5i’

(cs,2) Disk. 360 NF01/027 (OPM = NF01)

(cs,3) Disk. 361 NF01/034 (OPM = NF02)

(ATTENTION NOTE REPETITIVE COMMENCANT AU NUMERO 15):

xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx xx xx xxxx

---

National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.
National option.

(1BT) (BT10) Disk. 360 NF01/005

(67.TE.05.E)

(A1.23e) / [26e] **FOLIOS: 175 — 227 (DO PRC.COSY.2)**

MEP **[PA1]** : OK= [1]

Saisie 25.04.89 SB

ID + LASER 22.05.89 CW

MAJ diskette 24.05.89 CW

Corr. LASER (1re ´epreuve) = 3eme 26.05.89 GG

Espaces r´eserv´es 30.05.89 CW

AJOUTER (PA1) (CL1,0,0,0) pour MEP

MEP + LASER 13.06.89 GH/PC

Corr. MEP

Insertion des tableaux (tabulateurs...)

BAT du 6/6/89 07.07.89 PV

MAJ s/disquettes 2.07.89 CD

MONTAGE: FIN DU § 12.7 EN-TETE DE CETTE PAGE

13.1 *General*

National option.
The purpose of the signalling route management function is to ensure a reliable exchange of information between the signalling points about the availability of the signalling routes.

The unavailability, restriction and availability of a signalling route is communicated by means of the transfer-prohibited, transfer-restricted and transfer allowed procedures, respectively in §§ 13.2, 13.4 and 13.3.

Recovery of signalling route status information is made by means of the signalling-route-set-test procedure specified in § 13.5.

In the international signalling network, congestion of a route set is communicated by means of the transfer-controlled (TFC) messages specified in § 13.6.

In national networks, congestion of a signalling route set may be communicated by means of the TFC as specified in §§ 13.7 and 13.8 and the signalling route set congestion test procedure specified in § 13.9.

13.2 *Transfer prohibited*

13.2.1 The transfer-prohibited procedure is performed at a signalling point acting as a signalling transfer point for messages relating to a given destination, when it has to notify one or more adjacent signalling points that they must no longer route the concerned messages via that signalling transfer point.

13 Signalling route management

The transfer-prohibited procedure makes use of the transfer-prohibited message which contains:

— the label, indicating the destination and originating points;

— the transfer-prohibited signal; and

— the destination for which traffic transfer is no longer possible.

Format and code of these messages appear in § 15.

Transfer prohibited messages are always addressed to an adjacent signalling point. They may use any available signalling route that leads to that signalling point.

13.2.2 A transfer-prohibited message relating to a given destination X is sent from a signalling transfer point Y in the following cases:

i) When signalling transfer point Y starts to route (at changeover, changeback, forced or controlled rerouting) signalling destined to signalling point X via a signalling transfer point Z not currently used by signalling transfer point Y for this traffic. In this case the transfer-prohibited message is sent to signalling transfer point Z.

ii) When signalling transfer point Y recognizes that it is unable to transfer signalling traffic destined to signalling point X (see §§ 5.3.3 and 7.2.3). In this case a transfer-prohibited message is sent to all accessible adjacent signalling points (Broadcast method).

iii) When a message destined to signalling point X is received at signalling transfer point Y and Y is unable to transfer the message. In this case the transfer prohibited message is sent to the adjacent signalling point from which the message concerned was received (Response Method).

iv) When an adjacent signalling point Z becomes accessible, STP Y sends to Z a transfer prohibited message concerning destination X, if X is inaccessible from Y (see § 9).

v) When a signalling transfer point Y restarts, it broadcasts to all accessible adjacent signalling points transfer prohibited messages concerning destination X, if X is inaccessible from Y (see § 9).

As long as transfer-prohibited messages for a destination are being transmitted according to criteria i), ii), iv), or v) above, and also within T8 (see § 16) after the last transfer-prohibited message was transmitted, no transfer-prohibited messages will be sent via the Response Method (criterion iii) above) referring to that destination.

Examples of the above situation appear in Recommendation Q.705.

13.2.3 When a signalling point receives a transfer-prohibited message from signalling transfer point Y it performs the actions specified in § 7 (since reception of transfer-prohibited message indicates the unavailability of the concerned signalling route, see § 3.4.1). In other words, it may perform forced re-routing and, if appropriate, generate additional transfer-prohibited messages.

13.2.4 In some circumstances it may happen that a signalling point receives either a repeated transfer-prohibited message relating to a nonexistent route (i.e. there is no route from that signalling point to the concerned destination via signalling transfer point Y, according to the signalling network configuration) or to a destination which is already inaccessible, due to previous failures; in this case no actions are taken.

13.3 *Transfer allowed*

13.3.1 The transfer-allowed procedure is performed at a signalling point, acting as signalling transfer point for messages relating to a given destination, when it has to notify one or more adjacent signalling points that they may start

The possibility of referring to a more general destination than a single signalling point (e.g. a signalling region), or more restrictive destination than a signalling point is for further study.

to route to it, if appropriate, the concerned messages.

The transfer-allowed procedure makes use of the transfer-allowed message which contains:

— the label, indicating the destination and originating points;

— the transfer-allowed signal; and

— the destination for which transfer is now possible.

The format and code of these messages appear in § 15.

Transfer allowed messages are always addressed to an adjacent signalling point. They may use any available signalling route that leads to that signalling point.

