The TS4000 is a high performance radio modem designed to provide high speed narrow band data links over long distances (up to 25 miles) in harsh environments. It uses advanced data processing and provides data rates up to 19200bps (25KHz channel).

The serial ports are highly configurable and can interface to virtually any equipment with an asynchronous serial port. This includes equipment using most SCADA protocols like Modbus and DF1.

The TS4000 has the most advanced store and forward capability of any narrow band radio modem on the market. Any and all nodes can be configured as store and forward repeaters to allow system range to be easily extended. In addition, the TS4000 features Clear Channel Scan which automatically and dynamically selects the best channel. This is particularly useful for systems using shared channels in order to minimize interference to and from other users.

**APPLICATIONS**
- Water and Waste Water Management
- Oil and Gas Field Telemetry
- Unmanned Aerial Vehicles (UAV)
- Railroad Collision Avoidance
- Environmental Monitoring
- Electrical Utility SCADA
- Differential and RTK GPS Correction
- Automatic Vehicle Location (AVL)
TS4000 Radio Modem

AIRNET PACKET PROTOCOL
• Versatile addressing includes individual and group broadcasts
• Built in Store and Forward feature provides wide area coverage without requiring any additional equipment
• Store and Forward allows any number of store and forward points to be used
• Store and forward supports address filtering to allow selective routing and repeating
• Optional automatic acknowledgment of packets
• Provides addressable communications for host devices that do not have native addressing
• Can be optimized for point to point, point to multipoint or full mesh networks
• CSMA channel access algorithm has programmable access priority and randomization to maximize channel utilization

ADVANCED DIAGNOSTICS
• Remote diagnostics allows monitoring of any node in a network
• Non-intrusive operation efficiently mixes application and diagnostic packets
• Diagnostics data include RSSI (rx signal strength), transmit power (forward and reflected), input voltage, regulated voltage, temperature, firmware version, time since reset, path (shows store and forward route) and response time
• Diagnostics can be checked using a windows based application (supplied by Teledesign) or by the host application using control strings

SELECTABLE CHANNEL PROTOCOLS
• Clear Channel Scan feature provides automatic and dynamic selection of the best channel for operation. This minimizes the effect of interference on shared channels.
• Configurable scrambling codes for data privacy
• Optional Forward Error Correction (FEC) with interleaving corrects channel induced errors
• User selectable transparent (no formatting) or AirNet packet protocol

FLEXIBLE SERIAL PORTS
• Two highly configurable serial ports allow connection to any asynchronous device
• Full handshake and Data Activation modes supported
• Data Activation mode requires only receive and transmit data lines for full communication with host device
• 1200 to 38,400 baud
• RS-232, TTL (port 1) or RS-485 (with adapter)

INTEGRATED RF TRANSCEIVER
• Synthesized transceiver covers VHF and UHF frequency bands.
• Programmable output power level
• Up to 99 channel frequencies can be stored and selected on the fly

PC CONFIGURABLE
• Easy to use PC based configuration software provides quick setup and testing
• AirTest provides data and BER (Bit Error Rate) testing
• AirScan provides frequency scanning to determine possible sources of interference
• Remote Diagnostics supports monitoring of remote units
• Firmware is field upgradable

RUGGED AND RELIABLE
• Highly reliable with 100% factory burn-in and temperature testing
• Optional watertight housing designed to support outdoor installations
• Free technical support provided during all phases of installation and use
• Two year warranty
Data Interfaces
- **Data Rates**: 1200, 2400, 4800, 9600, 19200, 38400 baud
- **Data Format**: Asynchronous, 8 or 9 bit words
- **Signal Levels**: RS-232 or TTL (Data Port 1), RS-232 (Data Port 2), RS-485 (with adapter)
- **Handshake Protocols**: Data Activation (3 wire): Requires only TD, RD and ground (SG)
- **Data Only Time Out**: 1 to 500 character periods
- **Data Connectors**: 9 pin D, female, DCE (standard case), LEMO connector (watertight case)

Radio
- **Frequency Ranges**: 136-174, 340-400, 406.1-476 MHz
- **Number of Channels**: 99 receive/transmit pairs, stored in non-volatile memory
- **Channel Spacing**: 5, 6.25, 7.5, 10, 12.5, 15, 25 and 30 kHz (depends on model)
- **Channel Rate**: 4,000 to 19,200 bps - GMSK
- **RF Output Power**: 1 to 5 watts
  - external amplifiers available for up to 100 watts
- **Receive Data Sensitivity**: -103 dBm for less than 1 x 10E-4 BER (Bit Error Rate) (typical)
- **Carrier Detect Threshold**: -120 to -60 dBm, programmable
- **RF Connector**: BNC (standard case), TNC (watertight case), N (optional), SMA (optional)
- **RF Connector Type**: female, 50 ohm

Channel Options
- **Data Protocol**: Transparent or Packet (AirNet)
- **Data Security**: 254 Selectable Scrambling Codes
- **FEC (Error Correction Coding)**: None or 12.8 Hamming code with 16 bit Interleaving
- **Clear Channel Scan**: Automatic and dynamic selection from up to 9 channels

AirNet Packet Protocol (optional)
- **Channel Access**: Master-Slave or Carrier Sense Multiple Access (CSMA) with Programmatic Attempt Rate
- **Protocol**: Automatic Repeat reQuest (ARQ)
- **Packet Size**: 1 to 9999 characters
- **Retries**: 0 to 50 per packet
- **Address Space**: 999 Individual Addresses per Group, up to 60 Groups
- **Transfers**: Individual with Acknowledgment (to any address)
  - Individual without Acknowledgment (to any address)
  - Group Broadcast (to all addresses in a single group)
  - Network Broadcast (to all addresses in all groups)
  - Multicast Reception (from up to 20 other groups)

Relay Operation
- **Store and Forward Data Repeating with**: Address Filtering – minimizes traffic
  - Slotted MAC (Medium Access Control) – prevents collisions
  - Multiple Store and Forward Capability – allows complex topologies
  - Any unit can be a store and forward repeater – minimizes equipment

Diagnostics
- **Internally Monitored Values**: Supply Voltages, Temperature, Receive Signal Level (RSSI), Forward and Reflected Transmit Power
- **Remote Diagnostics**: Provides remote monitoring of any node (firmware option)

General
- **Supply Voltage**: 11 to 28 VDC
- **Power**: 3 watts receive (typical)
  - 20 watts transmit (typical)
- **Power Connector**: 2 pin Molex or through Data Ports
- **LED Indicators**: Transmit, Receive, Power
- **Operating Temperature**: -22 to +140 °F (-30 to +60 °C)
- **Dimensions**: 6.5” x 3.1” x 1.8” (165 mm x 79 mm x 46 mm) - with heat sink
  - 4.3” x 3.1” x 1.8” (109 mm x 79 mm x 46 mm) - without heat sink
- **Enclosure Options**: Standard and Watertight

This product is available for domestic and international sale. For domestic sale, some frequency bands cannot be approved by the Federal Communications Commission. Therefore, some devices are not, and may not be, offered for sale or lease, or sold or leased within the United States and its territories.
TS4000 Radio Modem

Standard TS4000

Antenna Connector Options
N
BNC
TNC
SMA

Data Port 2
TX RX Pwr
Data Port 1
Power

Options
N
BNC
TNC
SMA

Watertight TS4000

Antenna Connector Options
N
BNC
TNC
SMA

TS4000 Standard Case

Heatsink

4-40 thread, 6 places, 0.125 max penetration

TS4000 Watertight Case

6-32 thread, 4 places, 0.350 max penetration

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