



NOKIA D211



DEVELOPER MANUAL FOR NOKIA D211

TECHNICAL SPECIFICATIONS TO NETWORK ADMINISTRATORS AND SYSTEM DEVELOPERS

VERSION 1.1



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For your safety

Read these simple guidelines. Breaking the rules may be dangerous or illegal. Further detailed information is given in this manual.



Do not switch the radio card on when wireless equipment use is prohibited or when it may cause interference or danger.



Road safety comes first

Don't use the radio card while driving.



Interference

All radio cards may get interference, which could affect performance.



Switch off in hospitals

Follow any regulations or rules. Switch the radio card off near medical equipment.



Switch off in aircraft

Wireless devices can cause interference in aircraft.



Switch off when refuelling

Don't use the radio card at a refuelling point. Do not use near fuel or chemicals.



Switch off near blasting

Don't use the radio card where blasting is in progress. Observe restrictions, and follow any regulations or rules.



Use sensibly

Use only in the normal position. Don't touch the antenna unnecessarily.



Qualified service

Only qualified personnel may repair radio card equipment.



Accessories

Use only approved accessories. Do not connect incompatible products.



Water-resistance

Your radio card is not water-resistant. Keep it dry.



Backup copies

Remember to make backup copies of all important data.



Connecting to other devices

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.



1. INTRODUCTION

The Nokia D211 combines GSM/HSCSD/GPRS and WLAN in one PC card /11/. It includes a GSM transceiver with built-in data capabilities, SIM card reader, antenna and PC Card interface in a very compact package. The functionality of the Nokia D211 can be controlled by the host unit using AT commands. The Nokia D211 can be plugged into computers or other devices having a PC card type II slot, or integrated into vertical solutions such as vending machines or security systems.

With the Nokia D211 you have access to the data functionality of GSM and WLAN networks. Short message (SM), connection oriented data and facsimile services can be used. The Nokia D211 is a dual band PC card transceiver designed for operation in EGSM 900, GSM 1800 and GSM900/1800 dual band networks. It supports:

- High Speed Circuit Switched Data (HSCSD), which offers data rates of up to 43.2 kbit/s by using multiple receive and transmit time slots.
- General Packet Radio Service (GPRS), which offers data rates of up to 64.2 kbit/s by using multiple receive and transmit time slots.
- Wireless Local Area Network (IEEE 802.11b), which offers data rates of up to 11 Mbit/s by using 2.4GHz license free ISM band.

This document describes the interfaces of the Nokia D211 and the details required for implementing a functional interface to the Nokia D211. Both hardware and software issues are included in this document.



2. CHARACTERISTICS

2.1 WLAN

Wireless LANs (WLAN) were originally designed to be used as an extension or as an alternative to fixed LANs in order to avoid cabling costs, for example. Today, WLANs are rapidly gaining significance, as mobile devices, such as laptop computers, are replacing desktop personal computers. At the same time, major advances in the WLAN technology have taken place. The overall trend is towards higher bit rates, interoperable networking with other systems, compatible standards, and interoperable products between different WLAN product manufacturers.

2.1.1 Frequencies

Traditional cellular systems operate on licensed frequency bands. Operators are given a certain piece of spectrum from the total spectrum allocation to a particular system for their sole use. This scheme works nicely with systems covering large areas, such as GSM. However, given the limited amount of spectrum this means that only a few operators can have licenses per a given geographical area. For WLANs licensed frequencies clearly are not a feasible solution since by their nature these systems are operated, for example, by companies or individuals in a limited geographical area, such as a building. Therefore, pico cell networks and personal area networks operate on unlicensed spectrum. This means that a certain piece of spectrum is available for a set of systems/technologies, provided that they fulfil certain agreed, very basic requirements, like maximum allowed transmit power. This means that the operating environment, and the related problems, are very different compared to traditional cellular networks.

2.1.2 Standards

IEEE initiated the 802.11 /24/ working group in 1990 to develop a WLAN standard for the 2.4 GHz unlicensed ISM (Industrial, Scientific, and Medical) frequency band that is available globally (with some national and regional limitations). The IEEE 802.11 standard was approved in 1997, and the first products appeared roughly at the same time.

Like IEEE 802.3 (Ethernet) or 802.5 (Token Ring) also 802.11 only covers the two lowest layers of the OSI reference model. 802.11 reference model consists of two main parts, MAC (Medium Access Control) and PHY (Physical) layers. MAC functions on the Data Link layer and PHY on the Physical layer of the OSI model.

Currently, the IEEE 802.11 family of standards includes specifications for five different types of physical layers. Four of these are based on radio technologies and one on diffuse infrared technology. All physical layer alternatives utilise the same MAC protocol. Three of the radio PHY standards utilise the 2.4 GHz frequency band and one is designed for the 5 GHz frequency band.

IEEE 802.11b /25/, the current industry standard that the vast majority of the current WLAN products -- including the Nokia D211 -- support, specifies a 2.4 GHz radio that utilises Direct

Sequence Spread Spectrum (DSSS) technology. IEEE 802.11b offers 5.5 and 11 Mbit/s physical data rates. The multirate control of 802.11 MAC protocol allows a terminal to switch from the 11 Mbit/s link speed down to 5.5 and even further down to 2 and 1 Mbit/s if the radio channel quality for some reason cannot accommodate higher data rates.

The fundamental access method of 802.11 MAC is distributed coordination function (DCF) known as the carrier sense multiple access with collision avoidance, or CSMA/CA. It is implemented in all stations for use both within independent and infrastructure networks. CSMA/CA is a “listen before you talk” algorithm – similar to the protocol used in fixed Ethernet -- where the station wishing to transmit senses the transmission medium to determine whether it is idle or busy. If the medium is not busy the transmission may proceed. If the medium is busy the station defers until the end of the current transmission. After deferral or prior to attempting to transmit again immediately after a successful transmission, the station must select a random backoff interval before it starts the transmission. This reduces the probability of a collision at a point where it would most likely occur. This moment is just after the medium becomes free after transmission. Random backoff of different stations ensures that not all the stations begin transmission immediately.

The transmission time is limited to ensure fair access to the channel for all the stations. There has to be a gap of some minimum duration (Interframe Space) between two transmissions from one station.

2.1.3 Architecture

The standard defines the logical architecture of an 802.11 network. The architectural basic components are the station, wireless medium, access point (AP), distribution system and portal. These components are used to form the 802.11 network. There are two fundamental alternatives for the 802.11 architecture, namely independent (ad hoc) and infrastructure networks. These are depicted in Figure 1 and Figure 2 respectively.

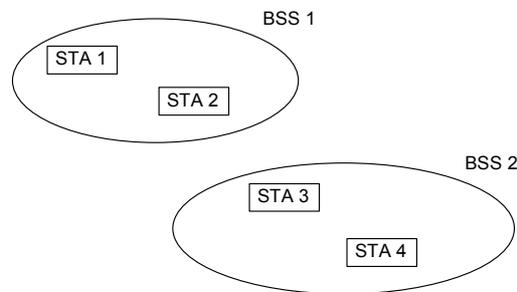


Figure 1. Independent networks BSS1 and BSS2.

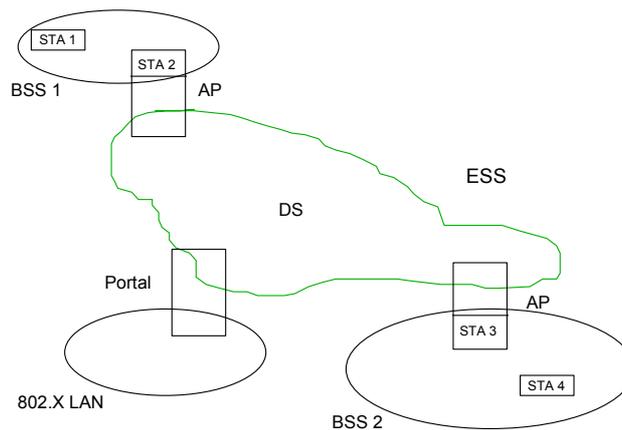


Figure 2. Infrastructure network (ESS).

An independent network, or BSS (Basic Service Set), consists of two or more stations that communicate directly with each other through the wireless medium. This kind of network can also be referred to as an ad hoc network. Physical limitations determine the direct station-to-station distance that can be supported. For some networks this distance is adequate, other networks require increased coverage.

An infrastructure network, or ESS (Extended Service Set), is constructed from multiple BSSs, access points and a distribution system (DS).

DS enables mobile device support by providing the logical services necessary to handle address to destination mapping and seamless integration of multiple BSSs. DS extends the network and enables communication between stations that are too far from each other to communicate directly.

An access point has station functionality and provides access to the distribution service. Data moves between the BSS and DS via an access point.

The key concept of ESS is that it appears to the LLC layer as an independent network. Stations within an ESS can communicate with the other stations, and mobile stations may move from one BSS to other BSSs within the same ESS transparently to LLC. 802.11 does not assume anything about the physical locations of the architectural components.

Integration with the existing wired LANs is possible through a portal. Portal is the logical point at which MSDUs (MAC Service Data Unit) from a non-802.11 wired LAN enter the 802.11 DS. A portal can be implemented in the same physical device as an access point, but not necessarily. Portal is not equivalent to a traditional bridge in the strict sense, since a bridge is used to connect similar MAC layers.

2.1.4 Services

The 802.11 architecture allows for the possibility that the DS may not be identical to an existing wired LAN. DS can be implemented with many different technologies, including current 802.X wired LANs. 802.11 does not constrain the DS to be either Data Link or Network layer based. Nor does 802.11 constrain the DS to be either centralized or distributed in nature. Instead of specific implementation, 802.11 defines services. There are two categories of 802.11 services: Station Services (SS) and Distribution System Services (DSS). Both categories are used by the 802.11 MAC layer.



Station services support transport of MSDUs between stations within the same BSS. They are present in every 802.11 station. The station service subset is

- a) Authentication
- b) Deauthentication
- c) Privacy
- d) MSDU delivery

Distribution system services are provided by the DS and they enable the MAC to transport MSDUs between BSSs within an ESS. The DSS service subset is

- a) Association
- b) Disassociation
- c) Distribution
- d) Integration
- e) Reassociation

Distribution delivers MSDUs within the DS. It is the job of the DS to deliver the message in such a way that it arrives at the appropriate DS destination for the intended recipient. The necessary information for the message distribution is provided by the three association related services.

Integration enables delivery of MSDUs between the DS and an existing wired network. The message is delivered via the portal and the integration service is responsible for accomplishing whatever is needed to deliver a message from the DS to the wired LAN media.

The different association services support different categories of mobility. The basic association service establishes association between a station and an access point. The information is needed for the message delivery via DS. At any time, a station may be associated with no more than one access point, while an access point may be associated with many stations at a time. Association is always initiated by the mobile station.

Reassociation enables the transfer of an existing association from one access point to another within an ESS. Reassociation also enables changing of attributes of an established association while a station remains associated with the same access point. The existing connections must be maintained during the reassociation.

Disassociation voids an existing association. It can be invoked by either party of the association and cannot be refused by the other party.

Authentication is used when stations identify each other. Since wireless media is not bounded like wired 802.11, it supports several authentication processes although it does not mandate the use of any particular authentication service. 802.11 provides link level authentication between stations. It does not provide end-to-end or user-to-user authentication. 802.11 authentication is simply used to bring the wireless link up to the assumed physical standards of a wired link. 802.11 also supports shared key authentication with the WEP (Wired Equivalent Privacy) option. Authentication is void by Deauthentication.

Privacy is closely related to authentication. This service is used to prevent the contents of messages from being read by anybody else than the intended recipient.

2.1.5 WLAN Summary

The Nokia D211 supports the IEEE 802.11b standard that is the industry de facto standard. The maximum data rate is 11 Mbit/s. The Nokia D211 operates on the 2.4 GHz ISM frequency band.

2.2 WECA

A few years ago several WLAN standards and proprietary implementations were competing at the same marketplace. WLAN networking components from one vendor would only work with WLAN terminal equipment from the same manufacturer. In other words, customers could not go and purchase a wireless access point (a wireless network hub) from one vendor and use a wireless network adapter from another vendor in the same installation. This was widely recognized as being the main limiting factor preventing wide scale market acceptance of the WLAN technology. The situation effectively limited the WLAN usage to a certain niche market segments where multi-vendor capability was not of primary concern.

In 1999, Wireless Ethernet Compatibility Alliance (WECA) was formed to tackle the interoperability problem by supporting the recently approved IEEE 802.11b standard and by testing and certifying WLAN multi-vendor interoperability. The founding members of the group include 3Com, Aironet (now part of Cisco systems), Intersil (formerly Harris Semiconductors), Lucent Technologies (now Agere systems), Nokia, and Symbol Technology. It is notable that today WECA has approximately 140 member companies.

In addition to certifying the interoperability of Wi-Fi™ (IEEE 802.11) products, WECA's mission includes the promotion of Wi-Fi™ as the global wireless LAN standard across all market segments.

Today, it is clear that the improved compatibility between different manufacturers' WLAN devices together with marketing activities have significantly fostered the overall WLAN market growth, which in turn has led to lower device costs to end users, thus further increasing the potential market size.

2.2.1 Testing Process

WECA's interoperability certification process can be divided into two main parts:

- 1) Definition of the test specifications and
- 2) Testing of the products from various manufacturers against the test specifications to make sure that products conform to the Wi-Fi™ standard

Agilent Technologies Interoperability Certification Lab (Agilent ICL) (former Silicon Valley Networking Labs) performs the WECA testing. Agilent's ICL is operating as an independent test facility. However, only WECA members can submit products to the lab for Wi-Fi™ interoperability testing.

When a product meets the interoperability requirements as described in the WECA test matrix, Agilent's ICL notifies WECA. WECA then grants a certification of interoperability, which allows the vendor to use the Wi-Fi logo on advertising and packaging for the certified product. The Wi-Fi logo is shown in Figure 3.



Figure 3: Wi-Fi™ logo.

The idea is that the Wi-Fi seal of approval assures the end customer of the interoperability with other network cards and access points which also bear the Wi-Fi logo.

The Nokia D211 is Wi-Fi compliant.



2.2.2 Further Reading

For more information on WECA and on the Wi-Fi standard, check the Wi-Fi™ web site at <http://www.wi-fi.com/>. The web site also contains a list of Wi-Fi certified products.

2.3 GSM

GPRS and HSCSD operate in GSM networks at the 900 MHz and 1800 MHz bands. The maximum transmit power is 2 W for GSM 900 and 1 W for GSM 1800.

The data services in the first commercial GSM systems in 1991-1992 were based on circuit switched technology. The connection over the air interface used one time slot per user offering a maximum user data rate of 9.6 kbit/s. Since then, mainly due to the increased Internet usage and ever increasing amount of information in the Internet, there has been a constantly increasing user demand for higher data rates. The fixed telephone modems have responded to these requirements with increased data rates – modem data rates have in fact increased over time from 1.2 kbit/s (V.23) to current 56 kbit/s (V.90). In the light of this, it has been very clear that, in order to remain competitive and to meet the customer requirements, the GSM system has to offer higher bit rates. Therefore, the work on GSM High Speed Circuit Switched Data (HSCSD) was started in 1994.

HSCSD is an enhancement of the original circuit switched data service to enable higher user data rates. The increased data rates are achieved by using multiple time slots per a user connection. In theory, one to eight time slots can be combined dynamically giving maximum speed of 76.8kbit/s ($9.6 \text{ kbit/s} * 8$) for one user. It should be noted that GSM circuit switched data shares the capacity with voice services, i.e. a data user using one time slot decreases the maximum amount possible for voice calls in that particular cell by one. Furthermore, if the data user uses several time slots for the connection, the maximum amount of voice calls is decreased by the amount of the used time slots.

In 1997, as a parallel activity to HSCSD, the GSM user data rate per single time slot was increased from 9.6 kbit/s to 14.4 kbit/s by applying different error coding mechanisms in the standard. The motivation for this activity was: 1) to better meet the data rates in the fixed telephone domain (that developed as multiples of 14.4 kbit/s) and 2) to further increase the maximum offered bit rates. The GSM 14.4 kbit/s data service gives a theoretical maximum user data rate of 115.2 kbit/s with eight time slots.

Fax is also a part of GSM data services. Fax uses the above mentioned data channels.

Because the transmission over GSM is digital, there is no need for a modem in a mobile station. Instead, during the communication over PSTN, a modem located at the GSM core network is used.

For HSCSD, the corresponding modem rates at the fixed telephone network side are for example V.90 and V.110. For example, with a V.90 modem the maximum bit rate of 43.2 kbit/s can be achieved, which matches with a GSM HSCSD mobile using 3 time slots.

An important feature in HSCSD is that it supports asymmetric connections: data rates (the amount of time slots) can be different in uplink (to the network) and in downlink (to the mobile). This is important for example in Internet browsing, where the nature of the traffic is asymmetric (more data comes to the terminal than leaves the terminal). In HSCSD, it is possible to reserve more time slots for downlink traffic than for uplink. Also streaming is possible over HSCSD since it offers guaranteed bit rate service.

2.3.1 HSCSD

The Nokia D211 supports non-transparent data. It also supports High Speed Circuit Switched Data (HSCSD) in non-transparent mode. With HSCSD a mobile can use several time slots at the same time. This makes the data transfer rate higher. Time slot usage is presented as the number of down links and up link slots. The Nokia D211 data transfer modes are presented in Table 1.

Table 1. The Nokia D211 data transfer modes.

Data transfer mode	Mode	Data rate
Non-transparent data	Asynchronous data	9600 bps
	Asynchronous data	14400 bps
	Asynchronous data HSCSD	43200 bps (Multi slot class 6, 3+1)

The Nokia D211 supports multi slot **class 6** (Max Rx time slots 3, Max Tx time slots 2, sum 4). One time slot can be from 9.6 kbit/s to 14.4 kbit/s (network dependent).

In HSCSD allocated time slots are reserved only for the user. Other technologies, such as General Packet Radio Service (GPRS), will complement and enhance the value of HSCSD. There are applications for both circuit-switched and packet-switched world. For instance, if the user needs to make PSTN/ISDN connection (towards corporate modem pools), only HSCSD can be used. HSCSD is ideal for real-time applications and GPRS for "always connected" applications. For example, HSCSD connections provide "active" e-mail and file transfer, while GPRS runs in the background for wireless data networking.

3+1 operation mode (43.2 + 14.4 kbit/s) is optimal for receiving e-mail, WWW browsing, video streaming, etc. 2+2 operation mode (28.8 + 28.8 kbit/s) is optimal for symmetric applications such as voice and video calls (e.g. Netmeeting) and e-mail message sending.

GSM CSD	Modulation	Code rate	Data rate / time slot (kbit/s)	Two slots (kbit/s)	Three slots (kbit/s)
CSD-3(T/NT)	GMSK	0.53	9.6	19.2	28.8
CSD-4(T/NT)	GMSK	0.64	14.4	28.8	43.2

2.3.2 GPRS

The nature of packet data is very different from the circuit switched data. GSM was originally designed for circuit switched traffic and thus introduction of packet data to GSM meant quite significant additions to the GSM network architecture (Figure 4). GPRS interworks with public data networks like the Internet (TCP/IP protocol) and X.25 networks. The architecture of GPRS infrastructure is based on GPRS support nodes, Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN), which receive and transmit packets between MSs and terminals connected to public data networks. The support nodes also forward packets to those MSs that are not located in the home GSN area. The operation is similar to the operation of routers in data networks (e.g. the Internet), except that GPRS nodes keep track of the locations of MSs.

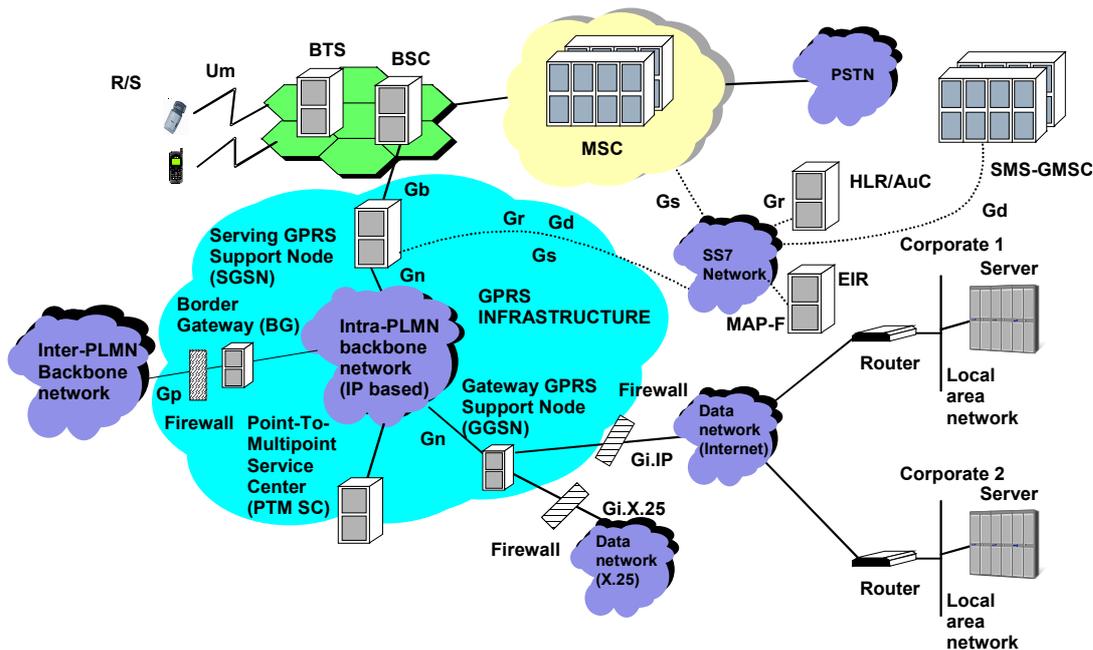


Figure 4. GPRS architecture.

GPRS introduces two new network nodes in the GSM PLMN: The Serving GPRS Support Node (SGSN), which is at the same hierarchical level as the MSC, keeps track of the individual MSS' location and performs security functions and access control. The SGSN is connected to the base station system with Frame Relay. The Gateway GSN (GGSN) provides interworking with external packet-switched networks, and is connected with SGSNs via an IP-based GPRS backbone network. The HLR is enhanced with GPRS subscriber information, and the SMS-GMSCs and SMS-IWMSCs are upgraded to support SMS transmission via the SGSN. Optionally, the MSC/VLR can be enhanced for more-efficient coordination of GPRS and non-GPRS services and functionality: for example, paging for circuit-switched calls that can be performed more efficiently via the SGSN, and combined GPRS and non-GPRS location updates.

The GPRS air interface uses the basic features of the GSM air interface, such as spectrum division, modulation and burst structure. Thus both the circuit switched GSM services and the GPRS service can be provided using the same carrier. However, the GPRS backbone network has been designed so that it is not dependent on the air interface used. Thus it will be possible to reuse the GPRS backbone network with different air interfaces. This implies that GPRS is an important step in providing packet data services in the next generation wireless systems

The Nokia D211 supports multi slot **class 6** (Max Rx time slots 3, Max Tx time slots 2, sum 4, type 1). Type 1 MS are not required to transmit and receive at the same time. No time slots are allocated explicitly for one user for a GPRS call period. Time slots are allocated only when needed. Allocation can be changed dynamically based on traffic conditions: for example, voice time slots are added when new voice calls are made or more time slots are given for GPRS when off-peak for voice. One time slot can be from 9.05 kbit/s to 21.4 kbit/s depending on coding scheme. The Nokia D211 supports all four channel coding schemes **GPRS-1, GPRS-2, GPRS-3 and GPRS-4**. Networks support initially schemes GPRS-1 and

GPRS-2 (Phase 1 network). This means that at the moment **13.4 kbit/s is the maximum speed for one time slot.**

3+1: 40.2 kbit/s + 13.4 kbit/s.

