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**Interworking between the PLMN and the PSPDN for PAD Access**

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**No changes since the previously distributed version.**



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## 0. SCOPE

The purpose of this Recommendation is to identify the interworking functions and requirements to support interworking between PLMN and PSPDN for PAD access.

Rec GSM 09.05 applies to PAD access in order to provide communications with host systems connected to PSPDN for MSs.

Within this Recommendation, the requirements for existing or dedicated PAD are considered separately. In each case, the general problem of charging is examined.

This Recommendation considers only the access by a MS to a PAD and not the reverse access.

## 1. REFERENCES

Bearer Services	Rec GSM 02.02
Charging Aspect	Rec GSM 02.20
Connection type	Rec GSM 03.10
Signalling interworking	Rec GSM 09.03
Numbering	Rec GSM 03.03
Rate adaptation	Rec GSM 04.21 and 08.20
Terminal Adaptation Function	Rec GSM 07.02

ENV 41901 ( date 06 1987 ) :

Information Systems Interconnexion : X.29-mode procedures between a packet mode DTE or a PAD and a PAD via a public or private X.25 switched network or ISO 8208 packet level entity and ISO 7776 link level entity/X.3 character-mode access via a public or private PAD attached to an X.25 packet switched network or ISO 8208 packet level entity and ISO 7776 link level entity/X.28 character-mode access via a telephonic or data circuit to a PAD.

## 2. DEFINITIONS AND ABBREVIATIONS

CUG Closed user group

DTE Data Terminal Equipment

IA5 Alphabet International number 5; a set of characters and their coding specified in the CCITT Rec T.50.

IWF InterWorking Function

ISDN Integrated Service Digital Network

NUI Network User Identification

NUA Network User Address

PSPDN Packed Switched Public Data Network

**PLMN** Public Land Mobile Network  
**PAD** Packed Assembler/Disassembler  
**PSTN** Public Switched Telephone Network  
**TON** Type of number

### Facility Request

The Table 09.05/7 (given in Annex 4), extracted from CCITT X.28 lists the facility request/indication codes.

Note : The facility " closed user group " needs a NUI.

### 3. NETWORK INTERWORKING

Bearer Service in GSM PLMN	Access at Mobile Station	Bearer service in ISDN (note 1)	Bearer service in PSTN (note 1)	Bearer service in PSPDN
21	Data Cct 300 bit/s			
22	Data Cct 1.2kbit/s			
23	Data Cct 1200/75 bit/s	Cct mode Structured 64 kbit/s	Cct mode 3.1 KHz Audio	(note 2)
24	Data Cct 2.4kbit/s	or 3.1 kHz audio		
25	Data Cct 4.8kbit/s			
26	Data Cct 9.6kbit/s			

Note 1: if used as a transit network

Note 2: See table 09.05/4 (Annex 1) for default parameters.

Table 09.05/1: Network interworking requirements

It should be noted that for basic PAD access the access rates of Table 1 are dependent on the provision of appropriate modems in the visited countries PADs.

#### 4. INTERWORKING TO PSPDN VIA PAD ACCESS

##### 4.1. General

This section of the Recommendations deals with the interworking functions which need to be provided to support Packet Assembler/Disassembler (PAD) access between the GSM PLMN and PSPDN. Two types of PAD access are examined :

- Basic PAD access
- Dedicated PAD access

In both cases data are normally encoded in accordance with IA5 (see section 4.3.7).

The basic PAD access refers to the use of existing PAD's in PSPDN via one or more transit PSTN or ISDN networks.

The dedicated PAD access refers to the use of a PAD whereby the mobile subscriber does not hold an NUI on that PAD and it is accessed by means of a special short code (see section 4.3.4), i.e. it is not accessed by a directory number as for the basic access.

Dedicated PADs may be provisioned by the network operator as either part of the PLMN or outside the PLMN (see section 4.3.2).

Normally basic PAD access is covered within the scope of Rec GSM 09.07, (Interworking to PSTN/ISDN). However, it is easier not to split PAD access between the two Recommendations, so specific functions associated with PAD access are presented in this Recommendation, with the general requirements for interworking associated with modem selection etc., being covered in Rec GSM 09.07.

