

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

Part 7: Implement messages application layer

ICS 35.240.99; 65.060.01

National foreword

This British Standard reproduces verbatim ISO 11783-7:2002 and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee AGE/31, Agricultural electronic equipment, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 7: Implement messages application layer

*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 3.

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*.

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: Data dictionary*

Annexes A and B form a normative part of this part of ISO 11783. Annex C is for information only.

Introduction

Parts 1 to 11 of ISO 11783 specify a communications system for agricultural equipment based on the CAN 2.0 B ^[1] protocol. SAE J 1939 ^[2] 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 J 1939 specifications to be used by agricultural and forestry equipment with minimal changes. General information on ISO 11783 is 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 units 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 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. For this purpose, the statement of the holder of this patent 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 patents other than that 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

This part of ISO 11783 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 sensor, 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

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 11783. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 11783 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 11783-1:—¹⁾, *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 11783-6:—¹⁾, *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*

ISO 11783-10:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 10: Task controller and management information system data interchange*

1) To be published.

ISO 11783-11:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 11: Data dictionary*

IEC 61162-3:—¹⁾ *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 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.

3.3.2 Data type

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

- Command data specifies the desired state of a multi-state 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.

EXAMPLE 1 Engage power take-off (PTO), extend auxiliary valve state, activate headlight high-beam, rear hitch position set point.

- 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 Table 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 should not be used. The data should 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 by ISO 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 ₁₆ to FA ₁₆	0 to 64 255 0000 ₁₆ to FAFF ₁₆	0 to 4 211 081 215 00000000 ₁₆ to FAFFFFFF ₁₆	1 to 254 01 ₁₆ to FE ₁₆
Reserved range for future indicator bits	251 to 253 FB ₁₆ to FD ₁₆	64 256 to 65 023 FB00 ₁₆ to FDFF ₁₆	4 211 081 216 to 4 261 412 863 FB000000 ₁₆ to FDFFFFFF ₁₆	none
Error indicator	254 FE ₁₆	65 024 to 65 279 FExx ₁₆	4 261 412 864 to 4 278 190 079 FExxxxxx ₁₆	0 00 ₁₆
Not available, not installed or not requested	255 FF ₁₆	65 280 to 65 535 FFxx ₁₆	4 278 190 080 to 4 294 967 294 FFxxxxxx ₁₆	255 FF ₁₆

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

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.

Annex A (normative)

Parameter definitions

A.1 Time (UTC)

Data length:	3 bytes
Resolution:	Byte 1 = 0,25 s/bit, 0 s offset Byte 2 = 1 min/bit, 0 min offset Byte 3 = 1 h/bit, 0 h offset
Operating range:	Byte 1 = 0 to 59,75 s Byte 2 = 0 min to 59 min Byte 3 = 0 h to 23 h
Type:	Measured

A.2 Date

Data length:	3 bytes
Resolution:	Byte 1 = 1 month/bit, 0 month offset Byte 2 = 0,25 d/bit, 0 day offset Byte 3 = 1 y ² /bit, + 1985 year offset
Operating range:	Byte 1 = 1 month to 12 months Byte 2 = 0,25 d to 31,75 d Byte 3 = + 1985 (year) to + 2 235 (year)
Type:	Measured

NOTE A value of 0 for the month (byte 1) is null. The value 1 identifies January, 2 identifies February, etc. A value of 0 for the day (byte 2) is null. The values 1, 2, 3 and 4 are used to identify the first day of the month; 5, 6, 7 and 8 identify the second day of the month etc. A value of 0 for the year (byte 3) identifies the year 1985; a value of 1 identifies 1986, etc.

2) The SI unit for “year” (annum) is a.

A.3 Local minute offset

Local time offset in minutes from a reference time (UTC).

Data length:	1 byte
Resolution:	1 min/bit, 0 min offset
Operating range:	0 min to 59 min
Type:	Measured

A.4 Local hour offset

Local time offset in hours from a reference time (UTC).

Data length:	1 byte
Resolution:	1 h/bit, – 24 h offset
Operating range:	– 24 h to 23 h
Type:	Measured

A.5 Ground-based speed

Actual groundspeed of a machine, measured by a sensor such as radar.

Data length:	2 bytes
Resolution:	0,001 m/s/bit, 0 m/s offset; upper byte resolution = 0,256 m/s/bit
Data range:	0 m/s to 64,255 m/s
Type:	Measured

A.6 Ground-based distance

Actual distance travelled by a machine based on measurements from a sensor such as radar.

