

Specification for

Data transfer between agricultural tractors and attached machinery (data bus protocol)

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Committees responsible for this British Standard

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- Agricultural Engineers' Association
- Forestry Commission
- Health and Safety Executive
- Milk Marketing Board
- Ministry of Agriculture, Fisheries and Food
- National Farmers' Union
- Silsoe College, Cranfield Institute of Technology
- Silsoe Research Institute
- Co-opted member

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Foreword

This Part of BS 7436 has been prepared by Technical Committee AGE/31 and is based on a draft prepared, under contract, by the Silsoe Research Institute.

This standard supersedes BS 7436 : Part 1 : 1991 which is withdrawn.

BS 7436 specifies a data transfer system for agricultural tractors and mounted, semi-mounted or trailed equipment. Its purpose is to standardize the method and format of transfer of data between sensors, actuators, control elements, information storage and display devices whether mounted on, or part of the tractor, or attached equipment.

This standard recognizes the increasing number of data producing and consuming devices on agricultural mobile equipment and the need to standardize data transfer between equipment supplied by different manufacturers. An introduction for those not familiar with the concept of a data bus is given in annex A.

The data transfer system specified is based on the controller area network protocol (CAN) version 2.0 B September 1991, developed in Germany. CAN specifies a random access, serial, digital, multi-master, multi-drop network and was developed for the automotive industry. Nodes are interconnected by a simple twisted pair or coaxial cable and transmission rates of up to one million bits per second are possible. Contention between transmitting nodes is determined on a bit-by-bit basis in a non-destructive arbitration scheme which allows for the highest priority message to be transmitted on to the bus.

Data integrity is assured through sophisticated error checking and correction mechanisms. The complexity of the protocol indicates that it has to be hardware implemented in integrated circuit form. The CAN protocol has been specified together with necessary additions to suit the mobile agricultural application such that currently available integrated circuits meeting the German specification may be implemented.

In due course an international CAN protocol for mobile agricultural systems will be specified (ISO 11783 is in the course of preparation)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This British Standard specifies multi-master digital data bus protocol for bi-directional transfer of data between devices mounted on agricultural tractors and attached machinery.

2 Definitions and acronyms

2.1 Definitions

For the purposes of this British Standard, the following definitions apply.

2.1.1 ACK delimiter

A recessive bit indicating the end of the acknowledge (ACK) slot.

2.1.2 ACK field

A two bit field wherein a receiver may indicate receipt of a message.

2.1.3 ACK slot

A bit that is transmitted recessive and is superscribed by a dominant bit by receivers receiving an error free message.

2.1.4 active error flag

A sequence of six dominant bits.

2.1.5 arbitration field

A field defining a node identifier and specifying whether the transmitted frame is data frame or a remote frame.

2.1.6 baud rate or bit rate (nominal)

The number of bits transmitted along the data bus per second.

2.1.7 bit stuffing

The insertion of a complementary bit in the actual transmission bit stream when a transmitter detects five consecutive bits of identical value in the stream to be transmitted.

NOTE. Bit stuffing applies to start of frame, arbitration field, control field, data field and CRC sequence only.

2.1.8 bit time (nominal)

The duration of one bit or unit of information.

2.1.9 bus

A physical length of wire(s) for data transmission.

2.1.10 bus idle

A period of arbitrary length following transmission of an intermission.

2.1.11 bus off

The condition of a node when the transmit error count is greater than 255. The node may not transmit onto the bus.

2.1.12 character

Eight bits of information.

2.1.13 contention

A state of the bus in which two or more transmitters are turned on simultaneously to conflicting logic states.

2.1.14 control field

A six bit field defining the data format in the message.

2.1.15 CRC delimiter

A single recessive bit indicating conclusion of the cyclical redundancy check (CRC) sequence.

2.1.16 CRC field

A field containing the cyclical redundancy code and CRC delimiter.

2.1.17 CRC sequence

An error sequence derived from the start of frame, arbitration field, control field and data field.

2.1.18 data field

A field containing 0 to 8 bytes of data.

2.1.19 data frame

A seven field frame for transmission of data.

2.1.20 data length code

Specifies the number of bytes in the data field.

2.1.21 dominant bit

One of two logical states of the bus (dominant or recessive).

2.1.22 end-of-frame

A flag sequence of seven recessive bits indicating end-of-frame.

2.1.23 error-active node

A node becomes error-active when the transmit-error count or receive-error count is less than 128.

2.1.24 error delimiter

A sequence of seven recessive bits transmitted after an error flag.

2.1.25 error frame

A two field frame transmitted on detection of an error condition.

2.1.26 error-passive node

A node becomes error-passive when the transmit-error count or receive-error count exceeds 127.