RECOMMENDATION 586-1*

AUTOMATED VHF/UHF MARITIME MOBILE TELEPHONE SYSTEM

(Question 23/8)

(1982-1986)

The CCIR,

CONSIDERING

(a) that an automated VHF/UHF maritime mobile telephone service would expedite the handling of traffic in the international maritime mobile service and increase the efficient use of radio channels;

(b) that there is an urgent need for such a service;

(c) that a system providing such a service could also allow for the transmission of, for example, telegraphy, facsimile and data;

(d) that international standardization is of great importance in the maritime mobile service;

(e) that the selective-calling system described in Recommendation 493 can form the basis for the signalling over the radio path and can provide for expansion to include other services;

(f) Recommendation No. 312 of the World Administrative Radio Conference (Geneva, 1979),

UNANIMOUSLY RECOMMENDS

1. that the automated VHF/UHF maritime mobile telephone system should be in accordance with either of the two configurations described in Annex I depending on channel availability, and geographical and other considerations;

2. that the signalling procedures to be used over the radio path should be in accordance with Annex II;

3. that the signalling messages to be transmitted over the radio path should be in accordance with Annex III.

Note – Annexes IV and V provide supplementary information relevant to the operation of the automated VHF/UHF maritime radiotelephone system.

ANNEX I

SYSTEM DESCRIPTION

1. General

1.1 The two configurations described in this Annex differ only in their method of use of the calling channels. The marked idle channel (MIC) configuration is based on the assignment of non-shared channels to each coast station while the time division multiple access (TDMA) configuration is based on time sharing of a common calling channel by a number of coast stations.

1.2 Signalling procedures have been unified to the maximum extent feasible in order to minimize the additional cost for a ship station compatible with both configurations. Annex II to this Recommendation describes the signalling procedures in detail.

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* The Director, CCIR, is requested to draw this Recommendation to the attention of the CCITT.

1.3 The signalling messages, described in Annex III to this Recommendation, are compatible with the digital selective-calling system (Recommendation 493).

1.4 In the following, a coastal area is defined as the geographic area covered by one or more coast stations controlled by a maritime switching centre (MSC). Note that the concept of a maritime switching centre does not preclude distributing the switching facilities at different locations.

2. Marked idle channel configuration

This configuration has the following characteristics:

2.1 Shore-to-ship calling should be carried out over a channel marked either as “calling channel” (see § 2.4) or as “calling/idle working channel” (see § 2.7 and Note 1).

2.2 Ship-to-shore calling should be carried out over a channel marked either as “idle working channel” (see § 2.5) or as “calling/idle working channel” (see § 2.7 and Note 1).

2.3 There is no need for the assignment of a dedicated frequency pair for a calling channel. However, administrations could provide for one or more dedicated calling frequencies, if this can be justified with respect to the number of available channels.

2.4 When at one coast station two or more channels are not in use for traffic at a given time:

– one of these channels should be designated as the calling channel (for shore-to-ship calling) and should be marked with a unique “calling channel” signal M1;

– one or more of the remaining idle channels should be marked with a unique “idle working channel” signal M2.

The number of idle working channels so marked is dependent on the expected number of ship-originated call attempts and the related probability of interference, etc., and should be determined by the administration for each coast station.

2.5 Idle channels not carrying the unique “idle working channel” marking signals would normally first be used for shore-originated traffic.

2.6 The designated “calling channel” should not be used for traffic unless all other channels of the coast station are occupied.

2.7 If, at any time, only one channel is not used for traffic, this channel may be marked with a unique “calling/idle working channel” signal M3 to allow for use for both shore-originated and ship-originated calling.

2.8 If all channels are occupied for traffic, no marking signals are transmitted by that coast station.

2.9 If, starting from the situation that all channels are occupied, one channel becomes free of traffic, this may then be marked as a “calling/idle working channel”.

2.10 If in addition to the “calling/idle working channel” a second channel becomes available, then the former channel should be marked (from that moment) with the “calling channel” marking signal. The second channel will then carry the “idle working channel” marking signal.

2.11 The marking signals should contain the coast station identification in accordance with Annex III to this Recommendation.

2.12 Since it is possible that more than one channel could be marked simultaneously with an “idle working channel” signal, ships should be provided with some means to randomize the selection of one of these idle channels for the call set-up procedure.

2.13 Marking signals sent on an idle working channel should be transmitted with reduced working power.

Marking signals on the calling channel may also be sent at reduced power. However, calling sequences and signalling sequences should be sent at full working power.

2.14 During the on-hook condition the ship station may lock on a channel marked either “calling channel” or “calling/idle working channel”.

When the ship is within radio coverage of several coast stations, the selection of which "calling channel" will be locked on may be based on signal quality measurements, such as field strength level or error-rate. In addition, provision should be made for manual or automatic selection of predetermined coast station identities by ship stations, e.g. coast stations of a particular nationality.

2.15 If a ship to coast station call attempt is unsuccessful, a second call attempt may be made after initiating a new search for an M2 or M3 marked working channel. After two unsuccessful call attempts the ship station should abandon the call and provide an unsuccessful call attempt indication to the ship subscriber.

3. Time division multiple access configuration (TDMA)

This configuration has the following characteristics:

3.1 Shore-to-ship and ship-to-shore calling should be carried out over a dedicated calling channel which is a particular frequency pair, which may be time-shared by a number of coast stations.

3.2 The calling channel is marked with a unique "random access" signal M4 during the time periods it is available for ship-to-shore call initiation (see § 3.4).

3.3 In the shore-to-ship direction, coast stations within interference range of each other should coordinate their transmissions so that no overlap occurs. Such time-sharing may be either on the basis of pre-allocated time slots or on a demand basis. In the latter case, arrangements should be made to ensure that one high-traffic coast station does not lock out other participating coast stations for excessive periods of time.

3.4 In addition to time periods for shore station originated call attempts, time periods are provided on the calling channel to allow initiation of ship-originated calls using random access. During these periods the channel is marked with a unique "random access" marking signal. Each marking sequence should also indicate the number of random access time slots still to follow in the particular random access period.

3.5 Ship-to-shore call attempts should be transmitted only during the random access periods. Transmissions should be in time slots which are referenced to the "random access" marking sequences. To further enhance the channel capacity, ship stations should employ a means to randomize the choice of time slot following reception of a "random access" marking sequence, taking into account the number of time slots remaining (encoded in the marking sequence, see § 3.4).

3.6 When coast stations are allocated individual random access periods, coordination of the time periods is required between coast stations within interference range of each other.

When a random access period is common to a number of coast stations, coordination between those coast stations should be effected to ensure full area coverage and non-interference of marking signals.

3.7 Upon receipt of a properly addressed call attempt from a coast station, the ship station shall immediately transmit its acknowledgement over the ship-to-shore frequency of the calling channel.

3.8 Upon receipt of a call attempt from a ship station, the appropriate coast station transmits a call sequence addressed to that ship station during its subsequent calling period.

3.9 Upon receipt of a location registration call attempt from a ship station (during the random access period) the appropriate coast station shall immediately transmit its acknowledgement over the shore-to-ship frequency of the calling channel.

4. Channel supervision

If the quality of a speech channel decreases below a threshold level during the conversation, either the connection may be interrupted or a procedure may be started to switch the call-in-progress to a satisfactory working channel controlled by the same maritime switching centre (MSC).

Two methods of channel quality supervision are given in Annex V of this Recommendation. The choice of the method used by each coast station may be decided by each administration; however, ship stations should be provided with facilities to enable the pilot tone method to be used, unless they sail only in waters where the pilot tone method is not used.

5. Location registration

Location registration is defined as the procedure to be followed for the ship station identity to be entered in a ship location register at the controlling maritime switching centre (MSC).

5.1 To simplify the routing of calls in the shore-to-ship direction procedures are used to update the MSC's location register. An updating procedure should be started by the ship station when entering a new coastal area and when initially switching on a ship station.

5.2 *Marked idle channel configuration*

5.2.1 Location registration in the MIC configuration should take place on a working channel.

5.2.2 If during the on-hook condition the ship station loses the calling channel it is locked to, it will search for another calling channel. If the new calling channel marking signal indicates that the calling channel belongs to a different coast station, then the ship station may initiate a location registration procedure (see also Recommendation 587).

5.3 *TDMA configuration*

5.3.1 Location registration in the TDMA configuration takes place on the calling channel.

5.3.2 If during the on-hook condition the ship station loses a particular coast station's signal, it will search for another time slot. If the new coast station identification indicates that it is a different coast station, then the ship station may initiate a location registration procedure (see also Recommendation 587).

5.4 *In both configurations:*

5.4.1 Location registration is considered to be finalized after a confirmation by the new coast station.

5.4.2 If the ship does not receive a confirmation from the coast station, it repeats the transmission of the relevant signal. (In the MIC configuration the second trial should be made after initiating a new working channel search.)

5.4.3 If the ship has not received a confirmation after 2 successive trials, it should not make further trials to the coast station. In this case non-completion of the location registration procedure should be indicated on the ship's equipment.

5.4.4 Administrations are urged to issue guidelines to avoid transmission of unnecessary location registration signals.

6. Polling

Coast stations may be provided with facilities for polling. Polling is defined as the procedure by which an MSC can interrogate ships in order to verify whether they are still within radio coverage. Polling is done to keep track of ships already registered in the service area. Before deleting a ship from the register, several polling attempts should have been unsuccessful.

6.1 All signals necessary for polling should be transmitted on calling channels.

Note 1 – No. 4908 of the Radio Regulations prohibits the use of devices for continuous or repetitive calling or identification; No. 4910 prohibits the emission of any carrier wave between calls. Therefore, continuous or repetitive marking of idle channels should be limited to the minimum required for the satisfactory operation of the system. Administrations are requested to reconsider this matter in preparing for the next competent World Administrative Radio Conference.

ANNEX II

SIGNALLING PROCEDURES

1. Introduction

1.1 *Purpose*

The purpose of this part of the Recommendation is to describe the calling and signalling arrangements to be used over the radio path. The description uses sequence diagrams to show how signals are exchanged between a coast station and a ship station.

In addition to the signalling over the radio path, interworking with the signalling over the public telephone network is necessary. Operation of the complete system is illustrated in Appendices I to VI (Note 1) using the specification and description language (SDL) developed by the CCITT. Appendix I provides a general introduction to SDL. Appendices II and III show logic procedures for land-originated calls at the maritime switching centre (MSC) and at the ship station, respectively. Appendices IV and V show logic procedures for ship-originated calls at the MSC and at the ship station, respectively. Appendix VI shows the procedure at the MSC for power level control and for switching call-in-progress.

Procedures are defined for both TDMA and MIC configurations (see Annex I). The procedures are such that the differences are as small as possible so that ship stations may operate in both configurations, if required.

Note 1 – Appendices I to VI are reproduced at the end of this Recommendation after Annex V.

1.2 *Definition of signals sent on the radio path*

1.2.1 *Marking sequences*

M1 – Signal used in MIC configuration to mark a channel as calling channel;

M2 – signal used in MIC configuration to mark idle working channels;

M3 – signal used in MIC configuration for combined calling/idle working channel marking;

M4 – signal used in TDMA configuration to indicate available slot periods for ship-to-coast station call initiation.

1.2.2 *Calling sequences*

C1 – Coast station to ship interrogation and polling signal;

C2 – acknowledgement by ship to C1;

C3 – coast station-to-ship call with indication of working channel;

C4 – acknowledgement by ship to C3;

C5X – coast station is unable to comply:

X = 0 no reason given,
X = 1 congestion at MSC,
X = 2 ship barred,
X = 3 queueing indicator (in TDMA configuration only),
X = 4, . . ., 9 reserved for future use;

C6X – ship-to-coast station call:

X = 0 no charging information requested,
X = 1 charging information requested;

C7 – signal sent by coast station in TDMA configuration to acknowledge C60 or C61. C7 includes indication of working channel;

C8X – ship is unable to comply:

X = 0 no reason given,
X = 1 busy,
X = 2 acknowledgement to C53 (in TDMA configuration only),
X = 3, . . ., 9 reserved for future use;

C10 – ship-to-coast station call for location registration;

C11 – acknowledgement by coast station to C10.

1.2.3 *Signalling sequences*

S10X – Coast station-to-ship signal to initiate continuity test of the working channel:
X = 0 charging information available,
X = 1 charging information not available;

S2 – acknowledgement by ship to S100 or S101;

S3 – ringing command coast station-to-ship;

S4 – answer signal from ship (off hook);

S5X – call unsuccessful:
X = 0 congestion,
X = 1 busy,
X = 2 send special information tone,
X = 3, . . ., 9 reserved for future use;

S6 – "selection" signal sent by ship for ship-to-coast station calling. (Includes the called subscriber's number);

S7 – acknowledgement by coast station to S6;

S8 – clearing by ship;

S9 – clear acknowledgement to S8;

S11 – clearing by coast station;

S12 – clear acknowledgement to S11;

S13 – coast station-to-ship signal used for power level control and/or switching call-in-progress;

S15 – coast station-to-ship signal to initiate continuity test on new working channel when switching call-in-progress;

S16 – acknowledgement by ship to S13 or S15;

S17 – coast station-to-ship signal to indicate start of chargeable duration and charging level, if available;

S18 – acknowledgement by ship to S17.

2. Call set-up and clearing procedures

2.1 *Land-originated calls*

2.1.1 *Marked idle channel (MIC) configuration.*
Channels with M1 marking sequences.

The call set-up and clearing procedures are shown in Fig. 1.

2.1.1.1 If the MSC does not require a ship interrogation prior to assigning the working channel, it sends the call signal C3 on the calling channel of the appropriate coast station. C3 contains the channel number of the assigned working channel. The ship will acknowledge C3 by sending the C4 signal on the return frequency of the calling channel. The MSC may continue to set up the call without awaiting the receipt of C4. However, the MSC must recognize and act upon a C80 or a C81 signal.

2.1.1.2 If the MSC requires a ship interrogation prior to assigning the working channel (e.g. it does not have accurate knowledge of the ship's location), the MSC must transmit C1 on all coast stations in the required area. If the ship is in the required area, the MSC will receive the ship's acknowledgement signal C2 from the coast station, the calling channel of which the ship is monitoring. The call set up would then continue as in § 2.1.1.1 above.

2.1.1.3 After having sent the call signal C3 on the calling channel, the MSC initiates the continuity check of the assigned working channel by sending the signal S101 on that channel.

2.1.1.4 The ship will, after having sent C4, start monitoring the receive frequency of the assigned channel. The ship must not turn on its transmit carrier before S101 has been recognized. Upon recognition of S101 the ship returns the acknowledgement signal S2.

However, if S101 has not been received within three seconds, relative to the instant when C4 was sent, the ship should stop monitoring the working channel and reassume monitoring of a calling channel.

2.1.1.5 When the MSC recognizes the S2 signal, it will start transmitting the ringing command signal S3 and wait for the answer signal, S4, from the ship.

2.1.1.6 S101 should not be sent more than 8 times. If the MSC has not received an S2 signal during this time it should clear the land and radio connection.

2.1.1.7 When the ship station subscriber goes off hook, the ship station transmits S4. As soon as S4 has been recognized by the MSC it must stop transmitting S3 and wait for cessation of S4. If the ship fails to turn off S4 within three seconds after initial recognition of S4, by the MSC, the MSC should clear the call by sending S11.

