[1]Radio Regulations (Article 1, No. 71), ITU, Geneva, 1982.

[2]Ibid., (Article 1, No. 73).

) This is currently under study by INMARSAT.

(to Recommendation Q.1101)

Logic procedures for outgoing INMARSAT Standard A signalling system (shore originated call)

This annex only includes those elements of the INMARSAT Standard A system which have to be implemented for inter-working purposes.

Internal procedures such as those required for setting-up and clearing of the satellite link are not shown. They are only included by task symbols.

Other procedures not shown are:

- interruption control procedures related to the satellite link;

- pre-emption procedures for assigning channels to distress calls.

For more details on the first generation INMARSAT Standard A signalling system, see Annex A.

FIGURE C-1/Q.1101

State overview diagram for outgoing INMARSAT Standard A signalling system

FIGURE C-2/Q.1101

(Reserved for future notes)

FIGURE C-3/Q.1101

Outgoing INMARSAT Standard A signalling system

wNote 2w - Includes also address translated from any received prefixes.

wNote 3w - If implemented.

FIGURE B-3/Q.1101
(sheet 2 of 2)

Incoming INMARSAT Standard A signalling system

wNote 1w - Includes also translation of prefixes to the appropriate destination number.

FIGURE B-3/Q.1101
(sheet 1 of 2)

Incoming INMARSAT Standard A signalling system

FIGURE A-5/Q.1101

Clearing sequences for terrestrial originated calls

ANNEX B

(to Recommendation Q.1101)

Logic procedures for incoming INMARSAT Standard A signalling system (ship originated call)

This annex only includes those elements of the Standard A INMARSAT system which have to be implemented for inter-working purposes.

Internal procedures such as those required for setting-up and clearing of the satellite link are not shown. They are only indicated by task symbols.

Other procedures not shown are:

- interruption control procedures related to the satellite link:
- pre-emption procedures for assigning channels to distress call.

For more details on the first generation INMARSAT Standard A signalling system, see Annex A.

FIGURE B-1/Q.1101

State overview diagrams for incoming INMARSAT Standard A signalling system

FIGURE B-2/Q.1101

Whether a telephone call originated from a ship earth station or from the terrestrial network, the MSSC, upon receiving a clear-forward signal, will begin to clear the call independently in each direction.

The MSSC, receiving a 2600 Hz clearing tone from a ship earth station will initiate clearing toward the terrestrial network in accordance with procedures defined for the signalling system used between the MSSC and the ISC. This applies to both clear-forward and clear-back from the ship earth station. Clearing will also be continued in the maritime satellite system independent of the terrestrial network.

Clearing initiated in the terrestrial network would be recognized by the MSSC receiving the appropiate clear-back or clear-forward signal. For clear-forward, the MSSC would continue clearing with normal terrestrial procedures and begin clearing the maritime satellite circuit. For clear-back from the terrestrial network, normal time-out supervision will take place and clear-forward will commence either after expiry of time-out or after receipt of a clear-forward from the ship, whichever happens first.

As examples of clearing sequences, Figure A-4/Q.1101 illustrates the clearing of a ship earth station originated call and Figure A-5/Q.1101 illustrates the clearing of a call originated in the terrestrial network. For a terrestrial originated call which has clearing initiated by the ship earth station, the satellite circuit is cleared after the MSSC recognizes the stopping of the ship earth station carrier. The terrestrial circuit is held until the end of release guard sequence as shown in Figure A-5/Q.1101.

SES = Ship earth station

FIGURE A-4/Q.1101

Clearing sequences for ship earth station originated calls

wNotew - If implemented.

FIGURE A-2/Q.1101

Ship earth station originated calls

FIGURE A-3/Q.1101

Terrestrial originated automatic call

MSSC and the international connection is established. The answer signal, if implemented, may then be passed to the ship earth station 1).

