

Radio Operating Practice

THE object of most radio communication is the transmission of intelligence from one point to another, accurately and in as short a time as possible. For efficiency in communication, each class of radio service has set up operating methods and procedure which provide the most expeditious handling of radio traffic. Skilled operators need not only to be expert in transmitting and receiving code or voice signals, but also must be thoroughly familiar with the uniform practices observed in the particular class of service concerned. The material following, although generally that of the amateur service, is typical of the basic operating procedure employed in nearly all services with necessary modifications.

☛ Radiotelegraph Operation

The radiotelegraph code is used for *record* communication. Aside from his ability to copy at high speeds, a good operator is noted for his neatness and accuracy of copy. It is evident that a radio operator should copy exactly what is sent, and if there is any doubt about a letter or word he should query the transmitting operator about it.

An operator with a clean-cut, slow, steady method of sending has a big advantage over a poor operator. Good sending is a matter of practice, but patience and judgment are just as important qualities in an operator as is a good fist. Very often, transmission at moderate speeds moves traffic more quickly than faster but erratic sending. In hand operating any unusual words should be sent twice, the word being repeated following transmission of "?". A transmitting operator who is notified of interference on his frequency, either by static or man-made, should adjust his speed of sending to require the least number of "fills." Every op-

erator should have facilities for monitoring to check the accuracy of his sending. Accuracy of transmission comes *first*.

To this end, an operator copying in long-hand should use extreme care in writing, so there will be no chance of confusing an "l" with an "e", and the like. On a typewriter, best practice is always to double-space between lines, write ten words to a line with an extra space or two after the fifth word in each line, triple-space between lines every fifth line. This is for the purpose of rapidly determining the number of words in a message as it is sent. As the operator gains mill-copying skill he will be able to typewrite subconsciously in this pattern, an example of which is shown below.

General procedure — (1) Calls should be made by transmitting not more than three times the call signal of the station called, and DE, followed by one's own call signal sent not more than three times, thus: VE2BE VE2BE VE2BE DE W1AW W1AW W1AW. In amateur practice this form is repeated completely once or twice. The call signal of the calling station must be inserted at frequent intervals for identification purposes. Repeating the call signal of the called station five times and signing not more than twice has proved excellent practice in connection with break-in operation (the receiver being kept tuned to the frequency of the called station). The use of a break-in system is highly recommended to save time and reduce unnecessary interference.

2) Answering a call: Call three times (or less); send DE; sign three times (or less); and after contact is established decrease the use of the call signals of both stations to once or twice. Example:

WIGNF DE W1AW GE OM GA K (meaning, "Good evening, old man, go ahead").

IN FULL FORCE STOP THE ATTACK WILL BE SUPPORTED BY
BOMBARDMENT AVIATION WITH LIGHT AND MEDIUM TANKS IMMEDIATELY PRECEDING THE
ARTILLERY UNITS STOP ATTACHED TO EACH DIVISION WILL BE UNITS
OF THE SIGNAL CORPS FROM FORTMONMOUTH NEWJERSEY UNDER COMMAND OF
MAJOR J WORTHINGTON SMITH WHOSE DUTIES WILL BE SUPPLYING POINT
TO POINT COMMUNICATION FOR STAFF HEADQUARTERS STOP THIRTY FIVE HIGH
SPEED OPERATORS WILL BE REQUIRED BY EACH STAFF HEADQUARTERS FOR
THE VOLUME OF TRAFFIC EXPECTED DURING THESE

3) Ending signals and sign off: The proper use of $\overline{AR}$, K and $\overline{VA}$ ending signals is as follows: $\overline{AR}$ (end of transmission) shall be used at the end of messages during communication; and also at the end of a call, indicating when so used that communication is not yet established. In the case of CQ calls, the international regulations recommend that K shall follow. K (invitation to transmit) shall also be used at the end of each transmission when answering or working another station, carrying the significance of "go ahead." $\overline{VA}$ (or $\overline{SK}$) shall be used by each station only when signing off, this followed by the call of the station being worked and your own call sent once for identification purposes. Examples:

($\overline{AR}$) — W1KQY DE W1CTI $\overline{AR}$ (showing that W1CTI has not yet gotten in touch with W1KQY but has called and is now listening for his reply). Used after the signature between messages, it indicates the end of one message. There may be a slight pause before starting the second of the series of messages. The courteous and thoughtful operator allows time for the receiving operator to enter the time on the message and put another blank in readiness for the traffic to come. If K is added, it means that the operator wishes his first message acknowledged before going on with the second message. If no K is heard, preparations should be made to continue copying.

