Improving compatibility of Isobus devices

Isobus standardizes communication between tractors and implements. Still, Isobus communication does not always ensure compatibility. AEF has developed a system that will help prevent and resolve these issues.

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For as long as agriculture has been around, people have been looking for ways to improve efficiency and yield by developing and using new technologies. This has led to the rise of many manufacturers of different types of agricultural equipment such as tractors, implements, displays, etc. As the number of manufacturers increased, farmers were able to purchase equipment to meet their specific needs. Unfortunately, this led to compatibility problems among different pieces of equipment, especially issues regarding communication between different devices. In an effort to alleviate these issues, equipment manufacturers along with organizations such as the International Organization for Standardization (ISO) have worked together to develop standard interfaces for different equipment: both physical and electrical. This led to the development of a standard for communication methods among different agricultural equipment parts called ISO 11783 – "Tractors and machinery for agriculture and forestry - Serial control and communications data network" – commonly known as the Isobus [1].

By adhering to the Isobus standard, equipment manufacturers strive to provide customers with equipment that will work properly with their equipment. However, this is not always the case. Sometimes a farmer will buy an implement or a device to install on their tractor from a different manufacturer and find that the implement's features do not work, and in some cases, the device does not work at all with the farmer's equipment. The farmer then contacts the manufacturer of the tractor or implement, but the technician has trouble finding the compatibility problem since the tractor or implement itself does not seem to have any issues. In this scenario, it is very difficult and time-consuming to find a solution to the problem. For this reason, the Agricultural Industry Electronics Foundation (AEF) has developed a system that will help prevent and resolve these compatibility issues and avoid this finger-pointing scenario. This system is the AEF Isobus Database and Isobus Check Tool system for agricultural equipment compatibility within Isobus.

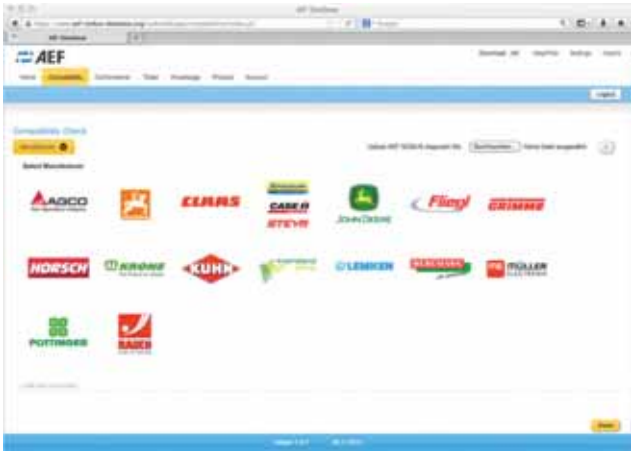

Figure 1: The Isobus Database shows various tractors, implements, and other agricultural equipment from manufacturers

AEF and Isobus

The Agricultural Industry Electronics Foundation (AEF) was established by a group of seven internation- ▷

Figure 2: The Isobus Check Tool collects important diagnosis information of different ECUs on the bus

References
[1] ISO 11783: An electronic communications Protocol for agricultural Equipment
[2] AEF website (http://www.aef-online.org/en/)
[3] AEF database presentation (https://www.aef-isobus-database.org/isobusdb/docs/aef_presentation_en.pdf)

