
TDA2

User's and Technical Manual V4.0

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INTRODUCTION

Thank you for your choosing **Advanced Technologies'** debit card reader, the **TDA2**, as a payment system for your vending machine (called VM in this manual).

The **TDA2** is a reader/encoder of magnetic *debit* cards, cards used -- just like money -- for purchasing product in a VM. It has been designed to fit into a VM's bill validator knockout hole, and to operate on MDB.

The magnetic cards used are proprietary; they are *not* banking cards like VISA or MASTERCARD. Magnetic cards are initialized and valued on the **TDA2**, using an **Administrator** card, or on a value adding card dispenser, the **DRC4**, or on a PC, using a **Card Manager** program in conjunction with the standalone **TC11RS** serial port card reader.

If you have more than one **TDA2**, they are "incompatible" by default. This means that cards issued on one **TDA2** cannot be used on another. **TDA2s** *can* however be made compatible with each other quite easily, through programming of so-called site numbers, so that cards issued on one **TDA2** can be used on another **TDA2**, or other compatible **Advanced Technologies'** products, such as the **TC11N**, **TC11RS**, or **TC4N**.

The main features of the **TDA2** are :

- the **TDA2** can be used with or without a coin changer and/or bill validator,
- cards can be either plastic (rechargeable), or paper (disposable),
- plastic cards may be rechargeable using a coin changer and/or bill validator, when installed*,
- discount pricing may be available when paying by card*,
- a statistical audit of debit card usage can be generated,
- power comes from the MDB cable.

All **TDA2** programming is done through software menus. The three (hidden) keys on the front panel are used to traverse these menus.

***Note:** MDB protocol comes in 2 levels. The **TDA2** responds to level 1 and level 2 commands. What commands the VM control board issues is another matter. If the VM control board is only level 1 as far as a card reader is concerned, then the **TDA2** will act like a level 1 card reader, even though it's a level 2 card reader. Specifically, features like using the coin changer and/or bill validator to recharge plastic cards is a level 2 feature. So is discount pricing when paying by card. So is multivend, the ability to buy more than one product with a card without reinserting it after every vend. Limitations you may encounter with **TDA2** features are probably related to the VM control board's MDB programming, not the **TDA2**, or its parameter settings. Much of what was just written will make more sense as you read the manual.

GLOSSARY

- ADMINISTRATOR:* He is the owner of the **Administration** card, and has access to all the **TDA2** functions, including programming **User** cards, and setting **TDA2** parameters.
- MDB:* MDB is a communication protocol (or language) for VMs. Designed in the USA around 1993 for Coca-Cola, it is currently the protocol of choice for communication between devices inside a VM. MDB means Multi Drop Bus.
- SITE or GROUP NUMBER:* Each **TDA2** has 3 site or group numbers (**S1, S2, S3**). All **User** cards also have a site or group number. A **User** card will only be accepted by a **TDA2** if the card has the same site number as one of the **TDA2**'s 3 site numbers. A **User** card programmed on a **TDA2** automatically receives site **S1** of the **TDA2** as its site or group number, allowing its use on that **TDA2**. To modify a site number on a **TDA2**, see page 22.
- SERIAL NUMBER:* Each **TDA2** has a fixed serial number, which is nonmodifiable. Each **Administration** card also has a serial number. For general programming purposes, the **TDA2** only accepts an **Administration** card bearing its own serial number. Its serial number can be changed under special circumstances; see p. 35.
- OPERATOR:* He is the owner of the **Operator** card. He has access and save all statistical audit features, but he cannot program **User** cards, or set **TDA2** parameters.

TRANSACTION:

A transaction is the succession of the following operations:

- Inserting a **User** card,
- Buying a product, *or* revaluing the (plastic) **User** card,
- Recovering the **User** card.

USER:

He is the owner of a **User** card. He can buy product, *or* revalue his plastic card, using a value adding card dispenser, the **DRC4**, or the coin changer and/or bill validator (MDB, level 2).

VALUE:

This is a number recorded on a **User** card. It represents a monetary credit towards the purchase of product. When product is purchased, value equal to the purchase price of the product is subtracted from the overall value of the card. The new value is written to the card when it is ejected.

Note: With MDB, you can have a coin changer, bill validator and card reader (**TDA2**) in the same VM, but when you have both a bill validator and card reader, special accommodations for mounting the card reader need to be made, since the bill validator hole is now occupied by the bill validator. See p. 29 for more details.

GENERAL PRINCIPLES

3.1 FUNCTIONS

The **TDA2** is a payment system for vending machines (VMs). A customer must insert a card into the **TDA2** -- or insert money into the coin changer and/or bill validator, if any -- to purchase product. If a card is used, once that card has been inserted, read and accepted, the **TDA2** displays the card's value on its LCD screen. At this point, the customer can purchase product of cost equal to, or less than, the card value displayed. When a product is selected for purchase, the **TDA2** display is updated to show the card's new, remaining value. The VM then vends the product selected for purchase. At the end this "vend cycle", the card is either given back to the **User** (*single vend mode*), or is kept inside the **TDA2** (*multivend mode*) until the ejection key is pressed. MDB level 1 supports only *single vend mode*.

An eeprom inside the **TDA2** allows the **TDA1** to remember all programming and debit card usage statistics, even when power is lost or off.

Each **TDA2** is supplied with two function cards: the **Operator** card, and the **Administration** card. With these cards, the following functions can be performed:

- programming **User** cards (**Administration** card only),
- reading usage statistics (both cards),
- saving usage statistics (**Operator** card only)
- setting and saving of **TDA2** parameters (**Administration** card only).

3.2. DESCRIPTION OF MAGNETIC CARDS

THE USER CARD

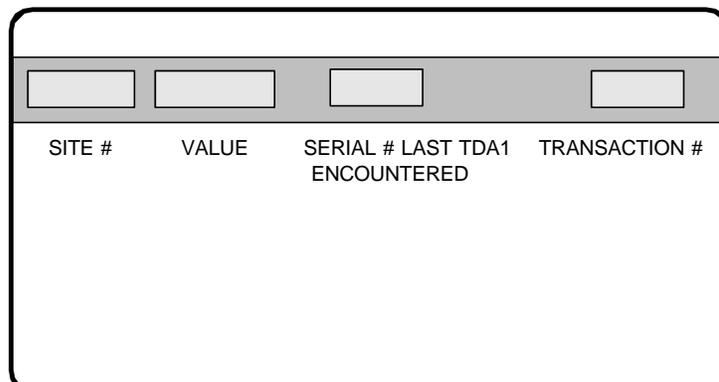
User cards come in two varieties:

- paper, or disposable cards,
- plastic, or rechargeable cards.

Disposable (paper) cards can be programmed for value (and group number) only once: they can be ordered from the factory blank (value zero), or with a preprogrammed value and group number. In either case, their maximum value is \$50, and can be *programmed only once*. When a disposable card has value below a certain programmably set *transfer value*, its remaining value can be transferred to another card, disposable or plastic.

Rechargeable (plastic) cards can be programmed for value (and group number) many times, hence the terms rechargeable or revaluable. You can purchase them from the factory blank (value zero) or preprogrammed for value and group number. Charging and recharging can be done by 1) the **Administrator**, using the **Administration** card in the **TDA2**, 2) by the customer, using the coin changer and/or bill validator, if any (MDB level 2), or the **DRC4**, a value adding card dispenser, or 3) by anybody with authority, using the PC based **Card Manager** program, in conjunction with the **TC11RS** serial card reader. A plastic card cannot be recharged an infinite number of times: if the number of transactions on the card exceeds 3,000, it can no longer be recharged, although it can of course be used until its reaches zero value. When a plastic card has value below a certain programmably set *transfer value*, its remaining value can be transferred to another card, disposable or plastic.

