INTRODUCTION

The scope of this document is to provide complete technical information about the MB Bill Recycler.

- Development of new equipment with the MB bill recycler.
- Selection of the right configuration and part number.
- Installation.
- Maintenance and service.
- Repair.

PRODUCT OVERVIEW

The CashCode MB bill recycler is typically installed on the front door (or the front panel) of a machine. Access to the recycling cartridge and the bill box is from the rear side of the validator.

A complete MB unit consists of three parts – the bill validator itself, the removable recycling cartridge and the removable bill box.

The MB has a fixed width bill path for currencies 66 mm wide.

The MB has very high acceptance rate, due to a set of advanced sensors and smart software that can precisely identify authentic bills from all known counterfeits.

Six multi-color optical sensors scan both sides of the bill.

Two patented inductive sensors read the magnetic properties of the bill.

All sensors have auto-calibration, no adjustments Required. The validator always provides the same high acceptance level during its lifetime.

The MB accepts bills in four ways and is equipped with a cross channel sensor to prevent stringing.

The MB bill recycler is very reliable and efficient, including the following features:

Beltless design minimizes maintenance of bill transport mechanism.

The “Clamshell” design for the bill recognition section provides a fast and easy access to the bill path.

Special rollers prevent bill jams when poor quality bills are inserted.

Software updates are fast and easy by means of BlueChipTM sim card. The update only take seconds. The procedure does not require technical personnel, tools, or disconnecting the unit. The socket for the BlueChipTM sim card is accessible from the back. No disassembly is required.
The MB can be mounted **Up(stacker)** (common for vending equipment) or **Down-stack**er (used in amusement machines).

**The MB uses standard MDB protocol.**

Is available with the standard coin-proof bezel with blue running lights or Vandal-proof metal bezel with single bicolor LED.

**The bill boxes** are available in 300 and 400 bill capacity sizes.

**The Recycling Cartridge has 30** bills capacity, which is also programmable in case the full capacity is not necessary. In addition, information concerning the type of denomination being recycled and cartridge contents is stored inside the module’s internal memory.  
A two digit display on the back of the module shows how many bills are inside the recycler cartridge.

Bill boxes available.
GENERAL SPECIFICATIONS

**Validation Sensors:**
- 3-color optical sensors: 6
- Inductive sensors: 2
- Anti-stringing sensor

**Interface connector:**
- 10-pin connector used with custom ribbon cable harness (compatible with SMV)

**Supported Protocols and Interfaces:**
- 24V Platform
- Custom interface channel for NRI changer connection, reading of statistical data and programming

**Supported bill boxes**
- Drop-resistant plastic bill box

**Maximum stacking capacity** (new bills): 300, 400

**Bezels**
- Coin-proof plastic bezel with running lights
- Vandal and coin-proof single-LED metal bezel

**Diagnostics indication**
- Blinks of the bezel lights

**Recycling cartridge features:**
- Capacity: 30 bills max. (programmable)
- Status/contents indication/software level (on power up only): 2-digit LED display
- Manual controls: 2 mode buttons (feed and unload), recycling cartridge assignment setup switch (2 positions)

**Unload level assignment**
- Using custom CashCode/NRI interface

**Memory programming**
- CashCode BlueChipTM sim card
  - In the service mode (via interface connector)
  - Using handheld device via custom NRI interface channel

**Supported BlueChipTM sim card types**
- Manufacturer, Multi-update

**Mode selection**
- 8-position DIP switch

**Acceptance:**
- Bills: lengthwise 4 ways or 1 way selectable by switch
- Custom coupons: lengthwise 4 ways or 1 way selectable by switch
- Bar-coded coupons: not supported
- Validating rate: 96% or higher on first insertion
  - Bill Width (mm): .66
  - Maximum length of a bill (mm): 160
  - Minimum length of bill (mm): 120
  - Bill escrow: one bill
Bill processing cycle:
Bill centring and validation (before escrow position) ........................................less than 1.5 second
Bill transport from escrow to cassette and stacking ..............................................less than 1 second
Bill rejection (from escrow) ..................................................................................less than 1.2 second
Target change cycle .................................................1st bill – 2 seconds, next – plus 0.7 second per bill

