Marine VHF radio

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Marine VHF radio refers to the radio frequency range between 156.0 and 162.025 MHz, inclusive. In the official language of the ITU the band is called the *VHF maritime mobile band*.

It's installed on all large ships and most seagoing small craft. It is also used, with slightly different regulation, on rivers and lakes. It is used for a wide variety of purposes, including summoning rescue services and communicating with harbours, locks, bridges and marinas, and operates in the very high frequency (VHF) range, between 156 and 162.025 MHz. Although it is widely used for collision avoidance, its use for that purpose is contentious and is strongly discouraged by some countries, including the UK.[1]

A VHF set and a VHF channel 70 DSC set, the DSC on top.

A marine VHF set is a combined transmitter and receiver and only operates on standard, international frequencies known as channels. **Channel 16** (156.8 MHz) is the international calling and distress channel. Transmission power ranges between 1 and 25 watts, giving a maximum range of up to about 60 nautical miles (111 km) between aerials mounted on tall ships and hills, and 5 nautical miles (9 km; 6 mi) between aerials mounted on small boats at sea level.[1] Frequency modulation (FM) is used, with vertical polarization, meaning that antennas have to be vertical in order to have good reception.

A standard handheld maritime VHF, mandatory on larger seagoing vessels under the GMDSS rules

Modern-day marine VHF radios not only offer basic transmit and receive capabilities. Permanently mounted marine VHF radios on seagoing vessels are required to have certification of some level of "Digital Selective Calling" (DSC) capability, to allow a distress signal to be sent with a single button press.

Marine VHF mostly uses "simplex" transmission, where communication can only take place in one direction at a time. A transmit button on the set or microphone determines whether it is operating as a transmitter or a receiver. The majority of channels, however, are set aside as "semi-duplex" transmission channels where communication can take place in both directions simultaneously.[1] Each semi-duplex channel has two frequency assignments. Semi-Duplex channels can be used to place calls on the public telephone system for a fee via a marine operator. This facility is still available in some areas, though its use has largely died out. Marine VHF radios can also receive weather radio broadcasts, where they are available.

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A classic maritime VHF set

Types of equipment

Sets can be fixed or portable. A fixed set generally has the advantages of a more reliable power source, higher transmit power, a larger and more effective aerial and a bigger display and buttons. A portable set (often essentially a waterproof, VHF walkie-talkie in design) can be carried on a kayak, or to a lifeboat in an emergency, has its own power source and is waterproof if GMDSS-approved. A few portable VHFs are even approved to be used as emergency radios in environments requiring intrinsically safe equipment (e.g. gas tankers, oil rigs, etc.).

Marine radios can be "voice-only" or can include "Digital Selective Calling" (DSC).

Voice-only equipment is the traditional type, which relies totally on the human voice for calling and communicating.

Digital Selective Calling equipment, a part of the Global Maritime Distress Safety System (GMDSS), provides all the functionality of voice-only equipment and, additionally, allows several other features:

- a transmitter can automatically call a receiver equipped with Digital Selective Calling, using a telephone-type number known as a Maritime Mobile Service Identity or MMSI. The DSC information is sent on the reserved Channel 70. When the receiver picks up the call, his active channel is automatically switched to the transmitter's channel and normal voice communication can proceed.
- a distress button, which automatically sends a digital distress signal identifying the calling vessel and the nature of the emergency
- a connection to a GPS receiver allowing the digital distress message to contain the distressed vessel's position

The MMSI is used for seagoing vessels and consists of a nine-digit number identifying a VHF set or group of sets. The left hand digits of MMSI indicate the country and type of station. For example, here are MMSI prefixes of four station types:

- Ship : 232, 233, 234 or 235 are the United Kingdom – e.g. a UK ship : 232003556
- Coastal station : 00 – e.g. Solent Coastguard : 002320011
- Group of stations : 0 – e.g. 023207823
- Portable DSC equipment : for UK 2359 - e.g. 235900498

For use on the inland waterways within continental Europe, a compulsory Automatic Transmitter Identification System (ATIS) transmission conveys the vessel's identity after each voice transmission. This is a ten-digit code that is either an encoded version of the ship's alphanumeric call sign, or for vessels from outside the region, the ship MMSI prefixed with '9'. The requirement to use ATIS in Europe, and which VHF channels maybe used are strongly regulated, most recently by the Basel agreements.

