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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 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.

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

For the purposes of interoperability:

- All data elements defined in this Part 5 shall be used interoperable 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, where applicable, are compatible with the EN1545 and IOPTA standards.

2. ITSO Product Entities (IPEs)

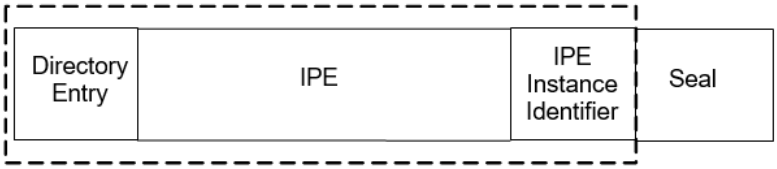
2.1 Introduction.

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 (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 IPE Data Groups.

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.

IPE Data Groups 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.

2.1.6 IPE Format Revisions

For this version of the Specification, devices which support any IPE TYP which has multiple values for the data element IPEFormatRevision (IFR) defined, shall only be considered compliant if all defined values of IFR in this version of the Specification (and therefore variants of the IPE) are fully supported. Where more than one IPE variant exists, support for a single variant of that IPE shall not be deemed acceptable.

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 the value of (IPEFormatRevision + 8), that is 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 except by the Product Owner or their authorised representative.
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.
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.

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
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	RFU	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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1
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
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.

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
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 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 - TYP 2 Flags 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 - TYP 2 ValueFlags 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 been 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Top-Up.
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 the value of (IPEFormatRevision + 8), that is 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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
			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 the value of (IPEFormatRevision + 8), that is to 9. The block size BL used for this version of this IPE shall be 4 bytes.

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

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 except by the Product Owner or their authorised representative.
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.
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						not be used.
TransactionSequenceNumber	2.5	TS#	1.5		V	Defined in ITSO TS 1000-2
DateTimeStamp	4	DTS	3	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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	
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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 - TYP 4 Flags 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 - TYP 4 ValueFlags 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 been 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 It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before loading this Product.

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 the value of (IPEFormatRevision + 8), that is 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 except by the Product Owner or their authorised representative.
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.
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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.
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 - TYP 5 Flags 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 - TYP 5 ValueFlags 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 been 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.

   Value adjustment in the IPE shall take place automatically, as follows. 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, following which a 0112 message shall be created and transmitted.

   Sales transactions shall not be allowed if CountOfTransactions exceeds QuantityTransactions.

1. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before loading this Product.
2. 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.

It may be used alone or in conjunction with a TYP 16 IPE where such entitlement cannot be recorded solely in a TYP 16 IPE. Local scheme rules shall determine if the presence of a TYP 14 and TYP 16 is required.

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.

Format Revision 1 is deprecated in this version of the Specification. References to this Format Revision will be removed from the next version of the Specification and is retained only for purposes of backwards compatibility.

No devices compliant to this version of the Specification shall issue TYP14 IPEs to IFR=1 but shall continue to accept them for backwards compatibility.

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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
CPICC	3	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
IDFlags	5	BMP	1	Flag	IPE	Refer to Table 24 (see clause 2.7.1.2).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						fare shall be rounded down.
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	Last date of validity[3] of a specific entitlement.
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 [EN1545-1] EntitlementTypeCode.
ConcessionaryClass	19	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to [EN1545-1] ProfileCodeIOP
SecondaryHolderID	20	HEX	4	HolderID	IPE O	Identifies a secondary person who is entitled to the products benefits subject to the

[3] For example, the day before the date when a scholar becomes an “adult”.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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

Bit	Data Element
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.

2.6.2 IPE Format Revision = 2

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 two (2). The block size BL used for this version of this IPE shall be 4 bytes.

All implementations compliant to this version of the Specification shall use this Format Revision.

2.6.2.1 IPE Data Group

Table 20a, 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
CPICC	3	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
IDFlags	5	BMP	1	Flag	IPE	Refer to Table 24 (see clause 2.7.1.2).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						fare shall be rounded down.
RoundingValueFlag	11.125	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).
EntitlementStartDate	11.25	DATE	1.75	StartDateStamp	IPE	Start date of validity of a specific entitlement
EntitlementExpiryDate	13	DATE	1.75	EndDateStamp	IPE	Last date of validity[4] of a specific entitlement.
RFU	14.75	RFU	0.75		IPE	
DepositCurrencyCode	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)
DepositMethodOfPayment	16	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	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)
DepositAmount	18	VALI	2	Deposit	IPE	Amount of deposit or charge paid for the IPE.
EntitlementCode	20	HEX	1	EntitlementTypeCode	IPE	Entitlement code according to [EN1545-1] EntitlementTypeCode.
ConcessionaryClass	21	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to [EN1545-1] ProfileCodeIOP
SecondaryHolderID	22	HEX	4	HolderID	IPE O	Identifies a secondary person who is entitled to the products

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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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	26	BMP	2	HalfDayOfWeek	IPE O	Defines AM/PM and Day of Week validity
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 trip)
Padding	62	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	62	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.

2.6.2.1.1 IPEBitMap Definitions

Table 21a - 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

2.6.2.2 IDFlags Definition

IDFlags are defined in 2.7.2.2.

2.6.2.3 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.

Format Revision 1 is deprecated in this version of the Specification. References to this Format Revision will be removed from the next version of the Specification and is retained only for purposes of backwards compatibility.

No devices compliant to this version of the Specification shall issue TYP16 IPEs to IFR=1 but shall continue to accept them for backwards compatibility.

[5] The terminal may find URI information in an ITSO Private Application (to be defined) or as defined in ISO/IEC 12905 (i.e. in an eURI ISO application selected by the eURI AID).

2.7.1.1 IPE Data Group

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 this IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed except by the Product Owner or their authorised representative.
CPICC	3	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owners discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
IDFlags	5	BMP	1		IPE	Refer to Table 24 (see clause 2.7.1.2).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
						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 data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
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 EN1545 LanguageCode. This data element shall be ignored if Idflag 3 is set to one (1).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
						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	Last date of validity[6] of a specific entitlement.
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)
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)

[6] For example, the day before the date when a scholar becomes an “adult”.

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
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[7]
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 0302 and 0303 data messages appropriate to the ITSO shell deposit, in addition to the 0200 and 0201 TYP 16 IPE data messages
EntitlementCode	27	HEX	1	EntitlementTypeCode	IPE	Entitlement code according to [EN1545-1] EntitlementTypeCode.
ConcessionaryClass	28	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to [EN1545-1] 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

[7] 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
						stored here.
Forename	34	ASCII	39	Forename	IPE O	Holder's Forename according to [EN1545-1]. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
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 [EN1545-1]. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
HalfDayOfWeek	113	BMP	2	HalfDayOfWeek	IPE O	Defines AM/PM and Day of Week validity
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 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.

2.7.1.1.1 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. The Gender1 and Gender2 Flag IDs are represented by a single data element in ITSO TS 1000-6 Clause 8 IPE Embodiment Parameters.
2	Gender2	
3	URI	When set to one (1), the POST shall read the URI information within the customer media, 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[8] 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

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

Flag ID	Flag name	Flag purpose
		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 Operational rules.

None defined.

2.7.2 IPE Format Revision = 2

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 two (2). The block size BL used for this version of this IPE shall be 4 bytes.

All implementations compliant to this version of the Specification shall use this Format Revision.

2.7.2.1 IPE Data Group

Table 22a - 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 this IPE, the remove date shall always be programmed with 255, indicating that the IPE may not be removed except by the Product Owner or their authorised representative.
CPICC	3	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
						for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owners discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
IDFlags	5	BMP	1		IPE	Refer to Table 24 (see clause 2.7.1.2).
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 data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
						EN1545 LanguageCode. This data element shall be ignored if Idflag 3 is set to one (1).
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).
EntitlementStartDate	16.25	DATE	1.75	StartDateStamp	IPE	Start date of validity of a specific entitlement.
EntitlementExpiryDate	18	DATE	1.75	EndDateStamp	IPE	Last date of validity[9] of a specific entitlement.
RFU	19.75	RFU	0.25	RFU	IPE	
DepositMethodOfPayment	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

[9] For example, the day before the date when a scholar becomes an "adult".

ITSO Name	Offset	Data Type	Size bytes	EN1545 equivalent	Group	Comment
						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	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)
ShellDepositMethodOfPayment	22	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	22.5	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	24	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	24.5	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	25	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[10]
ShellDeposit	27	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

[10] 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
						shall be reported using the 0302 and 0303 data messages appropriate to the ITSO shell deposit, in addition to the 0200 and 0201 TYP 16 IPE data messages
EntitlementCode	29	HEX	1	EntitlementTypeCode	IPE	Entitlement code according to [EN1545-1] EntitlementTypeCode.
ConcessionaryClass	30	HEX	1	ProfileCodeIOP	IPE	Concessionary class code according to [EN1545-1] ProfileCodeIOP
SecondaryHolderID	31	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	35	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 [EN1545-1]. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
SurnameLength	75	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	76	ASCII	39	Surname	IPE O	Holder's name according to EN1545. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
HalfDayOfWeek	115	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	117	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	134	LOC1	Variable, maximum 17	Destination	IPE O	Destination location code (or origin for return trip)
Padding	151	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	151	IIN	3	NetworkID	IPE O	Issuer Identification Number
			154			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.