Power supply voltage .................................................................................................22..40 V DC

Current consumption:
34 V DC, operating mode (max) ..............................................................................3 A
34 V DC, standby .....................................................................................................0.6 A

Power consumption:
Idle mode ................................................................................................................TBD
Validation mode .......................................................................................................TBD

Environmental:
Operating temperature ..............................................................................................–18 °C to +60 °C
Storage temperature .................................................................................................–30°C to +60°C
Humidity (non-condensing) ...................................................................................30%-90%RH
Validation M.T.B.F .................................................................................................750000 cycles
Lifetime expectation ...............................................................................................more than 1 000 000 processed banknotes or 10 years

Approvals
FCC class B
UL 756
CE
ROHS compliant

Installation ..............................................................................................................On a machine vertical front wall from inside
Two ways: drop cassette Up or Down
Cabinet front panel's thickness .................................................................1.5 to 12.7 mm (depends on a bezel type)
Access to drop and recycling cartridge .........................................................from back side of the validator

Dimensions (WxHxD)
With 300 bill cassette...............................................................................................104x450x130
With 400 bill cassette...............................................................................................104x450x146
Weight (kg) .........................................................................................................3.2kg (with 300 bill cassette and plastic bezel)
Protective earth ground terminal must be connected to the machine electric earth. This connection must be made by cable OPT-MKSM-GND or another cooper wire cable with 14 or 12 AWG gauge. Use the shortest, practical wire length. Refer to local wiring codes and regulations for grounding requirements.

**Chassis grounding.**

![Chassis grounding illustration]

**Metal bezel grounding**

![Metal bezel grounding illustration]
CHOOSING MB FEATURES AND PART NUMBERS

Bill Recycler

The information below helps to choose the appropriate MB:
- Bezel style
- Indoor or outdoor application (coated boards are used for outdoor application)

Bezel style

Three different styles of bezel are currently available:

The standard plastic bezel can be used for the STACKER UP configurations. The bezel has a status indicator with running lights that glow BLUE when ready and RED when disabled. The running lights are also used for diagnostics (described in the troubleshooting section). The bezel has protection from inadvertent insertion of coins.

The metal bezel is designed to provide more resistance to vandalism or rough environments and also includes the coin-resistant feature. A red/green light indicates status of the validator. The bezel is available in two configurations: UP STACKER or DOWN STACKER.

Indoor or outdoor application

The MB bill recycler can be ordered with boards coated for outdoor applications.

Bill Box

The MB bill box is available in two different capacities: 300 or 400 bills.
BlueChip™ sim card and software update options

Software updates are released to accommodate new currency releases, new features and enhancements or to improve security.

Software updates are offered in two options:

1) Multi-download Memory stick.

The multi-download Memory stick allows for unlimited downloads.

2) Download via interface connector.

The download is done thru the NRI coinchanger by means of a Palmtop.

Downloads may be done by connecting the recycler to a personal computer through a special adapter. Instructions on the software update procedure can be found in the chapter: “SOFTWARE UPDATES”.

There are two separate part numbers for the MB Bill Recycler - software part number and hardware part number.

Example hardware part number:

\[
\text{MB} - 2117
\]

Hardware part number

Example software part number:

\[
\text{MB} - \text{US88-1.00}
\]

Software part number

INSTALLATION

Bill recycler installation

The MB bill recycler is usually installed on a door or panel. The panel or door must have a rectangular cut-out, with three threaded studs (vending machines have four studs for the validator, the top right isn’t used with MB) and two additional studs at the top (per picture below, normally not necessary).
INTERFACE CONNECTION

The validator is powered by 24 Volt DC and is suited for MDB Interface (vending applications).
For detailed interface descriptions, please refer to Protocol Description Manuals available from the CashCode website: [www.cashcode.com](http://www.cashcode.com)

Pin Assignment (cable connector):

```
1 3 5 7 9
```

Molex, Part #: 90142;
90119, 9 pcs

The supplied harness OPT-HS-MDB connects the validator to a regular Multi Drop Bus.

