DYNAMIC CURRENCY CONVERSION SYSTEM AND METHOD

BACKGROUND

The present invention relates to a card-based system that can offer a user (e.g. a payment card holder) an alternative currency for payment.

A typical transaction terminal system, for example an automatic teller machine, a point of sale terminal, a workstation of the like, will offer transactions in a currency local to the transaction terminal system. However, sometimes users would wish to make a transaction in an alternative currency.

There is a need automatically to identify payments for which a user may wish to make a payment in a currency other than the currency local to the transaction terminal system. Some approaches to provide for the automatic determination of a currency for dynamic currency conversion have been proposed.

For example EP 1,018,711 discloses an approach that includes identifying an identifier code from a payment card number and comparing this to entries in a table containing issuer codes and a corresponding currency code to determine an operating currency for association with a card transaction.

International patent application WO 2006/009816 discloses an approach that includes a financial account number associated with a financial institution maintained by a customer being received, a foreign currency type associated with the financial account is determined, and a choice is presented to the user, the currency transaction then being conducted in accordance with a currency selection of the customer.

A draft Bulletin released by EMVCo in October 2007 entitled "Dynamic Currency Conversion (DCC) Processing" (Application Note No35, First Edition October 2007 – see http://www.emvco.com/documents/bulletin/view/AN35_Draft%20DCC%20Clarification%20v1.0.pdf) describes how a transaction should be performed when dynamic currency conversion (DCC) is offered for a chip, or EMV card.

Depending upon technical and legislative requirements, different options for automatically determining a currency for currency conversion may not be available in all locations at which a card transaction terminal may be located. Accordingly, it has traditionally been necessary to support multiple card transaction terminals in order to address these needs.

SUMMARY

One aspect can provide a transaction terminal system that includes an input interface to receive payment card details and transaction details, a communications interface to connect to a remote host system, and processing logic operable to transmit a rate request message to the host system to identify a dynamic currency conversion rate, and to receive a response message from the host system. A rate request message can include a request type indicator indicative of one of plurality of rate request message types and wherein, a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator.

A method of operating a transaction terminal system can comprise: receiving payment card details and transaction details; transmitting a rate request message to a host system to identify a dynamic currency conversion rate, wherein a rate request message includes a request type indicator indicative of one of plurality of rate request message types and wherein a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator; and receiving a response message from the host system.

Another aspect can provide a dynamic currency conversion host system comprising a host communications interface to connect to a transaction terminal system and host processing logic operable to receive a rate request message from the transaction terminal. A rate request message can include a request type indicator indicative of one of plurality of rate request message types and a rate request message for at least a selected rate request message type can include a conversion currency field for a conversion currency indicator. The processing logic can further be operable to determine a conversion rate in response to a rate request message that includes an indicated conversion currency or to determine a conversion currency and a conversion rate for the determined conversion currency in response to a rate request message without an indicated conversion currency. The processing logic can transmit to the transaction terminal system a rate response message that includes a conversion currency indicator and a conversion rate indicator for that currency.

A method of operating a dynamic currency conversion host system can comprise: receiving a rate request message from a transaction terminal system, wherein a rate request message includes a request type indicator indicative of one of plurality of rate request

message types and wherein a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator; determining a conversion rate in response to a rate request message that includes an indicated conversion currency or determining a conversion currency and a conversion rate for the determined conversion currency in response to a rate request message without an indicated conversion currency; and transmitting to the transaction terminal system a rate response message that includes a conversion currency indicator and a conversion rate indicator for that currency.

A dynamic currency conversion system can include one or more such transaction terminal systems and one or more such dynamic currency conversion host systems.

Although various aspects of the invention are set out in the accompanying claims, other aspects of the invention include any combination of features from the described embodiments and/or the accompanying dependent claims with the features of the independent claims, and not solely the combinations explicitly set out in the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments are described, by way of example only, with reference to the accompanying drawings.

Figure 1 is a schematic block diagram illustrating an example of a configuration of a card payment system providing dynamic currency conversion.

Figure 2 is a block diagram illustrating an example of a transaction terminal system.

Figure 3 is a block diagram illustrating an example of a dynamic currency conversion host system.

Figures 4A and 4B form a flow diagram illustrating an example operation of a transaction terminal system;

Figure 5 is a flow diagram illustrating an example operation of a dynamic currency conversion host system.

DETAILED DESCRIPTION

Figure 1 is a schematic block diagram illustrating an example of a payment card system 100.

Figure 1 illustrates a transaction terminal system (or transaction station system) 10 that includes card payment functionality and additionally includes dynamic currency conversion (DCC) system functionality. The transaction terminal system 10 can be configured as a point of sale terminal located, for example, in the premises of a retailer, or may, for example, be an automated teller machine.

The transaction terminal system 10 can include one or more interfaces for receiving card payment and purchase details. The transaction terminal system 10 is in communication via a communications network (for example via the Internet, a telephone network or another network) with a computer system 12 of a bank that provides banking services for the retailer, hereinafter referred to as an acquirer bank system 12. As a part of processing a card payment, the transaction terminal system 10 generates a payment authorisation request message 20.

The acquirer bank system 12 can include one or more computers. The acquirer bank system 12 can be operable to receive the payment authorisation request message 20 from the transaction terminal system 10 and to return an authorisation response message 30 in due course to the transaction terminal system 18. The acquirer bank system 12 is further in communication via a communications network (for example via the Internet, a telephone network or another network) with a network 14 of computer systems of a payment card operator (hereinafter referred to as the scheme network 14). Although only one scheme network 14 is shown in Figure 1, the acquirer bank system 12 will be in communication with respective scheme networks for respective payment card operators.