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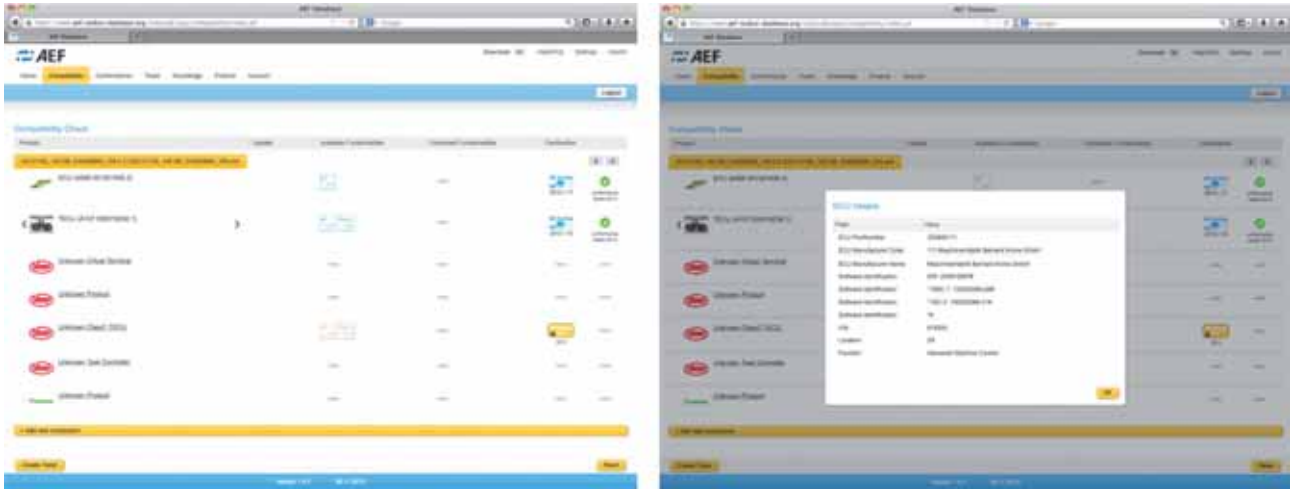

Figure 3: Scan data from the Isobus Check Tool uploaded to the AEF Database

al agricultural equipment manufacturers (Kverneland Group, Grimme, AGCO, John Deere, Pöttinger, Claas, and CNH) and two associations (VDMA, AEM) on October 28, 2008 as an independent international organization. Its aim is to provide resources and know-how for electronic systems in agriculture and to help with the adoption and execution of the Isobus standard. Since its inception, AEF has grown in membership to include more than 170 companies, associations, and organizations involved in electrical and electronic systems in agriculture and it has expanded its areas of interests to include Farm Management Information Systems (FMIS), electric drives, and camera systems [2].

The focus of Isobus is to standardize the communication between tractors and implements and to ensure full compatibility of data transfer between the different systems involved in farming. The use of such standardized interfaces and communication methods increases both efficiency and functionality of agricultural systems. The goal is to achieve plug-and-play functionality between different tractors, implements, and devices so that the farmer does not waste time, effort, and money searching for a compatible component to add to his system or trying to achieve full functionality from different components already in his system [1,2].

With the support of Isobus at the forefront of AEF's efforts, AEF aims to increase international acceptance and awareness of the standard, enhance customer benefits when using Isobus technology, and improve compatibility of Isobus products. The foundation also collects information about Isobus products for the service, marketing, and sales divisions of manufacturers and suppliers and promotes the acceptance of Isobus certified products worldwide [2]. It achieves these goals through different project groups and the development of tools that function as resources and support for manufacturers, suppliers, and farmers. Examples of such tools include the AEF Isobus Database and the AEF Isobus Check Tool. These tools help to mitigate compatibility issues among different tractor, implement, and device manufacturers as well as provide farmers with a valuable resource for selecting appropriate equipment.

Isobus Database

AEF has developed tools to help agricultural equipment users answer the following questions: Which implement/tractor should I purchase to take full advantage of the possible functions with my current system? and Are my current implements/tractors Isobus certified? [3] These are questions that farmers are faced with when evaluating their current system and when planning to add new equipment. For example, a person with a tractor from company X wants to buy an implement for their application. It is difficult for that person to truly know which implement will be compatible with the tractor and which functionalities will be available with each possible tractor/implement combination. The AEF Isobus Database and Isobus Check Tool system help to answer these questions as well as aid farmers in case of compatibility issues.

