

UNAPPROVED



Hi2110 AT Command Set

For the V100R100C00B600 firmware

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1. Introduction

This document gives details of the AT Command Set supported by the Neul Hi2110 chip loaded with V100R100C00B600 firmware.

At boot the following string will be output:

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

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

1.1 AT Command Syntax

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

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 new-line character is ignored so it is permissible to use carriage-return line-feed pairs on the input.

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.

Responses will be of the format:

```
<CR><LF>+CMD1:<parameters><CR><LF>  
<CR><LF>OK<CR><LF>
```

1.3 3GPP Alignment

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



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1.4 Modification History

Document ID	Firmware Release	Modification
V100R100C00B350 Issue 2	B350SP13	Output now uses <CR><LF> before and after each line of output. Previously only the trailing <CR><LF> was generated
V100R100C00B350 Issue 2	B350SP13	Error behaviour aligned to +CMEE=0 has been implemented. Only 'OK' and 'ERROR' are returned.
V100R100C00B600 Issue 1	B600	New commands added: +NBAND, +NLOGLEVEL, +CMEE have been added
V100R100C00B600 Issue 1	B600	3GPP numeric error codes have been implemented. Previous text errors have been removed.

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2. Implementation Status

Command	Description	Implemented In
3GPP		
+CGMI	Manufacturer Identification	B600
+CGMM	Manufacturer Model	B600
+CGMR	Manufacturer Revision	B600
+CGSN	Serial Number	B600
+CEREG	Network Registration	B600
+CSCON	Signalling connection status	B600
+CLAC	List Available Commands	B600
+CSQ	Get signal strength indicator	B600
+CGPADDR	Show PDP Addresses	B600
+COPS	PLMN selection	B600
+CGATT	PS attach or detach	B600
+CIMI	Request international mobile subscriber identity	B600
+CGDCONT	Define PDP Context	B600
+CFUN	Set phone functionality	B600
+CMEE	Report mobile termination error	B600
Neul General		
+NMGS	Neul Send Message Command	B600
+NMGR	Neul Get Message Command	B600
+NNMI	Neul New Message Indications	B600
+NSMI	Neul Send message Indications	B600
+NQMGR	Neul Query Messages Received	B600
+NQMGS	Neul Query Messages Sent	B600
+NRB	Neul Reboot	B600
+NCDP	Configure and read CDP server settings	B600
+NUESTATS	Query UE Statistics	B600
+NEARFCN	Specify a frequency point to search	B600
+NSOCR	Create Socket	B600
+NSOST	Send To Command	B600
+NSORF	Receive Command	B600
+NSOCL	Close Socket	B600
+NSONMI	Socket Message Arrived Indicator	B600
+NPING	Send an ICMP packet to a remote host	
+NBAND	Set bands to use	B600
+NLOGLEVEL	Set log level for each core	B600
Neul Temporary		
+NTSETID	Set IDs	B600

3. Commands (3GPP)

Hi2110 AT Command Set

Issue: 3

Owner: Neul

CogniDox Ref: **NL-002284-RN**

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3.1 Request Manufacturer Identification (+CGMI)

Command	Response	Example
+CGMI	<manufacturer> +CME ERROR: <err>	AT+CGMI Neul Ltd; www.neul.com/ OK
+CGMI=?		AT+CGMI=? OK

Description

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

Defined values

<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>

Neul Hi2110 Implementation

AT

3.2 Request Manufacturer Model (+CGMM)

Command	Response	Example
+CGMM	<model> +CME ERROR: <err>	AT+CGMM Neul Hi2110 OK
+CGMM=?		AT+CGMM=? OK

Description

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

Defined values

<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>

Neul Hi2110 Implementation

3.3 Request Manufacturer Revision (+CGMR)

This command returns the manufacturer revision. The text is human readable and is not intended for microcontroller parsing.

By default this will return the firmware revision – release and build.