The acquirer bank system 12 is operable to analyse a payment authorisation request message 20 received from the transaction terminal system 10 to determine an appropriate scheme network for the card concerned and to forward a payment authorisation request message 22 to the appropriate scheme network 14.

The scheme network 14 can be operable to receive the payment authorisation request message 22 from the acquirer bank system 12 and to return an authorisation response message 28 in due course to the acquirer bank system 12. The scheme network 14 is further in communication via a communications network (for example via the

Internet, a telephone network or another network) with a computer system 16 of a financial institution that issued the payment card (hereinafter referred to as the issuing financial institution system). Although only one issuing financial institution system 16 is shown in Figure 1, the scheme network 14 can be in communication with respective issuing financial institution systems 16 for respective issuing financial institutions.

The scheme network 14 can be operable to analyse the received payment authorisation request message 22 to identify the issuing financial institution that issued the payment card. The scheme network 14 is then operable to forward a payment authorisation request message 24 to the issuing financial institution system 16 concerned, and to receive a response message 26 from the issuing financial institution system 16.

The issuing financial institution system 16 can be operable to receive the payment authorisation request message 24, to process the authorisation request by comparing the details of the payment request to records held for the payment card concerned, and then to transmit an appropriate authorisation response message 26 to the scheme network 14. The authorisation response message includes various details including confirmation as to whether the payment is authorised or not. The authorisation response message 26 is then forwarded via the scheme network 14, the acquirer bank system 12 to the transaction terminal system 10.

In the following, further detail will be given of rate request and rate response messages passed between the transaction terminal system 10 and the DCC host system 18 to determine whether a DCC operation is to be performed.

On confirmation of a currency for a transaction, the transaction terminal system 10 can be operable to transmit a settlement message (e.g. for the card holder's home or billing currency message) to the issuing financial institution 16 via the acquirer bank system 12 and the scheme network systems 14.

Figure 2 is a schematic block diagram of an example of a transaction terminal system 10. The example transaction terminal system 10 illustrated in Figure 2 includes one or more processors 40, storage 42 (which can include volatile and non-volatile memory and storage), for the storage of programs and data. Figure 2 illustrates that the storage 42 includes a card processing application forming a card processing (CP) application module 44, a DCC application forming a DCC module 46 and reference country and/or currency information 48, a local Issuer Identification Number/Bank

Identifier Numbers (IIN/BIN) table 49 and a foreign currency table 47. It should be noted that the storage 42 can contain other applications and data.

The reference country/currency information 48 can be held, for example as an ISO country code and an alpha currency code and/or a numeric currency code in a file in the storage 42 or in a register.

Respective entries in the local IIN/BIN table 49 identify local banks and other financial institutions for which a payment card has the local currency of the transaction terminal as the billing currency for the payment card, whereby the user (card holder) for the payment card would not be eligible for dynamic currency conversion. Individual entries in the local IIN/BIN table 49 can include various fields including, for example, one or more of the following fields for:

an IIN/BIN;

an alpha billing currency code (e.g. an alpha ISO currency code);

a numeric billing currency code (e.g. a numeric ISO currency code);

a country code (e.g. an ISO country code).

The foreign currency table 47 can include indications of foreign currencies supported for dynamic currency conversion by the transaction terminal system 10. Individual entries in the foreign currency table 47 can include various fields including, for example, one or more of the following fields for:

an alpha foreign currency code (e.g. an alpha ISO currency code);

a numeric foreign currency code (e.g. a numeric ISO currency code).

Figure 2 also represents, schematically, a keyboard/keypad 50, a scanner 52 and a card reader 54. The keyboard/keypad 50 can be keyboard/keypad with separate keys, or can be configured as a touch screen keyboard/keypad and can be used for the input of numerical and/or other characters as appropriate. The scanner 52 can, for example be a bar code scanner, an RFI tag scanner or the like. The card reader 54 can be configured to read data from a payment card. The card reader 54 can be a magnetic stripe reader, a chip card reader, an RFI tag reader, etc., as appropriate. Also, where appropriate, the card reader 54 can also be operable to write information to a suitably configured payment card.

Figure 2 further represents, schematically, a display 56, a printer 58 and a communication interface 62. The display 56 can be a numeric display, an alphanumeric display, an image display, etc. as appropriate to display input data and/or messages to

assist the user (e.g. a payment card holder) and/or a retailer/merchant in operation of the transaction terminal system 10. The printer can be used for printing purchase receipts and/or other information. The communications interface 60 enables communications via one or more communications channels 62 from the transaction terminal system 10 to the DCC host 18, either directly or via an intermediate network (not shown).

In the example described above, the transaction terminal system 10 is an automated teller system or a point of sale system. However, it should be understood that the transaction terminal system could also be in the form of a workstation connected to the Internet. The transaction terminal system may also be fully or partially integrated into the transaction system of a hotel, theatre, retail establishment, or the like.

Figure 3 is a schematic block diagram of an example of a DCC host system 18. The example DCC host system 18 illustrated in Figure 3 includes one or more processors 70, storage 72 (which can include volatile and non-volatile memory), for the storage of programs and data. Figure 3 illustrates that the storage 72 includes one or more DCC programs forming a DCC module 76 and one or more data tables including a billing currency file (BCF) 75, currency conversion, or exchange rate tables 74 and a country to currency table 77. It should be noted that the storage 72 can contain other applications and data.

Entries in the BCF 75 can include various fields, including, for example, fields for:

a transaction code;

a transaction code qualifier;

a transaction component sequence number;

a destination BIN;

a source BIN;

a report identifier;

a report line sequence number;

an account billing file identifier;

a file recipient identifier;

an account low range value;

an account high range value; and

a currency code (e.g., a cardholder billing ISO currency code).

