INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

Q.71

TELECOMMUNICATION
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OF ITU

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GENERAL RECOMMENDATIONS ON TELEPHONE SWITCHING AND SIGNALLING

FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN

ISDN CIRCUIT MODE SWITCHED BEARER SERVICES

ITU-T Recommendation Q.71

(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.71 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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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SUMMARY

Recommendation Q.71 is the Stage 2 definition for point-to-point circuit mode switched bearer services. These services include speech, 3.1 kHz audio, multi-use 7 kHz, unrestricted and n × 64 kbit/s information transfers as well as broadband connection-oriented bearer services.

Stage 2 identifies the functional capabilities and information flows needed to support the service description. It provides information on the functions in ISDN entities and the information flows between the entities which are required to provide call set-up and call release procedures. This includes the description of the interfaces to the various supplementary services and the interface to private networks.

ISDN CIRCUIT MODE SWITCHED BEARER SERVICES

(Melbourne 1988, modified at Helsinki 1993)

1 Introduction

1.1 General

This Recommendation provides information on the functions in ISDN entities and the information flows between the entities which are required to provide call set-up and call release procedures for point-to-point services. Such services include:

- speech information transfer;
- 3.1 kHz audio information transfer;
- multi-use 7 kHz information transfer;
- unrestricted information transfer;
- n × 64 kbit/s information transfer;
- broadband connection oriented bearer services.

1.2 Definitions

For the purposes of this Recommendation, the following definitions apply:

call control functional entity (CC): CCs are functional entities which cooperate with each other to provide the services requested by the CCAs.

call control agent functional entity (CCA): A functional entity that serves the user and is responsible for initiating functional requests and interacting with CCs.

through connect: To establish a connection within a functional entity making it available for transport of user information.

private network (PN): private ISDN network consisting of ISDN PBX and/or ISDN Centrex.

1.3 Symbols and abbreviations

For the purposes of this Recommendation, the following abbreviations apply:

FEA Functional Entity Action

LE Local Exchange

PNX private network exchange

SDL Specification and Description Language Recommendation Z.100

1.4 Services supported by this Recommendation

1.4.1 64 kbit/s information transfer

An unrestricted bearer service (see Note 1) provides information transfer without alteration between S/T reference points. It may, therefore, be used to support various user applications. Examples include:

1) Speech information transfer (see Note 2).

This bearer service category is intended to support speech.

The digital signal at the S/T reference point is assumed to conform to the internationally agreed encoding laws for speech (i.e. Recommendation G.711 A-law, μ-law) and that the network may use processing techniques appropriate for speech such as analogue transmission, echo cancellation and low bit rate encoding. Hence, bit integrity is not assured. This bearer service is not intended to support modem derived voice-band data.

All CCITT Recommendations for the transfer of speech information in the network apply to this service.

2) 3.1 kHz audio information transfer (see Note 2).

This bearer service corresponds to the service which is currently offered in the PSTN.

This bearer service provides the transfer of speech and the transfer of 3.1 kHz bandwidth audio information such as voice-band data via modems, Groups I, II and III facsimile information (see Note 3). The digital signal at the S/T reference point is assumed to conform to the internationally agreed encoding laws for speech A-law and μ-law, i.e. Recommendation G.711. Connections provided for this service should provide for the transfer of the information indicated above. (This means that the network may include speech processing techniques provided that they are appropriately modified, or functionally removed prior to non-speech information transfer.) The control of echo control devices, speech processing devices etc., is only made by use of a 2100 Hz (disabling) in-band tone.

3) 7 kHz.

4) Multiple subrate information streams multiplexed into 64 kbit/s by the user.

5) Transparent access to an X.25 public network [(Recommendation I.462, case a)].

User information is transferred over a B-channel: signalling is provided over a D-channel.

NOTES

1 During an interim period some networks may only support restricted 64 kbit/s digital information transfer capability, i.e. information transfer capability solely restricted by the requirement that the all-zero octet is not allowed. For interworking the rules given in Appendix I/I.520 should apply. The interworking functions have to be provided in the network with restricted 64 kbit/s capability. The ISDN with 64 kbit/s transfer capabilities will not be affected by this interworking, other than conveying the appropriate signalling message to and from the ISDN terminal.

2 It is recognized that it is the responsibility of the customers to ensure that a compatible encoding scheme is in operation. Customers should also recognize that no network provision can be made for the control of such items as echo and loss, as the network is unaware of the application in use. Furthermore, the Quality of Service attribute for information transfer delay will indicate the suitability of a particular version of this bearer service for speech.

3 The maximum modem bit rate that can be used by users in applications of this bearer service depends on the modulation standard employed by the user and on the transmission performance within, or between, different Administrations. The extent of support is a network, or bilaterally agreed matter.

1.4.2 n × 64 kbit/s information transfer

The information flows etc., contained in this Recommendation apply to unrestricted information transfer at rates of n × 64 kbit/s where n is any positive integer. Time slot sequence integrity is maintained.

1.4.3 Broadband connection oriented bearer services

This bearer service category provides unrestricted transfer of user information over a B-ISDN virtual connection between the calling and called S_B/T_B reference points. The service allows for the establishment of multiple virtual connection each in a point-to-point configuration over the same physical interface.

The service provides cell based communication in a bidirectional symmetric or bidirectional asymmetric fashion. The user specifies several parameters at call set-up to characterize the communication. The symmetry and bit rate characterization will be provided. The bit rate may be characterized by a group of parameters such as peak bit rate, average bit rate, etc.

1.5 Service invocation

Users indicate their required bearer service capabilities at the time of call set-up by including appropriate information in the service request sent to the network via the user/network signalling channel. Subsequent interactions involving status and control information also occur using the signalling channel. However, tones and announcements associated with speech and 3.1 kHz and multi-use 7 kHz information services are sent to the user over the user access channel used for the call.

2 Call set-up and release

2.1 Functional model

See Figure 2-1

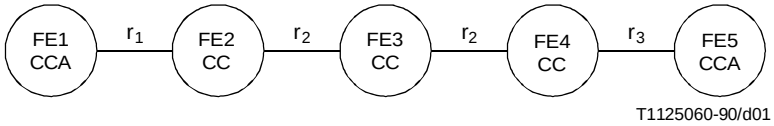


FIGURE 2-1/Q.71

Functional model

CCAs are functional entities that serve the users and are responsible for initiating functional requests and interacting with CCs. CCs are functional entities that cooperate with each other to provide the services requested by the CCAs. r_1, r_2 and r_3 are relationships between functional entities wherein information flows occur in order to process call attempts or service requests.

2.1.1 Description of the call control agent (CCA) functional entity

FE1 represents the originating CCA function which will

a) access the service-providing capabilities of the CC entities, using service requests for the establishment, manipulation and release of a single call;

b) receive indications relating to the call from the CC entity and relay them to the user;

c) maintain call state information as perceived from this functional end-point of the service (i.e. a single-ended view of the call).

FE5 represents the terminating CCA function which will:

a) access the service-providing capabilities of the CC entities using service requests for the establishment, manipulation and release of a single call;

b) receive indications relating to the call from the CC entity and relay them to the user;

c) maintain call status information as perceived from this functional end-point of the service (i.e. a single-ended view of the call).

In a single service example, one CCA originates the call and the other CCA terminates the call. The functions and relationships involved are not symmetric. This asymmetry is reflected in the different FE designations, FE1 and FE5, assigned to the two CCAs and in the different relationships designations between CCAs and CCs (r_1 and r_3).

2.1.2 Description of the call control (CC) functional entity

FE2 represents an originating CC function serving the calling party's CCA which will

a) establish, manipulation and release a single call (upon request of the CCA entity);

b) associate and relate the CCA entities that are involved in a particular call and/or service;

c) manage the relationship between the CCA entities involved in a call (i.e. reconcile and maintain the overall perspective of the call and/or service).

FE3 represents a transit CC function. There can be more than one FE3 functional entity involved in a call depending on depth of network hierarchy.

FE4 represents a terminating CC function serving the called party's CCA.

r_2 is a relationship between a CC-functional entity and another CC-functional entity. r_2 can be of different types, depending on the functionality the related CC-functional entity represents in a specific network scenario, e.g. a CC may be a gateway exchange or a PNX or a local exchange.

r_2* is the relationship between a private network and a public gateway CC at the originating side and r_2** is the relationship between a private network and a public gateway CC at the terminating side (see Figure 2-2).

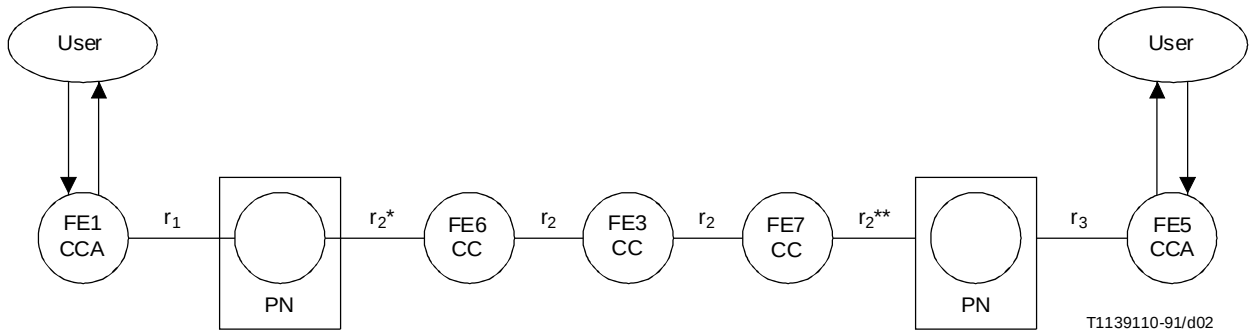


FIGURE 2-2/Q.71

Logical relationships at public ISDN accesses

Figure 2-2 illustrates that when an ISPBX is involved at the public ISDN access, the public ISDN provides gateway CCs which connect to the CCs of the PN via relationships r_2* and r_2**.

Note that the public ISDN may offer the basic service and the associated supplementary services at the customer network interface in two different versions as a subscription option.

FE6 represents an originating gateway CC function designed to interface a private network to a public network.

FE7 represents a terminating gateway CC function designed to interface a private network to a public network.

2.1.3 Interfaces to Intelligent Networks

The decision points are analogous to hooks for Supplementary Services. They use the capabilities of Intelligent Networks Capability Set 1. These decision points can be located on the Q.71 SDL diagrams. The inclusion of the IN decision points in this Recommendation remains to be done and will be included in the next update.

2.2 Information flows required for en-bloc and digit-by-digit sending call set-up and call release

2.2.1 Information flow diagrams

Information flow diagrams for circuit mode switched bearer service call set-up and call release are shown in Figures 2-3 through 2-12:

– Figure 2-3 shows a successful call set-up using *en-bloc* sending;

– Figures 2-4 through 2-6 show call set-up procedures for digit-by-digit sending cases;

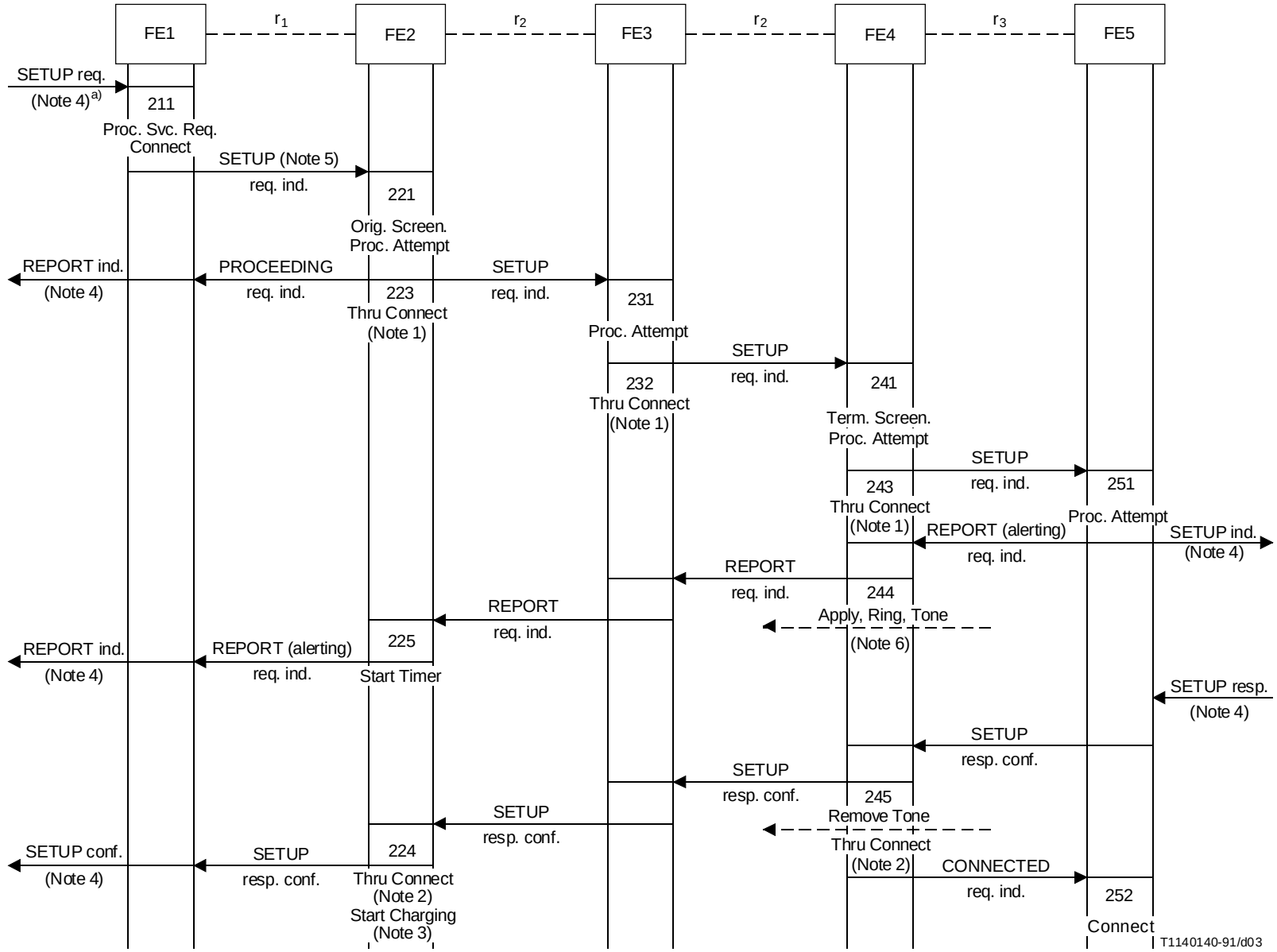
  a) case 1 Address Information with Address End Signal;

  b) case 2 Address Information without explicit Address End Signal distinguished between Figure 2-5, fixed number length, known at FE2 and Figure 2-6, number length determined at FE4;

– Figure 2-7 shows normal clearing initiated by a calling party disconnection;

– Figure 2-8 shows normal clearing initiated by a called party disconnection;

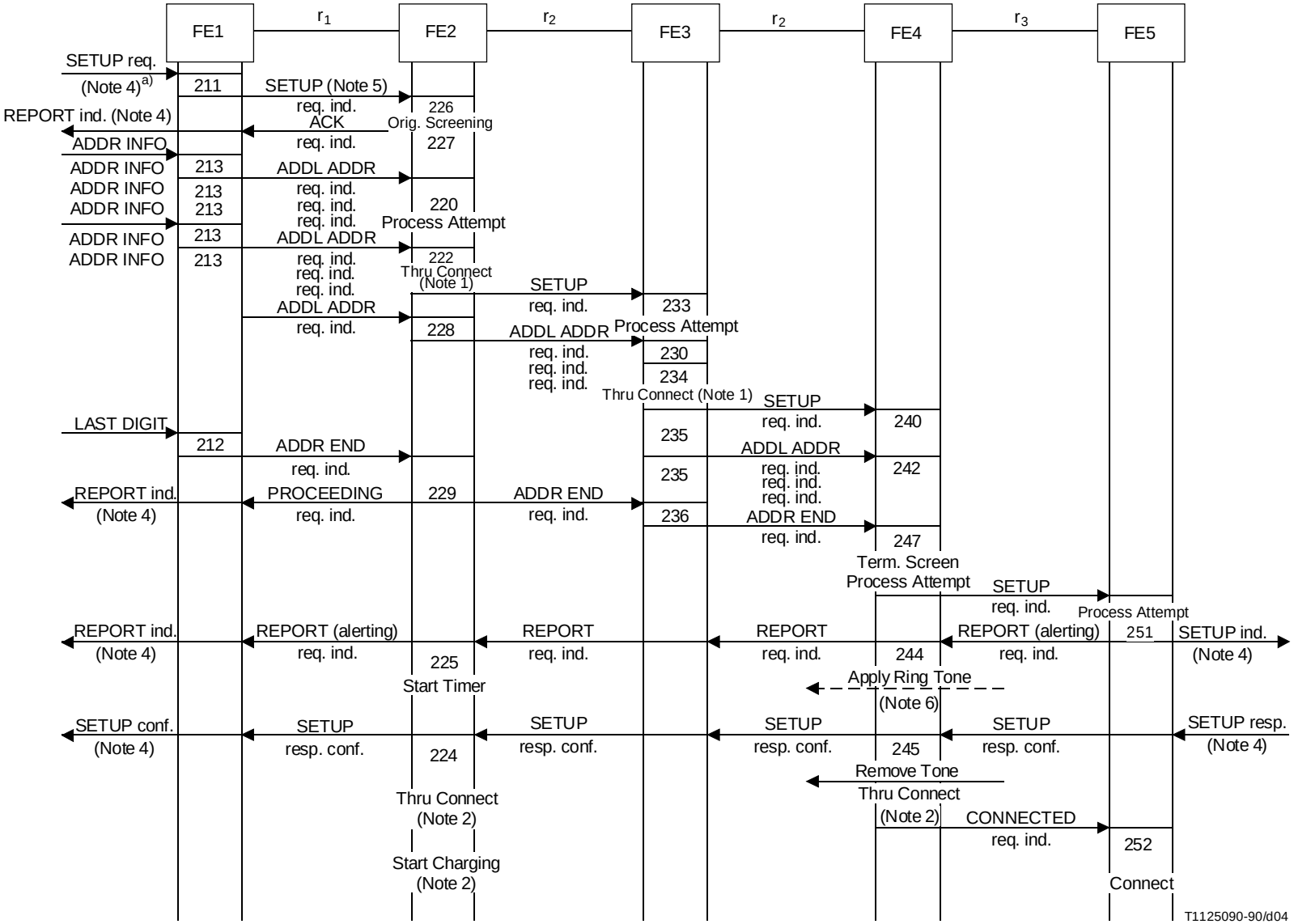
– Figures 2-9 to 2-12 show the above-mentioned flows for the interworking of public ISDNs with private ISDNs.



a) The Notes are found after Figure 2-12.

FIGURE 2-3/Q.71

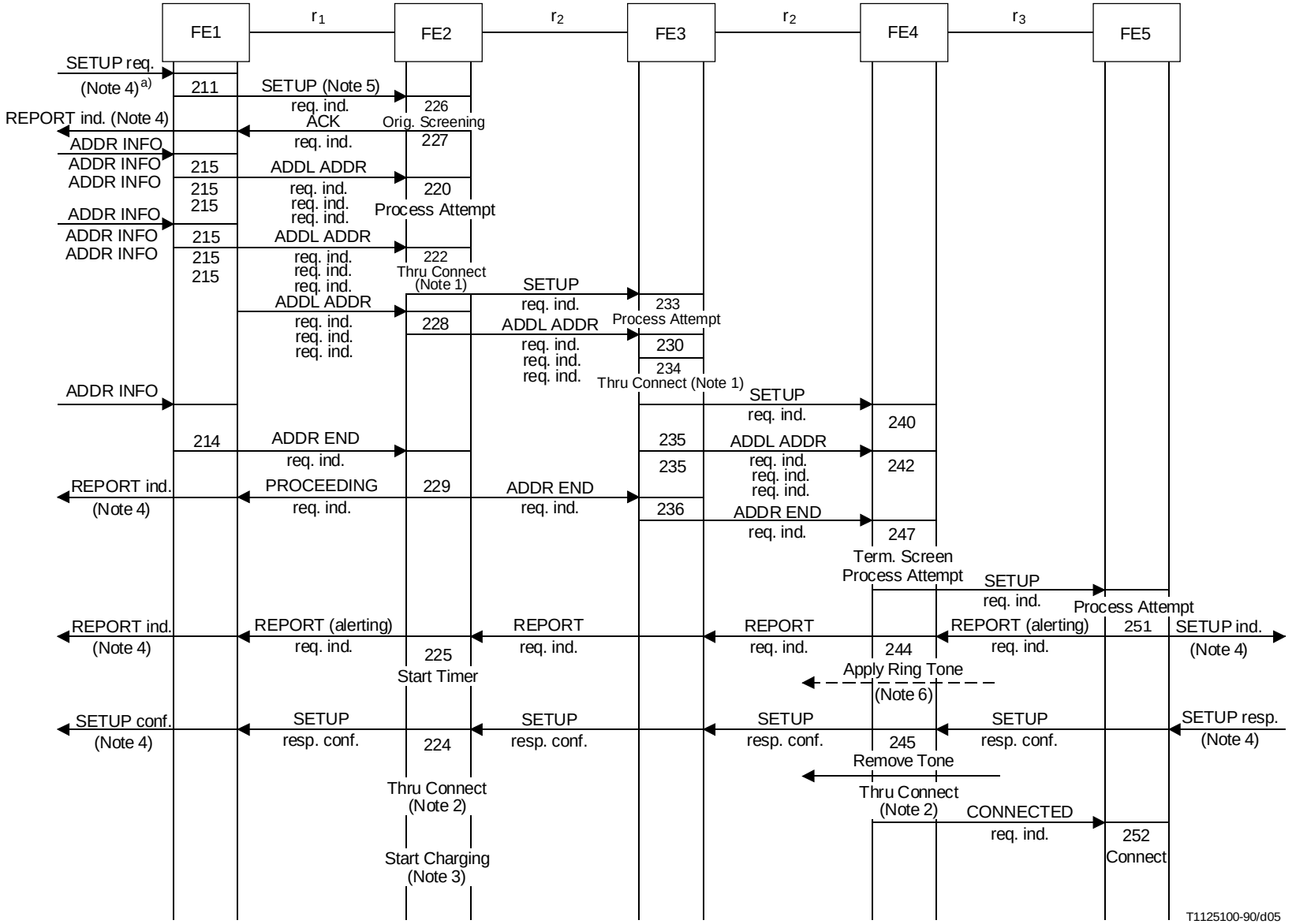
Successful ISDN call set-up en-bloc sending



a) The Notes are found after Figure 2-12.

FIGURE 2-4/Q.71

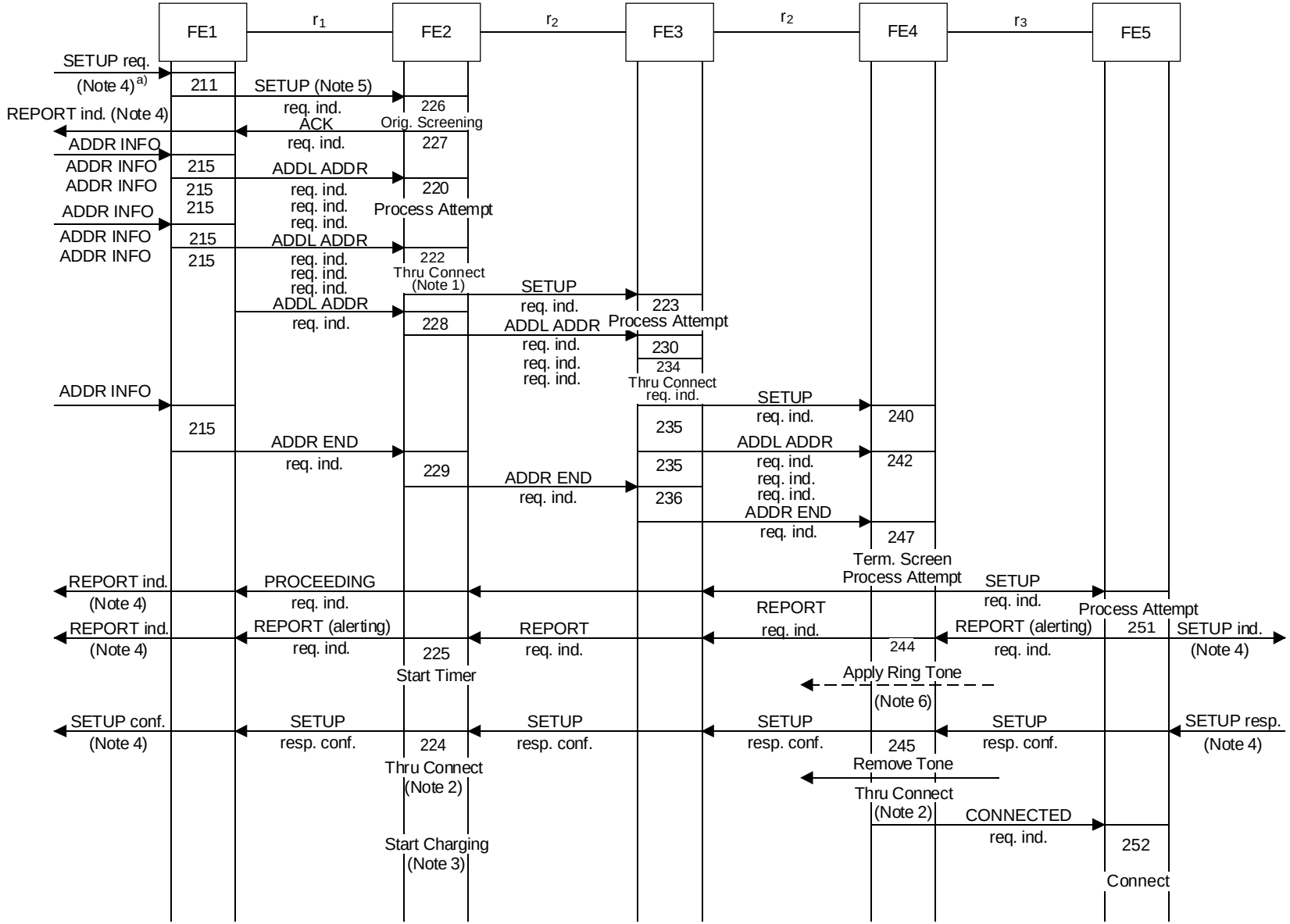
Successful ISDN call set-up, digit-by-digit sending – Case 1



a) The Notes are found after Figure 2-12.

FIGURE 2-5/Q.71

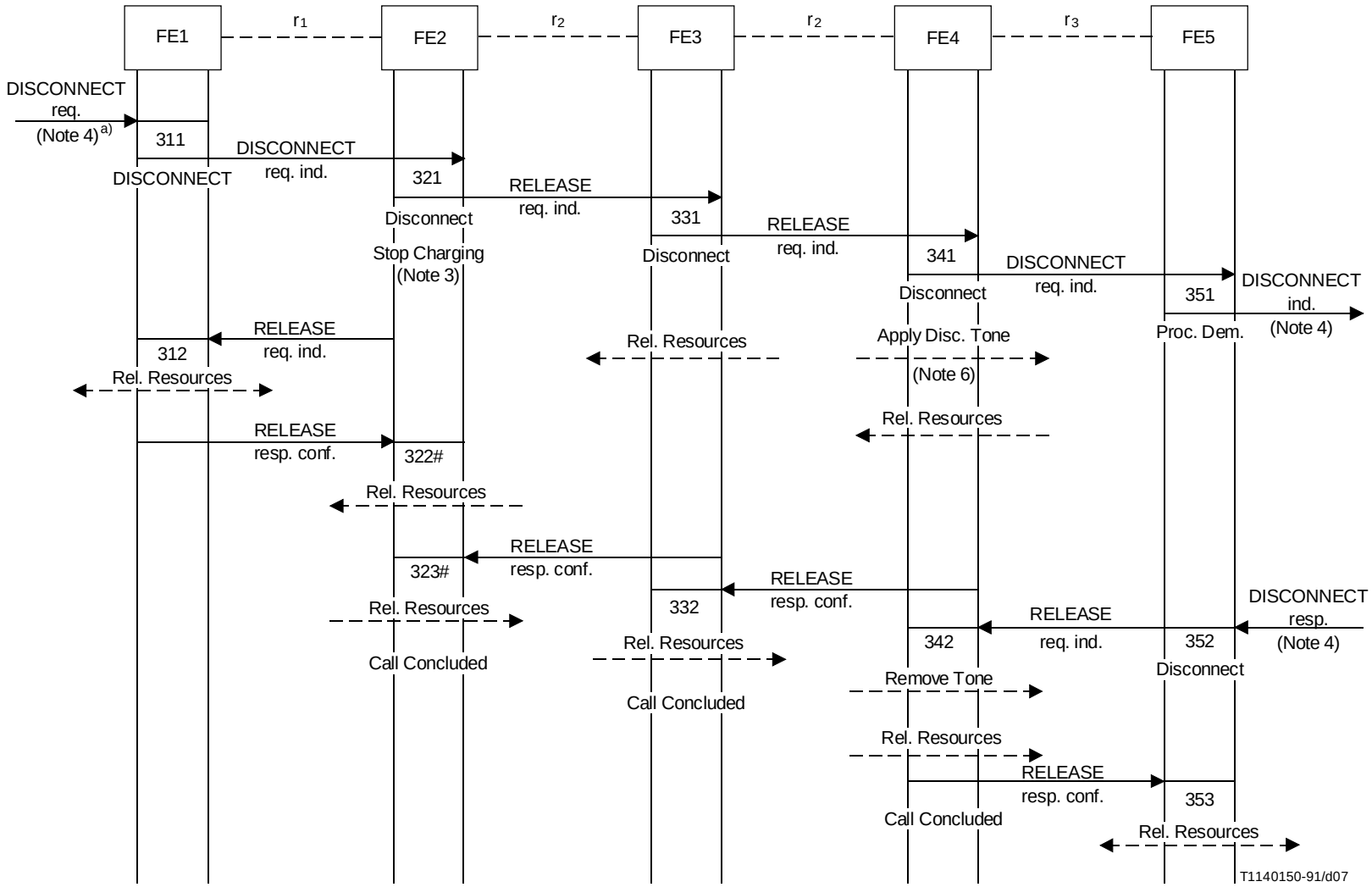
Successful ISDN call set-up, digit-by-digit sending – Case 2a number length known at FE2



a) The Notes are found after Figure 2-12.

FIGURE 2-6/Q.71

Successful ISDN call set-up, digit-by-digit sending – Case 2b number length unknown at FE2

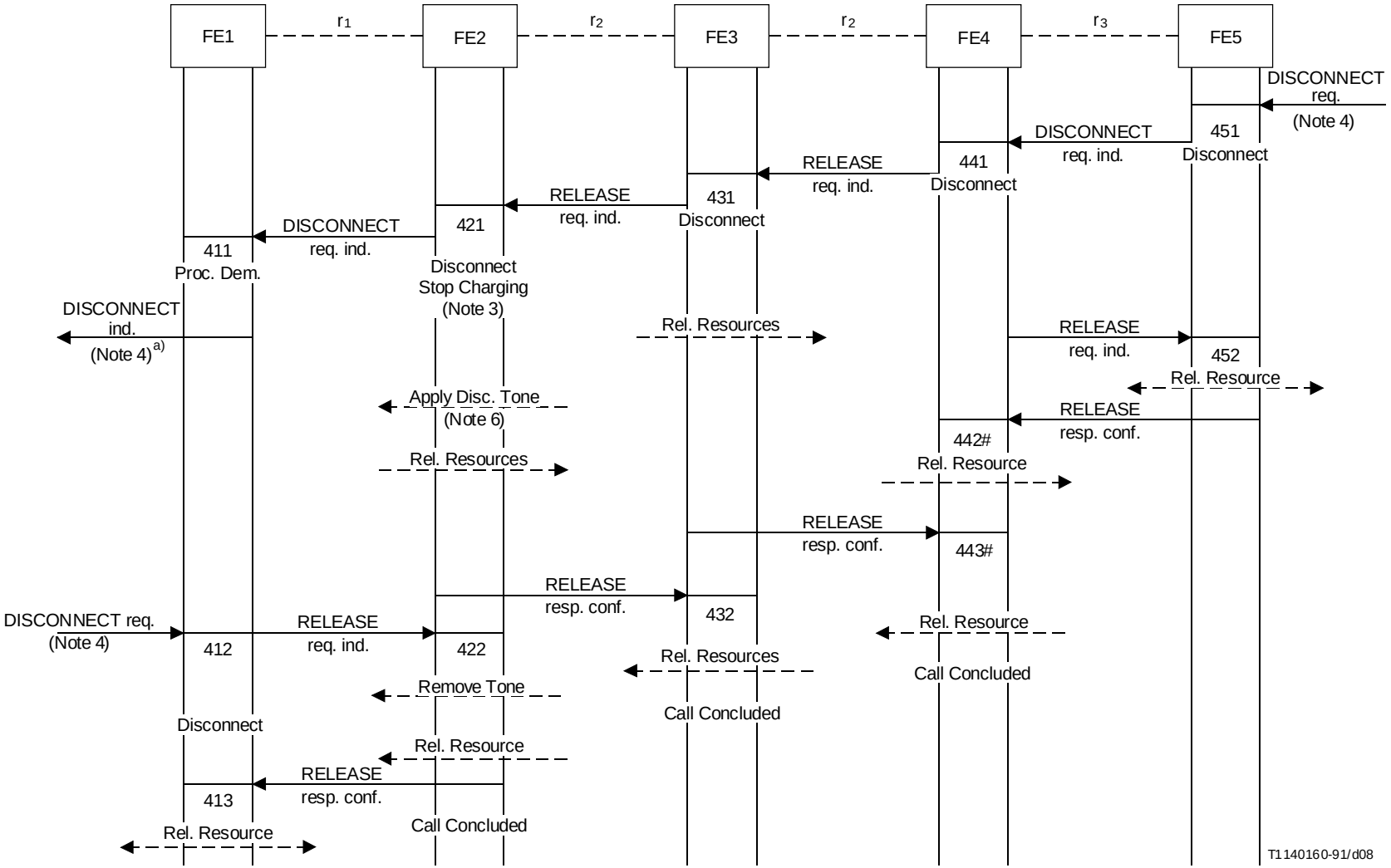


# Indicates sequence is not implied

a) The Notes are found after Figure 2-12.

FIGURE 2-7/Q.71

Normal clearing – Calling party disconnect

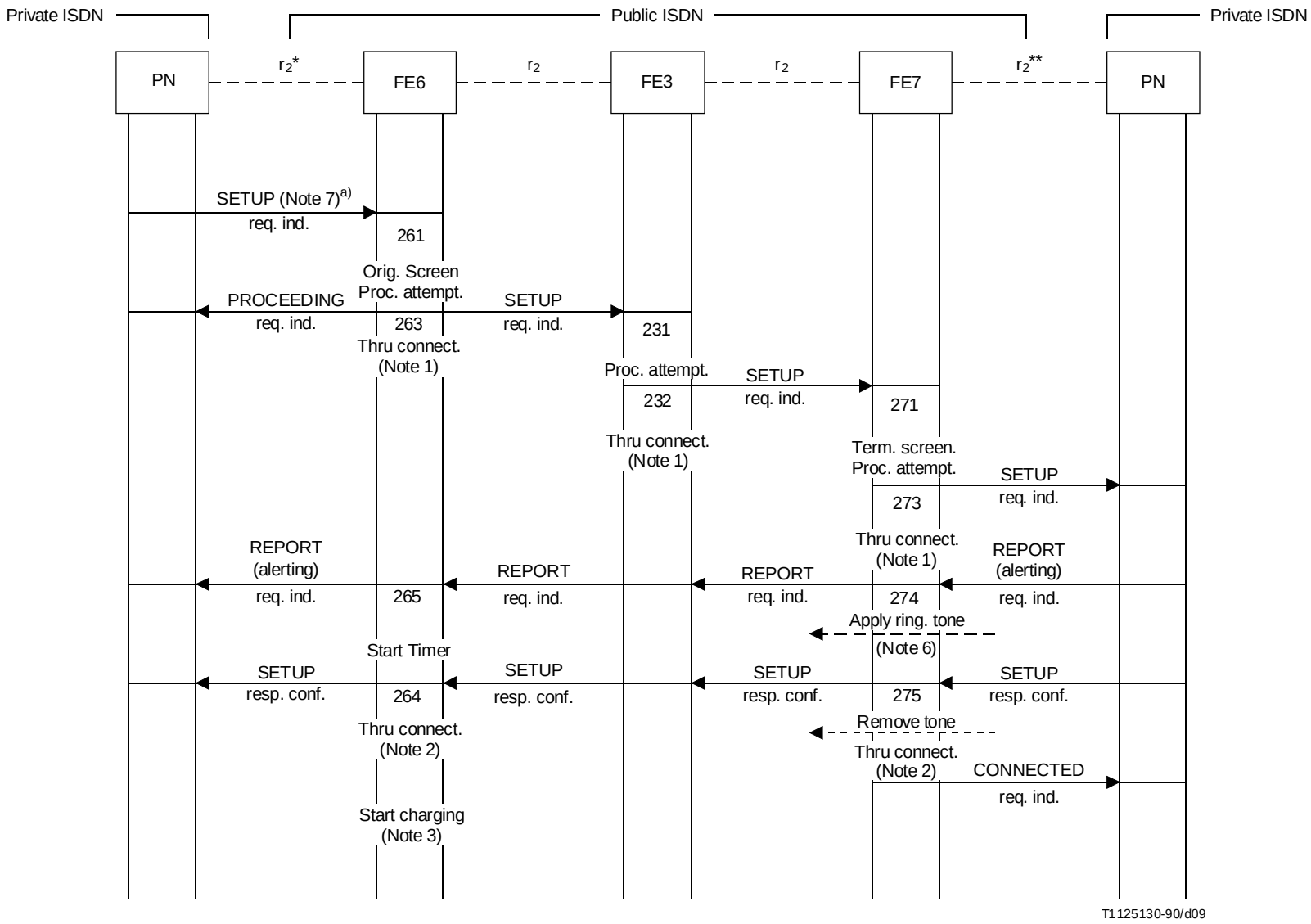


# Indicates sequence is not implied

a) The Notes are found after Figure 2-12.

FIGURE 2-8/Q.71

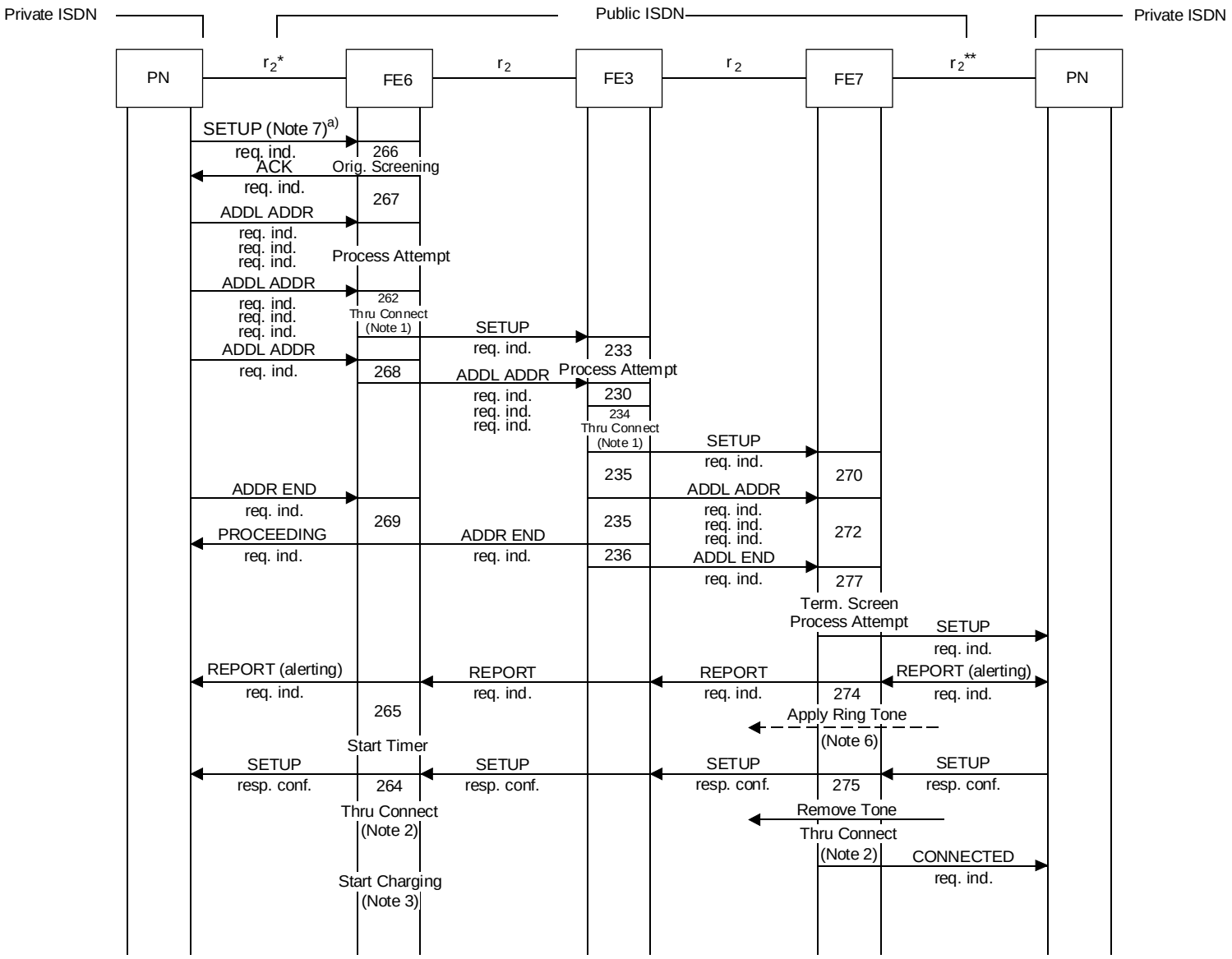
Normal clearing – Calling party disconnect



a) The Notes are found after Figure 2-12.

FIGURE 2-9/Q.71

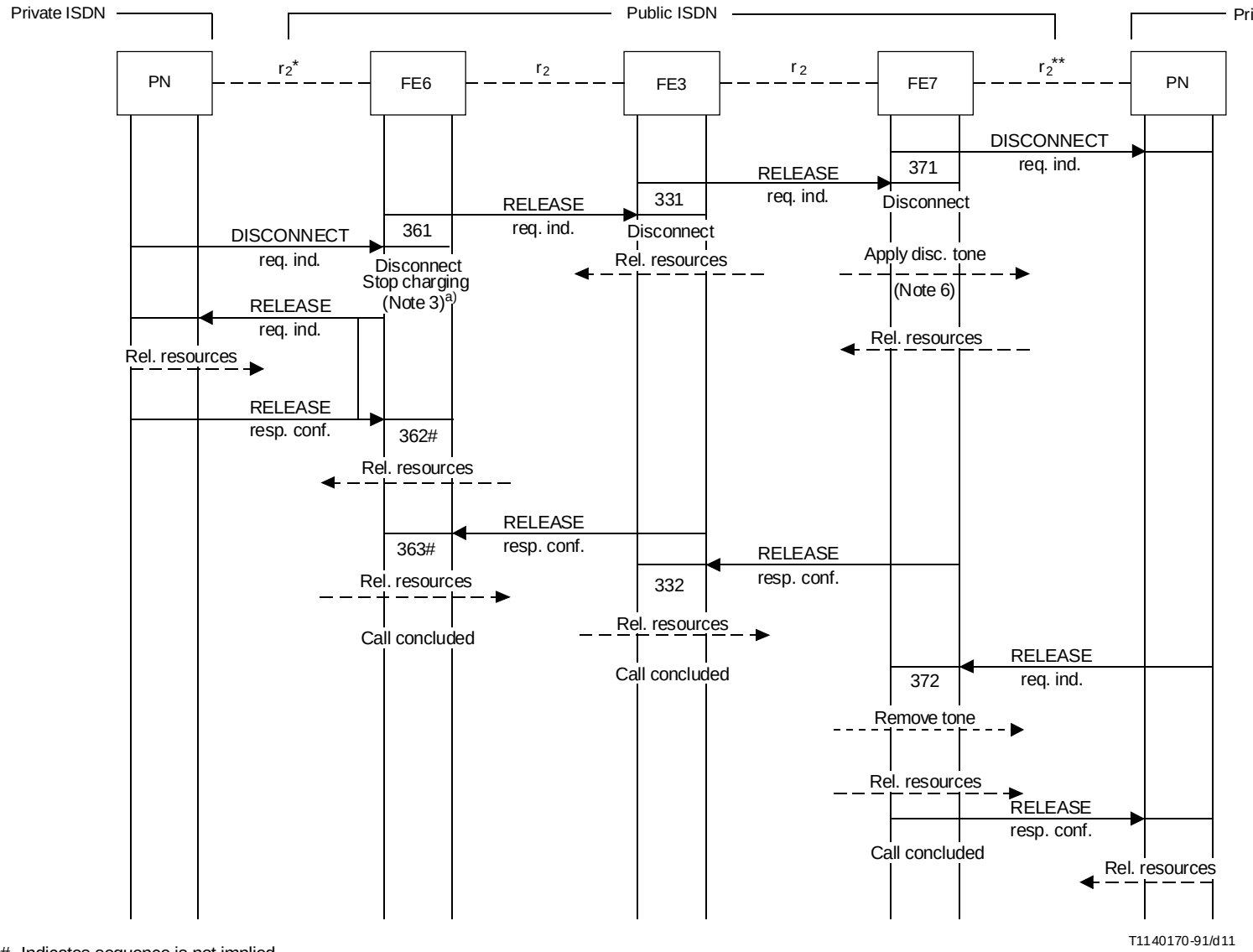
Successful ISDN call set-up en-bloc sending – Interworking public ISDN with private ISDNs



a) The Notes are found after Figure 2-12.

FIGURE 2-10/Q.71

Successful ISDN call set-up, digit-by-digit sending – Interworking public ISDN with private ISDNs

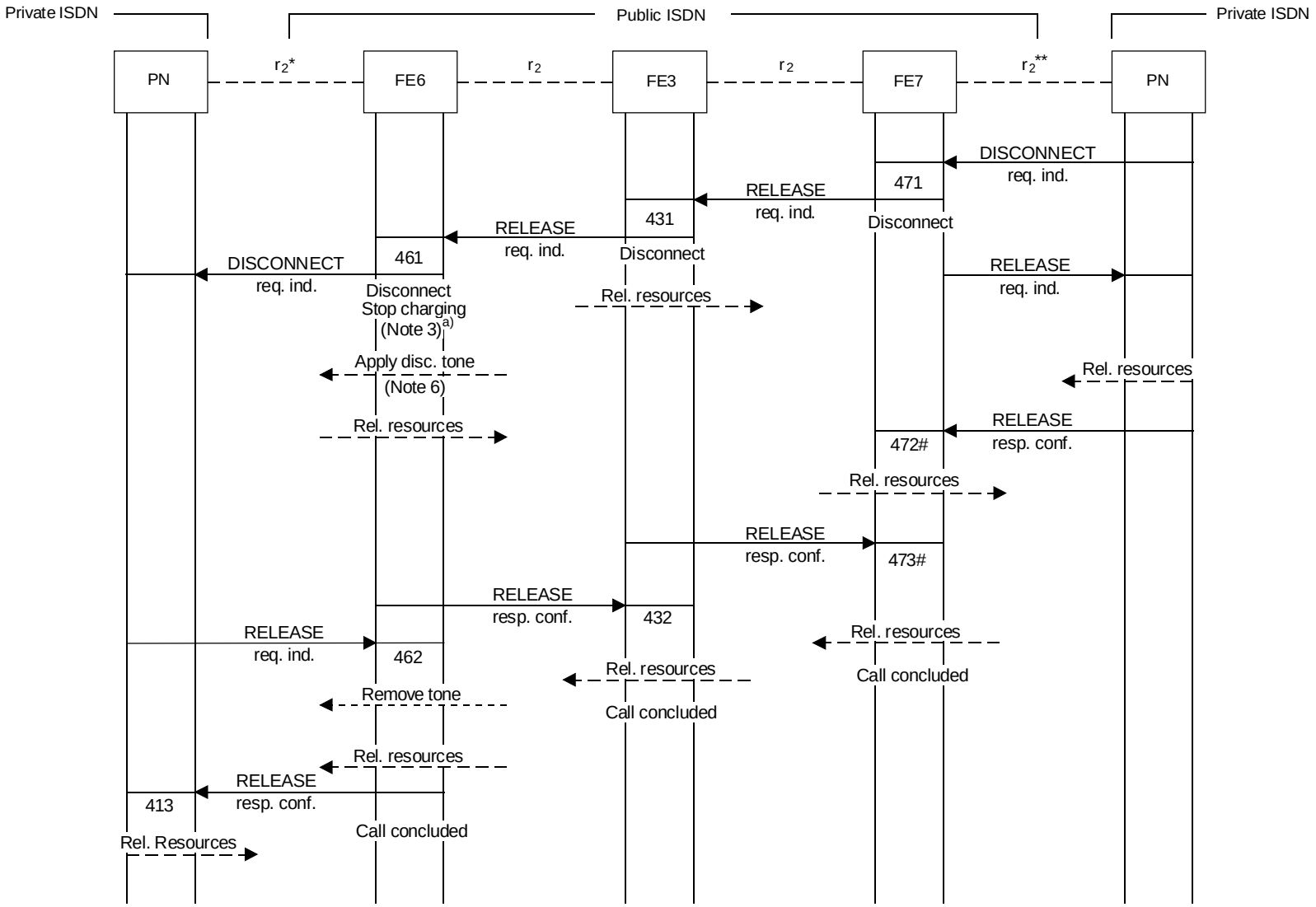


# Indicates sequence is not implied

a) The Notes are found after Figure 2-12.

FIGURE 2-11/Q.71

Normal clearing – Calling party disconnect – Interworking public ISDN with private ISDNs



\# Indicates sequence is not implied

a) The Notes are found after Figure 2-12.

FIGURE 2-12/Q.71

Normal clearing – Calling party disconnect – Interworking public ISDN with private ISDNs

NOTES to Figures 2-3 through 2-12

1 Through connection is dependent on the physical location of the functional entity:

a) Originating local exchange:

i) for 3.1 kHz audio bearer service, speech and telephony services, backwards only or both directions, depending on the approach adopted by the Administration;

ii) for 64 kbit/s and n × 64 kbit/s unrestricted information transfer, backwards only, except for own-exchange calls, which may be either backwards only or in both directions at the discretion of the Administration.

b) Transit exchange – both directions.

c) Terminating local exchange – No through connection at this stage of call set-up, except as a national option for certain classes of users, e.g. PABXs.

d) NT2 – May through connect as required.

2 If not already done, complete the through connection in both directions.

3 The method of initiating and stopping charging will depend on the Administration's method of charging for service (e.g. pulse metering, recording call detail and billing, etc.). The charging function may be performed at different entities at the discretion of the Administration.

4 The information delivered to the user is user agent dependent.

5 The intended use of the service (transfer capability required, e.g. speech, 3.1 kHz audio, multi-use 7 kHz, unrestricted or alternate speech/unrestricted information transfer) must be indicated as an element of the call SETUP information flow from the FE1 to the FE2 to support the relevant bearer or teleservice.

6 Tones are used with speech, 3.1 kHz audio and multi-use 7 kHz bearer services and telephony. The use of disconnect tone is a national option.

7 The intended use of the service (transfer capability required, e.g. speech, 3.1 kHz audio, multi-use 7 kHz, unrestricted or alternate speech/unrestricted information transfer) must be indicated as an element of call SETUP information flow from a PNX to the FE6 to support the relevant bearer or teleservice.

2.2.2 Definition of information flows

Every information flow contains a call reference.

2.2.2.1 CONNECTED req. ind is used to acknowledge that a previously sent SETUP resp. conf has been received and accepted. This is an unconfirmed information flow within the r_3 or r_2** relationship and is sent from the FE4 of the public ISDN to the FE5, or from the FE7 to the PNX of the private ISDN.

Item	*Relationship*	*req. ind*
Call ID	r_3, r_2**	Mandatory
Connection ID	r_3, r_2**	Optional

2.2.2.2 DISCONNECT req. ind is used to notify that the end user has disconnected from the connection or cannot be connected (e.g. the called user is busy). This is used to solicit a confirmed release of local channels and other resources associated with the connection. In general, it will not always result in immediate release of the connection and related resources. DISCONNECT req. ind is not confirmed and appears within relationship r_1, r_3, r_2* and r_2**.

The following item of information is conveyed with the DISCONNECT req. ind information flow:

Item	*Relationship*	*req. ind*
Call ID	r_1, r_3, r_2*, r_2**	Mandatory
Cause	r_1, r_3, r_2*, r_2**	Mandatory

2.2.2.3 PROCEEDING req. ind is an unconfirmed information flow that is used to indicate that sufficient address digits have been received to process a call attempt. This is an information flow within the r_1, r_2 and r_2* relationships.

Item	*Relationship*	*req. ind*
Call ID	r_1, r_2, r_2*	Mandatory
Address complete	r_1, r_2, r_2*	Optional
Connection ID	r_1, r_2*	Optional

2.2.2.4 RELEASE req. ind and resp. conf is used to free the resources associated with the call/connection such as call references and channels. This is a confirmed information flow whose confirmation indicates that all resources previously associated with the connection have been freed. It appears within relationship r_1, r_2, r_3, r_2*and r_2**.

The following item of information is conveyed with the RELEASE req. ind and resp. conf information flows:

Item	*Relationship*	*req. ind.*	*resp. conf.*
Call ID	r_1, r_2, r_3, r_2*, r_2**	Mandatory	Mandatory
Cause	r_1, r_2, r_3, r_2*, r_2**	Mandatory	Mandatory
Connection ID	r_1, r_2, r_2*, r_2**	Optional	Optional

2.2.2.5 REPORT req. ind is an information flow that is used to report status and/or other types of information across the network. The type of information may be indicated (e.g. alerting, suspended, hold, resume, etc.). This is an unconfirmed information flow within the relationships r_1, r_2, r_3, r_2*and r_2**.

The following items of information are or may be conveyed with the REPORT req. ind information flow:

Item	*Relationship*	*req. ind*
Call ID	r_1, r_2, r_3, r_2*, r_2**	Mandatory
Channel ID(s)	r_3, r_2**	Optional
Connection request	r_2	Optional
Called line category	r_2	Mandatory
Called line status	r_2	Mandatory
Report type	r_2	Mandatory
Connection ID	r_1, r_2, r_3, r_2*, r_2**	Optional

2.2.2.6 SETUP req. ind is used to request establishment of a connection. This is a confirmed information flow and SETUP resp. conf is used to confirm that the connection has been established. The request for establishment of a connection can be originated by either the network or the user. This information flow is within the r_1, r_2, r_2* and r_3 relationships.

The following items of information are or may be conveyed in the SETUP req. ind and SETUP resp. conf information flows:

Use	*Item*	*Relationship*	*req. ind.*	*resp. conf.*
Protocol info	Call ID	r_1, r_2, r_3, r_2*, r_2**	Mandatory	Mandatory
	Connection request	r_2	Optional	Optional
Bearer info	Bearer capability	r_1, r_2, r_2*, r_2**	Mandatory	
Bearer info	Nature of transmission	r_2	Mandatory	
Bearer info	Channel ID(s)	r_1, r_2, r_3, r_2*, r_2**	Mandatory	Optional r_2*
Bearer info	Time slot sequence information	r_1, r_2, r_3, r_2*, r_2**	Optional	Mandatory
Bearer info	Broadband attributes	r_1, r_2, r_3, r_2*, r_2**	Optional	Optional
Routing info	Called number	r_1, r_2, r_3, r_2*, r_2**	Mandatory	Optional
Routing info	Transit network selection	r_1, r_2, r_2*	Optional	
Routing info	Network specific facility	r_2*, r_2**	Optional	
Originator info	Calling line ID	r_1, r_2, r_3, r_2*, r_2**	Optional	Mandatory
Terminator info	Connected line ID	r_1, r_2, r_3, r_2*, r_2**		Optional
Terminator info	Connected line status	r_2		Mandatory
Access info	Low layer compatibility	r_1, r_2, r_3, r_2*, r_2**	Optional	Optional
Access info	High layer compatibility	r_1, r_2, r_3, r_2*, r_2**	Optional	Optional
	AAL attributes	r_1, r_2, r_3, r_2*, r_2**	Optional	Optional (Note)
	Connection ID	r_1, r_2, r_3, r_2*, r_2**	Optional	Optional

NOTE – Mandatory in broadband applications, otherwise of no significance.

2.2.2.7 SETUP REJECT req. ind is used to indicate that the SETUP req. ind has been rejected. This information is within the r_1 and r_2* relationships.

The following items of information are or may be conveyed in the SETUP REJECT req. ind information flow:

Item	*Relationship*	*req. ind*
Call ID	r_1, r_2*	Mandatory
Reject indication	r_1, r_2*	Mandatory
Cause	r_1, r_2*	Optional
Connection ID	r_1, r_2*	Optional (Note)

NOTE – Mandatory in broadband applications, otherwise of no significance.

2.2.2.8 PROGRESS req. ind is an unconfirmed information flow that is used to indicate that the call may leave an ISDN environment; e.g. because of interworking with another network, with a non-ISDN user or with non-ISDN equipment within the calling or called user's premises. This is an information flow within the r_1, r_2 and r_2* relationships.

Address complete information may be conveyed in this information flow.

Item	*Relationship*	*req. ind*
Call ID	r_1, r_2, r_2*	Mandatory
Address complete	r_1, r_2, r_2*	Optional

2.2.3 Additional information flows required for digit-by-digit call setup cases

2.2.3.1 ACK (Acknowledge) req. ind is used to notify a user that a request has been received and has been verified (if required). This information flow is not confirmed and appears within the relationship of r_1, and r_2*.

The following items of information are conveyed in the ACK req. ind:

Item	*Relationship*	*Request*
Call ID	r_1, r_2*	Mandatory
Channel ID(s)	r_1	Mandatory

2.2.3.2 ADDRESS INFO, ADDL ADDR, ADDR END req. ind. are called number (address) information flows that are sent during the digit-by-digit methods of call set-up. This information flow is not confirmed and appears in relationships r_1, r_2, r_3, r_2* and r_2**.

