Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 6:
Virtual terminal

Tracteurs et matériels agricoles et forestiers — Réseaux de commande et de communication de données en série —

Partie 6: Terminal virtuel
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11783-6 was prepared by Technical Committee ISO/TC 23, Tractors and machinery for agriculture and forestry, Subcommittee SC 19, Agricultural electronics.

This second edition cancels and replaces the first edition (ISO 11783-6:2004), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11783-6:2004/Cor.1:2005. It introduces requirements for Version 4 VTs and Working Sets, while retaining the requirements of the first edition for Version 3 VTs and Working Sets. The specific requirements of Annex G, as well as Annex J and the revised Table L.2, are also applicable to Version 3.

ISO 11783 consists of the following parts, under the general title Tractors and machinery for agriculture and forestry — Serial control and communications data network:

- Part 1: General standard for mobile data communication
- Part 2: Physical layer
- Part 3: Data link layer
- Part 4: Network layer
- Part 5: Network management
- Part 6: Virtual terminal
- Part 7: Implement messages application layer
- Part 8: Power train messages
- Part 9: Tractor ECU
- Part 10: Task controller and management information system data interchange
- Part 11: Mobile data element dictionary
- Part 12: Diagnostics services
- Part 13: File server
- Part 14: Sequence control
Introduction

Parts 1 to 14 of ISO 11783 specify a communications system for agricultural equipment based on the CAN 2.0 B\(^1\) protocol. SAE J 1939\(^2\) documents, on which parts of ISO 11783 are based, were developed jointly for use in truck and bus applications and for construction and agriculture applications. Joint documents were completed to allow electronic units that meet the truck and bus SAE J 1939 specifications to be used by agricultural and forestry equipment with minimal changes. The specifications for virtual terminals given in this part of ISO 11783 are based on DIN 9684-4\(^3\). General information on ISO 11783 is to be found in ISO 11783-1.

The purpose of ISO 11783 is to provide an open, interconnected system for on-board electronic systems. It is intended to enable electronic control units (ECUs) to communicate with each other, providing a standardized system.

All phrases in this part of ISO 11783 that refer explicitly to a software term for an object or a command have the first letter of each object or command word capitalized (e.g. Linear Bar Graph object, Change Numeric Value command). This aids in the recognition of each of these terms as being a specific item having a specific definition in the document.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this part of ISO 11783 may involve the use of a patent concerning the controller area network (CAN) protocol referred to throughout the document.

ISO takes no position concerning the evidence, validity and scope of this patent.

The holder of this patent has assured ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from:

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Germany

Attention is drawn to the possibility that some of the elements of this part of ISO 11783 may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.
Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 6:
Virtual terminal

1 Scope

ISO 11783 as a whole specifies a serial data network for control and communications on forestry or agricultural tractors and mounted, semi-mounted, towed or self-propelled implements. Its purpose is to standardize the method and format of transfer of data between sensors, actuators, control elements and information storage and display units, whether mounted on, or part of, the tractor or implement. This part of ISO 11783 describes a universal virtual terminal (VT) that can be used by both tractors and implements.

It is applicable to both Version 3 and Version 4 VTs and Working Sets.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11783-1, Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 1: General standard for mobile data communication

ISO 11783-3, Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 3: Data link layer

ISO 11783-5, Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 5: Network management

ISO 11783-7, Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 7: Implement messages application layer

ISO 15077, Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in ISO 11783-1 and the following terms and definitions apply.

3.1 auxiliary input unit
autonomous control function (CF) providing auxiliary controls for common use that may also be physically located within an electronic control unit (ECU), or on the virtual terminal (VT)
3.2 **object pool**
collection of objects that completely define the operator interface for an implement or a single Working Set

NOTE The complete VT definition will be made up of one or more object pools — one for each Working Set.

3.3 **object ID**
numeric value which references a specific object within an object pool

3.4 **attribute ID**
AID
numeric value which references a specific object’s attribute

NOTE 1 AID values range from 0 to FE_{16} (254_{10}), with 255 as the NULL_AID.

NOTE 2 This field appears in the attribute and record format tables. AIDs that are explicitly defined with square brackets, [ ], are read-only attributes using the Get Attribute Value message. AIDs that are explicitly defined without square brackets are writable with the Change Attribute command.