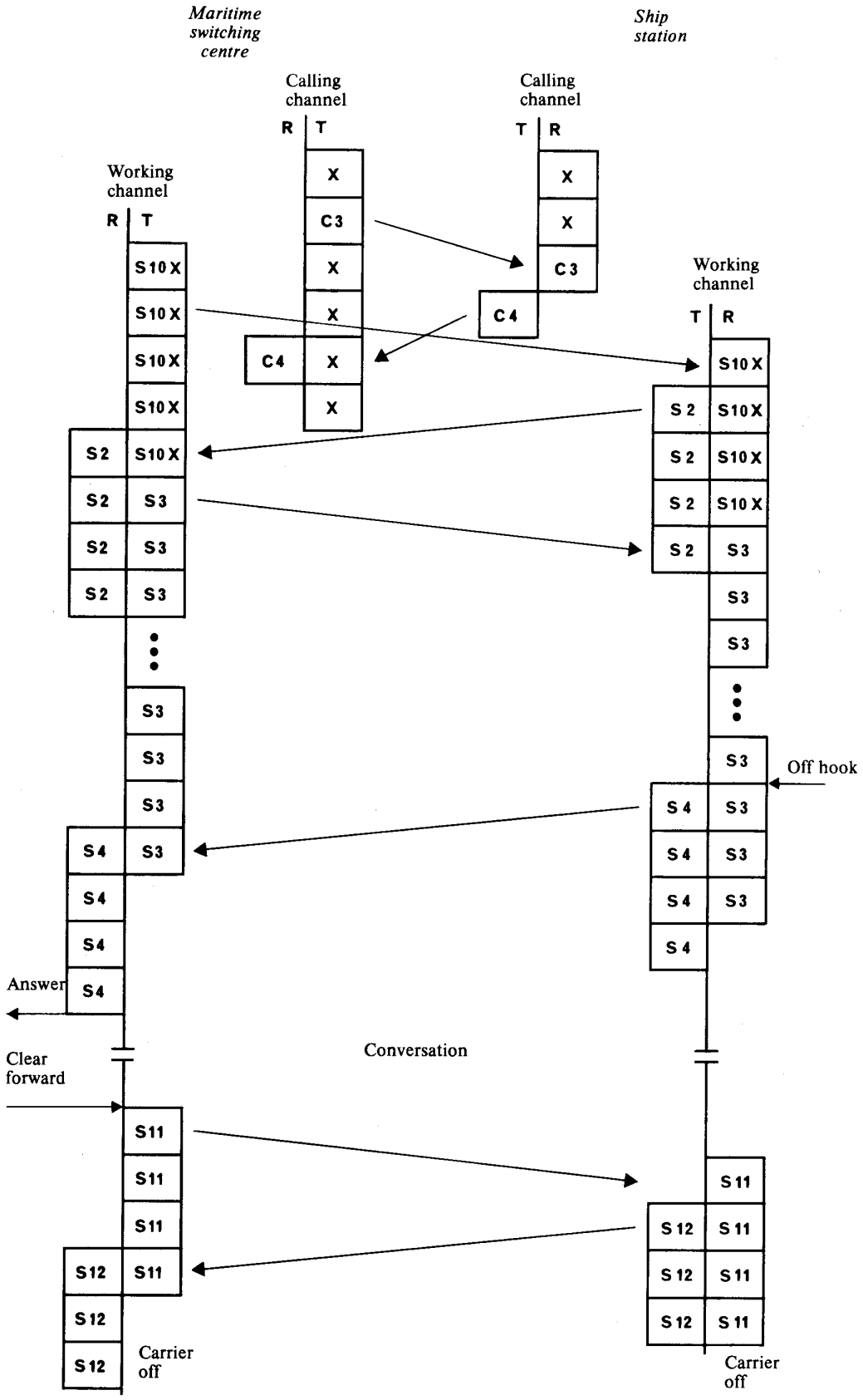

FIGURE 1 – *Call set-up and clearing procedures for land-originated call MIC configuration with M1 marking sequence*

X: any sequence (including M1 marking sequence) that may be sent on the calling channel.

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2.1.1.8 A similar time-out supervision applies to the ship station. If S3 is still being received after S4 has been sent 8 times, the ship station should initiate clearing of the connection.

2.1.1.9 Through-connection at the MSC should not take place until cessation of S4 has been recognized.

2.1.1.10 Clearing may be initiated at any time during conversation by either party.

2.1.1.11 As soon as a clear forward signal is received from the telephone network, the coast station initiates clearing of the radio path by transmitting the S11 sequence to the ship. The MSC may either receive the acknowledgement S12 to S11 or the sequence S8 from the ship. The latter would occur if both parties clear simultaneously. The MSC deactivates the radio carrier as soon as the S12 or S8 sequence has been recognized.

2.1.1.12 If the ship subscriber clears first, i.e. the ship station has not recognized an S11 signal from the MSC when the on hook condition is detected, the ship station sends the S8 sequence. The ship station will either receive the acknowledgement S9 to S8 or the sequence S11. The ship station deactivates the carrier as soon as the S9 or S11 sequence has been recognized.

2.1.1.13 The station that sends an acknowledgement sequence should deactivate its carrier as soon as it ceases to receive the clearing sequence.

2.1.1.14 A clearing sequence or a clear acknowledgement sequence should not be sent more than 8 times. Upon time-out the station should deactivate its carrier.

2.1.2 *Marked idle channel (MIC) configuration.*
Channels with M3 marking sequences.

The call set-up and clearing procedures are identical to those on channels with M1 marking sequences. However, it should be noted that:

– in this case calling sequences and signalling sequences are sent on the same channel, i.e. on the M3 marked channel;

– when a C3 signal is sent, the MSC must stop sending the M3 marking sequence until the channel has been released;

– any C60 or C61 sequences received from a ship should be ignored after the channel has been seized for a land-originated call.

2.1.3 *TDMA configuration*

The setting-up and clearing procedures are identical to that of the MIC configuration for channels with M1 marking.

2.2 *Ship-originated calls*

2.2.1 *Marked idle channel (MIC) configuration*

The set-up and clearing procedures are carried out on a working channel and are shown in Fig. 2.

2.2.1.1 When the MSC recognizes a C60 or C61 sequence it removes the M2 (M3) marking sequence (see § 2.1 of Annex IV).

2.2.1.2 If the received call sequence is C60, the MSC will transmit the S101 sequence in order to initiate the continuity check of the channel.

If the received call sequence is C61, the MSC will return:

– S100 if charging information can be provided. The detailed charging information will be provided later by use of the S17 sequence;

– S101 if charging information cannot be provided. This would enable the ship station to bar calls for which charging information cannot be obtained.

2.2.1.3 Upon recognition of the S100 or S101 sequence the ship will return the S6 sequence containing all digits of the called number (including prefixes).

If the ship station does not recognize S100 or S101 within three seconds, it may automatically start a search for a new M2 (M3) marked channel and repeat the call on that channel without disconnecting the subscriber (see Annex I, § 2.15).

2.2.1.4 Upon recognition of a valid S6 sequence the MSC will return the acknowledgement sequence S7 until it ceases to receive the S6 sequence. At this instant the MSC may through-connect the call.

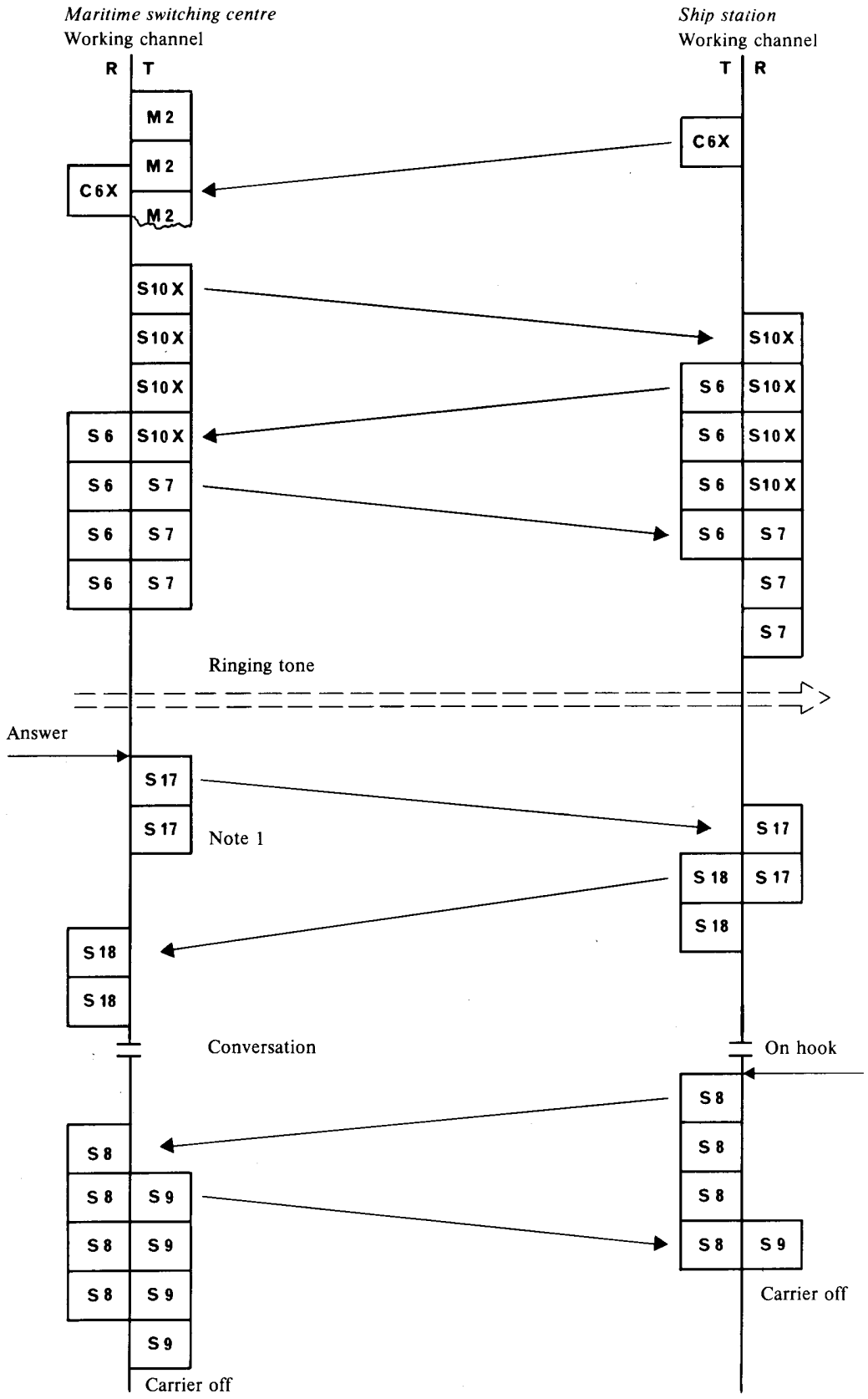

FIGURE 2 – *Call set-up and clearing procedures for ship-originated call. MIC configuration*

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Note 1. – If requested by ship.

2.2.1.5 The sequences S100, S101, S6 and S7 should not be sent more than 8 times. If no correct response is received within this time, the station times out and should clear the connection in the normal manner.

2.2.1.6 If the call sequence C61 was received from the ship, the MSC will send the sequence S17 upon detection of the answer signal from the telephone network. The ship will acknowledge S17 with S18. These signals are sent twice.

2.2.1.7 The ship station should be able to detect clearing by the on-board subscriber (on hook) at any time during the setting-up phase of the call and during conversation. In such cases the ship station should initiate clearing by transmitting the S8 sequence.

The MSC will acknowledge S8 by S9. However, S11 may be received by the ship station instead of S9 if simultaneous clearing takes place.

2.2.1.8 The ship station should respond to the clearing sequence S11 from the MSC by returning the clear acknowledgement sequence S12 provided that the ship has not already started sending S8. In the latter case it should deactivate its carrier upon completion of S8.

2.2.1.9 Release of the radio channel should take place as described in § 2.1.1.13 and 2.1.1.14.

2.2.2 *TDMA configuration without queueing*

The part of the call set-up procedure which takes place on the calling channel is shown in Fig. 3. The part of the procedure which will subsequently take place on the working channel is identical to that of the MIC configuration.

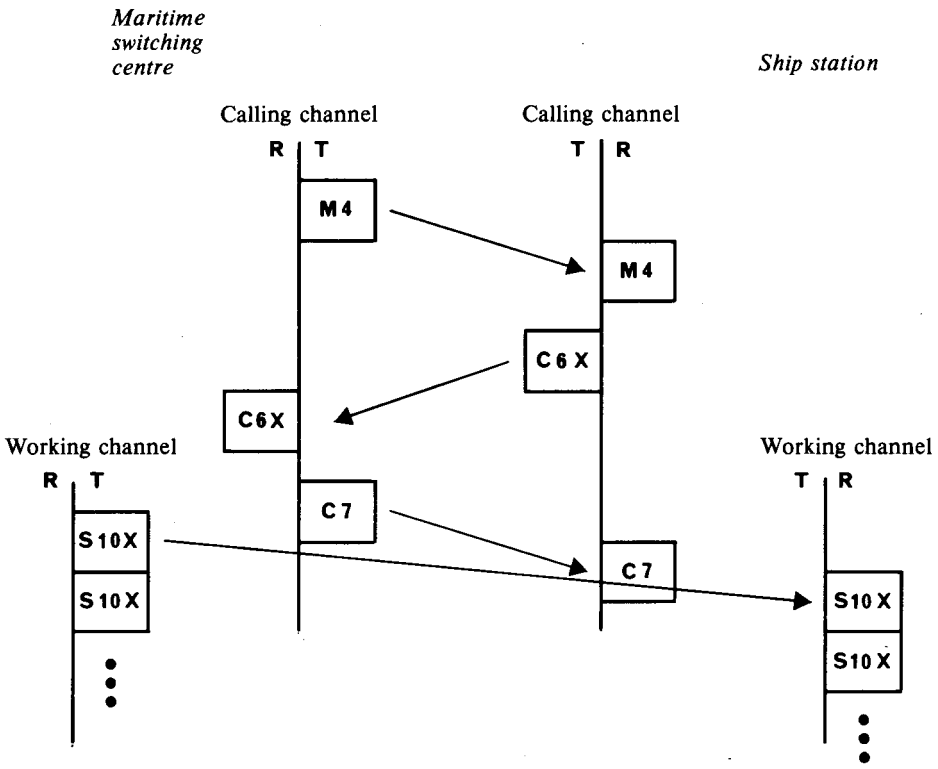


FIGURE 3 – *Call set-up procedure on calling channel for ship-originated call. TDMA configuration without queueing*

The ship transmits the call sequence C60 or C61 in a time slot during an M4 marked random access period.

The MSC will respond in its next assigned calling period with the sequence C7 which includes the channel number of the assigned working channel.

2.2.3 *TDMA configuration with queueing*

The part of the procedure which takes place on the calling channel is shown in Fig. 4.

The part of the procedure which would subsequently take place on the working channel is identical to that of the MIC configuration.

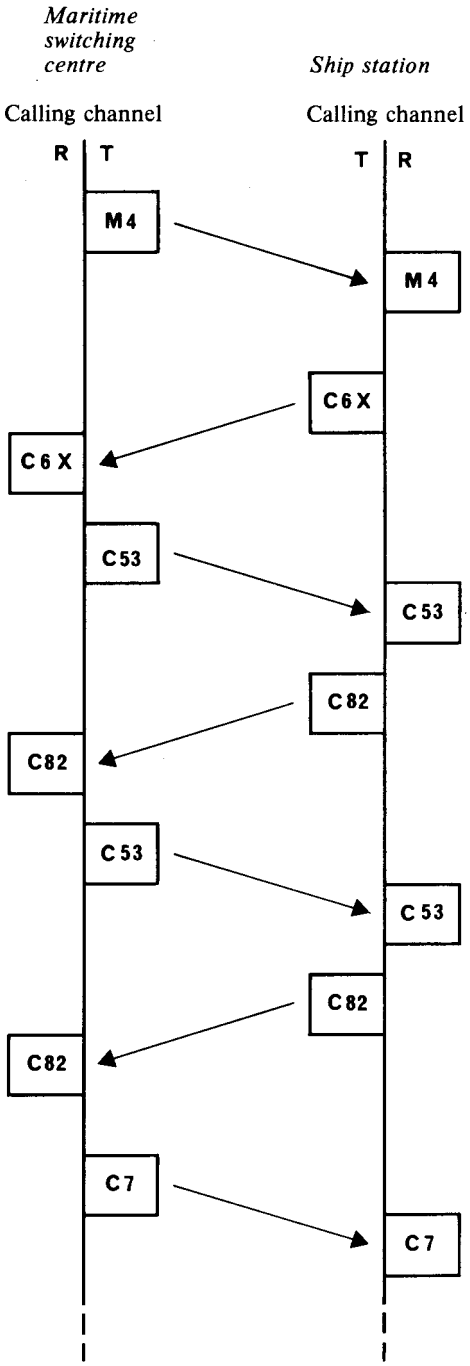


FIGURE 4 – *Calling procedure for ship-originated call. TDMA configuration with queueing*

2.2.3.1 If there is no queue at the MSC when the call sequence C60 or C61 is received, the MSC acts as in § 2.2.2.

2.2.3.2 If there is a queue, the MSC will return C53 to indicate that the call has been placed in the queue. This signal is acknowledged with C82 by the ship. If no such acknowledgement is received within a predetermined time the MSC would assume that the ship has cleared.

