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Technical Report

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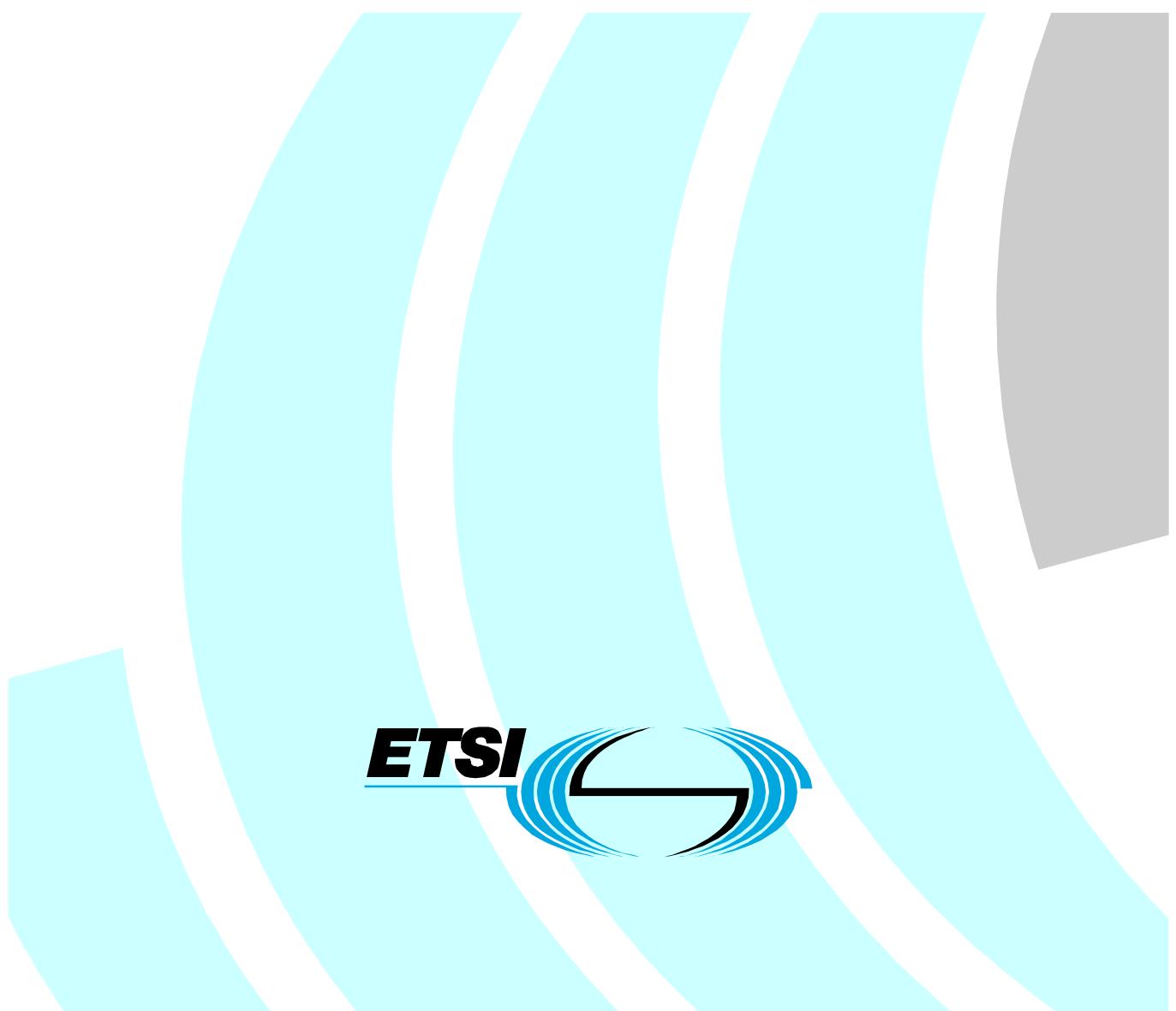
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Foreword

This Technical Report (TR) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT).

The present document covers the high-level description of the AT-command interface.

TRs are informative documents resulting from ETSI studies. A TR may be used to publish material which is either of an informative nature, relating to the use or the application of ENs or TSs, or which is immature and not yet suitable for formal adoption as an EN or an TS.

1 Scope

The present document specifies a profile of AT commands and recommends that this profile be used for controlling PT and FT functions.

2 References

For the purposes of this Technical Report (TR) the following references apply:

[1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] ETSI EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical Layer (PHL)".

[3] ETSI EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) Layer".

[4] ETSI EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[5] ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[6] ETSI EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".

[7] ETSI EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[8] ETSI EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[9] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A High Level Guide to the DECT Standardization".

[10] ETSI TS 127 005: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) (3GPP TS 27.005)".

[11] ETSI TS 127 007: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); AT command set for 3G User Equipment (UE) (3GPP TS 27.007)".

[12] ETSI TS 127 010: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Terminal Equipment to User Equipment (TE-UE) multiplexer protocol (3GPP TS 27.010)".

[13] ETSI TS 127 060: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Packet domain; Mobile Station (MS) supporting Packet Switched services (3GPP TS 27.060)".

[14] ETSI EN 301 649: "Digital Enhanced Cordless Telecommunications (DECT); DECT Packet Radio Service (DPRS)".

[15] ETSI EN 301 650: "Digital Enhanced Cordless Telecommunications (DECT); DECT Multimedia Access Profile (DMAP) Application Specific Access Profile (ASAP)".

[16] ETSI TS 101 942: "Digital Enhanced Cordless Telecommunications (DECT); DECT Packet Radio Service (DPRS); Application Specific Access Profile (ASAP): Ethernet (Eth) Interworking".

[17]   ETSI TS 101 947: "Digital Enhanced Cordless Telecommunications (DECT); DECT Packet Radio Service (DPRS); Application Specific Access Profile (ASAP): V.24 Interworking".

[18]   ITU-T Recommendation V.250: "Serial asynchronous automatic dialling and control".

[19]   ITU-T Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in EN 300 175-1 [1] and EN 300 175-5 [5] apply.

3.2   Abbreviations

For the purposes of the present document, the abbreviations defined in EN 300 175-1 [1] and the following apply:

AT	ATtention command set
DCE	Data Circuit-terminating Equipment
DLC	Data Link Control
DTE	Data Terminal Equipment
FT	Fixed radio Termination
GSM	Global System for Mobile communications
ISP	Internet Service Provider
IWU	InterWorking Unit
M	Modem
MAC	Medium Access Control
MSC	Message Sequence Chart
NWK	NetWorK
PC	Personal Computer
PHY	PHYsical layer
PT	Portable radio Termination
SMS	Short Message Service
UMTS	Universal Mobile Telecommunications System

4   Protocol architecture

The protocol architectures for PT and FT are shown in figures 1 and 2.

DTE1

Application 1
AT
IWU
NWK
DLC
MAC
PHY

PT
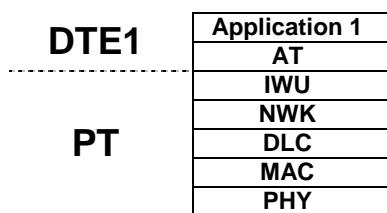
Figure 1: Protocol architecture PT

	Application 2
DTE2/DCE2	**AT**
	IWU
	NWK
FT	**DLC**
	MAC
	PHY
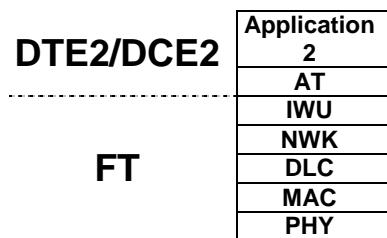
Figure 2: Protocol architecture FT

5 Configurations

5.1 NULL MODEM configuration

A NULL MODEM configuration is shown in figure 3. DTE1 (an application of the PC1) controls with the AT command set the PT. The PT establishes a connection to the FT. DTE2 (an application of the PC2) controls with the AT command set the FT.

Once the connection is established, data can be conveyed between DTE1 and DTE2.
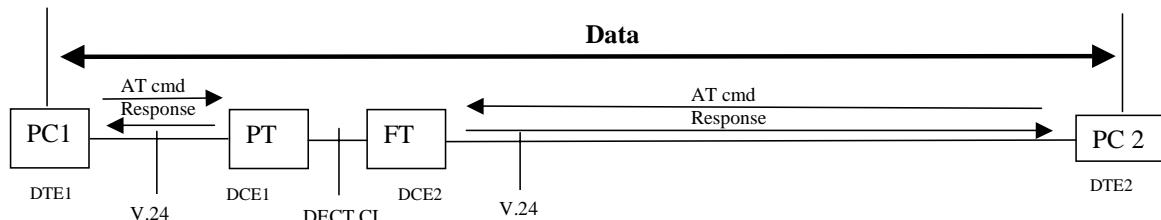
Figure 3: NULL MODEM reference configuration

5.2 ACCESS configuration

An ACCESS configuration is shown in figure 4. DTE1 (an application of the PC) controls with the AT command set the PT. The PT establishes a connection to the FT. The FT establishes a connection via the Modem (M) to an Internet Service Provider (ISP).

Once the connection is established, data can be conveyed between DTE1 and the ISP.
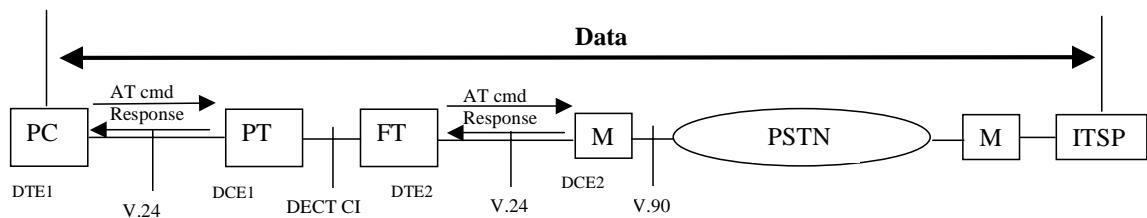
Figure 4: ACCESS configuration

6   Interworking procedures

6.1   General AT commands

Tables 1 to 5 list the general AT commands which should be implemented by the IWF of the PT and the FT. The PT is the DCE in the NULL MODEM configuration and in the ACCESS configuration. The FT is the DCE in the NULL MODEM configuration and the FT is the DTE in the ACCESS configuration.

