

VMC Retrofit Kits: Configuration and Usage Instructions

Revision 12, Dec 2022

1 Introduction

The VMC Retrofit Kit adds a number of state-of-the-art features to your vending machine:

- Two line by sixteen character display.
- User-friendly Service Mode for setup and maintenance tasks.
- Support for both MDB and non-MDB coin mechs, bill validators, and cashless devices.
- DEX port for accounting and configuration.
- MicroSD card or USB thumb drive (AP120) for accounting, configuration, and software upgrades.
- Optional drop sensor system ensures that customers receive the product they paid for.

This document explains how your vending machine will operate after it has been upgraded using the VMC Retrofit Kit. To get the most out of this document, it is suggested that you finish installing the Kit using the separate installation instructions. Then, proceed with Section 3, “Service Mode Basics”, when you are at the machine.

2 Kit-Specific Information

This document is used with several kits covering different machine types. The essential differences between the kits are outlined in the table below:

Kit Type	Execute Key	Cancel Key	Up Key	Down Key	Other Differences
RVMC-6/7000-x	14	12	11	13	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #1 ON • DIP Switch #2 OFF • DIP Switch #3 OFF
RVMC-LCM-x RVMC-LCM-x RVMC-LCM4-x	H	D	↑	↓	No door switch
RVMC-110-x	H	G	↑	↓	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #1 OFF • DIP Switch #2 ON • DIP Switch #3 ON
RVMC-NATL147-x RVMC-NATL148-x	#	*	F	J	Gum&Mint uses home switches <u>only</u> Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switches #5 & 6 OFF See Note 1 below.
RVMC-NATL145-x	E	D	F	G	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #5 ON • DIP Switch #6 OFF See Note 1 below.
RVMC-NATL146-x	E	D	F	G	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #5 OFF • DIP Switch #6 ON See Note 1 below.
RVMC-POLY-x	13	11	10	12	
RVMC-SLIM-x	#	*	F	G	No door switch
RVMC-USI3100-1	#	*	F	G	
RVMC-USISM3-x	#	*	F	G	No door switch

Table continued

Kit Type	Execute Key	Cancel Key	Up Key	Down Key	Other Differences
RVMC-USISM36	E	D	F	G	SM3 DIP Switch #3 OFF SM6 DIP Switch #3 ON
RVMC-120-SL	#	C	<	>	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #1 ON • DIP Switch #2 ON for Drop Sensors and OFF for no sensors
RVMC-120-ST	#	C	<	>	Required settings on VMC board: <ul style="list-style-type: none"> • DIP Switch #1 OFF • DIP Switch #2 ON for Drop Sensors and OFF for no sensors

DIP Switch #4 (#2 AP120) must be ON when a Drop Sensor is used. DIP Switch #4 (#2 AP120) is OFF otherwise.

NOTE 1: For indicated kits, Switch 3 is ON for a non-escrowing bill validator such as a Maka. Switch 3 is OFF for an escrowing bill validator such as a Mars/MEI or Coinco. This switch affects only non-MDB validators.

NOTE 2: The following are differences that affect the AP120 controller.

- Any reference to DIP Switch #4 is actually DIP Switch #2 (Drop Sensor ON/OFF).
- Any reference to the MicroSD card is actually a USB Thumb Drive. The MicroSD card is not supported.

3 Service Mode Basics

The VMC operates in one of three modes: Sales, Service, or Motor Status. Upon power-up, the VMC enters Sales Mode and remains there unless otherwise instructed. Personnel with access to the machine interior can enter Service Mode to configure the machine and obtain basic accounting information. Motor Status Mode allows route personnel to see and correct motor problems immediately after the door has been closed; see Section 6.5 for more details.

3.1 Entering Service Mode

With the machine turned on and the door open, press the round, yellow pushbutton on the VMC board. You will hear a beep, and the display will change to read either “Sys Errors,” “Main Menu,” or “SD Card Menu.”

If the display reads “Sys Errors”, the VMC has found problems that require your attention. Press the **Down key to reveal the first error message. If the message “MOTOR ERROR(S)” is displayed, see Section 7.3 for further instructions. Otherwise, press **Execute** to clear the error.**

If the display reads “SD Card Menu” see Section 6.7 for further instructions.

3.2 Navigating Service Mode

Think of Service Mode as a series of lists that can be scrolled up and down. A flashing block called the *cursor* shows the current position at all times.

To move around and do things, you will use these five keys (see also Section 2 for definitions):

Up to move upward within a menu

Down to move downward within a menu

Cancel to cancel something and return to the previous menu

Execute to do whatever the cursor is showing right now

1 displays a “menu” of helpful reminders, in case you forget which key is which

The **Execute** key can “do” several things, depending on where you are in Service Mode:

- It can take you to a lower-level menu (*most common usage*)
- It can perform the listed action (*for example, “Clear All Links”*)
- It can toggle a particular option on or off (*Options, Clock, and Sales Blocking menus*)
- It can acknowledge an error condition (*Sys Errors and Motor Errors menus*)
- It can delete a motor link (*Link Motors menu*)

The **Cancel** key backs you out of menus. The VMC remembers where you were on the last menu, and returns you to that location. If you press **Cancel** at the Main Menu, the VMC exits Service Mode and returns to Sales Mode.

