FEATURES

- INDUSTRY STANDARD RS-232 INTERFACE.
- UP TO 20km RANGE (Direct Line of Sight)
- 1 - 3km RANGE (Within Buildings)
- STANDARD BAUD RATES FROM 150 - 19,200
- 34 RF CHANNELS USER SELECTABLE
- TRANSMISSION DATA RATE 9,600/4,800
- NO HANDSHAKING REQUIRED
- STATION ADDRESSABLE
- TWO REPEATER MODES
- 4K BUFFER MEMORY
- PREDICTOR / CORRECTOR ERROR CHECKING
- NO OPERATING LICENCE REQUIRED

DESCRIPTION

The R.F. Solutions 458MHz Wireless MODEM provides a simple, reliable half duplex wireless communications link. The RF Modem can transmit up to 500mW RF output power which will give typically 7-10km in direct line of sight and 1-3km within a buildings environment.

The radio conforms to MPT1329 and the European ETSI 300-220 standards.

The MODEM is very simple to use, with very only three connections required to the RS232 connections (Tx, Rx, 0V). The serial data link can operate at data rates of up to 9600bps.

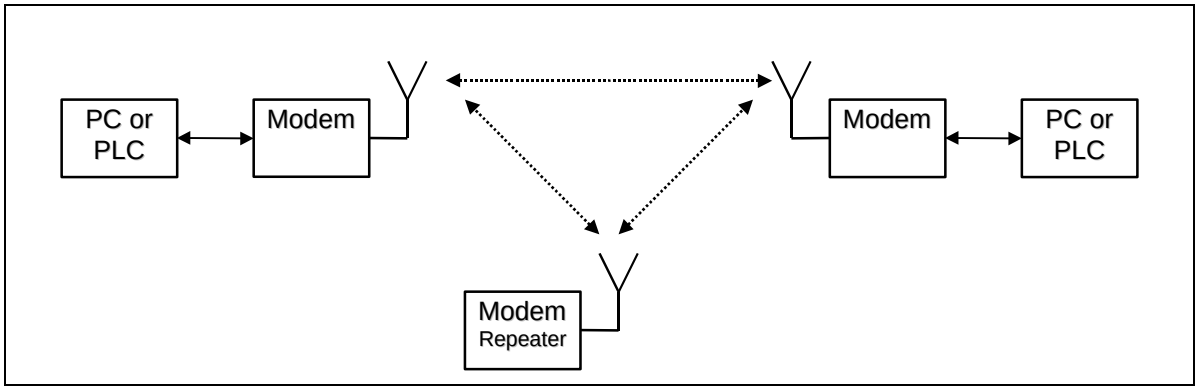
A 4K buffer memory is provided to enable the RF Modem can transmit and receive data independently of the host controller (synchronously or synchronously). The host controller can talk to the RF Modem a baud rate between 150 - 19,200baud, through the 9 way 'D' type connector. A forward error correcting algorithm may be used to increase the data communication integrity at high speed or over long distances.

The user may select the RF frequency channel, operational mode, baud rate and station address via either the DIP switches on the unit, or through the host serial port. The RF Modem retains the user set-up in its on board non-volatile memory, even when the power is removed.

The RF Modem may be configures as a repeater mode, where the unit automatically repeats the data received thereby extending the range of transmission or as an echo back configuration.

The unit requires a regulated dc source of between 8.5-14V, (this should be generated from a linear power supply). The RF Modem may be switched to power save mode by taking DTR low, in this 'Standby mode' the current consumption will be approx. 0.5mA.

TYPICAL OPERATION



Asynchronous Operation

Only three connections are made to the RS232 serial port (Rx, Tx, 0V). A transmission is started by writing data to the serial port. This is passed to the transmitter buffer memory. The radio channel is monitored, and if it is free, receiver alignment information along with the receiver address and repeater command is transmitted followed by the data in the transmitter buffer. Subsequent data is simultaneously received at the serial port and transmitted over air. CTS is taken low if the transmitter buffer overflows. If the error checking algorithm is set, then redundant bits are inserted between each data byte.

