc.
0001 0001 = 11 hex	Report Module Status	Go/No 00 hex = OK
0001 0010 = 12 hex	NOT ASSIGNED	
0001 0011 = 13 hex	NOT ASSIGNED	
0001 0100 = 14 hex	NOT ASSIGNED	
0001 0101 = 15 hex	NOT ASSIGNED	
0001 0110 = 16 hex	NOT ASSIGNED	
0001 0111 = 17 hex	NOT ASSIGNED	
0001 1000 = 18 hex	NOT ASSIGNED	
0001 1001 = 19 hex	Report Module is Off Line	
0001 1010 = 1A hex	NOT ASSIGNED	
0001 1011 = 1B hex	NOT ASSIGNED	
0001 1100 = 1C hex	NOT ASSIGNED	
0001 1101 = 1D hex	NOT ASSIGNED	
0001 1110 = 1E hex	NOT ASSIGNED	
0001 1111 = 1F hex	NOT ASSIGNED	
0010 0000 = 20 hex	Request Parameter by PID	Single Parameter
0010 0001 = 21 hex	Request Parameter by DMR	Single Byte Parameter
0010 0010 = 22 hex	Request Parameter by DMR	Double Byte Parameter
0010 0011 = 23 hex	NOT ASSIGNED	
0010 0100 = 24 hex	Request Parameter Packet	Multiple Parameters
0010 0101 = 25 hex	NOT ASSIGNED	
0010 0110 = 26 hex	NOT ASSIGNED	
0010 0111 = 27 hex	NOT ASSIGNED	
0010 1000 = 28 hex	Set up Parameter Packet	Assigns Packet Content
0010 1001 = 29 hex	NOT ASSIGNED	
0010 1010 = 2A hex	NOT ASSIGNED	
0010 1011 = 2B hex	NOT ASSIGNED	
0010 1100 = 2C hex	NOT ASSIGNED	

TABLE 1—DIAGNOSTIC OPERATION CODE ASSIGNMENTS (CONTINUED)

OPERATION CODE	FUNCTION	ADDITIONAL DESCRIPTION
0010 1101 = 2D hex	NOT ASSIGNED	
0010 1110 = 2E hex	NOT ASSIGNED	
0010 1111 = 2F hex	NOT ASSIGNED	
0011 0000 = 30 hex	Report PID Parameter	Single Parameter
0011 0001 = 31 hex	Report DMR Parameter	Single Byte Parameter
0011 0010 = 32 hex	Report DMR Parameter	Double Byte Parameter
0011 0011 = 33 hex	NOT ASSIGNED	
0011 0100 = 34 hex	NOT ASSIGNED	
0011 0101 = 35 hex	NOT ASSIGNED	
0011 0110 = 36 hex	NOT ASSIGNED	
0011 0111 = 37 hex	NOT ASSIGNED	
0011 1000 = 38 hex	NOT ASSIGNED	
0011 1001 = 39 hex	NOT ASSIGNED	
0011 1010 = 3A hex	NOT ASSIGNED	
0011 1011 = 3B hex	NOT ASSIGNED	
0011 1100 = 3C hex	NOT ASSIGNED	
0011 1101 = 3D hex	NOT ASSIGNED	
0011 1100 = 3E hex	NOT ASSIGNED	
0011 1111 = 3F hex	NOT ASSIGNED	
0100 0000 = 40 hex	Enter Diagnostic Routine	Invokes on board diag
0100 0001 = 41 hex	Exit Diagnostic Routine	cancel on-board diag
0100 0010 = 42 hex	NOT ASSIGNED	
0100 0011 = 43 hex	NOT ASSIGNED	
0100 0100 = 44 hex	NOT ASSIGNED	
0100 0101 = 45 hex	NOT ASSIGNED	
0100 0110 = 46 hex	NOT ASSIGNED	
0100 0111 = 47 hex	NOT ASSIGNED	
0100 1000 = 48 hex	NOT ASSIGNED	
0100 1001 = 49 hex	NOT ASSIGNED	
0100 1010 = 4A hex	NOT ASSIGNED	
0100 1011 = 4B hex	NOT ASSIGNED	
0100 1100 = 4C hex	NOT ASSIGNED	
0100 1101 = 4D hex	NOT ASSIGNED	
0100 1110 = 4E hex	NOT ASSIGNED	
0100 1111 = 4f hex	NOT ASSIGNED	
0101 0000 = 50 hex	Confirm Diag Routine Entry	
0101 0001 = 51 hex	Confirm Diag Routine Exit	
0101 0010 = 52 hex	NOT ASSIGNED	
0101 0011 = 53 hex	NOT ASSIGNED	
0101 0100 = 54 hex	NOT ASSIGNED	
0101 0101 = 55 hex	NOT ASSIGNED	
0101 0110 = 56 hex	NOT ASSIGNED	
0101 0111 = 57 hex	NOT ASSIGNED	
0101 1000 = 58 hex	Report Diag Results	
0101 1001 = 59 hex	NOT ASSIGNED	
0101 1010 = 5A hex	NOT ASSIGNED	
0101 1011 = 5B hex	NOT ASSIGNED	
0101 1100 = 5C hex	NOT ASSIGNED	

TABLE 1—DIAGNOSTIC OPERATION CODE ASSIGNMENTS (CONTINUED)

OPERATION CODE	FUNCTION	ADDITIONAL DESCRIPTION
0101 1101 = 5D hex	NOT ASSIGNED	
0101 1110 = 5E hex	NOT ASSIGNED	
0101 1111 = 5F hex	NOT ASSIGNED	
0110 0000 = 60 hex	substitution of parameter	
0110 0001 = 61 hex	NOT ASSIGNED	
0110 0010 = 62 hex	NOT ASSIGNED	
0110 0011 = 63 hex	NOT ASSIGNED	
0110 0100 = 64 hex	NOT ASSIGNED	
0110 0101 = 65 hex	NOT ASSIGNED	
0110 0110 = 66 hex	NOT ASSIGNED	
0110 0111 = 67 hex	NOT ASSIGNED	
0110 1000 = 68 hex	NOT ASSIGNED	
0110 1001 = 69 hex	NOT ASSIGNED	
0110 1010 = 6A hex	NOT ASSIGNED	
0110 1011 = 6B hex	NOT ASSIGNED	
0110 1100 = 6C hex	NOT ASSIGNED	
0110 1101 = 6D hex	NOT ASSIGNED	
0110 1110 = 6E hex	NOT ASSIGNED	
0110 1111 = 6F hex	NOT ASSIGNED	
0111 0000 = 70 hex	Report Packet #0	
0111 0001 = 71 hex	Report Packet #1	
0111 0010 = 72 hex	Report Packet #2	
0111 0011 = 73 hex	Report Packet #3	
0111 0100 = 74 hex	Report Packet #4	
0111 0101 = 75 hex	Report Packet #5	
0111 0110 = 76 hex	Report Packet #6	
0111 0111 = 77 hex	Report Packet #7	
0111 1000 = 78 hex	Report Packet #8	
0111 1001 = 79 hex	Report Packet #9	
0111 1010 = 7A hex	Report Packet #10	
0111 1011 = 7B hex	Report Packet #11	
0111 1100 = 7C hex	Report Packet #12	
0111 1101 = 7D hex	Report Packet #13	
0111 1110 = 7E hex	Report Packet #14	
0111 1111 = 7F hex	Report Packet #15	

3.2 **CODE 00 hex Request Module Identification**—The OFF-BOARD DIAGNOSTIC UNIT issues this command to request transmission of the Module Identification Report message.