The magnetic track of a **User** card contains several information fields, namely:



Site #:

When a card is charged or recharged for value, it automatically acquires the first site number (**S1**) of the **TDA2** revaluing it. A card's site number must be the same as one of the 3 site numbers in a **TDA2** to be accepted by that **TDA2**.

Value:

In decimal mode, the only mode used in the U.S. vending market, this field may have any value from 0 to 99,999 for plastic cards, and up to 5,000 for paper cards. This value represents the card's monetary credit, in pennies. It is reduced each time a product is purchased on the VM, by the value of the product purchased, and the remaining new balance is written to the card when it is ejected.

Serial # Last TDA2 encountered:

This field contains the serial number of the last **TDA2** which has written to the card. This information is useful only to service personnel.

Transaction #:

This field contains the number of transactions it has undergone in its lifetime. A maximum number of 3,000 transactions is allowed for plastic cards, before they can no longer be recharged.

THE OPERATOR CARD

The magnetic track of an **Operator** card contains the following information fields:

SITE #	SERIAL # TDA1 LAST COLLECTED	A0 CARD SALES	A13 TOTAL # OF TRANSACTIONS	A14 TOTAL # OF WRIT E ERRORS
--------	------------------------------------	------------------	-----------------------------------	---------------------------------------

The **Operator** card allows for the collection of usage statistics, without compromising the **TDA2**'s security regarding programming of **User** cards and the setting of **TDA2** parameters. It is accepted by any **TDA2** having a site number (**S1, S2, S3**) equal to the **Operator** card's site number. In MDB mode, the **Operator** card is used to save the **A0, A13, and A14** counters onto itself, while making note of the serial number of the **TDA2** it is saving. Each save operation on an **Operator** card automatically erases the last save. The saved counters in the **TDA2** are not zeroed out, but continue to accumulate, unless the **Administrator** zeroes them out (see p. 35).

Site #:

Typically, this is the site **S1** of the **TDA2** in use, the same **S1** automatically written on all **User** cards when value is written to them. The site number of an **Operator** card can be **S2** or **S3** of the **TDA1** however.

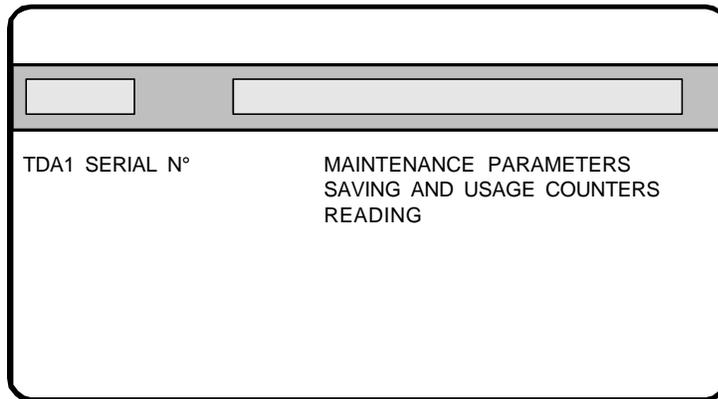
Serial # of TDA2 Last Collected:

The function **O** of the **Operator** menu records (saves) the serial number of the **TDA2** whose usage counters **A0**, **A13** and **A14** are also being recorded (saved). Any serial number previously saved is erased when a new save occurs.

A0, A13 and A14:

These counters are described in the audit counter section on page 17. The function **O** of the **Operator** menu records (saves) these counters, while erasing any previously saved data.

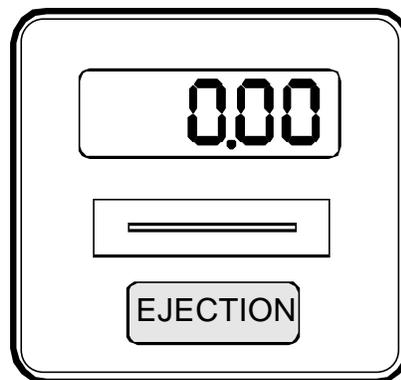
THE ADMINISTRATION CARD



The **Administration** card allows management functions such as user card programming, parameter settings, and usage counter reading (see page 11). It is accepted by a **TDA2** with an identical serial number. This card is supplied with the **TDA2** as a matched set.

TDA2 and its USERS

The **TDA2** indicates it is ready for normal vending operation by displaying the following message:

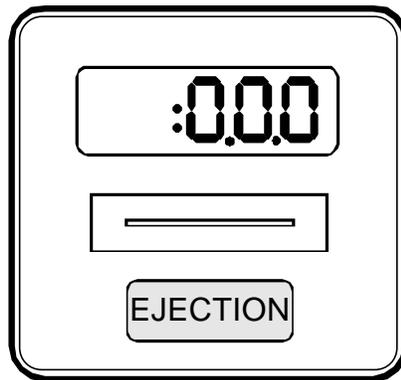


When this message is displayed, a **User** card can be inserted into the **TDA2**. If it is a good card, its value is displayed; the **User** will be able to buy any product on the VM whose cost is less than or equal to the value displayed. As soon as product is selected, the value on the display is updated. The **User** card is automatically given back to **User** at the end of the vending cycle when *single vend mode* is programmed (parameter F5). Alternatively, the **User** card remains inside the **TDA2** until the ejection key is pressed when *multivend mode* has been programmed (applies only to MDB level 2).

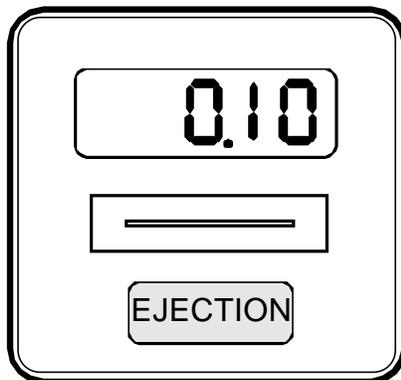
Value transfer:

In case the value of a card is too low for buying a product, it is possible to complete the purchase either by 1) inserting money in the coin changer and/or bill validator, or 2) transfer the small value balance of this "almost used up" card to another "fresh" card with sufficient value. This *value transfer* feature is available for both plastic and paper cards. This feature is particularly useful for paper (disposable) cards used on a VM with no coin changer or bill validator.

In order to use *value transfer*, a **User** card has to have a value equal to or less than the value of parameter **F3** programmed in the **TDA2**. To transfer value, first press the ejection key with no card inside the **TDA2**. The **TDA2** shows it is ready to transfer value from one card to another by displaying:



Within 10 seconds of this display, insert the low value card. The card is read, its value zeroed, and ejected to the **User**. While the **TDA2** waits for another **User** card to be inserted, the value transferred to the **TDA2** remains on the display (e.g., 10¢):



The insertion of another **User** card, e.g., \$10, completes the *value transfer*. This card is written to a new combined value (here \$10.10) and ejected back to the **User**.

TDA2 and its ADMINISTRATOR

All **TDA2** programming functions are accessible once the **Administration** card has been inserted in the reader. As mentioned before, this card's serial number matches the serial number of the **TDA2** it was sent with. For security purposes, an **Administration** card is intended to work on only one **TDA2**, the one it was sent with.

This card should remain in the exclusive possession of the **Administrator** in charge of the VM.

All **TDA2** functions are organized in menus and submenus. The sequencing of these menus is described in a flowchart on page 13.

This section describes the first four submenus:

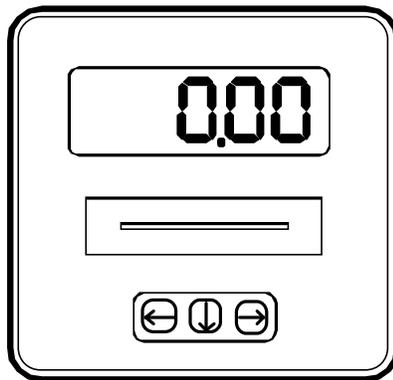
- **E** : Encoding,
- **A** : Audit,
- **C** : Cost,
- **S** : Site.

