the amount indicator 8 as described above. (Step S76) After the button is pressed, after a buzzer sounds, two products with the number of elapsed products displayed from the displayed column are carried out of the product carrying-out device 12 (Step S77), and the display on the side of the number of elapsed products is 0. displayed.

[0043]

423 The buzzer sound is, for example, a beep-beep-beep sound for 2 to 3 seconds.

[0044]

427 After that, as shown in FIG. 3(e), four commodities indicated by symbol D are put into the column of column number 1 (step S78).), when the preset switch 5 is pressed or held down (step S79), the number of products is stored as 4 in the memory 3, and the specified number of days for heating is stored (step S80). The display also becomes 0, indicating that the correspondence to the target column is completed.

[0045]

435 On the other hand, if the user does not have any commodities to be put in, when the number confirmation/confirmation switch 6 is pressed in step S76, two commodities of the number displayed from the displayed column are carried out of the commodity carry-out device 12. , the display on the elapsed number side becomes 0, and the column number, the number of pieces that can be put in, and the corresponding product selection push button are displayed. or when the outer door is closed, the display is switched or turned off, but the number of bottles that can be inserted remains stored in the memory 3.

442 In this case, since the number of items that can be put in is still stored, the required number of items can be easily put in by carrying out the operation shown in FIG. 6 by bringing the items at the next visit.

[0046]

448 In this way, when there are products to be carried out, by keeping the display of the number of products that have passed until the products are carried out, the products that have passed the prescribed number of heating days can always be carried out.

[0047]

454 With the above configuration, it is possible to easily put in, check, and take out the product with the specified number of days of heating, and it becomes easy to manage the expiration date of the product with the specified number of days of heating.

[0048]

460 It should be noted that although the number of days is subtracted from the prescribed number of days for heating, the date of application may be stored and the number of elapsed days may be calculated from the date of application.

[0049]

466 Further, when only the number of bottles that can be thrown is displayed, the display may be made for a predetermined period of time.

[0050]

471 Next, in order to warn of forgetting to operate, if the preset switch 5 is not operated between the opening of the outer door and the closing of the outer door, the sold-out lamp flashes for 10 to 30 seconds. It is possible to warn the user of forgetting to operate the device.

474 Only when there is a column that has passed the prescribed number of days of heating or a column that can be loaded with products, and if the preset switch 5 is not operated, the all-sold-out lamp is flashed for 10 to 30 seconds. good too.

477 Furthermore, when the preset switch 5 is not operated even though the merchandise has been replenished, the sold-out lamp may flash for 10 to 30 seconds.

[0051]

482 While the sold-out lamp is blinking, a warning by a buzzer sound may also be given.

[0052]

486 In addition, after 30 seconds have passed, the forgetting of the operation can be canceled by inserting money, opening the outer door, etc. In the case of inserting money, it is possible to sell the products in the sellable column.

[0053]

492 Next, if the product is not sold out even if the number of products that can be put in set in each mode is sold, the sold-out lamp is forcibly turned on to indicate that the product is sold out. Since it is not possible to manage the products that have been added, it is safe to prevent products that have passed the specified number of days from being sold. The stipulated number will be displayed as "--" so that it can be dispensed when the number of items that can be added is confirmed. to turn on the sold-out lamp.

[0054]

501 Next, for example, when looking at the sales situation of the product and wanting to change the input number of the operation column to "5" in mode "0", after operating the number confirmation/export switch 6, it corresponds to the column number 1. When the product selection push button 11 is pressed, the column number and the number of items that can be inserted are displayed on the price display unit 8, such as "0103". 8" is set, and the quantity confirmation/carrying-out switch 6 is operated again, and the product selection push button 11 corresponding to the column number is pushed. , the column number and the number of items that can be put in are displayed, and it is possible to put in "6" items. When the quantity confirmation/carrying-out switch 6 is operated again and the product selection push button 11 corresponding to the column number is pressed, the column number and input are displayed on the amount display 8 in the form of "0102" in the form of subtraction from the previously available number of input. The number of possible products is displayed, and it is possible to put in "2" products. In this way, it is possible to change the number of products that can be put in while watching the sales situation.

[0055]

518 Next, when the internal state is switched from heating to cooling, the target column is automatically deleted from the object of heating management, and conversely, when the internal state is switched from cooling to heating, The target column is operated as a heating control target.

[0056]

525 The display form of the sellable lamp and the sold out lamp is not limited to the above embodiment, and it is possible to display the status as easily as possible for the operator by appropriately combining lighting and blinking of the two lamps.

[0057]

531 1 is a configuration block diagram showing a vending machine control device that is an embodiment of the present invention;

533 The figure which shows the 1st display form of this invention.

534 FIG. 1 is a schematic configuration diagram showing a storage state of products according to the present invention;

536 The figure which shows the 2nd display form of this invention

537 Flowchart showing operation of time limit management processing in FIG.

538 Flowchart showing the operation of confirmation display processing for time limit management in FIG.

540 Flowchart showing operation of payout display processing for time limit management in FIG.

541 A diagram showing a third display form of the present invention.

542 Code explanation

[0058]

546 1 CPU 2, 3 Memory 4 Clock 5 Preset switch (replenishment completion switch) 6 Number confirmation/carrying out switch 7 Remote controller 8 Amount indicator 9 Sale possible lamp 10 Sold out lamp 11 Product selection push button

Notice

CLAIMS JP2004310740A

1.

13 In a vending machine that sells heated commodities with a specified number of heating days in a column in the order in which they are put into a column, the number of items loaded into a column that stores the heated commodities with a specified number of days of heating is set to a value between a plurality of pre-stored types. A setting means for selecting one and collectively setting it, a time limit input means for inputting the specified number of days for heating of the column storing the heated products with the specified number of days for heating, and for starting the operation of the specified number of days for heating. and a control means for storing the specified number of days for heating and the number of injections in a storage means by turning on the number of injections according to the mode selected by the setting means and pressing the setting switch. A vending machine characterized by:

2.

27 A vending machine according to claim 1, wherein said setting means includes a mode in which the number of commodities put into the column can be directly input.

3.

32 The vending machine according to claim 1, wherein said setting switch is activated by being pressed for a predetermined time.

4.

37 In the vending machine according to any one of claims 1 to 3, the number is subtracted from

the input number stored in the storage means each time the product is sold, and the number is stored in the storage means each time one day elapses from the prescribed number of days for heating. A vending machine characterized in that it calculates the number of days that have passed since it is stored, and when the number of days that have passed reaches the specified number of days for heating, the corresponding column is sold out and the sold out lamp of the product selection push button is lit. .

5.

47 The vending machine according to claim 4, wherein at least one of a lamp for indicating that sales are possible and a sold-out lamp blinks when the door is opened in order to distinguish sold-out products due to lack of products.

6.

53 The vending machine according to claim 5, wherein when the outer door is opened, the available-for-sale display lamp and sold-out lamp blink.

7.

58 The vending machine according to any one of claims 1 to 6, wherein a display switch is provided, and the display switch is operated in a state in which the number of bottles to be put in and the specified number of days for heating are stored each time the setting switch is pressed. When a product selection push button is pressed, the column corresponding to the push button, the number of days elapsed, and the number of stocks corresponding to the number of days elapsed are displayed on the price indicator, and the product selection push button corresponding to the corresponding product selection push button is displayed with a sellable display lamp or a sales indicator. A vending machine characterized by turning on at least one of off lamps.

8.

70 The vending machine according to claim 7, wherein the column number is displayed first on the price display device, and then the elapsed days and the number of stocks corresponding to the elapsed days are displayed, and a plurality of elapsed days data exist. A vending machine characterized by sequentially displaying the number of days elapsed and the number of stocks corresponding to the number of days elapsed.

9.

78 10. The vending machine according to any one of claims 1 to 9, wherein a confirmation switch is provided, and when a product selection push button is pushed when the confirmation

switch is operated, a column corresponding to the push button and a column corresponding to the push button are displayed on the price indicator. This automatic vending machine is characterized by displaying a new number of items that can be put in by subtracting the number of items to be sold from the number of items to be put in, and lighting at least one lamp of a sellable display lamp or a sell-out lamp of a corresponding product selection push button.

10.

89 In the vending machine according to claim 9, when the confirmation switch is operated and the product selection push button of the column that has reached the specified number of days for heating is pressed, the column number, the number of products that have passed the specified number of days for heating, and the number of products that have passed. A vending machine characterized by displaying the number of bottles that can be put in after dispensing.

11.

97 The vending machine according to claim 10, wherein the column number, the number of bottles that have passed the prescribed number of days for heating, and the number of bottles that can be put in after paying out the number of bottles that have passed are displayed alternately on the price display.

12.

104 In the vending machine according to claim 10 or 11, when the confirmation switch is pressed again during the display of the column number, the number of bottles that have passed the specified number of days of heating, and the number of bottles that can be put in after paying out the elapsed number, the specified number of days of heating has passed. A vending machine characterized by dispensing a number of commodities.

13.

112 In the vending machine according to any one of claims 4 to 12, when at least one of the setting switch and the confirmation switch is not operated while the door is opened and then closed, the all-sales-ready display lamp or the all-sold-out display is activated. A vending machine characterized by blinking at least one of the lamps.

14.

119 13. The automatic vending machine according to any one of claims 4 to 12, wherein when the setting switch is not operated while the outer door is opened and the outer door is closed, the sold-out lamp is flashed for a predetermined time. vending machine.

15.

125 13. The vending machine according to any one of claims 4 to 12, wherein the sold-out lamp is turned on when the setting switch is not operated while the outer door is opened and the outer door is closed while the sold-out lamp is lit. A vending machine characterized by blinking for a predetermined time.

16.

132 The vending machine according to claim 15, wherein a sound notification is given while the sold-out lamp is blinking.

17.

137 In the vending machine according to any one of claims 1 to 16, in the case where the set number of bottles inserted is not sold out, the column is forcibly sold out and the sold out lamp of the column is turned on. A vending machine characterized by:

18.

143 In the vending machine according to any one of claims 1 to 17, when a number of articles less than the set number of articles to be put in is put in, the sold out lamp of the column is turned on when the actual sold out occurs. A vending machine characterized by

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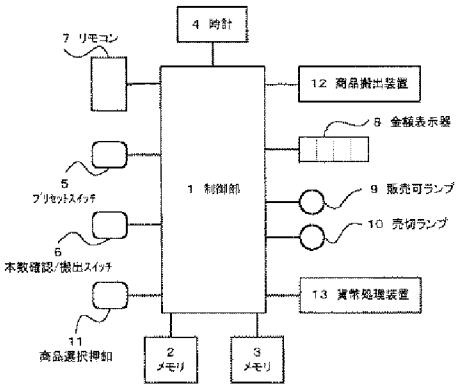
(54)【発明の名称】自動販売機

(57)【要約】

【課題】本発明の課題は、加温規定日数のある加温商品を扱う自動販売機において、販売期限についての商品管理や操作が容易な自動販売機の制御装置を提供することである。

【解決手段】加温規定日数付の加温商品をコラムに投入された順に販売する自動販売機において、加温規定日数付の加温商品を収納するコラムの投入本数を予め記憶されている複数種類の間の一つを選択して一括設定する設定手段と、該加温規定日数付の加温商品を収納するコラムの加温規定日数を入力する期限入力手段と、加温規定日数の運用を開始させるための設定スイッチと、前記設定手段により選択されたモードに応じた投入本数が投入され、設定スイッチが押されることにより、加温規定日数と投入本数とを記憶手段に記憶する制御手段とを備えたことを特徴とする。

【選択図】　図1



【特許請求の範囲】
【請求項1】
加温規定日数付の加温商品をコラムに投入された順に販売する自動販売機において、加温規定日数付の加温商品を収納するコラムの投入本数を予め記憶されている複数種類の間の一つを選択して一括設定する設定手段と、該加温規定日数付の加温商品を収納するコラムの加温規定日数を入力する期限入力手段と、加温規定日数の運用を開始させるための設定スイッチと、前記設定手段により選択されたモードに応じた投入本数が投入され、設定スイッチが押されることにより、加温規定日数と投入本数とを記憶手段に記憶する制御手段とを備えたことを特徴とする自動販売機。
【請求項2】
請求項１に記載の自動販売機において、設定手段には、コラムへの商品投入本数を直接入力可能なモードも含むことを特徴とする自動販売機。
【請求項3】
請求項１または２に記載の自動販売機において、設定スイッチは所定時間押されることにより有効となることを特徴とする自動販売機。
【請求項4】
請求項１ないし３のいずれかに記載の自動販売機において、商品販売毎に記憶手段に記憶されている投入本数から減算するとともに、加温規定日数から１日経過する毎に記憶手段に記憶されている経過日数を算出し、経過日数が加温規定日数に達した場合に、その該当するコラムを売切にするとともに、商品選択押釦の売切ランプを点灯させることを特徴とする自動販売機。
【請求項5】
請求項４に記載の自動販売機において、商品無しによる売切と区別するために、扉開時に販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点滅させることを特徴とする自動販売機。
【請求項6】
請求項５に記載の自動販売機において、外扉開時に販売可能表示ランプおよび売切ランプを点滅させることを特徴とする自動販売機。
【請求項7】
請求項１ないし６のいずれかに記載の自動販売機において、表示スイッチを設け、設定スイッチが押される毎に投入本数と加温規定日数とを記憶している状態で、表示スイッチが操作されたときに、商品選択押釦が押されると、金額表示器その押釦に対応するコラムと経過日数とその経過日数に対応する在庫数とを表示させるとともに、該当する商品選択押釦の販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点灯させることを特徴とする自動販売機。
【請求項8】
請求項７に記載の自動販売機において、金額表示器にコラム番号を始めに表示し、次に経過日数とその経過日数に対応する在庫数とを表示するとともに、複数の経過日数データが存在する場合には、順次、経過日数とその経過日数に対応する在庫数を表示することを特徴とする自動販売機。
【請求項9】
請求項１ないし９のいずれかに記載の自動販売機において、確認スイッチを設け、該確認スイッチが操作されたとき、商品選択押釦が押されると、金額表示器にその押釦に対応するコラムと前記投入本数から販売本数を減算した新たな投入可能本数を表示させるとともに、該当する商品選択押釦の販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点灯させることを特徴とする自動販売機。
【請求項10】
請求項９に記載の自動販売機において、確認スイッチが操作されたとき、加温規定日数に達しているコラムの商品選択押釦が押されると、そのコラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数とを表示することを特徴とする自動販売機。

【請求項11】
請求項１０に記載の自動販売機において、金額表示器にコラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数とを交互に表示することを特徴とする自動販売機。
【請求項12】
請求項１０または１１に記載の自動販売機において、コラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数との表示中に、再度確認スイッチが押されると、加温規定日数経過本数分の商品を払い出すことを特徴とする自動販売機。
【請求項13】
請求項４ないし１２のいずれかに記載の自動販売機において、扉開から扉閉とする間に、設定スイッチあるいは確認スイッチの少なくとも一方のスイッチでも操作されないときには、全販売可能表示ランプあるいは全売切ランプの少なくとも一方のランプを点滅させることを特徴とする自動販売機。
【請求項14】
請求項４ないし１２のいずれかに記載の自動販売機において、外扉開から外扉閉とする間に、設定スイッチが操作されないときには、全売切ランプを所定時間点滅させることを特徴とする自動販売機。
【請求項15】
請求項４ないし１２のいずれかに記載の自動販売機において、売切ランプが点灯している状態で、外扉開から外扉閉とする間に、設定スイッチが操作されないときには全売切ランプを所定時間点滅させることを特徴とする自動販売機。
【請求項16】
請求項１５に記載の自動販売機において、全売切ランプが点滅している間、音による報知を行なうことを特徴とする自動販売機。
【請求項17】
請求項１ないし１６のいずれかに記載の自動販売機において、設定された投入本数分、販売されても売切れとならない場合には、強制的に売切れとしてそのコラムの売切ランプを点灯させることを特徴とする自動販売機。
【請求項18】
請求項１ないし１７のいずれかに記載の自動販売機において、設定された投入本数より少ない本数の商品が投入された場合には、実際の売切発生した時点でそのコラムの売切ランプを点灯させることを特徴とする自動販売機。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は、加温商品劣化防止のため、販売期限として加温規定日数が設定されている商品を販売する自動販売機に関する。
【背景技術】
【0002】
近年、缶製品とくにホットコーヒーなどの加温商品は、その品質を保つために販売期限として加温規定日数を設定して、加温規定日数を過ぎた商品は販売不可とする自動販売機が知られている。
【0003】
このような要求に対して、加温規定日数付きの商品を提供する自動販売機としては、投入口センサからの信号によりカウントされる補充数と補充時刻とを記憶し、商品販売のたびに、記憶手段に記憶されている補充データの商品補充数を補充時刻の古い順に減算するとともに、日替わり時に、記憶手段に記憶されている補充データの補充時刻を参照し、加温規定日数の経過した商品が収納されているコラムの商品販売の停止を停止し、販売不可表示部に表示する。
【0004】
また、払出し起動スイッチにより商品払出し装置が期限切れ商品を払出し、確認起動ス

イッチにより確認表示装置に現在の商品在庫数と収納期限が表示できるようにした装置が開示されている(特許文献１参照）。
【特許文献1】特開平９－６２９１８号公報
【発明の開示】
【発明が解決しようとする課題】
【0005】
ところで、従来の方式では、各コラムの補充毎にスイッチを操作する必要があり、操作性が良くない。
【0006】
また、販売期限切れ（加温規定日数経過）の商品本数についても、解り難く、さらに、その表示にも次の問題がある。
【0007】
すなわち、商品販売の期限切れ確認のとき、期限切れの日数と個数がコラムごとにしか表示されないので、どの商品が期限切れに近いかが簡単にわからなかった。
【0008】
本発明の課題は、加温規定日数のある加温商品を扱う自動販売機において、販売期限についての商品管理や操作が容易な自動販売機の制御装置を提供することである。
【課題を解決するための手段】
【0009】
本発明は、以下の手段により達成されるものである。
（１）加温規定日数付の加温商品をコラムに投入された順に販売する自動販売機において、加温規定日数付の加温商品を収納するコラムの投入本数を予め記憶されている複数種類の間の一つを選択して一括設定する設定手段と、加温規定日数付の加温商品を収納するコラムの加温規定日数を入力する期限入力手段と、加温規定日数の運用を開始させるための設定スイッチと、前記設定手段により選択されたモードに応じた投入本数が投入され、設定スイッチが押されることにより、加温規定日数と投入本数とを記憶手段に記憶する制御手段とを備えたことを特徴とする。
（２）上記（１）に記載の自動販売機において、設定手段には、コラムへの商品投入本数を直接入力可能なモードも含むことを特徴とする。
（３）上記（１）または（２）に記載の自動販売機において、設定スイッチは所定時間押されることにより有効となることを特徴とする。
（４）上記（１）ないし（３）のいずれかに記載の自動販売機において、商品販売毎に記憶手段に記憶されている投入本数から減算するとともに、加温規定日数から１日経過する毎に記憶手段に記憶されている経過日数を算出し、経過日数が加温規定日数に達した場合に、その該当するコラムを売切にするとともに、商品選択押釦の売切ランプを点灯させることを特徴とする。
（５）上記（４）に記載の自動販売機において、商品無しによる売切と区別するために、扉開時に販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点滅させることを特徴とする。
（６）上記（５）に記載の自動販売機において、外扉開時に販売可能表示ランプおよび売切ランプを点滅させることを特徴とする。
（７）上記（１）ないし（６）のいずれかに記載の自動販売機において、表示スイッチを設け、設定スイッチが押される毎に投入本数と加温規定日数とを記憶している状態で、表示スイッチが操作されたときに、商品選択押釦が押されると、金額表示器その押釦に対応するコラムと経過日数とその経過日数に対応する在庫数とを表示させるとともに、該当する商品選択押釦の販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点灯させることを特徴とする。
（８）上記（７）に記載の自動販売機において、金額表示器にコラム番号を始めに表示し、次に経過日数とその経過日数に対応する在庫数とを表示するとともに、複数の経過日数データが存在する場合には、順次、経過日数とその経過日数に対応する在庫数を表示する

ことを特徴とする。
（９）上記（１）ないし（９）のいずれかに記載の自動販売機において、確認スイッチを設け、該確認スイッチが操作されたとき、商品選択押釦が押されると、金額表示器にその押釦に対応するコラムと前記投入本数から販売本数を減算した新たな投入可能本数を表示させるとともに、該当する商品選択押釦の販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点灯させることを特徴とする。
（１０）上記（９）に記載の自動販売機において、確認スイッチが操作されたとき、加温規定日数に達しているコラムの商品選択押釦が押されると、そのコラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数とを表示することを特徴とする。
（１１）上記（１０）に記載の自動販売機において、金額表示器にコラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数とを交互に表示することを特徴とする。
（１２）上記（１０）または（１１）に記載の自動販売機において、コラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数との表示中に、再度確認スイッチが押されると、加温規定日数経過本数分の商品を払い出すことを特徴とする。
（１３）上記（４）ないし（１２）のいずれかに記載の自動販売機において、扉開から扉閉とする際に、設定スイッチあるいは確認スイッチの少なくとも一方のスイッチでも操作されないときには、全販売可能表示ランプあるいは全売切ランプの少なくとも一方のランプを点滅させることを特徴とする。
（１４）上記（４）ないし（１２）のいずれかに記載の自動販売機において、外扉開から外扉閉とする際に、設定スイッチが操作されないときには、全売切ランプを所定時間点滅させることを特徴とする。
（１５）上記（４）ないし（１２）のいずれかに記載の自動販売機において、売切ランプが点灯している状態で、外扉開から外扉閉とする際に、設定スイッチが操作されないときには全売切ランプを所定時間点滅させることを特徴とする。
（１６）上記（１５）に記載の自動販売機において、全売切ランプが点灯している間、音による報知を行なうことを特徴とする。
（１７）上記（１）ないし（１６）のいずれかに記載の自動販売機において、設定された投入本数分、販売されても売切れとならない場合には、強制的に売切れとしてそのコラムの売切ランプを点灯させることを特徴とする。
（１８）上記（１）ないし（１７）のいずれかに記載の自動販売機において、設定された投入本数より少ない本数の商品が投入された場合には、実際の売切発生した時点でそのコラムの売切ランプを点灯させることを特徴とする。
【発明の効果】
【0010】
本発明によれば、加温規定日数付の加温商品をコラムに投入された順に販売する自動販売機において、加温規定日数付の加温商品を収納するコラムの投入本数を予め複数種類の間で一括設定する設定手段と、該設定手段により設定された複数種類の投入本数を切り換える切換手段と、加温規定日数付の加温商品を収納するコラムの加温規定日数を入力する期限入力手段と、切換手段により選択されたモードに応じた投入本数が投入され、設定スイッチが押されることにより、加温規定日数と投入本数とを記憶手段に記憶する制御手段とを備えることにより、投入本数の管理が容易となる。
【0011】
また、確認スイッチが操作されたとき、商品選択押釦が押されると、金額表示器にその押釦に対応するコラムと前記投入本数から販売本数を減算した新たな投入可能本数を表示させるとともに、該当する商品選択押釦の販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点灯させるため、追加投入数の管理が容易となる。
【0012】
また、扉開時に販売可能表示ランプあるいは売切ランプの少なくとも一方のランプを点滅させ、しかも、外扉開時に販売可能表示ランプおよび売切ランプを点滅させることにより、通常の売切れとの相違が容易に判別できる。

【0013】
また、確認スイッチが操作されたとき、加温規定日数に達しているコラムの商品選択押釦が押されると、そのコラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数とを表示することにより、搬出本数と投入可能本数とが一度に理解できるため、作業性が向上する。
【0014】
また、コラム番号と加温規定日数経過本数と経過本数払出し後の投入可能本数との表示中に、再度確認スイッチが押されると、加温規定日数経過本数分の商品を払い出すことで、加温規定日数を経過している商品の搬出が容易に行える。
【0015】
また、扉開から扉閉とする際に、設定スイッチあるいは確認スイッチの少なくとも一方のスイッチが操作されないときには、全販売可能表示ランプあるいは全売切ランプの少なくとも一方のランプを点滅させることで、操作忘れを警告することが可能となる。
【0016】
また、設定された投入本数分、販売されても売切れとならない場合には、強制的に売切れとしてそのコラムの売切ランプを点灯させることにより、誤って設定より投入した場合でも、加温規定日数経過した商品を搬出することを防止できる。
【0017】
以上のように、本発明は、加温規定日数付きの商品を販売する際の管理が非常に容易となる。
【発明を実施するための最良の形態】
【0018】
図１は、この発明の一実施の形態を示す構成ブロック図である。
【0019】
１は装置全体を制御するＣＰＵ、２は制御プログラムを格納するメモリ、３は補充データなど種々のデータを記憶するメモリ、４は計時用の時計、５は商品投入後に押すことにより投入数が設定される設定スイッチとしてのプリセットスイッチ（ＳＷ）で、プリセットスイッチ５は、商品の補充を完了して、期限管理の運用を開始するためのスイッチであり、補充完了スイッチともいう。
【0020】
次に、６は商品の投入可能本数あるいは搬出本数などの確認および搬出用の本数確認／搬出スイッチ（ＳＷ）、７は投入本数の設定、表示スイッチの起動などを行なうリモコン、８は金額表示器、９は販売可ランプ、１０は売切ランプ、１１は商品選択押釦、１２は商品搬出装置、１３は貨幣処理装置である。
【0021】
この構成において、投入本数の設定モードについて説明する。
【0022】
まず、この構成では、予め加温の全コラムで一括本数を設定する際にモード０，モード１，モード２，モード３との４モードを設けておき、自販機設置時にこのモード毎に、予めリモコン７によりモード０：「投入本数５本」，モード１：「投入本数１０本」，モード２：「加温劣化防止しない」，モード３：「０～９９本の間で投入本数をコラム毎に設定」の４モードの中から一つを選択して設定し、次に加温規定日数を設定する操作を行い、例えば「１０日」と設定して、プリセットスイッチ５が押されるか長押しされると、加温規定日数の運用を開始するものである。
【0023】
ここで、図５のフローチャートを参照しながら、商品投入操作について説明すると、４モードの中でモード「０」と設定した場合に（ステップＳ５１，Ｓ５２）、加温する全コラムに対して設定モードに応じた投入本数５本が投入され（ステップＳ５３，Ｙ）、プリセットスイッチ５が押されるか長押しされると（ステップＳ５４，Ｙ）、メモリ３に現在の商品数が５本と記憶されるとともに、加温規定日数が残日数として記憶される（ステッ

プＳ５５）。

【0024】

なお、プリセットスイッチ５の長押しについては、ブザー音による確認を併せて行なわせることも可能であり、例えば、ピーピッピッ音を鳴らす。

【0025】

この商品投入時に、本数確認／搬出スイッチ６を押した後、商品選択押釦１１を押すことで、金額表示器８にコラム番号と投入可能本数とが表示され、この表示した投入可能本数を投入すればよいことになり、全加温コラムに対して同様の操作を行なう。

【0026】

なお、本数確認／搬出スイッチ６の操作時にも、ブザー音を併せて報知してもよい。

【0027】

この５本を前提として、例えば、コラム番号１の商品の販売が行われると、そのコラム番号１の現在の商品数から１本減算し、１日経過すると、「経過日数１日、本数４本」となり、投入してから４日目に同じコラムの商品が２本売れ、その日が経過すると、「経過日数４日、本数２本」が現商品数となる。

【0028】

なお、商品の販売動作については、通常行なわれる動作であり、詳細な説明は省略する。

【0029】

このコラムを対象とし、投入可能本数を確認する場合に、図６のフローチャートを参照しながら説明すると、まず、本数確認／搬出スイッチ６が押され（ステップＳ６１，Ｙ）、例えば、コラム番号１に対応する商品選択押釦１１が押されると（ステップＳ６２，Ｙ）、既に対象とするコラムは、３本の商品が販売されているため、第１の表示形態を示す図２の図２（ａ）に示すように自動販売機の前面から見て金額表示器８の左２桁をコラム番号、右２桁を投入可能本数として金額表示器８に「０１０３」の表示を、図２（ｂ）に示すようにコラム番号１に対応する商品選択押釦１１の販売可ランプ９を点灯させる（ステップＳ６３）。この表示された投入可能本数に基づき、商品が投入され（ステップＳ６４，Ｙ）、このステップＳ６１～Ｓ６４までの操作を必要に応じて全加温コラムについて行い、プリセットスイッチ５が押されるか長押しされると（ステップＳ６５，Ｙ）、今回投入した商品３本と加温規定日数がメモリ３に記憶されて（ステップＳ６６）、処理を終了する。

【0030】

一方、投入商品を持っていない場合あるいは確認だけの場合には、ステップＳ６３にて押釦を押した後、表示中に別の操作、例えば、自動販売機に設けられている返却レバー、リモコンなどの操作、あるいは外扉が閉じられると、表示が変わるかあるいは表示を消すようにするが、確認操作のみであるので投入可能本数の記憶はメモリ３に記憶されたままとなる。

【0031】

この商品投入後の経過日数の算出した一例を、図３に示す商品の収納形態の概略構成図を用いて説明する。なお、便宜的に、１つの加温コラムのみを代表例として説明する。

【0032】

まず、上記のように、モード０で、加温規定日数１０日と設定されているものとして、図３（ａ）に示すように、コラム番号１のコラムに符号Ａで示す５本の商品が投入され、プリセットスイッチ５が押されるか長押しされると、メモリ３に現在の商品数が５本と記憶されるとともに、加温規定日数が残日数として記憶される。

【0033】

次に、４日経過するまでに、コラム番号１の商品が３本販売され、次の日に投入可能本数を確認した場合、本数確認／搬出スイッチ６が押され、コラム番号１に対応する商品選択押釦１１が押されると、上記図２に示すように、金額表示器８に「０１０３」とコラム番号１に対応する商品選択押釦１２の販売可ランプ９を点灯させ、この表示された投入可

能本数に基づき、図３（ｂ）に示すように、符号Ｂで示す３本の商品がコラム番号１のコラムに投入され、プリセットスイッチ５が押されるか長押しされると、メモリ３に商品数が３本と記憶されるとともに、加温規定日数が残日数として記憶される。この時点では、符号Ａの商品が２本、符号Ｂの商品が３本となる。

【0034】

次に、この３本の投入から４日経過するまでに、コラム番号１の商品が１本販売され、次の日に投入可能本数を確認した場合、本数確認／搬出スイッチ６が押され、コラム番号１に対応する商品選択押釦が押されると、図示しないが、金額表示器８に「０１０１」とコラム番号１に対応する商品選択押釦１１の販売可ランプ９を点灯させ、この表示された投入可能本数に基づき、図３（ｃ）に示すように、符号Ｃで示す１本の商品がコラム番号１のコラムに投入され、プリセットスイッチ５が押されるか長押しされると、メモリ３に商品数が１本と記憶されるとともに、加温規定日数が残日数として記憶される。

【0035】

この状態で、１日経過すると、それぞれ符号Ａ～Ｃで示した商品が投入時点から換算して、符号Ａで示す商品が「経過日数９日、本数１本」、符号Ｂで示す商品が「経過日数５日、本数３本」、符号Ｃで示す商品が「経過日数１日、本数１本」のようにメモリ３に記憶されている。

【0036】

ここで、この経過日数と本数の表示動作について説明すると、リモコン７の表示スイッチの操作によって経過日数・本数確認モードが選択され、商品選択押釦１１が押されると、金額表示器８にそのコラムの経過日数と本数（在庫数）が表示される。

【0037】

その表示内容としては、図３（ｃ）の符号Ａで示す商品が「経過日数９日、本数１本」、符号Ｂで示す商品が「経過日数５日、本数３本」、符号Ｃで示す商品が「経過日数１日、本数１本」を例にして表示内容を説明にすると、経過日数・本数確認モードとなり、コラム番号１の商品選択押釦１１が押されると、その押釦の販売可ランプが点灯し、まず、第３の表示形態を示す図８の図８（ａ）に示すようにコラム番号が表示され、所定時間経過後（例：５００ｍｓ）、図８（ｂ）に示すように自動販売機の前面から見て金額表示器８の左２桁を経過日数、右２桁を本数として金額表示器８に「０９０１」が表示され、所定時間経過後（例：５００ｍｓ）、図８（ｃ）に示すように自動販売機の前面から見て金額表示器８の左２桁を経過日数、右２桁を本数として金額表示器８に「０５０３」が表示され、所定時間経過後（例：５００ｍｓ）、図８（ｄ）に示すように自動販売機の前面から見て金額表示器８の左２桁を経過日数、右２桁を本数として金額表示器８に「０１０１」が表示され、図８（ａ）の表示に戻り、リモコン７の終了キーが押されるまで、表示を繰り返す。

【0038】

なお、この場合、３件分のデータであったが、最大５件分のデータを表示でき、この表示件数は適宜設定できる。

【0039】

次に、上記図３（ｃ）にて１本の商品が投入された後、５日経過する間に２本の商品が販売されたとすると、図３（ｄ）に示すように、上記図３（ｂ）の時点で投入された符号Ｂで示す２本の商品が加温規定日数の１０日を経過したということになり、このコラム番号１の商品選択押釦１１の売切ランプ１０を点灯させ、販売を停止する。

【0040】

この加温規定日数経過コラムが発生した際の確認操作について、図４の表示例（第２の表示形態を示す図）および図７のフローチャートを参照しながら説明すると、上記算出した経過日数が予め設定した加温規定日数に達した場合に、そのコラムを売切として、売切ランプ９が点灯されている状態で、図示しない自動販売機前面の外扉が開放され、加温規定日数経過コラムがあれば（ステップＳ７１，Ｙ）、通常の商品無しによる売切と区別するために、図４（ｃ）に示すように外扉開時に加温規定日数経過コラムのコラム番号１に

対応する商品選択押釦１１の販売可ランプ９、売切ランプ１０の両方のランプを点滅させて（ステップＳ７２）、作業者に加温規定日数経過コラムの存在を判り易くする。

【0041】

続いて、本数確認／搬出スイッチ６が押され（ステップＳ７３）、販売可ランプ９、売切ランプ１０が点滅しているコラム番号１の商品選択押釦１１が押されると（ステップＳ７４）、図４（ａ）に示すように金額表示器８に自動販売機の前面から見て金額表示器の右２桁にコラム番号「０１」を表示させ、その後、表示を切り換え、図４（ｂ）に示すように金額表示器に「０２０４」と表示させ、この場合の右２桁を加温規定日数経過本数、左２桁を加温規定日数経過本数搬出後の投入可能本数を表示させる（ステップＳ７５）。このように、商品選択押釦１１が押されることで、コラム番号と、経過本数と投入可能本数との表示を交互に表示させる。このことで、作業者は、加温規定日数経過本数搬出後の投入可能本数が簡単に理解できる。

【0042】

次に、加温規定日数経過商品の搬出は、上記のようにコラム番号と、経過本数と投入可能本数とを金額表示器８に表示中に、再度、本数確認／搬出スイッチ６が押されると（ステップＳ７６）、押されてから、ブザー音の後、その表示しているコラムから表示された経過本数の２本が商品搬出装置１２から搬出され（ステップＳ７７）、経過本数側の表示が０表示となる。

【0043】

なお、ブザー音は、例えば、ピッピッピー音と２～３秒の間報知するものである。

【0044】

その後、商品が搬出されたコラムへ表示された投入可能本数の４本が、図３（ｅ）に示すように、符号Ｄで示す４本の商品がコラム番号１のコラムに投入され（ステップＳ７８）、プリセットスイッチ５が押されるか長押しされると（ステップＳ７９）、メモリ３に商品数が４本と記憶されるとともに、加温規定日数が記憶され（ステップＳ８０）、投入可能本数側の表示も０表示となり、これで対象コラムへの対応が終了したことがわかる。

【0045】

一方、投入商品を持っていない場合には、ステップＳ７６にて本数確認／確認スイッチ６が押されると、その表示しているコラムから表示された経過本数の２本が商品搬出装置１２から搬出され、経過本数側の表示が０表示となり、コラム番号と投入可能本数並びに対応する商品選択押釦が表示され、この表示中に別の操作、例えば、自動販売機に設けられている返却レバー、リモコンなどの操作、あるいは外扉が閉じられると、表示が切り替るかあるいは表示を消すようにするが、投入可能本数の記憶はメモリ３に記憶されたままとなる。この場合には、投入可能本数は記憶されたままであるので、次回訪問時に商品を持ってくることで、図６に示した操作を行うことで、簡単に必要数の商品投入が可能となる。

【0046】

このように、搬出商品がある場合には、必ず搬出が行われるまでは経過本数の表示をさせたままにしておくことで、加温規定日数経過商品を必ず搬出できる。

【0047】

以上の構成により、加温規定日数付きの商品の投入、確認、搬出が容易に行うことができ、加温規定日数付き商品の期限管理が容易となる。

【0048】

なお、加温規定日数から減算するようにしたが、投入日を記憶して、投入日から経過日数を計算してもよい。

【0049】

また、投入可能本数のみの表示の際には、所定時間のみ表示させるようにしてもよい。

【0050】

次に、操作忘れを警告するため、外扉を開けてから外扉を閉めるまでの間にプリセットスイッチ５が操作されなかった場合には、全売切ランプを１０秒間から３０秒間の間、点

滅させることにより、操作忘れを警告できる。また、加温規定日数経過したコラムあるいは商品を投入可能なコラムがあった場合のみ、プリセットスイッチ５が操作されなかった場合には、全売切ランプを１０秒間から３０秒間の間、点滅させてもよい。さらに、商品は補充されたが、プリセットスイッチ５が操作されなかった場合には、全売切ランプを１０秒間から３０秒間の間、点滅させてもよい。

【0051】

この全売切ランプを点滅させている間は、ブザー音による警告も併せて行なうようにしてもよい。

【0052】

なお、操作忘れの解除としましては、３０秒経過後、貨幣投入、外扉開などが考られ、貨幣投入の場合には、売れるコラムの商品に関しては販売可能とするものである。

【0053】

次に、各モードで設定された投入可能本数分の商品が販売されても売切れとならない場合には、強制的に売切ランプを点灯させて売切とすることにより、誤って、余分に投入された商品の管理ができないため、安全サイドで加温規定日数を経過した商品が販売されることがないようにして、投入可能本数の確認動作時に余分な投入本数は管理不可能として、加温規定経過本数を「－－」本表示として、投入可能本数確認時に払い出せるようにし、逆に、投入可能本数未満の商品しか投入されなかったときには、加温規定日数前に売切れれば、実売切れとして売切ランプを点灯させる。

【0054】

次に、例えば、商品の販売状況を見て、モード「０」で運用のコラムの投入本数「５本」を切り替えたい場合には、本数確認／搬出スイッチ６操作後、コラム番号１に対応する商品選択押釦１１が押すと、金額表示器８に「０１０３」のようにコラム番号と投入可能本数とが表示され、この時点で、増やした場合にはリモコン７の操作で投入可能本数を例えば「８本」と設定し、再度、本数確認／搬出スイッチ６操作してコラム番号に対応する商品選択押釦１１が押すと、先の投入可能本数に加算した形で金額表示器８に「０１０６」のようにコラム番号と投入可能本数とが表示され、「６本」の商品の投入が可能となり、逆に、減らしたい場合にはリモコン７の操作で投入可能本数を例えば「４本」と設定し、再度、本数確認／搬出スイッチ６操作してコラム番号に対応する商品選択押釦１１が押すと、先の投入可能本数から減算した形で金額表示器８に「０１０２」のようにコラム番号と投入可能本数とが表示され、「２本」の商品の投入が可能となり、このように、販売状況をみながら、投入可能本数を変更することも可能である。

【0055】

次に、庫内状態を加温から冷却に切り替えた場合には、その対象コラムを加温管理対象から自動的に削除し、逆に庫内状態を冷却から加温に切り替えた場合には、その対象コラムを加温管理対象として運用される。

【0056】

なお、販売可ランプ、売切ランプの表示形態は、上記実施形態に限るものではなく、２つのランプの点灯，点滅を適宜組み合わせてできるだけ作業者に状態を判り易く表示することが可能である。

【図面の簡単な説明】

【0057】

【図1】本発明の一実施の形態である自販機の制御装置を示す構成ブロック図

【図2】本発明の第１の表示形態を示す図

【図3】本発明における商品の収納状態を示す概略構成図

【図4】本発明の第２の表示形態を示す図

【図5】図１における期限管理の処理の動作を示すフローチャート

【図6】図１における期限管理の確認表示処理の動作を示すフローチャート

【図7】図１における期限管理の払出し表示処理の動作を示すフローチャート

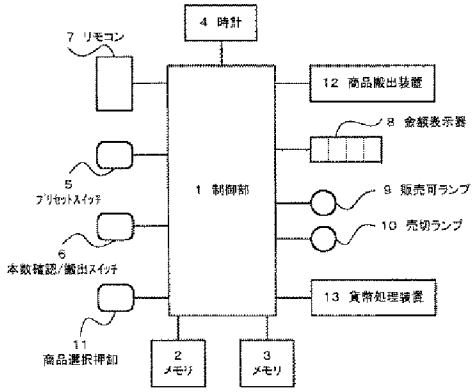
【図8】本発明の第３の表示形態を示す図

【符号の説明】

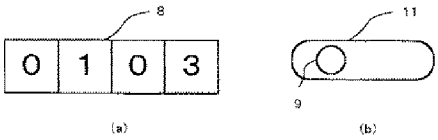
【0058】

１　　ＣＰＵ
２、３　メモリ
４　　時計
５　　プリセットスイッチ（補充完了スイッチ）
６　　本数確認／搬出スイッチ
７　　リモコン
８　　金額表示器
９　　販売可ランプ
１０　売切ランプ
１１　商品選択押釦

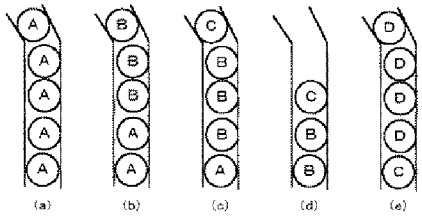
【図1】



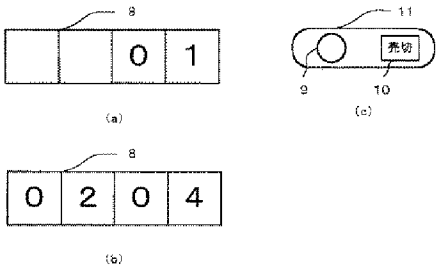
【図2】



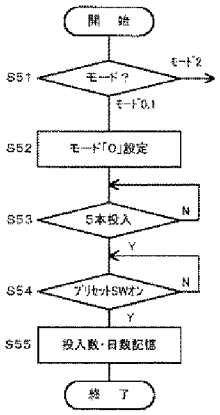
【図3】



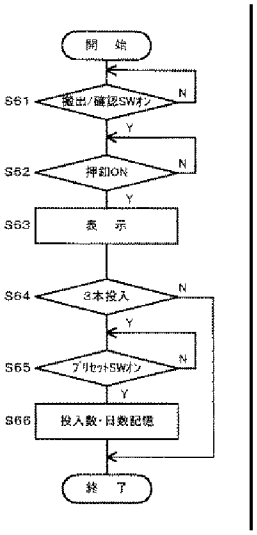
【図4】



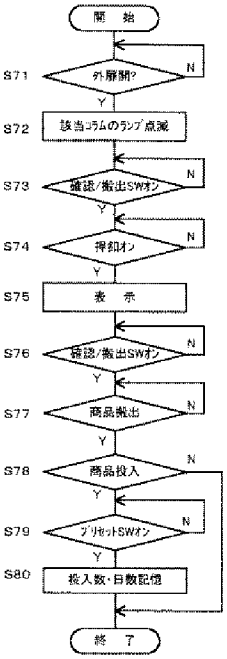
【図5】



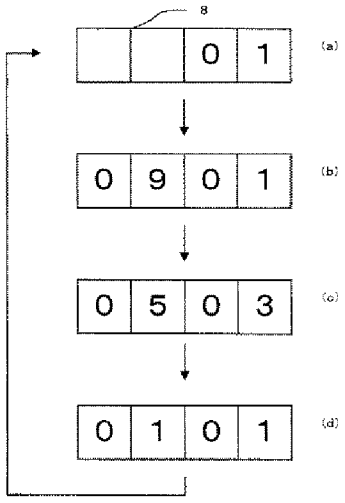
【図6】



【図7】



【図8】



Espacenet

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AUTOMATIC TRANSACTION SYSTEM

Inventor(s): KIHARA HIDEO

Applicant(s): OKI ELECTRIC IND CO LTD

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- cooperative:

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Abstract of JP2006277296 (A)

PROBLEM TO BE SOLVED: To provide an automatic transaction system improving efficiency of a campaign screen by performing display control of a stop instruction key in the campaign screen, regarding the automatic transaction system which is connected with a customer information management system (CRM system) and displays the campaign screen corresponding to a user. ;SOLUTION: The CRM system 4 receiving account information of a customer from the automatic transaction system 1 returns campaign screen information for the customer and display control information of the stop instruction key ("return to transaction" button) in the campaign screen to the automatic transaction system 1. The automatic transaction system 1 displays the campaign screen for the customer in intervals of transaction on the basis of the information from the CRM system 4, and controls display and non-display of the "return to transaction" button, and also controls transitional timing from the campaign screen to the transaction screen. ;COPYRIGHT: (C)2007,JPO&INPIT

Notice

DESCRIPTION JP4586607B2

10 Automatic transaction device

[0001]

14 TECHNICAL FIELD The present invention relates to transition control of display screens for customers in an automated teller machine.

[0002]

19 Conventionally, when customers of financial institutions such as banks, post offices, and credit unions perform financial transactions such as deposits, withdrawals, transfers, and balance inquiries, ATMs (Automatic Teller Machines) installed at branches of the financial institutions: Automatic teller machine), CD (Cash Dispenser), etc. When using an automatic transaction device, in addition to the display (guidance) of the operation instruction of the automatic transaction device on the display screen of the automatic transaction device, the financial Institution-to-customer messages (including campaign messages, advertisements, notifications, etc.).) is provided.

[0003]

30 For example, when the customer operates an automated teller machine at a bank to inquire about the balance, after entering the PIN, during the inquiry to the host, the display screen displays the following message: It was started.

33 Go ahead and use it, please! " is displayed as a campaign message.

[0004]

37 Furthermore, in recent years, by adopting a customer information management system (CRM

system: Customer Relationship Management System), it has become possible to create a message with contents corresponding to each customer.

40 In this case, based on information on the basic attributes of each customer such as address, name, age, occupation, income, family structure, etc., and information on the history of past account transactions of each customer. , a so-called tailor-made message with content corresponding to each customer can be created and presented to the customer.

[0005]

47 As a result, financial institutions can timely deliver messages on financial products that are suitable for each customer, and can deliver messages that are expressed appropriately for each customer. .

50 (For example, see Patent Document 1.) When the customer has finished viewing the campaign message, the customer touches the "Close" button displayed on the screen to stop displaying the campaign message screen and return to the account system screen. . (For example, see Patent Document 2.)

54 特開２００３－３４６０４０号公報

55 特開２００３－３２３６５９号公報

[0006]

59 However, in the conventional automated teller machine, the display of the campaign screen can be terminated before the account system transaction is completed by the customer touching the "close" button displayed on the campaign message screen. It was possible.

62 SUMMARY OF THE INVENTION An object of the present invention is to improve the efficiency of campaign display and effectively utilize the communication time of the accounting system.

[0007]

67 Therefore, the automatic transaction apparatus of the present invention comprises a display section for displaying guidance necessary for customer transactions, an operation input section for inputting customer instructions, and a control section for controlling these sections. wherein the automatic transaction device is communicably connected to an information management device that manages message screen information, the control unit acquires message screen information from the information management device, and displays the acquired message screen to the It is displayed on the display unit, and the display/non-display of the return-to-transaction instruction key is controlled based on the result of comparison between the display time of the message screen information stored in advance in the information management device and the display time threshold information. characterized by

[0008]

81 In the present invention, guidance necessary for customer transactions and message information to the customer are displayed on the display unit, and the display of a return-to-transaction instruction key that instructs to stop displaying the displayed message information is controlled to be valid/invalid. Thus, there is an effect that the display efficiency of message information performed between customer transactions can be improved.

[0009]

89 An embodiment of the present invention will be described with reference to the drawings.

90 In addition, the same code|symbol is attached|subjected to the element which is common to each drawing.

[0010]

95 First embodiment

96 (1) Structure of Automatic Transaction Apparatus FIG. 1 is a block diagram of an automatic transaction system showing the first embodiment of the present invention, and FIG.

98 In FIG. 1, an automated teller machine 1 operated by a customer for trading is connected to a host computer 3 and a CRM system 4 via a network 2 .

[0011]

103 The automated teller machine 1 is an ATM, CD, etc., installed in the branch, and is operated by the customer of the financial institution to deposit, withdraw, passbook entry, balance inquiry, transfer, transfer, remittance, fixed payment, etc. It is a device for conducting financial transactions such as setting up sex deposits.

107 In addition, the host computer 3 receives processing requests from the automated teller machine 1 and performs various data processing related to financial institution operations such as deposit account management.

110 The CRM system 4 is a system that holds customer information and provides various information to the automatic teller machine 1 based on the customer information, and functions as a customer information management device.

[0012]

116 FIG. 2 is a block diagram of the automatic transaction apparatus 1, and the configuration of the automatic transaction apparatus will be explained using this diagram.

118 The automated teller machine 1 includes an operation/display unit 11, a card processing unit 17, a passbook processing unit 18, a money processing unit 19, and a control unit 12 that controls these units.

121 Here, the operation/display unit 11 is composed of a liquid crystal display with a touch panel

that functions both as an input device and as a display device.

123 In addition to the guidance necessary for transactions (instructions for inputting PIN numbers, instructions for withdrawing amounts, instructions for picking up cards and cash, etc.), the display section also displays intermittent transaction guidance (such as counting deposited cash, It is possible to display a screen containing messages and advertisements regarding financial products on the display device during a period of time such as when the user is accessing an accounting system.

[0013]

132 The card processing unit 17 also handles cards such as cash cards and acquires customer IDs.

133 Here, the card is a card issued to a customer by a financial institution for performing financial transactions such as deposits, withdrawals, transfers, and balance inquiries. a magnetic stripe that stores the

136 The member for storing the information may be an IC card in which an IC chip is embedded instead of the magnetic stripe.

138 The card processing unit 17 has a card insertion slot into which a card is inserted. Behind the insertion slot, there is a conveying device for conveying cards, and recording information is read and written from the magnetic stripe and IC chip of the card. A magnetic head, terminals, and the like are provided for this purpose.

142 The card processing unit 17 in the present embodiment further includes a statement issuing unit that prints and issues a statement of transaction.

[0014]

147 The passbook processing unit 18 receives the passbook of the customer and performs processing such as printing and magnetic writing to the magnetic stripe provided on the passbook.

150 The money processing unit 19 has a banknote deposit/withdrawal unit that handles banknotes and a coin deposit/withdrawal unit that handles coins, and performs processes such as money deposit/withdrawal and counting according to customer transactions.

153 The control unit 12 includes a CPU 13, a memory 14, a timer 15, and the like, and controls each unit of the automated teller machine 1. FIG.

155 The control unit 12 also includes a communication control unit 16 that connects to the network 2 and communicates with the host computer and the CRM system 4 .

[0015]

160 Next, the configuration of the CRM system 4 in FIG. 1 will be described.

161 The CRM system 4 has a memory 42 that stores information necessary for various controls, a control unit 41 that performs various controls of the CRM system 4, a CRM database 43 that stores data related to campaign messages, and a customer data that stores customer data. A

master database 44 is provided.

165 Here, the CRM database 43 stores display data for each customer, campaign screen information, etc., and the customer master database 44 stores customer ID, address, name, age, occupation, income, family composition, etc. for each customer. basic attribute information, that is, customer basic attribute information, and account transaction information such as a history of past account transactions.

[0016]

173 The CRM database 43 also includes a history database that stores campaign information provided to customers, campaign histories related to messages, etc., and operation histories of customers operating the automatic teller machine 1 and the like.

176 The CRM system 4 uses these data to create guidance information with contents suitable for the customer.

[0017]

181 FIG. 3 is a diagram showing an example of data in the CRM database in the CRM system.

182 The CRM database 43 stores the campaign ID, campaign name, display timeout time, target person information (account number, etc.) and the like for each campaign.

184 Campaign screen information (screen data) is stored in the CRM database in association with this campaign ID.

186 Also, FIG. 4 is an example of customer data stored in the customer master database.

187 For each account number, the customer name, account balance, whether or not the account is a salary transfer destination, whether or not the account is a payment account for public utility charges, etc. are stored.

190 Next, the operation of the automatic transaction system according to this embodiment will be described using the flowchart of FIG.

192 In addition, as a transaction, the case of a withdrawal transaction will be described as an example.

[0018]

197 (1) From the start of the transaction to before the display of the campaign screen, the customer selects the transaction by touching the "withdrawal" transaction button on the transaction selection screen displayed on the operation/display unit 11 of the automated teller machine 1. , the card is inserted into the card processing unit 17 and the transaction is started (Sa1).

202 Note that the card may be inserted before transaction selection.

203 When a customer selects a transaction and inserts a card, the control unit 12 of the automated teller machine 1 reads the customer's account information (account number, etc.) from the magnetic stripe of the card and sends it to the CRM system via the communication

control unit 16. 4 (Sa2).

207 After that, the automated teller machine 1 guides the customer to input the personal identification number and the withdrawal amount via the operation/display unit 11, and prompts the customer to input (Sa3).

210 In addition, the automated teller machine 1 transmits the personal identification number entered by the customer and the withdrawal amount according to the guidance to the host computer 3 together with the account information described above (Sa4).

[0019]

216 The control unit 41 of the CRM system 4 receives the account information transmitted by the automatic teller machine 1 at Sa2, compares the received account information of the customer with the CRM database 43, and determines the campaign ID set for the customer. exists (Sa5).

220 If the campaign ID exists, the control unit 41 refers to the CRM database 43 and further acquires the timeout period set for that campaign ID (Sa6).

[0020]

225 The control unit 41 reads out the "threshold value of the timeout period" from the memory 42, and performs a comparison operation process with the timeout period acquired in Sa6 (Sa7).

228 If the timeout period of the current campaign is equal to or greater than the threshold, the control unit 41 sets the "return to transaction" button display flag (F) to "1" and stores it in the memory 42 (Sa8a).

231 On the other hand, if the timeout period of the current campaign is smaller than the threshold, the flag (F) is set to "0" and stored in the memory 42 (Sa8b).

233 The control unit 41 transmits campaign information to the automated teller machine 1 in a data format as shown in FIG. 6 (Sa9).

[0021]

238 In FIG. 6, the account number is the account information received from the automated teller machine 1 .

240 The campaign information consists of campaign ID, campaign name, campaign message screen data, campaign timeout time (To), etc., and is data obtained from the CRM database.

242 The button display flag is the value of the flag F set in Sa7-Sa8 and stored in the memory 42. FIG.

244 The header and footer are composed of addresses and check data for communication control.

[0022]

248 As described above, the reason why the "timeout time" is set for each campaign is to prevent the campaign screen from remaining displayed due to no customer operation during display of the campaign screen.

251 The CRM database 43 stores a timeout period set according to the notification content for each campaign.

253 In addition, the "threshold of timeout time" is set with the intention that the customer does not have to press the "return to transaction" button as much as possible, and is set to a value such as 7 seconds. be.

256 Therefore, in this example, if the timeout time (time to automatically return to the transaction screen) in the campaign screen is less than 7 seconds, the flag F is set to hide the "return to transaction" button. If it is set to "0" and the timeout period is 7 seconds or more, the flag F will be set to "1" to display the "return to trade" button.

260 Therefore, for example, in a campaign screen such as a questionnaire, in which the user reads the message content and thinks about the answer, the timeout period is set long, and the user can stop displaying the campaign screen and return to the transaction in the middle of the display. button is displayed.

[0023]

267 (2) Displaying the "return to transaction" button on the campaign screen When the control unit 12 of the flow automated teller machine 1 receives the campaign information from the CRM system 4, it stores the contents of the campaign data in the memory 14.

270 Also, the value of the flag (F) is checked (Sa10).

271 When the flag (F)= “1” , the control unit 12 synthesizes the campaign screen data stored in the memory 14 and the “return to transaction” button data stored in advance in the memory 14, and displays the campaign display screen. data is generated, the generated display screen data is transferred to the operation/display unit 11, and the campaign screen is displayed on the display unit (Sa11).

276 In this flow chart, an example of transmitting transaction information to the host computer 3 and then transferring display screen data to the operation/display unit 11 is described. This may be done in parallel, and the campaign screen may be displayed immediately after the input of the withdrawal amount is completed.

280 (This also applies to the following embodiments.

281) In any case, this campaign screen is displayed between transaction guidances for customers.

[0024]

285 FIG. 7(a) is an example of a campaign screen, in which a message for a questionnaire campaign is displayed.

287 A "return to transaction" button is displayed at the lower right of the screen, and by touching this button, the customer's instruction to return to the transaction is valid.

289 Further, at the upper left of the screen, "withdrawal" is displayed as information on the

current transaction, and the customer's name is displayed in the campaign message.

291 These screens are synthesized and displayed by the control unit 12 based on transaction information selected by the customer and relevant information transmitted from the host computer 3 or the CRM system 4 .

[0025]

297 Subsequently, while FIG. 7A is being displayed, the control unit 12 checks whether or not the customer has touched the "return to transaction" button (Sa12).

