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

**Part 7:  
Implement messages application layer**

**iTeh STANDARD PREVIEW**  
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*Tracteurs et matériels agricoles et forestiers — Réseaux de commande  
et de communication de données en série —  
Partie 7: Couche d'application de base*

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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 11783-7 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 11783-7:2002), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11783-7:2002/Cor.1:2004.

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*  
ISO 11783-7:2009
- *Part 2: Physical layer*  
<https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-ae0a15ef3bc7/iso-11783-7-2009>
- *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*

Sequence control is to form the subject of a future part 14.

## Introduction

ISO 11783 specifies a communications system for agricultural equipment based on the ISO 11898-1<sup>[1]</sup> protocol. SAE J1939<sup>[2]</sup> 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.

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:

Robert Bosch GmbH  
Wernerstrasse 51  
Postfach 30 02 20  
D-70442 Stuttgart-Feuerbach  
Germany

(standards.iteh.ai)

ISO 11783-7:2009

<https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-ae0a15ef3bc7/iso-11783-7-2009>

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.

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

## Part 7: Implement messages application layer

**SAFETY PRECAUTIONS** — Caution is to be taken with any automatic control of implements carried out using a message defined in this part of ISO 11783. See ISO 11783-9 for safe-mode operations.

### 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 part of ISO 11783 describes the implement messages application layer of the network, specifying the message set and defining the messages used for communication with and between tractors and connected implements.

### 2 Normative references

[ISO 11783-7:2009](https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-acc015e15007/iso-11783-7-2009)

[https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-](https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-acc015e15007/iso-11783-7-2009)

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 639 (all parts), *Codes for the representation of names of languages*

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*

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 11783-6, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 6: Virtual terminal*

ISO 11783-9, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 9: Tractor ECU*

IEC 61162-3, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 3: Serial data instrument network*

### 3 General requirements and recommendations

#### 3.1 General

The message set specified by this part of ISO 11783 is designed to support the basic needs of an implement for information from a tractor, as well as limited controls enabling coordination between implement and tractor. The message set supports messages containing information on

- time,
- ground speed,
- distance,
- navigation,
- PTO (power take-off) parameters,
- three-point hitch,
- general process data, and
- lighting function parameters.

Messages are regularly repeated at fixed intervals.

The message parameters are defined in Annex A, the parameter groups are specified in Annex B.

See Annex C for examples of tractor control messages.

#### 3.2 Signal characterization

The ISO 11783 network has been designed with the intent of providing current data from an electronic control unit (ECU) to, and for use by, other ECUs on the network.

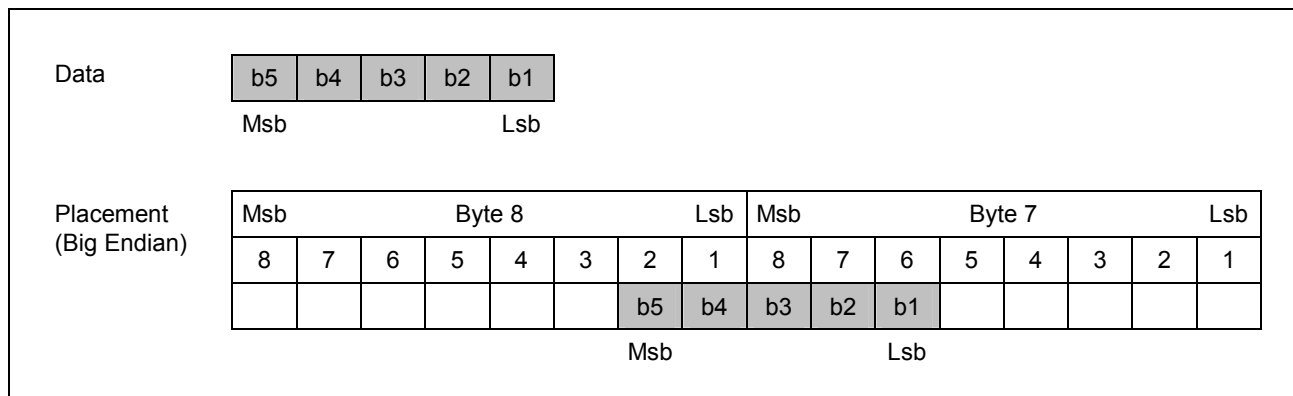
It is recommended that the time between physical data acquisition of a signal and the transmission of the data not exceed twice the repetition rate defined for the data.