Table 1: Generic DCE control commands

| Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT [<value>]	Reset to default configuration	6.1.1 [18]	Set all parameters to their factory defaults	OK, ERROR
AT&F[<value>]	Set to factory-defined configuration	6.1.2 [18]	Set all parameters to default values specified by the manufacturer	OK, ERROR
AT+GMI	Request manufacturer identification	6.1.4 [18]	Transmit information text: "Company name, Hotline: dial_string"	OK
AT+GMM	Request model identification	6.1.5 [18]	Transmit information text: "Company name, DECT Phone identifier"	OK
AT+GMR	Request revision identification	6.1.6 [18]	Transmit information text: "Version number of implemented CI"	OK
AT+GSN	Request product serial number identification	6.1.7 [18]	Transmit information text: "Serial number of PT/FT"	OK
AT+GCAP	Request complete capabilities list	6.1.9 [18]	Transmit list of specific capabilities commands	List of specific capabilities commands
AT+GCI	Country of installation	6.1.10 [18]	Store the country code	-

Table 2: DTE-DCE interface commands

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
ATS3	Command line termination character	6.2.1 [18]	-	-
ATS4	Response formatting character	6.2.2 [18]	-	-
ATS5	Command line editing character	6.2.3 [18]	-	-
ATE[<value>]	Command echo	6.2.4 [18]	Echo received characters	-
ATQ[<value>]	Result code suppression	6.2.5 [18]	Transmit result codes	(none)/OK, (none)/ERROR
ATV[<value>]	DCE response format	6.2.6 [18]	Transmit result code in numeric or alphabetic form	0/OK, 4/ERROR
ATX[<value>]	Result code selection and call progress monitoring control	6.2.7 [18]	Transmit particular result code	-
&C[<value>]	Circuit 109 behaviour	6.2.8 [18]	Determines how ITU-T V.24 [19] circuit 109 (or equivalent) relates to the detection of received line signal from remote end (recommended default 1 i.e. 109 operation relates to detection of received signal)	-

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
&D[<value>]	Circuit 108 behaviour	6.2.9 [18]	Determines how the DCE responds when ITU-T V.24 [19] circuit 108/2 (or equivalent) is changed from ON to OFF condition during online data state	-
+IPR=[<value>]	Fixed DTE rate	6.2.10 [18]	Recommended default 0 i.e. automatic detection	-
+ICF=[<format>[,<parity>]]	DTE-DCE character framing	6.2.11 [18]	Recommended default 3,3 i.e. eight data bits, no parity, 1 stop bit	-
+IFC= [<DCE_by_DTE> [,<DTE_by_DCE>]]	DTE-DCE local flow control	6.2.12 [18]	Recommended default 2,2 i.e. TE uses ITU-T V.24 [19] circuit 133 (or equivalent), and TA circuit 106 (or equivalent)	-
AT+ILRR=<value>	DTE-DCE local rate reporting	6.2.13 [18]	Transmit "+ILRR:<rate>"	-

Table 3: Call control commands

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
ATD[<dial_string>][;]	Dial	6.3.1 [18] and its clauses	Originate a call	OK, ERROR, NO CARRIER, BUSY, NO ANSWER, NO DIALTONE
ATT	Select tone dialling	6.3.2 [18]	Use tone dialling	-
ATP	Select pulse dialling	6.3.3 [18]	Use pulse dialling	-
ATA	Answer	6.3.5 [18]	Connect to the line	CONNECT, CONNECT <text>, NO CARRIER, ERROR, OK
ATH	Hook control	6.3.6 [18]	Disconnect from the line	OK, ERROR
ATO[<value>]	Return to online data state	6.3.7 [18]	Return to online data state from online command state	-
ATS0	Automatic answer	6.3.8 [18]	Automatic answering feature	-
ATS6	Pause before blind dialling	6.3.9 [18]	Time between connecting to the line and signalling call addressing information to the network	-
ATS7	Connection completion timeout	6.3.10 [18]	Time between answering a call and establishing a connection	-
ATS8	Comma dial modifier time	6.3.11 [18]	Time during signalling of call addressing information to the network	-
ATS10	Automatic disconnect delay	6.3.12 [18]	Time that the DCE will remain connected in the case of line signal absence	-
AT+ASTO= <location>,<dial_string>	Store telephone number	6.3.15 [18]	Store dialling string	
Command DCE to DTE	**Command description**	**Reference**	**DTE action**	**Response DTE to DCE**
RING,2	Incoming call indication	6.3.4 [18]	Connect line	ATA

Table 4: Modulation control commands

Command DCE to DTE	Command description	Reference	DTE action	Response DTE to DCE
AT+MR:<value>	Modulation reporting control	6.4.3 [18]	Receive "+MRR:<rate>"	OK, ERROR
AT+MRR:<rate>		6.4.3 [18]	Set the data rate	OK, ERROR
Command DTE to DCE	**Command description**	**Reference**	**DCE action**	**Response DCE to DTE**
AT+MR?		6.4.3 [18]	List the current settings	+MR:<current settings>

Table 5: Multiplexing control commands

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
+CMUX=<mode>[,<subset>[, <port_speed>[,<N1>[,<T1> [,<N2>[,<T2>[,<T3> [,<k>]]]]]]]]	Multiplexing mode	5.7 [11]	enable multiplexing protocol	+CME ERROR:<err>
+CMUX?		5.7 [11]	send the actual settings	+CMUX: <mode>,[<subset>],<port_speed>, <N1>,<T1>, <N2>,<T2>,<T3>[,<k>] +CME ERROR:<err>
+CMUX=?		5.7 [11]	send list of all possible settings	+CMUX: (list of supported <mode>s) (see 5.7 [11])

6.2 DECT specific AT commands

Tables 6 to 11 list the DECT specific AT commands which should be implemented by the IWF of the PT and the FT.

Table 6: AT commands for configuration

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT&F0	Set to factory-defined configuration	6.1.2 [18]	Select NULL MODEM configuration	OK, +CME ERROR: <err>
AT&F255	Set to factory-defined configuration	6.1.2 [18]	Select ACCESS configuration	OK, +CME ERROR: <err>
AT+CBST=[<speed> [,<name>[,<ce>]]]	Select bearer service type	6.7 [11]	Select the data rate <speed> when data calls are originated (values for this parameter are decimal encoded, in units of bit/s). <name> and <ce> are dummy values	OK, +CME ERROR: <err>
AT+CLAC	List all available AT commands	8.37 [11]	List available AT commands	List available AT commands

Table 7: AT commands for access rights procedures

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT+COAR=[<state>]	Obtain Access Rights	6.3.1	PT only: state=<1>: send ACCESS-RIGHTS-REQUEST	OK, +CME ERROR: <err>
AT+COAR?		6.3.1	PT only: State 0: PT has not executed obtain access rights; State 1: PT has successfully executed obtain access rights	+COAR:<state>
AT+COAR=?		6.3.1	PT only: List all possible states	+COAR:(0,1)

Table 8: AT commands for location procedures

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT+CGATT=[<state>]	PS attach or detach	10.1.9 [11]	PT only: state=<1>: send LOCATE-REQUEST	OK, +CME ERROR: <err>
AT+CGATT?		10.1.9 [11]	PT only: State 0: PT has not executed location registration; State 1: PT has successfully executed location registration	+CGATT:<state>
AT+CGATT=?		10.1.9 [11]	PT only: List all possible states	+CGATT:(0,1)

Table 9: AT commands for authentication procedures

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT+CPIN	Authentication procedure	8.3 [11]	PT/FT: send AUTHENTICATION-REQUEST	OK, +CME ERROR: <err>
AT+CPIN= <pin[,<newpin>]		8.3 [11]	PT only: set UPI	OK, +CME ERROR: <err>
AT+CPIN?		8.3 [11]	State 0: PT/FT has not executed authentication of FT/PT; State 1: PT/FT has successfully executed authentication of FT/PT	+CPIN:<state>
AT+CPIN=?		8.3 [11]	List all possible states	+CPIN:(0,1)
Command DCE to DTE	**Command description**	**Reference**	**DTE action**	**Response DTE to DCE**
AT+CPIN	Enter PIN	8.3 [11]	DTE1: send UPI to the PT	OK, +CME ERROR: <err>

Table 10: AT commands for ciphering

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT+CCF	Ciphering by FT	6.6	FT only: send CIPHER-REQUEST	OK, +CME ERROR: <err>

Table 11: AT commands for error procedures

Command DTE to DCE	Command description	Reference	DCE action	Response DCE to DTE
AT+CMEE=[<n>]	Report DECT error	9.1 [11]	Transmit "+CMEE ERROR <err>"	-
AT+CMEE?		9.1 [11]	Transmit actual value	+CMEE:<n>
AT+CMEE=?		9.1 [11]	List all possible values	+CMEE:(0,1,2,3)
Command DCE to DTE	**Command description**	**Reference**	**DTE action**	**Response DTE to DCE**
AT+CME ERROR: <id, err>	DECT error result code	9.2 [11]	-	-

6.3 PT subscription

If the PT is switched on for the first time, then the PT should execute the following procedures:

- Obtain access rights.

- Location registration.

Then the FT should execute:

- Authentication of PT.

If the PT is switched on after having executed the subscription, then the PT should execute the following procedure:

- Location registration.

DTE1 and DTE2 should be able to control the procedures mentioned above. The following clauses describe how DTE1 and DTE2 could control the PT subscription. If not mentioned otherwise all the procedures should be executed as described in EN 300 444 [6].

6.3.1 Obtain access rights

The Obtain Access Rights procedure is shown in figure 5, the related AT commands are listed in table 7.

If the P-IWU receives an **AT+COAR=1** command, then the P-IWU should issue a MM_ACCESS_RIGHTS.req primitive resulting in an ACCESS-RIGHTS-REQUEST message (see 8.30 [6]) being sent to the FT.

Access accept:

Upon receipt of the ACCESS-RIGHTS-REQUEST message the FT should either start the key allocation procedure or should send the ACCESS-RIGHTS-ACCEPT message to the PT.

If the P-IWU receives a MM_ACCESS_RIGHTS.ind primitive, then the P-IWU should send an **OK** message to the DTE.

Access reject:

Upon receipt of the ACCESS-RIGHTS-REQUEST message and access cannot be granted, then the FT should send the ACCESS-RIGHTS-REJECT message to the PT.

If the P-IWU receives a MM_ACCESS_RIGHTS.rej primitive, then the P-IWU should send the appropriate **D-ERROR-RESULT** command to the DTE.

Obtain access rights verification:

Upon receipt of the **AT+COAR?** command the PT should send either the **AT+COAR:<0>** command or the **AT+COAR:<1>** command according to its status of access rights.