The protocol models 1 and 3 described in Rec. GSM 03.10 are applied.

##### 4.2. Basic PAD access

###### 4.2.1. Definition

Existing PADs within the PSTN are used in this class of PAD access. Two types of network architecture are defined according to the location of the PAD, to cover the options open to a roaming subscriber, i.e use of a Home or Visited PAD. The basic access requires no further development other than the general interworking requirements defined in Rec GSM 09.07, plus the nationally defined access to the PSTN PAD.

###### 4.2.2. Home PAD access

Home PAD access would normally be available to a mobile subscriber both when he/she is present on his/her home PLMN and

when on a visited PLMN. Figure 09.05/1 illustrates both of these examples where he/she is accessing a PAD via his/her home PSTN. To access the PAD the user would need to be registered with the PSPDN and have his/her own NUI.

In this instance to initiate a call to the PAD the mobile subscriber sets up a call to the PSTN number associated with the PAD access. The interworking function provides only the necessary modem etc., as indicated in the call set-up message and does not provide any additional functionality associated with PAD access. This access being available to the mobile subscriber from his/her home PLMN implies the use of a national PSTN call and when in a foreign PLMN the use of an international PSTN call.

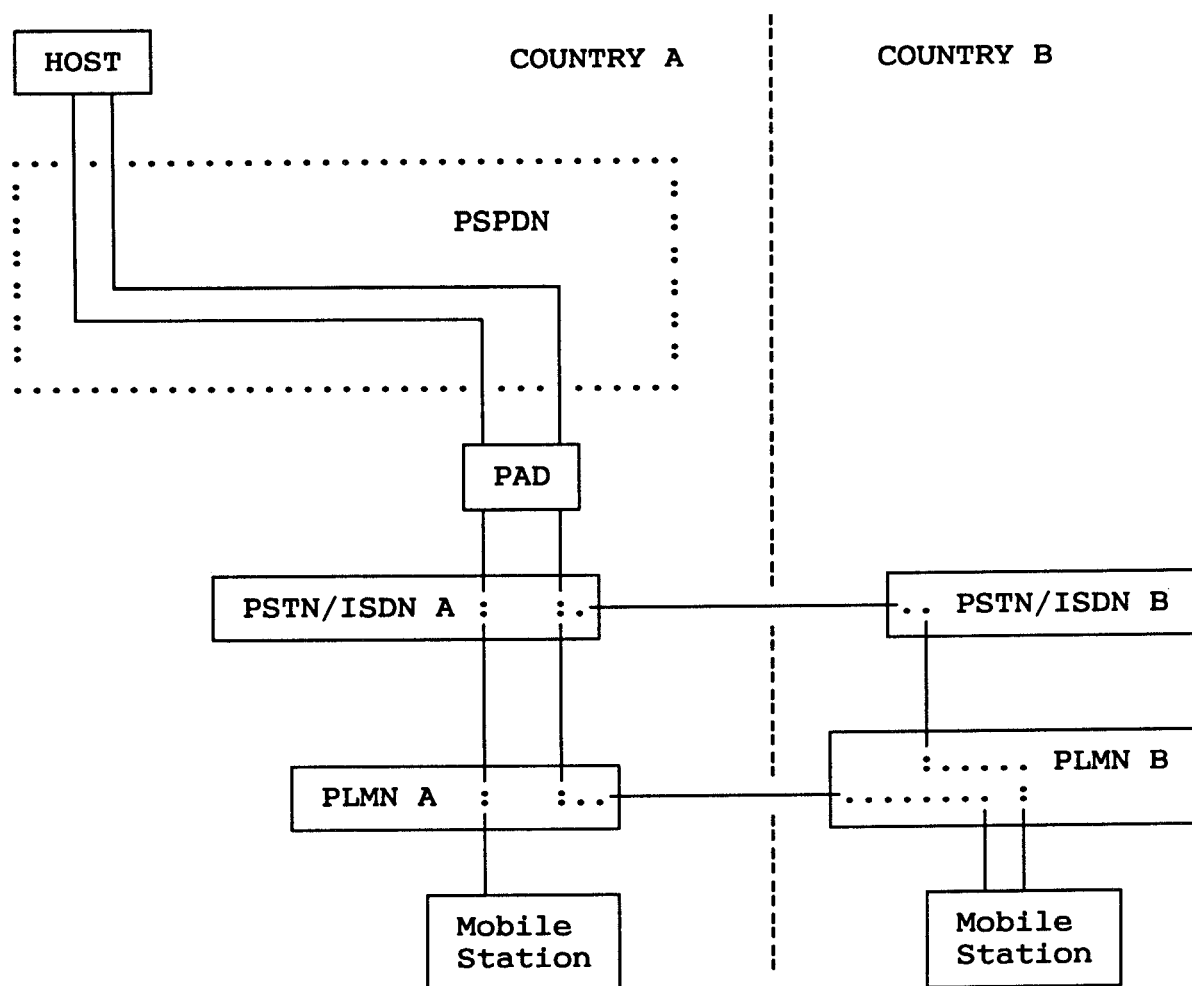


Figure 09.05/1: Home PAD access

#### 4.2.3. Visited PAD access

When the mobile subscriber is within PLMN in a foreign country an alternative to home PAD access is given in Figure 09.05/2. The PAD used in this case is a PAD within the visited country.

In this case the mobile subscriber initiates a PSTN call to the PAD in the visited country, and utilises the international link within the PSPDN.

The mobile subscriber would need to be registered with the visited PSPDN to obtain an NUI, plus needing to know the correct PSTN telephone number for accessing the PAD. The mobile subscriber would also need to know the user procedure for connecting to the PAD including the full NUA (international/national). Again the interworking function would not provide any additional requirements over and above the normal PSTN interworking.

