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ITSO Technical Specification 1000-5 – Interoperable public transport ticketing using contactless smart customer media – Part 5: Customer media data record definitions

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Foreword

This document is a part of ITSO TS 1000, a Specification published and maintained by the ITSO, a membership company limited by guarantee without shareholders. The membership of ITSO comprises transport organisations, equipment and system suppliers, local and national government. For the current list of members see the ITSO web site www.itso.org.uk

ITSO TS 1000 is the result of extensive consultation between transport providers, sponsors, system suppliers and manufacturers. The Department for Transport (DfT) has also contributed funding and expertise to the process.

Its purpose is to provide a platform and tool-box for the implementation of interoperable contactless smart customer media public transport ticketing and related services in the UK in a manner which offers end to end loss-less data transmission and security. It has been kept as open as possible within the constraints of evolving national, European and International standards in order to maximise competition in the supply of systems and components to the commercial benefit of the industry as a whole. In general, it promotes open standards but it does not disallow proprietary solutions where they are offered on reasonable, non-discriminatory, terms and contribute towards the ultimate objective of interoperability.

ITSO has been established to maintain the technical specification and business rules required to facilitate interoperability. It also accredits participants and interoperable equipment. ITSO is a facilitator of interoperability at the minimum level of involvement necessary. It will not involve itself in any commercial decisions or arrangements for particular ticketing schemes; neither will it set them up nor run them. It will however “register” them in order to provide the necessary interoperability services (e.g. issue and control of unique scheme identifiers, certification and accreditation, security oversight).

Consequently, adoption of this Specification for particular ticket schemes will be a matter for the commercial judgement of the sponsors/participants, as will the detailed business rules and precise partnership arrangements.

Contents

1. Scope

ITSO TS 1000 defines the key technical items and interfaces that are required to deliver interoperability. To this end, the end-to-end security system and shell layout are defined in detail; while other elements (e.g. terminals, 'back-office' databases) are described only in terms of their interfaces. The business rules that supplement the technical requirements are defined elsewhere.

1.1 Scope of Part 5

This Part of the Specification (Part 5) describes and defines the data related to ITSO Product Entities (IPEs), specifically:

— IPE data content; and

— Transient Ticket record data content.

This Part of the Specification relates to associated Specifications as follows:

— Refer to ITSO TS1000-1 version 2.1 for definitions of abbreviations, terms and data types.

— IPE data specified herein shall be held within IPE Data Groups as defined in ITSO TS 1000-2 version 2.1.

— Transient Ticket Data shall be held within the Transient Ticket record as defined in ITSO TS 1000-2 version 2.1.

For the purposes of interoperability:

— All data elements defined in this Part 5 shall be used interoperably as defined herein, excepting those elements defined as UD (User Defined) where use of the element shall be as defined by the IPE owner, or by the creator of a Transient Ticket record entry, as appropriate.

— Data elements in this Part of the Specification are compatible with the emerging EN1545 and IOPTA standards.

2. ITSO Product Entities (IPEs)

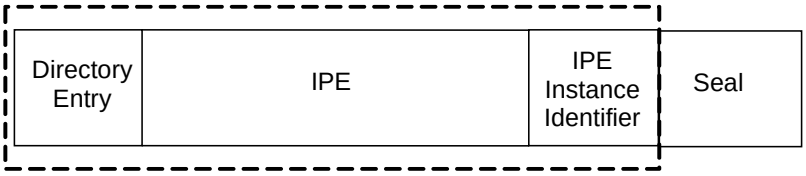
2.1 Introduction.

ITSO Product Entities are the constructs used to hold ITSO specified data.

2.1.1 Relationship with ITSO TS 1000-2

This clause (clause 2) defines the data required within each IPE type, as well as operating rules essential for inter-operability.

The IPE data records fit within the IPE Data Group defined in ITSO TS 1000-2, and shall comprise the “IPE Data” element specified therein.



The seal protects the structures included within the dotted line

The Seal, IPE Instance Identifier and Directory Entry are described in ITSO TS 1000-2

IPE Datasets are described herein

Figure 1 - Relationship between IPE data and an IPE Data Group.

2.1.2 Identification of IPEs

IPE embodiments shall be identified by the IPE owner’s OID, the IINL flag and IIN, and the TYP and PTYP data element as defined in ITSO TS 1000-2. These are to be found in the directory entry for the data group.

Specific instances of IPEs shall be identified by means of the IPE embodiment identity defined above together with the creating ISAM ID and ISAM sequence number stored in the instance identifier[1].

Should the IPE be created by a different operator from that which owns the IPE, then the creator’s OID shall be stored in the body of the IPE where a suitable ProductRetailer data element is defined herein.

The full definition of an operator or owner ID is given by Issuer Identification Number (IIN) and OID. Should the customer media or shell IIN be different from the IIN of the body responsible for allocating OID to a given IPE owner, then in the relevant directory entry the IINL flag shall be set to one, the IIN of the body responsible for issuing OID shall be included in the IPE data, and the relevant flag set to one (1) in the IPEBitMap.

2.1.3 IPE Types

IPE types are designated by TYP, which is defined in ITSO TS 1000-2.

[1] These two additional values are unique to an IPE instance.

2.1.3.1 Definition of TYP codes.

Table 1 - Definition of TYP codes

TYP code	IPE Title
0	Private entity within the ITSO directory as defined in ITSO TS 1000-2
1	RFU
2	Stored travel rights (STR)
3	Loyalty type 1 (Customer media Based)
4	Charge to Account (CTA) mode 1 (restriction on value spent)
5	Charge to Account (CTA) mode 2 (restriction on quantity of transactions per charge period)
6 – 13	RFU
14	Entitlement
15	RFU
16	ITSO ID & entitlement
17	Loyalty type 2 (Centrally Accounted)
18 - 21	RFU
22	Pre-Defined Ticket (Area based) with days selection, action list amendment and Auto-Renew capability options
23	Pre-Defined Specific Journey Ticket with multi-ride, Auto-Renew and action list amendment capability options
24	Pre-Defined Specific Journey Ticket including reservations and special restrictions with action list amendment and Auto-Renew capability options
25	Travel Related Voucher with multi-use, action list amendment and Auto-Renew capability options
26	Open system tolling with multi-use, action list amendment and Auto-Renew capability options
27	Period Pass (space saving)
28	Carnet (space saving)
29	Multi Journey Ticket (space saving)
30 – 31	RFU
32	ITSO shell environment group
33	ITSO directory group
34	ITSO Transient Ticket group
35 and above	RFU

Note that for IPE groups with TYP numbers greater than 31, the TYP value shall not be used in directory entries.

2.1.4 IPE Structure

Each IPE shall consist of one or more of the following areas:

— a value area; and / or

— one or more fixed data areas.

Value areas shall be constructed using the ‘Value Record Data Group’ structure defined in ITSO TS 1000-2. This provides for multiple copies of value records to be stored, and for customer media types where hardware anti-tear is not provided, a software anti-tear protection facility.

Fixed data areas provide for storage of data which does not normally change, or which is only changed under the control of a trained operator or by equipment that securely holds the customer media in place during the transaction.

Note that in the IPE definitions herein, data element offsets and byte counts are calculated assuming that all optional data elements are present. Implementers shall recalculate these values correctly when some (or all) optional data elements are not included.

2.1.5 Size of IPEs.

The size of IPE instances shall be recorded in the IPELength and VGLength data elements found in each IPE. The value contained in these elements is multiplied by the block size (BL) defined in ITSO TS 1000-2 and for an individual CMD in ITSO TS 1000-10. The maximum size of an IPE data group or Value data group shall not exceed IPELength multiplied by BL, or VGLength multiplied by BL, as appropriate.

2.2 Stored Travel Rights IPE. TYP = 2.

This IPE provides for Stored Travel Rights (STR).

This IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.2.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.2.1.1 IPE Data Group

Table 2 - TYP 2 IPE Data Group

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	For this IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP2Flags	5	BMP	1	FLAG	IPE	Refer to Table 5
Threshold	6	VALI	2	ThresholdAmount	IPE	Auto-Top-Up shall be triggered when Value is equal to or less than the value stored herein at the commencement of a transaction. The currency defined by ValueCurrencyCode shall apply.

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
TopUpAmount	8	VALI	2	LoadAmount	IPE	Value authorised for Auto-Top-Up, the currency defined by ValueCurrencyCode shall apply. This amount shall be added to value upon Auto-Top-Up. IPE Owners shall ensure that Threshold + TopUpAmount shall not exceed MaxValue2
MaxValue2	10	VALI	2	MaxAmountLimit	IPE	The value of stored travel rights shall not exceed this amount. The currency defined by ValueCurrencyCode shall apply.
MaximumNegativeAmount	12	VALI	2	Amount	IPE	A positive value defining the maximum amount by which Value may go negative under circumstances where the customer media user has insufficient funds in Value for the proposed transaction The currency defined by ValueCurrencyCode shall apply.
DepositAmount	14	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the IPE.
StartDateAutoTopUp	16	DATE	1.75	StartDateStamp	IPE	Validity start date. Stored travel rights may be used at any time, but Auto-Top-Up shall not be allowed if current date is prior to StartDate.
RFU	17.75	RUF	1.75		IPE	
DepositMethodOfPayment	19.5	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositCurrencyCode	20	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0))
DepositVATSalesTax	20.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
Padding	22	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	22	IIN	3	NetworkID	IPE O	Issuer Identification Number
			25			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.2.1.1.1 IPEBitMap Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 3 - TYP 2 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1 – 5 (most significant)	RFU

2.2.1.2 Value Record Data Group

The VGLength, VGBitMap and VGFormatRevision value header data elements shall only be included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 4.

Table 4 - TYP 2 Value Record Data Group

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Two transaction record messages shall be generated when an IPE is created containing value, one relating to the creation with TransactionType code 0, and one relating to the addition of value with the appropriate TransactionType code. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1	INTEGER	V	Defined in ITSO TS 1000-2
Value	12	VALS	2	Balance	V	Quantity of Stored travel rights available, the currency defined by ValueCurrencyCode shall apply

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
ValueCurrencyCode	14	VALC	0.5	PayUnitMap	V	
CountJourneyLegs	14.5	HEX	0.5	CountOfJourneyLegs	V	Count of qualifying journey legs, used for discounting fare in multi-leg journeys. This element shall be used to count the number of legs in a journey, and shall be incremented each time a qualifying leg is commenced. It may be used where the total number of legs permitted in a qualifying journey is limited.
CumulativeFare	15	VALI	1.625	CumulativeFare	V	Cumulative fare, used for discounting fare in multi-leg journeys, the currency defined by ValueCurrencyCode shall apply. Only positive values shall be stored in this data element. The fare paid for qualifying journey legs shall be added to the value already held in this element. The value held in this element shall be reset to zero (0) upon commencement of a new qualifying journey.
TYP2ValueFlags	16.625	BMP	0.375	FLAG	V	Refer to Table 6
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the data set comprising value records. Padding shall be positioned at the end of the data set.
			17			Count of bytes (Value header and one value record) , excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.2.1.3 TYP2Flags definitions.

Table 5 - TYP2Flags definitions

Flag ID	Flag name	Flag purpose
0 - 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this. Where this IPE is used, as a method of payment, together with an entitlement IPE, then the PrintTicket flag contained within the entitlement IPE shall take precedence over this flag.
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.2.1.4 TYP2ValueFlags definition

Table 6 - TYP2ValueFlags definition

Flag ID	Flag name	Flag purpose
0	AutoTopUp	when set to one (1) Auto-Top-Up is enabled
1	IPEPriorityOverride	When set to one (1) this IPE shall be used in preference to any other payment mechanism, stored travel rights or electronic purse, contained within the customer media, whether an IPE, private entity or an entity outside the ITSO shell. This flag shall always take precedence over any other IPE prioritisation method. POSTs setting this flag to one (1) shall ensure that no equivalent flag in any other IPE is set to one (1), and if any such flag is set to one (1), shall only set this flag to one (1) if the other flag has first be cleared.
2	AutoTopUpInternal	Set to one (1) if Auto-Top-Up from another value source on the customer media is enabled. For example, the top up amount may be deducted from an electronic purse facility contained within the same customer media.

2.2.1.5 Operational Rules.

1. Auto-Top-Up shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

2. Value and ValueCurrencyCode may be changed to accommodate a change of currency, and for this purpose are included in the value record. However, MaxValue2 and MaximumNegativeAmount are not included in the value record, and great care shall be taken to avoid IPE data corruption if these values also change upon currency change. Note that currency changes should only be undertaken infrequently and with care. CurrencyCode is only included in the Value Record to facilitate a change of STR currency to match a change of National Currency, not for regular changes of STR currency. Value should be stored in the currency used when the IPE is read, and should definitely not be stored in a different currency except when the IPE owner wishes to change the STR currency on a permanent basis.

2.3 Loyalty type 1 (Customer media Based), TYP = 3

This IPE structure shall only be used for loyalty type 1, where the loyalty points are stored on the customer media.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.3.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.3.1.1 IPE Data Group:

Table 7 - TYP 3 IPE Data Group

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
Padding	5	PAD	AR			Pad with 0x00’s to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	5	IIN	3	NetworkID	IPE O	Issuer Identification Number.
			8			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.3.1.1.1 IPEBitMap Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 8 - TYP 3 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1 – 5 (most significant)	RFU

2.3.1.2 Value Record Data Group

This IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 9.

Table 9 - TYP 3 Value Record Data Group

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
LoyaltyPoints	12	HEX	3	LoyaltyPoints	V	Quantity of Loyalty points stored
UserDefined	15	UD	2		V	IPE owner defined data
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.3.1.3 Operational Rules.

1. No storage is provided for a loyalty account number. For this purpose, a concatenation of IIN, OID, TYP, PTYP, creating ISAM serial number and creating ISAM sequence number shall be used, where the IPE identity elements IIN, OID, TYP and PTYP shall identify the individual loyalty scheme, and IPE Instance information shall identify the member.

2. When adding loyalty points to the LoyaltyPoints element, a code of one (1) shall be entered in the TransactionType element.

2.4 Charge To Account (CTA) Mode 1. TYP = 4.

This IPE provides for Charge To Account mode 1.

CTA mode 1 implements a credit limit, recorded in MaxAmount4, on the total sales value recorded in an accumulator, “CumulativeAmount”, to which the value of each sales transaction is added. The total value recorded in CumulativeAmount shall not exceed the value recorded in MaxAmount4. When a payment is made into the account, this payment amount is deducted from CumulativeAmount by either a counter transaction or an action list transaction[2].

This IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.4.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.4.1.1 IPE Data Group

Table 10 - TYP 4 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	For this IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.

[2] A counter transaction refers to a transaction conducted at a counter or Ticket office.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
TYP4Flags	5	BMP	1	FLAG	IPE	Refer to Table 13
MaxValue4	6	VALI	2	MaxAmountLimit	IPE	The maximum value which may be accumulated in CumulativeAmount. If this value is exceeded the IPE shall not be used. The currency defined by ValueCurrencyCode shall apply.
DepositAmount	8	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the IPE.
StartDateCTA	10	DATE	1.75	StartDateStamp	IPE	Validity start date, CTA shall not be used if current date is prior to StartDate.
EndDate	11.75	DATE	1.75	EndDateStamp	IPE	Validity end date. This date shall not be later than the IPE ExpiryDate stored in the directory.
DepositMethodOfPayment	13.5	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositCurrencyCode	14	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositVATSalesTax	14.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
Padding	16	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	16	IIN	3	NetworkID	IPE O	Issuer Identification Number
			19			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.4.1.1.1 IPEBitMap Definition

Table 11 - TYP 4 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1 – 5 (most significant)	RFU

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

2.4.1.2 Value Record Data Group

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 12.

