



## FEATURES

- Industry Standard RS-232.
- Automatic Data Packetising, Error Checking (Transparent link).
- Available at 433MHz (10mW ERP)
- Range upto 120 Metres
- Network Configurable, User Selectable as Master or Slave
- 56 Byte Data Buffer
- Broadcast Facility
- User Selectable Baud Rate 9600, 4800, 2400, 1200, Half Duplex
- Optional H/W or S/W Flow Control
- LED Indication of Data Tx, Rx, CD.
- 9-30Vdc Power Supply
- Requires no radio Licence To Operate
- Miniature enclosure 90 x 55 x 40mm



## DESCRIPTION

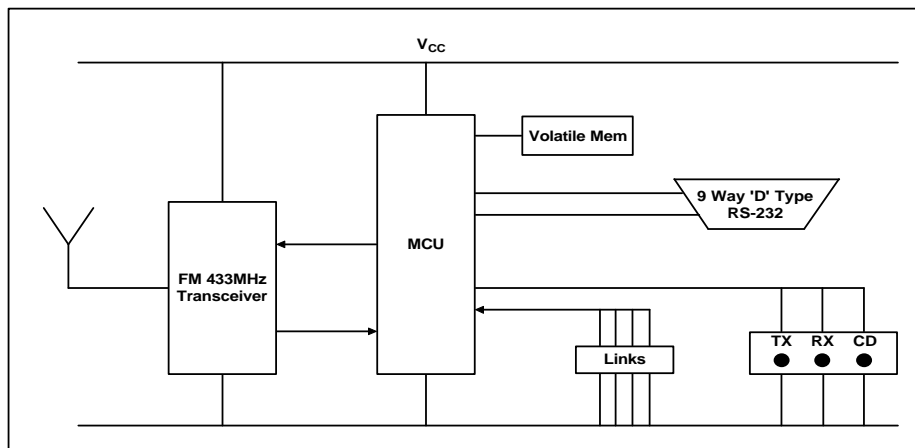
The R.F. Solutions low cost Wireless Modem provides a reliable serial data communications link that can be used for many data communications applications. The RF Modem is very simple to use and provides an RS232 'invisible link' up to 9600 baud.

Each Modem may be configured to be either a 'Master' or 'Slave' to be used in a wireless network. Up to 127 'slaves' may be controlled by a single 'Master' Modem.

Packetising and encrypting the data as well as error checking with full acknowledgement for all data transmitted achieve highly reliable communication.

The RF Modem is supplied with an RS232 cable to connect the host and requires only a 9-12Vdc power supply.

## BLOCK DIAGRAM





## FUNCTIONAL DESCRIPTION

The RF Modem is designed to connect two DTE devices (e.g. PC's). The RF Modem physical interface is a 9 pin DCE. The host communications RS232 operates at various baud rates, 8 data bits, 1 stop bit, no parity. The DTE device must either support hardware CTS flow control, XON/XOFF flow control or if hardware flow control is disabled then the user must be aware of the maximum buffer size of 56 bytes.

**(note:** if you use a null Modem to connect a DTE to a DCE using two RF Modems, then the DCE device should support RTS flow control.)

## LED's

The RF Modem has three LED's, Tx, Rx, and CD:

### CD (Carrier Detect).

The CD LED will flash on/off for 100 mSecs when a RF connection is active. The flashing status of CD is on a 60 Sec connection timer. After 60 Secs of inactivity the CD LED will automatically extinguish.

The CD LED is held on when the RF Modem detects another device transmitting (receiving). This could be its partner, another pair of RF Modems or another RF transmitting device using the same frequency.

### Tx (Transmit).

The Tx LED is illuminated when the RF Modem is currently transmitting an RF packet.

### Rx (Receive).

The Rx LED is illuminated when the RF Modem detects a receive packet which is addressed to that particular RF Modem.

## POWER SUPPLY

The RF Modem requires a 9 - 12V @ 100mA power source. On the power jack the centre is +ve connection. The power switch is a slide switch located on the bottom of the unit.