The last submenu is **F** for functional parameters. This submenu is described in detail on p. 30.

5.1. SEQUENCE OF MENUS

The front panel of the **TDA2** is fitted with a rectangular key showing an ejection button. The rectangular block is actually made up of 3 circular keys. In vending mode, any one of the three keys acts the same (eject or *transfer value*). When the **Administration** card is inserted however, and the **TDA2** enters programming, the 3 keys mean different things, allowing for navigation through and between the *submenus*.

In order to better understand this navigation process, we now show the three keys according to their functional significance:

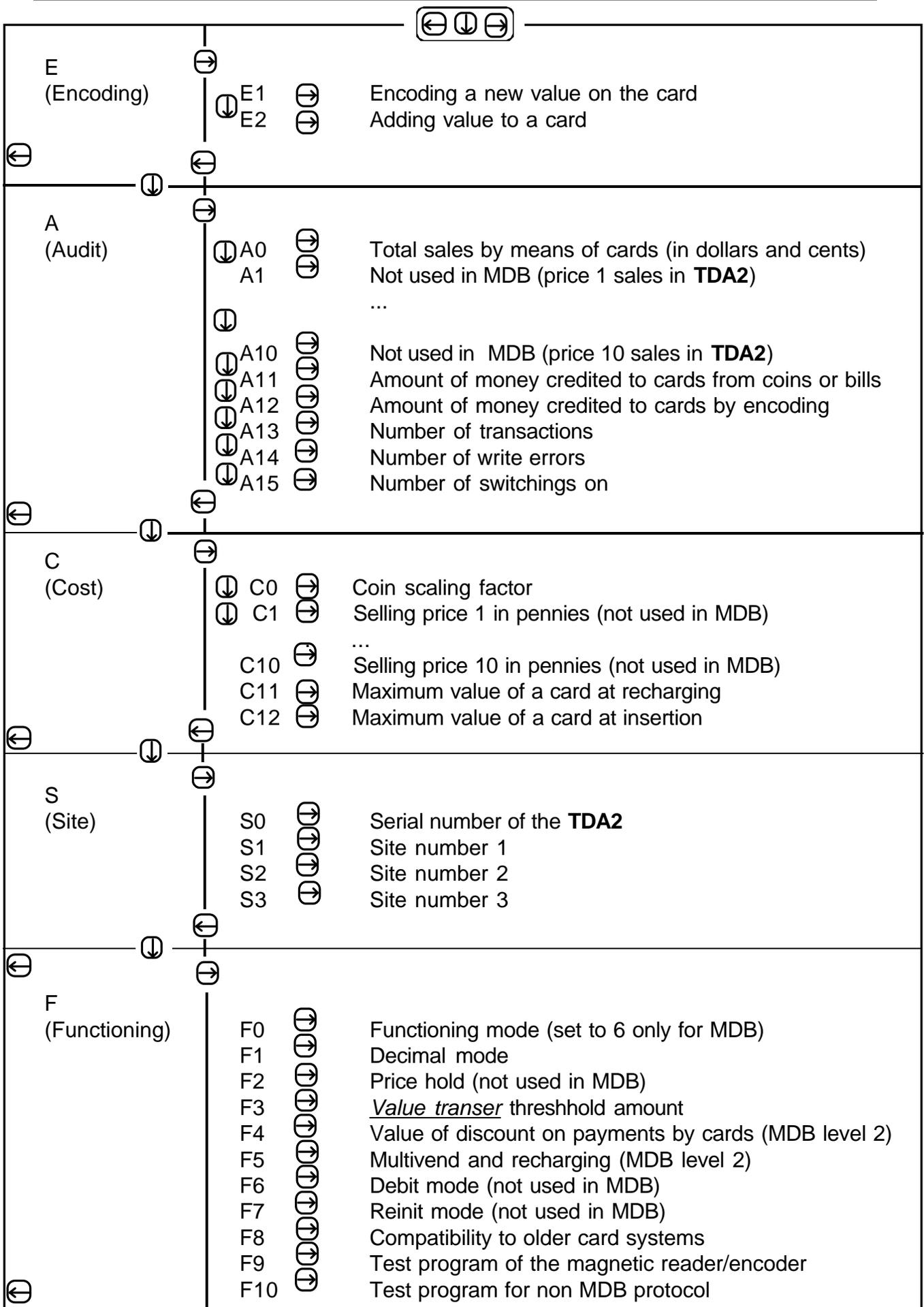


Once the **Administration** card is inserted, these keys navigationally mean:

- ← move to the left,
- move to the right,
- ↓ move down, or change the blinking digit.

All the *submenus* are described on the next page.

Keep in mind that the **Administration** card is always returned after insertion. If no activity occurs for a 4 minute period, the **TDA2** returns to vend mode, and a **User** card can be inserted to purchase product.



5.2. RECORDING MAGNETIC CARDS

User cards come in two varieties:

- paper (or disposable) cards,
- plastic (or rechargeable) cards.

Disposable cards can be programmed only once. Their maximum value is \$50. Value can be transferred from a disposable card to another card when a card has too little value to purchase a product (see page 10).

Rechargeable cards can be revalued many times by the **Administrator** or by the customer, depending on the process used, and the total number of transactions on the card.

Both types of cards are *high coercitivity*, i.e. they are not sensitive to small magnetic fields such as a magnetic paper clip holder, etc. This major technical feature of the **TDA2** greatly increases the integrity and durability of all information contained on the cards.

Cards may be supplied either already programmed for value and group (site) number, or blank. In this second case, a value and group number must be recorded on them before they can be used. This section describes this recording (or encoding) process. A rechargeable card can of course be reencoded once value has been used up, provided the maximum number of transactions (3,000) has not been exceeded.

Whatever the type of card, when value is encoded on a card by a **TDA2**, the card automatically receives that **TDA2**'s first site number (**S1**).

There are two ways to encode value onto cards :

- E1** : clears the old value of the card and encodes a new one, or
- E2** : adds an amount to the current value of the card.

Example of programming a set of cards for the value \$50:

a
Insert the **Administration** card. It is automatically ejected and the display shows :



⊞ activates the encoding menu

b



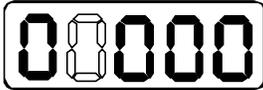
⊞ activates the encoding function for a new value

c



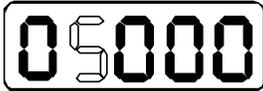
⊞ moves the blinking digit to the right

d



⏴⏴⏴⏴⏴ changes the digit from 0 to 5

e

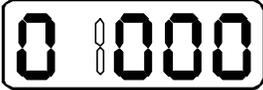
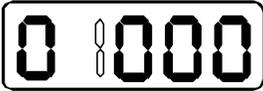


Insert any number of cards to program

f
To come back to **User** mode, press key
⊞ repeatedly till display shows



Example of adding \$10 of value to a set of rechargeable cards:

<p><i>a</i></p> <p>Insert the Administration card. It is automatically ejected and the display shows:</p>  <p>⊞ activates the encoding menu</p>
<p><i>b</i></p> <p>⏴ selects the adding function</p>  <p>⊞ activates the adding function for a new value</p>
<p><i>c</i></p>  <p>⊞ moves the blinking digit to the right</p>
<p><i>d</i></p>  <p>⏴ changes the digit from 0 to 1</p>
<p><i>e</i></p>  <p>Insert any number of cards to recharge</p>
<p><i>f</i></p> <p>To come back to User mode, press key</p> <p>⏴ repeatedly till display shows</p> 

5.3. AUDIT COUNTERS

The **TDA2** maintains several audit counters for monitoring usage and sales accountability. These counters can be displayed on the **TDA2**'s screen. They are called **A0**, **A1** ... up to **A15**. Three of them, **A0** (total sales by cards), **A13** (number of transactions) and **A14** (number of write error) can be *saved* on the **Operator** card. All the counters are readable and resettable by means of the **Administration** card.