Command	Response	Example
+CGMR	<revision> +CME ERROR: <err>	AT+CGMR Hi2110-V120R100C00B350 -5-g0298274 NEULVMUE-WIN Aug 22 2016 22:13:05 OK
+CGMR=?		AT+CGMR=? OK

Description

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

Defined values

<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>

Neul Hi2110 Implementation

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

3.4 Request Product Serial Number (+CGSN)

Command	Response	Example
+CGSN[=<snt>]	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> +CME ERROR: <err> when TE supports <snt> and command successful: +CGSN: (list of supported <snt>s)	AT+CGSN=0 123456789012334 OK AT+CGSN=1 +CGSN:49015420323751 OK AT+CGSN=? +CGSN: (1,2,3) OK

Description

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: *Error Values* for possible <err> values.

Defined values

<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;

Neul Hi2110 Implementation

- Serial number, +CGSN=0, is not implemented, and will return an error. This will change in a future release.

3.5 EPS network registration status (+CEREG)

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

Description

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: Error Values 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.

- 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 apply to the registration status and location information for those services.

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.

Defined values

`<n>`: integer type

- | | |
|---|--|
| 0 | disable network registration unsolicited result code |
| 1 | enable network registration unsolicited result code +CREG: <code><stat></code> |
| 2 | enable network registration and location information unsolicited result code +CREG: <code><stat>[,<tac>],[<ci>],[<AcT>]</code> |
| 3 | enable network registration, location information and EMM cause value information unsolicited result code +CREG: <code><stat>[,<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>]</code> |
| 4 | For a UE that wants to apply PSM, enable network registration and location information unsolicited result code +CREG: <code><stat>[,<tac>],[<ci>],[<AcT>][,<Active-Time>],[<Periodic-TAU>]</code> |
| 5 | For a UE that wants to apply PSM, enable network registration, location information and EMM cause value information unsolicited result code +CREG: <code><stat>[,<tac>],[<ci>],[<AcT>],[<cause_type>],[<reject_cause>][,<Active-Time>],[<Periodic-TAU>]</code> |

`<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) |

- NOTE 2: 3GPP TS 24.008 and 3GPP TS 24.301 specify the condition when the MS is considered as attached for emergency bearer services.



<ta>: string type; two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; four byte 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 |

- NOTE 3: 3GPP TS 44.060 specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
- NOTE 4: 3GPP TS 25.331 specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

<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, see the GPRS Timer 2 IE in 3GPP TS 24.008 Table

10.5.163/3GPP TS 24.008. See also 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, see the GPRS Timer 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 and 3GPP TS 23.401

Neul Hi2110 Implementation

- Only CREG <n> values of 0, 1 and 2 are supported.
- <stats> return values supported are 0-5
- Unsolicited notifications are not currently supported. This functionality will be added in a future release.

3.6 Signalling connection status (+CSCON)

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. Note however that this state is only updated when radio events, such as send and receive, 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

Command	Response	Example
+CSCON=[<code><n></code>]	+CME ERROR: <code><err></code>	AT+CSCON=0 OK
+CSCON?	+CSCON: <code><n></code> , <code><mode></code> [, <code><state></code>] +CME ERROR: <code><err></code>	AT+CSCON? +CSCON: 0, 1 OK
+CSCON=?	+CSCON: (list of supported <code><n></code> s)	AT+CSCON=? +CSCON: (0, 1) OK
	+CSCOM: <code><mode></code> , [<code><state></code>]	+CSCON: 1

Description

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: *Error Values* 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.

Defined values

`<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

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 List Available Commands (+CLAC)

This command lists the available AT commands.

Command	Response	Example
+CLAC	<AT Command> [<CR><LF><AT Command> [...]] +CME ERROR: <err>	AT+CLAC AT+GM AT+GMI ... AT+GSN AT+CLAC OK
+CLAC=?	+CME ERROR: <err>	AT+CLAC=? OK

Description

Execution command causes the MT to return one or more lines of AT Commands. Refer to Chapter 6: *Error Values* for possible <err> values

NOTE: This command only returns the AT commands that are available for the user.

Defined values

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

Neul Hi2110 Implementation

Hi2110 AT Command Set

Issue: 3

Owner: Neul

CogniDox Ref: **NL-002284-RN**

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3.8 Get signal strength indicator (+CSQ)

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.

