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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**

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*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  
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 11783-1 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

ISO 11783 consists of the following parts, under the general title *Tractors and machinery for agriculture and forestry — Serial control and communications data network*:

- *Part 1: General standard for mobile data communication*
- *Part 2: Physical layer*
- *Part 3: Data link layer*
- *Part 4: Network layer*
- *Part 5: Network management*
- *Part 6: Virtual terminal*
- *Part 7: Implement messages application layer*
- *Part 8: Power train messages*
- *Part 9: Tractor ECU*
- *Part 10: Task controller and management information system data interchange*
- *Part 11: Mobile data element dictionary*
- *Part 12: Diagnostics services*
- *Part 13: File server*

Automated functions is to form the subject of a future part 14.

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## Introduction

ISO 11783 specifies a communications system for agricultural equipment based on the CAN 2.0 B <sup>[1]</sup> protocol. SAE J 1939 documents<sup>1)</sup>, 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 J 1939 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.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this part of ISO 11783 may involve the use of a patent concerning the controller area network (CAN) protocol referred to throughout the document.

ISO takes no position concerning the evidence, validity and scope of this patent.

The holder of this patent has assured ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from:

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Attention is drawn to the possibility that some of the elements of this part of ISO 11783 may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

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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. Its annexes contain the identifiers for messages, addresses, control functions, implements and manufacturers, required for the implementation of a compliant network.

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### 2 Normative references

[ISO 11783-1:2007](#)

The following referenced documents are indispensable for the application 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.

#### 3.1

##### **active mask**

collection of display elements selected by a working set for display on a virtual terminal

NOTE An active mask may or need not be visible.

#### 3.2

##### **address**

eight-bit field used to define the source or destination of a message

#### 3.3

##### **alarm mask**

object that defines alarm information for display on a virtual terminal

**3.4  
auxiliary input unit**

electronic control unit providing auxiliary controls for common use

NOTE These may be physically located on the virtual terminal.

**3.5  
bridge**

electronic control unit interconnecting two ISO 11783 network segments that stores and forwards messages between the two or more network segments

NOTE 1 This permits changes of media, the electrical interface, and data rate between segments, but the data link protocol and address space are the same on both connections of a bridge.

NOTE 2 A bridge can selectively filter messages going across it so that the network load is minimized on each segment.

**3.6  
coding data**

data that changes infrequently, such as machine or chemical data, or that does not vary from task to task

**3.7  
command configurable address**

source address of a control function that can be altered using the command address message during normal operations

**3.8  
control function**

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

NOTE A control function has one unique address on the network.

**3.9  
data dictionary**

listing of data variables and their identifiers

NOTE The data dictionary is defined in ISO 11783-11.

**3.10  
data dictionary entity**

process data variable data dictionary identifier, definition, value range, value resolution and units specifications

**3.11  
data dictionary identifier**

16-bit number that uniquely identifies a data dictionary entity

NOTE The data dictionary identifier is used in the process data message to identify the data dictionary entity for which a value or command is communicated.

**3.12  
data page**

bit in the identifier portion of the CAN arbitration field used to select one of two pages of parameter group numbers

**3.13  
data transfer file**

generic term for files in the extensible markup language format, which are used for the data transfer between the farm management information system and the task controller of an ISO 11783 network

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**3.14****destination address****DA**

protocol data unit-specific field in the CAN identifier used to indicate the address of the intended receiver of the CAN message

**3.15****device**

mechanical system such as tractor, trailer or implement, or an independent sensor system

**3.16****device element**

any addressable item on a device

EXAMPLE Nozzle on sprayer boom where the nozzle has individually addressable process data variables.

**3.17****display**

part of a virtual terminal that presents visible information to an operator

**3.18****electronic control unit****ECU**

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

EXAMPLE Function controller, network interconnect unit or virtual terminal.

**3.19****equipment**

device or machine that performs a specific field operation

NOTE It can be a tractor or an implement attached to a tractor or self-propelled machine.

**3.20****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

**3.21****field**

one or more partfields

NOTE The field is only of importance within the farm management information system for business management considerations and is not necessarily related to a single crop.

**3.22****function**

action or activity by which equipment fulfils one of its intended purposes

**3.23****gateway**

electronic control unit that permits data to be transferred between two networks with different protocols or message sets

NOTE A gateway provides a means to repackage parameters into new message groups when transferring messages from one network to another.