3.5 **char**
single character where the size is 1 byte

NOTE Commonly used for ISO 8859 characters (e.g. 41_{16} in ISO/IEC 8859-1 represents “A”), see Annex L.

3.6 **character**
single text grapheme or symbol, as in an alphabet

NOTE Size is variable, based on the encoding scheme (see char and WideChar).

3.7 **code plane**
group of 65 536 possible character codes

NOTE Unicode/ISO 10646 organizes the characters in 17 code planes numbered 0 to 16.

EXAMPLE
   - Code plane 0 covers characters 000000_{16} to 00FFFF_{16}.
   - Code plane 1 covers characters 010000_{16} to 01FFFF_{16}.
   - ... Code plane 16 covers characters 100000_{16} to 10FFFF_{16}.

3.8 **open input object**
state of an input object where the object has focus and it is open for operator input

NOTE Open input object is used interchangeably with data input.

3.9 **selected input object**
state of an input object where the object has focus but it is not open for operator input

NOTE Selected input object is used interchangeably with “has focus”.


3.10 surrogate pair
32 bit code for characters composed of a 16 bit high pair and a 16 bit low pair

NOTE 1 UTF-16 encoding of characters in code plane 1 to 16 (see 4.6.16.6).
NOTE 2 The UTF-16 character encoding scheme is defined by ISO 10646.

3.11 WideChar
single character with a size of 2 bytes encoded in little endian order

EXAMPLE Byte sequence 41₁⁶, 00₁⁶ represents “A”.

NOTE 1 See Annex L.
NOTE 2 Two WideChars can be combined to indicate character codes exceeding 16 bits (see 4.6.16.6).

3.12 WideString
zero or more characters composed of the primitive type “WideChar” always preceded by the byte order mark FF₁⁶

EXAMPLE Byte sequence FF₁⁶, FE₁⁶, 41₁⁶, 00₁⁶, 42₁⁶, 00₁⁶, 43₁⁶, 00₁⁶ represents “ABC”. This WideString has a length of 8 bytes with the number of characters in the presentation equal to 3.

3.13 8 bit string
zero or more characters composed of the primitive type “char”

NOTE String length is variable.

3.14 VT number
identification number that is derived from the function instance of the VT

NOTE VTs can then be referenced as VT Number 1, VT Number 2, etc.

3.15 User-Layout Data Mask
special Data Mask controlled by the VT but laid out by the operator

NOTE See 4.1 and 4.7.

3.16 window cell
equal-sized cell in a grid on a User-Layout Data Mask

NOTE See 4.7.

3.17 window mask object
supplied by the Working Set for placement by the operator into the area of one or more window cells but not a partial cell

NOTE See 4.7.
3.18 User-Layout Soft Key Mask
Soft Key Masks that are controlled by the VT but laid out by the operator.
NOTE See 4.7.

3.19 Key Cell
Cell that is the size of a Soft Key designator in a User-Layout Key Mask.
NOTE See 4.7.

3.20 Key Group Object
Area of one or more Key Cells and containing a grouping of one or more Key Objects.
NOTE See 4.7.

3.21 non-VT screen
VT-capable display on which no Data Masks are visible.
NOTE See 4.7.

3.22 non-VT area
Area outside the normal Data Mask and Soft Key Mask visible at the same time as a Data Mask and Soft Key Mask are displayed.
NOTE See 4.7.

3.23 range
Value signifying that each object has an attributes and record format table.
NOTE Each parameter has a range or value for the specific attribute. Where there are ranges and values that are explicitly defined with square brackets, [ ], they are applicable to VT Version 3 and prior, whereas the adjacent unbracketed range or value applies to VT Version 4 or later.

4 Technical requirements

4.1 Overview
A virtual terminal (VT) is a control function (CF) within an electronic control unit (ECU), consisting of a graphical display and input functions, connected to an ISO 11783 network that provides the capability for a CF, composing an implement or a group of implements to interact with an operator. The VT provides the capability to display information and to retrieve data from an operator. The CF, as an implement or a group of implements represented by a Working Set Master, acquires storage for objects within the VT and on demand displays this stored information to an operator. In this part of ISO 11783, the term Working Set will be used for a CF, as an implement or a group of implements represented either by a single ECU or a group of ECUs acting as a Working Set. Working Sets on the network can also acquire the use of input and control keys of the VT to allow the operator to send signals back to the Working Set.

