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Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 12: Diagnostics services

Tracteurs et matériels agricoles et forestiers — Réseaux de commande et de communication de données en série —

Partie 12: Services de diagnostic

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

This third edition cancels and replaces the second edition (ISO 11783-12:2014), which has been technically revised. The main changes compared to the previous edition are as follows:

— addition of SPNs to all parameters;

— removal of the Control Function Functionality parameters to an online database;

— updated document references.

A list of all parts in the ISO 11783 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 11783 specifies a communications system for agricultural equipment, based on the ISO 11898[4] protocol. SAE J1939[7] documents, on which parts of ISO 11783 are based, were developed jointly for use in truck and bus applications and for construction and agriculture applications. Joint documents were completed to allow electronic units that meet the truck and bus SAE J1939 specifications to be used by agricultural and forestry equipment with minimal changes.

General information on ISO 11783 is to be found in ISO 11783-1. The purpose of ISO 11783 is to provide an open, interconnected system for on-board electronic systems. It is intended to enable electronic control units (ECUs) to communicate with each other, providing a standardized system.

Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 12: Diagnostics services

1 Scope

ISO 11783, as a whole, specifies a serial data network for control and communications on forestry or agricultural tractors and mounted, semi-mounted, towed, or self-propelled implements. Its purpose is to standardize the method and format of transfer of data between sensors, actuators, control elements and information storage, and display units, whether mounted on, or part of, the tractor or implement. This document describes the network's diagnostic system.

NOTE The name and contact information of the Maintenance Agency for this document can be found at http://www.iso.org/mara.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11783-1, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 1: General standard for mobile data communication*

ISO 11783-2, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 2: Physical layer*

ISO 11783-3, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 3: Data link layer*

ISO 11783-5, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 5: Network management*

ISO 11783-7, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 7: Implement messages application layer*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

SAE J1939-73, *Application layer — Diagnostics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11783-1, ISO 14229-1, SAE J1939-73 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
product
device or ECU produced by an original equipment manufacturer (OEM)

Note 1 to entry: When an ECU is installed by a device OEM, the device is a product. When an ECU is offered in the market, independent from a device (e.g. “aftermarket” installations), the ECU is a product.

3.2
basic tractor ECU
functionality characteristics which are specific to an ISO 11783-9 TECU

3.3
server
control function on the mobile implement bus that provides services to a client

4 Symbols and abbreviated terms

AUX-N	functionality – AUX new
CF	control function
DM	diagnostic message
DTC	diagnostic trouble code
ECU	electronic control unit
FMI	failure mode indicator
OC	occurrence count
PG	parameter group
PGN	parameter group number
TC-BAS	functionality – task controller basic
TC-GEO	functionality – task controller geo
TC-SC	functionality – task controller section control
TECU	functionality – tractor ECU
UT	functionality – universal terminal
VT	virtual terminal

5 General description

The standard diagnostic system specified in this document requires that all units connected to an ISO 11783 network provide the information specified in this document to enable the operator and/or service technician to complete network diagnostics and identify which unit has failed or is operating in a faulty state.

6 Requirements

6.1 ISO 11783 diagnostics

This document specifies the diagnostics capabilities of control functions. The terms “level 0” and “level 1” diagnostics described in the 1st edition of this document are obsolete.

Control functions shall support all ISO 11783 diagnostic information messages defined in Annex B and their derived requirements. Parameters for these messages are defined in Annex A.

An interface is required for an operator or service technician to diagnose problems and faults on an ISO 11783 network. This diagnostic user interface can be provided by the virtual terminal or another type of user interface connected to the network. The information specified in the following subclauses shall be provided to the operator or service technician by this user interface for diagnosing problems and faults of the suspect connected ECU, sensor or actuator.

6.2 Network information

All control functions connected to the ISO 11783 network shall provide network information to the diagnostic user interface. This information provides an overview of the status of all communicating control functions connected to the operating network. It shall include

a) the part number, serial number and manufacturer’s name of the connected ECU containing control functions,

b) the NAME of each control function as defined in ISO 11783-5,

c) the version (or versions) of software and the versions of ECU-related software required by each control function,

d) the compliance test data, including the laboratory that performed the test, certificate data and year tested as provided by the test lab prior to the test, and

e) the product identification message.

The diagnostic user interface shall monitor the messages on the network to obtain information from the address claim process and shall request additional information from control functions. All CFs within the same ECU shall send the same ECU identification information. A typical network status screen is shown in Annex D.

6.3 Network statistics

The diagnostic user interface that displays the network status shall also use its network connection to measure the network bus statistics. At a minimum, the diagnostic user interface shall include the following network statistics if supported by hardware: bus load, CAN errors detected while sending or receiving messages and network message count. If enabled by hardware, network statistics should also include average bus voltages over a time period of 250 ms to 5 s.

A typical screen of the network statistics is presented in Annex D.

6.4 Control function information

Each control function shall provide additional fault information to the diagnostic user interface. This information provides additional data to enable the operator or service technician to determine the problem or fault on a specific ECU. It includes

a) the specific protocol of a control function required for non-ISO 11783 or ISO 11783 diagnostics,

b) active diagnostic trouble codes (suspect parameter numbers and failure mode indicators),

c) previously active diagnostic trouble codes (suspect parameter numbers and failure mode indicators), and

d) fault occurrences (if available).

Control functions shall also support clearing previously active diagnostic trouble codes (if required).