The C53/C82 cycle is repeated at periodic intervals until a channel becomes available at which time the MSC returns the C7 sequence to the ship.

2.3 *Unsuccessful calls*

2.3.1 *Land-originated calls*

2.3.1.1 The ship station should have the capability of returning sequences C80 (unable to comply, reason not given) and C81 (busy). These sequences may be sent as a response to the call sequence C3.

2.3.2 *Ship-originated calls*

2.3.2.1 The MSC should respond to a C60 or C61 sequence by transmitting:

– the C51 sequence if there is congestion in the MSC;
– the C52 sequence if the calling ship is barred;
– the C50 sequence if the MSC cannot comply to the call for any other reason (e.g. a request for service which is not provided at the MSC).

On receipt of one of these sequences the ship station should provide an appropriate information to the on-board subscriber.

2.3.2.2 On receipt of an electrical signal from the telephone network indicating that the connection cannot be established the MSC should return one of the sequences S50, S51 or S52 as appropriate, followed by the clearing sequence S11.

The sequences S50, S51 or S52 should be sent twice.

3. Location registration procedure

3.1 When a ship station initiates a location registration procedure, it sends C10 to the appropriate coast station. Upon receipt of C10 without transmission errors the coast station returns C11 to the ship station. If the ship station does not receive C11, or if C11 is received with transmission errors, the ship station may repeat the location registration procedure or activate an indicator showing that the location registration was unsuccessful (see Annex I, § 5.4.2 and 5.4.3).

4. Polling procedure

4.1 When the coast station wishes to ascertain whether a registered ship is still in its service area it transmits C1 to the ship. Upon receipt of C1 the ship station returns C2 to the coast station (see also § 2.1.1.2).

ANNEX III

SIGNALLING MESSAGES

1. General

The signalling required for setting up calls comprises:

1.1 *marking sequences* to indicate:

1.1.1 in the marked idle channel configuration:

– calling channels (M1),
– idle working channels (M2),
– calling/idle working channels (M3);

1.1.2 in a time division multiple access configuration:

– time-shared dedicated calling channels (M4);

1.2 *calling sequences* to alert the required station;

1.3 *signalling sequences* to establish and to clear the speech path on the radio channel.

2. Technical characteristics

2.1 The system is a synchronous system with the following characteristics:

2.1.1 The modulation rate is 1200 bauds.

2.1.2 Signalling is provided by frequency-shift keying of a sub-carrier in the voice band; the frequency shift is 800 Hz, the sub-carrier is at 1700 Hz (which is compatible with CCITT Recommendation V.23). The lower frequency is referred to as the Y (binary 1) state and the higher frequency as the B (binary 0) state of the signal elements.

2.1.3 The code is a ten-unit error detecting code:

– the first seven bits are the information bits;

– the bits Nos. 8, 9 and 10 indicate, in the form of a binary number, the number of B elements in the seven information bits, as shown in Table I of Annex II to Recommendation 493;

– the seven information bits of the primary code express a symbol number from 0 to 127 inclusive as shown in Table I of Annex II to Recommendation 493;

– the symbols from 0 to 99 inclusive are used to code two decimal figures according to Table IVa of Annex II to Recommendation 493;

– the symbols from 100 to 127 inclusive are used to code service commands.

2.1.4 Apart from the phasing signals, each signal is transmitted twice in a time-spread mode; the first transmission (DX) of a specific signal is followed by the transmission of four other signals before the re-transmission (RX) of that specific signal takes place, allowing for a time-diversity reception interval of 33.3 ms.

2.2 *General format of marking, calling and signalling sequences*

The general format is shown in Fig. 5.

Phasing sequence	Format specifier	Address	Category	Self-identification	Message		End of sequence	Check character
					Tele-command	Other information		
A	B	C	D	E	F1	F2	G	H

FIGURE 5 – *General format of sequences*

2.2.1 *The phasing sequence* is identical for all sequences and is composed of the signals 125 in the DX-position (four times) and sequentially the signals 109, 108, 107, 106, 105 and 104 in the RX-position as shown in Fig. 6.

DX	125		125		125		125		110		X_1		X_2		Marking sequence
RX		109		108		107		106		105		104		110	
DX	125		125		125		125		120		X_1		X_2		Calling sequence
RX		109		108		107		106		105		104		120	
DX	125		125		125		125		124		X_1		X_2		Signalling sequence
RX		109		108		107		106		105		104		124	

FIGURE 6 – *Composition of the phasing sequence and the format specifiers*

X_1 and X_2: the first two characters of self identification (marking sequences) or address (calling and signalling sequences) in DX position.

2.2.2 *The format specifier* defines the type of sequence and is in accordance with Recommendation 493:

– signal 110 is used to define a marking sequence;

– signal 120 is used to define a calling sequence being a selective call directed to an individual station;

– signal 124 is used to define a signalling sequence.

2.2.3 *The end of sequence* consists in the DX-position of three identical signals (G_1, G_2, G_3) of which G_2 and G_3 are DX-stuffing signals to obtain time-diversity reception. In the RX-position only G_1 is sent as shown in Fig. 7.

DX	X_n		G_1		G_2		G_3	
RX		X_{n-2}		X_{n-1}		X_n		G_1

a) End of sequence for a single frame

DX	X_n		G_1		G_2		G_3		125		125
RX		X_{n-2}		X_{n-1}		X_n		G_1		109	

b) End of sequence for multiple frames

FIGURE 7 – *Composition of end of sequence*

In all types of sequences the G signal may be:

– 117, if the sequence requests an acknowledgement (RQ);
– 122, if the sequence is an acknowledgement (BQ);
– 127, if the sequence does not need to be acknowledged and is not an acknowledgement (END).

2.2.4 *The error check character* (E) is transmitted in the DX-position immediately after the signal X_{n-1} and in the RX-position immediately after the signal G_3 as shown in Fig. 8.

DX	X_n		G_1		E		G_2		G_3	
RX		X_{n-2}		X_{n-1}		X_n		G_1		E

a) End of sequence and error check character for single frames

DX	X_n		G_1		E		G_2		G_3		125		125
RX		X_{n-2}		X_{n-1}		X_n		G_1		E		109	

b) End of sequence and error check character for multiple frames

FIGURE 8 – *The composition of the end of sequence when an error-check character is incorporated*

The seven information bits of the error check character are equal to the least significant bit of the modulo-2 sums of the corresponding bits of all information characters starting with the format specifier and including the end-of-sequence character (separator characters, if any, are also considered to be information characters).

2.2.5 *The address and the self-identification* are the identities of the called and the calling station respectively and are coded in accordance with Table IVa of Annex II to Recommendation 493.

The ship identity comprises five signals:

$$MI\ DX_4\ X_5X_6\ X_7X_8\ X_90$$

The coast station identity also comprises five signals:

$$00\ MI\ DX_6\ X_7X_8\ X_90$$

(see Recommendation 587).

2.3 *Marking sequences*

The general format for marking sequences is given in Fig. 9 and the composition in Table I. The definition of marking sequences is given in § 1.2.1 of Annex II.

2.3.1 A marking sequence does not contain the address and the category.

2.3.2 The phasing sequence and the format specifier (110) are as shown in Fig. 6.

2.3.3 Self-identification is the coast station identity as defined in § 2.2.5.

2.3.4 The telecommand character identifies the type of marking sequence:

M1: 101
M2: 102
M3: 103
M4: 104.

Phasing sequence	Format specifier	Self-identification	Message		End of sequence
			Tele-command	Other information	
A	B	E	F1	F2	G

FIGURE 9 – *Format of a marking sequence*

2.3.5 Other information is as follows:

– Channel information and power level control comprising three characters:

$$8A_2\ A_3A_4\ A_5A_6$$

where A_2 indicates the power level as follows:

$A_2 = 0$, maximum power level;
$A_2 = 1$, power level not exceeded 2.5 W;
$A_2 = 2$, power level not exceeding 250 mW;
$A_2 = 3$ through 9 are reserved for future use;
and $A_3A_4A_5A_6$ indicates the channel number of the marked channel;

It should be mandatory that the ship station equipment is provided with the power levels corresponding to $A_2 = 0$ and 1. The level corresponding to $A_2 = 2$ may be used on a national basis. When only the mandatory levels are provided in the ship station equipment the response to $A_2 \neq 0$ should be the level corresponding to $A_2 = 1$.

Note – In certain regions of inland waterways administrations concerned may mutually agree that only ship stations which are capable of a power level not exceeding 250 mW will be admitted to the service.

– In addition, the M4 sequence contains a message $9Z_2\ Z_3Z_4$ indicating the number of random access time slots still to follow. This information is separated from the above by signal 126.

2.3.6 The end of sequence 127 is sent as shown in Fig. 7.

2.4 *Calling sequence*

The general format of calling sequences is given in Fig. 5 and the composition in Table II. The definition of calling sequences is given in § 1.2.2 of Annex II.

2.4.1 The phasing sequence and the format specifier (120) are sent as shown in Fig. 6.

2.4.2 The address and the self-identification are as defined in § 2.2.5.

2.4.3 The category signal is 100 (routine) for all calling sequences.

2.4.4 The telecommand character is:

101 (telephony) for C3, C4, C60, C61 and C7;
121 (up-dating information) for C10 and C11;
103 (polling) for signals C1 and C2;
104 (unable to comply) for signals C50, C51, C52, C53, C80, C81 and C82.

Note – If other services are introduced a telecommand character other than 101 should be used for signals C3, C4, C60, C61 and C7 in accordance with Tables Va and Vb of Annex II to Recommendation 493.

2.4.5 Other information includes:

– For signals C1, C3 and C7 the channel number and power level control indication of the actually used channel, comprising three characters, $8A_2\ A_3A_4\ A_5A_6$, where A_2 indicates the power levels as follows:

$A_2 = 0$, maximum power level;
$A_2 = 1$, power level not exceeding 2.5 W;
$A_2 = 2$, power level not exceeding 250 mW;
$A_2 = 3$ through 9 are reserved for future use;
$A_3A_4A_5A_6$ indicates the channel number of the channel on which the signal is sent.

It should be mandatory that the ship station equipment is provided with the power levels corresponding to $A_2 = 0$ and 1. The level corresponding to $A_2 = 2$ may be used on a national basis. When only the mandatory levels are provided in the ship station equipment the response to $A_2 \neq 0$ should be the level corresponding to $A_2 = 1$ (see Note in § 2.3.5).

– For signals C10 the character 80 and the channel number of the actually used channel $A_3A_4A_5A_6$;

– For signals C60 and C61 request for charging information and the channel number of the actually used channel $8A_2\ A_3A_4\ A_5A_6$ where

$A_2 = 0$, indicates that no charging information is requested (signal C60);
$A_2 = 1$, indicates that charging information is requested (signal C61);
$A_3A_4A_5A_6$, indicates the number of the actually used channel;

– the symbols 100, 101, 104, 103, 100, 102 and 103 are used as a second telecommand character in the call sequences C50, C51, C52, C53, C80, C81 and C82 respectively. Sequence C53 may contain an additional character Q_1Q_2 indicating the length of the queue at the MSC;

– in addition the call sequences C3, C60, C61 and C7 include the character 90 followed by the characters B_3B_4 and B_5B_6 where $B_3B_4B_5B_6$ indicates the number of the assigned channel;

– in TDMA configurations the call sequences C60 and C61 may contain optional channel information for ships which do not have multi-working channel capability.

2.4.6 The end of sequence is sent as shown in Fig. 8 and has the values shown in Table II.

2.4.7 All calling sequences comprise an error check character E.

2.5 *Signalling sequences*

The general format for signalling sequences is given in Fig. 5 and the composition in Table III. The definition of the signalling sequences is given in § 1.2.3 of Annex II.

2.5.1 The phasing sequence and the format specifier (124) are sent as shown in Fig. 6.

2.5.2 The address and the self-identification are as defined in § 2.2.5.

2.5.3 The category character is 100 for all signalling sequences.

2.5.4 The telecommand character is:

100 for S100
101 for S101 and S2
102 for S3 and S4
103 for S8, S9, S11 and S12
104 for S17 and S18
105 for S7
107 for S13
108 for S15 and S16
109 for S50, S51 and S52.

For S6 the telecommand character is 105 if the called number (including prefixes) has an odd number of digits and 106 if it has an even number of digits.

2.5.5 Other information included in the signalling sequences S5X, S6, S9, S11, S13 and S17:

– the symbols Nos. 101, 102 and 100 are used in the signalling sequences S50, S51 and S52 respectively;

– S6 contains all digits of the called number. If the called number has an odd number of digits, a stuffing digit 0 will be used in the T_1 position (see Table III). Examples of coding of subscriber numbers of various length are given in Table IV;

– S9 and S11 contain information of the calling channel in use at the coast station, $A_3A_4A_5A_6$ indicating the calling channel number;

– S13 contains a channel indication $9B_2\ B_3B_4\ B_5B_6$ where B_2 indicates the power level as follows:

$B_2 = 0$, maximum power level;
$B_2 = 1$, power level not exceeding 2.5 W;
$B_2 = 2$, power level not exceeding 250 mW;
$B_2 = 3$ through 9 are reserved for future use.

The digits $B_3B_4B_5B_6$ are the channel number. If S13 is used for power level control only, $B_3B_4B_5B_6$ is the channel number of the channel in use. Otherwise it indicates the channel to which the call has to be switched.

It is mandatory that the ship station equipment is provided with the power levels corresponding to $B_2 = 0$ and 1. The level corresponding to $B_2 = 2$ may be used on a national basis. When only the mandatory levels are provided in the ship station equipment the response to $B_2 \neq 0$ should be the level corresponding to $B_2 = 1$ (see Note in § 2.3.5).

– S17 contains charging information $P_1P_2P_3P_4$. If charging information cannot be provided, $P_1P_2P_3P_4$ will be 0000 and S17 may be used to indicate the start of the chargeable duration.

