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1 Introduction

1.1 Aim of the Document

This document describes the use of the MDB Interface when integrating the Electronic Purse Terminals (EPT) of the Swiss Electronic Purse (IEP) system - "CASH" - into vending machines. The document is principally intended for designers of vending machines and assumes a prior knowledge of the MDB Specification.

1.2 Structure of the Document

Chapter 2 supplies a brief introduction to the "CASH" IEP system. The important differences between this and the Swiss EFT/POS system are described.

Chapter 3 describes the messages and states according to the MDB interface specification and how the Electronic Purse Terminal (EPT) operates with these messages and states.

Chapter 4 summarises the user interface.

Chapter 5 provides the minimum acceptance procedure which must be completed when testing the integration of the EPT in the vending system.

1.3 Terms & Abbreviations

Term/Abbreviation	Meaning
CSM	Card Security Module
ECR	Electronic Cash Register
EFT\POS	Electronic Funds Transfer at Point Of Sale
EPT	Electronic Purse Terminal
ID	Identity, Identification (number)
IEP	Intersector Electronic Purse (= Wertkarte)
LOG File	File in the EPT containing entries relating to EPT events
MDP	Multi-Drop Bus (protocol for vending machines)
PSV	Payserv
PSVIC	Vending-IEP Communication (protocol for vending machines)
SWDL	Software Download
VEZ	Verband Elektronischer Zahlungsverkehr (protocol for ECRs)
VMC	Vending Machine Controller

1.4 References

Reference	Title	Version	Document-Id
[I1]	MDB Specifications, Serial Interface Specifications	Version 4 (6/10/94)	Issued by Coca-Cola™
[I2]	The Internal Communication Protocol (MDB Europe)	Version 2.1 (5/2/96)	Published by The European Vending Machine Manufacturers Assoc. (EVMMA)

2 Introduction to "CASH" System

2.1 Overview

The "CASH" IEP itself is based upon a microprocessor chip implanted into a plastic card. The chip will be available on many types of plastic card e.g. ec cards and banks' own cards as well as non-bank cards. As far as the "CASH" IEP system is concerned, all chips, and therefore cards, behave exactly the same when used for making purchases.

The card holder can load the chip with "electronic value", e.g. at a Bancomat, and then spend the "electronic value" to obtain goods and services at merchants participating in the system who have installed the necessary EPTs.

When making a purchase, a purchase transaction is carried out in which "electronic value" is transferred from the IEP to the EPT. The EPT accumulates the "electronic value" from many transactions and this is then transferred, as required, to Payserv in a process called a collection.

Payserv processes the collection data and performs the central clearing operation which results in the "electronic value" being credited to the merchant's bank account.

2.2 Differences between the EFT/POS and IEP Systems

2.2.1 Prepaid

The IEP system is a prepaid system. This means the "electronic value" is purchased by the card holder in advance of its use. Some card holders will typically use money from their bank accounts to purchase the "electronic value". Others, e.g. children without bank accounts, may purchase "electronic value" with cash, or have it purchased for them by other people with bank accounts.

The "electronic value" collected by the merchant in the EPT is cashed-in, resulting in money being paid into the merchant's bank account, at some later point in time after the transactions have been performed.

This is therefore very different to the EFT/POS situation where the transfer of money from card holder's bank account to merchant's bank account takes place, in effect, at the time of the transaction. Also, the EFT/POS system can only be used by those card holders with suitable bank accounts.

2.2.2 Off-Line

The purchase transaction in the IEP system is carried out offline. This means that at the time of the transaction, all the necessary security and authorisation checks are carried out locally between the IEP and the EPT.

Because the IEP is mainly intended to be used in low value transactions, as a replacement for cash and coins, there is no verification of the card holder, e.g. with a PIN code. This all makes for a very speedy transaction.

The effective loss to the card holder if the IEP is lost is limited to the "electronic value" held in the IEP at that moment in time, i.e. the same as with cash.

In contrast, the EFT/POS system is an online system. At the time of the transaction, not only are all security and authorisation checks made between the terminal and Payserv, or other card-issuer institution, but the card holders must confirm their identities by entering their PIN codes. These precautions are necessary because the transaction is effectively giving direct access to the card holder's bank account.

2.2.3 Collection

The data from the purchase transactions is initially stored in a transaction log file in the EPT and must be sent to Payserv for processing and crediting. This process is known as collection and can be performed in one of two ways:

- 1) Direct, online, from the EPT to Payserv.
In this case the EPT either has an in-built modem or is attached to an external modem and uses this to call the Payserv host computer (telecollection) or has a special collection device (network collection) which handles the communication between the Payserv host and the EPT by itself.
- 2) Indirect, initially offline, from the EPT to an intermediate device and then from the intermediate device online to Payserv.
In this case the data from the EPT is collected from the device using, for example, a portable PC or a Velocard. The collecting device is later connected to a telephone line and uses a modem to transfer the collection data to Payserv. The collecting device can first collect data from many EPTs and can then transfer all the data sets in one session online to Payserv.

Again, this is different to the usual situation with EFT/POS where each transaction is sent immediately and on-line to Payserv or the appropriate processor.

2.2.4 Final Balances

The crediting of the "electronic value" accumulated in the EPT is based upon the concept of final balances.

A final balance is an EPT operation which computes the sum of the amounts from all transactions which have occurred at the EPT since the last final balance and writes this sum, together with the date and time and a serial number for this final balance, into a special final-balance entry in the terminal transaction log.

A final balance entry is used at Payserv to initiate a credit, for the amount of the final balance, to the merchant's bank account. This gives the merchant a means of controlling the credits independent of the interval between collections. For example, the merchant may wish to have a credit for each day's business and therefore creates a final balance every day, although the collections are performed on a weekly basis.

Only transactions which have been included in a final balance will be included in a credit. The value of transactions which are collected but not yet included in a final balance will be held over until the next collection which includes the necessary final balance.

