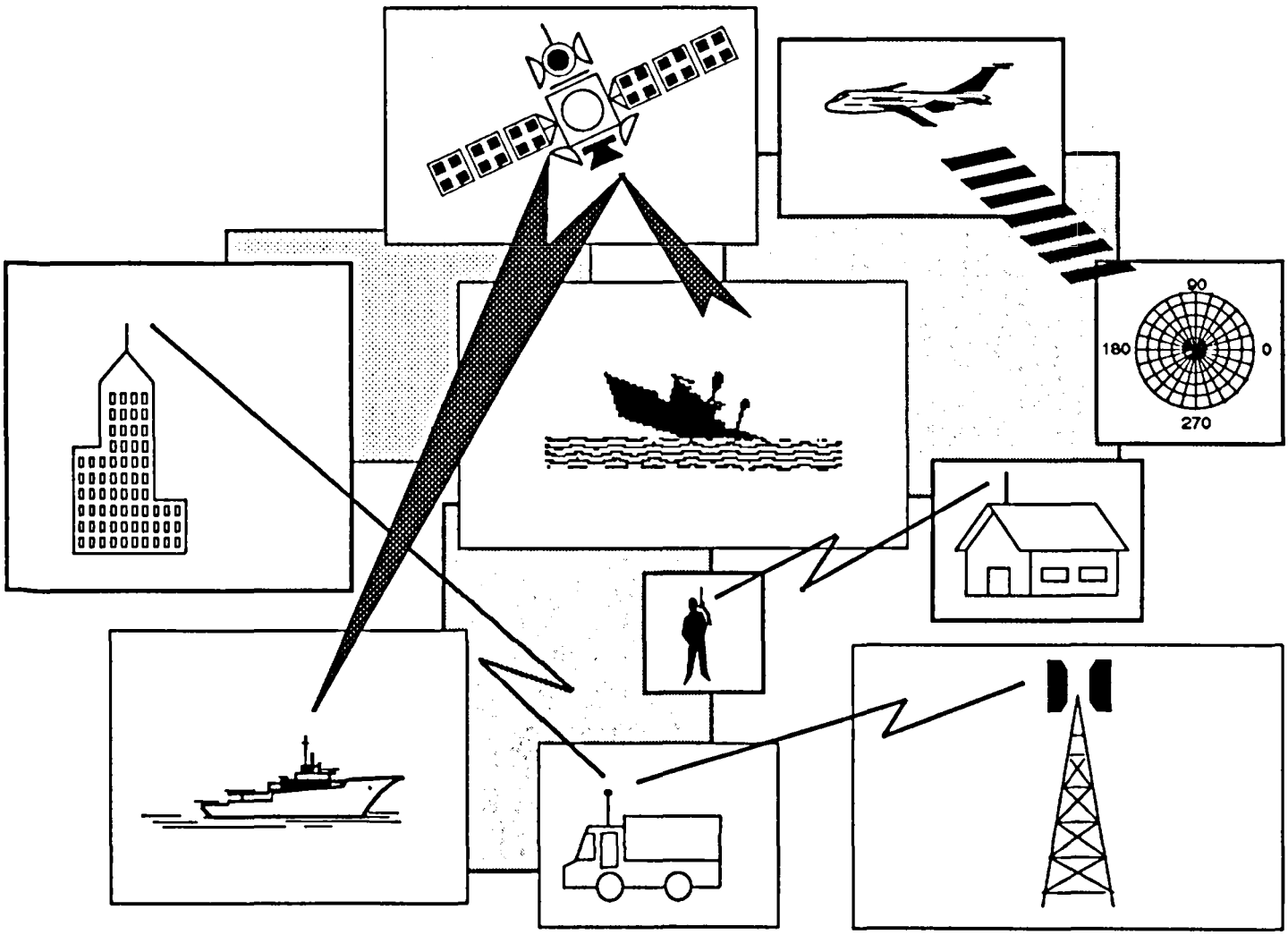
INTERNATIONAL TELECOMMUNICATION UNION

1992 - CCIR RECOMMENDATIONS

(New and revised as of 22 September 1992)



RM SERIES

MOBILE, RADIODETERMINATION, AMATEUR AND RELATED SATELLITE SERVICES

ARCHIVES U.I.T. GENÈVE

CCIR

INTERNATIONAL RADIO CONSULTATIVE COMMITTEE

ISBN 92-61-04561-8

Geneva, 1992

© ITU 1992

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without written permission from the ITU.

Recommendation 541-4 (1992)

Operational procedures for the use of digital selective-calling (DSC) equipment in the maritime mobile service

Extract from the publication:
CCIR Recommendations: RM Series: Mobile, Radiodetermination, Amateur and related Satellite Services
(Geneva: ITU, 1992), pp. 154-167

This electronic version (PDF) was scanned by the International Telecommunication Union (ITU) Library & Archives Service from an original paper document in the ITU Library & Archives collections.

La présente version électronique (PDF) a été numérisée par le Service de la bibliothèque et des archives de l'Union internationale des télécommunications (UIT) à partir d'un document papier original des collections de ce service.

Esta versión electrónica (PDF) ha sido escaneada por el Servicio de Biblioteca y Archivos de la Unión Internacional de Telecomunicaciones (UIT) a partir de un documento impreso original de las colecciones del Servicio de Biblioteca y Archivos de la UIT.

هذه النسخة الإلكترونية (PDF) للاتصالات الدولي (ITU) الاتحاد في والمحفوظات المكتبة قسم أجراه الضوئي بالمسح تصوير نتاج
والمحفوظات المكتبة قسم في المتوفرة الوثائق ضمن أصلية ورقية وثيقة من نقلاً.

