INTERNATIONAL STANDARDIZED PROFILE

ISO/IEC ISP 11185-11

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Information technology — International Standardized Profiles FVT2nn — Virtual Terminal Basic Class — Register of control object type definitions —

Part 11:
FVT232 — Paged FEPCO (Field Entry Pilot Control Object) No. 1

Technologies de l'information — Profils normalisés internationaux FVT2nn — Classe de base de terminal virtuel — Registre de définitions de type d'objet de commande —

Partie 11: FVT232 — Page FEPCO (objet de commande pilote d'entrée de zone) nº 1

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Contents

Page

Foreword ... iii

Introduction ... iv

1 Scope ... 1
1.1 General ... 1
1.2 Position within the taxonomy ... 1
1.3 Scenario ... 2

2 Normative references ... 3

3 Definitions ... 4
3.1 General OSI terminology ... 4
3.2 Terminology of VT base standards ... 4
3.3 Terminology of VT-user structure ... 4
3.4 Terminology of controlled data entry ... 5
3.5 Definitions of value types and properties ... 5

4 Abbreviations ... 5

5 Principles of conformance to VT Profiles ... 5

6 Entry number ... 6

7 Name of sponsoring authority ... 6

8 Date ... 6

9 Identifier ... 6

10 Descriptor value ... 6

11 CO parameters ... 6

12 CO values, syntax and semantics ... 6
12.1 The VT-user model ... 6
12.2 Local processing function ... 8
12.3 FEPCO structure ... 9
12.4 FEE definitions ... 9
12.5 FEC definitions ... 10
12.6 FER definitions ... 10
12.7 Update Syntax ... 14
12.8 Initial Content ... 14

13 Additional information ... 15

14 Usage ... 15

ANNEX A ISPICS Requirements List ... 16
A.1 Protocol requirements ... 16
A.2 Profile-specific requirements ... 16

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. In addition to developing International Standards, ISO/IEC JTC1 has created a Special Group on Functional Standardization for the elaboration of International Standardized Profiles.

An International Standardized Profile is an internationally agreed, harmonized document which identifies a standard or group of standards, together with options and parameters, necessary to accomplish a function or set of functions.

Draft International Standardized Profiles are circulated to national bodies for voting. Publication as an International Standardized Profile requires approval by at least 75% of the national bodies casting a vote.

International Standardized Profile ISO/IEC ISP 11185-11 was prepared with the collaboration of

- OSI Asia-Oceania Workshop (AOW);
- European Workshop for Open Systems (EWOS);
- Open Systems Environment Implementors Workshop (OIW).

This International Standardized Profile ISO/IEC ISP 11185 forms an International Register of information objects in accordance with the procedures for the operation of OSI Registration Authorities laid down in ISO/IEC 9834. It is issued in parts, with additional parts being issued as further entries are added to the register. Each part is prepared in accordance with an approval and maintenance process laid down by the Special Group on Functional Standardization of ISO/IEC JTC1, *Information technology*.

ISO/IEC ISP 11185 is issued under the general title *Information technology — International Standardized Profiles FVT2nn — Virtual Terminal Basic Class — Register of control object type definitions*. At present the following parts are published or are in the course of preparation:

- *Part 1: FVT211, FVT212 — Sequenced and Unsequenced Application Control Objects*
- *Part 2: FVT213, FVT214 — Sequenced and Unsequenced Terminal Control Objects*
- *Part 3: FVT215, FVT216 — Application RIO Record Loading Control Object, Terminal RIO Record Notification Control Object*
- *Part 4: FVT217 — Horizontal Tabulation Control Object*
- *Part 5: FVT218 — Logical Image Control Object*
- *Part 6: FVT219 — Status Message Control Object*
- *Part 7: FVT2110 — Entry-Control Control Object*
- *Part 8: FVT221 — Forms FEICO (Field Entry Instruction Control Object) No.1*
- *Part 9: FVT222 — Paged FEICO (Field Entry Instruction Control Object) No.1*
- *Part 10: FVT231 — Forms FEPCO (Field Entry Pilot Control Object) No.1*
- *Part 11: FVT232 — Paged FEPCO (Field Entry Pilot Control Object) No.1*
- *Part 12: FVT2116, FVT2117, FVT2118, FVT2119 — Generalized Telnet Synch, Signal, Negotiation and Subnegotiation Control Objects*
- *Part 13: FVT2111 — Waiting Time Control Object*
- *Part 14: FVT2112 — Printer Control Object*
- *Part 15: FVT2113 — Field Definition Management Control Object*
- *Part 16: FVT2114 — Terminal Signal Titles Control Object*
- *Part 17: FVT2115 — Help Text Control Object*

Annex A of this part of ISO/IEC ISP 11185 forms an integral part of this International Standardized Profile.

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Introduction

This International Standardized Profile ISO/IEC ISP 11185 is defined within the context of Functional Standardization, in accordance with the principles specified in ISO/IEC TR 10000, "Framework and Taxonomy of International Standardized Profiles". The context of Functional Standardization is one part of the overall field of Information Technology (IT) standardization activities, covering base standards, profiles and registration mechanisms.

The Open Systems Interconnection (OSI) Standard ISO 9040 for the Virtual Terminal Basic Class Service identifies a requirement for an International Register of VT Control Object type definitions. Procedures for the operation of this International Register are laid down in ISO/IEC 9834-5. This International Standardized Profile provides this register. The individual entries in this register constitute Interchange Format and Representation Profiles (F-Profiles) within the framework of ISO/IEC TR 10000.

This part of ISO/IEC ISP 11185 was developed in close cooperation between the three Regional OSI Workshops, namely the OSE Implementors Workshop (OIW) of the United States, the European Workshop for Open Systems (EWOS) and the OSI Asia-Oceania Workshop (AOW). It was developed under the editorship of EWOS. The text is harmonized between these three Workshops and it has been ratified by the plenary assemblies of each Workshop.

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Information technology — International Standardized Profiles FVT2nn — Virtual Terminal Basic Class — Register of control object type definitions —

Part 11:
FVT232 — Paged FEPCO (Field Entry Pilot Control Object) No.1

1 Scope

1.1 General

The concept of Profiles for OSI, and the structure of the International Standardized Profiles that document them, are defined in ISO/IEC TR 10000-1. Such Profiles are divided into a number of different classes and sub-classes. Two of these classes contain sub-classes comprising functions of the Virtual Terminal Basic Class Service and Protocol specified in the base standards ISO 9040 and ISO 9041. These are the Application Profiles (A-Profiles) and the Interchange Format and Representation Profiles (F-Profiles).

The relationship between A-Profiles and F-Profiles is described in 7.3.2 of ISO/IEC TR 10000-1 and is as follows. Application Layer base standards require, implicitly or explicitly, the structure of information carried or referenced by them to be specified for each instance of communication. It is the purpose of F-Profiles to specify such information structures. Particular functional requirements may then be met by the combination of an A-Profile with one or more F-Profiles.

Establishment of a VT-association involves the selection by negotiation of a particular Virtual Terminal Environment profile (VTE-profile), and of particular values for any arguments of that VTE-profile. The VTE-profile specification, and possibly also the values of certain VTE-profile arguments, may in turn reference the definitions of VT control object types and assignment types. These VTE-profiles, control object types and assignment types are thus information structures that require explicit reference within the VT protocol. Particular instances of these structures are fully defined within the base standards, but the base standards also provide for further instances to be defined by registration. Each registered instance constitutes an F-Profile within the framework of ISO/IEC TR 10000.

The Virtual Terminal Basic Class Service and Protocol may be used to realise a wide range of distinct functions. Particular functions may be realised through the selection of appropriate VT functional units, F-Profiles and other VTE-profile argument values. The specification of the selection required to realise a particular function and to promote interoperability constitutes a Virtual Terminal A-Profile within the framework of ISO/IEC TR 10000.

The three International Registers of VT information structures and the specifications of VT Application Profiles are each published as a separate multi-part ISP as follows:

— ISO/IEC ISP 11184 is the Register of VTE-profiles;

— ISO/IEC ISP 11185 is the Register of control object type definitions;

— ISO/IEC ISP 11186 is the Register of assignment-type definitions;

— ISO/IEC ISP 11187 contains the specifications of VT Application Profiles.

This part of ISO/IEC ISP 11185 contains the type definition of a Field Entry Pilot Control Object that provides substantial facilities during data entry for local processing under application control. It is intended for use in form-filling, text editing and similar applications during a VT-association in S-mode (synchronous mode) operation. The delegation of such processing to the terminal end system may reduce significantly the demands placed on the communication network and the application process, and may substantially improve the reaction time to users' actions.

1.2 Position within the taxonomy

The taxonomy of International Standardized Profiles for OSI is laid down in ISO/IEC TR 10000-2. Within the classification scheme of this taxonomy, the OSI Profiles specified in this International Standardized Profile are in the Virtual Terminal Registered Object sub-class of the class of Interchange Format and Representation Profiles.