2.5.6 The end of sequence is sent as shown in Fig. 8 and has the values shown in Table III.

2.5.7 All signalling sequences comprise an error check character E.

TABLE I – *Composition of marking sequences*

		M1	M2	M3	M4
	Format specifier	110	110	110	110
	Self-identification (coast station identity)	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90
Message	Telecommand	101	102	103	104
Message	Power level Own channel number	$8A_2$ A_3A_4 A_5A_6	$8A_2$ A_3A_4 A_5A_6	$8A_2$ A_3A_4 A_5A_6	$8A_2$ A_3A_4 A_5A_6
Message	Separator				126
Message	Number of random access time slots still to follow (TDMA only)				$9Z_2$ Z_3Z_4
	End of sequence	127	127	127	127
	Duration (ms)	283.3	283.3	283.3	333.3

TABLE II – *Composition of calling sequences*

		C1	C2	C3	C4	C50	C51	C52	C53	C60	C61	C7	C80	C81	C82	C10	C11
	Format specifier	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	Address: ship- or coast-station identity	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90				00 MI DX_6 X_7X_8 X_90		MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90			00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90
	Category	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Self-identification: ship- or coast-station identity	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90				MI DX_4 X_5X_6 X_7X_8 X_90		00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90			MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90
Message	Firts telecommand	103	103	101	101	104	104	104	104	101	101	101	104	104	104	121	121
	Second telecommand					100	101	104	103				100	102	103		
	Other information, own channel number	$8A_2$ A_3A_4 A_5A_6		$8A_2$ A_3A_4 A_5A_6					Q_1Q_2	80 A_3A_4 A_5A_6	81 A_3A_4 A_5A_6	$8A_2$ A_3A_4 A_5A_6				80 A_3A_4 A_5A_6	
	Separator			126						126	126	126					
	Working channel number			90 B_3B_4 B_5B_6						90 B_3B_4 B_5B_6	90 B_3B_4 B_5B_6	90 B_3B_4 B_5B_6					
	End of sequence	117	122	117	122	127	127	127	127	117	117	122	127	127	127	117	122
	Error check character	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	Duration of sequence (ms)	400	350	466.7	350	366.7	366.7	366.7	383.3	MIC: 400 TDMA: 466.7		466.7	366.7	366.7	366.7	400	350

TABLE III – *Composition of signalling sequences*

	S100	S101	S2	S3	S4	S50	S51	S52	S6[(1)]	S7	S8	S9	S11	S12	S13	S15	S16	S17	S18
Format specifier	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124
Address: ship- or coast-station identity	MI DX_4 X_5X_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90
Category	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Self-identification: ship- or coast-station identity	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90	00 MI DX_6 X_7X_8 X_90	MI DX_4 X_5X_6 X_7X_8 X_90
Message: Telecommand	100	101	101	102	102	109	109	109	105 106[(1)]	105	103	103	103	103	107	108	108	104	104
Message: Other information						101	102	100	T_1T_2 T_3T_4 T_5T_6 T_7T_8 T_9T_{10} $T_{11}T_{12}$ $T_{13}T_{14}$			80 A_3A_4 A_5A_6	80 A_3A_4 A_5A_6		$9B_2$ B_3B_4 B_5B_6			P_1P_2 P_3P_4	
End of sequence	117	117	122	127	127	127	127	127	117	122	117	122	117	122	117	117	122	117	122
Error check character	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Duration of sequence (ms)	350	350	350	350	350	366.7	366.7	366.7	> 350	350	350	400	400	350	400	350	350	383.3	350

(1) See § 2.5.4 for the use of symbols Nos. 105 and 106 as telecommand character.

TABLE IV – *Examples of coding of subscriber numbers of various length in the S6 sequence*

a)	*b)*	*c)*	*d)*	*e)*	
• • •	• • •	• • •	• • •	• • •	
$X_9$0	$X_9$0	$X_9$0	$X_9$0	$X_9$0	
106	106	106	105	105	Telecommand
	11	00 12 34 56	00 01 23 45	03 11 23	
117	117	117	117	117	End of sequence
E	E	E	E	E	Error check character

a) No digit information required. Telecommand 106 (even number of digits) followed by end of sequence 117.

b) Prefix 11 only. Telecommand 106 (even number of digits).

c) Prefix 00 and international number 12 34 56. Telecommand 106 (even number of digits including prefix digits).

d) Prefix 00 and international number 123 45. Telecommand 105 (odd number of digits): stuffing digit 0 underlined.

e) Prefix 31 and number 123. Telecommand 105 (odd number of digits): stuffing digit 0 underlined.

ANNEX IV

TIMING REQUIREMENTS

1. Shore-originated calling

1.1 When a coast station transmits a call sequence on the shore-to-ship frequency of the calling channel the ship sends a reply or an acknowledgement sequence on the ship-to-shore frequency of the same channel. Overlap between successive reply sequences of different ships cannot occur since the coast station call sequences are sufficiently longer than the ship reply sequence.

1.2 The ship station response time is the time between the end of coast station calling sequence and the beginning of the call acknowledgement message sequence indicated as t_3 in Fig. 10. Typically t_3 may be 30 ms ± 10%. The following partial times are of interest:

– the time interval from the end of the calling sequence until the instant that the transmitter output power is 40 dB below its steady-state value is indicated as t_1 in Fig. 10;

– because of the reaction time of the coast station squelch, the ship station must always wait a time t_2 before data signalling starts. This time interval, taken from the time that the transmitter output reaches a value of 2 dB below its steady-state output power, is shown in Fig. 10. Provisionally, t_2 should be at least 7 ms;

– the transmitter decay time is defined as the time interval from the end of the call acknowledgement until the instant that the transmitter output power has decayed to a value of 40 dB below its steady-state value, and is indicated as t_4 in Fig. 10. Provisionally, t_4 should be less than 20 ms.

1.3 The above discussion is equally applicable to the MIC and the TDMA configurations.

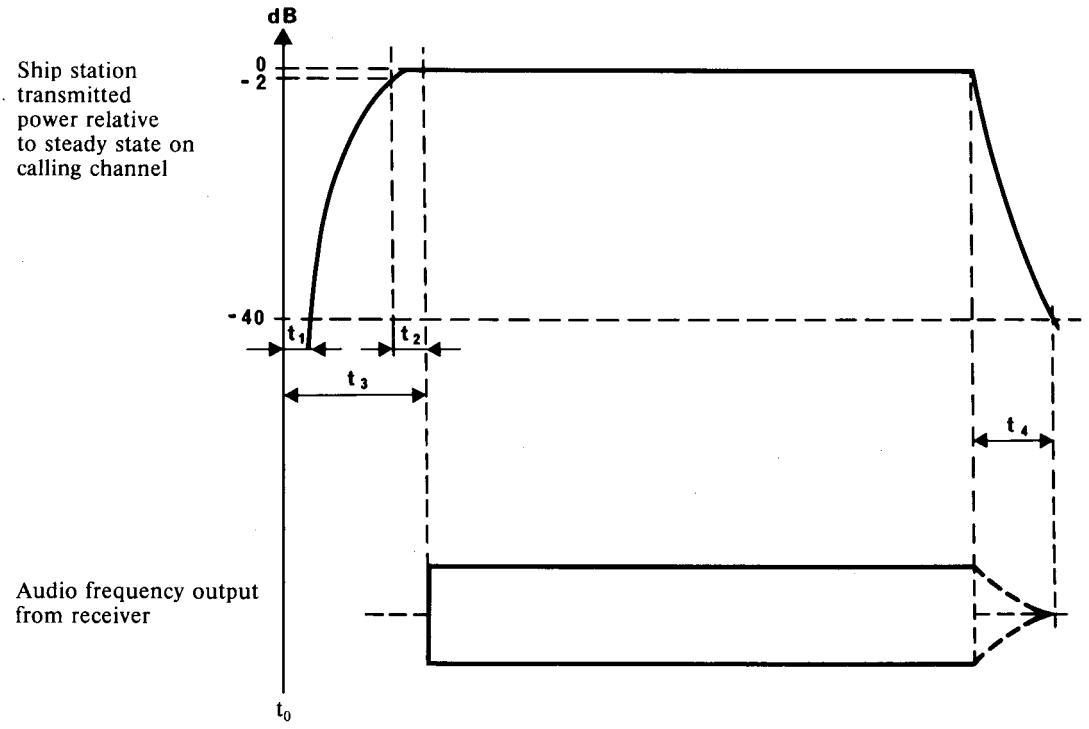


FIGURE 10 – *Timing diagram*

t_0: end of coast station-to-ship calling sequence. D05-sc

2. Ship-originated calling

2.1 *Marked idle-channel (MIC) configuration*

When a ship seizes an idle working (or calling/idle working) channel, it is important that the coast station removes the marking sequence before the next marking sequence is completed. Otherwise, another ship might try to seize the channel on recognition of this next marking sequence and thus cause overlap transmission. Fig. 11 illustrates this procedure.

The delays between the end of the last complete marking signal and the interrupt are:

– twice the one-way delay encountered on the landline between coast station and MSC (if separated);

– maximum turn-around time of the ship station;

– signal acquisition and processing time at the coast station/MSC.

For very long feeder lines between coast station and the MSC a maximum (one-way) delay of 10 ms may be assumed reasonable, and a maximum ship's station turn-around time of 33 ms was indicated in § 1.2 above. With a minimum length of the marking signal of 283.3 ms the interrupt should occur before the first end-of-sequence character, i.e. within 233.3 ms. Using these values would put an upper bound on the combined signal acquisition and processing time of approximately 180 ms.

2.2 *TDMA configuration*

Determination of the length of the time slots in the random access period is based on the following assumptions:

– while on-hook, the ship's timer is resynchronized by each received signal;

– the maximum interval between received signals is 10 time slots;

– the accuracy of the ship's timer is at least ± 1%.

With a ship station turn-around time of 30 ms ± 10% (see § 1.2 above) and a ship's call request message length of 450 ms the minimum time slot length should be approximately 530 ms.

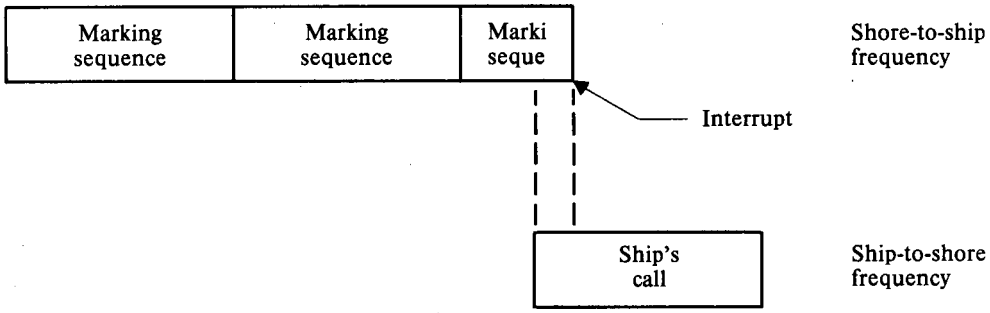


FIGURE 11 – *Interruption of marking sequence*

ANNEX V

CHANNEL QUALITY SUPERVISION

1. Channel quality supervision by means of carrier level measurement

The channel quality is supervised by continuously measuring the field strength of the radio carrier at the coast station. This method monitors only the ship-to-coast station direction of the radio path. No special provision is required at the ship station.

2. Channel quality supervision by use of pilot tones

2.1 *General*

The channel quality is continuously supervised at the coast station by modulating a pilot tone on the radio carrier together with the voice band signal. The ship stations must be capable of looping back such pilot tones on the return channel. With this method both directions of the radio path are monitored.

2.2 *Pilot frequency*

The pilot frequency could be any single tone within the frequency range 3900* to 4100* Hz. The ship station should be able to return any signal, including noise, received within a 6 dB bandwidth of 400* Hz with a centre frequency at 4000* Hz.

Pilot tone frequency offsets should be employed in multiple coast station areas to avoid interference problems.

2.3 *Peak frequency deviation*

The peak frequency deviation produced by the pilot tone both at the ship station and at the coast station should be 300* Hz ± 30* Hz.

* Provisional value.

2.4 *Loop-back filter*

The attenuation characteristic of the loop-back filter is given in Fig. 12.

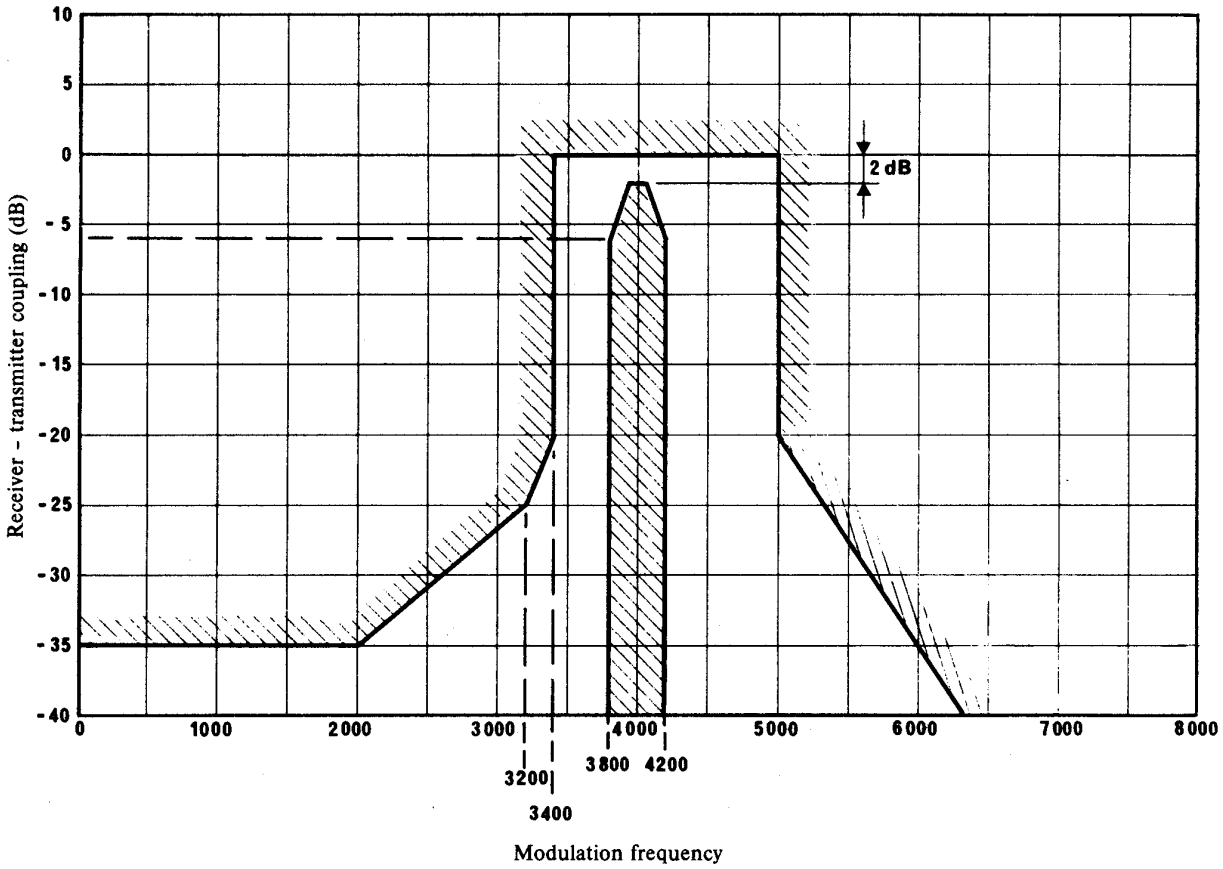


FIGURE 12 – *Attenuation characteristics for the loop-back filter in the mobile station* D07-sc

APPENDICES (ANNEX II)

APPENDIX I

GENERAL INTRODUCTION TO SPECIFICATION AND DESCRIPTION LANGUAGE (SDL)

1. General

In Appendices II to VI the calling and signalling arrangements to be used over the radio path are illustrated using the specification and description language (SDL) developed by the CCITT.

A full description of SDL is contained in CCITT Recommendations Z.101 to Z.104. Application of SDL to interworking of telephone signalling systems is found in the Q.600 to Q.699 series of CCITT Recommendations.

