

# MORSE CODE TO THE AGE OF INTERNET

• Sandeep Baruah

It may sound bizarre, but ham radio operators are the world's first electronic social networkers dating back to nearly 116 year in the history of communication. Amateur radio or ham radio as it is popularly known is the only two-way radio communication system that empowers private individuals, i.e. citizens across the world to communicate using personal radio communication devices in frequencies allotted by the government for which a governmental licence is required. In India, Ministry of Communications issues the licence to the individuals interested in setting up their personal two-way radio stations capable of worldwide communication for which they need to pass an examination conducted at their nearest wireless monitoring station as per the syllabus devised by the government.

## Ham Radio: Self-Reliance

One of the main reasons that a person becomes a ham radio operator is his/her desire to be self-reliant in a personal two-way radio communication system which functions independently of other communication systems run and maintained by governmental or private telecommunication service providers. A ham radio operator establishes his/her two-way radio communication system entirely with personal effort.

The self-reliance achieved by amateur radio experimenters in two-way radio communication owes to their dedication and passion in self-learning the different radio communication technologies for which they have to study technical literatures related to building of radio transmitters, receivers, test and measuring devices and antenna systems etc.

The Indian Wireless Telegraph (Amateur Service) Amendment Rules, 2009 defines amateur radio (ham radio) as: "'Amateur service' means a service of self-training, inter-communication and technical investigations carried on by amateurs that is, by persons duly authorised under these rules interested in radio technique solely with a personal aim and without pecuniary interest."

## The Pioneer who inspired hams

One of the first radio experimenters who is widely recognized as the father of radio and who inspired people

across the globe to build or operate their own personal radio stations was Guglielmo Marconi. In 1901, Guglielmo Marconi was successful in an experiment to transmit an unmodulated radio frequency carrier across the Atlantic Ocean.



*Guglielmo Marconi – Father of Radio (1901)*

In wireless telegraphy, a radio transmitter is switched on and switched off using a telegraph key. Depending on the duration for which is the telegraph key was used to switch on the radio transmitter, long and short burst of radio waves could be transmitted. Different combination of long and short bursts heard on the radio receiver could be suitably used to encode information using morse codes invented by Samuel Finley Breese Morse in 1837.

This is said to be the birth of modern wireless digital communication technology. Morse code is a method of transmitting text information as a series of on-off tones that can be directly understood by a skilled listener listening to the radio receiver without any special equipment.

A short tone heard on the radio is considered as 'Dot' (.) and a longer tone heard as 'Dash' (-). Different combination of 'dot' and 'dashes' were assigned to letters of the alphabets, numerals and punctuation marks as shown in table below.

A	· -	N	· ·
B	· · · ·	O	· - -
C	· - · · ·	P	· - · -
D	· - · -	Q	· - · · ·
E	·	R	· · · -
F	· · · -	S	· · · ·
G	· - · ·	T	· - · -
H	· · · ·	U	· · -
I	· ·	V	· · · ·
J	· - - -	W	· · - ·
K	· - · -	X	· · · -
L	· - · ·	Y	· - · -
M	· - -	Z	· - - ·
0	· - - - -	5	· · · · ·
1	· - - - ·	6	· · · · ·
2	· - - · -	7	· · · · ·
3	· - · - -	8	· · · · ·
4	· · · - -	9	· · · · ·
PERIOD	· - - - -		
COMMA	- · - - -		

