



SURFACE VEHICLE RECOMMENDED PRACTICE

J1939™-2

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(R) Agricultural and Forestry Off-Road Machinery Control and
Communication Network

RATIONALE

Document has been updated in as part of the Five-Year Review. Updated document with information related to SAE J1939DA and ISO 11783-14 which have been published since the last version of SAE J1939-2. Various updates throughout the document.

FOREWORD

The SAE J1939 communications network is defined using a collection of individual SAE J1939 documents based upon the layers of the Open System Interconnect (OSI) model for computer communications architecture. The SAE J1939-02 document specifies a particular set of SAE J1939 documents which define an SAE J1939 network as it applies to agricultural and forestry equipment.

The SAE J1939 communications network is a high-speed ISO 11898-1 CAN-based communications network that supports real-time closed-loop control functions, simple information exchanges, and diagnostic data exchanges between electronic control units (ECUs) physically distributed throughout the vehicle.

The SAE J1939 communications network is developed for use in heavy-duty environments and suitable for horizontally integrated vehicle industries. The SAE J1939 communications network is applicable for light-duty, medium-duty, and heavy-duty vehicles used on-road or off-road, and for appropriate stationary applications which use vehicle-derived components (e.g., generator sets). Vehicles of interest include, but are not limited to, on-highway and off-highway trucks and their trailers, construction equipment, and agricultural equipment and implements. The physical layer aspects of SAE J1939 reflect its design goal for use in heavy-duty environments. Horizontally integrated vehicles involve the integration of different combinations of loose package components, such as engines and transmissions that are sourced from many different component suppliers. The SAE J1939 common communication architecture strives to offer an open interconnect system that allows the ECUs associated with different component manufacturers to communicate with each other.

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1. SCOPE

SAE J1939-2 specifies the requirements for application of SAE J1939 in agricultural and forestry equipment. This document specifies the series of documents within the set of SAE J1939 documents that are applicable to agricultural and forestry equipment and provides further requirements for this industry.

The SAE and ISO groups have cooperated to define agricultural and forestry networks in a manner to allow compatibility of ECUs and messaging protocols between the A&F and the T&B networks.

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1.1 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 11783 Tractors and Machinery for Agriculture and Forestry - Serial Control and Communications Data Network

2.1.2 NMEA Publications

Available from National Marine Electronics Association, 7 Riggs Ave., Severna Park, MD 21146, 410-975-9425, www.nmea.org.

NMEA 2000 National Marine Electronics Association Standard for Serial-Data Networking of Marine Electronic Devices

3. DEFINITIONS

Terms and abbreviations are defined in SAE J1939 top level document for use in the context of this document. Additional terms are defined below.

3.1 Terms

3.1.1 CONTROLLER APPLICATION

The software within an Electronic Control Unit (ECU) that performs a particular control function. More than one controller application may reside within an ECU. In ISO 11783, the term control function (CF) is synonymous with controller application.

3.1.2 CONFIGURABLE MESSAGES

A set of message PGNs that can be configured to contain any desired combination of a set of parameters (SPNs) that are designated to be configurable.

3.1.3 FARM MANAGEMENT INFORMATION SYSTEM

The office computer system for the farmer or contractor. It includes the software for farm management such as book keeping, payroll, resource management for machines, products, workers, field management, GIS, decision support systems, and task management.

3.1.4 FAST PACKET

A transport protocol method employing broadcast messages with no minimum separation between packets.

3.1.5 IMPLEMENT NETWORK

Network segment that connects agricultural implement ECUs, as well as some ECUs on a tractor, such as a virtual terminal and a tractor ECU.

3.1.6 ISOBUS

Standardization of the agricultural implement network defined in ISO 11783.

3.1.7 MANAGEMENT COMPUTER INTERFACE

The method of exchanging information between the FMIS and the vehicle task controllers using XML data format. A physical interface is not specified.

3.1.8 NETWORK INTERCONNECTION ECU

A device that exists primarily for interconnecting networks or sub networks. Specific implementations for "forwarding" messages include: repeater, bridge, router, and gateway.

3.1.9 PROCESS DATA

A message that is used for the transmission of measured data and/or set point commands to one or more controllers.

3.1.10 TASK CONTROLLER

An electronic unit on the mobile implement control system that is responsible for the sending, receiving, and logging of process data. A task controller may have an operator interface.

3.1.11 TERMINATION BIAS CIRCUIT

A circuit required at each end of a network segment that provides bias voltages for the CAN high and CAN low signals, and the common mode impedance termination for the respective conductors.

3.1.12 TRACTOR NETWORK

Network segment that connects mainly tractor mounted ECUs, including power train modules.

3.1.13 TRACTOR ECU

Standardized network interconnect device between tractor network and implement network.

3.1.14 VIRTUAL TERMINAL

An ECU, consisting of a graphical display and input functions, which provides the capability to display information to and retrieve data from an operator for a connected implement or working set.

3.2 Abbreviations

Abbreviations are defined in SAE J1939 for use in the context of this document.

A&F	Agricultural and Forestry - A&F networks are those that are governed by this document and by ISO 11783
CA	Controller Application
ECU	Electronic Control Unit - Any of a number of electronic modules contained in a machine that communicates with other ECUs via the SAE J1939 network standard
ETP	Extended Transport Protocol
FMIS	Farm Management Information System
ISO	International Organization for Standardization

ISO/TC 23/SC 19/WG 1	International Organization for Standards, Technical Committee 23, Subcommittee 19, Working Group 1 - The group responsible for maintaining the ISOBUS protocol standard for A&F networks
NMEA	National Marine Electronics Association
PG	Parameter Group
PGN	Parameter Group Number
SPN	Suspect Parameter Number
T&B	Truck and Bus
TBC	Termination Bias Circuit
TC	Task Controller
VT	Virtual Terminal
XML	eXtensible Markup Language

4. DOCUMENTATION STRUCTURE

General information regarding this series of recommended practices is found in SAE J1939.

Agricultural and forestry CAN communication networks are defined and standardized based upon the SAE J1939 T&B standard and further elaborated in ISO 11783 to produce compatible networks. See Section 5 for details of the working process between SAE and ISO working groups.

A subset of the SAE J1939 documents is applicable for forestry and agricultural equipment. A combination of the SAE J1939 and ISO 11783 documents completely specifies the agricultural and forestry off-road control and communications networks. The series of documents applicable for agricultural and forestry equipment are listed in Table 1. Some information relating to foundation principles on which the networks operate are contained in both sets of documents. Other information relating to A&F application-specific features and services are contained only in the ISO documents.

Section 6 of this document summarizes the major points about each of the documents listed above. Additionally, Section 7 gives some guidance for those familiar with SAE J1939 who may want to design ECUs that will also be compatible with the A&F networks described here.