The exchange rate tables 74 can contain information from which current exchange rate data can be extracted. A header entry in the exchange rate table can include various fields, including for example, one or more of the following fields for:

an FCC outgoing file prefix;

a file identifier (e.g., 01 can indicate a foreign currency BIN table for gateway, 02 - 03 can indicate a foreign exchange rates table for a gateway);

a start effective date;

a start effective time;

a base currency code (e.g., using an ISO currency code);

a country code (e.g., using an ISO country code);

a file sequence number (e.g., 001, unless more than one file for the date);

a file extension (e.g., DAT).

A volume in the exchange rate tables 74 can include various fields, including, for example, one or more of the following fields for:

a volume header;

a start effective date;

a start effective time;'

a Rate ID.

Individual exchange rate entries in the exchange rate tables 74 can include various fields, including, for example, one or more of the following fields for:

an alpha currency code (e.g., an ISO standard 3 character alpha code);

a numeric currency code (e.g., an ISO standard 2-3 character numeric code);

a Euroband indicator (e.g. a flag to indicate whether the currency is a Euroband currency);

an exchange rate (e.g., a rate of exchange rounded to 4 decimal places);

a merchant FX-rate category;

a valid from date (e.g., the date from which the exchange rate is valid);

a valid from time (e.g., the time on that date from which the exchange rate is valid);

a valid to date (e.g., the date after which the exchange rate is not valid);

a valid to time (e.g., the time on that date after which the exchange rate is not valid);

a markup percentage value;

a markup precision value (e.g., to indicate a markup decimal place precision).

A final field in the exchange rate tables 74 can include various fields, including, for example, one or more of the following fields for:

a trailer line;

a checksum on the currency code field

a checksum on the exchange rate field;

a record count.

A country to currency table 77 is used to map between a country and a currency. Typically one currency is associated with per country, but there be multiple countries associated with each currency. In one example, the country to currency table is arranged by country and each entry for a country identifies a currency associated therewith. In this example, each entry can include one or more fields including, for example, one or more of the following fields:

a country code (e.g., an ISO country code);

an alpha currency code (e.g., an ISO standard 3 character alpha code);

a numeric currency code (e.g., an ISO standard 2-3 character numeric code).

Figure 3 also represents, schematically, a keyboard 78 and a display 80. The keyboard 78 can be keyboard with separate keys, or can be configured as a touch screen keyboard and can be used for the input of numerical and/or other characters as appropriate. The display 80 can be a numeric display, an alphanumeric display, an image display, etc. as appropriate to enable an operator to view system data.

Figure 3 further illustrates a printer 82 and a communications interface 84. The printer can be used for printing system data. The communications interface 84 enables communication via one or more communication channels 86 with the transaction terminal system 10 and the acquirer bank system 12, either directly or via intermediate networks (not shown).

Figure 4, formed from Figures 4A and 4B, is a process diagram 390 illustrating card transaction (e.g. a payment card transaction) and DCC operations for a payment card transaction at a transaction terminal system 10.

The transaction terminal system 10 is initially in an idle state 300. When a user (e.g. a card holder) wishes to conduct a transaction (for example to make a payment) the transaction terminal determines the type of payment card. If it is determined in step 302

that the payment card is an EMV card (i.e., a card with a chip), then EMV processing is performed at 392 by the transaction terminal 10 in combination with the EMV card.

At 304, the application selection takes place. In other words, the transaction terminal system 10 can be operative at 304 to receive information from the payment card as to the type of payment card being used (e.g., credit or debit, Mastercard or Visa, etc.)

At 306, the payment card application can be initiated, optionally using a Processing options Data Object List (PDOL) if provided on the payment card.

The initiate application processing function 306 can:

inform the payment card chip that processing of a new transaction is beginning;

provide the payment card chip terminal-related information about the transaction;

obtain from the payment card chip an application interchange profile and a list of files that contain payment card chip data to be used in processing the transaction; and

determine whether the transaction is allowed.

The PDOL if present on the payment card, is a list of tags and lengths of terminal-resident data elements for the payment card chip. If a PDOL is available, then the chip card will request the transaction terminal system 10 to use the information available in the PDOL for the applicable application. If present in the PDOL, the chip card may request a transaction amount and a currency from the transaction terminal system 10.

At 308, data is then read from the payment card. Data contained in the payment card chip can be used by the transaction terminal system 10 to perform various tasks.

A determination can be made at 310 as to whether the application currency code is present on the card. If an application currency code representative of a billing currency for the payment card is present on the card, then at step 312 the application currency code is compared to a reference code 48 held in storage 42 in the transaction terminal system 10 to determine DCC eligibility. The reference code 48 can identify a country in which the transaction terminal system 10 is located, or a currency of the country in which the transaction terminal system is located, and can therefore form, for example, a terminal country code or a terminal currency code. If the application currency code corresponds to a reference currency code representative of a local currency for the transaction terminal system 10, then this is indicative that the user is not eligible for dynamic currency conversion.

If, at 310, it is determined that application currency code was not present on the card, then at 314, a determination can be made whether an issuer country code representative of an issuer country is present on the payment card. If the issuer country code is present on the payment card, then at step 316 the issuer country code is compared to the reference code held in storage in the transaction terminal system 10 to determine DCC eligibility. If an issuer country or currency code retrieved from the payment card corresponds to the reference code, then this is indicative that the user is not eligible for dynamic currency conversion.

It will be appreciated that the order of the determinations at 310 and 314 could be reversed in another example.