2.7.2.1.1 IPEBitMap Definitions

Table 23a - 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.

2.7.2.2 IDFlags Definition

Table 24a - 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. The Gender1 and Gender2 Flag IDs are represented by a single data element in ITSO TS 1000-6 Clause 8 IPE Embodiment Parameters. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
2	Gender2	
3	URI	When set to one (1), the POST shall read the URI information within the customer media, 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[11] 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.

2.7.2.3 Operational Rules

None defined.

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

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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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 an 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 the value of (IPEFormatRevision + 8), that is 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST,

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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.
ExpiryTime	9.75	TIME	1.375	EndTimeStamp	IPE	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
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 [EN1545-1] 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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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
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)
CPICC	26	HEX	2	AccountingReference	IPE O	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall containt the relecant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g the identity

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						of a TCA, educational establishment or education authority, or to provide an addtional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value 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.
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	CPICC 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

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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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
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 TYP22Flags definitions

Table 30 - TYP 22 Flags 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[12]
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 special days (e.g. public holidays)

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

2.9.1.4 Operational rules.

1. When in Stored Tickets mode: 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.
4. A Stored Ticket (pass) shall be used when the current Ticket (pass) whose expiry date is stored in the value group of the IPE is found to be invalid by the POST (by reference to ExpiryDateCurrent, ExpiryTime and

[12] 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.

Ticketing Date), the Stored Ticket (Passes) flag is set to one (1), and the NumberRemainingPasses is greater than zero. ExpiryDateCurrent shall be recalculated as Ticketing Date plus the number of days defined by PassDuration, less one (1). 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.
7. Handling day type validity. For an IPE instance to be valid, then both the ValidOnDayCode element relating to today's day type, and the TYP22Flags element relating to today's day type and time of day, shall be true (i.e. set to 1).

2.9.2 IPE Format Revision = 2

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 two (2), and the value of the VGFormatRevision data element shall be set to the value of (IPEFormatRevision + 8), that is to 10. The block size BL used for this version of this IPE shall be 4 bytes.

2.9.2.1 IPE Data Group

Table 27a - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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			

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	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.
IssueDate	8	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
ExpiryTime	9.75	TIME	1.375	EndTimeStamp	IPE	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
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 [EN1545-1] 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	

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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	4	Amount	IPE	Actual amount paid
AmountPaidMethodOfPayment	26	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	26.5	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)
CPICC	28	HEX	2	AccountingReference	IPE O	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
PassDuration	30	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.
RouteCode	31	UD	5		IPE O	Pad with 0x00's to a whole number of bytes where necessary, if unused set to zero.
ValidAtOrFrom	36	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. If not used set this element to the Null LocDefType.
ValidTo	53	LOC1	Variable, Maximum 17	Destination	IPE O	Destination location code (or origin for return trips). If not used set this element to the Null LocDefType.
Padding	70	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	70	IIN	3	NetworkID	IPE O	Issuer Identification Number
			73			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.

2.9.2.1.1 IPEBitMap Definition

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

Table 28a - TYP 22 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	ValidAtOrFrom, ValidTo and RouteCode data elements present
2	RFU
3	PassDuration data element present
4	CPICC data element present
5 (most significant)	RFU. This bit is reserved to indicate the presence of a secondary bit map, which will only be specified, in a future format revision, in the event that all the bits in this bit map are utilised.

2.9.2.2 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.
- 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 29a.

Table 29a - 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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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
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.

2.9.2.3 TYP22Flags definitions

Table 30a - TYP 22 Flags 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[13]
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 special days (e.g. public holidays)

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

2.9.2.4 Operational rules

1. When in Stored Tickets mode: 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.
4. A Stored Ticket (pass) shall be used when the current Ticket (pass) whose expiry date is stored in the value group of the IPE is found to be invalid by the POST (by reference to ExpiryDateCurrent, EXpiryTime and Ticketing Date), the Stored Ticket (Passes) flag is set to one (1), and the NumberRemainingPasses is greater than zero. ExpiryDateCurrent shall be recalculated as the Ticketing Date plus the number of days defined by PassDuration, less one (1). NumberRemainingPasses shall be decremented by 1.

[13] 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.

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.
7. Handling day type validity. For an IPE instance to be valid, then both the ValidOnDayCode element relating to today's day type, and the TYP22Flags element relating to today's day type and time of day, shall be true (i.e. set to 1).

2.9.3 IPE Format Revision = 3

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 three (3), and the value of the VGFormatRevision data element shall be set to the value of (IPEFormatRevision + 8), that is to 11. The block size BL used for this version of this IPE shall be 4 bytes.

2.9.3.1 IPE Data Group

Table 3.27 - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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 3.30
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.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IssueDate	8	DATE	1.75	DateStamp	IPE	Date of IPE issue. The IPE shall not be used prior to the Issue Date.
ExpiryTime	9.75	TIME	1.375	EndTimeStamp	IPE	Expiry time, on the day defined by expiry date. IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
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 [EN1545-1] 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.
RFU	13	RFU	0.25		IPE	
ValidityStartDate	13.25	DATE	1.75		IPE	The date upon which ticket validity commences.
RFU	15	RFU	0.625		IPE	
ValidityStartTime	15.625	TIME	1.375		IPE	The time at which ticket validity commences.
PromotionCode	17	UD	1		IPE	An IPE owner defined data element
ValidOnDayCode	18	DOW	1	DAYOFWEEK	IPE	Defines days of the week upon which the IPE is valid
PartySizeAdult	19	HEX	1	NumberOfAdults	IPE	
PartySizeChild	20	HEX	1	NumberOfChildren	IPE	

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
PartySizeConcession	21	HEX	1		IPE	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
RFU	22	RFU	0.5		IPE	
AmountPaidCurrencyCode	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)
AmountPaid	23	VALI	4	Amount	IPE	Actual amount paid
AmountPaidMethodOfPayment	27	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	27.5	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)
CPICC	29	HEX	2	AccountingReference	IPE O	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
PassDurationCode	31	HEX	0.5		IPE O	Refer to Table 3.30a

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
PassDuration	31.5	HEX	1.5	ValidityDuration	IPE O	Duration of pass, defined as multiple of days, months, quarters of years, as defined in PassDurationCode. 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.
ExpiryDateSPDuration	33	HEX	2		IPE O	A quantity of days, which shall be used to define a new value of ExpiryDateSP during an Auto-Renew transaction. The content of this data element shall be added to the current date to determine the new value of ExpiryDateSP.
RouteCode	35	UD	5		IPE O	Pad with 0x00's to a whole number of bytes where necessary, if unused set to zero.
ValidAtOrFrom	40	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. If not used set this element to the Null LocDefType.
ValidTo	57	LOC1	Variable, Maximum 17	Destination	IPE O	Destination location code (or origin for return trips). If not used set this element to the Null LocDefType.
IdentityDocumentIDType	72	HEX	0.375		IPE O	Identifies the data format of IdentityDocumentID according to the following code list: -Zero (0) is not used and reserved for future use; -One (1) indicates that IdentityDocumentID contains a HEX value; -Two (2) indicates that IdentityDocumentID contains an ASCII value; -Three (3) indicates that IdentityDocumentID contains a HEX pointer to an IPE directory entry (by entry number); -Four (4) to Seven (7) are reserved for future use.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
IdentityDocumentIDLength	72.375	HEX	0.625		IPE O	The length of the IdentityDocumentID data element, in bytes, up to a maximum of 31 bytes.
IdentityDocumentID	73	see comment	Variable, maximum 31	IdentityDocumentID	IPE O	Corresponding identity document reference formatted according to IdentityDocumentIDType.
Padding	74	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	74	IIN	3	NetworkID	IPE O	Issuer Identification Number
			77			Maximum 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.

2.9.3.1.1 IPEBitMap Definition

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

Table 3.28 - TYP 22 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	ValidAtOrFrom, ValidTo and RouteCode data elements present
2	IdentityDocumentID data elements present
3	PassDurationCode, PassDuration and ExpiryDateSPDuration data elements present
4	CPICC data element present
5 (most significant)	RFU. This bit is reserved to indicate the presence of a secondary bit map, which will only be specified, in a future format revision, in the event that all the bits in this bit map are utilised.

2.9.3.2 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

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 3.29.

Table 3.29 - 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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1
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. unactivated passes enumerated by NumberRemainingPasses). In cases where stored passes are not required to expire then this data element shall contain a value equal to the IPE Expiry Date (EXP).
ExpiryDateCurrent	15.25	DATE	1.75	EndDateStamp	V	Expiry date of the current active pass
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.

2.9.3.3 TYP22Flags definitions

Table 3.30 - TYP 22 Flags 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	TreatmentOfExpiredSP	When set to zero (0), any expired stored passes shall be deleted during any top up process. When set to one (1) the new additional stored passes shallbe added to NumberRemainingPasses during any top upprocess.
8	OffPeakOnly	Set to one (1) if Ticket valid off-peak only[14]
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.