This message contains 6 bytes as shown in Figure 2.

START DELIMITER	☐	1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
DATA FIELD	REQUEST MODULE I.D. CODE – 00h	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS
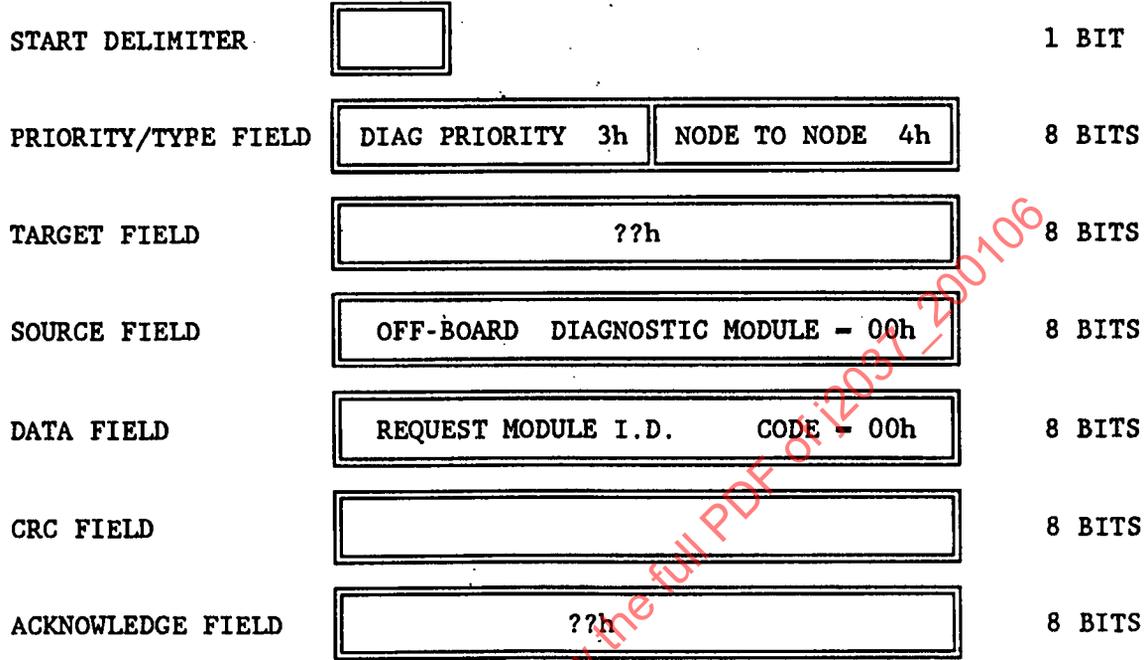
FIGURE 2—CODE 00 HEX REQUEST MODULE IDENTIFICATION

3.3   CODE 01 hex Request Diagnostic Status—The OFF-BOARD DIAGNOSTIC UNIT issues this command to request transmission of the Module Diagnostic Status Report message.

This message contains 6 bytes as shown in Figure 3.

START DELIMITER			1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h	NODE TO NODE 4h	8 BITS
TARGET FIELD	??h		8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE = 00h		8 BITS
DATA FIELD	REQUEST STATUS CODE = 01h		8 BITS
CRC FIELD			8 BITS
ACKNOWLEDGE FIELD	??h		8 BITS
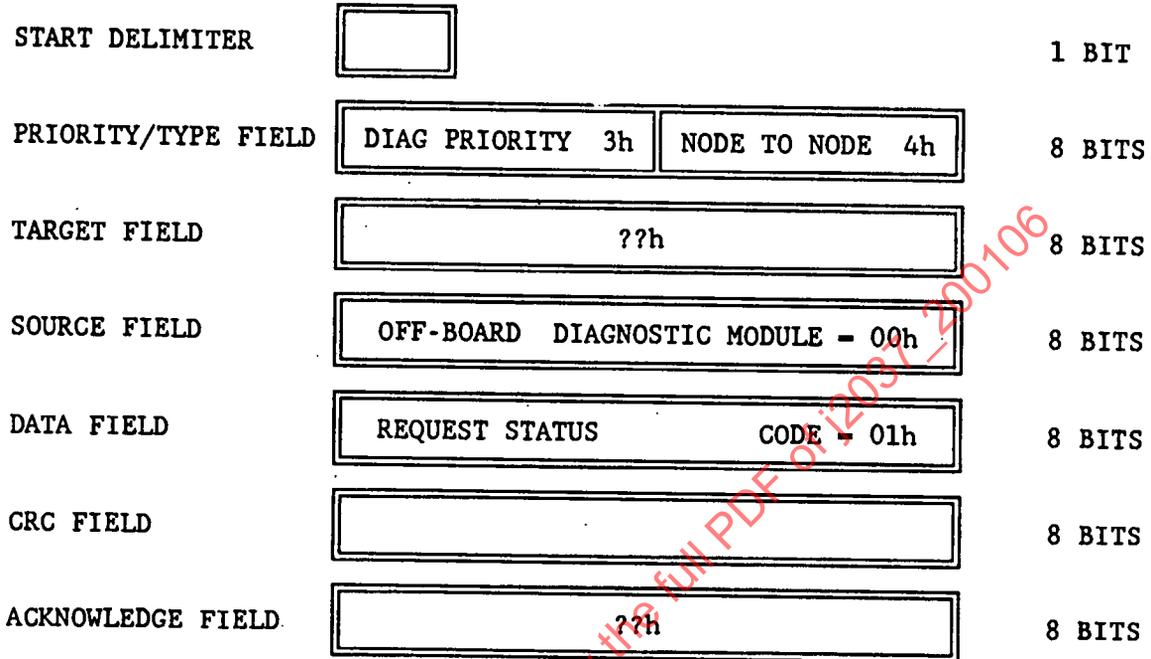
FIGURE 3—CODE 01 HEX REQUEST DIAGNOSTIC STATUS

3.4 **CODE 09 HEX REQUEST MODULE TO OFF LINE**—The OFF-BOARD DIAGNOSTIC UNIT issues this command to request a vehicle module to enter Off Line mode.

