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Modules

AT Command Reference Guide

WP8548, WP75xx, WP76xx, and WP77xx

December 2025

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Sierra Wireless

Semtech Corporation acquired Sierra Wireless in January 2023. The Sierra Wireless brand is gradually being phased out. During the phase-out period, references to both "Semtech" and "Sierra Wireless" may appear in product documentation.

Contact Information

Sales information and technical support, including warranty and returns	Web: sierrawireless.com/company/contact-us/ Global toll-free number: 1-877-687-7795 6:00 am to 6:00 pm PST
Corporate and product information	Web: sierrawireless.com

Revision History

Revision number	Release date	Changes
1	Nov 2015	▪ Document created

Revision number	Release date	Changes
2	Sep 2016	▪ Updated chapter: Modem Status, Customization, and Reset Commands · Removed +CGXCONT, $DIAG, !GCFEN, !GOBIIMPREF, !HWID, !LTENAS, !UDUSBCOMP, !SELACQ, !SIMRSTC · Added !IMPREF, !MAPUART, !PRLVER, !SELSNR, !USBCOMP, +WDDM, +WUSLMSK · Updated !BAND (added <Tdsmask> parameter>), +GMR (<tag> example>), !GSTATUS (show all response formats and parameters), ^MODE (<mode> parameter>), !PCINFO (response format, <ForceFlag> options), !PCTEMP (response format, added <mode>), !POWERDOWN (description/behavior), !PRIID (removed Execute format), !SCACT (<profile> parameter usage, default pid activation), !UDINFO (removed DIP interface type) · Moved commands from Audio chapter to Modem chapter: !PRLVER · Added !CUSTOM customization "BOOTQUIETDISABLE", "DHCPRELAYENABLE", "FASTBOOTEN", "HARDCODEDIPEN", "HSICENABLE", "IMCONFIG", "JAMENABLE", "RMNETREDIALEN" · Removed !CUSTOM customization(s): "CMCLIENT", "CSVOICEREJECT", "FLOWNOT-DISABLE", "GMMCAUSE7REMAP", "GOBIIMEN", "GPSSEL", "IMSIREFRESH", "ISVOICEN", "NETWORKNAMEFMT", "NOROAM", "QMIDETACHEN", "REL8FASTDORMDIS", "RRCREL7-CAPDIS", "UBISTENABLE", "USBSERIALENABLE", "WIN7MBOPTIONS" · Added unsolicted notifications: !AVVOCODER, !AMR_NB, !AMR_WB, +CSQ, !EONS, !EVRC, !EVRC_B, !EVRC_NW, !EVRC_WB, !GSM_EFT, !GSM_FR, !GSM_HR, ^MODE, !MODE, !NI, !PATEMP, !PCDEFR, !PCTEMP, !PCVOLT, !PSCS, !QCELP13K, !RI, RING, !RSSI, !SRV, !UIMREGSTATE, !UIMSTATUS, +WANS, +WCC, +WCNT, +WDDI, +WEND, +WJAM, +WMGF, +WORG, +WRMICN, +WVMI ▪ Updated chapter: Diagnostic Commands · Removed !RXDEN ▪ Removed chapter: Test Commands ▪ Updated chapter: GNSS Commands · Removed !GPSKEEPWARM, !GPSLBSAPN, !GPSMOMETHOD, !GPSMTLRSETTINGS, !GPSNIQOSTIME, !GPSNMEA, !GPSNMEACONFIG, !GPSNMEASENTENCE, !GPSONLY, !GPSPORTID, !GPSPOSMODE · Updated !GPSSATINFO (# of satellites), !GPSSUPLURL (added <portID>), !GPSTRANSSEC (<security> options) ▪ Removed chapter: OMA-DM Commands ▪ Removed chapter: SAR Backoff and Thermal Control Commands ▪ Updated chapter: Audio Commands · Removed !AVFLTREN, !AVRXAGC, !AVRXAVC, !RVRXG, !AVTXAGC, !AVTXG, +CMEP, +CNTI, !MLDTMFEN, +VTSBST, +WANTGNSSPWR, +WANTS, +WFSH, +WSOS · Updated !AVAUDIOLPBK (added <enable> values), !AVCFG (<interface> values), !AVSET-PROFILE (<volume> parameter), !AVSETVOL (<volume> parameter) · Added !AVAUDVOL, !AVCODECMICTXG, +CLVL ▪ Added Chapter: I/O Commands · Added !GPIOINT, !RIOWNER, !WEXTCLK, +WIOCFG, +WRID, +WWAKE, +WWAKESET · Moved commands from Audio chapter to I/O chapter: !MADC, +WIOR, +WIOW (Continued on next page)

Revision number	Release date	Changes

		▪ Added AirVantage Commands chapter
		  ▪ Added +WDSC, +WDSE, +WDSG, +WDSI, +WDSR, +WDSS
		▪ Added Chapter: Supported GSM/WCDMA AT Commands.
		  ▪ Added Result Codes section to Table 14-1
		  ▪ Added 27.007 commands to Table 14-3: +CGCONTRDP, +CGEQOS, +CGSCONTRDP, +CGTFTRDP, +CSIM
		  ▪ Updated 27.007 commands to Table 14-3: +CGCMOD (supported), +CPBR (supported)

3	Jun 2017	▪ Updated AT Password Commands chapter
		  ▪ Updated !ENTERCND and !SETCND parameter <key> format — special characters allowed
		▪ Updated Modem Status, Customization, and Reset Commands chapter
		  ▪ Added +KSLEEP, !POWERMODE, !POWERWAKE
		  ▪ Added !CUSTOM customizations: EXTUIMSWITCHEN, FLOWNOTIDISABLE, IPCHANNEL-RATEEN, UIMDETPULL
		  ▪ Removed +GMR, &V
		  ▪ Updated !GSTATUS? response format (WCDMA); added <smode>, <n>
		  ▪ Updated !PCDEFR <state> description
		  ▪ Updated !PCINFO <state> strings
		  ▪ Corrected !PRIID description
		  ▪ Corrected !UDPID? response format
		  ▪ Updated !GETBAND response format (removed 'Unknown')
		▪ Added Test Commands chapter
		▪ Updated GPS Commands chapter
		  ▪ Updated !GPSAUTOSTART command format (<function> replaces <enable>)
		  ▪ Updated !GPSSATINFO <SV n> description
		  ▪ Removed !GPSXTRAAAPN
		▪ Updated SIM Commands chapter
		  ▪ Added +CCID, +CCID (notification), +KSIMSEL
		▪ Added OMA-DM Commands chapter
		▪ Added SAR Backoff and Thermal Control Commands chapter
		  ▪ Added !SARBACKOFF, !SARINTGPIOMODE, !SARSTATE, !SARSTATEDFLT
		▪ Updated Audio Commands chapter
		  ▪ Corrected !AVAUDIO examples (removed quotations from filenames)
		  ▪ Updated !AVNS formats — changed <value> to <ns>, added <fns>
		▪ Updated I/O Commands chapter
		  ▪ Added !MCCELL, !MVCOIN
		  ▪ Added usage restriction for +WIOR
		  ▪ Corrected +WDSI <Level> description
		  ▪ Corrected +WIOCFG <trigger> description

4	Sep 2017	▪ Added WP77xx

Revision number	Release date	Changes

5	Feb 2018	▪ Updated About chapter — Added Response Format topic to explain whitespace display
		▪ Updated AT Password Commands chapter
		  · Updated !ENTERCND, !SETCND
		▪ Updated Modem Status Commands chapter
		  · Updated !ANTSEL, !BAND, +KSLEEP, !PCINFO, !PCVOLTLIMITS, !SCACT, !UDPID
		  · Updated !CUSTOM customizations: "RMNETREDIALEN"
		  · Added !CUSTOM customizations: "BOOTUARTDLOADEN", "GPSSEL"
		  · Added +CEDRXDP, +CEDRXS, +CPSMS, +KCELL, +KMCLASS, +KSRAT, +KSREP, +KSUP (notification), !MUSLEN, !NETNUM, !NI (notification), *PSRDBS, *PSSTKI (WP76xx/77xx), !SELACQ, !SELCIOT, !SELRAT, !SELSNR, !USBINFO, !USBPID, +WFWUPD, +WFWUPD (notification)
		▪ Added SIM Toolkit chapter
		▪ Updated Diagnostic Commands chapter
		  · Added !RXDEN
		▪ Updated Test Commands chapter
		  · Added !DAGGAVGRSSI, !DAGSRXBURST, !DAGSTXFRAME, !DALSNSVAL, !DALSTXMOD, !DALSTXPWR, !DAWSTXPWR
		▪ Updated Memory Management Commands chapter
		  · Updated !RMARESET
		▪ Updated GPS Commands chapter
		  · Added !GNSSCONFIG, !GPSNMEASENTENCE
		  · Updated !GPSAUTOSTART, !GPSFIX, !GPSSUPLVER, !GPSTRACK, !GPSXTRAINITDNLD
		▪ Updated OMA-DM Commands chapter
		  · Added !IDSDEBUGPRINT, !IMSTESTMODE
		▪ Updated Thermal Mitigation Commands chapter
		  · Added +KRFMUTE, +KRFMUTE (notification), !MAXPWR
		  · Updated !SARBACKOFF
		▪ Updated Audio Commands chapter
		  · Updated !AVTONEPLAY (<tone>), +VTS
		▪ Updated I/O Commands chapter
		  · Updated +WIOCFG, +WIOR
		▪ Updated AirVantage Commands chapter
		  · Updated +WDSC, +WDSR, +WDSS
		▪ Indicated 27.005 command +CNMI limitations
		▪ Marked 27.007 command +CGEQNEG as unsupported

Revision number	Release date	Changes
6	Oct 2018	Updated Modem Status Commands chapter • Corrected +CPSMS query list format, +CPSMS query list format • Added !CUSTOM customizations: BANDSELENEN, CSDDISABLE, EXTGPSLNAEN, LTECOEX-UARTENABLE, SNTPEN, UIMAUTOSWITCH • Updated *PSRDBS <band> values • Updated USBCOMP <Interface bitmask> values • Added +CBST, +CMUX, !DATALOOPBACK, !IMAGE, !MUXMODE, !SCUMMTU • Updated !ANTSEL (response formats for LTE CA conflicts, <gpio> details), !PRLVER (WP7504 only); !POWERWAKE (trigger value usage, <gpio> details) • Corrected !BAND execution format Updated GNSS Commands chapter • Added !GNSSDPOMODE, !GPSMTLRSETTINGS • Corrected !GPSXTRATIME execution response Updated SAR Backoff Commands chapter • Added !SARGPIO • Updated !SARINTGPIOMODE (noted minimum WPx5xx revision) Updated Audio Commands chapter • Updated <profile> range in !AV commands for WP76xx/WP77xx • Updated <volume> range in !AVSETVOL and !AVSETPROFILE for WP76xx/WP77xx, and <level> range in +CLVL • Updated !AVAUDIOLPBK — <enable>='2' for WPx5xx only Updated I/O Commands chapter • Marked !MCCELL, !MVCOIN support for WP75xx/8548 only • Updated +WEXTCLK — <mode_select>='2' for WPx5xx only • Updated +WIOCFG (<func> details for antenna select) Updated Supported GSM / WCDMA AT Commands chapter • Updated +IPR description Updated Supported 27.007 Commands table • +CGCLASS/+CIND not supported by WP77xx

Revision number	Release date	Changes
7	Sep 2019	Updated UIM2 descriptions across document Updated Modem Status Commands chapter • Updated !ANTSEL (band range), +CMUX (<N1> default), !GSTATUS (simplified response format description), !IMAGE (response format example/description), +KCELL (<rscp> description), +KSLEEP (<mngt> inactivity duration), !MAPUART (UART2 note, query response (optional parameter)), !PCTEMP (removed spaces from <mode> values, added WP76/77 format), !POWERMODE (added Query format, <mode> notes for WP76xx/ WP77xx), !POWERWAKE (fixed execution(timer) format typo, added <pull> to execution (GPIO), updated response formats, updated <timeout> and <active_time>), !SELACQ (note for last PLMN), +WORG (added CSFB examble), +WRID execution format (optional parameter), +WWAKESET execution format (optional parameter) • Added +CGAUTH, +CGDCONT (detailed command), !MCUWATCHDOG, +WJAMTHRESH, +WMGF • Added customizations: UAUDLOADDISABLE (and notes on effect on BOOTUARTDLOADEN customization), UIM2ENABLE • Updated customization BOOTQUIETDISABLE (applies to all WP) • Removed customizations: FASTBOOTEN, PCSCDISABLE (for WP76xx), UAUDLOAD-DISABLE (for WP77xx) Updated SIM Toolkit Commands chapter • Updated +CSPN (query format), !STKC (<cmdID=5> needs response), !STKCR (<cmdID=5> data format, several parameter updates), !STKGC (<cmdID=5> data format) • Added !ICCID Updated GPS Commands chapter • Added !GPSIDREN • Updated !GNSSDPOMODE (added Requirements) Updated Test Commands chapter • Added !DALGAVGAGC • Updated !DACGPSMASKON (<logmask> parameter description), !DASPDM (<PDMvalue>), !LEDTEST (removed Query response, updated <led_no>) Updated GPS Commands chapter • Updated !GNSSDPOMODE (requirements), !GPSNMEASENTENCE (added types 21–23) • Added !GPSIDREN Updated SIM Commands chapter • Updated +CPINR (<CPIN TYPE> valid values descriptinon), !UIMS (Query response format) • Added +CSPN Updated OMA-DM Commands chapter • Updated !HOSTDEVINFO (<hostid> replaced <hostplasmaid>) Updated Audio Commands chapter • Updated !AVDEF (added WP76/77 format) Updated I/O Commands chapter • Updated +CMUX (default <N1> value), +WIOCFG (usage notes), +WRID (execution description) Updated AirVantage Commands chapter • Updated +WDSI (<Level> range, <Event>=25), +WDSS (<Cid> range) Updated Supported GSM / WCDMA AT Commands chapter • Updated +CMER (note), +IPR (added default value, added !MUXMODE-related usage note)
7.1	Sep 2019	Updated page headers (displayed incorrect title)

Revision number	Release date	Changes
8	Aug 2020	Updated Modem Status Commands chapter • Updated customizations: GPSLPM (removed 'Default'), SIMLPM (QMI restriction) • Updated !NETNUM (<usb_netnum> range), !PATEMP (query response format), !PCTEMP (<state> 'initialization' value), !PCTEMP (notification) (terminology), !PCTEMPLIMITS (reset required), !PCVOLT (notification) (terminology), !PCVOLTLIMITS (reset required), !SELACQ, +WWAKESET • Added !SECINFO Updated Diagnostic Commands chapter • Updated !RXDEN Updated Test Commands chapter • Updated !DALSPARANGE (query response), !DALSWAVEFORM, !DASBAND (<rfband>), !DASCHAN (<rfchannel>) Updated Memory Management Commands chapter • Added !PARTITION Updated GPS Commands chapter • Updated !GNSSCONFIG, !GPSCLRASSIST (TTTF usage note), !GPSXTRASTATUS (<dataStatus>) Updated OMA-DM Commands chapter • Updated !HOSTDEVINFO (execution format; parameter names), !OSINFO (execution format) Updated SAR Backoff and Thermal Control Commands chapter • Updated !SARBACKOFF (LTE <Band> range) Updated AirVantage Commands chapter • Added Restoring AVMS Default Configuration • Updated +WDSC (<Timer> details) Added SMS Wake Commands chapter (!SMSWAKE, !SMSWAKEWIDTH) Updated Supported GSM / WCDMA AT Commands chapter • Updated +CCLK (support), +CIND (<battchg> not supported), +CLIP (note), +CTUZ (support) • Corrected 27.007 &C (command format)
9	July 2025	Updated Modem Status, Customization, and Reset Commands • !CUSTOM • !RESET • !USBCOMP Updated OMAA-DM Commands • !HOSTDEVINFO
10	December 2025	Updated Modem Status, Customization, and Reset Commands • !CUSTOM • !USBCOMP

Contents

1: About This Guide

1.1 Introduction

This document describes supported standard and proprietary AT commands available for Semtech AirPrime® WP products, and provides details where commands vary from the standards.

Important: *This document applies to the following WP Series module groups (as of date of publication): WP85xx, WP75xx, WP76xx, WP77xx.*

These commands are intended for use by OEMs, and are supplemental to the standard AT commands for GSM devices defined by the 3GPP (3rd Generation Partnership Project) in *TS 27.007 AT command set for User Equipment (UE)* and *TS 27.005 Use of Data Terminal Equipment — Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (BSE)*.

Note: For questions or concerns relating to command implementation, please contact your Semtech account representative.

1.2 Command Access

Some commands in this reference are password-protected. To use these commands, enter the correct password using AT!ENTERCND on page 27. Once the password is entered, all commands are available and remain available until the modem is reset or powered off and on.

The password assigned to !ENTERCND is unique to each customer and is configured onto the modem during manufacture. If you do not know your password, contact your Sierra Wireless Account Manager or Semtech distributor.

1.3 Command Timing

1.3.1 Interval Timing

Some commands require time to process before additional commands are entered. For example, the modem returns OK when it receives **AT**!DAFTMACT. If **AT**!DASBAND is received too soon after this, the modem returns an error.

When building automated test scripts, ensure that sufficient delays are embedded, where necessary, to avoid these errors.

1.3.2 Escape Sequence Guard Time

The AT escape sequence "**+++**" requires a guard time of 1.0 seconds before and after it is used.

1.4 Result Codes

Result codes are not shown in the command tables unless special conditions apply. Generally the result code OK is returned when the command has been executed. ERROR may be returned if parameters are out of range, and is returned if the command is not recognized or is not permitted in the current state or condition of the modem.

1.5 Response Formats

Response formats shown in this document are intended to accurately describe the non-whitespace content of responses. For display purposes within this document, extraneous whitespace content (blank lines between lines of text) may not be displayed, and whitespace (blank spaces) between text segments within lines may be shorter or longer than what is received in actual responses.

For example:

```
AT!THISEXAMPLE?

THISEXAMPLE:

TestVal1=7          TestVal2=Hello

OK
```

could be shown in this document without extra blank lines and with less space between TestVal1 and TestVal2

```
AT!THISEXAMPLE?

THISEXAMPLE:
TestVal1=7   TestVa2=Hello
OK
```

If automated scripts are used to parse command responses, make sure to parse whitespace appropriately.

1.6 References

This guide covers the command sets used by OEMs, designers and testers of Semtech AirPrime products, plus general operational use commands.

For additional product-specific documentation, refer to source.sierrawireless.com.

1.7 Terminology and Acronyms

This document makes wide use of acronyms that are in common use in data communications and cellular technology.

1.8 Current Firmware Versions

1.8.1 Version

To determine your firmware revision, enter the identification command **AT+GMR**.

1.8.2 Upgrading

To check for newer modem firmware, go to the device page at source.sierrawireless.com and select the Firmware option.

1.9 Document Structure

This document describes the proprietary commands listed in the tables below — each table corresponds to a specific chapter.

AT Password Commands — Commands used to enable access to password-protected AT commands and to set the AT command password.

Table 1-1: AT Password Commands

Command	Description	Page
!ENTERCND	Enable access to password-protected commands	27
!SETCND	Set AT command password	28

Modem Status, Customization, and Reset Commands — Commands used to determine modem status, adjust customization settings, and reset the modem.

Table 1-2: Modem Status Commands

Command	Description	Page
!AMR_NB (notification)	Vocoder in use — Unsolicited notification	33
!AMR_WB (notification)	Vocoder in use — Unsolicited notification	33
!ANTSEL	Set/query external antenna select configuration	34
!AVVOCODER (Notification group)	Vocoder in use — Unsolicited notifications	36
!BAND	Select/return frequency band set	37
!BOOTHOLD	Reset modem and wait in bootloader for firmware download	40
+CBST	Select Circuit-Switched Bearer	41
+CEDRXRDP	Read eDRX Dynamic Parameters	42
+CEDRXS	Configure eDRX	43
+CGAUTH	Set/Report PDP connection authentication parameters	44
+CGDCONT	Define PDP context	45
+CMUX	Configure Multiplexing Control Channel	47
+CPSMS	Configure Power Saving Mode (PSM)	49
+CSQ (notification)	RSSI change across threshold — Unsolicited notification	50
!CUSTOM	Set/return customization settings	51
!DATALOOPBACK	Enable/disable and configure loopback mode	57
!EONS (notification)	Enhanced Operator Name String (EONS) — Unsolicited notification	58
!EVRC (notification)	Vocoder in use — Unsolicited notification	58
!EVRC_B (notification)	Vocoder in use — Unsolicited notification	58
!EVRC_NW (notification)	Vocoder in use — Unsolicited notification	58

Table 1-2: Modem Status Commands (Continued)

Command	Description	Page
!EVRC_WB (notification)	Vocoder in use — Unsolicited notification	58
!GETBAND	Return the current active band	58
!GETRAT	Return the current active radio access technology (RAT)	59
!GSM_EFR (notification)	Vocoder in use — Unsolicited notification	59
!GSM_FR (notification)	Vocoder in use — Unsolicited notification	59
!GSM_HR (notification)	Vocoder in use — Unsolicited notification	59
!GSTATUS	Return operational status	60
!IMAGE	Manage Firmware Images	69
!IMPREF	Query/set Image Management preferences	71
+KCELL	Display Detected Cell Details	72
+KMCLASS	Set 2G multislot class	75
+KSLEEP	Configure UART1 power management (sleep mode entry conditions)	76
+KSRAT	Set the current RAT	77
+KSREP	Enable/disable startup reporting	78
+KSUP (notification)	Startup notification (unsolicited notification)	79
!LTEINFO	Display LTE network information	80
!MAPUART	Map services to UART	82
!MCUWATCHDOG	Set/Report MCU Watchdog Parameters	83
!MODE (notification)	Current system mode — Unsolicited notification	84
!MUSLEN	Enable/disable unsolicited messaging feature	84
!NETNUM	Set/report number of supported network interfaces	85
!NI (notification)	Network identity — Unsolicited notification	86
!PACKAGE	Return package version string	86
!PATEMP	Return PA temperature information	87
!PATEMP (notification)	PA temperature state change — Unsolicited notification	87
!PCDEFR (notification)	Deferred shutdown timer expired — Unsolicited notification	88
!PCINFO	Return power control status information	89
!PCOFFEN	Set/return Power Off Enable state	90
!PCTEMP	Return Power control temperature information	91
!PCTEMP (notification)	PA temperature state change — Unsolicited notification	92
!PCTEMPLIMITS	Set/report temperature state limit values	93

Table 1-2: Modem Status Commands (Continued)

Command	Description	Page
!PCVOLT	Return current power supply voltage information	94
!PCVOLT (notification)	PMIC voltage state change — Unsolicited notification	94
!PCVOLTLIMITS	Set/report power supply voltage state limit values	95
!POWERDOWN	Power down system	96
!POWERMODE	Set the module power saving mode	97
!POWERWAKE	Configure ULPS (ULPM/PSM) wakeup sources	100
!PRIID	Report module PRI part number and revision	103
!PRLVER	Display current PRL version	103
!PSCS (notification)	Packet switched data call status — Unsolicited notification	104
*PSRDBS	Select operating bands	104
!QCELP13K (notification)	Vocoder in use — Unsolicited notification	106
!RESET	Reset modem	106
!RI (notification)	Roaming indicator state — Unsolicited notification	106
RING (notification)	Incoming call notification — Unsolicited notification	106
!RSSI (notification)	Signal strength — Unsolicited notification	107
!SCACT	Activate/deactivate data connection	108
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!SECINFO	Display bootloader debug configuration	110
!SELACQ	Select RAT acquisition order	111
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!SELMODE	Set/return current service domain	114
!SELRAT	Set preferred RAT	115
!SELSNR	Set/report LTE-NB1 band scan configuration	117
!SRV (notification)	WWAN network status change — Unsolicited notification	118
!UDINFO	Return information from active USB descriptor	118
!UDPID	Set/report product ID in USB descriptor	119
!UIMREGSTATE (notification)	UIM registration state — Unsolicited notification	119
!UIMSTATUS (notification)	UIM status change — Unsolicited notification	120
!USBCOMP	Set/report USB interface configuration	121
!USBINFO	Return information from active USB descriptor	122
!USBPID	Set/report product ID in USB descriptor	123

Table 1-2: Modem Status Commands (Continued)

Command	Description	Page
+WANS (notification)	Call answered — Unsolicited notification	124
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+WCNT (notification)	Call connected — Unsolicited notification	126
+WDDI (notification)	DTMF tone detection — Unsolicited notification	127
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+WEND (notification)	Call end status — Unsolicited notification	128
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+WJAM (notification)	Jamming events — Unsolicited notification	133
+WJAMTHRESH	Set/Report Jamming Detection Threshold Value	134
+WMGF (notification)	SMS memory full — Unsolicited notification	134
+WORG (notification)	Call origination attempt — Unsolicited notification	135
+WRMICN (notification)	Roaming icon — Unsolicited notification (CDMA only)	135
+WUSLMSK	Enable/disable unsolicited notifications	136
+WVMI (notification)	Voicemail received — Unsolicited notification	139

SIM Toolkit Commands — Commands and notifications used to enable the AT Interface's SIM toolkit support, and receive and respond to unsolicited SIM command notifications.

Table 1-3: SIM Toolkit Commands

Command	Description	Page
*PSSTKI	Configure AT interface's SIM toolkit support	141
!STKC	Report last unsolicited proactive SIM command notification	142
!STKC (notification)	Unsolicited proactive SIM command notification	143
!STKCR	Respond to proactive SIM command	144
!STKGC	Get (retrieve) data for last unsolicited proactive SIM command notification	149
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Diagnostic Commands — Commands used to select frequency bands and diagnose problems.

Table 1-4: Diagnostic Commands

Command	Description	Page
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!GCCLR	Clear crash dump data	168
!GCDUMP	Display crash dump data	168
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Test Commands — Commands required to place the modem in particular modes of operation, test host connectivity, and to configure the transmitters and receivers for test measurements.

Table 1-5: Test Commands

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!DACGPSMASKON	Set CGPS log mask	172
!DACGPSSTANDALONE	Enter/exit Stand Alone RF mode	173
!DACGPSTESTMODE	Start/stop CGPS diagnostic task	173
!DAFTMACT	Put modem into Factory Test Mode	174
!DAFTMDEACT	Put modem into Online Mode from Factory Test Mode	174
!DAGGAVGRSSI	Return averaged RSSI value in dBm (GSM only)	175
!DAGSRXBURST	Set GSM receiver to burst mode (GSM only)	175
!DAGSTXFRAME	Set GSM Tx frame structure (GSM only)	176
!DALGAVGAGC	Return averaged Rx AGC value (LTE only)	177
!DALSNSVAL	Configure LTE Net Sig value (LTE only)	178
!DALSPARANGE	Set LTE PA range (LTE only)	178
!DALSRXBW	Set LTE Rx bandwidth (LTE only)	179
!DALSTXBW	Set LTE Tx bandwidth (LTE only)	179
!DALSTXMOD	Set LTE Tx modulation type (LTE only)	180
!DALSTXPWR	Set LTE Tx power level (LTE only)	181
!DALSWAVEFORM	Set LTE TX waveform (LTE only)	182
!DASBAND	Set frequency band	183
!DASCHAN	Set modem channel (frequency)	185
!DASLNAGAIN	Set LNA gain state	187
!DASPDM	Set PDM value (WCDMA and GSM only)	188

Table 1-5: Test Commands (Continued)

Command	Description	Page
!DASTXOFF	Turn Tx PA off	188
!DASTXON	Turn Tx PA on	189
!DAWGAVGAGC	Return averaged Rx AGC value (WCDMA only)	189
!DAWSPARANGE	Set PA range state machine (WCDMA only)	190
!DAWSSCHAIN	Enable secondary receive chain (WCDMA only)	190
!DAWSTXCW	Set waveform used by the transmitter (WCDMA only)	191
!DAWSTXPWR	Set desired Tx power level (WCDMA mode only)	191
!LDTEST	Test LED (WP8548/WP75xx)	192
!LDTESTOFF	Reset LED to normal mode from test mode	193
!LEDTEST	Test LED (WP76xx/WP77xx)	193

Memory Management Commands — Commands that control the data stored in non-volatile memory of the modem.

Table 1-6: Memory Management Commands

Command	Description	Page
!PARTITION	Display/set partition sizes	195
!RMARESET	Restore device	197

GNSS Commands — Supported on GPS-enabled modems only.

