

- Operates on international licensed and licence free radio bands
- RF Bands:
  - 147MHz to 174MHz VHF
  - 400MHz to 500MHz UHF
  - 868MHz to 920MHz UHF
- Conforms to ETSI 300-220, ETSI 300-113, ETSI 300-683, MPT1329, MPT1411
- Distant Modems can be monitored and configured over the radio link
- 17 to 99 selectable radio channels
- Range (500mW):
  - 10km to 20km line of sight
  - 1km to 3km in buildings
- RS232 & RS485 serial Interface
- Baud rates of 1.2K to 115.2K
- Commissioning and diagnostic futures
- Store and Forward Repeater Mode to extend range
- Addressable individually and globally
- On-line AT commands
- Packetised Data, and Forward Error Correction options
- Low power standby mode



## Description

The X8200 Radio Modem transmits and receives half duplex serial data at baud rates of 1.2K to 115.2K by means of a FM Radio Transceiver operating on the UK and European licence exempt bands and most other world wide data frequencies.

A 4K buffer memory is provided so that data can be passed asynchronously between the host and modem without the need for handshaking. The CTS output signal can be used for flow control in duplex applications. The over air data speed can be configured at either 5K bits/sec or 10K bits/sec. This is independent of the baud rate and should be set to a lower value where possible for the best radio propagation.

The set up menu of the X8200 can be accessed either by a PC running any terminal emulation program like Hyper Terminal in the accessories section or remotely over the radio link. The set up menu is selected either by connecting pin 6 on the 9 way D Connector to 0v or typing \$ then ESC directly after the power has been applied. The menu configuration is permanently stored on EEPROM.

On-line "AT" commands can be sent to the modem to change the address configuration, repeater path or RF frequency during normal operation so that any modem can "dial up" any other modem on the network.

Data can be formed into packets and passed from one modem to another. If the received packet has errors detected then the data will automatically be sent again. Both size of the data packet and the number of retries can be set in the menu.

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## 1 Specification

ELECTRICAL CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION	NOTE
Frequency Range	868		920	MHz	
	458.500		458.950	MHz	UK
	400.000		480.000	MHz	World
	147.000		174.000	MHz	Si (X8200 HP Only)
Channels		127			
Channel Separation	12.5	25.0	25.0	KHz	
Start up Time	5.0	10.0	30.0	mSecs	With \$ Selected
Modulation		F3D, F1D			
Power Supply X8200	10	12	26	Vdc	
X8200HP	10	12	14	Vdc	
Baud Rate	1.2		115.2	Kb/s	
<b>TRANSMITTER</b>					
RF Power X8200	5		500	mW	
RF Power X8200HP	1		5	W	
Data Input RS232	-10		10	V	
Data Input RS485	0		5	V	
Frequency Deviation		+/- 3.0		KHz	25KHz Channel
Modulation Rate	DC		10.0	Kbps	
Supply Current X8200		340		mA	
X8200HP		1800			
<b>RECEIVER</b>					
IF Frequencies		45/455		MHz	
Sensitivity		0.9		µV	
Bandwidth	+/- 7.5	KHz			
Data Output RS232	-10		10	V	
Data Output RS485	0		5	V	
Carrier Detect	-10		10	V	
Supply Current X8200		90		mA	
X8200HP		150			
Supply Current Standby	0.005	0.007	0.01	mA	

### 1.1 Mechanical and Environmental

Dimensions X8200 UHF 800mW  
 Dimensions X8200HP UHF 5W  
 Dimensions X8200HP VHF 5W

Length = 140mm Width = 65mm Height = 26mm  
 Length = 147mm Width = 65mm Height = 52mm  
 Length = 174mm Width = 80mm Height = 58mm

Operating Temperature Range -10 to +55 deg C

## 2 Connections

### 2.1 9 Way D Type Connector RS232/RS485

1	+VE POWER	INPUT
6	CONFIGURATION MODE	INPUT
2	RS232 RD RECEIVE DATA	INPUT
7	-VE RS485	INPUT/OUTPUT
3	RS232 TD TRANSMIT DATA	OUTPUT
8	CTS	OUTPUT
4	DTR (STANDBY)	INPUT
9	+VE RS485	INPUT/OUTPUT
5	0V	INPUT