3.3 Leaving Service Mode

There are five different ways to exit Service Mode:

- Close the door
- Press **Cancel** at the Main Menu (as noted above)
- Press **and hold Cancel** for two seconds, anywhere in Service Mode
- Press the yellow button on the VMC
- Wait for two minutes

4 First-Time Machine Configuration

Before trying to vend products, go to Service Mode and follow these steps to ensure the VMC is configured properly:

4.1 Configure and Test Drop Sensor

(Skip this section if not using the Drop Sensor option.)

If you have not already done so, complete the sensor’s mechanical installation using the separate “Sensor Kit Installation Instructions” document.

Check that DIP Switch #4 on the VMC is ON.

Go to the Options menu and scroll down to MOTOR STOP. The HOME setting (default setting on some models) causes the VMC to use a home switch to control motor movements, ignoring the Drop Sensor entirely. Press **Execute** to change the MOTOR STOP option to DROP or BOTH. In the DROP mode, the VMC uses only the Drop Sensor to control motor movements. In the BOTH mode, the VMC uses a home switch to stop a motor, but does not deduct credit unless the Drop Sensor

detects a falling product.

When you are finished setting the Motor Stop option, press **Cancel** to return to the Main Menu.

Go to the Diagnostics menu, scroll down to TEST DROP SENSOR, and press **Execute**. Each time you interrupt the sensor beam with your hand – or with a falling product – the VMC beeps and increments a number on the display. If the VMC fails to detect a sensor beam interruption, or if it beeps continuously, see Section 7.4 for troubleshooting suggestions. Otherwise, press **Cancel** twice to return to the Main Menu.

4.2 Motor Configuration

Go to the Config Menu and select CONFIGURE MOTORS. This identifies the available motors and, if applicable, ensures they are homed. If you observe a motor rotate more than once, it is probable that its home switch is stuck or otherwise broken. See the Troubleshooting section for details on how to clear this error.

4.3 Set the Clock

On the Config Menu, select SET CLOCK, then select CHANGE TIME. Enter the digits of the current 12-hour time, using **10** to represent zero if needed. Press **Execute** to proceed. Next, you are prompted to enter **Cancel** for AM or **Execute** for PM.

The date may set correctly already. To check it, scroll down one entry and select CHANGE DATE. If the month and date are valid, simply press **Execute**. Otherwise, enter the correct date and press **Execute**. Next, repeat the same process with the two-digit year number.

While still on the Clock Menu, you may wish to modify how the clock is used: the SHOW CLOCK option determines whether the clock appears in Sales Mode or not; use **Execute** to toggle it on or off. There are also options to enable 24-hour time display and automatic Daylight Savings Time correction (for United States/Canada, Europe, Australia, and Mexico).

4.4 Set the Asset Number

If you use a DEX accounting system and wish to assign your own ID106 asset number to this machine, select ASSET NUMBER on the Config Menu.

4.5 Set Motor Links (Space-to-Sales)

A Motor Link (also called Space-to-Sales) allows the VMC to distribute an identical product from several adjacent columns on the same row. Products are vended successively from each linked column, regardless of which column the customer actually entered.

To establish a link, select LINK MOTORS on the Config Menu, then select ASSIGN NEW LINK. The VMC will prompt you for the tray, starting column number, and ending column number.

To clear a link, go to the Link Motors menu, move the cursor to the desired link, and press **Execute**.

4.6 Set Sales Blocking

Sales Blocking is used to disable vending based on the day of week and time of day. Typically, this feature is used for machines inside schools. Up to four periods can be defined. The periods can even overlap if required.

To enable blocking, select SALES BLOCKING on the Config Menu, then select one of the four available blocking periods. For each blocking period, you are able to set starting time, ending time, the days of the week for which blocking will be active, and the products which will be blocked. Press **Execute** to change a time, to toggle the status of a day, or to toggle the status of a product. When finished, exit with **Cancel**.

The blocking period menu also contains the selections BLOCK ALL ITEMS and EXEMPT ALL ITEMS. The former selection causes all products in the machine to become subject to the blocking period. The latter item causes all products to become exempted from the blocking period, effectively disabling the blocking period.

To deactivate a blocking period, go to the Sales Blocking menu, select the desired period, and toggle all days of the week to OFF. Alternately, the EXEMPT ALL ITEMS selection can be used.

Blocking periods are allowed to extend beyond midnight. In such cases, the VMC uses the day-of-week in effect at the start time to decide when the blocking period ends. For example, consider a blocking period enabled for Monday through Friday for 6:00 PM through 5:00 AM. On Saturday, vending will be disabled from midnight until 5:00 AM because the start time occurred on a Friday, and blocking was enabled on Fridays.