#### 3.3 Message format

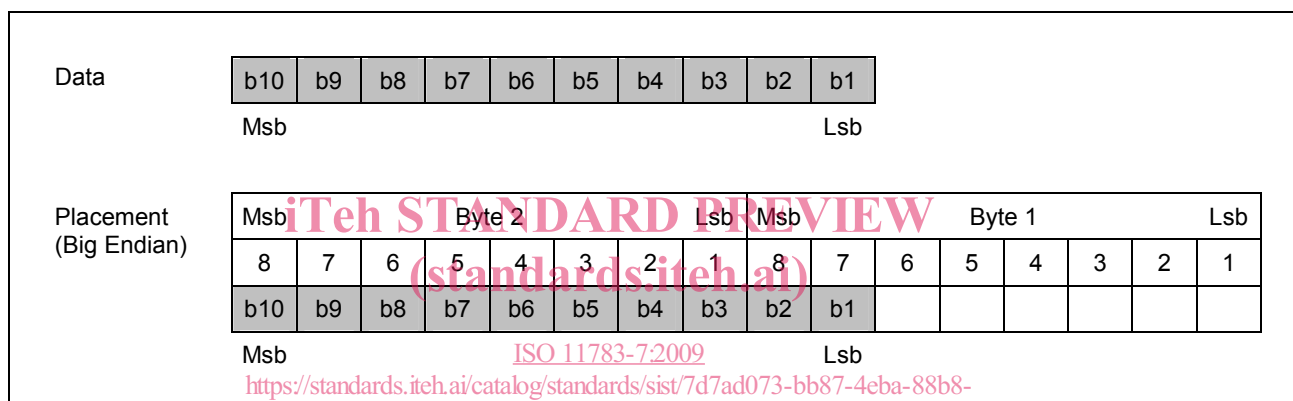
##### 3.3.1 General

The ISO 11783 network message format uses the parameter group number as the label for a group of parameters. Each parameter within the group can be expressed as characters, as scaled data defined by the ranges given in 3.3.3, or as function states consisting of one or more bits. Characters are transmitted with the left-most character first.

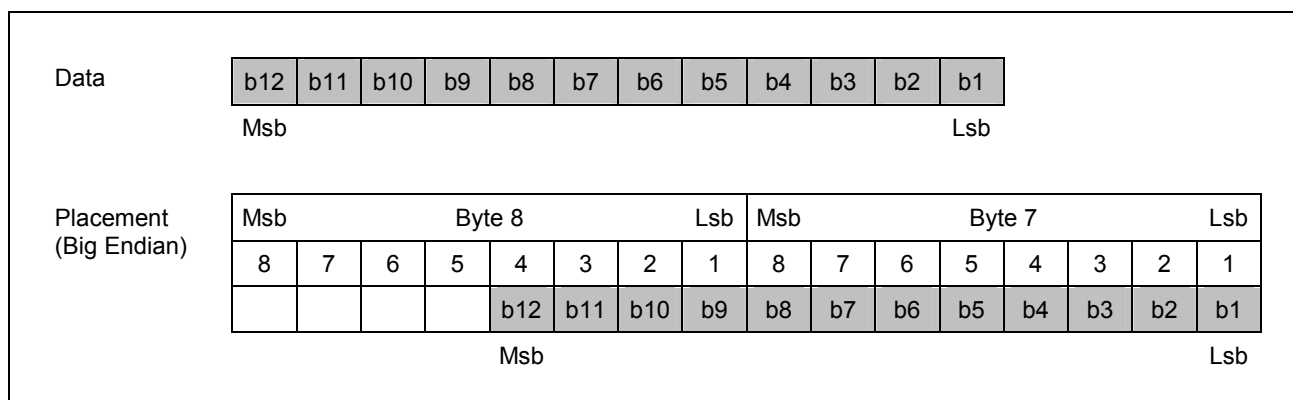
Numerical parameters consisting of two or more data bytes shall be transmitted least significant byte first. When a parameter is placed in more than one byte because of its location in the data field, the least significant bits (Lsb) of the parameter are placed in the least significant byte with the remaining most significant bits (Msb) placed in the next higher byte starting at the first bit. See Figure 1.



a) Data parameter of less than one byte crossing a byte boundary



b) Data parameter larger than one byte ending on a byte boundary



c) Data parameter larger than one byte starting on a byte boundary

Figure 1 — Placement of data parameters in more than one byte

### 3.3.2 Data types

Each parameter is identified as being of either the command or measured data type.

