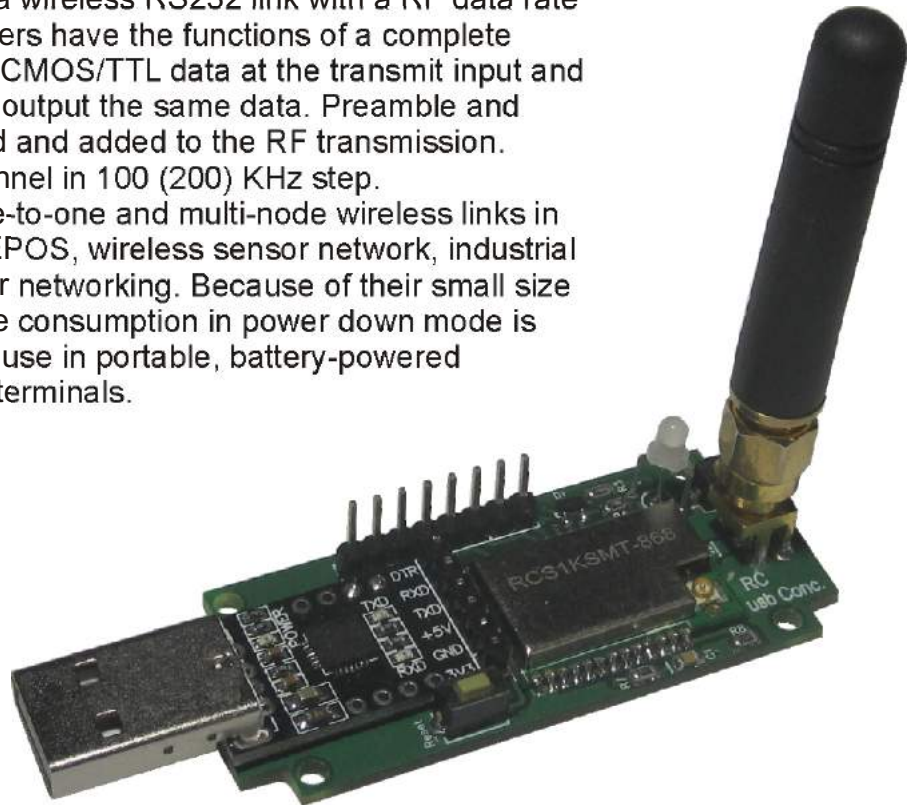


868MHz Multichannel Radio Modem based on RadioControlli RCS1KSMT-868 device

The RCQ2-868-DK is a high performance wireless modem providing a reliable low cost serial data communications link that can be used for many data communications applications at an exceptionally competitive price. The modem operates in the ISM 868 MHz band. The RF modem is very simple to use and provides a wireless RS232 link with a RF data rate of up to 100 kbps. The transceivers have the functions of a complete radio modem and simply require CMOS/TTL data at the transmit input and the corresponding transceiver(s) output the same data. Preamble and CRC are automatically generated and added to the RF transmission. The RCQ2-868 can use any channel in 100 (200) KHz step. Possible applications include one-to-one and multi-node wireless links in applications including security, EPOS, wireless sensor network, industrial process monitoring and computer networking. Because of their small size and low power requirements, (the consumption in power down mode is $< 2\mu\text{A}$) this module is a ideal for use in portable, battery-powered Applications such as hand-held terminals.



Applications :

- Wireless security systems
- Home and building automation
- Automatic Measure Reading
- Industrial Control and Monitoring
- Wireless Sensor Network
- EPOS Terminal

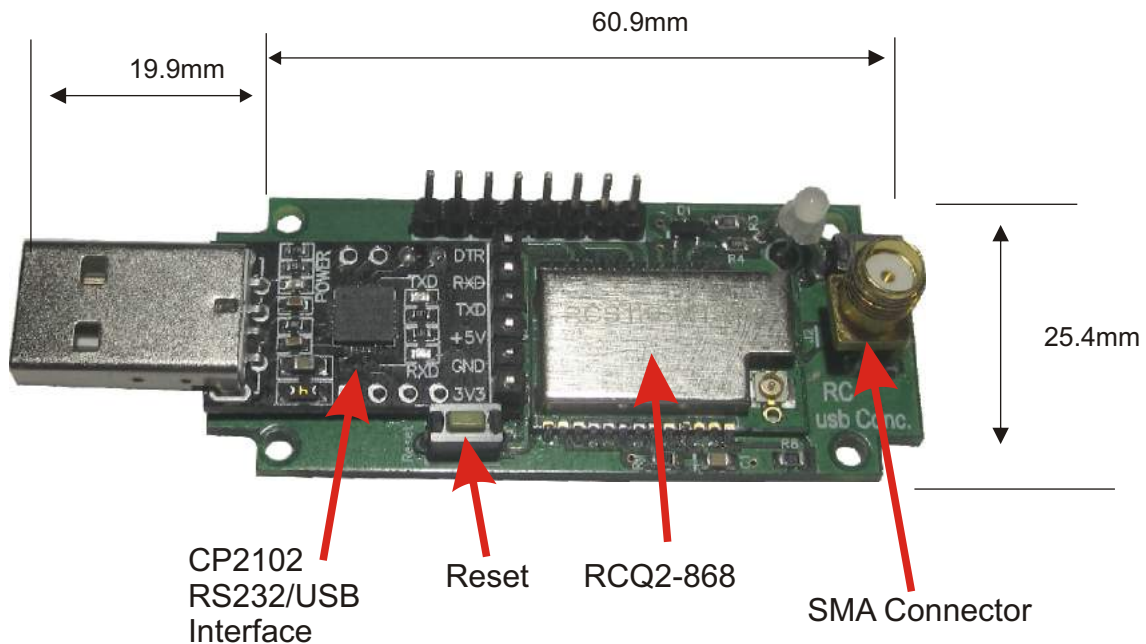
Feature :

- Radio Modems Application
- RF Power until +20dBm (100mW)
- RF Data Rate to 100Kbps
- RF Channel Selectable
- Serial Data Interface with Handshake
- Host Data Rate up to 38400 Baud
- Very Stable Operating Frequency

