

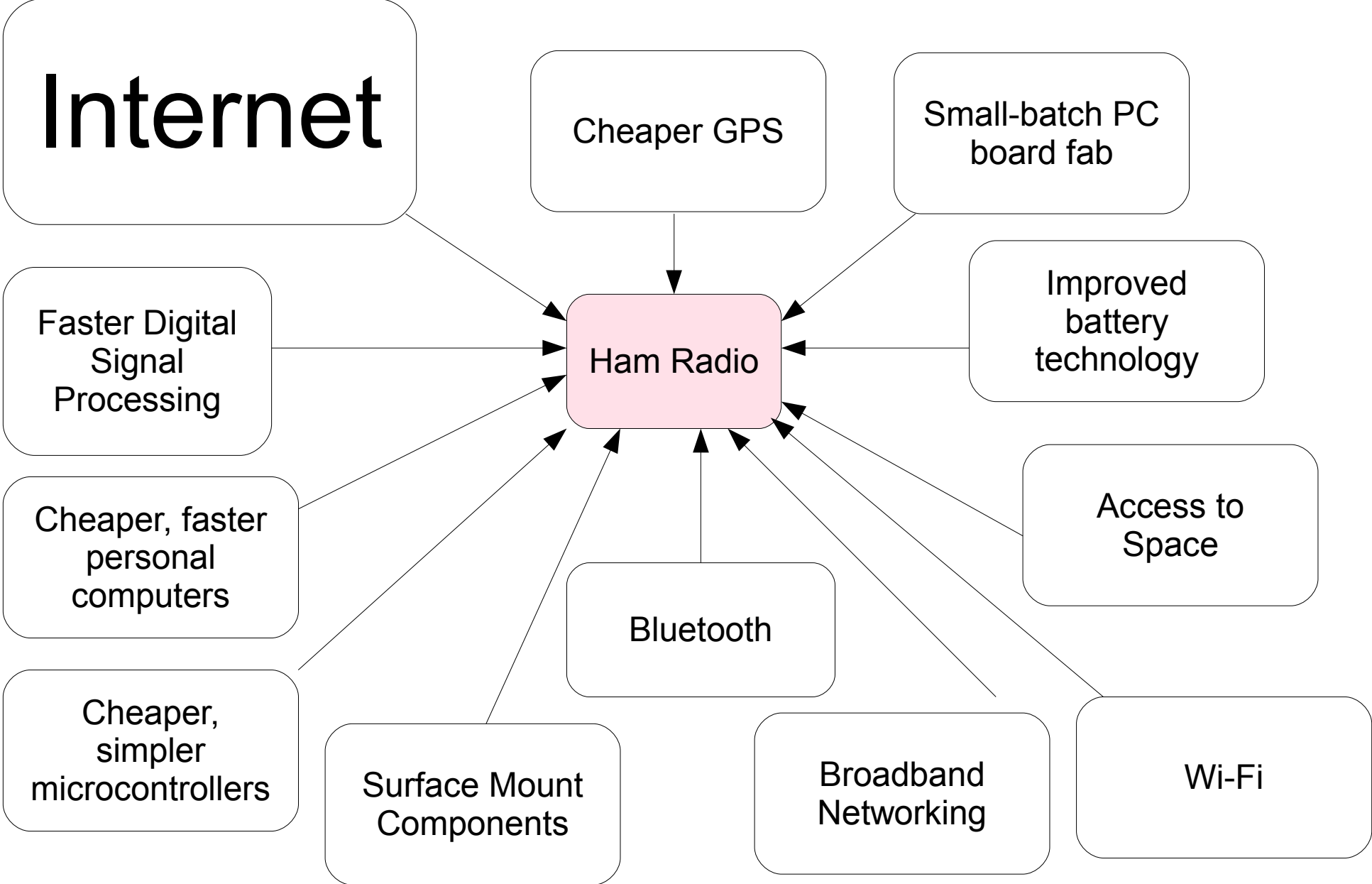
Modern Ham Radio



Tom O'Brien
AB5XZ

Member, San Antonio Radio Club