The following items of information are conveyed in the ADDRESS INFO, ADDL ADDR and ADDR END req. ind information flows:

Item	*Relationship*	*Request*
Call ID	r_1, r_2, r_3, r_2*, r_2**	Mandatory
Address information	r_1, r_2, r_3, r_2*, r_2**	Mandatory
End of address indication	r_1, r_2, r_3, r_2*, r_2**	Optional

2.2.4 Information flow meanings - Summary table

The individual semantics of the above information flows, and in particular the relationship between information flow meanings, is summarized in Table 2-1/Q.71.

2.3 SDLs

The SDLs included in this Recommendation cover only the allowable (expected) sequences for successful call set-up and release. It is assumed that errors detected by the incoming and outgoing signalling system protocols are handled within those protocol state machines.

The call control states describe the state of the entity in terms of the states of the relationships in both directions (i.e. when describing states related to the relationship "$r_1 - r_2$" the CC state identifies the states of the relationship over r_1 and r_2).

2.3.1 SDLs for the call control agent (CCA, FE1) entity are shown in Figure 2-13.

2.3.2 SDLs for the call control (CC, FE2) entity are shown in Figure 2-14.

TABLE 2-1/Q.71

Information flow meanings

Semantics	SETUP req. ind.	SETUP resp. conf.	SETUP REJECT req. ind.	PROCEEDING req. ind.	REPORT (Alerting) req. ind.	DISCONNECT req. ind.	RELEASE req. ind.	RELEASE resp. conf	CONNECTED req. ind.
Request for connection	X								
Connection accepted by user		X							
Call info complete		X		X	X				
Connection request accepted		X		X	X				
Connection request rejected			X						
Called user being alerted					X				
Connection unavailable						X	X		
Demand to disconnect bearer resources						X			
Demand to release bearer resources – With acknowledgement							X		
Disconnected – Ready to be released						X	X		
Bearer resources released – Reallocatable								X	
Request to terminate call						X	X		
Setup response accepted									X

2.3.3 SDLs for the call control (CC, FE3) entity are shown in Figure 2-15.

2.3.4 SDLs for the call control (CC, FE4) entity are shown in Figure 2-16.

2.3.5 SDLs for the call control agent (CCA, FE5) entity are shown in Figure 2-17.

2.3.6 SDLs for the Call Control (CC, FE6/FE7) entities (Interworking between Private and Public ISDNs) are shown in Figures 2-18 and 2-19.

Three digit numbers in the lower right corner of the symbols refer to the FEA numbers.

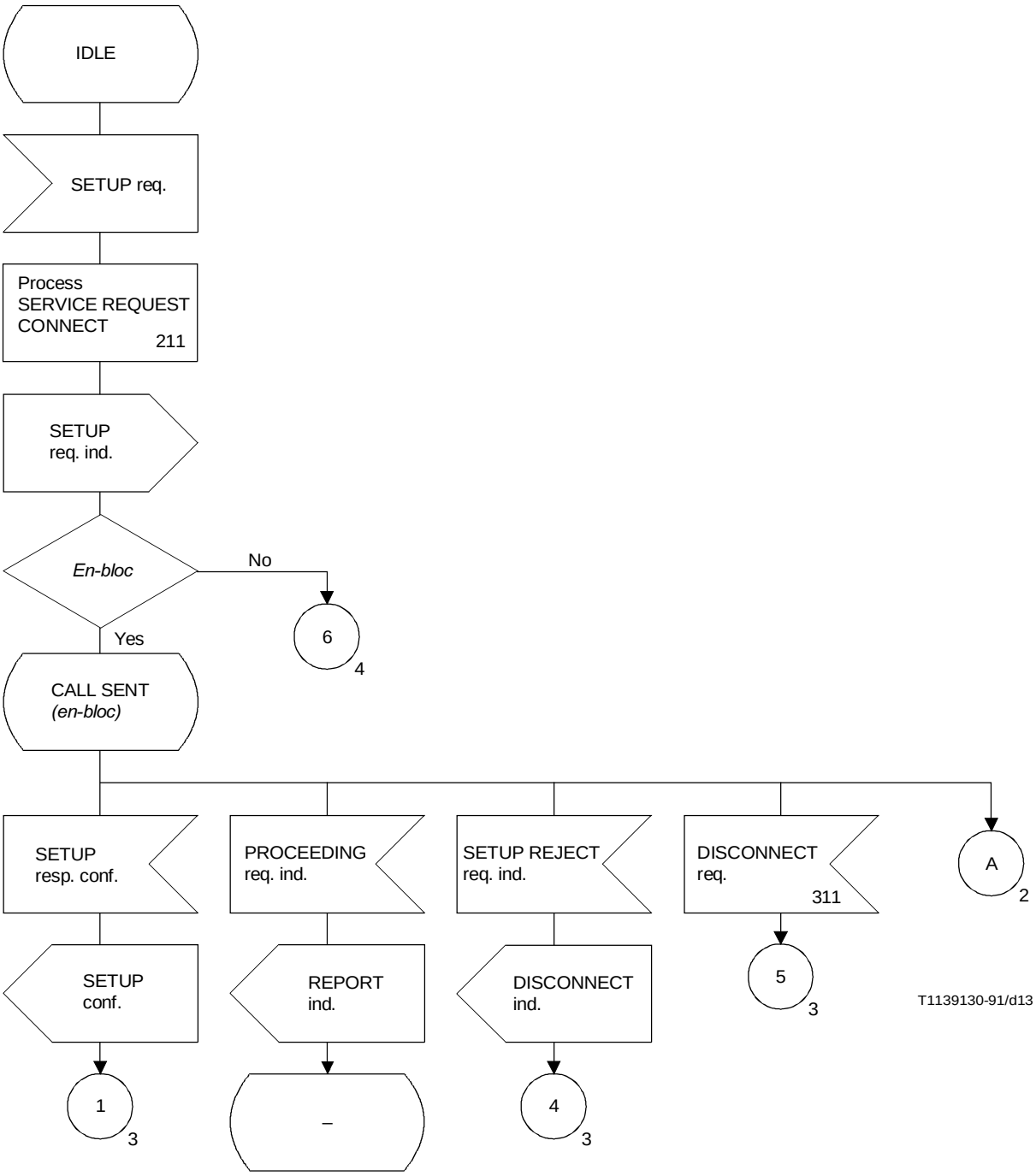


FIGURE 2-13/Q.71 (sheet 1 of 5)

CCA (FE1)

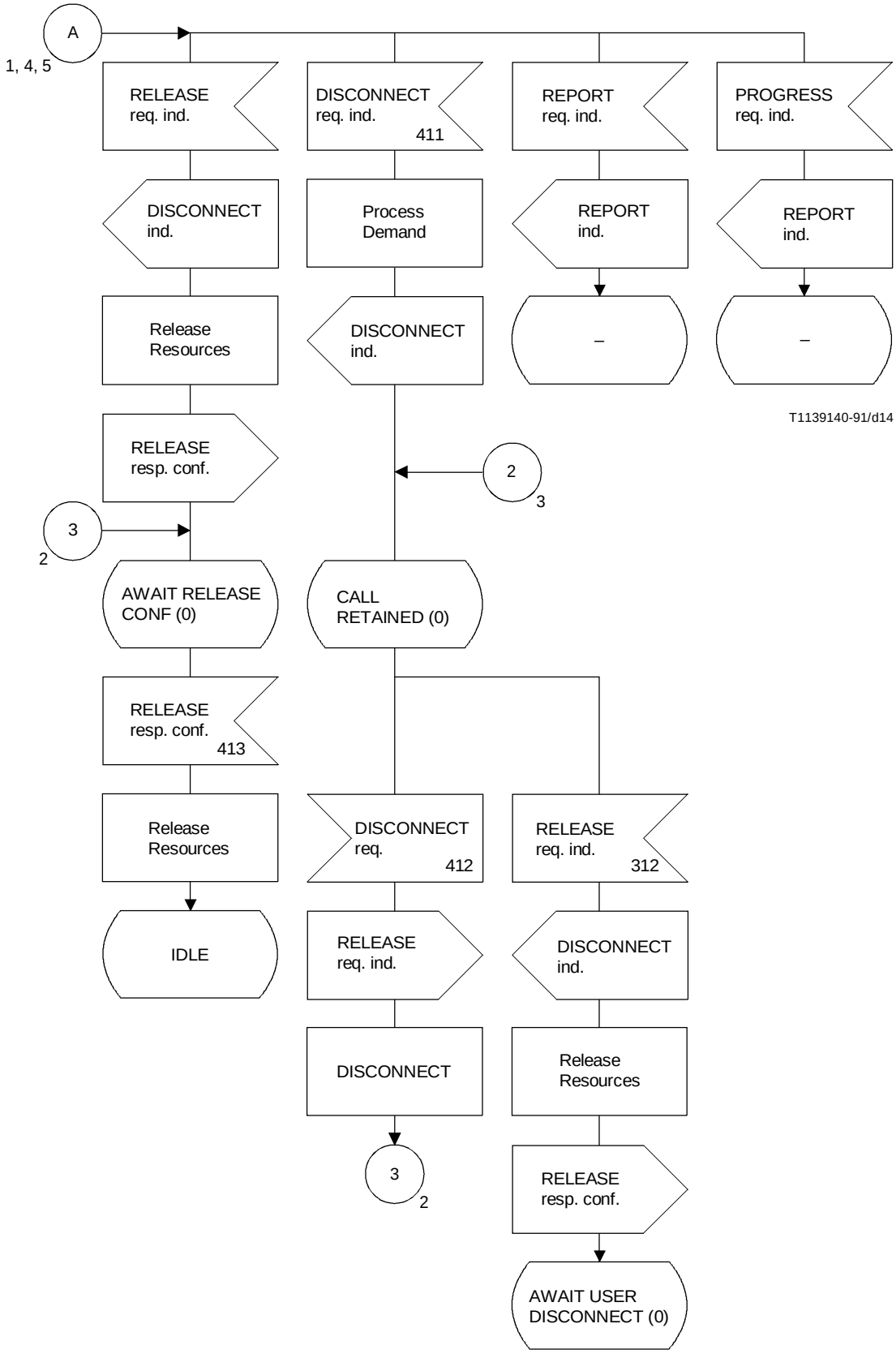


FIGURE 2-13/Q.71 (sheet 2 of 5)

CCA (FE1)

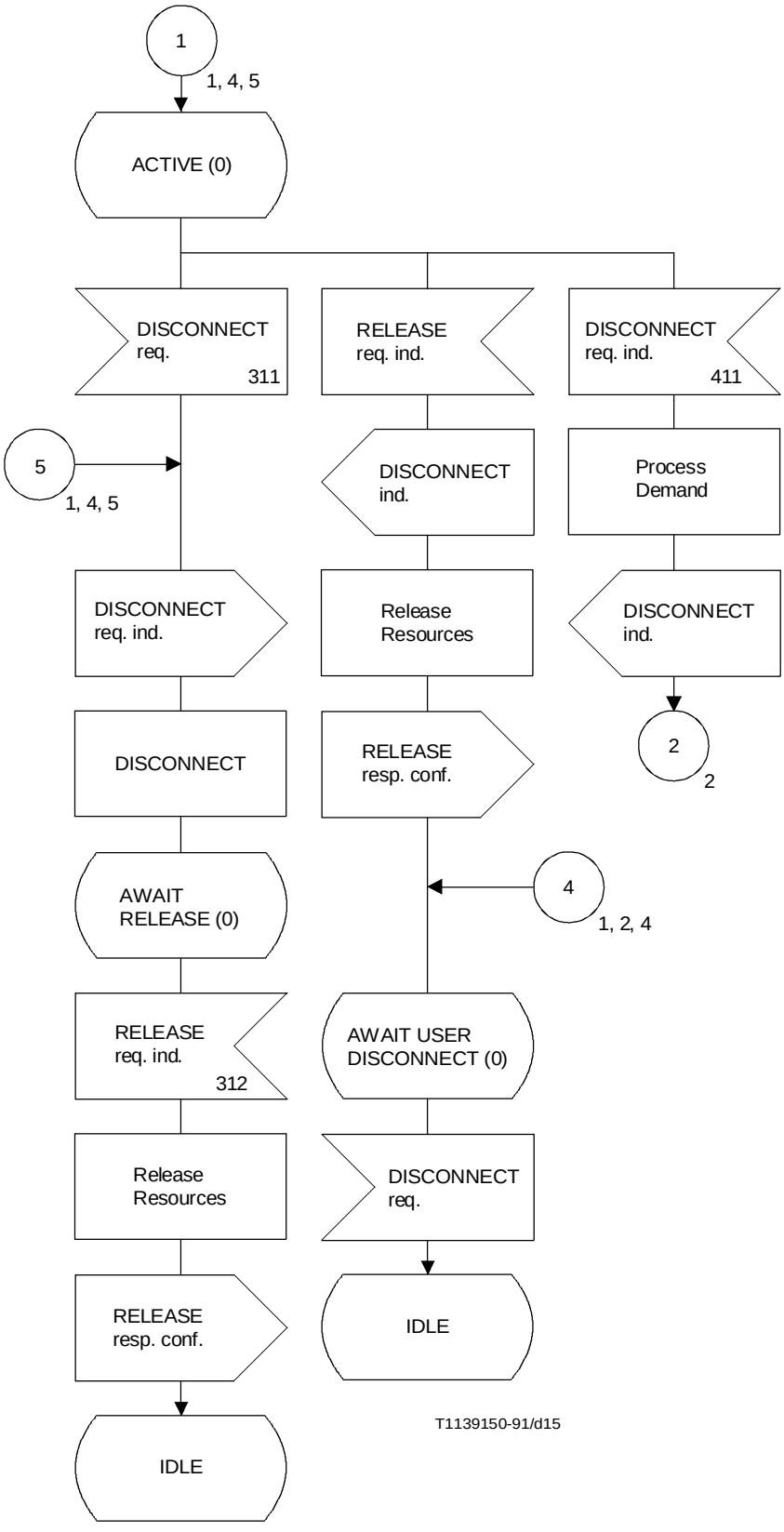


FIGURE 2-13/Q.71 (sheet 3 of 5)

CCA (FE1)

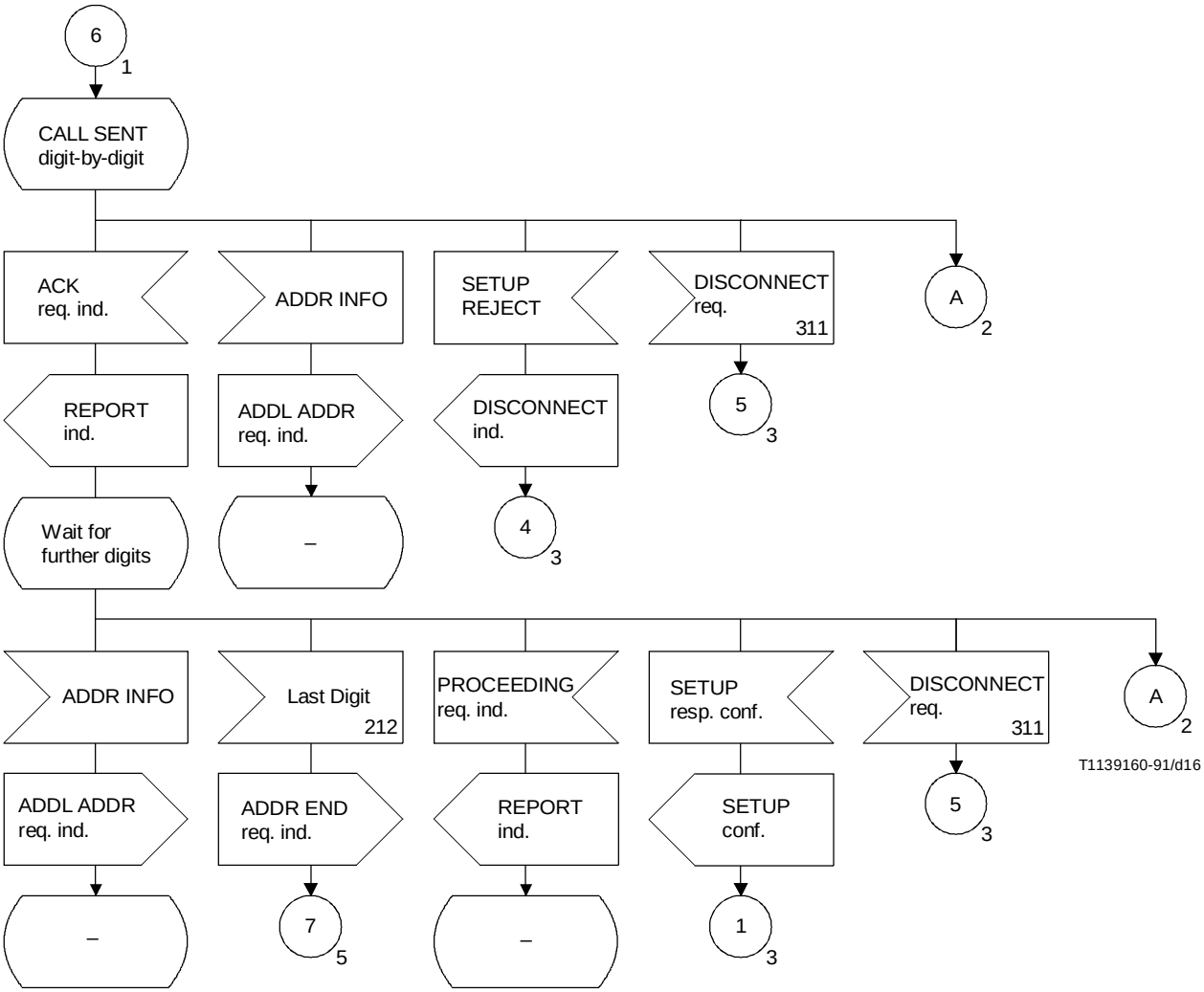


FIGURE 2-13/Q.71 (sheet 4 of 5)

CCA (FE1)

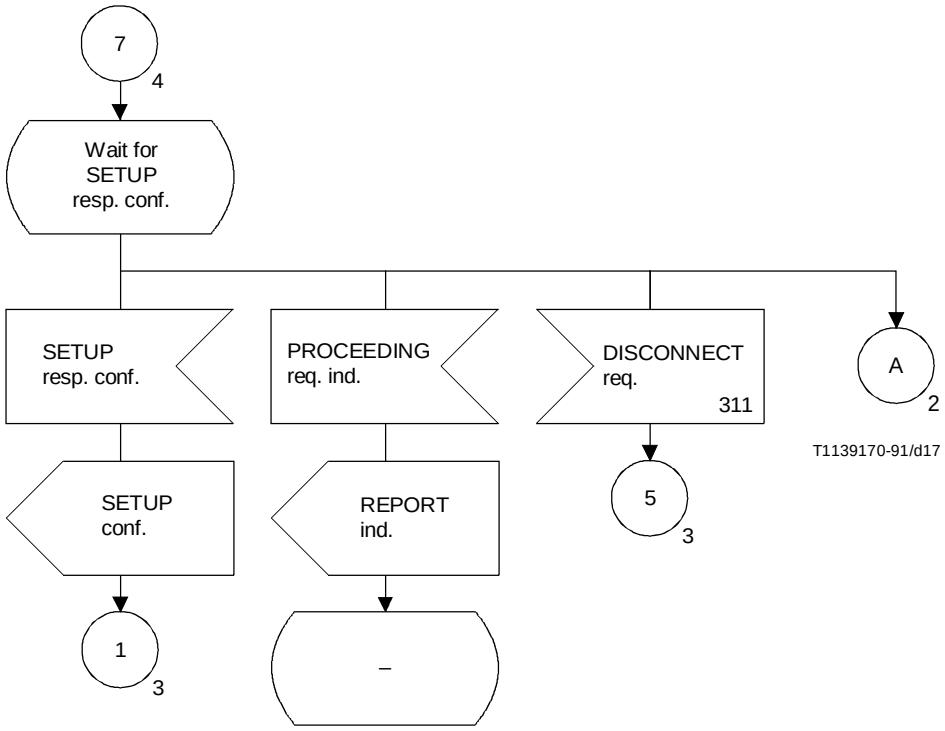


FIGURE 2-13/Q.71 (sheet 5 of 5)

CCA (FE1)

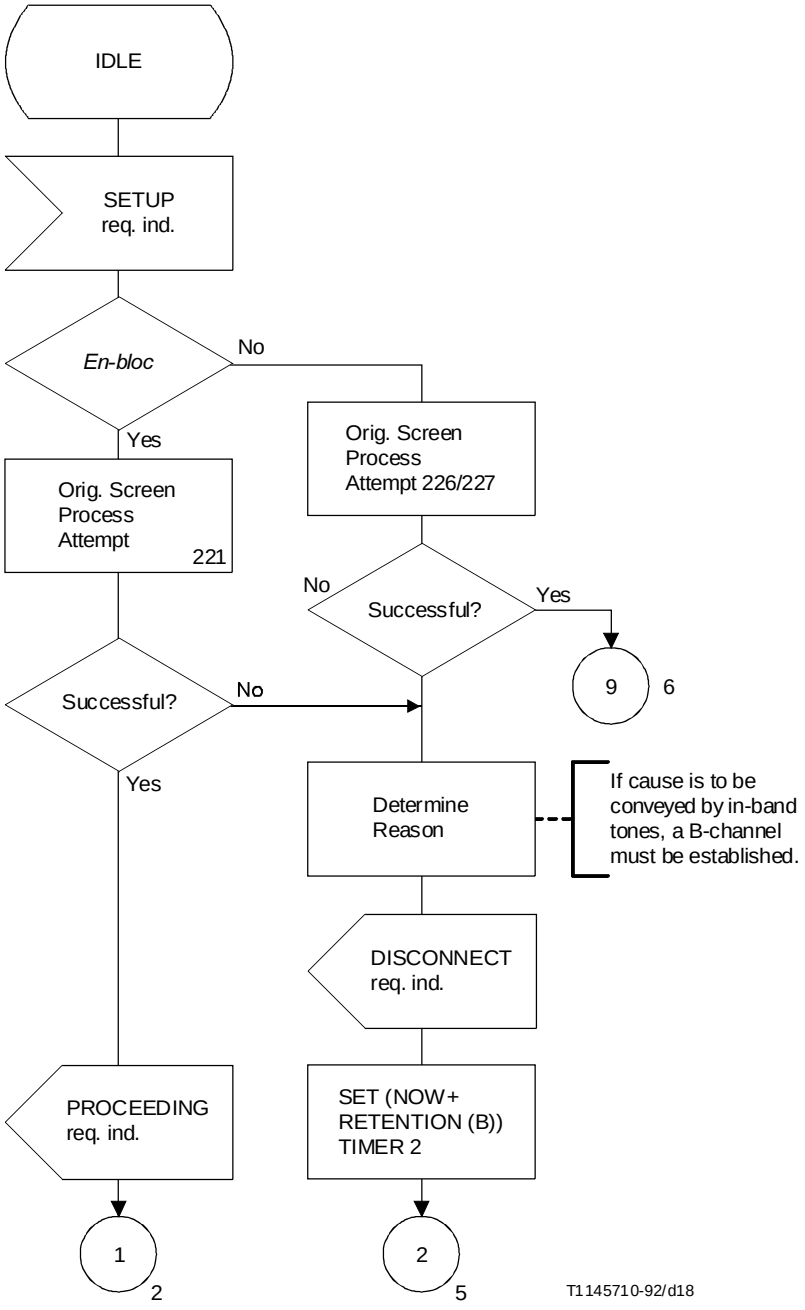


FIGURE 2-14/Q.71 (sheet 1 of 7)

CC (FE2)

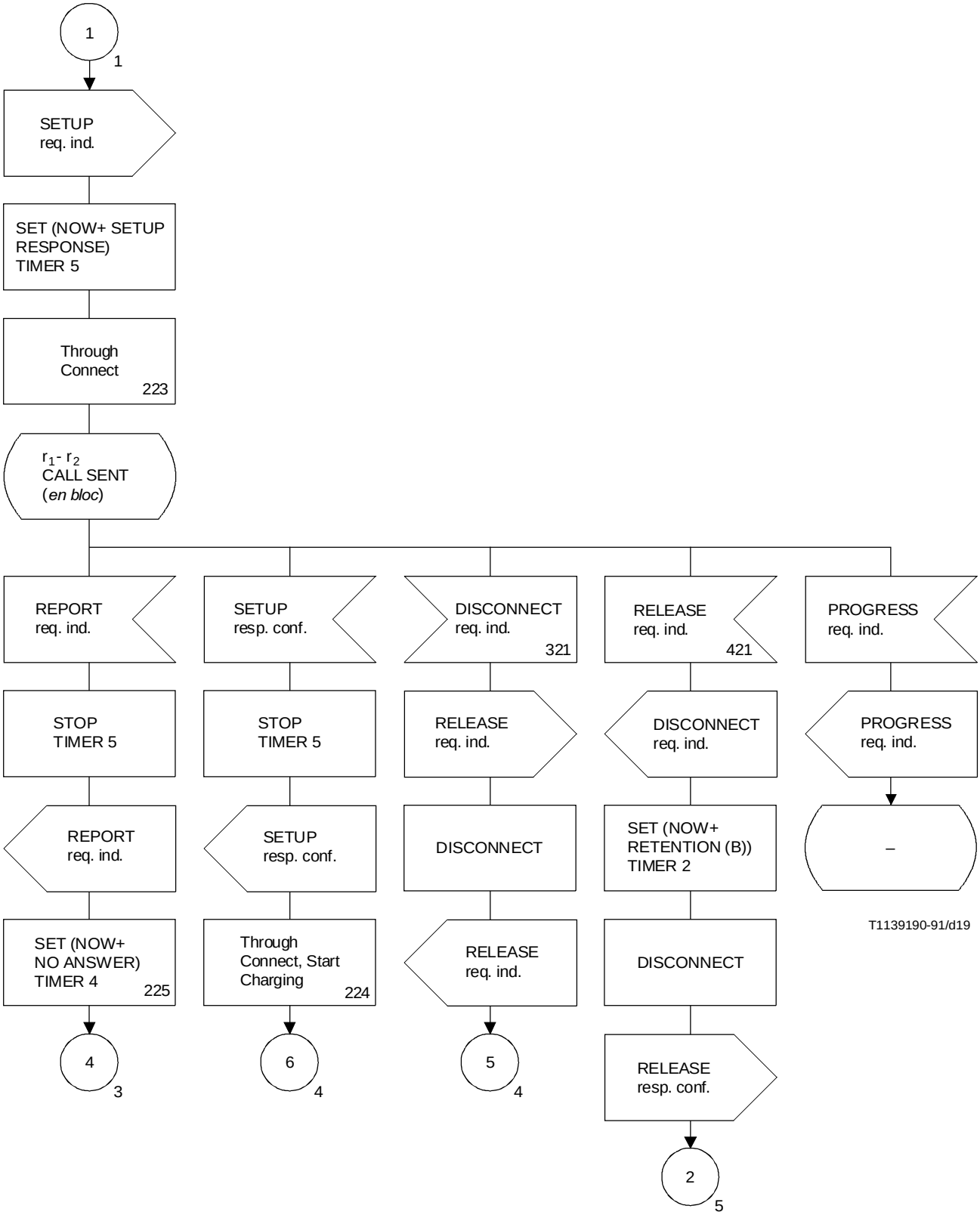


FIGURE 2-14/Q.71 (sheet 2 of 7)

CC (FE2)

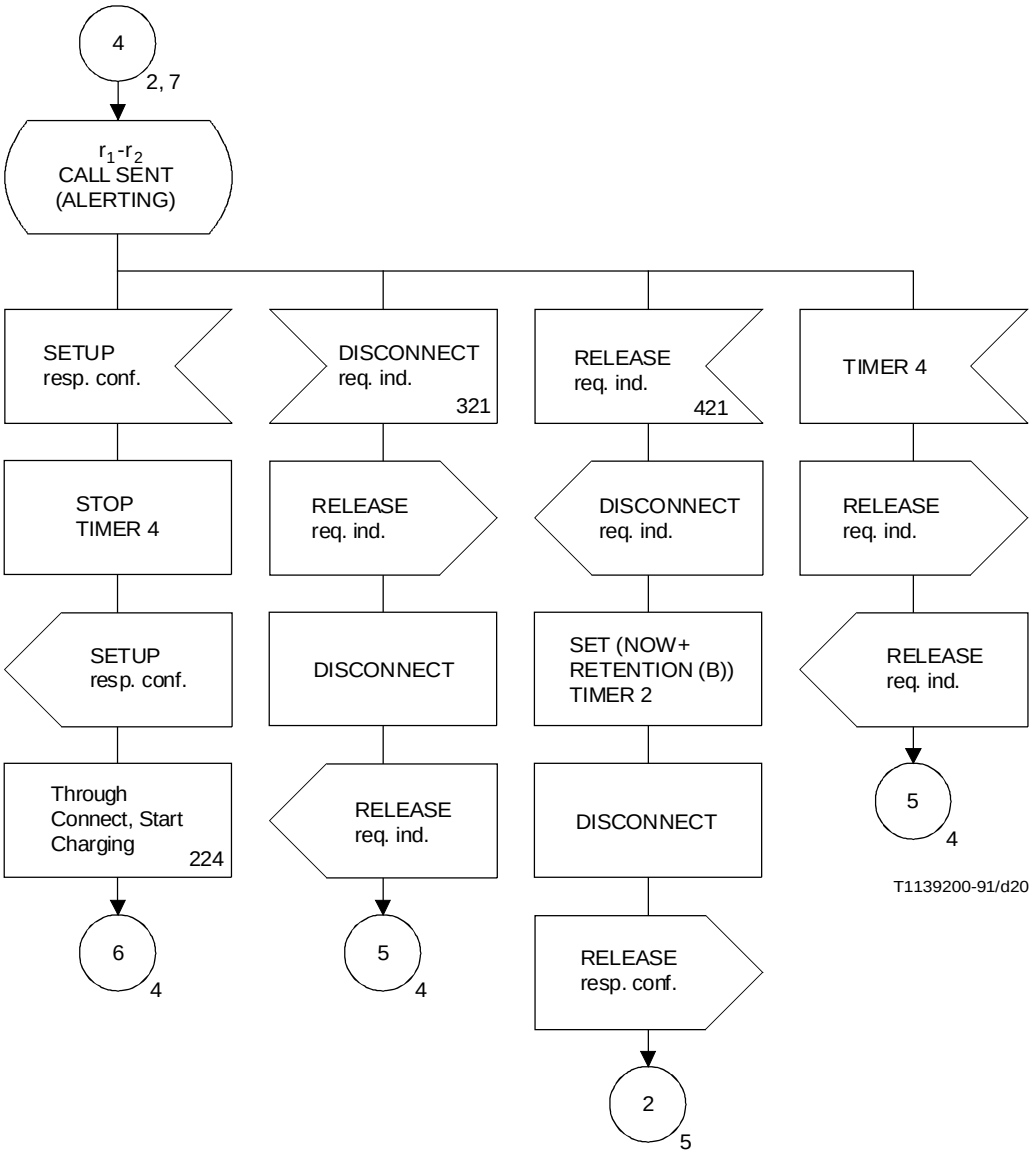


FIGURE 2-14/Q.71 (sheet 3 of 7)

CC (FE2)

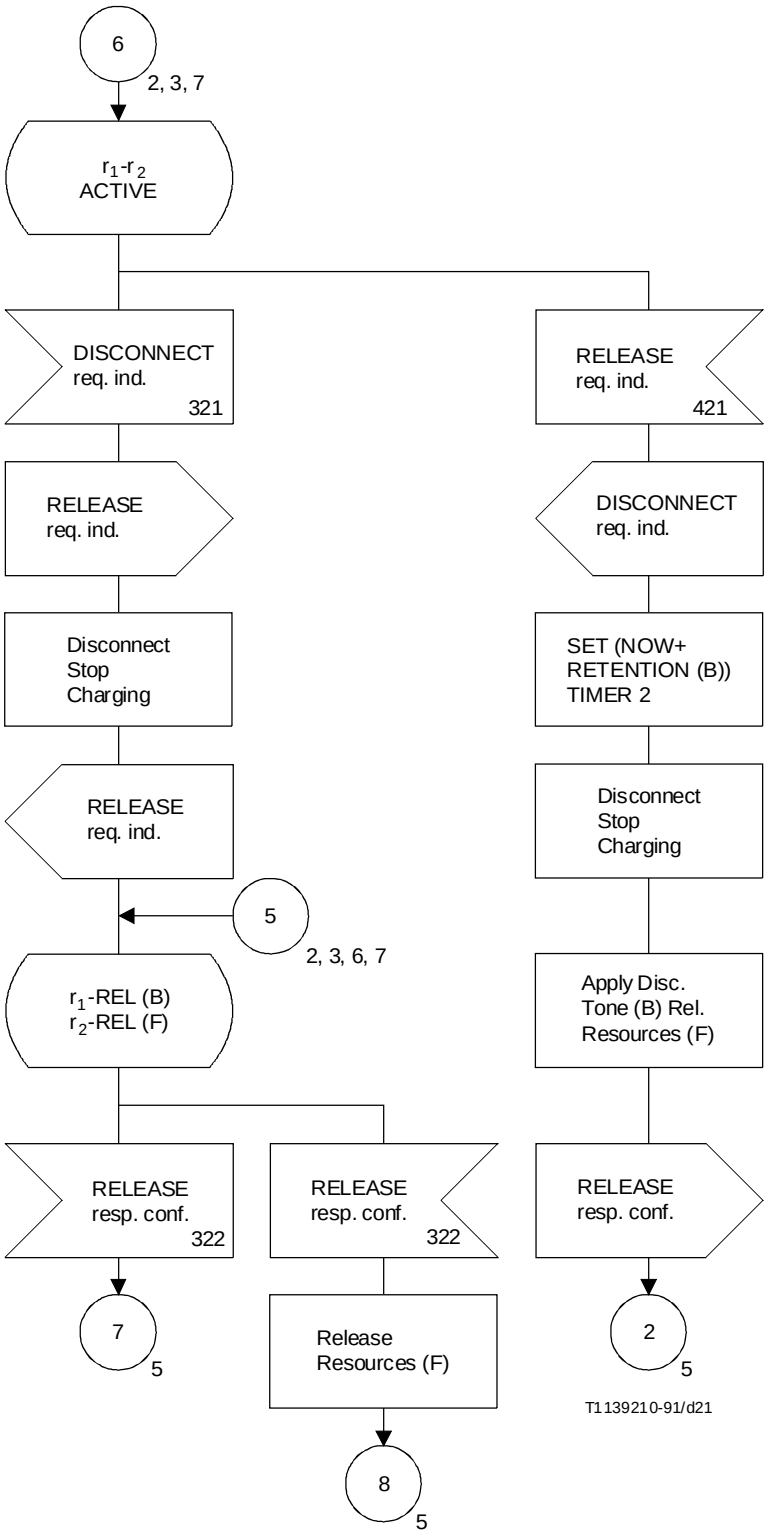


FIGURE 2-14/Q.71 (sheet 4 of 7)

CC (FE2)

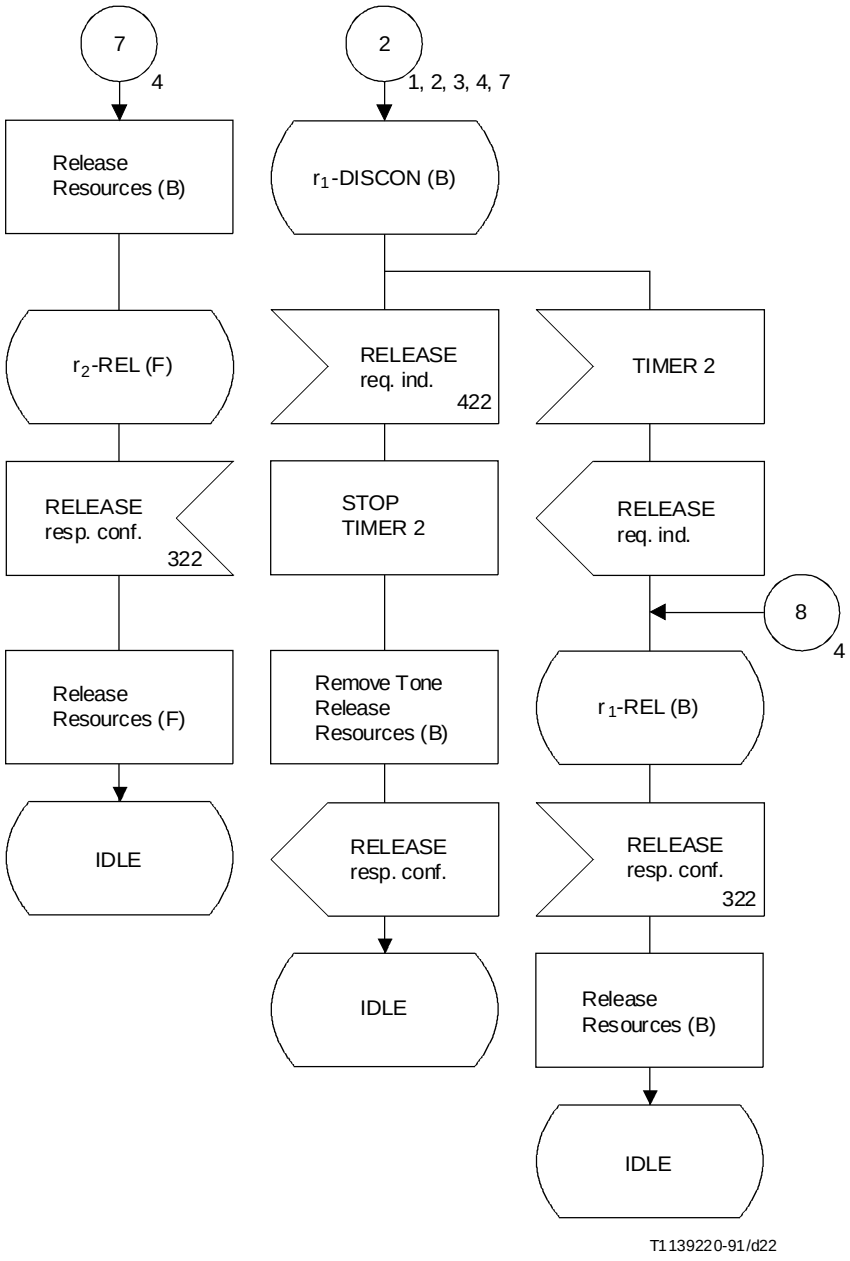


FIGURE 2-14/Q.71 (sheet 5 of 7)

CC (FE2)

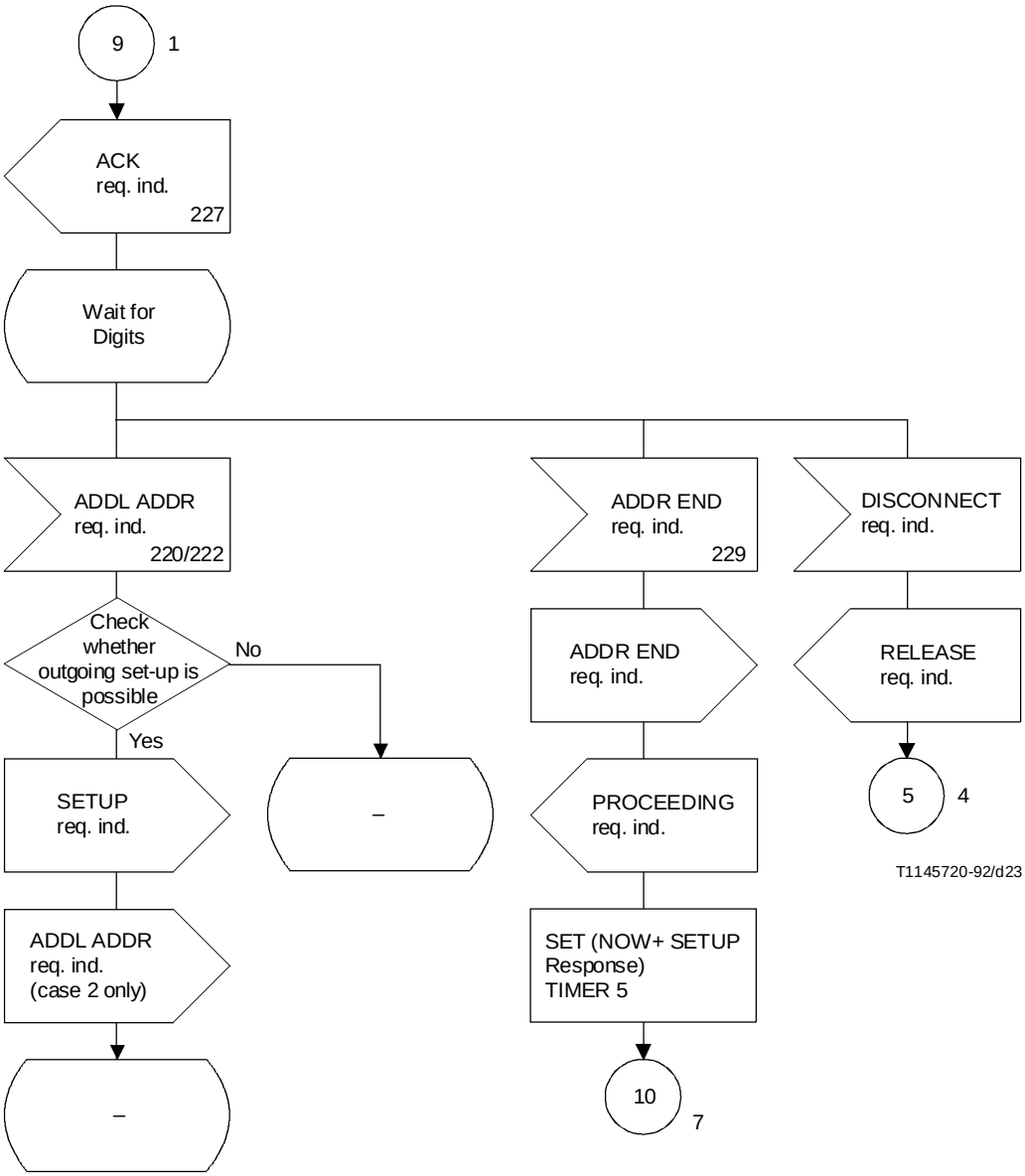


FIGURE 2-14/Q.71 (sheet 6 of 7)

CC (FE2)

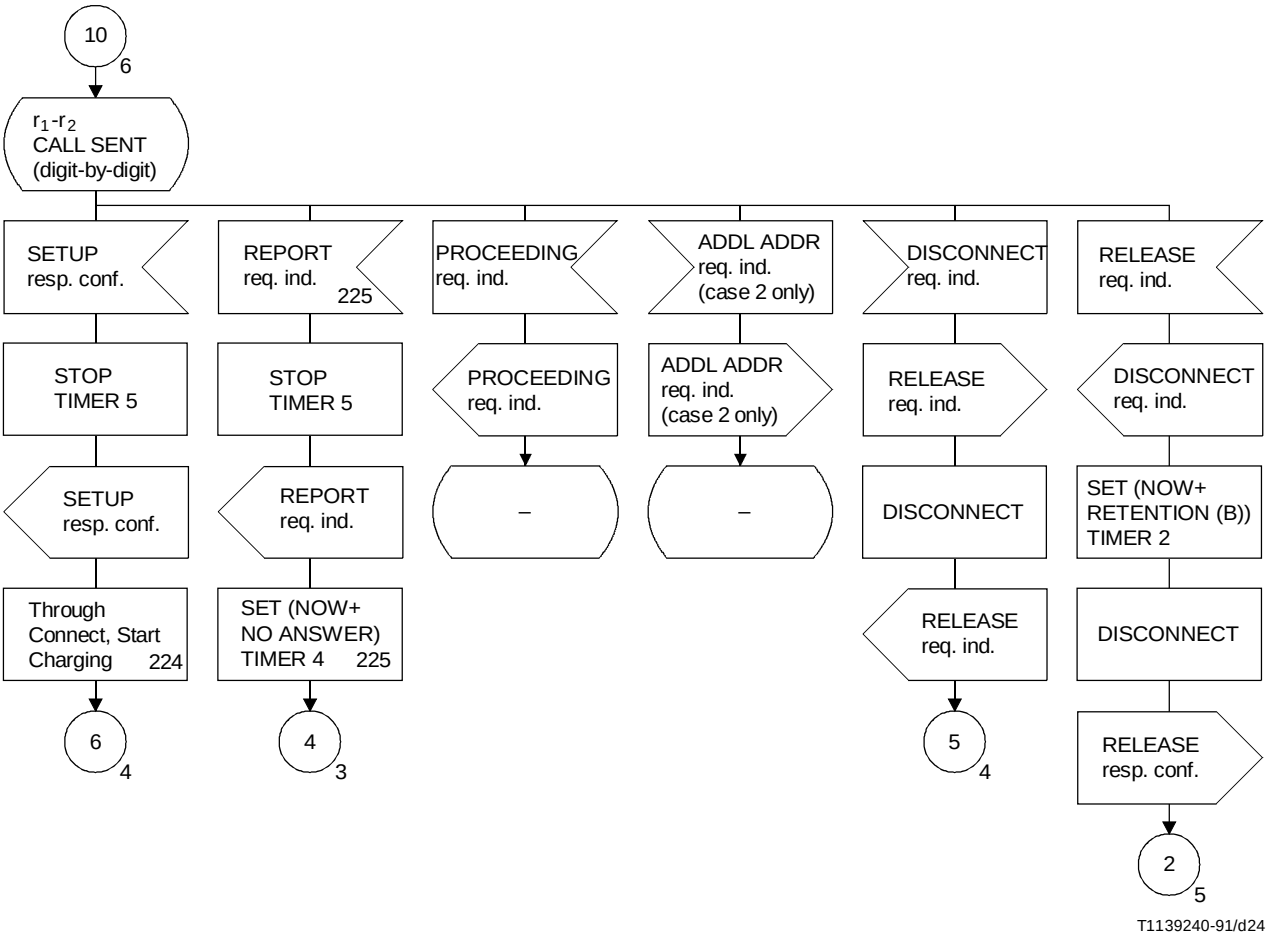


FIGURE 2-14/Q.71 (sheet 7 of 7)

CC (FE2)

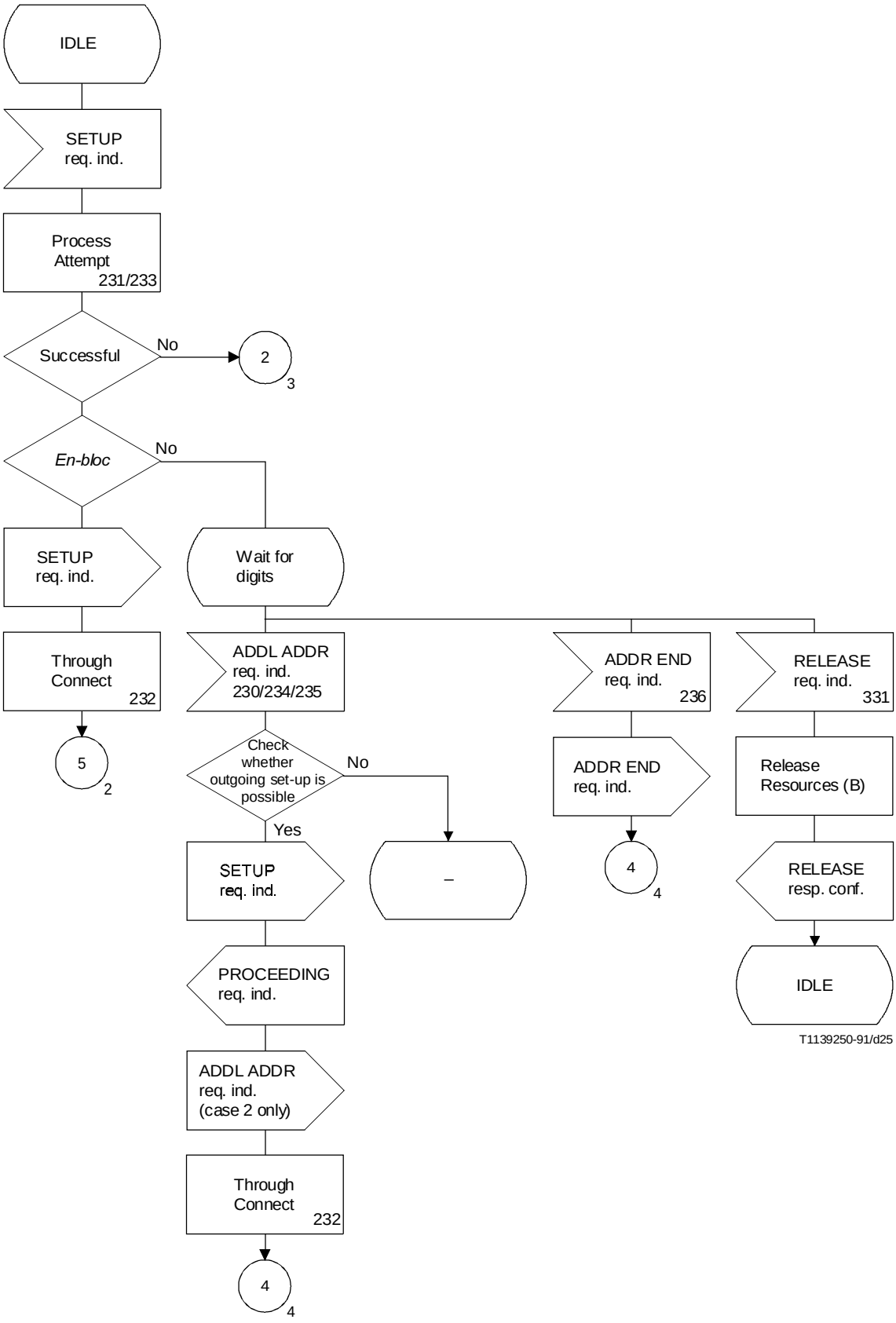


FIGURE 2-15/Q.71 (sheet 1 of 4)

CC (FE3)

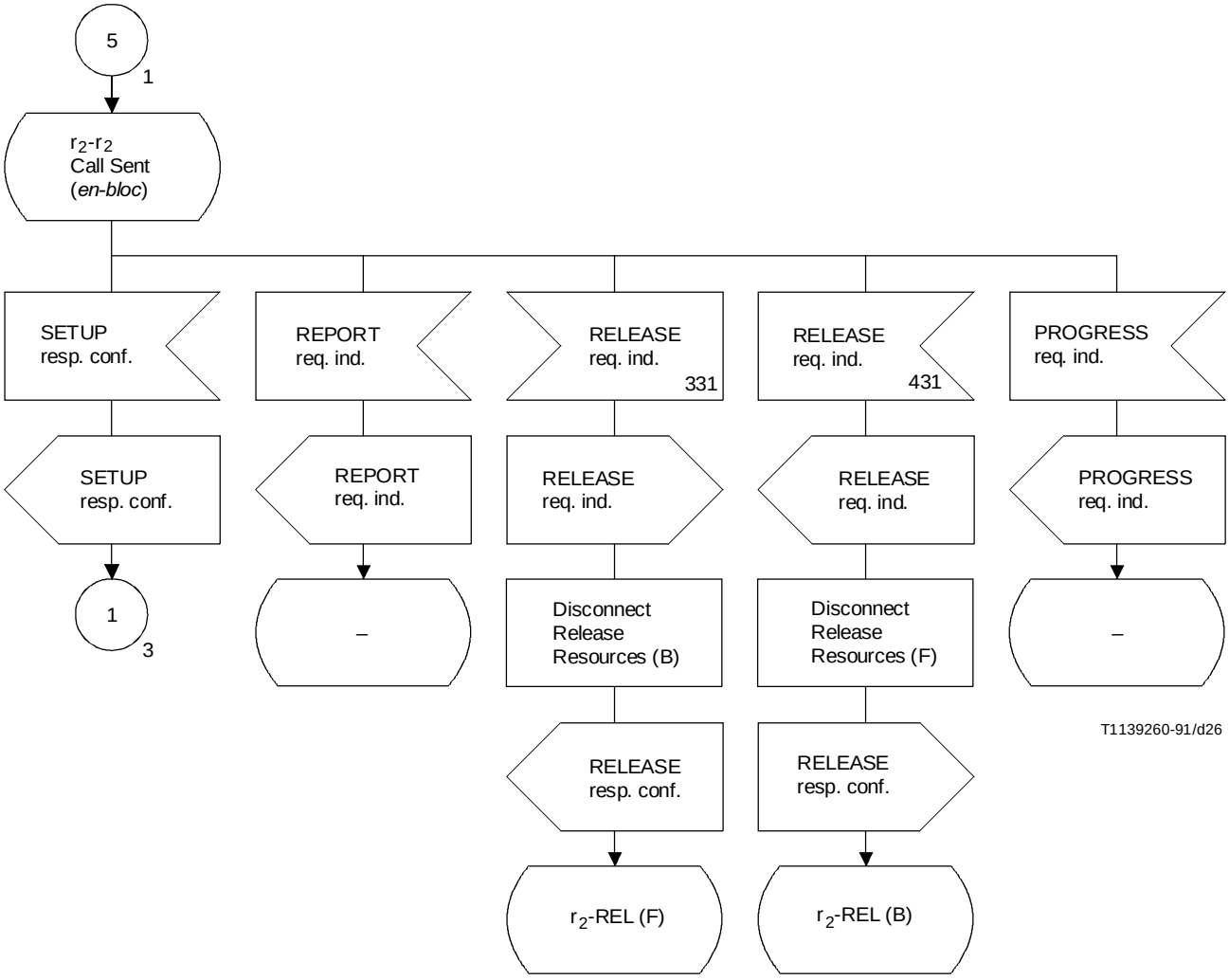


FIGURE 2-15/Q.71 (sheet 2 of 4)

CC (FE3)

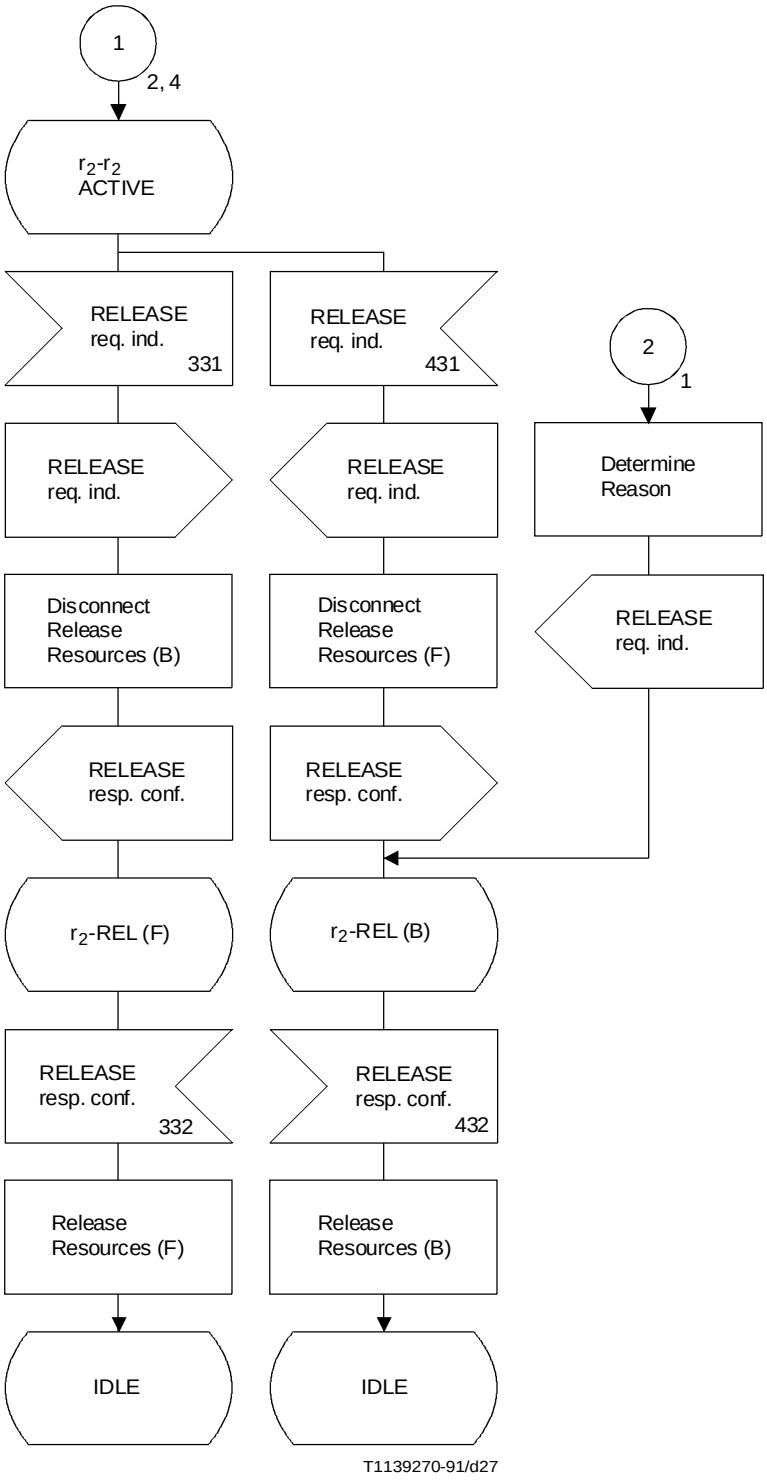


FIGURE 2-15/Q.71 (sheet 3 of 4)

CC (FE3)