The diagnostic user interface shall request the control function's suspect parameter number and failure mode indicator information using the messages specified in Annex B. Parameters for these messages are defined in Annex A or in the appropriate part of ISO 11783. A typical screen of the above control function information is presented in Annex D. In addition, the diagnostic user interface shall provide an equivalent screen of the network status. Annex E provides the definition of each failure mode indicator.

6.5 Functionalities

Each control function shall provide its active functionality information to the diagnostic user interface. This information includes all the active functionalities and their generations and options. Additional functionalities can be implemented but are inactive. Functionalities which are present, but not currently available in the system shall be communicated. Functionalities which are present but not currently enabled in the control function shall not be communicated.

EXAMPLE 1 Functionalities present but not currently available in the system: An implement has an ECU with a CF1 control function that has minimum CF, TC-GEO, and TC-SC functionality. The implement is connected to a tractor without a TC-SC server functionality. The TC-SC functionality is present but not currently available within the ECU. CF1 reports minimum CF, TC-GEO, and TC-SC functionality within the functionality information messages.

EXAMPLE 2 Functionalities present but not currently enabled in the control function: An implement has an ECU with a CF1 control function that has minimum CF, TC-GEO, and TC-SC functionality. The customer has purchased only the TC-GEO functionality. The TC-SC functionality is disabled within the ECU. CF1 reports only minimum CF and TC-GEO functionality within the functionality information messages.

The diagnostic user interface shall request a control function's functionality, generation and option information using the control function functionalities message specified in Annex B. Parameters for this message are defined in Annex A. An example of a network diagnostic screen showing a connected system's functionalities and their generation is illustrated in Annex D. Another typical screen is also shown in Annex D of the capable generation for each service type control function functionality and the capable functionality generation of each operating implement Working Set Master functionality.

The diagnostic protocol message is for diagnostic purposes only and shall not be used by CFs to configure run-time operation.

6.6 Control function diagnostics

Once a problem or fault has been isolated to a particular control function of an ECU, as displayed on the diagnostic information screen, a service tool that uses the identified protocol of that particular control function can be connected to the network through the diagnostic connector specified in ISO 11783-2. The tool can then be used to troubleshoot the problem identified by the displayed diagnostic trouble code.

6.7 ISO Latin 1 character set

There are 191 graphic character values and 65 control function character values (0 through 31 and 127 through 159) in the ISO/IEC 8859-1 Latin 1 character set. The terminology "ASCII" and "printable ASCII" are used in this document to refer to the set of 191 graphic character values. Unless otherwise specified, only these 191 character values are permitted for ASCII parameters.

Annex A
(normative)

Diagnostic information parameter definitions

A.1 ECU part number

This is the part number of the physical ECU connected to the ISO 11783 network.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 2901

The ASCII character "*" shall not be used in the ECU part number because it is used as a parameter delimiter.

A.2 ECU serial number

This is the serial number of the physical ECU connected to the ISO 11783 network.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 2902

The ASCII character "*" shall not be used in the ECU serial number because it is used as a parameter delimiter.

A.3 Number of software identification fields

This is the number of software identification designators represented in the software identification parameter group.

Data length: 1 byte

Resolution: 1 step/bit, 0 offset

Data range: 0 to 250 steps

Operational range: 0 to 125

Type: Measured

SPN: 965

A.4 Software identification

This is the identification of the software of a control function and any required ECU-related software versions. Software identification fields in the software identification shall be separated by an ASCII "*" as a delimiter. An ASCII "*" is required at the end of the last software identification field, even if there is only one software identification field.

Individual software module identifications within an identification field shall be separated by a "#" delimiter. The last module within a software identification field can be terminated by a "#" delimiter.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 234

The ASCII characters "*" and "#" shall not be used in the software identification parameters because they are used as parameter delimiters.

A.5 ECU manufacturer name

The manufacturer name is a human-readable string that can be interpreted by a service technician. The same text as registered with the manufacturer code can be used and can contain branding information as well. It can contain the manufacturer's name as well as the OEM integrator. This information aids the service technician to acquire service help.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 4304

The ASCII character "*" shall not be used in the ECU manufacturer name because it is used as a parameter delimiter.

A.6 Diagnostic protocol identification

This parameter indicates the diagnostic protocols in addition to ISO 11783 that are supported by a control function.

Data length: 8 bits

Value	Meaning
00000000	No additional diagnostic protocols supported
00000001	J1939–73
00000010	ISO 14230 (KWP 2000 using ISO 15765-3 transport protocol)
00000100	ISO 14229-3 (UDS on CAN)
00001000	Reserved for ISO assignment
00010000	Reserved for ISO assignment
00100000	Reserved for ISO assignment
01000000	Reserved for ISO assignment
10000000	Reserved for ISO assignment

Type: Measured

SPN: TBD

A.7 ECU location

The location on a tractor or implement of the physical ECU connected to the ISO 11783 network.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 2903

The ASCII character "*" shall not be used in the ECU location because it is used as a parameter delimiter.

A.8 ECU type

The type of the physical ECU connected to the ISO 11783 network. An example of an ECU type is the classification of ECU capabilities such as I/O.

Data length: Variable, up to 200 characters

Resolution: ASCII (1 byte), 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operational range: same as data range

Type: Measured

SPN: 2904

The ASCII character "*" shall not be used in the ECU type because it is used as a parameter delimiter.

A.9 Number of functionalities

This parameter reports the number of functionalities in the control function functionalities message.