Member, South Texas DX and Contest Club

A Few Modernizing Influences



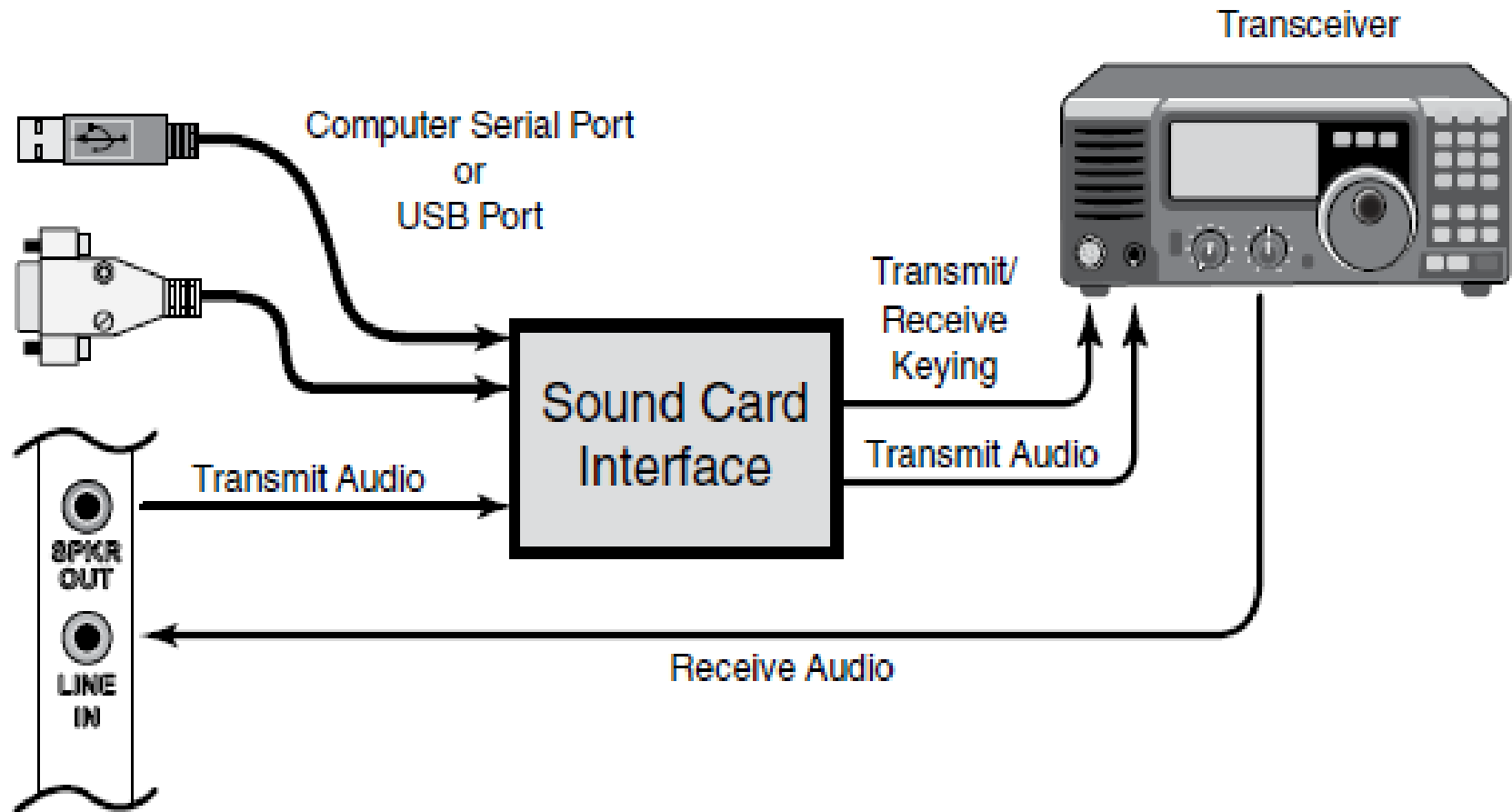
What's New About Ham Radio?