If, at 302, it is determined that the card is not a EMV card, or alternatively if the payment card is an EMV card and neither an application currency code nor an issuer country code are provided on the card (see 310 and 314), then at 318 the Primary Account Number (PAN) of the payment card, which includes the Issuer Identification Number/Bank Identifier Numbers (IIN/BIN) can be used to determine DCC eligibility. For example, the IIN/BIN retrieved from the PAN held on the magnetic strip or in the chip (if present) on the payment card, or entered manually by an user, can be compared to a list 49 of local, or reference IIN/BIN codes for issuers local to the currency zone in which the transaction terminal system is located and held in the IIN/BIN table 49 in storage 42 in the transaction terminal system 10. If the retrieved IIN/BIN code corresponds to a currency code corresponds to one of the list 49 of local, or reference IIN/BIN codes for issuers local to the currency zone in which the transaction terminal system is located, then this is indicative that the user is not eligible for dynamic currency conversion.

Accordingly, at 320, the determination is made whether the information identified at 312, 316 or 318 indicates that the user is potentially eligible for DCC.

If, at 320, it is determined from the information identified at 312, 316 or 318 that the user is not eligible for DCC, then at 384, the transaction continues using the local (or reference) currency, and at 386, the transaction is terminated after using that local currency.

If, however, at 320, it is determined that the user is eligible for DCC, then control passes via route A to Figure 4B.

Accordingly, in Figure 4B, a first module can make a determination at 330 whether an application currency code is available. If, at 330, it is determined that an application currency code is available, then at 332, a rate request message with the application currency code is transmitted to a DCC host system using a first process code (e.g., PROC CODE=000000) as indicated at F.

Alternatively, if it is determined at 330 that the application currency code is not available, then a second module can make a determination at 334 as to whether remote dynamic currency code retrieval is permitted for the transaction terminal system. Whether remote dynamic currency code retrieval is permitted, or not, can depend, for example, on the location of a transaction terminal and/or a DCC host system, and whether this functionality is enabled, or not. For example, in one embodiment, this functionality can be provided in that an appropriate functional module can be present, but this module can be deactivated prior to installation in an operator location. If it is determined that dynamic currency code retrieval is permitted (i.e. this functionality is enabled), then at 336, a rate request message without a currency code is transmitted to a DCC host system using a second process code (e.g., PROC CODE=000001) as represented at F.

Alternatively, if at 334, it is determined that dynamic currency code retrieval is not permitted in the present transaction terminal system, then a third module can make a determination at 335 as to whether an issuer country code is available. If at 335, it is determined that an issuer country code is available, then at 337 a rate request message with the issuer country code is transmitted to a DCC host system using a third process code (e.g., PROC CODE=000002) as indicated at F.

Alternatively, if at 335, it is determined that the issuer country code is not available, then a DCC supported currency list is offered to the user (e.g., a payment card holder) at 338 for the user to make a selection of a non-local currency (hereinafter referred to as a "foreign currency"). The list of supported foreign currencies can be held in storage in the transaction terminal system 10. If it is determined at 340 that a foreign currency has been selected by a user, then at 342 a rate request message with a selected foreign currency code is transmitted to a DCC host system using a fourth process code (e.g., PROC CODE=000003) as indicated at F.

If, at 340, it is determined that no foreign currency has been selected, then control passes via C to Figure 4A and it is determined at 382 that the DCC status is "unconverted",

whereby the transaction continues using the local currency (or reference) at 384, and the transaction terminates at 386 following completion of the transaction in the local currency.

Returning to steps 332, 336, 337 and 342, in each case, the rate request message is sent to the DCC host system 18 with an appropriate process code. It should be noted that the process codes 000000 or 000001, 000002 or 000003, are shown by way of example only, and that other values can be provided for the process codes in other examples. Also, it should be noted that the order of the steps 330/332, 334/336, 335/337 and 338/340/342 are shown in this order by way of illustration only, and that in other examples the steps could be performed in another order or in parallel.

At 350, a process is performed at the DCC host system 18 to obtain an exchange rate/converted sales amount. Figure 5 illustrates this process 350 as performed at the DCC host system 18 in more detail.

Turning to Figure 5, the process 350 starts where the rate request message is received at the DCC host system 18 at 402 from the payment card transaction terminal 10.

If, at 404, it is determined that the process code is the first process code (e.g., 000000), then at 406, the rate request with the application currency code is passed for processing.

Alternatively, if it is determined at 404 that the process code is not the first process code (e.g., not 000000), then at 408 a determination is made whether the process code is the second process code (e.g., 000001). If it is determined at 408 that the process code is the second process code (e.g., 000001), then at 410 it is determined that the rate request message without a currency code is passed for processing, and at 412 the currency code is obtained from a billing currency file (BCF) 75 held in storage 72 in the DCC host system 18. A BCF lookup can be made using, for example, selected digits (e.g., from the first eight digits) of the PAN. This is then passed for further processing.

Alternatively, if it is determined at 408 that the process code is not the second process code (e.g., not 000001), then at 409 a determination is made whether the process code is the third process code (e.g., 000002). If it is determined at 409 that the process code is the third process code (e.g., 000002), then at 411 it is determined that the rate request message with an issuer country code is passed for processing, and in 413 the currency code is obtained form the country to currency table 77 held in storage 72 in the DCC host system 18. A country to currency lookup can be made using for example, the

supplied issuer country code, to obtain the default currency code for the corresponding supplied country code.

Following 406, 412 or 413, at 414 it is determined whether the currency code is a supported currency by comparing the identified currency to a list of DCC supported currencies held in storage in the DCC host system 18.