2+2: 26.8 kbit/s + 26.8 kbit/s

It is also important to remember that peak bit rate is only one part to the actual end user experienced performance.

GPRS	Modulation	Code rate	Data rate / time slot (kbit/s)	Two slots (kbit/s)	Three slots (kbit/s)
GPRS-1	GMSK	0.50	9.05	18.1	27.15
GPRS-2	GMSK	0.64	13.4	26.8	40.2
GPRS-3	GMSK	0.74	15.6	31.2	46.8
GPRS-4	GMSK	1.00	21.4	42.8	64.2

2.3.3 Terminal classes

Three classes of GPRS MSs have been defined:

- Class-A MS can operate GPRS and other GSM services simultaneously
- Class-B MS can monitor control channels for GPRS and other GSM services simultaneously, but can only operate one set of services at one time
- Class-C GPRS MS can exclusively operate GPRS services.

The Nokia D211 is a class B terminal.

The Nokia D211 can be attached to GSM and GPRS services simultaneously. Data calls can be received during GPRS activity. No data calls, however, are possible when GPRS data transmission is active, and no GPRS data transmission is possible when a data call is active -> GPRS is put to suspend mode when there is an active data call.

2.3.4 GPRS security

GPRS security functionality is equivalent to the existing GSM security. The SGSN performs authentication and cipher setting procedures based on the same algorithms, keys, and criteria as in existing GSM. GPRS uses a ciphering algorithm optimised for packet data transmission. However, as GPRS data packets are transmitted using the Internet, VPN (Virtual Private Network) is recommended for end-to-end security in corporate networks.

2.3.5 GPRS summary

Data rates depend on the availability of channels in use per cell and on the channel quality. In weak channel conditions more protection (stronger channel coding) for user data bits is needed and this naturally means that less user data bits can be sent in a given time period. In good channel conditions the situation is obviously the opposite. The theoretical maximum data rate in GPRS is 64.2 kbit/s. The uplink and downlink data rates are asymmetric as in HSCSD.



The Nokia D211 is a GPRS Class B mobile. The Nokia D211 GPRS single slot data rate can be up to 21.4 kbit/s and multislot data (1+3 or 2+2 timeslots) can be up to 64.2 kbit/s.

2.4 SMS

The Nokia D211 supports several SMS-based services: OTA (over-the-air configuration), business cards, picture messages, and concatenated messages.

The software installation includes an SMS management software, *Nokia Short Messaging*. SMS services cannot be controlled using AT-commands, and if the Nokia Short Messaging is not a suitable solution, the developers must use the Nokia D211 SDK to create their own SMS application.

2.5 FAX CLASSES

The Nokia D211 supports group 3 fax classes 1, 2 and 2.0 including ECM. Using hardware flow control and Class 2 is recommended.

3. GENERAL HARDWARE SPECIFICATIONS

3.1 PRODUCT TYPE

The Nokia D211 is an extended type II PC card.

3.2 ELECTRICAL SPECIFICATIONS

The Nokia D211 supply voltage range is from 4.75V to 5.25V. If the supply voltage is lower than 4.75V, operation of the card is not guaranteed. Exceeding 5.5V supply voltage may damage the card.

3.3 ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V _{cc}	Supply voltage	-0.5 to 5.5	V
V _i	Input voltage range	-0.5 to V _{cc} +0.5	V

3.4 RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Ratings	Unit
V _{cc}	Supply voltage	4.75 to 5.25	V
V _{IH}	Input high voltage range	2.4 to V _{cc} +0.25	V
V _{IL}	Input low voltage range	0 to 0.8	V

3.5 EXTERNAL SIGNALS AND CONNECTIONS

There are three external interfaces in the Nokia D211. The PC card interface connects the card to the host system and the SIM connector is for SIM and smart card usage.



Warning: The third external connector is a service connector, which is used for service purposes. Using this connector is allowed only for Nokia service personnel. Improper usage may break the Nokia D211.

3.5.1 PC card interface

The main external interface of the Nokia D211 is a PC card connector. Host system handles all control and communication through the PC card connector to the card. Host system also provides the power supply to the card. The connector pin out and operation is compatible with the PC card standard release 7.0 (February 1999). PC Card Connection specifications, as seen from host:

Parameter	Unit	Min	Typical	Max	Description
V _{cc}	V	4.75	5.0	5.25	Power supply from host
V _{ih}	V	2.4		V _{cc} +0.25	Input high level, TTL and CMOS
V _{il}	V	0		0.8 ¹⁾	Input low level, TTL and CMOS
V _{oh}	V	2.8		V _{cc} ²⁾	Output high level, TTL
	V	0.9V _{cc}			Output high level, CMOS
V _{ol}	V	0.0		0.5	Output low level, TTL
				0.1V _{cc}	Output low level, CMOS

Note 1): PCMCIA connector requirement; based on PC Card Standard V7

Note 2): maximum allowed level tolerated by the Nokia D211 is 5.5 V

Power consumption (current):

WLAN: Average

- Sleep: 30 mA
- Acquisition (RX on) 192 mA
- Receive @ 11Mbit/s: 160 mA
- Transmit @ 1Mbit/s: 330 mA
- Transmit @ 2Mbit/s: 315 mA
- Transmit @ 11Mbit/s: 300 mA
- Continuous 330 mA

GSM (HSCSD): Average / Peak

- Sleep: 30 mA
- Idle: 32 mA
- GSM 900, power level 5 (2W): 270 mA 460 mA
- GSM 900, power level 5 (2W), multislot 3+1: 280 mA 470 mA
- GSM 900, power level 7 (0.8W): 190 mA 350 mA
- GSM 900, power level 7 (0.8W), multislot (3+1): 225 mA 370 mA
- GSM 900, power level 7 (0.8W), multislot (2+2): 320 mA 490 mA
- GSM 1800, power level 0 (1W): 200 mA 370 mA
- GSM 1800, power level 0 (1W), multislot (3+1): 230 mA 390 mA
- GSM 1800, power level 0 (1W), multislot (2+2): 350 mA 530 mA

GPRS

- Idle 32 mA
- Downloading 150 mA – 200 mA

3.5.2 SIM & smart card

1,8V and/or 3,0V SIM cards are supported (5V SIM cards are not supported).
Small form factor ISO 7816 smart cards are supported by the hardware.

3.6 MECHANICAL SPECIFICATIONS

Dimensions:

- Volume: 40cc
- Weight: 51g
- Length: 125mm
- Width: 54mm
- Thickness: 5/10mm

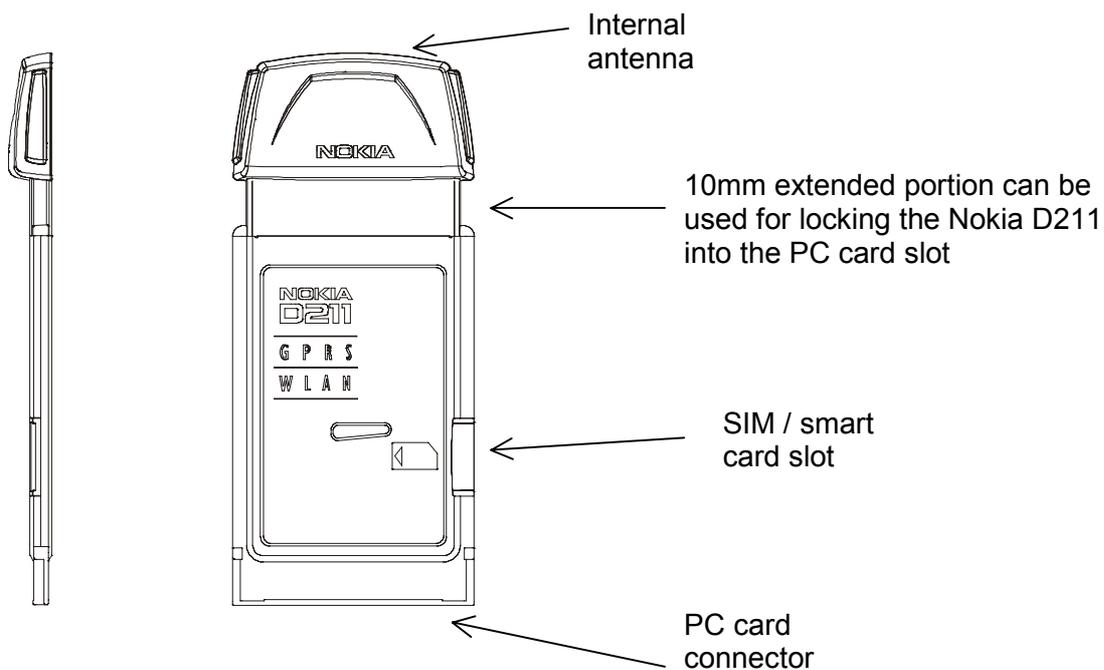


Figure 5: Nokia D211

3.7 ANTENNA

3.7.1 GSM

The Nokia D211 has an internal antenna for GSM 900/1800 MHz.



3.7.2 WLAN

Transmit (Tx) antenna peak gain 1dBi.

Receiver (Rx) diversity.

Receiver sensitivity (1, 2, 5.5, 11Mbit/s), 1024 byte packet, 8% Packet error rate:

- 11Mbit/s, -87dBm (conducted).
- 5.5Mbit/s, -89dBm (conducted).
- 2Mbit/s, -90dBm (conducted).
- 1Mbit/s, -93dBm (conducted).

Transmit (Tx) power

Four (4) transmit power levels are implemented in the Nokia D211:

- 100 mW (17.5 dBm, conducted, average).
- 30 mW (14.7 dBm, conducted, average).
- 10 mW (9.7 dBm, conducted, average).
- 3 mW (5.7 dBm, conducted, average).

Coverage area:

- Indoor 20-100 m radius depending on the surroundings.
- Outdoor 900 m max (line of sight).

Radiation pattern depends on the laptop or device that the Nokia D211 is connected to. Therefore it is not possible to give any specific radiation figure here.

3.8 ENVIRONMENTAL SPECIFICATIONS

- Temperature range, operation: -10...+55 °C
- Temperature range, storage: -40...+85 °C
- Humidity range, operation: 5...95 % non-condensing
- Humidity range, storage: 5...95 % non-condensing

The Nokia D211 is not protected against ingress of water.

3.9 TYPE APPROVAL AND EMC TESTING

The following statements reflect the current understanding of Nokia on type approval and electro-magnetic compatibility (EMC) testing. Please find out the testing status of the chosen application with the appropriate authorities.

3.9.1 GSM

Using Nokia D211 as a terminal adapter (TA) to a GSM network for data transmission in most host devices is covered by the type approval of the Nokia D211 if the interface between the host and the Nokia D211 is as specified in this document.

3.9.2 WLAN

The Nokia D211 operates at 2.4 -2.4835 GHz. The use of the frequency band is not harmonized throughout European Community or globally. Consult local authorities on the regulations concerning the use of the Nokia D211.

Using the Nokia D211 as a terminal adapter for data transmission in most host devices is covered by the type approval of the Nokia D211 if the interface between the host and the Nokia D211 is as specified in this document. National deviations, however, may exist.

3.9.3 Electromagnetic compatibility (inside Europe)

For electromagnetic compatibility (EMC) the Nokia D211 is tested according to the standards EN 301 489-7 /21/ and EN 301 489-17 /22/ as a 'Radio and ancillary equipment for fixed use (base station equipment)'. The standards refer to the standard EN 301 489-1 /20/. Spurious emission requirements for WLAN are specified in the standard EN 300 328-2 /18/, which refers to the standard EN 300 328-1 /17/.

If the host interface is designed for the Nokia D211 only, the combination of the host and the Nokia D211 has to fulfil the requirements of the standards EN 301 489-7, EN 301 489-17 and EN 300 328-2. The combination of the host and the Nokia D211 has to fulfil all relevant European directives.



Note: The Nokia D211 is tested against the requirements relating to residential, commercial and light industrial environment. No vehicular or automotive requirements are applied.

3.9.4 Electrical safety (inside Europe)

The Nokia D211 is tested for electrical safety according to the standard EN 60950 /23/. The Nokia D211 is a Class III product, which means that the Nokia D211 has to be supplied from safety extra-low voltage (SELV) circuits according to EN 60950.

4. GENERAL SOFTWARE SPECIFICATIONS

A very detailed description of the commands is beyond this document. The specifications can be found from the referred documents that are needed for thorough understanding of the capabilities of the Nokia D211 All ITU-T V.25ter /1/, ETSI GSM 07.07 /3/, ETSI GSM 07.05 /4/ and ETSI GSM 07.60 /16/ commands that are mandatory and those optional ones that are applicable to the Nokia D211 are included in the command set. Also those 'de facto' commands that are used widely among modems are supported. Note that V.25ter is a combination of three TIA standards (TIA-602, TIA-615, IS-131). The Nokia D211 can be utilised as an adapter for a Group 3 facsimile terminal-supporting facsimile Service Classes 1, 2 and 2.0. The supported facsimile AT commands are listed according to the standards they are specified: Service Class 1 TIA-578-A /5/, Service Class 2.0 TIA-592 /6/ and Service Class 2 TIA SP-2388 /7/. TIA SP-2388 is a draft of an oncoming standard, but yet it is referred here as a public standard.

4.1 SUPPORTED OPERATING SYSTEMS

The Nokia D211 is compatible with a wide range of laptops and handheld devices, as long as they include a type II or III PC card slot with sufficient power supply and run on one of the following operating systems:

- Drivers and software for Windows™ 98 SE, Me, 2000, and XP are included in the sales package (check the Nokia Web site for software updates)
- Drivers and software for Windows™ CE 3.0 (Pocket PC, Pocket PC 2002 and Handheld PC 2000) will be available on the Nokia Web site (check the Nokia Web site for compatibility with specific devices)
- Drivers for Linux will be available on the Nokia Web site



Note: The Nokia D211 cannot be used via serial interface like the Nokia Card Phone 2.0 can. The Nokia D211 needs at least one of the operating systems listed above.

4.2 INSTALLATION SOFTWARE

The Nokia D211 can be installed and configured using several methods. This gives great flexibility for corporate administrators.

4.2.1 Normal installation

Standard installation can be started from the product CD-ROM. The CD-ROM contains a multimedia presentation and installation software for Windows 98 SE, Me, 2000 and XP in

the following languages: Danish, Dutch, English, Finnish, French, German, Italian, Norwegian, Portuguese, Spanish and Swedish.

To install:

1. Exit all Windows programs. Insert the CD-ROM into the CD-ROM drive of your computer. If you do not have Autorun enabled, go to your CD-ROM drive and double-click on Start.exe.

If you just want to install the Nokia D211 without opening the entire multimedia, select Exit at the beginning of the multimedia and start the installation program by starting \\language\setup\setup.exe directly from the CD-ROM. Then move to step 4 below.

2. Select the language for the CD-ROM and Installation program and read through and accept the Nokia license agreement. If you do not accept the license agreement, you cannot use the CD-ROM.

3. The main screen of the CD-ROM opens. Click Install to start the installation.

4. The Welcome page of the installation wizard opens. Click Next to continue.

5. Read through and accept the Nokia license agreement. If you do not accept the license agreement, you cannot use the software and the installation procedure stops. Click I Accept to accept the license agreement.

6. Select the destination folder for the software. The default folder is C:\Program Files\Nokia\Nokia D211. If you want to install the software in another drive or folder, click Browse. When you have selected the correct destination folder, click Next. Note: You cannot install the Nokia D211 software on a network drive.

7. Select the type of installation you want. The Administrator option is for system administrators only, this installation type will install administrator module which can be used for monitoring WLAN network, creating installation disks and storing profiles to the SIM card.

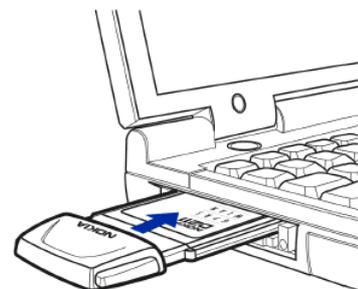


Note: You need to select Administrator as the installation type in order to create an installation disk described in 4.2.2

Custom allows you to choose the individual software components to be installed, and is recommended for advanced users. Typical installs the most common software components. This option is recommended for most users. When you have selected the desired type of installation, click Next.

8. Check the installation settings. To accept them, click Next. To change the settings, click Back, make the changes, and then click Next. The installation program starts copying the files.

9. When the installation program prompts you to insert the radio card, insert it into the PC card slot of your computer. In the Windows 2000 operating system you are informed that no digital signature was found. Click Yes in each dialog box to continue with the installation. In Windows XP, the operating system opens Found New Hardware wizards. For each of these wizards, first select the option Install the software automatically, and then select Continue Anyway to continue with the installation.





10. The Completion page informs you when the installation is completed. Remove the CD-ROM from the CD-ROM drive and click Finish. You may need to restart your computer.

11. A dialog box asks if you want to create a network profile now. Remember that you can create and edit your own network profiles at any time. If you do not want to create a profile, click No and the installation procedure is completed. If you want to create a profile, click Yes and the Welcome window of the profile wizard opens. Please see the User's Guide for further details.

4.2.2 Installation disk

A network administrator can create an installation disk using the Administrator module of the Nokia D211 UI. An installation disk can contain all network settings and profiles needed in your company network. This means that the user can install the Nokia D211 from an installation disk without any knowledge about GSM/GPRS/WLAN networks or network settings. Installation disks can be used for restricting user access for certain settings (profile editing, for example) Some of the setting are common for all profiles and they can be delivered to users only by using an installation disk, for example sending a profile as an OTA SMS or importing a profile file cannot be done. Profiles can be edited directly in the installation disk, so it is not necessary to make a new installation disk for every user. Personal WEP keys can be included in installation disks as exported files.

4.3 PROFILES

Profiles are a collection of settings that can be edited and delivered to users as one group of settings. A profile contains a GSM dial-up (used with CSD/HSCSD connections), GPRS access point and WLAN settings. Some of the settings are common for all profiles and they can be delivered to users only by using an installation disk. Profiles can be delivered using OTA (SMS) configuration or exporting/importing them as files. Please see the Nokia D211 User's Guide for further details.

4.4 ADVANCED SETTINGS

The Nokia D211 has several advanced setting for fine-tuning the WLAN connection.



Caution: Improper usage of advanced WLAN settings may disable the WLAN functionality of the Nokia D211, may disturb the WLAN network or may be illegal.

In the recommended values column, the default value -- if no automatic value is applicable -- is marked in parentheses.

Property	Description	Recommended values	Mode	Usage
Active scan timing	Indicates the maximum time that a station spends on each channel waiting for responses from the available access points when performing an active or hidden scan.	10 - 60 (30 time units)	scanning	Reducing the value results in less overhead from the scans. Too short a period results in unnecessary retransmissions of responses if the station moves away from the channel before all access points have been able to transmit their response. Too short a period can cause roaming problems.
Association time-out	Indicates for how long the station will wait for an association response from the WLAN access point.	10 - 100 (10 time units)	scanning	If no response is received within the specified time, the station will try to reconnect or will try to connect to another access point.
ATIM window	Announcement Traffic Indication Message defines for how long the stations have to be awake after every beacon period. This setting is valid only when power saving is used with the ad hoc operating mode	0 - 20 (10 time units)	ad hoc	Lower value will save power but may decrease transmission speed and might cause problems. If power save is enabled, the default value is 10. 0 value means no power saving.
Authentication time-out	Indicates for how long the station will wait for an authentication response from the WLAN access point.	0 - 100 (5 time units)	scanning	The time-out should be increased if a RADIUS server or some other advanced (external) authentication method is used on the access point side.

Beacon period	Indicates the number of time units that a station will use for scheduling beacon transmissions when in the ad hoc operating mode. Only valid when creating an ad hoc network.	100 - 1000 (100 time units)	ad hoc	Stations joining an existing ad hoc network assume that the beacon period is already defined for the network. Shorter beacon period means faster transmission in an ad hoc network with power saving. Longer period (when used with power saving) will result in lower power consumption.
Broadcast SSID	Defines the way how the station searches for the WLAN access point.	On, Off (Off)	scanning	If the access point does not allow for broadcast SSID, it should not be used with the station either.
Channel	Indicates the radio channel on which the radio card is used. The option "automatic" allocates an available channel automatically. The option "France" only allows the use of channels 10 – 13.	1 - 13 (automatic)	radio	If the radio channel is configured manually, no other channels are scanned for. In this case roaming between access points is not possible if they are in different channels. This value can be used if a station is stationary and it should associate to a certain access point. NOTE: Using some channels may be restricted by local laws e.g. in France.
Fragmentation threshold	Defines a threshold above which the RF packet will be split up. Note that performance management overrides this setting	256 - 2346 (2346 bytes)	Mac	The fragmentation procedure divides each frame into fragments that have the length of Fragmentation Threshold. Each fragment is acknowledged and retransmitted individually, thus increasing the robustness of the link in pulsed interference scenarios (e.g. Bluetooth) at the expense of reduced throughput. Other use for fragmentation would be in a high-multipath environment with fast changes (e.g. large industrial indoor sites with wireless LAN equipment mounted on moving vehicles). Setting the threshold to 2346 effectively disables the fragmentation (no frame can be this long). Must be an even value.

Hidden scan period	Indicates the number of seconds that will pass between performing two hidden scans when connected to a WLAN access point	10 - 100 (30 seconds)	Scanning	Mobility of a station is improved by reducing the hidden scan period at the expense of bandwidth. Note that scanning involves sending of probe requests to access points in the environment as well as receiving responses from the access points. Note: if there is no traffic, the scanning is carried out three times more frequently than defined in the parameter. For example, if the period is 30 seconds, scans are carried out every 10 seconds if there is no traffic.
Listen DTIM	When this setting is on, the wireless station wakes up from the power saving mode to listen to DTIM (Delivery Traffic Indication Message) frames	On, Off (On)	Power save	While infrastructure network is operating under power save, multicast traffic is buffered in the access point and transmitted only after DTIM beacon. By default, the station wakes up to listen to DTIMs, independent of Listen Interval, and is ready to collect the multicast traffic. The DTIM period is defined by the network administrator. Listen DTIM should be turned OFF if aggressive power saving is desired. Missing the multicast traffic may cause instability in upper layer protocols such as IP and ARP. This, however, is typically not a problem.
Listen interval	Indicates to the WLAN access point how often a wireless station wakes to listen to beacon management frames	1 - 100 (10 beacons)	Power save	Increasing the value results in more aggressive power saving and longer response times. See "Listen DTIM".
Long retry limit	Indicates the maximum number of transmission attempts of a frame, the length of which is greater than RTS (Request To Send) threshold. Note that performance management overrides this setting	1 - 20 (7)	Mac	Higher value can be useful when the signal strength is low and the traffic is mostly TCP unicast, such as reading e-mail, browsing the Web, uploading, or downloading. Lower value can be useful when the traffic is mainly UDP (audio/video streaming), voice over IP or multicast traffic.

