

International figure code

When communicating with ships of other administrations in the International Maritime Mobile Service, if it is necessary to spell out figures or marks, the following table should be used:

Figure or mark	Code word	Spoken as
0	Nadazero	NAH-DAH-ZAY-ROH
1	Unaone	OO-NAH-WUN
2	Bissotwo	BEES-SOH-TOO
3	Terrathree	TAY-RAH-TREE
4	Kartefour	KAR-TAY-FOWER
5	Pantafive	PAN-TAH-FIVE
6	Soxisix	SOK-SEE-SIX
7	Setteseven	SAY-TAY-SEVEN
8	Oktoeight	OK-TOH-AIT
9	Novenine	NO-VAY-NINER
Decimal point	Decimal	DAY-SEE-MAL
Full stop	Stop	STOP

Stations of the same country, when communicating between themselves, may use any other table recognized by their administration.

Source: International Telecommunication Union Radio Regulations, Appendix 24.





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All operators of radiotelephone stations licensed for operation in the Maritime Mobile Service must hold a valid Radiotelephone Operator's Certificate of the appropriate class. There are two classes of maritime restricted certificates as described below.

Operators of radiotelephone stations on board pleasure crafts or other vessels where the radio installation is fitted voluntarily must hold as a minimum the Restricted Certificate — Maritime Voluntary. The Department of Communications booklet A guide for the radiotelephone operator: Restricted Certificate — Maritime Voluntary provides all of the study material necessary for candidates preparing for the examination for this certificate.

Operators of radiotelephone stations on board vessels that are compulsorily fitted with a radio installation in accordance with the requirements of the Ship Station Radio Regulations, made under the Canada Shipping Act, must hold as a minimum the Restricted Certificate — Maritime Compulsory. Study material for this certificate is contained in this booklet as well as in A guide for the radiotelephone operator: Restricted Certificate — Maritime Voluntary.

Inquiries concerning the contents of this handbook, including suggestions for its improvement, may be directed to any office of the Department of Communications.







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VHF and MF Coverage — West Coast VHF and MF Coverage — East Coast Great Lakes VHF Coverage

=General informatic

Certificate requirements

A Radiotelephone Operator's Restricted Certificate — Maritime Compulsory is required by the operator of radiotelephone equipment on all compulsorily fitted vessels. Generally, compulsorily fitted vessels are those that are over 20 metres in length, passenger ships carrying six or more passengers, regardless of their length, and all towing ships. The holder of a Radiotelephone Operator's Restricted Certificate - Maritime Compulsory is restricted to the operation of stations whose power output does not exceed 1500 watts and the equipment must require only simple external switching with all frequency-determining elements being preset within the transceiver.

Application

Application for permission to attend an examination for a Radiotelephone Operator's Restricted Certificate should be made to the nearest office of the Department of Communications.

Examinations may be held at departmental district offices or at locations selected by the Department where suitable equipment is available for the examination.

Candidate requirements

The examination may consist of written, practical and oral exercises or a combination thereof. Candidates will be required to satisfy an examiner that they:

 are capable of operating modern radiotelephone equipment;

- possess a general knowledge of radiotelephone operation procedures, the international regulations applicable to maritime radiotelephone communications between stations and, in particular, those regulations relating to the safety of life;
- possess a general knowledge of the Radio Act and the regulations made thereunder;
- possess a general knowledge of the Ship Station Radio Regulations and Ship Station Technical Regulations.

Eligibility

Nationality

A candidate for a Radiotelephone Operator's Restricted Certificate examination must be a Canadian citizen or a landed immigrant within the meaning of the *Immigration Act.*

Age

There is no age restriction.

Physical

Candidates will be required to attest to the fact that they have no physical disabilities that would impair their ability to safely operate a radio station.

This attestation is to include the candidate's hearing which must not be less than 75 percent of normal in both ears. However, those candidates whose hearing does not meet this requirement may be considered under special circumstances.