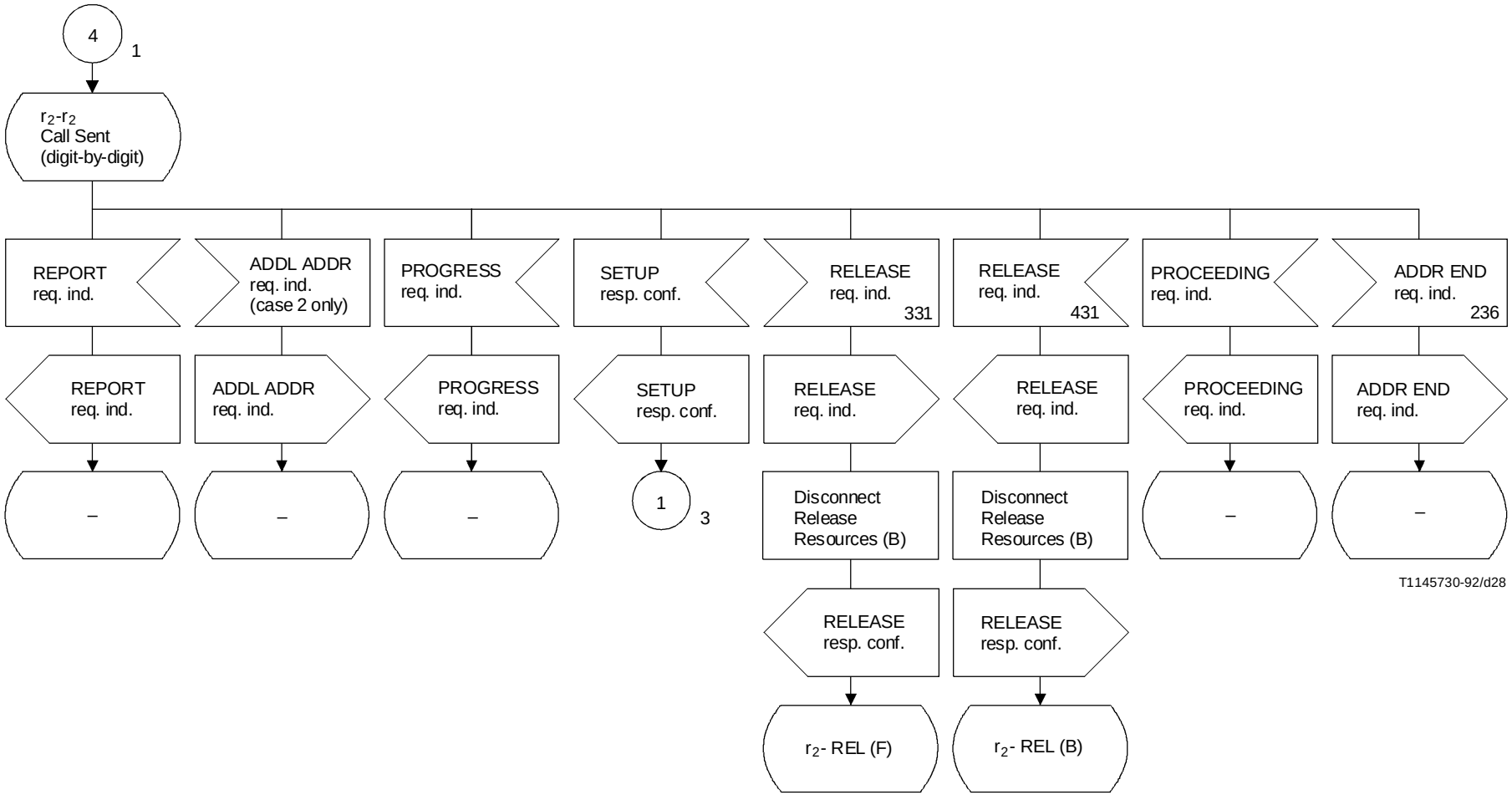


FIGURE 2-15/Q.71 (sheet 4 of 4)

CC (FE3)

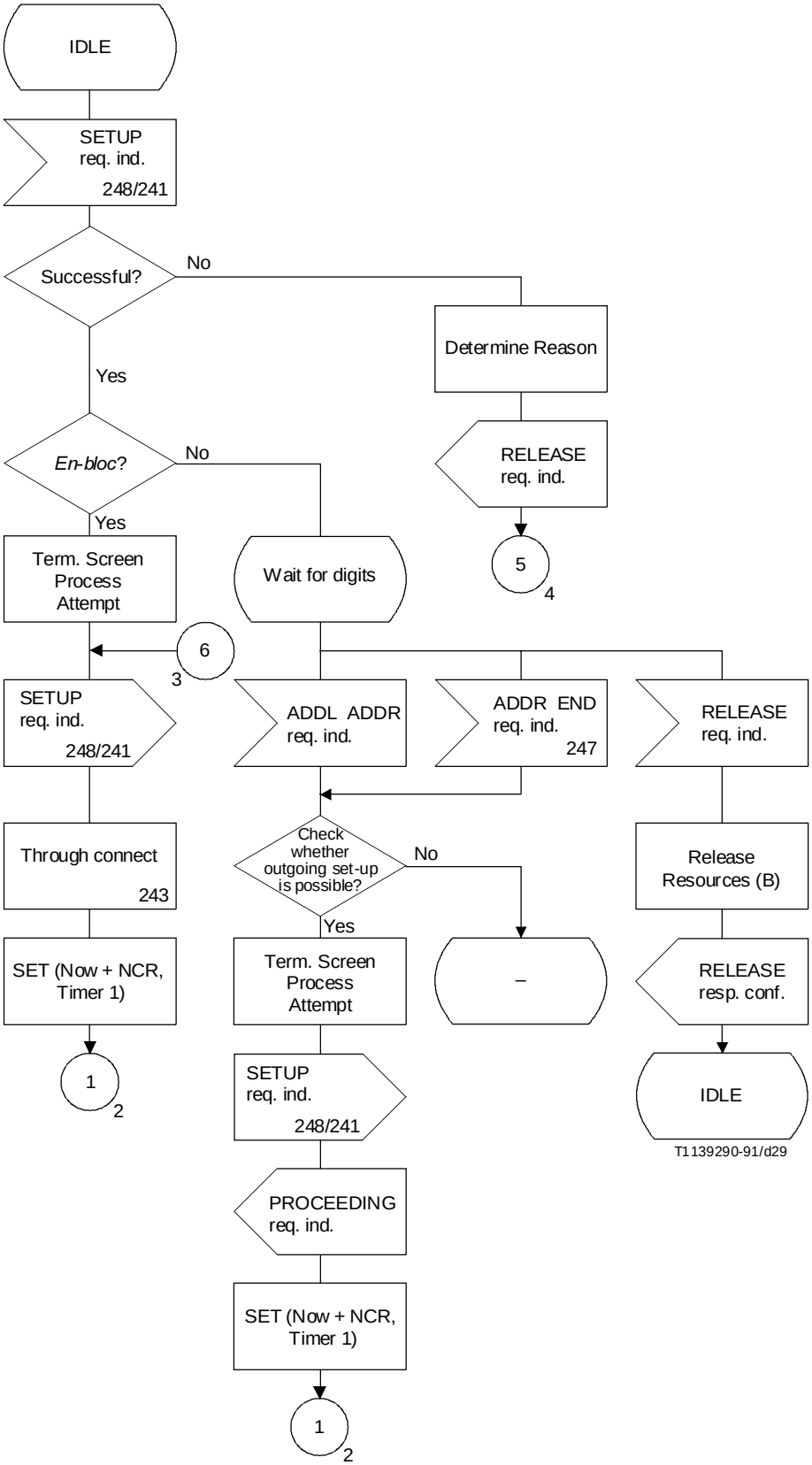


FIGURE 2-16/Q.71 (sheet 1 of 5)

CC (FE4)

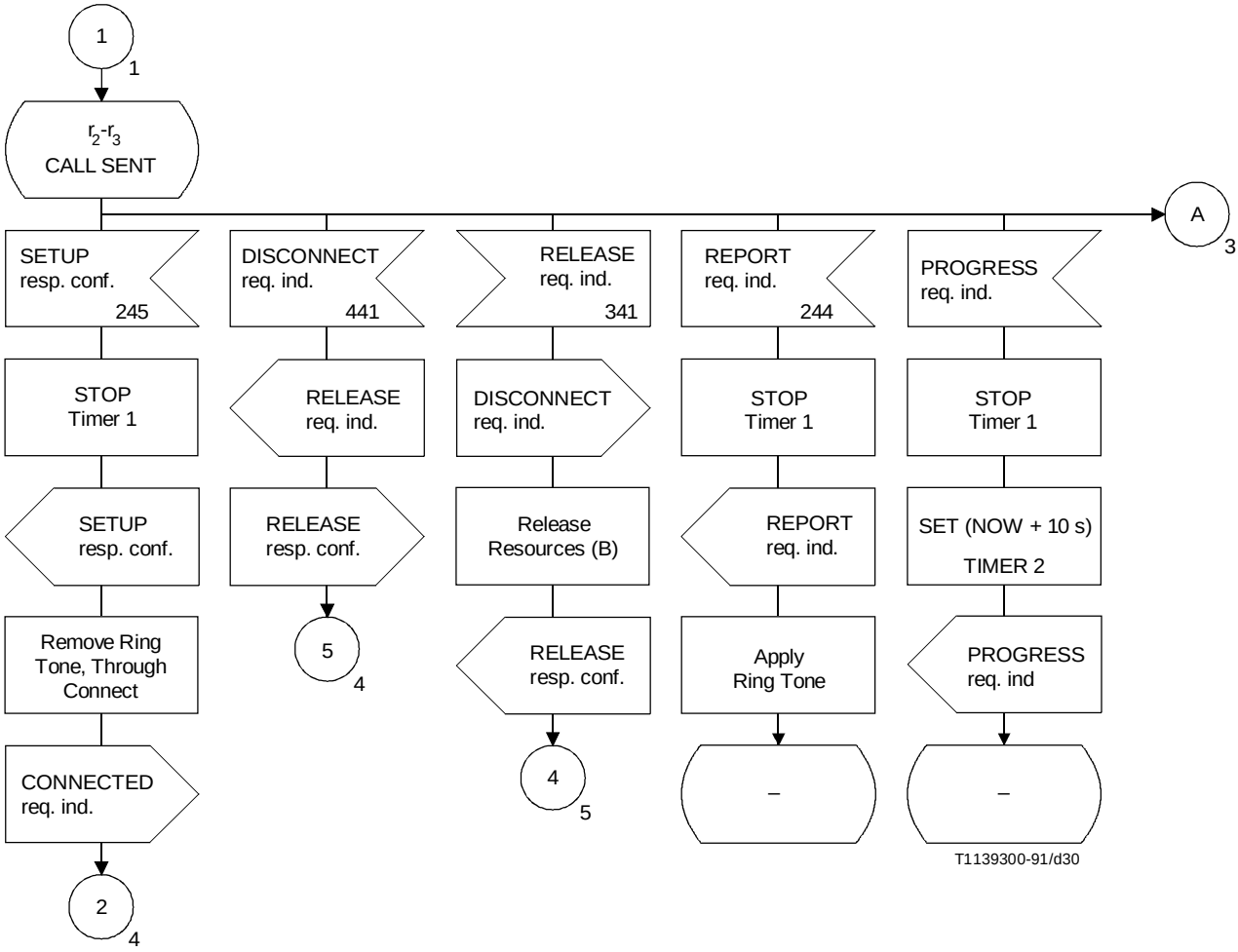


FIGURE 2-16/Q.71 (sheet 2 of 5)

CC (FE4)

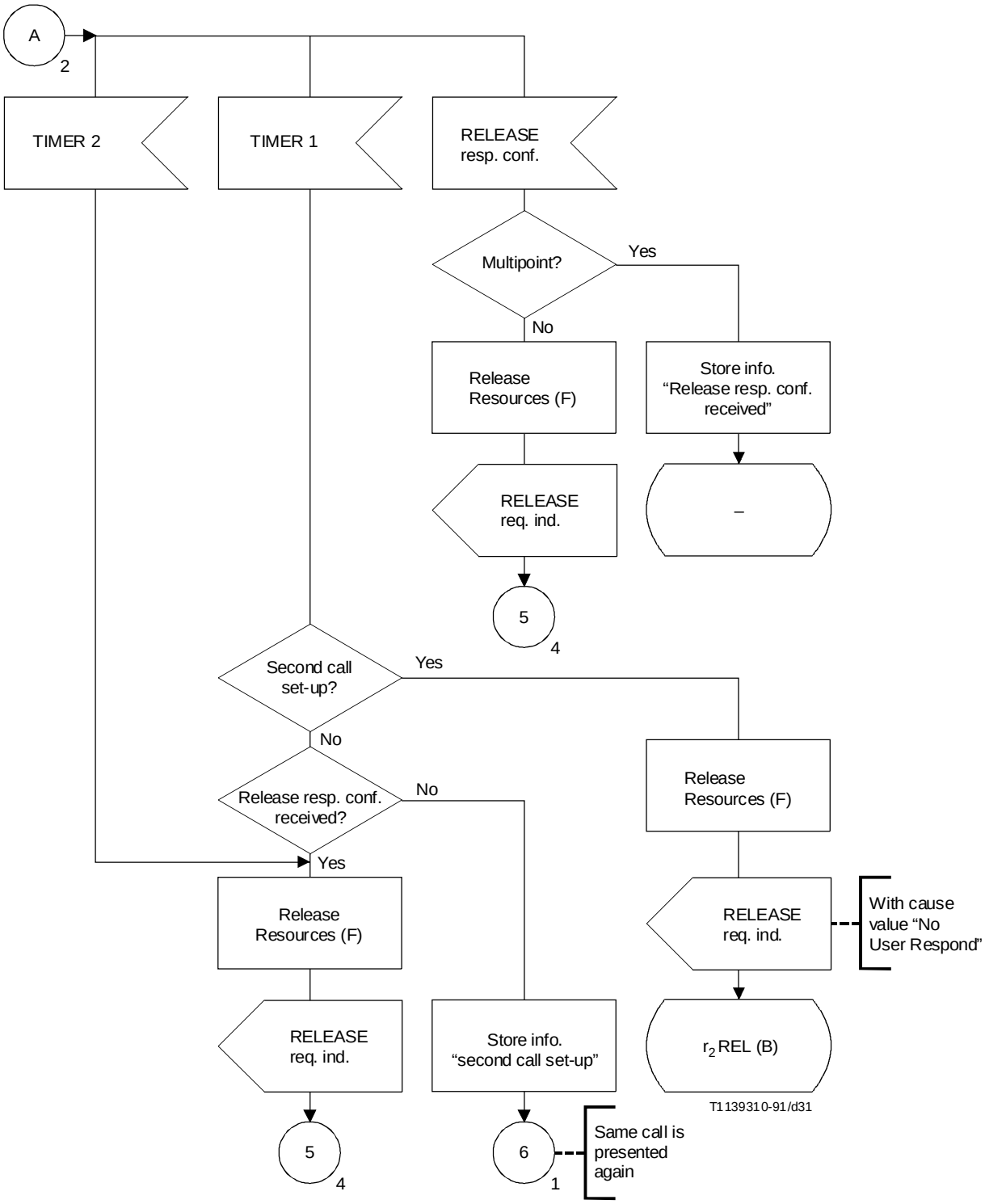


FIGURE 2-16/Q.71 (sheet 3 of 5)

CC (FE4)

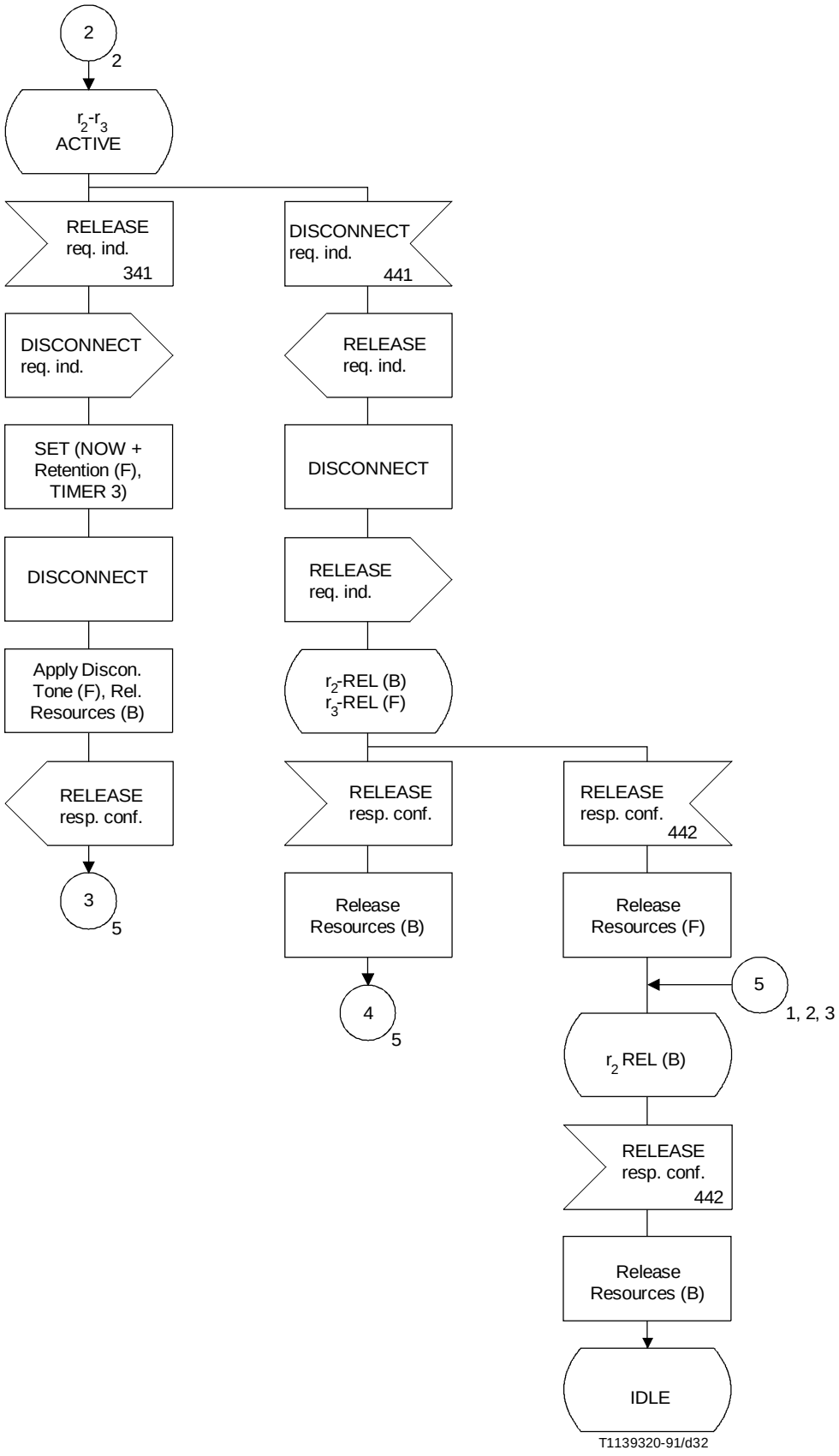


FIGURE 2-16/Q.71 (sheet 4 of 5)

CC (FE4)

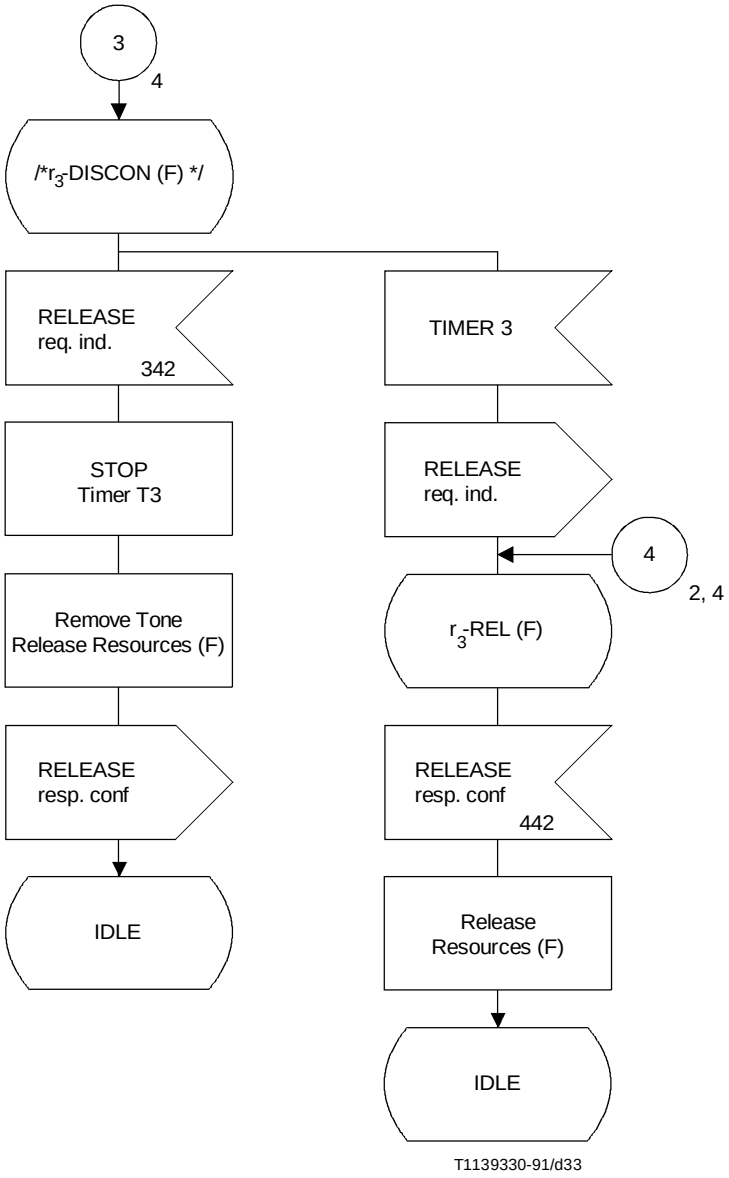


FIGURE 2-16/Q.71 (sheet 5 of 5)

CC (FE4)

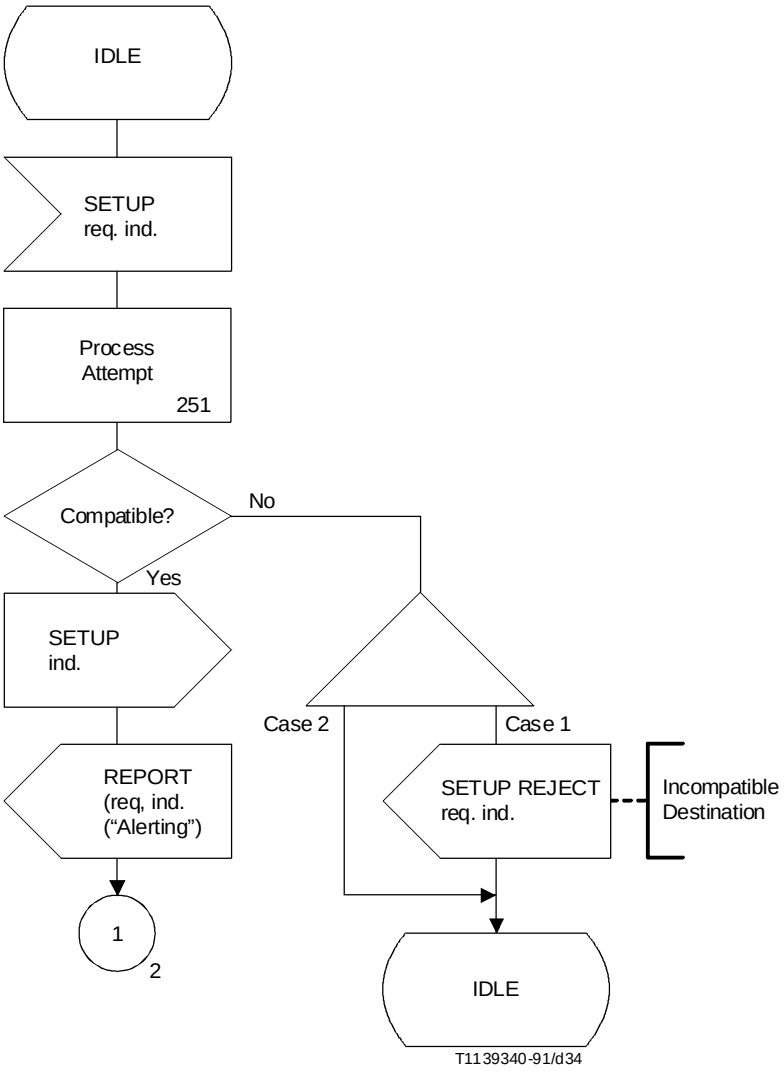


FIGURE 2-17/Q.71 (sheet 1 of 4)

CCA (FE5)

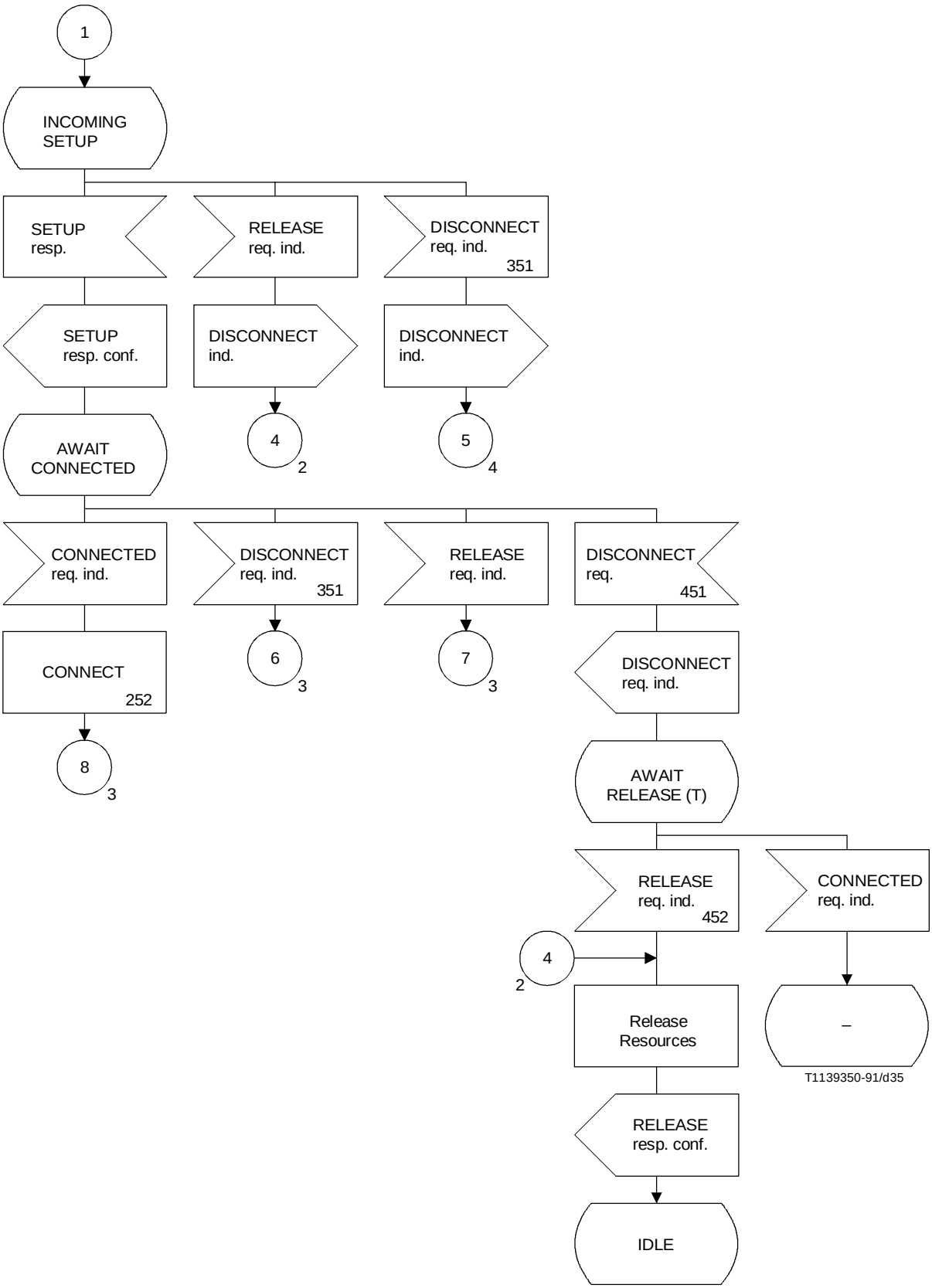


FIGURE 2-17/Q.71 (sheet 2 of 4)

CCA (FE5)

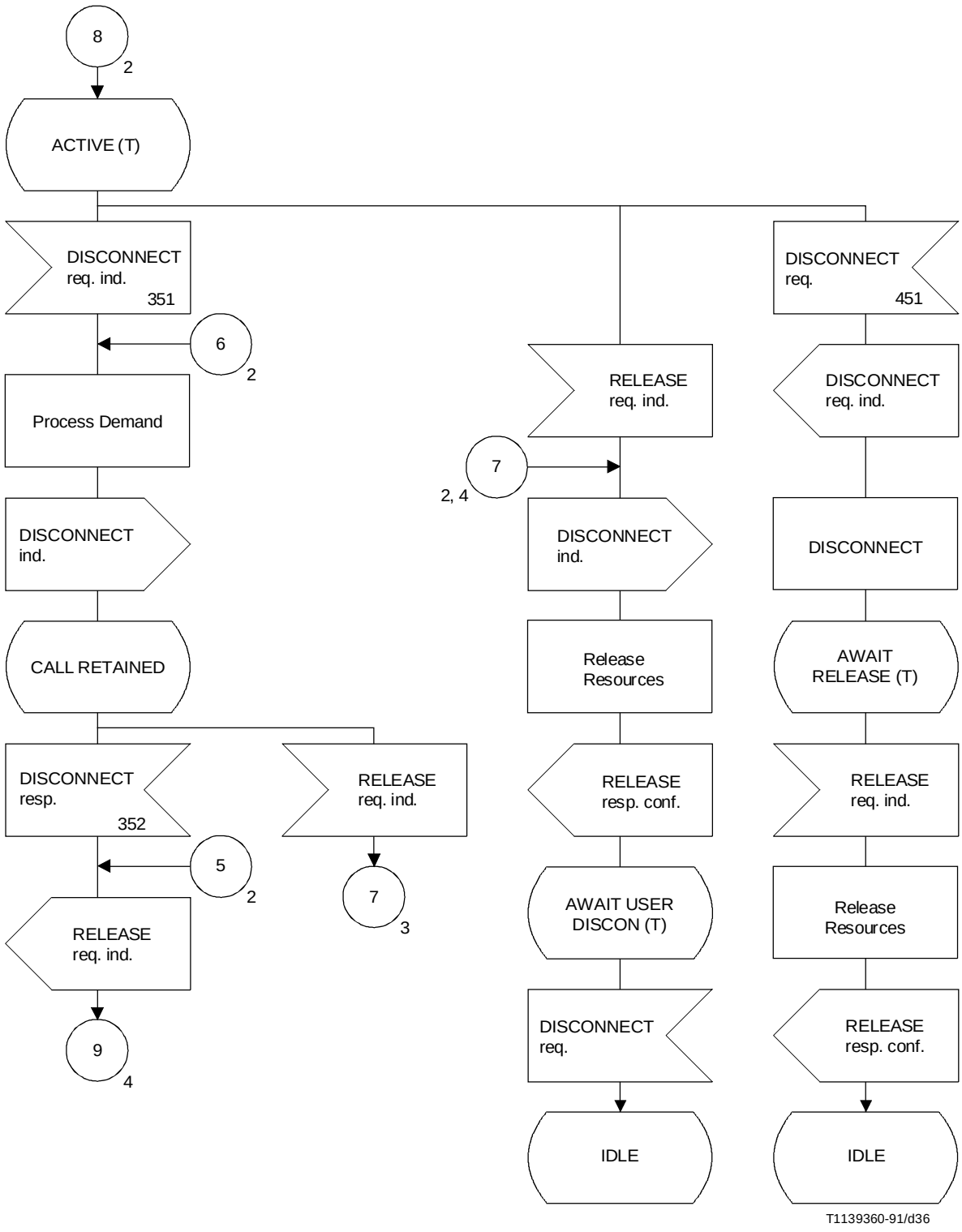


FIGURE 2-17/Q.71 (sheet 3 of 4)

CCA (FE5)

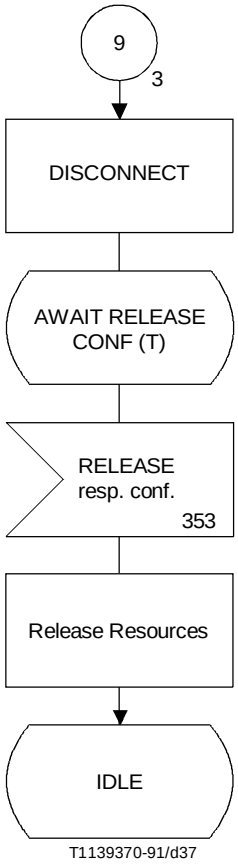


FIGURE 2-17/Q.71 (sheet 4 of 4)

CCA (FE5)

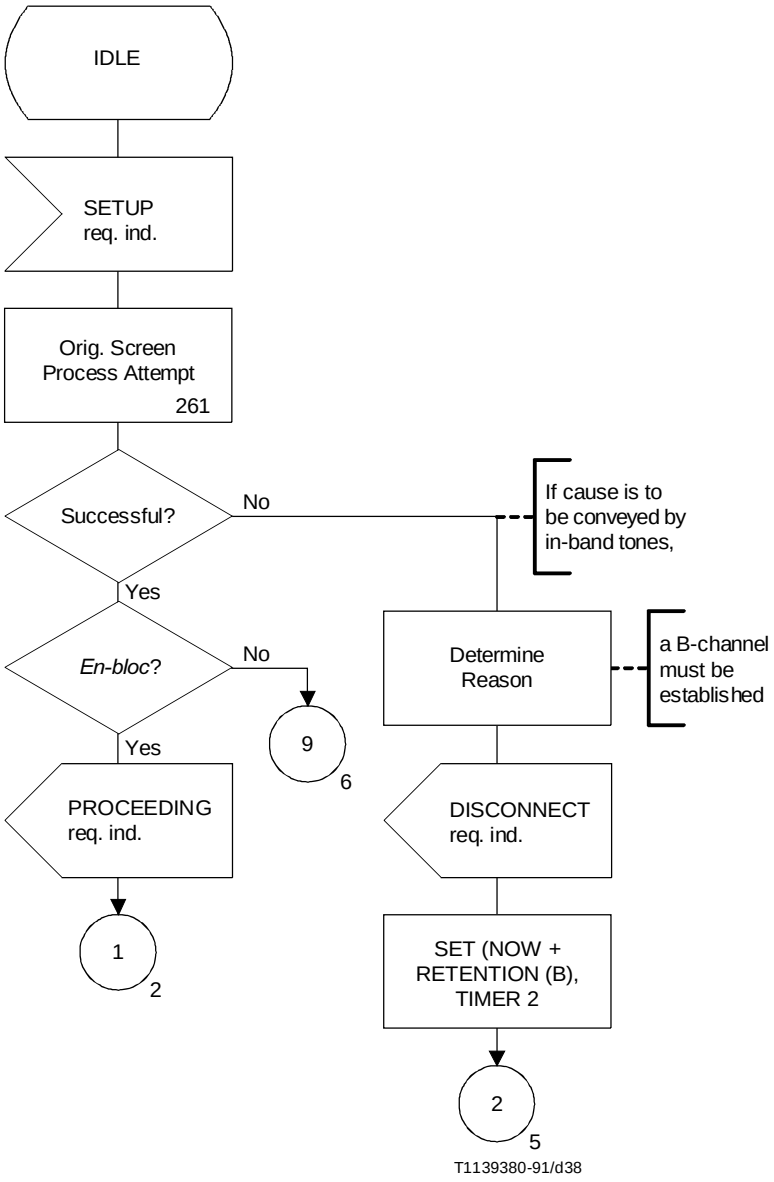


FIGURE 2-18/Q.71 (sheet 1 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

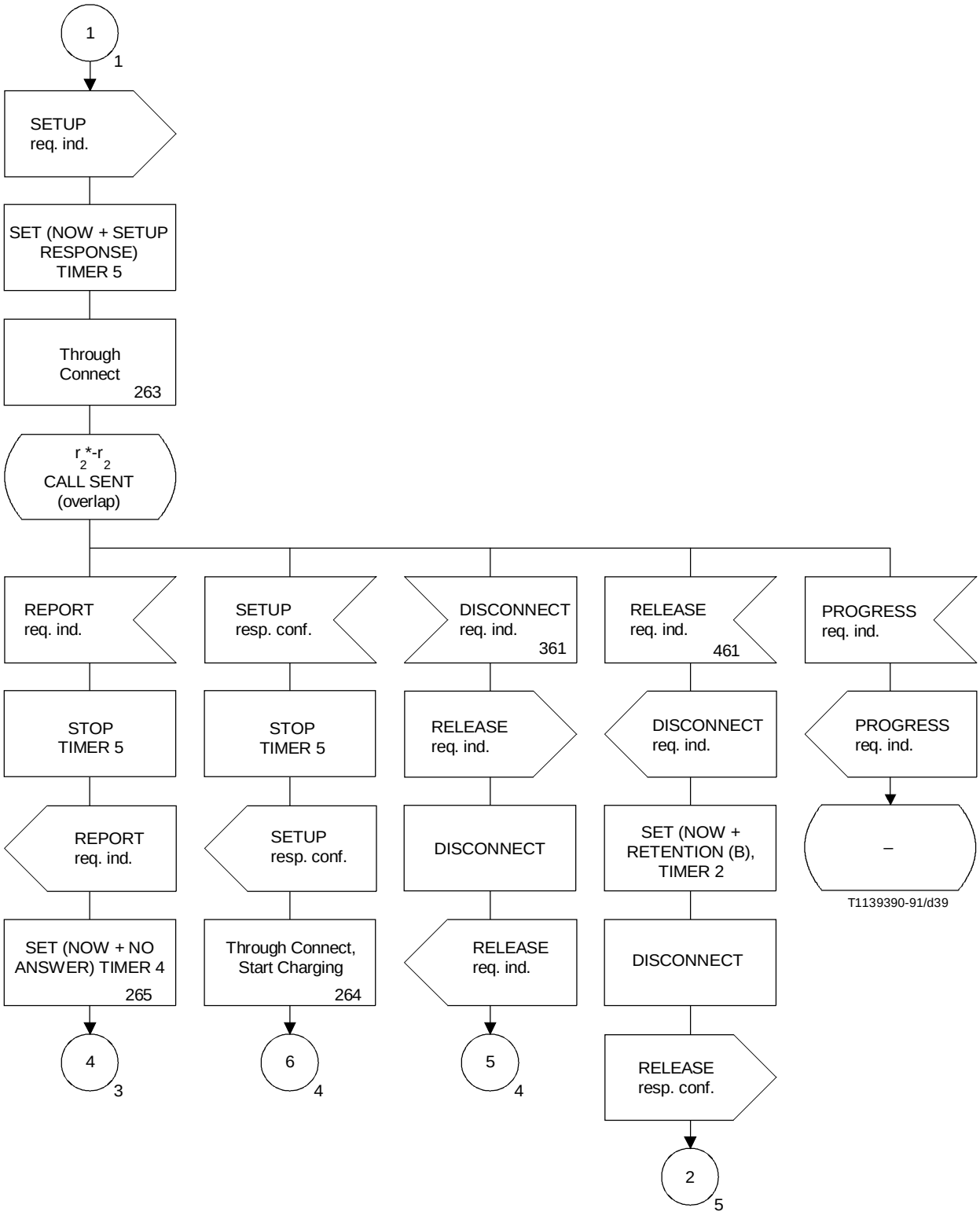


FIGURE 2-18/Q.71 (sheet 2 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

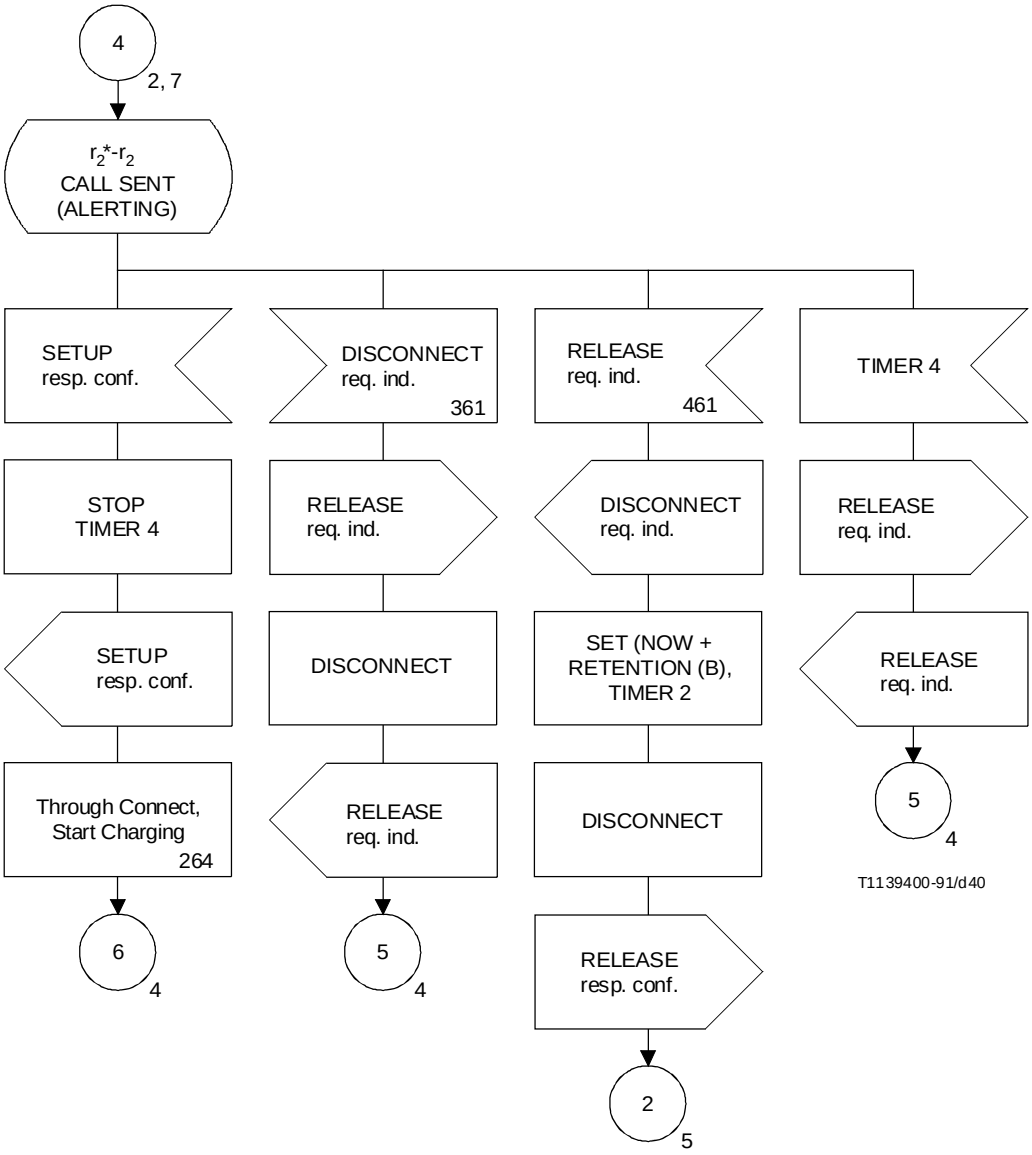


FIGURE 2-18/Q.71 (sheet 3 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

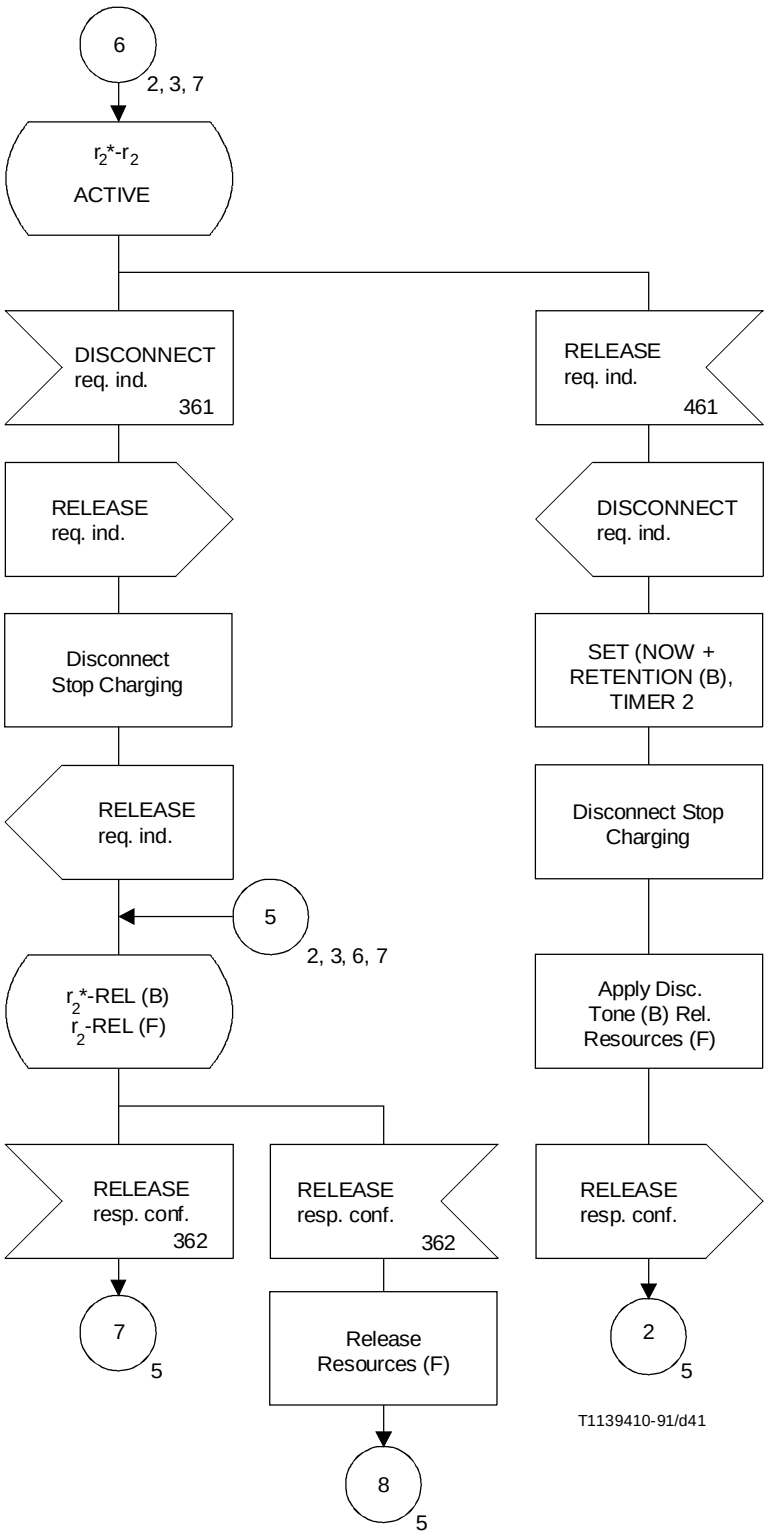


FIGURE 2-18/Q.71 (sheet 4 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

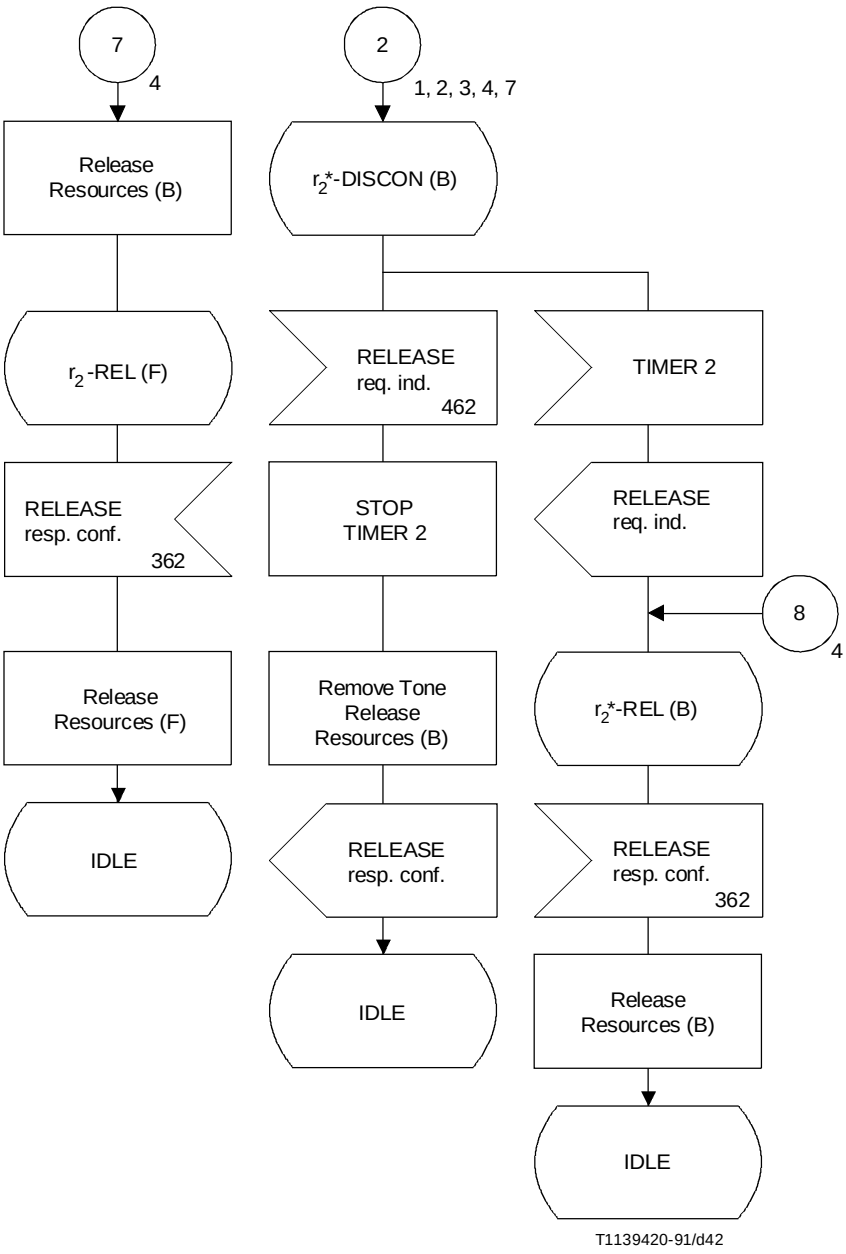


FIGURE 2-18/Q.71 (sheet 5 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

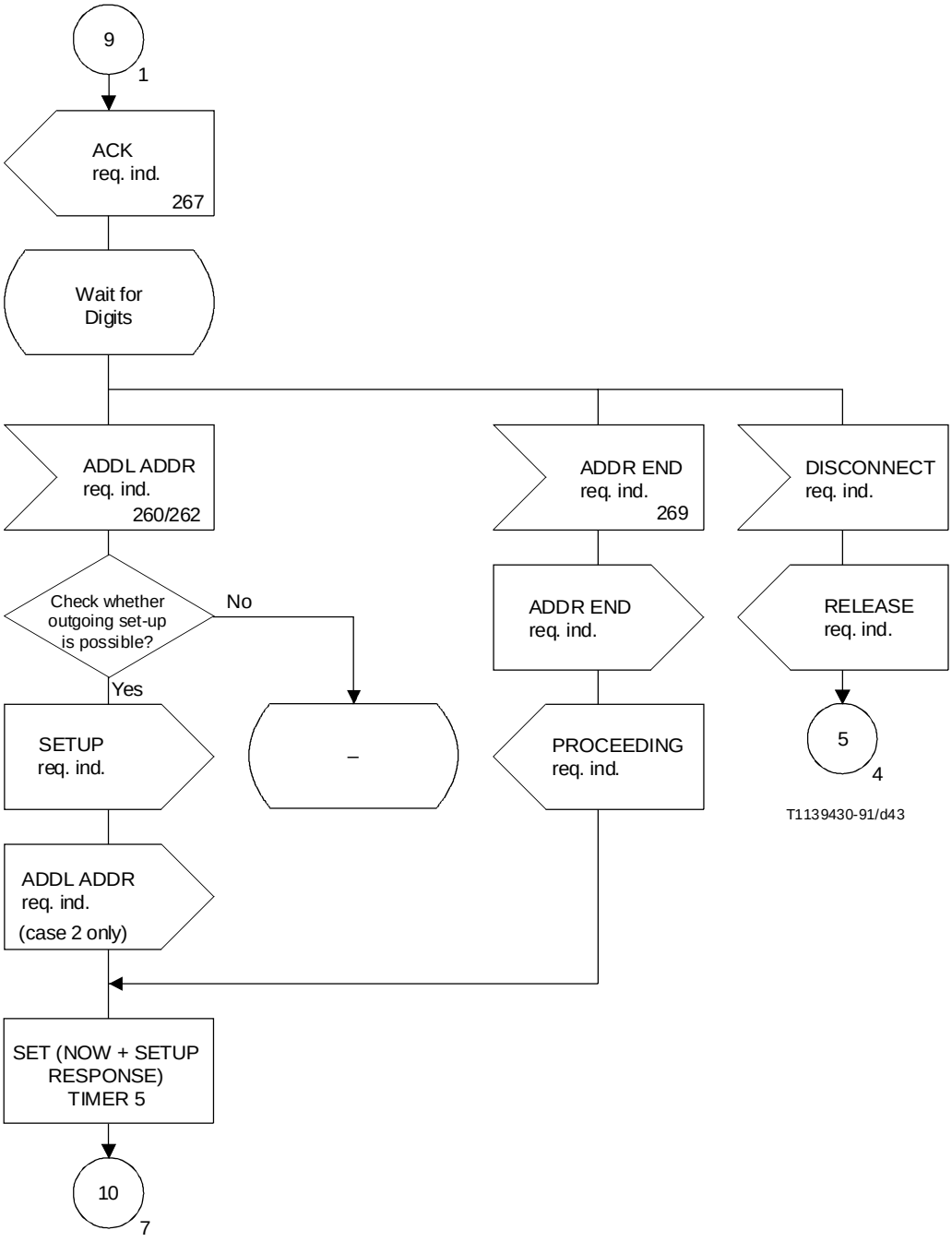


FIGURE 2-18/Q.71 (sheet 6 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

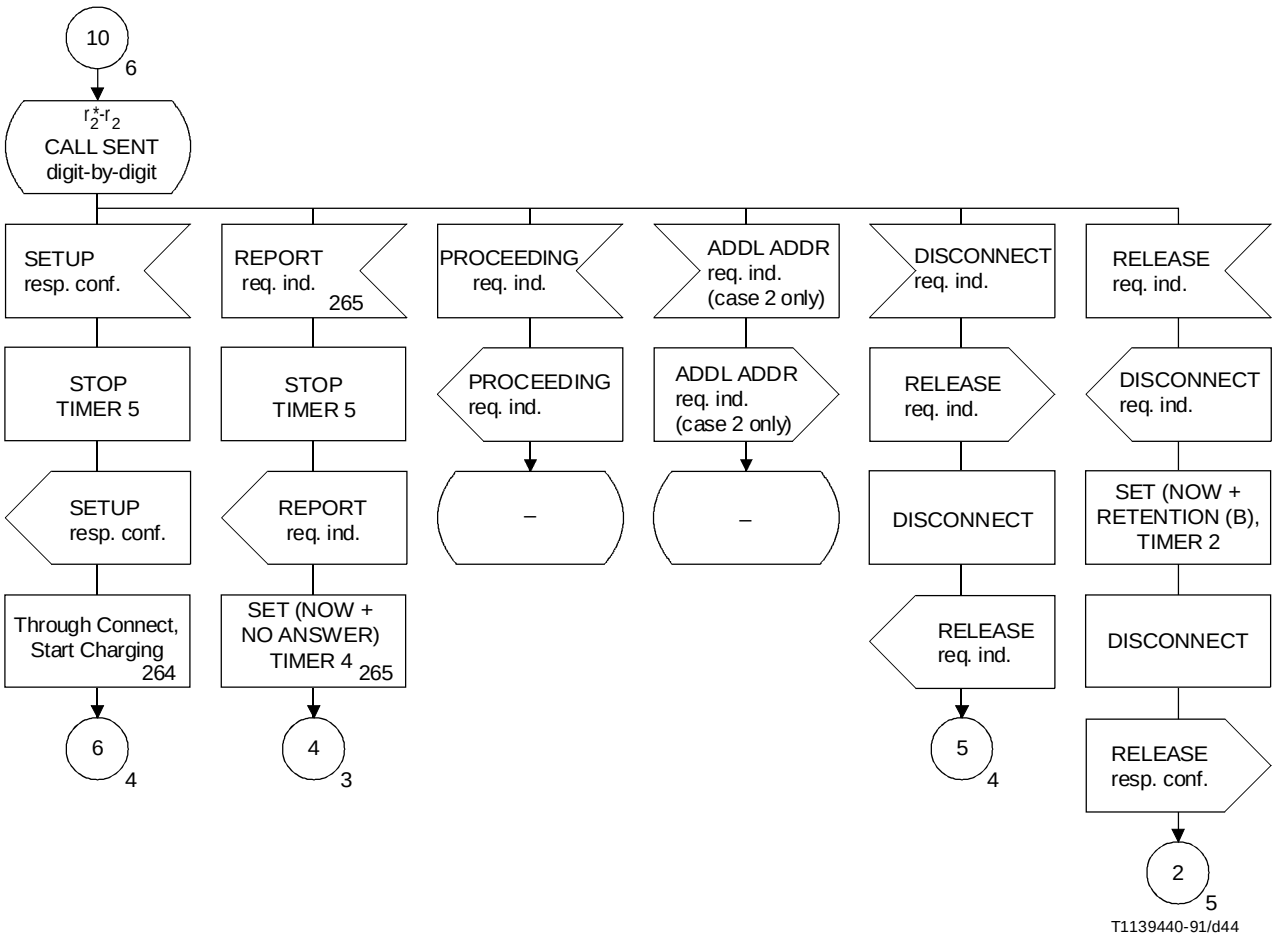


FIGURE 2-18/Q.71 (sheet 7 of 7)