Upon receipt of the **AT+COAR=?** command the PT should send the **AT+COAR:(0,1)** command.

```
MSC Obtain_Access_Rights
```
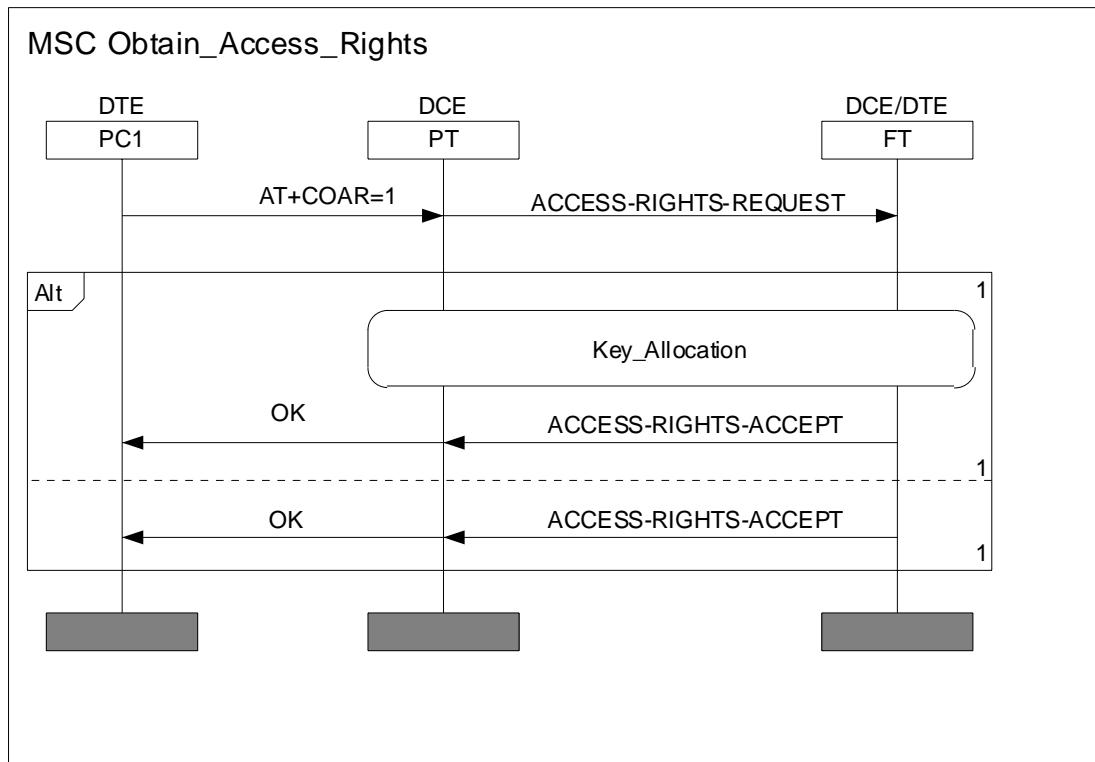
Figure 5: Obtain access rights

6.3.2   Location registration

The Location Registration procedure is shown in figure 6, the related AT commands are listed in table 8.

If the P-IWU receives an **AT+CGATT=1** command, then the P-IWU should issue a MM_LOCATE.req primitive resulting in a LOCATE-REQUEST message (see 8.28 [6]) being sent to the FT.

Locate accept:

Upon receipt of the LOCATE-REQUEST message the FT should send the LOCATE-ACCEPT message to the PT.

If the P-IWU receives a MM_LOCATE.ind primitive, then the P-IWU should send an **OK** command to the DTE.

Locate reject:

Upon receipt of the LOCATE-REQUEST message and location registration cannot be granted, then the FT should send the LOCATE-REJECT message to the PT.

If the P-IWU receives a MM_LOCATE.rej primitive, then the P-IWU should send the appropriate **D-ERROR-RESULT** command to the DTE.

Location registration verification:

Upon receipt of the **AT+CGATT?** command the PT should send either the **AT+CGATT:<0>** command or the **AT+CGATT:<1>** command according to its status of location registration.

Upon receipt of the **AT+CGATT=?** command the PT should send the **AT+CGATT:(0,1)** command.
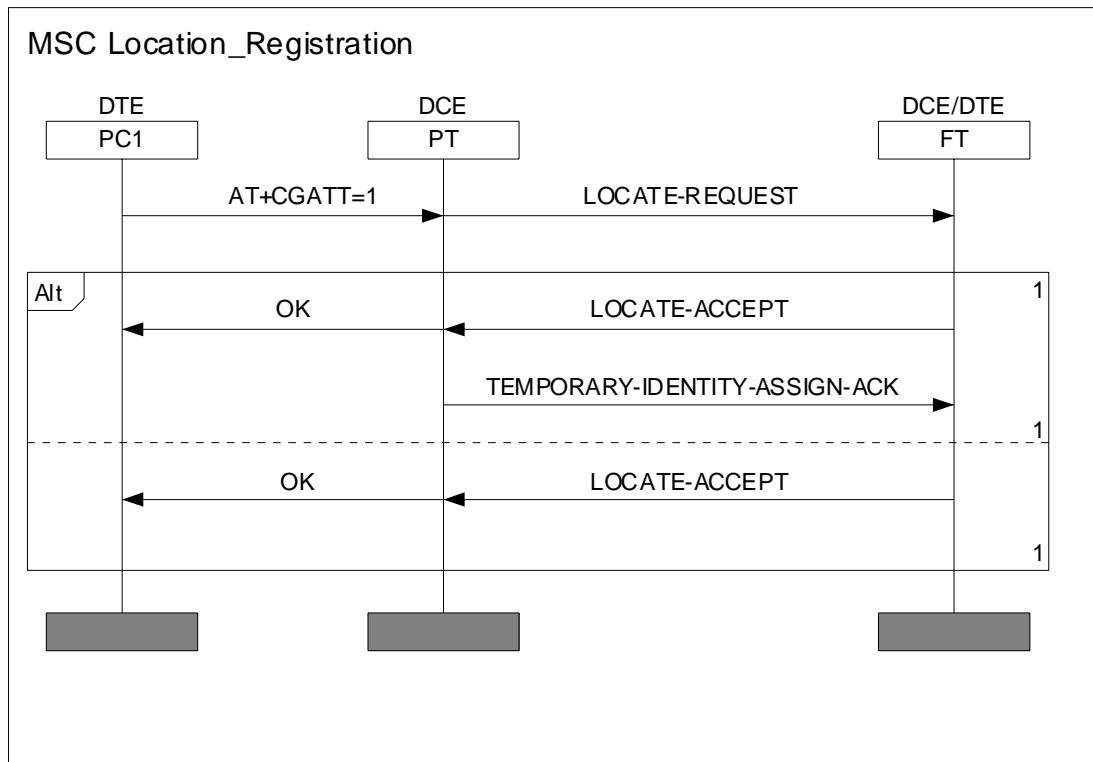
Figure 6: Location registration

6.3.3   Authentication

6.3.3.1   Authentication of the user

The Authentication of the user procedure is shown in figure 7, the related AT commands are listed in table 9.

If PC1 receives an **AT+CPIN** command, then PC1 should send the **AT+CPIN=UPI** command to the PT. The PT should store the UPI and send an **OK** command to PC1.

If PC1 wants to notify the PT directly with the UPI, then PC1 should send the **AT+CPIN=UPI** command to the PT. The PT should store the UPI and send an **OK** command to PC1.
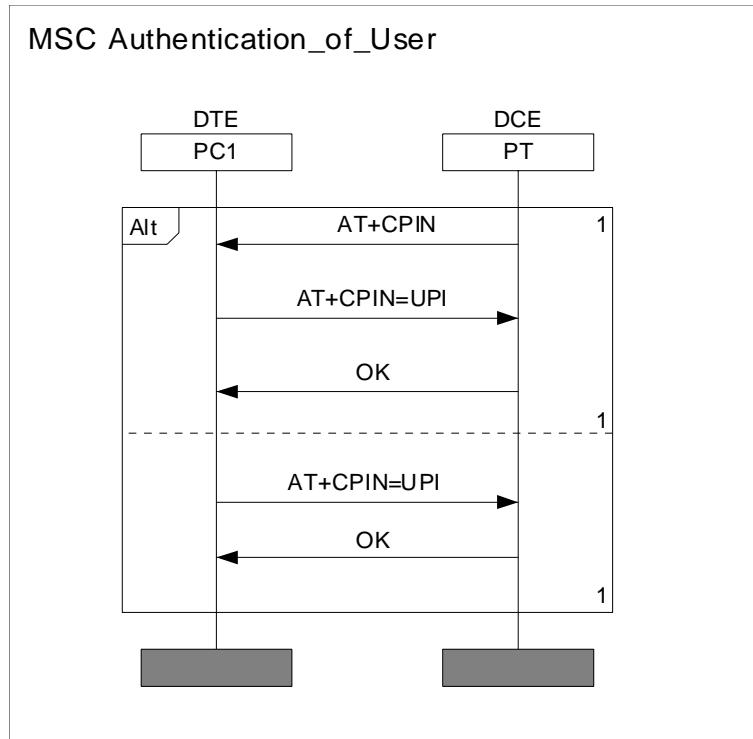
Figure 7: Authentication of the user

6.3.3.2 NULL MODEM authentication of a PT

The NULL MODEM Authentication of a PT procedure is shown in figure 8, the related AT commands are listed in table 9.

If the F-IWU receives an **AT+CPIN** command, then the F-IWU should issue a MM_AUTHENTICATE.req primitive resulting in an AUTHENTICATION-REQUEST message (see 8.24 [6]) being sent to the PT.

Authentication accept:

Upon receipt of the AUTHENTICATION-REQUEST message the PT should send the AUTHENTICATION-REPLY message to the FT.

If the F-IWU receives a MM_AUTHENTICATE.ind primitive, then the F-IWU should send an **OK** command to the DTE.

Authentication reject:

Upon receipt of the AUTHENTICATION-REQUEST message and if the PT rejects the authentication, then the PT should send the AUTHENTICATION-REJECT message to the FT.

If the F-IWU receives a MM_AUTHENICATE.rej primitive, then the F-IWU should send the appropriate **D-ERROR-RESULT** command to the DTE.

Authentication of PT verification:

Upon receipt of the **AT+CPIN?** command the FT should send either the **AT+CPIN:<0>** command or the **AT+CPIN:<1>** command according to its status of authentication of PT.

