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

Part 1: General standard for mobile data communication

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

Partie 1: Système normalisé général pour les communications de données avec les équipements mobiles

Reference number
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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).

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

For an explanation on 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 the following URL: 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 second edition cancels and replaces the first edition (ISO 11783-1:2007). The main change with respect to the previous edition is that all identifiers (parameters) listed in the first edition of ISO 11783-1:2007, Annexes A to G, have been moved to an electronic database and are now referenced as parameter group, address and identity assignments. These assignments are officially registered by the Society of Automotive Engineers — SAE and are a part of the recommended practices of SAE J1939.

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

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Introduction

ISO 11783 specifies a communications system for agricultural equipment based on the ISO 11898-2 protocol. SAE J1939 documents[1)], 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 this part of ISO 11783.

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.

1) Society of Automotive Engineers, Warrendale, PA, USA.

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

Part 1: General standard for mobile data communication

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. It is intended to provide open system interconnect (OSI) for electronic systems used by agricultural and forestry equipment. This part of ISO 11783 gives a general overview of ISO 11783.

For ISO 11783 application developers, the content of this electronic database provides the current listing of the ISO 11783-1 address assignments, identity assignments, and parameter definitions which have been assigned and which are officially registered by SAE J1939. This information is found in the online database on the ISOBUS website (http://www.isobus.net/).

NOTE The secretariat of the maintenance agency (MA) is provided by VDMA (German Engineering Federation) on behalf of DIN.

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 (all parts), *Tractors and machinery for agriculture and forestry — Serial control and communications data network*

ISO 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
address
8-bit field used to define the source or destination of a message

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3.2
alarm mask
object that defines alarm information for display on a virtual terminal

3.3
auxiliary input unit
autonomous *control function* (3.10) providing auxiliary controls for common use that can also be physically located within an *electronic control unit* (3.19), or on the *virtual terminal* (3.67)

3.4
auxiliary new
AUX-N
functionality (3.26) specific to Type 2 auxiliary controls defined in ISO 11783-6

3.5
auxiliary old
AUX-O
functionality (3.26) specific to Type 1 auxiliary controls defined in ISO 11783-6

3.6
char
single character whose size is 1 byte

Note 1 to entry: Commonly used for ISO/IEC 8859 characters (e.g. 41_{16} in ISO/IEC 8859-1 represents "A").

3.7
character
single text grapheme or symbol, as in an alphabet

Note 1 to entry: Size is variable based on the encoding scheme. See *char* (3.6) and *WideChar* (3.68).

3.8
client
control function on the mobile implement bus that uses the services of a server or master

3.9
code plane
group of 65536 possible character codes

Note 1 to entry: Unicode/ISO/IEC 10646 organizes the characters in 17 code planes numbered 0 to 16.

EXAMPLE Code plane 0 covers characters 000000_{16} to $00FFFF_{16}$. Code plane 1 covers characters 010000_{16} to $01FFFF_{16}$. … Code plane 16 covers characters 100000_{16} to $10FFFF_{16}$.

3.10
control function
CF
function that performs operations to complete a specific function on or within devices

Note 1 to entry: A control function has one unique address on the network.

3.11
data dictionary
DD
listing of data variables and their identifiers

Note 1 to entry: The data dictionary is defined in ISO 11783-11.

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3.12
data dictionary element
DDE
parameter defined in the *data dictionary* (3.11)

Note 1 to entry: The parameter is identified by a *data dictionary identifier* (3.13).

Note 2 to entry: This parameter is used for control/monitoring functions via the Process Data Message (PDM).

3.13
data dictionary identifier
DDI
16-bit number that uniquely identifies a *data dictionary element* (3.12)

Note 1 to entry: The data dictionary identifier is used in the process data message to identify the data dictionary element for which a value or command is communicated.

Note 2 to entry: See http://www.isobus.net/ for data dictionary identifiers.

3.14
data logger
DL
control function (3.10) defined specifically to perform data logging functionality that uses the task *controller* (3.59) *process data* (3.50) protocol

Note 1 to entry: A DL can be part of a telemetry system or can be a separate CF collecting device descriptions and process data messages in addition to logging data from any other *parameter groups* (3.43) that are broadcasted or can be requested on the ISO 11783 network. The DL is defined in ISO 11783-10.