CC (FE6) – Interworking Private ISDN with Public ISDN

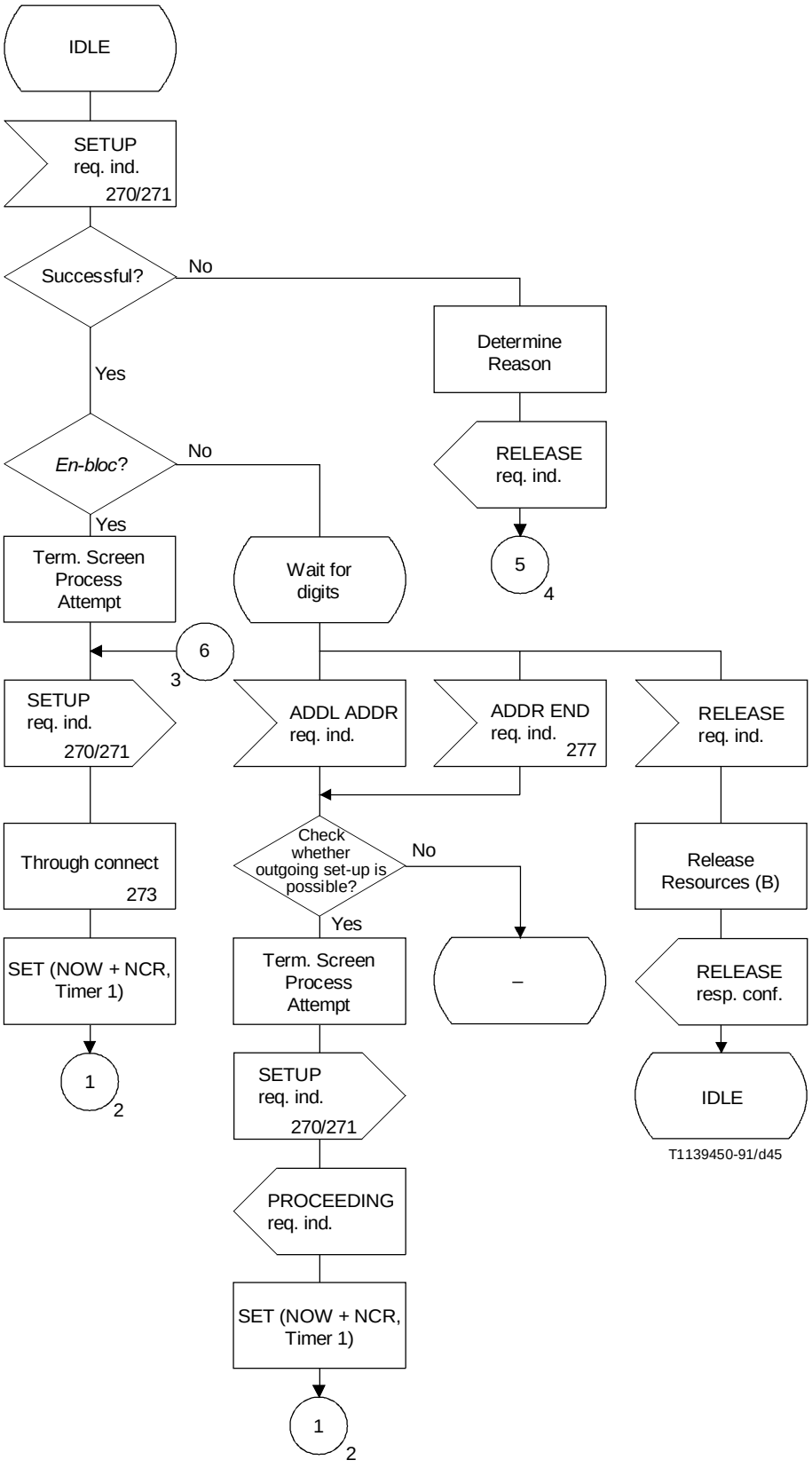


FIGURE 2-19/Q.71 (sheet 1 of 5)

CC (FE7) – Interworking Private ISDN with Public ISDN

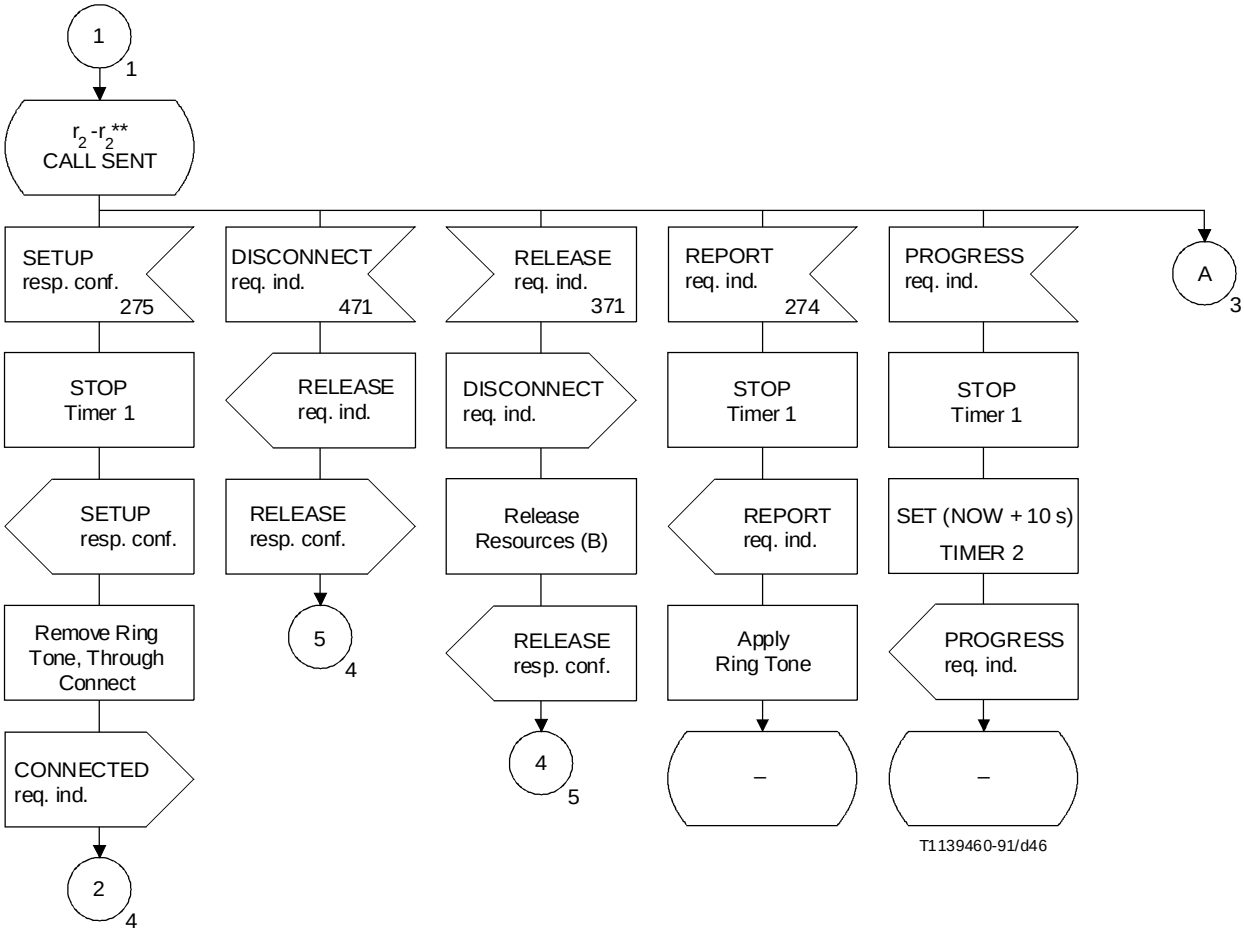


FIGURE 2-19/Q.71 (sheet 2 of 5)

CC (FE7) – Interworking Private ISDN with Public ISDN

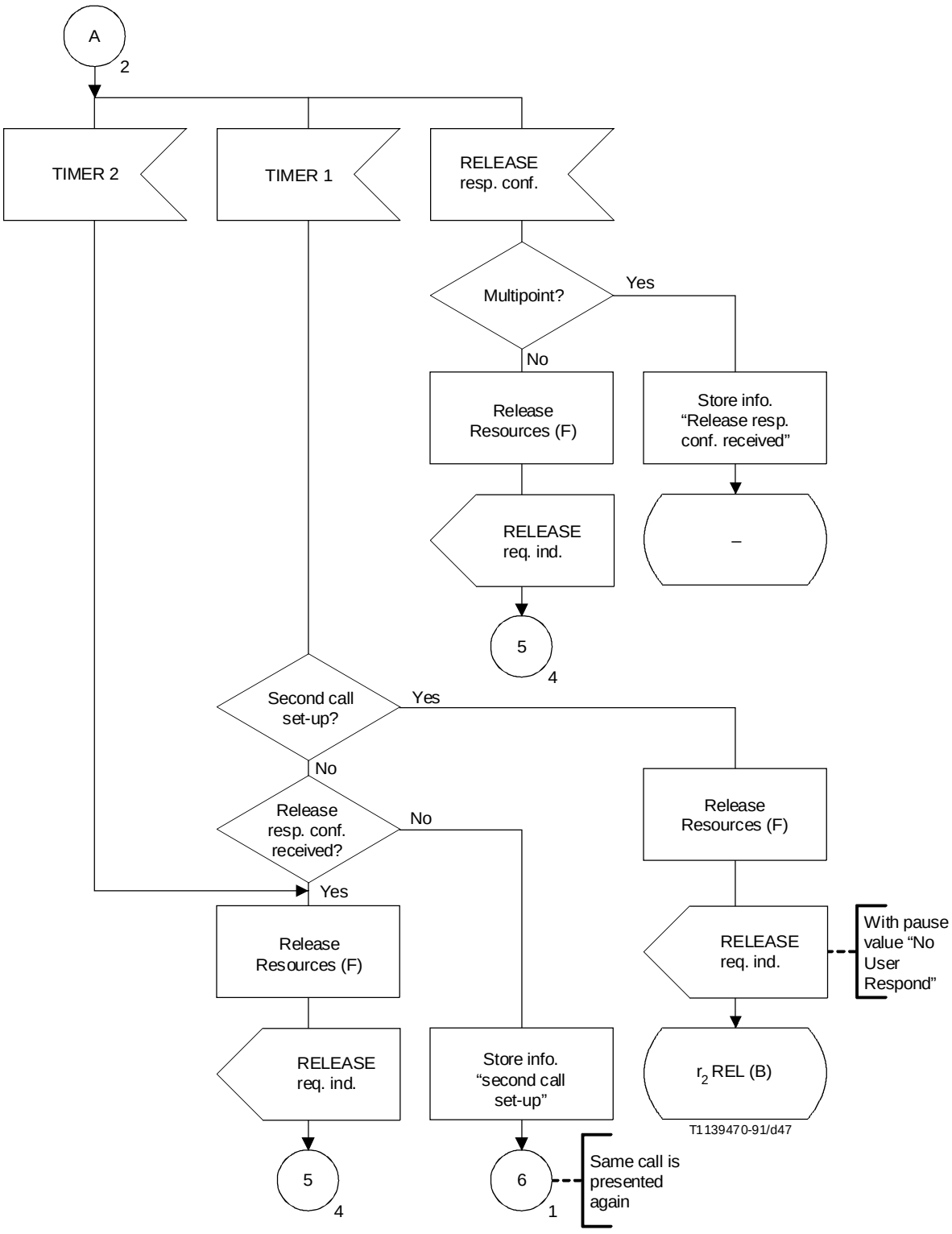


FIGURE 2-19/Q.71 (sheet 3 of 5)

CC (FE7) – Interworking Private ISDN with Public ISDN

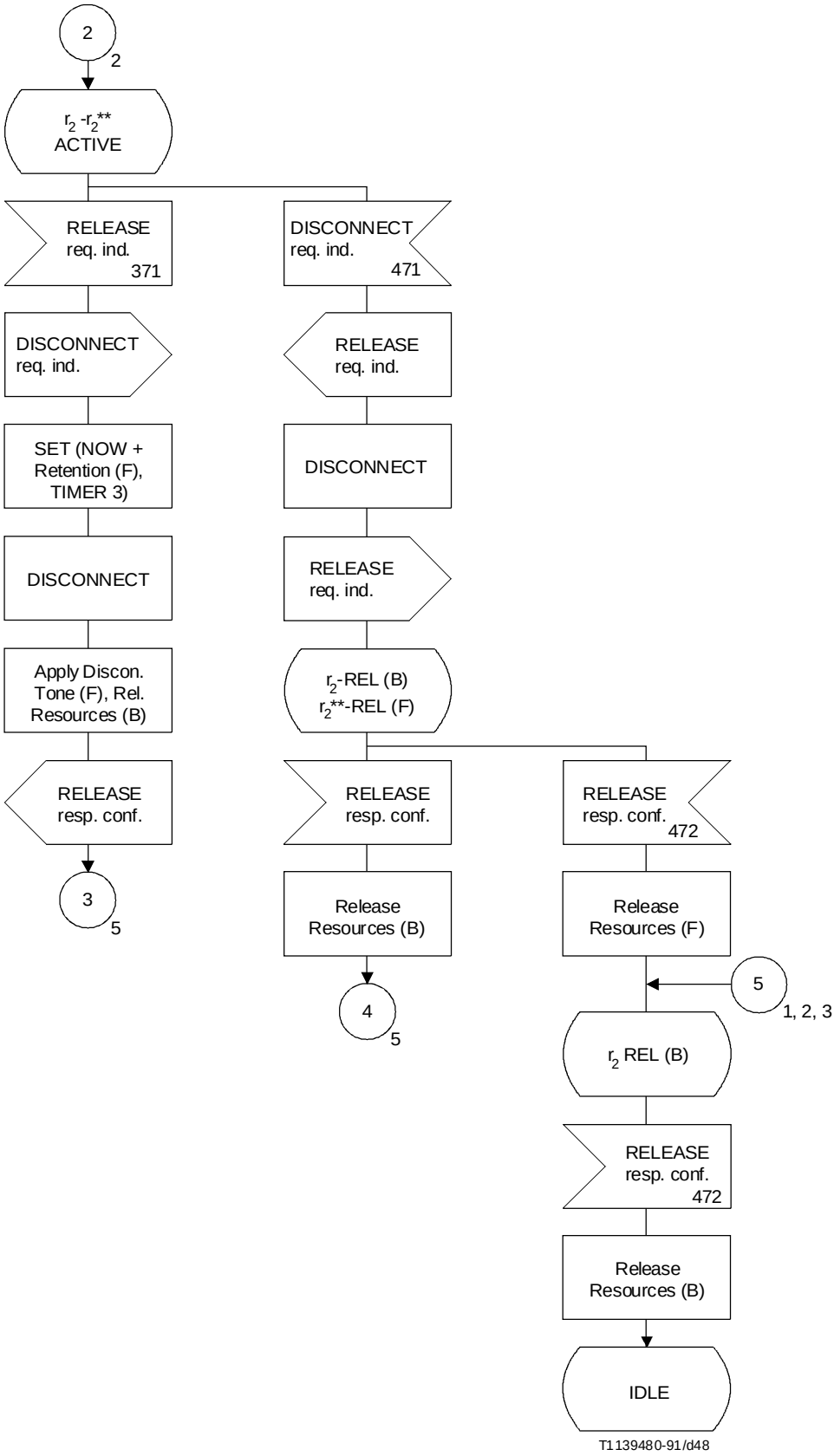


FIGURE 2-19/Q.71 (sheet 4 of 5)

CC (FE7) – Interworking Private ISDN with Public ISDN

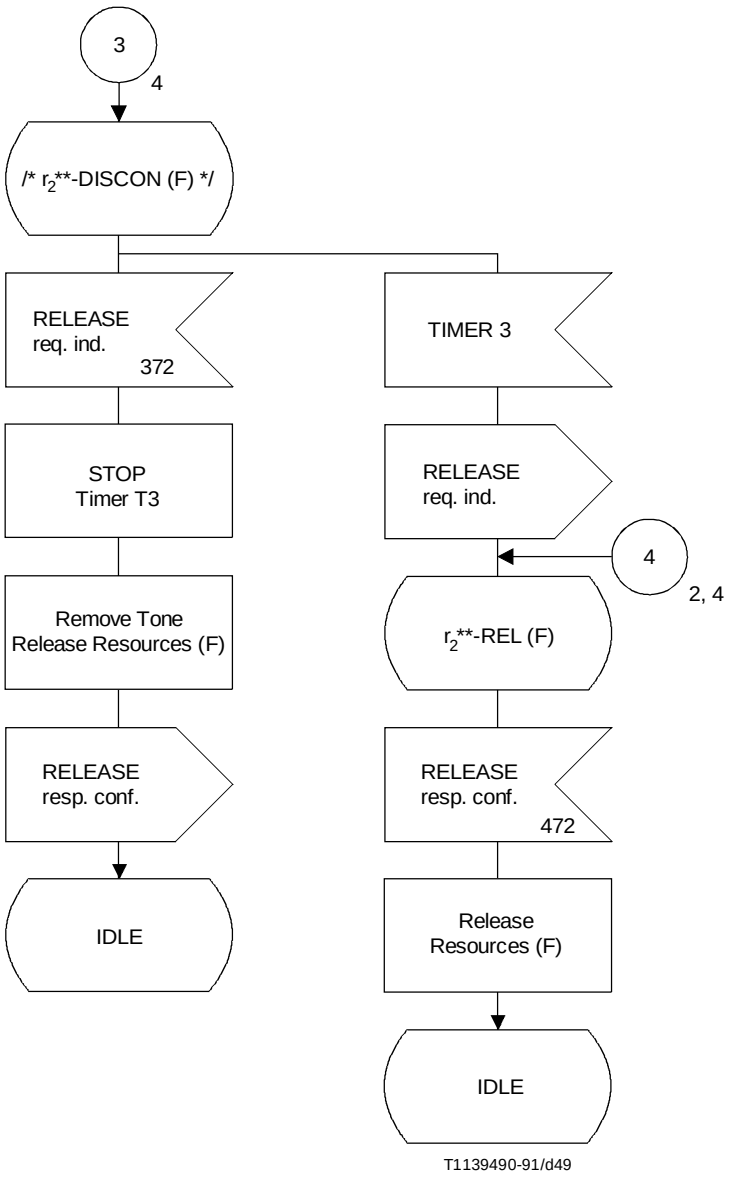


FIGURE 2-19/Q.71 (sheet 5 of 5)

CC (FE7) – Interworking Private ISDN with Public ISDN

2.4 Interworking between public and private ISDNs

2.4.1 Channel selection principle

For both directions of call set up, the selection of a distinct B- or D-channel of a trunk hunting group for user information transfer shall be based on the requested bearer capabilities (i.e. the acceptance of a call request by the requested ISDN does not indicate that terminal characteristics like layer compatibilities are met).

If in either direction of call setup no resources are available for further progressing the call, the setup request shall be rejected and a congestion indication shall be given to the requesting party.

NOTE – The receipt of a congestion indication shall be used to prevent the possible invocation of supplementary services by the requesting party which might be applicable in busy cases.

2.4.2 Interchange of call control information

Call control information relating to user information transfer over the B- or D-channels of a given access shall be conveyed on the D-channel belonging to the same access (access associated signalling). Within that D-channel call control information shall be interchanged in a symmetrical point-to-point mode of operation, i.e. a single, predetermined layer 2 connection shall carry all call control information, including requests for the establishment of calls.

NOTE – This does not preclude that for non-signalling applications, e.g. the transfer of packet data, connections need to be established on a D-channel which use non-predetermined data links, and that consequently assignment mechanisms for the determination of data link identifiers are needed.

2.5 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned functions in the ISDN (e.g. synchronism, signalling capabilities, etc.). In addition, the actions that occur at the functional entities during call processing stages for providing services described in this Recommendation have been given reference numbers and brief descriptions. The reference numbers are shown on the information flow diagrams and on SDL diagrams. The detailed list of descriptions of actions, together with references to the information flow diagrams, follow.

Reference number — *Actions*

211 *Process service request*

a) Receive, analyse and acknowledge (as required) user's SETUP req.

b) Interact with user to accumulate information.

c) Request network access resource.

d) Formulate and send call SETUP req. ind.

e) Formulate and send REPORT ind. to user.

f) Check for resource availability.

g) Select and reserve local resources, as required.

Connect

h) Establish connection as required.

221 *Perform originating screening*

a) Receive and react to SETUP req. ind. from the CCA.

b) Analyse the service request.

c) Identify the calling terminal at an interface between a public network and a terminal, or the PNX at an interface between a public network and a private network. At an interface between a public network and a private network, identify the terminal characteristics. Identify the user priority level, if any.

d) Verify the user's authorization, capabilities and availability of appropriate resources (this might involve analysis and storage of information at another location).

Process attempt

e) Establish call ID.

f) Reserve incoming resources.

g) Analyse information (called number, routing requirements, etc.).

h) Determine connection elements type, outgoing resource (or Broadband Bearer Connection), other resources (echo control pads, etc.), charging treatment, network management controls in effect and any other elements involved in call set-up.

i) Check resource availability, as required.

j) Select path(s) through entity.

k) Reserve outgoing resource and any other required resources.

l) Formulate and send PROCEEDING req. ind. and SETUP req. ind.

m) Start call control timing, as required.

n) Establish bearer connection ID.

223 *Through connect*

a) Establish through connection or allocate resources as required (see Note 1 to Figures 2-3 through 2-12).

224 *Through connect*

a) Receive and react to SETUP resp. conf.

b) Establish through connection or allocate resources as required (see Note 2 to Figures 2-3 through 2-12).

c) Formulate and send SETUP resp. conf.

Start charging

d) Start charging timing, as required (see Note 3 to Figures 2-3 through 2-12).

225 *Start timer*

a) Receive and react to REPORT req. ind.

b) Start user-answer timer.

c) Formulate and send REPORT (Alerting) req. ind.

231 *Process attempt*

a) Receive and analyse SETUP req. ind.

b) Establish call ID.

c) Establish bearer connection ID.

d) Reserve incoming resources, as required.

e) Analyse called number, routing information, network management and/or priority information.

f) Determine connection elements type, outgoing resource, need for other resources.

g) Select and reserve outgoing resource, other resources as required and path(s) through the entity.

h) Check resource availability, as required.

232 *Through connect*

a) Establish through connection as required (see Note 1 to Figures 2-3 through 2-12).

b) Formulate and send SETUP req. ind.

241 *Perform terminating screening*

a) Receive and analyse SETUP req. ind.

b) Analyse service request, called number and any routing information.

c) Identify the called line(s), characteristics of the called terminal (which is directly connected to the public ISDN), any priorities and resources required.

d) Check supplementary services provision and state in priority order.

e) Verify called user's authorization/capabilities (this might involve analysis and storage of information at another location).

f) Check resource availability.

Process attempt

g) Select and reserve outgoing resource, other resources and path through entity.

h) Reserve incoming resources.

i) Establish call.

j) Establish call ID.

k) Formulate and send SETUP req. ind. including requested service indication.

243 *Through connect*

a) Establish through connection, if required (see Note 1 to Figures 2-3 through 2-12).

b) Start user-response timer.

244 *Apply ringing tone*

a) Receive and react to REPORT (Alerting) req. ind.

b) Retain selected user device information, as required.

c) Release non-selected associations, as required.

d) Apply ringing tone, if required, to resource toward calling user (see Note 6 to Figures 2-3 through 2-12).

e) Formulate and send REPORT req. ind.

245 *Remove ringing tone*

a) Receive and react to SETUP resp. conf.

b) If applied, remove ringing tone.

c) Establish through connection if not done in Ref. 243 (see Note 2 to Figures 2-3 through 2-12).

d) Formulate and send SETUP resp. conf.

e) Formulate and send CONNECTED req. ind.

251 *Process attempt*

a) Receive and react to SETUP req. ind.

b) Analyse service request.

c) Identify called user.

d) Verify compatibility of called user terminal.

e) Reserve resources.

f) Send SETUP ind. to called user.

g) Establish bearer connection ID.

h) Formulate and send REPORT (Alerting) req. ind.

252 *Connect*

a) Receive and react to CONNECTED req. ind.

b) Establish connection.

261 see FEA 221.

263 see FEA 223.

264 see FEA 224.

265 see FEA 225.

271 see FEA 241.

273 see FEA 243.

274 see FEA 244.

275 see FEA 245.

311 *Disconnect*

a) Recognize user DISCONNECT req.

b) Formulate and send DISCONNECT req. ind.

c) Disconnect resources, as required.

312 *Release resources*

a) Receive and react to RELEASE req. ind.

b) Release resources – both directions.

c) Release bearer connection, as required.

321 *Disconnect*

a) Receive and react to DISCONNECT req. ind.

b) Disconnect resources, as required.

c) Formulate and send RELEASE req. ind.

Stop charging

d) Stop charging per Note 3 to Figures 2-3 through 2-12.

322 *Release resources*

a) Receive and react to RELEASE resp. conf.

b) Release resources in direction of incoming RELEASE resp. conf.

c) Release bearer connection ID, as required.

331 *Disconnect*

a) Receive and react to RELEASE req.

b) Disconnect resources, as required.

c) Formulate and send RELEASE req. ind.

Release resources

d) Release resource in direction of incoming RELEASE req. ind.

e) Formulate and send RELEASE resp. conf.

f) Release bearer connection ID, as required.

332 *Release resources*

a) Receive and react to RELEASE resp. conf.

b) Release resource in direction of incoming RELEASE resp. conf.

341 *Disconnect*

a) Receive and react to RELEASE req. ind.

b) Disconnect resources.

c) Formulate and send DISCONNECT req. ind.

Apply disconnect tone

d) If used, apply disconnect tone to resource toward user (see Note 6 to Figures 2-3 through 2-12).

Release resources

e) Release resources in direction of incoming RELEASE req. ind.

f) Formulate and send RELEASE resp. conf.

g) Release bearer connection ID, as required.

342 *Remove tone*

a) Receive and react to RELEASE req. ind.

b) If applied, remove tone.

Release resources

c) Release resources in direction of incoming RELEASE req. ind.

d) Formulate and send RELEASE resp. conf.

e) Release bearer connection ID, as required.

351 *Process demand*

a) Receive and react to DISCONNECT req. ind.

b) Initiate action to send DISCONNECT ind. to user.

352 *Disconnect*

a) Receive and react to DISCONNECT req. from user.

b) Disconnect resources.

c) Formulate and send RELEASE req. ind.

353 *Release resources*

a) Receive and react to RELEASE resp. conf.

b) Release resources – both directions.

c) Release bearer connection ID, as required.

361 see FEA 321.

362 see FEA 322.

371 see FEA 341.

372 see FEA 342.

411 *Process demand*

a) Receive and react to DISCONNECT req. ind.

b) Initiate action to send DISCONNECT ind. to user.

412 *Disconnect*

a) Receive and react to DISCONNECT req. from user.

b) Disconnect.

c) Formulate and send RELEASE req. ind.

413 *Release resources*

a) Receive and react to RELEASE resp. conf.

b) Release resources – both directions.

421 *Disconnect*

a) Receive and react to RELEASE req. ind.

b) Disconnect resources, as required.

c) Formulate and send DISCONNECT req. ind.

d) Stop charging as required per Note 3 to Figures 2-3 through 2-12.

e) If used apply disconnect tone to resource toward user (see Note 6 to Figures 2-3 through 2-12).

Release resources

f) Release resource in direction of incoming RELEASE req. ind.

g) Formulate and send RELEASE resp. conf.

422 *Remove tone*

a) Receive and react to RELEASE req. ind.

b) If applied, remove tone.

Release resources

c) Release resources in direction of incoming RELEASE req. ind.

d) Formulate and send RELEASE resp. conf.

e) Release bearer connection ID, as required.

431 *Disconnect*

a) Receive and react to RELEASE req. ind.

b) Disconnect resources, as required.

c) Formulate RELEASE req. ind.

Release resources

d) Release resources in direction of incoming RELEASE req. ind.

e) Formulate and send RELEASE resp. conf.

f) Release bearer connection ID, as required.

432 *Release resource*

a) Receive and react to RELEASE resp. conf.

b) Release resources in direction of incoming RELEASE resp. conf.

c) Release bearer connection ID, as required.

441 *Disconnect*

a) Receive and react to DISCONNECT req. ind.

b) Disconnect resources, as required.

c) Formulate and send RELEASE req. ind.

442 *Release resource*

a) Receive and react to RELEASE resp. conf.

b) Release resource in direction of incoming RELEASE resp. conf.

c) Release bearer connection ID, as required.

451 *Disconnect*

a) Recognize user DISCONNECT req.

b) Formulate and send DISCONNECT req. ind.

c) Disconnect.

452 *Release resources*

a) Receive and react to RELEASE req. ind.

b) Release resources – both directions.

c) Release bearer connection ID, as required.

d) Formulate and send RELEASE resp. conf.

461 see FEA 421.

462 see FEA 422.

471 see FEA 441.

472 see FEA 442.

2.6 Additional FEAs required for digit-by-digit call setup cases

Reference Number *Actions*

212 *Process attempt*

a) Interact with user to obtain call address.

b) Formulate messages to send address information to CC.

c) Determine end of dialling and so indicate to CC (if required).

213 *Process attempt*

a) Interact with user to obtain call address.

b) Formulate messages to send address information to CC.

214 *End of address*

a) Receive and analyse additional address digits.

b) Determine last digit by timeout.

c) Formulate and send ADDR END req. ind.

215 *Collect digits*

a) Interact with user to obtain called address.

b) Upon receipt of next digit or timeout send ADDR INFO to FE2.

220 *Process attempt*

a) Receive and analyse additional address digits.

b) Check whether outgoing setup is possible.

c) Restart call control timing, as required.

222 *Process attempt*

a) Receive and analyse additional address digits.

b) Check whether outgoing setup is possible.

c) Restart call control timing, as required.

d) Determine connection elements type, outgoing resource (or circuit), other resources (echo control, pads, etc.), charging treatment, network management controls in effect and any other elements involved in call set-up.

e) Select resources.

f) Select path(s) through entity.

g) Reserve outgoing resource and any other required resources.

h) Formulate and send appropriate SETUP req. ind. and ADDL ADDR req. ind.

i) Start/restart call control timing, as required.

Through connect

j) Establish through connection as required (see Note 1 to Figures 2-3 through 2-12).

226 *Perform originating screening*

a) Receive and react to SETUP req. ind.

b) Analyse service request.

c) Establish call reference.

d) Formulate and send ACKNOWLEDGE req. ind.

227 *Process attempt*

a) Reserve incoming resources.

b) Analyse information (called number, routing requirements, etc.).

c) Start call control timing, as required.

228 *Process*

a) Receive and analyse ADDL ADDR req. ind.

b) Formulate and send appropriate ADDL ADDR req. ind.

c) Restart call control timing, as required.

229 *Process*

a) Receive and analyse additional address digits.

b) Formulate and send appropriate ADDR END req. ind.

c) Stop/start call control timing, as required.

d) Send PROCEEDING req. ind.

230 *Process*

a) Receive and analyse ADDL ADDR req. ind.

b) Check whether outgoing setup is possible.

233 *Process attempt*

a) Receive and analyse SETUP req. ind. as required.

b) Establish call reference.

c) Reserve incoming resources.

234 *Process attempt*

a) Receive and analyse additional address digits.

b) Check whether outgoing setup is possible.

c) Restart call control timing, as required.

d) Determine connection elements type, outgoing resource (or circuit), other resources (echo control, pads, etc.), charging treatment, network management controls in effect and any other elements involved in call set-up.

e) Select resources.

f) Select path(s) through entity.

g) Reserve outgoing resource and any other required resources.

h) Formulate and send SETUP req. ind. and ADDL ADDR req. ind.

Through connect

i) Establish through connection as required (see Note 1 to Figures 2-3 through 2-12).

235 *Process*

a) Receive and analyse additional address digits.

b) Formulate and send appropriate ADDL ADDR req. ind.

236 *Process*

a) Receive and analyse ADDR END req. ind.

b) Formulate and send appropriate ADDR END req. ind.

240 *Process attempt*

a) Receive and analyse SETUP req. ind.

b) Establish call reference.

c) Reserve incoming resources.

242 *Process attempt*

a) Receive and analyse additional address digits.

b) Check whether outgoing SETUP req. ind. is possible.

c) If last digit is identified by comparison with numbering plan, then.

d) Analyse service request, called number and any routing information.

e) Identify the called line(s), characteristics of the called terminal directly connected to the public ISDN, any priorities and resources required.

f) Check supplementary services provision and state in priority order.

g) Verify called user's authorization/capabilities (this might involve analysis and storage of information at another location).

h) Select and reserve outgoing resources, other resources and path(s) through entity.

i) Formulate and send SETUP req. ind. including requested service indication, formulate and send PROGRESS req. ind.

247 *Perform terminating screening*

a) Receive and analyse last address digit.

b) Analyse service request, called number and any routing information.

c) Identify the called line(s), characteristics of the called terminal directly connected to the public ISDN, any priorities and resources required.

d) Check supplementary services provision and state in priority order.

e) Verify called user's authorization/capabilities (this might involve analysis and storage of information at another location).

f) Select and reserve outgoing resources, other resources and path(s) through entity.

Process attempt

g) Formulate and send SETUP req. ind. including requested service indication.

260 see FEA 220.

262 see FEA 222.

266 see FEA 226.

267 see FEA 227.

268 see FEA 228.

269 see FEA 229.

270 see FEA 240.

272 see FEA 242.

277 see FEA 247.

2.7 Allocation of functions to physical entities

The functional model relates to functions involved in handling a single call or call attempt. The scenarios in Table 2-2 identify the roles a physical device (e.g. exchange, NT2, terminal equipment, etc.) may play in handling that call or call attempt. A specific physical device may fulfil different roles in different scenarios, e.g. a local exchange may provide both CCA and CC capabilities (see scenario D).

In some private ISDNs, the "NT2" may be a set of PNXs performing both access functions and transport functions. The relationships within such a set of PNXs are for further study.

TABLE 2-2/Q.71

Physical allocation of functions

Functional Entities / Scenario	FE1 r_1 FE2 r_2 FE3 r_2 FE4 r_3 FE5				
A – ISDN Public Network	TE	LE	TR	LE	TE
B – NT2 Access to Public ISDN (Note 1)	TE / NT2	NT2 / LE	TR	LE	TE
C – Single Node Call	TE	LE ——— LE			TE

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TE Terminal Equipment
LE Local Exchange
NT2 Network Termination 2
TR Transit Exchange
ISDN Narrow-band or broadband ISDN

NOTES

1 In scenario B the NT2 provides the CC function of the TE and appears to be a CCA to the LE (e.g. when the NT2 is a non-ISDN switching or multiplexing function). In some private ISDNs, the "NT2" may be a set of NT2s performing both access functions and transport functions. The relationships within such a set of NT2s are for further study.

2 Entities connected by dashed line are the same physical entity.

TABLE 2-3/Q.71

Physical allocation of functions – Interface to private networks

Functional Entities / Scenario	FE1 r_1 PN r_2* FE6 r_2 FE3 r_2 FE7 r_2** PN r_3 FE5						
D – ISDN Access via private ISDN (PNX) at originating and/or terminating side (Note)	TE	PN	LE	TR	LE	PN	TE

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PNX NT2 providing ISDN connection types according to Recommendation I.340

NOTE – Scenario D shows the case where the NT2 is an ISDN switching function (e.g. a PNX) according to Figures 2a/I.324 and 3a/I.324 illustrating the overall reference configuration for a mixed public/private ISDN scenario. In this case the private ISDN (PNX) is directly involved in a common and consistent ISDN service provision and appears to be a CC to the LE at the public ISDN accesses which consequently offers an r_2*/r_2** relationship based on FE6/FE7 transit call control function as pointed out in 2.1.2.

Annex A

Interaction with Supplementary Services

(This annex forms an integral part of this Recommendation)

The following SDLs are basically the same as in the main part of this Recommendation with the difference that information on the interaction of the Supplementary Services to this Basic Service is given. As the information on the behaviour of all known or yet unknown Supplementary Services could not be collected to finalize these flows, the status of this annex is “under study”. When additional information is available, this annex will be amended.

This annex contains SDLs for the Functional Entities FE1 through FE5. For FE6 and FE7 providing the interface to private networks, no hooks have been incorporated yet. These hooks will be shown at a later point in time.

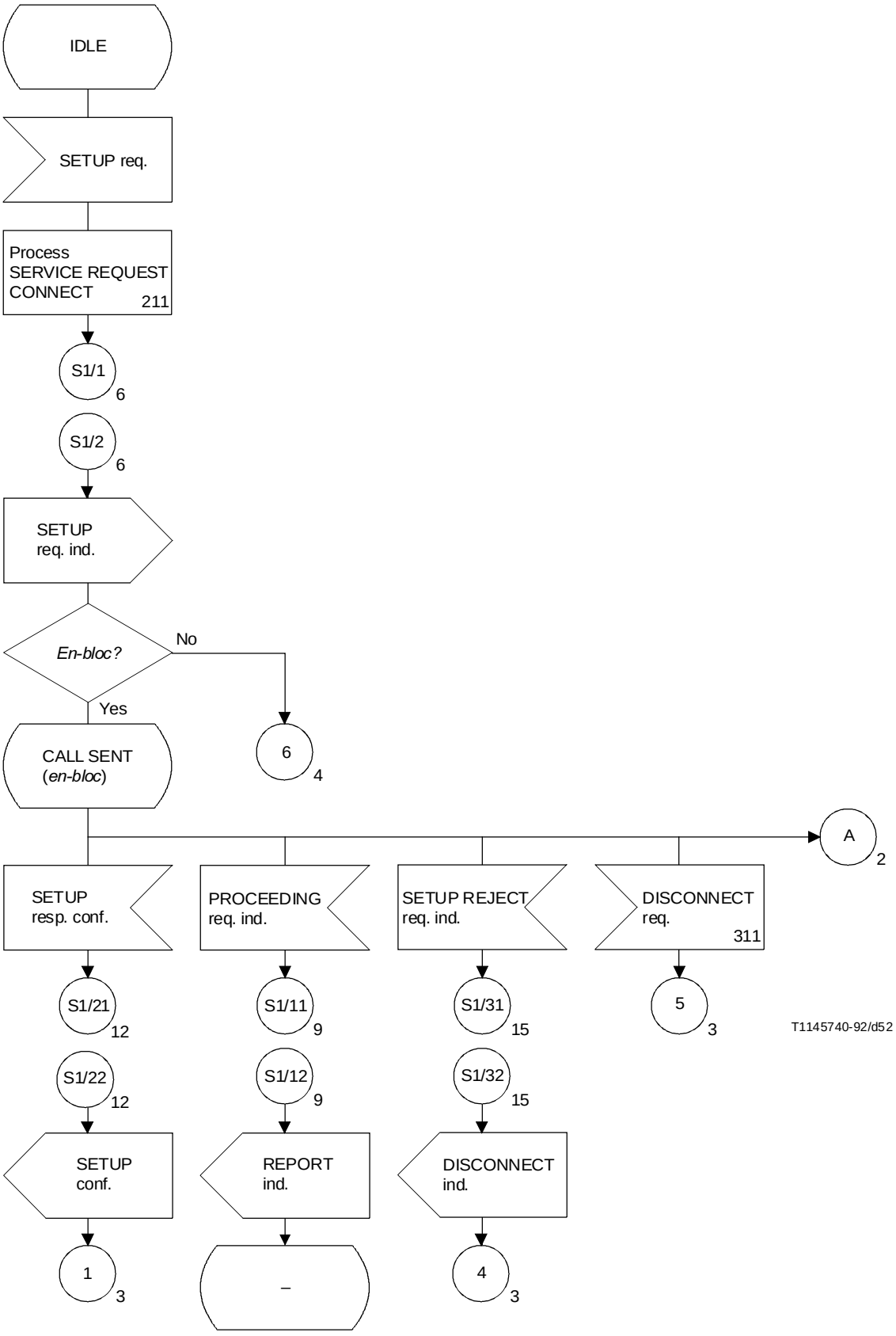

FIGURE A.1/Q.71 (sheet 1 of 15)

CCA (FE1) – Interworking with Supplementary Services

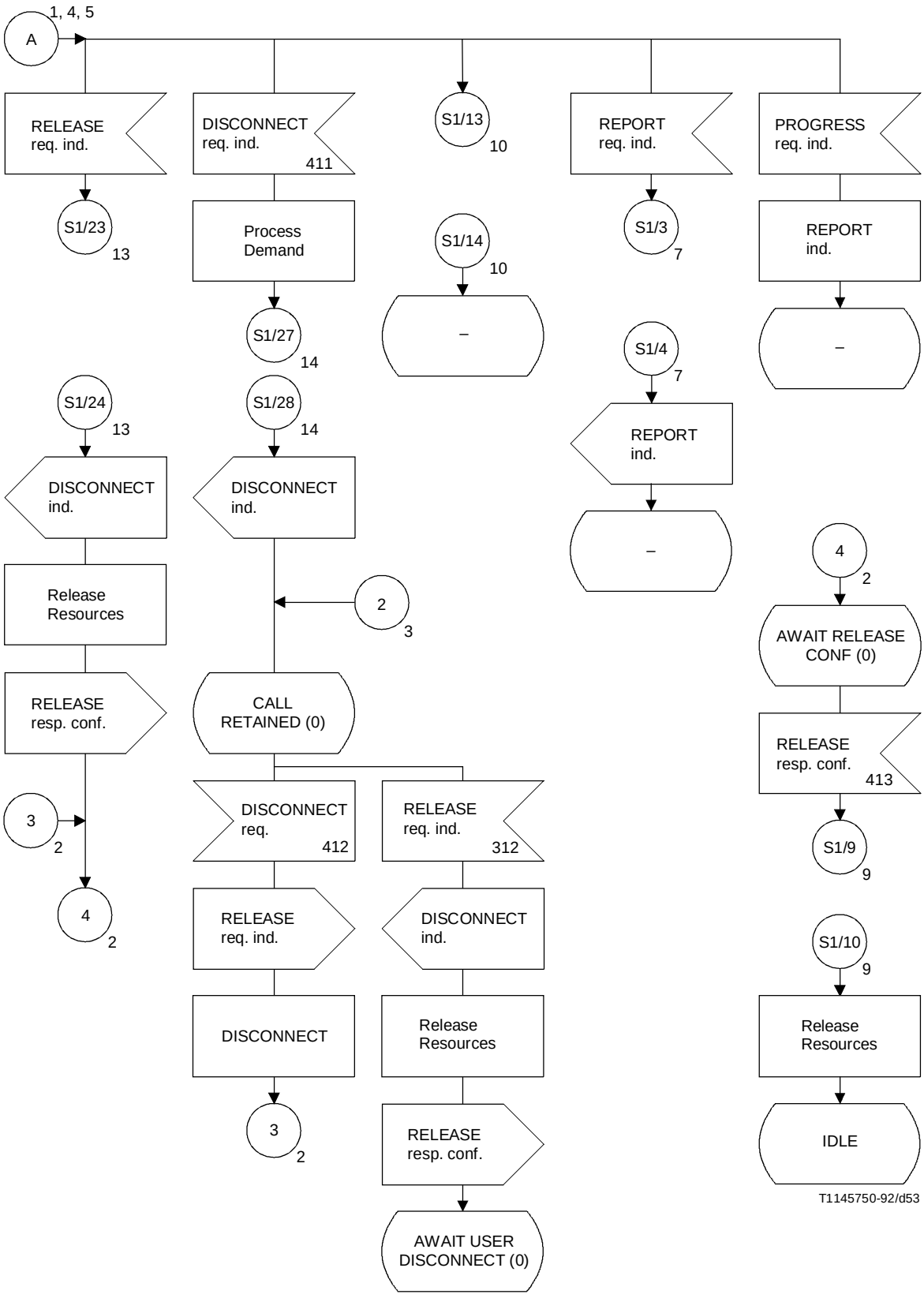

FIGURE A.1/Q.71 (sheet 2 of 15)

CCA (FE1) – Interworking with Supplementary Services

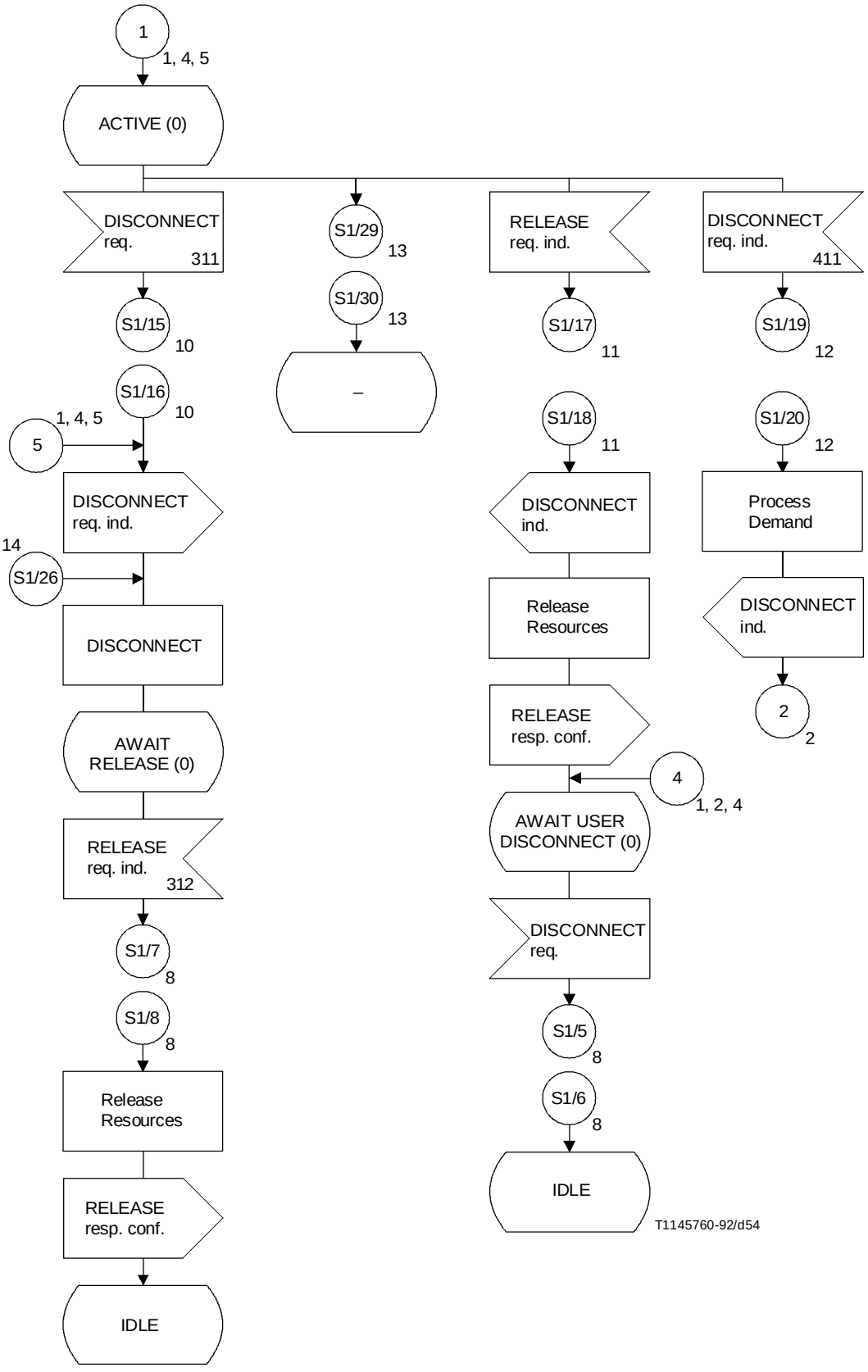

FIGURE A.1/Q.71 (sheet 3 of 15)

CCA (FE1) - Interworking with Supplementary Services

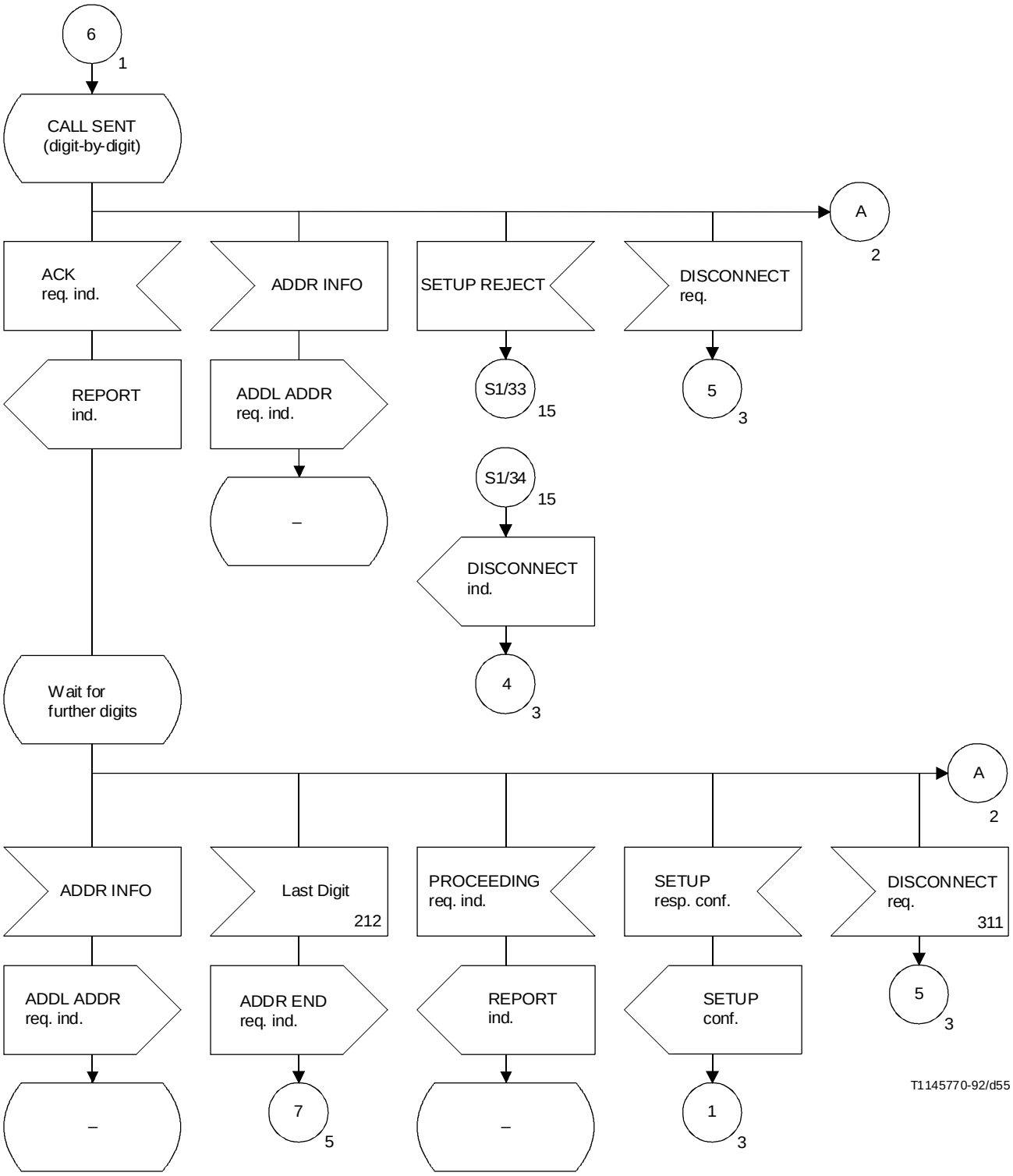

FIGURE A.1/Q.71 (sheet 4 of 15)

CCA (FE1) – Interworking with Supplementary Services

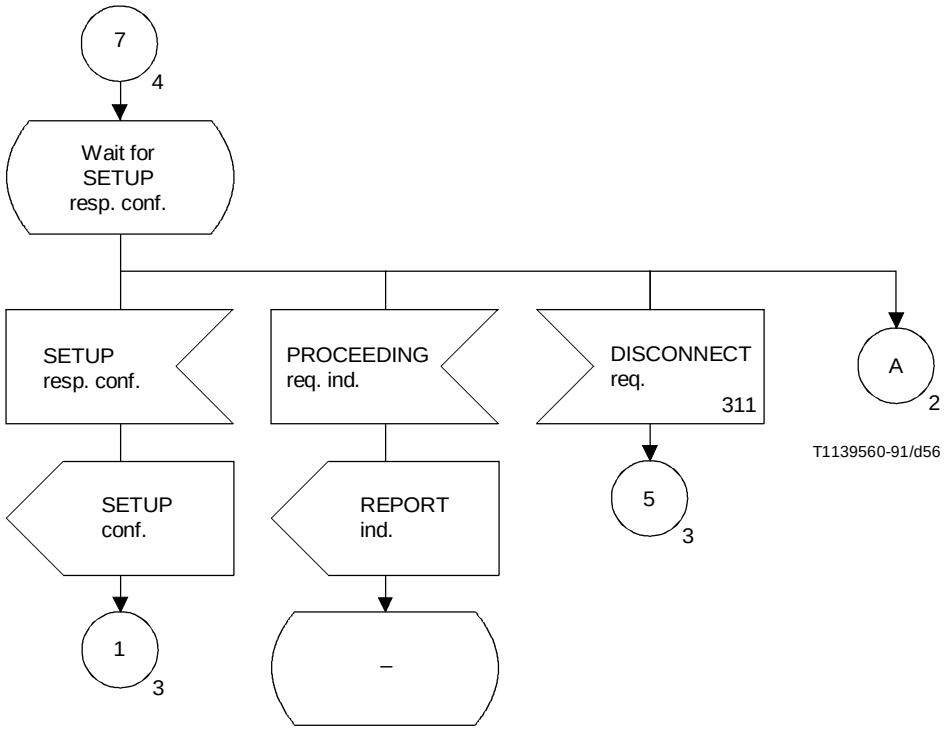

FIGURE A.1/Q.71 (sheet 5 of 15)

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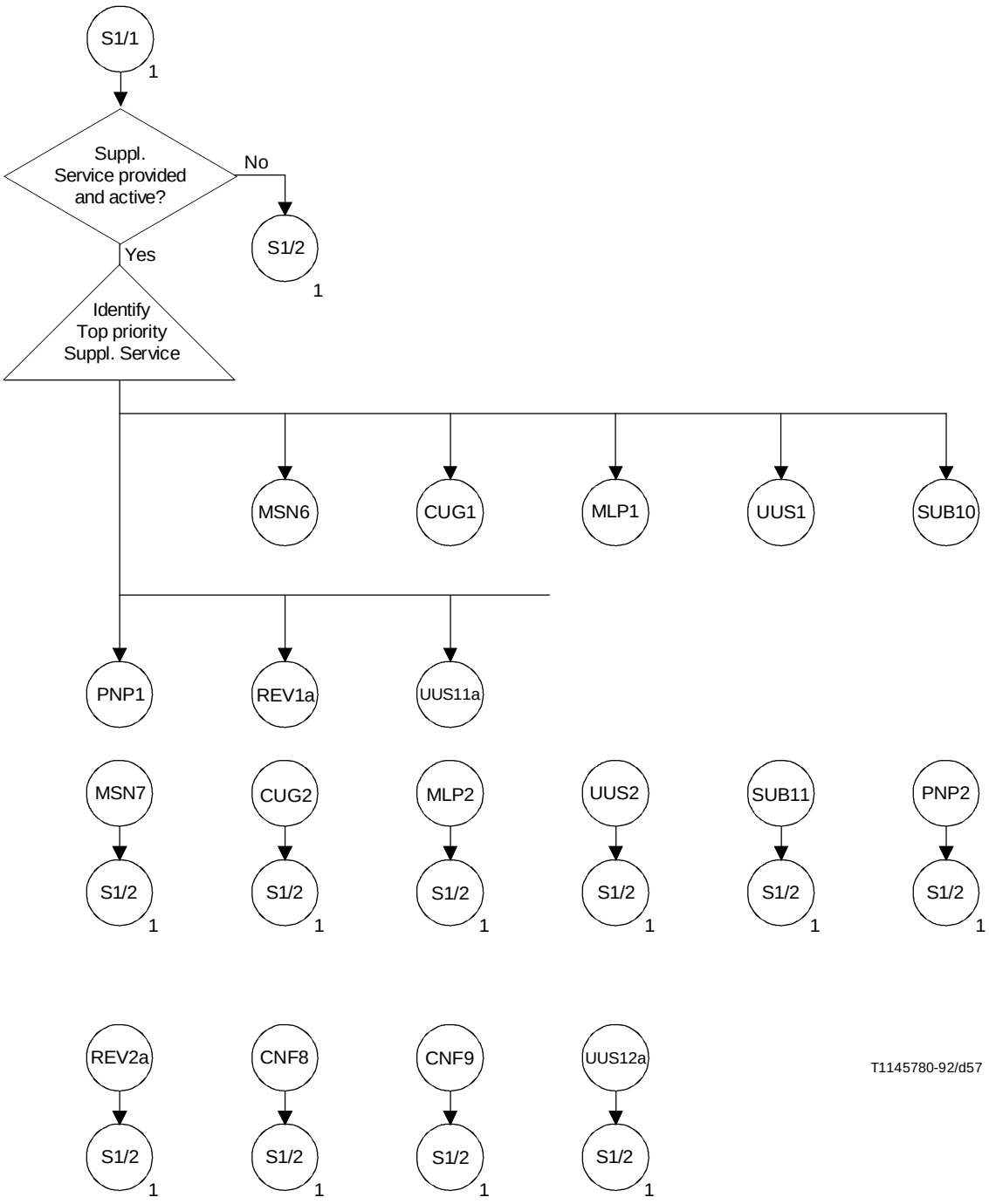

FIGURE A.1/Q.71 (sheet 6 of 15)

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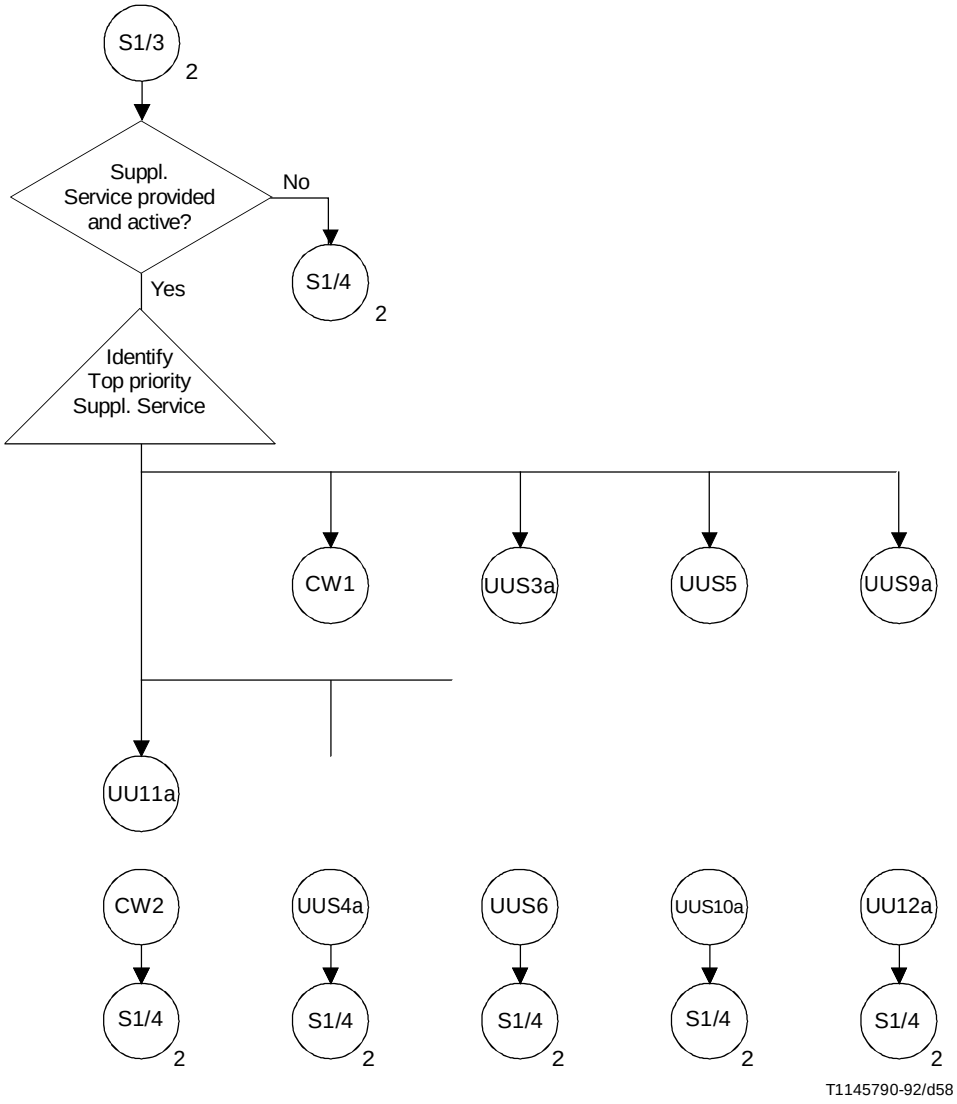