Documentation

Nationality status

Candidates should be prepared to produce any of the following documents for the examiner: birth certificate, Certificate of Canadian Citizenship, or Canadian Immigration Identification Card.

Two passport-type photographs are required for the Radiotelephone Operator's Restricted Certificate — Maritime Compulsory.

=Regulatory requirements

Radio station inspection certificates

In accordance with provisions of the Canada Shipping Act, owners and masters of vessels required to be fitted with a radio installation must ensure that the installation is inspected by a radio inspector and is issued an appropriate radio station inspection certificate. These inspections must take place not more than one month before the ship proceeds to sea and at least once a year thereafter. In the event that the radio installation undergoes a major modification or the ship returns to sea after having been out of service for more than 30 days, the radio installation must be re-inspected and a new certificate issued. A radio station inspection certificate is valid for no more than one year. A vessel that does not have a valid radio station inspection certificate on board may be detained by a Port Customs Officer until a valid certificate is obtained.

Applications for radio surveys or inspections should be made at least three days in advance to the Department of Communications office nearest to the desired port of survey. Application forms and further information may be obtained from any Department of Communications district office.

Should a radio inspection be required in a foreign port, the master, owner or agent should make application by letter or telex to The Director General, Telecommunications and Electronics Directorate, Department of Transport, Canadian Coast Guard, Ottawa, Canada, KIA 0N7, telex 053-3128. Applications for radio inspection of Canadian ships wintering in U.S. Great Lakes ports should be made by the owners, agents or masters on Federal Communications Commission (FCC) form 809 and filed directly with the FCC engineering office nearest to the port where the inspection is to take place.

Should any difficulties be encountered in making arrangements for an inspection in a foreign port, assistance is always available through the Canadian Consulate.

Radio inspectors of the Department of Communications are authorized to inspect radio installations on vessels during the course of investigations into radio communications interference or communications irregularities and/or violations.

In addition to the foregoing, departmental radio inspectors may at all reasonable times inspect any vessel fitted with radio equipment.

Ship Station radio regulations — Carriage requirements

Regardless of area of operation, a single radio installation is the minimum requirement on:

- (a) a ship of 20 metres or more in length;
- (b) any ship certified to carry more than six passengers when engaged in a voyage any part of which is within a VHF coverage area, or more than five miles from the shore; and

(c) towing ships of less than 300 gross tons.

This applies to a Canadian ship in any waters or a foreign ship operating in Canadian waters or in fishing zones of Canada.

The following table illustrates the multiple radio installations, by area, required to be fitted on:

- (a) ships of 300 gross tons or more;
- (b) towing ships of any size when towing large objects; and
- (c) ships of 20 metres or more in length carrying more than 12 passengers and operating outside sheltered waters.

VHF areas

Great Lakes Sea coasts of Canada

OR

MF areas

Non-passenger ships

SOLAS* passenger ships

Non-SOLAS passenger ships:

(a) carrying 50+ passengers for 200+ miles**, or carrying 250+ passengers for 90+ miles, or carrying 500+ passengers for 20+ miles OR

(b) not being a ship as described in (a) above

HF areas

Non-passenger ships,

OR

SOLAS passenger ships

Non-SOLAS passenger ships:

(a) carrying 50+ passengers for 200+ miles**, or carrying 250+ passengers for 90+ miles, or carrying 500+ passengers for 20+ miles OR

(b) not being a ship as described in (a) above

Beyond HF areas

Ships 300 gross tons and up, but less than 1600 gross tons,

OR

Ships more than 1600 gross tons, and passenger ships

All areas

Minimum requirement

- *A "SOLAS" ship is one to which the provisions of the International Convention for the Safety of Life at Sea, 1974, apply.
- **The use of the term "miles" in this document refers to nautical miles.

VHF R/T	MF R/T	MF/HF R/T	MF W/T	SES or Radioteley
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Note:

Cargo ships making "occasional international voyages" may fit a ship earth station (SES) in lieu of the MF radiotelegraph installation - conditions for the fitting of an SES installation are described in Department of Transport Ship Safety Bulletin Number 2/85. Other options are also described in that bulletin for cargo ships engaged on international voyages.

