'STORM' RADIO MODEM RS232 / USB

- Selectable Host Baud Rate 1200bps – 38.4Kbps

- USB or RS232 Cable Replacement

- Range up to 150 Metres

- European Operation 433 or 868MHz

- Narrow Band RF

- RF Data Rates to 100 kbps

- One to Many, Many to One

- 12V or USB Power

- Conforms to ETSI 300-220

- Requires no radio licence to operate

- ABS enclosure

Description

The RF Solutions STORM radio Modem is a simple to use and very versatile device. It can operate as a one to one cable replacement link, in multiple master/slave arrangements or in broadcast modes. The Small modem come in an ABS enclosure with external antenna and easily achieves a range of 150m.

Multiple connection options allow it connect to a PC or act as an M2M link via USB or RS232 with power though the data cable or via an external 12V DC supply.

Operation Modes

One-to-One operation; for point to point data communication

Broadcast Mode ; where a single master address many Storm Modem Modems concurrently. (using many Storm Modem Modems 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.

Because each Storm Modem can contain a unique address, multiple Storm Modem networks can co-exist in the same area.

Ordering Information

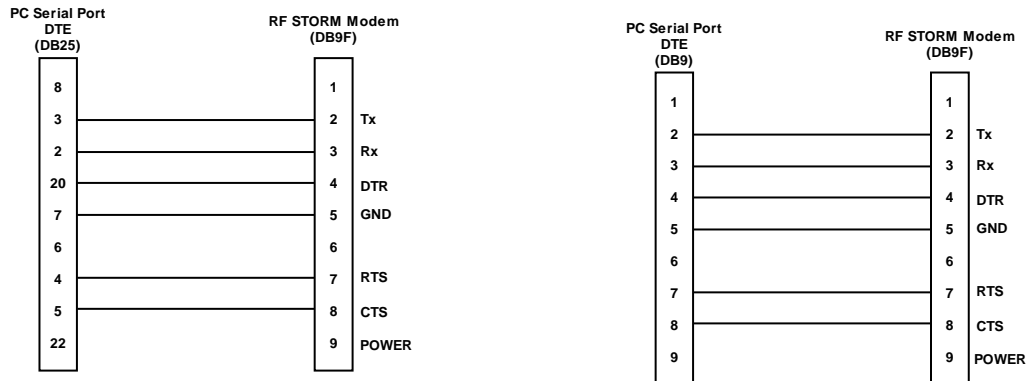| Part Number	Description
STORM-433F	Modem RS232, 433MHz 150Metres
PSU-CAB666	Serial cable and power supply (pin 9 on serial cable powers the modem)

'STORM' RADIO MODEM RS232 / USB

Connections and Set-up

USB Connector
The Storm Modem interfaces to the host computer via a USB Type A connector.

RS232 Connector
The RF Modem interfaces to the host computer via an RS232 connection using a standard DB9 connector with pin out as shown in the diagram below.

PC Serial Port DTE (DB25)		RF STORM Modem (DB9F)			PC Serial Port DTE (DB9)		RF STORM Modem (DB9F)	
8		1			1		1	
3		2	Tx		2		2	Tx
2		3	Rx		3		3	Rx
20		4	DTR		4		4	DTR
7		5	GND		5		5	GND
6		6			6		6	
4		7	RTS		7		7	RTS
5		8	CTS		8		8	CTS
22		9	POWER		9		9	POWER

Power supply
For USB comms, power is automatically obtained from the USB connection. (No external power required)
For RS232 comms external power is required. Power is provided by either J6 (as shown above) or by a special serial cable RFS part number PSU-M433UK

The PSU-M433UK power supply and serial cable supplies pin 9 of the 9 way Sub D connector with 12 Volts DC.

Serial Data
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

OPT 1	OPT 2	Host Baud Rate
Open	Open	4,800
Open	Fitted	9,600
Fitted	Open	19,200
Fitted	Fitted	38,400

(Factory Setting 19,200Kbps)

Status LED's
The RF Modem circuit board has three LED's, representing the following signals:

- **PWR** – Power on
- **Tx** – Transmitting data
- **Rx** – Receiving data

Configuration

The configuration of the STORM modem may be changed by placing it in Configuration mode, then sending a set of configuration data bytes to the module on the Tx pin.

To place the STORM modem in Configuration mode the user needs to send "+++" (three plus characters) within the 10mS timeout for each character. The STORM responds by returning it's current set of Configuration data bytes. The STORM Modem is now on Configuration mode.

To exit Configuration mode the user needs to send "---" (three minus characters) within the 10mS timeout for each character. The STORM will not return a response. The STORM is now in data mode.