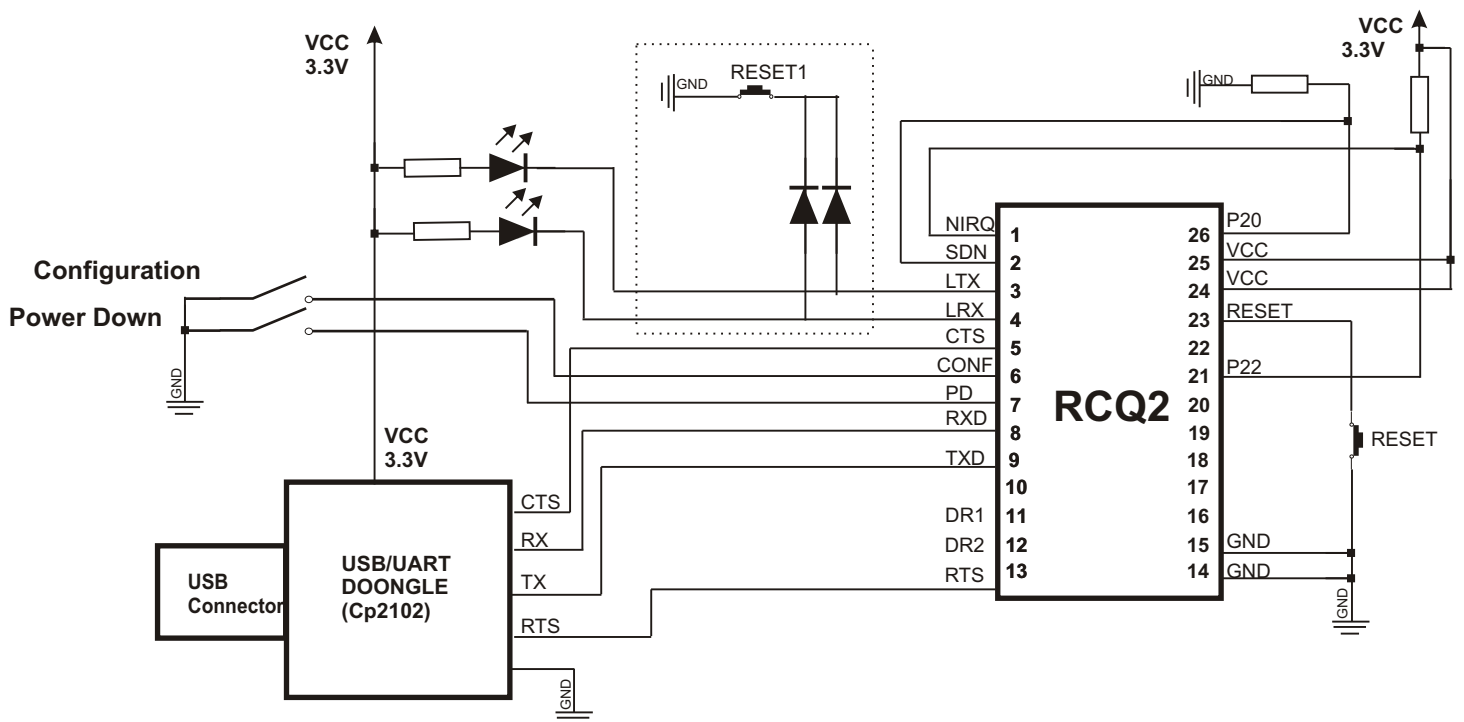
Operating Mode :

- One to One
- One to Many
- Broadcast
- Many to One

1.0 Description and Mechanical dimensions



2.0 Electrical schematics



With RESET / RESET1 is possible to active the bootloader inside

2.0 Technical Specifications

Technical Characteristics

Characteristics		MIN	TYP	MAX	UNIT
V _{CC}	Supply Voltage	2.2	3	3.6	VDC
I _s	Supply Current (RX mode)		20		MA
I _s	Supply Current (TX mode / +20dBm)		85		mA
I _s	Supply Current (TX mode / 0 dBm)		10		mA
F	RX Frequency Range CEPT/ERC/REC 70-03	868		870	MHz
P _o	RF Output Power	1		+20	dBm
S	RF Sensitivity (1.2 Kb/sec Data Rate)		-121		dBm
D	Frequency Deviation		+ - 50		KHz
M	GFSK Manchester encoded data rate		100		Kbps
T _{OP}	Operating Temperature Range	-10		+70	°C

3.0 Application

The RCQ2-868-DK Radio Modem has applications in many areas where reliable half duplex communications are required over ranges up to 200 meters (with the maximum RF Power is possible to reach up to 400-500meters).

The crystal controlled narrow band design, in the embedded RCQ2-868-DK device, gives reliable performance within the 868 MHz band.

The addressing protocol employed enables many different configurations such including:

one-to-one operation: for point to point data communication;

broadcast operation: where a single master address many RCQ2-868-DK modules concurrently (using many RCQ2-868-DK modules set to the same address);

one-to-many: a network consisting a master and many slaves (the receivers all have the same address)

many-to-one: where the transmitters all send to a single receiver address

Since each RCQ2-868-DK can contain a unique address, multiple RCQ2-868-DK network can co-exist in the same area.

4.0 Operation Mode

The RCQ2-868-DK must be put into standby mode by taking the PD JUMP J6.

The size of RF data packets are set in configuration mode.

If fewer bytes are received by the RCQ2-868-DK module than the preset size, then after 10ms from the last byte received from the host, the RF packet will be processed (expanded to meet the preset packet size) and transmitted.

The RF data packet size must be set the same for transmitter and receiver, otherwise the received packets will be discarded.

In order to optimize data rate, in a point-to-point configuration where data is mostly being sent in one direction, the packet size for one data direction can be set to the maximum size, however the reverse direction may be set to a smaller packet size, to implement an acknowledge reply for example.

The RTS pin overrides the timeout value. If a short data packet is sent, RF transmission will start as soon as the RTS pin is taken 'high' after the last byte is sent to the module.