2. Descriptive tools

2.1 *Basic concepts*

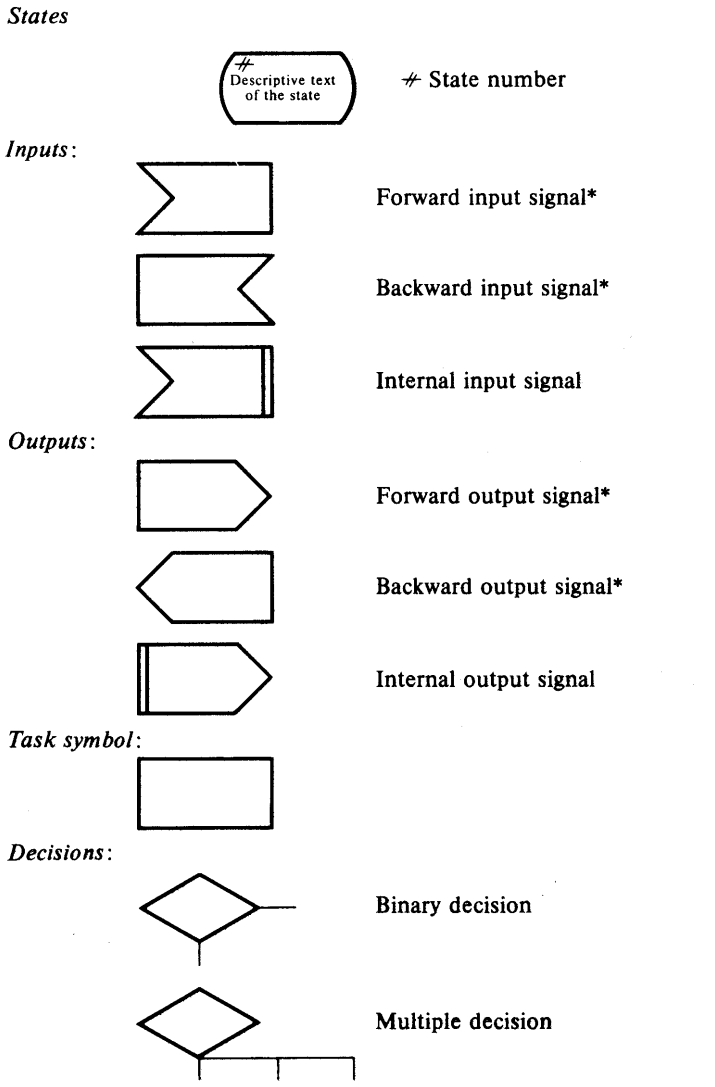
SDL is based on state transition diagrams. A signalling process consists of several states and the various transitions between them. The system is in a given state until an input signal is received.

The input will force the process to travel along a transition, executing tasks, generating outputs and branching on decisions until another state is reached.

The concepts of state, input, task, output and decision are represented with standard symbols. The interconnection of such symbols by flow lines represents the logical flow of a process.

2.2 *Graphical symbols*

Only a small set of graphical symbols is required to present a signalling system. The following symbols are required:

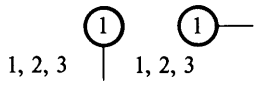


* A forward signal is sent in the direction of the called subscriber.
A backward signal is sent in the direction of the calling subscriber.

D08-sc

Connectors:

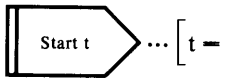
Out-connector No. 1: the corresponding in-connector is given on sheet 2.



In-connector No. 1: the corresponding out-connectors are given on sheets 1, 2 and 3.

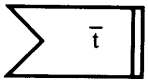
D09-sc

Timers:



Start of timer

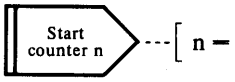
Stop timer



Expiry of timer

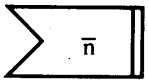
D10-sc

Counters are introduced as replacement of timers in cases where signals should only be sent a given number of times. The following symbols are used:



Start of counter

Reset of counter



Counter limit n has been reached

D11-sc

2.3 *FITEs, BITEs and SPITEs*

Forward interworking telephony events (FITEs) and backward interworking telephony events (BITEs) are used to standardize events that may occur on the interface between an incoming and an outgoing signalling system (e.g. between the incoming telephone signalling system and the MSC-to-ship signalling system). Switching process interworking telephony events (SPITEs) are used internally in the MSC.

Tables V, VI and VII list all FITEs, BITEs and SPITEs used in Appendices II and IV. These and other events have been specified by the CCITT and a full list is given in CCITT Recommendation Q.608.

TABLE V – *FITEs used in Appendices II and IV*

FITE No.	Meaning	Corresponding or equivalent call/ signalling sequence
1	Digit 1, 2, . . ., 9 or 0; or end-of-pulsing	C3, S6
15	Calling party's category subscriber (routine)	C3 (telecommand character)
22	Clear forward	S8, S11

TABLE VI – *BITEs used in Appendices II and IV*

BITE No.	Meaning	Corresponding or equivalent call/ signalling sequence
5	Address complete, charge	S2
11	Call unsuccessful, switching equipment congestion	S50
16	Call unsuccessful, address complete, subscriber busy	S51, C81
20	Call unsuccessful, send special information tone	S52, C80
22	Answer, subscriber free, charge	S17, S4
25	Clear back	S8
27	Sending finished, set up speech condition	–
29([1])	Release incoming side	S11

([1]) Not presently used by the CCITT.

TABLE VII – *SPITEs used in Appendices II and IV*

SPITE No.	Meaning	Symbol
1	Activate register function	task
3	Desactivate register function	task
4	Set up speech condition	task
6	Return appropriate tone (ringing tone, congestion tone, busy tone, special information tone)	task
6A	Remove tone	task
12	Perform digit analysis	task
13	Digit analysis cannot be completed	input
14	Routing information	input
15	Unallocated number	input
16	Unprovided routing	input
17	Barred routing	input
18	Switching equipment congestion	input
19	Circuit group congestion	input

2.4 The signals sent on the radio path are defined in § 1.2 of Annex II.

3. SDL diagrams

3.1 *Outgoing procedure at MSC (land-originated call)*

3.1.1 The SDL diagrams are given in Appendix II.

3.1.2 The following supervisory timers are used in the diagrams:

Type of timer	time-out	state	sheet
Timer t_1	1 s	02	1
Counter n_1	2 times	02	1
Counter n_2	8 times	04	2
Timer t_2	3 s	06	3
Counter n_3	8 times	08,09	3

3.2 *Incoming procedure at ship (land-originated call)*

3.2.1 The SDL diagrams are given in Appendix III.

3.2.2 The following supervisory timers are used in the diagrams:

Type of timer	time-out	state	sheet
Timer t_1	3 s	01	1
Counter n_1	8 times	02	1
Counter n_2	8 times	04	2
Counter n_3	8 times	06 08	2 3
Timer t_2	3 s	07	3

3.3 *Incoming procedure at MSC*

3.3.1 The SDL diagrams are given in Appendix IV.

3.3.2 The following supervisory timers are used in the diagrams:

Type of timer	time-out	state	sheet
Timer t_1	1 s	01	1
Timer t_2	*	02	1
Timer t_3	*	03	1
Counter n_1	8 times	05,06	2
Counter n_2	2 times	09	3
Timer t_5	3 s	10	3
Counter n_4	8 times	12,13	4

3.4 *Outgoing procedure at ship (ship-originated call)*

3.4.1 The SDL diagrams are given in Appendix V.

3.4.2 The following supervisory timers are used in the diagrams:

Type of timer	time-out	state	sheet
Timer t_1	*	02	1
Timer t_2	*	04	1
Timer t_3	*	05	1
Timer t_4	3 s	06	2
Counter n_1	8 times	07	2
Timer t_5	3 s	08	2
Timer t_6	3 s	10	3
Counter n_4	8 times	11,12	3

3.5 *Power level control and switching call-in-progress control at MSC*

3.5.1 The SDL diagrams are given in Appendix VI.

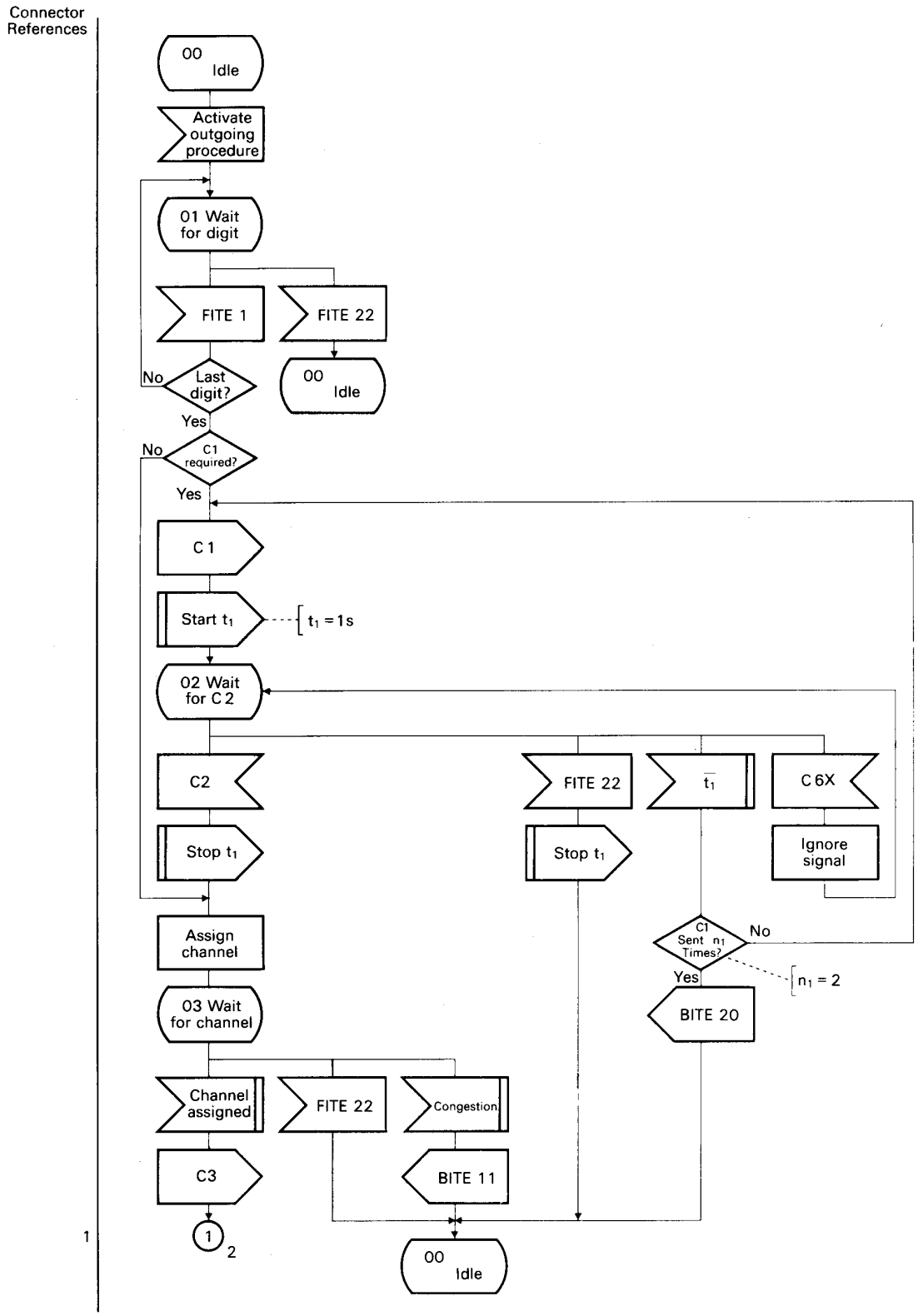
3.5.2 The following supervisory timers are used in the diagrams:

Type of timer	time-out	state	sheet
Timer t_1	2 s	01	1
Timer t_2	3 s	03	2
Counter n_2	5 times	03	2
Counter n_1	3 times	03	2
Counter n_3	8 times	03,04	2

* Not yet defined.

APPENDIX II

Sheet 1

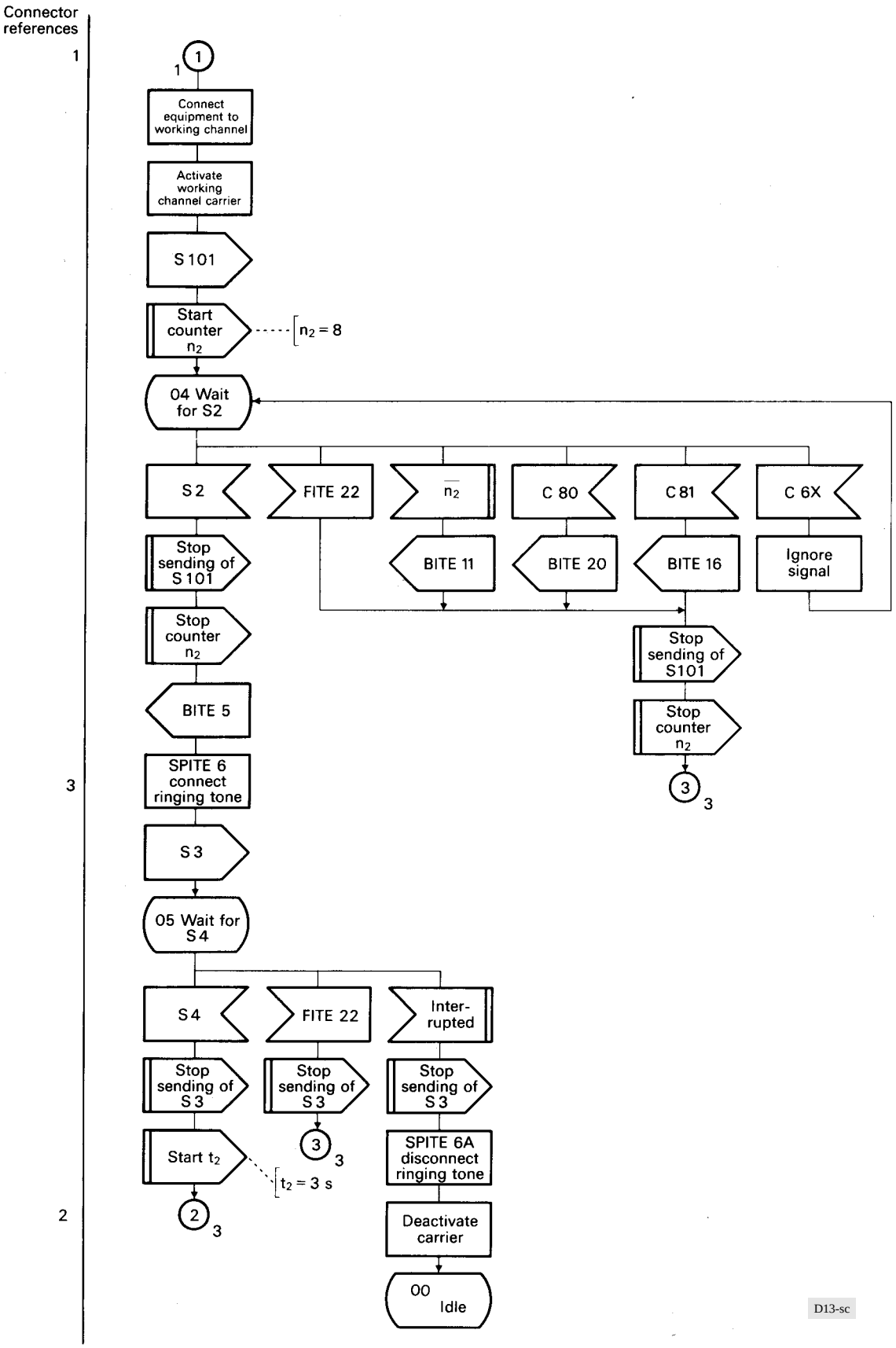


Outgoing procedure at MSC (land-originated call)