13.3.2 A transfer-allowed message relating to a given destination ‘‘X’’ is sent from signalling transfer point ‘‘Y’’ in the following cases:

i) When signalling transfer point ‘‘Y’’ stops routing (at changeback or controlled rerouting) signalling traffic destined to signalling point ‘‘X’’ via a signalling transfer point ‘‘Z’’ (to which the concerned traffic was previously diverted as a consequence of changeover or forced rerouting). In this case the transfer-allowed message is sent to signalling transfer point ‘‘Z’’.

ii) When signalling transfer point ‘‘Y’’ recognizes that it is again able to transfer signalling traffic destined to signalling point ‘‘X’’ (see §§ 6.2.3 and 8.2.3). In this case a transfer-allowed message is sent to all accessible adjacent signalling points. (Broadcast method).

Examples of the above situations appear in Recommendation Q.705.

13.3.3 When a signalling point receives a transfer-allowed message from signalling transfer point ‘‘Y’’, it performs the actions specified in § 8 (since reception of a transfer-allowed message indicates the availability of the concerned signalling route, (see § 3.4.2)). In other words, it may perform controlled re-routing and, if appropriate, generate additional transfer-allowed messages.

13.3.4 In some circumstances it may happen that a signalling point receives either a repeated transfer-allowed message or a transfer-allowed message relating to a non-existent signalling route (i.e. there is no route from that signalling point to the concerned destination via signalling transfer point Y according to the signalling network configuration); in this case no actions are taken.

13.4 *Transfer-restricted (National option)*

13.4.1 The transfer restricted procedure is performed at a signalling point acting as a signalling transfer point for messages relating to a given destination, when it has to notify one or more adjacent signalling points that they should, if possible, no longer route the concerned messages via the signalling transfer point.

The transfer-restricted procedure makes use of the transfer-restricted message which contains:

— the label, indicating the destination and originating points;

— the transfer-restricted signal, and

— the destination for which traffic is no longer desirable.

Formats and codes of this message appear in § 15.

Transfer restricted messages are always adressed to an adjacent signalling point. They may use any available signalling route that leads to that signalling point.

Note — Undesirable situations result in increased signalling delays, possibly overloading portions of the network. These inefficiencies could be avoided if the traffic can be appropriately diverted.

13.4.2 A transfer-restricted message relating to a given destination ‘‘X’’ is sent from a signalling transfer point ‘‘Y’’ when the normal link set (combined link set) used by signalling point ‘‘Y’’ to route to destination ‘‘X’’

The possibility of referring to a more general destination than a single signalling point (e.g. a signalling region), or a more restrictive destination than a single signalling point is for further study.

experiences a long-term failure such as an equipment failure, or there is congestion on an alternate link set currently being used to destination ‘‘X’’. In this case, a transfer-restricted message is sent to all accessible adjacent signalling points.

When an adjacent signalling point ‘‘X’’ becomes accessible, the STP ‘‘Y’’ sends to ‘‘X’’ transfer-restricted messages concerning destinations that are restricted from ‘‘Y’’ (see § 9).

When a signalling point Y restarts, it broadcasts to all accessible adjacent signalling points transfer restricted messages concerning destinations restricted from ‘‘Y’’ (see § 9).

Note — Characterization of long term failure remains for further study.

13.4.3 When a signalling point receives a transfer-restricted message from signalling transfer point ‘‘Y’’ and has an alternative equal priority link set available and not restricted to destination ‘‘X’’, it performs the actions in § 8.2. In other words, it performs controlled rerouting to maintain the sequence of messages while diverting them to the alternative link set. If it cannot perform alternate routing to destination ‘‘X’’ because no alternative link set is available, it may generate additional transfer-restricted messages.

13.4.4 In some circumstances, it may happen that a signalling point receives either a repeated transfer-restricted message or a transfer-restricted message relating to a non-existent route (i.e. there is no route from that signalling point to the concerned destination via signalling transfer point ‘‘Y’’, according to the signalling network configuration); in this case, no actions are taken.

13.4.5 When a transfer-restricted message is received updating a transfer-prohibited status, signalling traffic management decides if an alternative route is available or restricted; if it is not (i.e. no alternative route exists), the concerned traffic is restarted towards the signalling point from which the transfer-restricted message was received. Otherwise, no other actions are taken.

13.5 *Signalling-route-set-test*

13.5.1 The signalling-route-set-test procedure is used at a signalling point to test whether or not signalling traffic towards a certain destination may be routed via an adjacent signalling transfer point.

The procedure makes use of the signalling-route-set-test message, and the transfer-allowed and the transfer-prohibited procedures.

The signalling-route-set-test message contains:

— the label, indicating the destination and originating points;

— the signalling-route-set-test signal;

— the destination, the accessibility of which is to be tested; and

— the current route status of the destination being tested.

Format and coding of this message appear in § 15.

13.5.2 A signalling-route-set-test message is sent from a signalling point after a transfer-prohibited or transfer-restricted message is received from an adjacent signalling transfer point. In this case, a signalling-route-set-test message is sent to that signalling transfer point referring to the destination declared inaccessible or restricted by the transfer-prohibited or transfer-restricted message, every T10 period (see § 16) until a transfer-allowed message, indicating that the destination has become accessible, is received.

This procedure is used in order to recover the signalling route availability information that may not have been received because of some signalling network failure.

13.5.3 A signalling-route-set-test message is sent to the adjacent signalling transfer point as an ordinary signalling network management message.

13.5.4 At the reception of a signalling-route-set-test message, a signalling transfer point will compare the status of the destination in the received message with the actual status of the destination. If they are the same, no further action is taken. If they are different, one of the following messages is sent in response, dictated by the actual status of the destination:

The possibility of referring to a more general destination than a single signalling point (e.g. a signalling region), or a more restrictive destination than a single signalling point is for further study.

