

Telegesis		TG-ETRX2CF-PM-01-106
ETRX2CF v1		Product Manual 1.06

ETRX2CF COMPACT FLASH™ CARD v1

PRODUCT MANUAL



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1 Introduction

The ETRX2CF wireless mesh networking Compact Flash™ card is an RS232 to Compact Flash™ bridge, connected to an ETRX2 wireless meshing module. This allows connectivity to a PDA or laptop using either the Compact Flash™ or PCMCIA (with adapter) expansion slots.

The supplied drivers create a virtual COM Port, so that the command line of the ETRX2 can be accessed via any terminal software application or using custom software.

When using Windows® 9x/XP/2000 the Telegesis Terminal Application program can be used as described in the Development Kit Manual, alternatively the Telegesis Terminal for Pocket PC can be used with operating systems such as Windows Mobile 5.0.

In compliance with the Compact Flash™ standard, the ETRX2CF card can operate at either 3.3V or 5V to allow compatibility to the widest possible range of devices.

With the advent of EmberZNet3 the ETRX2CF cards can also support EZSP (Ember Serial ZigBee Protocol) as described in section 6 of the Ember EM260 datasheet.

1.1 Supported Operating Systems

- Windows 95
- Windows 98
- Windows XP
- Windows 2000
- Pocket PC
- Windows Mobile 5.0
- Linux

Information on Linux can be obtained from Elan at www.elandigitalsystems.com/support/ccpfaq/serialcardsinlinux.php

1.2 Supported hardware

There are many different PDAs available and it is not possible for us to verify the CF™ card's operation in all of them. We have used:

- HP iPAQ 5550
- HP iPAQ HX2490

Problems with interfacing the CF™ card to a PDA may be caused by the drivers associated with the VPU16551 CF-to-serial bridge chip in the ETRX2CF, and we recommend that you check the list of known issues at www.elandigitalsystems.com/support/commsfaq/index.php

1.3 Interoperability

Please note that the R2xx Telegesis AT-Command line Interpreter is based on a private application profile and uses the Ember meshing and self-healing stack, so interoperability with wireless mesh networking solutions from other manufacturers is unlikely when using the default firmware.

1.4 Related documents

The ETRX2CF card contains an ETRX2 radio module, details of which can be found in the ETRX2 Product Manual. The ETRX2CF-PA contains an ETRX2-PA module but is otherwise identical.

The AT command set is defined in the AT R2xx Commands Manual.

There is a general information on the setting up and maintenance of ZigBee® radio mesh networks, and examples of using the AT commands, in the ETRXn User Guide for R2xx.

All our documents can be found at www.telegesis.com/support/document_centre.htm.

2 Absolute Maximum Ratings

Parameter	Min.	Max.	Units	Condition
Supply Voltage V _{dd}	-0.3	6	V	
Voltage on any pin	-0.3	V _{dd} +0.3, max 6	V	
Storage Temperature range	-50	150	°C	

Table 1: Absolute Maximum Ratings

The absolute maximum ratings given above should under no circumstances be violated. Exceeding one or more of the limiting values may cause permanent damage to the device.

3 Operating Conditions

Typical values at 3.3V 25°C.

Parameter	Min.	Typ.	Max.	Units	Condition
Supply Voltage, Vdd	3.15	3.3	3.5	V	
Supply Current		37		mA	TX 3dBm
		30		mA	TX -28dBm
		37		mA	RX
		6 ¹		mA	Power Mode 01
		2.5 ¹		mA	Power Mode 02
		1.5 ¹		mA	Power Mode 03
Operating ambient temperature range	-20	25	70	°C	

Table 2: Operating Conditions at 3.3V

Typical values at 5V 25°C.