Upon receipt of the **AT+CPIN=?** command the FT should send the **AT+CPIN:(0,1)** command.
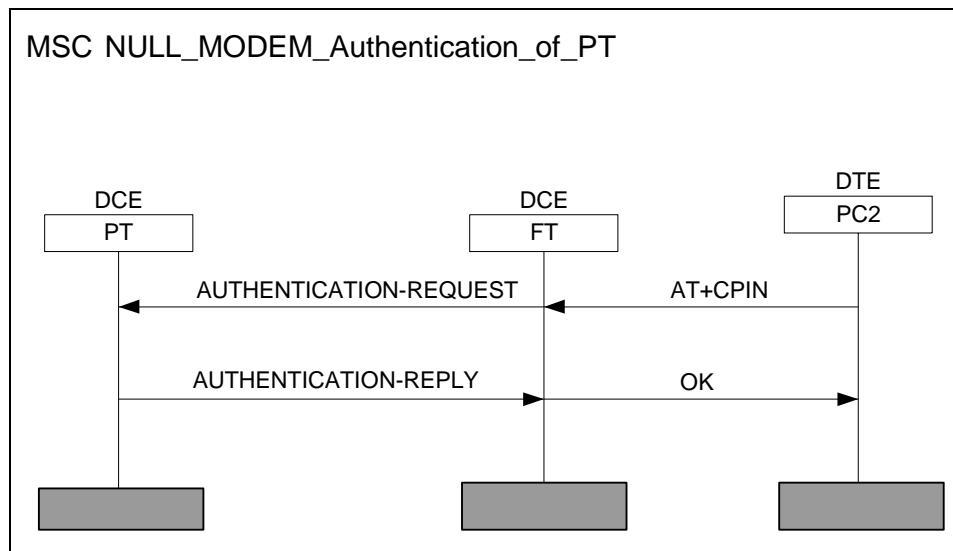
Figure 8: NULL MODEM authentication of a PT

6.3.3.3   Authentication of a FT

The Authentication of a FT procedure is shown in figure 9, the related AT commands are listed in table 9.

If the P-IWU receives an **AT+CPIN** command, then the P-IWU should issue a MM_AUTHENTICATE.req primitive resulting in an AUTHENTICATION-REQUEST message (see 8.24 [6]) being sent to the FT.

Authentication accept:

Upon receipt of the AUTHENTICATION-REQUEST message the FT should send the AUTHENTICATION-REPLY message to the PT.

If the P-IWU receives a MM_AUTHENTICATE.ind primitive, then the P-IWU should send an **OK** command to the DTE.

Authentication reject:

Upon receipt of the AUTHENTICATION-REQUEST message and if the FT rejects the authentication, then the FT should send the AUTHENTICATION-REJECT message to the PT.

If the P-IWU receives a MM_AUTHENICATE.rej primitive, then the P-IWU should send the appropriate **D-ERROR-RESULT** command to the DTE.

Authentication of FT verification:

Upon receipt of the **AT+CPIN?** command the PT should send either the **AT+CPIN:<0>** command or the **AT+CPIN:<1>** command according to its status of authentication of FT.

Upon receipt of the **AT+CPIN=?** command the PT should send the **AT+CPIN:(0,1)** command.

MSC Authentication_of_FT
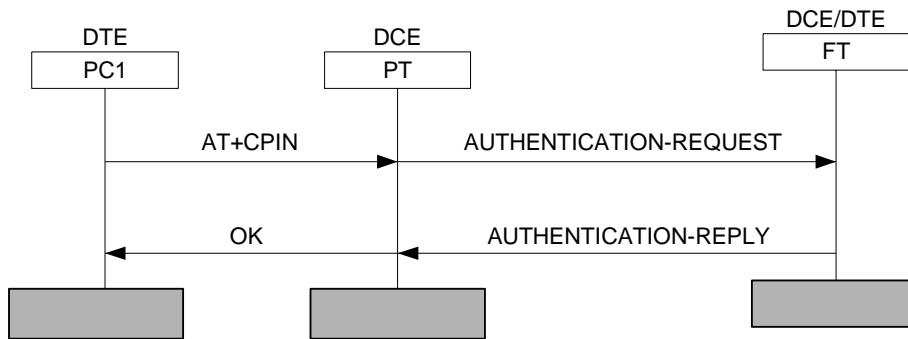
Figure 9: Authentication of a FT

6.4   Call control

Upon receipt of a CC-SETUP message the PT/FT sends:

- in the case of the NULL MODEM configuration a RING command; and

- in the case of the ACCESS configuration an ATD command.

The IWF of the PT/FT has to have information about the current configuration in order to send the correct AT command. The information about the current configuration should be included in the CC-SETUP message, and in the CC-CONNECT message respectively.

6.4.1   NULL MODEM call establishment

The NULL MODEM call establishment is shown in figure 10.

The default configuration could be the NULL MODEM configuration.

The NULL MODEM call establishment initiated by DTE1 is symmetric to the NULL MODEM call establishment initiated by DTE2 (except for the CC_CONNECT_ACK). Therefore only the NULL MODEM call establishment initiated by DTE1 is described.

If the P-IWU receives an **AT&F0** command, then the P-IWU should switch to NULL MODEM configuration and return an **OK** message. The value F255 should be mapped to the SETUP/IWU-TO-IWU message.

If the P-IWU receives an **ATD** command, then the P-IWU should issue a MNCC_SETUP.req primitive resulting in a CC-SETUP message being sent to the FT.

Upon receipt of a MNCC_SETUP.ind primitive the F-IWU should send a **RING** command to DTE1. PT and FT may perform the "Outgoing call accept to Outgoing call confirmation" procedure or "Incoming call accept to Incoming call confirmation" procedure.

Call accept:

Upon receipt of an **ATA** command the F-IWU should issue a MNCC_CONNECT.req primitive resulting in a CC-CONNECT message being sent to the PT.

If the P-IWU receives a MNCC_CONNECT.ind primitive, then the P-IWU should send a **CONNECT** command to DTE1.

Call reject:

Upon receipt of an **ERROR** command the F-IWU should issue a MNCC_REJECT.req primitive resulting in a
CC-RELEASE-COM message being sent to the PT.

If the P-IWU receives a MNCC_REJECT.req primitive, then the P-IWU should send the appropriate **an ERROR**
command to DTE1.
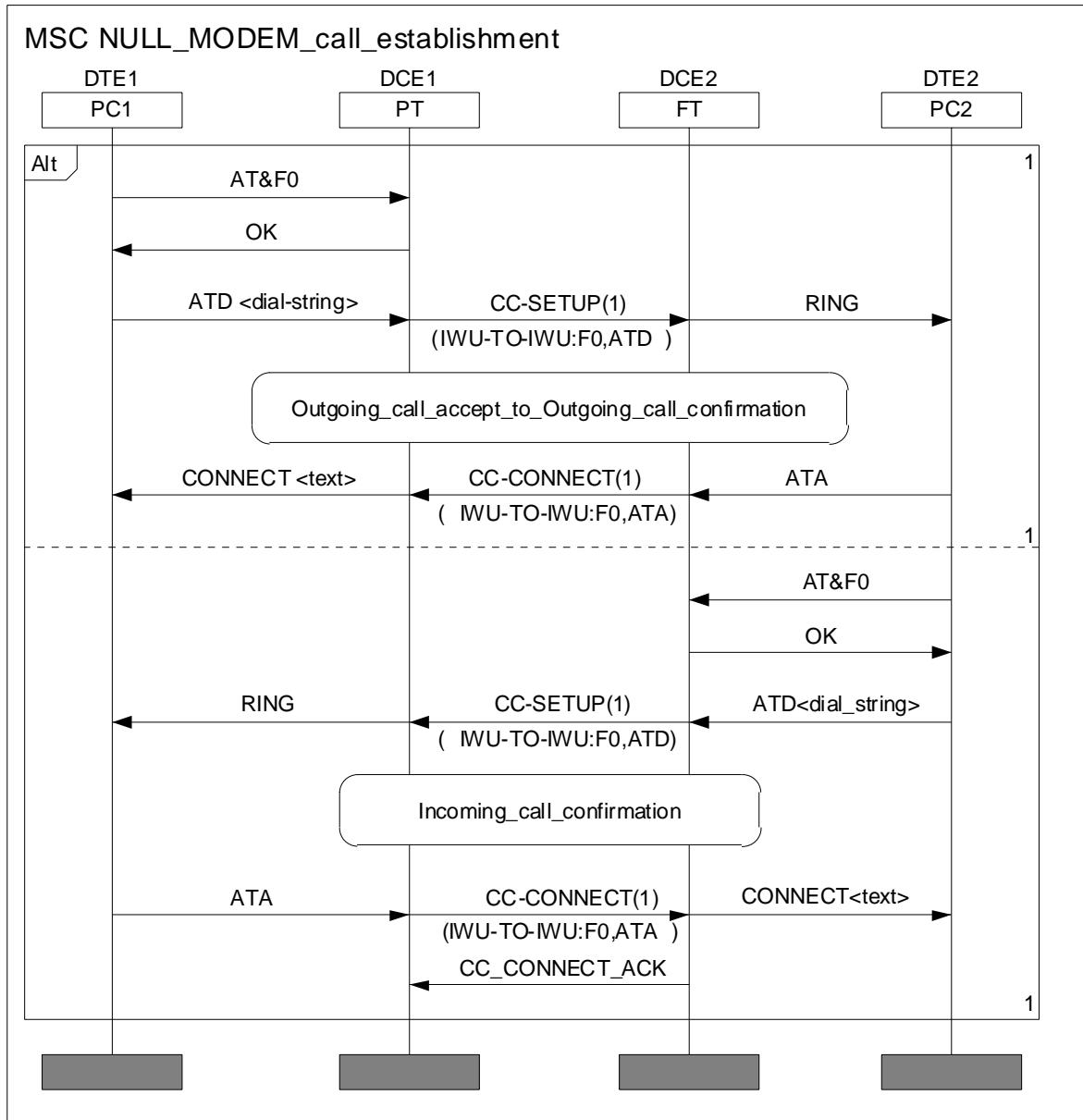
Figure 10: NULL MODEM call establishment; call accept

The message mapping is shown in tables 12 to 15.