A Profile within this subclass has a Profile identifier of the form FVT*abc*, where *abc* is a structured numerical identifier that identifies the position of the Profile within each of the three levels of subdivision of the subclass. The values of *a* and *b* are single digits but *c* is an integer that is not necessarily a single digit.

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In principle the ISO Virtual Terminal model allows for multiple classes of operation, although at the time of publication of this International Standardized Profile only the Basic Class has been defined. The value of the identifier component *a* distinguishes between distinct types of information object as follows:

— *a* = 1 for Basic Class VTE-profiles;

— *a* = 2 for Basic Class Control Objects;

— *a* = 3 for Basic Class Assignment Types.

Values of *a* greater than 3 are reserved for future developments.

This International Standardized Profile ISO/IEC ISP 11185 contains the specifications of the Profiles with identifiers of the form FVT2*bc*. For this form of identifier, the component *b* distinguishes between the five major classifications of Basic Class Control Objects as follows:

— *b* = 1 for Miscellaneous Control Objects;

— *b* = 2 for Field Entry Instruction Control Objects;

— *b* = 3 for Field Entry Pilot Control Objects;

— *b* = 4 for Reference Information Objects;

— *b* = 5 for Termination Conditions Control Objects.

Each of these classifications corresponds to a sub-register under the procedures of ISO/IEC 9834-5. The identifier component *c* is the serial number of the control object type in the appropriate sub-register. Values of *b* greater than 5 are reserved for new classifications of Basic Class Control Objects that may be defined in future amendments to ISO 9040.

This part of ISO/IEC ISP 11185 contains the definition of the Field Entry Pilot Control Object type with the Profile identifier

FVT232 — Paged FEPCO (Field Entry Pilot Control Object) No.1

1.3 Scenario

The specification of the Virtual Terminal Service is given in ISO 9040. It is based on a model in which two VT-users communicate by means of a shared Conceptual Communication Area (CCA) that is a conceptual part of the VT service-provider. Information exchange is modelled by one VT-user updating the content of the CCA and the changed state of the CCA then being made accessible to the peer VT-user.

Control objects (COs) form one of the types of information object that may be present in the CCA. This is illustrated in figure 1, in which CO-1, CO-2, ... CO-*n* represent a number of different control objects present in the CCA. The negotiation during establishment of a VT-association will determine whether or not these will include a control object of the type whose definition is given in this part of ISO/IEC ISP 11185.

The CCA is structured by the Virtual Terminal Service into a number of components. For a control object the Data

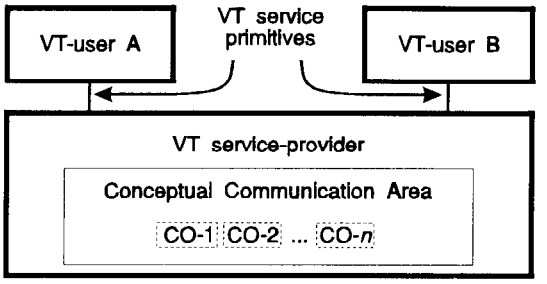

Figure 1 — Control objects in the VT Service model

Structure Definition (DSD) component of the CCA contains the syntax of its information content, including the range of possible values and the permitted update operations. The current value of its information content is contained in the Control, Signal and Status store (CSS) component. Updates to the current value take place through the issue of VT service primitives by one VT-user to the service-provider. Changes of state of the CCA are made accessible through the issue of VT service primitives by the service-provider to the peer VT-user.

By clause 14 of ISO 9040, COs enable VT-users to handle control information related to virtual terminal functions and to real devices. This control is exercised by the VT-users through semantics associated with the information content and with the update operations of the CO. Definition of the semantics, or specification of the source of the semantics if the semantic details are not fully prescribed, forms part of the registered definition of the CO. These semantics are not however of concern to the VT service-provider itself. The DSD will contain an ASN.1 object identifier that identifies the registered definition, but the VT service-provider merely acts as a repository of this value. It is only the VT-user that requires knowledge of the registered definition.

NOTE 1 — The VTE-parameter values that determine the syntax of the information content may not be negotiated explicitly during association establishment. Moreover, in the case of non-parametric COs these values do not determine the details of the syntax. Such values and details form part of the registered definition of the CO. Since the VT service-provider is not required to have knowledge of this registered definition, in principle the VT-users provide the VT service-provider with such information through local management procedures. Whether or not this is necessary in practice depends on the configuration of the implementations concerned.

The control object type defined in this part of ISO/IEC ISP 11185 assumes an asymmetry between the two communicating end systems. One end system is assumed to have a terminal role and to contain devices for the input and display of data and for signalling. These devices form part of the VT-user component of that end system. The other end system is assumed to have an application role and to contain an application package that the terminal end system desires to access.

This control object is intended for use in S-mode (synchronous mode) operation only. In S-mode operation such asymmetry is recognised by the VT Service in accordance with 19.3.2 of ISO 9040. One VT-user is designated as the Terminal VT-user, the other as the Application VT-user, and the two do not have equal access to the functions of the VT Service.

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A control object of the type defined in this part of ISO/IEC ISP 11185 is a Field Entry Pilot Control Object (FEPCO) as defined in 20.3.5 of ISO 9040. The content of a FEPCO is an array of records known as Field Entry Pilot Records (FEPRs) that may be referenced by a Field Definition Record (FDR). Such reference determines reactions that should occur in response to specified events that may occur during data entry. Provision is available for reactions to be conditional on the internal state of the VT-user at the time that the event occurs.

The definition of a FEPCO type specifies the events that it recognises and the conditions and reactions which may be used in the construction of a FEPR. The event definitions may make use of properties of a field, including validation rules for data entry, that are determined by one or more Field Entry Instruction COs (FEICOs) present in the VTE and referenced by the FDR of the field. A FEICO type suitable for use with the event definitions of this FEPCO type is defined in ISO/IEC ISP 11185-9.

The reactions permitted by a FEPCO may be recursive in that they may include the generation of further events to be processed in accordance with other FEPRs. These features permit powerful local processing capabilities to be specified by an Application VT-user for operation by the Terminal VT-user without further confirmation.

The VT service-provider may store updates received from one VT-user before delivery to the peer VT-user in accordance with the delivery control mechanisms of clause 24 of ISO 9040. So although the model of the VT Service is expressed in terms of a single shared CCA, at any instant the various elements of the two communicating end systems may have differing knowledge of its current content.

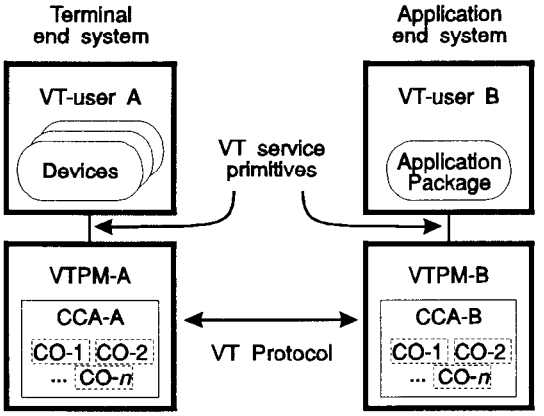

Figure 2 — Control objects in the VT Protocol model

This variation in knowledge extends within the VT service-provider itself. The Virtual Terminal Protocol specification given in ISO 9041-1 models the VT service-provider in terms of protocol exchange between two Virtual Terminal Protocol Machines (VTPMs), each with its own CCA. The CCA of each VTPM is updated both by service primitives received from its own VT-user and by protocol elements received from the peer VTPM. Corresponding service primitives and protocol elements are issued by the VTPM to provide notification of changes to the content of its CCA. This is illustrated in figure 2 in the context of the asymmetric end systems described above. The control object type definition given in this part of ISO/IEC ISP 11185 is expressed in terms of this model.

Each VTPM is permitted to store updates to its CCA before onward delivery, in accordance with the data transfer mechanisms of annex A of ISO 9041-1. These mechanisms permit storage both for updates that result from the reception of service primitives and for those that result from the reception of protocol elements. The combined effect of these mechanisms in both VTPMs is to implement the delivery control mechanisms of ISO 9040. But the effect of such storage is that the content of the two CCAs may differ from one another and that neither need correspond to the CCA of the VT Service model. The CCA of each VTPM should properly be regarded as an incompletely updated copy of the true CCA of the VT service-provider.

For certain types of control object the abstract syntax of ISO 9041-1 does not provide a complete specification for the representation of CO update operations. This arises where the abstract syntax of ISO 9041-1 makes use of an ASN.1 any type, or where symbolic values have to be encoded in terms of an ASN.1 integer type. Control object type definitions are required by ISO/IEC 9834-5 to provide the necessary refinement of the abstract syntax.

