

History of Radio and Particularly Amateur Radio  
Compiled by Dave Casler, KEØOG, 16 April 2014

Definition of amateur: one who uses his own resources to do something; not paid; not sponsored by a corporate entity or business.

Sources include the ARRL's Ham Radio History page at <http://www.arrl.org/ham-radio-history>, several Wikipedia articles, the ham radio history compiled by Rod Dinkins, AC6V (SK), at <http://ac6v.com/history.htm> (he provides a list of many contributors), and the excellent and detailed history on the site of Thierry Lombry, ON4SKY, at <http://www.astrosurf.com/luxorion/qs1-ham-history.htm>.

1890s and before

1844 Morse telegraph

1858 First transatlantic cable (doesn't last even a year because of gross misuse occasioned by complete lack of understanding of the physics involved)

1865 Continental Morse code differs from American Morse in about half the characters and all the punctuation and numerals

1865 ITU (International Telegraph Union) formed. ITU (International Telecommunications Union) still exists and governs worldwide use of radio spectrum

1866 Successful transatlantic cable

1868 Mahlon Loomis demonstrates wireless telegraphy of two stations 18 miles apart

(1832) 1800s Development of experiments and understanding of electricity: Oersted, Ampere, Faraday, Henry

1860-1861 James Clerk Maxwell wrote his equations which completely describe classical electromagnetics

1880 Heaviside invents coaxial cable and patents it in England

1883 Edison discovers "Edison effect," actually a diode, but does not capitalize on it

1887 Hertz demonstrates that Maxwell's postulated electromagnetic field (EMF) exists

Oliver Heaviside recasts Maxwell's equations in their present form

1890s Marconi does his early work

Spark transmitters are invented

1897 formation of Marconi's Wireless Telegraph and Signal Company Ltd

1889 Marconi bridges English Channel with wireless

1900s

1901 Marconi spans Atlantic (first contact is disputed, but other contacts followed) using spark transmitter and coherer detector

1901 Fessenden invents heterodyning

1902 Arc oscillator using a "negative resistance" effect in carbon arc; generates "pure" undamped wave

MCW) 1900s Synchronous rotary arc, caused an audio modulation of signal; permits easier reception (sort of like

1902 Heaviside postulates ionosphere

1903 Wright brothers: first controlled, powered, heavier than air flight at Kitty Hawk, NC

1904 Fleming valve (diode) invented by experimenting with Edison effect

1905 widespread use of 500 kHz as ship distress frequency

1905 Vibroplex introduced; still manufactured today

1905 SOS starts being used; gradually replaces CQD

1906 deForest adds grid ("Audion"--a triode) with amplification factor of about 4 to 20

1906 First broadcast of human speech and music, Fessenden

1906 The term "radio" introduced

1906 Hugo Gernsback opens Electro-Importing Company

1907 Einstein discovers  $E=mc^2$  relationship

forms a diode) 1900s Galena, silicon, and carborundum crystal receivers (a loose contact with galena via a "cat whisker"

1908 Hugo Gernsback publishes Modern Electrics magazine, first radio magazine

1909 Hugo Gernsback founds Wireless Association of America

Late 1900s Airways were a contentious mess with constant QRM

1909 Radio Club of America formed

1909 Don Wallace (later W6AM in 1928) on air for first time; later becomes famous for his huge rhombic farm atop Rancho Palos Verde in Los Angeles area

## 1910s

1910 cat whisker detector

Around 1910, term "ham" applied to amateurs; original meaning was derogatory, but hams wore it with pride and still do

A well-designed kilowatt transmitter has range of perhaps 100 miles (most of the kilowatt is wasted in the spark, signals extremely broadband)

1910 Gernsback issues Wireless Blue Book: first compendium of 90 stations

1912 Armstrong uses feedback in an Audion; amplifiers and oscillators become practical

1912 RMS Titanic sinks; major turning point in radio history

1912 Radio Act of 1912 prompted by Titanic disaster; "ownership" of bands removed from Marconi company; licenses required; amateurs licensed and restricted to "200 meters (and down)" (meaning 1.5 MHz and up); first licensed amateur is 1ZE, Irving Vermilya; essay tests required!