## STANDBY MODE

When not transmitting, the RF Modem continually searches for a carrier signal and valid I/D address, which match its own. When detected, the RF Modem receives the data, acknowledges back to the transmitting RF Modem and decodes the data before transmitting it out onto the host RS232 port.

## USER CONFIGURABLE JUMPER LINKS

There are several Jumper Links, which the user may set. Please note that these are only read at power up!

## ECHO / REPEATER MODE (J1)

In echo mode each data packet that is received is transmitted out immediately after reception. This may be used to extend the system range.

**note:** In Echo Mode, the RF Modem generates an acknowledge signal to the originating RF Modem. The originating RF Modem will not receive an acknowledge signal from the destination RF Modem if it has been echoed by another RF Modem.

J1	Option
Open	-
Connected	Echo Mode Selected



## HOST COMMUNICATION SPEED (J2, J3)

The data link between the Modem and the host computer may be set using the appropriate jumper links on the Modem circuit board. It is set according to the following table.

J3	J2	Baud Rate
Open	Open	1,200
Open	Connected	2,400
Connected	Open	4,800
Connected	Connected	9,600

**note:** The host communication link is ONLY the speed of communications between Modem and the host PC, The radio communications speed is controlled by the two Modems which are communicating which is dependant on many other factors.

## MASTER / SLAVE SELECTION (J13)

J13	Option
Open	Slave Mode
Connected	Master Mode

## MASTER / SLAVE ADDRESS SELECTION (J6-12)

Used to set the modem's address when in master or slave operation

Link no	J12	J11	J10	J9	J8	J7	J6
Address bit	6 (MSB)	5	4	3	2	1	0 (LSB)

**Note:** if the address links are set to zero (all address jumper links open) then the modem will be in Broadcast mode (see below for full description)

## DATA FLOW CONTROL (J4, J5)

J4	J5	Option
Connected	Open	Hardware Flow Control (RTS/CTS)
Open	Connected	XON/XOFF Flow Control
Open	Open	No Flow Control

**J18 - J21 RS232/5V data Input**, these jumpers are used to set the data into the modem, either as RS232 data or 5V inverted data. Usually set between pins one and two in all cases to select RS232 data in.



## MASTER SLAVE COMMUNICATION

When the modems are configured in a master / slave arrangement only the master can initiate communications. If a number of slaves are used within a network (all with different addresses) then the master will need to initiate communications with each slave modem in turn. This can be achieved by changing the address of the master modem from the host controller (see below).

**Note:** If two modems are both set to master with the same address then either modem can initiate communications.

## TRANSMIT ADDRESS SELECTION

There are two methods of selecting the transmit address;

1. **Jumper Link Header (JL)** - Through the address jumper links.
2. **Host Selected (HS)** - By host controller to which the Modem is connected. (See below)

## SENDING A NEW TRANSMIT ADDRESS FROM THE HOST CONTROLLER

The host generated address is communicated to the Modem via the standard RS232 data link. In order for the RF Modem to determine that the data being received from the host controller is a new transmit address (and not actual data to be transmitted), a specific command must be sent as below;

ZCZCnnnNNNN

where **ZCZC** is the transmit new address start identifier  
and **nnn** is the new 3 digit address.  
and **NNNN** is the transmit new address end identifier

The address is stored in volatile memory and will be lost on power down. If the modem is set to either master or slave then it will read its own address jumper links as a default on power up. This enables point to point communication between two master modems if they both have the same addresses on power up.

## CLEARING THE CD

When using the modems in a master slave situation it might be necessary to clear down the CD between the two modems. This will enable the master to talk to another slave immediately and not have to wait for the 60 seconds until the CD automatically clears down. This is achieved by sending the following string of characters from the master modem via the standard RS232 data link;

ZCZCCCCNNNN

## BROADCAST MODE

Broadcast mode can be used to send data from the master modem to all of the slave modems within range. When the master modem's address is set to zero it is then in broadcast mode. Broadcast mode is one way communication only and because of this if any of the data is lost in the transmission the slaves will not be able to request the data to be sent again by the master.

