Programming Manual for the BD-4000 Applications

Release: 1.2

Introduction

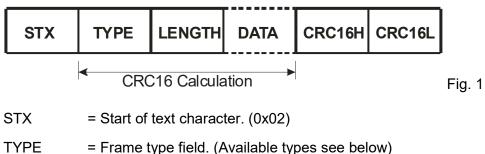Currently there are two application implemented:

- The MDB Master application to communicate with a real MDB cashless slave according section 7 of the MDB specification.
- The MDB slave application to communicate with a real MDB vending machine controller VMC according section 7 of the MDB specification.

The communication is implemented with the proprietary ECHO protocol over the real or virtual serial port. The communication speed is 38400 baud, 8 data bit, 1 stop bit, no parity and no handshake.

ECHO protocol for direct control over RS-232 serial link

The ECHO protocol encapsulates and secures the data frames between the host system and MDB interface. And it requires some additional effort to system integrators to implement the proprietary "Echo Protocol".

The encapsulation by the Echo Protocol

Fig. 1

STX   = Start of text character. (0x02)

TYPE   = Frame type field. (Available types see below)

LENGTH   = Length of data field, (0x00...0xFF)

DATA   = Data field.

CRC16H   = High byte of CRC16 calculation.

CRC16L   = Low byte of CRC16 calculation.

The "Echo Protocol" adds 3 leading bytes (STX, TYPE, LENGTH) and two trailing bytes (CRC16H, CRC16L) to each data frame as shown in Fig. 1 above.

The implementation of the Echo protocol

STX is the synchronization byte of a data frame and requires special considerations. If any STX character appears within TYPE, LENGTH, DATA, CRC16H and CRC16L field it must be doubled without CRC16 calculation. A single STX character will always resynchronize and reject any previous received data bytes. This applies to the receiver side too, on doubled STX characters one must be removed without CRC16 calculation.

The TYPE field defines the implemented frame types according following table:

0	0x00	Control frame.
1	0x01	MDB slave data frame.
2	0x02	MDB master data frame.

3	0x03	Communicate with the MDB Reader Emulation Application connected to a real Vending machine controller (VMC).
4	0x04	Communicate with the MDB Vending Machine Emulation Application connected to a real MDB Card Reader.
128	0x80	Loop back data frame. (Used for testing purposes.)

Any undefined frame types are ignored.

The DATA length field defines the number of encapsulated data bytes within the frame.

The CRC16H & CRC16L is the resulting CRC16 calculation on the transmitted frame (TYPE, LENGTH, DATA) and added as trailing bytes to the frame. The receiver can include CRC16H and CRC16L in it's CRC16 calculation and if the resulting value is zero then the frame is okay.

CRC16 start value: 0xFFFF

CRC16 Polynomial: 0x1021

Note: We do not publish any algorithm here as the internet brings a lot of samples on search for CRC16.

MDB Slave Commands

Emulating a MDB card reader connected to a real Vending Machine Controller VMC.

Command 'S' Status

Transmit: 'S'

Receive: 'S,0,0,0,0,0,0,0,0'

1. Parameter: 0..1 = Disabled, Enabled.
2. Parameter: 0..7 = Idle, Pending, Success, Failure, Cancel, Approve, Revalue Limit, Revalue Amount.
3. Parameter: Card number.
4. Parameter: Card funds.
5. Parameter: Item number.
6. Parameter: Item Price.
7. Parameter: Revalue Limit.
8. Parameter: Revalue Amount.

Command: 'A' Activate

Note: The card reader must be activated before a vend command is send.

Transmit: 'A,1,0'

1. Parameter: 0 = Deactivate, 1 = Activate.
2. Parameter:

Bit 0:	0 = Disable state change notifications. 1 = Enable state change notifications.
Bit 1:	0 = Automated vend without approve command. 1 = Automated vend with approve command.

Receive: Nothing.