A portable VHF which is ip67, GMDSS and ATEX approved

Channels and frequencies

Simplex channels here are listed with the A and B frequencies the same. The frequencies, channels, and some of their purposes are governed by the ITU. For an authoritative list see.[2] The original allocation of channels consisted of only channels 1 to 28 with 50 kHz spacing between channels, and the second frequency for duplex operation 4.6 MHz higher. Improvements in radio technology later meant that the channel spacing could be reduced to 25 kHz with channels 60 to 88 interspersed between the original channels. Channels 75 and 76 are omitted as they are either side of the calling and distress channel 16, acting as guard channels. The frequencies which would have been the second frequencies for simplex channels are not used for marine purposes and can be used for other purposes that vary by country. For example 161.000 to 161.450 MHz are part of the allocation to the American Association of Railroads channels used by railways in the USA and Canada.[3]

Channel number	Frequencies (MHz)		United Kingdom [4]	United States	Canada	Australia	New Zealand	Finland[5]
	A Usually ship stations	B Usually coast stations						
0	156.000	160.600	Private, coast guard A					
				Ship-to-	Public			Public

1	156.050	160.650		ship/shore, commercial and safety West Coast A	Correspondence (Ship-to-Shore Duplex) BC Coast			Correspondence (Ship-to-Shore Duplex) Port Operations
2	156.100	160.700			Public BC Coast			Public Correspondence (Ship-to-Shore Duplex) Port Operations
3	156.150	160.750		A Illegal for public use[1]	Public BC Coast/Inland		Boat to Boat - Kawau	Public Correspondence (Ship-to-Shore Duplex) Port Operations
4	156.200	160.800			Ship-to-ship/shore, commercial and safety East Coast and Inland A Canadian Coast Guard - public working channel BC Coast[4] A		Boat to Boat - Tutukaka/Raglan	Public Correspondence (Ship-to-Shore Duplex) Port Operations
5	156.250	160.850			Ship Movements			Public Correspondence (Ship-to-Shore Duplex) Port Operations
6	156.300	156.300	Ship-to-ship + Ship-to-Air A		Ship-to-ship + Ship-to-Air A	Distress - Ship-to-Air	Working - Intership	A Ship-to-ship also SAR: Ship-to-Ship + Ship-to-Air
7	156.350	160.950			General working channel			Public Correspondence (Ship-to-Shore Duplex) Port Operations
8	156.400	156.400	Ship-to-ship A		Ship-to-ship East and west coasts, Lake Winnipeg A	Working - Intership	Working - Intership	A Ship-to-ship
9	156.450	156.450	Frequently used by pilots A	Calling A, commercial and non-	Ship-to-air for maritime support Atlantic and BC	Pilots, Port Operations	Port Operations	A VTS (Ship-to-ship + Port Operations

				commercial.	coasts A			
10	156.500	156.500	Frequently used by HM Coastguard A		Ship-to-air - SAR and antipollution A General working - Atlantic and BC coasts, Great Lakes		Port Operations	A Ship-to-ship Port Operations also SAR and oil cleanup only VTS on Gulf of Finland
11	156.550	156.550	Port Operations		VTS - BC Coast Pilotage A		Port Operations	A Port Operations
12	156.600	156.600	Port Operations	VTS - San Francisco offshore Pilotage A	VTS - BC Coast Port and pilot ops A	Port Operations, VTS	Port Operations	A Port Operations
13	156.650	156.650	Bridge-to-Bridge Working A	Bridge-to-Bridge safety A : Vessels > 20m must maintain watch, Tx limited to 1 watt. Movable bridge / lock operations.	VTS - BC Coast Bridge-to-bridge safety A	Port Operations, VTS	Intership Nav Safety	A Pilots Ship-to-ship Port Operations
14	156.700	156.700	Port Operations	VTS - San Francisco Bay and Delta Pilotage A	VTS - BC Coast Port and pilot ops A		Port Operations	A Working channel for SAR authorities, Turku Radio (Port Operations)
15	156.750	156.750	On board working (limited to 1 watt) A					A max 1 W Intraship Ship-to-ship Port Operations
16	156.800	156.800	**International distress, safety and calling** A All vessels equipped with VHF must maintain watch.					
17	156.850	156.825	On board Working A				Aquatic Sports Events	A max 1 W Intraship Ship-to-ship Port Operations
18	156.900	161.500						Public Correspondence (Ship-to-Shore Duplex)