Pin	Connection	Description
1	+VE	Regulated power supply. It is not advisable to use some types of switched mode power supply either to drive the X8200 radio modem or in close proximity to it. This type of power supply can produce high energy radio frequencies over a broad spectrum thereby causing interference to the received signal.
2	RD	RS232 Receive serial data from host
3	TD	RS232 Transmit serial data to host
4	DTR	A signal of between 0v to -7V will switch the modem into standby power mode. Leave open circuit for normal use
5	GND	Power supply and common for host.
6	CON	Configuration input. Connecting 0V to this input will send the configuration menu to the host when the power is applied. It is left open circuit for normal operation
7	-VE	RS485 Bi-directional data.
8	CTS	Brought low by the modem when a RF carrier is detected or the receiver buffer memory is full. This can be connected to RTS on the host to inhibit data from the host in duplex operations.
9	+VE	RS485 Bi-directional data.

## 2.2 LED Indicators

Three LEDs on the front of the modem indicate the following states:

TX	Green	On when modem is transmitting data.
RX	Green	On when a RF carrier of greater than 0.9uV is detected by the modem.
POWER	Red	On when power is applied to the modem

## 2.3 Antenna Connector

BNC/TNC

## 3 Operation

A transmission is started by sending data to RD (pin 2) or the RS485 terminals (pin7 & 9).The radio modem places this data in the transmitter buffer memory while it checks to see if the RF channel is free. If it is not then the data is stored in the buffer until the channel becomes free. If it is free then a preamble message will be transmitted so that the receiving modems can align to the incoming data. When Tx Priority is set, data will be transmitted regardless of the condition of the RF Channel.

The modem will then transmit a command byte which will instruct the distant modems to perform the functions set in the menu followed by the addressing and repeater functions. The data that has been placed in the buffer memory will then be transmitted. The transmission is terminated when a gap of two data bytes is detected in the incoming data stream.

If more data is sent after a gap of two data bytes then the above sequence will be repeated.

When the receiving modem detects the presence of incoming data it takes CTS (pin 8) low. The repeater command byte is decoded and the transmitter address compared to the receiver address. If they are the same or if the global address of 00 is decoded or if the address mode is switched off then the data will be presented at the serial output port TD (pin 3). At the end of the message CTS is taken high.

If the packetisation option is selected the receiving modem will check the CRC byte. If it is correct an ACK sent to the transmitting modem. If the CRC is incorrect a NACK is sent to the transmitting modem and the data is sent again. The number of re-trys are set in the Menu.

If the repeater command is decoded or the repeater mode set in the configuration menu then the data will be stored and then re-transmitted.

## 4 Getting started

### 4.1 Basic Connection

TRANSMIT	(TD)	ON HOST TO RECEIVE (RD) ON MODEM PIN 2
RECEIVE	(RD)	ON HOST TO TRANSMIT (TD) ON MODEM PIN 3
GROUND	(0V)	ON HOST TO 0V ON MODEM PIN 5

### 4.2 Power Connection

PIN 1 = POSITIVE  
PIN 5 = GND

## 4.3 Factory Setting

The radio modem is supplied with the following settings:

X8200 Radio Modem V#.#	
Advanced Menu	Y
Modem ID	01
Baud	9600
Parity	N
Odd/Even	E
RF Power	5
Key Transmitter	N
RF Channel	17
RSSI	N
Sensitivity	00
Comms Speed	S
Address Mode	N
Enable AT Instr	N
Restore Defaults	N
Exit without Save	N
Save & Exit	N

Advanced Menu	
Return to Main Menu	Y
Message Tag	0000
TX Priority	N
FEC	N
Packetise Data	N
Number of Retries	05
Packet Size	20
Logger Mode	N
Enable Remote Access	Y
Access Remote Modem	N
Engage Repeater Path	N
Set Repeater Path	00
M01 M02 M03 M04 M05 M06 ---- M16	

## 4.4 Plug and Play

Connect three wires to the RS232 serial port of the host terminal (0V, TD and RD) as described above. Connect a regulated power supply to the radio modem. X7202 PC to Modem cables can be used along with a X7201 power supply.

