



# The Cruising Club of America

## Digital Selective Calling and Search And Rescue Areas (DSC and SAR)

Version 8.1

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## INTRODUCTION

Digital Selective Calling, usually called **DSC**, is the international maritime communication system for use by vessels in distress and by shore stations to communicate with them. It is used to assist in **SAR** (Search And Rescue) operations in the US's area of responsibility as well as by other countries in their areas. The system generates a signal that can be heard on your boat as well as by the authorities. It tells them you are in distress and where you are with emphasis on rapid response. DSC coverage is provided by VHF radio for coastal waters and, Inmarsat and SSB for the high seas.

All regulated ships (ocean going passenger ships and cargo ships of 300 tons or more on international voyages) are required to be equipped with this technology. Coastal vessel requirements are left up to the individual countries.

The US coastal DSC system is called "Rescue 21" by the Coast Guard who are installing the system around our coasts, some inland waters and around US possessions. It was initially scheduled for completion in 2006 but has been fraught with delays for both technical and budgetary reasons and is now targeted for completion in 2011 with most of the implementation now planned for the latter years.

The latest schedule of implementation for Rescue 212 as of February 2008 is included in Appendix I.

On the high seas, coverage is provided by seven USCG **SSB** (Single Side Band) transmitters but is on hold due to technical reasons.

The equipment required for coastal operations is a DSC equipped VHF radio connected to a GPS. For offshore, a DSC VHF and a DSC SSB enabled will suffice for all areas including the polar regions. All VHF & SSB radios sold in the US since June 1999 are DSC equipped. Some are better equipped than others and you get what you pay for.

Inmarsat communicating with satellites is an alternative on the high seas but not in the polar regions and won't be discussed here.

**Critical to the use of this equipment in an emergency is the connection of the radio to the GPS. If these units are not connected, the USCG can't know where you are or where to go to help you!**

While this is primarily a remarkable safety system for vessels at sea, it also has convenience features such as calling specific other yachts only which is almost like making a phone call. With this in mind, sending and receiving distress signals is first discussed followed by some technical aspects to help understand how DSC works. This is followed by an outline of Search and Rescue areas, an outline of some of the great convenience features of these radios making them very desirable for everyday use, and finally two appendices; the implementation schedule for VHF stations and a listing of country identifier codes.

Boat/US has a free interactive tutorial about VHF Radio & DSC called “Can You Hear Me?” which was developed in conjunction with the US Coast Guard. To download the tutorial, go to [www.boatus.com/mmsi](http://www.boatus.com/mmsi) and click on the 35 minute “DSC Radio Tutorial”. They have also posted an excellent tutorial at [www.boatus.com/foundation/dsc/player.html](http://www.boatus.com/foundation/dsc/player.html).

A few administrative notes:

1. All frequencies and SSB modes described are kHz and USB unless otherwise noted.
2. Although Ham radios and other equipment operate in single sideband mode, SSB throughout this paper pertains to Marine Single Sideband Radios.
3. The International Telegraphic Union (**ITU**) is a UN body located at Geneva, Switzerland that regulates radio usage including frequency and channel allocations. The US along with most maritime countries is party to treaties supporting these regulations. They are promulgated in the US by the Federal Communications Commission (**FCC**) and administered by various agencies. The US Coast Guard has responsibility for maritime applications.
4. The International Maritime Organization (**IMO**) is the UN’s agency responsible for improving maritime safety and preventing pollution from ships. It is based in the UK and has 167 member countries.
5. Computers running Windows XP require Acrobat Reader Version 6.0 or higher for correct printouts. The latest version of Acrobat Reader (available free at this website) will do the job properly.
6. It has been suggested that an index be added. Actually, a facility in Adobe Acrobat is available for this. Simply click on “Edit” on the Tool Bar, then “Find” and type in the reference word. The program will do the rest.
- .7. Margins, top and bottom, left and right have been set as follows:
  - a. Top and bottom – 0.9”
  - b. Left and right – 1.0”
  - c. Header and footer – 0.5”

Your comments, corrections and suggestions are always more than welcomed and I try to respond to each of these when received. There are a lot of abbreviations used in this paper and it might be helpful to list these separately as you progress through the paper the first time.

This is a great radio development and once you try the convenience features, I’m sure you will be impressed and want to take advantage of it.

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# 1 DSC Background

The Global Marine Distress and Safety System (**GMDSS**) is the international system for search and rescue at sea. It is a combination of land based radio stations and satellites which enable voice and/or digital systems to be used for communications at sea rather than Morse code as in the past.

This major change to communications at sea was first proposed by a subgroup of the International Maritime Organization (**IMO**). It was adopted by 77 countries in 1999, has been a requirement on most regulated (commercial and some fishing) vessels since then and is being implemented in Europe as well as other places throughout the world. Unfortunately it is off to a slow start in the US for a variety of reasons; some reasonable and some not so good.

Emergency Position Indicating Radio Beacons (**EPIRBs**) are part of the GMDSS system. In the US, EPIRBs are registered with NOAA's Beacon Registration Database. The database includes particulars about your boat, emergency contacts, etc.

Each EPIRB is assigned a 15 character identifying code when manufactured. Using this code to register with the authorities and completing the necessary data, the authorities will know who and what is sending a distress signal. Since it is a satellite system, they will also know very accurately where the signal is coming from. The system works superbly well as I can personally attest.

Registration in the US is free on the web at <https://beaconregistration.noaa.gov/> or by Phone: 301-817-4515, Toll free: 888-212-7283.

Failure to register an EPIRB and renew the registration every two years makes it a pointless piece of equipment to have on board. Surprisingly, some yacht owners don't bother.

In much the same way, Digital Selective Calling (**DSC**) equipped **VHF** (Very High Frequency) and **SSB** (Single Sideband) radios can be assigned a number to be used by a vessel at sea. Some countries convey the number with the purchase of the unit, but in the US, it must be applied for.

Coordinating the numbers of several or even many transmitting units from different manufacturers on an individual vessel over time would be a horrendous task, so after the equipment is installed, the owner obtains one identifying number for all the equipment. This number is called the Maritime Mobile Service Identity (**MMSI**) or, MMSI number. This one nine digit number is then programmed into all the DSC equipment on board including VHF and SSB radios and any other transmitting equipment with DSC features.

EPIRBs use satellites to relay distress signals. The design of the satellite system enables an EPIRB sending a signal to be located to within very short distances automatically. DSC on the other hand is radio and does not directly use satellites to obtain your position. However, a DSC radio can still send out location information if connected to a GPS. When connected, a DSC radio automatically sends location information enabling a non technically oriented person on board to send a distress signal with the exact location at the push of a button.

With the position locating feature of DSC determined from an on-board GPS rather than from a satellite, the GPS must be connected to the radio and turned on. This is the weak link in the system because many owner installations fail to make this connection. In not doing so, the CG will know you are in trouble but not where to go to help!

In the words of the USCG:

**“The Coast Guard urges, in the strongest terms possible, that you take the time to interconnect your GPS and DSC-equipped radio. Doing so may save your life in a distress situation!”**

## **2 AIS (Automated Identification System)**

New on the scene for regulated vessels is **AIS**, the Automated Identification System for collision avoidance. As the name indicates, it is an automatic system using VHF radio and MMSI numbers to identify regulated vessels. With the vessel’s characteristics available on file via the MMSI number, some versions of this equipment particularly commercial versions can provide the Closest Point of Approach (**CPA**), time to CPA, last port, destination port and the like of particular interest to commercial vessels.

AIS is a component of GMDSS and is becoming available for yachts. It can require two VHF radios, one for normal communications and one for AIS which can be a significant current drain for the average cruising yacht.

AIS has value mainly in congested areas or where poor visibility is the norm.

Compliance with regulations are not practiced by all vessels or in all parts of the world. Ships at sea usually are steered by autopilot and unfortunately often do not have someone immediately available on the bridge or the radio. From personal observation, this is almost always the case with commercial fishing vessels and many times if someone is available, they do not speak English.

In the Eastern Mediterranean, it is surprising when a vessel responds to a VHF call. Unless the vessel is on an international passage on the high seas, a VHF signal has little chance of being received.

The Coast Guard expects to have a “receive only” AIS coastal monitoring system within 2-3 years.

**Note:** Mexico recently published a notice requiring recreational vessels over 30 feet in length to carry AIS equipment and an annual fee of \$30.00 for participation. Going to Mexico requires patience with the bureaucracy.

