5i’

ANNEX B
(to Recommendation T.70)

B.1 *State tables*

The state tables:

B-1/T.70: Transport connection establishment, calling side

B-2/T.70: Transport connection establishment, called side

B-3/T.70: Data phase (symmetrical protocol)

present the transitions of the transport protocol in a table form in contrast to the diagram form to be seen in Annex A. While the diagrams are useful to overview the protocol mechanism the appropriate tables give clear information of which event is possible in which state and which actions are to be performed. Moreover each of the events and conditions is combined with a shortening in brackets (e.g.: E 5) which is a pointer to the 2nd part of this annex, so that the reader of these tables can easily come to know which meaning a certain event, action or condition has.

An impossible event related to a certain state can be recognized by an empty field in the crossing-point of the state and the event.

B.2 *Lists of events, actions and conditions*

The lists of events (Table B-4/T.70), actions (Table B-5/T.70) and conditions (Table B-6/T.70) intend to care for detailed explanations and clarification related to the protocol components (events, actions and conditions) found in the diagrams and tables.

All the components in the tables are accompanied by a list number (e.g. E 1, A 10, C 3, etc.) which can be interpreted as a pointer to the corresponding additional information in the lists. The letters E, A, C of the list numbers stand for Event, Action, Condition.

The following abbreviations are used:

EM End Mark

LI Length Indicator of the transport block (octet 1)

loc. local

NC Network Connection

NS Network Service

NSDU Network Service Data Unit

PLI Parameter Length Indicator

TC Transport Connection

TP Transport Protocol

TPDU Transport Protocol Data Unit

TS Transport Service

TSDU Transport Service Data Unit

AND, OR and NOT (used mainly in E 5) shall be considered as the known Boolean operators.

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**H.T. [T3.70]**

TABLE B-1/T.70
{
**State table for calling side**
}

| | | | | |
|---|---|---|---|---|
| { | | | | |

**TABLEAU B-1/T.70 [T3.70] (a l'italienne), p.**

**H.T. [T4.70]**

TABLE B-2/T.70
{
**State table for called side**
}

| | | | | |
|---|---|---|---|---|
| { | | | | |

**TABLEAU B-2/T.70 [T4.70] (à l'italienne), p.**

**H.T. [1T5.70]**

TABLE B-3/T.70

**Data phase (symmetrical protocol)**

| | |
|---|---|
| State Event Data phase 2.1 | |

**TABLEAU B-3/T.70 [1T5.70], p.**

**H.T. [1T6.70]**
TABLE B-4/T.70
**List of events**

| No. | Name | Type | Description |
|---|---|---|---|
| E 1<br>Layer 4 receives via the NS N-DATA indication a TPDU including the transport block TCR.<br>} | R-TCR | TP | { |
| E 2<br>Layer 4 receives via the NS N-DATA indication a TPDU including the transport block TCC.<br>} | R-TCC | TP | { |
| E 3<br>Layer 4 receives via the NS N-DATA indication a TPDU including the transport block TCA.<br>} | R-TCA | TP | { |
| E 4<br>Layer 4 receives via the NS N-DATA indication a TPDU including the transport block TBR.<br>} | R-TBR | TP | { |
| E 5<br>Layer 4 receives via the NS N-DATA indication a TPDU whose validity check fails due to following reasons:<br>— syntactical errors<br>— procedure errors<br>} | R-invalid TPDU | TP | { |

{
1. *Invalid TPDUs due to syntactical errors*
}
{
1.1
TCR:
1.1.1
The value of octet 1 (LI):
1.1.1.1
≠ the number of the TCR block octets minus 1
OR
1.1.1.2
is greater than 127
OR
1.1.1.3
is smaller than 6
OR
1.1.2
see 1.6
}
{
1.2
TCA:
1.2.1
The value of octet 1 (LI):
1.2.1.1
≠ the number of the TCA block octets minus 1
OR
1.2.1.2
is greater than 127
OR
1.2.1.3
is smaller than 6
OR
1.2.2
see 1.6
OR
1.2.3
The value of octet 3 (4 resp.) ≠ octet 5 (6 resp.) of

