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INTRODUCTION

ESTeem wireless modem products provide a "Wireless Solution" by eliminating conventional hardwiring of leased phone lines.

All of the ESTeem models come with the industry standard RS-232C, RS-422, and RS-485 asynchronous communications ports to give the user a new dimension to "Local Area Networking".

Our packet burst, frequency agile communications products allow the user to create a "Radio Area Network" of up to 255 users on a single frequency. The packet burst communications technique was chosen to give the system very high data integrity in high noise industrial environments. The ESTeem incorporates a method of error checking that provides received data accuracy of greater than one part in 100 million.

Internal Digi-Repeater features allow the user to increase operating range by relaying transmission through a maximum of three ESTeems to reach the destination ESTeem. An ESTeem can operate as an operating node, a repeater node, or both simultaneously for added flexibility.

"Private Data Communications" is provided by the use of an interleaving technique of the modulated data, user definable commands for unit addressing, network addressing, and security lock-out of software programming. If higher security is required, the ESTeem is compatible with asynchronous Data Encryption Standard (DES) encryption devices.

The ESTeem has programmable software commands to allow the user to easily configure the unit for any application or mission. The ESTeem setup parameters are saved in non-volatile memory.

When you buy ESTeem products you are getting equipment designed by the company that holds the United States and Canadian patent for the wireless modem. We are proud to say that we design, develop and manufacture our products in the United States. Each ESTeem is subjected to a rigorous quality control bench test before shipping to insure our customers have out-of-the-package reliability. We also have a dedicated Customer Support Staff, Field Engineering Services and Factory Training classes to make sure that your application problems are solved.

HOW IT WORKS

Now, as you can probably guess, the ESTeem is a sophisticated piece of technology, however the concept is easy to comprehend if you understand packet radio.

All packet systems, whether hardwired or radio, share the same principle of operation; data is taken from your standard RS-232C, RS-422, or RS-485 asynchronous port and is transmitted in "Blocks". Think of this block as an "Electronic Envelope" that we call a packet. The size of the packet can be defined by the user from 1 to 2000 bytes of information. Reducing the size of the packet allows the ESTeem to operate better in high EMF noise environments, because by reducing the packet size you reduce transmission exposure time on the radio waves thereby increasing your probability of a successful transmission.

Once this packet of data is formed, it's transmitted in a "burst," one ESTeem to another, hence the term "packet burst communications". Now, if more than one packet is required to send the data then the ESTeem goes into full automatic mode and transmits additional packets.

Before an ESTeem transmits its packet it listens to ensure that the air waves are clear before transmitting. This listen before transmit scheme is called "carrier sensed multiple access," or CSMA.

When a "packet" has been transmitted, every modem in radio range on the same frequency hears it. To design a modem to communicate with a network of modems it has to be "address specific" so only the modem you want to talk to accepts your information. It's like yelling into a crowd of 255 people but you want only the person's name you called to acknowledge (ACK). Well, very simply, that's how the ESTeem works. Once the address you're calling receives your packet, it's checked for accuracy.

Accuracy is probably the single most important part of any communication device. The ESTeem uses Forward Error Correction (FEC) and a 16 bit Cyclic Redundancy Check (CRC) which is a very sophisticated method of checking the data integrity of the packet once its been received. The CRC insures data integrity greater than one part in one hundred million. Once the CRC is completed on the received packet, the data is outputted to the user and a positive acknowledgment (ACK) is transmitted back to the sender.

It's safe to assume that the data you receive is good data or you get nothing at all using the CRC technique. If no ACK is returned after a given delay, the sender assumes the packet was not received and "retries" the transmission. The

ESTEEM

number of retries are user definable from 1 to 255, allowing the unit to automatically retry sending the packet.

SPECTRUM UTILIZATION

The ESTeem uses a "listen before transmit" or Carrier Sensed Multiple Access (CSMA) scheme. This means only one unit in a network is allowed to transmit at a time. By fixing each user's communication window and allowing the computer in the ESTeem to be the Air Traffic Controller, many individual users can share one frequency. The ESTeem firmware can support up to 255 ESTeems on a single channel or frequency.

The CSMA technique is a very efficient way to manage your network of ESTeems and prevent communication bottlenecks. In addition, an anti-collision software scheme is used to recover data if two or more units transmit at exactly the same time. When this feature is added the technical term for this technique is now called CSMA-CD (collision detection).

PACKET PROTOCOLS

By using CSMA no polling station or token is required in the ESTeem network. When an ESTeem has information to send it will check to see if the channel is clear before transmitting its packet and await an (ACK). The ESTeem is a Master/Master system, meaning any ESTeem can communicate with any other ESTeem.

FLOW CONTROL

The ESTeem supports hardware and software flow control, which allow different devices on the network to communicate at different baud rates. In addition to flow control the ESTeem also has a 4000 byte data buffer on both the receive and transmit buffers in the unit.

DATA PRIVACY

Data privacy in the ESTeem is provided by three levels of data encoding in the firmware and by the user being able to define over four security and communications parameters (Unit Address, Network ID, and Operating Frequency) that allow communications access to the modem giving over 100 million combinations. If higher security is required, the units are compatible with asynchronous Data Encryption Standard (DES) encryption peripherals.

EFFECTIVE BAUD RATE

The maximum input baud rate to the modem is 57,600 baud, asynchronous, full duplex, but this is misleading since the ESTeems actually communicate to each other simplex over the RF link, at 85.5kbps, 171kbps, 344kbps or 688kbps selectable by the user. The effective baud rate is a function of the above plus the packet length variable in the ESTeem (definable from 1 to 2000 bytes. The effective baud rate will degrade as the pack length variable is reduced.