299 When the control unit 12 determines that the customer has touched the "return to transaction" button by touch detection on the touch panel of the operation/display unit 11, whether or not the notification that the withdrawal transaction is possible has been received from the host computer 3. (Sa13), and if the notification has been received, a withdrawal transaction guidance screen as shown in FIG. 7(c) is displayed (Sa14).

304 The control unit 12 ejects the card and the receipt to the customer via the card processing unit 17, and when detecting that the customer has received them, pays out the money (Sa15).

307 When it is detected that the money dispensed to the money processing unit 19 has been taken out by the customer, the control unit 12 determines that the transaction is completed, notifies the host computer 3 and the CRM system 4 of the transaction completion, and The information of the transaction selection screen is transferred to the operation display unit 11, and the state of waiting for transaction selection is returned.

[0026]

315 The control unit 12 transmits to the CRM system 4 campaign screen display history information (corresponding account information, campaign ID, response information to the campaign (questionnaire response content), etc.).

318 The control unit 41 of the CRM system 4 updates the contents of the CRM database 43 based on these history information transmitted from the automated teller machine 1 .

320 If it is determined at Sa13 that the notification that the withdrawal transaction is possible has not yet been received from the host computer 3, the control section 12 displays the operation/display section 11 with the message "Inquiring to the host computer.

323 Please wait.

324 or the like, and waits for a notification from the host computer 3 (Sa16).

[0027]

328 Further, when receiving a notification that the personal identification number does not match from the host computer 3, the control section 12 displays a personal identification number re-input screen on the operation/display section 11, and repeats the process from Sa4 again.

331 Furthermore, when a notice of impossibility of transaction is received from the host computer

3, such as that there is no corresponding account, the control unit 12 displays "transaction impossibility" on the operation/display unit 11, and returns to the transaction selection screen. .

335 Further, the control unit 12 measures the campaign screen display time by the timer 15 while the campaign screen is being displayed, and determines whether or not the campaign screen display time is equal to or longer than the campaign timeout time (To) transmitted from the CRM system 4. , To or more, a withdrawal transaction guidance screen is displayed, and if it is less than To, the process returns to determine whether or not the "return to transaction" button has been selected (Sa12, Sa17).

341 This prevents the customer from returning to the transaction screen while the campaign screen is being displayed.

[0028]

346 (3) In the flow Sa10 when the "return to trade" button is not displayed on the campaign screen, the control unit 12 synthesizes the data of the "return to trade" button when the flag (F) = "0". The campaign screen data stored in the memory 14 is transferred to the operation/display unit 11, and the campaign screen is displayed on the display unit (Sa18).

350 FIG. 7(b) is an example of the campaign screen, in which the message of the questionnaire implementation campaign is displayed, but in this case the "return to transaction" button is not displayed.

353 That is, the instruction to stop displaying the campaign screen and return to the trading screen is disabled.

[0029]

358 The control unit 12 measures the campaign screen display time by the timer 15 while the campaign screen is being displayed, determines whether the campaign screen display time is equal to or longer than the campaign timeout time (To) transmitted from the CRM system 4, If the above is reached, the withdrawal transaction guidance screen is displayed, and if the To is not reached, the campaign screen is continued to be displayed.

363 （Ｓａ１８、Ｓａ１９）。

364 A supplementary description will be given of the processing of the control unit 12 when determining whether or not the display time of the campaign screen has passed the timeout time (To).

367 When the campaign screen spans a plurality of screens, when the screen is switched, the display time up to that point is cleared (set to "0"), the display time is measured again, and it is determined whether the timeout time has elapsed.

370 Also, when the "Return to Transaction" button is displayed while the campaign screen is being displayed, it is determined whether or not the timeout period (To) has elapsed without clearing the display time for the campaign screen being displayed. do.

[0030]

376 As described above, according to the first embodiment, for a campaign with a short time-out period, for example, a simple campaign whose content can be grasped in a short time, the instruction to stop displaying the campaign screen and return to the transaction is invalid. Yes, it will be displayed until timeout.

380 As a result, there is an effect that the customer can read the contents of the campaign more thoroughly.

382 On the other hand, for campaigns with a long time-out period (those that take time, such as questionnaires), the instruction to cancel the display of the campaign screen and return to the transaction is valid. can be used according to

[0031]

388 Second embodiment

389 A block diagram of the second embodiment is the same as that of the first embodiment, so description thereof is omitted.

391 The operation of the second embodiment will be described below with reference to the flow chart of FIG.

393 (Sb1) to (Sb4) are processed in the same manner as in the first embodiment.

394 The control unit 41 of the CRM system 4 receives the account information transmitted by the automatic teller machine 1 in Sb2, compares the received account information of the customer with the CRM database 43, and determines the campaign ID set for the customer. exists (Sb5).

[0032]

401 The control unit 41 acquires the campaign name, campaign message screen data, campaign timeout time (To), etc., from the extracted campaign ID, and transmits these campaign information to the automated teller machine 1 (Sb6).

404 The control unit 12 of the automated teller machine 1 stores campaign information such as campaign data and campaign timeout time (To) received from the CRM system 4 in the memory 14 .

407 Then, the campaign message screen data stored in the memory 14 is transferred to the operation/display section 11, and the campaign screen is displayed on the display section (Sb7).

410 At this time, the "return to transaction" button is not displayed.

[0033]

414 The control unit 12 reads the non-display time (Th1) of the "return to transaction" button stored in the memory 14 in advance, and compares it with the campaign screen display time

counted by the timer 15 .

417 As a result, if the display time is shorter than (Th1), this checking process is repeated (Sb8).

418 On the other hand, if the display time is longer than (Th1), the image of the "return to transaction" button stored in advance in the memory 14 is combined with the displayed campaign screen and displayed on the display unit. (Sb9).

421 When a plurality of campaign screens are displayed and the campaign screen is switched by the customer's operation, the display time is cleared and the display time of the new campaign screen is compared with (Th1).

424 As a result, even when the campaign screen is displayed over a plurality of screens, each screen can be reliably displayed to the customer.

426 The non-display time (Th1) is set in advance from the viewpoint of the minimum time that the customer should see the campaign screen, and is stored in the memory 14 .

[0034]

431 FIG. 9(a) is an example of a campaign screen, in which a message requesting cooperation in the questionnaire implementation campaign is displayed.

433 At the time of display in Sb7, the "return to transaction" button has not yet been displayed.

434 FIG. 9(b) is an example of the screen when the customer touches the "Next" button in FIG. It has become so.

436 In Sb8, when the display time in FIG. 9B is equal to or longer than the non-display time (Th1), as described in Sb9, the "return to transaction" button is displayed, and as shown in FIG. 9C screen display.

[0035]

442 Returning to the flowchart of FIG. 8, after displaying the screen of FIG. 9C in Sb9, the control unit 12 determines whether the display time is longer than the campaign timeout time (To) transmitted from the CRM system 4. (Sb10).

445 If the display time is shorter than (To), the control unit 12 checks whether or not the "return to transaction" button has been selected (Sb11), and if the "return to transaction" button has not been selected, , Sb10.

448 On the other hand, if the display time is equal to or longer than (To), the control unit 12 checks whether or not the notification that the withdrawal transaction is possible has been received from the host computer 3 (Sb12), and has received the notification. In this case, the guidance screen for the withdrawal transaction shown in FIG. 7(c) is displayed (Sb13).

452 After that, withdrawal processing is performed in the same manner as in the first embodiment, and the transaction is completed.

454 In Sb12, if the notification that the withdrawal transaction is possible has not been received from the host computer 3, a standby instruction screen is displayed and the notification from the host computer 3 is waited for.

[0036]

460 In the present embodiment, since the campaign screen can be displayed at least until the button non-display time elapses, the campaign can be carried out more reliably.

462 In this way, the "return to transaction" button is not displayed during the preset non-display time (Th1). occurrence can be suppressed.

464 Therefore, it is possible to effectively display the campaign.

[0037]

468 Third embodiment

469 A block diagram of the third embodiment is also the same as that of the first embodiment, so description thereof will be omitted.

471 In this embodiment, the memory 42 of the CRM system 4 stores the button non-display time (Th2) corresponding to the type of transaction received from the automatic teller machine 1. For example, the contents shown in FIG. is stored.

474 The operation of the third embodiment will be described below with reference to the flow chart of FIG.

[0038]

479 (Sc1) to (Sc4) are processed in the same manner as in the first embodiment.

480 The control unit 41 of the CRM system 4 receives the account information transmitted by the automated teller machine 1 in Sc2, compares the received account information of the customer with the CRM database 43, and determines the campaign ID set for the customer. exists (Sc5).

484 Further, the control unit 41 reads the button non-display time stored corresponding to the transaction from the memory 42 (Sc6).

486 Then, the campaign information including this button non-display time (Th2) is transmitted to the automated teller machine 1 (Sc7).

[0039]

491 The control unit 12 of the automated teller machine 1 stores the campaign information received from the CRM system 4 in the memory 14 .

493 Then, the campaign message screen data stored in the memory 14 is transferred to the operation/display section 11, and the campaign screen is displayed on the display section (Sc8).

496 At this time, the "return to transaction" button is not displayed.

497 The control unit 12 reads the non-display time (Th2) of the "return to transaction" button transmitted from the CRM system 4 from the memory 14 and compares it with the campaign screen display time counted by the timer 15 .

500 As a result, if the display time is shorter than (Th2), this checking process is repeated (Sc9).

501 On the other hand, when the display time is longer than (Th2), the image of the "return to transaction" button stored in advance in the memory 14 is combined with the displayed campaign screen and displayed on the display unit. (Sc10).

[0040]

507 When a plurality of campaign screens are displayed and the campaign screen is switched by the customer's operation, the display time is cleared and the display time of the new campaign screen is compared with (Th2).

510 As a result, even when the campaign screen is displayed over a plurality of screens, each screen can be reliably displayed to the customer.

512 In addition, the non-display time (Th2) is set in advance from the viewpoint of the minimum time that the customer wants to see according to the time between each transaction (processing time at the host, etc.).

[0041]

518 After the "return to transaction" button is displayed on the campaign screen in Sc10, the control unit 12 determines whether the display time is longer than the campaign timeout time (To) sent from the CRM system 4 (Sc11).

521 If the display time is shorter than (To), the control unit 12 checks whether or not the "return to transaction" button has been selected (Sc12), and if the "return to transaction" button has not been selected, , and return to Sc11.

524 On the other hand, if the display time is equal to or longer than (To), the control unit 12 checks whether or not a notification that the withdrawal transaction is possible has been received from the host computer 3 (Sc13), and has received the notification. In this case, the guidance screen for the withdrawal transaction shown in FIG. 7(c) is displayed (Sc14).

528 After that, withdrawal processing is performed in the same manner as in the first embodiment, and the transaction is completed.

530 In addition, in Sc13, if the notification that the withdrawal transaction is possible has not been received from the host computer 3, a standby instruction screen is displayed and the notification from the host computer 3 is waited for.

[0042]

536 In this embodiment, the time until the "return to transaction" button is displayed on the campaign screen can be changed for each transaction type.

538 Therefore, the campaign can be displayed in accordance with the communication time between the host computer and the automated teller machine, and the efficiency of implementing the campaign can be improved.

[0043]

544 Fourth embodiment

545 The block diagram of the fourth embodiment is also the same as that of the first embodiment, so the explanation is omitted.

547 The operation of the fourth embodiment will be described below with reference to the flowchart of FIG.

[0044]

552 (Sd1) and (Sd2) are processed in the same manner as in the first embodiment.

553 The control unit 41 of the CRM system 4 receives the account information transmitted by the automatic teller machine 1 in Sd2, compares the received account information of the customer with the CRM database 43, and determines the campaign ID set for the customer. exists (Sd3).

557 If the campaign ID exists, the control unit 41 refers to the CRM database 43, further acquires the timeout period set for the campaign ID, and transmits the campaign information to the automated teller machine 1 (Sd4).

[0045]

563 In parallel with these, the automated teller machine 1 guides the customer to input the personal identification number and the withdrawal amount via the operation/display unit 11, prompting the customer to input (Sd5).

566 The automated teller machine 1 transmits the personal identification number entered by the customer and the withdrawal amount according to these guidances to the host computer 3 together with the account information described above (Sd6).

569 Also, upon receiving the campaign information from the CRM system 4 , the control unit 12 of the automated teller machine 1 stores the campaign information in the memory 14 .

571 Among the data stored in the memory 14, the campaign message screen data is transferred to the operation/display section 11, and the campaign screen is displayed on the display section (Sd7).

574 At this time, the "return to transaction" button is not displayed.

[0046]

578 After displaying the campaign screen, the control unit 41 checks whether or not a notification that a withdrawal transaction is possible has been received from the host computer 3 (Sd8). If not, it is determined whether the display time of the campaign screen is equal to or longer than the campaign timeout time (To) sent from the CRM system 4 (Sd9).

582 If the campaign timeout time has not elapsed, the process returns to checking whether the accounting system communication has ended, and repeats this process (Sd8, Sd9).

584 As a result of checking whether or not the control unit 41 has received the notification that the withdrawal transaction is possible from the host computer 3 (Sd8), if the notification has been received, that is, the completion of the accounting communication has been notified. If so, the campaign image and the "return to trade" button are combined on the screen, and the "return to trade" button is displayed in the campaign screen via the operation/display unit 11 (Sd10).

[0047]

593 When the "return to transaction" button is displayed on the campaign screen in Sd10, the control unit 12 determines whether the campaign screen display time is equal to or longer than the campaign timeout time (To) sent from the CRM system 4 (Sd11).

596 If the display time is shorter than (To), the control unit 12 checks whether or not the "return to trade" button has been selected (Sd12), and if the "return to trade" button has not been selected, , Sd11.

599 On the other hand, if the display time is equal to or longer than (To), the control unit 12 displays the withdrawal transaction guidance screen shown in FIG. 7(c) (Sd13).

601 After that, withdrawal processing is performed in the same manner as in the first embodiment, and the transaction is completed.

[0048]

606 In the present embodiment, the timing for validating the display stop instruction key (end of the predetermined processing related to the transaction) is that the campaign screen is displayed until the notification that the withdrawal transaction is possible is received from the host computer, that is, until the accounting communication is completed. I don't see the "back to trade" button in

611 Therefore, the campaign can be displayed while the host computer and the automated teller machine are communicating with each other, and the efficiency of the campaign can be further improved.

[0049]

617 In this way, if the display control of the "Return to transaction" button is not performed according to the communication time of the accounting system communication with the host, for example, the communication time of the accounting system is 10 seconds for the balance inquiry. If the transfer time is 20 seconds, and the button non-display time is uniformly set to 15 seconds, there will be a difference between the communication time and the button display time.

623 For example, in balance inquiry processing, the campaign screen will always be displayed for 5 seconds after the completion of host processing and the notification of completion has been received. Sometimes, even if you can instruct to cancel the campaign display by

pressing the "Return to Transaction" button, the screen waiting for processing will be displayed for 5 seconds.

[0050]

631 Here, the time during which the campaign is being displayed even though the communication has ended is unnecessary time for the user who has no intention of viewing the campaign, and the usage efficiency of the automated teller machine tends to decrease accordingly. , the campaign ends, but the communication is not finished, there is a tendency that the campaign will not be seen by that much, and the effect of the campaign will decrease.

636 In the present embodiment, by adjusting the button non-display time according to the type of transaction, it is possible to increase the utilization efficiency of the automated teller machine and the implementation efficiency of the campaign.

[0051]

642 Fifth embodiment

643 In each of the above-described embodiments, the automated teller machine synthesizes and displays the "return to trade" button on the campaign message screen, but it can also be configured as follows.

646 In recent years, it has become possible to create a screen displayed on a display unit using a page description language such as HTML (Hyper Text Markup Language) or Java (registered trademark) Script, and to embed various control programs as objects. there is

[0052]

652 An example of using such a page description language will be described.

653 That is, on the CRM system 4 side, the campaign screen is created in HTML format, and the campaign timeout time (To), non-display time (Th1), non-display time (Th2), and operation instructions after these times have passed are stored as objects. , the automatic transaction device 1 may control display/non-display of the "return to transaction" button based on the script of this object.

658 Scripts for such objects serve as control information.

659 In the case of such a configuration, there is an effect that various controls for display screen transition can be incorporated on the CRM side without changing the program on the automatic transaction apparatus 1 side.

[0053]

665 The examples in the respective embodiments described above are examples, and the present invention is not limited thereto.

667 For example, although a campaign message has been described as an example of a message

addressed to a customer, it may be a campaign message or a financial product advertisement message.

670 Further, in each of the above-described embodiments, an example of controlling the display and non-display of the "return to trading" button has been described. When the key is displayed in color and pressed, the key functions as a valid key, and when the key is invalid, the key may be displayed in achromatic color and the key may not be validated even if the key is pressed.

675 That is, if the key operation for instructing to stop the display of the message display screen and shift to the transaction screen is enabled or disabled, even if it is the control of the display, the control of the key input is performed. or a combination thereof.

[0054]

681 In addition, the campaign message may be displayed on a screen that is completely different from the transaction screen, or may be displayed on a part of the transaction screen.

683 In addition, in the campaign message display stop instruction, if there is only one campaign screen, the stop will end the display of that screen, and if multiple campaign screens are flipped in sequence, the display of the second and subsequent screens will be displayed. including the case of canceling and returning to the transaction screen.

687 Also, although there is a "return to transaction button", this is also an example of how to call it, and it is not limited to the case of a physical button.

689 In addition, in the second embodiment, an example in which the non-display time (Th1) is stored in advance in the memory 14 of the automated teller machine 1 has been described. You may make it transmit to an automatic transaction apparatus as one of the campaign information.

[0055]

696 The host computer 3 and the CRM system 4 may be the same machine.

697 Also, the CRM system 4 may be composed of a plurality of machines.

698 Furthermore, the automatic transaction apparatus 1 may be provided with all or part of the functions of the CRM system.

700 For example, information such as the timeout period may be searched by the CRM system, or may be searched from data held in advance by the automated teller machine.

702 In addition, although an example of card transactions has been explained, other transactions such as passbook transactions may also be used.

704 Moreover, although the example of the account number was demonstrated as an example of the customer's identification information which is transmitted from the automated teller machine to the CRM system, it is not limited to this.

[0056]

710 In addition, the automatic transaction device 1 described above is a multifunctional terminal such as a kiosk terminal having other functions such as a ticket reservation function, a product purchase application function, a credit card credit confirmation function, a facility information guidance function, and the like. good too.

714 A customer is a person who opens an account in a financial institution and uses the financial institution, and is generally an individual, but may be a company, an organization, or the like.

716 The network 2 described above may be any network such as a wireless or wired dedicated communication line network or public communication line network, the Internet, a LAN (Local Area Network), a WAN (Wide Area Network), or the like.

719 The network 15 is preferably a dedicated network, but may be a VPN (Virtual Private Network) using a public network.

[0057]

724 It is a block diagram of an automatic transaction system in each embodiment.

725 It is a block diagram of automatic transaction device 1 in each embodiment.

726 It is a configuration example of a CRM database.

727 It is a configuration example of a customer master database.

728 4 is a flow chart in the first embodiment;

729 It is an example of transmission data transmitted from the CRM system to the automated teller machine.

731 It is an example of a screen display of the automatic transaction apparatus in 1st Embodiment.

733 It is a flow chart in a 2nd embodiment.

734 It is an example of a screen display of the automatic transaction apparatus in 2nd Embodiment.

736 It is a flow chart in a 3rd embodiment.

737 It is an example of a timeout period for each transaction type in the third embodiment.

738 It is a flow chart in a 4th embodiment.

739 Code explanation

[0058]

743 1 automatic transaction device 2 network 3 host computer 4 CRM system 11 operation/display unit 12 control unit 13 CPU 14 memory 15 timer 16 communication control unit 17 card processing unit 18 passbook processing unit 19 money processing unit 41 control unit 42 memory 43 CRM database 44 Customer master database

Notice

CLAIMS JP4586607B2

1.

13 An automatic transaction device comprising a display unit for displaying guidance necessary for customer transactions, an operation input unit for inputting customer instructions, and a control unit for controlling these units, The automatic transaction device is communicably connected to an information management device that manages message screen information, The control unit acquires message screen information from the information management device, displays the acquired message screen on the display unit, and displays a display time and display of the message screen information stored in advance in the information management device. An automatic transaction device that controls display/non-display of a return-to-transaction instruction key based on a result of comparison with time threshold information.

2.

26 An automatic transaction device comprising a display unit for displaying guidance necessary for customer transactions, an operation input unit for inputting customer instructions, and a control unit for controlling these units,

29 The automatic transaction device is communicably connected to an information management device that manages message screen information,

31 The control unit acquires message screen information from the information management device, displays the acquired message screen on the display unit, and displays information associated with the message screen information pre-stored in the information management device. An automated teller machine that acquires a non-display time and displays a return-to-transaction key based on the non-display time.

3.

39 An automatic transaction device comprising a display unit for displaying guidance necessary for customer transactions, an operation input unit for inputting customer instructions, and a control unit for controlling these units,

42 The automatic transaction device is communicably connected to an information management device that manages message screen information,

44 The control unit acquires message screen information from the information management device, displays the acquired message screen on the display unit, and based on the type of transaction currently being performed by the customer, the information management device An automated teller machine, wherein a non-display time associated with a stored transaction type is acquired, and a return instruction key to the transaction is displayed based on the non-display time.

4.

53 An automated teller machine equipped with a display section for displaying guidance necessary for customer transactions, an operation input section for inputting customer instructions, and a control section for controlling these sections, and information management for managing message screen information an automated trading system comprising:

57 The information management device

58 a search means for searching the display time set for the message screen information to be sent to the automated teller machine;

60 comparison means for comparing the retrieved display time with pre-stored display time threshold information;

62 transmitting means for transmitting the message screen information and the information based on the result of the comparison to the automated teller machine;

64 The automated teller machine comprises receiving means for receiving the message screen information transmitted from the information management device and the information based on the result of the comparison,

67 The automatic transaction system, wherein the control unit, when displaying the message screen on the display unit, controls display/non-display of a return-to-transaction instruction key based on information based on the result of the comparison.

5.

73 An automated teller machine equipped with a display section for displaying guidance necessary for customer transactions, an operation input section for inputting customer instructions, and a control section for controlling these sections, and information management for managing message screen information an automated trading system comprising:

77 The information management device

78 A retrieval means for retrieving non-display time information of a return-to-transaction key set for message screen information to be transmitted to an automated teller machine, and a non-

display time of said message screen information and the searched return-to-transaction key and transmission means for transmitting information to the automatic transaction machine, and the automatic transaction machine receives the message screen information and the non-display time information of the return-to-transaction instruction key transmitted from the information management device. and the control unit displays the message screen on the display unit, and controls to display the return-to-transaction instruction key after the non-display time of the return-to-transaction instruction key has elapsed. automated trading system.

6.

91 An automated teller machine equipped with a display section for displaying guidance necessary for customer transactions, an operation input section for inputting customer instructions, and a control section for controlling these sections, and information management for managing message screen information an automated trading system comprising:

95 The information management device

96 a retrieval means for retrieving non-display time information of a return-to-transaction instruction key set in advance for a transaction type currently being performed in an automated teller machine;

99 a transmission means for transmitting the message screen information and the non-display time information of the searched return instruction key to the transaction machine,

101 The automated teller machine comprises receiving means for receiving the message screen information and non-display time information of the return-to-trade instruction key transmitted from the information management device,

104 The automatic transaction system, wherein the control unit displays the message screen on the display unit and displays the return-to-transaction instruction key after a non-display time of the return-to-transaction instruction key has elapsed.

7.

110 An automatic transaction system according to claim 5, wherein said message screen information incorporates non-display time information and control information of said return-to-transaction instruction key.

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(54)【発明の名称】自動取引装置

(57)【特許請求の範囲】

【請求項1】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置であって、

前記自動取引装置は、メッセージ画面情報を管理する情報管理装置と通信可能に接続され、

前記制御部は、前記情報管理装置からメッセージ画面情報を取得し、前記取得したメッセージ画面を前記表示部に表示させるとともに、前記情報管理装置で予め記憶されている前記メッセージ画面情報の表示時間と表示時間閾値情報とを比較した結果に基づいて取引への戻り指示キーの表示・非表示を制御することを特徴とする自動取引装置。

【請求項2】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置であって、

前記自動取引装置は、メッセージ画面情報を管理する情報管理装置と通信可能に接続され、

前記制御部は、前記情報管理装置からメッセージ画面情報を取得し、前記取得したメッセージ画面を前記表示部に表示させるとともに、前記情報管理装置で予め記憶されている前記メッセージ画面情報に対応付けられた非表示時間を取得し、前記非表示時間に基づいて取引への戻り指示キーを表示することを特徴とする自動取引装置。

【請求項3】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置であって、

前記自動取引装置は、メッセージ画面情報を管理する情報管理装置と通信可能に接続され、

前記制御部は、前記情報管理装置からメッセージ画面情報を取得し、前記取得したメッセージ画面を前記表示部に表示させるとともに、当該顧客が現在行っている取引種別を基に、前記情報管理装置で予め記憶されている取引種別に対応付けられた非表示時間を取得し、前記非表示時間に基づいて取引への戻り指示キーを表示することを特徴とする自動取引装置。

【請求項4】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置、及びメッセージ画面情報を管理する情報管理装置とを備えた自動取引システムであって、

情報管理装置は、

自動取引装置に送信するメッセージ画面情報に対して設定された表示時間を検索する検索手段と、

前記検索した表示時間と予め記憶した表示時間閾値情報とを比較する比較手段と、

前記メッセージ画面情報及び前記比較の結果に基づく情報とを自動取引装置に送信する送信手段とを備え、

自動取引装置は、前記情報管理装置から送信された前記メッセージ画面情報及び前記比較の結果に基づく情報とを受信する受信手段を備えるとともに、

前記制御部は、前記メッセージ画面を前記表示部に表示させる際に、前記比較の結果に基づく情報により取引への戻り指示キーの表示・非表示を制御することを特徴とする自動取引システム。

【請求項5】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置、及びメッセージ画面情報を管理する情報管理装置とを備えた自動取引システムであって、

情報管理装置は、

自動取引装置に送信するメッセージ画面情報に対して設定された取引への戻り指示キーの非表示時間情報を検索する検索手段と、

前記メッセージ画面情報及び検索した取引への戻り指示キーの非表示時間情報とを自動取引装置に送信する送信手段とを備え、

自動取引装置は、前記情報管理装置から送信された前記メッセージ画面情報及び取引への戻り指示キーの非表示時間情報とを受信する受信手段を備えるとともに、

前記制御部は、前記メッセージ画面を前記表示部に表示しつつ、取引への戻り指示キーの非表示時間経過後に取引への戻り指示キーを表示するよう制御することを特徴とする自動取引システム。

【請求項6】

顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置、及びメッセージ画面情報を管理する情報管理装置とを備えた自動取引システムであって、

情報管理装置は、

自動取引装置で現在行なわれている取引種別に対して予め設定された取引への戻り指示キーの非表示時間情報を検索する検索手段と、

前記メッセージ画面情報及び検索した取引への戻り指示キーの非表示時間情報とを自動取引装置に送信する送信手段とを備え、

自動取引装置は、前記情報管理装置から送信された前記メッセージ画面情報及び取引への戻り指示キーの非表示時間情報とを受信する受信手段を備えるとともに、

前記制御部は、前記メッセージ画面を前記表示部に表示しつつ、取引への戻り指示

キーの非表示時間経過後に取引への戻り指示キーを表示するよう制御することを特徴とする自動取引システム。

【請求項7】

請求項５または６項において、前記メッセージ画面情報には、前記取引への戻り指示キーの非表示時間情報及び制御情報が組み込まれていることを特徴とする自動取引システム。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、自動取引装置における顧客への表示画面の遷移制御に関するものである。

【背景技術】

【0002】

従来、銀行、郵便局、信用金庫等の金融機関の顧客が、預金、引出し、振込、残高照会等の金融取引を行う場合、前記金融機関の営業店などに設置されたＡＴＭ（Ａｕｔｏｍａｔｉｃ Ｔｅｌｌｅｒ Ｍａｃｈｉｎｅ：現金自動預払機）、ＣＤ（Ｃａｓｈ Ｄｉｓｐｅｎｓｅｒ：現金自動支払機）等の自動取引装置を利用すると、該自動取引装置の表示画面に自動取引装置の操作指示の表示（ガイダンス）に加えて、前記金融機関から顧客へのメッセージ（キャンペーンメッセージ、広告、通知等を含む。）の付加情報が表示されるシステムが提供されている。

【0003】

例えば、前記顧客が銀行における自動取引装置を操作して残高照会を行う際、暗証番号入力の後、ホストへの照会中に、表示画面に「当行におきましては、○月○日より新しい××サービスを開始しました。どうぞご利用下さい。」というようなキャンペーンメッセージを表示するようになっている。

【0004】

さらに、近年においては、顧客情報管理装置（ＣＲＭシステム：Ｃｕｓｔｏｍｅｒ Ｒｅｌａｔｉｏｎｓｈｉｐ Ｍａｎａｇｅｍｅｎｔ システム）を採用することによって、それぞれの顧客に対応した内容のメッセージを作成することができるようになっている。この場合、それぞれの顧客の住所、氏名、年齢、職種、収入、家族構成等の顧客の基本的な属性に関する情報や、それぞれの顧客の過去に行われた勘定取引に関する履歴等の情報に基づいて、それぞれの顧客に対応した内容を備える、いわゆる、オーダーメイドのメッセージを作成して、顧客に提示することができる。

【0005】

これにより、金融機関は、それぞれの顧客に適した内容の金融商品に関するメッセージをタイムリーに顧客に伝えることができ、また、それぞれの顧客に即した適切な表現のメッセージを顧客に伝えることができる。（例えば、特許文献１参照。）

また、キャンペーンメッセージを見終わったときには、画面の中に表示される「閉じる」ボタンを顧客がタッチすることにより、キャンペーンメッセージ画面の表示を中止し、勘定系の画面に戻るようになっている。（例えば、特許文献２参照。）

【特許文献1】特開２００３－３４６０４０号公報

【特許文献2】特開２００３－３２３６５９号公報

【発明の開示】

【発明が解決しようとする課題】

【0006】

しかしながら、従来の自動取引装置にあっては、キャンペーンメッセージ画面に表示される「閉じる」のボタンを顧客がタッチすることにより、勘定系の取引が終了する前にキャンペーン画面の表示を終了させることが可能であった。

本発明は、キャンペーン表示の効率を高め、勘定系の通信時間を有効利用することを目的としている。

【課題を解決するための手段】

【0007】
そのため、本発明の自動取引装置は、顧客取引に必要なガイダンスを表示する表示部と、顧客の指示を入力するための操作入力部と、これら各部を制御する制御部とを備えた自動取引装置であって、前記自動取引装置は、メッセージ画面情報を管理する情報管理装置と通信可能に接続され、前記制御部は、前記情報管理装置からメッセージ画面情報を取得し、前記取得したメッセージ画面を前記表示部に表示させるとともに、前記情報管理装置で予め記憶されている前記メッセージ画面情報の表示時間と表示時間閾値情報とを比較した結果に基づいて取引への戻り指示キーの表示・非表示を制御することを特徴とする。
【発明の効果】
【0008】
本発明では、顧客取引に必要なガイダンス及び顧客へのメッセージ情報を表示部に表示するとともに、表示したメッセージ情報の表示中止を指示する取引への戻り指示キーの表示の有効・無効を制御することにより、顧客取引の合間に行なうメッセージ情報の表示効率を高めることができるという効果を奏する。
【発明を実施するための最良の形態】
【0009】
本発明の実施の形態について図面を参照しながら説明する。尚、各図面に共通な要素には同一符号を付す。
【0010】
第１の実施の形態
（１）自動取引装置の構成
図１は、本発明の第1の実施の形態を示す自動取引システムのブロック図であり、図２は、自動取引装置１のブロック図である。
図１において、顧客が取引のための操作を行う自動取引装置１は、ネットワーク２を介してホストコンピュータ３及びＣＲＭシステム４に接続されている。
【0011】
自動取引装置１は、前記営業店に配設されたＡＴＭ、ＣＤ等であり、前記金融機関の顧客が自分で操作して入金、出金、通帳記帳、残高照会、振込、振替、送金、定期性預金設定等の金融取引を行うための装置である。
また、ホストコンピュータ３は、自動取引装置１からの処理依頼を受けて、預金口座管理等の金融機関業務に関する各種データ処理を行う。
また、ＣＲＭシステム４は、顧客情報を保有し顧客情報に基づき種々の情報を自動取引装置１に提供するシステムであり、顧客情報管理装置として機能する。
【0012】
図２は自動取引装置１のブロック図であり、本図を用いて自動取引装置の構成を説明する。
自動取引装置１は、操作・表示部１１、カード処理部１７、通帳処理部１８、貨幣処理部１９及びこれら各部を制御する制御部１２を備えている。
ここで、操作・表示部１１は、入力装置と表示装置との機能を兼ね備えるタッチパネル付き液晶ディスプレイで構成されている。
なお、表示部では、取引に必要なガイダンス（暗証番号入力指示や引出金額入力指示、カードや現金の引き取り指示など）のほか、このような取引ガイダンスの合間（入金された現金をカウントしたり、勘定系のシステムにアクセスしているような時間）に金融商品に関するメッセージや広告を含む画面を前記表示装置に表示することができるようになっている。
【0013】
また、カード処理部１７は、キャッシュカード等のカードを取り扱い、顧客ＩＤの取得などを行う。ここで、前記カードは、金融機関が顧客に対して発行した入金、出金、振込、残高照会等の金融取引を行うためのカードであり、顧客識別情報として、店番号、科目、口座番号などを格納する磁気ストライプを備える。なお、前記情報を格納する部材とし

ては、前記磁気ストライプに代えて、ＩＣチップを埋め込んだＩＣカードであってもよい。

そして、カード処理部１７は、カードが挿入されるカード挿入口を備え、該挿入口の奥には、カードを搬送する搬送装置、及び、カードの磁気ストライプやＩＣチップから記録情報を読み取り・書き込むための磁気ヘッドや端子などが配設されている。なお、本実施の形態におけるカード処理部１７は、さらに取引明細票を印刷して発行する明細票発行部も備えている。

【0014】

通帳処理部１８は、顧客の通帳を受け入れ、印字や通帳に設けられた磁気ストライプへの磁気書き込みなどの処理を行う。

貨幣処理部１９は、紙幣を取り扱う紙幣入出金部や硬貨を取り扱う硬貨入出金部を有し、それぞれ顧客の取引に応じて貨幣の入金・出金や計数などの処理を行う。

制御部１２は、ＣＰＵ１３、メモリ１４、タイマ１５などを備え、自動取引装置１の各部を制御する。また制御部１２は、ネットワーク２に接続し、ホストコンピュータやＣＲＭシステム４との間で通信を行うための通信制御部１６を備えている。

【0015】

次に図１におけるＣＲＭシステム４の構成を説明する。

ＣＲＭシステム４は、各種制御に必要な情報を記憶するメモリ４２を有しＣＲＭシステム４の各種制御を行う制御部４１と、キャンペーンメッセージに関するデータを格納したＣＲＭデータベース４３と、顧客データを格納した顧客マスタデータベース４４を備えている。

ここで、ＣＲＭデータベース４３は、顧客別表示データ、キャンペーン画面情報等を格納し、顧客マスタデータベース４４は、それぞれの顧客について、顧客ＩＤ、住所、氏名、年齢、職種、収入、家族構成等の顧客の基本的な属性に関する情報、すなわち、顧客基本属性情報、及び、過去に行われた勘定取引に関する履歴等の勘定取引情報を格納している。

【0016】

また、ＣＲＭデータベース４３は、顧客に対して提供されたキャンペーン情報、メッセージ等に関するキャンペーン履歴、顧客が自動取引装置１等を操作した操作履歴等を格納する履歴データベースも備えている。

なお、ＣＲＭシステム４は、これらデータを利用して顧客に適した内容の案内情報を作成するようになっている。

【0017】

図３は、ＣＲＭシステムにおけるＣＲＭデータベース内のデータ例を示した図である。ＣＲＭデータベース４３には、それぞれのキャンペーンに関してキャンペーンＩＤ、キャンペーン名称、表示タイムアウト時間、対象者の情報（口座番号など）などが格納されている。なお、キャンペーン画面情報（画面データ）は、このキャンペーンＩＤに対応付けて、ＣＲＭデータベースに格納されている。

また、図４は、顧客マスタデータベースに格納された顧客データの例である。それぞれの口座番号に対し、顧客氏名、口座残高、当該口座が給与振込先で有るか無いか、公共料金の支払口座で有るか無いかなどが格納されている。

次に、図５のフローチャートを用いて、本実施の形態に係る自動取引システムの動作を説明する。なお、取引としては、引出し取引の場合を例に説明する。

【0018】

（１）取引開始～キャンペーン画面表示の前まで

顧客が、自動取引装置１の操作・表示部１１に表示された取引選択画面で、「引出」取引のボタンをタッチすることにより取引選択を行うとともに、カード処理部１７にカード挿入し、取引を開始する（Ｓａ１）。なお、取引選択の前にカードを挿入してもよい。

顧客によって取引が選択され、カードが挿入されると、自動取引装置１の制御部１２は、カードの磁気ストライプから顧客の口座情報(口座番号など)を読み取り、通信制御部１

６を介してＣＲＭシステム４へ送信する（Ｓａ２）。
自動取引装置１は、その後、操作・表示部１１を介して、顧客に暗証番号及び引出し金額の入力をガイダンスして、顧客入力を促す（Ｓａ３）。また、自動取引装置１は、これらガイダンスに従い顧客が入力した暗証番号及び引出し金額を上述した口座情報とともに、ホストコンピュータ３へ送信する（Ｓａ４）。

【0019】
ＣＲＭシステム４の制御部４１は、Ｓａ２において自動取引装置１が送信した口座情報を受信するとともに、受信した顧客の口座情報と、ＣＲＭデータベース４３とを対比して、当該顧客に設定されたキャンペーンＩＤが存在するかを検索する（Ｓａ５）。
制御部４１は、キャンペーンＩＤが存在する場合、ＣＲＭデータベース４３を参照して、さらにそのキャンペーンＩＤに設定されたタイムアウト時間を取得する（Ｓａ６）。

【0020】
制御部４１は、メモリ４２から「タイムアウト時間の閾値」を読み出すとともに、Ｓａ６で取得したタイムアウト時間と比較演算処理を行う（Ｓａ７）。
制御部４１は、今回のキャンペーンのタイムアウト時間が閾値以上の場合は、「取引に戻る」ボタン表示フラグ（Ｆ）を「１」に設定して、メモリ４２に記憶する（Ｓａ８ａ）。一方、今回のキャンペーンのタイムアウト時間が閾値より小さい場合は、フラグ（Ｆ）を「０」に設定して、メモリ４２に記憶する（Ｓａ８ｂ）。
制御部４１は、図６に示すようなデータフォーマットで、自動取引装置１にキャンペーン情報を送信する（Ｓａ９）。

【0021】
図６において、口座番号は自動取引装置１から受信した口座情報である。また、キャンペーン情報は、キャンペーンＩＤ、キャンペーン名称、キャンペーンメッセージの画面データ、キャンペーンタイムアウト時間（Ｔｏ）などからなり、ＣＲＭデータベースから取得したデータである。また、ボタン表示フラグは、Ｓａ７～Ｓａ８で設定されメモリ４２に記憶されたフラグＦの値である。また、ヘッダとフッダは通信制御のためのアドレスやチェックデータなどで構成される。

【0022】
なお、上述の通り、キャンペーン毎に「タイムアウト時間」を設定しているのは、キャンペーン画面表示中に顧客操作がないために、キャンペーン画面を表示したままになるのを防止するためである。キャンペーン毎の通知内容に応じて設定されたタイムアウト時間がＣＲＭデータベース４３に記憶されている。
また、「タイムアウト時間の閾値」は、顧客が「取引に戻る」ボタンを押すといった操作をなるべくしなくてもいいように、という意図で設定されるもので、例えば７秒などの値に設定される。従って、この例では、キャンペーン画面のうち、タイムアウト時間（自動的に取引画面に戻るまでの時間）が、７秒より小さい場合には、「取引に戻る」ボタンを非表示とするべくフラグＦが「０」に設定され、タイムアウト時間が７秒以上であれば、「取引に戻る」ボタンを表示するべくフラグＦが「１」に設定されることになる。従って、例えばアンケートのようにメッセージ内容読んで、回答を考えるようなキャンペーン画面では、タイムアウト時間が長く設定され、表示の途中でキャンペーン画面表示を中止して取引に戻れるように、「取引に戻る」ボタンを表示するようになっている。

【0023】
（２）キャンペーン画面に「取引に戻る」ボタンを表示する場合のフロー
自動取引装置１の制御部１２は、ＣＲＭシステム４からキャンペーン情報を受信すると、キャンペーンデータの内容をメモリ１４に格納する。また、フラグ（Ｆ）の値をチェックする（Ｓａ１０）。
制御部１２は、フラグ（Ｆ）＝「１」の場合には、メモリ１４に記憶したキャンペーン画面データ及び予めメモリ１４に記憶した「取引に戻る」ボタンのデータとを合成して、キャンペーン表示画面のデータを生成するとともに、この生成された表示画面データを操作・表示部１１に転送し、表示部にキャンペーン画面を表示する（Ｓａ１１）。なお、本

フローチャートでは、ホストコンピュータ３に取引情報を送信した後に操作・表示部１１への表示画面データの転送を行う例を記載しているが、暗証番号、引出し金額入力（Ｓａ３）の処理と並行して行い、引出し金額入力が済むと直ちにキャンペーン画面が表示されるようにしてもよい。（以下の実施の形態においても同様である。）

いずれにしても、顧客に対する取引ガイダンスの合間にこのキャンペーン画面を表示するようにしている。

【0024】

図７（ａ）は、キャンペーン画面の一例であり、アンケート実施キャンペーンのメッセージが表示されている。また、画面右下には、「取引に戻る」のボタンが表示され、このボタンをタッチすることにより、顧客による取引に戻る指示が有効となっている。さらに、画面の左上には、現在行っている取引の情報として「お引出し」と表示し、また、キャンペーンメッセージ中には、顧客氏名が表示されている。これらは、制御部１２が、顧客が選択した取引の情報やホストコンピュータ３あるいはＣＲＭシステム４から送信される該当する情報に基づき、画面合成を行い表示しているものである。

【0025】

続いて、図７（ａ）が表示されている状態で、制御部１２は、顧客が「取引に戻る」ボタンをタッチしたか否かをチェックする（Ｓａ１２）。

制御部１２は、操作・表示部１１のタッチパネルにおけるタッチ検出で、顧客が「取引に戻る」ボタンをタッチしたと判断した場合には、ホストコンピュータ３からの引出し取引可能の通知が届いているか否かをチェックし（Ｓａ１３）、当該通知を受信している場合には、図７（ｃ）に示すような、引出取引の誘導画面を表示する（Ｓａ１４）。

制御部１２は、カード処理部１７を介して顧客にカード及びレシートを排出し、顧客が受領したことを検出すると、貨幣の払い出しを行う（Ｓａ１５）。制御部１２は、貨幣処理部１９に払いだされた貨幣が顧客により取り出したことが検出されると、取引終了と判断し、ホストコンピュータ３及びＣＲＭシステム４に取引完了を通知するとともに、操作・操作表示部１１に取引選択画面の情報を転送して、取引選択待ちの状態に戻る。

【0026】

なお、制御部１２は、キャンペーン画面表示の履歴情報（該当口座情報、キャンペーンＩＤ、キャンペーンに対するレスポンス情報（アンケート回答内容）など）をＣＲＭシステム４に送信する。ＣＲＭシステム４の制御部４１は、自動取引装置１から送信されたこれら履歴情報に基づきＣＲＭデータベース４３の内容を更新する。

なお、Ｓａ１３において、ホストコンピュータ３からまだ引出し取引可能の通知が届いていないと判断された場合には、制御部１２は、操作・表示部１１に「ホストコンピュータに照会中です。しばらくお待ちください。」等の待機指示画面を表示して、ホストコンピュータ３からの通知を待つ（Ｓａ１６）。

【0027】

また、ホストコンピュータ３から、暗証番号不一致の通知を受信した場合には、制御部１２は、操作・表示部１１に暗証番号再入力画面を表示し、再度Ｓａ４から処理を繰り返す。さらに、ホストコンピュータ３から、該当口座が無いなど取引不可の通知が届いた場合には、制御部１２は、操作・表示部１１に「取引不可」の旨を表示して、取引選択画面に戻る。

また、制御部１２は、キャンペーン画面表示中に、タイマ１５によりキャンペーン画面表示時間を計測し、キャンペーン画面表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断し、Ｔｏ以上となった場合には、引出取引誘導画面を表示し、Ｔｏに満たない場合には、「取引に戻る」ボタンが選択されたか否かの判断に戻る（Ｓａ１２、Ｓａ１７）。これにより、顧客がキャンペーン画面を表示したまま、取引画面に戻らないこととなるのを防止する。

【0028】

（３）キャンペーン画面に「取引に戻る」ボタンを表示しない場合のフロー

Ｓａ１０において、制御部１２は、フラグ（Ｆ）＝「０」の場合には、「取引に戻る」

ボタンのデータを合成することなく、メモリ１４に記憶したキャンペーン画面データ操作・表示部１１に転送し、表示部にキャンペーン画面を表示する（Ｓａ１８）。

図7（ｂ）は、キャンペーン画面の一例であり、アンケート実施キャンペーンのメッセージが表示されているが、この場合には「取引に戻る」のボタンが表示されない。即ち、キャンペーン画面表示を中止して取引画面に戻る指示が無効となっている。

【0029】

制御部１２は、キャンペーン画面表示中に、タイマ１５によりキャンペーン画面表示時間を計測し、キャンペーン画面表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断し、Ｔｏ以上となった場合には、引出取引誘導画面を表示し、Ｔｏに満たない場合には、キャンペーン画面の表示を継続する。（Ｓａ１８、Ｓａ１９）。

なお、キャンペーン画面の表示時間がタイムアウト時間（Ｔｏ）を経過したか否かを判断する場合の制御部１２の処理について補足する。

キャンペーン画面が複数画面にわたる場合、画面を切替えた際にはそれまでの表示時間をクリア（「０」にして）再度表示時間を計測し、タイムアウト時間を経過したか判断する。また、キャンペーン画面表示中に「取引に戻る」ボタンを表示した際には、表示中のキャンペーン画面については、表示時間をクリアせずに、引き続きタイムアウト時間（Ｔｏ）が経過したか否かを判断する。

【0030】

以上のように、第１の実施の形態によれば、タイムアウト時間が短いキャンペーン、例えば、短時間で内容が把握できる簡単なキャンペーンについては、キャンペーン画面表示を中止して取引に戻る指示が無効であり、タイムアウトまで表示されることになる。これにより、顧客にキャンペーン内容をよりしっかり読んでもらえるという効果がある。

一方、タイムアウト時間が長いキャンペーン（アンケートなど時間を要するもの）については、キャンペーン画面表示を中止して取引に戻る指示が有効となっているので、キャンペーン画面途中で中止することができ、顧客の都合に合わせた利用が可能となる。

【0031】

第２の実施の形態

第２の実施の形態におけるブロック図は、第１の実施の形態と同じであるので説明を省略する。

以下、図８のフローチャートに沿って、第２の実施の形態における動作を説明する。（Ｓｂ１）から（Ｓｂ４）までは第１の実施の形態と同じく処理する。

ＣＲＭシステム４の制御部４１は、Ｓｂ２において自動取引装置１が送信した口座情報を受信するとともに、受信した顧客の口座情報と、ＣＲＭデータベース４３とを対比して、当該顧客に設定されたキャンペーンＩＤが存在するかを検索する（Ｓｂ５）。

【0032】

制御部４１は、抽出されたキャンペーンＩＤから、キャンペーン名称、キャンペーンメッセージの画面データ、キャンペーンタイムアウト時間（Ｔｏ）などを取得し、これらキャンペーン情報を自動取引装置１へ送信する（Ｓｂ６）。

自動取引装置１の制御部１２は、ＣＲＭシステム４から受信した、キャンペーンデータ及びキャンペーンタイムアウト時間（Ｔｏ）などのキャンペーン情報をメモリ１４に格納する。そして、メモリ１４に記憶したキャンペーンメッセージ画面データを操作・表示部１１に転送し、表示部にキャンペーン画面を表示する（Ｓｂ７）。なお、この時点では、「取引に戻る」のボタン表示は行わない。

【0033】

制御部１２は、予めメモリ１４に記憶された「取引に戻る」ボタンの非表示時間（Ｔｈ１）を読み出し、タイマ１５で計数しているキャンペーン画面の表示時間と比較する。この結果、表示時間が（Ｔｈ１）より小さい場合には、このチェックの処理を繰り返す（Ｓｂ８）。一方、表示時間が（Ｔｈ１）以上となっている場合には、表示しているキャンペーン画面に、予めメモリ１４に格納された「取引に戻る」のボタンの画像を合成して表示

部に表示する（Ｓｂ９）。

なお、キャンペーン画面が複数にわたる場合であって、顧客の操作によってキャンペーン画面が切替えられたときには、表示時間をクリアにし、新たなキャンペーン画面の表示時間が（Ｔｈ１）と比較される。これにより、複数の画面にわたりキャンペーン画面を表示する場合であっても、確実に各画面を顧客に対して表示することができる。

また、非表示時間（Ｔｈ１）は、そのキャンペーン画面について顧客に最低限見てもらいたい時間という観点で予め設定され、メモリ１４に格納されている。

【0034】

図９（ａ）は、キャンペーン画面の一例であり、アンケート実施キャンペーンへの協力要請のメッセージが表示されている。Ｓｂ７で表示した時点では、まだ「取引に戻る」のボタンが表示されていない。

図９（ｂ）は、図９（ａ）において、顧客が「次へ」のボタンをタッチした場合の画面例であり、ここでは、具体的なアンケート内容が表示され、顧客により回答が選択されるようになっている。

Ｓｂ８において、図９（ｂ）の表示時間が、非表示時間（Ｔｈ１）以上となった場合には、Ｓｂ９で説明した通り、「取引に戻る」ボタンが表示され、図９（ｃ）のような画面表示となる。

【0035】

図８のフローチャートに戻って、Ｓｂ９で図９（ｃ）の画面を表示したら、制御部１２は、表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断する（Ｓｂ１０）。

制御部１２は、表示時間が（Ｔｏ）より短い場合には、「取引に戻る」ボタンが選択されたか否かをチェックし（Ｓｂ１１）、「取引に戻る」ボタンが選択されていない場合には、Ｓｂ１０へ戻る。

一方、表示時間が、（Ｔｏ）以上の場合には、制御部１２は、ホストコンピュータ３からの引出し取引可能の通知が届いているか否かをチェックし（Ｓｂ１２）、当該通知を受信している場合には、図７（ｃ）に示す引出取引の誘導画面を表示する（Ｓｂ１３）。その後、第１の実施の形態と同様に引出し処理を行い取引終了する。なお、Ｓｂ１２において、ホストコンピュータ３から引出し取引可能の通知が届いていない場合には、待機指示画面を表示してホストコンピュータ３からの通知を待つ。

【0036】

本実施の形態では、少なくともボタン非表示時間が経過するまではキャンペーン画面を表示することができるため、キャンペーンの実施をより確実に行うことができる。

このように、予め設定した非表示時間（Ｔｈ１）の間は、「取引に戻る」ボタンを表示しないので、例えば、すぐに取引画面に戻っても通信が終わるまで顧客が待たされるようなケースの発生を抑えることができる。従って、キャンペーン表示を効果的に行うことが可能となる。

【0037】

第３の実施の形態

第３の実施の形態におけるブロック図も、第１の実施の形態と同じであるため説明を省略する。

なお、本実施の形態では、ＣＲＭシステム４のメモリ４２に、自動取引装置１から受信した取引種別に対応した、ボタン非表示時間（Ｔｈ２）が記憶されており、例えば、図１１のような内容が記憶されている。

以下、図１０のフローチャートに沿って、第３の実施の形態における動作を説明する。

【0038】

（Ｓｃ１）から（Ｓｃ４）までは第１の実施の形態と同じく処理する。

ＣＲＭシステム４の制御部４１は、Ｓｃ２において自動取引装置１が送信した口座情報を受信するとともに、受信した顧客の口座情報と、ＣＲＭデータベース４３とを対比して、当該顧客に設定されたキャンペーンＩＤが存在するかを検索する（Ｓｃ５）。

さらに、制御部４１は、メモリ４２から、当該取引に対応して記憶されたボタン非表示時間を読み出す（Ｓｃ６）。そして、このボタン非表示時間（Ｔｈ２）を含めたキャンペーン情報を自動取引装置１へ送信する（Ｓｃ７）。

【0039】

自動取引装置１の制御部１２は、ＣＲＭシステム４から受信した、キャンペーン情報をメモリ１４に格納する。そして、メモリ１４に記憶したキャンペーンメッセージ画面データを操作・表示部１１に転送し、表示部にキャンペーン画面を表示する（Ｓｃ８）。なお、この時点では、「取引に戻る」のボタン表示は行わない。

制御部１２は、ＣＲＭシステム４から送信された「取引に戻る」ボタンの非表示時間（Ｔｈ２）を、メモリ１４から読み出し、タイマ１５で計数しているキャンペーン画面の表示時間と比較する。この結果、表示時間が（Ｔｈ２）より小さい場合には、このチェックの処理を繰り返す（Ｓｃ９）。一方、表示時間が（Ｔｈ２）以上となっている場合には、表示しているキャンペーン画面に、予めメモリ１４に格納された「取引に戻る」のボタンの画像を合成して表示部に表示する（Ｓｃ１０）。

【0040】

なお、キャンペーン画面が複数にわたる場合であって、顧客の操作によってキャンペーン画面が切替えられたときには、表示時間をクリアにし、新たなキャンペーン画面の表示時間が（Ｔｈ２）と比較される。これにより、複数の画面にわたりキャンペーン画面を表示する場合であっても、確実に各画面を顧客に対して表示することができる。

また、非表示時間（Ｔｈ２）は、各取引における合間の時間（ホストでの処理時間など）に応じて顧客に最低限見てもらいたい時間という観点で予め設定される。

【0041】

Ｓｃ１０でキャンペーン画面に「取引に戻る」ボタンを表示したら、制御部１２は、表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断する（Ｓｃ１１）。

制御部１２は、表示時間が（Ｔｏ）より短い場合には、「取引に戻る」ボタンが選択されたか否かをチェックし（Ｓｃ１２）、「取引に戻る」ボタンが選択されていない場合には、Ｓｃ１１へ戻る。

一方、表示時間が、（Ｔｏ）以上の場合には、制御部１２は、ホストコンピュータ３からの引出し取引可能の通知が届いているか否かをチェックし（Ｓｃ１３）、当該通知を受信している場合には、図７（ｃ）に示す引出取引の誘導画面を表示する（Ｓｃ１４）。その後、第１の実施の形態と同様に引出し処理を行い取引終了する。なお、Ｓｃ１３において、ホストコンピュータ３から引出し取引可能の通知が届いていない場合には、待機指示画面を表示してホストコンピュータ３からの通知を待つ。

【0042】

本実施の形態では、キャンペーン画面に「取引に戻る」ボタンを表示するまでの時間を取引種別ごとに変更することができる。したがって、ホストコンピュータと自動取引装置の通信時間に合わせてキャンペーンを表示することができ、キャンペーンの実施効率を上げることができる。

【0043】

第４の実施の形態

第４の実施の形態におけるブロック図も、第１の実施の形態と同じであるので説明は省略する。

以下、図１２のフローチャートに沿って、第４の実施の形態における動作を説明する。

【0044】

（Ｓｄ１）、（Ｓｄ２）は、第１の実施の形態と同じく処理する。

ＣＲＭシステム４の制御部４１は、Ｓｄ２において自動取引装置１が送信した口座情報を受信するとともに、受信した顧客の口座情報と、ＣＲＭデータベース４３とを対比して、当該顧客に設定されたキャンペーンＩＤが存在するかを検索する（Ｓｄ３）。

制御部４１は、キャンペーンＩＤが存在する場合、ＣＲＭデータベース４３を参照して

、さらにそのキャンペーンＩＤに設定されたタイムアウト時間を取得し、これらキャンペーン情報を自動取引装置１へ送信する（Ｓｄ４）。

【0045】

これらと並行して、自動取引装置１は、操作・表示部１１を介して、顧客に暗証番号及び引出し金額の入力をガイダンスして、顧客入力を促す（Ｓｄ５）。自動取引装置１は、これらガイダンスに従い顧客が入力した暗証番号及び引出し金額を上述した口座情報とともに、ホストコンピュータ３へ送信する（Ｓｄ６）。

また、自動取引装置１の制御部１２は、キャンペーン情報をＣＲＭシステム４から受信すると、メモリ１４に格納する。そして、メモリ１４に記憶したデータのうち、キャンペーンメッセージ画面データを操作・表示部１１に転送し、表示部にキャンペーン画面を表示する（Ｓｄ７）。なお、この時点では、「取引に戻る」のボタン表示は行わない。

【0046】

制御部４１は、キャンペーン画面を表示した後、ホストコンピュータ３からの引出し取引可能の通知が届いているか否かをチェックし（Ｓｄ８）、当該通知を受信していない場合、即ち、勘定系通信が終了していない場合には、キャンペーン画面の表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断する（Ｓｄ９）。また、キャンペーンタイムアウト時間を経過していない場合には、勘定系通信が終了しているかどうかのチェックに戻り、この処理を繰り返す（Ｓｄ８、Ｓｄ９）。