Command: 'V' Vend

Transmit: 'V,1000,123456'

1. Parameter: Card funds.
2. Parameter: Card number.

Receive: Nothing.

Command: 'Y' Approve Vend

Transmit: 'Y,1,100'

1. Parameter: 0 = Deny vend, 1 = Approve vend.
2. Parameter: Item Price (Assign item price from status or force a different price).

Receive: Nothing.

Command: 'L' Set Revalue Limit

Transmit: 'L,10000'

Receive: Nothing

Note: This value might be changed at any time during the communication.

Note: This value will be show up in status Revalue Limit.

Note: A value of 0 will deny any revalue request from the VMC. (Default after reset)

Note: The behavior of the revalue function is VMC depend because of slightly different implementation by different VMC brands.

Command: 'C' Cancel

Transmit: 'C'

Receive: Nothing.

Command: 'I' Information

Transmit: 'I'

Receive: 'I,0,0,0,0,0,0'

1. Parameter: MDB feature level.
2. Parameter: Display columns.
3. Parameter: Display rows.
4. Parameter: Display info.
5. Parameter: Minimum price.
6. Parameter: Maximum price.

Command: 'R' Reset

Transmit: 'R'

Receive: Nothing.

If state change notifications are enabled (Command: 'A') a notification will be send on all state changes.

Command: 'N' Notification

Transmit: Nothing.

Receive: 'N,0'

1. Parameter: State 0..5 = Idle, Pending, Success, Failure, Cancel, Approve.

MDB Master Commands

Emulating a Vending Machine Controller (VMC) connected to a real MDB card reader.

Command: 'S' Status

Transmit: 'S'

Receive: 'S,0,0,0,0,0,0,0,0,0,0'

1. Parameter: 0..1 = Disabled, Enabled.
2. Parameter: 0..5 = Idle, Pending, Success, Failure, Cancel, Approve.
3. Parameter: Card number.
4. Parameter: Card funds.
5. Parameter: Payment type.
6. Parameter: Payment data.
7. Parameter: Item Price.
8. Parameter: Item number.
9. Parameter: Revalue amount.
10. Parameter: Revalue limit.

Command: 'A' Activate

Transmit: 'A,0,0'

1. Parameter: 0 = Deactivate, 1 = Activate.
2. Parameter:

Bit 0:	0 = Disable state change notifications.
	1 = Enable state change notifications.
Bit 1:	0 = Single vend.
	1 = Multi vend.

Receive: Nothing.

Command: 'E' Enable

Transmit: 'E,0'

1. Parameter: Disable, Enable reader card acceptance.

Receive: Nothing.

Command: 'D' Deduct

Transmit: 'D,1,100'

1. Parameter: Item number.
2. Parameter: Item price.

Receive: Nothing.

Command: 'F' Revalue

Transmit: 'F,1000?

1. Parameter: Revalue amount.

Receive: Nothing.

Command: 'I' Information

Transmit: 'I'

Receive: 'R,0,0,0,0,0,0,0'

1. Parameter: Feature level.
2. Parameter: Country code high byte.
3. Parameter: Country code low byte.
4. Parameter: Scaling factor.
5. Parameter: Decimal places.
6. Parameter: Maximum response time.
7. Parameter: Miscellaneous options.

Command: 'R' Reset

Transmit: 'R'

Receive: Nothing.

If state change notifications are enabled (Command: 'A') a notification will be send on all state changes.

Command: 'N' Notification

Transmit: Nothing.

Receive: 'N,0'

1. Parameter: State 0..5 = Idle, Pending, Success, Failure, Cancel, Approve.

Document History

25.09.2015	Release 1.0
	First draft document
22.10.2015	Release 1.1
	Final document of Programming Manual for the BD-4000 Applications.
08.08.2016	Release 1.2
	Additional functionality added to revalue from changer or bill validator to the card reader. The new command 'L' implemented.
	Note: This is available with firmware version V01.17 and above!