THE DRAWINGS CONTAINED IN THIS SUPPLEMENT HAVE BEEN DONE IN AUTOCAD.

Supplement No. 2

SIGNALLING ARRANGEMENTS IN THE MARITIME SATELLITE TELEX SERVICE VIA THE MARISAT SYSTEM

[*Source:* Kokusai Denshin Denwa Co., Ltd. (KDD)]

1 Introduction

In response to Recommendation U.4, this supplement describes the characteristics and signalling conditions of the Maritime Satellite Service being provided by KDD in Japan. The coast earth station at Yamaguchi was built by KDD to access the Indian Ocean MARISAT satellite.

Coast earth stations can be grouped into two types. As shown in Figure 1 *a)*, a coast earth station can be viewed as a gateway to accommodate international circuits directly by giving it routing, charging and other functions. On the other hand [Figure 1 *b)*] to simplify its functions the coast earth station can be regarded as a line concentrator, or local switch.

The Yamaguchi station is regarded as a local switch in the KDD telex network and uses domestic signalling, conforming to Recommendation U.1 (type B), between the station and a Tokyo gateway (CT10). Figure 1 shows the network configuration.

2 Numbering and routing

Ship stations are accessed by 3—digit destination codes of Recommendation F.69 [1] assigned to each maritime satellite (583 is assigned to the Indian Ocean satellite) and 7—digit ship numbers. Ship stations gain access by means of 2— or 3—digit destination codes of Recommendation F.69 [1] and subscriber numbers. When a ship station accesses a KDD operator for number inquiry, etc., the coast earth station converts the 2—digit number before sending it to the gateway.

Generally, maritime telex calls are connected automatically, while distress, urgent and safety calls have come to be operated manually.

3 Charging and accounting

At present, information, based on conversation time, about both subscribers' charging and international accounting is recorded onto the same toll ticket by transferring the originating subscriber's number to the gateway in the KDD network where it is recorded.

One of the tariff parameters in maritime satellite communications is space segment utilization. In order to base the accounting on holding times (including the time required for setting—up calls), recording at coast earth stations will be necessary. Fortunately, the MARISAT system has the same accounting structure as telex networks (i.e. based on conversation time). It is, therefore, possible to get charging and accounting information (including the space segment) from only one record, by transferring ship station numbers to gateways, and by utilizing the charging and accounting function of gateways.

Items recorded for ship originated calls are:

a) ship station number,

b) address number,

c) outgoing route information,

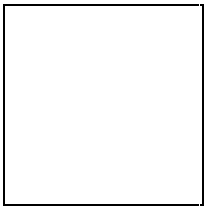
d) date and time at start of charging and accounting,

e) time at release of the connection.

Items recorded for calls originated by domestic subscribers are:

1) domestic subscriber number,
2) ship station number,
3) date and time at start of charging and accounting,
4) time at release of the connection.

Figure 1/Suppl. 2 - CCITT 47510



Items recorded for calls originated by foreign subscribers are:

i) incoming route information,
ii) ship station number,
iii) date and time at start of accounting,
iv) time at release of the connection.

Ship station numbers up to nine digits can be handled. Time information is recorded in units of seconds.

The above information is recorded at the outgoing gateway, or at gateways which have operator positions. For ship originated calls, a reference number consisting of the date, time in Japanese Standard Time (JST), and circuit number is sent by the charging gateway to the ship station when calls are accepted. The chargeable duration of communications is sent when signals indicating the end of call are received.

4 Signalling

When introducing a new service, the first consideration must be to minimize the impact on the existing network. For example, a call setting—up procedure from a ship station meeting this objective must be like the one shown in Figure 2. However, considering that shipboard operators are already familiar with the procedure at the U.S. coast earth stations, the procedure shown in Figure 3 has been adopted to unify the call setting—up procedure.

Figure 2/Suppl. 2 - CCITT 47520

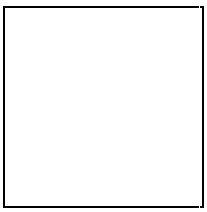
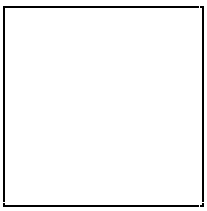


Figure 3/Suppl. 2 - CCITT 47530



4.1 *Ship originated call*

See Figure 2.