the
appropriate TCR block
OR
1.2.4
The value of octet 7 ≠ 0
OR
1.2.5
The parameter ‘‘Transport Data Block Size’’ is present:
1.2.5.1
AND its value ≠ 07 (hexadecimal), in response to a TCR
block without the transport data block size parameter
OR
1.2.5.2
AND its value does not respond to the rules
according to
§ 5.2.3.2 of Recommendation T.70
OR
1.2.5.3
AND its value is different from the values
(hexadecimal):
07, 08, 09, 0A, 0B
OR
1.2.5.4
AND the PLI > 1
OR
1.2.6
LI ≠ 6 + 2N + $\sum_{i=1}^{f\,IN}$ PLI
where N is the number of parameters
}
{
1.3
TCC:
1.3.1
The value of the LI (octet 1):
1.3.1.1
≠ the number of the TCC block octets minus 1
OR
1.3.1.2
is greater than 127
OR
1.3.1.3
is smaller than 6
OR
1.3.2
see 1.6
OR
1.3.3
The value of octet 3 (4 resp.) ≠ octet 5 (6 resp.) of
the
appropriate TCR block
OR
1.3.4
LI ≠ 6 + 2N + $\sum_{i=1}^{f\,IN}$ PLI
where N is the number of parameters
}
{
1.4
TBR: (also see § 5.4.1, Note 1)

| | | | |
|---|---|---|---|
| 1.4.1<br>The value of the LI:<br>1.4.1.1<br>≠ the number of the TBR block octets minus 1<br>OR<br>1.4.1.2<br>is greater than 127<br>OR<br>1.4.1.3<br>is smaller than 7<br>OR<br>1.4.2<br>see 1.6<br>OR<br>} | | | |
| | *(continued)* | | |

**TABLEAU B-4/T.70 [1T6.70], p.**

**H.T. [2T6.70]**
TABLE B-4/T.70 *(cont.)*

| No. | Name | Type | Description |
|---|---|---|---|
| E 5<br>R-invalid TPDU *(cont.)*<br>} | { | | |
| 1.4.3<br>The value of octet 3 (4 resp.) ≠ octet 5 (6 resp.) of the appropriate TC establishment block (TCR resp. TCA) received from the peer entity<br>OR<br>} | TP | { | |

{
1.4.4
The value of LI minus 6 ≠ value of the PLI
OR
1.4.5
The Rejected block parameter is not present
}
{
1.5
TDT:
1.5.1
The value of the LI ≠ 2
OR
1.5.2
The TSDU end mark is 0 AND the information field is empty
OR
1.5.3
The TDT block size is larger than negotiated in the establishment phase
}
{
1.6
No identified block:
The value of the TPDU octet 2 is not equal to one of the following values (hexadecimal): EX, DO, 80, 70, FO.
X may be in the range of 0 X F.
}
{
2. *Invalid TPDUs due to procedure errors*
}
{
Failure cases:
2.1
After S-TCR:
2.1.1
NOT R-TCA
OR
2.1.2
NOT R-TCC
OR
2.1.3
NOT R-TBR
OR
2.2
After S-TCA:
2.2.1
NOT R-TDT
OR
2.2.2
NOT R-TBR
OR

| | | | |
|---|---|---|---|
| 2.3<br>After S-TDT:<br>2.3.1<br>Not R-TDT<br>OR<br>2.3.2<br>Not R-TBR<br>OR<br>2.4<br>After S-TCC: NOT R-TCR<br>OR<br>2.5<br>After S-TBR: NOT R-TDT (in state 2.1)<br>OR<br>2.6<br>After R-TDT (EM = 1): R-empty TDT (EM = 1)<br>OR<br>2.7<br>After R-empty (EM = 1): R-empty TDT (EM = 1)<br>OR<br>2.8<br>After N-CONNECT response: NOT R-TCR<br>} | | | |
| E 6<br>Layer 5 requests a TC from layer 4.<br>} | T-CONNECT request | TS | { |
| E 7<br>Affirmative answer to N-CONNECT request (A 10); a NC is existing now.<br>} | N-CONNECT confirm | NS | { |
| E 8<br>Report from layer 3 to layer 4 that the NC is not existing (any more).<br>} | N-DISCONNECT indication | NS | { |
| E 9<br>Indication to layer 4 that an error has occurred in layer 1, 2 or 3, possibly with data loss. The NC is kept existing.<br>} | N-RESET indication | NS | { |
| E 10<br>Layer 5 requests a TC clearing from layer 4.<br>} | T-DISCONNECT request | TS | { |
| E 11<br>The timer presently surveying a state reached its limit. Following value ranges are defined:<br>}<br>Values | TIMEOUT | loc. | { |