D12-sc

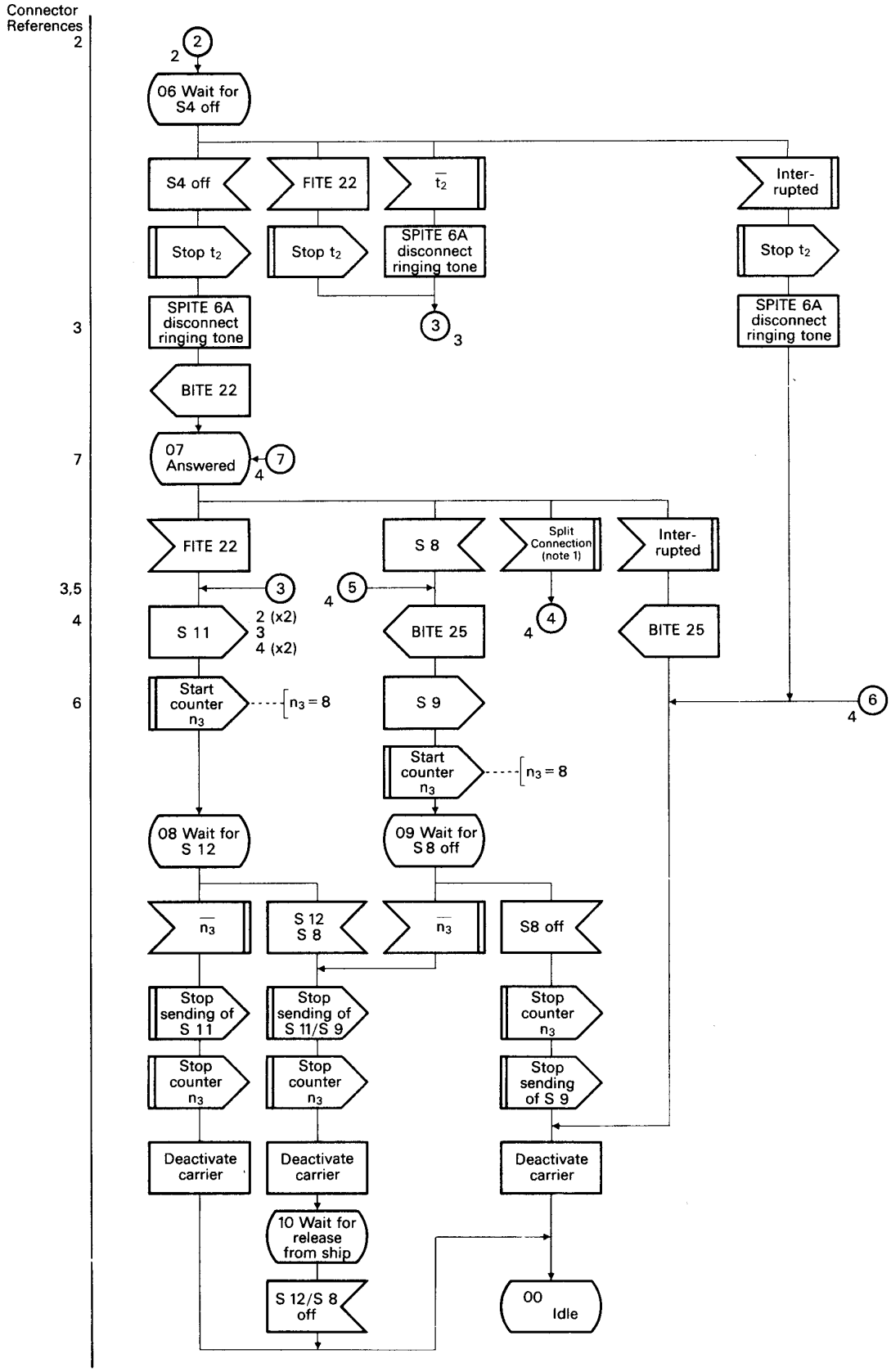
APPENDIX II

Sheet 2



APPENDIX II

Sheet 3

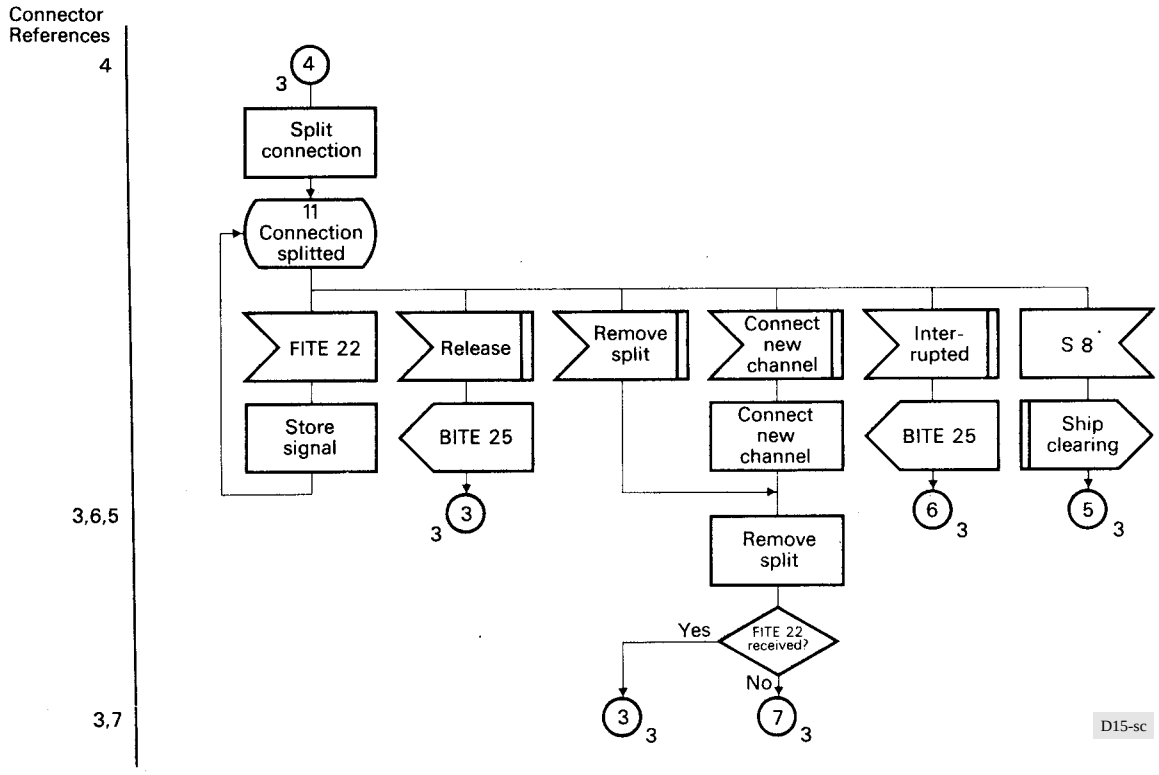


Note 1 – Signal used to initiate power level control and switching call-in-progress (see Appendix VI)

