

ISOBUS Introduction

A combine harvester is shown from a rear perspective, working in a field of golden-brown crops. The harvester's headlights are on, and the scene is set against a sunset sky with a gradient from dark blue to orange. The title 'ISOBUS Introduction' is centered in large, white, bold, sans-serif font.

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What is ISOBUS?



- A standardized communication protocol for the agriculture industry
- **Interconnectivity** between
 - tractor and implement control systems
 - cloud servers and office software used on farms
 - devices from different manufacturers
 - “plug and play” capability
- Based on CAN bus and SAE J1939 protocol

Intelligent Farming

An aerial photograph of a large farm complex. In the center, a tractor pulling a green trailer is positioned on a gravel area. Several white, semi-transparent circular paths are overlaid on the image, radiating from the tractor and other points, representing sensor ranges or data collection zones. The farm includes several large white barns with grey roofs and a red brick building. The surrounding landscape consists of green fields, trees, and a distant horizon under a clear sky.

Image source: Valtra,
<https://www.valtra.fi/alykas-maanviljely/teknologiaratkaisut.html#isobus.html.html>

What is ISOBUS?



AGRICULTURAL INDUSTRY
ELECTRONICS FOUNDATION

- ISOBUS trademark is owned by the Agricultural Industry Electronics Foundation (AEF)
- The AEF certified label states that
 - the respective ISOBUS components are in compliance with the ISO standard 11783 and with the additional AEF guidelines
 - The product has successfully passed the AEF certification process



AEF Certification Label



- States that the respective ISOBUS components are in compliance with the ISO standard 11783 and moreover, with the additional AEF guidelines
- Serves as visible proof for the public, that a product is AEF Certified
- Only products that have passed the AEF conformance test may be advertised with the label

ISOBUS Benefits

1. Easier installation
 - standardized cables and connectors
2. Only one terminal
 - Easier operation
3. Lower costs

ISOBUS Benefits



A tractor with
ISOBUS terminal

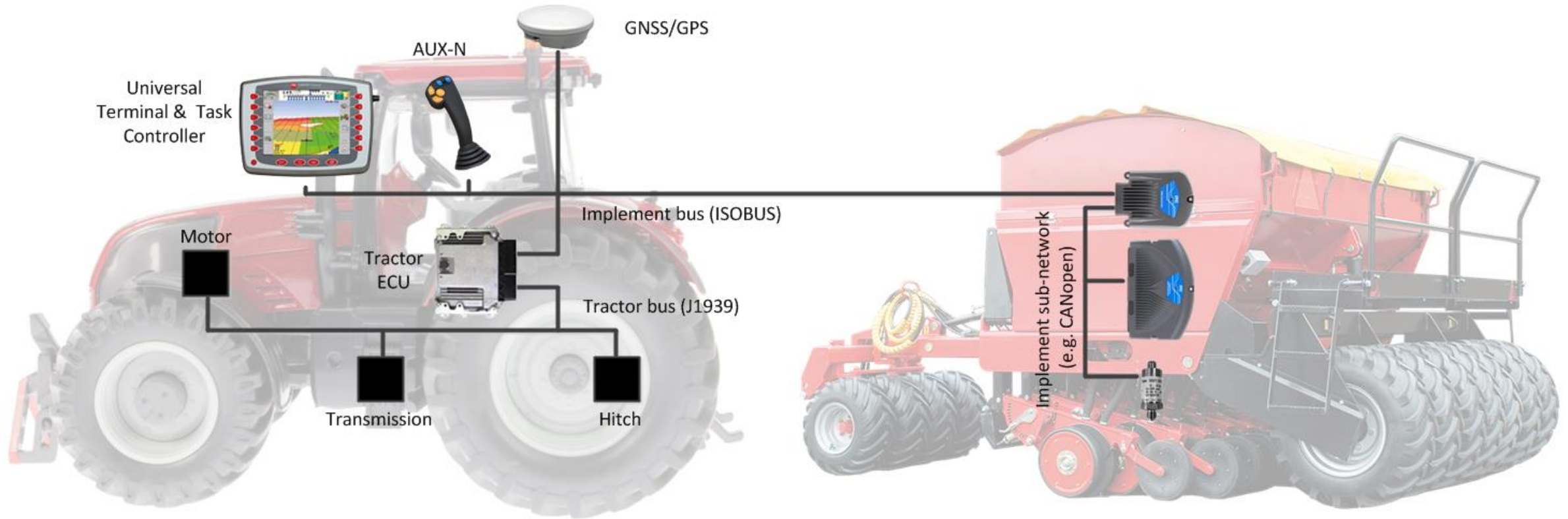


A tractor without
ISOBUS terminal

Image source:

https://www.deere.co.uk/common/docs/services_and_support/stellarsupport/en_R2/ag_management_solution/s/guidance_and_machine_control/isobus/PFP13080_ISOBUS_User_Guide_EN.pdf

ISOBUS System Example



Virtual Terminal - VT

- A graphical display in the tractor cabin
- One terminal for multiple implements
 - control different ISOBUS implements from several manufacturers
- The implement ECU **stores and downloads the user interface to the terminal**
- Shows information received from the implement ECU
- Transmits the commands from the operator to the implement ECU



VT Versions

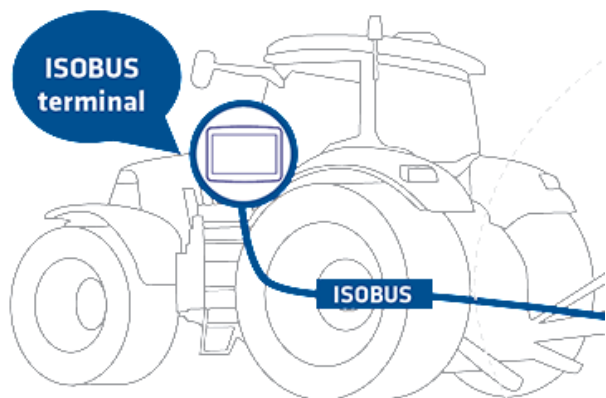
- ISOBUS standard defines different versions for VT features
- VT versions are backward compatible
 - Features from previous versions are supported in the later versions
- ISOBUS terminals can be referred as
 - **Universal Terminal (UT) by AEF** or
 - **Virtual Terminal (VT) by ISO standard**

VT Versions

- It is recommended to use VT 3 (UT 2.0) features
 - the most common version at the moment
- Object pool adapts according to VT versions

Epec's library support	VT(ISO)	UT (AEF)
X	VT 2	UT 1.0
X	VT 3	UT 2.0
partial	VT 4	-
-	VT 5	-
-	VT 6 (draft)	UT 3.0 (draft)

Communication Example



Hello, I am a VT.



Hi, I am a seeder! What kind of terminal are you?



I speak english and have 10 physical keys, 400x400 px data mask area..



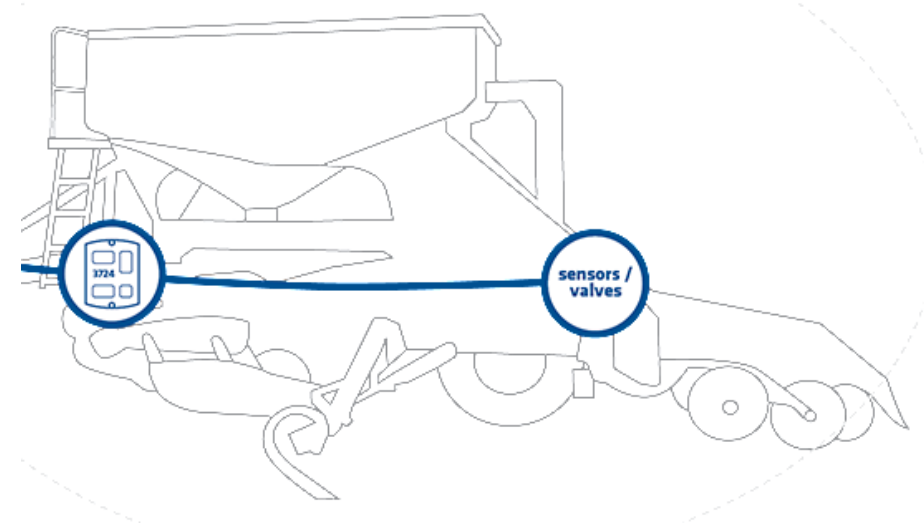
OK, here is my user interface



Operator input (e.g. left marker down)