- Modulation and coding
- Digital Signal Processing
- Software Defined Radio
- Low Power Radio
- Amateur Radio Satellites
- Remote Station Operation
- Voice over IP
- Internet-enhanced communications

Sound Card Modes

- Popular Sound Card Modes
 - PSK (PSK31 is most popular)
 - RTTY (it just won't die)
 - MFSK16
 - Olivia
 - Hellschreiber
 - MT63
- CW Skimmer

Sound Card setup



Sound Card
Inputs and Outputs

HBK0147

From ARRL Handbook 2011

CW Skimmer

- Requires wideband receiver for best operation
- Listens to a large part of the band
- Decodes the various CW signals it finds
- Makes them available to the CW operator
- Analyzes them for contesting value
- Loved/hated by CW contesters



Digital Signal Processing

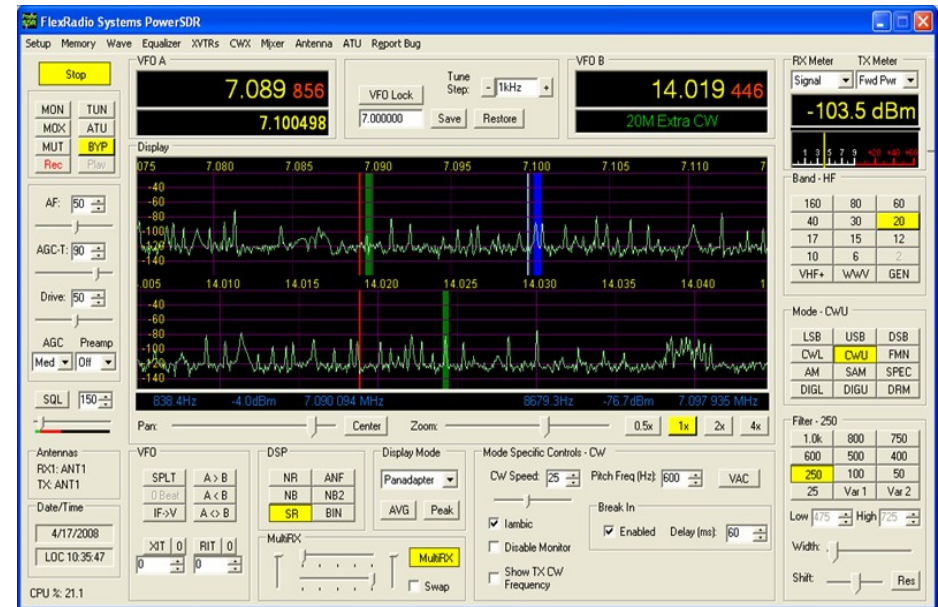
- Sound card DSP
- DSP in the IF
- IQ – see the next slide
- DSP can replace hundreds of dollars in hardware filter options – and do more!
- Capability of DSP depends on speed of
 - A/D conversion of input
 - Processor
 - D/A conversion of output

Software Defined Radio

- Enabled by powerful DSP
- Direct detection (not superheterodyne) provides a path to sophisticated functionality in the radio
- Redefine signal processing to take advantage of In-phase and Quadrature signals from the detector.
- Modulation, coding methods limited only by your imagination (and FCC regulations!)

FlexRadio

- 100 watt radio
- HF – 6 meters
- World-class performance
- DSP and hardware control software is open-source.
- Under \$2000 for Flex-3000



Low Power Radio

- QRP is under 5 Watts (to the antenna)
- QRPp is even lower
- QRP distance record millions of miles per watt
- Low power means smaller, lighter components
- Low power means more alternatives for power sources
- Advances in DSP bring high sophistication to small radios (K2, for example).