Command	Response	Example
+CSQ	+CSQ: <rss>, <ber> +CME ERROR: <err>	AT+CSQ +CSQ: 4, 99 OK
+CSQ=?	+CSQ: (list of supported <rss>s), (list of supported <ber>s)	AT+CSQ=? +CSQ: (0-31, 99), (99) OK

Description

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

Test command returns values supported as compound values.

Defined values

<rss>: integer type

- 0 -113 dBm or less
- 1 -111 dBm
- 2...30 -109... -53 dBm
- 31 -51 dBm 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

Neul Hi2110 Implementation

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

3.9 Show PDP Addresses (+CGPADDR)

This command returns the IP address of the device.

Command	Response	Example
+CGPADDR[=<cid>[,<cid>[,<cid>[,<cid>]]]]	<pre>[+CGPADDR: <cid>[,<PDP_addr_1> [,<PDP_addr_2>]]] [<CR><LF>+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]] [...]]</pre> <p>IPv4: The string is given as dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4</p> <p>IPv6: The string is given as colon-separated hexadecimal parameter.</p>	<pre>AT+CGPADDR +CGPADDR:1,101.43.5.1 +CGPADDR:2,2001:db8:85a3::8a2e:370 +CGPADDR:3 AT+CGPADDR=1 +CGPADDR:1,101.43.5.1 OK</pre>
+CGPADDR=?	+CGPADDR=(list of defined <cid>s)	<pre>AT+CGPADDR=? +CGPADDR: (0,1) OK</pre>

Description

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: *Error Values* 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.

Defined values

- <cid>: integer type; specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).
- <PDP_addr_1> and <PDP_addr_2>: each is a string type that identifies 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>.

Neul Hi2110 Implementation

- Only IPv4 is supported.
- <cid> values between 0 & 10 are supported.

Hi2110 AT Command Set

Issue: 3

Owner: Neul

CogniDox Ref: **NL-002284-RN**

- With autoconnect enabled, <cid>=0 will not be listed until an IP address is acquired.

3.10 PLMN selection (+COPS)

Command	Response	Example
+COPS=[<mode>[,<format>[,<oper>[,<AcT>]]]]	+CME ERROR: <err>	AT+COPS=1,2,"320160" OK
+COPS?	+COPS:<mode>[,<format>,<oper>][,<AcT>] +CME ERROR: <err>	AT+COPS? +COPS:1,2,"320160" OK
+COPS=?	+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)] +CME ERROR: <err>	AT+COPS=? +COPS: (2,,, "24405"), (0,,, "24491"),, (0-2), (2) OK

Description

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 apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to 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: *Error Values* 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 name of the operator, 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 access technology selected parameters, <AcT>, 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.

**Defined values**

<mode>: integer type

- 0 automatic (<oper> field is ignored)
- 1 manual (<oper> field shall be present, and <AcT> optionally)
- 2 deregister from network
- 3 set only <format> (for read command +COPS?), do not attempt registration/deregistration (<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

- 0 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 upto 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

- 0 GSM
- 1 GSM Compact
- 2 UTRAN
- 3 GSM w/EGPRS (see NOTE 1)
- 4 UTRAN w/HSDPA (see NOTE 2)
- 5 UTRAN w/HSUPA (see NOTE 2)
- 6 UTRAN w/HSDPA and HSUPA (see NOTE 2)
- 7 E-UTRAN

-
- NOTE 1: 3GPP TS 44.060 specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
- NOTE 2: 3GPP TS 25.331 specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

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- <Act>, if provided, must be set to 7
- Only <format>=2 is supported
- Only <mode>=0, <mode>=1 & <mode>=2 are supported

3.11 PS attach or detach (+CGATT)

Command	Response	Example
+CGATT=<state>	+CME ERROR:<err>	AT+CGATT=1 OK
+CGATT?	+CGATT:<state>	AT+CGATT? +CGATT:0 OK
+CGATT=?	+CGATT:(list of supported <state>s)	AT+CGATT=? +CGATT:(0,1) OK

Description

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: *Error Values* for possible <err> values.