Parameter	Min.	Typ.	Max.	Units	Condition
Supply Voltage, Vdd	4.5	5	5.5	V	
Supply Current		40		mA	TX 3dBm
		23		mA	TX -28dBm
		40		mA	RX
		9 ¹		mA	Power Mode 01
		5.5 ¹		mA	Power Mode 02
		4.5 ¹		mA	Power Mode 03
Operating ambient temperature range	-20	25	70	°C	

Table 3: Operating Conditions at 5V

Please Note: In order to conserve power some operating systems power-down the entire card until the virtual COM port is opened. Therefore, if you need to save power simply close the COM port and this will prevent the Compact Flash™ card from consuming any power at all.

4 ETRX2 I/O Connectivity

The I/Os of the built-in ETRX2 are connected as follows:

- I/O1 is connected to the LED (drive I/O1 low to sink LED)
- I/O2 is the CTS input to the ETRX2. Make sure I/O2 is never defined as an output.
- I/O4 is the RTS output from the ETRX2.

Note that if you use the command “AT&F” on the CF card, I/O1 will revert to being an input and the LED will not light up. To restore its function as a pilot light, use the command “ATS0E=00FA” (with R2xx firmware) or “ATS17=00FA” (with R3xx) followed by a reset. You may also need to do this after a firmware upgrade.

¹ Please note that the power consumption in various power modes is firmware and usage dependent. Please refer to the respective firmware manual for details.

Important Note: With hardware handshaking disabled on the ETRX2 make sure I/O2 is never defined as an output as this would drive against the CTS input and cause the supply current to increase.

5 Driver Installation and Operation

The ETRX2CF wireless mesh networking Compact Flash™ card can be operated using Windows 9x, Windows XP and Windows 2000 on any PC, or the Windows Mobile family on a PDA. Finally the ETRX2CF can also be used with Linux. The ETRX2CF-PA uses the same drivers and terminal software.

Host computer options

1. The ETRX2CF can be used with a Windows based PC or laptop which has a CF™ slot2 or by using an appropriate adapter to connect to the PCMCIA slot. After installing the Windows driver as described below, the standard Telegesis Terminal Application software (or HyperTerminal) can be used to control the ETRX2CF card. Custom application software can access the card's AT-Command interface via a virtual COM port.
2. The ETRX2CF can be used in most PDA devices running Pocket PC and Windows Mobile, however we can only give guidance on the following units: HP iPAQ 5550 running Pocket PC and the HP iPAQ HX2490 running Windows Mobile 5.0. In some instances the native drivers of the PDA are sufficient, but drivers for PocketPC, PocketPC 200x, Windows CE & CE.net on SH3, SH4, MIPS, X86, ARM, StrongARM, XScale (and other ARM cored processors) are available from our website. In the same way the Telegesis Terminal for Pocket PC demonstration software can be downloaded from our website.

To run Telegesis Terminal on a PDA, the PDA needs .NET Compact Framework 2.0, which is currently available at

www.microsoft.com/downloads/details.aspx?FamilyID=9655156b-356b-4a2c-857c-e62f50ae9a55&DisplayLang=en

To read more about the ETRX2 wireless meshing module and its command line interface please read the corresponding documentation, which can be found at www.telegesis.com.

Please Remember: In order to conserve power some operating systems power-down the entire card until the virtual COM port is opened. Therefore, if you need to save power simply close the COM port and this will prevent the Compact Flash™ card from consuming any power at all. Also, please note that after opening the COM port a short delay must be observed before trying to communicate with the ETRX2CF, to allow the unit time to boot-up. Wait until it writes an "OK" prompt before attempting to access it.

There are three options for installing the CF™ card software:

1. Install Windows drivers on a laptop PC and use the conventional Telegesis Terminal software
2. Install drivers and Telegesis Terminal for PPC on a PDA using a PC with ActiveSync
3. Install drivers and Telegesis Terminal for PPC on a PDA manually

In all cases, Telegesis Terminal or Telegesis Terminal for PPC is optional. You can choose to only install the drivers and then use your own application software.

² Fully functional CF™ host required. Basic CF™ memory card readers are not sufficient.

5.1 Installing Windows drivers and Telegesis Terminal on a laptop PC

The most common use of the ETRX2CF running under Windows is when the card has been installed in a laptop computer using a PCMCIA adapter suitable for CF™ Type II format cards.



