ZRT

RADIO MODEM

Judd Telemetry

TELEMETRY IN CONTROL

The ZRT Series has been designed as a flexible range of high specification, low cost radio modems for stand alone applications or for integration into OEM products.

The design has been optimised for reliability and low current consumption, making the ZRT suitable for operation on remote sites without mains power.

Applications include security, command & control, data logging, SCADA, telemetry, remote switching or any similar applications where serial data needs to be transmitted and a cable is not the most practical solution.

All versions meet the European licence-exempt ETS300-220 specification, while the higher performance ZRT170 & ZRT470 versions also meet the tougher ETS300-113 requirements. The ZRT470 version is FCC and Industry Canada certified for use in the USA and Canada.

Versions with RS232 Only, RS232/RS485/RS422 or 5V TTL serial data interfaces are available and it is possible to use a mixture of these interfaces within any given system.

SERIAL INTERFACES

The ZRT is available with three different interfaces:-

- An **RS232 Only** interface which has full handshaking including CTS, RTS, DSR, DTR and DCD lines.
- A **5VTTL** interface which is the same as the RS232 version but with 5V TTL voltage levels rather than RS232 levels.
- An **RS232/RS422/RS485** combined interface selectable under software control with limited handshaking. In this version the CTS output signalling line is just looped back to the RTS input line and the DSR output line is looped back to the DTR input line.

INTERNAL SOFT MODEM

The ZRT 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 handled by software upgrade.
Within a 12.5kHz channel, the over-air transmission from the unit can be user programmed for a range of speeds. If the maximum speed is not required, the unit can be configured for a lower speed to give an improved receiver threshold. The ZRT incorporates an internal buffer to cope with situations where the interface data rate differs from the over-air rate.
For 150, 300, 600,1200 & 2400 baud, FSK/FFSK is used with both Bell202 and V.23 supported. At 4800bps GMSK modulation is used, while at 9600bps, the modulation is 4-level FSK.

MODES AND PROTOCOLS

Transparent Mode

The ZRT requires no knowledge of the data it is transmitting. Data is simply sent and received with minimal delay. Transmission control can either use RTS control signals or be configured for automatic initiation of transmission on receipt of serial data.

Frame Specific Mode

The radio recognises a complete protocol frame and only transmits and receives data conforming to that format. No addressing of radios or routing of data is performed. MODBUS protocol is currently supported in this way.

Protocol Specific Mode & Repeaters

The radios recognise a protocol specific frame and the address to which the frame is to be sent. Routing information is stored in any radio that originates a call. Any radio in the system can operate as a "Store and Forward" repeater. Any protocol using a fixed address field such as MODBUS or DNP3, etc. can be supported.

CHANNEL SELECTION

The ZRT can be programmed for simplex or semi-duplex operation 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 via rotary switches on the front panel.

RF POWER

The transmit power can be accurately set using a locally connected PC with the supplied software. There are two transmit power ranges available. The low power ZRT169, ZRT450 & ZRT869 versions can be set between 10mW and 750mW, while the higher power ZRT170, ZRT225 & ZRT470 versions can be set between 100mW and 5W.

PROGRAMMABILITY

The parameters of the ZRT can be configured through the local serial port using DOS or Windows 95/98/2000/XP based software. The individual configurations can be stored on disc for future use or printed.

STATUS LEDs

The ZRT has 5 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.

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 packetisation option can be enabled using the configuration software.

FORWARD ERROR CORRECTION

Forward error correction is a programmable option at 9600bps, but as with all FECs, the associated overhead will reduce the effective data throughput rate when it is selected. Error correction offers insignificant performance improvements below 9600bps so the option is permanently disabled at those lower rates.

"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.

POWER SAVE MODE

The ZRT 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 ZRT has a time-out timer which allows the maximum continuous transmission time to be set in order to prevent channel blocking due to a to 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.

PC SOFTWARE

Dedicated PC software running under DOS or Windows 95/98/2000/XP allows configuration of the radios. This software provides unrivalled versatility combined with ease of use for the operator.