NOTE 2 — Since an abstract syntax is made available for use through its inclusion in a presentation context, and since the Presentation service-provider has no knowledge of control object type definitions, in principle the VT-users provide the Presentation service-provider with these refinements to the abstract syntax through local management procedures. Whether or not this is necessary in practice depends on the configuration of the implementations concerned.

2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC ISP 11185. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this International Standardized Profile are warned against automatically applying any more recent editions of the documents listed below, since the nature of references made by ISPs to such documents is that they may be specific to a particular edition. Members of IEC and ISO maintain registers of currently valid International Standards and ISPs, and CCITT maintains published editions of its current Recommendations.

ISO 7498:1984, *Information processing systems — Open Systems Interconnection — Basic Reference Model.*

ISO/TR 8509:1987, *Information processing systems — Open Systems Interconnection — Service conventions.*

ISO 8822:1988, *Information processing systems — Open Systems Interconnection — Connection oriented presentation service definition.*

ISO/IEC 8824:1990, *Information technology — Open Systems Interconnection — Specification of Abstract Syntax Notation One (ASN.1).*

ISO 9040:1990, *Information technology — Open Systems Interconnection — Virtual Terminal Basic Class Service.*

ISO 9041-1:1990, *Information technology — Open Systems Interconnection — Virtual Terminal Basic Class Protocol — Part 1: Specification.*

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ISO/IEC 9041-2:1993, *Information technology — Open Systems Interconnection — Virtual Terminal Basic Class Protocol — Part 2: Protocol Implementation Conformance Statement (PICS) Proforma.*

ISO/IEC 9834-1:1993, *Information technology — Open Systems Interconnection — Procedures for the Operation of OSI Registration Authorities — Part 1: General Procedures.*

ISO/IEC 9834-5:1991, *Information technology — Open Systems Interconnection — Procedures for the Operation of OSI Registration Authorities — Part 5: Register of VT Control Object Definitions.*

ISO/IEC TR 10000-1:1992, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: Framework* (second edition).

ISO/IEC TR 10000-2:1992, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 2: Taxonomy of Profiles* (second edition).

3 Definitions

For the purposes of this part of ISO/IEC ISP 11185 the following definitions apply.

3.1 General OSI terminology

3.1.1 This part of ISO/IEC ISP 11185 makes use of the following terms defined in ISO/TR 8509:

a) service primitive;

b) service-provider.

3.1.2 This part of ISO/IEC ISP 11185 makes use of the following terms defined in ISO 8822:

a) abstract syntax;

b) presentation context.

3.1.3 This part of ISO/IEC ISP 11185 makes use of the following terms defined in ISO/IEC 8824:

a) any type;

b) null type;

c) object descriptor type;

d) object identifier.

3.1.4 This part of ISO/IEC ISP 11185 makes use of the following terms defined in ISO/IEC 9834-1:

a) registration;

b) registration-hierarchical-name.

3.2 Terminology of VT base standards

3.2.1 This part of ISO/IEC ISP 11185 makes use of the following terms defined in ISO 9040:

a) array element;

b) character-repertoire;

c) control object;

d) device object;

e) display object;

f) field;

g) Field Definition Record;

h) Field Entry Condition;

i) Field Entry Event;

j) Field Entry Instruction;

k) Field Entry Instruction Record;

l) Field Entry Pilot Record;

m) Field Entry Reaction;

n) logical pointer;

o) object updating device;

p) primary attribute;

q) rendition attribute;

r) S-mode;

s) secondary attribute;

t) VT-association;

u) VT-environment (VTE);

v) VT-user;

w) VTE-parameter;

x) VTE-profile;

y) VTE-profile argument.

3.2.2 This part of ISO/IEC ISP 11185 makes use of the following term defined in ISO 9041-1:

a) protocol element.

3.3 Terminology of VT-user structure

3.3.1 **device control store**: A conceptual store containing abstract objects which represent aspects of the internal state of the VT-user that are not associated with a specific object updating device.

3.3.2 **device status store**: A conceptual store containing abstract objects which represent aspects of the state of a specific object updating device.

3.3.3 **external CCA**: A conceptual copy of the CCA maintained by a VT-user which takes account of all update operations that either have been received from, or have been issued to, the VT service-provider.

3.3.4 **internal CCA**: A conceptual copy of the CCA maintained by a VT-user which takes account of all update operations that either have been received from the VT

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service-provider or have been accepted from object updating devices. Its content may differ from that of the external CCA when controlled data entry is in use. In these circumstances it takes account of accepted update operations that have not yet been issued to the VT service-provider.

3.3.5 local action function: An abstract object within the device control store that associates a local action operation, possibly null, with each integer value.

3.3.6 local action operation: An operation that updates the content of a device status store or device control store.

3.3.7 logical entry location: An abstract object within a device status store, containing a logical address as defined in 13.1.3 of ISO 9040.

3.4 Terminology of controlled data entry

3.4.1 activated (of an FEPR): The state of an FEPR in which an event has occurred that is referenced by its FEE, the conditions referenced by its set of FECs are all satisfied, and its sequence of FERs is performed.

3.4.2 current signal: An abstract object within the device control store that contains an integer value stored by the event processing function.

3.4.3 event processing: A function that generates reactions dependent on the Field Definition Record of a field when specified events occur during the entry of data into the field.

3.4.4 free field: A field with a content that is subject to update by object updating devices. The Field Definition Record determines whether or not a field is a free field.

3.4.5 input-status: An abstract object within the device control store that takes a symbolic value from the set ("allowed", "not allowed"). When the value is "not allowed" then object updating devices are not permitted to add data to any data buffers that may be maintained by the VT-user; all actions of such devices shall be discarded. The initial value of this object is "allowed" and it is reset to this value when WAVAR is received by the VT-user concerned.

3.4.6 input validation: A function applied to test the validity of display object update requests that are generated by an object updating device and that use the logical pointer. The function is applied before the requested updates are applied to the internal CCA. A validation failure may result in a Field Entry Event and may cause an update request to be discarded.

3.4.7 linked (of an FEIR or FEPR): Assignment of the semantic properties of an FEIR or FEPR to a particular field by reference to that FEIR or FEPR in the Field Definition Record of that field.

3.4.8 output validation: A function that may be applied to test the validity of the content of a field as maintained by the internal CCA before updates to the content of that field are issued to the VT service-provider. A validation failure may result in a Field Entry Event but it cannot cause any updates to be discarded.

3.4.9 protected field: A field with a content that is not subject to update by object updating devices. The Field Definition Record determines whether or not a field is a protected field.

3.4.10 signal event: An atomic event with an associated integer parameter that may occur for control purposes during data entry by a VT-user.

3.5 Definitions of value types and properties

3.5.1 character: An item that is either a qualified character or an unqualified character.

3.5.2 character-string: An item that is either a qualified character-string or an unqualified character-string.

3.5.3 local action specifier: An item that references either a specific integer value or the value of the current signal.

3.5.4 qualified character: An unqualified character together with a rendition qualifier.

3.5.5 qualified character-string: An unqualified character-string together with a rendition qualifier; such a string also has a natural interpretation as a sequence of qualified characters.

3.5.6 rendition qualifier: A specification of a value for each rendition attribute. Each value may, but need not, be specified explicitly. Values that are not specified explicitly take dynamic default values that are determined at the time of access. The first choice default is the field modal attribute value defined in 13.1.3.2 of ISO 9040. A first choice default value of "null" is resolved as specified in 19.2.2.1 of ISO 9040 for the LOGICAL-TEXT update operation.

3.5.7 unqualified character: A primary attribute value together with a value for the character-repertoire secondary attribute.

3.5.8 unqualified character-string: A sequence of unqualified characters that all have the same value for the character-repertoire secondary attribute.

4 Abbreviations

For the purposes of this part of ISO/IEC ISP 11185 the following abbreviations apply.

AOW	OSI Asia-Oceania Workshop;
EWOS	European Workshop for Open Systems;
OIW	OSE Implementors Workshop;
OSE	Open Systems Environment.

All other abbreviations used are defined in ISO/IEC TR 10000-1 or ISO 9040.

5 Principles of conformance to VT Profiles

An implementation of the Virtual Terminal Protocol conforms to an FVT2*nn* Profile that defines a control object type if the protocol implementation is capable of sending and receiving PDUs corresponding to all update operations permitted for that CO type.

Conformance of a protocol implementation to an FVT2*nn* Profile does not place requirements on the ability of the implementation to negotiate the presence in the CCA of an instance of this CO type. Such requirements fall within the scope of conformance to an FVT1*nn* Profile that specifies a VTE-profile.

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A system that includes an implementation of the VT Protocol may be claimed to conform also to an AVT*nn* Profile. Conformance to an AVT*nn* Profile may require that CO update operations received by the VT-user component of the system are interpreted in accordance with the semantics defined within the appropriate CO type definition. Conformance to CO semantics is not within the scope of conformance to any FVT*nnn* Profile.

