

BC95

AT Commands Manual

NB-IoT Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2016-11-16	Walker HAN/ Donald TANG	Initial
1.1	2016-12-14	Walker HAN	1. Added AT+NCONFIG command 2. Updated description of Neul Hi2110 implementation for AT+COPS/CGATT/CGDCONT/NMGS/NRB/NCDP/NTSETID

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1 Introduction

This document gives details of the AT Command Set supported by Quectel NB-IoT BC95 module.

The following string will be output after booting the module:

```
\nNeul\nOK\n
```

After this string has been received, the AT command processor is ready to accept AT commands.

1.1. AT Command Syntax

Table 1: AT Commands Syntax

Test Command	AT+<cmd>=?	Check possible sub-parameter values
Read Command	AT+<cmd>?	Check current sub-parameter values
Set Command	AT+<cmd>=p1[,p2[,p3[.....]]]	Set command
Execute Command	AT+<cmd>	Execute command

Multiple commands can be placed on a single line using a semi-colon (“;”) between commands. Only the first command should have AT prefix. Commands can be in upper or lower case.

When entering AT commands spaces are ignored. They can be used to make the input more human-readable. On input, at least a carriage return is required. A newline character is ignored so it is permissible to use carriage return/line feed pairs on the input. For B600, the AT command processor uses carriage return/line feed pairs (\r\n, 0x0D0A) to end lines on its output.

1.2. AT Command Responses

When the AT Command processor has finished processing a line, it will output either OK or ERROR indicating that it is ready to accept a new command. Solicited informational responses are sent before the final OK or ERROR. Unsolicited information responses will never occur between a solicited informational response and the final OK or ERROR.

1.3. 3GPP Compliance

3GPP commands are complied with the *3GPP TS 27.007 v13.5.0 (2016-06)*. For clarification on 3GPP commands, please refer to this document.

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2 Implementation Status

Table 2: Types of AT Commands

Command	Description	Implemented in
3GPP		
+CGMI	Request Manufacturer Identification	B350 or later
+CGMM	Request Manufacturer Model	B350 or later
+CGMR	Request Manufacturer Revision	B350 or later
+CGSN	Request Product Serial Number	B350 or later
+CEREG	EPS Network Registration Status	B350 or later
+CSCON	Signalling Connection Status	B350 or later
+CLAC	List Available Commands	B350 or later
+CSQ	Get Signal Strength Indicator	B350 or later
+CGPADDR=?	Show PDP Addresses	B350 or later
+COPS	PLMN Selection	B350 or later
+CGATT	PS Attach or Detach	B350 or later
+CIMI	Request International Mobile Subscriber Identity	B350 or later
+CGDCONT	Define PDP Context	B350 or later
+CFUN	Set Phone Functionality	B350 or later
+CMEE	Report Mobile Termination Error	B600 or later
Neul		
+NMGS	Neul Send Message Command	B350 or later
+NMGR	Neul Get Message Command	B350 or later

+NNMI	Neul New Message Indications	B350 or later
+NSMI	Neul Send message Indications	B350 or later
+NQMGR	Neul Query Messages Received	B350 or later
+NQMGS	Neul Query Messages Sent	B350 or later
+NRB	Neul Reboot	B350 or later
+NCDP	Configure and Query CDP Server Settings	B350 or later
+NUESTATS	Query UE Statistics	B350 or later
+NEARFCN	Specify Search Frequencies	B350 or later
+NSOCR	Create Socket	B350 or later
+NSOST	SendTo Command (UDP Only)	B350 or later
+NSORF	Receive Command (UDP only)	B350 or later
+NSOCL	Close Socket	B350 or later
+NSONMI	Socket Message Arrived Indicator (Response Only)	B350 or later
+NPING	Test IP Network Connectivity To A Remote Host	B350 or later
+NBAND	Set Supported Bands	B600 or later
+NLOGLEVEL	Set Debug Logging Level	B600 or later
+NCONFIG	Configure UE Behaviour	B650
Temporary		
+NTSETID	Set ID	B350 or later

3 3GPP Commands

3.1. AT+CGMI Request Manufacturer Identification

This command returns manufacturer information. By default it will return “Neul Ltd; www.neul.com/” on the standard platform. Refer to **Chapter 6** for possible <err> values.

AT+CGMI Request Manufacturer Identification	
Execute Command AT+CGMI	Response <manufacturer> OK +CME ERROR: <err>
Test Command AT+CGMI=?	Response OK

Parameter

<manufacturer>	The total number of characters, including line terminators. In the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>.
----------------	--

Example

```
AT+CGMI
Neul Ltd; www.neul.com/
OK
```

3.2. AT+CGMM Request Manufacturer Model

This command returns manufacturer model information. By default it will return “Neul Hi2110” on the standard platform. Refer to **Chapter 6** for possible <err> values.

AT+CGMM Request Manufacturer Model

Execute Command AT+CGMM	Response <model> OK +CME ERROR: <err>
Test Command AT+CGMM=?	Response OK

Parameter

<model>	The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>.
----------------------	--

Example

```
AT+CGMM
Neul Hi2110

OK
```

3.3. AT+CGMR Request Manufacturer Revision

This command returns the manufacturer revision. The text is human-readable and is not intended for microcontroller parsing. By default it will return the firmware revision - release and build.

Execution command returns one or more lines of information text <revision>. Refer to **Chapter 6** for possible <err> values.

AT+CGMR Request Manufacturer Revision

Execute Command AT+CGMR	Response <Revision> OK +CME ERROR: <err>
Test Command AT+CGMR=?	Response OK

Parameter

<revision>	The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>
-------------------------	---

Example

```
AT+CGMR
V100R100C10B350

OK
AT+CGMR=?
OK
```

Neul Hi2110 Implementation

- <revision> will change format over time. It should be treated as an opaque identifier.

3.4. AT+CGSN Request Product Serial Number

Execution command returns the IMEI (International Mobile station Equipment Identity number) and related information. For a TA which does not support <snt>, only OK is returned. Refer to **Chapter 6** for possible <err> values.

AT+CGSN Request Product Serial Number

Execute Command
AT+CGSN[=<snt>]

Response

When <snt>=0 (or omitted) and command successful:
<sn>

When <snt>=1 and command successful:
+CGSN: <imei>

When <snt>=2 and command successful:
+CGSN: <imeisv>

When <snt>=3 and command successful:
+CGSN: <svn>

OK

+CME ERROR: <err>

Test Command AT+CGSN=?	Response When TE supports <snt> and command is successful: +CGSN: (list of supported <snt>s) OK
----------------------------------	--

Parameter

<snt>	Integer type indicating the serial number type that has been requested 0 Returns <sn> 1 Returns the IMEI (International Mobile station Equipment Identity) 2 Returns the IMEISV (International Mobile station Equipment Identity and Software Version number) 3 Returns the SVN (Software Version Number)
<sn>	The 128-bit UUID of the UE. The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0 <CR> or OK<CR>.
<imei>	String type in decimal format indicating the IMEI
<imeisv>	String type in decimal format indicating the IMEISV
<svn>	String type in decimal format indicating the current SVN which is a part of IMEISV

Example

```
AT+CGSN=1           //Request the IMEI
490154203237511
OK
```

Neul Hi2110 Implementation

- Serial number, +CGSN=0, is not implemented, and will return an error.

3.5. AT+CEREG EPS Network Registration Status

The set command controls the presentation of an unsolicited result code +CEREG: <stat> when <n>=1 and there is a change in the MT's EPS network registration status in E-UTRAN, or unsolicited result code +CEREG: <stat>[,<tac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in E-UTRAN. The parameters <AcT>, <tac> and <ci> are provided only if available. The value <n>=3 further extends the unsolicited result code with [<cause_type>,<reject_cause>], when available, when the value of <stat> changes. Refer to **Chapter 6** for possible <err> values.

