

# URT RADIO MODEM SERIES

ADVANCED  
RADIO  
TECHNOLOGIES



*The URT500 is an advanced, simplex/half-duplex, data radio designed to offer the UK utility market an easy upgrade path for systems using external modems, direct serial connections or a mixture of both. It has an audio interface for external modem connection and a serial port providing a true digital interface with speeds and data formats programmable to offer maximum compatibility with existing systems and other manufacturers products.*

*The URT500 is a derivative of our tried and tested SRT470 & ART400 modems so quality and reliability is assured. The large flash memory enables any future upgrades such as IP capability to be easily implemented without unit replacement.*

*The URT500 meets licence-exempt EN 300 220, licensed EN 300 113 and the UK VNS2111 (MPT1411) specifications.*

## MODES OF OPERATION

### **Simplex and Semi-Duplex**

The URT500 can be programmed for simplex or semi-duplex operation.

### **Store & Forward or Repeater Operation**

The URT500 can be used in single radio or dual radio configurations for Store & Forward and Repeater applications. In Store & Forward operation the message is received, the address checked and only forwarded if the address matches one in the routing table. In the Repeater mode, any message being received will be passed on.

## PROTOCOL HANDLING

### **Dumb mode**

The radio has no knowledge of the data it is transmitting; data is simply transmitted and received under hardware control with the option of RTS control or initiation of transmit after receipt of serial data, with CTS providing an optional flow control. This configuration is useful when expanding older systems where the radios must be compatible with others of a different manufacture.

### **Frame Specific Mode**

The radio recognises a complete frame and only transmits and receives data conforming to that format. No addressing of radios or routing of data is performed. Protocols such as MODBUS, DNP3 and IEC can be supported in this way.

### **Protocol Specific mode**

The radios recognise a protocol specific frame and the address to which the frame is to be sent. Routing information must be stored in any radio that originates a call. Any radio in the system can operate as a repeater and the radio does not perform any acknowledgement or retries. Any protocol using a fixed address field such as MODBUS or DNP3, etc. can be supported.

### **Dial Up Mode**

Hayes protocol is used to dial up the radio link which may include repeaters or store & forward stations. The route information is not stored but is passed in the dial up command in the form of a telephone number. Once the link is established it is transparent and therefore independent of the protocol being transported. This allows point to point protocols such as SLIP and PPP (and hence TCP/IP) to be conveyed. The dial up mode is less efficient for small data transactions because of the data transactions carried out during the connect and disconnect operation.

## CHANNEL SELECTION

The URT500 can be programmed with up to 80 discrete channels. Alternatively, complete band allocations like the UK MPT1329 and MPT1411 bands can be loaded. Once programmed the channels can then be selected either via rotary switches on the front panel or under software control (locally or over the air). The radios can cover both the existing and the proposed new MPT1411 frequency plans in the UK without re-alignment.

## RF POWER

The transmit power can be accurately set within the range 50mW to 5 Watts, either locally or over-the-air.

## COMPATABILITY

The URT500 is pin compatible with the CMD400 manufactured by Pacscom Ltd. and will work in any CMD400 legacy system. The inclusion of a programmable 1200/1800Hz FFSK modulation format, extends the range of compatibility to a number of products using CML chipsets such as the Thorcom modem.

For more compatibility details, please contact the sales office.

## INTERNAL / EXTERNAL MODEM

Both internal and external modems are supported:

### Internal Soft Modem

The URT500 features an internal “soft modem” which offers unparalleled performance and flexibility over a wide range of speeds and formats and enables future formats to be downloaded from a PC or over the air. Data is presented to the modem via the RS232 connection at speeds between 150 and 38400bps and then transmitted at the independently programmed over-air baud rate. Buffering is provided which allows the interface data rate to be higher than the transmission rate. Within a 12.5kHz channel, the unit can be programmed for 150, 300, 600 or 1200bps FSK with Bell202 and V23 supported, 2400 coherent FFSK, 4800bps GMSK or 9600bps 4 Level FSK.

### External Modem Applications

In external mode, the 600 ohm audio input and output will accommodate programmable audio levels between +3dBm and -30dBm. The external interface provides both flat and de/pre-emphasised responses for compatibility with older systems. The output can be muted in the absence of a carrier.

### Tone Operated Switch (TOX)

When using an external modem via the 600 ohm port, the soft decoder within the URT500 can be programmed to detect incoming FSK or PSK signals. Once detected the transmitter will key up and pass the incoming data.

## FORWARD ERROR CORRECTION

Forward error correction is a programmable option at 9600bps, but as with all FECs, the overhead will reduce user data throughput. However, since the “SoftModem” offers many data speeds, data integrity can be improved simply by running a lower speed.

## “RSSI” RECEIVE SIGNAL STRENGTH INDICATION

The RSSI signal is accurately measured by an internal A-D converter and compared to an individually calibrated RSSI graph within the processor. The signal strength can then be accurately read in engineering units from a PC connected to the serial port or remotely over the air.

## STATUS LEDs

The URT has 11 LEDs to enable the operator to see at a glance the status of the radio and its interfaces. The System LED provides the operator with a quick visual health check and if the software detects an error, a code is flashed on the LED to indicate the error.

## PROGRAMMING & MANAGEMENT SOFTWARE

The URT500 can be configured, either locally or over-air, using the DOS or Windows based software provided. Once installed in a system, the radios can be continuously monitored with our advanced network management package. The dedicated software provides unrivalled versatility combined with ease of use for the operator.

