**Purpose of DSC**

Digital Selective Calling provides automated access to coast stations and ship. The message information is stored in the receiver and can be displayed or printed out following receipt. Four levels of priority-distress, urgency, safety and routine are available for DSC calls. At the coast station, ship-to-shore distress calls receive priority handling and are routed to the nearest Rescue Co-ordination Centre (RCC). On board ship, DSC receivers sound an alarm when a distress call is received.

**DSC Concept**

DSC is a technique of transmitting digital codes which allow suitably equipped stations to:

1. Transmit and receive distress alerts.
2. Transmit and receive distress alert acknowledgments.
3. Relay distress alerts.
4. Announce urgency and safety calls.
5. Initiate routine priority calls and set up working channels for subsequent general communications on R/T or telex.

DSC channels have been allocated in the 2, 4, 6, 8, 12 and MHz MF/HF bands and on VHF channel 70.

**DSC Call Format**

All DSC calls automatically include phasing signals, error-checking signals and the identity (MMSI number)of the calling station. The protocol includes an initial dot pattern which is used to alert scanning receivers that a DSC call is imminent. Other information can be added, either manually or automatically. The actual information added is dependent upon the purpose of the call.

 **MMSI Number**

Each ship station has its own unique nine-digit Maritime Mobile Service Identity (MMSI) which is included automatically in each call. Included in the MMSI number are the Maritime Identification Digits (MID) which identify the country licensing/controlling the station. Three types of MMSI numbers:

1. Ship stations – 264001021
2. Group of ships – 026401143 (1 leading zero)
3. Coast station – 002640018 (2 leading zeroes)

Other codes make provision for “All Ships” calls or calls to ships in particular geographical areas. To avoid exhausting the supply of MID numbers too rapidly, MMSI numbers with three trailing zeroes should only be assigned to ships which expect to have automatic access to the public switched telephone network (PSTN) on a world-wide basis or which expect to use Inmarsat –B, -C and –M. In practice, most administrations assign MMSI numbers with three trailing zeroes only to zeroes only to vessels subject to the SOLAS Convention. Other ships which require access to such networks on a national or regional level are assigned MMSIs with only one or two trailing zeros.

**Operational procedures**

On the MF and HF bands, one frequency in each band is allocated for distress, urgency and safety purposes. Whenever possible, national channels should be used for routine calls; e.g., on MF, 2187.5 kHz is used only for distress/safety 2189.5 kHz is used for internationally for ship/ship calls and shore/ship calls.

On the VHF band, channel 70 is used for distress/safety as well as routine calling. In the case of a routine “All Ships” call the power output should not exceed 1 W. An example situation would be to contact a nearby ship. Some DSC installations have provision to reduce the power level from 25 W to 1 W automatically. The actual band chosen will depend upon the distance involved.

**General Calling Procedures**

 Routine calls should be made once on a single frequency or channel. Coast stations may, however, transmit a second call within 45 seconds if no acknowledgement has been received. If the call is still not acknowledged, the coast station should normally wait at least another 30 minutes before repeating the call attempt on the same frequency, or 5 minutes on another calling frequency.

Ship stations should not repeat a call attempt to a coast station until after an interval of at least 5 minutes when using manual procedures. In the case of ship stations using the semi-automatic/automatic DSC option, the minimum interval for the first repeat call is 5 seconds on VHF or 25 seconds on MF/HF. Alternative frequencies may be used for the repeat call attempt, if appropriate. The ship station call may be repeated again, but not until at least a further 15 minutes have elapsed.

To call a coast station or another ship by DSC in order to initiate routine/business communications:

1. Tune the transceiver to the appropriate DSC channel/frequency for the call
2. Set up the ship station DSC controller using the following general procedure:
	1. select the format for calling a specific station
	2. enter address (identification) – MMSI of called station
	3. select category of the call – routine or ship’s business (ship station MMSI is entered automatically)
	4. select type of subsequent communication – R/T or NBDP
	5. enter proposed working channel information if calling another ship (no proposal is normally made when calling a coast station since it is the responsibility the called coast station to indicate a vacant working channel in its acknowledgement)
	6. select end-of-sequence signal – usually the signal RQ, which means that a mandatory acknowledgement is required, when calling a specific coast station or ship station (the called station terminates its acknowledgement with the signal BQ)
	7. press <Call>

Routine DSC messages should be acknowledged using DSC either on the same frequency or on the appropriate paired frequency, either manually (within 4 ½ minutes) or automatically.

