INTERNATIONAL TELECOMMUNICATION UNION

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THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

BLUE BOOK

VOLUME VI — FASCICLE VI.6

INTERWORKING
OF SIGNALLING SYSTEMS

RECOMMENDATIONS Q.601-Q.699

IXᵀᴴ PLENARY ASSEMBLY
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OF SIGNALLING SYSTEMS

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CONTENTS OF THE CCITT BOOK
APPLICABLE AFTER THE NINTH PLENARY ASSEMBLY (1988)

BLUE BOOK

Volume X

CONTENTS OF FASCICLE VI.6 OF THE BLUE BOOK

Recommendations Q.601 to Q.699

Interworking of Signalling Systems

SECTION 2 — *Logic procedures*

1   The strict observance of the specifications for standardized international signalling and switching equipment is of the utmost importance in the manufacture and operation of the equipment. Hence these specifications are obligatory except where it is explicitly stipulated to the contrary.

The values given in Fascicles VI.1 to VI.14 are imperative and must be met under normal service conditions.

2   The Questions entrusted to each Study Group for the Study Period 1989-1992 can be found in Contribution No. 1 to that Study Group.

3   In this Fascicle, the expression "Administration" is used for shortness to indicate both a telecommunication Administration and a recognized private operating agency.

FASCICLE VI.6

Recommendations Q.601 to Q.699

INTERWORKING OF SIGNALLING SYSTEMS

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SECTION 1

GENERAL CONSIDERATIONS

Recommendation Q.601

1 GENERAL

1.1 *Change from narrative to SDL presentation*

These Recommendations provide a set of interworking specifications for CCITT signalling systems. The specifications are based on the CCITT Specification and Description Language (SDL) described in Recommendations Z.101 to Z.104. In these Recommendations on interworking, the SDL is used as a specification language.

Existing specifications in narrative form have not completely and unambiguously specified interworking of CCITT Signalling Systems. In addition, the introduction of digital switching, transmission and signalling systems creates new interworking demands.

Previous interworking specifications have been analysed and reconsidered in preparation of the present Recommendations. Where discrepancies exist between the previously printed interworking specifications and the interworking specifications of the present Recommendations, the latter shall be binding.

The new SDL interworking specifications will not replace the existing (narrative) specifications of the signalling systems concerned. They will only cover that part of the signalling system procedures which is of importance to interworking. The detailed procedures of the signalling systems are to be found in the existing Recommendations (Red Book, Fascicles VI.2, VI.3, VI.4, VI.7 and VI.8). Furthermore, only those switching procedures are shown that are relevant to interworking.

SDL provides an implementation independent and comprehensive method of presentation. It encompasses the previous interworking Recommendations and ensures that the interworking conditions are included in a regular and formalized manner. The chosen method facilitates the specification of interworking with future signalling systems. The use of well defined events with a graphical presentation reduces readers' language problems.

1.2 *Compatibility between signalling systems*

During the development of CCITT Signalling Systems, the signalling capacity has constantly been increased. In this way it has been possible to incorporate new features. However, it is not always possible to transfer these features when interworking with older systems.

In the case of signalling systems with large signalling capacity, it is possible to transmit distinct statements on certain conditions, e.g. "busy", "type of connection", etc. On the other hand, however, signalling systems with small signalling capacity require more general meanings to be assigned to the signals. Figure 1/Q.601 illustrates this by an example.

Since the CCITT Signalling Systems are to be used for international telephone communication, interworking between the different signalling systems must be ensured. Interworking takes place in a transit exchange which must possess suitable equipment for processing the signals of both signalling systems involved. Interworking of the signalling systems can take place on all levels of the telephone network:

- national,

- regional,

- international.

With a number of s different signalling systems the maximum number of interworking combinations will be:

$$i = s \cdot (s - 1)$$

If the present standardized Signalling Systems No. 4, No. 5, No. 6, No. 7, R1 and R2 only are taken into account, a total of 30 different interworking combinations is obtained with $s = 6$.

A ───── System No. 4 ───── T_1 ───── System No. 5 ───── T_2 ───── System R2 ───── T_3 ───── System No. 6 ───── B

Busy-flash signal	Busy-flash signal	A-4 : Congestion in the national network	NNC : National-network-congestion signal
		B-4 : Congestion (encountered after changeover from A signals to B signals)	CFL : Call-failure signal ADI : Address-incomplete signal
		A-15 : Congestion in an international exchange or its output	SEC : Switching-equipment-congestion signal CGC : Circuit-group-congestion signal
		B-3 : Subscriber line busy	SSB : Subscriber-busy signal (electrical)

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FIGURE 1/Q.601

Hypothetical transit connection; interworking of some backward signals

The number of possible combinations becomes even greater if the national signalling systems are taken into account.

The method for interworking of standardized CCITT Signalling Systems described in these Recommendations may also be advantageous for interworking with other signalling systems.

2 INTRODUCTION

interworking is defined to be

— the controlled transfer of signalling information across the interface between different signalling systems where the significance of the transferred information is identical or where the significance is translated in a defined number, and

— the performance of appropriate switching procedures in association with the transfer.

The duration of interworking commences with the instant when an outgoing signalling system is successfully selected and the interworking continues throughout the call until the connection is released. Interworking ceases with the release of the connection whether the release is initiated by reception of a clear-forward signal or in response to some other condition.

2.1   *Functional partitioning*

When interworking is specified in SDL, three separate functional blocks with distinct procedures[1] are used (see Figure 2/Q.602), namely

— the incoming signalling system logic procedures,

— the interworking logic procedures,

— the outgoing signalling system logic procedures.

It is understood that interworking logic procedures are dealt with in the second functional block. This functional subdivision allows only those events which can be processed within the individual incoming and outgoing signalling system logic procedures part to be sent to or from the interworking logic procedures part.

Both the incoming and outgoing signalling system logic procedures cause actions such as the sending of an acknowledgement signal, the starting of time supervision, and the generation of an interworking event that includes additional information, e.g. the use of satellite circuits and echo suppressors.

The action following the reception of an interworking event may be the generation of one or more signals as well as the operation of internal signalling and switching procedures.

The interworking logic procedures are used to specify the action to be taken in all cases, especially when there is no direct translation from an interworking event to a signal.

2.2   *Descriptive tools*

A general approach to specifying interworking — known as events approach — is used.

To prepare SDL diagrams three sets of events are used (see Recommendation Q.603), namely

— Forward Interworking Telephone Events (FITEs)

— Backward Interworking Telephone Events (BITEs) and

— Switching Processing Interface Telephone Events (SPITEs).

FITEs perform information transfer in the forward direction from an incoming signalling system to an outgoing signalling system.

BITEs perform information transfer in the backward direction from an outgoing signalling system to an incoming signalling system.

SPITEs describe the information flow at the functional interface between signalling and switching. These events are considered to be internal to the signalling procedures.

In the events approach, all information transfer between any incoming and outgoing signalling system occurs at a standard interface by means of interworking telephone events. This is illustrated in Figure 2/Q.602. The concept of an interworking event is generally valid and applies to all interworking combinations.

To provide a tool for the interworking specifications, *information analysis tables* (see Recommendation Q.604) are prepared. They identify the information elements of all forward and backward signals (which are relevant to interworking) for each signalling system. They also identify the possible information loss, addition or change which occurs in the case of interworking of signalling systems.

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[1] In the Recommendations on interworking of signalling systems the term "procedure" is used in the same way as the term "process" in Recommendation Z.101, § 2.1

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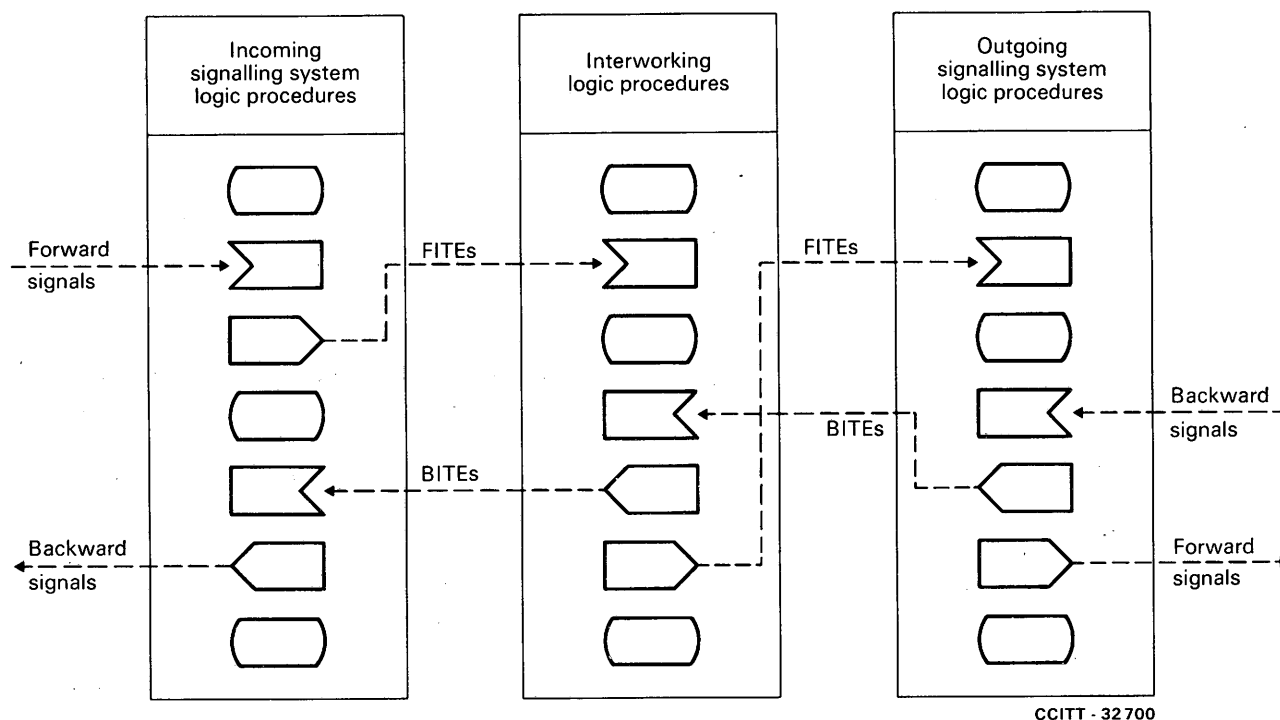
FIGURE 2/Q.602

Partitioning of interworking procedures in functional blocks (SPITEs are not presented in this figure)

2.3   *Symbols*

The symbols and rules of SDL used for interworking specifications are presented in Recommendation Z.102.

2.4   *Rules for interworking diagrams*

The general objective is to present all the interworking specifications by means of SDL.

The following rules apply to interworking specifications:

2.4.1   The interworking specifications shall be implementation independent.

2.4.2   They shall facilitate the specification of interworking with other signalling systems.

2.4.3   They shall be unambiguous and as complete as possible, this means specifically that:

a)   only those switching procedures shall be represented which directly influence the interworking of signalling systems;

b)   only those procedures of the outgoing and the incoming signalling system logic are specified which are relevant to interworking, i.e. procedures which are signalling system dependent and others which have no influence on the interworking procedures are not represented in the functional parts of the outgoing and incoming signalling system logic procedures;

c)   detailed information, such as the exact description of the compelled signalling cycle, recognition times of signals, encoding, frequencies used, is not described in the outgoing or incoming functional parts. Such details can be found in the specifications of the signalling system;

d)   conditions resulting from malfunctions of equipment which have no relevance to interworking, shall not be taken into account.

2.4.4   SDL connector symbols are used to cover some detailed procedures that need not be represented when their descriptions are not important for the interworking procedures.

2.4.5   Equipment terminology, e.g. "register" mentioned in the logic procedures is understood to be functional.

2.4.6   The information analysis tables include only signals relevant to interworking. Any internal signals with a meaning specific to a single signalling system are not listed.

2.4.7   In drawing the SDL diagrams for the interworking specifications, it was assumed that no time elapses between consecutive states; i.e. state transitions are instantaneous. Time elapses only within a state.

3 EVENTS

All information transfer between incoming and outgoing signalling systems logic procedures occurs as events. These events are represented as FITEs, BITEs and activation signals. In addition, SPITEs are used internally.

The translation of the information content of a signal into its corresponding interworking telephone event must not lead to a change of its information content, i.e. the information content must be translated only into one single interworking telephone event.

Tables A-1 to A-3[1] list all of the forward interworking telephone events (FITEs), backward interworking telephone events (BITEs) and switching processing interface telephone events (SPITEs).

There are some events which are the direct result of signals received in some particular call phase. These events perform the transfer of signalling information. However not all signals directly generate interworking events.

There are some events which are the result of signals in a particular call phase and internal logic procedures. This applies particularly to routing, country code indications and echo-suppressor control.

There are some events (e.g. due to time-outs) which are purely the result of internal interworking logic procedures. In addition, it may be useful to consider the internal procedures of the various signalling systems, which do not generate interworking events.

In using the events approach the following rules are observed:

a) In generating events all the circumstances under which the event may arise are examined so that the event description is exact.

b) All events which have been identified by considering the response of a signalling system to events are included in Tables A-1 to A-3.

Recommendation Q.604

4 INFORMATION ANALYSIS TABLES

Information analysis tables are provided for each signalling system. These tables list the information elements of the forward and backward signals for CCITT signalling systems.

Tables A-4 to A-8[1] show the forward signals relevant to interworking of Signalling Systems No. 4, No. 5, No. 6, No. 7, R1 and R2, split up into their individual information elements. In these tables, comparisons are made between the contents of the signals used by the different systems.

Tables A-9 to A-13[1] show the backward signals relevant to interworking of Signalling Systems No. 4, No. 5, No. 6, No. 7, R1 and R2, split up into their individual information elements. In the rows headed "corresponds to signal No. .... of Signalling System ..." the signals are entered together with their corresponding signal, if any, in the different systems.

The tables include an indication to the other signalling systems where:

— equivalent signals have the same information content,

— equivalent signals are not provided,

— equivalent signals contain less or substitute information,

— equivalent signals contain additional or changed information.

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[1] See Annex A to Recommendations Q.601-Q.608.

4.1 *Information content of the signals*

The individual signals are assigned specific information so as to enable messages to be transmitted. The meaning of these signals can be seen from the specifications of CCITT Signalling Systems.

With regard to their information content, a basic distinction can be made between:

— signals containing a single information element, and

— signals containing several information elements.

An information element is understood to be the smallest indivisible component of information (within a signal) considered in this Recommendation.

For the interworking of different signalling systems, the information content of the signals to be translated is of great importance. In the case where two signalling systems interwork, it is possible to assign all signals used in the CCITT Signalling Systems to one of the following categories:

a) signals coinciding in all information elements;

b) signals coinciding at least in one, but not in all information elements;

c) signals coinciding in no information element at all.

4.2 *Consequences*

If signals with identical information content are present in the signalling systems, the interworking condition is fulfilled. No modification of information occurs (refer to a) of § 4.1 above).

If the signal meanings do not agree in all information elements, those signals must be allocated to one another where maximum agreement is to be achieved, so as to minimize the loss or addition of information (refer to b) of § 4.1 above).

If a signal possesses information elements which are not present in the signals of the other signalling system with which interworking should take place, the information concerned cannot be transmitted and the appropriate performance feature cannot be utilized (refer to c) of § 4.1 above).

In a few cases special procedures have to be laid down if the status of the connection does not permit transmission of the intended interworking signal. If conversion is not possible with certain backward signals, it may be necessary to apply a corresponding tone (see Recommendation Q.35).

In addition, there are cases in which the information content of several signals of one of the signalling systems has to be converted so as to obtain one signal of the other signalling system and vice versa.

Recommendation Q.605

5 DRAWING CONVENTIONS

In addition to Recommendations Z.101 to Z.104, the following rules apply to the logic procedures of the interworking specifications.

5.1 *Inputs and outputs*

In accordance with the basic concepts of SDL, *internal* inputs and outputs are used for logic procedures that do not go beyond the functional block involved. In addition, some SPITEs are used as *internal* inputs to describe the information flow at the interface between the signalling and switching procedures.

All other inputs and outputs, including FITEs and BITEs as well as signals, which pass from one functional block to another are considered as being *external*.

The *external* inputs and outputs point in the direction of the data flow between the three functional blocks as shown in Figure 2/Q.602.

A multiple input (i.e. a group of signals) which leads to one and the same procedure can be represented by one standard symbol including that group of signals, if possible.

5.2   *States*

State symbols shall contain

— the state number, and

— the descriptive text of the state.

Most frequently the state indicates the input being waited for.

The layout of the state symbol to be used for the interworking specifications is given in Figure 3/Q.605.

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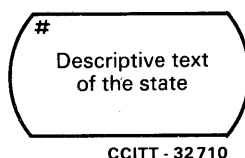
State number

FIGURE 3/Q.605

State symbol

5.3   *Connectors*

Connectors are represented by a circle. The in-connector labels (within the connector symbol) shall be unique within the same interworking diagram.

The designations used within the connector symbols are as follows (see Figure 4/Q.605):

a)   arabic numerals, where the vertical line of flow of the procedure is to be interrupted. Subscripts outside the connector indicate the sheet numbers on which the associated connectors appear;

b)   capital letters, where the horizontal line of a multiple branching of the process is to be interrupted. Subscripts outside the connectors indicate the sheet numbers, on which the associated connectors appear;

c)   "P_i" to indicate that the procedures are not completed (e.g. a subroutine or another detailed procedure). The connector symbol will then be non-subscripted with sheet numbers but be provided with the comment "to be completed" associated with a reference to the Recommendation concerned, if any.

The connector reference is always shown in the left-hand column of each sheet of the interworking diagrams.

Out-connectors

7	(7)₄	Out-connector No. 7, the corresponding in-connector is given on sheet 4
A	(A)₃	Out-connector A, the corresponding in-connector is given on sheet 3

In-connectors

7	2, 6, 8 (7) 2, 6, 8 or (7)	In-connector No. 7, the corresponding out-connectors are given on sheets 2, 6 and 8
A	5 (A)	In-connector A, the corresponding out-connector is given on sheet 5

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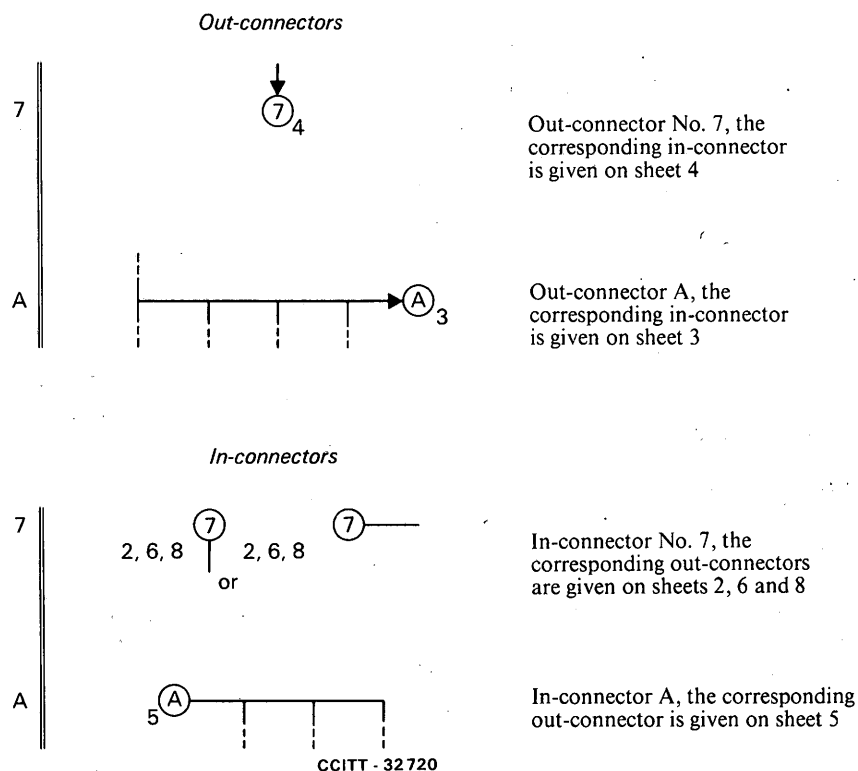
FIGURE 4/Q.605

Examples of how to use connectors

5.4 *Procedures not presented*

In general, possible signals which are not shown as inputs in a given state are to be considered as consumed but discarded, i.e. ignored. A special treatment may be required in the following cases:

a) electrical conditions not recognized as regular signals (e.g. 1 out of 6 frequencies in the case of MFC signalling);

b) regular signals, but not relevant to interworking (e.g. blocking, identification);

c) any other regular signal recognized as an abnormality (e.g. out of sequence).

In the cases a) and c), the appropriate actions to be taken are not specified in the existing Recommendations. Further study is required.

The reactions in case of signals out of sequence can be shown by means of a state/signal matrix as auxiliary documentation. The interpretation of the diagrams will then be unambiguous.

5.5 *Presentation of time supervision*

The method of time supervision presentation to be used is shown in Figure 5/Q.605.

If two timers are running in a state such that the longer timer can never mature, the input "time release" should nevertheless be shown for both timers in order that no misunderstanding can result. The meaning of start t_1 also includes the possibility of restart t_1, $\bar{t}_1$ means the expiry of t_1.
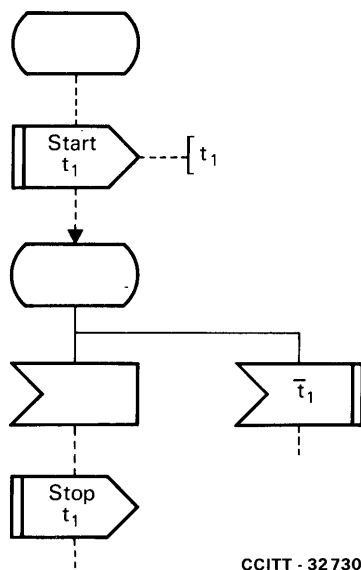
FIGURE 5/Q.605

Method of time supervision presentation

5.6   *Storage of inputs*

During the method of register function activation, all inputs are implicitly stored and the sequence of FITEs is also recorded. When the register function is not activated, inputs must explicitly be stored if required in a later state transition.

5.7   *Method of changing the order of signals*

In several interworking situations, the order in which signals are received is not necessarily the order of their utilization. Therefore, a rearrangement of the order is necessary. To change the signalling sequence in the interworking diagrams, the method indicated in Figure 6/Q.605 should be applied. Figure 6/Q.605 shows how such a situation can be coped with by SDL.

5.8   *Multiple sending of FITEs 1 or digits*

The case of multiple sending of FITEs 1 or digits often occurs in the logic procedures: in the former case in the incoming or interworking procedures, and in the latter case in the outgoing procedures of the en-bloc Signalling Systems No. 5 and R1. The presentation of Figure 7/Q.605 should be used. *a)* of Figure 7/Q.605 is used for multiple FITEs 1, while *b)* of Figure 7/Q.605 is used for outgoing Signalling Systems No. 5 or R1. In *b)* of Figure 7/Q.605 the outgoing logic has already received all the FITEs 1 and has established the "ST condition" prior to the logic sequence shown.

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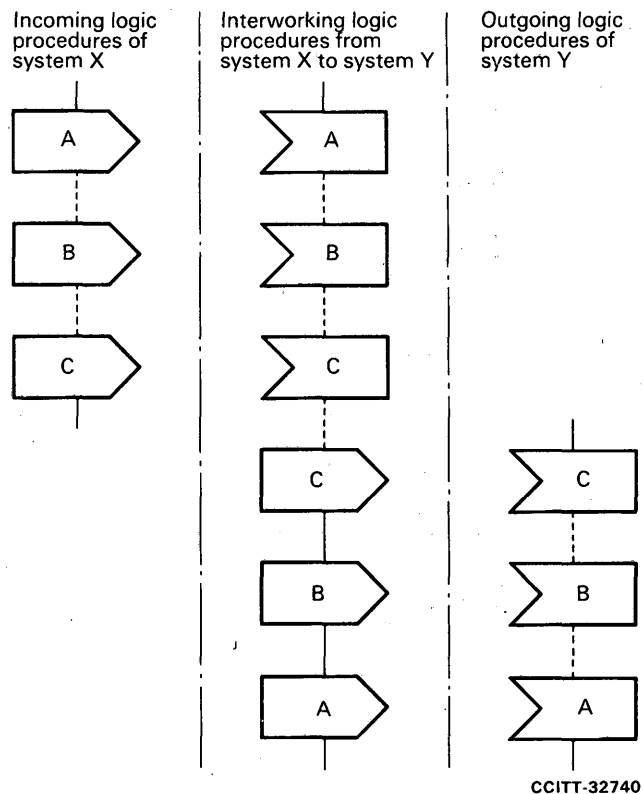
FIGURE 6/Q.605

Method of changing the order of signals

a) Normal method

*b) Method for outgoing
Signalling System R1 and No. 5*

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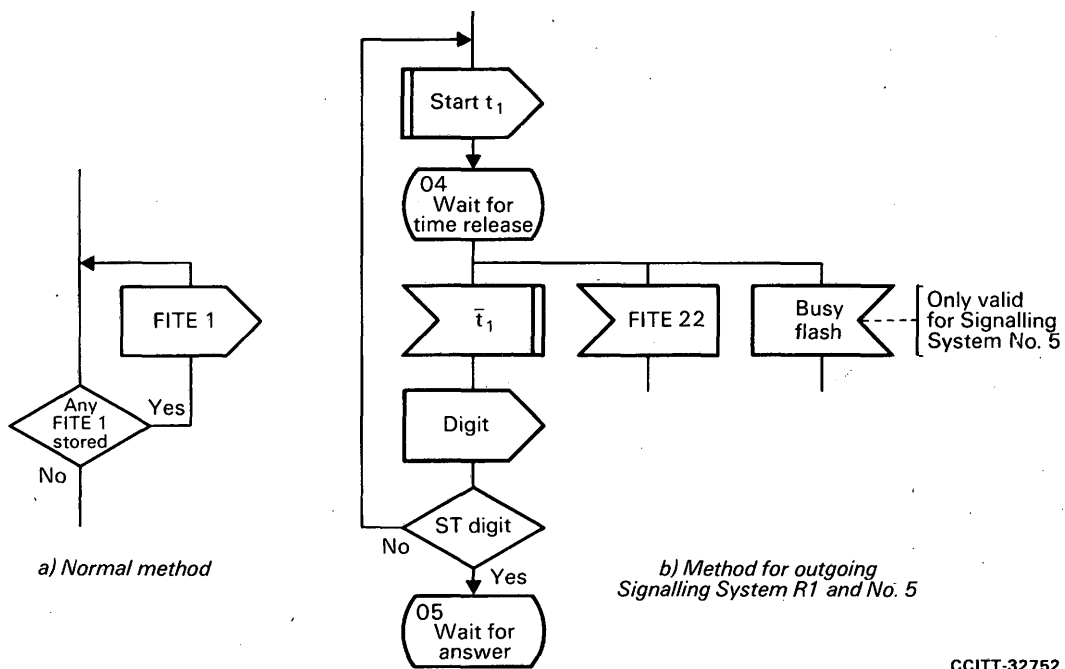
FIGURE 7/Q.605

Presentation method for multiple use of FITE 1

In interworking cases where the signalling system at the outgoing end uses the overlap signalling mode with acknowledgements (Signalling Systems No. 4 and R2) or where the signalling speed of the system at the outgoing end is lower than that at the incoming end, the presentation method indicated in Figure 8/Q.605 should be used.
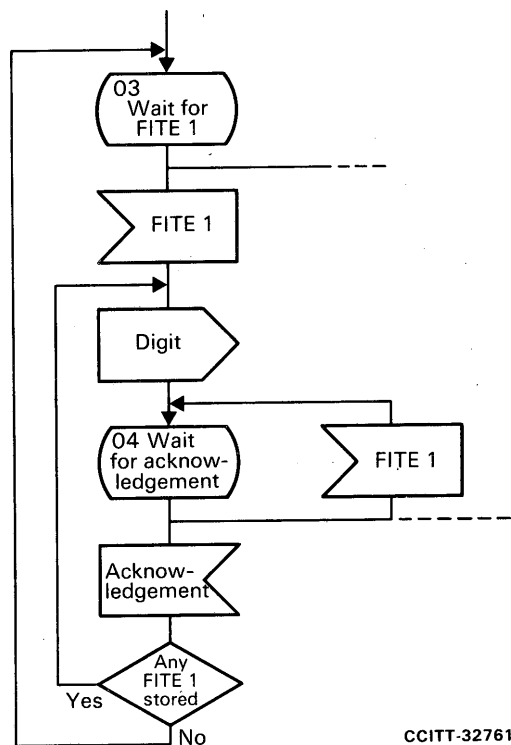
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FIGURE 8/Q.605

Presentation method for cases where the signalling system
at the outgoing end uses the overlap signalling method

Recommendation Q.606

6   LOGIC PROCEDURES

The logic procedures are prepared as:

a)   logic procedures for incoming signalling systems,

b)   interworking logic procedures,

c)   logic procedures for outgoing signalling systems.

A state overview diagram is provided with each procedure. The state overview diagram:

—   lists the states for the logic,

—   provides a sheet reference for each state, and

—   shows permitted transitions between states.

In addition, notes and timers are provided.

6.1 *Incoming signalling system logic procedures*

In specifying the logic procedures the following elements are used:

a) inputs in the form of forward signals,

b) outputs in the form of FITEs,

c) inputs in the form of BITEs,

d) outputs in the form of backward signals,

e) time supervision arrangements,

f) routing and switching aspects that are needed for interworking (SPITEs).

Incoming signalling system logic procedures are provided for:

— Signalling System No. 4 in Recommendation Q.611,

— Signalling System No. 5 in Recommendation Q.612,

— Signalling System No. 6 in Recommendation Q.613,

— Signalling System No. 7 (TUP) in Recommendation Q.614,

— Signalling System R1 in Recommendation Q.615,

— Signalling System R2 in Recommendation Q.616.

6.2 *Interworking logic procedures*

In specifying the logic procedures the following elements are used:

a) inputs in the form of FITEs from the incoming signalling system,

b) outputs in the form of FITEs to the outgoing signalling system,

c) inputs in the form of BITEs from the outgoing signalling system,

d) outputs in the form of BITEs to the incoming signalling system,

e) routing and switching aspects that are needed for interworking (SPITEs).

Interworking logic procedures can be provided for every possible combination of CCITT Signalling Systems.

The following interworking combinations are provided:

— Signalling System No. 4 to R2 in Recommendation Q.634,

— Signalling System No. 5 to No. 6 in Recommendation Q.642,

— Signalling System No. 5 to No. 7 (TUP) in Recommendation Q.643,

— Signalling System No. 5 to R1 in Recommendation Q.644,

— Signalling System No. 5 to R2 in Recommendation Q.645,

— Signalling System No. 6 to No. 5 in Recommendation Q.652,

— Signalling System No. 6 to No. 7 (TUP) in Recommendation Q.653,

— Signalling System No. 6 to R1 in Recommendation Q.654,

— Signalling System No. 6 to R2 in Recommendation Q.655,

— Signalling System No. 7 (TUP) to No. 5 in Recommendation Q.662,

— Signalling System No. 7 (TUP) to No. 6 in Recommendation Q.663,

— Signalling System No. 7 (TUP) to No. 7 in Recommendation Q.664,

— Signalling System No. 7 (TUP) to R1 in Recommendation Q.665,

— Signalling System No. 7 (TUP) to R2 in Recommendation Q.666,

— Signalling System R1 to No. 5 in Recommendation Q.671,

— Signalling System R1 to No. 6 in Recommendation Q.672,

— Signalling System R1 to No. 7 (TUP) in Recommendation Q.673,

— Signalling System R1 to R2 in Recommendation Q.674,

— Signalling System R2 to No. 4 in Recommendation Q.681,

— Signalling System R2 to No. 5 in Recommendation Q.682,

— Signalling System R2 to No. 6 in Recommendation Q.683,

— Signalling System R2 to No. 7 (TUP) in Recommendation Q.684,

— Signalling System R2 to R1 in Recommendation Q.685.

6.3   *Outgoing signalling system logic procedures*

In specifying the logic procedures, the following elements are used:

a)   inputs in the form of FITEs,

b)   outputs in the form of forward signals,

c)   inputs in the form of backward signals,

d)   outputs in the form of BITEs,

e)   time supervision arrangements,

f)   routing and switching aspects that are needed for interworking (SPITEs).

Outgoing logic procedures are provided for:

—   Signalling System No. 4 in Recommendation Q.621,

—   Signalling System No. 5 in Recommendation Q.622,

—   Signalling System No. 6 in Recommendation Q.623,

—   Signalling System No. 7 (TUP) in Recommendation Q.624,

—   Signalling System R1 in Recommendation Q.625,

—   Signalling System R2 in Recommendation Q.626.

Recommendation Q.607

7   INTERWORKING REQUIREMENTS FOR NEW SIGNALLING SYSTEMS

7.1   *Treatment of new signals in another signalling system*

In order to facilitate the interworking between new signalling systems and existing ones, it is desirable to elaborate rules to be taken into account when specifying the new signalling system(s). Since compatibility between all CCITT Signalling Systems must be ensured, any newly developed system has to meet the following requirements with regard to interworking:

a)   new signalling systems should be capable of processing all interworking events specified for the existing signalling systems without losing or adding information elements.

This is best achieved by the concept of transparency, whereby the signals of all existing systems have a unique translation into the new system and back again. In this way a tandem connection via an interposed link employing the new signalling system will neither add nor subtract from the information transfer that would otherwise have occurred had the new signalling system not been present;

b)   newly developed systems should not lead to any modification to the specifications covering the present signalling systems except that the translation of new interworking events arising from the meanings of new signals in the new system will need to be defined for the existing signalling systems.

In order that the new signals should cause the minimum loss or gain of information when interworking with existing signalling systems, any new signals should, if possible, not contain any information elements already existing. Hence it is better that these new signals convey only a single meaning rather than a multiple meaning as occurs in some existing systems (e.g. Signalling System R2 signal I-14 corresponds to FITE 8 which combines the elements of FITE 3 and FITE 5). Therefore, only one new information element will be associated with the new signal and only one new FITE or BITE will be needed.

In some cases the new signal will be translated into a presently defined signal of an existing system and hence will cause the addition or, more often, the loss of information. In some cases, no electrical signal being available, all the information may be lost or a tone may need to be used. In the case of Signalling Systems R2, No. 6 and No. 7, some reserved signals exist within the capacity of these systems and such signals may be introduced to enhance the signalling system and provide an interworking capability.

However it should be borne in mind that with such existing systems, it may not be easy or desirable to modify existing equipment, and even if such modification were possible, in the transitional period the interworking of existing and enhanced signalling equipment of the same system must also be considered.

In view of the difficulties of interworking with existing signalling systems, new features of signals should only be introduced in a new system if there are good operational reasons for doing so.

7.2 *Reserve for national use*

In practice, provision of appropriate spare signalling capacity in a new system reserved for national/regional use cannot be avoided. In such a case, precautions must be taken to prevent signals with an individual national meaning from entering the international network.

One general objective of a new signalling system should be to meet also the national requirements in order to avoid national versions of a given signalling system as far as possible.

7.3 *Unambiguous specifications*

After a clear specification of a new feature to be included in a signalling system, the related signalling procedures should be specified in a unique and standard form. The same applies to the signals involved.

The designation of signals of different signalling systems, which carry the same information, should be the same.

7.4 *Escape codes*

It is obvious that appropriate spare capacity should be provided in order to cope with future demands. One way of doing so is the provision of escape codes.

Recommendation Q.608

·8 MISCELLANEOUS INTERWORKING ASPECTS

In producing the interworking specifications in the present form some interworking aspects were found, which are not covered by the specifications of the signalling systems themselves and need to be taken into account when using the SDL diagrams for interworking specification.

8.1 *Transfer of no charge information*

Difficulties related to the use of charge or no charge information were recognized by CCITT for the following reasons:

In the case of interworking with systems not able to provide the no charge information together with the answer signal, a *no charge* call is only possible by withholding the answer signal. In the international network, the absence of the answer signal results in a time-out within a delay period of 2 to 4 minutes as described in Recommendation Q.118, which considers this situation to be abnormal. Thus for certain cases of interworking, intentional withholding of the answer signal would be identical with the abnormal condition. Thus discrimination is impossible.

It is recommended that:

a) withholding the answer signal cannot be a satisfactory solution since

   –   the connection may remain in the abnormal transmission condition (e.g. failure to enable the echo suppressor in Signalling System R2 and retention of band-stop filter in Signalling System R1),

   –   the time supervision will interrupt the connection after 2 or 4 minutes,

   and the answer signal should thus be retained (be used) even in the case of a *no charge* condition over the international network;

b) there is no necessity to modify existing equipment to provide *charge/no charge* information transfer capabilities.

From a technical viewpoint, international *no charge* calls are possible without restrictions only when the Signalling Systems No. 6, No. 7 (TUP) or R2 are used exclusively throughout the entire international network (assuming that *no charge* information is received from the national network).

In the case of interworking with systems not able to transfer the *no charge* information, a *no charge* call can at present only be provided by withholding the answer signal. Consequently the transfer of *no charge* information must not be performed in these cases.

In the case of Signalling System No. 6, the information *no charge* should be sent together with the *address-complete, no charge*. If this information is contradicted by the subsequent *answer, charge* signal the call should nevertheless not be charged (§ 4.1.9, Signalling System No. 6 specification).

The transfer of *no charge* information is possible when interworking:

from any of the Signalling Systems: No. 6[1], No. 7 (TUP)[1] and R2 to any of the Signalling Systems: No. 6, No. 7 (TUP) and R2.

8.2 *Time-out guidelines*

8.2.1 *Time-outs connected with subscribers' behaviour*

The specified register time-out of 4 to 6 seconds (after each digit is received which is resorted to when address complete cannot be identified in another way) has proved to give satisfactory technical functioning at least in those cases where the exception described in Recommendation Q.261, § 4.1.5, e) does not apply.

Insufficient information is obtained to motivate a change at this stage of the duration of the 4 to 6 seconds time-out specified in the outgoing register in cases where no address-complete indication is available.

It is recommended that the 4 to 6 seconds interdigital time-out procedure should be used where needed only. It is furthermore recommended that Administrations make their network numbering known to their respondents so that maximum use of number length analysis can be made whenever address-complete information cannot be given.

8.2.2 *General time-out guidelines for new signalling systems*

i) 20-30 seconds is considered to be the proper time-out interval for outgoing registers for non-receipt of address signals, or address complete.

ii) When backward signals are provided, if the address-complete signal is not available before 15-20 seconds after the last received address signal at the incoming register, then an address incomplete signal should be sent. If, however, it is known that the address is complete, then the time-out should be extended to 20-30 seconds.

iii) If it is known that a positive (real) address-complete signal is available but will *not* be returned within the lower limit of the 20-30 second time-out period of the outgoing register then an artificial address-complete signal should be sent within 15-20 seconds. The indiscriminate use of such a signal should be avoided. A new "call-in-progress" signal should not be used instead of the "artificial address-complete" signal.

iv) When backward signals are not available and complete number length analysis in the outgoing register is not practical, then the 4-6 seconds time-out is used to determine address complete instead of the 20-30 seconds time-out mentioned in point i). This time-out commences when the minimum number length has been reached. The number length is determined when the time-out matures or if the known maximum number length is received.

8.2.3 *General time-out guidelines for existing signalling systems*

These guidelines are primarily intended for signalling on international calls where fully overlap digit sending can occur. Other guidelines may be appropriate to some national applications.

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[1] When interworking from Signalling System No. 6 or No. 7 (TUP) to Signalling System R2 the comments of § 8.1 have to be taken into account.

During call set up both incoming and outgoing registers are normally supervised by timers. The duration of the time-out interval is defined in the relevant Recommendations defining the signalling systems. These are summarised in the table below. In the case of a multi-link connection with overlap signalling, the time between digit transmission or reception will be supervised at each exchange, and according to existing Recommendations, at both incoming and outgoing registers in each exchange. It is considered that this situation is unsuitable since the cleardown of a call where insufficient digits are dialled can lead to unpredictable results because of the possibility of timers expiring in a different order on subsequent call attempts. In some cases this can lead to different tones being returned to the calling subscriber on subsequent calls. Since the first to expire and therefore normally the controlling time-out will be the incoming register time-out of around 15-20 seconds, it is recommended that this time-out should only be activated at a single point in the connection at any stage of call set up. The most suitable point is the incoming register at the exchange closest to the called subscriber at any point in the call set up. To achieve this it is recommended that the incoming register time-out should be inhibited at each exchange once the outgoing circuit has been seized. The longer time-out of around 20-30 seconds which will be active at outgoing registers, and in some cases incoming registers also, should not be inhibited.

This feature need not be implemented at existing exchanges or for Signalling System No. 4 which has time-outs not in conformance with modern practice.

8.2.4   *Summary of inter-digital time-outs*

Type of time-out	Signalling System					
	4	5	6	7	R1	R2
Outgoing	15-30 s Q.127 § 4.4.1.2a.2		20-30 s Q.268 § 4.8.5.1(a)	20-30 s Q.724 § 6.4.1		> 24 s Q.476 § 5.5.1.2
Incoming Receipt of digit	30-60 s Q.127 § 4.4.3(2)a	10-20 s (to KP signal) 20-40 s typical (to ST signal) Annex 2 Tables 4 and 6	15-20 s Q.261 § 4.1.6	15-20 s Q.724 § 1.7	10-20 s (to ST signal) Q.325 § 3.6.2.2	8-24 s (15-24 s) (preferred) Q.476 § 5.5.2.1
Outgoing Determination of ST condition		4-6 s Q.152 § 3.2.1			4-6 s Q.321 § 3.2.1b(ii)	
Incoming Time-out after ST received			20-30 s Q.268 § 4.8.5.3(a)	20-30 s Q.724 § 6.4.3(a)		

8.3.1   When the reset signal is received on an incoming Signalling System No. 6 or 7 (TUP) circuit the succeeding circuit is released by the clear-forward procedure in all cases.

8.3.2   When the reset signal is received on an outgoing Signalling System No. 6 or 7 (TUP) circuit the response is:

   i)   to initiate the clear-forward sequence on the outgoing circuit;

   ii)   to release exchange equipment as appropriate, i.e. SPITE 3 in the register phase and SPITE 5 in the speech phase;

   iii) to return an appropriate signal and/or tone on the incoming circuit as shown in the following table.

Signalling System No.	Register phase	Wait for answer	Answered	Clear-back
4	Busy flash	Busy flash	Clear-back + congestion tone if possible	Congestion tone if possible
5	Busy flash	Busy flash		
6	CFL	CFL		
7 (TUP)	CFL	CFL		
R1	Congestion tone	Congestion tone		
R2	A4/B4	Congestion tone		

**Lists and meanings of FITEs, BITEs and SPITEs.
Representation of information contents of signals
of the Signalling Systems.**

TABLE A-1

List of forward interworking telephone events (FITEs)

No.	Forward interworking telephone events	Equivalent with signal of Signalling System					
		No. 4	No. 5	No. 6	No. 7 (TUP)	R1	R2
1	Digit 1, 2, ... 9 or 0, code 11 or 12, end-of-pulsing (ST) signal	1	1	1	1	1	1
2	Country-code indicator, country code not included	8	8	2	2		18
3	Country-code indicator, country code included	9	9	3	3		
4	Echo-suppressor indicator, outgoing half-echo suppressor not included, incoming half-echo suppressor not required			6	6		19
5	Echo-suppressor indicator, outgoing half-echo suppressor included, incoming half-echo suppressor required	10		7	7		11
6	Country-code indicator, country code included; echo-suppressor indicator, outgoing half-echo suppressor not included, outgoing half echo suppressor required						8
7	Country-code indicator, country code included; echo-suppressor indicator, outgoing half-echo suppressor not included, no echo suppressor required						9
8	Country-code indicator, country code included; echo-suppressor indicator, outgoing half-echo suppressor included, incoming half-echo suppressor required						10
9	Calling-party's-category indicator, operator, language French	2	2	8	8		2
10	Calling-party's-category indicator, operator, language English	3	3	9	9		3
11	Calling-party's-category indicator, operator, language German	4	4	10	10		4
12	Calling-party's-category indicator, operator, language Russian	5	5	11	11		5
13	Calling-party's-category indicator, operator, language Spanish	6	6	12	12		6
14	Calling-party's-category indicator, operator with forward-transfer facility						15
15	Calling-party's-category indicator, subscriber						7
16	Calling-party's-category indicator, subscriber or operator without forward-transfer facility						12

No.	Forward interworking telephone events	Equivalent with signal of Signalling System					
		No. 4	No. 5	No. 6	No. 7 (TUP)	R1	R2
17	Calling-party's-category indicator, subscriber, ordinary call	7	7	13	13		
18	Calling-party's-category indicator, subscriber, call with priority			14	14		14
19	Calling-party's-category indicator, data call			15	15		13
20	Nature-of-circuit indicator, no satellite circuit in the connection			4	4		20
21	Nature-of-circuit indicator, one satellite circuit in the connection			5	5		21
22	Clear-forward	11	10	16	16	3	16
23	Forward-transfer	12	11	17	17	2	
24	Continuity			18	18		
25	Continuity-check indicator, continuity check not required				21		
26	Continuity-check indicator, continuity check required on this circuit				20		
27	Continuity-check indicator, continuity check being done on previous circuit				22		
28	Spare						
29	Spare						
30	Service information				23		
31	General set-up message (GSM)				24		

A.1   *Explanatory notes on the meanings and uses of FITEs* (see Table A-1)

These are Forward Interworking Telephone Events sent from an incoming procedure to an interworking procedure, or from an interworking procedure to an outgoing procedure.

A.1.1   FITE 1 means one of the digits 1-9, 0, code 11, code 12 and code 15 (ST), when used as an *address signal* (i.e. not including their use for other information, e.g. language digits). Each FITE 1 represents one digit only and that digits value is implicit in the signal.

A.1.2   FITEs 2, 3, 6, 7 and 8 are events representing *country code indicators.* These signals are not sent from the incoming procedure to the interworking procedure, since the country code indicator is a link dependent signal and is used by the incoming procedure as part of the input information to the digit analysis. These FITEs are generated in the interworking procedure by the use of SPITE 22 (see Table A-3).

A.1.3   FITEs 4-8 are events representing *echo-suppressor indicators.* These signals are not sent from the incoming procedure to the interworking procedure, since the echo-suppressor indicator is a link dependent signal and is used by the incoming procedure as part of the input information to the digit analysis. These FITEs are generated in the interworking procedure by the use of SPITE 21 (see Table A-3).

A.1.4   FITEs 9-19 are events representing *calling-party's category indicators* and include telephone events derived from language digits, discriminating digits and calling-party's-category signals.

A.1.5   FITEs 20 and 21 are events representing *nature-of-circuit indicators.* These signals are not sent from the incoming procedure to the interworking procedure, but the nature-of-circuit indicator is used by the incoming procedure as part of the input information to the digit analysis. These FITEs are generated in the interworking procedure by the use of SPITE 20 (see Table A-3). These signals are not completely link dependent, since if the nature-of-circuit indicator on the incoming circuit implies one satellite in the connection, the same signal (FITE 21) will be sent to the outgoing procedure.

A.1.6   FITE 22 is an event representing the *clear-forward signal* and overrides all other procedures. It should therefore be shown as an input in all call states except idle, even though the waiting state might not appear to be capable of receiving FITE 22.

A.1.7   FITE 23 is an event representing the *forward-transfer signal* and is assumed to be capable of reception after the state *Address-complete* when the register function is deactivated and the speech condition is set up.

A.1.8   FITE 24 is an event representing the *continuity signal* in common channel signalling systems. When interworking from a channel associated signalling system to a common channel signalling system, FITE 24 must be generated by the interworking procedure.

A.1.9   FITEs 25, 26, 27 are events which define the continuity check requirements on outgoing circuits for common channel systems.

A.1.10   FITE 30 is an event which defines the Services which have been requested and can be provided e.g., Speech, Closed User Group, Digital Connectivity, etc.

A.1.11   FITE 31 is an event which defines the information to be carried by the General Set-up Message (GSM).

A.2   *Explanatory notes on the meanings and uses of BITEs* (see Table A-2)

These are Backward Interworking Telephone Events sent from an outgoing procedure to an interworking procedure, or from an interworking procedure to an incoming procedure.

A.2.1 BITE 2 is an *address-complete event* which may be originated either by the receipt of an address complete signal or by the simulation of the address complete condition from a signalling system not employing address complete signals. This latter event is designated BITE 26, when signalling from the outgoing procedure to the interworking procedure. Since in most cases the forward signalling continues beyond the time that the address-complete is simulated, BITE 2 does not cause register deactivation in the incoming logic in the way that BITEs 3-7 do. The incoming procedure must wait for the subsequent reception of BITE 27 or BITE 28 (see §§ A.2.7 and A.2.8).

A.2.2 BITEs 3-7 are *address-complete events* which cause the speech condition to be set up and the register function to be deactivated.

A.2.3 BITEs 8-17, 19, 20 are *call unsuccessful events* which cause the return of a corresponding event to the incoming procedure where the register function will be deactivated. They are separated according to the reasons of an unsuccessful call.

A.2.4 BITEs 21-24 are *answer events*, differentiated where possible.

A.2.5 BITE 25 is the event representing the *clear-back signal.*

A.2.6 BITE 26 is an event signalling the *simulation of address-complete* condition by an outgoing signalling system which does not employ address-complete signals (e.g. No. 5 or R1). If the incoming signalling system uses address-complete signals, BITE 26 is translated to BITE 2 in the interworking procedures, in other cases it is discarded.

A.2.7 BITE 27 means that an outgoing signalling system which does not employ address-complete signals has *completed forward signalling* (e.g. ST has been sent) and the *speech condition should be set up.* When used, it will follow after BITE 26.

For incoming signalling systems employing address-complete signals, BITE 27 will always be expected after BITE 2. Therefore when both interworking systems employ address-complete signals, the interworking procedure must translate BITE 2 to BITE 2 + BITE 27.

A.2.8 BITE 28 is used only from an interworking procedure to an incoming procedure in the case where a BITE is received from the outgoing procedure which has no corresponding BITE in the incoming procedure. A tone will be returned by the use of SPITE 6 in the interworking procedure, and BITE 28 is used solely to deactivate the register function in the incoming procedure.

A.2.9 BITE 29 *release incoming side*, is used from an interworking procedure to an incoming procedure for incoming systems where release procedures may be initiated in the backward direction (e.g. the INMARSAT signalling system).

A.2.10 BITE 30 *switchthrough may be completed* is used to signal from an outgoing procedure to an incoming procedure via the relevant interworking, that the speech path may be connected through.

A.2.11 BITE 31 is an event which requests the information asked for by the General Request Message (GRQ).

A.2.12 BITE 35 is a call unsuccessful event corresponding to the receipt of the Access Barred Signal (ACB). This BITE is used e.g. in Closed User Group calls.

A.2.13 BITE 36 is a call unsuccessful event that occurs when a digital path cannot be provided.

Note — Bites 35 and 36 are only used in No. 7 originated calls.

List of backward interworking telephone events (BITEs)

No.	Backward interworking telephone events	Equivalent with signal of Signalling System					
		No. 4	No. 5	No. 6	No. 7 (TUP)	R1	R2
1	Spare						
2	Address-complete, charge	1		1	1		2
3	Address-complete, no charge			2	2		
4	Address-complete, coin box			3	3		
5	Address-complete, subscriber free, charge	.		4	4		8 and 13
6	Address-complete, subscriber free, no charge			5	5		9
7	Address-complete, subscriber free, coin box			6	6		
8	Call unsuccessful	2	1				
9	Call unsuccessful, switching-equipment congestion			7	7		
10	Call unsuccessful, circuit-group congestion			8	8		
11	Call unsuccessful, switching-equipment congestion or circuit group congestion						3
12	Call unsuccessful, national-network congestion			9	9		1
13	Call unsuccessful, address-complete, national network congestion						6 and 15
14	Call unsuccessful, address incomplete			10	10		
15	Call unsuccessful, (address-complete), unallocated number			11	11		7 and 14
16	Call unsuccessful, address-complete, subscriber busy (elec.)			12	12		5
17	Call unsuccessful, address-complete, line out of service			13	13		10
18	Spare						
19	Call unsuccessful, call-failure			15	15		
20	Call unsuccessful, send special information tone			14	14		4 and 14
21	Answer, subscriber free						11
22	Answer, subscriber free, charge	3	2	16	16	1	
23	Answer, subscriber free, no charge			17	17		
24	Answer, re-answer			18	18		
25	Clear-back	4	3	19	19	2	12

No.	Backward interworking telephone events	Equivalent with signal of Signalling System					
		No. 4	No. 5	No. 6	No. 7 (TUP)	R1	R2
26	Artificial address complete is sent [a]		4			3	
27	Sending-finished; set up speech condition [a]		5			4	
28	Deactivate register function [a]						
29	Release incoming side [a]						
30	Switchthrough may be completed [a]						
31	General request message (GRQ)				20		
32	Spare						
33	Spare						
34	Spare						
35	Call unsuccessful, access barred				21		
36	Call unsuccessful, digital patch not provided (DPN)				22		

[a] These signals do not necessarily correspond to a backward signal but correspond to logic events.

TABLE A-3

List of switching processing interface telephone events (SPITEs)

No.	Designation	Symbol
1	Activate register function (physical register or equivalent function)	Task
2	Register function activated	Internal input
3	Deactivate register function	Task
4	Set up speech condition	Task
4A	Speech path may be set up	Task
5	Release speech condition (of the speech path in the exchange)	Task
6	Return appropriate tone	Task
7	Disconnect tone	Task
8	Release all equipment (covers also disconnection of tones; exclusively used at the incoming procedures)	Task
9	Spare	
10	Spare	
11	Shall digit analysis be started?	Decision
12	Perform digit analysis	Task
13	Digit analysis cannot be completed (covers insufficient information, waiting for enough digits for routing, etc.)	Internal input
14	Routing information and service provided	Internal input
15	Unallocated number	Internal input
16	Unprovided routing (e.g. transit connection received at an exchange handling termination traffic only)	Internal input
17	Barred routing	Internal input
18	Switching equipment congestion	Internal input
19	Circuit group congestion	Internal input
20	Satellite link included?	Decision
21	Incoming half-echo suppressor to be included at distant end?	Decision
22	Transit connection following? (otherwise a terminal connection is following)	Decision
23	Has Z-digit been received?	Decision
24	Is this the Z-digit?	Decision
31	Perform continuity check at the outgoing end (covers all necessary switching procedures: — connecting of the transceiver — disabling of echo suppressors — sending check tone — automatic reattempts, where applicable)	Task
32	Insert check loop at the incoming end (including disabling of echo suppressors)	Task
33	Continuity check OK (covers also receiving of checktone and removal of the transceiver)	Internal input
34	Remove check loop at the incoming end (including enabling of echo suppressors)	Task
35	Ignore further register signals	Task
36	Is continuity check required on outgoing circuit?	Decision

No.	Designation	Symbol
37	Analyze and store information (received in GSM)	Task
38	Access barred	Internal input
39	Digital path not possible	Internal input
40	Store services provided	Task
41	Spare	
42	Additional information required	Internal input
43	Set IAM fields as defined by services	Task
44	Analyze information requested (applicable to GRQ)	Task
45	Is service allowed? (applicable to GRQ)	Decision
46	Is information available? (applicable to GRQ)	Decision
47	Construct request message (applicable to GRQ)	Task
48	Construct information message (applicable to GSM)	Task
49	Spare	
50	Spare	

A.3   *Explanatory notes on the meanings and uses of SPITEs* (see Table A-3)

SPITEs are Switching Processing Interface Telephone Events used in all three procedures. For convenience the three signalling procedures are considered to be processes within a larger switching process and all SPITEs are considered to be *internal to the signalling procedures* but having, where necessary, full access to any switching information provided by other signalling procedures. For example digit analysis is initiated by the incoming procedure, but the results are available to both the interworking and outgoing procedures, where necessary. By contrast all FITEs, BITEs and telephone signals are external signals. The SPITEs are grouped into three categories:

a)   SPITEs 1-10 are allocated or reserved for *switching SPITEs*;

b)   SPITEs 11-30 are allocated or reserved for *digit analysis SPITEs*;

c)   SPITEs 31-40 are allocated or reserved for SPITEs used by a *restricted number of signalling systems.*

A.3.1   SPITE 1 *activate register function* is used in the incoming procedure to activate the register function following the receipt of the seizing signal or the initial address message. The register function keeps a memory of all received signals.

A.3.2   SPITE 2 *register function activated* is used following SPITE 1 where a proceed to send signal must be sent.

A.3.3   SPITE 3 *deactivate register function* is used in the incoming procedure to deactivate the register function. It is used after one of the following events:

—   clear-forward,

—   register timeout,

—   SPITEs 15-19 (reasons of unsuccessful calls),

—   BITEs 3-17, 19, 20, 27, 28 or any other error condition indicating an unsuccessful call.

A.3.4   SPITE 4 *set-up speech condition* is used in the incoming procedure to set-up the speech condition at the end of the register phase. It is therefore used in conjunction with SPITE 3 after reception of BITEs 3-7 and 27.

A.3.4(a) SPITE 4A *speech path may be set up*, is used in the incoming procedure on calls where a BITE 30, has been received in order to allow early switchthrough of the speech circuits.

A.3.5 SPITE 5 *release speech condition* is used in the incoming or interworking procedure where a call unsuccessful BITE is received after SPITE 4. If the BITE is returned to the incoming procedure, SPITE 5 is used there but if the BITE is translated to a tone in the interworking procedure using SPITE 6, then SPITE 5 is used in the interworking procedure.

A.3.6 SPITE 6 *return appropriate tone* is used in the incoming procedure where no electrical signal corresponds to SPITEs 15-19, and also in the interworking procedure when a BITE is received for which no corresponding BITE exists in the incoming procedure.

A.3.7 SPITE 7 *disconnect tone*, is used to disconnect a tone at a point in the logic procedures other than the release of the call, i.e. when SPITE 8 is not appropriate. An example is the disconnection of ringing tone in the outgoing INMARSAT procedures.

A.3.8 SPITE 8 *release all equipment* is used in the incoming procedure when a clear-forward signal is received after the register phase.

A.3.9 SPITE 11 *shall digit analysis be started?* is used in the incoming procedure to determine, when sufficient digits have been received, that digit analysis may begin.

A.3.10 SPITE 12 *perform digit analysis* is used in the incoming procedure to perform digit analysis. The analysis takes into account the following information, where available:

- address information,
- Z-digit (L- or D-digit),
- country-code indicator,
- echo-suppressor indicator,
- nature-of-circuit indicator,
- calling-party's-category.
- service requested.

SPITE 12 will be followed by one of the SPITEs 13-19 which indicate the result of the analysis, and are only used in the incoming procedure.

A.3.11 SPITE 13 *digit analysis cannot be completed* indicates that insufficient address information is available to complete the digit analysis.

A.3.12 SPITE 14 *routing information and service provided* indicates that digit analysis has been completed and the following information determined:

- type of outgoing signalling system,
- transit or terminal connection,
- echo-suppressor indicator,
- nature-of-circuit indicator,
- position of Z-digit.
- service provided.

SPITEs 15-19 are results of digit analysis.

A.3.13 SPITE 15 *unallocated number* indicates that the received address digits represent an unallocated number (country code, area code, etc.).

A.3.14 SPITE 16 *unprovided routing* indicates that the received address digits represent a valid code but that the required destination cannot be reached via this exchange.

A.3.15 SPITE 17 *barred routing* indicates that the received address digits represent a valid code but that access to it is barred by reason of, for example:

- wrong calling party's category,
- prohibited route-route combination.

A.3.16 SPITE 18 *switching equipment congestion* indicates that the switching attempt to the outgoing circuit met switching equipment congestion.

A.3.17 SPITE 19 *circuit group congestion* indicates that all circuit groups to the required destination were congested.

SPITEs 20-24 ask for information from the results of digit analysis.

A.3.18 SPITE 20 *satellite link included?* is used in the interworking procedure to determine the required nature of circuit indicator that should be transmitted. This information is available from the results of digit analysis.

A.3.19 SPITE 21 *incoming half-echo-suppressor to be included at distant end?* is used in the interworking procedure to determine the required echo suppressor indicator that should be transmitted. This information is available from the results of digit analysis.

A.3.20 SPITE 22 *transit connection following?* is used in the interworking procedure to determine the required country code indicator that should be transmitted. This information is available from the results of digit analysis.

A.3.21 SPITE 23 *has Z-digit been received?* is used in the incoming procedure following digit analysis to decide whether the Z-digit has already been received. The position of the Z-digit is determined as part of the digit analysis.

A.3.22 SPITE 24 *is this the Z-digit?* is used in the incoming procedure to decide whether a received register signal is the Z-digit or an address digit. This can be determined, since the position of the Z-digit is known after digit analysis.

A.3.23 SPITE 31 *perform continuity check* is used in the outgoing procedure of common channel signalling systems to perform the continuity check including all necessary switching procedures.

A.3.24 SPITE 32 *insert check loop* is used in the incoming procedure of common channel signalling systems to insert the continuity check loop.

A.3.25 SPITE 33 *continuity check O.K.* is used in the outgoing procedure of common channel signalling systems to indicate a successful continuity check.

A.3.26 SPITE 34 *remove check loop* is used in the incoming procedure of common channel signalling systems to remove the continuity check loop.

A.3.27 SPITE 35 *ignore further register signals* is used in the incoming procedure of Signalling System No. 5 and R1 following the receipt of the ST signal to indicate that all further register signals should be ignored.

A.3.28 SPITE 36 *is continuity check required on outgoing circuit?* is used in conjunction with information received on the incoming link to determine the continuity check indicator required on the outgoing link.

A.3.29 SPITE 37 *analyze and store information* is used in the incoming procedure on receipt of a General Set-up information Message (GSM).

A.3.30 SPITE 38 *access barred* indicates that a requested service cannot be completed (e.g. closed user group).

A.3.31 SPITE 39 *digital path not possible* indicates that a digital path cannot be provided.

A.3.32 SPITE 42 *additional information required* indicates that the I/C procedure must send a GRQ message.

Representation of the information contents – forward signals of Signalling System No. 5

Information elements / Signals of Signalling System No. 5	Address signals	Language digit 1: French	Language digit 2: English	Language digit 3: German	Language digit 4: Russian	Language digit 5: Spanish	Discriminating digit 0	Start-of-pulsing signal KP1	Start-of-pulsing signal KP2	Clear-forward signal	Forward-transfer signal
Signal No.	1	2	3	4	5	6	7	8	9	10	11
Digit 1, 2 ... 9 or 0, code 11 or 12,	X										
end-of-pulsing (ST) signal	X										
Country-code indicator								X	X		
Country-code not included								X			
Country-code included									X		
Nature-of-circuit indicator											
No satellite circuit in the connection											
One satellite circuit in the connection											
Echo-suppressor indicator											
Outgoing half-echo suppressor not included											
Outgoing half-echo suppressor included											
Outgoing half-echo suppressor required											
No echo-suppressor required											
Incoming half-echo suppressor required											
Calling party's category indicator		X	X	X	X	X	X				
Operator		X	X	X	X	X					
Subscriber							X				
Data call											
Ordinary call							X				
Call with priority											
Forward-transfer facility											
No forward-transfer facility											
Language: French		X									
Language: English			X								
Language: German				X							
Language: Russian					X						
Language: Spanish						X					
Clear-forward										X	
Forward-transfer											X
Continuity check indicator											
Continuity check required on this circuit											
Continuity check not required on this circuit											
Continuity check performed on previous circuit											
Continuity											
General setup information elements											
Service information elements											

Corresponds to signal No. ... of Signalling System		1	2	3	4	5	6	7	8	9	10	11
	No. 4	1	2	3	4	5	6	7	8	9	11	12
	No. 6	1	8	9	10	11	12	13	2	3	16	17
	No. 7 (TUP)	1	8	9	10	11	12	13	2	3	16	17
	R2	1	2	3	4	5	6	(7)	18	[8, 9 or 10]	16	17
	R1	1	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	3	2

T1107590-87

⊗ No equivalent signal

(No.) Loss of information

[No.] Additional information of change of information

No. Identical meaning of signals

TABLE A-5

Representation of the information contents – forward signals of Signalling System No. 6

Information elements	Address signals	Country-code indicator, country-code not included	Country-code indicator, country-code included	Nature of circuit indicator, no satellite circuit in the connection	Nature of circuit indicator, one satellite circuit in the connection	Echo-suppressor indicator, outgoing half-echo suppressor not included	Echo-suppressor indicator, outgoing half-echo suppressor included	Calling party's category indicator, operator, language French	Calling party's category indicator, operator, language English	Calling party's category indicator, operator, language German	Calling party's category indicator, operator, language Russian	Calling party's category indicator, operator, language Spanish	Calling party's category indicator, ordinary calling subscriber	Calling party's category indicator, calling subscriber with priority				
Signal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Digit 1, 2 ... 9 or 0, code 11 or 12,	X																	
end-of-pulsing (ST) signal	X																	
Country-code indicator		X	X															
Country-code not included		X																
Country-code included			X															
Nature-of-circuit indicator				X	X													
No satellite circuit in the connection				X														
One satellite circuit in the connection					X													
Echo-suppressor indicator						X	X											
Outgoing half-echo suppressor not included						X												
Outgoing half-echo suppressor included							X											
Outgoing half-echo suppressor required																		
No echo-suppressor required																		
Incoming half-echo suppressor required							X											
Calling party's category indicator								X	X	X	X	X	X	X	X			
Operator								X	X	X	X	X						
Subscriber													X	X				
Data call														X				
Ordinary call													X					
Call with priority														X				
Forward-transfer facility																		
No forward-transfer facility																		
Language: French								X										
Language: English									X									
Language: German										X								
Language: Russian											X							
Language: Spanish												X						
Clear-forward																X		
Forward-transfer																	X	
Continuity check indicator																		
Continuity check required on this circuit																		
Continuity check not required on this circuit																		
Continuity check performed on previous circuit																		
Continuity																		X
General setup information elements																		
Service information elements																		

Corresponds to signal No. ... of Signalling System																			
No. 4	1	8	9	⊗	⊗	⊗	10[a]	2	3	4	5	6	7	⊗	⊗	11	12	⊗
No. 5	1	8	9	⊗	⊗	⊗	⊗	2	3	4	5	6	7	⊗	⊗	10	11	⊗
No. 7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
R2	1	18	8, 9 or 10	20	21	19	11	2	3	4	5	6	12	14	13	16	17	⊗
R1	1	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	3	2	⊗

T1107600-87

[a] Signal code 14 is available for use upon multi-lateral or bilateral agreement for echo-suppressor control.

⊗ No equivalent signal

(No.) Loss of information

No. | Additional information or change of information

No. Identical meaning of signals

TABLE A-5 *bis*

Representation of the information contents — forward signals of Signalling System No. 7 (TUP)

Information elements	Signal No.	1 Address signals	2 Nature of address indicator, National significant number	3 Nature of address indicator, International number	4 Nature of circuit indicator, no satilite in the connection	5 Nature of circuit indicator, one satellite in the connection	6 Echo suppressor indicator, outgoing half-echo suppressor not included	7 Echo suppressor indicator, outgoing half-echo suppressor included	8 Calling party's category indicator, operator, language French	9 Calling party's category indicator, operator, language English	10 Calling party's category indicator, operator, language German	11 Calling party's category indicator, operator, language Russian	12 Calling party's category indicator, operator, language Spanish	13 Calling party's category indicator, ordinary calling subscriber	14 Calling party's category indicator, calling subscriber with priority	15 Calling party's category indicator, data call	16 Clear forward signal	17 Forward-transfer signal	18 Continuity proved	19 Continuity check failure a)	20 Continuity check required on this circuit	21 Continuity check not required on this circuit	22 Continuity check performed on previous circuit	23 Service information	24 General setup message
Digit 1, 2, ... 0, code 11, code 12		X																							
end pulsing		X																							
Country-code indicator			X	X																					
Country-code not included			X																						
Country-code included				X																					
Nature-of-circuit indicator					X	X																			
No satellite circuits in the connection					X																				
One satellite circuit in the connection						X																			
Echo-suppressor indicator							X	X																	
Outgoing half-echo suppressor not included							X																		
Outgoing half-echo suppressor included								X																	
Outgoing half-echo suppressor required																									
No echo suppressor required							X																		
Incoming half-echo suppressor required								X																	
Calling party's category indicator									X	X	X	X	X	X	X	X								
Operator									X	X	X	X	X												
Subscriber														X	X										
Data call																X									
Ordinary call														X											
Call with priority															X										
Language: French									X																
Language: English										X															
Language: German											X														
Language: Russian												X													
Language: Spanish													X												
Clear forward																	X			X					
Forward transfer																		X							
Continuity check indicator																					X	X	X		
Continuity check required on this circuit																					X				
Continuity check not required on this circuit																						X			
Continuity check performed on previous circuit																							X		
Continuity																			X						
General setup information elements																									X
Service information elements																								X	
Corresponding signals	No. 4	1	8	9	⊗	⊗	⊗	10b)	2	3	4	5	6	7	⊗	⊗	11	12	⊗	⊗	⊗	⊗	⊗	⊗	⊗
	No. 5	1	8	9	⊗	⊗	⊗	⊗	2	3	4	5	6	7	⊗	⊗	10	11	⊗	⊗	⊗	⊗	⊗	⊗	⊗
	No. 6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	⊗	⊗	⊗	⊗	⊗	⊗
	R1	1	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	3	2	⊗	⊗	⊗	⊗	⊗	⊗	⊗
	R2	1		8, 9 or 10	20	21	19	11	2	3	4	5	6	[12]		13	16	17	⊗	⊗	⊗	⊗	⊗	⊗	⊗

T1107580-87

a) For the purposes of interworking, the continuity check failure signal is equivalent to a clear forward (Recommendation Q.724, § 7.3). No specific continuity check failure information element has therefore been included.

b) Signal code 14 is available for use upon multilateral or bilateral agreement for echo-suppressor control.