Signal descriptions:

<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>SIGNAL</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC/AC POWER RET</td>
<td>POWER</td>
</tr>
<tr>
<td>2</td>
<td>24V DC</td>
<td>POWER</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MRX</td>
<td>MASTER RECEIVE INPUT</td>
</tr>
<tr>
<td>5</td>
<td>MTX</td>
<td>MASTER TRANSMIT OUTPUT</td>
</tr>
<tr>
<td>6</td>
<td>COMMON</td>
<td>COMMUNICATION’S COMMON</td>
</tr>
<tr>
<td>7</td>
<td>CMTX</td>
<td>MASTER TRANSMIT OUTPUT (Changer)</td>
</tr>
<tr>
<td>8</td>
<td>CMRX</td>
<td>MASTER RECEIVE INPUT (Changer)</td>
</tr>
<tr>
<td>9</td>
<td>GROUND</td>
<td>GROUND</td>
</tr>
<tr>
<td>10</td>
<td>+5V</td>
<td>POWER</td>
</tr>
</tbody>
</table>
SWITCH SETTINGS

Bill recycler

The DIP switches are on the CPU board and are accessible without removal of the bill box.

The MB operates in two basic modes: Validation and Service.

**Validation Mode:** The normal operation mode.

**Service Mode:** Used for testing purposes.

Selection between these two modes as well as denominations enable/disable, high acceptance/high security and coupon acceptance, is configured via these DIP switches

DIP switches function:

<table>
<thead>
<tr>
<th>Switch #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off= $1 Enabled, On= $1 Disabled</td>
</tr>
<tr>
<td>2</td>
<td>Off= $2 Enabled, On= $2 Disabled</td>
</tr>
<tr>
<td>3</td>
<td>Off= $5 Enabled, On= $5 Disabled</td>
</tr>
<tr>
<td>4</td>
<td>Off= $10 Enabled, On= $10 Disabled</td>
</tr>
<tr>
<td>5</td>
<td>Off= $20 Enabled, On= $20 Disabled</td>
</tr>
<tr>
<td>6</td>
<td>Off= Coupon Enabled, On= Coupon Disabled</td>
</tr>
<tr>
<td>7</td>
<td>Off= High Acceptance, On= High Security</td>
</tr>
<tr>
<td>8</td>
<td>Off= Normal operation, On= Service mode</td>
</tr>
</tbody>
</table>

Recycling cartridge

The two buttons and two DIP switches to operate and configure the recycling cartridge are accessible from the back without the need for disassembly.

The DIP switches set the denomination to be recycled and place the unit in “float” setting mode.

Switch 1 Off= Recycle $1, On= Recycler $5
Switch 2 Off= Normal operation, On= Float setting, when in float setting mode, the feed and unload buttons act as up/down for float adjustment, when desired float is set, return switch 2 to Off.
Description of the switch functions also comes in the Software User’s Guide (supplied with the unit) or at www.cashcode.com.

**FEED/UNLOAD BUTTONS**

The feed/unload buttons are next to the DIP switches on the back of the recycling cartridge.

The feed button is used to load the cartridge with bills for the denomination being recycled. The MB will go into feed mode by pressing and holding the feed button for 3 seconds. The running lights will go from running to a steady blinking, indicating the unit is in feed mode. At this point, the operator starts inserting bills for the denomination to be recycled until the desired float of bills is reached. The amount of bills will be shown on the two digit display on the back of the cartridge. To exit the loading mode, the feed button must be pressed again or if bills are not inserted within 30 seconds, the MB will time out and exit the feed mode automatically. The running lights will indicate normal operation again.

By pressing the unload button one bill will be unloaded from the recycling cassette out to the bezel. If the feed and unload buttons are pressed and held simultaneously for a couple of seconds, the entire recycler cartridge contents will be loaded into the bill box.

**MAINTENANCE AND SERVICE**

**Bill Box Removal and Installation**

To install the bill box into the bill recycler main chassis, insert the pins on the side of the bill box into the slots in the chassis and push down until the latch on the top of the bill box is engaged.

**Installing the Bill Box:**
Removing the Bill Box:

To remove the bill box, press on the latch to release, lift the box and remove it, outwards.
To collect bills from the bill box, press on the door's latch as indicated below to open door, remove bills. Close door by pressing door latch until is engaged. There is no need to remove the bill box from main chassis to collect the money.

