Packet Radio Basics

Taylorsville HAMnet

20140215

Packet Radio Contents

- Radio Communications History
- Advantages of Packet Radio
- How Packet Radio Operates
- Packet Radio Field Operations
- Packet Radio Range
- Packet Station Equipment
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- Review
- Packet Radio Resources

Radio Communications History

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- Can Digipeat

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- When complete the TNC passes the message to the computer for display

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- Receiving computer can print hard copy for agency

Packet Radio Effective Range

- VHF and UHF
- Line of Sight
- Antenna height
- Antenna type
- Feed line losses
- Obstructions
- Power – to a lesser extent – don't "over talk" the receiving station
- VIAs
- VHF – 10 to 100 miles depending on circumstances

Packet Radio Station Equipment

- Power supply(ies) appropriate for the equipment
- Antenna
- Radio
- Terminal Node Controller (TNC)
- Computer
- Cables
- Printer (optional)

Packet Radio Power Supplies

- Radio
- TNC
- Computer
- Illumination for night operations

Packet Radio Antenna

- Antenna Type
- Vertical
- Yagi
- Polarity
- Multipath
- Elevation

Packet Radio Radio

- VHF
- UHF
- Capable of voice communications
- Simplex operation

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- The TNC interfaces the computer with the radio
  - Data circuit
  - Radio control
- TNC-2 is the standard used today

Packet Radio Computer

- Terminal software applications
  - Windows terminal emulation bundled applications abandoned after XP
  - Tera Term – http://logmett.com/index.php?/download/tera-term-480-freeware.html
  - WinLink2000 – http://www.winlink.org/ClientSoftware
  - HyperTerminal – http://www.hilgraeve.com/hyperterminal/
  - ARESPack (MS-DOS) – http://www.laarc.org/Public_Service.html
- Serial port
- Usually portable: laptop, notebook
- USB ports

Packet Radio Cables

- Antenna feed line
- Radio ←→ TNC
- Computer ←→TNC
- Power
  - Radio
  - TNC
  - Computer
  - Illumination

Packet Radio Theory

- Simplex transmission
- Common frequency
  - Separates packet messages by geography
  - Separates packet messages by functions
- TNC identifies the packet station by call sign or alias
- Packets of data
- CRC
- Data collisions – AX.25 protocol
- Receipt of message acknowledgement

Packet Radio Parameters

- There are lots of parameters that must be met to establish reliable and accurate communications
- We usually use default parameters as they most always suffice
- Some special events (Wasatch 100) with extensive packet networks change some parameters to assure more reliable large scale network communications. Examples:
  - Wait times
  - Retries
  - Packet length

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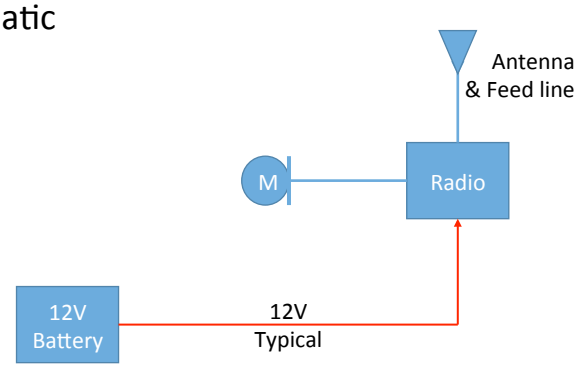
- During reception phase, TNC awaits the end of packet byte and attempts to confirm correctness of the data packet using CRC
- When the packet has been received correctly, the TNC transmits an acknowledgement to the sending station

Packet Radio Station Construction

- Station Block Diagram Schematic



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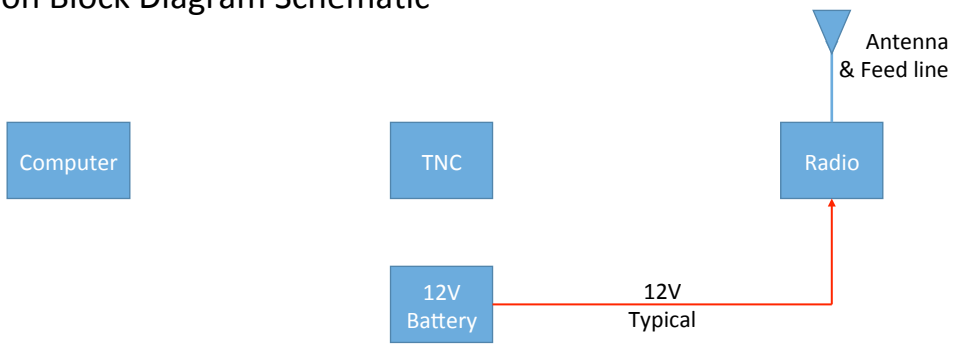