⊗ No equivalent information

(No.) Loss of information

[No.] Additional information or change of information

Representation of the information contents – forward signals of Signalling System R1

Information elements	Signal No.	Address signals	Ring-forward (forward-transfer)	Clear-forward																	
		1	2	3																	
Digit 1, 2, ... 9 or 0, ST signal		X																			
Country-code indicator																					
Country-code not included																					
Country-code included																					
Nature-of-circuit indicator																					
No satellite circuit in connection																					
One satellite circuit in connection																					
Echo-suppressor indicator																					
Outgoing half-echo suppressor not included																					
Outgoing half-echo suppressor included																					
Outgoing half-echo suppressor required																					
No echo suppressor required																					
Incoming half-echo suppressor required																					
Calling party's category indicator																					
Operator																					
Subscriber																					
Data call																					
Ordinary call																					
Call with priority																					
Forward-transfer facility																					
No forward-transfer facility																					
Language: French																					
Language: English																					
Language: German																					
Language: Russian																					
Language: Spanish																					
Clear-forward				X																		
Forward-transfer			X																			
Continuity check indicator																					
Continuity check required on this circuit																					
Continuity check not required on this circuit																					
Continuity check performed on previous circuit																					
Continuity																					
General setup information elements																					
Service information elements																					
Corresponds to signal No. ... of Signalling System	No. 5	1	11	10																	
	No. 6	1	17	16																	
	No. 7 (TUP)	1	17	16																	
	R2	1	17	16																	

T1107610-87

Representation of the information contents – forward signals of Signalling System R2

Information elements / Signals of Signalling System R2	Address signals	I-1: Language digit: French	I-2: Language digit: English	I-3: Language digit: German	I-4: Language digit: Russian	I-5: Language digit: Spanish	I-10: Discriminating digit	I-11: Country-code indicator, outgoing half-echo suppressor required	I-12: Country-code indicator, no echo suppressor required	I-14: Country-code indicator, incoming half-echo suppressor required	I-14: Incoming half-echo suppressor required	I-7: Calling party's category, subscriber or operator without forward-transfer facility	II-8: Calling party's category, data transmission control	II-9: Calling party's category, subscriber with priority	II-10: Calling party's category operator with forward-transfer facility	Clear-forward signal	Forward-transfer signal a)	First digit I-1, I-2, ... I-10	Reply to A-14, I-1, ... I-10 e)	Reply to first A-13, I-13	Reply to first A-13, I-14
Signal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Digit 1, 2, ... 9 or 0, code 11 or 12,	X																	X			
end-of-pulsing (ST) signal	X																				
Country-code indicator								X	X	X								X			
Country-code not included																		X			
Country-code included								X	X	X											
Nature-of-circuit indicator																				X	X
No satellite circuit in the connection																				X	
One satellite circuit in the connection																					X
Echo-suppressor indicator								X	X	X	X										
Outgoing half-echo suppressor not included								X	X												
Outgoing half-echo suppressor included										X	X										
Outgoing half-echo suppressor required								X													
No echo-suppressor required									X												
Incoming half-echo suppressor required										X	X										
Calling party's category indicator		X	X	X	X	X	X					X (or)	X	X	X						
Operator		X	X	X	X	X						X (or)			X						
Subscriber							X					X		X							
Data call													X								
Ordinary call													X								
Call with priority														X							
Forward-transfer facility															X						
No forward-transfer facility												X									
Language: French		X																			
Language: English			X																		
Language: German				X																	
Language: Russian					X																
Language: Spanish						X															
Clear-forward																X					
Forward-transfer																	X				
Continuity check indicator																					
Continuity check required on this circuit																					
Continuity check not required on this circuit																					
Continuity check performed on previous circuit																					
Continuity																					
General setup information elements																					
Service information elements																					

Corresponds to signal No. ... of Signalling System

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
No. 4	1	2	3	4	5	6	7	10c)+9d)	(9)	10d)+9	10	7	⊗	⊗	[7f)]	11	12	8	⊗	⊗	⊗
No. 5	1	2	3	4	5	6	7	⊗	(9)	⊗	⊗	7	⊗	⊗	[7f)]	10	11	8	⊗	⊗	⊗
No. 6	1	8	9	10	11	12	b)	3/7c)	3/+6	3/+7	7	13	15	14	[13f)]	16	17	2	6	4	5
No. 7	1	8	9	10	11	12	b)	3c)/8	3/6c)	3/7	7	13	15	14	[13f)]	16	17	2	6	4	5
R1	1	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	3	2	⊗	⊗	⊗

T1107620-87

a) See Recommendation Q.400, § 1.1.3. A forward-transfer signal does not normally form part of Signalling System R2.

b) See signals II-7, II-8 and II-9.

c) Translation of signal I-11, succeeding circuit must be equipped with outgoing half-echo suppressor.

d) Signal code 14 is available for use upon multilateral or bilateral agreement for echo-suppressor control.

e) In reply to signal A-14.

f) The 1/0 logic treats the signal II-10 as II-7, as long as no treatment of the forward-transfer signal is considered.

⊗ No equivalent signal

(No) Loss of information

[No] Additional information or change of information

No. Identical meaning of signals

Representation of the information contents — backward signals of Signalling System No. 5

Information elements	Busy-flash signal	Answer signal	Clear-back signal	Proceed-to-send signal	Inform that ST has been sent																	
Signal No.	1	2	3	4	5																	
Address-complete																						
Subscriber free		X																				
Coin box																						
Charge		X																				
No charge																						
Call unsuccessful	X																					
Switching-equipment congestion																						
Circuit-group congestion																						
National-network congestion																						
Address-incomplete																						
Unallocated number																						
Subscriber busy (elec.)																						
Line-out-of-service																						
Send special-information tone																						
Call failure																						
Answer		X																				
Re-answer																						
Clear-back			X																			
Artificial address-complete			X																			
Sending-finished				X																		
General setup request elements																						
Access barred																						
Digital path not provided																						
Corresponds to signal No. ... of Signalling System — No. 4	2	3	4	⊗	⊗																	
No. 6	8	or $^{16}_{18}$	19	⊗	⊗																	
No. 7 (T UP)	8	or $^{16}_{18}$	19	⊗	⊗																	
R2	(a)	(11)	12	⊗	⊗																	
R1	(b)	1	2	3	4																	

T1107640-87

a) Busy tone.

b) Appropriate tone or announcement.

⊗ No equivalent signal

(No.) Loss of information

[No.] Additional information or change of information

No. Identical meaning of signals

Representation of the information contents — backward signals of Signalling System No. 6

Information elements \ Signals of Signalling System No. 6	ADC: Address-complete, charge	ADN: Address-complete, no charge	ADX: Address-complete, coin box	AFC: Address-complete, subscriber free, charge	AFN: Address-complete, subscriber free, no charge	AFX: Address-complete, subscriber free, coin box	SEC: Switching-equipment congestion	CGC: Circuit-group congestion	NNC: National-network congestion	ADI: Address-incomplete	UNN: Unallocated number	SSB: Subscriber busy (elec.)	LOS: Line-out-of-service	SST: Send special information tone	CFL: Call failure	ANC: Answer, charge	ANN: Answer, no charge	RAI-3: Re-answer No. 1-No. 3	CBI-3: Clear-back No. 1-No. 3
Signal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Address-complete	×	×	×	×	×	×					×	×	×	×		(×)[c]	(×)[c]		
Subscriber free				×	×	×										×	×		
Coin box			×			×													
Charge	×			×												×			
No charge		×		×													×		
Call unsuccessful							×	×	×	×	×	×	×	×	×				
Switching-equipment congestion							×												
Circuit-group congestion								×											
National-network congestion									×										
Address-incomplete										×									
Unallocated number											×								
Subscriber busy (elec.)												×							
Line-out-of-service													×						
Send special-information tone														×					
Call failure															×				
Answer																×	×		
Re-answer																		×	
Clear-back																			×
Artificial address-complete																			
Sending-finished																			
General setup request elements																			
Access barred																			
Digital path not provided																			
Corresponds to signal No. ... of Signalling System — No. 4	1	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	b)	b)	(2)	b)	b)	(2)	3	(3)	(3)	4
— No. 5	⊗	⊗	⊗	⊗	⊗	⊗	(1)	(1)	(1)	b)	b)	(1)	b)	b)	(1)	2	(2)	(2)	3
— No. 7 (TUP)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
— R2	[2]	9	2	8	9	(8)	(3)	(3a)	1a)	(1)	7	5	10	4	(2a)	(11)	(11)	(11)	12
— R1	⊗	⊗	⊗	⊗	⊗	⊗	(b)	(b)	(b)	(b)	(b)	b)	(b)	(b)	(b)	1	(1)	(1)	2

T1107650-87

a) Before an address-complete signal is sent; otherwise audible tone.

b) Appropriate tone and possibly announcement.

c) When received before address complete.

⊗ No equivalent signal

(No) Loss of information

[No] Additional information or change of information

No. Identical meaning of signals

TABLE A-9 *bis*

Representation of the information contents – backward signals of System No. 7 (TUP)

Signals of Signalling System No. 7 (TUP)

Information elements	ADC: Address complete, charge c)	ADN: Address complete, no charge	ADX: Address complete, coin box	AFC: Address complete, subscriber free, charge	AFN: Address complete, subscriber free, no charge	AFX: Address complete, subscriber free, coin box	SEC: Switching-equipment congestion	CGC: Circuit-group congestion	NNC: National network congestion	ADI: Address-incomplete	UNN: Unallocated number	SGB: Subscriber busy (elec.)	LOS: Line-out-of-service	SST: Send special information tone	CFL: Call failure	ANC: Answer, charge	ANN: Answer, no charge	RAN: Re-answer	CLB: Clearback	GRQ: General request message	ACB: Access barred signal	DPN: Digital path not provided
Signal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Address complete	×	×	×	×	×	×					×	×	×	×	×	×	×					
Subscriber free				×	×	×										×	×					
Coin box			×			×																
Charge	×			×												×						
No charge		×			×												×					
Call unsuccessful							×	×	×	×	×	×	×	×	×							
Switching equipment congestion							×															
Circuit group congestion								×														
National network congestion									×													
Address incomplete										×												
Unallocated number											×											
Subscriber busy (elec.)												×										
Line out-of-service													×									
Send special information tone														×								
Call failure															×							
Answer																×	×					
Re-answer																		×				
Clear-back																			×			
Artificial address-complete																						
Sending-finished																						
General setup request elements																				×		
Access barred																					×	
Digital path not provided																						×
Corresponding signals No. 4	1	(1)	1	(1)	(1)	(1)	(2)	(2)	(2)	b)	(2)	b)	b)	b)	b)	3	(3)	3	4	⊗	⊗	⊗
No. 5	⊗	⊗	⊗	⊗	⊗	⊗	(1)	(1)	(1)	b)	(1)	b)	b)	b)	b)	2	(2)	(2)	3	⊗	⊗	⊗
No. 6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	⊗	⊗	⊗
R1	⊗	⊗	⊗	⊗	⊗	⊗	b)	b)	b)	b)	b)	b)	b)	b)	b)	1	(1)	1	2	⊗	⊗	⊗
R2	(2)	9	2	8	9	9	(3)	(3a)	1a)	(1)	7	5	10	4	2a)	(11)	(11)	(11)	12	⊗	⊗	⊗

T1107630-87

(See legend in previous table)

TABLE A-10

Representation of the information contents – backward signals of Signalling System R1

Information elements	Answer signal	Clear-back (hang-up)	Circuit seized	Inform that ST has been sent																			
Signal No.	1	2	3	4																			
Address-complete																							
Subscriber free	X																						
Coin box																							
Charge	X																						
No charge																							
Call unsuccessful																							
Switching-equipment congestion																							
Circuit-group congestion																							
National-network congestion																							
Address-incomplete																							
Unallocated number																							
Subscriber busy (elec.)																							
Line-out-of-service																							
Send special-information tone																							
Call failure																							
Answer	X																						
Re-answer																							
Clear-back		X																					
Artificial-address-complete			X																				
Sending-finished				X																			
General setup request elements																							
Access barred																							
Digital path not provided																							

Corresponds to signal No. ... of Signalling System

No. 5	2	3	4	5
No. 6	or $^{16}_{18}$	19	⊗	⊗
No. 7 (TUP)	or $^{16}_{18}$	19	⊗	⊗
R2	(11)	12	⊗	⊗

T1107660-87

⊗ No equivalent

(No.) Loss of information

[No.] Additional information or change of information

No. Identical meaning of signals

TABLE A-11

Representation of the information contents — backward signals of Signalling System R2

Information elements \ Signals of Signalling System R2	A-4: Congestion on the national network	A-6: Address-complete, charge, set-up speech conditions	A-15: Congestion in an international exchange or at its output	B-2: Send special-information tone	B-3: Subscriber line busy	B-4: Congestion (encountered after change-over from A-signals to B-signals)	B-5: Unallocated number	B-6: Subscriber line free, charge	B-7: Subscriber line free, no charge	B-8: Subscriber line out of order	Answer signal	Clear back signal	B-1-B-6: International, subscriber line free, charge	B-9, B-10: International send special information tone	B-11-B-15 = B-4				
Signal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Address-complete		X	(X)	X	X	(X)	X	X	X	X			X	(X)	X				
Subscriber free								X	X		X		X						
Coin box																			
Charge		X						X					X						
No charge									X										
Call unsuccessful	X		X	X	X	X	X			X				X	X				
Switching-equipment congestion			X (or)																
Circuit-group congestion			X																
National-network congestion	X				X										X				
Address-incomplete																			
Unallocated number							X												
Subscriber busy (elec.)					X														
Line-out-of-service										X									
Send special-information tone				X										X					
Call failure																			
Answer											X								
Re-answer																			
Clear-back												X							
Artificial address-complete																			
Sending-finished																			
General setup request elements																			
Access barred																			
Digital path not provided																			
Corresponds to signals No. ... of Signalling System — No. 4	(2)	1	(2)	a)	(2)	(2)	a)	(X)	(X)	a)	(3)	4	(X)	a)	(2)				
Corresponds to signals No. ... of Signalling System — No. 5	(1)	(X)	(1)	a)	(1)	(1)	a)	(X)	(X)	a)	(2)	3	(X)	a)	(1)				
Corresponds to signals No. ... of Signalling System — No. 6	9	1	(8)	14	12	9	11	4	5	13	16,17 or 18	19	4	14	9				
Corresponds to signals No. ... of Signalling System — No. 7	9	1	(8)	14	12	9	11	4	5	13	16,17 or 18	19	4	14	9				
Corresponds to signals No. ... of Signalling System — R1	(b)	(X)	(b)	(b)	(b)	(b)	(b)	(X)	(X)	(b)	1	2	(X)	(b)	(b)				

T1107670-87

a) Special information tone.

b) Appropriate tone or announcement.

⊗ No equivalent signal

(No) Loss of information

[No] Additional information or change of information

No. Identical meaning of signals

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SECTION 2

LOGIC PROCEDURES

Recommendation Q.611

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM No. 4
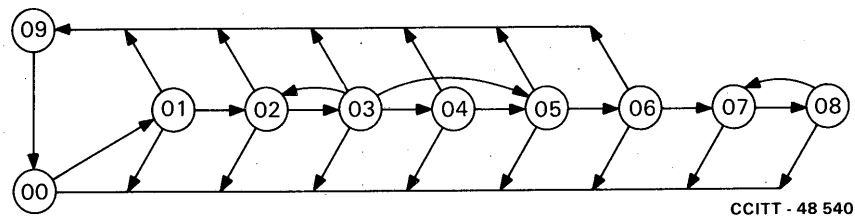
State number	State description	Sheet reference	Timers running
00	Idle	1, 3	
01	Wait for register activation	1	t_1
02	Wait for (next) forward reg. signal	1	t_2, (t_4)
03	Wait for digit analysis	2	t_3
04	Wait for address-complete	2	t_4
05	Wait for register deactivation	3	
06	Wait for answer	3	
07	Answered	3	
08	Clear-back	3	

FIGURE 1/Q.611

State overview diagram for incoming Signalling System No. 4

Supervisory timers

$t_1 \leqslant 5$ s	Recommendation Q.125, § 4.2.4
$t_2 = 5\text{-}10$ s	Recommendation Q.127, § 4.4.3 (2), b)
$t_3 \leqslant 10$	Recommendation Q.125, § 4.2.4
$t_4 = 30\text{-}60$ s	Recommendation Q.125, § 4.4.3 (2), a)

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

— Procedures for terminal connection

FIGURE 2/Q.611

Notes to incoming Signalling System No. 4

FIGURE 3/Q.611 (Sheet 1 of 3)

Incoming Signalling System No. 4

1

(1)

| 03 |
Wait for digit
analysis

SPITE
14

SPITE 13
Digit analysis
cannot be
communicated

SPITEs
18, 19

SPITEs
15,
16, 17

Clear-
forward
(PXX)

$\bar{t}_3$

Stop t_3

Stop t_3

Stop t_3

Stop t_3

Stop t_3

SPITE 3
Deactivate
register function

2, 3, 5

End-
to-end
signalling — Yes

(2)₁

SPITE 3
Deactivate
register function

Number-
received

(3)₁

(5)₃

5

No

Acknow-
ledgement
(Y)

Acknow-
ledgement
(X)

See Rec. Q.126 and
System No. 4 – Annex 1

(5)₃

SPITE 6
Return
tone

Activate
inter-
working

Activate
outgoing No. 4
end-to-end
signalling

SPITE 3
Deactivate
Register
function

4

FITE 1

SPITE 22 — Yes

(4)₃

Yes — Any
more
digits

No

FITE 2

FITE 3

No

6

No — SPITE 23

(6)₃

8

Yes — (8)₂

Which
Z-digit

| 1 | 2 | 3 | 4 | 5 | 0 |

FITE 9

FITE 10

FITE 11

FITE 12

FITE 13

FITE 17

Start t_4

| 04 | Wait for
address
complete

Forward
register
signal

BITE 2

Clear-
forward
(PXX)

BITE 8

BITE 28

$\bar{t}_4$

Acknow-
ledgement
(Y)

Stop t_4

Stop t_4

Stop t_4

Stop t_4

8

SPITE 24 — Yes

Number-
received

FITE 22

SPITE 3
Deactivate
register
function

SPITE 3
Deactivate
register
function

6, 3, 5

No — (8)₂

(6)₃

(3)₁

(5)₃

(4)₃

4

FITE 1

CCITT - 40710

FIGURE 3/Q.611 (Sheet 2 of 3)

Incoming Signalling System No. 4

6

2(2×)

(6)

05 Wait for
register
deactivation

BITE 27

BITE 28

BITE 8

Clear-
forward

(7)₃

7

SPITE 4
Set up speech
condition

SPITE 3
Deactivate
register function

SPITE 3
Deactivate
register function

(4)₃

(5)₃

5
4

SPITE 3
Deactivate
register function

06 Wait
for answer
(BITE 22)

BITE 22

Clear-
forward
(PXX)

BITE 8

Forward-
transfer

(7)₃

SPITE 5
Release
speech
condition

FITE 23

7

Answer
(PY)

(5)

5

Busy-
flash

1
2 (3×)
3

07
Answered

(4)

4

Clear-
forward
(PXX)

BITE 25

Forward-
transfer

09 Wait
for clear-
forward

1
2 (2×)
3

(7)

7

3(2×)

FITE 22

Clear-
back
(P)

FITE 23

Clear-
forward

SPITE 8
Release all
equipment

08
Clear-back

Release-
guard

Release-
guard

00
Idle

Clear-
forward

BITE 22

Forward-
transfer

00
Idle

(7)₃

CCITT - 40720

Answer
(PY)

FITE 23

7

FIGURE 3/Q.611 (Sheet 3 of 3)

Incoming Signalling System No. 4

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM No. 5

CCITT - 48550

State number	State description	Sheet reference	Running timers
00	Idle	1, 4	
01	Wait for register activation	1	
02	Wait for register signal	1	t_1, t_2
03	Wait for next register signal	1	t_2
04	Wait for digit analysis	2	t_2
05	Wait for acknowledgement	2	t_3
06	Wait for next register signal	3	t_2
07	Wait for register deactivation	3	
08	Wait for answer	3	
09	Wait for acknowledgement	4	t_3
10	Answered	4	
11	Wait for acknowledgement	4	t_3
12	Clear-back	4	
13	Wait for clear-forward	2	

FIGURE 1/Q.612

State overview diagram for incoming Signalling System No. 5

Supervisory timers

t_1 = 10-20 s   Recommendation Q.141, § 2.1.3.1, e); Q.141, § 2.1.6, d)

t_2 = 20-40 s   Recommendation Q.156, § 3.6.2, b)

t_3 = 10-20 s   Recommendation Q.141, § 2.1.3.1, e)

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures.

P_1 — Procedure for timeout of receipt of busy flash acknowledgement signal

P_2 — Procedure for timeout of receipt of answer acknowledgement signal

P_3 — Procedure for timeout of receipt of clearback acknowledgement signal

FIGURE 2/Q.612

Notes to incoming Signalling System N°. 5

FIGURE 3/Q.612 (Sheet 1 of 4)

Incoming Signalling System No. 5

7, 8

1, 2 ⑦

1, 2

| 04 | Wait for digit analysis |

05 | Wait for acknow-ledgement

8

1

SPITE 14
Routing
information

SPITE
13

SPITEs
15,
16, 17

SPITEs
18, 19

Register
signal

Clear-
forward

$\overline{t}_2$

Acknow-
ledgement

Clear-
forward

$\overline{t}_3$

1, 2, 5

Activate
inter-
working

①₁

Stop t_2

Stop t_2

ST-
signal   No

②₁

⑤₁

Stop t_3

Stop t_3

℗₁ --- Procedures for time-out routine

5, 9

FITE 1

SPITE 6
Return appro-
priate tone

⑤₁

Yes

Stop t_2

2, 3 ⑨

13 | Wait for clear-forward

Yes   Any
more digits

SPITE 3
Deactivate
register function

SPITE 35
Ignore further
register signals

Clear-
forward

9
7
4

No   SPITE 23

⑨₂

⑦₂

④₁

CCITT - 40740

12

Yes   ⑫
       3

Which
Z-digit

| 1 | 2 | 3 | 4 | 5 | 0 |

FITE 9

FITE 10

FITE 11

FITE 12

FITE 13

FITE 17

ST
received   Yes

No

10, 11   ⑩₃   ⑪₃

FIGURE 3/Q.612 (Sheet 2 of 4)

Incoming Signalling System No. 5

FIGURE 3/Q.612 (Sheet 3 of 4)

Incoming Signalling System No. 5

17

3, 4 (17)

| 09 | Wait for acknow-ledgement

Acknow-ledgement

Clear-forward

BITE 25

t̄₃

17

Stop t₃

Stop t₃

(17)₄

(P₂) --- Procedures for time-out routine

19

BITE 25 received — Yes

(19)₄

18, 20

(18)₄ → No (20)₄

| 10 | Answered

Clear-forward

BITE 25

Forward-transfer

19, 20

(19) →

(20)₄ →

FITE 23

3, 4
(3×)

FITE 22

Clear-back

(18)₄

18

SPITE 8
Release all equipment

Start t₃ --- t₃ = 10-20 s

21

(21)₄ →

Release-guard

| 11 | Wait for acknow-ledgement

| 00 | Idle

Acknow-ledgement

Clear-forward

BITE 22

t̄₃

21

Stop t₃

Stop t₃

(21)₄

(P₃) --- Procedures for time-out routine

19

BITE 22 received — Yes

(19)₄

22, 16

(22)₄ → No (16)₃

| 12 | Clear-back

BITE 22

Forward-transfer

Clear-forward

CCITT - 40760

16, 19

(16)₃

FITE 23

(19)₄

22

(22)₄

FIGURE 3/Q.612 (Sheet 4 of 4)

Incoming Signalling System No. 5

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM No. 6
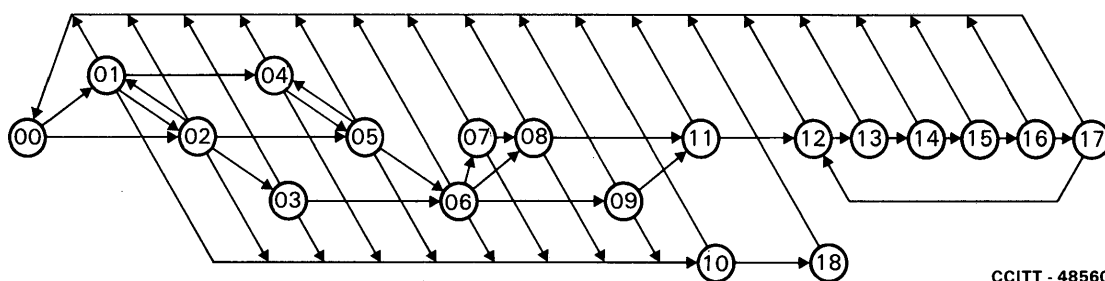
State number	State description	Sheet reference	Timers running
00	Idle	1, 8	
01	Wait for further digits	1	t_1, t_2
02	Wait for digit analysis	3	t_1, t_2 or t_3
03	Wait for continuity check (COT)	4	t_1, t_2 or t_3
04	Wait for further digits (COT received)	2	t_2
05	Wait for digit analysis (COT received)	2	t_2 or t_3
06	Wait for address complete (COT received)	5	t_2 or t_3
07	Wait for register deactivation	5	
08	Address complete – Wait for answer	7	
09	Address complete, subscriber free – Wait for answer	7	
10	Call unsuccessful – wait for clear-forward	6	t_4
11	Answered	7	
12	Clear-back 1	7	
13	Reanswer 1	7	
14	Clear-back 2	8	
15	Reanswer 2	8	
16	Clear-back 3	8	
17	Reanswer 3	8	
18	Call failure – wait for clear-forward	6	t_4, t_5

FIGURE 1/Q.613

State overview diagram for incoming Signalling System No. 6

Supervisory timers for incoming Signalling System No. 6

$t_1 = 10\text{-}15$ s	Recommendation Q.268, § 4.8.5.3, a)
$t_2 = 15\text{-}20$ s	Recommendation Q.261, § 4.1.6
$t_3 = 20\text{-}30$ s	Recommendation Q.268, § 4.8.5.3, a)
$t_4 = 4\text{-}15$ s	Recommendation Q.268, § 4.8.5.3, b)
$t_5 = 1$ min	Recommendation Q.268, § 4.8.5.3, b)

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures :

- Dual seizure,
- Blocking and unblocking sequences, .
- Unreasonable sequences,
- Confusion and message refusal signals,
- Reset circuit/band procedures,
- Test call procedures,
- Out of service.

Signal abbreviations used

The signal abbreviations used correspond to those of the Signalling System No. 6 specifications unless otherwise indicated on the same sheet.
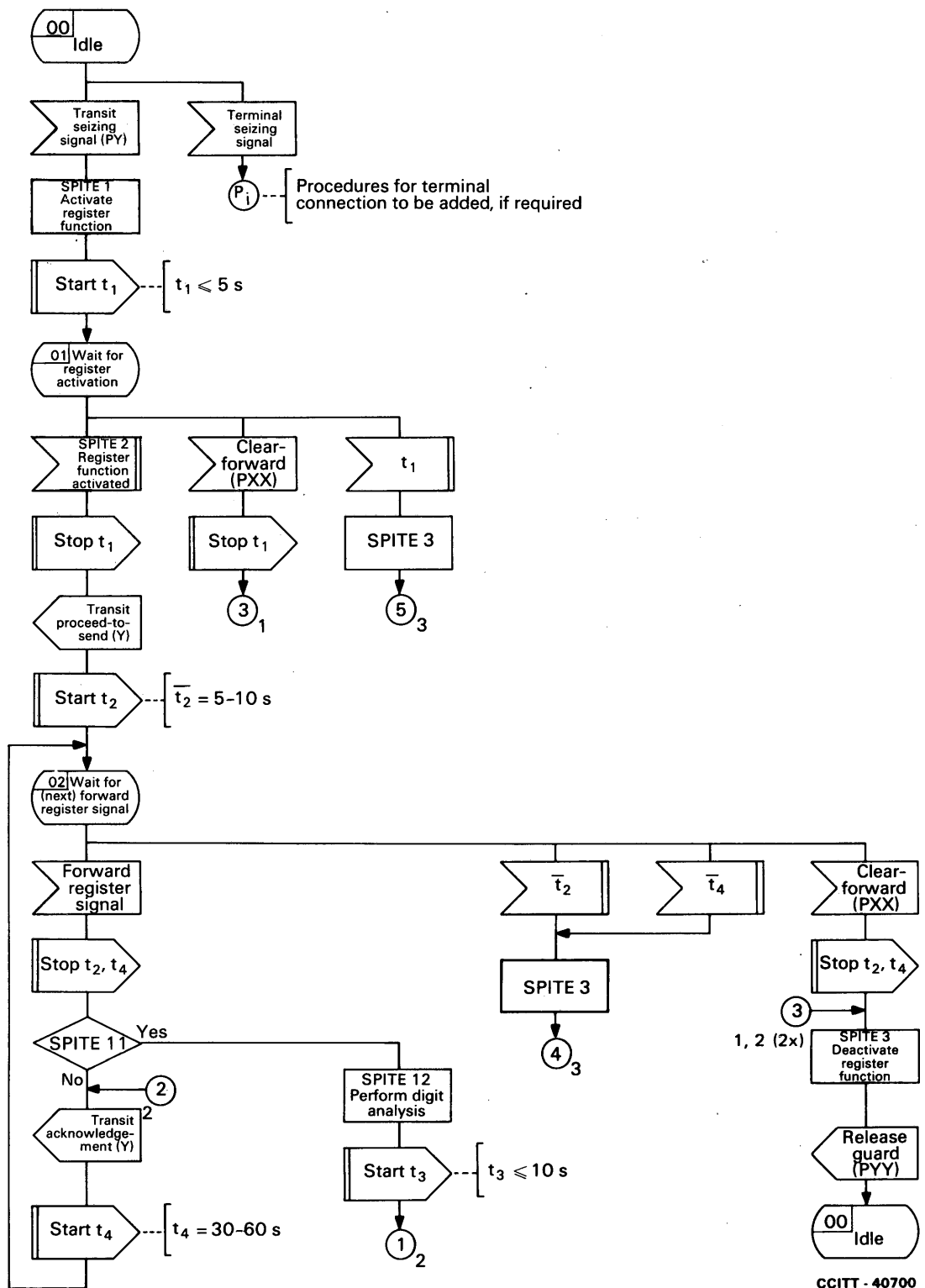
FIGURE 2/Q.613

Notes to incoming Signalling System No. 6
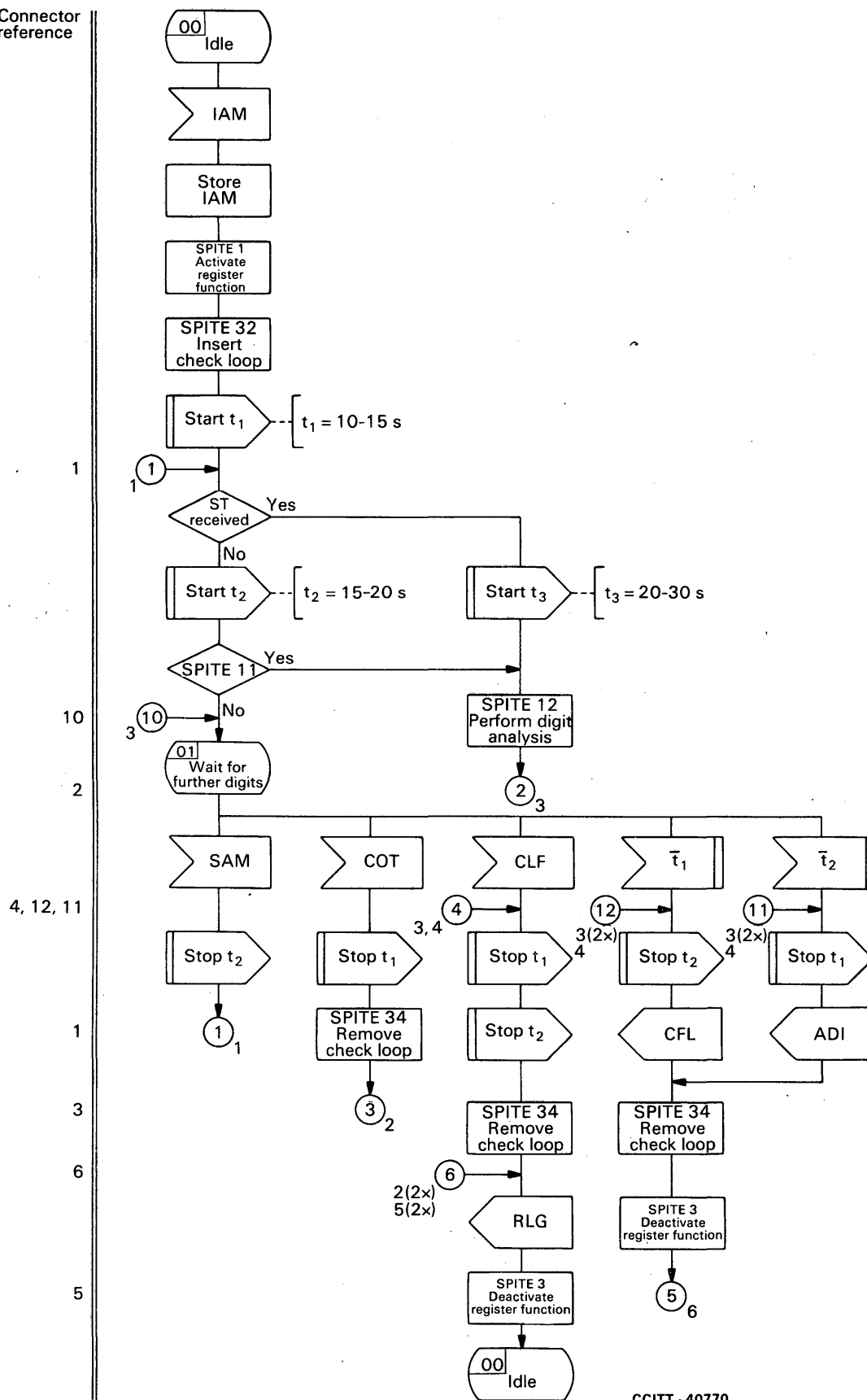
FIGURE 3/Q.613 (Sheet 1 of 8)

Incoming Signalling System No. 6
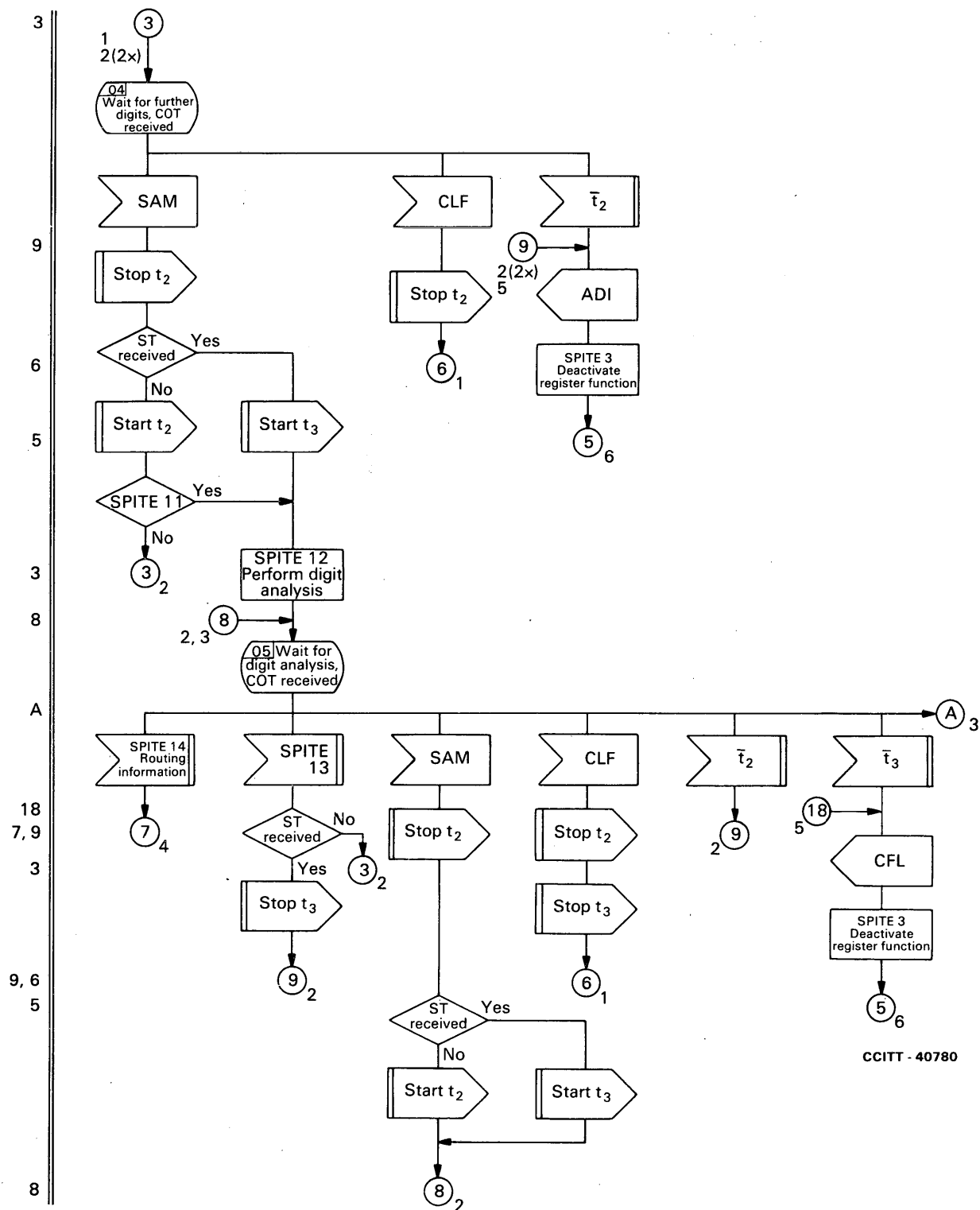
FIGURE 3/Q.613 (Sheet 2 of 8)

Incoming Signalling System No. 6

Connector
reference
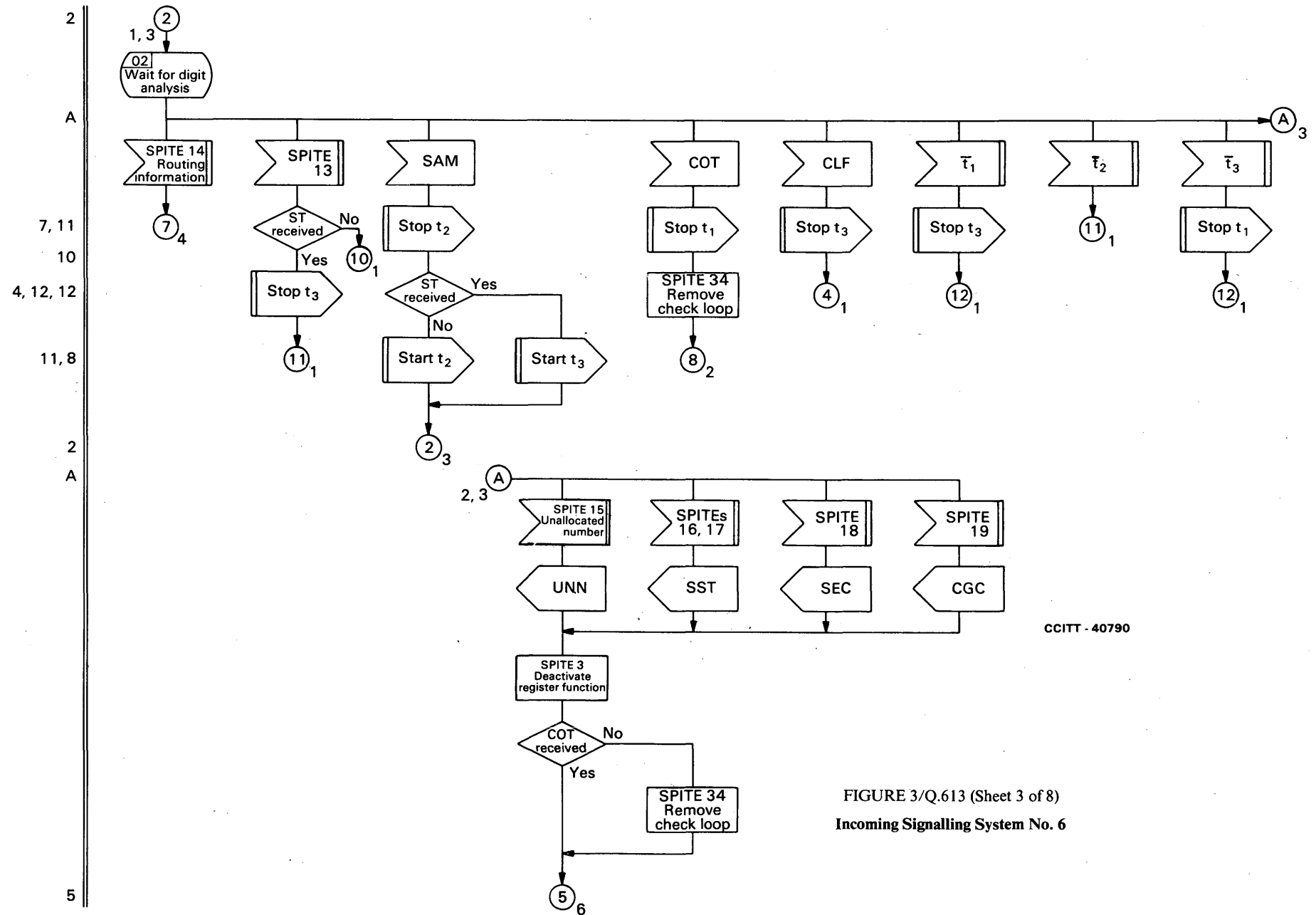
CCITT - 40790

FIGURE 3/Q.613 (Sheet 3 of 8)

Incoming Signalling System No. 6

Note – Is outgoing link a common channel signalling system ?

CCITT - 40800
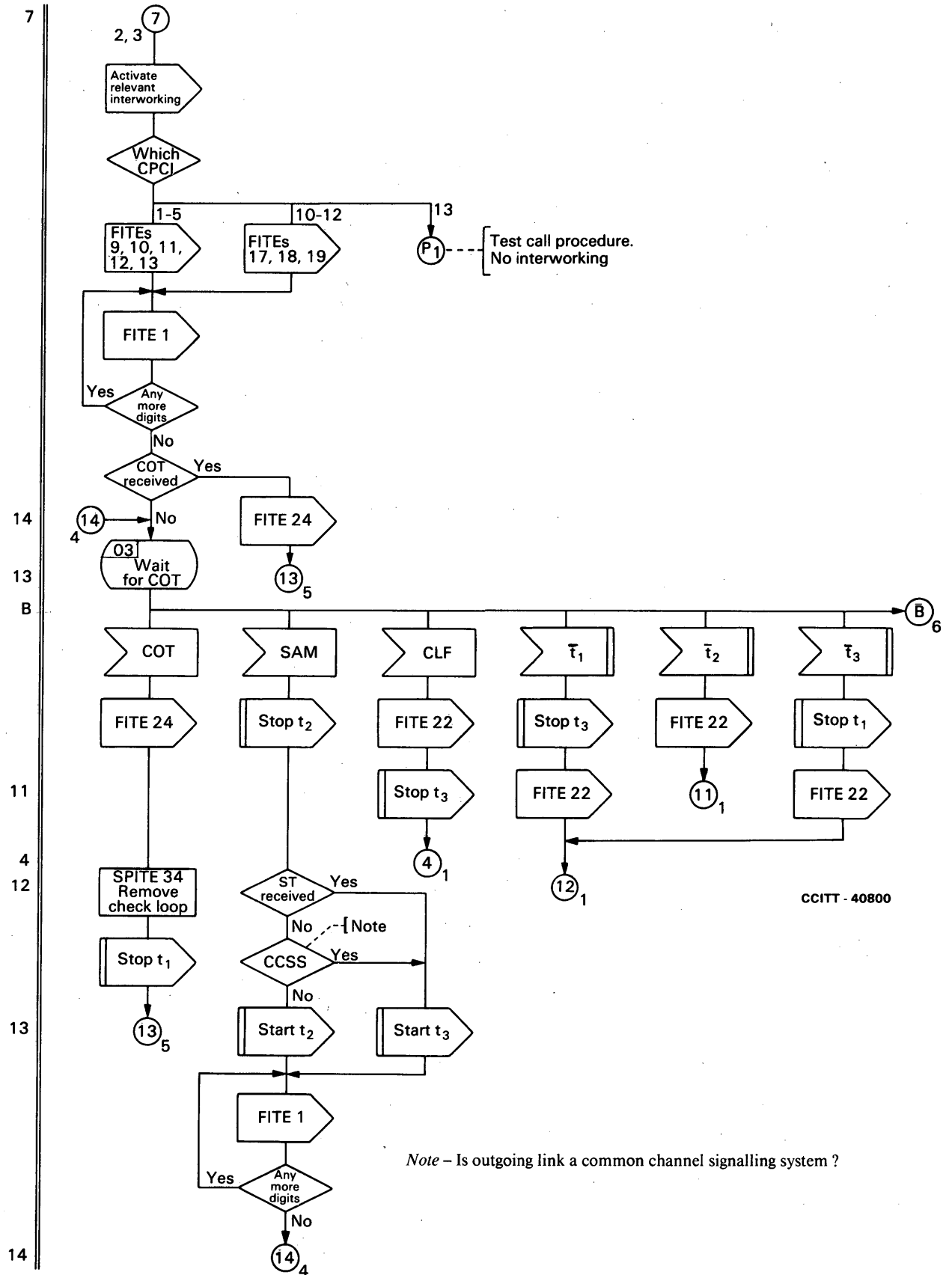
FIGURE 3/Q.613 (Sheet 4 of 8)

Incoming Signalling System No. 6

Connector
reference

13

13

13

15
6
28

B

16, 17
3, 9, 18
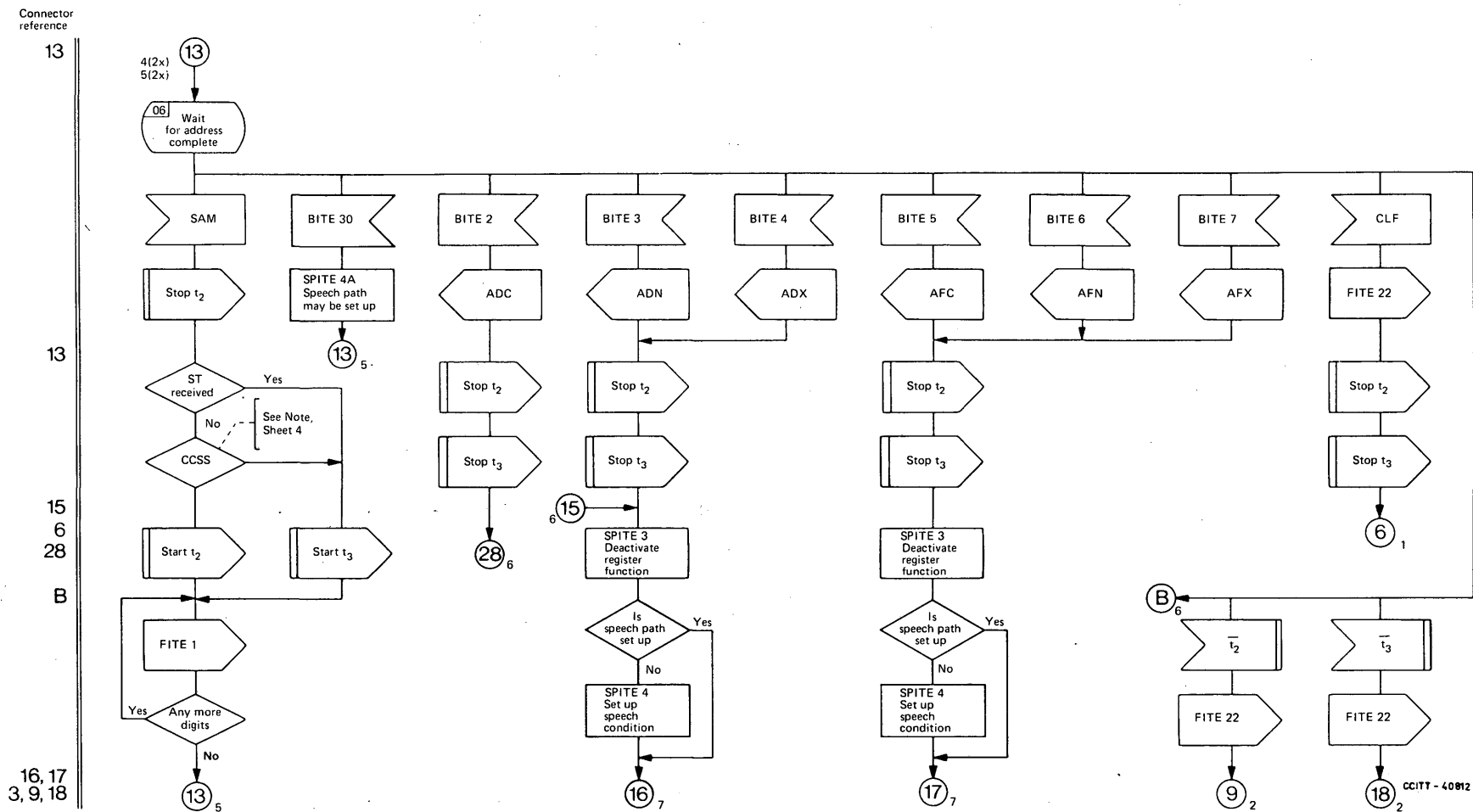
FIGURE 3/Q.613 (Sheet 5 of 8)

Incoming Signalling System No. 6

FIGURE 3/Q.613 (Sheet 6 of 8)

Incoming Signalling System No. 6

Connector
reference

16

5, 7 ⑯

| 08 | Address. complete, wait for answer |

| BITE 22 | BITE 23 | BITE 10 | BITE 12 | BITE 19 | CLF | FOT |

| ANC | ANN | CGC | NNC | CFL | FITE 22 | FITE 23 |

㉗₇

| SPITE 5 Release speech condition |

⑲₈   ⑯₇

27,19,16
17, 21

5, 7 ⑰

5

| 09 | ADC sub. free W.F. answer | Address complete, subscriber free, wait for answer |

⑤₆

7(2×)
8   ㉑

| 12 | Clear-back 1 |

| BITE 22 | BITE 23 | BITE 19 | CLF | FOT |

| BITE 24 | CLF | FOT |

| ANC | ANN | CFL | FITE 22 | FITE 23 |

| RA 1 | FITE 22 | FITE 23 |

27, 22

㉗ 7(2×)

| 11 | Answered |

| SPITE 5 Release speech condition |

⑲₈   ⑰₇

7 ㉒

| 13 | Reanswer 1 |

⑲₈   ㉑₇

19, 17, 19, 21

5

⑤₆

| BITE 25 | CLF | FOT |

| BITE 25 | CLF | FOT |

| CB 1 | FITE 22 | FITE 23 |

| CB 2 | FITE 22 | FITE 23 |

21, 19, 27
23, 19, 22

㉑₇   ⑲₈   ㉗₇

FIGURE 3/Q.613 (Sheet 7 of 8)

Incoming Signalling System No. 6

㉓₈   ⑲₈   ㉒₇

CCITT - 40830

23   7,8 ㉓

14 Clear-back 2

BITE 24   CLF   FOT

RA 2   FITE 22   FITE 23

24
19, 23   ㉔ 8   8   ⑲ 8   ㉓ 8

15 Reanswer 2

BITE 25   CLF   FOT

CB 3   FITE 22   FITE 23

25
19, 24   8 ㉕   8   ⑲ 8   ㉔ 8

16 Clear-back 3

BITE 24   CLF   FOT

RA 3   FITE 22   FITE 23

26
19, 25   8 ㉖   8   ⑲ 8   ㉕ 8

17 Reanswer 3

BITE 25   CLF   FOT

CB 1   FITE 22   FITE 23

19
21, 26   ㉑ 7   6 (2×)   SPITE 8   ㉖ 8
                 7 (5×)   Release all
                 8 (3×)   equipment

⑲

RLG
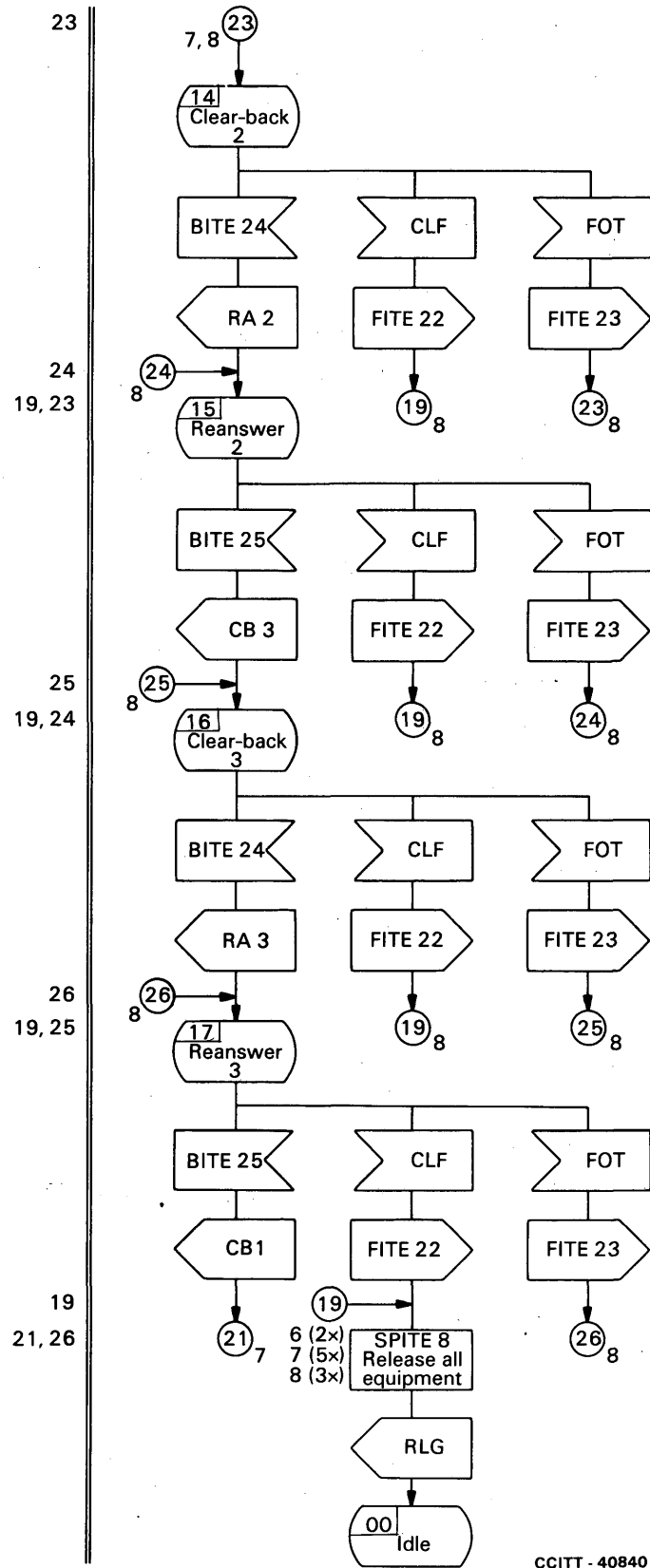
00 Idle

CCITT - 40840

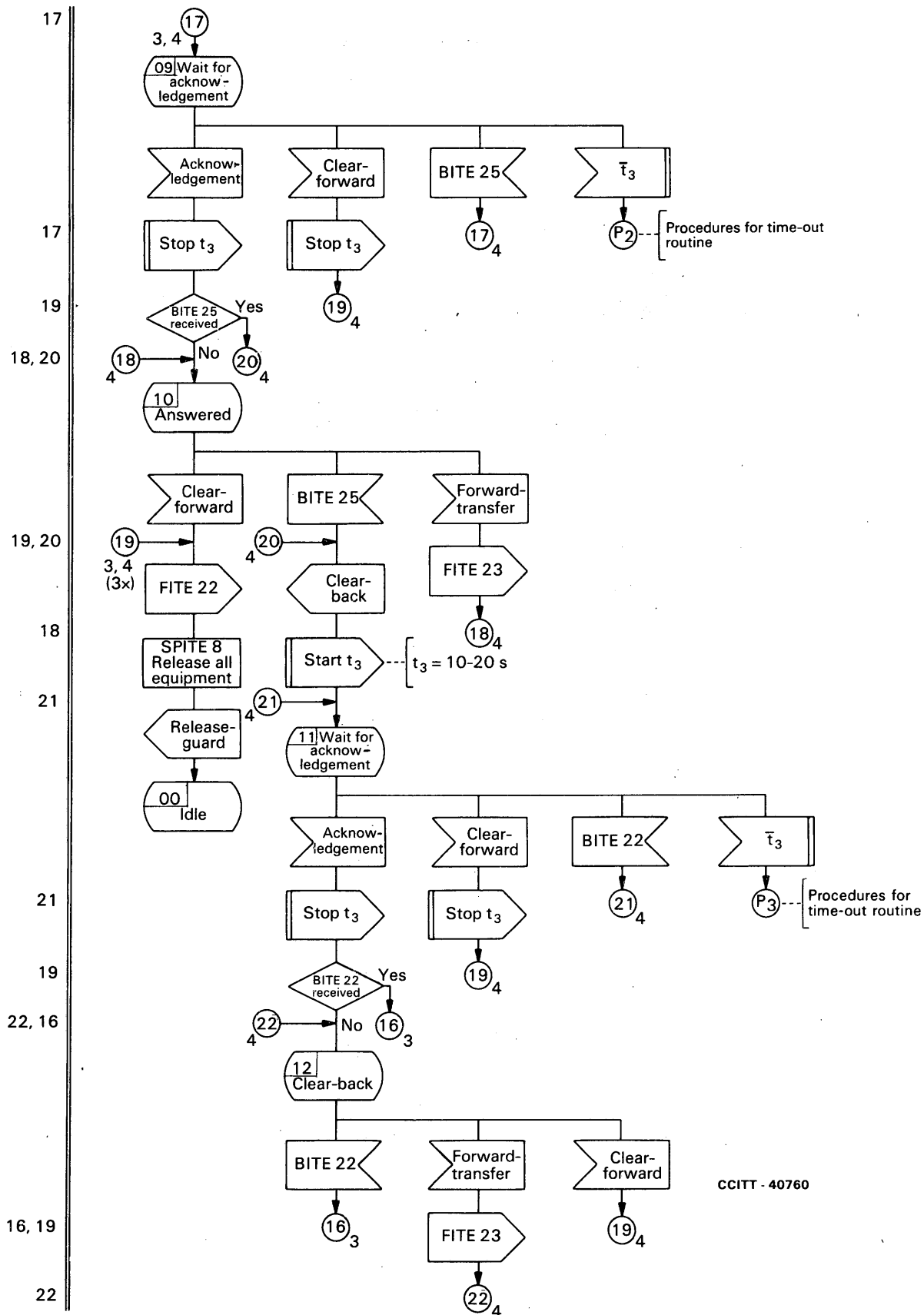FIGURE 3/Q.613 (Sheet 8 of 8)

Incoming Signalling System No. 6

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM No. 7 (TUP)

CCITT - 53621
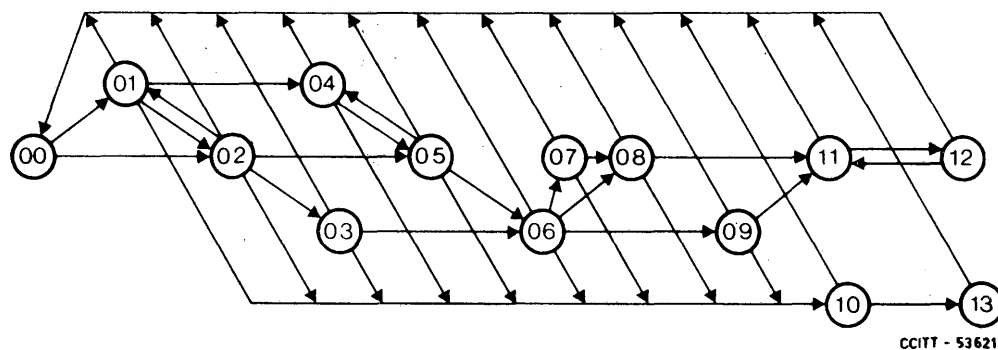
State number	State description	Sheet reference	Timers running
00	Idle	1, 13	
01	Wait for further digits	2	t_1, t_2
02	Wait for digit analysis	4	t_1, t_2 or t_3
03	Wait for continuity check (COT)	7	t_1, t_2 or t_3
04	Wait for further digits (COT received)	3	t_2
05	Wait for digit analysis (COT received)	3	t_2 or t_3
06	Wait for address complete (COT received)	9	t_2 or t_3
07	Wait for register deactivation	10	
08	Address complete — wait for answer	12	
09	Address complete, subscriber free — wait for answer	13	
10	Call unsuccessful — wait for clear-forward	11	t_4
11	Answered	13	
12	Clear-back	13	
13	Call failure wait for clear forward	11	

FIGURE 1/Q.614

State overview diagram for incoming Signalling System No. 7 (TUP)

$t_1 = 10 - 15$ s   Recommendation Q.724, § 6.4.2, a) $t_4 = 4 - 15$ s   Recommendation Q.724, § 6.4.2, b)

$t_2 = 15 - 20$ s   Recommendation Q.724, § 1.7 $t_5 = 1$ min   Recommendation Q.724, § 6.4.2, b)

$t_3 = 20 - 30$ s   Recommendation Q.724, § 6.4.3

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

— dual seizure,

— blocking and unblocking sequences,

— user part selection (see Note),

— confusion and message refusal signals,

— reset circuit procedures,

— test call procedures,

— out of service,

— national procedures.

Signal abbreviations used

The signal abbreviations used correspond to those of the Signalling System No. 7 specifications unless otherwise indicated on the same sheet.

The signal abbreviations used are listed below with their meanings:

ACM	Address complete message
ADC	Address complete, charge
ADI	Address incomplete
ADN	Address complete, no charge
ADX	Address complete, coin box
AFC	Address complete, subscriber free, charge
AFN	Address complete, subscriber free, no charge
AFX	Address complete, subscriber free, coin box
ANC	Answer charge
ANN	Answer no charge
CBK	Clear-back signal
CCF	Continuity-failure signal
CCH	Continuity check indicator
CFL	Call failure
CGC	Circuit group congestion
CLF	Clear-forward signal
COT	Continuity
CPCI	Calling party category indicator
ESI	Echo suppressor indicator
FOT	Forward-transfer signal
IAM	Initial address message
LOS	Line-out-of-service
NCI	Nature of circuit indicator
NNC	National network congestion
NAI	Nature of address indicator
RAN	Reanswer signal
RLG	Release-guard signal
SAM	Subsequent address message
SAO	Subsequent address message with one address digit
SEC	Switching equipment congestion
SSB	Subscriber busy
SST	Send special information tone
UNN	Unallocated number

Note — This SDL diagram relates only to the International Telephony User Part (TUP) specified for Signalling System No. 7 in Recommendations Q.721-Q.725. The selection of the TUP is assumed to have been made on a per message basis by the Level 3 message distribution process.

FIGURE 2/Q.614

Notes to incoming Signalling System No. 7 (TUP)
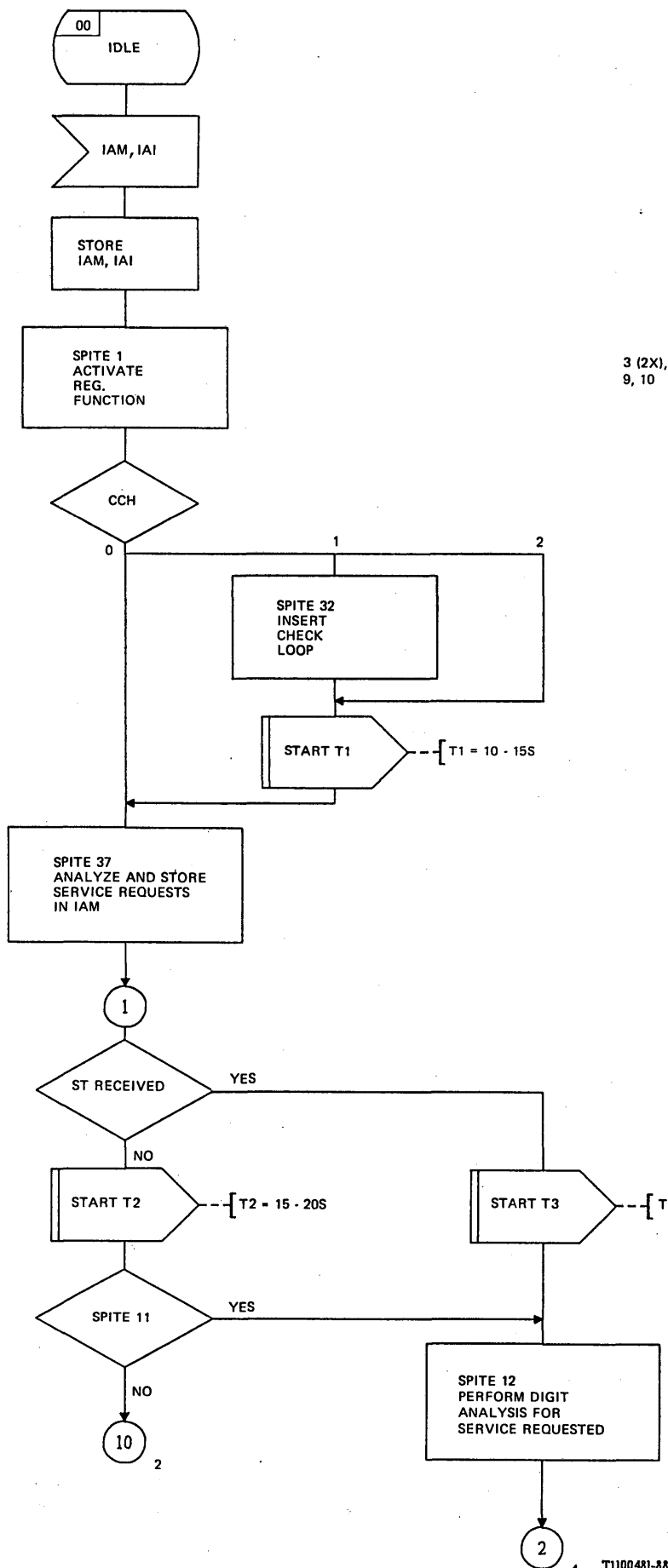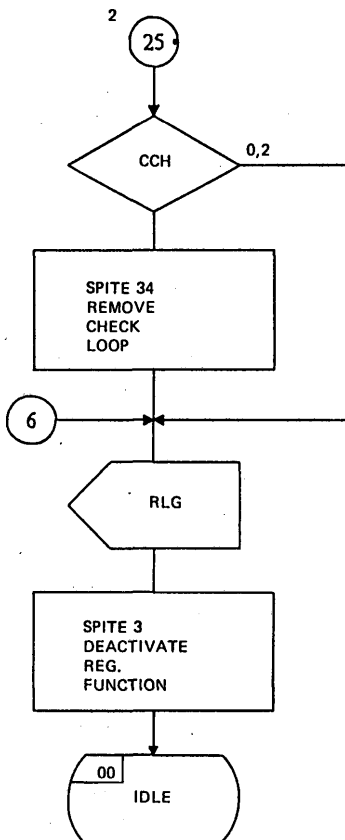
FIGURE 3/Q.614 (Sheet 1 of 14)

Incoming Signalling System No. 7 (TUP)
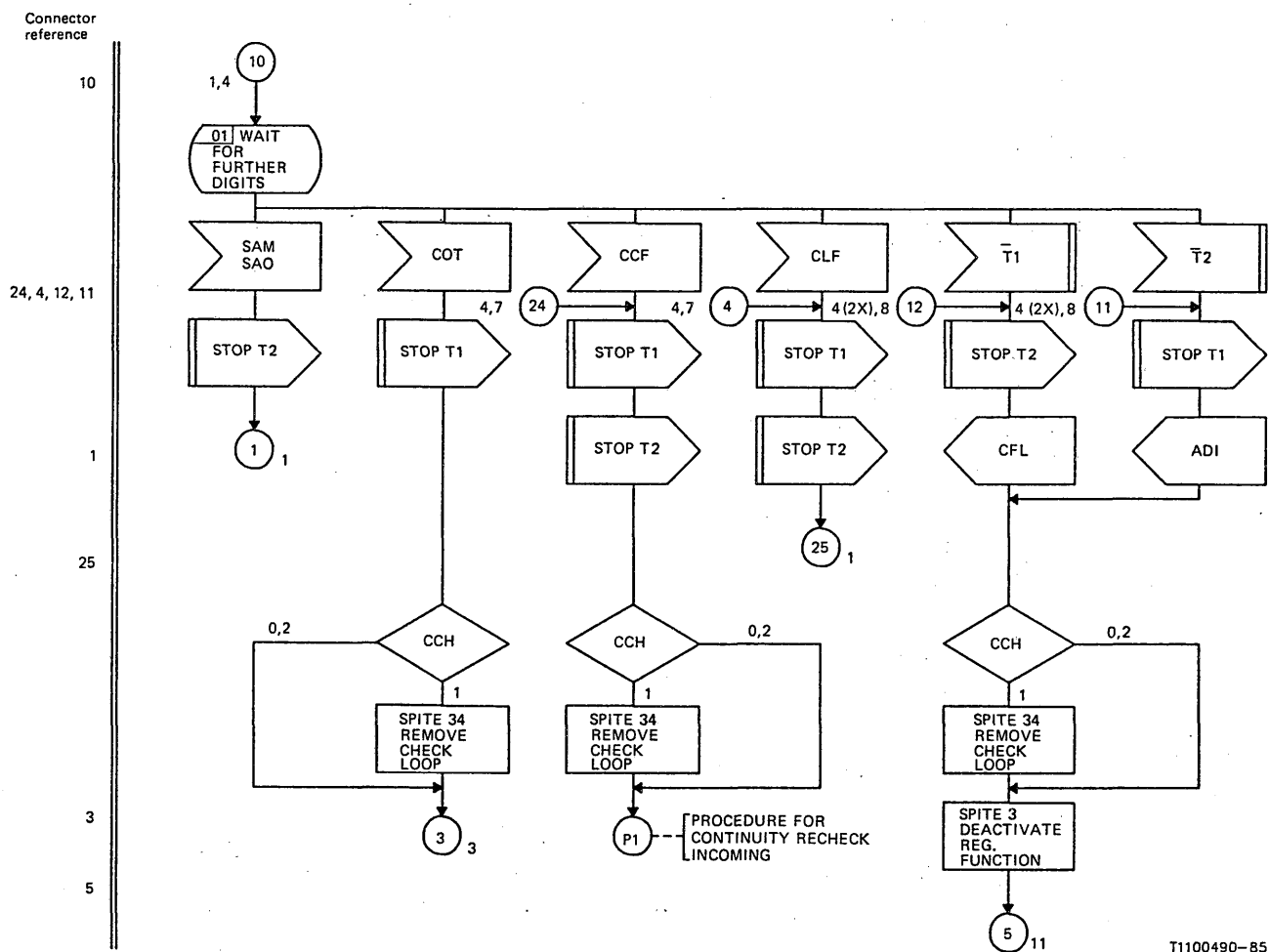
FIGURE 3/Q.614 (Sheet 2 of 14)

Incoming Signalling System No. 7 (TUP)

FIGURE 3/Q.614 (Sheet 3 of 14)

Incoming Signalling System No. 7 (TUP)

T1100500-85

FIGURE 3/Q.614 (Sheet 4 of 14)

Incoming Signalling System No. 7 (TUP)
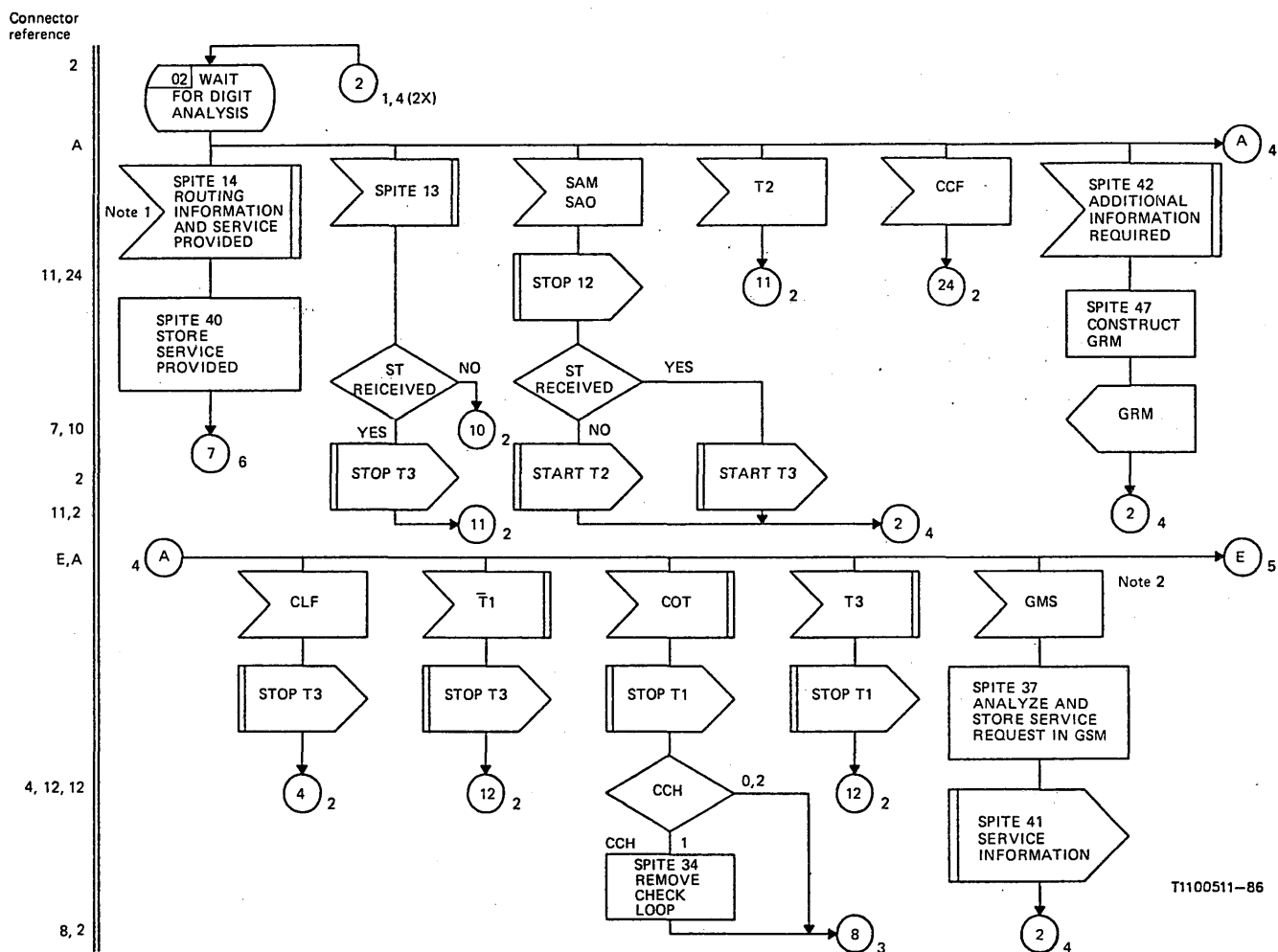
Note 1 — It is assumed that if a transit exchange has requested additional information then routing information will not be received until after the requested information has been received.