(K) — W1JEQ DE W6AJM R K. (This arrangement is very often used for the acknowledgment of a transmission. When anyone overhears this he knows at once that the two stations are in touch, communicating with each other, that W1JEQ's transmission was all understood by W6AJM, and that W6AJM is telling W1JEQ to go ahead with more of what he has to say.) W9KJY DE W7NH NR 23 R K. (Evidently W9KJY is sending messages to W7NH. The contact is good. The message was all received correctly. W7NH tells W9KJY to "go ahead" with more.)

($\overline{VA}$) — R NM NW CUL VY 73 $\overline{AR}$ $\overline{VA}$ W6TI DE W7WY. (W7WY says, "I understand OK, no more now, see you later, very best regards. I am through with you for now and will listen for whomever wishes to call. W7WY 'signing off' with W6TI.")

4) If a station sends test signals, to adjust the transmitter or at the request of another station to permit the latter to adjust its receiving apparatus, the signals must be composed of a series of Vs with the call signal of the transmitting station inserted at frequent intervals.

5) When a station receives a call without being certain that the call is intended for it, it should not reply until the call has been repeated and is understood. If it receives the call but is uncertain of the call signal of the sending station, it should answer using the signal . . . — . . . (?) instead of the call signal of this latter station. QRZ? (see Appendix) is the appropriate signal to use, followed by your call, to ask who is calling and get this station to call again.

6) Receipting for conversation or traffic: Never send a single acknowledgment until the transmission has been entirely received. "R" means, "All right, OK, I understand completely." When a poor operator, commonly called a "lid," has only received part of a mes-

sage, he will answer, "R R R R R R R R R R, sorry, missed address and text, pse repeat" and every good operator who hears will rave inwardly. Use "R" only when all is received correctly. Example:

When all the message has been received correctly, a short call with "NR 155 R K" or simply "155 K" is sufficient.

Abbreviations — To speed up radiotelegraph communication, a number of standard and special abbreviations have been devised. As time is a factor, uniform practices in operating are necessary to insure a ready understanding by both operators. Therefore proficiency in the commonly used abbreviations is to be desired. Some of those prescribed by the regulations attached to the International Telecommunications Convention and used by all radio services follow:

C	Yes.
N	No.
W	Word(s).
AA	All after (used after a question mark to request a repetition).
AB	All before (similarly).
AL	All that has just been sent (similarly).
BN	All between (similarly).
BQ	Announcement of reply to a request for rectification.
CL	I am closing my station.
GA	Go ahead (or resume sending).
JM	If I may send, make a series of dashes.
	To stop my transmission, make a series of dots.
MN	Minute(s) (to indicate duration of a wait).
NW	I resume transmission.
OK	We are in agreement.
RQ	Announcement of a request for rectification.
UA	Do you agree?
WA	Word after (to be used after a question mark to request a repetition).
WB	Word before (similarly).
ADR	Address (similarly).
PBL	Preamble (similarly).
SIG	Signature (similarly).
TXT	Text (similarly).
XS	Atmospherics.
YS	See your service advice.
ABV	Use abbreviations.
CFM	Confirm, or I confirm.
ITP	The punctuation counts.
MSG	Prefix to radiotelegram.
REF	Refer to, or referring to.
RPT	Repeat, or I repeat (to be used to ask or to give repetition of such traffic as is indicated after the abbreviation).
SVC	Prefix to service message.
TFC	Traffic.
P	Indicator or private telegram in the mobile service (to be used as a prefix).
NIL	I have nothing for you.
XXX XXX XXX DE . . .	urgent signal indicating message to follow regarding safety of mobile station or persons in sight therefrom (PAN is similarly used by aircraft);
TTT TTT TTT DE . . .	safety signal sent before meteorological warning messages and those concerning safety of navigation; SOS SOS SOS DE . . . , distress signal sent only by mobile stations in grave danger when requesting assistance (MAYDAY is the radiotelephone distress call similarly used).

In the text of a message, no words should be abbreviated by the operator unless they are so written by the sender. If the text includes punctuation, it should be spelled out in English.