If it is determined at 414 that the currency code is not a DCC supported currency, then at 415 parameters are set for a response message (Action Code= "AmtUnconverted" (amount unconverted) and Reason Code "Unsupported") is identified and a response message is created at 416 in which includes blank exchange rate and sales amount fields.. At 420 the response message is returned to the card transaction terminal 10 as indicated at G.

If at 414 it is determined that the currency code is DCC supported, then at 418 the currency conversion (exchange) rate for the currency concerned is obtained from the currency conversion rate tables 74 in the DCC host system 18 and the transaction amount is converted using the currency conversion rate. At 419, parameters are set for a response message (Action Code= "AmtConverted" (amount converted) and Reason Code "Normal") and a response message is created with the obtained exchange rates and converted transaction amounts.. At 420 the response message including with obtained exchange rates and converted transaction amounts fields is returned to the card transaction terminal 10 as indicated at G.

Returning to 409, if it is determined that the processor code is not the third processor code (e.g., is not 000002), then at 422, a determination is made whether the process code is the fourth processor code (e.g., 000003).

If it is determined at 422 that the processor code is the fourth processor code, then at 424, it is recognised that the received rate request is a rate request with a user selected currency. At 426, a billing currency code associated with the payment card is obtained from the BCF 75 using, for example, the first eight digits of the PAN. At 428, a determination is made as to whether the user selected currency code is the same as the billing currency code from the BCF 75.

If it is determined at 428 that the user selected currency code is the same as the billing currency code identified in the BCF, then at 418 the exchange rate applicable for the user selected currency is obtained from the rate table 74 and the converted transaction

amount is calculated. At 419, parameters are set for a response message (Action Code= "AmtConverted" (amount converted) and Reason Code "Normal") and a response message is created with the obtained exchange rates and converted transaction amounts. At 420 the response message including with obtained exchange rates and converted transaction amounts fields is returned to the card transaction terminal 10 as indicated at G..

Returning to 428, if it is determined that the selected currency code is not equal to the billing currency code identified from the BCF, then at 429, parameters are set for a response message (Action Code= "AmtConverted" (amount converted) and Reason Code "Different Currency"). At 430, the exchange rate applicable for the user selected currency is obtained from the rate table 74 and the converted transaction amount is calculated. A response message is then created at 432 that includes a billing currency code from BCF 75 populating the home currency field and selected identified currency, conversion rate and converted transaction amount fields populated. At 420 the response message including the populated home currency, identified currency, conversion rate and converted transaction amount fields is returned at to the card transaction terminal 10 as indicated at G.

Returning to 422, if it is determined that the process code is not the forth process code (e.g., 000003), then at 434 it is determined that there is an unknown error, and at 435 parameters are set for a response message (Action Code= "AmtUnconverted" (amount unconverted) and Reason Code "Unknown"). A response message is then created at 416 in which includes blank exchange rate and sales amount fields. At 420 the response message is returned to the card transaction terminal 10 as indicated at G...

It will be appreciated that the order of the steps 404, 408, 409 and 422 is shown by way of illustration only, and that in another example these steps could be effected in another order or in parallel.

Following the process 350 described with reference to Figure 5, the process returns at G to the card transaction terminal 10 and continues in Figure 4B at 352, where it is determined, whether, or not, the action code in the response message shows that the amount has been converted (Action Code – AmtConverted).

If the Action Code does not show that the amount is converted (Action Code – AmtUnconverted), then at 353 a determination of the reason is made. If the Reason Code in the response message is set to "Unsupported", then at 355 the DCC status is set to "Unsupported", and then the process returns via B to Figure 4A, the transaction proceeds at

384 in the local, or reference, currency and the transaction terminates at 386 following completion of the transaction in the local currency. If in 353 it is determined that the Reason Code in the response message is not set to "Unsupported", then at 354 the DCC status is set to "Leakage", and then the process returns via B to Figure 4A, the transaction proceeds at 384 in the local, or reference, currency and the transaction terminates at 386 following completion of the transaction in the local currency.

Alternatively, if at 352 it is determined that Action Code in the response message shows that the amount has been converted (Action Code – "AmtConverted"), then at 356 a determination is made whether the Reason Code in the message is set to "Normal".

If at 356 it is determined that the Reason Code is set to "Normal", then at 364 the user is given the option to confirm his/her selection of a DCC transaction. If the card holder does select DCC at 364, then at 368 a determination is made whether the transaction is a chip card (EMV) transaction. If the transaction is determined at 368 to be a chip card transaction, then at 370, a determination is made whether the transaction amount or currency has already been requested in the Initiate Application Processing stage with PDOL option. If at 370 it is determined that a transaction amount or currency has already been requested, then at 372 the process restarts via E by initiating application processing at 394 in Figure 4A and providing a normal EMV transaction flow at 396 in Figure 4A using the same Application Identifier AID derived at 304 with the converted transaction amount and the currency code confirmed in the DCC process at 350. Alternatively, if at 370 it is determined that transaction amount or currency has not been requested already at Initiate Application Processing stage with PDOL option, then at 374 the chip card transaction continues in the foreign currency code with the converted transaction amounts in foreign currency confirmed in the DCC process at 350.

If it is determined at 368 that the payment card transaction is not a chip card transaction, then at 376 the payment card transaction is continued in the foreign currency using the converted transaction amounts in foreign currency.

Following 374 or 376, at 378 the DCC status is noted as "converted" and the transaction flow returns at D to Figure 4A to continue and to end at 386.

Returning to 364, if at 364 the user does not select DCC, then the transaction flow returns via C to Figure 4A and at 382 the DCC status is noted as "unconverted" and

continues at 384 in the local (reference) currency, terminating at 386 after completion in the local currency.