3.15
data mask
top-level user interface object that contains other objects for display and operator interaction on a reserved area of the virtual terminal

3.16
data page
DP
1-bit field in the identifier portion of the CAN arbitration field that is combined with the *extended data page* (3.21) bit to select one of four pages of message definitions

3.17
destination address
DA
protocol data unit (3.51) specific field in the CAN identifier used to indicate the address of the intended receiver of the CAN message

3.18
device
mechanical system such as *tractor* (3.64), trailer or *implement* (3.30), or an independent sensor system

3.19
electronic control unit
ECU
electronic item consisting of a combination of basic parts, subassemblies and assemblies packaged together as a physically independent entity

Note 1 to entry: An ECU can contain one or more *control functions* (3.10).

EXAMPLE Implement controller, network interconnect unit or operator terminal.

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3.20
equipment
device (3.18) or *machine* (3.33) that performs a specific field operation

Note 1 to entry: It can be a *tractor* (3.64) or an *implement* (3.30) attached to a tractor or self-propelled machine.

3.21
extended data page
EDP
1-bit field in the identifier portion of the CAN arbitration field that is combined with the *data page* (3.16) bit to select between multiple pages of decoding of the remaining sections of the identifier field

Note 1 to entry: All ISO 11783 messages set the extended data page bit to zero on transmit.

3.22
extended transport protocol
ETP
message transfer protocol used for the transfer of *parameter groups* (3.43) that have 1786 to 117440512 bytes of data

3.23
farm management information system
FMIS
office computer system used by a farmer or contractor that includes the software for farm management, such as book keeping, payroll, resource management for machines, products, workers, field management, geographical information system, decision support systems and task management

3.24
file server
FS
control function (3.10) on the mobile implement bus that provides storage for files and uses a set of commands for the handling of, and access to, these files

3.25
function
action or activity by which *equipment* (3.20) fulfils one of its intended purposes

3.26
functionality
capability of units or items of a *mobile implement control system* (3.36) on an ISO 11783 network that performs a specific *function* (3.25) or group of functions and is offered to end users in the market

EXAMPLE Minimum control function, universal terminal (server), task controller basic (client) and file server.

3.27
functionality characteristic
distinction between the *functionality* (3.26) capabilities of a *control function* (3.10) as a result of changes to ISO 11783

EXAMPLE Virtual Terminal (Ver 2) - Virtual Terminal (Ver 3) and TECU Class1 (Ver 1) - TECU Class1 (Ver 2).

3.28
functionality generation
indication of the capability or level of a *control function's* (3.10) *functionality characteristic* (3.27)

3.29
group extension
GE
protocol data unit-specific field (3.46) that is used as part of the information necessary to determine the *parameter group number* (3.44)

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3.30
implement
device (3.18) or *machine* (3.33) that performs a specific operation and which is normally attached to a *tractor* (3.64)

3.31
industry group
IG
allocation of *devices* (3.18) and their functions used by a specific industry

3.32
initial address
source address of a *control function* (3.10) in a self-configuring *electronic control unit* (3.19) that is determined during initial power up of the ECU and which is used on the subsequent power up

3.33
machine
device (3.18) that uses or applies mechanical power, which has a definite function and which performs a specific kind or kinds of work

3.34
message
one or more CAN data frames used to communicate information from the same *parameter group number* (3.44)

Note 1 to entry: The information related to a single parameter group number to be transferred on the network can take several CAN data frames.

3.35
minimum control function
functionality (3.26) specific to ISO 11783-3, ISO 11783-5, and ISO 11783-12

3.36
mobile implement control system
MICS
devices (3.18) that are coupled together by, and that use, the ISO 11783 network

3.37
multi-packet message
message used when more than one CAN data frame is required to transmit all data specific to a given *parameter group number* (3.44)

Note 1 to entry: Each CAN data frame has the same CAN identifier but contains different data in each packet.

3.38
NAME
8-byte entity which provides an indication of each *control function* (3.10) of an *electronic control unit* (3.19)

Note 1 to entry: The NAME is used to provide a description of the control function and to provide a numerical value that can be used for arbitration of conflicting addresses.

3.39
Negative acknowledgement
response to a message that indicates that it has not been understood or that a requested action cannot be performed

3.40
node
physical connection of an *electronic control unit* (3.19) to the network

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3.41
non-configurable address
source address (3.56) of a *control function* (3.10) that cannot be altered by any means

3.42
packet
single CAN data frame of a multi-frame message

Note 1 to entry: This can also be a message if the data content to be transferred is in one CAN data frame.

3.43
parameter group
PG
identification of the data in a single-packet or multi-packet message

Note 1 to entry: Parameter groups are not dependent on the *source address* (3.56) field allowing any source to send any parameter group.

Note 2 to entry: Parameter groups include data, commands, requests, acknowledgements, and *negative acknowledgements* (3.39).