| States | Calling side | Called side |
|---|---|---|
| 0.2 | not applicable | 45 s ± 30 s |
| 0.3 | 6 s ± 4 s | 6 s ± 4 s |
| 1.1 | 45 s ± 30 s | not applicable |

**TABLEAU B-4/T.70 [2T6.70] (suite), p.**

**H.T. [3T6.70]**

TABLE B-4/T.70 *(end)*

| No. | Name | Type | Description |
|---|---|---|---|
| E 12<br>Indication to layer 4 by the layer 3 that an NC is being established; the answer to this is N-CONNECT response (A 22) or N-DISCONNECT request (A 4).<br>} | N-CONNECT indication | NS | { |
| E 13<br>Affirmative answer by the layer 5 to T-CONNECT indication (A 15).<br>} | T-CONNECT response | TS | { |
| E 14<br>Layer 4 receives via the NS N-DATA indication, an NSDU including the transport block TDT.<br>} | R-TDT | TP | { |
| E 15<br>Layer 5 requests the transmission of data. Whether this is a complete TSDU or not, is a local matter, and not subject of this definition.<br>} | T-DATA request | TS | { |
| E 16<br>Layer 4 is ready to send the next TDT block.<br>} | TSDU part(s) outstanding | loc. | { |

**TABLEAU B-4/T.70 [3T6.70] (fin), p.**

**H.T. [T7.70]**
TABLE B-5/T.70
**List of actions**

| No. | Name | Type | Description |
|---|---|---|---|
| A 1<br>Timer T1.1 surveying the state 1.1 is stopped.<br>} | STOP Timer T1.1 | loc. | { |
| A 2<br>Timer T0.3 surveying the state 0.3 is started after having been reset.<br>} | START Timer T0.3 | loc. | { |
| A 3<br>Via the NS N-DATA request a NSDU including the transport block TBR is sent to the peer entity.<br>} | S-TBR | TP | { |
| A 4<br>Layer 4 requests the layer 3 to release the offered or existing NC.<br>} | N-DISCONNECT request | NS | { |
| A 5<br>Layer 5 is informed by the layer 4 that the TC being established or existing is cleared.<br>} | T-DISCONNECT indication | TS | { |
| A 6<br>Timer T1.1 surveying the state 1.1 is reset and started again. Moreover, it is necessary either to limit the number of T1.1-restarts or to limit the sum of all the times of T1.1; otherwise, an infinite loop S-TCR — R-TCC — S-TCR — etc., would be allowed.<br>} | RESTART T1.1 | loc. | { |
| A 7<br>Via the NS N-DATA request a NSDU including the transport block TCR is sent to the peer entity.<br>} | S-TCR | TP | { |
| A 8<br>Affirmative answer to the event T-CONNECT request (E 6) indicating that the data phase of the TC has been entered.<br>} | T-CONNECT confirm | TS | { |
| A 9<br>Timer T0.2 surveying the state 0.2 is started after having been reset.<br>} | START T0.2 | loc. | { |
| A 10<br>Layer 4 requests the layer 3 for an NC to be established.<br>} | N-CONNECT request | NS | { |
| A 11<br>Timer T0.2 surveying the state 0.2 is stopped.<br>} | STOP T0.2 | loc. | { |
| A 12<br>Timer T1.1 surveying the state 1.1 is started after having been reset.<br>} | START T1.1 | loc. | { |
| A 13<br>Timer T0.3 surveying the state 0.3 is stopped.<br>} | STOP T0.3 | loc. | { |
| A 14<br>Any data received by N-DATA indication are discared. The transmission of further data is stopped.<br>} | DISCARD any R-TPDU | TS | { |
| A 15<br>Layer 4 indicates a request for a TC-establishment to the layer 5.<br>} | T-CONNECT indication | TS | { |
| A 16<br>Timer T0.2 surveying the state 0.2 is reset and started again.<br>} | RESTART T0.2 | loc. | { |
| A 17<br>Via the NS N-DATA request, an NSDU including the transport block TCC is | S-TCC | TP | { |