— a transfer-allowed message, referring to the destination the accessibility of which is tested, if the signalling transfer point can reach the indicated destination via a signalling link not connected to the signalling point from which the signalling-route-set-test message was originated, and via the normal routing;

— a transfer-restricted message when access to the destination is possible via an alternative to the normal routing which is less efficient, but still not via the signalling point from which the signalling route-set-test was originated;

— a transfer-prohibited message in all other cases (including the inaccessibility of that destination).

13.5.5 At the reception of the transfer-prohibited or transfer-allowed message, the signalling point will perform the procedures specified in §§ 13.2.3 or 13.2.4 and 13.3.3 or 13.3.4 respectively.

13.6 *Transfer controlled (International network)*

The only use made of the transfer controlled procedure in the international signalling network is to convey the congestion indication from the SP where congestion was detected to the originating SP (see § 11.2.3) in a transfer-controlled message.

The transfer-controlled message contains:

— the label, indicating the destination and originating points;

— the transfer controlled signal;

— the identity of the congested destination.

The format and coding of the transfer controlled message appear in § 15.

13.7 *Transfer controlled (National option with congestion priorities)*

13.7.1 The transfer-controlled procedure is performed at a signalling transfer point for messages relating to a given destination, when it has to notify one or more originating signalling points that they should no longer send to the concerned destination messages with a given priority or lower.

The transfer-controlled procedure makes use of the transfer-controlled message which contains:

— the label, indicating the destination and originating points,

— the transfer-controlled signal,

— the destination for which messages with a congestion priority lower than the specified congestion status should no longer be sent, and

— the current congestion status encountered in routing a particular message towards the concerned destination.

The format and coding of this message appear in § 15.

13.7.2 A transfer-controlled message relating to a given destination ‘‘X’’ is sent from a signalling transfer point ‘‘Y’’ in response to a received message originating from signalling point ‘‘Z’’ destined to signalling point ‘‘X’’ when the congestion priority of the concerned message is less than the current congestion status of the signalling link selected to transmit the concerned message from ‘‘Y’’ to ‘‘X’’.

In this case, the transfer-controlled message is sent to the originating point ‘‘Z’’ with the congestion status field set to the current congestion status of the signalling link.

13.7.3 When the originating signalling points ‘‘Z’’ receive a transfer-controlled message relating to destination ‘‘X’’, if the current congestion status of the signalling route set towards destination ‘‘X’’ is less than the congestion status in the transfer-controlled message, it updates the congestion status of the signalling route set towards destination ‘‘X’’ with the value of the congestion status carried in the transfer-controlled message.

13.7.4 If within T15 (see § 16) after the receipt of the last transfer-controlled message relating to destination ‘‘X’’, signalling point ‘‘Z’’ receives another transfer-controlled message relating to the same destination, the following action is taken: If the value of the congestion status carried in the new transfer-controlled message is greater than the current value of the congestion status of the signalling route set towards destination ‘‘X’’, then the current value is updated by the new value.

13.7.5 If T15 (see § 16) expires after the last update of the signalling route set towards destination ‘‘X’’ by a transfer-controlled message relating to the same destination, the signalling-route-set-congestion-test procedure is invoked (see § 13.9).

13.7.6 In some circumstances it may happen that a signalling point receives a transfer-controlled message relating to a destination which is already inaccessible due to previous failures; in this case the transfer-controlled message is ignored.

13.8 *Transfer controlled (National option without congestion priorities)*

The only use made of the TFC procedure by the national signalling network, using multiple congestion states without congestion priorities, is to convey the congestion indication primitive from the SP where congestion was detected to the originating SP (see § 11.2.5) in a transfer-controlled message.

The transfer-controlled message contains:

— the label, indicating the destination and originating points;

— the transfer-controlled signal;

— the identity of the congested destination;

— the current congestion status encountered in routing a particular message towards the concerned destination.

The format and coding of this message appear in § 15.

13.9 *Signalling-route-set-congestion-test (National Option)*

13.9.1 The signalling-route-set-congestion-test procedure is used at an originating signalling point to update the congestion status associated with a route set towards a certain destination. The purpose is to test whether or not signalling messages destined towards that destination with a given congestion priority or higher may be sent.

In the case of a processor restart the congestion status of all signalling route sets will be initialized to the zero value. The response mechanism within the transfer-controlled procedure will correct signalling route sets whose congestion status does not have the zero value.

The procedure makes use of the signalling-route-set-congestion-test message, and the transfer-controlled procedure.

The signalling-route-set-congestion-test message contains:

— the label, indicating the destination and originating points, and

— the signalling-route-set-congestion-test signal.

The format and coding of this message appear in § 15.

13.9.2 The signalling-route-set-congestion-test message differs from other signalling network management messages in that it is not assigned the highest congestion priority. Instead, the congestion priority assigned to a signalling-route-set-congestion-test message to be sent to a given destination is equal to one less than the current congestion status associated with the signalling route set towards the destination.

13.9.3 If within T16 (see § 16), after sending a signalling-route-set-congestion-test message, a transfer-controlled message relating to the concerned destination is received, the signalling point updates the congestion status of the signalling route set towards the concerned destination with the value of the congestion status carried in the transfer-controlled message. Following this, the procedures specified in §§ 13.9.4 and 13.9.5 are performed.

If T16 (see § 16) expires after sending a signalling-route-set-congestion-test message without a transfer-controlled message relating to the concerned destination having been received, the signalling point changes the congestion status associated with the signalling route set towards the concerned destination to the next lower status.