Note 2 — It is assumed that GRQ was sent.

Connector
reference

E

3,4 E

SPITE 15
UNALLO-
CATED NO.

SPITE
16, 17

SPITE 18

SPITE 19

SPITE 38
ACCESS
BARRED

SPITE 39 DIG.
CONNEC-
TION NOT
POSSIBLE

SPITE 38
ACCESS
BARRED

UNN

SST

SEC

CBC

ACB

DPN

ACB

T1100512−86

SPITE 3
DEACTIVATE
REG.
FUNCTION

CCH 0,2

1

SPITE 34
REMOVE
CHECK
LOOP

5

5 11

Note — It is assumed that if a transit exchange has requested additional information then routing information will not be received until after the requested information has been received.

FIGURE 3/Q.614 (Sheet 5 of 14)

Incoming Signalling System No. 7 (TUP)
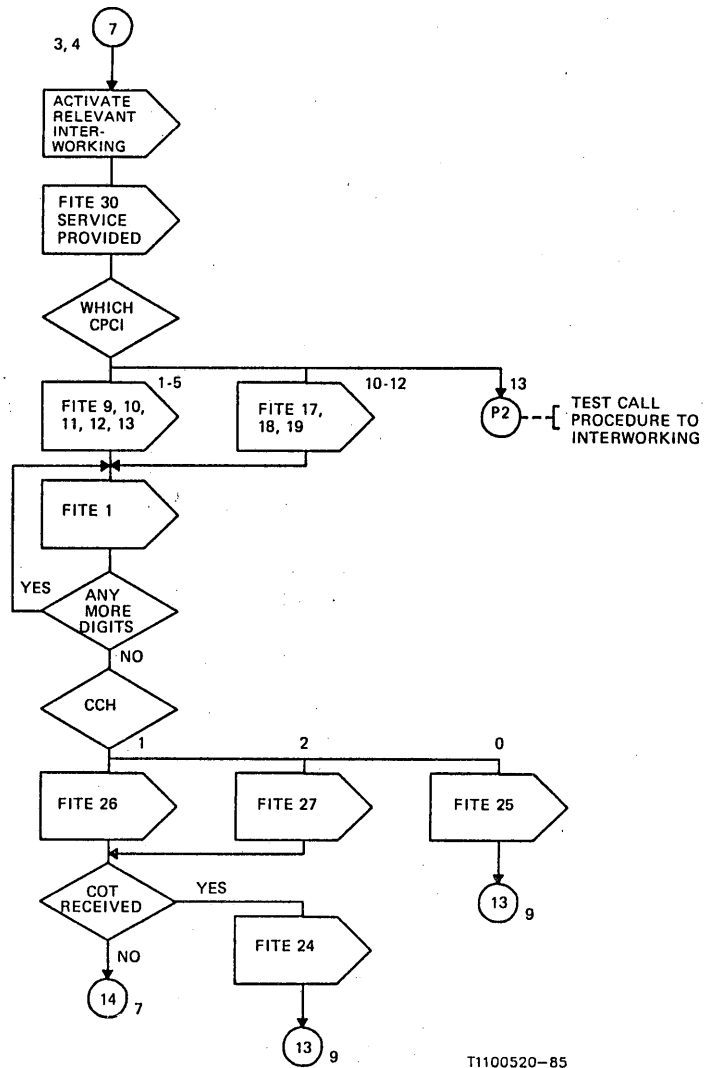
FIGURE 3/Q.614 (Sheet 6 of 14)

Incoming Signalling System No. 7 (TUP)
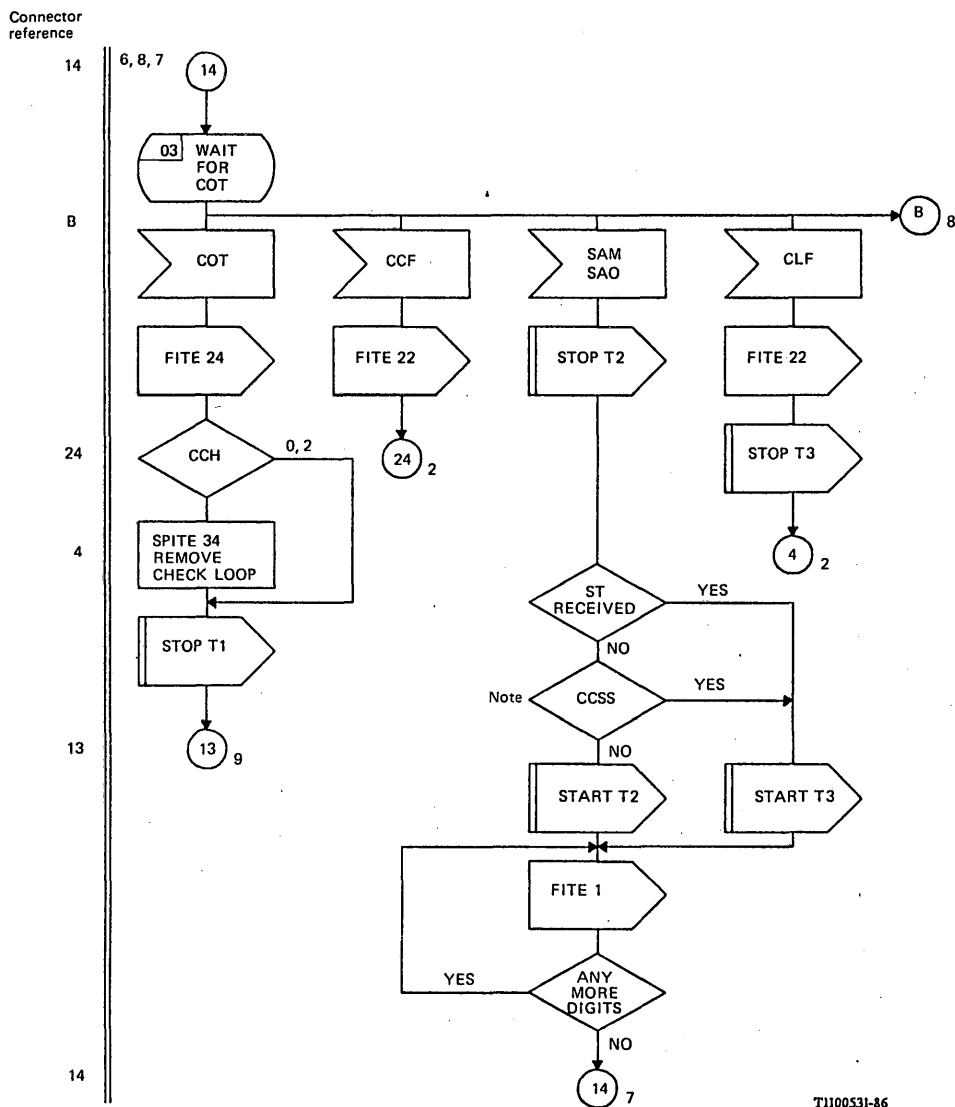
Note — Is outgoing link common channel signalling system?

FIGURE 3/Q.614 (Sheet 7 of 14)

Incoming Signalling System No. 7 (TUP)

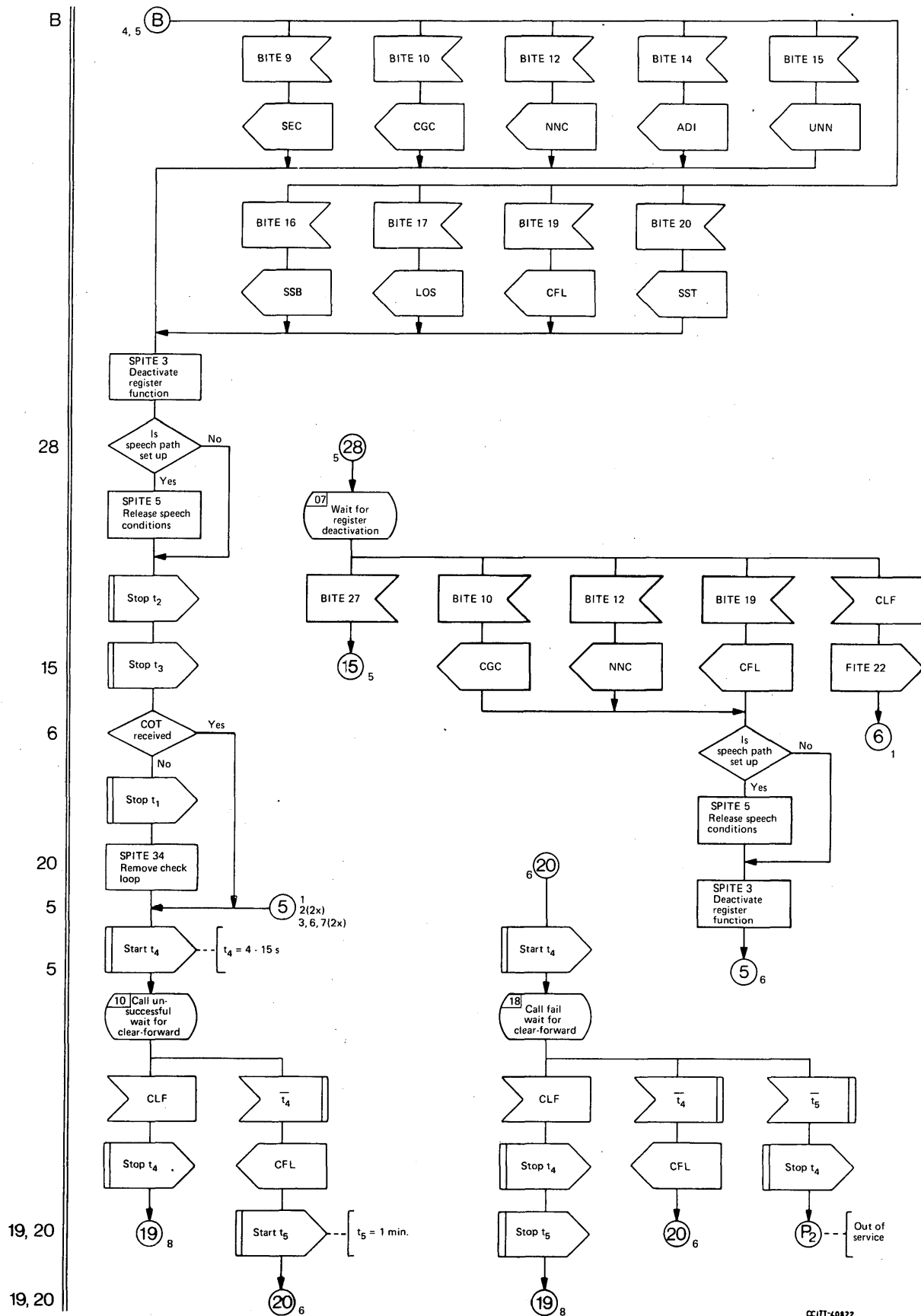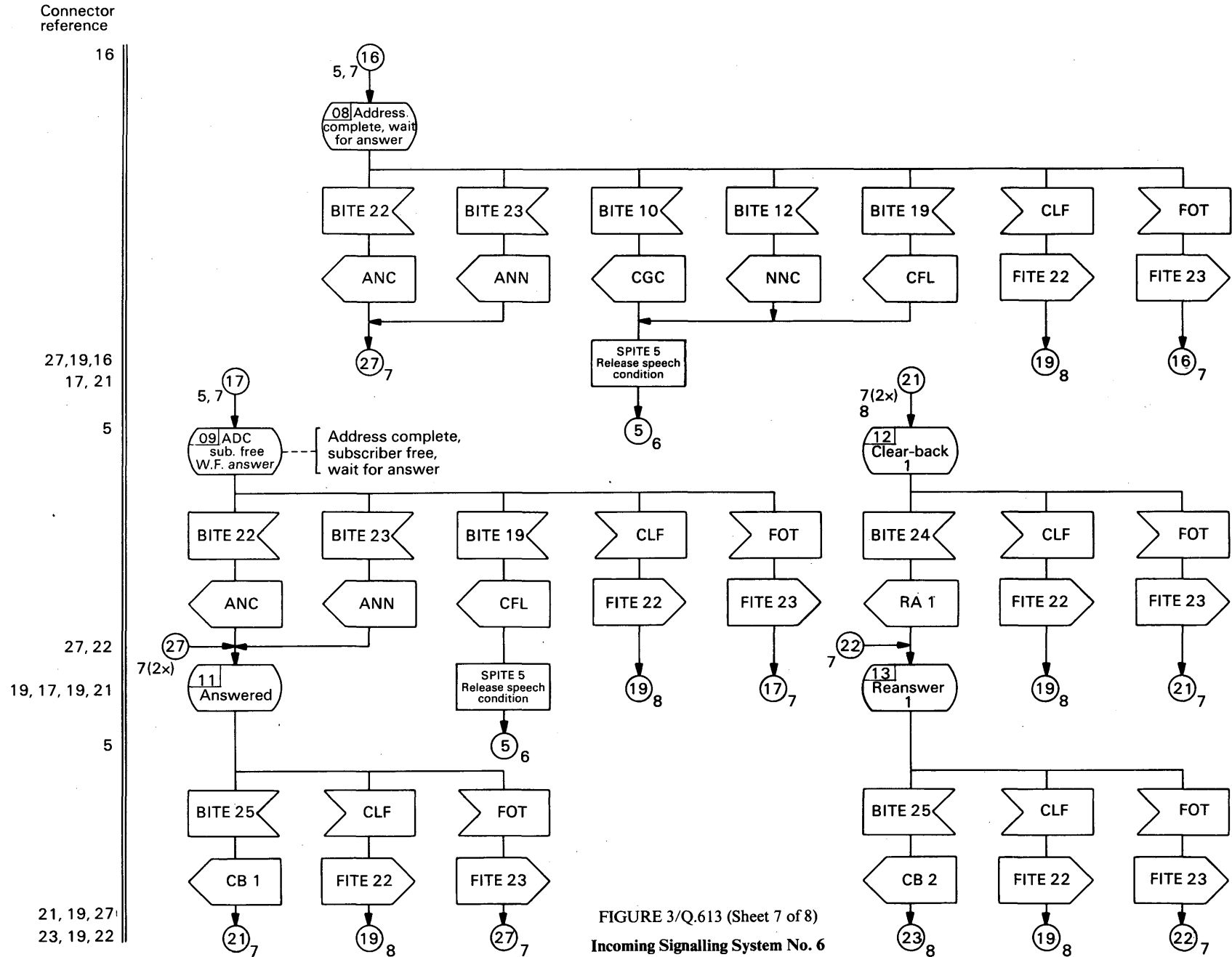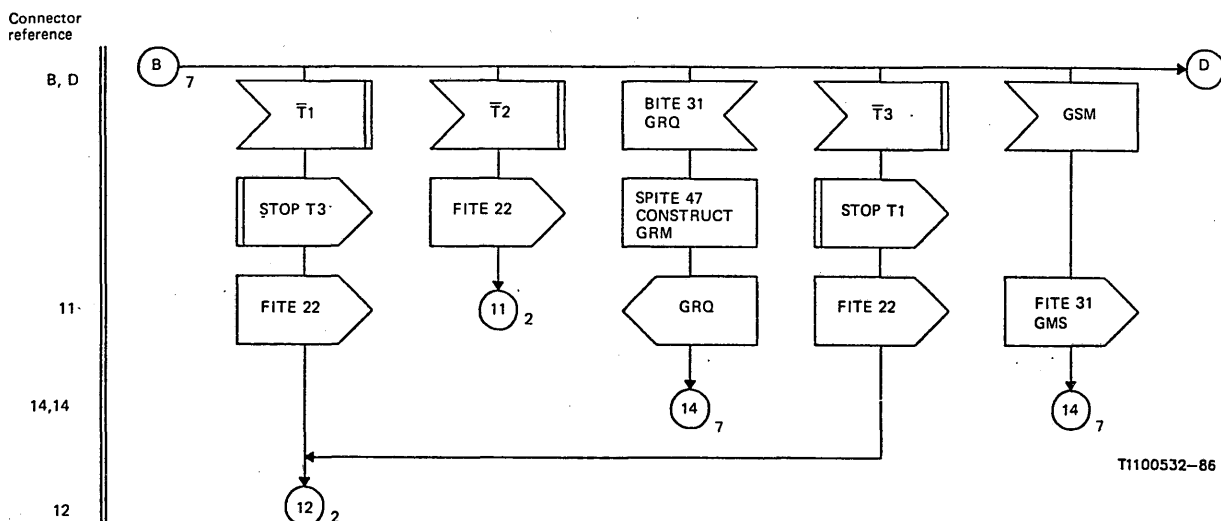FIGURE 3/Q.614 (Sheet 8 of 14)

Incoming Signalling System No. 7 (TUP)
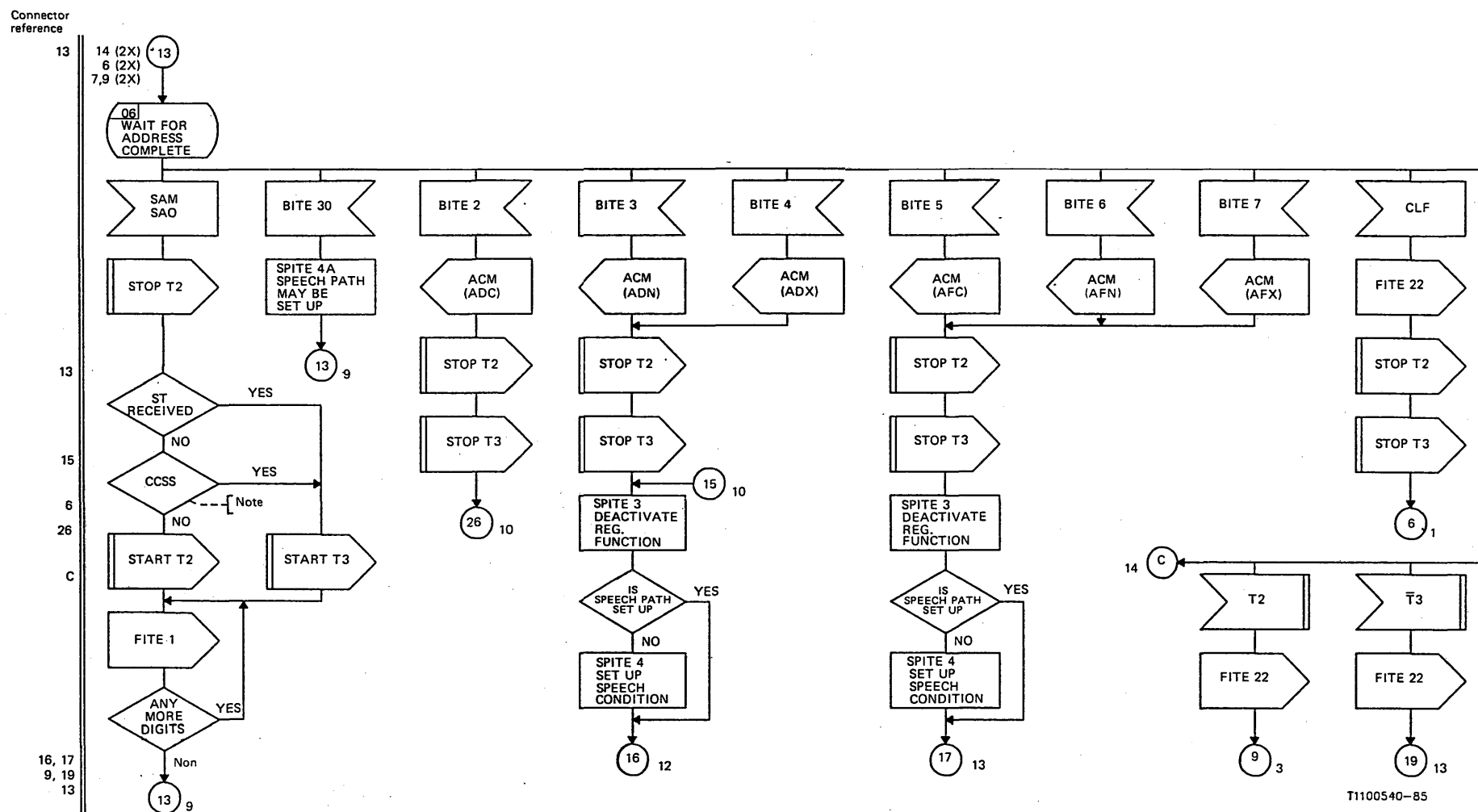
Note — Is outgoing link common channel signalling system?

FIGURE 3/Q.614 (Sheet 9 of 14)

Incoming Signalling System No. 7 (TUP)

FIGURE 3/Q.614 (Sheet 10 of 14)

Incoming Signalling System No. 7 (TUP)
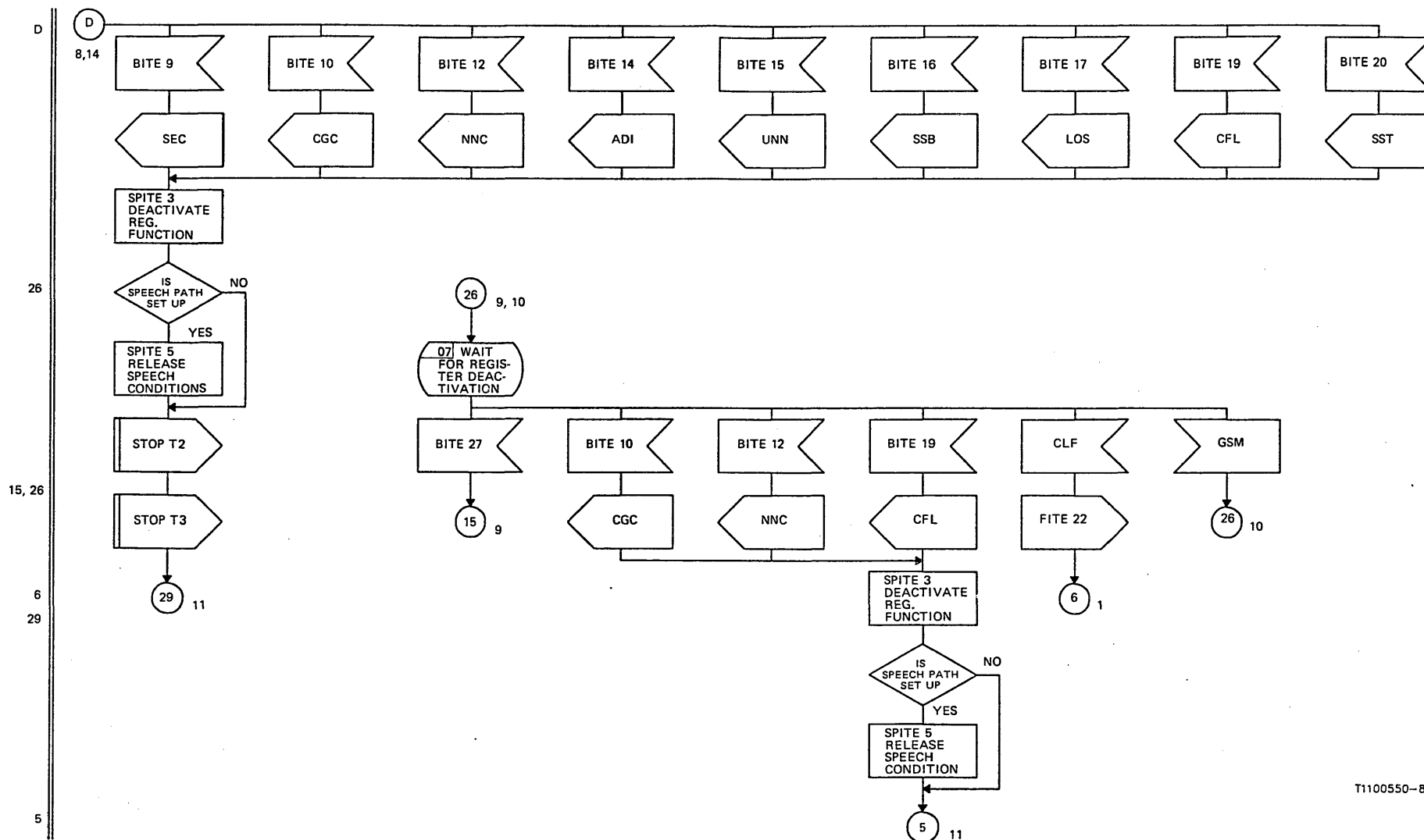
T1100550—85
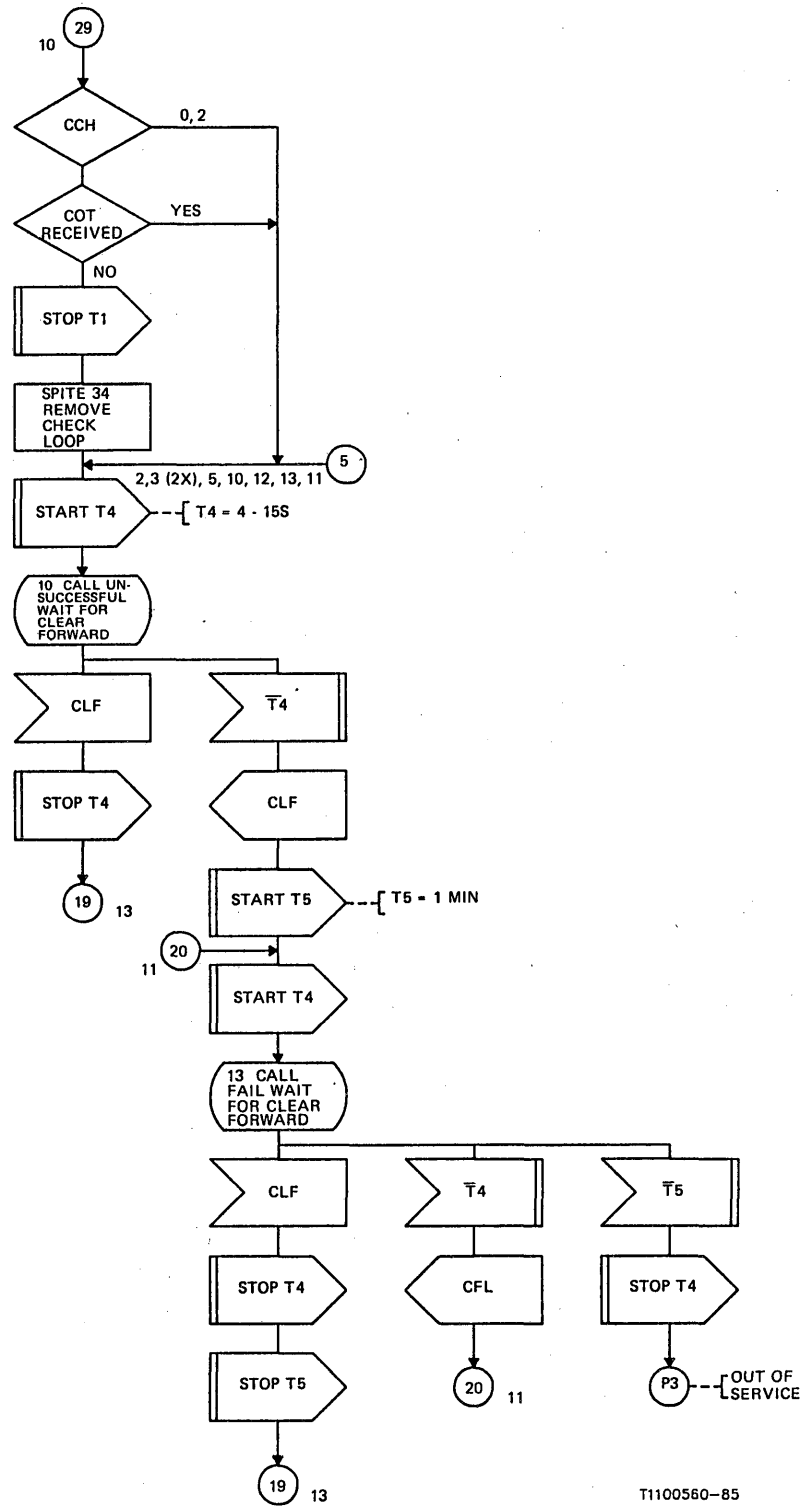
FIGURE 3/Q.614 (Sheet 11 of 14)

Incoming Signalling System No. 7 (TUP)
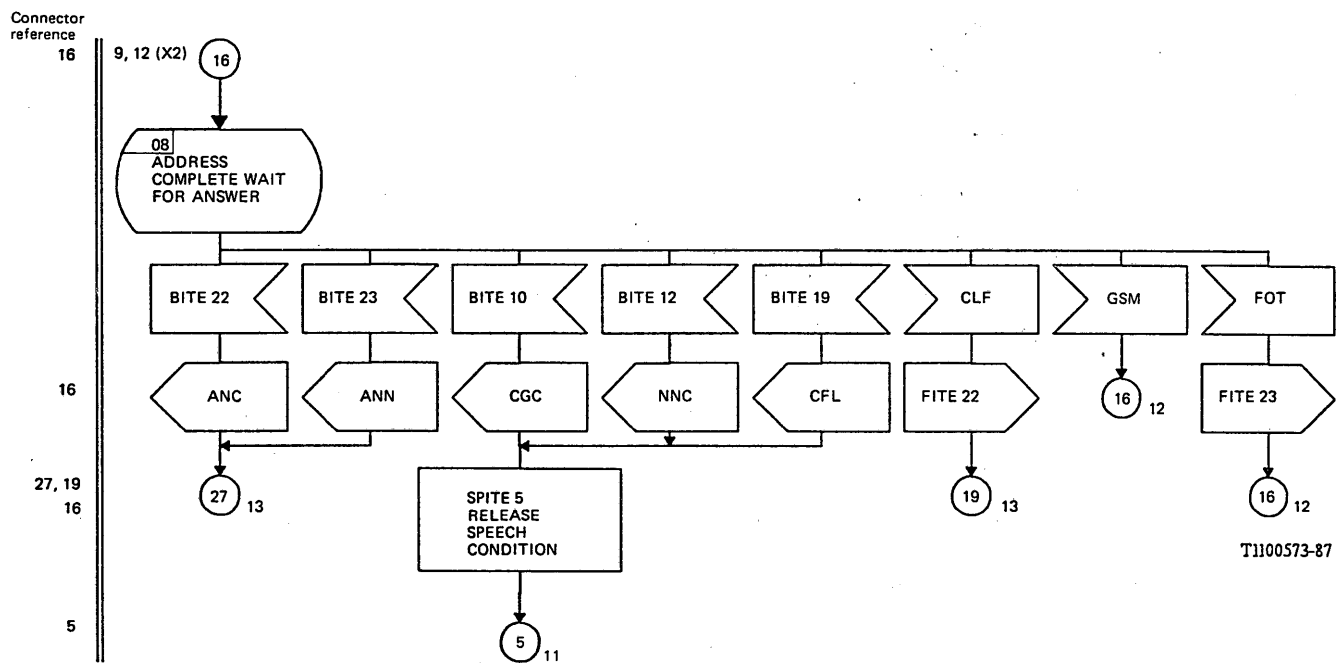
FIGURE 3/Q.614 (Sheet 12 of 14)

Incoming Signalling System No. 7 (TUP)
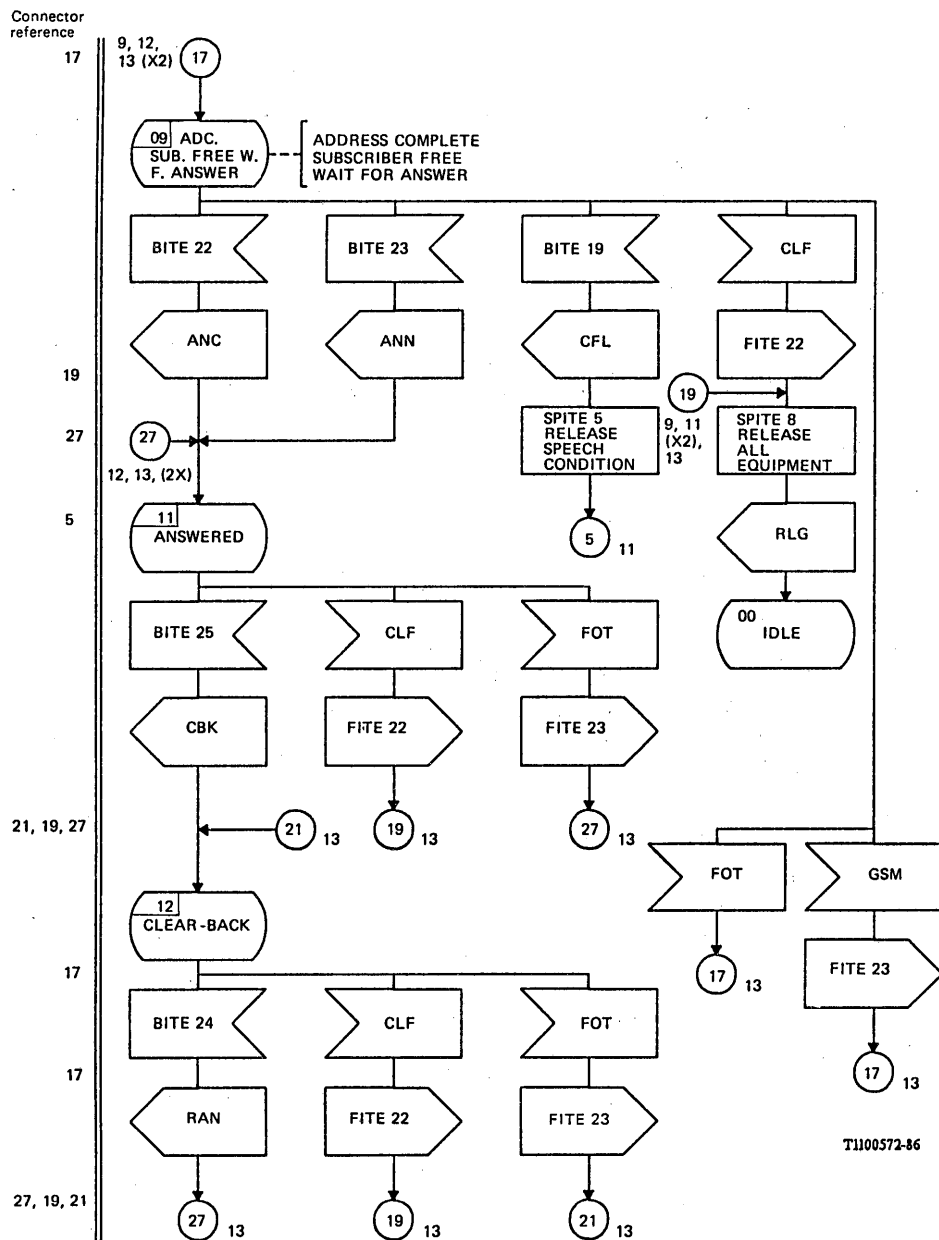
FIGURE 3/Q.614 (Sheet 13 of 14)

Incoming Signalling System No. 7 (TUP)
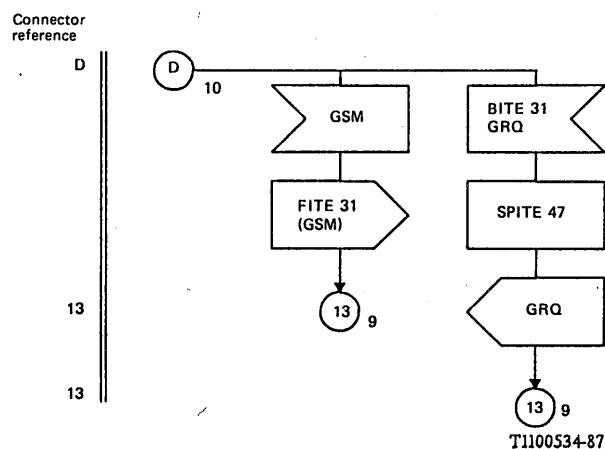
FIGURE 3/Q.614 (Sheet 14 of 14)

Incoming Signalling System No. 7 (TUP)

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM R1
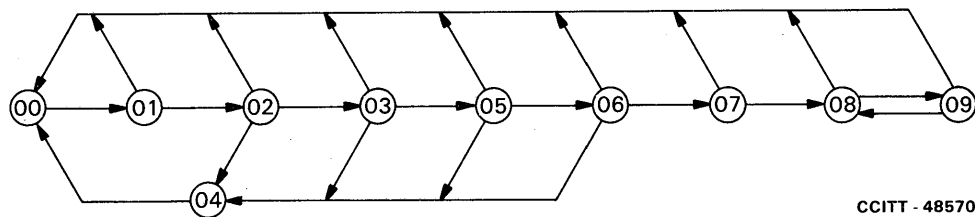
State number	State description	· Sheet reference	Timers running
00	Idle	1, 2	
01	Wait for register activation	1	
02	Wait for first register signal (KP)	1	t_1
03	Wait for next register signal	1	t_1
04	Wait for clear-forward	1	
05	Wait for digit analysis	2	
06	Wait for register deactivation	2	
07	Wait for answer	2	
08	Answered	2	
09	Clear-back	2	

FIGURE 1/Q.615

State overview diagram for incoming Signalling System R1

Supervisory timers for incoming Signalling System R1

t_1 = 10-20 s   Recommendation Q.325

Remarks to facilitate reading and understanding the SDL flow chart

a) The procedure described in Recommendation Q.313, § 2.3.3.2, e) is not shown because this has no impact on the interworking.

b) This incoming Signalling System R1 procedure assumes the inclusion of country code digits in the case where Signalling System R1 is used to access the outgoing international exchange.

FIGURE 2/Q.615

Notes to incoming Signalling System R1
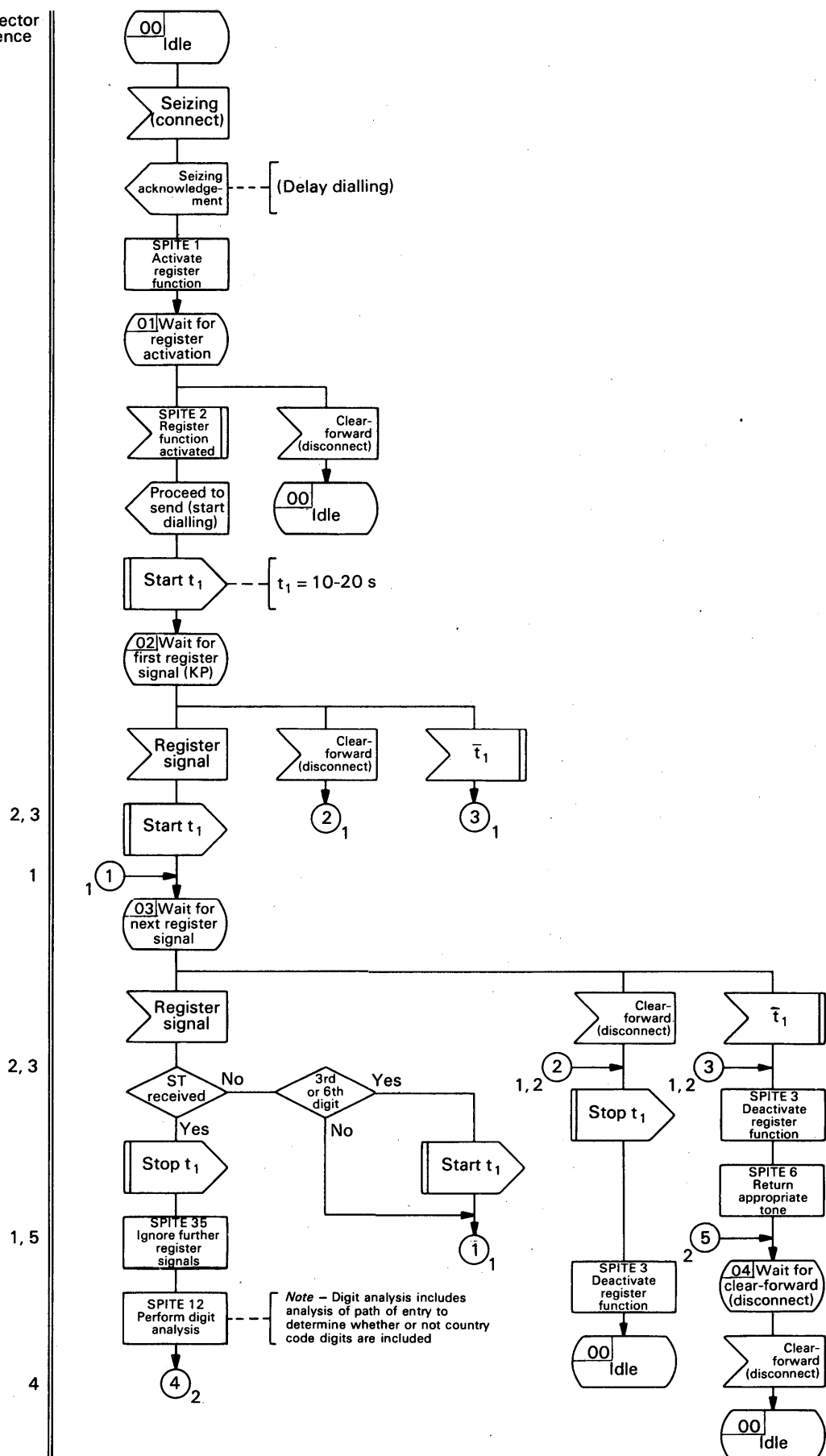
FIGURE 3/Q.615 (Sheet 1 of 2)

Incoming Signalling System R1

CCITT - 40850
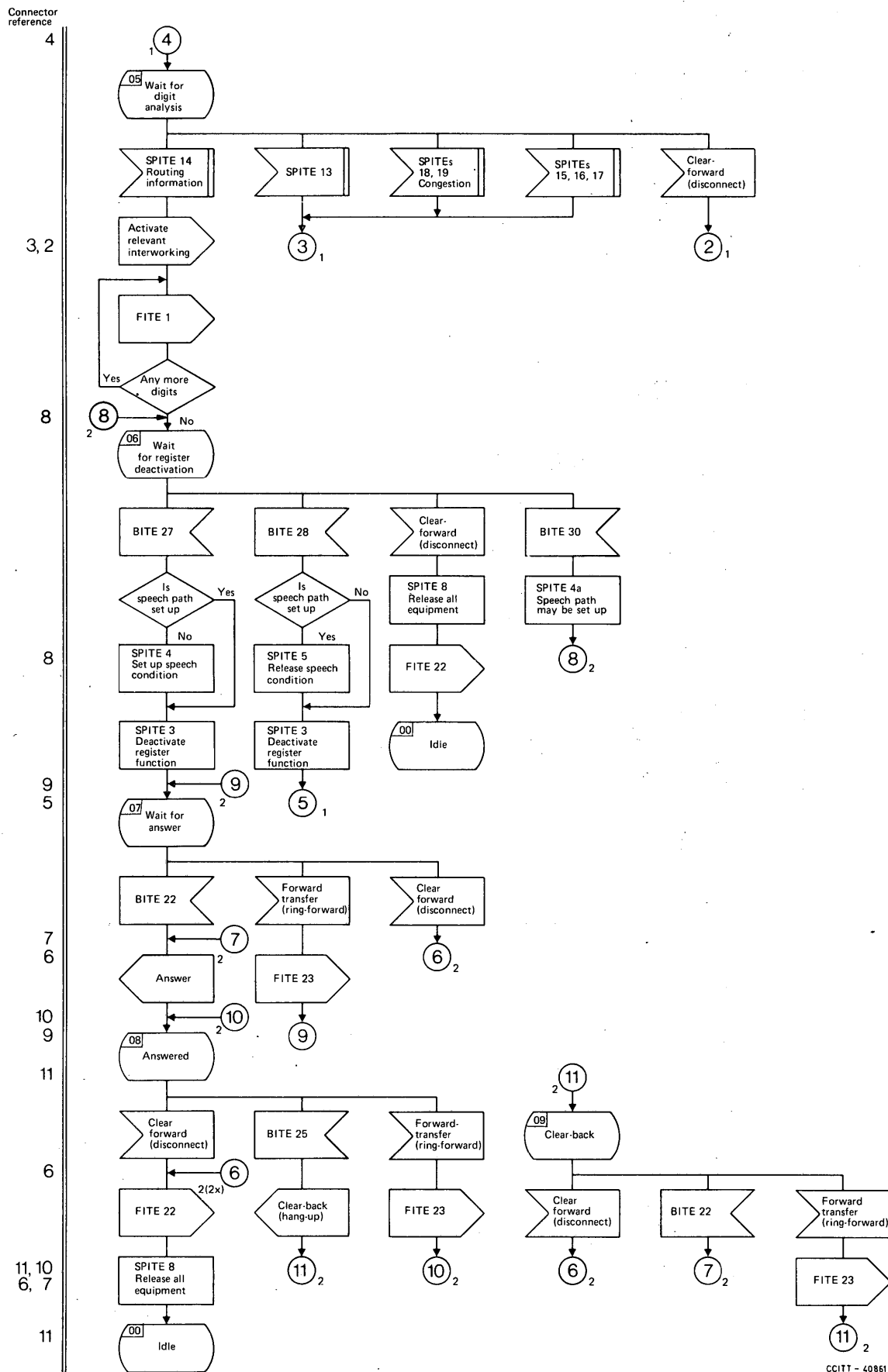
FIGURE 3/Q.615 (Sheet 2 of 2)

Incoming Signalling System R1

LOGIC PROCEDURES FOR INCOMING SIGNALLING SYSTEM R2
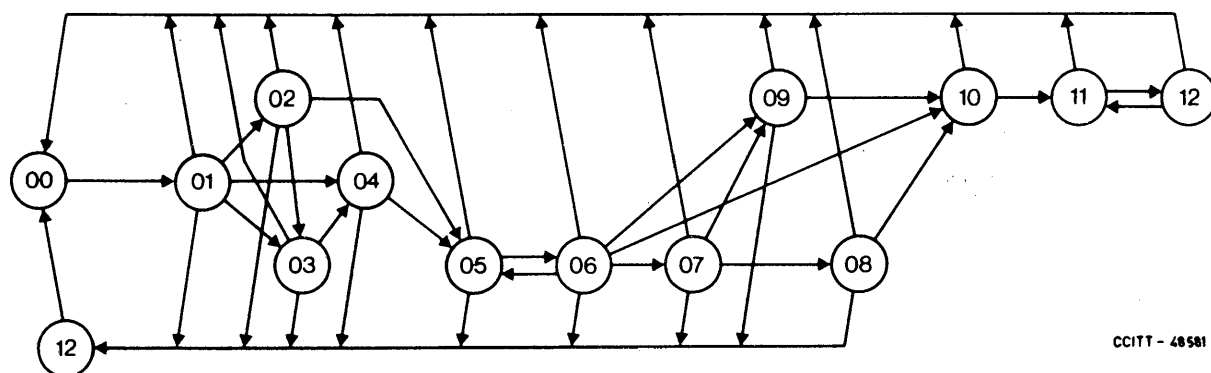
State number	State description	Sheet number	Running timers
00	Idle	1	
01	Wait for first forward signal	1	t_1
02	Wait for reply to A-14	2	t_1
03	Wait for nature of circuit indicator	1	t_1
04	Wait for calling party's category	2	t_1
05	Wait for forward register signal	2	t_1
06	Wait for digit analysis	2	t_1
07	Wait for address-complete	3	t_1
08	Wait for register deactivation	4	
09	Wait for group II signal	4	t_1
10	Wait for answer	4	
11	Answered	4	
12	Clear-back	4	
13	Wait for clear-forward	1	

FIGURE 1/Q.616

State overview diagram for Incoming Signalling System R2

Supervisory timers

t_1 = 8-24 s   Recommendation Q.476, § 5.5.2.1

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

 — Interrupt control procedures (analogue version).

 — Transmission fault procedures (digital version).

 — Test call procedures.

 — Analogue T_2 release guard timing.

 — Optional forward transfer procedure.

 — Blocking and unblocking sequences.

FIGURE 2/Q.616
Notes to incoming Signalling System R2
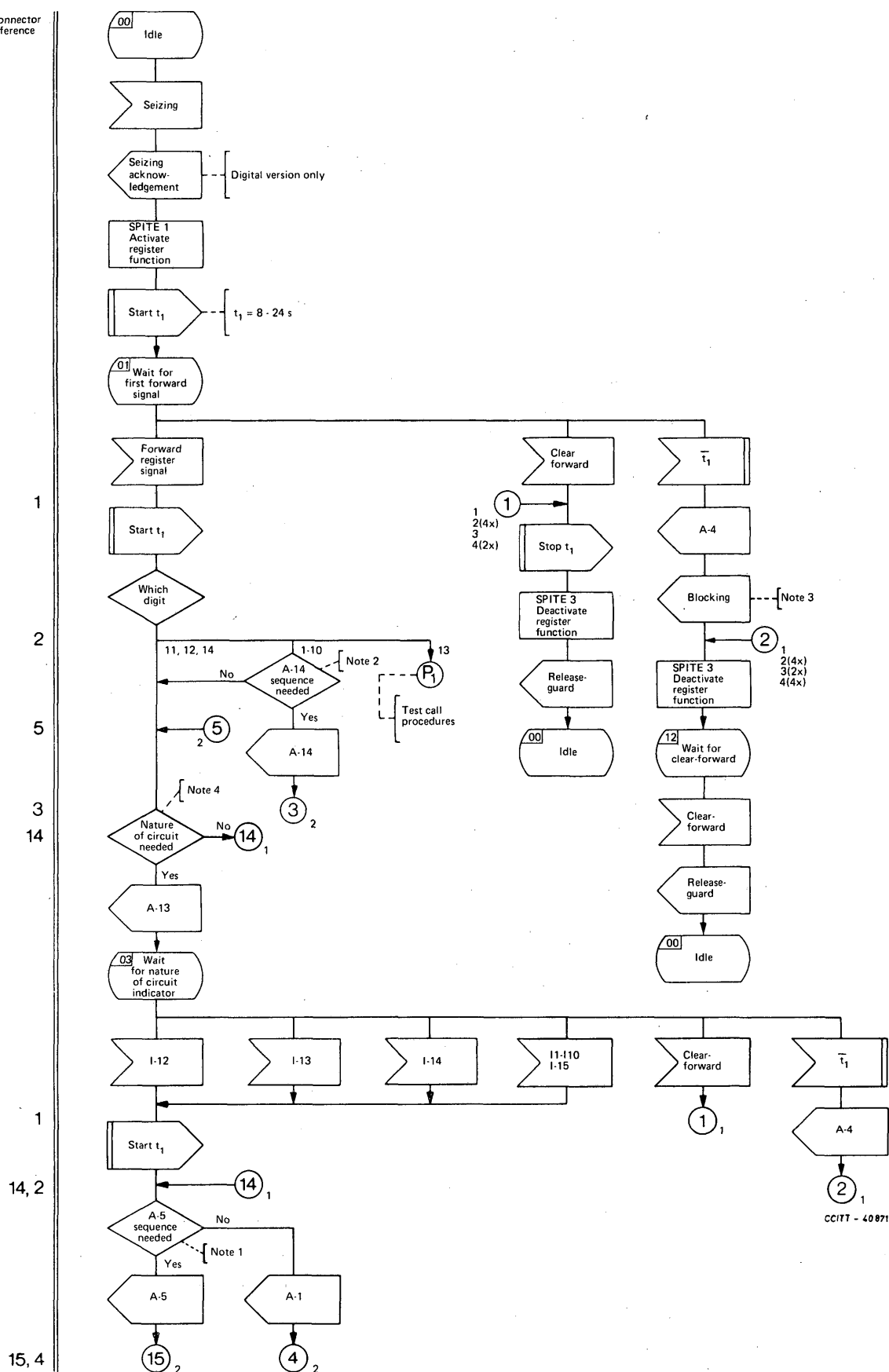
Note 1 — Required for interworking reasons except when only capable of interworking with Signalling System 4, 5 and R1, but A-5 may be sent at any time as required.

Note 2 — Required when the international exchange can insert incoming half-echo suppressors as specified in Recommendation Q.479. Q.479.

Note 3 — The blocking signal should not be sent if the digital version of line signalling is being used.

Note 4 — This sequence is defined in Recommendation Q.480, § 5.8.1.

FIGURE 3/Q.616 (Sheet 1 of 4)

Incoming Signalling System R2
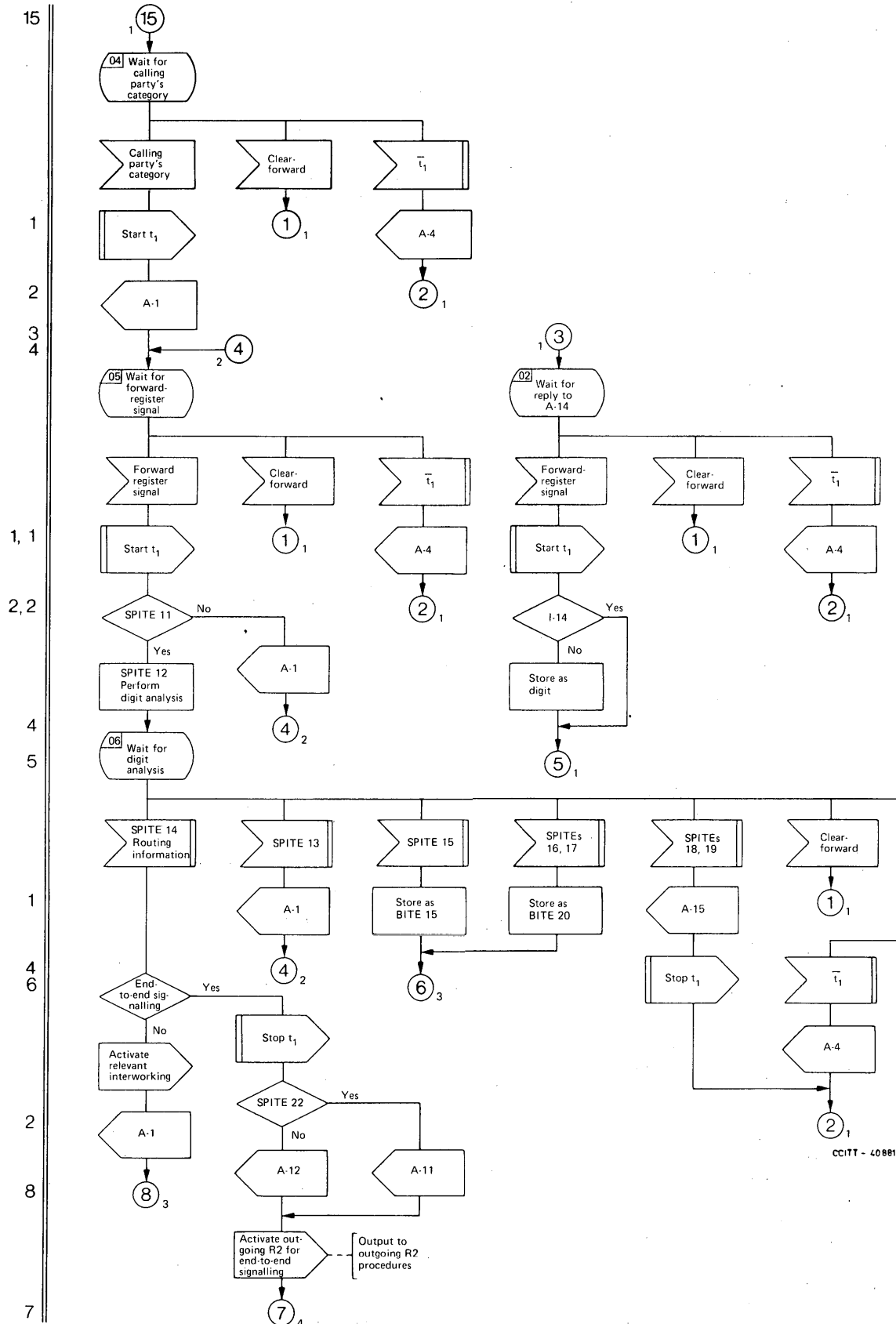
FIGURE 3/Q.616 (Sheet 2 of 4)

Incoming Signalling System R2

FIGURE 3/Q.616 (sheet 3 of 4)

Incoming Signalling System R2

CCITT-40890
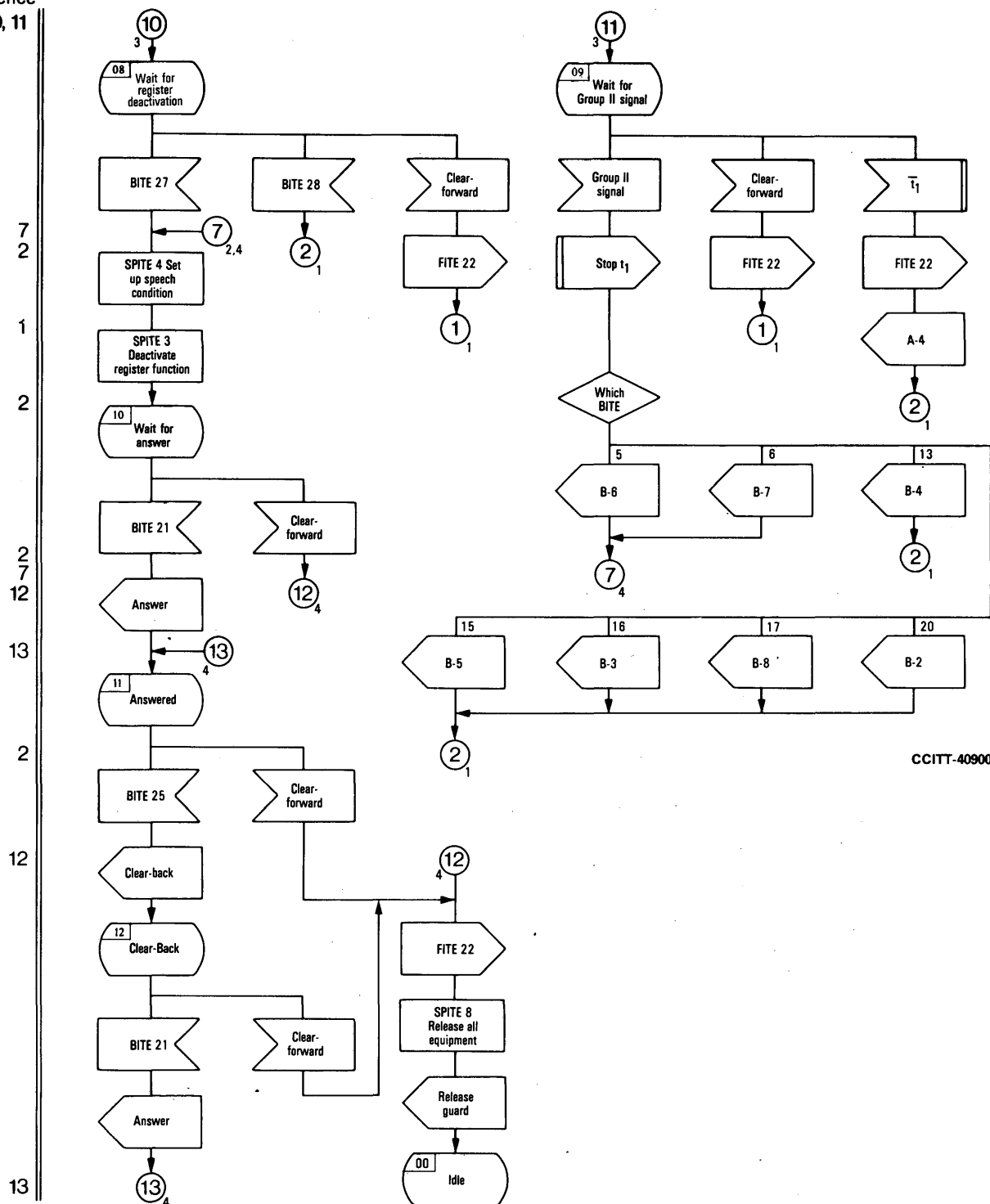
FIGURE 3/Q.616 (Sheet 4 of 4)

Incoming Signalling System R2

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM No. 4

CCITT-48590
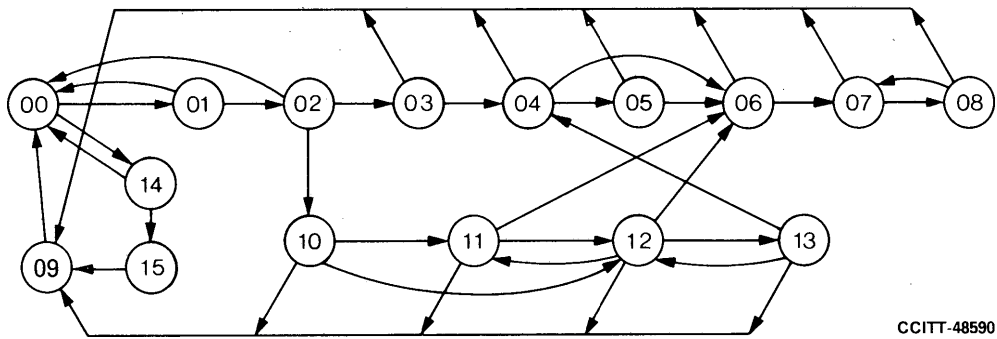
State number	State description	Sheet reference	Timers running
00	Idle	1, 2	
01	Wait for CPCI-FITE	1	
02	Wait for FITE 2 or 3	1	
03	Wait for terminal proceed-to-send	1	t_1
04	Wait for acknowledgement	1	t_2
05	Wait for number-received	2	t_3
06	Wait for answer	2	
07	Answered	2	
08	Clear-back	2	
09	Wait for release-guard	2	t_4
10	Wait for proceed-to-send	3	t_1
11	Wait for number-received	3	t_3
12	Wait for acknowledgement signal	3	t_2
13	Wait for proceed-to-send	4	t_3
14	Wait for FITE 2 or 3 (end-to-end)	1	
15	Wait for clear-forward	1	

FIGURE 1/Q.621

State overview diagram for outgoing Signalling System No. 4

Supervisory timers

t_1 = 10 - 30 s   Recommendation Q.127, § 4.4.1 (2), c)

t_2 = 5 - 10 s   Recommendation Q.127, § 4.4.1 (2), d)

t_3 = 15 - 30 s   Recommendation Q.127, § 4.4.1 (2), a)

t_4 = 5 - 10 s   Recommendation Q.130, § 4.7.1

Procedure not shown

The following procedure, not directly relevant to interworking, is not shown in the logic procedures:

    P_1 = Procedure for time-out due to non-receipt of release guard (see Recommendation Q.130, § 4.7.1).