Configure a PC to Hyperterminal in the Accessories section to the following:

Go to **File** and then t **Properties**.

Set the Configuration to :

9600 Baud  
No Parity  
1 Stop Bit  
XON/XOFF to OFF  
RTS/CTS to OFF (no handshaking)

Settings should be: Terminal Keys set  
Emulation set to ANSI

ASCII Set Up : Deselect all.

Connect up a second modem in the same way.

Pressing a key on one PC will transmit the character to the other. Refer to the Section 8.0 Trouble Shooting if this does not happen.

If a second PC is not available simply power up the second modem. Configure the ID numbers and the Enable Remote Access option on both. Then use the Access Remote Modem option to display the menu of the remote modem.

Fig 1 shows how an open network using the above configuration would work. All the data transmitted from one modem will be received by all of the others. This is similar to an RS485 network but instead of connecting the equipment by wire a radio modem is used.

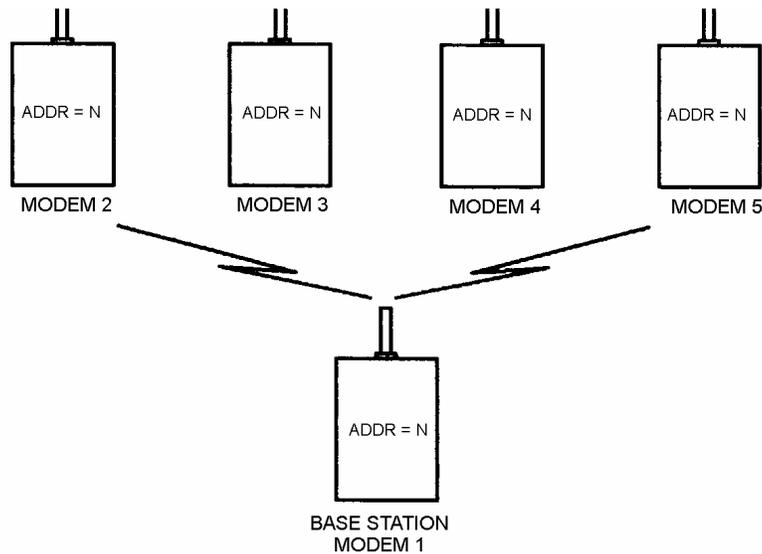


FIGURE 1 OPEN NETWORK

## 5 Configuration

### 5.1 Access Configuration Menu

There are three ways the menu can be accessed:

Typing \$ then pressing the Esc Key as the first two characters after the Radio Modems has been switched on.

Connecting Pin 6 on the D-connector to 0V on Pin 5. Then switching the Radio Modem on.

Using the Remote Access feature to display the menu of a distant Radio Modem.

A PC configured as a dumb terminal with the following settings should be used:

9600 Baud  
No Parity  
1 Stop Bit  
Echo off

XON/XOFF to OFF  
RTS/CTS to OFF (no handshaking)

## 5.2 Configuration Menu

The vertical and horizontal arrow keys are used to move around the menu. Alternatively the numbers keys 2, 4, 6 and 8 can also be used as follows:

Down arrow key or 2 key will move the cursor down the menu  
Left arrow key or 4 key will reduce the value  
Right arrow key or 6 key will increase the value  
Up arrow key or 8 key will move the cursor up the menu

The Enter Key is used in the following function:

Restore Defaults  
Exit without Save  
Save & Exit  
Access Remote Modem  
Set Repeater Path

The Space Bar Key is used to delete modem ID numbers in the Repeater Path

To save any changes made in the menu :

Move the cursor to **Save & Exit**,  
Use the horizontal arrow key to select **Y**.  
Press the **Enter** Key

The configuration menu shown below will be displayed when a radio modem with Modem ID set to 01 remotely accessed a radio modem with Modem ID set to 02.

