



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.1152

(03/93)

INTERWORKING WITH SATELLITE MOBILE SYSTEMS

PROCEDURES FOR INTERWORKING BETWEEN INMARSAT AERONAUTICAL MOBILE SATELLITE SYSTEM AND THE INTERNATIONAL PUBLIC SWITCHED TELEPHONE NETWORK/ISDN

ITU-T Recommendation Q.1152

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.1152 was revised by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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PROCEDURES FOR INTERWORKING BETWEEN INMARSAT AERONAUTICAL MOBILE SATELLITE SYSTEM AND THE INTERNATIONAL PUBLIC SWITCHED TELEPHONE NETWORK/ISDN

(Melbourne, 1988; modified at Helsinki, 1993)

1 Introduction

This Recommendation provides the detailed procedures for interworking between the INMARSAT aeronautical system and signalling systems of the public fixed network. For a brief description of the INMARSAT aeronautical system, see Appendix I/Q.1151.

2 Conversion of information elements

Tables 1 and 2 list the signals of the INMARSAT aeronautical system that are relevant for the purpose of interworking with the PSTN/ISDN. The forward interworking telephone events (FITEs) and backward interworking telephone events (BITEs), as defined in Annex A/Q.601-Q.608, that correspond to each of these signals is also provided in the tables.

TABLE 1/Q.1152

INMARSAT aeronautical – forward signals

FITE No.	Message: information element: value
Ground-to-air calls	
1	Call announcement: AES id: called terminal
17	Call announcement: service: telephone
22	Channel release: Cause: Normal clearing
Air-to-ground calls	
17	Access request: message type: public/crew voice
18	Access request: message type: crew distress voice
1	Access request: address digits 0, 1
1	Call information: address digits 2 ... 17
22	Channel release: Cause: Normal clearing
NOTE – Signals required for interworking with Signalling System No. 7 (ISUP) are for further study.	

Tables 3 to 18 give the relationship between signals of the fixed network signalling systems and the INMARSAT aeronautical system.

2.1 Signalling System R2

2.1.1 Table 3 gives the relationship between messages in the INMARSAT aeronautical signalling system and forward signals in Signalling System R2 for air-to-ground calls, i.e. interworking of INMARSAT aeronautical to Signalling System R2.

Table 4 shows the relationship between forward signals in Signalling System R2 and messages in the INMARSAT aeronautical signalling system for ground-to-air calls. In the comment column actions taken by the MSSC are indicated,

in particular for signals of R2 which have no equivalent message in the INMARSAT aeronautical system.

The signal numbers for forward signals of Signalling System R2 are those given in Table A.7/Q.601-Q.608.

TABLE 2/Q.1152

INMARSAT aeronautical – backward signals

BITE No.	Message: information element: value
Ground-to-air-calls	
5	Test
22	Connect
29	Channel release: Cause: Normal clearing
16	Call attempt result: Cause: User busy
12	Call attempt result: Cause: No channel available
17	Call attempt result: Cause: Destination out of service
Air-to-ground-calls	
22	Connect
2	Call attempt result: Address complete
29	Channel release: Cause: Normal clearing
20	Channel release: Cause: Unspecified
16	Channel release: Cause: User busy
15	Channel release: Cause: Unassigned number
17	Channel release: Cause: Destination out of service
12	Channel release: Cause: No channel available
14	Channel release: Cause: Invalid number format
NOTE – Signals required for interworking with Signalling System No. 7 (ISUP) are for further study.	

TABLE 3/Q.1152

**Conversion of forward signals in the INMARSAT aeronautical
signalling system to Signalling System R2
Air-to-ground calls**

INMARSAT aeronautical signalling system Message: information element: value	Signalling System R2 Signal name: information element	Signal No.
Access request: message type	Calling party's category	
– public voice	– subscriber/operator without forward transfer facility	12
– crew voice	– subscriber/operator without forward transfer facility	12
– crew distress voice	– subscriber/with priority	14
Access request: address digits 0, 1	Country code indicator (echo suppressor controls)	10
Call information: digits 2 to 17	Address signals/first digit	1
Test	Not applicable	
Channel release: Cause: Normal clearing	Clear forward	16
NOTE – Signal No. 21, nature of circuit indicator: one satellite circuit in the connection, is generated by the MSSC, if required.		