FIGURE 2/Q.621

Notes to outgoing Signalling System No. 4
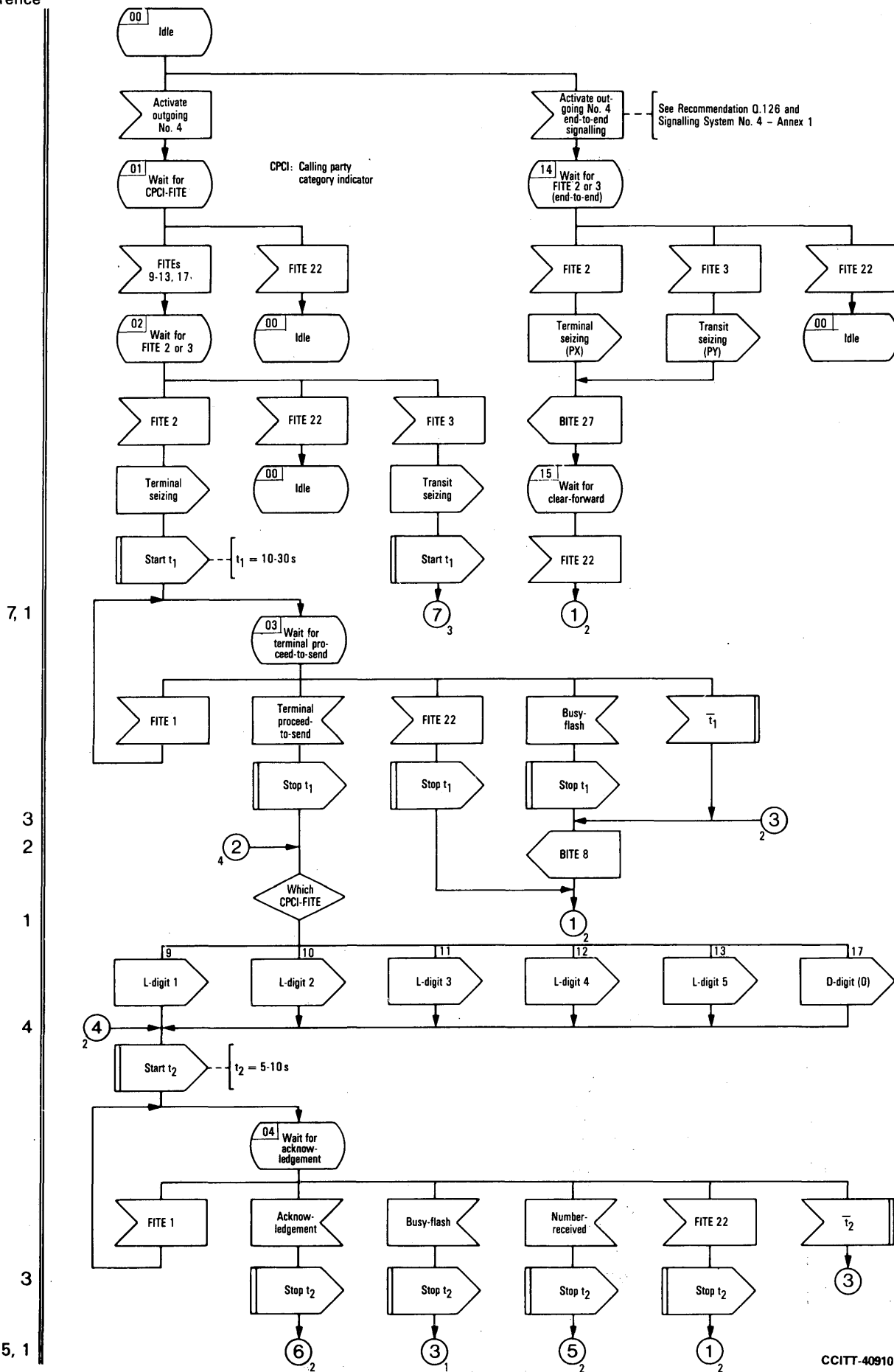
FIGURE 3/Q.621 (Sheet 1 of 4)
Outgoing Signalling System No. 4
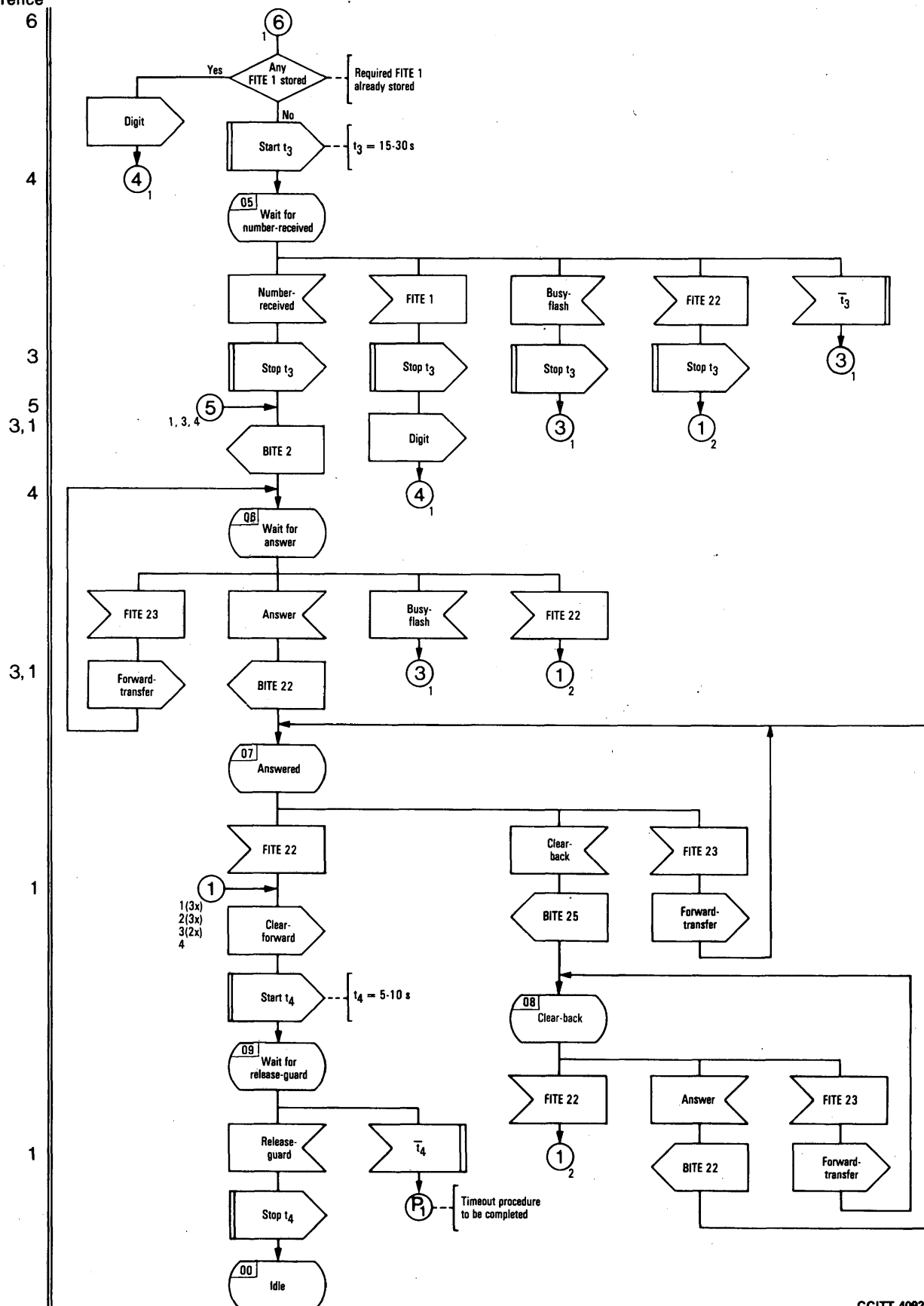
CCITT-40910

FIGURE 3/Q.621 (Sheet 2 of 4)

Outgoing Signalling System No. 4
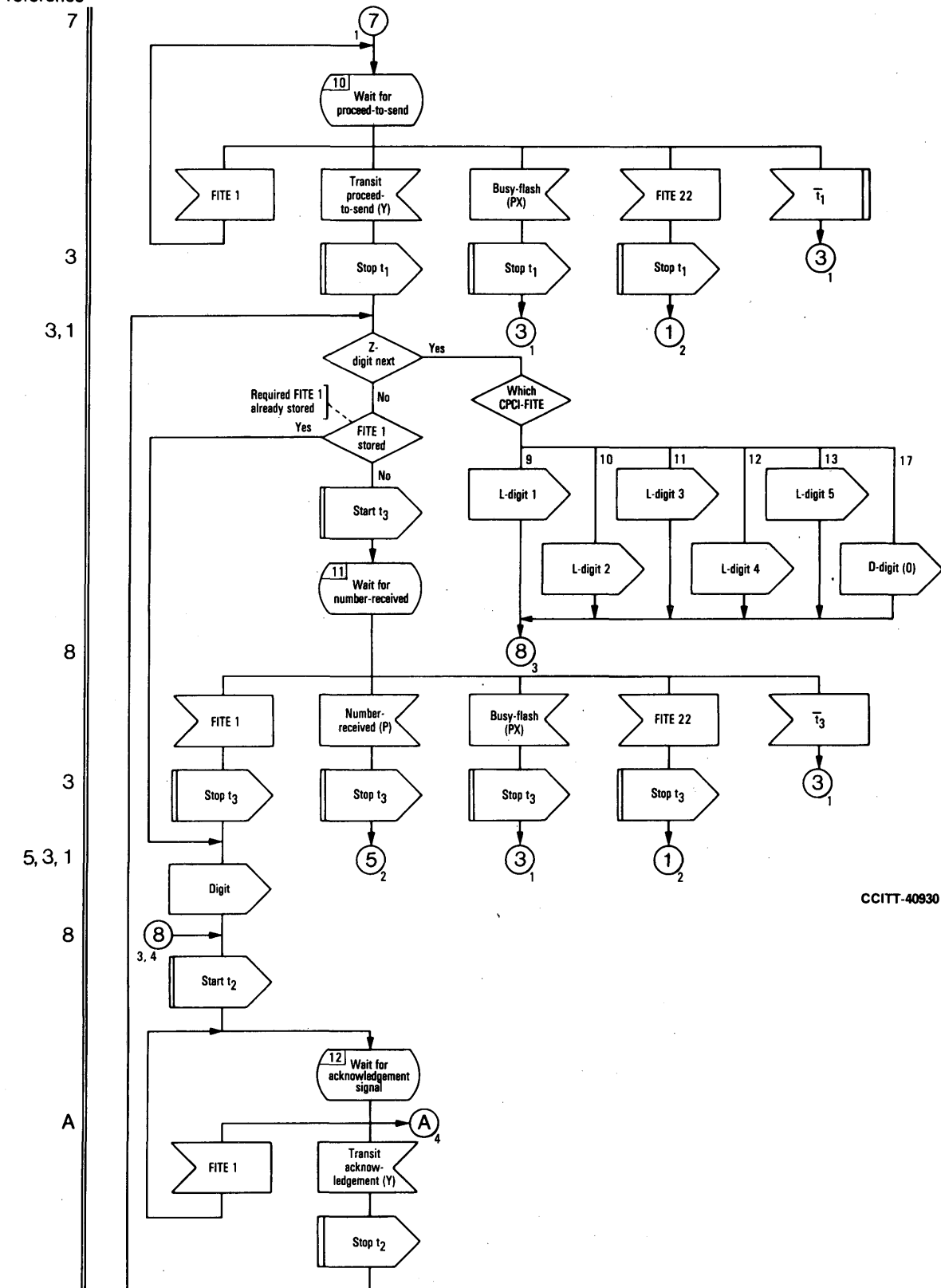
FIGURE 3/Q.621 (Sheet 3 of 4)

Outgoing Signalling System No. 4
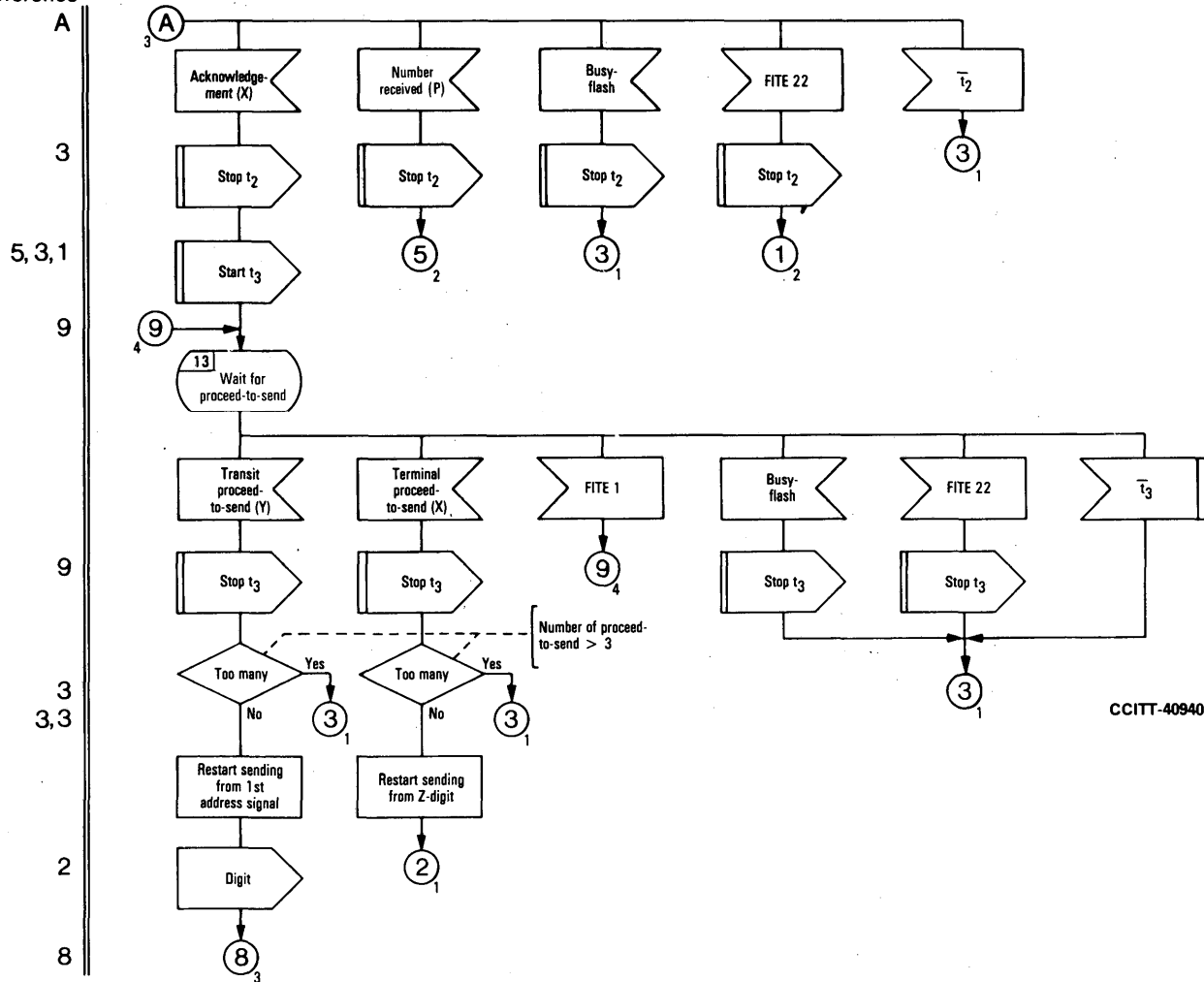
FIGURE 3/Q.621 (Sheet 4 of 4)
Outgoing Signalling System No. 4

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM No. 5
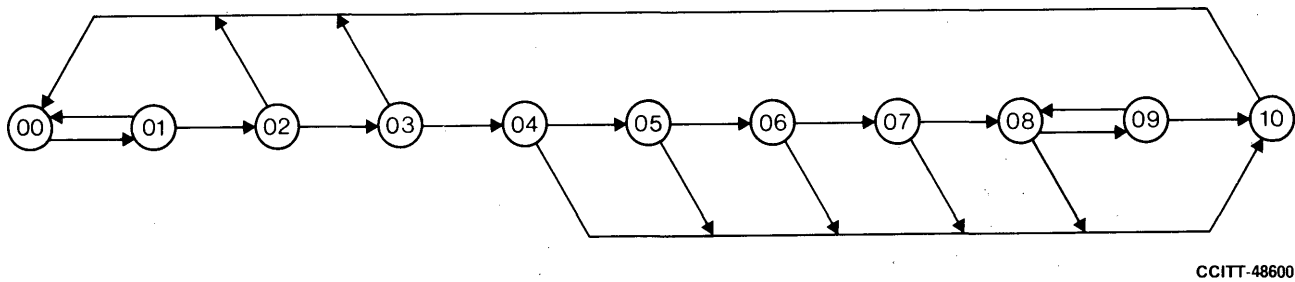
CCITT-48600

State number	State description	Sheet reference	Timers running
00	Idle	1	
01	Wait for calling party's category (CPCI)	1	
02	Wait for country code indicator (CCI)	1	
03	Wait for ST	1	t_1
04	Wait for proceed-to-send	1	t_2
05	Wait for time release t_3	2	t_3
06	Wait for time release t_4	2	t_4
07	Wait for answer	3	
08	Answered	3	
09	Clear-back	3	
10	Wait for release-guard	3	t_2

FIGURE 1/Q.622

State overview diagram for outgoing Signalling System No. 5

Supervisory timers for outgoing Signalling System No. 5

t_1	= 4-6 s	Recommendation Q.152, § 3.2.1, b)
t_2	= 10-20 s	Recommendation Q.141, § 2.1.3.1, e), i)
t_3	= $(100 \pm 10) + (55 \pm 5)$ ms	Recommendation Q.153, § 3.3.3
t_4	= $2 (55 \pm 5)$ ms	Recommendation Q.153, § 3.3.3

Procedure not shown

The following procedure, not directly relevant to interworking, is not shown in the logic procedures:

P_1 = Procedure for non-receipt of release-guard (Recommendation Q.141, § 2.1.3.1, e), i)).

FIGURE 2/Q.622

Notes to outgoing Signalling System No. 5

Connector reference

00 Idle

Activate outgoing No. 5

01 Wait for CPCI-FITE

FITEs 9, 10, 11, 12, 13, 17

FITE 22

02 Wait for country code indicator

00 Idle

FITE 2

FITE 3

FITE 22

00 Idle

03 Wait for ST

FITE 1

$\overline{t_1}$

FITE 22

Stop t_1

00 Idle

ST-FITE   No

Yes

Note 2

Enough digits   Yes

Note 1

No

Last FITE   Yes

No

$t_1 = 4 - 6$ secs

Start t_1

Store ST digit

CCITT - 40951

Stop t_1

Seizing

Start t_2 $t_2 = 10 - 20$ s

04 Wait for proceed-to-send

Proceed-to-send

FITE 22

$\overline{t_2}$

Stop t_2

Stop t_2

BITE 8

1, 7

①₁

⑦₃

Note 1 — Fixed or maximum number length reached?

Note 2 — Has the minimum number of digits been received?

FIGURE 3/Q.622 (Sheet 1 of 3)

Outgoing Signalling System No.5

Connector
reference

1

BITE 26

Which
CCI-FITE

2   3

KP1   KP2

Start t_3 --- $t_3 = (100 \pm 10) + (55 \pm 5)$ ms

05 Wait for
time release
t_3

$\overline{t_3}$ Busy-
flash   FITE 22

Stop t_3 Stop t_3

3   (3)

4, 7   (4)   (7)

Z-digit
next   Yes

No

Digit

ST-
digit   Yes

2   (2)   No

Start t_4 --- $t_4 = 2 \times (55 \pm 5)$ ms   BITE 27

5   06 Wait for
time release
t_4 (5)

Which
CPCI-FITE

9   10   11   12   13   17

$\overline{t_4}$ Busy-
flash   FITE 22   Language
digit 1   Language
digit 3   Language
digit 5

3   (3)   Stop t_4 Stop t_4 Language
digit 2   Language
digit 4   Discriminating
digit (0)

4   (4)

2   Acknowledgement   (2)

CCITT-40960

BITE 8

7   (7)

FIGURE 3/Q.622 (Sheet 2 of 3)
Outgoing Signalling System No. 5
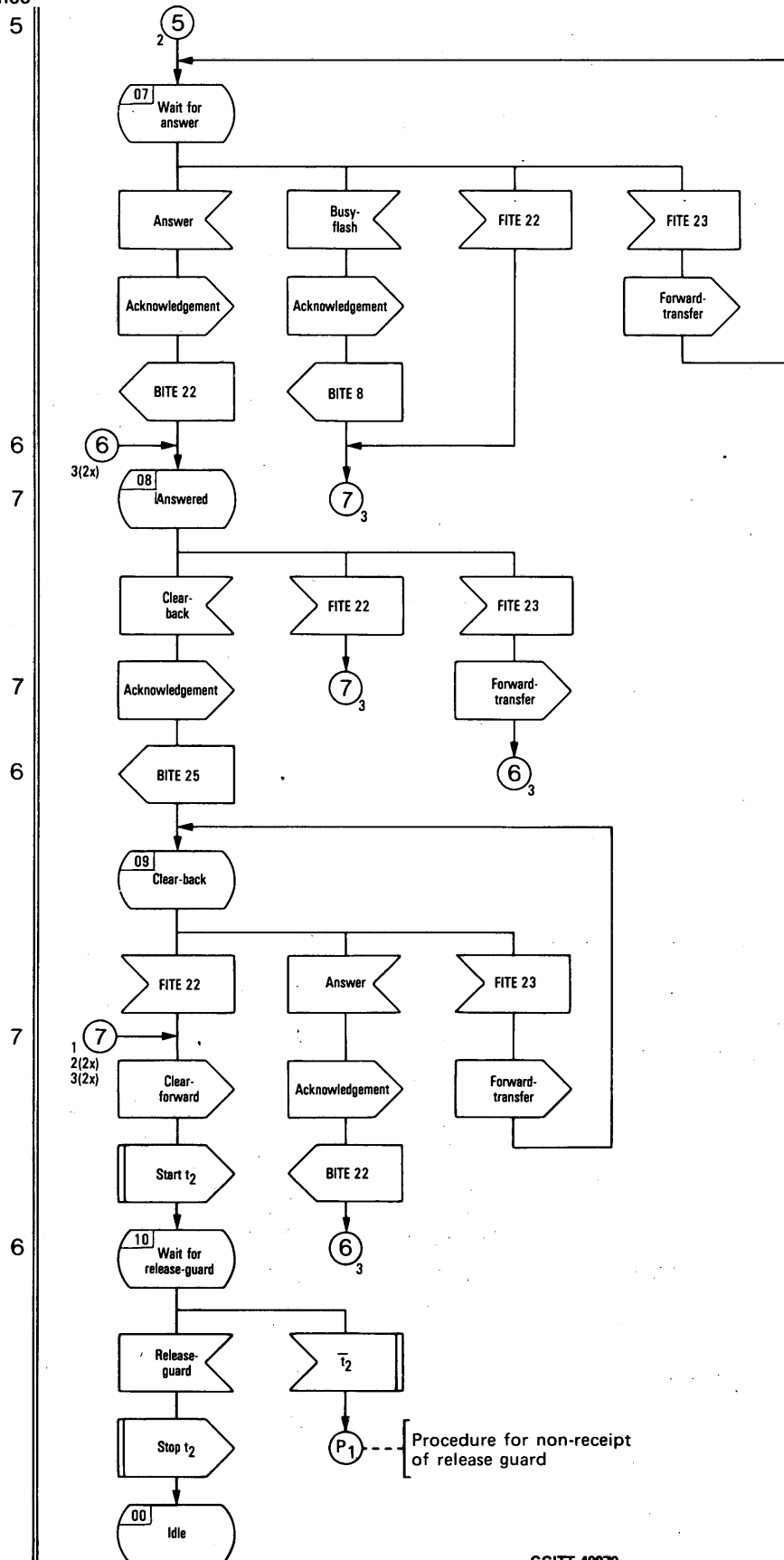
Figure 3/Q.622 (Sheet 3 of 3)

Outgoing Signalling System No. 5

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM No. 6
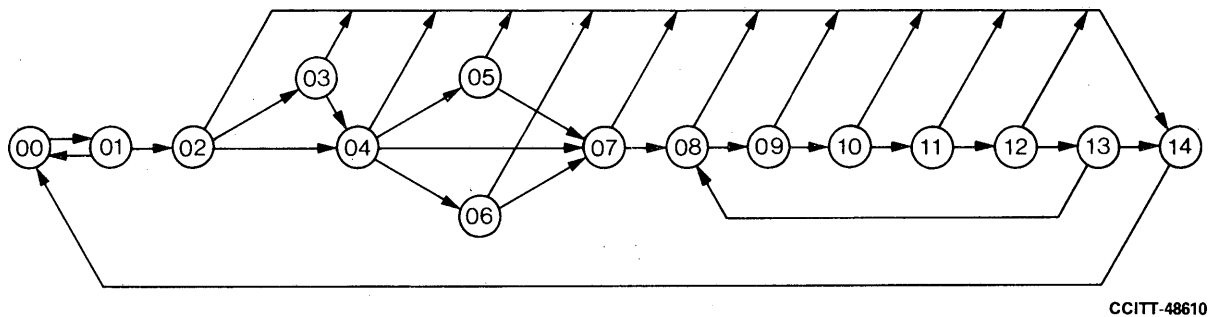
CCITT-48610

State number	State description	Sheet reference	Timers running
00	Idle	1, 5	
01	Wait for FITEs OF IAM	1	
02	Wait for continuity check	2	t_1, t_2
03	Wait for continuity indicator	2	t_2
04	Wait for address-complete	3	t_2
05	Wait for answer	3	
06	Wait for answer (subscriber free)	4	
07	Answered	4	
08	Clear-back 1	4	
09	Reanswer 1	4	
10	Clear-back 2	4	
11	Reanswer 2	5	
12	Clear-back 3	5	
13	Reanswer 3	5	
14	Wait for release-guard	5	t_3, t_4

FIGURE 1/Q.623

State overview diagram for outgoing Signalling System No. 6

Supervisory timers for outgoing Signalling System No. 6

$t_1 = 2$ s	Recommendation Q.271, § 5.7.1
$t_2 = 20\text{-}30$ s	Recommendation Q.268, § 4.8.5.1, a)
$t_3 = 4\text{-}15$ s	Recommendation Q.268, § 4.8.2.3
$t_4 = 1$ min.	Recommendation Q.268, § 4.8.2.3, a)

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

- Dual seizure.
- Blocking and unblocking sequences.
- Unreasonable sequences.
- Confusion and message refusal signals.
- Reset circuit/band procedures.
- Test call procedures.
- Out of service.

Signal abbreviations used

The signal abbreviations used correspond to those of the Signalling System No. 6 specifications unless otherwise indicated on the same sheet.

FIGURE 2/Q.623

Notes to outgoing Signalling System No. 6

Fascicle VI.6 – Rec. Q.623

Connector
reference

1

A

B

A

1

B

2

3

00 Idle

Activate
outgoing
No. 6

1

01 Wait for
FITEs of IAM

FITE 1

Set
address
digits

No | IAM complete | Yes

IAM

SPITE 31
Perform contin-
uity check

Start t_1 --- $t_1 = 2$ s

2

Start t_2 --- $t_2 = 20$-30 s

3

FITE 2

Set
CCI = 0

FITE 3

Set
CCI = 1

FITE 4

Set
ESI = 0

FITE 5

Set
ESI = 1

FITE 9

Set
CPCI = 1

FITE 10

Set
CPCI = 2

FITE 11

Set
CPCI = 3

FITE 12

Set
CPCI = 4

FITE 13

Set
CPCI = 5

A

FITE 17

Set
CPCI = 10

FITE 18

Set
CPCI = 11

FITE 19

Set
CPCI = 12

FITE 20

Set
NCI = 0

FITE 21

Set
NCI = 1

FITE 22

00 Idle

FITE 24

1

B

CCITT-40980

CPCI Calling party category indicator
CCI   Country code indicator
ESI   Echo suppressor indicator
NCI   Nature of circuit indicator

FIGURE 3/Q.623 (Sheet 1 of 5)
Outgoing Signalling System No. 6
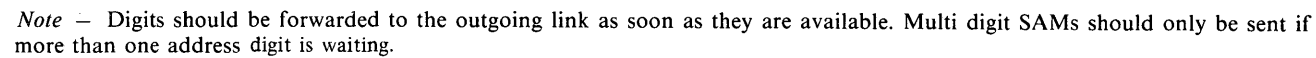
Note — Digits should be forwarded to the outgoing link as soon as they are available. Multi digit SAMs should only be sent if more than one address digit is waiting.

FIGURE 3/Q.623 (Sheet 2 of 5)

Outgoing Signalling System No. 6

Connector
reference

5

C

15

6,5
7

8

15

6
8,15

⑤
2, 3

04/ Wait for
address-
complete

⃝C₂

| ADC | ADN | ADX | AFC | AFN | AFX | ANC | ANN | FITE 1 | FITE 22 | t̄₂ |

BITE 2   BITE 3   BITE 4   BITE 5   BITE 6   BITE 7   BITE 2   BITE 3   SAM   Stop t₂   BITE 19

Note

BITE 22   BITE 23   Start t₂

Stop t₂   Stop t₂   ⑤₃   ⑮₅

₃⑥   ⑦₄   Stop t₂

05/ Wait for
answer   ⑧₄

| ANC | ANN | CGC | NNC | CFL | FITE 23 | FITE 22 |

BITE 22   BITE 23   BITE 10   BITE 12   BITE 19   Forward-transfer   ⑮₅

⑧₄   ⑮₅   ⑥₃

CCITT-50 001
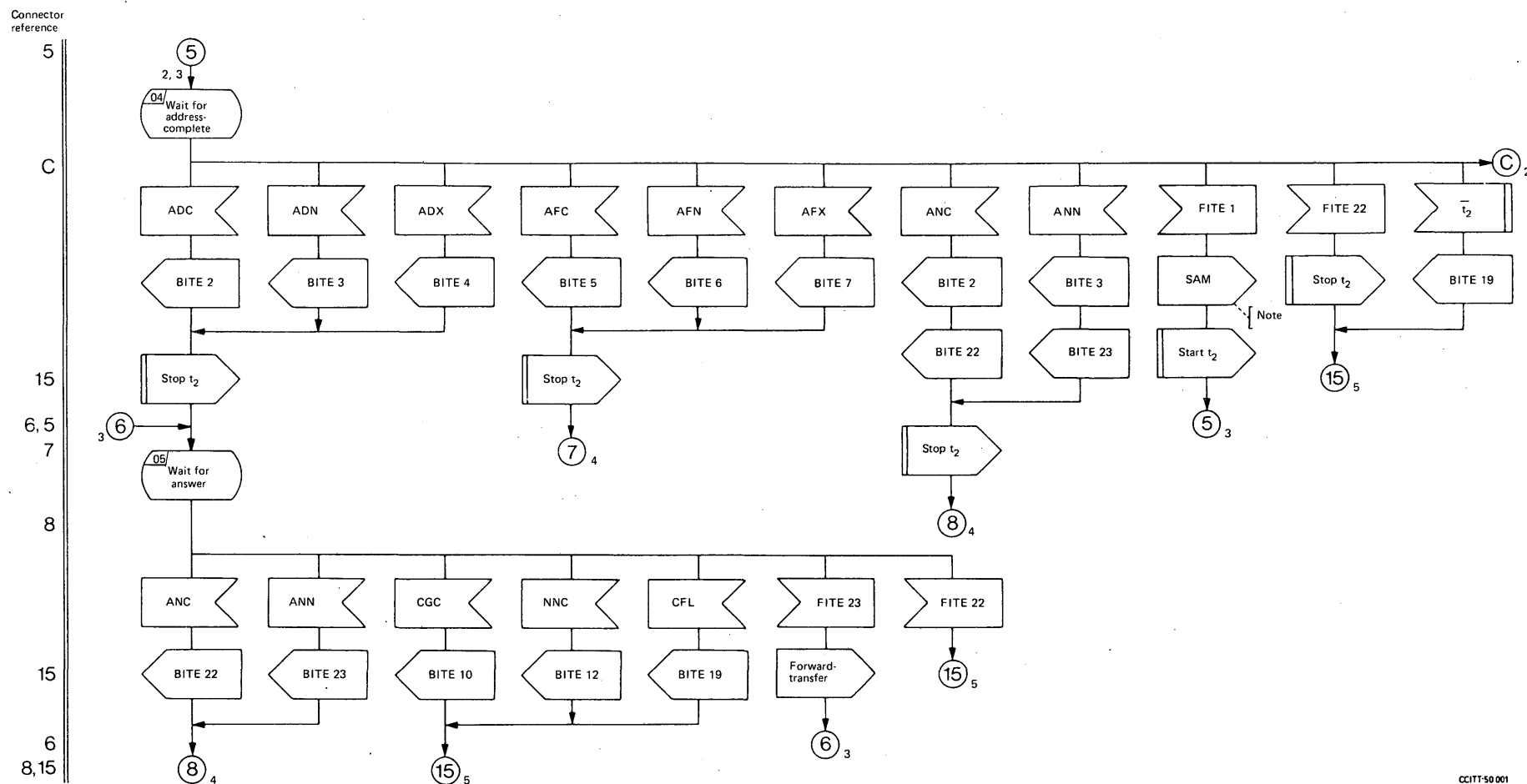
Note — Digits should be forwarded to the outgoing link as soon as they are available. Multi digit SAMs should only be sent if more than one address digit in waiting.

FIGURE 3/Q.623 (Sheet 2 of 5)

Outgoing Signalling System No. 6

FIGURE 3/Q.623 (Sheet 4 of 5)

Outgoing Signalling System No. 6
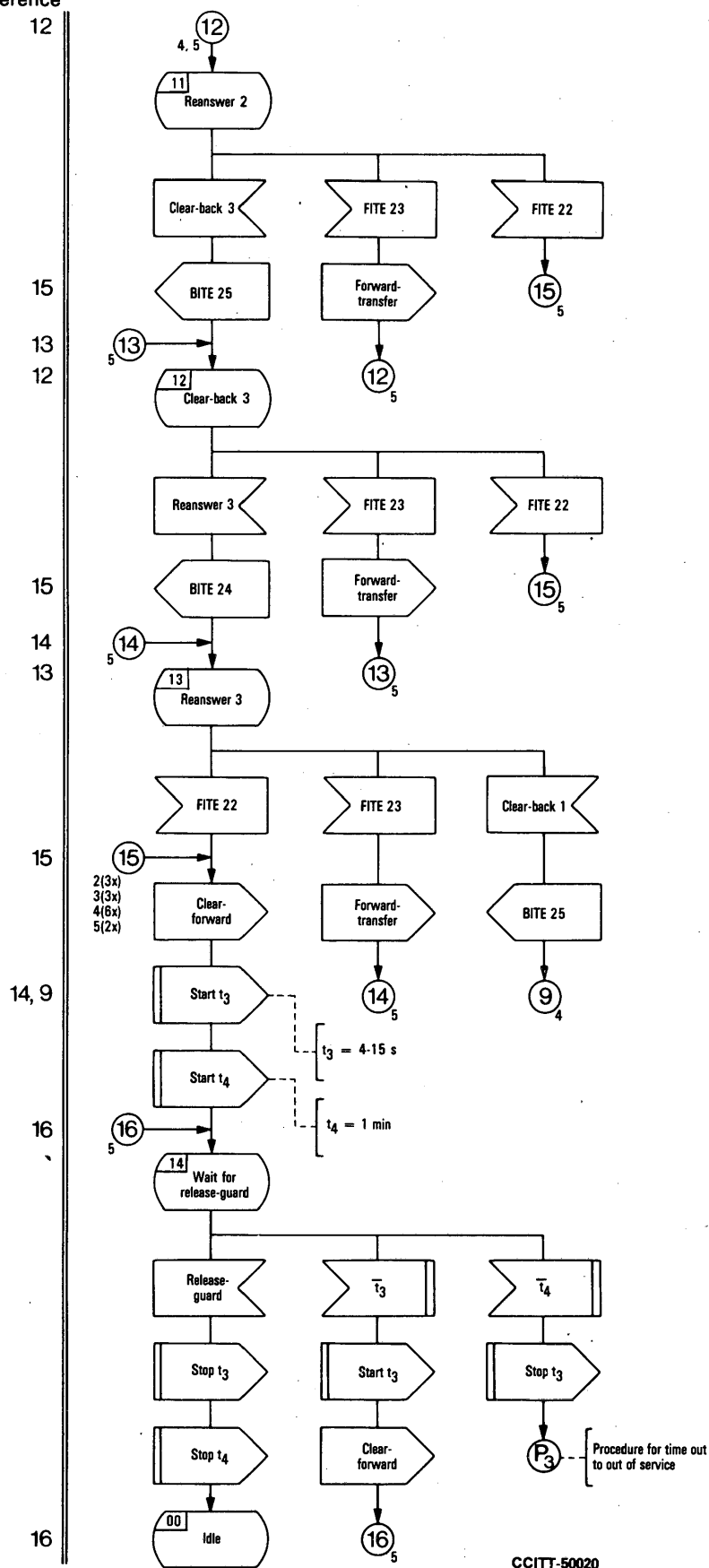
FIGURE 3/Q.623 (Sheet 5 of 5)

Outgoing Signalling System No. 6

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM No. 7 (TUP)

CCITT - 55891
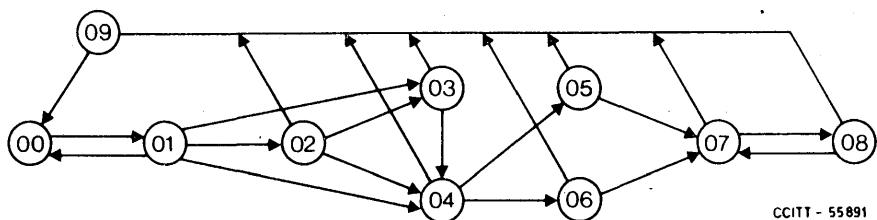
State number	State description	Sheet reference	Timers running
00	Idle	1, 10	
01	Wait for FITES of IAM/IAI	1	
02	Wait for continuity check	3	t_1, t_2
03	Wait for continuity indicator	3	t_2
04	Wait for address complete	7	t_2
05	Wait for answer	7	
06	Wait for answer (subscriber free)	9	
07	Answered	9	
08	Clear-back	9	
09	Wait for release-guard	10	t_3, t_4

FIGURE 1/Q.624

State overview diagram for outgoing Signalling System No. 7 (TUP)

Supervisory timers for outgoing Signalling System No. 7

t_1 = 2 s	Recommendation Q.724, § 7.4.1
t_2 = 20-30 s	Recommendation Q.724, § 6.4.1
t_3 = 4-15 s	Recommendation Q.724, § 6.2.3
t_4 = 1 min	Recommendation Q.724, § 6.2.3

Procedures not shown

   The following procedures, not directly relevant to interworking, are not shown in the logic procedures:
   — Dual seizure.
   — Blocking and unblocking sequences.
   — Reset signals.
   — Test call procedures.
   — Out of service.

Signal abbreviations used

   The signal abbreviations used correspond to those of the Signalling System No. 7 Specifications and are listed in Figure 2/Q.614.

FIGURE 2/Q.624

Notes to outgoing Signalling System No. 7 (TUP)

FIGURE 3/Q.624 (Sheet 1 of 10)

Outgoing Signalling System No. 7 (TUP)

Connector reference

CCH   Continuity check indicator
CPCI Calling party category indicator
ESI   Echo suppressor indicator
NAI   Nature of address indicator

T1100583-87

Connector
reference

A, J

B, E

J

E

NCI: Nature of circuit indicator

T1100582–86
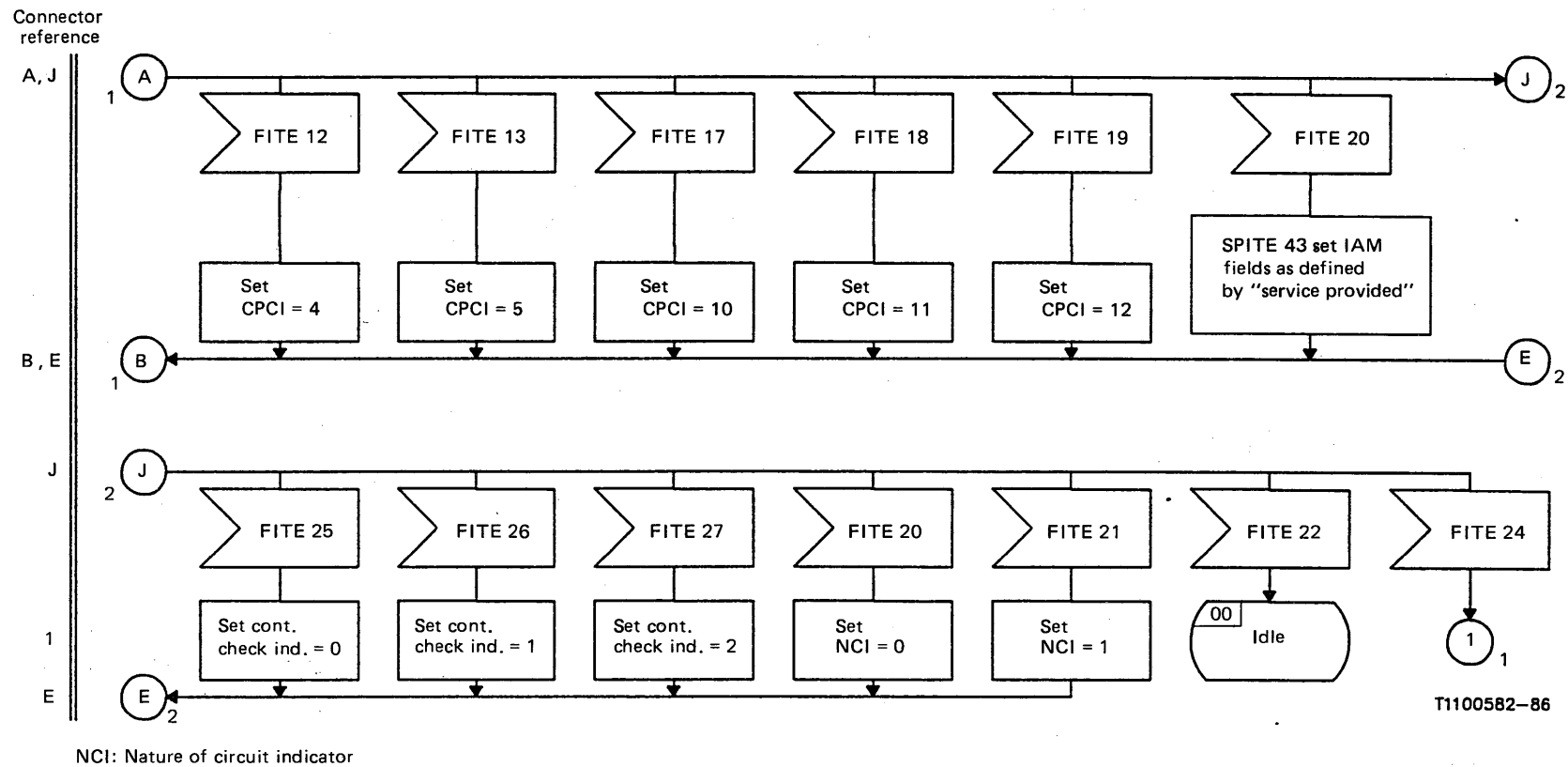
FIGURE 3/Q.624 (Sheet 2 of 10)

Outgoing Signalling System No. 7 (TUP)

Note – Digits should be forwarded to the outgoing link as soon as they are available, multi digit sams should only be sent if more than one address digit is waiting.

FIGURE 3/Q.624 (Sheet 3 of 10)

Outgoing Signalling System No. 7 (TUP)

T1100594-87
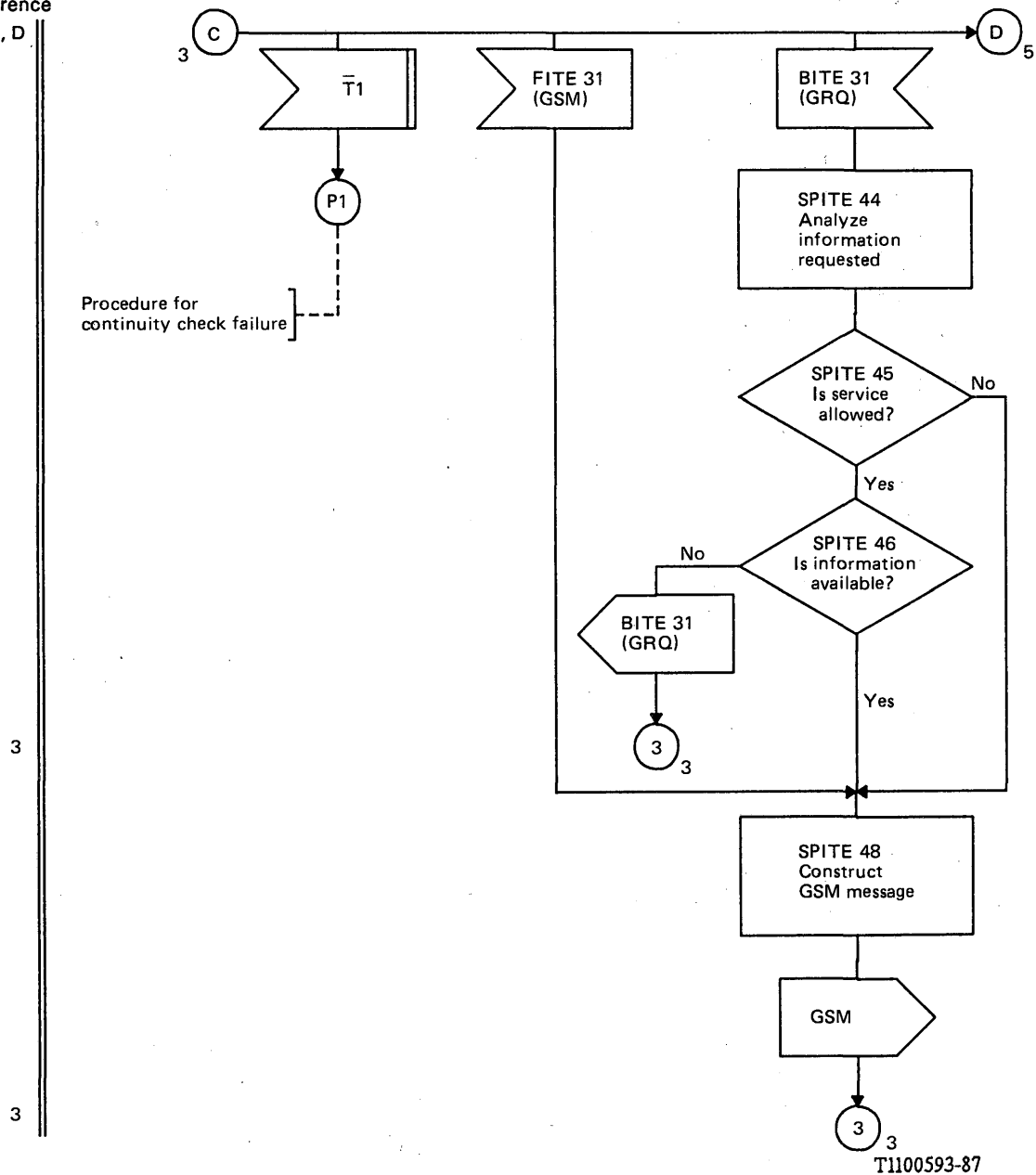
FIGURE 3/Q.624 (Sheet 4 of 10)

Outgoing Signalling System No. 7 (TUP)

Connector
reference

D, G

(D) 4, 8

(G) 6

| SEC | CGC | NNC | ADI | UNN | SSB | LOS | SST |

| BITE 9 | BITE 10 | BITE 12 | BITE 14 | BITE 15 | BITE 16 | BITE 17 | BITE 20 |

H

(H) 6

T1100601—86

Stop T2

CCH — 0, 2

1

Cont.
check
OK — Yes

No

Stop T1

15

(15) 10
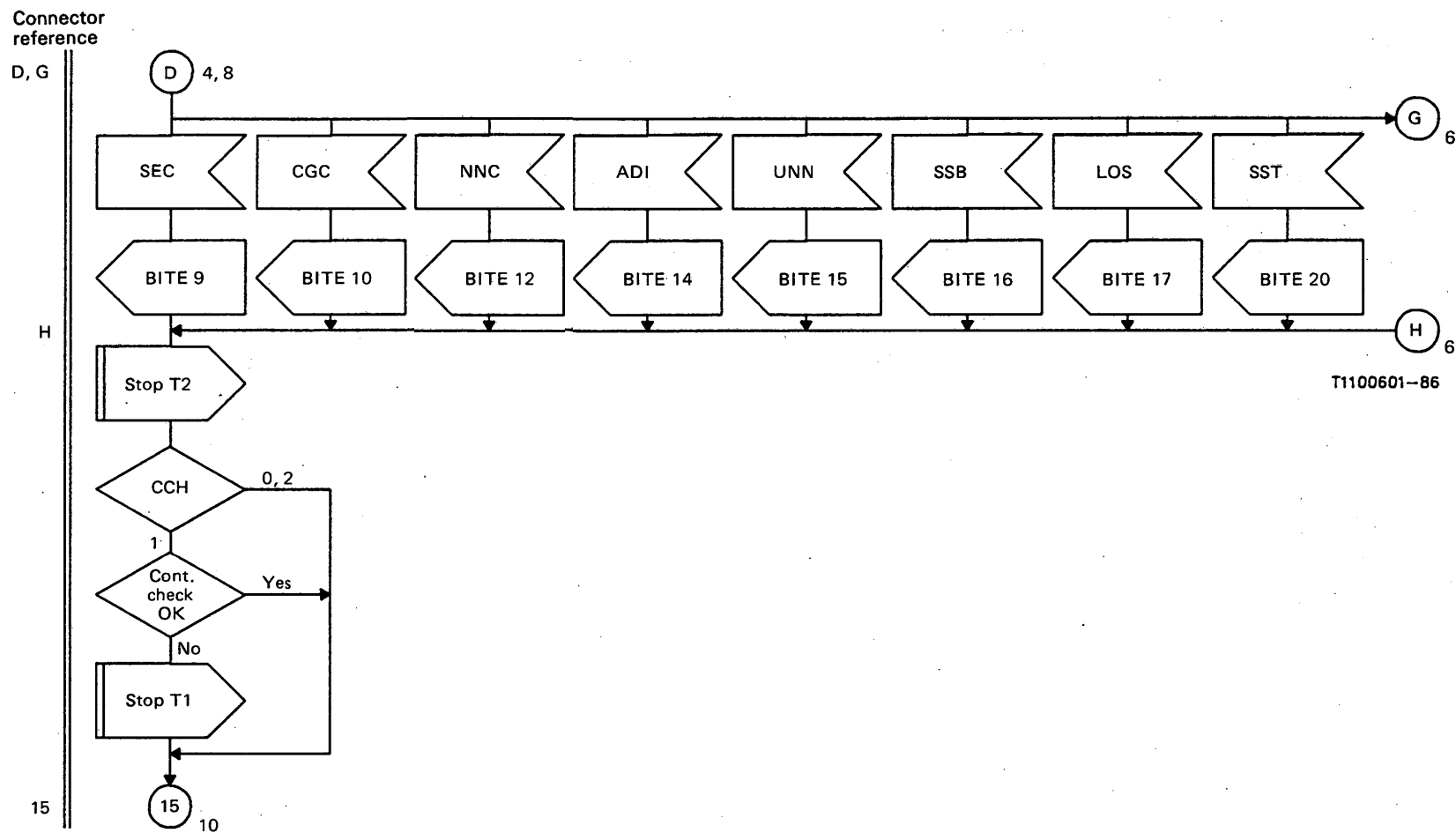
FIGURE 3/Q.624 (Sheet 5 of 10)

Outgoing Signalling System No. 7 (TUP)

Connector
reference

G

H

T1100603-87
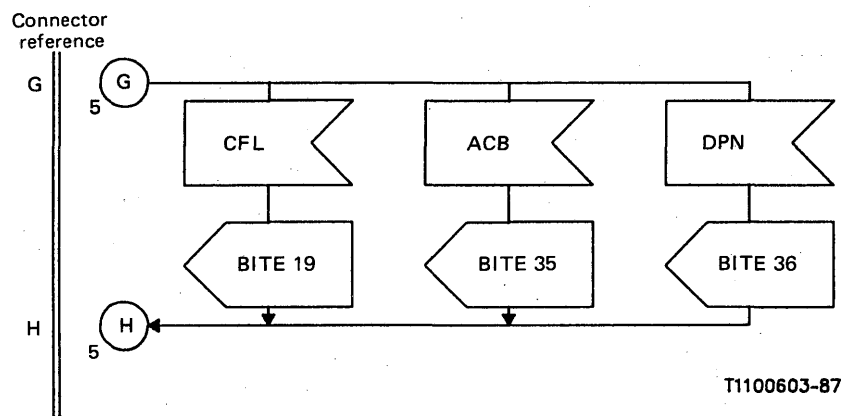
FIGURE 3/Q.624 (Sheet 6 of 10)

Outgoing Signalling System No. 7 (TUP)

Connector
reference

5 ‖ 3, 8 (4X) (5)

04
Wait for
address
complete

It was noted that further study is required concerning how additional information
in the address complete can be economically represented in this SDL diagram.

Z

ACM
(ADC)

ACM
(ADN)

ACM
(ADX)

ACM
(AFC)

ACM
(AFX)

ACM
(AFN)

(Z) 8

BITE 2

BITE 3

BITE 4

BITE 5

BITE 6

BITE 7

Stop T2

Stop T2

6

(6) 7

05
Wait for
answer

(7) 9

ANC

ANN

CGC

NNC

CFL

FITE 23

FITE 22

15, 7

BITE 22

BITE 23

BITE 10

BITE 12

BITE 19

FOT

(15) 10

T1100614-87

8, 15, 6

(8) 9

(15) 10

(6) 7

FIGURE 3/Q.624 (Sheet 7 of 10)

Outgoing Signalling System No. 7 (TUP)

Connector
reference

Z, D

Z

FITE 31
GSM

BITE 31
GRQ

FITE 1

FITE 22

T̄2

D

SPITE 44
Analyzis inf.
requested

SAM
complete

No

Stop T2

BITE 19

Yes

5

7

SPITE 45
In service
allowed

No

Start T2

15

10

5

15

Yes

SPITE 46
Is inf.
available

No

SAO/SAM

Note

T1100612–86

BITE 31
GRQ

5

7

5

Yes

5

7

SPITE 48
Construct
GSM message

5

GSM

5

7

Note — Digits should be forwarded to the outgoing link as soon as they are available. Multi digits SAMs should only be sent if more than one address digit is waiting.

FIGURE 3/Q.624 (Sheet 8 of 10)

Outgoing Signalling System No. 7 (TUP)

7

7,9 ⑦

⎡06⎤Wait
for answer
(SUB free)

ANC

ANN

CFL

FITE 23

FITE 22

15

BITE 22

BITE 23

BITE 19

FOT

⑮ 10

8,15,7

⑧

⑮ 10

⑦ 9

7,9(2X)

⎡07⎤
Answered

Clear
back

FITE 23

FITE 22

15

BITE 25

FOT

⑮ 10

9

⑨

8

9

⑧ 9

⎡08⎤
Clear-back

Re-answer

FITE 23

FITE 22

15

BITE 24

FOT

⑮ 10

8,9

⑧ 9

⑨ 9
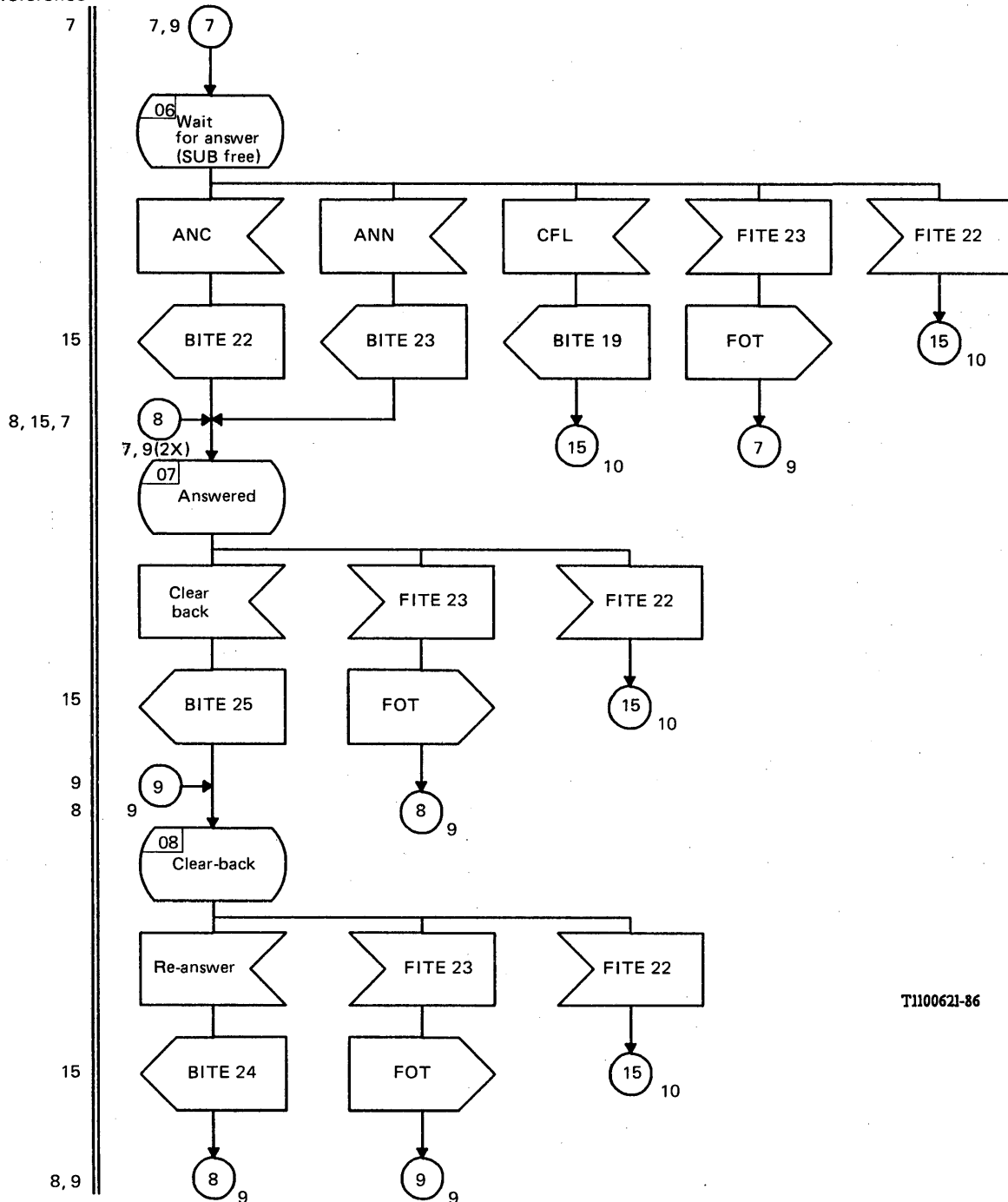
T1100621-86

FIGURE 3/Q.624 (Sheet 9 of 10)

Outgoing Signalling System No. 7 (TUP)
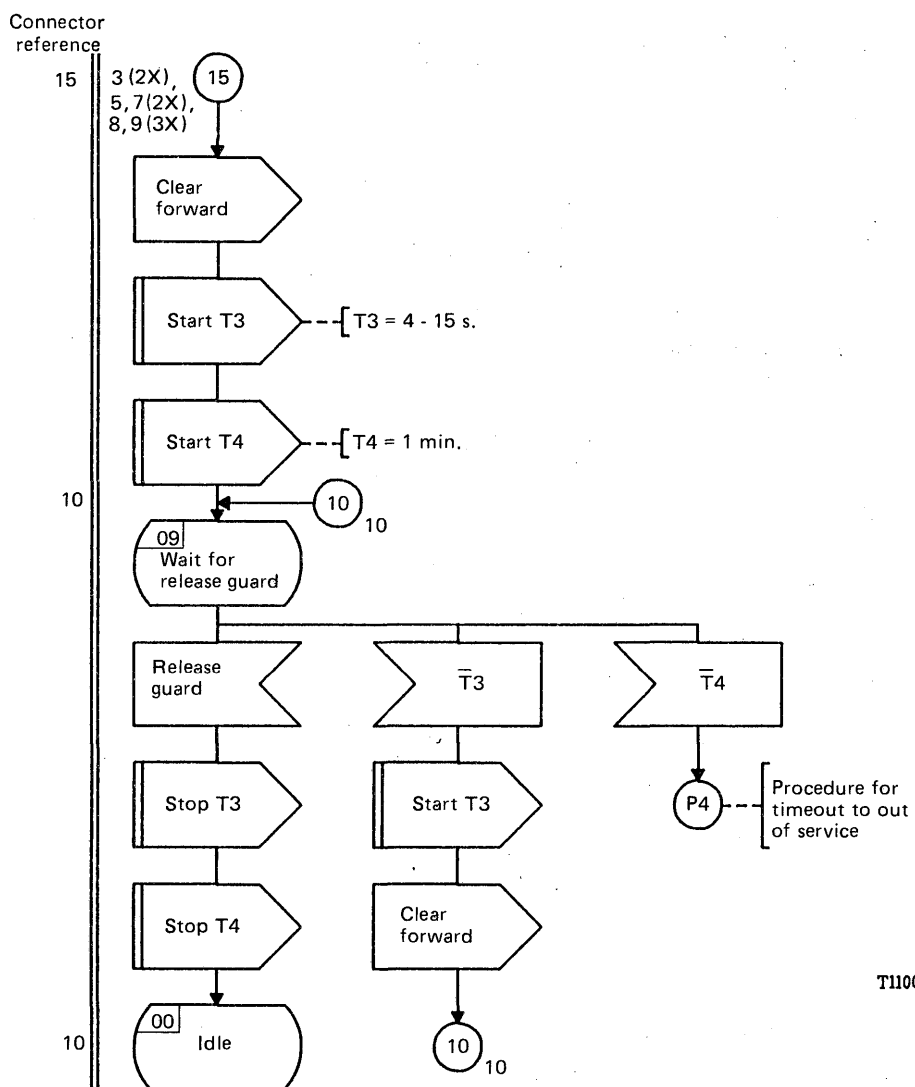
FIGURE 3/Q.624 (Sheet 10 of 10)

Outgoing Signalling System No. 7 (TUP)

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM R1

CCITT-48620
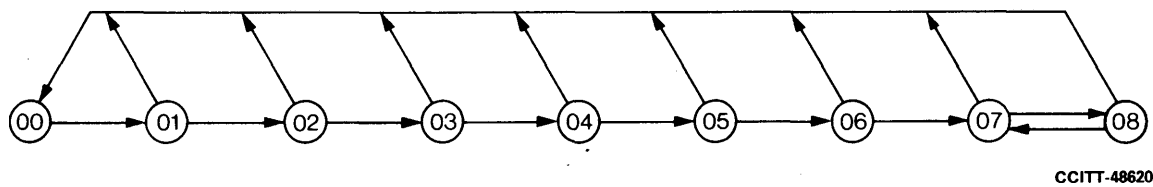
State number	State description	Sheet reference	Timers running
00	Idle	1	
01	Wait for ST-FITE	1	t_1
02	Wait for seizing acknowledgement	1	t_2
03	Wait for proceed-to-send	1	t_3
04	Wait for time release t_4 (KP pulse + pause)	2	t_4
05	Wait for time release t_5 (pulsed digit + pause)	2	t_5
06	Wait for answer	2	
07	Answered	2	
08	Clear-back	2	

FIGURE 1/Q.625

State overview diagram for outgoing Signalling System R1

Supervisory timers for outgoing Signalling System R1

$t_1 = 5 \pm 1$ s	Recommendation Q.321, § 3.2.1, b), ii)
$t_2 = 5$ s	Recommendation Q.325, § 3.6.2, 1), a)
$t_3 = 5$ s	Recommendation Q.325, § 3.6.2, 1), b)
$t_4 = 100 + 68$ ms	Recommendation Q.322, § 3.3.4
$t_5 = 2 \times 68$ ms	Recommendation Q.322, § 3.3.4

Remarks to facilitate reading and understanding the SDL flow chart

a) The procedure P_2 for non-receipt of seizing acknowledgement is described in Recommendation Q.325, § 3.2.6, 1), a).

b) The procedure P_3, related to dual seizure with both-way operation, is not described because no procedure is specified with consequences to interworking.

c) The time supervisions t_4 and t_5 are introduced to ensure the possibility of handling a clear-forward signal during outpulsing.

d) It is assumed that no country code digits are sent in the outgoing Signalling System R1 procedures.

FIGURE 2/Q.625

Notes to outgoing Signalling System R1

Connector reference

00 Idle

Activate outgoing R1

02 Wait for ST FITE

FITE 1

$\overline{t_1}$

FITE 22

Stop t_1

00 Idle

ST-FITE — No

Yes — Note 2

Enough digits — Yes — Note 1

No — Last FITE — Yes — Note 1

t_1 = 4 - 6 secs

Start t_1 — No

Store ST-digit

Stop t_1

BITE 26

Seizing (connect)

Start t_2 --- t_2 = 5 s

02 Wait for seizing acknowledgement

Seizing acknowledgement --- (Delay-dialling)

FITE 22

$\overline{t_2}$

Stop t_2

P_1 --- Procedure for non-receipt of seizing acknowledgement

Start t_3 --- t_3 = 5 s

1 2(5x)

2

Clear-forward (disconnect)

03 Wait for proceed-to-send

00 Idle

Proceed-to-send (start dialling)

FITE 22

$\overline{t_3}$

CCITT - 50031

Stop t_3

Stop t_3

P_2 --- Procedures for dual seizure

2

1, 2

1 ₂

2 ₁

Note 1 — Fixed or maximum number length reached?

Note 2 — Has minimum number of digits been received?

FIGURE 3/Q.625 (Sheet 1 of 2)

Outgoing Signalling System R1
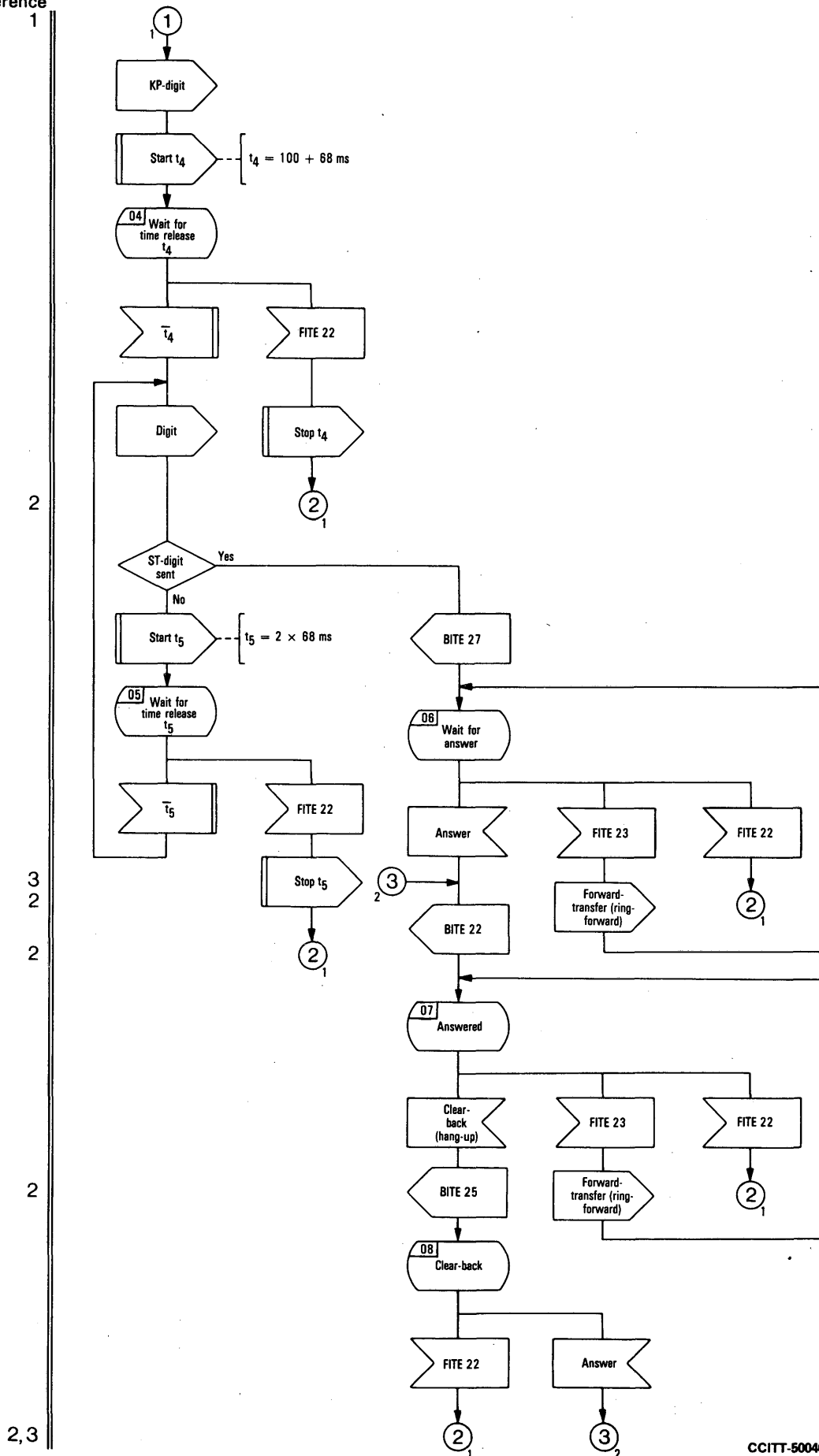
FIGURE 3/Q.625 (Sheet 2 of 2)
Outgoing Signalling System R1

LOGIC PROCEDURES FOR OUTGOING SIGNALLING SYSTEM R2
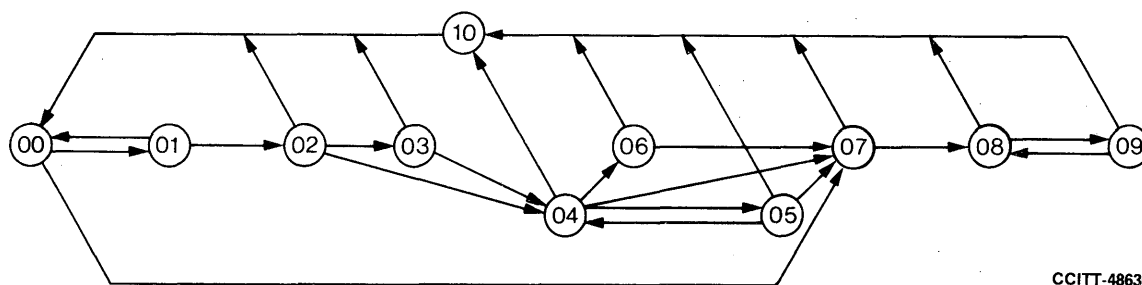
State number	State description	Sheet reference	Timers running
00	Idle	1, 4	
01	Wait for calling party's category (CPCI)	1	
02	Wait for country code indicator (CCI)	1	
03	Wait for echo suppressor indicator (ECI)	1	
04	Wait for backward signal	2	t_1
05	Wait for address information	3	t_2
06	Wait for Type B signal	3	t_1
07	Wait for answer	4	
08	Answered	4	
09	Clear-back	4	
10	Clear-forward	4	

FIGURE 1/Q.626

State overview diagram for outgoing Signalling System R2

Supervisory timers for outgoing Signalling System R2

$t_1 = 12\text{-}18$ s Recommendation Q.476, § 5.5.1.1

$t_2 > 24$ s Recommendation Q.476, § 5.5.1.2

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

— Interrupt control procedures (analogue version).

— Seizing acknowledgement (digital version).

— Transmission fault procedures (digital version).

— T_1 time-out and abnormal release sequence (analogue version).

— Optional forward transfer.

— Blocking and unblocking sequences.