Table 1-7: GPS Commands

Command	Description	Page
!GNSSCONFIG	Configure GNSS satellite constellation support	200
!GNSSDPOMODE	Enable/Disable Dynamic Power Optimization (DPO)	201
!GPSAUTOSTART	Configure GPS auto-start features	202
!GPSCLRASSIST	Clear specific GPS assistance data	203
!GPSCOLDSTART	Clear all GNSS assistance data	204
!GPSEND	End an active session	204
!GPSFIX	Initiate GPS position fix	205
!GPSIDREN	Enable/disable DR_SYNC	206
!GPSLOC	Return last known location of the modem	207
!GPSNMEASENTENCE	Set/report NMEA sentence type	209
!GPSSATINFO	Request satellite information	211
!GPSSTATUS	Request current status of a position fix session	212

Table 1-7: GPS Commands (Continued)

Command	Description	Page
!GPSSUPLURL	Set/report SUPL server URL	213
!GPSSUPLVER	Set/report SUPL server version	214
!GPSTRACK	Initiate local tracking (multiple fix) session	215
!GPSTRANSSEC	Control GPS transport security	216
!GPSXTRADATAENABLE	Set/report GPS XTRA settings	217
!GPSXTRADATAURL	Set/report GPS XTRA data server URLs	218
!GPSXTRAINITDNLD	Initiate GPS XTRA data download and inject operation	219
!GPSXTRASTATUS	Return current status of XTRA	220
!GPSXTRATIME	Inject GPS or UTC time into XTRA system	221
!GPSXTRATIMEENABLE	Set/report GPS XTRA time settings	222
!GPSXTRATIMEURL	Set/report GPS XTRA SNTP server URLs	223

SIM Commands — Commands used to communicate with an installed SIM.

Table 1-8: SIM Commands

Command	Description	Page
+CCID	Return SIM/eUICC ICCID and EID	227
+CCID (notification)	eUICC profile switch — Unsolicited notification	227
+CPINR	Display remaining number of SIM unlock retries	228
+CSPN	Display SIM card service provider's name (SPN)	229
!ICCID	Return SIM card's ICCID	229
+KSIMSEL	Select External SIM interface	230
!UIMS	Select active UIM interface	231

OMA-DM Commands — Commands used to configure DM (Device Management) accounts, sessions, and host–device–server interactions.

Table 1-9: OMA-DM Host Device Configuration Commands

Command	Description	Page
!HOSTDEVINFO	Configure host device details	234
!OSINFO	Configure host device operating system information	236

Table 1-10: OMA-DM Commands

Command	Description	Page
!IDSDEBUGPRINT	Enable/disable debug (detailed message) printing	237
!IMSTESTMODE	Enable/disable IMS test mode	237

SAR Backoff Commands — Commands used to configure SAR options.

Table 1-11: SAR Backoff and Thermal Control Commands

Command	Description	Page
+KRFMUTE	Enable/disable RAT-specific Tx muting	239
+KRFMUTE (notification)	RAT Tx mute mode status change (unsolicited notification)	240
!MAXPWR	Set/report maximum Tx power	241
!SARBACKOFF	Set/report offset from maximum Tx power	243
!SARGPIO	Set/report External GPIO controlling SAR	246
!SARINTGPIOMODE	Set/report default pull mode for SAR interrupt GPIOs	247
!SARSTATE	Set/report SAR backoff state	247
!SARSTATEDFLT	Set/report default SAR backoff state	248

Audio Commands — Commands used to configure and manage audio-capable devices.

Table 1-12: Audio Commands

Command	Description	Page
!AVAUDIO	Play/record audio file (.wav format)	250
!AVAUDIOLPBK	Start/stop audio loopback	251
!AVAUDVOL	Set/return audio playback volume	251
!AVCFG	Bind audio profile to device/physical interface	252
!AVCODECMICTXG	Set/return codec Tx path gain	254
!AVDEF	Reset configurable audio parameters to default settings	255
!AVEC	Enable/disable Echo Cancellation mode for audio profile	256
!AVMUTE	Mute/unmute earpiece/microphone/call waiting tone	257
!AVNS	Enable/disable Noise Suppression and Far-end Noise Suppression modes for audio profile	258
!AVSETPROFILE	Select/configure audio profile for CS call	259
!AVSETVOL	Query/set audio profile's Rx volume level	260
!AVTONEPLAY	Play a tone	261
!AVTXVOL	Query/set audio profile's Tx volume gain	262

Table 1-12: Audio Commands (Continued)

Command	Description	Page
+CLVL	Set active audio profile's Rx volume	263
+VTD	Set DTMF tone duration	263
+VTS	Send DTMF tone	264

I/O Commands — Commands used to configure and manage GPIOs, ADCs and other IOs.

Table 1-13: I/O Commands

Command	Description	Page
!GPIOINT	GPIO interrupt detected — Unsolicited notification	266
!MADC	Display ADC values	267
!MCCELL	Enable/disable coin cell charging feature	268
!MVCOIN	Configure coin cell charging	269
!RIOWNER	Set/query Ring Indicator owner	270
+WEXTCLK	Enable/Disable user clock mode	271
+WIOCFG	GPIO Configuration	272
+WIOR	Read GPIO value	274
+WIOW	Write GPIO value	275
+WRID	Set/query Ring Indicator Duration	275
+WWAKE	Query Wakeup Event	276
+WWAKESET	Set/query Wake Up Event Mask	277

AirVantage Commands — Commands used to work with AirVantage.

Table 1-14: AirVantage Device Services Commands

Command	Description	Page
+WDSC	Configure AirVantage Management Services	279
+WDSE	Display most recent AirVantage Management Services error	281
+WDSG	Display AirVantage Management Services status information	282
+WDSI	Activate/deactivate AirVantage Management Services unsolicited notifications	283
+WDSR	Reply to AirVantage server request	286
+WDSS	Configure/connect AirVantage Management Services session	287

SMS Wake Commands — Commands used for the SMS host wake-up feature.

Table 1-15: SMS Wake Commands

Command	Description	Page
!SMSWAKE	Enable/disable SMS host wake-up feature	289
!SMSWAKEWIDTH	Set/read SMS Wake signal width	290

1.10 Conventions

The following format conventions are used in this reference:

Character codes or keystrokes that are described with words or standard abbreviations are shown within angle brackets using a different font, such as <CR> for Carriage Return and <space> for a blank space character.

Numeric values are decimal unless prefixed as noted below.

Hexadecimal values are shown with a prefix of 0x, i.e. in the form 0x3D.

Binary values are shown with a prefix of 0b, i.e. in the form 0b00111101.

Command and register syntax is noted using an alternate font: **!CHAN=<c>[,b]**. The leading "**AT**" characters are not shown but must be included before all commands except as noted in the reference tables.

Characters that are required are shown in uppercase; parameters are noted in lowercase. Required parameters are enclosed in angle brackets (**<n>**) while optional parameters are enclosed within square brackets (**[x]**). The brackets are not to be included in the command string.

Commands are presented in table format. Each chapter covers the commands related to that subject and presents a summary table to help locate needed commands. Commands are in ASCII alphabetical order in the body of each chapter.

Any default settings are noted in the command tables. Note that these are the factory default settings and *not* the default parameter value assumed if no parameter is specified.

Result Code This is a numeric or text code that is returned after all commands (except resets) — text codes are returned if verbose responses are enabled. Only one result code is returned for a command line regardless of the number of individual commands contained on the line.

Response This term indicates a response from the modem that is issued prior to a result code. Reading registers or issuing commands that report information will provide a response followed by a result code unless the command generates an error.

Responses and result codes from the modem, or host system software prompts, are shown in this font:

```
CONNECT 14400
```

2: AT Password Commands

2.1 Introduction

AT commands described in this document are password-protected. This chapter describes how to enter and change the password.

2.2 Command Summary

Table 2-1 on page 26 lists the commands described in this chapter.

Table 2-1: AT Password Commands

Command	Description	Page
!ENTERCND	Enable access to password-protected commands	27
!SETCND	Set AT command password	28

2.3 Command Reference

Table 2-2: AT Password Command Details

Command	Description
!ENTERCND	**Enable access to password-protected commands** Before any password-protected AT commands can be used, !ENTERCND must be used to enter the password to gain access. The initial password is configured onto the modem during manufacture. You can change the password using !SETCND. If you do not know the password, contact your Sierra Wireless account manager. Once the password has been entered correctly, the password-protected AT commands are available until the modem is reset or powered off and on. **Password required:** Yes—Query format only. **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!ENTERCND=<"key">** Response: OK Purpose: Unlock password-protected commands. ▪ Query: **AT!ENTERCND?** Response: <key> *(if unlocked)* Purpose: This command is password-protected. After entering the password correctly using the execution operation ("="), you can use this command to display the password as a reminder. **Parameters:** <"key"> (Password stored in NV memory) • Password must be entered with quotation marks. (For example, AT!ENTERCND="ExamplePW".) • Length: (WP75xx/WP85xx) 4–10 characters; (WP76xx/WP77xx) 4–15 characters • Supported characters: '0'–'9', 'A'–'Z', 'a'–'z', special characters (e.g. "!#$%&'()*+,-./:<>=?@") Note: Double quotes (") are not allowed. • Characters may be entered in ASCII format, or in Hex format. (For example: "myPass3" or "ABCDEF01234".)

Table 2-2: AT Password Command Details (Continued)

Command	Description
!SETCND	**Set AT command password** Change the password used for the !ENTERCND command. (Before you can change the password using **!SETCND**, you must enable access to this command using **!ENTERCND**.) **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!SETCND=<"key">** Response: OK Purpose: Sets <"key"> as the new password for accessing protected commands. **Parameters:** <"key"> (New password) ▪ Password must be entered with quotation marks (for example, AT!SETCND="NewPW"). ▪ Length: (WP75xx/WP85xx) 4–10 characters; (WP76xx/WP77xx) 4–15 characters ▪ Supported characters: '0'–'9', 'A'–'Z', 'a'–'z', special characters (e.g. "!#$%&'()*+,-./:<>=?@") Note: Double quotes (") are not allowed. ▪ Characters may be entered in ASCII format, or in Hex format. (For example: "myPass3" or "ABCDEF01234".) **Warning:** *Do NOT enter a null password (that is, the <"Key'> cannot be "") — you will NOT be able to use password-protected commands, and will have to contact Sierra Wireless for help to reset the password.*

3: Modem Status, Customization, and Reset Commands

3.1 Introduction

This chapter describes commands used to reset the modem, adjust customization settings, retrieve the hardware version, and monitor the temperature, voltage, and modem status.

3.2 Command Summary

Table 3-1 lists the commands described in this chapter.

Table 3-1: Modem Status Commands

Command	Description	Page
!AMR_NB (notification)	Vocoder in use — Unsolicited notification	33
!AMR_WB (notification)	Vocoder in use — Unsolicited notification	33
!ANTSEL	Set/query external antenna select configuration	34
!AVVOCODER (Notification group)	Vocoder in use — Unsolicited notifications	36
!BAND	Select/return frequency band set	37
!BOOTHOLD	Reset modem and wait in bootloader for firmware download	40
+CBST	Select Circuit-Switched Bearer	41
+CEDRXRDP	Read eDRX Dynamic Parameters	42
+CEDRXS	Configure eDRX	43
+CGAUTH	Set/Report PDP connection authentication parameters	44
+CGDCONT	Define PDP context	45
+CMUX	Configure Multiplexing Control Channel	47
+CPSMS	Configure Power Saving Mode (PSM)	49
+CSQ (notification)	RSSI change across threshold — Unsolicited notification	50
!CUSTOM	Set/return customization settings	51
!DATALOOPBACK	Enable/disable and configure loopback mode	57
!EONS (notification)	Enhanced Operator Name String (EONS) — Unsolicited notification	58
!EVRC (notification)	Vocoder in use — Unsolicited notification	58
!EVRC_B (notification)	Vocoder in use — Unsolicited notification	58
!EVRC_NW (notification)	Vocoder in use — Unsolicited notification	58
!EVRC_WB (notification)	Vocoder in use — Unsolicited notification	58

Table 3-1: Modem Status Commands (Continued)

Command	Description	Page
!GETBAND	Return the current active band	58
!GETRAT	Return the current active radio access technology (RAT)	59
!GSM_EFR (notification)	Vocoder in use — Unsolicited notification	59
!GSM_FR (notification)	Vocoder in use — Unsolicited notification	59
!GSM_HR (notification)	Vocoder in use — Unsolicited notification	59
!GSTATUS	Return operational status	60
!IMAGE	Manage Firmware Images	69
!IMPREF	Query/set Image Management preferences	71
+KCELL	Display Detected Cell Details	72
+KMCLASS	Set 2G multislot class	75
+KSLEEP	Configure UART1 power management (sleep mode entry conditions)	76
+KSRAT	Set the current RAT	77
+KSREP	Enable/disable startup reporting	78
+KSUP (notification)	Startup notification (unsolicited notification)	79
!LTEINFO	Display LTE network information	80
!MAPUART	Map services to UART	82
!MCUWATCHDOG	Set/Report MCU Watchdog Parameters	83
!MODE (notification)	Current system mode — Unsolicited notification	84
!MUSLEN	Enable/disable unsolicited messaging feature	84
!NETNUM	Set/report number of supported network interfaces	85
!NI (notification)	Network identity — Unsolicited notification	86
!PACKAGE	Return package version string	86
!PATEMP	Return PA temperature information	87
!PATEMP (notification)	PA temperature state change — Unsolicited notification	87
!PCDEFR (notification)	Deferred shutdown timer expired — Unsolicited notification	88
!PCINFO	Return power control status information	89
!PCOFFEN	Set/return Power Off Enable state	90
!PCTEMP	Return Power control temperature information	91
!PCTEMP (notification)	PA temperature state change — Unsolicited notification	92
!PCTEMPLIMITS	Set/report temperature state limit values	93
!PCVOLT	Return current power supply voltage information	94

Table 3-1: Modem Status Commands (Continued)

Command	Description	Page
!PCVOLT (notification)	PMIC voltage state change — Unsolicited notification	94
!PCVOLTLIMITS	Set/report power supply voltage state limit values	95
!POWERDOWN	Power down system	96
!POWERMODE	Set the module power saving mode	97
!POWERWAKE	Configure ULPS (ULPM/PSM) wakeup sources	100
!PRIID	Report module PRI part number and revision	103
!PRLVER	Display current PRL version	103
!PSCS (notification)	Packet switched data call status — Unsolicited notification	104
***PSRDBS**	Select operating bands	105
!QCELP13K (notification)	Vocoder in use — Unsolicited notification	106
!RESET	Reset modem	106
!RI (notification)	Roaming indicator state — Unsolicited notification	106
RING (notification)	Incoming call notification — Unsolicited notification	106
!RSSI (notification)	Signal strength — Unsolicited notification	107
!SCACT	Activate/deactivate data connection	108
!SCUMMTU	Set/Report MTU Size	109
!SECINFO	Display bootloader debug configuration	110
!SELACQ	Select RAT acquisition order	111
!SELCIOT	Set/report Cellular IoT preferences	113
!SELMODE	Set/return current service domain	114
!SELRAT	Set preferred RAT	115
!SELSNR	Set/report LTE-NB1 band scan configuration	117
!SRV (notification)	WWAN network status change — Unsolicited notification	118
!UDINFO	Return information from active USB descriptor	118
!UDPID	Set/report product ID in USB descriptor	119
!UIMREGSTATE (notification)	UIM registration state — Unsolicited notification	119
!UIMSTATUS (notification)	UIM status change — Unsolicited notification	120
!USBCOMP	Set/report USB interface configuration	121
!USBINFO	Return information from active USB descriptor	122
!USBPID	Set/report product ID in USB descriptor	123
+WANS (notification)	Call answered — Unsolicited notification	124

Table 3-1: Modem Status Commands (Continued)

Command	Description	Page
+WCC (notification)	Call control status change — Unsolicited notification	125
+WCNT (notification)	Call connected — Unsolicited notification	126
+WDDI (notification)	DTMF tone detection — Unsolicited notification	127
+WDDM	Enable/disable DTMF detection	127
+WEND (notification)	Call end status — Unsolicited notification	128
+WFWUPD	Download/install firmware package	131
+WFWUPD (notification)	Firmware package install notification	132
+WJAM (notification)	Jamming events — Unsolicited notification	133
+WJAMTHRESH	Set/Report Jamming Detection Threshold Value	134
+WMGF (notification)	SMS memory full — Unsolicited notification	134
+WORG (notification)	Call origination attempt — Unsolicited notification	135
+WRMICN (notification)	Roaming icon — Unsolicited notification (CDMA only)	135
+WUSLMSK	Enable/disable unsolicited notifications	136
+WVMI (notification)	Voicemail received — Unsolicited notification	139

3.3 Command Reference

Table 3-2: Modem Status Command Details

Command	Description
!AMR_NB (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!AMR_WB (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!ANTSEL	**Set/query external antenna select configuration** Configure the modem to use GPIOs (GPIO28–31) to select the antenna to use for each specified frequency band. (Any of the available GPIOs that are not needed for a specific band should be configured as not required.) When the modem switches to a frequency band that has been configured using this command, the GPIOs are driven as specified and the host uses them to tune the external antenna appropriately. If the modem switches to a band that has not been configured, the host uses the default antenna. *Note: Frequency bands are RAT-independent. For example, Band 5 corresponds to any 850-band technology (CDMA, WCDMA, LTE, GSM).* **Requirements:** Before this command can be used: • Antenna selection is the secondary configuration for GPIO28–GPIO31. To use these GPIOs for antenna selection, use +WIOCFG to deallocate them from their current purpose(s). **Notes:** When designing the system, and configuring the device: ▪ Perform system level testing to ensure that the antenna switching feature does not introduce any handover issues. The tunable antenna should be designed to ensure that it can retune in < 5 µs (recommended) and < 10 µs (maximum). **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Usage:** ▪ Execution: **AT!ANTSEL=<band>, <gpio1>, <gpio2>, <gpio3>[, <gpio4>]** Response: OK Purpose: Configure the GPIOs for the specified <band>. ▪ Query: **AT!ANTSEL?** Response (WPx5xx): BAND <band *a*>: <gpio1>, <gpio2>, <gpio3>[, <gpio4>] BAND <band *b*>: <gpio1>, <gpio2>, <gpio3>[, <gpio4>] ... OK *Note:* The WPx5xx response (as of publication date) appears as "ANTSEL <band *a*>: ....". This will be corrected to display "BAND <band *a*>: ..." in a future firmware release. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!ANTSEL (continued)	**Set/query external antenna select configuration (continued)** Response (WP76xx/WP77xx): BAND <band *a*>: <gpio1>, <gpio2>, <gpio3>[, <gpio4>] BAND <band *b*>: <gpio1>, <gpio2>, <gpio3>[, <gpio4>] ... Conflict: *(Note: Heading is for LTE-CA conflicts, but WP76xx/WP77xx do)* *not support LTE-CA, so heading can be ignored.)* OK Example: BAND 2: 1, 0, 1, 1 BAND 5: 1, 1, 2, 2 Conflict: OK Purpose: Display the current external antenna select configuration. ▪ Query List: **AT!ANTSEL=?** Purpose: Display valid execution format and parameter values. **Parameters:** <band> (RF band) • 3GPP band number. For a full listing of 3GPP band numbers, see Table 17-2 on page 302. • Valid range: 1–71. Band support is product specific — see the device's Product Specification or Product Technical Specification document for details. <gpio1>, <gpio2>, <gpio3>, <gpio4> (GPIO configurations) • 0 = Logic low • 1 = Logic high • 2 = Not used for antenna selection (Default value for <gpio4>). • Notes: <gpio4> availability is device-specific — see the module's Product Technical Specification for details.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!AVVOCODER (Notification group)	**Vocoder in use — Unsolicited notifications** *Note: The unsolicited notification string for 'Vocoder in use' varies as described in the Notification format and example below. '!AVVOCODER' is a configuration option for +WUSLMSK, which enables these notifications.* Unsolicited notification indicating the codec and speech encoder sampling rate being used for a voice call. To enable !AVVOCODER (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification formats:** Speech Codec — Notification string QCELP-13K — !QCELP13K,freq: <sampling_rate> EVRC — !EVRC,freq: <sampling_rate> EVRC-B — !EVRC_B,freq: <sampling_rate> EVRC wideband — !EVRC_WB,freq: <sampling_rate> EVRC narrowband-wideband — !EVRC_NW,freq: <sampling_rate> AMR narrowband — !AMR_NB,freq: <sampling_rate> AMR wideband — !AMR_WB,freq: <sampling_rate> GSM enhanced full rate — !GSM_EFR,freq: <sampling_rate> GSM full rate — !GSM_FR,freq: <sampling_rate> GSM half rate — !GSM_HR,freq: <sampling_rate> **Examples:** • Notifications received: !AMR_NB,freq: 8000 (Codec used is AMR narrowband, with sampling rate=8000.) !GSM_FR,freq: 8000 (Codec used is GSM full rate, with sampling rate=8000.) **Parameters:** <sampling_rate> (Speech encoder sampling rate instructed by the network, in Hz) • 0 — Unknown/ignore • 8000 — Narrow-band • 16000 — Wide-band

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!BAND *Note: The 'Basic' command and response versions are used if you haven't entered the required password. (See Command Access on page 14.)*	**Select / return frequency band set** Configure the modem to operate on a set of frequency bands, look up available sets, create new sets, or return the current selection. **Important:** *To avoid issues with incompatible RAT / band combinations:* ▪ *If !BAND is used, +KSRAT must be set to 'All RATS, automatic'.* ▪ *If !BAND and !SELRAT are used, either !BAND must be set to 'All Bands' or !SELRAT must be set to 'Automatic'.* ▪ *If +KSRAT is used, !BAND must be set to 'All Bands' and !SELRAT must not be used.* *Note: The '02 User bands' set can also be changed using AT*PSRDBS on page 105 by selecting a set of bands that does not match any of the existing band sets.* **Password required:** Yes—Execution (Extended) format (see !ENTERCND for details) **Usage:** ▪ Execution (Basic): **AT!BAND=<Index>** Response: OK Purpose: Select an existing set of bands. ▪ Execution (Extended): **AT!BAND=<Index>,"<Name>",<GWmask>[,<Lmask>[,<Lmask2>[,<Tdsmask>]]]** Response: OK Purpose: Create a new set of bands for the specified <index> position and assign a descriptive <Name> to the set. ▪ Query (Basic): **AT!BAND?** Response: Index, Name <Index>, <Name> OK *or* *(If the current band mask doesn't match a band set)* Unknown band mask. Use AT!BAND to set band. <bandmask> OK Purpose: Report the current band selection. ▪ Query (Extended): **AT!BAND?** Response (WPx5xx): Index, Name, GW Band Mask L Band Mask TDS Band Mask <Index>, <Name>, <GWmask> <Lmask> <Tdsmask> OK *or* *(If the current band mask doesn't match a band set)* Unknown band mask. Use AT!BAND to set band. <Index> OK (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!BAND (continued)	**Select/return frequency band set (continued)** Response (WP76xx/WP77xx): Index, Name, GW Band Mask L Band Mask 1 TDS Band Mask L Band Mask 2 <Index>, <Name>, <GWmask> <Lmask> <Tdsmask> <Lmask2> OK *or* *(If the current band mask doesn't match a band set)* Unknown band mask. Use AT!BAND to set band. <Index> OK Purpose: Report the current band selection. (<GWmask>, <Lmask>, and <Tdsmask> will appear only in Extended responses, and only if applicable.) ▪ Query List (Basic): **AT!BAND=?** Response: Index, Name <Index1>, <Name1> ... <IndexN>, <NameN> OK Purpose: Display allowed <Index> values and descriptions of the associated band sets. ▪ Query List (Extended): **AT!BAND=?** Response (WPx5xx): Index, Name, GW Band Mask L Band Mask TDS Band Mask <Index1>, <Name1>, <GWmask1> <Lmask1> <Tdsmask1> ... <IndexN>, <NameN>, <GWmaskN> <LmaskN> <TdsmaskN> <TdsBand> ... <LBand> ... <GWBand> ... OK (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!BAND (continued)	**Select / return frequency band set (continued)** Response (WP76xx/WP77xx): Index, Name, GW Band Mask L Band Mask 1 L Band Mask 2 TDS Band Mask <Index1>, <Name1>, <GWmask1> <Lmask1(1)> <Lmask2(2)> <Tdsmask1> ... <IndexN>, <NameN>, <GWmaskN> <LmaskN(1)> <LmaskN(2)> <TdsmaskN> <TdsBand> ... <LBand> ... <GWBand> ... OK Purpose: Display allowed <Index> values and descriptions of the associated band sets. (<GWmask1..N>, <Lmask1..N>, and <Tdsmask1..N> will appear only in Extended responses, and only if applicable.) After the masks, lists of each bands comprising the masks are also shown. **Parameters:** <Index> (Index of a band set. Use the Query List command to display all supported sets) • Valid range: 0–13 (Hexadecimal — there are 20 possible values. By default, '0' indicates 'All bands'.) <Name> (Name of the band set) • ASCII string — Up to 30 characters <GWmask> (GSM/WCDMA bands included in the set) • Format: 64-bit bitmask • Example values (Available bands are device-dependent. Use the extended query command to display the list of bands available for your device): 0000000000000001 — BC0-A 0000000000000002 — BC0-B ... 0000000080000000 — BC15 0002000000000000 — W9001000000000000000 — B19 (850) <Lmask>, <Lmask2> (LTE bands included in the set) • Format: 64-bit bitmask • Example values (Available bands are device-dependent. Use the extended query command to display the list of bands available for your device.): 0000000000000001 — Band 1 0000000000000002 — Band 2 ... 0000008000000000 — Band 40 0000010000000000 — Band 41 • Note: For WP75xx, only the first <Lmask> field is used to select LTE bands. If <Tdsmask> is also being specified, leave <Lmask2> blank (or set to 0). (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!BAND (continued)	**Select/return frequency band set (continued)** <Tdsmask> (TD-SCDMA bands included in the set) • Format: 64-bit bitmask • Example values (Available bands are device-dependent. Use the extended query command to display the list of bands available for your device.): 0000000000000001 — TDS B34 0000000000000010 — TDS B39 0000000000000020 — TDS B40 <TdsBand> (List of individual TD-SCDMA bands forming the <Tdsmask>) • Format: <mask> - <description>. See <GWBand> for a GSM/WCDMA example. <LBand> (List of individual LTE bands forming the <Lmask>) • Format: <mask> - <description>. See <GWBand> for a GSM/WCDMA example. <GWBand> (List of individual GSM/WCDMA bands forming the <GWmask>) • Format: <mask> - <description>. • Example: 1000000000000000 - B19 (800) 0002000000000000 - B8 (900) 0000000008000000 - B6 (800) 0000000004000000 - B5 (850) 0000000000800000 - B2 (1900) 0000000000400000 - B1 (2100) 0000000000200000 - G1900 0000000000080000 - G850 0000000000000200 - G900P 0000000000000100 - G900E 0000000000000080 - G1800
!BOOTHOLD	**Reset modem and wait in bootloader for firmware download** Prepare for a firmware download by resetting the modem and waiting in 'boot and hold' mode. **Password required:** No **Usage:** ▪ Execution: **AT!BOOTHOLD** Response: OK Purpose: Force the modem to backup user NV options, reset, and then wait in boot and hold mode for a firmware download.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CBST	**Select Circuit-Switched Bearer** Select the circuit-switched bearer to use for data calls (mobile-originated or mobile-terminated). **Notes:** Only the following combinations are supported—If other combinations of valid parameter values are specified, ERROR will be returned: • <speed>=valid values up to 83; <name>=0; <ce>=1 • <speed>=83; <name>=4; <ce>=1 • <speed>=116 or 134; <name>=1; <ce>=0 **Supporting devices:** WPx5xx/WP76xx **Password required:** No **Usage:** ▪ Execution: **AT+CBST=[<speed>],[<name>],[<ce>]** Response: OK Purpose: Configure the circuit-switched bearer. ▪ Query: **AT+CBST?** Response: +CBST: <speed>,<name>,<ce> OK Purpose: Report current settings. ▪ Query List: **AT+CBST=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <speed> (Data call connection speed) ▪ 0—(Default) Autobaud (automatic speed selection) ▪ 7—9600 bps (V.32) ▪ 12—9600 bps (V.34) ▪ 14—14400 bps (V.34) ▪ 16—28800 bps (V.34) ▪ 17—33600 bps (V.34) ▪ 39—9600 bps (V.120) ▪ 43—14400 bps (V.120) ▪ 48—28800 bps (V.120) ▪ 51—56000 bps (V.120) ▪ 71—9600 bps (V.110) ▪ 75—14400 bps (V.110) ▪ 80—28800 bps (V1.110) ▪ 81—38400 bps (V.110) ▪ 83—56000 bps (X.31 flag stuffing, UDI/RDI) ▪ 116—64000 bps (bit transparent) ▪ 134—64000 bps (multimedia) <name> (Bearer Service) ▪ 0—(Default) Data circuit asynchronous (UDI or 3.1 kHz modem) ▪ 1—UI Data circuit synchronous (UDI or 3.1 kHz modem) ▪ 4—Data circuit asynchronous (RDI) <ce> (Connection element) ▪ 0—Data transparent ▪ 1—Data non-transparent