2.3 Electronic Purse Terminals - Functional Overview

2.3.1 Terminal Types

There are several different types of EPTs.

Some of them are intended for attended use and are controlled by the merchant, either directly by using the integrated keyboard or indirectly via an electronic interface. The electronic interface will most usually be used to connect the EPT to an ECR. The 'VEZ' protocol is supported in all terminal types for this purpose.

Other types of EPT are intended for integration into vending machines, i.e. for use in mostly unattended situations. This type of EPT is controlled only via an electronic interface, which is used to connect the EPT to the vending machine. The 'PSVIC' and 'MDB' protocols are provided in these terminal types for this purpose.

All EPT types contain a card reader, used to communicate with the chip in the IEP, a security module (CSM), used to make the EPT specific to the merchant, a customer display, used to give guidance or information to the card holder, and one or more buttons which the card holder can use to obtain information or to control the operation of the EPT.

2.3.2 Normal Purchase Transactions

The usual transaction process consists basically of the following steps:

- 3) Displaying the transaction price
- 4) Requesting the IEP card
- 5) Inserting the IEP card
- 6) Performing the transaction
- 7) Displaying the result
- 8) Removing the IEP card
- 9) Communicating the result

The card holder may press the information button [INFO] at any time whilst the IEP card is inserted. This causes the IEP balance to appear on the card-holder display for a short time.

The transaction price is transferred to the EPT, either via the merchant's keyboard or the electronic interface. The invitation to insert the IEP card is displayed in the default customer language set in the EPT.

When the card is inserted, the authenticity of the IEP is checked.

If these checks prove to be in order, then the card holder is asked to press the [OK] key.

The transaction is then started. The IEP validity date and balance are checked and the IEP is then debited and the transaction is recorded in the transaction log in the IEP.

The transaction is recorded in the memory of the EPT (the accumulated "electronic value" is incremented and the transaction log entry is written) and the card-holder display indicates the success of the transaction.

If the transaction fails, this fact is displayed together with an explanation.

The result of the transaction is also displayed on the merchant's display and/or returned via the electronic interface, but only when the card has been removed from the reader (to help prevent the card holder forgetting to take the card back).

Notes:

- 1) If the IEP is withdrawn during the critical phase of the transaction between the debit of the IEP and the credit of the EPT, then the EPT indicates to the card holder that the IEP should be reinserted in order to continue and complete the transaction.
- 2) The current IEP does not have the possibility to perform a refund transaction on the EPT, i.e. "electronic value" cannot be transferred from the EPT to the IEP.

2.3.3 Interim Balances

Special entries can be created in the EPT transaction log to register interim balance calculations.

An interim balance entry contains the sum of all amounts in all transactions in the EPT transaction log which have been registered since the last interim balance was calculated. Additionally the entry also contains the number of transactions concerned, the date and time the balance was calculated and a reference number for the interim balance entry (incremented by 1 for each new interim balance performed).

The interim balance entries can be used by the merchant to check the takings on the EPT, for example during a shift, or during the time that one operator is using the terminal.

Interim balance entries are purely informative and are the responsibility of the merchant. They are not sent to Payserv in the collection data and therefore have no effect upon the clearing and crediting operations in the system.

Interim balances are requested to be calculated explicitly via either the merchant keyboard or the electronic interface (only 'VEZ' and 'PSVIC' protocols).

2.3.4 Final Balances

Special entries can be created in the EPT transaction log to register final balance calculations.

A final balance entry contains the same items as the interim balance entry but is calculated over all transactions which have been registered since the last final balance entry and has a reference number for final balance entries (incremented by 1 for each new final balance performed).

The final balance entries in the transaction log can be produced either explicitly via a command or automatically by the terminal itself. The following options are provided:

- 1) Explicitly, via the electronic interface.
(The necessary commands for this are available in the 'VEZ' and 'PSVIC' protocols.)
- 2) Explicitly, via the merchant keyboard (where the EPT has one).

- 3) Automatically, on collection.
(When a collection is initiated, a final balance is first computed and written into the transaction log and then the collection is performed.)
- 4) Automatically, at preset time intervals.
(The final balance will be computed at the set time, either on the set day of the month, m, or every n days beginning on a set day of the month, m.)

2.3.5 Collections

A collection is basically a transfer of "electronic value" from the terminal's memory to the acquiring service at Payserv.

There are currently 4 collection methods:

- 1) **Telecollection:** This uses either the built-in modem or an external compatible modem connected to the EPT to transfer via the PSTN (Public Switched Telephone Network) direct, online, to Payserv.
- 2) **Off-Line Collection:** This is performed in two stages:
Stage 1: A collection device (e.g. a PC) connected to the EPT at the moment of the collection obtains and temporarily stores the data from the EPT.
Stage 2: The collection device is connected to the Payserv host, e.g. via a PC modem and the PSTN.
The collection data from several purchase devices can be collected using a single collection device.
A specific off-line collection software (Veloboss) is available for the PC.
- 3) **Velocollection:** This is performed in four stages:
Stage 1: The Velocard is inserted into the EPT which launches the collection. The Velocard obtains and temporarily stores the data from the EPT.
Stage 2: The Velocard is connected to a PC. The data is transferred from the Velocard to the PC.
Stage 3: The PC is connected to the Payserv host, e.g. via a PC modem and the PSTN.
Stage 4: The data is transferred from the PC to the Velocard.
The collection data from several purchase devices can be collected using a single Velocard.
A specific velocollection software (Veloboss) is available for the PC.
- 4) **Network Collection:** The EPT is connected via the PSVIC-interface to a collection device. The collection device is connected to the Payserv host, e.g. via modem and PSTN, and manages the collection by itself.

Desktop and portable EPTs must be programmed for PSVIC during off line and network collection.

During a collection, information is transferred from the EPT to the Payserv host computer. The information transferred during a collection currently is:

- The accumulated "electronic value".
- The log file containing the details of each transaction.
- Statistical information.