Message Handling—Each service—commercial, military, amateur—prescribes its own message form, but all are generally similar to the example here given. A message is broadly divided into four parts: (1) the preamble; (2) the address; (3) the text; (4) the signature. The preamble contains the following:

- a) Number (of this message).
- b) Station of origin.
- c) Check (number of words in text).
- d) Place of origin.
- e) Time filed.
- f) Date.

Therefore, it might look like this:

NR 34 WLTK JH 13
CHICAGO ILL 450 PM MAY 12 1942
CAPT WM MONTGOMERY
MUNITIONS BLDG
WASHINGTON DC BT
SIXTH CORPS AREA HAS 68
MEN AVAILABLE FOR ACTIVE DUTY
FIXED SERVICE REGARDS BT
HUNTER WLTK

This is obviously the 34th message (of that day or that month, as the policy of the station prescribes) from station WLTK. The "JH 13" is the "sine" of the operator plus the number of words in the message text. All operators designate themselves with a personal sine to be used on message traffic and on the air; in most cases it consists of the operator's initials. The signal BT (double-dash) is used to separate the text from address and signature.

Several radiograms may be transmitted in series (QSG. . . .) with the consent of the station which is to receive them. As a general rule long radiograms should be transmitted in sections of approximately fifty words, each ending with .. — — .. (?), meaning, "Have you received the message correctly thus far?"

If the first part of a message is received but substantially all of the latter portions lost, the request for the missing parts is simply RPT TXT AND SIG, meaning, "Repeat text and signature." PBL and ADR may be used similarly for the preamble and address of a message. RPT ALL or RPT MSG should not be sent unless nearly all of the message is lost. When a few word-groups in conversation or message handling have been missed, a selection of one or more of the following abbreviations are used to ask for a repeat on the parts in doubt.

Abbreviation	Meaning
?AA.	Repeat all after.
?AB.	Repeat all before.
?AL.	Repeat all that has been sent
?BN.	Repeat all between.
?WA.	Repeat the word after.
?WB.	Repeat the word before.

The good operator will ask only for what fills are needed, separating different requests for

repetition by using the break sign or double dash (— . . . —) between these parts. There is seldom any excuse for repeating a whole message just to get a few lost words.

Another interrogation method is sometimes used, the question signal (· · — — · ·) being sent between the last word received correctly and the first word (or first few words) received after the interruption.

As an example of what procedure would be followed in the transmission of a commercial message, let us assume that a passenger aboard the S.S. *Coastwise* wishes to notify a friend of his arrival. Station WKCZ aboard the ship would call a shore station (WSC) and the following would ensue:

WSC WSC WSC DE WKCZ WKCZ WKCZ P AR K
WKCZ WKCZ WKCZ DE WSC ANS 700 K

WSC WSC WSC DE WKCZ P 1 CK12 SS COASTWISE 0827 MAY 10 BT MISS JANET SHANNON 18 LAMBERT STREET BOSTON BT ARRIVE PIER 18 TONIGHT LOVE BT JOHN AR K

WKCZ DE WSC R 1 K
WSC DE WKCZ QRU SK
WKCZ DE WSC R SK

If the receiving operator missed the number of the pier of arrival, he would send:

PIER ?? TONIGHT OR ?WA PIER.

whereupon the transmitting operator would say:

PIER 18 TONIGHT

and then would stand by for an acknowledgment of receipt (R).

The service message—When one station has a message to transmit to another concerning the handling of a previous message, the message is titled a "service" and is indicated by "SVC" in the preamble when sent. It may refer to non-delivery, delayed transmission, errors, or to any phase of message handling activity. Words may be abbreviated in the text of the service message.

Provisions in the Communications Act of 1934 make it a misdemeanor to give out information of any sort to any person except the addressee of a message or his authorized agent. When for some reason a message cannot be delivered, a service message should be sent to the station of origin containing information to that effect.

Land-line check—The land-line or "text" count, consisting of count only of the words in the body or text of the message, is probably now most widely used. (The "cable" count covers all words in the address and signature, as well, probably accounting for its unpopularity.) When in the case of a few exceptions to the basic rule in land-line checking, certain words in the address, signature or preamble are counted, they are known as extra words and all such are so designated in the check right after the total number of words.

The check includes:

- 1) All words, figures and letters in the body, and
- 2) the following extra words
 - (a) Signature except the first, when there are more than one (a title with signature does not count extra, but an address following a signature does).
 - (b) Words "report delivery," or "rush" in the check.
 - (c) Alternate names and/or street addresses, and such extras as "personal" or "attention."