Table 12 - TYP 4 Value Record Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1	INTEGER	V	Defined in ITSO TS 1000-2
CumulativeAmount	12	VALI	2	INTEGER	V	Cumulative amount spent, the currency defined by ValueCurrencyCode shall apply
ValueCurrencyCode	14	VALC	0.5	PayUnitMap	V	

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
CountJourneyLegs	14.5	HEX	0.5	CountOfJourneyLegs	V	Count of qualifying journey legs, used for discounting fare in multi-leg journeys. This element is used to count the number of legs in a journey, and is incremented each time a qualifying leg is commenced. It may be used where the total number of legs permitted in a qualifying journey is limited.
CumulativeFare	15	VALI	1.5	CumulativeFare	V	Cumulative fare, used for discounting fare in multi-leg journeys. The currency defined by ValueCurrencyCode shall apply. Only positive values shall be stored in this data element. The fare paid for qualifying journey legs shall be added to the value already held in this element. The value held in this element shall be reset to zero (0) upon commencement of a new qualifying journey.
TYP4ValueFlags	16.5	BMP	0.5	FLAG	V	Refer to Table 14
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes (Value header and one value record) , excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.4.1.3 TYP4Flags definitions.

Table 13 - TYP4Flags definitions

Flag ID	Flag name	Flag purpose
0 - 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this. Where this IPE is used, as a method of payment, together with an entitlement IPE, then the PrintTicket flag contained within the entitlement IPE shall take precedence over this flag.
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.4.1.4 TYP4ValueFlags definition

Table 14 - TYP4ValueFlags definition

Flag ID	Flag name	Flag purpose
0	RFU	
1	IPEPriorityOverride	When set to one (1) this IPE shall be used in preference to any other payment mechanism, stored travel rights or electronic purse, contained within the customer media, whether an IPE, private entity or an entity outside the ITSO shell. This flag shall always take precedence over any other IPE prioritisation method. POSTs setting this flag to one (1) shall ensure than no equivalent flag in any other IPE is set to one (1), and if any such flag is set to one (1), shall only set this flag to one (1) if the other flag can first be cleared.
2	RFU	
3	RFU	

2.4.1.5 Operational Rules.

1 CTA Mode 1.

To support CTA mode 1, a record of the amount spent is held in the CumulativeAmount data element, allowing a credit limit to be implemented.

When a customer media holder uses their CTA IPE, then the transaction amount shall be added to the contents of CumulativeAmount and the new amount written back to the IPE.

When a customer media holder pays part or all of his outstanding balance, then the value held in CumulativeAmount shall be reduced by the amount paid off (CTA Value Adjustment).

2 CTA shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

3 CTA account number shall be a concatenation of IIN, OID, TYP, PTYP, ISAMIDCreator and ISAMS#, in the order indicated here.

2.5 Charge To Account (CTA) Mode 2. TYP = 5.

This IPE provides for Charge To Account mode 2.

CTA mode 2 implements a credit limit in terms of the number of transactions allowed in a predefined period of time, together with a restriction on the value of each transaction. The element CountOfTransactions is incremented for each transaction conducted, and automatically reset at the end of the defined time period. The value of any individual transaction shall not exceed the value recorded in MaxValue5.

This IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.5.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.5.1.1 IPE Data Group

Table 15 - TYP 5 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	For this IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP5Flags	5	BMP	1	FLAG	IPE	Refer to Table 18
WeeksPerPeriod	6	HEX	1	Quantity	IPE	Quantity of Weeks in a charge period.
QuantityTransactions	7	HEX	1	Quantity	IPE	Number of transactions allowed per charge period.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
MaxValue5	8	VALI	2	MaxAmountLimit	IPE	The value of any transaction shall not exceed this amount. The currency defined by ValueCurrencyCode shall apply
DepositAmount	10	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the IPE.
StartDateCTA	12	DATE	1.75	StartDateStamp	IPE	Validity start date, CTA shall not be used if current date is prior to StartDate. This date shall always refer to a Monday, and shall be the date of commencement of the first charge period.
EndDate	13.75	DATE	1.75	EndDateStamp	IPE	Validity end date. This date shall not be later than the IPE ExpiryDate stored in the directory.
DepositMethodOfPayment	15.5	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositCurrencyCode	16	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositVATSalesTax	16.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
Padding	18	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	18	IIN	3	NetworkID	IPE O	Issuer Identification Number
			21			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, and O an optional element.

2.5.1.1.1 IPEBitMap Definition

Table 16 - TYP 5 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1 – 5 (most significant)	RFU

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

2.5.1.2 Value Record Data Group

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in the Table 17.

Table 17 - TYP 5 Value Record Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1	INTEGER	V	Defined in ITSO TS 1000-2
CountOfTransactions	12	HEX	1	CounterOne	V	Cumulative count of CTA charge transactions
RFU	13	RFU	0.25		V	
LastResetDate	13.25	DATE	1.75	DateStamp	V	The date upon which CountOfTransactions was last reset.
ValueCurrencyCode	15	VALC	0.5	PayUnitMap	V	
TYP5ValueFlags	15.5	BMP	0.5	FLAG	V	Refer to Table 19
RFU	16	RFU	0.5		V	
CountJourneyLegs	16.5	HEX	0.5	CountOfJourneyLegs	V	Count of qualifying journey legs, used for discounting fare in multi-leg journeys. This element is used to count the number of legs in a journey, and is incremented each time a qualifying leg is commenced. It may be used where the total number of legs permitted in a qualifying journey is limited.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes (Value header and one value record) , excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.5.1.3 TYP5Flags definitions.

Table 18 - TYP5Flags definition

Flag ID	Flag name	Flag purpose
0 - 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this. Where this IPE is used, as a method of payment, together with an entitlement IPE, then the PrintTicket flag contained within the entitlement IPE shall take precedence over this flag.
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.5.1.4 TYP5ValueFlags definition

Table 19 - TYP5ValueFlags definition

Flag ID	Flag name	Flag purpose
0	RFU	
1	IPEPriorityOverride	When set to one (1) this IPE shall be used in preference to any other payment mechanism, stored travel rights or electronic purse, contained within the customer media, whether an IPE, private entity or an entity outside the ITSO shell. This flag shall always take precedence over any other IPE prioritisation method. POSTs setting this flag to one (1) shall ensure than no equivalent flag in any other IPE is set to one (1), and if any such flag is set to one (1), shall only set this flag to one (1) if the other flag can first be cleared.
2	RFU	
3	RFU	

2.5.1.5 Operational Rules.

1. CTA Mode 2.

   In CTA mode 2, risk is limited by restricting the value of each transaction by means of the MaxValue element, and the number of transactions which may be conducted in a time period (a charge period) whose length is defined by WeeksPerPeriod, using a cumulative transaction counter CountOfTransactions.

   The charge period shall always commence on a Monday.

   The transaction counter CountOfTransactions shall be automatically reset to one (1) upon first use of the IPE following 24:00 hours on the last Sunday in the charge period. Sales transactions shall not be allowed if CountOfTransactions exceeds QuantityTransactions.

2. CTA shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

3. CTA account number shall be a concatenation of IIN, OID, TYP, PTYP, ISAMIDCreator and ISAMS#, in the order indicated here.

2.6 Entitlement, TYP = 14

This IPE shall be used to record a customer media holder's entitlement, where such entitlement cannot be recorded in a TYP 16 IPE.

It shall only be used where a current and valid TYP 16 ITSO ID IPE already exists within the ITSO shell, where this TYP 16 is used to identify the holder. It should be noted that this IPE type is only valid whilst there is a valid TYP 16 IPE present on the customer media, and should cease to be valid when the TYP 16 becomes invalid. To this end the TYP 14 expiry date shall be set to a date no later than the TYP 16 expiry date.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under "Anti-Tear Protection".

2.6.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1). The block size BL used for this version of this IPE shall be 4 bytes.

2.6.1.1 IPE Data Group

Table 20 - TYP 14 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ConcessionaryPassIssuerCostCentre	3	HEX	2	AccountingReference	IPE	Defines a concessionary pass or permit issuing authority cost centre[3]. This value shall be determined by the IPE owner. A registered OID value may be used in this data element.

[3] A cost centre code identifying the local authority responsible for issuing the pass or permit

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IDFlags	5	BMP	1	Flag	IPE	Refer to Table 24
RoundingFlagsEnable	6.00	FLAG	0.125		IPE	This flag indicates when set to zero (0) that the RoundingFlag and RoundingValueFlag are not operational and that the POST shall use its own rules when calculating proportional and half fares. This flag indicates when set to one (1) that the RoundingFlag and RoundingValueFlag are operational and shall be used when calculating proportional and half fares
RFU	6.13	FLAG	0.125		IPE	
PassbackTime	6.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
HolderID	7	HEX	4	HolderID	IPE	Identifies the IPE Holder who is entitled to the products benefits subject to the products terms and conditions. Issuer defined holder identity number, OR electronically stored photo image serial number, OR the serial number of the customer media holder's photo identity card.
RoundingFlag	11.00	FLAG	0.125		IPE	This flag is only operative when the RoundingFlagsEnable flag is set to one (1). When set to one (1), any calculated fare shall be rounded up, otherwise, when set to zero (0), any calculated fare shall be rounded down.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
RoundingValueFlag	11.13	FLAG	0.125		IPE	This flag is only operative when the RoundingFlagsEnable flag is set to one (1). When set to zero (0), any calculated fare shall be rounded to the nearest single currency unit (e.g. 1p). When set to one (1), any calculated fare shall be rounded to the nearest multiple of 5 currency units (e.g. 5p).
EntitlementExpiryDate	11.25	DATE	1.75	EndDateStamp	IPE	Date a specific entitlement expires[4].
RFU	13	RFU	0.5		IPE	
DepositCurrencyCode	13.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositMethodOfPayment	14	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositVATSalesTax	14.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositAmount	16	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the IPE.
EntitlementCode	18	HEX	1	EntitlementTypeCode	IPE	Entitlement code according to EN1545 EntitlementTypeCode.

[4] For example, the date a scholar becomes an “adult”.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
ConcessionaryClass	19	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to EN1545 ProfileCodeIOP
SecondaryHolderID	20	HEX	4	HolderID	IPE O	Identifies a secondary person who is entitled to the products benefits subject to the products terms and conditions. Issuer defined holder identity number, OR electronically stored photo image serial number, OR the serial number of the customer media holder's photo identity customer media, for a secondary holder
HalfDayOfWeek	24	BMP	2	HalfDayOfWeek	IPE O	Defines AM/PM and Day of Week validity
ValidAtOrFrom	26	LOC1	Variable, maximum 17	Origin	IPE O	Area or location code at which the Ticket is valid, where the Ticket is valid in an area, or Origin location code (or destination for return trips) where the IPE is valid for a defined journey
ValidTo	43	LOC1	Variable, maximum 17	Destination	IPE O	Destination location code (or origin for return trip)
Padding	60	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	60	IIN	3	NetworkID	IPE O	Issuer Identification Number
			63			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.6.1.1.1 IPEBitMap Definition

Table 21 - TYP 14 Bit Map Definitions

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Bit	Data Element
0 (least significant)	IIN present
1	SecondaryHolderID element present
2	HalfDayOfWeek and ValidAtOrFrom elements present
3	ValidTo element present
4, 5 (most significant)	RFU

2.6.1.2 IDFlags definitions.

IDFlags are defined in 2.7.1.2.

2.6.1.3 Operational rules

EntitlementExpiryDate defines when a specific entitlement, identified by CustomerProfile or PTYP, becomes invalid. ExpiryDate defines when the whole IPE becomes invalid.

2.7 ITSO ID IPE, TYP = 16

The ITSO ID shall be present in circumstances where:

— Personalisation of the ITSO Shell is required; or

— Definition of an entitlement is required (e.g. concessionary pass, season Ticket entitlement, travelcard, etc); or

— A separate Application containing URI information is not available but the relevant information is required to be stored within the customer media.[5]

The ID can be added with the ITSO Shell when the ITSO Shell is first placed on the customer media, or at a later date.

Only one copy of this IPE shall be placed within a given ITSO shell. Additional entitlements shall be recorded using the Entitlement IPE TYP 14. Where appropriate, any information printed on the surface of the customer media shall link to the TYP 16 IPE.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.7.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1). The block size BL used for this version of this IPE shall be 4 bytes.

2.7.1.1 IPE Data Group

Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.

Table 22 - TYP 16 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	For the ITSO ID IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed.

[5] The terminal may find URI information in an ITSO Private Application (to be defined) or as defined in CWA 13987:2003 Part 1 (i.e. in an eURI ISO application selected by the eURI AID).

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
ConcessionaryPassIssuerCostCentre	3	HEX	2	AccountingReference	IPE	Defines a concessionary pass or permit issuing authority cost centre. This value shall be determined by the IPE owner. A registered OID value may be used in this data element.
IDFlags	5	BMP	1		IPE	Refer to Table 24
RoundingFlagsEnable	6.00	FLAG	0.125		IPE	This flag indicates when set to zero (0) that the RoundingFlag and RoundingValueFlag are not operational and the POST shall use its own rules when calculating proportional and half fares. This flag indicates when set to one (1) that the RoundingFlag and RoundingValueFlag are operational and shall be used when calculating proportional and half fares.
RFU	6.13	FLAG	0.125		IPE	
PassbackTime	6.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
DateOfBirth	7	DOB	4	BirthDate	IPE	Users of this field shall take note of the requirements of the Data Protection Act.
Language	11	HEX	1		IPE	Language code – A pointer to a table stored in the POST, which shall contain the matching codes based on ISO 639 and defined in Table 24a . This data element shall be ignored if Idflag 3 is set to one (1).

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
HolderID	12	HEX	4	HolderID	IPE	Identifies the IPE Holder who is entitled to the products benefits subject to the products terms and conditions. Issuer defined holder identity number, OR electronically stored photo image serial number, OR the serial number of the customer media holder's photo identity card.
RoundingFlag	16.00	FLAG	0.125		IPE	This flag is only operative when the RoundingFlagsEnable flag is set to one (1). When set to one (1), any calculated fare shall be rounded up, otherwise, when set to zero (0), any calculated fare shall be rounded down.
RoundingValueFlag	16.13	FLAG	0.125		IPE	This flag is only operative when the RoundingFlagsEnable flag is set to one (1). When set to zero (0), any calculated fare shall be rounded to the nearest single currency unit (e.g. 1p). When set to one (1), any calculated fare shall be rounded to the nearest multiple of 5 currency units (e.g. 5p).
EntitlementExpiryDate	16.25	DATE	1.75	EndDateStamp	IPE	Date a specific entitlement expires.
DepositMethodOfPayment	18	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositVATSalesTax	18.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
ShellDepositMethodOfPayment	20	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
ShellDepositVATSalesTax	20.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositCurrencyCode	22	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
ShellDepositCurrencyCode	22.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
DepositAmount	23	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the TYP 16 IPE. It may relate to a deposit for the ID, or for the Concessionary Entitlement, or may relate to a charge for an enhanced Concessionary Entitlement[6]
ShellDeposit	25	VALI	2	Deposit	IPE	Amount of deposit paid for the entire ITSO shell. Note that values recorded in this data element and its associated data elements shall be reported using the data messages appropriate to the ITSO shell deposit, not the TYP 16 IPE data messages

[6] Because a charge may not be refundable, a POST must either contain refund rules for each IPE embodiment, or must have on line access to a back office system which can provide the relevant information as to whether a deposit refund may be made or not.