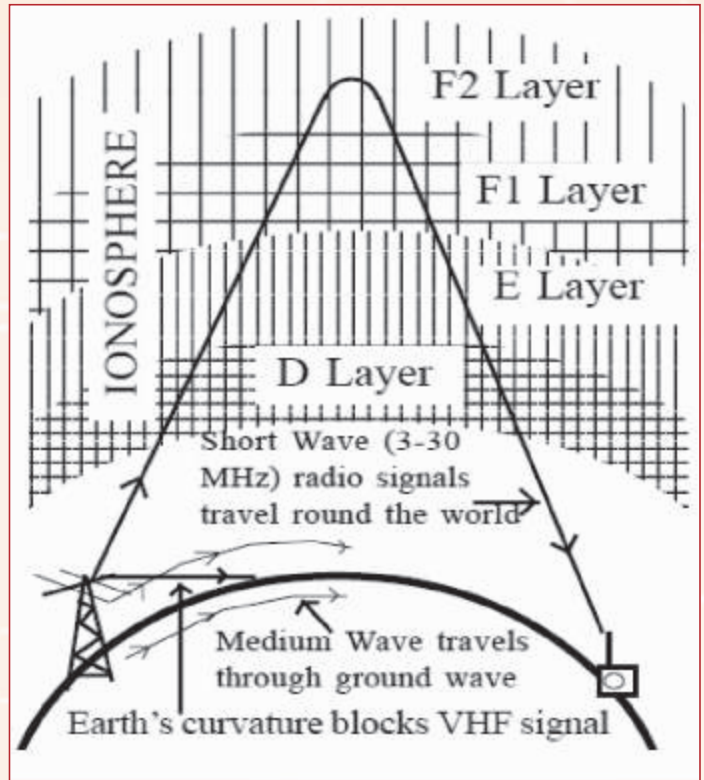


International Morse Code

Morse key

### How is the communication accomplished

Different radio frequencies have been utilized by hams as per governmental allocation which are the same throughout the world (See the table for frequencies allotted to hams in India). Radio signals in the shortwave spectrum (1.8 to 30 MHz) are transmitted using a short wave (also called High Frequency- HF) transceiver (a combined unit of a wireless transmitter and receiver) to the upper part of the Earth's atmosphere known as ionosphere (the ionosphere exists from a height of approximately 90 km extending up to a height of about 600 km). Short wave radio signals are reflected from this layer just as light rays are reflected from the surface of a mirror and radio signals may propagate to anywhere in the world due to reflection from ionosphere. But when the frequency of the radio wave increases (i.e. wavelength gets shorter), say above 30 MHz, where the Very High Frequency (VHF) range starts, and the ionosphere no longer acts as a reflective medium. Rather, these radio waves pass through the ionosphere and are lost into space. Hams use these frequencies for local point to point to communication using small handheld transceivers (HTs).

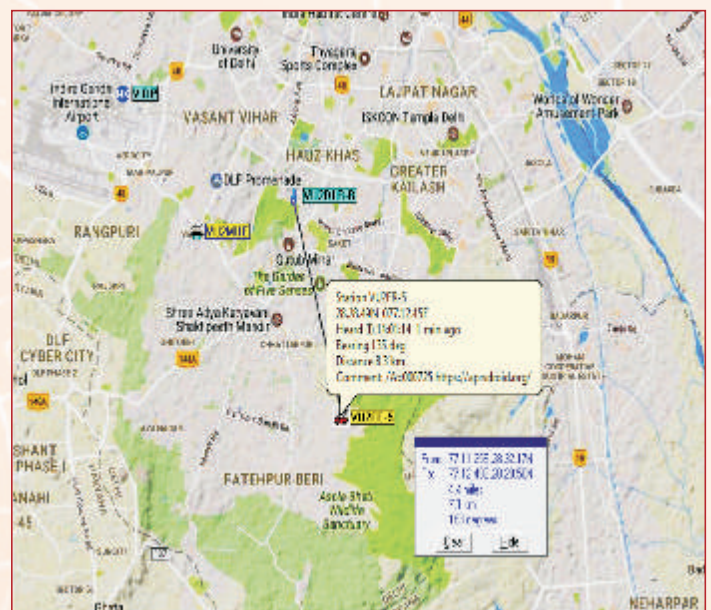


### worldwide communication

Modern hams are capable of interfacing their wireless equipment to computers for different type of digital communication. Most popular mode of keyboard to keyboard real time text chatting is PSK31. The texts typed by the ham appears on the computer screen at a distance part of the world on another ham's computer and both can text chat even when the propagation condition of the ionosphere is very poor. This mode of communication is very efficient for low power operation. Packet Radio and APRS® (Automatic



A typical modern table top portable amateur radio station for



Ham radio stations appearing on APRS® map

Packet Reporting System is the registered trademark of Bob Bruninga, US Naval Academy) are popular digital modes of communication for robust text messaging, remote file transfer. APRS allows ham radio operators to integrate Global Positioning System (GPS) to their radios and compatible radios are automatically capable of telling the distance, bearing (direction), altitude etc. along with multitude of other useful information on the radio display when the digital packet burst is received. SSTV (Slow Scan Television) is another mode of communication that hams use to transmit images using radio wave.