### 3 MMSI (Maritime Mobile Service Identity)

The MMSI number is an international identification numbering system for vessels and shore stations and is at the heart of DSC. Without an assigned MMSI number, the modern marine radio loses the outstanding DSC capability.

The MMSI is a nine digit number assigned in the US by the FCC (Federal Communications Commission) and similar to the fifteen character EPIRB file system. It is anticipated that the nine digit MMSI number will become exhausted in the future and will probably be expanded to more digits

When a MMSI distress signal is received, the number tells the authorities who you are, what kind of boat you have, your emergency contacts and the like. If properly installed with a GPS connected and turned on, it tells where the vessel is in precise terms of latitude and longitude. This applies to both DSC VHF and SSB radios which can display coordinates. You get what you pay for!

MMSI has some side features which makes it particularly attractive to recreational vessels. It can be and is encouraged to be used in non-distress situations such as calling other yachts. This avoids using the already overloaded Channel 16 on VHF or congested hailing channels on SSB. Group calls, position requests and so on can be made automatically as well, provided that their MMSI numbers are known.

#### 3.1 Obtaining an MMSI Number

##### 3.1.1 Yachts without a Radio Station License

Recreational vessels under 65 feet cruising only in US waters and equipped with only VHF (no other transmitters of any type excluding cell phones) do not require a radio station license. Through a special arrangement with the FCC, Boat/US and Sea Tow are issued blocks of MMSI numbers by the FCC for these coastal yachts. MariTEL, listed on the FCC site now defers MMSI inquires to Sea Tow.

MMSI numbers issued by Boat/US and Sea Tow are free and may be obtained on the web at:

[www.boatus.com/mmsi/default.asp](http://www.boatus.com/mmsi/default.asp)  
[www.4seatow.com/boating\\_safety/mmsi.asp](http://www.4seatow.com/boating_safety/mmsi.asp)

**Caution:** Boat/US and Sea Tow MMSI numbers are disowned by the FCC at the time of this writing. They are not merged back into the FCC data bank and therefore not included in ITU files. Accordingly, they are not internationally recognized.

The US Power Squadrons have recently applied to the FCC to become a MMSI issuing organization.

In January 2008, BOAT/US had assigned MMSI numbers to over 45,000 boats while the FCC has issued about 240,000. Boat/US has petitioned the FCC asking that boaters holding a BOAT/US MMSI number be permitted to retain it when applying for a Station License. As of this writing, the FCC has not responded and as a result, some yachts can have two distinct and separate MMSI numbers; one for domestic voyages and one for international. Your taxes a t w o r k !

Also in January 2006, the ad hoc committee working on GMDSS issues reported that about 70% of the VHF radios in use have DSC capability but the vast majority of these have not applied for an MMSI number.

### 3.1.2 Yachts requiring a Ship Radio Station Authorization (form FCC 605-S)

Yachts (recreational vessels) with other transmitting equipment on board such as radar, EPIRB, SSB, etc. or those with only VHF but planning to travel in foreign waters including Canada, Bahamas and Mexico and all regulated vessels must have a license from the FCC. Further, yachts with existing Ship Radio Station licenses must have them modified to obtain the MMSI number. This can be done on line or by phone with the assistance of a very helpful operator.

Doing this online without step-by-step guidance from the helpful operator is at least as difficult as some other FCC applications and might even set a new level for obfuscation.

Yachts with a Ship Radio Station Authorization issued before MMSI numbers were available were automatically assigned an MMSI number upon renewal. It appears that this was done in some instances with out notification to the vessel owners.

Yachts with a station authorization issued after MMSI numbers became available will need the number added to their license. Unfortunately, any modification to a Ship Radio Station Authorization (form FCC 605-S) involves a fee. The cost for this in December 2006 was \$160. This is not the Ship/Aircraft Radio Station License (form FCC 659) although it's hard to tell the d i f f e r e n c e b e t w e e n t h e t w o o f t h e m .

Yachts renewing their authorization upon expiration of the ten year period are charged \$160, the rate current in November 2007.

Yachts with one of the free MMSI numbers must obtain a second MMSI number if installing other transmitting equipment or planning to cruise in foreign waters.

The Ship Station License along with the MMSI number stays with the boat. If the new owner of your boat fails to re-register the Station License in his/her name and has an emergency, the authorities would be calling your emergency contacts looking for you on your old boat. It follows that your Emergency Contacts are bound to get very excited about this.

Further, the new owner's Emergency Contacts won't know there is an emergency and are likely to get very excited as well when they find out. The repercussions from all this will

probably linger on for both parties on the home front for a very long time and be brought up at the very worst time, which translates to often. Be sure the new owner re-registers.

While these numbers are administered in the US by the FCC for commercial and private vessels, the National Telecommunications and Information Administration (NTIA) administers codes for government and military vessels. It is difficult to understand the need for this  
a p p a r e n t d u p l i c a t i o n .

### 3 . 2 T h e M M S I N u m b e r

The MMSI number is an actually a coding system organized by the ITU for use by some 228 maritime countries. It is a series of nine digits used to identify the various countries, the calling  
s t a t i o n s a n d i n d i v i d u a l v e s s e l s a s w e l l .

The order or format of the numbers is important. It easily identifies Ship Stations such as your boat, Group Ship Stations such as Coast Guard vessels and Sea Tow with a fleet of over 600 vessels, Coast Stations such as your yacht club and, Group Coast Stations such as the Coast  
G u a r d .

Which Group Ship or Group Coast Station you get when you call is dependent upon the effective range of your radio transmission.

#### 3 . 2 . 1 M a r i t i m e I d e n t i f i c a t i o n D i g i t s ( M I D )

The format of an MMSI number is:

M I D X X X X X X

where **MID** is a three digit country code officially called Maritime Identification Digit and six digits **XXXXXX** which can be any number (almost).

A single **MID** has been allocated to each country. A second **MID** can be assigned once the first **MID** is more than 80% used and 90% is foreseen and so on. The US has five codes at the  
p r e s e n t t i m e , t h e B a h a m a s t h r e e .

The following table is a list of country codes for the US and neighboring maritime entities.

<a href="#">Bahamas</a>	308, 309, 311
<a href="#">Bermuda</a>	310
<a href="#">British Virgin Islands</a>	378
<a href="#">Canada</a>	316
<a href="#">Mexico</a>	345
<a href="#">Puerto Rico</a>	358
<a href="#">United States</a>	338, 366, 367, 368, 369
<a href="#">United States Virgin Islands</a>	379

A complete list of current assigned MIDs may be found in Appendix II courtesy of Wikipedia. As previous noted, there were 228 country codes at this time.

### 3.2.2 Ship Station Identities

Where the MID appears in the sequence of the nine number code has significance. If the MMSI starts with the MID identifying the country, it is an MMSI for any vessel. The format for a n y v e s s e l i s :

**MIDXXXXXX**

E x a m p l e s o f t h e M M S I a r e :

From the US: 367XXXXXX where 367 is one of several MIDs for vessels

From Canada: 316XXXXXX where 316 is the MID for Canadian vessels

### 3.2.3 Group Ship Stations

Group Ship Stations is another way of saying a group of vessels such as Sea Tow which are all assigned the same 9-digit code. For all vessels in this group, the MMSI has one leading zero before the three digit MID number and then five identifying digits:

**0MIDXXXXX**

Examples of the MMSI for Group Ship Stations are:

Sea Tow: 033801999 where 338 is the MID for these vessels

US Coast Guard: 036699999 where 366 is the MID for these vessels

### 3.2.4 Coast Station and Group Coast Stations Identities

The MMSI codes for Coast Stations and Group of Coast Stations have two leading zeros in the number which occur before the MID:

**00MIDXXXX**

Examples of the MMSI for Coast and Group Coast stations are:

Bermuda Radio: 003100001 where 310 is the MID for this shore station

US Coast Guard: 003669999 where 366 is the MID for these shore stations

### 3.2.5 Some Variations With The MMSI

The MMSI 3389XXXXX (note the “9” after the 338 MID) is normally reserved in the US for federal vessels and federal shore stations (note the USCG shore station MMSI above).

If a ship is equipped or expects to be equipped with Inmarsat C, the identity has one trailing zero.

**MIDXXXXX0**

If a ship is equipped or expects to be equipped with Inmarsat B or M, the identity has three trailing zeros.

**MIDXXX000**

These variations are still being debated and may change to accommodate Inmarsat identities.