Go to www.telegesis.com, follow the links to *Support* → *Software Download* and select “Download ETRX2CF driver for original card”, download and unzip the ETRX2CF driver package.

After insertion of the card, Windows® will prompt that new hardware has been found. When the new hardware wizard prompts you, simply select the location of the unzipped driver package.



When installing the driver under Windows XP® you will be informed that the driver has not passed the Windows XP logo test. When this happens simply press ‘continue’ to finalise the driver installation. The standard Telegesis Terminal Application software available from our web site will support the ETRX2CF card after the driver has been installed.

In order to find the identity/number of the virtual COM port assigned to the card, open the Device Manager under the Windows Computer Management screen (Figure 1) and click on the Ports (COM and LPT) section where you should find the new virtual COM port. By double clicking on the entry of the virtual COM port, you can also change the number assigned to the virtual COM port by entering the advanced setup of the device.

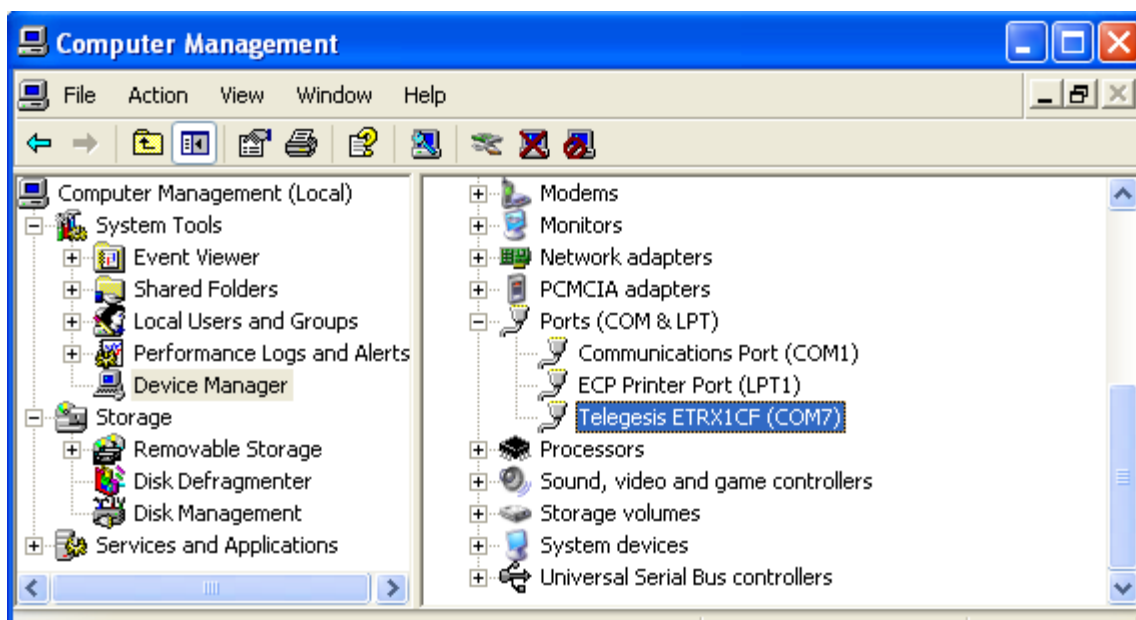


Figure 1. Windows Device Manager

Once Telegesis Terminal has been started and the correct COM port selected (Figure 2), the Terminal software can be used to control the ETRX2CF card as per the Development Kit Manual and the AT Command Manual.