### Amateur Radio in Public Service

Amateur Radio is a grand glorious technical activity which was recognized way back in 1914 when American inventor Hiram Percy Maxim founded the American Radio Relay League (ARRL) and started publishing a technical journal named 'QST' (telegraphic meaning of which is "message to all radio amateurs") for the radio experimenters. QST is in publication without missing a single issue since 1914. Now each country has its representative amateur radio bodies and government world over is providing whole-hearted support to the radio hams in appreciation of their skills as expert radio communicators. One aspect is the appreciation of hams as a source of skilled radio personnel in times of war and other calamities. Another aspect is the 'Public Service', which includes activities of hams during expeditions and emergencies. Ham radio can also very aptly be called as the 'radio science' or 'science of radio'. Radio waves exist naturally; we can also produce radio waves artificially and thus ham radio is recognized by the International Telecommunication Union (ITU), Geneva (which is the international authority that regulates different radio communication services through it different member countries) as an individual right for a person to produce his own radio waves regulated under a radio communication service designated as Amateur Radio.



*Ham radio during emergency communication*

### Learning the Science of Radio

Students can learn the principles of radios through practical experimentation by assembling wireless transmitter and receiver kits in the ham radio clubs established in their schools. Without a valid ham licence, it is illegal to operate wireless equipment. In India, The Central Board of Secondary Education (CBSE) has also taken some initiative



to include 'ham radio' in their course curriculum under the scheme of Work Experience. A chapter on ham radio is included in the NCERT Disaster Management Class X book TOGETHER TOWARDS a SAFER INDIA PART-III a STRIDE AHEAD for Class X under its newly introduced syllabus (<http://cbse.nic.in/DM%20ENGLISH.pdf>). The Member of Parliament Local Area Development Scheme has also included 'Ham Radio' as one of its projects and as per the direction of the Ministry of Programme Implementation, a Member of Parliament (MP) can spend money to establish ham radio stations in the schools located in his area. If these schemes are fruitfully utilised, many youngsters would be able to take interest in ham radio which they may also make into career.

\*Vigyan Prasar (an Autonomous Organisation under the Department of Science & Technology, Govt. of India) maintains a searchable database of ham radio operators in India at: <http://vigyanprasar.gov.in/science-communication-programs/ham-radio/db-search/>

### A Socially Constructive Technical Activity

Ham radio is considered as a socially constructive technical activity which helps complimenting theoretical learning in higher education in the field of radio communication as the theories learned can be put in to practice only through practical experimentation. Some hams build their own wireless transceivers by studying technical literatures.

## Amateur radio call-sign

Each amateur radio station (ham radio station) has its own unique "name" allotted by the authorities. In amateur radio,



the unique name assigned to a ham radio station and its owner helps us to know its operator as well as the country to which he/she belongs. It is similar to the identification of ships and aeroplanes. All Indian hams have a prefix of VU2, VU3 or VU4 (for Andaman & Nicobar Island area). Radio call-sign of this author is

VU2MUE. A person who does not hold a ham radio licence is not authorized to operate a ham radio station. This means that only a single station with a particular call-sign can exist in a particular location and only a licensed person with a valid call-sign is authorised to operate an amateur radio station. A person having a ham radio call-sign is not authorized to set up more than one ham radio stations at different locations.

## Licensing Examination

A Licensing examination (Amateur Wireless Telegraph Operator's Licensing Examination) is conducted by the Wireless Planning and Co-ordination (WPC) wing of the Ministry of Communications and Information Technology,

New Delhi at any one of the 22 Wireless Monitoring Stations located throughout the country. You need to apply to the 'Officer-in-Charge'(OC)/Engineer Inspection of the Wireless Monitoring Station nearest to your hometown (or wherever you wish). The examination consists of a 100 marks question paper (50 marks related to basic radio/electronics theory as per the prescribed syllabus <http://www.qsl.net/vu2msy/SYLLABUS.htm> and 50 marks related to Amateur Radio Rules & Regulations: <http://www.qsl.net/vu2msy/asocrules.htm> which is of one, two or three hours duration as per the "grade" of licence you intend to appear. There are two grades of licences.

1. General Grade: 100 marks (two hour exam with Morse Code Proficiency test)
2. Restricted Grade: 100 marks (One hour theory exam only) For latest rules and regulation and detailed guidelines and study material please refer to author's web link:

[http://www.qsl.net/vu2msy/ASOC\\_EXAM](http://www.qsl.net/vu2msy/ASOC_EXAM)

A practical test on Morse Code sending & receiving (at the speed 8 WPM for General Grade Licence) is also conducted to examine the candidate's proficiency in wireless telegraphy communication. More information on morse code is at authors web site URL: <http://www.qsl.net/vu2msy/MORSE1.htm>

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