This message contains 6 bytes as shown in Figure 4:

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h │ NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE − 00h	8 BITS
DATA FIELD	REQUEST MODULE TO OFF LINE − 09h	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE − 00h	8 BITS
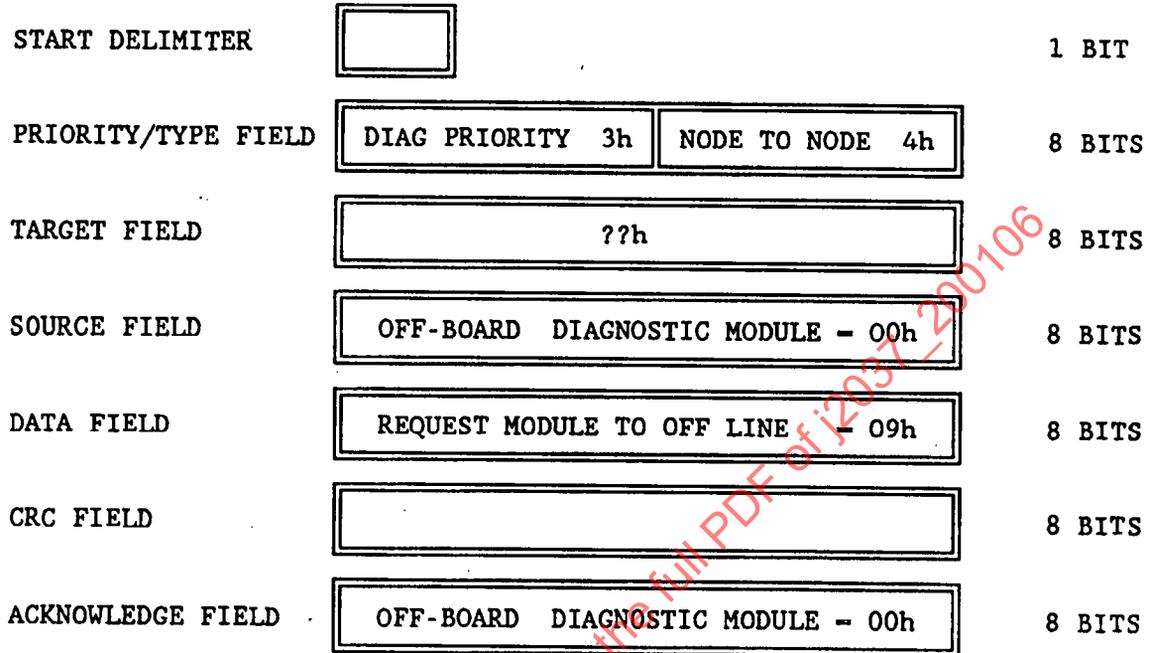
FIGURE 4—CODE 09 HEX REQUEST MODULE TO OFF LINE

3.5 CODE 10 hex Report Module Identification—This message is used by a vehicle module to report the Module Identification code(s).

This message is variable in length (7 to 12 bytes) depending upon the number of data bytes required to identify the module uniquely. The format is shown in Figure 5:

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT I.D. CODE – 10h	8 BITS
DATA FIELD	I.D. CODE(S)	?? BITS
DATA FIELD(optional)	I.D. CODE(S)	?? BITS
DATA FIELD(optional)	I.D. CODE(S)	?? BITS
DATA FIELD(optional)	I.D. CODE(S)	?? BITS
DATA FIELD(optional)	I.D. CODE(S)	?? BITS
DATA FIELD(optional)	I.D. CODE(S)	?? BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS

FIGURE 5—CODE 10 HEX REPORT MODULE IDENTIFICATION

3.6   CODE 11 hex Report Diagnostic Status—This message is used by a vehicle module to report the Module Diagnostic Status.

This message is variable in length (7 to 12 bytes) depending upon the number of data bytes required to report the module status. The format is shown in Figure 6:

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h	NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT STATUS CODE — 11h	?? BITS
DATA FIELD(optional)	STATUS CODE(S)	8 BITS
DATA FIELD(optional)	STATUS CODE(S)	8 BITS
DATA FIELD(optional)	STATUS CODE(S)	8 BITS
DATA FIELD(optional)	STATUS CODE(S)	8 BITS
DATA FIELD(optional)	STATUS CODE(S)	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS

FIGURE 6—CODE 11 HEX REPORT DIAGNOSTIC STATUS

3.7 CODE 19 hex Report Module is Off Line—This message is used by a vehicle module to report that the Module has entered Off Line mode.

This message contains 6 bytes as shown in Figure 7:

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h │ NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT MODULE IS OFF LINE — 19h	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS
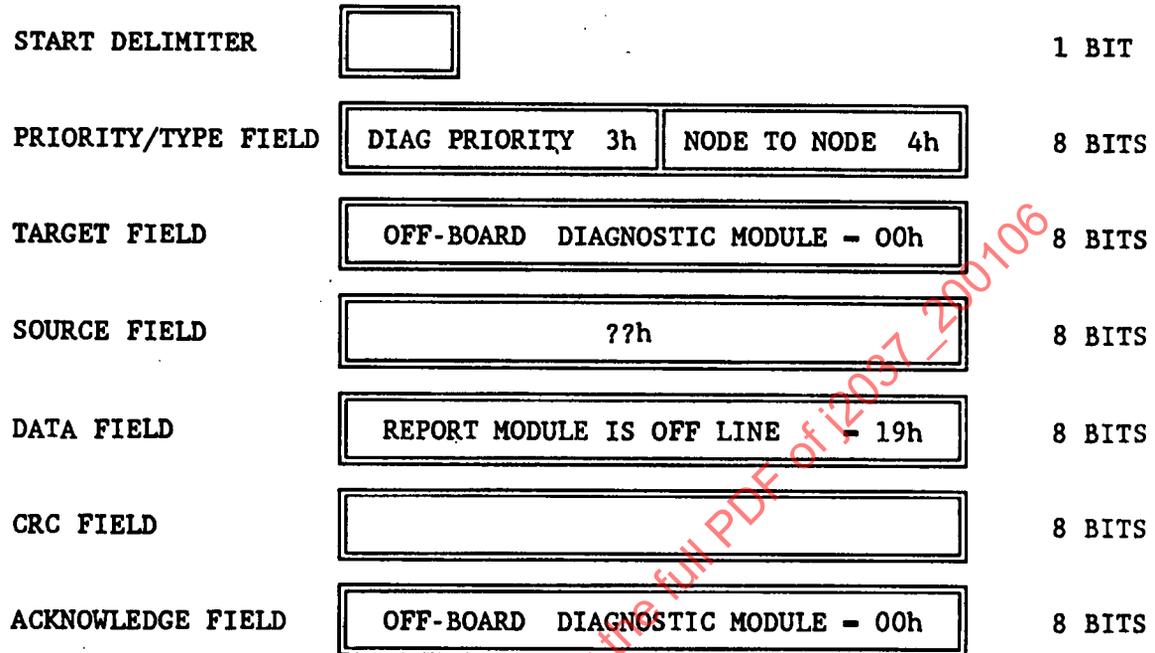
FIGURE 7—CODE 19 HEX REPORT MODULE IS OFF LINE

3.8 **CODE 20 hex Request Parameter by PID**—The OFF-BOARD DIAGNOSTIC UNIT issues this message to request a return transmission containing a parameter value. The parameter of interest is referenced by a preassigned index number which provides unique identification of the parameter within the module.

This message contains 7 bytes as shown in Figure 8.