FIGURE 2/Q.626

Notes to outgoing Signalling System R2
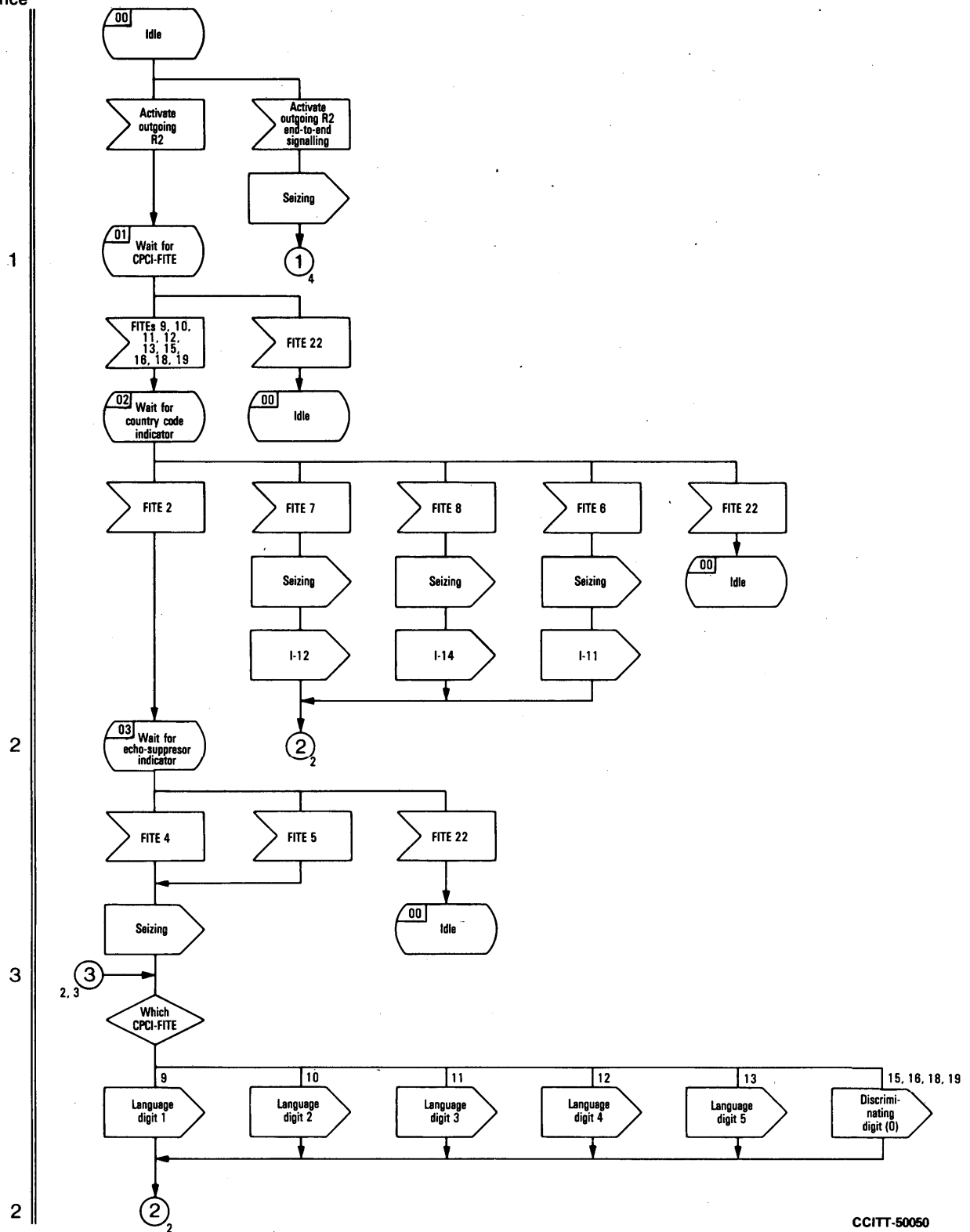
FIGURE 3/Q.626 (Sheet 1 of 4)
Outgoing Signalling System R2

Connector
reference

2

2

1(2x)
2(4x)
3(2x)

Stop t_2

Start t_1 ---- $t_1 = 12\text{-}18\,s$

5

5

2

04 Wait for backward signal

A

A 3

A-1

FITE 1

A-3, A-5

A-4

A-6

A-15

A-14

A-9, A-10

10,9

5

10

2, 3

9

3

Z-digit next — Yes

5 2

Which CPCI-FITE

BITE 12

BITE 2

BITE 11

Which ESI-FITE

I-12

3

No

3 1

7 4

8 4

7 4

5, 6, 8

4, 7

2 2

7,8,7
10,2

Required FITE 1 stored — Yes

9-13

10 2

No

15, 16

18

19

I-14

2

Stop t_1

Address signal

II-7

II-9

II-8

2 2

2

Start t_2 ---- $t_2 > 24\,s$

2 2

CCITT-50060

Which signal

6

6 3

A-3

A-5

Stop t_2

2 2

Start t_1 ---- $t_1 = 12\text{-}18\,s$

4

4 3
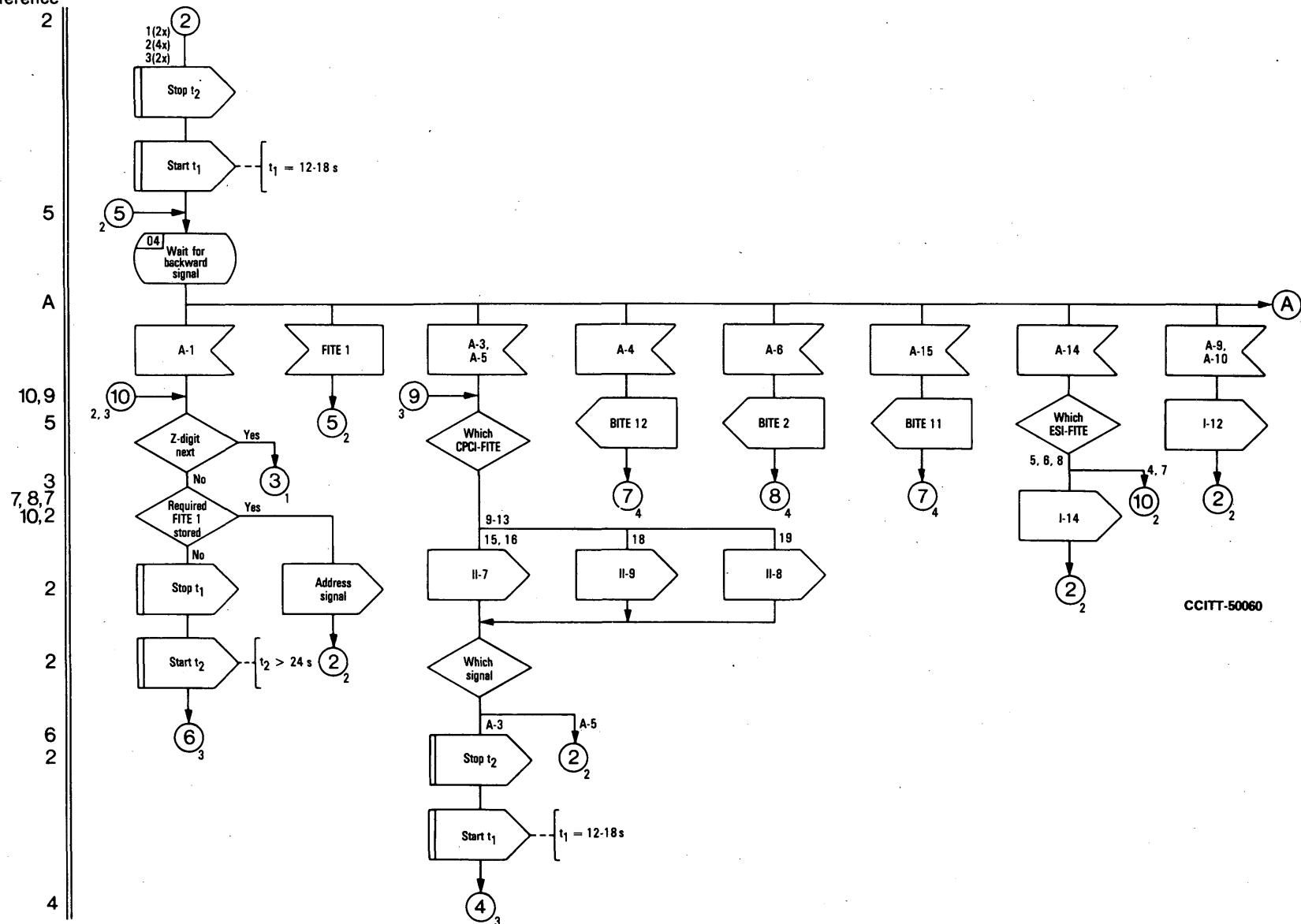
FIGURE 3/Q.626 (Sheet 2 of 4)
Outgoing Signalling System R2
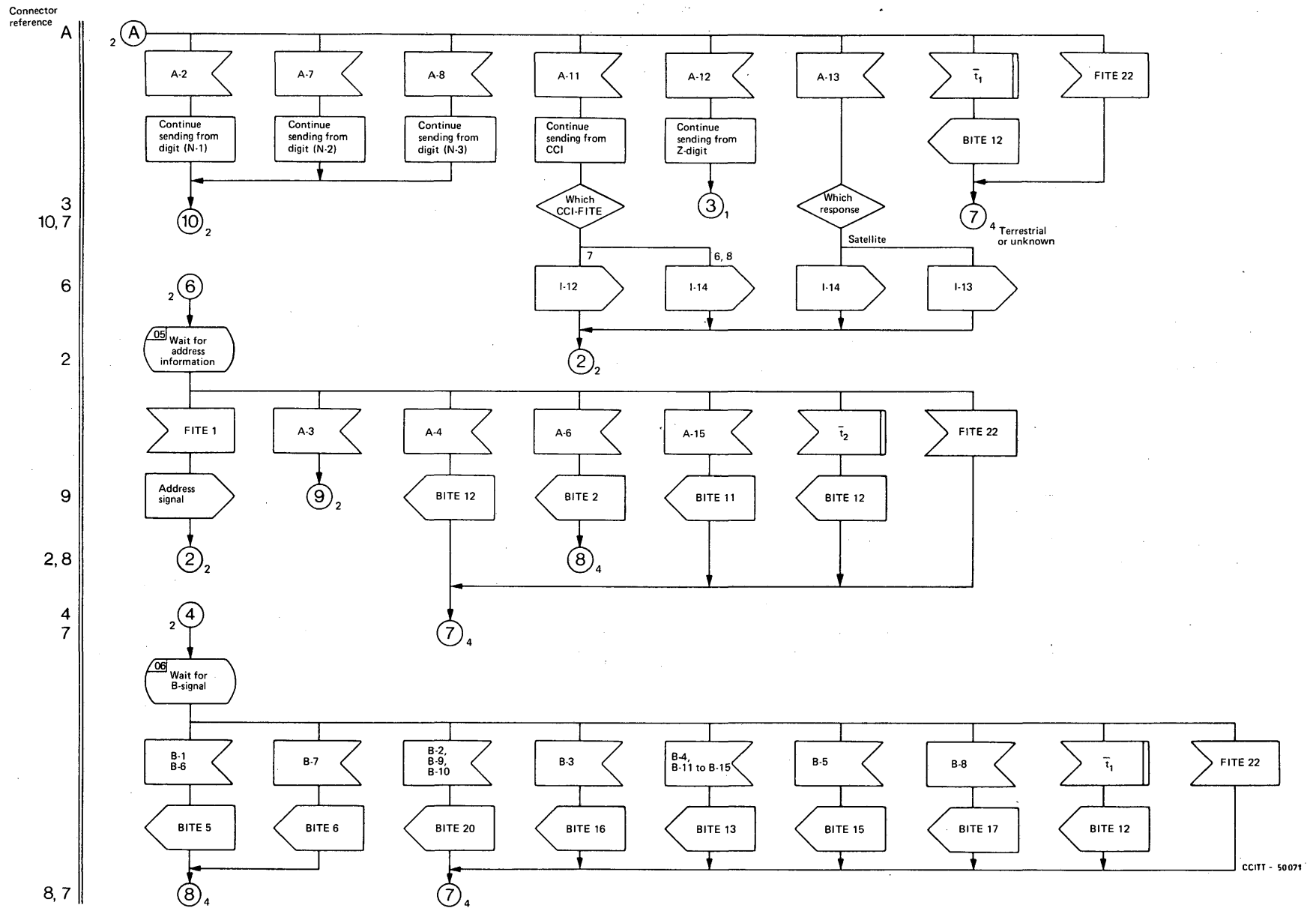
FIGURE 3/Q.626 (Sheet 3 of 4)

Outgoing Signalling System R2

Connector
reference
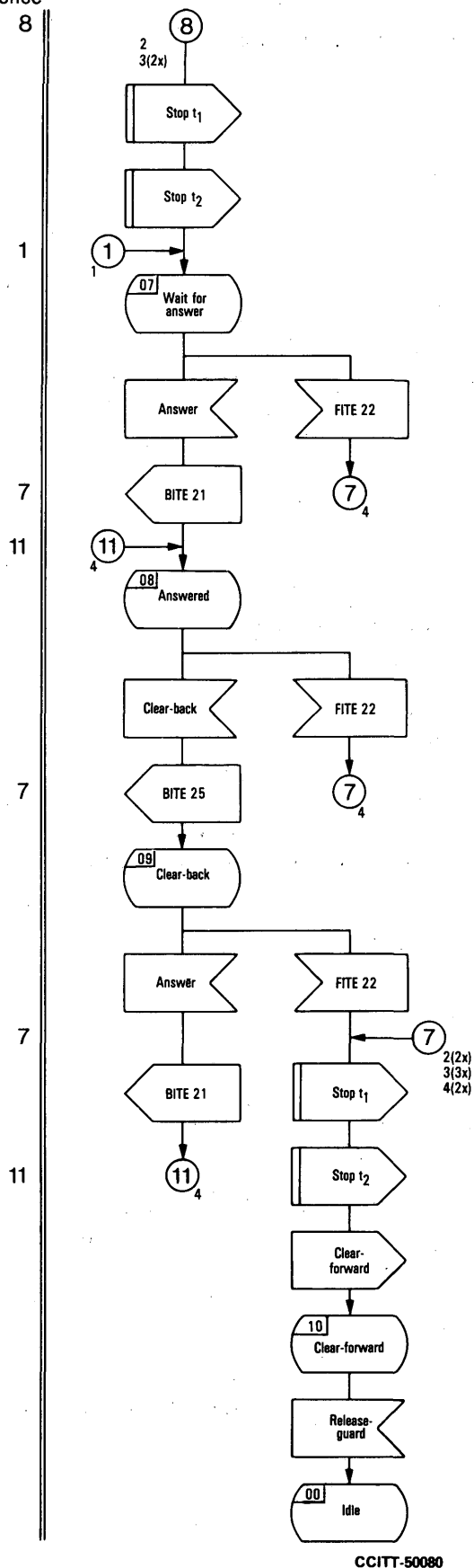
CCITT-50080

FIGURE 3/Q.626 (Sheet 4 of 4)

Outgoing Signalling System R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 4 TO R2

CCITT-48640
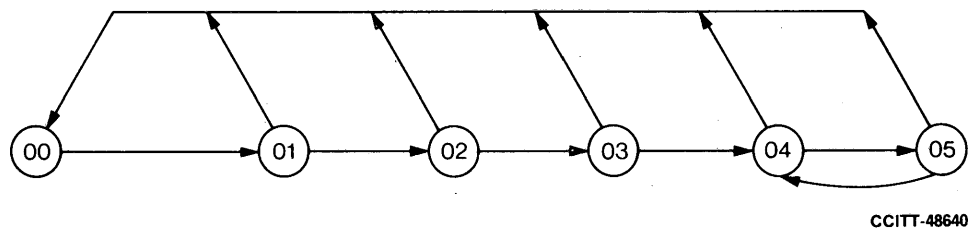
State number	State description	Sheet reference
00	Idle	1
01	Wait for CPCI-FITE	1
02	Wait for address-complete	1
03	Wait for answer	2
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.634

State overview diagram for interworking of Signalling System No. 4 to R2

Procedures not shown

The following procedures, not directly relevant to interworking, are not shown in the logic procedures:

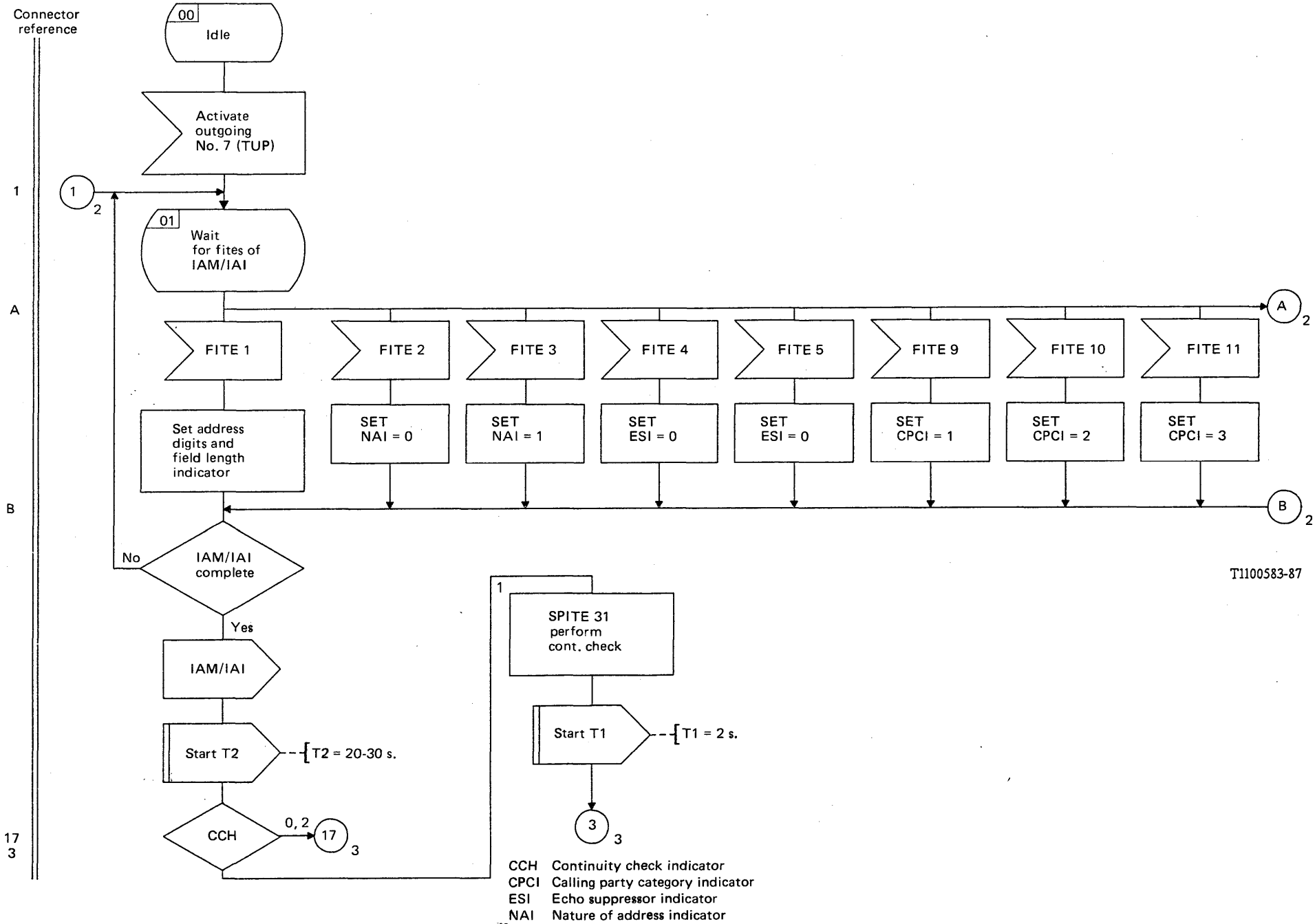— Repeat attempt.

FIGURE 2/Q.634

Notes to interworking of Signalling System No. 4 to R2
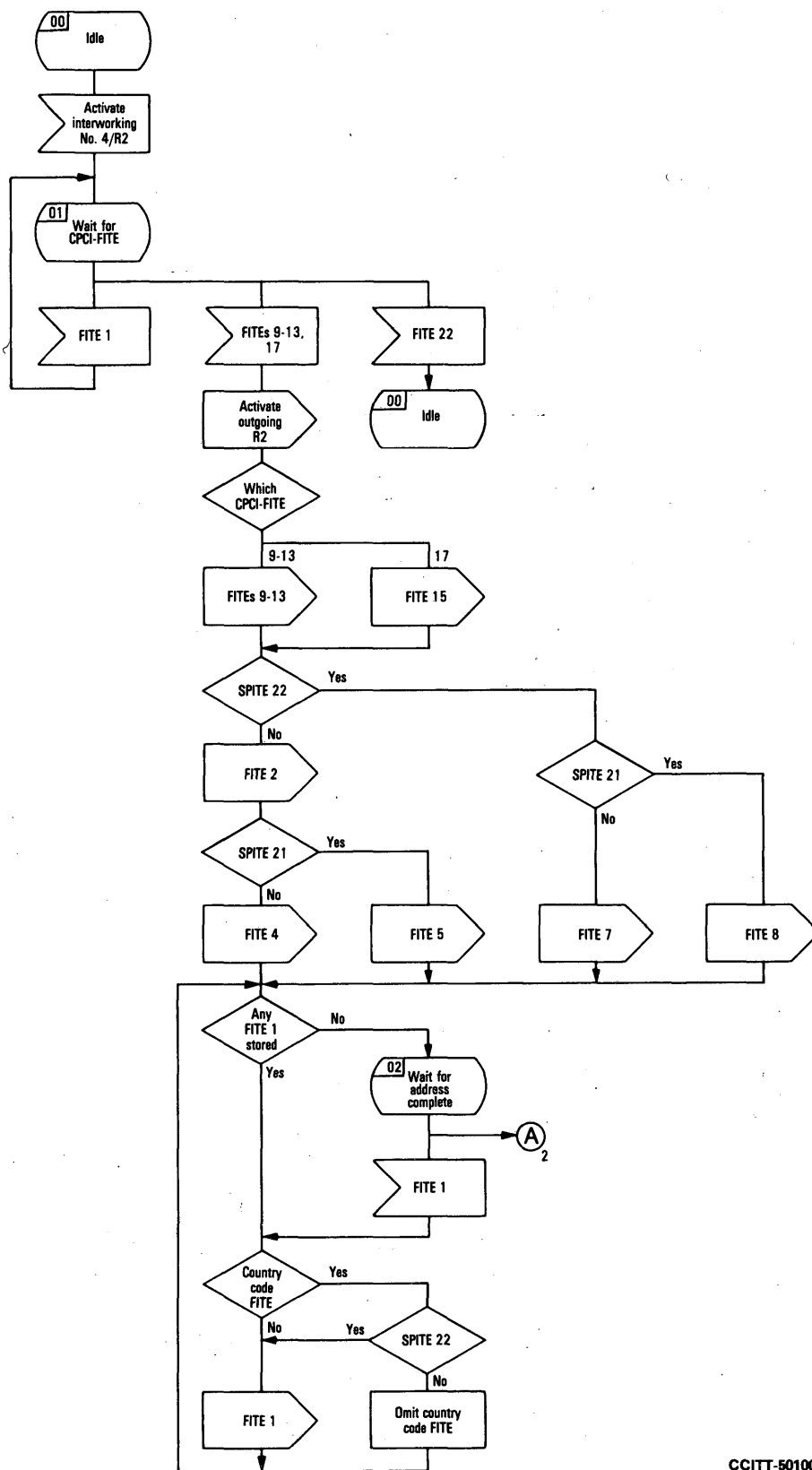
FIGURE 3/Q.634 (Sheet 1 of 2)
Interworking of Signalling System No. 4 to R2

FIGURE 3/Q.634 (Sheet 2 of 2)
Interworking of Signalling System No. 4 to R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 5 TO No. 6
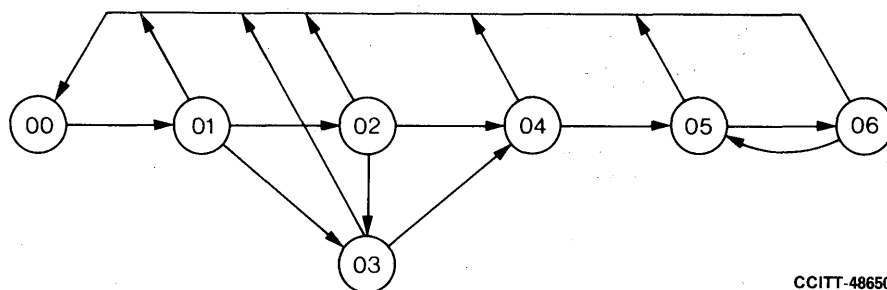
CCITT-48650

State number	State description	Sheet reference
00	Idle	1, 2, 3
01	Wait for CPCI-FITE	1
02	Wait for ST	2
03	Wait for address-complete	2
04	Wait for answer	3
05	Answered	3
06	Clear-back	3

FIGURE 1/Q.642

State overview diagram for interworking of Signalling System No. 5 to No. 6

Procedure not shown

P₁ — Procedure for repeat attempt.

FIGURE 2/Q.642

Notes to interworking of Signalling System No. 5 to No. 6

FIGURE 3/Q.642 (Sheet 1 of 3)

Interworking of Signalling System No. 5 to No. 6
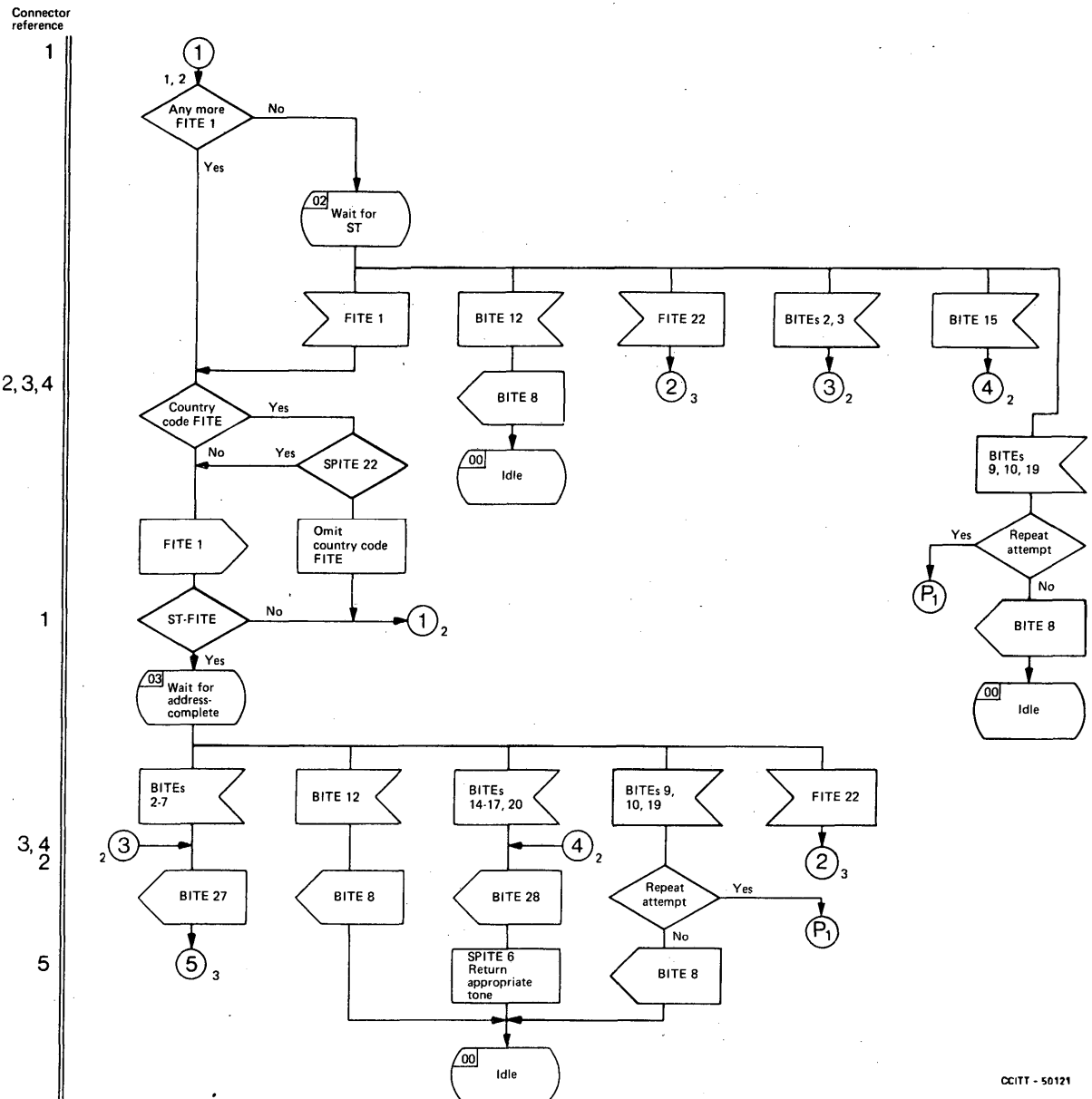
FIGURE 3/Q.642 (Sheet 2 of 3)

Interworking of Signalling System No. 5 to No. 6

Connector
reference
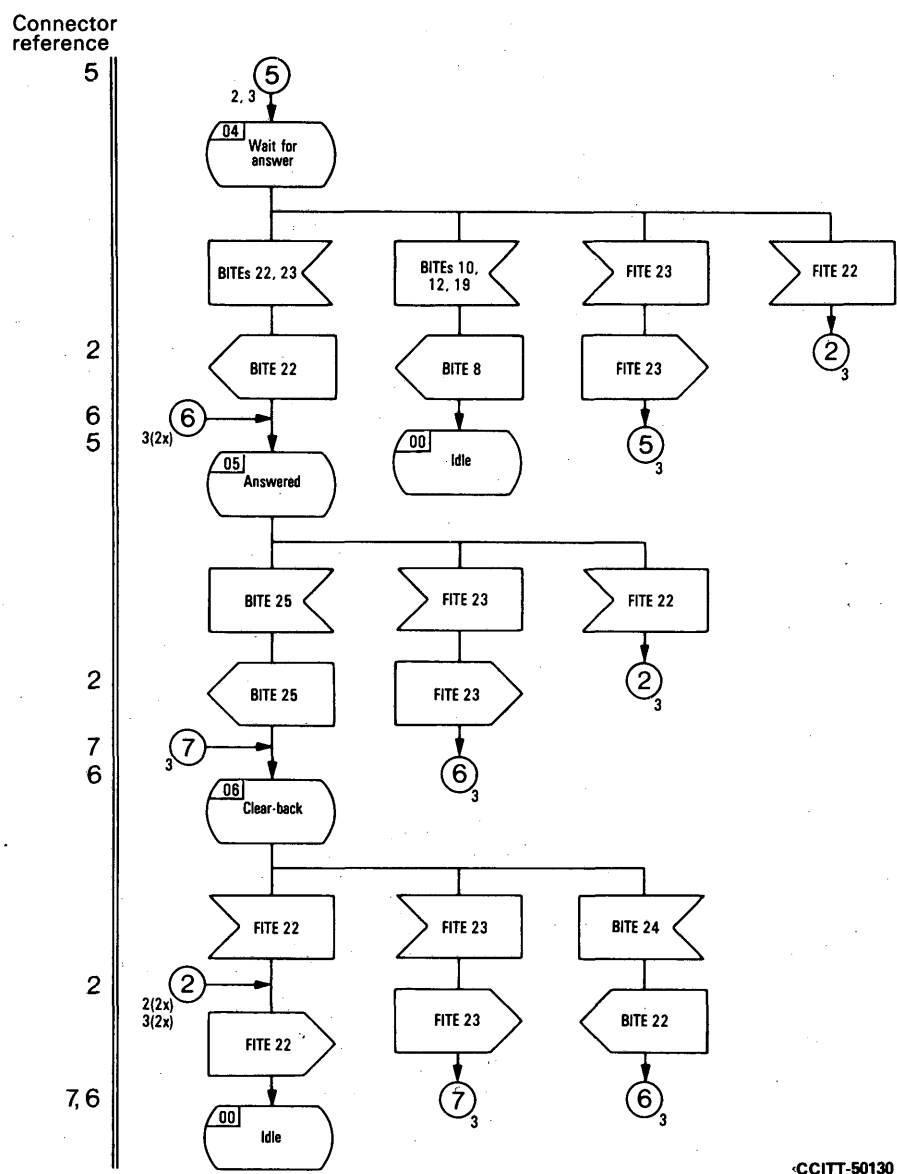
FIGURE 3/Q.642 (Sheet 3 of 3)
Interworking of Signalling System No. 5 to No. 6

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 5 TO No. 7 (TUP)

CCITT-48650

State number	State description	Sheet reference
00	Idle	1, 2, 3
01	Wait for CPCI-FITE	1
02	Wait for ST	2
03	Wait for address-complete	3
04	Wait for answer	3
05	Answered	3
06	Clear-back	3

FIGURE 1/Q.643

State overview diagram for interworking of Signalling System No. 5 to No. 7 (TUP)

FIGURE 2/Q.643

(Reserved for future notes)
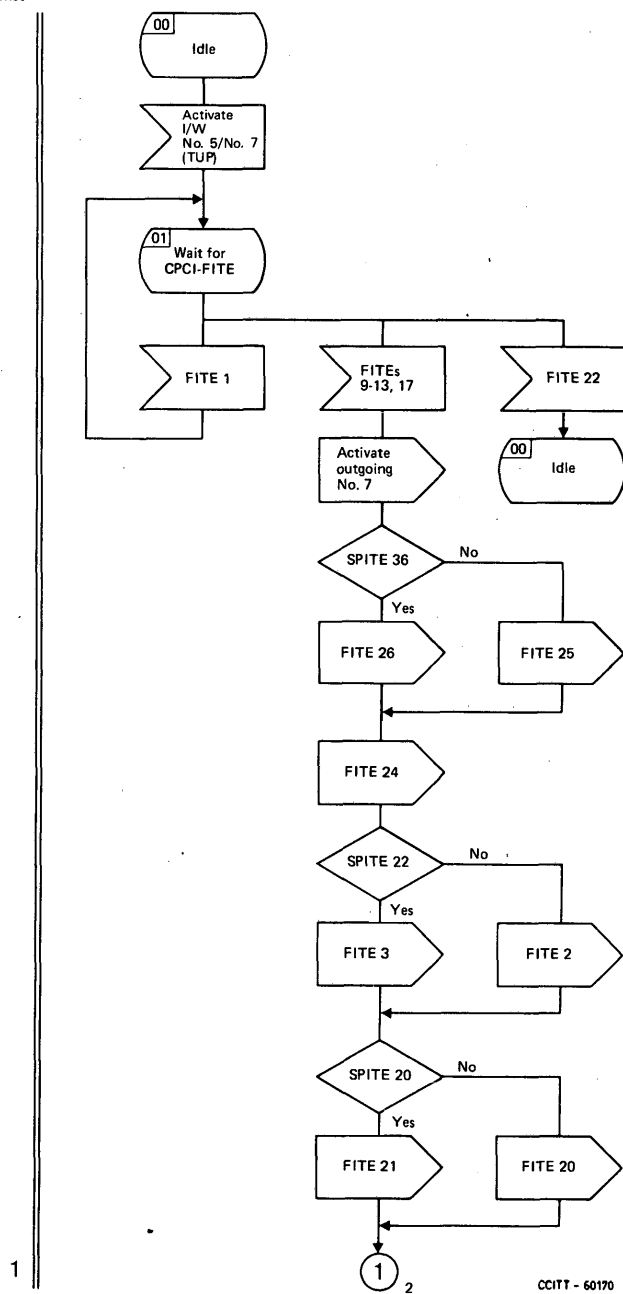
FIGURE 3/Q.643 (Sheet 1 of 3)

Interworking of Signalling System No. 5 to No. 7 (TUP)

1

①

SPITE 21 — No

Yes

FITE 5   FITE 4

Which
CPCI-FITE

9-13   17

FITE 9-13   FITE 17

2 ②

2

10

②

Any more
FITE 1 — No

Yes

2 ⑩

02
Wait for ST

FITE 1   BITEs 9,
10, 12, 19   FITE 22   BITEs 2, 3   BITE 15   BITE 30

BITE 8   ③₃   ④₃   ⑤₃   BITE 30

3, 4, 5

Country
code FITE — Yes

No   Yes

SPITE 22

00
Idle

⑩₂

10

No

FITE 1   Omit
country code
FITE

CCITT – 60180

2

ST FITE — No   ②₂

Yes

6   ⑥₃
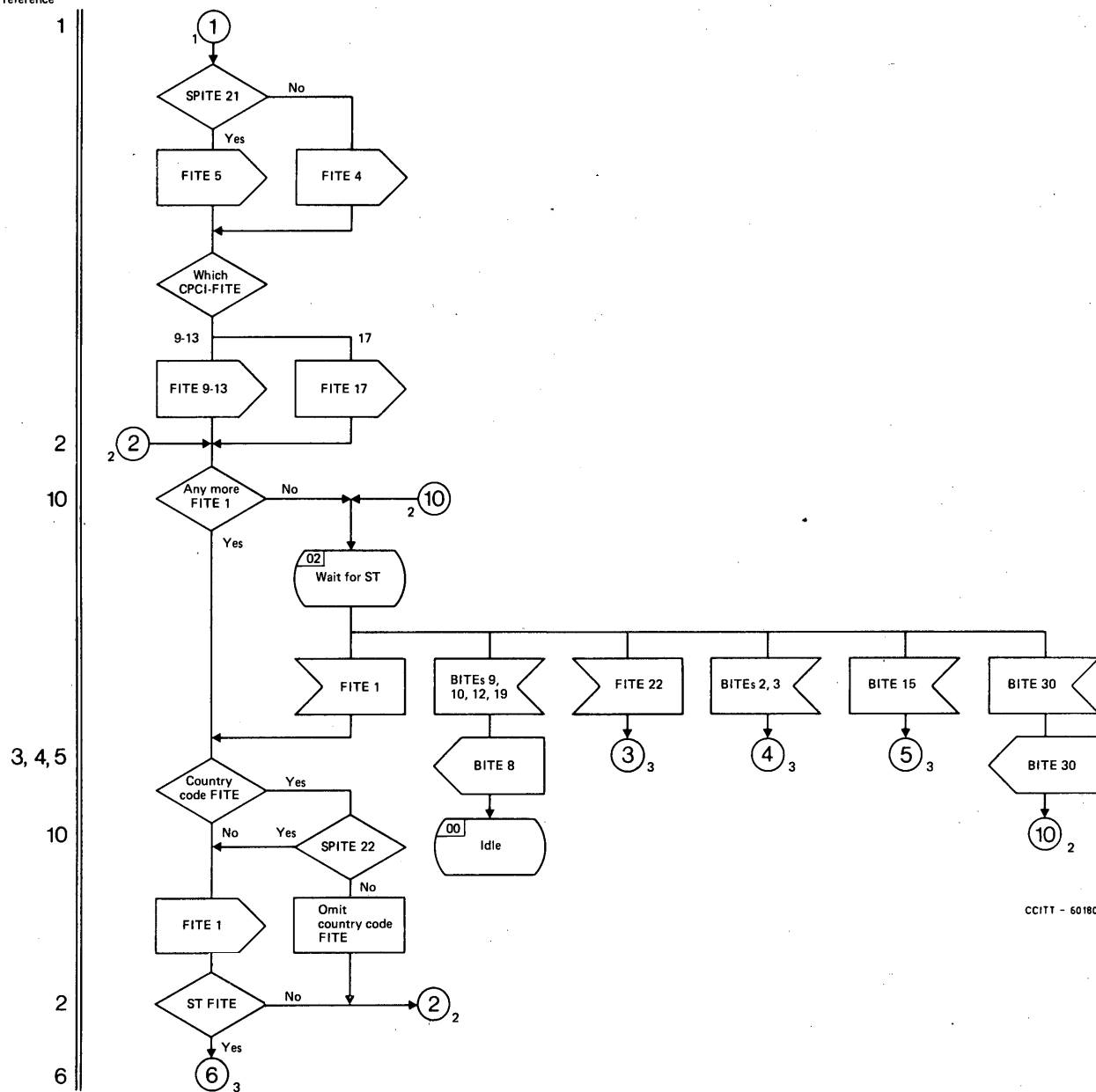
FIGURE 3/Q.643 (Sheet 2 of 3)

Interworking of Signalling System No. 5 to No. 7 (TUP)

T1104830-87

Note — This FITE 31 is to be translated as appropriate (e.g. Calling Party Category).

FIGURE 3/Q.643 (Sheet 3 of 3)

Interworking of Signalling System No. 5 to No. 7 (TUP)

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 5 TO R1

CCITT-48660
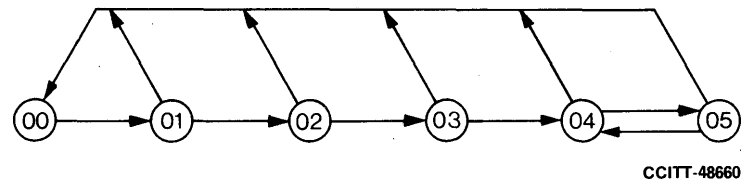
State number	State description
00	Idle
01	Wait for ST
02	Wait for register deactivation
03	Wait for answer
04	Answered
05	Clear-back

FIGURE 1/Q.644

State overview diagram for interworking of Signalling System No. 5 to R1

Procedures not shown

Procedure P_1 is not described because the procedure has not been specified in the Signalling System R1 specifications.

FIGURE 2/Q.644

Notes to interworking of Signalling System No. 5 to R1
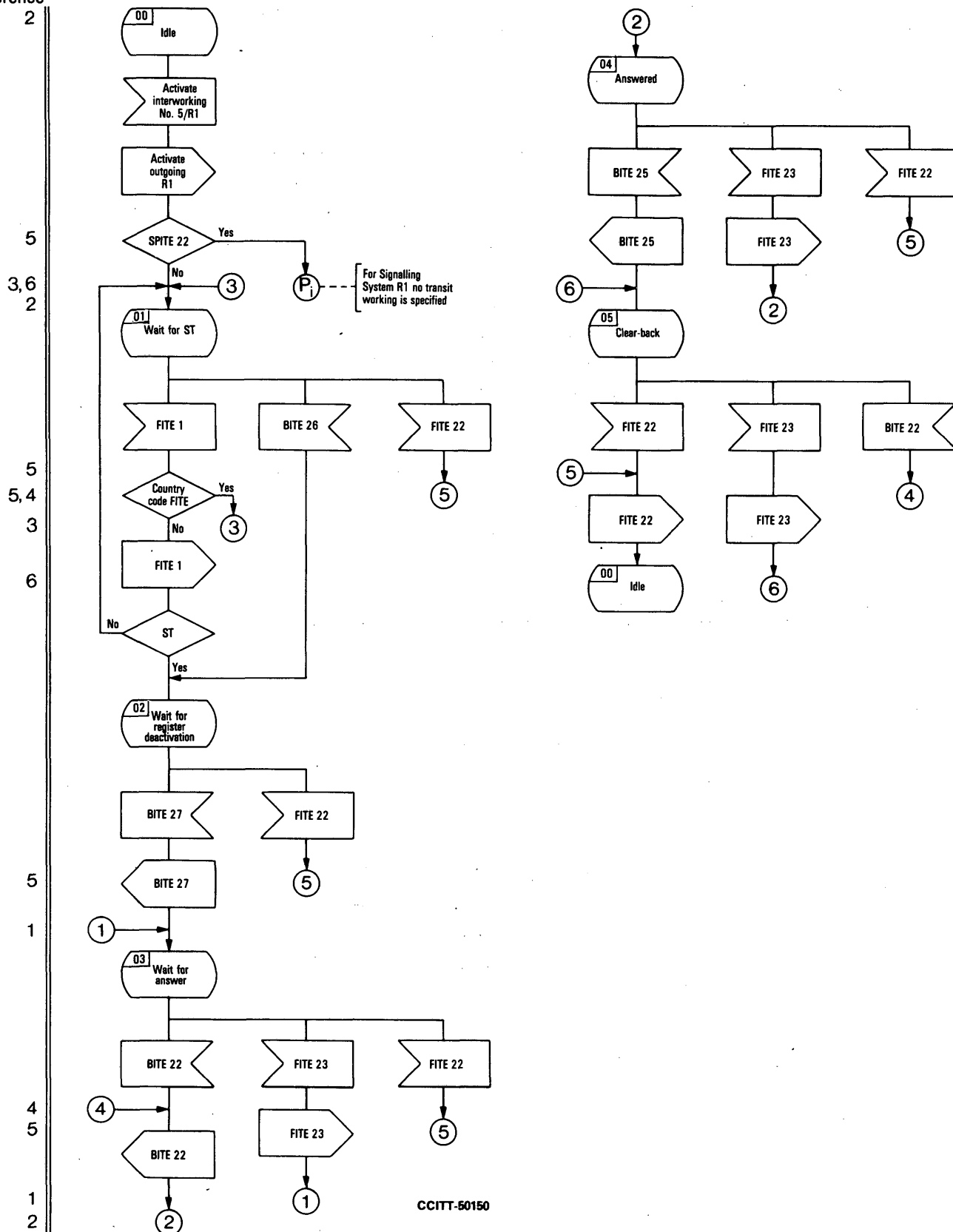
FIGURE 3/Q.644

Interworking of Signalling System No. 5 to R1

CCITT-50150

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 5 TO R2

CCITT-48670
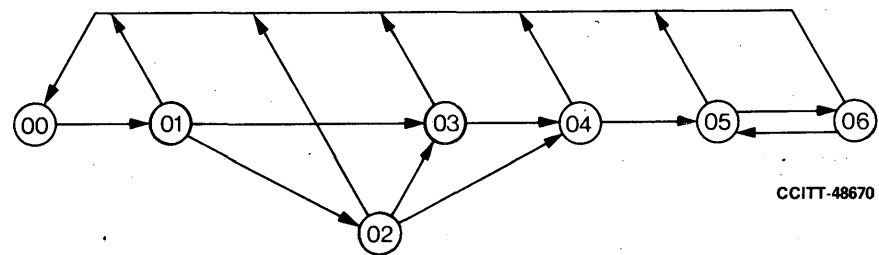
State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for calling party's category (CPCI)	1
02	Wait for ST	1
03	Wait for address-complete	2
04	Wait for answer	2
05	Answered	2
06	Clear-back	2

FIGURE 1/Q.645

State overview diagram for interworking of Signalling System No. 5 to R2

FIGURE 2/Q.645

(Reserved for future notes)
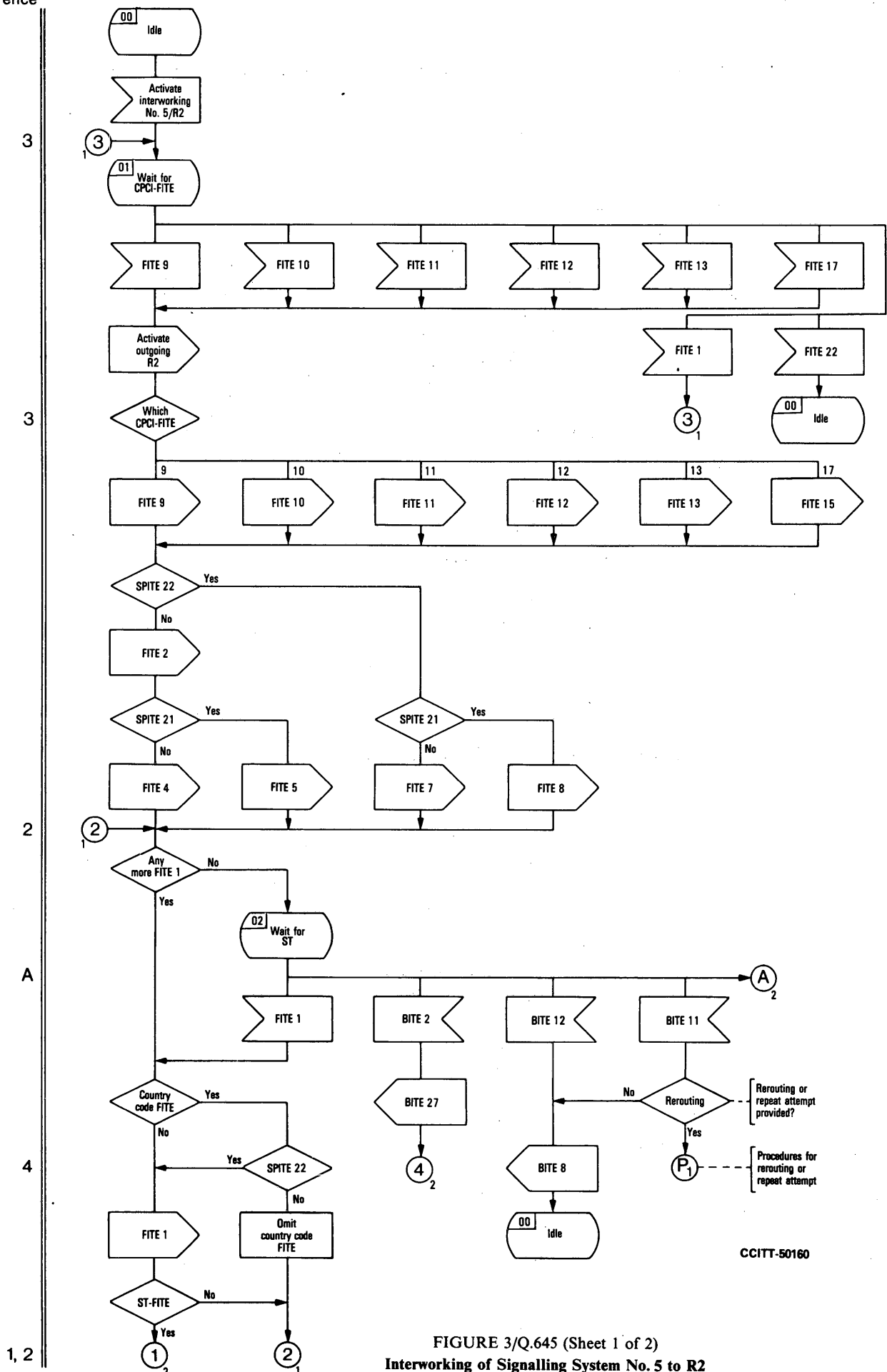
FIGURE 3/Q.645 (Sheet 1 of 2)
Interworking of Signalling System No. 5 to R2

CCITT-50160

Note — Rerouting of repeat attempt provided ?

FIGURE 3/Q.645 (Sheet 2 of 2)
Interworking of Signalling System No. 5 to R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 6 TO No. 5
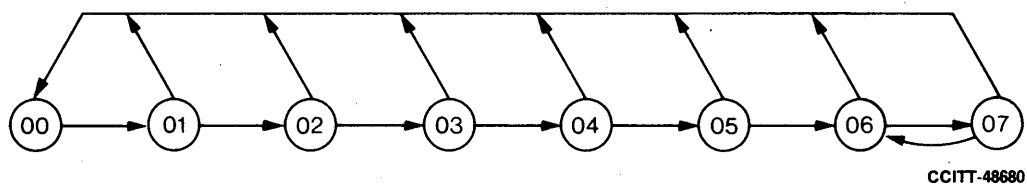
CCITT-48680

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for CPCI-FITE	1
02	Wait for COT	1
03	Wait for address-complete	1
04	Wait for register deactivation	2
05	Wait for answer	2
06	Answered	2
07	Clear-back	2

FIGURE 1/Q.652

State overview diagram for interworking of Signalling System No. 6 to No. 5

FIGURE 2/Q.652

(Reserved for future notes)

FIGURE 3/Q.652 (Sheet 1 of 2)

Interworking of Signalling System No. 6 to No. 5
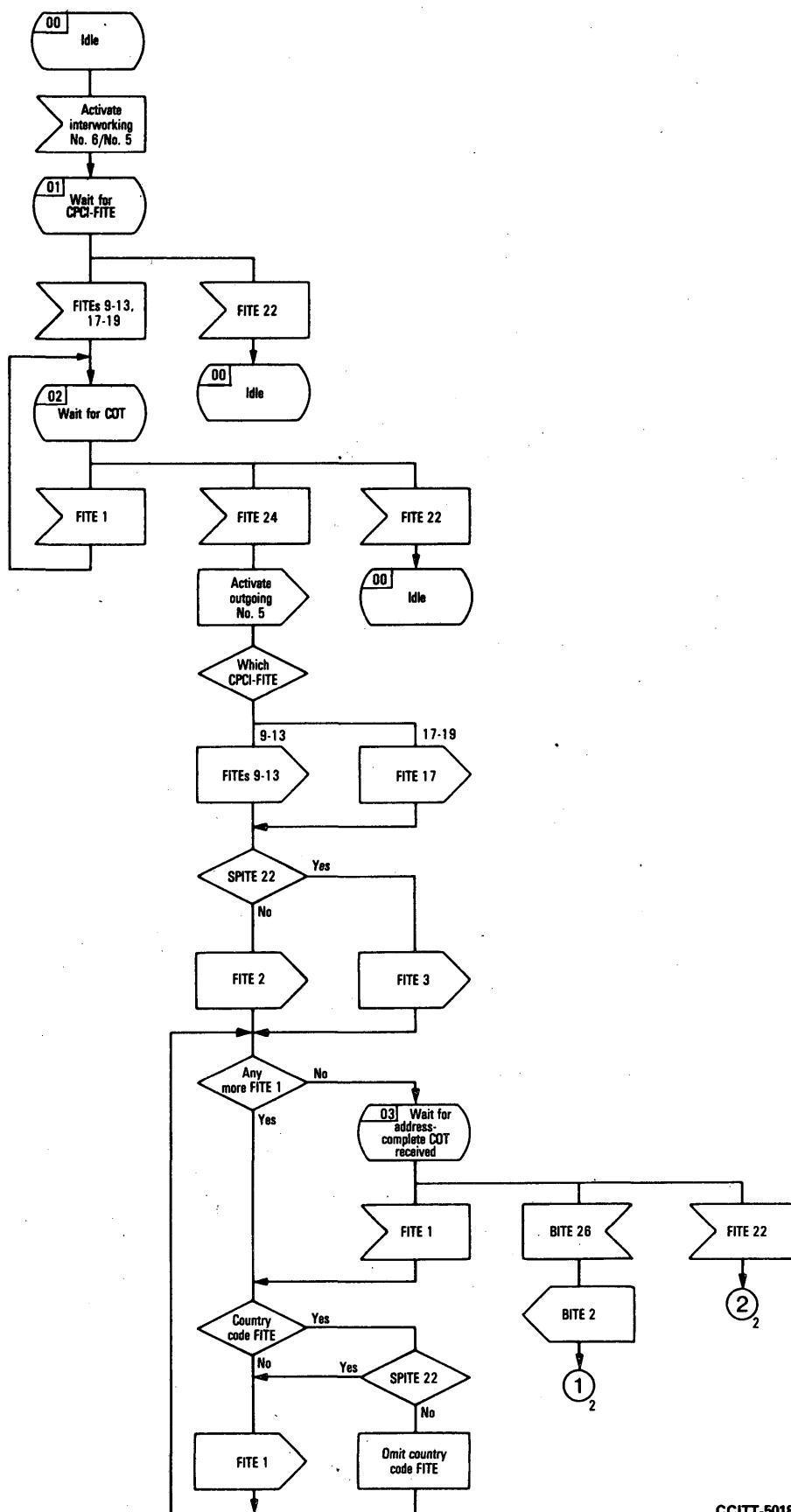
CCITT-50180
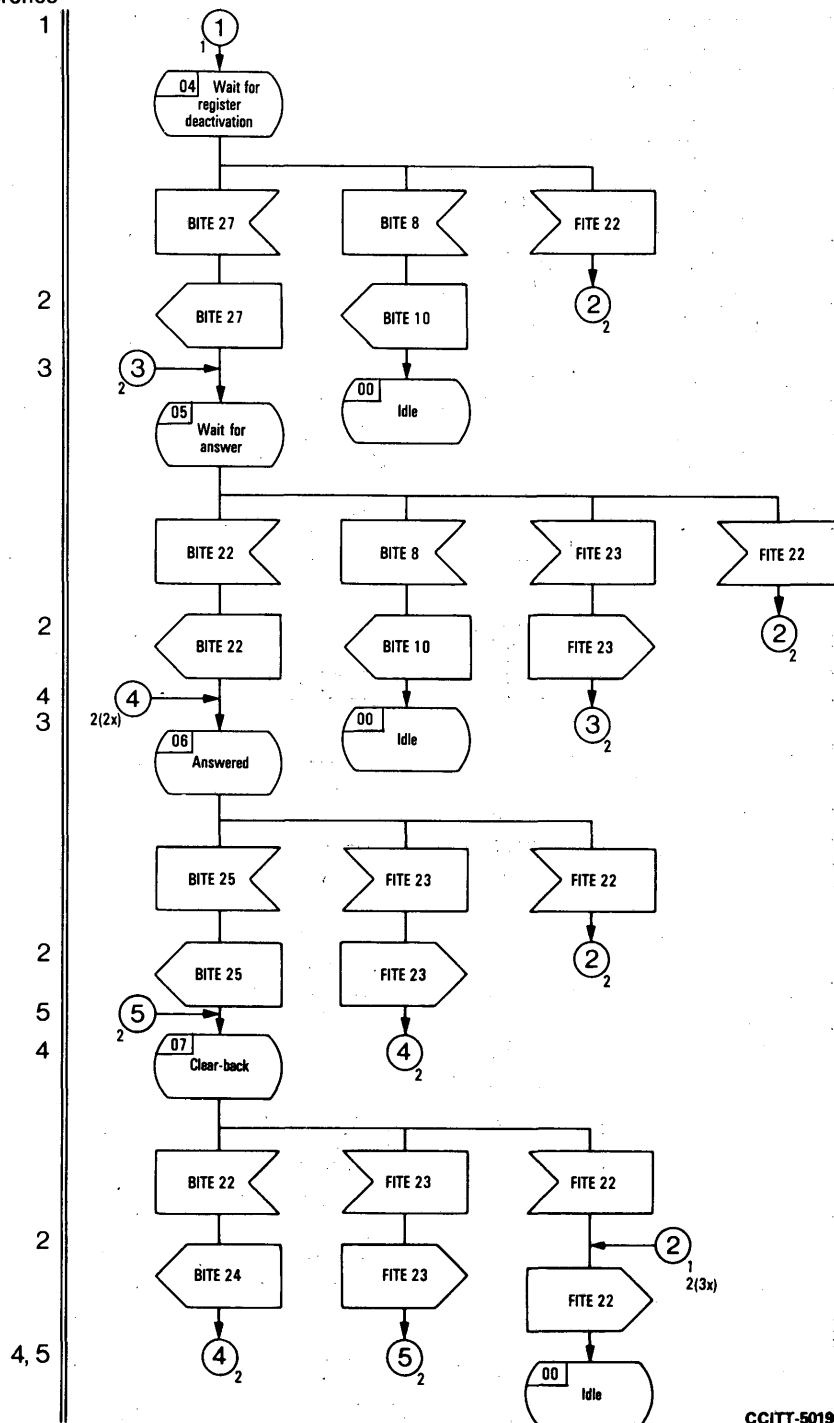
FIGURE 3/Q.652 (Sheet 2 of 2)

Interworking of Signalling System No. 6 to No. 5

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 6 TO No. 7 (TUP)

CCITT-48661
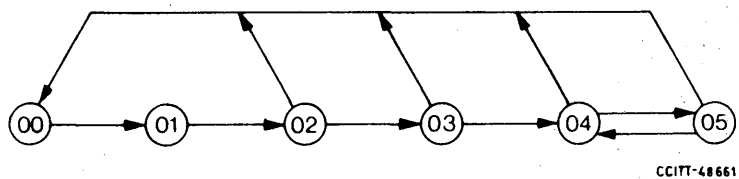
State number	State description	Sheet number
00	Idle	1, 2, 3
01	Wait for CPCI-FITE	1
02	Wait for address-complete	2
03	Wait for answer	2
04	Answered	3
05	Clear-back	3

FIGURE 1/Q.653

State overview diagram for interworking of Signalling System No. 6 to No. 7 (TUP)

FIGURE 2/Q.653

(Reserved for future notes)

FIGURE 3/Q.653 (Sheet 1 of 3)

Interworking of Signalling System No. 6 to No. 7 (TUP)

Note — This FITE 31 is to be translated as appropriate (e.g. Calling Party Category).
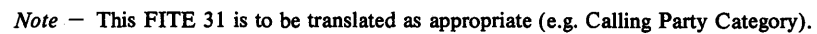
FIGURE 3/Q.653 (Sheet 2 of 3)

Interworking of Signalling System No. 6 to No. 7 (TUP)

T1104841-87

Connector
reference

3

2, 3 (2X)　③

| 04 |
| Answered |

BITE 25　　FITE 22　　FITE 23

BITE 25　　FITE 22　　FITE 23

4
3

3　④

| 05 |
| Clear-back |

| 00 |
| Idle |

③ 3

FITE 22　　FITE 23　　BITE 24

A

FITE 22　　FITE 23　　BITE 24

4, 3

| 00 |
| Idle |

④ 3　　③ 3

2　Ⓐ

BITE 9　　BITE 10　　BITE 12　　BITE 14　　BITE 15

BITE 9　　BITE 10　　BITE 12　　BITE 14　　BITE 15

BITE 16　　BITE 17　　BITE 19　　BITE 20

BITE 16　　BITE 17　　BITE 19　　BITE 20

| 00 |
| Idle |
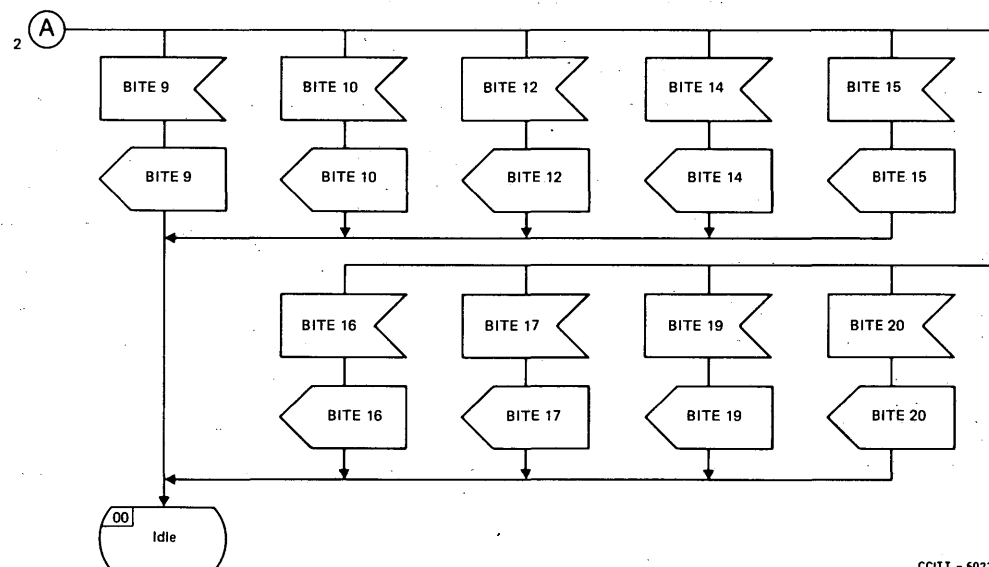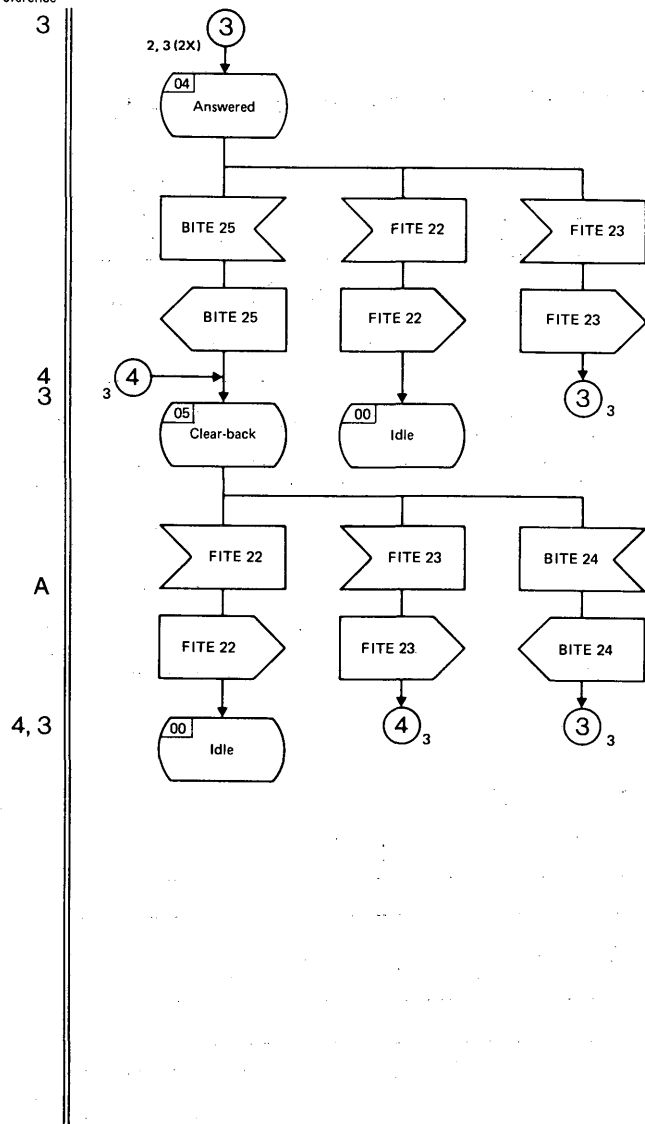
CCITT - 60230

FIGURE 3/Q.653 (Sheet 3 of 3)

Interworking of Signalling System No. 6 to No. 7 (TUP)

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 6 TO R1

CCITT-48690
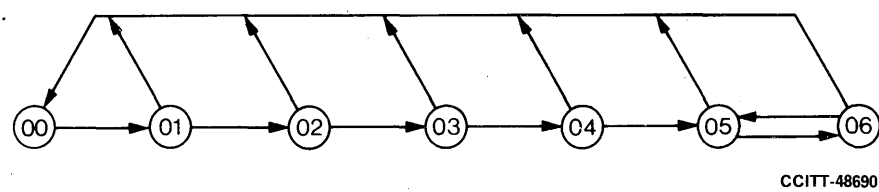
State number	State description
00	Idle
01	Wait for continuity check
02	Wait for address-complete
03	Wait for register deactivation
04	Wait for answer
05	Answered
06	Clear-back

FIGURE 1/Q.654

State overview diagram for interworking of Signalling System No. 6 to R1

Procedures not shown

Procedure P_1 is not described because no procedure is specified in the Signalling System R1 specifications.

FIGURE 2/Q.654

Notes to interworking of Signalling System No. 6 to R1

00 Idle

Activate
interworking
No. 6/R1

01 Wait for
continuity check

FITE 1

FITE 24

FITE 22

Activate
outgoing
R1

00 Idle

SPITE 22 — Yes

No

P_1 --- No transit working
is specified for
Signalling System R1

Any more
FITE 1 — No

5 — Yes

02 Wait for
address-
complete --- Artificial

Country
code FITE — Yes

No

FITE 1

Omit
country code
FITE

FITE 1

BITE 26

FITE 22

5

BITE 2

1

5

5
1

2

03 Wait for
register
deactivation

2

05 Answered

BITE 27

FITE 22

BITE 25

FITE 23

FITE 22

BITE 27

1

BITE 25

FITE 23

1

3

3

4

06 Clear-back

04 Wait for
answer

1

BITE 22

FITE 23

FITE 22

BITE 22

FITE 23

FITE 22

4
2

BITE 22

FITE 23

FITE 22

BITE 24

FITE 23

FITE 22

1

BITE 22

FITE 23

1

2

1

2,3

2

3

00 Idle

2,4

2

4

FIGURE 3/Q.654

Interworking of Signalling System No. 6 to R1

CCITT-50210

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 6 TO R2

CCITT-48700

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for calling party's category (CPCI)	1
02	Wait for address-complete	1
03	Wait for answer, charge	2
04	Wait for answer, no charge	2
05	Answered	2
06	Clear-back	2

FIGURE 1/Q.655

State overview diagram for interworking of Signalling System No. 6 to R2

Procedures not shown

The following procedure, not directly relevant to interworking, is not shown in the logic:

P_1 — Procedure for repeat attempt.