Table 12: ATD - CC-SETUP(1)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	ATD<dial-string> (6.3.1 [18])	CC-SETUP (12.1 [14], 12.2 [14])	m	The CC-SETUP message takes all settings (like data rate, configuration etc.) into account.
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	
4	-	Portable identity	-	
5	-	Fixed identity	-	
6	-	Basic service	-	
7	<speed>	IWU attributes/Data rate	o	from a previous AT+CBST command
7	<dial-string>	Called party number	c1201	
8	<F0>	IWU-TO-IWU	o	from a previous AT&F0/255 command: <0> indicates NULL MODEM config
9	<ATD>	IWU-TO-IWU	o	The command name <ATD> is mapped.
c1201:	IF Incoming call THEN n/a IF Outgoing call THEN m			

Table 13: CC-SETUP (1) - RING

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-SETUP (12.1 [14], 12.2 [14])	RING (6.3.4 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	
4	Portable identity	-	-	
5	Fixed identity	-	-	
6	Basic service	-	-	
7	IWU-TO-IWU <F0>	-	m	Indication of NULL MODEM configuration
8	IWU-TO-IWU <ATD>	-	m	This message was triggered by the <ATD> command

Table 14: ATA - CC-CONNECT (1)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	ATA (6.3.5 [18])	CC-CONNECT (8.6 [6], 8.15 [6])	m	
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	
4		IWU attributes/Data rate	o	Indication of data rate
5		IWU-TO-IWU <0>	o	NULL MODEM configuration. This setting is stored in the IWU.
6		IWU-TO-IWU <ATA>	o	This message was triggered by the <ATA> command

Table 15: CC-CONNECT (1) - CONNECT

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-CONNECT (8.6 [6], 8.15 [6])	CONNECT <text> (6.3.5 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	
4	IWU attributes/Data rate	<text>	o	Indication of data rate
5	IWU-TO-IWU <F0>		o	Indication of NULL MODEM configuration
6	IWU-TO-IWU <ATA>		o	This message was triggered by the <ATA> command

6.4.2 ACCESS DTE-initiated call establishment

The DTE-initiated call establishment is shown in figure 11.

The default configuration could be the NULL MODEM configuration. In order to change into ACCESS configuration the **AT&F255** command should be used.

If the P-IWU receives an **AT&F255** command, then the P-IWU should switch to ACCESS configuration and return an **OK** message. The **AT&F255** command should be mapped to the SETUP/IWU-TO-IWU message.

If the P-IWU receives an **ATD** command, then the P-IWU should issue a MNCC_SETUP.req primitive resulting in a CC-SETUP message being sent to the FT.

Upon receipt of a MNCC_SETUP.ind primitive the F-IWU should send an **ATD** command to DCE2. PT and FT may perform the "Outgoing call accept to Outgoing call confirmation" procedure.

Call accept:

Upon receipt of a **CONNECT** command the F-IWU should issue a MNCC_CONNECT.req primitive resulting in a CC-CONNECT message being sent to the PT.

If the P-IWU receives a MNCC_CONNECT.ind primitive, then the P-IWU should send a **CONNECT** command to DTE1.

Call reject:

Upon receipt of an **ERROR** command the F-IWU should issue a MNCC_REJECT.req primitive resulting in a CC-RELEASE-COM message being sent to the PT.

If the P-IWU receives a MNCC_REJECT.req primitive, then the P-IWU should send an **ERROR** command to DTE1.
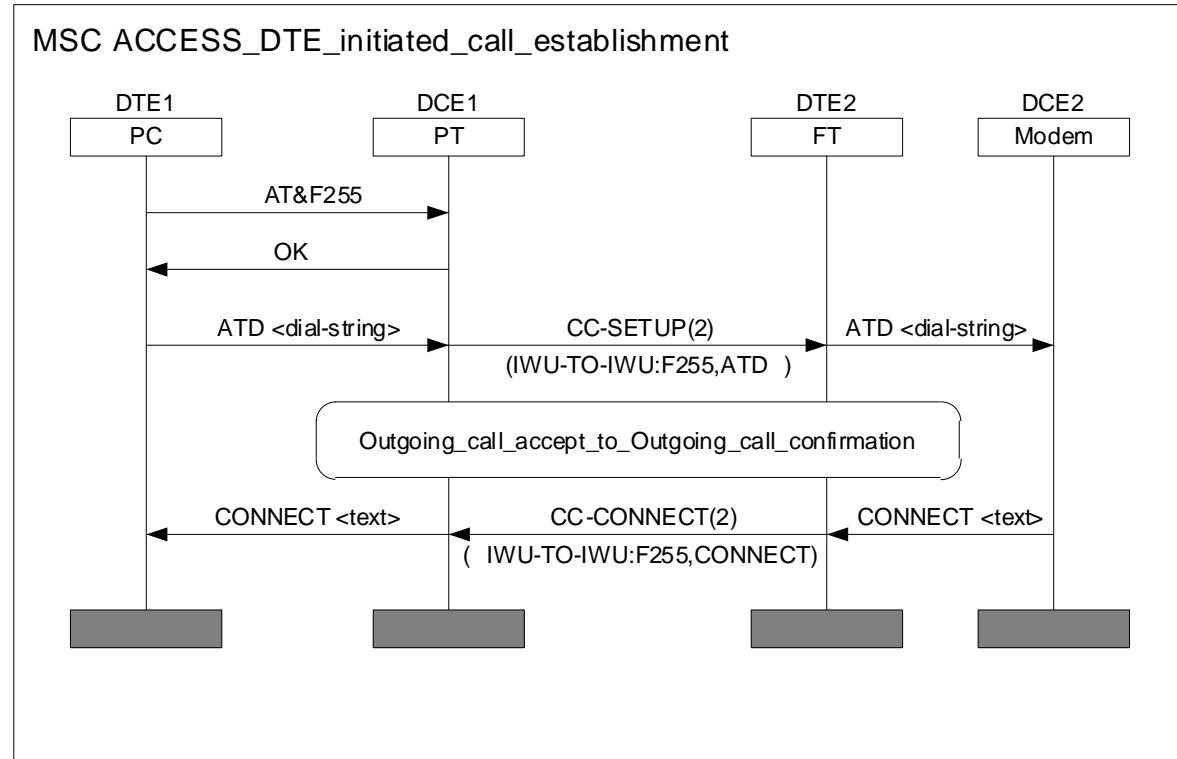
Figure 11: ACCESS DTE-initiated call establishment; call accept

The message mapping is shown in tables 16 to 19.

Table 16: ATD - CC-SETUP(2)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	ATD<dial-string> (6.3.1 [18])	CC-SETUP (12.1 [14], 12.2 [14])	m	The CC-SETUP message takes all settings (like data rate, configuration etc.) into account.
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	
4	-	Portable identity	-	
5	-	Fixed identity	-	
6	-	Basic service	-	
7	<speed>	IWU attributes/Data rate	o	From a previous AT+CBST command
7	<dial-string>	Called party number	m	
8	<F255>	IWU-TO-IWU	o	From a previous AT&F255 command: <255> indicates ACCESS config
9	<ATD>	IWU-TO-IWU	o	The command name <ATD> is mapped.

Table 17: CC-SETUP (2) - ATD

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-SETUP (12.1 [14], 12.2 [14])	ATD<dial-string> (6.3.1 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	
4	Portable identity	-	-	
5	Fixed identity	-	-	
6	Basic service	-	-	
8	Called party number	<dial-string>	m	
9	IWU-TO-IWU <F255>	-	o	Indication of ACCESS configuration
10	IWU-TO-IWU <ATD>	-	o	This message was triggered by the <ATD> command

Table 18: CONNECT - CC-CONNECT (2)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	CONNECT <text> (6.3.5 [18])	CC-CONNECT (8.6 [6], 8.15 [6])	m	
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	
4	<text>	IWU attributes/Data rate	o	Indication of data rate
5		IWU-TO-IWU <255>	o	NULL MODEM configuration. This setting is stored in the IWU.
6		IWU-TO-IWU <CONNECT>	o	This message was triggered by the <CONNECT> command

Table 19: CC-CONNECT (2) - CONNECT

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-CONNECT (8.6 [6], 8.15 [6])	CONNECT <text> (6.3.5 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	
4	IWU attributes/Data rate	<text>	o	Indication of data rate
5	IWU-TO-IWU <F255>		o	Indication of NULL MODEM configuration
6	IWU-TO-IWU <CONNECT>		o	This message was triggered by the <CONNECT> command

6.4.3 ACCESS DCE-initiated call establishment

The DCE-initiated call establishment is shown in figure 12.

If the F-IWU receives a **RING** command, then the F-IWU should issue a MNCC_SETUP.req primitive resulting in a CC-SETUP message being sent to the PT.

Upon receipt of a MNCC_SETUP.ind primitive the P-IWU should send a **RING** command to DTE1. PT and FT may perform the "Outgoing call accept to Outgoing call confirmation" procedure.

Call accept:

Upon receipt of an **ATA** command the P-IWU should issue a MNCC_CONNECT.req primitive resulting in a CC-CONNECT message being sent to the FT.

If the F-IWU receives a MNCC_CONNECT.ind primitive, then the F-IWU should send an **ATA** command to DCE2.

Call reject:

Upon receipt of an **ERROR** command (see table 24) the F-IWU should issue a MNCC_REJECT.req primitive resulting in a CC-RELEASE-COM message being sent to the PT.