Note 3 to entry: See http://www.isobus.net/ for parameter group assignments.

3.44
parameter group number
PGN
3-byte or 24-bit representation of the *data page* (3.16), *extended data page* (3.21), *protocol data unit format* (3.45) and *group extension* (3.29) fields that identifies a particular *parameter group* (3.43)

3.45
PDU format
protocol data unit format
PF
8-bit field in the 29-bit CAN identifier that identifies the format of the protocol data unit

Note 1 to entry: It is also one of the fields used to determine the *parameter group number* (3.44) that labels the data field of the CAN data frame.

3.46
PDU specific field
protocol data unit-specific unit field
PS
8-bit field in the 29-bit CAN identifier that is either a *destination address* (3.17) or *group extension* (3.29)

3.47
PDU1 format
protocol data unit format (3.45) used for messages which are to be sent to a *destination address* (3.17)

Note 1 to entry: The protocol data unit-specific field contains the destination address (specific or global).

3.48
PDU2 format
protocol data unit format (3.45) used to send information by the *group extension* (3.29) technique

Note 1 to entry: The protocol data unit specific field contains the group extension.

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3.49
preferred address
source address (3.56) of a *control function* (3.10) in electronic control units that is designated by ISO 11783 to be used as default on first connection to the network

Note 1 to entry: Control functions with a preferred address are listed in the ISO 11783 database at http://www.isobus.net/.

3.50
process data
measured data and/or set point commands communicated by *control functions* (3.10)

3.51
protocol data unit
PDU
ISO 11783 specified data field in a CAN data frame that defines the transmitted information

3.52
safe state
operating mode of a system with an acceptable level of risk for operator or bystander even when the control system fails or partly fails

3.53
self-configurable address
source address (3.56) of a *control function* (3.10), determined by internal calculations during initial power up of the *electronic control unit* (3.19), which the control function then claims as that address on the network

3.54
sequence control system
system with sequence control master and one or more clients performing the sequence control functionality as described in ISO 11783-14

3.55
soft key mask
object that contains soft key objects for display on a virtual terminal

3.56
source address
SA
8-bit field in the 29-bit CAN identifier that provides for the unique identification of the source of a message

Note 1 to entry: The source address field contains the address of the *control function* (3.10) that is sending the message.

3.57
surrogate pair
32-bit code for characters composed of a 16-bit high pair and a 16-bit low pair

Note 1 to entry: UTF-16 encoding of characters in code plane 1 to 16.

Note 2 to entry: UTF-16 character encoding scheme defined by ISO/IEC 10646.

3.58
suspect parameter number
SPN
19-bit number used to identify a particular element, component, or parameter associated with a *control function* (3.10)

Note 1 to entry: Suspect parameter numbers are assigned to each individual parameter in a *parameter group* (3.43), and to items that are relevant to diagnostics but are not presently a parameter in a parameter group.

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3.59
task controller
TC
control function (3.10) on the *mobile implement control system* (3.36) that is responsible for the sending, receiving and logging of process data

3.60
task controller basic
TC-BAS
functionality (3.26) specific to ISO 11783-10 defined capabilities which does not require geographic reference

3.61
task controller geo
TC-GEO
functionality (3.26) specific to ISO 11783-10 defined capabilities which requires geographic reference

3.62
task controller section control
TC-SC
functionality (3.26) specific to ISO 11783-10 section control specifications

3.63
terminating bias circuit
TBC
circuit required at each end of an ISO 11783 network segment that provides bias voltages for the CAN_H and CAN_L signals and the common mode impedance termination for the respective conductors

3.64
tractor
machine (3.33) that is the primary source of power in a connected system

Note 1 to entry: A connected system consists of a *tractor* (3.64) and can include one or more *implements* (3.30).

Note 2 to entry: Self-propelled agricultural *equipment* (3.20) or construction equipment includes a primary source of power.

3.65
universal terminal
UT
functionality (3.26) specific to ISO 11783-6 defined capabilities excluding auxiliary controls

3.66
vehicle
machine (3.33) for the transportation of goods and people on land

3.67
virtual terminal
VT
electronic control unit (3.19) consisting of a graphical display and input controls providing the capability to display information to and retrieve data from an operator for a connected *implement* (3.30) or *working set* (3.70)

3.68
WideChar
single character with a size of 2 bytes encoded in little endian order

EXAMPLE Byte sequence 41_{16}, 00_{16} represents 'A'.

Note 1 to entry: Two WideChars can be combined to indicate character codes exceeding 16-bit

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