FIGURE 2/Q.655

Notes to interworking of Signalling System No. 6 to R2

FIGURE 3/Q.655 (Sheet 1 of 2)

Interworking of Signalling System No. 6 to R2

Note – See Recommendation Q.261, § 4.1.2.
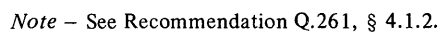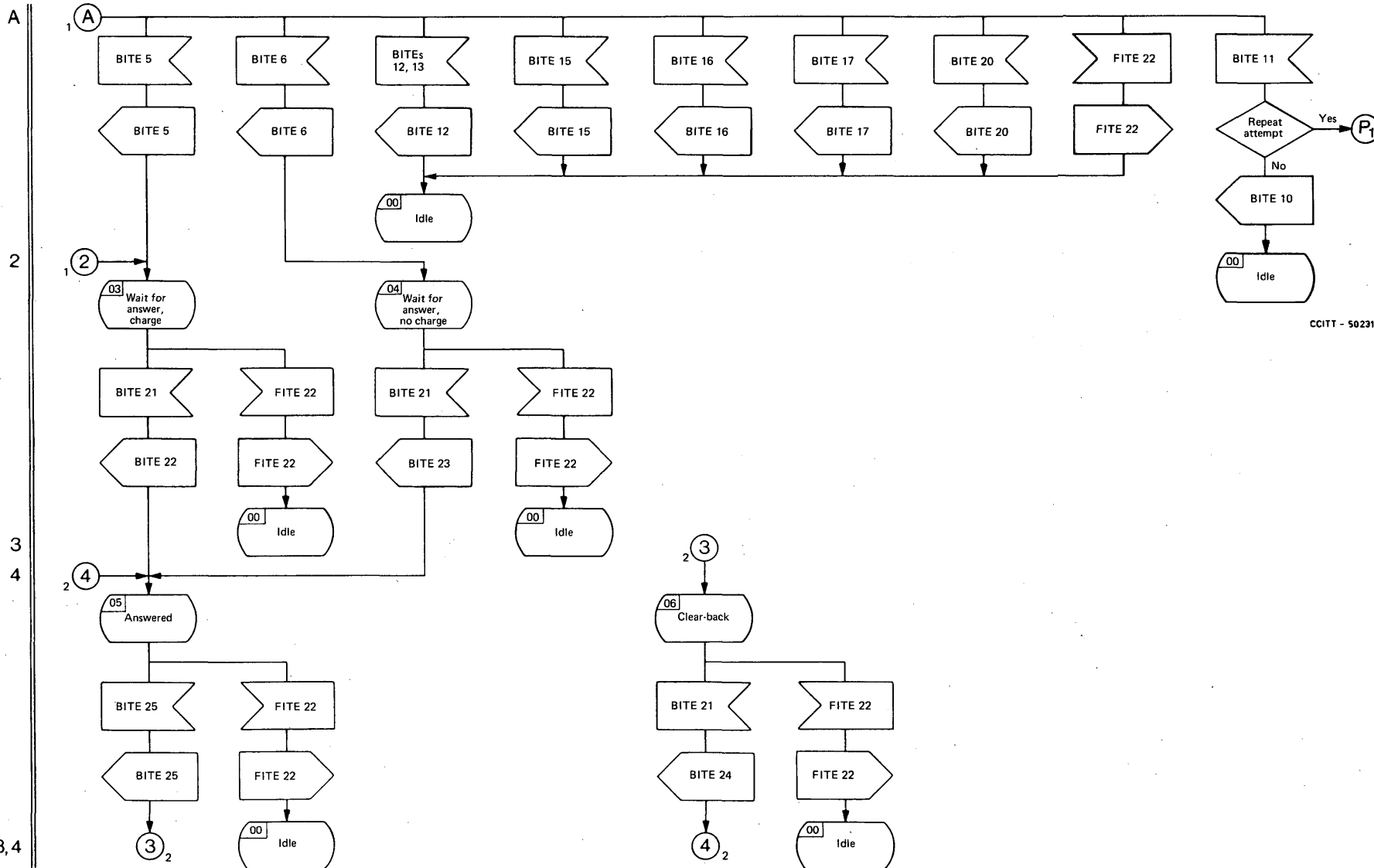
FIGURE 3/Q.655 (Sheet 2 of 2)

Interworking of Signalling System No. 6 to R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 7 (TUP) TO No. 5

CCITT-48680

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for CPCI-FITE	1
02	Wait for COT	1
03	Wait for address-complete	2
04	Wait for register deactivation	2
05	Wait for answer	2
06	Answered	2
07	Clear-back	2

FIGURE 1/Q.662

State overview diagram for interworking of Signalling System No. 7 (TUP) to No. 5

FIGURE 2/Q.662

(Reserved for future notes)

00 Idle

Activate
I/W No. 7
(TUP)/No. 5

8
1

8

01 Wait for
CPCI-FITE

FITEs
9-13,
17-19

FITE 22

FITE 30

00 Idle

8
1

8

02 Wait for COT

FITE 1

FITE 25

FITE 24

FITE 22

00 Idle

Activate
outgoing
No. 5

Which
CPCI-FITE

T1104850-87

9-13

17-19

FITE 9-13

FITE 17

SPITE 22

Yes

No

FITE 2

FITE 3

4
2

Any more
FITE 1s

2
2

1
2

4

2, 1

FIGURE 3/Q.662 (Sheet 1 of 2)

Interworking of Signalling System No. 7 (TUP) to No. 5

Connector
reference

1

1

```
00  Wait for
    address-
    complete
    COT received
```

FITE 1   BITE 26   FITE 22   BITE 8

2   BITE 2   BITE 10

1

Country   Yes
code FITE   00 Idle

No ◄ Yes
              SPITE 22
                                      04 Wait for
FITE 1   register
                                          deactivation
                 No

              Omit
              country code   BITE 27   BITE 8   FITE 22

4, 3   BITE 27   BITE 10

5   3
                                                               2
4   5   2
         1   05 Wait for   00 Idle
                                      answer

                                  BITE 22   BITE 8   FITE 23   FITE 22

3   BITE 22   BITE 10   FITE 23
6
5   3
                                                                     2
                                  6
                                  2 (2X) 06   00 Idle
                                          Answered   5
                                                                    2
                                  BITE 25   FITE 23   FITE 22

3   7   BITE 25   FITE 23

7   2 (2X)
                                                                    3
         07   2
         Clear-back
7, 6   7   6
                                  2   2
         BITE 22   FITE 23   FITE 22   T1104862-87

3   3
                                          2 (4X)

         BITE 24   FITE 23   FITE 22

6, 7   6   7   00 Idle
         2   2

FIGURE 3/Q.662 (Sheet 2 of 2)

Interworking of Signalling System No. 7 (TUP) to No. 5

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 7 (TUP) TO No. 6

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for CPCI-FITE	1
02	Wait for address-complete	1
03	Wait for answer	1
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.663

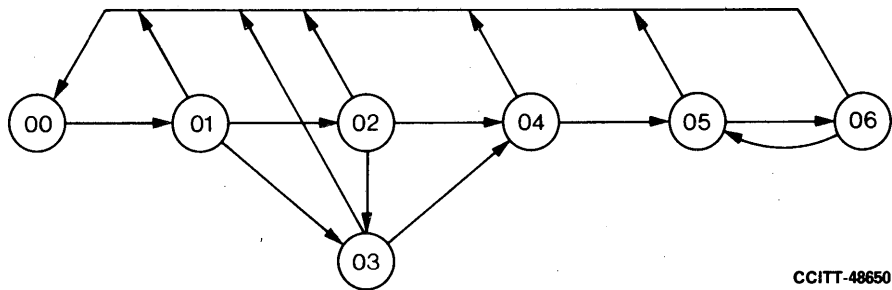**State overview diagram for interworking of Signalling System No. 7 (TUP) to No. 6**

Procedures not shown

The following procedure, not directly relevant to interworking, is not shown in the logic:

P_1 — Procedure for repeat attempt.

FIGURE 2/Q.663

Notes to interworking of Signalling System No. 7 (TUP) to No. 6
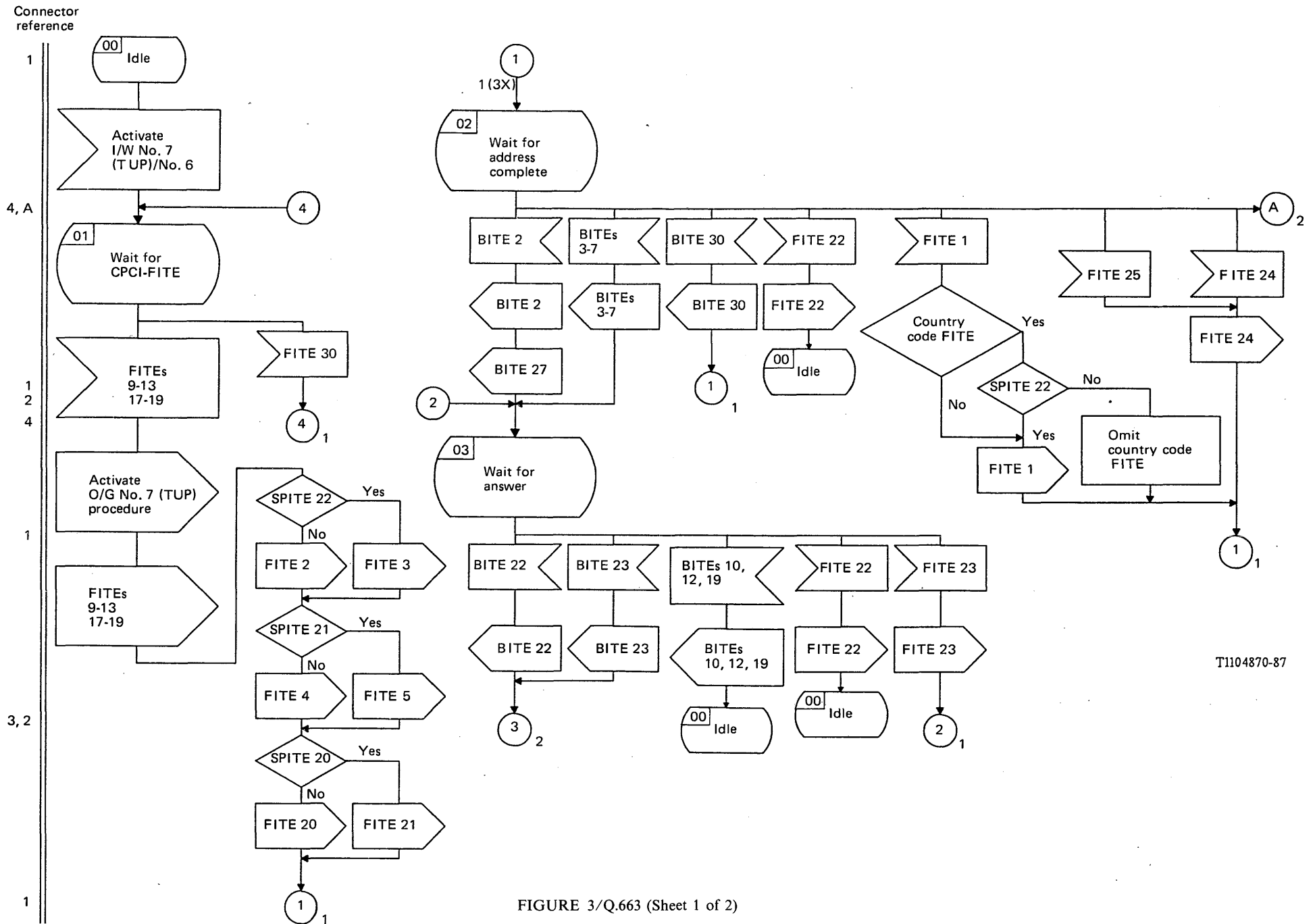
FIGURE 3/Q.663 (Sheet 1 of 2)

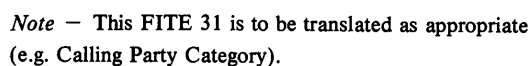**Interworking of Signalling System No. 7 (TUP) to No. 6**

T1104870-87
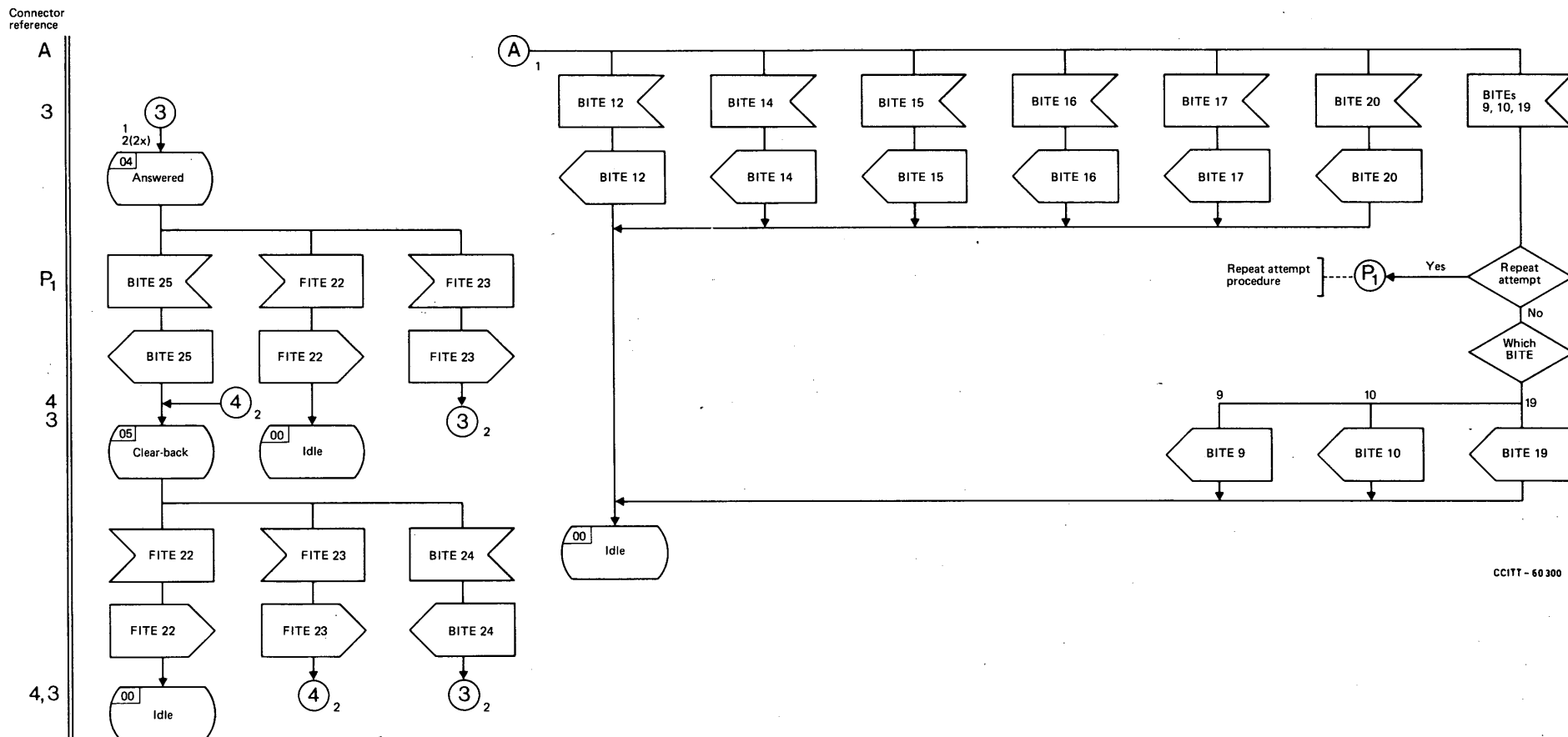
FIGURE 3/Q.663 (Sheet 2 of 2)

Interworking of Signalling System No. 7 (TUP) to No. 6

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 7 (TUP) TO No. 7 (TUP)

T1109085-87
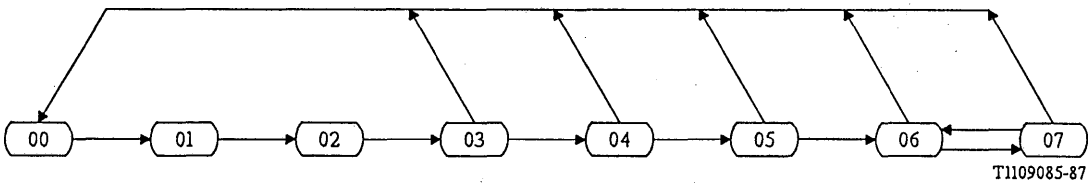
State number	State description	Sheet reference
00	Idle	1, 2, 4
01	Wait for service provided FITE	1
02	Wait for CPCI-FITE	1
03	Wait for continuity FITE	2
04	Wait for address-complete	3
05	Wait for answer	3
06	Answered	4
07	Clear-back	4

FIGURE 1/Q.664

State overview diagram for interworking of Signalling System No. 7 (TUP) to No. 7 (TUP)

FIGURE 2/Q.664

(Reserved for future notes)

Connector
reference
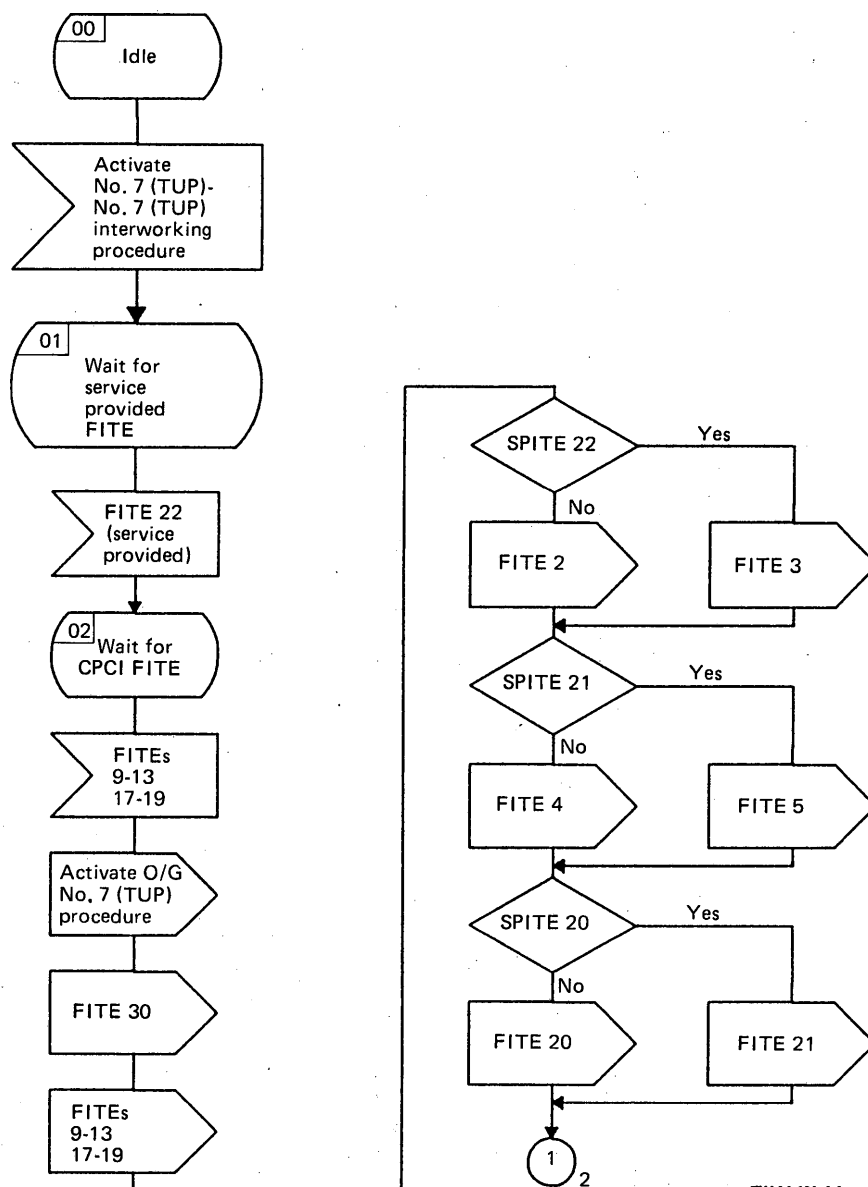
FIGURE 3/Q.664 (Sheet 1 of 4)

Interworking of Signalling System No. 7 (TUP) to No. 7 (TUP)

Connector
reference

1, 2 (3X)

03 Wait for continuity FITE

FITE 26 · | FITE 27 | FITE 25 | FITE 1 | FITE 22 | BITE 31 GRQ | FITE 31 GSM

FITE 1 | FITE 22 | BITE 31 GRQ | FITE 31 GSM

SPITE 36 — Yes

No

FITE 27 | FITE 26

1, 1, 1

SPITE 36 — Yes

No

FITE 25 | FITE 26

00 Idle

1)2 · 1)2 · 1)2

2
2
B

2)3 · 2)3

T1100643-87

FIGURE 3/Q.664 (Sheet 2 of 4)

Interworking of Signalling System No. 7 (TUP) to No. 7 (TUP)

Connector
reference

T1100644-87

FIGURE 3/Q.664 (Sheet 3 of 4)

Interworking of Signalling System No. 7 (TUP) to No. 7 (TUP)

FIGURE 3/Q.664 (Sheet 4 of 4)

Interworking of Signalling System No. 7 (TUP) to No. 7 (TUP)

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 7 (TUP) TO R1

CCITT-48690
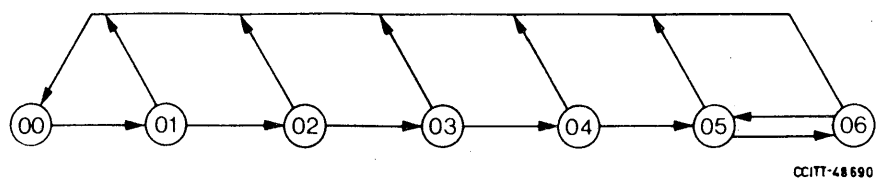
State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for continuity check	1
02	Wait for address-complete	1
03	Wait for register deactivation	1
04	Wait for answer	2
05	Answered	2
06	Clear-back	2

FIGURE 1/Q.665

State overview diagram for interworking of Signalling System No. 7 (TUP) to R1

Procedures not shown

P_1 — No transit working is defined for R1.

FIGURE 2/Q.665

Note to the interworking of Signalling System No. 7 (TUP) to R1

FIGURE 3/Q.665 (Sheet 1 of 2)

Interworking of Signalling System No. 7 (TUP) to R1

7,4

7

1

03
Wait for
register
deactivation

BITE 27 FITE 22

BITE 27

2
2

2,2

5
3
4

3
2

04
Wait for
answer

BITE 22 FITE 23 FITE 22

2

2

BITE 22 FITE 23

2
2

3,4
4,5

4
2

3
2

4

2 (3X)

05
Answered

BITE 25 FITE 23 FITE 22

BITE 25 FITE 23

2
2

5
2

4
2

06
Clear-back

BITE 22 FITE 23 FITE 22

2

1, 2 (X3)

BITE 24 FITE 23 FITE 22

Idle

4
2

5
2
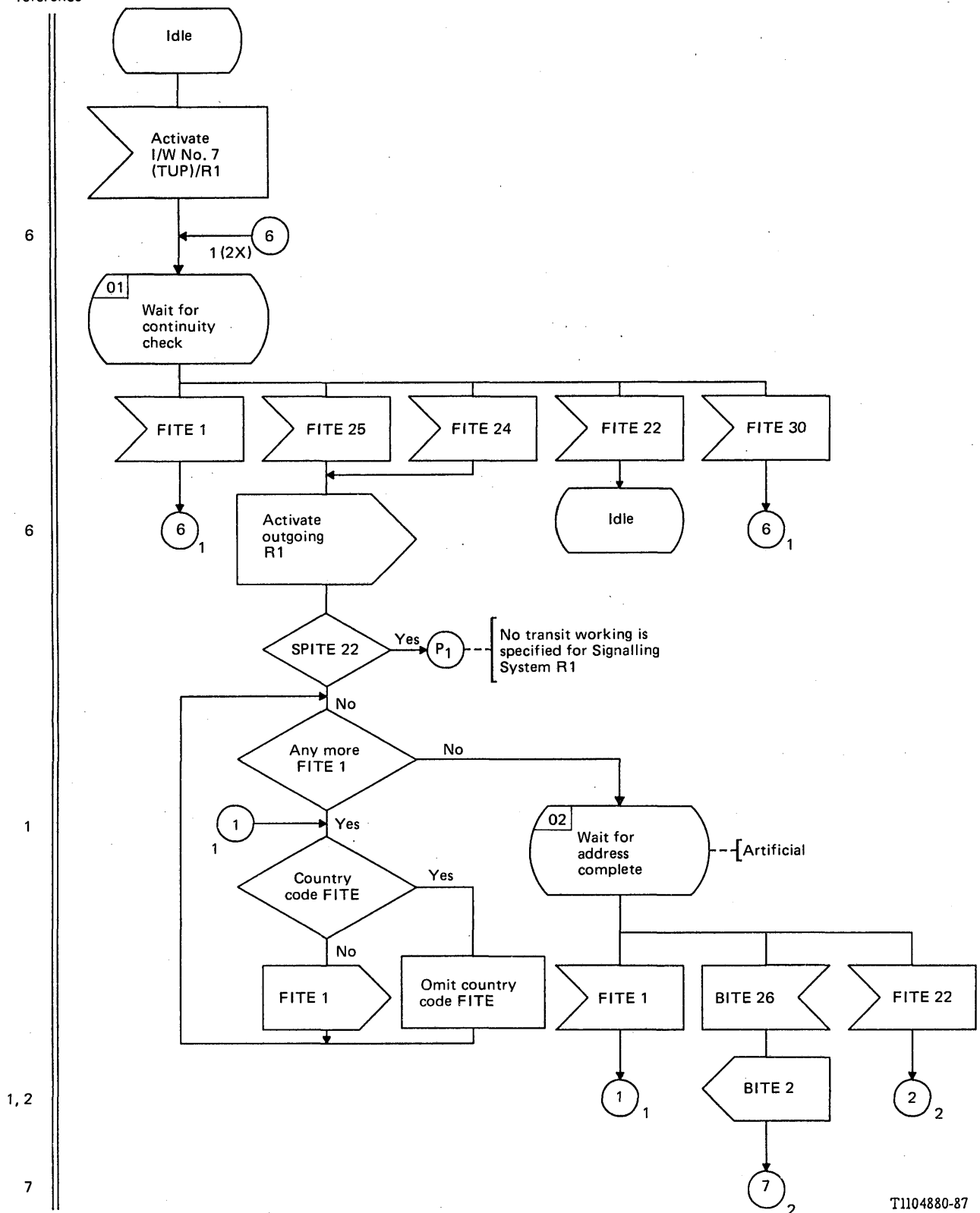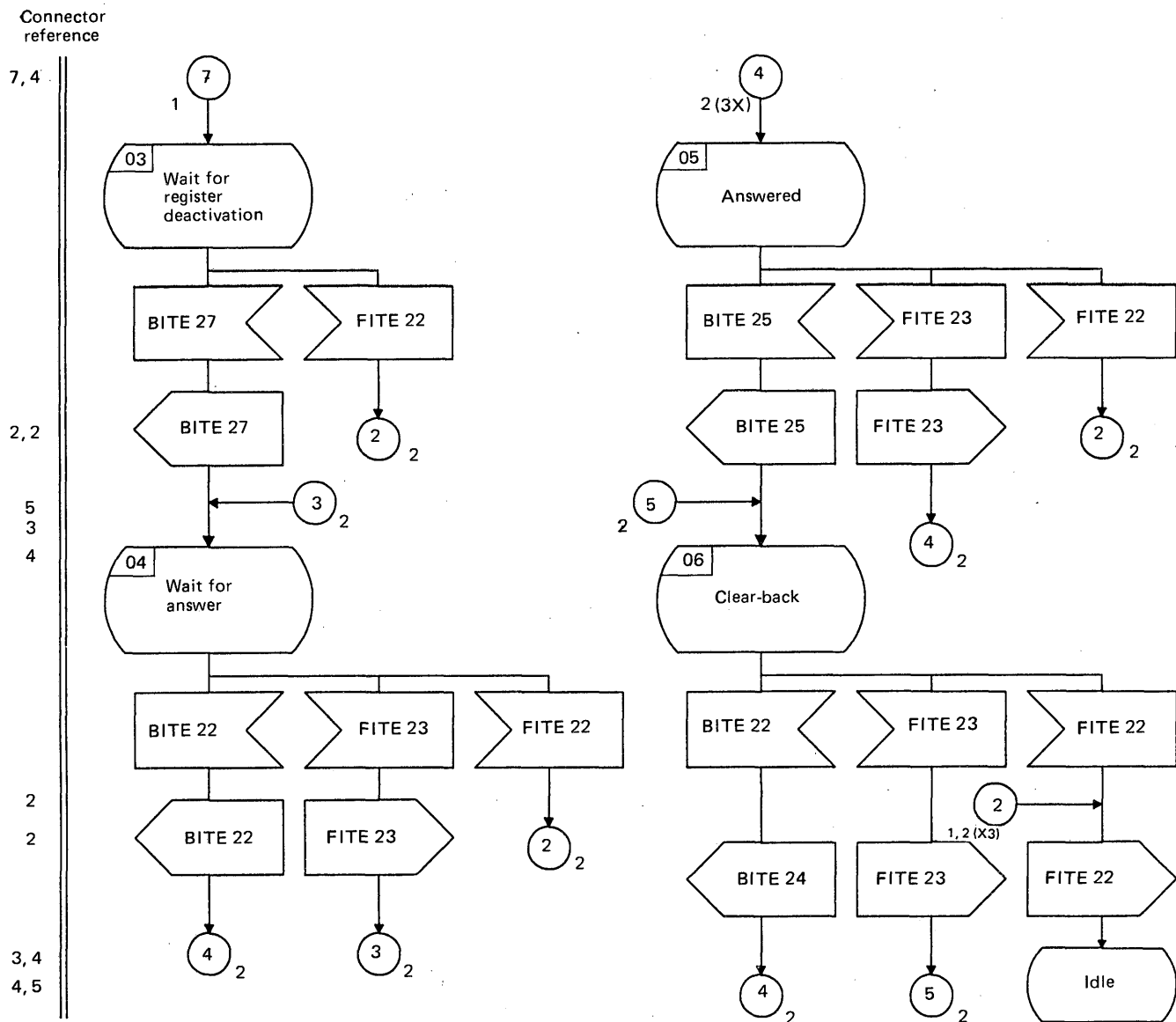
T1104885-87

FIGURE 3/Q.665 (Sheet 2 of 2)

Interworking of Signalling System No. 7 (TUP) to R1

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM No. 7 (TUP) TO R2

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for CPCI-FITE	1
02	Wait for address-complete	2
03	Wait for answer, charge	2
04	Wait for answer, no charge	2
05	Answered	2
06	Clear-back	2
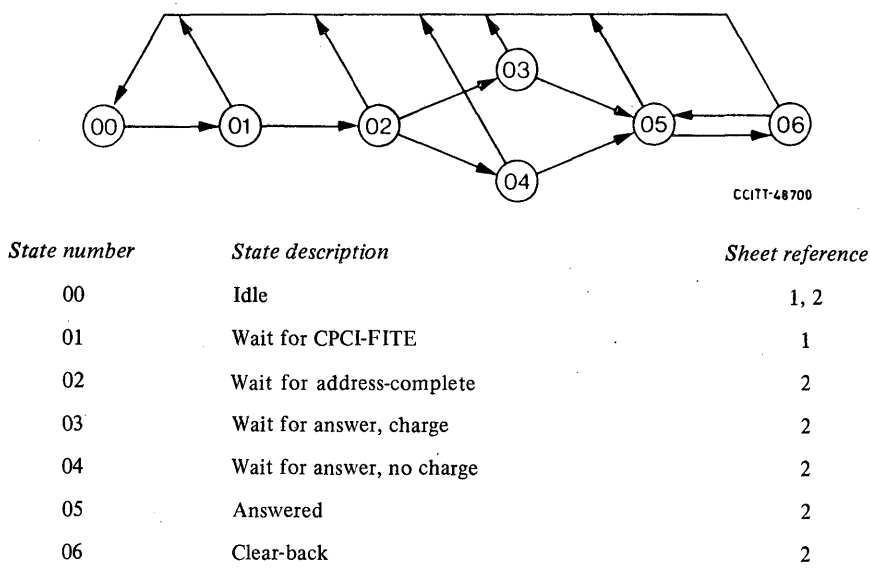
FIGURE 1/Q.666

State overview diagram for interworking of Signalling System No. 7 (TUP) to R2

FIGURE 2/Q.666

(Reserved for future use)
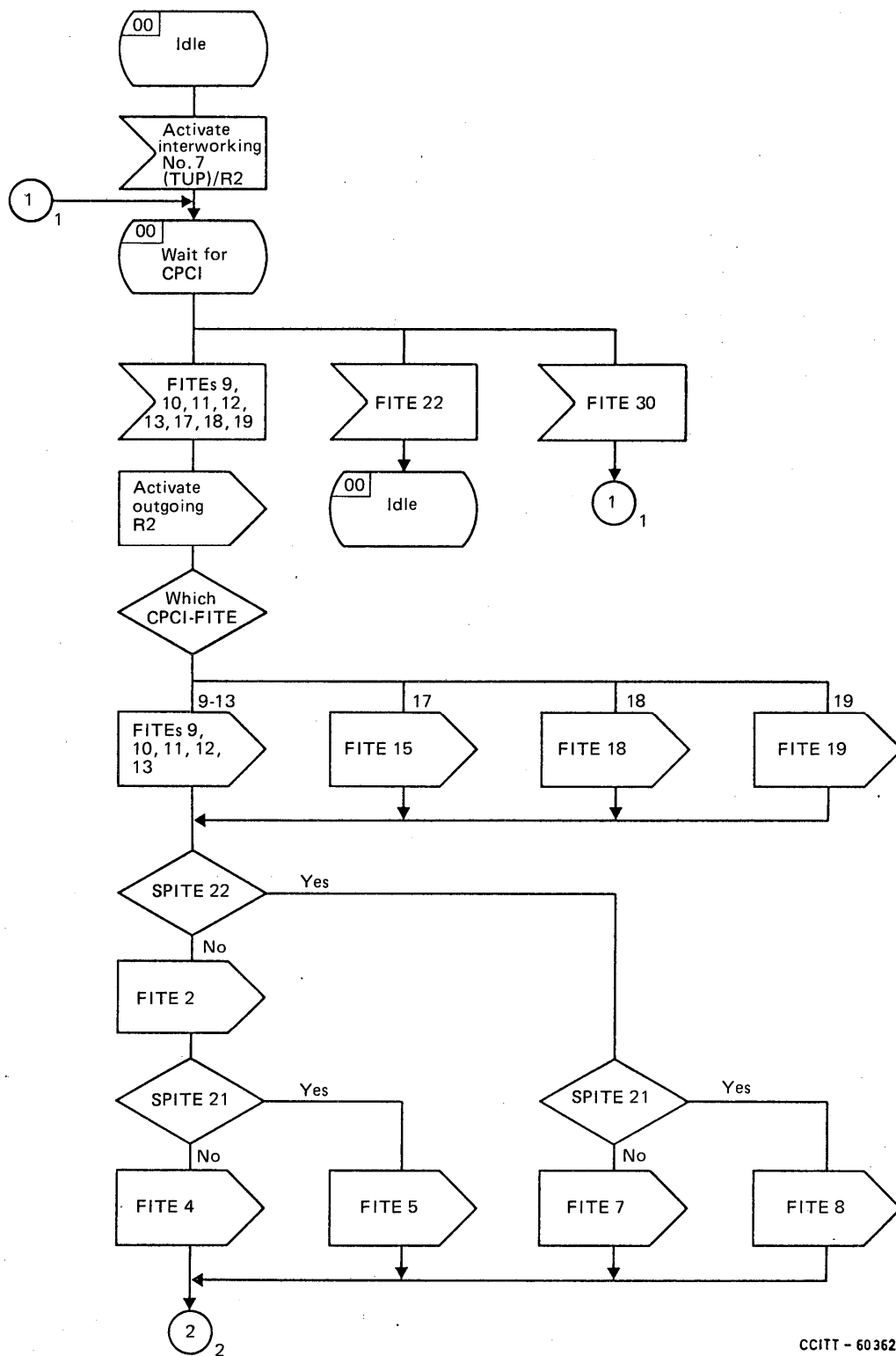
FIGURE 3/Q.666 (Sheet 1 of 2)

Interworking of Signalling System No. 7 (TUP) to R2

CCITT - 60362

Note – Sufficient FITEs must be withheld to
prevent an address-complete signal being received
before (continuity) has been established when
this is performed.
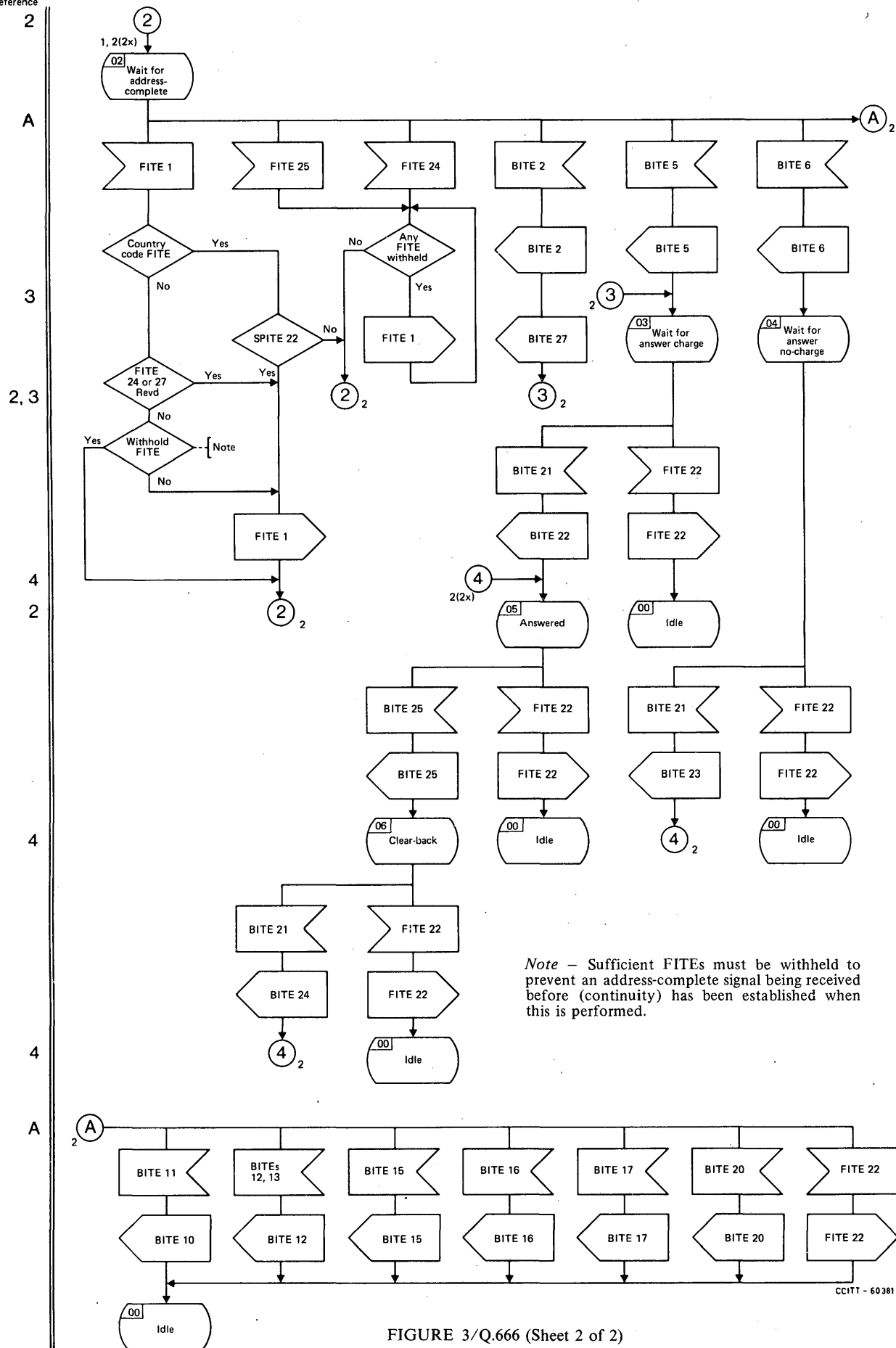
FIGURE 3/Q.666 (Sheet 2 of 2)

Interworking of Signalling System No. 7 (TUP) to R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R1 TO No. 5

CCITT-48710
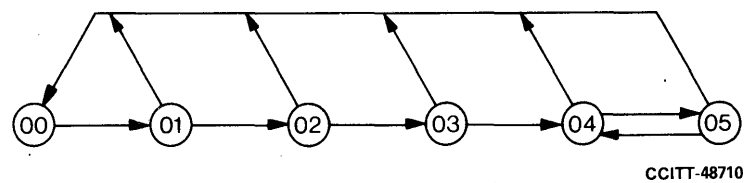
State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for ST	1
02	Wait for register deactivation	1
03	Wait for answer	2
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.671

State overview diagram for interworking of Signalling System R1 to No. 5
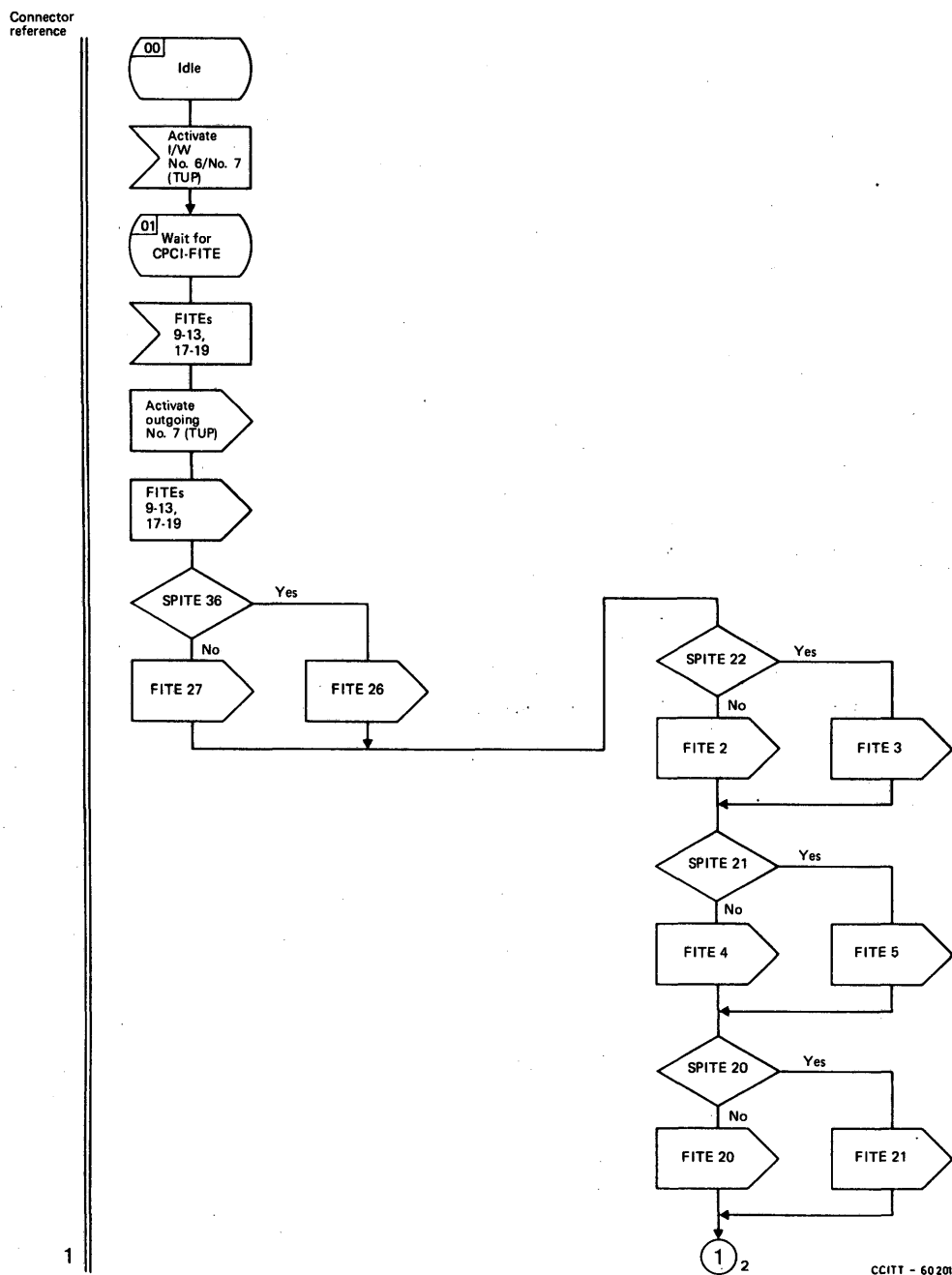
FIGURE 2/Q.671

(Reserved for future notes)

One of the FITEs 9-13 could be used to replace FITE 17 if the call was known to originate from an operator position, e.g. by analysis of path of entry, by use of a pseudo country code.
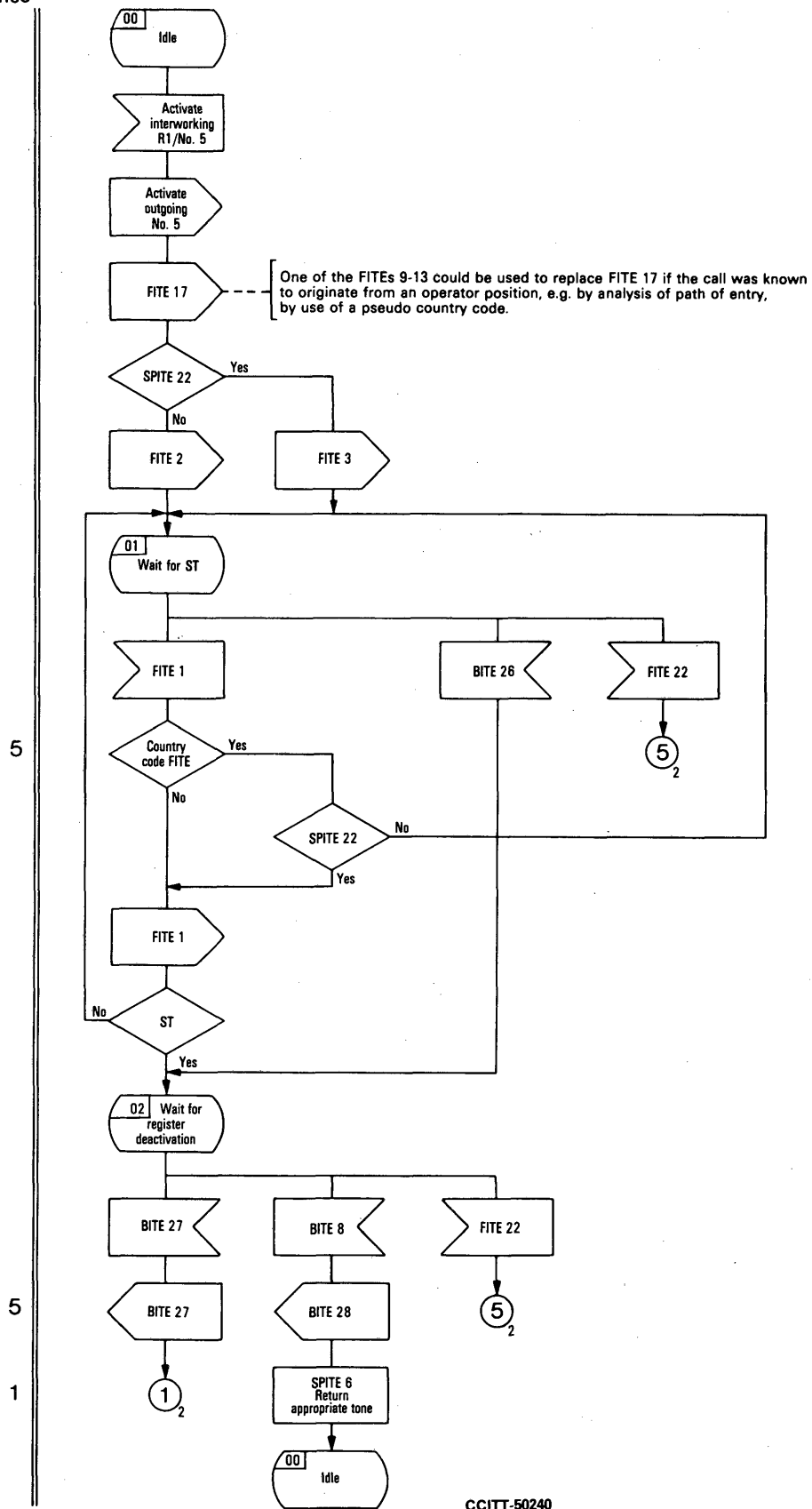
CCITT-50240

FIGURE 3/Q.671 (Sheet 1 of 2)

Interworking of Signalling System R1 to No. 5
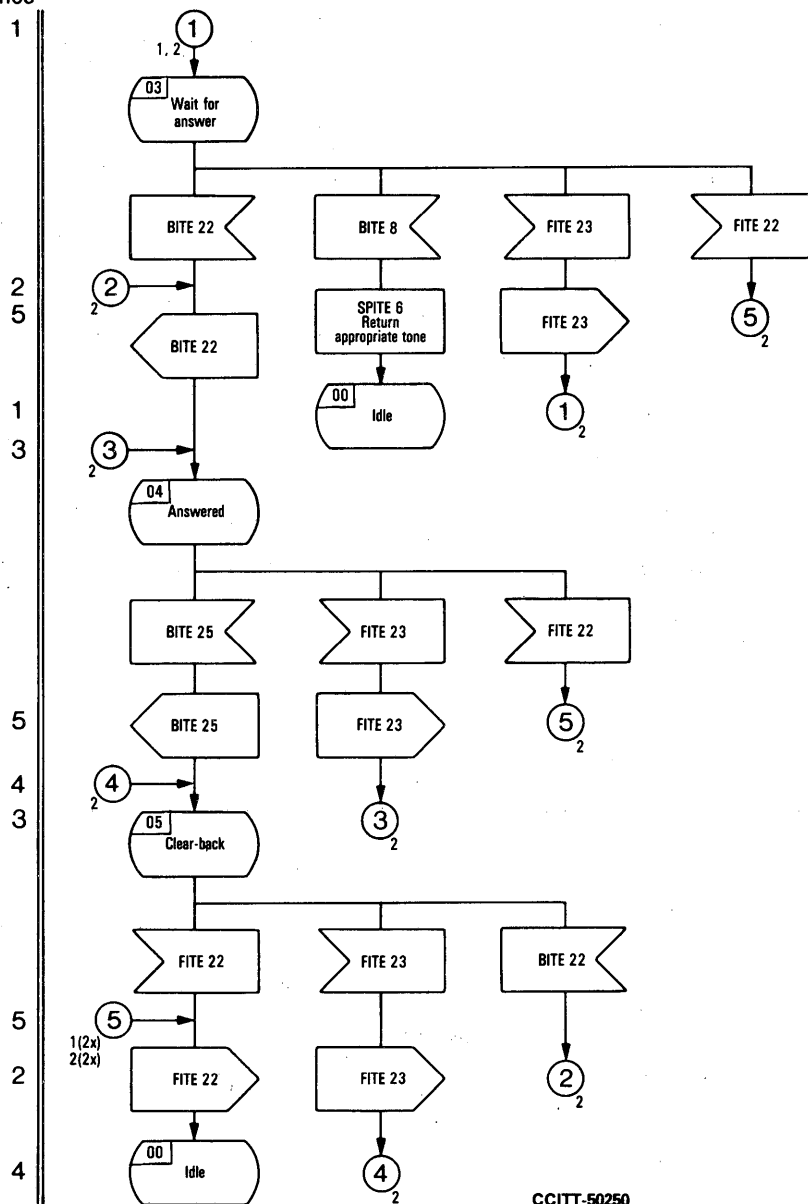
FIGURE 3/Q.671 (Sheet 2 of 2)
Interworking of Signalling System R1 to No. 5

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R1 TO No. 6
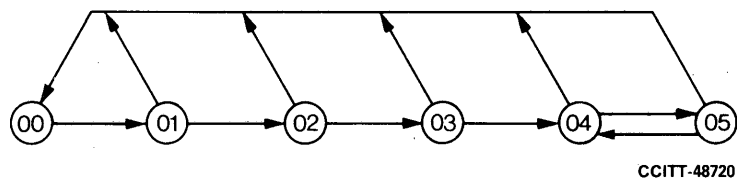
CCITT-48720

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for ST	1
02	Wait for address-complete	2
03	Wait for answer	2
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.672

State overview diagram for interworking of Signalling System R1 to No. 6

Procedures not shown

The following procedure, not directly relevant to interworking, is not shown in the logic procedures:

P_1 — Procedure for repeat attempt.

FIGURE 2/Q.672

Notes to interworking of Signalling System R1 to No. 6

One of the FITEs 9-13 (18, 19) could be used to replace FITE 17 if the call was known to originate from an operator position (priority call, data call) e.g. by analysis of path of entry, by use of a pseudo country code
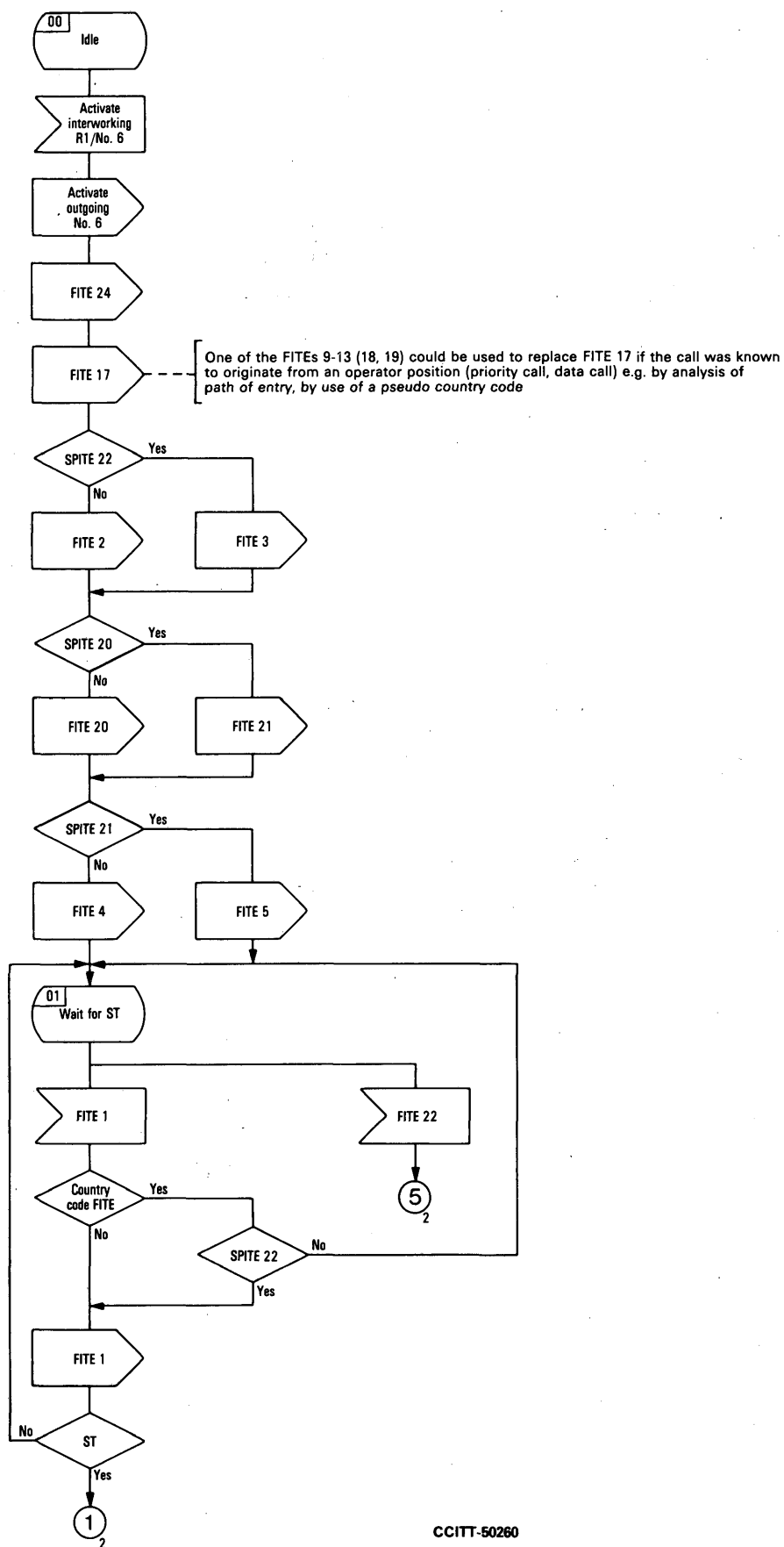
CCITT-50260

FIGURE 3/Q.672 (Sheet 1 of 2)

Interworking of Signalling System R1 to No. 6
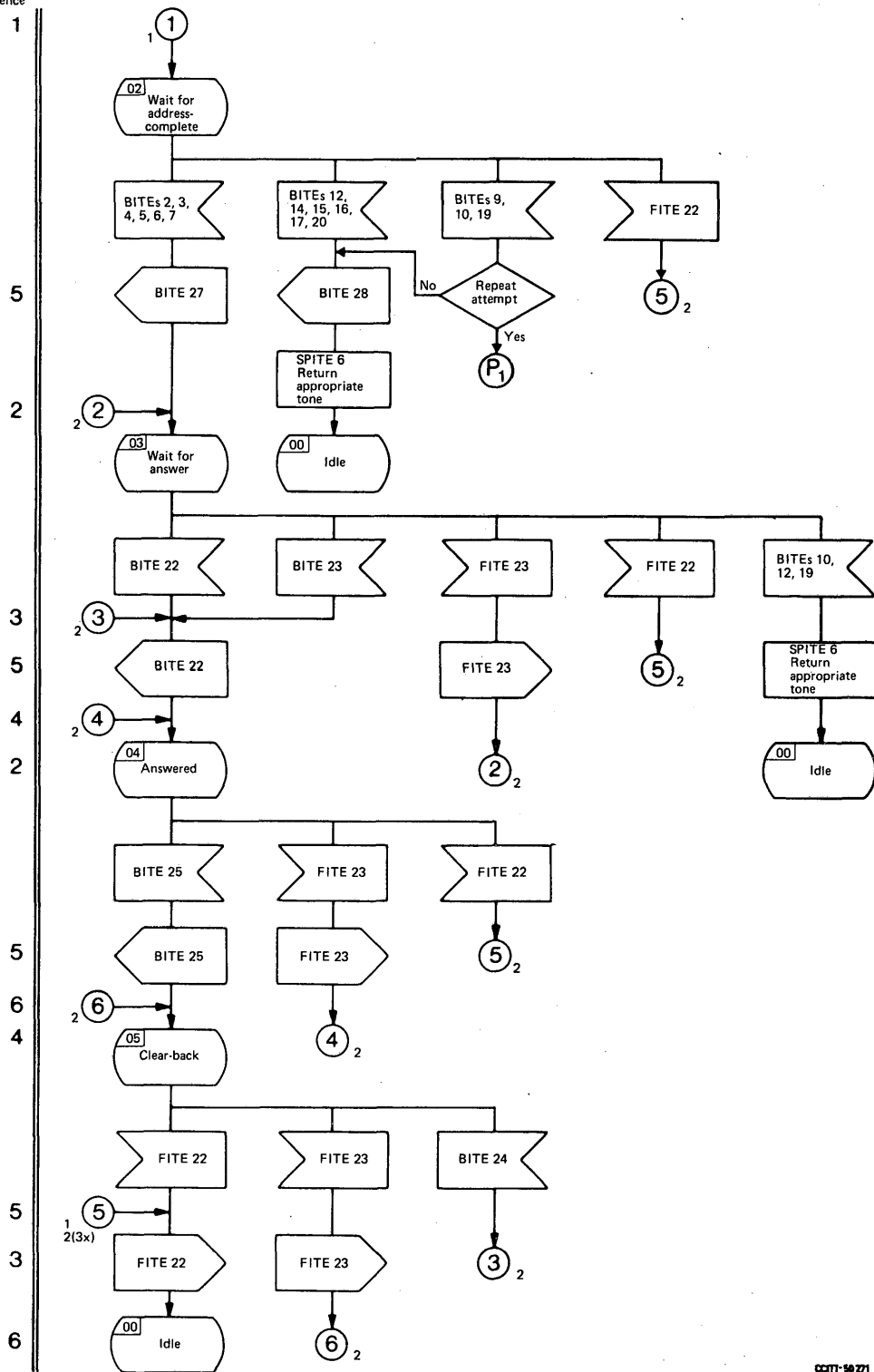
FIGURE 3/Q.672 (Sheet 2 of 2)

Interworking of Signalling System R1 to No. 6

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R1 TO No. 7 (TUP)
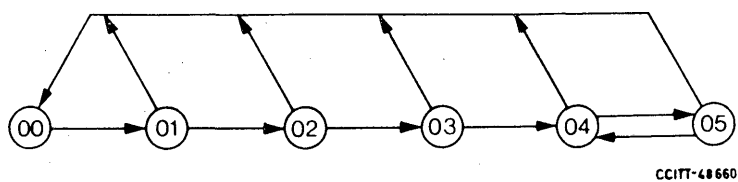
CCITT-48660

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for ST	1
02	Wait for address-complete	1
03	Wait for answer	2
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.673

State overview diagram for interworking of Signalling System R1 to No. 7 (TUP)

FIGURE 2/Q.673

Notes to interworking of Signalling System R1 to No. 7 (TUP)

(Reserved for future notes)

Note – This FITE 31 is to be translated as appropriate (e.g. Calling Party Category).
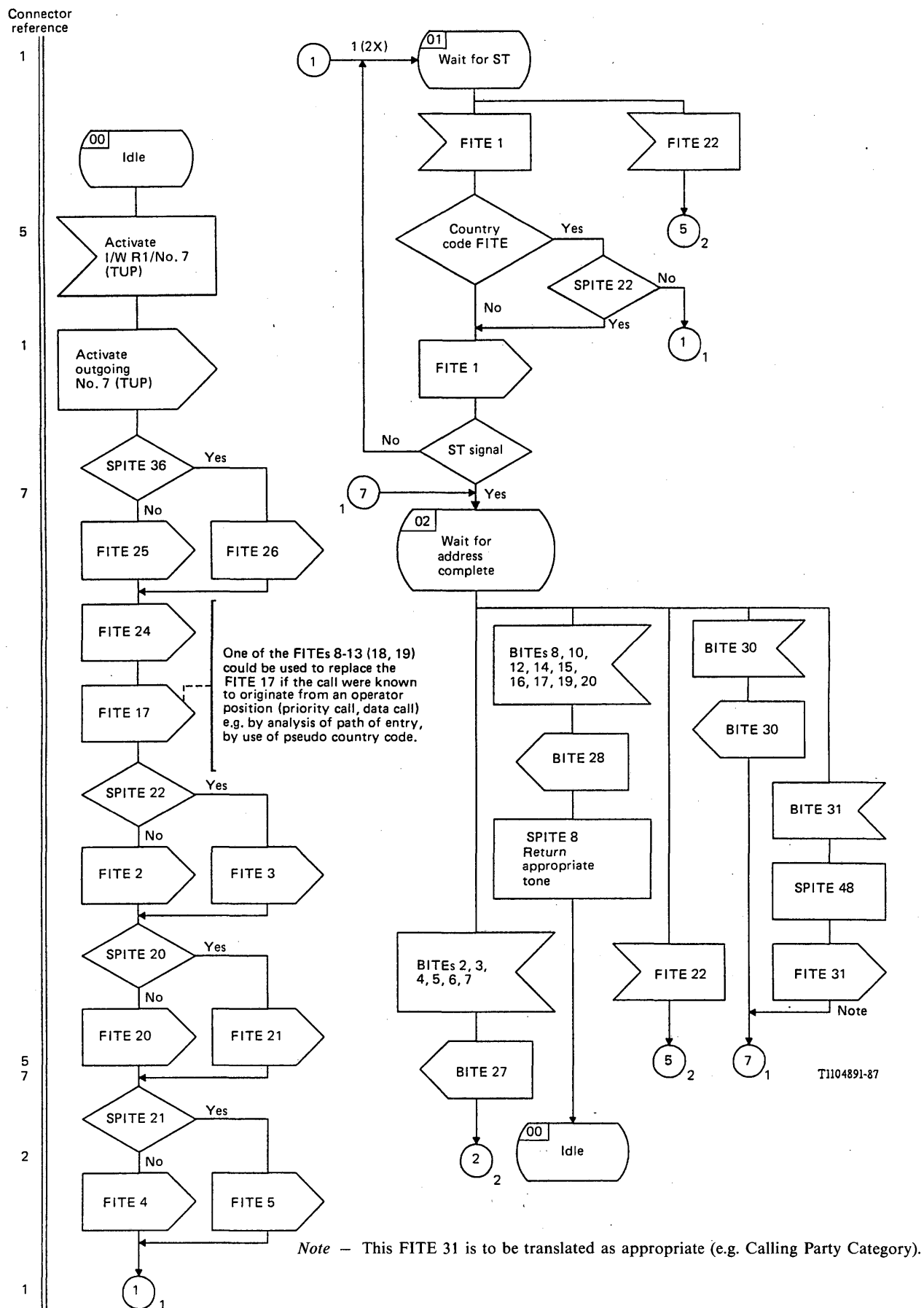
FIGURE 3/Q.673 (Sheet 1 of 2)

Interworking of Signalling System R1 to No. 7 (TUP)
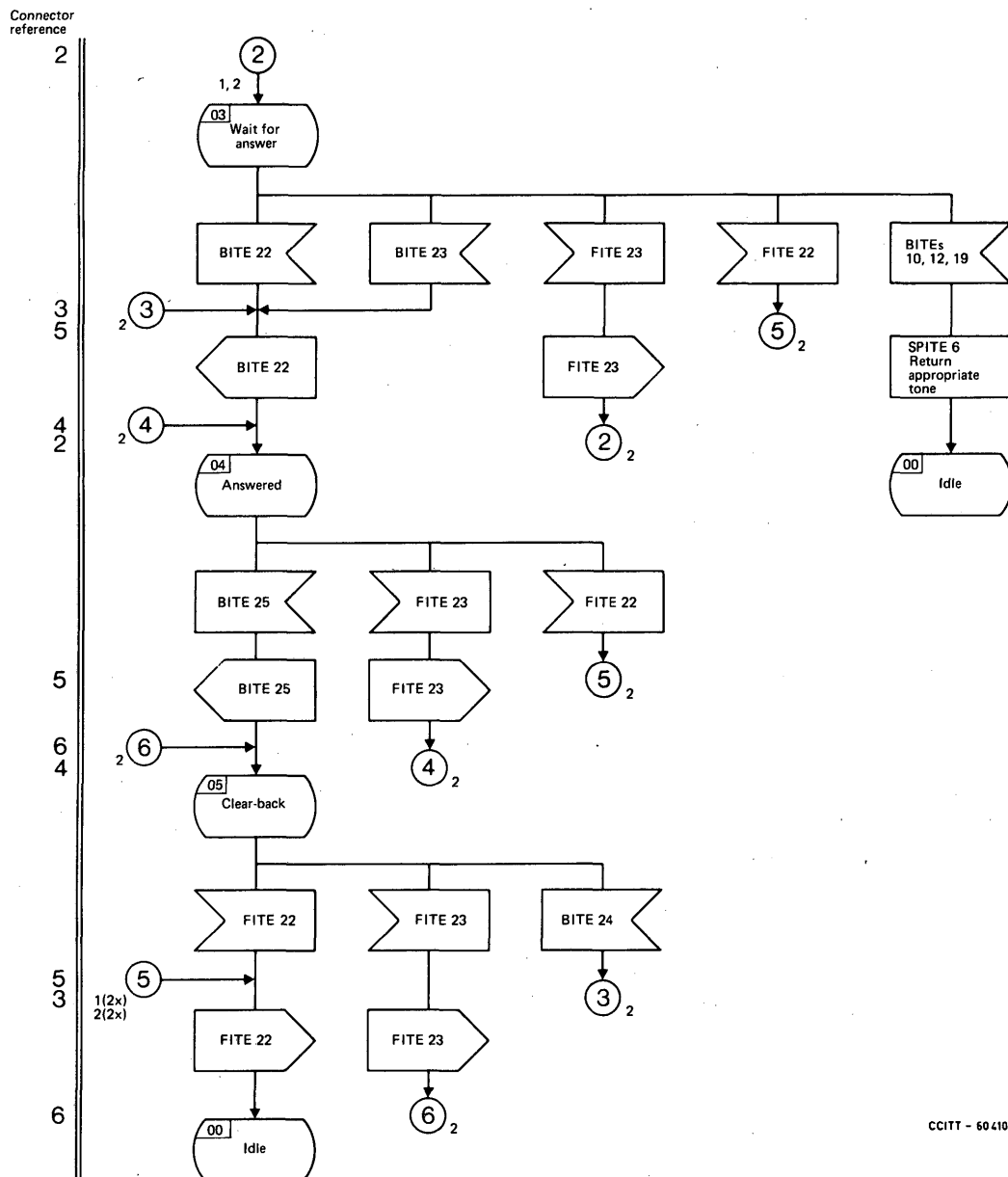
FIGURE 3/Q.673 (Sheet 2 of 2)

Interworking of Signalling System R1 to No. 7 (TUP)

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R1 TO R2

CCITT-48730
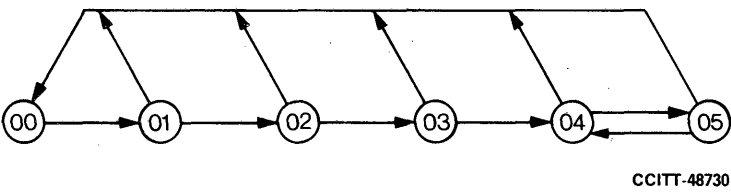
State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for ST-FITE	1
02	Wait for address-complete	1
03	Wait for answer	2
04	Answered	2
05	Clear-back	2

FIGURE 1/Q.674

State overview diagram for interworking of Signalling System R1 to R2

Procedures not shown

The following procedure not directly relevant to interworking, is not shown in the logic procedures:

P_1 — Procedure for repeat attempt.