Passive scan timing	Indicates the maximum time that a station spends on each channel when performing a passive scan	200 – 1000 (250 time units)	scanning	Passive scan is performed when prompting for network to be joined when selecting the profile. The value should be higher (at least double) than the beacon period of the networks available. Otherwise it is not guaranteed that all networks are found during the passive scan.
Performance management	Based on connection quality measurements, performance management can automatically change fragmentation threshold, RTS threshold, and data rate in order to improve stability and bandwidth.	On, Off (On)	Mac	The station learns which rates are most probably successful and weights these rates while selecting the transmission rate. Reduces unnecessary retransmissions while operating in low signal strength conditions.
RTS threshold	Controls for what size data packet the MAC (Media Access Control) protocol uses the RTS/CTS (Request to send/Clear To Send) handshake. Note that performance management overrides this setting.	256 - 2346 (2346 bytes)	Mac	RTS/CTS handshaking is used for reducing frame collisions arising from hidden node problems. Hidden node problems can also be present in a network where the stations are operating at the limits of the range of an access point so that individual stations are not able to hear each other. Hidden node problems can exist if there are overlapping networks operating on the same or neighbouring channels. RTS/CTS handshake reduces available bandwidth significantly, but effectively reduces collisions. Setting the limit to 2346 bytes disables the procedure (no frame can be this long). Value 0 means that no RTS/CTS is used.

Rx antenna diversity	Indicates whether Rx antenna diversity is used for receiving frames.	On, Off (On = Enabled)	radio	Antenna selection procedure chooses the antenna with higher received signal strength during each frame preamble. Use of antenna diversity improves reception in a multipath environment with typical signal strengths. When operating in extremely low signal strength environment capable of supporting only 1 Mbit/s data rate, disabling the antenna diversity may improve performance.
Security policy	With 'Station security' the station expects the WLAN access point to meet the security level configured in the station. With 'network security' the station will try to use the maximum level of security accepted by the access point	Station security, Network security (Station security)	security	If a station is trying to connect to a Wi-Fi access point (not a Nokia access point) with WEP keys, the user may need to use Network security.
Short retry limit	Indicates the maximum number of transmission attempts of a frame, the length of which is less than or equal to RTS (Request To Send) threshold.	1 - 20 (7 retries)	Mac	Higher value can be useful when the signal strength is low and the traffic is mostly TCP unicast, such as reading e-mail, browsing the Web, downloading, or uploading. Lower value can be useful when the traffic is mainly UDP (audio/video streaming), voice over IP or multicast traffic.



Supported rates	Supported rates are used for unicast (normal) traffic. Basic rates are used for transmitting multicast / broadcast data frames and control/management frames in the network. If the basic rates are configured to an access point, they have to be configured to the station as well.	1, 2, 5.5, 11 Mbit/s Basic (no selection)	radio	Automatic setting means that all rates are supported and are basic rates. When using an application that requires high bandwidth, the user may need to disable lower speeds. However, longer coverage area and better compatibility with IEEE 802.11 products can be achieved by using lower speeds. Required basic rates are defined by the access point. All stations within the range of the access point shall support all of the basic rates required by the access point, hence the name basic rate. Control and management frames, which all stations shall be capable of receiving, are sent using the basic rates. Multicast traffic will be sent at the basic rates. If high-speed multicast traffic is needed (e.g. streaming), higher rates (5.5 Mbit/s and 11 Mbit/s) should be defined as basic rates (both in the access point and the station).
Tx power level	Indicates the power level to be used when transmitting data	3, 10, 30, 100 mW (100 mW)	radio	In high density WLANs disturbances can be decreased by using lower power level.



4.5 SECURITY

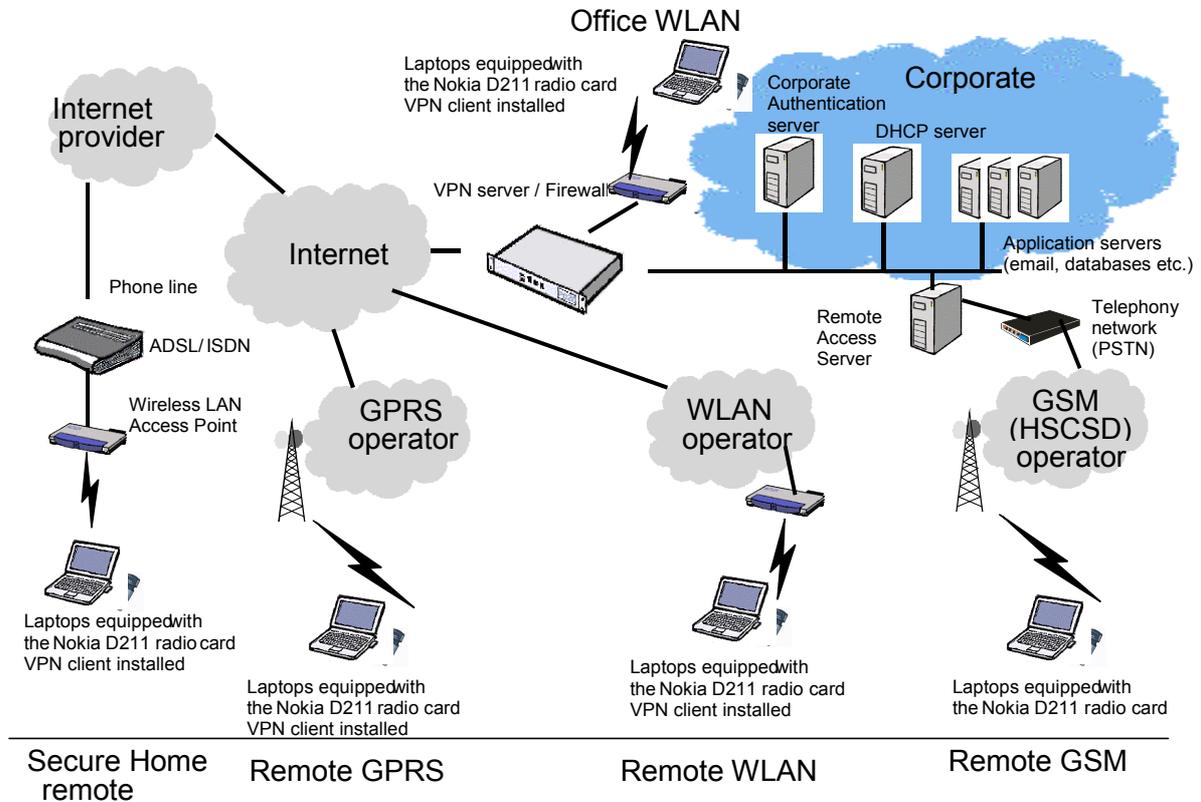


Figure 6: Secure remote access architecture

4.5.1 WEP keys

Wireless LAN offers basic protection in terms of WEP (Wired Equivalent Privacy). The Nokia D211 supports three key lengths: 40 (40+24), 128 (104+24), and 152 (128+24) bits.



Tip: Regardless of how the WEP keys have been named, all keys are compatible as long as their length is the same. For example, keys that are 40 bits long, always consist of 5 alphanumeric characters or 10 hexadecimal characters.

The 40-bit key is Wi-Fi™ (Wireless Fidelity) compatible.

Shared keys are specified in an access point and in a WLAN client. In other words, all WLAN clients are using the same WEP key in the same network.

Personal WEP keys are a Nokia proprietary solution for enhanced security. Personal WEP keys are stored in an access point or an access point can get users WEP keys from a RADIUS server. In the case of personal WEP keys, all users have different WEP keys. Please see the Nokia D211 User's Guide for further details.



WEP does not secure or encrypt an Internet connection. Therefore Nokia recommends using VPN in information critical applications, especially in corporate networks, where security and manageability are most important.

4.5.2 VPN

The introduced remote access architecture is composed of two main parts: the VPN server and the VPN client. The VPN server extends the corporate network with Internet access and offers a secure access to the corporate network resources from all alternative wireless networks: GPRS, HSCSD, or wireless LAN. The server offers remote access services to all kinds of remote users: home workers, GPRS roamers, public wireless LAN users, etc. This reduces administration costs and simplifies the network architecture. Typically, the company IT department administrates the VPN server.

The VPN client software is installed on the user's PC and is run on top of the Nokia D211 software. The same standard client configuration is used together with both GPRS and WLAN. The client automatically establishes a secure tunnel to the company VPN server. In addition, it may offer a personal firewall, which protects the PC against attacks. The company may select the most suitable VPN client, as the Nokia D211 is compliant with leading VPN clients.

The Nokia D211 allows the user to deploy conventional dial-up networking. In this configuration, the VPN client is not required, but the connection is established using standard Microsoft Windows dial-up functions.

VPN is the correct way to build a secure, private communication infrastructure on top of the Internet. There are a number of benefits with using Internet connectivity, GPRS, and WLAN whenever available:

- Rather than having the user making long distance phone calls to dial the company directly, GPRS and wireless LAN allow the user to utilise the public Internet connection.
- The charging in WLAN and GPRS is typically based on the data volume transmitted, not on the connection time. Thus, e-mail and browsing may be significantly cheaper over this kind of connection.
- With VPN, the companies get rid of their modem pools, expensive leased lines, and remote-access servers.
- Further savings come from reducing the operational costs associated with supporting remote users.

The security aspects have been considered in the product design. The Nokia D211 is interoperability tested in depicted reference designs with leading VPN client manufacturers' software and with Microsoft's embedded Internet security (IPSEC) solutions. Detailed information of the security issues can be found at www.nokia.com.



VPN client SW tested for interoperability	Version
CheckPoint SecuRemote/SecureClient	v.4.1-SP5 and NG-FP1
Cisco Systems VPN client	3.5
Nokia VPN Client	3.1 & 4.0
Nortel Contivity VPN client	4.10
SecGo Crypto IP Client	3.0
SSH Sentinel	1.23
Symantec Raptor Mobile	6.53
Windows 2000 built-in VPN	SP-2
Windows XP built-in VPN	

4.5.3 Personal firewall

Personal firewall is a software with a set of rules that allows and denies network traffic through a computer. It also monitors/controls applications to protect them against trojans and keyloggers. Primary use is to enhance security when a VPN client is used. The personal firewall controls access into the PC. When your laptop is used in unsecure networks, the protection level should be configured to be very high. In fact all connection attempts to your machine should be denied. When the firewall engine detects an intrusion, it commands the software to block the hacker's IP address. Since the firewall controls transmission at the network TCP/IP stack level, hackers cannot circumnavigate a block in the firewall. This kind of protection should always be active, regardless of location.

Personal firewall client SW tested for interoperability	Version
Sygate Personal Firewall Pro	v.5.0
ZoneAlarm	v.2.6
Tiny Personal Firewall	v.2.015
Kerio Personal Firewall	v.2.1.3
BlackICE Defender	v.2.5
Norton Personal Firewall	2002
Infoexpress' CyberArmor Personal Firewall client	2.1



Note: If you encounter problems with BlackICE and the Nokia D211, please read the following BlackICE support article on how to correct the situation:
<http://www.networkice.com/Advice/Support/KB/q000023/default.htm>.



4.6 WLAN COMPATIBILITY

4.6.1 List of tested access points

Wireless LAN access points tested for interoperability

3Com Airconnect 3CRWE747A-E1	2.20-04 / V2.20-01
3COM 6000	3.2.4#440 / 1.06EN
3COM Home Wireless Gateway	1.14-E1 (31.8.2001)
Agere ORiNOCO AP-1000	3.92 / 3.2
Buffalo AirStation	WLA-L11 ver.2.31
Cisco Aironet 350 series	4.25.22 / 11.10T1
Compaq WL 400	2.5.1
D-Link DI-713P Home gateway	2.56 build 20a
ELSA LANCOM IL-11	Ver. 2.14 (1/23/2001)
Gemtek WX1500	3.0.39
Nokia A032	04.04.01
Nokia MW1xx2	110.R01
NWN No Wires Needed	3.2.26
Symbol Spectrum24	2.51-20 / V2.50-13

4.6.2 Known limitations – recommended settings

Some access points have settings like "closed group = enabled" or "allow Broadcast SSID to associate = No". This means that the WLAN client must know the network name in order to associate to the network. The network name cannot be scanned. The Nokia D211 must be configured so that the Broadcast SSID value is compatible with the access point setting. Association to the WLAN may take more time.

4.7 SOFTWARE INTERFACE

The Nokia D211 System Development Kit (SDK) is a set of resources intended to aid application developers who wish to use the Nokia D211 as a part of their solution. The SDK is not shipped with the product, but it is available at www.forum.nokia.com. Typically, companies that wish to use the Nokia D211 as a part of their product, use the SDK. The SDK provides a software developer with the necessary software resources to access the functionality of the Nokia D211. They include header files, technical documentation and code samples. The SDK allows the user to access all WLAN and GSM/GPRS related capabilities of the product with the exception of the user interface of the product. In fact, the user interface of the Nokia D211 is itself built on the SDK. It should be noted that the SDK caters for control functions of the Nokia D211; it does not provide interfaces to access the data stream at any level. The developer must resort to operating system interfaces for these.

The SDK is available for the Win32-based platforms that are supported by the Nokia D211 itself (Windows 98SE, Windows Me, Windows 2000 and Windows XP). Support for Windows CE and Linux cannot be confirmed at this point.

The following paragraphs give more technical details about the interface. There is only a single interface that provides all the features available from Nokia D211. The Nokia D211 host OS service process that is installed as part of the Nokia D211 installation provides this interface. The interface is provided using an asynchronous message-passing mechanism (a utility library providing synchronous access is also provided). All requests for the Nokia D211 software need to be formulated into a service request such as REQ_PHONE_INFO (for requesting phone information) for which response messages will be offered. In addition, an application may register for indications from the Nokia D211 software, such as IND_PHONE_CALL. There are numerous messages that are used to access the features of the Nokia D211. For simplicity, they have been grouped into service sets that collect a set of related service message definitions together. Below is a list of service sets available.

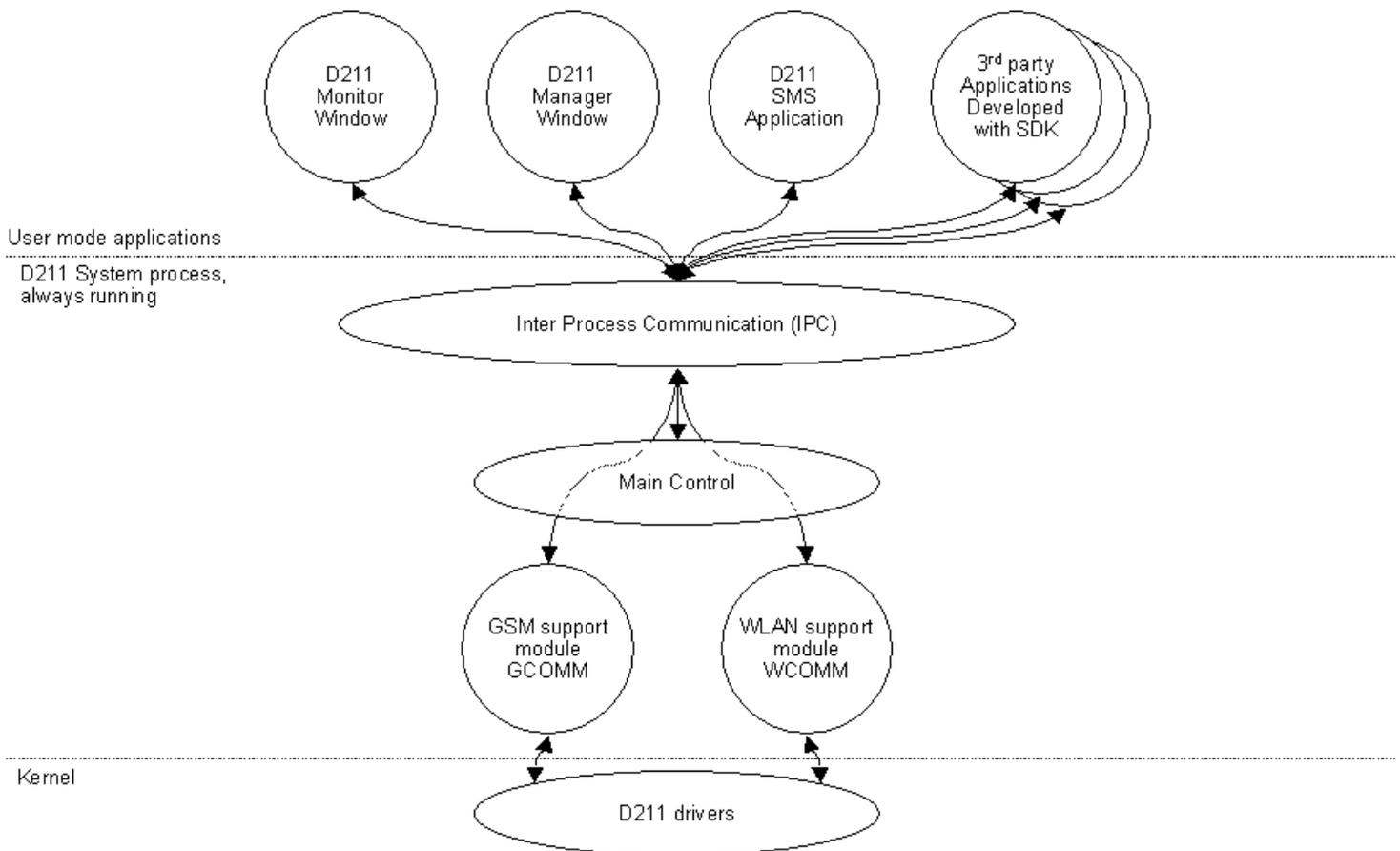


Figure 7: Software block diagram

Common: Common service set contains function, request response structures used by each module as basic elements of IPC communication.

Contacts: This module contains programming elements used to manage contacts, stored on a SIM card. It covers reading, adding, modifying and deleting contact cards. It also offers voice mailbox reading and setting functionality.



CTRL MIB: Control MIB service set provides interface functions, request-response structures to access ctrl specific MIB values.

Control: Control service set offers basic card managing functionality, such as operating mode settings, stopping the card, or connecting and disconnecting.

Dialup: Dialup service set offers the functionality to manage dial-up connection settings, establishing connections or disconnecting.

History: This service set provides history event inquiry and managing functionality. It includes enumerating, adding, deleting and marking history events.

Net: Net service set contains GSM network related programming elements for scanning, accessing, and selecting GSM networks.

Phone: Phone service set offers phone call related functionality such as indicating or dropping calls, requesting phone information, resetting or turning it off.

Popui: PopUI service set includes a tray icon, PIN or PUK code related dialogs, profile or network selection dialogs and logon desktop dialog handling.

Profiles: Profiles service set contains profile managing programming elements, such as enumerating, adding, deleting or applying profiles.

WEP: WEP service set contains WEP key managing programming elements, such as enumerating, reading, adding, deleting or changing WEP keys.

SCFS: Scfs service set provides programming interface for reading, storing or enumerating information that has been stored on a smart card, such as WEP keys or profiles.

Smart Card: Opening and closing smart cards, reading and writing files on the smart card.

SIM: SIM service set provides programming interface for SIM security settings such as PIN or PUK code handling, memory or phone access code. It also contains programming elements for managing SMSs that have been stored on a SIM card.

SMS: SMS service set contains programming elements for short message sending, receiving and managing. It includes SMS related parameters and settings management, reading, processing, sending functions and structures.

SS: SS service set provides programming interface for the most important supplementary services, such as call barring and diverting, fixed dialling, closed user group and call waiting.

Starter: This service set contains requests and functions to start an application, ejecting card or dialling.

Supplementary services: Controlling all the supplementary services.

Traffic statistics: Traffic service set provides interface for communication statistics, such as connection duration or data flow counters.

WLAN Control: This service set offers the functionality to turn WLAN automatic control on and off.

WLAN MIB: WLAN MIB service set provides interface functions, request-response structures to access WLAN-specific MIB values.

WLAN: This service set contains programming elements and can be used to read information related to wireless network elements, such as access points, stations or networks.

4.8 SIM SERVICES (NOKIA OPERATOR WIRELESS LAN)

The Nokia Operator Wireless LAN solution complements wide-area cellular data access, such as GPRS, by offering a highly cost-effective solution for indoor wireless broadband data access. Nokia Operator Wireless LAN provides mobile business subscribers with a fast Internet and intranet access that is automatically available for all customers who have the Nokia D211 and a GSM subscription. A regular SIM card that is inserted into the Nokia D211 is used for user authentication and billing. This makes the solution extremely easy to use and implement. Combined with a SIM-based user authentication and billing, the Nokia Operator Wireless LAN solution allows the mobile operator to implement fast and cost-effective wireless Internet access for mobile laptop users who have a cellular subscription. Furthermore, the solution provides roaming between different operator networks. Initially this network service will be offered at airports, railway stations, hotels, business parks, and even in large offices - wherever travelling professionals use their laptops and need network connections.

The Nokia Operator Wireless LAN solution offers several benefits:

- Fast mobile broadband service for mobile laptop users. Subscriber management and billing based on a GSM SIM card, which significantly improves the terminal's roaming capabilities. Access to several public operator networks all over the world, seamless operator-to-operator roaming.
- Useful "mobile laptop solution" which complements GPRS data services in public places.
- Mobile broadband service to the Internet and corporate data in public places (airports, hotels, etc.).
- Secure wireless IP access to corporate networks. The Nokia Operator Wireless LAN solution supports all legacy VPN solutions. Therefore the user may establish a highly secure end-to-end encrypted IP tunnel to the corporate network via a public access zone.
- Offers the mobile operator an easy and cost-effective way to enter the new mobile laptop market segment.
- Allows for integrated billing where cellular operators offer wireless LAN services to individuals as well as corporate customers.

When using a VPN client or personal firewall software, the VPN / firewall policy should allow sending and receiving certain network messages in clear text so that SIM services will work smoothly. In order to allow the "SIM services" protocol packets between the wireless station (the Nokia D211) and the Nokia P022 Access Controller, allow traffic in clear text format to and from all hosts in port UDP/1340.



Note: If the VPN policy cannot be configured to allow SIM services traffic, SIM services can still be used. In this scenario, the Nokia D211 user needs to authenticate to the SIM services via an access controller before opening the VPN connection to the wireless station. In addition, the users should not use the "Advanced Connection Controlling" setting on the wireless terminal.

5. AT COMMANDS

5.1 INTRODUCTION

This document describes the AT commands that may be used with Nokia D211 operating in the GSM / HSCSD/ GPRS network. A short description, syntax, possible setting values and responses of the AT commands are presented. Detailed description of supported commands can be found in the appropriate specification.

Computers use AT commands to communicate with modems. Most communications applications, however, have a user-friendly interface that hides these AT commands from the user. When the software in the Nokia D211 has received an AT command, it responds with a message that is displayed on the screen of the device you are using.

5.2 AT COMMAND SYNTAX

Refer V.25ter section 5 and GSM 07.07 section 4 for AT command syntax basics. This section describes the three different command formats and default value mechanisms for their parameters.



Note: Note that the "AT" or "at" prefix must be included at the beginning of each command line. You may type several AT commands on the same line, and in such cases you need to type the "AT" or "at" prefix only at the beginning of the command line.

5.2.1 S-register commands

Table format used in command description sections:

	Command	Response	<n> values
set	Sn=<n>		x. .y (default z)
read	Sn?	<n>	xxx. .yyy

S-register command factory default value (&F) is given in parenthesis under column ' <n> values'. The existence of an S-register command may be queried by giving command without equal or question marks (e.g. `ATS3` returns `OK`, but does not change the <n> setting). <n> may not be omitted when its value is set (e.g. `ATS3=` returns `ERROR`).