The Isobus Database is an online database of tractors, implements, and other agricultural equipment that is accessible by their respective manufacturers who are members along with their dealership networks. The equipment listed in this database is Isobus-certified and was published by their manufacturers. By accessing the database, the user can search through a list of implements and tractors by manufacturer, type, and model, as illustrated in Figure 1.

Once a piece of equipment is selected, such as a tractor, the database will display information about the equipment's product version, available functionalities, and Isobus compliance certifications. At this point the user can search for another piece of equipment, such as an implement, and select the one desired. The database will display the same type of information for the implement along with the information for the tractor. In addition, it will also show the combined functionalities between the selected tractor and implement. This allows the user to check the functionalities and certifications about an existing system, as well as determine which additional piece of equipment will yield the appropriate combined functionalities [3]. With this information, a dealership can better advice agricultural equipment customers on what tractor, implement, or device to purchase to ensure maximum functionality in his or her system.

Isobus Check Tool

If someone experiences compatibility issues with his or her equipment, AEF offers a tool to help mediate the situation: the Isobus Check Tool (Figure 2). Developed by Sontheim Industrie Elektronik, the Isobus Check Tool provides a mechanism for gathering important information about a specific combination of agricultural machines on the field and relaying that information to the manufacturers to help them work together to solve the problem. For example, ▷

when a farmer hooks up a new implement to his tractor, he might notice that certain functionalities are not working properly, and some might not be working at all. Traditionally, the farmer would call the dealer of one of the devices, such as the tractor dealer, to report the problem, hoping to get a fix fast since the harvest season is on its way. However, it can be very difficult for the technician to identify the source of the problem since it appears that the tractor itself is working correctly. Similarly, the implement service technician may struggle to identify the source of the problem since the implement does not appear to be out of order. The reason for this difficulty is that the compatibility problem is an issue related to the tractor-implement system as a whole and not necessarily an issue confined to a single standalone piece of equipment. Without a method for both manufacturers to work together on the issue, it can take a very long time for the problem to be fixed. With the Isobus Check Tool, such incidents can be remedied in a faster and more efficient manner.

The Isobus Check Tool is a software system that, in conjunction with a CAN interface, connects to the Isobus and runs and records a trace of important diagnostic information about the different ECUs (Electronic Control Units) available on the bus. In the example above, a service technician with this tool can connect directly to the tractor's Isobus and collect data from the tractor, implement, and any other devices on that bus. This information is neatly packaged up as an XML file in a zip folder. This folder can then be uploaded into the AEF Database by the technician, where a list of the devices on that bus will be displayed including information regarding their manufacturer, model, functionalities, certifications, and combined functionalities, as illustrated in Figure 3. This way the technician can pinpoint which devices are not compatible, create a ticket, and send it to the appropriate manufacturers along with any diagnostic information pulled from the system.

When a ticket is created in the database, engineers from the different manufacturers can work together to find the solution to the problem. The database provides them with a platform on which they can communicate and track the progress of the solution. It also stores information about the tickets and their solutions, which then serve as reference material that can be used to solve similar future compatibility issues. Essentially, the Isobus Check Tool and Isobus Database system provide the means to get the right people from the right companies to work together to address compatibility problems that may arise among equipment developed by different manufacturers. For this reason, the Isobus Check Tool is available to all manufacturers that are members of AEF at no charge, along with access and use of the Isobus Database.

The Isobus Database and Isobus Check Tool system was developed to provide support to the agricultural public for the Isobus standard. It provides a way for end-users of agricultural equipment to make smarter decisions on which devices to purchase to ensure maximum functionality. Furthermore, compatibility problems that an end-user might experience with the devices in his system can be solved in a much timelier manner due to the use of the Isobus Check Tool by the service technician. Manufacturers also benefit from the use of this database/check tool system. It allows them to track the certification status of their equipment, solve compatibility issues, and it provides a store of solutions, which is a valuable resource when solving compatibility problems.