TABLE 4/Q.1152

Conversion of forward signals in Signalling System R2
to INMARSAT aeronautical signalling system
Ground-to-air calls

Signal No.	Signalling System R2 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	Address signals	Call announcement: AES identity, called terminal	
2-6	Language digit: I-1, ... 5		Interpreted by MSSC
7	Discriminating digit		Interpreted by MSSC
8	Country code indicator, outgoing half suppressor required		MSSC will insert echo control device if needed
9	Country code indicator, no echo suppressor required		Interpreted by MSSC
10, 11	Country code indicator, incoming half echo suppressor required		Interpreted by MSSC
12	Calling party's category, subscriber or operator without forward transfer facility	Call announcement – service: telephone	
13	Calling party's category, data transmission control		Not applicable
14	Calling party's category, subscriber with priority	Call announcement – service: telephone, priority for further study	
15	Calling party's category, operator with forward transfer capability	Call announcement – service: telephone	
16	Clear forward	Channel release: Cause: Normal clearing	
17	Forward transfer		Not applicable
18	First digit: I-1, I-2 ... I-10		Interpreted by MSSC
19	Reply to A-14: I-1 ... I-10		Not applicable
20	Reply to first A-13; I-13		Not applicable
21	Reply to first A-13; I-14		Not applicable

2.1.2 Table 5 gives the relationship between messages in the INMARSAT aeronautical signalling system and backward signals in Signalling System R2 for ground-to-air calls, i.e. interworking of Signalling System R2 to INMARSAT aeronautical.

Backward signals in Signalling System R2 generated by the MSSC for unsuccessful ground-to-air calls are given in Table 5 bis. These signals are not related to any specific message received from the aircraft earth station.

TABLE 5/Q.1152

Conversion of backward signals in the INMARSAT aeronautical signalling system to Signalling System R2
Ground-to-air-calls

INMARSAT aeronautical signalling system Message: information element: value	Signalling System R2 Signal name: information element	Signal No.
Test	International, subscriber line free, charge	13
Connect	Answer signal	11
Channel release: Cause: Normal clearing	Clear back	12
Call attempt result: Cause:		
- user busy	Subscriber line busy	5
- no channel available	Congestion on the national network	1
- destination out of service	Subscriber line out of order	10
- others	International; send special info tone	14

TABLE 5 bis/Q.1152

Unsuccessssful call events and backward signals in Signalling System R2
Ground-to-air-calls

INMARSAT aeronautical signalling system Event in INMARSAT system	Signalling System R2 Signal name: information element	Signal No.
Congestion in MSSC	B4 – Congestion	6
Incomplete AES number	B5 – Unallocated number	7
Continuity test failure	B8 – Subscriber line out of order	10
AES barred for incoming access	B2 – Send special info tone	4
Called AES not logged on	B2 – Send special info tone	4
No satellite channel frequency/equipment available	B4 – Congestion	6

Table 6 gives the relationship between backward signals in Signalling System R2 and messages in the INMARSAT aeronautical signalling system for air-to-ground calls, i.e. interworking of INMARSAT aeronautical to Signalling System R2. The comments column indicates specific actions taken by the MSSC.

The signal number of backward signals of Signalling System R2 are those given in Table A.11/Q.601-Q.608.

2.2 Signalling System No. 7 (TUP)

2.2.1 Tables 7 and 8 are similar to Tables 3 and 4, respectively, and apply to forward signals in Signalling System No. 7 (TUP).

The signal numbers for forward signals of Signalling System No. 7 (TUP) are those given in Table A.5 bis/Q.601-Q.608.

TABLE 6/Q.1152

Conversion of backward signals in Signalling System R2
to INMARSAT aeronautical signalling system
Air-to-ground calls

Signal No.	Signalling System R2 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	A4 – Congestion on the national network	Channel release: remote public network, switching equipment congestion	
2	A6 – Address complete, charge, set up, speech condition	Call attempt result: address complete	
3	A15 – Congestion in an international exchange or at its output	Channel release: international network, switching equipment congestion	
4	B2 – Send special information tone	Channel release: remote public network, normal – unspecified	
5	B3 – Subscriber line busy	Channel release: remote public network, user busy	
6	B4 – Congestion	Channel release: remote public network, switching equipment congestion	
7	B5 – Unallocated number	Channel release: remote public network, unassigned number	
8	B6 – Subscriber line free, charge	Call attempt result: address complete	
9	B7 – Subscriber line free, no charge	Call attempt result: address complete	No-charge information, used by MSSC only
10	B8 – Subscriber line out of order	Channel release: remote public network, destination out of service	
11	Answer	Connect	
12	Clear back	Channel release: Cause: Normal clearing	Clearback supervision done by MSSC
13	B1-B6 – International, subscriber line free, charge	Call attempt result: address complete	
14	B9, B10 – International, send special information tone	Channel release: international network, normal – unspecified	
15	B11-B15– Congestion	Channel release: remote public network, switching equipment congestion	

2.2.2 Tables 9, 9 bis and 10 are similar to Tables 5, 5 bis and 6, respectively, and apply to backward signals in Signalling System No. 7 (TUP).

