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Machinery for agriculture and forestry — Data interchange between management computer and process computers — Data interchange syntax

Machines agricoles et forestières — Transfert de données entre l'ordinateur de gestion et les ordinateurs de contrôle de process — Échange des données (syntaxe)

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Contents

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Annexes

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11787 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

Annexes A and B of this International Standard are for information only.

Introduction

Stand-alone computers on the farm require that the same data must be manually collected from, and entered in, the different computers. This is a laborious task which becomes superfluous when the computers are interconnected and able to communicate with each other automatically to share and exchange information. Information exchange means data transport between the management computer on one side and each process computer on the other side.

NOTE 1 When in this text "process computer" is used, this can also be read as "datalogger".

Machinery for agriculture and forestry — Data interchange between management computer and process computers — Data interchange syntax

1 Scope

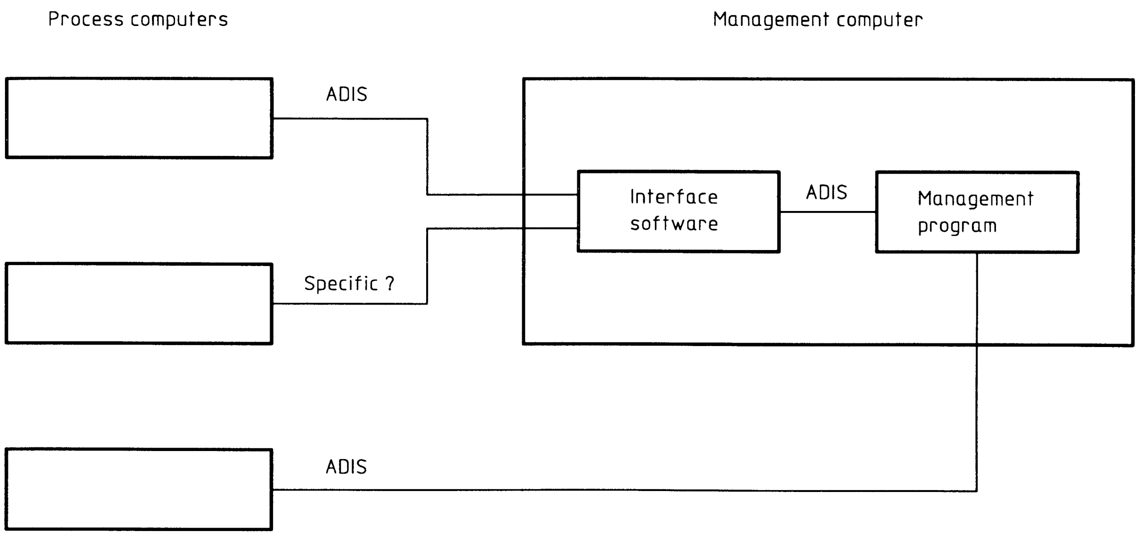
This International Standard provides the means to enable communication between on-farm process computers of stationary and mobile agricultural equipment or machinery, and management computers. It therefore specifies an Agricultural Data Interchange Syntax (ADIS), to exchange data electronically. It implies that the syntax is not intended for real-time data exchange.

ADIS may be used (see figure 1) for direct data exchange between process computer and management program.

ADIS may also be used for data exchange between process computer and interface software of the process computer on the PC.

Alternatively for this exchange, manufacturer-specific methods can be and are used for data exchange between the interface software for the process computer on the PC and the management program.

NOTE 2 This does not mean that ADIS cannot be used for other data interchange. Many farmers use a method similar to ADIS to exchange data between management computers and external computers: ADIS can be used for data interchange to external computers. ADIS can also be used to exchange data between independent software applications used on a management computer.



NOTE — Interface software is a communication program for the process computer that runs on the management computer. It takes care of the data exchange, and creates and reads the ADIS file(s).

Figure 1 — ADIS application possibilities

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 8601:1988, *Data elements and interchange formats — Information interchange — Representation of dates and times.*

3 Definitions

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

3.1 ADIS; Agricultural Data Interchange Syntax: Syntax for data exchange between management computer and process computer on a farm.

3.2 alphanumeric data: Series of figures representing characters and whole numbers.

3.3 data dictionary: Database or list in which all data items are described in a unique way.

NOTE 3 Several data dictionaries can be used in ADIS. The use of a data dictionary is one of the starting points of ADIS (see also annex B).

3.4 data (dictionary) item: Item of the data dictionary, uniquely identified by a DDI number.

3.5 datalogger: Computer system to collect data about a process, but not to control the process itself.