If it is not possible to use the working channels suggested in the call, this should be indicated in the acknowledgement. If no channel is mentioned, suitable frequencies or channels should be proposed in acknowledgement. Following agreement on, and transfer to, the working frequencies, the called station prepares to receive the traffic.

**Geographical Area Call**

To address a call to a specific geographical area, use the following general procedure:

1. select menu function
2. enter latitude of north-west corner of area
3. enter latitude range
4. enter longitude of north-west corner of area
5. enter longitude range.

**DSC Ship-Shore Link Call Automatic/Semi-automatic Service**

 In some countries, DSC can be used to obtain an automatic telephone call through suitably equipped coast stations. The initial DSC call should take place on a general DSC calling frequency or channel 70 VHF. The DSC message format is used to set up an automatic connection into the PSTN and select appropriate public correspondence working channels for the subsequent telephone traffic. The required subscriber number is included in the initial call to the coast station and the coast station replay indicates the working channels to be used.

To access the automatic/semi-automatic facilities provided at the coast station:

1. Tune the transceiver to the appropriate DSC channel/frequency for the call
2. Set up the ship station DSC controller, using the following general procedure:
	1. select format specifier – automatic/semi-automatic service
	2. enter address (identification) – MMSI of required coast station
	3. select category – routine
	4. (ship station MMSI is entered automatically)
	5. select first telecommand – J3E on MF, F3E/G3E duplex or F3E/G3E simplex on vhf, and second telecommand as appropriate
	6. enter called subscriber number (e.g., telephone number)
	7. select end-of sequence signal RQ
	8. press <Call>

The coast station will then acknowledge by DSC. The call will be repeated automatically if an error-free acknowledgement is not received from the coast station within 5 seconds on VHF, or 25 seconds on MF/HF. Further repetitions to the same coast station should only be initiated by manual control, and should be delayed for at least another 15 minutes. If working channels are free, the coast station equipment will also instruct the ship station DSC controller to commence operations on the working channels selected by the coast station. The coast station equipment will then dial the subscriber number and complete the telephone connection with the ship station. If the coast station send the “unable to comply” signal then, depending on the installed coast station facilities, the delay may last no longer than necessary for the problem (e.g., traffic queues or subscriber line busy) to clear. The fully automated from of the service has provision for repeated connection trials by the coast station for up to 15 minutes. However, if the call cannot complete in 15 minutes, or the problem is not straightforward then the call attempt will fail. In the event of a failed call, another attempt will have to be initiated by the ship station but not until at least 15 ½ minutes have elapsed since the previous attempt.

**DSC Testing**

DSC equipment has a built-in test facility which should be used daily but without radiating signals. A weekly live test should also be carried out by calling a suitable coast station with the indication that it is a test call. The call must be clearly identified as a test transmission and the test frequency/channel should always be monitored to ensure that it is free before the test commences.

Equipment tests on the exclusive DSC distress and safety calling frequencies should be avoided using other methods as far as possible. In any event, live test transmissions on the VHF DSC calling channel (channel 70) are NOT permitted. If general-purpose DSC calling facilities are not available through the nearby coast station, then an MF/HF DSC distress and safety calling frequency may be used for the test; the call would be classed as a “safety” call in these circumstances.

To send a test call to a coast station by DSC:

1. tune the transceiver to the appropriate DSC channel/frequency for the call;
2. set up the ship station DSC controller, using the following general procedure;
3. select <Test>;
4. enter MMSI of coast station;
5. press <Call> ;
6. wait for acknowledgement by coast station.

 The coast station will acknowledge the DSC test call but no further communication will normally take place.

**DSC DISTRESS ALERTING PROCEDURES**

**DSC Distress Alerting**

On DSC, two types of distress alert call attempts exist:

1. A single-frequency call attempt; where the alert is send on one frequency or channel.
2. A multi-frequency call attempt; where up to six consecutive alert calls can be sent once on each of the six DSC frequencies on MF and HF, i.e., 2,8,4,6,12 and 16 MHz.

The DSC message format identifies the station in distress, provides its last recorded position and, if entered, the nature of the distress.