This part of ISO 11783 describes the VT with the detail and clarity required for VTs built by different manufacturers to be interchangeable with any implement Working Set that uses the VT services. The interface protocol of this part of ISO 11783 also reduces the runtime ISO 11783 communication bus traffic as much as possible. For these reasons, the requirements of this part of ISO 11783 are organized in an object-oriented...
manner with specific attributes and behaviour of each object clearly and fully defined. The required behaviour of the VT given certain situations is also detailed.

In general, the functions, not the design, of the user interface of the VT are defined in order to avoid restrictions on possible designs. However, certain limitations are imposed in order to meet the goal of interchangeability between various manufacturers. Specifications regarding physical layout, components, processing power and the number of physical elements comprising a VT have been omitted in order to avoid restricting manufacturers’ designs.

The VT shall have a pixel-addressable (graphical) display. Information from connected Working Sets is shown to the operator on the graphical display. This information is shown in display areas that are defined by Data Masks, Alarm Masks and Soft Key Masks. The data for these masks is contained in object definitions that are loaded into a VT via the ISO 11783 CAN bus, or from non-volatile memory. When the information defined by a mask is required on the display, the mask can be made visible by a single Change Active Mask command from the Working Set, and therefore does not require significant additional network traffic.

The physical size, resolution, orientation and methods of implementing the graphical display are at the discretion of the designer of the VT. Figure 1 shows examples of some possible VT designs and orientations.
Key
1 Data Mask Area
2 Soft Key Mask area
3 physical screen
4 Soft Key designator
5 physical Soft Key

Figure 1 — Virtual terminal — Examples
4.2 Operator input and control

The VT shall provide the operator with means for control and input. There are five means associated with a VT that can be used for the input of data, selection of display data, and the control of connected Working Sets.

See Figure 2.

a) Soft

This is a means, most likely keys on the VT, using software-changeable designators (labels). “Soft Keys” have their identity changed depending on which Soft Key Mask is visible. The VT shall make the association between a Soft Key and its designator clearly evident to the operator.

b) Navigation

This is a means of selecting an input field or Button within the active Data Mask. If keys are used for “Navigation”, they do not send key activation information to the Working Set and are proprietary to the VT.

c) Data Input

This is a means of entering/editing information in an input field within the active Data Mask. If keys are used for “Data Input”, they do not send key activation information to the Working Set and are proprietary to the VT. A means shall be provided for entering any number or character sequence that is valid for the input field.

During the data input operation, the VT Status message will continue to indicate the active Working Set and active mask which contains the input object for which the data input operation applies. Data input operation that originates on a User-Layout Data Mask does not affect the VT Status message.

There are two types of Data Input: “editing” and “real time editing”.

1) Editing

This is a means of data input where the new value being entered is composed by the operator using a proprietary means within the VT. During the composition of the new value, changes to the original value are not communicated to the Working Set. A means shall also be provided for ESC from, or ENTER of, information into a data field.

The ENTER means shall be provided to indicate to the Working Set the completion of data entry and communication of the new value, and the ESC means shall be provided to indicate that the data entry was aborted. The ESC means either may be a permanent key or may only be available during data entry (see Table 4). The VT shall send a VT ESC message to a Working Set for an operator-activated ESC means or an ESC response as a response to receiving an ESC command from a Working Set.