FIGURE 2/Q.674

Notes to interworking of Signalling System R1 to R2

Connector
reference

FIGURE 3/Q.674 (Sheet 1 of 2)

Interworking of Signalling System R1 to R2

3

③
1

| 03 | Wait for answer |

BITE 21   FITE 22

6
2

⑥
2

②
2

BITE 22

| 04 | Answered |

FITE 22   BITE 25

2

②
1(2x)
2(2x)

FITE 22   BITE 25

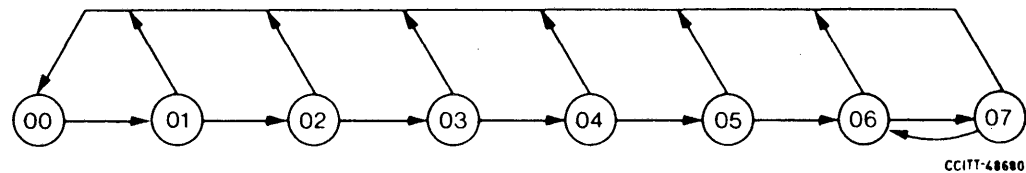| 00 | Idle | | 05 | Clear-back |

FITE 22   BITE 21

2,6

②
2

⑥
2
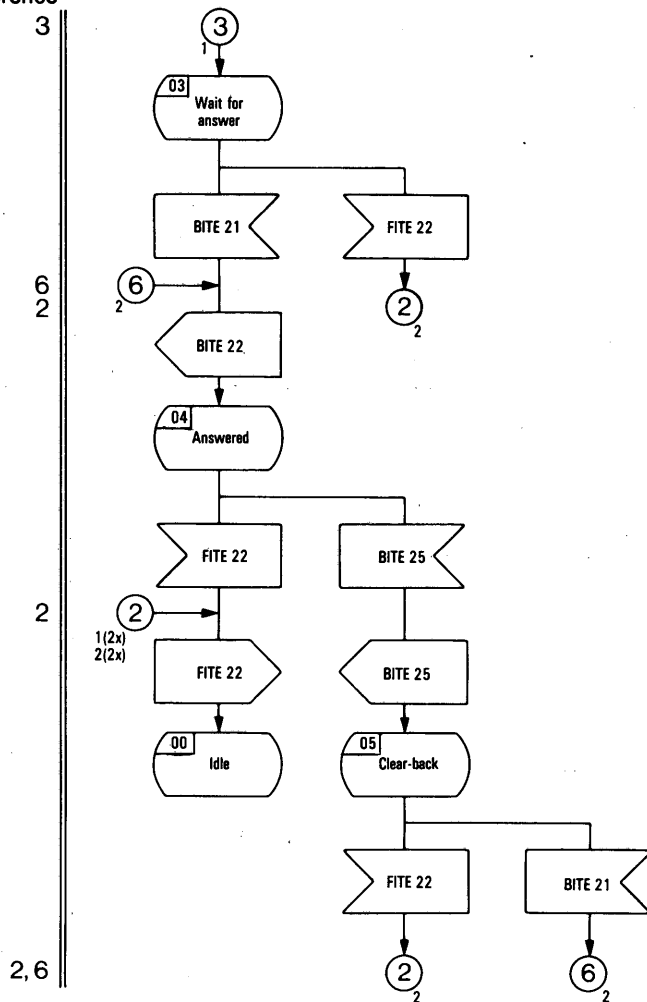
CCITT-50290

FIGURE 3/Q.674 (Sheet 2 of 2)
Interworking of Signalling System R1 to R2

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R2 TO No. 4

CCITT-58740
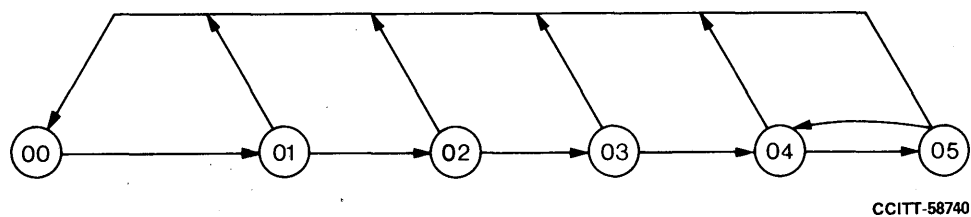
State number	State description
00	Idle
01	Wait for CPCI-FITE
02	Wait for address-complete
03	Wait for answer
04	Answered
05	Clear-back

FIGURE 1/Q.681

State overview diagram for interworking of Signalling System R2 to No. 4
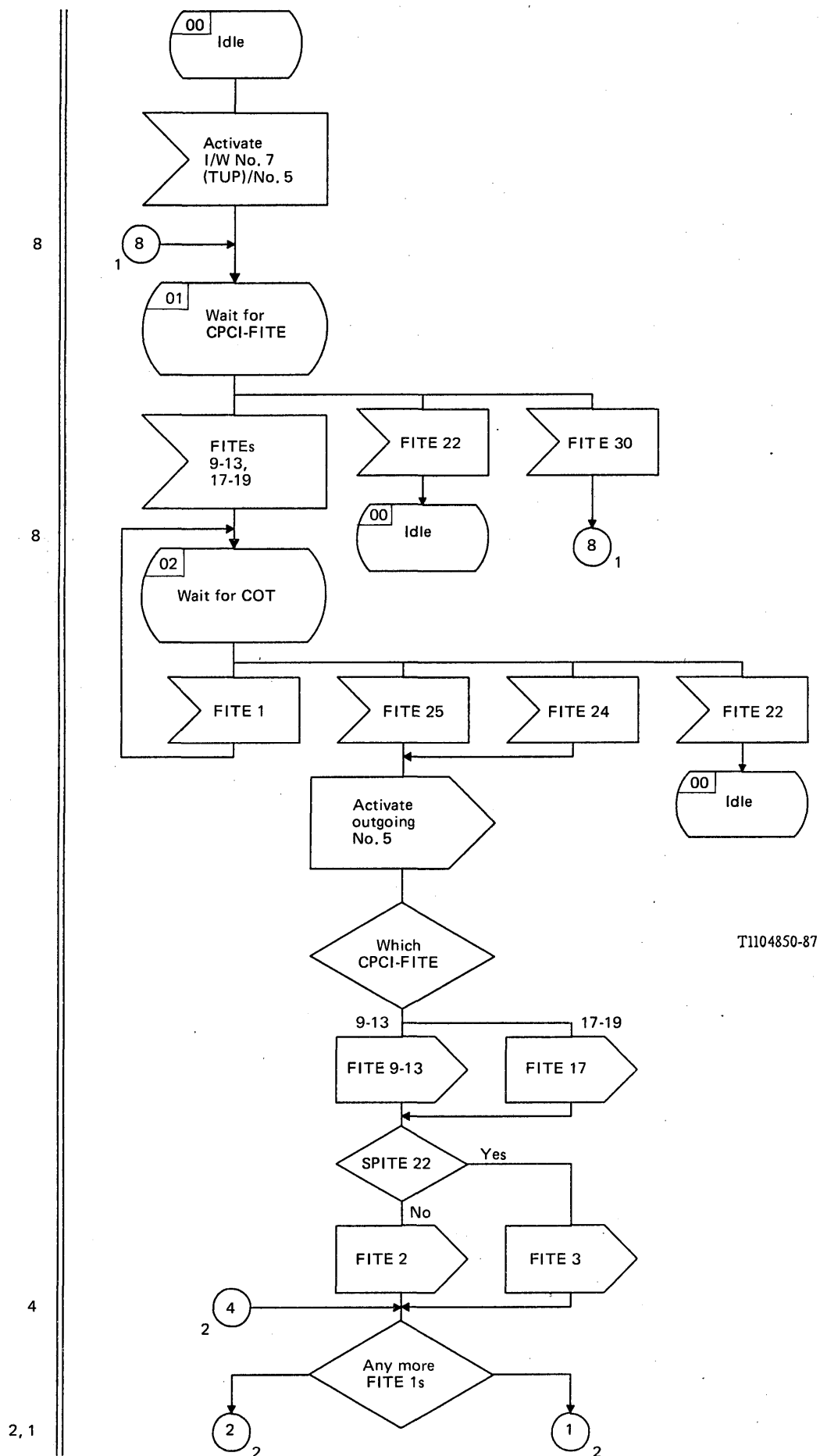
FIGURE 2/Q.681

(Reserved for future notes)

1

00 Idle

Activate
interworking
R2/No. 4

3
2

01 Wait for
CPCI-FITE

FITE 1

FITEs 9-13,
15

FITE 22

Activate
outgoing
No. 4

00 Idle

Which
CPCI-FITE

2

9-13

15

FITEs 9-13

FITE 17

SPITE 22

No

Yes

FITE 3

FITE 2

2, 3

Any
FITE 1 stored

No

Yes

02 Wait for
address-
complete

2

Country
code FITE

Yes

No

Yes

SPITE 22

Yes

No

1

FITE 1

Omit
country code
FITE

①

03 Wait for
answer

BITE 22

BITE 8

FITE 22

③

BITE 21

SPITE 6
Return
appropriate tone

②

00 Idle

04 Answered

FITE 22

BITE 25

②

FITE 22

BITE 25

00 Idle

05 Clear-back

FITE 22

BITE 22

②

③

FITE 1

BITE 2

BITE 8

FITE 22

BITE 2

SPITE 22

Yes

②

No

BITE 27

BITE 12

BITE 11

①

00 Idle

CCITT-50310

FIGURE 3/Q.681

Interworking of Signalling System R2 to No. 4

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R2 TO No. 5 (TUP)
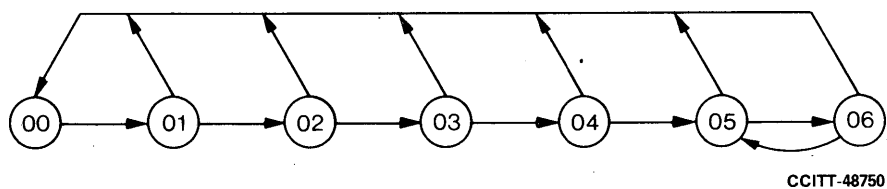
CCITT-48750

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for CPCI-FITE	1
02	Wait for address-complete	1
03	Wait for register deactivation	2
04	Wait for answer	2
05	Answered	2
06	Clear-back	2

FIGURE 1/Q.682

State overview for interworking of Signalling System R2 to No. 5

FIGURE 2/Q.682

(Reserved for futures notes)
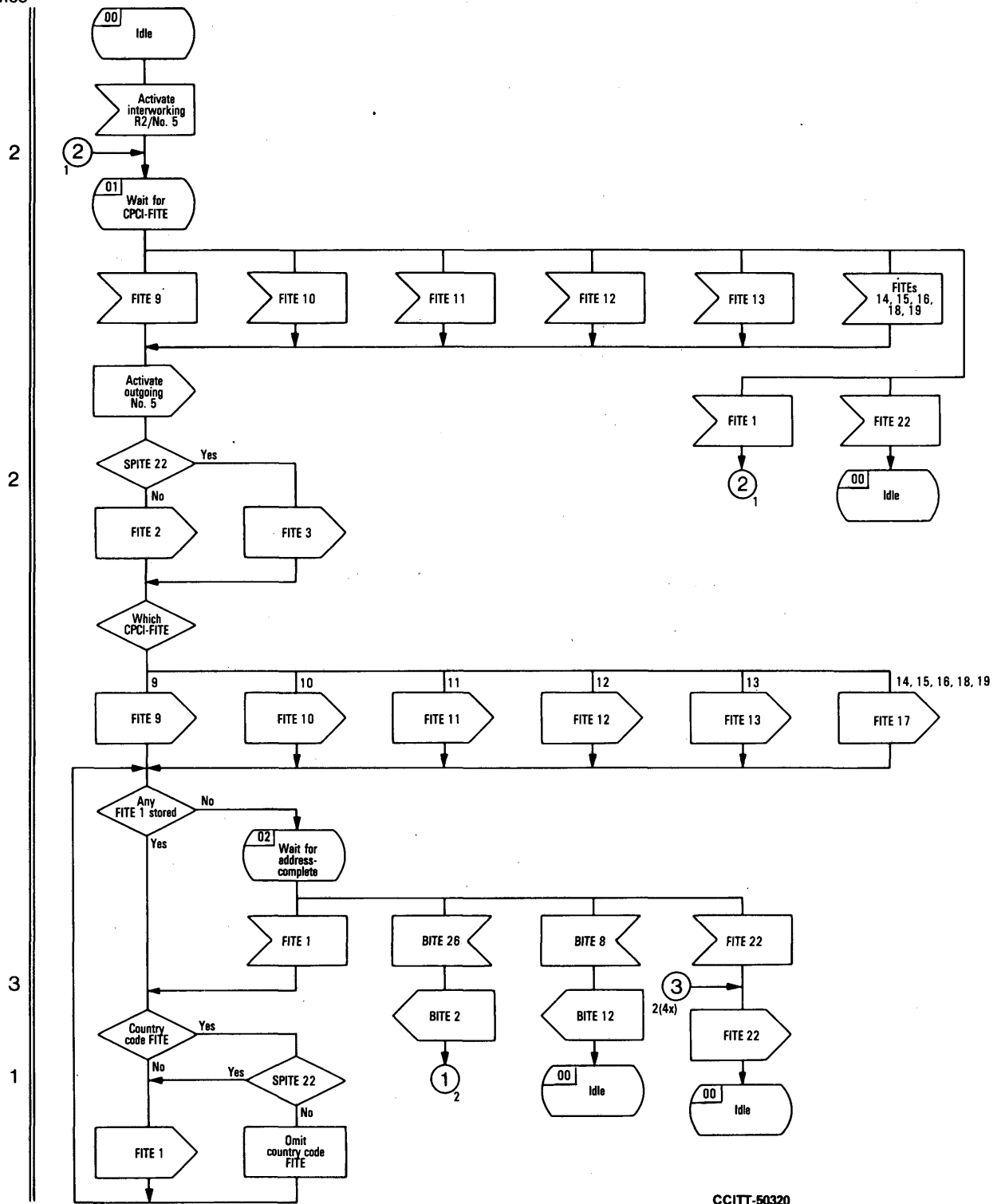
FIGURE 3/Q.682 (Sheet 1 of 2)
Interworking of Signalling System R2 to No. 5

Connector reference

1
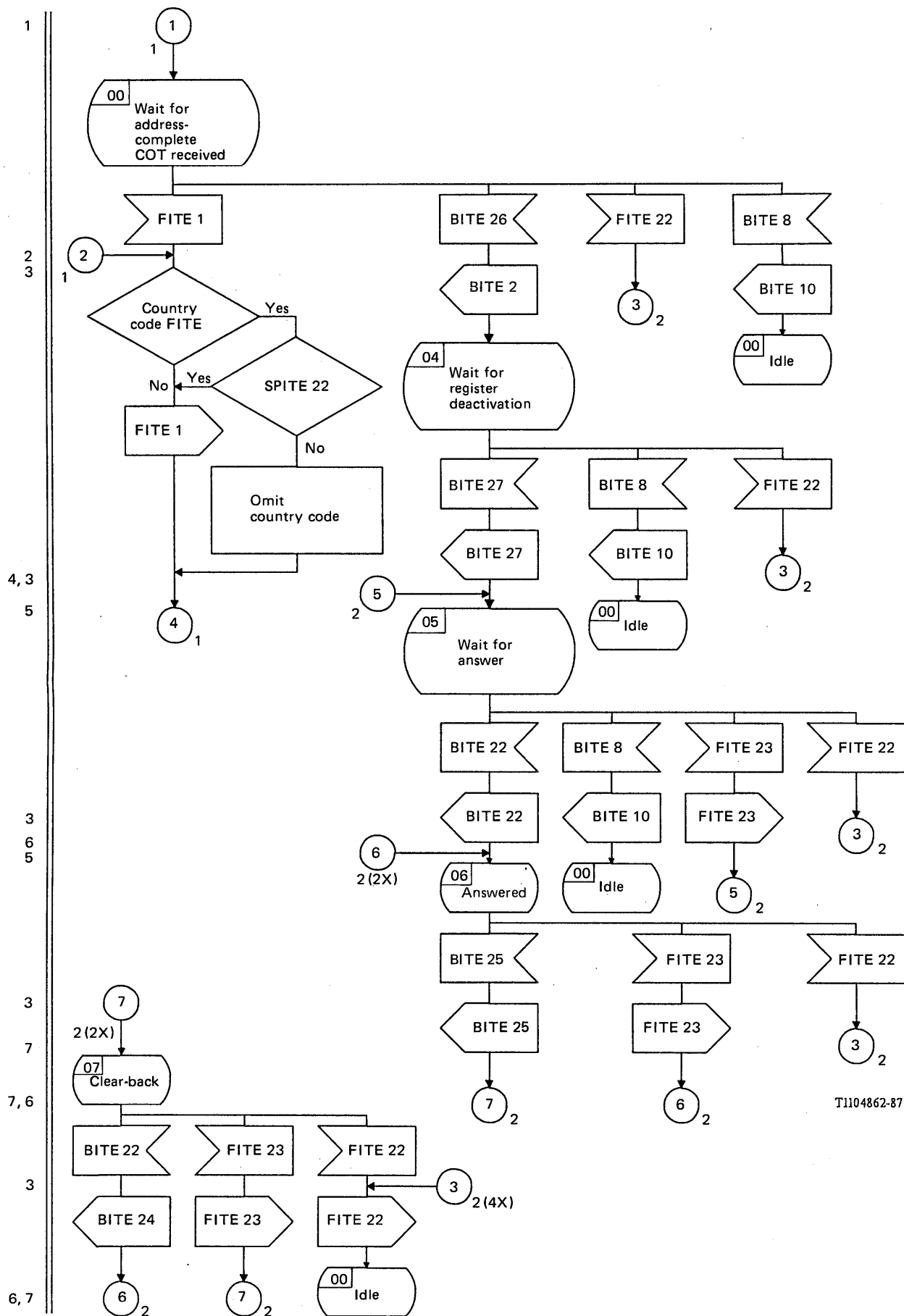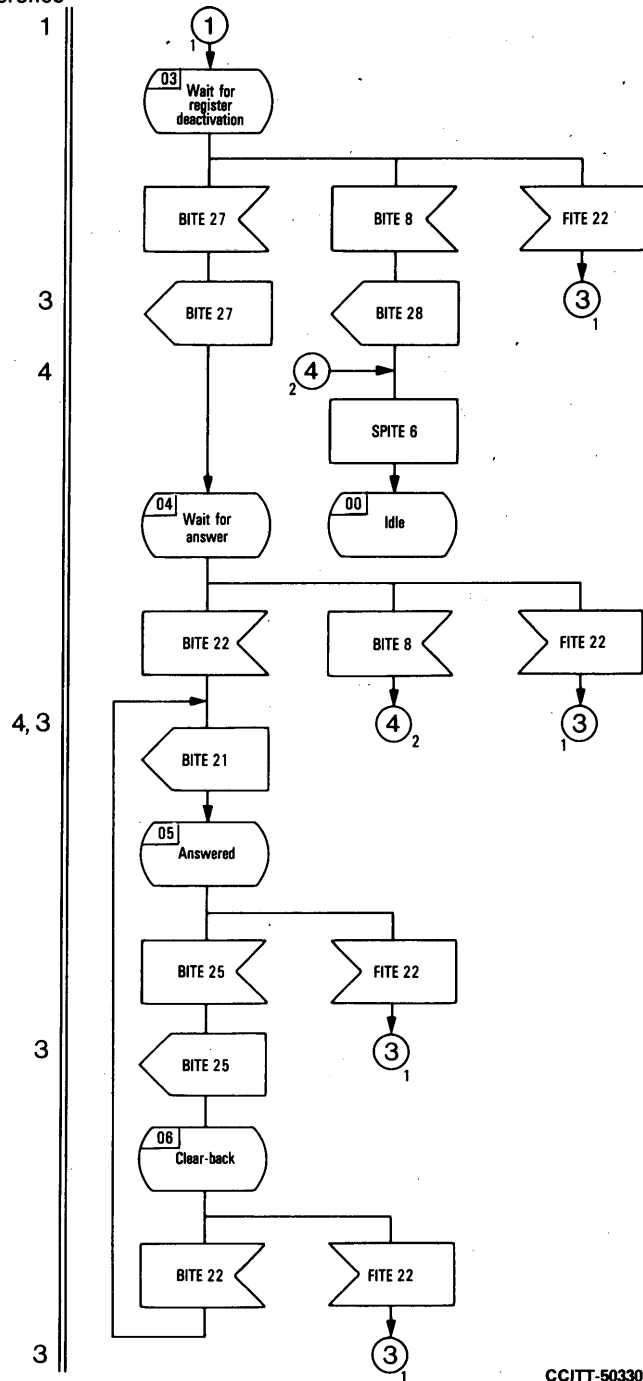

FIGURE 3/Q.682 (Sheet 2 of 2)
Interworking of Signalling System R2 to No. 5

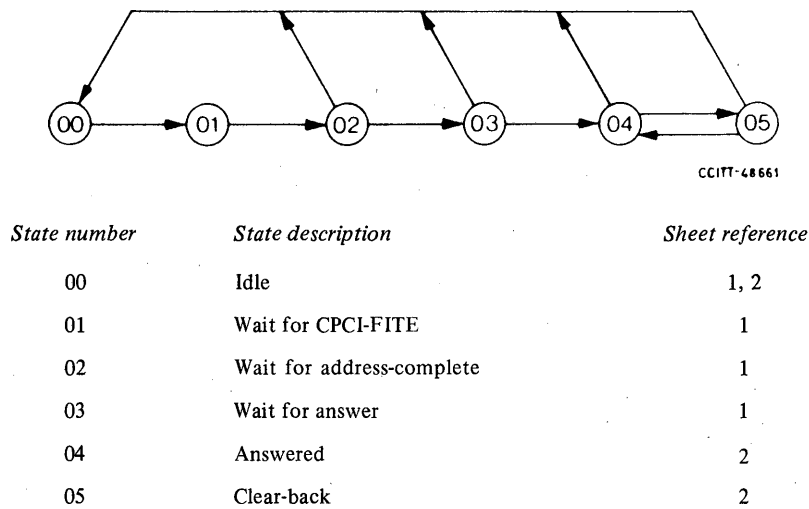**LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R2 TO No. 6**
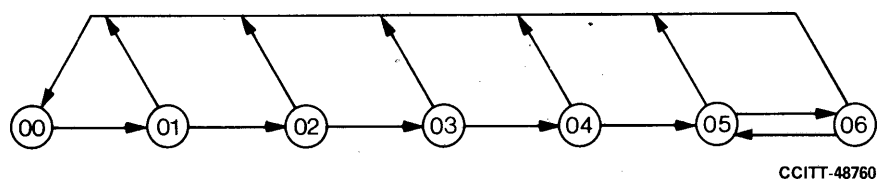
CCITT-48760

State number	State description	Sheet reference
00	Idle	1, 2
01	Wait for calling party's category	1
02	Wait for Z-digit	1
03	Wait for address-complete	2
04	Wait for answer	2
05	Answered	2
06	Clear-back	2

FIGURE 1/Q.683

State overview diagram for interworking of Signalling System R2 to No. 6

FIGURE 2/Q.683

(Reserved for future notes)

1

6, 2

1

00 Idle

Activate
interworking
R2/No. 6

01 Wait for
category

FITE 14   FITE 16   FITE 18   FITE 19   FITE 22

00 Idle

02 Wait for
Z-digit

FITE 1   FITEs 9,
10, 11,
12, 13, 15   FITE 22

00 Idle

Activate
outgoing
No. 6

FITE 24

SPITE 22   Yes
No
FITE 2   FITE 3

SPITE 20   Yes
No
FITE 20   FITE 21

SPITE 21   Yes
No
FITE 4   FITE 5

Which
Z-digit FITE

9-13   15
FITEs 9,
10, 11, 12,
13   Which
category
FITE

14, 16   18   19
FITE 17   FITE 18   FITE 19

1

1   2

Any
FITE 1 stored   No
Yes
6   2
2   2
CC
FITE   Yes.
No   Note

SPITE 22   No
Yes

FITE 1   Omit
CC-FITE

Note — Is this a country code FITE?

CCITT-50340

FIGURE 3/Q.683 (Sheet 1 of 2)
Interworking of Signalling System R2 to No. 6

Connector
reference
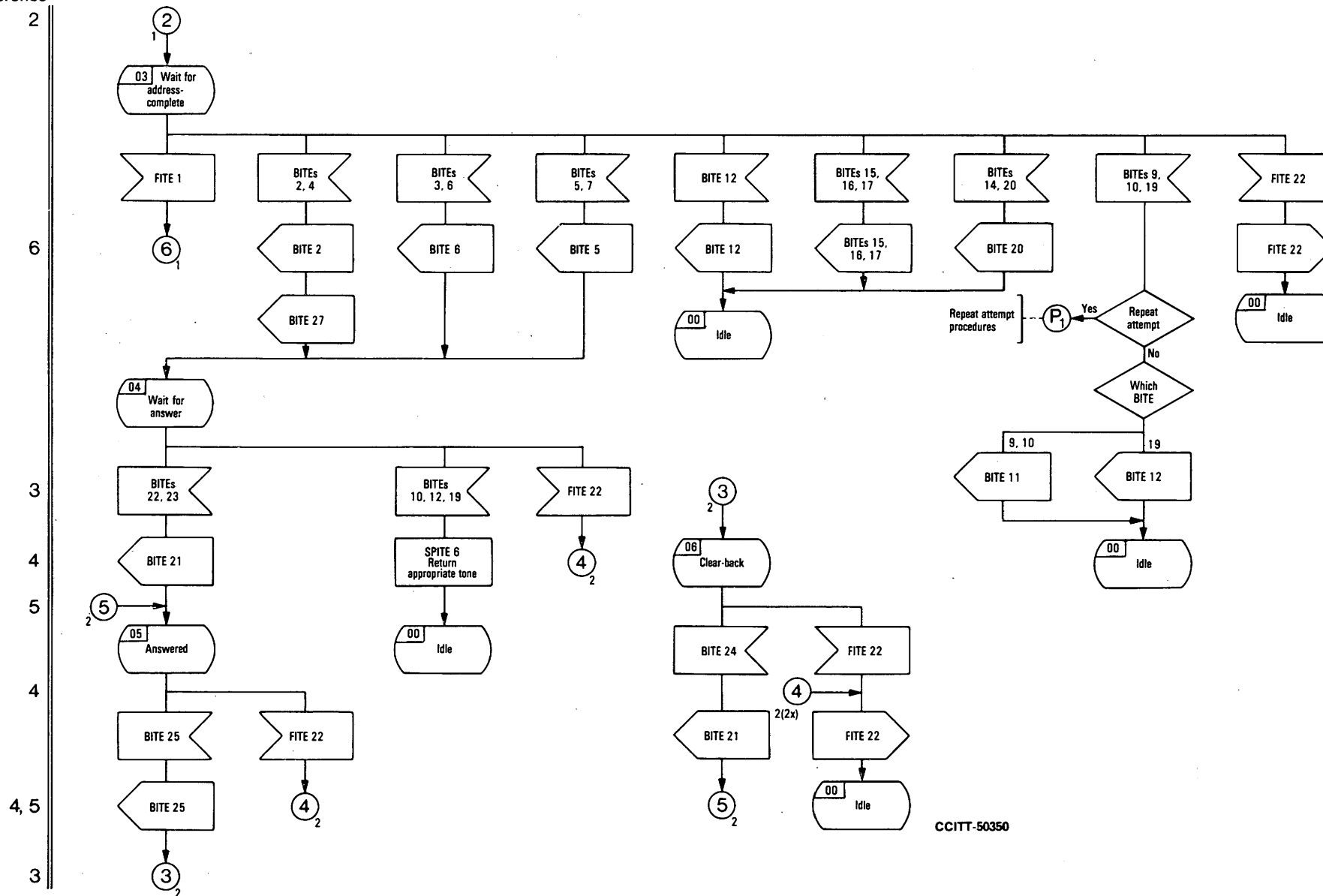
FIGURE 3/Q.683 (Sheet 2 of 2)
Interworking of Signalling System R2 to No. 6

CCITT-50350

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R2 TO No. 7 (TUP)

CCITT-48690
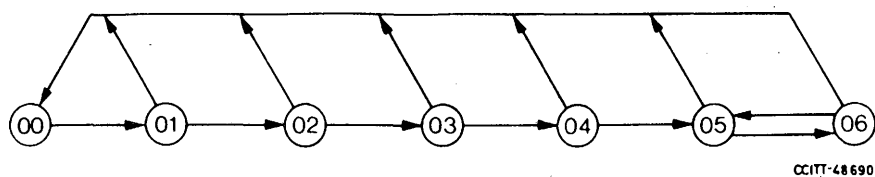
| State number	State description	Sheet reference
00	Idle	1, 2, 3
01	Wait for CPCI-FITE	1
02	Wait for Z-digit	1
03	Wait for address-complete	2
04	Wait for answer	2
05	Answered	2
06	Clear-back	3

FIGURE 1/Q.684

State overview diagram for interworking of Signalling System R2 to No. 7 (TUP)

FIGURE 2/Q.684

(Reserved for future notes)
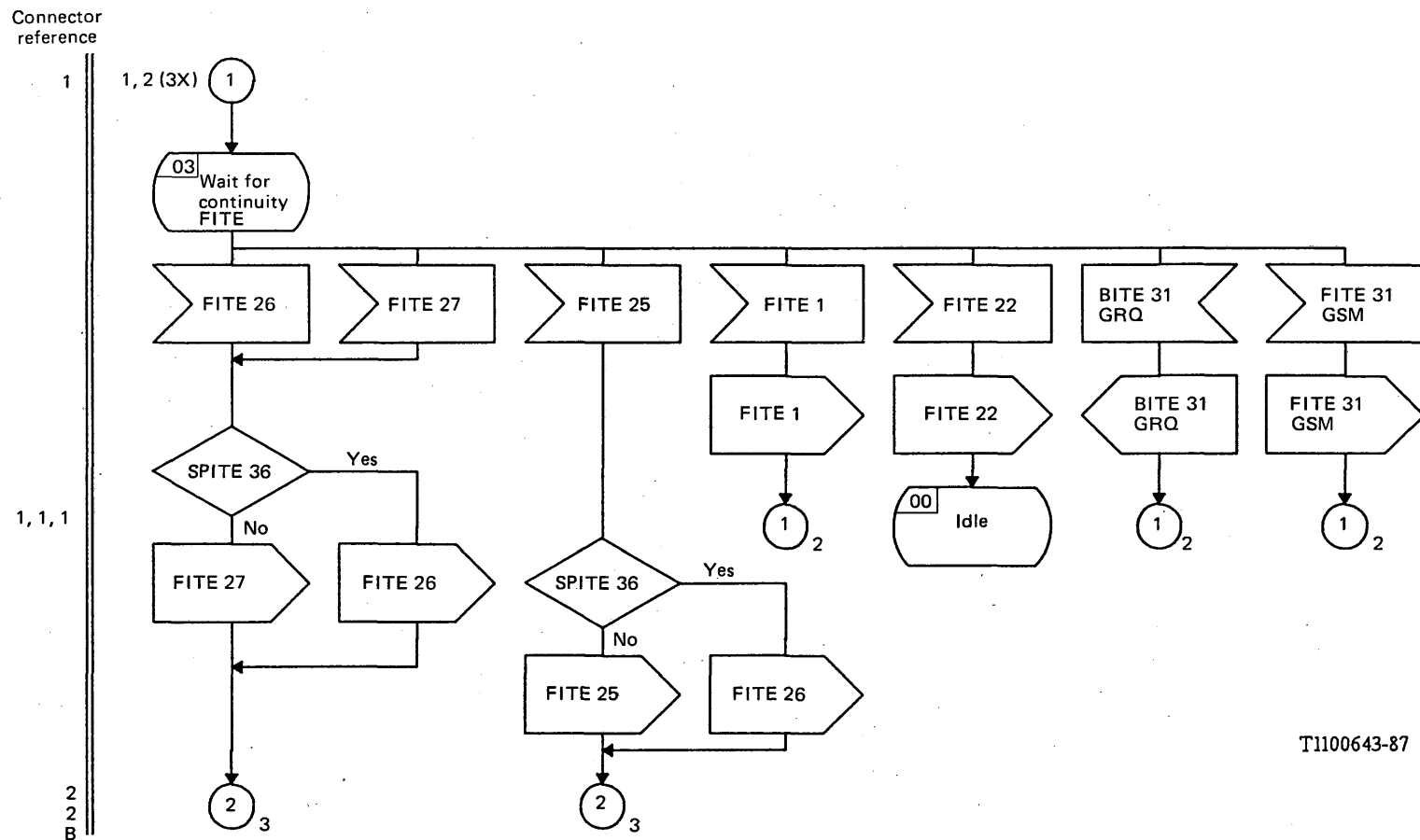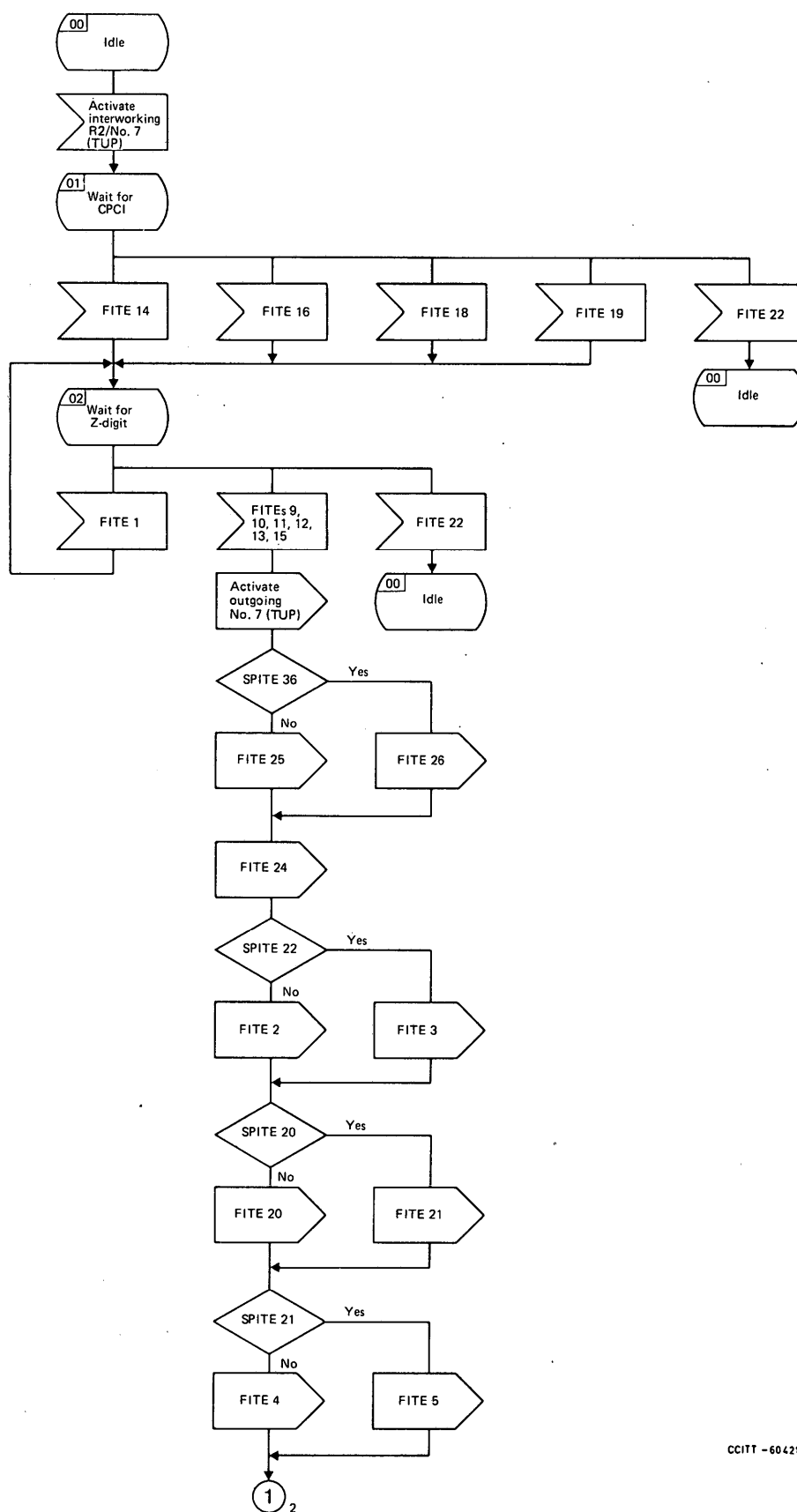
FIGURE 3/Q.684 (Sheet 1 of 3)

Interworking of Signalling System R2 to No. 7 (TUP)

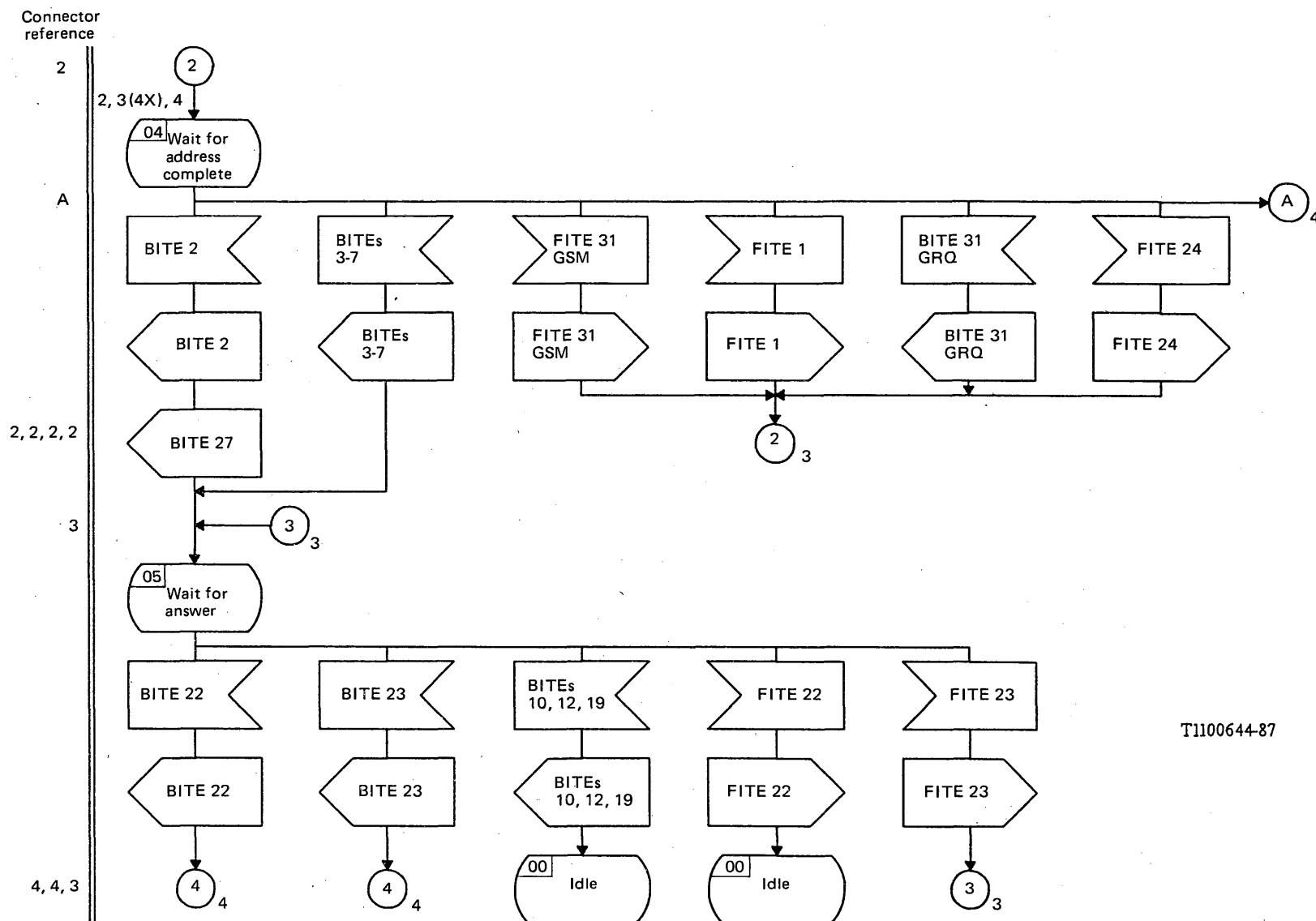FIGURE 3/Q.684 (Sheet 2 of 3)
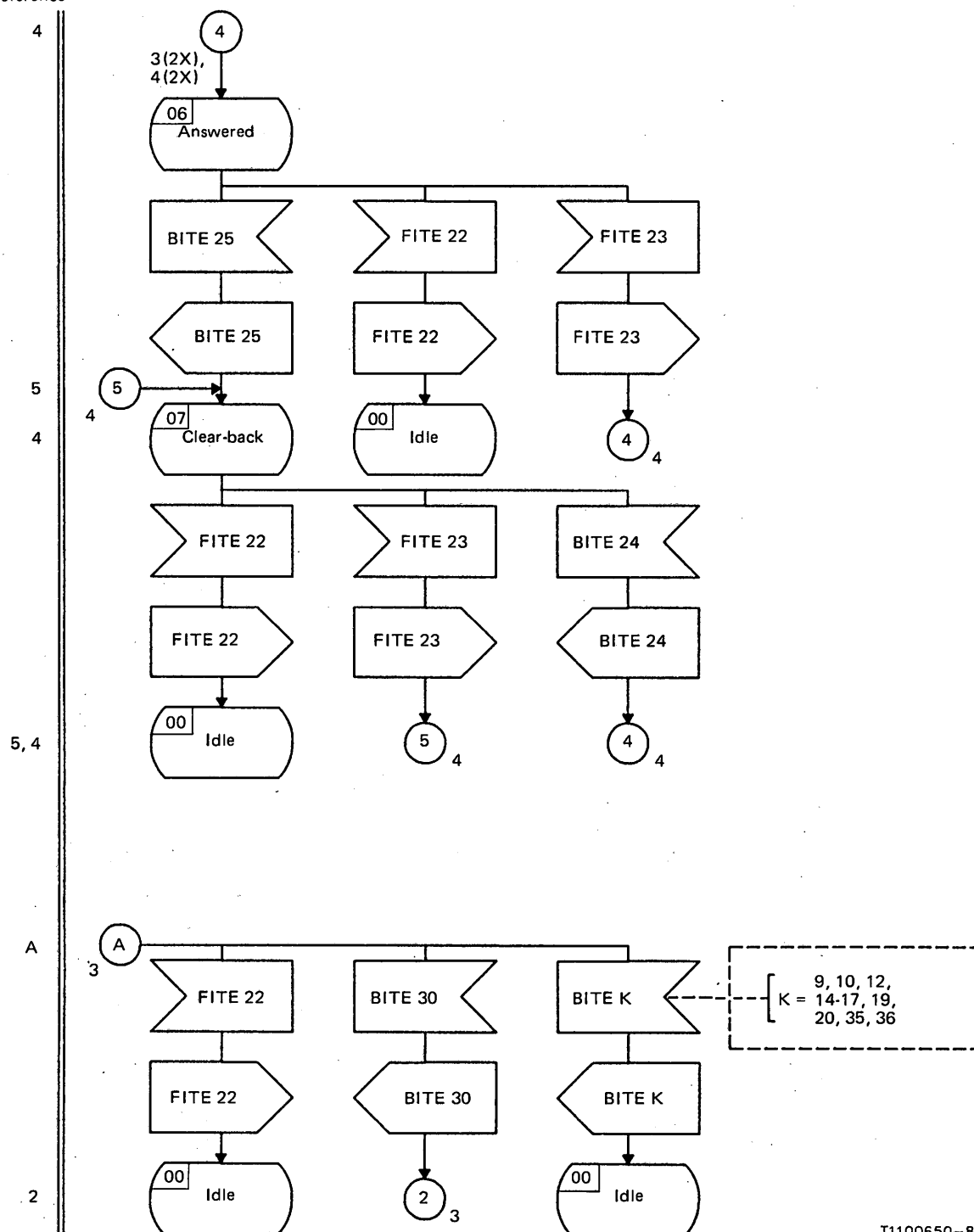
Interworking of Signalling System R2 to No. 7 (TUP)

CCITT – 60431
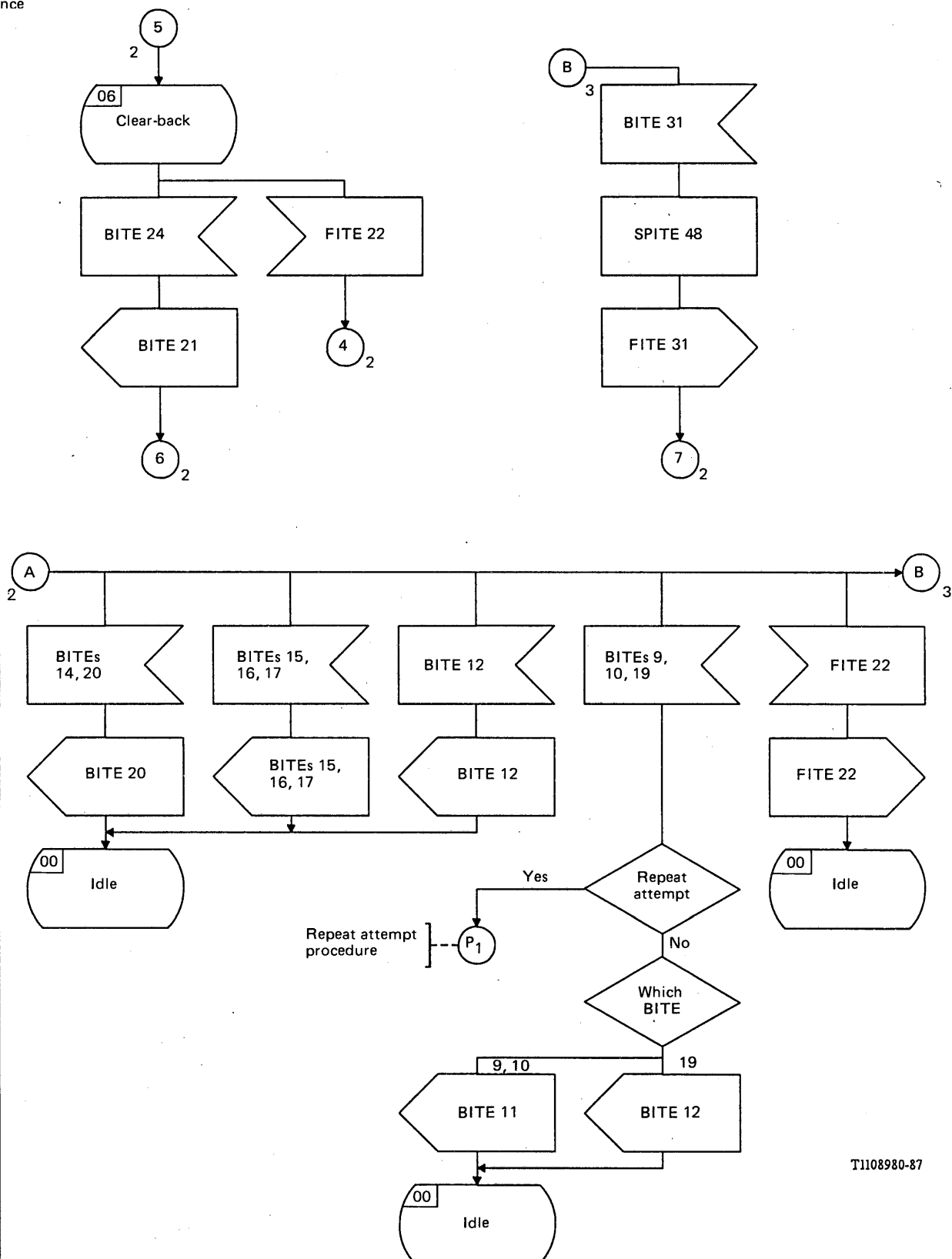
FIGURE 3/Q.684 (Sheet 3 of 3)

Interworking of Signalling System R2 to No. 7 (TUP)

LOGIC PROCEDURES FOR INTERWORKING OF SIGNALLING SYSTEM R2 TO R1

CCITT-48770
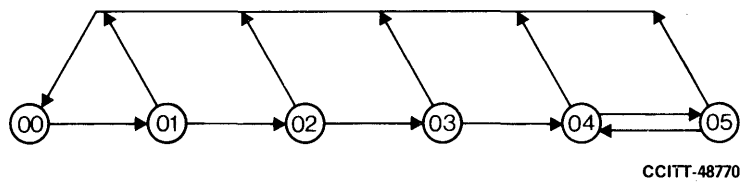
State number	State description	Sheet reference
00	Idle	1
01	Wait for address-complete	1
02	Wait for register deactivation	1
03	Wait for answer	1
04	Answered	1
05	Clear-back	1

FIGURE 1/Q.685

State overview diagram for interworking of Signalling System R2 to R1

Procedures not shown

Procedure P_1 is not described because no procedure is specified at present in the Signalling System R1 specifications.

FIGURE 2/Q.685

Notes to interworking of Signalling System R2 to R1
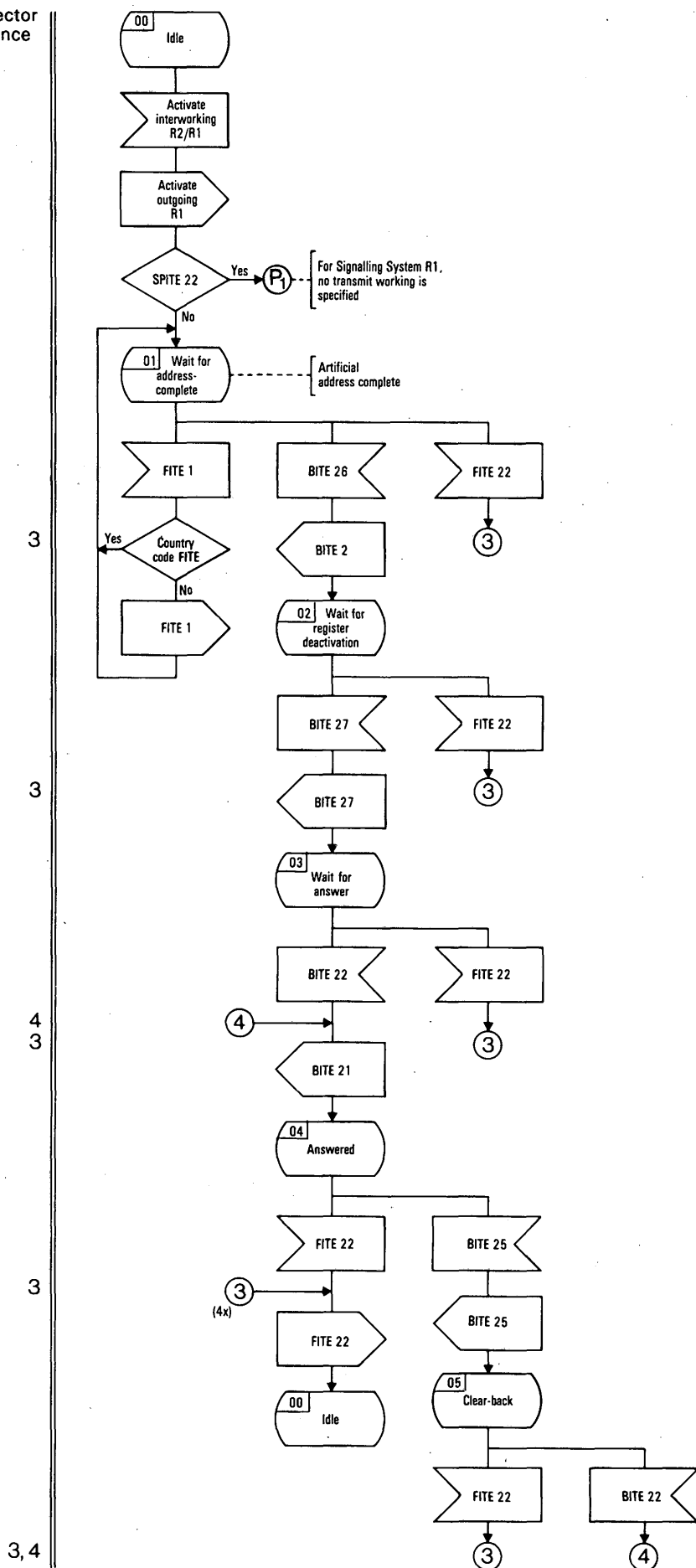
FIGURE 3/Q.685

Interworking of Signalling System R2 to R1

CCITT-50360

SECTION 3

INTERWORKING BETWEEN DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 AND SIGNALLING SYSTEM No. 7

Recommendation Q.699

INTERWORKING BETWEEN THE DIGITAL SUBSCRIBER SIGNALLING SYSTEM LAYER 3 PROTOCOL AND THE SIGNALLING SYSTEM No. 7 ISDN USER PART

1 General

1.1 Introduction

This Recommendation defines the interworking relationship between the layer 3 functions and protocol of Digital Subscriber Signalling System No. 1 (DSS 1) and the ISDN User Part functions and protocol of Signalling System No. 7.

The interworking between the above two signalling protocols typically may occur in an ISDN local exchange and is specified in the context of a typical call in a pure ISDN or mixed ISDN/non-ISDN environment.

1.2 Purpose

The purpose of the Recommendation is:

a) to define how the layer 3 protocol of DSS 1 and Signalling System No. 7 ISDN User Part protocol should be used in combination with call control functions, to support the basic bearer service;

b) to provide a logical bridge between the abstract signalling information flows, which are used in the description of ISDN services, and the corresponding messages and elements of procedure of the ISDN User-Network Interface User Part protocols.

1.3 Scope

This Recommendation is aimed at defining the interworking relationship between the call control protocol of the Digital Subscriber Signalling System No. 1 and the ISDN User Part of Signalling System No. 7.

The Recommendation defines in detail the relationship between signalling information conveyed via the Digital Subscriber Signalling System No. 1 protocol and similar signalling information conveyed via the ISDN User Part of Signalling System No. 7. The above relationship is described within the context of supporting the provision of basic bearer service for a call within an ISDN or mixed ISDN/non-ISDN environment.

This Recommendation forms part of a set of interlocking ISDN service and signalling Recommendations. Other members of this set include the following:

— the operation of basic ISDN telephony teleservice and 64 kbit/s bearer service, which is supported in part via the interworking of the ISDN signalling systems described herein, is defined in detail in Recommendation Q.71 (basic service stage 2 description);

— the signalling messages and elements of procedure of layer of the Digital Subscriber Signalling System No. 1 and the ISDN User Part of Signalling System No. 7 are defined in Recommendations Q.930/931 (I.450/451) and Recommendations Q.761-Q.764 and Q.766, respectively.

2   Methodology

2.1   *General*

This chapter describes the methodology used to model and define interworking between the ISDN User Part and layer 3 of Digital Subscriber Signalling System No. 1. The methodology is based on the layer service concepts prescribed by the Reference Model of Open System Interconnection (OSI) for CCITT Applications (Recommendation X.200) and uses the terms and conventions defined in Recommendation X.210 (OSI Layer Service Definition Conventions).

The methodology used is for description purposes only. It does not imply that this type of layering is essential in a real implementation.

The interworking model is described in § 2.2. Subsequent sections identify and review the diagrams and tables utilized in describing the model, its functions and the signalling information transfers between the call control functional entities.

2.2   *Interworking model*

The interworking model encompasses 3 functional entities, including call control, the incoming signalling system and the outgoing signalling system, where incoming or outgoing refers to the direction of call set-up. The signalling system entities may represent either the ISDN User Part of the User Network Interface Protocol.

The call control entity acts as an intermediary between the ISDN access and network signalling protocols. It typically invokes local call processing decisions/actions as a result of receiving a primitive from one signalling system (e.g. incoming access). As a result of that processing, it may send a primitive to the same signalling system and/or another signalling system (e.g. outgoing network). Local call processing decisions/actions (e.g. routing and through connection) are independent of the type of signalling system used by call control entities to communicate with each other.

There are 4 types of primitives:

a)   Request: A primitive issued by a call control entity to invoke a signalling procedure and thereby transfer information to a peer entity.

b)   Indication: A primitive issued by the signalling protocol to invoke a call control procedure or indicate that procedure has been invoked by the peer call control entity.

c)   Response: A primitive issued by call control (if required), to indicate completion of a procedure previously invoked by an indication.

d)   Confirm: A primitive issued by the signalling protocol to call control (if required) to indicate completion of a procedure previously invoked by a request from the same call control entity.

The descriptions of the incoming and outgoing signalling system functional entities are not part of this Recommendation but are provided in Recommendation Q.931 for Digital Subscriber Signalling System and in Recommendations Q.761-Q.764 and Q.766 for the ISDN User Part.

```
                    ┌─────────────────────────────────────────────────┐
                    │                 CALL CONTROL                    │
                    └─────────────────────────────────────────────────┘

    Indication          Response                Request        Confirm
      (1)                 (4)                     (2)            (3)
                                    Primitives
          ┌──────────────┐                    ┌──────────────┐
          │ Incoming     │                    │ Outgoing     │
          │ (Outgoing)   │                    │ (Incoming)   │
          │ Signalling   │                    │ Signalling   │
          │ System A     │                    │ System B     │
          │ (e.g. Q.931) │                    │ (e.g. ISDN   │
          │              │                    │ User Part)   │
          └──────────────┘                    └──────────────┘
                                                  T1110160-88
```
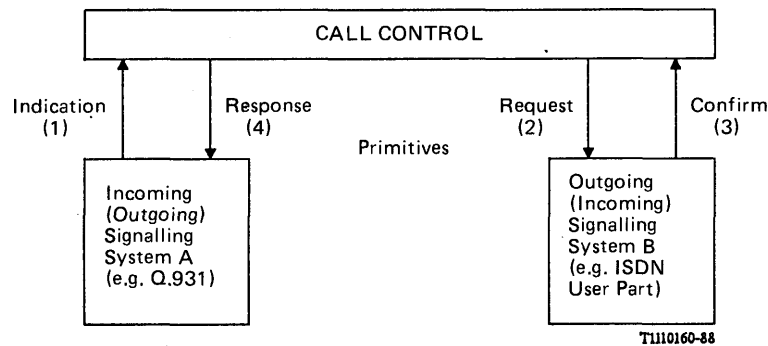
Note — Numbers in brackets indicate the sending sequence.

FIGURE 1/Q.699

Model for signalling protocol interworking

2.3   *Time sequence diagrams*

Time sequence or "arrow" diagrams are provided to show the permitted temporal relationships between primitives and between primitives and signalling messages, and the time sequence of these relationships during the process of executing a call control procedure. The general format of an arrow diagram is shown in Figure 2/Q.699.

Due to the multiplicity of optional possibilities in both the ISDN User Part and the Digital Subscriber Signalling System protocols not all possible cases are shown in the arrow diagrams. The diagrams which are included represent a sample of typical situations.

Sequences of interactions are shown along vertical lines which represent increasing time in the downward direction.

Broken line arrows represent individual primitives and indicate their direction of propagation, i.e. to or from call control.

Solid line arrows represent signalling messages and indicate their direction of propagation, i.e. to or from the incoming or outgoing signalling system.

Wavy line arrows (↬➤), if present, represent tones or announcements sent inband.

For call control the following symbols are used between vertical lines to indicate the relationship between the incoming and outgoing primitives (e.g. between B indication and B response) and possibly a call control action taken, where it is necessary to indicate clearly a particular function that is invoked by a received primitive.

Solid line (───): the incoming and outgoing primitives are unconditionally related, i.e. the incoming primitive always triggers the sending of the outgoing primitive independent of the service context in which the incoming primitive is received.

Broken line (- - -): the incoming and outgoing primitives are related only in the service context considered. In a different service context this relationship may not exist.

Squiggly line (∿): the reception of the incoming primitive and the transmission of the outgoing primitive are unrelated. This is to indicate that although these primitives are shown as adjacent in the arrow diagram, the generation of the outgoing primitive is unrelated to the receipt of the incoming primitive.

⊙ Tone generation

⊗ Through-connection of the path in the backward direction

⊘ Through-connection of the path in the forward direction

⊗ Through connection of the path in both directions

⊗ Disconnection of path through the exchange

◯ Reservation of an incoming/outgoing circuit/channel without through connection

⊠ Dissociation of incoming and outgoing signalling systems.

Where it is necessary to indicate the signalling system function performed on transmission or reception of a signalling message, the following symbols are shown below the concerned message:

✕ Release of the channel

▭ Release of the call information (e.g. Q.931 call reference)

△ Disconnection of channel from the user terminal

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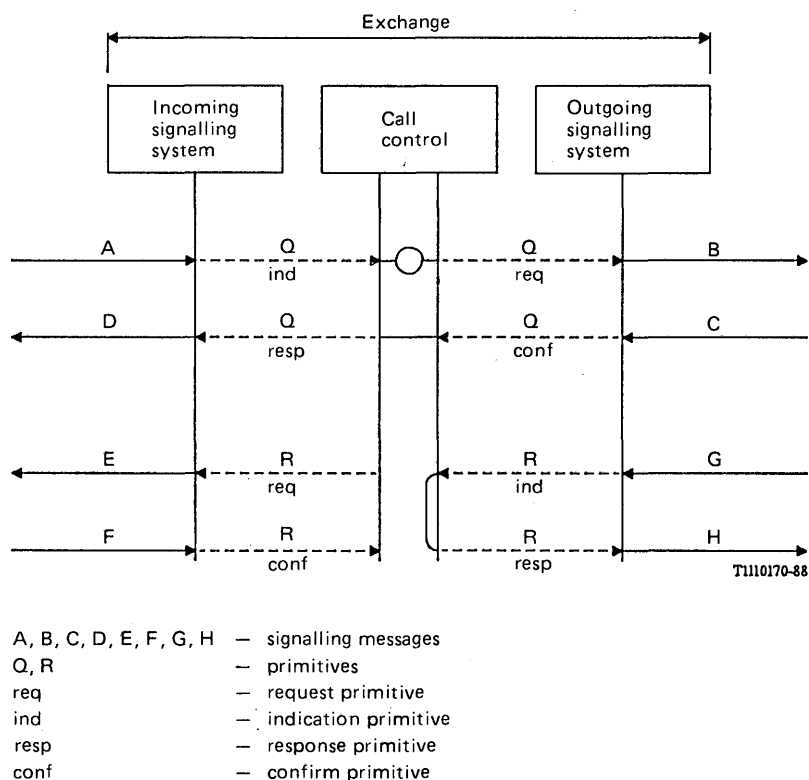
FIGURE 2/Q.699

Example of a time sequence or "arrow" diagram

A, B, C, D, E, F, G, H — signalling messages
Q, R   — primitives
req   — request primitive
ind   — indication primitive
resp   — response primitive
conf   — confirm primitive

2.4 *Mapping tables*

Mapping tables are provided to define the relationship between User-Network Interface Protocol messages and information elements on the one hand and ISDN User Part messages and parameters on the other hand.

One table is provided for each User-Network Interface Protocol message that maps onto an ISDN User Part message. The same table also specifies the mapping of elements of information which are carried by the concerned messages.

Elements of information that are of local significance only, i.e. are not mapped onto elements of information in the other signalling system, are not shown.

3 Interworking specification for successful call set-up procedures

3.1 *Arrow diagrams*

This section contains the interworking arrow diagrams for the successful call set-up procedures.

3.1.1 *Enbloc, non-automatic answering terminal, sending of address complete independent of access*

Figure 3/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the Address Complete Message (ACM) is sent by the network independent of access indications, and the called party is not an automatic answering terminal.

3.1.2 *Enbloc, automatic answering terminal, sending of address complete independent of access*

Figure 4/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the address complete Message is sent independent of access indications, and the called party is an automatic answer terminal (fast connect scenario).

3.1.3 *Enbloc, non-automatic answering terminal*

Figure 5/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the Address Complete Message is delayed until receipt of alerting indication from the access, and the called party is not an automatic answering terminal.

3.1.4 *Enbloc, automatic answering terminal*

Figure 6/Q.699 shows successful call set-up with enbloc address signalling, and the address complete indication delayed until receipt of connect indication from an automatic answering terminal. In this case the address complete indication and connect indication are combined in the Connect message in the network.

3.1.5 *Overlap addressing, originating access only, non-automatic answering terminal*

Figure 7/Q.699 shows the sequence of messages when overlap addressing is used between the calling party and the originating local exchange, and enbloc addressing is used within the network. An independent ACM and non-automatic answering terminal is assumed in this case. Variations are possible as in Figures 3/Q.699-6/Q.699.

3.1.6 *Overlap addressing, originating access and network, non-automatic answering terminal*

Figure 8/Q.699 shows the sequence of messages when overlap addressing is used at the originating access and within the network. In this case the ACM through the network informs the originating local exchange that enough address information has been received, and the exchange can therefore indicate CALL PROCeeding to the calling party.

3.1.7 *Overlap addressing, both accesses and network, address complete cannot be determined by number analysis*

In Figure 9/Q.699, overlap addressing is used at both accesses and in the network. An example is a call made to an ISDN PABX, where determination of address complete may only be made as a result of an indication, e.g. alerting, from the called access. In this case, the ALERTing message from the called access allows the sending of an ACM in the network, which since it carries the "subscriber free" indication is mapped to ALERTing at the calling access.

3.1.8 Overlap addressing, originating access and network, address complete determined by number analysis

In Figure 10/Q.699, overlap addressing is used to reduce the post-dialing delay by allowing connection set-up to be in parallel with the entering of digits by the calling party. In this case, proceeding indications can be independently derived from number analysis. The diagram assumes independent ACM sending, however alternative cases are possible as in Figures 3/Q.699-6/Q.699.

3.1.9 ISDN to analogue subscriber

Figure 12/Q.699 shows the sequence of messages for a call from an ISDN subscriber to an analogue subscriber. The arrows between the local exchange and non-ISDN user indicate signals that may vary with the access protocol.

3.1.10 Analogue subscriber to ISDN

Figure 13/Q.699 shows the sequence of messages for a call from an analogue subscriber to an ISDN subscriber. Again, the arrows between non-ISDN user and local exchange indicate signals that may vary with the access protocol. Procedures for ACM and ANM may vary as in Figures 3/Q.699-6/Q.699. Overlap addressing may also be used in this case. Interworking then follows the message flows shown in Figures 8/Q.699 and 10/Q.699.

3.1.11 ISDN-PSTN interworking

Figure 14/Q.699 shows the interworking between ISDN and PSTN, in the case where the PSTN does not provide an out-of-band address complete indication. More detailed interworking between ISDN and PSTN is given in the Q.600 Recommendations.

3.1.12 PSTN-ISDN interworking

Figure 15/Q.699 shows interworking in a call originating in the PSTN, where the PSTN does not provide an out-of-band address complete indication. Overlap addressing may also be used in this case. Interworking then follows the message flows shown in Figures 8/Q.699 and 10/Q.699.

3.1.13 ISDN-PSTN interworking, PSTN support out-of-band address complete indication

Figure 16/Q.699 shows interworking where the PSTN provides an out-of-band address complete indication. As noted, the primitive and ACM indicators may differ depending on whether or not the PSTN provides call progress indications. More detailed interworking between ISDN and PSTN is given in the Q.600 Recommendations.

3.1.14 PSTN-ISDN interworking, PSTN supports out-of-band address complete indication

Figure 17/Q.699 shows interworking for a call originating in the PSTN, where the PSTN provides out-of-band address complete indications.

3.1.15 User-generated PROGress message, sending of address complete independent of access

Figure 18/Q.699 shows the case where the PROGress message in Q.931 is used to indicate interworking outside of the public network. In order to support user-generated in-band information, the terminating exchange may optionally through-connect in the backwards direction on receipt of the PROGress message (see Annex O of Recommendation Q.931).

3.1.16 User-generated PROGress message

Figure 19/Q.699 shows the corresponding case when the address complete indication is delayed until an indication is received from the access, and the PROGress message maps to an Address Complete Message.

3.1.17 Overlap addressing, both accesses and within network, transfer of address complete indication via call proceeding

Figure 11/Q.699 shows the case where the indication that complete address information has been received is transferred by the terminating access in the proceeding primitive.

The following notes apply to all interworking diagrams in this section:

— If continuity check occurs in the network, the SET-UP request primitive in the terminating local exchange is not passed until continuity is verified.

— Through-connection for specific cases may vary from the examples shown, e.g. for different PSTN signalling systems. More detailed information can be found in Recommendation Q.764, §§ 2.1.1.1 and 2.1.2.1.

The remaining notes apply where referenced in particular figures:

Note 1 — This message may be sent by the user to achieve symmetrical working or to avoid timer expiry on response to SET-UP (see Recommendation Q.931 § 5.2.5.1).

Note 2 — This message may be sent by the user to achieve symmetrical working (see Recommendation Q.931 § 5.1.8).

Note 3 — Called line status = no indication; ISDN access indicator = ISDN access.

Note 4 — Called line status = subscriber free; ISDN access indicator = ISDN access.

Note 5 — The number of INFORMATION messages and primitives shown is for example only. In practice the number may be zero or more; of zero, the Set-up request and Proc request primitives may be originated on expiry of timer T302 (see § 5.1.5.2 of Recommendation Q.931).

Note 6 — Progress indicator = 2 — destination address is non-ISDN.

Note 7 — Called line status = subscriber free; ISDN User Part indicator = ISDN User Part used all-the-way; ISDN access indicator = non-ISDN Access.

Note 8 — ISDN User Part indicator = ISDN User Part used all-the-way; ISDN access indicator = non-ISDN Access.

Note 9 — Conditional on type of access.

Note 10 — Progress indicator = 3 — origination address is non-ISDN.

Note 11 — Completion of transmission path timing is described in § 2.1.9.1 of Recommendation Q.764.

Note 12 — Called line status = no indication; ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

Note 13 — ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

Note 14 — Primitive is either Progress or Alerting, depending on the PSTN indication. If the PSTN indicates Alerting (subscriber free), then an ALERTing message replaces the PROGress message at the originating Q.931 interface.

Note 15 — Called line status depends on PSTN indication; ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

Note 16 — Progress indicator = 1 — Call is not end-to-end ISDN, further information available inband.

Note 17 — Called line status = no indication; Access transport parameter contains Progress information element.

Note 18 — The set-up message may in some cases contain sufficient information. If user equipment can determine immediately that address information is complete, both SET-UP ACK and the sequence of INFO messages are omitted. Alternatively, the SET-UP ACK may be sent, followed by CALL PROC, which maps to ACM.