Data length: 1 byte

Range: 1 to 255

Resolution: 1 functionality/bit

Type: Measured

SPN: TBD

A.10 Functionalities

This parameter reports which functionalities are supported by a control function connected to the ISO 11783 network.

Data length: 1 byte

Value: 0 to 255 (see ISOBUS 11783 Online Database at www.ISOBUS.net/isobus)

Type: Measured

SPN: TBD

A.11 Functionality generation

This parameter reports the generation of the functionality provided by a control function connected to the ISO 11783 network.

Data length: 1 byte

Resolution: 1 generation/bit

Offset: 0

Range: 1 to 255

Unit: Number

Type: Measured

SPN: TBD

A.12 Number of option bytes

This parameter reports the number of bytes that follow to report which options are supported by a functionality provided by a control function connected to the ISO 11783 network. If a functionality has option bytes, all trailing zero option bytes shall be omitted and not counted in the number of option bytes. In case a functionality has no option bytes, the number of option bytes shall be set to 0.

Data length: 1 byte

Resolution: 1 byte/bit

Offset: 0

Range: 0 to 255

Unit: Number

Type: Measured

SPN: TBD

A.13 ECU hardware ID

This parameter is used to associate the hardware version of an ECU connected to the ISO 11783 network to a conformance test report of that hardware.

Data length: Variable, up to 200 bytes

Resolution: ASCII (1 byte)

Offset: 0

Range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Type: Measured

SPN: 6714

The ASCII character "*" shall not be used in the ECU hardware ID because it is used as a parameter delimiter. The "#" character shall not be used (reserved for future assignment).

A.14 Product identification code

The product identification code, as assigned by the manufacturer, corresponds with the number on the type plate of a product. For vehicles, this number can be the same as the VIN (vehicle identification number). For stand-alone systems, such as VT's, this number can be the same as the ECU identification number. The combination of the product identification code and the product identification brand shall make the product globally unique.

Data length: Variable, up to 50 characters ("*" delimited)

Resolution: ASCII, 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operation range: same as data range

Type: Measured

SPN: 6699

The ASCII character "*" shall not be used in the product identification code because it is used as a parameter delimiter.

A.15 Product identification brand

The product identification brand specifies the brand of a product. The combination of the product identification code and the product identification brand shall make the product unique in the world.

Data length: Variable, up to 50 characters ("*" delimited)

Resolution: ASCII, 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operation range: same as data range

Type: Measured

SPN: 6700

The ASCII character "*" shall not be used in product identification brand because it is used as a parameter delimiter.

A.16 Product identification model

The product identification model specifies a unique product within a brand.

Data length: Variable, up to 50 characters ("*" delimited)

Resolution: ASCII, 0 offset

Data range: 32 to 126 and 160 to 255 per byte (excluding non-printable characters)

Operation range: same as data range

Type: Measured

SPN: 6701

The ASCII character "*" shall not be used in product identification model because it is used as a parameter delimiter.

Annex B
(normative)

Diagnostic information message definitions

B.1 ECU identification information

The ECU identification information message is based on the same message as defined in SAE J1939DA[8] with the following specified parameters. Each control function in the ECU shall send the same ECU-related identification information.

NOTE The fields in this message are separated by an ASCII "*" delimiter.

Transmission repetition rate:	On request
Data length:	Variable
Data page:	0
PDU format:	253
PDU specific:	197
Default priority:	6
Parameter group number:	64965 ($00FDC5_{16}$)

Byte 1 … m	ECU part number	(See A.1)
Byte m + 1	Delimiter	
Byte m + 2 … n	ECU serial number	(See A.2)
Byte n + 1	Delimiter	
Byte n + 2 … p	ECU location	(See A.7)
Byte p + 1	Delimiter	
Byte p + 2 … q	ECU type	(See A.8)
Byte q + 1	Delimiter	
Byte q + 2 … r	ECU manufacturer name	(See A.5)
Byte r + 1	Delimiter	
Byte r + 2 … s	ECU hardware ID	(See A.13)
Byte s + 1	Delimiter	

B.2 Software identification

The software identification message is based on the same message as defined in SAE J1939DA[8] with the following specified parameters. The software identification in the software identification message is used to communicate the software version (or versions) of a control function and the versions of ECU-related software required by the control function.

Transmission repetition rate: On request

Data length: Variable

Data page: 0

PDU format: 254

PDU specific: 218

Default priority: 6

Parameter group number: 65242 ($00FEDA_{16}$)

Byte 1	Number of software identification fields	(See A.3)
Bytes 2 … n	Software identification	(See A.4)

NOTE The examples below have line feeds inserted for presentation purposes only. Line feeds are not part of the actual software identification string.

EXAMPLE 1 Three software identification fields.

Control function with four modules in the first software identification field, two modules in the second software identification field, and one module in the third software identification field.

Byte 1	0x03	Number of software identification fields
Byte 2-n	VT1.5#	Software identification
	Module1 3.1#	
	Module2 2.0#	
	Module3 2.0#	
	*OpSys XY MMDDYY2.12#	
	Spooler 2.0#	
	*Bootloader 2.12	
	*	

EXAMPLE 2 Four software identification fields.

Control function with three modules in the first software identification field, one module in the second software identification field, two modules in the third software identification field, and one module in the fourth software identification field.

Byte 1	0x04	Number of software identification fields
Byte 2-n	SW-PN 654321,01.00#	Software identification
	CFPN1234a#	
	LG-MK901243#	
	*SW-456789,050421A#	
	*SW-456789,050436B#	
	LG-LK123–20050421#	
	*LB-LH456	
	*	

B.3 ISOBUS certification

The ISOBUS certification message shall be in accordance with ISO 11783-7.