When distance exceeds 4 211 081,215 m, the value should be reset to zero and incremented as additional distance accrues.

Data length:	4 bytes
Resolution:	0,001 m/bit
Data range:	0 m to 4 211 081,215 m
Type:	Measured

A.7 Ground-based direction

Measured signal indicating either forward or reverse as the direction of travel.

When speed is zero, indicate the last travel direction until a different direction is detected.

Data length: 2 bits

Value	Meaning
00	Reverse
01	Forward
10	Error indication
11	Not available

Type: Measured

A.8 Wheel-based speed

Value of the speed of a machine as calculated from the measured wheel or tail shaft speed.

Data length: 2 bytes

Resolution: 0,001 m/s/bit, 0 m/s offset

upper byte resolution = 0,256 m/s/bit

Data range: 0 m/s to 64,255 m/s

Type: Measured

A.9 Wheel-based distance

Distance travelled by a machine as calculated from wheel or tail-shaft speed.

When distance exceeds 4 211 081,215 m, the value should be reset to zero and incremented as additional distance accrues.

Data length: 4 bytes

Resolution: 0,001 m/bit

Data range: 0 m to 4 211 081,215 m

Type: Measured

A.10 Wheel-based direction

Measured signal indicating either forward or reverse as the direction of travel.

When speed is zero, indicate the last travel direction until a different direction is detected or selected and engaged.

Data length: 2 bits

Value	Meaning
00	Reverse
01	Forward
10	Error indication
11	Not available

Type: Measured

A.11 Key switch state

Indicates the key switch state of the tractor or power unit.

This does not indicate unforeseen power interruptions such as those caused by starting the engine.

Data length: 2 bits

Value	Meaning
00	Key switch Off
01	Key switch not Off
10	Error indication
11	Not available

Type: Measured

A.12 Maximum time of tractor power

Maximum time of remaining tractor or power unit supplied electrical power at the current load.

This parameter may be estimated rather than being a measured value.

Data length: 1 byte

Resolution: 1 min/bit, 0 offset

Data range: 0 to 250

Type: Measured

A.13 Maintain ECU power

Request to the Tractor ECU to maintain ECU_PWR power for the next 2 s.

Data length: 2 bits

Value	Meaning
00	No further requirement for ECU_PW
01	Requirement for 2 s more of ECU_PWR
10	Reserved
11	Don't care

Type: Command

A.14 Maintain actuator power

Request to the Tractor ECU to maintain PWR power for the next 2 s.

Data length: 2 bits

Value	Meaning
00	No further requirement for PWR
01	Requirement for 2 s more for PWR
10	Reserved
11	Don't care

Type: Command

A.15 Implement transport state

Indicates the transport state of an implement connected to a tractor or power unit.

Data length: 2 bits

Value	Meaning
00	Implement may not be transported
01	Implement may be transported
10	Error indication
11	Not available

Type: Measured

A.16 Implement park state

Indicates the state of an implement where it may be disconnected from a tractor or power unit.

Data length: 2 bits

Value	Meaning
00	Implement may not be disconnected
01	Implement may be disconnected
10	Error indication
11	Not available

Type: Measured

A.17 Implement work state

Indicates that an implement is connected to a tractor or power unit and is ready for work.

Data length: 2 bits

Value	Meaning
00	Implement is not ready for field work
01	Implement is ready for field work
10	Error indication
11	Not available

Type: Measured

A.18 Navigation parameters

ISO 11783 networks shall use the navigation parameters specified in IEC 61162-3 (NMEA 2000³⁾). Messages requiring multiple data frames shall use the ISO transport protocol specified in IEC 61162-3, rather than the NMEA fast packet protocol.

NOTE The navigational receiver antenna is located at the navigational receiver point on the tractor/implement.

A.19 Hitch parameters

A.19.1 Front hitch position

Measured position of the front three-point hitch, it is expressed as a percentage of full travel: 0 % indicates the full down position; 100 %, the full up position.

Data length: 1 byte

Resolution: 0,4 %/bit, 0 % offset

Data range: 0 % to + 100 %

Type: Measured

A.19.2 Rear hitch position

Measured position of the rear three-point hitch, it is expressed as a percentage of full travel: 0 % indicates the full down position; 100 %, the full up position.

Data length: 1 byte

Resolution: 0,4 %/bit, 0 % offset

Data range: 0 % to + 100 %

Type: Measured

3) National Marine Electronics Association network standard.