なお、制御部４１は、ホストコンピュータ３からの引出し取引可能の通知が届いているか否かをチェック（Ｓｄ８）の結果、当該通知を受信している場合、即ち、勘定系通信の終了が通知されている場合には、キャンペーン画像と「取引に戻る」ボタンとの画面合成を行い操作・表示部１１を介してキャンペーン画面中に「取引に戻る」ボタンを表示する（Ｓｄ１０）。

【0047】

Ｓｄ１０でキャンペーン画面に「取引に戻る」ボタンを表示したら、制御部１２は、キャンペーン画面表示時間がＣＲＭシステム４から送信されたキャンペーンタイムアウト時間（Ｔｏ）以上となったかどうかを判断する（Ｓｄ１１）。

制御部１２は、表示時間が（Ｔｏ）より短い場合には、「取引に戻る」ボタンが選択されたか否かをチェックし（Ｓｄ１２）、「取引に戻る」ボタンが選択されていない場合には、Ｓｄ１１へ戻る。

一方、表示時間が、（Ｔｏ）以上の場合には、制御部１２は、図７（ｃ）に示す引出取引の誘導画面を表示する（Ｓｄ１３）。その後、第１の実施の形態と同様に引出し処理を行い取引終了する。

【0048】

本実施の形態では、表示中止指示キーを有効とするタイミング（取引に係る所定の処理の終了）として、ホストコンピュータからの引出し取引可能の通知が届くまで、即ち勘定系通信が終了するまでキャンペーン画面に「取引に戻る」ボタンが表示されない。したがって、ホストコンピュータと自動取引装置が通信を行っている間は常にキャンペーンを表示することができ、キャンペーンの実施効率をさらに上げることができる。

【0049】

なお、このように、ホストとの間の勘定系通信の通信時間に合わせて、「取引に戻る」ボタンの表示制御を行わない場合には、例えば、勘定系の通信時間が残高照会は10秒、振り込みは20秒の場合には、ボタン非表示時間を一律に15秒とすると、通信時間とボタンが表示されるまでの時間に差ができてしまう。このことは、例えば、残高照会処理においては、ホスト処理が完了し終了の通知が届いた後も必ず5秒間キャンペーン画面が表示されることになり、また、振り込みの場合には、15秒経過したときに、「取引に戻る」ボタンによるキャンペーン表示の中止指示を行うことができたとしても、5秒間は処理待ちの画面が表示されることとなる。

【0050】

ここで、通信は終わっているがキャンペーンを表示している時間は、キャンペーンを見る意思のない利用者にとって不要な時間であり、自動取引装置の利用効率もその分下がってしまう傾向があり、また、キャンペーンを終了したが、通信は終わっていない時間は、その分キャンペーンを見てもらえなくなり、キャンペーンの効果が下がってしまう傾向がある。

本実施の形態では、ボタン非表示時間を取引種別に応じて調節することで、自動取引装置の利用効率とキャンペーンの実施効率を上げることができる。

【0051】

第５の実施の形態

上記各実施の形態では、自動取引装置側でキャンペーンメッセージ画面に「取引に戻る」ボタンを合成して表示するようにしていたが、例えば次のように構成することもできる。

近年、表示部に表示される画面をＨＴＭＬ（Hyper Text Markup Language）やＪａｖａ（登録商標）Ｓｃｒｉｐｔなどのページ記述言語を用いて作成し、各種の制御プログラムをオブジェクトとして埋め込むことができるようになっている。

【0052】

このようなページ記述言語を利用した場合の例を説明する。

即ち、ＣＲＭシステム４側で、キャンペーン画面をＨＴＭＬ形式で作成するとともに、キャンペーンタイムアウト時間（Ｔｏ）、非表示時間（Ｔｈ１）、非表示時間（Ｔｈ２）及びこれら時間を経過した後の動作指示をオブジェクトとして埋め込んで作成することにより、自動取引装置１側では、このオブジェクトのスクリプト（script）に基づいて、「取引に戻る」ボタンの表示・非表示の制御を行うようにしてもよい。このようなオブジェクトのスクリプトは制御情報として機能する。

このように構成の場合、自動取引装置１側のプログラムを変更しなくとも、ＣＲＭ側で表示画面遷移の制御を各種作り込むことができるという効果がある。

【0053】

上述した各実施の形態における例は、一例であり本発明はこれに限られない。

例えば、顧客宛のメッセージとしてキャンペーンメッセージの例を説明したが、キャンペーンメッセージの他、金融商品広告のメッセージなどでもよい。

また、上述した各実施の形態では、「取引に戻る」ボタンの表示、非表示の制御例を説明したが、例えば、「取引に戻る」ボタンを常時表示させておくとともに、有効なときは有彩色で表示するとともにキーを押下すると有効なキーとして機能し、無効なときは無彩色で表示するとともにキーを押下してもキーが有効とならないようにしてもよい。即ち、メッセージ表示画面の表示を中止して取引用の画面に移行するよう指示するためのキー操作を有効にしたり、無効にしたりするものであれば、表示の制御であってもキー入力の制御であってもまたはこれらの組み合わせてであっても構わない。

【0054】

また、キャンペーンメッセージは、取引画面とは全く別の画面に切替えて表示する場合の他、取引画面の一部に表示するものであっても適用可能である。

また、キャンペーンメッセージ表示の中止指示における、中止とは、キャンペーン画面が１画面の場合にその画面の表示を終了させる他、複数のキャンペーン画面を順次捲っていく場合における2画面目以降の画面の表示を中止して、取引画面に戻る場合も含む。

また、「取引に戻るボタン」とあるが、これも一例としての呼び方であり、物理的なボタンの場合に限るものではない。

また、第２の実施の形態においては、非表示時間（Ｔｈ１）を予め自動取引装置１のメモリ１４に格納しておく例を説明したが、ＣＲＭシステム４のＣＲＭデータベース４３に格納しておき、キャンペーン情報の１つとして自動取引装置に送信するようにしてもよい。

【0055】

なお、ホストコンピュータ３とＣＲＭシステム４は同一のマシンでもよい。また、ＣＲ

Ｍシステム４は複数のマシンから構成されていてもよい。さらに、ＣＲＭシステムの機能の全部若しくは一部を自動取引装置１に備えるようにしてもよい。例えば、タイムアウト時間などの情報は、ＣＲＭシステムで検索するものの他、自動取引装置が予め保有しているデータから検索するようにしてもよい。

また、カード取引の場合の例を説明したが、通帳取引などその他の取引でも構わない。

また、自動取引装置からＣＲＭシステムへ送信する顧客の識別情報の例として、口座番号の例を説明したが、これに限られない。

【0056】

また、上述した自動取引装置１は、他の機能、例えば、チケット予約機能、商品購入申込機能、クレジットカードの与信確認機能、施設情報案内機能等を有するキオスク端末のような多機能端末であってもよい。また、顧客は、金融機関に自己の口座を開設し、前記金融機関を利用する者であり、一般的には個人であるが、企業、団体等であってもよい。

上述したネットワーク２は、無線又は有線の専用通信回線網又は公衆通信回線網、インターネット、ＬＡＮ（Ｌｏｃａｌ Ａｒｅａ Ｎｅｔｗｏｒｋ）、ＷＡＮ（ＷｉｄｅＡｒｅａ Ｎｅｔｗｏｒｋ）等いかなるものであってもよい。なお、前記ネットワーク１５は、専用ネットワークであることが望ましいが、公衆ネットワークを利用したＶＰＮ（Ｖｉｒｔｕａｌ Ｐｒｉｖａｔｅ Ｎｅｔｗｏｒｋ）であってもよい。

【図面の簡単な説明】

【0057】

【図1】各実施の形態における自動取引システムのブロック図である。

【図2】各実施の形態における自動取引装置１のブロック図である。

【図3】ＣＲＭデータベースの構成例である。

【図4】顧客マスタデータベースの構成例である。

【図5】第１の実施の形態におけるフローチャートである。

【図6】ＣＲＭシステムから自動取引装置に送信される送信データの例である。

【図7】第１の実施の形態における自動取引装置の画面表示例である。

【図8】第２の実施の形態におけるフローチャートである。

【図9】第２の実施の形態における自動取引装置の画面表示例である。

【図10】第３の実施の形態におけるフローチャートである。

【図11】第３の実施の形態における取引種別毎のタイムアウト時間の例である。

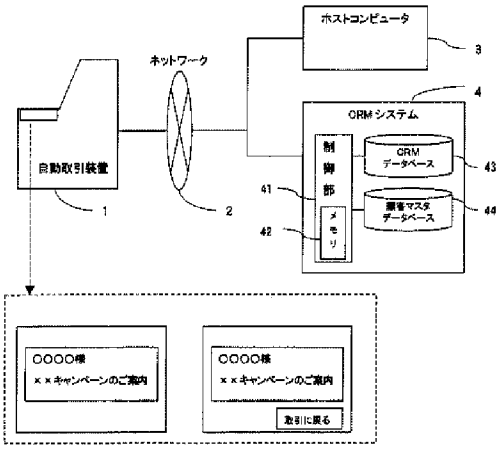
【図12】第４の実施の形態におけるフローチャートである。

【符号の説明】

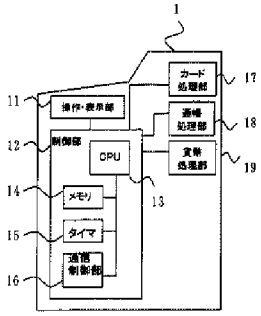
【0058】

１　　自動取引装置
２　　ネットワーク
３　　ホストコンピュータ
４　　ＣＲＭシステム
１１　操作・表示部
１２　制御部
１３　ＣＰＵ
１４　メモリ
１５　タイマ
１６　通信制御部
１７　カード処理部
１８　通帳処理部
１９　貨幣処理部
４１　制御部
４２　メモリ
４３　ＣＲＭデータベース
４４　顧客マスタデータベース

【図1】



【図2】



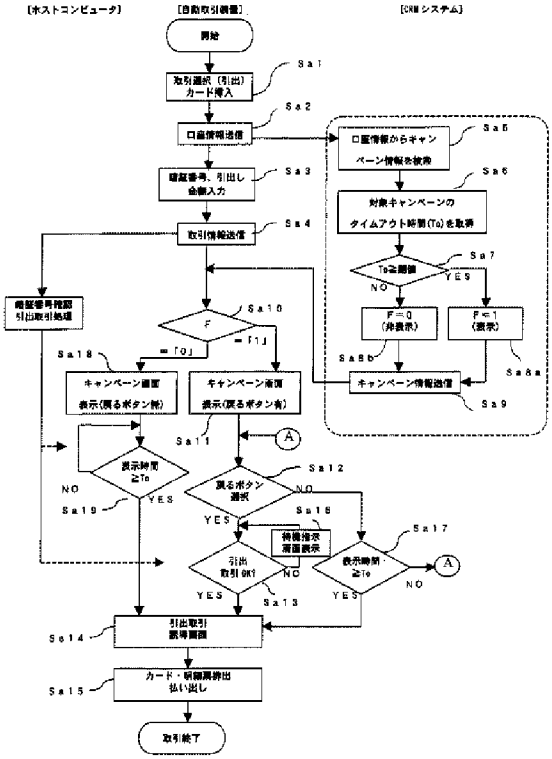
【図3】

キャンペーンID	名称	タイムアウト時間	対象者の情報
1	投資信託案内	15	0000001, 0000002, ...
2	○○アンケート	20	0000001, 0000003, ...

【図4】

口座番号	氏名	口座残高	給与振込	公共料金支払
0000001	山田 太郎	1,000,000	有	無
0000002	山田 花子	250,000	無	有

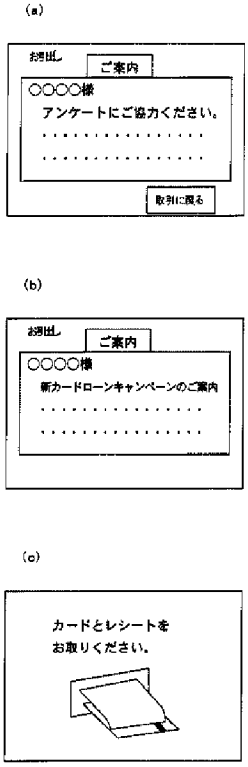
【図5】



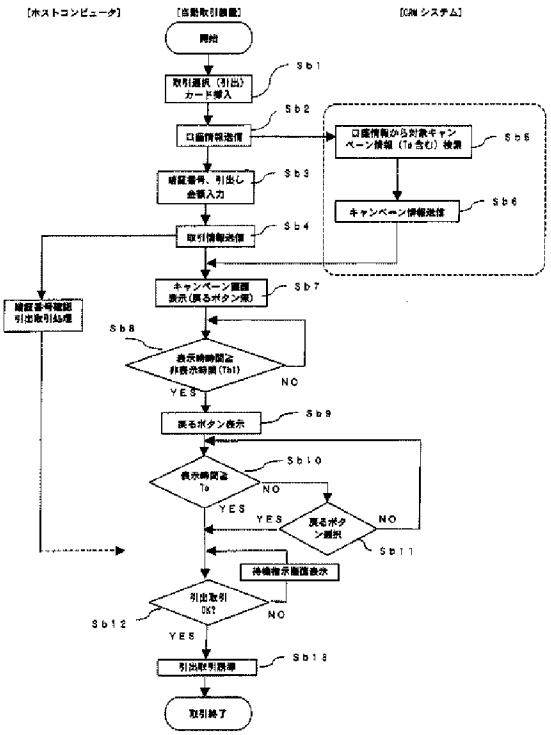
【図6】

ヘッダ	口座番号	キャンペーン情報 （画面情報、ボタン表示フラグ、表示タイムアウト時間など）	フッタ

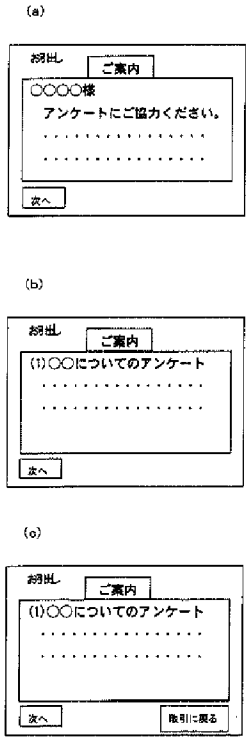
【図7】



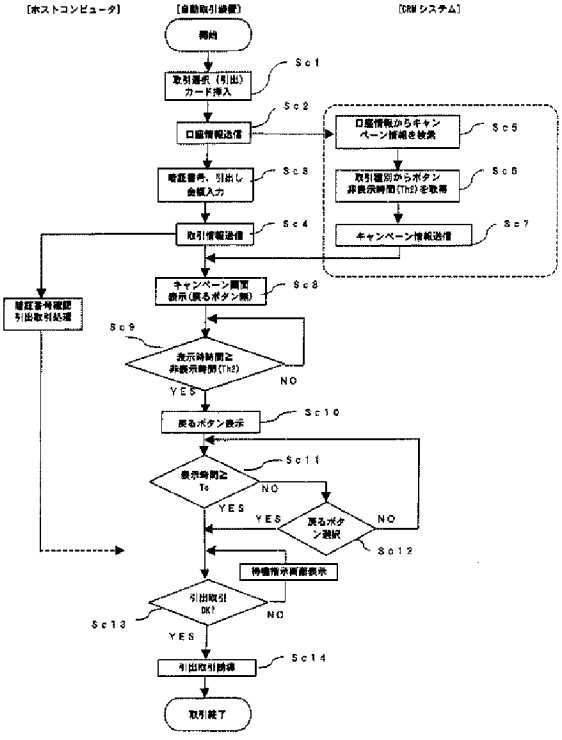
【図8】



【図9】



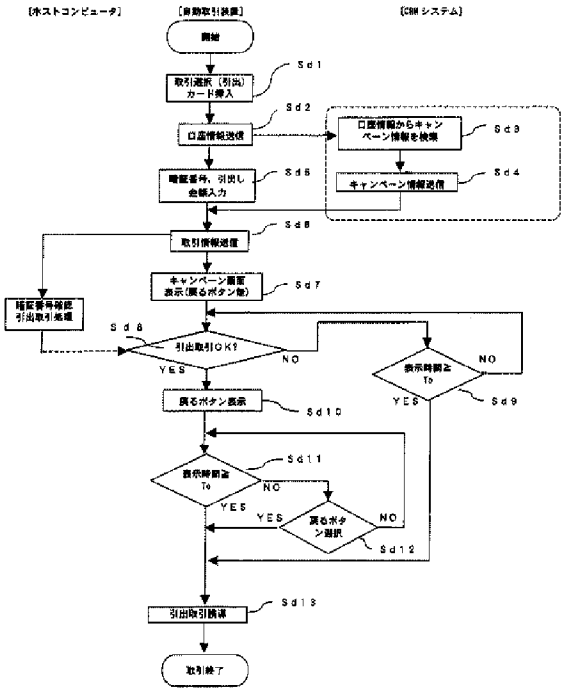
【図10】



【図11】

取引種別	タイムアウト時間(秒)
預金	5
引出	5
振込	10
振替	10
残高照会	5
通帳記帳	5

【図12】



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特開平１０－２２２７２５（ＪＰ，Ａ）
特開平０９－１９８５４５（ＪＰ，Ａ）
特開平０１－２３７８９７（ＪＰ，Ａ）

(58)調査した分野(Int.Cl.，ＤＢ名)
Ｇ０７Ｄ　　９／００
Ｇ０６Ｑ　４０／００

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A COMPREHENSIVE STUDY OF BLUETOOTH SIGNAL PARAMETERS FOR LOCALIZATION

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ABSTRACT

We provide an elaborate discussion on Bluetooth signal parameters with respect to localization, whereby we collectively designate all types of Bluetooth specification parameters that are related to signal strength – such as RSSI, Link Quality, Received and Transmit Power Level – as *Bluetooth signal parameters*. According to our analysis and experimental results, "RSSI" and "Transmit Power Level" turn out to be poor candidates for localization, while "Link Quality" has its limitations. On the other hand, "Received Power Level" correlates nicely with distance, which makes it the most desirable Bluetooth signal parameter to be used in location systems. We contend that it is vital to choose the appropriate signal parameter in Bluetooth location systems, and we expect our work to provide useful pointers in any future design of such systems. Existing systems can also benefit by adopting the appropriate Bluetooth signal parameter in their systems, and thereby, improve their location accuracy.

I INTRODUCTION

The future ubiquitous computing environment will consist of various types of gadgets, of which many will be equipped with wireless networking capabilities. The current popularity of Bluetooth wireless protocol – due to its short-range, low power consumption, and ease of integration – makes it a strong candidate to be incorporated into these mobile devices. With ubiquity, location awareness is expected to become a basic necessity for many applications. For example, a mobile user may require location-aware services in order to find the nearest points-of-interest, or to get around an exhibition center based on multimedia-guided tours. As a result, there is a keen interest to design positioning technologies that work indoors.

The current research efforts for indoor localization systems can largely be divided into two main categories:

- Those that rely on specialized hardware (e.g., IR or RF tags, ultrasound receiver) and extensive deployment of infrastructure solely for localization purpose [1, 2].
- Those that try to build localization systems on top of existing infrastructure (e.g., Wi-Fi networks) [3–5], and thereby, eliminating the need for any special modification at both the client and the infrastructure.

Between these two categories, the latter has a brighter prospect at achieving cost-effectiveness and deployability. Since Bluetooth is increasingly becoming popular in a wide variety of devices, and that a localization system built upon Bluetooth falls under the preferred category above, such a system would likely gain wide acceptance in the near future.

To the best of our knowledge, previous research on Bluetooth location system either provides discouraging results when considered alone, or requires the aid of additional wireless technologies [4, 5]. These unconvincing results thus far were often used to declare that Bluetooth is ill-suited for localization.

In this paper, we provide an elaborate discussion on all Bluetooth signal parameters, and discuss their potentials and pitfalls. To our knowledge, no previous work has delved into inspecting Bluetooth signal parameters in such great detail. In the remaining of this paper, we first provide in Section II an overview of these parameters, and then analyze in Section III their effects on location systems. In Section IV, we support these analyses with our experimental findings, and finally, we present in Section V the conclusions drawn, and future work.

II OVERVIEW OF BLUETOOTH SIGNAL PARAMETERS

We use the term *Bluetooth signal parameters* to denote all the status parameters of a Bluetooth connection together with any other signal strength values made available in Bluetooth Core Specification [6]. The Host Controller Interface (HCI) provides access to three such connection status parameters, namely, Link Quality (LQ), Received Signal Strength Indicator (RSSI), and Transmit Power Level (TPL). All these status parameters require the establishment of an active Bluetooth connection in order to be measured. From Bluetooth 1.2 onwards, another signal parameter, "Inquiry Result with RSSI", is made accessible. This is a special inquiry procedure which perceives RSSI from the responses sent by its nearby devices. To date, these are the 4 signal-related parameters made available by Bluetooth Core Specification. In the following, we briefly discuss each.

A *Link Quality (LQ)*

LQ is an 8-bit unsigned integer that evaluates the perceived link quality at the receiver. It ranges from 0 to 255; the larger the value, the better the link's state. For most Bluetooth modules, it is derived from the average bit error rate (BER) seen at the receiver, and is constantly updated as packets are received. However, the exact mapping from BER to LQ is device-specific. LQ is used mainly for adapting to changes in the link's state, notably to support CQDDR (Channel Quality Driven Data Rate).

B *Received Signal Strength Indicator (RSSI)*

RSSI is an 8-bit signed integer that denotes whether the received (RX) power level is within or above/below the Golden Receiver Power Range (GRPR), which is regarded as the ideal

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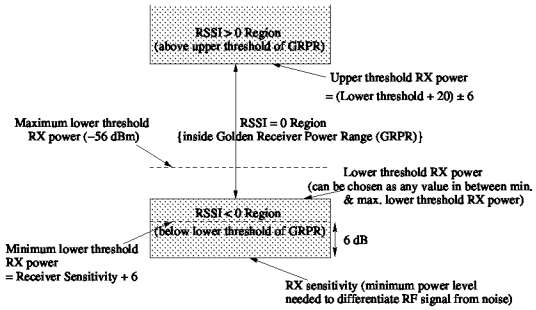


Figure 1: Relationship between GRPR and RSSI.

Table 1: LQ Conversion Algorithm of CSR Chipsets

BER, β (%)	LQ conversion equation	LQ value, l
$0 \le \beta \le 0.1$	$l = \lfloor 255 - \frac{\beta}{0.0025} \rfloor$	$255 \ge l \ge 215$
$0.108 \le \beta \le 10.1$	$l = \lfloor 215 - \frac{\beta - 0.1}{0.08} \rfloor$	$214 \ge l \ge 90$
$10.74 \le \beta \le 67.7$	$l = \lfloor 90 - \frac{\beta - 10.1}{0.64} \rfloor$	$89 \ge l \ge 0$

RX power range. Fig. 1 illustrates the relationship between GRPR and RSSI, as defined in Bluetooth specification. A positive or negative RSSI (in dB) means the RX power level is above or below the GRPR, respectively, while a zero implies that it is ideal (i.e., within GRPR). The lower and upper thresholds of GRPR are loosely bound, leaving them to be device-specific. This, in turn, affects the RSSI, since it is merely a relative parameter. In fact, its absolute accuracy is not mandated in the specification; the only requirement is to be able to indicate whether it is within, above, or below the GRPR. The RSSI status parameter of Bluetooth is particularly intended to be used for power control purpose [6]. The receiver sends "increase" or "decrease" TPL request to the transmitting side, depending on whether the perceived RSSI at its side is negative or positive, respectively.

C *Transmit Power Level (TPL)*

TPL is an 8-bit signed integer which specifies the Bluetooth module's transmit power level (in dBm). Although there are instances when a transmitter will use its device-specific default power setting to instigate or answer inquiries, its TPL may vary *during a connection* due to possible power control. For Class 1 devices, which have a maximum output power of +20 dBm, power control is mandatory when the TPL is between +4 and +20 dBm. In Bluetooth specification, power control is optional for TPL under +4 dBm. Therefore, Class 2 (maximum output power +4 dBm) and Class 3 (maximum output power 0 dBm) devices need not support power control, although their manufacturers may choose to implement it.

D *Inquiry Result with RSSI*

"Inquiry Result with RSSI" works in a similar manner as a typical inquiry. In addition to the other parameters (e.g., Bluetooth device address, clock offset) generally retrieved by a normal inquiry, it also provides the RSSI value. Since it requires no active connection, the radio layer simply monitors the RX power level of the current inquiry response from a nearby device, and infers the corresponding RSSI.

III Analysis

In this section, we analyze the various signal parameters' effects on location systems, as well as the different challenges posed by their inherent characteristics.

A *Effect of LQ*

As previously mentioned, the mapping from BER to LQ is device-specific. For our experiments, we have chosen Ranger's BT-2100 Bluetooth USB adapters, which use BlueCore4-ROM chips from Cambridge Silicon Radio (CSR). Table 1 shows the LQ approximation algorithm that they use. Since LQ is an 8-bit integer, it can only assume 256 different values to represent various BER conditions. From Table 1, we can see that LQ does not always decrease at the same rate when BER increases. For example, when we consider LQ between 255 and 215, each consecutive LQ value denotes an additional 0.0025% BER, whereas between 214 and 90, each consecutive value means an additional 0.08% BER. In other words, CSR chips report LQ with finer BER resolution when BER is small, but as the BER increases, the resolution becomes coarser. According to Bluetooth specification, a link is only considered workable if its BER is at most 0.1%. Therefore, it makes sense for LQ values below 215 to be mapped with a coarser BER resolution, as the link is already considered undesirable.

Prior works [4, 5] generally recorded LQ perceived by the mobile device as location fingerprints during the training phase. But we argue that devices that use chipsets from different vendors other than the one used at the mobile host during the training phase may unfortunately produce quite different LQ readings, because their LQ conversion algorithms may differ.

B *Effect of RSSI*

The RSSI reported by a Bluetooth device is completely dependent on the device's GRPR and its power control mechanism. The nominal range for GRPR of any Bluetooth device, according to Bluetooth specification, is 20 ± 6 dB. We have earlier seen that RSSI is 0 when the RX power level is within GRPR. Now, let us investigate RSSI's relationship with distance, and consequently, infer how it might affect location systems. Suppose a Bluetooth transmitter's TPL is set to P_t. Let P_{d_1} and P_{d_2} denote the upper and lower GRPR thresholds of the intended receiver, and assume that these power levels are detected at distances d_1 and d_2, respectively, from the transmitter. According to the free-space propagation model,

$$P_{d_1} \propto \frac{1}{{d_1}^2} \text{ and } P_{d_2} \propto \frac{1}{{d_2}^2}, \text{ giving } \frac{P_{d_1}}{P_{d_2}} = \frac{{d_2}^2}{{d_1}^2}. \quad (1)$$

If we consider 20 dB path loss between these two distances, which is approximately the nominal GRPR range, we get

$$10 \times \log \frac{P_{d_1}}{P_{d_2}} = 20. \quad (2)$$

Combining (1) and (2), we finally obtain

$$\frac{d_2}{d_1} = 10. \quad (3)$$

The above calculation implies that RSSI remains at 0 when the separation ranges between d_1 and d_2, although they differ by a factor of 10. Hence, we may not be able to differentiate over a wide area if we rely on RSSI for localization. To aggravate the problem, Bluetooth devices may request the transmitter to perform power control, so as to keep its RX power level within GRPR. Suppose the devices choose to perform power control over a range of 20 dB (the margin may even be larger according to Bluetooth specification). If we add this quantity to the 20 dB GRPR range, it means we can no longer discriminate path losses of 40 dB. Following the same analysis as before, it can be seen that, a device only 10 cm away may not be distinguishable from one that is 10 m away. This wide range is unacceptable for indoor localization. Hence, RSSI is argued to be a poor candidate for location systems.

C *Effect of TPL*

The power control feature is introduced into Bluetooth devices in order to facilitate energy conservation, and also to combat interference. The step size for power adjustments ranges between 2 and 8 dB. Upon receipt of a power control request message, the TPL is increased or decreased by a step.

Although according to specification, Class 1 devices are advised to perform power control even below -30 dBm, for the convenience of analysis, we assume here that the minimum selectable power is -30 dBm. In this scenario, Class 1 devices can thus vary its power over a range of 50 dB, since the maximum attainable power for Class 1 devices is $+20$ dBm. If we consider the minimum power control step size of 2 dB, then there can be at most $50 \div 2 = 25$ different TPL values for distinguishing unique locations, which is quite limited.

Our CSR adapters offer updated RSSI measurements once every second. Therefore, if it takes four power control steps to eventually reach a stabilized TPL for a specific location, the overhead can be as long as 4 seconds (ignoring transmission and processing delays), which contributes to the overall latency of such a location system.

D *Effect of Inquiry Result with RSSI*

Every inquiry that is sent and replied by a device will be transmitted at a device-specific default power setting. As a result, the RSSI fetched through an inquiry is free from the side-effect of power control as explained earlier. Hence, the inquiry-fetched RSSI is expected to provide finer measurements than the connection-based RSSI, although it still suffers from the GRPR-related zero-RSSI problem.

The Bluetooth inquiry procedure uses 32 dedicated inquiry hop frequencies (in countries with 79 Bluetooth frequency channels) according to the inquiry hopping sequence as defined in the Bluetooth specification [6]. The inquiry-hopping rate is twice the nominal frequency-hopping rate used by ordinary connections. In other words, an inquiring device switches to a new frequency every 312.5 μs, whereas a typical Bluetooth time slot is 625 μs long. The inquiry hopping sequence is split into two trains, **A** and **B**, of 16 frequencies each (see Fig. 2). In one slot (i.e., 625 μs), the inquiring device sequentially transmits on two different frequencies. In the following slot, it shall listen for any response to the previous two frequency hops, in the same sequence. Consequently, each train comprises 16 alternate transmitting and listening slots, and spans 625 μs $\times$ 16 = 10 ms. According to Bluetooth specification, a single train is repeated for at least N_{inquiry}= 256 times before switching to a new train. In an error-free environment, a Bluetooth device is recommended to perform at least three such switches in order to collect all responses. As a result, the whole inquiry procedure may last for $4 \times (256 \times 10 \text{ ms}) = 10.24$ sec, which can be a major drawback if latency is a prime concern. Nevertheless, the Bluetooth specification allows some flexibility pertaining to this inquiry duration. For example, the inquirer may stop inquiry process if it has collected enough responses.

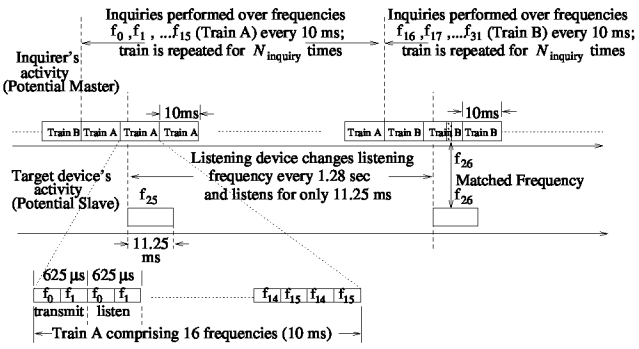


Figure 2: Potential Master's and Slave's frequency scanning during Bluetooth inquiry procedure (in countries with 79 Bluetooth frequency channels) [6].

IV Experiments

In this section, we first describe our experimental testbed. We then elaborate on our data collection procedure, and present the results along with discussions.

A *Testbed*

Our experimental testbed is located within a research laboratory. It has a dimension of 21.6 m $\times$ 9.56 m, an area of 206.496 m^2, and includes many small cubicles for research students. The whole experimental area is divided into an 11 $\times$ 6 grid, resulting in a unit grid size of 2.16 m $\times$ 1.912 m. We placed three BT-2100 Class 1 Bluetooth adapters in three such grid positions to serve as APs, and connected them to nearby Pentium-based PCs. As Bluetooth APs in an actual location system will invariably be located near ceilings, we raised our Bluetooth adapters with the help of USB cables, and attached them to the roof (2.57 m above the floor). Our mobile host,

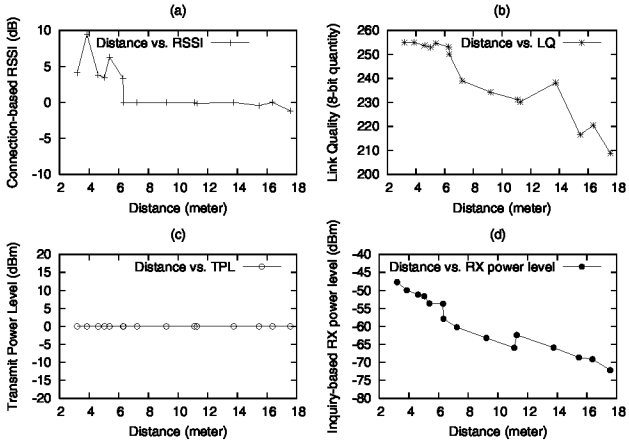


Figure 3: Relationship between various Bluetooth signal parameters & distance.

which is carried by the experimenter, is a Pentium-based Tablet PC. All the desktops (connected to the Bluetooth adapters by USB cables) together with our Tablet PC run Fedora Core 4, with the latest BlueZ protocol stack [7].

B Data Collection, Results and Discussion

During the experiments, our mobile host is connected using "SSH" (secure shell) to the desktops controlling the Bluetooth adapters. This facilitated the experimenter to have complete control over the whole system from the mobile host. While standing at a specific grid position, the experimenter could run Bluetooth signal extractor programs at both the mobile host and any AP over the network.

We now present the results from our various experiments:

1) Signal parameters' correlation with distance

For this experiment, we carefully chose five different grid positions where we took readings from each of the 3 APs, thus resulting in 15 data points. We adopted this methodology, rather than choosing 15 distinct distances from a single AP, because we wanted to correlate distance with signals originating from APs that were placed at different locations and surroundings.

In our experiments, we discovered that the Bluetooth wireless signal strengths tend to vary quite significantly depending on the user's orientation. Therefore, for every chosen grid position, we took 30 readings from every AP for each of the four different orientations. We then calculated the average of these 120 readings to obtain the signal parameter's value for that particular AP at the specific grid position. Since we know the distances of all grid positions from any AP, the signal strength values are simply mapped against the corresponding distances to generate Fig. 3.

In order to acquire the connection-based status parameter readings (i.e., RSSI, LQ, and TPL), we maintained connections at the HCI level from the APs to our mobile host.

From Fig. 3, the following observations can be made:

- As anticipated in our earlier analysis, RSSI turns out to correlate poorly with distance, as shown in Fig. 3(a).
- Fig. 3(c) shows a horizontal straight line for TPL values. This is because our Class 2 adapter at the mobile host which uses Broadcom's BCM2035 chip does not support power control feature. As a result, the TPL at the AP remained at its default value, which happens to be 0 dBm for the Bluetooth adapter used.
- From Fig. 3(b), we see that LQ correlates with distance much better than RSSI and TPL, although the LQ readings obtained at smaller distances show very little variation. Note that these readings were taken at the AP side, rather than at the mobile host side, as the LQ perceived at our mobile host was always 255 at any grid position, which is the highest possible LQ value. This is due to our Class 1 APs' large transmit power. The measurements at the AP side, on the other hand, show variations because our mobile host uses a Class 2 adapter.
- Our BT-2100 Class 1 adapters provide absolute RX power level through inquiry, instead of the relative RSSI values as suggested by Bluetooth specification. As the parameter "Inquiry Result with RSSI" also suffers from the GRPR-related zero-RSSI problem (just like the "connection-based RSSI"), we believe that making RX power level available should augur well in terms of distance. Fig. 3(d) certainly establishes this claim since the RX power level shows the best correlation with distance, compared to the other three signal parameters.

2) Effect of GRPR on RSSI

Fig. 5(a) illustrates the adverse effects of wider GRPR on the reported RSSI. From the figure, it is seen that BT-2100's RSSI readings (GRPR $\approx$ 80 dB) showed little variation compared to our Broadcom's adapter, which has a narrower GRPR. Because of the combined effect of large GRPR and power control, BT-2100's RSSI readings always remained at or above 0. On the contrary, Broadcom's adapter gave negative RSSI values at greater distances, although we did not have many such grid positions owing to our testbed's size.

3) TPL Consideration

For this experiment, we recorded the stabilized TPL values as well as the stabilization time periods for each AP's signal at specific grid positions using BT-2100 at the mobile host side. Fig. 4(a) indeed shows very few discrete transmit power levels, in harmony with our analysis in Section C. Moreover, the time periods required to reach these stabilized TPL values are also quite significant, as revealed in Fig. 4(b). Both these attributes make TPL a poor candidate for localization purpose.

4) Effect of Varying Inquiry Time Period

In this experiment, the inquirer, which is the mobile host, is placed at a location where it can hear all 9 Bluetooth devices to be discovered. Since BlueZ's HCI API allows us to vary the inquiry time period in increments of 1.28 sec, we varied it accordingly, and took 50 readings for each distinct inquiry time period. From Fig. 5(b), it is observed that, although the gap between the maximum and the minimum number of discovered

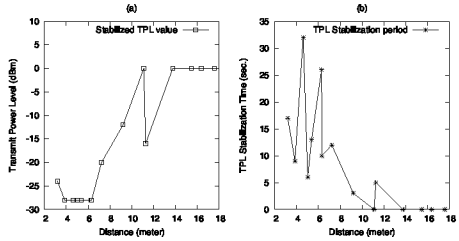
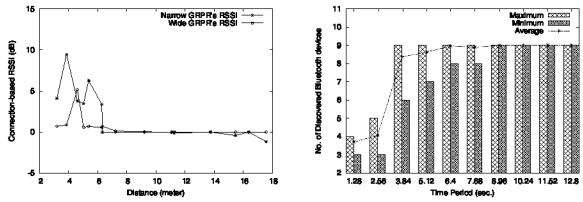


Figure 4: Stabilized TPLs & time periods to attain them.



(a) Connection-based RSSI for 2 Bluetooth adapters with different GRPR.

(b) Max, min and avg no. of discovered devices during various inquiry periods (Total no. of devices = 9).

Figure 5: RSSI comparison of 2 different Bluetooth adapters and Effect of Inquiry time variation on the number of discovered devices

devices can be quite large when the time periods are small, the average number of discovered devices is actually quite impressive at time period as low as 3.84 sec while the suggested inquiry time period in an error-free environment is 10.24 sec.

V Conclusion and Future Work

Based on our analysis and experimental results, the following conclusions can be drawn:

- Similar to previous works' verdict, we have shown RSSI's incompatibility for location systems. While previous works based their judgement solely on experimental data, we have also backed it up with proper analysis.
- To the best of our knowledge, no prior Bluetooth localization work has tried to use TPL. From our findings, we conclude that TPL is not suitable for localization.
- Through our experiments, we have shown that the LQ perceived at any location are rather sensitive to the transmitter's Bluetooth class. Therefore, problems would likely arise if LQ measurements were made at the AP side, and the mobile host's Bluetooth class is unknown. On the other hand, if LQ measurements were taken at the mobile host side, the fingerprints would then be sensitive to the BER-to-LQ mapping algorithm used by the mobile host, which is device-specific. Thus, LQ is not suitable for localization. Existing works on LQ-based localization [4,5] have also reported poor location accuracy so far.
- Location systems that depend on inquiry-based parameters should take into account the latency incurred during the inquiry. Our experimental results show that the default time period for Bluetooth inquiry may be reduced to some extent while still providing acceptable results.
- Because of RX power level's superior correlation with distance, location systems that rely on it would likely outperform any other location systems built upon other Bluetooth signal parameters.

The major contribution of our work is a complete understanding of the Bluetooth signal parameters' issues regarding localization. We contend that it is vital to choose an appropriate signal parameter for a location system. In the following, we list some important future directions that we foresee:

- We have earlier seen that the LQ readings do not vary much at close-range distances. On the other hand, we notice that the RSSI readings tend to change significantly at close-range distances as well as at distant locations, where the RX power levels are above and below the GRPR, respectively. Therefore, a hybrid location system that combines both LQ and RSSI may be a viable option.
- While the retrieval of inquiry-based signal parameters tends to induce latency to the location system, our results show that most nearby Bluetooth devices are discovered even when the inquiry time period is reduced. Therefore, more extensive analyses are needed in this regard.
- There is no additional latency in obtaining the connection-based signal parameters only if the location system already has pre-established connections to the mobile hosts. On the contrary, if a mobile host needs to be discovered and then subsequently connected when it requests for location service, it will also undergo the latency problem similar to the inquiry-based location systems. The designer of a location system needs to address these issues.
- Finally, if future Bluetooth specification decides to make RX power level available – both as a connection-based status parameter and also through inquiry, it should then instigate new possibilities for Bluetooth localization.

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MDB / ICP

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Version 4.2

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Multi-Drop Bus / Internal Communication Protocol

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Revisions

Version 4.2

Version 4.1 of this specification is the sixth release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the continued effort put forth by technical members of NAMA and the EVA. The basis for this specification is the Version 4.1 international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**) released in July, 2010.

There is just one major change within cashless device(s) section, related to cashless devices commonly new in public (credit card) transactions. These devices, especially contactless operated, need an uninterrupted transaction starting with the actual correct vend price and therefore are not able to deliver a begin session in front of the transaction. Previous work arounds have been

- Always starting a begin session by cashless with "unknown credit", which of course interferes with cash payment (normally a VMC would disable coin/bill acceptance, while a session is active)

- Forcing the customer to hold the payment media twice to the cashless device, once to start the session and second after pressing the selection to do the transaction.

The new modification allows such cashless devices, to identify themselves with an option bit, telling the VMC, that they are capable of accepting vend request, negative vend request and, if possible, revalue request, while in the enabled state as well as in the idle state.

If this option bit is set, a VMC will produce a vend request to the cashless whenever a selection is pressed and not sufficient cash credit is available. The cashless will proceed with this request like in the idle state. If in between, the customer will not present a valid cashless payment media and instead insert cash, the VMC will cancel the vend request with a vend cancel command and after this is accepted, a session complete to return to the enabled state.

Section 1 – General Information

Section 1.3.3

- Added b5, "always idle session" option

Section 7 – Cashless Device(s)

Section 7.2.3

- Added the "always idle session" option

Section 7.3

- Added the "always idle session" option

Section 7.4.4

- Added b5, "always idle session" option in Ident response

Section 7.7

- Added example #11, vend session (always idle session option set)
- Added example #12, vend session cancelled (always idle session option set)
- Added example #13, vend session timeout (always idle session option set)

Version 4.1

Version 4.1 of this specification is the fifth release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the continued effort put forth by technical members of NAMA and the EVA. The basis for this specification is the Version 4.0 international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**) released in April, 2009.

Of special note are the two major changes that were made to the specification:

- Changed the address of the second Coin Hopper / Tube Dispenser device peripheral in Section 10 from **68H** to **70H**.
- Added the Age Verification Device peripheral (address **68H**) in Section 11.

The following lists the primary revisions to the Version 4.1 of the **MDB / ICP.**

Section 2 – Communication Format

Section 2.3

- Changed the address for the second Coin Hopper or Tube – Dispenser to 01110xxxB (70H).

- Added address 01101xxxB (68H) for the Age Verification Device.

Section 5 – Coin Changer

- Corrected Page 5.14:
  Expansion command send diagnostic status (0F 05) response data:
  16 bytes: Z1-Z16 changed to 2 bytes: Z1-Z2

Section 6 – Bill Validator / Recycler

- Corrected Page 6.6:
  Notes: 1. Dispenser setup (3703) command replaced by recycler enabled (3704).
- Corrected Page 6.13:
  Under VMC Data: 19 bytes: Y1- Y19 replaced by Y1- Y18.
  Y3-Y19 replaced by Y3 – Y18 = 16 bytes
- Corrected Page 6.14:
  Y19 replaced by Y18
- Page 6.21, added after Expansion/ID:

  FEATURE ENABLE →
  ← ACK

Section 10 – Coin Hopper or Tube - Dispenser

Section 10.1, 10.2, 10.3

- Changed second device address to 01110xxxB (70H).

Section 11 – Age Verification Device

- Added entire section.

Version 4.0

Version 4.0 of this specification is the fourth release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the continued effort put forth by technical members of NAMA and the EVA. The basis for this specification is the Version 3.0 international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**) released on March 26, 2003.

Of special note are the three major changes that were made to the specification:

- Added the Bill Recycler command set to the Bill Validator / Recycler device peripheral in Section 6.
- Added a second address to the Coin Hopper / Tube Dispenser device peripheral in Section 10.
- Added the MDB Recommended "Best Practices" as **Appendix 3**.

The following lists the primary revisions to the Version 4.0 of the **MDB / ICP.**

Section 2 – Communication Format

Section 2.3

- Added address 01101xxxB (68H) for the second Coin Hopper or Tube – Dispenser.

Section 5 – Coin Acceptor / Changer

Section 5.3

- Added information regarding "Just Reset".
- Corrected typo for POLL command to **08h.**
- Added "Type activity" definitions in POLL Status section.
- Added Section 5.6 **Coin Acceptor/Changer Examples**.

Section 6 – Bill Validator

Section 6.3

- Added information regarding "Just Reset".
- Added "Type activity" definitions in POLL Status section
- Added all new command/responses for the Bill Recycler.

37H - 03H	RECYCLER SETUP
37H - 04H	RECYCLER ENABLE
37H - 05H	BILL DISPENSE STATUS
37H - 06H	DISPENSE BILL
37H - 07H	DISPENSE VALUE
37H - 08H	PAYOUT STATUS
37H - 09H	PAYOUT VALUE POLL
37H - 0AH	PAYOUT CANCEL

- Added Section 5.6 **Bill Validator/Recycler Examples**.

Section 7 – Cashless

Section 7.3

- Added information regarding "allows selection without displaying balance" in the Begin Sessions (03H) – Funds Available response.

Section 7.5

- Added information regarding using the Non-Response time for commands that require data to be returned.

Section 7.7

- Added Controller "ACKs" to the end of the card reader session examples.

Section 8 – Communication Gateway

Section 8.2

- Added 1FH/02H TIME/DATE REQUEST to VMC Command table.

Section 8.3

- Added option bit b2 : Expansion Time/Date Request command
- Added 1FH/02H TIME/DATE REQUEST command/response.

Section 9 – Universal Satellite Device (USD)

Section 9.3

- Corrected errors in 07H - Z3 to Z33 designations.

Section 10 – Coin Hopper or Tube - Dispenser

Section 10.1, 10.2, 10.3

- Added a second devices as address 11001xxxB (68H).
- Expanded on the "Coins Dispensed" section of the DISPENSER STATUS response.

Appendix 3 – MDB Recommended "Best Practices"

- Added entire appendix.

Version 3.0

Version 3.0 of this specification is the third release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the continued effort put forth by technical members of NAMA and the EVA. The basis for this specification is the Version 2.0 international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**) released on October 4, 2002.

Of special note are the four major changes that were made to the specification:

- Added a second Cashless Device peripheral address in Section 7
- Replaced the Audit Unit with the Communications Gateway in Section 8
- Added the Coin Hopper or Tube – Dispenser in Section 10 (new)
- Assigned 2 addresses to be used for experimental peripherals

The following lists the primary revisions to the Version 3.0 of the **MDB / ICP.**

Section 1 – General Information

Section 1.3

- Changed the Level and Options chart for the Communications Gateway and the Coin Hopper or Tube – Dispenser

Section 2 – Communication Format

Section 2.2

- Added headers for the Response Codes
- Clarified non response processing for Master-to-Peripheral and Peripheral-to-Master communication.

Section 2.3

- Updated the Peripheral Address table for the Communications Gateway, Coin Hopper, Cashless Payment 1, and Experimental addresses
- Defined the use of the experimental addresses

Section 2.5

- Added new RESET examples F & G.

Section 5 – Coin Acceptor / Changer

Section 5.2

- Renamed the STATUS command to SETUP command
- Added a new Possible Credited Coin Removal status code (0Dh)

Section 6 – Bill Validator

Section 6.2

- Renamed the STATUS command to SETUP command
- Added a new Possible Credited Bill Removal status code (0Ch)

Section 7 – Cashless Device(s) **(New Cashless Device #2)**

Changed name from Cashless Payment to Cashless Device

Section 7.1

- Added information regarding the dual addresses for two Cashless Device peripherals (10h and 60h)

Section 7.3

- Updated Command & Response table for dual addresses

Section 7.4

- Updated Command/Response Formats for dual addresses

Section 8 – Communications Gateway **(New Peripheral)**

Sections 8.1 through 8.6

- Replaced former Audit Unit sections with new Communications Gateway Sections

Section 9 –Universal Satellite Device (USDC)

Section 9.3

- Updated POLL table with proper number of bytes (FTL portion)
- Changed "numeric row and column" to "Item Number"

Section 10 – Coin Hopper or Tube – Dispenser **(New Peripheral)**

Sections 10.1 through 10.5

- Added complete new sections

Version 2.0

Version 2.0 of this specification is the second release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the culmination of effort put forth by technical members of NAMA, the EVMMA, and the EVA. The basis for this specification is the Version 1.0 international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**) released on October 14, 1998.

The following lists the primary revisions to the Version 2.0 of the **MDB / ICP**

Introduction

Foreword

- Clarified that the Standard is a communication interface

Section 1 - General Information

Section 1.1

- Added 3rd paragraph noting interface specification vs. system specification

Section 1.3

- Added entire Levels and Options section

Section 2 - Communication Format

Section 2.1

- Changed Mode Bit Master-to-Peripheral text

Section 2.2

- Removed "command" from Master-to-Peripheral 4th paragraph
- Changed RET description

Section 2.3

- Defined address 0000xxxB (00H) for VMC
- Provided address information to show hexadecimal format

Section 2.4

- Changed format to 2.4.X sub-sections and added 2.4.4 on Levels

Section 2.5

- Changed RET description

Section 2.6

- Added complete File Transport Layer Section

Section 3 - Bus Timing

Section 3.1

- Added 2nd sentence to t_{setup}

Section 4 - Hardware Specification

Section 4.3

- Modified complete section and added AMP as alternate source to Molex

Section 4.4

- Added pin numbers to schematic

Section 5 - Coin Acceptor / Changer

Section 5.1

- Provided additional address information

Section 5.3

- Added recommended RESET command sequence
- Modified STATUS response to indicate Country / Currency Codes
- Modified County / Currency Code to include ISO 4217 (Appendix A1)
- Added Note 2 to DISPENSE (ODH) command
- Added FTL POLLed responses
- Added FTL "b3" option bit
- Added FTL expansion commands
- Cosmetic changes to all EXPANSION commands
- Split ALTERNATIVE PAYOUT (0FH-02H) and PAYOUT STATUS (0FH-03H) command into two separate commands (cosmetic change only)
- Added text to ALTERNATIVE PAYOUT (0FH-02H) Y1 description
- Added Note 3 to ALTERNATIVE PAYOUT STATUS (0FH-03H)

Section 5.5

- Added "**See Note 2 …**" text
- Added "If both peripherals supported" to Note

Section 6 - Bill Validator

Section 6.1

- Provided additional address information

Section 6.3

- Added recommended RESET command sequence
- Modified STATUS response to indicate Country / Currency Codes
- Modified County / Currency Code to include ISO 4217 (Appendix A1)
- Added Level 2 information
- Added Level 2 option bytes w/ new EXPANSION COMMANDs:

  37H 01H Level 2 Option Bit Enable
  37H 02H Level 2 Identification
- Added FTL POLLed responses
- Added FTL "b0" option bit
- Added FTL expansion commands
- Modified last sentence in SECURITY command to link to Z9-Z10 STATUS response
- Cosmetic changes to all EXPANSION commands

Section 6.5

- Added "If both peripherals supported" to Note

Section 7 - Cashless Payment

Section 7.2 & 7.2.7

- Added Level 03 Negative Vend Request

Section 7.2.2

- Changed 1st sentence to link Setup to 7.4.1 information

Section 7.2.4

- Added Negative Vend and Revalue

Section 7.2.7

- Added Level 03 Negative Vend Request

Section 7.3

- Added bold text regarding defining currency at the beginning of a session
- Broke uninterruptable table into VMC Command and Reader Response
- Added Level 03 NEGATIVE VEND REQUEST to VMC Command table
- Added Level 03 DATA ENTRY REQUEST to Reader Response table
- Highlighted command out of sequence hard resets from VMC
- Moved Vend Failure Sequence to 7.4.8

Section 7.3 – Table 1

- Changed name to COMMANDS & RESPONSES
- Changed Comment column to VMC / Reader Level Support
- Linked all commands and responses to Levels
- Added DATA ENTRY REQUEST POLLed responses
- Added FTL POLLed responses
- Added FTL commands
- Added NEGATIVE VEND REQUEST responses
- Defined 14H-1AH and 20H-FEH as "For Future Use"

Section 7.4.1

- Cosmetically modified RESET command sequence
- Added 32 bit SETUP MAX/MIN PRICE
- Changed text following **Reader response**

Section 7.4.2

- Clarified Level 01 information (reader has no revalue capability)
- Added Level 03 information
- Modified SETUP response to indicate Country / Currency Codes
- Modified County / Currency Code to include ISO 4217 (Appendix A1)
- Added bold Note in Z3-Z4 County / Currency Code
- Added definition for Miscellaneous Options "b4 – b7"

Section 7.4.3

- Added Level 03 SETUP if Expanded Currency Mode

Section 7.4.4

- Added Level 03 BEGIN SESSION response if Expanded Currency Mode
- Added Level 03 VEND APPROVED response if Expanded Currency Mode

- Added Level 03 PERIPHERAL ID response if Expanded Currency Mode
- Clarified COMMAND OUT OF SEQUENCE definition
- Added Level 03 REVALUE LIMIT AMOUNT response if Expanded Currency Mode
- Added Level 03 DATA ENTRY REQUEST response if Data Entry Mode
- Added Level 03 DATA ENTRY CANCEL response if Data Entry Mode
- Added Level 03 FTL REQ TO RCV response if FTL Mode
- Added Level 03 FTL RETRY / DENY response if FTL Mode
- Added Level 03 FTL SEND BLOCK response if FTL Mode
- Added Level 03 FTL OK TO SEND response if FTL Mode
- Added Level 03 FTL REQ TO SEND response if FTL Mode

Section 7.4.5

- Added Level 03 VEND command if Expanded Currency Mode
- Added Level 03 VEND APPROVED response if Expanded Currency Mode

Section 7.4.8

- Added Vend Failure (from 7.3)

Section 7.4.10

- Added Level 03 VEND command if Expanded Currency Mode

Section 7.4.11 (new)

- Added complete Level 03 NEGATIVE VEND Request section

Section 7.4.15 (new)

- Added complete Level 03 DATA ENTRY Request section

Section 7.4.16

- Added Level 03 REVALUE Request command if Expanded Currency Mode

Section 7.4.17

- Added Level 03 REVALUE Limit Request command if Expanded Currency Mode

Section 7.4.18

- Added Level 03 EXPANSION REQUEST ID response if Expanded Currency Mode

Section 7.4.22

- Added Level 03 EXPANSION ENABLE OPTIONS command

Section 7.4.23

- Added Level 03 FTL REQ TO RCV command & responses if FTL Mode

Section 7.4.24

- Added Level 03 FTL RETRY / DENY command if FTL Mode

Section 7.4.25

- Added Level 03 FTL SEND BLOCK command & response if FTL Mode

Section 7.4.26

- Added Level 03 FTL OK TO SEND command if FTL Mode

Section 7.4.27

- Added Level 03 FTL REQ TO SEND command & responses if FTL Mode

Section 7.7

- Added Example Vend Session #10 (Single Negative Vend)

Section 8 - Audit Device

Section 8.1

- Provided additional address information

Section 8.3

- Added FTL POLLed responses
- Added FTL "b3" option bit
- Added FTL expansion commands

Section 9 - Universal Satellite Device

Section 9.1

- Provided additional address information

Section 9.3

- Added FTL POLLed responses
- Added FTL "b2" option bit
- Added FTL expansion commands

Document Revision History

- Deleted

Appendix 1 - Currency Codes

- Added entire section (based on **ISO 4217**)

Appendix 2 - Battery Operated Card Reader

- Added entire section

Version 1.0

Version 1.0 of this specification is the first release of the international **Multi-Drop Bus / Internal Communication Protocol** (**MDB / ICP**). This specification is the culmination of effort put forth by technical members of NAMA, the EVMMA, and the EVA. The basis for this specification is the **International Multi-Drop Bus Interface Standard** published by NAMA and the **Internal Communication Protocol** published by the EVMMA. The NAMA document was originally introduced on October 19, 1993 and later revised on August 19, 1994, June 20, 1997, and October 15, 1997. The EVMMA document was adopted in 1994 and later revised in 1995.

The following lists the primary revisions to the original two documents which were "combined" to create Version 1.0 of the **MDB / ICP**. In actuality, the NAMA **MDB** was the basis of the **MDB / ICP** with the exception of Section 7 which came from the EVMMA **ICP**. Besides typographical corrections and actual feature changes (below), the entire document was edited to provide a more uniform appearance.

The following lists the primary revisions to the Version 1.0 of the **MDB / ICP.**

Hardware Specification - Section 4.3

- Added drawings of the MDB male and female connectors.