1912 Q-codes developed; still used today; original list had 50

1912 International Morse introduced to replace both American Morse and Continental Morse; this is the code we use today

1912/1913 Armstrong invents regenerative receiver; becomes public in 1915; vastly more sensitive than crystal radios

1913 Severe windstorm in midwest creates blackout; first documented emergency communications by hams

1913 Wireless Society of London founded; later becomes RSGB

1914 Hiram Percy Maxim and Clarence Tuska create Amateur Radio Relay League with backing of Radio Club of Hartford, which appropriated \$50. Primary purpose to move traffic in an orderly way;

1914 Beginning of WW1 in Europe, "The Great War," "The war to end all wars"

1915 QST publishes first issue

1915 Ray Kellog invents electric moving coil loudspeaker

1915 John Carson applies for patent on idea to suppress carrier and one sideband

1917 Code speed requirement raised to 10 wpm

1917 US entered war; 4000 hams would serve; war ended in 1918; During WWI, QST shuts down

1917 saw 6000 amateurs in US armed forces

1918, 1919 HPM lobbies heavily for return of amateur radio; succeeds; shows lobbying power of ARRL

1918 Armstrong invents superheterodyne technique (creation of an intermediate frequency); also attributed to Levy of France

1919 Beverage antenna developed

1919 First use of "Wouff Hong" as something used to remedy poor operating techniques

## 1920s

Tuned Radio Frequency (TRF) radios become common; superhet becomes common toward end of decade

1920 First "Radio Amateur's Callbook" with Flying Horse design

1920 First licensed broadcast station KDKA, still operates today

1921 first transatlantic two-way CW in 1923 (France/US) on 110 meters (about 2.7 MHz)

1921 Round-trip cross-USA message in 6.5 minutes

1921 Pacific Radio News magazine founded, later becomes Radio News, after WWII becomes CQ

1921 10,809 amateurs in US

1922 16,467 amateurs in US; growth rate phenomenal!

1922 Wireless Society of London becomes Radio Society of Great Britain (RSGB), still active today

1922 Amateur First Grade and Amateur Second Grade (latter for those hams not personally examined by a US Radio Inspector) 10 wpm code, less than 1KW input power

1922 Carson describes FM and concludes it's inferior to AM (Armstrong's contribution comes a decade later)

1922 Armstrong invents super-regenerative receiver; used very few components, but superhet superceded it in popularity

1923 Patent granted for SSB

1923 WWV starts broadcasting time and frequency

1923 US Bureau of Standards suggests using frequency instead of wavelength

1924 Quartz crystals introduced to amateur community  
 1924 Spark banned on new amateur bands at 80, 40, 20 and 5 meter  
 1925 MARS precursor, the Army's Auxiliary Amateur Radio System (AARS) formed by Signal Corps  
 1925 Dynamic loudspeakers appear  
 1926 Spark prohibited for US Amateurs  
 1926 Yagi and Uda invent what we today call the Yagi (beam) antenna  
 1926 Japan Amateur Radio League (JARL) formed  
 1926 IARU introduces Worked All Continents (WAC) award  
 1920s Price of vacuum tubes falls (Moore's law already?)  
 1920s Amateurs use tubes for transmitting CW; very narrow bandwidth, allows putting lots of power on one frequency  
 1920s At end of decade amateurs had harmonically-related bands 160, 80, 40, 20, 10, 5  
 IARU formed  
 1920s Broadcast explodes; 1927 Radio Act; Federal Radio Commission formed to manage civilian communications (government frequencies managed separately: a situation that still exists)  
 1928 US callsigns add a W or K prefix  
 1928 Segal, W9EEA, writes a "suggested amateur's code" (considerate, loyal, progressive, friendly, balanced, and patriotic)  
 1928 First television station, W3XK  
 1929 Screen grid introduced (tetrode); suppressor grid (pentode) a year later  
 1929 German inventor Rudolph Hell invents Hellschreiber (light writer)  
 1929 Stock market crash; beginning of Great Depression

#### 1930s

1930 AM allowed on 20 meters  
 1931 Empire State Building opened  
 1931 AT&T patents a coaxial cable (originally invented by Heaviside in 1880)  
 1932 First panadapter (frequency analyzer) allows spotting of signals visually  
 1932 Beginnings of Amateur Radio Emergency Service (ARES)  
 1933 First Field Day; W4PAW group wins with 62 QSOs  
 1933 R/9 Magazine published articles by W6DEI, Robert Moore, on SSB; articles not widely noticed  
 1933 Astatic crystal microphones introduced  
 1933 President Roosevelt begins "fireside chats" via radio  
 1934 Communications Act (still in effect) creates Federal Communications Commission (FCC)  
 1934 Logs required  
 1936 HPM SK  
 1936 Armstrong publishes classic paper on FM; same method used today  
 1936 ARRL introduces Worked All States (WAS) Award  
 1937 ARRL acquires HPM's W1AW callsign, still used to this day  
 1937 DXCC introduced (discontinued during WWII)  
 1937 Marconi SK  
 1938 ARRL's W1AW station dedicated in Newington, CT, in building still used  
 1938 Coax RG/U (Radio Guide Utility) numbers introduced (e.g., RG-8, RG-58)  
 1938 Orson Welles's "War of the Worlds" broadcast  
 1939 Beginning of war in Europe; amateur operations restricted  
 1939 Cubical quad antenna introduced  
 1939 51,000 US hams  
 1939 FCC introduces multiple-choice tests  
 1939 RCA introduces 811 transmitting tube