**Sea Area Considerations**

In sea area A1, channel 70 would be used in the first instance to transmit a distress alert. In sea area A2, 2187.5 kHz and channel 70 could be used. In sea areas A3 and A4, 8414.5 kHz would be used in the first instance or a multi-frequency call attempt should be used; 2187.5 kHz would then be used to alert ships in the vicinity. Note that some models of equipment cannot perform multi-frequency calls; instead, each frequency has to be selected manually in turn.

**The DSC Distress Alert Call**

The DSC distress alert contains the following information:

1. Format Specifier – DISTRESS (automatically included)
2. Self-Identification – 9-digit MMSI (automatically included)
3. Nature of Distress – UNDESIGNATED DISTRESS is sent by default unless a choice is selected manually from a list of eight specific dangers, i.e., fire/explosion, flooding, collision, grounding, listing and in danger of capsizing, sinking, disabled and adrift or abandoning ship.
4. Position – LAT/LONG, automatically included if equipment is interfaced with, for example, GPS.
5. Time - TIME the position was valid. Automatic or manual entry, otherwise default information is transmitted.
6. Subsequent communications - R/T or NBDP, indicates whether radiotelephony or narrow-band direct printing will be used for the subsequent distress communications. The default information is “radiotelephony”.

In a basic distress alert only the identification, position/time and words “undesignated distress” are transmitted. The distress alert is automatically repeated every 3 ½ to 4 ½ minutes at random unless a DSC acknowledgement is received or the function is manually switched off. On receipt of a DSC distress acknowledgement, the ship in distress shall commence the distress on the appropriate R/T or NBDP distress traffic frequency as follows:

1. MAYDAY
2. THIS IS MMSI and CALL SIGN/IDENTIFICATION of ship in distress
3. POSITION (if not included in the DSC distress alert)
4. NATURE OF DISTRESS AND ASSISTANCE WANTED ANY OTHER USEFUL INFORMATION

**Watchkeeping on DSC Frequencies**

Every ship at sea shall maintain a continuous DSC watch as appropriate to the sea area in which the ship is sailing. The DSC watchkeeping frequencies are:

1. Channel 70
2. 2187.5 kHz
3. 8414.5 kHz and other HF frequency, selected according to the time of day, the season of the year and the distance from appropriate coast stations.

**Preparations for Handling Distress Traffic**

 When a DSC alert is received, a display or printout is produced giving all relevant details. DSC distress alerts are implicitly addressed to “All Stations”. Upon receiving a DSC distress alert, all stations should cease all transmissions, monitor the DSC distress and safety frequency on which the call was received and set watch on the R/T and/or NBDP distress and safety traffic frequencies in the same band. The DSC distress alert contains information under “subsequent communications” which indicates whether R/T or NBDP is to be used for subsequent distress communications.

**Acknowledgement and Relay of a DSC Distress Alert by Coast Stations and RCCs**

 On receiving a DSC distress alert, the coast station or coast earth station communicates the information as soon as possible to the appropriate RCC. The distress alert has then to be acknowledged as soon as possible by the coast station or by the RCC via a coast station or an appropriate coast earth station. A coast station receiving a distress alert on an MF or HF DSC distress calling frequency should acknowledge in a target time of 1 minute and should not take longer than 2 ¾ minutes. A VHF DSC distress alert should be acknowledged as soon as possible.

A coast station acknowledging a DSC distress alert shall acknowledge on the same DSC distress calling frequency or channel on which the call was received.

The acknowledgement by DSC should be addressed to “All ships” and include the identification of the station in distress using the following message format:

1. Format Specifier: ALL SHIPS
2. Category: DISTRESS
3. Self-Identification: MMSI (of transmitting station)
4. Telecommand : DISTRESS ACKNOWLEGEMENT
5. Message : REPEAT OF ORIGINAL ALERT: MMSI (of station in distress), NATURE OF DISTRESS, DISTRESS COORDINATES , TIME, NATURE OF DISTRESS, TYPE OF SUBSEQUENT COMMUNICATIONS.