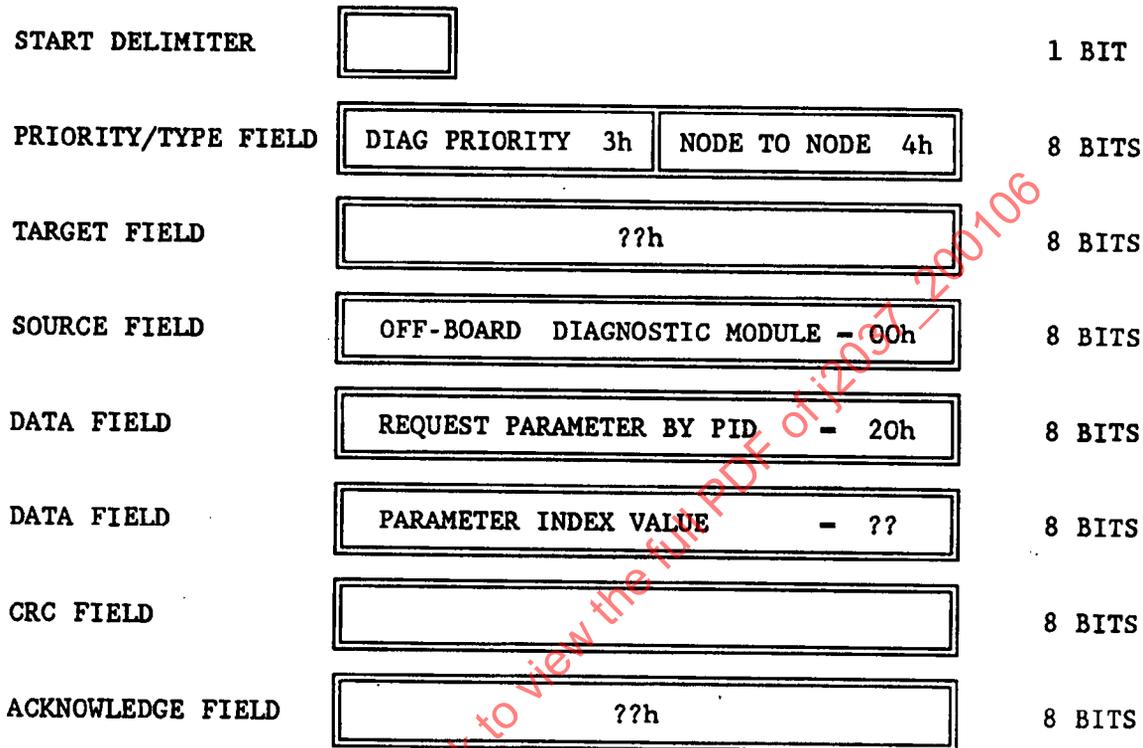|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h / NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
DATA FIELD	REQUEST PARAMETER BY PID – 20h	8 BITS
DATA FIELD	PARAMETER INDEX VALUE – ??	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 8—CODE 20 HEX REQUEST PARAMETERS BY PID

3.9 **CODE 21 hex Request Single Byte Parameter by DMR**—The OFF-BOARD DIAGNOSTIC UNIT issues this message to request a return transmission containing a single byte parameter value. The parameter of interest is referenced by its memory location within the module.

This message contains 8 bytes as shown in Figure 9:

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h │ NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS
DATA FIELD	REQUEST PARAMETER BY ADDRESS — 21h	8 BITS
DATA FIELD	PARAMETER ADDRESS LOW BYTE — ??	8 BITS
DATA FIELD	PARAMETER ADDRESS HIGH BYTE — ??	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 9—CODE 21 HEX REQUEST SINGLE BYTE PARAMETER BY DMR

3.10 CODE 22 hex Request Double Byte Parameter by DMR—The OFF-BOARD DIAGNOSTIC UNIT issues this message to request a return transmission containing a double byte parameter value. The parameter of interest is referenced by its memory location within the module.
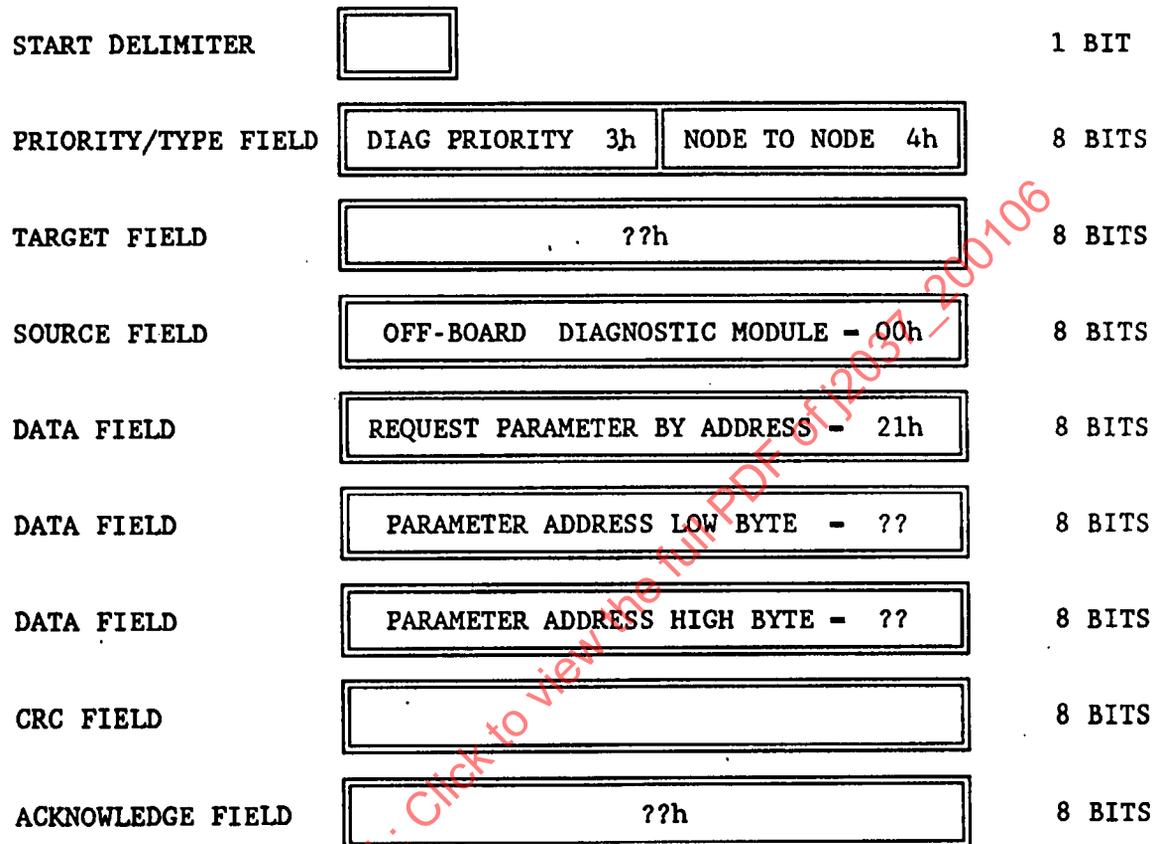
This message contains 8 bytes as shown in Figure 10.