B.4 ISO 11783 NAME

The ISO 11783 NAME shall be in accordance with ISO 11783-5. The industry, device class and function codes are in the address claim message sent by the specific control function. This information is from the address of the control function that has sent the specific address claim. The code values are specified in ISO 11783-1.

B.5 Diagnostic protocol

Each control function shall send this diagnostic protocol message to identify the supported protocols on the bus where the message is received.

Transmission repetition rate:	On request	
Data length:	8 bytes	
Data page:	0	
PDU format:	253	
PDU specific:	50	
Default priority:	6	
Parameter group number:	64818 ($00FD32_{16}$)	
Byte 1	diagnostic protocol identification	(See A.6)
Bytes 2–8	Reserved for ISO assignment	

B.6 Active diagnostic trouble codes (DM1)

This message is based on the same message as defined in SAE J1939-73 with the specified required parameters. The information communicated is limited to the currently active diagnostic trouble codes.

Transmission repetition rate: An active diagnostic trouble code (DM1) message is transmitted whenever a DTC becomes an active fault and at a normal update rate of once per second thereafter. If a fault has been active for 1 s or longer, and then becomes inactive, a DM1 message shall be transmitted to reflect this state change. After that, the DM1 is discontinued for this former error condition. If a different DTC changes state within the 1 s update period, a new DM1 message is transmitted to reflect this new DTC. To prevent a high message rate due to intermittent faults that have a very high frequency, no more than one state change per DTC per second should be transmitted.

Thus, a DTC that becomes active/inactive twice within a 1 s interval would have one message identifying the DTC becoming active, and one at the next periodic transmission identifying it being inactive. This message shall be sent every second if possible while one or more error conditions are active or in response to a request. If not possible according to timing constraints of ISO 11783-3, start the next transmission at the next 1 s interval.

Data length:	Variable
Data page:	0
PDU format:	254
PDU specific:	202
Default priority:	6
Parameter group number:	65226 ($00FECA_{16}$)

Byte: 1		Reserved, set to FF_{16}
Byte: 2		Reserved, set to FF_{16}
Byte: 3	bits 8–1	SPN, 8 least significant bits of SPN (most significant at bit 8)
Byte: 4	bits 8–1	SPN, second byte of SPN (most significant at bit 8)
Byte: 5	bits 8–6	SPN, 3 most significant bits (most significant at bit 8)
	bits 5–1	FMI (most significant at bit 5)
Byte: 6	bit 8	SPN conversion method (set to zero)
	bits 7–1	Occurrence count

When the occurrence count is not available, it shall be set to $7F_{16}$.

Bytes 3 to 6 shall be set to zero for no active faults.

This parameter group requires the use of transport protocol as specified in ISO 11783-3 when more than one active DTC exists.

NOTE Bytes 1 and 2 are not repeated in transport protocol DTC messages. Bytes 3 to 6 are repeated for each additional active DTC.

B.7 Previously active diagnostic trouble codes (DM2)

This message is based on the same message as defined in SAE J1939-73 with the specified required parameters. The information communicated is limited to the previously active trouble codes. It is used to notify other components on the network of the diagnostic condition of the transmitting electronic component. The data contains a list of diagnostic codes and occurrence counts for previously active

trouble codes. Whenever this message is sent, it shall contain all previously active trouble codes with an occurrence count not equal to zero.

Transmission repetition rate: On request only

A NACK is required if PGN is not supported (see ISO 11783-3, PGN 59392).

Data length: Variable

Data page: 0

PDU format: 254

PDU specific: 203

Default priority: 6

Parameter group number: 65227 ($00FECB_{16}$)

Byte: 1		Reserved, set to FF_{16}
Byte: 2		Reserved, set to FF_{16}
Byte: 3	bits 8–1	SPN, 8 least significant bits of SPN (most significant at bit 8)
Byte: 4	bits 8–1	SPN, second byte of SPN (most significant at bit 8)
Byte: 5	bits 8–6	SPN, 3 most significant bits (most significant at bit 8)
	bits 5–1	FMI (most significant at bit 5)
Byte: 6	bit 8	SPN conversion method (set to zero)
	bits 7–1	Occurrence count

When the occurrence count is not available, it shall be set to $7F_{16}$.

Bytes 3 to 6 shall be set to zero for no active faults.

This parameter group requires the use of transport protocol, as specified in ISO 11783-3, only when the message cannot be transmitted in a single frame.

NOTE Bytes 1 and 2 are not repeated in transport protocol. Bytes 3 to 6 are repeated for each additional active DTC.

B.8 Diagnostic data clear/reset previously active DTCs (DM3)

All of the diagnostic information pertaining to the previously active trouble codes (DM2) shall be erased when this PG is requested. The diagnostic data associated with active trouble codes are not affected. Upon the completion of this operation or if there are no faults to clear, a positive acknowledgement shall be sent as required (see ISO 11783-3, PGN 59392). If a control function cannot perform the requested action, then it is required to send a negative acknowledgement (see ISO 11783-3, PGN 59392). Designers should be aware that no positive or negative acknowledgement is sent when the request was sent to the global address.