### 3.2.6 MMSI Format Summary

To summarize all of this, there are three formats for MMSI numbers. They are:

<b>MIDXXXXXX</b>	Individual Vessel
<b>0MIDXXXXX</b>	Group Of Vessels
<b>00MIDXXXX</b>	Shore Stations

### 3.2.7 Before Casting Off

Unfortunately, Boat/US and Sea Tow MMSI numbers are not merged back into the FCC data base and some of the FCC files have not been merged into the ITU files. The prudent captain, before taking an offshore voyage might check the internet to ensure the information on file is correct and current for his yacht.

The websites are:

<b>AUTHORITY</b>	<b>WEB ADDRESS</b>
<b>USCG</b>	<a href="http://cgmix.uscg.mil/PSIX/VesselSearch.aspx">http://cgmix.uscg.mil/PSIX/VesselSearch.aspx</a>
<b>FCC</b>	<a href="http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp">http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp</a>
<b>ITU</b>	<a href="http://www.itu.int/cgi-bin/htsh/mars/ship_search.sh#start">http://www.itu.int/cgi-bin/htsh/mars/ship_search.sh#start</a>

## 4 Making A Distress Call

A distress call should be made only when an emergency actually exists and immediate help is needed. Activating a distress call on a DSC radio starts a significant chain of activity to respond to your emergency.

There are three levels of emergency calls. They are:

**MAYDAY** (May-Day) which means the situation is grave, personnel and/or property are in immediate danger and immediate assistance is requested. Examples: Man overboard, boat sinking, etc. The operative word is immediate.

**Pan-Pan** (PAH-N PAH-N) is an urgent message concerning the safety of a person or vessel but the situation doesn't require immediate assistance. Examples: An injury under control, unexplained water coming onboard but pumps containing the flow, etc.

**SECURITY** (SEA-CURE-EE-TAY) is the least critical level and is used to advise on safety or navigation information. Example: Vessel proceeding in heavy fog from point A to point B, strong weather warning, etc.

The level of emergency is repeated three times. For example, Mayday, Mayday, Mayday or Pan-Pan, Pan-Pan, Pan-Pan, etc.

Depending upon whether you are within 20 miles of a shore station and can reach them on VHF or further out to sea determines which radio to use when making a distress call. VHF is used for close in or when offshore and another vessel is within 20 miles. When offshore or when no other vessel is close by, a SSB should be used.

**Note:** SSB radios share certain frequencies with airplanes. Commercial flights monitor frequencies which can be accessed by marine SSB radios. See the paper "FREQUENCIES, NETS, WX FAX SCHEDULES AND TABLES" in this series.

### 4.1 VHF

When the button under the red flap is depressed for about five seconds, the radio will automatically send out a signal with your identification number and GPS information. It will continue to do this until it receives an acknowledgment signal and then automatically switch to VHF Channel 16. You only have to push the button under the red flap one time and hold it down for about 5 seconds. The signal repeats every 3 ½ to 4 ½ minutes until the call is answered. On some VHF sets, you will hear your radio sending the signal.

Be prepared to tell the authorities what the distress is about. For example, you may want to say something like:

*"MAYDAY, MAYDAY, MAYDAY - This is sailing vessel Nefertari, Nefertari, Nefertari, Call Sign WBJ 6623 requiring immediate assistance. We have struck a submerged object northwest of*

*Block Island and are taking on more water than we can pump. There are four people on board. One person is injured with a broken arm. We all have life jackets on and are preparing to abandon ship. Please acknowledge.”*

The authorities will already know who you are, what the boat looks like, and where you are, but by saying this, you will be telling them what the distress call is about. You will also be alerting other yachts in the immediate area not watching Channel 70 who may be your closest source of assistance. If you're in serious trouble, anything goes.

Designate one person to stand by the radio and relay any messages from the captain and others.

#### 4.2 SSB

With a SSB (MF and HF) radio purchased and installed since 1999, locate the red flap on the face of the radio and push the button under it for about five seconds to activate the distress features. You only have to push the button under the red flap one time.

The radio will automatically send out a signal with your identification number and GPS information on 2187.5 and 8414.5 kHz which all DSC equipped vessels at sea are required to watch. It will continue to transmit and the radio will beep until it receives an acknowledgment signal. It will then automatically switch to 2182 kHz for voice transmission. If the station sending the acknowledging signal cannot be reached on 2182 kHz, switch to 4125 kHz, the next higher Safety and Hailing frequency for greater range and so on until you can get through to the responding station.

Be prepared to tell the authorities what the distress is about. For example, you may want to say something like:

*“MAYDAY, MAYDAY, MAYDAY - This is sailing vessel Nefertari, Nefertari, Nefertari, Call Sign WBJ 6623 requiring immediate assistance. We have struck a submerged object about fifty miles west of Cabo De Sao Vicente and are taking on water faster than we can pump. There are four people on board. One person is injured with a broken arm. We all have life jackets on. Please acknowledge.”*

The SSB DSC frequencies, the related Safety and Hailing frequencies and the probable range limits in good propagation conditions are:

DSC Frequency	Safety & Hailing	Probable Range Limits
		<b>Day / Night</b>
2187.5	2182.0	100 / 300
4207.5	4125.0	300 / 800
6312.0	6215.0	400 / 1000
8414.5	8291.0	500 / 1200
12577.0	12290.0	2000 / 800
16804.5	16420.0	4000 / Unreliable

**Note:** The range increases with higher frequencies during the day but falls off at night. Also, HF transmissions have a “skip zone” close in where the transmission is not heard. The skip zone increases with frequency and is the reason the lowest frequency should be used first to reach the closest possible assistance.

As with VHF, the authorities should already know much about your vessel, who you are and where you are and while you don't have to repeat this, you will be telling them what the distress call is about. You will also be alerting other vessels without DSC in the immediate area who may be your closest source of assistance but are not watching the DSC frequencies. Hopefully, they are watching one of the Safety and Hailing channels. If you're in trouble, e v e r y t h i n g g o e s .

## 5 Distress Messages

With technology rolling on, some newer “and top of the line” radio designs include features not previously available. You get what you pay for.

### 5.1 VHF And SSB Preprogrammed Distress Messages

Most commercial and some recreational DSC VHF radio systems have preprogrammed messages which can be selected from a menu. These may include but are not limited to:

Abandoning Ship	Flooding
Capsizing	Grounding
Collision	Listing
Disabled	Man Overboard
Explosion	Piracy
Fire	Sinking

It's obvious that some of these messages would normally be sent by a dedicated radio operator on a large vessel equipped with Class A DSC equipment, a requirement on regulated vessels. Class A preprogrammed messages (above) are included here for background i n f o r m a t i o n .

Yachts in the US typically have US Class D DSC radios intended for use by recreational v e s s e l s w i t h l e s s e r D S C c a p a b i l i t i e s .

On the otherhand, some DSC SSB radios such as the Icom IC-M802 do have preprogrammed messages which are displayed when “DISTRESS” is selected on the menu. The message c a t e g o r i e s o n t h i s r a d i o i n a l p h a b e t i c o r d e r a r e :

Abandoning ship	Flooding
Capsizing	Grounding
Collision	Man overboard
Disable adrift	Piracy attack
EPIRB emission	Sinking
Fire, Explosion	Undesignated

Note that the list for this radio is almost the same as that for regulated vessels.

## 5.2 What To Do When You Hear a DSC Distress Signal

### 5.2.1 VHF

Some VHF Radios such as the Icom M-422 monitor Channel 70 (the Distress Channel) in a background mode while watching other channels.

When a Distress Call is received on a M-422 VHF, the alarm will sound for two minutes and RCV Distress will appear on the screen. The alarm will continue sounding until the radio sending the alarm receives an acknowledgement signal from a coastal station. The M-422 then will automatically switch to Channel 16. Pushing any key stops the alarm from sounding on your radio.

Unless you know that a coastal station or Coast Guard vessel is not within 20 miles, it is recommended you wait three minutes before you transmit an acknowledgement or attempt to relay the distress.

If a Coast Guard station or vessel is within 20 miles, standby on VHF 16 to ensure the coastal station can contain the situation (your boat may be the closest and they may need assistance) but don't interfere.

The US Coast Guard's program for establishing coastal and rescue co-ordination centers called "Rescue 21" is discussed below. Most coastal stations are not operational yet; the latest schedule (February 2008) may be found in Appendix 1.

### 5.2.2 SSB

As previous noted, regulated vessels are required to keep watch on 2187.5, 8414.5 kHz and one other DSC frequency selected according to the time of day, the season of the year and the distance from appropriate coast stations (47cfr 80.1123.3) to receive Distress Calls or any of the DSC convenience features. The Icom M-802 SSB has an independent DSC receiver circuit which scans the DSC as well as the Safety and Hailing channels concurrently and continuously when this feature is activated.