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

Flag ID	Flag name	Flag purpose
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 special days (e.g. public holidays)

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

2.9.3.3.1 PassDurationCode definitions

Table 3.30a PassDurationCode Definitions

Code	Meaning	PassDuration units
0	Days	PassDuration defined in days
1	Months	PassDuration defined in months
2	Quarter	PassDuration defined in quarters
3	Annual	PassDuration defined in years
4-7	RFU	

Definition of terms used in PassDurationCode

Month = Passes are valid from the day of activation* until the end of the Ticket Validity Period on the day preceding the corresponding day in the following month. For example, a pass activated on the 15th March, will be valid until, and including the 14th April.

Quarter = Passes are valid from the day of activation* until the end of the Ticket Validity Period on the day preceding the corresponding day in the 3rd month. For example, a pass activated on the 15th March, will be valid until, and including the 14th June.

Annual = Passes are valid from the day of activation* until the end of the Ticket Validity Period on the day preceding the corresponding day in the following year. For example, a pass activated on the 15th March, will be valid until, and including the 14th March in the following year.

In these definitions it should be noted that the “end of the Ticket Validity Period” may not be midnight, but may fall before or after midnight on the last day of validity, as defined by ExpiryTime or by POST configuration.

*The day on which a pass becomes valid. This may be the day of purchase for pass types which are valid from the point of purchase, or may be the day on which a stored pass is activated.

2.9.3.4 Operational rules

1. When in Stored Tickets mode: 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. If a Ticket purchase or activation operation would cause these rules to be broken then the operation shall not take place.

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 all Stored Tickets have been consumed, or 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.

4. A Stored Ticket (pass) shall be used (activated) when the current Ticket (pass) whose expiry date is stored in the value group of the IPE is found to be invalid by the POST (by reference to ExpiryDateCurrent and ExpiryTime), the Stored Ticket (Passes) flag is set to one (1), and the NumberRemainingPasses is greater than zero. A new Value of ExpiryDateCurrent shall be determined using the values contained in PassDurationCode and PassDuration, as follows:

   - If PassDurationCode = zero (0) (days) then ExpiryDateCurrent shall be recalculated as the current Ticketing Date plus the number of days defined by PassDuration, less one (1);
   - If PassDurationCode equals one (1) (months), then ExpiryDateCurrent shall be recalculated so as to give the pass holder a quantity of months' validity, as defined above under "Definition of terms used in PassDurationCode", where the quantity of months is defined by PassDuration;
   - If PassDurationCode equals two (2) (quarters), then ExpiryDateCurrent shall be recalculated so as to give the pass holder the quantity of quarter year periods of validity, as defined above under "Definition of terms used in PassDurationCode", where the quantity of quarters is defined by PassDuration;
   - If PassDurationCode equals three (3) (years), then ExpiryDateCurrent shall be recalculated so as to give the pass holder the quantity of years validity, as defined above under "Definition of terms used in PassDurationCode", where the quantity of years is defined by PassDuration;

   If PassDurationCode does not equal zero, and if the calculation gives an invalid date (e.g. The 30th February), then the preceding valid date shall be used (e.g. the 28th (or 29th in a leap year) of February).

5. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew. When recording customers personal data, Licensed Members must ensure that they comply with their responsibilities under the General Data Protection Regulation (GDPR).

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.

7. Handling day type validity. For an IPE instance to be valid, then both the ValidOnDayCode element relating to today's day type, and the TYP22Flags element relating to today's day type and time of day, shall be true (i.e. set to 1).

8. When a pass is topped up by adding additional stored passes, in circumstances where the IPE contains expired stored passes (i.e. ExpiryDateSP contains a date in the past), then the expired stored passes shall be dealt with as described below:

   a. Adding the quantity of additional stored passes, less the quantity of expired passes, to NumberRemainingPasses when the TreatmentOfExpiredSP flag is set to zero (0); or
   b. By adding the quantity of additional stored passes to NumberRemainingPasses when the TreatmentOfExpiredSP flag is set to one (1).

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 an 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 the value of (IPEFormatRevision + 8), that is 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative..
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.
ValidityCode	9	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.
ExpiryTime	9.625	TIME	1.375	EndTimeStamp	IPE	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
RFU	11	RFU	0.625		IPE	
Class	11.625	HEX	0.375	AccommodationClassCode	IPE	Coded according to [EN1545-1] 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	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	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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						element
CPICC	25	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
RFU	27	RFU	0.5		IPE O	This element is included if the TYP23Mode element is included.
TYP23Mode	27.5	HEX	0.5		IPE O	IPE operating Mode, see Table 35
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	This element is included if the ValueOfRideJourneyCurrencyCode element is included.
ValueOfRideJourneyCurrencyCode	32.5	VALC	0.5	PayUnitMap	IPE O	
Origin1	33	LOC1	Variable, max size	Origin	IPE O	Journey origin, or destination for reverse direction journeys where

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
			17			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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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	RFU	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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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 - TYP 23 Flags 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[15].
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 - TYP 23 Mode 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

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

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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.
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.

2.10.2 IPE Format Revision = 2

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 two (2), and the value of the VGFormatRevision data element shall be set to the value of (IPEFormatRevision + 8), that is to 10. The block size BL used for this version of this IPE shall be 4 bytes.

2.10.2.1 IPE Data Group

Table 31a - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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 34a
RFU	6	RFU	0.25			

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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.
ValidityCode	9	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.
ExpiryTime	9.625	TIME	1.375	EndTimeStamp	IPE	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
RFU	11	RFU	0.625		IPE	
Class	11.625	HEX	0.375	AccommodationClassCode	IPE	Coded according to [EN1545-1] 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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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	4	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)
PhotocardNumber	22	UD	4	IdentityDocumentID	IPE	Number of corresponding Transport photocard
PromotionCode	26	UD	1		IPE	An IPE owner defined data element

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
CPICC	27	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or education authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
RFU	29	RFU	0.5		IPE O	Include this data element if the TYP23Mode element is included.
TYP23Mode	29.5	HEX	0.5		IPE O	IPE operating Mode, see Table 35a
MaxTransfers	30	HEX	1	InterchangesAllowed	IPE O	Defines the maximum number of transfers allowable in a single journey
TimeLimit	31	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	32	VALI	2	Amount	IPE O	Nominal Value of one ride or journey

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
RFU	34	RFU	0.5		IPE O	Include this data element if the ValueOfRideJourneyCurrencyCode element is included.
ValueOfRideJourneyCurrencyCode	34.5	VALC	0.5	PayUnitMap	IPE O	
RouteCode	35	UD	5		IPE O	Pad with 0x00's to a whole number of bytes where necessary, if unused set to zero (0).
Origin1	40	LOC1	Variable, max size 17	Origin	IPE O	Journey origin, or destination for reverse direction journeys where these are allowed. If not used set this element to the Null LocDefType.
Destination1	57	LOC1	Variable, max size 17	Destination	IPE O	Journey destination, or origin for reverse direction journeys where these are allowed. If not used set this element to the Null LocDefType.
Padding	74	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	74	IIN	3	NetworkID	IPE O	Issuer Identification Number
			77			Count of bytes including IIN and other optional data elements

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.

2.10.2.1.1 IPEBitMap Definition

Table 32a - TYP 23 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	Destination1, Origin1 and RouteCode data elements present
2	RFU
3	TYP23Mode, MaxTransfers, TimeLimit, ValueOfRideJourney, optional RFU, ValueOfRideJourneyCurrencyCode data elements present

Bit	Data Element
4	RFU
5 (most significant)	RFU. This bit is reserved to indicate the presence of a secondary bit map, which will only be specified, in a future format revision, in the event that all the bits in this bit map are utilised.

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

2.10.2.2 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 33a.

Table 33a - 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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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	RFU	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.

2.10.2.3 TYP23Flags definitions

Table 34a - TYP 23 Flags 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.[16]

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

Flag ID	Flag name	Flag purpose
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	

2.10.2.4 TYP23Mode definitions

Table 35a - TYP 23 Mode 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

2.10.2.5 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.
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.

2.10.3 IPE Format Revision = 3

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 three (3), and the value of the VGFormatRevision data element shall be set to the value of (IPEFormatRevision + 8), that is to 11. The block size BL used for this version of this IPE shall be 4 bytes.