此电子版（PDF版本）由国际电信联盟（ITU）图书馆和档案室利用存于该处的纸质文件扫描提供。

Настоящий электронный вариант (PDF) был подготовлен в библиотечно-архивной службе Международного союза электросвязи путем сканирования исходного документа в бумажной форме из библиотечно-архивной службы МСЭ.

© International Telecommunication Union

RECOMMENDATION 541-4*

OPERATIONAL PROCEDURES FOR THE USE OF DIGITAL SELECTIVE-CALLING (DSC) EQUIPMENT IN THE MARITIME MOBILE SERVICE

(Question 9/8)

(1978-1982-1986-1990-1992)

The CCIR,

considering

a) that provisions for digital selective-calling (DSC) have been set out in Articles 60 and 62 of the Radio Regulations (RR);

b) Resolution No. 311 and Recommendation No. 312 of the World Administrative Radio Conference, Geneva, 1979;

c) that digital selective-calling will be used as described in Recommendation 493;

d) that the requirements of Chapter IV of the 1988 Amendments to the International Convention for the Safety of Life at Sea, 1974, for the Global Maritime Distress and Safety System (GMDSS) are based on the use of digital selective-calling for distress alerting on terrestrial frequencies and that operational procedures are necessary for transition to, and implementation of, that system;

e) that, as far as is practicable, operational procedures in all frequency bands and for all types of communications should be similar;

f) that digital selective-calling may provide a useful supplementary means of transmitting a distress call in addition to the provisions of transmitting the distress call by existing methods and procedures in the RR;

g) that conditions when alarms have to be actuated should be specified,

recommends

1. that the digital selective-calling system having technical and operational characteristics in accordance with Recommendation 493 should be used in the maritime mobile service;

2. that the operational procedures to be observed in the MF, HF and VHF bands for DSC calling should be in accordance with Annex 1 for distress and safety calls and Annex 2 for other calls;

3. that provisions should be made at stations equipped for DSC for:

3.1 the manual entry of address, type of call, category and various messages into a DSC sequence;

3.2 the verification and if necessary the correction of such manually formed sequences;

3.3 a specific aural alarm and visual indication to indicate receipt of a distress or urgency call or a call having distress category. It should not be possible to disable this alarm and indication. Provisions should be made to ensure that they can be reset only manually;

3.4 aural alarm(s) and visual indication for calls other than distress and urgency. The aural alarm(s) may be capable of being disabled;

3.5 such visual indicators to indicate:

3.5.1 type of received call address (to all stations, to a group of stations, geographical, individual);

---

* The Director, CCIR, is requested to bring this Recommendation to the attention of the International Maritime Organization (IMO) and the CCITT.

3.5.2 category;

3.5.3 identity of calling station;

3.5.4 numerical or alphanumerical type of information, e.g. frequency information and telecommand;

3.5.5 type of "end of sequence" character;

3.5.6 detection of errors, if any;

3.6 monitoring the VHF channel used for digital selective-calling purposes to determine the presence of a signal and, except for distress and safety calls, provide facilities for automatically preventing the transmission of a DSC call until the channel is free;

3.7 ship originated routine all-ships calls on VHF should be transmitted at a power level of 1 W or less. Integrated VHF DSC equipment should automatically reduce power for transmission of these calls;

4. that the equipment should be simple to operate.

Note 1 – The following definitions are used throughout this Recommendation:

a) *single frequency:* the same frequency is used for transmission and reception;

b) *paired frequencies:* frequencies which are associated in pairs; each pair consisting of one transmitting and one receiving frequency;

c) *international DSC frequencies:* those frequencies designated in the Radio Regulations for exclusive use for DSC on an international basis;

d) *national DSC frequencies:* those frequencies assigned to individual coast stations or group of stations on which DSC calling is permitted (this may include working frequencies as well as calling frequencies). The use of these frequencies must be in accordance with the Radio Regulations;

e) *automatic DSC operation at a ship station:* a mode of operation employing automatic tunable transmitters and receivers, suitable for unattended operation which provide for automatic call acknowledgements upon reception of a DSC and automatic transfer to the appropriate working frequencies;

f) *call attempt:* one or a limited number of call sequences directed to the same stations on one or more frequencies and within a relatively short time period (e.g. a few minutes). A call attempt is considered unsuccessful if a calling sequence contains symbol RQ at the end of the sequence and no acknowledgement is received in this time interval.

ANNEX 1

Provisions and procedures for distress and safety calls

1. Introduction

The terrestrial elements of the Global Maritime Distress and Safety System adopted by the 1988 Amendments to the International Convention for the Safety of Life at Sea, 1974, are based on the use of digital selective-calling (DSC) for distress and safety communications.

2. DSC distress call and message

The DSC "distress call" provides for alerting, self-identification, ship's position including time, nature of distress and contains both the distress call (No. 3091 and 3092) and the distress message (No. 3093 and 3094) as defined in the RR.

3. Procedures for DSC distress calls

3.1 Transmission by a mobile unit in distress

3.1.1 The DSC equipment should be capable of being preset to transmit the distress call on at least one distress alerting frequency.

3.1.2 The distress call shall be composed in accordance with Recommendation 493; the ship's position information, the time at which it was taken and the nature of distress should be entered as appropriate. If the position of the ship cannot be entered, then the position information signals shall be transmitted automatically as the digit 9 repeated ten times. If the time cannot be included, then the time information signals shall be transmitted automatically as the digit 8 repeated four times.