A.19.3 Front hitch position command

Command for allowing the position of the front three-point hitch to be set, it is expressed as a percentage of full travel: 0 % indicates the full down position; 100 %, the full up position.

Data length:	1 byte
Resolution:	0,4 %/bit, 0 % offset
Data range:	0 % to + 100 %
Type:	Command

A.19.4 Rear hitch position command

Command for allowing the position of the rear three-point hitch to be set, it is expressed as a percentage of full travel: 0 % indicates the full down position; 100 %, the full up position.

Data length:	1 byte
Resolution:	0,4 %/bit, 0 % offset
Data range:	0 % to + 100 %
Type:	Command

A.19.5 Front hitch in-work indication

Measured signal indicating that the front hitch is positioned below (in-work) or above (out-of-work) an adjustable switching threshold.

Data length: 2 bits

Value	Meaning
00	Hitch position is out-of-work
01	Hitch position is in-work
10	Error indication
11	Not available

Type: Measured

A.19.6 Rear hitch in-work indication

Measured signal indicating that the rear hitch is positioned below (in-work) or above (out-of-work) an adjustable switching threshold.

The method of determining switching threshold is not standardized and is to be determined by the machine designer.

Data length: 2 bits

Value	Meaning
00	Hitch position is out-of-work
01	Hitch position is in-work
10	Error indication
11	Not available

Type: Measured

A.19.7 Front draft

Apparent horizontal force applied to the front hitch by an implement.

A positive value indicates force applied to the tractor opposed to heading.

Data length:	2 bytes
Resolution:	10 N/bit, – 320 000 N offset
Data range:	– 320 000 N to 322 550 N
Type:	Measured

A.19.8 Rear draft

Apparent horizontal force applied to the rear hitch by an implement.

A positive value indicates force applied to the tractor opposed to heading.

Data length:	2 bytes
Resolution:	10 N/bit, – 320 000 N offset
Data range:	– 320 000 N to 322 550 N
Type:	Measured

A.19.9 Front nominal lower link force

Measurement providing an indication of draft at the lower links of the front three-point hitch.

Nominal lower link force may be expected to be approximately linear with respect to draft and may be proportional to draft for a single hitch position. This measurement is typically obtained from a transducer on the lower hitch links and typically used as raw data in draft control. A positive value indicates force applied to the tractor opposed to heading.

Data length:	1 byte
Resolution:	0,8 %/bit, – 100 % offset
Data range:	– 100 % to + 100 %
Type:	Measured

A.19.10 Rear nominal lower link force

Measurement providing an indication of draft at the lower links of the rear three-point hitch.

Nominal lower link force may be expected to be approximately linear with respect to draft and may be proportional to draft for a single hitch position. This measurement is typically obtained from a transducer on the lower hitch links and typically used as raw data in draft control. A positive value indicates force applied to the tractor opposed to heading.

Data length:	1 byte
Resolution:	0,8 %/bit, – 100 % offset
Data range:	– 100 % to + 100 %
Type:	Measured

A.20 PTO parameters

A.20.1 Front PTO output shaft speed

Measured rotational speed of the front power take-off (PTO) output shaft.

For existing tractors that monitor PTO speed prior to the engagement clutch, the PTO speed will only be valid when PTO is engaged, and will be unavailable when disengaged.

Data length:	2 bytes
Resolution:	0,125 1/min/bit, 0 1/min offset
Data range:	0 1/min to + 8 031,875 1/min
Type:	Measured

A.20.2 Rear PTO output shaft speed

Measured rotational speed of the rear power take-off (PTO) output shaft.

For existing tractors that monitor PTO speed prior to the engagement clutch, the PTO speed will only be valid when PTO is engaged, and will be unavailable when disengaged.

Data length:	2 bytes
Resolution:	0,125 1/min/bit, 0 1/min offset
Data range:	0 1/min to + 8 031,875 1/min
Type:	Measured

A.20.3 Front PTO output shaft speed set point

Measured value of the set point of the rotational speed of the front power take-off (PTO) output shaft.

Data length:	2 bytes
Resolution:	0,125 1/min/bit, 0 1/min offset
Data range:	0 1/min to + 8 031,875 1/min
Type:	Measured

A.20.4 Rear PTO output shaft speed set point

Measured value of the set point of the rotational speed of the rear power take-off (PTO) output shaft.