Coin Acceptor / Changer - Section 5.3

- Added Expansion commands:
  - 0F-05 Send Current Diagnostic Status
  - 0F-06 Send Controlled Manual Fill Report
  - 0F-07 Send Controlled Manual Payout Report

Coin Acceptor / Changer - Section 5.5

- Added coin acceptance and coin payout power requirements for coin changers using motorized payout mechanisms.
- Added note about simultaneously supplying bill validator transport power.

Bill Validator - Section 6.5

- Added note about simultaneously supplying coin mechanism coin acceptance power.

Cashless Payment - Section 7.2.6

- Added Level 02 Revalue capability.

Cashless Payment - Section 7.3

- Added Level 02 REVALUE REQUEST.
- Removed NAK (NCK) response from uninterruptable state and unexecutable command descriptions.
- Eliminated the BUSY response to vend failure sequences.
- Modified Table 1 per above.

Cashless Payment - Section 7.4.1

- Further defined the initializing sequence following a RESET command.

Cashless Payment - Section 7.4.2

- Further defined the Z7 Application Maximum Response Time.
- Added Z8 – b3 for supporting the VEND/CASH SALE subcommand.

Cashless Payment - Section 7.4.4

- Begin Session (03h) - Added Level 02 Reader Z4-Z10 data.
- Malfunction/Error (0Ah) - Added error code 1100 (refund error).
- Command Out of Sequence (0Bh) - Added Z2 data.
- Eliminated Busy (0Ch) response.
- Added Level 02 Reader Revalue Approved (0Dh) response.
- Added Level 02 Reader Revalue Denied (0Eh) response.
- Added Level 02 Reader Revalue Limit Amount (0Fh) response.

- Added Level 02 Reader User File Data (10h) response.
- Added Level 02 Reader Time/Date Request (11h) response.

Cashless Payment - Section 7.4.10

- Added Level 01 Reader CASH SALE (13h/05h) VMC command.

Cashless Payment - Section 7.4.14

- Added Level 02 Reader Revalue - Request (15h/00h) VMC command.

Cashless Payment - Section 7.4.15

- Added Level 02 Reader Revalue – Limit Request (15h/01h) VMC command.

Cashless Payment - Section 7.4.17

- Obsoleted EXPANSION – Read User File (17h/01h) VMC command.

Cashless Payment - Section 7.4.18

- Obsoleted EXPANSION – Write User File (17h/02h) VMC command.

Cashless Payment - Section 7.4.19

- Added Level 02 Reader Write Time/Date File (17h/03h) VMC command.

Cashless Payment - Section 7.5

- Further defined the non-response time with the "Application Maximum Response Time" Z7.

Cashless Payment - Section 7.6 (original ICP Spec)

- Moved this section (ICP Payment Media Return Button) to Section 7.3.2.

Cashless Payment - Section 7.6 (MDB/ICP Spec)

- Previously was the ICP 7.7 with no modifications.

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Introduction

Foreword

This voluntary Standard contains basic requirements for a vending machine communication interface within the limitations given below and in the General Information section of this Standard. These requirements are based on sound engineering principles, research, field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, and others having specialized experience. These requirements are subject to revision as further experience and investigation may show it necessary or desired.

NAMA, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of NAMA represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the NAMA Standard is processed. NAMA shall not be responsible to anyone for use or reliance upon Standard by anyone. NAMA shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, reliance upon this Standard.

Standard Review

A complete review of this standard shall be conducted at least every five years to keep requirements consistent with technology. These reviews shall be conducted by representatives from industry and user groups on the NAMA Vending Technology Standards Committee at that time.

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Section 1

General Information

1.1 Introduction

This document defines a serial bus interface for electronically controlled vending machines. The interface is a 9600 baud Master-Slave arrangement where all peripherals are Slaves to a Master controller.

The intent of this document is to standardize vending machines that employ electronic control (traditionally known as vending mechanism controller - VMC) so that all vending and peripheral equipment communicates identically.

It should be noted that this document is a vending machine interface / protocol specification and **not** a vending machine system specification. Each machine manufacturer should provide a specification on the overall operation of the machine.

1.2 Operational and Application Notes

The serial bus, or Multi-Drop Bus (MDB) is configured for Master-Slave operation. There is one Master with capability of communicating with up to thirty-two peripherals. The Master is defined as the Vending Machine Controller (VMC).

Each peripheral is assigned a unique address and command set. The master will "poll" the Bus for peripheral activity. That is, each peripheral is asked for activity, and responds with either an acknowledge, negative acknowledgment, or specific data dependent on its current activity. If a peripheral does not respond within a predefined time, (t-non-response as defined in the peripheral sections) it is assumed that it is not present on the Bus.

Bus interference, or "crashes" are prevented because each peripheral only responds upon being polled. Since there is only one master, and all communication is initiated by the Master, Bus "crashes" are easily precluded.

All peripherals will recognize a disable command, or commands, sent by the Master. This allows for disabling of individual peripherals for various reasons, for example, power management techniques.

Error checking and correction is accomplished by using checksums (CHK) and a retransmit command.

1.3 Levels and Options

Since the introduction of the earliest Multi-Drop Bus specification, functional levels and operational options have been established for most of the peripherals on the MDB/ICP interface. These have provided the capability for new features to be implemented as new requirements and features were needed for the international vending industry.

1.3.1 Levels

Levels of peripheral functionality were established when a major change occurred in the peripheral that added extended commands and responses. Due to potential conflicts between a VMC level and a peripheral level, neither the VMC nor the peripheral should issue a command or reply with a response that is not supported by the other device.

The VMC must initially determine (via the appropriate STATUS or SETUP command) the level of a peripheral before determining which commands it can issue to that device. **A VMC must only send commands that are supported by the peripheral.** For example, a Level 3 command may only be issued to a Level 3 or higher peripheral and must not be issued to a Level 1 or 2 peripheral.

The Cashless Payment and the Universal Satellite Device can also learn the respective level of the VMC for that device. This information is sent via the SETUP command. **It is the responsibility of the peripheral to only send responses that are supported by the VMC.** For example, a Level 3 response may only be sent to a Level 3 or higher VMC and must not be sent to a Level 1 or 2 VMC. Effectively, the VMC and peripheral should support the highest common level.

For total compatibility, VMCs and peripherals should support all lower levels. **For new designs after July 2000, it is strongly recommended that VMCs and peripherals must support all lower levels.** Commercial or regional issues may cause machine or peripheral manufacturers to implement only specific levels; however, this is a decision (and risk) made by the machine or peripheral manufacturer.

1.3.2 Options

Options were established in the peripherals to provide various additional operational features that may be required for specific vending applications. As the name implies, these features are "above and beyond" the standard core of required functionality.

At power on and after a Bus Reset or a RESET command, all options are disabled. During the initialization command sequences, the VMC determines the optional features supported by the peripherals. The VMC will then enable the features it is going to use. Until the feature is enabled, it is the responsibility of the peripheral to ignore feature specific commands and not respond with feature specific responses.

1.3.3 Currently Established Levels and Options

The following table provides a brief description of each of the currently established levels and options of the various MDB/ICP peripherals. Please refer to the specific sections for each device for more detailed information.

Peripherals	Levels	Options	Description
Coin Changer	1	n/a	Never released
	2	none	Supports standard commands
	3	below	Supports Expansion ID command and optionally supports commands for features below
		b0	Alternative Payout Method
		b1	Extended Diagnostics
		b2	Controlled Manual Fill and Payout
		b3	File Transport Layer (FTL)
Bill Validator	1	none	Supports standard commands and Expansion ID command without options
	2	below	Supports expansion ID command with options and optionally supports commands for features below
		b0	File Transport Layer (FTL)
		b1	Bill Recycling
Cashless Device #1 & #2	1	below	Supports standard commands and Expansion ID command. Readers do not have revaluation capability
		b0*	Reader is capable of restoring funds to card
		b1*	Reader is multivend capable
		b2*	Reader has a display available
		b3*	Reader supports VEND-CASH SALE command
			*bits in the SETUP-Config command
	2	above	Supports Revalue, Time/Date, Read User File (obsolete), and Write User File (obsolete) commands

Peripherals	Levels	Options	Description
Cashless Device #1 & #2 (continued)	3	above & below	Supports expansion ID command with options and optionally supports commands for features below (bits in the Level 3 Expansion ID command)
		b0**	File Transport Layer (FTL)
		b1**	16 or 32 Bit Monetary Format
		b2**	Multi Currency / Multi Lingual
		b3**	Negative Vend
		b4**	Data Entry
		b5**	Always Idle Session
			**bits in the Level 3 Expansion ID command
Communications Gateway	1	none	Obsolete (former Audit Unit)
	2	none	Obsolete (former Audit Unit)
	3	below	Supports Expansion ID command and optionally supports commands for features below
		b0	File Transport Layer (FTL)
		b1	Verbose Mode
		b2	Expansion Time/Date
Universal Satellite Device (USD)	1	below	Supports all basic commands and optionally supports commands for features below
		b0	USD is capable of storing and controlling pricing
		b1	USD is capable of selecting items to vend
		b2	File Transport Layer (FTL)
Coin Hopper or Tube - Dispenser	1	below	Supports Expansion ID command and optionally supports commands for features below
		b0	File Transport Layer (FTL)

Section 2

Communication Format

2.1 Byte Format

Baud Rate: 9600 NRZ

Serial Bit Format:
1 Start Bit
8 Data Bits
1 Mode Bit
1 Stop Bit

11 Bits Total

LSB										MSB
Start	0	1	2	3	4	5	6	7	Mode	Stop

Mode Bit: Master-to-Peripheral

The mode bit differentiates between ADDRESS bytes and DATA bytes. ADDRESS bytes must be read by all peripherals, DATA bytes are only read by the peripheral that has been addressed.

The mode bit is set (logic one) to indicate an ADDRESS byte, and not set (logic zero) to indicate a DATA byte.

Mode Bit: Peripheral-to-Master

The mode bit must be set on the last byte sent when data is sent from a Slave to the Master.

2.2 Block Format

Master-to-Peripheral

A Communication Block for Master-to-Slave transmissions is defined as an Address byte, optional data bytes, and a CHK byte. A block is limited to a maximum of thirty-six (36) bytes.

The upper five bits (MSB) of the Address Byte will be used for addressing. That is, bits 7,6,5,4,3 of the previous byte description will be used for addressing.

The lower three bits (i.e. 2,1,0) of the Address Byte will contain peripheral specific commands. This will allow up to eight instructions to be embedded in the first byte of a block.

The VMC Master will respond to data from a peripheral with an Acknowledgment (ACK), Negative Acknowledgment (NAK), or Retransmit (RET). These are defined later in the document. The 5 mS time-out (t-response) described in the Bus Timing section of this document is the equivalent of a NAK.

If the addressed Slave does not respond within the 5 mS time-out (silence), the Master may repeat the same command, or send a different command, until it receives an answer or until the end of the Non-Response time, as defined in the peripheral sections. See Example in 2.5D. The RESET command should not be used as a recovery method to a 5 mS time-out (t-response) until after exceeding the Non-response time. The VMC may send commands to any other peripheral during this time.

Peripheral-to-Master

A Communication Block for Slave-to-Master transmissions consists of either a data block and a CHK byte, a acknowledgment (ACK), or a negative acknowledgment (NAK).

The 5 mS time-out (t-response) described in the Bus Timing section of this document is the equivalent of a NAK command. In addition, it is recommended that the peripheral use this time-out as the NAK when a reception error of the ADDRESS byte occurs. This will prevent several peripherals from trying to simultaneously respond with a NAK.

A data block consists of one or more data bytes followed by a CHK byte. The CHK byte is defined later in this document.

The data block and CHK byte are limited to a maximum size of 36 bytes.

A CHK byte is not required when a peripheral responds with NAK or ACK byte. ACK and NAK are defined later in this document.

The peripheral must set the mode bit on the last byte sent to signify end of transmission. This will be either the CHK byte of a block, a NAK byte, or an ACK byte. The mode bit must not be set except for the conditions above.

A peripheral response of ACK or NAK signifies the end of the exchange.

When a peripheral responds with a data block, the VMC must respond with an ACK, NAK or RET. If the Master cannot respond within the 5 mS time-out (t-response) the peripheral must repeat the data block, or append it, at the next possible occasion (i.e. to a later POLL). The same behavior is to apply when the Master responds with NAK.

CHK Byte

A CHK byte must be sent at the end of each block of data. The CHK byte is a checksum calculated by adding the ADDRESS byte and all DATA bytes. The CHK byte is not included in the summation. The carry bit for CHK additions is ignored since the CHK byte is limited to eight bits.

The following example shows a CHK byte calculation for a possible response to a STATUS command sent to a USA changer slave. See section 5 for details of byte meanings.

```
02H   Changer feature level
00H   Country code for USA
01H   Country code for USA
05H   Coin scaling factor
02H   Decimal place
00H   Coin type routing
07H   Coin type routing
01H   Coin type 0 has value of 1 scaling factor
02H   Coin type 1 has value of 2 scaling factor
05H   Coin type 2 has value of 5 scaling factor
14H   Coin type 3 has value of 20 scaling factor
FFH   Coin type 4 is a token
12CH  Therefore the CHK byte would be equal to 2CH
```

A checksum will be performed on all full blocks of communication. A checksum will not be performed on ACK, NAK, or RET bytes.

Response Codes

The following codes are reserved for the ACK, NAK and RET bytes:

ACK	00H	(acknowledgment/checksum correct)
RET	AAH	(Retransmit the previously sent data. **Only the VMC can transmit this byte**)
NAK	FFH	(Negative acknowledge)
		The VMC and peripheral must also recognize the 5 mS time-out (t-response) as a NAK.

NOTE: To improve system reliability it is recommended that when receiving ACK, NAK, or RET the receiving device counts the number of bits set in the byte. This method will require at least two bit errors in the byte before the byte can be mis-interpreted.

Bus Reset

The VMC may reset all peripherals by pulling the transmit line "active" for a minimum of 100 mS. This informs all peripherals to abort any activity and return to its power-on reset state. Details of this state for each peripheral are provided in later sections of this document. It is recommended that the VMC re-initialize each peripheral after this type of reset.

2.3 Peripheral Addresses

The addresses below are defined. Note again that the bits shown are the upper five bits (7,6,5,4,3) of the Address Byte and will be used for all addressing including the File Transport Layer described in Section 2.6. The lower three bits (2,1,0) are used for the command.

Address		Definition
00000xxxB	(00H)	Reserved for VMC
00001xxxB	(08H)	Changer
00010xxxB	(10H)	Cashless Device #1
00011xxxB	(18H)	Communications Gateway
00100xxxB	(20H)	Display
00101xxxB	(28H)	Energy Management System
00110xxxB	(30H)	Bill Validator
00111xxxB	(38H)	Reserved for Future Standard Peripheral
01000xxxB	(40H)	Universal Satellite Device #1
01001xxxB	(48H)	Universal Satellite Device #2
01010xxxB	(50H)	Universal Satellite Device #3
01011xxxB	(58H)	Coin Hopper or Tube – Dispenser 1
01100xxxB	(60H)	Cashless Device #2
01101xxxB	(68H)	Age Verification Device
01101xxxB	(70H)	Coin Hopper or Tube – Dispenser 2
01111xxxB	(78H)	Reserved for Future Standard Peripherals
.	.	.
.	.	.
.	.	.
11011xxxB	(D8H)	Reserved for Future Standard Peripherals
11100xxxB	(E0H)	Experimental Peripheral #1
11101xxxB	(E8H)	Experimental Peripheral #2
11110xxxB	(F0H)	Vending Machine Specific Peripheral #1
11111xxxB	(F8H)	Vending Machine Specific Peripheral #2

Experimental Peripheral Addresses

Experimental Peripheral addresses 11100xxxB (E0H) and 11101xxxB (E8H) are reserved for use by manufacturers when designing and field testing potential new MDB/ICP devices. These addresses are **temporary** and once the new device is approved by NAMA and the EVA, the device will be assigned a different permanent peripheral address. Use of the Experimental Peripheral addresses shall be limited to "in house" testing and "closed site" field trials. Manufacturers must understand that any devices in the field with Experimental Peripheral addresses must be recalled or updated to the permanent address if the device is approved by NAMA and the EVA. If not approved by NAMA and the EVA, the devices must be recalled or have their addresses changed to the Vending Machine Specific peripheral addresses described below.

Vending Machine Specific Peripheral Addresses

Vending Machine Specific peripheral addresses (addresses 11110xxxB (F0H) and 11111xxxB (F8H)) are reserved for Non-Standard or proprietary applications. These devices are allowed a unique set of commands.

All other peripherals are defined as Standard devices. These peripherals must follow the specifications to ensure compatibility between manufacturers.

2.4 Software Operational Rules

2.4.1 Power Budget

The VMC must regulate the power budget. That is, peripherals must be enabled and disabled dependent on power availability. The power bus is defined later in this document.

2.4.2 Bytes

During multi-byte messages the most significant byte is sent first.

> Any bytes within a command or response that are not specifically defined should be left in a 0 state. For Level 03 or lower coin mechanisms, Level 01 bill validators, and Level 01 card readers, this is not a requirement but a suggestion.

2.4.3 Polling

The following are recommendations for the methods of VMC to peripheral software operation.

> Each peripheral should be polled every 25-200 milliseconds. This can be done by the POLL command or any other appropriate command.
>
> If a peripheral has not responded to a poll for its maximum Non-Response time, the VMC should continue to poll the peripheral at least every ten seconds with a RESET command. (See Example G in Section 2.5).

2.4.4 Levels

Due to potential conflicts between a VMC level and a peripheral level, neither the VMC nor the peripheral should issue a command or reply with a response that is not supported by the other device.

The VMC must initially determine (via the appropriate STATUS or SETUP command) the level of a peripheral before determining which commands it can issue to that device. **A VMC must only send commands that are supported by the peripheral.** For example, a Level 3 command may only be issued to a Level 3 or higher peripheral and must not be issued to a Level 1 or 2 peripheral.

The Cashless Payment and the Universal Satellite Device can also learn the respective level of the VMC for that device. This information is sent via the SETUP command. **It is the responsibility of the peripheral to only send responses that are supported**

by the VMC. For example, a Level 3 response may only be sent to a Level 3 or higher VMC and must not be sent to a Level 1 or 2 VMC. Effectively, the VMC and peripheral should support the highest common level.

For total compatibility, VMCs and peripherals should support all lower levels. **For new designs after July 2000, it is strongly recommended that VMCs and peripherals must support all lower levels.** Commercial or regional issues may cause machine or peripheral manufacturers to implement only specific levels; however, this is a decision (and risk) made by the machine or peripheral manufacturer.

2.5 Typical Session Examples

A. The diagram below represents a typical transmission when a peripheral is idle.

VMC:

ADD* CHK

Peripheral:

ACK*

B. The diagram below represents a typical transmission when a peripheral has data to return.

VMC:

ADD* CHK ACK

Peripheral:

DAT DAT CHK*

C. The diagram below represents a typical transmission when the VMC has data to send.

VMC:

ADD* DAT DAT CHK

Peripheral:

ACK*

*Indicates mode bit set

D. The diagram below represents a typical transmission when the VMC determines a CHK is not correct. The VMC will respond one of two ways:

Send a NAK to the peripheral to indicate that the information was not received correctly then perform other tasks. Note: When the Master answers with NAK (or silence which is treated equally) the slave has to repeat the response, in order to ensure the execution of the response (i.e. coin reception etc.).

OR

The VMC may send a retransmit (RET) command alerting the peripheral to retransmit the previously sent data.

VMC:

ADD* DAT CHK RET ACK

Peripheral:

DAT DAT CHK* DAT DAT CHK*

*Indicates mode bit set.

E. This diagram represents a situation where the peripheral does not respond within the 5 mS time-out (t-response).

VMC:

ADD* CHK ADD* CHK

Peripheral:

[silence…] ACK*

F. This diagram represents a situation where the peripheral does not respond to a command and after its maximum Non-Response time, is reset by the controller.

Controller		Peripheral	Comment
Command X	→		
	←	Response	Normal response
Command Y	→		
	←	[silence…]	No response
Command Y	→		
	←	[silence…]	No response
Command Y	→		
	←	[silence…]	No response
			Peripheral does not response within its allocated Non-Response Time.
RESET	→		Software Reset
	←	[silence…]	Peripheral in initialization routine
RESET	→		
	←	ACK	Peripheral operational again
POLL	→		
	←	JUST RESET	Peripheral indicates finished RESET processing
ACK	→		
			Peripheral initialization sequence is performed as recommended in each peripheral section.

G. This diagram represents a situation where the peripheral is disconnected or goes offline. The controller should send a RESET command every 10 seconds to determine if, and when, the peripheral becomes active again.

Controller		Peripheral	Comment
Command X	→		
	←	Response	Normal response
Command Y	→		
	←	[silence…]	No response
Command Y	→		
	←	[silence…]	No response
Command Y	→		
	←	[silence…]	No response
			Peripheral does not response within its allocated Non-Response Time.
RESET	→		Software Reset
	←	[silence…]	Peripheral offline
RESET	→		Software Reset
	←	[silence…]	Peripheral offline
			Wait 10 seconds
RESET	→		
	←	[silence…]	Peripheral offline
			Wait 10 seconds
RESET	→		
		[silence…]	Peripheral offline
			Wait 10 seconds
RESET	→		
		[silence…]	Peripheral offline

2.6 File Transport Layer

The File Transport Layer (**FTL**) provides a method to send and/or receive high level information between peripherals or between a peripheral and the VMC. It is **not** intended to be used for standard vending credit and control functions. An example would be loading new validation parameters into a coin changer or bill validator.

Since the MDB/ICP interface is "driven" by the VMC, it has to be a network manager for all FTL data transfers. It acts as a temporary mailbox and data switch for FTL blocks; however, the information that is sent via FTL does not have to be interpreted by the VMC. The VMC simply uses the destination and source address information provided in the MDB/ICP command and response structure to forward the data to the proper recipient.

2.6.1 FTL Process Overview

If a peripheral needs to transfer data to another peripheral (or the VMC):
- The VMC must poll the peripheral,
- The peripheral must answer with a "REQUEST TO SEND",
- The VMC must get approval to forward data (if necessary),
- The VMC requests the first data block,
- The VMC ACKs the first block and forwards to destination,
- The process repeats until all blocks are sent.

If the VMC needs to transfer data to a peripheral:
- The VMC must send a "REQUEST TO SEND",
- The peripheral approves or denies the transfer request,
- If approved, the VMC sends the first data block,
- The peripheral ACKs the first data block,
- The process repeats until all blocks are sent.

If a peripheral (A) needs to request a transfer of data from another peripheral (B):
- The VMC must poll the peripheral A,
- Peripheral A must send a "REQUEST TO RECEIVE",
- The VMC forwards the request to peripheral B,
- Peripheral B decides to honor the request or not,
- If approved, peripheral B sends the first data block,
- The VMC forwards the data block to peripheral A,
- The process repeats until all blocks are sent.

2.6.2 FTL Detailed VMC Operation

The VMC must act as a network manager, it is responsible for checking peripheral status and managing network resources as described below, it must:

- Be aware of which peripherals are active and support the FTL. If a file transfer is requested involving a peripheral that does not support it, the VMC should deny the transfer using RETRY/DENY defined later.
- Poll peripherals to become aware that a data transfer is requested.
- Read data blocks from selected peripherals.
- If VMC receives a NAK, it should attempt to finish current command/response up to 5 times. After that, it should abort file transfer as defined by the protocol.
- Send data blocks to destination device, if not the VMC itself.
- Repeat these steps for all data blocks, as needed.

2.6.3 FTL General Operation

- The FTL "session" would transfer a "file" using several "blocks". The "Dest" and "Src" are switched by the VMC directing each block to its destination.
- All responses can be sent immediately after receipt of command or the command can be ACK'ed and the response sent in a delayed fashion (meeting all appropriate time-outs). However, FTL responses must NOT be combined with responses to any other commands, at any time.
- File transfers less than 256 blocks are terminated by sending an empty data file (SEND BLOCK with no data). File transfers of exactly 256 blocks are terminated by block #FE followed by block #FF.
- It is recommended that files larger than one block:
  1) Include a CRC in their data. The transport layer is not responsible for checking for correct CRCs.
  2) Include a time out mechanism to prevent system dead locks. The transport layer is **not** responsible for checking for dead locked file transfers.
- To prevent a system dead lock, the VMC must poll other peripherals during all data transfers and service them accordingly.
- Since the VMC is not knowledgeable about the contents of the file transfer it should not disable any peripherals due to a transfer request. This will be the responsibility of the peripherals themselves. They may internally disable and report so to the VMC if possible, or they may just stop responding to the VMC until ready. The latter may cause the VMC to try to reset the peripheral.

2.6.4 FTL Command and Response Sets For All Components

The table below defines the VMC commands and peripheral responses that occur during an FTL data transfer. Note that the peripheral responses can either be immediate to the VMC's command or delayed and provided to a subsequent POLL. Definitions are provided on the following page.

Command / Response	VMC Cmd[1]	Resp	Source Data (bytes)	Destination Response
REQ TO SEND	α7/FE	1F	Dest (1) Src (1) File ID (1) Length (1) Control (1)	OK TO SEND or RETRY/DENY
OK TO SEND	α7/FD	1E	Dest (1) Src (1)	SEND BLOCK (repeated until whole file is transferred)
SEND BLOCK	α7/FC	1D	Dest (1) Block # (1) Data (1 to 31)	ACK
RETRY/DENY	α7/FB	1C	Dest (1) Src (1) Retry delay (1)	ACK
REQ TO RCV	α7/FA	1B	Dest (1) Src (1) File ID (1) Max Length (1) Control (1)	SEND BLOCK (repeated until whole file is transferred) or RETRY/DENY

Note 1: The α7 represents the address of the destination device (defined in Section 2.3) logically OR'd with a hexadecimal 0x07.

Dest **1 byte**

The destination address of the peripheral where the data block (**not the whole file**) is being sent to. All addresses refer to the standard MDB defined peripheral addresses as defined in Section 2.3. Note that 00000xxx (00H) will be used for the VMC. Examples are a changer (08H), audit system (18H), bill validator (30H), and universal satellite device #2 (48H).

Src **1 byte**

The source address of the peripheral where the data block (**not the whole file**) is being sent from. All addresses refer to the standard MDB defined peripheral addresses as defined in Section 2.3. Note that 00000xxx (00H) will be used for the VMC. Examples are the same as in the **Dest** above.

File ID **1 byte**

The type of information desired. NAMA will maintain a list of standard file ID's and a definition of what each file type means. Note that if a device responds with a "Retry delay" of FFH it should be interpreted that this device does not support the requested function.

Currently defined file IDs include:

00H: Manufacture ID information. This file must start with the manufactures three character manufactures code, anything after that would be up to the manufacture to define.

01H: DTS defined file. This file must follow the format defined in the EVA-DTS standard. This would include the DXS record as well as all data up to and including the DXE record.

0F0H to 0FFH: This range of files may be used for Manufacturer Specific information. The content and format of these files are left up to the manufacturer to define.

Additional ID proposals must be evaluated by the NAMA MDB/ICP technical standard committee.

(Max) Length **1 byte**

The total number of blocks that will (can) be included in the entire file. This byte should be used as a counter to determine the amount of data blocks to be transferred.

Control **1 byte**

This byte contains information that can be used by the VMC and peripherals to determine how the data transfer is conducted. Included controls are:

b0: Reset after transfer. The receiving peripheral should reset itself after the file transfer is complete.
b1: End of File. The last block of the current FTL session contains the end of this file. If clear (=0), then another FTL session will follow with additional blocks. If set (=1), then this is the last (or only) FTL session to be sent.
b2 - b7: Not used, must be set to 0

Block # **1 byte**

The sequential number of this block, within the total file, that is being requested/sent. All data blocks must be identified by a block number, counting up from 0 (first block) to 255.

Data Block **1 to 31 byte(s)**

The actual data portion of the block. All data must fit into a 31 byte, or less, string. The standard MDB CHK byte will signify the end of block. (Peripherals will have to use inter-byte time out when receiving blocks from the VMC.) Knowledge of the contents of this data is only required by the source and destination devices.

Retry Delay **1 byte**

A time delay that the sender should wait before trying to re-send the entire data file again. If a device is not capable of receiving a file in its current state, this byte should represent the number of seconds before it will be ready to receive the data. If the device simply refuses to accept the file it must answer with a “Retry Never” signified by a 00H retry delay. If the device is not present, block synchronization is lost, or other failure mode arises a “Retry Never” should be used to abort/deny the current file transfer.

File Transport Layer Examples

Below are examples of data transfers between the VMC and a peripheral or between two different peripherals via the VMC.

SUCCESSFUL TRANSFER – VMC TO PERIPHERAL A				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	REQ TO SEND (α7/FE)		Request to send "n" blocks
OK TO SEND (1E)	→			
	←	ACK		
	←	SEND BLOCK (α7/FC)		Repeated "n" times
ACK	→			

DENIED TRANSFER – VMC TO PERIPHERAL A				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	REQ TO SEND (α7/FE)		
RETRY/00 (1C)	→			Denied
	←	ACK		

SUCCESSFUL REQUEST – VMC TO PERIPHERAL A				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	POLL (varies)		
REQ TO RCV (1B)	→			Request receive "n" blocks
	←	ACK		
	←	SEND BLOCK (α7/FC)		Repeated "n" times
ACK	→			

DENIED REQUEST – VMC TO PERIPHERAL A				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	POLL (varies)		
REQ TO RCV (1B)	→			Request receive "n" blocks
	←	ACK		
	←	RETRY/00 (α7/FB)		Denied
ACK	→			

VMC ABORTED TRANSFER – VMC TO PERIPHERAL A			
Peripheral A	**VMC**	**Peripheral B**	**Comments**
	← REQ TO SEND (α7/FE)		Request to send "n" blocks
OK TO SEND (1E)	→		
	← ACK		
	← SEND BLOCK (α7/FC)		Repeated "n" times
ACK	→		
	← RETRY/00 (α7/FB)		Aborted!
ACK	→		

PERIPHERAL ABORT TRANSFER – VMC TO PERIPHERAL A			
Peripheral A	**VMC**	**Peripheral B**	**Comments**
	← REQ TO SEND (α7/FE)		Request to send "n" blocks
OK TO SEND (1E)	→		
	← ACK		
	← SEND BLOCK (α7/FC)		
RETRY/00 (1C)	→		Aborted!
	← ACK		

SUCCESSFUL TRANSFER – PERIPHERAL A TO VMC			
Peripheral A	**VMC**	**Peripheral B**	**Comments**
	← POLL (varies)		
REQ TO SEND (1F)	→		Request to send "n" blocks
	← ACK		
	← OK TO SEND (α7/FD)		
SEND BLOCK (1D)	→		Repeated "n" times
	← ACK		

DENIED TRANSFER – PERIPHERAL A TO VMC

Peripheral A		VMC	Peripheral B	Comments
	←	POLL (varies)		Request to send "n" blocks
REQ TO SEND (1F)	→			
	←	ACK		
	←	RETRY/00 (α7/FB)		Denied
ACK	→			

SUCCESSFUL TRANSFER – PERIPHERAL A TO PERIPHERAL B

Peripheral A		VMC		Peripheral B	Comments
	←	POLL (varies)			
REQ TO SEND (1F)	→				Request to send "n" blocks
	←	ACK			
		REQ TO SEND (1F) (α7/FE)	→		
			←	OK TO SEND (1E)	
		ACK	→		
	←	OK TO SEND (α7/FD)			
SEND BLOCK (1D)	→				Repeated "n" times
	←	ACK			
		SEND BLOCK (α7/FC)	→		
			←	ACK	

DENIED TRANSFER – PERIPHERAL A TO PERIPHERAL B

Peripheral A		VMC		Peripheral B	Comments
	←	POLL (varies)			
REQ TO SEND (1F)	→				Request to send "n" blocks
	←	ACK			
		REQ TO SEND (1F) (α7/FE)	→		
			←	RETRY/00 (1C)	Denied
		ACK	→		
	←	RETRY/00 (α7/FB)			
ACK	→				

SUCCESSFUL REQUEST - PERIPHERAL A TO PERIPHERAL B				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	POLL (varies)		
REQ TO RCV (1B)	→			Request receive "n" blocks
	←	ACK		
		REQ TO RCV (α7/FA) →		
			← SEND BLOCK (1D)	Repeated "n" times
		ACK →		
	←	SEND BLOCK (α7/FC)		
ACK	→			

DENIED REQUEST – PERIPHERAL A TO PERIPHERAL B				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	POLL (varies)		
REQ TO RCV (1B)	→			Request receive "n" blocks
	←	ACK		
		REQ TO RCV (α7/FA) →		
			← RETRY/00 (1C)	Denied
		ACK →		
	←	RETRY/00 (α7/FB)		
ACK	→			

PERIPHERAL A TRANSFER TO PERIPHERAL B – ABORTED BY A				
Peripheral A		**VMC**	**Peripheral B**	**Comments**
	←	POLL (varies)		
REQ TO SEND (1F)	→			Request to send "n" blocks
	←	ACK		
		REQ TO SEND (α7/FE) →		
			← OK TO SEND (1E)	
		ACK →		
	←	OK TO SEND (α7/FD)		
SEND BLOCK (1D)	→			
	←	ACK		
		SEND BLOCK (α7/FC) →		
			← ACK	
		. . .		Repeated "n" times
	←	POLL (varies)		
RETRY/00 (1C)	→			Aborted!
	←	ACK		
		RETRY/00 (α7/FB) →		
			← ACK	

PERIPHERAL A TRANSFER TO PERIPHERAL B – ABORTED BY B

Peripheral A	VMC	Peripheral B	Comments
	← POLL (varies)		
REQ TO SEND (1F)	→		Request to send "n" blocks
	← ACK		
	REQ TO SEND (α7/FE) →		
		← OK TO SEND (1E)	
	ACK →		
	← OK TO SEND (α7/FD)		
SEND BLOCK (1D)	→		
	← ACK		
	SEND BLOCK (α7/FC) →		
		← ACK	
	. . .		Repeated "n" times
	← POLL (varies)REQ BLOCK (α7/FD)		
SEND BLOCK (1D)	→		
	← ACK		
	SEND BLOCK (α7/FC) →		
		← RETRY/00 (1C)	Aborted!
	ACK →		
	← RETRY/00 (α7/FB)		
ACK	→		

Section 3

Bus Timing

3.1 Timing Definitions

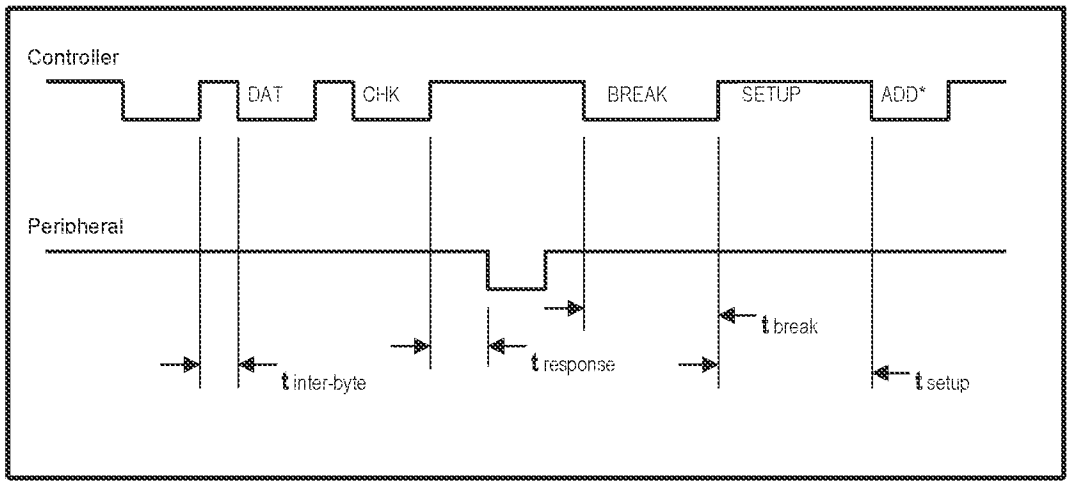
Baud rate	=	The rate of bit transfer per second.
t inter-byte (max.)	=	The maximum time allowed between bytes in a block transmission.
t response (max.)	=	The maximum time any device, master or peripheral, will take to respond to a valid communication.
t break (VMC)	=	The minimum time of the Bus Reset signal sent by the VMC to reset all peripherals.
t setup	=	The minimum set-up time before the VMC attempts to communicate after a reset signal. Peripheral devices may choose to not respond for up to the non-response time defined in each peripheral section.

3.2 Timing Specifications

Baud Rate	=	9600 +1%/-2% NRZ
t inter-byte (max.)	=	1.0 mS
t response (max.)	=	5.0 mS
t break (min.)	=	100 mS
t setup (min.)	=	200 mS

NOTE: All peripherals have the option of not responding to the VMC. Non-response timing is defined in the peripheral specification.

3.3 Timing Diagram



NOTE: * indicates that the mode bit is set

Section 4

Hardware Specification

4.1 Bus Power Supply Definition

The information below defines the minimum VMC voltage output. The actual current ratings per peripheral will be defined in their respective sections.

Power supply filtering is optional, therefore if a peripheral requires more power, or tighter regulation, they may elect to supply their own power, or filtering, from available sources elsewhere in the machine.

VMC Voltage Output:

Minimum	=	20 VDC rms.(rectified and optionally filtered)
Nominal	=	34 VDC unreg.(rectified and filtered) 24 VDC rms.(rectified only)
Maximum	=	42.5* VDC(ripple voltage upper limit) * High line input may allow 45 VDC peak (max.).

4.2 Bus Transmitter / Receiver Specification

The following section describes the 5V, optically isolated, current loop system between the Master and the Slave.

VMC Master:

Transmit:

Minimum source current (active):	100 mA @ 4V
Maximum leakage current (inactive):	100 uA

NOTES: 1) The transmit line must be able to withstand a short while in the active mode.

2) 15 mA should be added for each peripheral over six.

Receive:

Minimum input current (active):	15 mA @ 1V
Maximum input current (inactive):	1 mA

Peripheral Slave:

Receive:

Maximum input current (active):	15 mA @ 4V
Maximum input current (inactive):	100 uA

Transmit:

Minimum sink current (active):	15 mA @ 1V
Maximum leakage current (inactive):	30 uA

4.3 Connector Specification

Connector assemblies supplied by the NAMA approved suppliers, noted in Section 4.3.6, are intermateable and meet or exceed the minimum requirements identified in Sections 4.3.1, 4.3.2, 4.3.3, 4.3.4, and 4.3.5 when tested in the mated condition. NAMA must approve any supplier changes to the fit, form, or function. Discrete components, i.e. contacts, are not required to be inter-changeable between supplier products.

4.3.1. **Material**

4.3.1.1. Terminal: Phosphor Bronze
4.3.1.2. Plating: Tin or Tin/Lead
4.3.1.3. Housing: UL 94V-2 nylon

4.3.2. **Ratings**

Section	Item	Requirement
4.3.2.1.	Rated Voltage (Max)	600 Volts AC
4.3.2.2.	Maximum Rated Current (Six Circuit)	7 Amps
4.3.2.3.	Ambient Temperature Range (including terminal T-rise)	-40°C to +105°C

4.3.3. **Electrical Performance**

Section	Item	Test Condition	Requirement
4.3.3.1.	Contact Resistance	Mate Connectors, measure by dry circuit, 20 mV max., 10 mA. Wire resistance shall be removed from the measured value.	10 mΩ Max.
4.3.3.2.	Insulation Resistance	Mate Connectors, apply 500V DC between adjacent terminal or ground.	1000 MΩ Min.
4.3.3.3.	Dielectric Strength	Mate Connectors, apply 1500V AC for 1 minute between adjacent terminal or ground.	No Breakdown.

4.3.4. **Mechanical Performance**

Section	Item	Test Condition		Requirement
4.3.4.1.	Insertion and Withdrawal Force	Insert and withdraw connectors at a speed rate of 25 +/- 3mm / minute.		Noted Below
	6 Pos Insertion Max.		6 Pos Withdrawal Min.	
	Initial	30th cycle	Initial	30th cycle
	41.2 N	38.2 N	2.9 N	2.4 N
4.3.4.2.	Crimping Pull Out Force	Mount the crimped terminal, apply axial force on the wire at a rate of 25 +/- 3mm minute.		
		16 AWG		88 N Min.
		18 AWG		88 N Min.
		20 AWG		59 N Min.
		22 AWG		39 N Min.
		24 AWG		29 N Min.
		26 AWG		20 N Min.
		28 AWG		10 N Min.
4.3.4.3.	Terminal Insertion Force	Insert the crimped terminal into the housing.		15 N Max.
4.3.4.4.	Terminal/Housing Retention Force	Apply axial pull out force at the speed rate of 25 +/- 3mm / minute.		22 N Min.
4.3.4.5.	Locking / Unlocking Force	Measure force to lock & unlock connector housings (without contacts) at a rate of 25 +/- 3mm / minute.		Lock: 30 N Max. Unlock: 50 N Min.

4.3.5. **Environmental Performance**

Section	Item	Test Condition	Requirement	
4.3.5.1.	Repeated Insertion / Withdrawal	When mated up to 30 cycles repeatedly by rate of 10 cycles per minute.	Contact Resistance	20 mΩ Max.
4.3.5.2.	Temperature Rise	Carrying rated current load.	30°C Rise Max.	
4.3.5.3.	Vibration	Amplitude: 1.5mm P-P Sweep Time: 10-55-10 Hz in 1 minute. Duration: 2 hours in each X,Y,Z axis.	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
			Discontinuity	1 μ sec. Max.
4.3.5.4.	Shock	50 G; 3 strokes in each X,Y,Z axis.	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
			Discontinuity	1 μ sec Max.
4.3.5.5.	Heat Resistance	105 +/- 2°C, 96 hours	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
4.3.5.6.	Cold Resistance	-40 +/- 3°C, 96 hours	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
4.3.5.7.	Humidity	Temperature: 60 +/- 2°C Relative Humidity: 90% - 95% Duration: 96 hours	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
			Dielectric Strength	No Breakdown
			Insulation Resistance	1000 MΩ Min.
4.3.5.8.	Temperature Cycling	5 Cycles: a) - 55°C ; 30 Minutes b) 105°C ; 30 Minutes	Appearance	No Damage
			Contact Resistance	20 mΩ Max.
4.3.5.9.	Salt Spray	48 +/- 4 hours exposure to salt spray from 5 +/- 1% solution at 35 +/- 2°C.	Appearance	No Damage
			Contact Res.	20 mΩ Max.
4.3.5.10.	SO_2 Gas	24 hour exposure to 50 +/- 5 ppm SO_2 gas at 40 +/- 2°C.	Appearance	No Damage
			Contact Res.	Max.

4.3.6 Approved Suppliers and Part Numbers

4.3.6.1. Suppliers

Molex : Mini-Fit, Jr.™ Product
AMP: AMP-DUAC™ Product

4.3.6.2. Peripherals

Connector: Six (6) Circuit Receptacle Housing

Molex 39-01-2060
AMP P/N 106527-6

Terminals: Female Contacts (sockets), Tin

Molex 39-00-0065
AMP P/N 106528-2 or 106529-2

Strain Relief: The strain relief shall not exceed a Maximum Form Factor of 0.85 inch wide x 0.75 inch high x 1.90 inch long, excluding integrated hinges and wire ties.

Molex 15-04-0296
AMP P/N 1375618-1

4.3.6.3. Bus Harness

Connector: Six (6) Circuit Plug Housing

Molex 39-01-2061
AMP P/N 794550-6 or 794542-6

Terminals: Male Contacts (pins), Tin

Molex 39-00-0067
AMP P/N 794578-1 or 794576-1

4.3.6.4. VMC Connector (Direct PCB Mount)

Vertical Header: Male Contacts (pins), Tin

Molex 39-28-1063
AMP P/N 794664-6

Right Angle Header: Male Contacts (pins), Tin

Molex 39-30-1060
AMP P/N 794448-1

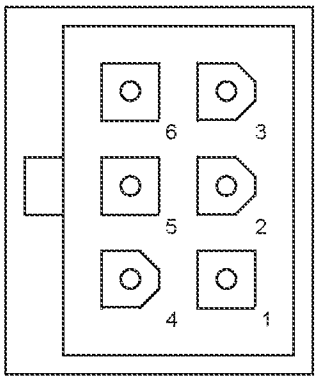
4.3.6.5. Approved Parts – Alternate Form Factors

Select applications may require connector configurations with alternate form factors. Alternate form factor connectors may be used provided they are:

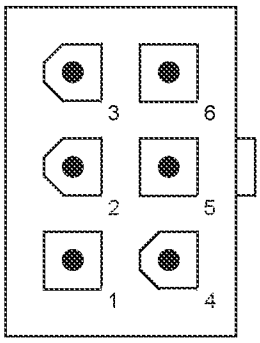
- provided by the Approved Suppliers listed
- part of the Approved Supplier Product Family portfolio
- intermateable with the approved connector part numbers listed
- meet the performance objectives set forth in this specification

Connector Pin-out:

Line 1 - 34 VDC
Line 2 - DC Power Return
Line 3 - N/C
Line 4 - Master Receive
Line 5 - Master Transmit
Line 6 - Communications Common

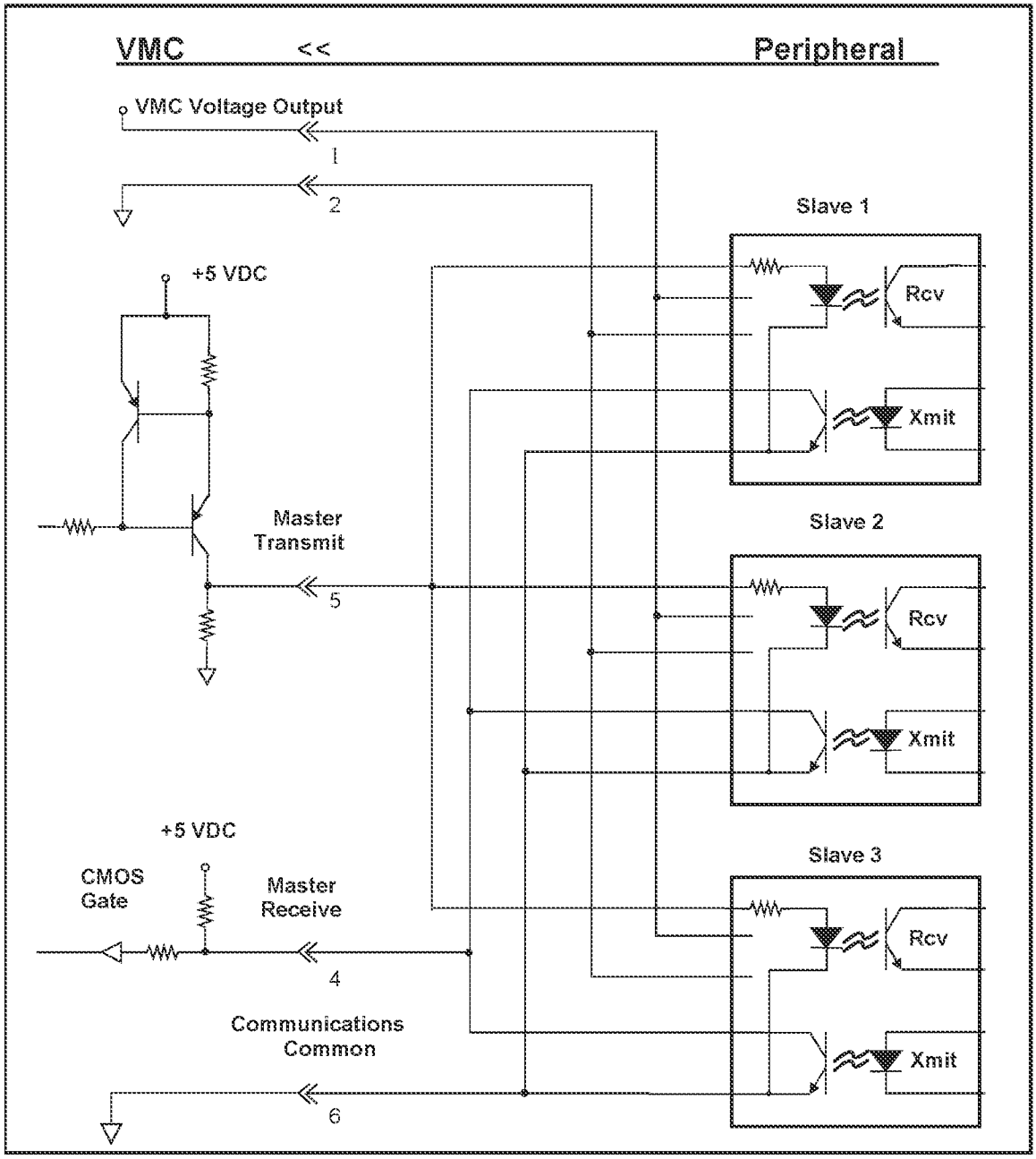


Peripheral Connector
Face View
Receptacle
(Sockets)



VMC / Bus Connector
Face View
Header
(Pins)

4.4 Example Schematic



Section 5
Coin Acceptor/Changer
VMC/Peripheral Communication Specifications

5.1 Introduction

This section defines the communication bytes sent and received by a coin accepting device ("Changer"). As defined in Section 2.3, the changer's address is 00001xxxB (08H).

Unless stated otherwise, all information is assumed to be in a binary format.

There are currently two levels of support defined for the coin mechanism interface, Level 2 and Level 3. The level of coin mechanism operation is sent to the VMC in the response to the STATUS command (defined later in this section). The following paragraphs will define how a VMC should differentiate between each level.

Level 2 Changers

For level 2 changers, VMC operation consists of monitoring inputs from the coin mechanism, accumulating credit, issuing a coin acceptance disable command when appropriate, and issuing appropriate payout commands based on the VMC resident payout algorithms and escrow rules.

Level 3 Changers

For level 3 changers, VMC operation is the same as defined above for level 2, with the addition of the EXPANSION command and its implications (defined later in this section). The VMC has the option of sending the EXPANSION command to the coin mechanism to determine the coin mechanism's manufacturer code, serial number, model/tuning revision, software version, and optional features. Based on the optional feature information the VMC will determine the appropriate operating mode (in other words, modes that both the coin mechanism and the VMC can support), enable any appropriate coin mechanism features by sending an appropriate feature enable command back to the coin mechanism, and enter the proper operating mode. This technique allows all VMCs and peripherals to accommodate existing feature capabilities and provides a means for upgrading Level 3 equipment.

5.2 VMC Commands

Command	Hex Code	Description
RESET	08H	Command for changer to self-reset
SETUP *	09H	Request for changer setup information.
TUBE STATUS	0AH	Request for changer tube status.
POLL	0BH	Request for changer activity status.
COIN TYPE	0CH	Signifies coin types accepted and allowable coin dispensing. This command is followed by setup data. See command format section.
DISPENSE	0DH	Command to dispense a coin type. Followed by coin type to dispense. See command format section.
EXPANSION COMMAND	0FH	Command to allow addition of features and future enhancements. Changers at feature level 2 do not support this command.

NOTE: An EXPANSION command is always followed by a "sub-command." This command allows for feature additions.

* In Version 1.0 & 2.0, **SETUP** was called **STATUS.**

5.3 VMC Command Format

VMC Command	Code	VMC Data
RESET	08H	No data bytes

This command is the vehicle that the VMC should use to tell the changer that it should return to its default operating mode. With the exception of the ACK response, it should abort all communication and disable all acceptance until otherwise instructed by the VMC.

The following initialization sequence is recommended for all new VMCs designed after July, 2000. It should be used after "power up", after issuing the RESET command, after issuing the Bus Reset (pulling the transmit line "active" for a minimum of 100 mS), or anytime a POLL command results in a "JUST RESET" response (i.e., peripheral self resets).

POLL – 08h
To obtain "JUST RESET" response

SETUP – 09h
To obtain changer level and configuration information

EXPANSION IDENTIFICATION – 0F 00h (Level 03+ only)
To obtain additional changer information and options

EXPANSION FEATURE ENABLE – 0F 01h (Level 03+ only)
To enable desired options

EXPANSION SEND DIAG STATUS – 0F 05h (Level 03+ & option b1 only)
To request the changer to report its current state of operation

TUBE STATUS – 0Ah (Note 1)
To obtain tube status / change information

COIN TYPE – 0Ch
To enable desired coin acceptance and disable manual coin payout if desired

Note 1 – A minimum 500 msec delay is required between a reset (regardless of type) and the first **TUBE STATUS** command for certain models of the existing MDB coin changer field base.

VMC Command	Code	Changer Response Data
SETUP	09H	23 bytes: Z1 - Z23

Z1 = Changer Feature Level - 1 byte

Indicates the feature level of the changer. This will distinguish the changers feature level to the VMC. Current defined levels:

Level 2: Supports "core" command set. These are: RESET, STATUS, TUBE STATUS, POLL, COIN TYPE, and DISPENSE. (Z1 = 02h)

Level 3: Supports level two and the EXPANSION command addition changer model number, manufacturer code, turning revision, etc. See the details of EXPANSION command later in this document. (Z1=03h)

Z2 - Z3 = Country / Currency Code - 2 bytes

The packed BCD country / currency code of the changer can be sent in two different forms depending on the value of the left most BCD digit.

If the left most digit is a 0, the International Telephone Code is used to indicate the country that the changer is set-up for. For example, the USA code is 00 01H (Z2 = 00 and Z3 = 01).

If the left most digit is a 1, the latest version of the ISO 4217 numeric currency code is used (see Appendix A1). For example, the code for the US dollar is 18 40H (Z2 = 18 and Z3 = 40) and for the Euro is 1978 (Z2 = 19 and Z3 = 78).

All new designs after July, 2000 must use the ISO 4217 numeric currency codes as listed in Appendix A1.

Z4 = Coin Scaling Factor - 1 byte

All accepted coin values must be evenly divisible by this number. For example, this could be set to 05H for the USA nickel.

Z5 = Decimal Places - 1 byte

Indicates the number of decimal places on a credit display. For example, this could be set to 02H in the USA.

Z6 - Z7 = Coin Type Routing - 2 bytes

Indicates what coin types can be routed to the Changer's tubes.

```
b15 b14 b13 b12 b11 b10 b9 b8 | b7 b6 b5 b4 b3 b2 b1 b0
Z6                                                Z7
```

Bit is set to indicate a coin type can be routed to the tube. Valid coin types are 0 to 15.

Z8 - Z23 = Coin Type Credit - 16 bytes

Indicates the value of coin types 0 to 15. Values must be sent in ascending order. This number is the coin's monetary value divided by the coin scaling factor. Unused coin types are sent as 00H. Unsent coin types are assumed to be zero. It is not necessary to send all coin types. Coin type credits sent as FFH are assumed to be vend tokens. That is, their value is assumed to worth one vend.

The bytes position in the 16 byte string indicates the coin type(s). For example, the first byte sent would indicate the value of coin type 0, the second byte sent would indicate the value of coin type 1, and so on. For example, the USA coin types may be; Coin type 0 = nickel, Coin type 1 = dime, Coin type 2 = quarter, Coin type 3 = dollar.

VMC Command	**Code**	**Changer Response Data**
TUBE STATUS	0AH	18 bytes: Z1 - Z18

Z1 - Z2 = Tube Full Status - 2 bytes

Indicates status of coin tube for coin types 0 to 15.

```
b15 b14 b13 b12 b11 b10 b9 b8 | b7 b6 b5 b4 b3 b2 b1 b0
Z1                                                Z2
```

A bit is set to indicate a full tube. For example, bit 7 = set would indicate the tube for coin type 7 is full.

Z3 - Z18 = Tube Status - 16 bytes

Indicates the greatest number of coins that the changer "knows" definitely are present in the coin tubes. A bytes position in the 16 byte string indicates the number of coins in a tube for a

particular coin type. For example, the first byte sent indicates the number of coins in a tube for coin type 0. Unsent bytes are assumed to be zero. For tube counts greater than 255, counts should remain at 255.

NOTE: If a changer can detect a tube jam, defective tube sensor, or other malfunction, it will indicate the tube is "bad" by sending a tube full status and a count of zero for the malfunctioning coin type.

VMC Command	Code	Changer Response Data
POLL	0BH	16 bytes: Z1 - Z16

Z1 - Z16 = Changer Activity - 16 bytes

Indicates the changer activity. If there is nothing to report, the changer should send only an ACK. Otherwise, the only valid responses are:

Coins Dispensed Manually:

Z1	Z2
(1yyyxxxx)	(zzzzzzzz)

yyy = The number of coins dispensed.
xxxx = The coin type dispensed (0 to 15)
zzzzzzzz = The number of coins in the tube.

Coins Deposited:

Z1	Z2
(01yyxxxx)	(zzzzzzzz)

yy = Coin routing. 00: CASH BOX
01: TUBES
10: NOT USED
11: REJECT

xxxx = Coin type deposited (0 to 15).

zzzzzzzz = The number of coins in the tube for the coin type accepted.

Status:

(00000001) = Escrow request[1] - An escrow lever activation has been detected.
(00000010) = Changer Payout Busy[2] - The changer is busy activating payout devices.

(00000011) = No Credit[1] - A coin was validated but did not get to the place in the system when credit is given.

(00000100) = Defective Tube Sensor[1] - The changer has detected one of the tube sensors behaving abnormally.

(00000101) = Double Arrival[1] - Two coins were detected too close together to validate either one.

(00000110) = Acceptor Unplugged[2] - The changer has detected that the acceptor has been removed.

(00000111) = Tube Jam[1] - A tube payout attempt has resulted in jammed condition.

