APPLICATIONS GUIDE

# P152A MDB CREDITOR INTERFACE

Version   5

Date: 29 March 2005

1. INTRODUCTION

This interface circuit board enables a standard parallel interfaced "pulsed" output payment device to work in a vending machine that operates with the "Multi-Drop-Bus" (MDB) protocol. The device emulates a "Bill Reader" to the MDB controller.

The P152 board itself is powered from the MDB nominal 34 volt power and handles the MDB serial interface communications with the vending machine. The board will work with up to 6 different input "values".

This application note describes how to connect the P152 Issue A board between the Payment Module and the Vending Machine.

MDB
To VMC

Non MDB "Pulse output"
payment module
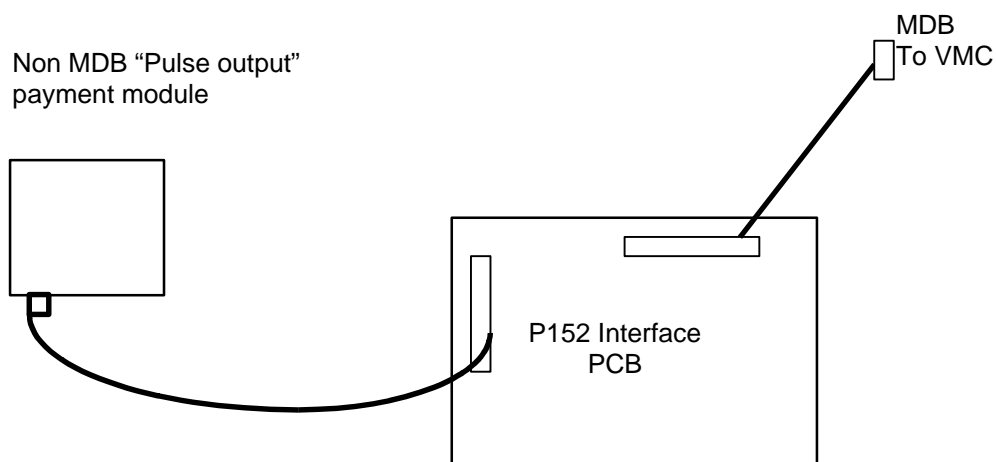
P152 Interface
PCB

2. BOARD MOUNTING & LAYOUT

The interface board is 3.2 inches by 1.9 inches, and has a maximum height of 29mm. The board is mounted using the 4 mounting holes located on each corner. The mounting holes are 2.8" by 1.5" apart and are 0.15" diameter to accept a conventional "stand-off".
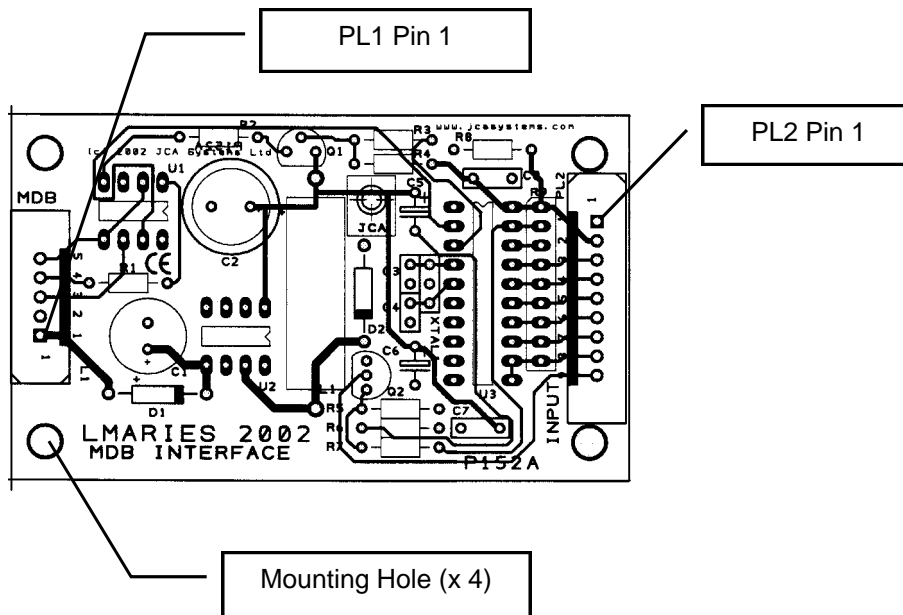
There are two connectors on the board :