Returning to 356, if at 356 it is determined that the Reason Code is not set to "Normal" , then at 358 an alert message 360 is displayed to the user. The alert message 360 could, for example, be "A transaction currency (xxx) other then your card's billing currency is chosen, do you wish to proceed? (Y/N)".

If, at 362, on the basis of the alert message 360 displayed at 358, the user chooses to continue with the selected currency, then control passes to 364 as described earlier. Alternatively, if at 362 it is determined that the user chooses not to continue with the selected currency, then the transaction flow returns at C to Figure 4A and at 382 the DCC status is noted as "unconverted" and continues in the local currency at 384 terminating at 386 after completion of the transaction in the local currency.

In the above described process, it will be noted that the transaction terminal system includes a process code in a rate request message transmitted to the DCC host system 18, and the DCC host system 18 is responsive to the process code to control the processing of the rate response message and the transaction terminal system 10 is responsive to the Action Codes and Reason Codes to determine further processing. It will be appreciated, however, that in another example, the encoding of the rate request message could be effected other than by using process, action and reason codes, for example by using selective population of fields of the rate request message and the rate response message, where certain fields could be left blank or set to predetermined values. Where reference is made to a blank field this can include, for example, setting the content of a field to all zeros, or to some other values that do not correspond to a valid content for the field.

Also, as well as the specific field mentioned above, a rate request message and a rate response message can include other fields.

An example rate request message can include, for example, one or more fields selected from the following fields for:

a date and time of transmission;

a system trace audit number;

a date and time of local transaction;

a local currency merchant ID;

a local currency TID;

an acquirer ID;

a base amount;

a card BIN/IIN number;

a rate request reference ID;

a card type;

a till ID/Merchant POS;

a foreign currency code (e.g., a foreign currency alpha code).

An example rate response message can include, for example one or more fields selected from the following fields for:

a date and time of transmission;

a system trace audit number;

a date and time of local transaction;

a local currency merchant ID;

a local currency TID;

an acquirer ID;

a base amount;

a foreign amount;

a card BIN/IIN number;

an exchange rate;

a rate request reference ID;

a card type;

an inverted rate;

a foreign currency code, (for example a foreign currency alpha code);

a home currency code (for example a home currency alpha code);

a till ID/merchant POS;

a markup percentage;

a commission percentage;

a commission value;

an action code;

a reason code.

Also, it should be mentioned that although reference is made to a rate request message and a rate response message, the message transfer could involve one or more rate request messages and one or more rate response messages.

The DCC program modules 46 and 76 may each be embodied in one or more computer program products for operating the processors 40 and 70, respectively. In other words, the processes and modules described with reference to Figures 4A and 4B can be implemented by one or more computer program products operable to control the processor(s) 40 of the transaction terminal system 10. Similarly, the processes and modules described with reference to Figure 5 can be implemented by one or more computer program products operable to control the processor(s) 70 of the DCC host system 18. Each computer program product may be in the form of one or more computer programs provided, for example on a carrier medium forming a computer readable medium. The carrier medium could be a storage medium such as a solid state, magnetic, optical, magneto-optical or other storage medium. The carrier medium could be a transmission medium such as broadcast, telephonic, computer network, wired, wireless, electrical, electromagnetic optical or any other transmission medium.

Although the embodiments described above have been described in detail, numerous variations and modifications will become apparent to those skilled in the art once the above disclosure is fully appreciated. It is intended that the following claims be interpreted to include all such variations and modifications and their equivalents.

CLAIMS

1. A transaction terminal system comprising:
- an input interface to receive payment card details and transaction details;
- a communications interface to connect to a remote host system;
- processing logic operable to transmit a rate request message to the host system to identify a currency conversion rate, and to receive a response message from the host system,
- wherein a rate request message includes a request type indicator indicative of one of plurality of rate request message types and wherein, a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator.

2. The system of claim 1, comprising storage operable to store at least one of a reference country indicator or a reference currency indicator for the transaction terminal system, the processing logic being operable to identify whether received payment card details are indicative of a payment card for which an issuer country or billing currency is the reference country or currency and, in the event that an indicated payment card issuer country or currency is the reference country or currency, to process a transaction in a currency corresponding to a currency for the reference country or to the reference currency without transmitting a rate request message.

3. The system of claim 1, comprising storage operable to store a reference currency indicator for the transaction terminal system, the processing logic being operable to identify whether received payment card details are indicative of a payment card for which a billing currency is the reference country and, in the event that an indicated payment card billing currency is the reference currency, to process a transaction in the reference currency without transmitting a rate request message.

4. The system of claim 3, wherein the storage is further operable to store indications of reference payment card issuers for which a billing currency is the reference currency, the processing logic being operable to compare payment card issuer information in the received payment card details to the reference payment card issuer indications to determine

whether the received payment card details are indicative of a payment card for which a billing currency is the reference currency.

5. The system of claim 1, comprising storage operable to store a reference country indicator for the transaction terminal system, the processing logic being operable to identify whether received payment card details are indicative of a payment card for which an issuer country is the reference country and, in the event that an indicated payment card issuer country is the reference country, to process a transaction in a currency corresponding to a currency for the reference country without transmitting a rate request message.

6. The system of claim 5, wherein the storage is further operable to store indications of reference payment card issuers for which an issuer country is the reference country, the processing logic being operable to compare payment card issuer information in the received payment card details to the reference payment card issuer indications to determine whether the received payment card details are indicative of a payment card for which an issuer country is the reference country.

7. The system of any preceding claim, wherein the input interface comprises a chip card reader, the processing logic comprising a chip logic module configured:

- to respond to insertion of a payment card having a logic chip to attempt to retrieve billing currency information stored on the payment card; and
- in the event of billing currency information being retrieved from the payment card, to transmit a rate request message that includes a first request type indicator and a conversion currency indicator representative of a billing currency retrieved or derived from information retrieved from the payment card.