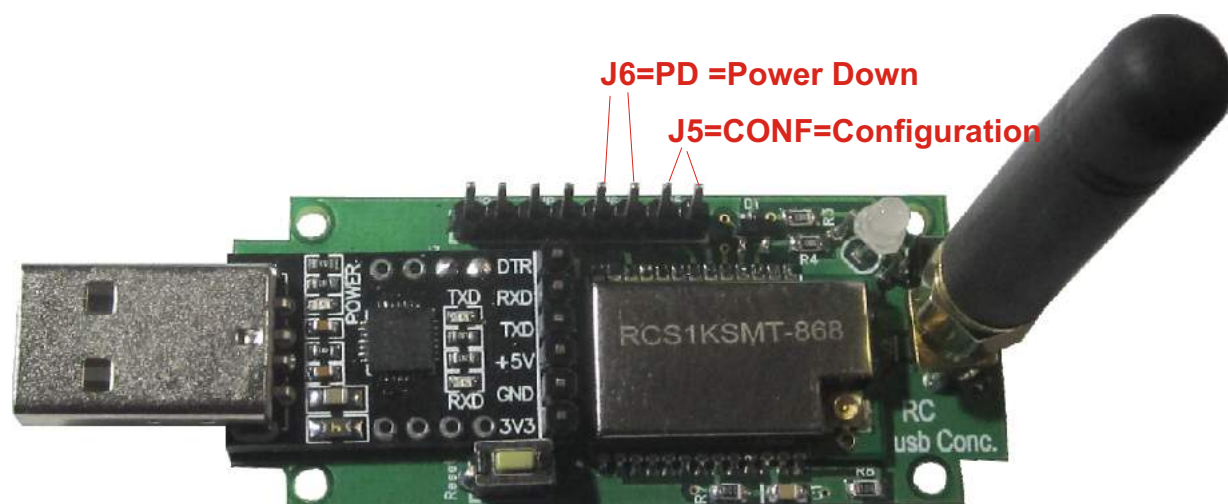
The RCQ2-868-DK contains an on-board data buffer equal to two data packets.

Therefore if RTS is asserted (then the host is unable to receive data) the RCQ2-868-DK will store a max of two data bytes, all further data packets received will be discarded.

No RF packets will be received by the module when it is in power down mode.

Each RCQ2-868-DK has its own preset address. This is set during configuration. Any data received is examined and the address header, embedded within the data packet, is compared with the RCQ2-868-DK address. Only data received with matching address will be processed and output to the host, all other data will be discarded.

All RCQ2-868-DK device are shipped with a default address of 7E7E7E7E.



5.0 Configuration Mode

Byte	Name	Description	Default Value (HEX)
0		MSB	7E
1	Destination Address		7E
2			7E
3		LSB	7E
4	RCQ2-868 Address	MSB	7E
5			7E
6			7E
7		LSB	7E
8	RF CHANNELS	75 = (868.2MHz)	75 = (868.2MHz)
		76 = (868.4 MHz)	
		77 = (868.6 MHz)	
		78 = (868.8 MHz)	
		79 = (869.0 MHz)	
		7A = (869.2 MHz)	
		7B = (869.4 MHz)	
		7C = (869.6 MHz)	
		7D =(869.8 MHz)	
		7E =(870.0 MHz)	
9	RF TX POWER	00 = 1 dBm (1.25mW)	00 = 1 dBm
		01 = 2 dBm (1.58mW)	
		02 = 5 dBm (3.16mW)	
		03 = 8 dBm (6.3mW)	
		04 = 11 dBm (12.5mW)	
		05 = 14 dBm (25mW)	
		06 = 17dBm (50mW)	
		07 = 20dBm (100mW)	
10	TX DATA PACKET SIZE		1E (30 bytes)
11	RX DATA PACKET SIZE		1E (30 bytes)

The RF Channel is calculated in this mode:

868 MHz working frequency : Configuration value (decimal) = [(desired RF frequency / 2) - 422.4MHz] * 10

The Configuration pin (Pin 6) must be low (ground) to set up the RCQ2-868-DK device.

If the Configuration pin is still low at the end of the configuration then the module will send the current configuration back to the host.

To retrieve the current configuration without changing any options the host can send a single byte to the module and wait for the response.

The RCQ2-DK module will accept a short configuration after a 10ms timeout after the last byte sent to the module, or when the RTS pin goes high.

This allows for the host to easily change the destination address of the RF data packet, thus enabling one RCQ2-868-Dk to send individual data to several different recipient modules.

RF data packets received by the RCQ2-868-DK with the embedded destination address which matches the RCQ2-868-DK address will be accepted, processed and passed to the host, all of the RF data packets will be ignored. When configuring the destination or RCQ2-868-Dk address an incorrect number of bytes for an address will leave the current address unchanged. An invalid Transmitter Power or Packet Size setting will leave the current setting unchanged.

WARNING

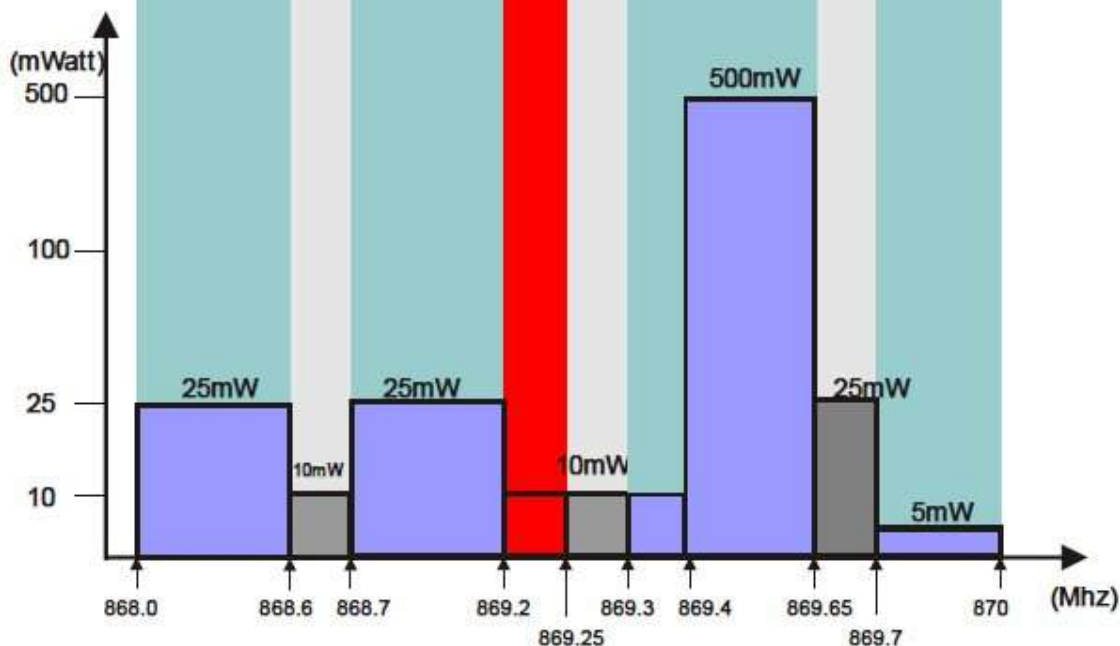
RF Channel frequency for default is fixed at 868.2MHz (parameter=75) .