Judd Ltd
Lower Voakes, West Chiltington
Pulborough, Sussex
RH20 2LU
'Phone - +44 (0)1798 815046
Email - juddtelemetry@gmail.com

TECHNICAL SPECIFICATIONS

General

Frequency Range:	ZRT169/170 138 - 175MHz ZRT 225 175 - 225MHz ZRT450/470 406 - 512MHz ZRT869 863 - 870MHz (50MHz – 950MHz to special order)
Power Requirements:	12VDC (10V – 15.5DC)
Standby:	< 75uA
Receive:	< 70mA
Transmit:	300mA to 2.1A dependent on Tx power
Number of Channels:	80 user programmable frequencies
Min. Programmable Channel Step:	6.25 or 5kHz
Channel Spacing:	12.5kHz, 20kHz or 25kHz
Frequency Stability:	2ppm (–30 to +60ºC)
Construction:	Milled aluminium enclosure
Size:	75mm W x 130mm L x 30mm H
Mounting:	Screws to a flat surface
Weight:	250gms
Connectors:	DC Power 2way Klippon Type RS232 I/O 9-way D-Type RF BNC (50 ohm)
Led Indicators:	TX, BUSY, TXD, RXD, SYSTEM
Approvals:	Products in the ZRT range have been designed to meet the following specifications. (for full information please contact the sales office) European: ETS 300-220 ETS 300-113 ETS 301-489 Australian: AS4268.2-1995 USA: FCC Part 90/15 Canadian: RSS-199

Receiver

Sensitivity:	-120dBm for 12dB SINAD de-emph. -117dBm for 12dB SINAD flat
Bandwidth:	VHF 5MHz without re- alignment UHF 12MHz without re- alignment 869 10MHz without re- alignment
Spurious Response:	ZRT 169/450/869 > 65dB ZRT 170/225/470 > 80dB
Blocking:	ZRT 169/450/869 > 85dBuV ZRT 170/225/470 > 90dBuV
Intermodulation:	ZRT 169/450/869 > 60dB ZRT 170/225/470 > 70dB
Adjacent Channel:	> 65dB at 12.5kHz
IF Frequencies:	45MHz and 455kHz
Spurious Emissions:	ZRT 169/450/869 < ETS 300-220 ZRT 170/225/470 < ETS 300-113
Mute Response Time:	< 2msec

Transmitter

RF Output Power:	ZRTxxxTR-1 10mW - 750mW ZRTxxxTR-5 100mW - 5Watts
Bandwidth:	VHF 10MHz without re- alignment UHF 12MHz without re- alignment 870 10MHz without re- alignment
Internal Modulation:	FFSK, 2 Level FSK, 4 Level FSK or GMSK via the internal modem.
Max. Deviation:	± 7.5kHz max
Adj. Channel Power:	> 65dB at 12.5kHz
Transient response:	As per ETS300-113
Spurious Emissions:	< 250nW and 4nW in specified bands
Intermodulation:	≥40dB at 5Watts
Rise Time:	< 9mS

Internal Modem

Radio Baud Rate:	150 – 9600bps over-air
RF Bandwidth:	12.5kHz
Signalling Formats:	Programmable for 12.5kHz channel:- Up to 1200bps - FSK with V23, Bell202 or 1200/1800Hz FFSK (MPT1327). 2400bps - coherent 1200/2400Hz FFSK. 4800bps - GMSK. 9600bps - 4 level FSK.
NRZI:	On or Off
Bit Error Rate:	
2400 baud	less than 1 in 10^{-3} at –120dBm
4800 baud	less than 1 in 10^{-3} at –117dBm
9600 baud	less than 1 in 10^{-3} at –115dBm (FEC on)
9600 baud	less than 1 in 10^{-3} at –112dBm (FEC off)
FEC:	Programmable option at 9600bps

Serial Data

Serial Interface:	Three versions available :- /RS232Full:- RS232 only /232+485:- RS232/RS485/RS422 /TTL:- 5 V TT L
Format:	Asynchronous (or Synchronous with custom software). Programmable; Odd, Even or No Parity, 1/2 stop bits, 7/8 data bits.
Interface Rates:	Programmable 150bps to 38400bps
Signalling Lines:	RS232Full & TTL interfaces support full RTS, CTS, DSR, DTR & DCD handshaking, although it is also possible to use just the TXD, RXD & Ground lines. Combined RS232/RS485/RS485 interface has DTR looped back to DSR and RTS looped back to CTS although the RTS line can still be used to control transmission.

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