FIGURE A.1/Q.71 (sheet 7 of 15)

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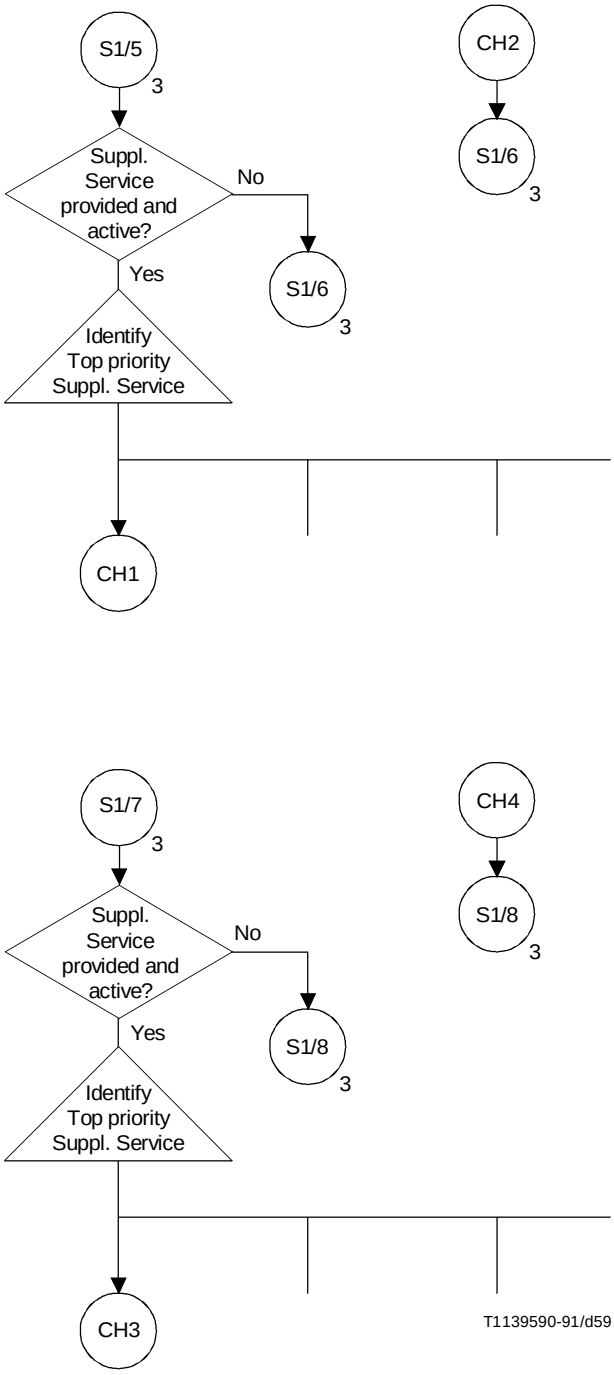

FIGURE A.1/Q.71 (sheet 8 of 15)

CCA (FE1) – Interworking with Supplementary Services

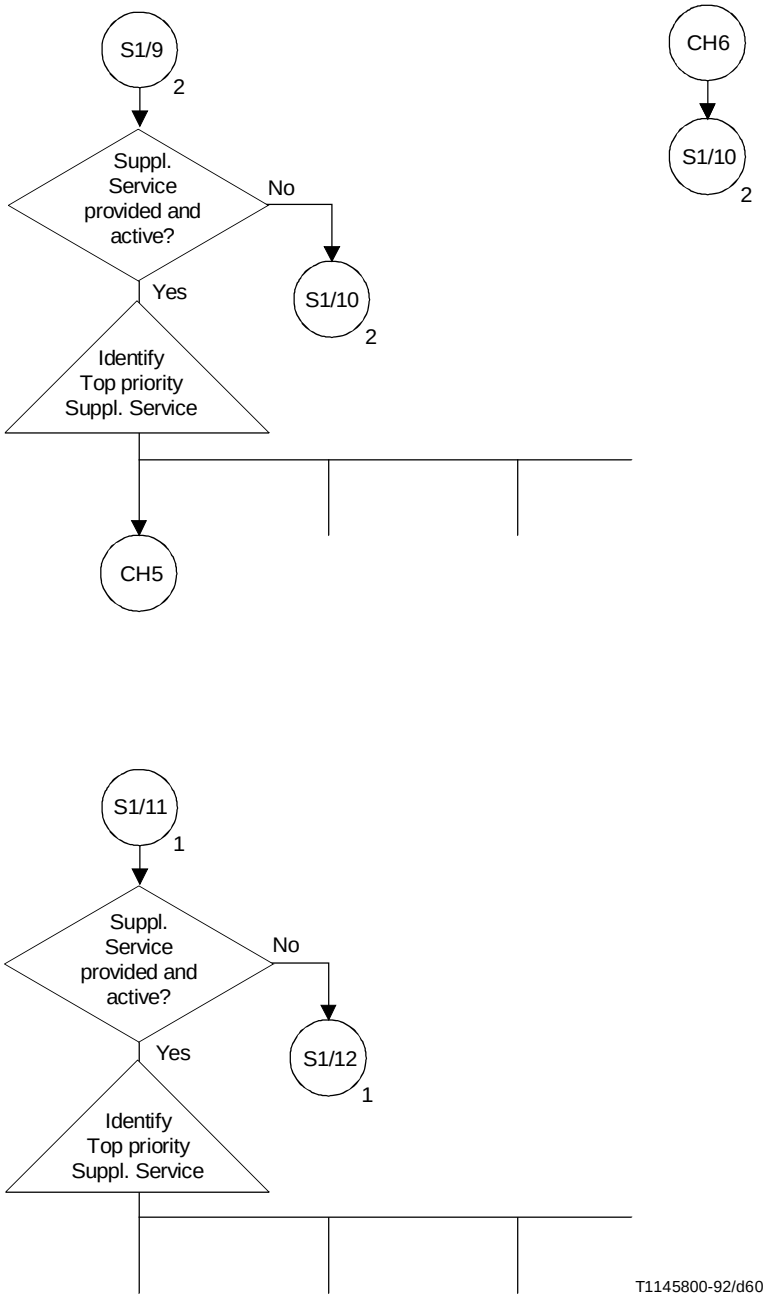

FIGURE A.1/Q.71 (sheet 9 of 15)

CCA (FE1) – Interworking with Supplementary Services

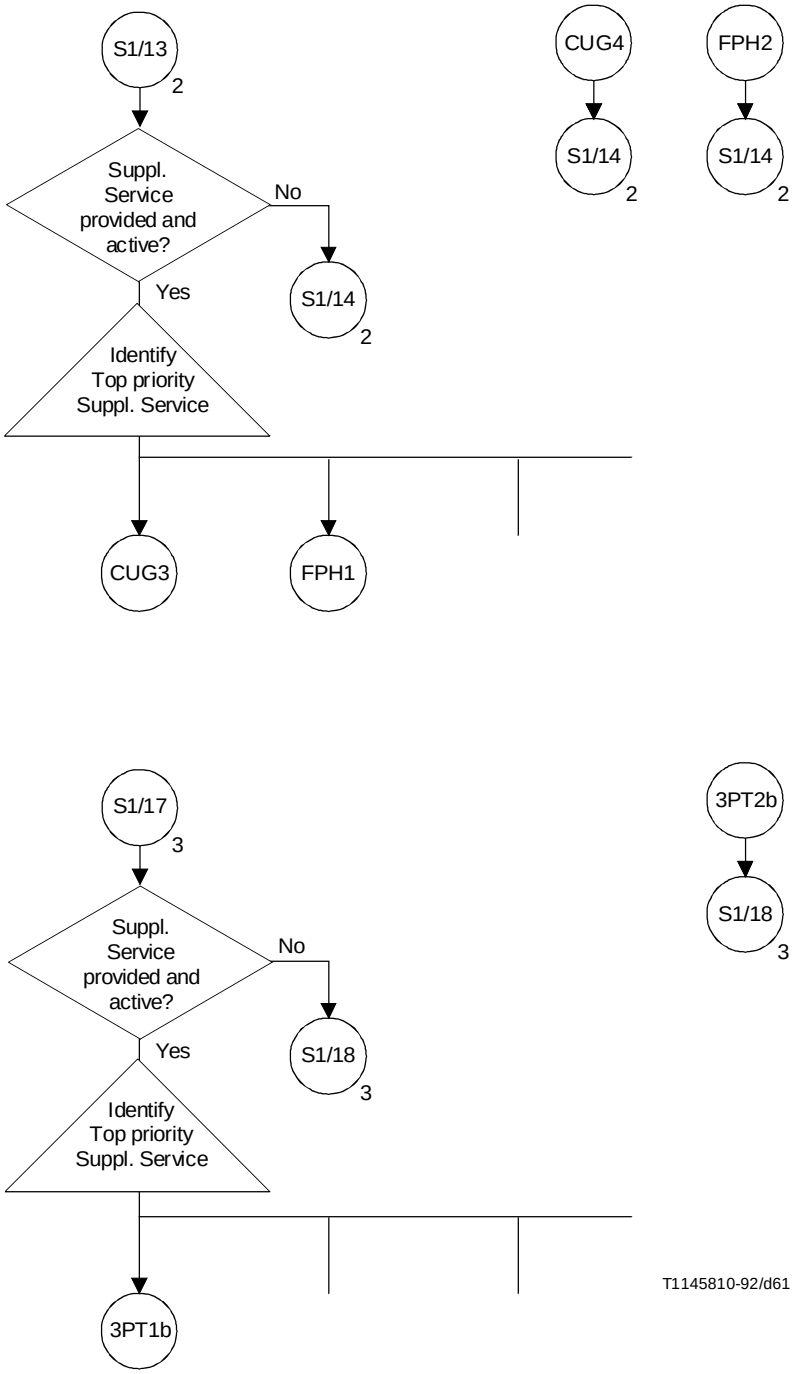

FIGURE A.1/Q.71 (sheet 10 of 15)

CCA (FE1) – Interworking with Supplementary Services

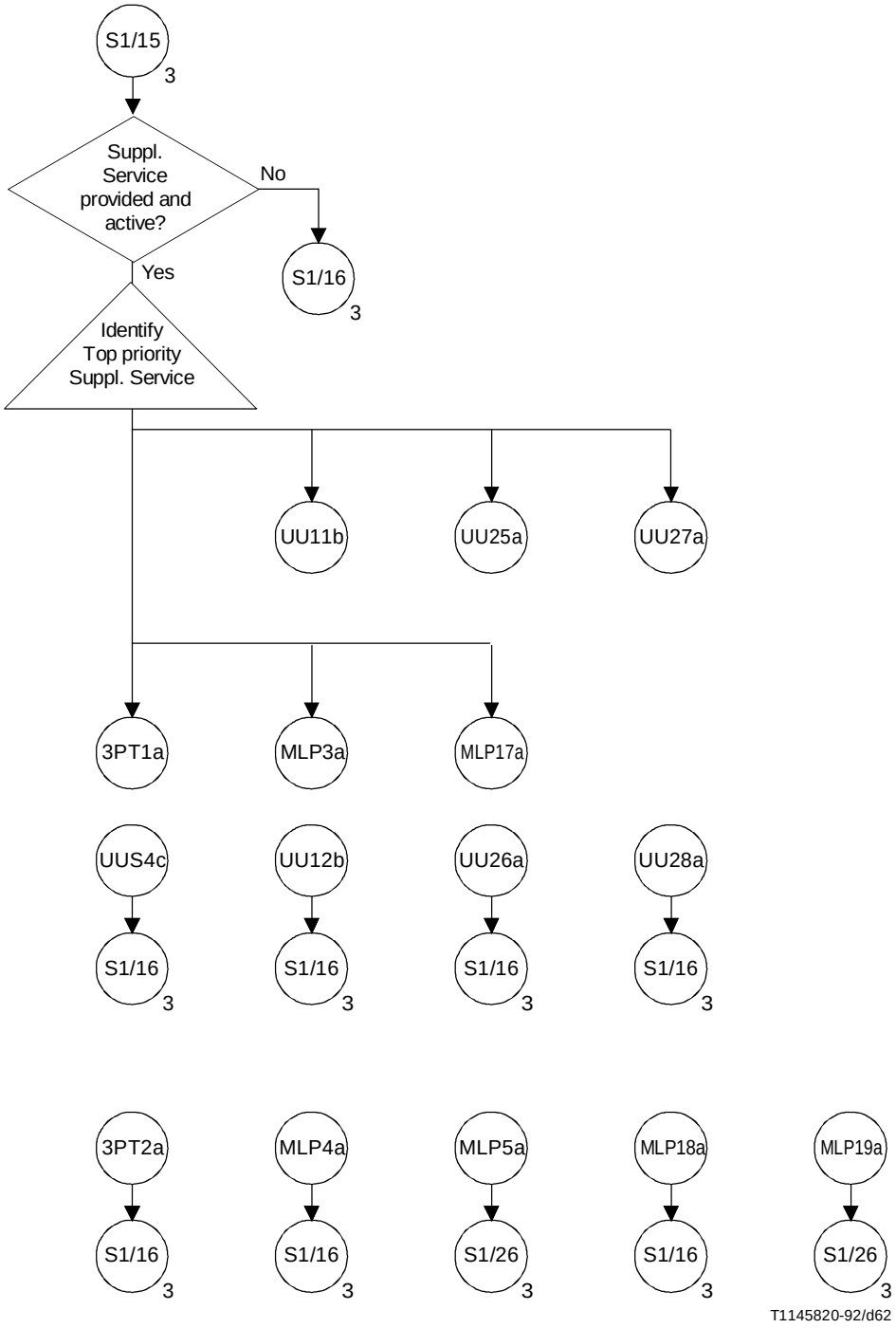

FIGURE A.1/Q.71 (sheet 11 of 15)

CCA (FE1) – Interworking with Supplementary Services

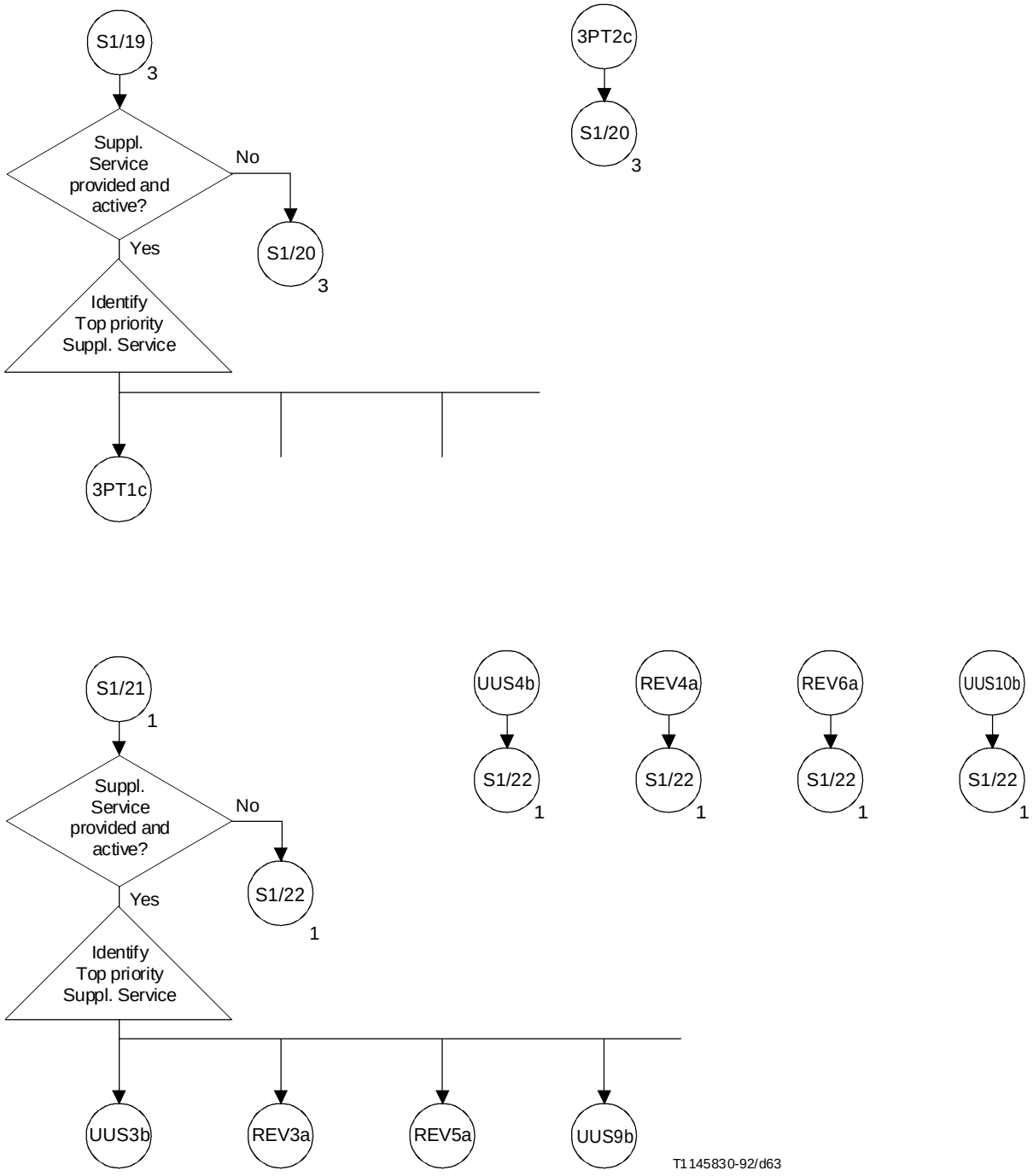

FIGURE A.1/Q.71 (sheet 12 of 15)

CCA (FE1) – Interworking with Supplementary Services

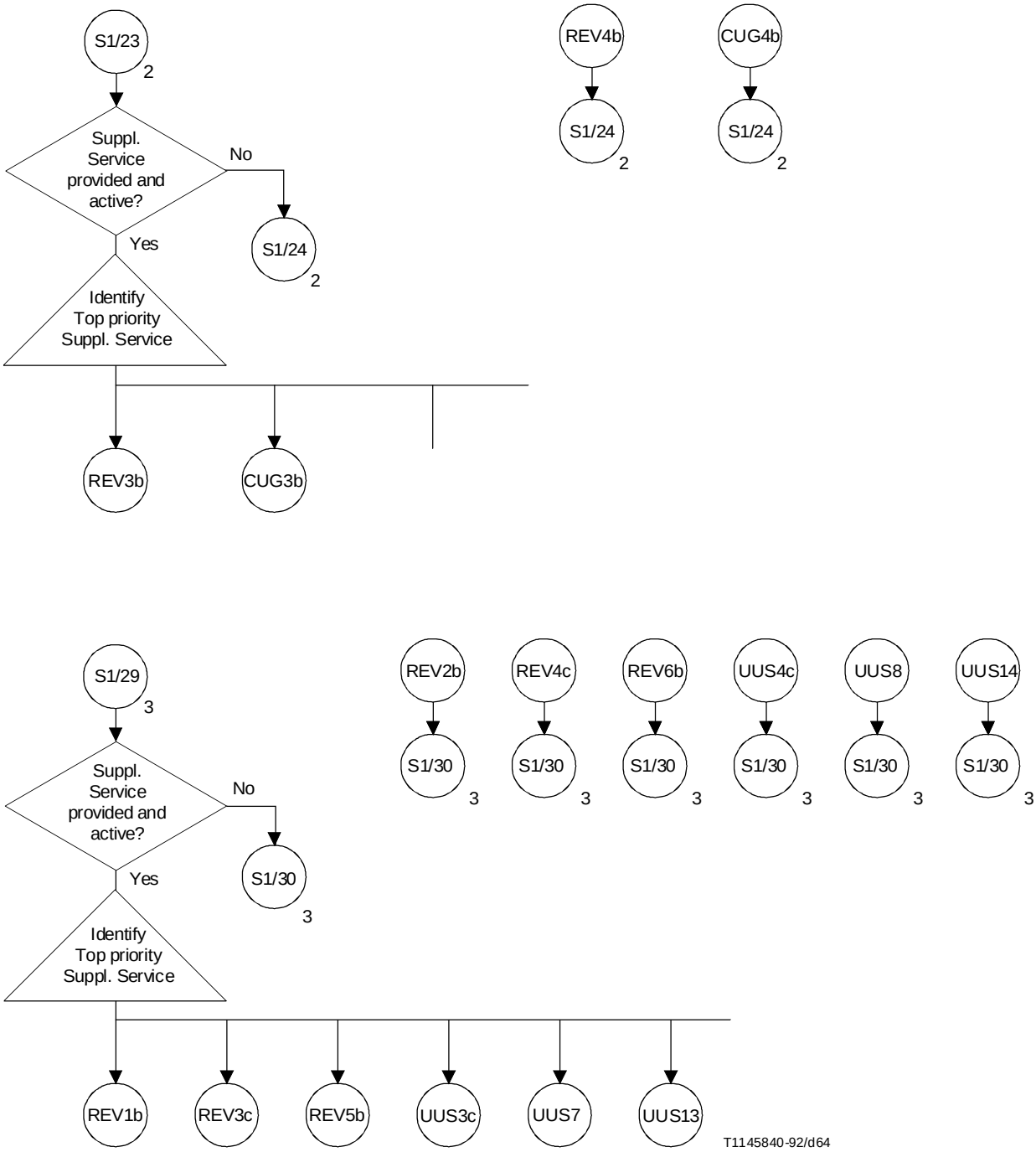

FIGURE A.1/Q.71 (sheet 13 of 15)

CCA (FE1) – Interworking with Supplementary Services

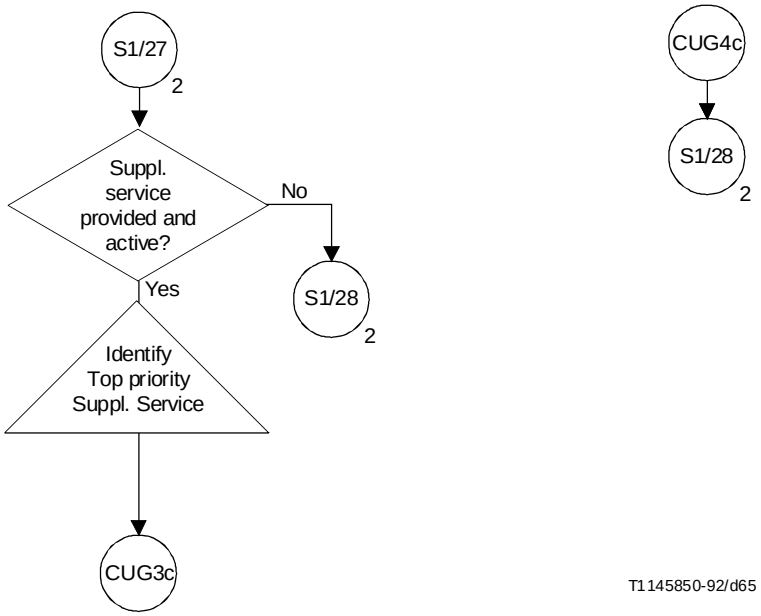

FIGURE A.1/Q.71 (sheet 14 or 15)

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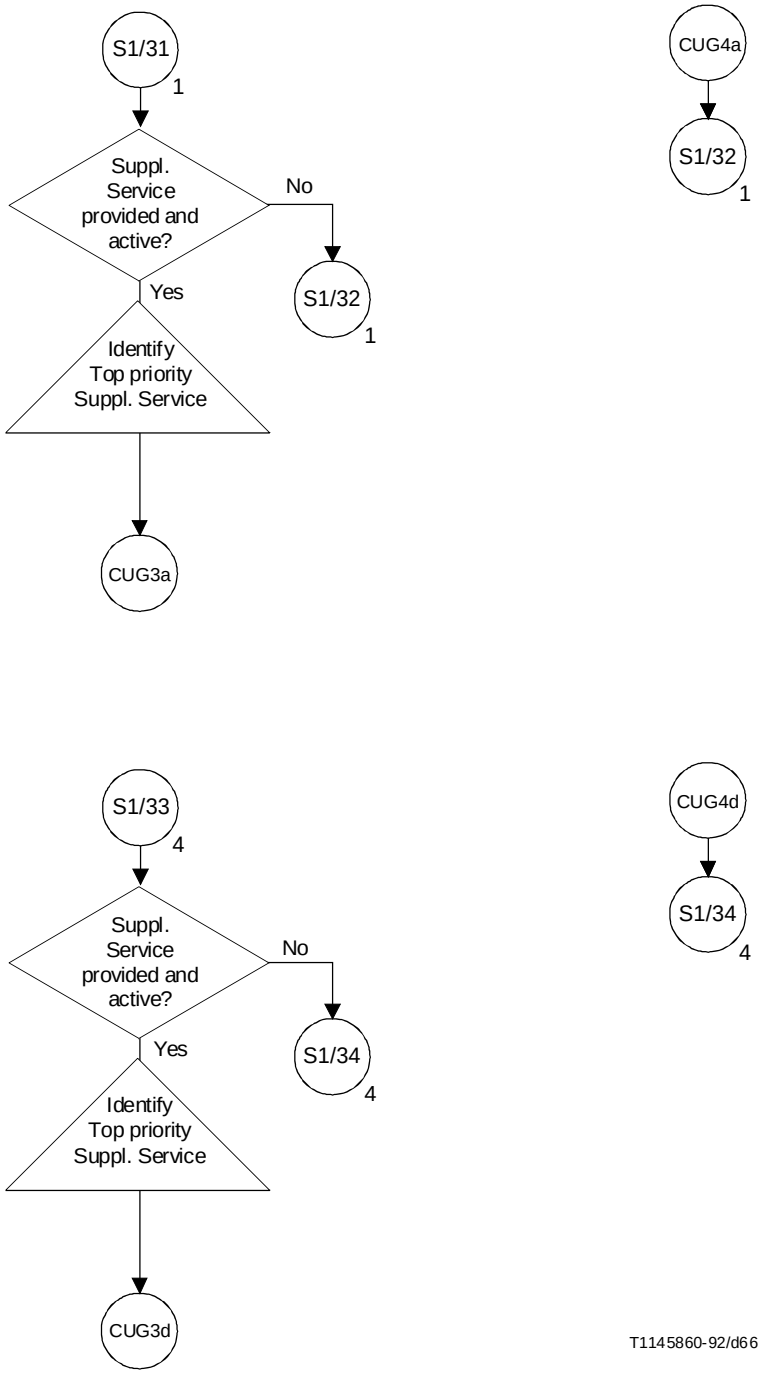

FIGURE A.1/Q.71 (sheet 15 of 15)

CCA (FE1) – Interworking with Supplementary Services

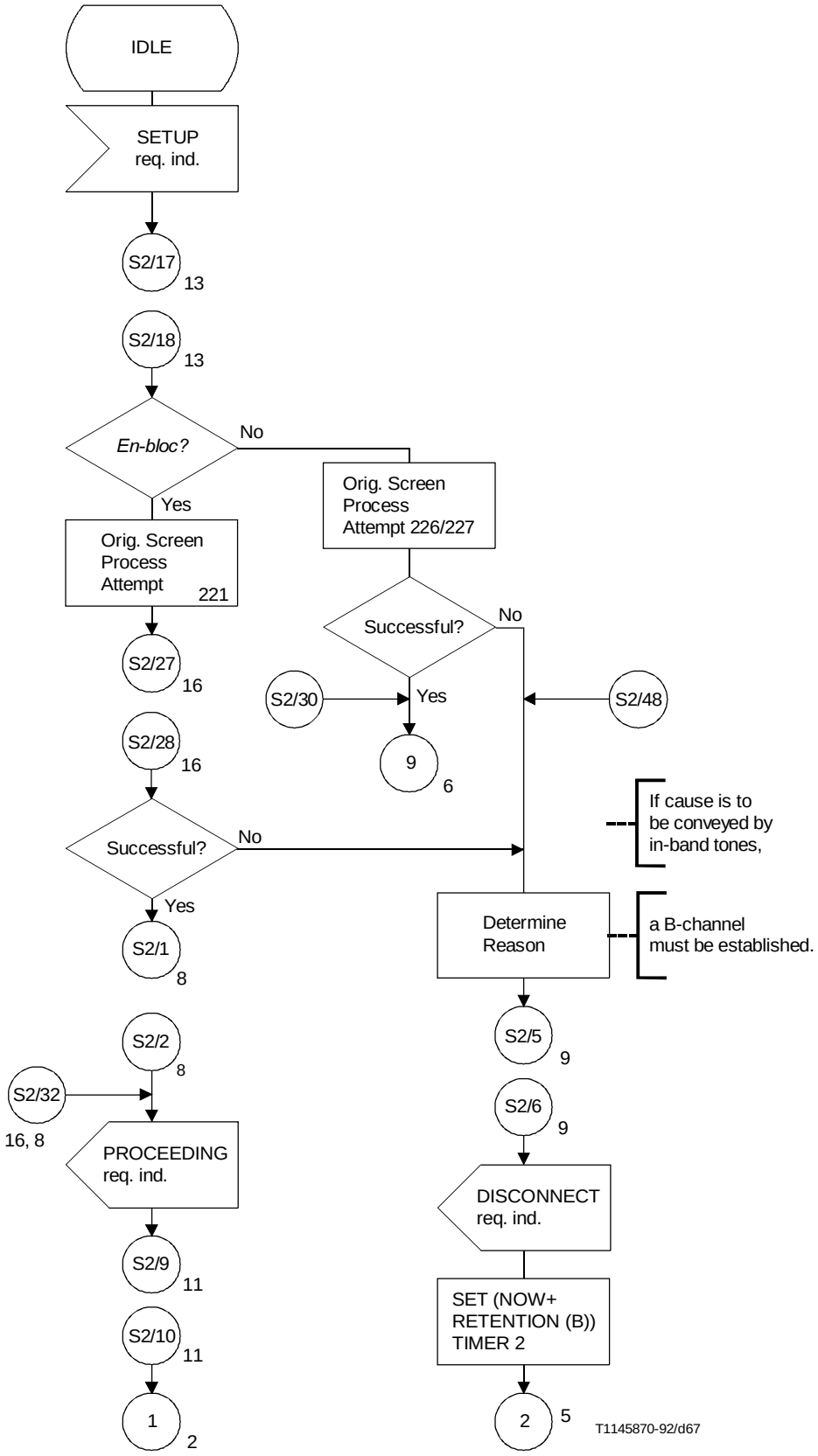

FIGURE A.2/Q.71 (sheet 1 of 20)

CC (FE2) – Interworking with Supplementary Services

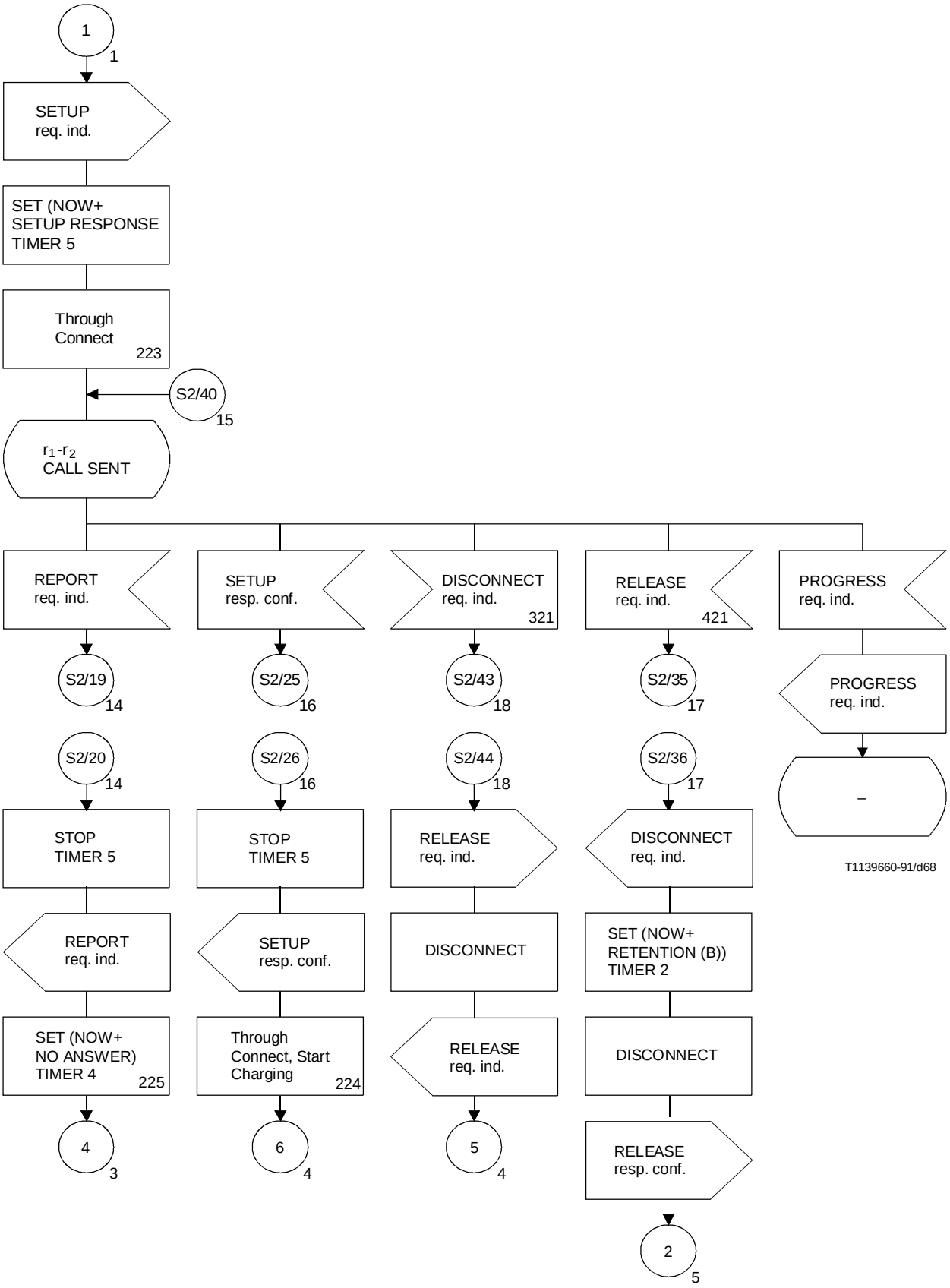

FIGURE A.2/Q.71 (sheet 2 of 20)

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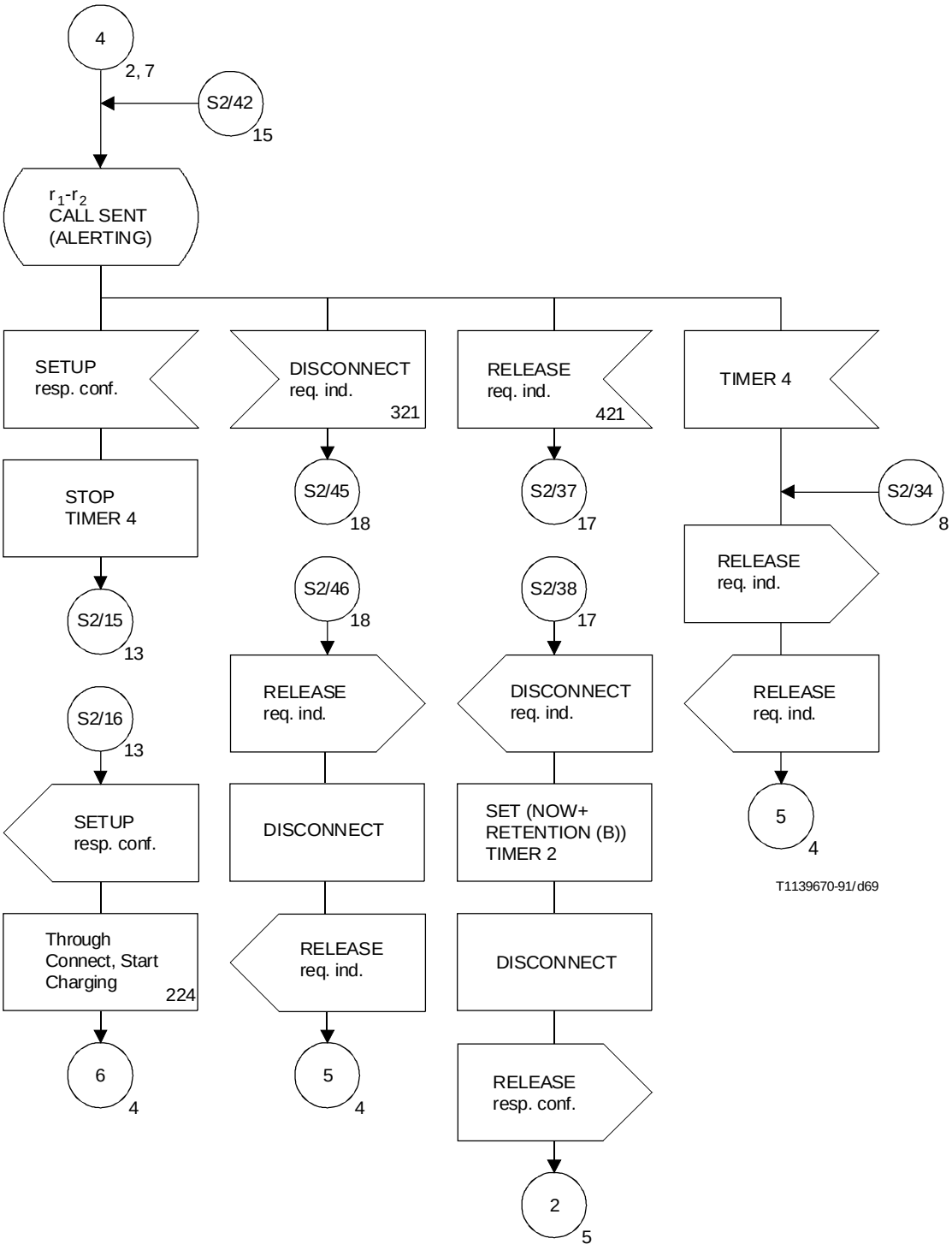

FIGURE A.2/Q.71 (sheet 3 of 20)

CC (FE2) – Interworking with Supplementary Services

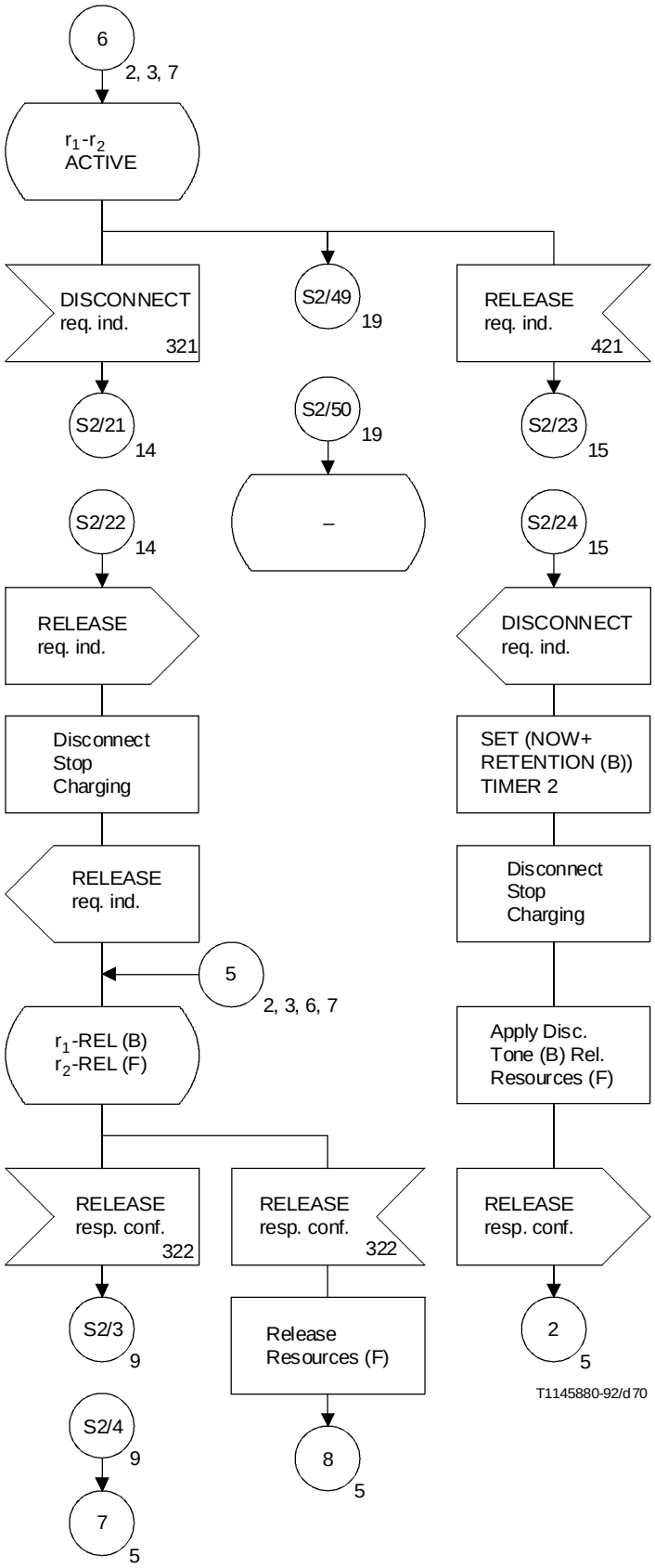

FIGURE A.2/Q.71 (sheet 4 of 20)

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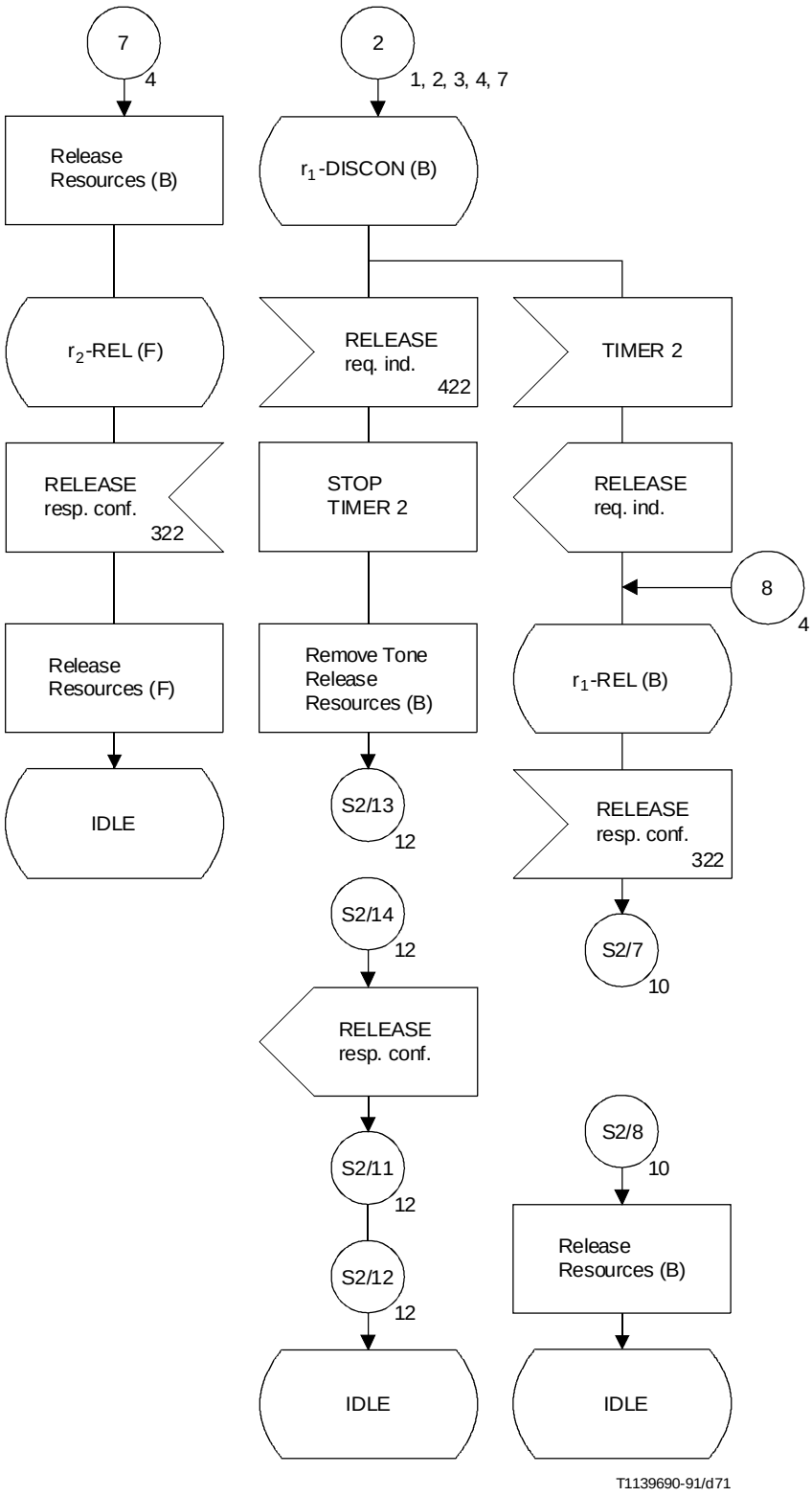

FIGURE A.2/Q.71 (sheet 5 of 20)

CC (FE2) – Interworking with Supplementary Services

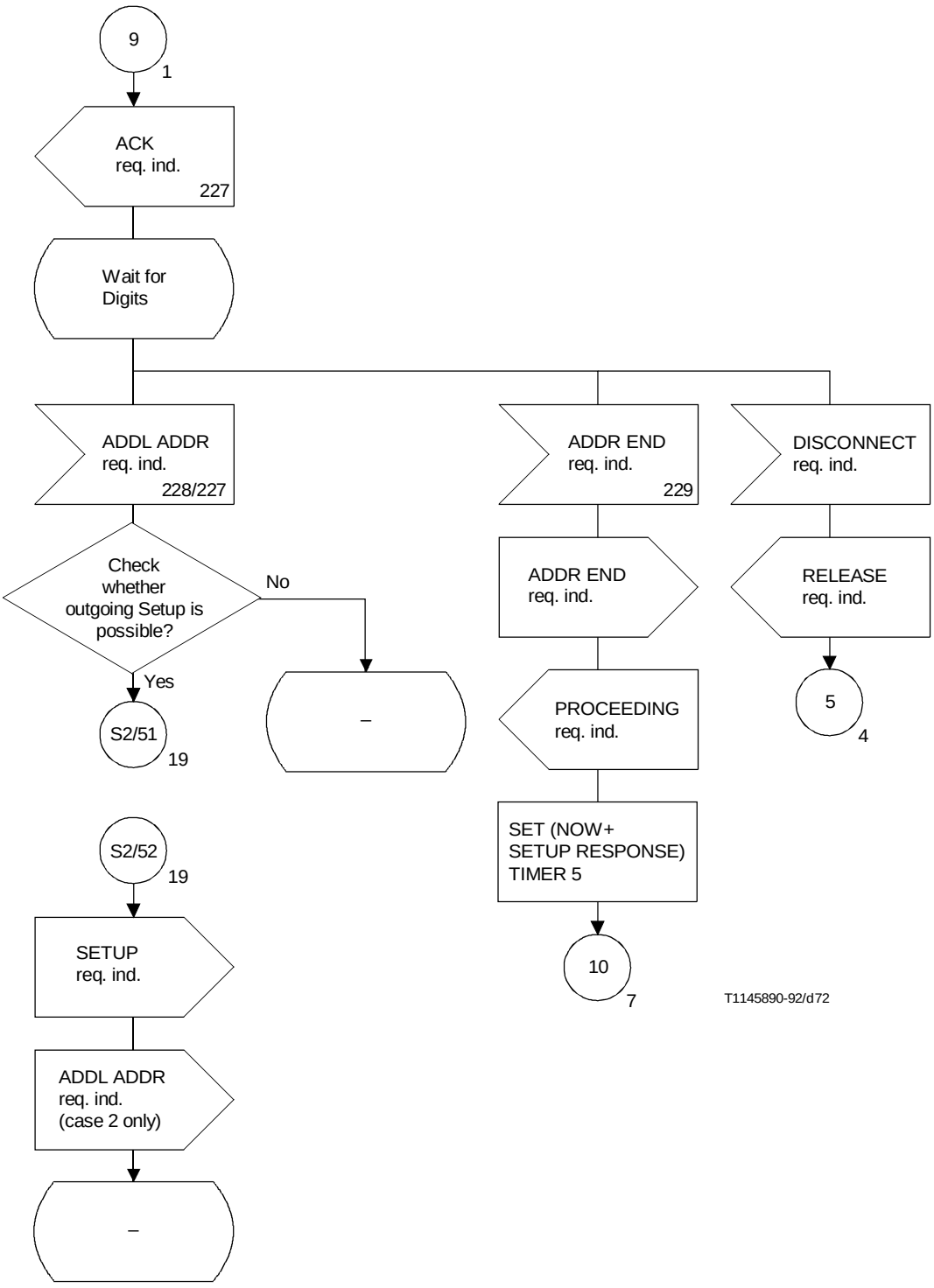

FIGURE A.2/Q.71 (sheet 6 of 20)

CC (FE2) – Interworking with Supplementary Services

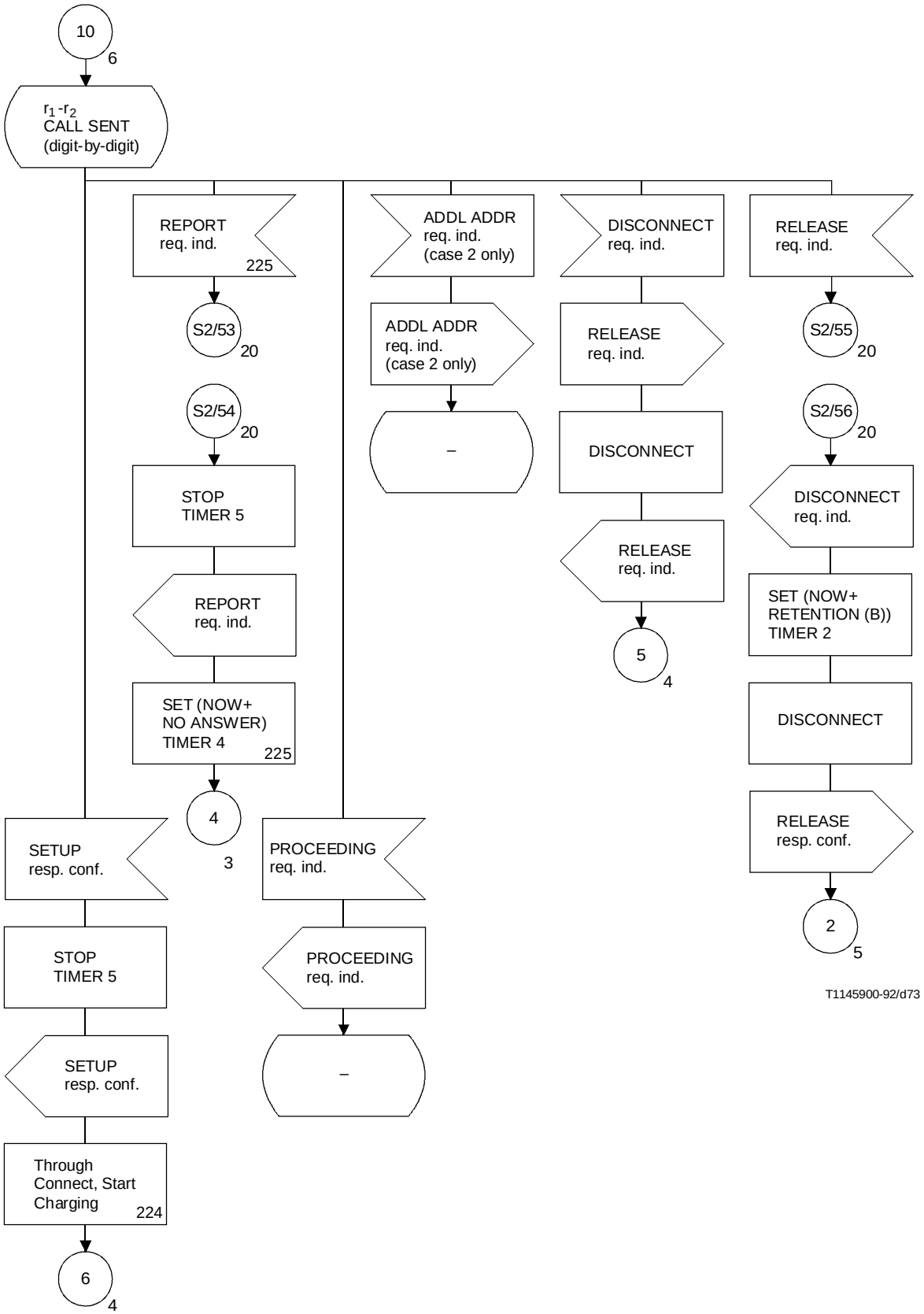

FIGURE A.2/Q.71 (sheet 7 of 20)

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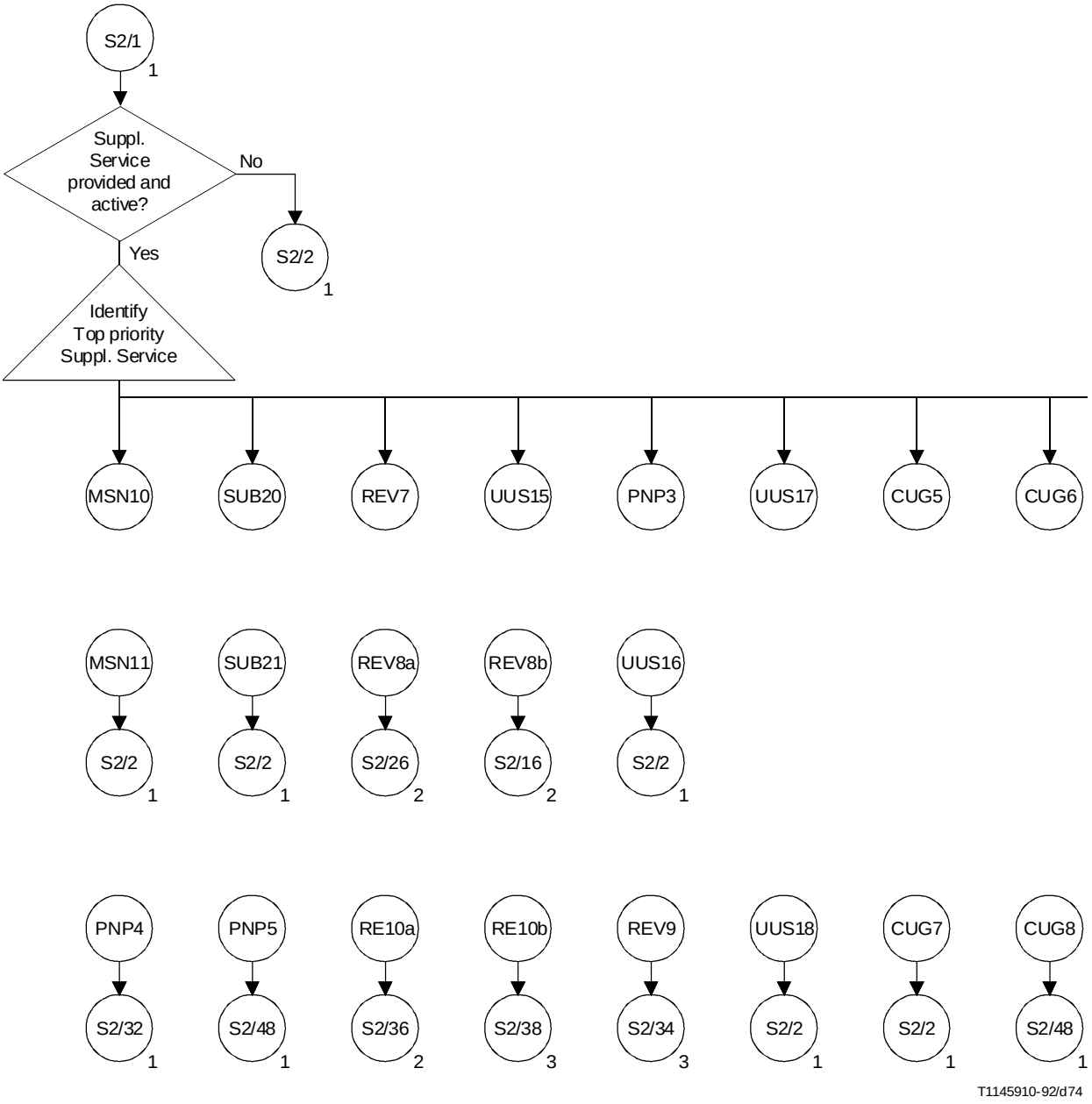

FIGURE A.2/Q.71 (sheet 8 of 20)