X8200 Radio Modem V#.#	Local	Remote
Advanced Menu	N	N
Modem ID	01	02
Baud	9600	9600
Parity	N	N
Odd/Even	E	E
RF Power	5	5
Key Transmitter	N	N
RF Channel	17	17
RSSI	N	N
Sensitivity	00	00
Comms Speed	S	S
Address Mode	N	N
Enable AT Instr	N	N
Restore Defaults	N	N
Exit without Save	N	N
Save & Exit	N	N

Advanced Menu	Local	Remote
Return to Main Menu	N	N
Message Tag	0000	0000
TX Priority	N	N
FEC	N	N
Packetise Data	N	N
Number of Retries	05	05
Packet Size	20	20
Logger Mode	N	N
Enable Remote Access	Y	Y
Access Remote Modem	Y	N
Engage Repeater Path	N	N
Set Repeater Path	02	00
Local	M01 M02 M03 M04 M05 M06 ----	M16
	02	
Remote	M01 M02 M03 M04 M05 M06 -----	M16
	(use space bar to delete repeater path)	

Advanced Menu:	Display Advanced Menu	Return to Main Menu	Display Main Menu.
Modem ID	User defined ID number.		
Baud	Baud Rate 1.2K to 115.2K	TX Priority	Data transmitted priority
Parity	Enable Parity.	Message Tag	Adds Ident. No. to Data
Odd/Even	Select Parity.	FEC	Forward Error Correction
RF Power	Set level of RF Power.		
Key Transmitter	Switch on Transmitter	Packetise Data	Data is formed into packets with error detections and Acknowledgments. Connect CTS to RTS on Host.
RF Channel	Set RF Frequency.		
RSSI	Bar Graph of Rx Signal		
Sensitivity	Set the Receiver Sensitivity	Number of Retries	Sets number of retries.
Comms Speed	Slow/Fast	Packet Size	Sets packet size. 64-1024
Address Mode	Enables Modem Address.	Logger Mode	Data is stored until polled.
AT Enable AT Instr	AT instruction are enabled.	Enable Remote Access	Allows distant Modem to change settings.
Restore Defaults	Set Factory Defaults.	Access Remote Modem	Displays settings of remote Modem with ID on AT Path.
Exit without Save	Return without saving operation without saving settings.	Engage Repeater Path	Enable repeater path.
Save & Exit	Return to Modem and save Settings.	Set Repeater Path	Sets AT Path M01 to M16.

## Advanced Menu

The horizontal arrows are used to select the Advanced Menu.

## Modem ID Number

Each modem in a network can be given an individual ID number between 0 and 99

This is used for:

- Remote Access Menu
- Modem Addressing
- Repeater Function
- Packet Data Function

## Baud Rate Settings

A baud rate is entered by moving the cursor under the current setting with the vertical arrow keys. Then by pressing the horizontal keys the value will change:

```

BAUD RATE
115.2K
57.6K
38.4K
19.2K
9.6K
4.8K
2.4K
1.2K
    
```

## Parity On/Off

If a parity bit is required use the horizontal arrow key to select Y  
The parity bit is only used between the host and the radio modem

### Odd or Even Parity O/E

If parity is required either O for Odd or E for Even parity can be set by pressing the horizontal arrow keys.

### RF Power

The RF output power can set using a number between 1 minimum and 5 maximum. The horizontal arrow keys are used to change the value.