A.4 Terrestrial originated calls

The normal call set-up procedure for automatic call processing from the terrestrial network to a ship earth station is shown in Figure A-3/Q.1101. The ISC selects a circuit and sends the seizing signal and the mobile terminal identification digits to the MSSC in accordance with the procedures used in the terrestrial signalling system. The MSSC then sends a request-for-assignment message to the NCS containing the ship earth station identity. The NCS responds by sending an assignment message to both the MSSC and the ship earth station. The MSSC and the ship earth station activate their carriers and send a 2600 Hz tone. Upon receipt of the 2600 Hz tone from the ship earth station the MSSC interprets this as an address complete condition, sends the ringing tone to the terrestrial network and stops sending 2600 Hz to the ship earth station. When the operator or subscriber at the ship earth station answers, the ship earth station discontinues sending its 2600 Hz tone.

The MSSC recognizes the cutting of the 2600 Hz tone as an answer signal from the ship earth station and begins the answer sequence toward the ISC as shown in Figure A-3/Q.1101.

The purpose of the MSSC is defined in § 2 of the Recommendation.

There is one operating Network Coordination Station (NCS) in each ocean area (there may in addition be one or more standby NCSs per ocean area). The main functions of the NCS are as follows.

The ship earth stations can only monitor one calling channel in the shore-to-ship direction. This calling channel, denoted as the common assignment channel, is transmitted by the NCS. Each coast earth station transmits its own calling channel which is monitored by the NCS for relaying signalling messages from a coast earth station to a ship.

The NCS also performs all assignment of telephone channels on a call-by-call basis and monitors the actual use of the channels for maintenance purposes. The NCS keeps an up-dated list of all busy ships in the ocean area. If a coast earth station calls a busy ship, the NCS may thus return a ship busy indication to the calling coast earth station on the common assignment channel.

The procedures are further described below.

A.3 Ship earth station originated calls

The normal call set-up procedure for automatic call processing from a ship earth station is shown in Figure A-2/Q.1101. The ship earth station transmits an out-of-band request message which includes the type of call desired, the identify of the MSSC through which the terminal wishes to communicate and the identification number of the ship earthstation.
* The NCS of an ocean area will normally be co-located with an MSSC of that area.

FIGURE A-1/Q.1101

**Composition of the maritime satellite system
for interconnection with the telephone network**

The MSSC upon reacting to the received request message, sends a Request for Assignment message to the Network Coordination Station (NCS). The NCS receiving the request for assignment message assigns a channel (frequency) and transmits this information in an assignment message to both the MSSC and the ship earth station. Both the MSSC and ship earth station receive the assignment message, automatically select the correct frequency, and initiate a continuity by transmitting a 2600 Hz tone.

When continuity has been established, the MSSC sends a dial tone pulse to the ship earth station. The ship earth station subscriber then dials in the desired prefix, country code and national significant number followed by an end-of-selection signal. The signals are transferred as in band push button signals on the satellite link.

The MSSC proceeds to select a terrestrial trunk and follows the standard signalling sequences of the signalling system used towards the ISC (Figure A-2/Q.1101). The ringing tone from the terrestrial network is allowed to pass directly to

a satellite link or on a circuit not containing a satellite link. The latter circuit should always be chosen (see Recommendation Q.14).

9.2 Ship originated calls

If the signalling system provided between the MSSC and the terrestrial network contains signals which may be used to indicate that one satellite link is included, such signals should be used.

If the signalling system does not contain such signals, the outgoing ISC should avoid forwarding the call on an outgoing circuit which includes a satellite link. If, however, the signalling system employed between the outgoing ISC and the next ISC in the connection contains such signals, the outgoing ISC should insert the required information. The outgoing ISC could base its procedure upon incoming route identification.

10Operator assistance for semi-automatic shore originated calls

If code 11/12 assistance facilities are not provided at the MSSC, then arrangements should be made to intercept such calls at the preceding ISC and route them to an appropriate operator.

It may be advantageous for Administrations to provide a publicized number (e.g. C12XXXX) for specialized assistance on calls to the maritime network.