(00001000) = ROM checksum error[1] - The changers internal checksum does not match the calculated checksum.

(00001001) = Coin Routing Error[1] - A coin has been validated, but did not follow the intended routing.

(00001010) = Changer Busy[2] - The changer is busy and can not answer a detailed command right now.

(00001011) = Changer was Reset[1] - The changer has detected an Reset condition and has returned to its power-on idle condition.

(00001100) = Coin Jam[1] - A coin(s) has jammed in the acceptance path.

(00001101) = Possible Credited Coin Removal[1] – There has been an attempt to remove a credited coin.

Note:
- changers must have a means to disable this code due to potential older VMC issues.
- virtually all VMCs designed prior to this code's introduction (10/16/02) will not support it.
- It is a vending machine system issue as to what is done when this code is received.

Slug:

(001xxxxx) = xxxxx is the number of slugs since the last activity.

NOTES: The Changer may send several of one type activity*, up to 16 bytes total. This will permit zeroing counters such as slug, inventory, and status.

1 Sent once each occurrence
2 Sent once each POLL

* Type activity is defined as Coins Dispensed Manually, Coins Deposited, Status, and Slug. All may be combined in a response to a POLL command providing the total number of bytes does not exceed 16. Note that Coins Dispensed Manually and Coins Deposited are dual byte codes.

File Transport Layer POLLed responses:

Note that all FTL responses are defined in Section 2.6. For the coin changer, the source address will always be the changer (08H) as defined in Section 2.3.

		Z1
1B	REQ TO RCV	The coin changer is requesting to receive data from a device or VMC. Z2 = Destination address of response Z3 = Source address of response (08H) Z4 = File ID Z5 = Maximum length Z6 = Control
1C	RETRY/DENY	The coin changer is requesting a device or VMC to retry or deny the last FTL command. Z2 = Destination address of response Z3 = Source address of response (08H) Z4 = Retry delay
1D	SEND BLOCK	The coin changer is sending a block of data (maximum of 31 bytes) to a device or VMC. Z2 = Destination address of data Z3 = Block # Z4-Z34 = Data (maximum of 31 bytes)
1E	OK TO SEND	The coin changer is indicating that it is OK for a device or VMC to send it data. Z2 = Destination address of response Z3 = Source address of response (08H)
1F	REQ TO SEND	The coin changer is requesting to send data to a device or VMC. Z2 = Destination address of response Z3 = Source address of response (08H) Z4 = File ID Z5 = Maximum length Z6 = Control

VMC Command	Code	VMC Data
COIN TYPE	0CH	4 bytes: Y1 - Y4

Y1 - Y2 = Coin Enable - 2 bytes

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y1															Y2

A bit is set to indicate a coin type is accepted. For example, bit 6 is set to indicate coin type 6, bit 15 is set to indicate coin type 15, and so on. To disable the changer, disable all coin types by sending a data block containing 0000H. All coins are automatically disabled upon reset.

Y3 - Y4 = Manual Dispense Enable - 2 bytes

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y3															Y4

A bit is set to indicate dispense enable. For example, bit 2 is set to enable dispensing of coin type 2. This command enables/disables manual dispensing using optional inventory switches. All manual dispensing switches are automatically enabled upon reset.

VMC Command	Code	VMC Data
DISPENSE	0DH	1 byte: Y1

b7	b6	b5	b4	b3	b2	b1	b0
							Y1

Bits b3, b2, b1, b0 indicate coin type to be dispensed. Valid codes are 0H to FH to indicate coin types 0 to 15.

Bits b7, b6, b5, b4 indicate the number of coins to be dispensed.

NOTE 1: If two coin types have the same value, the highest coin type should be paid out first.

NOTE 2: There is no defined limit on how long the actual dispense takes since the command allows for up to 15 coins to be paid out. The payout cycle begins when the changer ACKs the VMC's DISPENSE (0DH) command. This cycle typically lasts a minimum of 100 mS and ends when the changer stops dispensing the desired number of coins. VMCs should monitor the Changer Payout Busy response to the POLL command to determine when the entire payout cycle is completed.

However, it must be noted that other than ACKing the DISPENSE (0DH) command, the changer does not have to respond during the payout cycle provided the payout cycle is less than the changer's non-response time and the changer starts responding again prior to the end of the non-response time. Thus, it is acceptable for the changer to never report Changer Payout Busy, but simply start ACKing the POLL commands upon completion of a payout cycle provided the non-response time has not been exceeded.

LEVEL THREE CAPABILITIES - EXPANSION COMMAND

The following describes the currently defined expansion commands.

Sub-command 00H is used for a changer that has the capability of reporting model number, serial number, and so on.

VMC Command	Code	Sub-Command	Changer Response Data
EXPANSION COMMAND	0FH	00H IDENTIFICATION	33 bytes: Z1 - Z33

Z1 - Z3 = Manufacturer Code - 3 bytes
Identification code for the equipment supplier. Sent as ASCII characters. Currently defined codes are listed in the **EVA** document entitled "***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z4 - Z15 = Serial Number - 12 bytes

Factory assigned serial number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z16 - Z27 = Model #/Tuning Revision - 12 bytes

Manufacturer assigned model number and tuning number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable. Each manufacturer should include information concerning the changer tuning revision.

Z28 - Z29 = Software Version - 2 bytes

Current software version. Must be sent in packed BCD.

Z30 - Z33 = Optional Features - 4 bytes

Each of the 32 bits indicate an optional features availability. If the bit is set the feature is available. Bits should be sent in descending order, i.e. bit 31 is sent first and bit 0 is sent last. Currently defined options are:

b0 - Alternative Payout method. This method allows changer designs that determine change payout. That is, the payout algorithm may reside in the changer instead of the VMC.

b1 - Extended Diagnostic command supported. This command allows the VMC to request diagnostic status of the coin changer.

b2 - Controlled Manual Fill and Payout commands supported. These commands allows the VMC to request the number of coin inserted or dispensed while the changer was in a controlled manual fill or payback mode.

b3 - File Transport Layer (FTL) supported as defined in Section 2.6.

b4 - b31 Available for future use

VMC Command	Code	Sub-Command	VMC Data
EXPANSION COMMAND	0FH	01H FEATURE ENABLE	4 bytes: Y1 - Y4

This command is used to enable each of the optional features defined in Z30-Z33 above. To enable a feature a bit is set to one. **All optional features are disabled after reset.**

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND (Alternative Payout)	0FH	02H PAYOUT	Y1	None

Y1 = Value of coins to be paid out - 1 byte

This value is expressed as the number of coin scaling factors that would sum to the value. For example, in a USA system using a scaling factor of 05, if the change to be paid out is 75 cents, then Y1 will equal fifteen. That is, the sum of fifteen nickels equal 75 cents. The coin changer will determine which actual denominations of coins will be paid out. In the 75 cent example, the coins may be 3 quarters; or, 7 dimes & 1 nickel; or, 2 quarters & 2 dimes & 1 nickel, etc.

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND (Alternative Payout)	0FH	03H PAYOUT STATUS	None	16 bytes: Z1-Z16

Z1 - Z16 = Number of each coin type paid out - 16 bytes

This is the changer's response to the last VMC Alternative PAYOUT command (0FH-02H). Bytes are sent in ascending order of coin types. A bytes position in the string indicates the coin type. That is, byte one is the number of coins for coin type 1, byte two is the number of coins for coin type two, and so on. Unsent bytes are assumed to be zero.

The changer clears payout data after an ACK response from the VMC.

The VMC should compare the value of the coins paid out to the (0FH-02H) Alternative PAYOUT command's Y1.

NOTES: 1) If the changer's payout is busy it will respond to the Alternative PAYOUT STATUS command with an ACK only.

2) If no coins have been paid out, at least one zero valued data byte must be sent.

3) There is no defined limit on how long the actual payout takes. See Note 2 under the DISPENSE (0DH) command.

VMC Command	Code	Sub-command	Changer Response Data
EXPANSION COMMAND (Alternative Payout)	0FH	04H PAYOUT VALUE POLL	1 byte: Z1

Z1 = Changer Payout Activity - 1 byte

An interval value (scaled) which indicates the amount of paid out change since the previous PAYOUT VALUE POLL (or between the initial Alternative PAYOUT command (0FH-02H) and the first PAYOUT VALUE POLL).

An 00H response indicates no coins were paid out since the previous PAYOUT VALUE POLL (or the initial Alternative PAYOUT command (0FH-02H)).

An ACK only indicates that the change payout is finished. This should be followed by the PAYOUT STATUS command (0FH-03H) to obtain the complete payout data.

NOTE: The initial intent of this command is to determine the amount of change paid out so that the credit display can be decremented as coins are dispensed.

VMC Command	Code	Sub-Command	Changer Response Data
EXPANSION COMMAND	0FH	05H SEND DIAGNOSTIC STATUS	2 bytes: Z1-Z2

Send Current Diagnostic Status - This command requests the changer to report its current state of operation. The VMC should periodically transmit the command approximately every 1 to 10 seconds.

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Z1-Z2 = Current changer diagnostic information

The changer reports its current state of operation in a 2 byte code. Z1 is the main code and Z2 is the sub-code. The code is reported as long as the condition exists and stops being reported as soon as the condition does not exist. Multiple 2 byte codes may be sent in response to a single command which could result in a maximum of eight 2 byte codes (16 bytes total).

The following tables identify the currently defined extended diagnostic codes:

Z1 / Z2	Status	Cause(s) of Status / Error
01 / 00	Powering up	Changer powering up / initialization
02 / 00	Powering down	Changer powering down
03 / 00	OK	Changer fully operational and ready to accept coins
04 / 00	Keypad shifted	MODE key pressed and held so that LED flashes indicating keypad in shifted state. Reverts to normal mode if no key pressed for 15 seconds
05 / 10	Manual Fill / Payout active	Manual Fill or Manual Payout mode of operation in progress (under control of the changer). This response must be reported at least once to allow the VMC to request a manual fill or manual payout report.
05 / 20	New Inventory Information Available	Changer not in Manual inventory mode, but new inventory information available.
06 / 00	Inhibited by VMC	All coin acceptance inhibited at request of VMC, possibly due to product dispenser jams, completely sold out, etc.
10 / Z2	General changer error	Z2 defined as: **00** Non specific error. **01** Check sum error #1. A check sum error over a particular data range of configuration field detected. **02** Check sum error #2. A check sum error over a secondary data range or configuration field detected. **03** Low line voltage detected. The changer has disabled acceptance or payout due to a low voltage condition.

Z1 / Z2	Status	Cause(s) of Status / Error
11 / Z2	Discriminator module error	Z2 defined as: **00** Non specific discriminator error. **10** Flight deck open. **11** Escrow Return stuck open. **30** Coin jam in sensor. **41** Discrimination below specified standard. **50** Validation sensor A out of range. The acceptor detects a problem with sensor A. **51** Validation sensor B out of range. The acceptor detects a problem with sensor B. **52** Validation sensor C out of range. The acceptor detects a problem with sensor C. **53** Operating temperature exceeded. The acceptor detects the ambient temperature has exceeded the changer's operating range, thus possibly affecting the acceptance rate. **54** Sizing optics failure. The acceptor detects an error in the sizing optics.
12 / Z2	Accept gate module error	Z2 defined as: **00** Non specific accept gate error. **30** Coins entered gate, but did not exit. **31** Accept gate alarm active. **40** Accept gate open, but no coin detected. **50** Post gate sensor covered before gate opened.
13 / Z2	Separator module error	Z2 defined as: **00** Non specific separator error **10** Sort sensor error. The acceptor detects an error in the sorting sensor.
14 / Z2	Dispenser module error	Z2 defined as: **00** Non specific dispenser error.
15 / Z2	Coin Cassette / tube module error	Z2 defined as: **00** Non specific cassette error. **02** Cassette removed. **03** Cash box sensor error. The changer detects an error in a cash box sensor. **04** Sunlight on tube sensors. The changer detects too much ambient light on one or more of the tube sensors.

Diagnostic Status EVA-DTS Correlation

The Extended Diagnostic information reported may be used by the vending machine controller as desired (i.e., service mode displays); however, **EVA-DTS** data elements could also be used for reporting to a host system. Examples are:

- Via a translation of the Z1/Z2 code to one of the **Fault Lists** as described in Section 10 of the **EVA-DTS**.

- Via the EA201 Event Identification element with the format **EAxxyy** where xx = Z1 and yy = Z2.

- Via a customer / manufacture specific coding scheme using the **MA5xx** fields.

VMC Command	Code	Sub-Command	Changer Response Data
EXPANSION	0FH	06H	16 bytes Z1-Z16
COMMAND	SEND CONTROLLED MANUAL FILL REPORT		

Send Controlled Manual Fill Report - This command requests the changer to report the number of coins inserted during a changer controlled manual fill (controlled bulk fill) mode. While in this mode, the changer must not report coins inserted in response to the **POLL** command.

Z1-Z16 = number of controlled manual mode filled coins (by coin type)

A single byte is reported for each coin type, 0 to 15. For example, Z1 = number of coins of coin type 0 added in a controlled manual fill mode. Any amount above 255 will be reported as 255, i.e. it will reach a maximum limit.

Only coin types *supported* are required to be reported. Counts for unsent coins types will be assumed to be unchanged.

Notes: After power on, changer reset, closing of the machine door, or a change in controlled manual fill status in the changer (changer indicated it was in controlled manual fill mode via CM0510 then changed to any other state) the machine should request the controlled manual coin fill data from the changer using the above command.

See EVA-DTS correlation at end of **SEND CONTROLLED MANUAL PAYOUT REPORT** (0F-07H) command.

VMC Command	Code	Sub-Command	Changer Response Data
EXPANSION	0FH	07H	16 bytes Z1-Z16
COMMAND	SEND CONTROLLED MANUAL PAYOUT REPORT		

Send Controlled Manual Payout Report - This command requests the changer to report the number of coins dispensed during a changer controlled manual payout (controlled bulk dispense) mode. Note that this does not include the coins dispensed via the individual dispense switches.

If the new Controlled Manual Fill / Payout command is implemented in the coin mech **and** enabled by the VMC (0Fh, 01h, bit 2 of Y1 to Y4), while in a controlled manual payout (dispense) mode, the changer **must not** report the coins paid out in response to the **POLL** command. Conversely, if the changer does not support the new command or the VMC does not enable it, the changer **should** report the coins paid out in response to the **POLL** command.

Z1-Z16 = number of controlled manual mode dispensed coins (by coin type)

A single byte is reported for each coin type 0 to 15. For example, Z1 = number of coins of coin type 0 dispensed in a controlled manual payout mode. Any amount above 255 will be reported as 255, i.e. it will reach a maximum limit.

Only coin types supported are required to be reported. Counts for unsent coin types will be assumed to be unchanged.

Note: After power on, changer reset, closing of the machine door, or a change in controlled manual payout status in the changer (changer indicated it was in controlled manual payout mode via CM0510 then changed to any other state) the machine should request the controlled manual coin payout data from the changer using the above command.

Controlled Manual Fill / Payout EVA-DTS Correlation

The controlled manual fill and payout coin information may be used by the vending machine controller as desired (i.e., service mode displays); however, **EVA-DTS** data elements could be used for reporting to a host system. Examples are:

	CA3XX	CA4XX	CA1704	CA1705
Controlled Manual Fill	**0F06**	**n/a**	**0F06**	**n/a**
VMC Tube Fill	**VMC**	**n/a**	**VMC**	**n/a**
Controlled Manual Payout	**n/a**	**0F07***	**n/a**	**0F07***
VMC Coin Payout	**n/a**	**VMC**	**n/a**	**VMC**
Manual Dispense Switches	**n/a**	**0B**	**n/a**	**0B**

*If extended **0F06** & **0F07** commands are implemented.
If extended **0F06** & **0F07** commands are not implemented in the coin mech or not enabled by the VMC, the coin mech will respond to the **POLL** command with the controlled manual payout coins.

With the above, the **CA3XX** & **CA4XX** fields can continue to be the primary fields for cash audit and the **CA1704** & **CA1705** fields can be used for indicating controlled manually filled / dispensed coins.

Coin Tube Audit Fields

As a reference, below are the agreed **CA17XX** data elements that provide detailed coin tube count information and controlled-manual coin tube insertion / dispense information. These were approved by the **EVA - DTS** Technical Sub Committee on January 27, 1997.

Block Identifier Reference	Data Contents	Charac-teristic	Length Min	Length Max	Element
CA17	**Coin Type Number (per MDB coin type)**	**N**	**01**	**03**	**CA1701**
	Value of Coin	**N**	**01**	**08**	**CA1702**
	Number of Coins in Tube	**N**	**01**	**08**	**CA1703**
	Number of Coins Inserted during Controlled-Manual Fill	**N**	**01**	**08**	**CA1704**
	Number of Coins Dispensed during Controlled-Manual Payout	**N**	**01**	**08**	**CA1705**

Definitions:

CA1701 The coin type number as referred to in the MDB Interface Specification. If not an MDB system, the number represents the coin's position in the coin set starting with the lowest value coin accepted. Note if two or more vintage of the same coin is accepted, the oldest one is first.

For example, the Canadian coin types may be:

0 Old Nickel	3 Quarter
1 New Nickel	4 $1 Dollar
2 Dime	5 $2 Dollar

CA1702 The cash value of the coin (units base).

For example, the Canadian coin types would be:

Nickel	5	$1 Dollar	100
Dime	10	$2 Dollar	200
Quarter	25		

CA1703 The number of coins in the coin tube (or tubes if multiple tubes per coin) that are reported by the coin mech during normal vending operations. Note that this is the "best known tube count" and may be inaccurate if coins were manually added or removed by hand.

CA1704 The number of coins inserted while the changer was in a Controlled manual fill mode. Controlled manual fill indicates that the coins are being inserted under the control of the coin mech or VMC. Coins are not being loaded by hand through the tops of the tubes.

CA1705 The number of coins dispensed while the changer was in a controlled manual payout mode. Controlled manual payout indicates that the coins are being dispensed under the control of the coin mech or VMC. Coins are not being removed by hand by "dumping" the tubes.

VMC Command	Code Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH FAH **FTL** REQ TO RCV	Y1-Y5	Z1 - Zn (immediate or POLLed)

The VMC is requesting to receive data from the changer whose destination address will always be (08H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (08H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Block #
Z4 - Z34 = Data (maximum of 31 bytes)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (08H)
Z4 = Retry delay

VMC Command	Code Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH FBH **FTL** RETRY / DENY	Y1-Y3	None

The VMC is retrying, denying, or aborting a data transfer to/from the changer whose destination address will always be (08H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (08H)
Y2 = Source address of command
Y3 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH	FCH FTL SEND BLOCK	Y1-Y33	None

The VMC is sending data to the changer whose destination address will always be (08H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command & data (08H)
Y2 = Block #
Y3 - Y33 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH	FDH FTL OK TO SEND	Y1-Y2	Z1-Z34 (immediate or POLLed)

The VMC is indicating that it is OK for the changer to transfer data. The destination address will always be the changer (08H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (08H)
Y2 = Source address of command

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Source address of data
Z4 - Z34 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH	FEH FTL REQ TO SEND	Y1-Y5	Z1 (immediate or POLLed)

The VMC is requesting to send data to the changer whose destination address will always be (08H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (08H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1EH which indicates OK TO SEND
Z2 = Destination address of response
Z3 = Source address of response (08H)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (08H)
Z4 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Changer Response
EXPANSION COMMAND	0FH	FFH DIAGNOSTICS	Y1-Yn	Z1-Zn

Y1 - Yn = Device manufacturer specific instruction for implementing various manufacturing or test modes. Y1 - Yn implies that any number of bytes can be used for the VMC data to the peripheral.

Z1 - Zn = Device manufacturer specific responses after receiving manufacturing or test instructions. Z1 - Zn implies that any number of bytes can be used for the changer response data from the peripheral.

5.4 Changer Non-Response Time

The maximum non-response time for the changer is two seconds.

5.5 Changer Power Requirements

The current draw for any changer must fall within the following limits. All measurements are at the minimum VMC Voltage Output.

Idle mode	=	200 mA. (max.) continuous
Coin acceptance	=	1.8 A. (max.) for up to 2 seconds (For coin changers using solenoid based payout mechanisms - typical of 3 tube changers sold in the US market. Vending machines sold into the US market are required to supply this power.) 1.0A. (max.) for up to 2 seconds (For coin changers using motorized payout mechanisms - typical of 4 tube changers.)
Coin payout	=	3.6 A. (max.) for 100 mS. with 400 mS. idle current between pulses during the coin payout cycle. (For coin changers using solenoid based payout mechanisms - typical of 3 tube changers sold in the US market. Vending machines sold into the US market are required to supply this power.) 1.8 A. (max.) during the coin payout cycle. (For coin changers using motorized payout mechanisms - typical of 4 tube changers.

See Note 2 under the DISPENSE (0DH) command for further information on the coin payout cycles.)

Note: If both peripherals are supported, vending machines should be able to provide sufficient power to simultaneously supply the above power requirements for both the coin changer **Coin Acceptance** and bill validator **Bill Transport** as specified in Section 6.5.

5.6 Coin Acceptor/Changer Examples

Event	Exchange
Power up at VMC or JUST RESET received by VMC any other time without reset sequence	Reset sequence Enable sequence
Enter service mode	Disable sequence
Enter sales mode	Enable sequence
Consumer inserts coin	Coin Accept sequence
Credit acceptance is suspended (max. vend price achieved, free vend token accepted, etc.)	Disable sequence
Coins are dispensed	Disable sequence Dispense sequence Enable sequence
Error situation is detected at coin mech.	Error sequence
Manual dispense of coins at coin mech. (only while door is open)	Manual Dispense sequence
Manual filling of coins at coin mech.	Manual Filling sequence

Reset sequence

VMC		Coin Mechanism	Comments
RESET	→		Reset command
	←	ACK	
POLL	→		Allow peripheral to confirm RESET command
	←	JUST RESET	
ACK	→		
STATUS	→		Collect operational parameters
	←	COIN MECH. CONFIG.	
ACK	→		
EXPANSION/ID	→		Collect asset inf. and options list
	←	COIN MECH. ID	
ACK	→		
EXPANSION/ FEATURE ENABLE	→		Enable compatible options
	←	ACK	

Error sequence

VMC		Coin Mechanism	Comments
POLL	→		
	←	STATUS/ERROR	Error sent from coin mech.
ACK	→		

Enable sequence			
VMC		Coin Mechanism	Comments
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		
COIN TYPE ENABLE	→		Enable appropriate coin types
	←	ACK	

Disable sequence			
VMC		Coin Mechanism	Comments
COIN TYPE ENABLE	→		Disable all coin types
	←	ACK	

Coin Accepted	sequence		
VMC		Coin Mechanism	Comments
POLL	→		
	←	COINS DEPOSITED	Coin type, routing, and tube count
ACK	→		

Coin dispense sequence	VMC algorithm		
VMC		Coin Mechanism	Comments
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		
DISPENSE	→		Pay out first coin
	←	ACK	
POLL	→		Check to make sure coin pay out is complete
	←	PAY OUT BUSY	
ACK	→		
	.		
	.		
	.		
POLL	→		Changer confirms coin pay out complete
	←	ACK	
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		
DISPENSE	→		Pay out second coin etc.
	←	ACK	

Coin dispense sequence	Alternative pay out method		
VMC		Coin Mechanism	Comments
EXPANSION/ ALT. PAY OUT	→		Report value to be paid out
	←	ACK	
EXPANSION/ ALT. PAY OUT VALUE POLL	→		Request paid value
	←	VALUE PAID	"value" paid since last VALUE POLL (may be 00)
ACK	→		
	.		
	.		
	.		
EXPANSION/ ALT. PAY OUT VALUE POLL	→		Request paid value
	←	ACK	Pay out is complete
EXPANSION/ ALT. PAY OUT STATUS	→		Request pay out status
	←	COINS PAID	Itemization of coins paid
ACK	→		
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		

Manual dispense sequence			
VMC		Coin Mechanism	Comments
POLL	→		
	←	COINS DISPENSED MANUALLY	Number, type, and tube levels for coin just manually dispensed
ACK	→		
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		

Manual fill sequence			
VMC		Coin Mechanism	Comments
EXPANSION COMMAND (Send controlled manual fill report)	→		
	←	NUMBER OF CONTROLLED MANUAL MODE FILLED COINS	Number for coins manually filled, only possible, if the changer supports extended diagnostics and/or controlled manual filled and payout reports (at least b2 set in the options bytes)
ACK	→		
TUBE STATUS	→		Update current tube status counters
	←	TUBE STATUS	
ACK	→		

Section 6
Bill Validator / Recycler
VMC/Peripheral Communication Specifications

6.1 Introduction

This section defines the communication bytes sent and received between a Bill Validator / Recycler and the VMC. In the text below, all references to "bill validator" includes the optional bill recycler except where expressly noted.

As defined in Section 2.3, the bill validator's address is 00110xxxB (30H).

Unless stated otherwise, all information is assumed to be in a binary format.

There are currently two levels of support defined for the bill validator interface, Level 1 and Level 2. The level of bill validator operation is sent to the VMC in the response to the STATUS command (defined later in this section). The following paragraphs will define how a VMC should differentiate between each level.

Level 1 Bill Validators

Level 1 bill validators support all standard functions, but do not support any optional features.

Level 2 Bill Validators

Level 2 bill validators support all standard functions plus various optional features as defined in Section 6.3 under the Expansion command 37-02H. Based on the optional feature information the VMC will determine the appropriate operating mode (in other words, modes that both the bill validator and the VMC can support), enable any appropriate features by sending an appropriate feature enable command back to the bill validator, and enter the proper operating mode. This technique allows all VMCs and peripherals to accommodate existing feature capabilities and provides a means for upgrading Level 2 equipment.

Level 2 bill validator / recyclers will also support all standard functions plus the optional recycling feature as defined in Section 6.3 under the Expansion command 37-02H. Additional commands 37-03H through 37-09H allow control of the bill recycler. **The unit should NOT respond to any Recycler/Dispensor commands or send any Recycler POLL responses unless the Bill Recycler expansion commands are enabled by the VMC (b1=1) and the VMC has request the DISPENSER SETUP (37 03) command.**

6.2 VMC Commands

Command	Hex Code	Description
RESET	30H	Command for bill validator to self-reset.
SETUP *	31H	Request for bill validator setup information.
SECURITY	32H	Sets Validator Security Mode
POLL	33H	Request for Bill Validator activity Status.
BILL TYPE	34H	Indicates Bill Type enable or disable. Command is followed by set-up data. See command format.
ESCROW	35H	Sent by VMC to indicate action for a bill in escrow.
STACKER	36H	Indicates stacker full and the number of bills.
EXPANSION COMMAND	37H	Command to allow addition of features and future enhancements. Level 1 and above bill validators must support this command.

NOTE: The expansion command is always followed by a sub-command.

* In Version 1.0 & 2.0, **SETUP** was called **STATUS.**

6.3 VMC Command Format

VMC Command	Code	VMC Data
RESET	30H	No data bytes

This command is the vehicle that the VMC should use to tell the validator that it should return to its default operating mode. It should reject any bills in the validation process, return any bills in the escrow position, and disable all other activity until otherwise instructed by the VMC.

The following initialization sequence is recommended for all new VMCs designed after July, 2000. It should be used after "power up", after issuing the RESET command, after issuing the Bus Reset (pulling the transmit line "active" for a minimum of 100 mS), or anytime a POLL command results in a "JUST RESET" response (i.e., peripheral self resets).

POLL – 33h
To obtain "JUST RESET" response

SETUP – 31h
To obtain bill validator level and configuration information

EXPANSION IDENTIFICATION – 37 00h (Level 01+)
To obtain additional bill validator information

EXPANSION IDENTIFICATION w/ OPTION BITS – 37 02h (Level 02+ only)
To obtain additional bill validator information and options

EXPANSION FEATURE ENABLE – 37 01h (Level 02+ only)
To enable desired options

STACKER – 36h
To obtain stacker status and number of bills

BILL TYPE – 34h
To enable desired bill acceptance and desired bill escrow capability

VMC Command	Code	Validator Response Data
SETUP	31H	27 bytes: Z1 - Z27

Z1 = Bill Validator Feature Level - 1 byte
Indicates current feature level of the bill validator. Currently defined levels are:

Level **1** - does not support option bits (Z1 = 01h)
Level **2** - supports option bits (Z1 = 02h)

Z2 - Z3 = Country / Currency Code - 2 bytes
The packed BCD country / currency code of the bill validator can be sent in two different forms depending on the value of the left most BCD digit.

If the left most digit is a 0, the International Telephone Code is used to indicate the country that the validator is set-up for. For example, the USA code is 00 01H (Z2 = 00 and Z3 = 01).

If the left most digit is a 1, the latest version of the ISO 4217 numeric currency code is used (see Appendix A1). For example, the code for the US dollar is 18 40H (Z2 = 18 and Z3 = 40) and for the Euro is 1978 (Z2 = 19 and Z3 = 78).

All new designs after July, 2000 must use the ISO 4217 numeric currency codes as listed in Appendix A1.

Z4 - Z5 = Bill Scaling Factor - 2 bytes
All accepted bill values must be evenly divisible by this number. For example, this could be set to 0064H for the USA.

Z6 = Decimal Places - 1 byte
Indicates the number of decimal places on a credit display. For example, this could be set to 02H for the USA.

Z7 - Z8 = Stacker Capacity - 2 bytes
Indicates the number of bills that the stacker will hold. For example, 400 bill capacity = 0190H.

Z9 - Z10 = Bill Security Levels - 2 bytes
Indicates the security level for bill types 0 to 15. Since not all validators support multiple security levels, validators that do not have this feature must report a "high" security level.

Z11 = Escrow/No Escrow - 1 byte
Indicates the escrow capability of the bill validator. If Z11 = 00H, the bill validator does not have escrow capability. If Z11 = FFH, the bill validator has escrow capability.

Z12 - Z27 = Bill Type Credit - 16 bytes
Indicates the value of the bill types 0 to 15. Values must be sent in ascending order. This number is the bill's monetary value divided by the bill scaling factor. Unused bill types are sent as 00H. Unsent bill types are assumed to be zero. FFH bills are assumed to be vend tokens.

VMC Command	Code	VMC Data
SECURITY	32H	2 Bytes: Y1 - Y2

Y1 - Y2 = Bill Type(s) - 2 bytes

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y1								Y2							

A bit is set to indicate the type of bill(s) which are set to a "high" security level. Note that validators that do not support dual security levels should report a "high" security level in the response bytes Z9-Z10 to the STATUS (31H) command.

VMC Command	Code	Validator Response Data
POLL	33H	16 bytes: Z1 - Z16

Z1 - Z16 = Bill Validator Activity - 16 bytes

Indicates the validator activity, for example, the type and number of bills accepted, stacker position, recycler actions, or error conditions. If there is nothing to report, the validator should send only an ACK. Otherwise, the only valid responses are:

Bills Accepted:

Indicates the type and number of bills accepted, validator stacker status, or recycler status. The first four Bill Routing responses (yyy = 000 to 011) should be used to add or subtract credit. The last four Bill Routing responses (yyy = 100 to 111) are for audit information (EVS-DTS fields).

Z1
(1yyyxxxx)

yyy = Bill Routing;
- 000: BILL STACKED
- 001: ESCROW POSITION[2]
- 010: BILL RETURNED
- 011: BILL TO RECYCLER[1]
- 100: DISABLED BILL REJECTED
- 101: BILL TO RECYCLER – MANUAL FILL[1,3]
- 110: MANUAL DISPENSE[1]
- 111: TRANSFERRED FROM RECYCLER TO CASHBOX[1]

xxxx = Bill Type (0 to 15)

Notes:
1. These responses can only be sent if the Bill Recycler expansion commands are enabled by the VMC (b1=1) and the VMC has request the RECYCLER ENABLE (37 04) command.
2. A bill should not be considered secure unless the VMC gets the Bill Stacked or Bill To Recycler response.
3. If during manual fill mode a bill is put into the cashbox the validator/recycler must report a "BILL TO RECYCLER – MANUAL FILL" and "TRANSFERRED FROM RECYCLER TO CASHBOX".

(**Status** codes continued on next two pages)

Status: **Bill Validator (Only)**

(00000001) = Defective Motor[3] - One of the motors has failed to perform its expected assignment.

(00000010) = Sensor Problem[3] - One of the sensors has failed to provide its response.

(00000011) = Validator Busy[2] - The validator is busy and can not answer a detailed command right now.

(00000100) = ROM Checksum Error[3] - The validators internal checksum does not match the calculated checksum.

(00000101) = Validator Jammed[3] - A bill(s) has jammed in the acceptance path.

(00000110) = Validator was reset[1] - The validator has been reset since the last POLL.

(00000111) = Bill Removed[1] - A bill in the escrow position has been removed by an unknown means. A BILL RETURNED message should also be sent.

(00001000) = Cash Box out of position[3] - The validator has detected the cash box to be open or removed.

(00001001) = Validator Disabled[2] - The validator has been disabled, by the VMC or because of internal conditions.

(00001010) = Invalid Escrow request[1] - An ESCROW command was requested for a bill not in the escrow position.

(00001011) = Bill Rejected[1] - A bill was detected, but rejected because it could not be identified.

(00001100) = Possible Credited Bill Removal[1] – There has been an attempt to remove a credited (stacked) bill.

Note:
- validators must have a means to disable this code due to potential older VMC issues.
- virtually all VMCs designed prior to this code's introduction (10/16/02) will not support it.
- It is a vending machine system issue as to what is done when this code is received.

(010xxxxx) = Number of attempts to input a bill while validator is disabled.[1]

NOTE: The validator may send several of one type activity* up to 16 bytes total.

1 Sent once each occurrence.
2 Sent once each POLL.
3 Sent once each occurrence. The validator is then disabled until the condition is removed. Validator will respond with validator disabled until repaired or replaced.

* Type activity is defined as Bills Accepted and Status. All may be combined in a response to a POLL command providing the total number of bytes does not exceed 16.

Status:	Bill Recycler (Only)
(00100001) =	Escrow request[1] - An escrow lever activation has been detected. If a button is present and activated.
(00100010) =	Dispenser Payout Busy[2] - The dispenser is busy activating payout devices.
(00100011) =	Dispenser Busy[2] - The dispenser is busy and can not answer a detailed command right now.
(00100100) =	Defective Dispenser Sensor[4] - The dispenser has detected one of the dispenser sensors behaving abnormally.
(00100101) =	Not Used
(00100110) =	Dispenser did not start / motor problem[4].
(00100111) =	Dispenser Jam[4] - A dispenser payout attempt has resulted in jammed condition.
(00101000) =	ROM checksum error[4] - The dispensers internal checksum does not match the calculated checksum. (If separate from validator microprocessor.)
(00101001) =	Dispenser disabled – dispenser disabled because of error or bill in escrow position.
(00101010) =	Bill waiting[2,5] – waiting for customer removal
(00101011) =	Not Used
(00101100) =	Not Used
(00101101) =	Not Used
(00101110) =	Not Used
(00101111) =	Filled key pressed[1] – The VMC should request a new DISPENSER STATUS.

NOTES: The dispenser may send several of one type activity, up to 16 bytes total include both bill validator and bill recycler. This will permit zeroing counters such as inventory and status. These responses can only be sent if the Bill Recycler expansion commands are enabled by the VMC (b1=1) and the VMC has request the DISPENSER SETUP (37 03) command.

1 Sent once each occurrence.
2 Sent once each POLL
3 Not used
4 Sent once each occurrence. The dispenser is then internally disabled until the condition is removed. If the validator can still be used. Dispenser will respond with dispenser disabled until the condition is removed. If the failure affects both the validator and dispenser it will respond with both validator disabled and dispenser disabled until the condition is removed.
5 VMC must monitor this flag along with the PAYOUT VALUE POLL command (alternate Poll (33H) and Payout Status (37H-09H) commands) to determine when the recycler dispense operations are complete, or if a bill is in the inlet waiting for a customer to remove it.

File Transport Layer POLLed responses:

Note that all FTL responses are defined in Section 2.6. For the bill validator, the source address will always be the validator (30H) as defined in Section 2.3.

Z1		
1B	REQ TO RCV	The bill validator is requesting to receive data from a device or VMC. Z2 = Destination address of response Z3 = Source address of response (30H) Z4 = File ID Z5 = Maximum length Z6 = Control
1C	RETRY/DENY	The bill validator is requesting a device or VMC to retry or deny the last FTL command. Z2 = Destination address of response Z3 = Source address of response (30H) Z4 = Retry delay
1D	SEND BLOCK	The bill validator is sending a block of data (maximum of 31 bytes) to a device or VMC. Z2 = Destination address of data Z3 = Block # Z4-Z34 = Data (maximum of 31 bytes)
1E	OK TO SEND	The bill validator is indicating that it is OK for the device or VMC to send it data. Z2 = Destination address of response Z3 = Source address of response (30H)
1F	REQ TO SEND	The bill validator is requesting to send data to a device or VMC. Z2 = Destination address of response Z3 = Source address of response (30H) Z4 = File ID Z5 = Maximum length Z6 = Control

VMC Command	Code	VMC Data
BILL TYPE	34H	4 bytes: Y1 - Y4

Y1 - Y2 = Bill Enable - 2 bytes

Indicates what type of bills are accepted.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y1															Y2

Bill types are 0 to 15. A bit is set to indicate acceptance of bill type.

NOTE: Sending 0000H disables the bill validator.

Y3 - Y4 = Bill Escrow Enable:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y3															Y4

Bill types are 0 to 15. A bit is set to indicate enable of escrow for a bill type.

NOTE: On power-up or reset all bill acceptance and escrow are disabled.

VMC Command	Code	VMC Data
ESCROW	35H	1 byte: Y1

Y1 = Escrow status - 1 byte

If Y1 = 0;	Return bill in the escrow position.
If Y1 = xxxxxxx1;	Stack the bill ("x" indicates don't care)

NOTE: After an ESCROW command the bill validator should respond to a POLL command with the BILL STACKED, BILL RETURNED, INVALID ESCROW or BILL TO RECYCLER message within 30 seconds. If a bill becomes jammed in a position where the customer may be able to retrieve it, the bill validator should send a BILL RETURNED message.

It is the responsibility of the VMC to stack or return any bills in escrow PRIOR to issuing the DISPENSE BILL or DISPENSE VALUE message. Leaving a bill in escrow position may lead to failed recycler operations.

VMC Command	Code	Validator Response Data
STACKER	36H	2 bytes: Z1 - Z2

Indicates stacker full condition and the number of bills in the stacker.

Z1 Z2

(Fxxxxxxx) (xxxxxxxx)
F = 1 if stacker is full, 0 if not.

xxxxxxxxxxxxxxx = The number of bills in the stacker.

LEVEL ONE and TWO+ CAPABILITIES - EXPANSION COMMAND

In order to allow existing VMCs to operate with original Level 1 or new Level 2 bill validators, a separate identification sub-command has been introduced to handle the additional 4 bytes of Option Bit information.

The original sub-command 00H is used for obtaining Z1 to Z29 identification information from bill validators. This information includes the model number, serial number, software version, etc, but **not the option bits**. Note that if a Level 2+ bill validator is sent the 00H sub-command, it must **not** report the Z30 to Z33 option bytes.

Sub-command 01H is used for Level 2+ bill validators to enable option bits reported in the expansion command 02H sub-command below.

The new sub-command 02H is used for obtaining Z1 to Z33 identification information from Level 2+ bill validators. This information includes the model number, serial number, software version, etc, and the **option bits (Z30-Z33).**

VMC Command	Code Sub-Command	Validator Response Data
EXPANSION	37H 00H	29 bytes: Z1 - Z29
COMMAND	LEVEL 1 IDENTIFICATION WITHOUT OPTION BITS	

Z1 - Z3 = Manufacturer Code - 3 bytes
Identification code for the equipment supplier. Sent as ASCII characters. Currently defined codes are listed in the **EVA** document entitled " ***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z4 - Z15 = Serial Number - 12 bytes
Factory assigned serial number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z16 - Z27 = Model #/Tuning Revision - 12 bytes
Manufacturer assigned model number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z28 - Z29 = Software Version - 2 bytes
Current software version. Must be sent in packed BCD.

VMC Command	Code	Sub-Command	VMC Data
EXPANSION	37H	01H	4 bytes: Y1 - Y4
COMMAND	LEVEL 2+ FEATURE ENABLE		

This command is used to enable each of the Level 2+ optional features defined in the Level 2+ Identification response bytes Z30-Z33 below. To enable a feature a bit is set to one. **All optional features are disabled after reset.**

VMC Command	Code	Sub-Command	Validator Response Data
EXPANSION	37H	02H	33 bytes: Z1 – Z33
COMMAND	LEVEL 2+ IDENTIFICATION WITH OPTION BITS		

Z1 - Z3 = Manufacturer Code - 3 bytes
Identification code for the equipment supplier. Sent as ASCII characters. Currently defined codes are listed in the **EVA** document entitled " ***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z4 - Z15 = Serial Number - 12 bytes
Factory assigned serial number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z16 - Z27 = Model #/Tuning Revision - 12 bytes
Manufacturer assigned model number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z28 - Z29 = Software Version - 2 bytes
Current software version. Must be sent in packed BCD.

Z30 - Z33 = Optional Features - 4 bytes

Each of the 32 bits indicate an optional features availability. If the bit is set the feature is available. Bits should be sent in descending order, i.e. bit 31 is sent first and bit 0 is sent last. Currently defined options are:

b0 -	File Transport Layer (FTL) supported as defined in Section 2.6.
b1 -	Bill Recycling supported
b2 - b31	Available for future use

VMC Command	Code	Sub-Command	Recycler Response Data
EXPANSION COMMAND **(Bill Recycler)**	37H	03H RECYCLER SETUP	2 bytes: Z1 – Z2

Z1 – Z2 = Bill Type Routing - 2 bytes

Indicates what bill types can be routed to the Recycler dispenser.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Z1								Z2							

Bit is set to indicate a bill type can be routed to the dispenser. Valid bill types are 0 to 15.

VMC Command	Code	Sub-Command	VMC Data
EXPANSION COMMAND **(Bill Recycler)**	37H	04H RECYCLER ENABLE	19 bytes: Y1 – Y18

Y1 - Y2 = Manual Dispense Enable - 2 bytes

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y1								Y2							

A bit is set to indicate manual dispense enable. For example, bit 2 is set to enable manual dispensing of bill type 2. This command enables/disables manual dispensing using optional inventory switches. All manual dispensing switches are automatically disabled upon reset.

Y3 – Y18 = Bills Recycler Enabled - 16 bytes

Indicates which bills will be routed to the Recycler:
0 = Bill type disable
1 = Only High qualitybills are used
2 = Only High and Medium quality bills are used
3 = Use all possible bills (this is the recommended setting – the recycler will use its internal setting to determine what bill are put into the recycler)

Note: Y3 = Bill Type 0 while Y18 = Bill type 15

VMC Command	Code	Sub-Command	Recycler Response Data
EXPANSION COMMAND **(Bill Recycler)**	37H	05H BILL DISPENSE STATUS	34 bytes: Z1 – Z34

Z1 - Z2 = Dispenser Full Status - 2 bytes

Indicates status of dispenser for bill types 0 to 15.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Z1								Z2							

A bit is set to indicate a full dispenser. For example, bit 7 = set would indicate the dispenser for bill type 7 is full.

Z3 – Z34 = Bill Count - 32 bytes

Indicates the greatest number of bills that the dispenser "knows" definitely are present in the dispenser. A word (2 bytes) position in the 32 byte string indicates the number of bills in a dispenser for a particular bill type. For example, the first 2 bytes sent indicate the number of bills in a dispenser for dispenser type 0. Unsent bytes are assumed to be zero. For dispenser counts greater than 65535, counts should remain at 65535.

NOTE: If a dispenser can detect a dispenser jam, defective dispenser sensor, or other malfunction, it will indicate the dispenser is "bad" by sending a dispenser full status and a count of zero for the malfunctioning bill type.

VMC Command	Code	Sub-Command	VMC Data
EXPANSION COMMAND (Bill Recycler)	37H	06H DISPENSE BILL	3 bytes: Y1 – Y3

Y1 = Bill type to be dispensed

b7 b6 b5 b4 b3 b2 b1 b0

Bits b7, b6, b5, b4 = 0.
Bits b3, b2, b1, b0 indicate bill type to be dispensed.

Valid codes are 0H to FH to indicate bill types 0 to 15.

Y2 - Y3 = Number of bills to be dispensed of bill type defined in Y1

There is no defined limit on how long the actual dispense takes since the command allows for up to 65535 bills to be paid out. The payout cycle begins when the dispenser ACKs the VMC's DISPENSE BILL command. The VMC should wait at least 30 seconds per bill. If the VMC wants to stop the dispensing of bills it can send the CANCEL command.

The VMC must send the PAYOUT VALUE POLL message during the dispense operation to monitor payout, decrement the vendor display, and determine when the operation is complete. The VMC must also send the POLL command to determine if any bills are moved from the recycler to the cashbox or a bill is in the inlet waiting for a customer to remove it. After the dispense operation is complete the PAYOUT STATUS command must be sent to determine what bills were dispensed.

Only one payout operation (DISPENSE BILL or DISPENSE VALUE) may be active at one time. The bill validator is not expected to buffer additional dispense or payout commands while the current command is active. In addition, the VMC should not issue the DISPENSE BILL command if a bill is waiting to for customer removal or if any bills are in the escrow position.

VMC Command	Code	Sub-Command	VMC Data
EXPANSION COMMAND (Bill Recycler)	37H	07H DISPENSE VALUE	2 bytes: Y1, Y2

Y1 – Y2 = Value of bills to be paid out.

Y1 and Y2 are defined as the total value of bills to be paid out. This value is expressed as the actual credit value divided by the bill scaling factor. For example, in a USA system using a scaling factor of 100 (64H), if the change to be paid out is $15.00, then Y1 will equal 15. The bill dispenser will determine which actual denominations of bills will be paid out. In the

$15.00 example, the bills may be 3 $5 bills; or, 1 $10 bill & 1 $5 bill; or, 2 $5 bills & 5 $1 bills, etc. .

There is no defined limit on how long the actual dispense takes. The payout cycle begins when the dispenser ACKs the VMC's DISPENSE VALUE command. The VMC should wait at least 30 seconds per bill. If the VMC wants to stop the dispensing of bills it can send the CANCEL command.

The VMC must send the PAYOUT VALUE POLL message during the dispense operation to monitor payout, decrement the vendor display, and determine when the operation is complete. The VMC must also send the POLL command to determine if any bills are moved from the recycler to the cashbox or a bill is in the inlet waiting for a customer to remove it. After the dispense operation is complete the PAYOUT STATUS command must be sent to determine what bills were dispensed.

Only one payout operation (DISPENSE BILL or DISPENSE VALUE) may be active at one time. The bill validator is not expected to buffer additional dispense or payout commands while the current command is active. In addition, the VMC should not issue the DISPENSE BILL command if a bill is waiting to for customer removal or if any bills are in the escrow position.

VMC Command	**Code**	**Sub-Command**	**Recycler Response Data**
EXPANSION COMMAND **(Bill Recycler)**	37H	08H PAYOUT STATUS	32 bytes: Z1 – Z32

Z1 – Z32 = Number of each bill type paid out (2 bytes per bill type).

This is the dispenser's response to the last VMC DISPENSE BILL (37-06) or DISPENSE VALUE (37-07) command. Bytes are sent in ascending order of bill types. A byte's position in the string indicates the bill type. That is, bytes one and two are the number of bills for bill type 1, bytes three and four are the number of bills for bill type two, and so on. Unsent bytes above the bill types dispensed are assumed to be zero.

The dispenser clears payout data after an ACK response from the VMC.

The VMC should compare the value of the bills paid out to the VMC DISPENSE BILL (37-06) or DISPENSE VALUE (37-07) command.

NOTES: 1) If the dispenser's payout is busy it will respond to the PAYOUT STATUS command with an ACK only.

2) If no bills have been paid out, at least one zero valued data byte must be sent.

VMC Command	Code	Sub-Command	Recycler Response Data
EXPANSION COMMAND (Bill Recycler)	37H	09H PAYOUT VALUE POLL	2 bytes: Z1 – Z2

Z1 – Z2 = Dispenser Payout Activity - 2 bytes

An interval value (scaled) which indicates the amount of paid out bills since the previous PAYOUT VALUE POLL (or between the initial DISPENSE VALUE command and the first PAYOUT VALUE POLL).

A 00H response indicates no bills were paid out since the previous PAYOUT VALUE POLL (or the initial DISPENSE VALUE command).

An ACK only indicates that the bill payout is finished. This must be followed by the PAYOUT STATUS command to obtain the complete payout data.

NOTE: The initial intent of this command is to determine the amount of bills paid out so that the credit display can be decremented as bills are dispensed.

VMC Command	Code	Sub-Command	Recycler Response Data
EXPANSION COMMAND (Bill Recycler)	37H	0AH PAYOUT CANCEL	None

NOTE: The Recycler should stop the active payout function within 30 seconds. The VMC must continue to send the PAYOUT VALUE POLL until it receives an ACK indicating the payout is complete. The VMC must then send the PAYOUT STATUS to determine what bill were dispensed.

The VMC MUST issue this command if it implements any type of payout timeout.

VMC Command	Code	Sub-command	VMC Data	Validator Response
EXPANSION COMMAND	37H	FAH FTL REQ TO RCV	Y1-Y5	Z1 (immediate or POLLed)

The VMC is requesting to receive data from the bill validator whose destination address will always be (30H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (30H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Block #
Z4 - Z34 = Data (maximum of 31 bytes)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (30H)
Z4 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Validator Response
EXPANSION COMMAND	37H	FBH FTL RETRY / DENY	Y1-Y3	None

The VMC is retrying, denying, or aborting a data transfer to/from the bill validator whose destination address will always be (30H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (30H)
Y2 = Source address of command
Y3 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Validator Response
EXPANSION COMMAND	37H	FCH FTL SEND BLOCK	Y1-Y33	None

The VMC is sending data to the bill validator whose destination address will always be (30H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command & data (30H)
Y2 = Block #
Y3 - Y33 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Validator Response
EXPANSION COMMAND	37H	FDH FTL OK TO SEND	Y1-Y2	Z1-Z34 (immediate or POLLed)

The VMC is indicating that it is OK for the bill validator to transfer data. The destination address will always be the validator (30H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (30H)
Y2 = Source address of command

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Source address of data
Z4 - Z34 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Validator Response
EXPANSION COMMAND	37H	FEH FTL REQ TO SEND	Y1-Y5	Z1 (immediate or POLLed)

The VMC is requesting to send data to the bill validator whose destination address will always be (30H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (30H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1EH which indicates OK TO SEND
Z2 = Destination address of response
Z3 = Source address of response (30H)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (30H)
Z4 = Retry delay

VMC Command	Code	Sub-Command	VMC Data	Val Response
EXPANSION COMMAND	37H	FFH DIAGNOSTICS	Y1-Yn	Z1 - Zn

Y1 - Yn = Device manufacturer specific instruction for implementing various manufacturing or test modes. Y1 - Yn implies that any number of bytes can be used for the VMC data to the peripheral.

Z1 - Zn = Device manufacturer specific responses after receiving manufacturing or test instructions. Z1 - Zn implies that any number of bytes can be used for the bill validator response data from the peripheral.

6.4 Bill Validator / Recycler Non-Response Time

The maximum non-response time for the bill validator is five seconds.

6.5 Bill Validator / Recycler Power Requirements

The current draw for any bill validator must fall within the following limits. All measurements are at the minimum VMC Voltage Output.

Idle mode = 200 mA. (avg.) continuous

Bill transport = 2.5 A. (max.) up to 30 seconds

Bill dispense = 2.5 A. (max.) up to 30 seconds per bill

Note: If both peripherals are supported, vending machines should be able to provide sufficient power to simultaneously supply the above power requirements for both the bill validator **Bill Transport** and coin mechanism **Coin Acceptance** as specified in Section 5.5.

6.6 Bill Validator Examples

Event	Exchange
Power up at VMC or JUST RESET received by VMC any other time without reset sequence	Reset sequence Enable sequence
Mode switch activated, enter service mode	Disable sequence
Mode switch activated, enter sales mode	Enable sequence
Consumer inserts bill	Accept sequence
Bill in escrow position is stacked	Stack sequence
Bill in escrow position is returned	Return sequence
Error situation is detected at validator	Error sequence
Error situation is detected at validator/stacker	Stack control sequence
Bill dispense	Bill Dispense request
Value dispense	Value Payout request
Bill dispense with bill in escrow	Bill Dispense w/ Bill in Escrow
Value dispense with bill in escrow	Value Payout w/ Bill in escrow
Cancel dispense	Value Payout Cancelled
Multiple dispense	Multiple Dispense (or Payout) Requests

Reset sequence **VMC**		**Bill Validator**	**Comments**
RESET	→		Reset command
	←	ACK	
POLL	→		Allow peripheral to confirm RESET command
	←	JUST RESET	
ACK	→		
STATUS	→		Collect operational parameters
	←	VALIDATOR CONFIG.	
ACK	→		
SECURITY	→		Update bill security Levels (Optional)
	←	ACK	
EXPANSION/ID	→		Collect asset info.
	←	VALIDATOR ID	
ACK	→		
FEATURE ENABLE	→		
	←	ACK	
RECYCLER SETUP	→		If a recycler is available
	←	BILL ROUTING	
ACK	→		
RECYCLER ENABLE	→		If a recycler is available
	←	ACK	

Enable sequence			
Controller		**Bill Validator**	**Comments**
STACKER	→		Update stacker count
	←	BILL COUNT	
ACK	→		
BILL TYPE ENABLE	→		Enable appropriate
	←	ACK	bill types

Disable sequence			
Controller		**Bill Validator**	**Comments**
BILL TYPE ENABLE	→		Disable all bill
	←	ACK	types

Error sequence			
Controller		**Bill Validator**	**Comments**
POLL	→		
	←	STATUS/ERROR	Error sent from
ACK	→		Bill validator

Accept sequence	**Bill stacked**		
Controller		**Bill Validator**	**Comments**
POLL	→		
	←	BILL ACCEPTED	Bill type and routing
ACK	→		(ESCROW POSITION)
	.		
	.		
	.		
ESCROW	→		Send bill to stacker
	←	ACK	
	.		
	.		
	.		
POLL	→		
	←	BILL ACCEPTED	Bill type and routing
ACK	→		(BILL STACKED)

Accept sequence	**Bill returned**		
Controller		**Bill Validator**	**Comments**
POLL	→		
	←	BILL ACCEPTED	Bill type and routing
ACK	→		(ESCROW POSITION)
	.		
	.		
	.		