Parameter group number: 65228 ($00FECC_{16}$)

EXAMPLE 1 An operator or service technician desires to clear the diagnostic data of an ECU, and the CF is able to perform the action when requested. When initiated by the operator or service technician, the diagnostic user interface or a service tool sends the Request PGN 59904 specifically to the specific ECU with the PGN 65228 as the requested PGN. The ECU responds with the Acknowledgement PGN 59392, indicating that the action was successfully completed for PGN 65228.

EXAMPLE 2 An operator or service technician desires to clear the diagnostic data of an ECU. The ECU supports the request for clearing diagnostic data as required, but is not able to perform action when requested. When initiated by the operator or service technician, the diagnostic user interface or a service tool sends the Request PGN 59904 specifically to the specific ECU with PGN 65228 as the requested PGN. The ECU responds with the negative Acknowledgement PGN 59392, indicating that the action was not completed for PGN 65228.

EXAMPLE 3 An operator or service technician desires to clear the diagnostic data of all ECUs. When initiated by the operator or service technician, the diagnostic user interface or a service tool sends the Request PGN 59904 to the global address with PGN 65228 as the requested PGN. All of the ECUs clear the diagnostic data if they are able, but none of them respond with a positive or negative acknowledgement since the request for clearing diagnostic data was sent to the global address.

B.9 Control function functionalities

This message identifies all the functionalities, functionality, generation and functionality options, supported by control functions.

With an update of this message, the number of option bytes for functionalities can be increased. A receiver of this message shall be able to parse this new message with the added bytes. To guarantee backwards compatibility, the following rules apply.

— Functionality characteristics values reserved for ISO assignment shall be parsed without generating an error.

— If the number of option bytes is larger than specified in this document for a functionality, the receiving CF shall ignore the undefined functionality option bytes and parse the known option bytes for this functionality only.

Each control function shall respond with byte 1 set to FF_{16}. Receivers of this message shall not process the message if byte 1 is set to a value other than FF_{16}. Byte 2 shall be set to the number of functionalities reported in the message. Byte 3 shall be set to the first listed functionality, followed by byte 4 set to the functionality generation of the functionality in byte 3.

Byte 5 shall be set to the number of the following bytes required for the functionality options of the functionality in byte 3. The bits in byte(s) 6 – *n* are set to the supported functionality options.

If more than one functionality is supported, the bytes following the first group of functionality, functionality generation, number of following option bytes and options byte(s) shall be repeated for each additional functionality. If more than eight bytes are required for the message, the message shall be sent using transport protocol. If less than eight bytes are required, the unused bytes shall be set to FF_{16}.

Transmission repetition rate:	On request
Data length:	variable, 8 bytes minimum
Data page:	0
PDU format:	252
PDU specific:	142
Default priority:	6
Parameter group number:	64654 ($00FC8E_{16}$)

Byte 1	FF_{16}	
Byte 2	Number of functionalities reported in this message	(See A.9)
Byte 3	First listed functionality	(See A.10)
Byte 4	First listed functionality generation	(See A.11)
Byte 5	Number of following first listed functionalities options byte(s)	(A.12)
Bytes 6 … *n*	First listed functionality options, if provided	(see Functionality/ Option list at www .ISOBUS.net/isobus)
Byte *n*+1	Second listed functionality, if provided	(See A.10)
Bytes *n*+2	Second listed functionality generation, if provided	(See A.11)
Bytes *n*+3	Number of following second listed functionalities options byte(s)	(A.12)
Bytes *n*+4 … *m*	Second listed functionality options, if provided	(see Functionality/ Option list at www .ISOBUS.net/isobus)
Bytes *m*+1… *p*	Additional functionality, functionality generations and options as listed in bytes 3 – n	

EXAMPLE 1 Diagnostic protocol and functionality message for ISO 11783 version 3 virtual terminal with UT generation 2 and minimum CF generation 1.

Byte 1	FF_{16}	Reserved	
Byte 2	0x02	Number of functionalities in message	
Byte 3	0x00	Minimum CF	(See A.10)
Byte 4	0x01	Minimum CF generation 1	(See A.11)
Byte 5	0x00	Number of option bytes	(See A.12)
Byte 6	0x01	UT	(See A.10)
Byte 7	0x02	UT generation 2	(See A.11)
Byte 8	0x00	Number of option bytes	(See A.12)

EXAMPLE 2 ISO 11783 Working Set Master compliant with UT generation 3, AUX-N, TC-GEO generation 1, TECU generation 1, and minimum CF generation 1.

Byte 1	FF_{16}	Reserved	(See A.6)
Byte 2	0x06	Number of functionalities in message	
Byte 3	0x02	UT	(See A.10)
Byte 4	0x03	UT generation 3	(See A.11)
Byte 5	0x00	Number of option bytes	(See A.12)
Byte 6	0x06	AUX-N	(See A.10)

Byte 7	0x01	AUX -N generation 1	(See A.11)
Byte 8	0x01	Number of option bytes	(See A.12)
Byte 9	00000101	AUX-N function types 0 and 2	(see Functionality/Option list at www.ISOBUS.net/isobus)
Byte 10	0x08	TC-BAS	(See A.10)
Byte 11	0x01	TC BAS generation 1	(See A.11)
Byte 12	0x00	Number of option bytes	(See A.12)
Byte 13	0x0A	TC-GEO	(See A.10)
Byte 14	0x01	TC-GEO generation 1	(See A.11)
Byte 15	0x01	Number of option bytes	(See A.12)
Byte 16	0x04	Number of control channels	(See Functionality/Option list at www.ISOBUS.net/isobus)
Byte 17	0x0E	TECU	(See A.10)
Byte 18	0x01	TECU generation 1	(See A.11)
Byte 19	0x01	Number of option bytes	(See A.12)
Byte 20	00001001	Class 1, Navigation options	(See Functionality/Option list at www.ISOBUS.net/isobus)
Byte 21	0x00	Minimum CF	(See A.10)
Byte 22	0x01	Minimum CF generation 1	(See A.11)
Byte 23	0x00	Number of option bytes	(See A.12)

EXAMPLE 3 Proprietary CF FF_{16} conforming to minimum control function generation 1.