The conformance requirements of the Virtual Terminal Protocol are specified in clause 13 of ISO 9041-1. The supplier of a protocol implementation which is claimed to conform to ISO 9041-1 is required to complete a copy of the PICS proforma provided in ISO/IEC 9041-2. Annex A of this part of ISO/IEC ISP 11185 provides an ISPICS Requirements List (IPRL) for the Profile FVT232 specified herein. This IPRL specifies constraints on the answers that may be given in the completed PICS for a protocol implementation that claims conformance to this Profile.

6 Entry number

The remaining clauses of this part of ISO/IEC ISP 11185 provide the entry for the Paged FEPCO No.1 in the International Register of VT Control Object Type Definitions. The entry is structured in accordance with the requirements of ISO/IEC 9834-5. These requirements specify that this International Register shall consist of a number of sub-registers, each corresponding to a major classification of VT Control Object.

This entry is the second in the sub-register for Field Entry Pilot Control Objects. This register assigns it the entry number:

FEPCO-2.

7 Name of sponsoring authority

This entry is sponsored by the European Workshop for Open Systems (EWOS).

8 Date

The date of submission of this proposal was 1992-09-02.

9 Identifier

The name assigned to an information object by an International Register is required by ISO/IEC 9834-1 to be a registration-hierarchical-name. A registration-hierarchical-name may have more than one form. The permitted forms include an ASN.1 object identifier as defined in ISO/IEC 8824 and a relative distinguished name as defined in ISO/IEC 9594-2.

In accordance with A.4 of ISO/IEC 9834-5, this register assigns the following object identifier form for the name of this register entry:

{ iso(1) standard(0) 9834 vt-co-def(5) fepco(2) 2 }

In accordance with 20.1.1 of ISO 9040, this object identifier shall be used as the value of the CO-type-identifier VTE-parameter for a control object in order to identify this register entry as the source of the information structure and semantic content of the control object. This object identifier shall also be used to identify the ASN.1 module specified within this register entry as the source of abstract syntax by which update operations on this CO are specified within the VT protocol of ISO 9041-1.

This register does not assign any other form to the name of this entry.

NOTE — By ISO/IEC 9834-1 a relative distinguished name for the purposes of the OSI Directory may only be assigned together with an object identifier when the object identifier form is generated under the arc { joint-iso-ccitt(2) country(16) country-name }.

10 Descriptor value

The value of the ASN.1 object descriptor type assigned to this register entry is:

"First harmonized FEPCO for use by Paged VTE-profiles".

11 CO parameters

This CO type presumes S-mode operation in which one VT-user is designated as the Terminal VT-user and the other as the Application VT-user in accordance with 19.3.2 of ISO 9040.

This register entry specifies the following values for VTE-parameters of this control object type:

CO-structure:	"non-parametric"
CO-access:	takes the same value as the CO-access VTE-parameter for the FDCO.
CO-priority:	"normal"
CO-trigger:	"not selected"

The CO-access VTE-parameter for the FDCO, and thus also for this FEPCO, should be assigned the value that permits access only by the VT-user with the application role. This value will depend on whether the VT-association was initiated by the terminal or application end system.

NOTE — A single VTE-profile argument may be used to assign values to the CO-access VTE-parameter for all control objects in the CCA that presume an asymmetric assignment of terminal and application roles to the two communicating end systems.

12 CO values, syntax and semantics

12.1 The VT-user model

12.1.1 The semantic definition of this FEPCO is based on the structured model of the VT-user of the terminal end system that is illustrated in figure 3. This model is intended solely to assist the process of definition. It is not intended to provide a model for implementations. The requirement upon VT-user implementations is only that their external behaviour corresponds to the external behaviour of the model.

Real devices may possess internal state information. For an object updating device this information determines, among other things, the location of the DO array element that will be updated by the next data input and the manner in which this location will be made known to the human user of the device. In the model, the state information is represented by the

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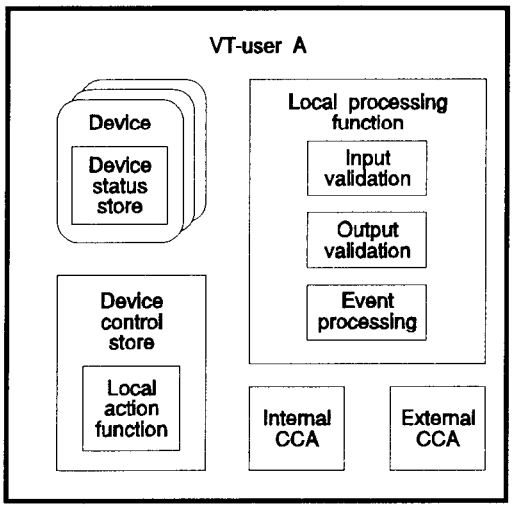

Figure 3 — Structure of the terminal VT-user

content of abstract objects held in a device status store. There will be one device status store for each real device.

NOTE — For an object updating device that consists of a keyboard and display screen, the above aspects of the state information correspond to the location and screen representation of an input cursor. Movement of the input cursor does not need to generate DO addressing operations until data is actually entered at the cursor location. The cursor location is thus internal state information that is separate from the display pointer of the CCA.

The VT-user processes data received both from its object updating devices and from the VT service-provider. It may possess internal state information of its own that affects this processing. Any such information is represented in the VT-user model by abstract objects held in a device control store.

The semantic definition of a control object may include the specification of one or more abstract objects that are to be maintained in a device status store or the device control store. In this way the implementation of a control object may place requirements on, and may exert control over, the capabilities of the real devices of the VT-user. The specification of such objects shall include any required rules that concern update access to these objects. Abstract objects specified in this way by one control object may be updated and referenced by other control objects if their definitions so permit.

12.1.2 The VT-user receives data from its object updating devices and assembles it into object updates that form permitted content for VT-DATA request primitives, and into local action operations that update objects held in the device status stores and the device control store. Only the object updates may be issued to the VT service-provider. Communication with the VT service-provider uses a model of update queues and priority handling that is specified in 24.5 of ISO 9040. Local action operations have an effect that is purely internal to the VT-user.

A sequence of DO updates and local action operations may be generated by a single action of an object updating device. The VT-user may treat such a sequence as an indivisible macro operation, provided that a single macro operation shall not contain both operations that use the display pointer and those that use the logical pointer. Such macros assume significance when controlled data entry is in use as defined by 14.2 of ISO 9040, since it is the effect of a macro as a whole and not that of any individual constituent item that is considered by input validation procedures.

NOTE — In the example of the note in 12.1.1, entry of a single character at the keyboard during controlled data entry may generate a single indivisible macro consisting of the following items:

— a logical addressing operation, if required, to set the logical pointer to the current position of the input cursor;

— a LOGICAL-TEXT operation to make an appropriate entry into the array element at this address;

— a local action operation to move the cursor position to the final position of the logical pointer.

Subsequent character entries immediately after the first will then not need to perform the first step. If any entered character is rejected by the input validation procedures of controlled data entry then use of a macro ensures that the associated cursor movement also does not take place.

During the processing of data from its object updating devices, the VT-user may identify events that have a significance in the semantics of objects present in the CCA. Examples are Field Entry Events and termination-events as defined in 3.3.65 and 3.3.72 of ISO 9040 respectively. These events cause actions determined by the semantics of these objects. These actions may result in the generation of object updates or of a 'deliver' stimulus for issue to the VT service-provider, but the event notification itself is not issued to the service-provider.

12.1.3 When controlled data entry is in use, the VT-user operates a local processing function that performs validation tests on DO update requests before they are issued to the VT service-provider. Only those DO update requests that use the logical pointer are subject to validation. In accordance with B.18.4 of ISO 9040, update requests that are accepted as valid are stored by the local processing function until some specific action causes their release. When release occurs, the stored updates are not forwarded as a simple queue. Instead, the effect on the DO of the stored updates is made available to the VT service-provider in accordance with the transmission policy for the fields concerned; see 20.3.3.3 of ISO 9040.

This process is performed in the present model of the VT-user by two local copies of the CCA, an external copy and an internal copy. Each is similar to that maintained by a VT protocol machine as described in 1.3. Both copies takes account of all update operations that either have been received from, or have been issued to, the VT service-provider. The internal copy is updated in addition by DO update requests as they are accepted by the local processing function. It is the DO of the internal CCA that is made available to the human user of the terminal end system through the real devices of the terminal VT-user.

When an event occurs that requires stored updates to be made available to the VT service-provider, the differences between the internal and external copies of the CCA are used to generate the updates for issue to the VT service-provider in accordance with the transmission policies of the individual fields of the DO. When they are issued, these updates are also applied to the external CCA. The content of the internal

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and external CCAs will then coincide, other than for fields whose transmission policy expressly requires field content not to be transmitted.