13.9.4 Provided that the signalling route set towards destination ‘‘X’’ is not in the ‘‘unavailable’’ state, a signalling-route-set-congestion-test message is sent from an originating signalling point to destination ‘‘X’’ in the following cases:

i) When T15 (see § 16) expires after the last update of the congestion status of the signalling route set toward destination ‘‘X’’ by a transfer-controlled message relating to the same destination.

ii) When T16 (see § 16) expires after sending a signalling-route-set-congestion-test message to destination ‘‘X’’ without a transfer-controlled message relating to the same destination having been received. After the congestion status has been decremented by one, the test is repeated, unless the congestion status is zero.

13.9.5 At the reception of a signalling-route-set-congestion-test message, a signalling transfer point will route it as an ordinary message, i.e. according to the procedure specified in § 2.3.5.

13.9.6 When a signalling-route-set-congestion-test message reaches its destination, it is discarded.

14 Common characteristics of message signal unit formats

14.1 *General*

The basic signal unit format which is common to all message signal units is described in Recommendation Q.703, § 2. From the point of view of the Message Transfer Part level 3 functions, common characteristics of the message signal units are the presence of:

— the service information octet;

— the label, contained in the signalling information field, and, in particular, the routing label.

14.2 *Service information octet*

The service information octet of message signal units contains the service indicator and the sub-service field. The structure of the service information octet is shown in Figure 13/Q.704.

Figure 13/Q.704, p.

14.2.1 *Service indicator*

The service indicator is used by signalling handling functions to perform message distribution (see § 2.4) and, in some special applications, to perform message routing (see § 2.3).

The service indicator codes *for the international signalling network* are allocated as follows:

bits D	C	B	A	
0	0	0	0	Signalling network management messages
0	0	0	1	Signalling network testing and maintenance messages
0	0	1	0	Spare
0	0	1	1	SCCP

0	1	0	0	Telephone User Part
0	1	0	1	ISDN User Part
0	1	1	0	Data User Part (call and circuit related messages)
0	1	1	1	Data User Part (facility registration and cancellation messages)
1	0	0	0	Reserved for MTP Testing User Part
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	spare
1	1	0	1	
1	1	1	0	
1	1	1	1	.bp

The allocation of the service indicator codes for national signalling networks is a national matter. However, it is suggested to allocate the same service indicator code to a User Part which performs similar functions as in the international network.

14.2.2 *Sub-service field*

The sub-service field contains the network indicator (bits C and D) and two spare bits (bits A and B).

The *network* | ndicator is used by signalling message handling functions (e.g., in order to determine the relevant version of a User Part), see §§ 2.3 and 2.4.

If the network indicator is set to 00 or 01, the two spare bits, coded 00, are available for possible future needs that may require a common solution for all international User Parts.

If the network indicator is set to 10 or 11, the two spare bits are for national use. They may be used, for example, to indicate message priority, which is used in the optional flow control procedure in national applications.

The network indicator provides for discrimination between international and national messages. It can also be used, for example, for the discrimination between functionally two national signalling networks, each having different routing label structures and including up to 16 User Parts defined by the 16 possible codes of the service indicator.

In the case of only one national signalling network the spare code of the network indicator reserved for national use can be used, for example, to define an additional 16 User Parts (making a total of 32 User Parts) for that national signalling network.

The network indicator codes are allocated as follows:

bits D	C	
0	0	International network
0	1	Spare (for international use only)
1	0	National network
1	1	Reserved for national use

The international spare code (01) should not be used for implementing features which are to be provided both internationally and nationally.

In national applications, when the discrimination provided by the network indicator between international and national messages is not used, i.e. in a closed national signalling network seen from the signalling point of view, the whole sub-service field can be used independently for different User Parts.

14.3 *Label*

The structure and content of the label is defined for each User Part and is defined in the relevant specification. The common part of the label used for signalling message handling, the routing label, is specified in § 2.2.

15 Formats and codes of signalling network management messages

15.1 *General*

15.1.1 The signalling network management messages are carried on the signalling channel in message signal units, the format of which is described in § 14 and in Recommendation Q.703, § 2. In particular, as indicated in § 14.2 these messages are distinguished by the configuration 0000 of the service indicator (SI). The sub-service field (SSF) of the messages is used according to the rules indicated in § 14.2.2.

15.1.2 The signalling information field consists of an integral number of octets and contains the label, the heading code and one or more signals and indications. The structure and function of the label, and of the heading code, are described in §§ 15.2 and 15.3 respectively; the detailed message formats are described in the following sections. For each message the sequence of fields is shown in the corresponding figure, including fields that may or may not be present.

In the figures, the fields are shown starting from the right to the left (i.e. the first field to be transmitted is at the right). Within each field the information is transmitted least significant bit first. Spare bits are coded 0 unlesss otherwise indicated.

15.2 *Label*

For signalling network management messages the label coincides with the routing label and indicates the destination and originating signalling points of the message; moreover, in the case of messages related to a particular signalling link, it also indicates the identity of the signalling link among those interconnecting the destination and originating points. The standard label structure of Message Transfer Part level 3 messages appears in Figure 14/Q.704; the total length is 32 bits.

Figure 14/Q.704, p.

The meaning and use of the destination point code (DPC) and of the originating point code (OPC) fields are described in § 2. The signalling link code (SLC) indicates the signalling link, connecting the destination and originating points, to which the message is related. If the message is not related to a signalling link, or another particular code is not specified, it is coded 0000.

15.3 *Heading code (H0)*

The heading code (H0) is the 4 bit field following the label and identifies the message group.