5.2.2 Basic commands

Table format used in command description sections:

	Command	Description
set/execute	CMD [x]	for value x
	CMDy	for value y

Commands D (dial), A (answer) and O (return to online data state) include also columns for possible result codes.

Basic command (no '+' prefix) &F default value is underlined. If no value is underlined, the setting of that command is not stored in non-volatile memory (command &Y is an exception). If command parameter is in brackets (usually zero), the parameter may be omitted.

5.2.3 Extended commands

Table format used in command description sections:

	Command	Response	Default	+cme error/+cms error
set/execute	+CMD [=<x>, ...]	[+CMD: <y>, ...]	[x, ...]	[x]
read	+CMD?	+CMD: <z> [, ...]		[x]
test	+CMD=?	[+CMD: ...]		[x]

Extended command ('+' prefix) subparameter default values are given in a separate column. If the default value is not in brackets, it is the &F default value of the corresponding subparameter. When this kind of subparameter is omitted when command is given, its value remains the same as before. If default value is in brackets, this value shall be used when subparameter is omitted in command line. The setting of this kind of subparameter is not stored in memory. If subparameter has no default value, it must always be given.

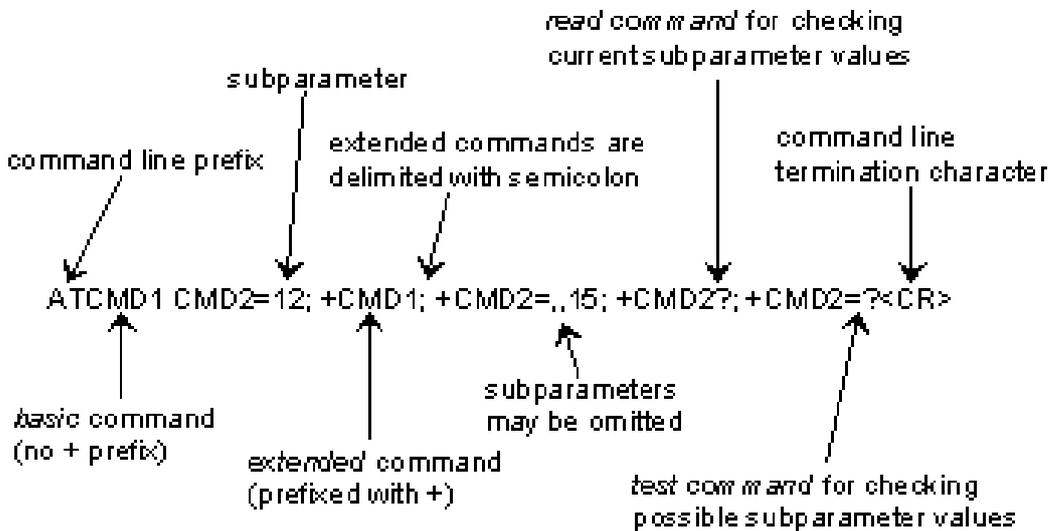
NOTE: Voice (+V) and fax (+F) commands do not follow this format exactly.

GSM commands may also return +CME ERROR or +CMS ERROR final result code, when error is related to ME or network functionality. The possibility to return these codes is indicated in the last column. Presentation of +CME ERROR can be controlled with +CMEE command. Possible error values for each command are presented in a separate section at the end of this document.



5.3 COMMAND LINE

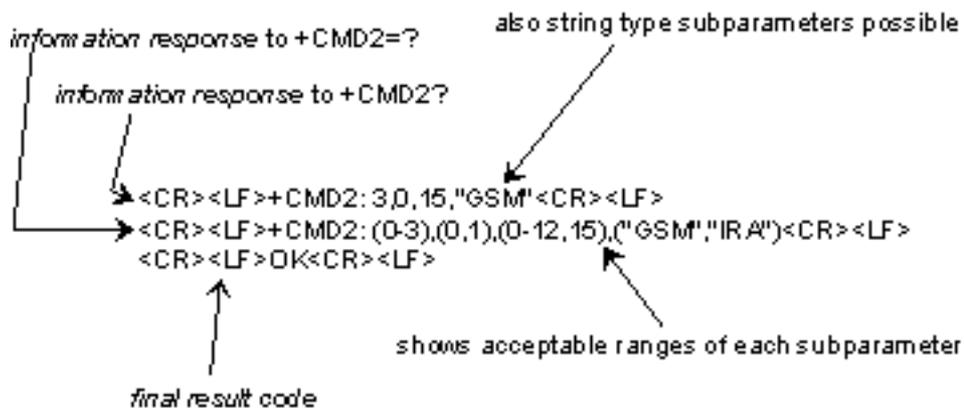
See figure below for general structure of a command line.



Basic structure of a command line (ETSI, GSM 07.07 version 5.4.0, chapter 4.1.)

5.4 INFORMATION RESPONSES AND RESULT CODES

The TA response for the example command line in the figure above could be as shown below. Here, the verbose response format is enabled with command V1. If numeric format V0 would have been used, <CR><LF> headers of information responses would have been left out and final result code changed to 0<CR>.



Response to a command line (ETSI, GSM 07.07 version 5.4.0, chapter 4.2.)

So called intermediate result codes inform about progress of TA operation (e.g. connection establishment CONNECT), and so called unsolicited result codes indicate occurrence of an event not directly associated with issuance of a command from TE (e.g. ring indication RING).



6. LIST OF AT COMMANDS SUPPORTED BY NOKIA D211

6.1 S REGISTERS

Here is a list of S registers, the values of which can be changed with AT commands. Unless otherwise specified, the value range is 0 – 255.

S-register	Definition	S register Value
0	Auto answer ring count (0 = disabled)	
1	Ring counter (read only)	
2	Escape code character	0 - 127
3	Carriage return	0 - 127
4	Line feed	0 - 127
5	Backspace	0 - 127
7	Wait for connection completion (sec)	
8	Interval of DTMF characters (sec)	
10	DCD OFF to hang-up delay (sec/10)	
12	Escape guard time (sec/50)	
25	Detect DTR change (sec)	
47	Fax ECM	
	ECM not used	0
	in Fax classes 2 and 2.0 ECM frame size = 64	1
	in Fax classes 2 and 2.0 ECM frame size = 256	2
48	14400 fax	
	FAX 14400 OFF	0
	FAX 14400 ON	1

6.2 TE-TA INTERFACE COMMANDS

6.3 V.25TER

6.3.1 S3 Command line termination character

	Command	Response	<n> values
set	S3=<n>		0..127 (default 13)
read	S3?	<n>	000.. 127

Mandatory. V.25ter section 6.2.1. Default character is carriage return. The setting is also used in result code and information response formatting (see command V).

6.3.2 S4 Response formatting character

	Command	Response	<n> values
set	S4=<n>		0.. 127 (default 10)
read	S4?	<n>	000.. 127

Mandatory. V.25ter section 6.2.2. Default character is line feed. See also command V.

6.3.3 S5 Command line editing character

	Command	Response	<n> values
set	S5=<n>		0.. 127 (default 8)
read	S5?	<n>	000.. 127

Mandatory. V.25ter section 6.2.3. Default character is backspace.

6.3.4 E Command echo

	Command	Description
set	E[0]	no echo
	E1	echo

Mandatory. V.25ter section 6.2.4. Controls command character echo in online/offline command state.

6.3.5 Q Result code suppression

	Command	Description
set	<u>Q</u> [0]	transmit codes
	<u>Q</u> 1	suppress codes

Mandatory. V.25ter section 6.2.5. Affects only result codes, not information responses.

6.3.6 V DCE response format

	Command	Description
set	<u>V</u> [0]	numeric V.25ter basic syntax result codes, limited headers and trailers
	<u>V</u> 1	verbose V.25ter basic syntax result codes, full headers and trailers

Mandatory. V.25ter section 6.2.6. For numeric result code values refer V.25ter section 5.7.1 and D, A and O commands in this document. Command S3 and S4 settings affect header/trailer formatting. Note that result codes defined in GSM 07.07 and 07.05 have only verbose values.

6.3.7 X Result code selection and call progress monitoring control

	Command	Description
set	<u>X</u> [0]	OK, CONNECT, RING, NO CARRIER, ERROR codes enabled
	<u>X</u> 1	also CONNECT 1200, CONNECT 2400 enabled
	<u>X</u> 2	same as value 1
	<u>X</u> 3	also BUSY enabled
	<u>X</u> 4	also NO ANSWER enabled
	<u>X</u> 5	also CONNECT 4800 (or higher data rates), DELAYED, BLACKLISTED enabled

Mandatory. V.25ter section 6.2.7. When BUSY, NO ANSWER, DELAYED or BLACKLISTED is not enabled, NO CARRIER is used instead. When CONNECT <rate> with a correct data rate is not enabled, a plain CONNECT is used instead. Also GPRS context activation is indicated by CONNECT. This command does not affect the presentation of other result codes than the ones mentioned in the table above.

6.3.8 &C Circuit 109 (received line signal detector) behaviour

	Command	Description
set	<u>&C</u> [0]	always on
	<u>&C</u> 1	normal operation

Mandatory. V.25ter section 6.2.8. Also known as DCD or carrier signal.

6.3.9 &D Circuit 108 (data terminal ready) behaviour

	Command	Description
set	&D[0]	ignored
	&D1	on->off causes transition to on-line command state if call in progress
	&D2	on->off causes hangup
	&D3	on->off causes hangup and performs reset (like Z) ('de facto' feature)

Mandatory (only values 0 and 2). V.25ter section 6.2.9.

6.3.10 +IPR Fixed DTE rate

	Command	Response	Default
set	+IPR=<rate>		[0]
read	+IPR?	+IPR: <rate>	
test	+IPR=?	+IPR: (0,300,600,1200,2400,4800,9600, 19200, 38400,57600,115200),()	

Optional. V.25ter section 6.2.10. Command must be in products that do not support autobauding in all configurations and have more than one <rate> to be set (either 1200 or 9600 is mandatory according to V.25ter). Note that reset commands Z and &F do not change this setting.

Response to +IPR test command includes a list of supported autodetectable <rate> values and list of fixed-only <rate> values.

6.3.11 +ICF Character framing

	Command	Response	Default
set	+ICF=<format>,<parity>		[0]
read	+ICF?	+ICF: <format>,<parity>	
test	+ICF=?	+ICF: (0,1,2,3,4,5,6), (0,1,2,3)	

Optional. V.25ter section 6.2.11. Command must be in products that do not support autobauding in all configurations and have more than one <format>/<parity> pair to be set. Note that reset commands Z and &F do not change this setting.

Parameters:

<format> determines the number of bits in the data bits, the presence of a parity bit, and the number of stop bits in the start-stop frame.

- 0 auto detect (default)
- 1 8 data, no parity, 2 stop
- 2 8 data, parity, 1 stop
- 3 8 data, no parity, 1 stop
- 4 7 data, no parity, 2 stop
- 5 7 data, parity, 1 stop
- 6 7 data, no parity, 1 stop

<parity> determines how the parity bit is generated and checked, if present.

- 0 odd
- 1 even
- 2 mark
- 3 space

6.3.12 +IFC DTE-DCE local flow control

	Command	Response	Default
set	+IFC=<dce-by-dte>, <dte-by-dce>		2, 2
read	+IFC?	+IFC: <dce-by-dte>, <dte-by-dce>	
test	+IFC=?	+IFC: (0-3), (0-2)	

Optional (mandatory if V.42 or buffered mode implemented). V.25ter section 6.2.12.

Parameters:

<DCE_by_DTE> specifies the method to be used by the DTE to control the flow of received data from the Nokia D211.

<DTE_by_DCE> specifies the method to be used by the Nokia D211 to control the flow of transmitted data from the DTE.

- 0 no flow control
- 1 Software flow control (XON/XOFF)
- 2 Hardware flow control (CTS/RTS)
- 3 Software flow control (XON/XOFF), with flow control characters passed also to the remote DCE

6.3.13 +ILRR DTE-DCE local rate reporting

	Command	Response	Default
set	+ILRR=<n>		0
read	+ILRR?	+ILRR: <n>	
test	+ILRR=?	+ILRR: (0, 1)	

Mandatory (for V-series data modems). V.25ter section 6.2.13. Controls presentation of +ILRR intermediate result code.

Values for <n>:

- 0 local port rate reporting disabled
- 1 local port rate reporting enabled

6.4 DE FACTO

6.4.1 S25 Detect DTR change time

	Command	Response	<n> values
set	S25=<n>		0 . . 255 (default 0)
read	S25?	<n>	000 . . 255

Mandatory for compatibility reasons. Time (in seconds) to react on DTR signal change. See also command &D.

6.4.2 &S DSR signal behaviour

	Command	Description
set	&S[0] &S1	always on normal operation

Mandatory for compatibility reasons. This is a dummy command for the Nokia D211.

6.4.3 &K Select flow control

	Command	Description
set	&K[0] &K3 &K4	no flow control hardware flow control (RTS/CTS) software flow control (XON/XOFF)

Mandatory for compatibility reasons (Microsoft Windows uses this). This command changes the same setting as +IFC. Use of +IFC is recommended.

7. GENERIC COMMANDS

7.1 V.25TER

7.1.1 Z Reset to default configuration

	Command	Description
execute	Z[0]	disconnect, reset to stored profile 0
	Z1	disconnect, reset to stored profile 1

Mandatory. V.25ter section 6.1.1. Settings that are not stored in a profile (refer &W) will be reset to their factory defaults (refer &F (Z resets also all fax commands)). Even when the product would not have memory profiles (or only one of them), it shall accept both Z0 and Z1 (and reset to factory defaults). Additional commands on the same command line after the Z command will be ignored. Note: profile is saved to the Nokia D211 card and it is NOT the same as a Profile in the Nokia D211 windows UI.

7.1.2 &F Set to factory-defined configuration

	Command	Description
execute	&F[0]	reset to factory defaults

Mandatory. V.25ter section 6.1.2. Command parameters (if implemented) that are reset to their factory defaults are: All S-registers, E, Q, V, X, &C, &D, +IFC, +ILRR, &S, +CSCS, +DS, +DR, +ES, +ER, +CSTA, +CMOD, +CBST, +CRLP, +CR, +CRC, +CSNS, +CHST, +CHSN, +CV120 (only <mf>), +CVHU, +CREG, +COPS (only <format>), +CLIP, +CLIR, +COLP, +CCWA (only <n>), +CUSD (only <n>), +CSSN, +CPBS, +CMEE, SMS commands, GPRS commands, Fax commands (except +FCLASS, and Class 2.0 specific parameters when +FCLASS = 2.0).

7.1.3 I Request identification information

	Command	Response	Description
execute	I[0]	Manufacturer identification (Nokia Corporation)	same as +GMI
	I1	Product serial number = IMEI	same as +GSN
	I2	Product version (V xx.xx dd-mm-yy DTE-1 © NMP.)	same as +GMR
	I3	Product name (Nokia D211)	same as +GMM
	I4	CSD SW version	
	I9	Plug and play info	
	I5-I8 and I10- I255		dummies that just are accepted

Mandatory for compatibility reasons (although optional in V.25ter). V.25ter section 6.1.3. E.g. Windows95 uses this.

7.1.4 +GMI Request TA manufacturer identification

	Command	Response
execute	+GMI	Nokia Corporation

Mandatory. V.25ter section 6.1.4.

7.1.5 +GMM Request TA model identification

	Command	Response
execute	+GMM	Model information (Nokia D211)

Mandatory. V.25ter section 6.1.5. Note that in case of a product with TA and ME in a single physical entity, response of +CGMM is identical.

7.1.6 +GMR Request TA revision identification

	Command	Response
execute	+GMR	V xx.xx dd-mm-yy DTE-1 © NMP.

Mandatory. V.25ter section 6.1.6. Response must include product SW version. Note that because TA and ME are in a single physical entity, response of +CGMR is identical.



7.1.7 +GSN Request TA serial number identification

	Command	Response
execute	+GSN	xxxxxxxxxxx...

Optional. V.25ter section 6.1.7. Note that because TA and ME are in a single physical entity, response of +CGSN is identical (i.e. IMEI).

7.1.8 +GCAP Request complete capabilities list

	Command	Response
execute	+GCAP	+GCAP: +CGSM, +FCLASS, +DS, +W

Mandatory. V.25ter section 6.1.9. Above mentioned response returned when GSM 07.07 commands, some fax classes, and V.42bis compression supported.

7.2 DE FACTO

7.2.1 &V View configuration

	Command	Description
execute	&V[0]	show current settings (all command parameter values defined under &F plus &Y setting)
	&V1	show settings in stored profile 0 (all command parameter values defined under &W)
	&V2	show settings in stored profile 1 (all command parameter values defined under &W)

Mandatory (values 1 and 2 shall be present only when stored profiles are supported). Response format must fit in one 80 times 24 character display and all command parameters stored in a profile (or current settings) must be shown as 'command name'-'values of parameters' pairs (e.g. +CSSN=0, 1 or E0 or S7=80 or +COPS=, 2 or +CSCS="HEX").

7.2.2 &W Store configuration

	Command	Description
execute	&W[0]	store to profile 0
	&W1	store to profile 1

Mandatory when stored profiles are supported. Command parameters that are stored to a profile are the same as listed under &F command except to the parameters of the following commands which are not stored: +CMOD, +CSCA, +CSMP.



7.2.3 &Y Select power-up configuration

	Command	Description
set	&Y[0]	power-up uses profile 0
	&Y1	power-up uses profile 1

Mandatory when stored profiles are supported. This setting is not a part of the settings that are stored in a profile. &F command does not affect this setting.

7.3 GSM 07.07

7.3.1 +CGMI Request ME manufacturer identification

	Command	Response
execute	+CGMI	Nokia Corporation
test	+CGMI=?	

Optional. 07.07 section 5.1.

7.3.2 +CGMM Request ME model identification

	Command	Response	+cme error
execute	+CGMM	Model info (Nokia D211)	x
test	+CGMM=?		

Optional. 07.07 section 5.2. Note that because TA and ME are in a single physical entity, response of +GMM is identical.

7.3.3 +CGMR Request ME revision identification

	Command	Response	+cme error
execute	+CGMR	SW version	x
test	+CGMR=?		

Optional. 07.07 section 5.3. Response must include product SW version. Note that because TA and ME are in a single physical entity, response of +GMR is identical.

7.3.4 +CGSN Request ME serial number identification

	Command	Response	+cme error
execute	+CGSN	xxxxxxxxxxxxxxxxxxx	x
test	+CGSN=?		

Optional. 07.07 section 5.4. Returns IMEI. Note that because TA and ME are in a single physical entity, response of +GSN is identical.



7.3.5 +CSCS Select TE character set

	Command	Response	Default
set	+CSCS=<chset>		"PCCP437"
read	+CSCS?	+CSCS: <chset>	
test	+CSCS=?	+CSCS: ("UCS2", "GSM", "PCCP437", "PCDN", "IRA", "8859-1", "HEX")	

Optional. 07.07 section 5.5.

7.3.6 +WS46 Select wireless network

	Command	Response
set	+WS46= [<n>]	
read	+WS46?	<n>
test	+WS46=?	(12)

Optional. 07.07 section 5.7, TIA-678 section 5.2.4.3. Currently there are no values for GSM1800 (or GSM1900) but '12' could be used for them also.



8. CALL CONTROL COMMANDS

NOTE: In case that the product implements call related supplementary services (hold/waiting/multiparty/etc.), AT interpreter must keep track of all available calls by keeping its own call stack.

8.1 V.25TER

8.1.1 D Dial

	Command	Possible verbose result codes (v1)	Numeric (v0)	Description
execute	D<dial-string>	BLACKLISTED	14	call to the number is forbidden until manual reset
		BUSY	7	called party is busy
		CONNECT	1	data/fax call established; rate 300 bps (or x forbids rate display) or GPRS context activation
		CONNECT 1200	5	data/fax call established; rate 1200 bps
		CONNECT 2400	10	data/fax call established; rate 2400 bps
		CONNECT 4800	11	data/fax call established; rate 4800 bps
		CONNECT 9600	12	data/fax call established; rate 9600 bps
		CONNECT 14400	17	HSCSD (or 14.4 tch) data/fax call established; rate 14400 bps
		CONNECT 19200	18	HSCSD data/fax call established; rate 19200 bps
		CONNECT 28800	19	HSCSD data/fax call established; rate 28800 bps
		CONNECT 38400	20	HSCSD data/fax call established; rate 38400 bps
		CONNECT 43200	21	HSCSD data/fax call established; rate 43200 bps
		DELAYED	13	call to the number is temporarily (5 sec - 3 min) forbidden
		ERROR	4	command cannot be actioned
		NO ANSWER	8	called party does not answer
NO CARRIER	3	call could not be established		
OK	0	command aborted or voice call started with semicolon character		

Mandatory. V.25ter section 6.3.1. All result codes are not in V.25ter. Before one of the above codes is issued, the terminal may return some of the following codes : +CSSI, +COLP, +CR, +ER, +DR, or +ILRR (in that order). In GPRS connections the data rate can actually be higher than the value desired because it is the minimum desired value. The only verbose code returned in the case of a GPRS call is the word CONNECT.

NOTE: +VTS command or comma modifier (e.g. "ATD,1234"; in this case the first comma does not cause a pause) can be used to send DTMF digits.



<dial-string> characters	Values	Description
V.25ter dialling digits	0123456789+* #ABCD	accepted as valid digits accepted but ignored
V.25ter modifiers	, T P ! W @	in case of voice call: originate call to the number preceding comma, wait for remote answer, pause for length specified with S8 register, and send numbers after comma as DTMF digits; further commas cause pause for length specified with S8 register (all commas are ignored in case of data call) accepted but ignored
V.25ter semicolon	;	NOT supported: voice call originating (must be the last character in a command line)
GSM 07.07 modifiers	> i I G	direct dialling from phonebook (must be the first character after D) (see next table) allow calling line id presentation for this call restrict calling line id presentation for this call control CUG information for this call; use +CCUG values
de facto	L	redial to the number last dialled
any other character	any of not listed above	accepted and ignored from command line for compatibility reasons

See also 07.07 section 6.2 and V.25ter sections 6.3.1.1-6.3.1.7. Note that I is the only case-sensitive dial string character.

Direct dialling command	Description	+cme error
D><str> [i/I] [G] [;]	Originate call to phone number whose corresponding alphanumeric field is <str>; search all ME, SIM (ADN) and TA memories (if available) for the entry; used character set should be the one specified by +CSCS	x
D>mem<n> [i/I] [G] [;]	Originate call to phone number found from location <n> in a specific memory mem, which is one of the two letter memory abbreviations as returned by +CPBS=? (without double quotes); location range can be queried with +CPBR=?; note that in case of SIM ADN memory (SM) also D>SIM<n> shall be accepted (due to inconsistency in 07.07)	x
D><n> [i/I] [G] [;]	Originate call to phone number in memory location <n>; memory selected with +CPBS is used	x

Direct dialling support is optional. 07.07 section 6.3.

Request GPRS service 'D'	Description	+cme error
D*99[* [<called_address>] [* [<L2P>] [* [<cid>]]]#	Causes the MT to enter the V.250 online data state and, with the TE, to start the specified layer 2 protocol.	x

Optional. 07.60 section 10.4.1.1.



Note: GPRS Phase 1 does not support mobile originated context modification



8.1.2 T Select tone dialling

	Command
execute	T

Mandatory. V.25ter section 6.3.2. This setting is ignored.

8.1.3 P Select pulse dialling

	Command
execute	P

Mandatory. V.25ter section 6.3.3. This setting is ignored.