It only makes sense for non-regulated vessels to do the same. SSB Radios may use the scan function for this requirement, scanning a maximum of six channels.

When a Distress Call is received on a M-802, the alarm will sound for two minutes, Distress will appear on the screen along with the MMSI for the vessel initiating the alert. Pushing **C A N C E L / C A L L** stops the alarm.

The radio operator should switch to the Safety and Hailing channel for the frequency of the distress alert and stand-by for five minutes to determine if the distress alert is acknowledged before relaying. If the frequency is not known, switch to 2182.0 kHz and work up the Safety and Hailing Frequencies. For obvious reasons, a crew member should standby to ensure the coastal station or Rescue Co-ordination Center can contain the situation (your vessel may be the closest and they may need assistance), but don't interfere.

The IMO (International Maritime Organization) has cited relaying distress alerts creates great confusion with how many distress situations actually exist and leads to delays in response time.

The two situations on the high seas in which vessels should relay a distress call are:

1. When "a distress alert on the SSB is not acknowledged by a coast station within 5 minutes."

**Note:** The USCG recommends three minutes.

2. When "knowing that another ship in distress is not able to transmit the distress alert and the Captain of your ship considers that further help is necessary. The distress relay call should be addressed to "all ships" or to the appropriate coast station."

## 6 Rescue 21

Rescue 21 is the name of the USCG's DSC system for areas within VHF range of coastal stations. It is expected to satisfy GMDSS requirement for coastal waters once declared operational.

It's well known that the Coast Guard often has additional duties assigned without adequate funding. Some programs have to suffer and one of them is the implementation schedule for Rescue 21.

The completed coastal system was initially scheduled to be operational by YE 2006. However, some coastal areas required additional VHF relay towers to achieve the complete coastal coverage specified in the plan. A lack of funds is the major hold up along with technical impediments as well. Accordingly, implementation of Rescue 21 has had major delays with most of the implementation skewed to the outer years; more than half of the locations are now scheduled to come on line between 2009 and 2011.

The completions summarized by year (as of February 2008) follows:

Year	Completions	Cumulative
2005	2	2
2006	4	6
2007	4	10
2008	8	18
2009	8	26
2010 - 2011	12 - TBD	38

TBD = To Be Determined

The complete schedule with start and completion by year, updated February 2008, may be found in Appendix 1.

## 7 The Sea Areas

The IMO is mainly concerned with vessels at sea, leaving control of coastal regulations up to the individual member countries. How far out at sea this is from a coast varies. In the US, there is the three mile line (state limit), the 12 mile limit, the Haig Line and the Fishery Conservation Zone of about 200 miles. Where countries share a body of water of less than 400 miles across, a line is usually drawn equidistant between the coasts to define who controls and is responsible for what area.

By convention, countries adjacent to each other with a relatively straight coast geometry draw a line perpendicular to the coast at the border. One exception to this is Israel that assumes all areas within fifty miles of their borders is under their authority and control including the sea area along the adjacent coasts.

To manage coastal and offshore coverage in an orderly manner and comply with IMO regulations, four zones called Sea Areas have been established which coincide with our Search And Rescue (**SAR**) responsibilities. The closest zone to land is **Sea Area A1** which extends out from the coast for about 20 to 25 miles or, practical VHF range. "Rescue 21" when completed is intended to satisfy this requirement.

The areas beyond that, **Sea Areas A2, A3 and A4** progress outward sequentially. These areas require INMARSAT or SSB radio for communication.

The FCC requires that Regulated Vessels (commercial, fishing, yachts over 65 feet, recreational yachts under 65 feet in trade, etc.) must be equipped with DSC equipment. This can be satellite (Inmarsat C) or HF radio (SSB). This does not apply to pleasure yachts less than 65 feet although it is certainly recommended when out on the high seas.

## 7.1 Sea Area A1

Communication coverage in Sea Area A1 is by VHF radio.

There are many gaps in the existing VHF coverage along our coasts (in 2003, there were 65 known gaps). One element of the Coast Guard's funding problem is the acquisition of land along the coasts to construct relay towers necessary for continuous VHF coverage. This is not progressing at the rate initially planned and now will not be completed until at least 2011.

Some areas previously operating on a test basis have now been declared operational by the CG. Unfortunately, only 11 areas have been declared operational as of February 2008. They are:

East Coast	Florida & Gulf Coast	West Coast
Long Island Sound, NY	Jacksonville, FL	Seattle, WA
New York, NY	St. Petersburg, FL	Port Angeles, WA
Atlantic City, NJ	Mobile, AL	
Delaware Bay, MD		
Eastern Shore, VA		

Long Island Sound, New York and Delaware Bay were completed and declared operational in late 2007. These stations now provide continuous coverage from Norfolk, VA to Cape Cod. Jacksonville was declared operational January 2008.

Three stations were deleted from the January 2007 plan which was presented in the form of a USA map. They are Moriches, NY, Mayport, FL. and Philadelphia, PA. Additional changes have been made to the current deployment schedule. See Appendix I.

## 7.2 Sea Area A2

Sea Area A2 is the next area outside and excluding Sea Area 1 where radio can reach at least one coastal station and can provide continuous MF (Medium Frequency) coverage on 2187.5 kHz. Effectively, this is up to about 200 miles offshore depending upon conditions. Any modern SSB radio should be able to do this on high power.

Communication coverage in Sea Area A2 is by SSB radio and possibly VHF in special coastal configurations.

The CG has installed seven stations for Sea Area A2 through A4 although technical reasons now have these installations on hold. In addition, a cost analysis is being prepared at this time to determine whether to repair the existing equipment, upgrade it or simply replace it. Accordingly, the USCG has not declared Sea Area A2 operational.

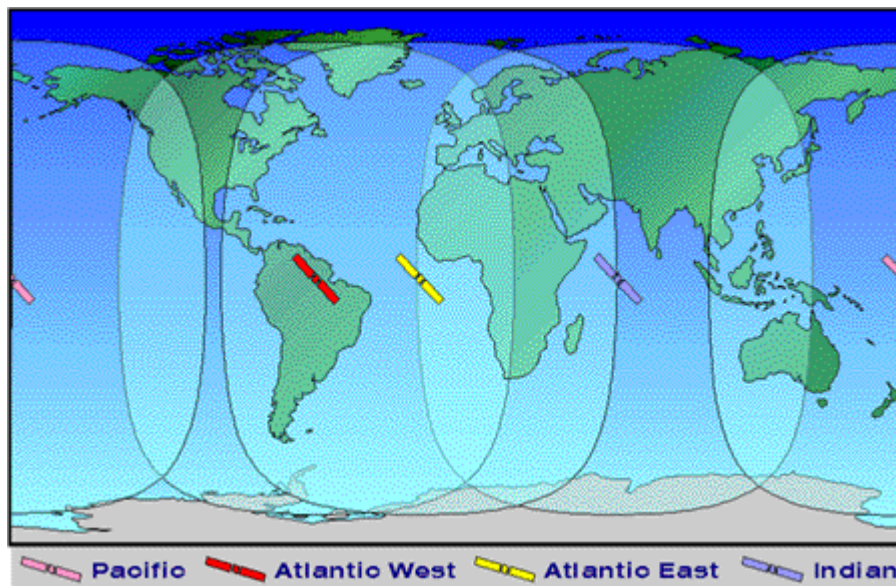
### 7.3 Sea Area A3

Communication coverage in Sea Area A3 is by DSC SSB radio or INMARSAT.

Sea Area A3 is the next area outside of and exclusive of A1 and A2. It is between 70° N and 70° S Latitude and within the coverage of an INMARSAT geostationary satellite with continuous alerting available. Regulated ships traveling this area must carry either an Inmarsat F77, B or C ship earth station or, a DSC-equipped HF radiotelephone/telex. Recreational vessels can get by with a DSC SSB radio.

The USCG has advised that this area is operational.

### 7.4 Satellite coverage for Sea Area A3



### 7.5 Sea Area A4

Sea Area A4 covers the Polar Regions; above 70° N and below 70° S Latitude.