| | | | |
|---|---|---|---|
| sent to the peer entity.<br>} | | | |
| A 18<br>Layer 4 indicates the receipt of a complete TSDU to the layer 5. How and when the contents are transferred is a local matter, and therefore, not shown here.<br>} | T-DATA indication | TS | { |
| A 19<br>Layer 5 is informed of an error which occurred between the layer 1 and layer 4, possibly with data loss; the TC is kept existing. Due to this error it is possible that the following TSDU transferred to the layer 5 contains errors or deficiencies.<br>} | T-EXCEPTION indication | TS | { |
| A 20<br>A TPDU with TSDU end mark set to 0 is sent to the peer entity and further parts of the TSDU will follow (i.e., segmenting occurs).<br>} | S-TDT (EM=0) | TP | { |
| A 21<br>See A 20, but the TSDU end mark is set to 1 (i.e., this TPDU contains a complete TSDU or the last part of a TSDU).<br>} | S-TDT (EM=1) | TP | { |
| A 22<br>Affirmative answer to N-CONNECT indication (E 12).<br>} | N-CONNECT response | NS | { |
| A 23<br>The called side sends a TBR block to the calling side in order to point to a received failured TPDU. In this case the destination reference can be set to 0.<br>} | S-TBR | TP | { |
| A 24<br>Via the NS N-DATA request an NSDU including the transport block TCA is sent to the peer entity.<br>} | S-TCA | TP | { |

**TABLEAU B-5/T.70 [T7.70], p.**

**H.T. [T8.70]**

TABLE B-6/T.70

**List of conditions**

| No. | Name | Description |
|---|---|---|
| C 1<br>The TC establishment is tried once more.<br>} | Retry | { |
| C 2 | No retry | NOT C 1 |
| C 3<br>The TC offered by the peer entity is accepted by the layer 4 due to local circumstances.<br>} | TC acceptable | { |
| C 4 | TC not acceptable | NOT C 3 |
| C 5<br>The NC offered by the layer 3 is accepted by the layer 4 due to local circumstances.<br>} | NC acceptable | { |
| C 6 | NC not acceptable | NOT C 5 |
| C 7<br>TSDU end mark of the TDT block is 0<br>} | EM = 0 | { |
| C 8<br>TSDU end mark of the TDT block is 1<br>} | EM = 1 | { |
| C 9<br>The terminal provides the TS T-EXCEPTION indication<br>} | Recovery | { |
| C 10 | No recovery | NOT C 9 |
| C 11<br>The TSDU received from layer 5 is longer than the negotiated TDT block size and has, therefore, to be segmented and consequently, to be reassembled on the receiver side.<br>} | Segmentation | { |
| C 12 | No segmentation | NOT C 11 |

**TABLEAU B-6/T.70 [T8.70], p.**

ANNEX C
(to Recommendation T.70)

**Recommendations for implementation of Recommendation X.21**

C.1 *General*

This Annex deals with recommended actions to be taken by a telematic DTE in relation to the receipt of call progress (CP) signals from the network and in relation to the handling of optional user facilities. The adherence to these recommendations is not mandatory in order to conform to Recommendation T.70 but may be of importance for the performance of the DTE.

Telematic terminals are in general assumed to make automatic repeated call attempts and sequential automatic calls to a number of addresses for which the following actions apply.

C.2 *Receipt of call progress signals 01 or 04*

When one of the CPS 01 or 04 is received the DTE should use the timer T3B and wait up to 60s for the completion of the call.

