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Secretariat: DIN

Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 7: Implement messages application layer

Tracteurs et machines agricoles et forestiers — Réseaux de commande et de communication de données en série — Partie 7: Couche d'application de base

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

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Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 7: Implement messages application layer
AMENDMENT 1: Ground speed clarification, hitch pitch, roll, yaw, guidance initiation, high resolution auxiliary valve flow, operator presence

Clause 2

Add the following new normative reference:

"ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*"

A.5

Replace the first paragraph with the following:

"Actual ground speed of a machine, measured by a sensor such as that is not susceptible to wheel slip (e.g. radar, GPS, LIDAR, or stationary object tracking)."

A.6

Replace the first paragraph with the following:

"Actual distance travelled by a machine, based on measurements from a sensor such as that is not susceptible to wheel slip (e.g. radar, GPS, LIDAR, or stationary object tracking)."

A.19.7

Replace the second paragraph with the following:

"A positive value indicates the force applied to the tractor opposed to its forward direction of travel.

NOTE Forward and reverse refer to the normal directions of travel of the tractor or implement chassis. The direction does not change when the operator's perspective is changed (i.e. when operator station is reversed)."

A.19.8

Replace the second paragraph with the following:

A positive value indicates the force applied to the tractor opposed to its forward direction of travel.

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NOTE Forward and reverse refer to the normal directions of travel of the tractor or implement chassis. The direction does not change when the operator's perspective is changed (i.e. when operator station is reversed).

A.19.9

Replace the last sentence of second paragraph with:

"A positive value indicates the force applied to the tractor opposed to its forward direction of travel.

NOTE Forward and reverse refer to the normal directions of travel of the tractor or implement chassis. The direction does not change when the operator's perspective is changed (i.e. when operator station is reversed)."

A.19

Add the following new subclauses after A.19.14.

A.19.15 Front hitch roll angle

Measured roll angle of the front three-point hitch expressed in degrees from horizontal alignment with the rear axle of the tractor. Facing the direction of travel, an anti-clockwise rotation would be indicated by a negative number and a clockwise rotation would be indicated by a positive number.

Data length:	2 bytes
Resolution:	0,002 °/bit, −64 degrees offset
Data range:	−64° to 64,51°
Type:	Measured
SPN:	7790

A.19.16 Front hitch roll limit status

Parameter used to report the Tractor ECU's present limit status associated with the front hitch roll commands.

Data length:	3 bits

Value	Meaning
000	Not limited
001	Operator limited/controlled (request cannot be implemented)
010	Limited High (only lower command values result in a change)
011	Limited Low (only higher command values result in a change)
100	Reserved
101	Reserved
110	Non-recoverable fault
111	Not available (parameter not supported)

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Note that the limited conditions (limited high and low) could be temporary, for example when a large set point change is limited by a ramp rate. This bit can be set until the ramp is complete to prevent windup (and subsequent overshoot) due to the response of the controlled value.

A non-recoverable fault is non-recoverable from the viewpoint of the implement. Operator action within the tractor may resolve the issue and result in a change to "Operator Limited/Controlled" status.

Type: Measured

SPN: 7791

A.19.17 Front hitch roll exit/reason code

This parameter is used to indicate why the front hitch cannot accept remote roll commands or has most recently stopped accepting remote commands.

Data length: 6 bits

Value	Meaning
000000	No reason/all clear
000001	Required level of operator presence/awareness not detected
000010	Implement released control of function
000011	Operator override of function
000100	Operator control not in valid position
000101	Remote command timeout
000110	Remote command out of range/invalid
000111	Function not calibrated
001000	Operator control fault
001001	Function fault
001010 to 010011	Reserved
010100	Hydraulic oil level too low
010101	Hitch locked out
010110 to 110000	Reserved
110001 to 111101	Manufacturer specific
111110	Error
111111	Not available (parameter not supported)

Type: Measured

SPN: 7792

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A.19.18 Front hitch roll sensitivity

The current sensitivity of the front hitch roll control expressed as a percentage of the maximum gain. 0 % indicates minimal gain in the control loop; 100 %, the maximum gain. Values near 0 may result in no reaction by the control loop.

Data length:	1 byte
Resolution:	0,4 %/bit, 0 % offset
Data range:	0 % to 100 %
Type:	Measured
SPN:	7800

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A.19.19 Front hitch roll command

Command for setting the roll angle of the front three-point hitch expressed in degrees with 0 being horizontally aligned with the rear axle of the tractor. Facing the direction of travel, an anti-clockwise rotation would be indicated by a negative number and a clockwise rotation would be indicated by a positive number.

Data length: 2 bytes

Resolution: 0,002 °/bit, −64 degrees offset

Data range: −64° to 64,51°

Type: Command

SPN: 7796

A.19.20 Front hitch roll sensitivity command

Command for setting the sensitivity of the front hitch roll control expressed as a percentage of the maximum gain. 0 % indicates minimal gain in the control loop; 100 %, the maximum gain. Values near 0 may result in no reaction by the control loop.