ANNEX A

(to Recommendation Q.1101)

Brief description of the INMARSAT Standard A system

A.1 Introduction

This annex describes the signalling in the INMARSAT Standard A system in a multiple Maritime Satellite Switching Centre (MSSC) configuration, i.e., there is more than one MSSC serving an ocean region. Automatic call set-up and clearing are illustrated below. For calls which cannot be completed, the subscriber will receive from the MSSC or the terrestrial network the proper audible tone which describes the call status (i.e., busy tone, congestion tone).

A.2 System configuration

The INMARSAT system is composed as shown in Figure A-1/Q.1101. Only the components required for interfacing the telephone network are shown. There are additional interfaces similar to the MSSC for interfacing the telex network and

Shore originated calls

a) When the international connection between the outgoing ISC and the incoming ISC (or MSSC) does not normally require the use of echo suppressors, the incoming ISC (or MSSC) should enable (or insert) an outgoing half-echo suppressor associated with the satellite link.

b) When the international connection between the outgoing ISC and the incoming ISC (or MSSC) normally requires the use of echo suppressors, the incoming ISC (or MSSC) should disable (or should not insert) any half-echo suppressors associated with either the satellite or terrestrial link.

8Handling of group calls

8.1 General

A group call is a simultaneous call to a given group of ships. Such calls are identified by the following international number:

$$87S0X_2X_3...X_k$$

where the first digit of the ship station number has the fixed value 0. The remaining digits determine which group of ships is being addressed.

Facilities for originating group calls from operators either in the MSSC country or another country may be readily made available by permitting such calls only when the Z digit is a language digit. Group calls originating from ordinary telephone subscribers should not be permitted so long as calling line identification is not available.

8.2 Barring at the ISC of origin

In order to avoid setting up of the international chain for unauthorized group calls from ordinary subscribers, barring of such calls should, as a general rule, be done at the ISC of origin.

8.3 Barring at the MSSC

Barring should also be provided at the MSSC in order to reject group call attempts from ships or from subscribers in countries where barring at the outgoing ISC is not possible.

9Avoiding two or more satellite links in tandem

9.1 Shore originated calls

7.1 Terrestrial signalling systems with signals for control of echo suppressors

7.1.1
Ship original calls

The MSSC should send an echo suppressor indicator informing transit centres or incoming centres whether or not an incoming half-echo suppressor should be included.

Insertion of an incoming half-echo suppressor will always be requested if the MSSC does not carry out echo suppressor control.

7.1.2
Shore originated calls

The MSSC will decide whether or not to insert an outgoing half-echo suppressor depending on the received echo suppressor indicator. If echo control is not performed at the MSSC, the echo suppressor indicator will always inform the MSSC that an outgoing half-echo suppressor has already been included.

7.2 Terrestrial signalling systems without signals from control of echo suppressors

When signals for the control of echo suppressors are not available on the particular terrestrial route, significant advantage is to be gained by carrying out the echo suppressor control at the international exchange. In any case the following rules should be observed:

7.2.1
Ship originated calls

a) When the terrestrial connection between the outgoing ISC, (or MSSC) and the incoming ISC (or national incoming switching centre) does not normally require the use of echo suppressors, the outgoing ISC (or MSSC) should enable (or insert) an incoming half-echo suppressor associated with the satellite link.

b) When the terrestrial connection between the outgoing ISC (or MSSC) and the incoming ISC (or national incoming switching centre) normally requires the use of echosuppressors, the outgoing ISC (or MSSC) should disable (or should not insert) any half-echo suppressors associated with either the satellite link or the terrestrial link.

5.5 Clear-forward

When detecting a clear-forward from the satellite link, the MSSC should immediately pass the clear-forward signal into the terrestrial network.

When detecting a clear-forward from the terrestrial network, the release guard (and clearing) sequence should follow the procedures defined for the signalling system used.

5.6 Splitting arrangement

When in-band signalling is used over the satellite link for setting-up and clearing of the link, a splitting arrangement shall be provided in order to avoid that signalling tones are passed into the terrestrial network. The splitting time shall be less than 20 ms.

In order to protect the maritime satellite system from line signals used on terrestrial signalling systems, it should be observed that such signalling tones passing through splitting arrangements in the terrestrial network may have a maximum duration of 50 ms.