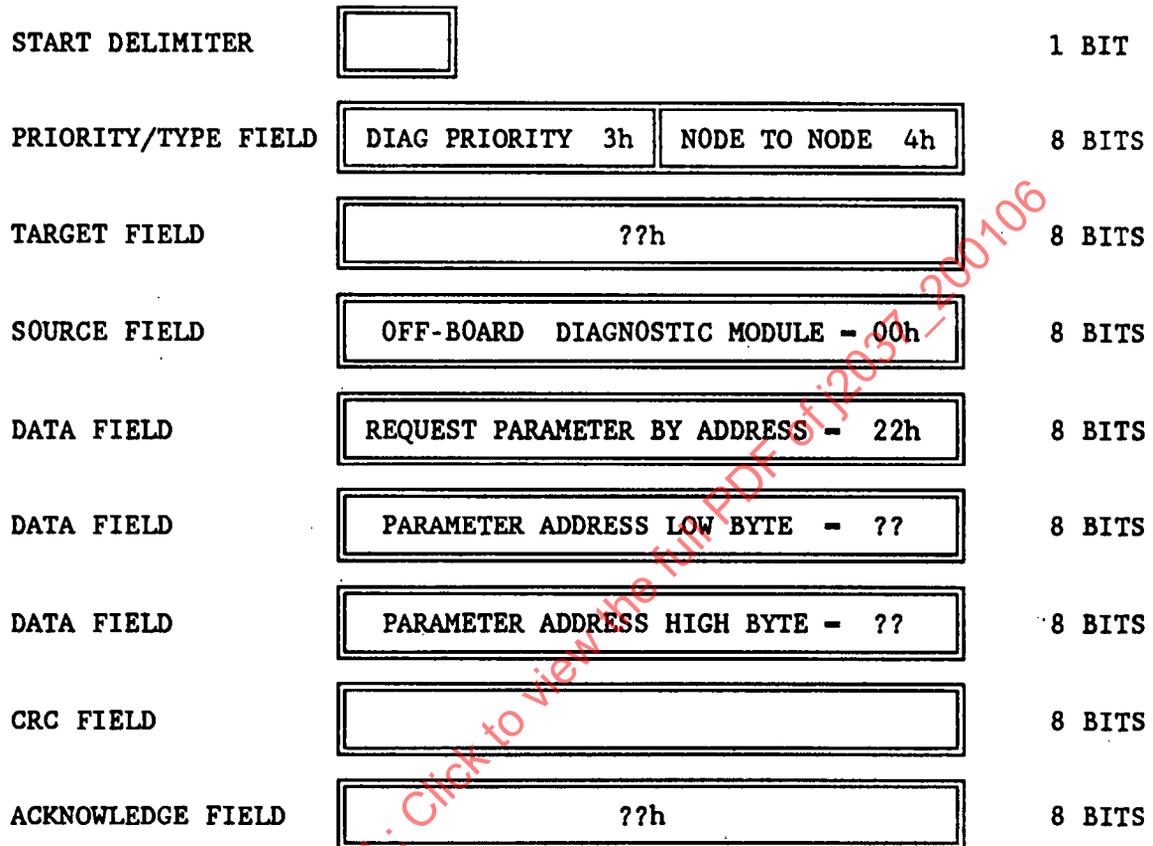|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h | NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
DATA FIELD	REQUEST PARAMETER BY ADDRESS – 22h	8 BITS
DATA FIELD	PARAMETER ADDRESS LOW BYTE – ??	8 BITS
DATA FIELD	PARAMETER ADDRESS HIGH BYTE – ??	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 10—CODE 22 HEX REQUEST DOUBLE BYTE PARAMETER BY DMR

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3.11 CODE 24 hex Request Multiple Parameter Packet Report—The OFF-BOARD DIAGNOSTIC UNIT issues this message to request a return transmission containing multiple parameters within a single message. A Multiple Parameter Packet contains either 6 single byte or 3 double byte (word) parameters. Either type may be specified with this request. This request message also specifies whether the packet is to contain parameters which are addressed by index or direct memory reference. This message may be used to start, stop, or specify a fixed rate of transmission for the return message.

This message contains 7 bytes as shown in Figure 11:

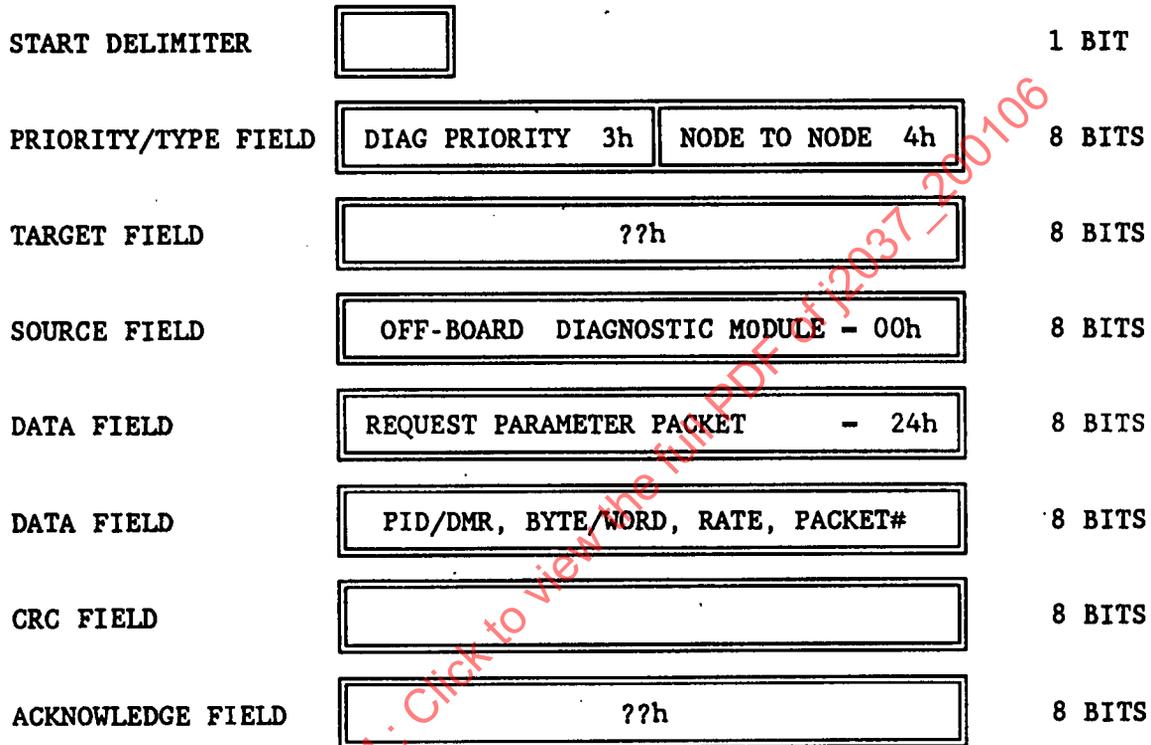|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
DATA FIELD	REQUEST PARAMETER PACKET – 24h	8 BITS
DATA FIELD	PID/DMR, BYTE/WORD, RATE, PACKET#	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 11—CODE 24 HEX REQUEST MULTIPLE PARAMETER PACKET REPORT

3.12 CODE 28 hex Setup Parameter Report Packet—The OFF-BOARD DIAGNOSTIC UNIT issues this message to configure the contents of a Report Packet which contains multiple parameters within a single message. This message must be sent once for each parameter to be positioned within the Report Packet. That is, a 6 parameter Report Packet will require 6 Setup messages; a 3 parameter Report Packet requires only 3 iterations of the Setup message to complete the configuration.

