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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

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Contents

Page

Foreword ... iv
Introduction ... v
1 Scope ... 1
2 Normative references ... 1
3 Terms and definitions ... 1
4 Abbreviated terms ... 9
5 Application of OSI model to ISO 11783 ... 10
6 ISO 11783 network requirements ... 11
6.1 General ... 11
6.2 Physical layer ... 11
6.3 Data link layer ... 11
6.4 Network layer ... 13
6.5 Network management ... 13
6.6 Network segments ... 13
6.7 Virtual terminal ... 15
6.8 Tractor ECU ... 15
6.9 Task controllers ... 15
6.10 Farm management computer interface ... 15
6.11 Diagnostics ... 16
6.12 File server ... 16
6.13 Process data ... 16
6.14 Working sets ... 16
6.15 Safe mode operation ... 18
6.16 Addition of parameters and messages ... 18
Annex A (normative) **Parameter group assignments** ... 19
Annex B (normative) **ISO 11783 Industry groups** ... 53
Annex C (normative) **ISO 11783 Industry group 0 preferred addresses** ... 54
Annex D (normative) **ISO 11783 Industry group 2 initial addresses** ... 59
Annex E (normative) **ISO 11783 NAMEs** ... 60
Annex F (normative) **ISO 11783 All industry NAMEs** ... 75
Annex G (normative) **ISO 11783 manufacturer codes** ... 81
Annex H (informative) **ISO 11783 Request forms** ... 88
Bibliography ... 94

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.

Introduction

ISO 11783 specifies a communications system for agricultural equipment based on the CAN 2.0 B [1] protocol. SAE J 1939 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 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.

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

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.

2 Normative references

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

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.

ISO 11783-1:2007 Tractors and machinery for agriculture and forestry - Serial control and communications data network - Part 1: General standard for mobile data communication