### RF Channel

The Radio Frequency can be set by using a number between 1 and 17. If channel 0 is selected the radio will use the DIL switch settings to select the RF frequency

Channel	RF Frequency	DIL SWITCH (Used when RF Ch is set to 0)				
		SW5	SW4	SW3	SW2	SW1
1	458.525	ON	ON	ON	ON	OFF
2	458.550	ON	ON	ON	OFF	ON
3	458.575	ON	ON	ON	OFF	OFF
4	458.600	ON	ON	OFF	ON	ON
5	458.625	ON	ON	OFF	ON	OFF
6	458.650	ON	ON	OFF	OFF	ON
7	458.675	ON	ON	OFF	OFF	OFF
8	458.700	ON	OFF	ON	ON	ON
9	458.725	ON	OFF	ON	ON	OFF
10	458.750	ON	OFF	ON	OFF	ON
11	458.775	ON	OFF	ON	OFF	OFF
12	458.800	ON	OFF	OFF	ON	ON
13	458.825	ON	OFF	OFF	ON	OFF
14	458.850	ON	OFF	OFF	OFF	ON
15	458.875	ON	OFF	OFF	OFF	OFF
16	458.900	OFF	ON	ON	ON	ON
17	458.925	OFF	ON	ON	ON	OFF

In addition an ATX instruction can be used to change the RF frequency form the serial port.  
For example to change the RF frequency to channel 09 the instruction would be:

```
A      T      X      0      9
41    54    58    30    39
```

Were the channel number is sent as two ASCII number characters 30-39 for 0-9



# Synthesised Radio Modem

**X8200**  
**X8200HP**

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## Key Transmitter

The Key Transmitter setting switches on the transmitter so that a radio site survey can be conducted. . A second Radio Modem can be used to move around the site observing either the Rx LED or the RSSI Bar Graph. If the Rx LED is on or there are more than 3 bars on the RSSI Bar Graph then there will be good communications.

## RSSI Relative Signal Strength Indicator

The RSSI function is used to detect radio activity on the RF Channel. It can also be used to measure the signal strength of a transmission from a distant radio modem.

A maximum of nine bars will appear relating to a signal strength of 0.3uV (-112dBm) to In the Remote Access Mode the distant modem will measure its own RSSI and radio the value back to the local radio modem were it will be displayed on a bar graph in the menu.

## Comms Speed

Two over air transmissions speeds can be selected. These are:

F = 10Kbits/sec  
S = 5Kbits/sec

## Address Mode

The address mode uses ID numbers to “dial up” distant modems. When the data is transmitted from a distant modem the first ID number set in the repeater path is added to the data string and used as a transmitter address. The receiving modem compares the transmitter ID in the data string with its own ID number. If they are the same the data string is passed to the serial port. In addition individual modems can be dialled up by using serial ATT and ATA Instructions to change the transmitting ID number.

The ATT instruction can be used to “dial up” distant modems as shown in fig 4. The base station modem has its ID number (receiver address RXA) set to 01. The four distant stations have ID numbers 2,3,4 and 5. All of the distant modems have the first value in their Repeater Path (transmitter address TXA) set to 01. Therefore any distant modem can transmit data to the base station but not to each other.

The serial ATT instruction is made up of the ASCII characters for A (41), T(54), T(54). This is then followed by the ID number of the addressed station as two ASCII numbers 30 to 39

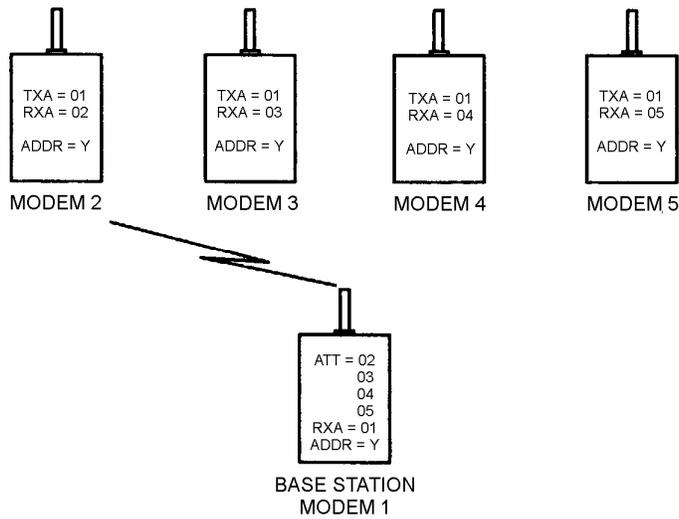
The instruction sent by the base station to address modem with ID set to 2 will be:

A	T	T	0	2	
41	54	41	30	32	DATA

Modem 3 can be dialled up in the same way with the instruction:

A	T	T	0	3	
41	54	41	30	33	DATA

The instruction string will not be transmitted over the air as long as it is sent to the modem without any breaks.