If the P-IWU receives a MNCC_REJECT.req primitive, then the P-IWU should send an **ERROR** command to DTE1.
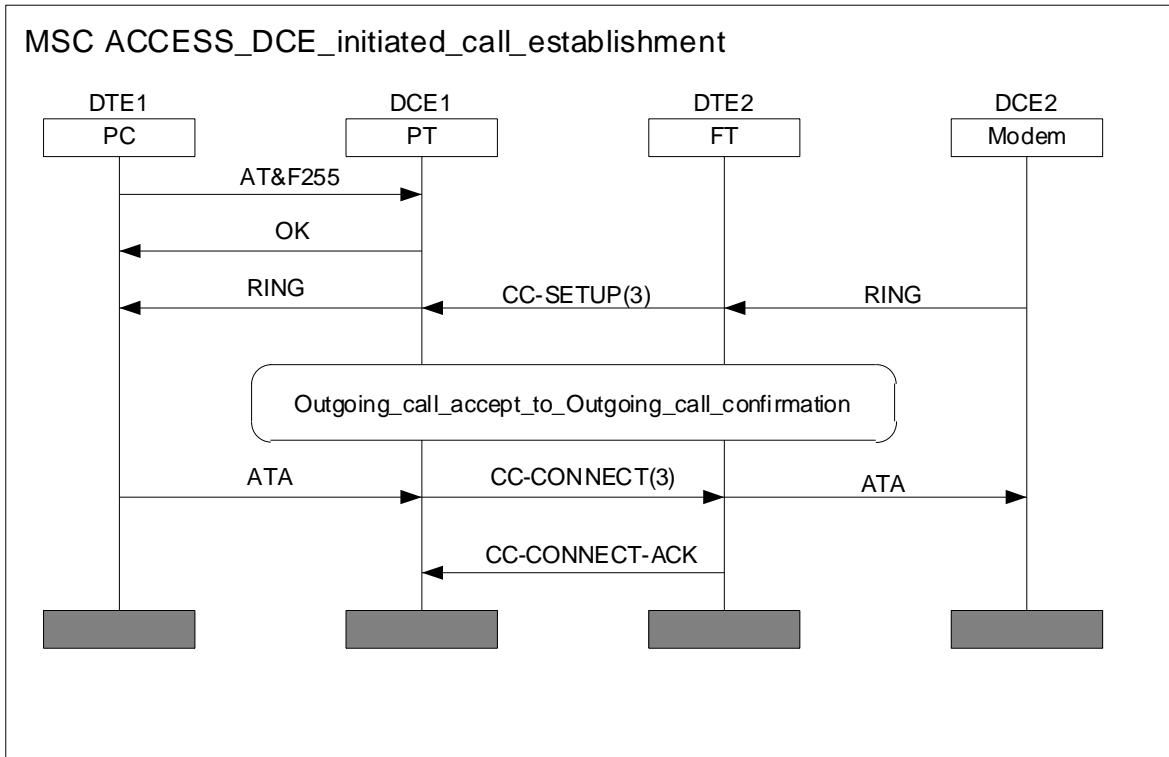
Figure 12: ACCESS DCE-initiated call establishment; call accept

The message mapping is shown in tables 20 to 23.

Table 20: RING - CC-SETUP(3)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	RING (6.3.4 [18])	CC-SETUP (12.1 [14], 12.2 [14])	m	
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	
4	-	Portable identity	-	
5	-	Fixed identity	-	
6	-	Basic service	-	
NOTE:	No parameters are mapped to the IWU-TO-IWU element because the modem (DCE) cannot set any parameters.			

Table 21: CC-SETUP (3) - RING

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-SETUP (12.1 [14], 12.2 [14])	RING (6.3.4 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	
4	Portable identity	-	-	
5	Fixed identity	-	-	
6	Basic service	-	-	

Table 22: ATA - CC-CONNECT (3)

Item No	Command coding AT	Message coding DECT	Map. status	Note
	ATA (6.3.5 [18])	CC-CONNECT (8.6 [6], 8.15 [6])	m	
1	-	Protocol discriminator	-	
2	-	Transaction identifier	-	
3	-	Message type	-	

Table 23: CC-CONNECT (3) - ATA

Item No	Message coding DECT	Command coding AT	Map. status	Note
	CC-CONNECT (8.6 [6], 8.15 [6])	ATA (6.3.5 [18])	m	
1	Protocol discriminator	-	-	
2	Transaction identifier	-	-	
3	Message type	-	-	

6.5   Bandwidth negotiation

6.5.1   NULL MODEM bandwidth negotiation

The NULL MODEM bandwidth negotiation is shown in figure 13.

The NULL MODEM bandwidth negotiation initiated by DTE1 is symmetric to the NULL MODEM bandwidth negotiation initiated by DTE2 (except for the CC_CONNECT_ACK). Therefore only the NULL MODEM bandwidth negotiation initiated by DTE1 is described.

DTE1 defines the data rate of the next call by sending an **AT+CBST=<speed>** command to the PT.

In function of its propagation scenarios, the PT calculates the modulation scheme, the slot structure and the adaptive code rate in order to ensure the required data rate (see annex I, EN 300 175-3 [3]).

At the next call attempt the PT maps the <speed > parameter to the Data rate field of the IWU-attributes element. The FT maps the Data rate field of the IWU-attributes element to the <speed> parameter of the **AT+MRR:<speed>** command.

Bandwidth negotiation accept:

DTE2 accepts the proposed data rate by sending an **OK** command.

Bandwidth negotiation reject:

DTE2 rejects the proposed data rate by sending an **ERROR** command. The FT might propose different data rates until DTE2 accepts.

Call connection:

The FT maps the negotiated data rate to the Data rate field of the IWU-attributes element of the CC-CONNECT message. The PT maps the Data rate field of the IWU-attributes element to the <text> parameter of the CONNECT command.

Call accept:

No action.

Call reject:

DTE1 sends an **ERROR** command.

Figure 13: NULL MODEM bandwidth negotiation

6.5.2 ACCESS DTE bandwidth negotiation

The ACCESS DTE bandwidth negotiation is shown in figure 14.

DTE1 defines the data rate of the next call by sending an **AT+CBST=<speed>** command to the PT. At the next call attempt the PT maps the <speed > parameter to the Data rate field of the IWU-attributes element. The FT maps the Data rate field of the IWU-attributes element to the <speed> parameter of the **AT+CBST=<speed>** command.

Bandwidth negotiation accept:

DCE2 accepts the proposed data rate by sending an **OK** command.

Bandwidth negotiation reject:

DCE2 rejects the proposed data rate by sending an **ERROR** command. The FT might propose different data rates until DCE2 accepts.

Call connection:

The FT maps the negotiated data rate to the Data rate field of the IWU-attributes element of the CC-CONNECT message. The PT maps the Data rate field of the IWU-attributes element to the <text> parameter of the CONNECT command.

Call accept:

No action.

Call reject:

DTE1 sends an **ERROR** command.

MSC ACCESS_DTE_bandwidth_negotiation
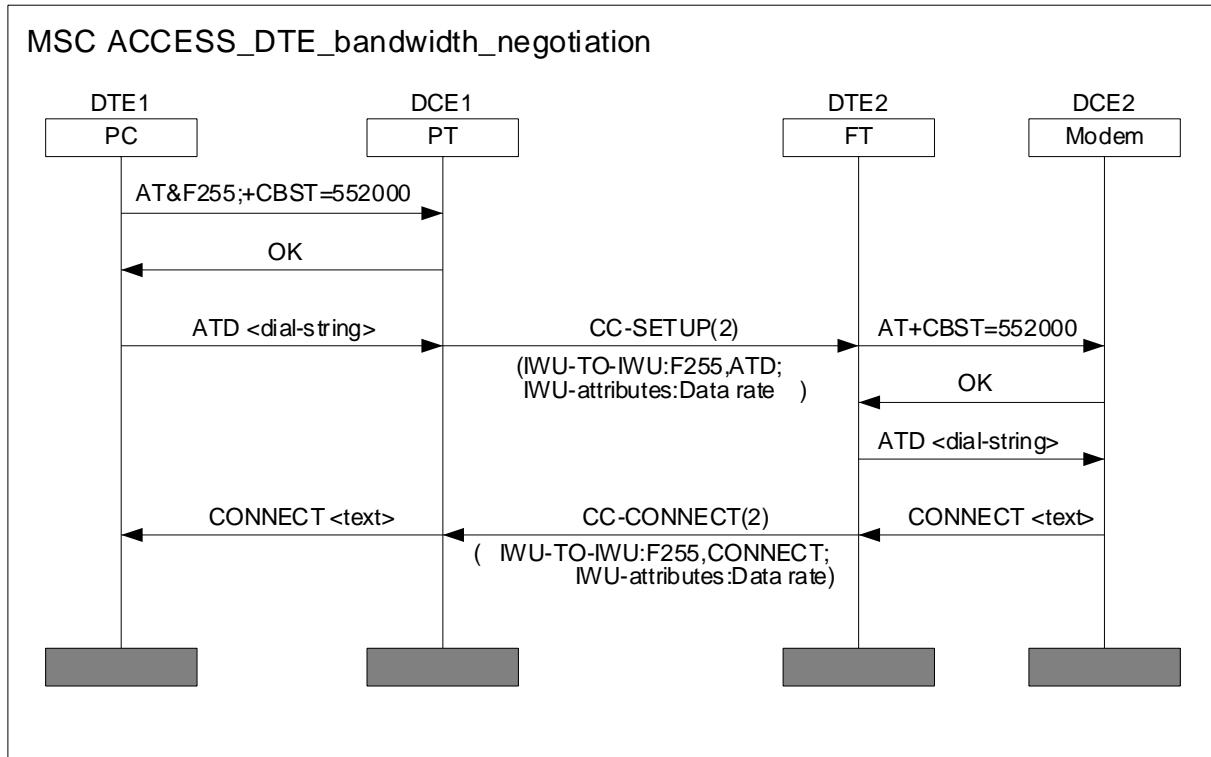
Figure 14: ACCESS DTE bandwidth negotiation

6.5.3   ACCESS DCE bandwidth negotiation

The ACCESS DCE bandwidth negotiation is shown in figure 15.

DCE2 defines the data rate of the next call by sending an **AT+MRR:<speed>** command to the FT. At the next call attempt the FT maps the <speed > parameter to the Data rate field of the IWU-attributes element. The PT maps the Data rate field of the IWU-attributes element to the <speed> parameter of the **AT+MRR:<speed>** command.

Bandwidth negotiation accept:

DTE1 accepts the proposed data rate by sending an **OK** command.

Bandwidth negotiation reject:

DTE1 rejects the proposed data rate by sending an **ERROR** command. A different data rate can only be proposed in a new call setup.

Call connection:

Negotiation is not possible. The PT sends the CC-CONNECT message. The FT sends the **ATA** command.

Call accept:

No action.