The signal numbers for backward signals in Signalling System No. 7 (TUP) are those given in Table A.9 bis/Q.601-Q.608.

TABLE 7/Q.1152

**Conversion of forward signals in INMARSAT aeronautical signalling system
to Signalling System No. 7
Air-to-ground calls**

INMARSAT aeronautical signalling system Message: information element: value	Signalling System No. 7 Signal name: information element	Signal No.
Access request: message type	Calling party's category indicator:	13
Public voice/	Ordinary subscriber/	13
Crew voice/	Ordinary subscriber/	13
Crew distress voice/	Subscriber with priority	14
Access request: address digits 0, 1	Address signals: Digit 1, 2 ... 0	1
	nature of address indicator, international number	3
Call information: digit 2 to 17		
Test	Continuity check performed on previous circuit	22
Channel release: Cause: Normal clearing	Clear forward signal	16
NOTE – Signal No. 5, nature of circuit indicator, one satellite in connection, is generated by the MSSC.		

2.3 Signalling System No. 5

2.3.1 Tables 11 and 12 are similar to Tables 3 and 4, respectively, and apply to forward signals in Signalling System No. 5.

The signal numbers for forward signals of Signalling System No. 5 are those given in Table A.4/Q.601-Q.608.

2.3.2 Tables 13, 13 *bis* and 14 are similar to Tables 5, 5 *bis* and 6, respectively, and apply to backward signals in Signalling System No. 5.

The signal numbers for backward signals in Signalling System No. 5 are those given in Table A.8/Q.601-Q.608.

2.4 The relationship between forward and backward signals of Signalling System No. 7 (ISUP) and messages of the INMARSAT aeronautical signalling system is for further study.

3 Incoming INMARSAT aeronautical logic procedures (air-to-ground calls)

Figure 1 contains the procedures for the incoming INMARSAT aeronautical signalling system.

This description only includes those aspects of the INMARSAT aeronautical system which have to be implemented for interworking purposes. Internal procedures, such as those required for setting up and clearing satellite channels are not shown. This also applies to pre-emption procedures for assigning channels to distress calls.

The following details should be noted:

3.1 The access request contains information elements for the required service, and the required network, plus two address digits. For some private networks, and/or subscription services on public networks, this information will be sufficient to determine the complete call routing. In all but the most exceptional cases, it will be enough information to select a circuit for onward routing from the MSSC.

TABLE 8/Q.1152

**Conversion of forward signals in Signalling System No. 7 TUP
to INMARSAT aeronautical signalling system
Ground-to-air calls**

Signal No.	Signalling System No. 7 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	Address signals	Call announcement: AES ID, called terminal	
2	Nature of address indicator, national significant number	—	Interpreted by MSSC
3	Nature of address indicator, international number	—	Interpreted by MSSC
4	Nature of circuit indicator, no satellite in connection	—	Ignored by MSSC
5	Nature of circuit indicator, one satellite in connection	—	Ignored by MSSC
6	Echo suppressor indicator, outgoing half-echo suppressor not included	—	MSSC will insert echo control device if needed
7	Echo suppressor indicator, outgoing half-echo suppressor included	—	Interpreted by MSSC
8-12	Calling party's category indicator, language digit	Call announcement — service: telephone	—
13	Calling party's category indicator, ordinary calling subscriber	Call announcement — service: telephone	—
14	Calling party's category indicator, calling subscriber with priority	Call announcement — service: telephone, priority for further study	—
15	Calling party's category indicator, data call	—	Not applicable
16	Clear forward	Channel release: Cause: Normal clearing	—
17	Forward transfer	—	Not applicable
18	Continuity proved	—	Interpreted by MSSC
19	Continuity check failure	Channel release: Cause: Normal clearing	—
20	Continuity check not required on this circuit	—	Interpreted by MSSC
21	Continuity check not required on this circuit	—	Interpreted by MSSC
22	Continuity check performed on previous circuit	—	Interpreted by MSSC
23	Service information	—	Interpreted by MSSC
24	General set-up message	—	Interpreted by MSSC

3.2 The initial analysis of the request checks that the AES is authorized for the service requested and finds a suitable channel and channel unit, on which to service the call. The call is aborted if the AES is not an authorized user of the INMARSAT system.