### Global Addressing

The base station can send the same data to all the modems by using the Global Address 00 (Fig 5). The following instruction would be inserted before the data by the base station host:

ATT00

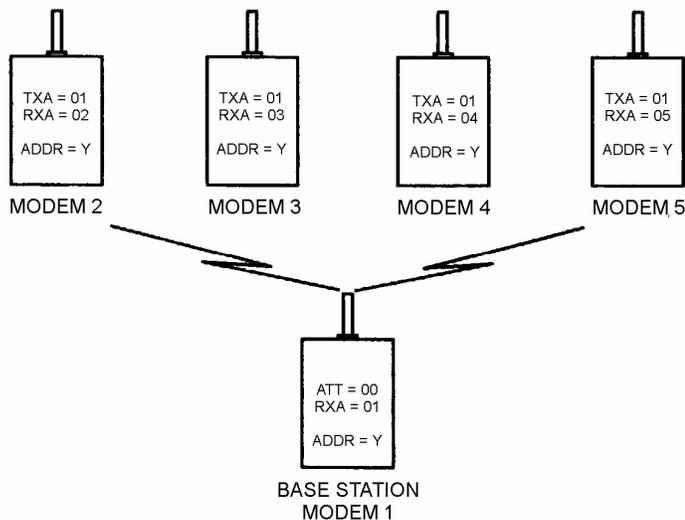


FIGURE 5 GLOBAL ADDRESSING

### Receiver Sensitivity

The receiver sensitivity can be adjusted so that the modem is less likely to be affected by the presence of RF interference. This will cause a reduction in overall range.

## Restore Defaults

The Factory Settings will be automatically be restored by pressing the horizontal arrow key followed by the Enter Key

They will not be stored in the EEPROM until Save and Exit has be selected and the Enter Key pressed again

## Exit without Save

The modem will return to normal operation without storing the menu settings in the EEPROM. Press the horizontal arrow key followed by the Enter Key.

## Save & Exit

The modem will store the menu in the EEPROM and return to normal operation  
Press the horizontal arrow key followed by the Enter Key.

## Return to Main Menu

Pressing the horizontal Arrow key will return to the Main Menu.

## Enable AT Instructions

Pressing the horizontal Arrow key will allow the modem to act on AT Instructions.

## Message Tag

The number set as a Message Tag will be transmitted at the start of each data string. It will be passed to the host at the receiving station to indicate the source of the data.

The function is disabled by setting the Message Tag to 0000

## TX Priority

With TX Priority set N the modem will monitor the RF Carrier frequency before transmitting. This is to prevent data collisions. If it is being used then a random number delay timer is started and the transmission is attempted again when this times out.

If the TX Priority is set to Y then data will be immediately transmitted regardless of whether there is an RF Carrier detected or not. This is used in environments with large amounts of RF emissions.

## FEC

The Forward Error Correction algorithm puts redundant bytes into the data string so that it can correct the data at the receiving modem.

## Packetise Data

The Packetised Data option is set to Y and the ID number of the destination modem is set in the Set Repeater Path. This could be a single ID number for a back to back system or multiple

ID numbers if a repeater path is to be used.

Data from the Host is stored in the modem memory. When the number of data bytes equals the number set in Packet Size or if there is a gap detected in the incoming data the CTS line is brought low. This line is connected to RTS on the Host and stops the data. A check sum is added to the data string and it is then transmitted over air.

The data string is checked at the receiving modem and if no corruptions have taken place an Acknowledge is sent to the transmitting modem. This then takes the CTS line high and the sequence is repeated.