- NOTE 1: If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup.

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.

- NOTE 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.

Defined Values

<state> integer type; indicates the state of PDP context activation. The default value is manufacturer specific.

0	detached
1	attached

<err> error value

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3.12 Request international mobile subscriber identity (+CIMI)

Returns International Mobile Subscriber Identity (string without double quotes).

Command	Response	Example
+CIMI	<IMSI> +CME ERROR:<err>	AT+CIMI 460001357924680 OK
+CIMI=?		AT+CIMI=? OK

Description

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: *Error Values* for possible <err> values

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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, see 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, <PDP_type>, the parameter value ranges for each <PDP_type> are returned on a separate line.

Defined values

<cid>: 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.

- NOTE 1: The <cid>s for network-initiated PDP contexts will have values outside the ranges indicated for the <cid> in the test form of the commands +CGDCONT and +CGDSCONT.

<PDP_type>: string type; specifies the type of packet data protocol. The default value is manufacturer specific.

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])

- NOTE 2: Only IP, IPV6 and IPV4V6 values are supported for EPS services.

<APN>: 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 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. NOTE 3: 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 SDCP 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. , see 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.

- NOTE 4: If the PDP context for emergency bearer services is the only activated context, only emergency calls are allowed, see 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, see 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".
 - NOTE 5: The MT utilises the provide NSLPI information as specified in 3GPP TS 24.301 [83] and 3GPP TS 24.008 .

<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, see 3GPP TS 24.008 subclause 10.5.6.3.

- 0 Preference of IPv4 MTU size discovery not influenced by +CGDCONT
1 Preference of IPv4 MTU size discovery through NAS signalling

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- 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 is supported.

3.14 Set phone functionality (+CFUN)

Command	Response	Example
+CFUN=[<fun>[,<rst>]]	+CME ERROR: <err>	AT+CFUN=1 OK
+CFUN?	+CFUN:<fun>	AT+CFUN? +CFUN:1 OK
+CFUN=?	+CFUN:(list of supported <fun>s), (list of supported <rst>s)	AT+CFUN=? +CFUN:(0,1),(0-1) OK

Description

Set command selects the level of functionality <fun> 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 6 Error Values for possible error values. Refer to Chapter 6: Error Values for possible <err> values.

NOTE 1: It is manufacturer specific if this command affects network registration. Command Operator Selection +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.

Defined values

<fun>: integer type

- 0 minimum functionality
1 full functionality. Enable (turn on) the 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=?. Current +CSRA setting is ignored. It is not required that the MT transmit and receive RF circuits are in a disabled state for this setting to have effect.
2 disable (turn off) MT transmit RF circuits only
3 disable (turn off) MT receive RF circuits only
4 disable (turn off) both MT transmit and receive RF circuits
5...127 reserved for manufacturers as intermediate states between full and minimum functionality

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- 128 Full functionality with radio access support according to the setting of +CSRA. Enables (turns on) the transmit and receive RF circuits if 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 detach. 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

NOTE 2: This shall be always default when <rst> is not given.

1 reset the MT before setting it to <fun> power level

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

3.15 Report mobile termination error (+CMEE)

Command	Response	Example
+CMEE=<n>		AT+CMEE=1 OK
+CMEE?	+CMEE:<n>	AT+CMEE? +CMEE:1
+CMEE=?	+CMEE:(list of supported <n>s)	AT+CMEE=? +CMEE=(0,1) OK

Description

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: *Error Values* for possible <err> values

Defined values

<n>: integer type

0 disable +CME ERROR: <err> result code and use ERROR instead

1 enable +CME ERROR: <err> result code and use numeric <err> values (Refer to Chapter 6: *Error Values* for possible <err> values)

2 enable +CME ERROR: <err> result code and use verbose <err> values

Neul Hi2110 Implementation

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



4. Commands (Neul)

4.1 Neul Send Message Command (+NMGS)

Send a message using the CDP server.

Command	Response	Example
+NMGS=<length>,<data>	+CME ERROR: <err>	AT+NMGS=3,AA11BB OK

Description

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: *Error Values* for possible <err> values.