8.1.4 A Answer

	Command	Possible verbose result codes (V1)	Numeric (V0)	Description
execute	A	CONNECT	1	data/fax call established; rate 300 bps (or x forbids rate display) or GPRS context activation
		CONNECT 1200	5	data/fax call established; rate 1200 bps
		CONNECT 2400	10	data/fax call established; rate 2400 bps
		CONNECT 4800	11	data/fax call established; rate 4800 bps
		CONNECT 9600	12	data/fax call established; rate 9600 bps
		CONNECT 14400	17	HSCSD (or 14.4 tch) data/fax call established; rate 14400 bps
		CONNECT 19200	18	HSCSD data/fax call established; rate 19200 bps
		CONNECT 28800	19	HSCSD data/fax call established; rate 28800 bps
		CONNECT 38400	20	HSCSD data/fax call established; rate 38400 bps
		CONNECT 43200	21	HSCSD data/fax call established; rate 43200 bps
		ERROR	4	command cannot be actioned
		NO CARRIER	3	call could not be established
		OK	0	command aborted

Mandatory. V.25ter section 6.3.5. All result codes are not in V.25ter. Before one of the above codes is issued, the terminal may return some of the following codes: +CR, +ER, +DR, or +ILRR (in that order). In GPRS connections the data rate can actually be higher than the value returned because it is the minimum desired value. The only verbose code returned in the case of a GPRS call is the word CONNECT.

8.1.5 H Hook control

	Command	Description
execute	H[0]	Hang up all calls (except possible waiting call) if only single mode calls in progress.

Mandatory. V.25ter section 6.3.6.

8.1.6 O Return to online data state

	Command	Possible verbose result codes (V1)	Numeric (V0)	Description
execute	O [0]	CONNECT	1	data/fax call continued; rate 300 bps (or x forbids rate display)
		CONNECT 1200	5	data call continued; rate 1200 bps
		CONNECT 2400	10	data call continued; rate 2400 bps
		CONNECT 4800	11	data call continued; rate 4800 bps
		CONNECT 9600	12	data call continued; rate 9600 bps
		CONNECT 14400	17	HSCSD data call continued; rate 14400 bps
		CONNECT 19200	18	HSCSD data call continued; rate 19200 bps
		CONNECT 28800	19	HSCSD data call continued; rate 28800 bps
		CONNECT 38400	20	HSCSD data call continued; rate 38400 bps
		CONNECT 43200	21	HSCSD data call continued; rate 43200 bps
		ERROR	4	command cannot be actioned
		NO CARRIER	3	call could not be continued

Mandatory. V.25ter section 6.3.7. In GPRS connections the data rate can actually be higher than the value returned because it is the minimum desired value. The only verbose code returned in the case of a GPRS call is the word CONNECT.

8.1.7 S0 Automatic answer

	Command	Response	<n> values
set	S0=<n>		0..255 (default 0)
read	S0?	<n>	000..255

Mandatory. V.25ter section 6.3.8. Value indicates number of rings (RING or +CRING result codes) to wait before answering automatically. Value 0 disables auto-answer.

8.1.8 S6 Pause before blind dialling

	Command	Response	<n> values
set	S6=<n>		0..255
read	S6?	002	002

Mandatory. V.25ter section 6.3.9. This setting is ignored.

8.1.9 S7 Connection completion timeout

	Command	Response	<n> values
set	S7=<n>		0..255 (default 60)
read	S7?	<n>	000..255

Mandatory. V.25ter section 6.3.10. Also known as 'no answer timeout'. Value is given in seconds. Value 0 (unlimited time) is not in V.25ter.

8.1.10 S8 Comma dial modifier time

	Command	Response	<n> values
set	S8=<n>		0..255 (default 2)
read	S8?	<n>	000..255

Mandatory. V.25ter section 6.3.11. Value is given in seconds. See also D.

8.1.11 S10 Automatic disconnect delay

	Command	Response	<n> values
set	S10=<n>		0..255 (default 100)
read	S10?	<n>	000..255

Mandatory. V.25ter section 6.3.12. Value is given in tenths of a second. Values 0 and 255 (do not disconnect) are not in V.25ter.

8.1.12 L Monitor speaker loudness

	Command
execute	L[0]..L3

Mandatory. V.25ter section 6.3.13. This setting is ignored.

8.1.13 M Monitor speaker mode

	Command
execute	M[0]..M2

Mandatory. V.25ter section 6.3.14. This setting is ignored.

8.1.14 +DS Data compression

	Command	Response	Default
set	+DS=<dir>, <neg>, <P1>, <P2>		0, 0, 2048, 20
read	+DS?	+DS: <dir>, <neg>, <P1>, <P2>	
test	+DS=?	+DS: (0-3), (0,1), (512-2048), (6-32)	

Mandatory when V.42bis data compression implemented. V.25ter section 6.6.1.

Parameters:

<dir> the desired direction(s) of operation of the data compression function; from the DTE point of view:

- 0 Negotiated ...no compression
- 1 transmit only
- 2 receive only
- 3 both directions, accept any direction

<neg> specifies if the DCE should continue to operate in case the desired result is not obtained:

- 0 Do not disconnect if Rec. V.42 bis is not negotiated by the remote DCE as specified in <dir>
- 1 Disconnect if Rec. V.42 bis is not negotiated by the remote DCE as specified in <dir>
- <P1> maximum number of dictionary entries that should be negotiated, 512 to 2048
- <P2> maximum string length to be negotiated, 6 to 32, default 20 (V.42bis P2).

8.1.15 +DR Data compression reporting

	Command	Response	Default
set	+DR=<mode>		0
read	+DR?	+DR: <mode>	
test	+DR=?	+DR: (0,1)	

Mandatory when V.42bis data compression implemented. V.25ter section 6.6.2. Controls presentation of +DR intermediate result code.

Parameters:

- <mode>
- 0 data compression reporting disabled
- 1 data compression reporting enabled

8.2 DE FACTO

8.2.1 B CCITT/Bell mode

	Command
execute	B[0]..B1

Mandatory for compatibility reasons. This setting is ignored.

8.2.2 S1 Ring count

	Command	Response	<n> values
read	S1?	<n>	000..255

Optional. Returns number of rings (RING or +CRING result codes) counted after last MT call setup.

8.2.3 S2 Escape code character

	Command	Response	<n> values
set	S2=<n>		0..127 (default 43)
read	S2?	<n>	000..127

Optional. Default character is a plus sign. See also Escape sequence.

8.2.4 S12 Escape guard time

	Command	Response	<n> values
set	S12=<n>		0..255 (default 50)
read	S12?	<n>	000..255

Optional. Value is in fiftieths of a second (default is one second). See also Escape sequence.

8.2.5 Escape sequence

Mandatory. During online data state, online command state can be entered by giving three same characters (defined by S2 register; default is '+') in a sequence. Before and after the sequence there must be a pause of at least the time defined by S12 register. By setting S12 to zero, escape sequence detection can be disabled.

During GPRS online data state, the escape sequence is handled similarly as of DTR OFF would have been seen. This enhancement implements an alternative way to terminate a GPRS DUN connection.

8.3 GSM 07.07

8.3.1 +CSTA Select type of address

	Command	Response	Default
set	+CSTA=<type>		129
read	+CSTA?	+CSTA: <type>	
test	+CSTA=?	+CSTA: (128-255)	

Mandatory when other than default value allowed. 07.07 section 6.1. Dial command D uses always this setting except when dial string includes the international access code character (+). In this case the type of address sent to the network defaults to 145 (international/telephony).



8.3.2 +CMOD Call mode

	Command	Response	Default
set	+CMOD=<mode>		0
read	+CMOD?	+CMOD: <mode>	
test	+CMOD=?	+CMOD: (0,1)	

Mandatory when alternating calls implemented. 07.07 sections 6.4, 6.6, and annexes E, F. Note that alternating call answering operations from an external UI may change +CMOD values.



Note: +CMOD shall be set to zero after a successfully completed alternating mode call. It shall be set to zero also after a failed answering. The power-up, factory (&F) and user resets (Z) shall also set the value to zero. This reduces the possibility that alternating mode calls are originated or answered accidentally. Alternating call answering operations from an external UI may change +CMOD values.

Values for <mode>:

- 0 single mode (default)
- 1 alternating voice/fax (teleservice 61) – This is a dummy value included for compatibility reasons.

8.3.3 +CHUP Hangup call

	Command
execute	+CHUP
test	+CHUP=?

Mandatory when alternating calls implemented. 07.07 sections 6.5, 6.6, and annexes E, F. This is an assured procedure to terminate an alternating mode call.

8.3.4 +CBST Select bearer service type

	Command	Response	Default
set	+CBST=<speed>, <name>, <ce>		0, 0, 1
read	+CBST?	+CBST: <speed>, <name>, <ce>	
test	+CBST=?		

Mandatory when data calls implemented. 07.07 section 6.7.

Parameters:

<speed>:

- 0 autobaoding (automatic selection of speed; this setting is possible in case of 3.1 kHz modem and non-transparent service)
- 1 300 bps (V.21)
- 2 1200 bps (V.22)
- 3 1200/75 bps (V.23)
- 4 2400 bps (V.22bis)
- 5 2400 bps (V.26ter)
- 6 4800 bps (V.32)



- 7 9600 bps (V.32)
- 12 9600 bps (V.34)
- 14 14400 bps (V.34)
- 15 19200 bps (V.34)
- 16 28800 bps (V.34)
- 34 1200 bps (V.120)
- 36 2400 bps (V.120)
- 38 4800 bps (V.120)
- 39 9600 bps (V.120)
- 43 14400 bps (V.120)
- 47 19200 bps (V.120)
- 48 28800 bps (V.120)
- 49 38400 bps (V.120)
- 50 48000 bps (V.120)
- 51 56000 bps (V.120)
- 65 300 bps (V.110)
- 66 1200 bps (V.110)
- 68 2400 bps (V.110 or X.31 flag stuffing)
- 70 4800 bps (V.110 or X.31 flag stuffing)
- 71 9600 bps (V.110 or X.31 flag stuffing)
- 75 14400 bps (V.110 or X.31 flag stuffing)
- 79 19200 bps (V.110 or X.31 flag stuffing)
- 80 28800 bps (V.110 or X.31 flag stuffing)
- 81 38400 bps (V.110 or X.31 flag stuffing)

<name>:

- 0 data circuit asynchronous (UDI or 3.1 kHz modem)
- 2 PAD Access (asynchronous) (UDI)

<ce>:

- 1 non-transparent

8.3.5 +CRLP Radio link protocol

	Command	Response	Default
set	+CRLP=<iws>,<mws> ,<T1>,<N2>[,<ver> ,<T4>]		RLP version 0 or 1 set: 61,61,48,6 RLP version 2 defaults depend on +CHSN selection
read	+CRLP?	+CRLP: <iws>,<mws>,<T1>,<N2> [<CR><LF> +CRLP: <iws>,<mws>,<T1>,<N2>,2,<T4>]	
test	+CRLP=?	+CRLP: (0-61),(0-61),(39-255),(1-255) [<CR><LF>+CRLP: (0-n),(0-n),(39-255), (1-255),2,(3-255)]	

Mandatory when non-transparent data implemented. 07.07 section 6.8. Command/response parameters in brackets are present when the product implements RLP version 2 (multislot RLP). Note that 0 is default for <ver> and each RLP version has its own parameter set stored in TA memory (with the exception of versions 0 and 1 which use the same set). Range of version 2 window size parameters depend on +CHSN selection (selected HSCSD speed).

Parameters:

<iws> Inter Working Function (IWF) to MS window size
<mws> MS to IWF window size
<T1> acknowledgement timer in units of 10 ms
<N2> retransmission attempts
<ver> RLP version number in integer format; when version indication is not present it shall equal 0
<T4> re-sequencing period in units of 10 ms

8.3.6 +CR Service reporting control

	Command	Response	Default
set	+CR=<mode>		0
read	+CR?	+CR: <mode>	
test	+CR=?	+CR: (0,1)	

Mandatory when data calls implemented. 07.07 section 6.9. Controls presentation of +CR intermediate result code.

8.3.7 +CEER Extended error report

	Command	Response
execute	+CEER	+CEER: <report>
test	+CEER=?	

Optional. 07.07 section 6.10. Returns the reason of last call setup or in-call modification failure, or the reason for last call release. <report> is the textual representation of network cause value as listed in GSM 04.08 annex H.

8.3.8 +CRC Cellular result codes

	Command	Response	Default
set	+CRC=<mode>		0
read	+CRC?	+CRC: <mode>	
test	+CRC=?	+CRC: (0,1)	

Mandatory when data or fax calls implemented. 07.07 section 6.11. Controls presentation of +CRING unsolicited result code, which can be returned instead of a regular RING. See also Result codes section.

8.3.9 +CSNS Single numbering scheme

	Command	Response	Default
set	+CSNS=<mode>		0
read	+CSNS?	+CSNS: <mode>	
test	+CSNS=?	+CSNS: (0-2,4,5)	

Optional. 07.07 section 6.18. Used to select the bearer service to be used when a call without bearer capability element is received.

Values for <mode>:

- 0 voice (default) – Dummy code included for compatibility reasons
- 1 alternating voice/fax, voice first (teleservice 61) – Dummy code included for compatibility reasons
- 2 fax (teleservice 62)
- 4 data
- 5 alternating voice/fax, fax first (teleservice 61) – Dummy code included for compatibility reasons

8.3.10 +CHSR HSCSD parameters report

	Command	Response	Default
set	+CHSR=<mode>		0
read	+CHSR?	+CHSR: <mode>	
test	+CHSR=?	+CHSR: (0-1)	

Mandatory when HSCSD is implemented. 07.07 section 6.16.

8.3.11 +CHSD HSCSD device parameters

	Command	Response	+cme error
execute	+CHSD	+CHSD: <mclass>, <maxRx>, <maxTx>, <sum>, <codings>	x
test	+CHSD=?	6, 3, 2, 4, 12	

Mandatory when HSCSD operation is implemented. 07.07 section 6.12.

Parameters:

<mclass>: integer type; multislot class

<maxRx>: integer type; maximum number of receive timeslots that ME can use

<maxTx>: integer type; maximum number of transmit timeslots that ME can use

<sum>: integer type; total number of receive and transmit timeslots that ME can use at the same time (per TDMA frame). The following applies in a HSCSD call: 1 <= (receive slots) + (transmit slots) <= <sum>

<codings> is a sum of integers, each representing a supported channel coding (e.g. value 12 indicates that 9.6k and 14.4k channel codings are supported):

- 1 4.8k full rate data traffic channel
- 4 9.6k full rate data traffic channel
- 8 14.4k full rate data traffic channel

8.3.12 +CHSN HSCSD non-transparent call configuration

	Command	Response	Default
set	+CHSN=<wAur>, <wRx>, <topRx>, <codings>		0, 0, 0, 0
read	+CHSN?	+CHSN: <wAur>, <wRx>, <topRx>, <codings>	
test	+CHSN=?	+CHSN: (list of supported <wAur>s), (list of supported <wRx>s), (list of supported <topRx>s), (list of supported <codings>s) (0-4,6), (0-3), (0-3), (0,4,8,12)	

Mandatory when non-transparent HSCSD calls are implemented.

Parameters

<wAiur>: integer type; wanted air interface user rate. 0 indicates that TA shall calculate a proper value from currently selected fixed network user rate (<speed> subparameter from +CBST command), <codings>, and <wRx> (or <maxRx> from +CHSD command if <wRx>=0). Other values:

- 1 9600 bps
- 2 14400 bps
- 3 19200 bps
- 4 28800 bps
- 6 43200 bps

<wRx>: integer type; wanted amount of receive timeslots. Default value 0 indicates that TA shall calculate a proper value from currently selected <wAiur> and <codings>

<topRx>: integer type; top value for <wRx> that user is going to request during the next established non-transparent HSCSD call. Default value 0 indicates that user is not going to change <wAiur>/<wRx> during the next call

<codings>: a sum of integers, each representing a channel coding that is accepted for non-transparent HSCSD calls. Default value 0 indicates that all supported codings are accepted (refer +CHSD command for other values). value 12 indicates that 9.6k and 14.4k channel codings are supported):

- 1 4.8k full rate data traffic channel
- 4 9.6k full rate data traffic channel
- 8 14.4k full rate data traffic channel

8.3.13 +CHSC HSCSD current call parameters

	Command	Response
execute	+CHSC	+CHSC: <rx>,<tx>,<aiur>,<coding>
test	+CHSC=?	

Optional. 07.07 section 6.15. When no call is in progress (or external ME is not connected), all values are zero.

Parameters:

<rx>: integer type; number of receive timeslots currently in use

<tx>: integer type; number of transmit timeslots currently in use

<aiur>: integer type; current air interface user rate (refer +CHSN command for possible values)

<coding>: current channel coding (refer +CHSD command for possible values)

8.3.14 +CV120 V.120 rate adaption protocol

	Command	Response	Default
set	+CV120=<rah>,<mfpm>,<mode>,<llineg>,<assign>,<negtype>		,1
read	+CV120?	+CV120: <rah>,<mfpm>,<mode>,<llineg>,<assign>,<negtype>	
test	+CV120=?	+CV120: (1),(0,1),(1),(0),(0),(0)	

Mandatory when V.120 interworking supported by ME. 07.07 section 6.20.

8.3.15 +CVHU Voice hangup control

	Command	Response	Default
set	+CVHU=<mode>		0
read	+CVHU?	+CVHU: <mode>	
test	+CVHU=?	+CVHU: (0-2)	

Optional. 07.07 section 6.19. By default, the Nokia D211 should ignore DTR drop, but disconnect on ATH during voice mode of a call.

9. NETWORK SERVICE COMMANDS (GSM 07.07)

9.1.1 +CREG Network registration

	Command	Response	Default	+cme error
set	+CREG=<n>		0	
read	+CREG?	+CREG: <n>,<stat>[,<lac>,<ci>]		x
test	+CREG=?	+CREG: (0-2)		

Optional. 07.07 section 7.2. Controls presentation of +CREG unsolicited result code or returns current registration status.

Parameters:

<n>:

- 0 disable network registration unsolicited result code
- 1 enable network registration unsolicited result code +CREG: <stat>
- 2 enable network registration and location information unsolicited result code +CREG: <stat>[,<lac>,<ci>]

<stat>:

- 0 not registered, ME is not currently searching a new operator to register to
- 1 registered, home network
- 2 not registered, but ME is currently searching a new operator to register to
- 3 registration denied
- 4 unknown
- 5 registered, roaming

<lac> string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 193 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

9.1.2 +COPS Operator selection

	Command	Response	Default	+cme error
set	+COPS=<mode>, <format>,<oper>		[0],0	x
read	+COPS?	+COPS: <mode>[,<format>,<oper>]		x
test	+COPS=?	+COPS: [(<stat>,<long>,,<numeric>) [,...]],,(0,1),(2)		x

Optional. 07.07 section 7.3. 'Set' command selects a network or sets automatic network selection. 'Read' command returns the current network. 'Test' command returns available networks. Short alphanumeric operator name format (<format>=1) and selection <mode>=2 and =4 are not supported by the Nokia D211.

Parameters:

<mode>:

- 0 automatic (<oper> field is ignored)
- 1 manual (<oper> field shall be present)

<format>:

2 numeric <oper>

<oper>: the numeric format is the GSM Location Area Identification number (refer GSM 04.08 10.5.1.3) which consists of a three BCD digit country code coded as in ITU-T E.212 Annex A, plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in Binary Coded Decimal (BCD) format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 2)(network code digit 1)

<stat>:

0 unknown
1 available
2 current
3 forbidden

9.1.3 +CLCK Facility lock

	Command	Response	Default	+cme error
execute	+CLCK=<fac>, <mode>, <passwd>, <class>	when <mode>=2: +CLCK: <status>[, <class1> [<CR><LF>+CLCK: <status>, <class2> [...]]]	[, , , 7]	x
test	+CLCK=?	+CLCK: ("PS", "SC", "AO", "OI", "OX", "AI", "IR", "AB", "AG", "AC")		

Optional. 07.07 section 7.4. Enables/disables or queries the state of SIM/ME security features (PIN/security code query or fixed dialling feature) or call barring supplementary services. <fac> values "AB", "AG" and "AC" are only applicable for <mode>=0. Only security code levels 'phone' and 'none' can be handled with this command. If 'memory' level is set and status is queried (+CLCK="PS", 2), AT interface shall indicate 'not active' (+CLCK: 0). When SS status request response from network indicates that SS is active for specific data bearer services (e.g. 'circuit async'), AT interface shall only indicate 'data' (<class>=32) ('not active' case is displayed only when SS is not active to any service; i.e. +CLCK: 0, 7). Supported <class> values: 1, 2, 4, 5, 7, 8, 12, 13, 15, 16, 32, 64, 128, 144, 160, 240, 242 and 255.

9.1.4 +CPWD Change password

	Command	Response	+cme error
execute	+CPWD=<fac>, <oldpwd>, <newpwd>		x
test	+CPWD=?	+CPWD: ("PS", 10), ("SC", 8), ("AB", 4), ("P2", 8)	

Optional. 07.07 section 7.5. Changes passwords of SIM/ME/network features. "AB" = network/barring password.

9.1.5 +CLIP Calling line identification presentation

	Command	Response	Default
set	+CLIP=<n>		0
read	+CLIP?	+CLIP: <n>, <m>	
test	+CLIP=?	+CLIP: (0,1)	

Optional. 07.07 section 7.6. Controls the presentation of +CLIP unsolicited result code or returns CLIP subscription status from the network. If the product does not support network status query, <m> shall always equal 2.

9.1.6 +CLIR Calling line identification restriction

	Command	Response	Default
set	+CLIR=<n>		0
read	+CLIR?	+CLIR: <n>, <m>	
test	+CLIR=?	+CLIR: (0-2)	

Optional. 07.07 section 7.7. Enables/disables own number sending to network or returns CLIR subscription status from the network.

<n>:
0 sets the adjustment for outgoing calls:
0 presentation indicator is used according to the subscription of the CLIR service
1 CLIR invocation
2 CLIR suppression
<m>:
0 shows the subscriber CLIR service status in the network:
0 CLIR not provisioned
1 CLIR provisioned in permanent mode
2 unknown (e.g. no network)
3 CLIR temporary mode presentation restricted
4 CLIR temporary mode presentation allowed

9.1.7 +COLP Connected line identification presentation

	Command	Response	Default
set	+COLP=<n>		0
read	+COLP?	+COLP: <n>, <m>	
test	+COLP=?	+COLP: (0,1)	

Optional. 07.07 section 7.8. Controls the presentation of +COLP intermediate result code or returns COLP subscription status from the network. If the product does not support network status query, <m> shall always equal 2.

Parameters:

<n >:
0 parameter sets/shows the result code presentation status in the TA:
0 disable
1 enable
<m >:
0 parameter shows the subscriber COLP service status in the network:
0 COLP not provisioned
1 COLP provisioned
2 unknown (e.g. no network)

9.1.8 +CCFC Call forwarding number and conditions

	Command	Response	Default	+cme error
execute	+CCFC=<reason>,<mode>,<number>,<type>,<class>,<subaddr>,<satype>,<time>	when <mode>=2: +CCFC: <status>,<class1>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]] [<CR><LF>+CCFC: <status>,<class2>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]] [...]]	[,,, see Note #1,7 ,, see Note #2,20]	x
test	+CCFC=?	+CCFC: (0-5)		

Optional. 07.07 section 7.10. Controls call forwarding supplementary services. <reason> values 4 and 5 are only applicable for <mode>=0. When the status request response from the network indicates that SS is active for specific data bearer services (e.g. 'circuit async'), AT interface shall indicate 'data circuit async' (<class>=32) ('not active' case is displayed only when SS is not active to any service; i.e. +CCFC: 0,7). Supported <class> values: 1, 2, 4, 5, 7, 8, 12, 13, 15, 16, 32, 64, 128, 144, 160, 240, 242 and 255.



