



## **ELAN DIGITAL SYSTEMS LTD.**

LITTLE PARK FARM ROAD,  
SEGENSWORTH WEST,  
FAREHAM,  
HANTS. PO15 5SJ.  
TEL: (44) (0)1489 579799  
FAX: (44) (0)1489 577516  
e-mail: [support@pccard.co.uk](mailto:support@pccard.co.uk)  
website: <http://www.pccard.co.uk>

## **CF428 COMPACT FLASH™ CF+ CARD USER'S GUIDE**



Compact Flash is a trademark of Sandisk Corporation. All other Trademarks are duly acknowledged.

### **REVISION HISTORY**

<b>ISSUE</b>	<b>PAGES</b>	<b>DATE</b>	<b>NOTES</b>
1	11	24.04.2002	FIRST ISSUE
2	11	24.05.2002	Electrical Specs Updated

# Table of Contents

<b>1. OVERVIEW.....</b>	<b>3</b>
<b>2. ABOUT THE CF428 .....</b>	<b>4</b>
<b>3. INSTALLING THE CF428 .....</b>	<b>5</b>
3.1 DOS & WINDOWS 3.1X.....	5
3.2 WINDOWS 95, 98, 98SE, ME, NT4, 2000, XP.....	5
3.3 WINDOWS CE, POCKETPC .....	5
<b>4. CF428 REGISTER INTERFACE.....</b>	<b>6</b>
<b>5. HARDWARE SPECIFICATION.....</b>	<b>7</b>
5.1 PINOUT .....	7
5.2 ELECTRICAL.....	8
5.3 POWER CONSUMPTION .....	8
5.4 MECHANICAL.....	8
5.5 ENVIRONMENTAL.....	8
5.6 NOTES ON SERIAL DATA THROUGHPUT.....	8
5.7 BAUD RATE SETTINGS.....	9
<b>6. USING THE CF428 CARD .....</b>	<b>10</b>
6.1 TERMINATION .....	10
6.2 FAIL SAFE OPEN CIRCUIT PROTECTION.....	10
6.3 TXD AND RTS DRIVERS .....	10
6.4 RS422 OPERATION.....	11
6.5 RS485 OPERATION.....	11

## DISCLAIMER

**This document has been carefully prepared and checked. No responsibility can be assumed for inaccuracies. Elan reserves the right to make changes without prior notice to any products herein to improve functionality, reliability or other design aspects. Elan does not assume any liability for losses arising out of the use of any product described herein; neither does it convey any licence under its patent rights or the rights of others. Elan does not guarantee the compatibility or fitness for purpose of any product listed herein. Elan products are not authorised for use as components in life support services or systems. Elan should be informed of any such intended use to determine suitability of the products.**

**Source code supplied with Elan PC-Cards and Compact Flash cards is provided “as-is” with no warranty, express or implied, as to its quality or fitness for a particular purpose. Elan assumes no liability for any direct or indirect losses arising from use of the supplied code.**

**Copyright © 2002 Elan Digital Systems Ltd.**

## 1. OVERVIEW

The CF428 card is an RS422/485 Serial card with the following features:

- Tiny TypeI Compact Flash form factor for CF+ equipped PDAs, Handheld PCs, laptops etc.
- DOS, Windows 3.1x, 95, 98, 98SE, Me, NT4, 2000, XP, CE, PocketPC compatible using O.S. standard drivers
- Industry standard 16550 register set.
- Transmission rates up to 115.2K Baud as standard.
- Switchable x1 or x8 baud rate giving up to 921Kbaud.
- Works at 3.3V or 5V.
- Hardware modem control line support.
- Works in PC-Card slots using Compact Flash adapter (not supplied as standard but available as an option)
- Standard PC IO port decode for COM1 to COMn
- “Any” IO port and interrupt decode option for best pnp flexibility
- ESD protected RS422/485 drivers
- Software controlled power management
- Low power consumption
- Supplied with 300mm DB9-male terminated cable

This guide aims to familiarise you with the way that the CF428 works and so will help you to maximise its performance in your application.

Elan will be happy to quote for either customisation of the CF428 if its exact specifications do not quite meet your needs, or to create complete application software.

## 2. ABOUT THE CF428

The CF428 card is an RS422/485 serial card with Elan's own 16550 compatible UART ASIC device, called the VPU16550. The serial data and control lines are buffered using ESD protected RS422/485 drivers.