12.1.4 The local processing function is the only constituent of the VT-user that may apply object update requests only to the internal CCA. It may do so only for DO updates. Processing of any object update request by the VT-user outside of the local processing function, or the generation of a CO update by the local processing function, shall result in the update request being entered directly into one of the three input queues to the VT service-provider. This causes the update to be applied to both the internal and the external CCA.

In order to preserve correct sequencing, the imminent entry of any update request into the queue with "normal" update priority shall be an event that requires stored DO update requests to be released to the VT service-provider in accordance with 12.1.3. The update operations so generated shall be added to the "normal" priority queue ahead of the update request that triggered the release. The capabilities of the local processing function are not available during such a release, so that in particular the output validation function (see 12.2.1) is not applied.

NOTE — Output validation is intended to be applied only on termination of data entry. When controlled data entry is in use it is the local processing function that determines when data entry terminates. Release of stored data due to actions outside of the local processing function is not considered as termination of data entry.

12.1.5 The issue of update requests by a VT-user to the VT service-provider does not in itself require the VT Protocol Machine of the end system concerned to forward these requests to the peer VTPM; see 1.3. An event within the Terminal VT-user that requires stored updates to be made available to the VT service-provider therefore does not necessarily cause them to be made available also to the Application VT-user. This is so for updates both to the DO and to COs with normal update priority. The terminal end system may use this feature of the VT Service to store such updates until implicit or explicit delivery of updates to the Application VT-user is required in accordance with clause 24 of ISO 9040.

NOTE — Unless quarantine delivery-control is in effect, the terminal end system cannot "net-effect" a sequence of update requests once they have been issued to the VT service-provider by the Terminal VT-user. In particular the transmission policy provisions for fields of the DO are applied within the Terminal VT-user and further net-effecting cannot take place once the updates generated by this process have been issused to the VT service-provider.

12.2 Local processing function

12.2.1 Unlike the other constituents of the VT-user of the terminal end system, the local processing function has its operation completely determined by the semantic definitions of the control objects in the CCA. The model used here for its operation is a refinement of that described in B.18.4 of ISO 9040.

The local processing function has three constituents:

— an input validation function;

— an output validation function;

— an event processing function.

The first two of these are specified by the FEICOs present in the CCA and the third is specified by the FEPCOs.

When controlled data entry is in use, the following items shall be passed to the local processing function:

— DO update requests that use the logical pointer, or any macro operation that includes such a request;

— notifications of events of semantic significance to any FEPCO present in the CCA.

DO update requests, including macro operations, are submitted to the input validation function. Event notifications are submitted to the event processing function. Nothing is submitted directly to the output validation function. Instead, it is available to the event processing function on request to test the content of a field in the DO of the internal CCA. It thus provides a test on the accumulated effect of all stored DO update requests, rather than on each individual update request as it is generated.

The event processing function may act upon a validation failure returned by the input validation function. The event processing function may call the output validation function and may initiate different actions according to the result that it returns. The local processing of any item shall proceed to completion before the VT-user initiates the processing of any further items.

12.2.2 A DO update request, or macro operation, submitted to the input validation function is processed sequentially in the context of each field that it addresses. The fields are taken in increasing order of their field addresses as defined in 13.1.3 of ISO 9040. For each field the function determines whether the entry-control provisions of the field, as specified in its FDR, are satisfied or violated by the update request.

The results are used by the local processing function as follows:

— if the update request satisfies the entry-control provisions of every field that it addresses then it is applied to the internal CCA and local processing of that update request is complete;

— if the update request violates the entry-control provisions for one or more fields then a validation failure event is generated in respect of each violated field. These are queued to the event processing function in increasing order of field address, and local processing of the update request is not complete until each of these events has been processed. The fate of the update request is determined by the processing of these events. The actions of the event processing function may include acceptance of the update request, with its consequent application to the internal CCA. If the processing of all the validation failure events terminates without the update request being accepted then the update request is discarded.

When a macro operation is accepted, the individual operations that comprise the macro operation are unpacked and performed in sequence. The restrictions on macro operations specified in 12.1.2 are such that each operation corresponds to an update to the DO of the internal CCA, to the device control store or to a device status store. One or more of these operations may itself generate an event that is notified to the event processing function. Such event

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processing shall occur before processing of the next operation of the macro is initiated.

12.2.3 The action of the event processing function may include the generation of local action operations to update objects maintained in the device control store or device status stores. This capability is provided through use of a local action function that is itself an object held in the device control store. This function takes an integer argument and returns a local action operation.

The local action function itself is not updateable. Its specification should form part of the specification of any VTE-profile that references a FEPCO that makes use of this function.

NOTE — The local action function cannot form part of the FEPCO specification since the objects that it updates may include objects defined in the specifications of other COs that are referenced by the VTE-profile concerned.

12.3 FEPCO structure

12.3.1 By 20.3.5.2 of ISO 9040 the content of a FEPCO is an array of Field Entry Pilot Records (FEPRs), each of which is identified for reference and update by an integer-valued FEPR-index. Each FEPR has a content with three components:

— a Field Entry Event (FEE);

— a set of Field Entry Conditions (FECs);

— a sequence of Field Entry Reactions (FERs).

The sets of values from which the FEEs, FECs and FERs are drawn form part of the registered definition of the FEPCO type. For the FEPCO type defined by this register entry, these sets of values are defined in 12.4 through 12.6 below. These definitions presuppose:

— that the FEICOs present in the CCA satisfy the requirements for use of this FEPCO that are specified in clause 13 below;

— that the device status store of each object updating device maintains a logical entry location as defined in 3.3.7;

— that the device control store maintains a current signal value as defined in 3.4.2 and an input-status value as defined in 3.4.5.

The first of these is a prerequisite for the use of this FEPCO. The other three are requirements placed by this FEPCO on the terminal VT-user.

NOTE — The logical entry location is intended to provide a guide to the human user of the device as to where the next entry will take place. It is a specific abstract object that corresponds to an entry cursor as described in the notes to 12.1.1 and 12.1.2. However, in macro operations as defined in 12.1.2 the significance of the logical entry location may be less direct. The availability of local action operations in macros enables the user interface to have complete control over the relationship between the logical pointer and the logical entry location.

12.3.2 A FEPR is linked to a field by reference in the FEPR-list component of some entry-control for the field; see 20.3.3.6 of ISO 9040.

The FEE component of the FEPR specifies one or more identifiable events that may occur during data entry and which are associated with the field to which the FEPR is linked. The definition of each event should specify the manner in which that event is associated with a particular field. Each FEC is a predicate concerning the state of the data entry process when an entry event occurs. Each FER specifies one or more reactions to be taken when the FEPR is activated. The FERs are performed in sequence order as given in the FEPR.

An FEPR can only be activated when the following conditions are all satisfied:

— the FEPR is linked to some field;

— the FEE referenced by the FEPR has been generated by the occurrence of an event which is associated with that field;

— the predicates specified by each FEC referenced by the FEPR all evaluate "true".

If exactly one FEPR satisfies all these conditions in respect of a particular event then that FEPR shall be activated. A FEPCO definition may impose additional conditions for activation when more than one FEPR satisfies all of the above conditions in respect of a particular event. A given event shall not activate an FEPR linked to any field with which the event occurrence is not associated.

12.3.3 The FEPCO defined by this register entry permits the FEE components of more than one FEPR linked to the same field to reference the same event. When an event occurs which could activate more than one FEPR for the field in accordance with 12.3.2, only the first of these is actually activated. The search order for this purpose is that the FEPR-list of each entry-control of the field is searched before proceeding to the FEPR-list of the next entry-control.

It is also possible for a single update operation to generate more than one event which need not all be associated with the same field. A REPEAT-LOGICAL-TEXT update initiated by an object updating device could, for example, either complete the field entry into more than one field or violate the entry rules of more than one field. In such circumstances the FEPRs activated for all the fields concerned are queued for processing in the order of their field addresses, lower addresses being activated before higher addresses. Logical address ordering is defined in 13.1.3 of ISO 9040. When more than one FEPR is activated for the same field but by different events caused by a single update operation then the order in which they are processed is undefined.

12.4 FEE definitions

The Field Entry Events (FEEs) that can occur in an FEPR of this FEPCO are defined in the following subclauses. One FEE is parametric.

12.4.1 Signal event (range)

This FEE may be generated for any field. The parameter is mandatory. Its value shall be a set of non-negative integers.

The identified local event that generates this FEE is a signal event that has a single integer parameter; see 3.4.10. This signal event may itself be generated either by an object updating device or as a Field Entry Reaction (FER) by the

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event processing function. When it is generated by an object updating device then the device provides the parameter value and the associated field is the field, if any, in which the logical entry location currently lies; see 3.3.7. When it is generated by the event processing function then the FER concerned determines both the parameter value and the associated field. An FER of this FEPCO is available that generates a signal event, but such an event may also be generated in accordance with the semantics of other FEPCOs present in the CCA.

NOTE — Generation of a signal event by an object updating device could, for example, correspond to the action of one of a set of numbered function keys.