RCQ2-868-DK max power is 20dBm (100mW)

It is recommended use this device in accordance with the CEP/ERC REC 70-03 (below band plan).

CEPT / ERC Rec 70-03 (869 MHz BAND PLAN)

Application	SRD	Alarms	SRD	Social	Alarms	SRD	SRD	Alarms	SRD
Channel Spacing	No spacing	25KHz	No spacing	25KHz	25KHz	25KHz	25KHz	25KHz	No spacing
Duty Cycle	< 1%	<0.1%	< 1%	<0.1%	No limit	< 10%	< 10%	< 10%	Up to 100%



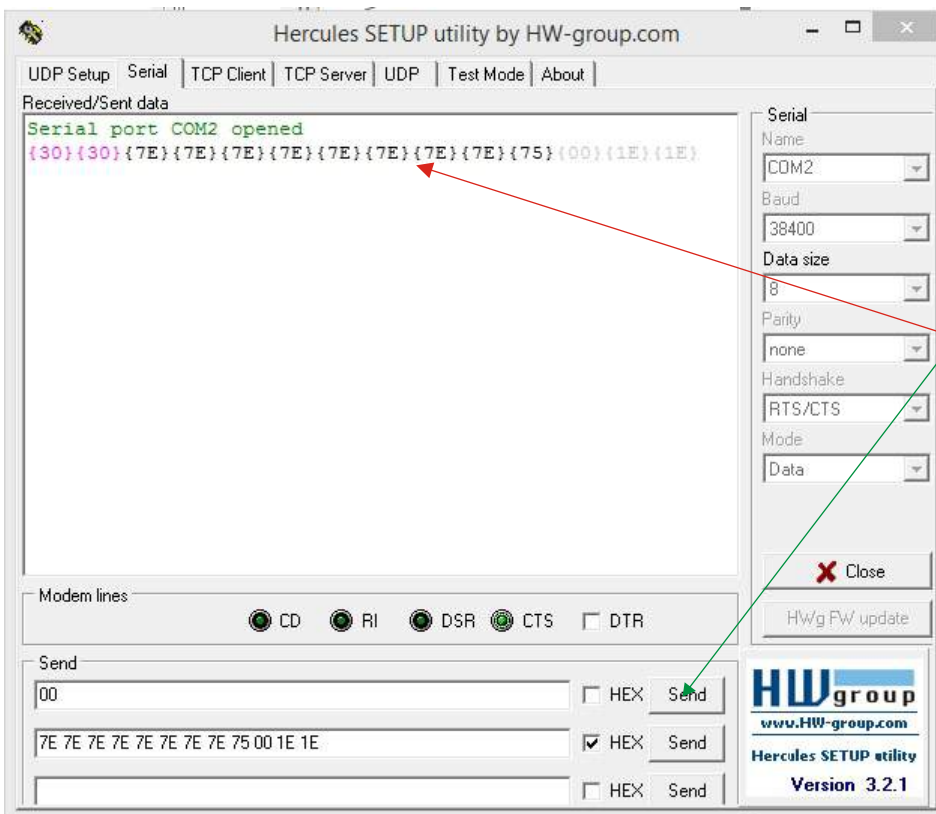
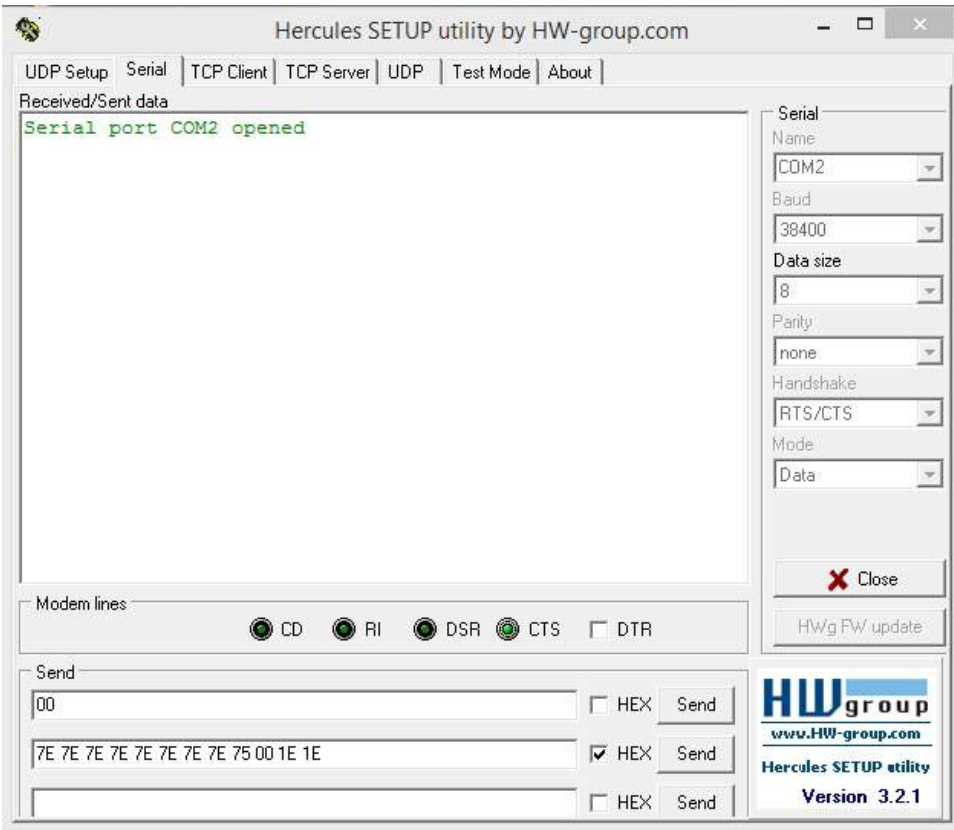
6.0 Example of Configuration

The Configuration pin (Jump J5 done) to enter into configuration mode.