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CEDRXRDP	**Read eDRX Dynamic Parameters** (WP76xx/WP77xx only.) Read the current eDRX status and related parameters. *Note: This implementation of +CEDRXRDP follows 3GPP TS 27.007, with exceptions as noted in the parameter descriptions.* **Password required:** No **Usage:** ▪ Execution: **AT+CEDRXRDP** Response: +CEDRXRDP: <AcT-type>[, <Requested_eDRX_value>[, <NW-provided_eDRX_value>[, <Paging_time_window>]]] OK Purpose: Report the current eDRX status and parameters. ▪ Query List: **AT+CEDRXRDP=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <AcT> (Relationship between Access technology Type (RAT) and requested eDRX value) • 0 — RAT is not using eDRX • 1 — EC-GSM-IoT (A/Gb mode) • 2 — GSM (A/Gb mode) • 3 — UTRAN (Iu mode) • 4 — E-UTRAN (WB-S1 mode) • 5 — E-UTRAN (NB-S1 mode) <Requested_eDRX_value> (eDRX value requested by module) • 4 bits represented as a string. Refers to bits 4–1 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. • Default — "1101" <NW-provided_eDRX_value> (eDRX value provided by network) • 4 bits represented as a string. Refers to bits 4–1 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. • e.g. "0011" <Paging_time_window> (Paging time window length) • 4 bits represented as a string. Refers to bits 8–5 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. • e.g. "0001"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CEDRXS	**Configure eDRX** (WP76xx/WP77xx only.) Enable/disable eDRX and configure settings for specified RATs. *Note: This implementation of +CEDRXS follows 3GPP TS 27.007, with exceptions as noted in the parameter descriptions.* **Password required:** No **Usage:** ▪ Execution: **AT+CEDRXS=<mode>[, <AcT-type>[, <Requested_eDRX_value>]]]** Response: OK or +CME ERROR: <err> Purpose: Enable/disable eDRX and configure setting for specified RAT. ▪ Query: **AT+CEDRXS?** Response: +CEDRXS: <AcT-type>[, <Requested_eDRX_value> ... OK Purpose: Report current eDRX settings for each RAT that has eDRX enabled. ▪ Query List: **AT+CEDRXS=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Enable/Disable LTE eDRX) • 0 — Disable eDRX • 1 — Enable eDRX • 2 — Enable eDRX and enable the unsolicited result code +CEDRXP: +CEDRXP: <AcT-type>[, <Requested_eDRX_value>[, <NW-provided_eDRX_value[, <Paging_time_window>]]] • 3 — Disable eDRX, discard eDRX parameters and reset to default values <AcT> (Access technology Type (RAT) and relationship to requested eDRX value) • 0 — RAT is not using eDRX • 1 — EC-GSM-IoT (A/Gb mode) • 2 — GSM (A/Gb mode) • 3 — UTRAN (Iu mode) • 4 — E-UTRAN (WB-S1 mode) • 5 — E-UTRAN (NB-S1 mode) <Requested_eDRX_value> (eDRX value requested by module) • 4 bits represented as a string. Refers to bits 4–1 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. • Default — "1101" <NW-provided_eDRX_value> (eDRX value provided by network) • 4 bits represented as a string. Refers to bits 4–1 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CEDRXS (continued)	**Configure eDRX (continued)** <Paging_time_window> (Paging time window length) • 4 bits represented as a string. Refers to bits 8–5 of octet 3 of extended DRX parameters information element. For coding and value range details, refer to the +CEDRXRDP description in 3GPP TS 27.007. • e.g. "0001"
+CGAUTH	**Set/Report PDP connection authentication parameters** Set or report the authentication parameters for a PDP context. The context is identified by the supported profile that was used during the PDP context activation and PDP context modification procedures. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT+CGAUTH=<cid>,<auth_prot>[, <userid>,<password>]** Response: OK or ERROR Purpose: Set the required authentication type and related values for the specified PDP profile (<cid>). ▪ Query: **AT+CGAUTH?** Response: +CGAUTH: <cid>, <auth_prot>[,<userid>] ... OK Purpose: Display the authentication type and (if required) the username required for each profile. (Note: The <password> does not appear, for security reasons.) ▪ Query List: **AT+CGAUTH=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <cid> (PDP context identifier) • Valid range: 1–24. • Maximum # of usable PDP contexts: 16 <auth_prot> (Required authentication type) • 0 — None. Username and password are not required. • 1 — PAP. Username and password accepted • 2 — CHAP. Username and password (secret) accepted <userid> (Username for PAP/CHAP authentication) • ASCII string within quotes (e.g. "userid") • Required for <auth_type> 1 (PAP) and 2 (CHAP) <password> (Password for PAP/CHAP authentication) • ASCII string within quotes (e.g. "123456") • Required for <auth_type> 1 (PAP) and 2 (CHAP)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CGDCONT	**Define PDP context** Define PDP (Packet Data Protocol) parameter values for a specific PDP context. **Supporting devices:** WP76xx/WP77xx. (WP8548/WP75xx supports the 3GPP TS 27.007 specification, not this extended version of the command.) *Note: This implementation of +CGDCONT is derived from the 3GPP TS 27.007 version 13.2.0 specification, but does not support the full set of parameters from the specification and has extended usage rules.* **Password required:** No **Notes:** ▪ Two or more PDP contexts having the same <APN> and <PDP_type> cannot be activated concurrently. **Usage:** ▪ Execution: **AT+CGDCONT=<cid>[, <PDP_type> [, <apn> [, <PDP_addr> [, <d_comp> [, <h_comp> [, <pd1> [... [, <pdN>]]]]]]]** Response: OK Purpose: Set the specified parameter values for the PDP context identified by <cid>. If only <cid> is specified, all parameter values are stored as undefined. ▪ Query: **AT+CGDCONT?** Response: +CGDCONT: <cid>, <PDP_type>, <apn>, <PDP_addr>, <d_comp>, <h_comp>[, <pd1>[, ...[,<pdN>]]] ... OK Purpose: Report the current settings for each defined PDP context. ▪ Query List: **AT+CGDCONT=?** Purpose: Return the execution command format and the supported parameter values. If multiple PDP types (<PDP_type>) are supported, the parameters for each <PDP_type> are returned on a separate line. **Parameters:** <cid> (PDP context identifier) • Valid range: 1–24. • Maximum # of usable PDP contexts: 16 <PDP_type> (Packet Data Protocol type) • "IP" — Internet Protocol, version 4 (IETF STD 5) • "IPV6" — Internet Protocol, version 6 (IETF RFC 2460) • "IPV4V6" — Virtual type that handles dual IP stack UE capability (3GPP TS 24.301[83]) Note: IPv4v6 is compliant up to 3GPP Release 7. <APN> (Access Point Name) • ASCII string within quotes • Logical name used to select GGSN or external packet data network • If null or omitted, subscription value will be requested (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CGDCONT (continued)	**Define PDP context (continued)** <PDP_addr> (Access Point Name) • ASCII string within quotes • Identifies the MT in the address space applicable to the PDP. • If the value is null or omitted then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The READ command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address may be read using the +CGPADDR command. • When +CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of +CGDCONT. • Note: 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> (Data compression) • Applies to SNDCP (Sub Network Dependent Convergence Protocol) only • 0 — (Default) Off. • 1 — On (Manufacturer preferred compression) • 2 — V.42 bis <h_comp> (PDP header compression) • 0 — (Default) Off • 1 — On (Manufacturer preferred compression) • 2 — RFC1144 (applies to SNDCP only) • 3 — RFC2507 • 4 — RFC3095 (applies to PDCP only) <pd1>, ... <pdN> (<PDP_type>-specific values)) • Zero to N string parameters • Parameter meanings are specific to <PDP_type>

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CMUX	**Configure Multiplexing Control Channel** Enable/disable multiplexing protocol control channel over the UART or USB modem port (selected via !MUXMODE). **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Requirements:** • AT!MUXMODE must be used to select either the UART or USB port before this command can be used. (The command returns ERROR if a port has not been selected.) **Usage:** ▪ Execution: **AT+CMUX=<mode>[,<subset>[,<port_speed>[,N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]** Response: OK Purpose: Configure the multiplexing control channel. ▪ Query: **AT+CMUX?** Response: +CMUX: <mode>,<subset>,<port_speed>,<N1>,<T1>,<N2>,<T2>,<T3>,<k> OK Purpose: Report current settings. ▪ Query List: **AT+CMUX=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Multiplexer transparency mechanism (mux mode)) • 0 — (Default) Basic option <subset> (Multiplexer control channel setup) • 0 — (Default) UIH frames • 1 — UI frames • 2 — I frames (Note: Not supported in Basic mux mode (<mode>=0) <port_speed> (Transmission rate) • Note: Not supported. Valid value must be specified, but has no effect. • 1 — 9600 bps • 2 — 19200 bps • 3 — 38400 bps • 4 — 57600 bps • 5 — 115200 bps • 6 — 230400 bps <N1> (Frame size, in bytes) • Valid range: 1–32786 • Default: 1800 <T1> (Acknowledgement Timer, in 0.01 second increments) • Note: Not supported. Valid value must be specified, but has no effect. • Valid range: 1–255 • Default: 10 Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CMUX (continued)	**Configure Multiplexing Control Channel (continued)** <N2> (Number of re-transmissions) • Valid range: 0–100 • Default: 3 <T2> (Response timer for multiplexer control channel, in 0.01 second increments) • Valid range: 2–255 • Default: 30 <T3> (Wake-up timer, in seconds) • Valid range: 1–255 • Default: 10 <k> (Window size) • Note: Not supported. Valid value must be specified, but has no effect. • Valid range 1 — 7 • Default: 2

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CPSMS	**Configure Power Saving Mode (PSM)** Enable/disable and configure the UE's Power Saving Mode parameters. *Note: This implementation of +CPSMS follows 3GPP TS 27.007, with exceptions as noted in the parameter descriptions.* **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT+CPSMS=<mode>[, <Requested_Periodic-RAU>], [<Requested_GPRS-READY-timer>], [<Requested_Periodic-TAU>], [<Requested_Active-Time>]** Response: OK or +CME ERROR: <err> Purpose: Enable/disable PSM, and configure PSM settings. ▪ Query: **AT+CPSMS?** Response: +CPSMS: <mode>, [<Requested_Periodic-RAU>], [<Requested_GPRS-READY-timer>], [<Requested_Periodic-TAU>], [<Requested_Active-Time>] OK Purpose: Report current PSM status and settings. ▪ Query List: **AT+CPSMS=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Enable/Disable PSM) · 0 — Disable PSM · 1 — Enable PSM <Requested_Periodic-RAU> (3G Routing Area Update timer) · Leave blank, not used by WP76xx/WP77xx <Requested_GPRS-READY-timer> (2G timer) · Leave blank, not used by WP76xx/WP77xx <Requested_Periodic-TAU> (TAU timer — Amount of time UE will be dormant before timer wakes it) · One byte (8 bits) represented as a string. For coding and value range details, refer to the +CPSMS description in 3GPP TS 27.007. · Default — "00011000" = 4 hours · e.g. "01000111" = 70 hours <Requested_Active-Time> (Amount of time UE will remain active (idle) before re-entering PSM) · One byte (8 bits) represented as a string. For coding and value range details, refer to the +CPSMS description in 3GPP TS 27.007. · Default — "00001010" = 20 seconds · e.g. "00100100" = 4 minutes

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+CSQ (notification)	**RSSI change across threshold — Unsolicited notification** Unsolicited notification indicating the signal strength (<rssi>) has changed. Typically, a !RSSI unsolicited notification will also be received (see !RSSI on page 107). To enable +CSQ (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+CSQ: <rssi>,<ber>** **Examples:** • Notifications received: +CSQ: 20,99 Signal strength (RSSI) -33 dBm, with bit error ration (BER) not known/not detectable **Parameters:** <rssi> (Received Signal Strength Indication offset value) • Integer value. Each step represents 2 dBm increase from base value • 0: -113 dBm or less • 1–30: -111 to -53 dBm • 31: -51 dBm or greater • 99: Not known, or not detectable <ber> (Channel Bit Error Rate, in percent) • Integer value. • 0–7: As RXQAL values in the table in 3GPP TS 45.008 subclause 8.2.4 • 99: Not known, or not detectable

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM *Note: Some customizations may not be available for certain chipsets, firmware revisions, or devices.*	**Set/return customization settings** Set or return several customization values. **Password required:** Yes (Execution only) (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!CUSTOM=<customization>, <value>** Response: OK Purpose: Assign <value> to a specific <customization> setting. ▪ Query: **AT!CUSTOM?** Response: (list of enabled <customization>s) OK Purpose: Display currently-enabled customizations. ▪ Query list: **AT!CUSTOM=?** Purpose: Return a list of valid <customization> values. **Parameters:** <value> (Value being assigned to a specific <customization> setting) · Descriptions are included in each of the customizations described below. · Numeric value. Valid range depends on the <customization> type. <customization> (String identifying customization setting. The default value for all customizations is 0.) *Note: Use quotation marks around the customization string. For example, AT!CUSTOM='CSDOFF',0.* · "AUTONETWORKMODE"—(WP8548/WP75xx) Indicate if UE should revert to Automatic Network mode after 60 seconds of Manual Network mode. <value>: ▪ 0—Remain in Manual. (Default) ▪ 1—Revert to Automatic. ▪ 2—Remain in Manual if UE is attached to the network, otherwise switch to Automatic. · "BANDSELEN"—Select GPIO28–31 usage type. <value>: ▪ 0—General purpose GPIO ▪ 1—Antenna select (with !ANTSEL) · "BOOTQUIETDISABLE"—Enable/disable Linux kernel console messages. Disabling non-critical Linux kernel console logging improves the boot time. <value>: ▪ 0—Disable Linux kernel console messages during boot (Default) ▪ 1—Enable all Linux kernel console messages during boot (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM (continued)	**Set — query customization settings (continued)** • "BOOTUARTDLOADEN" — (WP76xx/WP77xx) Enable/disable firmware download over UART on bootloader. <value>: ▪ 0 — Disable UART download. F/W download over USB only (Default) ▪ 1 — Enable UART download. F/W download over USB and UART. Bootloader download mode falls back to UART after USB mode timeout. ▪ If the "UAUDLOADDISABLE" customization has been used to disable firmware download, this customization is ignored. • "CFUNPERSISTEN" — (All WP) Enable/disable persistence (across power cycles) of AT+CFUN setting. <value>: ▪ 0 — Disable (+CFUN setting does not persist across power cycle) Note: If the modem is in P-LPM (persistent low power mode — AT+CFUN mode 0) when this option is used, persistence remains enabled until the modem is put into online mode using an AT or QMI command. ▪ 1 — Enable (+CFUN setting persists across power cycle) ▪ Note: This customization does not affect operating mode persistence set using other interfaces. For example, the QMI interface can still be used to set the operating mode to LPM or P-LPM, even if this customization is disabled. • "CSDDISABLE" — Disable/enable CSD call <value>: ▪ 0 — Enable (Default) ▪ 1 — Disable • "DHCPRELAYENABLE" — (WP76xx/WP77xx) Enable/disable DHCP relay feature. <value>: ▪ 0 — Disable (Default). Modem filters DHCP requests into internal DHCP server. ▪ 1 — Enable. DHCP requests (packets for port 67 with target IP address of DHCP server) go out over the network. • "EXTGPSLNAEN" — Enable/disable EXT_GPS_LNA_EN pin <value>: ▪ 0 — Disable ▪ 1 — (Default) Enable • "EXTUIMSWITCHEN" — Enable/disable control of fast SIM switching feature (see +KSIMSEL on page 230 for details) <value>: ▪ 0 — Disable (Default) ▪ 1 — Enable • "FASTENUMEN" — (All WP) Enable/disable fast enumeration for warm/cold boot. <value>: ▪ 0 — Disable fast enumeration (Default) ▪ 1 — Enable fast enumeration for cold boot and disable for warm boot ▪ 2 — Enable fast enumeration for warm boot and disable for cold boot ▪ 3 — Enable fast enumeration for warm and cold boot (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM (continued)	**Set/query customization settings (continued)** • "FLOWNOTIDISABLE" — (All WP) Enable/disable QoS QMI notification events. <value>: ▪ 0–255 (Default value = 0—all events enabled) ▪ Bit 0: Flow activated event (0=Enable, 1=Disable) ▪ Bit 1: Flow modified event (0=Enable, 1=Disable) ▪ Bit 2: n/a ▪ Bit 3: Flow deleted event (0=Enable, 1=Disable) ▪ Bit 4: Flow suspended event (0=Enable, 1=Disable) ▪ Bit 5: Flow enabled event (0=Enable, 1=Disable) ▪ Bit 6: Flow disabled event (0=Enable, 1=Disable) ▪ Bit 7: n/a • "GPIOSARENABLE" — (All WP) Indicate whether SAR backoff is controlled by GPIOs or by AT commands. <value>: ▪ 0—Controlled by AT commands (default) ▪ 1—Controlled by GPIOs • "GPSENABLE" — (All WP) Enable/disable the GPS feature. <value>: ▪ 0—GPS disabled ▪ 1—MO & MT enabled regardless of GPS_DISABLE setting ▪ 2—MO enabled regardless of GPS_DISABLE setting ▪ 3—MT enabled regardless of GPS_DISABLE setting ▪ 4—MO & MT enabled but are gated by GPS_DISABLE setting ▪ 5—MO enabled but is gated by GPS_DISABLE setting ▪ 6—MT enabled but is gated by GPS_DISABLE setting ▪ <value> + 80—Disable GLONASS (For example, 84 = MO & MT narrow-band GPS enabled, but gated by GPS_DISABLE setting.) • "GPSLPM" — (All WP) Enable/disable GPS in Low Power Mode. <value>: ▪ 0—Enable. GPS engine remains enabled when modem enters LPM. ▪ 1—Disable. GPS engine is disabled when modem enters LPM. • "GPSREFLOC" — (WP8548/WP75xx) Enable/disable reference GPS location reporting. <value>: ▪ 0—Enable (Default) ▪ 1—Disable • "HARDCODEDIPEN" — (WP8548/WP75xx) Enable/disable hard-coded IP. <value>: ▪ 0—Disable hard-coded IP (Default) ▪ 1—Enable hard-coded IP (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM (continued)	**Set/query customization settings (continued)** • "HSICENABLE" — (All WP) Enable/disable HSIC interface <value>: ▪ 0 — Disable HSIC host (Default) ▪ 1 — Enable HSIC host • "ICMPINTSRVDIS" — Bitmask for disablement of Modem internal ICMP service <value>: ▪ 0x00 — Enable IPv4 ICMP service ▪ 0x01 — Disable IPv4 ICMP service When internal ICM service is enabled, the modem is capable of replying to ping requests in an LTE attached state without a host or embedded data connection. *Note: IPV6/ICMPV6 stack is always enabled and cannot be disabled.* • "IMCONFIG" — (WP76xx/WP77xx) Image switching configuration <value>: ▪ 0 — On device (Default) ▪ 1 — On host ▪ 255 — Disable all IM features • "IPCHANNELRATEEN" — (All WP) Enable/disable calculation of IP channel rates (Rx and Tx) <value>: ▪ 0 — Disable (Default) ▪ 1 — Enable • "IPV6ENABLE" — (WP76xx/WP77xx) Enable/disable IPv6 support <value>: ▪ 0 — Disable ▪ 1 — Enable • "JAMENABLE" — (WP8548/WP75xx/WP76xx) Enable/disable JAM detection. <value>: ▪ 0 — Disable (Default) ▪ 1 — Enable • "LTECOEXUARTENABLE" — (WP76xx) Enable/disable Wi-Fi/LTE Coexistence <value>: ▪ 0 — Disable (Default) ▪ 1 — Enable feature (used on GPIO35 if configured using +WIOCFG) ▪ NOTE: This feature cannot be used with UART1 DSR pin. • "LTEREJDELAY" — (WP8548/WP75xx) Set delay before LTE attach requests are sent after TAU or service request rejection. <value>: ▪ 0–255 — Delay in 10 msec units. (e.g. 10=100 msec) ▪ Actual range is 0–2.55 sec ▪ Delay is cancelled if RRC connection is released early. ▪ Suggested value (if delay is being enabled) is 50 (500 msec). Adjust the value as necessary based on testing. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM (continued)	**Set/query customization settings (continued)** • "PCSCDISABLE" — (WP75xx/WP85xx) Determine functionality of PCSC, GSM Algorithm and Authenticate commands, and +CIMI command. <value>: ▪ 0–7 (Default value: 0—all functions enabled) ▪ Bit 0: PCSC (0—Enable, 1—Disable) ▪ Bit 1: GSM Algorithm and Authenticate commands (0—Enable, 1—Disable) ▪ Bit 2: AT+CIMI outputs IMSI (0=Enable, 1=Disable) • "RMNETREDIALEN" — (WP75xx/WP85xx) Enable/disable RmNet redial. <value>: ▪ 0—Disable RmNet redial (Default) ▪ 1—Enable RmNet redial • "SIMHOTSWAPDIS" — (All WP) Configure SIM hotswap feature. <value>: ▪ 0—(Default value for WPx5xx) Enable UIM1 and UIM2 ▪ 1—Disable UIM1, enable UIM2 ▪ 2—(Default value for WP76xx/WP77xx) Enable UIM1, disable UIM2 ▪ 3—Disable UIM1 and UIM2 ▪ Note: 'UIM2' refers to: ▪ (WPx5xx) External UIM interface #2 ▪ (WP76xx/WP77xx) eSIM (embedded SIM) • "SIMLPM" — (All WP) Indicate default SIM power state during Low Power Mode. <value>: ▪ 0—QCT default behavior (same as <value>=2) (Default) Note—The default behavior could change in future revisions. Use <value>=2 if you need to guarantee the described behavior. ▪ 1—SIM remains powered in LPM ▪ 2—Power down SIM with AT+CFUN=0; Power up SIM with AT+CFUN=1. (Note—This customization works only with +CFUN to power up/down the SIM.) • "SINGLEAPNSWITCH" — Indicate device behavior when changing APN name, username, or password. <value>: ▪ 0—Do nothing ▪ 1—Device detaches and re-attaches after changing APN information ▪ 2—Power-cycle the UE ▪ Note: No action is taken if APN is changed in non-LTE service. • "SNTPEN" — Bitmask configuration for SNTP client to obtain time when NITZ is unavailable. ▪ 0x01 – Enable Modem SNTP ▪ 0x02 – Enable SNTP Autoconnect. This allows the SNTP client to initiate a data connection, rather than wait for a user initiated connection to use. ▪ 0x04 – Enable retry on SNTP failure. This allows the SNTP client to retry on SNTP protocol or SNTP connection failure. A maximum retry count is defined in software. This feature may incur data usage charges when enabled, if NITZ time is not provided by the network. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!CUSTOM (continued)</td><td>
Set/query customization settings (continued)

"STKUIEN" — (All WP) Enable/disable SIM toolkit UI.
<value>:

0 — Enable for QMI interface
1 — Reserved
2 — Enable for AT interface

"UAUDLOADDISABLE" — (WP76xx) Enable/disable firmware download via unauthenticated channels such as local UART, USB, and X-MODEM interfaces.
<value>:

0 — (Default) Unauthenticated download enabled
1 — Unauthenticated download disabled, excluding firmware launch failure
2 — Unauthenticated download disabled, including firmware launch failure
Important notes:

This customization can be used only to disable firmware download. Once disabled, it cannot be re-enabled.
If disabled, BOOTUARTDLOADEN customization cannot be used and existing values are ignored.
If option 2 is selected, the device may be unrecoverable if a firmware launch failure occurs, since there is no way to update the firmware.

"UIMAUTOSWITCH" — (WP76xx/WP77xx) Enable/disable Automatic SIM switching ("Auto-SIM-Switch mode").
<value>:

0 — Disable automatic SIM switching
1 — Enable, UIM Slot 1 preferred (external SIM)
2 — Enable, UIM Slot 2 preferred (eSIM)
Note — If enabled (1 or 2), the !UIMS setting is updated to reflect the preferred slot.

"UIMDETPULL" — (WP8548/WP75xx) Configure UIM detect lines pull settings. (Note: Hotswap must be enabled for a UIM slot for the corresponding pull setting to take effect.)
<value>:

0–15 (4 bits)

Bits 1/0: UIM1_DET pull setting
Bits 3/2: UIM2_DET pull setting

<table>
<tr><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th><th>Description</th></tr>
<tr><td>1</td><td>1</td><td>X</td><td>X</td><td>UIM2 Pull Up</td></tr>
<tr><td>1</td><td>0</td><td>X</td><td>X</td><td>UIM2 Pull down</td></tr>
<tr><td>0</td><td>1</td><td>X</td><td>X</td><td>UIM2 No pull</td></tr>
<tr><td>0</td><td>0</td><td>X</td><td>X</td><td>UIM2 Default (Note: CF3 modules default is Pull up.)</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>1</td><td>UIM1 Pull Up</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>0</td><td>UIM1 Pull down</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>1</td><td>UIM1 No pull</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>0</td><td>UIM1 Default (Note: CF3 modules default is Pull up.)</td></tr>
</table>

(Continued on next page)
</td></tr>
</table>

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!CUSTOM (continued)	**Set/query customization settings (continued)** ▪ Example: ▪ AT!CUSTOM="UIMDETPULL",9 (9= '1001' = UIM2 Pull down ('10') and UIM1 No pull ('01') · "UIM2ENABLE" — (WP76xx/WP77xx) Enable/disable UIM2 slot (eSIM) support. <value>: ▪ 0—Disable ▪ 1—Enable (Default) · "WAKEHOSTEN" — (All WP) Enable/disable host wake-up via SMS or incoming data packet. <value>: ▪ 0—Disable—Host will not wake when SMS or incoming data packet is received. (Default) ▪ 1—Wake host when simple SMS is received. ▪ 2—Wake host when incoming data packet is received. ▪ 3—Wake host when simple SMS or incoming data packet is received.
!DATALOOPBACK	**Enable/disable and configure loopback mode** Enable or disable loopback mode and the loopback multiplier, or display the current settings. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Query: **AT!DATALOOPBACK?** Response: !DATALOOPBACK: Data Loopback Mode; <loopback_mode> Replication Count: <loopback_multiplier> OK Purpose: Display the loopback mode state, and loopback multiplier. ▪ Execution: **AT!DATALOOPBACK=<loopback_mode>[, <loopback_multiplier>]** Response: OK Purpose: Enable/disable loopback mode, and set the loopback multiplier. ▪ Query list: **AT!DATALOOPBACK=?** Purpose: Returns a list of valid parameter values. **Parameters:** <loopback_mode> (Loopback mode state) · 0=Disable data loopback mode · 1=Enable data loopback mode <loopback_multiplier> (Number of downlink bytes sent for each uplink byte (replication count)) · Decimal value · Valid range: 0–1

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!EONS (notification)	**Enhanced Operator Name String (EONS) — Unsolicited notification** Unsolicited notification indicating the current network's name. This would typically be received when entering an area with a new serving network, or when swapping SIMs for a different mobile network provider. To enable !EONS (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!EONS: <name_string>** **Examples:** • Notifications received: !EONS: "CHN-UNICOM" The current carrier is China Unicom. **Parameters:** <state> (Network name) • ASCII string within quotes
!EVRC (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!EVRC_B (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!EVRC_NW (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!EVRC_WB (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!GETBAND	**Return the current active band** Return the active band currently being used by the modem. **Password required:** No **Usage:** ▪ Query: **AT!GETBAND?** Response: !GETBAND: <active band description> OK *or* No Service OK Purpose: Return a description of the current active band, or return an error message. *Note: **!GETBAND** reports W800 for both W800 and W850.*