This FEE is generated for a particular field by any signal event associated with that field whose integer parameter value lies in the set specified by the parameter value of the FEE.

When this FEE is generated, the integer value of the parameter of the initiating signal event is stored in the current signal store before any further processing of the FEPR takes place; see 3.4.2.

When an FEPR with this FEE results in termination of data entry the field coordinates that should be given in a CCO update in accordance with 12.6.2.2 depend on whether the FEPR was activated by an object updating device or by the event processing function. If it was activated by an object updating device then the field coordinates are those contained in the logical entry location at the time when this FEE is generated. If the FEPR was activated by the event processing function then termination is considered to result from the FEPR whose FERs generated the signal event and the field coordinates are consequently determined by the FEE of that FEPR.

12.4.2 FEI violation

This FEE may be generated for any field. This FEE has no parameters. It is generated for a particular field by

— the input validation function as a result of a DO update being found to violate the input validation provisions of the field concerned;

— the event processing function as a result of the content of the field concerned being found by the output validation function to be invalid.

When an FEPR with this FEE results in termination of data entry, the field coordinates that should be given in a CCO update in accordance with 12.6.2.2 depend on whether the FEPR was activated by the input validation function or by the event processing function. If it was activated by the input validation function then the field coordinates are those of the array element of the field concerned with least k-coordinate value that would have been updated by the invalid update request. If it was activated by the event processing function then the field coordinates are those of the first array element of the field concerned.

NOTE — In the latter case the k-coordinate given in the CCO update conveys no information, but some value must be specified as it is not an optional parameter of the update.

12.5 FEC definitions

The Field Entry Conditions (FECs) that can occur in an FEPR of this FEPCO are defined in the following subclauses.

12.5.1 Violation (FEIR-list)

The parameter is mandatory. Its value is a set of FEIR identifiers. Each identifier is a pair <FEICO-name, index> where 'index' is an integer addressing a record in the FEICO whose name is specified.

If the FEE component of the FEPR that references this FEC is not the 'FEI violation' FEE then this predicate evaluates "true".

If the FEE component of the FEPR that references this FEC is the 'FEI violation' FEE then this predicate evaluates "true" if the generating event is also a violation of the entry-control provisions determined by the parameter value. Otherwise this predicate evaluates "false". The entry-control provisions concerned are those that correspond to an FDR containing a single entry-control in which the FEIR-list component is the parameter value; see 20.3.3.6 of ISO 9040.

NOTES

1 If the 'FEI violation' FEE was generated by the input validation function then this FEC references the input validation provisions determined by the parameter value. If the FEE was generated by the event processing function then this FEC references the output validation provisions determined by the parameter value.

2 The semantic definition of a FEICO may permit one FEIR to modify the provisions of another FEIR. As an example, the definition may include rules for the resolution of conflicts when two conflicting FEIRs are linked to the same field. In this situation it may be impossible to ascribe a violation to a single one of the FEIRs that are linked to the field concerned. This FEC is thus expressed in terms of the event that generated the violation, rather than in terms of which linked FEIR was actually violated. The generating event is re-tested against the entry-control provisions determined by the parameter value, irrespective of any correspondence between the FEIRs referenced by the parameter and those referenced by the entry-control-list of the field.

12.5.2 Unconditional

This predicate always evaluates "true".

NOTE — This FEC is given for completeness only. It has the same effect as an empty set of conditions in a FEPR.

12.6 FER definitions

The Field Entry Reactions (FERs) that can occur in an FEPR of this FEPCO are defined in the following subclauses. When an FEPR is activated, the operations specified by its sequence of FERs are performed in turn unless some FER specifies that subsequent FERs of the FEPR shall be abandoned.

12.6.1 Transmit updates

See the specification of the 'Relinquish WAVAR' FER in 12.6.2.

12.6.2 Relinquish WAVAR

This specification also covers the 'transmit updates' FER.

12.6.2.1 The content of every field that has been within the update-window for the z-dimension (see 19.1.1.3 of ISO 9040) at some time since the WAVAR access-right was last received by the Terminal VT-user, is first submitted to the output validation function; see 12.2.1. The content of each field is

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submitted in turn, in increasing order of field address as defined in 13.1.3 of ISO 9040. If the content of any field is found to be invalid, an 'FEI violation' FEE is generated in accordance with 12.4.6 and is placed in a queue for subsequent processing.

When all fields have been submitted to the output validation function, processing of the current FER is suspended. A separate invocation of the event processing function then acts on the queue of validation failure events, if any, that has been created. Subsequent actions depend on whether or not any FEPRs are activated by this invocation of the event processing function, as follows:

— if any FEPRs are activated then on completion of their actions, processing of the current FER is terminated. Subsequent FERs of the current FEPR are abandoned. This case is not considered as termination of data entry;

— if no FEPRs are activated then processing of the current FER is resumed in accordance with 12.6.2.2 and is followed by subsequent FERs of the current FEPR as usual. This case is considered as termination of data entry.

NOTES

1 The second case can arise either because all fields concerned have valid content or because no field with invalid content is linked to an FEPR whose FEE is the 'FEI violation' FEE and whose FECs all evaluate "true".

2 The above procedure implies that when action is taken as a result of an invalid field content then this FER does not cause updates to be transmitted or WAVAR to be relinquished.

3 Termination of data entry will occur either if all fields have valid content or if the entry-controls of the fields with invalid content do not specify any corrective action. In this latter case it is assumed that the application process will itself take appropriate action as a result of the input error.

12.6.2.2 When processing of the current FER is resumed, the following actions shall occur. The content of the DOs of the internal and external CCAs shall be used to issue VT-DATA request primitives to the VT service-provider in accordance with the transmission policies of the individual fields; see 12.1.3. These updates shall be followed sequentially by further updates as follows:

— if no Transmission Policy CO (TPCO; see 20.3.7 of ISO 9040) is present in the VTE or if boolean 4 of the TPCO takes the value "true", and if a Context CO (CCO; see 20.3.6 of ISO 9040) is present in the VTE, then an update to this CCO as specified in 12.6.2.3;

— a VT-DELIVER (for 'Transmit updates') or VT-GIVE-TOKENS (for 'Relinquish WAVAR') request.

NOTES

1 If the global transmission policy of a TPCO is used for the field concerned then it determines explicitly whether or not a CCO should be updated. However, if an explicit transmission policy for the field is set in accordance with 20.3.3.3 of ISO 9040 then there is no means of controlling the use of a CCO. The above specification makes the policy of a TPCO regarding use of a CCO apply to all fields, even when the remaining provisions of the TPCO have been over-ridden by an explicit transmission policy for an individual field.

2 When a VT-DELIVER request is issued, it is for the implementation to decide whether or not to request acknowledgement of delivery (see 32.1.3 of ISO 9040).

12.6.2.3 The information content of a CCO consists of six data elements and is not partially updateable. According to 20.3.6 of ISO 9040, the first three elements are used to identify the logical address at which data entry terminated. The last three elements reference the entry-control-list of the FDR of the field that contains this logical address. This description shall be interpreted as follows when the update is generated in accordance with 12.6.2.2 above.

The first three data elements shall be updated with the values specified in 12.4 for the FEE of the FEPR that has terminated data entry. The entry-control index and FEPR index elements of the CCO shall be used to reference the occurrence of this FEPR, and of the entry-control that contains it, within the FDR of the field concerned. The device-object index element of the CCO shall be omitted if the terminating FEPR was activated by the 'FEI violation' FEE generated by the event processing function. In all other cases generation of the FEE will have been associated with a specific device. If the device-object-list component of the entry-control concerned is not "void", the device-object index shall then be used to reference its associated device object within the entry-control concerned.

NOTE — In accordance with 12.4.1, when the FEPR was activated by a signal event resulting from an FER of a previous FEPR then it is this previous FEPR that is referenced by the above specification of the CCO data elements.

12.6.3 Erase field right (reset)

The parameter is mandatory. It takes a value from the set ("reset", "noReset").

If the field to which the FEPR is linked is not a free field (see 3.4.5) then this FER performs no action. If it is a free field then the following sequence of operations shall be performed by the event processing function on the internal CCA:

— a LOGICAL-ABSOLUTE addressing operation (see 19.1.3.2.1 of ISO 9040) in which the target-logical-address is the logical entry location;

— a LOGICAL-ERASE update operation in which the logical-erase-extent start is "log-current" and its end is "end-k". These values are defined by 19.1.3.5 of ISO 9040. The reset-attribute of the update operation takes the value "yes" or "no" according as the value of the parameter of this FER is "reset" or "noReset".

12.6.4 Erase path right (reset)

The parameter is mandatory. It takes a value from the set ("reset", "noReset").