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
EntitlementCode	27	HEX	1	EntitlementType Code	IPE	Entitlement code according to EN1545 EntitlementTypeCode.
ConcessionaryClass	28	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to EN1545 ProfileCodeIOP
SecondaryHolderID	29	HEX	4	HolderID	IPE O	Identifies a secondary person who is entitled to the products benefits subject to the products terms and conditions. Issuer defined holder identity number, OR electronically stored photo image serial number, OR the serial number of the customer media holder's photo identity card, for a secondary holder
ForenameLength	33	HEX	1		IPE O	Length of Forename, in bytes. The Forename element shall be compressed to the actual size required for the text stored, and the actual size of the element stored here.
Forename	34	ASCII	39	Forename	IPE O	Holder's Forename according to EN1545. Users of this field shall take note of the requirements of the Data Protection Act.
SurnameLength	73	HEX	1		IPE O	Length of Surname, in bytes. The Surname element shall be compressed to the actual size required for the text stored, and the actual size of the element stored here.
Surname	74	ASCII	39	Surname	IPE O	Holder's name according to EN1545. Users of this field shall take note of the requirements of the Data Protection Act.
HalfDayOfWeek	113	BMP	2	HalfDayOfWeek	IPE O	Defines AM/PM and Day of Week validity

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
ValidAtOrFrom	115	LOC1	Variable, maximum 17	Origin	IPE O	Area or location code at which the Ticket is valid, where the Ticket is valid in an area, or Origin location code (or destination for return trips) where the IPE is valid for a defined journey
ValidTo	132	LOC1	Variable, maximum 17	Destination	IPE O	Destination location code (or origin for return trip)
Padding	149	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	149	IIN	3	NetworkID	IPE O	Issuer Identification Number
			152			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.7.1.1.1 IPEBitMap Definition

Table 23 - TYP 16 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	SecondaryHolderID element present
2	ForenameLength, Forename, SurnameLength and Surname elements present
3	HalfDayOfWeek and ValidAtOrFrom elements present
4	ValidTo element present
5 (most significant)	RFU

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

2.7.1.2 IDFlags definitions

Table 24 - IDFlags definitions

Flag ID	Flag name	Flag purpose
0	Personalised	Set to one (1) to indicate that the surface of the customer media carries a photographic image of the customer media holder, otherwise cleared to zero (0).
1	Gender1	Condition where both Gender1 & Gender2 set to zero (00) indicates gender is not known; Set Gender2 to zero (0) & Gender1 to one (1) for male; Set Gender2 to one (1) & Gender1 to zero (0) for female; Condition where both Gender1 & Gender2 set to one (1) indicates that gender is not specified.
2	Gender2	
3	URI	When set to one (1), the POST shall read the URI information within the customer media[7], and shall use the information contained therein. This flag shall only be set to one (1) if the IPE creator or modifier is satisfied that a working URI application exists within the Customer Media and that that application includes the data which would otherwise be provided within this IPE. If, at the point of use, the URI application is found to be non-existent or non-functional then the POST shall check this IPE for relevant data.
4	CompanionAllowed	When this flag is set to one (1) a Companion is Allowed to travel at the same rate as the entitled concessionary person, no other evidence of entitlement is required for the companion.
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this
6	DepositRefundable?	When set to one (1), the deposit is refundable, when set to zero (0), the deposit may not be refunded without reference to the product owner.
7	ShellDepositRefundable?	When set to one (1), the shell deposit is refundable, when set to zero (0), the shell deposit may not be refunded without reference to the Shell owner.

2.7.1.3 Language

The language data element, to save CM memory space, is defined as a one byte code “pointing to a table stored in the POST, which shall contain the matching codes defined in ISO 639”.

Because ISO 639 contains several definitions of language codes, the POST table created individually by each implementer will in each case be different, and as a result the element cannot be used interoperably.

To ensure interoperability the following POST table shall be used in all cases.

This is based on ISO 639—1:2002, and assigns a numeric code suitable for use in TYP 16: Language, to each language identified in ISO 639.

Table 24a – Language Code

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
RFU	--	0
Abkhazian; Abkhaz	ab	1

[7] The URI information shall be stored in a Private Application within ITSO or in a separate application ouside ITSO.

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Afan Oromo; Oromo; Galla	om	2
Afar	aa	3
Afrikaans	af	4
Akan	ak	5
Albanian	sq	6
Amharic	am	7
Arabic	ar	8
Armenian	hy	9
Assamese	as	10
Avar; Avarish	av	11
Avestan	ae	12
Aymara	ay	13
Azerbaijani	az	14
Bambara	bm	15
Bashkir	ba	16
Basque	eu	17
Belarusian	be	18
Bengali; Bangla	bn	19
Bhutani; Butanese; Dzongkha	dz	20
Bihari	bh	21
Bislama	bi	22
Bosnian	bs	23
Breton	br	24
Bulgarian	bg	25
Burmese; Myanmar	my	26
Cambodian; Khmer	km	27
Castilian; Spanish	es	28
Catalan	ca	29
Chamorro	ch	30
Chechen	ce	31
Chichewa; Chewa; Nyanja	ny	32
Chinese	zh	33
Chuang; Zhuang	za	34
Church Slavonic; Church Slavic; Old Slavonic; Old Church Slavonic; Old Bulgarian	cu	35
Chuvash	cv	36
Cornish	kw	37
Corsican	co	38

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Cree	cr	39
Croatian	hr	40
Czech	cs	41
Danish	da	42
Dutch	ni	43
English	en	44
Esperanto	eo	45
Estonian	et	46
Ewe	ee	47
Faroese; Faeroese	fo	48
Fijian	fj	49
Finnish	fi	50
French	fr	51
Frisian	fy	52
Fulah; Fula; Fulani; Fulfulde; Peul	ff	53
Gaelic; Scottish Gaelic	gd	54
Galician; Gallegan	gi	55
Ganda; Luganda	lg	56
Georgian	ka	57
German	de	58
Gikuyu; Kikuyu	ki	59
Greenlandic; Kalaallisut	kl	60
Guarani	gn	61
Gujarati	gu	62
Hausa	ha	63
Hebrew	he	64
Herero	hz	65
Hindi	hi	66
Hiri Motu	ho	67
Hungarian	hu	68
Icelandic	is	69
Ido	io	70
Igbo	ig	70
Indonesian	id	72
Interlingue	ie	73
Irish	ga	74
Italian	it	75
Japanese	ja	76

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Javanese	jv	77
Kannada	kn	78
Kanuri	kr	79
Kashmiri	ks	80
Kazakh	kk	81
Kikuyu;Gikuyu	ki	82
Kinyarwanda; Rwanda	rw	83
Kirundi; Rundi	rn	84
Kiswahili; Swahili	sw	85
Komi	kv	86
Kongo	kg	87
Korean	ko	88
Kurdish	ku	89
Kwanyama; Kuanyama	kj	90
Kyrgyz; Kirghiz	ky	91
Laotian; Lao	lo	92
Latin	la	93
Latvian	lv	94
Lingala	ln	95
Lithuanian	lt	96
lnterlingua (International Auxiliary Language Association)	ia	97
lnuktitut	iu	98
lnupiaq	ik	99
Luba-Katanga	lu	100
Luganda; Ganda	lg	101
Luxembourgish	lb	102
Macedonian	mk	103
Malagasy	mg	104
Malay	ms	105
Malayalam	ml	106
Maldivian; Divehi	dv	107
Maltese	mt	108
Manx	gv	109
Maori	mi	110
Marathi	mr	111
Marshallese	mh	112
Modem Greek (post 1453)	el	113
Moldavian	mo	114

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Mongolian	mn	115
Nauruan	na	116
Navajo; Navaho	nv	117
Ndonga	ng	118
Nepali	ne	119
North Ndebele	nd	120
Northern Sami	se	121
Norwegian	no	122
Norwegian Bokmál	nb	123
Norwegian Nynorsk —	nn	124
Occitan; Provençal (post 1500)	oc	125
Ojibwa	oj	126
Oriya	or	127
Ossetian; Ossetic	os	128
Pali	pi	129
Pashto; Pushto	ps	130
Persian; Farsi	fa	131
Polish	pl	132
Portuguese	pt	133
Punjabi; Panjabi -	pa	134
Quechua	qu	135
Rhaeto-Romance	rm	136
Romanian	ro	137
Russian	ru	138
Rwanda; Kinyarwanda	rw	139
Samoan	sm	140
Sango; Sangho	sg	141
Sanskrit	sa	142
Sardinian	sc	143
Serbian	sr	144
Serbo-Croatian	sh	145
Sesotho; Southern Sotho	st	146
Setswana; Tswana	tn	147
Shona	sn	148
Sindhi	sd	149
Sinhala; Sinhalese; Singhalese	si	150
Slovak	sk	151
Slovenian	sl	152

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Somali	so	153
South Ndebele	nr	154
Spanish; Castilian	es	155
Sundanese	su	156
Swahili; Kiswahili	sw	157
Swazi; Swati; Siswati	ss	158
Swedish	sv	159
Tagalog	tl	160
Tahitian	ty	161
Tajiki	tg	162
Tamil	ta	163
Tatar	tt	164
Telugu	te	165
Thai	th	166
Tibetan	bo	167
Tigrinya	ti	168
Tongan (Tonga Islands)	to	169
Tsonga	ts	170
Turkish	tr	171
Turkmen	tk	172
Twi	tw	173
Uighur	ug	174
Ukrainian	uk	175
Urdu	ur	176
Uzbek	uz	177
Venda	ve	178
Vietnamese	vi	179
Volapuk	vo	180
Waltoon	wa	181
Welsh	cy	182
Wolof	wo	183
Xhosa	xh	184
Yiddish	yi	185
Yoruba	yo	186
Zulu	zu	187
RFU	---	188 - 255

2.7.1.4 Operational rules.

None defined.

2.8 Loyalty Type 2, TYP = 17

This IPE is used for centrally accounted loyalty schemes where the loyalty points are not held on the customer media. It simply serves to identify that the customer media holder is a member of the scheme and to identify the scheme.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.8.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1). The block size BL used for this version of this IPE shall be 4 bytes.

2.8.1.1 IPE Data Group

Table 25 - TYP 17 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
Padding	5	PAD	AR			Pad with 0x00’s to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	5	IIN	3	NetworkID	IPE O	Issuer Identification Number
			8			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.

2.8.1.1.1 IPEBitMap Definition

Table 26 - TYP 17 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1 – 5 (most significant)	RFU

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

2.8.1.2 Operational rules

No storage is provided for a loyalty account number. For this purpose, a concatenation of IIN, OID, TYP, PTYP, creating ISAM serial number and creating ISAM sequence number shall be used, where the IPE identity elements IIN, OID, TYP and PTYP shall identify the individual loyalty scheme, and IPE Instance information shall identify the member.

2.9 Pre-defined Ticket (Area Based), with days selection, action list amendment and Auto-Renew capability options, TYP = 22

This IPE is used to store Tickets.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

This IPE may be created with only a fixed IPE Data Group, or with both an IPE Data Group and an optional Value Record Data Group, according to the requirements of the Product Owner.

2.9.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.9.1.1 IPE Data Group

Table 27 - TYP 22 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP22Flags	5	BMP	2	FLAG	IPE	Refer to Table 30
RFU	7	RFU	0.25			
PassbackTime	7.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
IssueDate	8	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
ExpiryTime	9.75	TIME	1.375	EndTimeStamp	IPE	Expiry time, on the day defined by expiry date
RFU	11.13	RFU	0.125		IPE	
AutoRenewQuantity1	11.25	HEX	0.75	INTEGER	IPE	The contents of this element shall be interpreted differently depending upon the state of bit 1 of the TYP22ValueFlags element, refer to operational rules 5 & 6.
Class	12	HEX	0.375	AccommodationClassCode	IPE	Coded according to en1545 AccommodationClassCode code list
ValidityCode	12.375	UD	0.625		IPE	A user defined element which may be used to further define Product validity. A value of zero shall designate a null condition.
ValidityStartDTS	13	DTS	3	DateTimeStamp	IPE	Date and time of commencement of validity. The IPE shall be valid from the time specified
PromotionCode	16	UD	1		IPE	An IPE owner defined data element
ValidOnDayCode	17	DOW	1	DAYOFWEEK	IPE	Defines days of the week upon which the IPE is valid
PartySizeAdult	18	HEX	1	NumberOfAdults	IPE	
PartySizeChild	19	HEX	1	NumberOfChildren	IPE	
PartySizeConcession	20	HEX	1		IPE	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
RFU	21	RFU	0.5		IPE	
AmountPaidCurrencyCode	21.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	22	VALI	2	Amount	IPE	Actual amount paid

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
AmountPaidMethodOfPayment	24	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaidVATSalesTax	24.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
ConcessionaryPassIssuerCostCentre	26	HEX	2	AccountingReference	IPE O	Defines a concessionary pass or permit issuing authority cost centre. This value shall be determined by the IPE owner. A registered OID value may be used in this data element.
ValidAtOrFrom	28	LOC1	Variable, Maximum 17	Origin	IPE O	Area or location code at which the Ticket is valid, where the Ticket is valid in an area, or Origin location code (or destination for return trips) where the IPE is valid for a defined journey
ValidTo	45	LOC1	Variable, Maximum 17	Destination	IPE O	Destination location code (or origin for return trips)
PassDuration	62	HEX	1	ValidityDuration	IPE O	Duration of pass in days. This value shall be used to determine a new ExpiryDateCurrent when a Stored Ticket (Pass) is used, taking into account any remaining validity of the current pass. This element shall always be present and used when this IPE is used in Stored Ticket (Pass) mode.
Padding	63	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IIN	63	IIN	3	NetworkID	IPE O	Issuer Identification Number
			66			Count of bytes including IIN and other optional data elements where included, excluding any padding data element

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.9.1.1.1 IPEBitMap Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 28 - TYP 22 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	ValidAtOrFrom code present
2	ValidTo code present
3	PassDuration data element present
4	ConcessionaryPassIssuerCostCentre data element present
5 (most significant)	RFU

2.9.1.2 Optional Value Record Data Group.

This Optional Value Record Data Group provides a value and optionally software anti-tear protected area supporting multiple use Tickets, Auto-Renew and action list capability. It can be used to support a number of Ticket types, including carnets of day passes.

The validity of this IPE may be amended, typically extended, in four ways:

— by a transaction at a Ticket office or Ticket vending machine;

— by an action list item;

— by Auto-Renew;

— by use of an already purchased Stored Ticket validity contained within the IPE.