Dictionary words in most languages count as one word irrespective of length of the word. In counting figures, a group of five digits or less counts as one word. Bars of division and decimal points may constitute one or more of the digits in such a group. It is recommended that, where feasible, words be substituted for figures to reduce the possibility of error in transmission. Detailed examples of word counting are about as difficult in one system of count as another.

AMATEUR RADIO STATION LOG									
Date of log		Station		Frequency		Mode		Remarks	
DATE	TIME	STATION	CALLS	FREQ.	MODE	REMARKS	OTHER	REMARKS	OTHER
7-25-36	5:45 PM	W1EH	X	57.7	57.7	6:43 PM		None op.	
6-08	VESEP	X	57.7					No. op.	
6-14	W1EH	W1EH		57.7	57.7	7:12		Hi! How those Y's can chew!	
6-17	W1EH	X	57.7					Denver, Colo.	
7-20	CQ	X	57.7						
7-22	X	W1EH	57.7			3:39	7:55	Too early for 2nd response	
7-25	W1EH	X	57.7			7:30 PM		None	
7-31	X	W1EH	57.7			7:53		Chad about 1000	
8-07	CQ	X	57.7			57.7	6:38	W1EH at Key West	
8-13	W1EH	X	57.7					Switching!!	
8-20	CQ	W1EH	57.7						
8-10 PM	CQ	X	57.7			6:24 PM		Trans Line Station	
6-13	X	W1EH	57.7			6:58		Los Angeles	
6-22	W1EH	X	57.7						
7-00	GRY								

Keeping a log—FCC requires nearly every radiocommunication station to keep a complete operating record or "log," including such data as times and dates of transmissions, stations contacted, message traffic handled, input power to the transmitter, frequency used, and signature or "sine" of the operator in charge.

Log-keeping procedure differs with each class of communications service. A typical page from an amateur radio station log, prepared on the standard ARRL form, is shown above. Being that of the amateur service the example here shown is quite free in style, yet it is illustrative of the form and data generally required.

Time systems—While most continental telegraph and radio circuits use local standard (or war) time in log-keeping and message-handling, international radiocommunication stations and the military services now use a 24-hour system of time-keeping. One is Greenwich Civil Time, a 24-hour clock system used in international radiocommunication work. All figures are based on the time in Greenwich, England, the city of 0° meridian fame. 0000 represents midnight in Greenwich; 0600 represents 6 A.M. there; 1200 is noon; 1800 is 6 P.M.;

2400 is again midnight and the same as 0000 of the following day. The figures must be corrected to each individual time zone. The Central War Time zone is five hours behind Greenwich, so that 0630 GCT (6:30 A.M. in Greenwich) would represent 1:30 A.M. CWT, for example. As an example of reverse translation, 9:30 A.M. CWT would be designated in the log as 1430 GCT. EWT is four hours behind GCT; MWT, six hours; PWT, seven.

At present the military services use simply a 24-hour clock, based on local time, without correcting to Greenwich or any other longitude. Then 6 A.M. CWT becomes 0600; 6 A.M. EWT is 0600, and so on. The principal advantage of this system is an elimination of the necessity for the use of P.M. or A.M. abbreviations. The Greenwich system accomplishes this and, more important, provides a standard basis upon which time in all countries of the world may be based.

☛ Radiotelephone Operation

Procedure to be used in radiotelephone operation follows the foregoing general principles closely. The operator makes little use of the special abbreviations available for code work, of course, since he may directly speak out their full meaning. Radiotelephony is used principally for command and control purposes, such as communication between ground stations and aircraft, where recorded message traffic is at a minimum. Transmissions consist mostly of short bursts with little variety in form or content, and each operator must become familiar with procedure methods adopted by the particular service.

Unusual words should be avoided in the interest of accuracy if possible when drafting messages. When they unavoidably turn up difficult words may be repeated, or *repeated and spelled*. The operator says "I will repeat" when thus retransmitting a difficult word or expression. It is recommended that use of Q code and special abbreviations be minimized in voice work insofar as possible, and the full expression (with conciseness) be substituted.