3.1.3 Distress call attempt

At MF and HF a distress call attempt may be transmitted as a single frequency or a multi-frequency call attempt. At VHF only single frequency call attempts are used.

3.1.3.1 Single frequency call attempt

A distress call attempt should be transmitted as five consecutive calls on one frequency. To avoid call collision and the loss of acknowledgements, this call attempt may be transmitted on the same frequency again after a random delay of between 3½ and 4½ min from the beginning of the initial call. This allows acknowledgements arriving randomly to be received without being blocked by retransmission. The random delay should be generated automatically for each repeated transmission, however it should be possible to override the automatic repeat manually.

At MF and HF, single frequency call attempts may be repeated on different frequencies after a random delay of between 3½ and 4½ min from the beginning of the initial call. However, if a station is capable of receiving acknowledgements continuously on all distress frequencies except for the transmit frequency in use, then single frequency call attempts may be repeated on different frequencies without this delay.

3.1.3.2 Multi-frequency call attempt

A distress call attempt may be transmitted as up to 6 consecutive (see Note 1) calls dispersed over a maximum of 6 distress frequencies (1 at MF and 5 at HF). Stations transmitting multi-frequency distress call attempts should be able to receive acknowledgements continuously on all frequencies except for the transmit frequency in use, or be able to complete the call attempt within 1 min.

Multi-frequency call attempts may be repeated after a random delay of between 3½ and 4½ min from the beginning of the previous call attempt.

Note 1 – A VHF call may be transmitted simultaneously with an MF/HF call.

3.1.4 In the case of distress the operator should:

3.1.4.1 enter the desired mode of the subsequent communication and if time permits, enter the ship's position and time (see Note 1) it was taken and the nature of distress (see Note 1);

3.1.4.2 select the distress frequency(ies) to be used (see Note 1);

3.1.4.3 activate the "distress call" attempt by a simple action.

Note 1 – If these are not provided automatically.

3.2 Reception

The DSC equipment should be capable of maintaining a reliable watch on a 24-hour basis on appropriate DSC distress alerting frequencies.

3.3 Acknowledgement of distress calls

Acknowledgements of distress calls should be initiated manually.

Acknowledgements should be transmitted on the same frequency as the distress call was received.

3.3.1 Acknowledgements of DSC distress calls transmitted on MF or HF should be initiated with a minimum delay of 1 min after receipt of a distress call, and normally within a maximum delay of 2¾ min. This allows all calls within a single frequency or multi-frequency call attempt to be completed and should allow sufficient time for coast stations to respond to the distress call. Acknowledgements on VHF should be transmitted as soon as practicable.

3.3.2 The acknowledgement of a distress call consists of a single DSC acknowledgement call which should be addressed to "all ships" and include the identification (see Recommendation 493) of the ship whose distress call is being acknowledged.

3.3.3 Distress calls should normally be acknowledged by DSC only by appropriate coast stations. Coast stations should, in addition, set watch on radiotelephony and, if the "mode of subsequent communication" signal in the received distress call indicates teleprinter, also on narrow-band direct-printing (NBDP) (see Recommendation 493). In both cases, the radiotelephone and NBDP frequencies should be those associated with the frequency on which the distress call was received.

3.3.4 Ship stations should, on receipt of a distress call, set watch on an associated radiotelephone distress and safety traffic frequency and acknowledge the call by radiotelephony. If a ship station continues to receive a DSC distress call on an MF or VHF channel, a DSC acknowledgement should be transmitted to terminate the call and should inform a coast station or coast earth station by any practicable means.

3.3.5 The automatic repetition of a distress call attempt should be terminated automatically on receipt of a DSC distress acknowledgement.

3.3.6 When distress and safety traffic cannot be successfully conducted using radiotelephony, an affected station may indicate its intention (using an "all ships" DSC call, with the category distress, and normally indicating the frequency of the associated NBDP channel) to conduct subsequent communications on the associated frequency for narrow-band direct-printing telegraphy.

3.4 Distress relays

3.4.1 A distress relay call should use the telecommand signal "distress relay" in accordance with Recommendation 493 and the calling attempt should follow the procedures described in § 3.1.3 to 3.1.3.2 for distress calls.

3.4.2 Any ship, receiving a distress call on an HF channel which is not acknowledged by a coast station within 5 min, should transmit a distress relay call to the appropriate coast station.

3.4.3 Distress relay calls transmitted by coast stations, or by ship stations addressed to "all ships", should be acknowledged by ship stations using radiotelephony. Distress relay calls transmitted by ships should be acknowledged by a coast station transmitting a "distress relay acknowledgement" call in accordance with the procedures for distress acknowledgements given in § 3.3 to 3.3.3.

4. Procedures for DSC urgency and safety calls (see Note 1)

4.1 DSC, on the distress and safety calling frequencies, should be used to advise shipping on the impending transmission of urgency, vital navigational and safety messages, except when the transmissions take place at routine times. Where the subsequent transmission of an urgency, vital navigational or safety message takes place on a working frequency, the call should indicate the frequency which will be used.

4.2 The announcement and identification of medical transports should be carried out by digital selective calling techniques, using appropriate distress and safety calling frequencies. Such calls should use the category "urgency", and telecommand "medical transport" and be addressed to "all ships".

Note 1 – Use of the DSC distress and safety calling frequencies for urgency and safety calls is acceptable, technically, provided that the total channel loading is maintained below 0.1 erlang.