2) Real time input

This is a means of data input for an Input Number object and Input List object where the object has focus and is open for operator input, and changes by the operator to the value are periodically transmitted to the Working Set while the object is being changed. The VT Change Numeric Value message is limited to a 5 Hz update rate. Each value change sent to the Working Set is considered a complete transaction and cannot be reverted by the ESC means. The VT is not required to provide steps in uniform increments; however, it shall be possible to set any value (e.g. fast scrolling is allowed to span a wide range of values, with fine adjustment for final setting). If the ESC means is activated during real time data input, the VT shall ensure that the on-screen value is equal to the value last sent to the Working Set. The VT may send a final value to the Working Set prior to sending the VT ESC message or ESC response message to ensure this synchronization. Real time data input shall meet the operator controls requirement specified in ISO 15077.

d) Control

This is a means of selecting between Working Sets whenever a Data Mask is visible, and a means of acknowledging alarms. Both means are required. Since more than one Working Set can use the services
of the VT, the VT shall provide a means for the operator of selecting between connected Working Sets. The Working Set selection means should be indicated by three circular arrows or a similar graphic. Only the ACK means sends key activation information to the Working Set.

e) Auxiliary input

This is a means available to the operator for communicating input commands to the Working Set(s) using Auxiliary Controls which are assigned to Auxiliary Functions. (See Annex J.)

Figure 2 — Operator input and control means — Example

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>control</td>
</tr>
<tr>
<td>2</td>
<td>navigation</td>
</tr>
<tr>
<td>3</td>
<td>Soft Key 1</td>
</tr>
<tr>
<td>4</td>
<td>Soft Key 2</td>
</tr>
<tr>
<td>5</td>
<td>Soft Key 6</td>
</tr>
<tr>
<td>6</td>
<td>data input</td>
</tr>
<tr>
<td>7</td>
<td>auxiliary input</td>
</tr>
</tbody>
</table>
4.3 Acoustic alarm

The VT shall provide an acoustic alarm. The alarm may be a simple on/off type buzzer or an acoustic component capable of variable frequency and audio level.

4.4 Coordinate system

Positions and sizes in this part of ISO 11783 are always given in physical pixels unless otherwise stated. A two-dimensional coordinate plane \((x, y)\) is used, where \(x\) is the number of units wide (\(x\) increases from left to right) and \(y\) is the number of units high (\(y\) increases from top to bottom). The coordinates are signed values. The origin \((0, 0)\) for any object's coordinate system is located at the top left corner of the parent object.

4.5 Display areas

The following defines standard Data Mask and Soft Key Mask areas of the display. Alternative usage of these areas supports displaying data from multiple working sets (see 4.7).

4.5.1 Data Mask

The VT shall reserve an area of the display for displaying Data Masks and Alarm Masks. This area is called the Data Mask area (see Figure 1). Recognizing that the physical orientation of the VT display could be different, depending on the manufacturer of the VT, a square Data Mask aspect ratio is chosen to ensure correct display in either landscape or portrait orientation. The minimum Data Mask area shall be 200 pixels \(\times\) 200 pixels. This requirement does not limit the physical resolution or size of the display, only the usable Data Mask area. Higher resolution mask areas are permitted, but the square aspect ratio shall be strictly enforced. Examples of Data Mask areas that would meet this requirement are

- 200 \(\times\) 200,
- 240 \(\times\) 240,
- 320 \(\times\) 320, and
- 480 \(\times\) 480.

Any other square dimensions would be acceptable.

It is suggested that unused areas of the physical display be used for proprietary information such as vehicle data, VT statistics or other data.

4.5.2 Soft Key Mask area and Soft Key designators

The VT shall reserve an area of the display for Soft Key labels, separate from the Data Mask Area. This area is called the Soft Key Mask area (see Figure 1). Each Soft Key shall have a reserved display area, called a Soft Key designator, for displaying a label (see Figure 1). The minimum size of the designator field is 60 pixels wide \(\times\) 32 pixels high, regardless of screen orientation. The Soft Key designators may contain text, graphics or both. The Soft Key Mask area may be adjacent to, or physically separate from, the Data Mask area, but shall not be part of the Data Mask area.

The VT shall provide a clearly visible separation between the individual Soft Key designators (for example, by drawing a one-pixel line). It is recommended that this visible separation be drawn outside the Soft Key designator area.

The presentation of the Soft Keys can be further described in three groups, with a defined relationship: Navigation Soft Keys \(<\) Number of Physical Soft Keys \(\leq\) Number of Virtual Soft Keys.

a) VT Version 3 and prior VTs have no requirement on the number of physical Soft Keys.

b) VT Version 4 and later VTs shall provide at least six Physical Soft Keys.
c) VT Version 3 and prior shall support a maximum of 64 virtual Soft Keys per Soft Key Mask (see 4.5.2.2).

d) VT Version 4 and later shall support exactly 64 virtual Soft Keys per Soft Key Mask (see 4.5.2.2).

e) The VT shall provide a means for the operator to navigate and select all defined Soft Keys. For example, if there are six physical keys, some type of paging would be required to allow the operator to navigate to, and select from, any of the 64 Soft Keys using the six physical keys.