When you have completed all Sales Blocking changes, return to the Config Menu by pressing **Cancel**.

4.7 Set Prices

Exit the Config Menu by pressing **Cancel**. Scroll up to PRICE and select it.

The Price Menu allows you to set prices for the entire machine at once, on a tray-by-tray basis, or on an item-by-item basis. Make your selection, then enter the tray letter or selection number (if applicable). Now, you are able to key in the price directly. On machines with a "10" key, use that key to represent zero. You are not required to enter leading zeroes. Press **Execute** to save the price or **Cancel** to abandon it.

4.8 Check the Coin Mech

Exit the Price Menu by pressing **Cancel**. If you will use a coin mech, scroll up to FILL / DISPENSE and select it.

This part of Service Mode temporarily enables the coin mech so you can add or remove a few coins using the front panel. If you haven't already done so, add a few coins to the mech. Then, press **1** to dispense the smallest-value tubed coin (such as the USA nickel), **2** to dispense the second smallest coin, and so on. If the coin mech responds to the dispense commands, and added coins are displayed at their proper value, then the connections to the coin mech are working properly.

4.9 Check DEX

If you use a DEX audit terminal, you can try it now. Note that the DEX connection is active at all times; you do not have to enter Service Mode to turn it on.

4.10 Set Options

These options are available under the Options Menu if needed for a particular installation. Use **Execute** to toggle the option where the cursor is located.

- **Force Vend:** disallows use of coin return button in most circumstances
- **Multi Vend:** does not return change automatically after a vend
- **Free Vend:** deliver all products in the machine for free
- **Change Bill:** allow patron to receive change for a bill without making a purchase
- **Escrow Bill:** controls whether and how bills are parked while waiting for the customer to add coins or make a selection. Escrowed bills can be returned to the customer, while stacked bills usually cannot.

LAST <i>(default)</i>	Inserted bills are stacked until the maximum price is reached or the total credit can no longer be paid back in coins. When either of these conditions occur, the last inserted bill is held in escrow, preventing further bill insertions.
1st	The first inserted bill is held in escrow, preventing further bill insertions. This setting may be useful where prices are larger than a typical bill. While the customer's payment options are more limited than under LAST , the machine is also less likely to be misused as a change machine.
OFF	Inserted bills are stacked until the total credit can no longer be paid back in coins. When this condition occurs, the last inserted bill is returned. After the maximum price is reached or exceeded, further bill insertions are inhibited.

- **Motor Stop:** controls how the VMC knows when to stop a motor and deduct credit:

HOME	Motor stops after one revolution at the home position using a switch. Credit is deducted unconditionally. Spirals remain aligned at all times.
DROP	Motor stops when a drop is seen, or after several revolutions. Credit is deducted only if a drop is seen. Spirals do not remain aligned. <i>(Drop Sensor option required.)</i>
BOTH	Motor stops after one revolution at the home position using a switch. Credit is deducted only if a drop is seen. Spirals remain aligned at all times. <i>(Drop Sensor option required.)</i>

- **Gum Dropsen.** controls usage of the drop sensor on Gum & Mint trays:

ON	Drop sensor is used on Gum & Mint trays.
OFF	Drop sensor is not used on Gum & Mint trays. Select this option if the drop sensor has difficulty seeing some Gum & Mint dispenses, and if physically adjusting the sensor position does not help. This selection is disabled on some machines where the drop sensor cannot see Gum & Mint dispenses due to mechanical restrictions (see Section 2).

On Gum & Mint trays, the VMC automatically uses the home switch capability regardless of the Motor Stop and Gum Dropsen. settings.

- **Card Rdr:** controls how the Micromech connector is used:

MDB	Card reader uses MDB interface. The coin mech, if present, may be either Micromech or MDB. The coin mech type is detected automatically at power-up.
M-MECH	Card reader uses Micromech interface. The coin mech, if present, must be MDB.

- **Bill Val:** controls which type of bill validator is used:

MDB	Bill validator uses MDB interface.
PULSE	Bill validator uses a Micromech credit pulse interface through a separate VMC connector. NOTE: Non-MDB bill validators may need to be adjusted to work with the VMC; see Section 8 for details.

- **Coin Lev Mem:** controls whether Micromech coin levels are remembered after power loss.

OFF (default)	Micromech coin tube levels are not remembered after power loss. Instead, the VMC uses the coin mech’s low tube sensors to establish tube levels. This setting may cause the VMC to underestimate available change, restricting bill acceptance until change levels increase. For example, in USA applications where items are priced at more than \$1, customers will not be able to insert two \$1 bills in succession.
ON	Micromech coin tube levels are remembered after power loss. If coin cassettes or the coin mech itself are ever replaced, the VMC’s coin tube levels must be reset by one of these two methods: 1) Power up with the new cassette or mech empty, or 2) Toggle this setting OFF and then back ON.