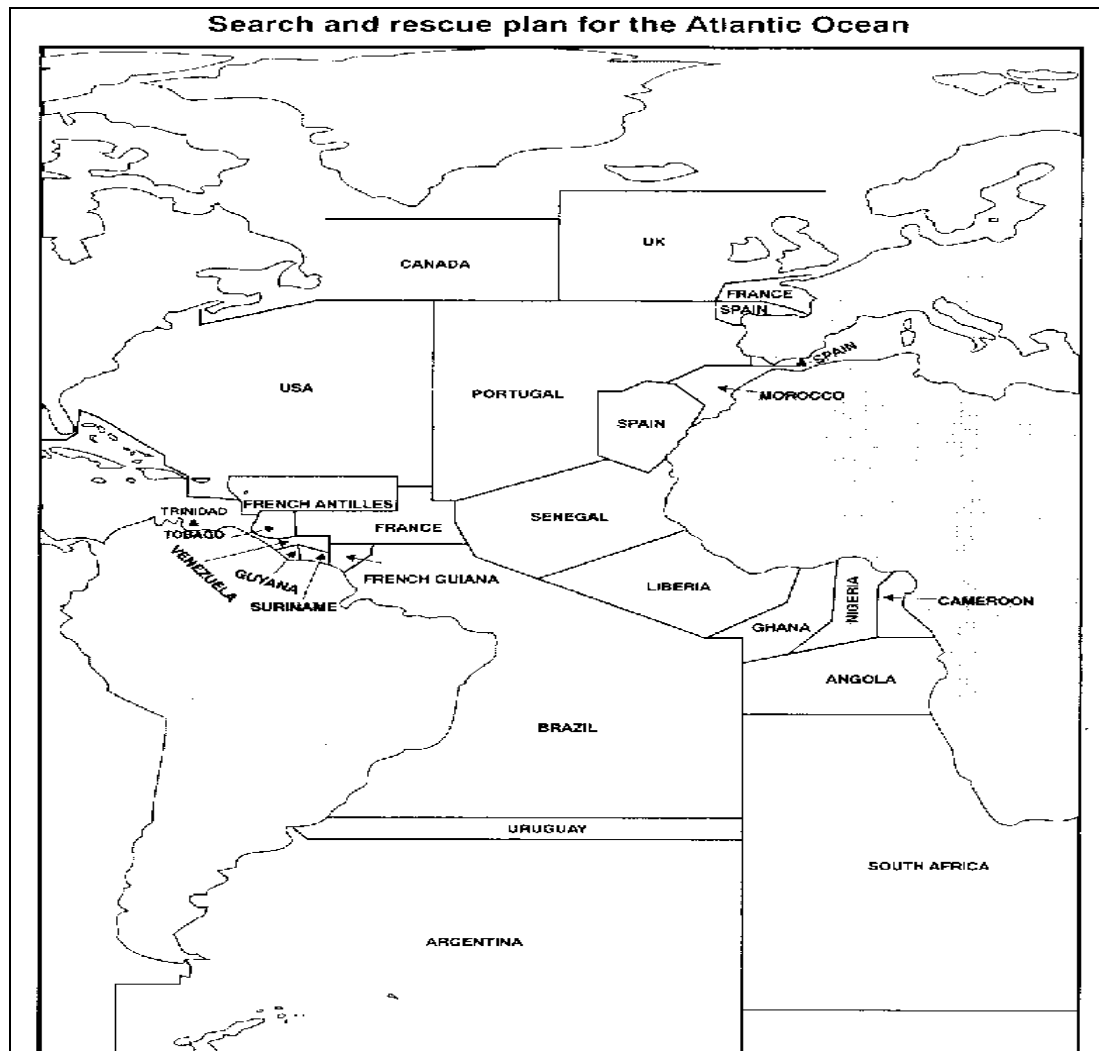
This area is out of Inmarsat coverage and accordingly, regulated vessels must carry a DSC SSB. All vessels in the north polar region should also carry a high powered rifle for polar bears.

## 8 SAR (Search And Rescue) Areas

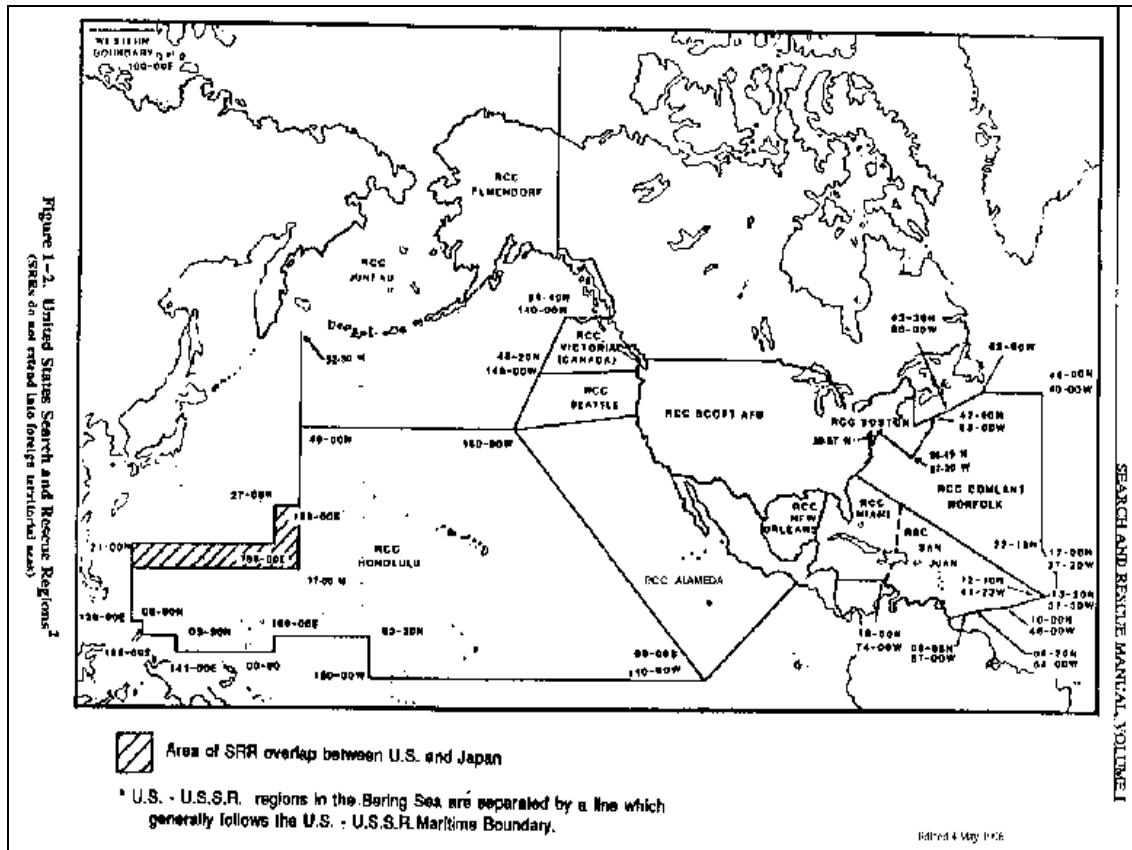
The oceans have been divided into areas of country responsibility. The US coverage in the Atlantic is the area eastward from south of Nova Scotia to about La 40°W, southward to about La 20°N, westward along 20°N, dipping down to include the Virgin Islands and Puerto Rico, northwestward east of the Bahamas and then to our south Florida coast. In the Pacific, the coverage is most of the NW Pacific down to about New Guinea.

The following charts outline country areas of responsibility with apologies for their poor quality. I would be happy to make improvements if anyone can advise on the source of better charts.,

### 8.1 Atlantic SAR areas:



## 8.2 Pacific SAR areas:



## 9 DSC Usage Concerns

The USCG has two major concerns with how vessels are using DSC and there are others you should be aware of as well.

### 9.1 GPS Connection To The VHF and/or SSB

Most distress calls occur via VHF in Sea Area 1 (Rescue 21) and many of these radios are owner installed.

The first concern is, many recreational vessel owners fail to connect their GPS to the radio (VHF or SSB). This critical portion of the system is often overlooked. Unless the GPS is connected and can input the location data of the distress, the CG will know who has a problem out there, but not where the vessel is!

Restated, they will know you are somewhere in their area and within a maximum radius of 25 miles from perhaps a relay station, sending a distress alert but will have difficulty knowing where to look!

Over and over, the CG cites this as a major problem with the system.

**Please make sure your GPS is connected to the VHF and SSB (if you have SSB DSC).**

It would also be a good idea to be sure the units are working as a system before heading out. DCS won't do you much good if the GPS isn't turned on.