If the UE wants to apply PSM for reducing its power consumption, the set command controls the presentation of an unsolicited result code: +CEREG: <stat>[,<tac>],[<ci>],[<AcT>],[<cause_type>],[<reject_cause>],[<Active-Time>],[<Periodic-TAU>]]]. When <n>=4.

The unsolicited result code will provide the UE with additional information for the Active Time value and the extended periodic TAU value if there is a change of the network cell in E-UTRAN. The value <n>=5 further enhances the unsolicited result code with <cause_type> and <reject_cause> when the value of <stat> changes. The parameters <AcT>, <tac>, <ci>, <cause_type>, <reject_cause>, <Active-Time> and <Periodic-TAU> are provided only if available.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Location information elements <tac>, <ci> and <AcT>, if available, are returned only when <n>=2 and MT is registered in the network. The parameters [,<cause_type>,<reject_cause>], if available, are returned when <n>=3.

Test command returns values supported as a compound value.

AT+CEREG EPS Network Registration Status	
Set Command AT+CEREG=[<n>]	Response OK +CME ERROR: <err>
Read Command AT+CEREG?	Response when <n>=0, 1, 2 or 3 and command successful: +CEREG: <n>,<stat>[,<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>]]] when <n>=4 or 5 and command successful: +CEREG: <n>,<stat>[,<lac>],[<ci>],[<AcT>],[<rac>],[<cause_type>],[<reject_cause>],[<Active-Time>],[<Periodic-TAU>]]] OK
Test Command AT+CEREG=?	Response +CEREG: (list of supported <n>s) OK

Parameter

<n>	Integer type
0	Disable network registration unsolicited result code

- 1 Enable network registration unsolicited result code +CEREG: <stat>
- 2 Enable network registration and location information unsolicited result code:
+CEREG: <stat>,[<tac>],[<ci>],[<AcT>]]
- 3 Enable network registration, location information and EMM cause value information unsolicited result code:
+CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>]]
- 4 For a UE that wants to apply PSM, enable network registration and location information unsolicited result code:
+CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[,],[<Active-Time>],[<Periodic-TAU>]]]]
- 5 For a UE that wants to apply PSM, enable network registration, location information and EMM cause value information unsolicited result code:
+CEREG:<stat>,[<tac>],[<ci>],[<AcT>],[<cause_type>],[<reject_cause>],[<Active-Time>],[<Periodic-TAU>]]]]

<stat> Integer type, indicates the EPS registration status

- 0 Not registered, MT is not currently searching an operator to register to
- 1 Registered, home network
- 2 Not registered, but MT is currently trying to attach or searching an operator to register to
- 3 Registration denied
- 4 Unknown (e.g. out of E-UTRAN coverage)
- 5 Registered, roaming
- 6 Registered for "SMS only", home network (not applicable)
- 7 Registered for "SMS only", roaming (not applicable)
- 8 Attached for emergency bearer services only
- 9 Registered for "CSFB not preferred", home network (not applicable)
- 10 Registered for "CSFB not preferred", roaming (not applicable)

<tac> String type; two bytes tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci> String type; four bytes E-UTRAN cell ID in hexadecimal format

<AcT> Integer type; indicates the access technology of the serving cell

- 0 GSM (not applicable)
- 1 GSM Compact (not applicable)
- 2 UTRAN (not applicable)
- 3 GSM w/EGPRS (not applicable)
- 4 UTRAN w/HSDPA (not applicable)
- 5 UTRAN w/HSUPA (not applicable)
- 6 UTRAN w/HSDPA and HSUPA (not applicable)
- 7 E-UTRAN

<cause_type> Integer type; indicates the type of <reject_cause>.

- 0 Indicates that <reject_cause> contains an EMM cause value
- 1 Indicates that <reject_cause> contains a manufacturer-specific cause

<reject_cause> Integer type; contains the cause of the failed registration. The value is of type as defined by <cause_type>.

<Active-Time> String type; one byte in an 8 bit format. Indicates the Active Time value (T3324)

allocated to the UE in E-UTRAN. The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and the value range, please refer to the *GPRS Timer 2 IE in 3GPP TS 24.008 Table 10.5.163/3GPP TS 24.008, 3GPP TS 23.682 and 3GPP TS 23.401*.

<Periodic-TAU> String type; one byte in an 8 bit format. Indicates the extended periodic TAU value (T3412) allocated to the UE in E-UTRAN. The extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, please refer to the *GPRS Timers 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008, 3GPP TS 23.682 and 3GPP TS 23.401*.

NOTE

1. If the EPS MT in GERAN/UTRAN/E-UTRAN also supports circuit mode services and/or GPRS services, the +CREG command and +CREG: result codes and/or the +CGREG command and +CGREG: result codes are applied to the registration status and location information for those services.
2. *3GPP TS 24.008* and *3GPP TS 24.301* specify the condition when the MS is considered as attached for emergency bearer services.
3. *3GPP TS 44.060* specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
4. *3GPP TS 25.331* specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

Example

```
AT+CREG=1           //Enable network registration URC.
OK
AT+CREG?
+CREG: 1

OK
AT+CREG=?
+CREG:(0,1,2)

OK
```

Neul Hi2110 Implementation

- Only CREG <n> values of 0, 1 and 2 are supported.
- <stats> return values 0-5 are supported.
- Unsolicited notifications are not currently supported.

3.6. AT+CSCON Signalling Connection Status

This command gives details of the terminal's perceived radio connection status (i.e. to the base-station). It returns an indication of the current state. Please note that this state is only updated when radio events, such as sending and receiving, take place. This means that the current state may be out of date. The terminal may think it is "Connected" yet cannot currently use a base station due to a change in the link quality.

The set command controls the presentation of an unsolicited result code +CSCON. If <n>=1, +CSCON: <mode> is sent from the MT when the connection mode of the MT is changed. If <n>=2 and there is a state within the current mode, +CSCON: <mode>[,<state>] is sent from the MT. If <n>=3, +CSCON: <mode>[,<state>[,<access>]] is sent from the MT. If setting fails, an MT error, +CME ERROR: <err> is returned. Refer to **Chapter 6** for possible <err> values.

When the MT is in UTRAN or E-UTRAN, the mode of the MT refers to idle when no PS signalling connection and to connected mode when a PS signalling connection between UE and network is setup. When the UE is in GERAN, the mode refers to idle when the MT is in either the IDLE state or the STANDBY state and to connected mode when the MT is in READY state.

The <state> value indicates the state of the MT when the MT is in GERAN, UTRAN connected mode or E-UTRAN.

The read command returns the status of result code presentation and an integer <mode> which shows whether the MT is currently in idle mode or connected mode. State information <state> is returned only when <n>=2. Radio access type information <access> is returned only when <n>=3.

Test command returns supported values as a compound value.

AT+CSCON Signalling Connection Status

Set Command AT+CSCON=[<n>]	Response OK +CME ERROR: <err>
Read Command AT+CSCON?	Response +CSCON:<n>,<mode>[,<state>] OK +CME ERROR: <err>
Test Command AT+CSCON=?	Response +CSCON: (list of supported <n>s) OK

Parameter

<n>	Integer type
0	Disable unsolicited result code
1	Enable unsolicited result code +CSCON: <mode>
2	Enable unsolicited result code +CSCON: <mode>[,<state>]
3	Enable unsolicited result code +CSCON: <mode>[,<state>[,<access>]]
<mode>	Integer type; indicates the signalling connection status
0	Idle
1	Connected
2-255	<reserved for future use>
<state>	Integer type; indicates the CS or PS state while in GERAN and the RRC state information if the MT is in connected mode while in UTRAN and E-UTRAN
0	UTRAN URA_PCH state
1	UTRAN Cell_PCH state
2	UTRAN Cell_FACH state
3	UTRAN Cell_DCH state
4	GERAN CS connected state
5	GERAN PS connected state
6	GERAN CS and PS connected state
7	E-UTRAN connected state
<access>	Integer type; indicates the current radio access type
0	Indicates usage of radio access of type GERAN
1	Indicates usage of radio access of type UTRAN TDD
2	Indicates usage of radio access of type UTRAN FDD
3	Indicates usage of radio access of type E-UTRAN TDD
4	Indicates usage of radio access of type E-UTRAN FDD

Example

```
AT+CSCON=0
```

```
OK
```

```
AT+CSCON?
```

```
+CSCON:0,1
```

```
OK
```

```
AT+CSCON=?
```

```
+CSCON:(0,1)
```

```
OK
```

```
AT+CSCON=1
```

```
OK
```

```
AT+CSCON?
```

```
+CSCON:1,1
```

OK

Neul Hi2110 Implementation

- Unsolicited notifications are not currently supported. This functionality will be added in a future release.
- Only <n>=0 and <n>=1 are supported. <n>=0 is the default value.