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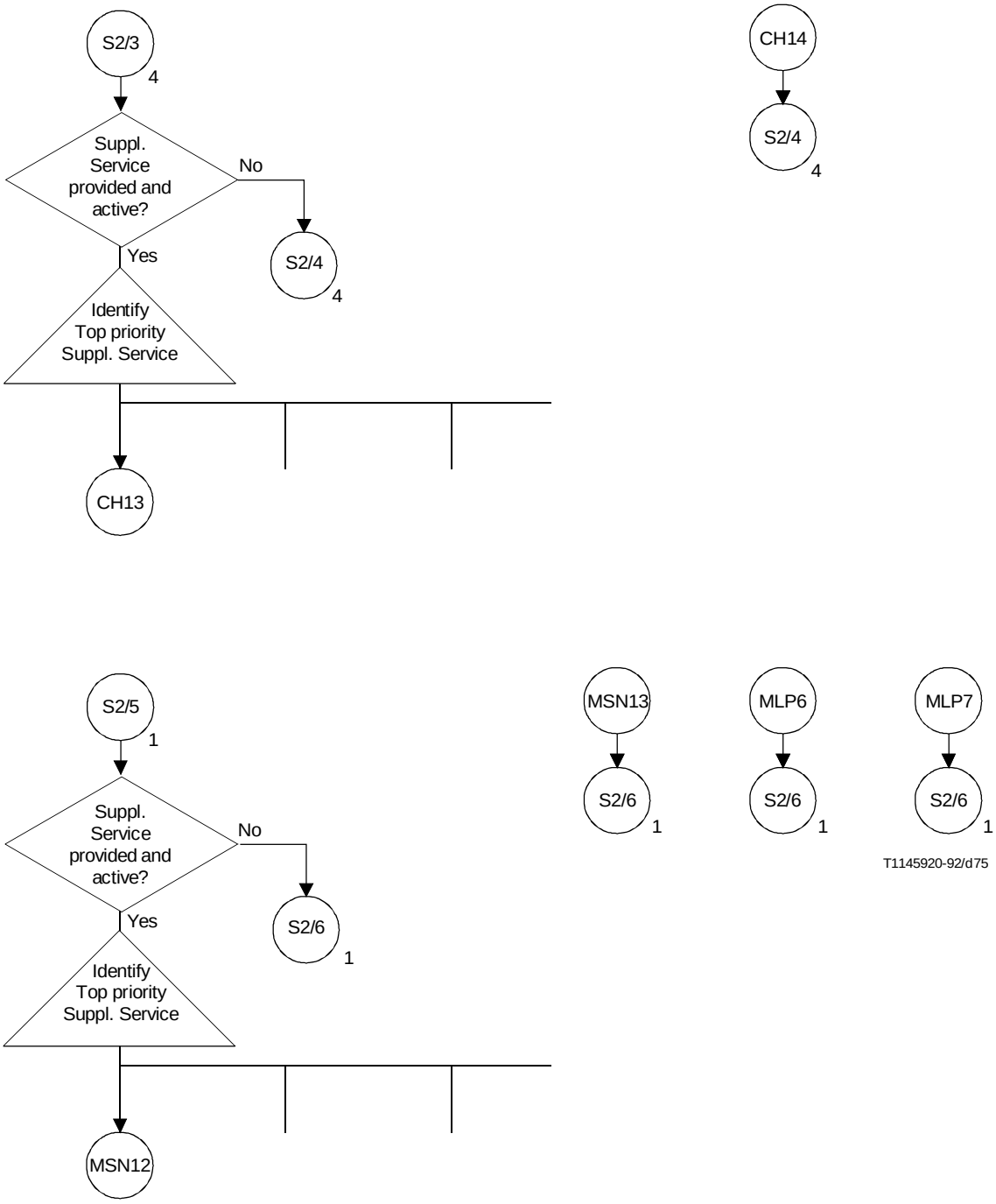

FIGURE A.2/Q.71 (sheet 9 of 20)

CC (FE2) – Interworking with Supplementary Services

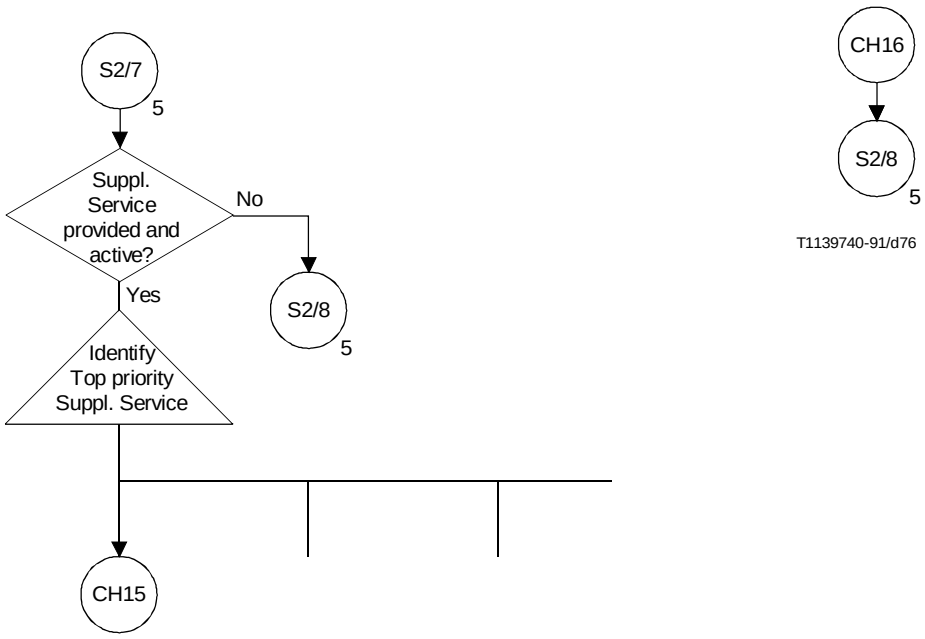

FIGURE A.2/Q.71 (sheet 10 of 20)

CC (FE2) – Interworking with Supplementary Services

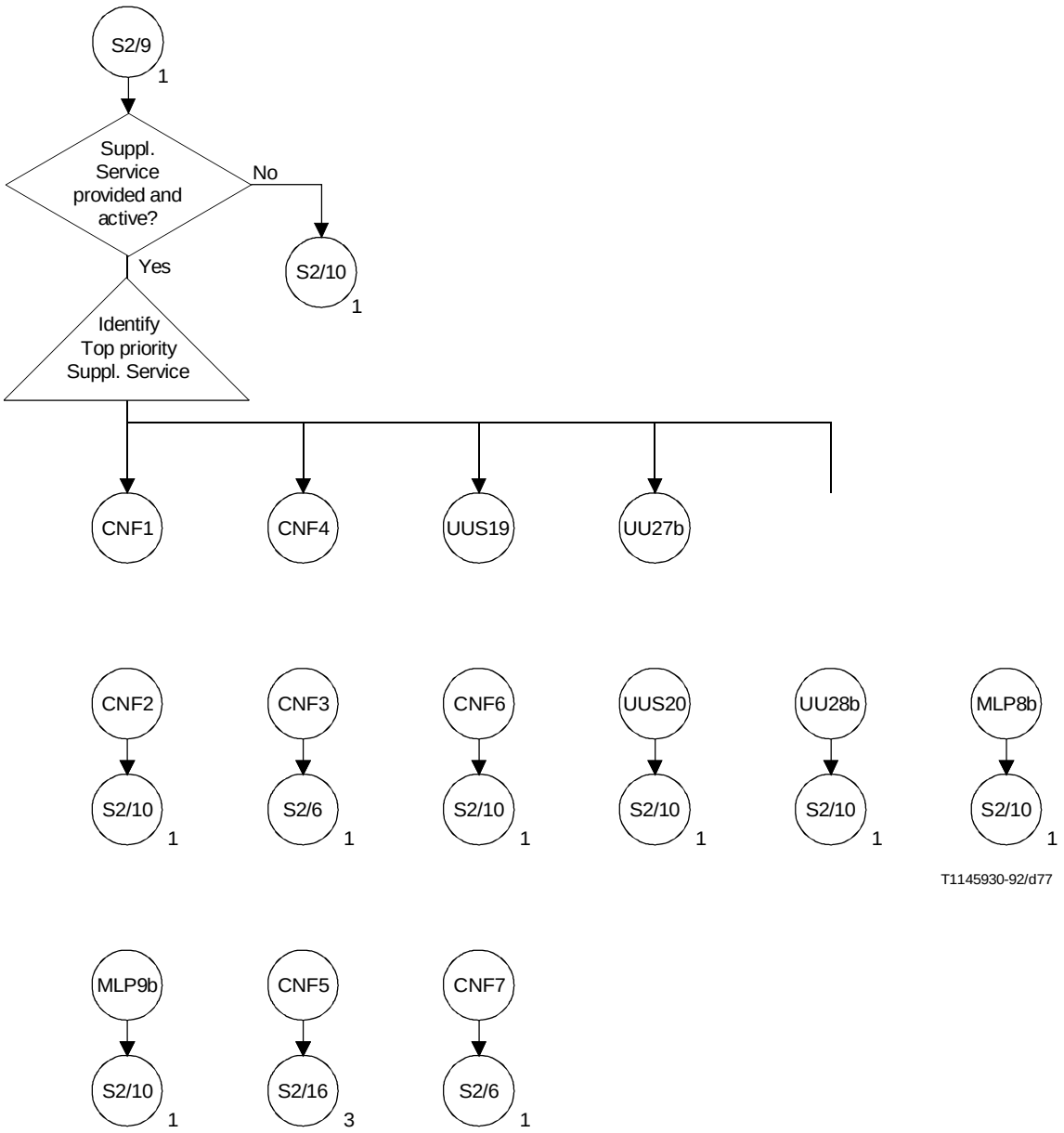

FIGURE A.2/Q.71 (sheet 11 of 20)

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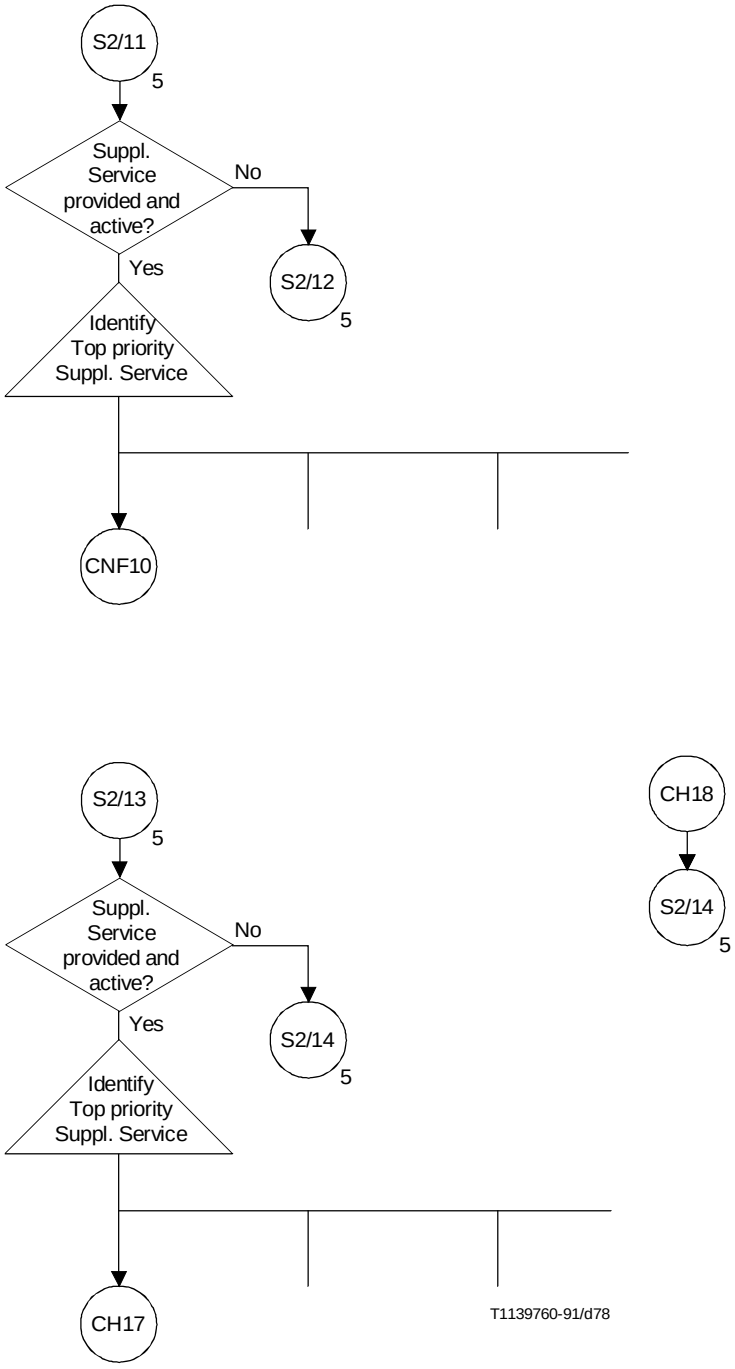

FIGURE A.2/Q.71 (sheet 12 of 20)

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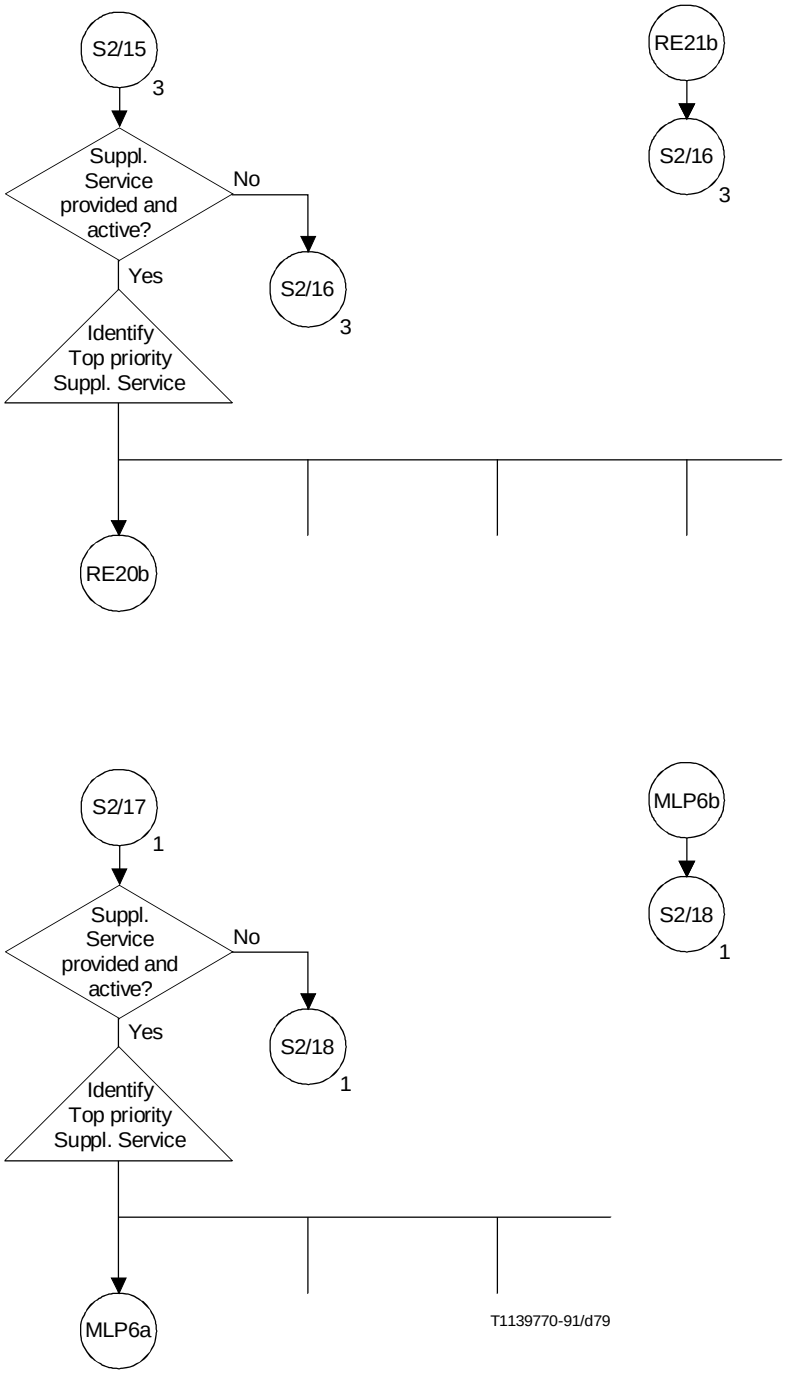

FIGURE A.2/Q.71 (sheet 13 of 20)

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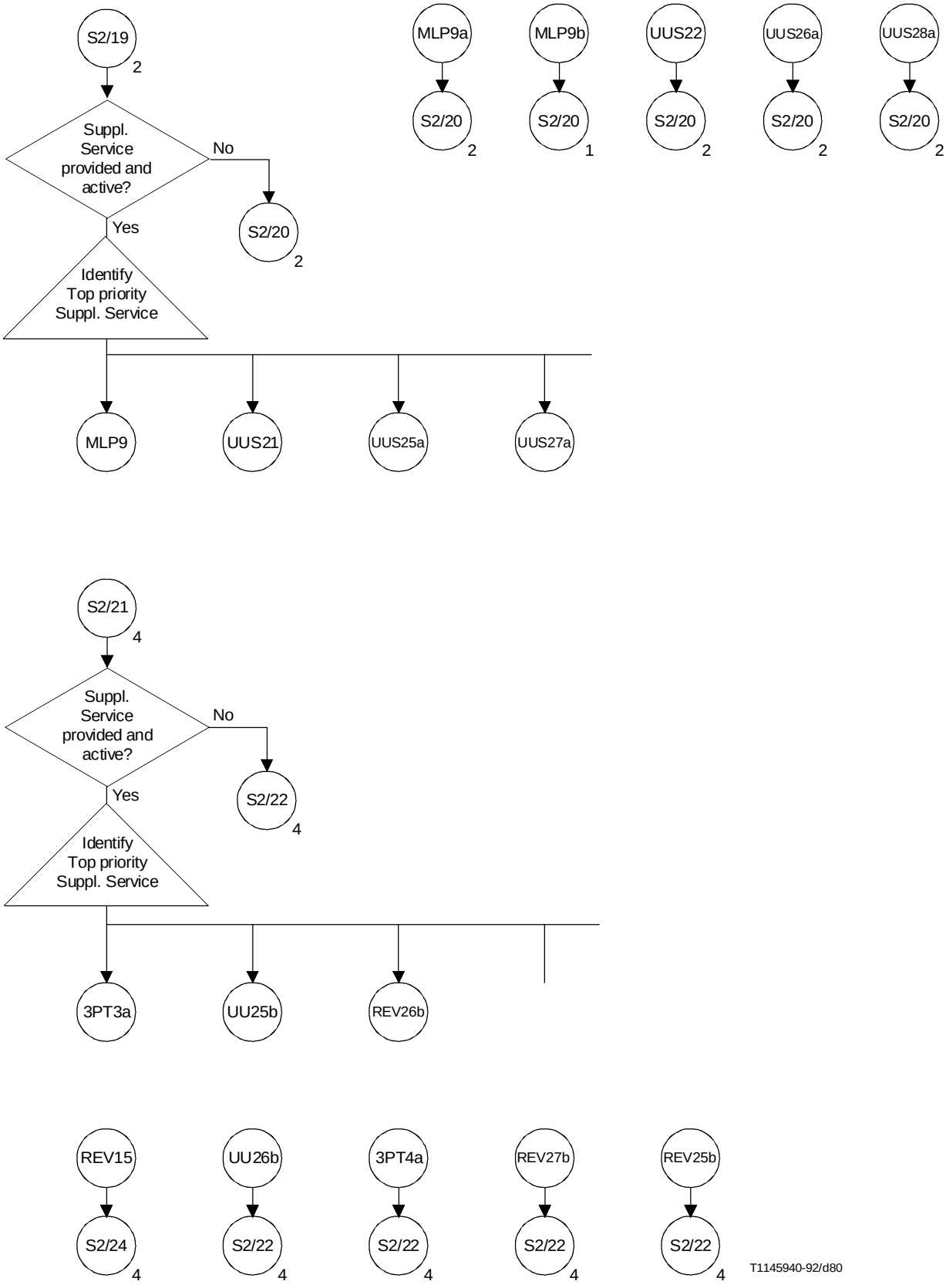

FIGURE A.2/Q.71 (sheet 14 of 20)

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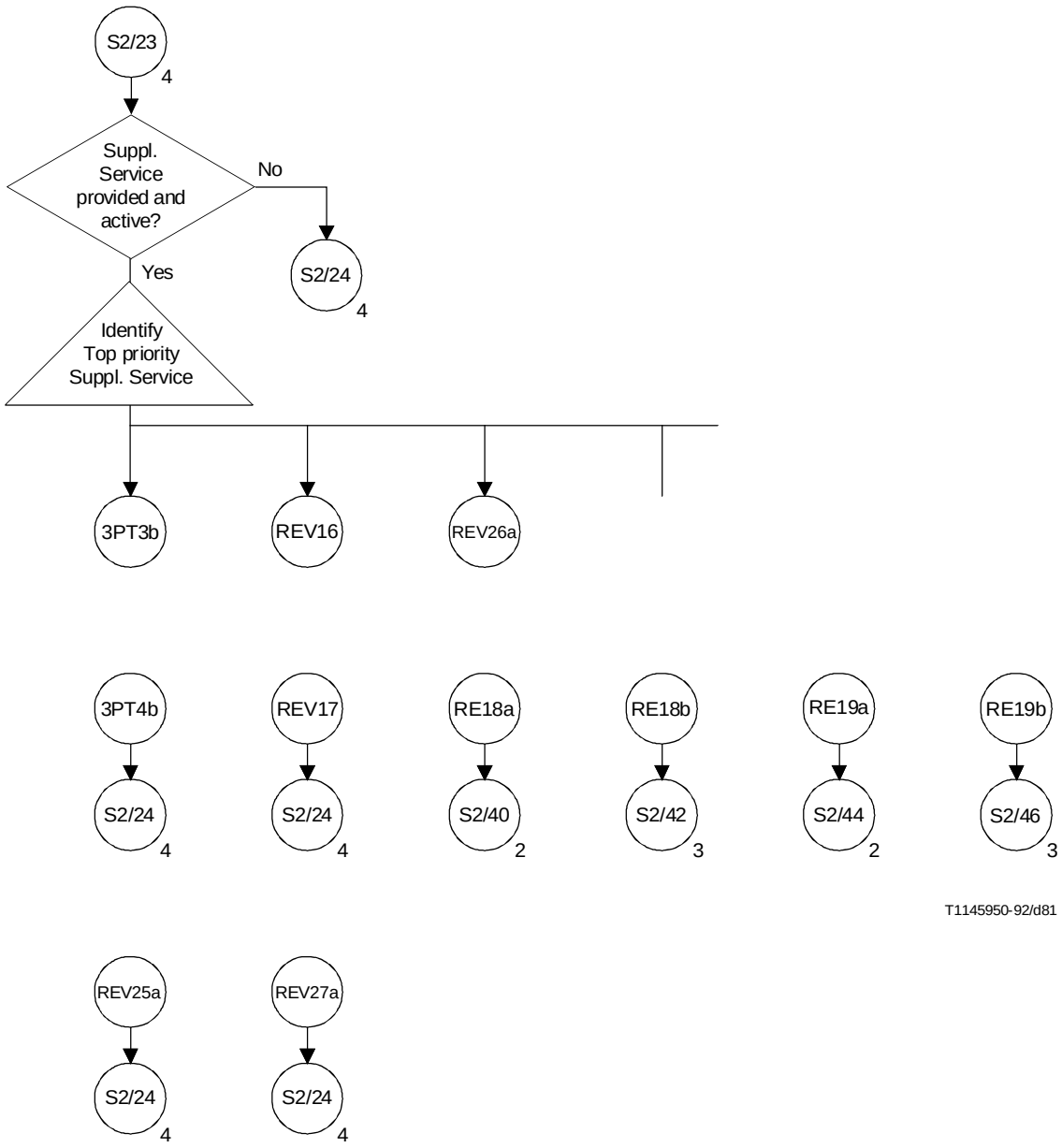

FIGURE A.2/Q.71 (sheet 15 of 20)

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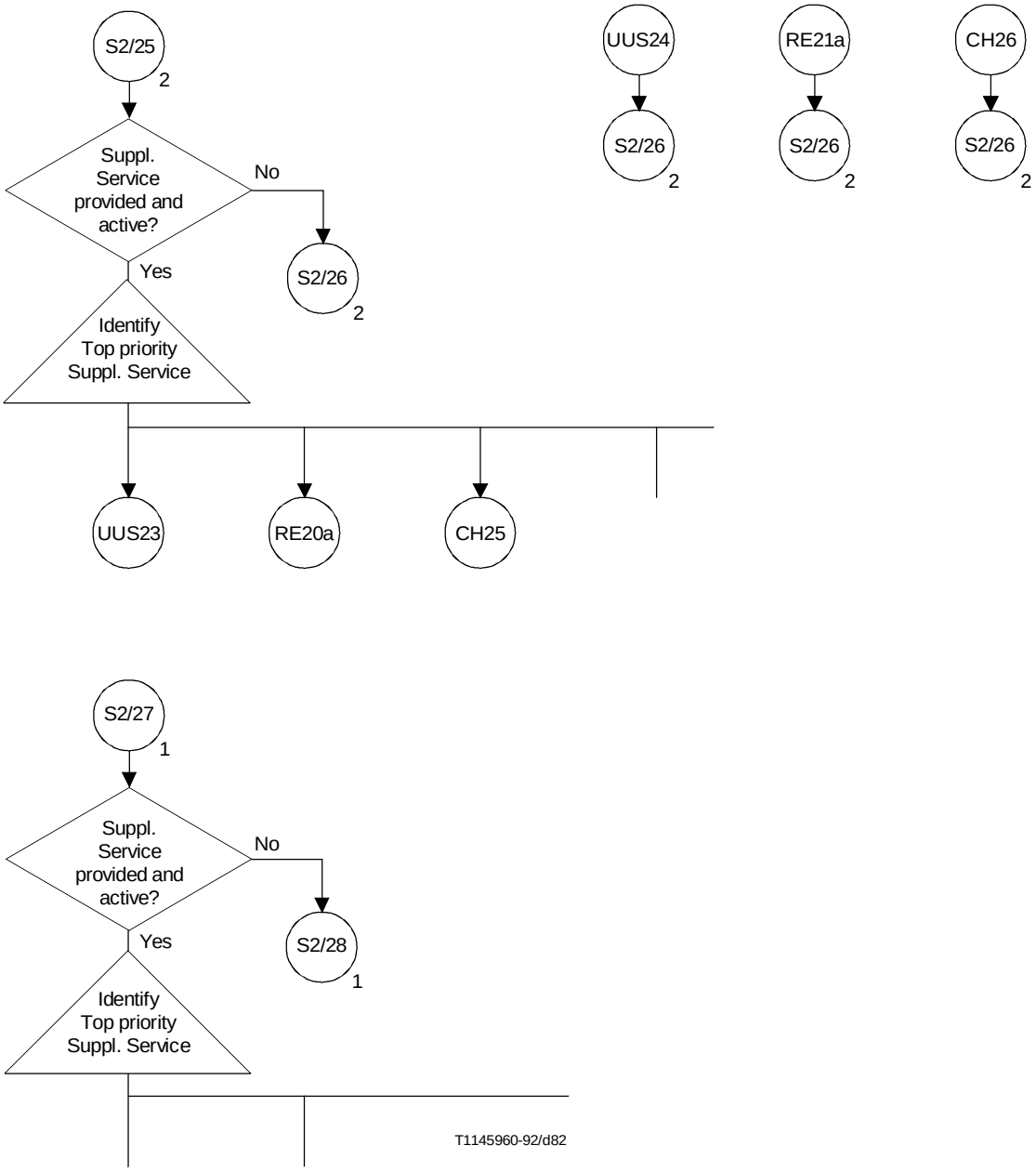

FIGURE A.2/Q.71 (sheet 16 of 20)

CC (FE2) – Interworking with Supplementary Services

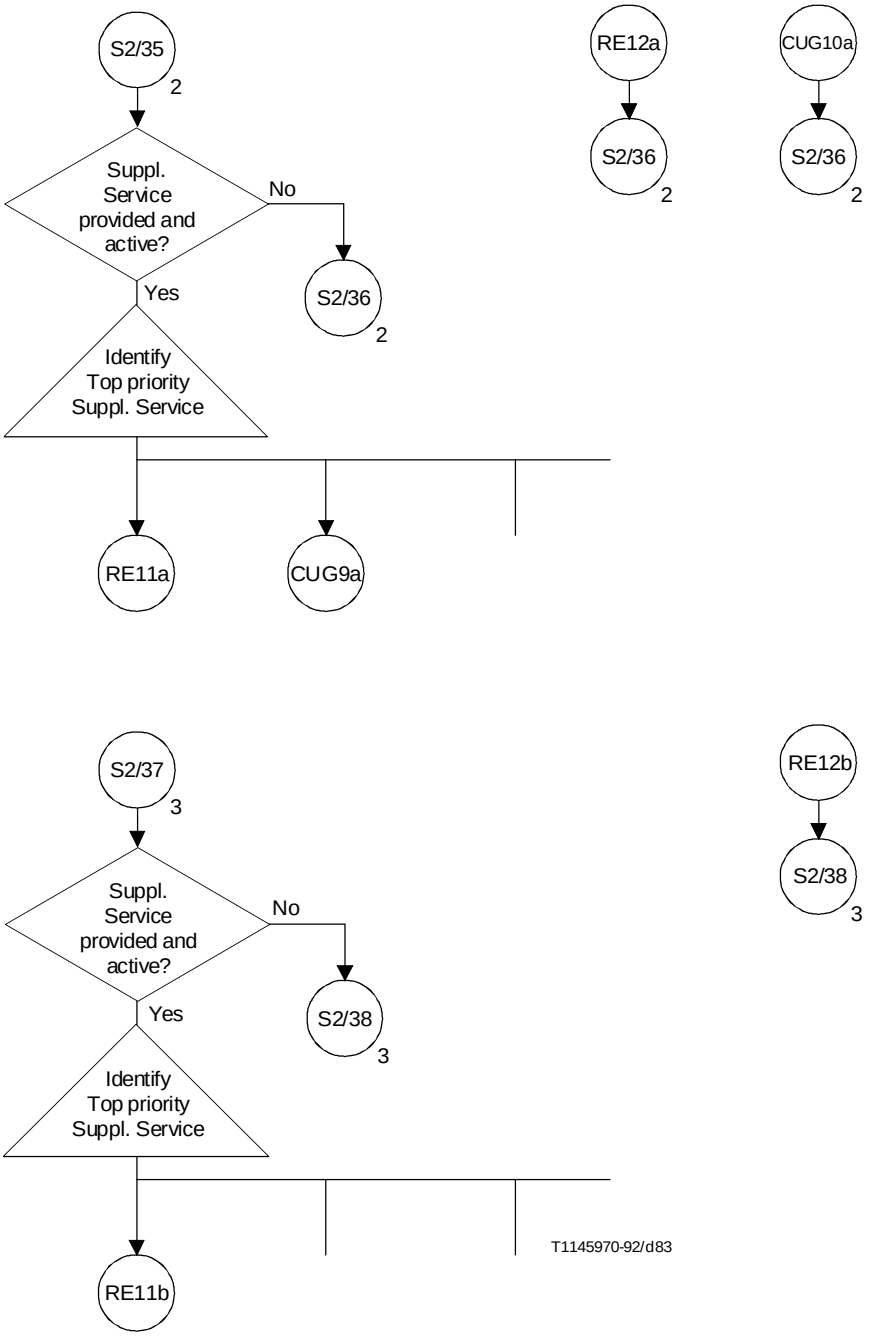

FIGURE A.2/Q.71 (sheet 17 of 20)

CC (FE2) – Interworking with Supplementary Services

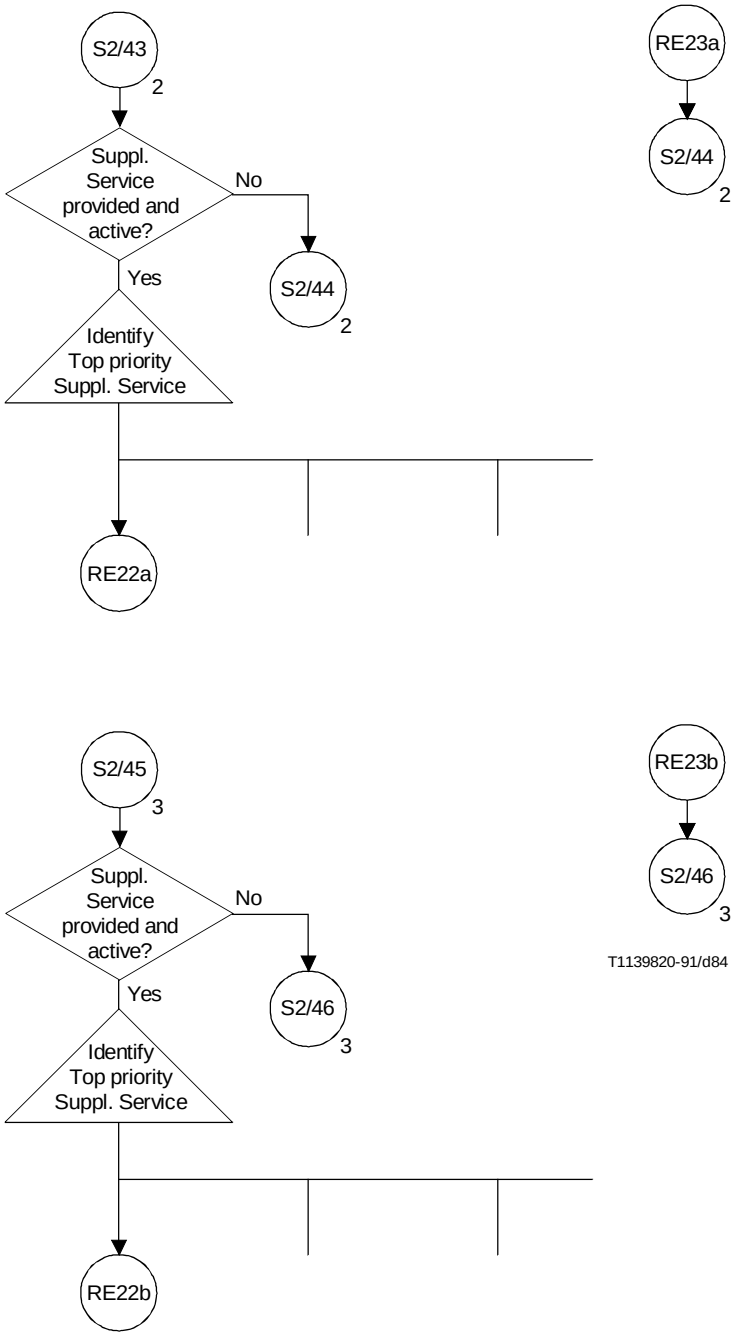

FIGURE A.2/Q.71 (sheet 18 of 20)

CC (FE2) – Interworking with Supplementary Services

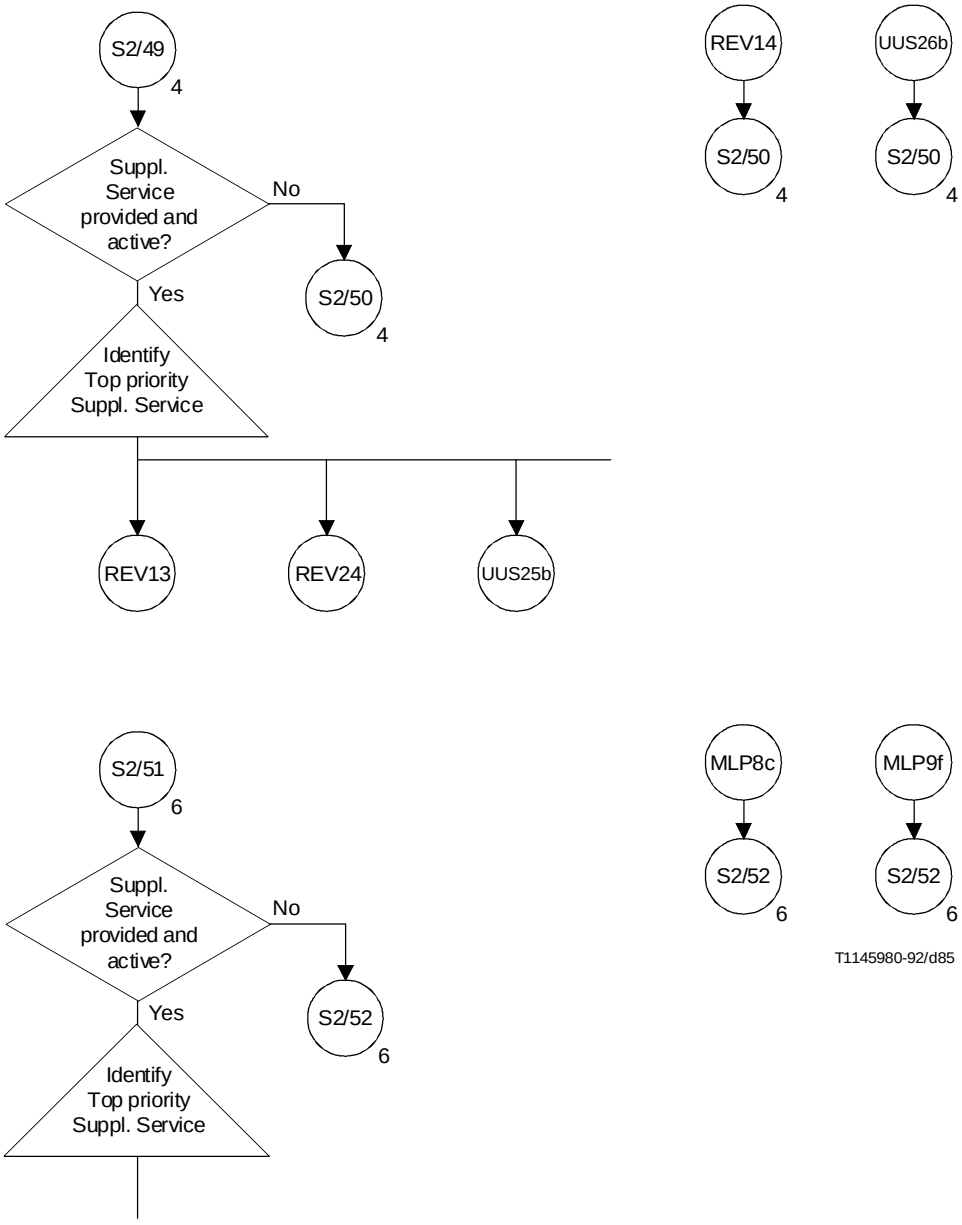

FIGURE A.2/Q.71 (sheet 19 of 20)

CC (FE2) – Interworking with Supplementary Services

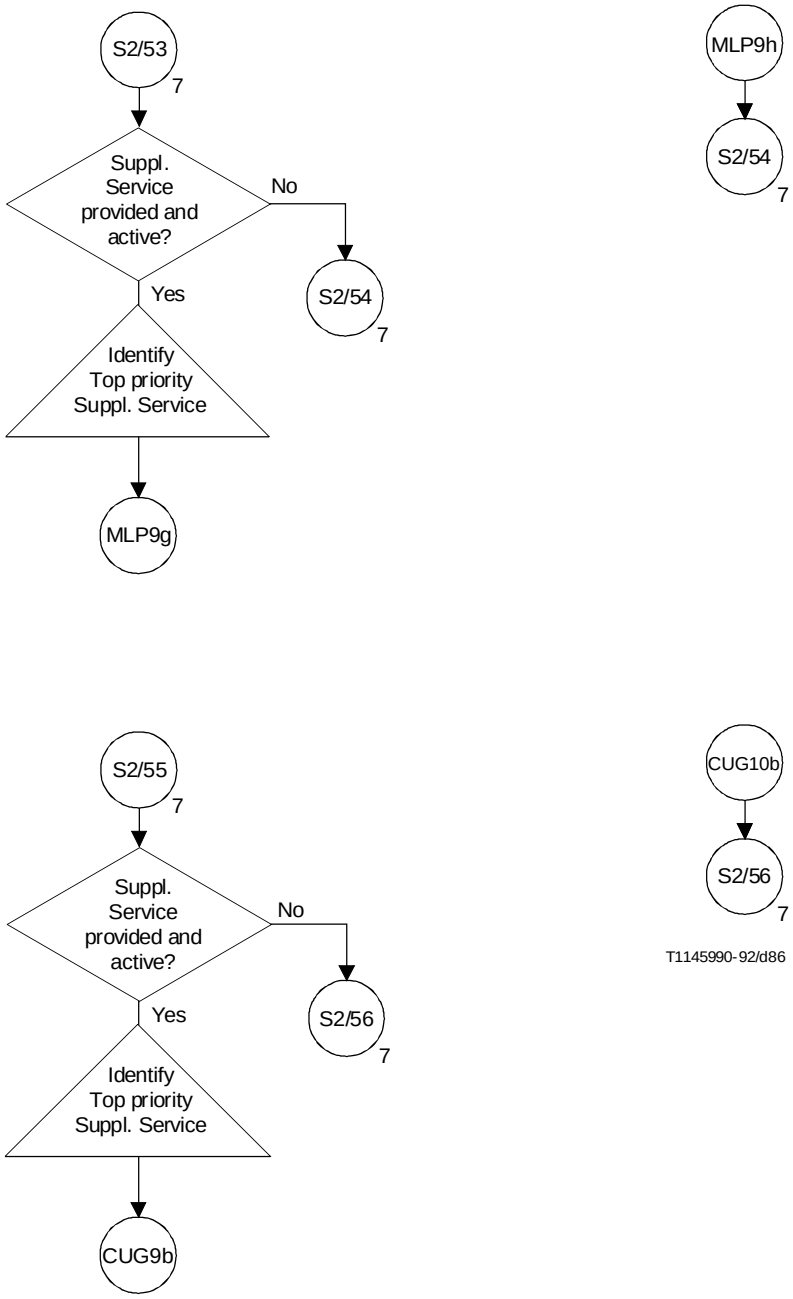

FIGURE A.2/Q.71 (sheet 20 of 20)

CC (FE2) – Interworking with Supplementary Services

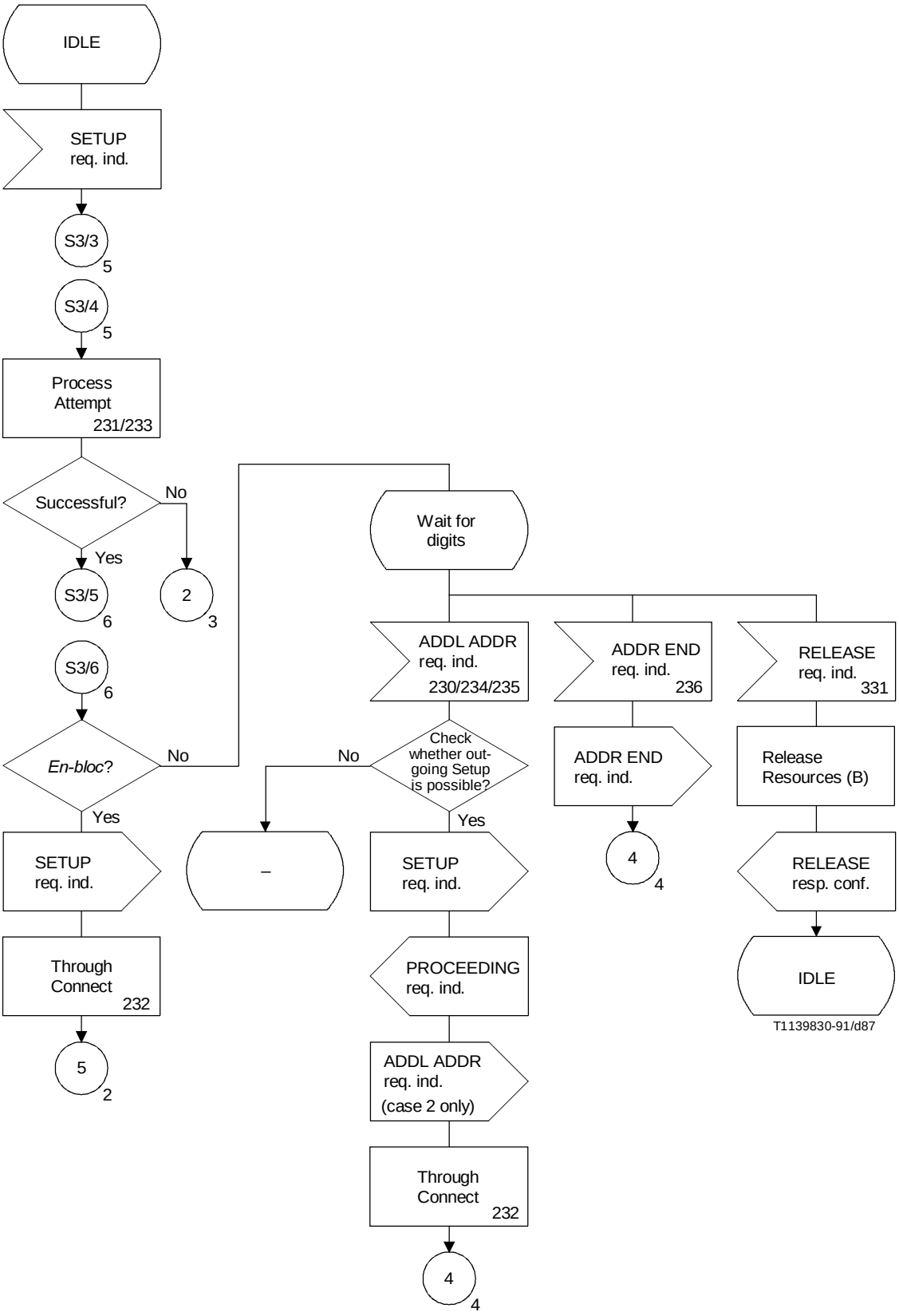

FIGURE A.3/Q.71 (sheet 1 of 7)

CC (FE3) – Interworking with Supplementary Services

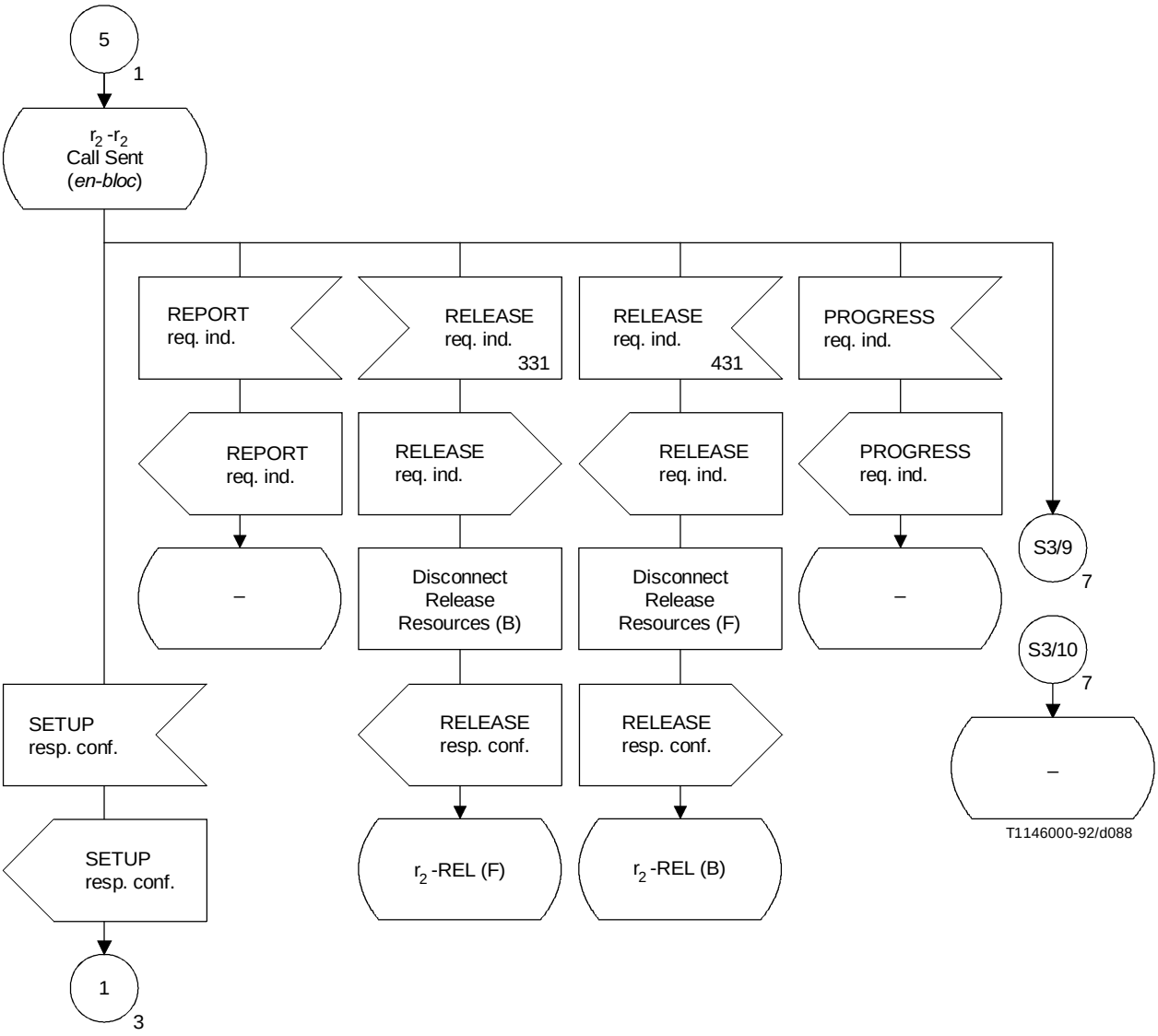

FIGURE A.3/Q.71 (sheet 2 of 7)

CC (FE3) – Interworking with Supplementary Services

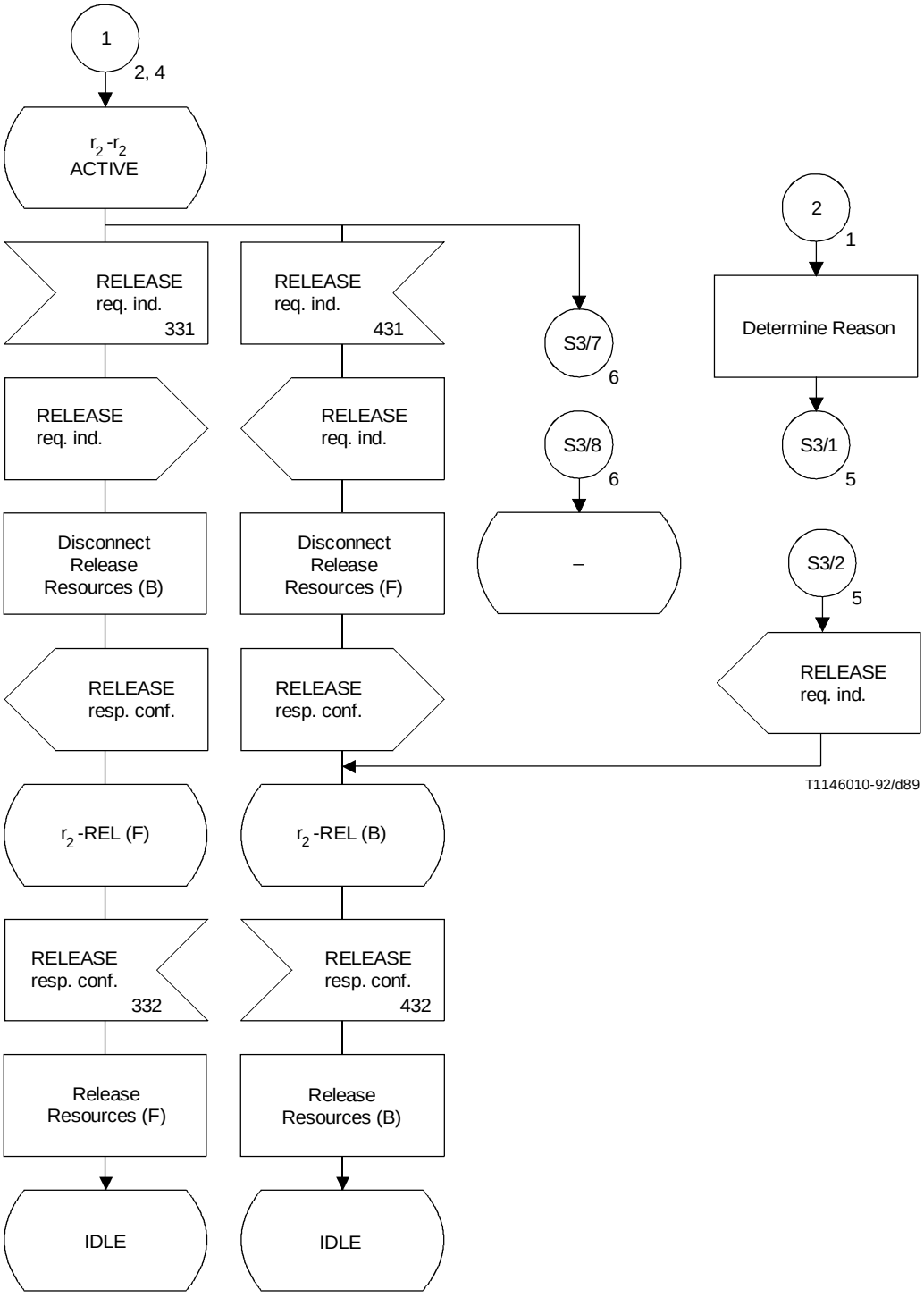

FIGURE A.3/Q.71 (sheet 3 of 7)

CC (FE3) – Interworking with Supplementary Services

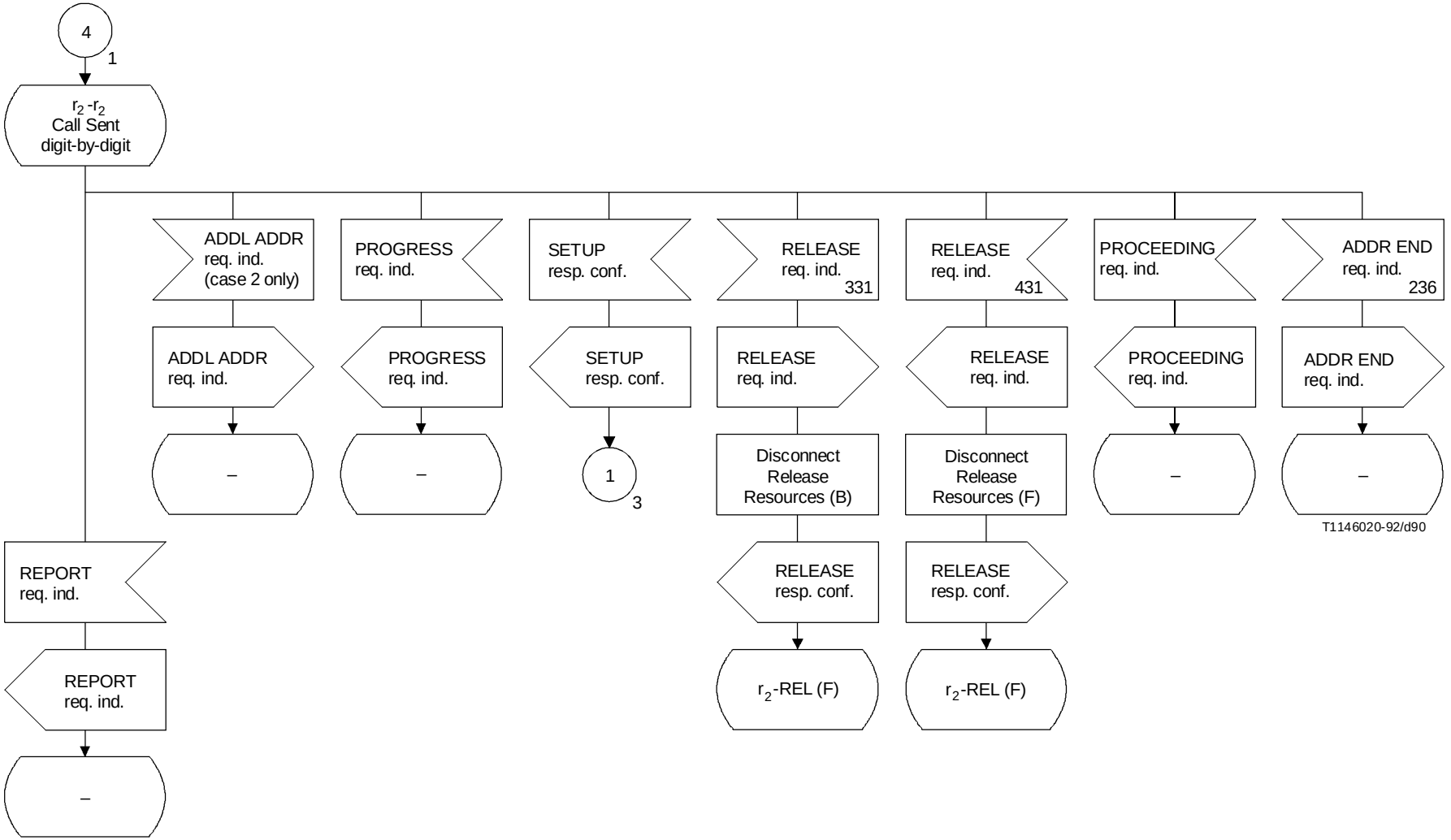

FIGURE A.3/Q.71 (sheet 4 of 7)

