ESTEEM TRANSCEIVER SPECIFICATION SHEET

ESTeem Model 192M

FCC ID: ENPESTEEM192M

Frequency Range	150 to 174 MHz
Frequency Selection	Digitally Synthesized - Software Selectable
Frequency Stability	+/- 2.5 ppm
Frequency Selectability	12.5 kHz
RF Data Rate	19,200 bps @ 25 kHz Channel Spacing U.S.A. Type Acceptance: ENPESTEEM192M Emission Designator: 17K6F1D 9,600 bps @ 12.5 kHz Channel Spacing U.S.A. Type Acceptance: ENPESTEEM192M Emission Designator: 10K8F1D 19,200 bps @ 25 kHz Channel Spacing Canada: ???? ??? ???? Emission Designator: 17K6F1D 9,600 bps @ 12.5 kHz Channel Spacing Canada: ???? ??? ???? Emission Designator: 10K8F1D
Transmitter Modulation	DC to 4800 Hz @ 19,200 bps
	DC to 2400 Hz @ 9,600 bps
Transmitter Deviation	4 kHz @ 19,200 bps
	3 kHz @ 9,600 bps
Transmitter RF Power Output	2 Watts (4 Watts optional)
Transmitter Duty Cycle	100%
Transmitter Spurious & Harmonics	> 55 dB down from carrier
Transmitter Rise Time	1 msec
Transmitter FM Hum & Noise	> 50 dB down from carrier
Receiver Sensitivity:	-101 dBm
Receiver Spurious & Image Rejection	> 50 dB
Receiver Squelch Sensitivity	Adjustable - Four Levels
Receiver Adjacent Channel Rejection	> 70 dB
Receiver Modulation Acceptance:	25 kHz
Receiver Base Bandwidth:	4.8 kHz
Transmit/Receive Switch	Integral to Unit
RF Output Impedance	50 Ohms
RF Input/Output Connector	TNC Female
Power Supply Voltage	12 to 15 VDC
Power Supply Current @ 12 VDC	750 ma Receive 1.6 A Transmit (2 W RF Output) 2.0 A Transmit (4 W RF Output)
Input Power Connector	2 Pin Molex (male)
Temperature Range	-30 to + 50 ° C.
Size	2 ¼ in. H x 5 ¼ in. W x 10 ¼ in. L.
Weight	3.2 lbs.

192 Description of device and circuitry
for
Determining and stabilizing operating frequency

The ESTeem 192 utilizes 4 VCO's for the transmitter. The local oscillator (240 to 264 MHz) consists of a master, fine and slave synthesized VCO locked to a quartz crystal that reside in an oven for temperature stability. The Exciter 90 MHz VCO uses a separate quartz crystal. Each VCO uses a low pass filter and is independently shielded. The loop bandwidth of each VCO is optimized for frequency stability and low susceptibility to microphonics. See overall transceiver and first L.O. block diagram.

Each of the four synthesizers lock detect output's are OR'ed to the transmitter on switch. The transmitter cannot be enabled if any one of the VCO are not locked on frequency.

The transmitter power up circuit consist of 3 stages. The first stage starts the Exciter VCO. Stage two turns on stages 1 and 2 of the power amp, while allowing time for the Exciter VCO to stabilize. Stage three turns on stages 3 and 4 of the power amp, and ramps the final section of the power amplifier on. Upon turn off the stages are delayed from each other in the reverse order.   This power up sequence provides a clean stable turn on and off sequence of the transmitter.

Suppression of Spurious Radiation
Modulation
and
Power Limiting

Spurious Radiation Suppression

The transmit signal is passed through 2, three pole band pass filters before amplified by the power amp.
The power amp output is fed to a 2 pole filter for harmonic attenuation and suppression of spurious emissions.

Modulation

Modulation is supplied by a 4 level FSK modem data pump.   The signal is passed through a RC low pass filter. Then through a 3 pole low pass Gaussian pre-mod filter with a cut off of 6.8 kHz, 18db per octave. Note: Primary bandwidth control is by the data pump. Clock spurs and quantization are filtered in the Gaussian pre-mod filter.