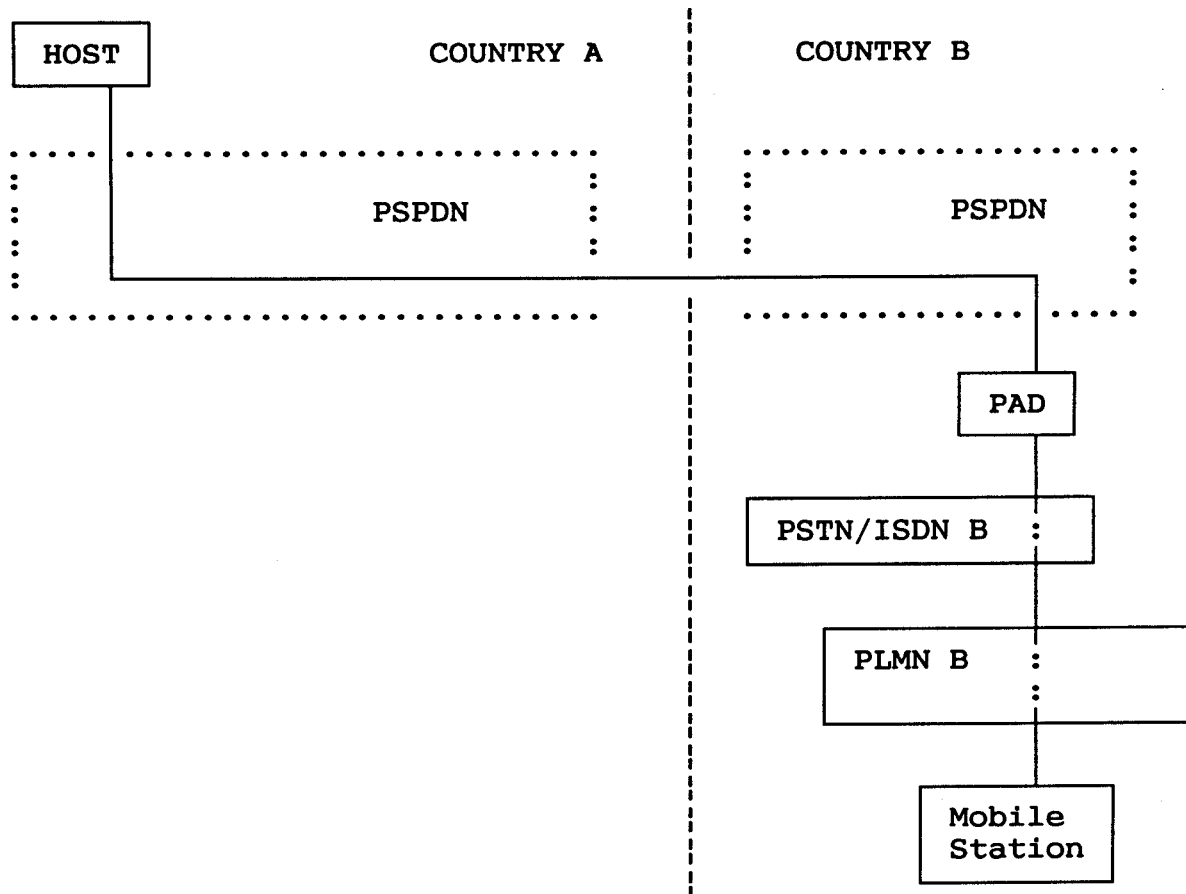


Figure 09.05/2 : Visited PAD Access

#### 4.2.4. Basic PAD access interworking functionality

The interworking function provides only the necessary modem RLP (if required) etc., as indicated in the call set-up message and does not provide any additional functionality associated with PAD access.



#### 4.2.5. Routing to and selection of PAD

The call is routed to the PAD on the basis of the called number. Further selection of PAD parameters is carried out between the MS and the PAD, as for normal PSTN access, with the interworking function having no participation in this activity.

#### 4.3. Dedicated PAD access

##### 4.3.1. Definition

In this type of PAD access, the PLMN has direct access to a PAD e.g. dedicated link, etc. In this Recommendation there is no difference between a PAD which has all its entry ports connected to the PLMN and a PAD which has only some entry ports dedicated to the PLMN.

For roaming subscribers, the user accesses a dedicated PAD of the visited PLMN, in that respect GSM 09.05 does not allow access to the dedicated PAD within the Home PLMN. In this case only figure 09.05/2 is valid.

The PAD in this case, is either an existing one or one which is provided by the PLMN. It is a network operator option as to which should be provided. When the PAD is restricted solely to PLMN use then it is defined as a GSM variant PAD.