These carriage requirements are a summary; the Ship Station Radio Regulations should be referred to for complete details.

To assist in the understanding of the terms VHF, MF and HF as they relate to the preceding table, see the section of this publication on Propagation as well as the charts in the Appendix, which illustrate VHF and MF coverage areas.

Legend

- very high frequency VHF
- medium frequency MF
- HF high frequency
- SES ship earth station
- R/T radiotelephone
- W/T wireless telegraphy

Radio operator's certificates

Canada is a member of the International Telecommunication Union (ITU), an international organization established to provide standardized communication procedures and practices, frequency allocation and radio regulations on a worldwide basis.

The ITU establishes the minimum conditions to be imposed for obtaining the various classes of radio operator certificates. The Department of Communications administers telecommunications in Canada, based upon both national and international acts, regulations and conventions.

Radio logs

All compulsorily fitted radio stations using Maritime Mobile frequencies are required to keep a radio log, wherein the activities of the station, the nature of messages and signals transmitted, received or intercepted are to be recorded in chronological order.

General information

The radio log required for all compulsorily fitted stations must be located at the main operating position of the ship station during the time the ship is at sea and be kept by the operator maintaining the listening watch in accordance with the Ship Station Technical Regulations. Some ships are also required to keep an official log, which contains some information on the radio installation. A radio log must contain entries recording the following:

- the name, port of registration and the official registration or licence number of the vessel;
- the gross tonnage of the vessel;
- the frequencies guarded;
- the time of log entries, whether:
 a) the local time of the area in which the vessel is operating, or
 - b) Co-ordinated Universal Time (UTC) when on international voyages;
- the time and reasons for any radio communication interruptions.

For VHF radiotelephone installations

Ship stations equipped with only VHF Maritime Mobile communication equipment (156.0 MHz - 162.5 MHz) must, in addition to the general information outlined above, record the following:

- The names of the radio operators on watch and their periods of watch.
- A detailed summary, in chronological order, of all communications transmitted, received or intercepted relating to distress, urgency or safety traffic.
- Brief summaries of communications exchanged with other stations, including frequencies used for reception and transmission.
- A statement setting out the time of and the reason for any discontinuance of the listening watch on frequency 156.8 MHz — Channel 16.

Note:

The VHF practices and procedures regulations state that watch on Channel 16 (156.8 MHz) can be relinquished in a Vessel Traffic Services (VTS) Zone when vessels are required to use a channel other than 16 for vessel traffic management purposes. In such circumstances, a continuous watch on Channel 16 is maintained for ships by the traffic centre, or a coast station that is able to establish contact with the traffic centre without delay.

- The departure and arrival times at port.
- The position of the vessel at least once a day while at sea.

For MF or combined MF/HF radiotelephone installations

Ship stations equipped with MF or with combined MF/HF radiotelephone equipment must, in addition to the information outlined for VHF installations, make a log entry setting out the time of and the reason for any interruption or failure to observe the silence periods prescribed by the International Radio Regulations, as well as details concerning any service incidents that relate to the safety of life at sea.

Retention of the radio log

The radio log, in its original form, must be retained on board the vessel for a period of one month from the date of the last entry. In addition, it must be retained in a place available for inspection for a period of not less than 11 months. When any portion of a radio log pertains to distress, urgency and safety communications, it must be retained until all investigations and action resulting from the incident are concluded.

Radio logs must be made available for inspection by departmental radio inspectors at all reasonable times either at the ship station or the offices of the licensee.

Note:

Should a hearing arise out of a marine incident, a ship's radio log may be used as evidence in a court of law. It is therefore considered good practice to keep an accurate and legible radio log so that it may be clearly understood.