3.3 In the cases where all of the required address information is contained in the access request signal unit, an address message is received by the incoming procedure, once continuity of the assigned satellite channel has been successfully tested.

TABLE 9/Q.1152

**Conversion of backward signals in INMARSAT aeronautical signalling system
to Signalling System No. 7 TUP
Ground-to-air calls**

INMARSAT aeronautical signalling system Message: information element: value	Signalling System No. 7 Signal name	Signal No.
Test	AFC: Address complete, subscriber free, charge	4
Connect	ANC: Answer, charge	16
Channel release: Cause: Normal clearing	CLB: Clear back	19
Call attempt result: Cause:		
– user busy	SGB: Subscriber busy	12
– no channel available	CGC: Circuit group congestion	8
– destination out of service	LOS: Line out of service	13
– others	SST: Send special information tone	14

TABLE 9 bis/Q.1152

**Unsuccessful events and backward signals in Signalling System No. 7
Ground-to-air calls**

INMARSAT aeronautical signalling system Event in INMARSAT system	Signalling System No. 7 Signal name	Signal No.
Congestion in MSSC	SEC: Switching equipment congestion	7
No satellite channel frequency/equipement available	NNC: National network congestion	9
Incomplete AES number	ADI: Address incomplete	10
Continuity test failure	LOS: Line out of service	13
AES barred for incoming access	SST: Send special information tone	14
Call AES not logged on	SST: Send special information tone	14

3.4 The called address is analysed to verify its integrity. The satellite channel may be cleared at this point, either if the dialled address is incomplete or if the AES goes on-hook. The call may also be aborted if proper credit card data is not received from the AES.

3.5 The dialled digits are transferred to the interworking procedure, and the answer signal is awaited. The last digit may be withheld until receipt of credit card information. All successful address complete signals are converted to a call attempt result message, with the cause field set to address complete.

3.6 Unsuccessful call event signals (BITEs 9-20) are transferred to the AES by the call attempt result message, with the cause field set appropriately.

3.7 On receipt of the answer signals, the connect message is sent to the AES.

3.8 The call is cleared in the normal way, either on receipt of a release message from the interworking procedure, or an indication of AES on-hook conveyed by means of a channel release message.

TABLE 10/Q.1152

**Conversion of backward signals in Signalling System No. 7 TUP
to INMARSAT aeronautical signalling system
Air-to-ground calls**

Signal No.	Signalling System No. 7 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	ADC: Address complete, charge	Call attempt result: Address complete	–
2	ADN: Address complete, no charge	Call result: Address complete	No-charge information used by MSSC only
3	ADX: Address complete, coinbox	Call result: Address complete	–
4	AFC: Address complete, subscriber free, charge	Call result: Address complete	–
5	AFN: Address complete, subscriber free, no charge	Call result: Address complete	No-charge information used by MSSC only
6	AFX: Address complete, subscriber free, coinbox	Call result: Address complete	–
7	SEC: Switching equipment congestion	Channel release: international network, switching equipment congestion	–
8	CGC: Circuit-group congestion	Call result: international network, no channel available	–
9	NNC: National network congestion	Call result: remote public network, switching equipment congestion	–
10	ADI: Address complete	Call result: remote public network, invalid number format	–
11	UNN: Unallocated number	Call result: remote public network, unassigned number	–
12	SGB: Subscriber busy	Call result: remote public network, user busy	–
13	LOS: Line out of service	Call result: remote public network, destination out of service	–
14	SST: Send special information tone	Call result: international network, normal – unspecified	–
15	CFL: Call failure	Call result: international network, normal – unspecified	–
16	ANC: Answer, charge	Connect	–
17	ANN: Answer, no charge	Connect	No charge information used by MSSC only
18	RAN: Reanswer	Connect	–
19	CLB: Clearback	Channel release: Cause: Normal clearing	Clearback supervision done by MSSC
20	GRQ: General request message	–	Interpreted by MSSC
21	Call unsuccessful, access barred	Call attempt result: remote public network, normal – unspecified	–
22	DPN: Call unsuccessful, digital path not provided	–	Not applicable

TABLE 11/Q.1152

Conversion of forward signals in INMARSAT aeronautical signalling system
to Signalling System No. 5
Air-to-ground calls