#### — Command

Command data specifies the desired state of a multistate parameter, function or numerical value of a set point as requested by a transmitting ECU. Specific confirmation of a command is not necessarily assured. For example, the command may request that a solenoid be activated, yet no measurement be taken to ensure the solenoid has accomplished its function.

The tractor is not expected to automatically execute any given command. Commands for control affect the change or introduction of motion or power into the system, and may be issued in parallel with other commands from within various tractor systems. Each command must be considered with other tractor controls and operating conditions, and only executed if the tractor control system considers it to be appropriate.

EXAMPLE 1 Engage PTO, extend auxiliary valve state, activate headlight high-beam, move rear hitch.

#### — Measured

Measured data conveys the current value of a parameter, as measured or observed by the transmitting ECU, determining the condition of the defined parameter.

EXAMPLE 2 Ground-based speed, hitch position, PTO engagement, implement position.

### 3.3.3 Parameter ranges

Table 1 defines the ranges used to determine the validity of a transmitted signal, Table 2 those ranges used to denote the state of a discrete parameter, and Table 3 those used to denote the state of a control mode command. The values in the range "error indicator" provide the means for an ECU to immediately indicate that valid parametric data are not currently available due to some type of error in the sensor, subsystem or ECU.

If an ECU failure prevents transmission of valid data for a parameter, the appropriate error indicator given in Tables 1 or 2 should be used in place of that parameter's data. However, if the measured or calculated data has yielded a value that is valid, yet which exceeds the defined parameter range, the error indicator shall not be used. The data shall be transmitted using the appropriate minimum or maximum parameter value. If the sensor cannot determine if the measured or calculated data is valid, it shall send the error indicator.

### 3.3.4 Adding to parameter groups

Several of the parameter groups contain bytes that are undefined and which may be replaced with new parameters defined at a future date. If existing parameter group definitions do not permit the inclusion of new parameters, then a new parameter group may be defined.

See ISO 11783-1 for additional definitions and the abbreviations of instructions for requesting that parameters be added to parameter groups and new parameter group numbers be created.

Table 1 — Transmitted signal ranges

Range name	1 byte	2 bytes	4 bytes	ASCII
Valid signal	0 to 250 00 <sub>16</sub> to FA <sub>16</sub>	0 to 64 255 0000 <sub>16</sub> to FAFF <sub>16</sub>	0 to 4 211 081 215 00000000 <sub>16</sub> to FAFFFFFF <sub>16</sub>	1 to 254 01 <sub>16</sub> to FE <sub>16</sub>
Parameter-specific indicator	251 FB <sub>16</sub>	64 256 to 64 511 FBxx <sub>16</sub>	4 211 081 216 to 4 227 858 431 FBxxxxxx <sub>16</sub>	None
Reserved range for future indicator bits	252 to 253 FC <sub>16</sub> to FD <sub>16</sub>	64 512 to 65 023 FC00 <sub>16</sub> to FDFF <sub>16</sub>	4 227 858 432 to 4 261 412 863 FC000000 <sub>16</sub> to FDFFFFFF <sub>16</sub>	None
Error indicator	254 FE <sub>16</sub>	65 024 to 65 279 FExx <sub>16</sub>	4 261 412 864 to 4 278 190 079 FExxxxxx <sub>16</sub>	0 00 <sub>16</sub>
Not available, not installed or not requested	255 FF <sub>16</sub>	65 280 to 65 535 FFxx <sub>16</sub>	4 278 190 080 to 4 294 967 294 FFxxxxxx <sub>16</sub>	255 FF <sub>16</sub>

Table 2 — Transmitted values for discrete parameters (measured)

Range name	Transmitted value
Disabled (Off, passive, etc.)	00
Enabled (On, active, etc.)	01
Error indicator	10
Not available or not installed	11

ISO 11783-7:2009

<https://standards.iteh.ai/catalog/standards/sist/7d7ad073-bb87-4eba-88b8-ae0a15ef3bc7/iso-11783-7-2009>

Table 3 — Transmitted values for control commands

Range name	Transmitted value
Command to disable function (turn Off, etc.)	00
Command to enable function (turn On, etc.)	01
Reserved	10
Don't care/take no action (leave function as is)	11

### 3.4 Implement configuration offsets

The configuration of a tractor/implement connection, and the offset to and from the tractor and implement reference points are used in the navigational parameters and in the implement configuration of process data messages. See ISO 11783-10.