Note: <type>: 129, when ISDN numbering plan / 145, when International number and ISDN numbering (in overall: could be between 128 and 255). See GSM 04.08 chapter 10.5.4.7 for other possible values.



Note: <satype>: "user specified". See GSM 04.08, ch. 10.5.4.8 for possible values.

9.1.9 +CCWA Call waiting

	Command	Response	Default	+cme error
set	+CCWA=<n>,<mode>,<class>	when <mode>=2: +CCWA: <status>,<class1> [<CR><LF>+CCWA: <status>,<class2> [...]]	0[, ,7]	x
read	+CCWA?	+CCWA: <n>		
test	+CCWA=?	+CCWA: (0,1)		

Optional. 07.07 section 7.11. Controls call waiting supplementary service and presentation of +CCWA unsolicited result code. When the status request response from the network indicates that SS is active for specific data bearer services (e.g. 'circuit async'), AT interface shall only indicate 'data' (<class>=2) ('not active' case is displayed only when SS is not active to any service; i.e. +CCWA: 0,7).

Parameters:

<n> (sets/shows the result code presentation status in the TA):

0 disable

1 enable

<mode> (when <mode> parameter is not given, network is not interrogated):

0 disable

1 enable

2 query status

<class> is a sum of integers each representing a class of information (default 7 equals to all classes):

- 1 voice
 - 2 data
 - 4 fax
- also all other values below 128 are reserved

<status>:

- 0 not active
- 1 active

9.1.10 +CHLD Call related supplementary services

	Command	Response	+cme error
execute	+CHLD=<n>		x
test	+CHLD=?	+CHLD: (0,1,1x,2,2x,3,4)	

Optional. 07.07 section 7.12. Controls call hold, multiparty and explicit call transfer supplementary service operations similarly as defined in GSM 02.30 section 4.5.5.1.

<n> values:

- 0 release all held calls or send 'busy' cause to network for a waiting call
- 1 release all active calls and accept other (waiting or held) calls
- 1x release a specific active call x
- 2 active calls on hold and accept other (waiting or held) calls
- 2x all active multiparty calls on hold except call x
- 3 add held call to multiparty call;
- 4 connect held and active (or MO alerting) call with each other (locally both calls are disconnected).

Where both a held and a waiting call exist, the above procedures shall apply to the waiting call (i.e. not to the held call) in a conflicting situation.

9.1.11 +CUSD Unstructured supplementary service data

	Command	Response	Default	+cme error
set	+CUSD=<n>, <str>, <dc>	+CUSD: <m>[, <str>, <dc>]	0[, , 0]	x
read	+CUSD?	+CUSD: <n>		
test	+CUSD=?	+CUSD: (0,1)		

Optional. 07.07 section 7.14. Used to send MO USSD and set the presentation of +CUSD unsolicited result code (MT USSD). Used also to reply to a network initiated USSD (see Result codes section).

Parameters:

<n>:

- 0 disable
- 1 enable

<str>: string type USSD-string (when <str> parameter is not given, network is not interrogated):

- if <dc> indicates that GSM 03.38 default alphabet is used:

- if TE character set other than "HEX" (refer command Select TE Character Set +CSCS): ME/TA converts GSM alphabet into current TE character set according to rules of GSM 07.05, Annex A
- if TE character set is "HEX": ME/TA converts each 7-bit character of GSM alphabet into two IRA character long hexadecimal number (e.g. character P (GSM 23) is presented as 17 (IRA 49 and 55))

- if <dc> indicates that 8-bit data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))
 <dc>: GSM 03.38, Cell Broadcast Data Coding Scheme in integer format (default 0)

<m>:
 0 no further user action required (network initiated USSD-Notify, or no further information needed after mobile initiated operation)
 1 further user action required (network initiated USSD-Request, or further information needed after mobile initiated operation)

9.1.12 +CAOC Advice of charge

	Command	Response	+cme error
execute	+CAOC=[<mode>]	[+CAOC: <ccm>]	x
read	+CAOC?	+CAOC: <mode>	
test	+CAOC=?	+CAOC: (0-2)	

Optional. 07.07 section 7.15. Returns current call meter value (in home units) from ME. The unsolicited result code +CCCM: <ccm> is sent when the CCM value changes, but not more than every 10 seconds. Deactivation of the unsolicited event reporting is made with the same command.

Parameters:

<ccm>: string type; three bytes of the current call meter value in hexadecimal format (e.g. "00001E" indicates decimal value 30); value is in home units, and bytes are similarly coded as the ACMmax value in the SIM.

9.1.13 +CSSN Supplementary service notifications

	Command	Response	Default
set	+CSSN=<n>, <m>		0, 0
read	+CSSN?	+CSSN: <n>, <m>	
test	+CSSN=?	+CSSN: (0, 1), (0, 1)	

Optional. 07.07 section 7.16. Controls presentation of +CSSI intermediate result code and +CSSU unsolicited result code.

Parameters:

<n>: parameter sets/shows the +CSSI result code presentation status in the TA:
 0 disable
 1 enable
 <m>: parameter sets/shows the +CSSU result code presentation status in the TA:
 0 disable
 1 enable

10. ME CONTROL AND STATUS COMMANDS (GSM 07.07)

10.1.1 +CPIN Enter PIN

	Command	Response	+cme error
set	+CPIN=<pin>, <newpin>		x
read	+CPIN?	+CPIN: <code>	x
test	+CPIN=?		

Optional. 07.07 section 8.3. Used to enter device passwords that ME is querying, or to query whether ME is currently querying a password. When the last executed AT command failed in PIN2/PUK2 authentication error (or security code error in case of memory updating), read command shall return PIN2/PUK2 (or security code) <code> although the operation of ME is not blocked.

10.1.2 +CBC Battery charge

	Command	Response	+cme error
execute	+CBC	+CBC: <bcs>, <bcl>	x
test	+CBC=?	+CBC: (0,1), (0-100)	

Optional. 07.07 section 8.4. Returns ME battery charging status and charge level. This setting is ignored. It is included for compatibility reasons.

10.1.3 +CSQ Signal quality

	Command	Response	+cme error
execute	+CSQ	+CSQ: <rssi>, 99	x
test	+CSQ=?	+CSQ: (0-31,99), (99)	

Optional. 07.07 section 8.5. Returns signal strength as calculated by ME. Bit error rate reporting not supported by the Nokia D211.

10.1.4 +CPBS Select phonebook memory storage

	Command	Response	Default	+cme error
set	+CPBS=<storage>		"SM"	
read	+CPBS?	+CPBS: <storage>, <used>, <total>		x
test	+CPBS=?	+CPBS: (list of supported <storage>s)		

Mandatory when +CPBR, +CPBF or +CPBW is implemented. 07.07 section 8.11. Selects memory where phonebook commands operate. Supported <storage> values are: "DC", "MC", "RC", "ME", "FD", "SM".

Read command returns the currently selected memory, number of used locations and total number of locations in the memory.

10.1.5 +CPBR Read phonebook entries

	Command	Response	+cme error
execute	+CPBR=<index1>,<index2>	[+CPBR: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CPBR: <index2>,<number>,<type>,<text>]]	x
test	+CPBR=?	+CPBR: (<index>-list) , [<nlength>] , [<tlength>]	x

Optional. 07.07 section 8.12. If the given index range is valid but all entries in it are empty, the response is empty. Test command returns the location range that is supported by the current storage as a compound value and the maximum length of <number> and <text> field.

10.1.6 +CPBF Find phonebook entries

	Command	Response	+cme error
execute	+CPBF=<findtext>	[+CPBF: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CPBF: <index2>,<number>,<type>,<text>]]	x
test	+CPBF=?	+CPBF: [<nlength>] , [<tlength>]	x

Optional. 07.07 section 8.13. If the searched text is not found from the entries in the current memory, the response is empty. Test command returns the maximum length of <number> and <text> field.

10.1.7 +CPBW Write phonebook entry

	Command	Response	Default	+cme error
execute	+CPBW=[<index>] [, <number> [, <type> [, <text>]]]		[, , 129/145]	x
test	+CPBW=?	+CPBW: (<index>-list) , [<nlength>] , (129,145) , [<tlength>]		x

Optional. 07.07 section 8.14. Execution command writes phonebook entry in location number <index> in the current phonebook memory storage selected with +CPBS. Entry fields written are phone number <number> (in the format <type>) and text <text> associated with the number. If those fields are omitted, the phonebook entry is deleted. If <index> is left out, but <number> is given, the entry is written to the first free location in the phonebook.

Test command returns location range supported by the current storage as a compound value, the maximum length of <number> field, supported number formats of the storage, and the maximum length of <text> field.

11. ME ERROR COMMAND (GSM 07.07)

11.1.1 +CMEE Report mobile equipment error

	Command	Response	Default
set	+CMEE=<n>		0
read	+CMEE?	+CMEE: <n>	
test	+CMEE=?	+CMEE: (0-1)	

Mandatory. 07.07 section 9.1. Controls the presentation of extended error information result code. See also result code +CME ERROR. Textual error code presentation (parameter value 2) is not supported.

SMS COMMANDS (GSM 07.05)



Note: SMS cannot be controlled using AT commands because the Nokia D211 SMS application (Nokia Short Messaging) controls them.

11.1.2 +CSMS Select message service

	Command	Response	Default
set	+CSMS=<service>	+CSMS: 1,1,1	0
read	+CSMS?	+CSMS: <service>,1,1,1	
test	+CSMS=?	+CSMS: (0,1)	

Mandatory. 07.05 section 3.2.1. Main difference between <service> 0 and 1 is that when <service>=1, +CNMA acknowledgement is required because most MT short messages are routed directly to TE.

11.1.3 +CPMS Preferred message storage

	Command	Response	Default	+cms error
set	+CPMS=<mem1> [, <mem2> [, <mem3>]]	+CPMS: <used1>, <total1>, <used2>, <total2>, <used3>, <total3>	"SM", "SM", "MT"	x
read	+CPMS?	+CPMS: <mem1>, <used1>, <total1>, <mem2>, <used2>, <total2>, <mem3>, <used3>, <total3>		x
test	+CPMS=?	+CPMS: ("ME", "SM"), ("ME", "SM"), ("MT")		

Mandatory. 07.05 section 3.2.2. <mem1> is for read/delete procedures, <mem2> for writing/sending, <mem3> is preferred memory for received messages (when they are not routed directly to TE).

11.1.4 +CMGF Message format

	Command	Response	Default
set	+CMGF= [<mode>]		0
read	+CMGF?	+CMGF: <mode>	
test	+CMGF=?	+CMGF: (0,1)	

Mandatory. 07.05 section 3.2.3. Used to select SMS PDU mode or SMS Text mode.

11.1.5 +CSCA Service centre address

	Command	Response	Default
set	+CSCA=<sca> [, <tosca>]		
read	+CSCA?	+CSCA: <sca>, <tosca>	
test	+CSCA=?		

Mandatory. 07.05 section 3.3.1. Controls the local (TA) SMSC address. SMSC address is fetched from the SMS server at the beginning of a DTE session. SMSC address may also change when +CRES is actioned.

11.1.6 +CSMP Set text mode parameters

	Command	Response	Default
set	+CSMP= [<fo> [, <vp> [, <pid> [, <dc>]]]]		17,167,0,0
read	+CSMP?	+CSMP: <fo>, <vp>, <pid>, <dc>	
test	+CSMP=?		

Mandatory when the text mode is implemented (needed also when +CRES/+CSAS is implemented). 07.05 section 3.3.2. The values of these parameters may change also when +CRES is actioned.

11.1.7 +CSDH Show text mode parameters

	Command	Response	Default
set	+CSDH= [<show>]		0
read	+CSDH?	+CSDH: <show>	
test	+CSDH=?	+CSDH: (0,1)	

Mandatory when the text mode is implemented. 07.05 section 3.3.3.

11.1.8 +CSCB Select cell broadcast message types

	Command	Response	Default	+cms error
set	+CSCB= [<mode> [, <mids> [, <dcss>]]]		0, "", ""	x
read	+CSCB?	+CSCB: <mode>, <mids>, <dcss>		
test	+CSCB=?	+CSCB: (0,1)		

Optional (needed when cell broadcast service is implemented). 07.05 section 3.3.4.

11.1.9 +CSAS Save settings

	Command	Response	Default	+cms error
execute	+CSAS [=<profile>]		[1]	x
test	+CSAS=?	+CSAS: (<profile>-list)		x

Optional. 07.05 section 3.3.5. Saves SMS settings (+CSMP and +CSCA parameters) to non-volatile memory (usually SIM). First <profile> location is 1. SMSC address is not stored if +CSCA is not set/restored during the current session (i.e. +CSCA? returns +CSCA: "", 129). Validity period is not stored if <fo> does not indicate the relative validity period format (i.e. bits 4-3 are not '10'). NOTE: The values that are not stored shall remain intact in the <profile>.

11.1.10 +CRES Restore settings

	Command	Response	Default	+cms error
execute	+CRES [=<profile>]		[1]	x
test	+CRES=?	+CRES: (<profile>-list)		x

Optional. 07.05 section 3.3.6. Restores SMS settings (+CSMP and +CSCA parameters) from non-volatile memory (usually SIM). First <profile> location is 1. In addition, if validity period is returned, <fo> is forced to indicate relative validity period format (i.e. bits 4-3 are set to '10').

11.1.11 +CNMI New message indications to TE

	Command	Response	Default	+cms error
set	+CNMI= [<mode> [, <mt> > [, <bm> [, <ds> [, <bfr>]]]]]		0,0,0,0,0	x
read	+CNMI?	+CNMI: <mode>, <mt>, <bm>, <ds>, <bfr>		
test	+CNMI=?	+CNMI: (0-2), (0-3), (0,2,3), (0-2), (0,1)		

Mandatory when messages can be received directly to TE. 07.05 section 3.4.1. <bm>=1 is not implemented in the Nokia D211 (requires CBM memory in ME).



Note: SMS cannot be controlled using AT command because the Nokia D211 SMS application (Nokia Short Messaging) controls them.

11.1.12 +CMGL List messages

	Command	Response	Default	+cms error
execute	+CMGL [= <stat>]	<p>text mode (+CMGF=1), SMS-DELIVER or SMS-SUBMIT:</p> <p>+CMGL: <index>, <stat>, <oa/da>, [<alpha>], [<scts>] [, <tooa/toda>, <length>] <CR><LF><data> [<CR><LF> +CMGL: <index>, <stat>, <oa/da>, [<alpha>], [<scts>] [, <tooa/toda>, <length>] <CR><LF><data> [...]]</p> <p>text mode (+CMGF=1), SMS-STATUS-REPORT:</p> <p>+CMGL: <index>, <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st> [<CR><LF> +CMGL: <index>, <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st> [...]]</p> <p>text mode (+CMGF=1), SMS-COMMAND:</p> <p>+CMGL: <index>, <stat>, <fo>, <ct> [<CR><LF> +CMGL: <index>, <stat>, <fo>, <ct> [...]]</p> <p>PDU mode (+CMGF=0):</p> <p>+CMGL: <index>, <stat>, [<alpha>], <length> <CR><LF><pdu> [<CR><LF>+CMGL: <index>, <stat>, [<alpha>], <length> <CR><LF><pdu> [...]]</p>	["REC UNREAD" /0]	x
test	+CMGL=?	<p>text mode (+CMGF=1):</p> <p>+CMGL: ("REC UNREAD", "REC READ", "STO UNSENT", "STO SENT", "ALL")</p> <p>PDU mode (+CMGF=0):</p> <p>+CMGL: (0-4)</p>		

Optional. 07.05 section 3.4.2. <alpha> not supported by the Nokia D211.

11.1.13 +CMGR Read message

	Command	Response	+cms error
Execute	+CMGR= <index>	<p>text mode (+CMGF=1), SMS-DELIVER:</p> <p>+CMGR: <stat>, <oa>, [<alpha>], <scts> [, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>] <CR><LF><data></p> <p>text mode (+CMGF=1), SMS-SUBMIT:</p> <p>+CMGR: <stat>, <da>, [<alpha>] [, <toda>, <fo>, <pid>, <dcs>, [<vp>], <sca>, <tosca>, <length>] <CR><LF><data></p> <p>text mode (+CMGF=1), SMS-STATUS-REPORT:</p> <p>+CMGR: <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st></p> <p>text mode (+CMGF=1), SMS-COMMAND:</p> <p>+CMGR: <stat>, <fo>, <ct> [, <pid>, [<mn>], [<da>], [<toda>], <length> <CR><LF><cdata>]</p> <p>PDU mode (+CMGF=0):</p> <p>+CMGR: <stat>, [<alpha>], <length> <CR><LF><pdu></p>	x
Test	+CMGR=?		

Optional. 07.05 section 3.4.3. <alpha> not supported by the Nokia D211.



11.1.14 +CNMA New message acknowledgement to ME/TA

	Command	Response	+cms error
Execute	text mode (+CMGF=1): +CNMA PDU mode (+CMGF=0): +CNMA= [<n> [, <length> [<CR>PDU is given<ctrl-Z/ESC>]]]		x
Test	+CNMA=?	PDU mode (+CMGF=0): +CNMA: (0-2)	

Optional. 07.05 section 3.4.4. PDU entering as specified in 07.05. Command is available only when +CSMS=1 is supported.



Note: It depends on the +CSMS setting and AT interface state (data/command mode) whether data task automatically handles acknowledgement or whether it waits for the +CNMA command from the terminal before sending it back.

11.1.15 +CMGS Send message

	Command	Response	Default	+cms error
Execute	text mode (+CMGF=1): +CMGS=<da> [, <today>] <CR> text is entered<ctrl-Z/ESC> PDU mode (+CMGF=0): +CMGS=<length><CR> PDU is given<ctrl-Z/ESC>	text mode (+CMGF=1) and sending ok: +CMGS: <mr> [, <scts>] PDU mode (+CMGF=0) and sending ok: +CMGS: <mr> [, <ackpdu>]	text mode: [, 129/145]	x
Test	+CMGS=?			

Optional. 07.05 section 3.5.1. Text/PDU entering as specified in 07.05.

11.1.16 +CMSS Send message from storage

	Command	Response	Default	+cms error
Execute	+CMSS=<index> [, <da> [, <today>]]	Text mode (+CMGF=1) and sending ok: +CMSS: <mr> [, <scts>] PDU mode (+CMGF=0) and sending ok: +CMSS: <mr> [, <ackpdu>]	[, "", 129/145]	x
Test	+CMSS=?			

Optional. 07.05 section 3.5.2. Also SMS-COMMANDs can be sent, but if <index> contains SMS-COMMAND and <da> is given, +CMS ERROR is returned.



11.1.17 +CMGW Write message to memory

	Command	Response	Default	+cms error
Execute	text mode (+CMGF=1): +CMGW [= <oa/da> [, <tooa/toda> [, <stat>]]] <CR>text is entered<ctrl-Z/ESC> PDU mode (+CMGF=0): +CMGW=<length> [, <stat>] <CR> PDU is given<ctrl-Z/ESC>	storing successful: +CMGW: <index>	text mode: [, 129/145, "STO UNSENT"] PDU mode: [, 2]	x
Test	+CMGW=?			

Optional. 07.05 section 3.5.3. Text/PDU entering as specified in 07.05.

11.1.18 +CMGD Delete message

	Command	Response	+cms error
Execute	+CMGD=<index>		x
Test	+CMGD=?	+CMGD: (list of supported <index>s) [, (list of supported <delflag>s)]	

Optional. 07.05 section 3.5.4.

11.1.19 +CMGC Send command

	Command	Response	Default	+cms error
Execute	text mode (+CMGF=1): +CMGC=<fo>, <ct> [, <pid> [, <mn> [, <da>, [<toda>]]]] <CR>text is entered <ctrl-Z/ESC> PDU mode (+CMGF=0): +CMGC=<length><CR> PDU is given<ctrl-Z/ESC>	text mode (+CMGF=1) and sending ok: +CMGC: <mr> [, <scts>] PDU mode (+CMGF=0) and sending ok: +CMGC: <mr> [, <ackpdu>]	text mode: [2, 0, 0, 0, "", 129/145]	x
Test	+CMGC=?			

Optional. 07.05 section 3.5.5. Text/PDU entering as specified in 07.05.

11.1.20 +CMMS More messages to send

	Command	Response	Default
Set	+CMMS= [<n>]		0
Read	+CMMS?	+CMMS: <n>	
Test	+CMMS=?	+CMMS: (0-2)	

Optional. 07.05 section 3.5.6. Controls the continuity of SMS relay protocol link. If enabled (and supported by the network), several consecutive messages can be sent (+CMGS etc.) much faster as the link is kept open.

12. FAX COMMANDS

The following fax (+F) command sets are available for products supporting GSM 03.45 facsimile group 3 transparent. Appendix D and E list possible responses that fax might give during a fax call.

Different flaggings of the fax sub-module are not considered in this document.

12.1 ALL CLASSES

12.1.1 +FCLASS DCE mode select

	Command	Response	Default
set	+FCLASS=<mode>		0
read	+FCLASS?	<mode>	
test	+FCLASS=?	0, 1, 2, 2.0	

This command selects a DCE mode - data (0) or facsimile (class 1, 2 or 2.0)

12.1.2 +FLO Select flow control

	Command	Response	Default
set	+FLO=<n>		2
read	+FLO?	<n>	
test	+FLO=?	(0-2)	

TIA/EIA-578-A Section 8.5.1 /5/ and TIA/EIA-592-A Section 8.5.3.1 /6/

12.1.3 +FPR Serial port rate control

	Command	Response	Default
set	+FPR=<n>		0
read	+FPR?	<n>	
test	+FPR=?	+FPR: (0, 1, 2, 4, 8, 10, 18, 30)	

TIA/EIA-578-A Section 8.5.2 /5/ and TIA/EIA-592-A Section 8.5.3.2 /6/

+FPR value	0	1	2	4	8	10	18	30
DTE speed	autobauding	2400	4800	9600	19200	38400	57600	115200

12.2 CLASS 1

All Class 1 facsimile commands are defined in ITU-T T.31 /8/ and TIA-578-A /5/.

12.2.1 +FDD Double escape character replacement

	Command	Response	Default
set	+FDD=0		0
read	+FDD?	0	
test	+FDD=?	0	

Dummy command. TIA/EIA-578-A Section 8.5.3 /5/.

12.2.2 +FMI Request manufacturer ID

	Command	Response	Default
set			
read	+FMI?	Nokia Corporation	
test			

TIA/EIA-578-A Section 8.2.4 /5/.

12.2.3 +FMM Request model ID

	Command	Response	Default
set			
read	+FMM?	Nokia D211	
test			

TIA/EIA-578-A Section 8.2.4 /5/.

12.2.4 +FMR Request revision ID

	Command	Response	Default
set			
read	+FMR?	V 5.00 01-04-02 DTE-1 (c)NMP	
test			

TIA/EIA-578-A Section 8.2.4 /5/.

12.2.5 +FRH Receive HDLC data with a supported carrier

	Command	Response	Default
set	+FRH=3		
read			
test	+FRH=?	3	

Can be set only when on-line. TIA/EIA-578-A Section 8.3.6 /5/.