INMARSAT aeronautical signalling system Message: information element: value	Signalling System No. 5 Signal name	Signal No.
Access request: message type		
– public voice	Discriminating digit 0	7
– crew voice	Discriminating digit 0	7
– crew distress voice	Discriminating digit 0	7
Access request: address digits: 0, 1	Address digits	1
Call information: digits 2 to 17		
Test	Not applicable	–
Channel release: Cause: Normal clearing	Clear forward	10

TABLE 12/Q.1152

Conversion of forward signals in INMARSAT aeronautical signalling system
to Signalling System No. 5
Ground-to-air calls

Signal No.	Signalling System No. 5 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	Address signals	Call announcement: AES identity, called terminal	
2-6	Language digit: 1 ... 5	–	Interpreted by MSSC
7	Discriminating digit 0	Call announcement – service: telephone	
8	Start of pulsing signal KP1	–	Interpreted by MSSC
9	Start of pulsing signal KP2	–	Interpreted by MSSC
10	Clear forward	Channel release: Cause: Normal clearing	
11	Forward transfer	–	Not applicable

TABLE 13/Q.1152

**Conversion of backward signals in INMARSAT aeronautical signalling system
to Signalling System No. 5
Ground-to-air calls**

INMARSAT aeronautical signalling system Message: information element: value	Signalling System No. 5 Signal name	Signal No.
Test	Inform that ST has been sent	5
Connect	Answer signal	2
Channel release: Cause: Normal clearing	Clear back	3
Call attempt result: Cause:		
– user busy	Busy flash signal	1
– no channel available	Busy flash signal	1
– destination out of service	Information tone (Note)	–
– others	Information tone (Note)	–
NOTE – May include appropriate recorded announcement.		

TABLE 13 bis/Q.1152

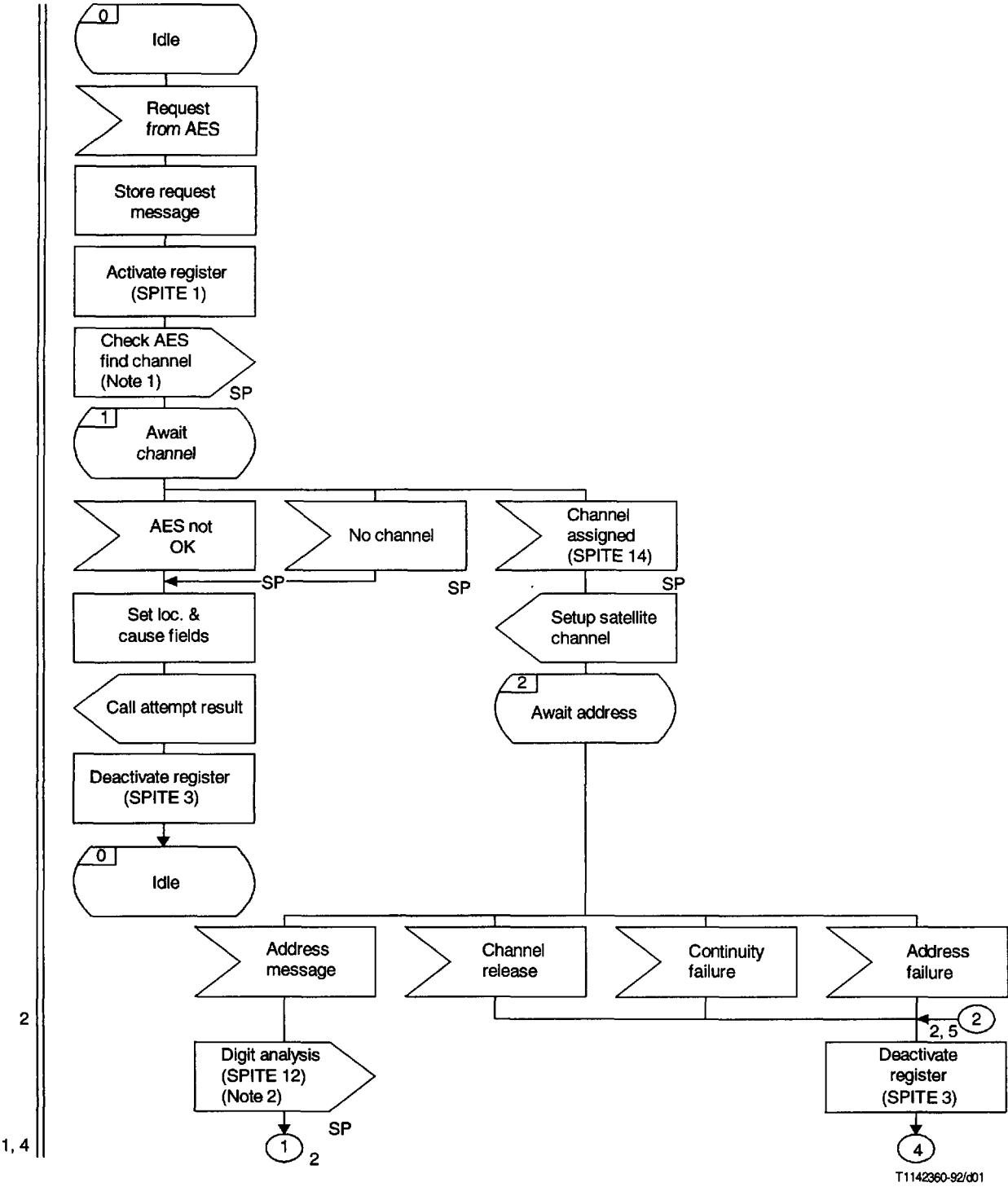
**Unsuccessful call events and backward signals in Signalling System No. 5
Ground-to-air calls**