Recycling Cartridge Removal And Installation
Removing the Recycling Cartridge:
- Push the latch on the side of the recycling cartridge as shown below;
- Swing cartridge open as indicated and complete removal by dislodging pins on the other side from their slots.

Installing the Cartridge:
- Insert the two metal pins into their slots and swing the cartridge close until the latch is engaged, as shown below.

Opening the Cartridge:

Manual Unloading:
Release plastic handle. Lift the gray cover and to turn it counter clockwise.
Open the gate assembly (fork shaped part at bills entrance) and rotate the plastic handle counterclockwise. The bills are manually dispensed one bill at a time. Should a jammed bill be present in the entrance slot, this bill can be easily removed without affecting the later operation of the cassette. Please note: manual bill unloading will reduce the number of the bills in the cartridge without changing the number of bills in the flash memory. It is strongly recommended to perform a complete unloading after the cartridge is replaced (please see the “Load/Unload buttons” section). This will allow the MB to readjust the flash memory when the cartridge is back in operation.

⚠️ Caution. Do not try to pull out the tape in the cassette! This can damage the cassette!

Scheduled Maintenance

During normal operation, dust and dirt accumulate on the optical sensors and the rollers. This could result in reduced acceptance rate. The bill path is recommended to be cleaned, as explained below, every 6 months or after acceptance of 60,000 bills, whichever comes first.

Remove the cartridge. Open the clamshell by pushing the button as shown below. Make certain that:

- there are no scratches on the guides and optical sensors
- there is no dirt or cracks on the surface of the transport rollers
- there is no dirt on the surface of the optical sensors
- the entire bill path is clean of paper debris or residue
The dirt must be removed with soft moistened cloth. Isopropyl Alcohol is recommended for cleaning rollers with excessive dirt build up.

DO NOT USE ACETONE OR PETROLEUM BASED PRODUCTS AS THEY COULD CAUSE DAMAGE PLASTIC PARTS.

Inspect the cartridge chamber to make certain that there are no bill fragments or paper residue left. They may be removed with compressed air.

**Maintenance of the Recycling Cartridge**

Maintenance is recommended approximately twice a year and includes:

- visual inspection of tapes
- visual inspection of optical sensors

A mechanism within the cartridge keeps the tapes tight at all times, which provides appropriate support for stored bills. Should any tape start sagging, simply rotating the plastic handle on the cartridge in any direction. This makes the cartridge mechanism retighten the tape.

For reliable operation, there must be no dust or dirt on the surface of the optical sensors. There are five sensors that must be cleaned with a soft cloth and isopropyl alcohol, once the front cover is open.
Installation of the BlueChipTM sim card

Accessing the BlueChipTM sim card slot is done from the back of the unit, no disassembly is required. Simply turn power off and insert the sim card in the way shown below.

Download procedure:

Step 1. Turn Power OFF.
Step 2. Insert sim card in its slot with contacts facing out.
Step 3. Turn power ON, running lights will blink in a special pattern, wait until the downloading is completed (@ 4 seconds). Once the download is completed, the running lights will go back to normal pattern. Should the lights stay red, this means there is no communication between the MB and the host controller. Further download attempts would have no effect.
SOFTWARE UPDATE DIAGNOSTICS

Normally, the download process will be accompanied by a blinking red-blue status light for about 5 seconds. If the download has completed successfully, the status light will turn blue. Should the download is unsuccessful, the status light will emit short blue flashes followed by a longer red flash (“blue flashes on red”).

The following table lists description of errors indicated by the flashes.