The information is checked by the Payserv host and the "electronic value", as determined by the final balance(s) contained in the log file, is then credited to the bank account associated with the terminal.

To complete a collection, information is also transferred in the other direction from the Payserv host computer to the EPT, as follows:

- An acknowledgment of the receipt of the collection, which allows the EPT to erase the log file.
- Parameters for the next collection, e.g. latest date for the next collection.
- Security information (the IEP system is secured through a dynamically evolving security which requires frequent security updates).
- A red list, containing suspect cards, and an associated validity date for this red list. (The red list is expected to be empty due to the high security level of the purse system, however an empty red list also has a limited validity duration.) The red list must be updated or revalidated before its expiry otherwise the operation of the EPT will be suspended.

Notes:

- 1) An invalid red list causes the EPT to suspend purchase operations. All other EPT functions are available however. In particular a collection may be performed, so as to obtain the update or revalidation of the red list and so to allow purchase operations to be resumed.
- 2) In the case of off-line or velocollection, the information from host to EPT is transferred to the collection device first and then delayed until the next connection of the collection device to the EPT. The merchant must therefore ensure that the information arrives at the EPT within the time limit(s).
- 3) Also due to the delay in the receipt acknowledgment information arriving at the EPT when using off-line or velocollection, the EPT can contain new transaction log entries in addition to the previous entries which have been collected but cannot yet be deleted. This may thus reduce the effective capacity of the EPT transaction log.

Each collection is allocated a collection number, which is incremented by 1 for each new collection performed. The attributes of a collection are the collection number, the number of transactions, the date on which the collection was initiated at the terminal and the date at which the corresponding receipt information was issued by the Payserv host. A history file in the EPT contains the attributes of previous collections, as well as previous interim and final balances, and has room for 50 entries. This file may be consulted via the merchant keyboard, or the electronic interface (fully via the 'PSVIC' protocol, partially via the 'VEZ' protocol).

The EPT will suspend purchase transactions if any one of the following conditions is reached:

- The transaction log has reached its maximum capacity.
- The accumulated "electronic value" has reached the maximum allowed by Europay or the merchant himself (whichever is least).
- The time-sensitive information of the EPT has expired.

A collection is then needed in order to make the EPT accept purchase transactions again.

In order to prevent a blocked EPT, in the case where the EPT has the possibility to perform a telecollection and the feature has not been disabled by terminal settings, it will attempt a telecollection automatically, at a time set by the Payserv host computer (normally during the night), if one of the following conditions is met:

- The transaction log has been filled to a set percentage of the maximum capacity.
- The accumulated "electronic value" has reached a set percentage of the maximum allowed by Europay or the merchant himself (whichever is least).
- The time remaining before a collection should be performed has reached a set percentage of the maximum time interval allowed by Europay.
- A request to 'collect next night' has been made via either the merchant keyboard or the electronic interface (only 'PSVIC' protocol).

The set percentage mentioned above is initially set by Europay when terminals are issued, but may be changed by the merchant if desired. A second percentage setting is also available which causes the EPT to attempt a telecollection immediately. An immediate collection can also be initiated explicitly.

If a collection does not succeed (e.g. because there is a telecommunication problem), the EPT will perform a set number of retries to achieve a successful collection.

3 Use of MDB Interface in EPT

3.1 Definitions

The MDB interface has been initially developed by Coca Cola. Further work is leading to a European MDB standard (from the European Vending Machine Manufacturers Association).

The MDB interface currently implemented in the EPT meets the requirements as described in the document 'MDB Specifications, Serial Interface Specifications', Revision 4 (6/10/94), pp74 - 95, as originally issued by Cocal-Cola. (Note that this corresponds to the specification for level 1 readers in the MDB Europe specification from the EVMMA.)

3.2 Restrictions

Customer OK

Because the MDB protocol requires the payment card to be inserted into the payment terminal before the transaction amount is displayed to the cardholder, the EPT **must** be fitted with an OK button to allow the cardholder to approve the payment before this is deducted from the IEP.

No Multi-Vend

Because the EPT requires that the IEP be removed, after the payment has been made, before the indication of the result of the payment is given to the vending machine, then it is **not possible** for the EPT to operate in the so-called multi-vend mode (where the card remains inserted and several vends are made with it before it is removed).

Transaction Abort or Reversal

It is **not possible to abort, cancel or reverse** a purchase transaction which has been successfully completed with the IEP. (This means the VMC must organise a refund or credit through some other means.)

Collections

When the EPT is performing a collection, it is effectively not available for payment during this period and furthermore **does not respond** to VMC POLLs or other commands (the EPT goes 'quiet') until the collection operation is ended.

EPTs which have modems attached and are set up to perform collections online, may need to do this during active operation of the vending machine. (This is also true in the case of a Velocollect, except that then there is an operator present.)

The VMC should, of course, detect this 'quiet' state (since it may also be due to a fault in the EPT) and commence to attempt to restart the EPT by sending the RESET command.

However, the VMC **must not use** power-off/on in an attempt to cause the EPT to reset during the collection period.

As soon as the EPT is finished with the collection it will return ACK to a RESET command or JUST RESET to a POLL. This signals to the VMC that the EPT is operational for payments again.

3.3 Communication Procedure Options

When the EPT receives a unknown message from the VMC, i.e. with message code different from 10, 11, 12, 13, 14, 17, the EPT responds with a NACK.

In case a valid message is received from the VMC, the EPT sends an ACK.

If the VMC message requires a reply message, this reply will either be sent in response to a subsequent POLL message or immediately after the reception of the message itself.

When the EPT is busy, e.g. just after a card is inserted (state 'enabled') or when processing a transaction, the EPT will not respond to all POLL messages. As specified in the MDB specification (section 3.4), a maximum of 5 seconds should be allowed for a response from the EPT, although the typical time is less than this.