INMARSAT aeronautical signalling system Event in INMARSAT system	Signalling System No. 5 Signal name	Signal No.
Congestion in MSSC	Busy flash	1
No satellite channel frequency/equipment available	Busy flash	1
Incomplete AES number	Information tone (Note)	
Continuity test failure	Information tone (Note)	
Called AES not logged on	Information tone (Note)	
AES barred for incoming access	Information tone (Note)	
NOTE – May include appropriate recorded announcement.		

TABLE 14/Q.1152

**Conversion of backward signals in Signalling System No. 7
to INMARSAT aeronautical signalling system
Air-to-ground calls**

Signal No.	Signalling System No. 5 Signal name	INMARSAT aeronautical signalling system Message: information element: value	Comments
1	Busy-flash	Channel release: international network, unspecified	–
2	Answer	Connect	–
3	Clear back	Channel release: Cause: Normal clearing	–
4	Proceed to send	–	Interpreted by MSSC
5	Inform that ST has been sent	Call attempt result: address complete	



NOTES

- 1 Analyse for authorized AES ID, availability of service requested, find a suitable satellite channel and channel unit.
- 2 Includes translation of prefixes to the appropriate B-party number, and verification that the number is valid.

FIGURE 1/Q.1152 (sheet 1 of 7)
Logic procedures for incoming INMARSAT aeronautical signalling
(air-to-ground calls)