#### 1940s

1941 Japanese attack Pearl Harbor; US enters war; all amateur activity ceases  
 1940s Of 60,000 US amateurs, 25,000 serve in armed forces, 25,000 more serve in industry or training positions (back then, amateurs were much younger). During war, military frequently looks to ARRL for technical advice; ARRL Handbook becomes invaluable aid to developing radios for military use  
 1942 War Emergency Radio Service (WERS) on 112 MHz; terminated after VJ day in 1945

1942 ARRL publishes a Defense Edition of ARRL Handbook  
 1943 US Supreme Court rules in Tesla's favor regarding radio patents by Marconi (culmination of a decades-long dispute)  
 1945 Civilian radio use explodes; many manufacturers  
 1945 Coax cable in wide use (was invented in 1880 by Heaviside)  
 1945 CQ magazine commences publication; predecessor magazines include Pacific Radio News  
 1945 6 meter and 2 meter bands added (forcing hams to change equipment from 5 meter and 2.5 meter bands)  
 Post 1945, military surplus radio equipment floods market  
 1946 first meteor scatter contacts  
 1946 Tenth call district added  
 1946 G5RV invents G5RV antenna  
 1947 11 meter band added on shared basis  
 1947 Hams at Stanford University in California begin experiments with SSB--took a decade to become common  
 1947 Transistor invented by Shockley et al at Bell Labs  
 1947 First electronic kit by Heathkit  
 1947 Quarter Century Wireless Association (QCWA) formed (25-year veterans); club still operates  
 1947 Beginnings of the "Red Scare"; through 1954 and beyond  
 1948 AARS changed to MARS

1950s  
 1950 US amateur population around 90,000  
 1951 Novice, Tech and Amateur Extra licenses. Old A, B, C, become Advanced, General, and Conditional. Novice is HF plus some VHF, 5 wpm code test; Tech is 220 MHz and up, 5 wpm code test  
 1951 AT&T introduces Direct Distance Dialing (DDD); takes years to become universal in US  
 1952 15 meter band added  
 1952 RACES founded  
 1952 Special privileges for Advanced and Amateur Extra were withdrawn (meaning Generals had all privileges)  
 1952 Central Electronics offers SSB gear  
 1953 first amateur moonbounce  
 1954 Texas Instruments introduces first all-transistor AM broadcast band receiver; Tokyo Tsushin Kogyo of Japan picks it up, changes its company name to Sony  
 1954 first color television system; what an opportunity for TVI!  
 1954 first all-transistor computer  
 1954 Herbert Armstrong SK  
 1955 160 meters returned to hams; many restrictions that were gradually lifted  
 1955 Collins introduces the "gold dust twins," the 75A-4 receiver and the KWS-1 transmitter; both optimized for SSB  
 1956 Elvis Presley's "Heartbreak Hotel" becomes US #1 single  
 1956 TAT-1, first transatlantic telephone cable, went into operation  
 1957 Sputnik; education system in US overhauled to create scientists needed for defense development; "missile gap"  
 1957 to 1962 CONELRAD; Hams had to monitor certain local broadcast signals; if these went off the air, hams were to go off the air also  
 1957 First integrated circuits by Fairchild Semiconductor; 1958 Jack Kilby invents first monolithic IC  
 1957/1958 International Geophysical Year  
 1957 Slow scan TV defined  
 1957 Drake issues first amateur band product, the 1A receiver  
 1958 Class D Citizen's Band on 11 meters; hams lose 11 meters (huge uproar!)  
 Late 1950s Log periodic antenna developed at University of Illinois

1960s  
 1960 FCC grants special temporary authority for SSTV  
 1960 First two-way 1296 MHz EME contact  
 1960 73 Magazine begins publishing by Wayne Green, W2NSD, who was often at odds with the ARRL

SSB 1960 QST surveys readers, finds about 50%-50% split between SSB and AM; though 20 meters about 75%

1961 Montrose Amateur Radio Club formed!!  
1961 Email invented  
1961 first OSCAR; formation of AMSAT in 1969  
1962 Cuban Missile Crisis  
1963 ARRL moves its headquarters from Hartford to W1AW site in Newington  
1963 Kennedy assassinated  
1963 250,000 hams; CBers outnumber ham population  
1963 Drake introduces TR-3 transceiver  
1964 IOTA (islands on the air) award created  
1965 Gordon Moore articulates Moore's Law  
1967 Hugo Gernsback SK  
1967 Incentive licensing removed privileges from General hams; huge controversy; ARRL was in favor of incentive licensing; caused enormous public relations problems for ARRL; exclusive Advanced and Extra subbands on 80, 40, 20, 15, and 6 (Even though there was incredible resistance to this, these subbands remain! Except on 6 meters)