- **DEX Support** determines how the VMC communicates over the DEX port:

V6 (default)	Use EVA-DTS 6.x communication and reporting conventions.
V5	Use EVA-DTS 5.0 communication and reporting conventions. Select this option only if your auditing system has problems communicating with the VMC under the “V6” setting.

- **Prize** enables the awarding of a free product after a chosen number of successful vends. Press **Execute** to view and adjust the current prize setting. The default value is 0, which disables the prize feature. Enter the desired prize count, using **10** to represent zero if needed. Finally, press **Execute** to complete the entry.

When a customer wins a free product, the message “YOU WON!” will be displayed. The customer will be either refunded (for cash vends) or not charged (for cashless vends).

5 Sales Mode

This section describes the typical operation of Sales Mode as well as some optional behaviors and features.

5.1 Typical Operation

Under normal circumstances, when the machine is idle, the Sales Mode display consists of the message “INSERT MONEY” optionally followed by the current time. When credit is inserted, the display shows the word “CREDIT” followed by the credit amount. If a selection is attempted without sufficient credit, the display shows the full price of the item.

Several other idle messages may be displayed under special circumstances:

- “USE EXACT CHANGE” alternates with “INSERT MONEY” when a low change condition is detected or if the coin mech becomes inoperative. Low change is defined as all coin tubes empty (if no bill validator is present) or less change than the smallest-value bill (if bill validator is present). This message can also appear at time of selection if the coin mech does not

have the proper coins to pay back either the inserted credit or the change for the selection.

- “NO SALES UNTIL *hh:mm*” appears when the Sales Blocking feature has disabled vending for a product based on the day of week and time of day. If all products in the machine are being blocked, this message replaces “INSERT MONEY” for the duration of the block.
- “FREE VEND” appears in place of “INSERT MONEY” if the machine-wide Free Vend option is enabled.

If all payment devices become inoperative or if other machine-wide failures occur, the VMC will display “OUT OF SERVICE” and disable all payment devices. See Section 7 for tips on troubleshooting these conditions.

5.2 Drop Sensor

If the optional Drop Sensor is enabled, the VMC is able to verify whether a product actually dropped during a vend. If the sensor path is clear throughout the entire vend, the VMC displays the message “PLEASE MAKE ANOTHER CHOICE.” On cash vends, the customer can then try a different selection or press coin return to get their money back. On some card (cashless) vends, the customer’s card is returned automatically, but the customer is able to re-insert it immediately.

5.3 Bill Validators and Exact Change

The VMC evaluates change conditions in the coin mech when deciding whether to enable or disable the bill validator. Essentially, the VMC looks ahead and predicts what would happen if the customer inserted the smallest-value bill right now. If there would not be enough change to vend any product in the machine, or if there would not be enough change to pay back the inserted bill, the bill validator will be disabled and an “EXACT CHANGE” message will be displayed.

If you are testing a bill validator, be sure that the coin mech has enough coins to equal the smallest-value bill – but never less than 10 coins in a tube – to allow the VMC to enable the validator.

5.4 Card Revaluation

Certain MDB card (cashless) readers are able to increase the value stored on a customer’s payment medium (card, key, or button) under VMC control. The VMC detects and supports such readers automatically. The VMC supports two slightly different forms of revaluation, depending on whether the customer inserts cash or card first:

1. “Cash First” revaluation: If the customer inserts a card when there is a cash balance, the VMC attempts to transfer the cash balance to the card, up to the card’s revaluation limit. Any excess cash balance is paid out in change. If the revaluation is successful, the message “CREDIT ADDED TO CARD” will appear. Otherwise, the card session is ended, causing a physical eject on some readers.
2. “Card First” revaluation: In this scenario, the customer inserts cash after a card has already been inserted. When the customer presses coin return, presses the reader’s cancel button, or makes a vend selection, the VMC tries to transfer the cash balance to the card, up to the revaluation limit. Any excess cash balance is paid out in change. If the revaluation is successful, the message “CREDIT ADDED TO CARD” will appear. Otherwise, the card session is ended, causing a physical eject on some readers.

6 Servicing the Machine

This section highlights some VMC features that can make routine machine servicing easier.

6.1 Checking Coin Tube Levels

In Service Mode, choose FILL/DISPENSE at the Main Menu. Either insert a coin of each type through the coin slot, or press **1**, **2**, **3**, and **4** to dispense a coin of each type. In either case, the display will show the number of available coins of that type.

If you need to remove a large number of coins, it is usually faster to do so directly at the coin mech. Many coin mechs offer a repeating dispense feature that is faster than requesting the same dispenses from the VMC. Note that DEX accountability will not be maintained for dispenses initiated from Micromech coin mechs.