The speed of radiotelephone transmission

WESTERN UNION WORD LIST

A—ADAMS	J—JOHN	S—SUGAR
B—BOSTON	K—KING	T—THOMAS
C—CHICAGO	L—LINCOLN	U—UNION
D—DENVER	M—MARY	V—VICTOR
E—EDWARD	N—NEW YORK	W—WILLIAM
F—FRANK	O—OCEAN	X—X-RAY
G—GEORGE	P—PETER	Y—YOUNG
H—HENRY	Q—QUEEN	Z—ZERO
I—IDA	R—ROBERT	

Example: W1EH . . . W1 EDWARD HENRY.

For best understandability numerals should be pronounced as follows:

Zē'-rō 0	Thuh'-ree' 3	Sev'-ven 7
Wun 1	Fō'-wer 4	Ate 8
Too 2	Fv'-yiv 5	Ni'-yen 9
	Siks 6	

(with perfect accuracy) depends almost entirely upon the skill of the two operators involved. One must learn to speak at a rate allowing perfect understanding as well as permitting the receiving operator to copy down the message text, if that is necessary. Because of the similarity of many English speech sounds, the use of alphabetical word lists has been found necessary. One such list — that used by the Army and Navy — is given in Chapter Sixteen. Another which has been widely used is the Western Union word list, shown herewith. A copy of this list can be obtained from the local Western Union office and posted beside the telephone to use when telephoning messages containing initials and difficult words. Such code words prevent errors due to phonetic similarity. All voice-operated stations should use a *standard* list as needed to identify call signals or unfamiliar expressions.

Names of states and countries may be used for identifying letters in radiotelephone work.

¶ Net Operation

In field work many military communications units operate in "net" fashion, wherein one station (at the headquarters of the unit) is designated as net-control station (NCS) to direct the business of the net. The operation of all stations in the same net is on one single frequency, so that any one operator may hear any other station(s) without retuning his receiver. "Break-in" is advantageously employed here — the receiver is kept running during transmissions, so that nearly simultaneous two-way communication is possible.

Briefly, the procedure in net operation is as follows: The NCS calls the net together at a pre-announced time and using a predetermined call. Immediately, station members of the net reply in alphabetical (or some other predetermined) order, reporting on the NCS's signal strength and stating what traffic is on hand and for whom. The NCS acknowledges, meanwhile keeping an account of all traffic on hand, by stations. He then directs the transfer of messages from one station to another, giving preference to any urgent traffic so indicated at roll call. When all traffic has been distributed and it is apparent there is no further business, the NCS will close the net, in most cases maintaining watch on the net frequency for any special traffic which might appear.

¶ ARRL Operating Organization

The American Radio Relay League maintains, at its headquarters in West Hartford, Connecticut, a Communications Department normally concerned with the practical operating activities of League members. A large field organization, headed by Section Communications Managers in each of the seventy-one sections into which the country is divided, consists of amateur stations especially selected for skill in certain phases of amateur commu-

nications work. There are appointments as Official Relay Station or Official 'Phone Station for traffic-handling; as Official Observer for monitoring of frequency and quality of transmissions; as Route Manager and 'Phone Activities Manager for the establishment of trunk lines and networks; as Emergency Coordinator for the promotion of amateur preparedness in the event of loss of commercial communications facilities through natural disaster. Mimeographed bulletins for each group of appointees keep members informed of the latest news and developments. Special activities, such as proficiency awards, contests and drills, promote operating skill and thereby add to the ability of amateur radio to function "in the public interest, convenience and necessity." A special section is reserved each month in *QST*, the League's official organ, for amateur news from every section of the country.

With the suspension of amateur activities as a result of the war, all such appointments have been "frozen" for the duration excepting those of Emergency Coordinators, who are engaged in promoting the War Emergency Radio Service. Complete information on all peacetime appointments and League awards for operating skills is included in the booklet, *Operating an Amateur Radio Station*. Members of the League may obtain a copy of this booklet from League Headquarters free upon request; to others, the cost is 10 cents.

¶ Amateur Licensing in the United States

For the duration of the war, amateur operation in this country is prohibited. Amateur frequencies have been temporarily withdrawn and, although amateur station licenses have not been cancelled, no new ones have been issued and no applications for renewal or modification are entertained. However, every effort will be made to reassign station calls to previous holders, after the war is over.

Amateur operator licenses remain in force, being valued by the military services as an attestation of radio proficiency, and new operator licenses are still being issued at the numerous FCC examining points. Details of the requirements, and a study guide for those preparing for the examination, are to be found in a League publication, *The Radio Amateur's License Manual*, available from the American Radio Relay League, West Hartford 7, Conn., for 25¢, postpaid. This publication, which is frequently revised, contains also the text of the U. S. regulations governing amateur stations and operators, and pertinent extracts from the basic Communications Act of 1934. It should be studied carefully by anyone intending to enter amateur radio or planning to apply for an amateur operator's license.