Publications

Ship stations compulsorily fitted with radiotelephone equipment and operating within VHF and MF coverage areas must carry the following documents and publications:

- Ship Station Radio Licence (or a copy thereof),
- radio operator's certificates,
- official radio log,
- Ship Station Technical Regulations and Ship Station Radio Regulations made under the Canada Shipping Act,
- radio inspection certificate,
- current edition of the Canadian Radio Aids to Marine Navigation (RAMN), published annually on April 1,

 manufacturer's operating and maintenance manuals for the radio equipment in use.

Ship stations compulsorily fitted with radiotelephone equipment and operating outside the VHF and MF coverage areas must, in addition to the above, carry the following publications:

 ITU Manual for use by the Maritime Mobile and Maritime Mobile Satellite Service, available from the International Telecommunication Union, Geneva, Switzerland.

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CALL SIGNS

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- Current quarterly AMVER Bulletin (Automated Mutual-assistance Vessel Rescue System) available free-ofcharge from the Department of Transportation, U.S. Coast Guard, Governors Island, New York, 10004.
- ITU List of Coast Stations available from the General Secretariat, International Telecommunication Union. Geneva.

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Portable lifeboat radio apparatus

Portable lifeboat radio apparatus is generally required to be carried on all Safety Convention Ships travelling more than 20 miles offshore.

A Safety Convention Ship is a steamship (other than a ship of war, a troop ship or a fishing vessel) registered in a country to which the Safety Convention applies, and is on an international voyage, is carrying more than 12 passengers, is of 300 gross tons or more, or is a nuclear ship.

The portable lifeboat radio apparatus should be stored in a suitable place on the ship (for example, chart room, radio room, bridge), ready to be moved to a survival craft in the event of an emergency.

Radio operators on board vessels compulsorily fitted with radiotelephone equipment should be familiar with the operation of portable lifeboat radio apparatus, even though they may presently be operators on vessels which are not required to fit portable lifeboat radio apparatus.

Frequencies usually fitted

The portable lifeboat apparatus usually transmits on either 500 kHz (telegraphy), on 2182 kHz (voice) or 8364 kHz (telegraphy). It receives on 500 kHz (telegraphy) or 2182 kHz (voice).

Distress and alarm signals International Radiotelegraph Auto Alarm Signal

This signal, once triggered, is automatically transmitted prior to the distress signal or message. It consists of 12 four-second dashes, each followed by one second of silence. When this signal is received by an automatic alarm receiver (required on most international vessels) it activates an associated mechanism causing alarms to ring.

Generally speaking, deep-sea vessels within a radius of 100 miles should receive this signal; that is, if radio conditions are favorable and the portable lifeboat radio equipment is set up and operated properly.



Portable lifeboat gear "stowed"

The Radiotelegraph Distress Signal

This signal can be transmitted manually or activated to transmit automatically and consists of the letters "SOS" transmitted as a signal three times in morse code, followed by two long dashes (the two long dashes are for directionfinding purposes). This signal follows the International Radiotelegraph Auto Alarm Signal and is sent on 500 kHz or 8364 kHz (most portable lifeboat radios can receive on 500 kHz but not on 8364 kHz).

International Radiotelephone Alarm Signal

In most portable lifeboat radios this signal, once activated, is usually transmitted automatically on the frequency 2182 kHz and consists of a warbling sound lasting for 30 to 60 seconds. It is best to send this message, followed by the spoken radiotelephone distress message, during the silence periods on the hour and the half hour. The function switch should then be turned to 2182 kHz/ receive to listen for a reply.

Instruction card

The plasticized card secured to the inside of the water-tight case of the lifeboat radio provides a comprehensive explanation of all operating instructions and procedures.

Maintenance

The portable lifeboat radio apparatus should be checked by a qualified operator to ensure it is in proper working order prior to leaving port on any international voyage extending beyond 20 miles from shore, and once a week while at sea. Where batteries are used as a power source, they should be brought up to full charge. A record of all tests should be noted in the ship's official radio log book.