A0 counter (total sales by cards):

This counter expresses in dollars and cents the total sales made using cards. The maximum value of **A0** is: \$999,999.99. Reading this counter is easy:

<p><i>a</i></p> <p>Insert the Administration card. It is automatically ejected and the display shows:</p>  <p>⏴ selects the audit menu</p>
<p><i>b</i></p>  <p>⏴ activates the audit function</p>
<p><i>c</i></p>  <p>⏴ activates the reading of A0</p>
<p><i>d</i></p> <p>The left part of the total is first displayed:</p>  <p>⏴ requests display of the right part</p>
<p><i>e</i></p>  <p>⏴ returns you to step <i>c</i></p> <p>⏴ returns to step <i>d</i>, followed by the User mode</p>

A1 to A10 counters:

Not used with MDB protocol. For price hold function of other protocols.

A11 counter (card recharging by means of coins and bills):

This counter expresses in dollars and cents the amount of money encoded to cards by means of the coin changer or bill validator, if any. This works only for MDB level 2, and **F5** needs to be set up properly. The maximum value of this counter is: \$999,999.99. The procedure for displaying this counter is the same as for **A0**.

A12 counter (total card recharging by means of the Administration card):

This counter expresses in dollars and cents the amount of value recorded onto cards by means of **E1** or **E2**. The maximum value of this counter is: \$999,999.99. The procedure for displaying this counter is the same as for **A0**.

A13 counter (number of transactions):

A transaction is the succession of the following operations:

- Insertion of a **User** card,
- Purchase of a product by card or recharging of a plastic card,
- Recovery of the **User** card.

This counter expresses the number of transactions made on **User** cards from the installation time of the **TDA2**. Its maximum value is 99,999. The procedure of displaying this counter is the same as for **A0**. This counter is intended for service personnel, and facilitates cleanings every 10,000 transactions.

A14 counter (number of write errors):

This counter represents the number of errors which occurred when writing to a card. On a **TDA1** in good condition, this number should always be 0. On a site equipped with several **TDA1**'s, it is not always easy for the service engineer to locate a unit with intermittent writing errors. This counter facilitates such identification.

A15 counter (number of switchings on):

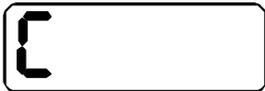
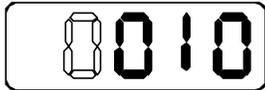
This counter is increased by 1 at every power up or switching on. It checks for correct functioning of the reader and *its* power supply. In case of power supply trouble, this counter increases more quickly than the number of actual switchings on of the VM. This counter can also be used to monitor for fraudulent activity.

No counters are resettable in general; they are all cumulative. To reset a counter, e.g. **A14** after corrective action has taken place, follow the procedure on p. 35. All counters are reset at the same time.

5.4. SELLING PRICES

Price C0 (coin scaling factor):

In MDB, the coin scaling factor has a function, but it may not be the same for every VM control board. Our experience indicates that it should be set up at 0005, meaning that prices on the VM increment in nickels, that an accompanying changer accepts at minimum a nickel, etc. If the coin scaling factor is set wrong, the display on the **TDA2** will not agree with the display on the VM mother board. To set the coin scaling factor, perform the following steps:

<p><i>a</i></p> <p>Insert the Administration card. It is automatically ejected and the display shows:</p>  <p>ⓂⓂ selects the prices menu</p>
<p><i>b</i></p>  <p>Ⓜ activates the price management function</p>
<p><i>c</i></p>  <p>Ⓜ activates CO for reading or change</p>
<p><i>d</i></p>  <p>The blinking digit can be modified by pressing Ⓜ</p> <p>Another digit can modified the same way, once selected with keys Ⓜ or Ⓜ</p>
<p><i>e</i></p> <p>To come back to User mode, press Ⓜ till the display shows</p> 

C1 to C10 counters (selling prices)

With MDB protocol, selling prices are defined on the VM mother board, so the counters **C1** to **C10** are not used.

C11 counter (maximum value of a card at reloading):

Card can be recharged from the coin changer and/or bill validator, if any, if the MDB protocol is level 2. Typically this is not available in the U.S. When recharging from an external money device, the maximum value the card can be recharged to is the value of **C11**. Basically, this counter is ignored for MDB level 1.

C12 counter (Maximum value of a card at insertion) :

When a card is read, its value is compared to **C12**; if the card value is higher than **C12**, it is ejected, with the code **E35**. When **C12** is set 00000, no check of value is made at insertion.

5.5. SITES MANAGEMENT

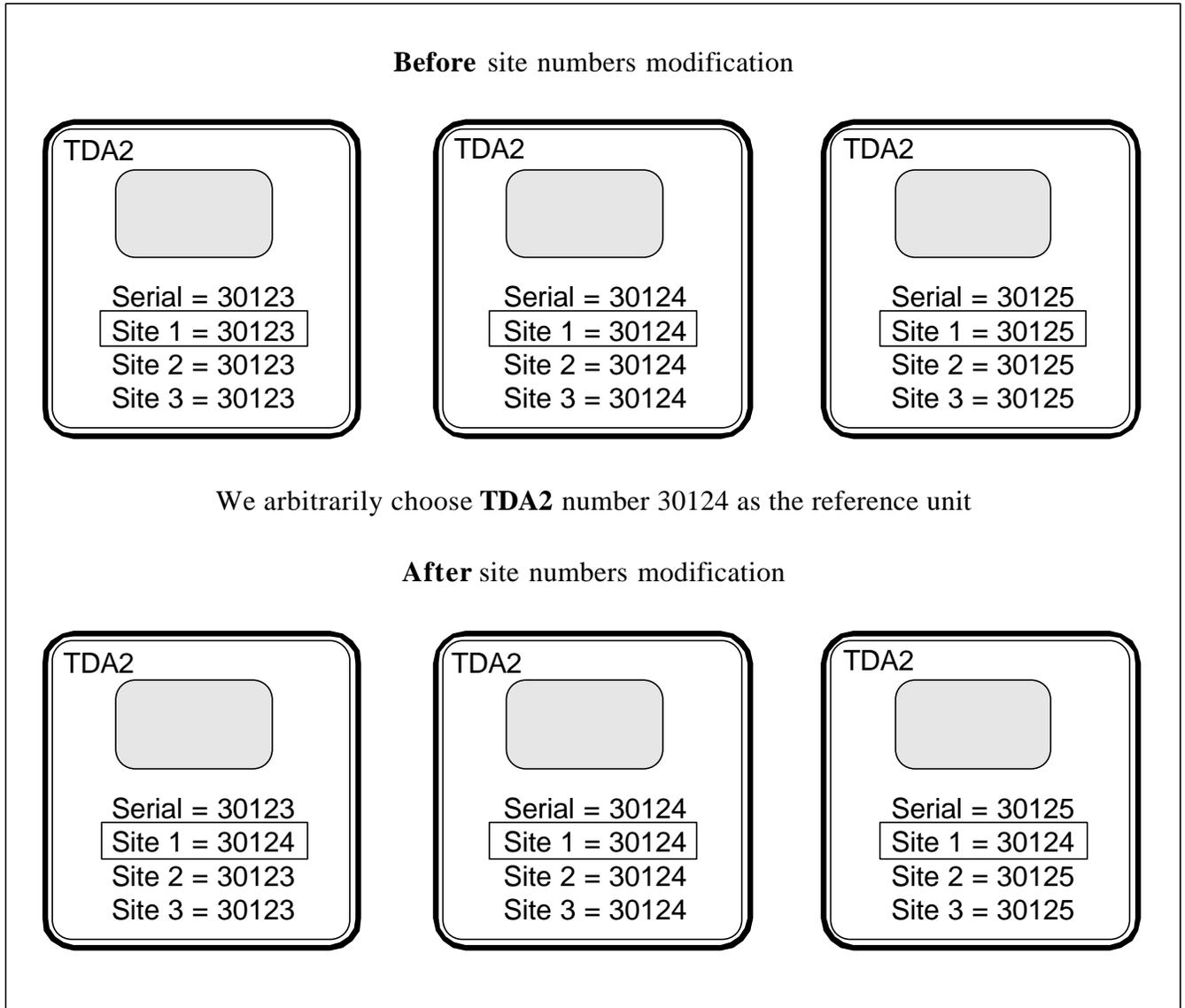
The use of site numbers allows a group of **User** cards to be accepted or excluded by a specific **TDA2**. The **TDA2**'s memory contains 3 site numbers (**S1**, **S2**, **S3**). They can be displayed -- and changed, as desired -- using the submenu **S** accessible by the **Administration** card. As previously mentioned, a **User** card being charged or recharged is always encoded with site number 1 (**S1**) of the **TDA2** recording the cards. For a **User** card to be accepted by a specific **TDA2**, the card's site number must be the same as one of the three site numbers in the **TDA2**.