Defined values

<length>	Decimal length of message.
<data>	Data to be transmitted in hexstring format.
<err>	TBD

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- There is a maximum data length of 512 bytes.

4.2 Neul Get Message Command (+NMGR)

Receive a message from the CDP server.

Command	Response	Example
+NMGR	<length>,<data> +CME ERROR: <err>	AT+NMGR 5,48656C6C6F OK

Description

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.

Defined values

<length>	Decimal length of message.
<data>	Data received in hexstring format.

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- Maximum received data length is 512 bytes.



4.3 Neul New Message Indications (+NNMI)

Command	Response	Example
+NNMI=<status>	+CME ERROR: <err>	AT+NNMI=1 OK
+NNMI?	+NNMI:<indications>	AT+NNMI? +NNMI:1 OK

Description

This command sets or gets whether new message indications 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: *Error Values* for possible <err> values.

When new message indications and messages are enabled (NNMI=1), all currently buffered messages will be returned.

Response	Example
+NNMI:<length>,<data>	+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.

Response	Example
+NNMI	+NNMI

The default setting is 0: no indications are sent.

Defined values

<status>

- 0, No indications
- 1, Indications and Message
- 2, Indications only

<length>Decimal length of message.

<data> Data to be transmitted in hexstring format.

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4.4 Neul Sent Message Indications (+NSMI)

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

Command	Response	Example
+NSMI=<indications>	+CME ERROR: <err>	AT+NSMI=1 OK
+NSMI?	<indications>	AT+NSMI? +NSMI:1 OK

Description

If sent message indications are turned on, the following unsolicited informational response will be issued when a new message is sent into NB-IoT stack.

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

Response	Example
+NSMI:<status>	+NSMI:SENT

The default setting is 0: no indications are sent.

Defined values

<indications>

0, No indications

1, Indications will be sent

<status>

SENT

DISCARDED

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4.5 Neul Query Messages Received (+NQMGR)

Command	Response	Example
+NQMGR	BUFFERED=<buffered>, RECEIVED=<received>, DROPPED=<dropped> +CME ERROR: <err>	AT+NQMGR BUFFERED=0,RECEIVED=34,DROPPED=2 OK AT+NQMGR OK

Description

This command queries the status of the received downstream messages received from the CDP server.

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

Defined values

<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

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4.6 Neul Query Messages Sent (+NQMGs)

Command	Response	Example
+NQMGs	PENDING=<pending>, SENT=<sent>, ERROR=<error> +CME ERROR: <err>	AT+NQMGs PENDING=1, SENT=34, ERROR=0 OK AT+NQMGs OK

Description

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

Defined values

<pending> The number of messages waiting to be sent in the upstream buffer, if a registered and activated Layer 3
<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

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4.7 Neul Reboot (+NRB)

Command	Response	Example
+NRB	REBOOTING/r/n	AT+NRB REBOOTING

Description

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: *Error Values* for possible <err> values.

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.

Defined values

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4.8 Configure and Query CDP Server Settings (+NCDP)

Command	Response	Example
+NCDP=<ip_addr>[,<port>]	+CME ERROR: <err>	AT+NCDP=192.168.5.1 OK
+NCDP?	+NCDP:<ip_addr>,<port> +CME ERROR: <err>	AT+NCDP? +NCDP:192.168.5.1,5683 OK

Description

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

+NCDP=

Will update the CDP server configuration from the supplied parameters. If they are set correctly, return OK. If it fails, an error is returned.

+NCDP?

Return the current CDP server IP address and port. Will return an error if not set.

Defined values

<ip_addr>

IPv4 address

IP address in dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4

<port> Unsigned integer 1-65535. Default to 5683 if not specified.