The signal is modulated using a VCXO with a maximum worst case mod of 5 kHz.

Power Limiting

The RF power output is limited by regulator U707 which supplies 8 VDC to stages 1 and 2 of the power amp U702.   The power amp U702 is also limited in design.

ESTeem 192 Occupied Bandwidth

Modulation type 10K8F2D

The modem assembles incoming data , adds forward error correction and error detection information and interleaves the result for burst-error protection. After automatically adding symbol and frame sync code words the data packet is converted into filtered 4-level 0 to 2400 Hz analog signals for modulating the radio transmitter.

Necessary Bandwidth

Bn = 2M + 2D

M = 2400 Hz

D = ± 3 KHz

Bn = 10K8 F2D

Modulation type 17K6F2D

The modem assembles incoming data , adds forward error correction and error detection information and interleaves the result for burst-error protection. After automatically adding symbol and frame sync code words the data packet is converted into filtered 4-level 0 to 4800 Hz analog signals for modulating the radio transmitter.

Necessary Bandwidth

Bn = 2M + 2D

M = 4800 Hz

D = ± 4 KHz

Bn = 17K6 F2D

ESTEEM
Model 192M

Wireless Solution
New Product Release

ESTeem® wireless modem products provide a "Wireless Solution" by eliminating conventional hard wiring, leased phone lines, or cellular costs.

The ESTeem Model 192M comes 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, narrow band, frequency agile, UHF 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 forward error correction and CRC error checking that provides received data accuracy of greater than one part in 100 million.

Packet Protocols
By using a Carrier-Sensed-Multiple-Access (CSMA) communication protocol 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 acknowledge. The ESTeem is a Master/Master system, meaning any ESTeem of the same model type can communicate with any other ESTeem of the same model type.

Data Privacy
Transmitted data privacy is insured 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.

Increased Operating Range
The internal Digi-Repeater feature allows the user to increase operating range by relaying transmissions 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.

User Friendly
The ESTeem has user programmable software to allow the configuration of the unit for any application. These commands are saved in the ESTeem's internal non-volatile memory.
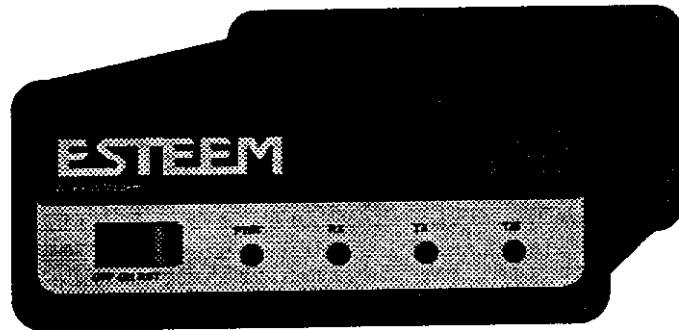
FEATURES

Transceiver
- 19,200 bps RF data rate
- 150 to 174 MHz VHF operating frequencies
- Integral Digi-Repeater
- Frequency of operation Software Programmable
- Receiver Squelch Software Programmable
- Remote Programmability of all features over the RF, Infrared, or Phone Interfaces
- Radio Diagnostic Programs included
- Radio Self-Test
- Packet Monitor
- Received Signal to Noise Ratio
- Received Signal Strength Output (Optional)

Interfaces
- RS-232C, RS-422, and RS-485 communications ports for hardware interfacing
- Infrared communication port for Local Programming and Diagnostics
- Optional Phone communication port for Remote Programming and Diagnostics

Protocols
- Integral PLC And RTU Protocol Drivers
- Point-to-Point Protocol
- Point-to-Multi-Point Protocol
- Polled With Report-By-Exception Protocol
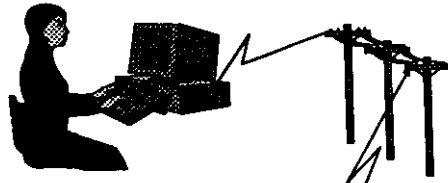- Contingent Protocol
- Transparent Protocol