In the case of dedicated PAD access, the mobile network is registered with the PSPDN operating the PAD and provides the appropriate NUI/password. In this instance the mobile subscriber accesses the PAD and the Interworking functions will insert the PLMN NUI/ password. Charging procedures are covered in section 4.3.8. It is this type of PAD access and the procedures necessary to invoke it that will be discussed in the rest of this section.

As previously indicated it is a network operators option as to whether basic or basic and dedicated PAD access should be provided (see section 4.3.4.2).

##### 4.3.2. Location of the PAD

###### 4.3.2.1. PAD external to the PLMN

- a) This case takes into account PADs which are not part of the PLMN but are connected to it by dedicated circuits.
- b) This case takes into account PADs which are not part of the PLMN, but where the PLMN establishes a circuit switched connection to the PAD in the PSTN/ISDN automatically, i.e. the user does not enter the directory number of the PAD, only the normal dedicated PAD short code access number.

#### 4.3.2.2. PAD internal to the PLMN

This case takes into account PADs which are part of the PLMN. It is possible that each MSC within the PLMN offers PAD access by a PAD integrated in the MSC.

#### 4.3.3. GSM profile

There is a common set of profiles for the dedicated PAD access described in the annexes.

The user may use the default profile or may select one of the other common profiles or may set individual parameters amongst those in the GSM profiles.