The EPT uses the multi-message response format, as specified in the MDB specification (section 3.1.3), which the VMC must therefore correctly process. In particular this is used when returning VEND DENIED together with SESSION CANCEL REQUEST.

3.4 Unused Messages

Since the EPT has its own display, the display of the vending machine is not used. The message 'DISPLAY REQUEST' is thus not used.

The message MALFUNCTION / ERROR is not used in the current implementation.

The message EXPANSION / diagnostics is also not used in the current implementation. If the VMC sends this message, the EPT replies with NACK.

3.5 Action on MDB Messages

The tables below describe the messages that are exchanged between the VMC and the EPT and their effect.

Table 1 is a state table for the EPT which describes the messages the EPT expects to receive when in a particular state and gives the state the EPT goes to after having dealt with the message.

Table 2 lists the messages the VMC can send to the EPT and, in each case, the reply message from the EPT and the action taken by the EPT.

Table 3 lists the messages send from the EPT, on the EPT's initiative, in response to a POLL message from the VMC.

The circumstances under which these messages are sent are described.

3.5.1 Table 1: Next EPT State as Function of Message received

Current EPT State	MESSAGE												
	RESET	SETUP		VEND					READER			EXPANSION	
		configuration	max./min. prices	vend request	vend cancel	vend success	vend failure	session complete	disable	enable	cancel	identification	diagnostics
'inactive'	'inactive'	'inactive' or 'disabled' - see note 3	'inactive' or 'disabled' - see note 3									'inactive'	'inactive'
'disabled'	'inactive'	'disabled'	'disabled'							'enabled'		'disabled'	'disabled'
'enabled' - see note 5	'inactive'								'disabled'		'enabled'	'enabled'	'enabled'
'session_idle' - see note 5	'inactive'			'vend'				'enabled'	'disabled'				
'vend'	'inactive'				'session_idle' - see note 6	'session_idle' - see note 6	'session_idle' - see note 6		'disabled' - see note 4				

Notes:

- 1) When the EPT expects a VMC message, in a certain state, then the cell in the table above indicates the new state of the EPT after the received message has been correctly treated.
- 2) When a VMC message is not expected by the EPT then the corresponding table cell is left empty. Should, however, in such cases, the message still be sent by the VMC, the EPT will reply with a COMMAND OUT OF SEQUENCE message.
- 3) The EPT enters the state 'disabled', if the SETUP message is received after the EPT has sent a JUST RESET message to the VMC.
- 4) The EPT records the disable request and waits until the VEND session is completed, before entering the state 'disabled'.
- 5) The transition from the state 'enabled' to the state 'session_idle' occurs when a valid IEP is inserted.
- 6) The transition to the state 'session_idle' occurs either when the IEP is removed or after the timeout. The EPT then sends SESSION CANCEL REQUEST.

3.5.2 Table 2: Action on Messages received from the VMC

Message sent by VMC		Reply from EPT			
Message Name	Code	EPT Action	Message Name	Code	New EPT State
RESET	10h	Any transaction is aborted, if possible. The EPT goes to the state 'inactive'.			'inactive'
SETUP / configuration	11h/00h	The information sent in this message by the VMC is ignored. The READER CONFIGURATION reply is returned, with: CARD FEATURE LEVEL = 01 COUNTRY CODE = 0041 SCALE FACTOR = 01 (all prices in Swiss cents) DECIMAL PLACES = 02 (all prices displayed in Swiss francs and cents) APPLICATION MAXIMUM RESPONSE TIME = 60 (3Ch) MISCELLANEOUS OPTIONS = 04 (no refund capability, no multi-vend, EPT has display). If the EPT is in the state 'inactive' and SETUP / max./min. prices has already been received since the last RESET, then the state 'disabled' is entered.	READER CONFIGURATION	01h	'inactive' or 'disabled'
SETUP / max./min. prices	11h/01h	MINIMUM PRICE is memorised and will be used when the IEP is inserted to check if the purse balance is sufficient. MAXIMUM PRICE is not used. If the EPT is in the state 'inactive' and SETUP configuration has already been received since the last RESET, then the state 'disabled' is entered.			'inactive' or 'disabled'
VEND / vend request	13h/00h	Provided that the EPT is in the state 'session_idle', it goes to state 'vend'. The price sent in the message is displayed on the EPT display. The EPT displays the invitation to the card holder to press the OK button. After the OK button is pressed, the IEP is debited by the displayed amount. If the transaction is completed correctly, and the IEP has been removed from the EPT or the timeout has occurred, the reply VEND APPROVED is returned to the VMC and the EPT stays in state 'vend'. If an error occurs, the reply VEND DENIED/SESSION CANCEL REQUEST is returned to the VMC and the EPT goes to the state 'session_idle'. Possible errors: - customer time-out (OK button was not pressed within the allowed time limit) - card withdrawal before completion - transaction amount exceeds IEP balance - IEP communication error - etc.	VEND APPROVED or VEND DENIED/SESSION CANCEL REQUEST	05h 0604h	'vend' 'session_idle'
VEND / vend cancel	13h/01h	If the message is received before the transaction has really been performed, then the transaction will be aborted and, after the IEP has been removed from the EPT or the timeout occurs, the reply VEND DENIED/SESSION CANCEL REQUEST is returned to the VMC. The EPT goes from the state 'vend' to the state 'session_idle'. If the transaction has already been performed, then the action is as described under vend request.	VEND DENIED/SESSION CANCEL REQUEST	0604h	'session_idle'
VEND / vend success	13h/02h	The EPT stays in the state 'session_idle' and returns the reply SESSION CANCEL REQUEST.	SESSION CANCEL REQUEST	04h	'session_idle'
VEND / vend failure	13h/03h	The EPT stays in the state 'session_idle' and returns the reply SESSION CANCEL REQUEST. (No refund is performed.)	SESSION CANCEL REQUEST	04h	'session_idle'