**3.24**

**grid cell**

rectangular areas defined by overlaying a grid on a partfield

**3.25**

**group extension**

protocol data unit-specific field that is used as part of the information necessary to determine the parameter group number

**3.26**

**implement**

device or machine that performs a specific operation and which is normally attached to a tractor

**3.27**

**industry group**

**IG**

allocation of devices and their functions used by a specific industry

**3.28**

**initial address**

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

**3.29**

**machine**

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

**3.30**

**management computer gateway**

electronic control unit that interfaces to the management computer system and to the ISO 11783 network

NOTE

A management computer gateway can store data for transmission at a later time.

**3.31**

**mask**

top-level object that contains other objects for display on the virtual terminal

**3.32**

**media**

physical entity that conveys the electrical transmission (or equivalent means of communication) between ECUs on the network

NOTE

ISO 11783 media consists of quad-twisted copper wires.

**3.33**

**message**

one or more CAN data frames with the same parameter group number

NOTE

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

**3.34**

**mobile implement control system**

devices that are coupled together by, and that use, the ISO 11783 network

**3.35**

**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

NOTE

Each CAN data frame has the same CAN identifier but contains different data in each packet.

**3.36****NAME**

eight-byte entity which provides an indication of each control function of an ECU

NOTE 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.

**3.37****negative-acknowledgement**

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

**3.38****network interconnection unit**

electronic control unit used for interconnecting networks or network segments

NOTE Specific implementations for forwarding messages include repeaters, bridges, routers and gateways.

**3.39****node**

physical connection of an ECU to the network

**3.40****non-configurable address**

source address of a control function that can not be altered by any means

**3.41****object pool**

collection of objects that define the operator interface, user interface or device description for an implement or single working set

NOTE A complete virtual terminal interface is composed of one or more object pools — one for each implement or working set.

**3.42****packet**

single CAN data frame of a multi-frame message

NOTE 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 Parameter groups are not dependent on the source address field allowing any source to send any parameter group.

NOTE 2 Parameter groups include data, commands, requests, acknowledgments, and negative-acknowledgments.

NOTE 3 See Annex A for parameter group assignments.

**3.44****parameter group number**

three-byte or 24-bit representation of the data page, protocol data unit format and group extension fields that identifies a particular parameter group

**3.45****partfield**

area characterized by the cultivation of only one agricultural crop

NOTE Partfield is the XML element to which tasks are allocated to obtain smallest granularity.

**3.46**  
**PDU format**

eight-bit field in the 29-bit CAN identifier that identifies the format of the protocol data unit

NOTE It is also one of the fields used to determine the parameter group number that labels the data field of the CAN data frame.

**3.47**  
**PDU specific**  
**PS**

eight-bit field in the 29-bit CAN identifier that is either a destination address or group extension

**3.48**  
**PDU1 format**

protocol data unit format used for messages which are to be sent to a destination address

NOTE The protocol data unit-specific field contains the destination address (specific or global).

**3.49**  
**PDU2 format**

protocol data unit format used to send information by the group extension technique

NOTE The protocol data unit specific field contains the group extension.

**3.50**  
**preferred address**

source address of a control function in electronic control units that cannot be changed after device configuration

NOTE Control functions with preferred address are listed in Annex C.

**3.51**  
**pixel**

smallest addressable picture element on a virtual terminal display

**3.52**  
**polygon**

planar surface, defined by one exterior boundary, and by zero or more interior boundaries

NOTE 1 Each interior boundary describes a hole in the surface.

NOTE 2 A single or group of polygons can be used to define a treatment zone.

**3.53**  
**priority**

three-bit field in the CAN identifier that establishes the arbitration priority of the information communicated

NOTE The highest priority is zero and the lowest priority is seven.

**3.54**  
**process data message**

message used for the transmission of measured data and/or set point commands to one or more control functions

**3.55**  
**process data variable**

information unit that describes an individual characteristic

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NOTE Process data variables consist of the attributes range, resolution and units, as defined in the data dictionary.

### 3.56

#### protocol data unit

#### PDU

ISO 11783-specific CAN data frame

### 3.57

#### repeater

electronic control unit that regenerates the data signal to and from another network segment, permitting more electrical loads (i.e. ECU) to be connected or connection to another type of media (physical layer expansion)

NOTE The data rate, protocol and address space are the same on both sides of the repeater.