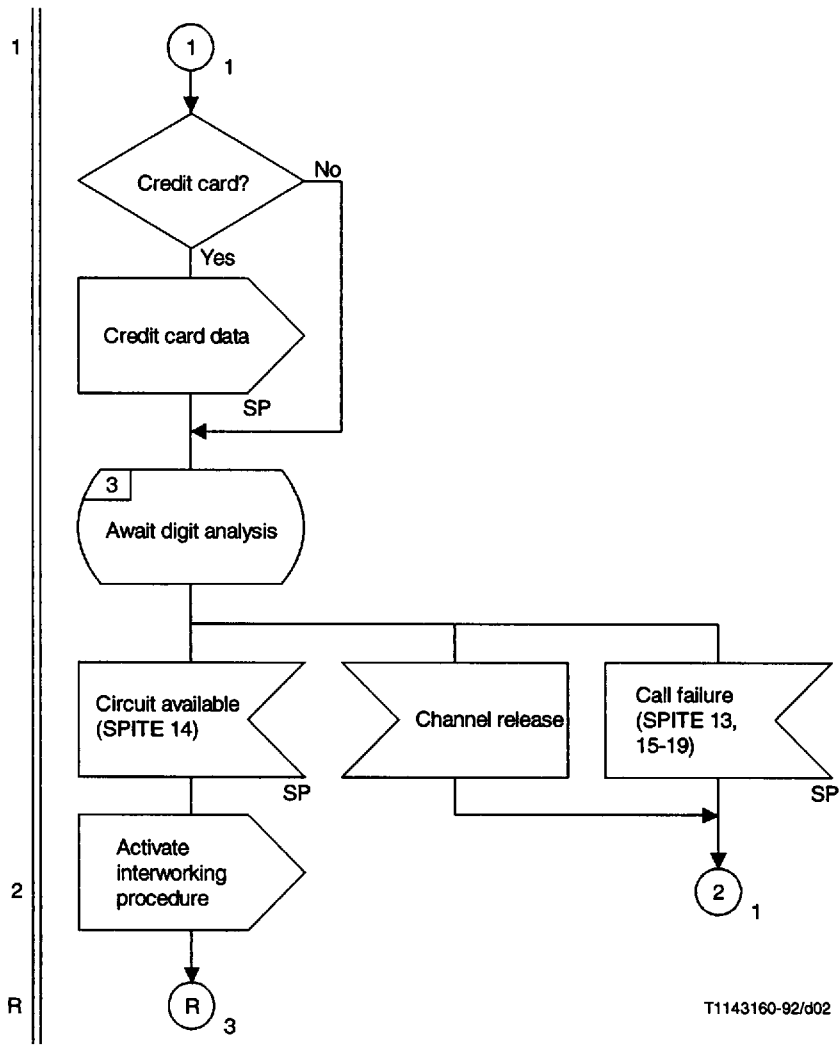


FIGURE 1/Q.1152 (sheet 2 of 7)
Logic procedures for incoming INMARSAT aeronautical signalling
(air-to-ground calls)

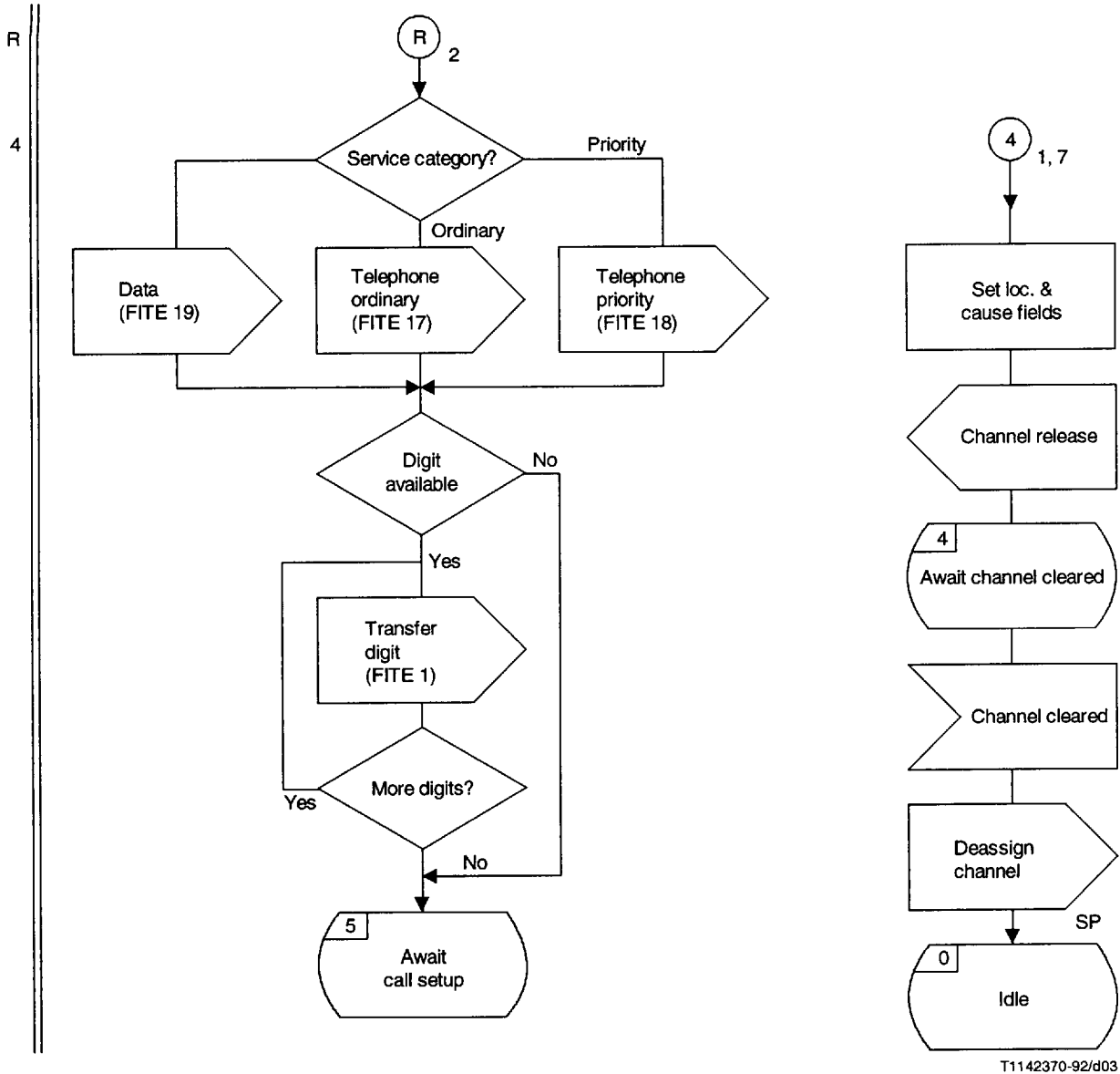


FIGURE 1/Q.1152 (sheet 3 of 7)
Logic procedures for incoming INMARSAT aeronautical signalling
(air-to-ground calls)