4.1.1 *Acceptance of requests*

Ship stations sending request signals are checked to determine whether or not they are authorized in the MARISAT system. Requests from ship stations that are not authorized are neglected. However, requests for distress calls are unconditionally accepted.

Request signals are of two types — release requests and assignment requests. On reception of a release request, a *channel release* is sent if a channel has already been assigned to that station; if an assignment request is waiting in a queue, it is deleted from that queue.

In the case of assignment requests, a *request not acceptable* is sent if assignment requests have already been accepted. Requests from ships to which the coast earth station is broadcasting are accepted. *Request not acceptable* is sent when request signals contain errors.

For routine requests, a circuit is assigned to the ship if there is an idle circuit. If there is no idle circuit, the request signal is put into the queue, and *acknowledged message (queue)* is sent. The length of a queue can vary up to a maximum size of 10.

In the case of distress requests, the request is handled in the same manner as for routine calls if there is an idle circuit. If there is no idle circuit, one circuit is pre—empted automatically. The priority order for this is as follows:

a) a circuit in setting—up procedure;

b) a circuit in progress.

For urgent or safety requests, the same procedure that is applied to routine calls is taken.

A circuit is selected from the higher order channel numbers.

After the request is accepted, the polarity of the transmission line on the gateway side is immediately inverted from an A polarity to Z polarity (backward busy). This backward busy signal is released on reception of the end—of—selection signal (+) from the ship station. However, in the case of distress, urgent, or safety requests, this signal is released after the second answerback is received from the ship.

During this time, the receive channel from the gateway is not monitored.

4.1.2 *Response to assignment*

If the carrier does not arrive at the coast earth station within ten seconds of sending the assignment signal, a second identical *assignment* signal is sent. The call is released if carrier is not received within a further ten seconds.

4.1.3 *Response to coast earth station identification*

The “Who are you?” signal is sent out after receiving a carrier, but the call is released unless a group of 20 characters (ship's answerback) is received within ten seconds. After receiving the answerback, the coast earth station identification (<-=**KDD**->**xx**->**xxxx**Z-> where **xx** and **xxxx** are the date and time in UTC) and “Who are you?” are sent. Unless a further answerback is received within ten seconds, the call is released. Any characters received from ship stations while sending *Who are you*? or coast earth station identification signals are neglected, and character groups received are not checked as to whether answerbacks are those of eligible ship stations, or not.

4.1.4 *Processing of selection signals (except distress, urgent and safety)*

The numerical information received from the ship station between the end of the ship's answerback and the end—of—selection signal is stored. It is checked to see that the inter—digit pause does not exceed 16 seconds. The call is also released should the numerical information exceed 15 digits.

In cases where the first—digit numerical information is "1", the following conversion is performed:

a) Numbers 10 and 19 are converted to a number for the information position at the Tokyo gateway.

b) Number 18, to a number for the telephone booking position at the Tokyo international telephone office.

c) Numbers 17 and 16 are also accepted for the connection to the technical operator's position at the shore station and automatic test code sender respectively.

d) Any characters received from ships between the end—of—selection signal and connect—through are ignored.

4.1.5 *Transmission of a calling signal*

After releasing the backward—busy signal, reception of the clear—confirmation signal (A polarity for 450—600 ms) is confirmed. Three seconds later, a calling signal (inversion from A to Z polarity) is sent to the gateway. Unless the clear—confirmation signal is received within five seconds, the circuit is released after returning the service signal **NC** to ship station.

4.1.6 *Response to a calling signal*

Unless proceed—to—select (a Z polarity pulse for 20—40 ms followed by A polarity for 20 ms) is received from the gateway within three seconds of it sending a calling signal, the calling signal is repeated after sending an A polarity for three seconds. If no proceed—to—select signal is received in this time, the circuit is released after returning **NC** to the ship. The gateway side is cleared after detecting the clear confirmation signal and *carrier off* (three sequential TDMA bursts missing) from the ship. Three seconds thereafter, a retest signal (a Z polarity pulse for two seconds) is periodically sent to the gateway. If the proceed—to—select signal is received while sending the Z polarity, the retest is stopped, and the circuit status is made idle three seconds after receiving a clear—confirmation signal from the gateway. If a calling signal is detected while sending the A polarity, retest is stopped and the call is accepted.