D14-sc

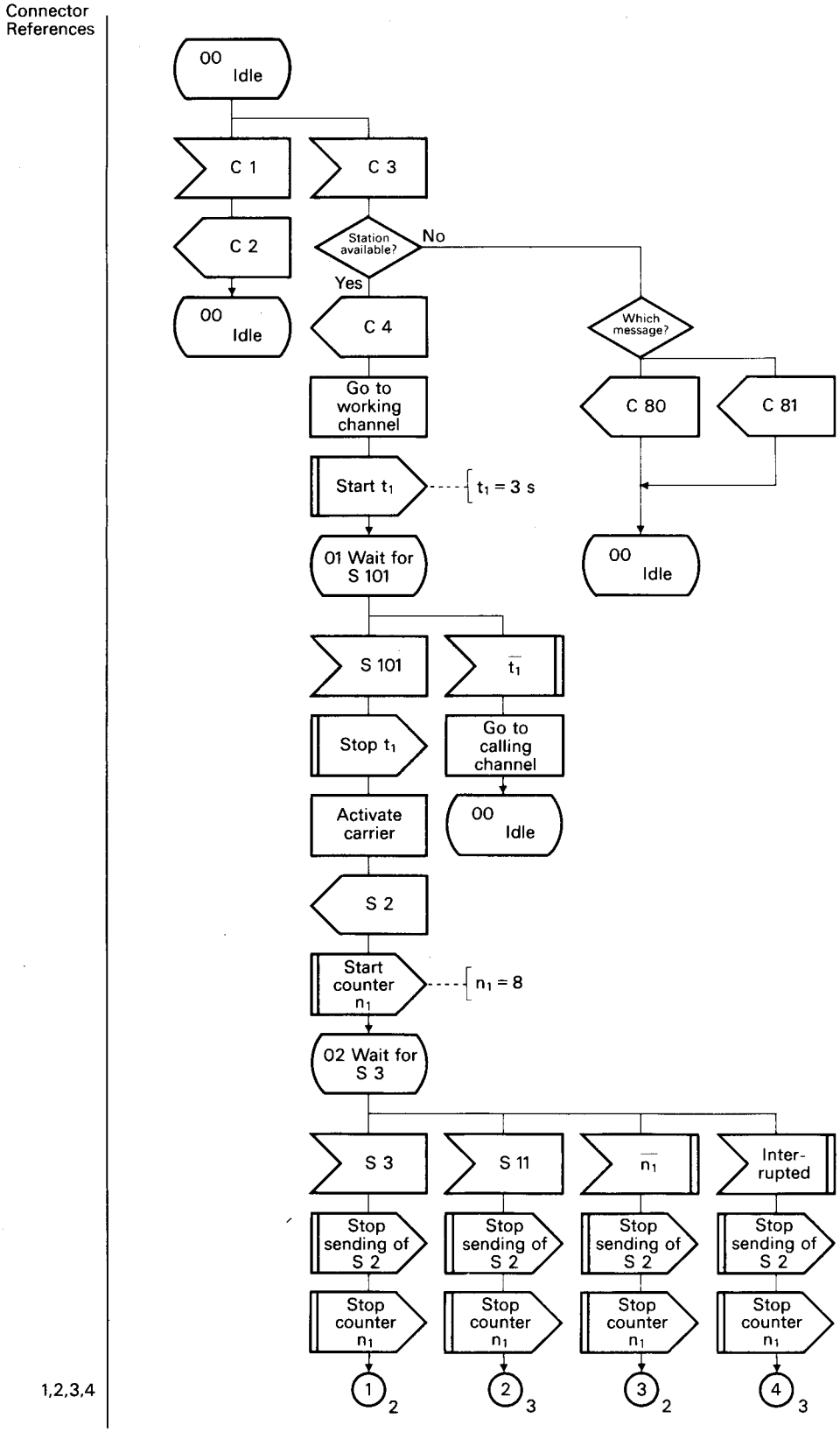
APPENDIX II

Sheet 4



APPENDIX III

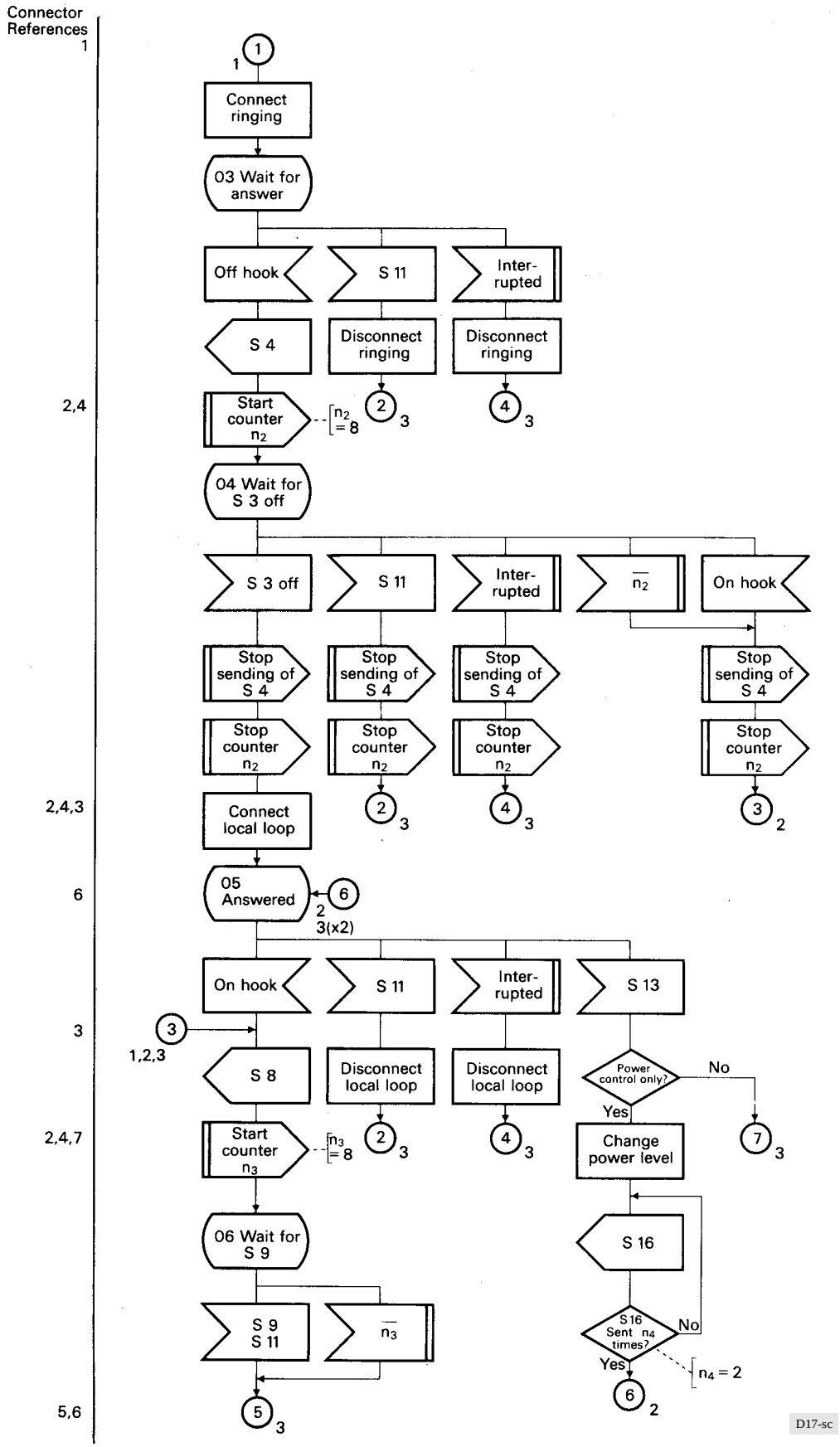
Sheet 1



Incoming procedure at ship (land-originated call) D16-sc

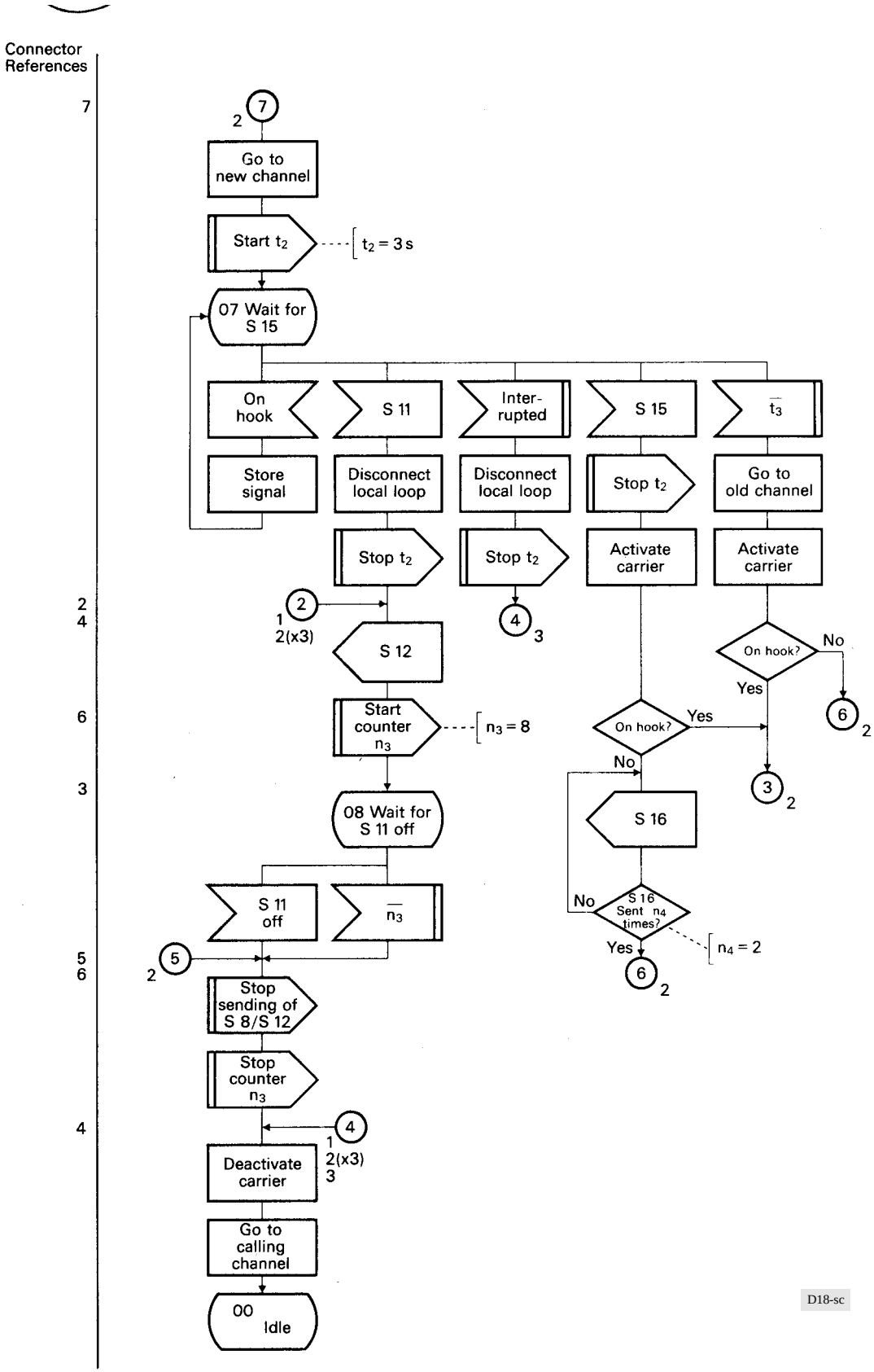
APPENDIX III

Sheet 2



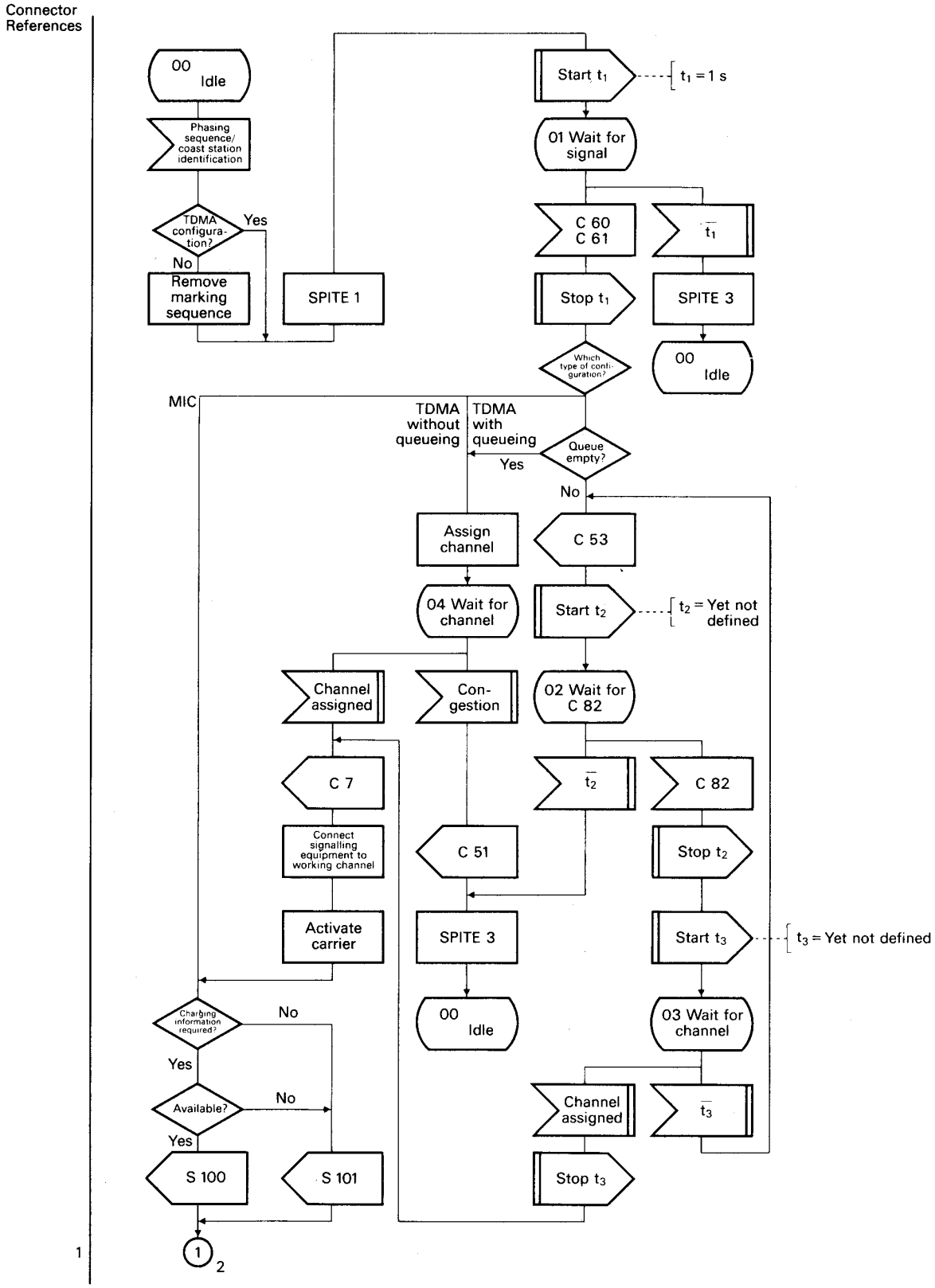
APPENDIX III

Sheet 3



APPENDIX IV

Sheet 1

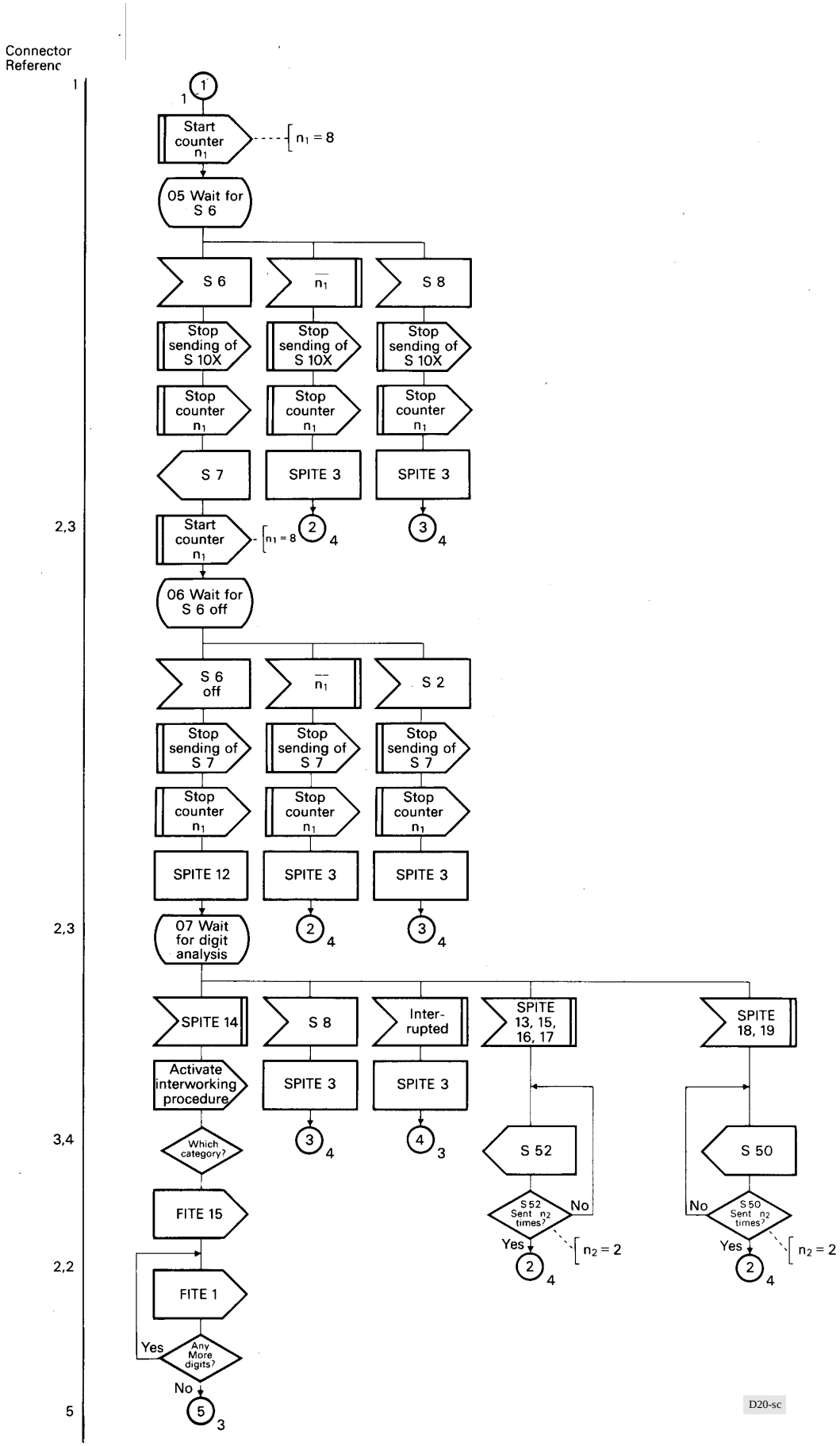


Incoming procedure at MSC (ship-originated call)