2.10.3.1 IPE Data Group

Table 31b - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
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 34b
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.
ValidityStartDTS	9	DTS	3	DateTimeStamp	IPE	The IPE shall not be used prior to this date and time.
ValidityCode	12	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.
ExpiryTime	12.625	TIME	1.375	EndTimeStamp	IPE	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
RFU	14	RFU	0.625		IPE	
Class	14.625	HEX	0.375	AccommodationClassCode	IPE	Coded according to [EN1545-1] AccommodationClassCode code list
PartySizeAdult	15	HEX	1	NumberOfAdults	IPE	
PartySizeChild	16	HEX	1	NumberOfChildren	IPE	
PartySizeConcession	17	HEX	1	INTEGER	IPE	The number of concessionary travellers recorded here shall not also be recorded in either PartySizeAdult or PartySizeChild
RFU	18	RFU	0.5		IPE	
AmountPaidCurrencyCode	18.5	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	19	VALI	4	Amount	IPE	Actual amount paid
AmountPaidMethodOfPayment	23	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	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)
PhotocardNumber	25	UD	4	IdentityDocumentID	IPE	Number of corresponding Transport photocard
PromotionCode	29	UD	1		IPE	An IPE owner defined data element
CPICC	30	HEX	2	AccountingReference	IPE	Where used within the Concessionary Pass schemes in England, Scotland and Wales, this data element shall contain

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						the relevant Concessionary Pass Issuer Identity as defined for those schemes. Otherwise this element may be used to store a concessionary pass issuer cost centre, e.g. the identity of a TCA, educational establishment or educational authority, or to provide an additional level of granularity when identifying a commercial ticket type, or for other identification purposes at the product owner's discretion. Where not required by the product owner or the scheme rules, it is not mandatory to store a value in this data element.
AutoRenewQuantity	32	HEX	1	INTEGER	IPE	The quantity of individual rides or journeys added to CountRemainingRidesJourneys during an Auto-Renew event.
RFU	33	RFU	0.5		IPE O	Include this data element if the TYP23Mode element is included.
TYP23Mode	33.5	HEX	0.5		IPE O	IPE operating Mode, see Table 35b
MaxTransfers	34	HEX	1	InterchangesAllowed	IPE O	Defines the maximum number of transfers allowable in a single journey
TimeLimit	35	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	36	VALI	4	Amount	IPE O	Nominal Value of one ride or journey
RFU	40	RFU	0.5		IPE O	Include this data element if the ValueOfRideJourneyCurrencyCode element is included.
ValueOfRideJourneyCurrencyCode	40.5	VALC	0.5	PayUnitMap	IPE O	
RouteCode	41	UD	5		IPE O	Pad with 0x00's to a whole

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						number of bytes where necessary, if unused set to zero (0).
Origin1	46	LOC1	Variable, max size 17	Origin	IPE O	Journey origin, or destination for reverse direction journeys where these are allowed. If not used set this element to the Null LocDefType.
Destination1	Variable	LOC1	Variable, max size 17	Destination	IPE O	Journey destination, or origin for reverse direction journeys where these are allowed. If not used set this element to the Null LocDefType.
Padding	Variable	PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN	Variable	IIN	3	NetworkID	IPE O	Issuer Identification Number
			83			Maximum count of bytes including IIN and other optional data elements.

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.

2.10.3.1.1 IPEBitMap Definition

Table 32b - TYP 23 Bit Map Definition

Bit	Data Element
0 (least significant)	IIN present
1	Destination1, Origin1 and RouteCode data elements present
2	RFU
3	TYP23Mode, MaxTransfers, TimeLimit, ValueOfRideJourney, optional RFU, ValueOfRideJourneyCurrencyCode data elements present
4	RFU
5 (most significant)	RFU. This bit is reserved to indicate the presence of a secondary bit map, which will only be specified, in a future format revision, in the event that all the bits in this bit map are utilised.

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

2.10.3.2 Optional Value Record Data Group

Table 33b - 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	
TransactionType	2	HEX	0.5	EventTypeCode	V	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] 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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1
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	RFU	0.25		V	

ExpiryDateSRJ	15.25	DATE	1.75	EndDateStamp	V	Expiry date of Stored Rides or Journeys (i.e. unactivated tickets enumerated by CountRemainingRidesJourneys) In cases where stored passes are not required to expire then this data element shall contain a value equal to the IPE Expiry Date (EXP).
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.

2.10.3.3 TYP23Flags definitions

Table 34b - TYP23Flags 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.
6	PrintReceipt	When set to one (1) a Ticket shall be printed, when appropriate, if the POST is capable of this.
7	RFU	

2.10.3.4 TYP23Mode definitions

Table 35b - 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	A return ticket – i.e. discrete pairs of stored journeys. The Ticket may be used, subject to the Return ticket operational rules, 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”.
4 - 15	RFU

2.10.3.5 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). The quantity of individual rides or journeys added shall be defined in AutoRenewQuantity.

2. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.

3. A Return ticket may be implemented by means of creating a value group and setting the TYP23Mode element to a value of three (3):

   a. When a ticket is sold at the commencement of a Journey, when boarding a bus for example, then the process defined in 3.b. and 3.c. below shall be followed, with the 3.c. process following immediately after the 3.b. process

   b. When a ticket is sold in advance of travel, at a travelshop or ticket office for example, then set the value in the CountRemainingRidesJourneys data element to two (2), indicating that the ticket is valid for both outward and return Journey legs

   c. When the outward Journey commences, the value in CountRemainingRidesJourneys shall be decremented by one, and the TransactionType data element shall be set to two (2) indicating that the Value Group record relates to an outward leg of a Return journey

   d. In all cases when the Return Journey commences, the value in CountRemainingRidesJourneys shall be decremented by one, and the TransactionType data element shall be set to six (6) indicating that the Value Group record relates to a return journey leg

4. When a carnet of Return Tickets is required, the processes defined in business rule 3 shall be followed, with the exception that the value stored in CountRemainingRidesJourneys shall be used to indicate the quantity of tickets stored in the carnet, as follows:

   a. When a ticket is sold at the commencement of a Journey then the process defined in 4.b. below shall be followed. This shall be immediately followed by the commencement of journey process

b. When a ticket is sold in advance of travel then set the value in the CountRemainingRidesJourneys data element to the quantity of Return tickets stored in the carnet, multiplied by 2. For example, if the carnet contains 5 return tickets, then the value stored will be 10

5. When a carnet of Return Tickets is issued and each return journey is to be treated as a discrete pair, then if the POST detects that the “current” journey is in the same direction as the previous journey or is not in the correct direction for the value of CountRemainingRidesJourneys or does not correspond with the TransactionType value stored at the previous transaction, then at the discretion of the Product Owner the POST may decrement CountRemainingRidesJourneys by two rides because the missed trip is forfeited

a. The correct direction of travel can be determined by examination of the ValidAtOrFrom and ValidTo data elements where these contain specific origin and destination location data. Note that this process cannot be used where location definition is not specific, e.g. zones, and it is recommended that carnets of single rides, rather than returns, are used in zonal tickets

6. When a value group is used, ExpiryDateSRJ shall not be set to a later date than that contained in EXP

a. When a carnet is topped up by adding additional stored rides, in circumstances where the IPE contains expired stored rides (i.e. ExpiryDateSRJ contains a date in the past), then the expired stored rides shall be removed prior to top up

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 = 2

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 two (2), and the value of the VGFormatRevision data element shall be set to the value of (IPEFormatRevision + 8), that is to 10. The block size BL used for this version of this IPE shall be 4 bytes.

This IPE may be created with only an 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.

The total length of the IPE Data Group must not exceed 256 bytes (this is as a consequence of using a block size of 4).

2.11.1.1 IPE Data Group

Table 136 - TYP 24 IPE Data Group - Format Version 2

ITSO Name	Offset	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

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
RemoveDate	2	RDATE	1	HangoverPeriod	IPE	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative .
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 138.
ProductTypeEncoding	6.5	HEX	0.5	INTEGER	IPE	Binary encoding to determine product type (single, return) 0 = n journeys in one direction. 1 = n journeys where pairs are treated as returns. 2 = n journeys in either direction. 3 – 15 = RFU. See 'NumberOfJourneysSold'.
TicketNumber	7	UD	4	DossierID	IPE	Unique reference number for the ticket. Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
NumberOfAssociatedIPEs	11	HEX	0.25	INTEGER	IPE	Indicates the presence and number of the optional 'Associated IPE reference' data elements.
NumberOfDiscounts	11.25	HEX	0.25	INTEGER	IPE	Indicates the presence and number of the optional 'Discounts' data elements.
NumberOfSupplements	11.5	HEX	0.25	INTEGER	IPE	Indicates the presence and number of the optional 'Supplements' data elements.
NumberOfTransferTypes	11.75	HEX	0.25	INTEGER	IPE	Indicates the presence and number of the optional 'Transfer' data elements.
NumberOfInterchanges	12	HEX	0.375	INTEGER	IPE	Indicates the presence and number of the optional 'Interchange' data elements. (these may be used to record nominated breaks of journey)
NumberOfRestrictionTime Bands	12.375	HEX	0.375	INTEGER	IPE	Indicates the presence and number of the optional 'Restriction time band' data elements.