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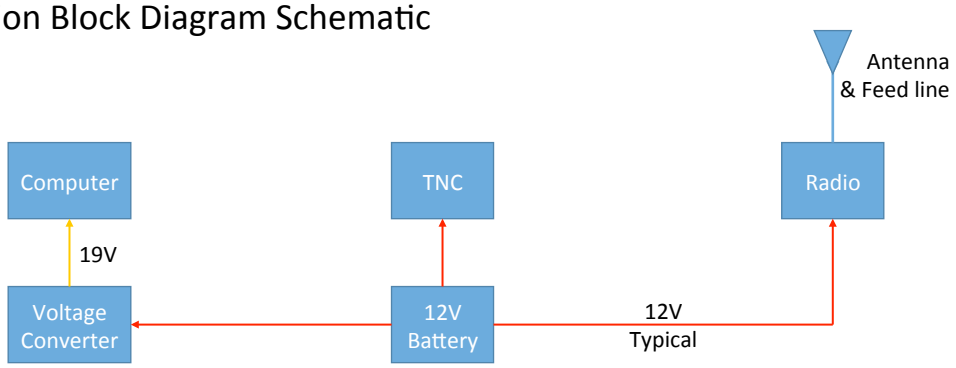

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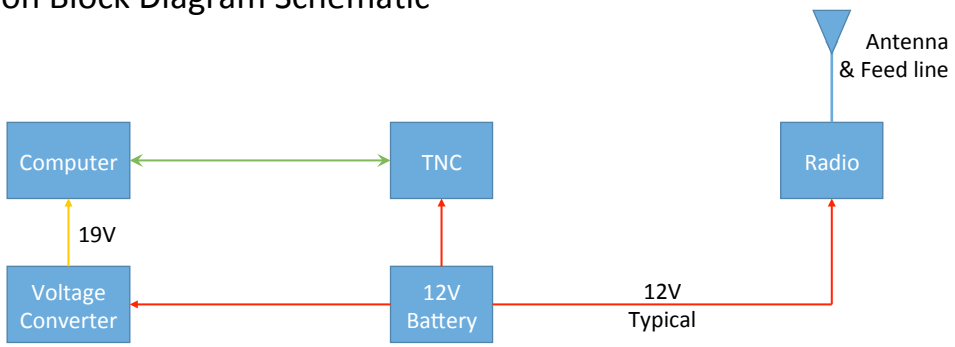

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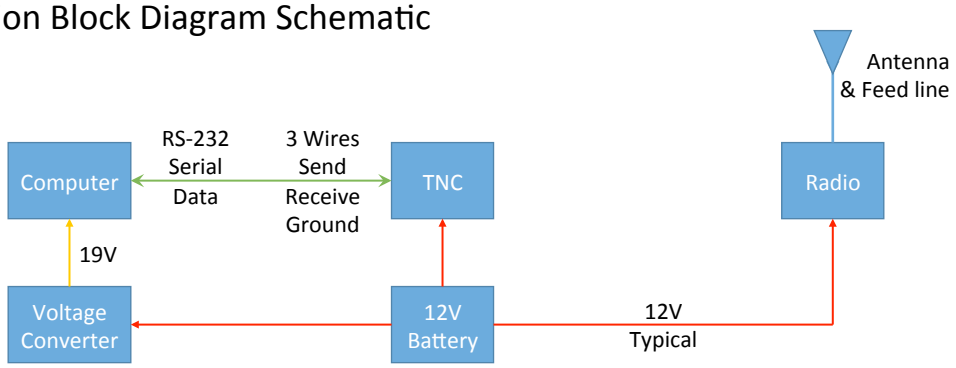

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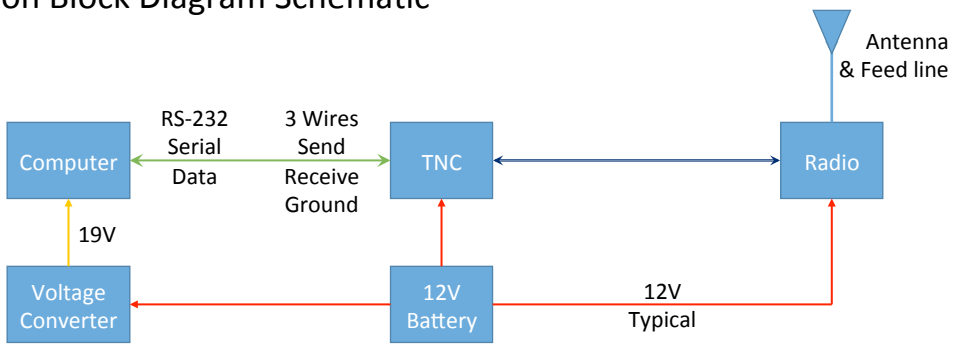