To change **S1**, **S2**, or **S3** of a specific **TDA2**, you will need that **TDA2**'s **Administration** card, and the **Administration** cards having serial numbers equal to the new site numbers desired.

On power up, if the middle key remains pressed, the **TDA2** will first display its software version, followed by:

- **S0** : serial number - **S1**: site #1 - **S2** : site #2 - **S3** : site #3

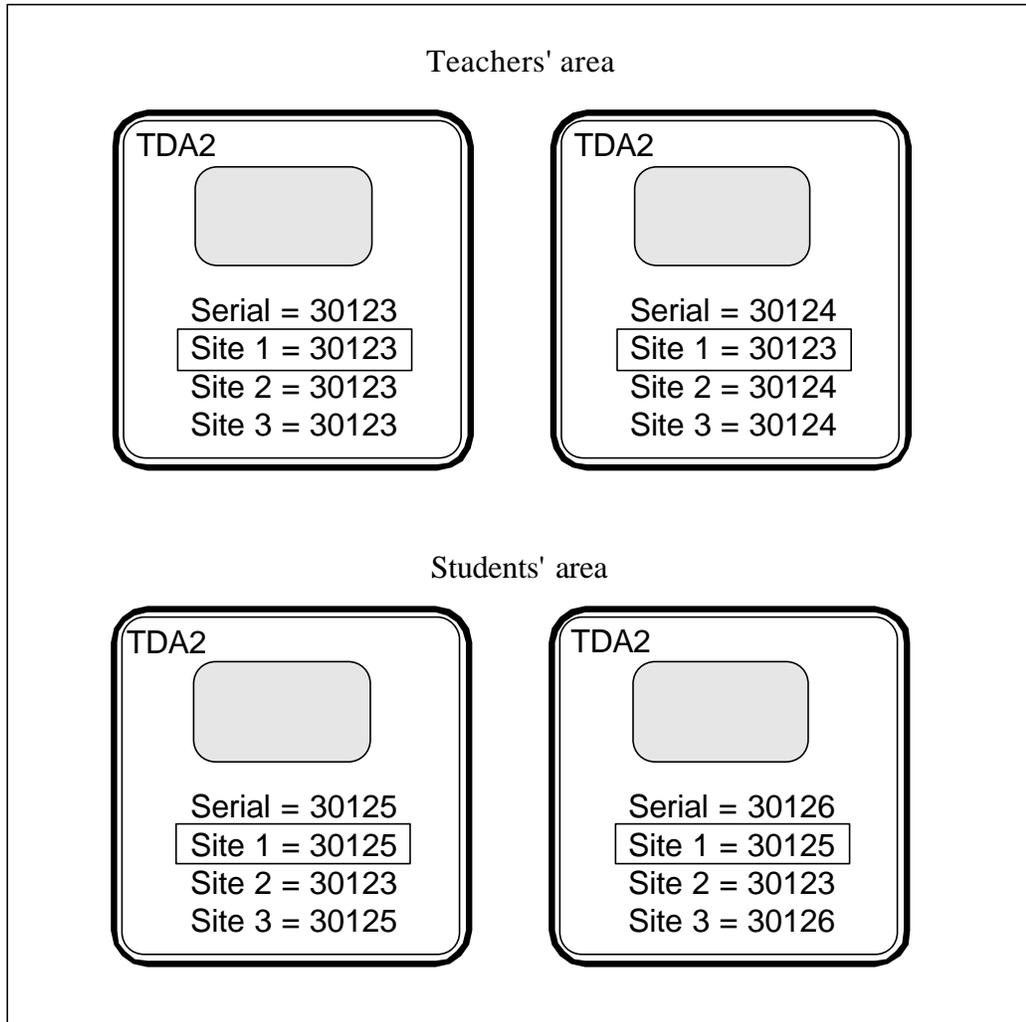
To show how to modify site numbers, let's take the case of three **TDA2**s installed in one location, with the following serial numbers: 30123, 30124 and 30125. In order for any **User** card made on any **TDA2** to work on all the **TDA2**s, we arbitrarily choose **TDA2** number 30124 as the reference unit. We then modify site #1 on both the other **TDA2**s.



Site number 1 (**S1**) is quite different from site numbers 2 and 3 (**S2**, **S3**): **S1** of the recording **TDA2** is always recorded on a **User** card recorded via functions **E1** or **E2**.

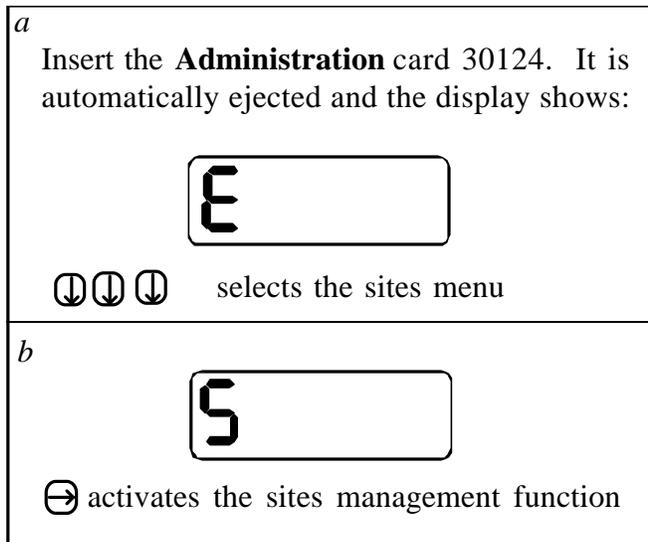
Site numbers 2 and 3 are only really needed when access to VMs is organized by hierarchy.

For example, in a school, teachers' **User** cards are to be accepted by all VMs, whereas students' **User** cards are not be accepted by those VMs reserved exclusively for the teachers.



Cards issued on the **TDA2s** 30123 and 30124 can be used on all the VMs in the school.
 Cards issued on the **TDA2s** 30125 and 30126 can only be used in the students' room.

*Detail of the operations required to modify **SI** of the **TDA2** 30124*



c



Ⓚ passes over the serial number, to select site number 1

d



⇒ activates display/modification of **S1**

e



The current value of site number 1 is displayed

f

Insertion of reference **Administration** card (in this example 30123)



g

to return to **User** mode, press sequence Ⓚ Ⓚ until **TDA2** requests reinsertion of original **Administration** card



This saves the new site numbers to the **TDA2's Administration** card

h

The **TDA2** is now available to **Users**



TDA2 and its OPERATOR

The **TDA2** is supplied with another function card too, called the **OPERATOR** card. It is used to collect usage statistics only. You cannot encode value on **User** cards, or set **TDA2** parameters with an **Operator** card. Keep in mind that the **Administration** card does everything the **Operator** card does too, except that it doesn't save usage data.