**9.2 Failure To Switch To A Safety & Hailing Channel**

The second concern is the failure of vessels in distress to switch to a safety and hailing channel. Some VHF radios will automatically switch to Channel 16 once a distress call has been acknowledged but not all. It is also a concern with SSB radios which may not automatically switch to the safety channel for the for the frequency band of the distress alert.

With non-distress VHF calls, the radio should switch to a pre-designated channel to be used for non-omni-traffic.

On the high seas and out of VHF range, the operator must ensure the SSB switches to a Safety and Hailing channel such as 2182 kHz, 4125 kHz, etc. for further communication leaving the distress frequency clear for other traffic. This may not be automatic on some radios.

If it is critical for you to talk with the Coast Guard or other authorities in other SAR areas in a distress situation, they will expect you to switch to the Safety and Hailing Frequency for that frequency band your call was acknowledged on to clear the channel for other distress traffic.

With SSB, be sure the safety frequencies necessary to communicate with the CG are listed close by to the radio and you and the crew are well aware of the implications before going offshore.

The following table lists the DSC watch frequencies and the respective Safety and Hailing follow up voice frequencies. It is recommended that the channels these SSB frequencies are located on your SSB be entered in the table and posted.

Sea Area	DSC Watch Frequency – kHz	SSB Channel	Safety & Hailing Response - kHz	SSB Channel	Probable Range Limits Day / Night
A 1	VHF 70		VHF 16		20 / 25
A 2	2187.5		2182.0		100 / 300
	2187.5		2182.0		100 / 300
	4207.5		4125.0		300 / 800
	6312.0		6215.0		400 / 1000
	8414.6		8291.0		500 / 1200
	12577.0		12290.0		2000 / 800
	16804.5		16420.0		4000 / Unreliable

**Note:** In the frequency list, 12577.0 and 16804.5 kHz have the greatest range in terms of distance from the shore during daylight hours. However, 12 megs tapers off at night and 16 megs can be unreliable. What ever works in a distress situation is good.

**Note:** Signal “skip” may extend these ranges while poor propagation will reduce it.

Watching the DSC channels may be done with the scan feature available on most SSBs.

These ranges are well within the limits of the CG’s SAR areas of responsibility in the North Atlantic but not the total Pacific. In polar regions, anything can happen with transmission.

If you are making an oceanic crossing, make sure your EPIRB is in good shape.

### 9 . 3      R e q u i r e m e n t   F o r   A   S e c o n d   A n t e n n a

The third concern has to do with the Icom M-802 SSB radio installed on many cruising yachts. The M-802 has DSC built in, but requires a second antenna for the DSC feature to operate. This second antenna requirement was not clearly delineated in the manual.

Some Icom M-802 radios do not transmit properly on 12 megs due to a design anomaly intended to protect the output transistor from high reflected signal conditions. Icom has a five day turnaround recall at no charge no matter how old the unit is.

The US version of the Icom M-710 SSB, an older but excellent radio was not equipped with DSC since it wasn’t required when that model was released. The emergency switch on this radio is for the traditional short range safety and hailing frequency, 2182 kHz. This frequency is located in channel 0 and cannot be reprogrammed by the user.

Unfortunately, the propagation mode of channel 0 on the M-710 SSB was set to AM rather than USB at the factory. To correct this, have a technician change it or program 2182.0 kHz USB into Channel 1 and instruct your crew to ignore using the Emergency Alarm feature.

## 9.4 Testing & Cancelling Accidental Distress Signals

It is obvious that there is need to test the DSC system on a yacht to ensure it is operating satisfactorily. Unfortunately, the traffic generated by testing has far exceeded that anticipated by the Coast Guard. As a result, they ask that testing be limited to a maximum of one test per week and by FCC Certified Operators.

SSB testing is limited by the USCG to 4207.5 kHz only.

**Note:** All accidental distress signals sent must be cancelled. Per the USCG, "Reports of un-cancelled or unacknowledged inadvertent transmitted distress calls will be forwarded to the Federal Communications Commission." The fines can be stiff.

The following was modified from the CG's Notice To Mariners:

- 9 . 4 . 1            C a n c e l l i n g   W i t h   V H F**
- 1 .     S w i t c h   o f f   t r a n s m i t t e r   i m m e d i a t e l y
  - 2 .     S w i t c h   e q u i p m e n t   o n   a n d   s e t   t o   C h a n n e l   1 6
  3. Broadcast to "All Stations" giving the ship's name, call sign and DSC number, and cancel the false distress alert.

### Example:

All Stations, All Stations, All Stations, This is Nefertari, Call Sign ABC 1234, DSC Number 123456789. Please cancel my distress alert.

### 9.4.2 Cancelling With SSB

1. Switch off equipment immediately
2. Switch equipment on and tune for transmission on 2,182 kHz
3. Broadcast to "All Stations" giving the ship's name, call sign and DSC number, and cancel the false distress alert.

On the high seas using HF frequencies, the alert must be cancelled on all frequency bands on which it was transmitted. Hence, the transmitter should be tuned consecutively to the distress frequencies in the 4, 6, 8, 12 and 16 MHz bands, as necessary.

## 9.5 DSC Emergency Card

The steps needed to set up DSC and use it can be complex. An "Emergency Card" posted near the radio would certainly be an asset to the occasional crew on your boat and for you if you are the reason for the emergency call.

Each radio is different and sometimes, there are even differences between different models from the same company. Make it easy for the person operating the radio in a distress situation and post an "Emergency Card".

## **9.6 Some Observations and Opinions**

At the time of this writing:

1. Boat/US has assigned over 42,000 MMSI numbers and Sea Tow about 18,000. The FCC has issued about 240,000 MMSI numbers.
2. Boat/US has written to the FCC requesting the MMSI numbers granted in blocks by the FCC and issued by Boat/US, be merged back into the FCC data base. The FCC has not responded to this request.
3. Some of the USCG's data base for items such as Call Signs have not been merged into FCC files.
4. Some FCC files are not reconciled or merged with ITU files.
5. NOAA's Beacon Registration Database is not reconciled with the FCC files for EPIRB registration.

With all this confusing duplication and omission, the prudent skipper when going offshore, should ensure the EPIRB is working until DSC in the US is in-place and stable.

## 10 CONVENIENCE FEATURES OF DSC

The distress and safety features of a DSC radio lend themselves to non-safety traffic as well. Their use is encouraged by the IMO and they work so well that it makes these radios attractive for the convenience features alone.

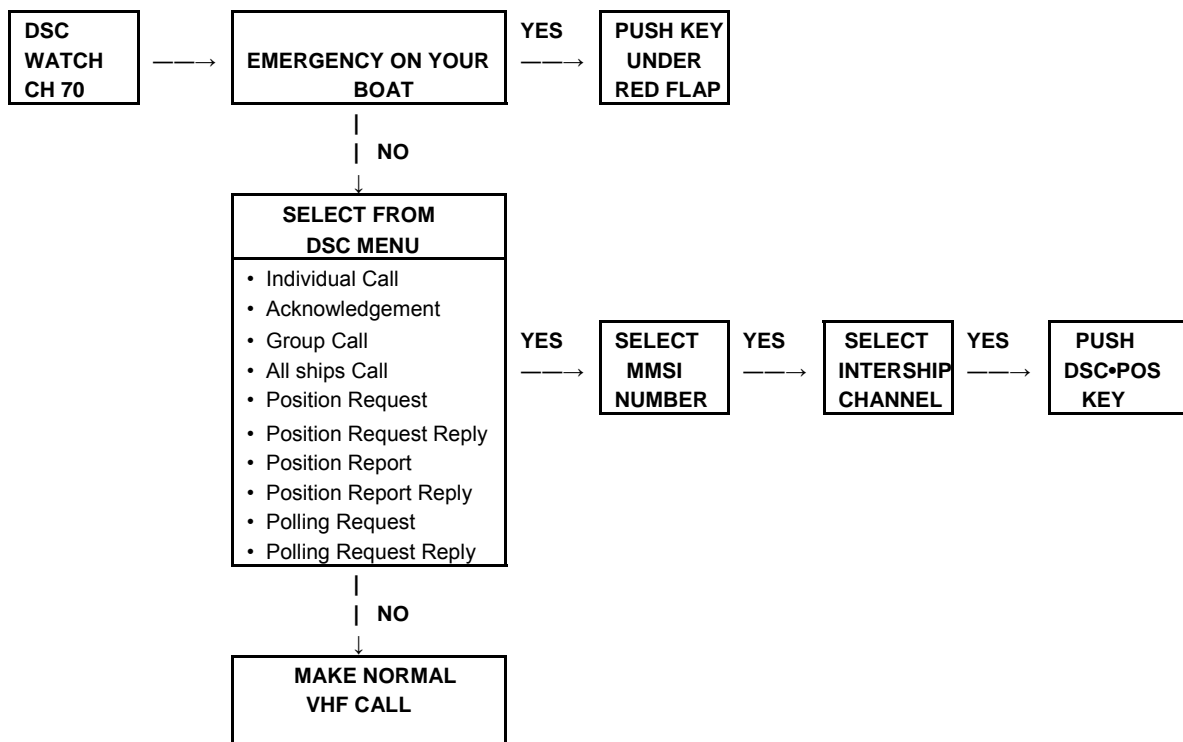
These features all require an MMSI number and calls involving position information naturally require GPS data. In all instances to take advantage of these features, the GPS must be turned on, the VHF radio must be switched to VHF Channel 70 to transmit and/or the SSB scanning the DSC frequencies must be switched on to receive.