If the receiving modem detects a data corruption a Not Acknowledge is sent to the transmitting modem and the data is sent again. The number of retries is set in the menu.

## Number of Retries

The number of retries before the data is abandoned can be set between 0 and 99 using the horizontal arrow key.

## Packet Size

The number of data bytes in the data packet can be set by the following number:

- 2 = 64 Bytes
- 4 = 128 Bytes
- 8 = 256 Bytes
- 10 = 512 Bytes
- 20 = 1024 Bytes

## Logger Mode

The modem will place all data from the host into its 4K buffer memory. When it receives an addressed message from a distant modem all the contents of the memory will be transmitted.

## Enable Remote Access

Enable Remote Access is set so that a local modem can access, monitor or change the settings of a distant modem over the radio link.

## Access Remote Modem.

The radio link can be used to display the menu of a remote modem. All the parameters can be changed including the RF Frequency and the RF Power. In addition the value of the receiver signal strength will be radio back.

First set the ID number of the target modem in the first location of the Repeater Path by pressing the horizontal arrow until the number is arrived at. Press the Enter Key. If the ID number is not known then 99 can be used as a universal entry code. Please note that using 99 will address all the Radio Modems within radio range.

Move the cursor to Access Remote Modem, press the horizontal arrow key to select Y. Then press the Enter Key. The menu from the target modem will be displayed along side the local modem.

Any and all the parameters can be altered using the arrow keys. In addition the signal strength

at the distant modem will be displayed as a bar graph on the RSSI setting.

Save & Exit is used to update the menu of the distant modem. Note that the real ID of the distant modem has to be used. The 99 access code will not allow the menu in a distant modem to be changed. This is to prevent all the menus of radio modems within radio range from being modified.

Setting Exit without Save to Y and pressing the Enter Key will disconnect the link

## Engage Repeater Path

Data will be first set to the modem with the ID number set in MO1 it will be then repeated to modem ID set in MO2 and so on until the last ID number set in the repeater chain.

ATA instruction can also be used from the Host to select different paths and different destinations.

## Set Repeater Path

The Engage Repeater Path is set to Y.

A repeater path is set up by using the horizontal keys to increment the Set Repeater Path number. When it is the same as the ID number of the repeater modem press the Enter key. The next modem in the repeater chain is set in the same way. Finally enter the ID number of the destination Modem

The Space Bar is used to delete the entry.

The serial ATA instruction can also be used to select a data path. It is made up of the ASCII characters for A (41), T(54), A(41). This is followed by the number of stations (two ASCII numbers) to be used in the repeater path followed by the destination station ID numbers. (two ASCII numbers).

If the data string was to be transmitted to modem with ID9 and it was to be repeated at modem ID4 and then at modem ID6. The ATA Instruction would be:

```
A  T  A  3 Stations  ID4    ID6    ID9
41 54 41 30 33    30 34   30 36   30 39   DATA
```

The maximum number of repeaters is 99

## 6 Radio Transmission

### Radio Propagation

When installing a X8200 Radio Modem there are a number of factors that should be considered as they will affect the performance of the radio link. These are:

- Transmitter power output.
- Sensitivity of the receiver.
- Height of transmitter and receiver antenna.
- Length and type of the coaxial feeder cables to the antenna. These should be low loss

RU67 type and kept as short as possible. As a rule of thumb the RF power is halved every 10m of antenna feeder. It is better to keep the signal wire long and the antenna feeder short.

Type of Antenna used.

Surrounding Topography.

Interference for other networks operating on the same frequency.

The Weather.

## Antennas

The main types of antenna used in telemetry applications are as follows:

Helical

End Fed Dipole

Yagi

## Helical Antenna

The helical stub antenna is robust, low cost and physically small. It has a gain less than unity. Range of up to 2Km.

## End Fed Dipole

The end fed dipole antenna has a unity gain. Its main application is to provide cost effective omni-directional radiation.