You can read and/or save the following on the **TDA2**:

- serial number of the **TDA2** collected,
- **A0**, total sales by cards,
- **A13**, number of transactions,
- **A14**, number of write errors.

These data can then be viewed on another **TDA2**, provided the **Operator** card has a site number shared by both **TDA2**s. This quick and reliable way of collecting data simplifies the management of large sites.

Just like **User** cards, the **Operator** card has a site number. It is accepted only by **TDA2**s where one of the **TDA2**'s 3 site numbers is the same as the site number on the **Operator** card. This feature guarantees that usage data will only be collected by authorized personnel.

The functions accessible with an **Operator** card are:

O (Operator)	⊖	Saves audit counters A0, A13 and A14 onto the Operator card																																				
d (Display)	⊖	Displays the audit counters read by the Operator card																																				
A (Audit)	⊖	<table border="0"> <tr> <td data-bbox="454 630 487 661">⊖</td> <td data-bbox="495 630 544 661">A0</td> <td data-bbox="576 630 617 661">⊖</td> <td data-bbox="673 630 1404 661">Total sales by means of cards (in dollars and cents)</td> </tr> <tr> <td data-bbox="454 661 487 693">⊖</td> <td data-bbox="495 661 544 693">A1</td> <td data-bbox="576 661 617 693">⊖</td> <td data-bbox="673 661 1242 703">Not used in MDB (price 1 sales in TDA2)</td> </tr> <tr> <td data-bbox="454 714 487 745">⊖</td> <td colspan="3" data-bbox="673 714 706 745">...</td> </tr> <tr> <td data-bbox="454 787 487 819">⊖</td> <td data-bbox="495 787 544 819">A10</td> <td data-bbox="576 787 617 819">⊖</td> <td data-bbox="673 787 1258 819">Not used in MDB (price 10 sales in TDA2)</td> </tr> <tr> <td data-bbox="454 819 487 850">⊖</td> <td data-bbox="495 819 544 850">A11</td> <td data-bbox="576 819 617 850">⊖</td> <td data-bbox="673 819 1437 850">Amount of money credited on cards from coins or bills</td> </tr> <tr> <td data-bbox="454 850 487 882">⊖</td> <td data-bbox="495 850 544 882">A12</td> <td data-bbox="576 850 617 882">⊖</td> <td data-bbox="673 850 1347 892">Amount of money credited to cards by encoding</td> </tr> <tr> <td data-bbox="454 882 487 913">⊖</td> <td data-bbox="495 882 544 913">A13</td> <td data-bbox="576 882 617 913">⊖</td> <td data-bbox="673 882 998 924">Number of transactions</td> </tr> <tr> <td data-bbox="454 913 487 945">⊖</td> <td data-bbox="495 913 544 945">A14</td> <td data-bbox="576 913 617 945">⊖</td> <td data-bbox="673 913 990 955">Number of write errors</td> </tr> <tr> <td data-bbox="454 945 487 976">⊖</td> <td data-bbox="495 945 544 976">A15</td> <td data-bbox="576 945 617 976">⊖</td> <td data-bbox="673 945 1023 997">Number of switchings on</td> </tr> </table>	⊖	A0	⊖	Total sales by means of cards (in dollars and cents)	⊖	A1	⊖	Not used in MDB (price 1 sales in TDA2)	⊖	...			⊖	A10	⊖	Not used in MDB (price 10 sales in TDA2)	⊖	A11	⊖	Amount of money credited on cards from coins or bills	⊖	A12	⊖	Amount of money credited to cards by encoding	⊖	A13	⊖	Number of transactions	⊖	A14	⊖	Number of write errors	⊖	A15	⊖	Number of switchings on
⊖	A0	⊖	Total sales by means of cards (in dollars and cents)																																			
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⊖	A11	⊖	Amount of money credited on cards from coins or bills																																			
⊖	A12	⊖	Amount of money credited to cards by encoding																																			
⊖	A13	⊖	Number of transactions																																			
⊖	A14	⊖	Number of write errors																																			
⊖	A15	⊖	Number of switchings on																																			

6.1. SAVING THE AUDIT COUNTERS ONTO THE OPERATOR CARD

The magnetic track of the **Operator** card contains:

- the serial number of the **TDA2** whose data was last collected,
- **A0**, total sales by means of cards,
- **A13**, number of transactions,
- **A14**, number of write errors.

Saving of data automatically erases any data present on the card from a previous save, regardless of the **TDA2** saved.

a
 Insert the **Operator** card; the display shows:



⊞ activates the saving function

b
 To be sure, the **TDA2** requests confirmation



⊞ confirms the request ("Good")

c
 The card is immediately ejected with audit counters saved.

6.2. DISPLAY OF THE AUDIT COUNTERS SAVED ON THE CARD

Function **d** of the **Operator** menu allows viewing of the counters currently saved on the **Operator** on the **TDA2**'s display. To view the currently saved data:

a
 Insert the **Operator** card; the display shows:



⏴ selects the display *submenu*

b



⊞ activates the display function

c
 The data display sequence that follows occurs at the rate of one message per second.

6.3. AUDIT COUNTERS

Function **A** from **Operator** menu enables the audit counters to be displayed on the **TDA2**'s screen just as they would be using the **Administration** card. See page xx for details on using this menu driven reading of the counters.

6.4. MODIFICATION OF THE SITE NUMBER ON AN OPERATOR CARD

The **Operator** card supplied with the **TDA2** comes with a site number identical to the **TDA2**'s first site number (**S1**). If necessary, this number can be changed. First change **S1** in the **TDA2** as necessary (see p. 20) and then encode the **Operator** card as if you were adding value to it (use function **E1** or **E2**).

INSTALLATION

In this section, we tell you how to mechanical install the **TDA2** inside a VM, as well as how to set the functional parameters for MDB operation.

7.1. MECHANICAL INSTALLATION

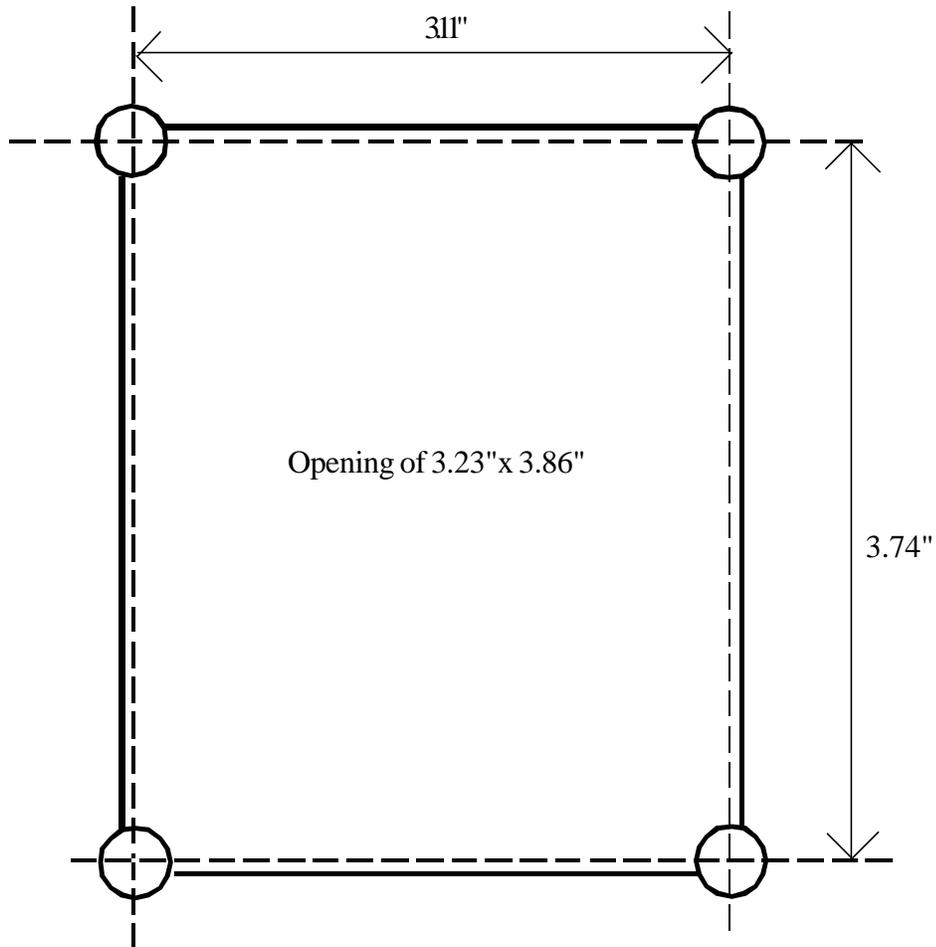
The **TDA2** has been designed to be fit into a VM, using the bill validator knockout already therein. In the event that the bill validator knockout is already being used by a bill validator, you can cut out a new hole in the frame of the VM. The instructions that follow are for mounting the **TDA2** in a newly cut hole, where the **TDA2** does not have on it the bill validator cutout adaptor plate. Before cutting this new hole, make sure that the space on the front panel and inside the VM is sufficiently large to take the **TDA2**.