The primary role of the shore-based rescue co-ordination infrastructure in the GMDSS also requires that the coast station or RCC which receives a distress alert shall initiate the transmission of a shore-to-ship distress alert relay when the method of receipt warrants a broadcast alert to shipping or when the circumstances of the distress incident indicate that further help is necessary. The shore-to-ship distress relay must contain the identification of the station in distress, its position and all other information that might assist rescue operations. The distress alert relay by DSC is addressed, as appropriate, to all ships, to selected group of ships, to a geographical area or to a specific ship, and transmitted using the following format:

1. Format Specifier: ALL SHIPS
2. Address: SHIPS IN SPECIFIC AREA (are to be defined), or INDIVIDUAL STATION (MMSI Required)
3. Category: DISTRESS
4. Self-Identification: MMSI (of transmitting station)
5. Telecommand : DISTRESS RELAY
6. Message : REPEAT OF ORIGINAL ALERT

Note that whatever means of transmission are used, the distress alert relay must indicate clearly that the transmitting station is not itself in distress.

**Acknowledgement and Relay of a DSC Distress Alert by Ship Stations**

 Ship stations which receive a DSC distress alert must prepare to acknowledge or relay the distress alert according to the progress of events immediately following receipt of the distress alert. In Sea areas A1 and A2, coast stations are expected to acknowledge receipt of a DSC distress alert in the first instance. Ship should therefore acknowledge after the coast station using R/T on the R/T distress and safety traffic frequency in the same bands as the distress and safety calling frequency on which the original distress alert or the shore-to-ship distress alert relay was received. The acknowledge should use the following format:

1. MAY DAY
2. MMSI (x 3) of the station in distress
3. THIS IS MMSI (x 3) or CALL SIGN (x 3) or other IDENTIFICATION (x 3) of own station
4. RECEIVED MAYDAY

If no acknowledgement from a coast station is received within 3 minutes, still acknowledge to the station in distress on R/T. However, if there is no reply from the station in distress, it will be necessary to send a DSC acknowledgement on the same distress and safety frequency on which the distress alert was received. The nearest coast station must then be informed by any suitable communication means or by sending a distress alert relay.

The same action must also be taken in the event that the DSC distress alert is repeated. DSC distress alerts are automatically repeated after an interval of 3 ½ to 4 ½ minutes until cancelled by the reception of a DSC distress alert acknowledgement. The repeat of the DSC distress alert means that no DSC acknowledgement by a coast station was received by the ship in distress. Making the acknowledgement via DSC will halt the transmission of further DSC distress alert signals from the ship in distress. Such a situation could occur, for example, if a VHF or MF DSC distress alert was transmitted in sea area A3 where the most appropriate form of distress alert, acknowledgement and shore-to-ship distress alert relay would normally be via satellite

In sea areas A4, special care is needed to avoid making spurious distress alert relays or cancelling the distress alert prematurely by sending a DSC acknowledgement. Note that, because of the possibility of HF transmission being received at some locations but not at others (being in the skip zone), it should not be assumed either that a particular coast station has also received the distress alert or that the lack of acknowledgement implies that none was sent. A ship station receiving an HF distress alert should therefore NOT acknowledge but set watch on the HF R/T (or NBDP, if indicated in the distress alert) distress and safety traffic frequencies associated with the DSC distress and safety calling frequency on which the distress alert was received.

If no acknowledgement is received within 5 minutes then the distress alert should be relayed by any suitable means to an appropriate coast station or coast earth station. In the event that it is deemed necessary to send a DSC distress alert relay on HF, transmissions should be made on one band at a time and communications established with any responding ships before repeating the DSC distress alert relay on other band. This procedure is necessary to avoid causing confusion on other ships as to which band will be used for subsequent distress traffic.

Note: Never, under any circumstances, attempt to use the DSC equipment to relay a relayed distress alert. Such action can initiate a chain of misleading relays and responses to several RCCs.

**Transmission of a Distress Alert by a Station Not Itself in Distress**

 The circumstances in which a ship station should transmit a distress alert relay in response to distress alert which does not appear to have been to received and acted upon by a coast station have been covered above. In other cases also, a ship station may have a duty to initiate a distress alert even though not itself in distress. In particular, a ship station which learns that a mobile unit is in distress is obliged to initiate and transmit a distress relay in any of the following cases:

1. when the mobile unit in distress is unable to send a distress alert itself;
2. when the master or other person responsible for the ship not in distress considers that further help is necessary .