The receiver decodes the station address and alignment information, and then passes the data to the receive buffer. It is then presented to the serial port at the baud rate set on the receiver. If error checking has been selected, then the redundant bits are used to check and recreate the corrupted data. If the data is totally corrupted, then the CONTROL E (05H) will be inserted at the end of the data stream.

Synchronous Operation

Here, the data transfer is controlled by the RTS input. When RTS is taken high, the alignment data, followed by the receiver station address and repeater command is transmitted. The modem then sets CTS high to indicate that the radio channel is free and it is ready to receive data. When all data has been transmitted, RTS should be taken low to switch of the transmitter. This is confirmed by CTS returning low.

Repeater Mode

There are two repeater modes. The transmitter can command any receiver within range to repeat the data stream. This may be used as an echo back when the transmitted data needs to be confirmed. If the repeater mode is used in conjunction with the address mode, then a unique chain of X7200 modems may be formed thereby extending the range over geographical barriers.

Power Save Mode

By taking DTR low, the Modem enters power save mode.

Configuring your RF Modem

The Modem may be configured by connecting to a dumb terminal. Connect the terminal via the ‘D’ type connector. The terminal should be set to 9600baud, no parity and 2 stop bits. Remove the power to the modem and connect 0V to pin 6. When the power is applied the following will appear on the screen.

BAUD	PARY	O/E	REPT	ERR	ADR	TXAD	RXAD	TXON	?
B	N	O	N	N	N	00	00	N	Y/N

To reconfigure the modem type upper case ‘N’

Baud Rate Settings (BAUD)

The speed of communications between the host and modem may be configured by typing the letter A - E as shown below

Letter	A	B	C	D	E
Baud Rate	19,200	9,600	4800	2400	1200

(The speed of RF transmission can be either 9,600, or 4,800bps.)

Parity Bit (PARY)

If the Parity Bit is required for the Modem to host communications then type ‘Y’. Note that the Parity Bit is only used between the Host PC and the modem. It is not transmitted by the RF Modem.

Odd or Even Party Bit (O/E)

If parity is required either ‘O’ for odd, of ‘E’ for even must be entered next. Otherwise no parity will be used.

Stop Bits

The Modem interface has 1 stop bit.

Repeater Mode (REPT)

The Modem can be set to one of two repeater modes by typing 'Y' (upper case)

Open Repeater : In this mode, any transmitting Modem can command a receiving Modem to repeat the data stream. This is achieved by setting the repeater mode without the address mode set. The repeater mode on the Modem does not need to be set. Data can therefore be echoed back. This serves as a useful method to check the system range and radio integrity.

Chain Repeater : If the chain repeater mode is used in conjunction with the address mode, then a chain of Modems may be set up.

Each Modem in the chain is given a receiving address and a transmitting address. A maximum of 99 addresses are available.

Error Correction Mode (ERR)

This option is selected by typing a 'Y'. A forward error correcting algorithm is activated. Redundant bits are inserted into the transmitted data.

If the receiving station also had the option selected, corrupt data will be detected and then the redundant bits are used to check and recreate the corrupted data. If the data is totally corrupted, then the ASCII character "CTRL E" (05H) will be loaded into the Rx serial port at the end of the data stream.

The algorithm has the effect of reducing the data transmission speed by $^1/_3$ but extending the effective range.

Address Mode (ADDR)

Modem to Modem : With this option selected, the address set in the TXAD will be transmitted as the first byte of the data stream. The receiving Modem will compare this address to the address set by its own RXAD and if it is the same then the data will be passed to its serial output Tx.

Transmitter On (TXON)

Typing 'Y' to this option will switch the transmitter on. This may then be used in the following three ways;

1. To test the power output of the transmitter using an RF power meter.
2. To check the SWR on the antenna
3. To survey the site for optimum reception conditions using a scanning receiver set at the same frequency.

Transmission Speed

Can be selected as either 4,800bits/sec or 9,600bits/sec. This is set by the link on the PCB. Note that at 4,800 the maximum range will be achieved.