Software used : **Hercules SETUP utility** (free use)

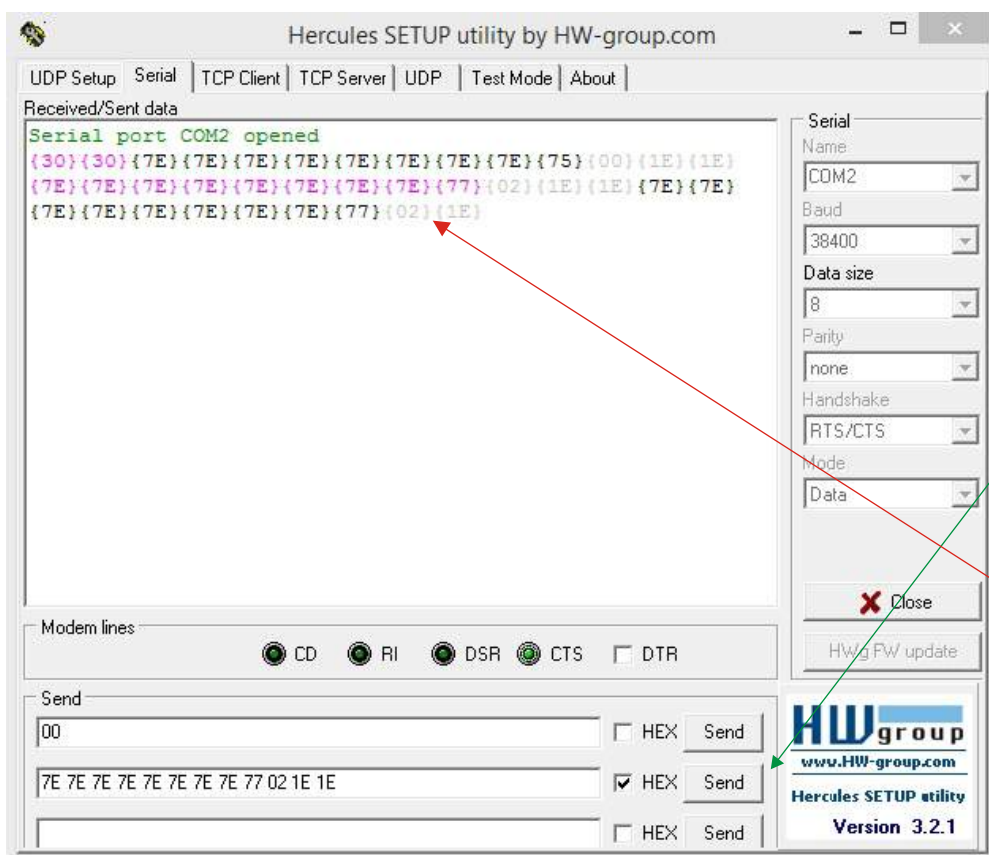
Open the serial port with this parameters

Set the Hercules software to receive hexadecimal character (press the right mouse button).



We hold this button, in this mode we sent "00" only 2 character

The module answer sent your configuration default parameters: 7E 7E 7E 7E 7E 7E 7E 7E 75 00 1E 1E



We hold this button, in this mode we sent the new Configuration String 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 77 02 1E 1E (hexadecimal string) We have changed the parameters in red :

77 Frequency = 868.6MHz

02 RF Power Output = 5dBm

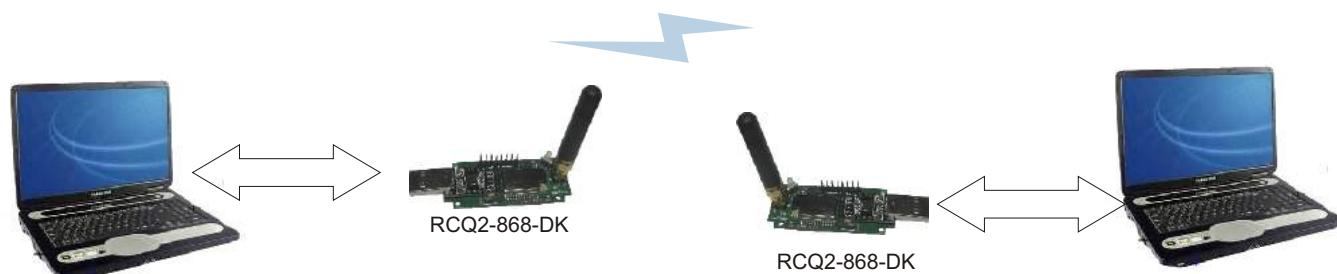
The module answer confirming the new configurazion :

7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 77 02 1E 1E

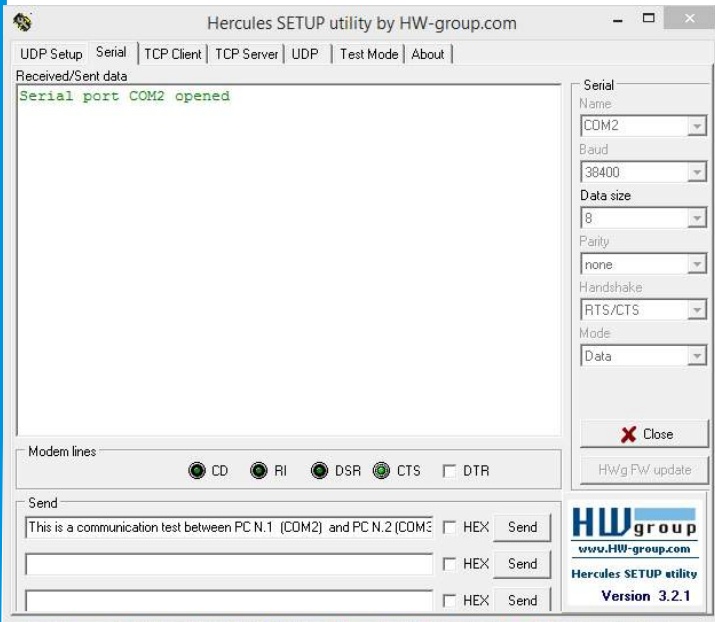
For operation mode it is necessary to remove jump J5..