The profiles listed are :

- 1) GSM default profile ( Annex 1 ).
- 2) GSM Version of five PAD profiles ( Annex 2 ).
- 3) European Pre Standard ENV 41901 ( Annex 3 )

#### 4.3.4. Routing to and selection of PAD

##### 4.3.4.1. Introduction

It is desirable that a uniform, user friendly access is provided for users of GSM PAD access. However, it is not possible to standardise completely all uses of dedicated PAD access which may be provided by a PLMN operator to their home subscribers e.g. short code access to specific services (including auto selection of the required NUA). A minimum standard access shall be provided that will be compatible for all PLMN's providing a dedicated access service.

##### 4.3.4.2. General selection procedures

The user should be able to set up a call to the PAD connected to the PLMN providing service. Access to the PAD will be on the basis of the value "X.28 dedicated access, universal NUI" in the signalling access protocol" element of the bearer capability of the call set up request (see GSM 04.08). In addition, there is an indication in the type of number (TON) field that it is a PAD short code access, plus the appropriate NPI (private numbering plan) and short code address.

When this is used the IWF on identifying the TON as PAD access short code, uses the short code number to select a dedicated PAD access and routes the call according to the short code selected to the appropriate PAD. When no short code information is contained then the default GSM profile is selected. In addition the IWF "registers" the user on PAD using the PLMN registration code.

In addition the Interworking function ( IWF ) would need to determine the following points:

- User rate from the call set-up request to determine the correct PAD setting (parameter 1) for the transparent bearer service.
- Selection of the RLP function and rate for the Non Transparent bearer service.
- For the Non Transparent service flow control of the PAD would need to be invoked.

Table 09.05/2 lists the short code designations which may be provided and the PAD profiles allocated for the GSM standard access codes.

The first two digits of the four digit short code identify if it is a GSM standard access code or a network specific additional access code e.g. 00xx GSM standard access, 01xx COUNTRY A Network 1 additional access code.

GSM standard access code	Type of PAD profile
0000	GSM default profile (1)
0001	GSM profile 1 (2)
0002	GSM profile 2 (2)
0003	GSM profile 3 (2)
0004	GSM profile 4 (2)
0005	GSM profile 5 (2)
0006	reserved
⋮	⋮
0099	reserved

Table 09.05/ 2 : GSM standard access code associated PAD profile.

Notes : (1) defined in Annex 1.  
 (2) defined in Annex 2.

4.3.4.3. Minimum Standard access functionality

As indicated a standard minimum access shall be specified which will be compatible for all PLMN's such that it will possible

for roaming subscribers to have a common invocation for this service ( GSM default profile associated with access code 0000).

**Note:**

This could take the form of a single short access code which the Interworking function would act upon as indicated in the general selection procedures, all of which would be transparent to the user. The first indication of access to the PAD which the user would see would be the enter NUA command. This would then mean that network operators could provide specialised services without imposing those requirements on other networks.

**4.3.4.4. Additional access functionality**

This access offers PLMN operators the opportunity to define special features specifically for the use of their customers, or perhaps additionally through reciprocal arrangements, for the use of a roamed subscriber onto their networks. Table 09.05/3 lists the identification, by means of the first two digits, of the network operator offering these services.

Network operator	Identification digits (first two digits of four digit short code )
COUNTRY A Operator 1	01
COUNTRY A Operator 2	02
COUNTRY B Operator 1	03
COUNTRY B Operator 2	04
COUNTRY B Operator 3	05
:     ....	:     ...     :
....	99

**Table 09.05/3 :** Table of network operators identification (note the above table is intended as an example at this stage and should be completed in the due course).

To access one of the additional access functions the mobile subscriber would indicate in the call set up message the normal PAD bearer service, with the TON indicated dedicated PAD access short code number. In addition the appropriate network operator identification digits should be sent, ( on which the access is

provided and to whom the subscriber is within coverage at that time), plus the specific type of profile, NUA etc indicated by the last two digits.

An example of this could be COUNTRY A operator 1 offering PAD access and NUA etc for an electronic mail system. This could well be identified by the four digits (0108). In this case 01 identifies that it is the appropriate network and the 08 identifies particularly PAD profile required. This recommendation will not identify specific allocation of these profiles and it is left to the network operators to allocate codes for the last two digits as they are required.