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

4.9 Query UE Statistics (+NUESTATS)

Command	Response	Example
+NUESTATS	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> +CME ERROR: <err>	AT+NUESTATS 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

Description

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

Defined values

<signal power in centibels>

<total power in centibels>



<current TX power level in centibels >
<total TX time since last reboot in millisecond>
<total Rx time since last reboot in millisecond>
<last cell ID>
<last DL MCS value>
<last UL MCS value>
<last DCI MCS value>

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4.10 Specify search frequencies (+NEARFCN)

Command	Response	Example
+NEARFCN=<search_mode>,<earfcn>	+CME ERROR: <err>	AT+NEARFCN=0,10 OK

Description

The set command provides a mechanism to lock to a specific E-ULTRA Absolute Radio Frequency Channel Number (EARFCN).

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

Defined values

<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

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4.11 Create Socket (+NSOCR)

Create a socket and associate with specified protocol.

Command	Response	Example
+NSOCR=<type>,<protocol>,<listen port>[,<receive control>]	<socket> +CME ERROR: <err>	AT+NSOCR=DGRAM,17,56 1 OK AT+NSOCR=DGRAM,17,1234,0 2 OK

Description

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

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

Defined values

<type> Socket Type. Supported value is DGRAM.
<protocol> Standard internet protocol definition. For example, UDP is 17.

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<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. Defaults to 1 (messages will be received)

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 SendTo Command (UDP only) (+NSOST)

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

Command	Response	Example
<code>+NSOST= socket, remote addr, remote_port, length, data</code>	<code>socket, length</code> <code>+CME ERROR: <err></code>	<code>AT+NSOST=1,192.158.5.1,1024,2,AB30</code> 1,2 OK

Description

This command sends a UDP datagram 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, the +NSOST return value will indicate how much of the data was successfully sent. Refer to Chapter 6: *Error Values* for possible <err> values.

Defined values

<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 that messages will be received on
<length>	Decimal length of data to be sent.
<data>	Data received in hexstring format, or quoted string format.

Neul Hi2110 Implementation

- Maximum data size is 512 bytes.
- Only IPv4 is supported.
- <data> Only hexstring format is supported

4.13 Receive Command (UDP only) (+NSORF)

Command	Response	Example
<code>+NSORF=<socket>,<req_length></code>	<code><socket>,<ip addr>,<port>,<length>,<data>,<remaining_length></code> <code>+CME ERROR: <err></code>	<code>AT+NSORF=1,10</code> 1,192.168.5.1,1024,2,ABAB,0 OK

Description

Reads up to <req length> characters of data from <socket>. Returned length is the actual number of characters returned.



Receive data on a socket. When data arrives a +NSONMI response will be generated that indicates the socket the message was received on and 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: *Error Values* 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.

Defined values

<socket>	Socket number returned by +NSOCR
<req_length>	Maximum amount of data to be returned as a decimal byte length.
<remote addr>	Address of system sending the message
IPv4:	A dot notation IP address
<remote 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 hexstring format

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 Close Socket (+NSOCL)

Command	Response	Example
+NSOCL= socket	+CME ERROR: <err>	AT+NSOCL=1 OK

Description

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.

Defined values

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

Neul Hi2110 Implementation

4.15 Socket message arrived indicator (+NSONMI) (Response Only)

Command	Response	Example
+NSONMI:	<socket>, <length>	+NSONMI:1,10

Description

Unsolicited message to notify that data has been received on a socket and is ready to be read. 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: *Error Values* for possible <err> values.

Defined values

<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 Test IP network connectivity to a remote host (+NPING)

Command	Response	Example
+NPING=<remote_address>	+CME_ERROR: <err>	AT+PING=192.168.1.1 OK
+NPING	+NPING:<retry_num>,<remote_address>,<t t1>,<rtt>	+NPING:1,192.168.1.1,20,50
+NPINGERR	+NPINGERR:<err>	+NPINGERR:1

Description

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

AT+NPING initiates the sending of a PING packet to the specified address. This will either cause a packet 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.

Defined values

<remote addr> Address of system sending the message
 IPv4: A dot notation IP address
 <retry_num> numer of packets sent before a response was received.
 <t1> ttl in the response packet
 <rtt> elapsed time in msec from packet sent to response received.