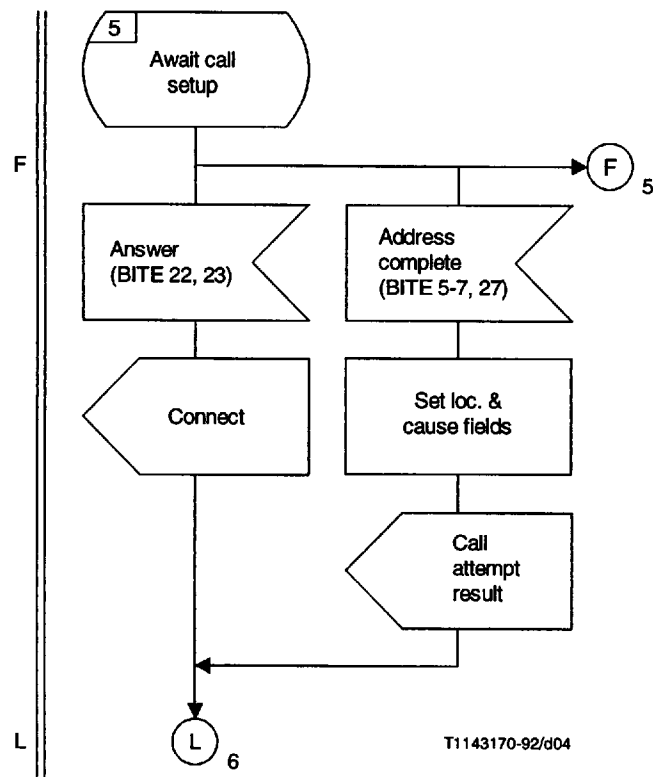


FIGURE 1/Q.1152 (sheet 4 of 7)
Logic procedures for incoming INMARSAT
aeronautical signalling (air-to-ground calls)

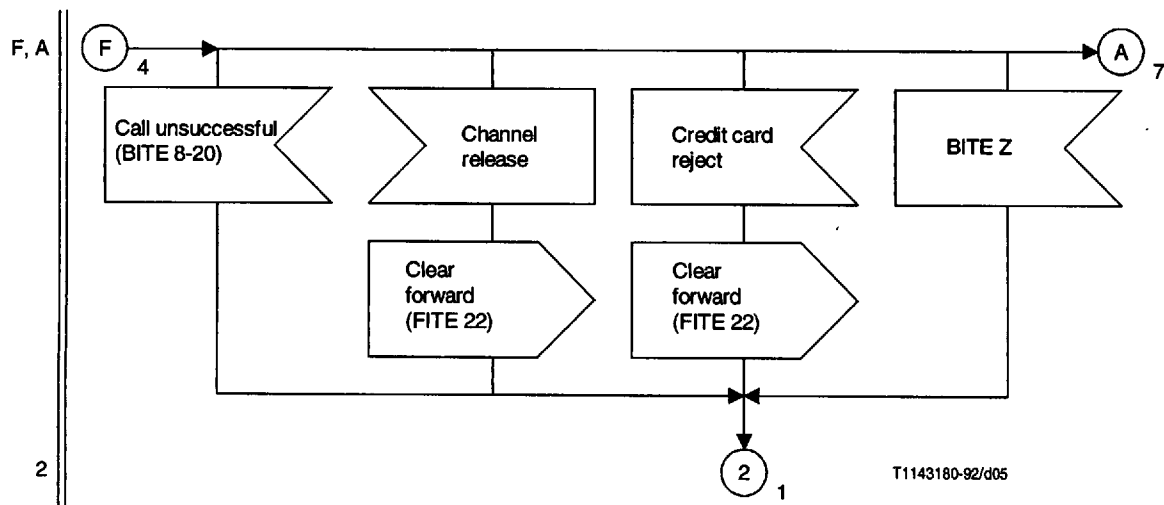


FIGURE 1/Q.1152 (sheet 5 of 7)
Logic procedures for incoming INMARSAT aeronautical signalling
(air-to-ground calls)