6.2 Accounting

The Accounting Menu provides audit counters that are accessible to service personnel, yet are completely separate from DEX activity. "HISTORICAL VENDS" and "HISTORICAL VALUE" show the number and amount of paid vends over the lifetime of the VMC. "RESETTABLE VENDS" and "RESETTABLE VALUE" are resettable versions of the same counters. Counters labeled "CARD" show only cashless payments, while counters labeled "TOKEN" show only token payments. Select the "CLEAR ALL" item when you wish to clear the resettable counters.

6.3 Motor Re-homing

On most kits, all motors can be moved back to their home positions by pressing **5** at the Main Menu or Sys Errors Menu. This feature is available regardless of the Motor Stop mode. Note that some types of motors must be moved through a full revolution to discover the home position, even if they are already stopped at home. Re-homing does not change any accounting data.

6.4 Manual Motor Testing

To test a motor without changing any of the accounting data, go to the Diag Menu and select "TEST MOTORS." You can test either a single motor or an entire tray at one time. Watch the display for any error messages that may appear.

If the Motor Stop mode is HOME or BOTH, each tested motor will turn one complete revolution to the home position. If the Motor Stop mode is DROP, each tested motor will run for about one-third of a second.

6.5 Automatic Sensor Testing and Auto-Disable

If the Motor Stop option is set to DROP or BOTH, automatic scanning for sensor blockage takes place at three times: at power-up, at door closure (for machines with door switches), and when leaving Service Mode. If a blockage is detected, the VMC emits a long beep and displays the message "SENSOR DISABLED DUE TO BLOCKAGE."

On most kits, the VMC keeps the machine operating following a failure in the Drop Sensor system. When an automatic scan finds a blockage, or when a consecutive series of customer vends fails due to a sensor blockage, the VMC will disable the Drop Sensor and continue to operate using home switches only.

If the Drop Sensor has been automatically disabled, it can be re-enabled in Service Mode by clearing the “SENSOR BLOCK” error message. Clearing the error message has the effect of restoring the Motor Stop setting that existed at the time the Drop Sensor problem was first discovered.

6.6 Automatic Motor Testing

Automatic scanning for motor problems takes place at two times: at door closure (for machines with door switches) and when leaving Service Mode. If no problems are seen, the VMC double-beeps and returns to Sales Mode. If problems are detected, the VMC enters Motor Status Mode.

In Motor Status Mode, the VMC progressively displays all failed motor designations in the machine. If all configured motors on a given tray have problems, only a tray designation is displayed. The only key entry permitted is **Execute**, which re-scans for motor problems. If the re-scan finds that all motor problems have been resolved, the VMC will double-beep and return to Sales Mode. If no door or keypad activity is detected within a short time, the VMC will emit five short beeps and return to Sales Mode.

Here is an example of a display sequence from Motor Status Mode:

```
*MOTOR ERROR(S) *      *MOTOR ERROR(S) *
CHECK TRAY A           TO RE-TEST: H
```

In this example, all configured motors on Tray A have failures. It is likely that the mating connectors on the rear of Tray A are not fully engaged. Once Tray A has been re-seated, the route driver may either press **H** to scan again, or simply re-close the door.

6.7 MicroSD Card Features

The VMC contains a MicroSD socket which can assist in transferring accounting, configuration, and firmware data to and from the machine. MicroSD cards of up to 32 GB capacity may be used. Regardless of the brand of card, it must be formatted with a FAT12, FAT16, or FAT32 file system.

When a MicroSD card is inserted in Service Mode, a menu appears with four card-specific options:

```
SAVE AUDIT
LOAD CONFIG
SAVE CONFIG
NEW FIRMWARE
```

SAVE AUDIT creates a DEX audit file on the card containing the same report that is transmitted through the ¼” DEX jack. The file name will be automatically chosen based on this pattern: *Acccc_nn.TXT*, where “*ccccc*” is the last 4 characters of ID101 (typically the VMC serial number) and “*nn*” is a number that increments from 00 to 99.

LOAD CONFIG reads a configuration file containing machine settings such as pricing. The file – which must end in the extension .CFG – can be generated by the SAVE CONFIG function on this or another VMC. DEX-standard records such as IC5, PC1, and SD1 are also accepted in the file. In the menu, use the **Up** and **Down** keys to view the available files, then **Execute** to select the highlighted file.

SAVE CONFIG saves all of the machine settings into a filename of your choice. The filename may consist of 1 to 8 characters; an extension of .CFG is automatically added. To enter the filename, a telephone-like selection system is used: by repeatedly pressing one of the machine’s number keys, you can select the different letters or symbols available on that key. By pausing a moment, the selected character is confirmed and you can enter additional ones if needed. The **Cancel** key will erase the last character, and the **Execute** key will confirm the entire filename (unless the filename is blank). The characters mapped to each number key are:

1: -_!\$&#%'1	6: MNO6
2: ABC2	7: PQRS7
3: DEF3	8: TUV8
4: GHI4	9: WXYZ9
5: JKL5	0: 0

NEW FIRMWARE will allow new VMC firmware to be read from the card. In order to complete this operation, you must have transferred the firmware file (always ending in the extension .BI2) onto the card through some other Internet-connected device. For best results, use a PC to transfer the file onto the card. After selecting this item several things will happen in quick succession: 1) current machine settings are saved, 2) a selection menu appears where you can choose the firmware file to be loaded, 3) the new firmware is programmed, and 4) the new firmware reads the machine settings and starts up.