PL1   MDB – connect to VMC

PL2   Pulse Inputs – connect to payment device

3. Payment Device Interface

PL2 Pin	Signal / Function	Credit Value
1	0v (GND)	
2	+5v output (max 100mA)	
3	Pulse Input 6	$10
4	Pulse Input 5	$5
5	Pulse Input 4	$2
6	Pulse Input 3	$1
7	Pulse Input 2	25 cents
8	Pulse Input 1	10 cents
9	INHIBIT	

Signal Descriptions

Pulse Input - Active LOW input to the P152 board, connect to a corresponding an open - collector output from the Payment device, or a relay switch between the pulse input and Ground. A minimum pulse width of 25 milli-seconds is required to identify a valid credit pulse. The inputs generate the credit amounts shown above to the VMC.

The pulse inputs have a 10K ohm on board pull-up to the 5 volts line.

INHIBIT - Open collector output from the P152 board. A LOW level enables Payment Acceptance. A HIGH level inhibits acceptance. When the MDB master device enables any of the 6 inputs this line will be driven LOW. If an input pulse is detected on a line that is individually inhibited by the MDB master, the INHIBIT line will pulse to reject the input and no credit will be sent to the machine.
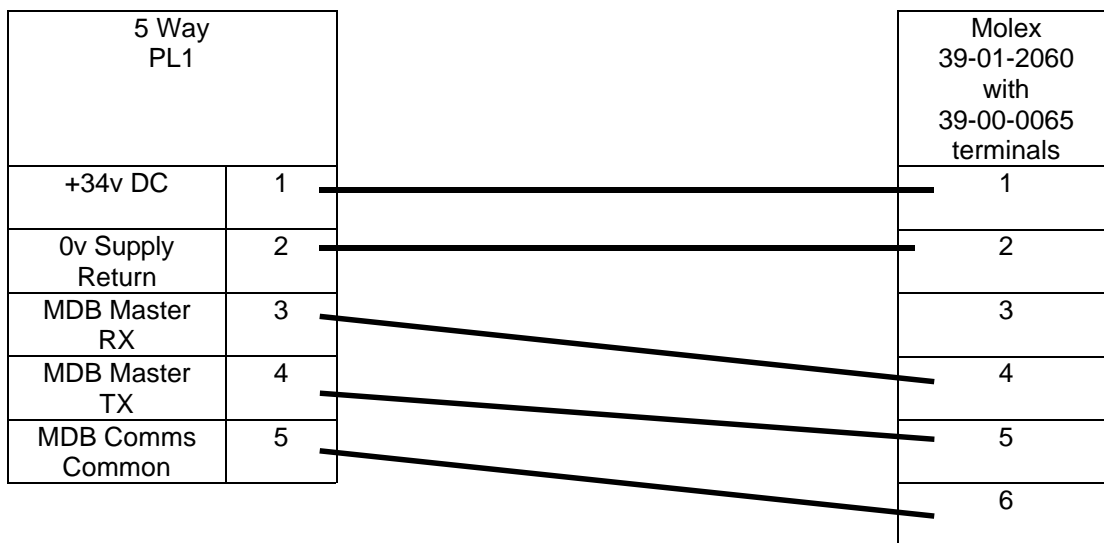
4. STANDARD MDB CONNECTIONS TO VENDING MACHINE

This connection is for a standard MDB machine with a nominal 34v DC power supply.
(The unit will operate with a power supply in the range 15v DC to 42v DC).

Connect as shown below to PL1 using a 5 way Molex Mini KK 6741 Series connector
(Molex 22-01-2055 using crimps Molex 08-50-0032)

P152 INTERFACE BOARD			MDB CONNECTION TO VENDING MACHINE
5 Way PL1			Molex 39-01-2060 with 39-00-0065 terminals
+34v DC	1		1
0v Supply Return	2		2
MDB Master RX	3		3
MDB Master TX	4		4
MDB Comms Common	5		5
			6

Appendix 1 - SPECIFICATION

- **OPERATING ENVIRONMENT**

Operating Temperature	+10°C to +40°C
Storage Temperature	0°C to +60°C
EMC	The Control PCB is supplied as a component with no intrinsic function under the definition of the EMC Directive. The complete vending machine is subject to EMC conformance. Measures have been taken to minimise EMC effects within the design.
Safety	The Control PCB is a low voltage device - Note, should a mains power supply be used with the VMC it is recommended that it should conform to a relevant standard such as IEC 950.