Byte 1		Reserved	
Byte 2	0x01	Number of functionalities in message	
Byte 3	0x00	Minimum control function	(See A.10)
Byte 4	0x01	Minimum control function generation 1	(See A.11)
Byte 5	0x00	Number of option bytes	(See A.12)
Bytes 6 - 8	$FFFFFF_{16}$		

B.10 Product identification

Each control function shall provide information of the product in which it is used. With this information, a service technician will know which control functions belong to which product. An operator or service technician can also use this information when contacting a dealer or manufacturer to identify a product.

Each control function of a product shall respond with the same product identification information when it receives the Request PGN message for this PGN.

NOTE The fields in this message are separated by an ASCII "*" delimiter.

Future versions of the product identification information message can contain additional fields, separated by a "*". Control functions based on the version specified in this document shall be able to encode at least the information specified in this document.

Transmission repetition rate:	On request
Data length:	Variable
Data page:	0
PDU format:	252
PDU specific:	141
Default priority:	6
Parameter group number:	64653 (00FC8D16)
Byte 1 … k	product identification code (see A.14)
Byte k + 1	Delimiter
Byte k + 2 … m	product identification brand (see A.15)
Byte m + 1	Delimiter
Byte m + 2 … n	product identification model (see A.16)
Byte n + 1	Delimiter

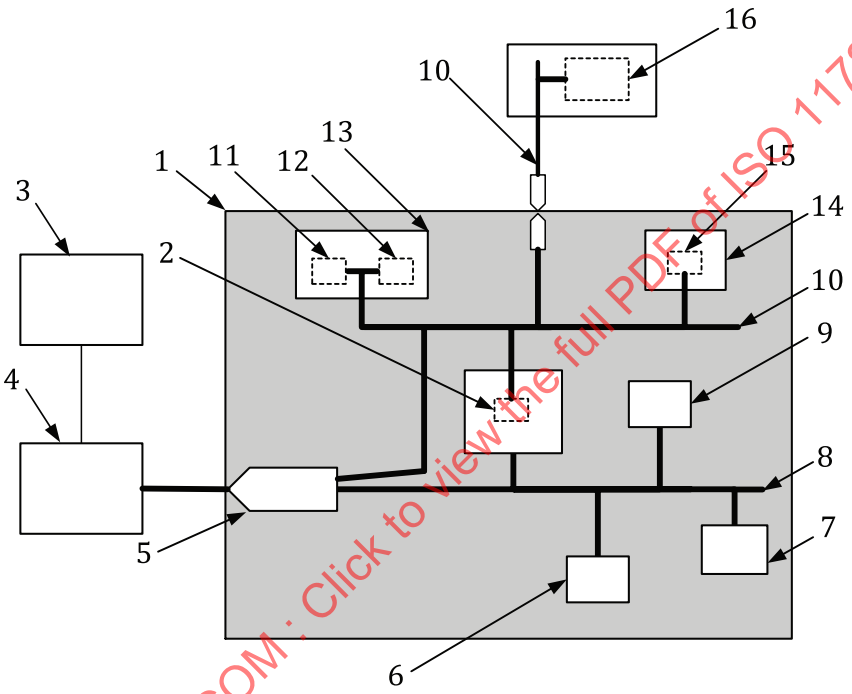
EXAMPLE For product model 1926i from Brand B with identification code 1234567890ABC: 1234567890ABC*Brand B*1962i*.

Annex C
(normative)

Network configuration

C.1 Network configuration

Figure C.1 illustrates an example network configuration that shall support the diagnostic system and its connection to the ISO 11783 diagnostic connector.



Key

1	Product1: tractor or self-propelled implement	9	tractor bus ECU n
2	tractor ECU CF	10	ISO 11783 bus
3	diagnostic tool	11	ISO 11783, CF1
4	diagnostic tool interface	12	ISO 11783, CF2
5	ISO 11783 diagnostic connector	13	ISO 11783 OEM-installed ECU
6	tractor bus ECU 1	14	Product 2: ISO 11783 aftermarket ECU
7	tractor bus ECU 2	15	ISO 11783 CF n
8	tractor bus	16	ISO 11783 implement CF

Figure C.1 — Network configuration

C.2 Diagnostic connector

The diagnostic connector and its installation shall be in accordance with ISO 11783-2.

Annex D
(informative)

Network configuration screen examples — Network information screens

D.1 Network information screen

Figure D.1 illustrates an example of a typical network information screen (see 6.2).