12.2.6 +FRM Receive data with a supported carrier

	Command	Response	Default
set	+FRM=<n>		
read			
test	+FRM=?	S48 = 0 : 24,48,72,96 S48 = 1 : 24,48,72,96,121,145	

Can be set only when on-line. TIA/EIA-578-A Section 8.3.4 /5/.

Accepts also values "73, 74 , 97, 98, 122 and 146", but those are internally converted to "72,96,121 or 145".

12.2.7 +FRS Receive silence

	Command	Response	Default
set	+FRS=<n>		
read			
test	+FRS=?	(0-255)	

Dummy command. Can be used only when on-line. TIA/EIA-578-A Section 8.3.2 /5/.

12.2.8 +FTH Transmit HDLC data with a supported carrier

	Command	Response	Default
set	+FTH=3		
read			
test	+FTH=?	3	

Can be set only when on-line. TIA/EIA-578-A Section 8.3.5 /5/.

12.2.9 +FTM Transmit data with a supported carrier

	Command	Response	Default
set	+FTM=<n>		
read			
test	+FTM=?	S48 = 0 : 24,48,72,96 S48 = 1 : 24,48,72,96,121,145	

Can be set only when on-line. TIA/EIA-578-A Section 8.3.3 /5/.

Accepts also values "73, 74 , 97, 98, 122 and 146", but those are internally converted to "72,96,121 or 145".

12.2.10 +FTS Transmit silence

	Command	Response	Default
set	+FTS=<n>		
read			
test	+FTS=?	(0-255)	

Dummy command. Can be used only when on-line. TIA/EIA-578-A Section 8.3.1 /5/.

12.3 CLASS 2

All Class 2 facsimile commands are defined in SP-2388 /7/.

12.3.1 +FAA Adaptive answer

	Command	Response	Default
set	+FAA=<n>		0
read	+FAA?	<n>	
test	+FAA=?	(0-1)	

SP-2388 Section 8.5.4.1 /7/.

12.3.2 +FAXERR Fax error value parameter

	Command	Response	Default
set			
read	+FAXERR?	<n>	0
test	+FAXERR=?	(0-103)	

SP-2388 Section 8.5.2.7 /7/.

12.3.3 +FBADLIN RTN threshold number of consecutive bad lines for FCQ

	Command	Response	Default
set	+FBADLIN=<n>		0
read	+FBADLIN?	<n>	
test	+FBADLIN=?	(0-255)	

SP-2388 Section 8.5.2.5 /7/.

12.3.4 +FBADMUL RTN threshold error rate multiplier for FCQ

	Command	Response	Default
set	+FBADMUL=<n>		20
read	+FBADMUL?	<n>	
test	+FBADMUL=?	(0-255)	

SP-2388 Section 8.5.2.4 /7/.

12.3.5 +FBOR Data bit order

	Command	Response	Default
set	+FBOR=<n>		0
read	+FBOR?	<n>	
test	+FBOR=?	(0-3)	

SP-2388 Section 8.5.3.3 /7/.

12.3.6 +FBUF DCE's data buffer characteristics

	Command	Response	Default
set			
read	+FBUF?	e.g. 6000,0,0,0	
test			

SP-2388 Section 8.5.4.2 /7/.

12.3.7 +FBUG Session message reporting

	Command	Response	Default
set	+FBUG=<n>		0
read	+FBUG?	<n>	
test	+FBUG=?	(0-1)	

SP-2388 Section 8.5.1.10 /7/.

12.3.8 +FCIG Local polling ID string

	Command	Response	Default
set	+FCIG="<string>"		" "
read	+FCIG?	"<string>"	
test	+FCIG=?	(20) (32-126)	

SP-2388 Section 8.5.1.6 /7/.

12.3.9 +FCQ Quality checking

	Command	Response	Default
set	+FCQ=<n>		0
read	+FCQ?	<n>	
test	+FCQ=?	(0,2)	

SP-2388 Section 8.5.2.3 /7/.

12.3.10 +FCR Capability to receive

	Command	Response	Default
set	+FCR=<n>		1
read	+FCR?	<n>	
test	+FCR=?	(0-1)	

SP-2388 Section 8.5.1.9 /7/.



12.3.11 +FCTCRTY ECM retry count

	Command	Response	Default
set	+FCTCRTY=<n>		0
read	+FCTCRTY?	<n>	
test	+FCTCRTY=?	(0-255)	

SP-2388 Section 8.5.2.8 //.

12.3.12 +FDCC Capabilities parameters

	Command	Response	Default
set	+FDCC=<a>, ,<c>, <d>,<e>, <f>,<g>,<h>		S47=0, S48=0: 1,3,0,2,0,0,0,0 S47=1, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=0: 1,3,0,2,0,2,0,0 S47=2, S48=1: 1,5,0,2,0,2,0,0
read	+FDCC?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	
test	+FDCC=?	S48=0: (0-1),(0-3),(0-4),(0-2), (0-3),(0-2),(0-1),(0-7) S48=1: (0-1),(0-5),(0-4),(0-2), (0-3),(0-2),(0-1),(0-7)	

SP-2388 Section 8.5.1.1 //.

Value in S47 (ECM) affects to sixth and S48 (14.4k) to second parameter. See chapter 4.3 and 15.2.

12.3.13 +FDCCS Negotiated current session parameters

	Command	Response	Default
set			
read	+FDCCS?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	0,0,0,0,0,0,0,0
test			

SP-2388 Section 8.5.1.3 //.

12.3.14 +FDFFC Data encoding format conversion parameter

	Command	Response	Default
set	+FDFFC=0		0
read	+FDFFC?	0	
test	+FDFFC=?	0	

Dummy command. SP-2388 Section 8.5.3.6 //.





12.3.15 +FDIS Current session parameters

	Command	Response	Default
set	+FDIS=<a>, ,<c>, <d>,<e>, <f>,<g>,<h>		S47=0, S48=0: 1,3,0,2,0,0,0,0 S47=1, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=0: 1,3,0,2,0,2,0,0 S47=2, S48=1: 1,5,0,2,0,2,0,0
read	+FDIS?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	
test	+FDIS=?	S48=0: (0-1), (0-3), (0-4), (0-2), (0-3), (0-2), (0-1), (0-7) S48=1: (0-1), (0-5), (0-4), (0-2), (0-3), (0-2), (0-1), (0-7)	

SP-2388 Section 8.5.1.2 /7/.

Value in S47 (ECM) affects to sixth and S48 (14.4k) to second parameter. See chapter 4.3 and 15.2.

12.3.16 +FDR Receive phase C data

	Command	Response	Default
action	+FDR		
read			
test			

Can be used only when on-line. SP-2388 Section 8.3.5 /7/.

12.3.17 +FDT Transmit phase C data

	Command	Response	Default
action	+FDT		
read			
test			

Can be used only when on-line. SP-2388 Section 8.3.3 /7/.

12.3.18 +FECM ECM control parameter

	Command	Response	Default
set	+FECM=<n>		2
read	+FECM?	<n>	
test	+FECM=?	(0, 2)	

SP-2388 Section 8.5.2.1 /7/.



12.3.19 +FET Transmit page punctuation

	Command	Response	Default
set	+FET=<n>		0
read	+FET?	<n>	
test	+FET=?	(0-2)	

SP-2388 Section 8.3.4 /7/.

12.3.20 +FK Terminate session

	Command	Response	Default
action	+FK		
read			
test			

SP-2388 Section 8.3.6 /7/.

12.3.21 +FLID Local ID string

	Command	Response	Default
set	+FLID="<string>"		" "
read	+FLID?	"<string>"	
test	+FLID=?	(20) (32-126)	

SP-2388 Section 8.5.1.5 /7/.

12.3.22 +FLNFC Page length format conversion parameter

	Command	Response	Default
set	+FLNFC=0		0
read	+FLNFC?	0	
test	+FLNFC=?	0	

Dummy command. SP-2388 Section 8.5.3.7 /7/.

12.3.23 +FLPL Indicate a document to poll

	Command	Response	Default
set	+FLPL=<n>		0
read	+FLPL?	<n>	
test	+FLPL=?	(0-1)	

SP-2388 Section 8.5.1.7 /7/.

12.3.24 +FMDL Request model ID

	Command	Response	Default
set			
read	+FMDL?	Nokia D211	
test			

SP-2388 Section 8.2.5 /7/.

12.3.25 +FMFR Request manufacturer ID

	Command	Response	Default
set			
read	+FMFR?	Nokia Corporation	
test			

SP-2388 Section 8.2.4 /7/.

12.3.26 +FMINSF Minimum acceptable Phase C speed

	Command	Response	Default
set	+FMINSF=<n>		0
read	+FMINSF?	<n>	
test	+FMINSF=?	(0-3)	

SP-2388 Section 8.5.2.9 /7/.

12.3.27 +FPHCTO Phase C response timeout

	Command	Response	Default
set	+FPHCTO=<n>		30
read	+FPHCTO?	<n>	
test	+FPHCTO=?	(0-255)	

SP-2388 Section 8.5.2.6 /7/.

12.3.28 +FPTS Page transmission status parameter

	Command	Response	Default
set	+FPTS=<n>		1
read	+FPTS?	<n>	
test	+FPTS=?	(1-3)	

SP-2388 Section 8.5.2.2 /7/.

12.3.29 +FRBC Phase C receive data block size

	Command	Response	Default
set	+FRBC=0		0
read	+FRBC?	0	
test	+FRBC=?	0	

Dummy command. SP-2388 Section 8.5.3.2 /7/.

12.3.30 +FREL Phase C received EOL alignment control parameter

	Command	Response	Default
set	+FREL=0		0
read	+FREL?	0	
test	+FREL=?	0	

Dummy command. SP-2388 Section 8.5.3.4 /7/.

12.3.31 +FREV Request revision ID

	Command	Response	Default
set			
read	+FREV?	e.g. V 5.00 01-04-02 DTE-1 (c)NMP	
test			

SP-2388 Section 8.2.6 /7/.

12.3.32 +FSPL Request to poll

	Command	Response	Default
set	+FSPL=<n>		0
read	+FSPL?	<n>	
test	+FSPL=?	(0-1)	

SP-2388 Section 8.5.1.8 /7/.

12.3.33 +FTBC Phase C transmit data block size

	Command	Response	Default
set	+FTBC=0		0
read	+FTBC?	0	
test	+FTBC=?	0	

Dummy command. SP-2388 Section 8.5.3.1 /7/.



12.3.34 +FVRFC Vertical resolution format conversion

	Command	Response	Default
set	+FVRFC=0		0
read	+FVRFC?	0	
test	+FVRFC=?	0	

Dummy command. SP-2388 Section 8.5.3.5 /7/.

12.3.35 +FWDFC Page width format conversion

	Command	Response	Default
set	+FWDFC=0		0
read	+FWDFC?	0	
test	+FWDFC=?	0	

Dummy command. SP-2388 Section 8.5.3.8 /7/.

12.4 CLASS 2.0

All Class 2.0 facsimile commands are defined in ITU-T T.32 /9/ and TIA/EIA-592-A /6/.

12.4.1 +FAA Adaptive answer

	Command	Response	Default
set	+FAA=<n>		0
read	+FAA?	<n>	
test	+FAA=?	(0-1)	

TIA/EIA-592-A Section 8.5.2.5 /6/.

12.4.2 +FBO Data bit order

	Command	Response	Default
set	+FBO=<n>		0
read	+FBO?	<n>	
test	+FBO=?	(0-3)	

TIA/EIA-592-A Section 8.5.3.4 /6/.

12.4.3 +FBS Buffer size

	Command	Response	Default
set			
read	+FBS?	e.g. 1C2,1770	
test			

TIA/EIA-592-A Section 8.5.3.2 /6/.

12.4.4 +FBU HDLC frame reporting

	Command	Response	Default
set	+FBU=<n>		0
read	+FBU?	<n>	
test	+FBU=?	(0-1)	

TIA/EIA-592-A Section 8.5.1.10 /6/.

12.4.5 +FCC Capabilities parameters

	Command	Response	Default
set	+FCC=<a>, ,<c>, <d>,<e>, <f>,<g>,<h>		S47=0, S48=0: 1,3,0,2,0,0,0,0 S47=1, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=1: 1,5,0,2,0,1,0,0
read	+FCC?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	
test	+FCC=?	S48=0: (0-1), (0-3), (0-4), (0-2), (0-3), (0-1), (0-1), (0-7) S48=1: (0-1), (0-5), (0-4), (0-2), (0-3), (0-1), (0-1), (0-7)	

TIA/EIA-592-A Section 8.5.1.1 /6/.

Value in S47 (ECM) affects to sixth and S48 (14.4k) to second parameter. Values of 1 and 2 makes still difference in S47 even when it is not shown when reading values. See chapter 6.1 and 16.2.

12.4.6 +FCQ Copy quality checking

	Command	Response	Default
set	+FCQ=<n>, 0		1, 0
read	+FCQ?	<n>, 0	
test	+FCQ=?	(0-1), (0)	

TIA/EIA-592-A Section 8.5.2.3 /6/.

12.4.7 +FCR Capability to receive

	Command	Response	Default
set	+FCR=<n>		1
read	+FCR?	<n>	
test	+FCR=?	(0-1)	

TIA/EIA-592-A Section 8.5.1.9 /6/.

12.4.8 +FCS Current session results

	Command	Response	Default
set			
read	+FCS?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	0, 0, 0, 0, 0, 0, 0, 0
test			

TIA/EIA-592-A Section 8.5.1.3 /6/.

12.4.9 +FCT Phase C response timeout

	Command	Response	Default
set	+FCT=<n>		1E
read	+FCT?	<n>	
test	+FCT=?	(0-FF)	

TIA/EIA-592-A Section 8.5.2.6 /6/.

12.4.10 +FDR Receive phase C data

	Command	Response	Default
action	+FDR		
read			
test			

Can be used only when on-line. TIA/EIA-592-A Section 8.3.4 /6/.

12.4.11 +FDT Transmit phase C data

	Command	Response	Default
action	+FDT		
read			
test			

Can be used only when on-line. TIA/EIA-592-A Section 8.3.3 /6/.

12.4.12 +FEA Phase C receive EOL alignment

	Command	Response	Default
set	+FEA=0		0
read	+FEA?	0	
test	+FEA=?	0	

Dummy command. TIA/EIA-592-A Section 8.5.3.5 /6/.

12.4.13 +FFC Data encoding format conversion

	Command	Response	Default
set	+FFC=<a>, , <c>, <d>		0, 0, 0, 0
read	+FFC?	0, 0, 0, 0	
test	+FFC=?	(0), (0), (0), (0)	

Dummy command. TIA/EIA-592-A Section 8.5.3.6 /6/.

12.4.14 +FHS Call termination status

	Command	Response	Default
set			
read	+FHS?	<n>	00
test			

TIA/EIA-592-A Section 8.5.2.7 /6/.

12.4.15 +FIE Procedure interrupt enable

	Command	Response	Default
set	+FIE=<n>		0
read	+FIE?	<n>	
test	+FIE=?	(0-1)	

TIA/EIA-592-A Section 8.5.2.1 /6/.

12.4.16 +FIP Initialize facsimile parameters

	Command	Response	Default
action	+FIP		
set	+FIP=0		0
read	+FIP?	0	
test	+FIP=?	0	

TIA/EIA-592-A Section 8.3.6 /6/.

12.4.17 +FIS Current session parameters

	Command	Response	Default
set	+FIS=<a>, ,<c>, <d>,<e>, <f>,<g>,<h>		S47=0, S48=0: 1,3,0,2,0,0,0,0 S47=1, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=0: 1,3,0,2,0,1,0,0 S47=2, S48=1: 1,5,0,2,0,1,0,0
read	+FIS?	<a>,,<c>,<d>,<e>,<f>,<g>,<h>	
test	+FIS=?	S48=0: (0-1), (0-3), (0-4), (0-2), (0-3), (0-1), (0-1), (0-7) S48=1: (0-1), (0-5), (0-4), (0-2), (0-3), (0-1), (0-1), (0-7)	

TIA/EIA-592-A Section 8.5.1.2 /6/.

Value in S47 (ECM) affects to sixth and S48 (14.4k) to second parameter. Values of 1 and 2 makes still difference in S47 even when it is not shown when reading values. See chapter 6.1 and 16.2.

12.4.18 +FKS Terminate session

	Command	Response	Default
action	+FKS		
read			
test			

TIA/EIA-592-A Section 8.3.5 /6/.

12.4.19 +FLI Local ID string

	Command	Response	Default
set	+FLI="<string>"		" "
read	+FLI?	"<string>"	
test	+FLI=?	(20-7E)	

TIA/EIA-592-A Section 8.5.1.5 /6/.

12.4.20 +FLP Indicate a document to poll

	Command	Response	Default
set	+FLP=<n>		0
read	+FLP?	<n>	
test	+FLP=?	(0-1)	

TIA/EIA-592-A Section 8.5.1.7 /6/.

12.4.21 +FMI Request manufacturer ID

	Command	Response	Default
set			
read	+FMI?	e.g. Nokia Mobile Phones	
test			

TIA/EIA-592-A Section 8.2.4 /6/.

12.4.22 +FMM Request model ID

	Command	Response	Default
set			
read	+FMM?	e.g. Datacom	
test			

TIA/EIA-592-A Section 8.2.4 /6/.

12.4.23 +FMR Request revision ID

	Command	Response	Default
set			
read	+FMR?	e.g. V 5.00 1-04-02 DTE-1 (c)NMP	
test			

TIA/EIA-592-A Section 8.2.4 /6/.

12.4.24 +FMS Minimum phase C speed

	Command	Response	Default
set	+FMS=<n>		0
read	+FMS?	<n>	
test	+FMS=?	S48=0: (0-3) S48=1: (0-5)	

TIA/EIA-592-A Section 8.5.2.9 /6/.

12.4.25 +FNR Negotiation message reporting

	Command	Response	Default
set	+FNR=<a>, , <c>, <d>		0, 0, 0, 0
read	+FNR?	<a>, , <c>, <d>	
test	+FNR=?	(0-1), (0-1), (0-1), (0-1)	

TIA/EIA-592-A Section 8.5.1.11 /6/.

12.4.26 +FNS Non-standard frame FIF octet string

	Command	Response	Default
set	+FNS="<string>"		" "
read	+FNS?	"<string>"	
test	+FNS=?	5A	

New string is added to the already stored string. String consists of hexadecimal numbers.

TIA/EIA-592-A Section 8.5.1.6 /6/.

12.4.27 +FPI Local polling ID string

	Command	Response	Default
set	+FPI="<string>"		" "
read	+FPI?	"<string>"	
test	+FPI=?	(20-7E)	

TIA/EIA-592-A Section 8.5.1.5 /6/.

12.4.28 +FPP Packet protocol command

	Command	Response	Default
set	+FPP=0		0
read	+FPP?	0	
test	+FPP=?	0	

Dummy command. TIA/EIA-592-A Section 8.5.3.3 /6/.

12.4.29 +FPS Page status

	Command	Response	Default
set	+FPS=<n>		1
read	+FPS?	<n>	
test	+FPS=?	(1-5)	

TIA/EIA-592-A Section 8.5.2.2 /6/.

12.4.30 +FRQ Receive quality threshold

	Command	Response	Default
set	+FRQ=<a>, 		5F, 0
read	+FRQ?	<a>, 	
test	+FRQ=?	(0-64), (0-FF)	

TIA/EIA-592-A Section 8.5.2.4 /6/.

12.4.31 +FRY ECM Retry Count

	Command	Response	Default
set	+FRY=<n>		0
read	+FRY?	<n>	
test	+FRY=?	(0-FF)	

TIA/EIA-592-A Section 8.5.2.8 /6/.

12.4.32 +FSP Request to poll

	Command	Response	Default
set	+FSP=<n>		0
read	+FSP?	<n>	
test	+FSP=?	(0-1)	

TIA/EIA-592-A Section 8.5.1.8 /6/.

13. VOICE COMMANDS (PN-3131)



Note: These are dummy commands that are included for compatibility reasons. The Nokia D211 does not support voice calls.

13.1.1 +FCLASS DCE mode

	Command	Response	Default
set	+FCLASS=<mode>		0
read	+FCLASS?	<mode>	
test	+FCLASS=?	0,1,2,2.0	

This command selects a DCE mode – data or facsimile. Dummy command, included for compatibility reasons.

13.1.2 +VTS DTMF generation

	Command	Response
execute	+VTS=<str>,<str>,...	
test	+VTS=?	+VTS: (), (), ()

PN-3131 section 10.1.3. Also dialling command can be used to send DTMFs (see D). Parameter <str> is <DTMF> or {<DTMF>,<duration>}, where <DTMF> is a single ASCII character in the set 0-9,#,*,A-D. If no duration is given, the command uses 100 ms as a "manufacturer-specific" value.

14. GPRS COMMANDS (GSM 07.07)

14.1.1 +CGDCONT Define PDP context

	Command	Response	Default
set	+CGDCONT=<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>,<pd1>[,...[,<pdN>]]		1,"IP",,,0,0
read	+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<data_comp>,<head_comp>,<pd1>[,...[,pdN]] [<CR><LF>+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<data_comp>,<head_comp>,<pd1>[,...[,pdN]] [...]]	
test	+CGDCONT=?	+CGDCONT: (1-2),"IP",,,(0,1),(0,1)	

Mandatory unless only a single subscribed context is supported. 07.60 section 10.2.1. Specifies PDP context parameter values for a PDP context. Supported value of <cid>: 1. This command is used in conjunction with the +CGDATA command.

14.1.2 +CGQREQ Quality of service profile (requested)

	Command	Response
set	+CGQREQ=<cid>,<precedence>,<delay>,<reliability>,<peak>,<mean>	
read	+CGQREQ?	+CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> [<CR><LF>+CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> [...]]
test	+CGQREQ=?	+CGQREQ: (1-2),(1-3),(1-4),(1-5),(1-9),(1-18,31)

Optional. 07.60 section 10.2.2. Used to specify a Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network. Supported value of <cid>: 1. This command is used in conjunction with the +CGDATA command.

14.1.3 +CGQMIN Quality of service profile (minimum acceptable)

	Command	Response
set	+CGQMIN=<cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>	
read	+CGQMIN?	+CGQMIN: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean> [<CR><LF>+CGQMIN: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean> [...]]
test	+CGQMIN=?	+CGQMIN: (1-2), (1-3), (1-4), (1-5), (1-9), (1-18,31)

Optional. 07.60 section 10.2.3. This command is used to specify the minimum acceptable profile that is checked by the MT against the negotiated profile returned in the Activate PDP Context Accept message. Supported value of <cid>: 1. This command is used in conjunction with the +CGDATA command.

14.1.4 +CGATT GPRS attach or detach

	Command	Response
set	+CGATT= <state>	
read	+CGATT?	+CGATT: <state>
test	+CGATT=?	+CGATT: (0-1)

Optional. The execution command is used to attach the MT to the GPRS service, or detach the MT from the GPRS service. Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

14.1.5 +CGACT PDP context activate or deactivate

	Command	Response
set	+CGACT= [<state> [, <cid> [, <cid> [, ...]]]	
read	+CGACT?	+CGACT: <cid>, <state> [<CR><LF>+CGACT: <cid>, <state> [...]]
test	+CGACT=?	+CGACT: (0-1)

Optional. The execution command is used to activate or deactivate the specified PDP context(s). <cid>: a numeric parameter which specifies a particular PDP context definition. Supported value of <cid>: 1

14.1.6 +CGDATA Enter data state

	Command	possible result codes	Description
execute	+CGDATA=<L2P>[, <cid>]	CONNECT NO CARRIER	Enter data state Data state cannot be entered
test		+CGDATA: ("PPP")	

Optional. 07.60 section 10.2.6. Causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more GPRS PDP types. The Nokia D211 supports only <L2P>="PPP". Valid <cid> values are 1 and 2 for current GSM products. If the user, however, uses a non-existent <cid> value, even if within valid range, DCE shall issue an ERROR result code to such an attempt. See +CGDCONT. Supported value of <cid>: 1. NOTE: GPRS Phase 1 does not support mobile-originated context modification.