This message contains 8 bytes when configuring Report Packets with PID referenced parameters; and requires 9 bytes when configuring DMR type Report Packets, as shown in Figure 12.

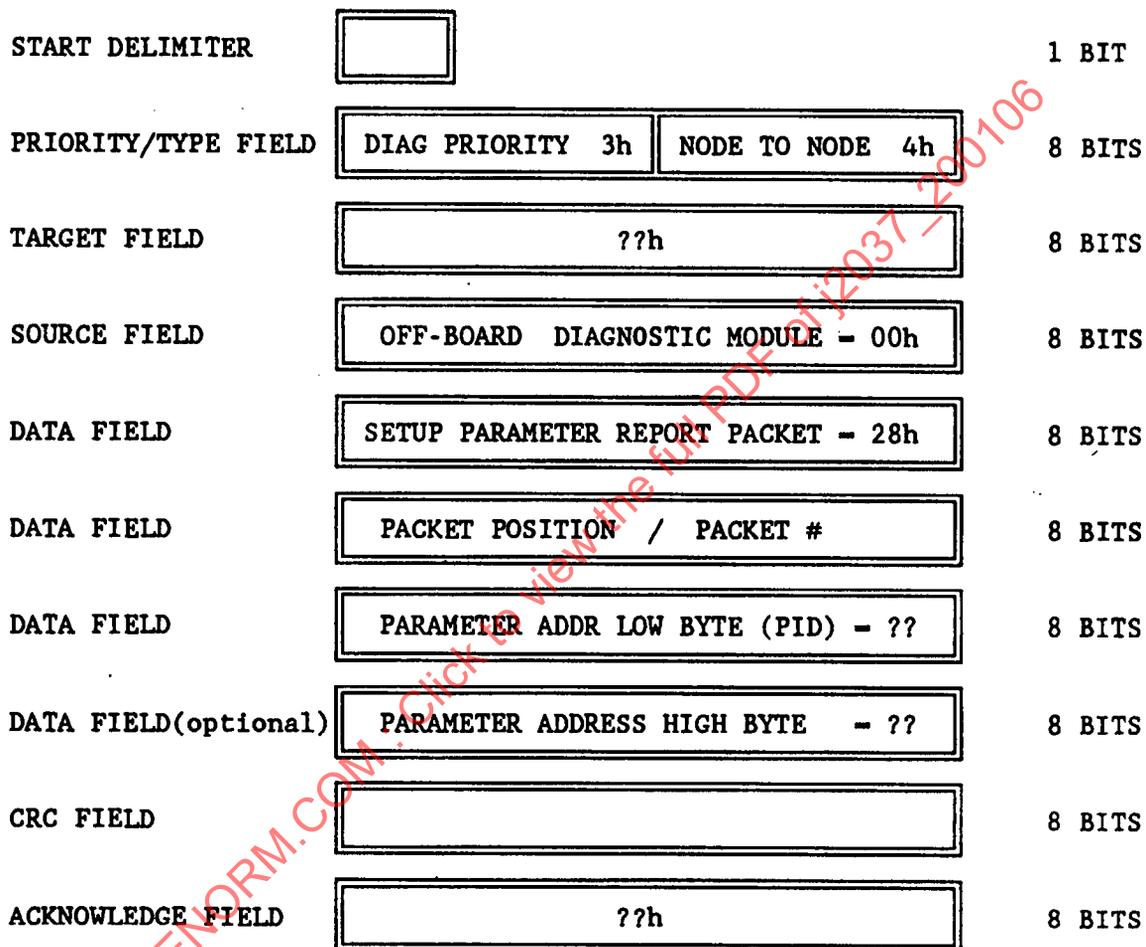|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h | NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE = 00h	8 BITS
DATA FIELD	SETUP PARAMETER REPORT PACKET = 28h	8 BITS
DATA FIELD	PACKET POSITION / PACKET #	8 BITS
DATA FIELD	PARAMETER ADDR LOW BYTE (PID) = ??	8 BITS
DATA FIELD(optional)	PARAMETER ADDRESS HIGH BYTE = ??	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 12—CODE 28 HEX SETUP PARAMETER REPORT PACKET

3.13 CODE 30 hex Report PID Parameter—This message is used by a vehicle module to report the value of a specific parameter value. The parameter of interest is referenced by a preassigned index number which provides unique identification. The parameter may be a single byte or a double byte (word).

This message contains 8 or 9 bytes as shown in Figure 13:

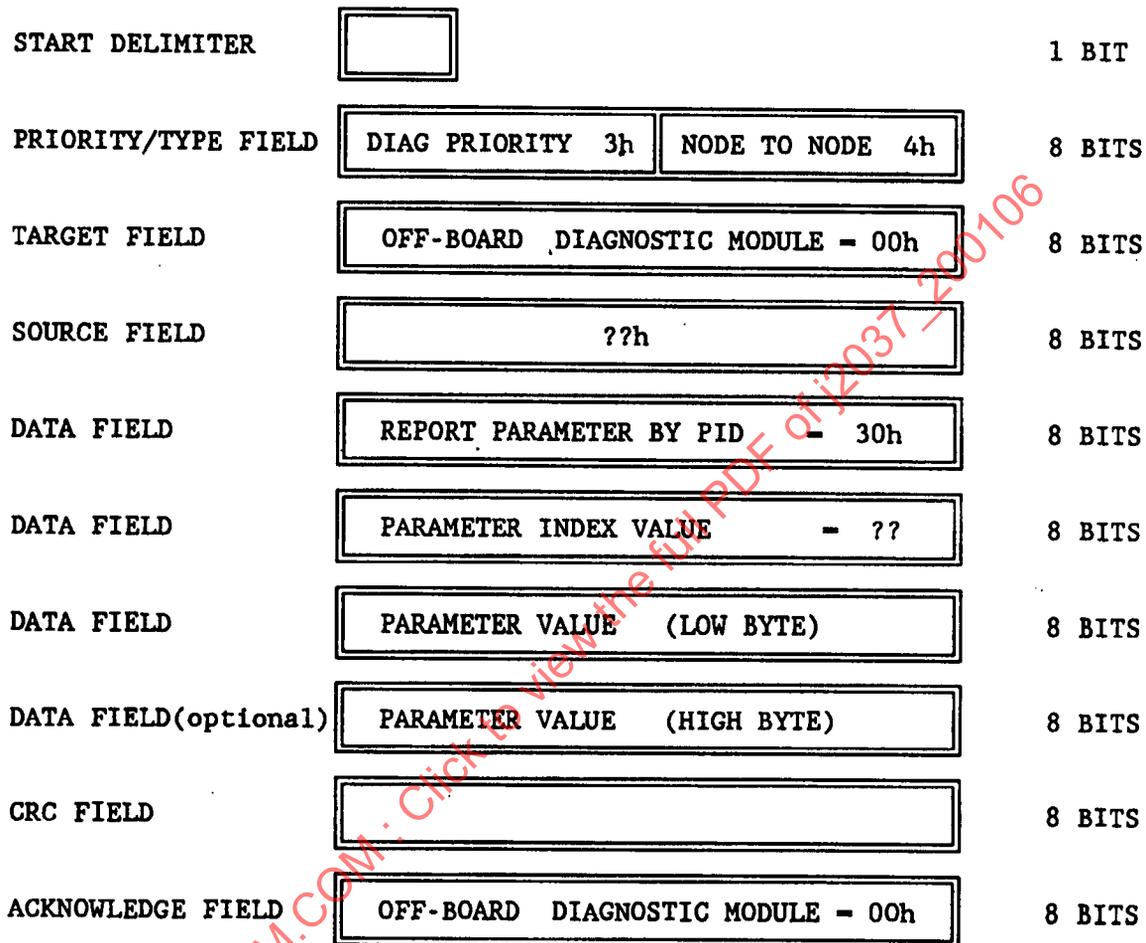|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h │ NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE = 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT PARAMETER BY PID = 30h	8 BITS
DATA FIELD	PARAMETER INDEX VALUE = ??	8 BITS
DATA FIELD	PARAMETER VALUE (LOW BYTE)	8 BITS
DATA FIELD(optional)	PARAMETER VALUE (HIGH BYTE)	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE = 00h	8 BITS