LED Indicators

The three LED's indicate the following;

- Transmitting Mode Green
- Receiving Mode Green
- Power ON Red

Frequency of Operation

The RF Modem operated on the 458.500MHz to 458.950MHz telemetry band. There are 15 channels within this band. It is possible to have up to 15 different X7200 RF Modem networks operating simultaneously within the same area. The channel / frequency may be set ;

DIL Switches : Located inside the Modem enclosure, these set the default frequency of operation;

Ch No (Hex)	Frequency (MHz)	SW5	SW4	SW3	SW2	SW1
02	458.525	ON	ON	ON	ON	OFF
04	458.550	ON	ON	ON	OFF	ON
06	458.575	ON	ON	ON	OFF	OFF
08	458.600	ON	ON	OFF	ON	ON
0A	458.625	ON	ON	OFF	ON	OFF
0C	458.650	ON	ON	OFF	OFF	ON
0E	458.675	ON	ON	OFF	OFF	OFF
10	458.700	ON	OFF	ON	ON	ON
12	458.725	ON	OFF	ON	ON	OFF
14	458.750	ON	OFF	ON	OFF	ON
16	458.775	ON	OFF	ON	OFF	OFF
18	458.800	ON	OFF	OFF	ON	ON
1A	458.825	ON	OFF	OFF	ON	OFF
1C	458.850	ON	OFF	OFF	OFF	ON
1E	458.875	ON	OFF	OFF	OFF	OFF
20	458.900	OFF	ON	ON	ON	ON
22	458.925	OFF	ON	ON	ON	OFF

Radio Propagation

With any radio system, there are a number of factors affecting the system performance. These are

- Transmitter power output
- Height of transmitter and receiver antenna
- Length of feeder cables to the antenna
- Type and efficiency of antenna
- Surrounding topography
- The weather

Antennas

The types of antenna we recommend for this Modem are;

Helical : The smallest, most compact antenna, has a gain of <1, designed for short ranges up to 2km

1/4 Wave Flexi : General purpose antenna with gain <1 gives slightly better range than Helical

Yagi : A highly directional antenna (Looks similar to a standard TV aerial). Typically has a gain of +3dB. The output power of a transmitter connected to a Yagi must be reduced in order to comply to the DTI specifications. This does however have the advantage of reducing the power consumed by the transmitter to achieve the same range. By connecting a Yagi to a receiver, the system range may be extended to 20km.

Connections : 9 Way 'D' Type Connector

Pin	Signal	Description	Direction
1	+12V	+Vcc	Input
2	Rx	Receive Data	Input
3	Tx	Transmit Data	Output
4	DTR	Data Terminal Ready (Standby)	Input
5	0V	GND	Input
6	MODE		Input
7	RTS	Request to Send	Input
8	CTS	Clear to Send	Output
9	CD	RF Carrier Detect	Output

The Minimum Connection Required for operation is

1	+12V	+Vcc	Input
2	Rx	Receive Data	Input
3	Tx	Transmit Data	Output
5	0V	GND	Input

Power Supply

It is not advisable to use a switched mode power supply, either to drive the X7200 Modem or within close proximity to it. Switched mode power supplies can produce high energy radio frequencies over a broad spectrum potentially causing interference with the operation of the Modem.

Power Save Mode

A signal of between 0 - -15V on pin 4 will switch the modem into power save mode. This input has an impedance of 22KΩ.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature.....-30 to +85o Celsius.
Operating Temperature..... -10 to +55o Celsius.

Dimensions

114mm x 65mm x 26mm (without baseplate)

TECHNICAL SPECIFICATION

Ambient temperature = 25° Celsius.

ELECTRICAL CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION	NOTE
Transmission Frequency	458.500		458.900	MHz	see note 1
Supply Voltage	8.5	12	14	V	
Supply Current			0.5	mA	Standby Mode
TRANSMITTER					
RF Power Output	5		500	mW	Adjustable
Supply Current			290	mA	Transmitting
RECEIVER					See note 2
Supply Current			80	mA	Receiving
Sensitivity		0.3		uV	for 10dB Signal
IF Frequency '1'		45		MHz	
IF Frequency '2'		455		KHz	
Bandwidth		+/-7.5		KHz	

Notes:

1. There are 15 channels in 5MHz sub-bands. Channel Separation is 25KHz.

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