C.3 *Receipt of call progress signal 03*

The DTE should use either timer T3A or T3B in this case, depending on the time the DTE is prepared to wait for the completion of the call. Observe that the queuing time is charged as communication time in some networks.

C.4 *Receipt of call progress signals of the group 2 to 8*

See Table C-1/T.70.

**H.T. [T9.70]**

TABLE C-1/T.70

| Code group/Code<br>Delay between series of reattempts (s)<br>} | Delay for reattempts (s) | Number of reattempts | { |
|---|---|---|---|
| 2, 6 | ≥" 5 | 7 | ≥" 60 |
| 41, 42, 43, 48 5, 8<br>Reattempts are not recommended<br>} | ≥" 5 | 1 | { |
| 44, 45, 46, 47, 49 7 | ≥" 5 | 1 | ≥" 600 |

**Tableau C-1/T.70 [T9.70], p.**

*Note* — Some networks charge for call attempts, when the call is unsuccessful due to the condition of the called DTE. Examples of such situations are the receipt of the call progress signals 21 (busy) and 45 (controlled not ready).

ANNEX D
(to Recommendation T.70)

**Service definitions and state transition diagrams**

**for the HDLC procedure**
**and the network layer defined for CSPDN**

D.1 *Service definitions*

D.1.1 *Physical service used by HDLC*

**Figure D-1/T.70, p.**

D.1.2 *Data link service (HDLC)*

D.1.2.1 *Data link connection establishment*

**Figures D-2/T.70 et D-3, p.**

D.1.2.2 *Data link transfer phase*

**Figure D-4/T.70, p.**

D.1.2.3 *Data link release*

**Figures D-5/T.70, et D-6 p.**

D.1.2.4 *Data link resetting*

**Figures D-7/T.70 à D-10, p.**

## D.2 *State transition diagrams HDLC*

### D.2.1 *The relation between the diagrams*

The following diagrams describe the HDLC procedure as one functional unit. The first page comprises the whole protocol and the following page gives the details to specific states.

### D.2.2 *Abbreviations*

ABM Asynchronous balanced mode

ADM Asynchronous disconnected mode

R:xxx Receive xxx (command or response)

R:Cxxx Receive a command

R:Rxxx Receive a response

S:xxx Send xxx

F Final bit

P Poll bit

XXX Not this condition

RC Redrive counter

RCB Redrive counter busy

IC I-Frame counter

$V_{u\backslash du}$ Variable for sequence updating

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**Figure D-11/T.70, p.**

**Figure D-12/T.70, p.**

**Figure D-13/T.70, p.**

**Figure D-14/T.70, p.**

**Figure D-15/T.70, p.**

**Figure D-16/T.70, p.**

D.3 *Summary of frame definitions*

D.3.1 *Invalid frame*

— frames not properly bounded by flags;

— frames containing addresses other than A or B;

— frames with frame check sequence (FCS) error;

— frames containing less than 32 bits between blags.

D.3.2 *Valid frames*

D.3.2.1 *Not expected frames*

NEF, not expected frames (for the receiver) which lead to a frame reject condition (excluding frames with a FRMR control field):

— a command or response control field that is undefined or not implemented; Type W — a frame with an information field which is not permitted or supervisory or unnumbered frame with incorrect length; Type X — an I-frame with an information field which exceeds the maximum established length; Type Y — a frame with an invalid N (R). Type Z

D.3.2.2 *Expected frames*

— frames which must lead to a reaction (in accordance to the Recommendation) by the receiving station;

— frames which must be ignored only in determined states by the receiving station.