The different heading codes are allocated as follows:

0000 Spare

0001 Changeover and changeback messages

0010 Emergency changeover message

0011 Transfer controlled and signalling route set congestion messages

0100 Transfer-prohibited-allowed-restricted messages

0101 Signalling-route-set-test messages

0110 Management inhibit messages

0111 Traffic restart allowed message

1000 Signalling-data-link-connection messages

1001 Spare

1010 User part flow control messages

The remaining codings are spare.

The synopsis of singalling network management messages is given in Table 1/Q.704.

15.4 *Changeover message*

15.4.1 The format of the changeover message is shown in Figure 15/Q.704.

Figure 15/Q.704, p.

15.4.2 The changeover message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.4.3

— Forward sequence number of last accepted message signal unit (7 bits)

— A filler bit coded 0

15.4.3 The heading code H1 contains signal codes as follows:

bit D	C	B	A	
0	0	0	1	Changeover order signal
0	0	1	0	Changeover acknowledgement signal

15.5 *Changeback message*

15.5.1 The format of the changeback message is shown in Figure 16/Q.704.

Figure 16/Q.704, p.

15.5.2 The changeback message is made up of the following fields:

— Label (32 bits) see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.5.3

— Changeback code (8 bits): see § 15.5.4

15.5.3 The header code H1 contains signal codes as follows:

bit D	C	B	A	
0	1	0	1	Changeback declaration signal
0	1	1	0	Changeback acknowledgement signal

15.5.4 The changeback code is an 8 bit code assigned by the signalling point which sends the message according to the criteria described in § 6.

15.6 *Emergency changeover message*

15.6.1 The format of the emergency changeover message is shown in Figure 17/Q.704.

Figure 17/Q.704, p.

15.6.2 The emergency changeover message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.6.3

15.6.3 The header code H1 contains signal codes as follows:

bit D	C	B	A	
0	0	0	1	Emergency changeover order signal
0	0	1	0	Emergency changeover acknowledgement signal

15.7 *Transfer-prohibited message*

15.7.1 The format of the transfer-prohibited message is shown in Figure 18/Q.704.

Figure 18/Q.704, p.

15.7.2 The transfer-prohibited message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.7.3

— Destination (14 bits): see § 15.7.4

— Spare bits (2 bits) code 00

15.7.3 The heading code H1 contains one signal code as follows:

bit	D	C	B	A
	0	0	0	1 Transfer-prohibited signal

15.7.4 The destination field contains the identity of the signalling point to which the message refers.

15.8 *Transfer-allowed message*

15.8.1 The format of the transfer-allowed message is shown in Figure 19/Q.704.

Figure 19/Q.704, p.

15.8.2 The transfer-allowed message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.8.3

— Destination (14 bits): see § 15.7.4

— Spare bits (2 bits) coded 00

Note — For the use of the 2 spare bits in the national option for a SIF compatibility mechanism, see Recommendation Q.701, § 7.2.6.

15.8.3 The heading code H1 contains one signal code as follows:

bit D C B A

0	1	0	1	Transfer-allowed signal

15.9 *Transfer restricted message (national option)*

15.9.1 The format of the transfer restricted message is shown in Figure 18/Q.704.

15.9.2 The transfer restricted message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.9.3

— Destination (14 bits): see § 15.9.4

— Spare (2 bits) coded 00

15.9.3 The heading code H1 contains one signal code as follows:

bit D	C	B	A	
0	0	1	1	Transfer restricted

15.9.4 The destination field contains the identity of the signalling point to which the message refers.

15.10 *Signalling-route-set-test message*

15.10.1 The format of the signalling-route-set-test message is shown in Figure 20/Q.704.

Figure 20/Q.704, p.

15.10.2 This message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.10.3

— Destination (14 bits): see § 15.7.4

— Spare bits (2 bits) coded 00

15.10.3 The heading code H1 contains signal codes as follows:

bit D	C	B	A	
0	0	0	1	Signalling-route-set-test signal for prohibited destination
0	0	1	0	Signalling-route-set-test signal for restricted destination (national option)

15.11 *Management inhibit message*

15.11.1 The format of the management inhibit message is shown in Figure 20a/Q.704.

Figure 20a/Q.704, p.

15.11.2 The management inhibit message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.11.3

15.11.3 The header code H1 contains signal codes as follows:

bit D	C	B	A	
0	0	0	1	Link inhibit signal
0	0	1	0	Link uninhibit signal
0	0	1	1	Link inhibited acknowledgement signal
0	1	0	0	Link uninhibited acknowledgement signal
0	1	0	1	Link inhibit denied signal
0	1	1	0	Link force uninhibit signal
0	1	1	1	Link local inhibit test signal
1	0	0	0	Link remote inhibit test signal

15.12 *Traffic restart allowed message*

15.12.1 The format of the traffic restart allowed message is shown in Figure 21/Q.704.

Figure 21/Q.704, p.

15.12.2 The traffic restart allowed message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.12.3

15.12.3 The heading code H1 contains one signal code as follows:

bit	D	C	B	A
	0	0	0	1	Traffic restart allowed signal

15.13 *Signalling-data-link-connection-order message*

15.13.1 The format of the signalling-data-link-connection-order message is shown in Figure 22/Q.704.

Figure 22/Q.704, p.

15.13.2 The signalling-data-link-connection-order message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.13.3

— Signalling data link identity (12 bits): see § 15.13.4

— Spare bits (4 bits) coded 0000.