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
NumberOfVehicleSpecific Restrictions	12.75	HEX	0.375	INTEGER	IPE	Indicates the presence and number of the optional vehicle specific restrictions/easements' data elements.
NumberOfRoutingPoints	13.125	HEX	0.375	INTEGER	IPE	Indicates the presence and number of the optional 'Routing points' data elements.
Class	13.5	HEX	0.375	Accommodation ClassCode	IPE	Accommodation class (1st or std or unknown)
AutoRenewTimeAfterExpiry	13.875	HEX	0.75	INTEGER	IPE	Number of days after expiry of original product that auto-renew still applies
NumberOfJourneysSold	14.625	HEX	1.125	CouponsLoaded	IPE	The interpretation of this field depends on the value of the ProductTypeEncoding field, for example: Value of 'n' in 'ProductTypeEncoding', Where: n=1 for a single n=2 for a return n=10 for a carnet of 10 singles n=60 for a carnet of 30 returns. Note that the list of n= above provides some examples only (i.e. the list is not exhaustive)
OutPortionPeriodOfValidity	15.75	HEX	1.125	INTEGER	IPE	Out portion period of validity in days relative to 'OutPortionValidFrom' - used to define outward portion end of validity.
RtnPortionPeriodOfValidity	16.875	HEX	1.125	INTEGER	IPE	Rtn portion period of validity in days relative to 'RtnPortionValidFrom' - used to define return portion end of validity.
OperatorSpecificity	18	UD	2		IPE	Used to indicate that product is only valid on the services of a specific operator.
FaresTypeOfTicket	20	UD	3		IPE	Fares Type of Ticket (FTOT) code.
PartySizeAdult	23	HEX	1	NumberOfAdults	IPE	Number of adult passengers Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
PartySizeChild	24	HEX	1	NumberOfChildren	IPE	Number of child passengers Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
PartySizeConcession	25	HEX	1	NumberOfC Oncessionary Passengers	IPE	Number of concessionary passengers Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
IdDocumentReference	26	UD	4	IdentityDocumentI D	IPE	To cross reference to an ID document (e.g. non-smart railcard or photocard) Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
Origin	30	LOC1	Variable (17 max)	Origin	IPE	Location of ticket origin (as sold). For validation purposes: on a return ticket, for the out portion, this is the journey origin , on the return portion this field is to be used as the destination. See note 1
Destination	36	LOC1	Variable (17 max)	Destination	IPE	Location of ticket destination (as sold). See note 1
AlternativeOrigin	42	LOC1	Variable (17 max)	Origin	IPE	An alternative Location of ticket origin. See note 1
AlternativeDestination	48	LOC1	Variable (17 max)	Destination	IPE	An alternative Location of ticket destination. See note 1
Route	54	UD	5	RouteID	IPE	UD Route code.
OutPortionValidFrom	59	DTS	3	DateTimeStamp	IPE	Out portion valid from date.
RtnPortionValidFrom	62	DTS	3	DateTimeStamp	IPE	Rtn portion valid from date
RestrictionCode	65	UD	2		IPE	Restriction code.
DaysTravelPermitted	67	DOW	1	DAYSOFWEEK	IPE	Restriction definition - days of week on which product is valid (binary flags for MTWTFSS & Bank Holidays)

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
DaysRestrictionApplies	68	DOW	1	DAYSOFWEEK	IPE	Restriction definition - days of week where restriction applies (binary flags for MTWTFSS & Bank Holidays)
AmountPaidCurrencyCode	69	VALC	0.5	PayUnitMap	IPE	As per item name.
AmountPaidMOP	69.5	MOP	0.5	PaymentsMeansCode	IPE	Method of payment (majority if multiple)
AmountPaid	70	VALI	4	Amount	IPE	Price paid by customer
VendorLoc	74	LOC1	Variable (17 max)		IPE	Location of the ticket vendor See note 1
			80		IPE	Count of bytes for mandatory data elements.
IPEInstanceID	0	HEX	1	INTEGER	AssociatedIPE	Pointer to the directory entry of other IPEs that form part of the total product (one entry per associated IPE)
			1 x Number of Associated IPEs		AssociatedIPE	Count of bytes for this option.
DiscountCode	0	UD	5		Discounts	5 character UD code to identify discount.
DiscountAmount	5	VALI	4		Discounts	Value in base units e.g. pence. Set to zero if 'DiscountPercentage' is populated.
DiscountPercentage	9	HEX	1.25		Discounts	Specified to 1 decimal place (e.g. 33.3% = 333). Set to zero if 'DiscountAmount' is populated
DiscountCodeType	10.5	UD	0.625		Discounts	Type of discount code.
RFU	10.875	RFU	0.125		Discounts	
			11 x Number Of Discounts		Discounts	Count of bytes for this option.

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
AssociatedSupplementCode	0	ASCII	3		Supplement	UD Supplement Code.
			3 x Number Of Supplements		Supplement	Count of bytes for this option
OutOfLocationInterchangeExit	0	LOC1	Variable (17 max)		Interchange	Location where an interchange exit may be required for the journey (may be used for nominated break of journey) See note 1
OutOfLocationInterchangeEntry	6	LOC1	Variable (17 max)		Interchange	Location where an interchange entry may be required for the journey (may be same as Interchange exit location) See note 1
PermittedInterchangeTime	12	HEX	0.75		Interchange	Permitted interchange time - number of minutes.
RFU	12.75	RFU	0.25		Interchange	
			13 x Number Of Interchanges		Interchange	Count of bytes for this option
TransferEntitlementType	0	HEX	1		Transfers	Encoded transfer entitlement.
NumberOfTransfers	1	HEX	1.125	INTEGER	Transfers	Number of permitted transfers of type defined in 'TransferEntitlementType'.
RFU	2.125	RFU	0.125		Transfers	
ExtendedValidityPeriod	2.25	HEX	0.75	INTEGER	Transfers	POV that transfer is valid for after end of main product validity - number of hours.
			3 x Number Of Transfer Types		Transfers	Count of bytes for this option
OperatorApplicability	0	UD	2		Restriction1	UD Operator code to which the restriction time band applies

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
SpecificLocationApplicability	2	LOC1	Variable (17 max)		Restriction1	Specific Origin or Destination location to which the restriction time band applies. See note 1
TimeBandOnOutOrReturn	8	BMP	0.25		Restriction1	Used to indicate if associated time band applies to the outward or return journey or both
TimeBandStart	8.25	TIME	1.375	TimeStamp	Restriction1	Restriction definition - start time of time band
TimeBandEnd	9.625	TIME	1.375	TimeStamp	Restriction1	Restriction definition – end time of time band
TimeBandOnArriveOrDepart	11	FLAG	0.125		Restriction1	Restriction definition - defines whether time band restriction applies to departure or arrival
TimeBandIncludeExcludeFlag	11.125	FLAG	0.125		Restriction1	Restriction definition - defines whether the product is valid or not within the time band
RFU	11.25	RFU	0.75		Restriction1	
			12 x Number Of Restriction Time Bands		Restriction1	Count of bytes for this option
SpecificVehicleDepartureLocation	0	LOC1	Variable (17 max)		Restriction2	Location of departure (service origin) See note 1
SpecificServiceId	6	UD	6		Restriction2	UD ID of the specific service
SpecificVehicleDepartureTime	12	TIME	1.375	TimeStamp	Restriction2	Timestamp of the departure time (from service origin) of the vehicle that is either restricted or 'eased'.
RestrictionOrEasementFlag	13.375	FLAG	0.125		Restriction2	Flag to indicate whether travel is permitted on the specific service defined in the rest of this data block
RFU	15.5	RFU	0.5		Restriction2	
			14 x Number of Vehicle Specific Restrictions		Restriction2	Count in bytes for this option

ITSO Name	Offset	Data Type	Size (Bytes)	EN1545 Equivalent	Group	ITSO comment
RoutingLocation	0	LOC1	Variable (17 max)		Route	Location of routing point See note 1
ViaNotVia	6	UD	0.25		Route	Indicates whether the routing point is a via or no-via constraint
RFU	6.25	RFU	0.75		Route	
			7 X Number Of Routing Points		Route	Count of bytes for this option
Name	0	ASCII	20	Name	PaxDetail	Passenger's name Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
Gender	20	BMP	0.25	GenderCode	PaxDetail	Passenger's gender Users of this data element shall take note of the requirements of the General Data Protection Regulation (GDPR).
RFU	20.25	RFU	0.75		PaxDetail	
			21		PaxDetail	Count of bytes for this option
Padding		PAD	AR			Pad with 0x00's to a whole number of blocks, less 3 bytes for IIN if that element is present.
IIN		HEX	3	NetworkID	IPE O	Issuer Identification Number

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

Note the following group column options.

- 'AssociatedIPE' indicates data elements specified by NumberOfAssociatedIPEs
- 'Discounts' indicates data elements specified by NumberOfDiscounts
- 'Supplement' indicates data elements specified by NumberOfSupplements
- 'Transfers' indicates data elements specified by NumbersOfTransferTypes
- 'Interchange' indicates data elements specified by NumberOfInterchanges
- 'Restriction1' indicates data elements specified by NumberOfRestrictionTimeBands
- 'Restriction2' indicates data elements specified by NumberOfVehicleSpecificRestrictions
- 'Route' indicates data elements specified by NumberOfRoutingPoints
- 'PaxDetail' indicates data elements present if bit 1 of IPEBitMap is set.

