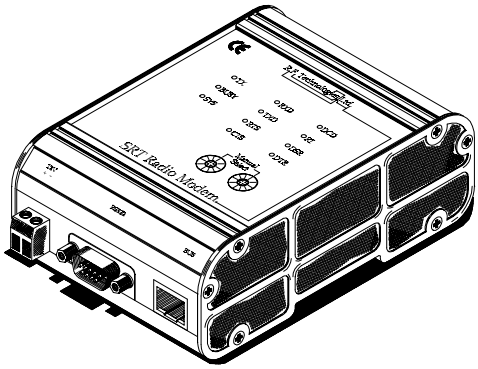
CHURCHILL CONTROLS

Data_Link 2000

SRT Narrow Band Radio Modems



- *Compliant with the relevant UK, European, Canadian, USA And Australian standards for licensed & license exempt operation*
- *Available in VHF, UHF & 900MHz*
- *PC programmable*
- *Internal soft modem with programmable speeds of: 150, 300, 600 1200 & 2400bps FFSK & FSK (including V23 & Bell 202) , 4800bps GMSK & 9600bps 4 level FSK within a 12.5KHz channel*
- *Low power consumption in standby & receive mode*
- *Supports "AT" commands*
- *RS232, V28 and 5V TTL interface*
- *Front panel LED's display RS232 functions,*
- *128K flash processor with EEPROM for easy downloading of new firmware & upgrades*
- *Simplex & semi-duplex operation*
- *External I^2C bus interface to support a range of I/O modules*
- *Remote control of RF power, channels & baud rates with RSSI reporting*

INTRODUCTION

The SRT Radio Modem Series have been designed for transparent operation or system applications under "AT" commands. The SRT Series feature the soft modem as used in our advanced ART Series, with all relevant parameters controlled by software. The large flash memory and EEROM enables software upgrades, code changes or bespoke client code to be programmed via an internal download port.

The SRT Series was designed as a lower cost alternative to the ART products, where the need many of the ART'S features are not required. The unit will fit into most licensed or license exempt systems in the VHF, UHF or 900MHz bands.

CHANNEL SELECTION:

The SRT Series is PC programmed with up to 80 channels. Alternatively, complete band allocations like the MPT1329 and MPT1411 bands as used within the UK can be downloaded, providing of course the channels are within the products tuneable bandwidth. Once programmed, channels can then be selected via rotary switches on the front panel or from a PC program via the serial port.

PROGRAMMABILITY:

All the parameters of the SRT Series can be programmed via the serial port using either a DOS or Windows 95/98 based software. The individual program can be stored on disc for future use or printed.

POWER SAVE MODE

The SRT Series 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 save ON/OFF and resume time are all programmable via the PC program.

External Power Save Mode

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

SOFT MODEM

The SRT Radio Modem has a "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. Within a 12.5KHz channel, the unit can be programmed for 150-2400bps FSK/FFSK with Bell202 & V23 supported, 4800bps GMSK & 9600bps 4 Level FSK.

"RSSI" RECEIVE SIGNAL STRENGTH INDICATION

Each SRT has an individually calibrated RSSI output which is accurately measured by an internal A-D converter. The signal strength can then be read in dBµV on a PC connected to the serial port.

STATUS LED's

The SRT Radio Modems have 11 LED's to enable the operator to see at a glance the status of the product and the serial port in operation or on test.

RF POWER

The SRT Series is available in two power ranges, 10mW to 1 Watt for ultra low power requirement, and 20mW to 5 Watts. There are no internal power adjustment points inside the modem, the RF power level is PC and over air programmable directly in Watts & mW with an accuracy of +/-1dB.

TX TIME-OUT TIMER

The transmitter within the ART 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.

REMOTE OPERATION DURING SETUP

When the internal modem is configured for remote set-up, the RF power level can be remotely changed over the link. Once the link is established the receiver RSSI values at either the outstation or base station can be requested, so the RF power and antenna can be adjusted for optimum link performance.

MODES OF OPERATION & PROTOCOL HANDLING:

Radio Modem Modes of Operation

The basic modes of operation of the radio modem are as follows:

Dumb modem

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.

Protocol specific modem

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 can be supported in this way.

Routing modem

The radios recognise a protocol specific frame and the address to which the frame is to be sent. Routing information must be stored in each radio for each destination address that requires the use of repeaters. Any radio in the system can operate as a repeater. The radio does not perform any acknowledgement or retries. Any protocol using a fixed address field such as MODBUS can be supported.

Dial up modem

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 so independent of the protocol being transported. This allows point to point protocols such as SLIP and PPP (and hence TCP/IP) to be conveyed. Dial up is less efficient for small data transactions because of the data transactions carried out during the connect and disconnect phases.

I/O Modes of Operation

Isolated network with point to point I/O mapping

Inputs and outputs at outstations are mapped to corresponding outputs and inputs at the master.

Network with retrieved data access at base station.

Instead of mapping data to physical inputs and outputs at the master, data is exchanged in memory. The memory is accessible using MODBUS. The base station carries out its data retrieval process independently of the MODBUS accesses.

Externally controlled network

In this mode the base station only carries out data retrieval when requested to do so by the MODBUS interface.

The above modes are not independent processes but are run according to set up, it is possible to configure operation to be a mix of all three. E.g. some physical I/O might be desirable at the base station whilst the rest is passed by MODBUS, the base station can be set to keep polling independently in order to maintain the physical I/O but can also mix in commands passed by MODBUS.