15.13.3 The heading code H1 contains one signal code as follows:

bit D	C	B	A	
0	0	0	1	Signalling-data-link-connection-order signal

15.13.4 The signalling data link identity field contains the circuit identification code (CIC), or the bearer identification code (BIC) in case of a 64 kbit/s channel used to carry submultiplex data streams, of the transmission link corresponding to the signalling data link.

15.14 *Signalling-data-link-connection-acknowledgement message*

15.14.1 The format of the signalling-data-link-connection-acknowledgement message is shown in Figure 22a/Q.704.

Figure 22a/Q.704, p.

15.14.2 The signalling-data-link-connection acknowledgement message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.14.3

15.14.3 The heading code H1 contains signal codes as follows:

bit D	C	B	A	
0	0	1	0	Connection-successful signal
0	0	1	1	Connection-not-successful signal
0	1	0	0	Connection-not-possible signal

15.15 *Transfer controlled message*

15.15.1 The format of the TFC message is shown in Figure 22b/Q.704.

Figure 22b/Q.704, p.

15.15.2 The transfer controlled message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.15.3

— Destination (14 bits): see § 15.15.4

— Spare (2 bits): see §15.15.5

15.15.3 The heading code H1 contains one signal code as follows:

bit D	C	B	A	
0	0	1	0	Transfer controlled signal

15.15.4 The destination field carries the address of the destination to which the message refers.

15.15.5 In national signalling networks using multiple congestion states, the spare bits in the transfer controlled message are used to carry the congestion status associated with the destination.

15.16 *Signalling-route-set-congestion-test message (national option)*

15.16.1 The format of the signalling-route-set-congestion-test message is shown in Figure 22c/Q.704.

Figure 22c/Q.704, p.

15.16.2 The signalling-route-set-congestion test message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.16.3

15.16.3 The heading code H1 contains one signal code as follows:

bit	D	C	B	A
	0	0	0	1 Signalling-route-set-congestion-test signal

15.17 *User part unavailable message*

15.17.1 The format of the user part unavailable message is shown in Figure 22d/Q.704.

Figure 22d/Q.704, p.

15.17.2 The user part unavailable message is made up of the following fields:

— Label (32 bits): see § 15.2

— Heading code H0 (4 bits): see § 15.3

— Heading code H1 (4 bits): see § 15.17.3

— Destination (14 bits): see § 15.15.4

— Spare (2 bits): coded 00

— User part identity (4 bits): see § 15.17.4

— Spare (4 bits) coded 0000

15.17.3 The heading code H1 contains signal codes as follows:

bit	D	C	B	A
	0	0	0	1 User part unavailable

15.17.4 The user part identity is coded as follows:

bit D	C	B	A	
0	0	0	0	Spare
0	0	0	1	Spare
0	0	1	0	Spare
0	0	1	1	SCCP
0	1	0	0	TUP
0	1	0	1	ISUP
0	1	1	0	DUP
0	1	1	1	Spare
1	0	0	0	MTP Testing User Part
1	0	0	1	
to	Spare			
1	1	1	1	

H.T. [1T1.704]

TABLE 1/Q.704

Heading code allocation of signalling network management messages

Message Group	H1 H0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
	0000																
CHM	0001		COO	COA			CBD	CBA									
ECM	0010		ECO	ECA													
FCM	0011		RCT	TFC													
TFM	0100		TFP	*	TFR		TFA	*									
RSM	0101		RST	RSR													
MIM	0110		LIN	LUN	LIA	LUA	LID	LFU	LLT	LRT							
TRM	0111		TRA														
DLM	1000		DLC	CSS	CNS	CNP											
	1001																
UFC	1010		UPU														
	1011																
	1100																
	1101																
	1110																
1111																	

Note — Values marked * should not be used (codes used in the Yellow Book for TFP and TFA acknowledgement).

CBA Changeback-acknowledgement signal

CBD Changeback-declaration signal

CHM Changeover and changeback messages

CNP Connection-not-possible signal

CNS Connection-not-successful signal

COA Changeover-acknowledgement signal

COO Changeover-order signal

CSS Connection-successful signal

DLC Signalling-data-link-connection-order signal

DLM Signalling-data-link-connection-order message

ECA Emergency-changeover-acknowledgement signal

ECM Emergency-changeover message

Table 1/Q.704 + Notes [1T1.704], p.

H.T. [2T1.704]

ECO Emergency-changeover-order signal

FCM Signalling-traffic-flow-control messages

RCT Signalling-route-set-congestion-test signal

RSM Signalling-route-set-test message

RSR Signalling-route-set-test signal for restricted destination (national option)

RST Signalling-route-set-test signal for prohibited destination

TFR Transfer-restricted signal (national option)

TFA Transfer-allowed signal

TFC Transfer-controlled signal

TFM Transfer-prohibited-transfer-allowed-transfer-restricted messages

TFP Transfer-prohibited signal

TRA Traffic-restart-allowed signal

TRM Traffic-restart-allowed message

MIM Management inhibit messages

LID Link inhibit denied signal

LFU Link forced uninhibit signal

LIN Link inhibit signal

LIA Link inhibit acknowledgement signal

LUA Link uninhibit acknowledgement signal

LUN Link uninhibit signal

LLT Link local inhibit test signal

LRT Link remote inhibit test signal

UFC User part flow control messages

UPU User part unavailable signal

Notes to Table 1/Q.704 (cont.) [2T1.704], p.

16 State transition diagrams

16.1 *General*

§ 16 contains the description of the signalling network functions described in §§ 2 to 13 in the form of state transition diagrams according to the CCITT Specification and Description Language (SDL).