Message sent by VMC		EPT Action	Reply from EPT		
Message Name	Code		Message Name	Code	New EPT State
VEND / session complete	13h/04h	The EPT goes from the state 'session_idle' to the state 'enabled'.	END SESSION	07h	'enabled'
READER / disable	14h/00h	If the EPT is in the state 'enabled' or the state 'session_idle', then the state 'disabled' will be entered. (In state 'session_idle' the EPT demands that the IEP be removed.) If the EPT is in the state 'vend', then the state 'disabled' will be entered as soon as the state 'vend' is left. (The transaction is completed as normal.) If the EPT is in the state 'vend' or 'session_idle' when the READER disable message is received, then the EPT will return the END SESSION reply, when entering the 'disabled' state.	END SESSION	07h	'disabled', now or later if in state 'vend'
READER / enable	14h/01h	The EPT goes from the state 'disabled' to the state 'enabled'. The EPT displays the message inviting the card holder to insert the IEP.			'enabled'
READER / cancel	14h/02h	If the EPT is in the state 'enabled', then it returns the CANCELLED reply	CANCELLED	08h	(unchanged)
EXPANSION / identification	17h/00h	The EPT returns the PERIPHERAL ID reply, with: MANUFACTURER CODE = " " (i.e. a string of three blanks) SERIAL NUMBER = the terminal number "12345678 " (left justified plus four blanks) MODEL NUMBER = "CZAM PROTON" SOFTWARE VERSION = software version number in packed BCD	PERIPHERAL ID	09h	(unchanged)
EXPANSION / diagnostics	17h/FFh	Not currently implemented. The EPT returns NACK	NACK		(unchanged)

3.5.3 Table 3: Messages sent to the VMC on the EPT's Initiative

Message sent by EPT			
Message Name	Code	Reason for sending Message	New EPT State
JUST RESET	00h	Message sent after start-up of the application program, e.g. after power-up.	'inactive'
DISPLAY REQUEST	02h	Not used.	
BEGIN SESSION	03h	Message sent when the EPT is in the state 'enabled' and a valid IEP is inserted.	'session_idle'
SESSION CANCEL REQUEST	04h	Message sent when the EPT goes from the 'vend' state to the 'session_idle' state following the completion of a transaction (successful or not) and the withdrawal of the IEP or the occurrence of the timeout or when the IEP is removed when in state 'session_idle' and the EPT goes to state 'enabled'.	'session_idle' 'enabled'
END SESSION	07h	Message sent as response to SESSION COMPLETE. The EPT normally goes to state 'enabled' unless the READER / disable message was also sent in which case state 'disabled' is entered.	'enabled' 'disabled'
MALFUNCTION / ERROR	0Ah	Not used.	
COMMAND OUT OF SEQUENCE	0Bh	Message sent when a VMC message is received which cannot be executed.	(unchanged)

3.6 Use in Power-saving Environments

Certain systems in which the EPT is to be integrated may need to conserve power, e.g. vending machines powered from batteries charged from solar cells. With these systems it is possible to remove the power from the EPT when not in use.

If the EPT is used in a power saving environment, it is highly recommended to use the PSVIC-protocol because only this protocol is capable of handling all problems associated with power saving environments.

3.6.1 Powering-on the EPT

To assist in determining when to power-on the EPT, the EPT provides an isolated contact-closure which is activated when a card is fully inserted into the EPT or one or more of the EPT buttons is pressed. The contact closure exists only for as long as the button is pressed or the card is fully inserted, i.e. the signal must be latched by the vending machine itself. The vending machine must guarantee that the power will be applied to the EPT when this contact-closure is detected and that the power will remain applied for a minimum of ten seconds. The vending machine manufacturer should determine if a longer minimum period is needed, depending for instance upon the complexity of the vending machine.

Of course, the vending machine may use its own signals in addition, e.g. from buttons used to select products, to determine that the EPT should be powered on. The same minimum power-on time must be guaranteed in this case also.

Once power is applied to the EPT, it performs its start-up procedures and returns the JUST RESET message, to indicate the EPT is now ready.

If the power-on was triggered by the EPT contact-closure due to a valid card being inserted, then, as soon as the VMC has put the EPT into the state 'enabled' (and assuming the card remains inserted) the EPT will return the BEGIN SESSION message and move to state 'session_idle'.

Note that the method to be used to perform the collections from the EPT may also determine when power is to be applied. If a manually controlled velocollection is to be made, then power should be switched on manually before starting the velocollection. If the collection is to be made automatically, either by the vending machine using the PSVIC off-line collection messages or by a direct telecollection (i.e. with modem and telephone line), then the vending machine must apply power before starting the collection.

3.6.2 Powering-off the EPT

If power has been applied in order to perform a collection then the power must remain applied at least until the collection or SWDL operation is fully completed (regardless of whether the operation is successful or not).

There is no way for the MDB-protocol to determine that a SWDL is running. In this case the power must be switched on under all circumstances (e.g. manually)!

Otherwise, if no customer actions indicate that a transaction is to be performed within the minimum power-on period (ten seconds or more as described above in 3.6.1) then the power may be removed from the EPT. The vending machine must itself decide both how to interpret the customer actions and when the power should be left applied to the EPT in anticipation of a transaction.

However, once a transaction has been started, i.e. the VEND/vend request message has been sent, the vending machine must in any case keep the power applied to the EPT until at least ten seconds after the VEND APPROVED or VEND DENIED answer has been received from the EPT. This allows time for the EPT to display the transaction result to the customer. The vending machine may, of course, continue to apply power to the EPT if desired, e.g. if it anticipates a further operation with the EPT.

The VEND APPROVED or VEND DENIED message is normally sent after the transaction is completed and the IEP has been removed. It will, however, in any case be sent, even if the IEP has not been removed, if the EPT timeout occurs.

3.7 Selecting MDB Protocol in EPTs

As described in section 2.3.1, the vending machine terminal module supports three protocols which may be used to perform purchase transactions, i.e. PSVIC, MDB and VEZ.