## POWER SAVE MODE

The URT500 has both internal and external power save modes.

### Internal Power Save Mode

The microprocessor controls the on/off function of the receiver and after a pre-programmed time the MPU will switch on the receiver to look for a carrier. If a carrier is not detected then the transceiver goes back into sleep mode. If during the time the transceiver is awake a carrier is received, the unit will stay awake. After the carrier drops out, the receiver will stay awake until the programmed resume time elapses. Once the resume time has elapsed the transceiver will go back into sleep mode. The power-save, wake and resume times are all user programmable.

### External Power Save Mode

In the external mode the ON/OFF function of the modem is controlled by the host via the DTR line.

## Tx TIME-OUT-TIMER

The transmitter within the URT500 has a time-out timer which allows the maximum continuous transmission time to be set in order to prevent channel blocking due to a fault. The timer operates in all modes and can be programmed in one second steps between 0 and 255 seconds. If programmed and the time is exceeded, transmission will cease until the action that normally causes transmission is removed and then re-applied.

## SQUELCH TAIL ELIMINATION

For old or non tolerant protocols, where the presence of a mute (Squelch) tail may cause a problem at the end of a message, a simple packetising option can be enabled from within the PC programming software.

# TECHNICAL SPECIFICATIONS

## General

|                                 |  |               |
|---------------------------------|--|---------------|
| Frequency Range:                | New & old MPT1411 band without re-alignment  |               |
| Power Requirements:             | 12VDC (10V – 15.5DC)   |               |
| Standby:                        | <75uA  |               |
| Receive:                        | <70mA  |               |
| Transmit:                       | 300mA to 2.2A, dependent on Tx power   |               |
| Number of Channels:             | 80 user programmable frequencies   |               |
| Min. Programmable Channel Step: | 6.25kHz  |               |
| Channel Spacing:                | 12.5kHz  |               |
| Frequency Stability:            | 1.5ppm      (–30 to +60°C)   |               |
| Construction:                   | Milled aluminium enclosure   |               |
| Size:                           | 100mm W x 125mm L x 45mm H   |               |
| Mounting:                       | DIN rail or screwed to a flat surface  |               |
| Weight:                         | 620gms   |               |
| Connectors:                     | Main   | 25-way D-Type |
|                                 | RF   | BNC (50 ohm)  |
| Led Indicators:                 | TX, BUSY, SYSTEM, RXD, TXD, RTS,CTS, DCD,DTR,DSR,RI  |               |
| Approvals:                      | The products have been designed to meet the following specifications.<br>UK RF :      MPT1411/VNS2111<br>European:    ETS 300-220<br>ETS 300-113 |               |

## Transmitter

|                      |   |
|----------------------|---|
| RF Output Power:     | 50mW - 5Watts   |
| Bandwidth:           | New & old MPT1411 band without re- alignment  |
| Internal Modulation: | FFSK, 2 Level FSK, 4 level FSK & GMSK via the internal modem.   |
| Analogue Mode        | Programmable audio input levels over the range +3dBm to -30dBm into 600ohm, selectable for pre-emphasised or flat response. |
| Max. Deviation:      | ± 2.5kHz  |
| Adj. Channel Power:  | >65dB at 12.5kHz  |
| Transient response:  | As per ETS300-113   |
| Spurious Emissions:  | As per ETS300-113   |
| Intermodulation:     | 40dB at 5Watts  |
| Rise Time:           | ≤8mS  |

## Receiver

|                     |   |
|---------------------|---|
| Sensitivity:        | -120dBm for 12dB SINAD de-emph.<br>-117dBm for 12dB SINAD flat  |
| Bandwidth:          | New & old MPT1411 band without re-alignment   |
| Spurious Response:  | >80dB   |
| Blocking:           | >90dB relative to 1uV   |
| Intermodulation:    | >70dB   |
| Adjacent Channel:   | >65dB at 12.5kHz  |
| IF Frequencies:     | 45MHz and 455kHz  |
| Spurious Emissions: | <ETS 300-113  |
| Analogue Mode:      | Programmable audio output levels over the range +3dBm to -30dBm into 600ohm, selectable for de-emphasised or flat response. |
| Mute Response Time: | <2msec  |

## Internal Modem

|                     |  |
|---------------------|--|
| Serial Interface:   | Asynchronous (or Synchronous with custom software).<br>Baud rate programmable between 150bps and 38400bps<br>Interface selectable for RS232 or inverted/non-inverted 5V TTL, Programmable; Odd, Even or No Parity, 1/2 stop bits, 7/8 data bits. |
| Radio Baud Rate:    | 150 – 9600bps within 12.5kHz   |
| Signalling Formats: | Programmable for a 12.5kHz channel:<br>Up to 1200bps - FSK with V23, Bell202 or 1200/1800Hz FFSK (MPT1327) support.<br>2400bps - coherent 1200/2400Hz FFSK.<br>4800bps - GMSK<br>9600bps - 4 level FSK.  |
| NRZI:               | On or Off  |
| Bit Error Rate:     | 2400 baud    less than 1 in 10 <sup>-3</sup> at –120dBm<br>4800 baud    less than 1 in 10 <sup>-3</sup> at –117dBm<br>9600 baud    less than 1 in 10 <sup>-3</sup> at –115dBm  |
| F.E.C.              | Programmable on/off at 9600 bps  |

*In the interest of continuous improvement, the above specifications are subject to change without notice.*