A set of diagrams is provided for each of the following major functions:

— signalling message handling (SMH), described in § 2;

— signalling traffic management (STM), described in §§ 4 to 11;

— signalling route management (SRM), described in § 13;

— signalling link management (SLM), described in § 12.

16.1.1 For each major function a figure illustrates a subdivision into functional specification blocks, showing their functional interactions as well as the interactions with the other major functions. In each case this is followed by figures showing state transition diagrams for each of the functional specification blocks.

The detailed functional breakdown shown in the following diagrams is intended to illustrate a reference model and to assist interpretation of the text in the earlier sections. The state transition diagrams are intended to show precisely the behaviour of the signalling system under normal and abnormal conditions as viewed from a remote location. It must be emphasized that the functional partitioning shown in the following diagrams is used only to facilitate understanding of the system behaviour and is not intended to specify the functional partitioning to be adopted in a practical implementation of the signalling system.

16.2 *Drafting conventions*

16.2.1 Each major function is designated by its acronym (e.g. SMH = signalling message handling).

16.2.2 Each functional block is designated by an acronym which identifies it and also identifies the major function to which it belongs (e.g. HMRT = signalling message handling-message routing; TLAC = signalling traffic management-link availability control).

16.2.3 External inputs and outputs are used for interactions between different functional blocks. Included within each input and output symbol in the state transition diagrams are acronyms which identify the functions which are the source and destination of the message, e.g.:

L2 | 3 indicates that the message is sent between functional levels:

from: functional level 2,

to: functional level 3.

RTPC | SRC indicates that the message is sent within a functional level (3 in this case):

from: signalling route management-transfer prohibited control,

to: signalling traffic management-signalling routing control.

16.2.4 Internal inputs and outputs are only used to indicate control of time-outs.

16.2.5 *Notations for national operations*

National options are included in the main body of the state transition diagrams (STDs) with dotted or dashed lines; if their use should exclude or modify some of the international logic, the relevant sections are marked ‘‘t’’ and a note is added to the figure. Also, the options are marked as follows:

Transfer restricted — dashed lines.

Multiple congestion states — dotted lines (with the hatched symbols removed where shown).

16.3 *Signalling message handling*

Figure 23/Q.704 shows a subdivision of the signalling message handling (SMH) function into smaller functional specification blocks and also shows the functional interactions between them. Each of these functional specification blocks is described in detail in a state transition diagram as follows:

a) message discrimination (HMDC) is shown in Figure 24/Q.704;

b) message distribution (HMDT) is shown in Figure 25/Q.704;

c) message routing (HMRT) is shown in Figure 26/Q.704;

d) handling of messages under signalling link congestion is shown in Figure 26a/Q.704.

16.4 *Signalling traffic management*

Figure 27/Q.704 shows a subdivision of the signalling traffic management (STM) function into smaller functional specification blocks and also shows functional interactions between them. Each of these functional specification blocks is described in detail in a state transition diagram as follows:

a) link availability control (TLAC) is shown in Figure 28/Q.704;

b) signalling routing control (TSRC) is shown in Figure 29/Q.704;

c) changeover control (TCOC) is shown in Figure 30/Q.704;

d) changeback control (TCBC) is shown in Figure 31/Q.704;

e) forced rerouting control (TFRC) is shown in Figure 32/Q.704;

f) controlled rerouting control (TCRC) is shown in Figure 33/Q.704;

g) signalling traffic flow control (TSFC) is shown in Figure 34a/Q.704;

h) signalling route set congestion control (TRCC) is shown in Figure 29a/Q.704;

i) signalling point restart control (TPRC) is shown in Figure 34b/Q.704.

16.5 *Signalling link management*

Figure 35/Q.704 shows a subdivision of the signalling link management function (SLM) into smaller functional specification blocks and also shows functional interactions between them. Each of these functional specification blocks is described in detail in a state transition diagram as follows:

a) link set control (LLSC) is shown in Figure 36/Q.704;

b) signalling link activity control (LSAC) is shown in Figure 37/Q.704;

c) signalling link activation (LSLA) is shown in Figure 38/Q.704;

d) signalling link restoration (LSLR) is shown in Figure 39/Q.704;

e) signalling link deactivation (LSLD) is shown in Figure 40/Q.704;

f) signalling terminal allocation (LSTA) is shown in Figure 41/Q.704;

g) signalling data link allocation (LSDA) is shown in Figure 42/Q.704.

16.6 *Signalling route management*

Figure 43/Q.704 shows a subdivision of the signalling route management (SRM) function into smaller functional specification blocks and also shows functional interactions between them. Each of these functional specification blocks is described in detail in a state transition diagram as follows:

a) transfer prohibited control (RTPC) is shown in Figure 44/Q.704;

b) transfer allowed control (RTAC) is shown in Figure 45/Q.704;

c) transfer restricted control (RTRC) is shown in Figure 46c/Q.704;

d) transfer controlled control (RTCC) is shown in Figure 46a/Q.704;

e) signalling route set test control (RSRT) is shown in Figure 46/Q.704;

f) signalling-route-set-congestion-test control (RCAT) is shown in Figure 46b/Q.704.