7.0 Example of Operation Mode (One to One)

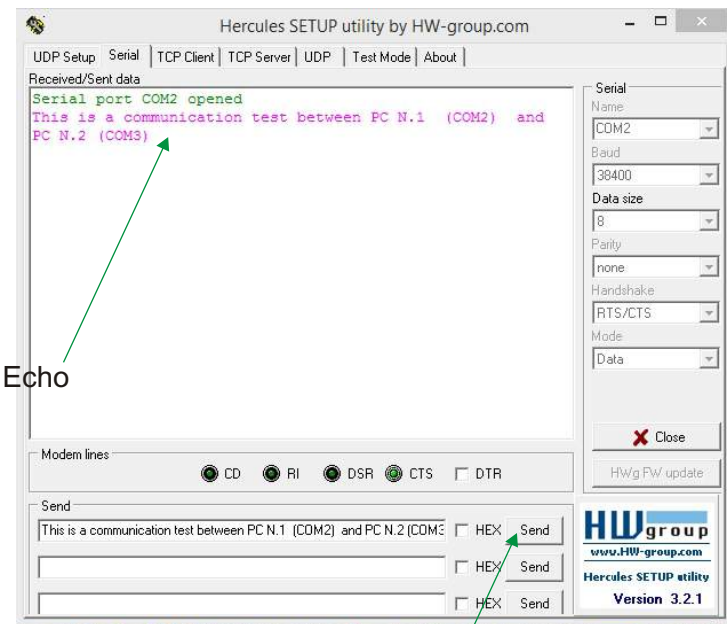
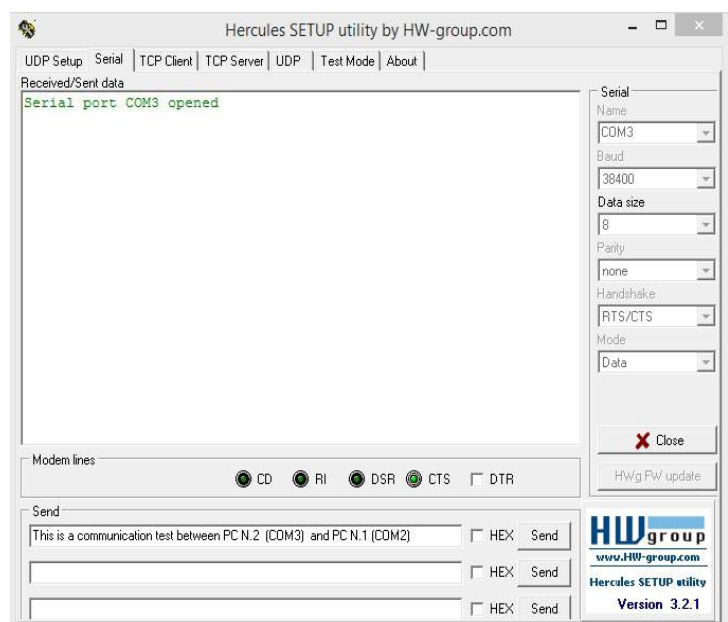
This example is performed according to the following schematics and using the software Hercules SETUP utility (free use).



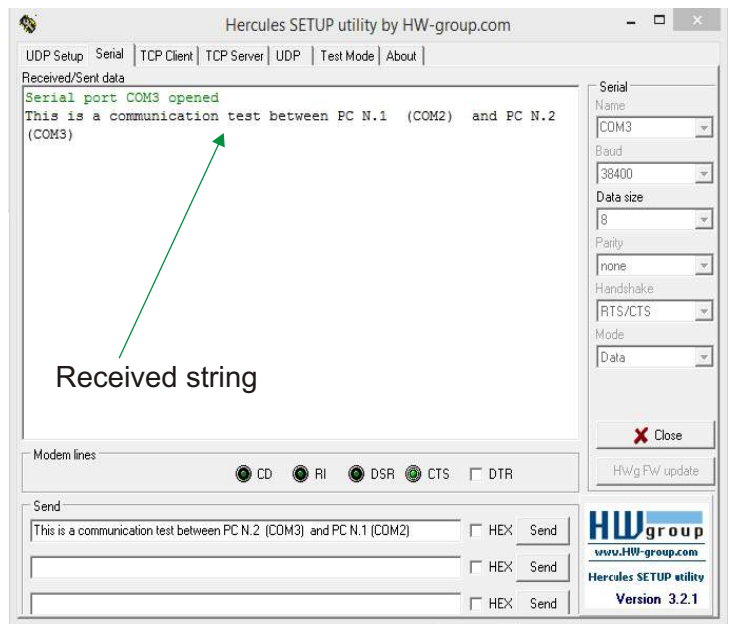
Personal Computer N.1 (COM2)



Personal Computer N.2 (COM3)