3.6 DD number: Number that is used to identify a data item in a data dictionary with a 6-digit decimal code.

3.7 DDI number: Number that is used to identify a data dictionary item clearly in the ADIS file, with

— two leading zeros, followed by the data dictionary number (DD number);

— an identifier number;

— a number out of another data dictionary.

NOTE 4 The DDI number may contain additional information about the destination of the data item if it is sent through a CAN-bus.

3.8 management computer: Computer system in an agricultural enterprise used for management purposes.

3.9 management system: Programs and data bases on a management computer used for management purposes, but not for process control.

3.10 numerical data: Series of digits.

3.11 process computer: Computer system on an agricultural enterprise for process control purposes (milking, feeding, climate control, on-board computer, etc.).

4 General

4.1 The data to be exchanged between management computers and process computers shall be presented in standard files for data exchange on the management computer. The management system shall provide the programs for conversion of its data to or from the standard file for data exchange. The process computer system shall provide the programs for conversion of its data to or from the standard files for data exchange.

For data exchange the data needs to be known to both parties, and there needs to be a way to put the data in the standard exchange file: this is the syntax (ADIS).

NOTE 5 For background information, see annex A.

4.2 The following characters occur in this International Standard, to give a better description of the ADIS syntax:

<...> contains the description of an item;

[...] conditional (not mandatory) parts are put between square brackets;

(...) parts between parentheses can occur a number of times repeatedly, at least once.

EXAMPLE

DN(<DDI-no><field length><resolution>) means that the combination of a DDI number, its field length and resolution can occur a number of times.

5 Main ADIS characteristics

5.1 An ADIS file is a file with extended ASCII characters (ISO 8-bit code).

5.2 An ADIS file contains lines that are ended with <CR><LF>.

The minimum line length that a program shall be able to support is at least 256 characters, including <CR> <LF>.

The maximum line length in an ADIS file is not specified but should be agreed on by the communication group which uses the syntax.

5.3 Both the sending and receiving party of an ADIS file need to have a data dictionary or a subset of it. This data dictionary keeps the characteristics of each data dictionary item. A DD item is uniquely identified by an 8-character DDI number. A DDI number can for instance be a DD number or an identifier.

5.4 A file name is not specified. The file name of an ADIS file is free.

6 Reserved characters

The following reserved characters are characters with a predefined meaning. They may not be used freely.

Character	Name	DEC	HEX	Function
^M	CR	13	0D	Carriage-return
^J	LF	10	0A	Line-feed
|	vertical bar	124	7C	Error code for unrecognized DDI numbers
?	Question mark	63	3F	Null value (uninitialized fields)

NOTE 6 ASCII defines characters 0 to 31 and 127 to be control characters (or non-printing characters). The control sequences shown can be used to enter these values from most system keyboards.

Apart from these reserved characters, all characters with ASCII values 32 to 255 (except 127) may be used.

NOTE 7 In some cases ASCII values above 127 can cause problems because they are country-dependent.

7 Line types

Each line is of a certain type. Which type is shown by the first character of the line. This character specifies what type of data the line contains.

7.1 Line type identification

The standard file syntax requires capitalized line type characters. Lower case characters are manufacturer-specific, and have to be agreed upon by both the sending and receiving party. If the line type character is unknown, the line is ignored.

7.2 Classification of line types

The features of ADIS can be used stepwise. Therefore the line types are divided into four different classes:

class A: the use of D, V, C, E and Z lines;

class B: class A plus additional use of F, I and T lines;

class C: class A plus additional use of R and O lines;

class D: class A plus additional use of S, R and O lines.

Class A is mandatory for using ADIS. Classes B, C and D are permissible extensions.

It does not mean that, for instance, when class C is supported that automatically class B will be supported. When synchronizing (initializing), the sender and receiver (communication group) must tell each other in which class they can communicate. This can be done, for instance, on paper, but also automatically by using a DDI number in the ADIS file for line type classification.

7.3 Standardized line types

The following line types are standardized:

D	Definition
V	Value
E	End of logical file
C	Comment
S	Search
R	Request
F	File

I Include
O Output
T Terminate
Z Physical end of file

7.4 Definition line

A definition line (D line) specifies the contents of the value lines that succeed it. A D line shall always be succeeded by 1 or more V lines. If no data are available then all fields (starting from position 9 of the line) of the complete V line are filled out with "?" (see also 15.3).

D<status><event-no>(<DDI-no><field length><resolution>)<CR><LF>

7.5 Value line

Value lines (V lines) contain the values of the DD items that were specified in the last preceding D line. V lines without a preceding D line with the same event number are illegal (see also 10.2).