An Icom M-422 VHF radio and an M-802 SSB radio were used in the preparation of this paper with the intent they are representative of other products. The M-422 can be switched to allow “Automatic Acknowledgement” for non-distress calls. The M-802 does not have this feature.

The following is a brief overview of the calls that can be made and is equally applicable to calls received. The instruction manual for your radio should be consulted for the specific steps to use these features and others.

### 10.1 MAKING A DSC CALL On VHF

The following is a simplified block diagram illustrating the options available on the Icom M-422 VHF. The features available on these radios can seem complex until you get a working knowledge of them, so practice helps.



### **10.1.1 Calls To A Specific Vessel Only**

Calls can be made to a specific vessel to the exclusion of others and these calls can be acknowledged to the caller, again exclusively. As with all of these features, it is done through the use of the MMSI number for the vessel being called which must be preloaded into the memory on your radio. It's similar to having someone's phone number preloaded into your cell phone.

On VHF, the call is made on Channel 70 and if the channel is busy, the transceiver stands by until the channel is clear. It then places the call to the specified MMSI number and stands by on VHF 70 until the call is acknowledged. If the called vessel is able to receive the call (indicated by the acknowledgement), your radio will then switch to the pre-selected channel. If not, your transceiver will revert to the channel you were at prior to making the call.

This means you must pre-arrange the channel you will use for your traffic with the vessel you want to call privately.

In the same way when another vessel is calling you, you can transmit an acknowledgement using screen prompts or via a menu to divert to the pre-selected channel or stay on the channel you were at if you can't reply and the "Automatic Acknowledgement" is turned off.

### **10.1.2 Calls To A Select Group**

Calls can be made to a select group such as a fleet from a yacht club on cruise in much the same way. This is done by preprogramming the group's addresses and selecting an intership channel. The Group call is made on VHF 70 and the radio diverts to the pre-selected channel.

Once again, everyone in the group will have to know the pre-selected channel to get your message.

### **10.1.3 Calls To “All Ships”**

Calls can be made to “All Ships” on VHF 70. This would be used when there is a message of general interest such as a Security alert when proceeding in dense fog. On the Icom M-422, the radio then automatically switches to VHF 16.

### **10.1.4 Calls For A “Position Request”**

Calls can be made when you want to know a specific vessel’s current position provided you know the vessel’s MMSI number. No one else will hear this message unless they happen to be standing watch on your pre-selected channel. This could be very handy for team racing, for race committees and for rendezvousing with other yachts on a cruise.

### **10.1.5 Calls To Report Your Position**

Calls can be made reporting your position to a specific vessel when you want to announce your position and get a response. This can be done privately and automatically such as when passing a particular point in a race or advising the authorities of your approach, SAR, and so on.

## **10.2 MAKING A DSC CALL On SSB**

All of the DSC functions available on VHF are available as well as some additional on SSB. But there are a few twists.

Since SSB does not have a single dedicated frequency for distress as with VHF 70, four frequencies plus two alternates have been designated as noted above. When any call on SSB using DSC is to be made, one of these specific frequencies must be selected.

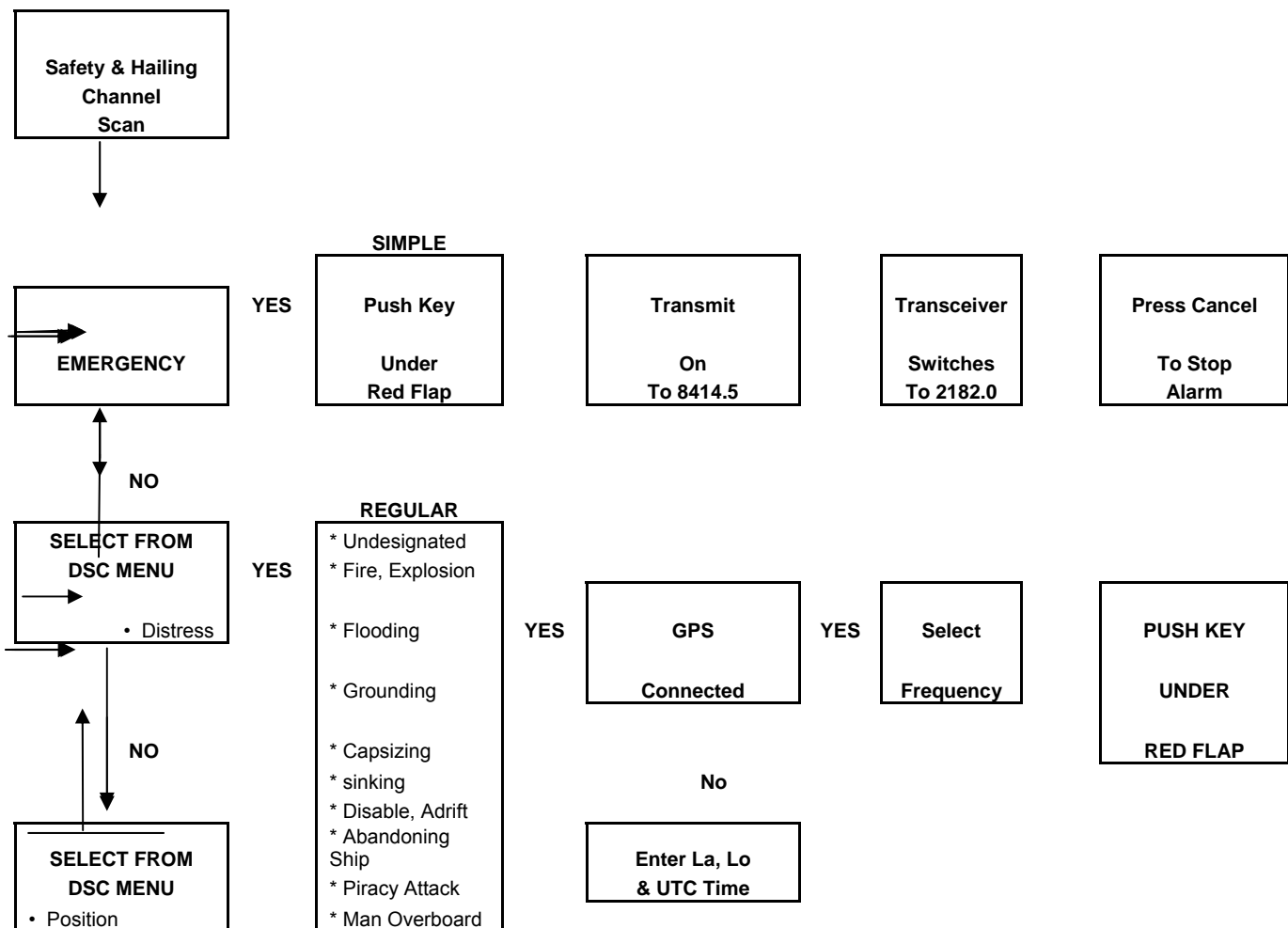
The general rule on frequency selection is, lower frequencies are for short range; 2182.0 kHz was originally selected because with a normal maximum range of about 200 miles, it was considered the maximum distance away a vessel could be to render assistance with in 24 hours. Ships traveled slower those days when this was put into place.