3.7. AT+CLAC List Available Commands

This command lists the available AT commands. Execution command causes the MT to return one or more lines of AT commands. Refer to **Chapter 6** for possible <err> values. Please note that this command only returns the AT commands that are available for the user.

AT+CLAC List Available Commands

Execute Command

AT+CLAC

Response

<AT Command>

[<CR><LF><AT Command>[...]]

OK

+CME ERROR: <err>

AT+CLAC=?

Response

OK

Parameter

<AT Command>

Defines the AT command including the prefix AT. Text shall not contain the sequence 0<CR> or OK<CR>

Example

AT+CLAC

AT+GM

AT+GMI

...

AT+GSN

AT+CLAC

OK

3.8. AT+CSQ Get Signal Strength Indicator

The terminal will provide a current signal strength indicator of 0 to 255 where larger is generally better. This information is based on a single measurement so can be expected to change greatly over short periods of time and may never use all possible (or even the majority) of the entire possible range or codes.

Execution command returns received signal strength indication <rss> and channel bit error rate <ber> from the MT. Refer to **Chapter 6** for possible <err> values.

Test command returns values supported as compound values.

AT+CSQ Get Signal Strength Indicator

Execute Command AT+CSQ	Response +CSQ: <rss>,<ber> OK +CME ERROR: <err>
Test Command AT+CSQ=?	Response +CSQ: (list of supported <rss>s),(list of supported <ber>s) OK

Parameter

<rss>	Integer type 0 -113dBm or less 1 -111dBm 2...30 -109... -53dBm 31 -51dBm or greater 99 Not known or not detectable
<ber>	Integer type; channel bit error rate (in percent) 0...7 As RXQUAL values (refer to 3GPP specification) 99 Not known or not detectable

Example

```
AT+CSQ
+CSQ:31,99

OK
```

Neul Hi2110 Implementation

- <ber> is currently not implemented, and will always be 99.

3.9. AT+CGPADDR Show PDP Addresses

This command returns the IP address of the device.

The execution command returns a list of PDP addresses for the specified context identifiers. If no <cid> is specified, the addresses for all defined contexts are returned. Refer to **Chapter 6** for possible <err> values.

The test command returns a list of defined <cid>s. These are <cid>s that have been activated and may or may not have an IP address associated with them.

AT+CGPADDR Show PDP Addresses

Execute Command

AT+CGPADDR[=<cid>[,<cid>[,...]]]

Response

[+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]]]
[<CR><LF>+CGPADDR:
<cid>[,<PDP_addr_1>[,<PDP_addr_2>]]
[...]]

OK

IPv4: The string is given as dot-separated numeric (0-255) parameter of the form:
a1.a2.a3.a4

IPv6: The string is given as colon-separated hexadecimal parameter.

Test Command

AT+CGPADDR=?

Response

+CGPADDR: (list of defined <cid>s)

OK

Parameter

<cid> Integer type; specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

<PDP_addr_1> and <PDP_addr_2> String type that identify the MT in the address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the +CGDCONT and

+CGDSCONT commands when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation that used the context definition referred to by <cid>. Both <PDP_addr_1> and <PDP_addr_2> are omitted if none is available. Both <PDP_addr_1> and <PDP_addr_2> are included when both IPv4 and IPv6 addresses are assigned, with <PDP_addr_1> containing the IPv4 address and <PDP_addr_2> containing the IPv6 address.

The string is given as dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4 for IPv4 and a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16 for IPv6.

When +CGPIAF is supported, its settings can influence the format of the IPv6 address in parameter <PDP_addr_1> or <PDP_addr_2> returned with the execute form of +CGPADDR.

NOTE

In dual-stack terminals (<PDP_type> IPV4V6), the IPv6 address will be provided in <PDP_addr_2>. For terminals with a single IPv6 stack (<PDP_type> IPV6) or due to backwards compatibility, the IPv6 address can be provided in parameter <PDP_addr_1>.

Example

```
AT+CGPADDR=1
+CGPADDR:1,101.43.5.1
```

OK

```
AT+CGPADDR=?
+CGPADDR:(1)
```

OK

Neul Hi2110 Implementation

- Only IPv4 is supported.
- <cid> values between 0 & 10 are supported.
- With AUTOCONNECT enabled, <cid>=0 will not be listed until an IP address is acquired.

3.10. AT+COPS PLMN Selection

Set command forces an attempt to select and register the GSM/UMTS/EPS network operator using the SIM/USIM card installed in the currently selected card slot. <mode> is used to select whether the selection is done automatically by the MT or is forced by this command to operator <oper> (it shall be given in format <format>) to a certain access technology, indicated in <AcT>. If the selected operator is not available, no other operator shall be selected (except <mode>=4). If the selected access technology is not available, then the same operator shall be selected in other access technology. The selected operator name format shall also apply to further read commands (+COPS?). <mode>=2 forces an attempt to deregister from the network. The selected mode affects all further network registration (e.g. after <mode>=2, MT shall be unregistered until <mode>=0 or 1 is selected). This command should be abortable when registration/deregistration attempt is made. Refer to **Chapter 6** for possible <err> values.

Read command returns the current mode, the currently selected operator and the current access technology. If no operator is selected, <format>, <oper> and <AcT> are omitted.

Test command returns a set of five parameters, each representing an operator present in the network. A set consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the operator's name, numeric format representation of the operator and access technology. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM or active application in the UICC (GSM or USIM) in the following order: HPLMN selector, user controlled PLMN selector, operator controlled PLMN selector and PLMN selector (in the SIM or GSM application), and other networks.

It is recommended (although optional) that after the operator list TA returns lists of supported <mode>s and <format>s. These lists shall be delimited from the operator list by two commas.

The <AcT> access technology selected parameters should only be used in terminals capable to register to more than one access technology. Selection of <AcT> does not limit the capability to cell reselections, even though an attempt is made to select an access technology, the phone may still re-select a cell in another access technology.