Data length: 2 bytes
Resolution: 0,125 1/min/bit, 0 1/min offset
Data range: 0 1/min to + 8 031,875 1/min
Type: Measured

A.20.5 Front PTO output shaft speed set point command

Command for setting the rotational speed of the front power take-off (PTO) output shaft.

Data length: 2 bytes
Resolution: 0,125 1/min/bit, 0 1/min offset
Data range: 0 1/min to + 8 031,875 1/min
Type: Command

A.20.6 Rear PTO output shaft speed set point command

Command for setting the rotational speed of the rear power take-off (PTO) output shaft.

Data length: 2 bytes
Resolution: 0,125 1/min/bit, 0 1/min offset
Data range: 0 1/min to + 8 031,875 1/min
Type: Command

A.20.7 Front PTO engagement

Measured signal indicating that the front power take-off (PTO) is engaged or disengaged.

Data length: 2 bits

Value	Meaning
00	PTO disengaged
01	PTO engaged
10	Error indication
11	Not available

Type: Measured

A.20.8 Rear PTO engagement

Measured signal indicating that the rear power take-off (PTO) controller has engaged or disengaged the rear PTO.

Data length: 2 bits

Value	Meaning
00	PTO disengaged
01	PTO engaged
10	Error indication
11	Not available

Type: Measured

A.20.9 Front PTO mode

Measured signal indicating that the front power take-off (PTO) mode is either 540 rpm or 1 000 r/min.

Data length: 2 bits

Value	Meaning
00	PTO mode is 540
01	PTO mode is 1 000
10	Error indication
11	Not available

Type: Measured

A.20.10 Rear PTO mode

Measured signal indicating that the rear power take-off mode (PTO) is either 540 r/min or 1 000 r/min.

Data length: 2 bits

Value	Meaning
00	PTO mode is 540
01	PTO mode is 1 000
10	Error indication
11	Not available

Type: Measured

A.20.11 Front PTO economy mode

Measured signal indicating that the front power take-off (PTO) economy mode is engaged or disengaged.

Economy mode PTO operates at 540 r/min or 1 000 r/min at lower engine revolutions.

Data length: 2 bits

Value	Meaning
00	PTO economy mode is disengaged
01	PTO economy mode is engaged
10	Error indication
11	Not available

Type: Measured

A.20.12 Rear PTO economy mode

Measured signal indicating that the rear power take-off (PTO) economy mode is engaged or disengaged.

Economy mode PTO operates at 540 r/min or 1 000 r/min at lower engine revolutions.

Data length: 2 bits

Value	Meaning
00	PTO economy mode is disengaged
01	PTO economy mode is engaged
10	Error indication
11	Not available

Type: Measured

A.20.13 Front PTO engagement command

Command for engaging or disengaging the front power take-off (PTO).

Data length: 2 bits

Value	Meaning
00	Disengage PTO
01	Engage PTO
10	Reserved
11	Don't care

Type: Command

A.20.14 Rear PTO engagement command

Command for engaging or disengaging the rear power take-off (PTO).

Data length: 2 bits

Value	Meaning
00	Disengage PTO
01	Engage PTO
10	Reserved
11	Don't care

Type: Command

A.20.15 Front PTO mode command

Command for selecting the mode of the front power take-off (PTO).

Data length: 2 bits

Value	Meaning
00	Select 540 r/min mode
01	Select 1 000 r/min mode
10	Reserved
11	Don't care

Type: Command

A.20.16 Rear PTO mode command

Command for selecting the mode of the rear power take-off (PTO).

Data length: 2 bits

Value	Meaning
00	Select 540 rpm mode
01	Select 1 000 rpm mode
10	Reserved
11	Don't care

Type: Command

A.20.17 Front PTO economy mode command

Command for engaging and disengaging the front power take-off (PTO) economy mode.

Data length: 2 bits

Value	Meaning
00	Disengage PTO economy mode
01	Engage PTO economy mode
10	Reserved
11	Don't care

Type: Command

A.20.18 Rear PTO economy mode command

Command for engaging and disengaging the rear power take-off (PTO) economy mode.

Data length: 2 bits

Value	Meaning
00	Disengage PTO economy mode
01	Engage PTO economy mode
10	Reserved
11	Don't care

Type: Command

A.21 Auxiliary valve parameters**A.21.1 Auxiliary valve number**

Numeric identification of auxiliary hydraulic valve instance within a device identified by a NAME.