<table>
<thead>
<tr>
<th>STATUS OF DIAGNOSTIC LIGHT</th>
<th>ERROR DESCRIPTION</th>
<th>FAULT – HANDLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Blue Flash on Red</td>
<td>External interface</td>
<td>1. Verify that software is appropriate for downloading via interface. Repeat the procedure.</td>
</tr>
<tr>
<td>2 Blue flashes on red</td>
<td>Memory Stick CRC ERROR</td>
<td>1. Turn power off, remove and insert the Memory stick again, turn power on. Replace the Memory Stick with a new one.</td>
</tr>
<tr>
<td>3 Blue flashes on red</td>
<td>Incorrect data in the Memory Stick</td>
<td>1. Verify that the software is suitable to the Bill Validator type. Insert correct type of CashCode Memory stick.</td>
</tr>
<tr>
<td>4 Blue flashes on red</td>
<td>Memory stick is not inserted</td>
<td>Insert the Memory Stick properly.</td>
</tr>
<tr>
<td>5 Blue flashes on red</td>
<td>Wrong type of the Memory Stick</td>
<td>Insert the proper type of CashCode Memory Stick.</td>
</tr>
<tr>
<td>6 Blue flashes on red</td>
<td>Failure during download</td>
<td>1. Turn power off, remove and insert the Memory stick again, turn power on. Repeat the procedure.</td>
</tr>
<tr>
<td>7 Blue flashes on red</td>
<td>Operation ERROR of the Memory Stick Interface</td>
<td>1. Turn power off, remove and insert the Memory stick again, turn power on. Replace the Memory stick with a new one.</td>
</tr>
</tbody>
</table>
TROUBLESHOOTING

The MB Bill Recycler has self-diagnostic capabilities to assist in a repair or maintenance. When the power is on, the Bill Recycler starts its self-diagnostic procedure. If the self-diagnostics test has passed, then the status light will turn blue. If an error is detected, then the status light on the front will blink red. The number of times the red light flashes is an indication of a specific problem or malfunction. A detailed list of these errors and corrective actions is provided below. Every time the running lights are red, you can insert a bill in the bezel, the unit will return a blinking pattern, just count the number of flashes and look on the table below for the problem associated.

Operation Mode Diagnostics

<table>
<thead>
<tr>
<th>Number of status light flashes</th>
<th>Error description</th>
<th>Fault – handling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bill Box removed</td>
<td>Check if bill box is installed correctly</td>
</tr>
<tr>
<td>2</td>
<td>Wrong type of sensors</td>
<td>Check accordance type of the sensor to software</td>
</tr>
<tr>
<td>3</td>
<td>Bill Box full</td>
<td>Empty Bill Box</td>
</tr>
<tr>
<td>4</td>
<td>Recycling cartridge is out of position or there is a communication failure</td>
<td>Check if recycling cartridge is installed correctly</td>
</tr>
<tr>
<td>5</td>
<td>Failure of the recycling cartridge gate</td>
<td>Open the recycling cartridge and clean the optical sensors for the gate position</td>
</tr>
<tr>
<td>6</td>
<td>Failure of the optical sensors</td>
<td>Open the guides and clean the optical sensors.</td>
</tr>
<tr>
<td>7</td>
<td>Failure of the inductive sensors</td>
<td>Open the guides and clean the inductive sensors.</td>
</tr>
<tr>
<td>8</td>
<td>Failure of the transport motor</td>
<td>Remove bill box and recycler cartridge and clean the bill path.</td>
</tr>
<tr>
<td>9</td>
<td>Failure of the recycling cartridge tape</td>
<td>Open the recycling cartridge, clean the optical sensors for the tape position</td>
</tr>
<tr>
<td>10</td>
<td>Communication failure between main chassis and recycling cartridge</td>
<td>Check comb connector</td>
</tr>
<tr>
<td>11</td>
<td>The bill pathway is not empty</td>
<td>Open the sensors compartment and check the condition of the bill path</td>
</tr>
<tr>
<td>12</td>
<td>Bill that should have been paid out was sent to the bill box</td>
<td>Remove bill box and recycler cartridge and clean bill path.</td>
</tr>
<tr>
<td>13</td>
<td>Bill jam in the recycling cartridge</td>
<td>Remove the recycling cartridge and pull out jammed bill</td>
</tr>
</tbody>
</table>
TECHNICAL SUPPORT

2720 Steeles Ave W.
Concord, Ontario
Canada L4K 4S3

Phone: 1-800-584-2633 (1-905-303-8874)
Fax: 1-800-593-2633 (1-905-303-8875)
E-mail: support@cashcode.com
Website: support.cashcode.com