The Communications Act lodges in the Federal Communications Commission authority to classify and license radio stations and to

prescribe regulations for their operation. Pursuant to the law, FCC has issued detailed regulations for the amateur service.

An amateur is a duly authorized person interested in radio technique solely with a personal aim and without pecuniary interest. Amateur operator licenses are given to United States citizens who pass an examination on radio operation and apparatus and on the provisions of law and regulations affecting amateurs, and who demonstrate ability to send and receive the International Morse Code at 13 words per minute. Amateur station licenses are granted only to licensed amateur operators and permit radio communication between such amateur stations for amateur purposes, i.e., for personal and noncommercial aims flowing from an interest in radio technique. An amateur station may not be used for material compensation of any sort nor for broadcasting. Narrow bands of frequencies beginning at 1,715, 3,500, 7,000, 14,000, 28,000, 56,000, 112,000, 224,000 and 400,000 kc., as shown in the adjoining column, are allocated exclusively for use by amateur stations, and amateurs also may operate on any frequency above 300,000 kc. Amateur transmissions may be on any frequency within the assigned bands. All the frequencies may be used for c.w. telegraphy and certain of them are available for radiotelephony by any amateur, while certain other frequencies are reserved for radiotelephone use by persons who have had at least a year's experience and who pass a more difficult examination resulting in the issuance of what is called a Class A license. The input to the final stage of amateur stations is limited to 1,000 watts and on frequencies below 60,000 kc. must be adequately filtered direct current. Emissions must be free from spurious radiations. The licensee must provide for the measurement of the transmitter frequency and establish a procedure for checking it regularly. A complete log of station operation must be maintained, with specified data. The amateur station license also authorizes the holder to operate portable and portable-mobile amateur stations in certain frequency bands, subject to certain further regulations. An amateur station may be operated only by the holder of an amateur operator license, but any licensed amateur operator may operate any amateur station. All radio licensees are subject to heavy penalties for violation of the law or regulations.

The frequent changes in amateur regulations, and the new requirements which may come up during the war under special orders of FCC, are regularly reported in the League's magazine, *QST*.

☛ FCC Frequency Allocations

The following is a condensed table of frequency allocations established by the Federal Communications Commission in the United

States, as they existed prior to the war. Certain departures from it under wartime conditions are, of course, to be expected.

<i>Frequencies (Kc.)</i>	<i>Allocation</i>
10-103	Fixed, government.
103-141	Coastal telegraph, government.
143-193	Maritime calling, ship telegraph, fixed and coastal telegraph. (190 kc. to state police and government.)
194-391	Government, fixed, airport, aircraft (375 kc. to direction finding).
392-548	Coastal telegraph, government, ship telegraph, aircraft, intership 'phone. (500 kc. to maritime calling and government).
550-1,600	Broadcasting (1,592 to Alaska services).
1,600-1,712	Geophysical, relay, police, government, experimental, marine fire, aviation, motion picture.
1,715-2,000	<i>Amateur.</i>
2,004-2,500	Experimental visual and relay broadcast, police, government, ship harbor, fixed, miscellaneous.
2,504-3,497.5	Coastal harbor, government, aviation, fixed, miscellaneous.
3,500-4,000	<i>Amateur.</i>
4,005-6,000	Government, aviation, fixed.
6,020-6,190	International broadcast, government.
6,200-6,990	Coastal telegraph and 'phone, government, fixed, miscellaneous.
7,000-7,300	<i>Amateur.</i>
7,305-9,490	Government, fixed, aviation, ship telegraph, coastal telegraph, miscellaneous.
9,510-9,690	International broadcast.
9,710-11,000	Government, fixed aviation.
11,010-11,685	Ship telegraph, maritime calling, government, coastal telegraph, fixed, aviation, miscellaneous.
11,710-11,890	International broadcast, government.
11,910-13,990	Aviation, fixed, government, ship telegraph, coastal telegraph, miscellaneous.
14,000-14,400	<i>Amateur.</i>
14,410-15,085	Fixed.
15,110-15,330	International broadcast, government.
15,355-17,740	Fixed, government, aviation, ship and coastal telegraph, miscellaneous.
17,760-17,840	International broadcast.
17,860-21,440	Fixed, government, aviation.
21,460-21,650	International broadcast, government.
21,650-23,175	Coastal telegraph, government, ship telegraph, miscellaneous.
23,200-25,000	Aviation, government, miscellaneous.
25,025-26,975	Broadcast, government.
27,000-27,975	Government, general communication.
28,000-30,000	<i>Amateur.</i>
30,000-42,000	Police, government, relay broadcast, coastal and ship harbor, miscellaneous.
42,000-50,000	Broadcast and educational (FM).
50,000-56,000	Television, fixed.
56,000-60,000	<i>Amateur.</i>
60,000-112,000	Government, television.
112,000-116,000	<i>Amateur.</i>
116,110-139,960	Broadcast, government, aviation, police, miscellaneous.
140,100-143,880	Aviation.
144,000-224,000	Government, television, fixed.
224,000-230,000	<i>Amateur.</i>
230,000-400,000	Government, television, fixed.
401,000 and above	<i>Amateur and experimental.</i>