Call reject:

DCE1 sends an **ERROR** command.
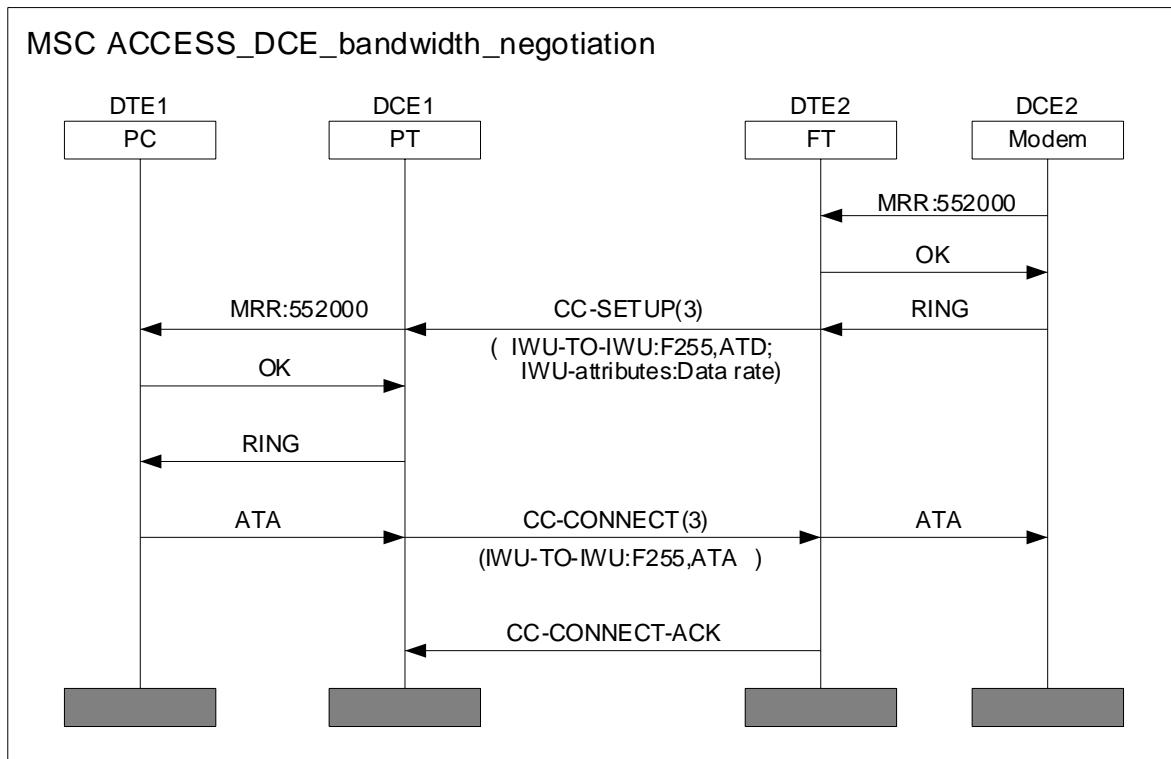
Figure 15: ACCESS DCE bandwidth negotiation

6.6 Ciphering

6.6.1 NULL MODEM ciphering by FT

The NULL MODEM ciphering by FT is shown in figure 16.

If the F-IWU receives an **AT+CCF** command, then the F-IWU should either send a CIPHER-REQUEST message or execute the key allocation procedure.

Ciphering accept:

The FT sends an **OK** command.

Ciphering reject:

The FT sends the appropriate **D-ERROR-RESULT** command.
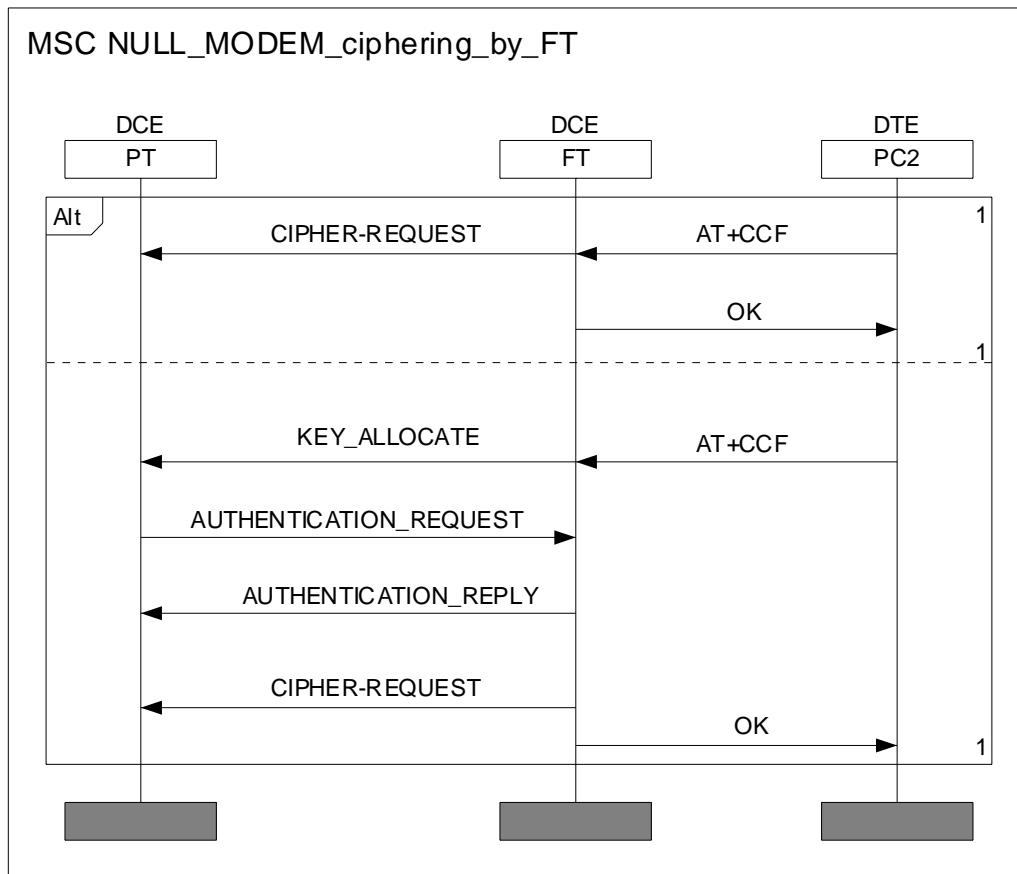
Figure 16: NULL MODEM ciphering by FT

6.7   Error handling

The definition of the **+CMEE** command and **+CME ERROR** command should apply as described in TS 127 007, clauses 9.1 and 9.2 [11] with the following modifications.

6.7.1   +CMEE

Defined values

   <n>:

   3 enable +CME ERROR: <err> result code and use hex <err> values

6.7.2   +CME ERROR

The id parameter (decimal value of the element header) is introduced in order to distinguish between Reject reasons and Release reasons which have the same decimal value.

Defined values

   <id, err>:

   id (decimal):

   96 Reject reason

   226 Release reason

err:

copy from the DECT values

6.8   Multiplexing

The **+CMUX** command should enable/disable the multiplexer protocol, as specified in TS 127 010 [12]. The multiplexing protocol allows a number of virtual channels to be established between DTE1 and a the PT, and DTE2 and the FT respectively.

In the following clauses possible appliances are described.

6.8.1   Bandwidth change

Once a connection is established, the bandwidth can be changed.

6.8.1.1   NULL MODEM bandwidth change

The NULL MODEM bandwidth change is shown in figure 23.

The NULL MODEM bandwidth change initiated by DTE1 is symmetric to the NULL MODEM bandwidth change initiated by DTE2. Therefore only the NULL MODEM bandwidth change initiated by DTE1 is described.

DTE1 changes the data rate of the call by sending an **AT+CBST=<speed>** command to the PT.

In function of its propagation scenarios, the PT calculates the modulation scheme, the slot structure and the adaptive code rate in order to ensure the required data rate (see annex I, EN 300 175-3 [3]).

If the P-IWU receives the **AT+CBST=<speed>** command, then the P-IWU should issue a MNCC_MODIFY.req primitive resulting in a CC-SERVICE-CHANGE message being sent to the FT.

Upon receipt of a MNCC_MODIFY.ind primitive the F-IWU should send an **AT+MRR:<speed>** command to the DTE2.

Service change accept:

Upon receipt of an **AT+MRR:<speed>** command DTE2 should send an **OK** command.

Upon receipt of the **OK** command the F-IWU should issue a MNCC_MODIFY.cfm primitive resulting in a CC-SERVICE-ACCEPT message being sent to the PT.

If the P-IWU receives a MNCC_SERVICE-ACCEPT.ind primitive, then the P-IWU should send an **OK** command to DTE1.

Service change reject:

Upon receipt of an **AT+MRR:<speed>** command DTE2 should send an **ERROR** command.

Upon receipt of an **ERROR** command the F-IWU should issue a MNCC_MODIFY.req primitive resulting in a CC-SERVICE-REJECT message being sent to the PT.

If the P-IWU receives a MNCC_SERVICE-REJECT.ind primitive, then the P-IWU should send an **ERROR** command to DTE1.
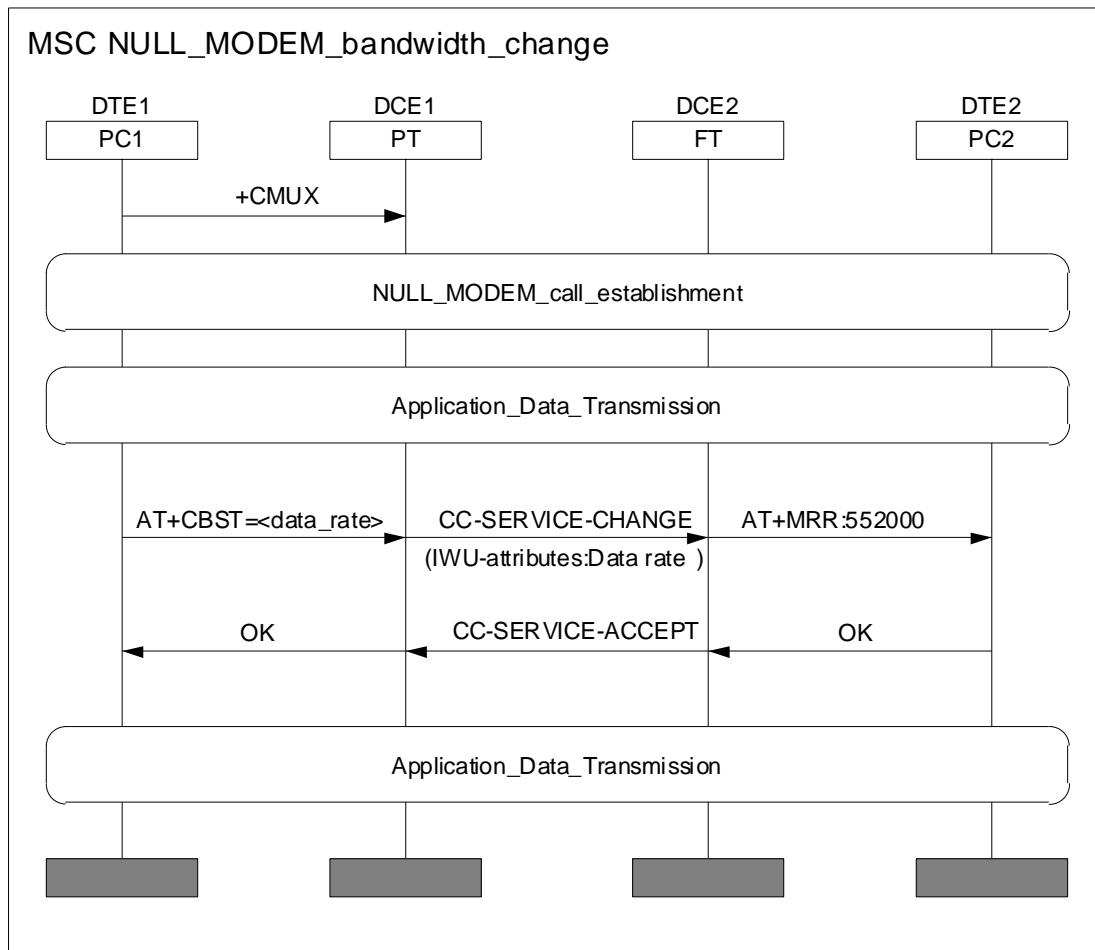
Figure 17: NULL MODEM bandwidth change