4.5.2.1 Physical Soft Keys

Physical Soft Keys is the count of the number of permanently dedicated keys that the VT makes available to active Working Sets. The term “physical Soft Key” does not imply that the VT must provide physical buttons for the Soft Keys. For example, on a VT with touch screen, the physical Soft Keys may be located directly on the touch screen, as shown in Figure 1.

For VTs with a vertical arrangement of Physical Soft Keys, key number 1 shall be on the right and the top-most position. Key number 2 shall be adjacent and below Key 1. Key $m$ shall be at the bottom of the first column. If there are additional physical Soft Keys, the column containing keys $m+1$ to key $n$ shall be to the left of the first column. Each additional column of physical Soft Keys shall continue to the left. For VTs with a horizontal arrangement of Physical Soft Keys, Key number 1 shall be on the top row and in the left-most position. Key number 2 shall be adjacent and to the right of Key 1. Key $m$ shall be at the far right of the top row. If there are additional physical Soft Keys, the row containing keys $m+1$ to key $n$ shall be below the first row. Each additional row of physical Soft Keys shall continue below the previous row. Examples of these arrangements are shown in Figure 3.

For VTs without a clear horizontal or vertical arrangement of physical Soft Keys (e.g. physical Soft Keys located in a matrix on the touch screen), the rules for a VT with a vertical arrangement of physical Soft Keys apply.

![Figure 3 — Physical Soft Key orientation examples showing key locations](image-url)
4.5.2.2 Virtual Soft Keys

Virtual Soft Keys is the count of the number of Soft Keys that the VT supports for each active Working Set's Data Mask. If the physical Soft Keys count is less than the virtual Soft Keys count, the VT shall provide a means for navigation to allow the operator to choose from any of the Working Set's Soft Keys.

4.5.2.3 Navigation Soft Keys

Navigation Soft Keys is the count of the number of physical Soft Keys that the VT may allocate for the purpose of navigation among the Soft Keys. The number of navigation Soft Keys shall be less than the number of physical Soft Keys. If the VT provides another means of navigation that does not use the physical Soft Keys, this value shall be zero.

4.5.2.4 Navigation among Soft Keys

If the Working Set provides a number of Soft Keys on a Soft Key Mask equal to or less than the number of physical Soft Keys reported by the VT, then all of the Soft Keys on this Soft Key Mask shall be accessible with the physical Soft Keys. The VT shall not provide any navigation means for this Soft Key Mask.

If the Working Set provides more Soft Keys than the VT has reported in the number of physical Soft Keys, the VT shall provide navigation for that Soft Key Mask. This navigation among the Soft Keys shall be done by paging through the Soft Keys in groups, not by scrolling. Further, a “group” is defined as the “physical Soft Keys” count minus the “navigation Soft Keys” count. The navigation Soft Keys shall always occupy the same physical Soft Key positions on all pages, although the VT designer may choose to disable (but not remove) the navigation keys on certain pages. The last set of virtual Soft Keys (depending on how many Soft Keys the Working Set provided to the VT) may not completely fill the Soft Key Mask. The remainder of the Soft Key designators shall not be used.

The VT shall not provide navigation to any trailing Soft Keys while those items are Pointers to NULL Object ID.