Operating procedures

The following is a basic step-by-step operating plan for the portable lifeboat radio apparatus:

- Open portable lifeboat radio apparatus.
- Separate the instruction card from the headset and antenna.
- Read the instruction card.
- Assemble antenna and erect according to instructions.
- Attach antenna to the attachment lug marked rod aerial on the portable lifeboat radio apparatus.
- 6. Plug headset into location marked headset (entry plug).
- 7. Remove *earth ground* and throw overboard.
- Insert crank handles into the designated slots in the sides of the casing of the portable lifeboat radio apparatus.
- Select transmitting frequency by turning frequency selector knob to the desired frequency.
- 10. Crank handles until **both** lamps are lit, then maintain cranking speed.



Portable lifeboat apparatus

- 11. Tune frequency by using the tuning knob. Tune for the highest possible number on meter.
- 12. After tuning you are ready to transmit on the frequency you have selected.
- To transmit the Radiotelegraph Automatic Distress Signal, turn frequency selector knob to 500 kHz/transmit, then turn the mode switch to auto; wind auto key one full turn clockwise.

The automatic distress signal (consisting of the alarm signal, the SOS signal three times, and two long dashes) is then transmitted automatically, taking approximately two minutes. The pointer turns when the auto key is working.

Adjust tune knob for maximum reading on meter, if necessary.

Auto key knob must be rewound before each automatic transmission.

Automatic distress signals should be transmitted particularly at the start of a silence period (15 and 45 minutes past each hour for morse code).

- To transmit messages in morse code after the automatic distress signal, simply turn mode switch to manual, then transmit using manual key provided.
- To transmit the radiotelephone twotone alarm signal, turn frequency selector knob to 2182 kHz/ transmit, turn the mode switch to auto, adjust tune knob for maximum reading on meter.

The alarm signal should be transmitted for 30 to 60 seconds, if at all possible, at the start of or during the radiotelephone silence period (on the hour and 30 minutes past the hour for three minutes). The alarm signal and the voice message should be alternated, but where there is insufficient time the voice message should be given priority.

- 16. To transmit voice messages after the radiotelephone two-tone alarm signal, simply turn mode switch to the manual position and speak into the microphone.
- To test these alarms, simply go through the above steps, making sure that the mode switch is in the *test* position at all times.



Maritime Distress-alarm-signal Generator

Distress-alarm-signal Generator

The International Radiotelephone Alarm Signal consists of a repetitive transmission of two audio tones (1.3 and 2.2 kHz; the duration of each tone is 250 milliseconds). This produces a warbling sound lasting for a period of at least 30 seconds, but not exceeding one minute. The purpose of this signal is to alert stations guarding 2182 kHz that a distress call is to follow and to activate distress frequency watch receivers. This alarm signal is to precede a distress signal, call and message.

The Distress-alarm-signal Generator must be located with the main MF or MF/HF transceiver, which by regulation must be located on the bridge convenient to the conning position. It should be an integral part of the transmitter, and if it is a separate device it is to be hard-wired in line with the transmitter and microphone.

The controls on this piece of equipment are a three-position switch: *test, off,* and *transmit*. A direct current voltmeter for checking the internal battery voltage, and a speaker to hear the alarm signal are usually incorporated in these units.

VHF radiotelephone equipment is generally not fitted with a radiotelephonealarm-signal generating device.

Testing and operating procedures

To test the Distress-alarm-signal Generator, simply turn mode knob to test. This action will cause the device to start working, sending an audio version of the alarm through the installed speaker but not transmitted over the air; it will also give a reading of the internal power source on the meter.

To send the alarm signal in the case of distress, first depress the small button to the left of the mode knob, then turn the mode knob to *transmit*. This will enable the device to transmit the alarm signal over the air. Maintain transmission of the alarm signal for a minimum of 30 seconds to a maximum of 60 seconds.

Distress frequency watch receiver (DFWR)

The radiotelephone distress frequency watch receiver installation is located at the place on board the ship from which it is normally navigated. This receiver is to be fixed in tune to the frequency of 2182 kHz and be activated upon receipt of the radiotelephone alarm signal or the navigational warning signal.