Industry standard baud rates up to 115.2K baud are supported, together with 16-byte deep TX and RX FIFOs. A small switch is located at the back edge of the card, which allows selection of "x1" or "x8" baud rate multiplier. This feature allows up to 921KBaud operation without needing special device drivers on the host (in x8 mode you simply multiply the setting shown on the host by 8 to get the real serial data rate e.g. 19200 Baud set on host with x8 mode gives 153600Baud true rate in hardware). See section 5 for the switch settings.

For further information please refer to the VPU16550 data sheet available from our website, <http://www.pccard.co.uk>

The CF428 conforms to the industry standard Compact Flash+ interface that allows connection of peripherals to the system bus of a laptop, handheld PC or PDA. The CF+ specification extends the earlier memory-only Compact Flash interface to allow I/O devices and extra power for the card. The CF428 is an I/O type device and therefore requires a CF+ capable slot.

## **3. INSTALLING THE CF428**

### **3.1 DOS & Windows 3.1x**

Operation in DOS or Windows 3.1 requires 3<sup>rd</sup> party Card and Socket Services drivers to be properly installed and configured. Follow your software vendor's instructions on how to do this.

The CF428 requires no extra drivers to operate in DOS. Insertion of the card should create a familiar "happy beep" as the host software configures the card a standard DOS COM port. Resource allocation and troubleshooting is all down to the 3<sup>rd</sup> party software and any issues that may arise during configuration of the CF428 should be addressed to the vendors of this software.

The CF428 has been tested with:

SystemSoft Cardware  
Award Cardwizard

### **3.2 Windows 95, 98, 98SE, Me, NT4, 2000, XP**

The "generic" serial drivers in these Operating Systems support the CF428. No extra driver software is needed but you will need to install Card Center Pro, or use the INF file that can be found on the first disk of the installation set.

Installing the supplied Card Center Pro software that comes with your product will copy the INF file into the Windows/INF folder. Windows will use this INF file to "recognise" the CF428 card. Alternatively, when Windows does a first-time search for the driver for the CF428 card, you can use Disk#1 from the CCP set.

### **3.3 Windows CE, PocketPC**

There is no need to install any software for Windows CE or PocketPC. Simply insert the CF428 card and it will appear in a list when you go to set up a "Connection".

## 4. CF428 REGISTER INTERFACE

Full details of the CF428's register interface can be found in the VPU16550 data sheet, available at Elan's website

<http://www.pccard.co.uk>

For reference, the CF428 behaves as a 5V card to the host system because Vs1 and Vs2 pins are no connects. This is to make the host default to 5V when possible, giving the highest RS422/485 output signals and therefore best noise margins. The Card Information Structure does not define any 3.3V tuples because some platforms will also take this as a sign to run at 3.3V even when 5V is available. On a PDA or HPC, the host will power the card at 5V if it's available, or 3.3V otherwise (despite there being no 3.3V tuple entries).

## 5. HARDWARE SPECIFICATION

### 5.1 PINOUT

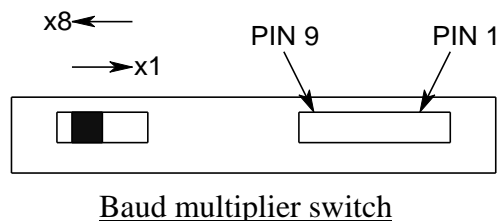
The CF428 is supplied with a 300mm long Type46 cable that terminates with a DB9 Male connector with female screwlocks (to match the port at the back of a PC)

The pin-out below applies to **both** the CF428 card and the DB9 male connector on the supplied cable (the cable is pinned one-to-one).

PIN	NAME	FUNCTION
1*	RXD-	Receive Data inverting input
2	RXD+	Receive Data non-inverting input
3	TXD-	Transmit Data inverting output
4	TXD+	Transmit Data non-inverting output
5	GND	GROUND
6	CTS-	Clear To Send inverting input
7	RTS-	Request To Send inverting output
8	CTS+	Clear To Send non-inverting input
9	RTS+	Request To Send non-inverting output

For ref: mating connector type: Honda rmc-e9f2s-bsla2n-a2

\*Pin 1 is nearest the edge of the card.



## **5.2 ELECTRICAL**

All figures quoted are typical parameters @ 25°C

ESD PROTECTION:	All RS422/485 signal lines on the CF428 card are protected against electrostatic discharge (ESD) <ul style="list-style-type: none"><li>• &gt;1kv – IEC1000-4-4</li></ul>
UART CLOCK SPEED:	x1: UART CLOCK is 1.8432MHz ->115.2KBaud max x8: UART CLOCK is 14.7456MHz->921.6KBaud max
RS422 MODE:	CTS/RTS flow control signals available.
RS485 MODE:	Auto-tristate of TXD drivers when not transmitting
TERMINATORS:	None fitted in card, use an external termination resistor as required.
FAIL-SAFE FEATURE:	The receiver inputs include a fail-safe feature that guarantees a logic high on the receiver when the inputs are open circuit.