								Port Operations
19	156.950	161.550		Landside facilities: harbormaster, marinas.	Canadian Coast Guard - Working Channel			Public Correspondence (Ship-to-Shore Duplex) Port Operations
20	157.000	161.600				Repeater Operations	Continuous Weather Maritime Safety Service	Public Correspondence (Ship-to-Shore Duplex) Port Operations
21	157.050	161.650		A U.S. Coast Guard Only	Continuous marine broadcasts B (WX 8)		Continuous Weather Maritime Safety Service	Public Correspondence (Ship-to-Shore Duplex) Port Operations
22	157.100	161.700		A U.S. Coast Guard—public working channel[2]			Continuous Weather Maritime Safety Service	Public Correspondence (Ship-to-Shore Duplex) Port Operations
23	157.150	161.750	HM Coastguard Maritime Safety Information	A U.S. Coast Guard Only			Continuous Weather Maritime Safety Service	Public Correspondence (Ship-to-Shore Duplex) Port Operations
24	157.200	161.800	UKSAR G/A Winching A UKSAR TWC B					Public Correspondence (Ship-to-Shore Duplex) Port Operations
25	157.250	161.850					Maritime Radio Working Channel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
26	157.300	161.900	HM Coastguard Maritime Safety Information	Public correspondence (marine telephone operator)				Public Correspondence (Ship-to-Shore Duplex) Port Operations
27	157.350	161.950						Public Correspondence (Ship-to-Shore Duplex) Port Operations
								Public Correspondence

28	157.400	162.000						(Ship-to-Shore Duplex) Port Operations
60	156.025	160.625						GOFREP on Gulf of Finland Public Correspondence (Ship-to-Shore Duplex) Port Operations
61	156.075	160.675		A Illegal for public use[1]				GOFREP (Estonia) on Gulf of Finland Public Correspondence (Ship-to-Shore Duplex) Port Operations
62	156.125	160.725	UKSAR Calling and Helicopter Channel A UKSAR TWC B				Boat to Boat - Waiheke/Whangaroa	Public Correspondence (Ship-to-Shore Duplex) Port Operations
63	156.175	160.775	UKSAR TWC (simplex)				Boat to Boat - Manukau	Public Correspondence (Ship-to-Shore Duplex) Port Operations
64	156.225	160.825	UKSAR TWC (simplex)	A Illegal for public use[1]				Public Correspondence (Ship-to-Shore Duplex) Port Operations
65	156.275	160.875			Marine Assistance Working Channel		Boat to Boat - Coromandel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
66	156.325	160.925			Marinas - BC Coast A			Public Correspondence (Ship-to-Shore Duplex) Port Operations
67	156.375	156.375	UK Small Ship Safety Channel			Working Channel, Marine Weather	Maritime Radio Working Channel	A VTS (Ship-to-ship + Port Operations)
68	156.425	156.425		Non-			Maritime Radio	A Port

				commercial A			Working Channel	Operations
69	156.475	156.475	Port Operations	Non-commercial A		Australian Navy	Maritime Radio Working channel Surf Lifesaving	A Ship-to-ship Port Operations
70	156.525	156.525	Digital Selective Calling A					
71	156.575	156.575		Non-commercial A			Maritime Radio Working Channel	A VTS (Ship-to-ship + Port Operations) Port Operations
72	156.625	156.625	Ship-to-ship A	Non-commercial ship-to-ship A	Ship-to-ship			A Ship-to-ship Ship-to-air
73	156.675	156.675	HM Coastguard Safety Broadcasts			Ship-to-ship	Marinas - Working	A Ship-to-ship Ship-to-air (Port Operations)
74	156.725	156.725	British Waterways/Canal and River Trust Channel (Canal and River System)			Ship-to-ship	Working - Coast/Ship	A Port Operations
75	156.775	156.775	Navigaton related communications (limited to 1 watt)					A Restricted Ship-to-ship Port Operations
76	156.825	156.825						A Restricted Port Operations
77	156.875	156.875	Ship-to-ship A			Ship-to-ship		A Ship-to-ship
78	156.925	161.525		Non-commercial A				Public Correspondence (Ship-to-Shore Duplex) Port Operations
79	156.975	161.575						Public Correspondence (Ship-to-Shore Duplex) Port Operations
80	157.025	161.625	UK Marina Channel			Repeater Operations	Coastguard Radio - Working Channel	GOFREP on Gulf of Finland Public Correspondence (Ship-to-Shore Duplex)

								Port Operations
81	157.075	161.675		A U.S. Government Use Only		Repeater Operations	Coastguard Radio - Working Channel	GOFREP (Estonia) on Gulf of Finland Public Correspondence (Ship-to-Shore Duplex) Port Operations
82	157.125	161.725		A U.S. Government Use Only	Canadian Coast Guard - Working Channel		Coastguard Radio - Working Channel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
83	157.175	161.775		A U.S. Coast Guard Use Only	Continuous Marine Broadcasts B (WX 9)			Public Correspondence (Ship-to-Shore Duplex) Port Operations
84	157.225	161.825	HM Coastguard Maritime Safety Information				Coastguard Radio - Working Channel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
85	157.275	161.875	UKSAR TWC (simplex)		Radio Telephone - Duplex		Coastguard Radio - Working Channel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
86	157.325	161.925	HM Coastguard Maritime Safety Information				Coastguard Radio - Working Channel	Public Correspondence (Ship-to-Shore Duplex) Port Operations
87B	161.975	161.975	Automatic Identification System B					
88B	162.025	162.025	Automatic Identification System B					

[6] **Notes:**

1: Some radios enable channels 3A, 61A, and 64A when configured for "USA mode" even though those channels are allocated exclusively for Public Safety use by the FCC. The frequencies 156.075, 156.150, and 156.225 MHz are used for interoperability communication by police and fire departments in many areas.