DFWR testing and operating procedures

The DFWR has two mode settings: normal, where it functions as a conventional receiver tuned to 2182 kHz; and muted, where the receiver is quiet until activated by a radiotelephone alarm or navigational warning signal. The muting switch will then switch off automatically and the distress alarm or navigational warning is heard at maximum volume through the loudspeaker.

To make sure that the receiver is functioning properly, return the response switch to the *normal* mode and listen for incoming signals on 2182 kHz.

All DFWRs incorporate self-testing devices. When the *test* button is depressed, a radiotelephone alarm signal or a navigational warning signal is generated which should deactivate the muting device and allow the alarm or the navigational warning signal to be heard. Some DFWRs are synchronized with the ship's clock so that the muting device is deactivated during the international radiotelephone silence periods.

Distress frequency watch receiver

Search and rescue frequencies

The frequencies 3023.5 kHz and 5680 kHz have been designated for voice communications between ships and aircraft during co-ordinated search and rescue operations.

Call sign formation

The majority of licensed radio stations are identified by a call sign, which appears on their licence. In the examples shown below for coast stations and ship stations, a "character" may be a letter or a digit. The first two characters or, in certain cases, the first character of a call sign constitutes the nationality designation.

Coast stations

There are three possible ways the call signs for coast stations can be arranged:

- two characters and one letter (for example, VAC);
- two characters and one letter followed by no more than three digits (CJU52);
- the geographical name of the place as it appears in the list of coast stations, followed by the word "radio" (Halifax Coast Guard Radio).

Ship stations

Call signs for ship stations may be configured in the following ways:

two characters and two letters (VCRJ);

- two characters, two letters and one digit (other than the digit 0 or 1) (VCBM3);
- two characters (provided that the second is a letter) followed by four digits (other than 0 or 1 in cases where they immediately follow a letter) (VC2345);
- the official name of the ship followed by, if necessary, the name of the owner, as long as the combination of names used cannot be confused with a distress, urgency or safety signal (Seawolf — High Seas Fisheries);
- two characters and one letter followed by four digits (other than 0 or 1 in cases where they immediately follow a letter) (WXV/9581).

In addition, administrations have been allocated blocks of Maritime Mobile Service identities. These blocks are formed by a series of nine digits in such a way that the identity or part thereof can be used by telephone and telex subscribers connected to the general telecommunications network to call ships automatically in the shore-to-ship direction.

= Coast Guard and ement radio station movement systems reporting systems

Canadian Coast Guard radio stations

The Canadian Coast Guard has established an extensive telecommunications network in order to promote safety in Canadian waters. This network includes Coast Guard radio stations on the Atlantic, Pacific and Arctic coasts and along the St. Lawrence River and the Great Lakes.

The main function of the Coast Guard radio station system is to continuously monitor, on a 24-hour basis, international distress and calling frequencies to detect distress situations and to ensure assistance in a timely manner.

In addition, the Coast Guard continuously monitors the Marine Radio Navigation Systems and broadcasts weather, ice information and hazards to navigation.

Coast Guard radio stations also provide a service that broadcasts shipping notices and meteorological information at advertised times and on frequencies listed in Parts II to IV (stations listings) of *Radio Aids* to Marine Navigation (RAMN).

Notices to ships (Notships) are broadcast on the broadcast frequencies as follows:

- on receipt, or
- at all scheduled broadcast periods during the following 48 hours unless cancelled.

After a period of 48 hours, Notships still in effect will be broadcast in an abbreviated format until cancelled, except for information of a safety nature and Notships broadcast on Continuous Marine Broadcast Service (CMB).

The CMB of the Canadian Coast Guard provides immediate access to the latest meteorological, ice information and hazards to navigation.

The Public Correspondence Service (duplex calls and radiotelegrams) consists of Coast Guard radio station facilities used to provide short- and long-range ship/ shore radiotelegraph and radiotelephone communications, as indicated in the station listings in RAMN.

Coast Guard radio stations will broadcast traffic lists at scheduled times and on published frequencies **only** when they have traffic on hand.