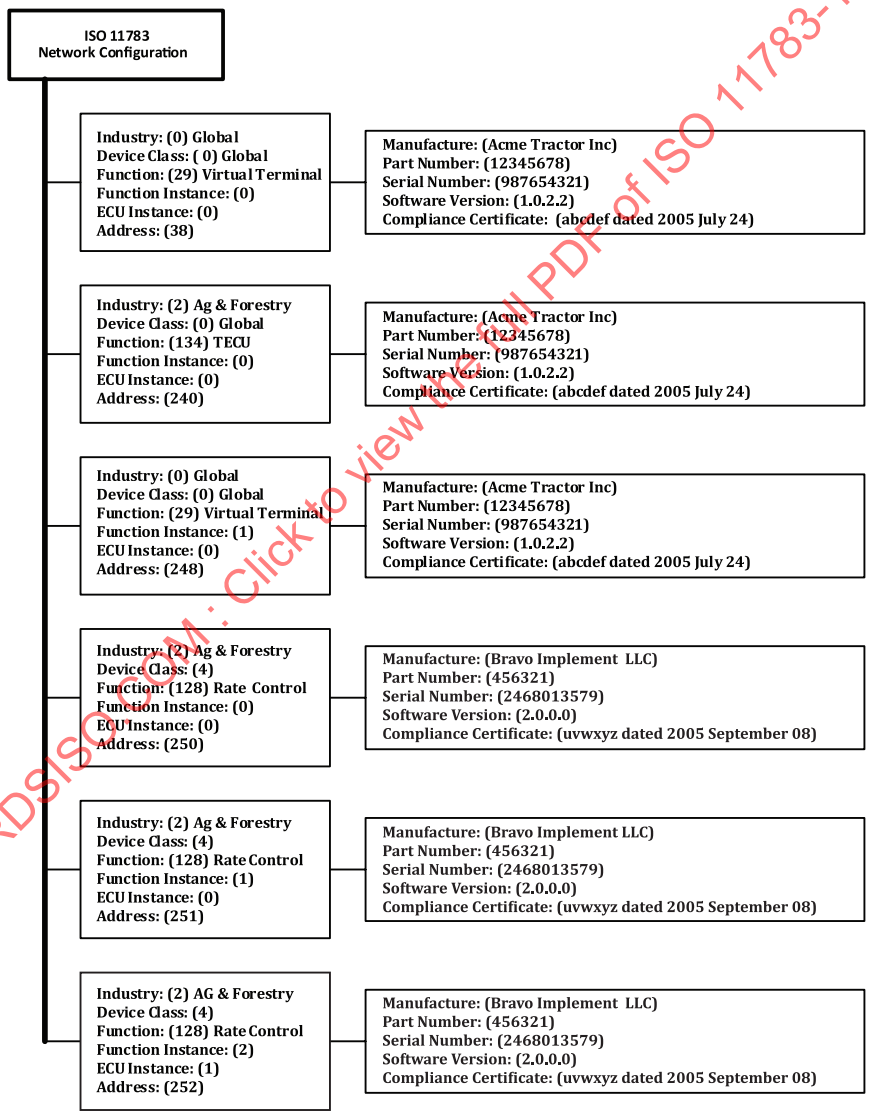


Figure D.1 — Typical network information screen

D.2 Network statistics screen

Figure D.2 illustrates an example of a typical network statistics screen (see 6.3).

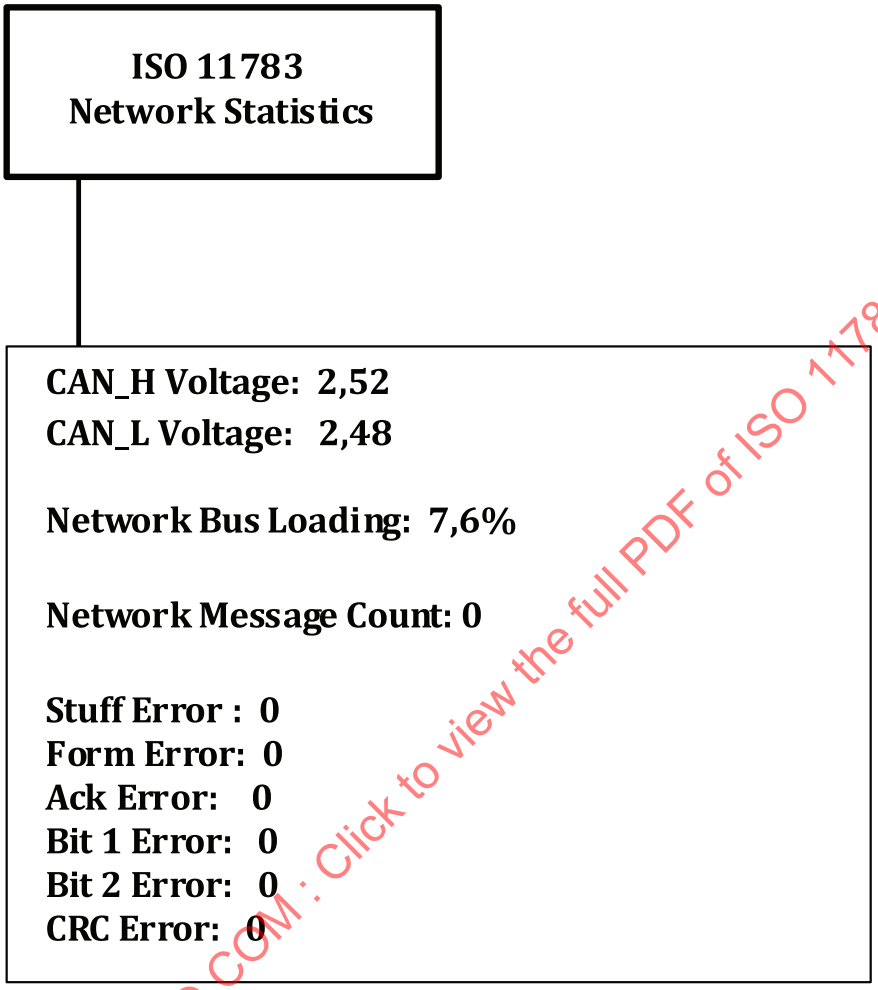


Figure D.2 — Typical network statistics screen

D.3 Network diagnostic screen

Figure D.3 illustrates an example of a typical network diagnostic information screen (see 6.4).