7 Troubleshooting

This section highlights some Service Mode features that help detect and recover from machine failures.

7.1 Error Display

As mentioned earlier, the VMC automatically displays detected errors upon entry to Service Mode. Like other parts of Service Mode, “Sys Errors” is a scrolling menu: if several errors are outstanding, the menu will expand to hold the entire list. Use **Down** and **Up** to navigate the list. To clear motor errors, see Section 7.3. To clear other types of errors, press **Execute**.

All errors initially appear as two-line entries on the display. For example, consider the following display: “MOTOR ERROR(S) 0002 08/13 09:34”. This indicates that two motor errors have been recorded, and that the first one occurred on August 13th at 9:34 AM.

The following table lists all errors along with possible resolutions:

Error Name	Origin	Resolution
BV CHECK SUM	Bill Validator: internal problem has occurred in the firmware.	Repair or replace bill validator.
BV COMMUNICATION	Bill Validator, VMC, or cabling: communications between VMC and validator stopped unexpectedly.	Ensure cabling between VMC and validator is secure, with no broken wires. In unusual cases, bill validator or VMC may need to be replaced.
BV JAMMED BILL	Bill Validator: a bill has jammed in the acceptance path.	Remove the jammed bill.
BV MOTOR	Bill Validator: one of the motors has failed.	Repair or replace bill validator.
BV OPEN BOX	Bill Validator: cash box was removed while the machine door was closed.	Remove any foreign objects from the validator. Ensure that the cash box is firmly seated on the validator. Check that the machine’s door switch is connected properly to the VMC. Ensure that the machine door switch is not stuck closed.
BV SENSOR	Bill Validator: one of the sensors has failed.	Repair or replace bill validator.
BV STACKER FULL	Bill Validator: cash box is full.	Empty the cash box.

CC CHECK SUM	Coin Mech: internal problem has occurred in the firmware.	Repair or replace coin mech.
CC COMMUNICATION	Coin Mech, VMC, or cabling: communications between VMC and coin mech stopped unexpectedly.	Ensure cabling between VMC and coin mech is secure, with no broken wires. See also Section 7.2. In unusual cases, coin mech or VMC may need to be replaced.
CC JAMMED TUBE	Coin Mech: a payout tube has jammed.	Check for coin jams. On mechs with removable cassettes, ensure that the cassette is seated properly.
CC SENSOR	Coin Mech: one of the payout tube sensors is behaving abnormally.	Repair or replace coin mech.
CC UNPLUGGED	Coin Mech: the acceptor module seems to be missing.	Repair or replace coin mech.
CR CARD ERROR	Card Reader: the payment media is defective.	This is an informational message; the problem may be limited to one particular payment medium.
CR COMM - MINOR CR COMM - MAJOR	Card Reader: a communications problem occurred with or within the reader. Problem is either recoverable ("MINOR") or non-recoverable ("MAJOR").	Ensure cabling between VMC and reader is secure, with no broken wires. Repair or replace card reader.
CR INVALID CARD	Card Reader: payment media problem.	This is an informational message; the problem may be limited to one particular payment medium.
CR JAMMED CARD	Card Reader: payment media has jammed inside the reader.	Clear the jam.
CR READER FAIL	Card Reader: an unspecified problem developed within the reader; device is not presently functional.	Repair or replace card reader.
CR REFUND FAIL	Card Reader: funds could not be credited to the payment medium following a failed vend; funds were lost.	Determine if problem is limited to one particular payment medium. Repair or replace reader if problem affects more than one payment medium.
CR SERVICE SOON	Card Reader: reader device requires maintenance.	Perform maintenance as recommended by reader's manufacturer.
CR TAMPER	Card Reader: a security breach has been detected.	This is an informational message.
MOTOR ERROR(S)	VMC: a vend motor is missing, jammed, or has a defective home switch.	Press the Execute key to see a detailed list of motor problems. See Section 7.3 for more information.
STUCK KEY	VMC: a key has been depressed for an abnormally long time.	Repair or replace machine keypad.
SENSOR BLOCKED	VMC: Drop Sensor system was found to be blocked at machine power-up, door closure, Service Mode exit, or after a consecutive series of failed customer vends.	See Section 7.4 for more information.

SENSOR SECURITY	VMC: an unusual number of missed product drops were detected.	Check sensor and related cabling for signs of tampering. See Section 7.4 for sensor testing procedures.
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7.2 Payment System Errors

As noted earlier, the VMC displays the “OUT OF SERVICE” message in Sales Mode if all payment devices become inoperative. If an individual payment device becomes inoperative, the VMC will continue without it. In the case of a coin mech failure, the loss of change-making capability may make the machine unusable even though it technically remains in service.