- Minimum surface needed on VM front panel = 3.74" x 4.33"
- Minimum surface needed inside the VM = 3.38" x 4.02"
- Minimum depth needed = 5.71"

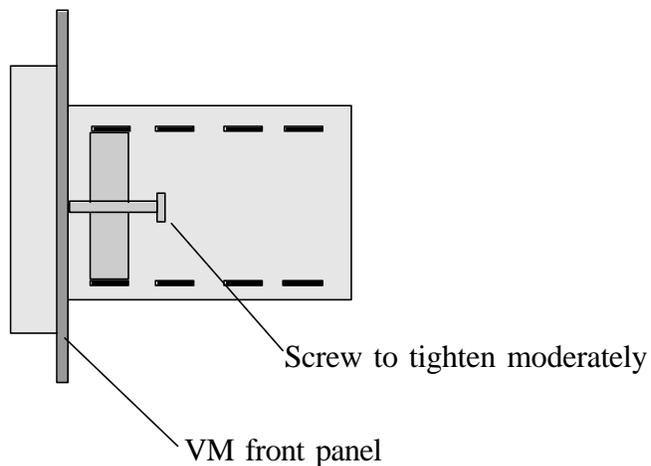
Here's how to cut the hole into the front panel:

- draw a rectangle of 3.11" x 3.74" on the VM front panel,
- drill 4 holes of .28" diameter at each corner,
- cut the hole in the panel, using metal shears.

The width of the shears knife should be .12" to create an opening of 3.23" x 3.86"



Once the **TDA2** is placed in the VM hole, it is to be secured by means of 2 removable fasteners described below. These fasteners normally come with the **TDA2**.



7.2. FUNCTIONAL PARAMETERS

The **Administration** card gives access to the menu **F**, which configures all functioning parameters of the **TDA2**.

Parameter F0 (Functioning mode):

It may have a value from 0 through 6, but only 6 applies to MDB protocol. Set this parameter to 6 only.

Note: Any modification of the **F0** parameter must be followed by a switching off to on.

Parameter F1 (Decimal mode):

It may have following values:

- 0 : The value of the card is displayed without decimal point. This mode is useful when cards are valued in points (or drinks), instead of in currency.
- 1 : The value of the card is displayed with 2 digits after the decimal point. In the U.S., only the decimal mode is used.

Parameter F2 (price hold):

For MDB, there is no price hold within the **TDA2**. Set this variable to 0 only.

Parameter F3 (Threshold value of transfer value):

This parameter defines the value on a card, plastic or paper, under which the *transfer value* mechanism kicks in. See page 10.

Parameter F4 (Discount value on payment by cards):

This parameter only applies to MDB protocol level 2 (not currently available in the U.S.). Leave at 0000.

Parameter F5 (Multivend, Card recharging):

This parameter does not apply to MDB protocol, level 1, the only level supported currently in the U.S. For MDB protocol, level 2, set this parameter to 0 for single vend, no recharging, to 1 for multivend, no recharging, 2 for single vend, recharging, and 3 for multivend, recharging.

Parameter F6 (debit mode):

Parameter F7 (reinit mode):

These parameters do not apply to MDB protocol.

Parameter F8 (maximum recovery):

This parameter defines the way of writing on the magnetic track. Set it only to value 1 for optimum reliability.

Parameter F9 (Reader test):

This is not a parameter, but a test function of the magnetic card reader/encoder. Once **F9** is selected, the **TDA2** waits for the insertion of a card. A test of 300 writing/reading cycles then starts. During the test, the left side of the display shows the number of the cycle currently in process; the right side of the display shows the number of write errors, if any. At the end of the test, **300.00** will be shown on the display. This test may be terminated prior to completion, by pressing the ejection key.

Parameter F10 (Test of the current loop link):

This parameter does not apply to MDB protocol. Occasionally you may see an Error code **E80**, **E81**, **E82**, or **E83**, on bootup (powerup), if, in addition to the **TDA2**, a bill validator, or coin changer are attached onto the MDB serial network. These bootup errors can be ignored, because they only happen due to differences in bootup times.

SERVICE

To insure continued dependable operation from your **TDA2**, the following care is advised:

- clean the rubber driving roller with a cloth soaked in alcohol.
- clean the magnetic head with a cleaning card soaked in alcohol.
- blow any dust out of the reader assembly with a compressed air spray.
- check the write error counter **A14**.

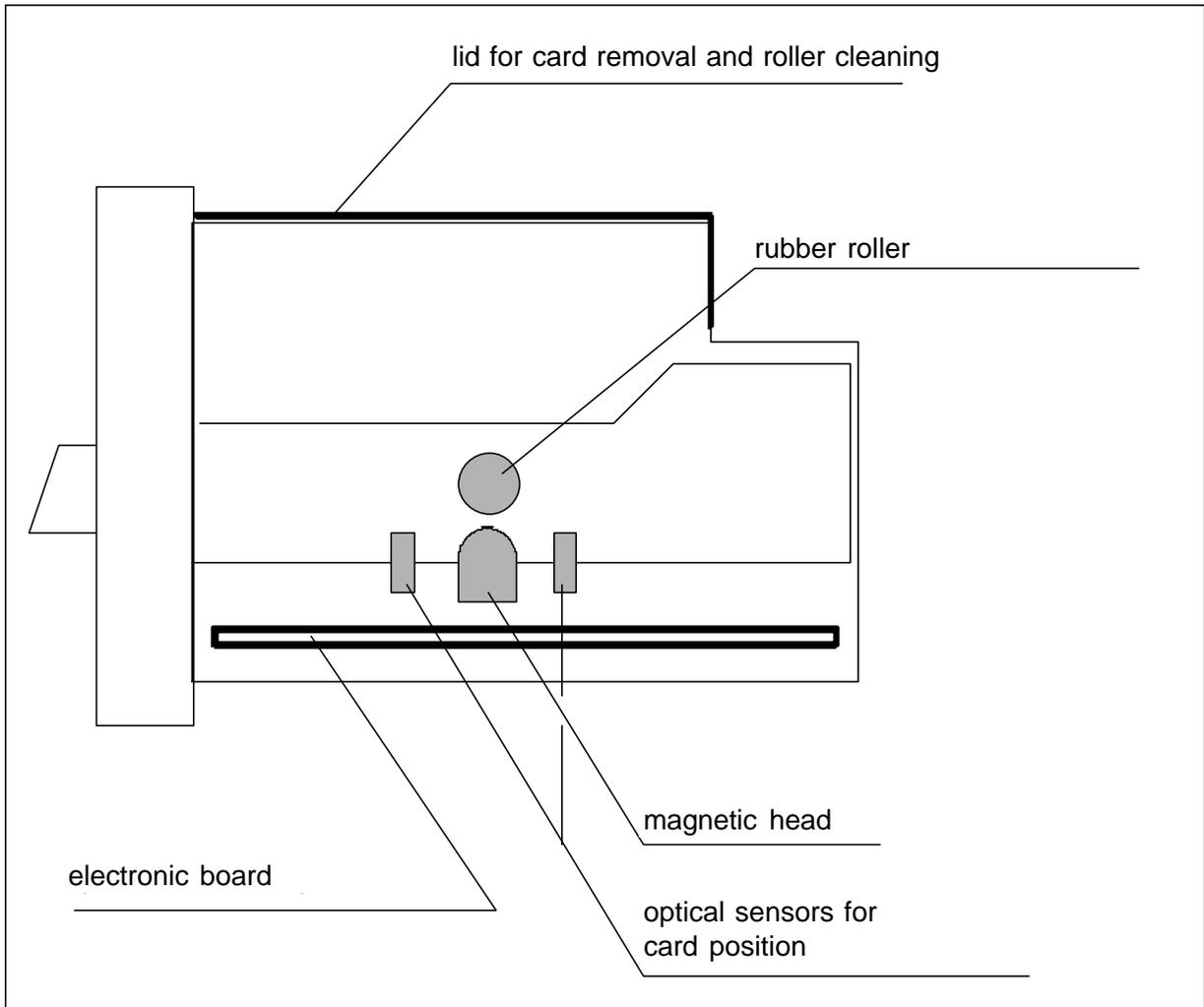
The frequency of this preventive maintenance depends on the **TDA2**'s working environment. If the **TDA2** is installed in an office, these procedures should be performed every 20,000 transactions, or every six months, whichever is sooner.