D.4 *X.21 service, controlled by the network layer*

D.4.1 *X.21 connection establishment*

**Figure D-17/T.70 et D-18, p.**

D.4.2 *X.21 connection release*

**Figures D-19/T.70 et D-20, p.**

**Figure D-21/T.70, p.**

**Figure D-22/T.70, p.31**

**H.T. [T10.70]**

TABLE D-1/T.70

**Application rules regarding the network protocol data unit (NPDU)**

| Conditions ↓ | Combination of conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i |
| C1 | Transmit/receive | T | T | T | T | T | R | R | R | R |
| C2 | NPDU length (octet) | > 2 | > 2 | > 2 | > 2 | < 3 | > 2 | > 2 | > 2 | < 3 |
| C3 | 1st octet 01/<> | 01 | 01 | 01 | <> | * | 01 | 01 | <> | * |
| C4 | 2nd octet bits 1 to 7 | 0 | 0 | <> | * | * | * | * | * | * |
| C5 | 2nd octet bit 8 (M-bit) | 0 | 1 | * | * | * | 0 | 1 | * | * |

**Tableau D-1/T.70 [T10.70], p.32**

**Recommendation T.71**

## LINK ACCESS PROTOCOL BALANCED (LAPB)

## EXTENDED FOR HALF-DUPLEX PHYSICAL LEVEL FACILITY

*(Malaga-Torremolinos, 1984; amended at Melbourne, 1988)*

The CCITT,

*considering*

(a) that the Teletex service will be introduced in different types of networks, i.e. circuit switched public data networks (CSPDN), packet switched public data networks (PSPDN) and public switched telephone networks (PSTN);

(b) that depending on the service provided by the physical level, the link level procedures may have to cater for a half-duplex transmission facility;

(c) that some Administrations are considering the provision of a Teletex service with a half-duplex transmission facility on the PSTN;

(d) that modems according to Recommendation V.26 | fIbis are suitable for half-duplex transmission at 2400 bit/s on PSNTs,

*unanimously declares*

that this Recommendation defines the link level procedure using LAPB extended for half-duplex physical level service.

### 1 Introduction

#### 1.1 *General*

1.1.1 Figure 1/T.71 shows the half-duplex transmission module (HDTM) for extending the use of LAPB for operation of Teletex terminals connected to the PSTN where use of half-duplex 2400 bit/s modems is planned. This is referred to in Recommendation T.70 as LAPX.

**Figure 1/T.71 p.**

1.1.2 Before the HDTM begins operation the physical circuit must be established by the appropriate PSTN call control procedures. The operation of the HDTM is such that the calling DTE will initially have the right to transmit. For the link addressing conventions refer to Recommendation T.70.

## 1.2 *Architecture*

### 1.2.1 *Level relationships*

It is an objective to avoid modification of the definition of LAPB in order to adapt it for half-duplex operation. However, there is a functional requirement that the HDTM inhibit LAPB from sending frames during certain phases of the half-duplex procedure. The means of accomplishing this functional requirement is not defined.

The logical relationships between LAPB, the HDTM and the physical level are as shown in Figure 2/T.71.

**Figure 2/T.71 p.**

### 1.2.2 *Control (C) and status (S) functions*

The following logical functions are defined to describe the interactions between LAPB and the HDTM:

Control <TERM>

— Revert to the HDTM idle state since LAPB has entered the disconnected phase (equivalent to ADM of HDLC).

Status <OP-T>

— LAPB is enabled to send frames.

Status <INOP-T>

— LAPB is inhibited from sending frames.

## 2 State diagram and descriptions

### 2.1 *State diagram*

The state diagram shown in Figure 3/T.71 describes the procedure for controlling the right to transmit. The number in each ellipse is the state reference number.

**Figure 3/T.71 p.**

2.2 *State definitions*

2.2.1 *Idle state (state 0)*

The DTE is in an inactive state. This is the initial state prior to call establishment and the final state after call termination.

2.2.2 *Half-duplex sending state (state 1)*

The DTE is in a half-duplex sending state, so that all signals generated by LAPB are passed to the physical level.

2.2.3 *Wait for receiving state (state 2)*

The DTE is awaiting indication that the remote DTE has entered the half-duplex sending state. No signals generated by LAPB are passed to the physical level.

2.2.4 *Half-duplex receiving state (state 3)*

The DTE is in a half-duplex receiving state, so that no signals generated by LAPB are passed to the physical level. The remote DTE is considered to be in the half-duplex sending state.

2.2.5 *Wait for sending state (state 4)*

The DTE is awaiting indication of the availability of the physical level for transmission of frames to the remote DTE. All signals generated by LAPB are passed to the physical level, but LAPB is inhibited from sending frames.