The message format to be used in these circumstances is the same as described above for the transmission of a DSC distress alert relay.

**Acknowledgement of a DSC Distress Alert Relay Received from Coast Stations**

Ship stations which receive a DSC distress alert relay call that is transmitted by a coast station should acknowledge receipt of the call using R/T on the R/T distress and safety traffic frequency in the same band as the distress and safety calling frequency on which the shore-to-ship distress alert relay was received. The acknowledgement should use the following format:

1. MAYDAY
2. MMSI or CALL SIGN of the calling coast station
3. THIS IS MMSI or CALL SIGN or other IDENTIFICATION of own station
4. RECEIVED MAYDAY

**Cancelation procedures for false distress alerts**

**VHF**

1. Switch off the transmitter immediately if the false alert is detected during transmission.
2. Switch equipment on and set to channel 16.
3. Make broadcast to ”All stations”, giving the ship’s name, call sign and MMSI number, and cancel the false distress alert.

Example:

1. ALL STATIONS (X3)
2. THIS IS NAME, CALL SIGN, MMSI NUMBER
3. POSITION
4. Cancel my distress alert of DATE, TIME UTC
5. Master NAME, CALL SIGN, MMSI NUMBER
6. DATE TIME UTC

 **MF**

1. Switch off the transmitter immediately if the false alert is detected during transmission.
2. Switch equipment on and set to 2182 kHz.
3. Make broadcast to ”All stations”, giving the ship’s name, call sign and MMSI number, and cancel the false distress alert.

**HF**

Use the same procedure as for MF, but the alert must be cancelled on all of the frequency bands on which the alert was transmitted. The transmitter should therefore be tuned consecutively to the radiotelephone distress frequencies in the 4, 6, 8, 12 and 16 MHz bands, as necessary.

Avoid sending false alerts on HF! The DSC distress alert will be received at greater distances than the cancelation by the wider bandwidth radiotelephone transmission.

**GMDSS FREQUENCIES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Distress, Urgency & Safety** | **DSC** | **Radiotelephony** | **NBDP (Telex)** |
| **MF** | 2187.5 kHz | 2182 kHz | 2174.5 kHz |
| **HF** | 4207.5 kHz | 4125 kHz | 4177.5 kHz |
|  | 6312 kHz | 6215 kHz | 6268 kHz |
|  | 8414.5 kHz | 8291 kHz | 8376.5 kHz |
|  | 12577 kHz | 12290 kHz | 12520 kHz |
|  | 16804.5 kHz | 16420 kHz | 16695 kHz |
| **VHF** | 156.525 MHz (Ch. 70) | 156.65 MHz (Ch13) | Ship-ship safety of navigation |
|  |  | 156.8 MHz (Ch. 16) |  |
|  |  | 121.5 MHz - | Ship-aircraft comm. |

|  |  |  |
| --- | --- | --- |
| **NAVTEX** | 490 kHz | National language broadcasts |
|  | 518 KHz | English language broadcasts |
|  | 4209 kHz | National language broadcasts |

|  |  |  |  |
| --- | --- | --- | --- |
| **Maritime Safety** | 4210 kHz | 12579 kHz | 22376 kHz |
| **Information** | 6314 kHz | 16806.5 kHz | 26100.5 kHz |
|  | 8416 kHz | 19680 kHz |  |

|  |  |  |
| --- | --- | --- |
| **DSC CALLING** | Ship-Shore | 2189.5 kHz (+National frequencies) |
|  | Ship-Ship | 2177 kHz (+acknowledgement) |
|  | Shore-Ship | 2177 kHz (+National frequencies) |
|  | VHF DSC Calling | 156.525 MHz (Channel 70) |

|  |  |  |
| --- | --- | --- |
| **On-scene comm.** | 2182 kHz | 5680 kHz |
|  | 3023 kHz | Channel 6 (also, intership freq.)Channel 16 |
|  | 4125 kHz - | Ship-aircraft |
|  | 123.1 MHz- | Ship-aircraft |

|  |  |
| --- | --- |
| **Survival Craft** | Channel 16 |
|  |  |
| **On-Board Comm.** | Channel 15 (1 watt) |
|  | Channel 17 (1 watt) |
|  |  |
| **Bridge-bridge Comm.** | Channel 13 (relating to safety of navigation) |