## **5.3 POWER CONSUMPTION**

All figures quoted are typical parameters @ 25°C

COMMUNICATION ACTIVE:	80mA typical @ 5V, 55mA typical @ 3.3V (includes 45mA consumed by terminating resistors)
IDLE MODE :	22mA typical @ 5V, 10mA typical @ 3.3V

## **5.4 MECHANICAL**

MASS:	10g typical.
FORM FACTOR:	36.4mm x 42.8mm x 3.3 mm overall size

## **5.5 ENVIRONMENTAL**

HUMIDITY:	<80% non-condensing
TEMP:	0-50°C ambient

## **5.6 NOTES ON SERIAL DATA THROUGHPUT**

The maximum serial baud rate of 921KBits/sec does not imply that the maximum sustained throughput rate of the serial port will be as high. The actual throughput rate that can be achieved depends on many factors including the host PC speed, the serial data source's data block size and whether the block are "back-to-back", whether the interrupt in use on the host is being shared by other devices leading to increased latency etc.

As a simple rule of thumb, using the standard serial drivers on a fast PC will allow throughput rates of 400-600KBits/sec although these rates can't be guaranteed and will be application specific.

### **5.7 BAUD RATE SETTINGS**

The table below illustrates the common baud rate values available for each of the baud rate multiplier switch positions:

<b>HOST SETTING</b>	<b>SWITCH = x1</b>	<b>SWITCH = x8</b>
300	300	2400
1200	1200	9600
2400	2400	19200
4800	4800	38400
9600	9600	76800
19200	19200	153600
38400	38400	307200
57600	57600	460800
115200	115200	921600

## **6. USING THE CF428 CARD**

### **6.1 TERMINATION**

RS422 and RS485 lines should be terminated at the end of the main branch of the receiver with the cables characteristic impedance. These terminating impedances reduce signal reflections at the cable end. It is not necessary to terminate the transmitter end of the cable. The most common method of termination is to install a terminating resistor, typically with a value of 120Ω, at a single receiver.

The CF428 does not have internal terminating resistors fitted as standard. If required, a 120Ω resistor should be connected between the RXD+ and RXD- pins of the DB9 connector. For RS422 applications, a terminating resistor will also be required between the CTS+ and CTS- pins.

### **6.2 FAIL SAFE OPEN CIRCUIT PROTECTION**

A transmission line enters an indeterminate state if no drivers are transmitting on it or the line has been cut. This indeterminate state can cause the receivers to receive invalid data bits from noise picked up on the cable. To prevent reception of these data bits, the CF428 receiver inputs incorporate 1.2kΩ bias resistors (one pulling up on “+” and one pulling down on “-“) that ensure that the differential voltage on the RXD and CTS pairs is greater than the 200mV input logic “1” threshold (even in the presence of an external 120Ω terminating resistor).

### **6.3 TXD AND RTS DRIVERS**

The RTS signal driver on the CF428 is always enabled, regardless of the mode in which the card is to be used.

The CF428 incorporates an auto-tristate feature on the TXD signal driver. The driver is enabled only when data is in the process of being transmitted. This mechanism can prevent bus contention in RS485 systems (caused by multiple transmitters driving the line in opposing states). The RS485 transmitter arbitration scheme is

beyond the scope of this guide, and is typically handled by application software.

Note that when multiple characters are transmitted “back-to-back” the output drivers stay active for the entire duration of the transmission i.e. the drivers do not go in and out of tri-state for each character in a multi-character block.

The auto-tristate feature is always in operation, regardless of the mode in which the card is to be used.

#### **6.4 RS422 OPERATION**

Generally, in RS422 systems, all 8 signal lines from the DB9 connector are used. Thus 4 twisted pair cables are used, one pair for each of the 4 signals TXD, RXD, RTS and CTS. The RS422 arrangement allows data to be transmitted and received simultaneously since each signal has its own twisted pair.

#### **6.5 RS485 OPERATION**

The CF428 can be used for both half-duplex (one twisted pair) and full-duplex (two twisted pairs) arrangements, however for half-duplex mode, the link between the TXD and RXD signals must be made externally on the DB9 connector. Also, it should be noted that the transmitted characters will always be received in this mode. The RXD receiver is not disabled during transmission.

The handshaking signals RTS and CTS, although driven by the card, are usually not connected to another node. However, if required by the application software, to force the CTS signal input on the CF428 true, the RTS signals must be looped back to the CTS inputs.