On some machines, the MDB coin mech is connected to the VMC through an existing machine harness. In these situations, it is helpful to unmount the coin mech and plug it into the VMC board directly. By bypassing the machine harness, you can help determine whether the coin mech, the harness, or the VMC itself is at fault.

7.3 Motor Errors

When “MOTOR ERROR(S)” appears, one or more motors have been disabled due to detected error conditions. To view the list of problem motors, press **Execute** to view the Motor Error menu, then press **Down**. The following three letters are used on the error reports:

- “M” indicates that a motor was present when the machine was configured, but was missing when last checked.
- “J” indicates that the motor drew an excessive amount of current, and is probably jammed.
- “H” indicates that the motor failed to re-home itself within a reasonable amount of time.

To re-test a defective motor, press **Execute**. If the error has been resolved, it will be removed from the menu. On the other hand, if the error persists, the entry on the Motor Error menu will remain. Any motor appearing on this menu cannot be used for vending until the problem is resolved.

7.4 Sensor Errors

As described in Section 6.5, the VMC can detect Drop Sensor blockages in a variety of ways. A SENSOR BLOCK error can indicate debris blocking the sensor’s light path, a cabling problem, or an electronic failure on one of the two sensor boards.

IMPORTANT: After resolving a sensor error, be sure to clear the error in Service Mode to restore the Drop Sensor to full operation.

The best way to troubleshoot sensor-related problems is to use the TEST DROP SENSOR function under the Diagnostics menu. During a Drop Sensor test, the VMC indicates the blockage status of the sensor through both audio and visual cues. You will hear one beep for each momentary blockage (such as a product drop) or one beep per second for a sustained blockage. The audio cues can be silenced by pressing the **Execute** key. If there is no obvious blockage in the sensor path, check the physical alignment of the sensor boards to verify that each is perpendicular to the sides of the delivery bin.

The main sensor board provides a red diagnostic light which may be helpful during testing. If the light is fully illuminated, the sensor path is clear. If the light is pulsing, blockages are being detected. If the light is not illuminated, the sensor board is either defective or not receiving power; check the cable connection between the VMC and the main sensor board.

7.5 Other Types of Errors

The remaining error types are simple notifications; you press the **Execute** key to acknowledge that you read them. If you don't acknowledge these errors, they will keep appearing until you do. These errors do not cause the machine to go out-of-service.

7.6 Machine History Logs

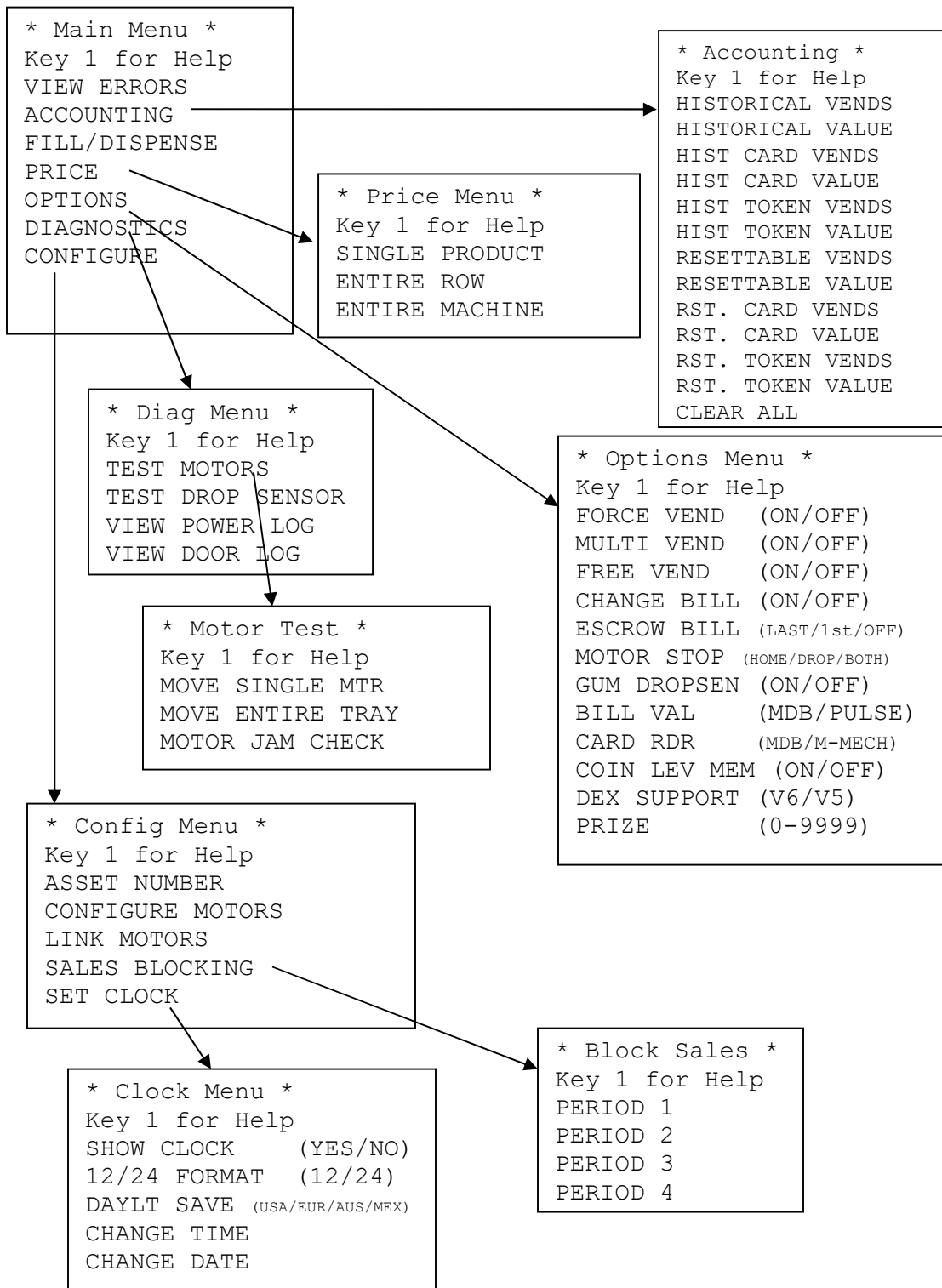
The VMC maintains a history of door and power events it has observed. To access these logs, go to the Diag Menu and select VIEW POWER LOG or VIEW DOOR LOG. In each case, the logs are shown starting from the most recent event and moving backwards in time, up to 10 events deep. Once the end of the log has been reached, scrolling down will cause the most recent event to be displayed again.