2.12.1.1.1 IPEBitMap Definition

Table 137 - 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	PaxDetail data elements present
2	IPE contains optional data elements as specified in: NumberOfAssociatedIPEs NumberOfDiscounts NumberOfSupplements NumbersOfTransferTypes NumberOfInterchanges NumberOfRestrictionTimeBands NumberOfVehicleSpecificRestrictions NumberOfRoutingPoints
3	VG contains optional data elements as specified in NumberOfReservations.
4	RFU
5 (most significant)	RFU

2.11.1.1.2 Typ24Flags definition

Table 138 - TYP 24 Flags Definition

Flag ID	Flag name	Flag purpose
0	Follow-on	When set to one (1) indicates that the product contains a Follow-on renewal Ticket
1	Duplicate	When set to one (1) indicates that the product contains a Duplicate Ticket
2	Replacement	When set to one (1) indicates that the product contains a Replacement Ticket
3	UnfulfilledWarrant	When set to one (1) indicates that the product contains an Unfulfilled Warrant
4	Carnet	When set to one (1) indicates that the product contains a Carnet
5	TestOrLive	When set to one (1) indicates that the product is a test ticket.
6	PassengerDetails	When set to one (1) indicates that the IPE contains passenger name and gender details.
7	ReservationsMandatory	When set to one (1) indicated that a reserved seat is mandatory.
8	CompanionPermitted	When set to one (1) indicates that a companion is allowed.
9	AutoRenew	When set to one (1) indicates that AutoRenew is enabled.

Flag ID	Flag name	Flag purpose
10	RFU	
11	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 = 1 or 2 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 = 1.
- 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 139.

The total length of the Value Record Data Group must not exceed 256 bytes (i.e. for a block size of 4).

Table 139 - 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	
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

ITSO Name	Offset	Data Type	Size (bytes)	EN1545 Equivalent	Group	ITSO comment
						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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
ISAMIDModifier	7	HEX	4	SerialNumberFour	V	Defined in ITSO TS 1000-2
ActionSequenceNumber	11	HEX	1		V	Defined in ITSO TS 1000-2
JourneysRemaining	12	HEX	1	CountOfCoupons	V	Count of the number of journeys that the ticket is still valid for and is reduced on exit at destination. Initially set to 2 for a return ticket and 1 for a single.
TransfersRemaining	13	BMP	1.375	INTEGER	V	Count of the total number of remaining transfers - reduced by the equipment of the service provider honouring the transfer entitlement. Up to 3 transfer types are permitted each with up to 511 transfers
JourneyPartUsedFlag	14.375	FLAG	0.125		V	Indicates that the current part of the product has been part used (e.g. an outward leg up to an out-of-station interchange) Set to 1 on exit at interchange and re-set to 0 when a journey is completed e.g. when the out portion is used
NumberOfReservations	14.5	HEX	0.5	INTEGER	V	Product structuring data: indicates the presence and number of the optional reservations data elements.
RFU	15	HEX	2	Hex	V	RFU
Padding		PAD	AR			Pad to a whole number of blocks with 0x00. Padding shall be provided once only for the Data Group comprising all value records within the Value Record Data Group. Padding shall be positioned at the end of the Data Group. Note this padding shall be placed after the end of the VGX Dataset and immediately before the InstanceID.

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 an element in the value record

Note 1: The length of these LOC1 data elements is 6 (six) for UK Rail applications.

Note 2: This Value Record Data Group requires a Value Group Extension to be present with VGXRef set to 3. See Clause 4.1.3.

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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.

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 an 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 the value of (IPEFormatRevision + 8), that is 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 36 - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative.
ProductRetailer	3	OID16	2	CompanyID	IPE	Identity of retailer, included for information purposes, not for the purpose of determining IPE

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						acceptability at the point of use.
TYP25Flags	5	BMP	1	Flag	IPE	Refer to the Table 39
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.
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	IPE expiry time. Default ticket expiry time which may be overridden by local POST configuration data where so agreed by the product owner and the service provider. • For values less than 1440 expiry time falls on the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate); • Values greater than or equal to 1440 indicate an expiry time on the day following the day defined by ExpiryDate (defined by either EXP or ExpiryDateCurrent as appropriate).
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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, 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 37 - 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 38.

Table 38 - 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	
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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
						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 39 - TYP 25 Flags 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.

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 an 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 the value of (IPEFormatRevision + 8), that is 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 40 - 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	A count of days. The IPE can be removed after ExpiryDate + RemoveDate by any POST, except that a value of 255 indicates that the IPE may not be removed except by the Product Owner or their authorised representative..
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 43
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
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.

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
			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 41 - 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 42.

Table 42 - 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	
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	Not equivalent to EN1545	V	Defined in ITSO TS 1000-1.
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 43 - TYP 26 Flags 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. It is recommended that the Product Owner take care to positively identify the Customer Media holder and to record their personal and contact details before enabling Auto-Renew.

2.14 Period 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 shall only 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 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 [EN1545-1]
Event2	HEX	0.5	EventTypeCode	Dyn	Coded as defined in [EN1545-1]
LastUseDTS	DTS	3	DateTimeStamp	Dyn	For IPE creation this element shall be set to zero. This element shall be set to the current date & time for all usage transactions.
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 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)	RFU
4	Set to 1 if the Seq# is present
5 (most significant)	RFU

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 shall only 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 54 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	
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	

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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	
LastUseDTS	DTS	3	DateTimeStamp	Dyn	For IPE creation this element shall be set to zero. This element shall be set to the current date & time for all usage transactions.
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

To prevent a TYP 28 IPE being rejected for Anti-passback violation when the IPE is used immediately after creation, the POST shall implement the following process:

- Upon IPE creation:
  - IssueDate shall be set to the date of issue;
  - LastUseDTS shall be set to zero;
- Upon first use:

A LastUseDTS value of zero shall be taken by the POST to mean that the Anti-passback algorithm should not be applied.

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 23:59When 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 .

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.

2.15.1.1 IPEBitMap Definition

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

Table 54 - TYP 28 Bit Map Definition

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

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 than 6 tickets, then all the bits of 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 shall only 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 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 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.
AmountPaidMethodOfPayment	MOP	0.5	PaymentMeansCode	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	

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
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.
RFU	RFU	2		Dyn	
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[17], 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

[17] 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	RFU	0.125		Static	
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	RFU	1.0		Static	
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

ITSO Name	Data Type	Size bytes	EN1545 Equivalent	Group	Comment
					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.
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 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	For IPE creation this element shall be set to zero. This element shall be set to the current date & time for all usage transactions
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

Flag ID	Flag name	Flag purpose
3	ExpiryTimeFlag	When set to zero (0) indicates expiry time of 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 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 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)	RFU
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)	RFU

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 IPE Data Group.

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[18]; and
- Closed System entry records.[19]

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 [EN1545-1] 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	Not equivalent to EN1545	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	TT AMT

[18] 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.

[19] As defined in TS1000-1

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
					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.	
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
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 1 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

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
			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	

3.1.1.1 Bit Map Definition

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

Table 59a - 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

TTBitMap2	Data Element or Group	Description
6	RFU	
7	IIN structure present	IIN
8 – 10	RFU	
11	UserDefined element present	

3.1.2 TTFormatRevision = 2

Table 60 - 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 [EN1545-1] 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	Not equivalent to EN1545	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,	TT AMT

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
					deducted from stored travel rights or from an external purse).	
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.	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
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 1 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	TT IPEID

ITSO Name	Offset	Format	Size bytes	EN1545 equivalent	Comment	Data Group
					to the transaction, or set to zero indicating that no IPE is pointed to.	
			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 60a - 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

TTBitMap2	Data Element or Group	Description
4	RFU	
5	RC structure present	Routing code
6	RFU	
7	IIN structure present	IIN
8 – 10	RFU	
11	UserDefined element present	

3.1.3 TTFormatRevision = 3

From version 2.1.4 of the specification, format revision 3 is deprecated. Equipment operating to version 2.1.4 of the specification shall support format revision 3 but no new implementations should implement functionality dependent on the use of format revision 3. Format revision 3 will be removed from the next version of the specification.

Table 61 - Transient Ticket Record Format Revision 3 Data Definition

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	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 [EN1545-1] 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	Not equivalent to EN1545	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	TT AMT

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
					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.	
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
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.	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
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 1 to e# identifying a directory	TT IPEID

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
					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.	
			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
IPEID1	0	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the first candidate IPE. A 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. This entry shall always be populated.	TT CIPE
IPEID2	0.625	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the second	TT CIPE

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
					candidate IPE. A 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. This entry may be populated. If not populated, shall be set to 0.	
IPEID3	1.25	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the third candidate IPE. A 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. This entry may be populated. If not populated, shall be set to 0.	TT CIPE
IPEID4	1.875	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the forth candidate IPE. A 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. This entry may be populated. If not populated, shall be set to 0.	TT CIPE
CIPEFlags	2.5	BMP	0.5		Defined in table 62 below	TT CIPE
			3		Group size	TT CIPE
UserDefined	0	UD	variable		The 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	

3.1.3.1 CIPEFlags Definition Format Revision 3

Table 62 - CIPEFlags Definition Format Revision 3.

