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CashCode® Bill Validator

MDB Protocol

Interface Descriptions

PT# MAN-MDB Rev.B 11/99

INTRODUCTION

This document defines a serial bus interface for electrically 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.
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 acknowledge, 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.

BILL VALIDATOR VMC/PERIPHERAL COMMUNICATION SPECIFICATIONS

1. Introduction.

This section defines the communication bytes sent and received between a Bill Validator and the VMC. The Bill Validator's address is 00110 binary.
Unless stated otherwise, all information is assumed to be in a binary format.

2. VMC Commands

Command	*HEX*	*Code Description*
RESET	30H	Command for bill validator to self-reset.
STATUS	31H	Request for bill validator set-up status.
SECURITY	32H	Sets Validator Security Mode.
POLL	33H	Request for Bill Validator activity Status.
BILLTYPE	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 bill validators must support this command.

Note: The expantion command is always followed by a sub- command.

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 bill in the escrow position, and disable all other activity untill otherwise instructed by the VMC.

VMC Command	*Code*	*Validator Response Data*
STATUS	31H	27 bytes: Z1 Z27

Z1= Bill Validator Feature Level 1 byte Indicates current feature level of the bill validator. Currently defined level is one.

Z2 Z3= Country Code 2 bytes The International Telephone Code for the country that the Validator is set-up for. Sent in packed BCD. For example, the code for the USA is 00 01H.

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 features 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. Unseen 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 h12 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. Validators that do not support dual security levels should report a high security level.

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, and stacker position.
If there is nothing to report, the validator should send only an ASK. Otherwise, the only valid responses are:

Bills Accepted:

Indicates the type and number of bills accepted and stacker status.
Byte 1 (1 yyyxxxx)

y y y = Bill Routing: 000: BILL STACKED
001: ESCROW POSITION
010: BILL RETURNED
011: NOT USED
100: DISABLED BILL REJECTED

xxxx = Bill Type (0 to 15)

NOTE: These responses should be used to add or subtract credit.

Status:

(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 messade should also be sent.

(00001000)= Cash Box out of position (3). The validator has detected the cash box to be open or removed.

(00001001)= Unit 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.

(010xxxxxx)= Number of attempts to input a bill while validator is disabled (3).

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 unit is then disabled until the condition is removed. Validator will respond with unit disabled until repaired or replaced.

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, or INVALID ESCROW 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.

VMC Command	*Code*	*Validator Response Data .*
STACKER	36H	2 bytes: Z1 Z2

Indicates stacker full condition and the number of bills in the stacker.

Byte 1	Byte 2 .
(Fxxxxxxx)	(xxxxxxxx)

F = 1 if stacker is full, 0 if not.

Xxxxxxxxxxxxxxxx = The number of bills in the stacker.

VMC Command	*Code*	*Sub Command*	*Validator Response Data .*
EXPANSION COMMAND (Identification)	37H	00H	29 bytes: Z1 Z29

Z1 Z3 = Manufacturer Code 3 bytes Identification code for the equipment supplier. Sent as ASCII characters. Currently defined codes are listed in the NAMA document entitled " The Vending Industry Data Transfer Standard", the Audit Data Dictionary section, sub-section 5, "Manufacturer Codes".
Z4 Z15= Serial Number -12 bytes Factory assigned serial number. All bytes must be sent as ASCII Characters, zero (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 pasked BCD.

VMC Command	*Code*	*Sub-command*	*VMC Data*	*Changer Response Data*
EXPANSION COMMAND (Diagnostics)	0FH	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 changer response data from the
peripheral.

4. Bill Validator Non-Response Time.

The maximum non-response time for the bill validator is five seconds.

5. Bill Validator 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 (standby) = 200 mA. (avg.) Continuous.
Bill transport (operate) = 500 mA. (avg.) up to 10 seconds.
Peak Current (nonoperate)= 2.2 A (max.) up to 2 sec.