Note that the Auto-Renew function cannot be combined with the Stored Ticket function.

When value groups are included this IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE;

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD;

— Number of value records per value record data group = at least 2;

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 29.

Table 29 - TYP 22 Value Record Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
NumberRemainingPasses	12	HEX	0.75	CountOfCoupons	V	Count of passes remaining. This count shall be decremented each time a pass is activated. A count of zero shall indicate that no passes are available.
TYP22ValueFlags	12.75	BMP	0.75	FLAG	V	Bit 0 = set to one (1) when Auto-Renew enabled Bit 1 = set to one (1) when Stored Tickets (Passes), defined by NumberRemainingPasses, are enabled Bits 2-5 RFU
ExpiryDateSP	13.5	DATE	1.75	EndDateStamp	V	Expiry date of Stored Tickets (Passes) (i.e. inactivated passes enumerated by NumberRemainingPasses)
ExpiryDateCurrent	15.25	DATE	1.75	EndDateStamp	V	Expiry date of the current active pass

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.9.1.3 Typ22Flag definitions

Table 30 - TYP22Flag definitions

Flag ID	Flag name	Flag purpose
0	Transferable	Set to one (1) if Ticket transferable
1 – 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	
8	OffPeakOnly	Set to one (1) if Ticket valid off-peak only[8]
9	ValidAMWeekdays	Set to one (1) if valid for travel AM weekdays.
10	ValidPMWeekdays	Set to one (1) if valid for travel PM weekdays.
11	ValidAMSaturdays	Set to one (1) if valid for travel AM Saturdays.
12	ValidPMSaturdays	Set to one (1) if valid for travel PM Saturdays.
13	ValidAMSundays	Set to one (1) if valid for travel AM Sundays.
14	ValidPMSundays	Set to one (1) if valid for travel PM Sundays.
15	ValidPublicHoliday	Set to one (1) if valid for travel on public holidays

Note that in this context weekdays shall be defined as Monday to Friday.

[8] The time periods defining 'peak' shall be defined by the appropriate parameter table transmitted to the POST using the format defined in ITSO TS 1000-6.

2.9.1.4 Operational rules.

1. ExpiryDateCurrent shall not be set to a later date than that contained in ExpiryDateSP. ExpiryDateSP shall not be set to a later date than that contained in EXP.

2. Auto-Renew shall occur automatically when the user tries to use the IPE, but the POST finds that the current pass is either out of date, or will become out of date within a period of days defined by a POST configurable parameter, or that all Stored Tickets have been consumed, or that the number of remaining Stored Tickets has fallen below a threshold value stored as a POST configurable parameter, and the Auto-Renew flag is set to one (1). Note that implementation of the ability to Auto-Renew in advance of expiry or use of all Stored Tickets is optional in a POST.

3. Auto-Renew shall only be enabled if the shell is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

4. A Stored Ticket (pass) shall be used when the IPE is found to be invalid by the POST, the Stored Ticket (Passes) flag is set to one (1), and the NumberRemainingPasses is greater than zero. ExpiryDateCurrent shall be recalculated as the later of (ExpiryDateCurrent or Today's date) plus the number of days defined by PassDuration. NumberRemainingPasses shall be decremented by 1.

5. When in Stored Ticket (Passes) mode (TYP22ValueFlags/bit 1 is set to one (1)), then the AutoRenewQuantity1 data element shall contain the quantity of Stored Tickets (Passes) which are added to NumberRemainingPasses upon Auto-Renew.

6. When not in Stored Ticket (Passes) mode (TYP22ValueFlags/bit 1 is cleared to zero (0)), then the AutoRenewQuantity1 data element shall contain the quantity of days which are added to the validity period, as defined by the ExpiryDateCurrent element, upon auto-renew

2.10 Pre-defined Specific Journey Ticket, with multi-ride and action list amendment capability options, TYP = 23

This IPE is used to store Tickets.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

This IPE may be created with only a fixed IPE Data Group, or with both an IPE Data Group and an optional Value Record Data Group, according to the requirements of the Product Owner.

2.10.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.10.1.1 IPE Data Group

Table 31 - TYP 23 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75		H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75		H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP23Flags	5	BMP	1	FLAG	IPE	Refer to Table 34
RFU	6	RFU	0.25			
PassbackTime	6.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
RFU	7	RFU	0.25		IPE	
IssueDate	7.25	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
ValityCode	9	UD	0.625		IPE	A user defined element which may be used to further define Product validity. A value of zero

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						shall designate a null condition.
ExpiryTime	9.625	TIME	1.375	EndTimeStamp	IPE	Expiry time, on the day defined by expiry date
RFU	11	RFU	0.625		IPE	
Class	11.625	HEX	0.375	Accommodation ClassCode	IPE	Coded according to en1545 AccommodationClassCode code list
PartySizeAdult	12	HEX	1	NumberOfAdults	IPE	
PartySizeChild	13	HEX	1	NumberOfChildren	IPE	
PartySizeConcession	14	HEX	1	INTEGER	IPE	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
RFU	15	RFU	0.5		IPE	
AmountPaidCurrencyCode	15.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	16	VALI	2	Amount	IPE	Actual amount paid
AmountPaidMethodOfPayment	18	MOP	0.5	PaymentMeans Code	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaidVATSalesTax	18.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
PhotocardNumber	20	UD	4	IdentityDocumentID	IPE	Number of corresponding Transport photocard
PromotionCode	24	UD	1		IPE	An IPE owner defined data element
ConcessionaryPassIssuerCostCentre	25	HEX	2	AccountingReference	IPE	Defines a concessionary pass or permit issuing authority cost centre. This value shall be determined by the IPE owner. A registered OID value may be used in this data element.
RFU	27	RFU	0.5		IPE O	
TYP23Mode	27.5	HEX	0.5		IPE O	IPE operating Mode, see Table 35

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
MaxTransfers	28	HEX	1	InterchangesAllowed	IPE O	Defines the maximum number of transfers allowable in a single journey
TimeLimit	29	HEX	1		IPE O	Defines the maximum elapsed time allowed between the start of a leg and the start of the next leg for the second of the two legs to qualify as part of a multi-leg journey, as a count of 30 second intervals. i.e. a count of 1 indicates 30 seconds, and a count of 60 decimal indicates 30 minutes.
ValueOfRideJourney	30	VALI	2	Amount	IPE O	Nominal Value of one ride or journey
RFU	32	RFU	0.5		IPE O	
ValueOfRideJourneyCurrencyCode	32.5	VALC	0.5	PayUnitMap	IPE O	
Origin1	33	LOC1	Variable, max size 17	Origin	IPE O	Journey origin, or destination for reverse direction journeys where these are allowed
Destination1	50	LOC1	Variable, max size 17	Destination	IPE O	Journey destination, or origin for reverse direction journeys where these are allowed
Padding	67	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	67	IIN	3	NetworkID	IPE O	Issuer Identification Number
			70			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.10.1.1.1 IPEBitMap Definition

Table 32 - TYP 23 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	Destination1 data element present
2	Origin1 Data element Present
3	TYP23Mode, MaxTransfers, TimeLimit, ValueOfRideJourney, optional RFU, ValueOfRideJourneyCurrencyCode data elements present
4 – 5 (most significant)	RFU

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

2.10.1.2 Optional Value Record Data Group

This Optional Value Record Data Group provides a value and optionally software anti-tear protected area supporting multi-ride and action list capability.

When value groups are included this IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 33.

Table 33 - TYP 23 Value Record Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
CountRemainingRidesJourneys	12	HEX	1	CountOfCoupons	V	Count of remaining rides, journeys or Tickets. This count shall be decremented each time the Ticket is used. A count of zero shall indicate that no rides or journeys are available.
CountTransfers	13	HEX	1	INTEGER	V	Count of transfers made in the current multi-leg journey. This element shall be set to zero (0) upon IPE creation and when an initial Journey leg is made, and only incremented on subsequent Journey legs if the transfer rules indicate that it should be incremented.
TYP23ValueFlags	14	BMP	1	FLAG	V	Bit 0 = Auto-Renew flag Bit 1 = UsedChecked Bits 2 – 7 RFU
RFU	15		2		V	
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.10.1.3 TYP23Flags definitions

Table 34 - TYP23Flags Definitions

Flag ID	Flag name	Flag purpose
0	RFU	
1	UsedChecked	Set to one (1) to mark the Ticket as used and/or checked. Note that POSTs changing this data element shall provide an anti-tear facility for customer media types which do not provide anti-tear facilities in hardware.[9]
2 – 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.10.1.4 TYP23Mode definitions

Table 35 - TYP23Mode definitions

Code	Mode
0	Stored single use of the Ticket – i.e. the Ticket may be used for the number of rides stored in “CountRemainingRidesJourneys”
1	Stored journeys, i.e. multi-leg journeys are allowed. The Ticket may be used for the number of journeys stored in “CountRemainingRidesJourneys”, where each journey may have a number of legs, subject to the limit in “MaxTransfers”, and the elapsed time between each leg not exceeding “TimeLimit”.
2	A simple ticket, the default option
3 – 15	RFU

2.10.1.5 Operational Rules

1. Auto-Renew shall be performed when the user tries to use the IPE, but the POST finds that all Stored Tickets have been consumed, and the Auto-Renew flag is set to one (1). Only a single pass shall be added upon each auto-renew event.

2. Auto-Renew shall only be enabled if the shell is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

3. Return tickets may be implemented by means of creating a value group, and setting the value in the CountRemainingRidesJourneys data element to the appropriate value.

[9] Such a facility could be implemented through operating procedures for staff operated equipment.

2.11 Pre-defined Specific Journey Ticket Including Reservations/Special Restrictions, with action list amendment, TYP = 24

This IPE is used to store Tickets.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.11.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

This IPE may be created with only a fixed IPE Data Group, or with both an IPE Data Group and an optional Value Record Data Group, according to the requirements of the Product Owner.

2.11.1.1 IPE Data Group

Table 36 - TYP 24 IPE Data Group

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP24Flags	5	BMP	1.5	FLAG	IPE	See Table 38
Class	6.5	HEX	0.5	AccommodationClassCode	IPE	Coded according to EN1545 AccommodationClassCode code list.
RFU	7	RFU	0.25			

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
PassbackTime	7.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
IssueDateTime	8	DTS	3	DateTimeStamp	IPE	Date and time of IPE issue. The IPE shall not be used prior to the Issue Date and Time.
IssueLocation	11	LOC2	7		IPE	This element may be used for Issuing office location code.
PartySizeAdult	18	HEX	1	NumberOfAdults	IPE	
PartySizeChild	19	HEX	1	NumberOfChildren	IPE	
AmountPaidMethodOfPayment	20	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaidCurrencyCode	20.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	21	VALI	2	Amount	IPE	Actual amount paid
RFU	23	RFU	0.5		IPE	
AmountPaidVATSalesTax	23.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
Origin2	25	LOC2	7	Origin	IPE	Journey origin, or destination for return trips where these are allowed
Destination2	32	LOC2	7	Destination	IPE	Journey destination, or origin for return trips where these are allowed
RFU	39	RFU	0.25		IPE	
DepartureDate	39.25	DATE	1.75	DateStamp	IPE	
TicketNumber	41	HEX	4	DossierID	IPE	

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
ValidOnDayCode	45	DOW	1	DAYOFWEEK	IPE	Defines days of the week upon which the IPE is valid
RFU	46	RFU	0.75		IPE	
JourneyTypeCode	46.75	HEX	0.25	JourneyTypeCode	IPE	A code indicating the type of journey defined in a travel contract, e.g. single, return, circular, according to EN1545 code list
RouteNumber	47	HEX	1	RouteNumber	IPE	Route number according to EN1545.
ProfileCode	48	HEX	1	AssistanceTypeCode	IPE	Assistance type code list according to EN1545. Used to identify the type of Ticket holder (which where more than one person is entitled to travel using a Ticket, shall identify the type of primary Ticket holder and the additional service requested).
WarrantNumber	49	HEX	3		IPE	
CustomerTransactionReference#	52	HEX	4		IPE	May be used to store a CTR number which is used for Ticket on departure handling
PhotocardNumber	56	UD	4	IdentityDocumentID	IPE O1	Number of corresponding Transport photocard
TicketStatusCode	60	UD	2		IPE O1	
TypeOfTicketCode	62	UD	3		IPE O1	
RouteCode	65	UD	5		IPE O1	
ValidityCode	70	UD	2		IPE O1	
PartySizeAdultConcession	72	HEX	0.5	INTEGER	IPE EV	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
PartySizeChildConcession	72.5	HEX	0.5	INTEGER	IPE EV	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
RFU	73	RFU	0.625		IPE EV	
DepartureTime	73.625	TIME	1.375	TimeStamp	IPE EV	

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
RestrictionCode	75	UD	6		IPE EV	
RFU	81	RFU	0.625		IPE EV	
ArrivalBandStart	81.625	TIME	1.375	Timestamp	IPE EV	
RFU	83	RFU	0.625		IPE EV	
ArrivalBandEnd	83.625	TIME	1.375	Timestamp	IPE EV	
RFU	85	RFU	0.625		IPE EV	
DepartureBandStart	85.625	TIME	1.375	Timestamp	IPE EV	
RFU	87	RFU	0.625		IPE EV	
DepartureBandEnd	87.625	TIME	1.375	Timestamp	IPE EV	
RFU	89	RFU	0.625		IPE EV	
NotValidTime1	89.625	TIME	1.375	Timestamp	IPE EV	
RFU	91	RFU	0.625		IPE EV	
NotValidTime2	91.625	TIME	1.375	Timestamp	IPE EV	
RFU	93	RFU	0.625		IPE EV	
NotValidTime3	93.625	TIME	1.375	Timestamp	IPE EV	
RFU	95	RFU	0.625		IPE EV	
ArrivalTime	95.625	TIME	1.375	Timestamp	IPE EV	
RestrictedCode	97	UD	2		IPE EV	
RFU	99	RFU	0.625		IPE EV	
FirstUseTime	99.625	TIME	1.375	Timestamp	IPE EV	
ValidityTime	101	HEX	2	ValidityDuration	IPE EV	Time, in hours, for which Ticket is valid from either time of sale or from time of first use, depending on specific Ticket rules
IntermediatePoint	103	LOC2	7	Via	IPE EV	

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
NotViaPoint	110	LOC2	7	NotVia	IPE EV	
AssistanceType	117	HEX	1	ProfileCodeIOP	IPE EV	Type of Assistance requested by or granted to passenger. Code value 100 (decimal) shall be used to indicate that the passenger is a wheelchair user.
QuantityResBlocks	118	HEX	0.5		IPE R1	Quantity of reservation data blocks, where each block consists of all the reservation optional data elements defined below. This element shall only be stored once, prior to the first reservation data block.
ResBlock#	118.5	HEX	0.5		IPE R1	Reservation block number. The first block read shall be numbered one, the second two, and so on.
ResDepartureDTS	119	DTS	3	DateTimeStamp	IPE R1	
Seat	122	HEX	1	SeatNumber	IPE R1	
Coach	123	UD	4	VehicleID	IPE R1	
SeatType1	127	UD	1		IPE R1	
ServiceIdentifier	128	ASCII	8		IPE R1	
UserDefined	136	UD	3		IPE R1	
ResOrigin	139	LOC2	7	Origin	IPE R1	Journey origin relevant to this reservation
ResDestination	146	LOC2	7	Destination	IPE R1	Journey destination relevant to this reservation
BookingReferenceNumber	153	HEX	4	ReservationID	IPE R1	May be used for a National Rail NRS number
QuantityResBlocks	157	HEX	0.5		IPE R2	Quantity of reservation data blocks, where each block consists of all the reservation optional data elements defined below. This element shall only be stored once, prior to the first reservation data block.
ResBlock#	157.5	HEX	0.5		IPE R2	Reservation block number. The first block read shall be numbered one, the second two, and so on.
ResDepartureDTS	158	DTS	3	DateTimeStamp	IPE R2	

ITSO Name	Off set	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
Seat	161	HEX	1	SeatNumber	IPE R2	
Coach	162	UD	4	VehicleID	IPE R2	
RFU	166	RFU	0.75		IPE R2	
SeatPositionCode	166.75	HEX	0.25	SeatPositionCode	IPE R2	
SeatType2	167	HEX	1	AccommodationClassCode	IPE R2	Accommodation Class as defined in EN1545 This element shall occupy the 4 least significant bits, the 4 most significant bits shall be set to zero
RFU	168	RFU	1		IPE R2	
TravelServiceNumber	169	ASCII	2	TravelServiceID	IPE R2	Identity of the service according to EN1545
ResOrigin	171	LOC2	7	Origin	IPE R2	Journey origin relevant to this reservation
ResDestination	172	LOC2	7	Destination	IPE R2	Journey destination relevant to this reservation
BookingReferenceNumber	185	HEX	4	ReservationID	IPE R2	May be used for a National Rail NRS number
Padding	189	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	189	HEX	3	NetworkID	IPE O	Issuer Identification Number
			192			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, O the IIN optional element, O1 an optional group, EV an element in the extended validity optional group, R1 an element in a reservation optional group containing reservation data elements used by National Rail, and R2 an element in a reservation optional group containing EN1545 reservation data elements.