5. Testing the equipment used for distress and safety calls

Testing on the exclusive DSC distress and safety calling frequencies should be avoided as far as possible by using other methods. There should be no test transmissions on the DSC calling channel on VHF. However, when testing on the exclusive DSC distress and safety calling frequencies on MF and HF is unavoidable, it should be indicated that these are test transmissions (see RR No. N3068 (Mob-87). The test call should be composed in accordance with Recommendation 493 (see Table 6) and the call should be acknowledged by the called coast station. Normally there would be no further communication between the two stations involved.

ANNEX 2

Provisions and procedures for calls other than distress and safety

1. Frequency/channels

1.1 As a rule, paired frequencies should be used at HF and MF, but in exceptional cases for national purposes, a single frequency may be used. A single frequency channel should be used at VHF.

1.2 International calling

The paired frequencies listed in Appendix 31 and Article 62 of the RR should be used for international DSC calling.

1.2.1 At HF and MF international DSC frequencies should only be used for shore-to-ship calls and for the associated call acknowledgements from ships fitted for automatic DSC operation where it is known that the ships concerned are not listening to the coast station's national frequencies.

1.2.2 All ship-to-shore DSC calling at HF and MF should be done on the coast station's national frequencies.

1.3 National calling

Coast stations should avoid using the international DSC frequencies for calls that may be placed using national frequencies.

1.3.1 Ship stations should keep watch on appropriate national and international channels. (Appropriate measures should be taken for an even loading of national and international channels.)

1.3.2 Administrations are urged to find methods and negotiate terms to improve the utilization of the DSC channels available, e.g.:

- coordinated and/or joint use of coast station transmitters;
- optimizing the probability of successful calls by providing information to ships on suitable frequencies (channels) to be watched and by information from ships to a selected number of coast stations on the channels watched on-board.

2. Operating procedures

A typical DSC calling and acknowledgement sequence contains the following signals (see Recommendation 493).

Composition of a typical DSC calling and acknowledgement sequence

Signal	*Method of composition*
– format specifier	selected
– address	entered
– category	selected
– self-identification	pre-programmed
– telecommand information	selected
– frequency information (if appropriate)	entered
– telephone number (semi-automatic/automatic ship-to-shore connections only)	entered
– end of sequence signal	selected (see Note 1)

Note 1 – If the calling sequence EOS signal incorporates a request for acknowledgement "RQ" (117) an acknowledgement is mandatory and shall incorporate the EOS signal "BQ" (122).

The method of composing a DSC sequence is illustrated in the flow diagram of Fig. 5.

2.1 Coast station initiates call to ship

Figures 1 and 2 illustrate the procedures below in flow chart and by time sequence diagram respectively.

2.1.1 There are two categories of calls for commercial communications:

- routine call;
- ship's business call (see Recommendation 493, Annex 1, § 6.4.1).

2.1.2 If a direct connection exists between the calling subscriber and the coast station, the coast station asks the calling subscriber for the approximate position of ship.

2.1.3 If the ship's position cannot be indicated by the caller, the coast station operator tries to find the location in the information available at the coast station.

2.1.4 The coast station checks to see whether the call would be more appropriate through another coast station (see § 1.3.2).

2.1.5 The coast station checks to see whether transmission of a digital selective call is inappropriate or restricted (e.g. ship not fitted with DSC or barred).

2.1.6 Assuming a DSC is appropriate the coast station composes the calling sequence as follows:

- selects format specifier;
- enters address of the ship;
- selects category;
- selects telecommand information;
- inserts working frequency information in the message part of the sequence, if appropriate;
- usually selects "end of sequence" signal "RQ". However, if the coast station knows that the ship station cannot respond or the call is to a group of ships the frequency is omitted and the end of sequence signal should be 127, in which case the following procedures (§ 2.1.13 to 2.1.15) relating to an acknowledgement are not applicable.

2.1.7 The coast station verifies the calling sequence.

2.1.8 The coast station operator chooses the calling frequencies which are most suitable for the ship's location.

2.1.8.1 After checking as far as possible that there are no calls in progress, the coast station operator initiates the transmission of the sequence on one of the frequencies chosen. Transmission on any one frequency should be limited to no more than 2 call sequences separated by intervals of at least 45 s to allow for reception of an acknowledgement from the ship, or exceptionally (see Recommendation 493) to one "call attempt" consisting of up to five transmissions.

2.1.8.2 If appropriate, a "call attempt" may be transmitted, which may include the transmission of the same call sequence on other frequencies (if necessary with a change of working frequency information to correspond to the same band as the calling frequency) made in turn at intervals of not less than 5 min, following the same pattern as in § 2.1.8.1.

2.1.9 If an acknowledgement is received further transmission of the call sequence should not take place.

2.1.10 The acknowledgement of the received call should only be transmitted upon receipt of a calling sequence which terminates with an acknowledgement request.

2.1.11 When a station called does not reply, the call attempt should not normally be repeated until after an interval of at least 30 min. The same call attempt should not be repeated more than five times every 24 h. The aggregate of the times for which frequencies are occupied in one call attempt, should normally not exceed 1 min.

The following procedures apply at the ship:

2.1.12 Upon receipt of a calling sequence at the ship station, the received message is recorded and an appropriate indication is activated as to whether the call category is "routine" or "ship's business". The category does not affect the DSC procedures at the ship.

2.1.13 When a received call sequence contains an end of sequence signal RQ, an acknowledgement sequence should be composed and transmitted in accordance with § 2.

The format specifier and category information should be identical to that in the received calling sequence.