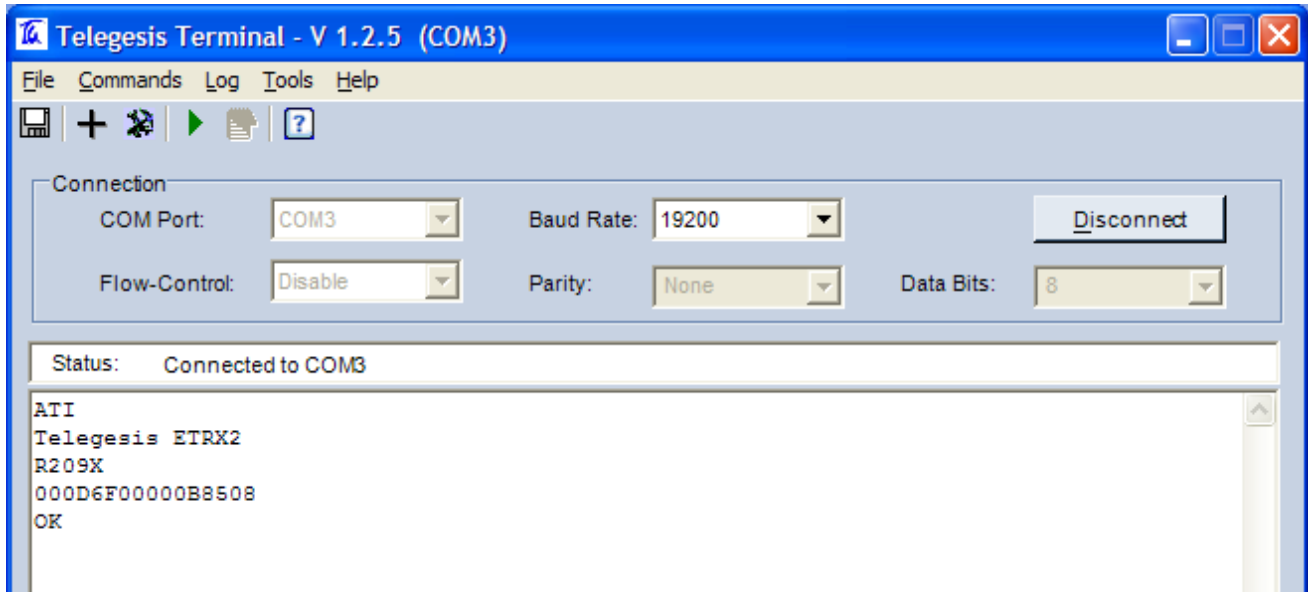


Figure 2. Telegesis Terminal

5.2 Installing drivers and Telegesis Terminal for PPC on a PDA using a PC with ActiveSync

5.2.1 Drivers only

If you do not want to use the Telegesis Terminal for PPC software, you can install just the CF™ card drivers. Go to www.telegesis.com, follow the links to *Support* → *Software Download*. Then you can select “Download Drivers for PDA only - ActiveSync” and download the driver installation file `TGserialsetup_pocketpc.exe`. Save `TGserialsetup_pocketpc.exe` on your PC in order to execute it from there.

Do not insert the ETRX2CF card into your PDA yet (it does not have the correct drivers), connect the PDA to your PC running Microsoft Active Sync and execute the provided exe file (`TGserialsetup_pocketpc.exe`).

Simply follow the instructions on the screen as shown in Figure 3.