Range 10 to 20 Km

## Yagi

This antenna has a high gain typically twice (3dB) to ten times (10dB) the input power in the direction of orientation. It is the type of aerial commonly used in domestic televisions.

The output power of a transmitter connected to a Yagi antenna has to be reduced to conform to the DTI specification. This has the advantage of reducing the overall power consumed by the transmitter without effecting the range in the direction of orientation. It also reduces interference from other users.

The receiver signal is also amplified if a Yagi antenna is used thereby extended range in the direction of orientation to around 20 Km line of sight.

## Antenna Alignment

If directional yagi antenna are used it is important to align them correctly. This can be done using a compass and ordinance survey maps. The alignment can be checked by selecting the Key Transmitter option at the transmitting station. A radio modem is then attached to the yagi antenna feeder at the receiving station. By selecting the RSSI option in the menu the yagi antenna can be rotated to a position of peak signal strength This will be in the direction of the transmitter beacon.

## Site Survey

First check the occupancy of all the radio channels at all the proposed sites. This can be achieved by using an antenna, radio modem and PC. Select the RSSI option and observe the bar graph. Note any activity. Go to the RF channel option and select the next RF

Channel. Again observe the RSSI reading and make a note of any activity. Repeat this for all the RF Channels.

The radio range can be tested by erecting a radio modem, Antenna and PC at the proposed base station site. Select the Key Transmitter option.

Use a second radio modem, antenna at the distant site. If the Rx LED is lit then there is a good propagation path. In addition the RSSI option can be selected for a more accurate reading of the signal strength.

The propagation path can be tested by using the Access Remote Modem option. The RSSI value from each of the distant modems will be measured, radioed back and displayed

## Radio Propagation

When installing a X8200 Radio Modem there are a number of factors that should be considered as they will affect the performance of the radio link. These are:

Transmitter power output.

Sensitivity of the receiver.

Height of transmitter and receiver antenna.

Length and type of the coaxial feeder cables to the antenna. These should be low loss RU67 type and kept as short as possible. As a rule of thumb the RF power is halved every 10m of antenna feeder. It is better to keep the signal wire long and the antenna feeder short.

Type of Antenna used.

Surrounding Topography.

Interference for other networks operating on the same frequency.

The Weather.

## 7 Trouble shooting

### No Data Transmission

Check that TD and RD are connected to the 9 way D Connector correctly. This can be checked by using a voltmeter:

- a) Connect the Host to the Modem.
- b) With no signal present, measure the voltage between:  
0V (Pin 5) and TD (Pin 3)  
0V (Pin 5) and RD (Pin 2)
- c) Both should be between -5V to -15V.

If only one is at a negative voltage then the RD and TD connections are reversed.

### No Data Reception

If the RX LED on the receiver is not lighting at the same time as the TX LED on the transmitter then check the RF frequency is the same on both modems.

If the RX LED is lit when no data is being transmitted then there might be another user on the channel. Select an RF channel were the RX LED is not lit.

If RX LED is flickering on all RF channels then look for a source of local interference such as a switch mode power supply or a computer in close proximity.

If there are other radio modems or radio telemetry systems operating on adjacent frequencies on the same site then the antenna on your system must be mounted at least 3m away from the antenna of the other systems. This will prevent the transmitter of one system interfering with the receiver of the other.

## Corrupted Data

Corrupted data can be caused by poor power supplies.

Check that the power supply is regulated at 12V and has a ripple of less than 50mV on load. It must also be capable of delivering an inrush current of 0.7Amps for 20mSec. when the radio modem starts its transmit cycle.

The ripple voltage can be measured with a voltmeter set on A.C. volts.

## Radio Path

The radio path can be tested by using the Access Remote Modem option. If the remote modem is in radio range and is receiving good data it will respond by displaying the signal strength of the remote modem in the RSSI option.

If the remote modem does not respond then use the Key Transmitter option to permanently transmit a carrier. Go to the distant modem and observe the RX LED. It should be on. Alternatively access the set up menu and select the RSSI option. A minimum of 3 bars should be shown.