2.1.13.1 If the ship station is not equipped for automatic DSC operation, the ship's operator initiates an acknowledgement to the coast station after a delay of at least 5 s but no later than 4½ min of receiving the calling sequence, using the ship-to-shore calling procedures detailed in § 2.2. However the transmitted sequence should contain a "BQ" end of sequence signal in place of the "RQ" signal. If such an acknowledgement cannot be transmitted within 5 min of receiving the calling sequence then the ship station should instead transmit a calling sequence to the coast station using the ship-to-shore calling procedure detailed in § 2.2.

2.1.13.2 If the ship is equipped for automatic DSC operation, the ship station automatically transmits an acknowledgement with an end of sequence signal "BQ". The start of the transmission of this acknowledgement sequence should be within 30 s for HF and MF or within 3 s for VHF after the reception of the complete call sequence.

2.1.13.3 If the ship is able to comply immediately the acknowledgement sequence should include a telecommand signal which is identical to that received in the calling sequence indicating that it is able to comply.

2.1.13.4 If the ship is not able to comply immediately the acknowledgement sequence should include the telecommand signal 104 (unable to comply), with a second telecommand signal giving additional information (see Recommendation 493).

At some later time when the ship is able to accept the traffic being offered, the ship's operator initiates a call to the coast station using the ship-to-shore calling procedures detailed in § 2.2.

2.1.14 If a call is acknowledged indicating ability to comply immediately and communication between coast station and ship station on the working channel agreed is established, the DSC call procedure is considered to be completed.

2.1.15 If the ship station transmits an acknowledgement which is not received by the coast station then this will result in the coast station repeating the call (in accordance with § 2.1.11). In this event the ship station should transmit a new acknowledgement. If no repeated call is received the ship station should transmit an acknowledgement or calling sequence in accordance with § 2.1.13.1.

*2.2 Ship station initiates call to coast station**

Figures 3 and 4 illustrate the procedures below in flow chart and by time sequence diagram respectively.

This procedure should also be followed both as a delayed response to a call received earlier from the coast station (see § 2.1.13.1) and to initiate traffic from the ship station.

2.2.1 The ship composes the calling sequence as follows:

- selects the format specifier;
- enters address;
- selects the category;
- selects the telecommand information;
- inserts working frequency information in the message part of the sequence if appropriate;
- inserts telephone number required (semi-automatic/automatic connections only);
- selects the "end of sequence" signal RQ.

2.2.2 The ship verifies the calling sequence.

2.2.3 The ship selects the most appropriate calling frequency.

2.2.4 The ship initiates the transmission of the sequence on the frequency selected after checking as far as possible that there are no calls in progress on that frequency.

2.2.5 If a called station does not reply, the call sequence from the ship station should not normally be repeated until after an interval of at least 5 min for manual connections, or 5 s or 25 s in the case of semi-automatic/automatic VHF or MF/HF connections respectively. These repetitions may be made on alternative frequencies if appropriate. Any subsequent repetitions to the same coast station should not be made until at least 15 min have elapsed.

2.2.6 The coast station should transmit an acknowledgement sequence (after checking as far as possible that there are no calls in progress on the frequency selected), after a delay of at least 5 s but not later than 4½ min for manual connections, or, within 3 s for semi-automatic/automatic connections, containing the format specifier, the address of the ship, the category, the coast station self-identification and:

- if able to comply immediately on the working frequency suggested, the same telecommand and frequency information as in the call request;
- if no working frequency was suggested by the ship station then the acknowledgement sequence should include a channel/frequency proposal;
- if not able to comply on the working frequency suggested but able to comply immediately on an alternative frequency, the same telecommand but an alternative working frequency;
- if unable to comply immediately the telecommand signal 104 with a second telecommand signal giving additional information. For manual connections only, this second telecommand signal may include a queue indication.

The end of sequence signal BQ should also be included.

---

* See Recommendation 689 and Report 1161 for further details of procedures applicable only to the semi-automatic/automatic services.

2.2.7 For manual connections, if a working frequency is proposed in accordance with § 2.2.6 but this is not acceptable to the ship station, then the ship station should immediately transmit a call to the coast station indicating (by the use of telecommand signals 104 and 108) that it cannot comply on that frequency.

2.2.7.1 The coast station should then transmit an acknowledgement in accordance with § 2.2.6 either accepting the ship station's original suggested frequency or proposing a second alternative.

2.2.8 On receipt of an acknowledgement which indicates ability to comply the DSC procedures are complete and both coast station and ship station should communicate on the working frequencies agreed with no further exchange of DSC calls.

2.2.9 If the coast station transmits an acknowledgement which is not received at the ship station then the ship station should repeat the call in accordance with § 2.2.5.