The selection of the protocol to be used for purchase transactions is performed with the initialisation program, pcpdv. The selection, once made, is stored in the terminal and in the CSM. Thus the setting is retained if the terminal hardware has to be replaced but the same CSM is used. Information on the pcpdv program and the terminal initialisation procedure is given in a separate document available from Payserv.

Note that the off-line collection is only performed with the PSVIC protocol and that this takes place via a separate interface port with a separate connector on the terminal. There is thus no selection procedure needed for this.

4 EPT User Interface (MDB)

4.1 Physical

The user interface of the purchase terminal consists of three buttons and a display.

The [OK] button is used to confirm the purchase transaction.

The [STOP] button can be used to cancel a transaction, provided that the [OK] button has not yet been pressed.

The [INFO] button can be pressed after the IEP has been inserted, in order to display the purse balance.

This can be done before [OK] is pressed or after the transaction, when the remove card message is displayed.

If the [INFO] button is pressed, before the IEP is inserted, then the EPT enters an information mode in which the IEP balance, details of the last IEP transaction and information about the EPT itself can be displayed.

The display shows user messages relating to the IEP and the operation of the EPT.

With the exception of the message displayed in state 'session_idle', to indicate to the user that he should, for example, select a product, no messages directly relating to the vending machine itself are displayed here.

4.2 Display States

Shown here is a flow-diagram to indicate the operation of the EPT, as seen by the cardholder from the messages displayed.

The display states are numbered and the messages displayed in these states are listed in the section 4.3.

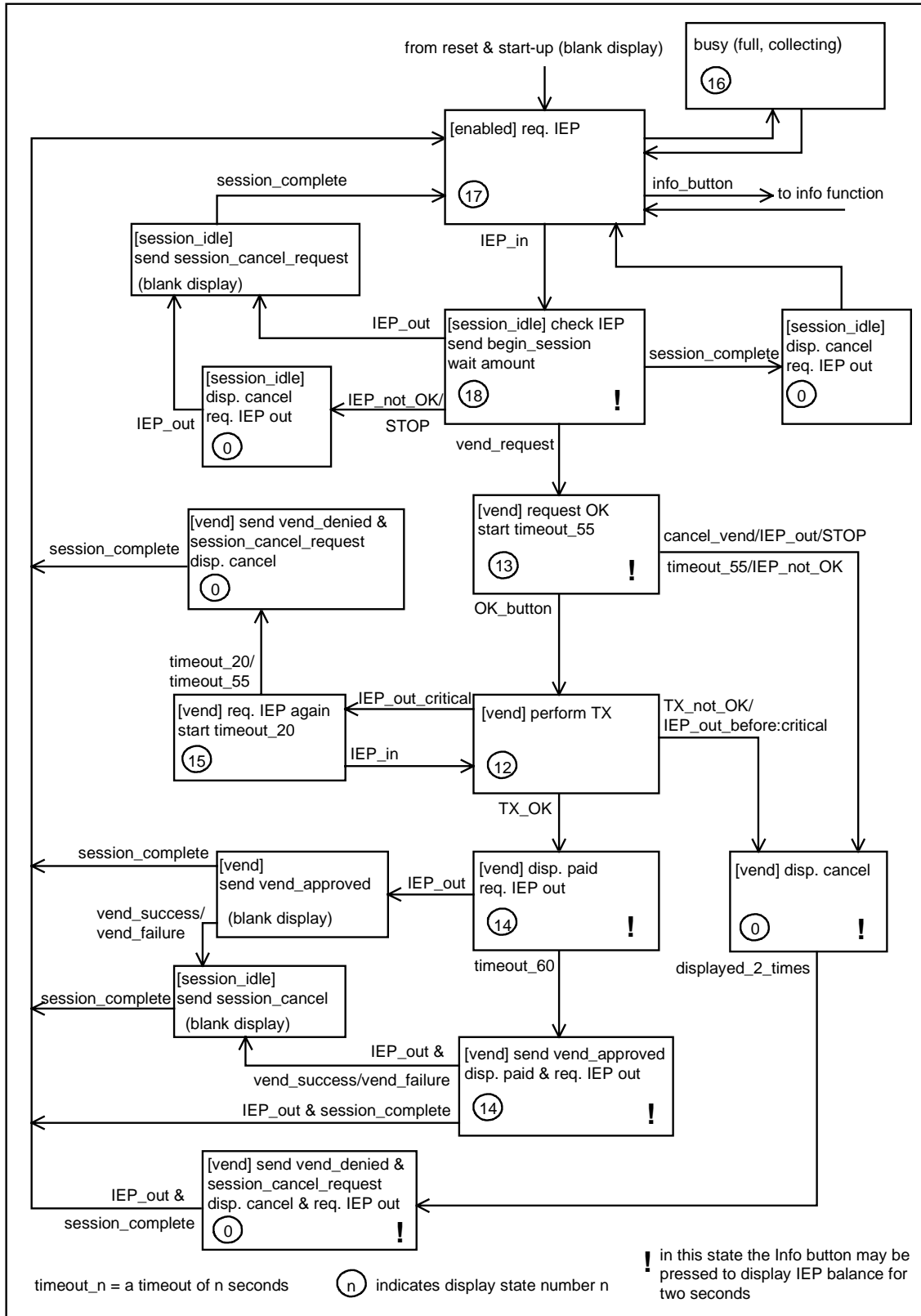


Diagram 1: Display States

4.3 User Messages

Listed here are the messages relating to the EPT operation, for the various display states.

If an IEP is inserted and the language code can be correctly read from this, then the messages are displayed in the corresponding language.

If no IEP is inserted, or if the language code cannot be read from an inserted IEP, then the messages are displayed in the default customer code set into the EPT.