8. The system of any preceding claim, the processing logic comprising a switchable logic module switchable to be active or inactive, which switchable logic module is operable, when active and in the absence of a conversion currency being identified in the transaction terminal system, to transmit a rate request message that includes a second request type indicator and does not include a conversion currency indicator.

9. The system of any preceding claim, wherein the input interface comprises a chip card reader, the processing logic comprising a chip logic module configured:

- to respond to insertion of a payment card having a logic chip to attempt to retrieve issuer country information stored on the payment card; and
- in the event of issuer country information being retrieved from the payment card, to transmit a rate request message that includes a third request type indicator and a conversion currency indicator representative of an issuer country retrieved or derived from information retrieved from the payment card.

10. The system of any preceding claim, further comprising an output interface, the processing logic comprising a menu logic module operable, in the absence of other identification of a conversion currency in the transaction terminal system:

- to identify to an user via the output interface a plurality of available conversion currencies for selection by the user of a conversion currency, and
- in response to user selection of a conversion currency, to transmit a rate request message that includes a fourth request type indicator and a conversion currency indicator representative of the user selected conversion currency.

11. The system of claim 10, wherein the processing logic is responsive to a rate response message indicative that the user selected currency is not a billing currency for the payment card to output via the output interface an alert to the user and to prompt the user to confirm or otherwise the user selected conversion currency.

12. The system of any preceding claim, wherein the process means, on receipt of a rate response message identifying a conversion currency and conversion rate for that conversion currency, is operable to output via the output interface an indication of the conversion currency and a conversion rate for that conversion currency and to prompt the user to confirm or otherwise the indicated conversion currency and the conversion rate for the conversion currency.

13. The system of claim 12, responsive to user confirmation of the indicated conversion currency and the conversion rate for the conversion currency to effect the

transaction using the input transaction details using the indicated conversion currency and the conversion rate for the conversion currency.

14. The system of claim 13, wherein the process means is operable to cause settlement information for the indicated conversion currency and the conversion rate for the conversion currency to be transmitted to a remote external system.

15. The system of any of claims 10 to 14, wherein the output interface comprises a display device.

16. The system of any preceding claim, comprising a printer operable to print a receipt on completion of a transaction using the transaction details.

17. A dynamic currency conversion host system comprising:

- a host communications interface to connect to a transaction terminal system; and
- host processing logic operable:
    - to receive a rate request message from the transaction terminal, wherein a rate request message includes a request type indicator indicative of one of plurality of rate request message types and wherein a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator;
    - to determine a conversion rate in response to a rate request message that includes an indicated conversion currency or to determine a conversion currency and a conversion rate for the determined conversion currency in response to a rate request message without an indicated conversion currency; and
    - to transmit to the transaction terminal system a rate response message that includes a conversion currency indicator and a conversion rate indicator for that currency.

18. The system of claim 17, operable to maintain conversion rates for respective available conversion currencies.

19. The system of claim 17 or claim 18, operable to provide a mapping between a payment card issuers and associated billing currencies, wherein a rate request message includes input payment card details and the processing logic is operable, in response to a rate request message without an indicated conversion currency to determine a conversion currency and a conversion rate for the determined conversion currency by accessing the mapping using payment card issuer information from the input payment card details.

20. The system of any of claims 17 to 19, wherein the processing logic is responsive to a rate request message that includes a first request type indicator and a conversion currency indicator representative of a currency to determine an available conversion rate for the currency indicated by the conversion currency indicator.

21. The system of any of claims 17 to 20, wherein the processing logic is responsive to a rate request message that includes a second request type indicator and does not include a conversion currency indicator, to determine an available conversion currency that corresponds to a billing currency for the payment card and a conversion rate for the billing currency.

22. The system of any of claims 17 to 21, wherein the processing logic is responsive to a rate request message that includes a third request type indicator and an issuer country indicator to access a country to currency mapping to determine an available conversion rate for a currency identified by the country to currency mapping.

23. The system of any of claims 17 to 22, operable to provide a mapping between a payment card issuer and an associated billing currency, wherein the processing logic:

- is responsive to a rate request message including a fourth request type indicator, input payment card details and a user selected currency to use the mapping to determine a billing currency associated with a payment card issuer identified in the input payment card details;
- to compare the determined billing currency with the user selected conversion currency; and

- to transmit a rate response message indicating whether or not the determined billing currency corresponds to the user selected billing currency.

24. A dynamic currency conversion system comprising at least one transaction terminal system as claimed in any of claims 1 to 16 and a dynamic currency conversion host system as claimed in any of claims 17 to 23.

25. A method of operating a transaction terminal system comprising:
- receiving payment card details and transaction details;
- transmitting a rate request message to a host system to identify a currency conversion rate, wherein a rate request message includes a request type indicator indicative of one of plurality of rate request message types and wherein, a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator; and
- receiving a response message from the host system.

26. The method of claim 25, comprising:
- storing at least one of a reference country indicator or a reference currency indicator for the transaction terminal system;
- identifying, in the transaction terminal system, whether received payment card details are indicative of a payment card for which an issuer country or billing currency is the reference country or currency, and
- in the event that that an indicated payment card issuer country or currency is the reference country or currency, processing a transaction in a currency corresponding to a currency for the reference country or to the reference currency without transmitting a rate request message.

27. The method of claim 25, comprising:
- storing a reference currency indicator for the transaction terminal system;
- identifying, in the transaction terminal system, whether received payment card details are indicative of a payment card for which a billing currency is the reference currency, and

- in the event that an indicated payment card billing currency is the reference currency, processing a transaction in the reference currency without transmitting a rate request message.