CC (FE3) – Interworking with Supplementary Services

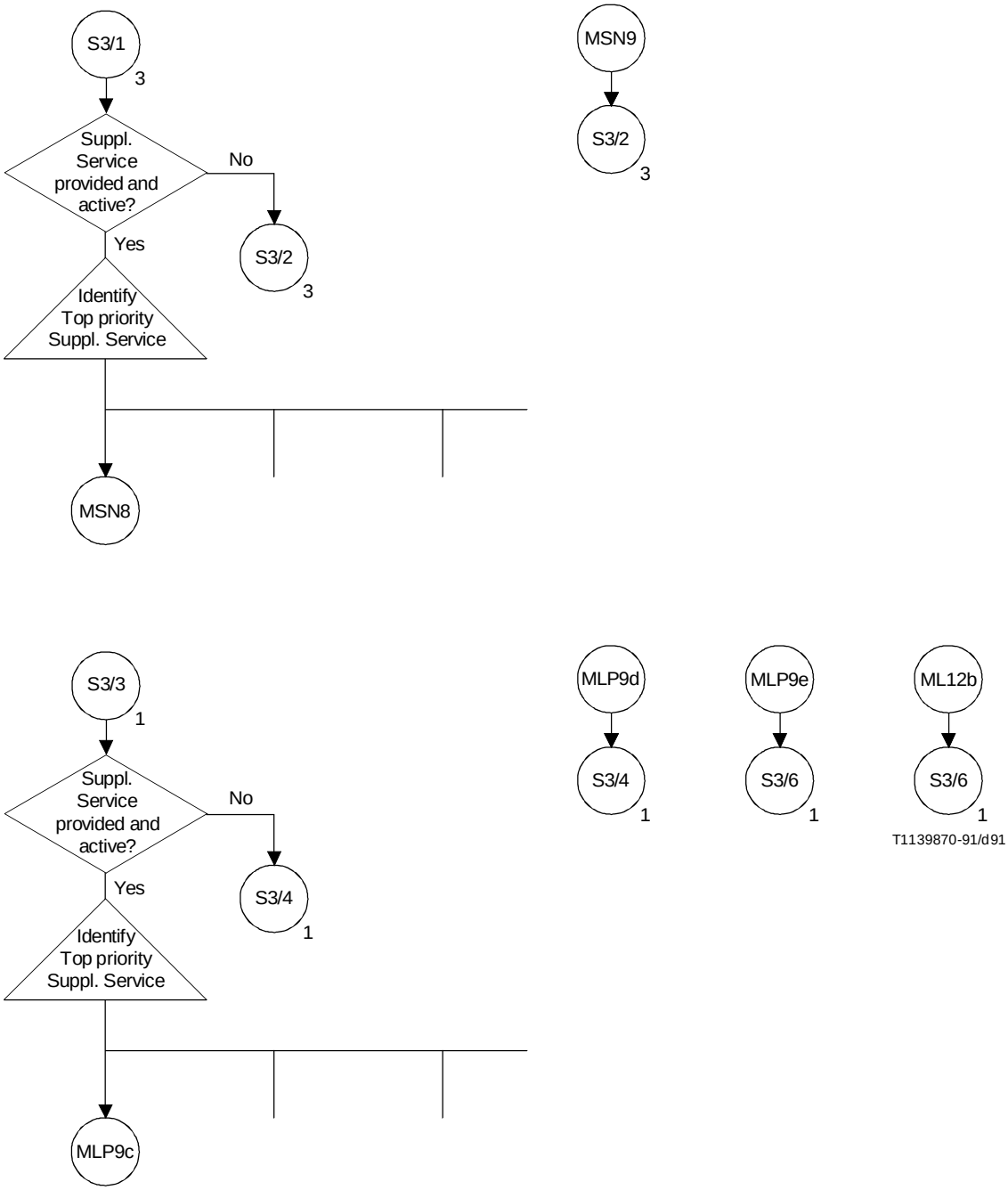

FIGURE A.3/Q.71 (sheet 5 of 7)

CC (FE3) – Interworking with Supplementary Services

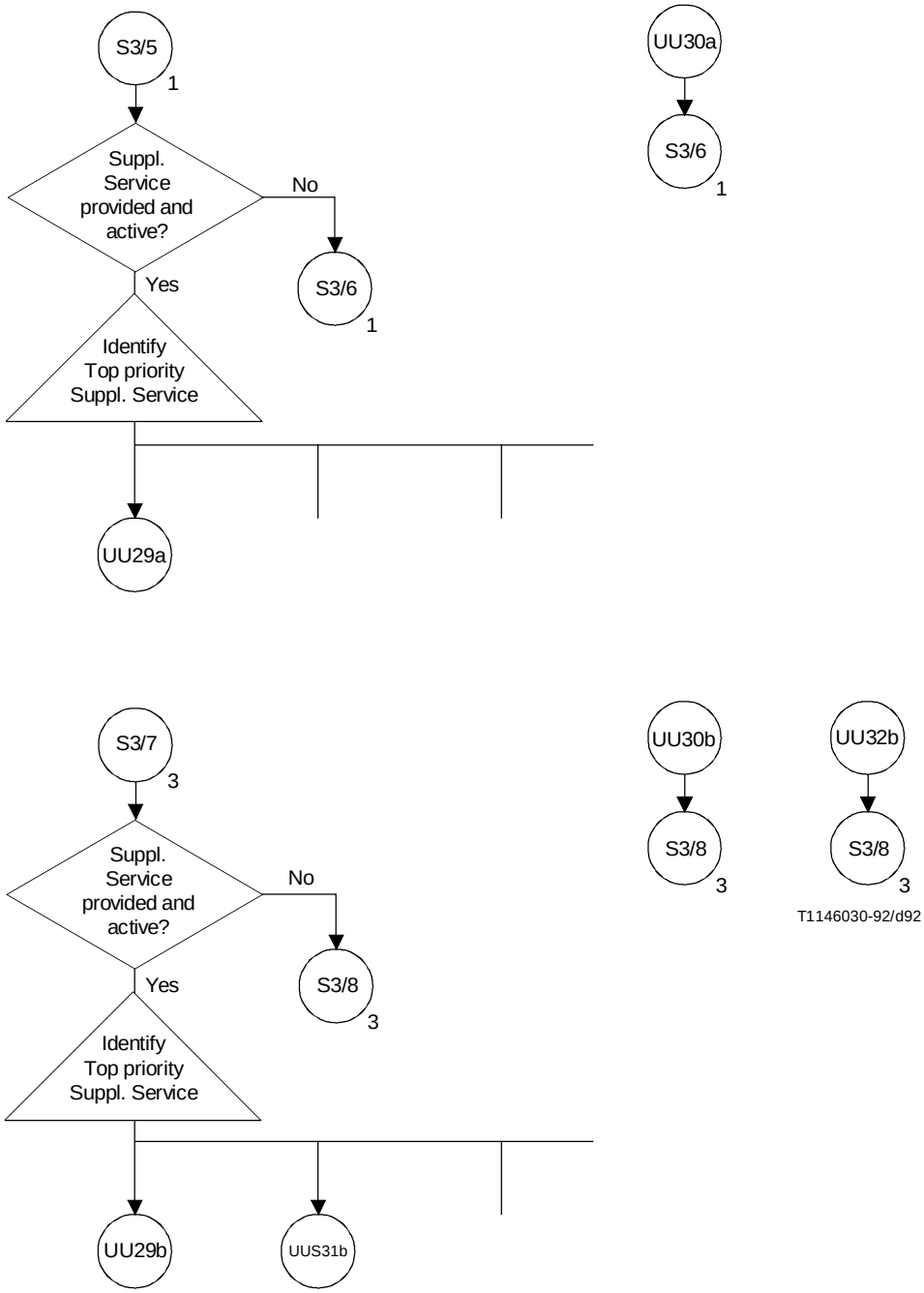

FIGURE A.3/Q.71 (sheet 6 of 7)

CC (FE3) – Interworking with Supplementary Services

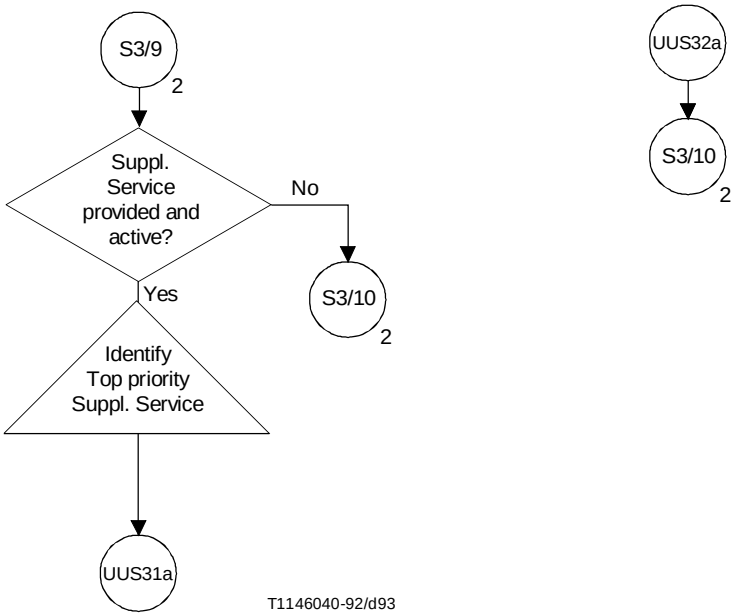

FIGURE A.3/Q.71 (sheet 7 of 7)

CC (FE3) – Interworking with Supplementary Services

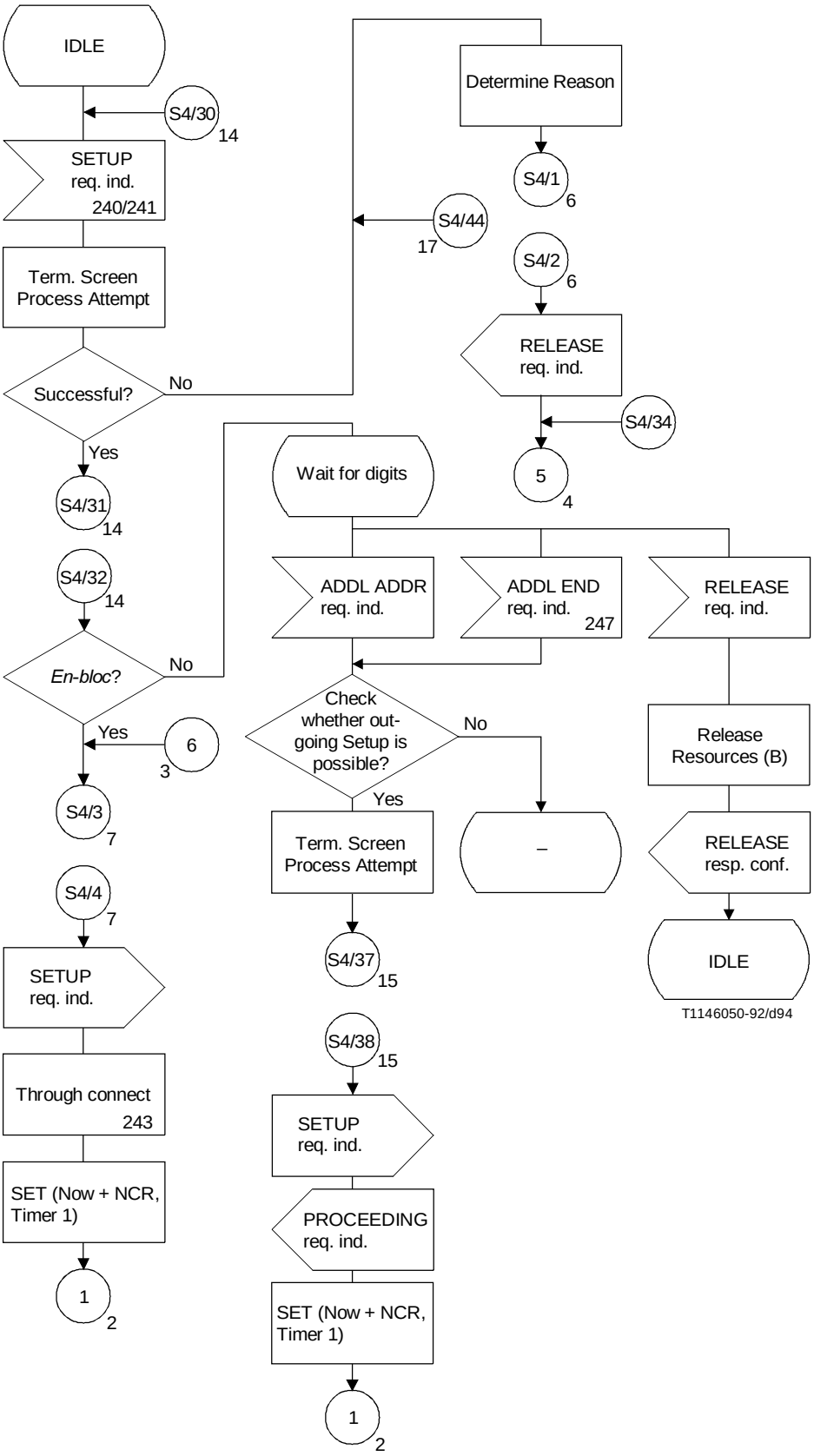

FIGURE A.4/Q.71 (sheet 1 of 17)

CC (FE4) – Interworking with Supplementary Services

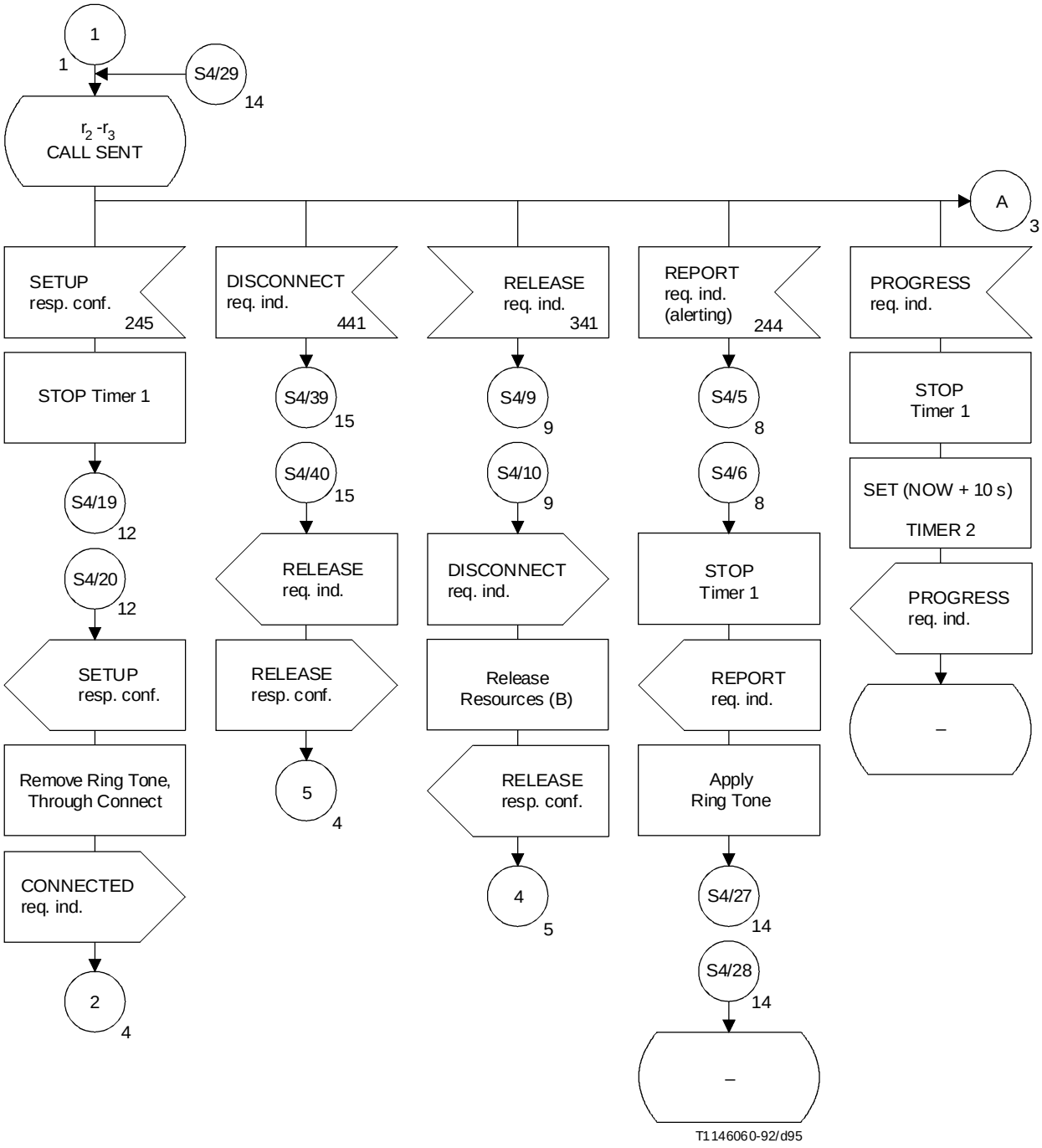

FIGURE A.4/Q.71 (sheet 2 of 17)

CC (FE4) – Interworking with Supplementary Services

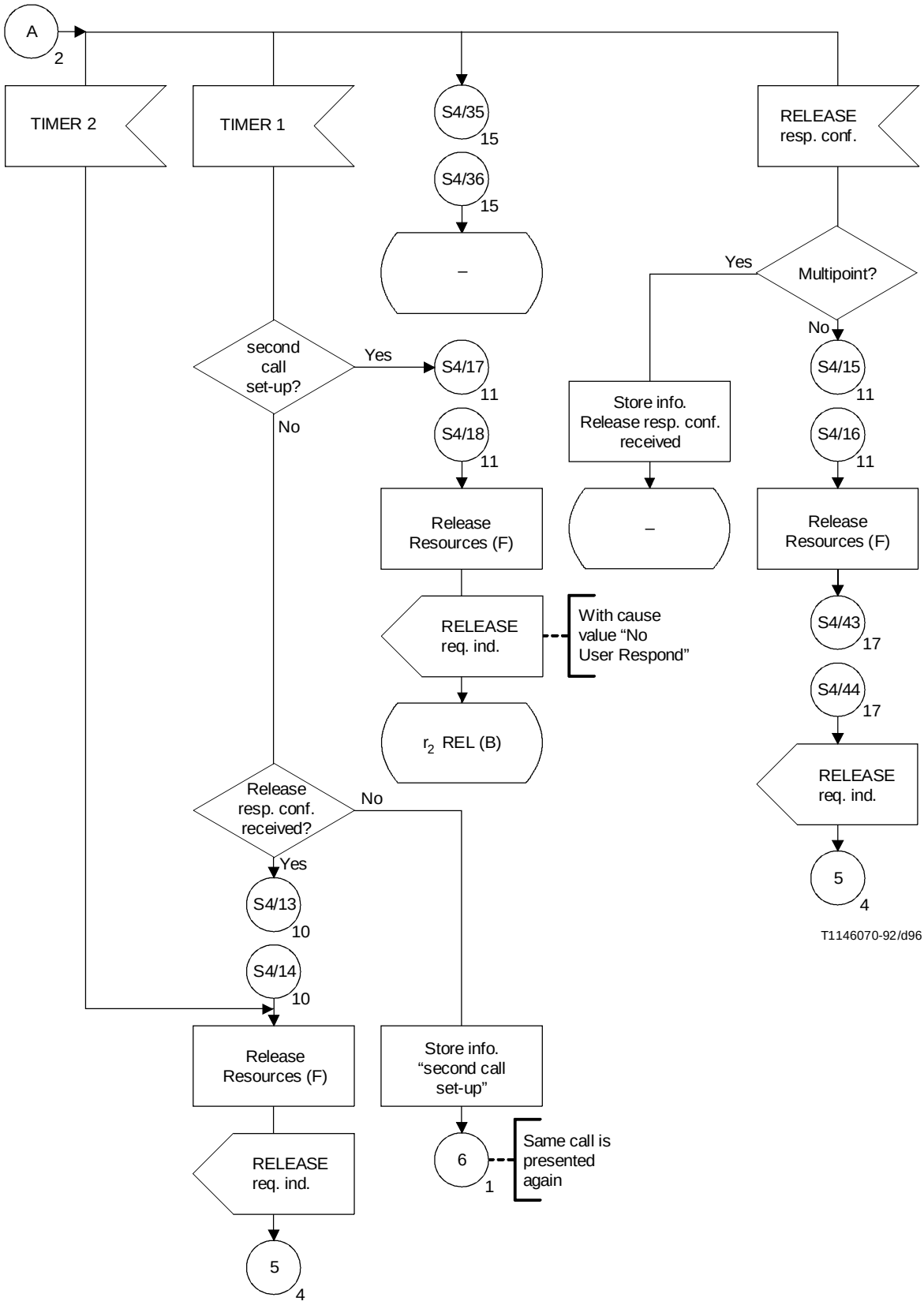

FIGURE A.4/Q.71 (sheet 3 of 17)

CC (FE4) – Interworking with Supplementary Services

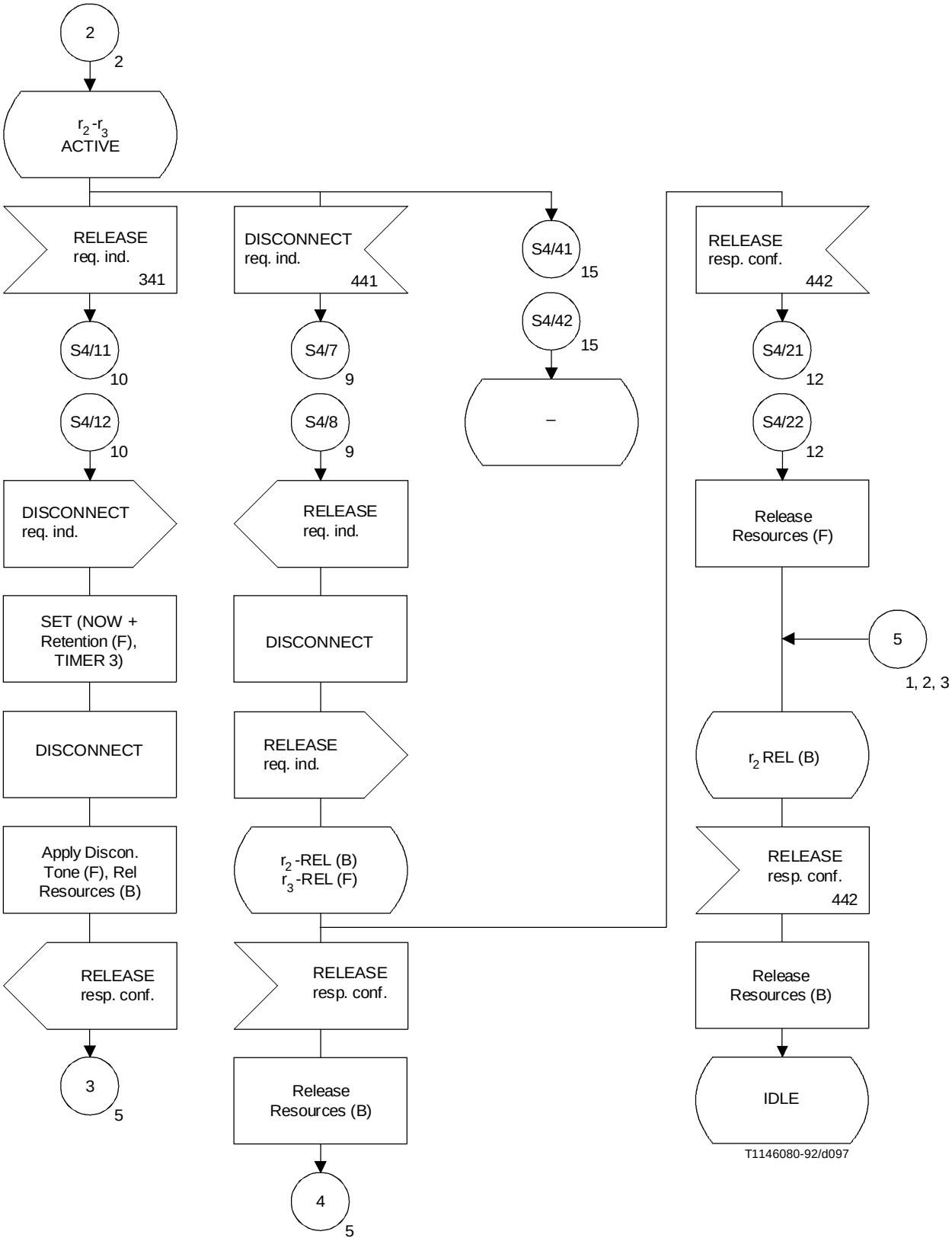

FIGURE A.4/Q.71 (sheet 4 of 17)

CC (FE4) – Interworking with Supplementary Services

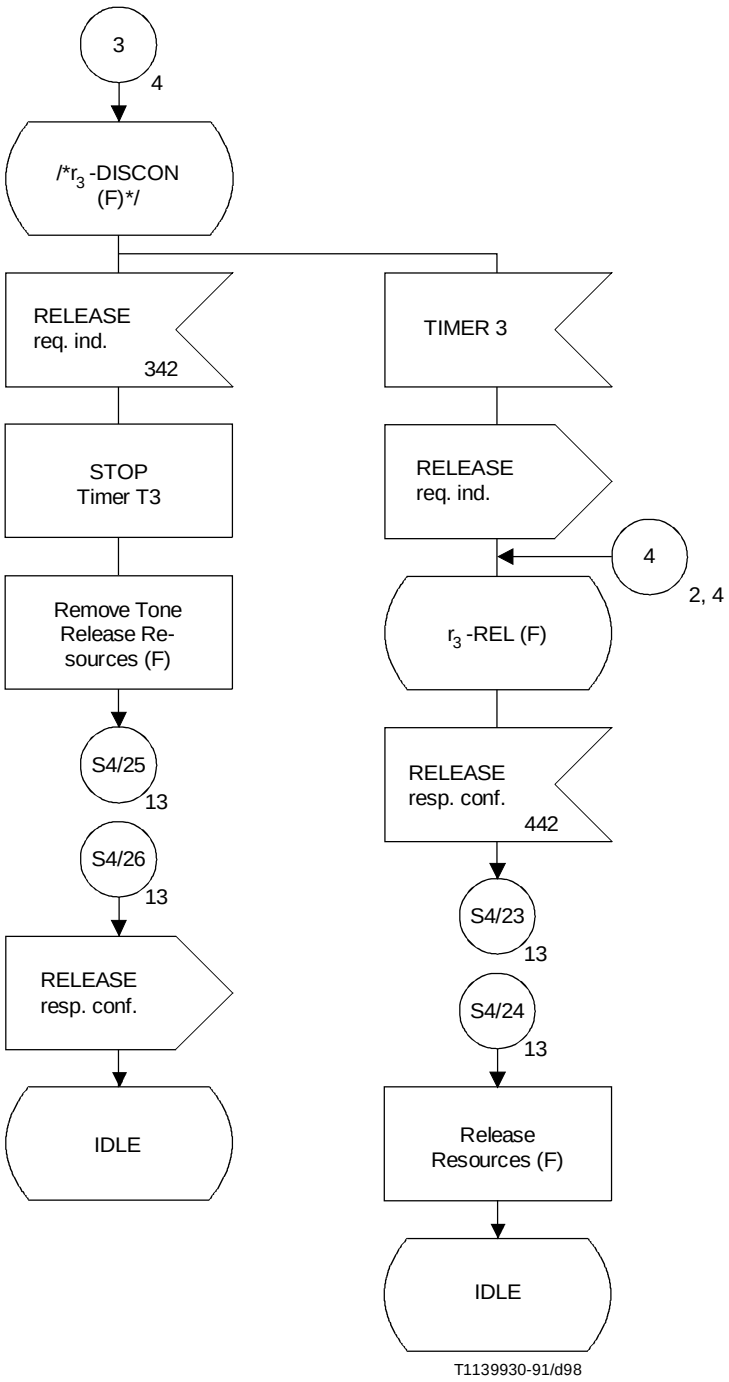

FIGURE A.4/Q.71 (sheet 5 of 17)

CC (FE4) – Interworking with Supplementary Services

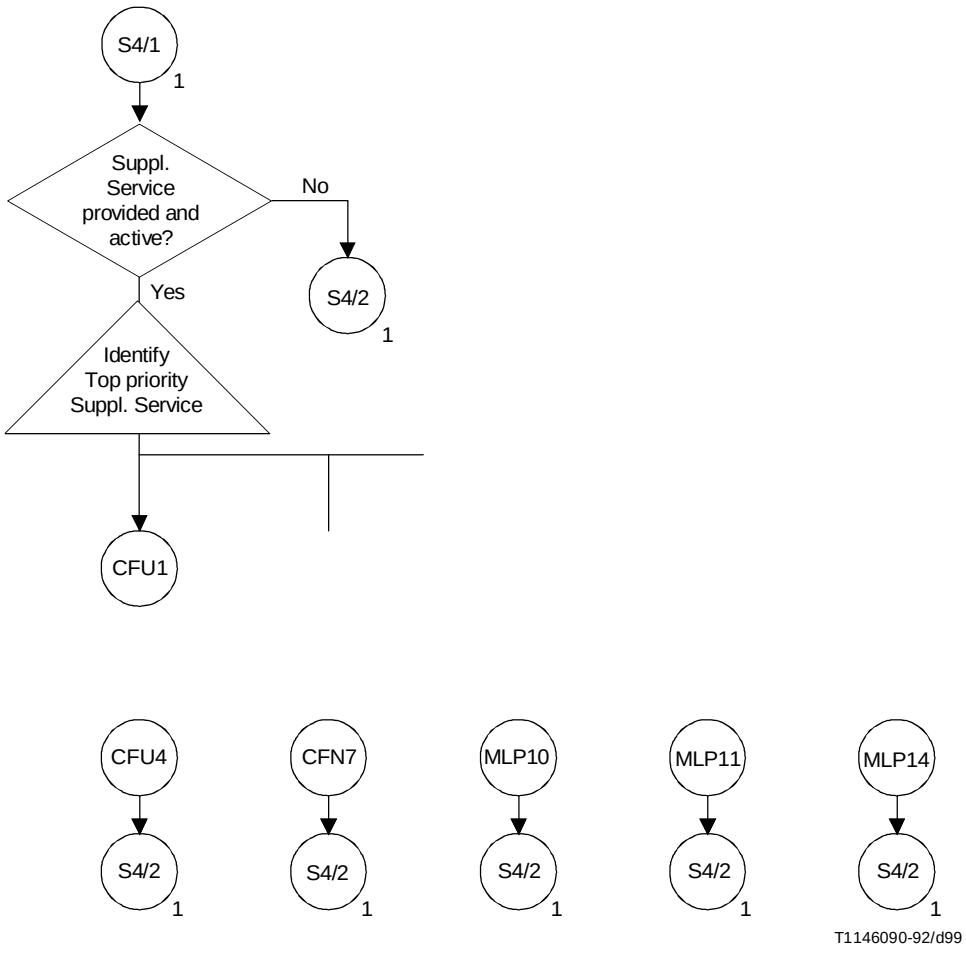

FIGURE A.4/Q.71 (sheet 6 of 17)

CC (FE4) – Interworking with Supplementary Services

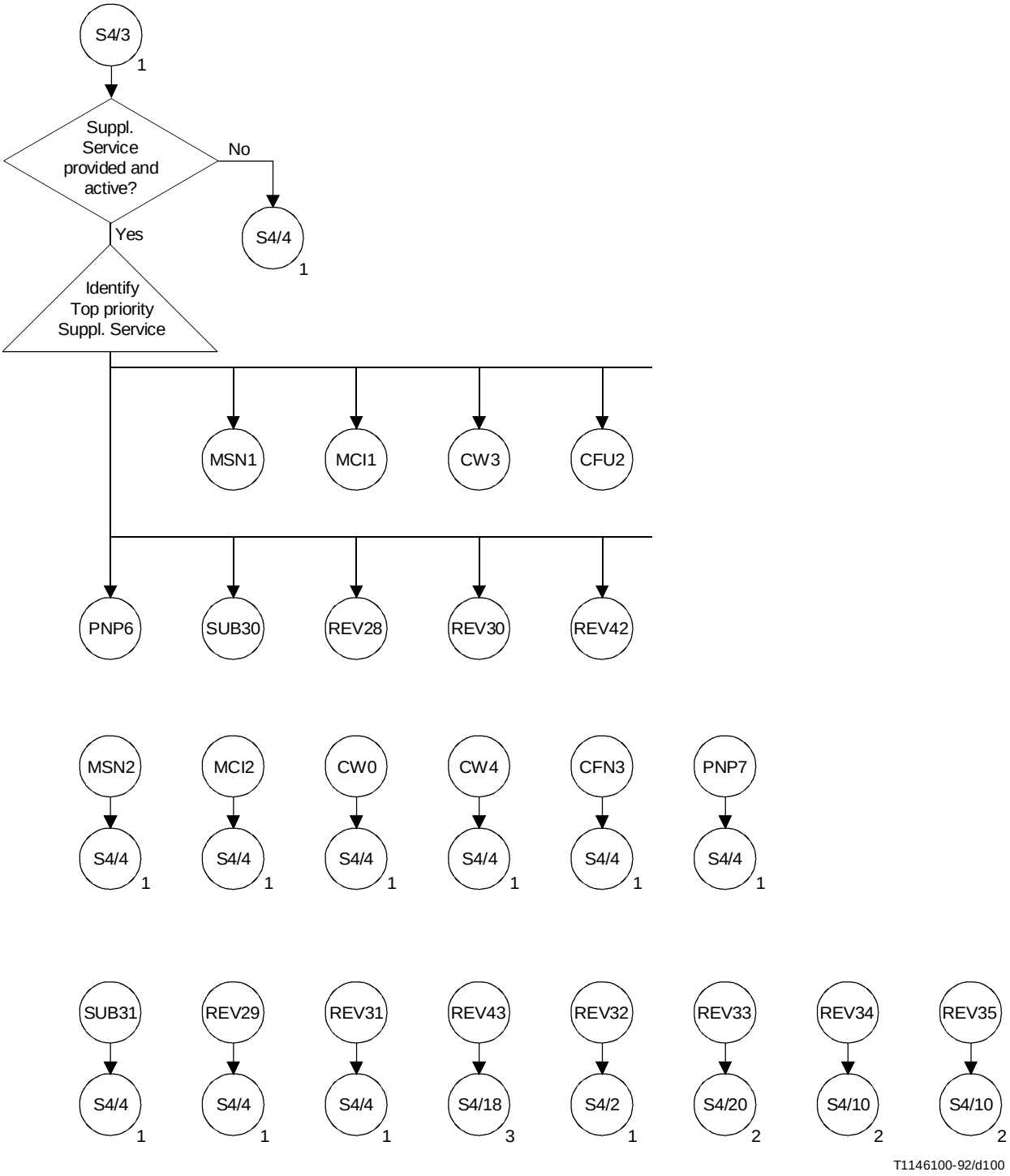

FIGURE A.4/Q.71 (sheet 7 of 17)

CC (FE4) – Interworking with Supplementary Services

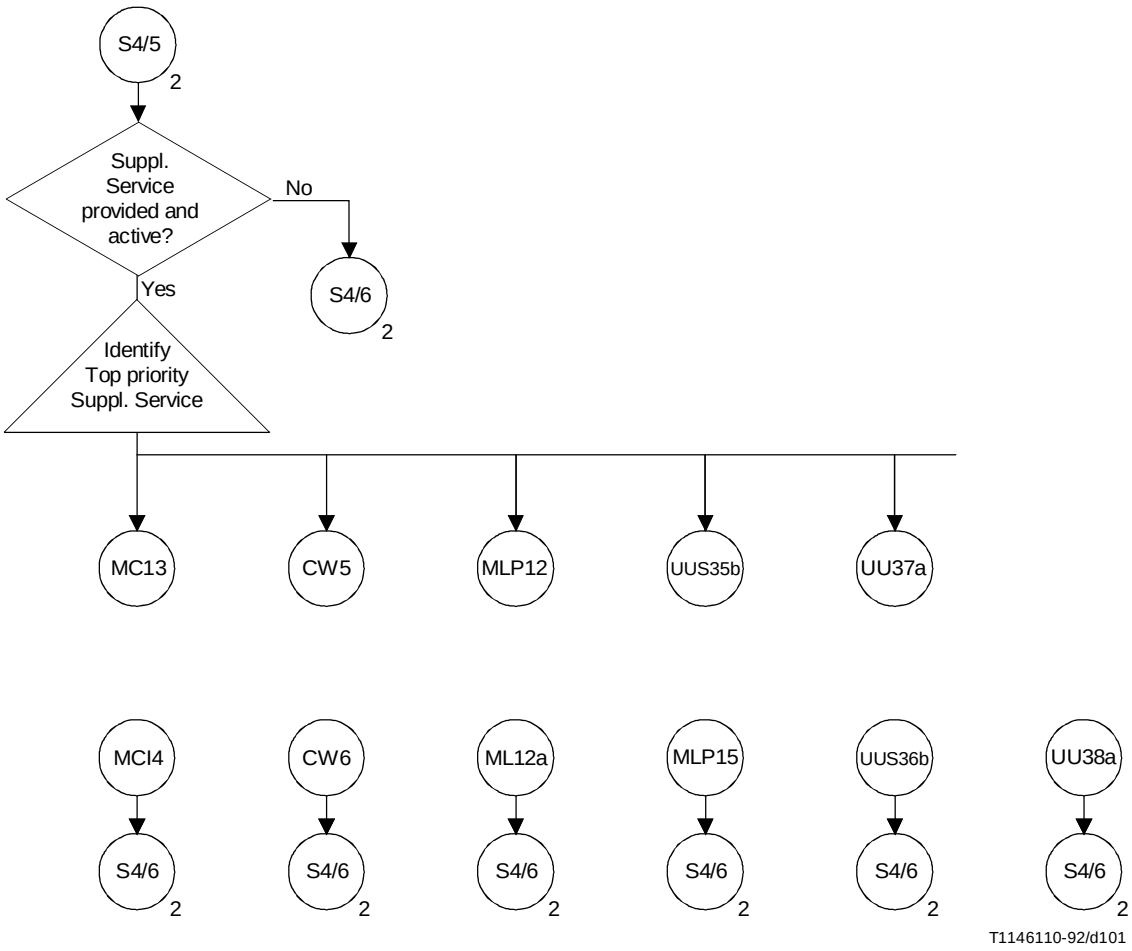

FIGURE A.4/Q.71 (sheet 8 of 17)

CC (FE4) – Interworking with Supplementary Services

FIGURE A.4/Q.71 (sheet 9 of 17)

CC (FE4) – Interworking with Supplementary Services

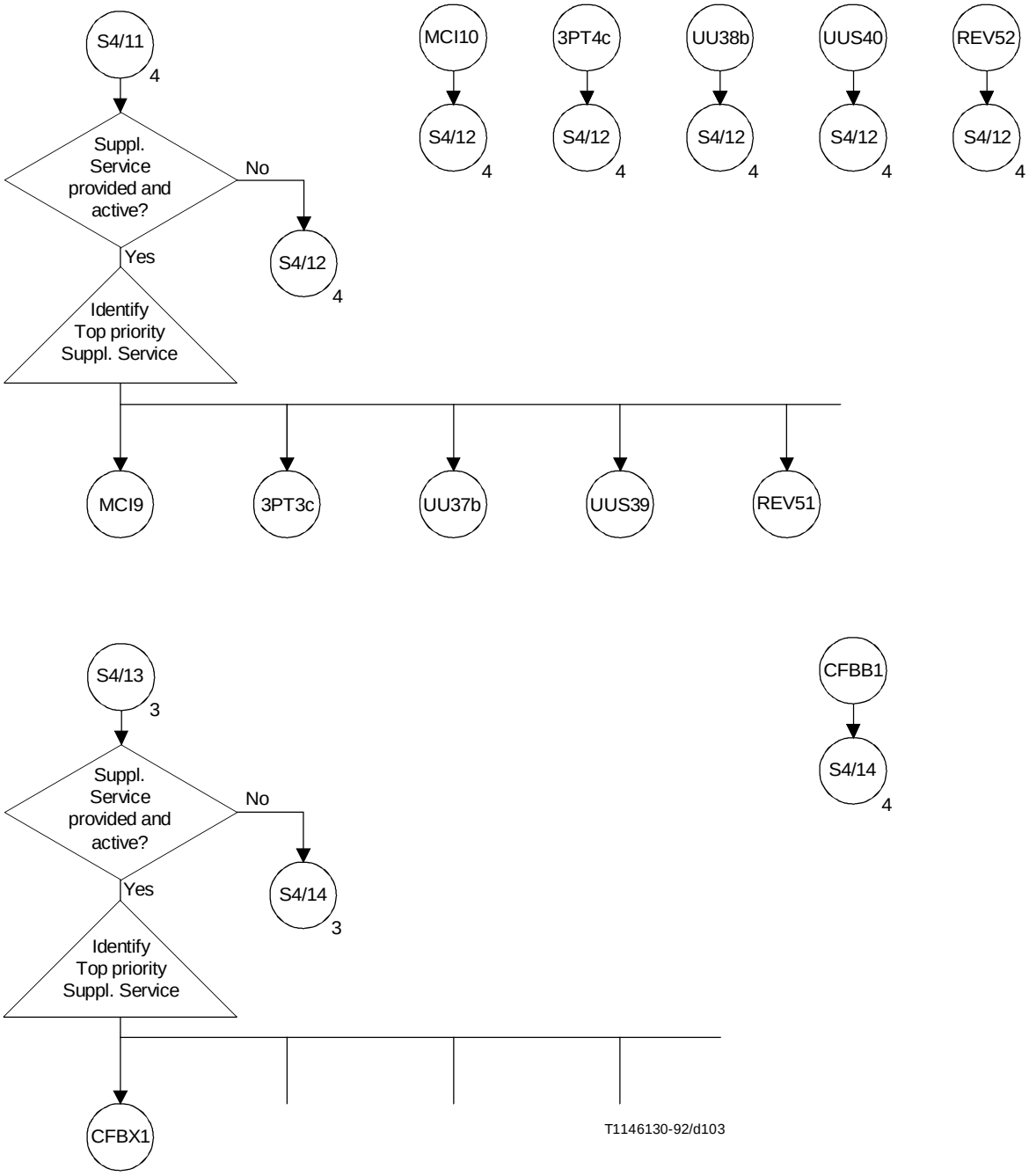

FIGURE A.4/Q.71 (sheet 10 of 17)

CC (FE4) – Interworking with Supplementary Services

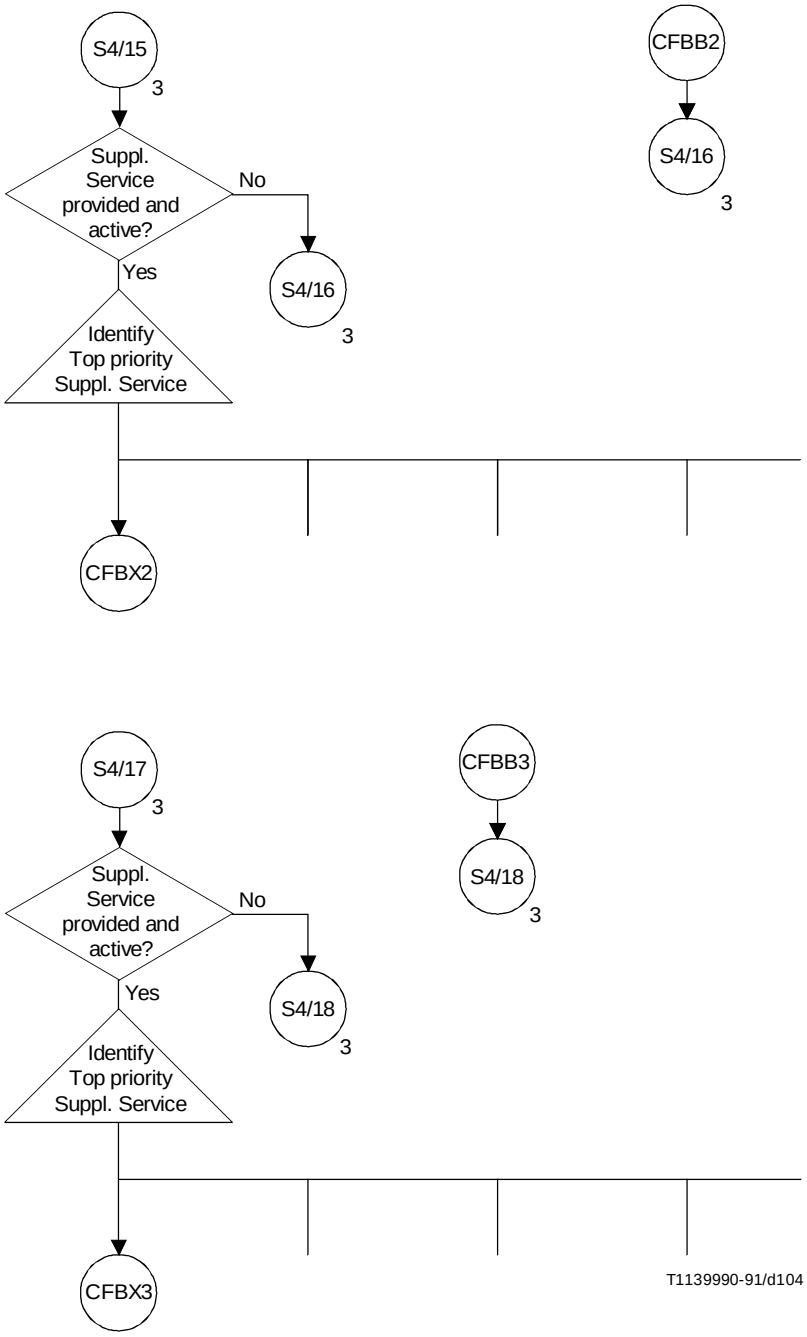

FIGURE A.4/Q.71 (sheet 11 of 17)

CC (FE4) – Interworking with Supplementary Services

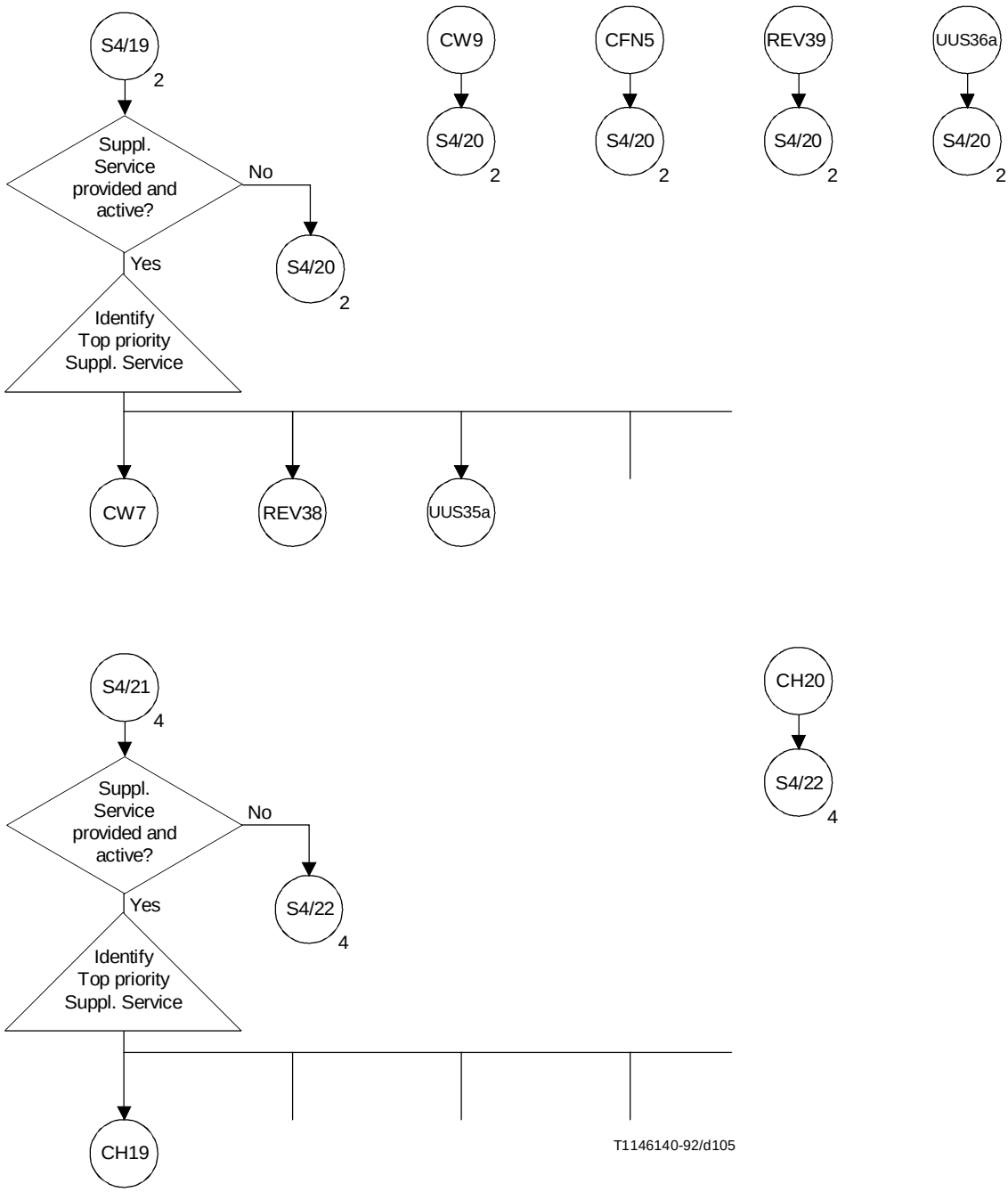

FIGURE A.4/Q.71 (sheet 12 of 17)

CC (FE4) – Interworking with Supplementary Services

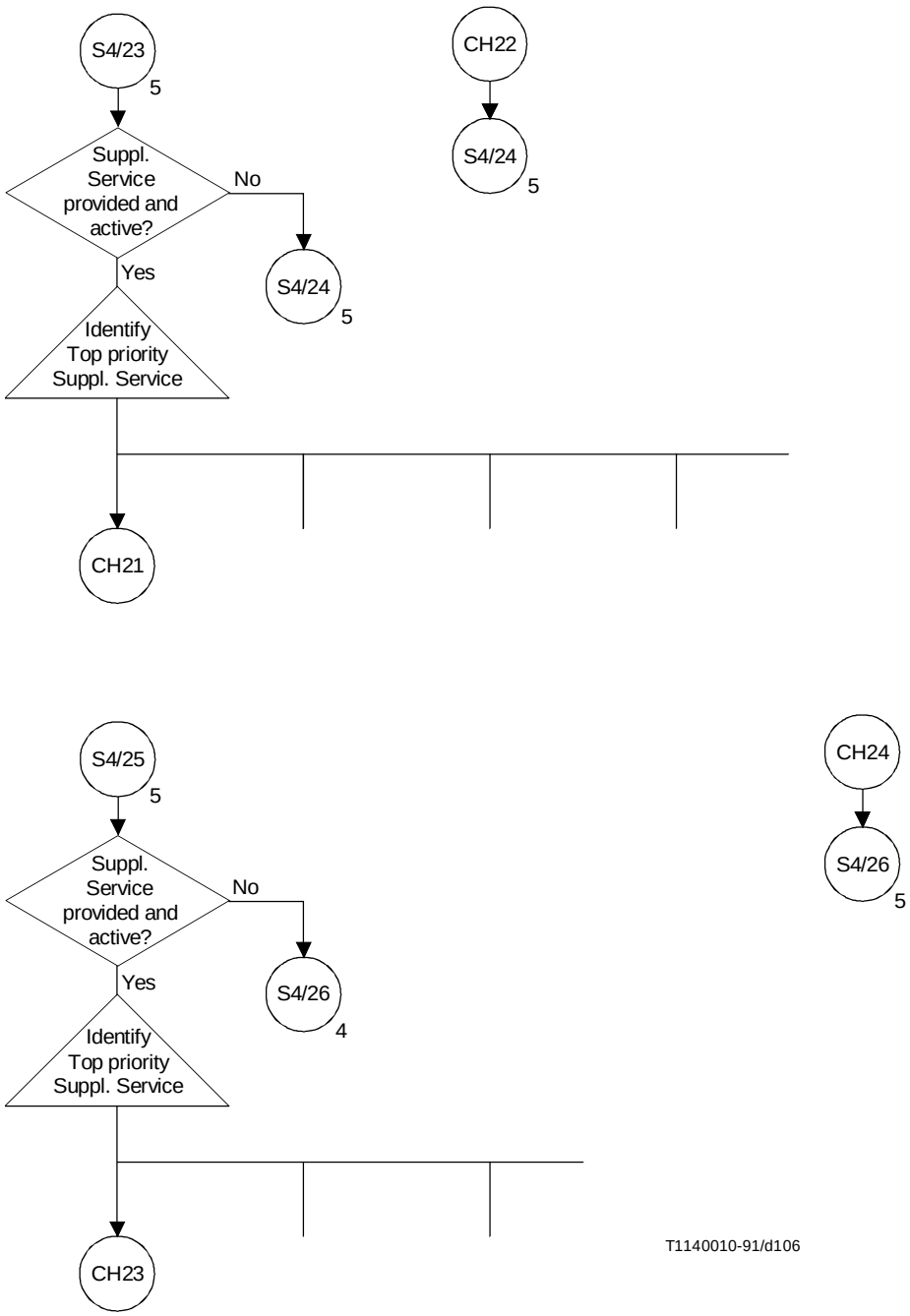

FIGURE A.4/Q.71 (sheet 13 of 17)

CC (FE4) – Interworking with Supplementary Services

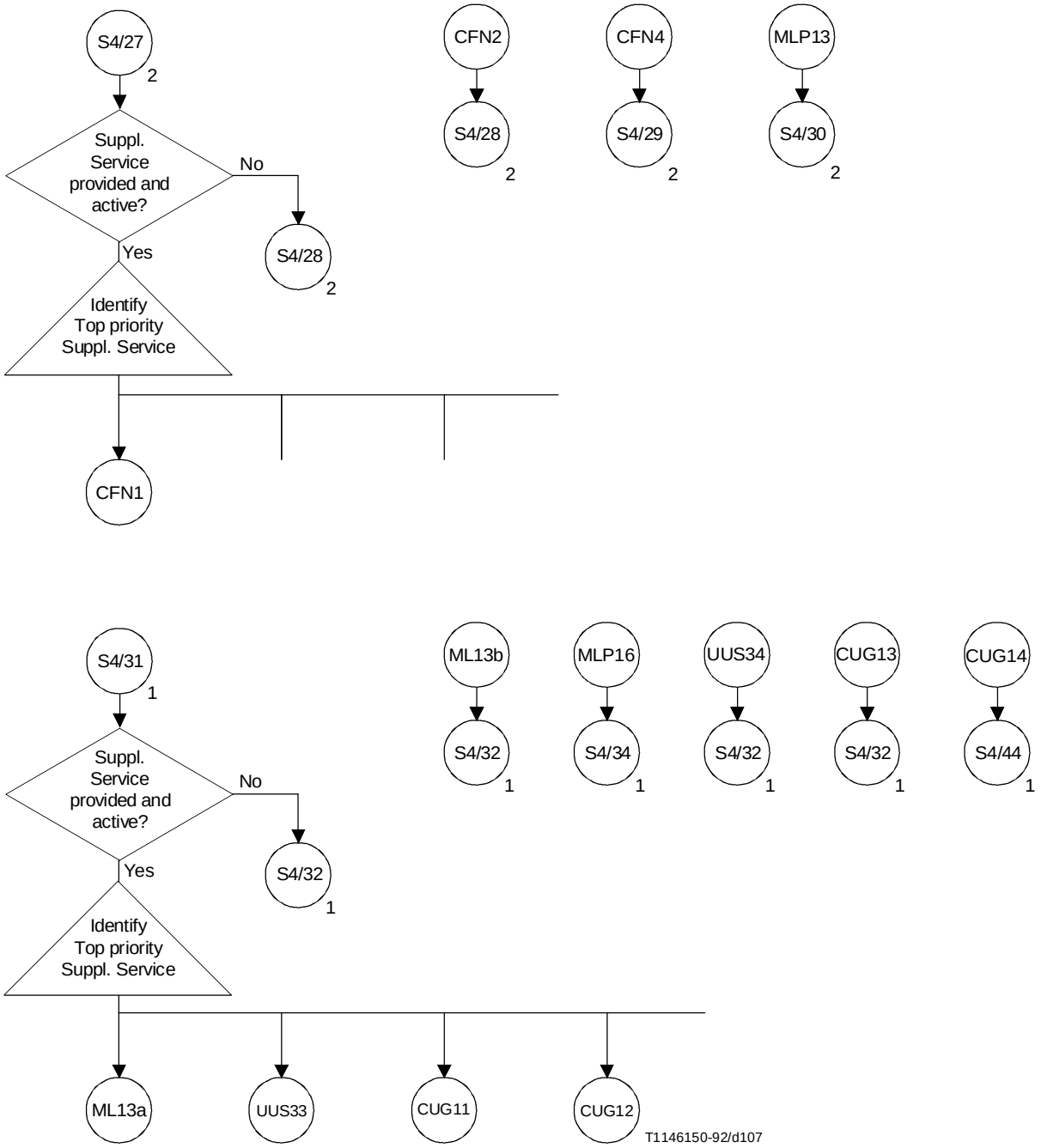

FIGURE A.4/Q.71 (sheet 14 of 17)

