ISO 11783: CAN CANBus deliver what we hope it CAN?

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INTRODUCTION

During 2004 Kondinin Group surveyed 200 farmers and found many were frustrated with the lack of compatibility between the different components used in precision agriculture. Having a standard platform for precision farming hardware and software was equally ranked as the second most prominent issue in providing potential benefit to growers. The survey found standards for precision agriculture hardware and software was second only to targeted chemical applications technology in an estimated potential benefit matrix.

ISO 11783 FOR FARMERS

ISO 11783 is a voluntary standard to which companies can manufacture electronic components. The standard specifies the use of the Controller Area Network (CAN) bus communication system.
Companies supplying ISO 11783-compliant components, allows customers the option to buy different devices that communicate using a standard system.
ISO 11783 is designed to improve the compatibility of electrical components just like the three-point linkage system standardised implement attachment. The voluntary standard has 13 parts specifying how data should be transferred between sensors, actuators, control elements, mounted or integrated tractor information storage and display units and implements.
The standard goes a long way toward helping to standardise the platform for precision farming technology. Manufacturers who embrace the standard will improve the compatibility of devices including virtual terminals, tractors, steering controllers, application rate devices and yield sensors. The standard describes this communication via a 250 kilobytes per second twisted non-shielded quad layer cable.
Manufacturers selling ISO 11783-compliant products will use common hardware including plugs, cables and software data exchange. As a result, the standard should mean improved efficiencies for farmers in terms of implement combinations and automation. The virtual terminal is one of the most important components of any precision farming system as it provides the user with an interface and control centre. The terminal is described as ‘dumb’ because the information it displays is generally governed by an electronic control unit. Data entered is supplied to the electronic control unit via the virtual terminal (VT). ISO 11783 standardises operator prompts and data entry on the VT.

POTENTIAL BENEFITS

According to Kondinin Group’s 2004 Machinery Survey, simplified integration of precision farming technology would increase farmers’ annual returns by up to $23 per hectare.

Manufacturers might take some time to release CAN bus technology to a plug-and-play stage but this will increase as companies embrace ISO 11783. Widespread uptake of the standard will give farmers more freedom to choose the most appropriate precision agricultural components for their operations. This might include differing makes and models of tractor, spray controller, guidance system or yield monitor with the ability for equipment transfer between units.

LIMITATIONS

According to some manufacturers, one of the limitations of ISO 11783 is the specification of only the lowest common denominator expected from each component. While a solid platform to start with, the capabilities of standard compliant ISO 11783 systems are relatively basic in comparison to some of the graphically rich colour moving maps some operators are now familiar with.
ISO 11783 delivers a maximum bandwidth of 250kbits/second but manufacturers report that some graphically rich colour moving maps can consume between two and three times this bandwidth.
CAN bus as a system, is designed not to fail but it may suffer degradation as a result of overloading. For example, the bus could become overloaded with graphically rich data transferred to the virtual terminal. The results of an overloaded bus may include unresponsive steering.
Until all manufacturers switch to CAN bus technology, farmers will continue to experience data transfer compatibility problems. For example, late model CAN bus-wired harvesters will be unable to use National Maritime Electronics Association (NMEA) positional strings via an RS232 input from an inexpensive handheld global positioning system (GPS). Manufacturers could provide gap solutions for these problems in the form of CAN bus adapters to cater to market demand.

SOLUTIONS

Some manufacturers include a second CAN to maintain prompt control signals for commands with time-sensitive operations such as automated steering.
The second CAN uses the same virtual terminal as the original. While still receiving raw data input from a remote electronic control unit, a dedicated graphics engine in the virtual terminal renders graphics for the display, preventing the bus from becoming clogged with bandwidth-heavy graphics information. This would alleviate data response delays. While 250kbits/second should provide ample bandwidth for most operations, farmers using combinations of time sensitive applications such as automated steering and moving map graphics may need to consider supplementary CAN networks or VT-based data processing.

COMPLIANCE TESTING

During August 2004, the Association of Equipment Manufacturers (AEM) represented by its North American ISOBUS Implementation Task Force (NAIITF) and the Federation of Engineering Industry (VDMA) represented by its Implementation Group ISOBUS (IGI) agreed on common procedures for the release of the ISOBUS Compliance Specification and revisions; ISOBUS Compliance Test Protocol and revisions; ISOBUS labels; and relevant test information. In the future, electrical components that are ISO 11783 ready will be indicated by ISOBUS conformity label.