- **PAYMENT DEVICE INTERFACE**

Pulse Inputs	Internal 10K ohm pull up to 5 volts Logic Zero < 0.5 volts Logic One >4.0 volts, or open circuit
INHIBIT output	Logic One : open circuit (max voltage applied 30V) Logic Zero : <0.5volts at 30mA sink current maximum
Power Output	5 volts DC +/- 0.5 volts at 100 milli-amps maximum

- **MDB VENDING MACHINE INTERFACE**

Serial Interface (Peripheral Slave at 9600 baud)

Receive:	Maximum input current (active)	15mA @ 4 volts
	Maximum input current (inactive)	100uA
Transmit:	Minimum sink current (active)	15 mA @ 1 volt
	Maximum leakage current (inactive)	30uA

Power Input	Minimum 20v DC (rectified and optionally filtered) Nominal 34v DC (rectified and filtered) / 24v DC (rectified only) Maximum 42.5v DC (ripple upper voltage limit, absolute maximum 45v DC peak)
	Maximum current 200 milli-amps from this supply

Appendix 2 - FUNCTIONAL DESCRIPTION

MDB Protocol Supported
- (refer to full MDB Level One Bill Validator specification for data settings)

Command	Response
RESET (30H)	Interface reset, acceptance inhibited.
STATUS (31H)	Fixed data response – see later
SECURITY (32H)	ACK only, the Interface always adopts a high security mode.
POLL (33H)	The following responses may be expected : 80H-85H Bill Stacked C0H-C5H Disabled Bill Returned 06H Recent Reset completed 09H Bill Reader disabled (all bills inhibited after reset or by a BILL TYPE Command 0AH Invalid Escrow Request
BILL TYPE (34H)	Enable / Disable bills 0 - 5 Escrow / Stack directly bills 0 - 5
ESCROW (35H)	ACK only, sets invalid escrow request flag. No actions on the hardware
STACKER (36H)	Responds with the number of payment items since last reset. Never responds with a Full condition.
EXPANSION (37H 00H)	Responds with a fixed message with a manufacturer code "JCA" and the software version number. The serial number and tuning revision are constants.
EXPANSION (37H FFH)	Responds with a hardware test for factory testing of the P152 PCB only.
EXPANSION (37H)	Sub commands other than 00H or FFH are responded to with a NAK

The software only recognises the six least significant bills (0 - 5), and treats the bill validator as "disabled" when the acceptance of ALL these six bills is disabled.

The communication package supports the hardware BUS RESET and will reset if the Master Transmit Signal is held active for more than 100ms, however the VMC is expected to issue a RESET command to re-initialise the Bill Validator anyway as recommended in the MDB Specification.

All messages for other peripherals are ignored by the software. Any messages in the range 30H - 37H are recognised and will be checked for a valid CHECKSUM. If the checksum is in error the message will be NAKed. The response to a valid message will be an ACK if the peripheral does not have to send data. If data is being sent to the VMC, the peripheral supports an ACK, NAK , RET (Retransmit) or timeout (treated as a NAK) response from the VMC.

The Error codes sent in response to a POLL command occur under the following conditions:

If the P152 board is "busy" processing an action with the payment device, any command from the MDB bus will receive an immediate NAK response. The maximum time that the P152 board will NAK respond is 5 seconds, in line with the MDB "maximum non-response time" for a Bill Validator.

On initial power up all payment acceptance is inhibited for 7 seconds.

Payment Pulse Handling

- **Pulse Acceptance**

When an Input Pulse is detected the following sequence occurs :

(i)	The input is filtered to ensure that it is stable (20ms)
(ii)	The end of the pulse is detected (error timeout approx. 5 secs)
(iii)	If the particular bill (input) is disabled (MDB command 34H) the INHIBIT line is pulsed to return the payment, and this is indicated by a "Disabled Bill Rejected Code" (C0H - C5H) in the next POLL response.
(iv)	Otherwise a successful credit is generated using the "Bill Stacked Code" (80H - 85H) in the next POLL response.

Status Response Settings

Software Version	5.00	5.01	5.02	5.03
Country Code:	01 (USA)	44 (UK)	1702	1702(Singapore)
Scaling factor	5 (5 cents)	5 (5 pence)	1	5
Decimal Places	2	2	2	2
Bill Values				
Bill 1	10c	5p	1c	5c
Bill 2	25c	10p	5c	20c
Bill 3	$1	20p	10c	50c
Bill 4	$2	50p	20c	$2
Bill 5	$5	£1	50c	$5
Bill 6	$10	£2	$1	$10
Escrow :	None	None	None	None
Stacker capacity :	600	600	600	600