8 Pulse Bill Validator Settings

You may need to adjust DIP switch settings on pulse (non-MDB) bill validators, even if the validator was used with the vending machine's original control board. After adjusting DIP switches, you should cycle power on the machine. The following table lists switch settings for several popular types of bill validators. Settings marked in **bold** are required for proper operation.

Validator Model	DIP Switch Location	Settings
Mars/MEI VFM1	Underneath control box, which is screwed to the side of the validator.	#1: One direction (ON) or two direction (OFF) #2: Std. security (ON) or high security (OFF)
Mars/MEI VFM3	Underneath control box, which is screwed to the side of the validator.	#1: One direction (ON) or two direction (OFF) #2: ON (short pulse) #3: OFF (1 pulse per dollar) #4: OFF (1 pulse per dollar) #5: Std. security (ON) or high security (OFF) #6: ON (relay output) #7: ON (high- or low-level pulse) #8: \$1 only (ON) or \$1/\$2/\$5 (OFF)
Mars/MEI VN2300	Right side of validator.	#1/#2: Bill direction (1 OFF, 2 ON = 2-way) #3: High security (ON) or high accept. (OFF) #4: ON (accept \$1) #5: \$2 bill acceptance (ON=accept) #6-#8: Unused
Mars/MEI VN2500	Right side of validator.	#1/#2: Bill direction (1 ON, 2 ON = 4-way) #3: High security (ON) or high accept. (OFF) #4: ON (accept \$1) #5/#6: \$2/\$5 bill acceptance (ON=accept) #7: ON (short pulse) #8: OFF
Mars/MEI AE2600	Right side of validator.	#1/#2: Bill direction (1 ON, 2 ON = 4-way) #3: High accept. (ON) or high security (OFF) #4/#5: \$2/\$20 Bill acceptance (OFF=accept) #6: OFF (harness enabled) #7: OFF (short pulse) #8: ON (vending interfaces)
Mars/MEI AE2800	Right side of validator.	#1/#2: Bill direction (1 ON, 2 ON = 4-way) #3: High accept. (ON) or high security (OFF) #4/#5: \$50/\$100 Bill acceptance (OFF=accept) #6: OFF (harness enabled) #7: OFF (1 pulse per dollar) #8: ON (vending interfaces)
Coinco BA30S	On control board; remove retaining screw and slide board out from its plastic case.	#1: High security (ON) or std. accept (OFF) #2: One direction (ON) or two direction (OFF) #3: OFF (pulse interface) #4-#7: \$20/\$10/\$5/\$2 acceptance (ON=accept) #8: ON (accept \$1)

9 Service Mode Quick Reference



10 Revision History

16 February 2017: Firmware Revision 3.56
AP120 RVMC added

13 May 2013: Firmware Revision 3.08
Section 2 updated with new kits.

7 March 2012: Firmware Revision 3.07
Section 2 updated with new kits.

9 November 2011: Firmware Revision 3.05
Section 2 updated with new kits.

24 August 2011: Firmware Revisions 3.00-3.04
Section 2 updated for "RVMC" series of kits.
Added explanation of DIP Switch #4.
Added option "GUM DROPSEN."
Added MicroSD features.