AT+COPS PLMN Selection	
Set Command AT+COPS=[<mode>[,<format>[,<oper>[,<AcT>]]]]	Response OK +CME ERROR: <err>
Read Command AT+COPS?	Response +COPS: <mode>[,<format>,<oper>][,<AcT>] OK +CME ERROR: <err>

Test Command AT+COPS=?	Response +COPS: [list of supported(<stat>,long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>[,<AcT>])s][,,(list of supported <mode>s),(list of supported <format>s)] OK +CME ERROR: <err>
----------------------------------	--

Parameter

<mode>	Integer type <u>0</u> Automatic (<oper> field is ignored) 1 Manual (<oper> field shall be present, and <AcT> is optional) 2 Deregister from network 3 Set only <format> (for read command +COPS?), do not attempt to register/deregister (<oper> and <AcT> fields are ignored); this value is not applicable in read command response 4 Manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered
<format>	Integer type <u>0</u> Long format alphanumeric <oper> 1 Short format alphanumeric <oper> 2 Numeric <oper>
<oper>	String type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters; numeric format is the GSM Location Area Identification number which consists of a three BCD digit ITU-T country code coded, plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in 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 3)(network code digit 2)(network code digit 1)
<stat>	Integer type 0 Unknown 1 Available 2 Current 3 Forbidden
<AcT>	Integer type; access technology selected <u>0</u> GSM 1 GSM Compact 2 UTRAN 3 GSM w/EGPRS 4 UTRAN w/HSDPA 5 UTRAN w/HSUPA 6 UTRAN w/HSDPA and HSUPA

NOTES

1. *3GPP TS 44.060* specifies the system information messages which give the information about whether the serving cell supports EGPRS.
2. *3GPP TS 25.331* specifies the system information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

Example

```
AT+COPS=0,2
```

```
OK
```

```
AT+COPS?
```

```
+COPS:0,2,"46001"
```

```
OK
```

```
AT+COPS=?
```

```
+COPS:(2,"RADIOLINJA","RL","24405"),  
(0,"TELE","TELE","24491"),(2)
```

```
OK
```

Neul Hi2110 Implementation

- <Act>, if provided, must be set to 7.
- Only <format>=2 is supported.
- Only <mode>=0, <mode>=1 & <mode>=2 are supported.
- When <mode>=1, the PLMN setting will not be retained after the UE is rebooted.
- <mode>=1 is only for development use and <mode>=0 should be used in production when AUTOCONNECT is enabled.

3.11. AT+CGATT PS Attach or Detach

The execution command is used to attach the MT to, or detach the MT from, the Packet Domain service. After the command has completed, the MT remains in V.250 command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. If the requested state cannot be achieved, an ERROR or +CME ERROR response is returned. Refer to **Chapter 6** for possible <err> values.

Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

The read command returns the current Packet Domain service state.

The test command is used for requesting information on the supported Packet Domain service states.

AT+CGATT PS Attach or Detach

Execute/Set Command AT+CGATT=<state>	Response OK +CME ERROR:<err>
Read Command AT+CGATT?	Response +CGATT:<state> OK
Test Command AT+CGATT=?	Response +CGATT:(list of supported <state>s) OK

Parameter

<state>	Integer type; indicates the state of PDP context activation. The default value is manufacturer specific 0 Detached 1 Attached
<err>	Error value

Example

```

AT+CGATT?
+CGATT:0

OK
AT+CGATT=1
OK
AT+CGATT=?
+CGATT:(0,1)

OK

```

NOTES

1. If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup.
2. This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Neul Hi2110 Implementation

- When <state>=1, +COPS=0 is automatically selected.

3.12. AT+CIMI Request International Mobile Subscriber Identity

This command returns International Mobile Subscriber Identity (string without double quotes).

Execution command causes the TA to return <IMSI>, which is intended to permit the TE to identify the individual SIM card or active application in the UICC (GSM or USIM) which is attached to MT.

Refer to **Chapter 6** for possible <err> values.

AT+CIMI Request International Mobile Subscriber Identity

Execute Command
AT+CIMI

Response

<IMSI>

OK

+CME ERROR: <err>

Test Command
AT+CIMI=?

Response

OK

Parameter

<IMSI>	International Mobile Subscriber Identity (string without double quotes)
<err>	TBD

Example

```
AT+CIMI
460001357924680

OK
```

Neul Hi2110 Implementation

- IMSI may not be displayed for a few seconds after power-on.

3.13. AT+CGDCONT Define PDP Context

The set command specifies PDP context parameter values for a PDP context identified by <cid>, the (local) context identification parameter, and also allows the TE to specify whether security protected transmission of ESM information is requested, because the PCO can include information that requires ciphering. There can be other reasons for the UE to use security protected transmission of ESM information, e.g. if the UE needs to transfer an APN. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command. Refer to **Chapter 6** for possible <err> values.

For EPS, the PDN connection and its associated EPS default bearer is identified herewith.

A special form of the set command, +CGDCONT=<cid> causes the values for context number <cid> to become undefined.

If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup, please refer to 3GPP TS 27.007 V13.5.0, subclause 10.1.0. As all other contexts, the parameters for <cid>=0 can be modified with +CGDCONT. If the initial PDP context is supported, +CGDCONT=0 resets context number 0 to its particular default settings.

The read command returns the current settings for each defined context.

The test command returns values supported as compound values. If the MT supports several PDP types, the parameter value ranges for each <PDP_type> are returned on a separate line.

AT+CGDCONT Define PDP Context

Execute/Set Command AT+CGDCONT=[<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>,<IPv4AddrAlloc>,<request_type>,<P-CSCF_discovery>,<IM_CN_Si_gnalling_Flag_Ind>,<NSLPI>,<securePCO>,<IPv4_MTU_discovery>,<Local_Addr_Ind>]]]]]]]]]]	Response [+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>,<IPv4AddrAlloc>,<request_type>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>,<NSLPI>,<securePCO>,<IPv4_MTU_discovery>]]]]]]]]] OK
Read Command AT+CGDCONT?	Response [<CR><LF>+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>,<IPv4AddrAlloc>,<request_type>,<P-CSCF_disco

	<p>very>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>[,<IPv4_MTU_discovery>]]]]]] [...]]</p> <p>OK</p>
<p>Test Command</p> <p>AT+CGDCONT=?</p>	<p>Response</p> <p>+CGDCONT: (range of supported <cid>s),<PDP_type>,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AddrAlloc>s),(list of supported <request_type>s),(list of supported <P-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s) ,(list of supported <NSLPI>s),(list of supported <securePCO>s),(list of supported <IPv4_MTU_discovery>s)</p> <p>[<CR><LF>+CGDCONT: (range of supported <cid>s),<PDP_type>,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AddrAlloc>s),(list of supported <request_type>s),(list of supported <p-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s) ,(list of supported <NSLPI>s),(list of supported <securePCO>s,(list of supported <IPv4_MTU_discovery>s)) [...]]</p> <p>OK</p>

Parameter

<cid>	<p>Integer type; specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value=1 or if the initial PDP context is supported, minimum value=0) is returned by the test form of the command.</p> <p>The <cid>s for network-initiated PDP contexts will have values outside the ranges indicated for the <cid> in the test form of the +CGDCONT and +CGDSCONT commands.</p>												
<PDP_type>	<p>String type; specifies the type of packet data protocol. The default value is manufacturer specific.</p> <table> <tr> <td>X.25</td><td>ITU-T/CCITT X.25 layer 3 (Obsolete)</td></tr> <tr> <td>IP</td><td>Internet Protocol (IETF STD 5 [103])</td></tr> <tr> <td>IPV6</td><td>Internet Protocol, version 6</td></tr> <tr> <td>IPV4V6</td><td>Virtual <PDP_type> introduced to handle dual IP stack UE capability</td></tr> <tr> <td>OSPIH</td><td>Internet Hosted Octect Stream Protocol (Obsolete)</td></tr> <tr> <td>PPP</td><td>Point to Point Protocol (IETF STD 51 [104])</td></tr> </table> <p>Only IP, IPV6 and IPV4V6 values are supported for EPS services.</p>	X.25	ITU-T/CCITT X.25 layer 3 (Obsolete)	IP	Internet Protocol (IETF STD 5 [103])	IPV6	Internet Protocol, version 6	IPV4V6	Virtual <PDP_type> introduced to handle dual IP stack UE capability	OSPIH	Internet Hosted Octect Stream Protocol (Obsolete)	PPP	Point to Point Protocol (IETF STD 51 [104])
X.25	ITU-T/CCITT X.25 layer 3 (Obsolete)												
IP	Internet Protocol (IETF STD 5 [103])												
IPV6	Internet Protocol, version 6												
IPV4V6	Virtual <PDP_type> introduced to handle dual IP stack UE capability												
OSPIH	Internet Hosted Octect Stream Protocol (Obsolete)												
PPP	Point to Point Protocol (IETF STD 51 [104])												
<APN>	<p>String type; a logical name that is used to select the GGSN or the external packet data network. If the value is null or omitted, then the subscription value will be requested. The</p>												

APN is a string of up to 82 characters.