ESCROW	→		Return bill to consumer
	←	ACK	
	.		
	.		
	.		
POLL	→		
	←	BILL ACCEPTED	Bill type and routing (BILL RETURNED)
ACK	→		

Check stacker after Accept sequence		**Bill stacked**	
Controller		**Bill Validator**	**Comments**
POLL	→		
	←	BILL ACCEPTED	Bill type and routing (BILL STACKED)
ACK	→		
	.		
	.		
	.		
STACKER	→		Update stacker count
	←	BILL COUNT	
ACK	→		
BILL TYPE ENABLE	←		Disable all bill types, if stacker is full
	→	ACK	

Dispense Sequence			
Controller		**Bill Validator**	**Comments**
POLL	→		
	←	BILL WAITING	Inlet blocked, pending customer
ACK	→		
POLL	→		
	←	ACK	Inlet unblocked
DISPENSE BILL	→		Dispense # of bills
	←	ACK	
PAYOUT VALUE POLL	→		
	←	VALUE PAID	
ACK	→		
POLL	→		Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	←	ACK	
	•		Repeat last 2 commands
	•		
	•		
PAYOUT VALUE POLL	→		
	←	ACK	Payout Complete
PAYOUT STATUS	→		

ACK	← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts

Value Payout Controller		**Bill Validator**	**Comments**
POLL ACK	→ ← →	BILL WAITING	Inlet blocked, pending customer
POLL	→ ←	ACK	Inlet unblocked
DISPENSE VALUE	→ ←	ACK	Dispense Value
PAYOUT VALUE POLL ACK	→ ← →	VALUE PAID	
POLL	→ ←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	• • •		Repeat last 2 commands
PAYOUT VALUE POLL	→ ←	ACK	Payout Complete
PAYOUT STATUS ACK	→ ← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts

Dispense Sequence w/ bill in escrow Controller		**Bill Validator**	**Comments**
POLL ACK	→ ← →	BILL IN ESCROW	
	• • •		
ESCROW	→ ←	ACK	Return bill to consumer
	• • •		

POLL	→		
	←	BILL ACCEPTED	Bill type and routing
ACK	→		(BILL RETURNED)
POLL ACK	→ ← →	BILL WAITING	Inlet blocked, pending customer
POLL	→ ←	ACK	Inlet unblocked
DISPENSE BILL	→ ←	ACK	Dispense # of bills
PAYOUT VALUE POLL ACK	→ ← →	VALUE PAID	
POLL	→ ←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	• • •		Repeat last 2 commands
PAYOUT VALUE POLL	→ ←	ACK	Payout Complete
PAYOUT STATUS ACK	→ ← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts

Value payout w/ bill in escrow **Controller**		**Bill Validator**	**Comments**
POLL ACK	→ ← →	BILL IN ESCROW	
	• • •		
ESCROW	→ ←	ACK	Return bill to consumer
	• • •		
POLL	→		
	←	BILL ACCEPTED	Bill type and routing
ACK	→		(BILL RETURNED)
POLL	→ ←	BILL WAITING	Inlet blocked, pending customer

ACK	→		
POLL	→ ←	ACK	Inlet unblocked
DISPENSE VALUE	→ ←	ACK	Dispense value
PAYOUT VALUE POLL ACK	→ ← →	VALUE PAID	
POLL	→ ←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	• • •		Repeat last 2 commands
PAYOUT VALUE POLL	→ ←	ACK	Payout Complete
PAYOUT STATUS ACK	→ ← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts

Operation Cancelled **Controller**		**Bill Validator**	**Comments**
	• • •		Payout or dispense in progress
PAYOUT CANCEL	→ ←	ACK	Request to abort consumer
PAYOUT VALUE POLL ACK	→ ← →	VALUE PAID	
POLL	→ ←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	• • •		Repeat last 2 commands
POLL	→ ←	ACK	Inlet unblocked
PAYOUT STATUS ACK	→ ← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts

Multiple Operations

Controller		Bill Validator	Comments
POLL	→		
	←	BILL WAITING	Inlet blocked, pending customer
ACK	→		
POLL	→		
	←	ACK	Inlet unblocked
DISPENSE BILL	→		Dispense # of bills
	←	ACK	
	•		
	•		
	•		
PAYOUT VALUE POLL	→		
	←	VALUE PAID	
ACK	→		
POLL	→		
	←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	•		
	•		
	•		
PAYOUT VALUE POLL	→		
	←	ACK	Payout Complete
PAYOUT STATUS	→		
	←	BILLS PAID	Count of each bill type
ACK	→		
BILL DISPENSE STATUS	→		
	←	DISPENSER STATUS	Update Bill counts
ACK	→		
POLL	→		
	←	BILL WAITING	Inlet blocked, pending customer
ACK	→		
POLL	→		
	←	ACK	Inlet unblocked
DISPENSE BILL	→		Dispense # of bills
	←	ACK	
	•		
	•		
	•		
PAYOUT VALUE POLL	→		
	←	VALUE PAID	
ACK	→		
POLL	→		
	←	ACK	Inlet blocked, bill transferred from the recycler to the cashbox, or error code
	•		
	•		Repeat last 2 commands
	•		

PAYOUT VALUE POLL	→ ←	ACK	Payout Complete
PAYOUT STATUS ACK	→ ← →	BILLS PAID	Count of each bill type
BILL DISPENSE STATUS ACK	→ ← →	DISPENSER STATUS	Update Bill counts
POLL ACK	→ ← →	BILL WAITING	Inlet blocked, pending customer
POLL	→ ←	ACK	Inlet unblocked

Section 7
Cashless Device(s)
VMC/Peripheral Communication Specifications

7.1 Introduction

This section defines the communications bytes sent and received between the cashless device(s) and the Vending Machine Controller (VMC). As defined in Section 2.3, there are two cashless device addresses; Cashless #1, 00010xxxB (10H) and Cashless #2, 11000xxxB (60H). The second address has been assigned to allow for two unique forms of cashless devices to be resident in the vending machine simultaneously. An example would be a card based system as Cashless Device #1 (10H) and a mobile phone based system as Cashless Device #2 (60H). **Everything defined in this section will be common to the two cashless devices – only the addresses will be different.**

Unless otherwise stated, all monetary values used by the cashless devices and the VMC will be sixteen bit (Level 01 & 02) or thirty-two bit (Level 03 if 32 bit option enabled), unsigned binary numbers. The numbers will be sent most significant byte first and scaled using the parameters provided by the cashless device's READER CONFIGURATION DATA response.

7.2 State Definitions

MDB cashless devices may be viewed as state machines. These states are as follows:

1) Inactive
2) Disabled
3) Enabled
4) Session Idle
5) Vend
6) Revalue (Level 02/03 cashless devices)
7) Negative Vend (Level 03 cashless devices)

7.2.1 Inactive

This is the state of the cashless device at power up or after a reset. While in the Inactive state, cashless devices will NOT be accepted for vending purposes. The cashless device cannot leave this state until all Setup information is received from the VMC.

7.2.2 Disabled

The cashless device automatically enters this state from the Inactive state when it has received the Setup information specified in 7.4.1. It will also enter the Disabled state from the Enabled state when it receives the READER DISABLE command. While in the Disabled state, payment medias will NOT be accepted for vending purposes. The cashless device will remain in this state until either a READER ENABLE command is received (when it will enter the Enabled state) or a RESET is received (when it will enter the Inactive state). For power

management purposes, current consumption will not exceed idle mode specification during disabled state.

7.2.3 Enabled

In this state, cashless devices may be used for MDB transactions. The cashless device will remain in this state until a valid payment media is read (when it will enter the Session Idle state), a READER DISABLE command is received (when it will return to the Disabled state) or a RESET is received (when it will enter the Inactive state).

When the device is enabled to operate in an "always idle" state, a request vend will directly enter the vend session, as well as a negative request vend will directly enter the negative vend request session. During enabled "always idle" state, the cashless device may although perform normal sessions starting with a BEGIN SESSION command – the VMC needs to accept both and should after detecting a BEGIN SESSION response act the whole session like "always idle" state disabled" temporarily.

7.2.4 Session Idle

In the Enabled state, when a valid payment media is processed, the cashless device will issue a BEGIN SESSION response to a VMC POLL and enter the Session Idle state. This indicates that the cashless device is available for vending activities. The only structured exit from the Session Idle state is through the SESSION COMPLETE message from the VMC. The SESSION COMPLETE command will cause the cashless device to respond with an END SESSION message and enable/disable itself appropriately. Vend / Negative Vend / Revalue commands will cause the cashless device to leave the Session Idle state and enter the Vend / Negative Vend / Revalue state when products are selected and purchased.

7.2.5 Always Idle

When the device is able to operate in an "Always Idle" state (enabled with the Optional Feature Bits of the EXPANSION Enable Options command), a VEND REQUEST from the Enabled state will directly enter the Vend state. Additionally, when the device is able to operate in an "Always Idle" state, a NEGATIVE VEND REQEQUEST will directly enter the Negative Vend Request state.

7.2.5 Vend

This state is entered from the Session Idle state upon reception of a VEND REQUEST message from the VMC. The entire Vend state is an uninterruptable command/response sequence. The cashless device will return to the Session Idle state upon completion of this sequence.

7.2.6 Revalue (Level 02 / 03 Cashless Devices)

This state is entered from the Session Idle state upon reception of a REVALUE REQUEST message from the VMC. The entire Revalue state is an uninterruptable command/response sequence. The cashless device will return to the Session Idle state upon completion of this sequence.

7.2.7 Negative Vend Request (Level 03 Cashless Devices)

This state is entered from the Session Idle state upon reception of a NEGATIVE VEND REQUEST message from the VMC. The entire Negative Vend Request state is an uninterruptable command/response sequence. The cashless device will return to the Session Idle state upon completion of this sequence.

7.3 Command Protocol

After the VMC has issued a command, no new commands may be issued until all data generated in response to that command has been received from the cashless device. The complete response may be an ACK only (e.g. the READER ENABLE command). Alternatively, it may consist of an informational response (e.g. READER CONFIGURATION DATA).
The cashless device may provide an informational response in two ways. It may respond immediately with the requested data, or the cashless device may ACK the VMC command. If ACKed, the VMC must issue POLLs until the cashless device responds with the requested data, or until the Application Maximum Response Time (defined in READER CONFIGURATION response) has elapsed.

The cashless device will define the currency type at the beginning of each session. The currency type will be used for all following transactions in that session. If the VMC does not support this currency type, it will end the session.

Below are the uninterruptable VMC commands which require an informational cashless device response and their associated result:

VMC Command	Cashless Device Response	Result
SETUP/CONFIGURATION DATA =>	READER CONFIGURATION DATA	
EXPANSION/REQUEST ID =>	PERIPHERAL ID	
READER CANCEL =>	CANCELLED	
VEND REQUEST... VEND CANCEL =>	VEND DENIED*	
VEND REQUEST =>	VEND DENIED*	
VEND REQUEST =>	VEND APPROVED =>	VEND SUCCESS*
VEND REQUEST =>	VEND APPROVED =>	VEND FAILURE*
NEGATIVE VEND REQUEST =>	NEGATIVE VEND DENIED*	
NEGATIVE VEND REQUEST =>	NEGATIVE VEND APPROVED =>	NEGATIVE VEND SUCCESS*
NEGATIVE VEND REQUEST =>	NEGATIVE VEND APPROVED =>	NEGATIVE VEND FAILURE*
REVALUE REQUEST=>	REVALUE APPROVED/DENIED*	
SESSION COMPLETE =>	END SESSION	

*These VEND / NEGATIVE VEND / REVALUE REQUEST response sequences constitute the Vend / Negative Vend / Revalue Request states.

Below are the uninterruptable POLLed cashless device which require an informational response from the VMC:

VMC Command & Data	Cashless Device Response	Result
POLL =>	DATA ENTRY REQUEST + DISPLAY REQUEST (optional)	
POLL =>	DATA ENTRY CANCEL	Cancelled
DATA ENTRY RESPONSE w/ FFs =>		Cancelled

Any command may be issued by the VMC at anytime providing the above command protocol is observed. There are four exceptions to this rule:

1) VEND REQUEST, REVALUE REQUEST, and NEGATIVE VEND REQUEST response sequences may only be initiated in the Session Idle state. In other words, the Cashless Device does not allow an "Always Idle" state unless enabled from setting the corresponding enable bit in the enable options command. If this option is enabled, the VEND REQUEST, the NEGATIVE VEND REQUEST, and the REVALUE REQUEST are allowed also during Enabled state.
2) The VMC may issue a VEND CANCEL command after issuing a VEND REQUEST, but before receiving a VEND APPROVED/DENIED response. In this case the cashless device will issue a VEND DENIED response to satisfy the original VEND REQUEST response requirement.
3) The cashless device may issue DISPLAY REQUESTs in response to POLLs at any time, if the VMC's display is available for use.
4) The RESET command is allowed at any time, it is not subject to any restrictions.

If a VMC command is received by the cashless device while it is in one of the preceding uninterruptable states, the following will occur:

The cashless device will ACK the offending command (no data response will be forthcoming). The cashless device will respond to the next poll with the "COMMAND OUT OF SEQUENCE" response (0BH).

It should be pointed out to cashless device developers that a command out of sequence will always cause the VMC to issue a RESET command to the cashless device.

7.3.1 Multi-Message Response Format

The multi-message response format permits the cashless device to send multiple messages in response to a single command or POLL. Because all messages are of a fixed length, there is no confusion determining where one message ends and the next message begins. (The total message length is subject to the 36 byte limit imposed by Section 2 of this standard.)

For example, if a cashless device fails to correctly write a payment media after a VEND REQUEST, it may need to report:

1) VEND DENIED
2) MALFUNCTION/ERROR subcode 07h
3) SESSION CANCEL REQUEST

The multi-message response (hex) would look like this:

06	0A 07	04	1B*
1	2	3	4

The first byte above (marked 1) is the VEND DENIED message. The next two bytes (marked 2) are the MALFUNCTION/ERROR message. The third and final message is the CANCEL SESSION REQUEST (marked 3). An eight bit checksum with the mode bit set (marked 4) finishes the message.

It is important to note that the controller must service the messages in the order in which they are received. This is necessary to ensure that command protocol is maintained.

7.3.2 Coin Mechanism Escrow Return Actions

If present, the cashless device return button is controlled by the cashless device and it is the responsibility of the cashless device to terminate a vend sequence if the return button is pressed during a vend sequence.

The reaction of the VMC to the coin mechanism escrow return will vary depending upon the state of the system at the time it is pressed. If escrow return is allowed then a coin mechanism escrow return should be interpreted as VEND CANCEL or END OF SESSION.

1) In the Enabled state, the VMC should send a READER CANCEL command to the cashless device. This allows the user to abort a pre-approved on-line authorisation request.

2) In the Session Idle state, the VMC should send a SESSION COMPLETE command to the cashless device. This will return the cashless device to the Enabled state. The escrow return may cause the system to enter the revalue state prior to the VMC sending the "SESSION COMPLETE" command.

3) In the Vend state, before the cashless device has sent a VEND APPROVED or a VEND DENIED, the VMC should send a VEND CANCEL command to the cashless device. This will cancel the vend and cause the cashless device to refund the payment media if necessary.

4) In all other cases, no message is sent from the VMC to the cashless device.

TABLE 1: COMMANDS & RESPONSES

Command	Code	Sub-command / Data	Response	VMC / Cashless Level Support
Reset	10H 60H	(none)	No Data *	(Level 01+)
Setup	11H 61H	00H - Config Data	01H - Reader Config Data	(Level 01+)
		01H - Max/Min Prices	No Data *	(Level 01+)
Poll	12H 62H	(none)	00H - Just Reset	(Level 01+)
			01H - Reader Config Data	(Level 01+)
			02H - Display Request	(Level 01+)
			03H - Begin Session	(Level 01+)
			04H - Session Cancel Request	(Level 01+)
			05H - Vend Approved	(Level 01+)
			06H - Vend Denied	(Level 01+)
			07H - End Session	(Level 01+)
			08H - Cancelled	(Level 01+)
			09H - Peripheral ID	(Level 01+)
			0AH - Malfunction / Error	(Level 01+)
			0BH - Cmd Out Of Sequence	(Level 01+)
			0DH - Revalue Approved	(Level 02+) (option)
			0EH - Revalue Denied	(Level 02+) (option)
			0FH - Revalue Limit Amount	(Level 02+) (option)
			10H - User File Data	(Level 02) **
			11H - Time/Date Request	(Level 02+) (option)
			12H - Data Entry Request	(Level 03+) (option)
			13H - Data Entry Cancel	(Level 03+) (option)
			14H -1AH	(For Future Use)
			1BH - FTL REQ TO RCV	(Level 03+) (option)
			1CH - FTL RETRY / DENY	(Level 03+) (option)
			1DH - FTL SEND BLOCK	(Level 03+) (option)
			1EH - FTL OK TO SEND	(Level 03+) (option)
			1FH - FTL REQ TO SEND	(Level 03+) (option)
			20H - FEH	(For Future Use)
			FFH - Diagnostic Response	(Level 01+)
Vend	13H 63H	00H - Vend Request	05H - Vend Approved	(Level 01+)
			06H - Vend Denied	(Level 01+)

		01H - Vend Cancel	06H - Vend Denied	(Level 01+)
		02H - Vend Success	No Data *	(Level 01+)
		03H - Vend Failure	No Data *	(Level 01+)
		04H - Session Complete	07H - End Session	(Level 01+)
		05H - Cash Sale	No Data *	(Level 01+)
		06H - Negative Vend Request	05H – Vend Approved 06H – Vend Denied	(Level 03+) (option) (Level 03+) (option)
Reader	14H 64H	00H - Reader Disable	No Data *	(Level 01+)
		01H - Reader Enable	No Data *	(Level 01+)
		02H - Reader Cancel	08H - Cancelled	(Level 01+)
		03H - Data Entry Response	No Data *	(Level 03+) (option)
Revalue (option)	15H 65H	00H - Revalue Request	0DH - Revalue Approved 0EH - Revalue Denied	(Level 02+) (option) (Level 02+) (option)
		01H - Revalue Limit Request	0FH - Revalue Limit Amount 0EH - Revalue Denied	(Level 02+) (option) (Level 02+) (option)
Expansion	17H 67H	00H - Request ID	09H - Peripheral ID	(Level 01+)
		01H - Read User File	10H - User File Data	(Level 02) **
		02H - Write User File	No Data *	(Level 02) **
		03H - Write Time/Date (option)	No Data *	(Level 02+) (option)
		04H - Optional Feature Enabled	No Data	(Level 03+)
		FAH - FTL REQ TO RCV (option)	1DH - SEND BLOCK 1CH - RETRY / DENY	(Level 03+) (option) (Level 03+) (option)
		FBH - FTL RETRY / DENY (option)	No Data	(Level 03+) (option)
		FCH - FTL SEND BLOCK (option)	No Data	(Level 03+) (option)
		FDH - FTL OK TO SEND (option)	1DH - SEND BLOCK	(Level 03+) (option)
		FEH - FTL REQ TO SEND (option)	1EH - OK TO SEND 1CH - RETRY/DENY	(Level 03+) (option) (Level 03+) (option)
		FFH - Diagnostics	FFH - Diagnostic Response	(Level 01+)

* No Data response = peripheral just responds with ACK or NAK
** **Obsolete Command – Do not use for new designs. Use EXPANSION - Diagnostics.**
The term (option) indicates that the command/response is a feature enabled by option bits.

NOTE: Cashless device responses which are part of request / response sequences are listed more than once in the above table since the cashless device may respond either immediately to the request (within 5 milliseconds) or to a later POLL.

7.4 VMC/ Cashless Device Command/Response Formats

In the following section, the term "Reader" will indicate either Cashless Device #1 or #2.

7.4.1 Reset and Initialising

RESET (10H / 60H)

Reader response:

No Data response

If this command is received by a cashless device it should terminate any ongoing transaction (with an appropriate credit adjustment, if appropriate), eject the payment media (if applicable), and go to the Inactive state.

All Level 02 and above VMCs must follow the RESET command with the following cashless device initializing sequence: (Any new Level 01 VMCs are recommended to follow the sequence.)

Note that the example shows commands for Cashless Device #1 (10H) only. They would be the same for Cashless Device #2 (address 60H).

POLL – 12h
To obtain "JUST RESET" response

SETUP CONFIGURATION DATA – 11 00h
To send the VMC's configuration data and obtain the cashless device's data

SETUP MAX/MIN PRICE – 11 01h
To send the maximum and minimum prices in the VMC. These prices must be sent as Level 01/02 16 bit credit.

EXPANSION REQUEST ID – 17 00h
To obtain additional cashless device information and options (options in Level 03+ only)

EXPANSION ENABLE OPTIONS – 17 04h (Level 03+ only)
To enable desired options

SETUP MAX/MIN PRICE – 11 01h (Level 03+ and option bits 1 & 2 only)
If 32 bit currency option and/or multi currency – multi lingual is enabled (i.e. bits 1 & 2 of expansion enable options), perform **SETUP MAX/MIN PRICE** again to get 32 bit credit and/or user currency – user language (this conditions will be known as EXPANDED CURRENCY MODE in the rest of the document).

READER ENABLE – 14 01h
To enable cashless device (if desired)

7.4.2 SETUP - Config Data

SETUP (11H / 61H)	Config Data (00H) Y1	VMC Feature Level Y2	Columns on Display Y3	Rows On Display Y4	Display Info Y5

Y1 : Configuration data.
VMC is sending its configuration data to reader.

Y2 : VMC Feature Level.
Indicates the feature level of the VMC. The available feature levels are:

01 - The VMC is not capable or will not perform the advanced features as specified in Table 1: COMMANDS & RESPONSES following Section 7.3.2. The reader will not provide advanced information to the VMC, but can do the advanced features internally (transparently to the VMC). The reader has no revaluation capability.

02 - The VMC is capable and willing to perform the advanced features as specified in Table 1: COMMANDS & RESPONSES following Section 7.3.2. The reader will provide advanced information to the VMC (if possible) and will not do the advanced features internally.

03 - The VMC is able to support level 02, but also supports some or all of the optional features listed in the EXPANSION ID command (i.e., file transfer, 32 bit credit, multi-currency / language features, negative vend, and / or data entry).

Y3 : Columns on Display. The number of columns on the display. Set to 00H if the display is not available to the reader.

Y4 : Rows on Display.
The number of rows on the display

Y5 : Display Information – xxxxxyyy
xxxxx = Unused
yyy = Display type
000 : Numbers, upper case letters, blank and decimal point.
001 : Full ASCII
010-111: Unassigned

Reader Response:

Reader Config Data (01H) Z1	Reader Feature Level Z2	Country Code High Z3	Country Code Low Z4	Scale Factor Z5	Decimal Places Z6	Application Maximum Response Time Z7	Miscellaneous Options Z8

Z1 : READER - Configuration data.
Indicates the payment media reader is responding to a SETUP – Configuration data request from the VMC.

Z2 : Reader Feature Level.
Indicates the feature level of the reader. Currently feature levels are:

01 - The reader is not capable or will not perform the advanced features as specified in Table 1: COMMANDS & RESPONSES following Section 7.3.2. The reader will not provide advanced information to the VMC, but can do the advanced features internally (transparently to the VMC). The reader has no revaluation capability.

02 - The reader is capable and willing to perform the advanced features as specified in Table 1: COMMANDS & RESPONSES following Section 7.3.2. The reader will provide advanced information to the VMC (if possible) and will not do the advanced features internally.

03 - The reader is able to support level 02, but also supports some or all of the optional features listed in the EXPANSION ID command (i.e., file transfer, 32 bit credit, multi-currency / language features, negative vend, and / or data entry).

Z3-Z4 : Country / Currency Code - packed BCD.
The packed BCD country / currency code of the reader can be sent in two different forms depending on the value of the left most BCD digit.

If the left most digit is a 0, the International Telephone Code is used to indicate the country that the reader is set-up for. For example, the USA code is 00 01H (Z3 = 00 and Z4 = 01).

If the left most digit is a 1, the latest version of the ISO 4217 numeric currency code is used (see Appendix A1). For example, the code for the US dollar is 18 40H (Z2 = 18 and Z3 = 40) and for the Euro is 1978 (Z3 = 19 and Z4 = 78). Use FFFFh if the country code in unknown.

For level 3 cashless devices, it is mandatory to use the ISO 4217 numeric currency code (see Appendix A1).

Z5 : Scale Factor.
The multiplier used to scale all monetary values transferred between the VMC and the reader.

Z6 : Decimal Places.
The number of decimal places used to communicate monetary values between the VMC and the payment media reader.

All pricing information sent between the VMC and the payment media reader is scaled using the scale factor and decimal places. This corresponds to:

$$\text{ActualPrice} = P \cdot X \cdot 10^{-Y}$$

where P is the scaled value send in the price bytes, and X is the scale factor, and Y is the number of decimal places. For example if there are 2 decimal places and the scale factor is 5, then a scaled price of 7 will mean an actual of 0.35.

Z7 : Application Maximum Response Time - seconds.
The maximum length of time a reader will require to provide a response to any command from the VMC. The value reported here supercedes the payment reader's default NON-RESPONSE time defined in section 7.5 if the value reported here is greater. (See Section 7.5)

Z8 : Miscellaneous Options – xxxxyyyy

xxxx: Unused (must be set to 0)

yyyy: Option bits

b0=0: The payment media reader is NOT capable of restoring funds to the user's payment media or account. Do not request refunds.

b0=1: The payment media reader is capable of restoring funds to the user's payment media or account. Refunds may be requested.

b1=0: The payment media reader is NOT multivend capable. Terminate session after each vend.

b1=1: The payment media reader is multivend capable. Multiple items may be purchased within a single session.

b2=0: The payment media reader does NOT have a display.

b2=1: The payment media reader does have its own display.

b3=0: The payment media reader does NOT support the VEND/CASH SALE subcommand.

b3=1: The payment media reader does support the VEND/CASH SALE subcommand.

b4-b7=0 **Any future options must be covered by the EXPANSION COMMAND option bits.**

7.4.3 SETUP – Max / Min Prices

SETUP (11H / 61H)	Max / Min Prices (01H) Y1	Maximum Price Y2-Y3	Minimum Price Y4-Y5

Level 01 / 02 / 03 Readers

Y1 : Max / Min prices
Indicates the VMC is sending the price range to the reader.

Y2 - Y3 : Maximum Price – scaled
This information should be sent as soon as the VMC prices have been established and any time there is a change in the maximum price, If the VMC does not know the maximum price, FFFFh should be sent.

Y4 -Y5 : Minimum Price – scaled
This information should be sent as soon as the VMC prices have been established and any time there is a change in the minimum price. If the VMC does not know the minimum price, 0000h should be sent.

SETUP (11H / 61H)	Max / MinPrices (01H) Y1	Maximum Price Y2-Y5	Minimum Price Y6-Y9	Currency Code Y10-Y11

Level 03 (EXPANDED CURRENCY MODE) Readers

Y1 : Max / Min prices
Indicates the VMC is sending the price range to the reader.

Y2 – Y5 : Maximum Price – scaled
This information should be sent as soon as the VMC prices have been established and any time there is a change in the maximum price, If the VMC does not know the maximum price, FFFFFFFFh should be sent.

Y6 –Y9 : Minimum Price – scaled
This information should be sent as soon as the VMC prices have been established and any time there is a change in the minimum price. If the VMC does not know the minimum price, 00000000h should be sent.

Y10-Y11 Currency Code
The currency code used during this command per ISO 4217 (see Appendix A1). The value is configured as packed BCD with the leading digit a 1 (one). For example, the code for the US dollar would be 1840 (Z10 = 18 and Z11 = 40). and for the Euro is 1978 (Z10 = 19 and Z11 = 78).

Reader response:

No Data response

7.4.4 POLL

POLL (12H / 62H)

The POLL command is used by the VMC to obtain information from the payment media reader. This information may include user actions (CANCEL SESSION REQUEST), hardware malfunctions (MALFUNCTION /ERROR), software malfunctions (COMMAND OUT OF SEQUENCE) or information explicitly requested by the controller (READER CONFIGURATION DATA). An ACK response indicates that no error states exist, and either no information request is pending or pending information is not yet ready for transmission.

In addition to an ACK, the VMC may receive the following POLL responses from the payment media reader.

Reader responses:

Just Reset (00H) Z1

Z1 : JUST RESET
Indicates the payment media reader has been reset.
Note: the difference between ACK and JUST RESET responses is:
00H 00H* =JUST RESET
00H* =ACK
*mode bit=1

Reader Config Info (01H) Z1	Reader Feature Level Z2	Country Code High Z3	Country Code Low Z4	Scale Factor Z5	Decimal Places Z6	Application Maximum Response Time Z7	Miscellaneous Options Z8

See paragraph 7.4.2 for a detailed explanation of this response.

Display Request (02H) Z1	Display Time Z2	Display Data Z3-Z34

Z1 : DISPLAY REQUEST
The payment media reader is requesting a message to be displayed on the VMC's display.

Z2 : Display Time - 0.1 second units
The requested display time. Either the VMC or the payment media reader may overwrite the message before the time has expired.

Z3-Z34 : Display Data – ASCII
The message to be displayed. Formatting (leading and/or trailing blanks) is the responsibility of the payment media reader.

The number of bytes must equal the product of Y3 and Y4 up to a maximum of 32 bytes in the setup/configuration command.

Begin Session (03H) Z1	Funds Available Z2-Z3

Level 01 Readers

Z1 : BEGIN SESSION (**level 01 readers**)
Allow a patron to make a selection, but do not dispense product until funds are approved.

Z2-Z3 : Funds Available – scaled
a. Lesser of the user's payment media or account balance or FFFEh units.
b. Not yet determined - FFFFh. (Allows selection without displaying balance)

Begin Session (03H) Z1	Funds Available Z2-Z3	Payment media ID Z4-Z7	Payment Type Z8	Payment Data Z9-Z10

Level 02 / 03 Readers

Z1 : BEGIN SESSION (**level 02/03 readers**)
Allow a patron to make a selection, but do not dispense product until funds are approved.

Z2-Z3 : Funds Available – scaled
a. Lesser of the user's payment media or account balance or FFFEh units.
b. Not yet determined - FFFFh. (Allows selection without displaying balance)

Z4-Z7 : Payment media ID.
00000000h-FFFFFFFEh=Payment media identification number.
FFFFFFFFh = unknown payment media ID.

Z8 : Type of payment:
00xxxxxxb = normal vend card (refer EVA-DTS Standard, Appendix A.1.1 Definitions)
x1xxxxxxb = test media
1xxxxxxxb = free vend card
xx000000b -0 VMC default prices.
xx000001b -1 User Group (Z9 = EVA-DTS Element DA701)
Price list number (Z10 = EVA-DTS Element LA101)*
xx000010b -2 User Group (Z9 = EVA-DTS Element DA701)
Discount group index (Z10 = EVA-DTS Element MA403)
xx000011b -3 Discount percentage factor (Z9=00, Z10 = 0 to 100**, report as positive value in EVA-DTS Element MA404)

xx000100b -4 Surcharge percentage factor (Z9=00, Z10 = 0 to 100**, report as negative value in EVA-DTS Element MA404)

* User Group is a segmentation of all authorized users. It allows selective cost allocation. A User Group usually has no direct relation to a price list.
Price Lists are tables of prices. Each Price List contains an individual price for each product.
Discount Group indicates the Price List on which the Percentage Factor will be applied.
If the User Group, the Price List or Discount Group is unknown by the VMC, the normal prices are used (Z8 is defaulted to 00h).
Minimum value for Z9 and Z10 is 0.

** Percentages are expressed in binary (00 to 64h)

Note:
These functions may NOT be supported by all VMCs.

Z9-Z10 : Payment data as defined above.

Begin Session (03H) Z1	Funds Available Z2-Z5	Payment media ID Z6-Z9	Payment Type Z10	Payment Data Z11-Z12	User Language Z13-Z14	User Currency Code Z15-Z16	Card Options Z17

Level 03 (EXPANDED CURRENCY MODE) Readers

Z1 : BEGIN SESSION (**level 03 readers / EXPANDED CURRENCY MODE**)
Allow a patron to make a selection, but do not dispense product until funds are approved.

Z2-Z5 : Funds Available – scaled
a. Lesser of the user's payment media or account balance or FFFFFFFEh units.
b. Not yet determined - FFFFFFFFh.

Z6-Z9 : Payment media ID.
00000000h-FFFFFFFEh=Payment media identification number.
FFFFFFFFh = unknown payment media ID.

Z10 : Type of payment:
00xxxxxxb = normal vend card (refer EVA-DTS Standard, Appendix A.1.1 Definitions)
x1xxxxxxb = test media
1xxxxxxxb = free vend card
xx000000b -0 VMC default prices.

xx000001b -1 User Group (Z11 = EVA-DTS Element DA701)
Price list number (Z12 = EVA-DTS Element LA101)*
xx000010b -2 User Group (Z11 = EVA-DTS Element DA701)
Discount group index (Z12 = EVA-DTS Element MA403)
xx000011b -3 Discount percentage factor (Z11=00, Z12 = 0 to 100**, report as positive value in EVA-DTS Element MA404)
xx000100b -4 Surcharge percentage factor (Z11=00, Z12 = 0 to 100**, report as negative value in EVA-DTS Element MA404)

* User Group is a segmentation of all authorized users. It allows selective cost allocation. A User Group usually has no direct relation to a price list.
Price Lists are tables of prices. Each Price List contains an individual price for each product.
Discount Group indicates the Price List on which the Percentage Factor will be applied.
If the User Group, the Price List or Discount Group is unknown by the VMC, the normal prices are used (Z10 is defaulted to 00h).
Minimum value for Z11 and Z12 is 0.

** Percentages are expressed in binary (00 to 64h)

Note:
These functions may NOT be supported by all VMCs.

Z11-Z12: Payment data as defined above.

Z13-Z14 User language to use during this session (2 ASCII characters per ISO 639:latest version). The user language is read from the patrons card and, if supported, should be used instead of the VMC default language (taken according to the setup command International Telephone code) up to the next "session complete". If the VMC is not able to support this language, the default setting should be used.

Z15-Z16 User currency code to use during this session per ISO 4217 (see Appendix A1). The value is configured as packed BCD with the leading digit a 1 (one). For example, the code for the US dollar would be 1840 (Z15 = 18 and Z16 = 40). and for the Euro is 1978 (Z6 = 19 and Z7 = 78).

Z17 Card options (overrides any previous default settings for reader)
b0=0: The VMC displays the credit if it is programmed to do so
b0=1: The VMC **must not display** the credit (privacy purpose – user option)
b1=0: The actual inserted patrons card has no refund capability
b1=1: The actual inserted patrons card has refund capability (Note: a reader with refund capability may be used with both type of cards)
b2=0 The actual inserted patrons card has no revalue capability
b2=1 The actual inserted patrons card has revalue & negative vend

capability
b3-b7: Reserved for future extensions (unused bits must be set to 0)

Refund means the ability to put money back on the inserted patrons card up to the value of the last transaction. Revalue means the ability to put money back on the inserted patrons card up to any value.

The card reader will define the currency type at the beginning of each card session. **The currency type will be used for all following transactions in that session. If the VMC does not support this currency type, it will end the session.**

Session Cancel Request (04H) Z1

Z1 : SESSION CANCEL REQUEST
The payment media reader is requesting the VMC to cancel the session. The VMC should initiate an eventual SESSION COMPLETE. This response is sent to the VMC whenever the payment media is removed or a request for removal from the reader is made by the user (e.g. if a return button on the reader is pressed).

Vend Approved (05H) Z1	Vend Amount Z2-Z3

Level 01 / 02 / 03 Readers

Refer to paragraph 7.4.5 for detailed explanation.

Vend Approved (05H) Z1	Vend Amount Z2-Z5

Level 03 (EXPANDED CURRENCY MODE) Readers

Refer to paragraph 7.4.5 for detailed explanation.

Vend Denied (06H) Z1

Refer to paragraph 7.4.5 for detailed explanation.

End Session (07H) Z1

Refer to paragraph 7.4.9 for detailed explanation.

Cancelled (08H) Z1

Refer to paragraph 7.4.14 for detailed explanation.

Peripheral ID (09H) Z1	Manufacturer Code Z2-Z4	Serial Number Z5-Z16	Model Number Z17-Z28	Software Version Z29-Z30

Level 01 / 02 / 03 Readers (If VMC indicates Level 01 or 02)

Z1 : PERIPHERAL ID
Reader is sending peripheral ID information.

Z2 - Z4 : Manufacturer Code - ASCII
Identification code for the equipment supplier. Currently defined codes are listed in the **EVA** document entitled "***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z5-Z16 : Serial Number – ASCII
Factory assigned serial number.

Z17-Z28 : Model Number - ASCII
Manufacturer assigned model number.

Z29-Z30 : Software Version - packed BCD
Current software version.

Peripheral ID (09H) Z1	Manufacturer Code Z2-Z4	Serial Number Z5-Z16	Model Number Z17-Z28	Software Version Z29-Z30	Optional Feature bits Z31 - Z34

Level 03 Readers (If VMC indicates Level 03)

Z1 : PERIPHERAL ID

Reader is sending peripheral ID information.

Z2 - Z4 : Manufacturer Code - ASCII
Identification code for the equipment supplier. Currently defined codes are listed in the **EVA** document entitled "***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z5-Z16 : Serial Number – ASCII
Factory assigned serial number.

Z17-Z28 : Model Number - ASCII
Manufacturer assigned model number.

Z29-Z30 : Software Version - packed BCD
Current software version.

Z31- Z34 Optional Feature Bits. Each of the 32 bits indicate an optional feature availability. Bits should be sent in descending order, i.e. bit 31 is sent first and bit 0 is sent last. Options **must be enabled by the VMC** using the Expansion Optional Feature Bit Enable (17H-04H) command and **all features are disabled after a reset**. Currently defined options are:

b0 - File Transport Layer supported
b1 - 0 = 16 bit monetary format, 1 = 32 bit monetary format
b2 – support multi currency / multi lingual
b3 – allow Negative Vend
b4 – allow data entry
b5 – allow "Always Idle" state
b6 to b31 not used (should be set to 0)

Note: If 32 bit monetary format (b1) and or multi currency / multi lingual (b2) options are enabled, this condition will be known as **EXPANDED CURRENCY MODE** in the rest of the document.

Malfunction / Error	Error Code
(0AH) Z1	Z2

Z1 : MALFUNCTION/ERROR
The payment media reader is reporting a malfunction or error.

Z2 : Error Code – xxxxyyyy

xxxx	error types
0000:	Payment media Error1
0001:	Invalid Payment media1
0010:	Tamper Error1
0011:	Manufacturer Defined Error1

0100: Communications Error2
0101: Reader Requires Service2
0110: Unassigned2
0111: Manufacturer Defined Error2
1000: Reader Failure3
1001: Communications Error3
1010: Payment media Jammed3
1011: Manufacturer Defined Error
1100: Refund error – internal reader credit lost
1101-1111: Unassigned

1 Transient error - Reported once
2 Non-transient error - Reported every POLL until cleared. Reader still functional.
3 Non-transient error - Reported every POLL until cleared. Reader not presently functional.

yyyy = Manufacturer defined subcode

Transient Error Handling
The error will be reported to the VMC until it has been ACKnowledged. The error state will be cleared in the reader, and normal operations will continue.

Non-transient Error Handling
The error will be reported to the VMC at each POLL as long as it exists. If the reader is still functional, multi-message responses will allow normal responses in addition to the error report.

Note: Refund error is sent from the media reader when it is not able to refund money to the payment media following a failed or cancelled vend. The reader internally cancels the credit and the credit is lost.

Command Out of Sequence (0BH) Z1

Level 01 Readers

Z1 : COMMAND OUT OF SEQUENCE (Level 01 readers)
The payment media reader has received a command that is not executable in its current state, or that violates one of the uninterruptable sequences. The offending command should be ACKed but not acted upon the reader. The VMC will send the RESET command to the reader upon reception of this response. Note that the reader will continue with

any credit update process prior to resetting.

Command Out of Sequence (0BH)	Status
Z1	Z2

Level 02 / 03 Readers

Z1 : COMMAND OUT OF SEQUENCE. (Level 02/03 readers)
The payment media reader has received a command that is not executable in its current state, or that violates one of the uninterruptable sequences. The offending command should be ACKed but not acted upon the reader. The VMC will send the RESET command to the reader upon reception of this response. Note that the reader will continue with any credit update process prior to resetting.

Z2 : Status
The state of the payment media reader.
01: Inactive state
02: Disabled state
03: Enabled state
04: Session idle state
05: Vend state
06: Revalue state
07: Negative Vend state

Revalue Approved (0DH)
Z1

Level 02 / 03 Readers

Refer to paragraph 7.4.16 for detailed explanation.

Revalue Denied (0EH)
Z1

Level 02 / 03 Readers

Refer to paragraph 7.4.16 for detailed explanation.

Revalue	Revalue

Limit Amount (0FH) Z1	Limit Amount Z2-Z3

Level 02 / 03 Readers

Refer to paragraph 7.4.17 for detailed explanation.

Revalue Limit Amount (0FH) Z1	Revalue Limit Amount Z2-Z5

Level 03 (EXPANDED CURRENCY MODE) Readers

Refer to paragraph 7.4.17 for detailed explanation.

User File Data (10H) Z1	Number of User File Z2	Length Of User File Z3	User Data Z4-Zn

Level 02 Readers

Obsolete Response – Do not use for new designs!! (Use EXPANSION – Diagnostics)

Refer to paragraph 7.4.19 for detailed explanation.

Time/Date Request (11H) Z1

Level 02 / 03 Readers

Z1 : TIME DATE REQUEST
In certain circumstances it will be necessary to synchronize the real time clock of the card reader with real time clock of the VMC. The card reader will respond with TIME/DATE REQUEST to a POLL command of the VMC. The VMC will follow with the EXPANSION-WRITE TIME/DATE FILE to the card reader. Refer to paragraph 7.4.19.

Data Entry Request Response (12H) Z1	Data Entry Length and Repeat Bit Z2

Level 03 Readers (if Data Entry option enabled)

Z1 : DATA ENTRY REQUEST
The reader is making a DATA ENTRY REQUEST.

Z2 : DATA ENTRY LENGTH and REPEAT BIT
mnnnnnnn
r – Repeat Bit (0 = initial request / 1 = repeated requests
nnnnnnn – number of requested characters / keys

Depending on the type of data being entered, it is a higher level system decision on whether or not the data is displayed on either the vending machine or card reader. If the data is not displayed (a recommendation for certain types of sensitive data) the vending machine or card reader display can still be optionally used to indicate a prompt and/or representation of the data entered for user feedback (i.e., asterisks *****).

If the card reader uses the vending machine's display for Data Entry information, it **must concatenate** the DATA ENTRY REQUEST Response (12H) with the DISPLAY REQUEST response (02H). Upon receipt of the response pair, the vending machine controller will give its display to the card reader for the duration of the Data Entry session plus the amount of time specified in the Z2 Display Time following the end of the session (regardless of a normal or cancelled session). In essence, the vending machine controller will not write anything to its display during the Data Entry session plus the Z2 time. The reader will be able to update the Data Entry information on the vending machine's display by sending additional DISPLAY REQUEST responses during the Data Entry session.

Please see additional DATA ENTRY procedures in Section 7.4.15.

Data Entry Cancel (13H) Z1

Level 03 Readers (if Data Entry option enabled)

Z1 : DATA ENTRY CANCEL
The user has pushed the reader's RETURN button before completing the DATA ENTRY. The VMC should terminate all DATA ENTRY activity in progress.

FTL
REQ TO RCV
(1BH)
Z1

Level 03 Readers (if File Transport Layer option enabled)

Z1 : **FTL** REQ TO RCV
The reader is requesting to receive data from a device or VMC.

Z2 : **FTL** Destination Address
The destination address of the response as defined in Section 2.6.

Z3 : **FTL** Source Address (Reader = 10H / 60H)
The source address of the response as defined in Section 2.6.

Z4 : **FTL** File ID
The type of information desired as defined in Section 2.6.

Z5 : **FTL** Maximum Length
The total number of blocks in the file as defined in Section 2.6.

Z6 : **FTL** Control
Data transfer control information as defined in Section 2.6.

FTL
RETRY/DENY
(1CH)
Z1

Level 03 Readers (if File Transport Layer option enabled)

Z1 : **FTL** RETRY / DENY
The reader is requesting a device or VMC to retry or deny the last FTL command.

Z2 : **FTL** Destination Address
The destination address of the response as defined in Section 2.6.

Z3 : **FTL** Source Address (Reader = 10H / 60H)
The source address of the response as defined in Section 2.6.

Z4 : **FTL** Retry Delay
The retry delay as defined in Section 2.6.

FTL
SEND
BLOCK
(1DH)
Z1

Level 03 Readers (if File Transport Layer option enabled)

Z1 : **FTL** SEND BLOCK
The reader is sending a block of data (maximum of 31 bytes) to a device or VMC.

Z2 : **FTL** Destination Address
The destination address of the response as defined in Section 2.6.

Z3 : **FTL** Block #
The sequential number of the block as defined in Section 2.6.

Z4- Z34 : **FTL** Data (maximum of 31 bytes)
The actual data portion of the block as defined in Section 2.6.

FTL
OK TO SEND
(1EH)
Z1

Level 03 Readers (if File Transport Layer option enabled)

Z1 : **FTL** OK TO SEND
The reader is indicating that it is OK for the device or VMC to send it data.

Z2 : **FTL** Destination Address
The destination address of the response as defined in Section 2.6.

Z3 : **FTL** Source Address (Reader = 10H / 60H)
The source address of the response as defined in Section 2.6.

FTL REQ TO SEND (1FH) Z1

Level 03 Readers (if File Transport Layer option enabled)

Z1 : **FTL** REQ TO SEND
The reader is requesting to send data to a device or VMC.

Z2 : **FTL** Destination Address
The destination address of the response as defined in Section 2.6.

Z3 : **FTL** Source Address (Reader = 10H / 60H)
The source address of the response as defined in Section 2.6.

Z4 : **FTL** File ID
The type of information desired as defined in Section 2.6.

Z5 : **FTL** Maximum Length
The total number of blocks in the file as defined in Section 2.6.

Z6 : **FTL** Control
Data transfer control information as defined in Section 2.6.

Diagnostics Response (FFH) Z1	User Defined Data Z2-Zn

Refer to paragraph 7.4.28 for detailed explanation.

7.4.5 VEND - Request

Vend (13H / 63H)	Vend Request (00H) Y1	Item Price Y2-Y3	Item Number Y4-Y5

Level 01 / 02 / 03 Readers

Y1 : VEND REQUEST
The patron has made a selection. The VMC is requesting vend approval from the payment media reader before dispensing the product.

Y2-Y3 : Item Price - scaled
The price of the selected product.

Y4-Y5 : Item Number
The item number of the selected product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Reader response:

Vend Approved (05H) Z1	Vend Amount Z2-Z3

Z1 : VEND APPROVED
Allow the selected product to be dispensed.

Z2-Z3 : Vend Amount - scaled
This is the amount deducted from the user's payment media or account. This may not match the amount specified in the VEND REQUEST command; it may be surcharged or discounted.
FFFFh - an electronic token was used.

NOTE: The VMC must use Vend Amount to update the credit on the screen. The Reader must fill this field with the used amount for the transaction.

Vend Denied (06H) Z1

Z1 : VEND DENIED
Approval denied for the patron's selection. Do not dispense any products.

	Vend Request (00H) Y1	Item Price Y2-Y5	Item Number Y6-Y7
Vend (13H / 63H)			

Level 03 (EXPANDED CURRENCY MODE) Readers

Y1 : VEND REQUEST
The patron has made a selection. The VMC is requesting vend approval from the payment media reader before dispensing the product.

Y2-Y5 : Item Price -- scaled
The price of the selected product.

Y6-Y7 : Item Number
The item number of the selected product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Reader Response:

Vend Approved (05H) Z1	Vend Amount Z2-Z5

Level 03 (EXPANDED CURRENCY MODE) Readers

Z1 : VEND APPROVED
Allow the selected product to be dispensed.

Z2-Z5 : Vend Amount - scaled
This is the amount deducted from the user's payment media or account. This may not match the amount specified in the VEND REQUEST command; it may be surcharged or discounted.
FFFFFFFFh - an electronic token was used.

NOTE: The VMC must use Vend Amount to update the credit on the screen. The Reader must fill this field with the used amount for the transaction.

7.4.6 VEND - Cancel

Vend (13H / 63H)	Vend Cancel (01H) Y1

Y1 : VEND CANCEL
This command can be issued by the VMC to cancel a VEND REQUEST command before a VEND APPROVED/DENIED has been sent by the payment media reader. The payment media reader will respond to VEND CANCEL with a VEND DENIED and return to the Session Idle state.

Reader response:

Vend Denied (06H) Z1

See paragraph 7.4.5 for explanation.

7.4.7 VEND - Success

Vend (13H / 63H)	Vend Success (02H) Y1	Item Number Y2-Y3

Y1 : VEND SUCCESS
The selected product has been successfully dispensed.

Y2-Y3 : Item number
The item number of the selected product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

NOTE A reset between VEND APPROVED and VEND SUCCESS shall be interpreted as a VEND SUCCESS.

Reader response:

No Data response

7.4.8 VEND - Failure

Vend (13H / 63H)	Vend Failure (03H) Y1

Y1 : VEND FAILURE
A vend has been attempted at the VMC but a problem has been detected and the vend has failed. The product was not dispensed. Funds should be refunded to user's account.

Reader response:

No Data response

Vend failure sequence

In order to ensure that a reader refunds after a Vend Failure command, the VMC must send at least a single Poll command to obtain the reader possible answers:

ACK	Refund Complete
MALFUNCTION ERROR code 1100yyyy	Refund error-internal reader credit lost
SILENCE	Refund in progress. VMC must repoll reader until ACK or Malfunction error answer for maximum NON Response time.

7.4.9 SESSION COMPLETE

Vend (13H / 63H)	Session Complete (04H) Y1

Y1 : SESSION COMPLETE
This tells the payment media reader that the session is complete and to return to the Enabled state. SESSION COMPLETE is part of a command/response sequence that requires an END SESSION response from the reader.

Reader response:

End Session (07H) Z1

Z1 : END SESSION
This command is issued in response to a SESSION COMPLETE command. The END SESSION response indicates the reader has returned to the Enabled state. If "END SESSION" is not received by the VMC within a the maximum application non-response time, the VMC must issue a "RESET" command.

7.4.10 CASH SALE

Vend (13H / 63H)	Cash Sale (05H) Y1	Item Price Y2-Y3	Item Number Y4-Y5

Level 01 / 02 / 03 Readers

Y1 : CASH SALE
A cash sale (cash only or cash and cashless) has been successfully completed by the VMC.

Y2-Y3 : Item Price – scaled
The price of the selected product or cash portion of the price.

Y4-Y5 : Item Number
The item number of the selected product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Note: This command is issued for cash auditing applications and is sent to the payment media reader if the SETUP/CONFIGURATION bit (b3) is enabled anytime a valid cash transaction is completed via a coin mechanism or bill validator.

Reporting of free vends, token vends, etc. should commonly be done, using the following item number conventions:

Set bit b15 in item number to signal the cash vend as a free vend
Set bit b14 in item number to signal the cash vend as a test vend
Set bit b13 in item number to signal the cash vend as a negative vend (an item was returned and cash was payed out)
Set bit b12 in item number to signal the cash vend as a token vend

Reader response:

No Data response

Vend (13H)	Cash Sale (05H) Y1	Item Price Y2-Y5	Item Number Y6-Y7	Item Currency Y8-Y9

Level 03 (EXPANDED CURRENCY MODE) Readers

Y1 : CASH SALE
A cash sale (cash only or cash and cashless) has been successfully completed by the VMC.

Y2-Y5 : Item Price – scaled
The price of the selected product or cash portion of the price.

Y6-Y7 : Item Number
The item number of the selected product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Y8-Y9 : Item Currency
The currency for the item price used during the vend. This value may be converted within the reader to the readers balancing currency. The item currency is sent using the numeric code as defined in ISO 4217 (see Appendix A1). The value is configured as packed BCD with the leading digit a 1 (one). For example, the code for the US dollar would be 1840 (Z10 = 18 and Z11 = 40). and for the Euro is 1978 (Z10 = 19 and Z11 = 78).

Note: This command is issued for cash auditing applications and is sent to the payment media reader if the SETUP/CONFIGURATION bit (b3) is enabled anytime a valid cash transaction is completed via a coin mechanism or bill validator.

Reader response:

No Data response

7.4.11 Negative Vend Request

Vend (13H / 63H)	Neg.Vend Request (06H) Y1	Item Value Y2-Y3	Item Number Y4-Y5

Level 03 Reader

Y1 : NEGATIVE VEND REQUEST

The patron has inserted an item. The VMC is requesting negative vend approval from the payment media reader before accepting the returned product.

Y2-Y3 : Item value – scaled
The value of the inserted product (16 Bit).

Y4-Y5 : Item Number
The item number of the inserted product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Reader response:

Vend Approved (05H) Z1	Vend Amount Z2-Z3

Level 03 (EXPANDED CURRENCY MODE disabled) Readers

Z1 : VEND APPROVED
Allow the returned product to be accepted, i.e. this means, the reader will be able to credit the value to the patrons card, when a vend success will follow the approved.

Z2-Z3 : Vend Amount – scaled
This is the amount of credit, which will be added to the user's payment media or account. This may not match the amount specified in the NEGATIVE VEND REQUEST command; it may be surcharged or discounted.
FFFFh - an electronic token will be credited.

Vend (13H / 63H)	Neg.Vend Request (06H) Y1	Item Value Y2-Y5	Item Number Y6-Y7

Level 03 (EXPANDED CURRENCY MODE) Readers

Y1 : NEGATIVE VEND REQUEST
The patron has inserted an item. The VMC is requesting negative vend approval from the payment media reader before accepting the returned product.

Y2-Y5 : Item value – scaled

The value of the inserted product.

Y6-Y7 : Item Number
The item number of the inserted product. This number is defined by the manufacturer, and set to FFFFh for undefined or not implemented.

Reader response:

Vend Approved (05H) Z1	Vend Amount Z2-Z5

Level 03 (EXPANDED CURRENCY MODE) Readers

Z1 : VEND APPROVED
Allow the returned product to be accepted, i.e. this means, the reader will be able to credit the value to the patrons card, when a vend success will follow the approved.

Z2-Z5 : Vend Amount – scaled
This is the amount of credit, which will be added to the user's payment media or account. This may not match the amount specified in the NEGATIVE VEND REQUEST command; it may be surcharged or discounted.
FFFFFFFFh - an electronic token will be credited.

Vend Denied (06H) Z1

Z1 : VEND DENIED
Approval denied for the returned product. Do not accept the product or return it if possible.

Note: This command is used in the uninterruptable vend sequence like the normal REQUEST VEND and is followed by the normal responses VEND APPROVED or VEND DENIED, for the reader to confirm the credit update possibility and the final VEND SUCCESS or VEND FAILURE command to update the patron's credit.

Designers of cashless devices must pay special attention in implementing this command, especially for non locking readers. Credit should only be generated on the media upon final reception of VEND SUCCESS to avoid unwanted credit in the system.

Designers of both the VMC and the readers have to deal with fault conditions of such a system carefully. A normal sequence description is added to the example vend sessions with hints to different application features.

7.4.12 READER - Disable

Reader (14H / 64H)	Disable (00H) Y1

Y1 : READER DISABLE
This informs the payment media reader that it has been disabled, i.e. it should no longer accept a patron's payment media for the purpose of vending. Vending activities may be re-enabled using the READER ENABLE command. The payment media reader should retain all SETUP information.

NOTE Any transaction in progress will not be affected and should continue to its normal completion.

Reader response:

No Data response

7.4.13 READER - Enable

Reader (14H / 64H)	Enable (01H) Y1

Y1 : READER ENABLE
This informs the payment media reader that is has been enabled, i.e. it should now accept a patron's payment media for vending purposes. This command must be issued to a reader in the Disabled state to enable vending operations.

Reader response:

No Data response

7.4.14 READER - Cancel

Reader (14H / 64H)	Cancel (02H) Y1

Y1 : READER CANCEL
This command is issued to abort payment media reader activities which occur in the Enabled state. It is the first part of a command/response sequence which requires a CANCELLED response from the reader.

Reader response:

Cancelled (08H) Z1

Z1 : CANCELLED
This is the reader's response to the READER CANCEL command from the VMC. This command comprises a command/response sequence. Its use is only appropriate in the Enabled state.

7.4.15 DATA ENTRY – Response (Key Entries)

The purpose of the overall Data Entry request / response sequence is to allow the machine user to enter data (i.e., a card validation number) using the selection buttons on the vending machine.

The DATA ENTRY request / response sequence can occur in the Enabled state only. It is the responsibility of the reader to enforce this rule.

Depending on the type of data being entered, it is a higher level system decision on whether or not the data is displayed on either the vending machine or card reader. If the data is not displayed (a recommendation for certain types of sensitive data) the vending machine or card reader display can still be optionally used to indicate a prompt and/or representation of the data entered for user feedback (i.e., asterisks *****). **Please see additional information on the vending machine's display usage for Data Entry in the DATA ENTRY REQUEST Response (12H) description in the 7.4.4 POLL section.**

The DATA ENTRY RESPONSE key entries are sent to the reader as they are pressed. Depending on the user's speed of entry and vending machine controller cycle time, the data may be sent either as a digit at a time, a sub group of digits, or the entire length of digits as specified in the Z2 Data Entry Length byte in the DATA ENTRY REQUEST response. For example, if the Data Entry Length is 6 digits, but only 2 are initially (and quickly) entered, the vending machine controller will send the 2 that are available via the DATA ENTRY

RESPONSE Y2-Y9 command. The balance will be sent via other DATA ENTRY RESPONSE Y2-Y9 commands when available.

It is up to the reader to merge the received DATA ENTRY RESPONSE data and optionally update the display as required. The session is ended after the VMC sends the final DATA ENTRY RESPONSE data (no SESSION COMPLETE command is required). Note that the VMC display will remain available to the reader for the amount of time requested in the previous DISPLAY REQUEST response.

If the data entry process is cancelled by the VMC for any reason, the VMC will send the DATA ENTRY RESPONSE with all data bytes (Y2-Y9) set to FFh. This will terminate the DATA ENTRY REQUEST and return the reader to the Enabled state.

For ease of command message processing, the Data Entry Data has been fixed at 8 characters (Y2-Y9). Unused bytes must be sent as 00h to pad out the entire command to byte Y9.

Reader (14H / 64H)	Data Entry Response (03H) Y1	Data Entry Data Y2-Y9

Level 03 Readers (if option enabled)

Y1 : DATA ENTRY RESPONSE
The VMC is providing a DATA ENTRY RESPONSE to the reader.

Y2-Y9 : DATA ENTRY DATA
Data should be in ASCII, one character per byte. Data should be left justified (first character / key in Y2, second in Y3, etc.). The number of data bytes must equal eight (8) and unused data bytes must be sent as 00h.

If the data entry process is cancelled by the VMC for any reason, the VMC will send this message with all DATA ENTRY data bytes set to FFh.

Note: The reader must translate the VMC key information into the appropriate key needed for the application

Reader response:

No Data response

Note: If the reader has additional display information to send to the VMC following the DATA ENTRY RESPONSE, it should send it via a DISPLAY REQUEST response to one of the next POLL commands from the VMC.

7.4.16 REVALUE - Request (Level 02 / 03 Readers)

Revalue (15H / 65H)	Revalue Request (00H) Y1	Revalue Amount Y2-Y3

Level 02 / 03 Readers

Y1 : REVALUE REQUEST (Level 02 Readers)
A balance in the VMC account because coins or bills were accepted or some balance is left after a vend. With this command the VMC tries to transfer the balance to the payment media.

Y2-Y3 : Revalue amount - scaled.
The revalue amount should not exceed the revalue limit value given by the command REVALUE LIMIT REQUEST.

Revalue (15H / 65H)	Revalue Request (00H) Y1	Revalue Amount Y2-Y5

Level 03 (EXPANDED CURRENCY MODE) Readers

Y1 : REVALUE REQUEST (Level 03 Readers)
A balance in the VMC account because coins or bills were accepted or some balance is left after a vend. With this command the VMC tries to transfer the balance to the payment media.

Y2-Y5 : Revalue Amount - scaled.
The revalue amount should not exceed the revalue limit value given by the command REVALUE LIMIT REQUEST.