2.11.1.1.1 IPEBitMap Definition

Table 37 - TYP 24 Bit Map Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Bit	Data Element
0 (least significant)	IIN present
1	Optional area one (O1) data elements present
2	Extended Validity (EV) data elements present
3	Reservation data type 1 (R1) elements present
4	Reservation data type 2 (R2) elements present
5 (most significant)	RFU

2.11.1.1.2 Typ24Flags definition.

Table 38 - Typ24Flags Definition

Byte offset	Bit	Definition
5	0	When set to one (1) indicates that the product contains a Follow-on renewal Ticket
5	1	When set to one (1) indicates that the product contains a Duplicate Ticket
5	2	When set to one (1) indicates that the product contains a Replacement Ticket
5	3	When set to one (1) indicates that the product contains an Unfullfilled Warrant
5	4	When set to one (1) indicates that the product contains a Carnet
5	5-7	RFU
6	4 – 7	RFU

2.11.1.2 Optional Value Record Data Group

This Optional Value Record Data Group provides a value and optionally software anti-tear protected area supporting multi-ride tickets, ticket use flags and action list capability.

When value groups are included this IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 39.

Table 39 - TYP 24 Value Record Data Group

ITSO Name	Offset	Data Type	Size (bytes)	EN1545 Equivalent	Group	ITSO comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used. This element may be used to record Ticket use, where code 2 shall be used to record use for an outbound leg of a return Ticket, and code 6 to indicate that either a single Ticket, or the return leg of a return Ticket, has been consumed.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
CountRemainingJourneys	12	HEX	1	CountOfCoupons	V	Count of journeys remaining. Range 0 to 31. 0 indicates no rides left.

ITSO Name	Offset	Data Type	Size (bytes)	EN1545 Equivalent	Group	ITSO comment
TicketUseFlags	13	BMP	1		V	Bit 0 when set to one (1) indicates that the Ticket has been or is in use. If the Ticket is a return, then this flag relates to the outward portion of the journey. Bit 1 when set to one (1), indicates that the Ticket has been used or is in use for the return portion of a journey. If the Ticket is not a return then use of this flag is RFU. Bits 2 – 6 are RFU. Bit 7 when set to (1) indicates that Auto-Renew is enabled. Note that use of the bits 0 and 1 of TicketUseFlags is not EN1545 compliant, TransactionType should be used in preference
RFU	14	RFU	3		V	
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.11.1.3 Operational Rules

1. Auto-Renew shall be performed when the user tries to use the IPE but the POST finds that either all Stored Tickets (passes) have been consumed, or that the number of remaining Stored Tickets has fallen below a threshold value stored as a POST configurable parameter, and the Auto-Renew flag is set to one (1). Note that implementation of the ability to Auto-Renew in advance of use of all Stored Tickets is optional in a POST. Only a single pass (Stored Ticket) shall be added upon each auto-renew event.

2. Auto-Renew shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

2.12 Travel Related Voucher, with multi-use, action amendment and Auto-Renew capability options, TYP = 25

This type of voucher may be used for any travel related activity, such as, for example, car parking associated with a rail Ticket, or on-train meals.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

This IPE may be created with only a fixed IPE Data Group, or with both an IPE Data Group and an optional Value Record Data Group, according to the requirements of the Product Owner.

2.12.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.12.1.1 IPE Data Group

Table 40 - TYP 25 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
TYP25Flags	5	BMP	1	Flag	IPE	Refer to the Table 43
RFU	6	RFU	0.25			
PassbackTime	6.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
RFU	7	RFU	0.25		IPE	
IssueDate	7.25	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
ValidityStartDTS	9	DTS	3	DateTimeStamp	IPE	Date and time of commencement of validity. The IPE shall be valid from the time specified
RFU	12	RFU	0.625		IPE	
ExpiryTime	12.625	TIME	1.375	EndTimeStamp	IPE	Expiry time, on the day defined by expiry date
ServiceID	14	UD	1		IPE	Could be used to identify a particular car park, or a meal type. An IPE owner defined value
MaxValue25	15	VALI	2	MaxAmountLimit	IPE	Maximum value of service obtainable with the voucher
MaxValueCurrencyCode	17	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaidCurrencyCode	17.5	VALC	0.5	PayUnitMap	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	18	VALI	2	Amount	IPE	Actual amount paid
AmountPaidMethodOfPayment	20	MOP	0.5	PaymentMeansCode	IPE	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaidVATSalesTax	20.5	VAT	1.5	Percentage-2	IPE	Where the associated value data element is not used, the value of this element shall be set to zero (0)
UserDefined	22	UD	1		IPE	IPE owner defined data
AutoRenewQuantity2	23	HEX	1	INTEGER	IPE O	This element contains the value which shall be added to CountUsesAvailable during an Auto-Renew transaction.
Padding	24	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	24	IIN	3	NetworkID	IPE O	Issuer Identification Number.
			27			Count of bytes including IIN and other optional data elements where included,

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.12.1.1.1 IPEBitMap Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 41 - TYP 25 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	AutoRenewQuantity2 present
2 – 5 (most significant)	RFU

2.12.1.2 Optional Value Record Data Group

This Optional Value Record Data Group provides a value and optionally software anti-tear protected area supporting multi-use capability.

When value groups are included this IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 42.

Table 42 - TYP 25 Value Group Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
CountUsesAvailable	12	HEX	1	CountOfCoupons	V	Count of uses available. This count shall be decremented each time the IPE is used. A count of zero shall indicate that no uses of the IPE are available.
TYP25ValueFlags	13	BMP	1	Flag	V	Bit 0 = Auto-Renew flag Bits 1 – 7 RFU
RFU	14	RFU	3		V	
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.12.1.3 TYP25Flags Definition

Table 43 - TYP25Flags Definition

Flag ID	Flag name	Flag purpose
0 – 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.12.1.4 Operational Rules

1. Auto-Renew shall be performed when the user tries to use the IPE, but the POST finds that the pass is out of date, and the Auto-Renew flag is set to one (1).

2. Auto-Renew shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

2.13 Open System Tolling Ticket, with multi-use, Action List Amendment and Auto-Renew capability options, TYP = 26

This IPE is used to store Tickets.

This IPE may be used for tolling where the fee is not distance related, for example, for river crossings, either bridge, tunnel or ferry.

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

This IPE may be created with only a fixed IPE Data Group, or with both an IPE Data Group and an optional Value Record Data Group, according to the requirements of the Product Owner.

2.13.1 IPE Format Revision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1), and the value of the VGFormatRevision data element shall be set to 9. The block size BL used for this version of this IPE shall be 4 bytes.

2.13.1.1 IPE Data Group

Table 44 - TYP 26 IPE Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	0	HEX	0.75	INTEGER	H	Defined in ITSO TS 1000-2
IPEBitMap	0.75	BMP	0.75	INTEGER	H	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined below.
IPEFormatRevision	1.5	HEX	0.5	VersionNumber	H	This element shall be set to the value of the version used for this IPE
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	Count of days. IPE can be removed after ExpiryDate + RemoveDate A value of 255 indicates that the IPE may not be removed.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE acceptability at the point of use.
RFU	5	RFU	0.25			
PassbackTime	5.25	HEX	0.75	PassBackTime	IPE	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
TYP26Flags	6	BMP	1	Flag	IPE	Refer to the Table 47
TYP26Class	7	UD	1		IPE	Class of vehicle or service
RFU	8	RFU	0.25		IPE	
IssueDate	8.25	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
ValidityStartDTS	10	DTS	3	DateTimeStamp	IPE	Date and time of commencement of validity. The IPE shall be valid from the time stated.
UserDefined	13	UD	7		IPE	IPE owner defined data

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
AutoRenewQuantity3	20	HEX	1	INTEGER	IPE O	This element contains the value which shall be added to CountRemainingRidesJourneys during an Auto-Renew transaction.
Padding	21	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	21	IIN	3	NetworkID	IPE O	Issuer Identification Number.
			24			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, H indicates an element in the Header, IPE indicates a mandatory element, and O an optional element.

2.13.1.1.1 IPEBitMap Definition

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 45 - TYP 26 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	AutoRenewQuantity3present
2 – 5 (most significant)	RFU

2.13.1.2 Optional Value Record Data Group

This Optional Value Record Data Group provides a value and optionally software anti-tear protected area supporting multi-use products, Auto-Renew and action list capability.

When value groups are included this IPE is constructed using both an IPE data group and value record data group(s). It shall as a minimum be set up with the following parameters:

— Number of data groups = 2 or 3 depending upon the CMD for the platform used for a particular instance of the IPE.

— Number of value record data groups shall be at least the number of such groups defined in the CMD for the platform used for a particular instance of the IPE, which shall be at least 1 or at least 2 depending upon the type of anti-tear protection defined within the CMD.

— Number of value records per value record data group = at least 2.

— Number of IPE data groups = 1.

The VGLength, VGBitMap and VGFormatRevision value header data elements are only included once in the record. These are followed by the number of value records indicated in VGBitMap – a value record consists of each of the data elements indicated by a V in the Group column in Table 46.

Table 46 - TYP 26 Value Record Data Group

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
VGLength	0	HEX	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGBitMap	0.75	BMP	0.75	INTEGER	VH	Defined in ITSO TS 1000-2
VGFormatRevision	1.5	HEX	0.5	VersionNumber	VH	Defined in ITSO TS 1000-2
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to EN1545 EventTypeCode list. Note that a code of zero shall be used for the creation of an IPE which contains no value. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	DateTimeStamp	V	Defined in ITSO TS 1000-2
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
CountRemainingRidesJourneys	12	HEX	1	CountOfCoupons	V	Count of remaining rides, journeys or Tickets. This count shall be decremented each time the Ticket is used. A count of zero shall indicate that no rides or journeys are available.
TYP26ValueFlags	13	BMP	1	Flag	V	Bit 0 = Auto-Renew flag Bits 1 – 7 RFU
RFU	14	RFU	3		V	
Padding	17	PAD	AR			Pad to a whole number of blocks with 0x00's Padding shall be provided once only for the Data Group comprising value records. Padding shall be positioned at the end of the Data Group.
			17			Count of bytes including IIN and other optional data elements where included, excluding any padding

Note: AR = as required.
Note that the shaded area comprises the Dataset Header as defined in ITSO TS 1000-2.
Note that in the Group column, VH indicates an element in the Value Header, and V and element in the value record.

2.13.1.3 TYP26Flags Definition

Table 47 - TYP26Flags Definition

Flag ID	Flag name	Flag purpose
0 - 4	RFU	
5	PrintTicket	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this
6	PrintReceipt	When set to one (1) a receipt shall be printed, when appropriate, if the POST is capable of this
7	RFU	

2.13.1.4 Operational Rules

1. Auto-Renew shall be performed when the user tries to use the IPE but the POST finds that the pass is out of date and the Auto-Renew flag is set to one (1).

2. Auto-Renew shall only be enabled if the shell account is personalised by means of the entry of customer media holder personal data in a valid TYP 16 IPE.

2.14 Period Pass Ticket (space saving), TYP = 27

This IPE is used to store Tickets.

This IPE supports a period pass.

The IPE is designed to use the minimum amount of memory space possible, and may be implemented in single function small memory customer media types. Details of the mapping of the IPE to a particular CMD are found in the appropriate CMD definition within ITSO TS 1000-10.

The IPE design assumes that two types of customer media memory will be used to store IPE data:

— Static memory is used to store data which will not change after IPE creation;

— Dynamic memory is used to store data which may change after IPE creation, and which will be protected against tearing, according to the provisions of the CMD employed as defined in ITSO TS 1000-10;

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.14.1 TYP 27, IPEFormatRevision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1). The block size BL used for this version of this IPE shall be 4 bytes. The contents of the TYP 27 Dataset is defined in table 48.

Notes:

Certain types of Customer Media use an array of one time programmable bits to store the Data Elements shown within the bold outline in table 48. This restricts the way these Data Elements may be altered, if required, during the life of the IPE.

The following abbreviations are used:

AR = as required.