V<status><event-no>(<value>)<CR><LF>

7.6 End line

An end line (E line) marks the logical end of a data file. In a file more than one E line can occur. The E line is always followed by a DH+VH line or a Z line. The physical end of the file is marked by a Z line. The last E line just before the Z line is not mandatory. An E line is always the same:

EN<CR><LF>

7.7 Comment line

Comment lines (C lines) can be put anywhere in an ADIS file. They can hold free text.

C<status><free text><CR><LF>

7.8 Search line

In a search line (S line) one or more search conditions can be specified. See also clause 11.

7.9 Request line

A request line (R line) holds the data dictionary numbers of attributes which are requested. See also clause 11.

7.10 File line

A file line (F line) gives the complete name of a library file (pathname and filename). This line avoids including the file itself.

F<status><path + filename><CR><LF>

7.11 Include line

An include line (I line) holds the pathname and filename of a file to be included at the position of the I line. The include file shall meet the ADIS requirements as if it were part of the parent file. This implies that the combination of the parent file and the include file shall meet the ADIS requirements.

I<status><path + filename><CR><LF>

NOTE 8 The include option is a way to separate files physically which are one logically. The included file can contain a header, if the combination with the parent file meets the ADIS requirements.

7.12 Output line

An output line (O line) holds the pathname and filename of a file to which data must be written.

O<status><path + filename><CR><LF>

7.13 Termination line

A termination line (T line) marks the end of a main unit of information in an ADIS file. A T line can be used to distinguish different blocks within one file. A T line cannot be followed by a DH + VH line (see also E line). A T line is always the same:

TN<CR><LF>

7.14 Physical end of file line

A physical end of file line (Z line) marks the end of a physical datafile. When a Z line occurs, the physical end of the file is reached. Everything beyond the Z line will be ignored. There shall never occur a new DH+VH line after a Z line. It is possible but not mandatory to put an E line before the Z line. A Z line is always the same:

ZN<CR><LF>

8 Status characters

The second position of each line holds the status character. This character explains the function of the data in that line.

8.1 Status identification

The standard file syntax requires capitalized status characters. Lower case characters are manufacturer-specific, and shall be agreed upon by both the sending and receiving party. If the status character is unknown, the line is ignored.

8.2 Standardized status characters

The following status characters are standardized:

H	Header data
N	Normal data
S	Synchronization data
F	Faulty data
D	Deletion data

8.3 Header data

Each data file shall have a header. This implies that an ADIS file has to start with one DH line, followed by a VH line. Only comment lines (irrespective of their status characters) can precede the header. If the header is omitted, the whole file is illegal.

It is mandatory to start the header data (right after the event number) with the name of the data dictionary that was used when creating the file. Several data dictionaries can be used. To read the received ADIS file, the receiver needs to known which data dictionary has to be used for recognizing the DDI numbers.

It is recommended that the header also contains at least the following information (from the sender):

Manufacturer: organization/company that made the ADIS file;

Receiver: the name of the receiver of the ADIS file;

DDI list version: version of the DDI list that was used when creating the file;

Product name: name of the software program that created the file;

Sofware version: Program version that was used to create the file;

Creation date: date of creation of the file;

Creation time: time of creation of the file.

It is permissible to put more data in the header.

The DDI numbers of these data items have to be part of the data dictionary.

8.4 Normal data

Normal data is data that is sent for updating the database of the receiving party.

8.5 Synchronization data

Synchronization data is sent with the intention of

initializing the database (filling the first time);

comparing data in the databases of the sending and the receiving party to determine which is correct between the communication groups.

8.6 Faulty data

If an ADIS file contains a line which seems to contain one or more errors, it is possible for the receiver to put this whole line in a separate ADIS file, with the status character changed into an "F". It is also possible that an F status line has more fields than the corresponding N status line. For instance the F status line can contain detailed information about the kind of error, what is wrong, etc. This kind of information can be placed in the F status line, according to the preceding DF line. The receiver discovers the errors in the ADIS line, and sends the F line back to the original sender.

8.7 Deletion data

If an ADIS file has been sent that kept incorrect information, the transmitter can copy the line that contained the error into another ADIS file, with the status character changed into a "D", and send that file as well. A line with a D status shall be deleted completely. The use of the D status is conditional. If the D status is not supported, it shall be answered by an F line.

9 Combination of line types and status characters

The matrix in figure 2 shows which combinations of line types and status characters are allowed and which are not.