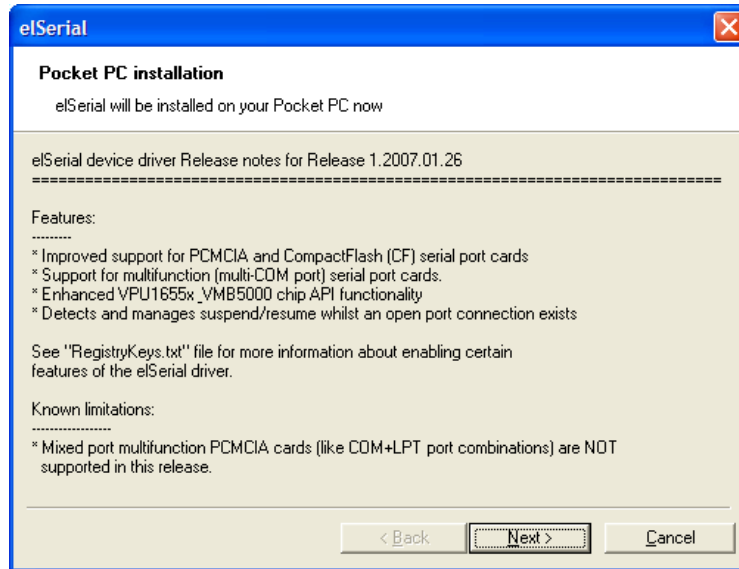


Figure 3. Pocket PC driver installation

5.2.2 Telegesis Terminal

There are two versions, according to whether you are using R2xx or R3xx firmware. Select “Download Telegesis Terminal PPC for PDA – ActiveSync for R2xx”, or “Download Telegesis Terminal PPC for PDA – ActiveSync for PRO R3xx”, download and unpack the file. Save it on your PC in order to execute it from there. Run the file setup.exe; this will install TelegesisTermPPC.msi on the PC. Connect your PDA to the PC using Active Sync and use ActiveSync to install the Software on your PDA by selecting Extra -> Software.

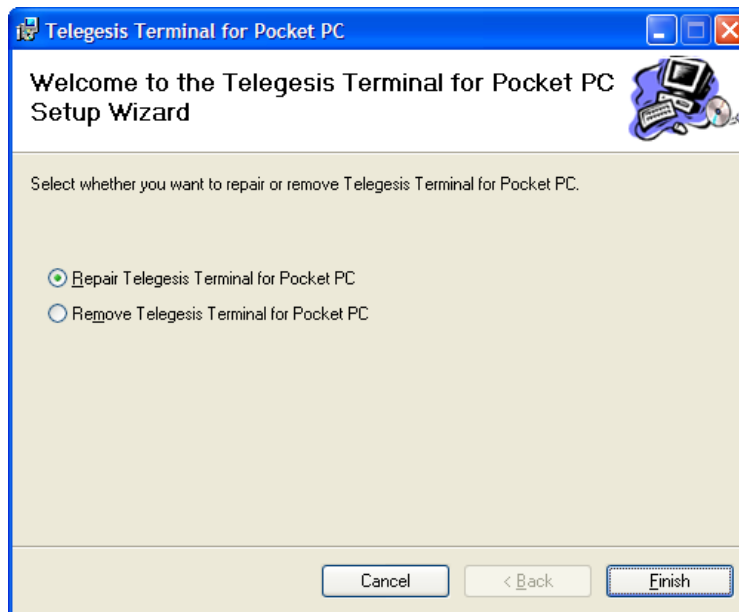


Figure 4. TelegesisTermPPC.msi

5.3 Install drivers and Telegesis Terminal for PPC on a PDA manually

5.3.1 Drivers only

Go to www.telegesis.com, follow the links to *Support* → *Software Download*. Select “Download Drivers for PDA – CAB” and download the driver file TGserial_pocketpc Cab Files.zip to your PC. Unpack it, transfer the appropriate cabinet file to the appropriate folder of your PDA, and execute it there. It is a self-extracting cabinet file.

5.3.2 Telegesis Terminal

There are two versions, according to whether you are using R2xx or R3xx firmware. Select “Download Telegesis Terminal PPC for PDA – CAB for R2xx” or “Download Telegesis Terminal PPC for PDA – CAB for PRO R3xx” and download the zip file. Unpack it, transfer it to your PDA, and execute it there. It is a self-extracting cabinet file.

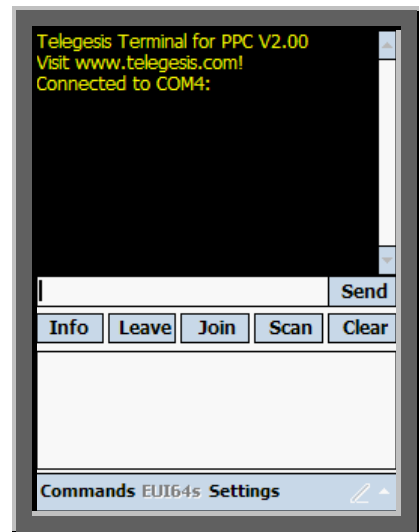
5.4 Telegesis Terminal for PPC

The Telegesis Terminal Software for Pocket PC was primarily designed to showcase Telegesis R2xx firmware on a Pocket PC. In essence, it is a miniature version of the Telegesis Terminal program for PCs, through which a user can (i) establish and manage a PAN (ii) turn on the buzzer and LEDs of other ETRX2 modules (iii) Send AT commands. Consult the AT Command Manual for full details of the command set.