Static = Static Data memory

Dyn = Dynamic Data memory

Table 48 - TYP 27 Period Pass Dataset

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	HEX	0.75		Static	Defined in ITSO1000-2
IPEBitMap	BMP	0.75		Static	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined in table 48a below.
IPEFormatRevision	HEX	0.5	VersionNumber	Static	This element shall be set to the value of the version used for this IPE
IssueDate	DATE	1.75	DateStamp	Static	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
Sterling/Euro	FLAG	0.125		Static	This bit shall be cleared to zero (0) to indicate that currency is denominated in Sterling, and shall be set to one (1) to indicate that currency is denominated in Euro
Child	FLAG	0.125		Static	When set to zero (0) indicates that the Ticket applies to an adult When set to one (1) indicates that the Ticket applies to a child
PassbackTime	HEX	0.5	PassBackTime	Static	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
AmountPaidMethod OfPayment	MOP	0.5	PaymentMeans Code	Static	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	VALI	2	Amount	Static	
TYP27PassFlags	BMP	0.5		Static	Refer to table 49.
GeoValidity / AreaValidity	LOC4 or LOC 3	8.5		Static	Geographic validity encoded according to ITSO TS 1000-1. When the first 4 bits of this element are set to zero (0), then the remainder of the element shall have special meaning, refer to table 50.
		4.0		Dyn	When a LOC 3 type is stored in this element these 4 bytes in dynamic memory shall be set to zero (0).
Event1	HEX	0.5	EventTypeCode	Dyn	Coded as defined in EN1545
Event2	HEX	0.5	EventTypeCode	Dyn	Coded as defined in EN1545
LastUseDTS	DTS	3	DateTimeStamp	Dyn	
PhotocardNumber	HEX	3.0	IdentityDocumentID	Dyn	Number of associated Photocard set to 0 if no associated card
TYP27ExpiryDate	HEX	1		Dyn	Date upon which Ticket expires. Coded as a negative offset in days from the ExpiryDate found within the directory entry. For a TYP 27 IPE where this element is used, the ExpiryDate directory element shall not be set to zero (0).
Seq#	HEX	1		Dyn	Where present as determined by the IPEBitMap the Sequence number shall be incremented each time the IPE is modified. This element shall be set to zero when an IPE is created and has not been used.
Padding	PAD	AR		Dyn	Pad to a whole number of blocks with 0x00's

Table 49 - Definition of TYP27PassFlags

Flag ID	Flag name	Flag purpose
0	OffPeakOnly	When set to zero (0) indicates valid at all times When set to one (1) indicates valid off-peak only
1	WeekdayOnly	When set to zero (0) indicates valid on all days When set to one (1) indicates valid weekdays only
2	Class	When set to zero (0) indicates standard class When set to one (1) indicates first class
3	ExpiryTimeFlag	When set to zero (0) indicates expiry time of 23:59 When set to one (1) indicates an IPE owner defined expiry time

Table 50 - GeoValidity coding – codes specific to this IPE

Condition	Interpretation
Bits 96-99 = zero and Bit 95 = zero	Bits 0-94 contain a Reference Fare Code, coded in HEX
Bits 96-99 = zero and Bit 95 = one	Bits 0-94 contain a Fare Value, coded as a HEX integer
Bits 96-99 not equal zero	Content of Bits 96-99 shall be interpreted as LOCDEFTYPE minus 200, and the remainder of the element treated as a LOCE as defined in ITSO TS 1000-1.

2.14.1.1 IPEBitMap Definition

Flag bits in the IPEBitMap shall be set as required and as shown in table 48a.

Table 48a - TYP 27 Bit Map Definition

Bit	Interpretation
0 – 3 (least significant)	Set to 0 and RFU by ITSO
4	Set to 1 if the Seq# is present
5 (most significant)	Set to 0 and RFU by ITSO

Bit 4 shall be set to 1 where the CMD supports full software anti tear.

2.15 Carnet Ticket (space saving) supporting day passes, TYP = 28

This IPE is used to store Tickets.

This IPE supports carnets of day passes.

The IPE is designed to use the minimum amount of memory space possible, and may be implemented in single function small memory customer media types. Details of the mapping of the IPE to a particular CMD are found in the appropriate CMD definition within ITSO TS 1000-10.

The IPE design assumes that two types of customer media memory will be used to store IPE data:

— Static memory is used to store data which will not change after IPE creation;

— Dynamic memory is used to store data which may change after IPE creation, and which will be protected against tearing, according to the provisions of the CMD employed as defined in ITSO TS 1000-10;

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

As ExpiryTick1, ExpiryTick2, ExpiryTick3, ExpiryTick4, ExpiryTick5, and ExpiryTick6 are defined as an offset from the expiry date held in the directory (EXP), EXP shall not be set to zero.

2.15.1 TYP 28, IPEFormatRevision = 1

For IPEs formatted according to this sub-clause of this version of the Specification the value of the IPEFormatRevision data element shall be set to one (1). The block size BL used for this version of this IPE shall be 4 bytes.

The content of the TYP 28 Dataset is defined in table 51.

Notes:

Certain types of Customer Media use an array of one time programmable bits to store the Data Elements shown within the bold outline in table 51. This restricts the way these Data Elements may be altered, if required, during the life of the IPE.

The following abbreviations are used:

AR = as required.

Static = Static Data memory

Dyn = Dynamic Data memory

Table 51 - TYP 28 IPE Carnet Dataset (IPEFormatRevision = 1)

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	HEX	0.75		Static	Defined in ITSO1000-2
IPEBitMap	BMP	0.75		Static	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined in table 54a below.
IPEFormatRevision	HEX	0.5	VersionNumber	Static	This element shall be set to the value of the version used for this IPE
IssueDate	DATE	1.75	DateStamp	Static	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
Sterling/Euro	FLAG	0.125		Static	This bit shall be cleared to zero (0) to indicate that currency is denominated in Sterling, and shall be set to one (1) to indicate that currency is denominated in Euro
RFU	FLAG	0.125		Static	Set to 0

PassbackTime	HEX	0.5	PassBackTime	Static	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
AmountPaidMethod OfPayment	MOP	0.5	PaymentMeans Code	Static	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	VALI	2	Amount	Static	
TYP28PassFlags	BMP	0.5		Static	Refer to table 52.
AreaValidity	LOC3	8.5		Static	Area validity encoded according to ITSO TS 1000-1. When the first 4 bits of this element are set to zero (0), then the remainder of the element shall have special meaning, refer to table 53.
RFU	HEX	5		Dyn	Set to all 0's
LastUseDTS	DTS	3	DateTimeStamp	Dyn	
ExpiryTick1	HEX	0.625		Dyn	Date upon which Ticket expires. Coded as a negative offset from the ExpiryDate found within the directory entry
ExpiryTick2	HEX	0.625		Dyn	As for ExpiryTick1
ExpiryTick3	HEX	0.625		Dyn	As for ExpiryTick1
ExpiryTick4	HEX	0.625		Dyn	As for ExpiryTick1
ExpiryTick5	HEX	0.625		Dyn	As for ExpiryTick1
ExpiryTick6	HEX	0.625		Dyn	As for ExpiryTick1
NDoIE	FLAG	0.125		Dyn	When set to zero (0), indicates that the Ticket is not valid on the day of issue. When set to one (1), indicates that the Ticket is valid on the day of issue.
NDoEE	FLAG	0.125		Dyn	When set to zero (0), indicates that the Ticket is not valid on the day of expiry. When set to one (1), indicates that the Ticket is valid on the day of expiry.
Seq#	HEX	1		Dyn	Where present as determined by the IPEBitMap the Sequence number shall be incremented each time the IPE is modified. This element shall be set to zero when an IPE is created and has not been used.
Padding	PAD	AR		Dyn	Pad to a whole number of blocks with 0x00's

Table 52 - Definition of TYP28PassFlags

Flag ID	Flag name	Flag purpose
0	OffPeakOnly	When set to zero (0) indicates valid at all times When set to one (1) indicates valid off-peak only
1	WeekdayOnly	When set to zero (0) indicates valid on all days When set to one (1) indicates valid weekdays only
2	Class	When set to zero (0) indicates standard class When set to one (1) indicates first class
3	ExpiryTimeFlag	When set to zero (0) indicates expiry time of 23:59 When set to one (1) indicates an IPE owner defined expiry time, which will be stored as a POST configuration parameter, and which may extend the validity period (operating day) to more than 24 hours, or reduce it to less than 24 hours. Note that the validity period always starts at 00:00 midnight.

Table 53 - AreaValidity coding – codes specific to this IPE

Condition	Interpretation
Bits 64-67 = zero and Bit 63 = zero	Bits 0-62 contain a Reference Fare Code, coded in HEX
Bits 64-67 = zero and Bit 63 = one	Bits 0-62 contain a Fare Value, coded as a HEX integer
Bits 64-67 not equal zero	Content of Bits 64-67 shall be interpreted as LocDefType minus 200, and the remainder of the element treated as a LOCE as defined in ITSO TS 1000-1.

Table 54 - Definition of TYP28UsageRecCode

Flag ID	Flag purpose
0	When set to zero (0), UsageRec records boarding point When set to one (1), UsageRec records alighting point
1	Two bits coded as follows (flag 1 is the LSB): The code shall relate to a LocDefType code as defined in ITSO TS 1000-1. To obtain the full value of LocDefType, add 200 to this code.
2	

2.15.1.1 IPEBitMap Definition

Flag bits in the IPEBitMap shall be set as required and as shown in table 54a.

Table 54a - TYP 28 Bit Map Definition

Bit	Interpretation
0 – 3 (least significant)	Set to 0 and RFU by ITSO
4	Set to 1 if the Seq# is present
5 (most significant)	Set to 0 and RFU by ITSO

Where the CMD supports full software anti tear the sequence number shall be present.

2.15.2 Use of TYP 28 carnet IPE

TYP 28 allows a carnet of up to 8 day pass Tickets to be stored. Usage is as follows, but note that the use of the ExpiryTimeFlag may modify the logic required to implement the validity rules described in this clause 2.15.2.

- When a TYP 28 card is issued:
  - the IssueDate and directory ExpiryDate are the first and last day on which the pass is valid. The ExpiryTick1-6 values are set to zero, indicating that they are unused.
  - If the IPE is issued for less then 6 tickets, then the excess (unrequired) ExpiryTick elements will be preset to 1's.
  - The pass validity period, IssueDate to ExpiryDate inclusive, can not exceed a 32 day period.
  - If the Product is valid on the day of issue, i.e. the first Ticket is issued for the day of Product issue (IPE creation), then the NDoIE bit is set to one. In this case there is no need to use one of the ExpiryTick elements to record this day of validity.

  - If the Product is valid on the ExpiryDate day (i.e. the last Ticket is valid on the day of IPE expiry), then the valid on day of expiry (NDoEE) bit is set to one. In this case there is no need to use one of the ExpiryTick elements to record this day of validity.

- When the pass is first used:
  - If current day is the day of issue and NDOIE is set to one, then the pass is valid for travel;
  - On a day other than the first day of validity, or on the first day of validity when NDOIE is set to zero, then the first ExpiryTick1-6 element containing zero is set to the offset for the current day.
- If the pass is used again on the same day then it's validity can be determined by either:
  - Confirming that current date is the date of issue and that the NDOIE flag is set; or
  - Confirming a match between current date and the offset encoded in one of the ExpiryTick elements (excluding those set to either all 0's or to all 1's);
- When the pass is used on a new day (i.e. a day when it has not been used before), then:
  - If any ExpiryTick# element contains zero, then this element can be set to the offset for the current date and the pass is valid for travel; or
  - If current date is the date of expiry, and the NDoEE flag is set to one, then the pass is valid for travel; or
  - If no ExpiryTick elements containing zero are available, and either current day is not the date of expiry or the NDoEE is set to zero, then the pass has been exhausted and the pass is no-longer valid.

Note that use of the NDoEE flag is limited, in that the day of use of the ticket represented by this flag must be predicted at the time of ticket issue.

2.16 Multi-Use Ticket (space saving), TYP = 29

This IPE supports three varieties of ticket namely:

— A carnet of single journey tickets

— multi-journey coupons

— multi leg journeys

The IPE is designed to use the minimum amount of memory space possible, and may be implemented in single function small memory customer media types. Details of the mapping of the IPE to a particular CMD are found in the appropriate CMD definition within ITSO TS 1000-10.

The IPE design assumes that two types of customer media memory will be used to store IPE data:

— Static memory is used to store data which will not change after IPE creation;

— Dynamic memory is used to store data which may change after IPE creation, and which will be protected against tearing, according to the provisions of the CMD employed as defined in ITSO TS 1000-10;

The data stored in this IPE is deemed to be critical as defined in ITSO TS 1000-2, under “Anti-Tear Protection”.

2.16.1. TYP 29, IPEFormatRevision=1, IPEFormatRevision=2.

There are two versions of the TYP 29 IPE formatted according to this sub-clause of this version of the Specification. If the value of the IPEFormatRevision data element is set to one (1) the IPE shall be usable for a carnet of single journey tickets or for multi-journey coupons and the content of the TYP 29 Dataset is defined in table 55. If the value is set to two (2) the IPE shall be used for multi-leg journeys and the content of the Dataset is defined in table 55a

The block size (BL) used where IPEFormatRevsion=1 or where IPEFormatRevsion=2 for this IPE shall be 4 bytes.

Note:

> Certain types of Customer Media use an array of One Time Programmable (OTP) bits to store the Data Elements shown within the bold outline in tables 55 and 55a. This restricts the way these Data Elements may be altered, if required, during the life of the IPE.

The following abbreviations are used:

AR = as required.

Static = Static Data memory

Dyn = Dynamic Data memory

Table 55 - TYP 29 IPE Data Group (IPEFormatRevision = 1)

A Carnet of single journey tickets or multi-journey Coupons

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	HEX	0.75		Static	Defined in ITSO1000-2
IPEBitMap	BMP	0.75		Static	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined in table 58a below.
IPEFormatRevision	HEX	0.5	VersionNumber	Static	This element shall be set to the value of the version used for this IPE
IssueDate	DATE	1.75	DateStamp	Static	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
Sterling/Euro	FLAG	0.125		Static	This bit shall be cleared to zero (0) to indicate that currency is denominated in Sterling, and shall be set to one (1) to indicate that currency is denominated in Euro
Ticket/Coupon	FLAG	0.125		Static	Set to zero (0) the QtyRemaining element shall be interpreted as tickets set to one (1) it shall be interpreted as coupons.
ScalingFactor	HEX	0.5		Static	The multiplier to be applied to the one time programmable ScaledQtyBackup Bitmap coded in accordance with table 58b. If set to all zeros (0's) then ScaledQtyBackup is not used.
AmountPaidMethod OfPayment	MOP	0.5	PaymentMeans Code	Static	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner. Where the associated value data element is not used, the value of this element shall be set to zero (0)
AmountPaid	VALI	2	Amount	Static	
TYP29PassFlags	BMP	0.5		Static	Refer to table 56.

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
AreaValidity	LOC3	8.5		Static	Area validity encoded according to ITSO TS 1000-1. When the first 4 bits of this element are set to zero (0), then the remainder of the element shall have special meaning, refer to table 57.
RFU		2		Dyn	Set to all 0's
TYP29UsageRecCode	HEX	0.375		Dyn	Refer to Table 58
QtyRemaining	HEX	1.625	CouponsDeducted	Dyn	This data element contains a count of tickets or coupons used, where each ticket or coupon authorises an element of travel[10], i.e. a journey or a part of a journey. Upon commencement of each journey, the value in this element shall be incremented by the number of tickets or coupons used. Maximum value contained within this element shall be 8191, if use of the ticket would exceed this value, then the ticket shall not be used. The value in this element shall be initialised upon ticket creation such that it contains 8191 minus the number of coupons purchased.
UsageRec	LOCE	4		Dyn	Location at which journey commenced or ended encoded according to ITSO TS 1000-1
ScaledQtyBackup	BMP	4		Dyn	If indicated in the IPEBitMap a backup to enable recovery of the QtyRemaining Data Element to an accuracy determined by the ScalingFactor. Otherwise set to all 0's
Seq#	HEX	1		Dyn	Where present as determined by the IPEBitMap the Sequence number shall be incremented each time the IPE is modified. This element shall be set to zero when an IPE is created and has not been used.
Padding	PAD	AR		Dyn	Pad to a whole number of blocks with 0x00's

[10] For coupons all parties utilising a coupon shall agree on the journey value(s) (deduction rate) and reimbursement value(s) (coupon value) of coupons.