"Q CODE"

IN THE REGULATIONS accompanying the existing International Radiotelegraph Convention, there is a very useful internationally agreed code designed to meet the major needs in international radio communication. This code

is given in the following table. The abbreviations themselves have the meanings shown in the "answer" column. When an abbreviation is followed by an interrogation mark (?), it assumes the meaning shown in the "question" column.

Abbreviation	Question	Answer
QRA	What is the name of your station?	The name of my station is
QRB	How far approximately are you from my station?	The approximate distance between our stations is nautical miles (or kilometers).
QRC	What company (or Government Administration) settles the accounts for your station?	The accounts for my station are settled by the company (or by the Government Administration of).
QRD	Where are you bound and where are you from?	I am bound for from
QRC	Will you tell me my exact frequency (wave-length) in kc/s (or m)?	Your exact frequency (wave-length) is kc/s (or m).
QRH	Does my frequency (wave-length) vary?	Your frequency (wave-length) varies.
QRI	Is my note good?	Your note varies.
QRJ	Do you receive me badly? Are my signals weak?	I cannot receive you. Your signals are too weak.
QRK	What is the legibility of my signals (1 to 5)?	The legibility of your signals is (1 to 5).
QRL	Are you busy?	I am busy (or I am busy with). Please do not interfere.
QRM	Are you being interfered with?	I am being interfered with.
QRN	Are you troubled by atmospherics?	I am troubled by atmospherics.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster (..... words per minute).
QRS	Shall I send more slowly?	Send more slowly (..... words per minute).
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready.
QRW	Shall I tell that you are calling him on kc/s (or m)?	Please tell that I am calling him on kc/s (or m).
QRX	Shall I wait? When will you call me again?	Wait (or wait until I have finished communicating with). I will call you at o'clock (or immediately).
QRY	What is my turn?	Your turn is No. (or according to any other method of arranging it).
QRZ	Who is calling me?	You are being called by
QSA	What is the strength of my signals (1 to 5)?	The strength of your signals is (1 to 5).
QSB	Does the strength of my signals vary?	The strength of your signals varies.
QSD	Is my keying correct; are my signals distinct?	Your keying is incorrect; your signals are bad.
QSG	Shall I send telegrams (or one telegram) at a time?	Send telegrams (or one telegram) at a time.
QSJ	What is the charge per word for including your internal telegraph charge?	The charge per word for is francs, including my internal telegraph charge.
QSK	Shall I continue with the transmission of all my traffic. I can hear you through my signals?	Continue with the transmission of all your traffic, I will interrupt you if necessary.
QSL	Can you give me acknowledgment of receipt?	I give you acknowledgment of receipt.
QSM	Shall I repeat the last telegram I sent you?	Repeat the last telegram you have sent me.
QSO	Can you communicate with direct (or through the medium of)?	I can communicate with direct (or through the medium of).
QSP	Will you retransmit to free of charge?	I will retransmit to free of charge.
QSR	Has the distress call received from been cleared?	The distress call received from has been cleared by
QSU	Shall I send (or reply) on kc/s (or m) and/or on waves of Type A1, A2, A3, or B?	Send (or reply) on kc/s (or m) and/or on waves of Type A1, A2, A3, or B.
QSV	Shall I send a series of VVV	Send a series of VVV
QSW	Will you send on kc/s (or m) and/or on waves of Type A1, A2, A3, or B?	I am going to send (or I will send) on kc/s (or m) and/or on waves of Type A1, A2, A3, or B.
QSX	Will you listen for (call sign) on kc/s (or m)?	I am listening for (call sign) on kc/s (or m).
QSY	Shall I change to transmission on kc/s (or m) without changing the type of wave? or Shall I change to transmission on another wave?	Change to transmission on kc/s (or m) without changing the type of wave or Change to transmission on another wave.
QSZ	Shall I send each word or group twice?	Send each word or group twice.
QTA	Shall I cancel telegram No. as if it had not been sent?	Cancel telegram No. as if it had not been sent.
QTB	Do you agree with my number of words?	I do not agree with your number of words; I will repeat the first letter of each word and the first figure of each number.
QTC	How many telegrams have you to send?	I have telegrams for you (or for).