2.3 *Table of transitions between states*

Table 1/T.71 shows the events that cause transitions from one state to another, along with any resulting actions. This shows a generalized description of the operation of the HDTM.

2.4 *State definitions expressed in terms applicable to a modem interface*

The following definitions apply to the use of the HDTM with the V.26 | fIbis modem interface, as an example.

2.4.1 *Idle state (state 0)*

Circuit 107 is OFF.

2.4.2 *Half-duplex sending state (state 1)*

Circuit 105, circuit 106 and circuit 107 are ON. LAPB is connected to circuit 103 and enabled to send frames.

2.4.3 *Wait for receiving state (state 2)*

Circuit 107 is ON, circuit 105 is OFF. LAPB is inhibited from sending frames and disconnected from circuit 103, which is held in the binary 1 condition. Timer T is running.

2.4.4 *Half-duplex receiving state (state 3)*

Circuit 107 is ON, circuit 105 is OFF. LAPB is inhibited from sending frames and disconnected from circuit 103, which is held in the binary 1 condition.

2.4.5 *Wait for sending state (state 4)*

Circuit 105 and circuit 107 are ON, and circuit 106 is OFF. LAPB is connected to circuit 103 but is inhibited from sending frames.

2.5 *Table of transitions between states expressed in terms applicable to a modem interface*

Table 2/T.71 shows, in terms of the V.26 | fIbis modem interface, the events that cause a state transition and the resulting action(s).

2.6 *Timer T*

This timer is used to recover from an apparent failure of the remote DTE to take the right to transmit. To avoid a contention condition during this recovery process, different values of timer T are to be used by the called and calling DTE. A calling DTE uses the value $T_a$, and a called DTE uses the value $T_b$.

The values of $T_a$ and $T_b$ are system parameters and must be studied further in relationship to interworking requirements and other system parameters in Recommendation T.70.

**H.T. [T1.71]**

TABLE 1/T.71

**Description of state transitions**

| Present state | Event | Action | New state |
|---|---|---|---|
| 0<br>Calling DTE: Data circuit established (e.g. data set ready, ready for data)<br>} | {<br><br><br>> | <br><br><br>4 | |
| 0<br>Called DTE: Data circuit established (e.g. data set ready, ready for data)<br>} | {<br><br><br>Start timer T | <br><br><br>2 | |
| 4<br>Indication of availability of the physical level for transmission<br>}<br>Send indication to the remote DTE that the half-duplex sending state has been entered<br>Status <OP-T><br>(see Note 1)<br>} | {<br><br>{<br><br><br><br><br>1 | | |
| 1<br>Send request that remote DTE enter the half-duplex sending state<br>(see Note 4)<br>Start timer T<br>Status <INOP-T><br>(see Note 2)<br>} | Conclusion of transmission<br><br><br><br><br><br>2 | {<br><br><br><br><br><br> | |
| 2<br>Reception of indication that the remote DTE has entered the half-duplex sending state<br>} | {<br><br><br>Stop timer T | <br><br><br>3 | |
| 2 | Expiry of timer T | > | 4 |
| 3<br>Reception of notification that the remote DTE is requesting a change in the direction of transmission<br>} | {<br><br><br>> | <br><br><br>4 | |
| 1<br>LAPB has entered a disconnected phase<br>(i.e. Conrol <TERM>, see Note 3)<br>} | {<br><br><br>> | <br><br><br>0 | |
| 3<br>LAPB has entered a disconnected phase<br>(i.e. Conrol <TERM>, see Note 3)<br>} | {<br><br><br>> | <br><br><br>0 | |
| Any<br>Physical level has no circuit to a remote DTE<br>} | {<br><br>> | <br><br>0 | |

*Note 1* — Status <OP-T> indicates to LAPB that the sending of frames is enabled.

*Note 2* — Status <INOP-T> indicates to LAPB that the sending of frames is inhibited.

*Note 3* — Control <TERM> indicates that LPAB has entered the disconnected phase (equivalent to ADM of HDLC).