Table 55a - TYP 29 IPE Data Group (IPEFormatRevision = 2)

Multi-Leg Journeys

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IPELength	HEX	0.75		Static	Defined in ITSO1000-2
IPEBitMap	BMP	0.75		Static	Functionally defined in ITSO1000-2, bit assignment specific to this IPE is defined in table 58a below.
IPEFormatRevision	HEX	0.5	VersionNumber	Static	This element shall be set to the value of the version used for this IPE
IssueDate	DATE	1.75	DateStamp	Static	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
Sterling/Euro	FLAG	0.125		Static	This bit shall be cleared to zero (0) to indicate that currency is denominated in Sterling, and shall be set to one (1) to indicate that currency is denominated in Euro
RFU		0.125		Static	Set to 0
PassbackTime	HEX	0.5	PassBackTime	Static	Passback time in minutes. A setting of zero shall indicate that passback time is not defined within the IPE, in which case anti passback rules defined within the POST shall be implemented.
MaxDailyJourneys	HEX	0.5		Static	Quantity of daily journeys allowed
MaxTransfers	HEX	0.5	InterchangesAllowed	Static	Defines the maximum number of transfers allowable in a single journey
ScalingFactor	HEX	0.5		Static	The multiplier to be applied to the one time programmable ScaledQtyBackup Bitmap coded in accordance with table 58b. If set to all 0's then ScaledQtyBackup is not used.
RFU		1.0		Static	Set to all 0's
TYP29PassFlags	BMP	0.5		Static	Refer to table 56.
AreaValidity	LOC3	8.5		Static	Area validity encoded according to ITSO TS 1000-1. When the first 4 bits of this element are set to zero (0), then the remainder of the element shall have special meaning, refer to table 57.
JnyComDTS	DTS	3	DateTimeStamp	Dyn	Date and time of journey commencement
QtyRemaining	HEX	1	CountOfJourneys	Dyn	This data element contains a count of journeys remaining. Upon commencement of each journey, the value in this element shall be incremented by one. The maximum value contained within this element shall be 255, if use of this ticket would exceed this value, then it shall not be used. The value in this element shall be initialised upon ticket creation such that it contains 255 minus the number of coupons purchased.
TransferCounter	HEX	0.5	CountOfJourneyLegs	Dyn	A count of transfers made within a journey. This value shall be incremented for each new leg commenced within an existing journey, and shall be set to zero (0) at the commencement of each new journey. If commencing a new leg would cause this value to be greater than MaxTransfers then a new journey shall be commenced.

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
DailyJnyCounter	HEX	0.5		Dyn	A count of journeys made on a given day. This value shall be incremented for each new journey commenced during a given day, and shall be set to one (1) for the first journey commenced after midnight on a given day. If commencing a journey would cause this value to be greater than MaxDailyJourneys then the Ticket shall not be used for the journey. The first journey on a given day is determined by reference to JnyComDTS. If this is the first Journey on a given day, then JnyComDTS will contain a previous day's date or a null value.
LastUseDTS	DTS	3	DateTimeStamp	Dyn	LastUseDTS
ScaledQtyBackup	BMP	4		Dyn	If indicated in the IPEBitMap a backup to enable recovery of the QtyRemaining Data Element to an accuracy determined by the ScalingFactor. Otherwise set to all 0's
Seq#	HEX	1		Dyn	Where present as determined by the IPEBitMap the Sequence number shall be incremented each time the IPE is modified. This element shall be set to zero when an IPE is created and has not been used.
Padding	PAD	AR		Dyn	Pad to a whole number of blocks with 0x00's

Table 56 - Definition of TYP29PassFlags

Flag ID	Flag name	Flag purpose
0	OffPeakOnly	When set to zero (0) indicates valid at all times When set to one (1) indicates valid off-peak only
1	WeekdayOnly	When set to zero (0) indicates valid on all days When set to one (1) indicates valid weekdays only
2	Class	When set to zero (0) indicates standard class When set to one (1) indicates first class
3	ExpiryTimeFlag	When set to zero (0) indicates expiry time of 23:59 When set to one (1) indicates an IPE owner defined expiry time

Table 57 - AreaValidity coding – codes specific to this IPE

Condition	Interpretation
Bits 64-67 = zero and Bit 63 = zero	Bits 0-62 contain a Reference Fare Code, coded in HEX
Bits 64-67 = zero and Bit 63 = one	Bits 0-62 contain a Fare Value, coded as a HEX integer
Bits 64-67 not equal	Content of Bits 64-67 shall be interpreted as LocDefType minus 200, and the remainder of the element treated as a LOCE as defined in ITSO TS

zero	1000-1.

Table 58 - Definition of TYP29UsageRecCode

Flag ID	Flag purpose
0	When set to zero (0), UsageRec records boarding point When set to one (1), UsageRec records alighting point
1	Two bits coded as follows (flag 1 is the LSB): The code shall relate to a LocDefType code as defined in ITSO TS 1000-1. To obtain the full value of LocDefType, add 200 to this code.
2	

2.16.1.1 IPEBitMap Definition

Flag bits in the IPEBitMap shall be set as required and as shown in table 58a.

Table 58a - TYP 29 Bit Map Definition

Bit	Interpretation
0 – 2 (least significant)	Set to 0 and RFU by ITSO
3	Set to 1 to indicate the ScaledQtyBackup Data Element shall be used.
4	Set to 1 if the Seq# is present
5 (most significant)	Set to 0 and RFU by ITSO

Where the CMD mandates software or hardware anti-tear the Seq# shall be present and the ScaledQtyBackup shall not be used.

Where the CMD mandates the use of OTP memory the Seq# shall not be present and the ScaledQtyBackup shall be used.

2.16.1.2 ScalingFactor Definition

The value of the ScalingFactor element is converted to a Multiplier (m) by the POST application as defined in table 58b.

Table 58b – ScalingFactor Definition

Scaling Factor Code	m	Scaling Factor Code	m	Scaling Factor Code	m	Scaling Factor Code	m
0	(see note below)	4	4	8	8	12	32
1	1	5	5	9	9	13	64
2	2	6	6	10	10	14	128
3	3	7	7	11	20	15	256

Note: If the ScalingFactor element is not active it shall be coded as 0.

Use of the Multiplier (m) in conjunction with the ScaledQtyBackup BitMap

This is primarily intended for use with small memory customer media that have insufficient capacity to support full software anti-tear but do contain an array of “one time programmable” flag bits. This array is used in conjunction with the ScalingFactor to re-generate the approximate value of the QtyRemaining element in the event of this element becoming corrupted.

As tickets or coupons are used then for every m used one of the Bits in the ScaledQtyBackup is set irrevocably to a logical 1. The value m is determined from table 58b indexed by the value of the ScalingFactor stored in the fixed part of the IPE.

In the event that the QtyRemaining element is corrupted (determined by the failure of the Seal) then it can be regenerated by the formula 8191 – m x u

Where u is the number of bits left unset, i.e. at logical 0, in the ScaledQtyBackup BitMap.

The granularity and hence accuracy of the regeneration from the backup is set by the ScalingFactor in conjunction with the number of Coupons initially loaded on the IPE.

Taking a ScaledQtyBackup BitMap of n bits, as an example:

- if n coupons were initially loaded then by having m=1 this would ensure that in the event of a tear the QtyRemaining element Can be reset to the exact last known good value.
- if 2n coupons were loaded then m must be more than 1 and having m=2 ensures that in the event of a tear the QtyRemaining element Can be reset to within 2 of the last known value.
- Where the number of coupons purchased (p) does not equal an exact multiple of n Then n-(p/m) bits (rounded down to the nearest whole number) in the bit map shall be set to logical 1 concurrent with the coupon purchase.

3. Transient Ticket Record

This log is used only to record Transient Tickets and other specific event records:

— Tickets issued when an IPE is not created[11]; and

— closed system entry records[12].

Each data record is made up of a concatenation of a number of data groups. The standard data group must always be present, other data groups are optional. TTBitMap2 is used to indicate which data groups are present.

3.1 Transient Ticket Record Data Definition

3.1.1 TTFormatRevision = 1

Table 59 - Transient Ticket Record Data Definition

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
TTLength	0	HEX	0.75		Equivalent to IPELength which is Defined in ITSO TS 1000-2	TT STD
TTBitMap1	0.75	BMP	0.75		Equivalent to IPEBitMap which is Defined in ITSO TS 1000-2. This element shall be set to Zero (0).	TT STD
TTFormatRevision	1.5	HEX	0.5	VersionNumber	Equivalent to IPEFormatRevision, This element shall be set to the value of the version used for this record	TT STD
TTBitMap2	2	BMP	1.5		this element defines which optional elements are present in a record instance.	TT STD
TTTransactionType	3.5	HEX	0.5	EventTypeCode	Category of transaction, coded according to EN1545 EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.	TT STD
DateTimeStamp	4	DTS	3	DateTimeStamp	Date and time of the transaction	TT STD
			7		group size	TT STD

[11] For example, a concessionary half fare Ticket is sold on the basis of a concessionary entitlement contained within the shell. A record is added to the Transient Ticket Record to record the event.

[12] A closed system is one where the user presents their card both on entry and exit from the system, and pays on exit.

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
AmountPaidMethodOfPayment	0	MOP	0.5	PaymentMeansCode	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner.	TT AMT
AmountPaidCurrencyCode	0.5	VALC	0.5	PayUnitMap		TT AMT
AmountPaid	1	VALI	2	Amount	Actual Amount paid (cash or amount charged to CTA, deducted from stored travel rights or from an external purse).	TT AMT
RFU	3	RFU	0.375			TT AMT
NoFareCharged	3.375	FLAG	0.125		When set to one (1), indicates that an operator has issued this Ticket without collecting all or part of the fare, at his own risk, against the IPE designated by IPEPointer with the outstanding fare recorded in an Amount optional data group included in this record.	TT AMT
AmountPaidVATSalesTax	3.5	VAT	1.5	Percentage-2		TT AMT
			5		group size	TT AMT
DestinationTT	0	LOC2	7	Destination	Location information, used only when destination (alighting) location is determined at the outset of a journey.	TT DEST
			7		group size	TT DEST
RFU	0	RFU	0.375			TT IPEID

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 0 to E identifying a directory entry which relates to the IPE used, where E is defined in ITSO TS 1000-2. When a ticket has been recorded in the Transient Ticket Record this element shall contain a pointer to any entitlement IPE used in the Ticket's creation. Where the above does not apply then the element may be used to record the identity of any IPE relevant to the transaction, or set to zero indicating that no IPE is pointed to.	TT IPEID
			1		group size	TT IPEID
OriginLocation	0	LOC2	7	Origin	The location at which the transaction was conducted, which may be the location of journey commencement (boarding). This data element shall be used for entry location in a closed system.	TT ORGN
			7		group size	TT ORGN
RoutingCode	0	LOC2	7	Via	Routing Indicator where affects fares charged etc – typically a Rail National Location Code (NLC) would be stored here	TT RC
			7		group size	TT RC
IIN	0	IIN	3	NetworkID	Issuer identification number. In this context this value shall identify the network with which the POST is registered.	TT IIN
			3		Group size	TT IIN
UserDefined	0	UD	variable		Contents of this data element are determined by the operator writing the record.	TT UD
			variable		group size	TT UD
Padding		PAD	AR		Pad to a whole number of blocks with 0x00's	

3.1.2 TTFormatRevision = 2

Table 60a - Transient Ticket Record Data Definition

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
TTLength	0	HEX	0.75		Equivalent to IPELength which is Defined in ITSO TS 1000-2	TT STD
TTBitMap1	0.75	BMP	0.75		Equivalent to IPEBitMap which is Defined in ITSO TS 1000-2. This element shall be set to Zero (0).	TT STD
TTFormatRevision	1.5	HEX	0.5	VersionNumber	Equivalent to IPEFormatRevision, This element shall be set to the value of the version used for this record	TT STD
TTBitMap2	2	BMP	1.5		this element defines which optional elements are present in a record instance.	TT STD
TTTransactionType	3.5	HEX	0.5	EventTypeCode	Category of transaction, coded according to EN1545 EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.	TT STD
DateTimeStamp	4	DTS	3	DateTimeStamp	Date and time of the transaction	TT STD
			7		group size	TT STD
AmountPaidMethodOfPayment	0	MOP	0.5	PaymentMeansCode	Where more than one method of payment is used, it is suggested that the method used to pay the most monetary value shall be recorded here, but any appropriate method may be recorded at the discretion of the IPE Owner.	TT AMT
AmountPaidCurrencyCode	0.5	VALC	0.5	PayUnitMap		TT AMT
AmountPaid	1	VALI	2	Amount	Actual Amount paid (cash or amount charged to CTA, deducted from stored travel rights or from an external purse).	TT AMT

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
CompanionTravelled	3	FLAG	0.125		When set to zero (0) indicates that a single person is travelling. When set to one (1) indicates that a companion is travelling in addition to the Product holder.	TT AMT
ReturnTicket	3.125	FLAG	0.125		When set to zero (0) indicates that a single Journey Ticket was purchased. When set to one (1) indicates that a Return Ticket was purchased.[13]	TT AMT
RFU	3.25	FLAG	0.125			TT AMT
NoFareCharged	3.375	FLAG	0.125		When set to one (1), indicates that an operator has issued this Ticket without collecting all or part of the fare, at his own risk, against the IPE designated by IPEPointer with the outstanding fare recorded in an Amount optional data group included in this record.	TT AMT
AmountPaidVATSalesTax	3.5	VAT	1.5	Percentage-2		TT AMT
			5		group size	TT AMT
DestinationTT	0	LOC2	7	Destination	Location information, used only when destination (alighting) location is determined at the outset of a journey.	TT DEST
			7		group size	TT DEST
RFU	0	RFU	0.375			TT IPEID

[13] This flag could be used in conjunction with marking of the record as semi-permanent (as defined in ITSO 1000-2) to implement electronic Return ticketing. The record containing the Return Ticket could be marked as semi-permanent. When the Return ticket is used it can be cancelled by removing the semi-permanent marking from the record.

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 0 to E identifying a directory entry which relates to the IPE used, where E is defined in ITSO TS 1000-2. When a ticket has been recorded in the Transient Ticket Record this element shall contain a pointer to any entitlement IPE used in the Tickets creation. Where the above does not apply then the element may be used to record the identity of any IPE relevant to the transaction, or set to zero indicating that no IPE is pointed to.	TT IPEID
			1		group size	TT IPEID
OriginLocation	0	LOC2	7	Origin	The location at which the transaction was conducted, which may be the location of journey commencement (boarding). This data element shall be used for entry location in a closed system.	TT ORGN
			7		group size	TT ORGN
RoutingCode	0	LOC2	7	Via	Routing Indicator where affects fares charged etc – typically a Rail National Location Code (NLC) would be stored here	TT RC
			7		group size	TT RC
IIN	0	IIN	3	NetworkID	Issuer identification number. In this context this value shall identify the network with which the POST is registered.	TT IIN
			3		Group size	TT IIN
UserDefined	0	UD	variable		Contents of this data element are determined by the operator writing the record.	TT UD
			variable		group size	TT UD
Padding		PAD	AR		Pad to a whole number of blocks with 0x00's	

3.1.2.1 Bit Map definition.

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 60b - Transient Ticket Record Bit Map Definition.