Auxiliary valves are numbered beginning with 0 and increase in sequence to the maximum number of auxiliary hydraulic valves in the device. The tractor's auxiliary valves shall be labelled with valve numbers corresponding to these auxiliary valve numbers. In a connected system where auxiliary valve messages are broadcast, the transmitted valve number shall correspond to the number label of the auxiliary valve which an implement or equipment is connected. The auxiliary valve numbers do not reference any location or mounting of the auxiliary valves.

In systems using “power beyond” technology, valve number 0 shall be used to identify the power beyond control valve.

Data length:	8 bits
Resolution:	1
Data range:	0 to 15
Type:	Measured

A.21.2 Auxiliary valve number 0 extend port measured flow

Measured flow through the extend port of auxiliary valve number 0 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Measured

A.21.3 Auxiliary valve number 0 retract port measured flow

Measured flow through the retract port of auxiliary valve 0 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100% indicates maximum flow returning to the tractor through this port.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Measured

A.21.4 Auxiliary valve number 0 extend port estimated flow

Value reported by the controller of flow through the extend port of auxiliary valve 0 of a tractor which could be based on the commanded position of the valve.

Zero percent indicates no flow, 100 %, maximum flow, – 100 % maximum flow returning to the tractor through this port. Caution should be exercised when using this parameter in feed back control systems because this parameter is estimated and not measured.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Estimated

A.21.5 Auxiliary valve number 0 retract port estimated flow

Value reported by the controller of flow through the retract port of auxiliary valve 0 of a tractor which could be based on the commanded position of the valve.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port. Caution should be exercised when using this parameter in feedback control systems owing to this parameter being estimated and not measured.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Estimated

A.21.6 Auxiliary valve number 0 valve state

Measured state of the auxiliary valve number 0.

A blocked state means the valve is closed and there is no flow from or to the valve and the fluid may be under pressure. A floating state means that there is no control flow from or to the valve and that the valves ports are connected directly to the hydraulic fluid's tank. This means that the hydraulic fluid may flow to or from the valve as driven by the actuator. Extend state means that flow is controlled from the valve's extend port and the fluid returns into the retract port. Retract state means that flow is controlled from the valve's retract port and the fluid returns into the extend port.

Data length: 4 bits

Value	Meaning
0000	Blocked
0001	Extend
0010	Retract
0011	Floating
0100 to 1101	Reserved
1110	Error indication
1111	Not available

Type: Measured

A.21.7 Auxiliary valve number 0 extend port pressure

Measured nominal pressure at the extend port of auxiliary valve of a tractor 0.

Data length:	2 bytes
Resolution:	5 kPa/bit, 0 offset
Data range:	0 kPa to 321 275 kPa
Type:	Measured

A.21.8 Auxiliary valve number 0 retract port pressure

Measured nominal pressure at the retract port of auxiliary valve 0 of a tractor.

Data length:	2 bytes
Resolution:	5 kPa/bit, 0 offset
Data range:	0 kPa to 321 275 kPa
Type:	Measured

A.21.9 Auxiliary valve number 0 return port pressure

Measured nominal pressure at the return port of auxiliary valve 0 of a tractor.

Data length:	1 byte
Resolution:	16 kPa/bit, 0 offset
Data range:	0 kPa to 4 000 kPa
Type:	Measured

A.21.10 Auxiliary valve number 0 port flow

Command for setting the flow through the extend or retract port of auxiliary valve 0 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow; the flow returns to the tractor through the opposite port.

Data length:	1 byte
Resolution:	0,4 %/bit, 0 % offset
Data range:	0 % to 100 %
Type:	Command

A.21.11 Auxiliary valve number 0 state

Command for setting the auxiliary valve number 0 state.

With float enabled, hydraulic fluid may flow to or from the tractor as driven by the implement.

Data length: 4 bits

Value	Meaning
0000	Block
0001	Extend
0010	Retract
0011	Float
0100 to 1110	Reserved
1111	Don't care

Type: Command

A.21.12 Auxiliary valve number 0 fail safe mode — Command

Command for setting the fail safe mode of auxiliary valve number 0.

Data length: 2 bits

Value	Meaning
00	Block
01	Float
10	Reserved
11	Don't care

Type: Command

A.21.13 Auxiliary valve number 0 fail safe mode — Measured

Measured state of the fail safe mode of auxiliary valve number 0.