When a subscriber requests a home network specific access, when connected to a visited network, which is unable to offer the desired profile or unable to interpret the code indicated, then the visited network will reject the call with the call failure cause indication N°63 "service or option not available, unspecified" (ref. GSM 04.08).

#### 4.3.5. Dedicated PAD access interworking functionality

The functions which have to be provided within the interworking are :

- To program the PAD parameters according to the profile selected by the user or according to the default profile ( see Annex 1 ).
- To establish connection/clearance to/from the PAD at the request of the mobile subscriber and to provide "password"/NUI associated with the PLMN.

The first function allows for all users (home or visitors) to see the same PAD functionalities even when the actual PAD implementation is different in different PLMN's.

The second function provides for establishment of the connection to the PAD at the initiation of the mobile subscriber by means of the selection procedures as indicated in paragraph 4.2.3.4. In addition it provides the automatic registration of the mobile subscriber on the PAD without requiring additional information from the mobile subscriber.

Clearance from the PAD will only be provided on receipt of call release. This enables the connection to the PAD to be retained during breaks on the radio link.

Another function of the PAD may be the conveyance of the MSISDN-number of the calling subscriber for passing to the called party. Where this procedure is provided the PSPDN will need to accept the entry of this information into an appropriate message field unchanged and may use it also for establishing a call-individual charge record. For this purpose the VMSC will need to acquire an MSISDN-number of the calling DTE.

#### 4.3.6. Transparent bearer service

For this service the user rate indicated in the call set up message is used both from the terminal to the MT and between the IWF and the dedicated PAD.

#### 4.3.7. Non Transparent bearer service

For this service the user rate at each end may be different. The data rate between the IWF and the PAD is the highest mutually available.

Additionally for this service the user is constrained to using IA5 characters throughout the period of the connection in order that flow control using XON/XOFF may be used ( see GSM 09.07 ).

In this case the PAD must also have flow control enabled (parameter 12) by the IWF.

#### 4.3.8. Technical aspects of charging

Since the charging requirements for the dedicated PAD service assume knowledge of the volume of data sent and the destination mechanisms have to be provided associated with the IWF or the PAD which enables this information to be determined.

ANNEX 1

Parameter reference number	Parameter Description	Parameter setting for GSM default profiles
1	PAD recall using a character	1
2	Echo	1
3	Selection of data forwarding signal	126
4	Selection of idle timer delay	0
5	Ancillary device control	1
6	Control of PAD service signals	1
7	Selection of operation of PAD on receipt of break signal from the start-stop mode DTE	21
8	Discard output	0
9	Padding after carriage return (CR)	0
10	Line folding	80
11	Binary speed of start-stop mode DTE	read only
12	Flow control of the PAD by the start-stop mode DTE	1
13	Linefeed insertion after carriage return	4

Table 09.05/4 : GSM default profile in dedicated PAD access

Parameter reference number	Parameter Description	Parameter setting for GSM default profiles
14	Linefeed padding	0
15	Editing	0
16	Character delete	127
17	Line delete	24
18	Line display	18
19	Editing PAD service signals	0
20	Echo mask	0
21	Parity Treatment	0
22	Page wait	0

Table 09.05/4 (cont'd): GSM default profile in dedicated PAD access



## ANNEX 2

Parameter	DESCRIPTION	Param. values in suboptions				
		1	2	3	4	5
1	PAD recall using a character	0	1	1	1	0
2	Echo	0	1	0	0	0
3	Selection of data forwarding signal	0	126	126	0	0
4	Selection of idle timer delay	20	0	0	1	1
5	Ancillary device control	1	1	1	1	0
6	Control of PAD service signals	0	1	1	0	0
7	Selection of operation of PAD on receipt of break signal from the start-stop mode DTE	2	2	21	21	8
8	Discard output	0	0	0	0	0
9	Padding after carriage return (CR)	0	0	0	0	0
10	Line folding	0	0	80	0	0
11	Binary speed of Start-Stop mode DTE	parameter with read only access				
12	Flow control of the PAD by the start-stop mode DTE	0	1	1	1	0
13	Line feed insertion after carriage return	0	0	4	0	0
14	Linefeed padding	0	0	0	0	0
15	Editing	0	0	0	0	0
16	Character delete	127	127	127	127	127