Automated Mutualassistance Vessel Rescue System (AMVER)

AMVER, operated by the U.S. Coast Guard, is a maritime mutual-assistance program that provides important aid to the development and co-ordination of search and rescue (SAR) efforts in the oceans of the world. Merchant vessels of all nations making offshore passages of more than 24 hours are encouraged to send sail plans and periodic position reports to the AMVER centre in New York. There is no charge for these radio messages when they are sent through Canadian Coast Guard radio stations. Information from these messages is entered into a computer that generates and maintains "dead reckoning" positions for participating vessels throughout their voyages. The predicted locations and SAR characteristics of all vessels known to be within a given area are furnished, upon request, to recognized SAR agencies of any nation for use during an emergency. A vessel's predicted location is disclosed only for reasons related to maritime safety.

AMVER is a free and voluntary program. The benefits of such a system to shipping include the improved likelihood of rapid aid in emergencies, a reduced number of calls for assistance to vessels not in favorable locations, and less time lost by vessels responding to calls for assistance. An AMVER participant is under no greater obligation to render assistance during an emergency than is a nonparticipating vessel.

AMVER system communications network

The AMVER system is supported by a worldwide radio station communications network of coastal and ocean station vessel facilities. Propagation conditions, location of the vessel and traffic density will normally determine the best station to establish communications. To ensure that no charge is applied, all AMVER reports should be passed through specified radio stations. Those stations that currently accept AMVER reports and apply no coastal station, ship station or landline charge are listed in each issue of the AMVER Bulletin. Also listed are international radio call signs, locations, frequency bands and hours of operation of these stations. Although AMVER reports may be sent through non-participating stations, the Coast Guard cannot reimburse the sender for any charges applied.

For further information on the AMVER system, including detailed operating procedures, the current edition of *Radio Aids to Marine Navigation* or the annual edition of *Notices to Mariners* should be consulted.

Vessel Traffic Services

Vessel Traffic Services (VTS) is a communications and surveillance system operated by the Canadian Coast Guard in selected Canadian waters for the purpose of ensuring the safe and efficient movement of marine traffic and the protection of the marine environment. There are essentially two categories of VTS in Canada:

- A category operating on VHF that exchanges pertinent traffic movement information and waterway status with ships operating in coastal and port approach areas where traffic density and/or environmental conditions so warrant.
- A category, such as ECAREG or NORDREG services, operating through the MF and HF facilities of a Coast Guard radio station ascertains the movement and onboard status of ships entering Canadian waters from the high seas and maintains surveillance of shipping in coastal areas of lesser traffic density than the above category.

For additional information on VTS areas of operation, categories of service, clearance and reporting procedures, refer to *Notice to Mariners* — TP390E, available from the Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, KIA 0S9. Arctic Canada Vessel Traffic Services (VTS) Zone (NORDREG Canada)





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Radio frequency bands

= propagation

The radio spectrum is divided into specific radio frequency bands for radio communications. The three main frequency bands that concern the radiotelephone operator are as follows:

Medium frequency(MF)300 - 3000 kHzHigh frequency(HF)3 - 300 MHzVery high frequency(VHF)30 - 300 MHz

Influences on radiotransmissions

In order to understand how radio waves travel it is important to note that there are a number of factors that govern the distance they may travel. The reception of the various radio frequency bands is also affected by factors which influence the reliability and continuity of radio transmissions.

lonosphere

The region above the earth between 50 and 300 km is known as the ionosphere. It consists of several ionized layers at various heights surrounding the earth. The density of these layers varies from day to night.

Radio frequency energy, which leaves the transmitting antenna, travels to the receiving antenna by a number of directions and methods. This is illustrated in the diagram below.

For the sake of simplicity, we will mention only ground waves and sky waves, which have the greatest influence on the MF and HF radio frequency bands.