D19-sc

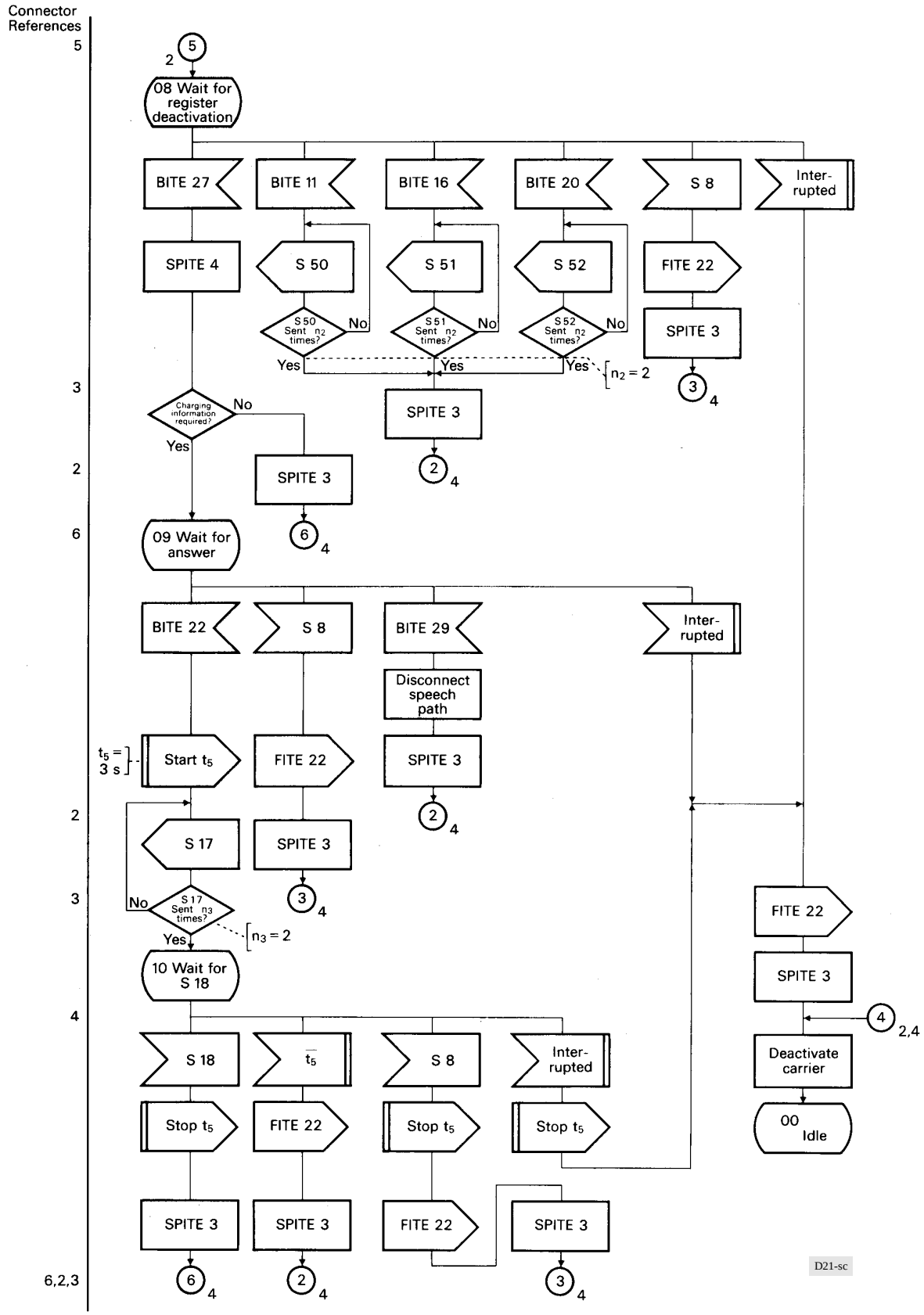
APPENDIX IV

Sheet 2



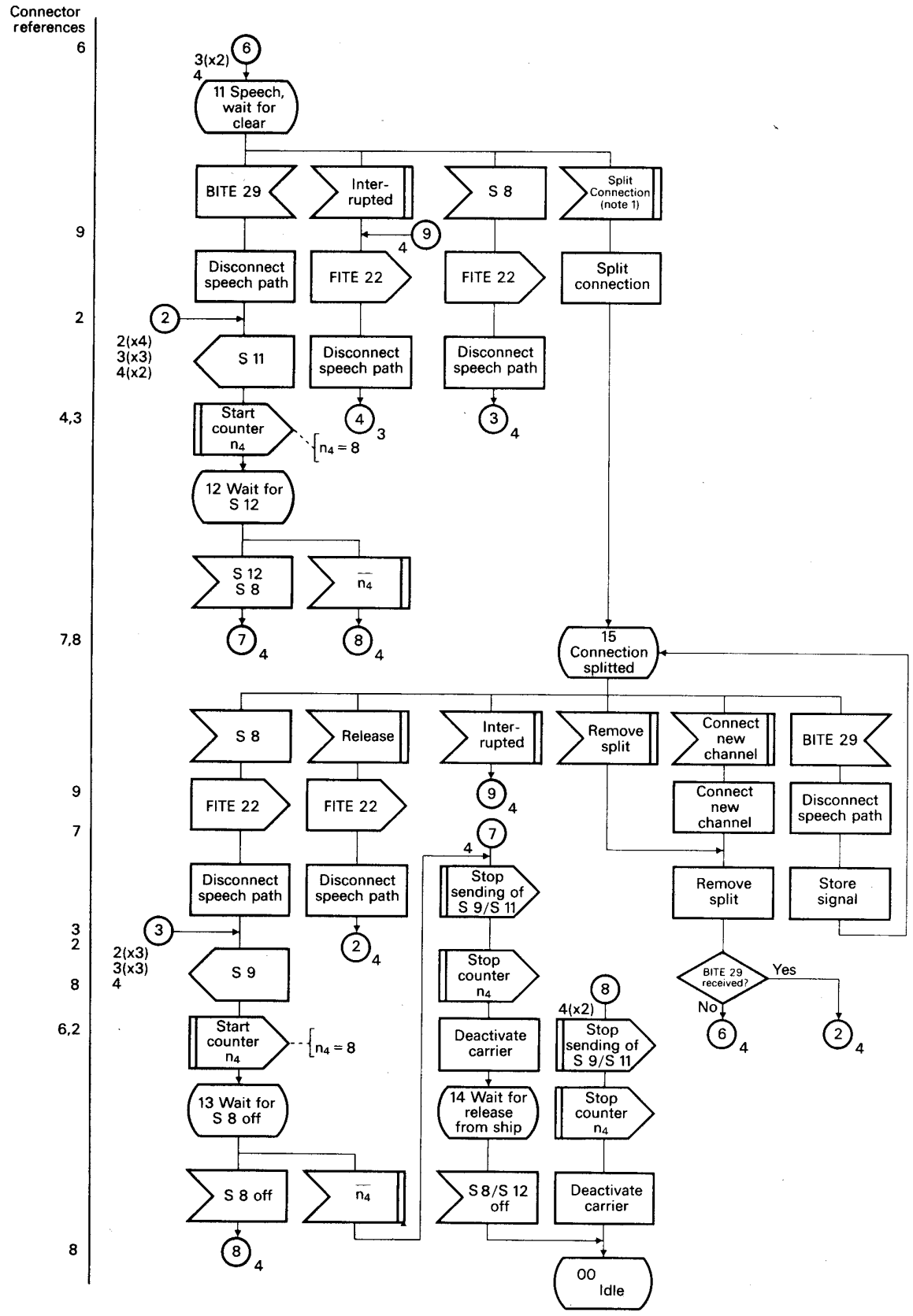
APPENDIX IV

Sheet 3



APPENDIX IV

Sheet 4

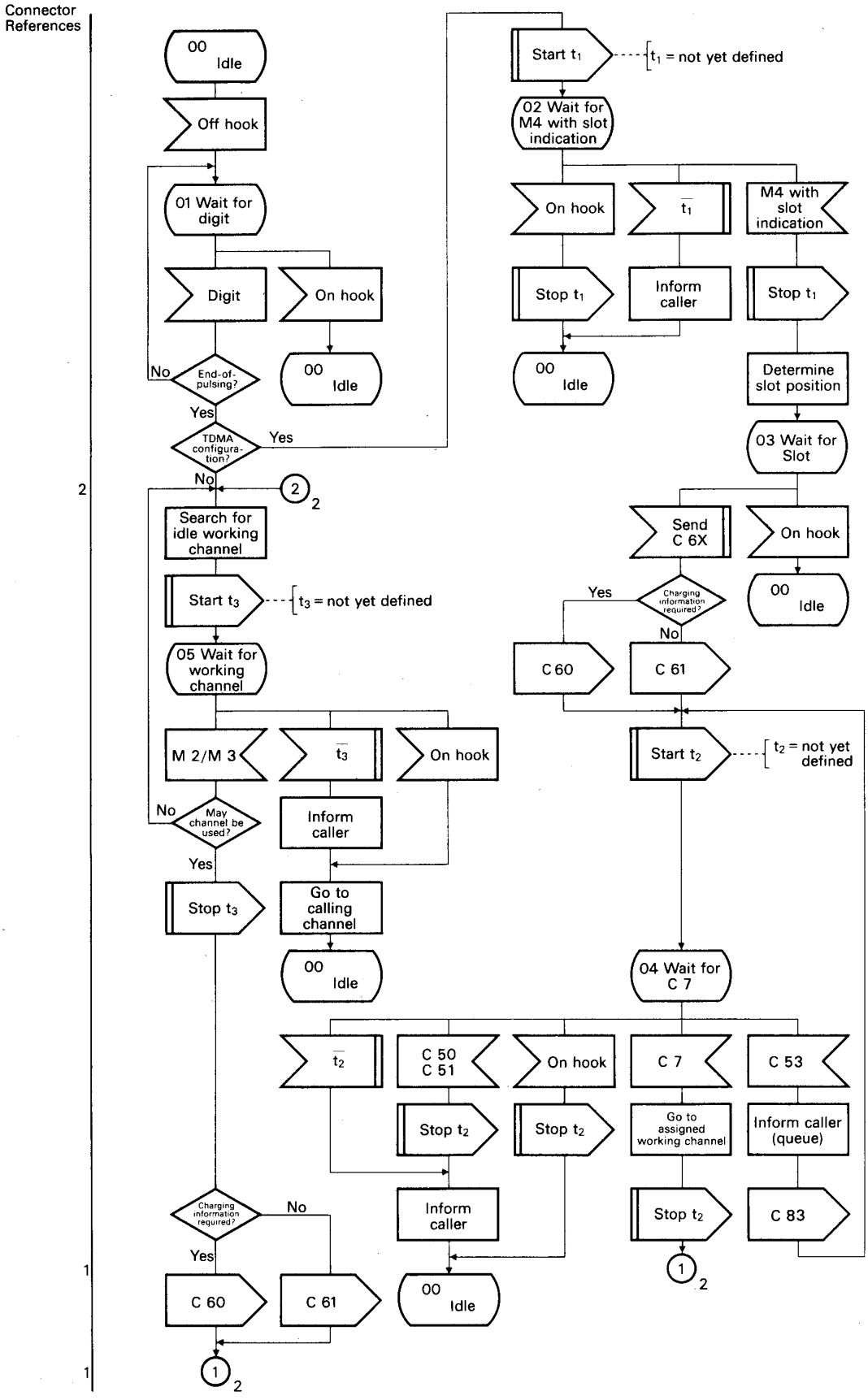


Note 1 – Signal used for initiating power level control and switching call in progress (see Appendix VI).

D22-sc

APPENDIX V

Sheet 1

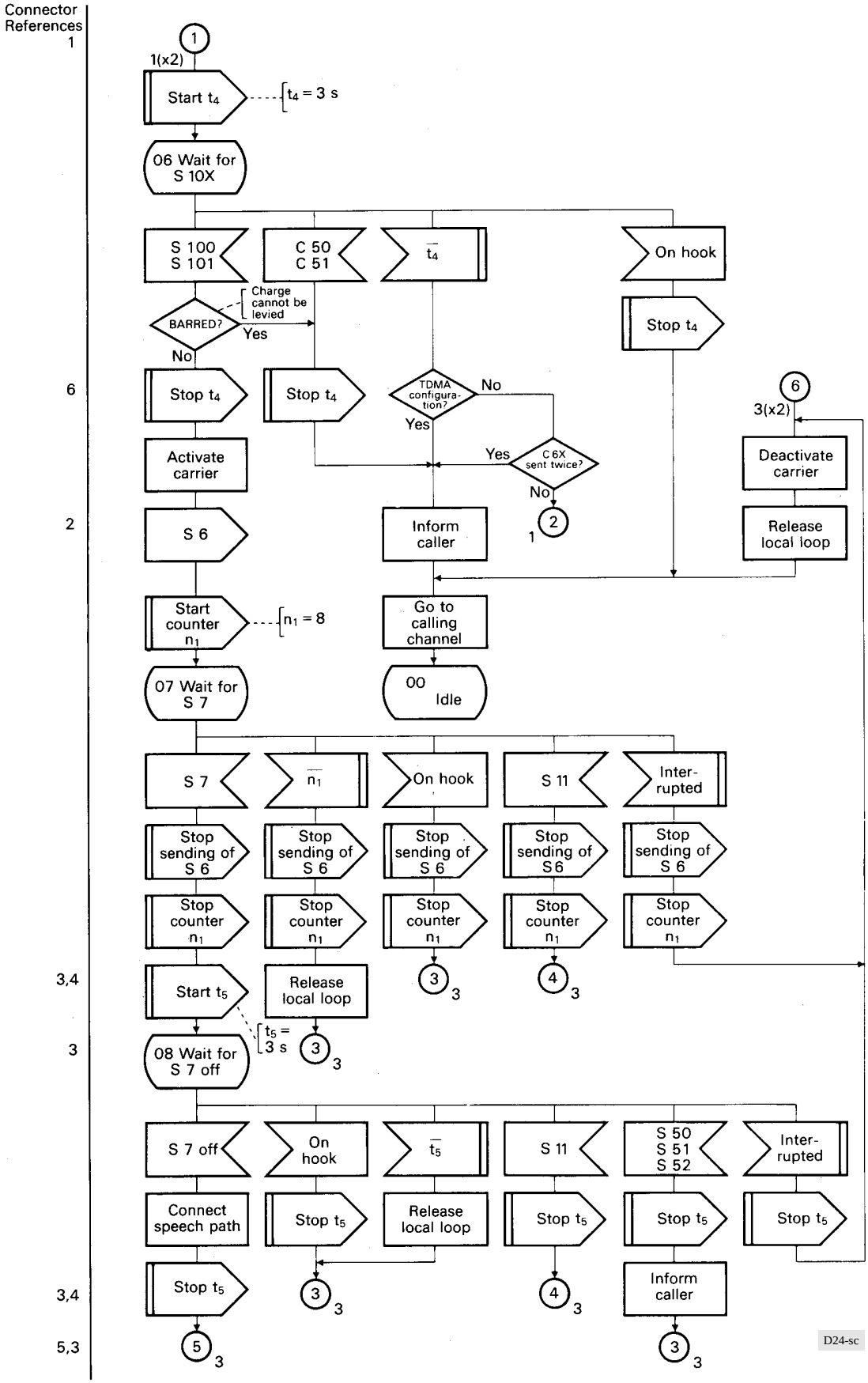


Outgoing procedure at ship (ship-originated call)

D23-sc

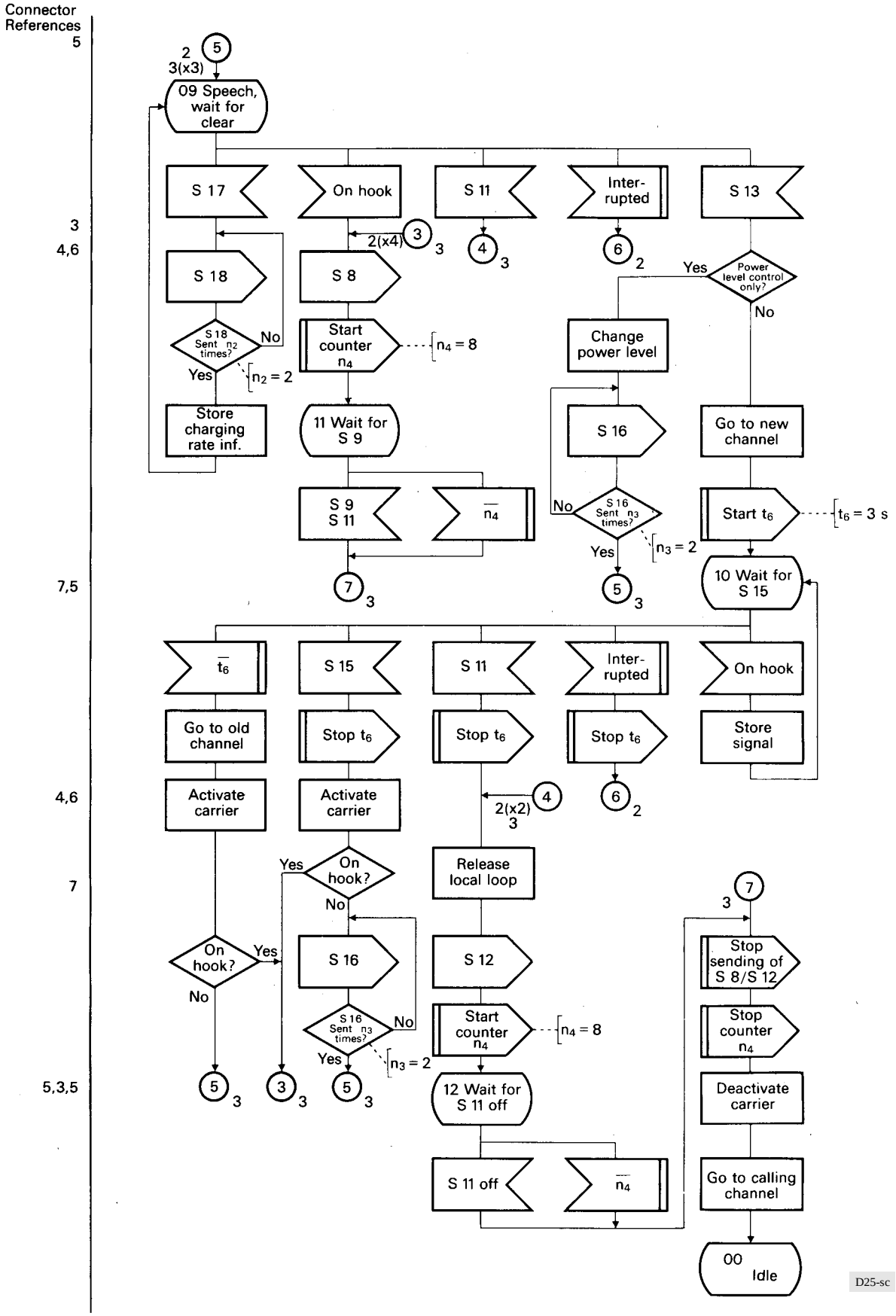
APPENDIX V

Sheet 2



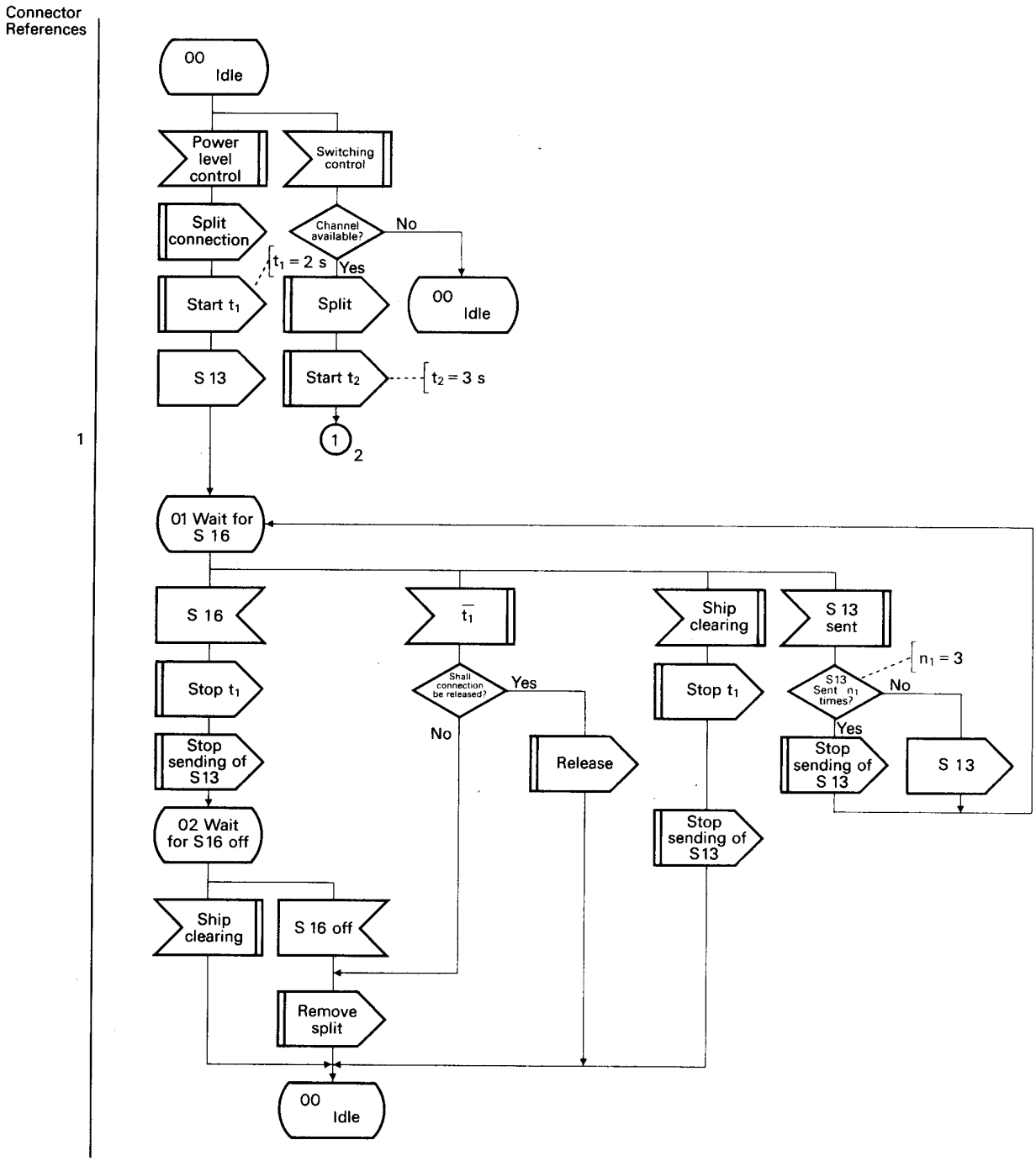
APPENDIX V

Sheet 3



APPENDIX VI

Sheet 1



Power level control and switching call in progress control at MSC

D26-sc

APPENDIX VI

Sheet 2