Reader response:

Revalue Approved (0DH) Z1

Level 02 / 03 Readers

Z1 : REVALUE APPROVED (Level 02 / 03 Readers)
A balance is in the VMC account because coins or bills were accepted or some balance is left after a vend. The VMC has issued a REVALUE REQUEST to the payment media reader to transfer the balance to the payment media. The payment media reader accepted the request and added its value to the payment media balance. The reader then responds with a REVALUE APPROVED, so the VMC may clear the account.

Revalue Denied (0EH) Z1

Level 02 Readers

Z1 : REVALUE DENIED (Level 02 / 03 Readers)
A balance is in the VMC account because coins or bills were accepted or some balance is left after a vend. The VMC has issued a REVALUE REQUEST to the payment media reader to transfer the balance to the payment media. The payment media reader does not accept the request and responds with a REVALUE DENIED, so the VMC has to pay out change. It is a quite common situation if there is no payment media inserted at this moment.

7.4.17 REVALUE - Limit Request (Level 02 / 03 Readers)

Revalue (15H / 65H)	Revalue Limit Request (01H) Y1

Level 02 / 03 Readers

Note: If revaluing, follow the BEGIN SESSION with this command.

Y1 : REVALUE LIMIT REQUEST (Level 02 Readers)
In a configuration with a bill and/or coin acceptor and payment media reader connected to a VMC, the VMC must know the maximum amount the payment media reader eventually will accept by a REVALUE REQUEST. Especially if the bill acceptor accepts a wide range of bills. Otherwise the VMC may be confronted by the situation where it accepted a high value bill and is unable to pay back cash or revalue it to a payment media. (see also below)

Reader response:

Revalue Limit Amount (0FH) Z1	Revalue Limit Amount Z2-Z3

Level 02 / 03 (EXPANDED CURRENCY MODE disabled) Readers

Z1 : REVALUE LIMIT AMOUNT (Level 02 / 03 Readers)

The patron intends to revalue the payment media with a bill of some value. The VMC must know what kind of bills to accept, so it will issue a REVALUE LIMIT REQUEST to get the amount the payment media reader will accept. The payment media reader will respond with the scaled value, calculated with the maximum allowed payment media balance minus the current balance of the payment media. The payment media reader responds with REVALUE DENIED if there is no payment media available upon this request.

Z2-Z3 : Revalue limit value - scaled.

Reader response:

Revalue Limit Amount (0FH) Z1	Revalue Limit Amount Z2-Z5

Level 03 (EXPANDED CURRENCY MODE) Readers

Z1 : REVALUE LIMIT AMOUNT (Level 03 Readers)
The patron intends to revalue the payment media with a bill of some value. The VMC must know what kind of bills to accept, so it will issue a REVALUE LIMIT REQUEST to get the amount the payment media reader will accept. The payment media reader will respond with the scaled value, calculated with the maximum allowed payment media balance minus the current balance of the payment media. The payment media reader responds with REVALUE DENIED if there is no payment media available upon this request.

Z2-Z5 : Revalue Limit Value - scaled.

7.4.18 EXPANSION - Request ID

	Request ID (00H) Y1	Manufacturer Code Y2-Y4	Serial Number Y5-Y16	Model Number Y17-Y28	Software Version Y29-Y30
Expansion (17H / 67H)					

Y1 : REQUEST ID
The VMC is requesting payment media reader identification information. The information included above (Y2-Y30) provides the payment media reader with VMC identification information.

Y2-Y4 : Manufacturer Code - ASCII
Identification code for the equipment supplier. Currently defined

codes are listed in the EVA document entitled "The Data Transfer Standard EVA-DTS" document, the Audit Data Dictionary section, chapter 4, "Manufacturer Codes".

Y5-Y16 : Serial Number - ASCII
Factory assigned serial number.

Y17-Y28 : Model Number - ASCII
Manufacturer assigned model number.

Y29-Y30 : Software Version - packed BCD
Current software version.

Reader response:

Peripheral ID (09H) Z1	Manufacture Code Z2-Z4	Serial Number Z5-Z16	Model Number Z17-Z28	Software Version Z29-Z30

Level 01 / 02 / 03 Readers (If VMC indicates Level 01 or 02)

Peripheral ID (09H) Z1	Manufacture Code Z2-Z4	Serial Number Z5-Z16	Model Number Z17-Z28	Software Version Z29-Z30	Optional Feature Bits Z31-Z34

Level 03 Readers (If VMC indicates Level 03)

See paragraph 7.4.4 for a detailed explanation of this response.

7.4.19 EXPANSION - Read User File (Level 02 Readers)

Obsolete Command – Do not use for new designs!! (Use EXPANSION - Diagnostics)

Expansion (17H / 67H)	Read User File (01H) Y1	Number of User File Y2

Level 02 Readers

Y1= READ USER FILE
The VMC request's the user file. The length of the file is variable with a

maximum length of 32 bytes. The contents of the data are defined by the VMC manufacturer. If the payment media reader does support this command it will respond with USER FILE DATA.

Y2= Number of User File.
The File identification number. The number and size of the data files are defined by the payment media reader manufacturer. The maximum number of user files are FFh.

Reader response:

User Data File (10H) Z1	Number of User File Z2	Length of User File Z3	User Data Z4-Zn

Z1 : USER FILE DATA (only level 02 readers)
The VMC requires user data and has issued a EXPANSION - READ USER FILE to the payment media reader.

Z2 : Number of User File.
The File identification number. The number and size of data files are defined by the payment media reader manufacturer. The maximum number of user files are FFh.

Z3 : Length of user file
The length of the user file. The maximum length of the user file is 32 bytes. If the user file don't exists the length will be set to 00h.

Z4-Zn : Data defined by the VMC manufacturer.

7.4.20 EXPANSION - Write User File (Level 02 Readers)

Obsolete Command – Do not use for new designs!! (Use EXPANSION - Diagnostics)

Expansion (17H / 67H)	Write User File (02H) Y1	Number of User File Y2	Length of User File Y3	User Data Y4-Yn

Y1 : WRITE USER FILE
The VMC request's to write the user file. The length of the file is variable with a maximum length of 32 bytes. The contents of the data are defined by the VMC manufacturer. If the command is supported but the payment media reader is unable to write the payment media (writing problem or data too long) it will respond with MALFUNCTION/ERROR.

Y2 : Number of User File.
The File identification number. The number and size of data files are defined by the payment media reader manufacturer. The maximum number of user files are FFh.

Y3 : Length of user file
The length of the user file. The maximum length of the user file is 32 bytes.

Y4-Yn : Data defined by the VMC manufacturer.

Reader response:

No Data response

7.4.21 EXPANSION - Write Time/Date File (Level 02/03 readers)

Expansion (17H / 67H)	Write Time/ Date File (03H) Y1	Time Date Y2-Y11

Y1 : WRITE TIME/DATE FILE
The VMC requests to write the Time/Date file.

Y2- Y11: Time/Date to synchronize the card reader real time clock. The date bytes are BCD encoded.

Y2 = Years (Range: 00..99)
Y3 = Months (Range: 01..12)
Y4 = Days (Range: 01..31)
Y5 = Hours (Range: 00..23)
Y6 = Minutes (Range: 00..59)
Y7 = Seconds (Range: 00..59)
Y8 = Day of Week (Range: 01..07, Monday = 1..Sunday = 7)
Y9 = Week Number (Range: 01..53)
Y10 = Summertime (Range: 00..01, Summertime = 1)
Y11 = Holiday (Range: 00..01, Holiday = 1)

If any item of the time/date is not supported use FFH instead.

7.4.22 EXPANSION – Enable Options (Level 03 readers)

Expansion (17H / 67H)	Optional Feature Bit Enable (04H) Y1	Optional Feature Bits Y2-Y5

Level 03 Readers

Y1 : OPTIONAL FEATURE BIT ENABLE
The VMC can enable which level 3 features it desires.

Y2 - Y5: Individual expanded feature bits as sent by reader in response to the 17H-00H EXPANSION REQUEST ID command. To enable a feature, a bit is set to one. Bits should be sent in descending order, i.e. bit 31 is sent first and bit 0 is sent last. **All features are disabled after a reset.**

b0 - File Transport Layer supported
b1 - 0 = 16 bit monetary format, 1 = 32 bit monetary format
b2 – Enable multi currency / multi lingual
b3 – Enable negative vend
b4 - Enabledata entry
b5 – Enable "Always Idle" state
b6 to b31 not used (should be set to 0)

Note: If 32 bit monetary format (b1) and or multi currency / multi lingual (b2) options are enabled, this condition will be known as **EXPANDED CURRENCY MODE** in the rest of the document.

7.4.23 EXPANSION – FTL REQ TO RCV

Expansion (17H / 67H)	FTL (FAH) Y1	REQ TO RCV Y2-Y6

Level 03 Readers (if File Transport Layer option enabled)

The VMC is requesting to receive data from the reader whose destination address will always be 10H or 60H. Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 : **FTL** REQ TO RCV
The VMC is requesting to receive data from the reader.

Y2 : **FTL** Destination Address (Reader = 10H / 60H as defined in Section 2.6.

Y3 : **FTL** Source Address
The source address of the command as defined in Section 2.6.

Y4 : **FTL** File ID
The type of information desired as defined in Section 2.6.

Y5 : **FTL** Maximum Length
The total number of blocks in the file as defined in Section 2.6.

Y6 : **FTL** Control
Data transfer control information as defined in Section 2.6.

Reader response:

Two responses are possible from the reader, either the SEND BLOCK (1DH) which transmits the initial (or only) part of the data or the RETRY / DENY (1CH). Note that the response can either be immediate or delayed.

FTL (1DH) SEND BLOCK Z1	SEND BLOCK Information Z2-Z34

Z1 : 1DH response which indicates SEND BLOCK

Z2 : Destination address of data as defined in Section 2.6

Z3 : Block # of data as defined in Section 2.6

Z4-Z34: Data (maximum of 31 bytes)

or

FTL (1CH) RETRY / DENY Z1	RETRY / DENY Information Z2-Z4

Z1 : 1CH response which indicates RETRY / DENY

Z2 : Destination address of response as defined in Section 2.6

Z3 : Source address of response (10H / 60H) as defined in Section 2.6

Z4 : Retry delay

7.4.24 EXPANSION – FTL RETRY / DENY

Expansion (17H)	FTL (FBH) Y1	RETRY / DENY Y2-Y4

Level 03 Readers (if File Transport Layer option enabled)

The VMC is retrying, denying, or aborting a data transfer to/from the reader whose destination address will always be 10H or 60H. Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 : **FTL** RETRY / DENY
The VMC is requesting to retry, deny, or abort a data transfer.

Y2 : **FTL** Destination Address (Reader = 10H / 60H)
The destination address of the command as defined in Section 2.6.

Y3 : **FTL** Source Address

The source address of the command as defined in Section 2.6.

Y4 : **FTL** Retry Delay
The time delay required of the sender as defined in Section 2.6.

Reader response:

None

7.4.25 EXPANSION – FTL SEND BLOCK

Expansion (17H / 67H)	FTL (FCH) Y1	SEND BLOCK Y2-Y34

Level 03 Readers (if File Transport Layer option enabled)

The VMC is sending data to the reader whose destination address will always be 10H or 60H. Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 : **FTL** SEND BLOCK
The VMC is requesting to send data.

Y2 : **FTL** Destination Address (Reader = 10H / 60H)
The destination address of the command / data as defined in Section 2.6.

Y3 : **FTL** Block #
The block # of data as defined in Section 2.6

Y4-Y34 **FTL** Data (maximum of 31 bytes)
The actual data block as defined in Section 2.6.

Reader response:

None

7.4.26 EXPANSION – FTL OK TO SEND

Expansion (17H / 67H)	FTL (FDH) Y1	OK TO SEND Y2-Y3

Level 03 Readers (if File Transport Layer option enabled)

The VMC is indicating that it is OK for the reader to transfer data. The destination address will always be the reader 10H or 60H. Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 : **FTL** OK TO SEND
The VMC is indicating it is OK to send data.

Y2 : **FTL** Destination Address (Reader = 10H / 60H)
The destination address of the command / data as defined in Section 2.6.

Y3 : **FTL** Source Address
The source address of the command as defined in Section 2.6.

Reader response:

One response is possible from the reader which transmits the initial (or only) part of the data. Note that the response can either be immediate or delayed.

FTL (1DH) SEND BLOCK Z1	SEND BLOCK Information Z2-Z34

Z1 : 1DH response which indicates SEND BLOCK

Z2 : Destination address of data as defined in Section 2.6

Z3 : Block # of data as defined in Section 2.6

Z4-Z34: Data (maximum of 31 bytes)

7.4.27 EXPANSION – FTL REQ TO SEND

Expansion (17H / 67H)	FTL (FEH) Y1	REQ TO SEND Y2-Y6

Level 03 Readers (if File Transport Layer option enabled)

The VMC is requesting to send data to the reader whose destination address will always be 10H or 60H. Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 : **FTL** REQ TO SEND
The VMC is requesting to send data to the reader.

Y2 : **FTL** Destination Address (Reader = 10H / 60H)
The destination address of the command as defined in Section 2.6.

Y3 : **FTL** Source Address
The source address of the command as defined in Section 2.6.

Y4 : **FTL** File ID
The type of information desired as defined in Section 2.6.

Y5 : **FTL** Maximum Length
The total number of blocks in the file as defined in Section 2.6.

Y6 : **FTL** Control
Data transfer control information as defined in Section 2.6.

Reader response:

Two responses are possible from the reader, either the OK TO SEND (1EH) which allows the data transfer to start or the RETRY / DENY (1CH). Note that the response can either be immediate or delayed.

FTL (1EH) OK TO SEND Z1	OK TO SEND Information Z2-Z3

Z1 : 1EH response which indicates OK TO SEND

Z2 : Destination address of response as defined in Section 2.6

Z3 : Source address of response (10H / 60H) as defined in Section 2.6

or

FTL (1CH) RETRY / DENY Z1	RETRY / DENY Information Z2-Z4

Z1 : 1CH response which indicates RETRY / DENY

Z2 : Destination address of response as defined in Section 2.6

Z3 : Source address of response (10H / 60H) as defined in Section 2.6

Z4 : Retry delay

7.4.28 EXPANSION - Diagnostics

Expansion (17H / 67H)	Diagnostics (FFH) Y1	User Defined Data Y2-Yn

Y1 : DIAGNOSTICS.
Device manufacturer specific instruction for implementing various manufacturing or test modes.

Y2-Yn : User Defined Data.

The data portion of this command is defined by the manufacturer and is not part of this document.

Reader response:

Diagnostics Response (FFH) Z1	User Defined Z2-Zn

Z1 : DIAGNOSTICS RESPONSE

Z2-Zn : User Defined Data.
The data portion of this response is defined by the manufacturer and is not part of this document.

7.5 Cashless Device Non-Response Time

The default maximum non-response time for a cashless device is 5 seconds. This is the maximum time for which a cashless device will not respond to a command or a POLL with ACK, NAK or a message. The "Application Maximum Response Time" reported in byte Z7 of the Reader Configuration Data (7.4.2) supersedes this default value if Z7 is greater.

Unless otherwise specified, a VMC should also use this value as a timeout for a response to commands that require data to be returned. (See Section 7.3.)

7.6 Cashless Device Power Requirements

The current draw for any cashless device must fall within the following limits. All measurements are at the minimum VMC Voltage Output.

Idle mode = 300 mA. (avg.) continuous

Transport or Read/Write cycle = 1.5 A @ 50% maximum duty cycle up to 5 seconds.

7.7 Example Vend Sessions

EXAMPLE VEND SESSION #1
(Valid Single Vend)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #2
(Valid Multiple Vend)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #3
(Session cancelled by user with reader return button)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
	User pushes reader RETURN button		
POLL	→		
	←	SESSION CANCEL	
ACK	→		
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #4a
(Session cancelled by user via coin mechanism escrow return button before product was selected)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
	User pushes coin mech. escrow return		
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #4b
(Session cancelled by user via coin mechanism escrow return button after product was selected)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
User pushes coin mech. escrow return			
CANCEL VEND	→		
	←	ACK	
POLL	→		
	←	VEND DENIED	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #5
(VMC Failure/product not dispensed Refund positive)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
Reader deducts purchase price from payment media			
POLL	→		
	←	VEND APPROVED	
VMC fails to dispense product			
VEND FAILURE	→		
	←	ACK	
POLL	→		
	←	Silence during the refund operation	
POLL	→		
	←	ACK	C
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #5A
(VMC Failure/product not dispensed Refund fail)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
Reader deducts purchase price from payment media			
POLL	→		
	←	VEND APPROVED	
VMC fails to dispense product			
VEND FAILURE	→		
	←	ACK	
POLL	→		
	←	Silence during the refund operation	
POLL	→		
	←	MALFUNCTION ERROR code 1100yyyy=refund fail	(Level 02 / 03)
		ACK	(Level 01)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #6
(Vend denied by reader)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)

Insufficient funds or payment media/account error

POLL	→		
	←	VEND DENIED	(Session Idle)

VMC makes no attempt to dispense product

SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #7
(Command Out of Sequence Error)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
EXPANSION ID REQUEST	→		
	←	ACK	
POLL	→		
	←	COMMAND OUT OF SEQUENCE	(Session Idle)
ACK	→		
RESET	→	{**Mandatory**}	
	←	ACK	
			(Inactive)

EXAMPLE VEND SESSION #8a
(Reader busy for longer than max. non response time)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
		[silence…]	(Reader busy)
POLLs (numerous)	→		
	←	[silence…]	(continued POLLs w/ no response)
POLL	→		
	←	ACK	(restart Non-Response timer)
POLLs (numerous)	→		
	←	[silence…]	(continued POLLs w/ no response)
POLL	→		
	←	[silence…]	(Reader almost finished)
POLL	→		
	←	VEND APPROVED	(Reader ready)
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION #8b
(Reader busy for shorter than max. non response time)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	[silence...]	(Reader busy)
POLLs (numerous)	→		
	←	[silence...]	(Continued POLLs w/ no response)
POLL	→		
	←	[silence...]	(Reader almost finished)
POLL	→		
	←	VEND APPROVED	(Reader ready)
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

NOTE
If the peripheral omits to respond within the maximum non-response time, it is considered to be off-line.

EXAMPLE VEND SESSION #8c
(No Response, Reader busy at Vend Request.)

Controller		Cashless Device	State/ Comment
POLL	→		
	←	BEGIN SESSION	
ACK	→		
VEND REQUEST	→		
	←	[silence…]	Reader busy. The reader may not send the response within the t-response(max) timeout or hasn't received the command completely due to line breakdown
VEND REQUEST	→		VMC repeats the command: As the VMC isn't sure, that the slave has received the command free of errors it repeats it. The command itself is not yet performed by the reader as long the ACK hasn't been sent.
	←	[silence…]	Reader busy
VEND REQUEST	→		
	←	ACK	(Vend) The reader will now perform the command. The response isn't available at the moment, thus the VEND REQUEST is only acked
POLL (numerous)	→		VMC polls the reader to obtain the data in VEND APPROVED
	←	ACK	The reader may send a ACK or [silence] to each POLL
POLL	→		
	←	VEND APPROVED	The response to the VEND REQUEST is now available. It must be sent within the time defined by the APPLICATION MAXIMUM RESPONSE TIME. This is measured from the ACK following the VEND REQUEST.
ACK	→		

EXAMPLE VEND SESSION #9
(Pre-approved authorization aborted by coin mechanism escrow return button before BEGIN SESSION)

Controller		Cashless Device	State
	User swipes payment media		
			(Enabled)
POLL	→		
	←	ACK	
READER CANCEL	→		
	←	ACK	
	(If applicable, reader aborts HOST communications, ejects payment media, etc...)		
POLL	→		
	←	CANCELLED	
ACK	→		

EXAMPLE VEND SESSION #10
(Single Negative Vend)

Controller		Cashless Device	State
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		
	User inserted a payment media, and inserted then a product, which was detected valid, or pressed a selection button to identify the desired product which will be inserted later on		
NEGATIVE VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	VEND APPROVED	
	The payment reader is able to add the desired value to the credit		
ACK	→		
	The product is now fully accepted from the machine or the user has finally finished insertion of a valid product		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
	The payment media reader has added the credit		
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

Normally, can or bottle return-vendors may check the product first, before the patron inserts his card. It is up to the VMC, to delay the negative vend request, until the session idle state is reached. In many return-vendors, from this state, the product is already fully accepted. Therefore, there is no need for the further sequences, this means, vend accepted, vend success will follow each other immediately.

If the payment media reader is not able to update the credit, there will be two conditions:

- The return vendor is able to escrow the product after the vend denied. In this case the session complete is sent, the product is return and the credit remains unchanged.
- The return vendor is not able to escrow the product after vend denied. In this case, session complete should be sent and there should be an update credit within the system (VMC), which could be returned by other means (i.e. return coins, tokens, etc).

If a return vendor is able to escrow the product again, this vendor normally accepts the product finally only a vend accepted was sent. In this case there may happen some fault condition which allows no final acceptance of the product. The return vendor then closes the session with vend failed instead of vend success, indicating to the reader not to update the system credit, or, if the payment media is no longer present, request re-insertion of the media.

EXAMPLE VEND SESSION #11
(Always Idle state option set)

Controller		Cashless Device	State
POLL	→		
	←	ACK	(Enabled)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	ACK	(repeated until User presents cashless media or timeout)
POLL	→		
	←	VEND APPROVED	
ACK	→		
VEND SUCCESS	→		
	←	ACK	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION CANCELLED #12
(Always Idle state option set)

Controller		Cashless Device	State
POLL	→		
	←	ACK	(Enabled)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	ACK	(repeated until User presents cashless media), but instead of this, cash is inserted

VEND CANCEL	→		
	←	ACK	(Session Idle)
POLL	→		
	←	VEND DENIED	(Session Idle)
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE VEND SESSION TIMEOUT#13
(Always Idle state option set)

Controller		Cashless Device	State
POLL	→		
	←	ACK	(Enabled)
VEND REQUEST	→		
	←	ACK	(Vend)
POLL	→		
	←	ACK	(repeated until User presents cashless media or timeout), timeout occurs
POLL	→		
	←	VEND DENIED	
ACK	→		
SESSION COMPLETE	→		
	←	ACK	
POLL	→		
	←	END SESSION	(Enabled)
ACK	→		

EXAMPLE DATA ENTRY SESSION #1
(Three key Data Entry w/ Prompt & Asterisks for Entries)

Controller		Cashless Device	State
		Previously Enabled	Enabled
POLL	→		
	←	DATA ENTRY REQUEST + DISPLAY REQUEST (prompt)	
ACK	→		
	User	**pushes Selection Key 1**	
DATA ENTRY RESPONSE (Key 1)	→		
	←	ACK	
POLL	→		
	←	DISPLAY REQUEST (prompt + *)	
ACK	→		
	User	**pushes Selection Key 2**	
DATA ENTRY RESPONSE (Key 2)	→		
	←	ACK	
POLL	→		
	←	DISPLAY REQUEST (prompt + **)	
ACK	→		
	User	**pushes Selection Key 3**	
DATA ENTRY RESPONSE (Key 3)	→		
	←	ACK	(Enabled)
POLL	→		
	←	DISPLAY REQUEST (prompt + *** or "Entry OK")	
ACK	→		
	Note:	**After Display Request Time expires, VMC regains control of display**	
POLL	→		
	←	BEGIN SESSION	(Session Idle)
ACK	→		

EXAMPLE DATA ENTRY SESSION #2
(Data Entry with Reader Cancel)

Controller		Cashless Device	State
		Previously Enabled	Enabled
POLL	→		
	←	DATA ENTRY REQUEST + DISPLAY REQUEST (prompt)	
ACK	→		
	User	**pushes (valid) Selection Key**	
DATA ENTRY RESPONSE (Key 1)	→		
	←	ACK	
POLL	→		
	←	DISPLAY REQUEST (prompt + *)	
ACK	→		
	User	**pushes (invalid) Selection Key**	
DATA ENTRY RESPONSE (Key 2)	→		
	←	ACK	
POLL	→		
	←	DATA ENTRY CANCEL	
ACK	→		(Enabled)
POLL	→		
	←	DISPLAY REQUEST ("Error")	
ACK	→		
	After VMC	**Display Request Time expires, regains control of display**	

Note that the above scenario is only an example and it may not be prudent to cancel a session after the first wrong entry. (Someone could fraudulently obtain a password by trying the maximum of selection keys at each position.)

EXAMPLE DATA ENTRY SESSION #3
(Data Entry with VMC Cancel)

Controller		Cashless Device	State
		Previously Enabled	Enabled
POLL	→		
	←	DATA ENTRY REQUEST + DISPLAY REQUEST (prompt)	
ACK	→		
	User	**pushes Selection Key**	
DATA ENTRY RESPONSE (Key 1)	→		
	←	ACK	
POLL	→		
	←	DISPLAY REQUEST (prompt + *)	
ACK	→		
	User	**walks away & VMC times out**	
DATA ENTRY RESPONSE (FF's)	→		
	←	ACK	(Enabled)
POLL	→		
	←	DISPLAY REQUEST ("Try Again")	
ACK	→		
	After	**Display Request Time expires,**	
	VMC	**regains control of display**	

Section 8
Communications Gateway
VMC/Peripheral Communication Specifications

8.1 Introduction

This section defines the communications bytes sent and received between a Communications Gateway (Comms Gateway) and the VMC. The Comms Gateway address is 00011xxxB (18H).

Unless otherwise stated, all information is assumed to be in a binary format.

After the VMC has issued a command, the Comms Gateway must respond with a reply. The reply may be an ACK or a detailed message response. If the command format expects a response, the Comms Gateway may: 1) respond with an ACK, to acknowledge receiving the command, and send the response later as a response to a POLL, or 2) immediately respond with the expected message.

The Comms Gateway response to a command from the VMC may be an ACK, a single message, or if there is more data to send it may be a multi message reply, up to the MDB maximum of 36 bytes.

The following command / response set has been defined to provide a means to transfer vending information system data from the VMC to the Comms Gateway in one of two ways;

1) Entire DTS files (including DXS, ST, SD1, G85, SE, and DXE records) are transferred using the file transport layer (FTL) of MDB.

2) Activity "Reports" are sent from the VMC to the Comms Gateway every time something happens in the vending system, it is then the Comms Gateways responsibility to store and assemble the DTS file. (DXS, ST, SD1, G85, SE and DXE data are not sent.) Obviously, a combination of these two methods can be designed to meet specific needs also.

8.2 VMC Commands

VMC Cmd	Code	VMC Data	Comm Gateway response
RESET	18H		00H - Just RESET (1)
SETUP	19H	Feature level (1) Scale factor (1) Decimal places (1)	01H - Comms Gateway Config (1) Feature level (1) Max. App. Resp. (2)
POLL	1AH		00H - Just RESET (1)
			01H - Comms Gateway Config (1) Feature level (1) Max. App. Resp. (2)
			02H - Request transmit (1)
			03H - Data transmitted (1)
			04H - Error (1) Error code (n)
			05H - DTS Event Acknowledge (1)
			06H - Peripheral ID: (1) Mfg. code (3) Serial number (12) Model number (12) Software ver. (2) Opt. features (4)
			07H - Radio Signal Strength (2)
			1BH - FTL REQ to RCV (option) (1)
			1CH - FTL RETRY / DENY (option) (1)
			1DH - FTL SEND BLOCK (option) (1)
			1EH - FTL OK to SEND (option) (1)
			1FH - FTL REQ to SEND (option) (1)
			FFH - Diagnostics (n)
REPORT	1BH	Type = 01, Transaction (1) Transaction Type (1) Selection (Row/Col.) (2) Price (2) Cash in, Coin tubes (2) Cash in, Cashbox (2) Cash in, Bills (2) Value in, Cashless #1 (2) Value in, Cashless #2 (2) Revalue to Cashless #1 (2) Revalue to Cashless #2 (2) Cash out (2) Discount Amount (2) Surcharge Amount (2) User Group # (1) Price List (1) Date (4) Time (2)	

		Type = 02, DTS Event (1) DTS Event Code (10) Date (4) Time (2) Duration (4) Activity (1) Terminal ID (12)	05-DTS Event Acknowledge (1)
		Type = 03, Asset ID (1) Asset Type = 0n (1) Manufacture Code (3) Serial Number (12) Model Number (12) Software Version (2) Type = 03, Asset ID (1) Asset Type = 8n (1) Asset Number (20)	
		Type = 04, Currency ID (1) VMC Currency Code (2) VMC Currency (1) VMC Decimal Point (1)	
		Type = 05, Product ID (1) Product Identification (20) Selection Presence (1)	
CONTROL	1CH	00H - Disable (1)	
		01H - Enable (1)	
		02H - Transmit (1)	
EXPANSION	1FH	00H - Identification	06H - Peripheral ID: (1) Mfg. code (3) Serial number (12) Model number (12) Software ver. (2) Opt. features (4)
		01H - Feature enable (1) Features enabled (4)	
		02H – Time/Date Request (1) Time/Date (1)	07H – CG Time/Date (1) Years (1) Months (1) Days (1) Hours (1) Minutes (1) Seconds (1) Day of Week (1) Summertime (1) Holiday (1)
		FAH - FTL (option) REQ TO RCV	1DH - SEND BLOCK 1CH - RETRY / DENY
		FBH - FTL (option) RETRY / DENY	No Data
		FCH - FTL (option) SEND BLOCK	No Data

		FDH - FTL (option) OK TO SEND	1DH - SEND BLOCK
		FEH - FTL (option) REQ TO SEND	1EH - OK TO SEND 1CH - RETRY/DENY
		FFH - Diagnostics (n)	FFH - Diagnostics (n)

8.3 Communications Gateway Command Format

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
RESET	18H	No data	None

This command is the vehicle that the VMC should use to tell the Comms Gateway that it should perform its initialization procedure. With the exception of the ACK response, it should abort all communication and revert to the internally stored operational parameters.

The following initialization sequence is recommended. It should be used after "power up", after issuing the RESET command, or after issuing the Bus Reset (pulling the transmit line "active" for a minimum of 100 mS).

POLL – 18H
To obtain "JUST RESET" response

SETUP – 19H
To obtain Comms Gateway level and configuration information

EXPANSION IDENTIFICATION – 1F 00H
To obtain additional identification information and options

EXPANSION FEATURE ENABLE – 1F 01H
To enable desired options

CONTROL / ENABLE – 1CH / 01H
To enable / alert the Comms Gateway to start collecting data and / or monitoring for REPORT commands situations.

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
SETUP	19H	Y1 - Y3	Z1 - Z4

Y1 = VMC feature level

Indicates the highest Comms Gateway feature level that the VMC supports. Currently the highest feature level is 03, with no requirement to support previous (obsolete) levels 1 and 2.)

Y2 = Scale factor

The multiplier used to scale all monetary values transferred between the VMC and the Comms Gateway.

Y3 = Decimal places

The number of decimal places used to communicate monetary values between the VMC and the Comms Gateway.

Z1 = 01 COMMS GATEWAY CONFIGURATION

The Comms Gateway is responding to a SETUP command. This response includes the following data;

Z2 = Comms Gateway feature level

The feature level of the Comms Gateway. Currently the highest feature level is 03, with no requirement to support previous (obsolete) levels 1 and 2.)

Z3 - Z4 = Application maximum response time

The maximum length of time, in seconds, that an Comms Gateway may be unable to respond to any commands. This includes the time communicating over an external network. The VMC should continue POLLing the Comms Gateway during this time in an attempt to re-synchronize communications earlier. When the Comms Gateway is ready to communicate over the bus again, it should respond to the next POLL with COMPLETE (if communicating externally) or ACK. This time essentially replaces the standard MDB non-response time, as such it's default value is equal to the defined non-response time (5 seconds).

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
POLL	1AH	No data	Z1 - Zn

The POLL command is used by the VMC to obtain information from the Comms Gateway. This information may include setup information, activity requests, or error conditions. An ACK response indicates that no error states exist and either no information request is pending or pending information is not yet ready for transmission.

In addition to an ACK, the VMC may receive the following POLL responses from the Comms Gateway.

Z1 = 00 JUST RESET

Indicates the Comms Gateway has been reset internally or on command from the VMC.

Z1 = 01 COMMS GATEWAY CONFIGURATION

The Comms Gateway is responding to a SETUP command. This response includes the following data;

Z2 = Comms Gateway feature level

The feature level of the Comms Gateway. Currently the highest feature level is 03, with no requirement to support previous (obsolete) levels 1 and 2.)

Z3 - Z4 = Application maximum response time

The maximum length of time, in seconds, that an Comms Gateway may be unable to respond to any commands. This includes the time communicating over an external network. The VMC should continue POLLing the Comms Gateway during this time in an attempt to re-synchronize communications earlier. When the Comms Gateway is ready to communicate over the bus again, it should respond to the next POLL with COMPLETE (if communicating externally) or ACK. This time essentially replaces the standard MDB non-response time, as such it's default value is equal to the defined non-response time (5 seconds).

Z1 = 02 REQUEST TO TRANSMIT

The Comms Gateway is requesting permission to transmit data to an external collection device. This is done to control the bus power supply. The Comms Gateway should continue sending this response to each POLL until permission to transmit has been granted or the need to transmit goes away.

Z1 = 03 DATA TRANSMITTED

The Comms Gateway is finished transmitting to an external collect device.

Z1 = 04 ERROR

The Comms Gateway has developed some type of detectable error. The error codes will be sent continuously, or until the error is resolved.

Z2 – Zn = Error code

The error codes are ASCII strings taken from the EVA DTS Communications fault list.

Z1 = 05 DTS EVENT ACKNOWLEDGE

The Comms Gateway has recognized that a DTS Event has occurred and must act accordingly. The specific actions will be defined by the Comms Gateway operational specifications.

Z1 = 06H PERIPHERAL ID

Comms Gateway is sending peripheral ID information. This response includes the following data;

Z2 - Z4 = Manufacturer code

Identification code for the equipment supplier. Sent as ASCII characters. Blanks (20H) are acceptable.

Z5 - Z16 = Serial number

Factory assigned serial number sent as numeric ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Z17 - Z28 = Model number ASCII.

Manufacturer assigned model number sent as ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Z29 - Z30 = Software version

Current software version sent as packed BCD.

Z31 - Z34 = Optional Features

Each of the 32 bits indicate an optional features availability. If the bit is set the feature is available. Currently defined options are:

b0: File transport layer support
b1: Verbose mode: See REPORT command
b2 : Expansion Time/Date Request command
b3- b31: Future use, must be set to 0.

Z1 = 07H RADIO SIGNAL STRENGTH

The Comms Gateway is reporting its signal strength from the network. This response includes the following data;

Z2 = Signal Strength

The level of radio signal strength detected by the Comms Gateway. This is a binary number from 00H to 64H (100%) representing the percentage of expected signal. This can be sent after every POLL, or as needed due to changes in the signal.

Note that all FTL responses below are defined in Section 2.6. For the Comms Gateway, the source address will always be the Comms Gateway (18H) as defined in Section 2.3.

Z1 = 1BH REQ TO RCV (File Transport Layer)

The Comms Gateway is requesting to receive data from a device or VMC.

Z2 = Destination address of response
Z3 = Source address of response (18H)
Z4 = File ID
Z5 = Maximum length
Z6 = Control

Z1 = 1CH RETRY/DENY (File Transport Layer)

The Comms Gateway is requesting a device or VMC to retry or deny the last FTL command.

Z2 = Destination address of response
Z3 = Source address of response (18H)
Z4 = Retry delay

Z1 = 1DH SEND BLOCK (File Transport Layer)

The Comms Gateway is sending a block of data (maximum of 31 bytes) to a device or VMC.

Z2 = Destination address of data
Z3 = Block #
Z4-Z34 = Data (maximum of 31 bytes)

Z1 = 1EH OK TO SEND (File Transport Layer)

The Comms Gateway is indicating that it is OK for a device or VMC to send it data.

Z2 = Destination address of response
Z3 = Source address of response (18H)

Z1 = 1F REQ TO SEND (File Transport Layer)

The Comms Gateway is requesting to send data to a device or VMC.

Z2 = Destination address of response
Z3 = Source address of response (18H)
Z4 = File ID
Z5 = Maximum length
Z6 = Control

Z1 = FFH DIAGNOSTICS

The Comms Gateway is responding to a EXPANSION/DIAGNOSTICS command. This response includes the following data;

Z2 - Zn User defined data

Device manufacturer specific responses after receiving manufacturing or test instructions. Z1 - Zn implies that any number of bytes may be used for the response data from the Comms Gateway.

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
REPORT	1BH	Y1 – Ynn	No data

The REPORT command is used by the VMC to pass activity information to the Comms Gateway. If the "Verbose mode" is enabled via the EXPANSION / FEATURE ENABLE command, this command must be sent immediately following the completion of any activity it is describing. The activities may include; a transaction, a DTS defined event, an asset identification, currency identification, or product identification.

The intent of this command is to provide information so that the Comms Gateway can create a Data Transfer Standard file. All of the following fields show their corresponding DTS fields for reference, for further detail refer to the Data Transfer Standard.

If the "Verbose mode" is disabled, only the "DTS Event" report type records must be sent. This mode uses the FTL to transfer the complete DTS files and the DTS Event report types to alert the VMC of any alarm conditions.

Since reports data may vary, any field that is not relevant, or not known, should be populated with 00H's. All cash values are scaled and decimal adjusted using the data provided in the SETUP command.

Y1 = Type: The type of activity that is being reported, includes one of the following:

01H	Transaction
02H	DTS Event
03H	Asset ID
04H	Currency ID
05H	Product ID

If Y1 = 01H then the following "Transaction" data fields have been identified to be included:

Y2 = Transaction Type

This field defines the type of transaction that the following data describes. The defined transaction types include;

01H	Paid Vend
02H	Token Vend
03H	Free Vend
04H	Test Vend
05H	Revalue
06H	Negative Vend
07H	Vendless*
08H	Manual / Service

* The end of a "Vendless" transaction is defined by the VMC manufacturer, for example an escrow request, a failed vend, etc.

Y3 – Y4 = Item Number

This is the binary field used to link REPORT type 01 to REPORT type 05. It is an item number, 0000H through FFFFH of the selected product involved in the most recent transaction. This number is defined by the manufacturer.

Y5 – Y6 = Price (PA102)

The established price of the product involved in the most recent transaction. The established price is the price before any adjustments i.e. discounts surcharges, etc.

Y7 – Y8 = Cash in, Coin Tubes (CA303/CA307 or CA1001/CA1002)

The value of cash deposited into the coin tubes since the completion of the previous transaction.

Y9 – Y10 = Cash in, Cashbox (CA302/CA306)

The value of cash deposited into the cashbox since the completion of the previous transaction.

Y11 – Y12 = Cash in, Bills (CA304/CA308)

The value of cash deposited into the bill stacker since the completion of the previous transactions.

Y13 – Y14 = Value in, Cashless Device #1 (DA201/DA203)

The value removed from the media in cashless device #1 since the completion of the previous transaction.

Y15 – Y16 = Value in, Cashless Device #2 (DB201/DB203)

The value removed from the media in cashless device #2 since the completion of the previous transaction.

Y17 – Y18 = Revalue to Cashless Device #1 (DA401/DA402)

The value returned to the media in cashless device #1 since the completion of the previous transaction.

Y19 – Y20 = Revalue to Cashless Device #2 (DB401/DB402)

The value returned to the media in cashless device #2 since the completion of the previous transaction.

Y21 – Y22 = Cash out (CA401/CA403 or CA402/CA404)

The total value of the cash dispensed from the system since the completion of the previous transaction.

Y23 – Y24 = Discount Amount (CA701/CA702)

The value of any discounts awarded since the completion of the previous vend.

Y25 – Y26 = Surcharge Amount (CA705/CA706)

The value of any surcharges collected since the completion of the previous vend.

Y27 = User Group # (DA701 or DB701)

The user group number that the transaction is associated with.

Y28 = Price List (LA101)

The price list that the transaction is associated with

Y29 – Y32 = Date (PA501)

The date of the transaction. This data is sent as BCD in the following sequence YYYY/MM/DD. For example, 17 March 2002 would be 20H 02H 03H 17H. If the date is not known these bytes are filled with 99Hs.

Y33 – Y34 = Time (PA502)

The time of the transaction. This data is sent as BCD , 24 hour format, in the following sequence HHMM. For example, 6:30 PM would be 18H 30H. If the time is not known these bytes are filled with 99Hs.

If Y1 = 02H then the following "DTS Event" data fields have been identified to be included:

Y2 – Y11 = DTS Event Code (EA101 or EA201 or EA701)

This is an alpha-numeric ASCII code defining the event being reported. The codes are list in the EVA DTS manual. In addition to the standard DTS event codes, an interrogation event is reported as "EA3" and a power outage event is reported as "EA7".

Y12 – Y15 = Date (EA102)

The date of the event. This data is sent as BCD in the following sequence YYYY/MM/DD. For example, 17 March 2002 would be 20H 02H 03H 17H. If the date is not known these bytes are filled with 99Hs.

Y16 – Y17 = Time (EA103)

The time of the event. This data is sent as BCD in the following sequence HH/MM. For example, 6:30 PM would be 18H 30H. If the time is not known these bytes are filled with 99Hs.

Y18 – Y21 = Duration (EA206)

The duration of the event in total minutes. This data is sent as binary. For example, 4 hours and 15 minutes would be 00H 00H 00H FFH.

Y22 = Activity (EA205)

The current status of the events activity. This field is equal to 00H if the event is inactive (or not reset for "EA3") or 01H if the event is active (or reset for "EA3").

Z1 = 05 DTS EVENT ACKNOWLEDGE

The Comms Gateway has recognized that a possible alarm situation has occurred and must act accordingly. The specific actions will be defined by the Comms Gateway operational specifications.

If Y1 = 03H then the following "Asset ID" data fields have been identified to be included:

Y2 = Asset Type

The following code pairs have been defined to represent the type of equipment asset that is being communicated.

Code	Equipment type	DTS header (αα)
01H / 81H	Audit Module / Data Carrier (DC) Identification	AM1
02H / 82H	Bill Validator Identification	BA1
03H / 83H	Changer Identification	CA1
04H / 84H	Control Board Identification	CB1
05H / 85H	Cashless #1 Identification	DA1
06H / 86H	Cashless #2 Identification	DB1
07H / 87H	Machine Identification	ID1

If Y2 has the MSB = 0 (i.e. Y2 = 01H) then the following asset data fields have been identified to be included:

Y3 – Y5 = Manufacturer code (αα101, first 3 characters)

Identification code for the equipment supplier. Sent as ASCII characters. Blanks (20H) are acceptable.

Y6 - Y17 = Serial number (αα101, 4th through 15th characters)

Factory assigned serial number sent as numeric ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Y18 - Y29 = Model number (αα102)

Manufacturer assigned model number sent as ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Y30 - Y31 = Software version (or Build Standard) (αα103)

Current software version sent as packed BCD.

If Y2 has the MSB = 1 (i.e. Y2 = 81H) then the following asset data fields have been identified to be included:

Y2 – Y21 = Asset Number (αα105 or αα106)

The asset number of the equipment. This is a reference number used for tracking purposes, separate from the serial number. It is usually programmed by the equipment operator.

If Y1 = 04H then the following "Currency ID" data fields have been identified to be included:

Y2 – Y3 = VMC's Country / Currency Code (ID402)

The packed BCD Country / Currency code of the VMC can be sent in two different forms depending on the value of the left most BCD digit.

If the left most digit is a 0, the International Telephone Code is used to indicate the country that the changer is set-up for. For example, the USA code is 00 01H (Z2 = 00 and Z3 = 01).

If the left most digit is a 1, the latest version of the ISO 4217 numeric currency code is used. For example, the code for the US dollar is 18 40H (Z2 = 18 and Z3 = 40) and for the Euro is 1978 (Z2 = 19 and Z3 = 78).

All new designs after July, 2000 must use the ISO 4217 numeric currency codes.

Y4 = VMC's Coin Scaling Factor / Currency Description (ID403)

The multiplier used to scale all monetary values transferred between the VMC and the vending machines monetary system.

Y5 = VMC's Decimal Point (ID401)

The number of digits to the right of the decimal point. This field is used in countries whose currency requires a number of digits to the right of the decimal point other than 2.

If Y1 = 05H then the following "Product ID" data fields have been identified to be included:

Y2 – Y3 = Item Number

This is the binary field used to link REPORT type 01 to REPORT type 05. This number is defined by the manufacturer.

Y4 – Y9 = Product Number (PA101)

This is the ASCII representation of the Item Number that should be included in the DTS file. All bytes must be sent, leading blanks (20H) are acceptable.

Y10 – Y29 = Product Identification (PA103)

The ASCII product identification that should identify the product itself, as in a name (chips/crisps) or an ID number / bar code. All bytes must be sent, leading blanks (20H) are acceptable.

Y30 = Selection Presence Status (PA107)

This field is set to 00H if a vend mechanism (motor, solenoid, etc.) is present for this selection. This field is set to 01H if a vend mechanism is not present.

An example of a 01H being sent would be if the vend mechanism was present previously, and something occurred so that it is not being currently detected (i.e., removed, broken wire, etc.). It is **not** intended to indicate that a product is not available for vending (i.e., sold out).

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
CONTROL	1CH	Y1	No data

This command is the vehicle that the VMC uses to control the Comms Gateway's use of an external collection device. For example when it should, or should not, transmit through the external collection device. The information is identified by one of the following subcommands;

Y1 = 00 Disabled

No external transmissions will be granted and no REPORT commands will be sent.

Y1 = 01 Enabled

External transmissions may be requested and REPORT commands will be sent.

Y1 = 02 Transmit

Permission to transmit and / or receive data is granted, or a transmission session is requested. A DATA TRANSMITTED response to a POLL must be sent when the transmission session is complete.

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION/ IDENTIFICATION	1FH/00H	Y1	Z1 - Z34

Y1 = 00H IDENTIFICATION subcommand

The VMC is requesting Comms Gateway identification information for asset tracking and optional feature purposes.

Z1 = 06H PERIPHERAL ID

Comms Gateway is sending peripheral ID information. This response includes the following data;

Z2 - Z4 = Manufacturer code

Identification code for the equipment supplier. Sent as ASCII characters. Blanks (20H) are acceptable.

Z5 - Z16 = Serial number

Factory assigned serial number sent as numeric ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Z17 - Z28 = Model number ASCII.

Manufacturer assigned model number sent as ASCII characters. All bytes must be sent. Zeros (30H) and blanks (20H) are acceptable.

Z29 - Z30 = Software version

Current software version sent as packed BCD.

Z31 - Z34 = Optional Features

Each of the 32 bits indicate an optional features availability. If the bit is set the feature is available. Currently defined options include:

b0: File transport layer support.
b1: Verbose mode: See REPORT command
b2 - b31: Future use, must be set to 0.

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION/ FEATURE ENABLE	1FH/01H	Y1 - Y5	No data

Y1 = 01H FEATURE ENABLE subcommand

This command is used to enable each of the optional features defined in Z32-Z35 of the PERIPHERAL ID response. The VMC should send the EXPANSION /IDENTIFICATION command, receive the PERIPHERAL ID response, perform a logical OR with the optional features it wants to enable, and return the resulting enabled features back to the Comms Gateway by setting a bit to 1 for each respective optional feature enabled. All optional features are disabled after reset.

Y2 - Y5 = Optional features enabled

Each of the 32 bits indicates an optional features state. If the bit is set the feature is enabled.

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION/ TIME/DATE REQUEST	1FH/02H	Y1	Z1-Z11

Y1 = 01H TIME/DATE subcommand

Normally the Comms Gateway is a networked device, and therefore capable of asking the actual time from a server if required. This command is used to synchronize the VMC's real time clock from the Comms Gateway.

To be able to use the command it must be enabled via the EXPANSION / FEATURE ENABLE command.

Z1 = 01H CG Time/Date

The date bytes are BCD encoded
Z2 = Years (Range: 00..99)
Z3 = Months (Range: 01..12)
Z4 = Days (Range: 01..31)
Z5 = Hours (Range: 00..23)
Z6 = Minutes (Range: 00..59)
Z7 = Seconds (Range: 00..59)
Z8 = Day of Week (Range: 01..07, Monday = 1..Sunday = 7)

Z9 = Week Number (Range: 01..53)
Z10 = Summertime (Range: 00..01, Summertime = 1)
Z11 = Holiday (Range: 00..01, Holiday = 1)

If any item of the time/date is not supported use FFH instead

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION COMMAND	0FH FAH **FTL** REQ TO RCV	Y1-Y5	Z1 - Zn (immediate or POLLed)

The VMC is requesting to receive data from the Comms Gateway whose destination address will always be (18H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (18H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Block #
Z4 - Z34 = Data (maximum of 31 bytes)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (18H)
Z4 = Retry delay

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION COMMAND	0FH FBH **FTL** RETRY / DENY	Y1-Y3	None

The VMC is retrying, denying, or aborting a data transfer to/from the Comms Gateway whose destination address will always be (18H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (18H)
Y2 = Source address of command
Y3 = Retry delay

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION COMMAND	0FH FCH **FTL** SEND BLOCK	Y1-Y33	None

The VMC is sending data to the Comms Gateway whose destination address will always be (18H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command & data (18H)
Y2 = Block #
Y3 - Y33 = Data (maximum of 31 bytes)

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION COMMAND	0FH FDH **FTL** OK TO SEND	Y1-Y2	Z1-Z34 (immediate or POLLed)

The VMC is indicating that it is OK for the Comms Gateway to transfer data. The destination address will always be the Comms Gateway (18H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (18H)
Y2 = Source address of command

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Source address of data
Z4 - Z34 = Data (maximum of 31 bytes)

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION COMMAND	0FH FEH FTL REQ TO SEND	Y1-Y5	Z1 - Zn (immediate or POLLed)

The VMC is requesting to send data to the Comms Gateway whose destination address will always be (18H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (18H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1EH which indicates OK TO SEND
Z2 = Destination address of response
Z3 = Source address of response (18H)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (18H)
Z4 = Retry delay

VMC Command	Code/Sub-code	VMC Data	Comms Gateway Response
EXPANSION/ DIAGNOSTICS	1FH/FFH	Y1 - Yn	Z1 - Zn

Y1 = FFH DIAGNOSTICS subcommand

Device manufacturer specific instruction for implementing various manufacturing or test modes.

Y2 - Yn = User defined data

The data portion of this command is defined by the manufacturer and is not part of this document.

Z1 = FFH DIAGNOSTICS

The Comms Gateway is responding to a EXPANSION/DIAGNOSTICS command. This response includes the following data;

Z2 - Zn = User defined data

Device manufacturer specific responses after receiving manufacturing or test instructions. Z1 - Zn implies that any number of bytes may be used for the response data from the Comms Gateway.

8.4 Communications Gateway Non-Response Time

The maximum non-response time for a Comms Gateway is 5 seconds. This is the maximum time for which a Comms Gateway will not respond to a command with ACK, NAK, or a data message.

8.5 Communications Gateway Power Requirements

The current draw for any Comms Gateway must fall within the following limits. All measurements are at the minimum VMC Voltage Output.

Idle mode = 300 mA. (avg.) continuous

Active mode = 1.8 A continuous and up to 2.5 A (max) for an accumulated maximum of 10 seconds. The active power mode must be initiated by the REQUEST TO TRANSMIT followed by the CONTROL/TRANSMIT. The active power mode must be closed by sending the DATA TRANSMITTED. During this time the VMC will make its own decisions about which other peripherals will be disabled or not. This may result in the entire machine being disabled for normal vending.

8.6 Communications Gateway Examples

Event	Exchange
Power on Reset at VMC or JUST RESET received by VMC any other time	Reset sequence Enable sequence
Communications Gateway is triggered to send a file	Request sequence Transmit sequence
VMC is triggered to send a file	Dump sequence Transmit sequence
DTS Event situation occurs at VMC	DTS Event sequence Request sequence Transmit sequence
Error situation is detected at Comms Gateway	Error sequence
Every vend completion	Vend sequence

Reset sequence			
VMC		**Comms Gateway**	**Comments**
RESET (18)	→		Reset command
	←	ACK	
POLL (1A)	→		Must be sent once reset, internal or external
	←	JUST RESET (00)	
ACK	→		
SETUP (19…)	→		Establish operation configuration
	←	CONFIG. (01…)	
ACK	→		
EXPANSION/ID (1F/00…)	→		Send asset information
	←	PERIPHERAL ID (06…)	Get asset information
ACK	→		
EXPANSION/FEATURE ENABLE (1F/01…)	→		Enable additional feature if necessary
	←	ACK	
Enable sequence			
VMC		**Comms Gateway**	**Comments**
CONTROL/ENABLE (1C01)	→		Enable command
	←	ACK	
Disable sequence			
VMC		**Comms Gateway**	**Comments**
CONTROL/DISABLE (1C00)	→		Disable command
	←	ACK	

Request sequence VMC		Comms Gateway	Comments
File transfer done		**using the MDB**	**file transport layer**

Dump sequence VMC		Comms Gateway	Comments
File transfer done		**using the MDB**	**file transport layer**

Transmit sequence VMC		Comms Gateway	Comments
POLL (1A)	→		
	←	Request to transmit (02)	
ACK	→		
CONTROL/ TRANSMIT (1C/02)	→		
	←	ACK	
POLL (1A)			
		ACK	
		.	Continue POLLing until …
		.	
POLL (1A)	→		
	←	Data transmitted (03)	
ACK	→		

DTS Event sequence VMC		Comms Gateway	Comments
REPORT (1B / 02…)	→		
	←	ACK	
		.	Repeat until recognized
		.	
REPORT (1B /02…)	→		
	←	DTS EVENT ACKNOWLEDGE (05)	

Error sequence VMC		Comms Gateway	Comments
POLL (1A)	→		Sent continuously, or until the error is resolved
	←	ERROR (06)	
ACK	→		

Activity sequence VMC		Comms Gateway	Comments
REPORT (1B…)	→		Sent every activity
	←	ACK	

Section 9
Universal Satellite Device (USD)
VMC/Peripheral Communication Specifications

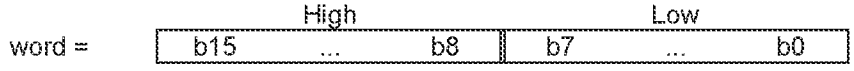
9.1 Introduction

An MDB Universal Satellite Device (USD) is a vending device which lacks customary credit acceptance peripherals. As such, a USD must rely on a host vending machine controller (VMC) to establish credit sufficient to perform a vend. The specification herein describes a protocol by which a USD and a VMC exchange messages and credit via the MDB bus.

9.1.1 Definitions

This section defines the non-response and application response time, base addresses, and the communication bytes sent by the MDB Universal Satellite Device (USD) and a Vending Machine Controller.

- The default maximum non-response time of the USD is 5 seconds.
- The default maximum application response time of the USD is 5 seconds.
- Three consecutive USD base addresses are defined to allow multiple USDs to operate simultaneously from a single VMC
- As defined in Section 2.3, the USD Base addresses are as follows: 01000xxxB (40H), 01001xxxB (48H), and 01010xxxB (50H).
- The specification defined herein assumes a USD base address of 40H in all examples. It should be understood that differing USD base addresses (48H and 50H) will follow the same command format.
- Multi-message responses to a single command are supported. Message length is subject to the 36 byte limit imposed by the MDB standard.
- Unless stated otherwise, all byte information contained herein is assumed to be in a binary format.
- Y_n represents bytes transmitted by the VMC, and Z_n are bytes transmitted by the USD.
- When words are referenced, they consist of two bytes with the higher order byte first.



9.2 USD Summary

This section is a summary of the USD command set and an overview of the modes of operation.

9.2.1 Command Summary

Command	Hex Code	Description
RESET	40	Command for USD to self-reset.
SETUP	41	Command to configure USD to VMC requirements.
POLL	42	Command to request for USD activity status.
VEND	43	Command for vend approve / deny.
FUNDS	44	Command to send funds available or to set prices.
CONTROL	45	Command to enable/disable USD.
EXPANSION	47	Command to allow addition of features and enhancements.

9.2.2 Overview

The USD Command set described herein allows USDs' to be controlled under the following three modes of operation. The USD's mode of operation is determined by the USD's configuration byte[1] and the sequence of commands the VMC uses.

Mode One VMC is used to select items to be vended from the USD and the VMC contains all pricing information. The USD receives vend requests from the VMC and reports vend success or failure.

Mode Two The USD or the VMC may select items to be vended. The USD may have special requirements for price and/or selection ID display. In this case, the USD may issue a **FUNDS** request to retrieve this information. The USD must then issue a **VEND** request to gain approval from the VMC before a vend can take place.

Mode Three The USD selects items to be vended and has its own pricing information. The USD must issue an vend request to the VMC and gain approval before a vend can take place.

[1] Configuration byte refers to byte Z31 of the sequence Z31 through Z34 of the expansion 07 command. Please refer to page 9.12 for more information on how this byte influences the USD's mode of operation.

9.3 Command Protocol

This section contains the complete command set relating to the USD.

9.3.1 RESET

Command	Code	VMC Data	USD Response data
RESET	40	No data bytes.	ACK

The **RESET** command is the vehicle that the VMC should use to instruct the USD to return to its default (power on) operating mode. The USD should respond to a reset command with an ACK to acknowledge receipt of the reset command. The USD must not accept any vend requests until the VMC issued setup command sequence has been completed.

The USD must also respond to the VMC issued "master reset" which resets all MDB peripheral devices. The VMC causes a master reset by transmitting a continuous break condition for a minimum of 100 milliseconds.