Start-up

On start-up, the following screen will be displayed on the Pocket PC:

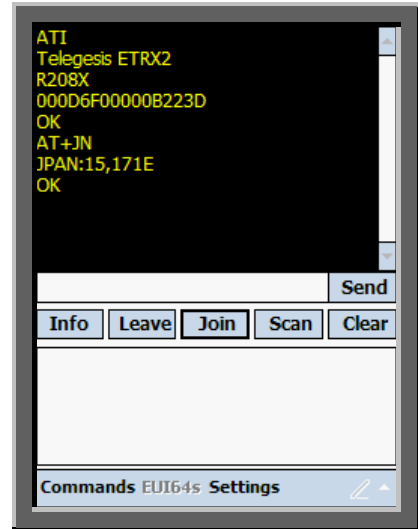
To close the window, select “Settings → Exit”



The preset buttons

INFO executes the AT+I command and gives details of the card's hardware and firmware

JOIN joins the card to an existing PAN, if one is available

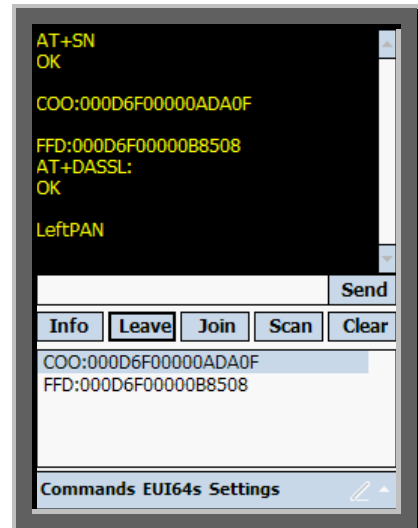


The preset buttons

SCAN shows the ID of other devices in the PAN

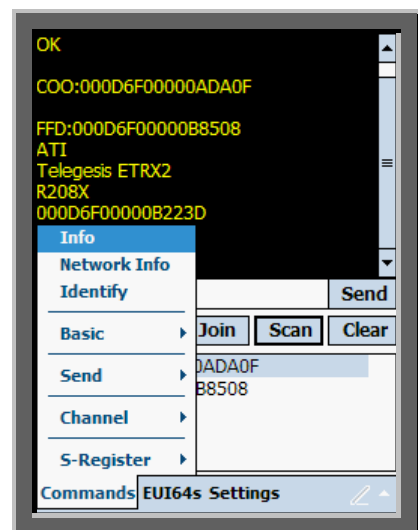
LEAVE disassociates the device from the PAN

CLEAR erases the upper window



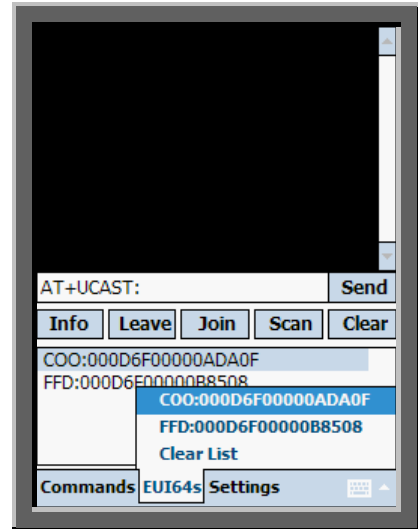
The Commands menu

This gives a shortcut to many of the AT commands for setting up the PAN and sending data. See the AT Command Manual for a full description of the various commands and registers.