CC (FE4) – Interworking with Supplementary Services

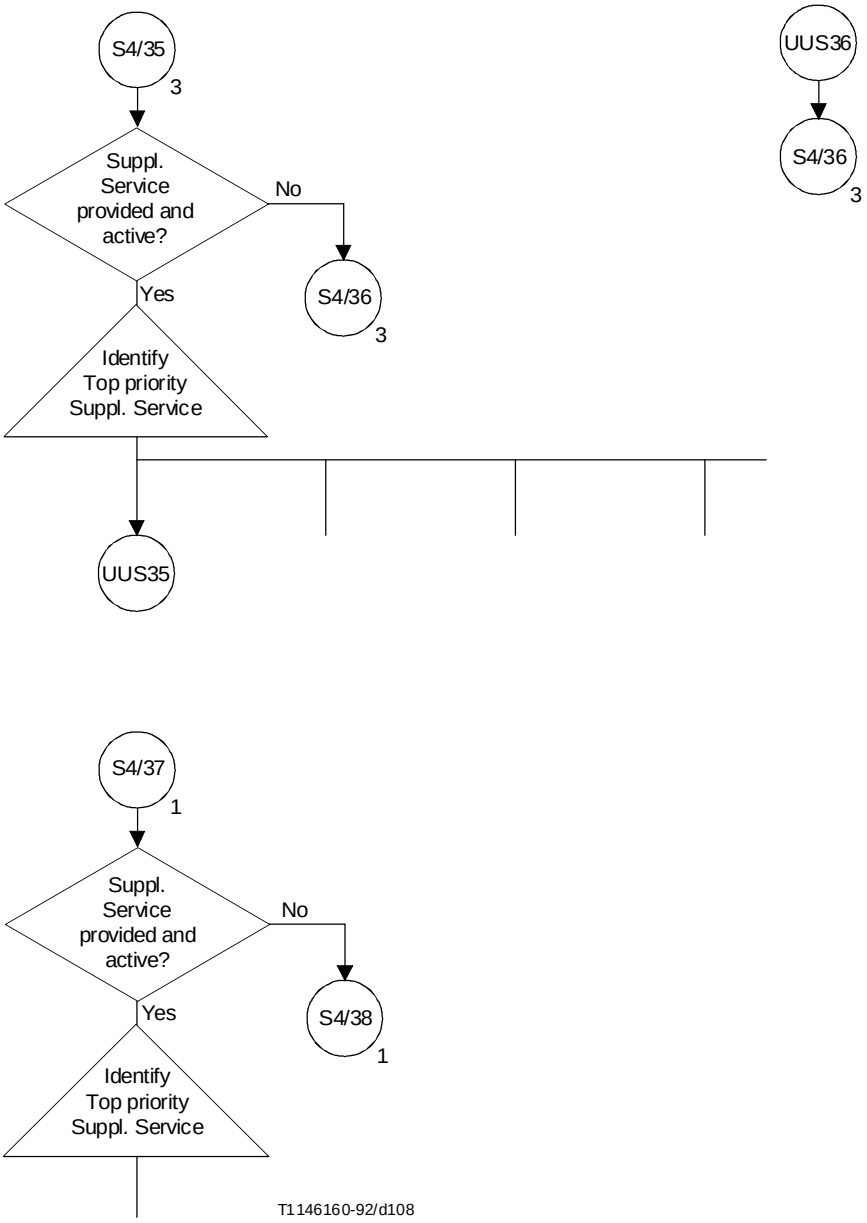

FIGURE A.4/Q.71 (sheet 15 of 17)

CC (FE4) – Interworking with Supplementary Services

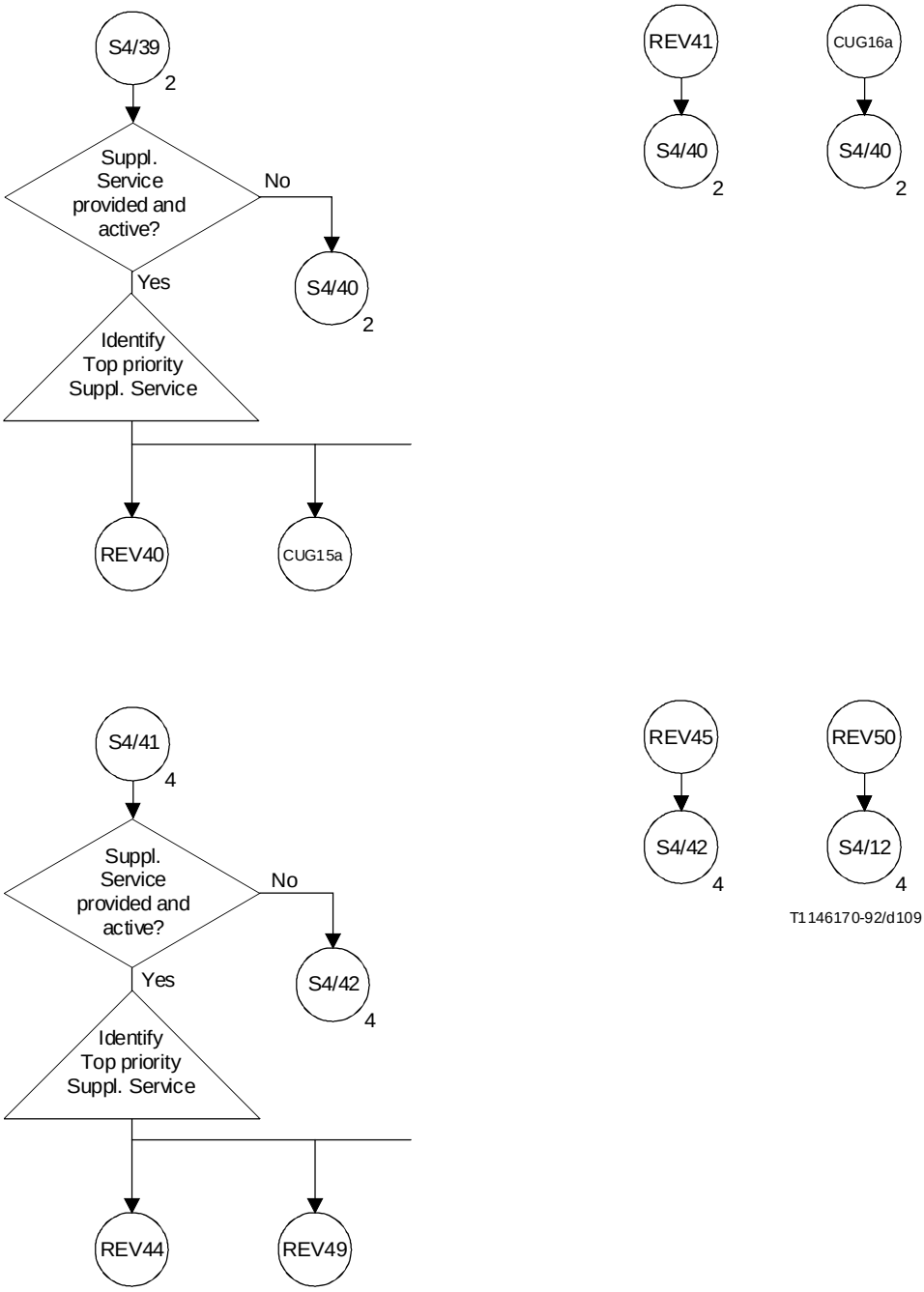

FIGURE A.4/Q.71 (sheet 16 of 17)

CC (FE4) – Interworking with Supplementary Services

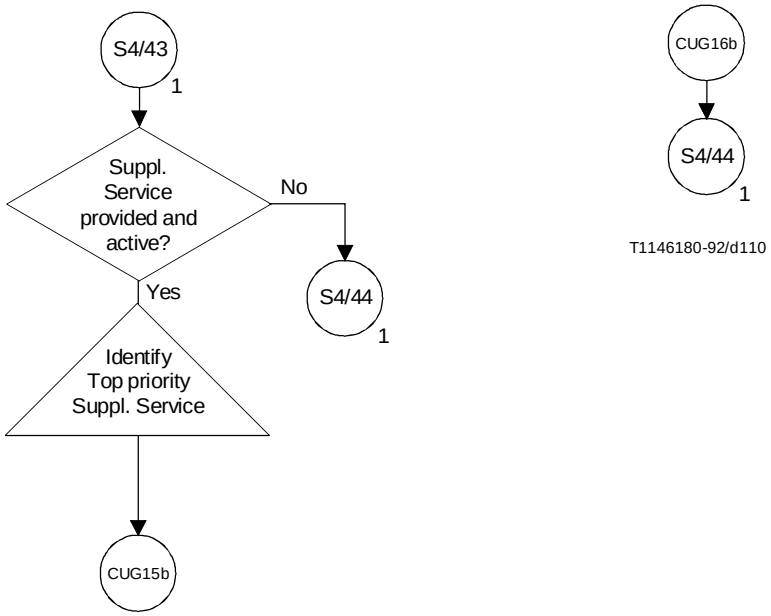

FIGURE A.4/Q.71 (sheet 17 of 17)

CC (FE4) – Interworking with Supplementary Services

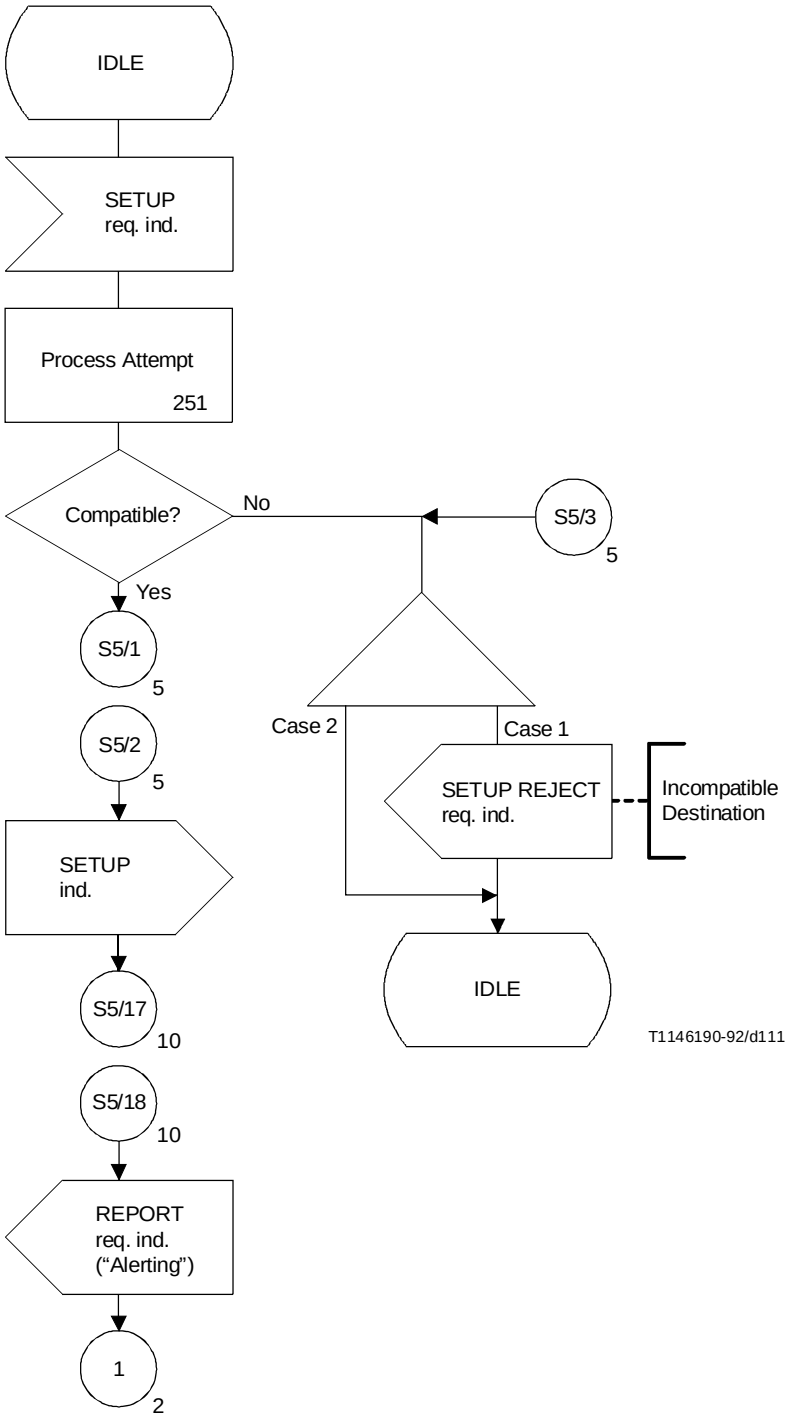

FIGURE A.5/Q.71 (sheet 1 of 12)

CCA (FE5) – Interworking with Supplementary Services

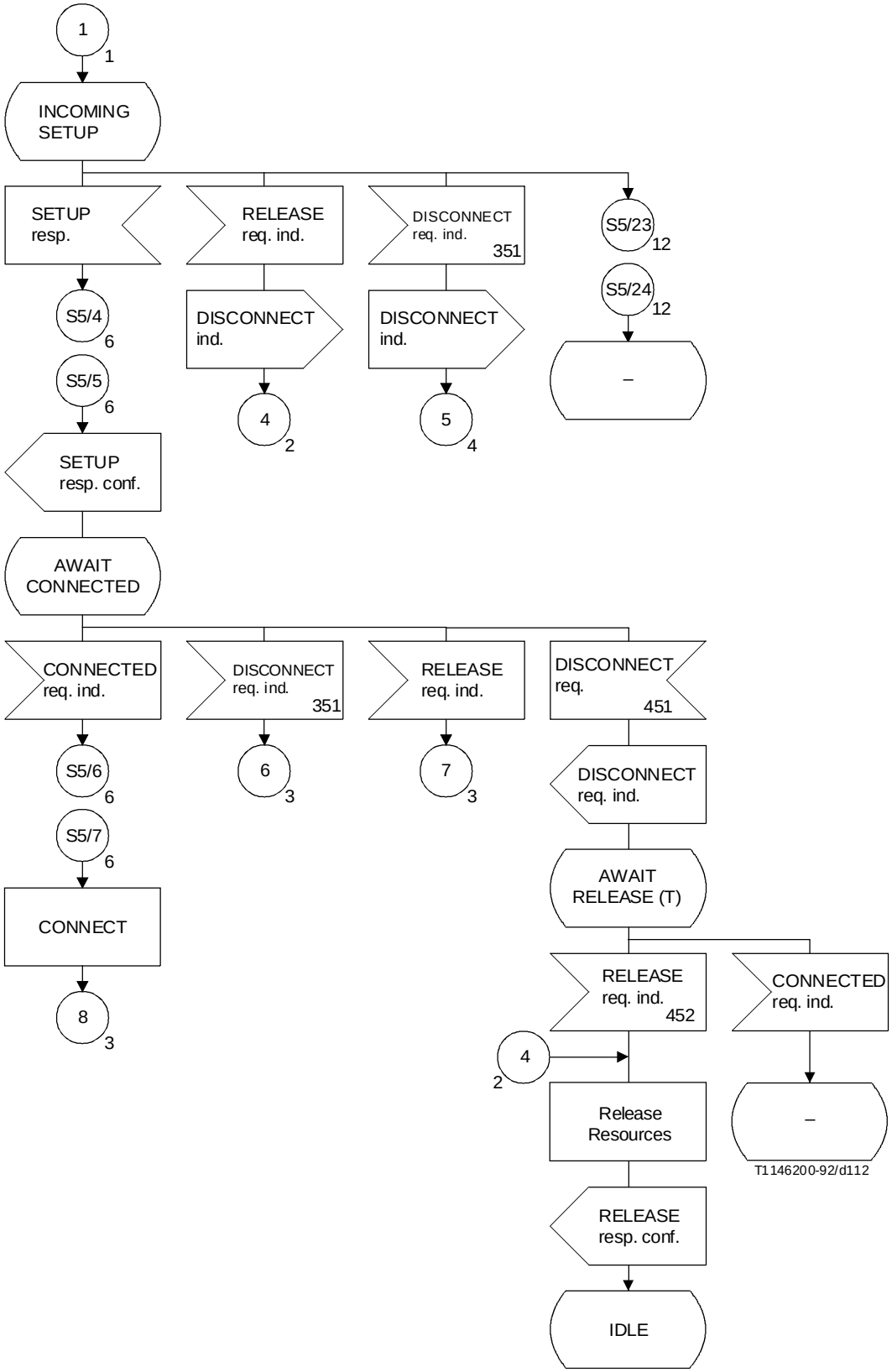

FIGURE A.5/Q.71 (sheet 2 of 12)

CCA (FE5) – Interworking with Supplementary Services

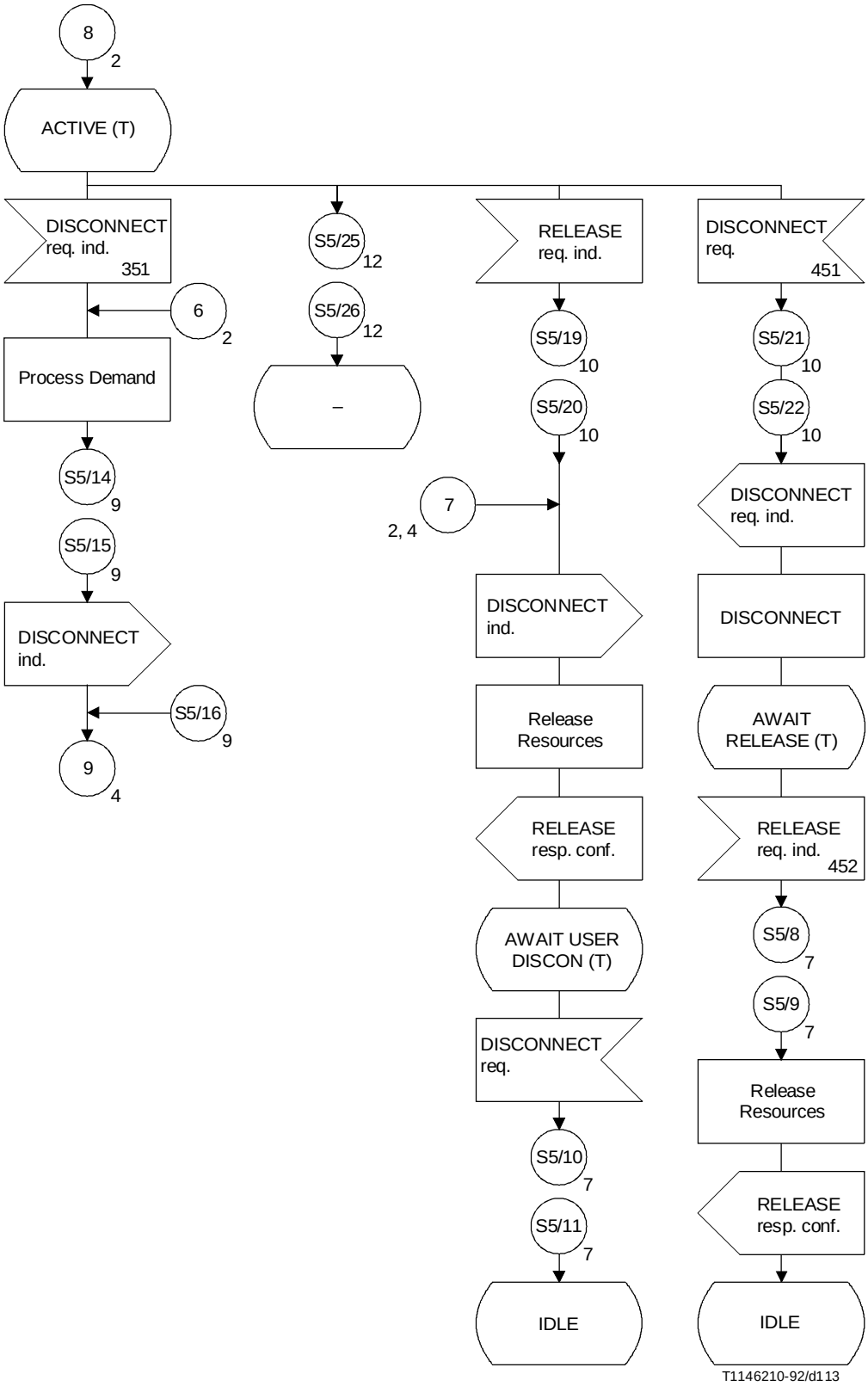

FIGURE A.5/Q.71 (sheet 3 of 12)

CCA (FE5) – Interworking with Supplementary Services

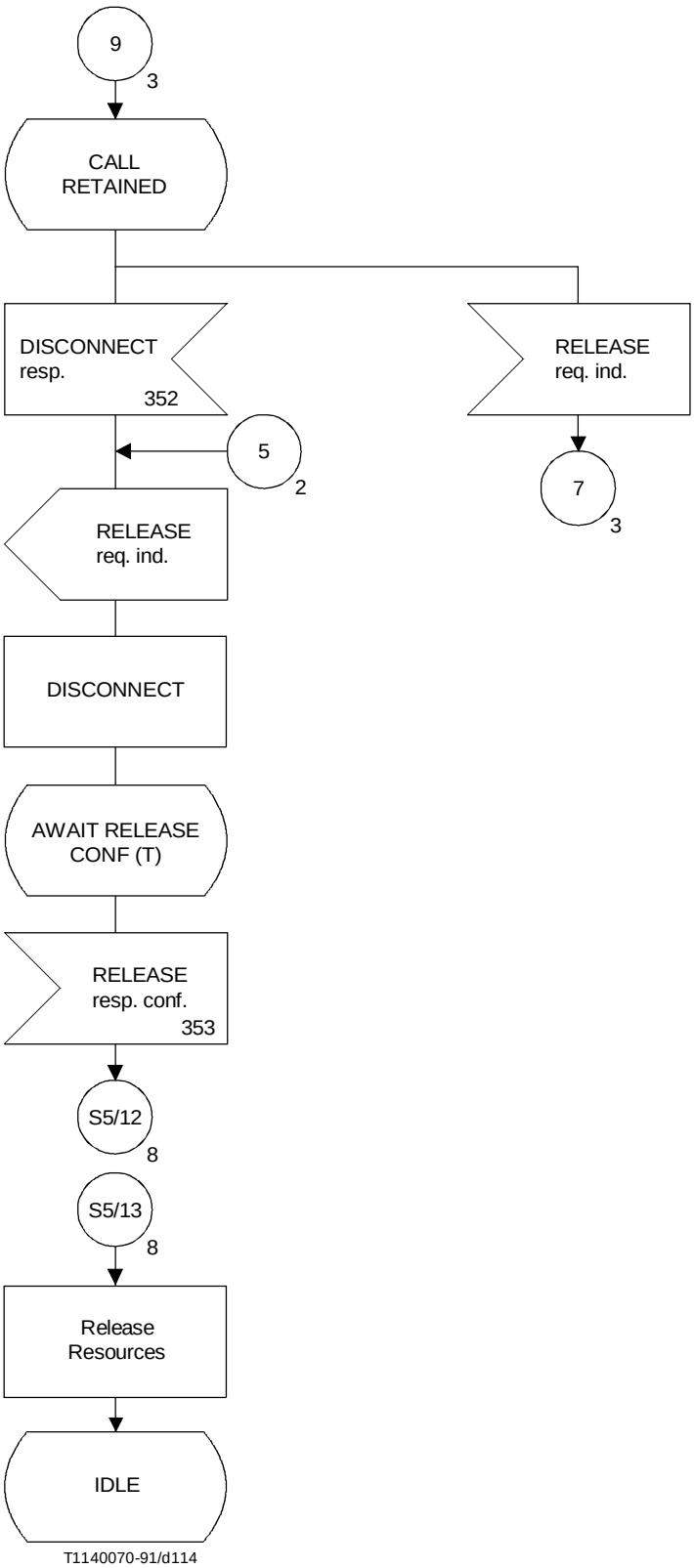

FIGURE A.5/Q.71 (sheet 4 of 12)

CCA (FE5) – Interworking with Supplementary Services

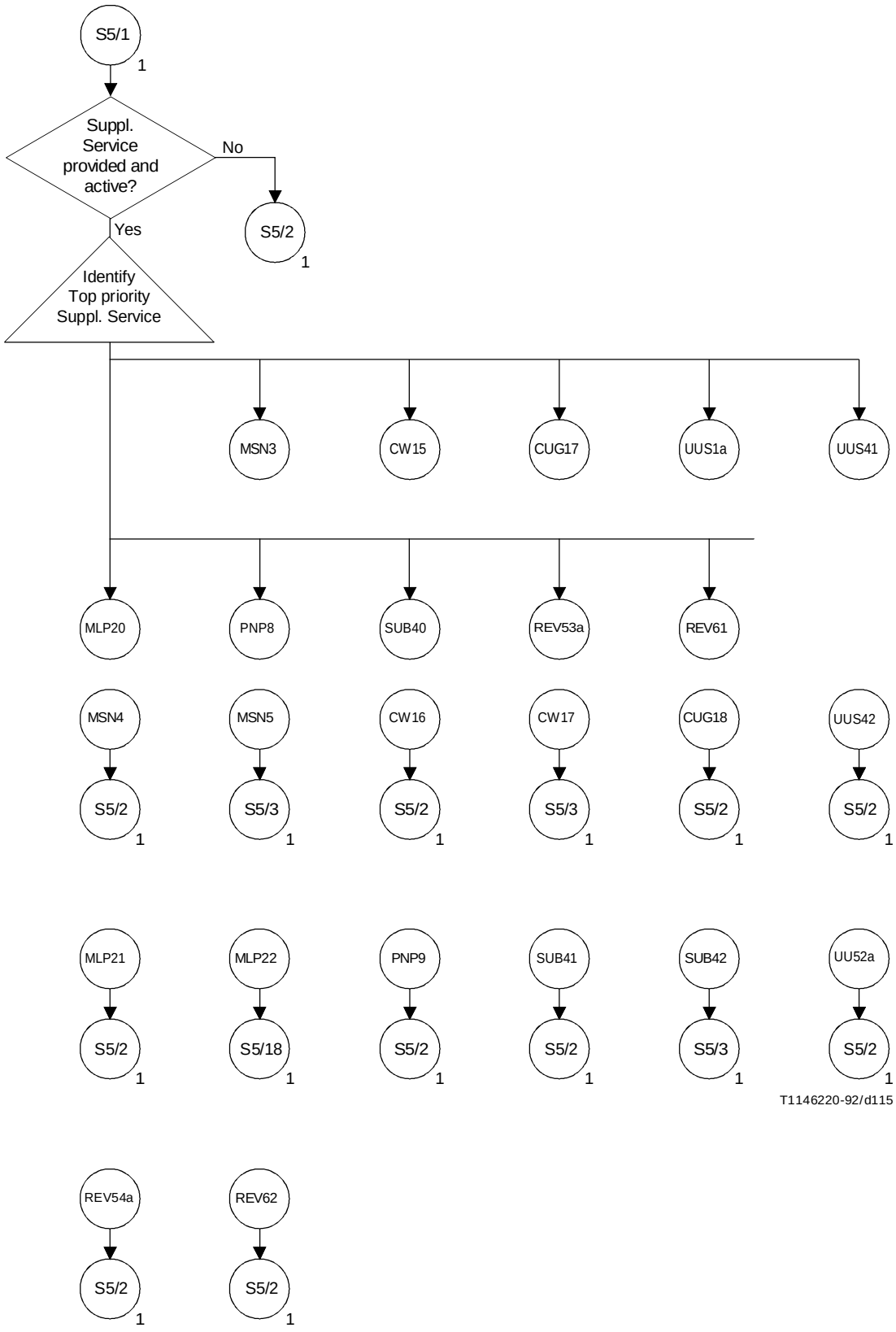

FIGURE A.5/Q.71 (sheet 5 of 12)

CCA (FE5) – Interworking with Supplementary Services

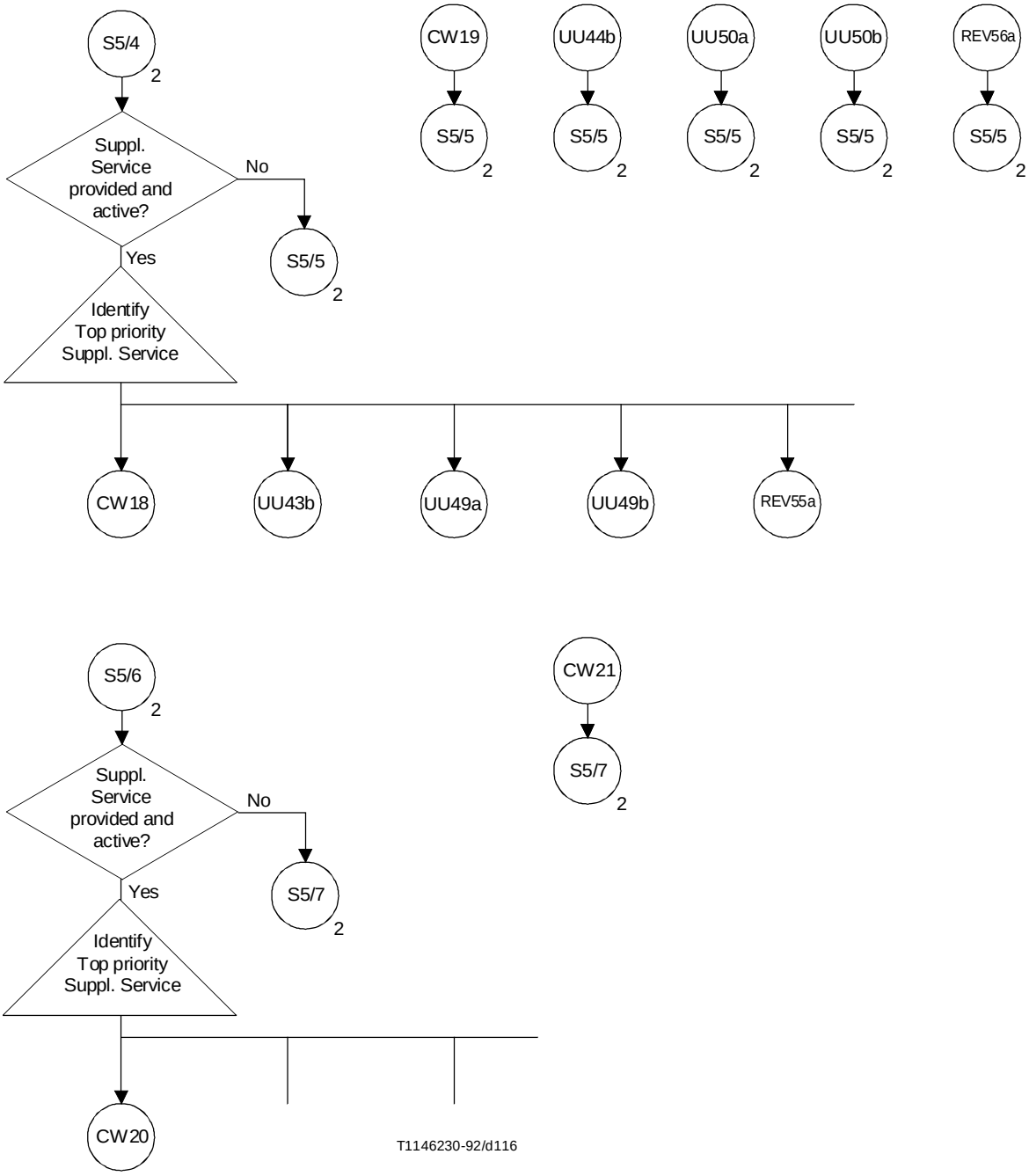

FIGURE A.5/Q.71 (sheet 6 of 12)

CC (FE5) – Interworking with Supplementary Services

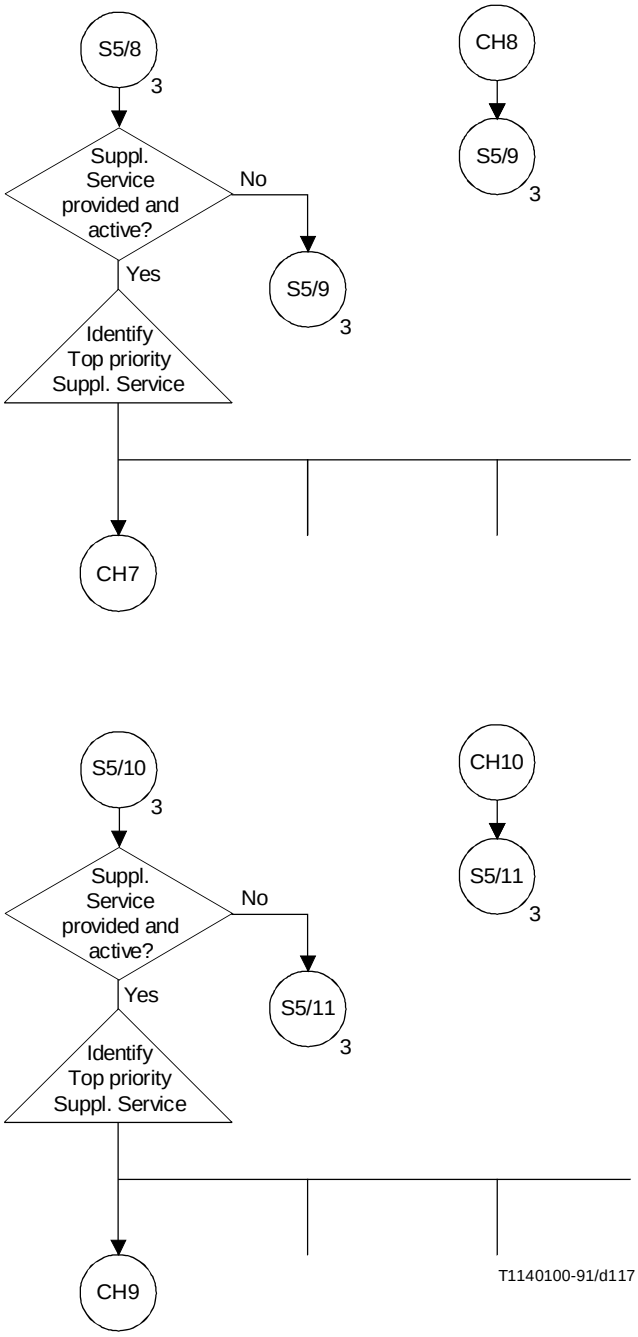

FIGURE A.5/Q.71 (sheet 7 of 12)

CCA (FE5) – Interworking with Supplementary Services

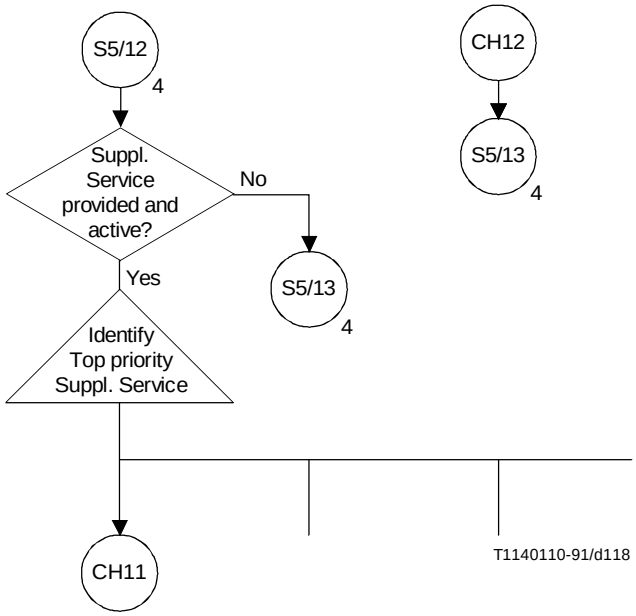

FIGURE A.5/Q.71 (sheet 8 of 12)

CCA (FE5) – Interworking with Supplementary Services

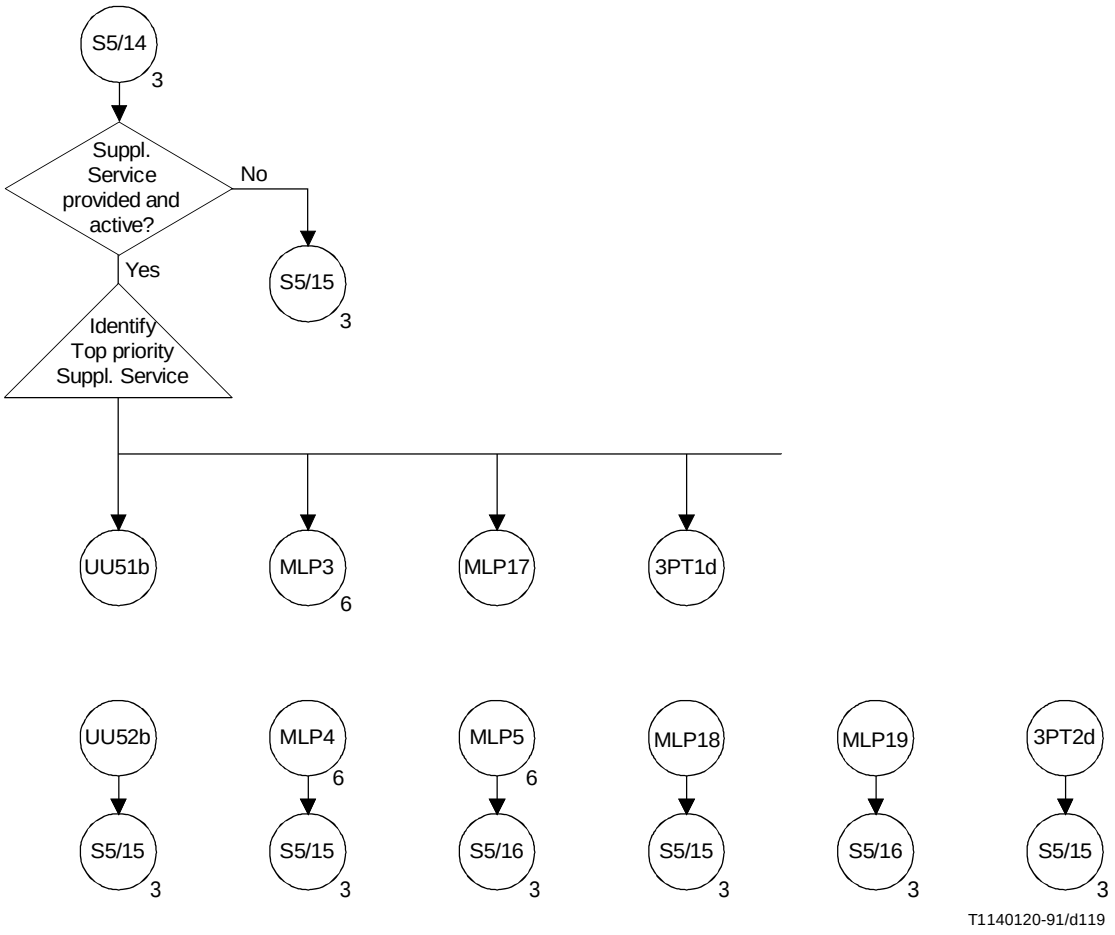

FIGURE A.5/Q.71 (sheet 9 of 12)

CCA (FE5) – Interworking with Supplementary Services

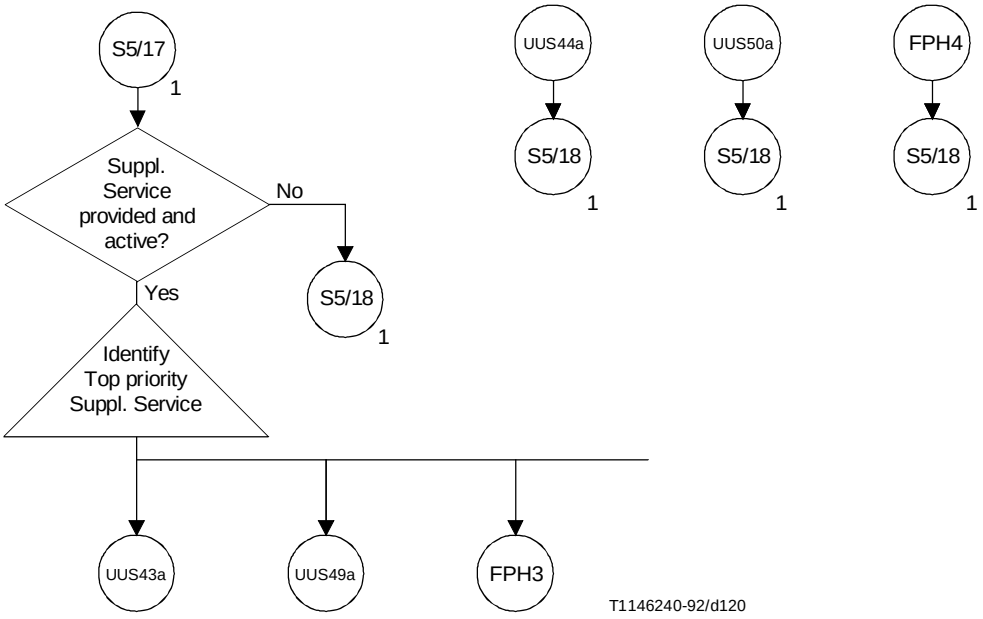

FIGURE A.5/Q.71 (sheet 10 of 12)

CCA (FE5) – Interworking with Supplementary Services

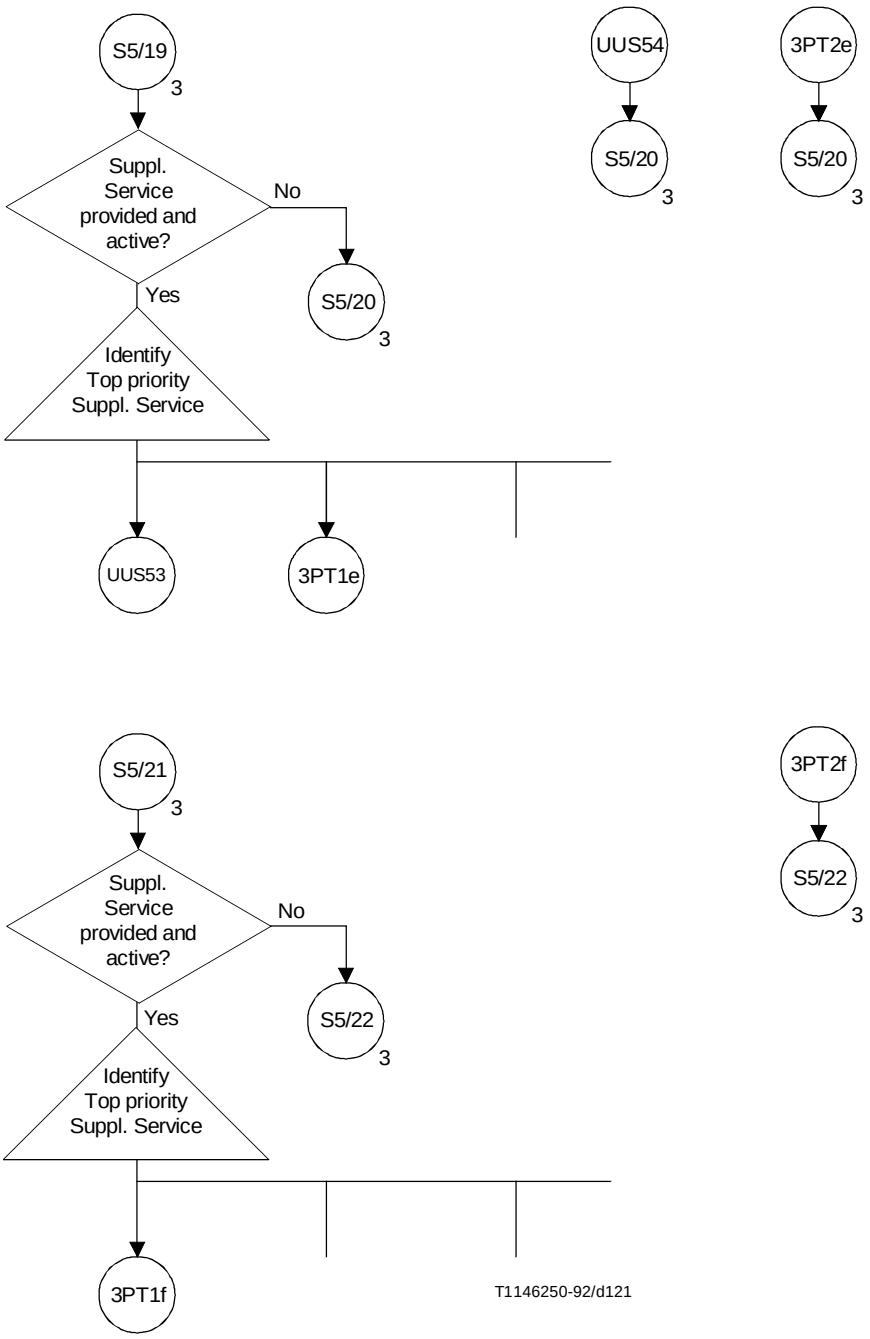

FIGURE A.5/Q.71 (sheet 11 of 12)

CCA (FE5) – Interworking with Supplementary Services

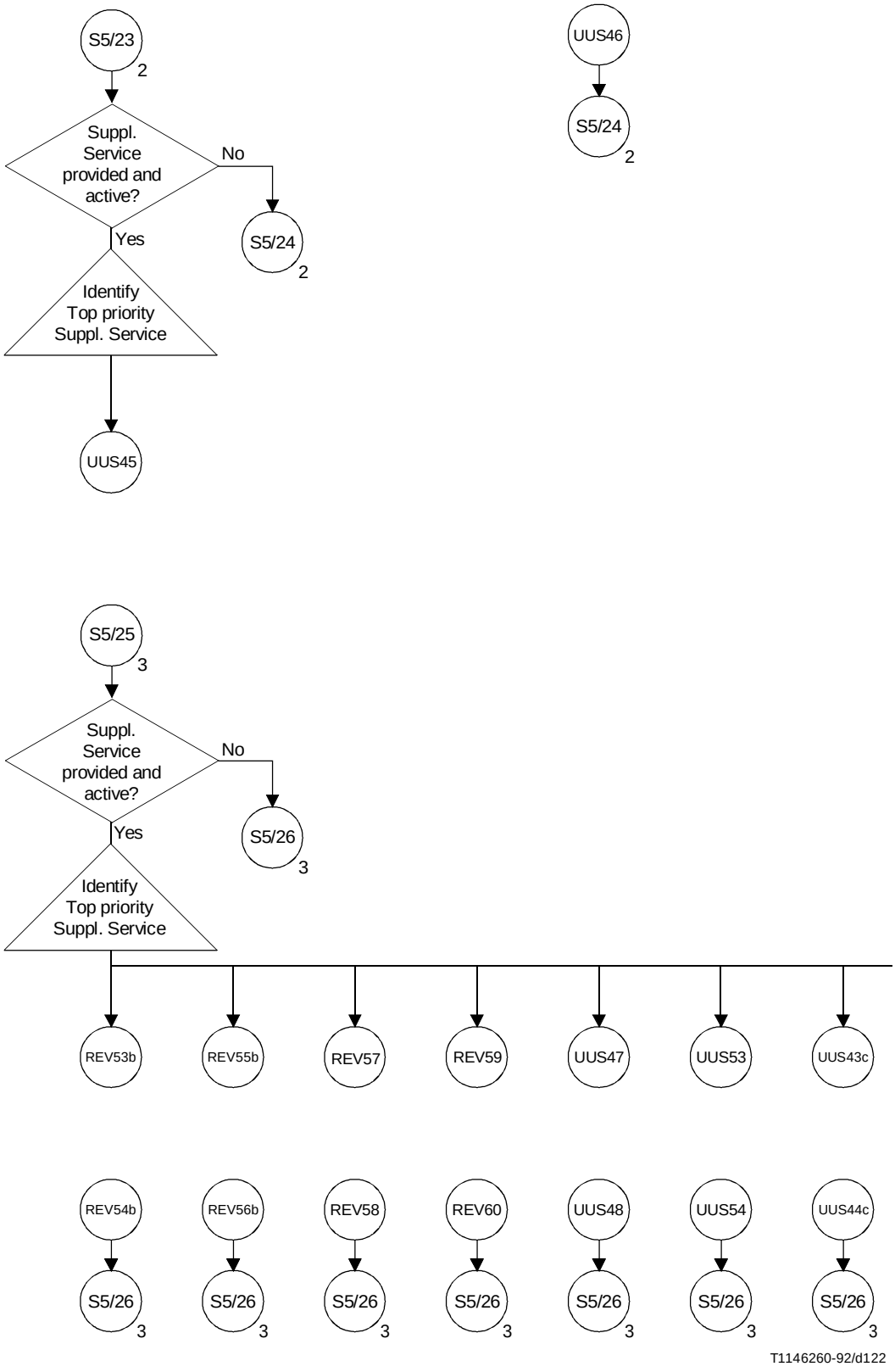

FIGURE A.5/Q.71 (sheet 12 of 12)

CCA (FE5) – Interworking with Supplementary Services

Reference table for relationship between Hooks referred to in Supplementary Services published in CCITT *Blue Book* (1988) and in the present version of this Recommendation

User-to-User-Signalling

Blue Book	This annex
UUS1 and UUS2 break the transition during FEA 211 by following the "Process service request" and prior to the sending SETUP req.ind. [see Figure 2-8 (Sheet 1 of 11)]. (Ref. 1)	S1/1 S1/2
UUS3a and UUS4a break the transition during CCA's state "1 CALL SENT" subsequent to the receipt REPORT (alerting) req.ind. but prior to the receiving SETUP resp.conf. [see Figure 2-8 (Sheet 2 of 11)]. (Ref. 2)	S1/3 S1/4
UUS3b and UUS4b break the transition during CCA's state "1 CALL SENT" subsequent to the receipt SETUP resp.conf. but prior to the sending of SETUP conf. [see Figure 2-8 (Sheet 2 of 11)]. (Ref. 3)	S1/21 S1/22
UUS3c and UUS4c occurs during CCA state "ACTIVE" prior to the reception of the basic call clearing information flow [see Figure 2-8 (Sheet 5 of 11)]. (Ref. 4)	S1/29 S1/30
UUS5 and UUS6 break the transition during CCA state "1 CALL SENT" subsequent to the receipt REPORT (alerting) req.ind. but prior to the receiving SETUP resp.conf. [see Figure 2-8 (Sheet 2 of 11)]. (Ref. 5)	S1/3 S1/4
UUS7 and UUS8 same as Reference No. 4 (Ref. 6)	S1/29, S1/30
UUS9 and UUS10 same as Reference No. 5 (Ref. 7)	S1/3, S1/4
UUS11a and UUS12a same as Reference No. 1 (Ref. 8)	S1/1, S1/2
UUS11b and UUS12b break the transition during CCA state "ACTIVE" subsequent to the reception DISCONNECT req. but prior to the sending DISCONNECT req.ind. to FE2 [see Figure 2-8 (Sheet 5 of 11)]. (Ref. 9)	S1/15 S1/16
UUS13 and UUS14 same as Reference No. 4 (Ref. 10)	S1/29, S1/30
UUS15 and UUS16 break the transition during the basic call CCA's FEA 221 by following the "Y" branch of the decision "Successful" and prior to the decision "Full Address" [see Figure 2-9 (Sheet 1 of 19)]. (Ref. 11)	S2/1 S2/2
UUS17 and UUS18 same as Reference No. 11 (Ref. 12)	S2/1, S2/2
UUS19 and UUS20 break the transition during the basic call CC FEA 221 subsequent to the sending PROCEEDING req.ind. but prior to the sending SETUP req.ind. to FE3 [see Figure 2-9 (Sheet 2 of 19)]. (Ref. 13)	S2/9 S2/10
UUS21 and UUS22 break the transition during CC state "1 CALL SENT" subsequent to the receiving REPORT (alerting) req.ind. but prior to the receiving SETUP resp.conf. [see Figure 2-9 (Sheet 3 of 19)]. (Ref. 14)	S2/19 S2/20
UUS23 and UUS24 break the transition during CC state "CALL SENT" subsequent to the receiving SETUP resp.conf. but prior to the sending SETUP resp.conf. [see Figure 2-9 (Sheet 4 of 19)]. (Ref. 15)	S2/25 S2/26

Blue Book	This annex
UUS25a and UUS26a same as Reference No. 14 (Ref. 16)	S2/19, S2/20
UUS25b and UUS26b break the transition during CC state "ACTIVE" prior to the reception of the basic call clearing information flow [see Figure 2-9 (Sheet 5 of 19)]. (Ref. 17)	S2/49 S2/50
UUS27a and UUS28a same as Reference No. 14 (Ref. 18)	S2/19, S2/20
UUS27b and UUS28b same as Reference No. 17 (Ref. 19)	S2/9, S2/10
UUS29a and UUS30a break the transition during FEA 231 by following the "Y" branch of the decision "Successful" and prior to the sending SETUP req.ind. to FE4 [see Figure 2-9 (Sheet 11 of 19)]. (Ref. 20)	S3/5 S3/6
UUS29b and UUS30b break the transition during CC state "ACTIVE" prior to the receipt of the basic call clearing information flow [see Figure 2-9 (Sheet 12 of 19)]. (Ref. 21)	S3/7 S3/8
UUS31a and UUS32a break the transition during CC state "CALL SENT" subsequent to the sending SETUP req.ind. but prior to the receipt SETUP resp.conf. [see Figure 2-9 (Sheet 11 of 19)]. (Ref. 22)	S3/9 S3/10
UUS31b and UUS32b same as Reference No. 21 (Ref. 23)	S3/7, S3/8
UUS33 and UUS34 break the transition during CC state FEA 241 by following the "Y" branch of the decision "Successful" and prior to the sending SETUP req.ind. to FE5 [see Figure 2-9 (Sheet 7 of 19)]. (Ref. 24)	S4/31 S4/32
UUS35a and UUS36a break the transition during CC state "CALL SENT" subsequent to the receipt SETUP resp.conf. [see Figure 2-9 (Sheet 8 of 19)]. (Ref. 25)	S4/19 S4/20
UUS37a and UUS38a break the transition during CC state "CALL SENT" subsequent to the receipt SETUP resp.conf. [see Figure 2-9 (Sheet 8 of 19)]. (Ref. 27)	S4/5 S4/6
UUS37b and UUS38b break the transition during CC state "ACTIVE" prior to the receipt of the basic all clearing information flow [see Figure 2-9 (Sheet 9 of 19)]. (Ref. 28)	S4/11 S4/12
UUS39 and UUS40 same as Reference No. 28 (Ref. 29)	S4/11, S4/12
UUS41 and UUS42 break the transition during FEA 251 "Process Attempt" [see Figure 2-8 (Sheet 7 of 11)]. (Ref. 30)	S5/1 S5/2
UUS43a and UUS44a break the transition during CCA state "CALL SENT" subsequent to the sending REPORT (alerting) req.ind. [see Figure 2-8 (Sheet 7 of 11)]. (Ref. 31)	S5/17 S5/18
UUS43b and UUS44b break the transition during CCA state "incoming setup" subsequent to the reception SETUP resp. but prior to the sending of SETUP resp.conf. [see Figure 2-8 (Sheet 8 of 11)]. (Ref. 32)	S5/4 S5/5

Blue Book	This annex
UUS43c and UUS44c break the transition during CCA state "ACTIVE" prior to the reception of the basic call clearing information flow [see Figure 2-8 (Sheet 10 of 11)]. (Ref. 33)	S5/25 S5/26
UUS45 and UUS46 break the transition during CCA state "INCOMING SETUP" subsequent to the sending REPORT (alerting) req.ind. but prior to the receiving SETUP resp.conf. [see Figure 2-8 (Sheet 8 of 11)]. (Ref. 34)	S5/45 S5/46
UUS47 and UUS48 same as Reference No. 33 (Ref. 35)	S5/25, S5/26
UUS49a and UUS50a same as Reference No. 31 (Ref. 36)	S5/17, S5/18
UUS49b and UUS50b break the transition during CCA state "INCOMING SETUP" subsequent to the reception of SETUP resp. but prior to the sending SETUP resp.conf. to FE4 [see Figure 2-8 (Sheet 8 of 11)]. (Ref. 37)	S5/4 S5/5
UUS51a and UUS52a break the transition during CCA state FEA 251 by following the "Y" branch of the decision "Compatible" and prior to the incoming "SETUP ind." to user [see Figure 2-8 (Sheet 7 of 11)]. (Ref. 38)	S5/1 S5/2
UUS51b and UUS52b break the transition during CCA state FEA 351 subsequent to the receipt of the DISCONNECT req.ind. but prior to the sending of the DISCONNECT ind. to the user [see Figure 2-8 (Sheet 10 of 11)]. (Ref. 39)	S5/14 S5/15
UUS53 and UUS54 same as Reference No. 33 (Ref. 40)	S5/25, S5/26
MLPP	
MLPP 1 and MLPP 2 break the basic call transition during FEA 211 [see Figure 2-8 (Sheet 1 of 11) of CCITT Recommendation Q.71 [3]], immediately following the task "process service request connect". MLPP 2 reconnects at the same point.	S1/1 S1/2
MLPP 3, MLPP 4 and MLPP 5 break the basic call transition during FEA 351 [see Figure 2-8 (Sheet 10 of 11) of CCITT Recommendation Q.71 [3]], immediately following the task "process demand". MLPP 4 reconnects at the same point. MLPP 5 connects immediately after event "DISCONNECT ind."	S5/14 S5/15 S5/16
MLPP 6, MLPP 7 and MLPP 8 enter the basic call transition during FEA 221 [see Figure 2-9 (Sheet 1 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "No" branch of the decision "Successful".	S2/6
MLPP 6a and MLPP 6b break the basic call transition Featuring FEA 221 [see Figure 2-9 (Sheet 1 of 19) of CCITT Recommendation Q.71 [3]], immediately following the event "SETUP req.ind." LPP 6b reconnects at the same point.	S2/17 S2/18
MLPP 8b enters the basic call transition during FEA 221 [see Figure 2-9 (Sheet 2 of 19) of CCITT Recommendation Q.71 [3]], immediately prior to the event "SETUP req.ind."	S2/10

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MLPP 9 and MLPP 9a break the basic call transition during FEA 233 [see Figure 2-9 (Sheet 3 of 19) of CCITT Recommendation Q.71 [3]], immediately following the event "REPORT req.ind." MLPP 9a reconnects at the same point.	S2/19 S2/20
MLPP 9b enters the basic call transition during FEA 221 [see Figure 2-9 (Sheet 2 of 19) of CCITT Recommendation Q.71 [3]], immediately prior to the event "SETUP req.ind."	S2/10
MLPP 9c and MLPP 9d break the basic call transition during FEA 231 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the event "SETUP req.ind." MLPP 9d reconnects at the same point.	S3/3 S3/4
MLPP 9e enters the basic call transition during FEA 231 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "Yes" branch of the decision "Successful?".	S3/6
MLPP 10 and MLPP 11 enter the basic call transition during FEA 241 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the task "Determine reason".	S4/2
MLPP 12 and MLPP 12a break the basic call transition during FEA 243 [see Figure 2-9 (Sheet 8 of 19) of CCITT Recommendation Q.71 [3]], immediately following the event "REPORT req.ind." MLPP 12a reconnects at the same point.	S4/5 S4/6
MLPP 12b enters the basic call transition during FEA 231 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "Yes" branch of the decision "Successful?"	S3/6
MLPP 13 enters the basic call transition during FEA 241 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "Idle" state.	S4/30
MLPP 13a and MLPP 13b break the basic call transition during FEA 241 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "Yes" branch of the decision "Successful?". MLPP 13b reconnects at the same point.	S4/31 S4/32
MLPP 14 enters the basic call transition during FEA 241 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "No" branch of the decision "Successful".	S4/2
MLPP 15 enters the basic call transition during FEA 244 [see Figure 2-9 (Sheet 8 of 19) of CCITT Recommendation Q.71 [3]], immediately following the event "REPORT req.ind."	S4/6
MLPP 16 enters the basic call transition during FEA 241 [see Figure 2-9 (Sheet 7 of 19) of CCITT Recommendation Q.71 [3]], immediately following the "RELEASE req.ind."	S4/34