4.3.1 Main Display Texts

		German	French	Italian	English	Spanish	Display sequence
Display State	1234567890123456	1234567890123456	1234567890123456	1234567890123456	1234567890123456	1234567890123456	(two lines)
12	Check IEP, do TX	Fr 999.99 ...	Fr 999.99 ...	Fr 999.99 ...	Fr 999.99 ...	Fr 999.99 ...	a a_,a_...
13	Ask if OK	Fr 999.99 OK? Fr 999.99	Fr 999.99 OK? Fr 999.99	Fr 999.99 OK? Fr 999.99	Fr 999.99 OK? Fr 999.99	Fr 999.99 OK? Fr 999.99	a (1s.) b (1s.) a_,b_,a_,b_...
14	Payment OK	Fr999.99 BEZAHLT KARTE ENTNEHMEN	Fr999.99 PAYE RETIREZ LA CARTE	Fr999.99 PAGATI RITIRARE CARTA	Fr999.99 PAID REMOVE CARD	Fr999.99 PAGADO RETIRAR TARJETA	a b (1s.) ab,a_,ab,a_...
	Payment OK, IEP balance low	Fr999.99 BEZAHLT SALDO Fr 999.99 KARTE ENTNEHMEN	Fr999.99 PAYE SOLDE Fr 999.99 RETIREZ LA CARTE	Fr999.99 PAGATI SALDO Fr 999.99 RITIRARE CARTA	Fr999.99 PAID BAL. Fr 999.99 REMOVE CARD	Fr999.99 PAGADO SALDO Fr 999.99 RETIRAR TARJETA	a b (1s.) c (1s.) ab,ab,ac,a_,ac,a_...
15	IEP out when critical	ZAHLUNG UNFERTIG NOCHMAL'S KARTE	PAIEM. INACHEVE REINSEREZ CARTE	PAGAM.INCOMPIUTO REINSERIRE CARTA	PAYMENT UNENDED REINSERT CARD	PAGO SIN FIN REINSERTAR TARJ.	a b (1s.) ab,a_,ab,a_...
16	Busy: collecting	MOMENT BITTE	UN INSTANT SVP	UN MOMENTO PREGO	A MOMENT PLEASE	MOMENTO P.FAVOR	a b ab,ab...
	Busy: otherwise	AUSSER BETRIEB	HORS SERVICE	FUORI SERVIZIO	OUT OF SERVICE	FUERA SERVICIO	a a_,a_...
17	Ask for card, no amount shown	WILLKOMMEN BITTE CASH	BIENVENUE CASH S.V.P.	BENVENUTI INSERIRE CASH PF	WELCOME CASH PLEASE	BIENVENIDO CASH POR FAVOR	a b (1s.) ab,a_,ab,a_...
18	Wait amount (IEP inserted)	CASH BEREIT... WAHL TREFFEN	CASH PRETE... FAITES LE CHOIX	CASH PRONTA... SCEGLIERE P.F.	CASH READY... MAKE SELECTION	CASH PRONTO... SELECCIONAR	a b (1s.) ab,a_,ab,a_...

4.3.2 Cancel Texts (display state 0):

Display State		German	French	Italian	English	Spanish	Display sequence
1234567890123456		1234567890123456	1234567890123456	1234567890123456	1234567890123456	1234567890123456	(two lines)
0	IEP not correct	KARTE VERKEHRT? KARTE OHNE CASH? KARTE ENTNEHMEN	CARTE FAUX COTE? CARTE SANS CASH? RETIREZ LA CARTE	VOLTARE CARTA? E' CARTA CASH? RITIRARE CARTA	CARD WRONG WAY? NOT CASH CARD? REMOVE CARD	TARJ. AL REVES? TARJ. SIN CASH? RETIRAR TARJETA	a (1s.) b (1s.) c (1s.) ac, bc, ac, bc...
	STOP, timeout, vmc_cancel, vmc_abort, IEP out (not critical)	ABBRUCH KEINE ZAHLUNG KARTE ENTNEHMEN	ANNULATION PAS DE PAIEMENT RETIREZ LA CARTE	INTERRUZIONE NESSUN PAGAMENTO RITIRARE CARTA	CANCELLED NO PAYMENT REMOVE CARD	CANCELADO NO REMUNERACION RETIRAR TARJETA	a (1s.) b c (1s.) ba, ba, bc, ba, bc...
	IEP balance too low	SALDO UNGENÜGEND KEINE ZAHLUNG KARTE ENTNEHMEN	SOLDE INSUFF. PAS DE PAIEMENT RETIREZ LA CARTE	SALDO NON BASTA NESSUN PAGAMENTO RITIRARE CARTA	BALANCE TOO LOW NO PAYMENT REMOVE CARD	SALDO. INSUF. NO REMUNERACION RETIRAR TARJETA	a (1s.) b c (1s.) ba, ba, bc, ba, bc...
	IEP in red list	CASH VERWEIGERT KEINE ZAHLUNG KARTE ENTNEHMEN	CASH REFUSEE PAS DE PAIEMENT RETIREZ LA CARTE	CASH RIFIUTATA NESSUN PAGAMENTO RITIRARE CARTA	CASH REJECTED NO PAYMENT REMOVE CARD	CASH DENEGADO NO RENUMERACION RETIRAR TARJETA	a (1s.) b c (1s.) ba, ba, bc, ba, bc...
	IEP expired	CASH VERFALLEN KEINE ZAHLUNG KARTE ENTNEHMEN	CASH ECHUE PAS DE PAIEMENT RETIREZ LA CARTE	CASH SCADUTA NESSUN PAGAMENTO RITIRARE CARTA	CASH EXPIRED NO PAYMENT REMOVE CARD	CASH CADUCADO NO REMUNERACION RETIRAR TARJETA	a (1s.) b c (1s.) ba, ba, bc, ba, bc...
	IEP pur_locks_online set	LADUNG UNFERTIG NEULADEN NOETIG KEINE ZAHLUNG KARTE ENTNEHMEN	CHARGE INACHEVEE RECHARGEZ SVP PAS DE PAIEMENT RETIREZ LA CARTE	CARICO NONFINITO RICARICARE PF NESSUN PAGAMENTO RITIRARE CARTA	LOAD UNFINISHED NEW LOAD NEEDED NO PAYMENT REMOVE CARD	CARGA INACABADA CARGAR OTRA VEZ NO REMUNERACION RETIRAR TARJETA	a (1s.) b (1s.) c d (1s.) ca, cb, cd, ca, cb, cd...
	(possible) IEP problem	CASH DEFEKT? KARTE ENTNEHMEN	ANOMALIE CASH? RETIREZ LA CARTE	CASH DIFETTOSA? RITIRARE CARTA	CASH FAULTY? REMOVE CARD	CASH DEFECTUOSO? RETIRAR TARJETA	a b (1s.) a_, a_, ab, a_, ab...