Abbreviation	Question	Answer
QTE	What is my true bearing in relation to you? or What is my true bearing in relation (call sign)? What is the true bearing of (call sign) in relation to (call sign)?	Your true bearing in relation to me is degrees or Your true bearing in relation to (call sign) is degrees at (time) or The true bearing of (call sign) in relation to (call sign) is degrees at (time).
QTF	Will you give me the position of my station according to the bearings taken by the direction-finding stations which you control?	The position of your station according to the bearings taken by the direction-finding stations which I control is latitude longitude.
QTC	Will you send your call sign for fifty seconds followed by a dash of ten seconds on kc/s (or m) in order that I may take your bearing?	I will send my call sign for fifty seconds followed by a dash of ten seconds on kc/s (or m) in order that you may take my bearing.
QTH	What is your position in latitude and longitude (or by any other way of showing it)?	My position is latitude longitude (or by any other way of showing it).
QTI	What is your true course?	My true course is degrees.
QTJ	What is your speed?	My speed is knots (or kilometers) per hour.
QTM	Send radioelectric signals and submarine sound signals to enable me to fix my bearing and my distance.	I will send radioelectric signals and submarine sound signals to enable you to fix your bearing and your distance.
QTO	Have you left dock (or port)?	I have just left dock (or port).
QTP	Are you going to enter dock (or port)?	I am going to enter dock (or port).
QTO	Can you communicate with my station by means of the International Code of Signals?	I am going to communicate with your station by means of the International Code of Signals.
QTR	What is the exact time?	The exact time is
QTU	What are the hours during which your station is open?	My station is open from to
QUA	Have you news of (call sign of the mobile station)?	Here is news of (call sign of the mobile station).
QUB	Can you give me in this order, information concerning: visibility, height of clouds, ground wind for (place of observation)?	Here is the information requested
QUC	What is the last message received by you from (call sign of the mobile station)?	The last message received by me from (call sign of the mobile station) is
QUD	Have you received the urgency signal sent by (call sign of the mobile station)?	I have received the urgency signal sent by (call sign of the mobile station) at (time).
QUF	Have you received the distress signal sent by (call sign of the mobile station)?	I have received the distress signal sent by (call sign of the mobile station) at (time).
QUG	Are you being forced to alight in the sea (or to land)?	I am forced to alight (or land) at (place).
QUH	Will you indicate the present barometric pressure at sea level?	The present barometric pressure at sea level is (units).
QUJ	Will you indicate the true course for me to follow, with no wind, to make for you?	The true course for you to follow, with no wind, to make for me is degrees at (time).
QUK	Can you tell me the condition of the sea observed at (place or coördinates)?	The sea at (place or coördinates) is
QUL	Can you tell me the swell observed at (place or coördinates)?	The swell at (place or coördinates) is
QUM	Is the distress traffic ended?	The distress traffic is ended.

Special abbreviations adopted by the ARRL:

QST General call preceding a message addressed to all amateurs and ARRL Members. This is in effect "CQ ARRL."

QRR Official ARRL "land SOS." A distress call for use by stations in emergency zones only.

Scales Used in Expressing Signal Strength and Readability

(See QRK and QSA in the Q Code)

Strength	Readability
QSA1.....Barely perceptible.	QRK1.....Unreadable.
QSA2.....Weak.	QRK2.....Readable now and then.
QSA3.....Fairly good.	QRK3.....Readable with difficulty.
QSA4.....Good.	QRK4.....Readable.
QSA5.....Very good.	QRK5.....Perfectly readable.