The following sequence of operations shall be performed by the event processing function on the internal CCA:

a) a LOGICAL-ABSOLUTE addressing operation (see 19.1.3.2.1 of ISO 9040) in which the target-logical-address is the logical entry location;

b) if the logical pointer is within a free field then a LOGICAL-ERASE update operation in which the logical-erase-extent start is "log-current" and its end is "end-k". These values are as defined by 19.1.3.5 of ISO 9040. The

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reset-attribute of the update operation takes the value "yes" or "no" according as the value of the parameter of this FER is "reset" or "noReset. This step is null if the logical pointer is in a protected field.

c) a NEXT FIELD macro addressing operation as defined by 19.1.3.2.2 of ISO 9040;

d) repeat operations (b) and (c) until either the last field of the forward navigation path has been erased, or (c) results in the logical pointer being set to a value that it has already had at some stage during this sequence of operations;

e) a LOGICAL-ABSOLUTE addressing operation (see 19.1.3.2.1 of ISO 9040) in which the target-logical-address is the logical entry location.

NOTE — Both this FER and the 'erase field right' FER leave the logical entry location unchanged and the logical pointer set to this location. This FER requires step (e) to repeat the setting originally performed in step (a); the 'erase field right' FER does not require such a step.

12.6.5 Local action (action)

The parameter is mandatory. Its value is a local action specifier; see 3.5.3.

When this FER is accessed, the local action function is applied to the integer referenced by the parameter value to give a local action operation that is then performed; see 12.2.3.

12.6.6 Signal reaction (action)

The parameter is mandatory. Its value is a local action specifier; see 3.5.3.

This FER performs the following sequence of actions:

— the content of the current signal store (see 3.4.2) is saved for later restoration;

— a signal event is generated, with the value referenced by the 'action' parameter as its parameter, and associated with the field, if any, in which the logical entry location currently lies;

— if the signal event activates an FEPR in accordance with the 'Signal event' FEE of 12.4.1 then processing of that FEPR shall take place before processing of this FER is resumed;

— finally the content of the current signal store is restored to its original value.

Processing of subsequent FERs of the original FEPR then resumes.

12.6.7 Update integer CO (name, action)

Both parameters are mandatory. The value of the 'name' parameter shall be the CO-name of a CO present in the CCA that has CO-category "integer". The value of the 'action' parameter shall be a local action specifier; see 3.5.3.

If the CCA does not contain an integer-valued CO with the specified CO-name then this FER shall have no effect. If it does contain such a CO then the effect of this FER depends on the CO-priority value for that CO.

If the named CO has CO-priority "normal" then the event processing function shall first use the content of the DOs of the internal and external CCAs to issue VT-DATA request primitives to the VT service-provider in accordance with the transmission policies of the individual fields; see 12.1.3. These updates shall be followed sequentially by further updates as follows:

a) a VT-DATA request to update the data element of the CO identified by the 'name' parameter with the integer referenced by the value of the 'action' parameter;

b) a VT-DELIVER request.

If the named CO has CO-priority "high" or "urgent" then the event processing function shall issue only the update specified in a).

NOTES

1 This FER is suitable for use with COs that convey uninterpreted signals from the terminal to the application VT-user. The CO types with Register Numbers MISCO-3 and MISCO-4 that are defined in ISO/IEC ISP 11185-2 are available for this purpose. They have taxonomy identifiers FVT213 and FVT214 and are described as Sequenced and Unsequenced Terminal COs respectively.

2 The local processing function only stores DO updates; CO updates must be issued directly to the VT service-provider. If a CO has CO-priority = "normal" then the DO updates must first be made available to the service-provider in order to preserve their sequence order relative to the CO update; see also 12.1.4.

3 This FER is not considered to terminate controlled data entry, so the output validation function is not invoked.

12.6.8 Execute RIO record reference (RIORecordID)

The parameter is mandatory. Its value is the name of a record in some RIO that is present in the VTE; see 22.2.2 of ISO 9040.

The event processing function shall first use the content of the DOs of the internal and external CCAs to issue VT-DATA request primitives to the VT service-provider in accordance with the transmission policies of the individual fields; see 12.1.3. These updates shall be followed sequentially by further updates as follows:

— a LOGICAL-ABSOLUTE addressing operation (see 19.1.3.2.1 of ISO 9040) in which the target-logical-address is the logical entry location;

— an EXECUTE-RECORD RIO reference operation for the record specified by the 'RIORecordID' parameter.

NOTES

1 The object updates contained in the RIO record may include CO updates that cannot be stored by the local processing function. However, this FER does not issue a VT-DELIVER request to the VT service-provider. The VT-service-provider may thus store the updates, as described in 12.1.5, until some subsequent action causes implicit or explicit delivery.

2 This FER is not considered to terminate controlled data entry, so the output validation function is not invoked.

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12.6.9 Execute RIO record content (RIORecordID)

The parameter is mandatory. Its value is the name of a record in some RIO that is present in the VTE; see 22.2.2 of ISO 9040.

Each object update in the sequence that forms the content of the RIO record referenced by the parameter value is treated in turn. Each DO update that uses the logical pointer is applied to the content of the internal CCA. Each other update first causes the content of the DOs of the internal and external CCAs to be used to issue VT-DATA request primitives to the VT service-provider in accordance with the transmission policies of the individual fields; see 12.1.3. These updates are then followed by the other update concerned.

NOTES

1 For a RIO record consisting solely of DO updates that use the logical pointer, this FER may provide for more efficient notification of updates than does the 'Execute RIO record reference' FER. Execution by content permits the DO updates that precede the RIO record execution, those of the RIO record itself, and those that follow it, to be considered together during the net-effecting operations permitted by the transmission policy of the field. Execution by reference requires separate application of the transmission policy before the EXECUTE-RECORD operation is issued to the VT service-provider. This advantage is not present if the RIO record contains CO updates, since any CO update itself causes stored DO updates to be released to the VT service-provider; see 12.1.4.

2 This FER is not considered to terminate controlled data entry, so the output validation function is not invoked.

12.6.10 Call RIO record reference (RIORecordID)

The specification of this FER is the same as that for the 'Execute RIO record reference' FER, except that the 'EXECUTE-RECORD' operation is replaced by a 'CALL-RECORD' operation.

12.6.11 Call RIO record content (RIORecordID)

The specification of this FER is the same as that for the 'Execute RIO record content' FER, except that the values of the display pointer and logical pointer are saved before any of the updates are treated and are restored by pointer addressing operations after all the updates have been treated.

12.6.12 Visual indication

This FER shall cause an 'indication of visual alarm' signal to be issued by the event processing function to some device.

NOTES

1 The device that responds to the indication should signal this event to the human user of the device in a manner that enables it to be identified and distinguished from other signals. The manner in which this is achieved is implementation-dependent.

2 This FER is intended to be used in conjunction with the 'FEI violation' FEE. The device that responds to the indication may present information specific to the particular violation concerned.

12.6.13 Audible indication

This FER shall cause an indication of audible alarm' signal to be issued by the event processing function to some device.

NOTES

1 The device that responds to the indication should signal this event to the human user of the device in a manner that enables it to be identified and distinguished from other signals. The manner in which this is achieved is implementation-dependent. In particular it need not sound a real audible alarm; a visual signal that is distinct from that used to present an 'indication of visual alarm' would be equally conformant.

2 This FER is intended to be used in conjunction with the 'FEI violation' FEE. The device that responds to the indication may present information specific to the particular violation concerned.

12.6.14 Prevent further entry

A local action operation is issued to set the input-status value to "not allowed"; see 3.4.5.

12.6.15 Write disallowed characters

This FER shall have no effect unless the FEPR was activated directly or indirectly by an 'FEI violation' FEE (see note 1) generated by the input validation function.

If the FEPR was activated in this way then this FER cancels that violation for the field concerned; see 12.2.2. If the activating FEE is the last 'FEI violation' FEE generated from the submission of a single DO update request or macro operation to the input validation function, and if every other such FEE has also generated this FER, then and only then shall the DO update be applied to the internal CCA.

NOTES

1 In accordance with 12.4.1, when the present FEPR was activated directly by a signal event resulting from an FER of a previous FEPR then it should also be considered as activated indirectly by the FEE of the previous FEPR.

2 A typical use is with an FEI that disallows the entry of particular characters. Such an FEI may be used with this FER to specify particular characters that should generate delivery to the application VT-user. If the FERs of the FEPR contains both this FER and the 'transmit updates' FER then these characters will be entered into the DO but will also cause delivery of stored updates. This same effect can be achieved in the absence of controlled data entry by the use of the device-termination-event-list VTE-parameter, but the device termination parameters are disabled during controlled data entry; see 23.5 of ISO 9040.

12.6.16 Write string (string)

The parameter is mandatory. Its value is a sequence, each element of which is a qualified character-string as defined in 3.5.5.