6Audible tones sent by the MSSC

Tones sent by the maritime switching centre (MSSC) should have the following characteristics:

Dial tone: 425 Hz (1.5 seconds maximum, minimum is determined by receipt of first dial digit)
Ringing tone:425 Hz (1 second on, 4 seconds off, immediate ringing)
Busy tone: 425 Hz (1/2 second on, 1/2 second off)
Congestion tone:425 Hz (1/4 second on, 1/4 second off)
Special information tone:as defined in Recommendation Q.35.

Note - The dial tone is given as 1.5 seconds pulse in order to avoid subscribers' confusion due to the two-way transmission delay of 0.5 seconds. If the normal continuous tone with interruption after the receipt of the first digit was used, the delay would cause the tone to stay on after entry of the first digit.

7Control of echo suppressors

Since all calls to and from a ship earth station will include a satellite link, appropriate actions must be taken to insert an incoming or outgoing half-echo suppressor at the MSSC or at an international exchange closer to the terrestrial subscriber. The ship earth station will connect to the satellite link on a 4-wire basis or will be provided with the equivalent of a half-echo suppressor. In order to reduce the analysis and control requirements at the MSSC it may prove convenient to carry out all echo suppressor control at one of the international exchanges rather than at the MSSC. This is most easily achieved by fitting permanent half-echo suppressors at the ISC end of each MSSC-ISC circuit. In any case the overall

5.1 Setting-up time for shore originated calls

The setting-up time for shore originated calls should be as short as possible. If the MSSC has not been able to establish the connection within a period of 20 seconds after receipt of all address digits, a congestion indication should be returned.

Note - In maritime satellite systems the setting-up time is not controlled by each individual MSSC but may depend on the overall traffic load in the system and on the assignment procedure used. For several reasons the setting-up time of the radio path is likely to be longer than the setting-up time of the subscriber connection in terrestrial systems.

5.2 Transmission of answer signal

5.2.1 When the maritime satellite switching centre (MSSC) detects the answer signal from the maritime satellite system, the MSSC must remove the ringing tone, through-connect the circuit and return the answer signal as soon as possible to the terrestrial switching centre.

Precautions should be taken at the MSSC to avoid interpreting an interruption of the satellite link as an answer signal.

5.2.2 For ship originated calls the maritime satellite system should preferably include provisions for transferring the answer signal to the ship earth station.

5.3 Seizure of a terrestrial circuit from the MSSC

The maritime satellite switching centre should not seize a terrestrial circuit before each of the following conditions has been met:

- the satellite channel has been assigned;
- the continuity of the satellite channel has been verified;
- all digits necessary for routing decision by the maritime satellite switching centre have been received.

5.4 Clear-back conditions

5.4.1 The clear-back/re-answer sequence may not apply for shore originated calls, in which case the satellite link will be released when a clear-back signal is detected at the maritime satellite switching centre from the satellite link, without waiting for a clear-forward signal from the terrestrial network.

Precautions should be taken either at the MSSC or at the ship earth station in order to avoid unintentional clearing.

5.4.2 For ship originated calls the normal clear-back procedures should apply (see Recommendation Q.118).

code, to identify the type of operator required (see Recommendation Q.11$_{w}$quater$_{w}$).

The MSSC could then convert the received dialling information as required for setting up the terrestrial connection to the operator.

4.5$_{w}$Special service terminations$_{w}$

The desired MSSC is selected at the ship earth station by procedures within the maritime satellite system. After the dialling tone has been provided to the subscriber, he will dial a two digit prefix possibly followed by other digits to identify the type of special service termination required. (See Recommendation Q.11$_{w}$quater$_{w}$.) The MSSC should convert the received dialling information as required for setting up the terrestrial connection.

- Q.107, sending sequence of forward-address information
- Q.107$_{w}$bis$_{w}$, analysis of forward-address information for routing
- Q.109, transmission of the answer signal
- Q.112 through Q.114, transmission clauses
- Q.115, control of echo suppressors
- Q.116 through Q.118$_{w}$bis$_{w}$, abnormal conditions.

