

matrix

RS232 Interface Manual

Introduction

The *Matrix* series of currency validators provides a 'True' RS232 output from its 16 pin output connector. No special interface cables are required. This is a three wire interface utilizing a Transmit Line (TXD), Receive Line (RXD) and Ground/Earth. In this polled system, the controller (*Master*) requests information from the *Matrix* (*Slave*) at a periodic rate (*Polling Rate*).

General Data

Baud Rate: 9600 BPS

Duplex: Half Duplex

Character Format

1 Start, 1 Stop Bit

7 Data Bits

1 Parity Bit (Bit 7, Even)

NRZ Format

Polling Rate

100 mS – 5 Sec: Longer poll rates (750 mS and above) will increase the overall transaction time.

Inactive Timing

If the *Matrix* does not receive a poll within 25 seconds from the previous *poll*, the following conditions will apply.

1. Reject any note held in *Escrow*.
2. Will not accept any note until the *Master* initiates the *polling* sequence.

Configuration

Hardware

For "True" RS232 operation, an internal module #VA-PCBA09 must be installed. It may either be installed by customer or the factory. For installation instruction, contact your local sales office.

Software

The *Matrix* may be configured to operate in the RS232 mode via the *Matrix Tools* program available for PDA or PC device. The *Matrix* can also be factory set to operate in the RS232 mode.

Connection

Please see Electrical Connection section at the end of this manual.

Message Format

Each message follows a common format as below;

STX, Length, MSG type and ACK number, Data fields, ETX, Checksum

Bytes are as follows;

STX =02H One byte that indicates the start of a message

Length: One byte representation of the number of bytes in each message including **STX**, **ETX** and **Checksum**.

MSG type and ACK number: One byte of data

MSG type: Bits 4, 5 and 6 of byte
=1 for Master to Slave (Matrix) messages
=2 for Slave (Matrix) to Master messages

ACK number: Bits 0, 1, 2 and 3 of byte
=0 or 1

In messages sent by the Master, the ACK# is used to identify the message. As messages are sent to the Matrix, the number alternates between 0 and 1. If the acceptor receives two consecutive messages with the same ACK#, it is treated as a resend request. If no reply is received, (ie. The acceptor is busy) continue to send the same message and ACK# until a response is made.

In messages sent by the Slave (Matrix) the number is used to acknowledge specific messages sent by the Master. When the Matrix receives a Master's message correctly, the ACK number of Slave's message is set to the ACK number of the Master's message. If the Slave does not receive the Master's message correctly, Slave will not reply to that message.

Data: The data portion of the message consists of multiple data fields (see next section)

ETX =03H End of message byte.

Checksum: One byte checksum. The checksum is calculated on all bytes except the STX, ETX and checksum itself. The calculation is done by Xoring the bytes.

States and Events

During the note validation process, the Matrix will pass through various “States’ of operation and will report various ‘Events’ to the Master. Multiple States can be reported by Matrix in any one poll or they can also be reported on subsequent polls. Events are only reported once per occurrence and are cleared once acknowledged by the Master (changing ACK#)

Acceptor Status

1. **Idle:** Not processing currency, waiting for note insertion.
2. **Accepting:** A note has entered the sensor array and is being processed
3. **Escrowed:** A note has been validated. Note value will be reported to Master. The Matrix will continue to hold the note awaiting for a message from the Master to **Stack** or **Return**.
4. **Note Jam:** The note cannot be stacked or returned.
5. **Stacker Full:** The note cannot be stacked because of a full cashbox.
6. **Failure:** A condition exists that prevents the Matrix from validating additional currency.
7. **Returning:** Master has instructed the Matrix to return the note.
8. **Rejecting:** Matrix is rejecting a note that cannot be recognized.
9. **Stacking:** Matrix is transporting a note to the cash box after being instructed by the Master to Stack.

Acceptor Events

1. **Stacked:** A note has been successfully stacked into the cashbox. Master can report credit for note.
2. **Rejected:** A note has been returned because it was found to be invalid.
3. **Returned:** A note has been returned per request of Master.
4. **Power Up:** The Matrix power has been cycled since receipt of the last poll.
5. **Empty Stacked:** When Matrix executed an arbitrary stacking action to clear the note path.

Miscellaneous

1. **Bill Value Field:** Used in conjunction with Escrowed to indicate the channel of the current valid note.

Data Fields For Messages Sent By Master (Host Machine)

Byte 0

- Bit 0: Set to 1 for 1st Note enable (eg. USA \$1)
- Bit 1: Set to 1 for 2nd Note enable (eg. USA \$5)
- Bit 2: Set to 1 for 3rd Note enable (eg. USA \$10)
- Bit 3: Set to 1 for 4th Note enable (eg. USA \$20)
- Bit 4: Set to 1 for 5th Note enable (eg. USA \$50)
- Bit 5: Set to 1 for 6th Note enable (eg. USA \$100)
- Bit 6: Set to 1 for 7th Note enable

Byte 1

Bit 0: Reserved for future (Set to 0).
Bit 1: Security. Reserved for future (Set to 0).
Bit 2: Reserved for future (Set to 0).
Bit 3: Reserved for future (Set to 0).
Bit 4: Reserved for future (Set to 1).
Bit 5: Stack (=1 causes note to be stacked).
Bit 6: Return (=1 causes note to be returned).