These procedures must be carried out with the unit electrically disconnected. This advisory applies also to cover removal and replacement. After cleaning, reset the write error counter A14 -- and all the other counters -- to zero. See p. 35 for details.

Note: In case counter **A14** is over 5, the **TDA2** needs urgent cleaning. If after the cleaning process the unit still has a write error problem, the magnetic head probably needs changing.

To help identify the components that need to be cleaned, refer to the **TDA2** cross-sectional view on the next page.

TDA2 cross-sectional view



In case the electronic board needs to be replaced, please read on p. 35 about creating a "memory error" in order to restore the original serial number.

ERRORS CODES

In case of trouble, the **TDA2** displays an error code; their meanings follow:

E11, E12, E13 : Memory error

A memory error has occurred as a result of hardware trouble, major electric interference, disconnected electronic cards, etc. To clear this error, you just have to insert the **Administration** card into the **TDA2**.

Note: Do not insert the **Administration** card of another **TDA2**, otherwise the **TDA2** in need of memory error clearing will acquire the serial number of this "wrong" card.

Codes **E11** to **E13** appears when the **TDA2** detects that some information stored in its memory has been modified without any good reason. This information is thought to be damaged, and correspond to statistics counters or the internal parameters of the **TDA2**. For greater diagnostic accuracy, the **TDA2** displays one of three errors codes:

- **E11** means that the error lies in **S0** through **S3**. Inserting the **Administration** card clears the memory error and automatically regenerates the serial number and the site numbers. **S1** through **S3** will be equal to **S0** in this default restoration of site numbers.
- **E12** means that the error lies in the variables **C0** to **C10**, **A1** to **A14**, and or **F0** to **F8**. Inserting the **Administration** card clears the error, but cannot regenerate any damaged data. A readout of usage statistic is advised, to determine whether crucial data has been lost.
- **E13** means that the error lies in both the **E11** and **E12** areas.

In case statistics counters need to be reset, proceed as follows:

- 1) Insert the **Administration** card and display serial number (parameter **S0**).
- 2) Press the mid-key: the code **E41** is displayed.
- 3) During the **E41** display, quickly press in order these keys: right, middle, left.
- 4) A little later, the message **Good** is displayed and all the usage counters are reset.

Note: In case the electronic board inside the **TDA2** has to be changed, the new one may have to have its serial number changed so as to agree with the customer's preexisting **Administration** card. To modify the serial number of the new electronic board, it has to be put in "memory error", after which the customer's **Administration** card is inserted to clear that "memory error".

To put the **TDA2** in "memory error" and change its serial number, you will need the **Administration** card that comes with the new board, as well as the customer's **Administration** card:

- 1) Insert the **Administration** card that came with the board, and display the number of transactions (parameter **A13**).
- 2) Press the mid-key.
- 3) While the message **E41** is displayed, press these keys in this order: right, middle, left.
- 4) A little later, the message **E11** is displayed. You are now in "memory error".
- 5) Insert the customer's **Administration** card to clear the "memory error" and rewrite the serial number to the serial number of the customer's **Administration** card.

E14 : Eeprom breakdown

The electronic board inside the **TDA2** probably needs changing.

E15 : Interrupt error

E16 : Message overflow

Software error: consult your distributor.

E17 : Power supply voltage too low

The **TDA2** cannot start if its power supply voltage is too low. Nominal voltage is 24VAC or DC.

E21 : Card reading error

The **TDA2** cannot read the card just inserted. Call the key operator.

E23 : Card jam

Card is jammed inside the **TDA2** for mechanical reasons. Cycle the **TDA2** power off, then on (usually you just cycle the VM power off and on). If the card does not come out, and the message returns, turn the **TDA2** power off, and manually remove the card. See page 33 for the location of the **TDA2**'s removable cover.

E24 : Write error

The **TDA2** cannot write a new value onto the **User** card just inserted. The number displayed on the screen is the current value of this **User** card; please refund this value to the customer. To correct this situation, remove card manually, as necessary, and turn the **TDA2** off and on (cycle the VM power off and on). Generally, the card removed is unusable. Clean the reader (see page 32), as necessary. The magnetic head may need to be changed.

E31 : Wrong card

This is a legitimate card, but not the type of card presently expected by the **TDA2**. For example, an attempt to record value on an **Administration** card, or a disposable card previously encoded.

E32 : Site error

The magnetic track of this card does not have the same site number as one of the 3 **TDA2** site numbers (**S1 - S3**). The site number of a **User** card can be changed by recording its value again (using function **E1** or **E2**).

E33 : Serial number error

The **Administration** card inserted does not correspond to this **TDA2**'s serial number.

E34 : Worn card

Attempt to revalue a plastic card with over 3,000 transactions.

E35 : Too high value

Attempt to encode too high a value on a disposable card (usually \$50), or higher than **C11** or **C12**.

E40 : Blank card

This is a new card, ready for recording.

E41 : Modification forbidden

Attempt to modify a nonmodifiable parameter, for example the serial number (**S0**).

E50 : Unknown card

This card is not compatible with the **TDA2**.

E70 : Illegal extract

This card has not been recovered from the unit by manually opening case. Card retains value, which can be read, but cannot be used until rewritten (plastic only).

TECHNICAL SPECIFICATIONS

NAME	TDA2.
FUNCTION	Debit card system for vending machines.
CARDS	Card with high coercitivity magnetic track.
ELECTRONICS	Very large scale integrated 8 bit microcontroller, eeprom for parameters backup, double current loop.
OPERATING CONDITIONS	
Moisture	20% - 90% RH
Temperature	50 - 120° F
ASSEMBLY	Fits into the VM bill validator knockout, if available.
DIMENSIONS	3.8"W x 4.3"H x 6.0"D, exclusive of adaptor plate.
WEIGHT	3.3 lbs.
POWER SUPPLY	Supplied by MDB cable, per MDB spec.
POWER CONSUMPTION	40mA idle, 450 mA for 0.2s at motor start.