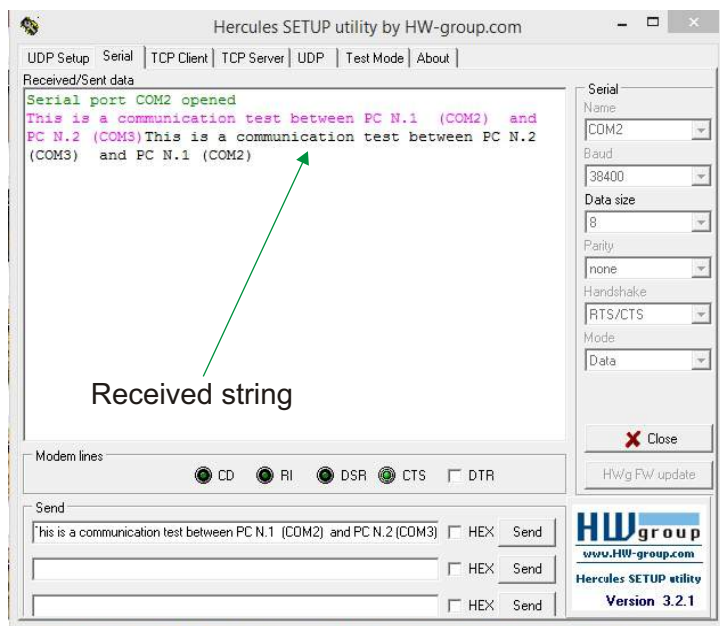
Echo



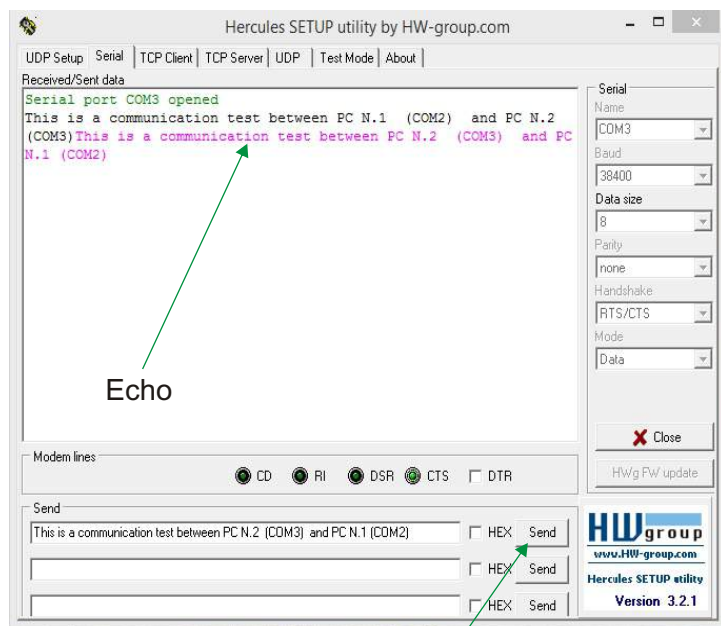
Received string

We hold this button, in this mode we sent the following string **"This is a communication test between PC N.1 (COM2) and PC N.2 (COM3)"**

Personal Computer N.1 (COM2)



Personal Computer N.2 (COM3)

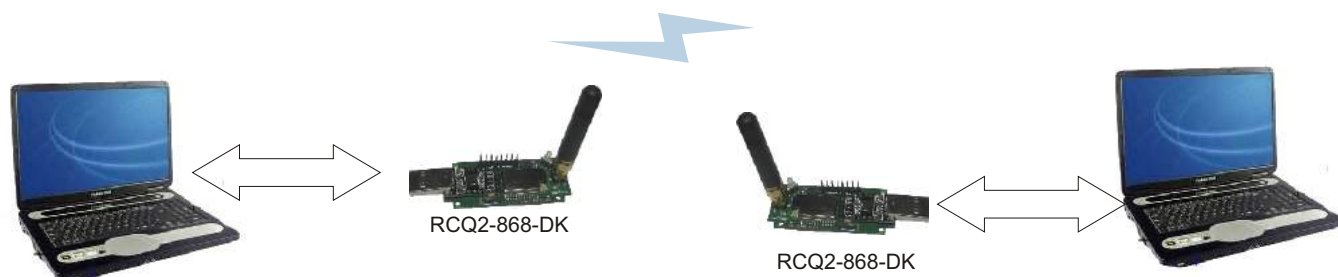


We hold this button, in this mode we sent the following string:

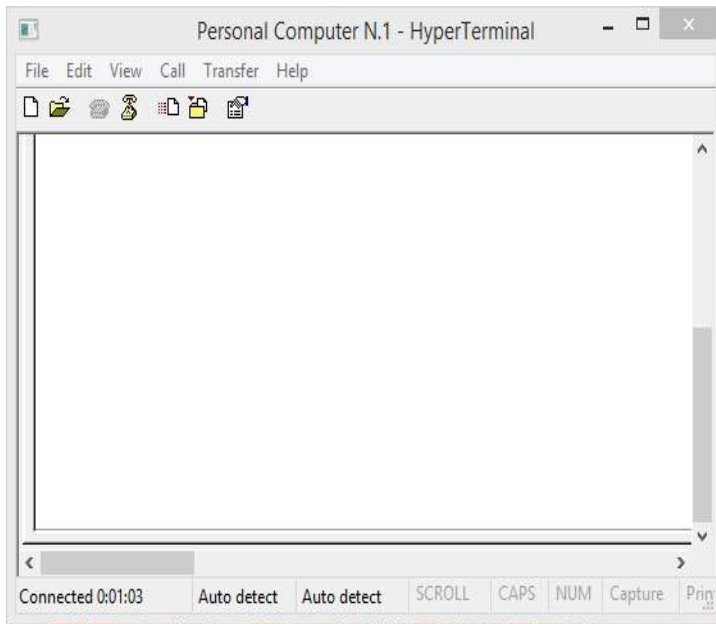
“This is a communication test between PC N.2 (COM3) and PC N.1 (COM2)”

8.0 Example of wireless transfer files (One to One)

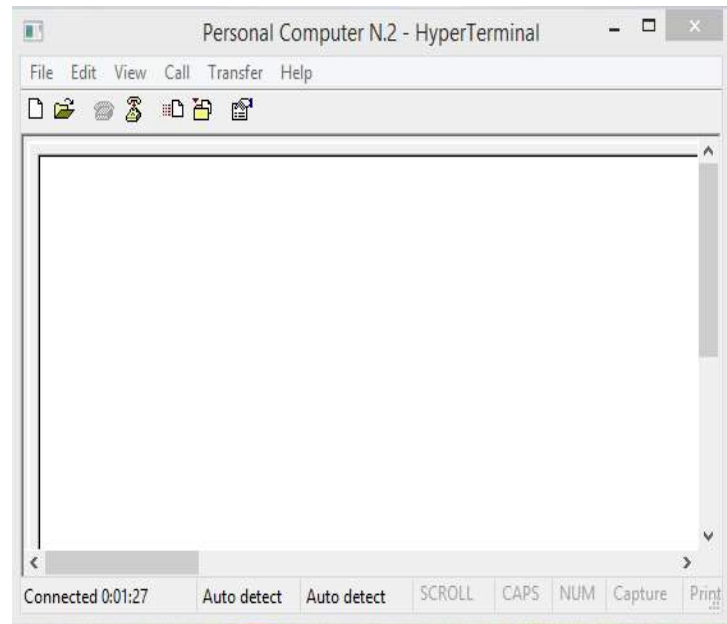
This example is performed according to the following schematics and using the Hyperterminal software (free use).