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GETRAT	**Return the current active radio access technology (RAT)** Return the RAT currently being used by the modem. **Password required:** No **Usage:** ▪ Query: AT!GETRAT? Response: !GETRAT: <active RAT description> OK *or* Unknown OK *or* No Service OK Purpose: Return a description of the current RAT, or return an error message.
!GSM_EFR (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!GSM_FR (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!GSM_HR (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS	**Return operational status** Return specific details about the current operational status of the modem. **Important:** *Response details vary depending on the current RAT, and may evolve from release to release. Parameter descriptions show all possible values—actual supported values vary depending on module type and current RAT. Contact Sierra Wireless for further details if required.* **Password required:** No **Usage:** ▪ Query: **AT!GSTATUS?** Response (As noted above, details vary depending on RAT and module type.): !GSTATUS: <param_label>: <param> [[<param_label>:]<param>] ... OK Purpose: Display details about the modem's current operational state. Details shown will vary depending on the current RAT, module type, and firmware release. **Example:** !GSTATUS: Current Time: <ctime> Temperature: <temp> Reset Counter: <rstcount> Mode: <mode> System mode: <smode> PS state: <PSstate> IMS Reg State: <imsstate> IMS mode: <ims mode> IMS Service: <imssrvstatus> WCDMA band: <wband> WCDMA channel: <wchan> GMM (PS) state: <gmmstate> <gmmsubstate> MM (CS) state: <mmstate> <mmsubstate> WCDMA L1 State: <wrstate> LAC: <LAC> RRC State: <wrstate> Cell ID: <Cell ID> RxMRSSI C0: <wrxlev> RxDRSSI C0: <wrxlev> RxMRSSI C1: <wrxlev> RxDRSSI C1: <wrxlev> OK **Parameters:** <param_label> • Parameter description. e.g. "WCDMA channel" <param> • Parameter value. Refer to the parameter descriptions listed below. <btime> ((WPx5 only) "Bootup Time"—Time (in 24-hour format) that system booted)) • 32-bit decimal (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <cband> ("CDMA band") · ASCII string (quotation marks do not appear): ▪ "US Cellular" ▪ "US PCS" ▪ "JTACS" ▪ "JCDMA" ▪ "Korean PCS" ▪ "NMT" ▪ "IMT" ▪ "No band" <cchan> ("CDMA channel"—CDMA Rx channel) · decimal <Cell ID> ("Cell ID" or "TDS Cell ID") · Hex (decimal) <cnid> ("NID"—CDMA Network ID) · decimal <csid> ("SID"—CDMA System ID) · decimal <ctime> ("Current Time"—Number of seconds since the system booted/rebooted) · 32-bit decimal <ecio> ("ECIO (db)"—Ratio of received pilot energy (Ec) to total received energy) · -31.5 to 0 <emmcon> ("EMM connection"—Current EMM connection state) · ASCII string (quotation marks do not appear): ▪ "RRC Idle" ▪ "Waiting RRC Cfm" ▪ "RRC Connecting" ▪ "RRC Releasing" <emmstate> ("EMM state" first field—Current EMM state) · ASCII string (quotation marks do not appear): ▪ "Deregistered" ▪ "Reg Initiated" ▪ "Registered" ▪ "TAU Initiated" ▪ "SR Initiated" ▪ "Dereg Initiated" ▪ "Invalid" ▪ "NULL" (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <emmsubstate> ("EMM state" second field—Current EMM sub-state) • ASCII string (quotation marks do not appear): ▪ For <emmstate> = "Deregistered": ▪ "No IMSI" ▪ "PLMN Search" ▪ "Attach Needed" ▪ "No Cell" ▪ "Attaching" ▪ "Normal Service" ▪ "Limited Service" ▪ "Waiting for PDN" ▪ For <emmstate> = "Reg Initiated": ▪ "Waiting for NW" ▪ "Waiting for ESM" ▪ For <emmstate> = "Registered": ▪ "Normal Service" ▪ "Update Needed" ▪ "Attempt Update" ▪ "No Cell" ▪ "PLMN Search" ▪ "Limited Service" ▪ "MM Update" ▪ "IMSI Detach" ▪ "Waiting for ESM" ▪ For all other <emmstate>s: ▪ "---" <gband> ("GSM band"—Current GSM band being accessed (TCH or BCCH)) • ASCII string (quotation marks do not appear): ▪ "GSM850" ▪ "GSM900" ▪ "DCS1800" ▪ "PCS1900" ▪ "Unknown" <gchan> ("GSM channel"—GSM channel number) • 32-bit decimal ASCII <gmmstate> ("GMM (PS) state" first field—Current GMM state) • ASCII string (quotation marks do not appear): ▪ "DEREGISTERED" ▪ "Registering" ▪ "REGISTERED" ▪ "Deregistering" ▪ "RA updating" ▪ "Requesting srvc" ▪ "NULL" (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <gmmsubstate> ("GMM (PS) state" second field—Current GMM sub-state) · ASCII string (quotation marks do not appear): ▪ "NORMAL SERVICE" ▪ "LIMITED SERVICE" ▪ "ATT NEEDED" ▪ "ATTEMPTING ATT" ▪ "NO IMSI" ▪ "NO SERVICE" ▪ "PLMN SEARCH" ▪ "SUSPENDED" ▪ "UPDATE NEEDED" ▪ "UPDATING" ▪ "DEATACHING" ▪ "---" —No sub-state, or a sub-state not defined in this command <gstate> ("GPRS State"—State of GMM ↔ LLC interface) · ASCII string (quotation marks do not appear): ▪ "GPRS IDLE" ▪ "GPRS READY" ▪ "GPRS STANDBY" <hccode> ("Color code"—HDR color code) · decimal <hpoff> ("PN offset"—HDR PN offset) · decimal <hscid> ("Sector ID"—HDR sector ID) · 32 hexadecimal digits in eight groups of four digits, separated by ":" · Example: ABCD:EF12:3456:7890:ABCD:EF23:ED45:B2C3 <hsmsk> ("Subnet mask"—HDR subnet mask) · decimal <ims mode> ("IMS mode") · ASCII string (quotation marks do not appear): ▪ "Normal" ▪ "Test" ▪ "Not Support"— Device is not configured with IMS <IMS state> ("IMS Reg State"—IMS registration state) · ASCII string (quotation marks do not appear): ▪ "NOT REGISTERED" ▪ "REGISTERED" ▪ "UNKNOWN" (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <imssrvstatus> ("IMS Service"—IMS Registered Server status) • ASCII string (quotation marks do not appear): ▪ "NO SMS,NO VoIP" ▪ "NO SMS,FULL VOIP" ▪ "LIMITED SMS,NO VOIP" ▪ "LIMITED SMS,FULL VOIP" ▪ "FULL SMS,NO VoIP" ▪ "FULL SMS,FULL VoIP" ▪ "LIMITED SMS,UNKNOWN VoIP" ▪ "UNKNOWN SMS,UNKNOWN VoIP" <io> ("IO (dBm)"—Total received energy (Io)) • -106 to -21 <lac> ("LAC" or "TDS LAC"—Location Area Code) • Hex (decimal) <lband> ("LTE band") • ASCII string (quotation marks do not appear): ▪ "B1" .. "B41" ▪ "No band" <lbw> ("LTE bw"—LTE bandwidth) • ASCII string (quotation marks do not appear): ▪ "1.4 MHz" ▪ "3 MHz" ▪ "5 MHz" ▪ "10 MHz" ▪ "15 MHz" ▪ "20 MHz" ▪ "Unknown" <lrchan> ("LTE Rx chan"—LTE Rx channel) • decimal <ltchan> ("LTE Tx chan"—LTE Tx channel) • decimal (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <mmstate> ("MM (CS) state" first field—Current MM state) • ASCII string (quotation marks do not appear): ▪ "NULL" ▪ "IDLE" ▪ "LA Rejected" ▪ "LA Start" ▪ "CONNECTED" ▪ "Network Command" ▪ "IMSI Detach" ▪ "Wait RR Active" ▪ "Wait RR LU" ▪ "Wait RR Detach" ▪ "Wait RR MM" ▪ "Wait MM" ▪ "Wait add'l MM" ▪ "Wait Re-est Dec" ▪ "Wait RR Re-est" ▪ "Re-est" ▪ "LU Pending" ▪ "Rel not allowed" ▪ "Prompt" <mmsubstate> ("MM (CS) state" second field—Current MM sub-state) • ASCII string (quotation marks do not appear): ▪ "NORMAL SERVICE" ▪ "LIMITED SERVICE" ▪ "NO IMSI" ▪ "NO SERVICE" ▪ "PLMN SEARCH" ▪ "UPDATE NEEDED" ▪ "UPDATING" ▪ "ECALL INACTIVE" ▪ "---" —No sub-state, or a sub-state not defined in this command <mode> ("Mode"—Current module mode) • ASCII string (quotation marks do not appear): ▪ "POWERING OFF" ▪ "FACTORY TEST" ▪ "OFFLINE" ▪ "ONLINE" ▪ "LOW POWER MODE" ▪ "RESETTING" ▪ "NETWORK TEST" ▪ "OFFLINE REQUEST" ▪ "PSEUDO ONLINE" ▪ "RESETTING MODEM" ▪ "Unknown" (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <PSstate> ("PS state"—Current PS state of module) · ASCII string (quotation marks do not appear): ▪ "Attached" ▪ "Not attached" <ri> ("Roaming Indicator") · decimal <rsrp> ("RSRP (dBm)"—Reference Signal Receive Power) · -140 to -44 <rsrq> ("RSRQ (dB)"—Reference Signal Receive Quality) · -20 to -3 <rssi> ("RSSI", "RxM RSSI", "PCC RxM RSSI"—Total received power) · -120 to 0 <rstcount> ((WP76/WP77 only) "Reset Counter"—Number of resets since last power cycle) · 32-bit decimal · Value resets to 0 on power cycle/power on/off. · Value increments when a hardware or software reset is performed. <rxdivpwr> ("RX1 (dBm)"—Diversity received power) · -106 to -21 <sinr> ("SINR (dB)"—Signal to Interference plus Noise) · -20 to +30 <smode> ("System mode"—Current system mode) · ASCII string (quotation marks do not appear): ▪ "None" ▪ "No service" ▪ "AMPS" ▪ "CDMA" ▪ "GSM" ▪ "HDR" ▪ "WCDMA" ▪ "GPS" ▪ "WCDMA+GSM" ▪ "WLAN" ▪ "LTE" ▪ "GWL" ▪ "TD-SCDMA" ▪ "eHRPD" ▪ "Unknown" <tac> ("TAC"—Tracking Area Code) · Hex (decimal) <tdsband> ("TDS band"—Current TD-SCDMA band being accessed) · ASCII string (quotation marks do not appear): ▪ "TDS B34" ▪ "TDS B39" ▪ "TDS B40" (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <tdschan> ("TDS channel"—TD-SCDMA channel number) • 32-bit decimal ASCII <tdsrstate> ("TDS RRC State"—TD-SCDMA RRC state) • ASCII string (quotation marks do not appear): ▪ "DISCONNECTED" ▪ "CONNECTING" ▪ "CELL_FACH" ▪ "CELL_DCH" ▪ "CELL_PCH" ▪ "URA_PCH" ▪ "State N/A" ▪ "---" <tdsrxlev> ("RxM RSSI"—Receive power in dBm) • decimal <tdsstate> ("TDS L1 State"—TD-SCDMA L1 state) • ASCII string (quotation marks do not appear): ▪ "L1M_IDLE" ▪ "L1M_FS" ▪ "L1M_ACQ" ▪ "L1M_SYNC" ▪ "L1M_BCH" ▪ "L1M_PCH" ▪ "L1M_FACH" ▪ "L1M_DCH" ▪ "L1M_PCH_SLEEP" ▪ "L1M_STOPPED" ▪ "L1M_SUSPENDED" ▪ "L1M_PCH_BPLMN" ▪ "L1M_WAIT_TRM_STOP" ▪ "L1M_IRAT" ▪ "---" <temp> ("Temperature"—Temperature (approximate) in °C, accurate within ~5 °C) • 32-bit decimal <txpwr> ("Tx Power"—Transmit Power) • -100 to +100 • "--"—No transmission (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!GSTATUS (continued)	**Return operational status (continued)** <wband> ("WCDMA band"—Current WCDMA band being accessed) • ASCII string (quotation marks do not appear): ▪ "WCDMA 2100" ▪ "WCDMA 1900" ▪ "WCDMA BC3" ▪ "WCDMA 1700" ▪ "WCDMA 800" ▪ "WCDMA 900" ▪ "WCDMA BC9" ▪ "WCDMA BC11" ▪ "WCDMA BC19" <wchan> ("WCDMA channel"—WCDMA channel number) • 32-bit decimal ASCII <wrstate> ("WCDMA L1 State", "RRC State"—WCDMA RRC state) • ASCII string (quotation marks do not appear): ▪ "DISCONNECTED" ▪ "CONNECTING" ▪ "CELL_FACH" ▪ "CELL_DCH" ▪ "CELL_PCH" ▪ "URA_PCH" ▪ "State N/A" ▪ "---" <wrxlev> ("RxDRSSI", "RxMRSSI"—Receive power in dBm) • decimal <wstate> ("WCDMA L1 state") • ASCII string (quotation marks do not appear): ▪ "L1M_IDLE" ▪ "L1M_FS" ▪ "L1M_ACQ" ▪ "L1M_BCH" ▪ "L1M_PCH" ▪ "L1M_FACH" ▪ "L1M_DCH" ▪ "L1M_DEACTIVE" ▪ "L1M_PCH_SLEEP" ▪ "L1M_DEEP_SLEEP" ▪ "L1M_STOPPED" ▪ "L1M_SUSPENDED" ▪ "L1M_PCH_BPLMN" ▪ "L1M_WAIT_TRM_STOP" ▪ "---"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!IMAGE	**Manage Firmware Images** List or delete stored firmware and configuration (PRI) images. *Note: This command is intended for use by advanced users who are familiar with the nuances of firmware and PRI image storage requirements and naming conventions.* **Password required:** No **Usage:** ▪ Execution: **AT!IMAGE=<op>[,<type>[,<slot>[,<build_id>,<unique_id>]]]** Response: OK Purpose: Delete or list stored FW and/or PRI images. ▪ Query: **AT!IMAGE?[<op>[,<type>]]** Response: TYPE SLOT STATUS LRU FAILURES UNIQUE_ID BUILD_ID <TY> <slot> <status> <lru> <f1> <f2> <unique_id> <build_id> ... Max FW images: <max_fw> Active FW image is at slot <slot> TYPE SLOT STATUS LRU FAILURES UNIQUE_ID BUILD_ID <TY> <slot> <status> <lru> <f1> <f2> <unique_id> <build_id> ... Max PRI images: <max_pri> OK Purpose: Display lists of stored firmware and/or PRI images, or the quantity of stored firmware or PRI images. (In the format shown above, the <TY> value in the first group of responses will be 'FW', and the value in the second group will be 'PRI'.) Note: If the active firmware image has been deleted from storage, the "Active FW image is at slot <slot>" line will show "slot 255". **Parameters:** <op> (Operation) • 0 — Delete. (Note: Valid only for Execution format.) • 1 — List stored FW and/or PRI images, depending on <type> • 2 — List Max FW images or Max PRI images, depending on <type> <type> (Image type) • 0 — FW (firmware) • 1 — PRI (configuration) <slot> (Firmware image slot ID) • Valid range: 0–FF • Field is ignored for PRI images. <build_id> (Build ID) • ASCII string, including double-quotes (e.g. "01.00.04.00_ATT") <unique_id> (Unique ID) • ASCII string, including double-quotes (e.g. "001.000_000") (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!IMAGE (continued)	**Manage Firmware Images (continued)** <TY> (Image type) • FW • PRI <status> (Image status) • EMPTY • GOOD <lru> (Least Recently Used count) • Indicates how recently the image has been used. • Used automatically during slot selection process to determine which image to remove if a new image is being loaded and there are no empty slots. <f1> (Programming failure count) • 0–255 <f2> (Switching failure count) • 0–255 <max_fw> (Programming failure count) • Device-dependent, maximum number of firmware images that can be stored <max_pri> (Programming failure count) • Device-dependent, maximum number of PRI images that can be stored

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!IMPREF	**Query/set Image Management preferences** Indicate (set) which firmware image (firmware plus carrier configuration pair) should be downloaded to the module or enable SIM-based image switching, or list (query) the configuration pairs that are currently downloaded and preferred. **Password required:** No **Usage:** ▪ Execution: **AT!IMPREF=<carrier-name>** or **AT!IMPREF="AUTO-SIM"** Response: OK Purpose: Indicate which carrier should be used (if a matching carrier PRI and required firmware are found), or specify "AUTO-SIM" to enable SIM-based image switching. Note: If AUTO-SIM is currently enabled, selecting a carrier will disable it. ▪ Query: **AT!IMPREF?** Response:! IMPREF: preferred fw version: <firmware-ver> preferred carrier name: <carrier-name> preferred config name: <carrier-config> current fw version: <firmware-ver> current carrier name: <carrier-name> current config name: <carrier-config> [<mismatch information>] OK Purpose: Query (show) the preferred and current firmware plus carrier carrier configuration pairs. **Parameters:** <carrier-name> (Unique code identifying the carrier that the firmware was designed for) ▪ ASCII string <firmware-ver> (Unique firmware version number assigned by Sierra Wireless) ▪ ASCII string <carrier-config> (Unique code identifying the carrier and configuration details) ▪ ASCII string **Example(s):** ▪ AT!IMPREF="ABC" *(where 'ABC' is a carrier name)*

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KCELL	**Display Detected Cell Details** Display information about the cells (serving, neighbor, detected) detected by the module, which are of the currently attached RAT. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT+KCELL=<revision>** Response (GSM): <nbGSMcells>[, <cell_type=0>, <ARFCN>, <BSIC>, <PLMN>, <LAC>, <GSM_CI>, <RXLEV>, <GSM_TA>][[,<cell_type=1>,<ARFCNi>,<BSIC>, <PLMN>, <LAC>, <CI>, <RXLEV>] [...]] OK Response (UMTS): <nbUMTScells>[, <cell_type=2 | 3 | 4>, <dl_ARFCN>, <PLMN>, <LAC>, <UMTS_CI>, <scrambling_code>, <rscp>, <ecio>[, <pathloss>] [...] OK Response (LTE): <nbLTEcells>[, <cell_type=5>, <PLMN>, <LTE_CI>, <PhyCellInd>, <TrackingAreaCode>, <RSRPResult>, <RSRQResult>, <LTE_TA>][[, <cell_type=6>, <Earfcn>, <PhyCellId>, <RSRPResult>, <RSRQResult>] [...]] OK Purpose: Display details about all cells detected by the module that are of the currently attached RAT: • GSM—Active cell first, followed by neighbor cells • UMTS—Serving cell first, then neighbor cells, then monitored cells. • LTE—Serving cell first, followed by neighbor cells ▪ Query: **AT+KCELL?** Response:! OK Purpose: TBD ▪ Query list: **AT+KCELL=?** Purpose: Displays execution format. **Parameters:** <revision> (Reserved field) • 0—Only valid option. Parameter is reserved for future development. <nbGSMcells> (Number of available GSM base stations) • Valid range: 0–7 <cell_type> (Cell type) • 0—GSM serving cell • 1—GSM neighbor cell • 2—UMTS serving cell • 3—UMTS neighbor cell • 4—UMTS detected cell • 5—LTE serving cell • 6—LTE neighbor cell (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KCELL (continued)	**Display Detected Cell Details (continued)** <ARFCN> (Absolute Radio Frequency Channel Number) • Valid range: 0–1023 • Decimal format <BSIC> (Base Station Identity Code) • Valid range: 0–63 <PLMN> (PLMN identifier) • Format: Hexadecimal (3 bytes) per GSM 11.11 specification • Combines MCC (Mobile Country Code) and MNC (Mobile Network Code) • Example: 42F618 (Hex value for MCC=246 and MNC=81) <LAC> (Location Area Code) • Format: Hexadecimal (4 hex digits) <GSM_CI> (GSM Cell Identity) • Format: Hexadecimal (4 hex digits) • Example: ABCD <RXLEV> (Received signal level of BCCH carrier) • Valid range: 0–63 • Represents signal level in range -110 to -48 dBm. Refer to GSM 05.08 Radio Subsystem Link Control for details. <GSM_TA> (GSM Timing Advance for serving cell) • Only available when module is in connected state • Valid values: ▪ -1—Not available ▪ 0–63 <nbUMTScells> (Number of available UMTS base stations) • Valid range: 0–25 <dl_UARFCN> (DL UARFCN (UTRA Absolute Radio Frequency Channel Number) of serving cell) • Format: Decimal • For valid range, refer to 3GPP TS 25.101 <UMTS_CI> (UMTS Cell Identity) • Format: Hexadecimal (8 hex digits) • Example: A12BC3DF <scrambling_code> (Downlink scrambling code) • Valid range: 0–511 • Format: Decimal <rscp> (Received Signal Code Power, in dBm) • Power level in one chip <ecio> (Ec/Io—Energy per chip to Interference power ratio, in dB) • Valid range: TBD (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KCELL (continued)	**Display Detected Cell Details (continued)** <pathloss> (Path loss, in dB) • Format: Decimal • Appears for <cell_type=2 | 3> • Valid values: ▪ 46–158—Path loss in dB ▪ 255—Not available <nbLTEcells> (Number of available LTE base stations) • Valid range: 0–33 <LTE_CI> (LTE Cell Identity) • Format: Hexadecimal (8 hex digits; length 28 bits), per 3GPP TS 36.331, 6.3.4, Cell Identity • Example: A12BC3DF <PhyCellInd> (Physical layer identity of LTE Cell) • Valid range: 0–503, per 3GPP TS 36.331, 6.3.4, PhysCellId <TrackingAreaCode> (Tracking Area Code of LTE Cell) • Valid range: 0–65535, per 3GPP TS 36.331, 6.3.4, TrackingAreaCode <RSRPResult> (Reference Signal Received Power) • Valid range: 0–97. Refer to 3GPP TS 36.331, 6.3.5, RSRP-Range for details. <RSRQResult> (Reference Signal Received Quality) • Valid range: 0–34. Refer to 3GPP TS 36.331, 6.3.5, RSRQ-Range for details. <LTE_TA> (LTE Timing advance) • Value available only when module is in connected state. • Valid values: ▪ -1—Not available ▪ 0–63—Timing advance ▪ 255—Module is in a 3G voice call <Earfcn> (Neighbor cell carrier frequency • Carrier frequency of the neighbor cell designated by the EUTRA Absolute Radio Frequency Channel Number (EARFCN). Refer to 3GPP TS 36.101, 5.7.3 for details. • Valid range: 0–0xFFFF

Table 3-2: Modem Status Command Details (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+KMCLASS</td><td>
Set 2G multislot class
Set the device's 2G (GPRS/EGPRS) multislot class. The new setting takes effect after the device is reset.
Supporting devices: WP76xx/WP77xx. Not supported by WP8548/WP75xx.
Password required: No
Reset required to apply changes: Yes
Persistent across power cycles: Yes
Usage:
▪ Execution: AT+KMCLASS=<mclass>
Response: OK
Purpose: Set the desired multislot class.
▪ Query: AT+KMCLASS?
Response: +KMCLASS: <mclass>
OK
Purpose: Report the current multislot class.
▪ Query List: AT+KMCLASS=?
Purpose: Return the execution command format and the supported parameter values.
Parameters:
<mclass> (Multislot class)
• Integer value (Default — 33)
• Valid values:
<table>
<tr><th rowspan="2">Class</th><th colspan="3">Max number of slots</th></tr>
<tr><th>Rx</th><th>Tx</th><th>Total</th></tr>
<tr><td>1</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>2</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>3</td><td>2</td><td>2</td><td>3</td></tr>
<tr><td>4</td><td>3</td><td>1</td><td>4</td></tr>
<tr><td>5</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td>6</td><td>3</td><td>2</td><td>4</td></tr>
<tr><td>7</td><td>3</td><td>3</td><td>4</td></tr>
<tr><td>8</td><td>4</td><td>1</td><td>5</td></tr>
<tr><td>9</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td>10</td><td>4</td><td>2</td><td>5</td></tr>
<tr><td>11</td><td>4</td><td>3</td><td>5</td></tr>
<tr><td>12</td><td>4</td><td>4</td><td>5</td></tr>
<tr><td>30</td><td>5</td><td>1</td><td>6</td></tr>
<tr><td>31</td><td>5</td><td>2</td><td>6</td></tr>
<tr><td>32</td><td>5</td><td>3</td><td>6</td></tr>
<tr><td>33</td><td>5</td><td>4</td><td>6</td></tr>
</table>
</td></tr>
</table>

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KSLEEP	**Configure UART1 power management (sleep mode entry conditions)** Configure UART1 power management, indicating under which conditions the module will enter sleep mode. **Password required:** No **Persistent across power cycles:** Yes **Requirements:** · To have DTR control sleep mode (<mngt>=0), AT!RIOWNER=0 must be used before using +KSLEEP. **Notes:** · Controls only UART1 power management; does not affect USB AT command port. · When KSLEEP=1 and the module is in sleep mode, the user must input a character to wake the module. When the module is awake, AT commands can be input as normal. · (WP76xx/WP77xx) When CMUX is enabled over UART (via !MUXMODE=1), DTR cannot be used to enable or disable sleep mode. **Usage:** ▪ Execution: **AT+KSLEEP=<mngt>** Response: OK Purpose: Set the power management configuration. ▪ Query: **AT+KSLEEP?** Response:! +KSLEEP: <mngt> OK Purpose: Indicate current power management configuration. ▪ Query list: **AT+KSLEEP=?** Purpose: Return a list of supported <mngt> values. **Parameters:** <mngt> (UART1 Power management configuration) · 0 — Module will not enter sleep mode when DTR is active (low level). If DTR is inactive, module enters sleep mode: ▪ (WP8548/WP75xx) after 5 seconds ▪ (WP76xx/WP77xx) once all wakeup sources are released. Note: DTR must be active to send AT commands. · 1 — Module enters sleep mode automatically after 5 seconds of inactivity. · 2 — Module never enters sleep mode (regardless of DTR state)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KSRAT	**Set the current RAT** Set the current RAT mode(s) for acquisition. **Important:** *To avoid issues with incompatible RAT/band combinations, !BAND must be set to 'All Bands', and !SELRAT must not be used.* **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+KSRAT=<ratInd>** Response: OK Purpose: Set the desired RAT. ▪ Query: **AT+KSRAT?** Response: +KSRAT: <ratInd> OK *or* Unknown RAT mode. Use AT+KSRAT to set mode. OK Purpose: Return the current RAT (<ratInd>). ▪ Query List: **AT+KSRAT=?** Purpose: Return a list of supported RAT index values and their descriptions. **Parameters:** <ratInd> (RAT index): ▪ 0 — All RATs, automatic ▪ 1 — GSM only ▪ 2 — UMTS only ▪ 4 — UMTS and GSM ▪ 5 — LTE only ▪ 7 — LTE and UMTS ▪ 9 — LTE and GSM

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KSREP	**Enable/disable startup reporting** Enable or disable startup reporting. When enabled, the module sends an unsolicited notification (+KSUP (notification)) during startup. By default, startup reporting is disabled. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+KSREP=<mode>** Response: OK Purpose: Enable or disable startup reporting. ▪ Query: **AT+KSREP?** Response: +KSREP: <mode>,<status> OK Purpose: Report current setting for startup reporting, and the current status. ▪ Query List: **AT+KSREP=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <mode> (Startup reporting state) · 0 (Default) — Disabled · 1 — Enabled <status> (Module status) · 0 — Module is ready to receive commands for the TE. No access code is required. · 1 — Module is waiting for an access code. Use AT+CPIN? to determine the code. · 2 — SIM card is not present. · 3 — Module is in "SIM lock" state. · 4 — Unrecoverable error · 5 — Unknown state

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+KSUP (notification)	**Startup notification (unsolicited notification)** Unsolicited notification received from the module at startup, if enabled using +KSREP. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Usage:** ▪ Notification: **+KSUP: <status>** Purpose: Indicates the state of the module at startup time. **Parameters:** <status> (Module status) · 0 — Module is ready to receive commands for the TE. No access code is required. · 1 — Module is waiting for an access code. Use AT+CPIN? to determine the code. · 2 — SIM card is not present. · 3 — Module is in "SIM lock" state. · 4 — Unrecoverable error · 5 — Unknown state

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!LTEINFO	**Display LTE network information** Display LTE network information. **Password required:** No **Usage:** ▪ Query: **AT!LTEINFO?** Response: !LTEINFO: Serving: ...<list of applicable parameters> IntraFreq: ...<list of applicable parameters> InterFreq: ...<list of applicable parameters> GSM: ...<list of applicable parameters> WCDMA: ...<list of applicable parameters> CDMA 1x: ...<list of applicable parameters> CDMA HRPD: ...<list of applicable parameters> Purpose: Return LTE network measurements. **Parameters:** <earfcn> (E-UTRA absolute radio frequency channel number of the serving cell) · 16-bit decimal <mcc> (MCC code) · 16-bit decimal <mnc> (MNC code) · 16-bit decimal <tac> (Tracking area code) · 16-bit decimal <cid> (LTE Serving cell id) · 16-bit hexadecimal <bd> (Serving cell operating band) · 8-bit decimal <d> (Transmission bandwidth configuration of serving cell on the downlink) · 8-bit decimal <u> (Transmission bandwidth configuration of serving cell on the uplink) · 8-bit decimal <snr> (Average RSSNR of the serving cell over last measurement period in decibels) · 8-bit decimal <pci> (Physical cell ID) · 16-bit decimal <rsrq> (Current Reference Signal Receive Quality as measured by L1) · 16-bit decimal <rsrp> (Current Reference Signal Receive Power in dBm x10 as measured by L1) · 16-bit decimal <rssi> (Current Received Signal Strength Indication as measured by L1) · 16-bit decimal (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!LTEINFO (continued)	**Display LTE network information (continued)** <rxlv> (Cell selection Rx level (Srxlev) value) · 16-bit decimal <thresholdlow> (Cell Srxlev low threshold) · 8-bit decimal <thresholdhi> (Cell Srxlev high threshold) · 8-bit decimal <priority> (Cell reselection priority) · 8-bit decimal <threshl> (Reselection threshold for low priority layers) · 8-bit decimal <threshh> (Reselection threshold for high priority layers) · 8-bit decimal <prio> (Priority of this frequency group) · 8-bit decimal <ncc> (Bitmask identifying whether neighbor with a particular Network Color Code is to be reported) · 8-bit decimal <arfcn> (GSM frequency being reported) · 16-bit decimal <1900> (Band indicator for the GSM ARFCN, only valid if arfcn is in the overlapping region) · boolean <valid> (Flag indicating whether the BSIC ID is valid) · boolean <bsic> (BSIC ID) · 8-bit decimal <uarfcn> (WCDMA layer frequency) · 16-bit decimal <psc> (Scrambling code) · 16-bit decimal <rscp> (Absolute power level of the CPICH as received by the UE in dBm x10) · 16-bit decimal <ecn0> (Ratio of received energy per PN chip for the CPICH to the total received power spectral density at the UE antenna connector) · 16-bit decimal <chan> (Channel number) · 16-bit decimal <bc> (Band class) · 16-bit decimal <offsey> (The neighbor cell Pilot PN offset) · 16-bit decimal <phase> (The neighbor cell Pilot PN phase) · 16-bit decimal <str> (The neighbor cell Pilot EC/IO) · 16-bit decimal