Byte	Name	Description	Default Supplied Value
0		MSB	7E hex
1	**Destination Address**		7E hex
2			7E hex
3		LSB	7E hex
4		MSB	7E hex
5	**STORM Address**		7E hex
6			7E hex
7		LSB	7E hex
8	**RF Channel**	100 kHz step offset from 422.4MHz	107 (433.1MHz)
9	**Tx Power**	0 = -10dBm	0 (-10dBm)
		1 = -2dBm	
		2 = +6dBm	
		3 = +10dBm	
10	**Tx data packet size**	3 – 31 bytes	30 bytes
11	**Rx data packet size**	3 – 31 bytes	30 bytes

The RF Channel is calculated as:
433 MHz working frequency: Config value (decimal) = (desired RF frequency - 422.4MHz) * 10
868 MHz working frequency: Config value (decimal) = [(desired RF frequency / 2) - 422.4MHz] * 10

Please Note, the calculated value must be converted into hexadecimal format.

While the STORM is in configuration mode it will send the current configuration back to the host each time a data packet is received. To retrieve the current configuration without changing any options the host can send a single byte to the modem and wait for the response.

It is not necessary to send all configuration bytes to the modem, but all data sent must be valid. For example to change the destination address the host may just send four bytes. Configuration data excluded from the end of the data stream will be unchanged. The STORM modem will accept a short configuration when a 10ms timeout after the last byte sent to the module expires. This allows for the host to easily change the destination address of the RF data packet, thus enabling one STORM to send individual data to several different recipient modules.

A destination address of 00000000 will reset the STORM to the default settings shown above.
RF data packets received by the STORM with the embedded destination address which matches the STORM address will be accepted, processed and passed to the host, all of the RF data packets will be ignored.

When configuring the destination or STORM 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.

Operational notes

RF data packets received by the Storm Modem with an embedded destination address which matches the Storm Modem address will be accepted, processed and passed to the host, all other RF data packets will be ignored.

The size of RF data packets is set during configuration. If fewer bytes are received by the Storm Modem than the preset size, then after 10ms from the last byte received from the host, the RF packet will be processed and transmitted anyway, (the data is expanded to meet the preset packet size).
The RF data packet size must be set the same for transmitter and receiver; otherwise the received packets will be discarded.
In order to optimise 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 Storm Modem 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 Storm Modem will store a max of two data packets (2 x 31 bytes), all further data packets received will be discarded.

Each Storm Modem 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 Storm Modem address. Only data received with matching address will be processed and output to the host, all other data will be discarded.
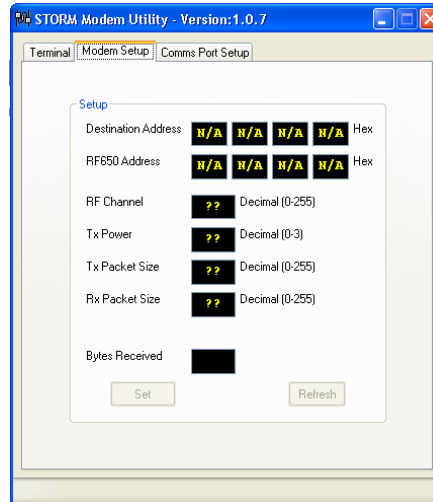
STORM Configuration Utility

The STORM modem can be easily configured using the **STORM Configuration Utility** available from the RF Solutions Website.

1.1 Technical Specifications

Absolute Maximum Ratings

Operating temperature:	-10 ^{0}C to +70 ^{0}C
Storage temperature:	-40 ^{0}C to +100 ^{0}C
Supply Voltage	11.1 to 25.6V
Data input	±15V (RS232 serial levels)

Electrical Characteristics

	Min.	Typ.	Max.	Units	Notes
DC Levels					
Supply voltage	11.1	12	25.6	V	1
Supply current (Transmit mode)	11		45	mA	
Supply current (Receive mode)		12.5		mA	
Supply current (Standby mode)		125		uA	
RF					
Working frequency	430.0	433.1	440.0	MHz	2
Receiver sensitivity		-100		dBm	
Transmitter RF power out		+10		dBm	
Frequency deviation		+/- 50		kHz	
GFSK Manchester encoded data rate		100		kbps	
Dynamic Timing					
Power up to stable receiver data out		30		mS	
Power up to full RF out		30		mS	
Standby to Receive mode		1		mS	
Standby to Transmit mode		1		mS	

CTS timing

With a standard buffer size of 30 bytes, CTS is asserted 41uS after the buffer is full. In cases where less than 20 bytes are sent CTS is asserted after a timeout of 10mS.

otes

1. Supply voltage should have <10mV ripple.
2. The application operating frequency must be chosen to comply with the Short Range device regulation in the area of operation.

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