(Notes are given in § 3.1.18)

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FIGURE 3/Q.699

**Enbloc, non-automatic-answering terminal,
sending of ACM independent of access**

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req — SETUP → Setup Ind — ⊗ — Setup Req → IAM → Setup Ind — ⊗ — Setup Req → IAM → Setup Ind — ○ — Setup Req — SETUP → Setup Ind

Proc Ind ← CALL PROC — Proc Req — ∿ — Proc Ind ← ACM (Note 3) — Proc Req ← Proc Ind ← ACM (Note 3) — Proc Req ← Proc Ind — ∿ — Proc Ind ← CALL PROC (Note 1) — Proc Req

Setup Conf ← CONN — Setup Resp — ⊗ — Setup Conf ← ANM — Setup Resp ← Setup Conf ← ANM — Setup Resp ← Setup Conf — ⊗ — Setup Conf ← CONN — Setup Resp

CONN ACK (Note 2) →

Setup complete Req — CONN ACK → Setup Complete Ind →

(Notes are given in § 3.1.18)

T1110200-88

FIGURE 4/Q.699

**Enbloc, automatic-answering terminal,
sending of ACM independent of access**

Fascicle VI.6 — Rec. Q.699

User	Local exchange	Transit exchange	Local exchange	User

| O/G SS Q.931 | I/C SS Q.931 | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS Q.931 | I/C SS Q.931 |

Setup Req — SETUP — Setup Ind — ⊗ — Setup Req — IAM — Setup Ind — ⊗ — Setup Req — IAM — Setup Ind — ○ — Setup Req — SETUP — Setup Ind

Proc Ind — CALL PROC — Proc Req — — — — Proc Ind — CALL PROC (Note 1) — Proc Req

Alert Ind — ALERT — Alert Req — Alert Ind — ACM (Note 4) — Alert Req — Alert Ind — ACM (Note 4) — Alert Req — Alert Ind — ALERT — Alert Req

Setup Conf — CONN — Setup Resp — ⊗ — Setup Conf — ANM — Setup Resp — Setup Conf — ANM — Setup Resp — ⊗ — Setup Conf — CONN — Setup Resp

CONN ACK (Note 2)

Setup Comp Req — CONN ACK — Setup Comp Ind

(Notes are given in § 3.1.18)

T1110210-88

FIGURE 5/Q.699

Enbloc, non-automatic-answering terminal

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req → SETUP → Setup Ind → ⊗ → Setup Req → IAM → Setup Ind → ⊗ → Setup Req → IAM → Setup Ind → ◯ → Setup Req → SETUP → Setup Ind →

Proc Ind ← CALL PROC ← Proc Req ← Proc Ind ← CALL PROC (Note 1) ← Proc Req

Setup Conf ← CONN ← Setup Resp ← ⊗ ← Setup Conf ← CON ← Setup Resp ← Setup Conf ← CON ← Setup Resp ← ⊗ ← Setup Conf ← CONN ← Setup Resp

CONN ACK (Note 2) →

Setup Complete Req → CONN ACK → Setup Complete Ind →

(Notes are given in § 3.1.18)

FIGURE 6/Q.699

Enbloc, automatic-answering terminal

T1110220-88

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req → SETUP → Setup Ind

More Info Req ← SETUP ACK ← More Info Req

Info Req (Note 5) → INFO → Info Ind ⊗ Setup Req → IAM → Setup Ind ⊗ Setup Req → IAM → Setup Ind ○ Setup Req → SETUP → Setup Ind →

Proc Ind ← CALL PROC ← Proc Req ∿ Proc Ind ← ACM (Note 3) ← Proc Req ← Proc Ind ← ACM (Note 3) ← Proc Req ∿ Proc Ind ← CALL PROC (Note 1) ← Proc Req ←

Alert Ind ← ALERT ← Alert Req ← Alert Ind ← CPG ← Alert Req ← Alert Ind ← Alert Req ← CPG ← Alert Req ← Alert Ind ← ALERT ← Alert Req ←

Setup Conf ← CONN ← Setup Resp ⊗ Setup Conf ← ANM ← Setup Resp ← Setup Conf ← ANM ← Setup Resp ⊗ Setup Conf ← CONN ← Setup Resp ←

CONN ACK (Note 2) →

Setup Comp Req → CONN ACK → Setup Comp Ind →

(Notes are given in § 3.1.18)

T1110230-88

FIGURE 7/Q.699

**Overlap addressing, originating access only,
non-automatic-answering terminal**

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req — SETUP → Setup Ind (Note 6)

More Info Req ◄— SETUP ACK — More Info Req

Info Req (Note 5) — INFO → Info Ind ⊗ Setup Req --→ IAM → Setup Ind ⊗ Setup Req --→ IAM → Setup Ind

Info Req — INFO → Info Ind — Info Req — SAM → Info Ind — Info Req — SAM → Info Ind ○ Setup Req --→ SETUP --→ Setup Ind

Proc Ind ◄— CALL PROC — Proc Req ◄ Proc Ind ◄ ACM (Note 3) ◄ Proc Req ◄ Proc Ind ◄ ACM (Note 3) ◄ Proc Req ◄ Proc Ind ◄ CALL PROC (Note 1) ◄ Proc Req

Alert Ind ◄— ALERT — Alert Req ◄ Alert Ind ◄ CPG ◄ Alert Req ◄ Alert Ind ◄ CPG ◄ Alert Req ◄ Alert Ind ◄ ALERT ◄ Alert Req

Setup Conf ◄— CONN — Setup Resp ⊗ Setup Conf ◄ ANM ◄ Setup Resp ◄ Setup Conf ◄ ANM ◄ Setup Resp ⊗ Setup Conf ◄ CONN ◄ Setup Resp

CONN ACK (Note 2) →

Setup Comp Req --→ CONN ACK --→ Setup Comp Ind

(Notes are given in § 3.1.18)

T1110240-88

FIGURE 8/Q.699

Overlap addressing, originating access and in network, non-automatic-answering terminal

(Notes are given in § 3.1.18)

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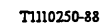
FIGURE 9/Q.699

**Overlap addressing, both accesses and within network, address complete
cannot be determined by number analysis**

User		Local exchange			Transit exchange			Local exchange			User

O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req → SETUP → Setup Ind (Note 6)

◄ More Info Req — SETUP ACK — More Info Req

Info Req (Note 5) → INFO → Info Ind — Setup Req → IAM → Setup Ind — Setup Req → IAM → Setup Ind →

Info Req → INFO → Info Ind — Info Req → SAM → Info Ind — Info Req → SAM → Info Ind — Setup Req → SETUP → Setup Ind →

◄ Proc Ind — CALL PROC — Proc Req

Proc Ind ◄ ACM (Note 3) — Proc Req — Proc Ind ◄ ACM (Note 3) — Proc Req

Proc Ind ← CALL PROC (Note 1) — Proc Req

◄ Alert Ind — ALERT — Alert Req — Alert Ind ◄ CPG — Alert Req — Alert Ind — Alert Req ◄ CPG — Alert Req — Alert Ind ← ALERT — Alert Req

◄ Setup Conf — CONN — Setup Resp — Setup Conf ◄ ANM — Setup Resp — Setup Conf — Setup Resp ◄ ANM — Setup Resp — Setup Conf ← CONN — Setup Resp

— CONN ACK (Note 2) →

Setup Comp Req — CONN ACK → Setup Comp Ind →

(Notes are given in § 3.1.18)

T1110260-88

FIGURE 10/Q.699

Overlap addressing, originating access and network, address complete determined by number analysis
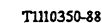
(Notes are given in § 3.1.18)

T1110350-88

FIGURE 11/Q.699

Overlap addressing, both access and within network, transfer of address complete indication
via call proceeding (option a: Call proceeding mapped to address complete)

(Notes are given in § 3.1.18)

FIGURE 12/Q.699

ISDN to analogue subscriber

T1110270-88

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Non ISDN	I/C SS Non ISDN	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Off Hook plus digits — Setup Ind — ⊗ — Setup Req — IAM (Note 8) — Setup Ind — ⊗ — Setup Req — IAM (Note 8) — Setup Ind — ○ — Setup Req — SETUP (Note 10) — Setup Ind

Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — CALL PROC (Note 1) — Proc Req

Alert Ind — CPG — Alert Req — Alert Ind — CPG — Alert Req — Alert Ind — ALERT — Alert Req

Inband Answer (Note 9) — Setup Resp — ⊗ — Setup Conf — ANM — Setup Resp — Setup Conf — ANM — Setup Resp — ⊗ — Setup Conf — CONN — Setup Resp

Setup Comp Req — CONN ACK — Setup Comp Ind

(Notes are given in § 3.1.18)

T1110280-88

FIGURE 13/Q.699

Analogue subscriber to ISDN

User	Local exchange			Transit exchange			Local exchange			PSTN
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS PSTN	I/C SS PSTN

(Note 11)

| Setup Req | SETUP | Setup Ind | ⊗ | Setup Req | IAM | Setup Ind | ⊗ | Setup Req | IAM | Setup Ind | ⊗ | Setup Req | Seize and send digits |

| Proc Ind | CALL PROC | Proc Req |

| Prog Ind | PROG | Prog Req | | Prog Ind | ACM (Note 11) | Prog Req | | Prog Ind | ACM (Note 11) | Prog Req |

| Setup Conf | CONN | Setup Resp | ⊗ | Setup Conf | ANM | Setup Resp | | Setup Conf | ANM | Setup Resp | | Setup Conf | Answer Signal |

CONN ACK (Note 2)

T1110290-88

(Notes are given in § 3.1.18)

FIGURE 14/Q.699

ISDN-PSTN interworking

PSTN | Interworking exchange | Transit exchange | Local exchange | User

| O/G SS PSTN | I/C SS PSTN | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS Q.931 | I/C SS Q.931 |

Seize and send digits

Setup Ind — Setup Req — IAM (Note 13) — Setup Ind — Setup Req — IAM (Note 13) — Setup Ind — Setup Req — SETUP (Note 16) — Setup Ind

Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — CALL PROC (Note 1) — Proc Req

Alert Ind — CPG — Alert Req — Alert Ind — CPG — Alert Req — Alert Ind — ALERT — Alert Req

Answer Signal — Setup Resp — Setup Conf — ANM — Setup Resp — Setup Conf — ANM — Setup Resp — Setup Conf — CONN — Setup Resp

Setup Comp Req — CONN ACK — Setup Comp Ind

(Notes are given in § 3.1.18)

T1110300-88

FIGURE 15/Q.699

PSTN-ISDN interworking

User | Local exchange | Transit exchange | Interworking exchange | PSTN

| O/G SS Q.931 | I/C SS Q.931 | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS ISUP | I/C SS ISUP | CALL CNTL | O/G SS PSTN | I/C SS PSTN |

Setup Req → SETUP → Setup Ind → ⊗ → Setup Req → IAM → Setup Ind → ⊗ → Setup Req → IAM → Setup Ind → ○ → Setup Req → Seize and send digits

Proc Ind ← CALL PROC ← Proc Req

Prog Ind (Note 14) ← PROG ← Prog Req (Note 14) ← Prog Ind (Note 14) ← ACM (Note 15) ← Prog Req (Note 14) ← Prog Ind (Note 14) ← ACM (Note 15) ← Prog Req (Note 14) ← ⊗ ← Prog Ind (Note 14) ← Address complete

Setup Conf ← CONN ← Setup Resp ← ⊗ ← Setup Conf ← ANM ← Setup Resp ← Setup Conf ← ANM ← Setup Resp ← Setup Conf ← Answer Signal

CONN ACK (Note 2) →

(Notes are given in § 3.1.18)

T1110310-88

FIGURE 16/Q.699

ISDN-PSTN interworking, PSTN supports address complete indication

PSTN		Interworking exchange			Transit exchange			Local exchange		User
O/G SS PSTN	I/C SS PSTN	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

(Note 11)

| | Seize and Send digits | Setup Ind | ⊗ | Setup Req | IAM (Note 13) | Setup Ind | ⊗ | Setup Req | IAM (Note 13) | Setup Ind | ○ | Setup Req | SETUP | Setup Ind |

| Address Complete | Proc Req | Proc Ind | ACM (Note 3) | Proc Req | Proc Ind | ACM (Note 3) | Proc Req | Proc Ind | CALL PROC (Note 1) | Proc Req |

| | Alert Ind | CPG | Alert Req | Alert Ind | CPG | Alert Req | Alert Ind | ALERT | Alert Req |

| Answer Signal | Setup Resp | Setup Conf | ANM | Setup Resp | Setup Conf | ANM | Setup Resp | ⊗ Setup Conf | CONN | Setup Resp |

| | | | | | | | | | Setup Comp Req | CONN ACK | Setup Comp Ind |

(Notes are given in § 3.1.18)

T1110320-88

FIGURE 17/Q.699

PSTN-ISDN interworking, PSTN supports address complete indication

User		Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931	

Setup Req — SETUP — Setup Ind — ⊗ — Setup Req — IAM — Setup Ind — ⊗ — Setup Req — IAM — Setup Ind — ○ — Setup Req — SETUP — Setup Ind

Proc Ind — CALL PROC — Proc Req — Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — ACM (Note 3) — Proc Req — Proc Ind — CALL PROC (Note 1) — Proc Req

Progress Ind — PROG — Progress Req — Progress Ind — CPG — Progress Req — Progress Ind — CPG — Progress Req — Progress Ind — PROG — Progress Req

Setup Conf — CONN — Setup Resp — ⊗ — Setup Conf — ANM — Setup Resp — Setup Conf — ANM — Setup Resp — ⊗ — Setup Conf — CONN — Setup Resp

CONN ACK (Note 2)

Setup Complete Req — CONN ACK — Setup Complete Ind

(Notes are given in § 3.1.18)

T1110330-88

FIGURE 18/Q.699

User-generated PROGress message, ACM generated independent of access

User	Local exchange			Transit exchange			Local exchange			User
O/G SS Q.931	I/C SS Q.931	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS ISUP	I/C SS ISUP	CALL CNTL	O/G SS Q.931	I/C SS Q.931

Setup Req — SETUP → Setup Ind ⊗ Setup Req — IAM → Setup Ind ⊗ Setup Req — IAM → Setup Ind ○ Setup Req — SETUP → Setup Ind

Proc Ind ← CALL PROC Proc Req Proc Ind ← CALL PROC (Note 1) Proc Req

Progress Ind ← PROG Progress Req Progress Ind ← ACM Progress Req Progress Ind ← ACM Progress Req Progress Ind ← PROG Progress Req

Setup Conf ← CONN Setup Resp ⊗ Setup Conf ← ANM Setup Resp Setup Conf ← ANM Setup Resp ⊗ Setup Conf ← CONN Setup Resp

CONN ACK (Note 2)

Setup Complete Req — CONN ACK → Setup Complete Ind

(Notes are given in § 3.1.18)

T1110340-88

FIGURE 19/Q.699

User-generated PROGress message, ACM dependent on access, enbloc sending

3.2 *Mapping of Parameters*

This section contains the mapping tables of successful call set-up messages and associated parameters and information elements.

TABLE 1/Q.699

Mapping of set-up procedure parameters for ISDN call

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ⟶	IAM ⟶	SETUP
Contents	Bearer capability	User service information	Bearer capability
		Trans. med. reqts (Note 1)	
	No mapping	Forward call indicator	No mapping
	Progress indicator	Access transport (Note 2)	Progress indicator
	Calling party number (Note 6)	Calling party number (Note 3)	Calling party number
	Calling party subaddress	Access transport	Calling party subaddress
	Called party number (Note 4)	Called party number	Called party number
	Setup complete	ST digit (Note 5)	No mapping
	Called party subaddress	Access transport	Called party subaddress
	Transit network sel.	Transit network sel.	No mapping
	Low layer compatibility	Access transport	Low layer compatibility
	High layer compatibility	Access transport	High layer compatibility

Note 1 — The User Service Information parameter carries the customer's bearer service request unchanged through the network, and is mapped at the terminating exchange. Transmission Medium Requirements maps from the service request to a network connection type. It is not mapped at the terminating exchange in an ISDN call. For calls between networks (e.g. international gateways), the contents of the Bearer Capability information element carried within the User Service Information parameter may be changed, e.g. where A-law to mu-law conversion applies.

Note 2 — The access Transport parameter carries information elements transparently from one User/Network interface to the other User/Network interface.

Note 3 — The calling party number is recommended to be carried in the IAM, however it may optionally be delayed until a subsequent end-to-end request in the network. Number and subaddress should be carried in the same message.

Note 4 — The Keypad Facility information element may be used to carry called party number information in the user-to-network direction (described in § 5.1 of Recommendation Q.921) rather than the Called Party Number information element. This is then mapped to the Called Party Number parameter within the network.

Note 5 — The ST digit is an address signal carried within the Called Party Number parameter.

Note 6 — The calling party number may be provided solely to indicate calling line identity restriction.

Mapping of set-up parameters for PSTN-ISDN call

	Not Applicable	Network	Terminating User/Network
Message		IAM ⟶	SETUP
		Transmission medium requirements	Bearer capability
		Forward call indicators (interworking)	Progress indicator

TABLE 3/Q.699

Mapping of subsequent address information for overlap sending

	Originating User/Network	Network	Terminating User/Network
Message	INFO ⟶	SAM ⟶	INFO
Contents	Called party number of Keypad (Note)	Subsequent number	Called party number (Note)

Note — Sending complete may be included at both User/Network interfaces in the INFORMATION message.

TABLE 4/Q.699

Mapping of interworking with PSTN inband

	Originating User/Network	Network	Terminating User/Network
Message	PROGress (Note) ⟵	ACM ⟵	Not applicable
Contents	Progress indicator	Backward call indicator (interworking)	

Note — The ACM may also map to the CALL PROCEEDING message if this has not already been sent.

TABLE 5/Q.699

Mapping of alerting, independent ACM

	Originating User/Network	Network	Terminating User/Network
Message	ALERTing ◄――――――― CPG ◄――――――― ALERTing		
Contents	alerting (implicit)	Event information (alerting)	alerting (implicit)
	Progress indicator	Access transport	Progress indicator

TABLE 6/Q.699

Mapping of alerting

	Originating User/Network	Network	Terminating User/Network
Message	ALERTing ◄――――――― ACM ◄――――――― ALERTing		
Contents	alerting (implicit)	Backward call indicators (subscriber free)	alerting (implicit)
	Progress indicator	Access transport	Progress indicator

TABLE 7/Q.699

Mapping of answer indication, non-automatic answering terminal

	Originating User/Network	Network	Terminating User/Network
Message	CONNect ◄――――――― ANM ◄――――――― CONNect		
Contents	Progress indicator	Access transport	Progress indicator

TABLE 8/Q.699

Mapping of answer indication, automatic answering terminal

	Originating User/Network	Network	Terminating User/Network
Message	CONNect ◄——————— CON ◄——————— CONNect		
Contents	Progress indicator	Access Transport	Progress indicator

TABLE 8a/Q.699

Mapping of progress indication

	Originating User/Network	Network	Terminating User/Network
Message	PROGress ◄——————— CPG ◄——————— PROGress		
Contents	Progress (implicit)	Backward call indicators (no indication)	Progress (implicit)
	Progress indicator	Access transport	Progress indicator

TABLE 8b/Q.699

Mapping of progress indication

	Originating User/Network	Network	Terminating User/Network
Message	PROGress ◄——————— ACM ◄——————— PROGress		
Contents	Progress (implicit)	Backward call indicators (no indication)	Progress (implicit)
	Progress indicator	Access transport	Progress indicator

3.3 Mapping of the parameter fields

This section contains the mapping tables of parameter subfields and values for the Progress Indicator of Recommendation Q.931 and the associated fields in ISUP.

The following notes apply to all mapping tables in this attachment:

— The mapping of the Backward Call Indicator in the Answer Mesage only applies when this indicator is included in the Answer Message.

— For simplicity, these diagrams assume the case where the ACM is not sent independently, and a non-automatic answering terminal is the called party. Other configurations are possible as shown in the arrow diagrams, but do not affect parameter mapping rules.

3.3.1 Scenario 1

USER — Q.931 — ○ — ISUP — ○ — Q.931 — USER

T1110370-88
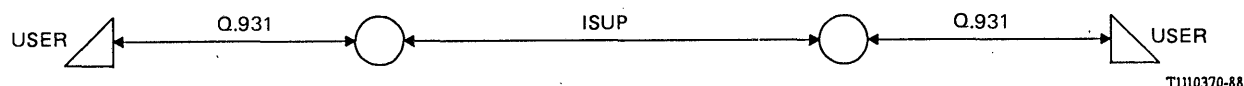
TABLE 9/Q.699

Parameter fields mapping for Q.931-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ——→	IAM ——→	SETUP
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.
Message	ALERTing ◄——	ACM ◄——	ALERTing
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	CONNect ◄——	ANM ◄——	CONNect
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.

T1110380-88

TABLE 10/Q.699

Parameter fields mapping for Q.931-ISUP-PSTN

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ──────▶	IAM	N/A

Content	no Progress ind.	Forward call ind.
		Bit D = 0, no interworking encountered
		  F = 1, ISUP used all the way
		  I = 1, originating access ISDN
			no mapping applied

Message	PROGress ◀──────	ACM	N/A

Content	Progress ind. progress description = # 1, call is not end-to-end ISDN	Backward call ind.
		Bit I = 1, interworking encountered
		  K = 0, ISUP not used all the way
		  M = 0, terminating access ISDN
			no mapping applied

Message	CONNect ◀──────	ANM	N/A

Content	Progress ind. progress description = # 1, call is not end-to-end ISDN	Backward call ind.
		Bit I = 1, interworking encountered
		  K = 0, ISUP not used all the way
		  M = 0, terminating access ISDN
			no mapping applied

T1110390-88

TABLE 11/Q.699

Parameter fields mapping for PSTN-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	N/A	IAM ⟶	SETUP
Content	no mapping applied	Forward call ind. Bit D = 1, interworking encountered F = 0, ISUP not used all the way I = 0, originating access non-ISDN	Progress ind. progress description = # 1, call is not end-to-end ISDN
Message	N/A	ACM ⟵	ALERTing
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	N/A	ANM ⟵	CONNect
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no mapping applied

T1110400-88

TABLE 12/Q.699

Parameter fields mapping for ISUP-Q.931-ANALOGUE

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ——————▶	IAM	N/A

Content	no Progress ind.	Forward call ind.
		Bit D = 0, no interworking encountered
		    F = 1, ISUP used all the way
		    I = 1, originating access ISDN
			no Progress ind.

Message	ALERTing◀——————	ACM	N/A

Content	Progress ind. progress description = # 2, destination address is non-ISDN	Backward call ind.
		Bit I = 0, no interworking encountered
		    K = 1, ISUP used all the way
		    M = 1, terminating access non-ISDN
			no mapping applied

Message	CONNect◀——————	ANM	N/A

Content	Progress ind. progress description = # 2, destination address is non-ISDN	Backward call ind.
		Bit I = 0, no interworking encountered
		    K = 1, ISUP used all the way
		    M = 1, terminating access non-ISDN
			no mapping applied

TABLE 13/Q.699

Parameter fields mapping for ANALOGUE-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	N/A	IAM ⟶ SETUP	
Content	no mapping applied	Forward call ind. Bit D = 0, no interworking encountered 　　F = 1, ISUP used all the way 　　I = 0, originating access non-ISDN	Progress ind. progress description = # 3, originating address is non-ISDN
Message	N/A	ACM ⟵ ALERTing	
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered 　　K = 1, ISUP used all the way 　　M = 1, terminating access ISDN	no Progress ind.
Message	N/A	ANM ⟶ CONNect	
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered 　　K = 1, ISUP used all the way 　　M = 1, terminating access ISDN	no Progress ind.

T1110420-88

TABLE 14/Q.699

Parameter fields mapping for ANALOGUE-Q.931-ISUP-Q.931

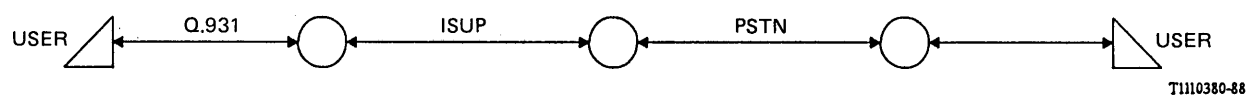|	Originating User/Network	Network	Terminating User/Network
Message	SETUP ─────────►	IAM ─────────►	SETUP
Content	Progress ind. progress description = # 3, originating address in non-ISDN location = private network	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN Access transport carries Progress ind.	Progress ind. as received from the ATP
Message	ALERTing ◄─────────	ACM ◄─────────	ALERTing
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	CONNect ◄─────────	ANM ◄─────────	CONNect
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.

TABLE 15/Q.699

Parameter fields mapping for Q.931-ISUP-Q.931-ANALOGUE

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ————————▶	IAM ————————▶	SETUP

Content	no Progress ind.	Forward call ind.
		Bit D = 0, no interworking encountered
		    F = 1, ISUP used all the way
		    I = 1, originating access ISDN
			no Progress ind.

Message	ALERTing ◀————	ACM ◀————	ALERTing

Content	Progress ind. as received in the ATP	Backward call ind.
		Bit I = 0, no interworking encountered
		    K = 1, ISUP used all the way
		    M = 1, terminating access ISDN
		        ATP carries Progress indicator
			Progress ind. progress description = # 2, destination address in non-ISDN location = private network

Message	CONNect ◀————	ANM ◀————	CONNect

Content	Progress. ind. as received in the ATP	Backward call ind.
		Bit I = 0, no interworking encountered
		    K = 1, ISUP used all the way
		    M = 1, terminating access ISDN
		        ATP carries Progress indicator
			Progress ind. (Note) progress description = # 2, destination address in non-ISDN location = private network

Note – The Progress indicator is not necessarily repeated in the CONNECT message if it has already appeared in the ALERTING message.

4   Release procedures

4.1   *Arrow diagram*

This section contains the arrow diagrams for the Q.931/Q.764 interworking release procedures.

4.1.1   *End-to-end ISDN scenario*

The following normal call release procedures are indicated.

Case 1: This case shows the normal call release interworking procedure without tone provision (Figure 20/Q.699).

A DISConnect message from the originating user is mapped via the Disconnect Indication and Release Request primitives into a RELease message in the network.

At the destination end, a RELease message from the network is mapped into a DISConnect message sent to the terminating user via Release Indication and Disconnect Request primitives.

The tone/announcement option is not applied in the terminating exchange.

Case 2: This case shows the normal call release interworking procedure with tone provision (Figure 21/Q.699).

The tone/announcement option is applied in the terminating exchange.

A RELease message from the network is mapped into a DISConnect message with progress indicator (# 8, in-band information or appropriate pattern is now available) sent to the terminating user.

4.1.2   *PSTN/ISDN interworking scenario*

The following normal release procedures in PSTN to ISDN interworking scenario are indicated.

Case 1: Clear forward (Figure 22/Q.699, Case 1)

This case shows the normal call release procedure being initiated from the originating PSTN by means of a clear forward signal.

At the ISDN/PSTN interworking exchange, the clear forward signal is mapped into a RELease message to the ISDN exchange.

Case 2: Clear backward (Figure 22/Q.699, Case 2)

This case shows the normal call release procedure being initiated from the terminating ISDN user by means of a DISConnect message.

At the ISDN-PSTN interworking exchange, a RELease message is mapped into an appropriate backward signal in PSTN.

4.1.3   *ISDN/PSTN interworking scenario*

The following normal release procedures in the ISDN to PSTN interworking scenario are indicated.

Case 1: Clear forward (Figure 23/Q.699, Case 1)

This case shows the normal call release procedure being initiated from the originating ISDN user by means of a DISConnect message.

At the ISDN/PSTN interworking exchange, a RELease message is mapped into an appropriate clear forward signal in PSTN.

Case 2: Clear backward (Figure 23/Q.699, Case 2)

This case shows the normal call release procedure being initiated from the terminating PSTN by means of a clear backward signal.

At the ISDN/PSTN interworking exchange, the clear backward signal is mapped into a SUSpend message with suspend/resume indicator (network initiated).

The terminating ISDN exchange starts the time. Upon expiry of the timer, if the terminating exchange has not received a RESume message, the terminating exchange initiates clearing by sending a DISConnect message to the user, and sending a RELease message to the preceding exchange.

4.1.4   *Notes for Figures 20/Q.699-23/Q.699*

Note 1 — This procedure is applicable to those basic services where in-band tone/announcement is not provided, e.g. 64 kbit/s unrestricted bearer service.

Note 2 — The DISC message should not include the progress indicator #8.

Note 3 — This procedure is applicable to both speech and 3.1 kHz audio bearer services.

Note 4 — The provision of tone is optional. If tone is provided, progress indicator #8 should be included in the DISC message. If tone is not provided, progress indicator #8 should not be included.

(Notes are given in § 4.1.4)

FIGURE 20/Q.699

Normal call release procedure without tone provision (Note 1)

T1110441-88
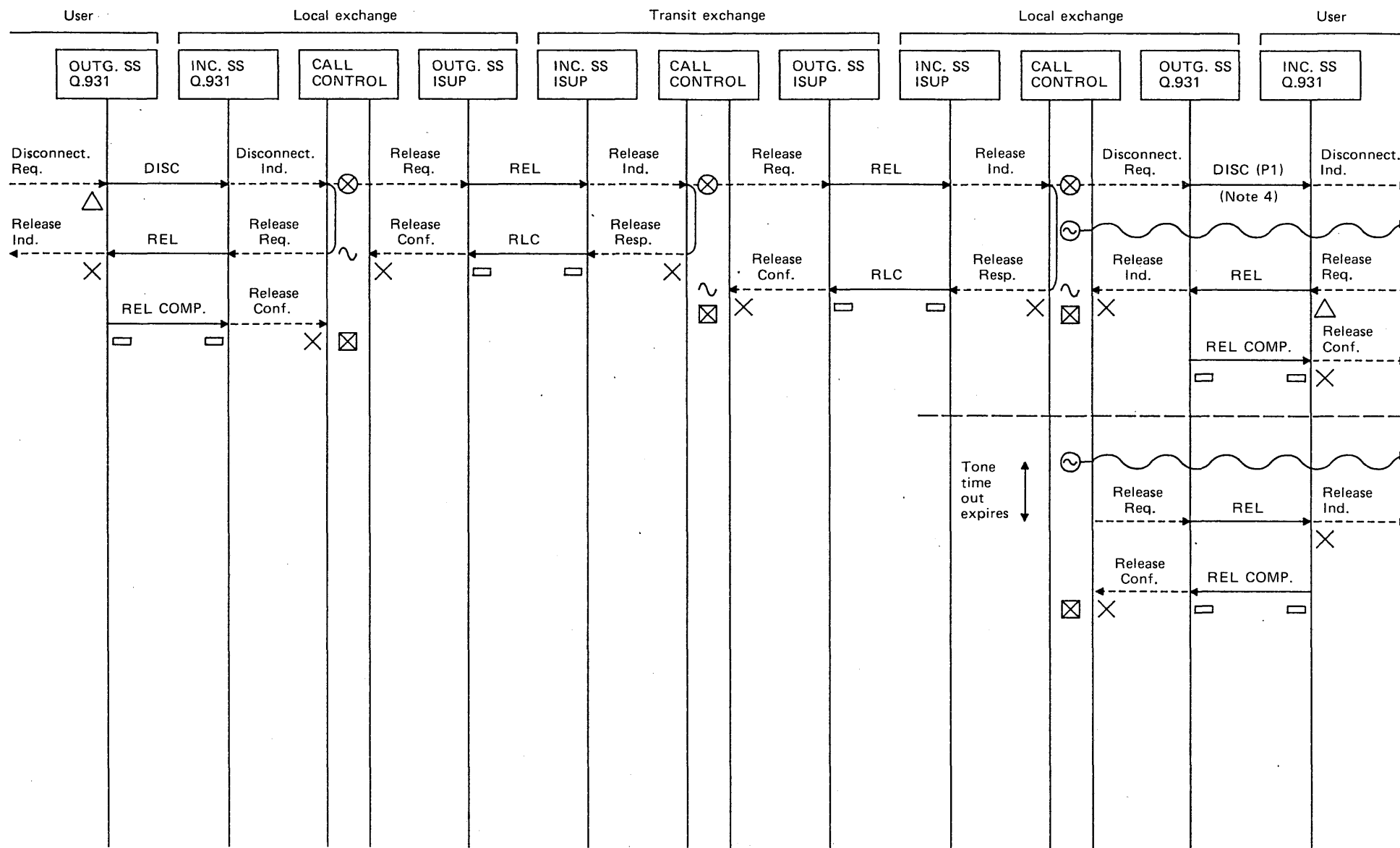
(Notes are given in § 4.1.4)

FIGURE 21/Q.699

Normal release procedure with tone provision (Note 3)

PSTN exchange Interworking exchange ISDN exchange User

| OUTG. SS NON ISDN | INC. SS NON ISDN | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS Q.931 | INC. SS Q.931 |

Case 1: Clear Forward

CLEAR FORWARD · Release Req. · REL · Release Ind. · Disconnect. Req. · DISC (P1) · Disconnect. Ind.

(Note 4)

Release Conf. · RLC · Release Resp. · Release Ind. · REL · Release Req.

REL COMP. · Release Conf.

Case 2: Clear Backward

CLEAR BACKWARD · Release Ind. · REL · Release Req. · Disconnect. Ind. · DISC · Disconnect. Req.

Release Resp. · RLC · Release Conf. · Release Req. · REL · Release Ind.

Release Conf. · REL COMP.

(Notes are given in § 4.1.4)

T1110460-88

FIGURE 22/Q.699

Normal release procedure for PSTN to ISDN interworking

User	ISDN exchange			Interworking exchange			PSTN exchange
OUTG. SS Q.931	INC. SS Q.931	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS NON ISDN	INC. SS NON ISDN

Case 1: Clear Forward

Disconnect. Req.   DISC   Disconnect. Ind.   Release Req.   REL   Release Ind.   CLEAR FORWARD

Release Ind.   REL   Release Req.   Release Conf.   RLC   Release Resp.

REL COMP.   Release Conf.

Case 2: Clear Backward

Suspended Ind.   SUS   Suspended Req.   CLEAR BACKWARD

(network)

Time out

Disconnect. Ind.   DISC (P1)   Disconnect. Req.   Release Req.   REL   Release Ind.   CLEAR FORWARD

(Note 4)

Release Conf.   RLC   Release Resp.

Release Req.   REL   Release Ind.

Release Conf.   REL COMP.

T1110471-83

(Notes are given in § 4.1.4)

FIGURE 23/Q.699

Normal release procedure for ISDN to PSTN interworking

4.2 *Mapping of parameters*

This section contains the mapping table of Q.763/Q.931 messages and associated parameters.

TABLE 16/Q.699

Mapping of release procedure parameters for ISDN call

	User/Network	Network	User/Network
Message	DISConnect ←————→	RELease ←—————	→ DISConnect
Contents	*Cause	*Cause	*Cause

TABLE 17/Q.699

Mapping of release procedure parameters for PSTN-ISDN call (Called party clears)

	PSTN	Network	User/Network
Message	Clear Backward Signal ←———	RELease ←———————	DISConnected
Contents		*Cause	*Cause

TABLE 18/Q.699

Mapping of release procedure parameters for PSTN-ISDN call (Called party clears)

	PSTN	Network	User/Network
Message	Clear forward signal ←———	RELease ←———	DISConnect
Contents		*Cause #16, Normal call clearing	*Cause #16, Normal call clearing

Mapping of release procedure parameters for ISDN-PSTN call (Calling party clears)

	User/Network ──────	────►Network ──────	────► PSTN
Message	DISConnect	RELease	Clear forward signal
Contents	*Cause	*Cause	

5 · Interworking specification for unsuccessful set-up procedure

5.1 *Arrow diagram*

This section contains the arrow diagrams for the unsuccessful call set-up procedures.

5.1.1 *Unsuccessful call set-up, point-to-point data link*

Figure 24/Q.699 shows the unsuccessful call set-up procedure, where inband tones/announcements are not provided (e.g. 64 kbit/s unrestricted bearer service). The RELease COMPlete message at the destination exchange is mapped into the RELease message via the Reject Indication and Release Request primitives. At the originating exchange the RELease message is mapped via the Release Indication and Disconnect Request primitives into the DISConnect message.

5.1.2 *Unsuccessful call — Broadcast data link*

Figure 25/Q.699 shows the unsuccessful call set-up procedure, where inband tones/announcements are not provided (e.g. 64 kbit/s unrestricted bearer service), in the case where the called party is addressed via a broadcast data link. The returning of the RELease COMPlete message via a broadcast data link is optional. In the case shown, on receipt of the RELease COMPlete message at the destination exchange the cause value is retained, and to allow for the possibility of another terminal accepting the call, the Reject Indication primitive is not generated until the expiry of timer T303.

Note — Where the network does not receive any response to the initial SETUP message before the expiry of timer T303, the SETUP message is retransmitted and T303 is restarted. If no further response is received by the network on the second expiry of timer T303, the Reject Indication primitive is generated.

The RELease message is then mapped from the Reject Ind and Release Request primitives. At the originating exchange the RELease message is mapped via the Release Indication and Disconnect Request primitives into the DISConnect message.

5.1.3 *Unsuccessful call — Tone/announcement applied at the originating exchange*

Figure 26/Q.699 shows the unsuccessful set-up procedure where tones or announcements are generated in the originating exchange towards the ISDN user as a result of receiving a RELease message.

Timer T306 is started after the appropriate tone/announcement is sent. Figure 26/Q.699 shows the originating ISDN user releasing before timer T306 expires.

5.1.4 Unsuccessful call — Tone applied by terminating exchange

Figure 27/Q.699 shows an unsuccessful call where certain tones and announcements can only be generated in the terminating exchange (or transit exchange) during call establishment. This is a typical case, for example, for a changed number announcement where the changed number information is only available at the terminating local exchange. Alternatively, a specific announcement may be applied at a transit exchange to indicate, for example, that all circuits to a particular destination are busy.

The originating exchange sends a DISconnect message to the calling user with progress indicator # 8, thus indicating that in-band information is available. Normal release procedures apply after the in-band information has been connected.

5.1.5 Unsuccessful call — Originating exchange tone/announcement time-out expires

Figure 28/Q.699 shows the case of tone time-out expiry at the local exchange. This is very similar to § 5.1.3 above except that the caller fails to clear the call following the application of the tone. Timer T306 then expires.

5.1.6 ISDN-PSTN interworking — Tone/announcements applied by terminating exchange within PSTN

Figure 29/Q.699 shows an unsuccessful call where the sending of tones and announcements is generated by the terminating exchange during the call set-up phase. In this case, an Address Complete Message is returned from the interworking point with indicators set as shown in Note 8 (see § 5.1.8). This is mapped to a PROGress Message at the originating local exchange, with the progress indicator set to value 1, to indicate that in-band information may be available. The sequence applies to failure occurring at any point within the PSTN.

5.1.7 Premature release — Point-to-point data link

Figure 30/Q.699 shows a premature release situation where release is received at the terminating local exchange prior to any terminal response. In this situation a DISConnect message is sent to the called user and the normal clearing procedure is initiated.

5.1.8 Notes for Figures 24/Q.699-30/Q.699

Note 1 — This procedure is applicable in those cases where in-band tone/announcements are not provided, e.g. 64 kbit/s unrestricted bearer service.

Note 2 — This message is delivered by a point-to-point data link.

Note 3 — This message is sent by a broadcast data link.

Note 4 — Timer T306 is started in the Q.931 protocol block.

Note 5 — If tones/announcements are applied, a DISConnect message may be sent containing progress indicator # 8. As an alternative, a PROGress message may also be sent containing progress indicator # 8.

Note 6 — Customized announcements can only be provided by this exchange.

Note 7 — Tone/announcement time-out expires.

Note 8 — Backward call indicators in the Address Complete Message set as follows:

ISDN access indicator = non-ISDN
Protocol control indicators = interworking encountered
Called party's status indicator = no indication.

Note 9 — See § 2.1.9.1 of Recommendation Q.764 for through-connect timing.

Note 10 — If the clearing ISDN user is the called party, this message becomes a clear back.

Note 11 — In the case of point-to-multipoint, the DISConnect message is not sent. Terminals are released as they respond.

User	Local exchange	Transit exchange	Local exchange	User

| OUTG. SS Q.931 | INC. SS Q.931 | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS Q.931 | INC. SS Q.931 |

Set-up Req.   SET-UP   Set-up Ind.   Set-up Req.   IAM   Set-up Ind.   Set-up Req.   IAM   Set-up Ind.   Set-up Req.   SET-UP   Set-up Ind.

(Note 2)

Proc. Ind.   CALL PROC.   Proc. Req.

Disconnect. Ind.   DISC   Disconnect. Req.   Release Ind.   REL   Release Req.   Release Ind.   REL   Release Req.   Reject Ind.   REL COMP.   Reject Req.

Release Req.   REL   Release Ind.   Release Resp.   RLC   Release Conf.   Release Resp.   RLC   Release Conf.

Release Conf.   REL COMP.

T1110481-88

(Notes are given in § 5.1.8)

FIGURE 24/Q.699

Unsuccessful call set-up, point to point data link (Note 1)

User	Local exchange	Transit exchange	Local exchange	User

| OUTG. SS Q.931 | INC. SS Q.931 | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS Q.931 | INC. SS Q.931 |

Set-up Req.   SET-UP   Set-up Ind.   Set-up Req.   IAM   Set-up Ind.   Set-up Req.   IAM   Set-up Ind.   Set-up Req.   SET-UP   Set-up Ind.

(Note 3)

Proc. Ind.   CALL PROC.   Proc. Req.

Timer 303 expires   REL COMP.   Reject Req.

Disconnect. Ind.   DISC   Disconnect. Req.   Release Ind.   REL   Release Req.   Release Ind.   REL   Release Req.   Reject Ind.

Release Req.   REL   Release Ind.   Release Resp.   RLC   Release Conf.   Release Resp.   RLC   Release Conf.

Release Conf.   REL COMP.

(Notes are given in § 5.1.8)

T1110491-88

FIGURE 25/Q.699

Unsuccessful call set-up, broadcast data link (Note 1)

| User | | Local exchange | | | Transit exchange | | | Local exchange | | | User |

| OUTG. SS Q.931 | INC. SS Q.931 | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS Q.931 | INC. SS Q.931 |

Set-up Req. SET-UP Set-up Ind. Set-up Req. IAM Set-up Ind. Set-up Req. IAM Set-up Ind. Set-up Req. SET-UP Set-up Ind.

Proc. Ind. CALL PROC. Proc. Req.

Disconnect. Ind. DISC Disconnect. Req. Release Ind. REL Release Req. Release Ind. REL Release Req. Reject Ind. REL COMP. (e.g. user busy) Reject Req.

(P1 = 8)
(Note 5)

Release Resp. RLC Release Conf. Release Resp. RLC Release Conf.

Tone/Annct

Release Req. REL Release Ind.

(Note 4)

Release Conf. REL COMP.

(Notes are given in § 5.1.8)

T1110500-88

FIGURE 26/Q.699

Unsuccessful call set-up tone/announcement applied at originating exchange

233

(Notes are given in § 5.1.8)

T1110511-88

FIGURE 27/Q.699

Unsuccessful call set-up tone/announcement applied by terminating exchange

| User | | Local exchange | | | Transit exchange | | | Local exchange | | | User |

T1110520-88

(Notes are given in § 5.1.8)

FIGURE 28/Q.699

Unsuccessful call set-up originating exchange tone/announcement time-out expires

Fascicle VI.6 — Rec. Q.699

User	Local exchange			Transit exchange			Interworking exchange			PSTN exchange

OUTG. SS Q.931	INC. SS Q.931	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS NON-ISDN	INC. SS NON-ISDN

(Note 9)

Set-up Req. ----SET-UP----> Set-up Ind. ⊗ ----Set-up Req.---- IAM ----> Set-up Ind. ⊗ ----Set-up Req.---- IAM ----> Set-up Ind. ⊗ ----Set-up Req.---- SEIZE ---->

Proc. Ind. <----CALL PROC.---- Proc. Req.

(Note 8)

Progress Ind. <----PROG.---- Progress Req. <---- Inband Inform. Ind. <----ACM---- Inband Inform. Req. <---- Inband Inform. Ind. <----ACM---- Inband Inform. Req.

(P1 = 1) (Progress ind.)

Tone/Annct <~~~~~~ ◎

e.g. busy tone

Disconnect. Req. ----DISC----> Disconnect. Ind. ⊗ ----Release Req.---- REL ----> Release Ind. ⊗ ----Release Req.---- REL ----> Release Ind. ⊗ ----Release Req.---- CLEAR FORWARD ---->

△

Release Ind. <----REL---- Release Req. ~ <----Release Conf.---- RLC Release Resp. ~ <----Release Conf.---- RLC Release Resp.

× × ☐ ☐ × ⊠ × ☐ ☐ × ⊠

----REL COMP.----> Release Conf. ---->

☐ ☐ × ⊠

(Notes are given in § 5.1.8)

T1110531-88

FIGURE 29/Q.699

ISDN-PSTN interworking tones/announcements applied by terminating exchange within PSTN

(Notes are given in § 5.1.8)

FIGURE 30/Q.699

Premature release point-to-point data link

T1110540-88

5.2 Mapping of parameters

This section contains the mapping of Q.763/Q.931 messages, and associated parameters.

TABLE 20/Q.699

Mapping of ISDN user part address complete message parameters

	Originating user/network	Network
Message	DISCONNECT (Q.931) ◄———	ADDRESS COMPLETE MESSAGE (ISUP)
Contents	Cause Progress indicator	Cause Inband information indicator (Network tone or announcement applied)

Note — In this case the inclusion of a Progress Indicator is mandatory.

TABLE 21/Q.699

Mapping of ISUP Call Progress parameters

	Originating user/network	Network
Message	(Q.931) PROGRESS	ADDRESS COMPLETE MESSAGE (ISUP)
Contents	Cause Progress indicator	Cause Inband information indicator (Network Tone/Announcement applied)

Note — In this case the inclusion of a Progress Indicator is mandatory.

TABLE 22/Q.699

Mapping of Q.931 RELease COMPlete message information elements

	Originating user/network	Network	Terminating user/network
Message	(Q.931) DISC ◄———	——— (ISUP) RELEASE ◄———	——— (Q.931) REL COMP
Contents	Cause	Cause	Cause

Note — The Progress Indicator is included when Tones/Announcements are provided at the originating local exchange when the Bearer Capability = speech or 3.1 kHz Audio (see Fig. 5.3).

TABLE 23/Q.699

Alternative mapping of Q.931 RELease COMPlete message information elements

	Originating user/network	Network	Terminating user/network
Message	(Q.931) PROGRESS	(ISUP) RELEASE	(Q.931) REL COMP
Contents	Cause	Cause	Cause

6 Interworking specifications for suspend/resume procedures

6.1 Arrow diagrams

This section contains the arrow diagrams for the Recommendation Q.931/Q.764 interworking suspend/resume procedures.

6.1.1 Successful and unsuccessful suspend/resume procedures

Figure 31/Q.699 indicates the successful and unsuccessful suspend and resume procedures.

Suspension control and supervision point is the originating local exchange and maybe a controlling exchange in the network.

The ISDN User Part protocol in the network is used to convey the notification to the remote end from the originating exchange.

6.1.2 Suspend/resume — Control and supervision within NT2

Figure 32/Q.699 illustrates the suspend and resume interworking procedures, where the control and supervision point is located within the NT2.

6.1.3 Suspend/resume — ISDN/PSTN interworking

Figure 33/Q.699 illustrates the suspend and resume procedures for ISDN-PSTN interworking.

6.1.4 Suspend/resume — PSTN/ISDN interworking

Figure 34/Q.699 illustrates the suspend and resume procedures for PSTN-ISDN interworking.

6.1.5 Notes for Figures 31/Q.699-34/Q.699

Note 1 — Supervision control in controlling exchange.

Note 2 — Supervision may be performed by the interworking exchange. In that case the clear-back and reanswer messages would not be sent.

Note 3 — When a DISConnect message is sent by the terminating subscriber, the release procedures in accordance with § 4 apply.

User	Local exchange			Transit exchange			Local exchange			User
OUTG. SS Q.931	INC. SS Q.931	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS Q.931	INC. SS Q.931

Case 1: Successful Call Suspension/Resumption

Suspended. Req.	SUSP	Suspend Ind.									
Suspended Conf.	SUSP ACK	Suspend Resp.	Suspended Req.	SUSPEND	Suspended Ind.	Suspended Req.	SUSPEND	Suspended Ind.	Notify Req.	NOTIFY	Notify Ind.
				(user)	(Note 1)		(user)		(user suspended)	(user suspended)	(user suspended)

Resume Req.	RES	Resume Ind.									
Resume Conf.	RES ACK	Resume Resp.	Resumed Req.	RESUME	Resumed Ind.	Resumed Req.	RESUME	Resumed Ind.	Notify Req.	NOTIFY	Notify Ind.
				(user)			(user)		(user resumed)	(user resumed)	(user resumed)

T1110550-88

Case 2: Unsuccessful Call Suspension

| Suspend Req. | SUSP | Suspend Ind. |
| Suspend Reject Ind. | SUSP REJ | Suspend Reject Req. |

Case 3: Unsuccessful Call Resumption

| Resume Req. | RES | Resume Ind. |
| Resume Reject Ind. | SUSP REJ | Resume Reject Req. |

(Notes are given in § 6.1.5)

FIGURE 31/Q.699

Suspend/resume interworking

User	NT2			Local exchange			Local exchange			NT2/User
OUTG. SS Q.931	INC. SS Q.931	CALL CONTROL	OUTG. SS Q.931	INC. SS Q.931	CALL CONTROL	OUTG. SS ISUP	INC. SS ISUP	CALL CONTROL	OUTG. SS Q.931	INC. SS Q.931

Suspend Req. — SUSP — Suspend Ind.

Suspend Conf. — SUSP ACK — Suspend Resp. — Notify Req. — NOTIFY — Notify Ind. — Suspended Req. — SUSPEND — Suspended Ind. — Notify Req. — NOTIFY — Notify Ind.

(user suspended) (user suspended) (user suspended) (user suspended) (user suspended) (user suspended)

(Note 1)

Resume Req. — RESUME — Resume Ind.

Resume Conf. — RES ACK — Resume Resp. — Notify Req. — NOTIFY — Notify Ind. — Resumed Req. — RESUME — Resumed Ind. — Notify Req. — NOTIFY — Notify Ind.

(user resumed) (user resumed) (user resumed) (user resumed) (user resumed) (user resumed)
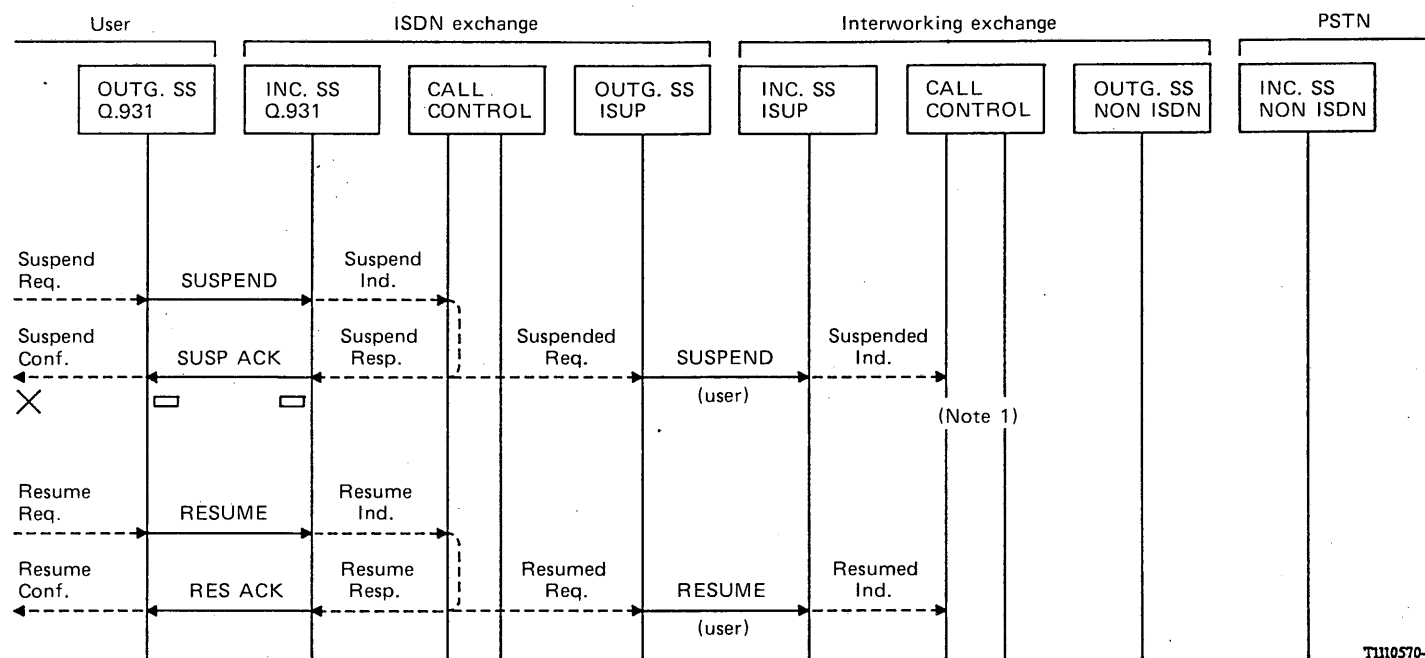
T1110561-88

(Notes are given in § 6.1.5)

FIGURE 32/Q.699

Suspend/resume interworking
Where the control point is located in the NT2

| User | ISDN exchange | | | Interworking exchange | | | PSTN |

| OUTG. SS Q.931 | INC. SS Q.931 | CALL CONTROL | OUTG. SS ISUP | INC. SS ISUP | CALL CONTROL | OUTG. SS NON ISDN | INC. SS NON ISDN |

Suspend Req.   SUSPEND   Suspend Ind.

Suspend Conf.   SUSP ACK   Suspend Resp.   Suspended Req.   SUSPEND   Suspended Ind.

(user)

(Note 1)

Resume Req.   RESUME   Resume Ind.

Resume Conf.   RES ACK   Resume Resp.   Resumed Req.   RESUME   Resumed Ind.

(user)

T1110570-88

(Notes are given in § 6.1.5)

FIGURE 33/Q.699

Suspend/Resume ISDN-PSTN interworking arrow diagram

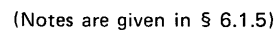(Notes are given in § 6.1.5)

FIGURE 34/Q.699

Suspend/Resume PSTN-ISDN interworking arrow diagram

6.2 Mapping of parameters

This section contains the mapping of Q.763/Q.931 messages and associated parameters.

TABLE 24/Q.699

Mapping of SUSPEND/RESUME parameters

	User/Network ─────────► Network ─────────► Network/User		
Message/information element parameter	SUSPEND	SUSPEND Suspend/Resume indicator (Note)	NOTIFY Notification indicator (set to user suspended)
	RESUME	RESUME Suspend/Resume indicator (Note)	NOTIFY Notification indicator (set to user resumed)

Note — The values of the SUSPEND/RESUME indicator in Q.763 are respectively "ISDN subscriber initiated" and "network initiated". This SUSPEND/RESUME message is only mapped into the Q.931 NOTIFY message when the SUSPEND/RESUME indicator is set to "ISDN subscriber initiated".

TABLE 25/Q.699

Mapping of SUSPEND/RESUME parameters for interworking with NT2

User/NT2	NT2/Network	Network	Network/NT2	NT2/User
SUSPEND	NOTIFY Notification indicator (user suspended) (Note 2)	SUSPEND SUSPEND/Resume indicator (Note 1)	NOTIFY Notification indicator (set to user suspended)	NOTIFY Notification indicator (set to user suspended)
RESUME	NOTIFY Notification indicator (user resumed) (Note 2)	RESUME Suspend/Resume indicator (Note 1)	NOTIFY Notification indicator (set to user resumed)	NOTIFY Notification indicator (set to user resumed)

Note 1 — The values of the SUSPEND/RESUME Indicator in Q.763 are respectively "ISDN subscriber initiated" and "network initiated". This SUSPEND/RESUME message is only mapped into the Q.931 NOTIFY message when the SUSPEND/RESUME Indicator is set to "ISDN subscriber initiated".

Note 2 — Only when the NOTIFY message indicates a SUSPEND/RESUME is this message mapped into the ISUP messages SUSPEND and RESUME.

ANNEX A

(to Recommendation Q.699)

Source of busy tone generation

A.1   Introduction

A.1.1   This annex provides a set of rules by which the location of the busy signal tone generation point could be determined for signalling interworking cases.

A.1.2   It is important to recognize that for those cases where a busy tone is generated at a location other than the originating exchange, an end-to-end path between the busy tone source and the user must exist.

A.2   Terminology

A.2.1   The terms originating exchange and terminating exchange refer to the public network exchange that is closest to the respective end user.

Note 1 — When an exchange of a public network has no appropriate pre-arrangement with the calling or the called user, it assumes that the exchange is closest to the end user, and therefore serves as an originating or a terminating exchange in this terminology.

Note 2 — Some networks may, as a network option, permit NT2s to generate busy tone (e.g. according to Annex C/Q.931 or Annex O/Q.931). In these cases, the following rules shall also be applied, using the terminology "NT2" to replace "originating exchange" or "terminating exchange" as appropriate.

A.2.2   There are three types of signalling to be considered in these discussions viz.:

i)   ISDN signalling systems, i.e. Signalling System No. 7 ISDN User Part (SS7 ISUP) and ISDN user-network interface;

ii)   Type 1 PSTN signalling systems which can convey a clearing message (e.g. a subscriber busy signal) for an unsuccessful call, e.g. SS7 TUP, SS6, R2; and

iii)   Type 2 PSTN signalling systems which cannot convey a clearing message (e.g. the subscriber busy signal) for an unsuccessful call, e.g. R1, and in this signalling system, busy tone is used to indicate that the called user interface is busy.

A.3   Rules

This section presents the set of rules for speech and 3.1 kHz audio bearer services.

A.3.1   Rule No. 1

For ISDN to ISDN connections, the in-band busy tones shall normally be generated at the originating exchange. The terminating exchange shall originate a clearing message to the originating exchange upon notification or identification that the user interface is busy.

A.3.2   Rule No. 2

For non-ISDN to ISDN connections, the in-band busy tone shall normally be generated at the interworking exchange. The terminating exchange shall originate a clearing message towards the originating exchange. The first exchange that cannot originate, or convey, the clearing message (or subscriber busy signal) towards the originating exchange shall be defined as the interworking exchange and shall generate the busy tone. This interworking exchange serves as an interworking exchange either between ISDN signalling system and Type 2 PSTN signalling system or between Type 1 PSTN signalling system and Type 2 PSTN signalling system. A network containing both the terminating and the interworking exchange shall have the option of providing the busy tone from anywhere inside its network.

For ISDN to non-ISDN connections, the in-band busy tone shall be generated at either the originating exchange or in the non-ISDN network. The source of busy will depend on the connection configuration and shall be determined uniquely by the following:

— For ISDN to non-ISDN connections:

    a)   in which ISDN signalling exists from the originating exchange to the terminating exchange, or

    b)   in which ISDN signalling and Type 1 signalling exists from the originating to the terminating exchange, then the in-band busy tone shall be generated at the originating exchange.

— For all other ISDN to non-ISDN connections, the in-band busy signal shall be generated in the non-ISDN network.

Note — In cases where special call handling, upon user busy, is offered, the exchange(s) other than specified by the above three rules can have the option of providing the busy tone and causing the appropriate message to be sent to the originator, and retain the connection for subsequent user requests.

ANNEX B

(to Recommendation Q.699)

Usage of "Cause" in Recommendations Q.931, Q.763 and Q.730

B.1   *Format*

Format of Q.931 Cause information element or Q.763/Q.730 Cause indicators parameters *contents* is shown in Figure B-1/Q.699.

8	7	6	5	4	3	2	1
0/1 Ext	Coding standard		0 Spare	Location			
1 Ext	Recommendation						
1 Ext	Cause value						
Diagnostic(s) (if any)							

Note — If the default applies for the Recommendation field, octet including this field shall be omitted.

FIGURE B-1/Q.699

Format of "Cause"

B.2   *Codes used in the sub-field of the "Cause"*

B.2.1   *Extension indicator (ext)*

Bit
8
—
0   octet continues through the next octet (e.g. octet 1 to 1a)
1   last octet

B.2.2   *Coding standard*

Bits
7 6

0 0	CCITT standardized coding, as described below
0 1	reserved for other international standards (Note)
1 0	national standard (Note)
1 1	standard specific to identified location (Note)

Note — These other coding standards should be used only when the desired cause can not be represented with the CCITT-standardized coding.

B.2.3   *Location*

Bits
4 3 2 1

0 0 0 0	user
0 0 0 1	private network serving the local user
0 0 1 0	public network serving the local user
0 0 1 1	transit network
0 1 0 0	public network serving the remote user
0 1 0 1	private network serving the remote user
0 1 1 1	international network
1 0 1 0	network beyond interworking point

All other values are reserved.

Note 1 — Depending on the location of the users, the local public network and remote public network may be the same network.

Note 2 — Examples of location values to be used for various busy/congestion conditions appear in Annex J to Recommendation Q.931.

B.2.4   *Recommendation*

Bits
7 6 5 4 3 2 1

0 0 0 0 0 0 0	Q.931/Q.763 (Note 2)
0 0 0 0 0 1 1	X.21
0 0 0 0 1 0 0	X.25
0 0 0 0 1 0 1	public land mobile networks, Q.1031/Q.1051 (Q.763)

All other values are reserved.

Note 1 — If octet including this field is omitted, Recommendation Q.931/Q.763 is assumed.

Note 2 — This value is used only when the preceding octet is extended and the cause in octet 4 is from Table B-1/Q.699.

B.2.5   *Cause value*

The cause value is divided into two fields, a class (bits 5 through 7) and a value within the class (bits 1 through 4).

(1) The class indicates the general nature of the event.

Class (000) : normal event
Class (001) : normal event
Class (010) : resource unavailable
Class (011) : service or option not available
Class (100) : service or option not implemented
Class (101) : invalid message (e.g. parameter out of range)
Class (110) : protocol error (e.g. unknown message)
Class (111) : interworking

(2) The cause values are listed in Table B-1/Q.699.

TABLE B-1/Q.699

Cause values

Cause value		Cause number	Cause	Recommendations
Class	Value			
7 6 5	4 3 2 1			
0 0 0	0 0 0 1	1	Unallocated (unassigned) number (Note 1)	Q.931, Q.763
0 0 0	0 0 1 0	2	No route to specified transit network	Q.931, Q.763
0 0 0	0 0 1 1	3	No route to destination	Q.931, Q.763
0 0 0	0 1 0 0	4	Send special information tone	Q.763
0 0 0	0 1 0 1	5	Misdialled trunk prefix	Q.763
0 0 0	0 1 1 0	6	Channel unacceptable	Q.931
0 0 0	0 1 1 1	7	Call awarded and being delivered in an established channel	Q.931
0 0 1	0 0 0 0	16	Normal call clearing	Q.931, Q.763
0 0 1	0 0 0 1	17	User busy	Q.931, Q.763
0 0 1	0 0 1 0	18	No user responding	Q.931, Q.763
0 0 1	0 0 1 1	19	No answer from user (user alerted)	Q.931, Q.763
0 0 1	0 1 0 1	21	Call rejected	Q.931, Q.763
0 0 1	0 1 1 0	22	Number changed	Q.931, Q.763
0 0 1	1 0 1 0	26	Non-selected user clearing	Q.931
0 0 1	1 0 1 1	27	Destination out of order	Q.931, Q.763
0 0 1	1 1 0 0	28	Invalid number format	Q.931, Q.763
0 0 1	1 1 0 1	29	Facility rejected	Q.931, Q.730
0 0 1	1 1 1 0	30	Response to STATUS ENQUIRY	Q.931
0 0 1	1 1 1 1	31	Normal, unspecified	Q.931, Q.763
0 1 0	0 0 1 0	34	No circuit/channel available	Q.931, Q.763
0 1 0	0 1 1 0	38	Network out of order	Q.931, Q.763
0 1 0	1 0 0 1	41	Temporary failure	Q.931, Q.763
0 1 0	1 0 1 0	42	Switching equipment congestion	Q.931, Q.763
0 1 0	1 0 1 1	43	Access information discarded	Q.931
0 1 0	1 1 0 0	44	Requested circuit/channel not available	Q.931, Q.763
0 1 0	1 1 1 1	47	Resources unavailable, unspecified	Q.931, Q.763
0 1 1	0 0 0 1	49	Quality of service unavailable	Q.931
0 1 1	0 0 1 0	50	Requested facility not subscribed	Q.931, Q.730
0 1 1	0 1 0 1	53	Outgoing calls barred within CUG	Q.730
0 1 1	0 1 1 1	55	Incoming calls barred within CUG	Q.730
0 1 1	1 0 0 1	57	Bearer capability not authorized	Q.931, Q.763
0 1 1	1 0 1 0	58	Bearer capability not presently available	Q.931, Q.763
0 1 1	1 1 1 0	62	Inconsistency in designated outgoing access information and subscriber class	Q.730
0 1 1	1 1 1 1	63	Service or option not available, unspecified	Q.931, Q.763

Cause value							Cause number	Cause	Recommendations
Class			Value						
7	6	5	4	3	2	1			
1	0	0	0	0	0	1	65	Bearer capability not implemented	Q.931, Q.763
1	0	0	0	0	1	0	66	Channel type not implemented	Q.931
1	0	0	0	1	0	1	69	Requested facility not implemented	Q.931, Q.730
1	0	0	0	1	1	0	70	Only restricted digital information bearer capability is available	Q.931, Q.763
1	0	0	1	1	1	1	79	Service or option not implemented, unspecified	Q.931, Q.763
1	0	1	0	0	0	1	81	Invalid call reference value	Q.931
1	0	1	0	0	1	0	82	Identified channel does not exist	Q.931
1	0	1	0	0	1	1	83	A suspended call exists, but this call identity does not	Q.931
1	0	1	0	1	0	0	84	Call identity in use	Q.931
1	0	1	0	1	0	1	85	No call suspended	Q.931
1	0	1	0	1	1	0	86	Call having the requested call identity has been cleared	Q.931
1	0	1	0	1	1	1	87	Called user not member of CUG	Q.730
1	0	1	1	0	0	0	88	Incompatible destination	Q.931, Q.763
1	0	1	1	0	1	0	90	Non-existent CUG	Q.730
1	0	1	1	0	1	1	91	Invalid transit network selection (Note 1)	Q.931, Q.763
1	0	1	1	1	1	1	95	Invalid message, unspecified	Q.931, Q.763
1	1	0	0	0	0	0	96	Mandatory information element is missing	Q.931
1	1	0	0	0	0	1	97	Message type non-existent or not implemented	Q.931, Q.763
1	1	0	0	0	1	0	98	Message not compatible with call state or message type non-existent or not implemented	Q.931
1	1	0	0	0	1	1	99	Information element non-existent or not implemented (Note 2)	Q.931, Q.763
1	1	0	0	1	0	0	100	Invalid information element contents	Q.931
1	1	0	0	1	0	1	101	Message not compatible with call state	Q.931
1	1	0	0	1	1	0	102	Recovery on timer expiry	Q.931
1	1	0	0	1	0	1	103	Parameter non-existent or not implemented — passed on	Q.763
1	1	0	1	1	1	0	110	Inconsistency in data	Q.730
1	1	0	1	1	1	1	111	Protocol error, unspecified	Q.931, Q.763
1	1	1	1	1	1	1	127	Interworking, unspecified	Q.931, Q.763

All other values are reserved.

Note 1 — In Recommendation Q.763, the words "(national use)" are added.

Note 2 — In Recommendation Q.763, the name of this cause value is "parameter non-existent or not implemented-discard". Further alignment of definition for this cause may be required.

TABLE B-2/Q.699

Cause	Diagnostic(s)	Recommendations
1	Condition (Note 1)	Q.931, Q.763
2	Transit Network identity	Q.931, Q.763
3	Condition (Note 1)	Q.931, Q.763
16	Condition (Note 1)	Q.931, Q.763
21	Condition (Note 1), User supplied diagnostics	Q.931, Q.763
22	New Destination [Q.931]/Called party number (new) [Q.763]	Q.931, Q.763
29	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
43	Discarded information element identifier(s)	Q.931
49	Condition (Note 2)	Q.931
50	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
57	Attribute identity (Note 2)	Q.931, Q.763
58	Attribute identity (Note 2)	Q.931, Q.763
65	Attribute identity (Note 2)	Q.931, Q.763
66	Channel type	Q.931
69	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
82	Channel identity	Q.931
86	Clearing cause	Q.931
88	Incompatible parameter [Q.931]	Q.931, Q.763
96	Information element identifier	Q.931
97	Message type	Q.931, Q.763
98·	Message type	Q.931
99	Information element identifier(s) [Q.931]/Parameter name(s) [Q.763]	Q.931, Q.763
100	Information element identifier(s)	Q.931
101	Message type	Q.931
·102	Timer number	Q.931
103	Parameter name(s)	Q.763

Note 1 — The following coding is used:

Bit 8:   1
Bits 7-3: 00000
Bits 2-1: Condition as follows:
        00 — Unknown
        01 — Permanent
        10 — Transient.

Note 2 — The format of the diagnostic field for causes number 57, 58 and 65 is as shown in Figure B-2/Q.699 and Table B-2a/Q.699 to B-2b/Q.699.

Note 3 — Description in [ ] indicates current difference in description among Recommendations Q.931 and Q.763. Further alignment may be required for those cause values, i.e., #22, #29, #50, #69 and #99.

8	7	6	5	4	3	2	1	
0/1 ext	Attribute number							Octet 5
0/1 ext	Rejected attribute							5a
1 ext	Available attribute							5b*

Note 1 — When diagnostics information is provided, octet 5 and 5a shall be present. Octet 5b is optional.

Note 2 — Octets 5-5b may be repeated to report multiple rejected attributes.

FIGURE B-2/Q.699

Coding of the diagnostic field for causes number 57, 58 and 65

TABLE B-2a/Q.699

Coding of the diagnostic field for causes number 57, 58 and 65

Attribute number (octet 5)

Bits 7 6 5 4 3 2 1	No.	
0 1 1 0 0 0 1	1	Information transfer capability
0 1 1 0 0 1 0	2	Information transfer mode
0 1 1 0 0 1 1	3	Information transfer rate
0 1 1 0 1 0 0	4	Structure
0 1 1 0 1 0 1	5	Configuration
0 1 1 0 1 1 0	6	Establishment
0 1 1 0 1 1 1	7	Symmetry
0 1 1 1 0 0 0	8	Information transfer rate (dest. → orig.)
0 1 1 1 0 0 1	9	Layer identification

Coding of the diagnostic field for causes number 57, 58 and 65

Rejected attribute (octet 5a)

Attribute No.

1. *Information transfer capability:*

   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 3.

2. *Information transfer mode:*

   Bits 7-6 according to Table 4-6, octet 4.
   Bits 5-1 : 00000

3. *Information transfer rate:*

   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 4.

4. *Structure:*

   Bits 7-5 according to Table 4-6, octet 4a.
   Bits 4-1 : 0000

5. *Configuration:*

   Bits 7-5 : 000
   Bits 4-3 according to Table 4-6, octet 4a.
   Bits 2-1 : 00

6. *Establishment:*

   Bits 7-3 : 00000
   Bits 2-1 according to Table 4-6, octet 4a.

7. *Symmetry:*

   Bits 7-6 according to Table 4-6, octet 4b.
   Bits 5-1 : 00000

8. *Information transfer rate (dest. → orig.):*

   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 4b.

9. *Layer identification:*

   Bits
   7 6

   0 1 (layer 1)   Bits 5-1 according to Table 4-6, octet 5.
   1 0 (layer 2)   Bits 5-1 according to Table 4-6, octet 6.
   1 1 (layer 3)   Bits 5-1 according to Table 4-6, octet 7.

Available attributes (octet 5b)

The same coding as octet 5a.

Note — Table 4-6 referred to above is found in Recommendation Q.931. The relevant description is found in § 3.36 of Recommendation Q.763.