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!MAPUART	**Map services to UART** Map services to the module's physical UARTs. Note that a reset is required for the change to take effect. *Note: Input to UART2 (when mapped as a Linux Console) cannot wake the module while it is sleeping.* **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!MAPUART=<service>[,<uart>]** Response: OK Purpose: Map the specified <service> to the specified <uart> (if no <uart> is specified, UART1 is used). ▪ Query: **AT!MAPUART?** Response: !MAPUART: <service (UART1)>[, <service (UART2)>] OK Purpose: Report the current mappings for both UARTs. ▪ Query List: **AT!MAPUART=?** Purpose: Return the command format and the supported parameter values. **Parameters:** <service> (Service to map to a UART) • 0 — UART disabled • 1 — AT command service (Note: Not available for UART2) • 2–3 — Reserved • 4 — NMEA service • 5–15 — Reserved • 16 — Linux Console • 17 — Customer Linux application <uart> (Physical UART) • 1 — UART1 (Default) • 2 — UART2

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!MCUWATCHDOG	**Set/Report MCU Watchdog Parameters** Configure or display the MCU Watchdog parameters that are stored on the module at /sys/module/swimcu_pm/watchdog/. Note: This command applies only to modules that have on-board MCUs. **Supporting devices:** WP76xx (only modules with MCUs). Not supported by WP8548/WP75xx/WP77xx. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!MCUWATCHDOG=<timeout>,<reset_delay>,<enable>** Response: OK or ERROR Purpose: Set the specified watchdog parameters. ▪ Query: **AT!MCUWATCHDOG?** Response: !MCUWATCHDOG: <timeout>,<reset_delay>,<enable>,<count> OK or ERROR Purpose: Report the current watchdog settings. ▪ Query List: **AT!MCUWATCHDOG=?** Purpose: Return the command format and the supported parameter values. **Parameters:** <timeout> (Timeout value for the watchdog, in seconds) • 0–3456000 • Value must be >0 if <enable>=1 <reset_delay> (Delay before reset after watchdog timeout, in seconds) • 0–3456000 • Value must be >0 if <enable>=1 <enable> (Enable/disable watchdog timer) • 0 — Disable • 1 — Enable (Note: <timeout> and <reset_delay> must both be >0) <count> (Number of times the watchdog timer has restarted) • Integer • When <timeout> occurs, <count> increases by 1 and timer restarts automatically.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!MODE (notification)	**Current system mode — Unsolicited notification** Unsolicited notification indicating the network's current system mode. To enable !MODE (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!MODE: <mode>** **Examples:** • Notifications received: !MODE: 3 (Indicates current system mode is GSM.) **Parameters:** <mode> (System mode) • 0 — No service • 2 — CDMA • 3 — GSM • 4 — HDR • 5 — WCDMA • 9 — LTE • 11 — TDS
!MUSLEN	**Enable / disable unsolicited messaging feature** Enable or disable the module's unsolicited messaging feature. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!MUSLEN=<enable>** Response: OK Purpose: Enable or disable unsolicited messaging feature. ▪ Query: **AT!MUSLEN?** Response: !MUSLEN: <enable> OK Purpose: Report current state of unsolicited messaging feature. ▪ Query List: **AT!MUSLEN=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <enable> (Unsolicited messaging feature support state) • 0 = Disabled (Default) • 1 = Enabled

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!MUXMODE	**Enable/disable CMUX mode** Enable CMUX (over UART or USB) or disable the feature. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!MUXMODE=<mode>** Response: OK Purpose: Enable or disable CMUX feature. ▪ Query: **AT!MUXMODE?** Response: !MUXMODE: <mode> OK Purpose: Report current state of CMUX feature. ▪ Query List: **ATMUXMODE=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (CMUX feature state) • 0 — Disable (Default) • 1 — Enable CMUX over UART. (Note — If this mode is enabled, the +KSLEEP option <mngt=0> will not work, since DTR cannot be used to enable or disable sleep mode.) • 2 — Enable CMUX over USB
!NETNUM	**Set/report number of supported network interfaces** Configure the modem to support a specific NAS (Non-Access Stratum) release compliance version. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!NETNUM=<usb_netnum>** Response: OK Purpose: Set the number of supported network interfaces. ▪ Query: **AT!NETNUM?** Response: <usb_netnum> OK Purpose: Report the number of supported network interfaces. **Parameters:** <usb_netnum> (Number of network interfaces supported over USB (RmNet)) • 0–127

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!NI (notification)	**Network identity — Unsolicited notification** Unsolicited notification indicating the network identity (MCC and MNC codes), received when the identity changes. To enable !NI (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!NI: <MCC>,<MNC>** **Parameters:** <MCC> (Mobile Country Code) • 3-digit number <MNC> (Mobile Country Code) • 2-digit or 3-digit number, depending on <MCC> value
!PACKAGE	**Return package version string** This command returns the configuration package name loaded in the modem. **Password required:** No **Usage:** ▪ Query: **AT!PACKAGE?** Response: !PACKAGE:<PackageName> OK Purpose: Return the package name string. **Parameters:** <PackageName> • Character string, maximum 126 characters • Example: MC7750_01.00.02.03_00_VZW_011.006_000

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PATEMP	**Return PA temperature information** Return the module's PA temperature state and current temperature. **Password required:** No **Usage:** ▪ Query: **AT!PATEMP?** Response (WPx5): Temp state: <state> Temperature: <temperature> degC OK Response (WP76/WP77): Temp state: <state> PA THERM1 Temperature: <temperature> degC OK Purpose: Return the module's Power control temperature information. **Parameters:** <state> (Temperature state): ▪ Valid values: ▪ "Initializing" ▪ "Normal" ▪ "High Warning" ▪ "High Critical" <temperature> (Current temperature): ▪ Decimal ASCII string ▪ Current PA temperature in degrees Celsius. This is the temperature reported by a thermistor positioned near the power amplifiers. ▪ Example: "32.3"
!PATEMP (notification)	**PA temperature state change — Unsolicited notification** Unsolicited notification received when the PA temperature state changes. To enable !PATEMP (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!PATEMP: <state>** **Parameters:** <state> (PMIC temperature state) ▪ Valid range: 1–3 ▪ 1 — Normal ▪ 2 — High Warning ▪ 3 — High Critical

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCDEFR (notification)	**Deferred shutdown timer expired — Unsolicited notification** Unsolicited notification received when the Deferred Shutdown timer has expired. The timer is pre-set for 1 minute and starts automatically at power ON. This 'guard time' allows emergency calls to be made or received regardless of the temperature monitoring state. However, if the PMIC thermistor exceeds its hard limit, the device can power off regardless of this timer. To enable !PCDEFR (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!PCDEFR: <state>** **Examples:** • Notifications received: !PCDEFR: 0 Deferred shutdown timer expired. **Parameters:** <state> (Deferred Shutdown timer state) • 0 — Timer has expired

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCINFO	**Return power control status information** Return the modem's power control status information. **Password required:** No **Usage:** ▪ Query: **AT!PCINFO?** Response: State: <state> LPM force flags - W_DISABLE:<ForceFlag>, User:<ForceFlag>, Temp:<ForceFlag>, Volt:<ForceFlag>, BIOS:<ForceFlag>, GOBIIM:<ForceFlag> W_DISABLE: <ForceFlag> Poweroff mode: <ForceFlag> LPM Persistent: <ForceFlag> OK Purpose: Return power control information. **Parameters:** <state> (The modem's power mode) · ASCII string (quotation marks do not appear): ▪ WP75xx/WP85xx states: ▪ "EnteringLowPowerMode" ▪ "Initialization" ▪ "LowPowerMode" ▪ "Offline" ▪ "Online" ▪ "PowerOff" ▪ WP76xx/WP77xx states: ▪ "Emergency Call" ▪ "Emergency Call LPM" ▪ "Emergency Call Power Down" ▪ "Emergency Call Reset" ▪ "Initialization" ▪ "Low Power Mode" ▪ "LPM in Progress" ▪ "Offline" ▪ "Offline In Progress" ▪ "Online" ▪ "Online In Progress" ▪ "Power Down" ▪ "Power Down In Progress" ▪ "Reset" ▪ "Reset In Progress" <ForceFlag> (List of conditions indicating which ones caused modem to enter LPM) · Valid values: ▪ 0=Did not cause 1=Caused (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCINFO (continued)	**Return power control status information (continued)** • Condition types: ▪ W_DISABLE—W_DISABLE is asserted ▪ USER—AT/SDK/Legato command was issued ▪ TEMP—Temperature is outside operational limits ▪ VOLT—Voltage is outside operational limits ▪ BIOS—Host BIOS locking is enabled ▪ GOBIIM—Image preference mismatch
!PCOFFEN	**Set/return Power Off Enable state** The modem can be configured to enter low power mode or power off when W_DISABLE is asserted. (This is called the Power Off Enable feature.) Use this command to indicate or set the Power Off Enable feature state. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!PCOFFEN=<state>** Response: OK Purpose: Set the current state. ▪ Query: **AT!PCOFFEN?** Response: <state> OK Purpose: Report the current <state>. **Parameters:** <state> (Current state of Power Off Enable) • 0 = Modem will enter LPM (low power mode) when W_DISABLE is asserted. • 2 = Ignore changes on W_DISABLE.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCTEMP	**Return Power control temperature information** Return the module's power control temperature state and current temperature. **Password required:** No **Usage:** ▪ Query: **AT!PCTEMP?** Response (WPx5): Temp state: <state> Temperature: <temperature> degC Call mode: <mode> OK Response (WP76/77): Temp state: <state> Temperature: <temperature> degC OK Purpose: Return the module's power control temperature information. **Parameters:** <state> (Temperature state): ▪ Valid values: · WPx5: ▪ "Initializing" ▪ "Normal" ▪ "HighTemperatureWarning" ▪ "HighTemperatureCritical" ▪ "LowTemperatureWarning" ▪ "LowTemperatureCritical" · WP76/77: ▪ "Initialization" ▪ "Normal" ▪ "High Warning" ▪ "High Critical" ▪ "Low Warning" ▪ "Low Critical" <temperature> (Current temperature): ▪ Decimal ASCII string ▪ Current temperature in degrees Celsius. ▪ Example: "32.3" <mode> (Call mode; WPx5 only): ▪ Valid values: · "Initializing" · "NoCallsAllowed" · "AllCallsAllowed" · "EcallOnly"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCTEMP (notification)	**PA temperature state change — Unsolicited notification** Unsolicited notification received when the PA temperature state changes. To enable !PCTEMP (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!PCTEMP: <state>** **Parameters:** <state> (PA temperature state) • Valid range: 1–5 • 1 — Normal • 2 — High Warning • 3 — High Critical • 4 — Low Warning • 5 — Low Critical

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCTEMPLIMITS	**Set/report temperature state limit values** Certain modem functionality is affected by the modem's temperature state. The possible temperature states are high critical, high warning, high normal, low normal, and low critical. Use this command to report or set the limits that correspond to these temperature states. To display the current temperature and temperature state, see !PCTEMP on page 91. *Note: All temperatures are in Celsius.* **Password required:** Yes **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!PCTEMPLIMITS=<hc>,<hw>,<hn>,<ln>,<lc>** Response: OK Purpose: Set the temperature limits for each state (all five values must be specified). ▪ Query: **AT!PCTEMPLIMITS?** Response: HI CRIT: <hc> HI WARN: <hw> HI NORM: <hn> LO NORM: <ln> LO CRIT: <lc> Purpose: Return the temperature limits for each state. **Parameters:** *Note: Minimum separation between threshold values is 4 °C. (e.g. If <hc> = 120, <hw> must be ≤ 116.)* <hc> (High Critical) · Temperature limit varies by device (see device Product Specification Document or Product Technical Specification). · Default = 108 °C. <hw> (High Warning) · Temperature limit varies by device (see device Product Specification Document or Product Technical Specification). · Default = 95 °C. <hn>(High Normal) · Temperature limit varies by device (see device Product Specification Document or Product Technical Specification). · Default = 85 °C. <ln> (Low Normal) · Temperature limit varies by device (see device Product Specification Document or Product Technical Specification). · Default = -15 °C. <lc> (Low Critical) · Temperature limit varies by device (see device Product Specification Document or Product Technical Specification). · Default = -25 °C.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCVOLT	**Return current power supply voltage information** Return the module's power control supply state and actual voltage. **Password required:** No **Usage:** ▪ Query: AT!PCVOLT? Response: Volt state: <state> Power supply voltage: <voltage> mV (<raw> cnt) OK Purpose: Return the module's voltage information. **Parameters:** <state> (Power supply state): ▪ Valid values: ▪ "Initializing" ▪ "Normal" ▪ "High Critical" ▪ "Low Warning" ▪ "Low Critical" <voltage>: ▪ Current voltage reading in mV. ▪ Decimal ASCII <raw>: ▪ ADC (Analog/digital convertor) reading ▪ Decimal ASCII
!PCVOLT (notification)	**PMIC voltage state change — Unsolicited notification** Unsolicited notification received when the PMIC voltage state changes. To enable !PCVOLT (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!PCVOLT: <state>** **Parameters:** <state> (Power supply state) ▪ Valid range: 1–4 ▪ 1 — Normal ▪ 2 — Low Warning ▪ 3 — Low Critical ▪ 4 — High Critical

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PCVOLTLIMITS	**Set/report power supply voltage state limit values** Certain modem functionality is affected by the modem's power supply voltage state. The possible voltage states are high critical, high normal, low normal, low warning, and low critical. Use this command to report or set the limits that correspond to these voltage states. **Password required:** Yes **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!PCVOLTLIMITS=<hc>,<hn>,<ln>,<lw>,<lc>** Response: OK Purpose: Set the voltage limits for each state (all five values must be specified). ▪ Query: **AT!PCVOLTLIMITS?** Response: HI CRIT: <hc> HI NORM: <hn> LO NORM: <ln> LO WARN: <lw> LO CRIT: <lc> Purpose: Return the voltage limits for each state. **Parameters:** <hc> (High Critical) · Voltage limit varies by device (see device Product Specification Document or Product Technical Specification) · Default = 4400 mV <hw> (High Normal) · Voltage limit varies by device (see device Product Specification Document or Product Technical Specification) · Default = 4300 mV <ln> (Low Normal) · Voltage limit varies by device (see device Product Specification Document or Product Technical Specification) · Default = 3300 mV <lw> (Low Warning) · Voltage limit varies by device (see device Product Specification Document or Product Technical Specification) · Default = 3200 mV <lc> (Low Critical) · Voltage limit varies by device (see device Product Specification Document or Product Technical Specification) · Default = 3100 mV

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERDOWN	**Power down system** Power down the system. **Password required:** No **Usage:** ▪ Execution: **AT!POWERDOWN** Response: OK Purpose: Power the system down.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERMODE	**Set the module power saving mode** Set the module's power saving mode. **Password required:** No **Requirements:** • AT!POWERWAKE must be used to configure wakeup sources before using this command to enable a power saving mode. **Usage:** ▪ Execution: **AT!POWERMODE=<mode>** Response: OK Purpose: Set the module's power <mode>. ▪ Query (WP76xx/WP77xx): **AT!POWERMODE?** Response: !POWERMODE: [No request|mode=<mode>-<mode_desc>], status=<status>-<status_desc> Purpose: Display the current requested mode and execution status. ▪ Query List: **AT!POWERMODE=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Power saving mode) • WPx5xx: ▪ 1—Enable Ultra-low Power Mode (ULPM). When selected, the module powers down immediately, then begins monitoring for wakeup sources that were previously configured using !POWERWAKE. • WP76xx/WP77xx ▪ Note: ULPM is not supported by 'MCU-less' WP76xx/WP77xx module variants (modules that do not include an on-board MCU (e.g. WP7610)). ▪ 0—Disable PSM (if enabled) and suspend any further PSM cycles from occurring. ▪ 1—Enable PSM (Power Saving Mode) with ULPM fallback. Use PSM if network accepts request, otherwise fall back to ULPM immediately without active time duration. If ULPM fallback occurs, neither PSM nor ULPM will be performed in subsequent cycles unless requested explicitly. Note: MCU-less modules will not be able to fall back from PSM. ▪ 2—Enable PSM with wakeup sources (psm timer, GPIO, or ADC). If not accepted by network, PSM is disabled and neither PSM nor ULPM will be performed in current and subsequent cycles unless requested explicitly. ▪ 3—Enable ULPM in current cycle with wakeup sources (timer, GPIO, or ADC). No change occurs to PSM configuration. Important: This <mode> will not function on MCU-less modules. ▪ 4—Do not use. ▪ When enabled (options 1–3), the module enters the selected power saving mode, then (for options 1–3) begins monitoring for wakeup sources that were previously configured using !POWERWAKE. ▪ To power down the module use !POWERDOWN. <mode_desc> (Short description of <mode>) • ASCII string (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERMODE (continued)	**Set the module power saving mode (continued)** <status> (Execute status code) • -18 — ULPM not supported • -17 — ULPM failed to enter ULPS • -16 — Failed to configure wakeup sources • -15 — No wakeup source configured to wake from ULPS • -13 — PSM/ULPM time not specified • -12 — Module not attached to network • -11 — PSM client failed to request PSM in OOS or LS • -10 — Network is Limited Service (LS) • -9 — Network is out of service (OOS) • -8 — PSM request rejected due to short PSM time • -7 — PSM request rejected due to PSM time longer than modem • -6 — PSM request rejected due to modem not ready • -5 — PSM request rejected due to PSM not enabled • -4 — PSM request rejected due to invalid user-requested PSM time • -3 — PSM request rejected due to invalid user-requestedUser requested active time • -2 — PSM request failed • -1 — QMI DMS service not ready for accept request • 0 — Initial state • 1 — Waiting for QMI DMS service • 2 — QMI DMS service ready (initialized) • 3 — Request PSM disable • 4 — Request PSM enable • 5 — Modem ready for PSM • 6 — Modem not ready for PSM • 7 — PSM transition completed on modem • 8 — PSM enabled • 9 — PSM disabled • 10 — PSM client has requested PSM in OOS or LS • 15 — ULPM requested • 16 — ULPM requested as fallback from PSM failure • 17 — ULPM entered ULPS successfully • 18 — Power off (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERMODE (continued)	**Set the module power saving mode (continued)** <status_desc> (Short description of <status>) • ASCII string • Values (shown for each <status> value): ▪ -18—"ULPM not supported" ▪ -17—"ULPM failed" ▪ -16—"Wakeup source failed" ▪ -15—"No wakeup source" ▪ -13—"PSM/ULPM time not valid" ▪ -12—"Not attached to network" ▪ -11—"OOS or LS backoff failed" ▪ -10—"Network is Limited Service (LS)" ▪ -9—"Network is out of service (OOS)" ▪ -8—"PSM rejected (PSM time too short)" ▪ -7—"PSM rejected (PSM time too long)" ▪ -6—"PSM rejected (modem not ready)" ▪ -5—"PSM rejected (PSM not enabled)" ▪ -4—"PSM rejected (PSM time invalid)" ▪ -3—"PSM rejected (active time invalid)" ▪ -2—"PSM request failed" ▪ -1—"Not ready" ▪ 0—None ▪ 1—"Waiting" ▪ 2—"Initialized" ▪ 3—"PSM disable requested" ▪ 4—"PSM enable requested" ▪ 5—"PSM ready" ▪ 6—"PSM not ready" ▪ 7—"PSM completed" ▪ 8—"PSM enabled" ▪ 9—"PSM disabled" ▪ 10—"Backoff requested in OOS or LS" ▪ 15—"ULPM requested" ▪ 16—"PSM fallback to ULPM" ▪ 17—"ULPM completed" ▪ 18—"Power off"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERWAKE	**Configure ULPS (ULPM / PSM) wakeup sources** Configure the wakeup sources (triggers) for Ultra-low Power State (Ultra-Low Power Mode (ULPM) and Power Saving Mode (PSM)). *Note: WPx5xx supports only ULPM, not PSM.* When a module is in ULPS, the module is almost completely powered off (Note: In PSM the module is in a network-aware state. The module's low state is registered on the network and sleep time is negotiated.). When a configured trigger is detected (e.g. when the trigger meets the <above> and <below> conditions), the module boots. *Note: Use <above> and <below> as follows:* ▪ *To set a trigger condition inside a range (e.g. trigger in the range 0.5 to 1.0V), set <below> > <above> (e.g. trigger: <above> 0.5V and <below> 1.0V)* ▪ *To set a trigger condition outside a range (e.g. trigger outside the range 0.5 to 1.0 V, set <below> < <above> (e.g. trigger: <below> 0.5V and <above> 1.0V)* After configuring wakeup triggers, the command AT!POWERMODE can be used to enter ULPM or PSM. **Password required:** No **Persistent across power cycles:** Partial (ULPM and PSM timers persist, GPIO and ADC do not persist) **Notes:** · Timer must be configured for PSM mode. · At least one wakeup source must be configured before !POWERMODE can be used to select a power saving mode option that requires wakeup sources. · The PSM timer is not cleared by the "Execution (clear)" command format. **Usage:** ▪ Execution (clear) (WP76xx/WP77xx only): **AT!POWERWAKE=<clear>** Response: OK Purpose: Clear all wakeup sources (except the PSM timer). ▪ Execution (timer): WPx5xx: **AT!POWERWAKE=<type=1>,<timeout>** WP76xx/WP77xx: **AT!POWERWAKE=<type=1>,<timeout>[,<active_time>[,<sync>]]** Response: OK Purpose: Set the timeout period for a wakeup timer. ▪ Execution (GPIO): **AT!POWERWAKE=<type=2>,<gpio>,<edge>[,<pull>]** Response: OK Purpose: Configure a GPIO as a wakeup source. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERWAKE continued	**Configure ULPS (ULPM / PSM) wakeup sources (continued)** ▪ Execution (ADC): **AT!POWERWAKE=<type=3>,<adc>, <above>, <below>, <interval>** Response: OK Purpose: Configure an ADC as a wakeup source. ▪ Query: **AT!POWERWAKE?** Response (WPx5xx): !POWERWAKE: [TIMER: <timeout>] [GPIO<gpio>: <edge>] ... [ADC<adc>: <above>, <below>, <interval>] [Last Wakeup event: <type>[,[<gpio>] [<adc>]]] OK Response (WP76xx/WP77xx): !POWERWAKE: [ULPM TIMER: <timeout>] [PSM TIMER: <timeout>, ACTIVE TIMER: <active_time>, SYNC: <sync>] [GPIO: <gpio>, edge: <edge>, pull: <pull>] ... [ADC<adc>: <above>, <below>, <interval>] [Last Wake Event: <type>] OK Purpose: Show currently configured wakeup sources. If a source is not configured, it will not appear. ▪ Query List: **AT!POWERWAKE=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <clear> (Clear wakeup source(s)) · 0 — Clear all sources <type> (Wakeup source type) · 1 — Timer · 2 — GPIO · 3 — ADC <timeout> (Requested timer duration for staying in ULPM/PSM) · For ULPM: ▪ 0—Disable Timer wakeup source ▪ 1–3456000—Timer duration in seconds · For PSM: ▪ Timer is the requested extended periodic TAU value (see +CPSMS). ▪ Timer value must be greater than threshold specified in PSM configuration. ▪ For PSM with ULPM fallback, if the timer value does not meet the PSM requirement, ULPM operation is assumed. ▪ Max value: 3456000 (Timer duration in seconds) · Note: Power consumption may be impacted if a short timeout is used. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!POWERWAKE continued	**Configure ULPS (ULPM / PSM) wakeup sources (continued)** <active_time> (Requested active timer duration, in seconds) • 0–3456000 — Active timer duration. This timer is used only for PSM mode. The value indicates the period during which the device remains reachable for mobile-terminated (MT) transactions on transition from connected mode to idle mode. • If no value is specified, active time of 0 is configured. • Value must conform to GPRS Timer 2 IE in 3GPP TS 24.008. • For PSM with ULPM fallback, if the value does not meet the PSM requirement, ULPM operation is assumed. <sync> (Synchronization method between on-board MCU and MDM in PSM/ULPM power state transition) • 1 — MDM PMIC RTC alarm counts PSM time and wakes the MDM. The MCU keeps the I2C module on to detect device power-up. • 2 — (Default) MDM PMIC RTC alarm counts PSM time and wakes the MDM. MCU turns I2C module off until just before the <timeout> expires, then turns it on so device power-up can be detected. • 3 — MDM completely powered off. MCU RTC alarm used to count PSM time and used as wakeup source to exit PSM. <gpio> (GPIO to configure as wakeup source) • 36 — GPIO36 • 38 — GPIO38 • 39 — GPIO39 (WPx5xx only. Does not apply to WP76xx / WP77xx.) • Multiple GPIOs can be configured as wakeup sources. <edge> (GPIO trigger type) • 0 — Off • 1 — High level trigger • 2 — Low level trigger • 3 — Rising edge trigger • 4 — Falling edge trigger • 5 — Both (rising or falling) <pull> (Pull up or down on GPIO) • 0 — None (default) • 1 — Down • 2 — Up <adc> (ADC to configure as wakeup source) • 2 — ADC2 • 3 — ADC3 • Note: Only one ADC at a time can be configured as a wakeup source — If a different <adc> is selected, the module clears the existing source before setting the new source. For example, if ADC3 is currently configured and then ADC2 is configured, the configuration for ADC3 is replaced by the ADC2 configuration. <above> (ADC trigger lower bound, in mV) • 0 — Remove the ADC configuration • Valid range: 1–1800 <below> (ADC trigger upper bound, in mV) • 0–1800 <interval> (ADC voltage sampling interval, in ms) • 1–65535 — Sampling interval

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PRIID	**Report module PRI part number and revision** Report the module's customer and carrier PRI part numbers and revisions. **Password required:** No **Usage:** ▪ Query: **AT!PRIID?** Response: PRI Part Number: <priPn> Revision: <priRevDisplay> Carrier PRI: None OK Purpose: Return the module's PRI part number (<priPn>) and revision (<priRev-Display>). (In the example shown above, no Carrier PRI is present. If it were, then the Part Number and Revision would display.) **Parameters:** <priPn> (PRI part number) • 7-digit ASCII number • Example: 9991234 <priRevDisplay> (PRI revision number being read from the module) • 4-digit ASCII: XX.YY • Example: 01.00
!PRLVER	**Display current PRL version** Display the device's current PRL (Preferred Roaming List) version. **Supporting devices:** WP7504 **Password required:** No **Usage:** ▪ Query: **AT!PRLVER?** Response: PRL VER: <n> Purpose: Display the PRL version. **Parameters:** <n> (PRL version number) • Integer

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!PSCS (notification)	**Packet switched data call status — Unsolicited notification** Unsolicited notification indicating the current state of packet switched (PS) data calls (multiple PDP is supported, allowing data calls on multiple APNs), received when the state changes (e.g. <status>=1 is received when the first data call is brought up, and <status>=0 is received when the last data call is torn down). To enable !PSCS (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!PSCS: <status>** **Parameters:** <status> (PS data call status) • 0 — No active PS calls • 1 — Active PS calls

Table 3-2: Modem Status Command Details (Continued)