4Sending sequence of numerical (or address) signals

4.1$_{w}$Calls toward ship earth station$_{w}$ [2]$_{w}$ (shore-to-ship)$_{w}$

In most cases the MSSC will not need the information contained in the S-digit of the country code 87S. In this situation the sequence of forward-address information sent to the MSSC should be as for a terminal international call.

Cases may arise where an MSSC requires the S-digit to distinguish between ocean areas, satellite systems or VHF/UHF vs. satellite. In this situation the sequence of forward-address information should be as for an international transit call, i.e. the sequence includes the country code 87S.

4.2$_{w}$S-digit$_{w}$

It is a matter for the terrestrial subscriber to choose the proper S-digit and the MSSC to be used will be decided by the outgoing country. (For technical reasons accounting between Administrations should be performed on the basis of only 87S.)

4.3$_{w}$Calls from ship earth station (ship-to-shore)$_{w}$

The desired MSSC is selected at the ship earth station by procedures within the maritime satellite system. After the dialling tone has been provided to the subscriber, he will dial a prefix followed by the full international telephone number required, whether or not the MSSC is located in the required subscriber's country (see also Recommendation Q.11$_{w}$quater$_{w}$).

The prefix must be suppressed by the MSSC since it is only required for internal routing in the MSSC.

For calls to subscribers in the MSSC country, the country code should also be suppressed by the MSSC.

A discriminating digit must be inserted by the MSSC according to Recommendation Q.104.

4.4$_{w}$Operator services$_{w}$

The desired MSSC is selected at the ship earth station by procedures within the maritime satellite system. After the dial-

- Q.11, Q.11$_{w}$bis$_{w}$, Q.11$_{w}$ter$_{w}$, and Q.12, Q.13, numbering and routing plan
- Q.14, means of controlling the number of satellite links
- Q.15 through Q.22, general Recommendations
- Q.23, technical features of push-button telephone sets
- Q.25, splitting arrangement
- Q.26 through Q.33, miscellaneous provisions
- Q.35, tones of national signalling systems
- Q.40 through Q.45, transmission characteristics
- Q.102, facilities provided in international automatic working
- Q.103, numbering used
- Q.104, language digit or discriminating digit
- Q.105, national (significant) number

GENERAL REQUIREMENTS FOR THE INTERWORKING OF THE TERRESTRIAL TELEPHONE NETWORK AND INMARSAT STANDARD A SYSTEM

1Introduction

1.1The purpose of this Recommendation is to define the general interworking requirements between the telephone network and the INMARSAT Standard A system.

1.2In order to support automatic working between subscribers in the public telephone service and telephone subscribers to the maritime mobile-satellite service, it is necessary that the interface between the terrestrial telephone network and the maritime satellite system be defined.

1.3It should be possible to interface the maritime-mobile satellite system with any signalling system standardized by the CCITT for automatic working. In order to facilitate the preparation of the interworking equipment, and also aiming at the international standardization of the service, this Recommendation lists several basic interworking requirements common to all signalling systems.

1.4More specific interworking requirements applicable to System No. 5 are given in Recommendation Q.1103 and System R2 are given in Recommendation Q.1102.

1.5A brief description of the INMARSAT Standard A system is given in Annex A. SDL descriptions of incoming and outgoing signalling procedures for the INMARSAT system are given in Annexes B and C respectively.

1.6Interworking between the telephone network/ISDN and other INMARSAT systems is given in separate Q-Series Recommendations.

2Maritime satellite switching centre

For the purpose of this Recommendation the term Maritime Satellite Switching Centre (MSSC) is used to indicate the interworking point between the terrestrial telephone network and the maritime satellite system. The maritime satellite switching centre (MSSC) may be located at the antenna site of the coast earth station [1] and operate as an independent international switching centre connected to one or more international switching centres (ISCs) or national switching centres, or it may be remote as a supplement to or as a part of an international switching centre.

3List of general Series Q Recommendations