The EUI64s menu

When a command such as AT+UCAST has been selected from the Commands menu, the required EUI64 parameter to specify the destination node is appended to the command by selecting it from the EUI64s menu. This menu becomes populated with up to 10 EUI64s at the time one or more remote devices are reporting in with their IDs, which for example can be triggered using the AT+SN command (Scan Button).



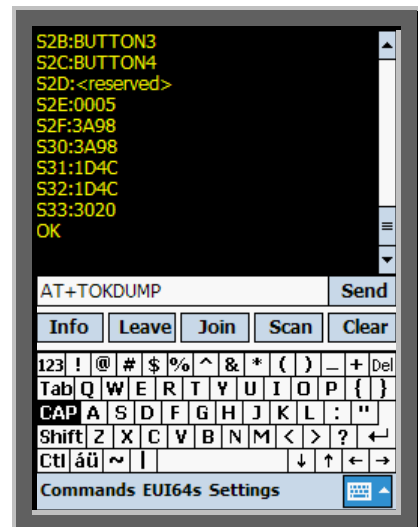
The Settings menu

- This gives access to the serial port parameters
- "About" shows the version number of the Telegesis Terminal for Pocket PC software
- "Exit" closes the Terminal



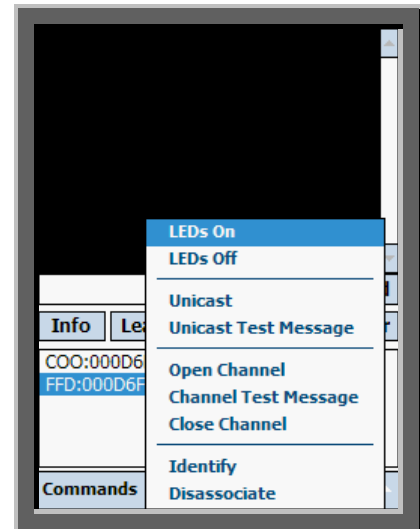
The Command window

The full set of AT commands is available by typing them into the command window



The Device List

Holding down the PDA's stylus on an entry in the Device List (below the preset buttons bar) is the equivalent of "right-clicking" with a PC's mouse. It brings up a further menu of AT commands that are specific to the selected node.



6 Custom Application Design for Mobile Devices

As a starting point for custom application development, the Visual Studio 2008 sourcecode (written in Visual Basic) for the Telegesis Terminal for Pocket PC can be provided on request, on an unsupported basis.

When developing a custom application for mobile devices please note that some operating systems require the virtual COM port to be closed before the device enters sleep mode and to be re-opened upon wakeup. This mechanism has to be handled by the application and is currently not supported by Telegesis Terminal for Pocket PC.

7 Firmware upgrades

The firmware which is loaded onto the integrated ETRX2 module can be upgraded over the air using the Ember bootloader as described in the Development Kit manual. Also a CF™ card connected to a laptop via a PCMCIA adaptor can be upgraded using Telegesis Terminal as described in the Development Kit manual. Note that there are complications if you wish to bootload new firmware using Windows Vista. This is because you need to change the CF card's baud rate to 115200 to operate the bootloader; under Vista you must click the "Disconnect" button on Telegesis Terminal before you can change the baud rate, which will usually power down the CF card and terminate the bootloader. Setting the correct baud rate before issuing the "AT+BLOAD" command should solve the problem but the ETRX2's baud rate must also be altered by setting the correct S-register.

Alternatively, access to the SIF programming interface is possible by removing the antenna cover of the ETRX2CF wireless mesh networking Compact Flash™ card. It is not permanently attached.

Via the SIF interface it is also possible to upgrade the card with the Ember EZSP interface.

8 Custom Firmware Development

If you intend to develop custom firmware to go on to the ETRX2CF you need to contact Ember to obtain access to their suite of development tools and their stack. The CF card contains an ETRX2 module based on the Ember EM250 and a CF-to-serial bridge chip. The ETRX2 communicates via its serial port, so the user's firmware must use the UART of Serial Controller 1. The nRTS and nCTS lines are connected to the CF bridge chip. The LED on the CF card is driven from ETRX2 pad I/O1, which is EM250 pin GPIO14.