FIGURE 13—CODE 30 HEX REPORT PID PARAMETER

3.14 CODE 31 hex Report Single Byte DMR Parameter—This message is used by a vehicle module to report the value of a specific parameter. The parameter of interest is referenced by its memory location within the module. The parameter value is described with a single byte.

This message contains 9 bytes as shown in Figure 14.

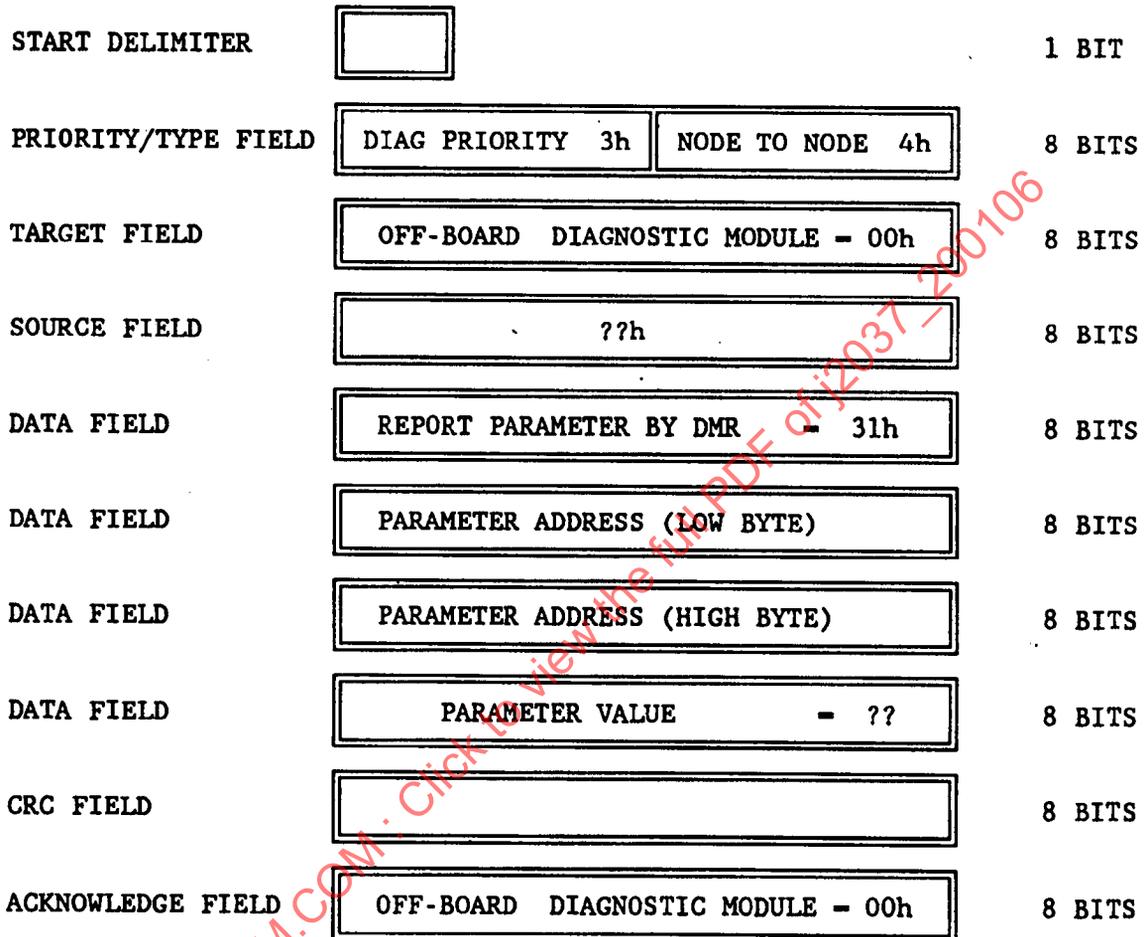|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h | NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT PARAMETER BY DMR — 31h	8 BITS
DATA FIELD	PARAMETER ADDRESS (LOW BYTE)	8 BITS
DATA FIELD	PARAMETER ADDRESS (HIGH BYTE)	8 BITS
DATA FIELD	PARAMETER VALUE — ??	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE — 00h	8 BITS

FIGURE 14—CODE 31 HEX REPORT SINGLE BYTE DMR PARAMETER

3.15 **CODE 32 hex Report Double Byte Parameter**—This message is used by a vehicle module to report the value of a specific parameter value. The parameter of interest is referenced by its memory location within the module. The parameter value is described with two bytes (word).