FIGURE 1

Flow chart of operational procedures for calling in the shore-to-ship direction

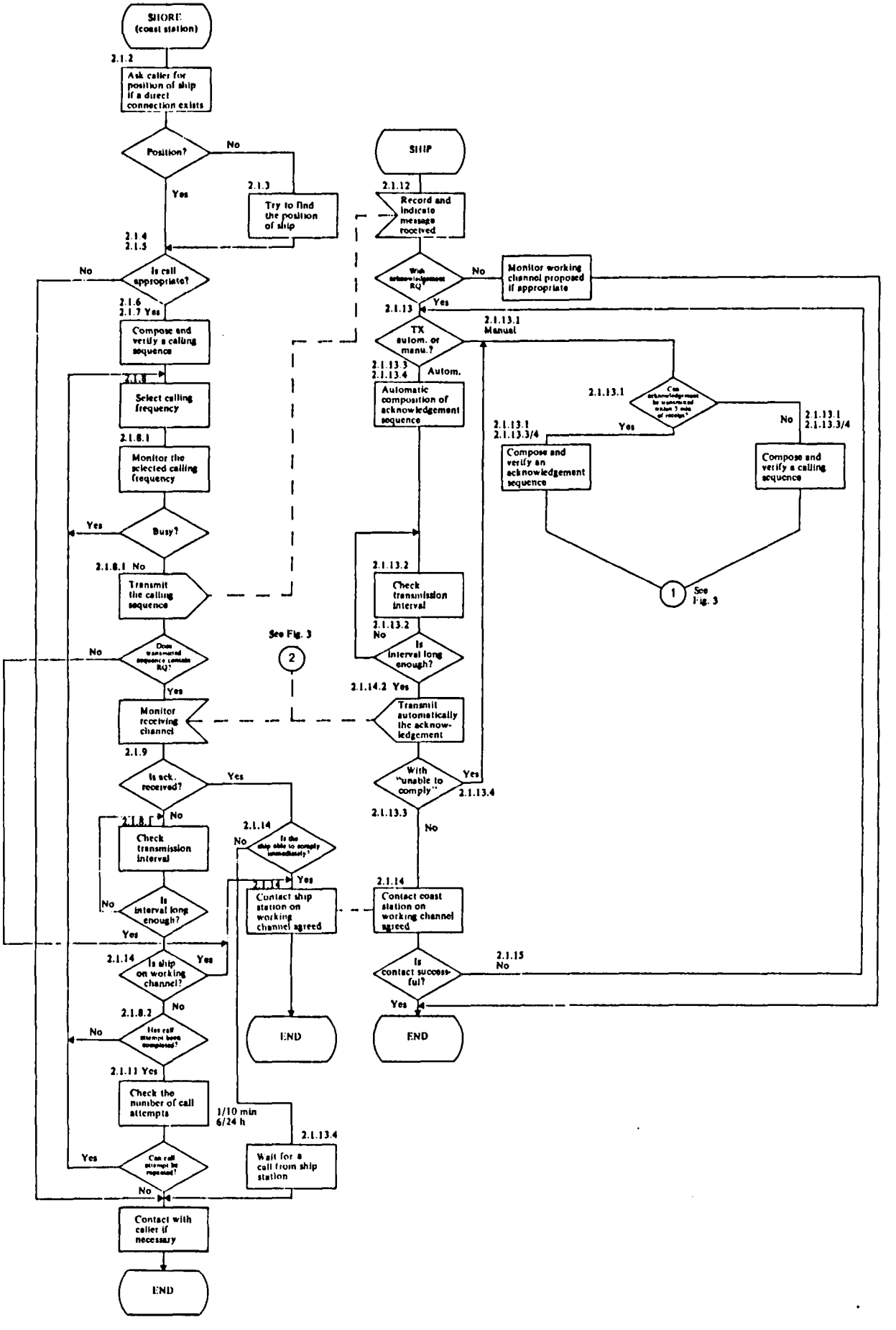
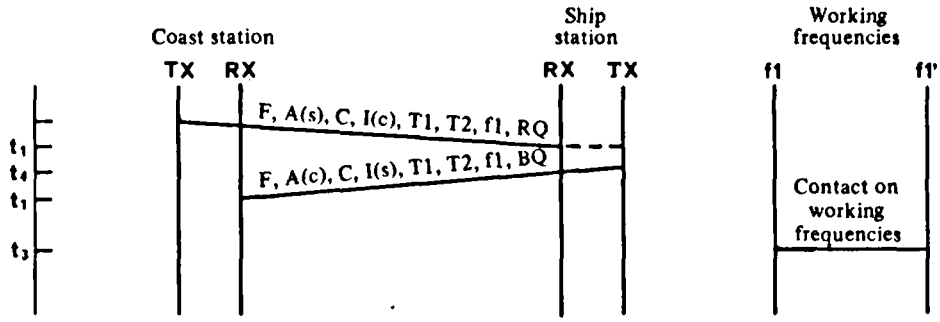
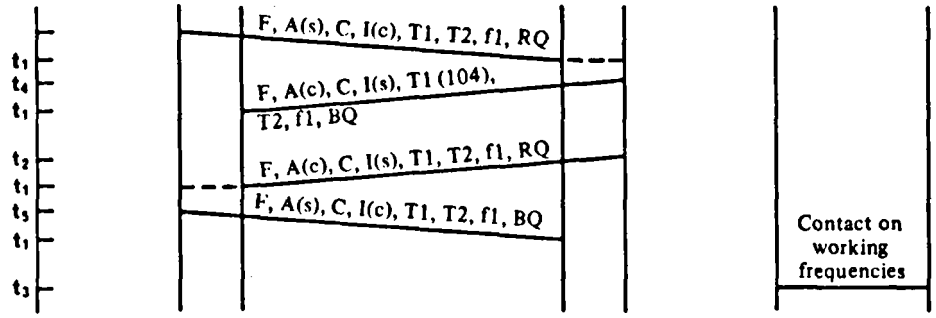


FIGURE 2

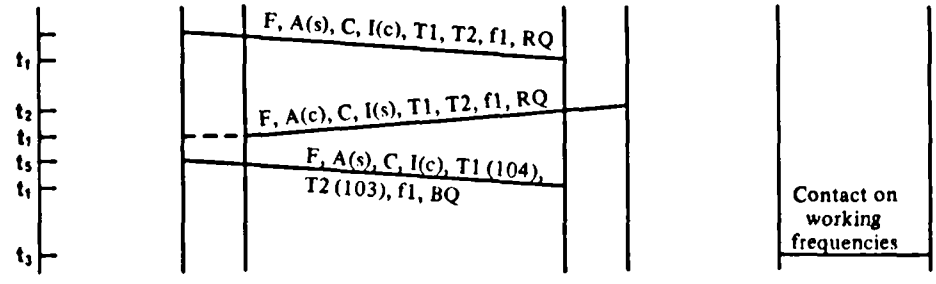
Examples of timing diagrams for calling in shore-to-ship direction
(See legend in Fig. 4)



a) Automated transmitter (able to comply)



b) Automated transmitter (unable to comply)



c) Ship transmitter not automated. Ship makes a delayed (> 5 min) response to coast station and encounters queue on working frequency