15. MISCELLANEOUS COMMANDS

15.1 V.25TER

15.1.1 A/ Repeat last command line

Mandatory. V.25ter section 5.2.4. As first chars in command line replacing normal AT. Also lowercase (a/) accepted.

15.2 NMP SPECIFIC

15.2.1 S47 Force fax class 2/2.0 error correction mode

	Command	Response	<n> values
set	S47=<n>		0 . . 2 (default 0)
read	S47?	<n>	000 . . 002

Recommended when fax ECM is implemented. Used to force ECM on, as most fax software does not function so as to enable it. 0=disabled, 1=enabled with 64 byte frames, 2=enabled with 256 byte frames.

15.2.2 S48 Force fax 14.4kB

	Command	Response	<n> values
set	S48=<n>		0..1(default 0)
read	S48?	<n>	000..001

Mandatory when a 14.4kB fax service is implemented. This command is used to force a 14.4kB fax service on. Value 0 is recommended if the network or phone doesn't support the 14.4kB service. 0=disabled, 1=enabled.

16. RESULT CODES

16.1 V.25TER

16.1.1 Basic syntax result codes

OK, ERROR, BUSY, CONNECT, CONNECT <rate>, NO ANSWER, NO CARRIER: see V.25ter section 5.7.1 and X, D, A and O commands in this document. Note that OK may be a result of a successful, remotely initiated in-call modification from data to speech mode, and CONNECT[<rate>] a result of a successful, remotely initiated in-call modification from speech to data mode (when alternating calls are supported by the product). NO CARRIER can also indicate a remote hang-up of a speech call. No OK shall be returned when a voice call is originated/answered through the external ME UI.

16.1.2 +DR Data compression report

Format	Description
+DR: <type>	given when +DR=1; informs about the presence of V.42bis data compression in the established connection

V.25ter section 6.6.2. This intermediate result code is given after a (possible) +ER result code.

16.1.3 +ILRR DTE-DCE local rate report

Format	Description
+ILRR: <rate>[, <rxRate>]	given when +ILRR=1; informs about the local port rate after connection establishment

V.25ter section 6.2.13. <rxRate> parameter is not needed with the Nokia D211. This intermediate result code is given after a (possible) +DR result code.

16.2 DE FACTO

16.2.1 Call repeat restriction result codes

BLACKLISTED and DELAYED. Refer to dialling command D and GSM 02.07 Annex A. This mechanism is mandatory.

16.3 GSM 07.07

16.3.1 +CSSI Intermediate supplementary service notification

Format	Description
+CSSI: <code1>[,<index>]	given when +CSSN=1 and some supplementary service notification is given by network during MO call establishment

07.07 section 7.2. This is the first intermediate result code after dial command D. Supported <code1>s depend on the supplementary services implemented in a product.

16.3.2 +COLP Connected line identification report

Format	Description
+COLP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]]	given when +COLP=1 and number received from network when MO call established

07.07 section 7.8. This intermediate result code is given after a (possible) +CSSI result code. Subaddress and alpha are not supported by the Nokia D211.

16.3.3 +CR Data service report

Format	Description
+CR: <type>	given when +CR=1 and data call established; informs about the type of data call being established

07.07 section 6.9. This intermediate result code is given after a (possible) +COLP result code during a MO data call setup. During a MT data call setup this is the first intermediate result code. Note that this result code shall replace the CARRIER result code (when X5 is set).

16.3.4 +CRING Distinctive ring

Format	Description
+CRING: <type>	given when +CRC=1 and incoming MT call (no active or held calls in ME)

07.07 section 6.11. Note that this replaces the V.25ter RING result code.

16.3.5 +CLIP Calling line identification report

Format	Description
+CLIP: <number>, <type> [, <subaddr>, <satype> [, <alpha>]]	given when +CLIP=1 and number received from network when MT call received (no active or held calls in ME)

07.07 section 7.6. This result code is sent to TE after every RING (or +CRING) result code. Subaddress and alpha are not supported by the Nokia D211.

16.3.6 +CSSU Unsolicited supplementary service notification

Format	Description
+CSSU: <code2> [, <index> [, <number>, <type> [, <saddr>, <satype>]]]	given when +CSSN=, 1 and some supplementary service notification is given by the network during a MT call setup, during a voice call, or whenever in case of forward check SS notification; note that also remote release of a held call is informed with this result code

07.07 section 7.16. In case of a MT call setup, this result code is sent to the TE after every (possible) +CLIP result code. In case of a waiting call, this is given after the +CCWA result code (but discarded if the TA is in on-line data state "disabled" or "not supported"). Supported <code2>s depend on the supplementary services implemented in a product.

16.3.7 +CCWA Call waiting

Format	Description
+CCWA: <number>, <type>, <class> [, <alpha>]	given when +CCWA=1 and an incoming MT call is received when there are active or held calls in the ME (discarded if in on-line data state)

07.07 section 7.11. Note that this result code is not repeated similarly as RING, but given only once. Alpha is not supported by the Nokia D211.

16.3.8 +CREG Network registration

Format	Description
+CREG: <stat> [, <lac>, <cid>]	when +CREG=1: given when <stat> value changes; given after NO CARRIER if network lost when on-line when +CREG=2: given when <stat> value changes and when the network cell (<lac> and <cid>) of ME changes; given after NO CARRIER if network lost when on-line; if V.80 is enabled

07.07 section 7.2.

16.3.9 +CUSD Network initiated unstructured supplementary service data

Format	Description
+CUSD: <m>, <str>, <dc>	given when +CUSD=1 and network initiated 'notify' or 'request' USSD message received; discarded if in on-line data

07.07 section 7.14. Note that only the first 'request' message during a network-initiated USSD session yields to this unsolicited result code. The rest are information responses of the +CUSD command.

16.3.10 +CME ERROR Mobile equipment error

Format	Description
+CME ERROR: <err>	given instead of ERROR when +CMEE=1 or =2 and error is related to ME or network operation

07.07 section 9.2. See also section Error values.

16.3.11 +CHSR HSCSD parameters report

Format	Description
+CHSR: <rx>, <tx>, <aiur>, <coding>	Given when +CHSR=1. Result code transmission is done after possible service (+CR), error control (+ER), and/or compression (+DR) reporting but before possible TE-TA rate (+ILRR) reporting and before the intermediate result code CONNECT is transmitted.

07.07 section 6.16.

16.4 GSM 07.05

16.4.1 +CMTI New SMS-DELIVER indication

Format	Description
+CMTI: <mem>, <index>	when +CNMI=0: indications are buffered into TA/ME when +CNMI=1: in on-line data state indications are discarded; in command mode forwarded directly to TE when +CNMI=2: in on-line data state indications are buffered into TA/ME; in command mode forwarded directly to TE

07.05 section 3.4.1. See also +CNMI.

16.4.2 +CMT New SMS-DELIVER

Format	Description
text mode: +CMT: <oa>, [<alpha>], <scts> [, <toa>, <fo>, <pid>, <dc>, <sca>, <tosca>, <length>] <CR><LF><data> PDU mode: +CMT: [<alpha>], <length> <CR><LF><pdu>	when +CNMI=0: routed messages are buffered into TA/ME when +CNMI=1: in on-line data state routed messages are rejected and in command mode forwarded directly to TE when +CNMI=2: in on-line data state routed messages are buffered into TA/ME and in command mode forwarded directly to TE

07.05 section 3.4.1. <alpha> is not supported by the Nokia D211. See also +CNMI.

16.4.3 +CBM New CBM

Format	Description
text mode: +CBM: <sn>, <mid>, <dc>, <page>, <pages> <CR><LF><data> PDU mode: +CBM: <length> <CR><LF><pdu>	when +CNMI=0: messages are discarded when +CNMI=1-2: messages are forwarded directly to TE (CBMs cannot be received during a call)

07.05 section 3.4.1. See also +CNMI.

16.4.4 +CDSI New SMS-STATUS-REPORT indication

Format	Description
+CDSI: <mem>, <index>	when +CNMI=0: indications are buffered into TA/ME when +CNMI=1: in on-line data state indications are discarded; in command mode forwarded directly to TE when +CNMI=2: in on-line data state indications are buffered into TA/ME; in command mode forwarded directly to TE

07.05 section 3.4.1. See also +CNMI.

16.4.5 +CDS New SMS-STATUS-REPORT

Format	Description
text mode: +CDS: <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st> PDU mode: +CDS: <length> <CR><LF><pdu>	when +CNMI=0: routed messages are buffered into TA/ME when +CNMI=1: in on-line data state routed messages are rejected and in command mode forwarded directly to TE when +CNMI=2: in on-line data state routed messages are buffered into TA/ME and in command mode forwarded directly to TE

07.05 section 3.4.1. See also +CNMI.

16.4.6 +CMS ERROR Message service failure

Format	Description
+CMS ERROR: <err>	given instead of ERROR when the error is related to the ME or network operation

07.05 section 3.2.5. See also section Error values.

16.5 PN-3131

16.5.1 +VCID Calling line identification report

Format	Description
+VCID: <tag> = <value>[, <tag> = <value>[,...]]	given when +VCID=1 and +VEM enables reporting of this result code.
+VCID: MSG = <data>	given when +VCID=2 and +VEM enables reporting of this result code.

PN-3131 section 9.2.3. This result code is sent to the TE after the first RING result code.

In the formatted presentation (+VCID=1):

<u><tag></u>	<u><value></u>
DATE	MMDD (month, day)
TIME	HHMM (hour, minute)
NMBR	calling number or P or O (P=number is private, O=number is unavailable)
NAME	subscription listing name
MSG	data from other (unknown) tags

Unformatted presentation (+VCID=2): <data> is presented in ASCII hex as printable numbers.

16.5.2 In-band events from DCE to DTE

The following <dle> shielded codes (refer PN-3131 sections 5.2 and 7.3) can be sent by DCE when in class 8 mode (+FCLASS=8). At least some of these events are required if binary voice data is transferred through the AT command interface. Other events of PN-3131 are not applicable to GSM. See also +VLS command.

event	code	description	state
3	R	ring	command
5	o	receive buffer overrun	receive
6	c	facsimile calling	command
7	e	data calling	command
9	s	presumed hang-up	receive
10	q	presumed end of message	receive
18	r	ringback	command
19	b	busy	command
23	u	playback buffer underrun	transmit
-	<DLE>	single <DLE> in data	receive
-	<SUB>	<DLE><DLE> in data	receive
-	<ETX>	end data state	receive

17. ERROR VALUES

17.1 +CME ERROR VALUES

The columns in the following table indicate which AT commands can return the numeric <err> value given in the topmost row. Numbers in the cells indicate which kind of error can generate the <err>. Meaning of the numbers is given under the table. This table presents the maximum set of error cases supported by NMP products (the Nokia D211 may be unable to produce some of these cases).

	1	3	4	5	10	11	12	16	17	18	21	22	23	24	26	27	30	31	100
+CGMM	21																		
+CGMR	21																		
+CGSN	21																		
D><str>	21	9		1	2	3	4					7	8						
D>mem<n>	21	9		1	2	3	4				5, 6		8						
D><n>	21	9		1	2	3	4				5, 6		8						
+CHSD	21																		
+CREG?	21																		
+COPS=	21	10		1	2	3	4												
+COPS?	21			1	2	3	4												
+COPS=?	21			1	2	3	4												
+CLCK=	21		15	1	2	3	4	11		12			8				13	23	14
+CPWD=	21			1	2	3	4	11		12			8				13	23	14
+CCFC=	21			1	2	3	4										13	23	14
+CCWA=	21			1	2	3	4										13	23	14
+CHLD=	21	9																	
+CTFR=	21	9																	
+CUSD=	21			1	2	3	4										13	23	14
+CAOC	21			1	2	3	4						8						
+CLCC	21																		
+CPIN=	21			1	2	3	4	11					8						
+CPIN?	21			2															
+CBC	21																		
+CSQ	21																		
+CPBS?	21			1	2	3	4						8						
+CPBR=	21			1	2	3	4			5			8		18				
+CPBR=?	21			1	2	3	4						8						
+CPBF=	21			1	2	3	4						8						
+CPBF=?	21			1	2	3	4						8						
+CPBW=	21	24	15	1	2	3	4		16	12	5		8	17	18	19			
+CPBW=?	21			1	2	3	4						8						

- 1 Nokia D211 security code required to execute the AT command
- 2 ME does not have a SIM card attached to it
- 3 PIN code required to execute the AT command
- 4 PUK code required to execute the AT command
- 5 memory location does not exist
- 6 phonebook memory location is empty
- 7 match in searched string is not found from any of the memory locations
- 8 general memory error; e.g. problems in SIM database communication
- 9 call hold/retrieve/swap/build/split/transfer/deflection failed or cannot be actioned
- 10 manual network selection is not possible because an unavailable or forbidden network name was given, or call is active
- 11 invalid password was given
- 12 PUK2 code required to execute the AT command
- 13 there is no network service to complete the request
- 14 supplementary service command failed due to an unknown error; i.e. an error that is not covered by other <err> values
- 15 AT interpreter does not support the operation (in case of +CLCK= when <fac>="AB" or "AG" or "AC" but <mode>≠0; in case of +CPBW= when <index> is not given but <number> is)
- 16 PIN2 code required to execute the AT command
- 17 alpha entry to be stored is too long
- 18 number to be read/stored is too long
- 19 number to be stored contains characters that are not available in that memory
- 20 SIM interface control is not reserved (possible in case of +CSIM=) or maximum number of applications has reserved SIM control
- 21 external ME is not connected to TA; this is not applicable to products that have ME and TA in one entity
- 22 external ME UI cannot be accessed
- 23 network timeout
- 24 entries cannot be stored in currently selected phone book memory (e.g. in missed calls list)
- 25 there is no active voice call

17.2 +CMS ERROR VALUES

Final result code +CMS ERROR: <err> indicates an error related to mobile equipment or network.

<err>

- 0 – 127 GSM 04.11 Annex E-2 values
- 128 – 255 GSM 03.40 subclause 9.2.3.22 values
- 300 – 340, 500 GSM 07.05 subclause 3.2.5 values

18. CIRCUITS

Official name	Abbreviation	Circuit number	Unofficial name
Signal Ground	GND	Circuit 102	
Transmitted Data	TxD	Circuit 103	
Received Data	RxD	Circuit 104	
Request To Send	RTS	Circuit 105	
Ready For Sending	CTS	Circuit 106	
Data Set Ready	DSR	Circuit 107	
Data Terminal Ready	DTR	Circuit 108/2	
Received Line Signal Detector	RLSD	Circuit 109	Data Carrier Detect (DCD)
Calling Indicator	CI	Circuit 125	Ring Indicator (RI)

19. FAX CLASS 2 RESPONSES

Below is a list of possible responses that a fax can give to the DTE during a Class 2 fax call. They are defined in SP-2388 /7/.

Response	Description
+FCIG:	report a CIG frame received from remote, example: +FCIG:" +358105056888"
+FCFR	indicate that CFR (Confirmation to Receive) frame has been received
+FCON	indicate a facsimile connection, issued in the beginning of Phase B
+FCSI:	report a CSI frame received from remote, example: +FCSI:" +358105056888"
+FDCS:	report a DCS frame (sent or received), example: +FDCS:0,3,0,2,0,0,1
+FDIS:	report a DIS frame received from remote, example: +FDIS:1,3,0,2,3,1,0,3
+FDTC:	report a DTC frame received from remote, example: +FDTC:1,3,0,2,3,1,0,3
+FET:	report post message command in a receiving session, example (EOP): +FET:2
+FHNG:	report call termination status response, example (normal termination): +FHNG:0
+FHR:	report a received HDLC frame, only used when +FBUG parameter sets to 1
+FHT:	report a transmitted HDLC frame, only used when +FBUG parameter sets to 1
+FNSC:	report an NSC frame received from remote
+FNSF:	report an NSF frame received from remote
+FNSS:	report an NSS frame received from remote
+FPOLL	an indication of the remote having indicated that it has a document for polling
+FPTS:	page transfer status response as indicated by the receiver, be it our end or the other
+FTSI:	report a TSI frame received from remote, example: +FTSI:" +358105056888"
+FVOICE	an indication of the session having been suspended through a procedure interruption



20. FAX CLASS 2.0 RESPONSES

Below is a list of possible responses that a fax can give to the DTE during a Class 2.0 fax call. They are defined in ITU-T T.32 /9/.

Response	Description
+FCI:	report a CIG frame received from remote, example: +FCI:” +358105056888”
+FCO	indicate a facsimile connection, issued in the beginning of Phase B
+FCS:	report a DCS frame (sent or received), example: +FCS:0,3,0,2,0,0,1
+FDM	indicate transition to data modem operation
+FET:	report the post message command in a receiving session, example (EOP): +FET:2
+FHS:	report call termination status
+FHR:	report a received HDLC frame (only reported when +fbu has been set to 1)
+FHT:	report a transmitted HDLC frame (only reported when +fbu has been set to 1)
+FIS:	report the capabilities of the remote station (from received DIS frame)
+FNC:	report a received NSC frame
+FNF:	report a received NSF frame
+FNS:	report a received NSS frame
+FPI:	report remote ID, CIG
+FPO	an indication of the remote having indicated that it has a document for polling
+FPS:	Phase C page reception response
+FTC:	report remote capabilities, DTC
+FTI:	report remote ID, TSI
+FVO	Transition to voice, an indication of a procedure interrupt and suspended session

21. SUPPORTED AT COMMAND STANDARDS

21.1 SUPPORTED STANDARDS

All ITU-T V.25ter /1/, ETSI GSM 07.07 /3/, and ETSI GSM 07.05 /4/ commands that are mandatory and those optional ones that are applicable to GSM products are included in this document. Also those ‘de facto’ commands that are used widely among modems, and commands specific to NMP products are also presented. Note that V.25ter is a combination of three TIA standards (TIA-602, TIA-615, IS-131).

Fax command sets for classes 1, 2, and 2.0 are referenced in section 13. Detailed fax command descriptions are found from the standards themselves.



Note: This document does not give very detailed descriptions of each command. For all the details, please refer to the corresponding standard.

Links to the web sites of the standardization organizations:

ETSI: <http://www.etsi.fr>
ITU: <http://www.itu.ch>
TIA: <http://www.industry.net/tia>

22. ABBREVIATIONS

AP	Access Point
AT	Attention
BCD	Binary Coded Decimal
CBM	Cell Broadcast Message
CIS	PCMCIA Card Information Structure
CLI	Calling Line Identity
COL	Connected Line identity
COR	Configuration Option Register
CR	Carriage Return
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Circuit-terminating Equipment; see TA
DTE	Data Terminal Equipment; see TE
DTMF	Dual Tone Multiple Frequency
DTR	Data Terminal Ready
DSR	Data Set Ready
EMC	Electro-Magnetic Compatibility
ERL	Echo Return Loss
ESD	Electro-Static Discharge
GSM	Groupe Special Mobile, Global System for Mobile communications
HSCSD	High Speed Circuit Switched Data
IMEI	International Mobile Station Equipment Identity
IRA	International Reference Alphabet
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union
IWF	Inter working Function
ME	Mobile Equipment, e.g. Nokia D211
MO	Mobile Originated
MT	Mobile Terminated
MS	Mobile Station

MSISDN	Mobile Station ISDN Number
NMP	Nokia Mobile Phones
PC	Personal Computer
PCM	Pulse Code Modulation
PCMCIA	PC Memory Card International Association
PDU	Protocol Data Unit
PIN	Personal Identity Number
PUK	Personal Unblocking Key
RI	Ring Indicator
RLP	Radio Link Protocol
RLSD	Received Line Signal Detector
RTS	Request To Send
SIM	Subscriber Identity Module
SM	Short Message
SMS	Short Message Service
SMSC	Short Message Service Centre
TA	Terminal Adapter, the physical equipment where AT command interpreter resides (May be combined with ME)
TCH	Traffic Channel
TE	Terminal Equipment, the physical equipment from where applications communicate with a TA using AT commands
TIA	Telecommunications Industry Association
UART	Universal Asynchronous Receiver Transmitter
UI	User Interface
USRT	Universal Synchronous Receiver Transmitter
USSD	Unstructured Supplementary Service Data
WLAN	Wireless Local Area Network

23. DEVELOPER SUPPORT

If you have any questions regarding this Developer Manual, please submit your queries at www.forum.nokia.com (Click *Feedback*, then *Developer feedback*).

24. REFERENCES

- /1/ ITU-T Recommendation V.25ter: Serial asynchronous automatic dialling and control; Aug 1995.
- /2/ ITU-T Recommendation V.250 - Serial asynchronous automatic dialling and control; Jul 1997;
- /3/ GSM 07.07: Digital cellular telecommunications system (Phase 2+); AT command set for GSM Mobile Equipment (ME); version 5.4.0; Nov 1997.
- /4/ GSM 07.05: Digital cellular telecommunications system (Phase 2+); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS); version 5.4.0; Nov 1997.
- /5/ TIA-578-A Facsimile Digital Interfaces - Asynchronous Facsimile DCE Control Standard, Service Class 1; May 1995.
- /6/ TIA-592 Facsimile Digital Interfaces - Asynchronous Facsimile DCE Control Standard, Service Class 2; May 1995.
- /7/ TIA SP-2388: Proposed new standard - Asynchronous Facsimile DCE Control Standard; Aug 1990.
- /8/ ITU-T T.31 asynchronous facsimile DCE control - service class 1; Aug 95
- /9/ ITU-T T.32 asynchronous facsimile DCE control – service class 2; Aug 95
- /10/ TIA PN-3131: Project to complete IS-101 Facsimile Digital Interfaces - Voice Control Interim Standard for Asynchronous DCE; Feb 1995.
- /11/ PC Card '97 release published by Personal Computer Memory Card International Association.
- /12/ GSM 03.40: Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS); Point-to-Point (PP).
- /13/ GSM 03.38: Digital cellular telecommunications system (Phase 2+); alphabets and language-specific information.
- /14/ GSM 03.41: Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service Cell Broadcast (SMSCB).
- /15/ GSM 03.60: Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2 (GSM 03.60 version 6.2.0 Release 1997)
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- /17/ EN 300 328-1 Electromagnetic compatibility and radio spectrum matters (ERM); Wideband transmission systems; data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Part 1: Technical characteristics and test conditions

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- /18/ EN 300 328-2 Electromagnetic compatibility and radio spectrum matters (ERM); Wideband transmission systems; data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonised EN covering essential requirements under Article 3(2) of the R&TTE Directive
 - /19/ ETS 300 342-1: Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC)for European digital cellular telecommunications system (GSM 900 MHz and DCS 1 800 MHz).
 - /20/ EN 301 489-1 Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
 - /21/ EN 301 489-7 Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
 - /22/ EN 301 489-17 Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for wideband data and Hiperlan equipment
 - /23/ EN 60950 Safety of information technology equipment, including electrical business equipment
 - /24/ IEEE Std 802.11-1997: Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks— Specific requirements
Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications
 - /25/ IEEE Std 802.11b-1999 (Supplement to ANSI/IEEE Std 802.11, 1999 Edition) Supplement to IEEE Standard for Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks— Specific requirements
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