Data length: 2 bits

Value	Meaning
00	Block
01	Float
10	Error indication
11	Not available

Type: Measured

A.21.14 Parameters for auxiliary valves number 1 to 14

This part of ISO 11783 specifies the parameters only for auxiliary valves number 0 and 15. However, the data structures for valves 1 to 14 are to be identical. The data are also identical, except for the valve number.

A.21.15 Auxiliary valve number 15 extend port measured flow

Measured flow through the extend port of auxiliary valve number 15 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port.

Data length: 1 byte

Resolution: 1 %/bit, – 125 % offset

Data range: – 125 to 125 %

Type: Measured

A.21.16 Auxiliary valve number 15 retract port measured flow

Measured flow through the retract port of auxiliary valve 15 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Measured

A.21.17 Auxiliary valve number 15 extend port estimated flow

Value reported by the flow controller through the extend port of auxiliary valve 15 of a tractor, which could be based on the commanded position of the valve.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port. Caution should be exercised when using this parameter in feedback control systems owing to this parameter being estimated and not measured.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 % to 125 %
Type:	Estimated

A.21.18 Auxiliary valve number 15 retract port estimated flow

Value reported by the flow controller through the retract port of auxiliary valve 15 of a tractor, which could be based on the commanded position of the valve.

Zero percent indicates no flow, 100 % indicates maximum flow, – 100 % indicates maximum flow returning to the tractor through this port. Caution should be exercised when using this parameter in feed back control systems owing to this parameter being estimated and not measured.

Data length:	1 byte
Resolution:	1 %/bit, – 125 % offset
Data range:	– 125 to 125 %
Type:	Estimated

A.21.19 Auxiliary valve number 15 valve state

Measured state of the auxiliary valve number 15.

A blocked state means the valve is closed and there is no flow from or to the valve and the fluid may be under pressure. A floating state means that there is no control flow from or to the valve and that the valves ports are connected directly to the hydraulic fluid's tank. This means that the hydraulic fluid may flow to or from the valve as driven by the actuator. Extend state means that flow is controlled from the valve's extend port and the fluid returns into the retract port. Retract state means that flow is controlled from the valve's retract port and the fluid returns into the extend port.

Data length: 4 bits

Value	Meaning
0000	Blocked
0001	Extend
0010	Retract
0011	Floating
0100 to 1101	Reserved
1110	Error indication
1111	Not available

Type: Measured

A.21.20 Auxiliary valve number 15 extend port pressure

Measured nominal pressure at the extend port of auxiliary valve of 15 a tractor.

Data length: 2 bytes

Resolution: 5 kPa/bit, 0 offset

Data range: 0 kPa to 321 275 kPa

Type: Measured

A.21.21 Auxiliary valve number 15 retract port pressure

Measured nominal pressure at the retract port of auxiliary valve 15 of a tractor.

Data length: 2 bytes

Resolution: 5 kPa/bit, 0 offset

Data range: 0 kPa to 321 275 kPa

Type: Measured

A.21.22 Auxiliary valve number 15 return port pressure

Measured nominal pressure at the return port of auxiliary valve 15 of a tractor.

Data length: 1 byte

Resolution: 16 kPa/bit, 0 offset

Data range: 0 kPa to 4 000 kPa

Type: Measured

A.21.23 Auxiliary valve number 15 port flow

Command for setting the flow through the extend or retract port of auxiliary valve 15 of a tractor, expressed as a percentage of full flow.

Zero percent indicates no flow, 100 % indicates maximum flow; the flow returns to the tractor through the opposite port.

Data length: 1 byte

Resolution: 0,4 %/bit, 0 % offset

Data range: 0 % to 100 %

Type: Command

A.21.24 Auxiliary valve number 15 state

Command for setting the auxiliary valve number 15 state.

With float enabled, hydraulic fluid may flow to or from the tractor as driven by the implement.

Data length: 4 bits

Value	Meaning
0000	Block
0001	Extend
0010	Retract
0011	Float
0100 to 1101	Reserved
1111	Don't care

Type: Command

A.21.25 Auxiliary valve number 15 fail safe mode — Command

Command for setting the fail safe mode of auxiliary valve number 15.

Data length: 2 bits

Value	Meaning
00	Block
01	Float
10	Reserved
11	Don't care

Type: Command

A.21.26 Auxiliary valve number 15 fail safe mode — Measured

Measured state of the fail safe mode of auxiliary valve number 15.

Data length: 2 bits

Value	Meaning
00	Blocked
01	Floating
10	Error indication
11	Not available

Type: Measured