*Note 4* — HDTM uses the idle data link channel state indication (at least 15 contiguous 1's) for requesting that the remote DTE enter the half-duplex sending state.

**Tableau 1/T.71 [T1.71] + Notes, p.36**

**H.T. [T2.71]**

TABLE 2/T.71

**Description of state transitions in terms of the V.26**

**| fIbis**

**modem interface**

| Present state | Event | Action | New state |
|---|---|---|---|
| 0<br>Turn circuit 105 0N<br>Connect LAPB to circuit 103<br>} | Calling DTE: Circuit 107 ON<br><br><br>4 | { | |
| 0 | Called DTE: Circuit 107 ON | Start timer T | 2 |
| 4<br>Enable sending of LAPB frames<br>(see Note 1)<br>} | Circuit 106 ON<br><br><br>1 | { | |
| 1<br>Transmission concluded (see Note 2)<br>}<br>Inhibit sending of LAPB frames<br>Disconnect LAPB from circuit 103<br>Hold circuit 103 in the binary 1 condition<br>Turn circuit 105 OFF (see Note 3)<br>Start timer T<br>} | {<br><br>{<br><br><br><br><br><br>2 | | |
| 2 | Reception of a flag | Stop timer T | 3 |
| 2<br>Turn circuit 105 ON<br>Release circuit 103 from binary 1 condition<br>Connect LAPB to circuit 103<br>} | Expiry of timer T<br><br><br><br>4 | { | |
| 3<br>Reception of 15 contiguous 1 bits (see Notes 4 and 5)<br>}<br>Turn circuit 105 ON<br>Release circuit 103 from binary 1 condition<br>Connect LAPB to circuit 103<br>} | {<br><br>{<br><br><br><br>4 | | |
| 1<br>LAPB has entered a disconnected phase<br>} | {<br><br>Turn circuit 105 0FF | <br><br>0 | |
| 3<br>LAPB has entered a disconnected phase<br>} | {<br><br>> | <br><br>0 | |
| Any | Circuit 107 OFF | Turn circuit 105 OFF | 0 |

*Note 1* — It is necessary to ensure that at least one full flag is transmitted after circuit 106 comes ON. This flag may be the opening flag of the first frame.

*Note 2* — The HDTM may determine that a transmission by the LAPB module has been concluded by either of the following:

— counting a sequence of contiguous flags on circuit 103 while in state 1, — a time-out, T, — a signal from another source, e.g., from a higher level.

However, if no frame is transmitted while in state 1, not less than five contiguous flags shall be sent in state 1 before entry into state 2.

*Note 3* — It is recommended that circuit 105 not be turned OFF until 15 bit times after the binary 1 condition is established on circuit 103. This will assure transmission of an idle sequence to the remote DTE.

*Note 4* — It is recognized that whether or not an idle sequence is sent by the remote DTE, the DTE will detect an idle sequence after circuit 109 goes OFF, since according to Recommendation V.26 | fIbis , this will hold circuit 104 in the binary 1 condition.

*Note 5* — It is understood that circuit 109 will go OFF. Entry into state 4 may be made dependent on this OFF condition, as an implementation option.

**Tableau 2/T.71 [T2.71] + Notes, p.37**

ANNEX A
(to Recommendation T.71)

**Additional rules making for greater efficiency in half-duplex transmission**

A.1 *General considerations*

— Greater efficiency is obtained in recovery situations.

— The application of these rules is optional.

— The application of these rules does not imply any incompatibility or entail any amendment of DTEs (or DCEs) which observe the procedures described in Recommendation T.71.

A.2 *Rules of operation*

1) Before the DTE (or DCE) gives the turn back , it ensures that it has acknowledged all the frames received and accepted before it received the turn.

2) If the DTE (or DCE) receives or takes the turn, it will always first retransmit all the I-frames which have not been acknowledged.

3) The DTE (or DCE) must replace the last RR frame in each turn, if any, by an REJ frame carrying the appropriate N(R).

**MONTAGE: RECOMMANDATION T.90 SUR LE RESTE DE CETTE PAGE**