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<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

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4.17 Set Supported Bands (+NBAND)

Command	Response	Example
+NBAND=n[,n[,n[...]]]	+CME ERROR: <err>	AT+NBAND=5,8 OK
+NBAND?	+NBAND: n[,n[,n[...]]]	AT+NBAND? +NBAND:5,8 OK
+NBAND=?	+NBAND: (n[,n[,n[...]]])	AT+NBAND=? +NBAND: (5,8,20) OK

Description

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

Defined values

<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 Set Debug Logging Level (+NLOGLEVEL)

Command	Response	Example
+NLOGLEVEL=<core>,<level>	+CME ERROR: <err>	AT+NLOGLEVEL=PROTOCOL,ERROR OK
+NLOGLEVEL?	+NLOGLEVEL:<core>,<level>	AT+NLOGLEVEL? +NLOGLEVEL:PROTOCOL,ERROR +NLOGLEVEL:SECURITY,NONE +NLOGLEVEL:APPLICATION,WARNING OK
+NLOGLEVEL=?	+NLOGLEVEL: (<core>,...), (<level>,<level>,...)	AT+NLOGLEVEL=? +NLOGLEVEL: (PROTOCOL,APPLICATION,SECURITY), (VERBOSE,NORMAL,WARNING,ERROR,NONE) OK

Description

This command sets the logging level. It can take one of the following values: The default logging level is NONE. This value is persistent across reboots.

Defined values

<level> Logging level required
VERBOSE

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NORMAL
WARNING
ERROR
NONE

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

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5. Commands (Temporary)

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 Set ID (+NTSETID)

Set system identities. This is a temporary command that will be replaced with a production tool

Command	Response	Example
+NTSETID=<snt>,<data>	+CME ERROR: <err>	AT+NTSETID=1,123456789012345 OK

Description

Set uuid or IMEI value.

Defined values

<snt> integer type indicating the serial number type that has been requested.
1 set the IMEI (International Mobile station Equipment Identity)
2 SVN
<data>
If <snt>=1 IMEI 15-character string type in decimal format
If <snt>=2 SVN 2 digit SVN

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IMEI is persistent.

SVN is not persistent and will default to 0x00;



6. Error Values

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

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

6.1 Overview

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.

6.2 General Errors

Error Code	Error Text	Error Code	Error Text	Error Code	Error Text
3	operation not allowed	4	operation not supported	23	memory failure
50	Incorrect parameters				

6.3 NEUL specific error codes

Error Code	Error Text	Error Code	Error Text	Error Code	Error Text
256					



7. Examples

7.1 UDP Sockets

7.1.1 Sending a message

A simple example sending a UDP datagram. Once the socket is closed, no replies will be received.

```
AT+NSOCR=17
1
OK
AT+NSOST=1,192.158.5.1,8080,19,"http://www.neul.com"
1,19
OK
AT+NSOCL=1
OK
```

7.1.2 Receiving messages from multiple remote systems

An example receiving messages from multiple hosts and consuming different amounts of the received data.

```
AT+NSOCR=17,1024
1
OK
+NSONMI:1,11
AT+NSORF=1,5
1,192.168.5.1,1024,5,68656C6C6F,6
OK
AT+NSORF=1,999
1,192.168.5.1,1024,6,20776F726C64,0
OK
+NSONMI:1,8
AT+NSORF=1,8
1,10.11.12.13,32701,8,616172647661726B,0
OK
```

7.1.3 Server

Example of a server-style implementation, where multiple remote systems can request to communicate with the UE.

Messages:

```
63616E204920636F6E6E656374 "can I connect"
73757265 "sure"
```

Example

```
AT+NSOCR=17,56
1
OK
+NSONMI:1,13
AT+NSORF=1,13
1,192.168.5.1,1234,13,63616E204920636F6E6E656374,0
```

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```
OK
AT+NSOCR=17,45678
2
OK
AT+NSOST=2,192.158.5.1,1234,4,73757265
2,4
OK
+NSONMI:1,13
AT+NSORF=1,13
1,10.11.12.13,2345,13,63616E204920636F6E6E656374,0
OK
AT+NSOCR=17,45679
3
OK
AT+NSOST=3,210.11.12.13,2345,4,73757265
3,4
OK
```

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