Command	Description
***PSRDBS**	**Select operating bands** Select the device's operating bands. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT*PSRDBS=<mode>,<band>** Response: OK Purpose: Set a group of bands (<band>) to take effect when specified by <mode>. If the selected bands conflict with the current RAT setting, an error will be returned. If the command succeeds and <band> does not match any of the existing frequency groups from AT!BAND=?, then <band> creates or replaces the "User bands" group in the !BAND list. (This is a persistent change.) ▪ Query: **AT*PSRDBS?** Response: *PSRDBS: <band> OK Purpose: Report the current <band> value (which identifies the list of operating bands). ▪ Query List: **AT*PSRDBS=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Time when <band> selection takes effect) · 0 = Set operating bands at next boot · 1 = Set operating bands immediately <band> (Operating bands to use) · Integer value (sum of values associated with operating bands): ▪ 2—GSM 900MHz (G900) ▪ 8—DCS 1800MHz (G1800) ▪ 32—UMTS Band I (W2100) ▪ 64—UMTS Band II (W1900) ▪ 128—UMTS Band IV (W1700) ▪ 256—UMTS Band V (W850) ▪ 512—UMTS Band VIII (W900) ▪ 131072—LTE Band 1 (B1) ▪ 524288—LTE Band 3 (B3) ▪ 1048576—LTE Band 4 (B4) ▪ 2097152—LTE Band 5 (B5) ▪ 8388608—LTE Band 7 (B7) ▪ 16777216—LTE Band 8 (B8) ▪ 268435456—LTE Band 12 (B12) ▪ 536870912—LTE Band 13 (B13) ▪ 1073741824—LTE Band 14 (B14) ▪ 8589934592—LTE Band 17 (B17) ▪ 68719476736—LTE Band 20 (B20) ▪ 2199023255552—LTE Band 25 (B25) (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
***PSRDBS (continued)**	**Select operating bands (continued)** ▪ 4398046511104—LTE Band 26 (B26) ▪ 17592186044416—LTE Band 28 (B28) ▪ 72057594037927936—LTE Band 40 (B40) ▪ 144115188075855872—LTE Band 41 (B41) ▪ 2305843009213693952—LTE Band 66 (B66)
!QCELP13K (notification)	**Vocoder in use — Unsolicited notification** See !AVVOCODER on page 36 for details.
!RESET	**Reset modem** Perform a modem reset. It is also recommended to use AT!RESET for a software reset. **Password required:** No **Usage:** ▪ Execution: **AT!RESET** Response: OK Purpose: Reset the modem.
!RI (notification)	**Roaming indicator state — Unsolicited notification** Unsolicited notification indicating the current state of the roaming indicator, received when the roaming state changes. To enable !RI (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!RI: <state>** **Parameters:** <state> (Roaming indicator state) ▪ 0 — Roaming indicator off ▪ 1 — Roaming indicator on
RING (notification)	**Incoming call notification — Unsolicited notification** Unsolicited notification indicating an incoming call from the network. To enable RING (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **RING** **Parameters:** None

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!RSSI (notification)	**Signal strength — Unsolicited notification** Unsolicited notification indicating the current signal strength, received when the strength changes. Typically, a +CSQ unsolicited notification will also be received (see +CSQ on page 50). The signal strength ranges vary depending on the RAT. To enable !RSSI (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!RSSI: <strength>** **Parameters:** <strength> (Signal strength in dBm) • Note: Values have implied '-'. For example, <strength> = 75 indicates -75 dBm. • AMPS range: 89–110 • 800 CDMA range: 90–105 • 1900 CDMA range: 93–108 • GSM/WCDMA/LTE range: 60–105 • TD-SCDMA range: 25–125

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SCACT	**Activate / deactivate data connection** Activate or deactivate a specific data connection between the host and network. **Password required:** No **Usage:** ▪ Execution: **AT!SCACT=<state>[,<pid>]** Response: OK Purpose: Activate or deactivate the connection for the specified <pid>. If <pid> is not included, use the default <pid> (see <pid> for values). ▪ Query: **AT!SCACT?[<pid>]** Response: !SCACT: <pid>,<state> ... *(additional <pid>/<state> combinations)* OK Purpose: Display a list of all defined connections and their current state, or display a specified connection and its state. ▪ Query list: **AT!SCACT=?** Purpose: Display valid execution format and parameter values. **Parameters:** <pid> (PDN connection ID) · Valid values: ▪ GSM/UMTS/LTE: ▪ (WP75xx/WP85xx) 1–16 (WP76xx/WP77xx) 1–24 ▪ Default: 1 (all networks except Sprint and Verizon) ▪ 3 (Sprint, Verizon) ▪ CDMA: ▪ 101–107 ▪ Default: 101 (all networks except Sprint and Verizon) ▪ 103 (Sprint, Verizon) <state> (Current state of specified <pid>) · 0 = Deactivated · 1 = Activated · Any other value causes command execution to return ERROR.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SCUMMTU	**Set/Report MTU Size** Set or report the MTU (maximum transmission unit) size used by 3GPP/3GPP2 Um and USB Rm interface. **Password required:** Yes **Usage:** ▪ Execution: **AT!SCUMMTU=<mtu>** Response: OK Purpose: Set the MTU size for all RATs/interfaces. ▪ Query: **AT!SCUMMTU?** Response (WPx5xx): !SCUMMTU: 3GPP MTU : <mtu> HRPD MTU : <mtu> EHRPD MTU : <mtu> USB MTU : <mtu> OK Response (WP76xx/WP77xx): !SCUMMTU: 3GPP MTU : <mtu> USB MTU : <mtu> OK Purpose: Display the MTU sizes used for supported RATs (only supported RATs will appear). ▪ Query list: **AT!SCUMMTU=?** Purpose: Display valid execution format and parameter values. **Parameters:** <mtu> (Maximum Transmission Unit, in bytes) • 0 — Use default value • (WPx5xx) 576–1500 — Other values required by carriers. • (WP76xx/WP77xx) 576–2000 — Other values required by carriers.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SECINFO	**Display bootloader debug configuration** Display the bootloader debug configuration. **Supporting devices:** WP76xx/WP77xx **Password required:** No **Usage:** ▪ Query: **AT!SECINFO** Response: - Secure boot: <secure_boot> - Memory dump: <memory_dump> - JTAG access: <jtag_access> OK Purpose: Display the elements that will be included in bootloader debug information. **Parameters:** <secure_boot> (Secure Boot debug information) • 0 — Disabled • 1 — Enabled <memory_dump> (Memory dump debug information) • 0 — Disabled • 1 — Enabled <jtag_access> (JTAG debug information) • 0 — Disabled • 1 — Enabled

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELACQ	**Select RAT acquisition order** Select the acquisition order for RATs (Radio Access Technologies). **Password required:** Yes **Notes:** ▪ If the last registered PLMN is found from either the SIM / USIM card or NV storage, it takes precedence over the acquisition order from this command for registration. ▪ Supported <mode> values are device-dependent. · To see only the supported modes for the device (in their current acquisition order), use the Query command. · To see the full list of supported modes across all WP-series modules, use the Query List command. ▪ Up to six supported RATs can be entered. If fewer than six RATs are entered, remaining supported RATs are appended in the order shown in the <mode> parameter description below. **Usage:** ▪ Execution: **AT!SELACQ=<mode1>[,<mode2>[,<mode3>[,<mode4>[,<mode5>[,<mode6>]]]]]** Response: OK Purpose: Indicate the RAT acquisition order (number of RATs is device dependent). See <mode> parameter description for details. ▪ Query: **AT!SELACQ?** Response: <mode1> <mode2> <mode3> <mode4> <mode5> <mode6> OK Purpose: Show the current acquisition order for the supported RATs. ▪ Query List: **AT!SELACQ=?** Purpose: Display valid execution format and parameter values. **Parameters:** <mode*n*> (RAT types) · Available RAT types are device-dependent. (e.g. "TDS' valid only on modules supporting TDSCDMA) Valid values (shown in default acquisition order): ▪ "CDMA" ▪ "LTE" ▪ "LTE-M1" ▪ "LTE-NB1" ▪ "WCDMA" ▪ "HDR" ▪ "GSM" ▪ "TDS" · If the execution format is issued with fewer than the number of supported <mode>s, the missing entries are appended based on the default order shown above. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELACQ (continued)	**Select RAT acquisition order (continued)** **Examples:** The following sequence of examples is for a hypothetical device that supports GSM, LTE, and LTE-M modes in the default order. • Display supported modes: AT!SELACQ? LTE LTE-M1 GSM • Change the acquisition order by entering all three modes in the preferred order: AT!SELACQ=LTE-M1,GSM,LTE OK AT!SELACQ? LTE-M1 GSM LTE • Change the order again to use GSM first and the other modes in default order: AT!SELACQ=GSM OK AT!SELACQ? GSM LTE-M1 LTE

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELCIOT	**Set/report Cellular IoT preferences** Use this command to set Cellular IoT (CIOT) operating mode preferences on the device. *Note: The acquisition order of the selected LTE operating modes can be set using AT!SELACQ.* **Supporting devices:** WP77xx **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!SELCIOT=<oper_mode>** Response: OK Purpose: Enable/disable the LTE operating modes (based on bitmask value). ▪ Query: **AT!SELCIOT?** Response: Current Operating Mode: <oper_mode> Supported Operating Modes: LTE WB: 0x01 LTE M1: 0x02 LTE NB1: 0x04 OK Purpose: Indicate the currently enabled LTE operating modes (bitmask value). ▪ Query List: **AT!SELCIOT=?** Purpose: Display valid execution format and parameter values. **Parameters:** <oper_mode> (LTE operating modes) • Format: 8-bit bitmask ▪ Each bit: 0=Disabled; 1=Enabled ▪ Bit 0—LTE WB (Non-CIOT (M1/NB1) operation) ▪ Bit 1—LTE M1 ▪ Bit 2—LTE NB1

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELMODE	**Set/return current service domain** Configure the modem to use a specific service domain. **Password required:** No **Usage:** ▪ Execution: **AT!SELMODE=<sdInd>** Response: OK Purpose: Set the desired service domain. ▪ Query: **AT!SELMODE?** Response: <sdInd>, Service Domain description OK *or* Unknown service domain mask. Use AT!SELMODE to set service domain. <sdInd> OK Purpose: Return the current service domain index (<sdInd>) and description. If the <sdInd> is undefined, an error message is returned. ▪ Query List: **AT!SELMODE=?** Purpose: Return a list of supported service domain indexes. **Parameters:** <sdInd> (Service domain index): ▪ 00=CS only ▪ 01=PS only ▪ 02=CS and PS

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELRAT	**Set preferred RAT** Set the preferred RAT mode(s) for acquisition. If the module's current band setting is not compatible with the selected RAT, an appropriate band will be selected automatically and set on the modem. TD-SCDMA-related RATs are available only on products supporting TD-SCDMA. **Important:** *To avoid issues with incompatible RAT/band combinations:* ▪ *If !SELRAT is used, +KSRAT must be set to 'All RATS, automatic'.* ▪ *If +KSRAT is used, !SELRAT must not be used and !BAND must be set to 'All Bands'.* ▪ *If !BAND and !SELRAT are used, either !BAND must be set to 'All Bands' or !SELRAT must be set to 'Automatic'.* **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!SELRAT=<ratInd>** Response: OK Purpose: Set the desired RAT. ▪ Query: **AT!SETRAT?** Response: <ratInd>, RAT configuration description OK *or* Unknown RAT mode. Use AT!SELRAT to set mode. <ratInd> OK Purpose: Return the current RAT (<ratInd>) and description. If the <ratInd> is undefined, an error message is returned. ▪ Query List: **AT!SELRAT=?** Purpose: Return a list of supported RAT index values and their descriptions. (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELRAT (continued)	**Set preferred RAT (continued)** **Parameters:** <ratInd> (RAT index): ▪ 00 — Automatic ▪ 01 — UMTS 3G only ▪ 02 — GSM 2G only ▪ 03 — UMTS 3G preferred ▪ 04 — GSM 2G preferred ▪ 05 — GSM and UMTS only ▪ 06 — LTE only ▪ 07 — GSM, UMTS, LTE ▪ 08 — CDMA, HRPD, GSM, UMTS, LTE ▪ 09 — CDMA only ▪ 0A — HRPD only ▪ 0B — hybrid CDMA/HRPD ▪ 0C — CDMA, LTE ▪ 0D — HRPD, LTE ▪ 0E — CDMA, HRPD, LTE ▪ 0F — CDMA, GSM, UMTS ▪ 10 — CDMA, HRPD, GSM, UMTS ▪ 11 — UMTS and LTE only ▪ 12 — GSM and LTE only ▪ 13 — TDS and LTE only ▪ 14 — TDS, GSM, LTE ▪ 15 — TDS, WCDMA, LTE ▪ 16 — TDS, GSM, WCDMA, LTE ▪ 17 — TDS only ▪ 18 — TDS and GSM only ▪ 19 — TDS and WCDMA only ▪ 1A — TDS, GSM, WCDMA

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SELSNR	**Set/report LTE-NB1 band scan configuration** Use this command to set the band scan configuration on LTE-NB1 networks to restrict scanning to certain SNR levels. The available scan options are based on SNR and reflect a trade-off between scan time and depth of scan: ▪ Frequency scan level 0 — Used for good SNR levels; detects strong cells first and has the shortest cell acquisition time. ▪ Frequency scan level 1 — Used for medium SNR levels. ▪ Frequency scan level 2 — Used for poor SNR levels; has the longest cell acquisition time. **Supporting devices:** WP77xx **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!SELSNR=<scan_level>** Response: OK Purpose: Set the specified scan level combination. ▪ Query: **AT!SELSNR?** Response: !SELSNR: <scan_level> OK Purpose: Indicate the current scan level combination. ▪ Query List: **AT!SELSNR=?** Purpose: Display valid execution format and parameter values. **Parameters:** <scan_types> (SRN Level combinations to attempt by UE during band scan) · Integer value · Valid options: ▪ 0—Frequency scan level 0 only ▪ 1—Frequency scan level 0, then level 1 ▪ 2—Frequency scan level 0, then level 1, then level 2 ▪ 3—Frequency scan level 2 only

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!SRV (notification)	**WWAN network status change — Unsolicited notification** Unsolicited notification received when the WWAN network status changes. To enable !SRV (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!SRV: <state>** **Parameters:** <state> (Network status notifications) • 0 — No service • 1 — Limited service • 2 — Service available • 3 — Regional service • 4 — Power save
!UDINFO	**Return information from active USB descriptor** Return information from the active USB descriptor. **Supporting devices:** WP75xx/WP8548. For WP76xx/WP77xx, use !USBINFO on page 122.). **Password required:** No **Usage:** ▪ Query: **AT!UDINFO?** Response: VID: <vendor_id> APP PID: <app_product_id> BOOT PID: <boot_product_id> Interface: <interfaceType> Manufacturer: <manuString> Product: <prodString> Purpose: Display USB descriptor information. **Parameters:** <vendor_id> (Vendor ID): ▪ Valid range: 0000–FFFF <app_product_id> (Product ID used when modem is in application mode): ▪ Valid range: 0000–FFFF <boot_product_id> (Product ID used when modem is in boot loader mode): ▪ Valid range: 0000–FFFF <interfaceType> (USB interface type): ▪ ASCII string: • "QBI" — QBI interface • "QMI" — QMI interface <manuString> (Manufacturer string): ▪ ASCII string (32 characters maximum) ▪ Example: "Semtech, Incorporated" <prodString> (Product string): ▪ ASCII string (64 characters maximum) ▪ Example: "WP8548"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!UDPID	**Set/report product ID in USB descriptor** Use this command to set the device's product ID in the USB descriptor. (Some devices may support more than one product ID.) **Supporting devices:** WP75xx/WP8548. For WP76xx/WP77xx, use !USBPID on page 123.). **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!UDPID=<app product_id>** Response: OK Purpose: Set the application ID in the USB descriptor. ▪ Query: **AT!UDPID?** Response: !UDPID: <app_product_id> OK Purpose: Report the product ID that is stored in the USB descriptor. ▪ Query List: **AT!UDPID=?** Purpose: Display a list of default (non-custom) product IDs for the device. **Parameters:** <app product_id> • Hexadecimal ASCII value. • Valid range: 0000–FFFF
!UIMREGSTATE (notification)	**UIM registration state — Unsolicited notification** Unsolicited notification indicating the UIM registration state of the active UIM interface, received when the state changes. The active UIM interface is selected using AT!UIMS — see !UIMS on page 231 for details. To enable !UIMREGSTATUS (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!UIMREGSTATE: <state>** **Parameters:** <state> (UIM card registration state) • 0 — UIM not available • 1 — UIM available • 2 — UIM marked by network as invalid for CS services • 3 — UIM marked by network as invalid for PS services • 4 — UIM marked by network as invalid for CS and PS services • 5 — UIM is PIN1 locked

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!UIMSTATUS (notification)	**UIM status change — Unsolicited notification** Unsolicited notification received when the UIM status changes. To enable !UIMSTATUS (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **!UIMSTATUS: <uim_interface>,<uim_event>** **Examples:** • Notifications received: !UIMSTATUS: 1,1 Embedded UIM is detected. **Parameters:** <uim_interface> (UIM interface that has a status change) • 0 — UIM1 (External UIM interface 1) • 1 — UIM2. Refers to: ▪ (WPx5xx) External UIM interface #2 ▪ (WP76xx/WP77xx) eSIM (embedded SIM) <uim_event> (Event causing status change) • 0 — SIM card deactivated (switched/removed) • 1 — SIM card activated (switched/inserted/detected)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!USBCOMP	**Set/report USB interface configuration** Use this command with modems that have been configured with multiple USB compositions. By default, devices are typically configured to use a USB composition that presents a minimal set of interfaces. If the device also supports other compositions, this command is used to choose from any of the supported compositions. **Important:** *By default, the DIAG (DM) interface is enabled. This command can be used (only on WP76xx/WP77xx) to disable DIAG (DM), but cannot re-enable it.* The USB device in WP76 supports a maximum of 16 endpoints for each direction (IN and OUT). Endpoint 0 is reserved for control transfers in both directions, leaving 15 endpoints available for data transfer in each direction: ▪ DIAG, ADB, AUDIO Interfaces: Require 1 Bulk IN and 1 Bulk OUT endpoint each. ▪ NMEA, MODEM, RAWDATA, RMNET0, RMNET1, RMNET2, ECM, NCM, MBIM Interfaces: Require 2 Bulk IN and 1 Bulk OUT endpoint each. When enabling multiple USB interfaces simultaneously, ensure the total number of Bulk IN and Bulk OUT endpoints used do not exceed the maximum limit of 15 endpoints for each direction. Otherwise, the following error is displayed: ▪ ERROR: USB endpoints exhausted **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!USBCOMP=<Config Index>,<Config Type>,<Interface bitmask>** Response: OK Purpose: Set the current composition. For the change to take effect, you must reset the modem. ▪ Query: **AT!USBCOMP?** Response: Config Index: <Config Index> Config Type: <Config Type> Interface bitmask: <Interface bitmask> OK Purpose: Report the current interface composition. ▪ Query List: **AT!USBCOMP=?** Purpose:Display valid execution format and parameter values. **Parameters:** <Config Index> (Configuration index to which composition applies) ▪ Valid value(s): 1 <Config Type> (Configuration type) ▪ Valid value(s): 1 — Generic (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!USBCOMP (continued)	<Interface bitmask> (Interfaces enabled for selected configuration) • Format: 32-bit bitmask • Valid values: ▪ 00000001—DIAG (DM). This interface cannot be disabled on WPx5xx. It can be disabled on WP76xx/WP77xx, but cannot be re-enabled. ▪ 00000002—ADB. This interface cannot be disabled. ▪ 00000004—NMEA ▪ 00000008—MODEM ▪ 00000010—AT ▪ 00000040—RAWDATA ▪ 00000100—RMNET0 ▪ 00000400—RMNET1 ▪ 00000800—RMNET2 ▪ 00001000—MBIM ▪ 00010000—AUDIO ▪ 00080000—ECM ▪ 00400000—NCM *Note: Availability of specific interfaces is product-dependent.*
!USBINFO	**Return information from active USB descriptor** (WP76xx/WP77xx only. For WP75xx/WP85xx, use !UDINFO on page 118.) Return information from the active USB descriptor. **Supporting devices:** WP76xx/WP77xx. For WP75xx/WP8548, use !UDINFO on page 118.). **Password required:** No **Usage:** ▪ Query: **AT!USBINFO?** Response: VID: <vendor_id> APP PID: <app_product_id> BOOT PID: <boot_product_id> Manufacturer: <manuString> Product: <prodString> Purpose: Display USB descriptor information. **Parameters:** <vendor_id> (Vendor ID): ▪ Valid range: 0000–FFFF <app_product_id> (Product ID used when modem is in application mode): ▪ Valid range: 0000–FFFF <boot_product_id> (Product ID used when modem is in boot loader mode): ▪ Valid range: 0000–FFFF <manuString> (Manufacturer string): ▪ ASCII string (32 characters maximum) ▪ Example: "Semtech, Incorporated" <prodString> (Product string): ▪ ASCII string (64 characters maximum) ▪ Example: "Semtech WP7603"

Table 3-2: Modem Status Command Details (Continued)

Command	Description
!USBPID	**Set/report product ID in USB descriptor** Use this command to set the device's product ID in the USB descriptor. (Some devices may support more than one product ID.) *Note: If a custom PID is used for <app product_id>, then the <boot product_id> must be set at the same time.* **Supporting devices:** WP76xx/WP77xx. For WP75xx/WP8548, use !UDPID on page 119.). **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!USBPID=<app product_id> [,<boot product_id>]** Response: OK Purpose: Set the application and boot product IDs in the USB descriptor. NOTE: <boot_product_id> is required if <app_product_id> is a custom PID. ▪ Query: **AT!USBPID?** Response: !USBPID: <app_product_id>[, <boot product_id>] OK Purpose: Report the product ID that is stored in the USB descriptor. ▪ Query List: **AT!USBPID=?** Purpose: Display a list of default (non-custom) product IDs for the device. **Parameters:** <app product_id> · Hexadecimal ASCII value. · Valid range: 0000–FFFF < boot product_id> · Hexadecimal ASCII value. · Valid range: 0000–FFFF · In the Execution command format, if the <app product_id> is a custom PID>, then the <boot product_id> must be set at the same time. (To check if the <app product_id> is a custom PID, use AT!UDPID=? to see a list of all available non-custom PIDs.)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WANS (notification)	**Call answered — Unsolicited notification** Unsolicited notification received when a voice or data call has been answered. To enable +WANS (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WANS: <call_type>],<RAT>** **Examples:** • When an incoming call is answered: Notifications received: +WANS: 0,0 +WCNT: 0,0 **Parameters:** <call_type> (Call type) • Valid range: 0–9 • 0 — Voice • 1 — Circuit-switched data • 2 — Packet-switched data • 3 — SMS • 4 — Position determination • 5 — Reserved • 6 — OTAPA • 7 — Standard OTASP • 8 — Non-standard OTASP • 9 — Emergency <RAT> (Network type) • Valid range: 0–3 • 0 — GSM / WCDMA • 1 — LTE • 2 — CDMA • 3 — TDS

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WCC (notification)	**Call control status change — Unsolicited notification** Unsolicited notification received when the call control status changes. To enable +WCC (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WCC: <status>[,<cause>]** **Examples:** • Notification received: +WCC:2 Call control status — alerting • Notification received: +WCC:4,1 Call disconnected, unassigned (unallocated) number **Parameters:** <status> (Call status) • 0 — Call proceeding (for MO call) • 1 — Call confirmed (for MT call) • 2 — Alerting • 3 — Connected • 4 — Disconnect <cause> (Reason for status change) • Refer to 3GPP TS 24.008 Annex H (3GPP specific cause values for call control) for defined values.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WCNT (notification)	**Call connected — Unsolicited notification** Unsolicited notification received when an incoming or outgoing call has been connected into a traffic channel state. To enable +WCNT (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WCNT: <service_option>,<RAT>** **Examples:** • Call originated using ATD18005551212 on a GSM/WCDMA/LTE connection: Notifications received: +WORG: 18005551212 +WCNT: 0,0 **Parameters:** <service_option> (Service option indicating type of call) • 0 — GSM/WCDMA/LTE call • All other options are for 1x/EVDO calls: ▪ 2 — Loopback (Note: 9 and 55 also indicate loopback) ▪ 3 — Speech (Note: 17, 68, 32768 also indicate speech) ▪ 6 — SMS (Note: 14 also indicates SMS) ▪ 9 — Loopback (Note: 2 and 55 also indicate loopback) ▪ 12 — Circuit-switched data ▪ 14 — SMS (Note: 6 also indicates SMS) ▪ 17 — Speech (Note: 3, 68, 32768 also indicate speech) ▪ 18 — OTAPA (Note: 19 also indicates OTAPA) ▪ 19 — OTAPA (Note: 18 also indicates OTAPA) ▪ 33 — 1x data ▪ 35 — Position determination (Note: 36 also indicate position determination) ▪ 36 — Position determination (Note: 35 also indicate position determination) ▪ 55 — Loopback (Note: 2 and 9 also indicate loopback) ▪ 68 — Speech (Note: 3, 17, 32768 also indicate speech) ▪ 32768 — Speech (Note: 3, 17, 68 also indicate speech) ▪ 33023 — 1xEVDO <RAT> (Network type) • Valid range: 0–3 • 0 — GSM/WCDMA • 1 — LTE • 2 — CDMA • 3 — TDS

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WDDI (notification)	**DTMF tone detection — Unsolicited notification** Unsolicited notification indicating a DTMF value was detected on the downlink audio. To enable +WDDI (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WDDI: <dtmf>** **Requirements:** • DTMF detection must be enabled via AT+WDDM for these notifications to occur — see +WDDM on page 127. **Parameters:** <dtmf> (DTMF value) • 0–9, *, #, A–D
+WDDM	**Enable / disable DTMF detection** Enable or disable DTMF detection on the downlink audio. When enabled, unsolicited notifications are received when DTMF values are detected — see +WDDI on page 127 for details. **Password required:** No **Usage:** ▪ Execution: **AT+WDDM=<status>** Response: OK Purpose: Enable or disable DTMF detection. ▪ Query: **AT+WDDM?** Response: +WDDM: <status> OK Purpose: Report the current jamming thresholds for all four <modes>. ▪ Query List: **AT+WDDM=?** Purpose: Display valid execution format and parameter values. **Parameters:** <status> (DTMF detection status) • 0 — Disabled • 1 — Enabled

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WEND (notification)	**Call end status — Unsolicited notification** Unsolicited notification received when a call or call attempt has ended. To enable +WEND (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WEND: <reason>,<service_option>,<RAT>** **Examples:** • Call originated using ATD1800555; on a GSM/WCDMA/LTE connection: Notifications received: +WORG: 1800555 +WCNT: 0,0 Call disconnected with ATH: Notifications received: +WEND: 29,0,0 This call ended with a normal release (<reason>=29) • Call originated using ATD18005551212; on a GSM/WCDMA/LTE connection: Notifications received: +WORG: 18005551212 +WEND: 22,0,0 This call failed because the signal faded (<reason>=22) **Parameters:** <reason> (Reason for end of call.) • For LTE: ▪ ESM cause from the network, if available. For a list of ESM causes, refer to section 9.9.4.4 of 3GPP TS 24.301. • For non-LTE RATs: ▪ 0—Phone is offline ▪ 20—Phone is CDMA locked ▪ 21—Phone has no service ▪ 22—Call faded/dropped (CDMA only) ▪ 23—Received intercept from base station (CDMA only) ▪ 24—Received reorder from base station (CDMA only) ▪ 25—Received release from base station (normal call termination) ▪ 26—Service option rejected by base station (CDMA only) ▪ 27—Received incoming call ▪ 28—Received an alert stop from base station (CDMA only) ▪ 29—Software ended the call (normal release) ▪ 30—Received end activation (OTASP calls only) ▪ 31—Internal software aborted the origination/call (CDMA only) ▪ 32—Maximum access probes exhausted; the module failed to connect to the base station (CDMA only) ▪ 33—Persistence test failure (CDMA only) ▪ 34—RUIM not present ▪ 35—Origination already in progress ▪ 36—General access failure ▪ 37—Received retry order (IS-2000 only) ▪ 38—Concurrent service not supported by base station (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WEND (notification) (continued)	**Call end status — Unsolicited notification (Continued)** ▪ 39—No response received from base station ▪ 40—Call rejected by base station (CDMA only) ▪ 41—Concurrent services requested were not compatible ▪ 42—Access blocked by base station (Release A only) ▪ 43—Traffic channel already available ▪ 44—Call ended because an Emergency call is flashed over this call (CDMA only) ▪ 45—CM is ending a GPS call in favor of a user call (gpsOne only) ▪ 46—CM is ending a SMS call in favor of a user call ▪ 47—CM is ending a DATA call in favor of an emergency call ▪ 48—Call rejected because of redirection or handoff ▪ 49—Access blocked by base station for all mobiles (KDDI specific) ▪ 50—OTASP SPC Error indication ▪ 51—Max access (CDMA only) ▪ 100—Lower layer error (GSM/WCDMA only) ▪ 101—Call origination request failed (GSM/WCDMA only) ▪ 102—Client rejected the incoming call (GSM/WCDMA only) ▪ 103—Client rejected the call setup (GSM/WCDMA only) ▪ 104—Network ended the call (GSM/WCDMA only) ▪ 105—No funds (GSM/WCDMA only) ▪ 106—Phone has no service (GSM/WCDMA only) ▪ 108—Full services unavailable ▪ 109—Call general or network busy ▪ 150—Abort connection setup - connection denied ▪ 151—Abort connection setup - billing or authentication failure ▪ 152—Change HDR system due to redirection or PRL not preferred ▪ 153—Exit HDR due to redirection or PRL not preferred ▪ 154—No HDR session ▪ 155—Fail to acquire collocated HDR for origination ▪ 156—HDR call origination ended in favor of GPS fix ▪ 157—HDR connection setup timeout ▪ 158—HDR call ended so 1x call can continue ▪ 159—CM will hold the HDR origination to allow 1x SMS to end ▪ 160—Call ended due to OTASP commit in progress ▪ 161—Phone has no hybrid HDR service ▪ 162—Call ended because HDR did not get the RF lock ▪ 163—Call held to allow other call to end ▪ 164—Call ended due to fade ▪ 165—Call ended due to access failure attempts (HDR only) ▪ 202—Call origination on IP failed ▪ 203—Call needs to be retried on IP ▪ 204—IP call ended due to Emergency origination ▪ 401—Origination throttled ▪ 402—Unknown error (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WEND (notification) (continued)	**Call end status — Unsolicited notification (Continued)** <service_option> (Service option indicating type of call) • 0 — GSM / WCDMA / LTE call • All other options are for 1x/EVDO calls: ▪ 2 — Loopback (Note: 9 and 55 also indicate loopback) ▪ 3 — Speech (Note: 17, 68, 32768 also indicate speech) ▪ 6 — SMS (Note: 14 also indicates SMS) ▪ 9 — Loopback (Note: 2 and 55 also indicate loopback) ▪ 12 — Circuit-switched data ▪ 14 — SMS (Note: 6 also indicates SMS) ▪ 17 — Speech (Note: 3, 68, 32768 also indicate speech) ▪ 18 — OTAPA (Note: 19 also indicates OTAPA) ▪ 19 — OTAPA (Note: 18 also indicates OTAPA) ▪ 33 — 1x data ▪ 35 — Position determination (Note: 36 also indicate position determination) ▪ 36 — Position determination (Note: 35 also indicate position determination) ▪ 55 — Loopback (Note: 2 and 9 also indicate loopback) ▪ 68 — Speech (Note: 3, 17, 32768 also indicate speech) ▪ 32768 — Speech (Note: 3, 17, 68 also indicate speech) ▪ 33023 — 1xEVDO <RAT> (Network type) • Valid range: 0–3 • 0 — GSM / WCDMA • 1 — LTE • 2 — CDMA • 3 — TDS