16.7 *Abbreviations used in Figures 23/Q.704 onwards*

BSNT Backward sequence number of next signal unit to be transmitted

DPC Destination point code

FSNC Forward sequence number of last message signal unit accepted by remote level 2

HMCG Signalling link congestion

HMDC Message discrimination

HMDT Message distribution

HMRT Message routing

L1 Level 1

L2 Level 2

L3 Level 3

L4 Level 4

LLSC	Link set control
LSAC	Signalling link activity control
LSDA	Signalling data link allocation
LSLA	Signalling link activation
LSLD	Signalling link deactivation
LSLR	Signalling link restoration
LSTA	Signalling terminal allocation
MGMT	Management system
RCAT	Signalling-route-set-congestion-test control
RSRT	Signalling route set test control

RTAC Transfer allowed control

RTCC Transfer controlled control

RTPC Transfer prohibited control

RTRC Transfer restricted control

SLM Signalling link management

SLS Signalling link selection

SLTC Signalling link test control

SMH Signalling message handling

SRM Signalling route management

STM Signalling traffic management

TCBC Changeback control

TCOC Changeover control

TCRC Controlled rerouting control

TFRC Forced rerouting control

TLAC Link availability control

TPRC Signalling point restart control

TRCC Signalling route set congestion control

TSFC Signalling traffic flow control

TSRC Signalling routing control

16.8 *Timers and timer values*

The following timers have been defined. The ranges are given below. The values, in brackets, are the minimum values for use when routes with long propagation delays are used (e.g., routes including satellite sections).

T1 Delay to avoid message mis-sequencing on changeover.

500 (800) to 1200 ms.

T2 Waiting for changeover acknowledgement.

700 (1400) to 2000 ms.

T3 Time controlled diversion-delay to avoid mis-sequencing on changeback.

500 (800) to 1200 ms.

T4 Waiting for changeback acknowledgement (first attempt).

500 (800) to 1200 ms.

T5 Waiting for changeback acknowledgement (second attempt).

500 (800) to 1200 ms.

T6 Delay to avoid message mis-sequencing on controlled rerouting.

500 (800) to 1200 ms.

T7 Waiting for signalling data link connection acknowledgement.

1 to 2 seconds.

T8 Transfer prohibited inhibition timer (transient solution).

800 to 1200 ms.

T9 Not used.

T10 Waiting to repeat signalling route set test message.

30 to 60 seconds.

T11 Transfer restricted timer. (This is one way of implementing the function described in § 13.4 and mainly intended to simplify STPs.)

30 to 90 seconds.

T12 Waiting for uninhibit acknowledgement.

800 to 1500 ms.

T13 Waiting for force uninhibit.

800 to 1500 ms.

T14 Waiting for inhibition acknowledgement.

2 to 3 seconds.

T15 Waiting to start signalling route set congestion test.

2 to 3 seconds.

T16 Waiting for route set congestion status update.

1.4 to 2 seconds.

T17 Delay to avoid oscillation of initial alignment failure and link restart.

800 to 1500 ms.

T18 Timer at restarting STP, waiting for signalling links to become available.

20 seconds (provisional value).

T19 Timer at restarting STP, started after T18, waiting to receive all traffic restart allowed messages.

4 seconds (provisional value).

T20 Timer at restarting STP, started after T19, waiting to broadcast traffic restart allowed messages, and restart remaining traffic.

4 seconds (provisional value).

T21 Timer at restarting signalling point having no STP function, waiting to restart traffic routed through adjacent SP;

AND timer at STP adjacent to restarting STP, waiting for traffic restart allowed message;

AND timer at SP having no STP function adjacent to restarting SP, waiting to restart any traffic to route through adjacent SP.

30 seconds (provisional value).

T22 Local inhibit test timer.

3 min to 6 min (provisional value).

T23 Remote inhibit test timer.

3 min to 6 min (provisional value).

T24 Stabilising timer after removal of local processor outage, used in LPO latching to RPO (national option).

500 ms (provisional value).

Blanc

Figure 23/Q.704, p.18

Figure 24/Q.704, p.19

Figure 25/Q.704 (feuillet 1 sur 2), p.20

Figure 25/Q.704 (feuillet 2 sur 2), p.21

Figure 26/Q.704 (feuillet 1 sur 2), p.22

Figure 26/Q.704 (feuillet 2 sur 2), p.23

Figure 26a/Q.704, p.24

Figure 27/Q.704 (feuillet 1 sur 3), p.25

Figure 27/Q.704 (feuillet 2 sur 3), p.26

Figure 27/Q.704 (feuillet 3 sur 3), p.27

Figure 28/Q.704 (feuillet 1 sur 17), p.28

Figure 28/Q.704 (feuillet 2 sur 17), p.29

Figure 28/Q.704 (feuillet 3 sur 17), p.30

Figure 28/Q.704 (feuillet 3bis sur 17), p.31

Figure 28/Q.704 (feuillet 4 sur 17), p.32

Figure 28/Q.704 (feuillet 5 sur 17), p.33

Figure 28/Q.704 (feuillet 5bis sur 17), p.34

Figure 28/Q.704 (feuillet 6 sur 17), p.35

Figure 28/Q.704 (feuillet 6bis sur 17), p.36

Figure 28/Q.704 (feuillet 7 sur 17), p.37

Figure 28/Q.704 (feuillet 8 sur 17), p.38

Figure 28/Q.704 (feuillet 9 sur 17), p.39

Figure 28/Q.704 (feuillet 10 sur 17), p.40

Figure 28/Q.704 (feuillet 11 sur 17), p.41

Figure 28/Q.704 (feuillet 12 sur 17), p.42

Figure 28/Q.704 (feuillet 13 sur 17), p.43

Figure 28/Q.704 (feuillet 14 sur 17), p.44

Figure 28/Q.704 (feuillet 15 sur 17), p.45

Figure 28/Q.704 (feuillet 16 sur 17), p.46

Figure 28/Q.704 (feuillet 17 sur 17), p.47