### 3.58

#### router

electronic control unit that connects network segments with independent address space, data rates and media, but which has the same protocol across all network segments

NOTE A router permits a tractor or an implement to appear as a single ECU to other network segments.

### 3.59

#### segment

portion of the network using the same physical media

NOTE 1 There is only one path between any two nodes and the data transmitted by any node are available to all other nodes connected to the same segment.

NOTE 2 Multiple segments are connected together by network interconnect units, including gateways, repeaters, bridges and routers.

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### 3.60

#### self-configurable address

source address of a control function, determined by internal calculations during initial power up of the electronic control unit, which ECU then claims as that address on the network

### 3.61

#### service-configurable address

source address of a control function that is changed in operational service mode by using a service tool and any of a number of proprietary techniques, or by using the commanded-address message

### 3.62

#### soft key mask

object that contains key data for display on a virtual terminal

### 3.63

#### source address

#### SA

eight-bit field in the 29-bit CAN identifier that provides for the unique identification of the source of a message

NOTE The source address field contains the address of the control function that is sending the message.

### 3.64

#### subnetwork

specific ISO 11783 network segment when multiple segments are used on a device

NOTE 1 Subnetworks can include tractor, implement, hydraulic auxiliary valves and braking system.

NOTE 2 Collectively, the subnetworks are the ISO 11783 system network.

**3.65**

**task**

execution or performance of work on one partfield, for one farm or for one customer

NOTE 1 An operator can activate one task that contains process data variable values for one or more working sets.

NOTE 2 A maximum of one task can be active at the one time on a single task controller.

**3.66**

**task controller**

electronic control unit on the mobile implement control system that is responsible for the sending, receiving and logging of process data

**3.67**

**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

**3.68**

**tractor**

machine that is the primary source of power in a connected system

NOTE 1 A connected system consists of a tractor and can include one or more implements.

NOTE 2 Self-propelled agricultural equipment or construction equipment include a primary source of power.

**3.69**

**treatment zone**

area to be treated with a constant value of one or more process data variables

NOTE A treatment zone can consist of several grid cells or a polygon with the same treatment parameters.

**3.70**

**vehicle**

machine for the transportation of goods and people on land

**3.71**

**virtual terminal**

**VT**

electronic control unit 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 or working set

**3.72**

**visible mask**

active data or alarm mask that is visible on the display of the virtual terminal

**3.73**

**working set**

group of NAMEs in one or more ECUs that collectively provide a control function or group of control functions

NOTE All control functions that are part of a working set, whether or not they are in separate electronic control units, are identified as members by the working-set master.

**3.74****working-set master**

coordinator of the communications of a working set

NOTE 1 The source address of the working-set master is used to identify the working set and, for others, to communicate with the working set.

NOTE 2 The working-set master is identified by a specific control function within a specific electronic control unit.

**3.75****XML element**

element representing an object of the real world

NOTE The extensible markup language element is characterized by a specific name and a definition. It contains several extensible markup language attributes, each with a name and a definition.

**4 Abbreviated terms**

ADIS	agriculture data interface syntax	P	page
AID	attribute identifier	PDU	protocol data unit
BMG	bit mapped graphics	PF	PDU format
BNF	Backus-Naur format	PG	parameter group
CAN	controller area network	PGN	parameter group number
DA	destination address	Pri	priority
DID	device identifier	PS	PDU specific
DTD	document type definition	PS_DA	PDU Specific_Destination Address
DP	data page	PS_GE	PDU Specific_Group Extension
DTF	data transfer file	PTO	power take-off
ECU	electronic control unit	R	reserved
FMIS	farm management information system	RAM	random access memory
GE	group extension	RTB	request to broadcast
GIS	geographical information system	SA	source address
GPS	global positioning system	SLOT	scaling, limits, offset and transfer function
IDn	identification	SPN	suspect parameter number
IDr	identifier	SRR	substitute remote request
IDE	identifier extension bit	TBC	terminating bias circuit
IDN	identification number	Un	undefined
IG	industry group	UTC	coordinated universal time
LSB	least significant byte or least significant bit	VT	virtual terminal
MICS	mobile implement control system	WU	world units
MSB	most significant byte/most significant bit	XML	extensible markup language
NA	not allowed	XSD	XML schema definition
OEM	original equipment manufacturer		
OSI	open system interconnect		