<PDP_addr> String type; identifies the MT in the address space applicable to the PDP.

When +CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of +CGDCONT.

The value of this parameter is ignored with the set command. The parameter is included in the set command for backwards compatibility reasons only.

<d_comp> Integer type; controls PDP data compression

- 0 Off
- 1 On (manufacturer preferred compression)
- 2 V.42bis
- 3 V.44

<h_comp> Integer type; controls PDP header compression

- 0 Off
- 1 On (manufacturer preferred compression)
- 2 RFC 1144 [105] (applicable for SMDCP only)
- 3 RFC 2507 [107]
- 4 RFC 3095 [108] (applicable for PDCP only)

<IPv4AddrAlloc> Integer type; controls how the MT/TA requests to get the IPv4 address information

- 0 IPv4 address allocation through NAS signalling
- 1 IPv4 address allocated through DHCP

<request_type> Integer type; indicates the type of PDP context activation request for the PDP context. Please refer to *3GPP TS 24.301 (subclause 6.5.1.2)* and *3GPP TS 24.008 (subclause 10.5.6.17)*. If the initial PDP context is supported it is not allowed to assign <cid>=0 for emergency bearer services. According to *3GPP TS 24.008 (subclause 4.2.4.2.2 and subclause 4.2.5.1.4)* and *3GPP TS 24.301 (subclause 5.2.2.3.3 and subclause 5.2.3.2.2)*, a separate PDP context must be established for emergency bearer services.

If the PDP context for emergency bearer services is the only activated context, only emergency calls are allowed, refer to *3GPP TS 23.401 subclause 4.3.12.9*.

- 0 PDP context is for new PDP context establishment or for handover from a non-3GPP access network (how the MT decides whether the PDP context is for new PDP context establishment or for handover is implementation specific).
- 1 PDP context is for emergency bearer services
- 2 PDP context is for new PDP context establishment
- 3 PDP context is for handover from a non-3GPP access network

<P-CSCF_discovery> Integer type; influences how the MT/TA requests to get the P-CSCF address, refer to *3GPP TS 24.229 [89] annex B and annex L*.

- 0 Preference of P-CSCF address discovery not influenced by +CGDCONT
- 1 Preference of P-CSCF address discovery through NAS signalling
- 2 Preference of P-CSCF address discovery through DHCP

<IM_CN_Signalling_Flag_Ind> Integer type; indicates to the network whether the PDP context is for IM CN subsystem related signalling only or not.

- 0 UE indicates that the PDP context is not for IM CN

		subsystem-related signalling only
	1	UE indicates that the PDP context is for IM CN subsystem-related signalling only
<NSLPI>	Integer type; indicates the NAS signalling priority requested for this PDP context	
	0	Indicates that this PDP context is to be activated with the value for the low priority indicator configured in the MT.
	1	Indicates that this PDP context is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority".
	The MT utilizes the provided NSLPI information as specified in <i>3GPP TS 24.301 [83]</i> and <i>3GPP TS 24.008</i> .	
<securePCO>	Integer type. Specifies if security protected transmission of PCO is requested or not (applicable for EPS only).	
	0	Security protected transmission of PCO is not requested
	1	Security protected transmission of PCO is requested
<IPv4_MTU_discovery>	Integer type; influences how the MT/TA requests to get the IPv4 MTU size, refer to <i>3GPP TS 24.008 subclause 10.5.6.3</i> .	
	0	Preference of IPv4 MTU size discovery not influenced by +CGDCONT
	1	Preference of IPv4 MTU size discovery through NAS signalling

Example

```
AT+CGDCONT=?
+CGDCONT:(1-3),("IP"),,(0-1),(0-1)

OK
AT+CGDCONT=1,"IP","HUAWEI.COM"
OK
AT+CGDCONT?
+CGDCONT:1,"IP",HUAWEI.COM, ,0,0

OK
```

Neul Hi2110 Implementation

- Only <PDP_type>="IP" is supported. <PDP_type>="IPV6" will be supported in a future release.
- Neul supports +CGDCONT=<cid>,<PDP_type>,<APN> only.
- <cid> values of 0-10 are supported.
- <cid>=0 is read only and is only defined when AUTOCONNECT is enabled.
- Only <hcomp> and <dcomp> values of 0 are supported.

3.14. AT+CFUN Set Phone Functionality

Set command selects the level of functionality in the MT. Level "full functionality" is where the highest level of power is drawn. "Minimum functionality" is where minimum power is drawn. Level of functionality between these may also be specified by manufacturers. When supported by manufacturers, MT resetting with <rst> parameter may be utilized. Refer to **Chapter 6** for possible <err> values.

NOTE

It is manufacturer specific if this command affects network registration. +COPS is used to force registration/deregistration.

Read command returns the current setting of <fun>.

Test command returns values supported by the MT as compound values.

AT+CFUN Set Phone Functionality

Set Command AT+CFUN=[<fun>[,<rst>]]	Response OK +CME ERROR: <err>
Read Command AT+CFUN?	Response +CFUN:<fun> OK
Test Command AT+CFUN=?	Response +CFUN:(list of supported<fun>s), (list of supported<rst>s) OK

Parameter

<fun>	Integer type
<u>0</u>	Minimum functionality
1	Full functionality. Enable MT to transmit and receive RF circuits for all supported radio access technologies. For MTs supporting +CSRA, this equals the RATs indicated by the response of +CSRA=?. Currently +CSRA setting is ignored. It is not required that the transmitting and receiving RF circuits are in a disabled state when this setting takes effect.
2	Disable MT to transmit RF circuits only
3	Disable MT to receive RF circuits only
4	Disable MT to transmit and receive RF circuits

5...127	Reserved for manufacturers as intermediate states between full and minimum functionality
128	Full functionality with radio access support according to the setting of +CSRA. Enables MT to transmit and receive RF circuits if it not already enabled. This <fun> setting is applicable for MTs supporting +CSRA.
129	Prepare for shutdown. This setting has its prime use when some of the MT's resources (e.g. file system) are located on a tightly integrated TE (host). The MT will execute pending actions resulting in "permanent" changes, e.g. execute pending file system operations. The MT will also make an orderly network detachment. After this action and +CFUN has returned OK, the MT can be shut down with <fun>=0, or by other means. After setting <fun>=129, only <fun>=0 is valid. All other values will make +CFUN return ERROR.
<rst>	Integer type
0	Do not reset the MT before setting it to <fun> power level. This shall be always default when <rst> is not given.
1	Reset the MT before setting it to <fun> power level

Example

```

AT+CFUN=?
+CFUN:(0,1),(0,1)

OK
AT+CFUN=1
OK
AT+CFUN?
+CFUN:1

OK

```

Neul Hi2110 Implementation

- Only <fun>=0&1 are supported.
- <rst> is not supported and will be ignored.

3.15. AT+CMEE Report Mobile Termination Error

Set command disables or enables the use of final result code +CME ERROR: <err> as an indication of an error relating to the functionality of the MT. When enabled, MT related errors cause +CME ERROR: <err> final result code instead of the regular ERROR final result code. ERROR is returned normally when error

is related to syntax, invalid parameters or TA functionality.

Read command returns the current setting of <n>.

Test command returns values supported as a compound value.

Refer to **Chapter 6** for possible <err> values.