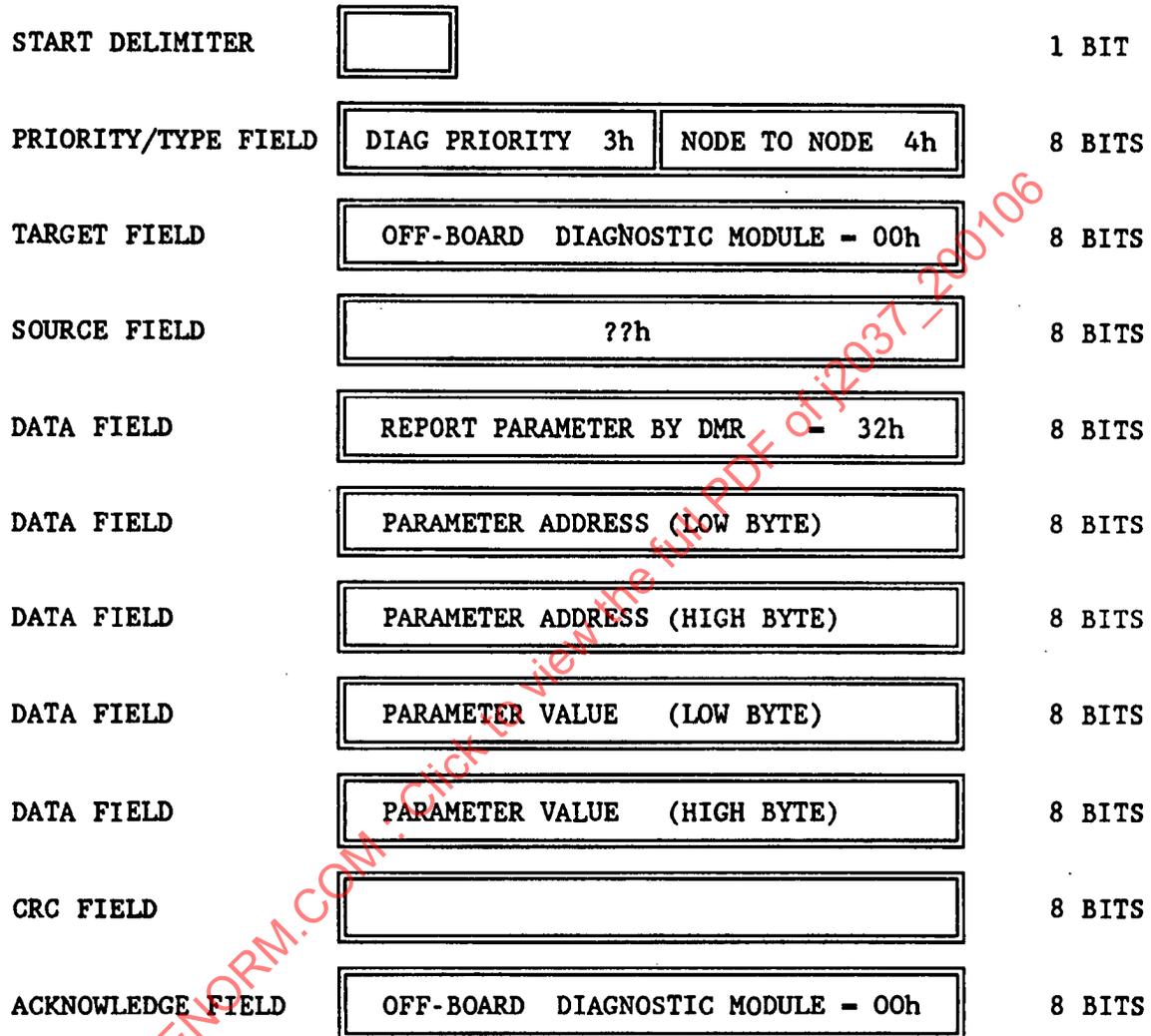This message contains 10 bytes as shown in Figure 15.

START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h NODE TO NODE 4h	8 BITS
TARGET FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS
SOURCE FIELD	??h	8 BITS
DATA FIELD	REPORT PARAMETER BY DMR – 32h	8 BITS
DATA FIELD	PARAMETER ADDRESS (LOW BYTE)	8 BITS
DATA FIELD	PARAMETER ADDRESS (HIGH BYTE)	8 BITS
DATA FIELD	PARAMETER VALUE (LOW BYTE)	8 BITS
DATA FIELD	PARAMETER VALUE (HIGH BYTE)	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	OFF-BOARD DIAGNOSTIC MODULE – 00h	8 BITS

FIGURE 15—CODE 32 HEX REPORT DOUBLE BYTE PARAMETER

3.16 CODE 40 hex Enter Diagnostic Routine—The OFF-BOARD DIAGNOSTIC UNIT issues this message to request that a specific on-board test diagnostic routine be entered and that the results, if any, be reported in a return message. The second data byte specifies which on-board diagnostic routine is being invoked.

This message contains 7 bytes as shown in Figure 16.

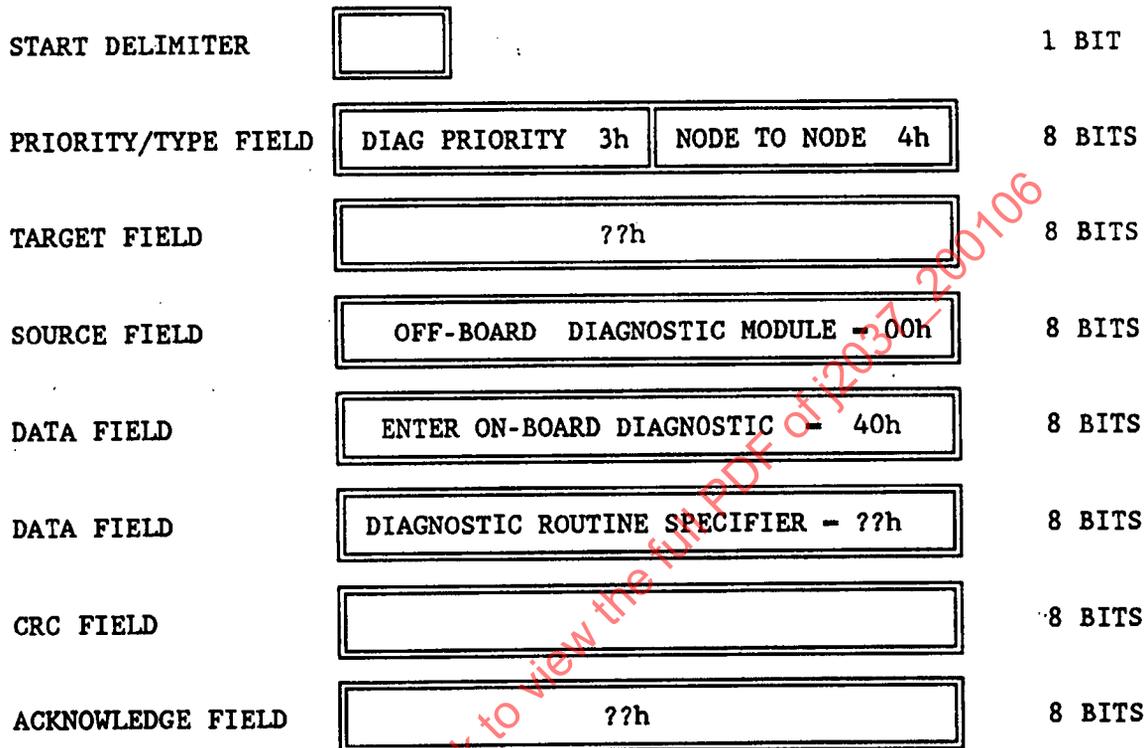|		
START DELIMITER		1 BIT
PRIORITY/TYPE FIELD	DIAG PRIORITY 3h NODE TO NODE 4h	8 BITS
TARGET FIELD	??h	8 BITS
SOURCE FIELD	OFF-BOARD DIAGNOSTIC MODULE − 00h	8 BITS
DATA FIELD	ENTER ON-BOARD DIAGNOSTIC − 40h	8 BITS
DATA FIELD	DIAGNOSTIC ROUTINE SPECIFIER − ??h	8 BITS
CRC FIELD		8 BITS
ACKNOWLEDGE FIELD	??h	8 BITS

FIGURE 16—CODE 40 HEX ENTER DIAGNOSTIC ROUTINE