2: Channel 22A is reserved for communication between the U.S. Coast Guard vessels and private vessels. The Coast Guard does not monitor 22A: Contact must first be established on 16.

3: UKSAR land-based search and rescue teams have access to the simplexed versions of 24, 62, 63, 64, 85 for operational and training needs. These include mountain rescue teams in England, Wales and Scotland.

4: CCG public operations moved from 22A to 04A to avoid interference from USCG stations in northern Washington state.

Operating procedure

The accepted conventions for use of marine radio are collectively termed "proper operating procedure." These conventions include:

- Listening for 2 minutes before transmitting
- Using Channel 16 only to establish communication (if necessary) and then switch to a different channel
- using a set of international "calling" procedures such as the "Mayday" distress call, the "Pan-pan" urgency call and "Securité" navigational hazard call.
- using "pro-words" based on the English language such as *Acknowledge, All after, All before, All stations, Confirm, Correct, Correction, In figures, In letters, Over, Out, Radio check, Read back, Received, Repeat, Say again, Spell, Standby, Station calling, This is, Wait, Word after, Word before, Wrong* (local language is used for some of these, when talking to local stations)
- using the NATO phonetic alphabet: *Alpha, Bravo, Charlie, Delta, Echo, Foxtrot, Golf, Hotel, India, Juliet, Kilo, Lima, Mike, November, Oscar, Papa, Quebec, Romeo, Sierra, Tango, Uniform, Victor, Whiskey, X-ray, Yankee, Zulu*
- using a phonetic numbering system based on the English language or a combination of English and Roman languages: *Wun, Too, Tree, Fow-er, Fife, Six, Sev-en, Ait, Nin-er, Zero, Decimal*, alternatively in marine communication: *unaone, bissotwo, terrathree, kartefour, pantafive, soxisix, setteseven, oktoeight, novenine, nadazero*

Slightly adjusted regulations can apply for inland shipping, such as the Basle rules in Western Europe.

See also

- 2182 kHz
- Maritime mobile amateur radio
- Radio horizon

References

1. ^ ***a*** ***b*** ***c*** UK Maritime and Coastguard Agency Marine Guidance Note MGN324
2. ^ Circular letter CM/19-E, International Telecommunications Union, 27 March 2009
3. ^ American Association of Railroads channel allocation [1] (http://www.arrl-al.org/Railroad%20Communications%20Channels.pdf) accessed 23 September 2013
4. ^ *VHF Radio (including GMDSS)* (2nd ed.). RYA. 2008. ISBN 978-1-906435-20-2. Unknown parameter `|ditor1-last=` ignored (help)
5. ^ Kommunikationsverket 2010: *Handbok i VHF-radiokommunikation för radiooperatör med kusttrafikcertifikat*
6. ^ http://www.navcen.uscg.gov/?pageName=mtvhf

External links

- US Coast Guard basic radio information for boaters (http://www.navcen.uscg.gov/?pageName=mtBoater)
- Coast Guard marine channel listing (with frequencies) (http://www.navcen.uscg.gov/?pageName=vhf)
- US FCC marine channel listing (by function) (http://wireless.fcc.gov/marine/vhfchanl.html)
- UK MCA advice on use of VHF at sea, including collision avoidance, effective ranges, and International channel usage (http://www.mcga.gov.uk/c4mca/mgn_324.pdf)*
- Canadian VHF Bands in the Maritime Service (http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01011.html#sched1)
- VHF Marine Band Plan in TURKEY (Türkiye'deki VHF Deniz Telsiz Frekans Kanal Listesi) (http://www.GemiTrafik.com/vhf.htm)
- Listen LIVE! VHF Marine Radio @ East of Izmit Bay / TURKEY (İzmit Körfezi Doğusu - Canlı VHF Marin Telsiz Dinleme) (http://www.GemiTrafik.com/canliyayin.htm)
- New Zealand VHF Radio Resource Center (http://www.vhfradio.co.nz)
- Australian VHF Radio Network locations and How to Make A Distress Call (http://www.vhfradiocourse.com)
- Phonetic Alphabet (http://www.vhfradiocourse.com/Be_Prepared.html#Phonetic_Alphabet)

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