NETWORK MANAGEMENT SOFTWARE

Network management software provides the user with direct access to the radio modems, for diagnostics, programming & re-programming, safe downloading of new firmware and for the retrieval of data. All products on the I^2C bus can be accessed in the same way.

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.

FORWARD ERROR CORRECTION (FEC)

Forward error correction is not implemented as standard in the modem because of the loss of throughput in good signal situations, however FEC can be offered as a custom option if required. Note that since the internal modem offers many data speeds data integrity can be improved simply by running a lower speed.

AUTOMATIC FREQUENCY CONTROL

The network management software, enables the outstation's receiver and transmitter to be frequency locked onto the base station s frequency and automatically re-aligned, thereby minimising the effects of long term drift (Ageing).

PROGRAMMING SERVICE & MANAGEMENT SOFTWARE

Dedicated PC software packages have been written that provide unrivalled versatility combined with ease of use to the user.

Programming software:

Programming software in DOS and Windows 95/98 is available for the SRT Series

Service Software

Service software is available to enable competent engineers to perform first line testing of the product and re-alignment when used in conjunction with suitable test equipment.

Custom Software

Custom software can be written for user specific applications, further details are available on request.

OPTIONS AND ACCESSORIES:

DIN Uninterruptable Power Supplies with Chargers

ART750	80…250VAC to 12VDC 3 Amps with backup battery charger & fault reporting via the I^2C Bus
ART751DC	18…60VDC to 12VDC 3 Amps isolated with backup battery charging and fault reporting via the I^2C bus

DIN Mountable RF Power Amplifier

ART400PA-25	UHF 5Watt to 25Watt RF power amplifier with built-in VSWR facility that measures Forward & Reflected power and conveys the information back to the ART400 via the I2C bus.
ART170PA-25	VHF 5Watt to 25Watt RF power amplifier as the ART400PA-25

Manuals & Connecting leads

Programming, installation and operations manual

TECHNICAL SPECIFICATIONS

General

Frequency Range:	SRT150	138…175MHz
	SRT450	406…512MHz
	SRT950	820…950MHz
Power Requirements:	12VDC (10V…15.5DC)	
	Standby:	< 75uA
	Receiver on & decoding:	<70mA
	Transmitter:	Dependant on Power
Number of Channels:	80 user programmable frequencies or all UK pre-programmed MPT1411 & MPT1329 channels	
Min. Programmable Channel Step:	6.25 or 5KHz	
Channel Spacing	12.5KHz, 20KHz or 25KHz	
Operating Temp. Stability:	2ppm –30 to +60ºC	
Construction:	Milled aluminium enclosure	
Size:	90mm W x 125mm L x 45mm H	
Mounting:	DIN or can be screwed to a flat surface	
Weight:	550gms	
Connectors:	RS232:	9 Way "D" Type
	12VDC	2Way Klippon Type
	RF	BNC
Led Indicators:	TX, Busy, System, RXD, TXD, RTS, CTS, DCD, DTR, DSR, RI	
Approvals:	The products have been designed to meet the following approvals.	
	UK RF :	MPT1411, 1329 & 1328
	European RF:	ETS 300-220
		ETS 300-113
		ETS300-224
	Australian:	AS4268.2-1995
	USA:	FCC Part 90/15
	Canadian	DOC
	European CE:	IETS 300-683

Transmitter:

RF Output Power:	1Watt unit:	10mW…1W	
	5Watt unit:	50mW…5W	
Bandwidth:	Without alignment:	VHF	10MHz
		UHF	20MHz
		900MHz	30MHz
Modulation:	FFSK, 2 Level FSK, 4 level FSK & GMSK via the internal modem, or external audio at +3dBm to –30dBm into 600ohm, with a programmable pre-emphasised or flat response.		
Max. Deviation:	± 7.5KHz max		
Adj. Channel Power:	>65dB		
Hum and Noise:	>-35dB		
Spurious Emissions:	< 250nW & 4nW in specified bands		
Rise Time:	< 7mS		

Receiver:

Sensitivity:	0.25uV for 12dB SINAD		
Bandwidth:	Without re-alignment	VHF	5MHz
		UHF	10MHz
		900MHz	20MHz
Spurious Response:	> 70dB		
Blocking:	> 90dB relative to 1uV		
Intermodulation:	> 65dB		
Adjacent Channel:	> 65dB at 12.5KHz		
IF Frequencies:	45MHz and 455KHz		
Spurious Emissions:	< 2nW		
Audio Output:	+3…–30dBm into 600 ohms, with a programmable de-emphasised or flat response		
Mute Response Time:	< 3msec		

Internal Modem

Serial Interface:	Asynchronous or Synchronous with custom software. Baud rate programmable between 150bps and 38400bps. Interface selectable for RS232 or inverted/non-inverted 5V TTL, odd even or no parity, 1-2 stop bits, 7-8 data bits parameters independently programmable.
Signalling Formats:	V23, Bell202, FFSK, 2 level FSK, 4 Level FSK & GMSK.
NRZI:	On or Off
Baud Rate:	150…9600bps within 12.5KHz
Bit Error Rate:	2400 baud: Less than 1 in 10^3 at –118dBm 4800 baud: Less than 1 in 10^3 at –115dBm 9600 baud: Less than 1 in 10^3 at –110dBm

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

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