Data length: 1 byte

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

Data range: 0 % to 100 %

Type: Command

SPN: 7797

A.19.21 Front hitch pitch angle

Measured pitch angle of the front three-point hitch expressed in degrees from vertical alignment of the upper and lower attachment points. Positive is in the anti-clockwise direction when viewed from the left-hand side of the tractor.

Data length: 2 bytes

Resolution: 0,002 °/bit, −64 degrees offset

Data range: −64° to 64,51°

Type: Measured

SPN: 7793

A.19.22 Front hitch pitch limit status

Parameter used to report the Tractor ECU's present limit status associated with the front hitch pitch commands.

Data length: 3 bits

Value	Meaning
000	Not limited
001	Operator limited/controlled (request cannot be implemented)
010	Limited High (only lower command values result in a

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	change)
011	Limited Low (only higher command values result in a change)
100	Reserved
101	Reserved
110	Non-recoverable fault
111	Not available (parameter not supported)

Note that the limited conditions (limited high and low) could be temporary, for example when a large set point change is limited by a ramp rate. This bit can be set until the ramp is complete to prevent windup (and subsequent overshoot) due to the response of the controlled value.

A non-recoverable fault is non-recoverable from the viewpoint of the implement. Operator action within the tractor may resolve the issue and result in a change to "Operator Limited/Controlled" status.

Type: Measured

SPN: 7794

A.19.23 Front hitch pitch exit/reason code

This parameter is used to indicate why the front hitch cannot accept remote pitch commands or has most recently stopped accepting remote commands.

Data length: 6 bits

Value	Meaning
000000	No reason/all clear
000001	Required level of operator presence/awareness not detected
000010	Implement released control of function
000011	Operator override of function
000100	Operator control not in valid position
000101	Remote command timeout
000110	Remote command out of range/invalid
000111	Function not calibrated
001000	Operator control fault
001001	Function fault
001010 to 010011	Reserved
010100	Hydraulic oil level too low
010101	Hitch locked out
010110 to 110000	Reserved
110001 to	Manufacturer specific

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111101	
111110	Error
111111	Not available (parameter not supported)

Type: Measured

SPN: 7795

A.19.24 Front hitch pitch sensitivity

The current sensitivity of the front hitch pitch control expressed as a percentage of the maximum gain. 0 % indicates minimal gain in the control loop; 100 %, the maximum gain. Values near 0 may result in no reaction by the control loop.

Data length: 1 byte

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

Data range: 0 % to 100 %

Type: Measured

SPN: 7801

A.19.25 Front hitch pitch command

Command for setting the pitch angle of the front three-point hitch expressed in degrees from vertical alignment of the upper and lower attachment points. Positive is in the anti-clockwise direction when viewed from the left-hand side of the tractor.

Data length: 2 bytes

Resolution: 0,002 °/bit, −64 degrees offset

Data range: −64° to 64,51°

Type: Command

SPN: 7798

A.19.26 Front hitch pitch sensitivity command

Command for setting the sensitivity of the front hitch pitch control expressed as a percentage of the maximum gain. 0 % indicates minimal gain in the control loop; 100 %, the maximum gain. Values near 0 may result in no reaction by the control loop.

Data length: 1 byte

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

Data range: 0 % to 100 %

Type: Measured

SPN: 7799

A.19.27 Front hitch yaw angle

Measured yaw angle of front hitch relative to the reference frame indicated by A.19.28 parameter.

The yaw angle measurement around the yaw (z-axis) of the hitch. The yaw angle is defined to be the angle from the null position on the reference frame. A positive yaw angle results when the hitch is rotated anti-clockwise when viewing the tractor from above.

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Data length: 2 bytes

Resolution: 1/128 °/bit, −200 degrees offset

Data range: −200° to 200°

Type: Measured

SPN: 9714

A.19.28 Front hitch yaw angle reference frame

This parameter is used to indicate the reference frame for the yaw angle of the front hitch.

Data length: 4 bits

Value	Meaning
0000	Main body of the machine
0001	Body of the hitch
0010	Direction of travel
0011 to 1101	Reserved
1110	Non-recoverable fault
1111	Not available (parameter not supported)

NOTE Main body of the machine reference is the recommended reference frame for all tractors with front wheel steering. Direction of travel reference frame is suitable for tractors with capability in crab steering mode. Body of the hitch reference frame is suitable for articulated tractors with front hitch.

Type: Measured

SPN: 9721

A.19.29 Front hitch yaw angle actual control mode

This parameter is used to indicate the control mode active in the tractor.

Data length: 4 bits

Value	Meaning
0000	Disabled, yaw angle is locked in a position (e.g. transport).
0001	Direct hydraulic valve control, manual operation
0010	Floating mode
0011	Automatic control: 1:1 to adjacent steering wheels
0100	Automatic control: N:1, basic curvature contour mode
0101	Automatic control: position control
0110 to 1101	Reserved

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