Bit Number	Data Element or Group
0 (least significant)	Invalid travel detected
1	CM has been inspected during the current journey
2-3	RFU

3.1.3.2 Bit Map definition

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

Table 63 - Transient Ticket Record Format Revision 3 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	CIPE structure present	Candidate IPE’s available for travel from the known Origin
9-10	RFU	
11	UserDefined element present	

3.1.4 TTFormatRevision = 4

This format revision should be used where a post is operating in a check in /check out Closed System environment where the product being used is identified on exit. (Note that the check in and check out service operators may be different.)

Table 64 - Transient Ticket Record Format Revision 4 Data Definition

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	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 [EN1545-1] 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	Not equivalent to EN1545	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
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.	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

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
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
IPEPointer	0.375	HEX	0.625	EntryPointer	Pointer to an IPE directory entry, a number in the range 1 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
IPEID1	0	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the first candidate IPE. A Pointer to an IPE directory entry, a number in the range 1 to e# identifying a directory entry which relates to the IPE used, where e# is defined in ITSO TS 1000-2. This entry shall always be populated.	TT CIPE

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
IPEID2	0.625	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the second candidate IPE. A Pointer to an IPE directory entry, a number in the range 1 to e# identifying a directory entry which relates to the IPE used, where e# is defined in ITSO TS 1000-2. This entry may be populated. If not populated, shall be set to 0.	TT CIPE
IPEID3	1.25	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the third candidate IPE. A Pointer to an IPE directory entry, a number in the range 1 to e# identifying a directory entry which relates to the IPE used, where e# is defined in ITSO TS 1000-2. This entry may be populated. If not populated, shall be set to 0.	TT CIPE
IPEID4	1.875	HEX	0.625	EntryPointer	Shall be the Directory Entry ID that identifies the forth candidate IPE. A Pointer to an IPE directory entry, a number in the range 1 to e# identifying a directory entry which relates to the IPE used, where e# is defined in ITSO TS 1000-2. This entry may be populated. If not populated, shall be set to 0.	TT CIPE
CIPEFlags	2.5	BMP	.5		Defined in table 65 below	TT CIPE
			3		Group size	TT CIPE
ENTRY_TT_IPE_ISAMID	0	ISAM ID	4		Identifies the TTR (IPE) instance of the original TTR created for check in to a Closed System. This value shall be taken from the (TTR) IPE data group instance.	TT ENTRY
ENTRY_TT_IPE_SAMSequence Number	4	IPE ISAMS #	3		Identifies the TTR (IPE) instance of the original TTR created for check in to a Closed System. This value shall be taken from the (TTR) IPE data group instance.	TT ENTRY
ENTRY_DateTimeStamp	7	DTS	3	DateTimeStamp	The DateTime where the customer media checked in to the Closed System. This value shall be taken from the (TTR) DateTimeStamp field.	TT ENTRY
			10		Group size	TT ENTRY
ENTRY_OID	0	OID	2		The service operator OID where the customer media entered (checked in) to the Closed System	TT ENTRY_OID
ENTRY_IIN_Index	2	IINIndex	1		The IIN Index for the service operator where the customer media entered (checked in) to the Closed System	TT ENTRY_OID
			3		Group size	TT ENTRY_OID
UserDefined	0	UD	Variable		The Contents of this data element are determined by the operator writing the	TT UD

ITSO Name	Offset	Data Type	Size bytes	EN1545 Equivalent	Comment	Group
					record.	
			Variable		Group size	TT UD
Padding		PAD	AR		Pad to a whole number of blocks with 0x00's	

Table 65 – CIPEFlags Definition Format Revision 4.

Bit Number	Data Element or Group
0 (least significant)	Invalid travel detected
1	CM has been inspected during the current journey
2-3	RFU

Table 66 - Transient Ticket Record Format Revision 4 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	CIPE structure present	Candidate IPE's available for travel from the known Origin
9	ENTRY structure present	Entry information for check in/check out Closed System operation
10	ENTRY OID structure present	Entry OID information for check in/check out Closed System operation

TTBitMap2	Data Element or Group	Description
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.
    - 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

4. Additional Data Definitions

4.1 Value Group Extensions

The following tables define the data contents of Value Group Extensions (VGX) supported by the specification. Implementation of the following data sets is optional in POSTs.

4.1.1 VGX Record Data Group for Complex Capping (Type 1, Reduced Data) – VGXRef = 1.

Table AD1 - Complex Capping VX Record Data Group – VGXRef =1

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
VGXLength	0	HEX	0.75	INTEGER	VXH	Defined in ITSO TS 1000-2
VGXRef (Bit9; Bit8)	0.75	BMP	0.25	INTEGER	VXH	Defined in ITSO TS 1000-2 ***Both bits set to 0 for this VGX data group.***
VGXRef (Bit7 – Bit0)	1	HEX	1	INTEGER	VXH	Defined in ITSO TS 1000-2 ***Set to 1 for this VGX data group.***
CapStrategyCode	2	HEX	2	INTEGER	VX	User Defined. Used to conjunction with IIN and OID to form a pointer to a Capping business rule. Set to 0 if not used.
CapAccumulator1Rule	4	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid1TransactionType	4.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator1	5	VALI	2	CumulativeFare	VX	
DayCapAccumulator1	7	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator1	9	VALI	2	CumulativeFare	VX	

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
Cap1DayCount	11	HEX	2	INTEGER	VX	See Note 2
CapAccumulator2Rule	13	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid2TransactionType	13.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator2	14	VALI	2	CumulativeFare	VX	
DayCapAccumulator2	16	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator2	18	VALI	2	CumulativeFare	VX	
Cap2DayCount	20	HEX	2	INTEGER	VX	See Note 2
CapAccumulator3Rule	22	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid3TransactionType	22.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator3	23	VALI	2	CumulativeFare	VX	
DayCapAccumulator3	25	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator3	27	VALI	2	CumulativeFare	VX	
Cap3DayCount	29	HEX	2	INTEGER	VX	See Note 2
CapAccumulator4Rule	31	HEX	0.5	INTEGER	VX	CapRule [Note 1]

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
						0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid4TransactionType	31.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator4	32	VALI	2	CumulativeFare	VX	
DayCapAccumulator4	34	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator4	36	VALI	2	CumulativeFare	VX	
Cap4DayCount	38	HEX	2	INTEGER	VX	See Note 2
Location	40	LOC1	Variable (17 max, 7 for this example)	Origin/Destination	VX	For cap accumulator set 1 - used to indicate where the last cap was applied (where the previous value is overwritten) or to indicate zone usage (see note 4).
			47			Count of bytes (Value eXtra data group) , excluding any padding
VGX_Padding		PAD	AR			Pad to a whole number of blocks for the Value Group Extension with 0x00. Padding shall be provided once at the end of the Value Group Extension(VGX) dataset.

Note: AR = as required.
Note that in the Group column VXH indicates an element in the Value Header and VX an element in the value record.

[Note 1]

n and m are set by the Cap Strategy Rule (e.g. n=7 days and m=28 days).

[Note 2]

(a) CapDayCount = 0 for single day accumulation.

(b) CapDayCount is set to 1 at the start of a multi-day accumulation, then:

(c) CapDayCount is updated when the STR (or CTA) is used, e.g.

CapDayCount = CapDayCount + (Date[Current] – Date[Previous])

(Where Date is the number of days indicated by DateTimeStamp and Date[Previous] is obtained from the Value Group prior to being updated).

[Note 3]

The assignment of Transport Modes or Operators are set by the Cap Strategy Rule (e.g. Accumulator Set 1 = Bus, Accumulator Set 2 =Tram, Accumulator Set 3 = Rail, say).

[Note 4]

Where Zonal Bitmaps are used, the current zone can be logically ORed with the previous contents of Location(n) so that a record of zone usage is maintained.