AT+CMEE Report Mobile Termination Error

Set Command AT+CMEE=<n>	Response OK
Read Command AT+CMEE?	Response +CMEE:<n> OK
Test Command AT+CMEE=?	Response +CMEE:(list of supported<n>s) OK

Parameter

<n>	Integer type
<u>0</u>	Disable +CMEE ERROR: <err> result code and use ERROR instead
1	Enable +CMEE ERROR: <err> result code and use numeric <err> values (Refer to Chapter 6 for possible <err> values)
2	Enable +CMEE ERROR: <err> result code and use verbose <err> values

Neul Hi2110 Implementation

- Only <n>=0 & <n>=1 are supported.

4 Neul Commands

4.1. AT+NMGS Neul Send Message Command

The send message command is used to send a message from the Terminal to the network via the CDP server. This command will give an <err> code and description as an intermediate message if it can't send the message. Refer to **Chapter 6** for possible <err> values.

AT+NMGS Neul Send Message Command

Set Command
AT+NMGS=<length>,<data>

Response
OK

+CME ERROR: <err>

Parameter

<length>	Decimal length of message
<data>	Data to be transmitted in hex string format
<err>	TBD

Example

```
AT+NMGS=3,AA11BB
OK
```

Neul Hi2110 Implementation

- There is a maximum data length of 512 bytes.
- Only one message will be buffered at any one time.

4.2. AT+NMGR Neul Get Message Command

Receive a message from the CDP server.

The get message command returns the oldest buffered message and deletes from the buffer. If there are no messages then no command response will be given. If new message indications (+NNMI) are turned on then received messages will not be available via this command.

AT+NMGR Neul Get Message Command

Execute Command
AT+NMGR

Response

<length>,<data>

OK

+CME ERROR: <err>

Parameter

<length>	Decimal length of message
<data>	Data received in hex string format

Example

```
AT+NMGR
5,48656C6C6F
OK
```

Neul Hi2110 Implementation

- Maximum received data length is 512 bytes.

4.3. AT+NNMI Neul New Message Indications

This command sets or gets new message indications that are sent. New message indications can be sent when a downstream message is received by the terminal from the CDP server. Refer to **Chapter 6** for possible <err> values.

When new message indications and messages are enabled (NNMI=1), all currently buffered messages will be returned in the format of +NNMI: <length>,<data>. For example: +NNMI: 5,48656C6C6F.

If indications alone are turned on (NNMI=2), each newly received message triggers an indication that a new datagram is waiting using the unsolicited informational response. The buffered messages can be collected using +NMGR. The format of response is: +NNMI.

The default setting is 0: no indications are sent.

AT+NNMI Neul New Message Indications

Set Command AT+NNMI=<status>	Response OK +CME ERROR: <err>
Read Command AT+NNMI?	Response +NNMI: <status> OK

Parameter

<status>	0	No indications, the default setting
	1	Indications and message
	2	Indications only
<length>	Decimal length of message.	
<data>	Data to be transmitted in hex string format	

Example

```
AT+NNMI=1
OK
AT+NNMI?
+NNMI:1
OK
```

4.4. AT+NSMI Neul Sent Message Indications

This command sets or gets indications that are sent when an upstream message is sent to the CDP server.

If sent message indications are turned on, the unsolicited informational response: +NSMI:<status> (e.g +NSMI: SENT) will be issued when a new message is sent into NB-IoT stack. Refer to **Chapter 6** for possible <err> values.

The default setting is 0: no indications are sent.

AT+NSMI Neul Sent Message Indications

Set Command AT+NSMI=<indications>	Response OK +CME ERROR: <err>
Read Command AT+NSMI?	Response +NSMI:<indications> OK

Parameter

<indications>	0 No indications, the default setting 1 Indications will be sent
<status>	SENT DISCARDED

Example

```
AT+NSMI=1
OK
AT+NSMI?
+NSMI:1
OK
```

4.5. AT+NQMGR Neul Query Messages Received

This command queries the status of the downstream messages received from the CDP server. Refer to **Chapter 6** for possible <err> values.

AT+NQMGR Neul Query Messages Received

Execute Command AT+NQMGR	Response BUFFERED=<buffered> , RECEIVED=<received> , DROPPED=<dropped> OK +CME ERROR: <err>
------------------------------------	---

Parameter

<buffered>	The number of messages waiting to be read in the downstream buffer
<received>	The total number of messages received by the terminal since terminal boot
<dropped>	The number of messages dropped by the terminal since terminal boot

Example

```
AT+NQMGR
BUFFERED=0,RECEIVED=34,DROPPED=2
OK
```

4.6. AT+NQMGS Neul Query Messages Sent

This command queries the status of the upstream messages sent to the CDP server. Refer to **Chapter 6** for possible <err> values.

AT+NQMGS Neul Query Messages Sent

Execute Command AT+NQMGS	Response PENDING=<pending>, SENT=<sent>, ERROR=<error> OK +CME ERROR: <err>
------------------------------------	---

Parameter

<pending>	The number of messages waiting to be sent in the upstream buffer, if Layer 3 is registered and activated
<sent>	The total number of uplink messages sent into the NB-IoT stack since terminal boot
<error>	The number of messages that could not be sent by the terminal due to an error since terminal boot

Example

```
AT+NQMGS
PENDING=1,SENT=34,ERROR=0
OK
```


4.7. AT+NRB Neul Reboot

This command reboots the terminal. There is a short delay after issuing this command before the terminal reboots. No further AT commands will be processed. Refer to **Chapter 6** for possible <err> values.

Please note that there is no final OK to signal that the command line has finished processing as AT command processing terminates with this command. No confirmation messages are expected until the reboot.

AT+NRB Neul Reboot

Execute Command AT+NRB	Response REBOOTING
----------------------------------	------------------------------

Example

```
AT+NRB
REBOOTING
```

4.8. AT+NCDP Configure and Query CDP Server Settings

This command is used to set and query the server IP address and port for the Connected Device Platform (CDP) server. It is used when there is a Neul CDP or Huawei IoT platform acting as gateway to network server applications. Refer to **Chapter 6** for possible <err> values.

AT+NCDP Configure and Query CDP Server Settings

Set Command AT+NCDP=<ip_addr>[,<port>]	Response Update the CDP server configuration from the supplied parameters. If they are set correctly, return OK. If it fails, an error is returned. +CME ERROR: <err>
Test Command AT+NCDP?	Response Return the current CDP server IP address and port. Return an error if not set. +NCDP:<ip_addr>,<port> OK +CME ERROR: <err>

Parameter

<ip_addr>	IPv4 address, IP address in dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4
<port>	Unsigned integer 0-65535. Default is 5683 if not specified.

Example

```
AT+NCDP=192.168.5.1
OK
AT+NCDP?
+NCDP:192.168.5.1,5683
OK
```

Neul Hi2110 Implementation

- Only IPv4 is supported.
- The server address is currently not preserved across reboot. After a reboot it needs to be set again.
- This command is available after the IMEI has been configured.

4.9. AT+NUESTATS Query UE Statistics

This command fetches the most recent operational statistics. Refer to **Chapter 6** for possible <err> values.

AT+NUESTATS Query UE Statistics

Execute Command
AT+NUESTATS

Response

Signal power:<signal power in centibels>
Total power:<total power in centibels>
TX power:<current Tx power level in centibels >
TX time:<total Tx time since last reboot in millisecond>
RX time:<total Rx time since last reboot in millisecond>
Cell ID:<last cell ID>
DL MCS:<last DL MCS value>
UL MCS:<last UL MCS value>
DCI_MCS:<last DCI MCS value>

OK

+CME ERROR: <err>

Parameter

<signal power in centibels>	Signal power in centibels
<total power in centibels>	Total power in centibels
<current Tx power level in centibels>	Current Tx power level in centibels
<total Tx time since last reboot in millisecond>	Total Tx time since last reboot in millisecond
<total Rx time since last reboot in millisecond>	Total Rx time since last reboot in millisecond
<last cell ID>	Last cell ID
<last DL MCS value>	Last DL MCS value
<last UL MCS value>	Last UL MCS value
<last DCI MCS value>	Last DCI MCS value

Example

AT+NEUSTATS

Signal power:50
Total power:500
TX power:30
TX time:1234567
RX time:12345
Cell ID:70
DL MCS:5
UL MCS:5
DCI_MCS:5

OK

4.10. AT+NEARFCN Specify Search Frequencies

The set command provides a mechanism to lock to a specific E-ULTRA Absolut Radio Frequency Channel Number (EARFCN). Refer to **Chapter 6** for possible <err> values.