TTBitMap2	Data Element or Group	Description
0 (least significant)	AMT structure present	Amount paid data
1	DEST structure present	Destination data
2	IPEID structure present	IPE identity data
3	ORGN structure present	Origin data
4	RFU	
5	RC structure present	Routing code
6	RFU	
7	IIN structure present	IIN
8 – 10	RFU	
11	UserDefined element present	

3.1.1.1 Bit Map definition.

A bit shall be set to one (1) when the corresponding data element (or elements) is present.

Table 48 - Transient Ticket Record Bit Map Definition.

TTBitMap2	Data Element or Group	Description
0 (least significant)	AMT structure present	Amount paid data
1	DEST structure present	Destination data
2	IPEID structure present	IPE identity data
3	ORGN structure present	Origin data
4	SPC structure present	Discounted multi-leg journey data
5	RC structure present	Routing code
6	VA structure present	Value added
7	IIN structure present	IIN
8 – 10	RFU	
11	UserDefined element present	

3.2 Operational Rules

1. Each Transient Ticket Record shall be stored in an Orphan IPE Data Group as defined in ITSO TS 1000-2.
2. The total size of the record shall not exceed the size specified for a sector in the appropriate Customer Media Code definition in ITSO TS 1000-10.
3. Optional data elements shall be added to the record in the order shown in the bit map (i.e. amount structure first, user defined structure last)
4. The user defined structure may occupy all the unused space available in the record.

Annex A
EN1545 Code Lists and Data Element Definitions.
Informative

This Annex reproduces code lists and definitions from EN1545, for the information of users. However, users shall take note that the formal definition of all code lists and elements reproduced herein lies in EN1545, and in the case of any discrepancy, the definition within EN1545 shall take precedence over the version reproduced here.

Note that in the titles below, the left hand term is the ITSO term, the right hand the EN1545 term. Where a single term is shown in the title, this refers to the EN1545 term. The EN1545 definition follows.

Some of the EN1545 code lists have been expanded, and are now larger than can be accommodated in the element size allocated by ITSO. In these circumstances, the size of the code list shall be constrained to the size which may be accommodated by ITSO, and only codes in the range zero to [maximum size which may be accommodated by ITSO] shall be used.

A.1 Class = AccommodationClassCode

The following table has been extracted from EN1545.

Code representing an accommodation class.

AccommodationClassCode ::= ENUMERATED {

unknown	(0),
first	(1),
second-standard-traveller	(2),
small	(3),
large	(4),
business	(5),
economy	(6),
club	(7),
enhanced-standard	(8),
premium	(9),
rfuCEN1	(10),
rfuCEN2	(11),
rfuCEN3	(12),
networkIdSpecific1	(13),
networkIdSpecific2	(14),
networkIdSpecific3	(15),

}

This code list is used in the ITSO Class data elements. These are only 3 bits in size, and therefore can only accept codes up to and including 7. Codes 8 to 15 inclusive shall not be used.

A.2 Coach = CoachID

The identification of a coach.

CoachId ::= ReferenceIdentifier (4)

Value Assignment : a NetworkId specific value.

A.3 DATE = DateStamp

Number of days relative to 1 January 1997, where 1 January 1997 is day 0.

DateStamp ::= BIT STRING(SIZE(14))

Value Assignment : ‘ddddddddddddd’B (14 bits)

A.4 Datef

Date expressed in a readily printable numeric format.

Datef ::= SEQUENCE {

year	BCDString (SIZE(2)),
month	BCDString (SIZE(1)),
day	BCDString (SIZE(1))

}

Value Assignment :

yyyy Year
mm Month
dd Day
'00000000'H denotes explicitly no date.

A.5 DateOfBirth = BirthDate

BirthDate is the date of birth of a person.

BirthDate ::= Datef

A.6 DOW = DAYOFWEEK

The selected days of the week.

DAYOFWEEK ::= BIT STRING (SIZE(8))

Value Assignment :

The bits are coded each to represent a day. A bit value ‘1’B signifies that the corresponding day is selected. Multiple bits indicate multiple day selection.

‘abcdefgh’B Selected days :

a	Monday,
b	Tuesday,
c	Wednesday,
d	Thursday,
e	Friday,
f	Saturday,
g	Sunday,
h	Special Days, contract provider specific (such as public holidays).

Variable restrictions such as school holidays are covered under the detailed terms of the contract specified in contractTariff.

A.7 DTS = DateTimeStamp

This is a three byte field with a precision of +-1 minute and a periodicity of approximately 31 years. Coded as the number of minute intervals from 01/01/1997,

where 01/01/1997 00:00 = 0.

DateTimeStamp ::= I3

A.8 EntitlementTypeCode

A code identifying the nature of an entitlement. These are attributes of the relationship between the holder and the contract that lead to discount percentages and/or benefits.

```
EntitlementTypeCode ::= ENUMERATED {
        no-entitlement              (0),
        warrant                     (1),
        limited-free-ride           (2),
        proportional-fare           (3),
        flat-fare-discount          (4),
        flat-fare                   (5),
        charge-to-account           (6),
        subscription                (7),
        frequent-traveller          (8),
        senator                     (9),
        premium                     (10),
        gold-status                 (11),
        silver-status               (12),
        capped-fare                 (13),
        free-travel                 (14),
        half-fare                   (15),
        rfuCEN1                     (15), - not to be used by ITSO implementations,
        rfuCEN2                     (16),
        rfuCEN3                     (17),
        rfuCEN4                     (18),
        rfuCEN5                     (19),
        rfuCEN6                     (20),
        rfuCEN7                     (21),
        rfuCEN8                     (22),
        rfuCEN9                     (23),
        networkIdSpecific1          (24),
        networkIdSpecific2          (25),
        networkIdSpecific3          (26),
        networkIdSpecific4          (27),
        networkIdSpecific5          (28),
        networkIdSpecific6          (29),
        networkIdSpecific7          (30),
        networkIdSpecific8          (31)
}
```

Note that two values are assigned to code 15 in EN1545. Users should ignore the second value for ITSO implementations.

A.9 Forename

Forename is the forename (given name) or forenames of a person

Forename ::= Name

A.10 HalfDayOfWeek

HalfDayOfWeek is a pointer to an entry in a table, held within the CAD and defined in the network, which indicates a period of a day in the week during which information, a contract, a product or a Ticket is valid or not valid.

HalfDayOfWeek ::= BIT STRING (SIZE (16))

The bits are coded each to represent a day. A bit value ‘1’B signifies that the corresponding day is selected. Multiple bits indicate multiple day selection.

‘abcdefghijklmnop’B Selected days :

a monday first period,
b Monday second period,
c Tuesday first period,
d Tuesday second period,
e Wednesday first period,
f Wednesday second period,
g Thursday first period,
h Thursday second period,
i Friday first period,
j Friday second period,
k Saturday first period,
l Saturday second period,
m Sunday first period,
n Sunday second period,
o Special day first period,
p Special day second period,

first and second periods are network specific, special days are network specific

A.11 HolderName = HolderName

The name of the person who is recognised as being the holder within the Application.

HolderName ::= SEQUENCE {

holderSurname	Surname,
holderForename	Forename

}

holderSurname is the surname (family name) of the holder, in the case where the holder is a person. This surname should not include titles.

holderForename is the forename (given name) or forenames of the holder.

A.12 MOP = PaymentMeansCode

The means by which the payment is effected.

PaymentMeansCode ::= BIT STRING (SIZE(5))

mmmm Payment means (5 bits) :

'00000'	Unspecified
'00001'	Cash
'00010'	Cheque
'00011'	Credit-Debit-card
'00100'	IEP

'00101'	CTA
'00110'	Direct-Debit-offline
'00111'	Invoicing
'01000'	Stored-Travel-Rights
'01001'	Loyalty-redemption
'01010'	Token
'01011'	Membership benefit
'01100'	Auto-Renew
'01101'	Warrant
'01110'	Voucher
’11111’	Traveller-cheque
‘10000’	Cheque-vacances
‘10001’	Direct-Debit-Online
‘10011’ – ‘10111’	rfuCEN
‘11000’ – ‘11111’	networkIDSpecific

There are only 4 bits available in ITSO for this code and therefore ITSO implementations shall only use those codes that start with a zero (0) ignoring the first zero (0) in the string. Assignments starting with a 1 in the above table, i.e. codes 10000 to 11111 inclusive, shall not be used in ITSO implementations as they cannot be stored in the relevant data elements.

A.13 JourneyTypeCode

A code indicating the type of journey defined in a travel contract.

JourneyTypeCode ::= ENUMERATED {

unspecified	(0),
single	(1),
return	(2),
circular	(3),
rfuCEN1	(4),
rfuCEN2	(5),
networkIdSpecific1	(6),
networkIdSpecific2	(7)

}

The data elements that use this code only provide 2 bits of storage so codes 4 to 7 inclusive shall not be used. Since these currently are undefined this is not an issue.

A.14 Name

Data type to serve the identification of a person, a location, an equipment, etc…, as defined in ISO/IEC 7816-6

Name ::= UTF8String (SIZE(0..39))

Authors note on application in ITSO. ITSO text strings (type ASCII) are stored in US ASCII, which is allowable within the UTF8 definition. This coding should be used here.

A.15 ProfileCode & ConcessionaryClass = ProfileCodeIOP

Code classifying the customer according to certain criteria. This profile may be used to determine price calculation. Classes may describe the customer (e.g. student) but may also directly refer to the price reduction percentage (e.g. 25%) applying to the customer.

It is recommended that the Adult(1) & Child(2) codes are not used. The distinction between adult and child should be based upon date of birth." {we have left the codes in the list for reasons of backwards compatibility with ENV1545-1}.

ProfileCodeIOP ::= INTM

--unspecified	(0),
--adult	(1),
--child	(2),
--student	(3),
--pensioner	(4),
--disabledNotfurtherspecified	(5),
--disabledVisuallyImpaired	(6),
--disabledHearingImpaired	(7),
--unemployed	(8),
--staff	(9),
--military	(10),
--resident	(11),
--industrialOwnedHaulage	(12),
--busTransportCompany	(13),
--longDistanceTransport	(14),
--localTransport	(15),
--commuter	(16),
--chargeableAnimal	(17),
--chargeableObject	(18),
--scholar	(19),
--trainee	(20),
--police	(21),
--motorbike	(22),
--pushbike	(23),
--perambulator-without-child	(24),
--senior	(25),
--rfuCEN	(26 .. 63)

A.17 ReferenceIdentifier

A character string to identify a unique object (e.g. : contract, receipt, event, …). The string is unique within a specified system of reference.

ReferenceIdentifier {INTEGER : referenceIdentifierRange } ::= OCTET STRING (SIZE (referenceIdentifierRange))

A.18 Surname

Surname is the surname (family name) of a person

Surname ::= Name

A.19 TIME = TimeStamp

Number of minutes after midnight, where midnight is time 0.

TimeStamp ::= BIT STRING (SIZE(11))

Value Assignment : 'mmmmmmmmmmm'B (11 bits)

A.20 TransactionType = EventTypeCode

```
EventTypeCode ::= ENUMERATED {
        not-specified                                (0),
        sale                                         (1),
        validation-outward-journey-if-return-ticket  (2),
        undo-previous-event-without-refund           (3),
        str-load                                     (4),
        str-autoload                                 (5),
        validation-return-journey                    (6),
        str-debit                                    (7),
        exchange                                     (8),
        redeem-loyalty-points                        (9),
        undo-previous-event-with-refund              (10),
        check-in                                     (11),
        check-out                                    (12),
        activate-stored-ticket                       (13),
        record-of-multiple-leg-journey               (14),
        cta-payment-received                         (15),
        check-in-transfer                            (16),
        be-in-transfer                               (17),
        user-modification                            (18),
        consumed                                     (19),
        marked-as-blocked                            (20),
        undo-blocking                                (21),
        be-in                                        (22),
        be-out                                       (23),
        interruption                                 (24),
        refund-authorised                            (25),
        rfuCEN1                                      (26),
        rfuCEN2                                      (27),
        rfuCEN3                                      (28),
        networkIdSpecific1                           (29),
        networkIdSpecific2                           (30),
        networkIdSpecific3                           (31)
}
```

Explanations of the codes:

- Validation means that the contract is marked as in use by time stamping. Validity checks may be made as a part of this process.

- Consumed means that the contract is marked as in use or has been used and shall not be used again.

- Undo-validation means to reverse the validation process to re-instate the contract (e.g. if after validation the service cannot be provided)

- Interruption indicates that the service was only partially provided.

- Exchange means change of service elements (such as reservations) without changing the terms of the underlaying contract

A.21 VALC = PayUnitMap

A space saving mapping to a currency code definition held in the card accepting device, which may be used as an alternative to Currency. The Currency code definition is subservient to IIN or Networkid and is on 2 bits, and two bits define scaling factor.

PayUnitMap: = BIT STRING (SIZE(4))

Bit	3	2	1	0
Code Bit	Bit 3	Bit 2	Bit 1	Bit 0

A.21.1 Definition of Currency code, bits 0 and 1:

#	Bit 1	Bit 0	Currency definition	***As an EXAMPLE: Currency definition where IIN / Networkid denotes ITSO***
0	0	0	local currency according to IIN / Networkid	*£ Sterling, base unit shall be £0.01*
1	0	1	Global currency according to IIN / Networkid	*Euro, base unit shall be ∈0.01*
2	1	0	Tokens defined according to IIN / Networkid	*ITSO defined Tokens*
3	1	1	Product owner defined tokens (could be used for a third currency)	*IPE owner defined tokens*

A.21.2 Definition of Scaling factor, bits 2 and 3:

#	Bit 3	Bit 2	Scaling factor
0	0	0	X1
1	0	1	X10
2	1	0	X100
3	1	1	X1000

The scaling factor shall be multiplied by the value register to which the currency code definition applies for the purposes of determining the true value represented by the value register.

A.22 SeatPositionCode = SeatPositionCode

To identify the position of the passenger seat with respect to the direction of travel.

```
SeatPositionCode ::= ENUMERATED {

        not-specified                   (0),
        facing direction of travel      (1),
        back to direction of travel     (2),
        airline                         (3), --(fixed position)
        facing-right                    (4), --relative to direction of travel
        facing-left                     (5), --relative to direction of travel
        rfuCEN                          (6),
        networkIdspecific               (7),
        }
```

The data elements used by ITSO only provide 2 bits of storage. Codes 4 to 7 inclusive shall not be used.

A.23 Assistance Type Code

Code defining the service provided by service provider staff.

```
AssistanceTypeCode ::= ENUMERATED {
        unspecified                             (0),
        assist-wheelchair-user                  (1),
        assist-visually-impaired-person         (2),
        assist-hearing-impaired-person          (3),
        assist-mobility-impaired-person         (4),    -- without wheelchair
        assist-persons-accompanied-by-infants   (5),
        assist-unaccompanied-minor              (6),
        assist-mentally-handicapped-person      (7),
        rfuCEN1                                 (8),
        rfuCEN2                                 (9),
        rfuCEN3                                 (10),
        rfuCEN4                                 (11),
        networkIdSpecific1                      (12),
        networkIdSpecific2                      (13),
        networkIdSpecific3                      (14),
        networkIdSpecific4                      (15)
}
```