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WFWUPD	**Download/install firmware package** Download a firmware package, or install the downloaded package locally over the AT port using 1K X-modem protocol. Package download process: 1. Download requested with AT+WFWUPD=0. 2. AT port switches to raw data mode. 3. TE sends <NACK> character to host at 1 second intervals to indicate it is ready to receive data using the 1K-Xmodem protocol. 4. Package download begins. 5. 'OK' response is received if package downloads successfully, or a CME ERROR: 3 response is received if no data is sent to the device in 5 minutes. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT+WFWUPD=<op>** Response: OK or ERROR Purpose: Download or install a firmware package. See <op> parameter description for response details. ▪ Query: **AT+WFWUPD?** Response: +WFWUPD: <pkg> OK Purpose: Indicate whether a package is available to be installed ▪ Query List: **AT+WFWUPD=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <op> (Operation mode) · 0 — Start downloading the firmware package using the XModem protocol Execution response: ▪ OK—Download succeeded ▪ ERROR—Download failed · 1 — Install the firmware update from the downloaded package Execution response: ▪ OK—Package is available (has been downloaded). Device reboots immediately to start the firmware update. ▪ ERROR—Package is not available (has not been downloaded). <pkg> (Package loading status) · 0 — No package is available to be installed · 1 — Package is loaded and available to be installed

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WFWUPD (notification)	**Firmware package install notification** Notification received after a package install is launched with AT+WFWUPD=1. After receiving the notification, use ATI3 and ATI8 to confirm the installed version information. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Notification format:** **+WFWUPD: <stat>** **Examples:** • AT+WFWUPD? +WFWUPD: 1 *Check whether package was previously downloaded. Response indicates package is downloaded and ready to install.* AT+WFWUPD=1 *Request package installation. Device reboots immediately to start firmware update* *...* +WFWUPD: 0 *Unsolicited notification received indicating package installed successfully* • *Package previously downloaded using AT+WFWUPD=0* AT+WFWUPD=1 *Device reboots immediately to start firmware update* *...* +WFWUPD: 1 *Notification received indicating package failed to install* **Parameters:** <stat> (Installation status) • 0 — Package installed successfully • 1 — Package did not install. Optionally, use !BCFWUPDATESTATUS on page 167 for firmware update status details.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WJAM (notification)	**Jamming events — Unsolicited notification** Unsolicited notification received for various jamming events. To enable +WJAM (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WJAM: <response type>,<jam status>]** **Examples:** • +WJAM: 0,2 *Intermediate report, possible jammer detected* • +WJAM: 1,1 *Final result, no jamming detected* **Parameters:** <response type> (Response type) • 0 — Final • 1 — Intermediate *Note: If <response_type> = 0 (Final), the <jam status> value can only be 1 (Null) or 5 (Jammed).* <jam status> (Jamming status) • 0 — Unknown. Status is unknown. • 1 — Null. No jamming suspicion; radio environment is considered normal. • 2 — Low. Low probability that the device is jammed, but some radio environment parameters are considered abnormal. • 3 — Medium. Medium probability that the device is jammed; a lot of interference in the radio spectrum. • 4 — High. High probability that the device is jammed; radio environment is considered jammed, but there is still a possibility that the module succeeds in synchronizing a cell. • 5 — Jammed. Module is jammed; cell synchronization impossible while sufficient power level is detected on a large number of frequencies.

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WJAMTHRESH	**Set/Report Jamming Detection Threshold Value** Set or report (display) the jamming detection threshold values for supported modes. *Note: For details on unsolicited jamming notifications received in response to jamming events, see +WJAM on page 133 for details.* **Supporting devices:** WP76xx **Password required:** No **Usage:** ▪ Execution: **AT+WJAMTHRESH=<mode>,<threshold>** Response: OK Purpose: Set the jamming threshold value for the specified <mode>. ▪ Query: **AT+WJAMTHRESH?** Response: +WJAMTHRESH: <mode>,<threshold> ... OK Purpose: Display all configured jamming threshold values. ▪ Query List: **AT+WJAMTHRESH=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <mode> (Radio Access Technology (RAT)) · 0 — GSM · 1 — UMTS · 2 — CDMA · 3 — LTE <threshold> (Jamming threshold value) · Supported range is <mode>-dependent. · Value corresponds to RSSI value (e.g. '45' represents "-45 dBm") · GSM: 0–63 · UMTS: 0–70 · CDMA: 0–125 · LTE: 0–125
+WMGF (notification)	**SMS memory full — Unsolicited notification** Unsolicited notification received when the SMS Service Center has tried to send an SMS message to the module, but the message was rejected because the SMS memory storage on the module is full. (The Service Center will attempt to resend the message to the module at a later time.) No new SMS messages will be received until old messages are deleted from storage using AT+CMGD. To enable +WMGF (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WMGF** **Parameters:** None

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WORG (notification)	**Call origination attempt — Unsolicited notification** Unsolicited notification received when an attempt is made to establish a voice or data call. To enable +WORG (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WORG: <dialing_string>** **Examples:** • Call originated using ATD18005551212: Notifications received: +WORG: 18005551212 +WCNT: 0,0 • PDP activation by the network after CS fallback (CSFB): Notifications received: +WORG: *98# **Parameters:** <dialing_string> (Dialing string sent to the base station) • Format: ASCII string • Valid characters: '0'..'9', + * #
+WRMICN (notification)	**Roaming icon — Unsolicited notification (CDMA only)** Unsolicited notification received for call control status notifications (CDMA devices only). **Notification format:** **+WRMICN: <mode>,<icon>]** **Examples:** • +WRMICN: 0,0 *1xRTT network, home icon (not roaming)* • +WRMICN: 1,2 *EVDO network, roam icon on, blinking (affiliated network)* **Parameters:** <mode> (Current RAT) • 0 — 1xRTT • 1 — EVDO <icon> (Roaming icon type) • 0 — Home • 1 — Roam icon ON (affiliated network) • 2 — Roam icon Blink (foreign network)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WUSLMSK	**Enable/disable unsolicited notifications** Enable or disable unsolicited notifications. When enabled, unsolicited notifications are output to the AT port when specific events occur. By default, unsolicited notifications are disabled. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+WUSLMSK=<bitmask>,<mask_position>** Response: OK Purpose: Enable or disable the selected notifications (in <bitmask>) defined in the specified 32-bit <mask_position>. ▪ Query: **AT+WUSLMSK?** Response: +WUSLMSK: <bitmask><mask_position> OK Purpose: Report current state of system mode indications (enabled/disabled), showing the upper 32-bit mask followed by the lower 32-bit mask. Example: +WUSLMSK: 00002B0E710241D0 OK (The upper mask is 00002B0E, and lower mask is 710241D0.) ▪ Query List: **AT+WUSLMSK=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <bitmask> (Unsolicited notifications bit mask, applied to the specified 32-bit <mask_position>) ▪ Bit mask indicating which notifications to enable/disable. ▪ Range: 00000000–FFFFFFFF. For example: ▪ 00000000=All bits off (Default value) ▪ FFFFFFFF=All bits on ▪ Any other combination=Combination of bits off and on ▪ See **LOWER unsolicited notifications mask** on page 137 and **UPPER unsolicited notifications mask** on page 138 for supported messages <mask_position> (The 32-bit mask of notifications that the <bitmask> is to be applied to.) ▪ 0=Lower 32-bit mask ▪ 1=Upper 32-bit mask (Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WUSLMSK (continued)	**Enable/disable unsolicited notifications (continued)** *Note: Notification support is firmware-dependent. Some of these notifications may not be supported or applicable.* **LOWER unsolicited notifications mask**

Bit	Mask value	Unsolic. Notif.	Responsible for:
0	0x00000001	---	Reserved
1	0x00000002	---	Reserved
2	0x00000004	+CSQ	RSSI change across threshold
3	0x00000008	---	Reserved
4	0x00000010	+WORG	Call State origination
5	0x00000020	---	Reserved
6	0x00000040	+WANS	Call State answered
7	0x00000080	+WCNT	Call State conversation
8	0x00000100	+WEND	Call End status
9	0x00000200	---	Reserved
10	0x00000400	---	Reserved
11	0x00000800	---	Reserved
12	0x00001000	+WRMICN	Roaming change
13	0x00002000	---	Reserved
14	0x00004000	---	Reserved
15	0x00008000	---	Reserved
16	0x00010000	---	Reserved
17	0x00020000	---	Reserved
18	0x00040000	---	Reserved
19	0x00080000	---	Reserved
20	0x00100000	---	Reserved
21	0x00200000	---	Reserved
22	0x00400000	---	Reserved
23	0x00800000	---	Reserved
24	0x01000000	+WMGF	SMS +WMGF memory full notification
25	0x02000000	---	Reserved
26	0x04000000	---	Reserved
27	0x08000000	+WVMI	Voice Mail indication
28	0x10000000	---	Reserved
29	0x20000000	RING	Incoming call notification
30	0x40000000	---	Reserved
31	0x80000000	---	Reserved

(Continued on next page)

Table 3-2: Modem Status Command Details (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+WUSLMSK (continued)</td><td>
Enable/disable unsolicited notifications (continued)
UPPER unsolicited notifications mask

Note: Notification support is firmware-dependent. Some of these notifications may not be supported or applicable.
<table>
<tr><th>Bit</th><th>Mask value</th><th>Unsolic. Notif.</th><th>Responsible for:</th></tr>
<tr><td>0</td><td>0x00000001</td><td>---</td><td>Reserved</td></tr>
<tr><td>1</td><td>0x00000002</td><td>!PCVOLT</td><td>PMIC voltage state change</td></tr>
<tr><td>2</td><td>0x00000004</td><td>!PCTEMP</td><td>PMIC temperature state change</td></tr>
<tr><td>3</td><td>0x00000008</td><td>!PATEMP</td><td>PA Temperature state change</td></tr>
<tr><td>4</td><td>0x00000010</td><td>+WJAM</td><td>Jamming event</td></tr>
<tr><td>5</td><td>0x00000020</td><td>---</td><td>Reserved</td></tr>
<tr><td>6</td><td>0x00000040</td><td>---</td><td>Reserved</td></tr>
<tr><td>7</td><td>0x00000080</td><td>---</td><td>Reserved</td></tr>
<tr><td>8</td><td>0x00000100</td><td>+WCC</td><td>Call Progress</td></tr>
<tr><td>9</td><td>0x00000200</td><td>!UIMSTATUS</td><td>UIM status change</td></tr>
<tr><td>10</td><td>0x00000400</td><td>---</td><td>Reserved</td></tr>
<tr><td>11</td><td>0x00000800</td><td>!PCDEFR</td><td>Deferred shutdown timer expiration</td></tr>
<tr><td>12</td><td>0x00001000</td><td>!GPIOINT</td><td>GPIO Interrupt detected</td></tr>
<tr><td>13</td><td>0x00002000</td><td>!SRV</td><td>WWAN Service State change</td></tr>
<tr><td>14</td><td>0x00004000</td><td>+WDDI</td><td>DTMF tone Detection notification</td></tr>
<tr><td>15</td><td>0x00008000</td><td>!AVVOCODER</td><td>Vocoder In Use notifications</td></tr>
<tr><td>16</td><td>0x00010000</td><td>!RSSI</td><td>Signal strength in dBm</td></tr>
<tr><td>17</td><td>0x00020000</td><td>!RI</td><td>Roaming indicator</td></tr>
<tr><td>18</td><td>0x00040000</td><td>!EONS</td><td>Enhanced Operator Name String indicator. String appears within quotes (e.g. ‘ "Response String" ‘)</td></tr>
<tr><td>19</td><td>0x00080000</td><td>---</td><td>Reserved</td></tr>
<tr><td>20</td><td>0x00100000</td><td>!NI</td><td>Network Identity indication</td></tr>
<tr><td>21</td><td>0x00200000</td><td>---</td><td>Reserved</td></tr>
<tr><td>22</td><td>0x00400000</td><td>!PSCS</td><td>Indication status of the packet switched data calls</td></tr>
<tr><td>23</td><td>0x00800000</td><td>---</td><td>Reserved</td></tr>
<tr><td>24</td><td>0x01000000</td><td>!MODE</td><td>Indication of Network modes</td></tr>
<tr><td>25</td><td>0x02000000</td><td>---</td><td>Reserved</td></tr>
<tr><td>26</td><td>0x04000000</td><td>!UIMREGSTATE</td><td>UIM registration state</td></tr>
<tr><td>27</td><td>0x08000000</td><td>---</td><td>Reserved</td></tr>
<tr><td>28</td><td>0x10000000</td><td>---</td><td>Reserved</td></tr>
<tr><td>29</td><td>0x20000000</td><td>---</td><td>Reserved</td></tr>
<tr><td>30</td><td>0x40000000</td><td>---</td><td>Reserved</td></tr>
<tr><td>31</td><td>0x80000000</td><td>---</td><td>Reserved</td></tr>
</table>
</td></tr>
</table>

Table 3-2: Modem Status Command Details (Continued)

Command	Description
+WVMI (notification)	**Voicemail received — Unsolicited notification** Unsolicited notification that indicates a voicemail has been received. To enable +WVMI (and other notifications), use AT+WUSLMSK. See +WUSLMSK on page 137 for details. **Notification format:** **+WVMI: <count>]** **Parameters:** <count> (Number of messages stored in voicemail system) • Valid range: 0–*n*

4: SIM Toolkit Commands

Introduction

This chapter describes commands and notifications used to enable the AT Interface's SIM toolkit support, and receive and respond to unsolicited SIM command notifications.

Note: SIM toolkit commands are available only if the feature is enabled via AT!CUSTOM='STKUIEN',2).

Command summary

Table 4-1 lists the commands described in this chapter.

Table 4-1: SIM Toolkit Commands

Command	Description	Page
***PSSTKI**	Configure AT interface's SIM toolkit support	141
!STKC	Report last unsolicited proactive SIM command notification	142
!STKC (notification)	Unsolicited proactive SIM command notification	143
!STKCR	Respond to proactive SIM command	144
!STKGC	Get (retrieve) data for last unsolicited proactive SIM command notification	149
!STKMS	Inform SIM of menu item selection or provide help information	161
!STKN (notification)	Response to mobile-originated Call or SMS control request (notification)	162
!STKPD	Select host-supported STK features	164

Command reference

Table 4-2: SIM Toolkit Command Details

Command	Description
***PSSTKI**	**Configure AT interface's SIM toolkit support** Configure the AT interface's support (interaction method with terminal equipment (TE)) for SIM Toolkit. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT*PSSTKI=<mode>** Response: OK Purpose: Configure the AT interface's STK support to the specified <mode>. ▪ Query: **AT*PSSTKI?** Response: *PSSTKI: <mode> OK Purpose: Display the AT interface's current <mode> for STK support. ▪ Query List: **AT*PSSTKI=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <mode> (AT interface's STK support mode) · 0 — STK not supported. Module does not send unsolicited result codes to TE, and TE does not send STK AT command to module. · 1 — Manual mode. Module sends URCs to TE, and TE must acknowledge proactive command notification to continue · 2 — Auto-acknowledge mode. Module responds to STK without TE. Any URCs are sent to TE. · 3 (Default) — Auto-acknowledge mode. Module responds without sending URC to the TE. · NOTE: Modes 2 and 3 are used only for the following STK proactive commands that require user interaction: ▪ Commands that require Yes/No responses: ▪ SEND SMS ▪ SEND SS ▪ SEND USSD ▪ SEND DTMF ▪ SET UP CALL ▪ SET UP MENU ▪ Commands that require MMI (man-machine interaction) and Yes/No responses when complete: ▪ SET UP IDLE MODE TEXT ▪ DISPLAY TEXT ▪ For BIP (Bearer Independent Protocol) feature: ▪ OPEN CHANNEL

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKC	**Report last unsolicited proactive SIM command notification** Display the most recent unsolicited proactive SIM command notification (!STKC (notification) on page 143). All notifications (except where <cmdId> is "01"or "81") require a response to be sent using AT!STKCR on page 144. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Query: **AT!STKC?** Response: [Outstanding Proactive Command: <cmdId>] OK Purpose: Display the most recent unsolicited !STKC notification. If none, return only "OK". **Parameters:** <cmdId> (Unique ID of proactive SIM command) • Note: This is the full set of supported <cmdID> types. • Hexadecimal ID as ASCII string (without quotation marks): ▪ "01"—Refresh ▪ "05"—Set Up Event List ▪ "10"—Set Up Call ▪ "11"—Send SS ▪ "12"—Send USSD ▪ "13"—Send SMS ▪ "14"—Send DTMF ▪ "15"—Launch Browser ▪ "20"—Play Tone ▪ "21"—Display Text ▪ "22"—Get Inkey ▪ "23"—Get Input ▪ "24"—Select Item ▪ "25"—Set Up Menu ▪ "28"—Set Up Idle Mode Text ▪ "35"—Language Notification ▪ "40"—Open Channel ▪ "81"—End of proactive session

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKC (notification)	**Unsolicited proactive SIM command notification** Unsolicited notification indicating a proactive SIM command has been received. All notifications (except where <cmdId> is "01"or "81") require a response to be sent using AT!STKCR on page 144. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Notification format:** **+STKC: <cmdId>** **Parameters:** <cmdId> (Unique ID of proactive SIM command) • Note: This is the full set of supported <cmdID> types. • Hexadecimal ID as ASCII string (without quotation marks): ▪ "01"—Refresh ▪ "05"—Set Up Event List ▪ "10"—Set Up Call ▪ "11"—Send SS ▪ "12"—Send USSD ▪ "13"—Send SMS ▪ "14"—Send DTMF ▪ "15"—Launch Browser ▪ "20"—Play Tone ▪ "21"—Display Text ▪ "22"—Get Inkey ▪ "23"—Get Input ▪ "24"—Select Item ▪ "25"—Set Up Menu ▪ "28"—Set Up Idle Mode Text ▪ "35"—Language Notification ▪ "40"—Open Channel ▪ "81"—End of proactive session

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKCR	**Respond to proactive SIM command** Respond to the last unsolicited proactive SIM command. This command must be issued before the next unsolicited command is received, otherwise an error will be returned. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!STKCR=<cmdId>,<result>[,<data>]** Response: OK *or* ERROR Purpose: Respond to the last received unsolicited proactive SIM command. If the <cmdId> is different than the last received command, ERROR is returned. ▪ Query List: **AT!STKCR=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <cmdId> (Unique ID of proactive SIM command being responded to) • Note: !STKCR is not used to respond to the following <cmdID> values: '81'. • Hexadecimal ID as ASCII string (without quotation marks): ▪ "05"—Set Up Event List (Note: This triggers the event identified in the response and sends the corresponding ENVELOPE command to the UICC. Once the envelope is sent successfully, the event is removed from the event list, per 3GPP TS 31.111.) ▪ "10"—Set Up Call ▪ "11"—Send SS ▪ "12"—Send USSD ▪ "13"—Send SMS ▪ "14"—Send DTMF ▪ "15"—Launch Browser ▪ "20"—Play Tone ▪ "21"—Display Text ▪ "22"—Get Inkey ▪ "23"—Get Input ▪ "24"—Select Item ▪ "25"—Set Up Menu ▪ "28"—Set Up Idle Mode Text ▪ "35"—Language Notification ▪ "40"—Open Channel (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKCR (continued)	**Respond to proactive SIM command (continued)** <result>[,<data>] (Response being sent for the specified <cmdId>) • Note: The <data> portion of the response format is unique for each <cmdID>. For example, <cmdId = "05"> returns <event> as the <data> portion, and <cmdID = "22"> returns <DCS>,<text> as the <data> portion. • The response format depends on the <cmdId> type: ▪ If <cmdId>="05" (Set Up Event List), then response format is: <result>,<event> ▪ <result> (Command result being returned) ▪ 0—No meaning, 0 always returned as <result> value ▪ <event> (Supported Events list) ▪ 4—User activity ▪ 5—Idle Screen available ▪ Note: This is to trigger the <event> and send the corresponding ENVELOPE command to the UICC. Once the envelope is sent successfully, the event will be removed from the event list (per 3GPP TS 31.111). ▪ If <cmdId>="10" (Set Up Call), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command beyond ME's capabilities ▪ 2—Currently busy on call ▪ 3—Currently busy with SS transaction ▪ 4—Terminated by user ▪ 5—SS returned Result Error Code ▪ 6—Network currently unable to process command ▪ 7—Call setup not accepted ▪ 8—User cleared down call before connection or network release ▪ 9—Command performed successfully, but requested icon could not be displayed ▪ If <cmdId>="11" (Send SS), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command beyond ME's capabilities ▪ 2—Currently busy with USSD transaction ▪ 3—Currently busy with SS transaction ▪ 4—Terminated by user ▪ 5—SS returned Result Error Code ▪ 6—Network currently unable to process command ▪ 7—Command performed successfully, but requested icon could not be displayed (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKCR (continued)	**Respond to proactive SIM command (continued)** ▪ If <cmdId>="12" (Send USSD), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command beyond ME's capabilities ▪ 2—Currently busy with USSD transaction ▪ 3—Currently busy with SS transaction ▪ 4—Terminated by user ▪ 5—USSD returned Result Error Code ▪ 6—Network currently unable to process command ▪ 7—Command performed successfully, but requested icon could not be displayed ▪ If <cmdId>="13" (Send Short Message), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command beyond ME's capabilities ▪ 2—SMS RP error ▪ If <cmdId>="14" (Send DTMF), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command beyond ME's capabilities ▪ 2—Not in speech call ▪ 3—Terminate proactive session ▪ 4—Command performed successfully, but requested icon could not be displayed ▪ If <cmdId>="15" (Launch Browser), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Command performed – partial completion ▪ 2—Command performed – missing information ▪ 3—Error – no specific cause given ▪ 4—Bearer unavailable ▪ 5—Browser unavailable ▪ 6—ME cannot process command ▪ 7—Network cannot process command ▪ 8—Command beyond ME's capabilities ▪ If <cmdId>="20" (Play Tone), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—Terminate proactive session ▪ 2—Specified tone not supported (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKCR (continued)	**Respond to proactive SIM command (continued)** ▪ If <cmdId>="21" (Display Text), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Message displayed OK ▪ 1—Terminate proactive session ▪ 2—Screen is busy ▪ 3—Backward move requested ▪ 4—No response from user ▪ If <cmdId>="22" (Get Inkey), then response format is: <result>[,<DCS>,<text>] ▪ <result> (Command result being returned) ▪ 0—Data entered OK ▪ 1—Terminate proactive session ▪ 2—Help information requested ▪ 3—Backward move requested ▪ 4—No response from user ▪ Note: <DCS> and <text> are sent only for <result>=0 (The SIM expects input to be in a Text String Data Object in the Terminal Response SIM command when data has been input.) ▪ <DCS> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Text string, in <DCS> format) ▪ Hex string ▪ For Yes/No responses, use the following hex strings: 00—Negative response entered 01—Positive response entered ▪ If <cmdId>="23" (Get Input), then response format is: <result>[,<DCS>,<text>] ▪ <result> (Command result being returned) ▪ 0—Data entered OK ▪ 1—Terminate proactive session ▪ 2—Help information requested ▪ 3—Backward move requested ▪ 4—No response from user ▪ Note: <DCS> and <text> are sent only for <result>=0 (The SIM expects input to be in a Text String Data Object in the Terminal Response SIM command when data has been input.) ▪ <DCS> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Text string, in <DCS> format) ▪ Hex string ▪ If the string is empty (e.g. the user makes an 'empty' input), either leave the parameter blank or send a null test string (""). (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKCR (continued)	**Respond to proactive SIM command (continued)** ▪ If <cmdId>="24" (Select Item), then response format is: <result>[,<itemId>] ▪ <result> (Command result being returned) ▪ 0—Item selected OK ▪ 1—Terminate proactive session ▪ 2—Help information requested ▪ 3—Backward move requested ▪ 4—No response from user ▪ <itemId> (Identifier of menu item selected) ▪ Integer value ▪ Applies to <result> types 0 and 2 ▪ If <cmdId>="25" (Set Up Menu), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Menu successfully added/removed ▪ 1—Problem with menu operation ▪ If <cmdId>="28" (Set Up Idle Mode Text), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Text successfully added/removed ▪ 1—Problem performing command ▪ If <cmdId>="35" (Language Notification), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ If <cmdId>="40" (Open Channel), then response format is: <result> ▪ <result> (Command result being returned) ▪ 0—Command performed successfully ▪ 1—User did not accept the proactive command