FIGURE 3

Flow chart of operational procedures for calling in the ship-to-shore direction

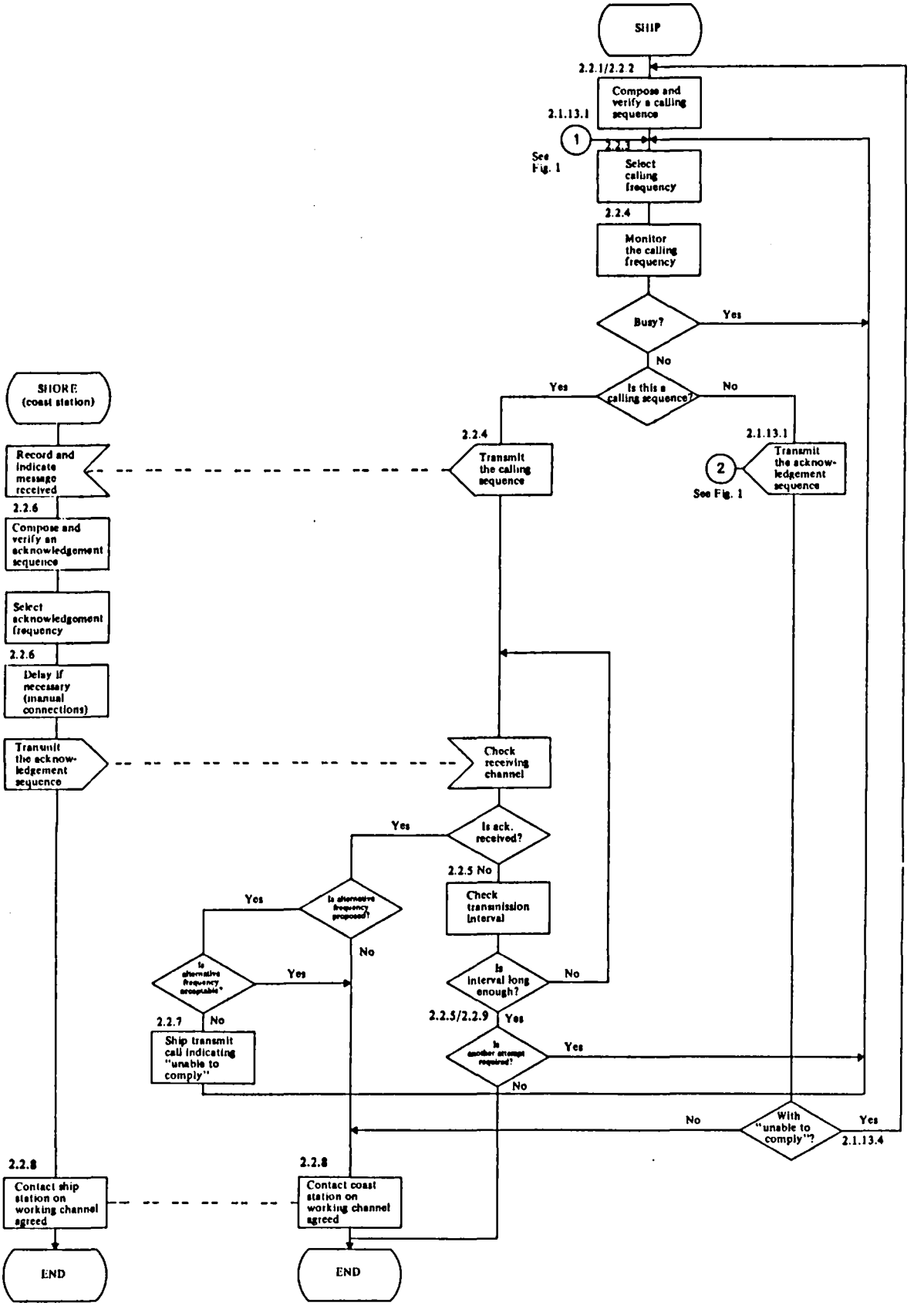
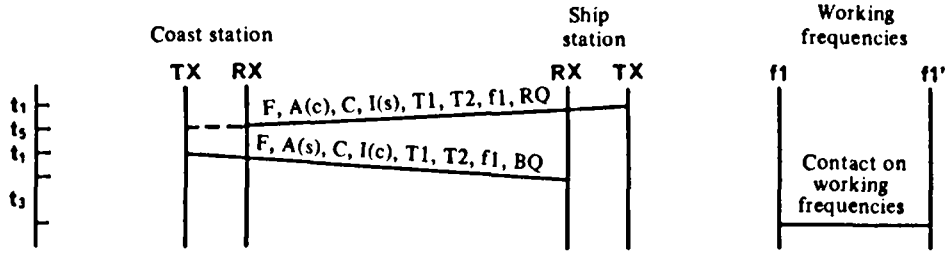
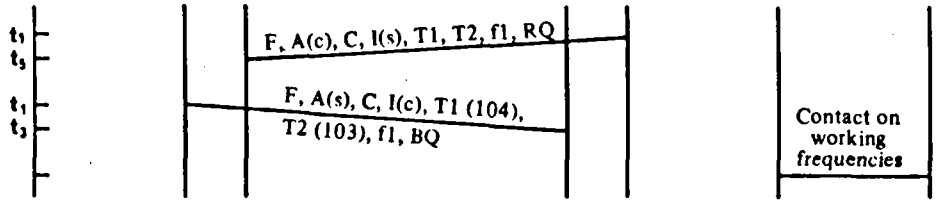