Failure to receive a proceed—to—select signal after making five retests at one—minute intervals and, thereafter, an additional five at 30—minute intervals, causes the circuit status to be changed to a fault condition.

A head—on collision is registered and the gateway side is released if Z polarity is received continuously for more than 40 ms against a calling signal. Three seconds after receiving a clear—confirmation signal, a calling signal is again sent out. Failure to receive a clear—confirmation signal within five seconds causes the ship station to be released after returning **NC**, and the gateway is released after detecting the clear—confirmation signal and *carrier off* condition from the ship station.

4.1.7 *Sending of selection signals*

After receiving a proceed—to—select signal from the gateway, the coast earth station sends a selection signal in one of the formats shown in Table 1. The numerical information is coded using a 2—out—of—5 code.

Priority calls are connected to a special operator position at the Tokyo gateway.

The class of calling party is used for barring and other uses in the KDD network. Number 02 is assigned to MARISAT ship stations, and number 21, to priority calls.

TABLE 1

Routine	↓ Start of selection	02 Class of calling party	xxxxxxx Ship station number in the out—of—band request signal	V Delimiter	xxx...x Numerical information from ship	E End of selection
Distress, urgent and safety	↓ Start of selection	21 Class of calling party	xxxxxxx Ship station number	V Delimiter	xxx Position's number	E End of selection

4.1.8 *Response to selection*

After sending the end—of—selection signal to the gateway, the coast earth station inspects the return channel for 10 seconds to detect the gateway call—connected signal (Z polarity for 100—150 ms). The circuit is connected through if this is successfully detected.

Failure to detect the call—connected signal results in the release of the ship station after returning **NC**, the channel to the gateway being released after receiving the clear—confirmation signal, and *carrier off* from the ship station.

4.1.9 *Monitoring after through—connection*

See Figure 4.

The circuit is monitored at the coast earth station. When a clearing signal (an A polarity for 450—600 ms) is detected, either from the ship station or the gateway, the circuit is split at this point.

When clearing from the ship station, the clear—confirmation signal is returned to the ship station after splitting the circuits without waiting for a clear—confirmation signal from the gateway or a *carrier off* from the ship station.

The ship status is changed to the idle condition when *carrier off* has been detected, and the circuit's status is changed to the idle condition three seconds after a clear—confirmation signal has been received from the gateway and the conditions for the detection of *carrier off* have been fulfilled.

In the case of clearing from the gateway, the circuits are split when the clearing signal is detected. Then, the ship station status is changed to the idle condition when *carrier off* is detected after the arrival of a clear—confirmation signal from the ship station. At the same time, the clear—confirmation signal is returned to the gateway, and the circuits status changed to the idle condition after three seconds.

Unless a clear—confirmation signal and *carrier off* are received from the ship within 60 seconds of sending a clearing signal to the ship, or unless *carrier off* is received from the ship within 60 seconds of sending a clear—confirmation signal to the ship, a backward busy signal is sent to the gateway, and *channel release* command is sent to the ship, five times at intervals of one minute. *Carrier off* is then expected. Failure to detect *carrier off* causes the circuits and ship stations to be regarded as having failure status.

If *carrier off* is detected when release is not detected in both directions, the circuits are split, and clearing signals are sent to both the ship station and the gateway. A backward busy signal is sent to the gateway after receiving a clear—confirmation signal from the gateway. When *carrier off* is detected prior to a clear—confirmation signal after sending a clearing signal to the ship, an A polarity is sent for three seconds to the gateway, following which a backward busy signal is sent. In either case, a backward busy signal is sent for 50 seconds after receiving *carrier off*, and the circuits are made idle three seconds thereafter. The ship station is made idle when *carrier off* is detected.

If five continuous *full stops* (ITA 2 combination No. 13) or *commas* (ITA 2 combination No. 14) are received from the ship station together with release and *carrier off*, the circuits are split for 600 ms. During this time, an A polarity is continuously sent to the gateway, and a Z polarity, to the ship stations.