In order to download custom firmware onto the ETRX2, the Ember bootloader can be used or alternatively the ETRX2CF's SIF programming interface can be directly connected to the Ember InSight Adaptor as shown in Figure 5. The SIF interface allows real time debugging of custom applications using Ember's development toolchain.

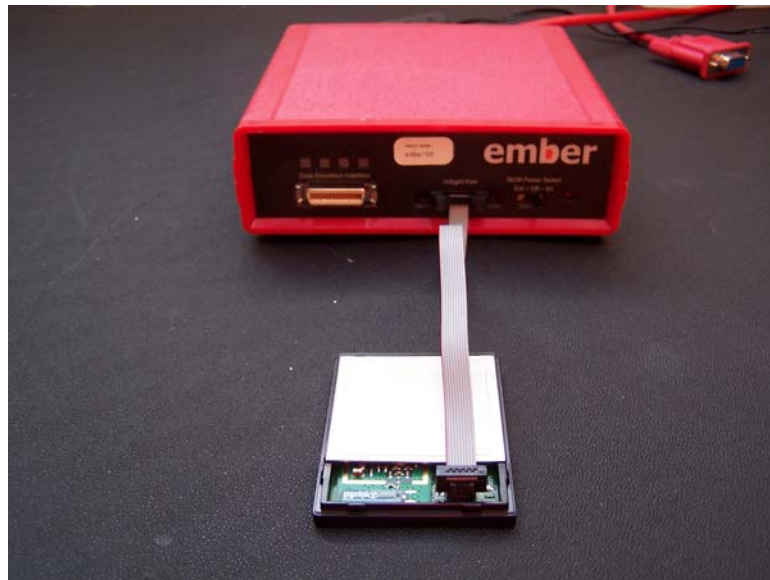


Figure 5. CF™ card and Insight Adaptor

Please Note: Whilst programming the ETRX2CF using the Ember InSight Adaptor or InSight USB link, the card should be powered from a suitable PC or PDA and the power select switch of the InSight Adaptor should be set to "Ext".

9 Ordering Information

Ordering/Product Code	Description
ETRX2	Module with: <ul style="list-style-type: none"> • AT Style Command Interpreter • Integrated 2.4GHz Antenna • <u>No</u> Harwin Connector
ETRX2CF	Compact Flash™ Card <ul style="list-style-type: none"> • Type II Compact Flash™ Card Design • AT Style Command Interpreter • Integrated 2.4GHz Antenna • Based on the ETRX2
ETRX2HR	Module with: <ul style="list-style-type: none"> • AT Style Command Interpreter • Hirose U.FL Antenna Connector • <u>No</u> 2.4GHz Antenna • <u>No</u> Harwin Connector
ETRX2USB	USB Stick: <ul style="list-style-type: none"> • AT Style Command Interpreter • Integrated 2.4GHz Antenna • Based on the ETRX2

Notes:

- Customers' PO's must state the Ordering/Product Code.
- There is no "blank" version of the ETRX2 Module available. All Modules carry both the Ember Stack and the Telegesis AT style Command Layer. Where customers wish to add their own firmware they can erase and write it to the flash memory of the Ember EM250.
- Please contact Telegesis if you require additional AT style commands or specific integration assistance.

Table 4. Ordering information

10 Trademarks

All trademarks, registered trademarks and products names are the sole property of their respective owners.

CompactFlash™ is a trademark of SanDisk Corporation.

11 Disclaimer

Product and Company names and logos referenced may either be trademarks or registered trademarks of their respective companies. We reserve the right to make modifications and/or improvements without prior notification. All information is correct at time of issue. Telegesis (UK) Ltd does not convey any license under its patent rights or assume any responsibility for the use of the described product

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13 References

Telegesis - www.telegesis.com

Ember - www.ember.com