AT+NEARFCN Specify Search Frequencies

Set Command	Response
AT+NEARFCN=<search_mode>,<earf cn>	OK
	+CME ERROR: <err>

Parameter

<search_mode>	Specifies the type of search and defines the supplied parameters 0 Single point EARFCN search
<earfcn>	A number in the range 0-65535 representing the EARFCN to search

Example

```
AT+NEARFCN=0,10
OK
```

4.11. AT+NSOCR Create Socket

This command creates a socket on the UE and associates with specified protocol. If the port is set, receiving is enabled and +NSONMI unsolicited messages will appear for any message that is received on that port. Refer to **Chapter 6** for possible <err> values.

If a socket has already been created for a protocol, port combination, +NSOCR will fail if requested a second time.

AT+NSOCR Create Socket

Set Command AT+NSOCR=<type>,<protocol>,<listen port>[,<receive control>]	Response <socket> OK +CME ERROR: <err>
--	--

Parameter

<type>	Socket Type. Supported value is DGRAM
<protocol>	Standard internet protocol definition. For example, UDP is 17
<listen port>	A number in the range 0-65535. This is the local port that will be included in sent messages and on which messages will be received.
<socket>	This is a reference to the created socket. It is an integer greater than or equal to 0.
<receive control>	Set to 1 if incoming messages should be received, 0 if incoming messages should be ignored. Default is 1 (messages will be received).

Example

```
AT+NSOCR=DGRAM,17,5683,1
0

OK
AT+NSOCR=DGRAM,17,1234,1
1

OK
```

Neul Hi2110 Implementation

- A maximum of 7 sockets are supported, but other services may reduce this number.
- Only UDP, protocol 17, is supported.
- <type>=RAW and <protocol>=6 will be accepted, but are not supported and should not be used.

4.12. AT+NSOST SendTo Command (UDP Only)

Send a UDP datagram containing length bytes of data to remote_port on remote_addr.

This command sends a UDP datagram containing length bytes of data to the specified host:port. It will return with the socket that it was sent on, and the number of bytes of data sent. If the amount of data is larger than the largest datagram that can be sent, +NSOST return value will indicate how much of the data was successfully sent. Refer to **Chapter 6** for possible <err> values.

AT+NSOST SendTo Command (UDP Only)

Set Command	Response
AT+NSOST=socket,remote_addr,remote_port, length,data	<socket>,<length>
	OK
	+CME ERROR: <err>

Parameter

<socket>	Socket number returned by +NSOCR
<remote_addr>	IPv4 A dot notation IP address
<remote_port>	A number in the range 0-65535. This is the remote port on which messages will be received
<length>	Decimal length of data to be sent
<data>	Data received in hex string format, or quoted string format

Example

```
AT+NSOST=0,192.158.5.1,1024,2,AB30
0,2
OK
```

Neul Hi2110 Implementation

- Maximum data size is 512 bytes.
- Only IPv4 is supported.
- <data>: only hex string format is supported

4.13. AT+NSORF Receive Command (UDP Only)

Read up to <req_length> characters of data from <socket>, and returned length is the actual number of characters returned.

Receive data on a socket. When data arrives a +NSONMI response will be generated to indicate the socket the message was received on and also the amount of data. The +NSORF command takes a length, which is the maximum amount of data that will be returned.

If the requested length is larger than the actual size of the returned data, only the length of returned data is provided, and the remaining length is returned as 0. If the requested length is less than the amount of data returned, only the requested amount of data will be returned, plus an indication of the number of bytes remaining. Once a message has been fully read, a new +NSONMI notification will be sent if there is another message to process. Refer to **Chapter 6** for possible <err> values.

If messages arrive faster than they are read, and the internal message buffer is full, the most recent message will be discarded.

AT+NSORF Receive Command (UDP Only)

Set Command AT+NSORF=<socket>,<req_length>	Response <socket>,<ip_addr>,<port>,<length>,<data>,<remaining_length>
	OK
	+CME ERROR: <err>

Parameter

<socket>	Socket number returned by +NSOCR
<req_length>	Maximum amount of data to be returned as a decimal byte length.
<ip_addr>	Address of system sending the message IPv4 A dot notation IP address
<port>	A number in the range 0-65535. This is the remote port that messages was sent from
<length>	Amount of data returned as a decimal byte length
<remaining_length>	Amount of data left to read for this message as a decimal byte length
<data>	Data received in hex string format, or quoted string format.

Example

```
AT+NSORF=0,10
0,192.168.5.1,1024,2,ABAB,0
OK
```

Neul Hi2110 Implementation

- Maximum data size is 512 bytes.
- Only IPv4 is supported.
- Remaining length is always 0. The remaining data is readable.

4.14. AT+NSOCL Close Socket

Close the specified socket. If there are pending messages to be read, they will be dropped. No further unsolicited +NSONMI notifications will be generated. If the socket has already been closed, or was never created, an error will be returned.

AT+NSOCL Close Socket

Set Command AT+NSOCL=<socket>	Response OK +CME ERROR: <err>
---	---

Parameter

<socket>	Socket number returned by +NSOCR
----------	----------------------------------

Example

```
AT+NSOCL=0
OK
```

4.15. +NSONMI Socket Message Arrived Indicator (Response Only)

Unsolicited message to notify that data has been received on a socket and is ready to be read. This command returns socket number and number of bytes of data available to read for the first message that is queued. If another message is received on the same socket, it will only be notified when the preceding message has been completely read. Refer to **Chapter 6** for possible <err> values.

+NSONMI Socket Message Arrived Indicator (Response Only)

Command	Response
+NSONMI:	<socket>,<length>

Parameter

<socket>	Socket on which data is received. Decimal number returned by +NSOCR
<length>	Number of bytes of data in the first message

Neul Hi2110 Implementation

- Maximum data size is 512 bytes.
- This message can occur at any point if it is indicating a new message with no messages buffered. If there are buffered messages it will occur in the AT+NSORF command before the data is returned.

4.16. AT+NPING Test IP Network Connectivity To A Remote Host

This command sends an ICMP packet to the specified host address. Refer to **Chapter 6** for possible <err> values.

AT+NPING initiates the sending of a PING packet to the specified address. This will either cause a packer to be returned if the remote system is connected and responding to PING packets or no response will be received. A maximum of 1 ping attempts will be tried. If none of the packets receive a response within the timeout period, an error will be raised.

If a response is received, the unsolicited +NPING message will be returned. If no response is received the +NPINGERR unsolicited response will be returned with an error value.

AT+NPING Test IP Network Connectivity To A Remote Host

Set Command AT+NPING=<remote_address>	Response OK +NPING:<retry_num>,<remote_address>,<ttl>,<rtt> Else +NPINGERR: <err>
---	--

Parameter

<remote_address>	Address of system sending the message IPv4 A dot notation IP address
<retry_num>	Number of packets sent before a response was received
<ttl>	TTL in the response packet
<rtt>	Elapsed time in msec from packet sent to response received
<err>	An integer value to provide some information on why the ping request failed 1 No response from remote host within timeout period 2 Failed to send ping request

4.17. AT+NBAND Set Supported Bands

This command restricts the set of bands to be used. Refer to **Chapter 6** for possible <err> values.