For *carrier off* with less than three sequential TDMA bursts, the circuits are maintained in a condition of through—connection, and characters stored are sent to the ship station when the carrier recovers.

4.2 *Shore originated call*

See Figure 5.

4.2.1 *Sending of proceed—to—select signal*

When a calling signal from the gateway is detected (Z polarity for 100 ms), a proceed—to—select signal (Z polarity for 25 ms) is sent in response to it.

4.2.2 *Processing of selection signal*

After sending a proceed—to—select signal to the gateway, the coast earth station monitors the channel for 16 seconds to detect the start—of—selection signal (ITA 2 combination No. 29). If it fails to receive it, the circuit status is changed to a hold condition until the receiving line from the gateway is cleared. The characters received after receiving the start—of—selection signal are stored while performing inter—digit pause monitoring for 16 seconds, until an end—of—selection (ITA 2 combination No. 5) is received. Should a failure be detected the gateway is released after returning the service signal **NC**.

Figure 4/Suppl. 2 - CCITT 47540

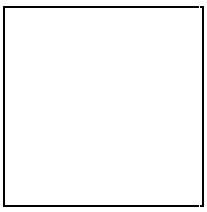
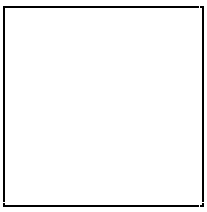


Figure 5/Suppl. 2 - CCITT 47550



The formats of selection signal received are as follows. Numerical information is coded using the 2—out—of—5 code.

↓	xx	V	xxxxxxx	E
Start of selection	Class of calling party	Delimiter	Ship station number	End of selection

Checks made to the ship station number and to the service signals returned to the gateway are given in Table 2.

TABLE 2

Checks	Service signal
Ship station is engaged	**OCC**
Ship station is not authorized	**NA**
Ship station is out of service (failure to stop carrier)	**DER**
Ship station number is other than seven digits	**NP**

Checks made to selection signals and service signals are given in Table 3.

TABLE 3

Checks	Service signal
Checking of 2—out—of—5—codes	**NC**
Checking of class of calling party for broadcast	**NA**

The kinds of class of calling party are: 1) foreign subscribers, 2) domestic subscribers and 3) service. At present, only service calls are accepted for broadcast calls.

4.2.3 *Response to assignment*

If a carrier is not received in the assigned channel within 10 seconds of sending an assignment, the call to the ship station is repeated by sending an assignment of the same content. If a carrier is not received within a further 10 seconds, the ship station is released, and the gateway is released by returning the service signal **ABS**.

4.2.4 *Response to coast earth station identification*

After receiving a carrier from the ship station, the coast earth station identification and "Who are you?" signal are sent. If the answerback sequence (group of 20 characters) is not received from the ship station within 10 seconds of the completion of the coast earth station identification, the gateway is released by returning **DER**. Characters from the ship other than the 20—character group are ignored until the sending of the station identification has been completed. Characters received between the end of the 20—character group and connect—through are returned to the ship station as they are received.

4.2.5 *Through—connection*

After receiving the answerback sequence from the ship station, a call—connected signal (a polarity inversion to a Z polarity) is sent to the gateway. Three seconds thereafter, the stored answerback sequence from the ship station is sent.

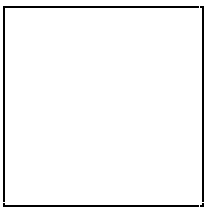
4.2.6 *Monitoring after through—connection*

This is the same as the procedure for a ship originated call.

4.3 *Broadcast*

See Figure 6.

Figure 6/Suppl. 2 - CCITT 47560



4.3.1 *Call—connected signal*

Seven seconds after sending an assignment, a call—connected signal is returned to the gateway.

4.3.2 *Coast earth station identification and dummy answerback*

Three seconds after returning a call—connected signal, a dummy answerback in the following format is returned to the gateway, and coast earth station identification is returned to the ship:

↓ ← ≡ ↓ ↓**GA** → ↑ **xxxxxxx** ↓ ← ≡

Where **xxxxxxx** is the ship station number in the selection signals from the gateway.

The circuit is connected through after completing the return of the dummy answerback.

Reference

[1] CCITT Recommendation *Plan for telex destination codes*, Rec. F.69.