4.1.2 VGX Record Data Group for Complex Capping (Type 2, Full Data) – VGXRef = 2.

Table AD2 - Complex Capping VX Record Data Group – VGXRef =2

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
VGXLength	0	HEX	0.75	Integer	VXH	Defined in ITSO TS 1000-2
VGXRef (Bit9; Bit8)	0.75	BMP	0.25	INTEGER	VXH	Defined in ITSO TS 1000-2 ***Both bits set to 0 for this VGX data group.***
VGXRef (Bit7 – Bit0)	1	HEX	1	INTEGER	VXH	Defined in ITSO TS 1000-2 ***Set to 2 for this VGX data group.***
CapStrategyCode	2	HEX	2	INTEGER	VX	User Defined. Used to conjunction with IIN and OID to form a pointer to a Capping business rule. Set to 0 if not used.
CapAccumulator1Rule	4	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid1	4.5	HEX	2	Amount	VX	
LastFarePaid1TransactionType	6.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
						[EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator1	7	VALI	2	CumulativeFare	VX	
DayCapAccumulator1	9	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator1	11	VALI	2	CumulativeFare	VX	
Cap1DayCount	13	HEX	2	INTEGER	VX	See Note 2
CapAccumulator2Rule	15	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid2	15.5	HEX	2	Amount	VX	
LastFarePaid2TransactionType	17.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator2	18	VALI	2	CumulativeFare	VX	
DayCapAccumulator2	20	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator2	22	VALI	2	CumulativeFare	VX	
Cap2DayCount	24	HEX	2	INTEGER	VX	See Note 2
CapAccumulator3Rule	26	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid3	26.5	HEX	2	Amount	VX	
LastFarePaid3TransactionType	28.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
						[EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator3	29	VALI	2	CumulativeFare	VX	
DayCapAccumulator3	31	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator3	33	VALI	2	CumulativeFare	VX	
Cap3DayCount	35	HEX	2	INTEGER	VX	See Note 2
CapAccumulator4Rule	37	HEX	0.5	INTEGER	VX	CapRule [Note 1] 0: No Capping 1: Day Capping Only 2: Accumulate for n days 3: Accumulate for m days 4-15: RFU
LastFarePaid4	37.5	HEX	2	Amount	VX	
LastFarePaid4TransactionType	39.5	HEX	0.5	EventTypeCode	VX	Defined in ITSO TS 1000-2 Coded according to [EN1545-1] EventTypeCode list. Only codes in the range 0 to 15 are permissible, codes with values of 16 and greater shall not be used.
UncappedAccumulator4	40	VALI	2	CumulativeFare	VX	
DayCapAccumulator4	42	VALI	2	CumulativeFare	VX	
MultidayCapAccumulator4	44	VALI	2	CumulativeFare	VX	
Cap4DayCount	46	HEX	2	INTEGER	VX	See Note 2
Location1	48	LOC1	Variable (17 max, 7 for this example)	Origin/Destination	VX	For cap accumulator set 1 - used to indicate where the last cap was applied (where the previous value is overwritten) or to indicate zone usage (see note 4).
DateTimeStamp1	55	DTS	3	Not equivalent to EN1545	VX	For cap accumulator set 1 - used to indicate when the last cap was applied.
Location2	58	LOC1	Variable (17 max, 7 for	Origin/Destination	VX	For cap accumulator set 2 - used to indicate

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
			this example)			where the last cap was applied (where the previous value is overwritten) or to indicate zone usage (see note 4).
DateTimeStamp2	65	DTS	3	Not equivalent to EN1545	VX	For cap accumulator set 2 - used to indicate when the last cap was applied.
Location3	68	LOC1	Variable (17 max, 7 for this example)	Origin/Destination	VX	For cap accumulator set 3 - used to indicate where the last cap was applied (where the previous value is overwritten) or to indicate zone usage (see note 4).
DateTimeStamp3	75	DTS	3	Not equivalent to EN1545	VX	For cap accumulator set 3 - used to indicate when the last cap was applied.
Location4	78	LOC1	Variable (17 max, 7 for this example)	Origin/Destination	VX	For cap accumulator set 4 - used to indicate where the last cap was applied (where the previous value is overwritten) or to indicate zone usage (see note 4).
DateTimeStamp4	85	DTS	3	Not equivalent to EN1545	VX	For cap accumulator set 4 - used to indicate when the last cap was applied.
			88			Count of bytes (Value eXtra data group) , excluding any padding
VGX_Padding		PAD	AR			Pad to a whole number of blocks for the Value Group Extension with 0x00. Padding shall be provided once at the end of the Value Group Extension(VGX) dataset.

Note: AR = as required.
Note that in the Group column VXH indicates an element in the Value Header and VX an element in the value record.

[Note 1]

n and m are set by the Cap Strategy Rule (e.g. n=7 days and m=28 days).

[Note 2]

(a) CapDayCount = 0 for single day accumulation.

(b) CapDayCount is set to 1 at the start of a multi-day accumulation, then:

(c) CapDayCount is updated when the STR (or CTA) is used, e.g.

CapDayCount = CapDayCount + (Date[Current] – Date[Previous])

(Where Date is the number of days indicated by DateTimeStamp and Date[Previous] is obtained from the Value Group prior to being updated).

[Note 3]

The assignment of Transport Modes or Operators are set by the Cap Strategy Rule (e.g. Accumulator Set 1 = Bus, Accumulator Set 2 =Tram, Accumulator Set 3 = Rail, say).

[Note 4]

Where Zonal Bitmaps are used, the current zone can be logically ORed with the previous contents of Location(n) so that a record of zone usage is maintained.

4.1.3 VGX Record Data Group for TYP 24 IPE Value Record Data Group – VGXRef = 3.

This Value Group Extension is for use with the TYP 24 IPE when the optional Value Record Data Group is used.

Table AD3 – TYP 24 VX Record Data Group – VGXRef =3

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
VGXLength	0	HEX	0.75	INTEGER	VXH	The Value Group Extension length (in Blocks)
VGXRef(Bit9,Bit8)	0.75	BMP	0.25	INTEGER	VXH	Defined in ITSO TS 1000-2 **Both bits set to 0 for this VGX data group.**
VGXRef(Bit7-Bit0)	1	HEX	1	INTEGER	VXH	Defined in ITSO TS 1000-2 ***Set to 3 for this VGX data group***
DTSOfLastValidation	2	DTS	3	Not equivalent to EN1545	VX	DTS of last validation event. Maybe an on vehicle or the start of an interchange period.
LocationOfLastValidation	5	LOC1	Variable (17 max)		VX	Location of last validation event. See note 1
BookingReference	11	ASCII	8	ReservationID	VX	UD Booking Reference
			36			Count of bytes for the Value Group with no optional reservations.
LegDepartureDateTime	0	DTS	3	Not equivalent to EN1545	VXO	Date and time of reserved leg departure.
LegServiceId	3	ASCII	6		VXO	UD Retail Service ID of the

ITSO Name	Offset	Data Type	Size Bytes	EN1545 Equivalent	Group	Comment
						reserved leg.
LegOrigin	9	LOC1	Variable (17 max)	Origin	VXO	Location of Leg origin. See note 1
LegDestination	15	LOC1	Variable (17 max)	Destination	VXO	Location of leg destination. See note 1
Coach	21	ASCII	2	VehicleID	VXO	UD Coach ID.
SeatNumber	23	ASCII	3	SeatNumber	VXO	RD Seat Number ID.
AccommodationAttribute	26	ASCII	4		VXO	UD Accommodation Attribute
SeatDirection	30	BMP	0.25	SeatPositionCode	VXO	Facing, Back or Airline - or null if not used
BerthUpperLower	30.25	BMP	0.25		VXO	Indicates sleeper berth position: (binary) 00 = Not specified 01 = Lower 10 = Upper 11 = RFU
ReservationType	30.5	UD	0.5		VXO	Seat/Berth/Bike/No-place/Wheelchair type code.
TogetherFlag	31	FLAG	0.125		VXO	Indication as to whether sleeper cabin is shared.
RFU	31.125	RFU	0.875		VXO	
			32			Count of bytes for each (optional) reservation
VGX_Padding		PAD	AR			Pad to a whole number of blocks for the Value Group Extension with 0x00. Padding shall be provided once at the end of the Value Group Extension(VGX) dataset.

Note: AR = as required.

Note 1: In the Group Column, VXH indicates an element in the Value Group Extension Header, VX an element in the value Group extension record, and VXO an Optional element (within the Optional Reservation).

Note 2: The length of the LOC1 data elements is 6 (six) for UK Rail applications.

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 [EN1545-2].

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 , where is day 0.

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

Value Assignment : ‘dddddddddddddd’B (14 bits)

A.4 Datef

Date expressed in a readily printable numeric format.

Datef ::= SEQUENCE {

yearBCDString (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 24-bit field, coded as a Two’s complement signed integer, representing a displacement in minutes from the Epoch (24/11/2028 - 20:16h).

It provides a range of Date-Time values from 13/12/2012 - 10:08h (Epoch minus approx. 16 years) to 06/11/2044 - 06:23h (Epoch plus approx. 16 years).

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 [EN1545-1]. 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 {

holderSurnameSurname,
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.

Editor’s Note: There is an error in the table in EN1545, from which this table is derived. The code 11111 – Traveller-cheque is an error and cannot be used. For ITSO implementations this code shall therefore be ignored.

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 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 [EN1545-1]}.

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 , where 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:

Note that code 0 has been used for three purposes within the ITSO environment:

- In a Transient Ticket record created during a mid-journey validation event in a check in – check out environment with Product selection on exit;
- To indicate creation of an IPE which contains no value (e.g. a TYP 2 STR IPE where no value is loaded initially), reference the IPE definitions in this specification; and
- To indicate a Transaction where there is no suitable Transaction Type code defined, for example enabling or amending Auto-Renew.

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)
}
```

A.24 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] and assigns a numeric code suitable for use in TYP 16: Language, to each language identified in [ISO 639].

Language Code

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

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
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
Cree	cr	39
Croatian	hr	40
Czech	cs	41
Danish	da	42
Dutch	ni	43
English	en	44
Esperanto	eo	45

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
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
Javanese	jv	77
Kannada	kn	78

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
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

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
Marshallese	mh	112
Modem Greek (post 1453)	el	113
Moldavian	mo	114
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

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
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
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)	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

ISO 639—1: Language Name (in English)	ISO 639—1: Language Code	ITSO Language Code
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