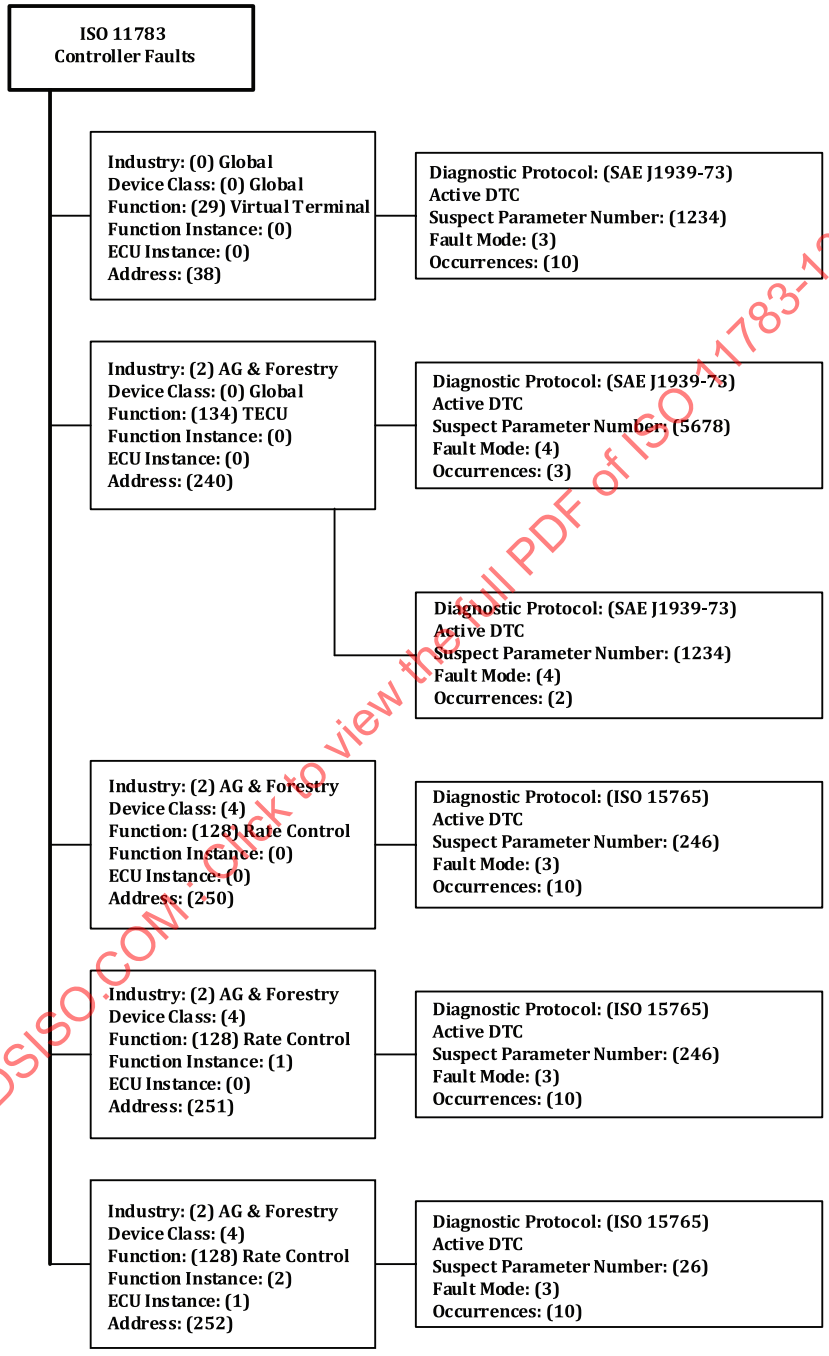


Figure D.3 — Typical network diagnostic information screen

D.4 Connected system functionalities screen

Figure D.4 illustrates an example of a typical connected system functionalities screen (see 6.5).

Functionalities	System Configured	System Generation
UT	✓	Gen: 3
AUX-O	✘	✘
AUX-N	✓	Gen: 2
TC-BAS	✓	Gen: 1
TC-GEO	✓	Gen: 1
TC-SC	✘	✘
TECU	✘	✘

NOTE 1 X indicates not installed or not available.

NOTE 2 Displayed functionality names are examples only and not specified in this document.

Figure D.4 — Typical connected system functionalities screen

D.5 Implement capable functionalities screen

Figure D.5 illustrates an example of a typical implement capable functionalities screen (see 6.5).

Functionalities	Actual Tractor Functionalities	Actual Implement Functionalities
UT	Gen: 4	Gen: 3
AUX-O	✘	✘
AUX-N	Gen: 4	Gen: 2
TC-BAS	Gen: 1	Gen: 1
TC-GEO	Gen: 1	Gen: 1
TC-SC	✘	✘
TECU	✘	✘

NOTE 1 X indicates not installed or not available.

NOTE 2 Displayed functionality names are examples only and not specified in this document.

Figure D.5 — Typical implement capable functionalities screen