During the day, radio energy from MF transmissions that reaches the ionosphere is absorbed and not reflected back to earth. Thus the sky-wave portion of the transmitted energy is not considered during daytime hours. The signal that reaches the receiver travels along the surface of the earth and is known as a ground wave.



Propagation of radio waves

Eastern Canada Vessel Traffic Services (VTS) Zone



Therefore, during the day, MF transmissions (on frequency 2182 kHz, etc.) are usually reliable and consistent over ranges up to 290 km depending upon transmitter power, antenna type or other equipment-related qualities.

It is important to note, however, that during the hours of darkness the reliability of MF communications may be adversely affected by sky-wave interference. As darkness approaches, the ionospheric layers change and MF signals may reach a receiver by both ground- and sky-wave paths. Radio-frequency energy from many distant stations may be reflected off the ionosphere and back to earth, resulting in severe interference.

For example, during the hours of darkness it is possible to hear distant stations that are located more than 1600 km away. Under these same conditions, however, you may not be able to carry out local communications even with stations within a 80 km radius of your location. Generally speaking, sky-wave transmissions are possible in the HF bands during the day and night over long distances. The radio frequency energy from the transmitter reaches the ionosphere via sky waves and is reflected back to earth over distances which may exceed 1600 km. The HF bands are generally not suitable for communications with local stations as the ground-wave energy is insignificant. Both MF and HF communications are also affected by other factors.

VHF transmissions are by direct or space waves over relatively short distances. For optimum communications results, the transmitting and receiving antennae should see one another; in other words, VHF is line-of-sight communications. VHF communication is not greatly affected by atmospheric or ionospheric disturbances over normal communication distances. Physical obstructions do adversely affect VHF coverage areas.





Propagation in the Arctic

lonospheric disturbances may cause total or partial blackouts on MF and HF bands in latitudes above 60 degrees North. Such occurrences are evidenced by magnetic storms and by auroral activity (northern lights) and are more prevalent during periods of sunspot activity. They may last anywhere from a few hours to several days.

Ground-wave propagation in the Arctic tends to be poor. This is caused by the frozen nature of the land area during much of the year and because of the amount of sea ice present. Radio frequencies in the 2 MHz band are particularly affected by loss of range due to the poor conductivity of frozen media.

The lower frequencies (300-520 kHz) in the MF band generally provide the best possible range over frozen seawater since they are capable of penetrating the frozen portion to the high conductivity seawater beneath.

Sunspot activity

Severe or abnormal solar storms produce solar noise that may seriously impair or wipe out HF communications.

Weather

Electrical storms often create havoc for MF and HF communications for periods ranging from a few minutes to many hours at a time. Lightning crashes may be heard on MF or HF receivers originating from electrical storms which are 320 km away. Only severe local storms affect VHF communications. During periods of precipitation, whether it be rain, drizzle or wet snow, a phenomenon often occurs that is called "antenna charging or discharging." This phenomenon results in very high noise levels that may begin and end suddenly and last for periods of a few seconds up to an hour. During these periods, MF and HF communications may be wiped out entirely. VHF communications are sometimes also affected, but to a much lesser degree.

Seasonal effects

Radiotelephone operators should of course be aware that the time of year influences radio communications due to changing weather patterns, changing ionospheric and atmospheric temperatures, summertime electrical storms, seasonal solar storms, etc.

Nature of radio waves

Communications distances in the MF, HF and VHF ranges are all affected to some degree by the following:

- antenna heights, especially for VHF communications, where adequate antenna height is very important;
- physical obstructions in the surrounding terrain, such as buildings, hills and mountains severely limit the range of VHF communications and, to a lesser degree, MF communications.

In general, the distances of the communication ranges can be as follows:

√HF band	16 to 80 km
MF band	160 to 400 km
HF band	320 to more than 1600 km.

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=Appendix

VHF and MF Coverage — West Coast VHF and MF Coverage — East Coast Great Lakes VHF Coverage

West Coast of Canada Theoretical VHF and MF Coverage



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East Coast of Canada Theoretical VHF and MF Coverage



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Great Lakes VHF Coverage





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