Elecraft K2

- The very popular K2 is available in *kit* form
- QRP but 100w amp available
- SSB, 160m, other features optional
- Starts at \$700
- Newer K3 is a 100w transceiver

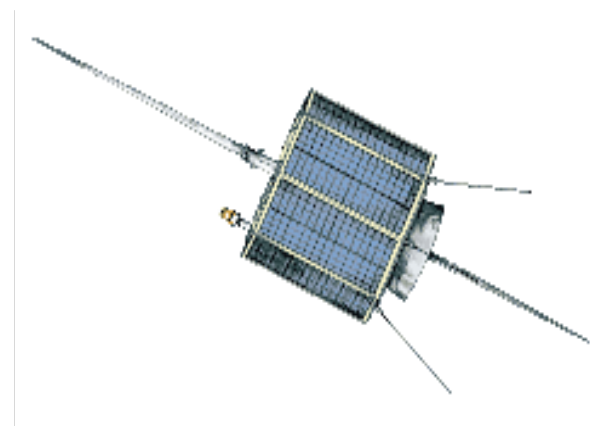


Amateur Radio Satellites

- Currently there are 40+ amateur satellites operating in low Earth orbit.
- OSCAR I was launched 12 December 1961
- Amateur satellite programs are still going strong after 50 years!



FASTRAC-1 Nov 2010



OSCAR 7 Nov 1974

A Recent Satellite You Can Hear



NanoSail-D spacecraft measures 4 inches wide, 4 inches deep and 13 inches long, roughly the size of a loaf of bread, and weighs about 9 pounds. The NanoSail-D beacon signal can be found at 437.270 Mhz It was ejected 19 Jan 2011.

Remote Station Operation

- Internet links operating position to transceiver and station controls
- Avoids local antenna restrictions
- Allows use of ideal transmitter location
- Issues:
 - Power-up sequencing
 - Access security
 - Master power shutdown

Glentek

- No PC required
- Two way audio plus rig control
- Interface radio to the box
- Connect box to router, DSL, or cable modem
- \$300 - \$350 range



Voice over IP

- Echolink
 - Repeaters link to Internet
 - Hams with Internet access can talk to other hams worldwide
 - Conferencing
- IRLP – Internet Radio Linking Project
 - Like Echolink except radio access only
 - But there are stations that bridge IRLP and Echolink
- Yaesu WIRES II

Internet-Enhanced Communications

- D-Star
- Reverse Beacon Network
- WSPRnet – weak signal propagation reporting

WSPRnet

- This is a real-time propagation data collection.
- Users report contacts to a central spot database.
- User data includes power, antenna info, received signal strength
- Concept by Nobel Prize winner Joe Taylor K1JT

Micro-Controllers invade the ham shack!

- Easy-to-use, inexpensive microcontrollers make it easier to design and build ham shack accessories. Typical ones are:
 - Arduino (\$30 for complete computer)
 - FEZdomino (\$50)
 - PIC by Microchip
 - TI MSP430 (\$4.30 for development kit!)
- Many have free development & support software
- Lots of free application software

Microcontroller apps for the shack

- Satellite radio controller
 - Calculates for antenna steering and doppler correction
- SO2R (Single Op, 2 Radio) controller for contesting
- Iambic keyer
- DX spot announcer
- Internet remote station control
- Hundreds of others (look in any *QST*)

The New Face of Homebrewing

- Circuit simulation (LTSpice)
 - Schematic capture, simulation, export
- Circuit board fabrication
 - Import from LTSpice, routing, labeling, ordering
- Microcontroller software development (Arduino)
 - Inexpensive, open source, open hardware
- Design capture (Fritzing)
 - Still in alpha test, but ...

What's Next?

A) If you have experience (not necessarily expertise) in any new ham radio technology, please share it!

A) Demonstrate or present it at a club meeting

B) Write a 1-page article for your club newsletter

C) Teach a class

B) If you learn about a new technology, look for a way to apply it to ham radio (go to A)

C) That's how our hobby grows and advances!