1968 FCC authorizes SSTV  
1969 Man lands on the moon and returns safely  
1969 First computer network between major university campuses; first ARPANET message (predecessor to the Internet)

#### 1970s

FM repeaters gain major traction  
Channelized FM  
Mc and Kc replaced by MHz and kHz (metric system)  
1970 270,000 US hams  
1970 Drake TR-4 introduced  
1971 Yaesu introduces FT-101 HF transceiver; it and its successors are highly popular  
1972 Novices can use VFO; no longer "rock-bound"  
1972 Kenwood introduces TS-520 HF transceiver  
1972 FCC widened HF phone bands; reduced impact of incentive licensing  
1972 First repeater; duplexer made from discarded Navy shell casings  
1975 ARPANET declared "operational"  
1975 MIPS Altair 880 microcomputer uses Intel 8080  
1976 Requirement removed to change callsign if you moved to a different call area  
1976 Microsoft begins business  
1976 Apple 1 computer released  
1977 Radio Shack TRS-80 released  
1977 327,000 US hams; portable and mobile identification no longer required  
1977 Instant upgrades became available, license fees abolished  
1977 Experience requirement for Extra eliminated; Conditional class is abolished  
1978 Novice term 5 years and renewable  
1978 first Canadian experiments with packet using ASCII  
1979 ICOM America established  
1979 WARC Conference; new amateur bands at 10, 18, and 24 MHz (30 meters, 17 meters, and 12 meters); known as WARC bands; King Hussein of Jordan, JY1, provides key support

#### 1980s

1980 FCC permits ASCII, which enables packet for US hams  
1980 Russia launches first amateur satellites, destroyed in launch failure; three years to replace  
1981 Tuscon Amateur Packet Group (TAPR) formed  
1982 First access to 30 meters for US hams; restrictions apply  
1982 AMTOR (Amateur Teleprinting over Radio) developed; adaptation of SITOR for amateur use, offers error-free communication  
1983, Owen Garriott, W5LFL, takes 2 meter rig into space; NASA creates SAREX (Shuttle Amateur Radio

## Experiment)

1983, first cellular telephone network in US

1983 1000-watt input rule replaced by 1500 watt peak output rule. Most modes gained power, but some (e.g., AM) lost power.

1984 License terms extended to 10 years

1984 Launch of Volunteer Exam Coordinator program

1985 PRB-1 provides modicum of protection from local government regulations regarding outdoor antennas (does not override CC&Rs, though); "reasonable accommodation"

1985 24 MHz band and 902 MHz bands are opened for amateur use; 10 MHz band allotted permanently

1986 AEA releases PK-232; digital modes on HF explode (RTTY, AMTOR, PACTOR)

1987 Novice/Tech 10 meter SSB privileges from 28.3 to 28.5

1988 International Marine Organization (UN) establishes GMDSS system; effect is to end Morse code use by both commercial (high seas shipping) and military interests

1989 17 meter band becomes available

1989 over 500,000 US amateurs

## 1990s

1991 No code Tech

1991 Invention of the World Wide Web at CERN in Switzerland

1993 Coast Guard ceases monitoring 500 kHz emergency frequency

1993 Global Positioning System (GPS) achieves Initial Operational Capability (IOC)

1995 Vanity call signs

1997 Internet Radio Linking Project (IRLP) launched

1997 Kachina radio introduced; controlled via a PC; exits ham market in 2001

1990s Cell phones start to render autopatches obsolete

1990s World Wide Web becomes widely used

1990s APRS (Automatic Position/Packet Reporting System) becomes more popular

1998 Advent of PSK-31; uses computer soundcard and vastly opens up HF digital radio without need for expensive TNC; the original software required extremely precise tuning;

1999 Many commercial CW stations close. Globe Wireless closes last coast station in North America to use

## Morse

1990s Appearance of software-defined radios

1999 TenTec introduces Pegasus; requires PC to control; later released as Jupiter with self-contained front panel

## 2000s

2000 FCC reduces number of classes to three: Technician, General, Extra; reduces code requirement to 5 wpm

2000 Digipan released; makes PSK-31 easy, PSK-31 use explodes, still most popular digital mode today

2001 First amateur two-way transatlantic exchange on 136 kHz, with 90-second dits and 180 second dahs, the contact took two weeks to complete

2002 EchoLink

2003 ITU ratifies changes to Radio Regulations to allow each country to determine Morse code requirement

2006 All Morse testing requirements for US ham licenses abolished

2007 Over 652,000 US hams

## 2010s

2011 Montrose Ham Radio Club turns 50! (And IBM turns 100!)

2012 US ham population 738,497

2014 ARRL is one century old

2015 QST is one century old