WARRANTY
- One Year

Resale Pending
F.C.C. Type Acceptance

Technical Specifications   Model 192M

Optional Phone
Modem For Remote
Programming and
Diagnostics

19,200 Bps Narrow Band
Packet Burst Radio
Communications

Communication
Interfaces
• RS-232
• RS-422
• RS-485

ESTeem
Utility
Software
Provided

Infrared Communications Port for Remote
Programming and Diagnostics Without
Interruption Of The Wireless Radio Area Network

FREQUENCY OF OPERATION
• 150 to 174 MHz.
• 25 KHz & 12.5 KHz Channel
  Spacing Software Programmable
• Simplex

RF POWER
• 2 Watts (4 Watts optional)

RF DATA RATE
• 19,200 bps @ 25 KHz channel
  spacing
• 9,600 bps @ 12.5 KHz channel
  spacing

RECEIVER SENSITIVITY
• < 1 uv

RECEIVER SQUELCH
• Four Levels · Software
  Programmable

MINIMUM RADIO TURN AROUND TIME
• < 30 ms + Data (W/ACK)
• < 15 ms + Data (W/O ACK)

POWER REQUIREMENTS
• 11-15 VDC @ 750 MA Receive
                1.6 A Transmit - 2 watt
                2.0 A Transmit - 4 watt

SIZE
• 2 1/4 in. Height
  5 1/4 in. Width
  10 1/4 in. Length

WEIGHT:
• 3.2 lbs.

ENVIRONMENT
• -30° to 50° C
• 95% Non-condensing

WARRANTY
• 1 Year

SWITCHES
• Off/On/CPU Reset
• RS-232/422/485 Setup

LED INDICATORS
• Power On
• Receiver Carrier Detect
• Transmitter Enable
• Link Connect/Disconnect
• Auto Connect Enable
• RS-232/422/485 Framing Error

I/O - CONNECTORS
• RS-232C/422/485 - 25 Pin Sub D
  Female
• Infrared Programming Port
• RJ 11 Phone Interface (optional)
• Antenna Output - TNC
• Input Power - 2 Pin Molex Female

ADDRESSING RANGE
• 0 to 254

DATA INPUT
• RS-232/422/485 Async
• Selectable 600 to 19,200 baud
• 7 to 8 data bits
• Even, Odd or no parity
• One or Two Stop Bits

DATA BUFFERS
• Transmit 4000 bytes
• Receive   4000 bytes
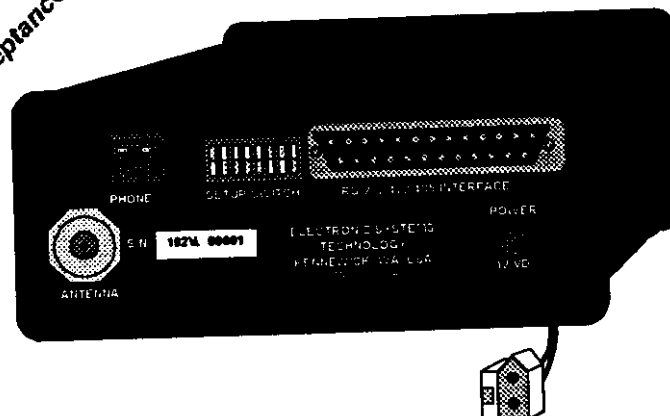
FLOW CONTROL
• Hardware or Software

DATA TRANSMISSION PROTOCOL
• Carrier Sensed Multiple Access with
  Collision Detection (CSMA-CD)

ERROR CHECKING
• Forward Error Correction and 16 Bit
  Cyclic Redundancy check (CRC)
  with Packet Acknowledge and Retry

Pending F.C.C. Type Acceptance

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