Byte 2

Bit 0 to 6: Reserved for future (Set to 0).

Data Fields For Messages Sent By Slave (Matrix)

Byte 0

Bit 0: Idling (1=acceptor in idle state)
Bit 1: Accepting (1= accepting note)
Bit 2: Escrowed (1=note in escrow)
Bit 3: Stacking (1=note being stacked)
Bit 4: Stacked (1=note stacked)
Bit 5: Returning (1=note being returned)

Byte 1

Bit 0: Cheated (1=Cheated)
Bit 1: Rejected (1=note rejected)
Bit 2: Jammed (1=note jammed)
Bit 3: Stacker Full (1=Cashbox Full)
Bit 4: Cashbox Present (1=Cashbox Present)
Bit 5: Empty Stacked (1=an arbitrary stack occurred)
Bit 6: Reserved

Byte 2

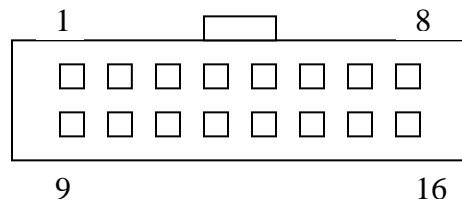
Bit 0: Power Up (1=Initialization)
Bit 1: Invalid Command (1=Invalid)
Bit 2: Failure (1=failure)
Bit 3 to 5: Note Value Field (000=none/unknown, 001=1st note, 010=2nd note, 011=3rd note, etc.).
Binary format
Bit 6: Reserved

Byte 3: Reserved

Byte 4: Reserved

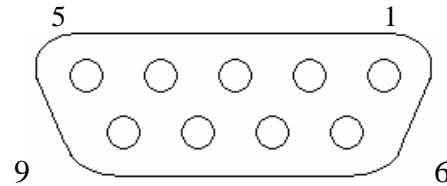
Byte 5: Firmware Revision (00-7FH)

Electrical Connection



**16 Pin Mating Connector
(toward Matrix)**

- Pin 1: +12 VDC (power)**
- Pin 2: Ground/Earth**
- Pin 14: RXD (receive data to Matrix)**
- Pin 15: Common (signal gnd)**
- Pin 16: TXD (transmit data from Matrix)**



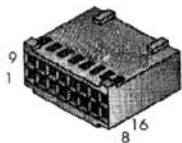
**DB9 Female Connector
(toward connector)**

- Pin 2: Host Receive**
- Pin 3: Host Transmit**
- Pin 5: Common (signal gnd)**

Interface Cable/Tools

For 'True' RS232 Interface: VA-WIR09
RS232 Test/Evaluation Software: VTIRSTEST-1

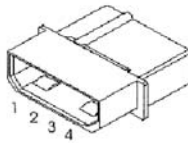
**CONNECTOR TYPE A
AMP 1-87631-2**



**TERMINAL PIN
AMP 87046-4**



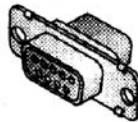
**CONNECTOR B
MOLEX 8981**



**TERMINAL PIN
MOLEX 8980**



**CONNECTOR C
DB9 FEMALE**



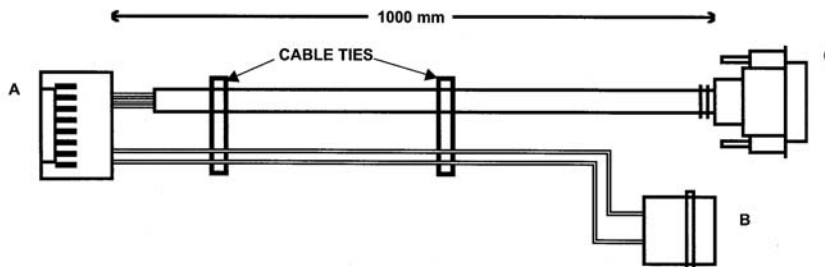
CONNECTION TABLE

A	WIRE TYPE	B
1	22AWG Stranded UL1061 300V 80C YLW	1
2	22AWG Stranded UL1061 300V 80C BLK	2
14	24AWG Stranded UL1061 300V 80C Any Color	
15	24AWG Stranded UL1061 300V 80C Any Color	
16	24AWG Stranded UL1061 300V 80C Any Color	

CONNECTOR A : AMP 1-87631-2 or equivalent 1 PC
TERMINAL PIN : AMP 87046-4 or equivalent 5 PC:

CONNECTOR B : MOLEX 8981 or equivalent 1 PC
DISK DRIVE POWER SOCKET
TERMINAL PIN: MOLEX 8980 or equivalent 2 PC:

CONNECTOR C : DB9 FEMALE 1 PC
WITH STRAIN RELIEF



Cable VA-WIR09 (RS232)