Personal Computer N.1

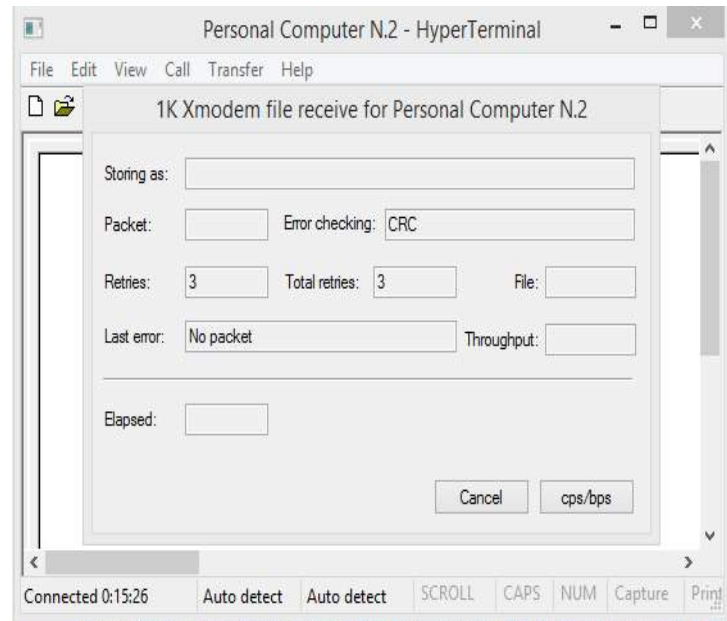
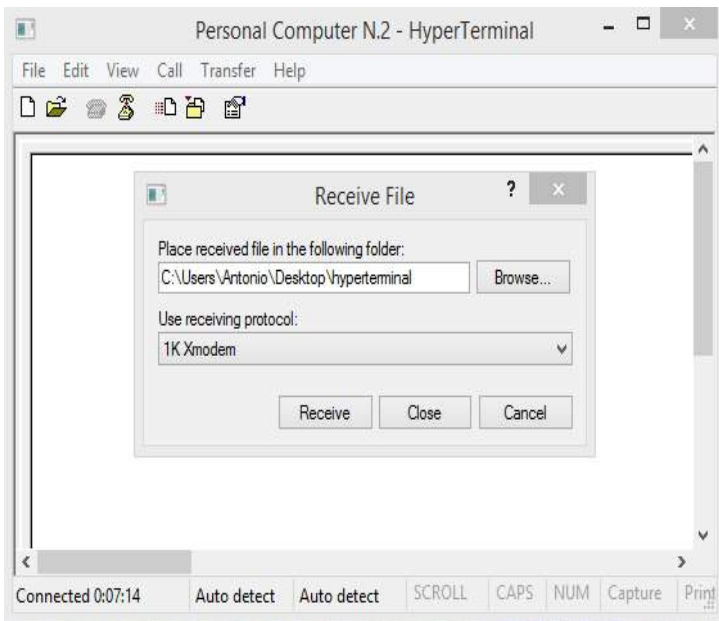


Personal Computer N.2



Serial Port Configuration = 38400, 8, N, 1, Hardware

Personal Computer N.2 - Receiver Setting

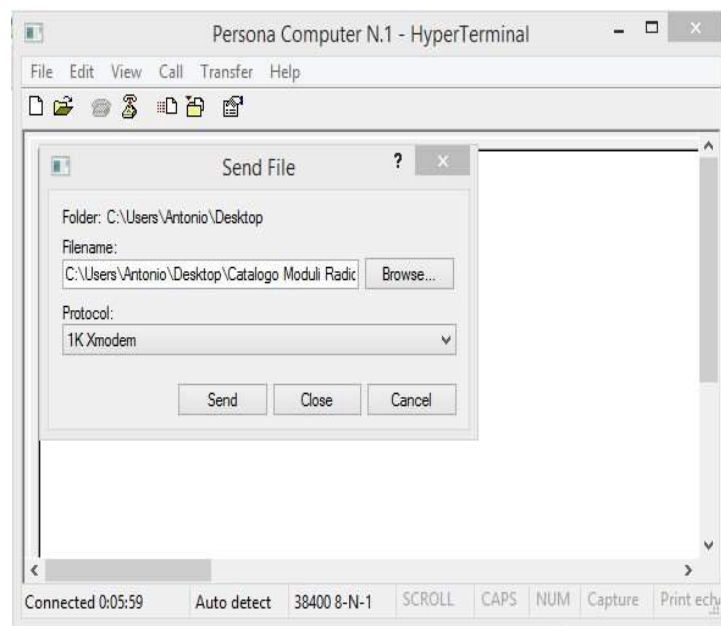
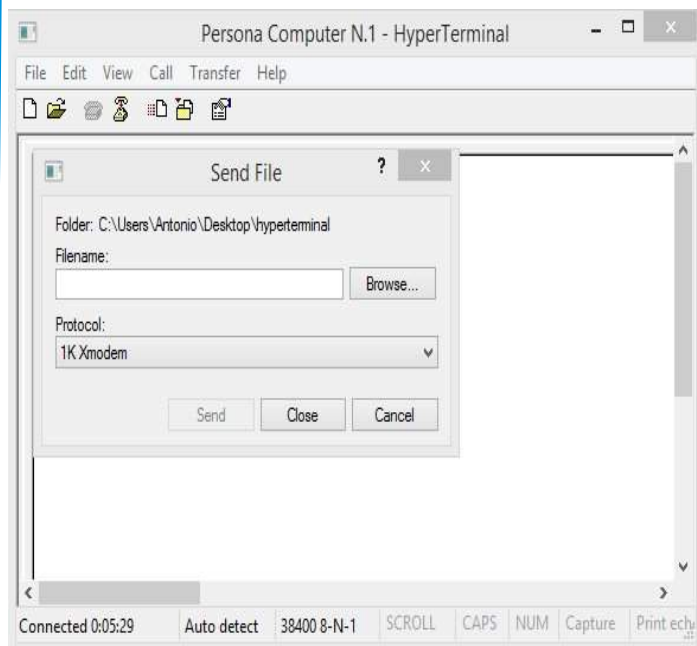


Menù Transfer ----> Receive Files -----> Select 1K Xmodem protocol

Press "Receive" button and insert file name.

The Personal Computer N.2 is ready to receive files from Personal Computer N.1

Personal Computer N.1 - Transmitter Setting



Menù Transfer ----> Send ----> Select 1K Xmodem protocol

Press "Send" button and choose the file to be transmitted.

In the picture below the Personal Computer N.1 is transmitting the file denominated : Catalogo Moduli Radio_1.pdf and the Personal Computer N.2 is receiving this file.