28. The method of claim 27, comprising:
- storing indications of reference payment card issuers for which a billing currency is the reference currency; and
- comparing payment card issuer information in the received payment card details to the reference payment card issuer indications to determine whether the received payment card details are indicative of a payment card for which a billing currency is the reference currency.

29. The method of claim 25, comprising:
- storing a reference country indicator for the transaction terminal system;
- identifying, in the transaction terminal system, whether received payment card details are indicative of a payment card for which an issuer country is the reference country, and
- in the event that an indicated payment card issuer country is the reference country, processing a transaction in a currency corresponding to a currency for the reference country without transmitting a rate request message.

30. The method of claim 29, comprising:
- storing indications of reference payment card issuers for which an issuer country is the reference country; and
- comparing payment card issuer information in the received payment card details to the reference payment card issuer indications to determine whether the received payment card details are indicative of a payment card for which an issuer country is the reference country.

31. The method of any of claims 25 to 30, comprising, where the payment card comprises a logic chip:

- attempting to retrieve billing currency information stored on the payment card; and

- in the event that billing currency information is retrieved from the payment card, transmitting a rate request message that includes a first request type indicator and a conversion currency indicator representative of a billing currency retrieved or derived from information retrieved from the payment card.

32. The method of any of claims 25 to 31, comprising selectively, and in the absence of a conversion currency being identified in the transaction terminal system, transmitting a rate request message that includes a second request type indicator and does not include a conversion currency indicator.

33. The method of any of claims 25 to 32, comprising, where the payment card comprises a logic chip:

- attempting to retrieve issuer country information stored on the payment card; and

- in the event that issuer country code information is retrieved from the payment card, transmitting a rate request message that includes a third request type indicator and a conversion currency indicator representative of an issuer country retrieved or derived from information retrieved from the payment card.

34. The method of any of claims 25 to 33, comprising:

- in the absence of other identification of a conversion currency in the transaction terminal system, identifying to an user via an output interface of the transaction terminal system, a plurality of available conversion currencies for selection by the user of a conversion currency, and

- in response to user selection of a conversion currency, transmitting to the host system a rate request message that includes a fourth request type indicator and a conversion currency indicator representative of the user selected conversion currency.

35. The method of claim 34, comprising responding to a rate response message indicative that the user selected currency is not a billing currency for the payment card to

output via the output interface an alert to the user and to prompt the user to confirm or otherwise the user selected conversion currency.

36. The method of any of claims 25 to 35, comprising, on receipt of a rate response message identifying a conversion currency and conversion rate for that conversion currency, outputting via the output interface an indication of the conversion currency and a conversion rate for that conversion currency and prompting the user to confirm or otherwise the indicated conversion currency and the conversion rate for the conversion currency.

37. The method of claim 36, comprising responding to user confirmation of the indicated conversion currency and the conversion rate for the conversion currency to effect the transaction using the input transaction details using the indicated conversion currency and the conversion rate for the conversion currency.

38. The method of claim 37, comprising causing settlement information for the indicated conversion currency and the conversion rate for the conversion currency to be transmitted to a remote external system.

39. The method of any of claims 25 to 38, comprising printing a receipt on completion of a transaction using the transaction details.

40. A method of operating a dynamic currency conversion host system comprising:

- receiving a rate request message from a transaction terminal, wherein a rate request message includes a request type indicator indicative of one of plurality of rate request message types and wherein a rate request message for at least a selected rate request message type includes a conversion currency field for a conversion currency indicator;
- determining a conversion rate in response to a rate request message that includes an indicated conversion currency or determining a conversion currency and a conversion rate for the determined conversion currency in response to a rate request message without an indicated conversion currency; and

- transmitting to the transaction terminal system a rate response message that includes a conversion currency indicator and a conversion rate indicator for that currency.

41. The method of claim 40, comprising maintaining conversion rates for respective available conversion currencies.

42. The method of claim 40 or claim 41, comprising:

- providing a mapping between payment card issuers and associated billing currencies, and

- in response to a rate request message including input payment card details and without an indicated conversion currency, determining a conversion currency and a conversion rate for the determined conversion currency by accessing the mapping using payment card issuer information from the input payment card details.

43. The method of any of claims 40 to 42, comprising responding to a rate request message that includes a first request type indicator and a conversion currency indicator representative of a currency by determining an available conversion rate for the currency indicated by the conversion currency indicator.

44. The method of any of claims 40 to 43, comprising responding to a rate request message that includes a second request type indicator and does not include a conversion currency indicator, by determining an available conversion currency that corresponds to a billing currency for the payment card and a conversion rate for the billing currency.

45. The method of any of claims 40 to 44, comprising responding to a rate request message that includes a first request type indicator and an issuer country indicator to access a country to currency mapping to determine an available conversion rate for a currency identified by the country to currency mapping.

46. The method of any of claims 40 to 45, comprising:

- providing a mapping between a payment card issuer and an associated billing currency, wherein the processing logic; and
- responding to a rate request message including a third request type indicator, input payment card details and a user selected currency by using the mapping to determine a billing currency associated with a payment card issuer identified in the input payment card details;
- comparing the determined billing currency with the user selected conversion currency; and
- transmitting a rate response message indicating whether or not the determined billing currency corresponds to the user selected billing currency.

47. A system substantially as hereinbefore described with reference to the accompanying drawings.

48. A method substantially as hereinbefore described with reference to the accompanying drawings.

49. A computer program product comprising program code operable to carry out the method of any of claims 25 to 46 and 48.