AT+NBAND Set Supported Bands

Set Command AT+NBAND=n[,n[,n[...]]]	Response OK +CME ERROR: <err>
Read Command AT+NBAND?	Response +NBAND: n[,n[,n[...]]] OK
Execute Command AT+NBAND=?	Response +NBAND: (n[,n[,n[...]]) OK

Parameter

<n> Band as a decimal number

Neul Hi2110 Implementation

- Only bands 5, 8 & 20 are supported initially.
- AT+NBAND=? does not return the list of supported bands.

4.18. AT+NLOGLEVEL Set Debug Logging Level

This command sets the logging level. It can take one of the following values. The default logging level is NORMAL. And the value is persistent across reboots.

AT+NLOGLEVEL Set Debug Logging Level

Set Command AT+NLOGLEVEL=<core>,<level>	Response OK +CME ERROR: <err>
Read Command AT+NLOGLEVEL?	Response +NLOGLEVEL: <core>,<level> OK
Execute Command AT+NLOGLEVEL=?	Response +NLOGLEVEL: (<core>, ...),(<level>,<level>, ...) OK

Parameter

<level> Logging level required
 VERBOSE
 NORMAL
 WARNING
 ERROR
 NONE

<core> PROTOCOL
 APPLICATION
 SECURITY

Neul Hi2110 Implementation

- Logging level is not persistent.
- Application and Security core logging are not supported.

4.19. AT+NCONFIG Configure UE Behaviour

This command allows configuring certain aspects of UE behavior. It takes a function and a value that controls operation of that function.

AT+NCONFIG Configure UE Behaviour	
Set Command AT+NCONFIG=<function>,<value>	Response OK +CME ERROR: <err>
Read Command AT+NCONFIG?	Response +NCONFIG:<function>,<value> [+NCONFIG:<function>,<value> [...]] OK
Execute Command AT+NCONFIG=?	Response +NCONFIG:(<function>,<value1>,<value2>[,<value3>[,...]])) [+NCONFIG:(<function>,<value1>,<value2>[,<value3>[,...]])) [,...]] OK

Parameter

<function>	UE function to configure AUTOCONNECT: Control whether the platform will automatically attempt to connect to the network after power-on or reboot. When enabled, it will set +CFUN=1 and read the PLMN from the SIM. And it will use the APN provided by the network.
-------------------------	---

5 Temporary Commands

As part of development, some commands are temporarily added. They are unsupported and may disappear, or change behaviour, without warning. They are listed here for completeness.

5.1. AT+NTSETID Set ID

Set system identities such as UUID or IMEI value. This is a temporary command that will be replaced with a production tool.

AT+NTSETID Set ID	
Set Command AT+NTSETID=<snt>,<data>	Response OK +CME ERROR: <err>

Parameter

<snt>	Integer type indicating the serial number type that has been requested		
1	Set the IMEI		
2	SVN		
<data>	If <snt>=1	IMEI	15-character string type in decimal format
	If <snt>=2	SVN	2 digit SVN

Example

```
AT+NTSETID=1,123456789012345
OK
```

Neul Hi2110 Implementation

- IMEI is persistent.
- SVN is not persistent and will default to 0x00.
- IMEI can only be set when <fun>=0.

6 Error Values

The error codes listed below are not implemented, and only a subset will be implemented.

In B600 and later, the +CMEE command is implemented and supports modes 0 & 1. In mode 1 a limited set of error codes are returned.

Error codes are aligned to the 3GPP spec. Refer to *3GPP TS 27.007 V13.5.0, sub-clause 9.2* for all possible <err> values. The error codes listed are those returned for the Hi2110 implementation.

Error codes 0-255 are reserved and defined in *3GPP TS 27.007* and may be used by Neul in future releases.

Table 3: Error Values

Error Code	Error Text
3	Operation not allowed
4	Operation not supported
23	Memory failure
50	Incorrect parameters

7 Examples

7.1. Attach Network

The following shows a simple example to attach the network.

```
Neul //Module is powered on, wait for 3 seconds
OK
AT+NTSETID=1,460012345678966 //Configure IMEI number, set it only once and cannot change
                                again after a successful setup (If the module has been
                                configured, this step can be omitted).
OK
AT+NRB //Reboot the module (If the module has been configured, this
REBOOTING step can be omitted).

Neul
OK
AT+CGSN=1 //Query the IMEI number
+CGSN: 460012345678966
OK
AT+CFUN=1 //Configuration CFUN
OK
AT+CIMI //Query the IMSI
460012345678966

OK
AT+Nband=8 //Configure only once, set to BAND 8 for BC95-CM,
            set to BAND 5 for BC95-SL and set to BAND 20 for BC95-VF.
OK
AT+CGDCONT=1,"IP","HUAWEI.COM" //Configuration PDP
OK
AT+CGATT=1 //Activate the network
OK
AT+CGATT? //Query whether network is activated. Need to wait for some
+CGATT:1 time.
```

OK

7.2. CoAP Messages

The following is a simple example of sending, receiving and reading a CoAP message.

```
AT+NCDP=192.53.100.53           //Configuration CDP server
OK
AT+NCDP?                         //Query CDP server
+NCDP:192.53.100.53,5683

OK
AT+NMGS=10, AA7232088D0320623399 //Send messages

+LOG[D]ep=460012345678969
+LOG[D]create success
+LOG[I]UE->IOM: POST t/r register
+LOG[D]ep=460012345678969
OK
+LOG[I]IOM->UE: ACK response code=2.04
+LOG[I]IOM->UE: ACK  device Changed
+LOG[D]IOM->UE: GET request
+LOG[D]IOM->UE: GET request
+LOG[I]IOM->UE: GET request direct upload len=10
+LOG[D]IOM->UE: POST request      //IOM posts messages to UE

AT+NQMGS                         //Query whether messages is sent
PENDING=0,SEND=1,ERROR=0

OK
AT+NMGR                          //Get messages
2,AABB

OK
AT+NQMGR                         //Query whether messages is received
BUFFERED=0,RECEIVED=1,DROPPED=0

OK
AT+NMGS=10, AA7232088D0320623399 //Send messages
+LOG[D]IOM->UE: GET request
+LOG[I]IOM->UE: GET request direct upload len=10
```

```
OK
+LOG[D]IOM->UE: POST request

AT+NMGR                                //Get messages
2,AABB

OK
```

7.3. UDP Messages

The following shows a simple example of sending, receiving and reading a UDP message. Once the socket is closed, no replies will be received.

```
AT+NSOCR= DGRAM,17,5683,1            //Create socket
0

OK
AT+NSOST=0,192.53.100.53,5683,25,400241C7B17401724D0265703D323031363038323331363438
                                //Send messages
0,25

OK
+NSONMI:0,4                        //Receive messages

AT+NSORF=0,4                        //Read messages
0,192.53.100.53,5683,4,60A041C7,0

OK
AT+NSOCL=0                        //Close socket
OK
```


8 Appendix A Reference

Table 4: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
CDP	Connected Device Platform
CS	Circuit Switched
DCE	Data Communication Equipment
EGPRS	Enhanced General Packet Radio Service
GPRS	General Packet Radio Service
GERAN	GSM/EDGE Radio Access Network
HPLMN	Home Public Land Mobile Network
HSDPA	High Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
IMEI	International Mobile Equipment Identity
IMEISV	International Mobile Equipment Identity and Software Version
ICMP	Internet Control Messages Protocol
MS	Mobile Station
NB-IoT	Narrow Band-Internet of Thing
PDP	Packet Data Protocol
RRC	Radio Resource Control
SVN	Software Version Number
TA	Terminal Adapter

TCP	Transmission Control Protocol
TE	Terminal Equipment
TTL	Time To Live
UDP	User Datagram Protocol
UE	User Equipment
UICC	Universal Integrated Circuit Card
UUID	Universally Unique Identifier

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