To ensure proper initialization, the USD should issue a "just reset" (see **POLL** response **00**) whenever it's pricing or configuration has changed.

9.3.2 SETUP

Command	Code	VMC Data	USD Response Data
SETUP	41	5 bytes: Y1-Y5	7 bytes: 04 + Z1 - Z6

The **SETUP** command is the vehicle that the VMC should use to configure the USD for feature level, credit scaling factor, display decimal place, and maximum vend approve/deny time. The USD responds to this command by returning it's feature level, highest vend price (divided by the scaling factor), selection configuration, and maximum application response time.

Alternatively, if the USD is not prepared to render a full response to the **SETUP** command, it may reply with an ACK. If this occurs, the USD must transmit it's setup data later, in response to a **POLL** command (see **POLL** command, response **04**). Until the **SETUP** command has been received by the USD, and the USD has correspondingly returned it's own setup data to the VMC, all vend requests will be disallowed.

Data sequence transmitted by the VMC to the USD during SETUP

VMC Data	Meaning or interpretation

Y1 =	VMC Feature level, Indicates current feature level of the VMC. Currently defined level is one.[2]
Y2 - Y3 =	Scaling factor 2 bytes (word). All transactions with the USD must be evenly divisible by this number.
Y4 =	Decimal place (02=US). Indicates the position of the decimal place on the USD's optional credit display
Y5 =	VMC maximum approve / deny time in seconds, FF = 255 seconds.

Data sequence transmitted by the USD to the VMC during SETUP

USD Response	Meaning or interpretation
04 + Z1 =	USD Feature level, indicates current feature level of the USD. Currently defined level is one.[3]
Z2 - Z3 =	Maximum price on USD in 2 bytes (word). Indicates the highest priced item on the USD.[4] USD should return FF FFh if it does not have internal pricing capability.
Z4 - Z5 =	Item number, defined by the manufacturer configuration (Binary).
Z6 =	USD maximum application response time in seconds, FF = 255 seconds.

[2] Feature level of the VMC is sent to allow the USD to arbitrate command compatibility with the VMC.
[3] Feature level of the USD is sent to allow the VMC to arbitrate command compatibility with the USD. The USD may opt to send this data later in response to a POLL.
[4] The maximum price on the USD is returned to the VMC so this price can be used in the computation of maximum credit acceptance.

9.3.3 POLL

Command	Code	USD response Data	USD Response Description
POLL	42	00	USD has just been reset, or wishes to be reset by the VMC.
		01 + 4 bytes Z1- Z4	Vend request, USD requests approval to vend a specified item from VMC.
		02	Vend or home success, requested vend or home was successful.
		03 + 4 bytes Z1 - Z4	Vend or home fail, requested vend or home has failed. Reason for failure is returned.
		04 + 6 bytes Z1 - Z6	USD configuration and setup data.
		05 + 2 bytes Z1 - Z2	USD item price request.
		06 + 2 bytes Z1 - Z2	USD Error codes.
		07 + 34 bytes Z1 - Z34	USD Peripheral ID string.
		08 + 4 bytes Z1 - Z4	USD Status response.
		09 + *n* bytes Z1 - Z*n*	USD multiple data block transfer response.
		0A + n bytes Z1 - Zn	USD single data block response
		1B + 5 bytes Z2 - Z6	FTL REQ TO RCV response
		1C + 3 bytes Z2 - Z4	FTL RETRY / DENY response
		1D + n bytes Z2 - Zn	FTL SEND BLOCK response
		1E + 2 bytes Z2 - Z3	FTL OK TO SEND response
		1F + 5 bytes Z2 - Z6	FTL REQ TO SEND response
		FF + Z1 - Z*n*	USD Diagnostic response.

The **POLL** command is used by the VMC to obtain status information from the USD. The same command is used by the USD to indicate a reset, request a vend, indicate vend success, indicate the reason for a vend failure, request the price of an item, send configuration and/or error data, return the USD's peripheral identification string, control the transmission and reception of data blocks, return a status and/or diagnostic response.

The USD responds to the **POLL** command with either an ACK, or a multi-byte response if there is more information to convey.

Data sequence transmitted by the USD to the VMC after a *Reset Request*

USD Response	Meaning or interpretation
00	The 00 response indicates that the USD has just been reset or wishes to be reset[5].

Data sequence transmitted by the USD to the VMC for a V*end Request*

USD Response	Meaning or interpretation
01 + Z1- Z2 =	Selection in 2 bytes. Indicates the product to be vended by item number, defined by the manufacturer, as part of a vend request.
Z3 - Z4 =	Scaled product price in 2 bytes (word). Indicates the price of the product to be vended divided by the scaling factor. A price of FFFF is transmitted if the USD does not contain price information.

Data sequence transmitted by the USD to the VMC after a V*end or Home success*

USD Response	Meaning or interpretation
02	Indicates that the requested vend or home was successful.

Data sequence transmitted by the USD to the VMC after a V*end or Home Fail*

USD Response	Meaning or interpretation
03 + Z1 - Z2 =	USD item number, defined by the manufacturer.
Z3 - Z4 =	Bits: b0 = Selection sold out. b1 = Selection motor / actuator jam. b2 = Non-existent motor / actuator. b3 = Invalid selection range[6]. b4 = Health safety error. b5 - b15 = Not defined.

[5] The VMC is expected to reconcile whether the USD is transmitting a 00 in confirmation of a VMC issued reset that has just occurred, or as an unsolicited request to be reset. The context of the VMC's prior communication activity should be used in making this assessment.

Data sequence transmitted by the USD to the VMC if *SETUP response delayed*

USD Response	Meaning or interpretation
04 + Z1 =	USD Feature level, Indicates current feature level of the USD. The currently defined level is one.[7]
Z2 - Z3 =	Maximum price on USD 2 bytes (word). Indicates the highest priced item on the USD.[8] USD should return FF FFh if it does not have internal pricing capability.
Z4 - Z5 =	Item number, defined by the manufacturer.
Z6 =	USD maximum application response time in seconds, FF = 255 seconds.

Data sequence transmitted by the USD if the *USD needs pricing information*

USD Response	Meaning or interpretation
05 + Z1 - Z2 =	Item number, defined by the manufacturer.

Data sequence transmitted by the USD if the *USD has a failure to report to VMC*

USD Response	Meaning or Interpretation
06 + Z1 - Z2 =	Bits: b0 = Health Safety violation. b1 = Home or Chute sensor failure b2 = Keypad or Selection switch failure b3 - b15 = Not defined.

Data sequence transmitted by the USD for peripheral ID

[6] This error code is included to identify actuators that may not be present within the initially defined row and column configuration. See bytes Z4 and Z5 of the USD's setup response. This is typical in a snack machine implementation where some trays may not be populated with a full complement of motors and/or actuators.

[7] Feature level of the USD is sent to allow the VMC to arbitrate command compatibility with the USD. The USD may have elected to transmit this setup data in fulfillment of an earlier **SETUP** command.

[8] The maximum price on the USD is returned to the VMC so this price can be used in the computation of maximum credit acceptance.

USD Response	Meaning or Interpretation
07 + Z1 - Z3 =	Manufacturer ID Code.
Z4 – Z15 =	USD Serial Number.
Z16 – Z27 =	USD Model Number.
Z28 – Z29 =	USD Software Version.
Z30 – Z33 =	Optional feature bits.

Data sequence transmitted by the USD to the VMC after a Status request

USD Response	Meaning or interpretation
08 + Z1 - Z2 =	Item number, defined by the manufacturer.
Z3 - Z4 =	Bits: b0 = Selection sold out. b1 = Selection motor / actuator jam. b2 = Non-existent motor / actuator. b3 = Invalid selection range. b4 = Health safety error. b5 - b15 = Not defined.

Data sequence transmitted by the USD to the VMC after a USD data transfer command

USD Response	Meaning or interpretation
09 + Z1 =	Z1 = 00 USD requests to receive data block Z2 from VMC Z1 = 01 USD requests to send Z2 data block(s) to VMC Z1 = 02 USD data block response where: Z2 = data block number Z3 - *Zn* = contents of data block
Z2 =	Z2 = Block number USD requests to receive if Z1 = 00 Z2 = Number of blocks the USD requests to send if Z1 = 01 Z2 = Block number the USD is sending if Z1 = 02.
Z3 - *Zn* =	Contents of data block sent by USD to VMC if Z1 = 02

Data sequence transmitted by the USD to the VMC to send a single block of data

USD Response	Meaning or interpretation
0A + Z1 - Z*n*=	Z1 -Z*n* = Arbitrary data to be received by the VMC. The number "*n*" must be less than 35 per MDB standards

Data sequence transmitted by the USD to the VMC after an File Transport Layer (FTL) REQ TO RCV command

USD Response	Meaning or interpretation
Z1=1B + Z2 - Z6	The USD is requesting to receive data from a device or VMC Z2 = Destination address of response Z3 = Source address of response (40H, 48H, 50H) Z4 = File ID Z5 = Maximum length Z6 = Control

Data sequence transmitted by the USD to the VMC after an File Transport Layer (FTL) RETRY / DENY command

USD Response	Meaning or interpretation
Z1=1C + Z2 - Z4	The USD is requesting a device or VMC to retry or deny the last FTL command. Z2 = Destination address of response Z3 = Source address of response (40H, 48H, 50H) Z4 = Retry delay

Data sequence transmitted by the USD to the VMC after an File Transport Layer (FTL) SEND BLOCK command

USD Response	Meaning or interpretation
Z1=1D + Z2 - Z34	The USD is sending a block of data (maximum of 31 bytes) to a device or VMC. Z2 = Destination address of response Z3 = Block # Z4 - Z34 = Data (maximum of 31 bytes)

Data sequence transmitted by the USD to the VMC after an File Transport Layer (FTL) OK TO SEND command

USD Response	Meaning or interpretation
Z1=1E + Z2 - Z3	The USD is indicating that it is OK for the device or VMC to send it data. Z2 = Destination address of response Z3 = Source address of response (40H, 48H, 50H)

Data sequence transmitted by the USD to the VMC after an File Transport Layer (FTL) REQ TO SEND command

USD Response	Meaning or interpretation
Z1=1F + Z2 - Z6	The USD is requesting to send data to a device or VMC. Z2 = Destination address of response Z3 = Source address of response (40H, 48H, 50H) Z4 = File ID Z5 = Maximum length Z6 = Control

Data sequence transmitted by the USD to the VMC after a diagnostic command

USD Response	Meaning or interpretation
FF + Z1 - Z*n* =	Diagnostic response.

9.3.4 VEND

Command	Code	Sub-Cmd	VMC Data	Response Data
VEND	43	00	none	none
	43	01	none	none
	43	02	2 bytes Y1-Y2	none
	43	03	2 bytes Y1-Y2	none
	43	04	2 bytes Y1-Y2	5 bytes: 08 + Z1 - Z4

The **VEND** command is the vehicle that the VMC uses to signal vend approval or disapproval in response to a USD issued vend request (**POLL** response 01). The

VEND command can also be used by the VMC to initiate a vend, home a selection, or query the status of a selection on the USD.

Sub Cmd:	Meaning or interpretation
00 =	Requested vend approved.
01 =	Requested vend disapproved.
02 =	Vend specified Item number, defined by the manufacturer.
03 =	Home specified Item number, defined by the manufacturer.
04 =	Request status of specified Item number, defined by the manufacturer.

Data sequence transmitted by the USD to the VMC after a Status request

USD Response	Meaning or interpretation
08 + Z1 - Z2 =	Item number, defined by the manufacturer.
Z3 - Z4 =	Bits: b0 = Selection sold out. b1 = Selection motor / actuator jam. b2 = Non-existent motor / actuator. b3 = Invalid selection range. b4 = Health safety error. b5 - b15 = Not defined.

9.3.5 FUNDS

Command	Code	Sub-Cmd	VMC Data	Response Data
FUNDS	44	00	2 bytes: Y1-Y2	none
	44	01	6 bytes: Y1-Y6	none

The **FUNDS** command is the vehicle the VMC should use to specify the funds available for vending. The **FUNDS** 00 command is issued by the VMC whenever the level of credit changes. Typically, the USD would display the credit information returned by a **FUNDS** 00 command on a credit display. The **FUNDS** 01 is issued by the VMC in response to an item price request (**POLL** response 05) by the USD.

Sub-Cmd	Meaning or interpretation
00 + Y1 - Y2 =	Funds available in 2 bytes (word), scaled by the coin scaling factor.

Sub Cmd	Meaning or interpretation
01 + Y1 - Y2 =	Item number, defined by the manufacturer.
Y3 - Y4 =	Selection price in 2 bytes (word) scaled by coin scaling factor.
Y5 - Y6 =	Alphanumeric selection identifier 2 bytes (word), or FFFF if not available.[9]

9.3.6 CONTROL

Command	Code	Sub-Cmd	VMC Data	Response Data
CONTROL	45	00	none	none
	45	01	none	none

This command is the vehicle the VMC should use to enable or disable the USD.

Sub-Cmd	Meaning or interpretation
00	Disable USD.
01	Enable USD.

9.3.7 EXPANSION

Command	Code	Sub-Cmd	VMC Data	Response Data
EXPANSION	47	00	None	07 + Z1 - Z34 Peripheral ID string and feature bits.
	47	01	Y1 – Y4	none
	47	02	Y1	none
	47	03	Y1 - Y*n*	none
	47	04	Y1	09 + Z1 + Z2 - Z*n*
	47	05	Y1 - Y*n*	none
	47	FA	Y1 - Y5	1D + Z2 - Z34 or 1C + Z2 - Z4
	47	FB	Y1 - Y3	none
	47	FC	Y1 - Y33	none
	47	FD	Y1 - Y2	1D + Z2 - Z34

[9] Alpha-numeric selection identifier is provided to the USD for display purposes only.

	47	FE	Y1 - Y5	1E + Z2 - Z3 or 1C + Z2 - Z4
	47	FF	Diagnostics	Diagnostic response.

Data sequence transmitted by the USD to the VMC after an expansion 00 sub-command

USD Response	Meaning or Interpretation
07 + Z1 - Z3 =	Manufacturer ID Code.
Z4 - Z15 =	USD Serial Number.
Z16 - Z27 =	USD Model Number.
Z28 – Z29 =	USD Software Version.
Z30 – Z33 =	Optional feature bits: b0 = USD is capable of storing and controlling pricing. b1 = USD is capable of selecting items to vend. b2 = USD is capable of supporting the File Transport Layer. This support is defined in Section 2.6. b3 - b31 = Available for future use.

Sub-Command used by the VMC to enable optional feature bits on the USD

Sub-Cmd	Meaning or interpretation
01 + Y1 - Y4	Enable optional feature bits defined in Z31-Z34 above. Feature is enabled if bit is set to 1, all features are disabled after a reset.

Sub-Command used by the VMC to identify the number of data blocks it wishes to send to the USD

Sub-Cmd	Meaning or interpretation
02 + Y1	Number of data blocks the VMC has to send to the USD (Binary)

Sub-Command used by the VMC to transmit a data block to the USD (Y2-Y*n*) and to identify the current block number being transmitted (Y1)

Sub-Cmd	Meaning or interpretation

03 + Y1	Block number the VMC is transmitting to the USD
Y2 - Y*n*[10]	Data the VMC is transmitting to the USD

Sub-Command used by the VMC to request that the USD send or re-send data block number (Y1)

Sub-Cmd	Meaning or interpretation
04 + Y1	VMC requests USD to send block Y1

Sub-Command used by the VMC to send a single block of data to the USD

Sub-Cmd	Meaning or interpretation
05 + Y1 - Y*n*	VMC sends a single block of data consisting of Y1..Y*n*

Sub-Command used by the VMC for an FTL REQ TO RCV. The Z1- Zn response can be either immediate or delayed (POLLed).

Sub-Cmd	Meaning or interpretation
FA + Y1 - Y5	The VMC is requesting to receive data from the USD whose destination address will always be (40H, 48H, 50H). Note that all FTL Commands / Responses are defined in Section 2.6. Y1 = Destination address of command (40H,48H,50H) Y2 = Source address of command Y3 = File ID Y4 = Maximum length Y5 = Control
USD Response	**Meaning or interpretation**
Z1 - Z34	Z1 = 1DH which indicates SEND BLOCK Z2 = Destination address of data Z3 = Block # Z4 - Z34 = Data (maximum of 31 bytes)
or	or
Z1 - Z4	Z1 = 1CH which indicates RETRY / DENY Z2 = Destination address of response Z3 = Source address of response (40H,48H,50H) Z4 = Retry delay

[10] The number "*n*" is limited by the MDB maximum message length of 36 bytes.

Sub-Command used by the VMC for an FTL RETRY / DENY.

Sub-Cmd	Meaning or interpretation
FB + Y1 - Y3	The VMC is retrying, denying, or aborting a data transfer to/from the USD whose destination address will always be (40H, 48H, 50H). Note that all FTL Commands / Responses are defined in Section 2.6. Y1 = Destination address of command (40H,48H,50H) Y2 = Source address of command Y3 = Retry delay

Sub-Command used by the VMC for an FTL SEND BLOCK.

Sub-Cmd	Meaning or interpretation
FC + Y1 - Y33	The VMC is sending data to the USD whose destination address will always be (40H, 48H, 50H). Note that all FTL Commands / Responses are defined in Section 2.6. Y1 = Destination address of command (40H,48H,50H) Y2 = Block # Y3 - Y33 = Data (maximum of 31 bytes)

Sub-Command used by the VMC for an FTL OK TO SEND. The Z1 to Z33 response can be either immediate or delayed (POLLed).

Sub-Cmd	Meaning or interpretation
FD + Y1 - Y2	The VMC is requesting to receive data from the USD whose destination address will always be (40H, 48H, 50H). Note that all FTL Commands / Responses are defined in Section 2.6. Y1 = Destination address of command (40H,48H,50H) Y2 = Source address of command
USD Response	**Meaning or Interpretation**
Z1 - Z34	Z1 = 1DH which indicates SEND BLOCK Z2 = Destination address of data Z3 = Source address of data Z4 - Z34 = Data (maximum of 31 bytes)

Sub-Command used by the VMC for an FTL REQ TO SEND. The Z1 - Zn response can be either immediate or delayed (POLLed).

Sub-Cmd	Meaning or interpretation
FE + Y1 - Y5	The VMC is requesting to send data to the USD whose destination address will always be (40H, 48H, 50H). Note that all FTL Commands / Responses are defined in Section 2.6. Y1 = Destination address of command (40H,48H,50H) Y2 = Source address of command Y3 = File ID Y4 = Maximum length Y5 = Control
USD Response	**Meaning or Interpretation**
Z1 - Z34 or Z1 - Z4	Z1 = 1EH which indicates OK TO SEND Z2 = Destination address of response Z3 = Source address of response (40H,48H,50H) or Z1 = 1CH which indicates RETRY / DENY Z2 = Destination address of response Z3 = Source address of response (40H,48H,50H) Z4 = Retry delay

Data sequence transmitted by the USD to the VMC after a diagnostic command

USD Response	Meaning or interpretation
FF + Z1 - Z*n* =	Diagnostic response.

9.4 USD Power Requirements

This section defines the maximum power requirements for a USD.

USD peripherals may draw power from the MDB bus or from an integral power supply. In such cases where the USD will require power from the MDB bus, the current draw must remain within the following limits:

USD Mode	Current draw
Idle	200 mA (maximum continuous)
Vending/Homing	1.75 A (for up to 10 seconds)

9.5 Examples – Mode 1 / 2 / 3 Sessions

This section contains three examples of USD sessions in which each of the three modes of USD operation are demonstrated operation respectively.

9.5.1 MODE ONE

In this example session the VMC selects the item to vend and knows the vend price. The USD receives the vend command, attempts the vend, and reports if the attempted vend failed or was successful.

VMC	MDB Data	Explanation	USD
⇒	**43+02+01+03**	VMC requests to vend item from the USD.	
	<ACK>	USD acks vend request.	⇐
⇒	**42**	VMC polls the USD.	
	<ACK>	USD acks receipt of poll.	⇐
⇒	**42**	VMC polls the USD again .	
	02	USD responds: vend complete	⇐
⇒	**<ACK>**	VMC acks vend outcome.	

9.5.2 MODE TWO

In this example session the USD or the VMC can select items to vend but the USD may not be aware of the vend price of the item selected. If the USD needs the selected item price, it may request the item price from the VMC. The USD must then issue a **VEND** request, and wait for approval from the VMC before a vend is attempted. The VMC then approves or denies the requested vend and polls the USD for vend success or vend fail.

VMC	MDB Data	Explanation	USD
⇒	**42**	VMC polls the USD.	
	05+02+06	USD responds with pricing request for item in USD.	⇐
⇒	**<ACK>**	VMC acks the USD price request.	
⇒	**44+01+02+06+00+14+FF+FF**	Using the Funds command the VMC sends a price of 20 coin factors for item in USD.	
	<ACK>	USD acks receipt of VMC price data.	⇐
⇒	**42**	VMC polls the USD.	
	01+02+06+FF+FF	USD responds with a request to vend item in USD at the VMC selected price.	⇐
⇒	**<ACK>**	VMC acks receipt of vend request.	
⇒	**43 + 00** or **01**	VMC approves or denies vend request.	
	<ACK>	USD acks receipt of approval or denial.	⇐
⇒	**42**	VMC polls the USD.	
	03+02+06+00+01	USD responds: vend fail, sold out.	⇐
⇒	**<ACK>**	VMC acks vend outcome.	

- The **FUNDS** command can be used by USD's which do not have internal prices but need pricing information for display purposes or for other reasons that are not required to complete a transaction.

9.5.3 MODE THREE

In this example session the USD selects the item to vend and is aware of the vend price of the item. The USD must issue a vend request and the VMC then approves or denies the requested vend. The VMC then polls the USD for vend success or vend fail.

VMC	MDB Data	Explanation	USD
⇒	**42**	VMC polls the USD.	
	01+03+02+00+1E	USD requests vend for item at in USD with price of 30 coin factors.	⇐
⇒	**<ACK>**	VMC acks the USD vend request.	
⇒	**43+ 00** or **01**	VMC approves or denies vend request.	
	<ACK>	USD acks receipt of approval or denial.	⇐
⇒	**42**	VMC polls the USD.	
	02	USD responds: vend complete	⇐
⇒	**<ACK>**	VMC acks vend outcome.	

9.6 Examples - Data Block Transfers

This section contains two examples in which data blocks are transferred between the VMC and the USD and vice versa.

9.6.1 Data Block Transfer from VMC to USD

In this example the VMC wishes to send two data blocks to the USD. To do this, the VMC uses the expansion 02 command to advise the USD of it's request to send data and also to identify the number of data blocks it wishes to send. In response, the USD uses a poll 09 to request the transmission of a data block with the block number enumerated as part of it's poll response. The VMC then uses a different expansion command (03) to send the data to the USD.

VMC	MDB Data	Explanation	USD
⇒	**47+02+02**	VMC issues a request to send two data blocks to the USD	
	<ACK>	USD acks receipt of the request	⇐
⇒	**42**	VMC polls the USD	
	09+00+01	USD responds with a request to receive data block number 01 from the VMC	⇐
⇒	**<ACK>**	VMC acks receipt of block number	
⇒	**47+03+01+21+22+23**	VMC transmits block number 01 containing data: 21, 22, and 23.	
	<ACK>	USD acks receipt of the data block	⇐
⇒	**42**	VMC polls the USD.	
	09+00+02	USD responds with a request to receive data block number 02 from the VMC.	⇐
⇒	**<ACK>**	VMC acks receipt of the block number.	
⇒	**47+03+02+24+25+26**	VMC transmits block number 02 containing data: 24, 25, and 26.	
	<ACK>	USD acks receipt of the data block	⇐

9.6.2 Data Block Transfer from USD to VMC

In this example the USD wishes to send two data blocks to the VMC. To do this, the USD makes use of the Poll 09 command to inform the VMC of it's request to send data and also to identify the number of data blocks it wishes to send. In response, the VMC uses expansion 04 command to request the transmission of a data block by the individual block number. The USD then uses the poll 09 response to send the data blocks to the VMC.

VMC	MDB Data	Explanation	USD
⇒	**42**	VMC polls the USD	
	09+01+02	USD responds with a request to send 2 data blocks to the VMC	⇐
⇒	**<ACK>**	VMC acks request to send data	
⇒	**47+04+01**	VMC responds with a request to receive data block number 01 from the USD	
	<ACK>	USD acks receipt of block number request	⇐
⇒	**42**	VMC polls the USD	
	09+02+01+55+56+57	USD responds by transmitting block number 01 containing data 55, 56, and 57.	⇐
⇒	**<ACK>**	VMC acks receipt of data	
⇒	**47+04+02**	VMC responds with a request to receive data block number 02 from the USD	
	<ACK>	USD acks receipt of block number request	⇐
⇒	**42**	VMC polls the USD	
	09+02+02+58+59+60	USD responds by transmitting block number 02 containing data 58, 59, and 60.	⇐
⇒	**<ACK>**	VMC acks receipt of data	

9.7 Universal Satellite Device Examples

Reset Sequence			
Controller		USD	Comments
RESET (40)	→		Reset command
	←	ACK	
POLL (42)	→		
	←	JUST RESET (00)	Must be sent once
ACK	→		
SETUP (41)	→		Establish operation configuration
	←	CONFIG. (04…)	
ACK	→		
EXPANSION/ID (47/00…)	→		Send asset information
	←	PERIPHERAL ID (07…)	Get asset information
ACK	→		
EXPANSION/FEATURE ENABLE (47/01…)	→		Enable additional feature if necessary
	←	ACK	
VEND/STATUS REQUEST (43/04 01 01)	→		Check the status of column 1
	←	ACK	
POLL (42)	→		
	←	STATUS (08…)	Status of column 1
ACK	→		
		.	
		.	
		.	
CONTROL/ENABLE (45/01)	→		Enable command
	←	ACK	
VEND/HOME REQUEST (43/03 01 01)	→		Home column 1
	←	ACK	
POLL (42)	→		
	←	VEND COMPLETE (02…)	Homing of column 1 completed
ACK	→		
		.	
		.	
		.	

Enable Sequence			
Controller		USD	Comments
CONTROL/ENABLE (45/01)	→		Enable command
	←	ACK	

Disable Sequence			
Controller		USD	Comments
CONTROL/DISABLE (45/00)	→		Disable command
	←	ACK	

Vend Sequence Controller		USD	Comments
FUNDS/FUNDS AVAIL (43…)	→		Post funds available to alert device of pending activity
	←	ACK	
POLL	→		Waiting for activity
	←	ACK	
VEND/VEND REQUEST (43/02 01 03)	→		Vend from row 1, col. 3
	←	ACK	
POLL (42)	→		
	←	ACK	Nothing to report
	.		waiting for vend to complete
	.		
	.		
POLL (42)	→		
	←	VEND COMPLETE (02)	or VEND FAIL (03…)
ACK	→		

Error Sequence Controller		USD	Comments
POLL (42)	→		
	←	ERROR (06…)	Sent once for each error
ACK	→		

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Section 10

Coin Hopper or Tube - Dispenser VMC/Peripheral Communication Specifications

10.1 Introduction

This section defines the communication bytes sent and received by a coin dispensing device, which may be in the form of a hopper or tube device. As defined in Section 2.3, there are two dispenser device addresses; Dispenser #1, 01011xxxB (58H) and Dispenser #2, 01110xxxB (70H). The second address has been assigned to allow for two unique forms of dispenser devices to be resident in the vending machine simultaneously. **Everything defined in this section will be common to the two dispenser devices – only the addresses will be different.**

Unless stated otherwise, all information is assumed to be in a binary format

10.2 VMC Commands

Command	Hex Code	Description
RESET	58H / 70H	Command for dispenser to self-reset
SETUP	59H / 71H	Request for dispenser setup.
DISPENSER STATUS	5AH / 72H	Request for dispenser tube / hopper status and coin count.
POLL	5BH / 73H	Request for dispenser activity status.
MANUAL DISPENSE ENABLE	5CH / 74H	Signifies coin types allowable for coin dispensing. This command is followed by setup data. See command format section.
DISPENSE *	5DH / 75H	Command to dispense coins. Followed by coin type or value to dispense. See command format section.
PAYOUT *	5EH / 76H	Command to determine value of coins dispensed. Followed by payout status or value poll. See command format section.
EXPANSION *	5FH / 77H	Command to allow addition of features, File Transport Layer, and future enhancements. See command format section.

* **NOTE:** DISPENSE, PAYOUT, and EXPANSION commands are always followed by a "sub-command."

10.3 VMC Command Format

VMC Command	Code	VMC Data
RESET	58H / 70H	No data bytes

This command is the vehicle that the VMC should use to tell the dispenser that it should return to its default operating mode and initialize internal hardware systems. With the exception of the ACK response, it should abort all communication until otherwise instructed by the VMC.

The following initialization sequence is recommended. It should be used after "power up" or after issuing the Bus Reset (pulling the transmit line "active" for a minimum of 100 mS).

RESET – 58h / 70h
POLL – 5Bh / 73h
To obtain "JUST RESET" response

SETUP – 59h / 71h
To obtain dispenser level and configuration information

EXPANSION IDENTIFICATION – 5F 00h / 77 00h
To obtain additional dispenser information and options

EXPANSION FEATURE ENABLE – 5F 01h / 77 01h
To enable desired options

DISPENSER STATUS – 5Ah / 72h (Note 1)
To obtain dispenser status / change information

MANUAL DISPENSE ENABLE – 5Ch / 74h
To enable and disable manual coin pay-out if desired

No power above idle current can be drawn until after the first POLL following the RESET command. Also, the JUST RESET response to the POLL command must be delayed until any high current usage has been completed.

The dispenser must hold its response of the DISPENSER status until a valid current reading from the sensor system is achieved.

VMC Command	Code	Dispenser Response Data
SETUP	59H / 71H	26 bytes: Z1 - Z26

Z1 = Dispenser Feature Level - 1 byte

Indicates the feature level of the dispenser. This will distinguish the dispensers feature level to the VMC. Currently only level 1 is supported.

Z2 - Z3 = Country / Currency Code - 2 bytes

The packed BCD currency code of the dispenser is sent with the left most digit a 1. See Appendix A1 for the latest version of the ISO 4217 numeric currency code. For example, the code for the US dollar is 18 40H (Z2 = 18 and Z3 = 40) and for the Euro is 1978 (Z2 = 19 and Z3 = 78).

Z4 = Coin Scaling Factor - 1 byte

All dispensed coin values must be evenly divisible by this number. For example, this could be set to 05H for the USA nickel.

Z5 = Decimal Places - 1 byte

Indicates the number of decimal places on a credit display. For example, this could be set to 02H in the USA.

Z6 = Application Maximum Response Time (seconds) -- 1 byte
The maximum length of time a dispenser will require to provide a response to any command from the VMC. The value reported here supercedes the dispenser's default NON-RESPONSE time defined in section 10.4 if the value reported here is greater.

Z7 -- Z8 = Bit set, if coin disabled by dispenser (i.e. switch).

Z9 -- Z10 = Bit set, if coin is self filling.

Z11 - Z26 = Coin Type Credit - 16 bytes

Indicates the value of coin types 0 to 15. Values must be sent in ascending order. This number is the coin's monetary value divided by the coin scaling factor. Unused coin types are sent as 00H. Unsent coin types are assumed to be zero. It is not necessary to send all coin types. Coin type credits sent as FFH are assumed to be vend tokens. That is, their value is assumed to be worth one vend.

The byte position in the 16 byte string indicates the coin type(s). For example, the first byte sent would indicate the value of coin type 0, the second byte sent would indicate the value of coin type 1, and so on. For example, the USA coin types may be; Coin type 0 = nickel, Coin type 1 = dime, Coin type 2 = quarter, Coin type 3 = dollar.

VMC Command	Code	Dispenser Response Data
DISPENSER STATUS	5AH / 72H	34 bytes: Z1 – Z34

Z1 - Z2 = Dispenser Full Status - 2 bytes

Indicates status of coin tube / hopper for coin types 0 to 15.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Z1								Z2							

A bit is set to indicate a full dispenser. For example, bit 7 = set would indicate the dispenser for coin type 7 is full.

Z3 – Z34 = Coin Count - 32 bytes

Indicates the greatest number of coins that the dispenser "knows" definitely are present in the coin tube / hopper. A word (2 bytes) position in the 32 byte string indicates the number of coins in a tube / hopper for a particular coin type. For example, the first 2 bytes sent indicate the number of coins in a tube / hopper for coin type 0. Unsent bytes are assumed to be zero. For tube / hopper counts greater than 65535, counts should remain at 65535.

NOTE: If a dispenser can detect a tube or hopper jam, defective tube or hopper sensor, or other malfunction, it will indicate the tube / hopper is "bad" by sending a tube / hopper full status and a count of zero for the malfunctioning coin type.

VMC Command	Code	Dispenser Response Data
POLL	5BH / 73H	32 bytes: Z1 – Z32

Z1 - Z32 = Dispenser Activity - 32 bytes

Indicates the dispenser activity. If there is nothing to report, the dispenser should send only an ACK. Otherwise, the only valid responses are:

Coins Dispensed:

This response should be sent once at the end of a payout cycle.

Z1 (10yzxxxx)

z	z =1 for manual dispense z =0 to report a non manual (automatic) dispense
y	y =1 for payout completed successfully y =0 for payout completed unsuccessfully (aborted)
xxxx	The coin type dispensed (0 to 15)
Z2 - Z3	The number of coins dispensed.
Z4 – Z5	The number of coins in the dispenser.

Status:

(00000001) =	Escrow request[1] - An escrow lever activation has been detected. If a button is present and activated.
(00000010) =	Dispenser Payout Busy[2] - The dispenser is busy activating payout devices.
(00000011) =	Not Used
(00000100) =	Defective Dispenser Sensor[1] - The dispenser has detected one of the dispenser sensors behaving abnormally.
(00000101) =	Not Used
(00000110) =	Dispenser did not start[1].
(00000111) =	Dispenser Jam[1] - A dispenser payout attempt has resulted in jammed condition.
(00001000) =	ROM checksum error[1] - The dispensers internal checksum does not match the calculated checksum.
(00001001) =	Not Used
(00001010) =	Not Used
(00001011) =	Dispenser was "Just Reset"[1] - The dispenser has detected a Reset condition and has returned to its power-on idle condition.
(00001100) =	Not Used
(00001101) =	Not Used
(00001110) =	Not Used
(00001111) =	Filled key pressed[1] -- The VMC should request a new DISPENSER STATUS.

NOTES: The dispenser may send several of one type activity, up to 16 bytes total. This will permit zeroing counters such as inventory and status.

1 Sent once each occurrence.
2 Sent once each POLL

File Transport Layer POLLed responses:

Note that all FTL responses are defined in Section 2.6. For the coin dispenser, the source address will always be the dispenser (58H/70H) as defined in Section 2.3.

		Z1
1B	REQ TO RCV	The coin dispenser is requesting to receive data from a device or VMC. Z2 = Destination address of response Z3 = Source address of response (58H/70H) Z4 = File ID Z5 = Maximum length Z6 = Control
1C	RETRY/DENY	The coin dispenser is requesting a device or VMC to retry or deny the last FTL command. Z2 = Destination address of response Z3 = Source address of response (58H/70H) Z4 = Retry delay
1D	SEND BLOCK	The coin dispenser is sending a block of data (maximum of 31 bytes) to a device or VMC. Z2 = Destination address of data Z3 = Block # Z4-Z34 = Data (maximum of 31 bytes)
1E	OK TO SEND	The coin dispenser is indicating that it is OK for a device or VMC to send it data. Z2 = Destination address of response Z3 = Source address of response (58H/70H)
1F	REQ TO SEND	The coin dispenser is requesting to send data to a device or VMC. Z2 = Destination address of response Z3 = Source address of response (58H/70H) Z4 = File ID Z5 = Maximum length Z6 = Control

VMC Command	Code	VMC Data
MANUAL DISPENSE ENABLE	5CH / 74H	2 bytes: Y1 – Y2

Y1 - Y2 = Manual Dispense Enable - 2 bytes

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Y1								Y2							

A bit is set to indicate dispense enable. For example, bit 2 is set to enable dispensing of coin type 2. This command enables/disables manual dispensing using optional inventory switches. All manual dispensing switches are automatically disabled upon reset.

VMC Command	Code	Sub-command	VMC Data
DISPENSE COINS	5DH / 75H	00H	3 bytes: Y1 – Y3

b7	b6	b5	b4	b3	b2	b1	b0
Y1							

Bits b3, b2, b1, b0 indicate coin type to be dispensed. Valid codes are 0H to FH to indicate coin types 0 to 15.

Bits b7, b6, b5, b4 = 0

Y2 - Y3 = Number of coins to be dispensed of coin type defined in Y1

There is no defined limit on how long the actual dispense takes since the command allows for up to 65535 coins to be paid out. The payout cycle begins when the dispenser ACKs the VMC's DISPENSE (5DH/75H) command. This cycle typically lasts a minimum of 100 mS and ends when the dispenser stops dispensing the desired number of coins. VMCs should monitor the Dispenser Payout Busy and Dispenser Activity response to the POLL (5BH/73H) command to determine when the entire payout cycle is completed.

VMC Command	Code	Sub-command	VMC Data
DISPENSE VALUE	5DH / 75H	01H	2 bytes: Y1, Y2

Y1 – Y2 = Value of coins to be paid out.

Y1 and Y2 are defined as the value of coins and this value is expressed as the number of coin scaling factors that would sum to the value. For example, in a USA system using a scaling factor of 05, if the change to be paid out is 75 cents, then Y1 will equal fifteen. That is, the sum of fifteen nickels equal 75 cents. The coin dispenser will determine which actual denominations of coins will be paid out. In the 75 cent example, the coins may be 3 quarters; or, 7 dimes & 1 nickel; or, 2 quarters & 2 dimes & 1 nickel, etc. The actual coins dispensed and if the dispense is finished can be acquired via the PAYOUT STATUS (5EH/76H, 00) and PAYOUT VALUE POLL (5EH/76H, 01).

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
PAYOUT STATUS	5E / 76H	00H	None	32 bytes: Z1-Z32

Z1 – Z32 = Number of each coin type paid out - 32 bytes (2 bytes per coin type).

This is the dispenser's response to the last VMC DISPENSE VALUE command (5DH sub command 01H). Bytes are sent in ascending order of coin types. A bytes position in the string indicates the coin type. That is, bytes one and two are the number of coins for coin type 1, bytes three and four are the number of coins for coin type two, and so on. Unsent bytes above the coin types dispensed are assumed to be zero.

The dispenser clears payout data after an ACK response from the VMC.

The VMC should compare the value of the coins paid out to the (5DH/75H) DISPENSE VALUE command's Y2-Y3.

NOTES:

1) If the dispenser's payout is busy it will respond to the PAYOUT STATUS command with an ACK only.

2) If no coins have been paid out, at least one zero valued data byte must be sent.

3) There is no defined limit on how long the actual payout takes. See dispense command (5DH/75H) for further details

VMC Command	Code	Sub-command	VMC Data	Dispenser Response Data
PAYOUT VALUE POLL	5EH /76H	01H	None	2 bytes: Z1-Z2

Z1 – Z2 = Dispenser Payout Activity - 2 bytes

An interval value (scaled) which indicates the amount of paid out change since the previous PAYOUT VALUE POLL (or between the initial DISPENSE VALUE command (5DH/75H sub command 01H) and the first PAYOUT VALUE POLL).

A 00H response indicates no coins were paid out since the previous PAYOUT VALUE POLL (or the initial DISPENSE VALUE command (5DH/75H sub command 01H)).

An ACK only indicates that the change payout is finished. This should be followed by the PAYOUT STATUS command (5EH/76H-00H) to obtain the complete payout data.

NOTE: The initial intent of this command is to determine the amount of change paid out so that the credit display can be decremented as coins are dispensed.

VMC Command	Code	Sub-Command	Dispenser Response Data
EXPANSION COMMAND	5FH / 77H IDENTIFICATION	00H	33 bytes: Z1 - Z33

Z1 - Z3 = Manufacturer Code - 3 bytes
Identification code for the equipment supplier. Sent as ASCII characters. Currently defined codes are listed in the **EVA** document entitled "***European Vending Association Data Transfer Standard***" (**EVA-DTS**), the Audit Data Lists section, sub-section 2, "Manufacturer Codes".

Z4 - Z15 = Serial Number - 12 bytes

Factory assigned serial number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z16 - Z27 = Model Number - 12 bytes

Manufacturer assigned model number. All bytes must be sent as ASCII characters, zeros (30H) and blanks (20H) are acceptable.

Z28 - Z29 = Software Version - 2 bytes

Current software version. Must be sent in packed BCD.

Z30 - Z33 = Optional Features - 4 bytes

Each of the 32 bits indicate an optional features availability. If the bit is set the feature is available. Bits should be sent in descending order, i.e. bit 31 is sent first and bit 0 is sent last. Currently defined options are:

b0 - File Transport Layer (FTL) supported as defined in Section 2.6.

b1 - b31 Available for future use

VMC Command	Code	Sub-Command	VMC Data
EXPANSION COMMAND	5FH / 77H FEATURE ENABLE	01H	4 bytes: Y1 - Y4

This command is used to enable each of the optional features defined in Z30-Z33 above. To enable a feature a bit is set to one. **All optional features are disabled after reset.**

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H **FTL** REQ TO RCV	FAH	Y1-Y5	Z1 - Zn (immediate or POLLed)

The VMC is requesting to receive data from the dispenser whose destination address will always be (58H/70H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (58H/70H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Block #
Z4 - Z34 = Data (maximum of 31 bytes)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (58H/70H)
Z4 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H **FTL** RETRY / DENY	FBH	Y1-Y3	None

The VMC is retrying, denying, or aborting a data transfer to/from the dispenser whose destination address will always be (58H/70H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (58H/70H)
Y2 = Source address of command
Y3 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H **FTL** SEND BLOCK	FCH	Y1-Y33	None

The VMC is sending data to the dispenser whose destination address will always be (58H/70H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command & data (58H/70H)
Y2 = Block #
Y3 - Y33 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H **FTL** OK TO SEND	FDH	Y1-Y2	Z1-Z34 (immediate or POLLed)

The VMC is indicating that it is OK for the dispenser to transfer data. The destination address will always be the dispenser (58H/70H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (58H/70H)
Y2 = Source address of command

Z1 = 1DH which indicates SEND BLOCK
Z2 = Destination address of data
Z3 = Source address of data
Z4 - Z34 = Data (maximum of 31 bytes)

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H FTL REQ TO SEND	FEH	Y1-Y5	Z1 (immediate or POLLed)

The VMC is requesting to send data to the dispenser whose destination address will always be (58H/70H). Note that all FTL Commands / Responses are defined in Section 2.6.

Y1 = Destination address of command (58H/70H)
Y2 = Source address of command
Y3 = File ID
Y4 = Maximum length
Y5 = Control

Z1 = 1EH which indicates OK TO SEND
Z2 = Destination address of response
Z3 = Source address of response (58H/70H)

or

Z1 = 1CH which indicates RETRY / DENY
Z2 = Destination address of response
Z3 = Source address of response (58H/70H)
Z4 = Retry delay

VMC Command	Code	Sub-command	VMC Data	Dispenser Response
EXPANSION COMMAND	5FH / 77H DIAGNOSTICS	FFH	Y1-Yn	Z1-Zn

Y1 - Yn = Device manufacturer specific instruction for implementing various manufacturing or test modes. Y1 - Yn implies that any number of bytes can be used for the VMC data to the peripheral.

Z1 - Zn = Device manufacturer specific responses after receiving manufacturing or test instructions. Z1 - Zn implies that any number of bytes can be used for the Dispenser response data from the peripheral.

10.4 Dispenser Non-Response Time

The default maximum non-response time for the dispenser is 5 seconds. This is the maximum time for which a dispenser will not respond to a command or a POLL with ACK, NAK or a message. The "Application Maximum Response Time" reported in byte Z6 of the SETUP (10.3) supersedes this default value if Z6 is greater.

10.5 Dispenser Power Requirements

The current draw for any dispenser must fall within the following limits. All measurements are at the minimum VMC voltage output.

Idle mode	=	200 mA. (max.) continuous
		Coin payout = 2.5 A. (max.) for up to 15 seconds per coin dispensed. This is the maximum for all dispensers operating simultaneously in this unit.

Section 11
Age Verification Device
VMC/Peripheral Communication Specifications

11.1 Introduction

Due to legal restrictions, a variety of products are only allowed to be vended via vending machines by checking the customers age. The age and the rules vary from country to country.

This is i.e. related in some countries to cigarettes or alcoholic products. Some services or product contents may restrict a different age, related to the vending machine, this needs different ages to be checked within the same machine.

Age verification may be done with different electronic means, i.e. public cashless systems, which know the card users age, i.e. biometric systems, i.e. ID-card-readers or driving license readers, etc.

A common and state of the art usage in some countries is a public cashless system working as an Age Verification Device. Therefore it is good practice to define first an interface of commands as an addition to the cashless devices.

Second as MDB describes two cashless devices, which in some machines may be both only cashless readers, it is necessary to define an Age Verification Device only as an additional device, allowing the two readers within the machine working as before. The cashless readers which run as a multi-function device may choose to run the additional set of commands or respond as slaves on two peripheral addresses – the cashless 1 or 2 and the Age Verification Device address.

Therefore this paper describes two additional diagnostic commands for the cashless systems, to work as age verification devices. Second this paper describes a command set for an age verification device, which uses only two commands for age verification purpose -- the structure of these two commands is similar to the cashless diagnostic commands, therefore allowing any VMC, to use the same command interface for cashless and Age Verification Device as well.

These command are not bound to a cashless-transaction and may be therefore be used, if verification is done by other cards (i.e. without payment functions.) These command are independent of the cashless function (i.e. payment out of order, transaction memory full, ...) and do not interfere with the payment sequences. Sequences at MDB are changed slightly only.

Observing the age verification is done by the VMC. Only the VMC knows, what type of products it sells. The cashless device delivers the only information to VMC, whether the cashless media finds a valid age. The cashless device will approve a payment always, when the VMC requests this (MDB command request vend). The cashless device will not deny a payment, even if the age verification is not found. This allows simultaneous vend of age protected and free products from a vending machine.

After each power on or after reception of MDB-Reset the cashless device or Age Verification Device will ignore age verification. First after the VMC switches on age verification with the MDB-command "**DRAVP**" (Diagnostic Request Age Verification On) and Y4>0, verification cards will be checked. Only in this case the cashless device or Age Verification Device sends responses to the second new command "**DRAVS**" (Diagnostic Response Age Verification Status) to the VMC.

11.2 VMC Commands

The Age Verification Device uses the MDB address

0x68 (the next address after the second cashless device)

It implements a command set similar to a cashless device with a reduced command dictionary. All the not used commands are reserved for further use to hold the software functions compatible to a cashless subdevice.

The following describes the age verification commands common to the standalone Age Verification Device as well as a subdevice within the cashless device, whereas chapter 4 describes the additional setup commands for the standalone age verification device. Note, that these commands are the same commands as for a cashless device.

11.2.1 General Format EXPANSION Diagnostic

The MDB command EXPANSION Diagnostic allows transfer of manufacturer specific information between cashless reader and VMC. For transmission of the age verification information, the EXPANSION diagnostic command will be used. While implemented in a cashless device, this is similar to a virtual subdevice within the reader, whereas, when used with a separate address, these may be treated as normal standardized commands.

General format:

expansion (17H) (67H) (6FH)	Diagnostics (FFH) Y1	User Defined Data Y2-Yn

Y1 : DIAGNOSTICS.
Device manufacturer specific instruction for implementing various manufacturing or test modes.

Y2-Yn : User Defined Data.
The data portion of this command is defined by the manufacturer and is not part of this document.

Reader response:

Diagnostics Response (FFH) Z1	User Defined Z2-Zn

Z1 : DIAGNOSTICS RESPONSE

Z2-Zn : User Defined Data.
The data portion of this response is defined by the manufacturer and is not part of this document.

11.2.2 Switch On / Off of Age Verification

Diagnostic Request Age Verification On/Off (**DRAVP**)

This command is used to switch On or Off the age verification and to setup the minimum testing age within the device. While in state "on" each inserted media is checked and the result is messaged to the VMC.

After the VMC is powered on, the command DRAVP will be sent at least with Y4 = 0x00 or Y4 = 0xff to the age verification device.

Expansion	Diagnostics Request	Age verifi-cation On/Off	Length	Age	Ident
(17H) (67H) (6FH)	(FFH) Y1	(0x05) Y2	Y3	Y4	Y5-Y9

Diagnostics Response	Age verifi-cation On/Off	Length	Feature byte	Ident
(FFH) Z1	(0x05) Z2	Z3	Z4	Z5-Z9

Y1 : DIAGNOSTICS Request

Y2 : Age verification on/off

Y3 : Length, the number of bytes of this command, not including Y1-Y3, therefore set to 6.

Y4 Age

Y4 = 0x00	Switch off age verification. Additionally informs the card reader, that the VMC software supports age verification, but age verification is not necessary for any product
0x00<Y4<0x64	Level for age verification (0x01 - 0x63 = 1..99 years). Additionally informs the card reader, that the VMC software supports age verification and age verification is necessary
0x63<Y4<0xFF	Reserved for future use
Y4 = 0xFF	Informs the card reader, that the VMC software supports age verification and that age verification will be switched on at xx.xx.xxxx automatically and the level of age will be changed to the default checking.

Y5-Y9 Ident "DRAVP" (hex 0x44 0x52 0x41 0x56 0x50)

Used to prevent misinterpretation of this command and to separate it against possible other manufacturer defined 17 FF 05 commands.

The Age Verification Device takes the given age and responses with the diagnostic response. The VMC will detect, that an Age Verification Device is connected (or built in as a subdevice in cashless), which is doing age verification.

As the verification of the requested minimum age is depending of the (later) inserted media, the requested minimum age is only set to the age verification device. Whether a verification is really possible, will be messaged later within the DRAVS command.

The DRAVP command will be sent by VMC always after power up and after each RESET within the known initializing sequence to the Age Verification Device (cashless or stand alone). If the VMC is aware of a necessary age, the minimum age will be set to a value > 0, i.e. for today's cigarette vendor to 0x12 = 18.

If different products with different age levels are sold, the VMC may send this command before each vend transaction and temporarily change age due to selected product minimum age. Switch off of the age verification is only allowed, if all selections of the vendor do not require a verification.

The age verification device responds with:

Z1 :	DIAGNOSTICS Response	
Z2 :	Age verification on/off	
Z3 :	Length, the number of bytes of this command, not including Z1-Z3, therefore set to 6.	
Z4	Feature Byte	
	b0 = 0	A customer card is not in reading position, but may be inserted (refer to b7)
	b0 = 1	A customer card is in reading position.
	b1...b6	Reserved, should be set to 0
	b7= 0	A customer card is not inserted
	b7= 1	A customer card is inserted, but may not be in reading position (refer to b0)
Z5-Z9	Ident "DRAVP" (hex 0x44 0x52 0x41 0x56 0x50)	

11.2.3 Check of Age Verification

Diagnostic Request Age Verification Status (DRAVS)

If the VMC activated the age verification with DRAVP, the Age Verification Device is checking each inserted media for age information and sends after insertion the DRAVS response to the VMC. The VMC may send the command itself to the age verification device, to get an actualisation of the status. The verification device answers with the actual response. The command may be sent in all MDB states (especially within cashless devices).

expansion	Diagnostics Request	Age verifi-cation Status	length	Features	Ident
(17H) (67H) (6FH)	(FFH) Y1	(0x06) Y2	Y3	Y4	Y5-Y9

Y1 *: DIAGNOSTICS Request*

Y2 *: Age Information*

Y3 *: length, the number of bytes of this command, not including Y1-Y3, therefore set to 6*

Y4 *Feature bits*
b0..b7: Reserved, should be set to 0

Y5-Y9 *Ident "DRAVS" (hex 0x44 0x52 0x41 0x56 0x53)*

If the VMC has activated the age verification with the DRAVP, each inserted media will be checked for age information and after insertion, the DRAVS response will be sent to the VMC.

Diagnostics Response (FFH) Z1	Age (0x06) Z2	length Z3	feature byte 1 Z4	feature byte 2 Z5	Ident Z6-Z10

Z1 : DIAGNOSTICS Response

Z2 : Age verification status

Z3 : length, the number of bytes of this command, not including Z1-Z3, therefore set to 7

b0=0: A customer card is not in reading position, but may be
b0=1: A customer card is in reading position

b1=0: Age information is not available on the customer card
b1=1: Age information is available on the customer card

b2=0: Age verification is not possible (MSAM error or no MSAM)
b2=1: Age verification is possible (MSAM ok and present)

b3=0: The age level from DRAVP command can't be checked
b3=1: The age level from DRAVP command (or a higher value) can be checked

b4=0: The customer is not allowed to buy the product, because the age information on the card is less than the value in DRAVP
b4=1: The customer is allowed to buy the product, because the age information on the customer card is equal or greater than the value in DRAVP

b5=0: reserved, should be set to zero
b6=0: Age verification information *) is valid

b6=1: Age verification information *) is invalid and set to 0, because age verification is under progress (busy)

b7=0: A customer card is not inserted
b7=1: A customer card is inserted, but may not be in reading position (refer to b0)

b0...b3: Reserved, should be set to 0

b4=1: Age verification done by private ident media 1

b5=1: Age verification done by private ident media 2
b6=1: Age verification done by driving license reader

b7=1: Age verification done by public cash card

Z6-Z10 Ident "DRAVS" (hex 0x44 0x52 0x41 0x56 0x53)

*) Age verification information refers to feature byte 1 (b1…b4) and feature byte 2 (all bits)

**) must be valid only, if age verification is positively checked (b4=1 of feature byte 1)

If a DRAVS response with positive checked age information sent from the age verification device, the VMC will enable the vend for selected product for typically 30 seconds. This duration should be programmable.

11.3 MDB Interface

11.3.1 MDB initializing

The general MDB-session consists of the known init-sequence as well as the polling sequence. The init sequence is extended with the DRAVP command.

RESET – 10h

POLL – 12h
To obtain "JUST RESET" response

SETUP CONFIGURATION DATA – 11 00h
To send the VMC's configuration data and obtain the reader's data

SETUP MAX/MIN PRICE – 11 01h
To send the maximum and minimum prices in the VMC. (Reader Level 01/02 syntax, 16 bit credit).

EXPANSION REQUEST ID – 17 00h
To obtain additional reader information and options (options in Level 03+ only)

EXPANSION ENABLE OPTIONS – 17 04h (Level 03+ only)
To enable desired options

SETUP MAX/MIN PRICE – 11 01h (Level 03+ and option bits 1 & 2 only)
To send the maximum and minimum prices in the VMC. (Reader Level 03+, 32 bit credit).

DRAVP – 17 ff 05 06 Age 'D' 'R' 'A' 'V' 'P' *)
switch on or off youth protection, set age level to be checked

POLL – 12h
To obtain "DRAVP" response

**)

READER ENABLE – 14 01h
To enable reader (if desired)

POLL – 12h
To obtain further responses, loop it.

*) the DRAVP may be sent in the following contents as often as needed, to switch on or off the verification or to change the verification age.

**) the cashless reader as well as the Age Verification Device are required to check the actual date and it is suggested for the VMC, to send an expansion diagnostic date/time command to actualize the date within the age verification device.

11.3.2 MDB Polling Loop, Vend Sequence

The polling loop will lead to a vend following the known sequence and is extended with an optional DRAVS.

Customer inserts card

POLL – 12h
DRAVS, card present, age verification status

POLL – 12h
Begin Session (value = 0, > 0 or –1). *)

Customer presses selection and/or inserts money.

VEND REQUEST – 13 00 xx xx xx xx yy yyh **)
ACK (xx = vend price, yy = selection number)

POLL – 12h
looped until vend approved or denied is sent. During this loop, display messages should be shown on the vending machines display

VEND SUCCESS/FAILED – 13 02 yy yyh or 13 03h **)
vend is completed

SESSION COMPLETE – 13 04
close session

POLL – 12h
End session

*) only if cashless is used, independent of cashless credit

**) only if cashless payment is done

All answer will be seen in the known format, the new command DRAVS is enabling a cash vend, if the "age valid" (b4 = 1) is set.

11.4 Age Verification Device Command/Response Formats

11.4.1 Reset

RESET (68H)

Reader response:

No Data response

11.4.2 Setup

SETUP (69H)	Config Data (00H) Y1	VMC Feature Level Y2	Columns on Display Y3	Rows On Display Y4	Display Info Y5

Y1 : Configuration data.
VMC is sending its configuration data to reader.

Y2 : VMC Feature Level.
Indicates the feature level of the VMC. The available feature levels are:
01 -- the actual used level is 1

Y3 : Columns on Display. The number of columns on the display. Set to 00H if the display is not available to the reader.

Y4 : Rows on Display.
The number of rows on the display

Y5 : Display Information - xxxxxyyy
xxxxx = Unused
yyy = Display type
000 : Numbers, upper case letters, blank and decimal point.
001 : Full ASCII
010-111: Unassigned

Reader Response:

Reader Config Data (01H) Z1	Reader Feature Level Z2	Country Code High Z3	Country Code Low Z4	Scale Factor Z5	Decimal Places Z6	Application Maximum Response Time Z7	Miscellaneous Options Z8

Z1 : READER - Configuration data.
Indicates the Age Verification Device is responding to a SETUP -- Configuration data request from the VMC.