FIGURE 4

Examples of timing diagrams for calling in ship-to-shore direction



a) Able to comply immediately



b) Queue exists on working frequency

The following symbols are used in Figs. 2 and 4:

t_1 : transmission time of a DSC sequence

t_3 : interval between the DSC reception at the ship and transmission from the ship after the operator's appearance in the radio room (from several minutes up to several hours)

t_3 : transition time from calling to working frequency including, if necessary, the time for working channel clearing (queue waiting time)

t_4 : as defined in § 2.1.13.2

t_5 : time for coast station to prepare acknowledgement (see § 2.2.6)

F : format specifier

A : called station address

I : calling station self-identification { suffix (c) or (s) indicates coast station or ship station respectively

C : category

T1 : first telecommand signal, (104) indicates unable to comply

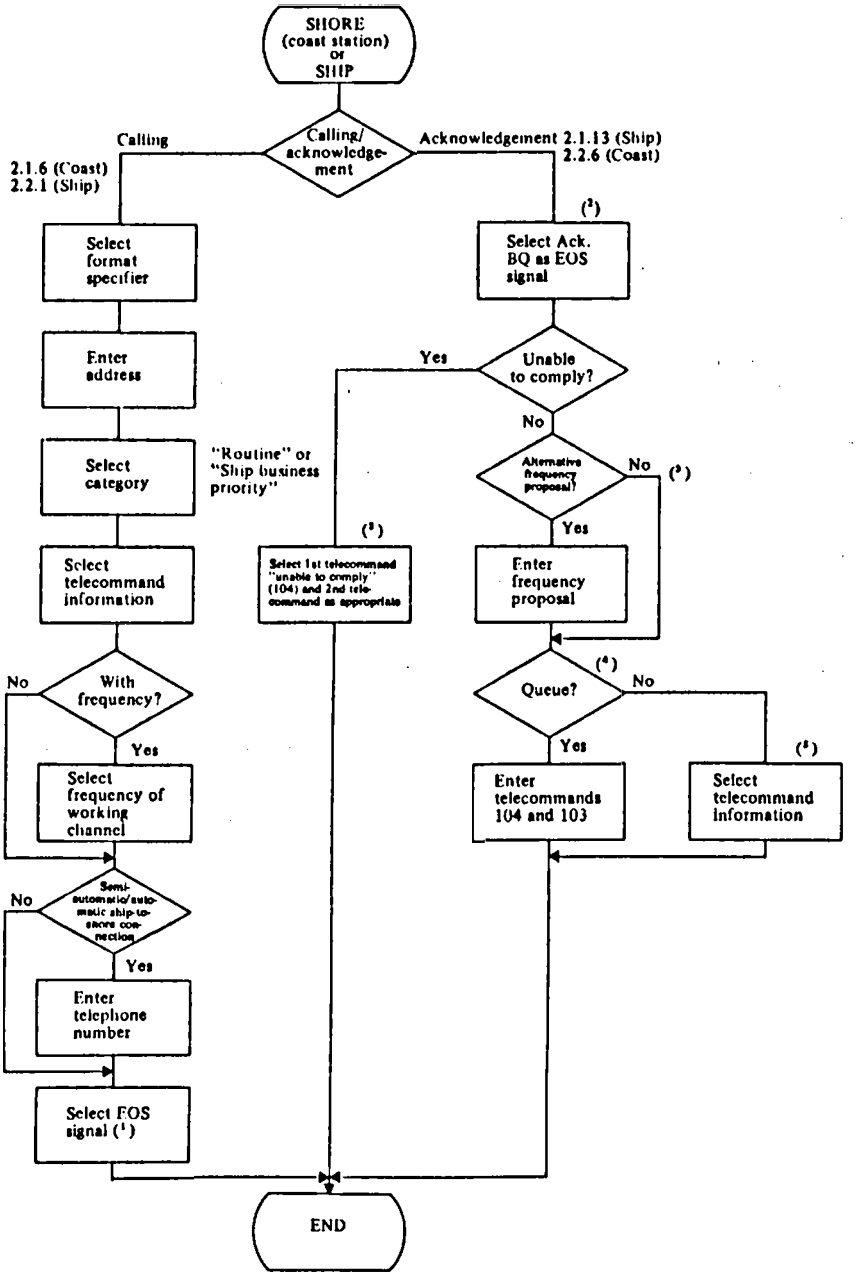
T2 : second telecommand signal, (103) indicates queue

f1, f1' : working frequencies

RQ, BQ : end of sequence signals

FIGURE 5

Composition procedures for calling and acknowledgement sequences
(for calls other than distress and safety)



(1) Normally Ack. RQ may automatically be selected as an EOS signal of a calling sequence to an individual station.

(2) The format specifier and the category are automatically transferred from the received call. The self-ID in the received sequence is automatically transferred into the address part of acknowledgement sequence by selecting Ack. BQ.

(3) The frequency information is automatically transferred from the received call.

(4) This procedure is only for coast stations.

(5) When able to comply, and no queue exists, then the telecommand information is automatically transferred from the received call.