Table 09.05/5 : GSM dedicated PAD Profiles

Parameter	DESCRIPTION	Param. values in suboptions				
		1	2	3	4	5
17	Line delete	24	24	24	24	24
18	Line display	18	18	18	18	18
19	Editing PAD service signals	0	0	0	0	0
20	Echo mask	0	0	0	0	0
21	Parity Treatment	0	0	0	0	0
22	Page Wait	0	0	0	0	0

Table 09.05/5 (cont'd) : GSM dedicated PAD Profile

## ANNEX 3

Parameter	DESCRIPTION	Param. values in suboptions				
		1	2	3	4	5
1	PAD recall using a character	0	1	1	1	0
2	Echo	0	1	0/1	0	0
3	Selection of data forwarding signal	0	126	2/126	0	0
4	Selection of idle timer delay	20	0	0	1	1
5	Ancillary device control	*	*	*	*	0
6	Control of PAD service signals	*	*	*	*	*
7	Selection of operation of PAD on receipt of break signal from the start-stop mode DTE	2	2	21	21	8
8	Discard output	0	0	0	0	0
9	Padding after carriage return (CR)	*	*	*	*	0
10	Line folding	*	*	*	*	0
11	Binary speed of Start-Stop mode DTE	*	*	*	*	*
12	Flow control of the PAD by the start-stop mode DTE	0	1	1	1	0
13	Line feed insertion after carriage return	0	0	4	0	0
14	Linefeed padding	*	*	*	*	0
15	Editing	0	0	0/1	0	0
16	Character delete	127	127	127	127	127

Table 09.05/6 : PAD Profiles in ENV 41901

Parameter	DESCRIPTION	Param. values in suboptions				
		1	2	3	4	5
17	Line delete	24	24	24	24	24
18	Line display	18	18	18	18	18
19	Editing PAD service signals	*	*	*	*	*
20	Echo mask	*	*	*	*	*
21	Parity Treatment	*	*	*	*	0
22	Page Wait	*	*	*	*	0

Table 09.05/6 (cont'd) : PAD Profiles in ENV 41901

NOTE:

1. Parameters 19 to 22 inclusive may not be available without option 1.
2. Parameter 8 may be set to 0 by a packet mode DTE to recommence the delivery of data to a start-stop mode DTE after it has been inhibited as a result of the receipt of a break signal from a start-stop mode DTE by a PAD.
3. Sub option 1 is compatible with the CCITT transparent standard profile and sub-option 2 is compatible with the CCITT simple standard profile. CCITT Recommendations give no indications as to the circumstances under which parameters may be manipulated by a packet mode DTE. Thus as with sub-options 3,4 and 5, parameters have been defined to be packet mode DTE independent or dependent and rules provided for parameter manipulation.
4. Where Table 09.05/6 shows the parameter setting as "\*" the parameter is defined to be "packet mode DTE independent "; otherwise it is "packet mode DTE independent".
5. Sub option 0 : GSM Default Profile (ref. Table 09.05/4)  
 Sub option 1 : Transparent Standard Profile  
 Sub option 2 : Simple Standard Profile  
 Sub option 3 : Message Profile  
 Sub option 4 : Character Profile  
 Sub option 5 : Transparent profile

ANNEX 4

Code of the facility	Definition of the facility
4/7 -G-	Closed user group
4/2 -B-	Bilateral closed user group
5/2 -R-	Reverse charging
4/6 -F-	Fast Select
5/4 -T-	RPOA transit network selection
5/0 -P-	Packet size negotiation
5/7 -W-	Window size negotiation
4/4 -D-	Throughput class negotiation
4/3 -C-	Charging information
4/13 -M-	Called line address modification notification
5/5 -U-	Call redirection notification
4/14 -N-	Network user Identification
5/3 -S-	Call DTE reselection
4/15 -O-	Closed User Group with outgoing access

Table 09.05/7 : Facility request/indication Codes