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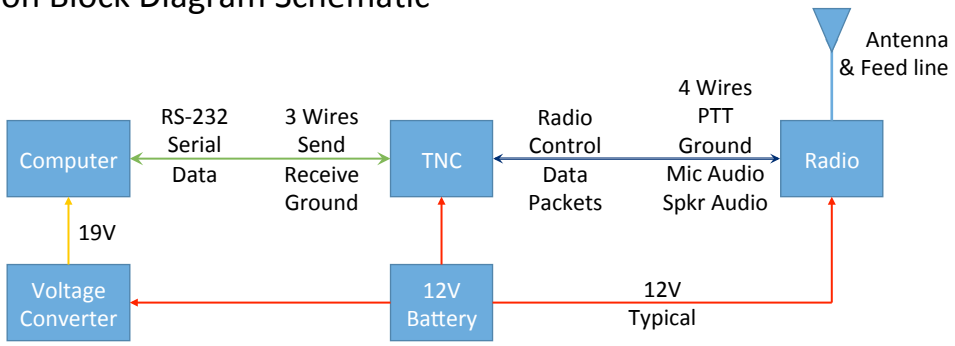

Packet Radio Beginning Commands

- **MYC**all – enter your call sign and SSID
- **MYA**lias – enter a tactical call sign or other easy identifier
- **C**onnect – connects to a specific station or node – transitions to converse mode upon successful connection
- **CONV**erse – enter text conversation mode between stations
- **Ctrl-C** – return to command mode
- **D**isconnect – tear down connection on current stream
- **B**ye – releases connection to a station or node
- **MH**eard – shows calls heard, and date/time if clock is set
- **DA**ytime – sets date and time: yymmddhhmmss
- **?** Help – requests command help script and other information from the current node

Packet Radio Repeaters

- Voice Repeater
  - Too slow for packet
  - Too complicated for packet
- Digipeater (Digi)
  - VIAs
  - Extends your range by the combined ranges of digipeaters used
  - Receiver your message completely
  - Sends your message to the next message destination
  - Accuracy is less certain – game of telephone

Packet Radio Bulletin Boards

- You can send a message to a bulletin board (BBS) for later retrieval by a specific station, specific stations, or all stations
- Can be used for forwarding mail to stations not on the air continuously
- Can be used to post bulletins of general interest to any station "reading the mail" at a particular BBS
- Some BBS software can retransmit mail during off hours to reduce network congestion

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- Printed messages available

Packet Radio Frequencies

FREQ	USAGE	WASATCH 100 USAGE	
144.390	National APRS		
144.910	Rural Wasatch Front Packet (AX.25)	CLAY	Clayton Peak (also 145.530)
144.930	Utah County Packet	ISLAND	Antelope Island
144.950	Salt Lake County Packet		
144.970	Davis/Weber/Box Elder Counties Packet	MDELL	Mountain Dell
144.990	Rural Wasatch Front Packet (TCP/IP)	LEWIS	Lewis Peak
145.010	Statewide Packet (not for metro-area users)		
145.030	Utah County Packet		
145.050	Salt Lake County Packet (AX.25, MSYS)	PEAK	Ensign Peak
145.070	Davis/Weber/Box Elder Counties Packet (AX.25, MSYS)		
145.090	Tooele/Weber Counties Packet		

Packet Radio Nodes

ALIAS	CALL	FREQ	BBS	AREA
PEAK	KD0J-11	145.05	No	SL County, Wasatch 100; deviation metering
IMED	KI7L-7	145.05	No	SL County
ENSIGN	KD0J-10	145.05?	No	SL County
KATE	W0HU-6	145.05	Yes	SL County
SLCOAT	KD7OAT-7	145.05	Yes	SL County
	K7DAV-10	145.07	N7MLR	Davis County
CLAY		144.91 145.53	No	Wasatch 100 Clayton Peak
MDELL		144.97	No	Wasatch100 Mountain Dell
ISLAND		144.93	No	Wasatch 100 Antelope Island
LEWIS		144.99	No	Wasatch 100 Lewis Peak

Packet Radio Resources

- Tucson Amateur Packet Radio (TAPR) – www.tapr.org
- BUXCOMM –
  - http://www.buxcomm.com/catalog/
  - http://www.hamqrp.com/techfiles.html
- Wikipedia – Packet radio – http://en.wikipedia.org/wiki/Packet_radio
- TNC Manufacturers
  - MFJ – http://www.mfjenterprises.com/Categories.php?sec=236
  - PacComm – http://paccomm.com/
  - AEA Timewave – http://www.timewave.com/amprods.html
  - Kantronics – http://www.kantronics.com/modems.html
  - TinyTrak – http://www.byonics.com/tinytrak4/