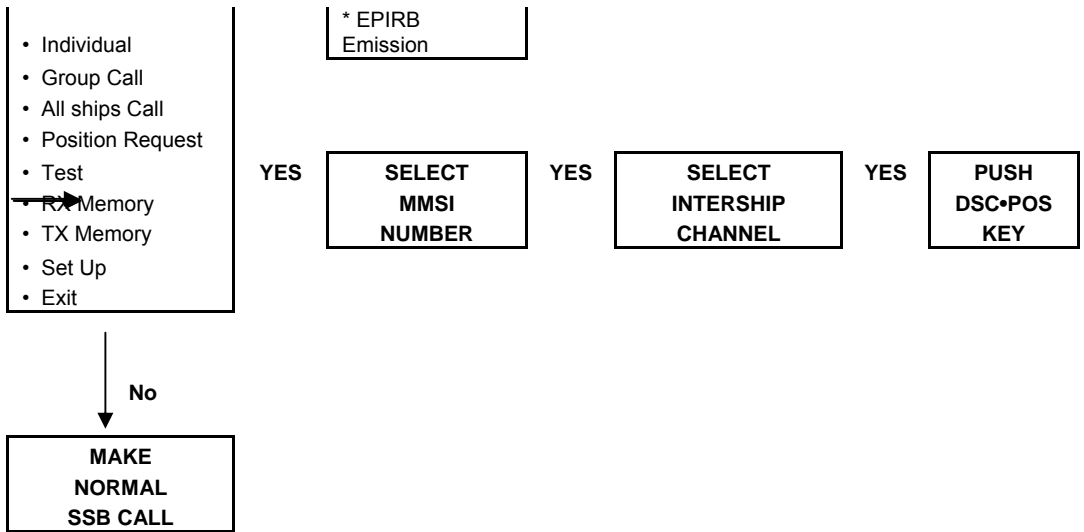
Higher frequency transmissions reflect off the ionosphere at a higher altitude which gives greater range but at the same time, produces a transmission skip zone close in. The result is, close vessels may not receive higher frequency transmissions. With this in mind, frequency selection start with the lowest frequency (2187.5 kHz) and work up.

Since 2187.5 kHz is for short range, it follows that anyone at sea would have to rely on other vessels for a relay if using this frequency. To put this in perspective, a vessel sailing from Rhode Island to Bermuda will usually be out of range of shore stations on 2187.5 kHz for a portion of the passage. Therefore, a higher frequency should be used unless it is known that a relay or rescue vessel is close by.

Depressing the DSC button on the Control Panel of the Icom 802 brings up the DSC Watch page. It also activates a scan of the DSC frequencies noted above which should be on all the time while offshore.

The simplified block diagram below may help to illustrate the steps taken when making a call:





To send a distress message, highlight DSC to get the DSC menu button under the red flap for about five seconds to activate the distress features.

## APPENDIX 1 - USCG “Rescue 21” Implementation Schedule (as of February 2008)

Station	2005	2006	2007	2008	2009	2010	2011
1 Astoria, OR				APR			
2 Atlantic City, NJ	DEC						
3 Baltimore, MD				MAY			
4 Boston, MA					3Q		
5 Caribbean					2Q		
6 Charleston, SC					2Q		
7 Corpus Christi, TX					1Q		
8 Delaware Bay, DE			SEP				
9 Eastern Shore, MD	DEC						
10 Hampton Roads, VA				FEB			
11 Humboldt Bay, CA					4Q		
12 Huston Galveston, TX					1Q		
13 Jacksonville, FL				JAN			
14 Key West, FL				SEP			
15 Long Island Sound, NY			OCT				
16 Miami, FL				MAR			
17 Mobile, AL		MAY					
18 New Orleans, LA			FEB - 01		1Q - 02		
19 New York, NY			NOV				
20 North Bend, OR				JUN			
21 Port Angeles, WA		DEC					
22 Portland, OR				JUL			
23 San Diego, CA						4Q	
24 Seattle, WA		DEC					

25	St. Petersburg, FL		JUN				
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**To Be Determined and Original Completion Dates**

		2006	2007	2008	2009	2010	2011
1	Anchorage					TBD	
2	Buffalo, NY					TBD	Finish
3	Detroit, MI					TBD	Finish
4	Guam					Finish - TBD	
5	Honolulu, HA					TBD	Finish
6	Juneau, AL					TBD	Finish
7	LA / Long Beach, CA					Finish - TBD	
8	Lake Michigan					TBD	
9	Lower Mississippi					TBD	Finish
10	Northern New England					TBD	
11	Ohio River Valley					TBD	Finish
12	San Francisco, Ca					TBD	Finish
13	San Juan, PR					TBD	
14	Sault St. Marie, MI					TBD	Finish
15	SE New England					TBD	
16	Upper Mississippi					TBD	Finish

**Stations No Longer Scheduled**

		2007	2008	2009	2010	2011	
1	N. Carolina - Cape Hatteras					Finish	
2	Fort Macon, NC					Finish	
3	Grand Haven, MI						Finish
4	Kodiak, AK						Finish
5	Milwaukee, WI						Finish
6	Philadelphia, PA			Finish			
7	Portland, ME					Finish	
8	SW Harbor, ME					Finish	
9	Valdez, AK						Finish
10	Woods Hole, MA					Finish	

1Q - First Quarter

Ø1 - First Phase

TBD - To Be Determined

Note: Stations no longer scheduled may simply reflect reassignment to another station in the region or improved capabilities.

## Appendix 2 – MID Country Codes\*

	Country	Code
1	Adelie Land (French Southern Territories)	501
2	<a href="#">Afghanistan</a>	401
3	<a href="#">Alaska (State of)</a>	303
4	<a href="#">Albania (Republic of)</a>	201
5	<a href="#">Algeria</a>	605
6	<a href="#">American Samoa</a>	559
7	<a href="#">Andorra</a>	202
8	<a href="#">Angola (Republic of)</a>	603
9	<a href="#">Anguilla</a>	301
10	<a href="#">Antigua and Barbuda</a>	304
11	<a href="#">Argentine Republic</a>	701
12	<a href="#">Aruba</a>	307
13	<a href="#">Ascension Island</a>	608
14	<a href="#">Australia</a>	503
15	<a href="#">Austria</a>	203
16	<a href="#">Azerbaijani Republic</a>	423
17	<a href="#">Azores</a>	204
18	<a href="#">Bahamas</a>	308, 309, 311
19	<a href="#">Bahrain</a>	408
20	<a href="#">Bangladesh</a>	405
21	<a href="#">Barbados</a>	314
22	<a href="#">Belarus</a>	206
23	<a href="#">Belgium</a>	205
24	<a href="#">Belize</a>	312
25	<a href="#">Benin</a>	610

	Country	Code
4	<a href="#">Albania (Republic of)</a>	201
7	<a href="#">Andorra</a>	202
15	<a href="#">Austria</a>	203
17	<a href="#">Azores</a>	204
23	<a href="#">Belgium</a>	205
22	<a href="#">Belarus</a>	206
33	<a href="#">Bulgaria</a>	207
222	<a href="#">Vatican City State</a>	208
57	<a href="#">Cyprus</a>	209, 210, 212
80	<a href="#">Germany</a>	211, 218
79	<a href="#">Georgia</a>	213
136	<a href="#">Moldova</a>	214
129	<a href="#">Malta</a>	215, 248, 249, 256
59	<a href="#">Denmark</a>	219, 220
194	<a href="#">Spain</a>	224, 225
75	<a href="#">France</a>	226, 227, 228
74	<a href="#">Finland</a>	230
72	<a href="#">Faroe Islands</a>	231
217	<a href="#">United Kingdom of Great Britain and Northern Ireland</a>	232, 233, 234, 235
82	<a href="#">Gibraltar</a>	236
83	<a href="#">Greece</a>	237, 239, 240
54	<a href="#">Croatia</a>	238
141	<a href="#">Morocco</a>	242
95	<a href="#">Hungary</a>	243
147	<a href="#">Netherlands</a>	244, 245, 246

26	<a href="#">Bermuda</a>	310
27	<a href="#">Bhutan</a>	410
28	<a href="#">Bolivia</a>	720
29	<a href="#">Botswana</a>	611
30	<a href="#">Brazil</a>	710
31	<a href="#">British Virgin Islands</a>	378
32	<a href="#">Brunei Darussalam</a>	508
33	<a href="#">Bulgaria</a>	207
34	<a href="#">Burkina Faso</a>	633
35	<a href="#">Burundi</a>	609
36	<a href="#">Cambodia</a>	514, 515
37	<a href="#">Cameroon</a>	613
38	<a href="#">Canada</a>	316
39	<a href="#">Cape Verde</a>	617
40	<a href="#">Cayman Islands</a>	319
41	<a href="#">Central African Republic</a>	612
42	<a href="#">Chad</a>	670
43	<a href="#">Chile</a>	725
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