The character-strings are concatenated to form a sequence of qualified characters which need not all have the same character-repertoire or rendition qualifier. The members of this sequence are then written to the array elements of the field as follows:

a) updates are applied to the internal CCA so as to update the content of the array element at the logical entry location with the primary and secondary attributes of the next qualified character of the sequence;

b) the k-coordinate of the logical entry location is incremented by 1;

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c) if the logical entry location has not moved past the end of the field, and there are still unprocessed elements of the sequence, the procedure is repeated from a). Otherwise the procedure terminates.

These updates are applied without regard to the entry-controls of the field concerned. In particular this FER may update the content of a protected field.

NOTE — Although input validation is not invoked during these updates to the internal CCA, the final content will be subject to output validation in accordance with 12.6.2.1 when data entry is terminated.

12.7 Update Syntax

The abstract syntax for an update to a FEPCO is specified in 12.2.4 of ISO 9041-1 in terms of ASN.1 any types with type references FEE, FEC and FER. The ASN.1 module ISP11185-FEPCO2 defined below provides the resolution of these ASN.1 any types when the update is to this FEPCO. Two ASN.1 types used in this module are imported from the module ISP11185-FEICO2 that is defined in ISO/IEC ISP 11185-9. The rules given there for the use of these types in the representation of parameter values should be applied also to their use in the present module.

Each FEE, FEC or FER with no parameter is represented in this module by a value reference to a null type. Each one with one or more parameters is represented by a value of a named type.

```
ISP11185-FEPCO2

{ iso(1) standard(0) 9834 vt-co-def(5) fepco(2) 2 }

DEFINITIONS IMPLICIT TAGS ::= BEGIN

EXPORTS FEE, FEC, FER;

IMPORTS Character, CharacterValues
FROM ISP11185-FEICO2
{ iso(1) standard(0) 9834 vt-co-def(5) feico(1) 2 };

FEE ::= CHOICE {
   signalEvent              [1]  Range,
   fee02                    [2]  NULL,

   feiViolation             FEE  ::= fee02 NULL


FEC ::= CHOICE {
   fec01                    [1]  NULL,
   violation                [2]  SET OF SEQUENCE {
     feiconame          PrintableString,
     recordIndex        INTEGER } }

   unconditional            FEC  ::= fec01 NULL


FER ::= CHOICE {
   fer01                    [1]  NULL,
   fer02                    [2]  NULL,
   eraseFieldRight          [3]  ResetAttribute,
   erasePathRight           [4]  ResetAttribute,
   local                    [5]  Action,
   signalReaction           [6]  Action,
   updateIntegerCO          [7]  SEQUENCE {
     name               PrintableString,
     value              Action },
   executeRIOReference      [8]  RIORecordID,
   executeRIOContent        [9]  RIORecordID,
   callRIOReference         [10] RIORecordID,
   callRIOContent           [11] RIORecordID,
   fer12                    [12] NULL,
   fer13                    [13] NULL,
   fer14                    [14] NULL,
   fer15                    [15] NULL,
   writeString              [16] SEQUENCE OF
                        ISP11185-FEICO2.Character }

   transmitUpdates      FER  ::= fer01 NULL
   relinquishWAVAR      FER  ::= fer02 NULL
   visualIndication     FER  ::= fer12 NULL
   audibleIndication    FER  ::= fer13 NULL
   preventFurtherEntry  FER  ::= fer14 NULL
   writeDisallowedChars FER  ::= fer15 NULL


RIORecordID ::= SEQUENCE {
   rioName                  [1]  PrintableString  OPTIONAL,
   -- optional if there is only one RIO in the VTE
   recordID                 [2]  PrintableString }


Range ::= SEQUENCE OF SEQUENCE {
                            [1]  INTEGER,
                            [2]  INTEGER OPTIONAL,
   mask                     [3]  BIT STRING OPTIONAL  }

   -- A value of the Range type determines a set of
   -- integers. An integer is a member of the set if it is
   -- contained in any of the intervals determined as
   -- follows by the sequence elements. The first two
   -- values of each element specify the end points of an
   -- interval of integer values. The second value shall not
   -- be smaller than the first value. If the second value
   -- is omitted, the interval contains only the specified first
   -- value. If the optional mask is given, then the value
   -- being tested is bitwise logically ANDed with the mask
   -- before being compared with the end points of the
   -- interval.


ResetAttribute ::= BOOLEAN

   reset            ResetAttribute  ::= TRUE
   noReset          ResetAttribute  ::= FALSE

Action ::= CHOICE {
                            [1]  INTEGER,
   current                  [2]  NULL  }

   currentSignal    Action ::= current NULL

END -- OF FEPCO DEFINITIONS
```

12.8 Initial Content

An initial content of a FEPCO of this type may be provided in the specification of any VTE-profile that references it. In the absence of such a specification, the FEPCO initially contains no FEPRs.

NOTE — A useful initial content for a FEPCO of this type will normally include FERs that reference the local action function

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described in 12.2.3. A particular local action function should be specified by any VTE-profile that references such a FEPCO and may be used by that VTE-profile in its specification of the initial content for the FEPCO.

13 Additional information

A CO of this type requires the use of the Structured Control Objects, Enhanced Access-rules and Fields VT functional units.

This CO type requires any FEICOs present in the CCA to be compatible with the model of the terminal VT-user that is given in 12.1. It assumes further that the FEICOs present are compatible with the following classification of fields:

— each field is either a free field or a protected field as defined in 3.4.5 and 3.4.10.

It is intended that this FEPCO type should be used in conjunction with a FEICO that enables these characteristics to be assigned to any field. An appropriate FEICO type for this purpose is that with taxonomy identifier FVT222 that is defined in ISO/IEC ISP 11185-9.

A VTE-profile that uses a FEPCO of this type has the facility to specify the particular local action function, as described in 12.2.3, that is referenced by the FER definitions. If such a FEPCO is used in the absence of such a specification then the local action function is taken as associating a null action with all argument values. This reduces the power of the FEPCO but does not prevent its use.

14 Usage

A FEPCO of this type may be used in S-mode VTE-profiles whenever its comprehensive facilities are required.

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Annex A
(normative)

ISPICS Requirements List

A.1 Protocol requirements

This annex provides an ISPICS Requirements List (IPRL) for the Profile FVT232 specified in this part of ISO/IEC ISP 11185. The PICS proforma for the VT protocol is given in ISO 9041-2. This IPRL specifies constraints on the answers that may be given in the completed PICS for an implementation that claims conformance to these Profiles.

These constraints are given in tables A.1 and A.2. The notation used in the tables is as follows. Individual items in a PICS proforma are referenced by the means specified in A.9.1 of ISO/IEC 9646-2. Such a reference has the form *x-y/z*, where *x* is the number of the ISO Standard that specifies the protocol, *y* is a reference within the PICS proforma of this Standard to the smallest subclause that contains the item concerned, and *z* is the reference number of the item within that subclause. Where this IPRL needs to present the constraints on a particular item as two or more separate cases, a suffix of the form '.*n*' is added to the item reference where *n* is a serial number that labels the different cases.

The item name is taken from the PICS proforma. The "status" columns of the IPRL tables take priority over the corresponding "status" columns of the PICS proforma and they use the notation of that proforma. They refine the PICS proforma status values by evaluating conditional expressions or converting optional values to a more specific form. The following conditional values are used in these tables:

c1 If application implementation then m else -;
c2 If terminal implementation then m else -;

Where an IPRL table has a "Profile values" column, the status value applies separately to each listed Profile value.

For any column in an IPRL table that corresponds to an answer column in the PICS proforma, the values listed are the acceptable answers for the item concerned. The following special notation is used in these columns:

Any The IPRL places no constraint on the answer;
n/a The column is not relevant to this item.

A.2 Profile-specific requirements

An IPRL may also specify constraints on the answers to additional questions that concern Profile-specific conformance requirements which are outside the scope of any referenced base standard. These questions will be given in the IPRL itself.

This IPRL does not specify any Profile-specific constraints.

Table A.1 — VTE requirements for FVT232 (Paged FEPCO No.1)

Item reference no. 9041-	Name of item	Status	Numbers supported	Negotiable
A.2.1/6	Enhanced Access-rules	m	n/a	n/a
A.2.1/7	Structured Control Objects	m	n/a	n/a
A.2.1/9	Fields	m	n/a	n/a
A.3.8/4	Field Definition CO (FDCO)	m	1	No
A.3.8/6	Field Entry Pilot CO (FEPCO)	m	≥1	Any

Table A.2 — PDU requirements for FVT232 (Paged FEPCO No.1)

Item reference no. 9041-	Name of item	Profile values	SENDING Status	RECEIVING Status
A.5.15.4/12	fdco	n/a	c1	c2
A.5.15.4/14	fepco	n/a	c1	c2
A.5.15.4.3/4	event	See note	c1	c2
A.5.15.4.3/5	condition	See note	c1	c2
A.5.15.4.3/6	reactions	See note	c1	c2

NOTE — For values of the event, condition and reactions items, support is mandatory respectively for the ASN.1 types FEE, FEC and FER exported from the module ISP11185-FEPCO2.

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