As shown in Figure 4, a VT is designed with six physical Soft Keys, 64 virtual Soft Keys, and one [a) in Figure 4] navigation Soft Key. The Working Set provides 18 Soft Keys to the VT; however, there are three which are Pointers to NULL Object ID. To support navigating among the Soft Keys, the VT designer alters Soft Key 6 into a “next Soft Key group” button. A navigation group is calculated as sets of five Soft Keys [a) in Figure 4], starting with the first Soft Key. When the navigation key is pressed, the VT shows the next group of Soft Keys. Another example [b) in Figure 4] shows a similar example with two navigation Soft Keys. Another example [c) in Figure 4] shows an arrangement with two columns of keys and two navigation keys. If the VT provides dedicated navigation keys, the number of navigation Soft Keys reported shall be zero [d) in figure].
4.6 Behaviour

4.6.1 Object pools

4.6.1.1 General

The operator interface definition for a device or one or more implements represented by either a single ECU or a Working Set consists of a set of objects, hereafter referred to as the Working Set's object pool. These objects are defined in detail in the following subclauses. Each object contains all necessary attributes and child object references for processing the object to completion. The Working Set assigns a unique Object ID to each object in its object pool so that each object is uniquely addressable. Object IDs shall be unique within a single Working Set's object pool but may not be between different Working Sets.

The object pool is transferred to the VT at initialization by using the transport protocol described in ISO 11783-3, and the extended transport protocol specified in Annex K. The procedure is described in more detail in Annex C. The VT is intended to be capable of storing the object pools in a modifiable memory area. The size and number of object pools are limited only by the VT's available memory and software design, but only one object pool per Working Set exists. All objects shall be fully described before they are made active in a mask on the display.
4.6.1.2 NULL Object ID

Object ID FFFF₁₆ (65535₁₀) is reserved for use as the NULL Object ID.

4.6.1.3 Processing objects

Objects listed in parent objects may also list child objects, thereby creating a tree hierarchy in the object pool. Objects are always processed in the order listed in the parent object in a “depth-first” manner. In other words, if a reference is made to an object that references other objects, the child references are processed to completion before returning to the parent to continue processing.

4.6.2 Working Sets

The Object Pool supplied by a Working Set Master is associated with all members of that Working Set. This allows object information from one CF or all the CFs that make up a Working Set to be collectively presented as a common object pool. One ISO 11783-5 NAME shall be designated as the Working Set Master for each Working Set. As coordinator of the communications of a Working Set, the Working Set Master shall secure the use of the VT and provide the object pool definition. It shall also send Working Set messages that provide the NAMES of the members of said Working Set to the VT. This identifies the members of the Working Set and hence those CFs which can communicate to the VT. Appropriate messages for defining a Working Set are given in ISO 11783-7.

Once members of the Working Set have been identified and after the object pool has been loaded into the VT, any member of the Working Set has the ability to provide data for objects and to change attributes in the object pool during runtime.

The Working Set Master shall provide the initial object pool definition. Any data input by the operator into input field objects is always transmitted to the Working Set Master.

The VT is never considered to be a Working Set and therefore shall never have Working Set Members and shall not transmit the Working Set Master or Working Set Member messages (see ISO 11783-7).

The handling of VT Response messages defined herein supersedes ISO 11783-1 in respect of responses being directed only to the Working Set Master. See Table 1.

Table 1 — VT Response message behaviour

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Working Set Versionᵃ</th>
<th>VT Versionᵇ</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 and prior</td>
<td>3 and prior</td>
<td>VT response to any command is directed to the WS Master</td>
</tr>
<tr>
<td>2</td>
<td>3 and prior</td>
<td>4 and later</td>
<td>VT response to any command is directed to the WS Master</td>
</tr>
<tr>
<td>3</td>
<td>4 and later</td>
<td>3 and prior</td>
<td>VT response to any command is directed to the WS Master</td>
</tr>
<tr>
<td>4</td>
<td>4 and later</td>
<td>4 and later</td>
<td>VT response to any command is directed to the originator</td>
</tr>
</tbody>
</table>

ᵃ Working Set Version is reported in the Working Set Maintenance message.
ᵇ VT Version is reported in the Get Memory response message.

In configurations 1 to 3, the Working Set Member has the responsibility to monitor all (destination-specific) VT-to-Working-Set-Master messages in order to pair its commands with responses. The Working Set Master will receive unsolicited responses from the VT (which were originated by its members), and will not be able to pair these with messages the master originated.

In configuration 4, all responses from the VT are directed to the originating nodes. Responses that are communicated via transport protocol are now possible (e.g. Get Supported Widechar response). Further, the Working Set Master no longer receives unsolicited response messages. Working Set Members no longer have an obligation to monitor destination-specific messages directed to another address.