**Note:** The CD will only be active for 5 seconds in Broadcast mode



## ERROR CHECKING / RELIABILITY

Several methods are employed,

- a. **Checksum.**
- b. **I/D & COMMAND** : bits are sent to on each packet.
- c. **Data Sequencer** : this ensures that the receiving Modem knows the logical sequence of packets so that if an 'acknowledge' only, was destroyed causing re-transmission of a data packed, the receiver knows this packet has already been received and discards the data.

## ANTENNA & RF MODEM POSITIONING

The helical antenna provided will provide adequate range for most applications. For optimum range, follow these general rules:

- The space around the antenna is as important as the antenna itself.
- The optimum position is to locate the antenna so that it protrudes upwards.
- If this is not possible due to other design constraints, try to keep the antenna away from other potential sources of interference such as transformers, batteries and PCB tracks, especially ground planes.

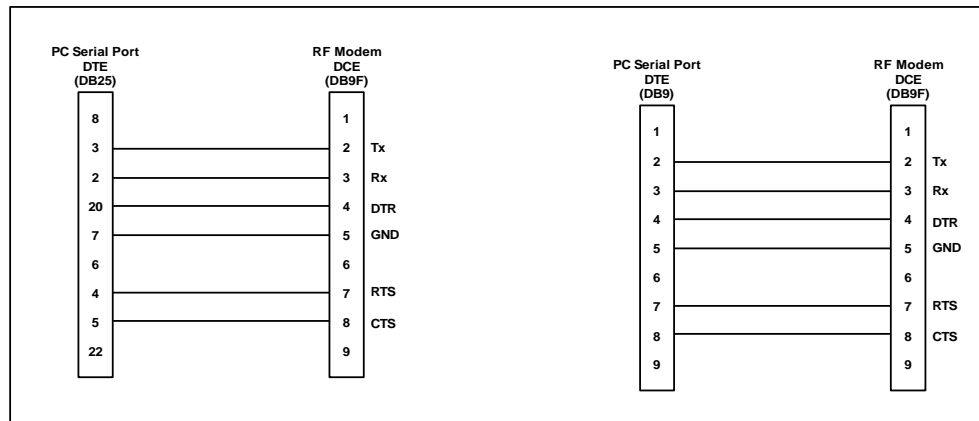
**Note:** Personal computers are one of the one of the greatest generators of RF interference. Ensure the RF Modem is situated as far away as possible.

## CE COMPLIANCE

This product is a sensitive electronic instrument and as such it may **temporarily** be affected by Radio Transmitting Devices being used in close proximity to it (such as Mobile Phones, Walkie Talkies, CB Radios, Radio Model Controllers and some Microwave Ovens). If it does exhibit symptoms such as display of erratic or erroneous data, try moving this product away from the source of interference or switching off that source of interference whilst you are using this product.

## CONNECTION INFORMATION

The RF Modem interfaces to the host computer via RS232 connection. A standard DB9 connector as shown in the diagram below.





# RS232 Low Cost RF MODEM

FM-232C-433

## TECHNICAL SPECIFICATIONS

Storage Temperature; -10 to +70° Celsius.  
Operating Temperature; 0 to +55° Celsius.

### Dimensions:

Enclosed products : 90mm x 55mm x 40mm  
PCB 81mm x 46mm

ELECTRICAL CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION
Supply Voltage	9	12.0	16.0	V
Supply Current		21		mA
Transmission Frequency		433.92		MHz
Radiated Power (ERP)		10		mW

## Ordering Information;

Part Number	Description
FM-232C-433	FM Radio Modem 2 <sup>nd</sup> Generation
PSU12V1AUK	Power Supply 240Vac (12Vdc @1000mA)
ICEPIC-PSU-INTL	Power Supply 110-240Vac (9Vdc @750mA)

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