Note:

The line indicating 'REMOVE CARD' is only displayed until the card is removed. The cancel texts are always shown at least twice, even if the card has been removed, except for the first condition (IEP not correct) which is only shown whilst the card is inserted.

5 Acceptance Procedure

There is no official certification to be performed when the EPT has been integrated into a vending system.

The following acceptance procedure should, however, be gone through, either by the manufacturer of the vending system or by the integrator of the CASH terminal, to ascertain that the integration has been correctly implemented to a minimum acceptable standard.

Note that this procedure is only intended to test the payment function and that not all possible uses of the MDB messages or EPT features are included.

Note also that if the vending system is modified later, e.g. with a new software release, this acceptance procedure should be repeated for the new system.

No	To be tested:	Test procedure:	Expected results:
1	Start-up:	Power-on of VMC and EPT:	Correct establishment of MDB communications:
		a) first VMC then EPT	via JUST RESET from EPT
		b) first EPT then VMC	via RESET from VMC
		c) VMC and EPT together	depends on start-up times
2	Normal transactions:	Several transactions are performed with valid IEPs loaded with sufficient value: All cardholder actions are performed correctly; Various transaction amounts are used.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction OK, via VEND APPROVED, sent when card removed; IEP balance correctly debited by transaction amount; Goods/services correctly supplied by vending system.
3	Abnormal transactions: cancelled with [STOP]	A transaction is performed with a valid IEP loaded with sufficient value: All cardholder actions are performed correctly except that [STOP] is pressed instead of [OK].	Correct amount displayed on EPT; Correct transaction result, i.e. transaction not OK, via VEND DENIED, sent when card removed; IEP balance not debited; Goods/services not supplied by vending system.
4	Abnormal transactions: cancelled by timeout	A transaction is performed with a valid IEP loaded with sufficient value: All cardholder actions are performed correctly except that [OK] is not pressed.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction not OK, via VEND DENIED, sent after EPT timeout; IEP balance not debited; Goods/services not supplied by vending system.
5	Abnormal transactions: cancelled by too-early withdrawal of IEP	A transaction is performed with a valid IEP loaded with sufficient value: All cardholder actions are performed correctly except that the IEP is removed too soon after pressing [OK]; The IEP is not reinserted whilst the EPT is displaying the message requesting card reinsertion.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction not OK, via VEND DENIED, sent after EPT timeout; (IEP balance may or may not have been debited); Goods/services not supplied by vending system.

No	To be tested:	Test procedure:	Expected results:
6	Abnormal transactions: interrupted by too-early withdrawal of IEP but IEP reinserted in order to complete transaction successfully	A transaction is performed with a valid IEP loaded with sufficient value: All cardholder actions are performed correctly except that the IEP is removed too soon after pressing [OK]; The IEP is reinserted whilst the EPT is displaying the message requesting card reinsertion, i.e. before the timeout occurs.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction OK, via VEND APPROVED, sent when card removed for second time, i.e. after transaction actually completed; IEP balance correctly debited by transaction amount; Goods/services correctly supplied by vending system.
7	Abnormal transactions: insufficient value loaded in IEP	A transaction is performed with a valid IEP not loaded with sufficient value: The transaction amount must be greater than the IEP balance; All cardholder actions are performed correctly.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction not OK, via VEND DENIED, sent when card removed; IEP balance not debited; Goods/services not supplied by vending system.
8	Abnormal transactions: IEP not removed after successful transaction	A transaction is performed with a valid IEP loaded with sufficient value: All cardholder actions are performed correctly, except that the card is not removed when requested at the end of the transaction.	Correct amount displayed on EPT; Correct transaction result, i.e. transaction OK, via VEND APPROVED, sent when EPT timeout occurs; IEP balance correctly debited by transaction amount; Goods/services correctly supplied by vending system.
9	Operation during collections:	A collection is started, under the correct conditions for the type of collection to be used in the VM; Attempts to perform transactions are made on the VM whilst the collection is taking place.	Transactions are not performed whilst the collection is taking place; VMC does not attempt to reset by removing power from EPT whilst the collection is taking place; When the collection is finished the communication is correctly restored between EPT and VMC.
10	Application & removal of power to EPT in idle (only applies to power-saving environments, see 3.6)	When power is not applied to the EPT, one of the buttons is pressed.	Power is applied to the EPT for at least ten seconds.

No	To be tested:	Test procedure:	Expected results:
11	Application & removal of power to EPT during transaction (only applies to power-saving environments, see 3.6)	When power is not applied to the EPT, a normal transaction is started by user action, e.g. by selection on the VM; All cardholder actions are performed correctly, i.e. the transaction is completed correctly and the IEP is removed at the end of the transaction, when requested by the EPT.	Power is correctly applied to EPT when initiated by user action; Correct amount displayed on EPT; Correct transaction result, i.e. transaction OK, via VEND APPROVED, sent when card removed; IEP balance correctly debited by transaction amount; Goods/services correctly supplied by vending system; Power not removed from EPT until at least ten seconds after the IEP has been removed.