Implement action (left marker down)



Task Controller - TC

- The Task Controller is a software
 - running normally on the VT in the tractor cabin
- Every VT does not automatically include a TC
- Two main functions:
 1. Give control commands to the implement ECU according to work plans
 2. Data logging of performed tasks to be used later by farm management information system (FMIS)
- Three functionality types
 - basic (BAS), geo-based (GEO), section control (SC)

Task Controller - TC

1. TC Basic (TC-BAS)
 - Manages the documentation of total values from the implement
2. TC Geo-Based (TC-GEO)
 - Supports also TC-BAS
 - Defines a way to
 - collect location-specific data
 - plan location-specific tasks
 - vary the rate of applications
 - Requires position source

Task Controller - TC

3. TC Section Control (TC-SC)

- Handles the automatic switching of partial widths depending on GPS position and the desired degree of overlap
 - For example, for sprayers, spreaders and planters
- Can deliver higher yields while saving 5 to 10% of material inputs

Task Controller - TC

- Epec TC client library supports
 - ISO TC V3
 - AEF TC 1.0

Tractor ECU (TECU)

- The gateway between the tractor (J1939) and the implement bus (ISOBUS)
 - Shares information to the implement
 - Provides limited controls enabling coordination between implement and tractor
- ISO 11783-9 defines three tractor-implement interface classes
 - TECU class 1 and 2 provides information from tractor to implement
 - TECU class 3 includes commands from implement to tractor

TECU Class 1

- Power management
 - Key switch state
 - Maximum time of tractor power
 - Maintain power requests
- Speed information
 - Wheel/ground-based machine speed
 - Engine speed
- Hitch information
 - Rear hitch position
 - Rear hitch in-work indication
- PTO (power take-off) information
 - Rear PTO output shaft speed
 - Rear PTO engagement
- Language information (default)
- Tractor facilities response

TECU Class 2

- Provides the total set of tractor measurement functions
- The main enhancements of class 2
 - Wheel/ground-based machine distance and direction
 - Rear draft information
 - Lighting messages
 - Auxiliary valve estimated/measured flow
 - Time and date

TECU Class 3

- Class 3 covers Tractor ECUs that accept commands from an implement bus.
- The tractor with this tractor–implement interface supports class 2 messages and the following commands
 - Rear hitch command
 - Rear PTO (power take-off) commands
 - Auxiliary valve command

TECU Functionalities

Epec's library support	Functionality	Comments
X	TECU class 1	
X	TECU class 2	
partial	TECU class 3	Only aux command messages implemented
	Navigation (N-option)	
x	Front mounted implement (F-option)	Excluding TECU class 3 dependencies
	Guidance (G-option)	
	Powertrain (P-option)	

Auxiliary Control - AUX-N / AUX-O

- An additional control element, such as a joystick, for easier controlling of implement functions
- Connected directly to the implement bus (ISOBUS)
- There are “old” (AUX-O) and “new” (AUX-N) auxiliary control
 - not compatible with each other
 - implements and functions certified according to AUX-N cannot be operated with input devices certified according to AUX-O and vice versa
- (Auxiliary Control is currently not supported by Epec ISOBUS libraries)

Supported ISOBUS Standards

Epec libraries	ISOBUS Standard
	ISO 11783-1, Part 1: General standard for mobile data communication
	ISO 11783-2, Part 2 : Physical Layer
X	ISO 11783-3, Part 3 : Data link layer
	ISO 11783-4, Part 4 : Network Layer
X	ISO 11783-5, Part 5 : Network management
X	ISO 11783-6, Part 6 : Virtual terminal
X	ISO 11783-7, Part 7 : Implement message application layer
	ISO 11783-8, Part 8 : Power train messages
	ISO 11783-9, Part 9 : Tractor ECU
X	ISO 11783-10, Part 10 : Task controller and management information system data interchange
	ISO 11783-11 Part 11 : Mobile data element dictionary
X	ISO 11783-12, Part 12 : Diagnostic services
	ISO 11783-13, Part 13 : File server
	ISO 11783-14, Part 14 : Sequence control



Thank you!

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EPEC