7 Message mappings

7.1 AT to DECT

Table 24: List of mapped messages, AT to DECT

Item No	AT command	DECT message	Mapping status
1	AT+COAR	ACCESS-RIGHTS-REQUEST	o
2	AT+CGATT=1	LOCATE-REQUEST	o
3	AT+CPIN	AUTHENTICATION-REQUEST	o
4	ATD <dial-string>	CC-SETUP	o
5	ATA	CC-CONNECT	o
6	CONNECT <text>	CC-CONNECT	o
7	RING	CC-SETUP	o
8	AT+CBST=<data rate>	CC-SERVICE-CHANGE	o
9	OK	CC-SERVICE-ACCEPT	o
10	AT+CCF	CIPHER-REQUEST	o
11	AT+CCF	KEY-ALLOCATE	o
12	ERROR/NO CARRIER/BUSY/NO ANSWER/NO DIALTONE	CC-RELEASE	o
13	ERROR/NO CARRIER/BUSY/NO ANSWER/NO DIALTONE	CC-RELEASE-COM	o

7.2 DECT to AT

Table 25: List of mapped messages, DECT to AT

Item No	DECT message	AT command	Mapping status
1	ACCESS-RIGHTS-ACCEPT	OK	o
2	ACCESS-RIGHTS-REJECT	AT+CME ERROR	o
3	LOCATE-ACCEPT	OK	o
4	LOCATE-REJECT	AT+CME ERROR	o
5	AUTHENTICATION-REPLY	OK	o
6	AUTHENTICATION-REJECT	AT+CME ERROR	o
7	CC-SETUP(1)	RING	o
8	CC-SETUP(2)	ATD	o
9	CC-RELEASE-COM	AT+CME ERROR	o
10	CC-CONNECT(1)	CONNECT<text>	o
11	CC-CONNECT(2)	ATA	o
12	CC-RELEASE	AT+CME ERROR	o
13	CC-SERVICE-CHANGE	AT+MRR:<data rate>	o
14	CC-SERVICE-CHANGE	AT+CBST=<data rate>	o
1	CC-SERVICE-ACCEPT	OK	o
16	CC-SERVICE-REJECT	AT+CME ERROR	o
17	CC-CIPHER-REQUEST	OK	o

Annex A:
Common MSCs
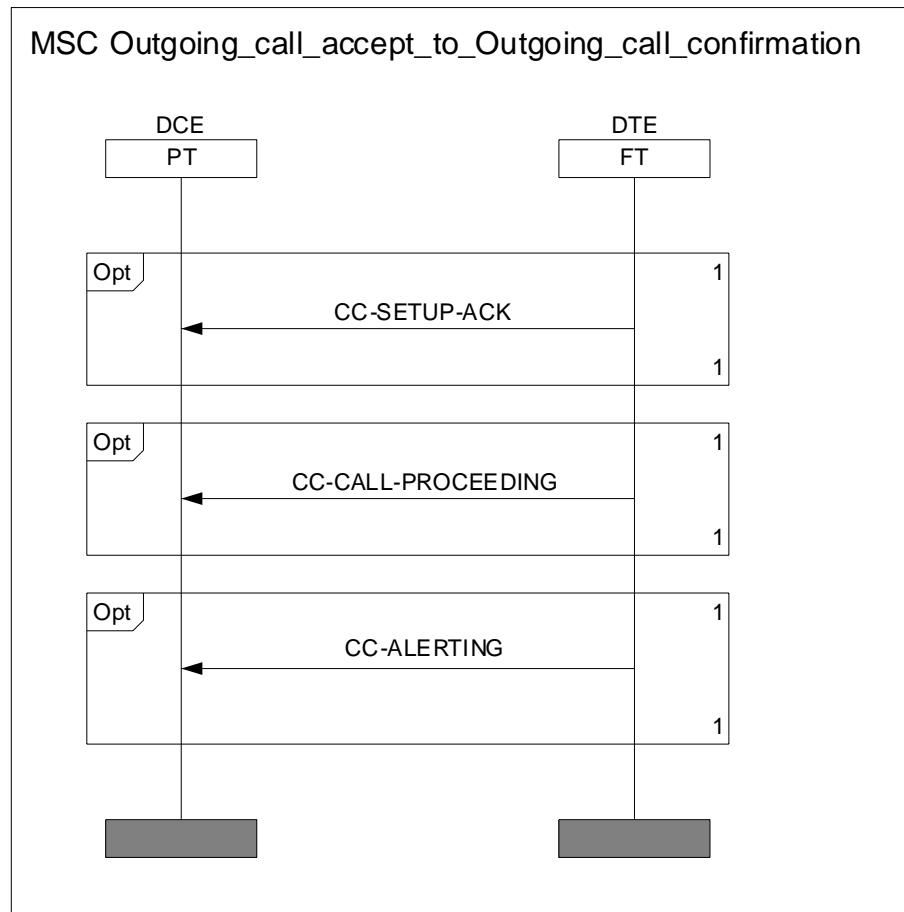
Figure A.1: Outgoing call accept to Outgoing call confirmation

MSC Incoming_call_confirmation

PT   FT

CC_ALERTING

Opt   1

CC_INFO

1
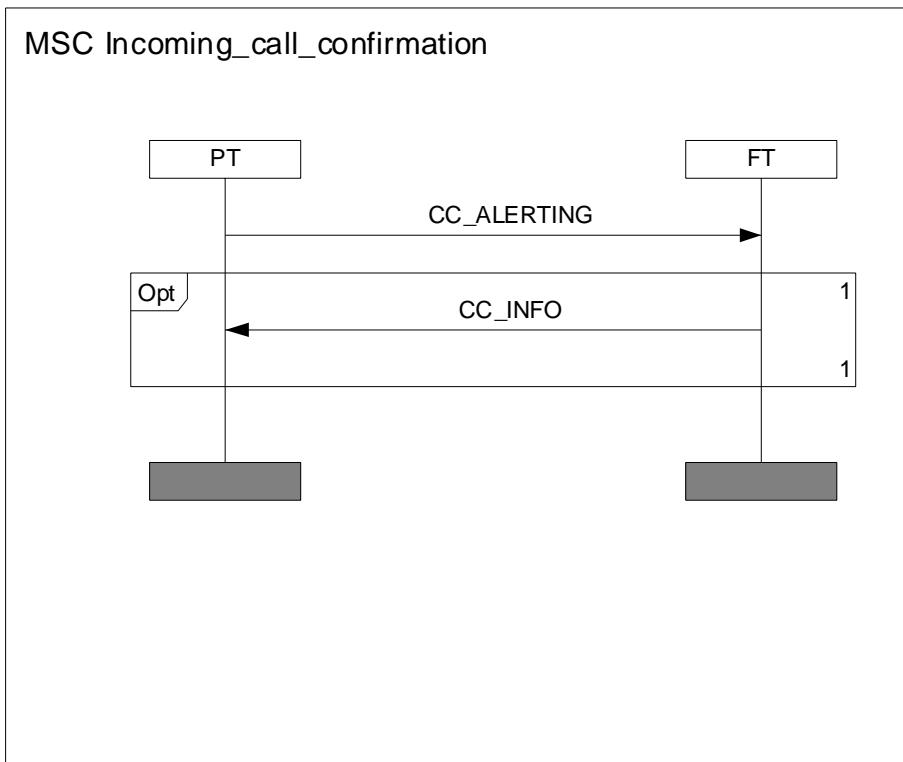
Figure A.2: Incoming call confirmation

MSC Key_Allocation

DCE   DCE/DTE
PT   FT

KEY_ALLOCATE

AUTHENTICATION_REQUEST

AUTHENTICATION_REPLY

CIPHER-REQUEST
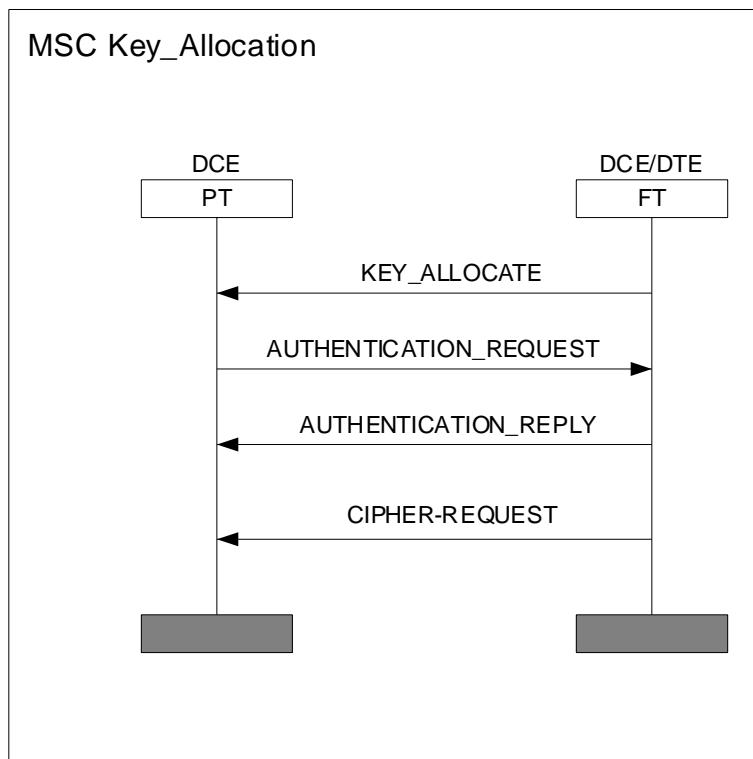
Figure A.3: Key allocation

History

Document history		
V1.1.1	March 2003	Publication