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC	**Get (retrieve) data for last unsolicited proactive SIM command notification** Get the data associated with the most recent unsolicited proactive SIM command. This command must be issued before the next unsolicited command is received, otherwise the data will not be accessible. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!STKGC=<cmdId>** Response: !STKGC: <cmdId>[,<data>] OK *or* ERROR Purpose: Get the data associated with the last received unsolicited proactive SIM command. If the <cmdId> is different than the last received command, ERROR is returned. ▪ Query List: **AT!STKGC=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <cmdId> (Unique ID of proactive SIM command for which data is to be retrieved) • Note: !STKGC is not used to respond to the following <cmdID> values: '01', '81'. • Hexadecimal ID as ASCII string (without quotation marks): ▪ "05"—Set Up List ▪ "10"—Set Up Call ▪ "11"—Send SS ▪ "12"—Send USSD ▪ "13"—Send SMS ▪ "14"—Send DTMF ▪ "15"—Launch Browser ▪ "20"—Play Tone ▪ "21"—Display Text ▪ "22"—Get Inkey ▪ "23"—Get Input ▪ "24"—Select Item ▪ "25"—Set Up Menu ▪ "28"—Set Up Idle Mode Text ▪ "35"—Language Notification ▪ "40"—Open Channel (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** <data> (Data retrieved for the specified <cmdId>) • The format of the received <data> depends on the <cmdId> type: ▪ If <cmdId>="05" (Set Up Event List), then <data> format is a string containing all supported event types: <event><event> ▪ <event> (Event types, to be monitored by the host) ▪ 04—User activity ▪ 05—Idle screen available ▪ If <cmdId>="10" (Set Up Call), then <data> format is: <method>, <TON>, <NPI>, <address>, <subaddress>, <ccp>, <DCS1>, <alphaId1>, <iconId1>, <dispMode1>, <DCS2>, <alphaId2>, <iconId2>, <dispMode2>, <redial>, <timeout> ▪ <method> (Call setup method) ▪ 0—Only if there are no other calls ▪ 1—Put all other calls on hold ▪ 2—Disconnect all other calls ▪ <TON> (Type of number) ▪ 0—Unknown ▪ 1—International ▪ 2—National ▪ 3—Network-specific ▪ <NPI> (Numbering Plan Identifier) ▪ 0—Unknown ▪ 1—ISDN Telephony ▪ 3—Data ▪ 4—Telex ▪ 9—Private ▪ <address> (Dialing address) ▪ Hex string ▪ <subaddress> (Dialing sub-address) ▪ Hex string ▪ <ccp> (Capability configuration parameters) ▪ Hex string ▪ <DCS1> (Data coding scheme for <alphaID1>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId1> (Alpha identifier for user confirmation> ▪ Hex string ▪ <iconId1> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <dispMode1> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId1>) ▪ 1—Display with <alphaId1> ▪ <DCS2> (Data coding scheme for <alphaId2>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId2> (Alpha identifier for call setup display> ▪ Hex string ▪ <iconId2> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode2> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId2>) ▪ 1—Display with <alphaId2> ▪ <redial> (Redial flag) ▪ 0—Redial not required ▪ 1—Redial required ▪ <timeout> (Timeout period, in ms) ▪ Integer ▪ 0—No timeout ▪ 100–15300000—Timeout ranging from 0.1 second to 255 minutes ▪ If <cmdId>="11" (Send SS), then <data> format is: <TON>, <NPI>, <address>, <DCS>, <alphaId>, <iconId>, <dispMode> ▪ <TON> (Type of number) ▪ 0—Unknown ▪ 1—International ▪ 2—National ▪ 3—Network-specific ▪ <NPI> (Numbering Plan Identifier) ▪ 0—Unknown ▪ 1—ISDN Telephony ▪ 3—Data ▪ 4—Telex ▪ 9—Private ▪ <address> (Dialing address) ▪ Hex string ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation> ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId>) ▪ 1—Display with <alphaId> ▪ If <cmdId>="12" (Send USSD), then <data> format is: <DCS1>, <ussd>, <DCS2>, <alphaId>, <iconId>, <dispMode> ▪ <DCS1> (Data coding scheme for <ussd>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <ussd> (USSD string>) ▪ Hex string ▪ <DCS2> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation>) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId>) ▪ 1—Display with <alphaId> ▪ If <cmdId>="13" (Send Short Message), then <data> format is: <pack>, <tpdu>, <TON>, <NPI>, <address>, <DCS>, <alphaId>, <iconId>, <dispMode> ▪ <pack> (Packing flag) ▪ 0—Packing not required ▪ 1—Packing required ▪ <tpdu> (TPDU string>) ▪ Hex string ▪ <TON> (Type of number) ▪ 0—Unknown ▪ 1—International ▪ 2—National ▪ 3—Network-specific ▪ <NPI> (Numbering Plan Identifier) ▪ 0—Unknown ▪ 1—ISDN Telephony ▪ 3—Data ▪ 4—Telex ▪ 9—Private ▪ <address> (Destination address) ▪ Hex string (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation>) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId>) ▪ 1—Display with <alphaId> ▪ If <cmdId>="14" (Send DTMF), then <data> format is: <dtmf>, <DCS>, <alphaId>, <iconId>, <dispMode> ▪ <dtmf> (DTMF string) ▪ Hex string ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation>) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId>) ▪ 1—Display with <alphaId> ▪ If <cmdId>="15" (Launch Browser), then <data> format is: <comQual>, <url>, <browserId>, <bearer>, <DCS1>, <gateway>, <DCS2>, <alphaId>, <iconId>, <dispMode>, <numFiles>[, <provFiles>, [...]] ▪ <comQual> (Command qualifier) ▪ 0—Launch browser if not already launched ▪ 2—Use existing browser ▪ 3—Close existing browser and launch new browser ▪ <url> (URL to connect to in browser>) ▪ Format: 8-bit data using GSM default 7-bit alphabet ▪ Special case: If <url>="" (Null string), use the default URL. ▪ <browserId> (Browser ID to use>) ▪ "00"—Use default browser (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <bearer> (Allowed bearers> ▪ List of allowed bearers in priority order ▪ "00"—SMS ▪ "01"—CSD ▪ "02"—USSD ▪ "03"—GPRS ▪ Example: 01030200 (CSD, GPRS, USSD, SMS) ▪ <DCS1> (Data coding scheme for <gateway>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <gateway> (Gateway address> ▪ Hex string ▪ <DCS2> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation> ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <alphaId>) ▪ 1—Display with <alphaId> ▪ <numFiles> (Number of <provFiles> following this parameter) ▪ Integer ▪ <provFile> (Provisioning File reference> ▪ 0 or more provisioning file pathnames, separated by commas ▪ Full pathnames are provided ▪ If <cmdId>="20" (Play Tone), then <data> format is: <DCS>, <alphaId>, <tone>, <duration> ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation> ▪ Hex string (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <tone> (Requested SST (Standard Supervisory Tone) or MPT (ME Proprietary Tone) type) ▪ Hex value ▪ 01—Dial (SST) ▪ 02—Called subscriber busy (SST) ▪ 03—Congestion (SST) ▪ 04—Radio path acknowledge (SST) ▪ 05—Radio path not available/Call dropped (SST) ▪ 06—Error/Special information (SST) ▪ 07—Call waiting (SST) ▪ 08—Ringing tone (SST) ▪ 10—General beep (MPT) ▪ 11—Positive ack (MPT) ▪ 12—Negative ack or Error (MPT) ▪ If no tone is specified, default to General beep. ▪ <duration> (Tone duration, in ms> ▪ Integer ▪ 0—Use the ME default value ▪ 100–15300000—Duration ranging from 0.1 second to 255 minutes ▪ If <cmdId>="21" (Display Text), then <data> format is: <DCS>, <text>, <priority>, <clear>, <iconId>, <dispMode>, <response> ▪ <DCS> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Text string in <DCS> format) ▪ Hex string ▪ <priority> (Display priority information) ▪ 0—Do not display information ▪ 1—Display information ▪ <clear> (Allow message to be cleared) ▪ 0—Clear message automatically after a delay ▪ 1—Allow user to clear message ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <text>) ▪ 1—Display with <text> ▪ <response> (Response requirement) ▪ 0—Normal response expected ▪ 1—Immediate response expected (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ If <cmdId>="22" (Get Inkey), then <data> format is: <DCS>, <text>, <response>, <helpInfo>, <iconId>, <dispMode> ▪ <DCS> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Text string in <DCS> format) ▪ Hex string ▪ <response> (Expected response character format> ▪ 0—SMS default alphabet ▪ 1—Yes/No response only ▪ 2—Digits (0–9, *, #, +) only ▪ 3—UCS2 alphabet ▪ <helpInfo> (Help information availability> ▪ 0—Not available ▪ 1—Available ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces <text>) ▪ 1—Display with <text> ▪ If <cmdId>="23" (Get Input), then <data> format is: <DCS1>, <text>, <response>, <echo>, <helpInfo>, <minLgth>, <maxLgth>, <DCS2>, <default>, <iconId>, <dispMode> ▪ <DCS1> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Text string in <DCS1> format) ▪ Hex string ▪ <response> (Expected response character format) ▪ 0—SMS default alphabet ▪ 1—Yes/No response only ▪ 2—Digits (0–9, *, #, +) only ▪ 3—UCS2 alphabet ▪ <echo> (Echo input availability) ▪ 0—Echo not allowed. Actual string entered by user cannot be displayed, but can be 'masked' to indicate key entry using characters from the set (0–9, *, #, +). ▪ 1—Echo input to display ▪ <helpInfo> (Help information availability> ▪ 0—Not available ▪ 1—Available ▪ <minLgth> (Minimum length of expected response) ▪ 0–255 (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <maxLgth> (Maximum length of expected response) ▪ 0–254 ▪ 255—No maximum length (can be ≥ 255 bytes) ▪ <DCS2> (Data coding scheme for <default>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <default> (Text string in <DCS2> format) ▪ Hex string ▪ If string is provided, ME will display this text for the user to accept, reject, or edit as appropriate. ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces any text string or <alphaId>) ▪ 1—Display with <alphaId> or text string ▪ If <cmdId>="24" (Select Item), then <data> format is: <numItems>, <selection>, <default>, <helpInfo>, <DCS>, <alphaId>, <iconId>, <dispMode> <CR><LF> [<itemId>, <itemText>, <iconId>, <dispMode>, <nai>] <CR><LF> [...] ▪ <numItems> (Number of items that are accessible in the menu structure)) ▪ 0—Remove existing menu from the ME's menu structure ▪ 1–255—Number of items in menu structure ▪ <selection> (Preferred user selection method) ▪ 0—No selection preference ▪ 1—Soft key selection preferred ▪ <default> (Default selection item) ▪ Integer value corresponding to one of the <itemId>s in the menu ▪ <helpInfo> (Help information availability>) ▪ 0—Not available ▪ 1—Available ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation, in <DCS> format) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces any text string or <alphaId>) ▪ 1—Display with <alphaId> or text string (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <itemId> (Menu item identifier) ▪ Integer value ▪ <itemText> (Menu item text) ▪ Hex string ▪ <nai> (Next Action Indicator) ▪ Action that SIM can initiate if selected by the user. For a list of available values, refer to TS 31.111 Section 9.4 and TS 102 223 Section 9.4. ▪ Hex value ▪ Example: 13 (Send Short Message) ▪ If <cmdId>="25" (Set Up Menu), then <data> format is: <numItems>, <selection>, <helpInfo>, <DCS>, <alphaId>, <iconId>, <dispMode>[, <itemId>, <itemText>, <iconId>, <dispMode>, <nai>] [<itemId>, <itemText>, <iconId>, <dispMode>, <nai>] [...] ▪ <numItems> (Number of items that are accessible in the menu structure)) ▪ 0—Remove existing menu from the ME's menu structure ▪ 1–255—Number of items in menu structure ▪ <selection> (Preferred user selection method) ▪ 0—No selection preference ▪ 1—Soft key selection preferred ▪ <helpInfo> (Help information availability>) ▪ 0—Not available ▪ 1—Available ▪ <DCS> (Data coding scheme for <alphaId>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <alphaId> (Alpha identifier for user confirmation, in <DCS> format) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces any text string or <alphaId>) ▪ 1—Display with <alphaId> or text string ▪ <itemId> (Menu item identifier) ▪ Integer value ▪ <itemText> (Menu item text) ▪ Hex string ▪ <nai> (Next Action Indicator) ▪ Action that SIM can initiate if selected by the user. For a list of available values, refer to TS 31.111 Section 9.4 and TS 102 223 Section 9.4. ▪ Hex value ▪ Example: 13 (Send Short Message) (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ If <cmdId>="26" (Set Up Idle Mode Text), then <data> format is: <DCS>, <text>, <iconId>, <dispMode> ▪ <DCS> (Data coding scheme for <text>) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpacked) ▪ 8—UCS2 alphabet ▪ <text> (Idle Mode text string, in <DCS> format) ▪ Hex string ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces any text string or <alphaId>) ▪ 1—Display with <alphaId> or text string ▪ If <cmdId>="35" (Language Notification), then <data> format is: <spec>, <lang> ▪ <spec> (Language notification type) ▪ 0—Non-specific language notification ▪ 1—Specific language notification ▪ <lang> (List of language codes) ▪ Hex string ▪ Example: 656E ("en"—English. Refer to ISO 639 for complete list of language codes.) ▪ If <cmdId>="40" (Open Channel), then <data> format is: <onDemand>, <alphaId>, <iconId>, <dispMode>, <bearerType>, <bearer>, <bufSize>, <apn>, <localAddrType>, <localAddr>, <login>, <pwd>, <transProtocol>, <portNum>, <destAddrType>, <destAddr> ▪ <onDemand> (Link establishment method) ▪ 0—On-demand link establishment ▪ 1—Immediate link establishment ▪ <alphaId> (Alpha identifier for user confirmation) ▪ Hex string, 7-bit GSM format or UCS2 ▪ <iconId> (Numeric tag (index) of icon image file on SIM to be displayed) ▪ 0—No icon ▪ 1–255—Icon tag ▪ <dispMode> (Icon image usage) ▪ 0—Display icon only (replaces any text string or <alphaId>) ▪ 1—Display with <alphaId> or text string ▪ <bearerType> (Bearer type) ▪ Integer value ▪ 1—CSD ▪ 3—GPRS ▪ 4—Default bearer ▪ All other values are reserved (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKGC (continued)	**Get (retrieve) data for last unsolicited proactive SIM command notification (continued)** ▪ <bearer> (Encoded bearer description (QoS and packet data protocol type)) ▪ Hex string (byte order: B1B2B3B4B5B6) ▪ B1—Precedence class ▪ B2—Delay class ▪ B3—Reliability class ▪ B4—Peak throughput ▪ B5—Mean throughput ▪ B6—Packet data protocol type ▪ Example: 020405051602 (e.g. "04" is the Delay class (B2)) ▪ <bufSize> (Buffer size requested) ▪ Integer value ▪ <apn> (Access point name) ▪ Hex string ▪ <localAddrType> (Local address type) ▪ Integer value ▪ 0—No address given ▪ 1—Dynamic address ▪ 2—IPv4 address ▪ 3—IPv6 address ▪ <localAddr> (Local address) ▪ Hex string ▪ <login> (User login name) ▪ Hex string ▪ <pwd> (User password) ▪ Hex string ▪ <transProtocol> (Transport protocol) ▪ Integer value ▪ 0—Not present ▪ 1—UDP ▪ 2—TCP ▪ 3—TCP server ▪ <portNum> (Port number) ▪ Integer value ▪ 0–65535 ▪ <destAddrType> (Data destination address type) ▪ Integer value ▪ 0—No address given ▪ 1—Dynamic address ▪ 2—IPv4 address ▪ 3—IPv6 address ▪ <destAddr> (Data destination address) ▪ Hex string

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKMS	**Inform SIM of menu item selection or provide help information** Host uses this command to tell the SIM which menu item was selected, or to request that the SIM provide help information for a menu item. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!STKMS=<item>[, <help>]** Response: OK *or* ERROR *or* Error code: <error> Purpose: Indicate to the SIM that menu <item> was selected, or that the SIM must provide help information for the menu <item>. ▪ Query List: **AT!STKMS=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <item> (Menu item) • Integer value <help> (Request help text or menu selection) • 0 (Default) — Request SIM to select menu item • 1 — Request SIM to provide help info to the host for the specified <item> by issuing a DISPLAY TEXT proactive SIM command. <error> (Error reason) • 1 — SIM card busy • 2 — General failure

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKN (notification)	**Response to mobile-originated Call or SMS control request (notification)** Unsolicited notification indicating the result of a mobile-originated call control or SMS control request. No host response is required to this notification. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Notification format:** **+STKN: <cmdId>, <data>** **Parameters:** <cmdId> (Notification type) • Hexadecimal ID as ASCII string (without quotation marks): ▪ "D4"—Response to mobile-originating Call Control request ▪ "D5"—Response to mobile-originating SMS Control request <data> (Notification content) • Content format depends on <cmdId> type: ▪ If <cmdId>="D4", then <data> format depends on call type: For Voice: <result>, <repeatind>, <alphaId>, 0, <TON>, <NPI>, <address>, <subaddress>, <ccp1>, <ccp2> For SS: <result>, <repeatind>, <alphaId>, 1, <TON>, <NPI>, <address> For USSD: <result>, <repeatInd>, <alphaId>, 2, <dcs>, <ussd> For PDP context: <result>, <repeatind>, <alphaId>, 3, <pdp> None: <result>, <repeatind>, <alphaId>, 4 ▪ <result> (Call control result) ▪ 0—Allowed with no modifications ▪ 1—Not allowed ▪ 2—Allowed with modifications ▪ <repeatind> (BC repeat indicator) ▪ 1—Alternate mode ▪ 3—Sequential mode ▪ <alphaId> (Alpha identifier) ▪ Hex string ▪ <TON> (Type of number) ▪ 0—Unknown ▪ 1—International ▪ 2—National ▪ 3—Network specific (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKN (notification) (continued)	**Response to mobile-originated Call or SMS control request (notification) (continued)** ▪ <NPI> (Numbering Plan Identifier) ▪ 0—Unknown ▪ 1—ISDN Telephony ▪ 3—Data ▪ 4—Telex ▪ 9—Private ▪ <address> (New dialing address) ▪ Hex string ▪ <subaddress> (New dialing sub-address) ▪ Hex string ▪ <ccp1> (First capability configuration parameters) ▪ Hex string ▪ <ccp2> (Second capability configuration parameters) ▪ Hex string ▪ <dcs> (Data coding scheme) ▪ 0—7-bit GSM default alphabet (packed) ▪ 4—8-bit GSM default alphabet (unpaced) ▪ 8—UCS2 alphabet ▪ <ussd> (USSD control string) ▪ Hex string ▪ If <cmdId>="D5", then <data> format is: <result>, <alphaId>, <TON>, <NPI>, <rpaddress>, <TON>, <NPI>, <tpddress> <result>, <repeatind>, <alphaId>, 4 ▪ <result> (SMS control result) ▪ 0—Allowed with no modifications ▪ 1—Not allowed ▪ 2—Allowed with modifications ▪ <alphaId> (Alpha identifier) ▪ Hex string ▪ <TON> (Type of number) ▪ 0—Unknown ▪ 1—International ▪ 2—National ▪ 3—Network specific ▪ <NPI> (Numbering Plan Identifier) ▪ 0—Unknown ▪ 1—ISDN Telephony ▪ 3—Data ▪ 4—Telex ▪ 9—Private ▪ <rpaddress> (RP address) ▪ Hex string

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKPD	**Select host-supported STK features** Host uses this command to select the set of STK features the host will support and inform the SIM of the set. The module must be reset for the selected set of features to take effect. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT!STKPD=<bitmask>** Response: OK *or* ERROR Purpose: Indicate to the SIM which STK features the host will support after the next reset. ▪ Query: **AT!STKPD?** Response: Profile config=<bitmask> OK Purpose: Report the current set of host-supported STK features by displaying the <bitmask>. Refer to the parameter description below to decode the settings. ▪ Query List: **AT!STKPD=?** Purpose: Return the execution command format. See the parameter descriptions below for details. **Parameters:** <bitmask> (Host-supported STK features) · 7-byte Hex string, big-endian format. Example: Byte order: 07060504030201; Bit order: 76543210 · Bit value 1=Supported; Bit value 0=Not supported · Note: Feature descriptions below include a code in brackets (e.g. "(B16b2)". This refers to the position of the bit in the terminal profile message according to 3GPP TS 11.14, using the following encoding: BX = Byte X bY = Bit Y · Byte 01: ▪ Bit 0—Menu selection support (B1b4) ▪ Bit 1—Support for alpha in call control (B2b5) ▪ Bit 2—UCS2 entry support (B2b6) ▪ Bit 3—UCS2 display support (B2b7) ▪ Bit 4—Display Text command support (B3b1) ▪ Bit 5—Get Inkey command support (B3b2) ▪ Bit 6—Get Input command support (B3b3) ▪ Bit 7—Play Tone command support (B3b5) (Continued on next page)

Table 4-2: SIM Toolkit Command Details (Continued)

Command	Description
!STKPD (continued)	**Select host-supported STK features (continued)** • Byte 02: ▪ Bit 0—Select Item command support (B4b1) ▪ Bit 1—Send SMS command support (B4b2) ▪ Bit 2—Send SS command support (B4b3) ▪ Bit 3—Send USSD command support (B4b4) ▪ Bit 4—Set Up Call command support (B4b5) ▪ Bit 5—Set Up Menu command support (B4b6) ▪ Bit 6—Set Up Idle Mode Text command support (B8b5) ▪ Bit 7—Second alpha in setup call support (B8b7) • Byte 03: ▪ Bit 0—Second capability configuration parameter support (B8b8) ▪ Bit 1—Sustained display text support (B9b1) ▪ Bit 2—Send DTMF command support (B9b2) ▪ Bit 3—Language notification command support (B9b6) ▪ Bit 4—Launch Browser command support (B9b7) ▪ Bit 5—Softkey support in select item command (B10b1) ▪ Bit 6—Softkey support in setup menu command (B10b2) ▪ Bit 7—Screen size support (B14b8) • Byte 04: ▪ Bit 0—Variable font size support (B15b8) ▪ Bit 1—Display resized support (B16b1) ▪ Bit 2—Text wrapping support (B16b2) ▪ Bit 3—Text scrolling support (B16b3) ▪ Bit 4—Not used ▪ Bit 5—Not used ▪ Bit 6—Not used ▪ Bit 7—Not used • Byte 05: ▪ Bit 0–7—Maximum softkey size (B11b1–B11b8) • Byte 06: ▪ Bit 0–4—Number of character support down ME (screen height) (B14b1–B14b5) ▪ Bit 5–7—Reduce width of menu support (B16b6–B16b8) • Byte 07: ▪ Bit 0–6—Number of character support across ME (screen width) (B15b1–B15b7) ▪ Bit 7—Not used

5: Diagnostic Commands

Introduction

This chapter describes commands used to diagnose modem problems.

Command summary

The table below lists the commands described in this chapter.

Table 5-1: Diagnostic Commands

Command	Description	Page
!BCFWUPDATESTATUS	Report status of most recent firmware update attempt	167
!ERR	Display/clear diagnostic information	168
!GCCLR	Clear crash dump data	168
!GCDUMP	Display crash dump data	168
!RXDEN	Enable/disable WCDMA/LTE receive diversity	169

Command reference

Table 5-2: Diagnostic Command Details

Command	Description
!BCFWUPDATESTATUS	**Report status of most recent firmware update attempt** Return the status of the most recent firmware update attempt made since the last cold restart. **Password required:** No **Usage:** ▪ Execution: **AT!BCFWUPDATESTATUS** Response: !BCFWUPDATESTATUS: <result> *or* !BCFWUPDATESTATUS: <result> Failed IMG TYPE <type>, DATA <data>, PART <part> OK Purpose: Return the status of the most recent firmware update attempt. The second response format appears only if <result> = “FAILED". **Parameters:** <result> (Status of last firmware update attempt) · ASCII string: ▪ “UNKNOWN"—Status of last attempt is unknown. ▪ “SUCCESS" —Last update was successful. ▪ “FAILED"—Last update failed. <type> (Firmware image type that failed to update) · ASCII string <data> (Reference data for failed image) · Location of the reference data as an offset in the CWE image · Valid range: 0–(2^{32}-1) <part> (Partition associated with the failed image) · ASCII string

Table 5-2: Diagnostic Command Details (Continued)

Command	Description
!ERR	**Display/clear diagnostic information** This command is used to display or clear diagnostic information (logged error conditions) that Sierra Wireless uses to assist in resolving technical issues. **Password required:** No **Usage:** ▪ Execution: **AT!ERR=0** Response: OK Purpose: Clear the logged error conditions. Use this command before running tests to make sure that details displayed using AT!ERR are relevant to the tests being performed. ▪ Query: **AT!ERR** Response: 00 [F] <count> <file> <line> ... nn [F] <count> <file> <line> OK Purpose: Return all logged error conditions that are stored in NVRAM. **Parameters:** <count> (Number of occurrences) · Valid range: 0x00–0xFF <file> (Log file name) · Name of log file using ASCII characters <line> (Line number in log file) · Valid range: 1–99999
!GCCLR	**Clear crash dump data** Clear crash dump data. **Password required:** No **Usage:** ▪ Execution: **AT!GCCLR** Response: Crash data cleared OK Purpose: Clear crash dump data. **Parameters:** None
!GCDUMP	**Display crash dump data** Display crash dump data. **Password required:** No **Usage:** ▪ Execution: **AT!GCDUMP** Response: (crash dump data) OK or No crash data available OK Purpose: Display crash dump data.

Table 5-2: Diagnostic Command Details (Continued)

Command	Description
!RXDEN	**Enable/disable WCDMA/LTE receive diversity** Enable or disable WCDMA/LTE receive diversity, or (for testing purposes only) establish receive diversity as the primary path. The new state takes effect the next time the modem is reset. *Note: To change from <state=0> to <state=2> (or from <state=2> to <state=0>, you must issue AT!RXDEN=1, reset the modem, and then make the final state change.* **Password required:** Yes—Execution format only **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!RXDEN=<state>** Response: OK Purpose: Set the current receive diversity state. ▪ Query: **AT!RXDEN?** Response: !RXDEN: <state> OK Purpose: Return the current receive diversity <state>. ▪ Query List: **AT!RXDEN=?** Purpose: Return a list of available <state> values to use in this command. **Parameters:** <state> (Current/ requested receive diversity state) · 0 = Rx diversity disabled · 1 = Rx diversity enabled · 2 = Rx diversity as primary path FOR TESTING PURPOSES ONLY. (The diversity path cannot be used to transmit data in an actual deployment.)

6: Test Commands

6.1 Introduction

To obtain regulatory approval and carrier approvals for your product, you may be required to perform tests on the radio component of the embedded modem. This chapter describes AT commands used to perform those tests.

Warning: *These commands are intended for use by developers, not end-users. The commands should be used only in a controlled network environment.*

In most cases the modem must be in a particular mode before you can issue the AT commands to perform particular tests. Therefore, the order in which you issue certain commands is important. Three AT commands are important in setting the mode:

- !DAFTMACT—puts the modem in factory test mode (a non-signaling mode). You must issue **AT!DAFTMACT** before issuing any other command that starts with "!DA".
- !DASBAND—selects the frequency band.
- !DASCHAN—selects the channel. This command must be run after you have selected the band with **!DASBAND**. (If you don't select a channel, the modem uses a default.)

6.2 Command Summary

The table below lists the commands described in this chapter.

Table 6-1: Test Commands

Command	Description	Page
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6.3 Command Reference

Table 6-2: Test Command Details

Command	Description
!DACGPSCTON	**Return CGPS C/N and frequency** Return the CGPS C/N (signal strength) and frequency measurement. **Requirements:** Before this command can be used: • Use !DACGPSTESTMODE=1 to start the CGPS diagnostic task • Use !DACGPSSTANDALONE=1 to enter standalone RF mode • Use !DACGPSMASKON to enable the CGPS log mask **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: AT!DACGPSCTON Response: CtoN=<CtoN>,Freq=<freq> OK Purpose: Return the current CGPS signal strength and frequency. **Parameters:** <CtoN> (Signal strength) • 0.0–99.0 — Signal strength calculated in 0.1 dBHz. <freq> (Frequency offset) • 0–4294967295 — Frequency offset in Hz.
!DACGPSMASKON	**Set CGPS log mask** Set the CGPS IQ log mask. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: AT!DACGPSMASKON Response: <logmask> OK Purpose: Set the log mask. **Parameters:** <logmask> (CGPS IQ log mask) • 288-character hexadecimal string • The <logmask> is the raw data returned by the Qualcomm GPS Diag module. This value does not affect the GPS test and can be ignored.

Table 6-2: Test Command Details (Continued)

Command	Description
!DACGPSSTANDALONE	**Enter/exit Stand Alone RF mode** Enter or exit stand alone (SA) RF mode. **Requirements:** Before this command can be used: • Use !DACGPSTESTMODE=1 to start the CGPS diagnostic task. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DACGPSSTANDALONE=<state>** Response: <status> OK *or* ERROR Purpose: Enter or exit Stand Alone RF mode. **Parameters:** <state> (Requested SA RF mode) • 0 — Exit • 1 — Enter <status> (Return value indicating requested <state> change) • Appears only if <state> change is successful. • 4B0D65001400 — Successfully changed state.
!DACGPSTESTMODE	**Start/stop CGPS diagnostic task** Start or stop the CGPS diagnostic task. This command allows the GNSS engine to be tested without obtaining a GNSS position fix. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DACGPSTESTMODE=<mode>** Response: <status> OK *or* ERROR Purpose: Start or stop the CGPS diagnostic task. **Parameters:** <mode> (Start/stop CGPS diagnostic task) • 0 — Stop • 1 — Start <status> (Return value indicating requested <mode> change) • Appears only if <mode> change is successful. • 4B0D0800 — Successfully started the CGPS diagnostic task • 4B0D0C00 — Successfully stopped the CGPS diagnostic task

Table 6-2: Test Command Details (Continued)

Command	Description
!DAFTMACT	**Put modem into Factory Test Mode** Place the modem in FTM (Factory Test Mode). FTM is a non-signaling mode that allows the radio component to be manually configured to conduct certain types of tests. The modem must be in FTM mode to use the test commands described in this chapter (except for commands that start with "!DACGPS" *Note: When this command executes successfully, the modem responds with the value 290300. Any other response indicates an error.* **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DAFTMACT** Response: 290300 *(Success. Any other response indicates an error.)* OK Purpose: Place modem in FTM mode (from online mode)
!DAFTMDEACT	**Put modem into Online Mode from Factory Test Mode** Take the modem out of FTM and put it back into online mode. (!DAFTMACT puts the modem into FTM.) *Note: When this command executes successfully, the modem responds with the value 290400. Any other response indicates an error.* **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DAFTMDEACT** Response: 290400 *(Success. Any other response indicates an error.)* OK Purpose: Place modem in online mode (from FTM mode).

Table 6-2: Test Command Details (Continued)

Command	Description
!DAGGAVGRSSI	**Return averaged RSSI value in dBm (GSM only)** Return an averaged RSSI (Received Signal Strength Indicator) value in dBm. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a GSM band. **Password required:** Yes **Usage:** ▪ Execution: **AT!DAGGAVGRSSI=<channel>, <LNA Index>** Response: <rssi> dBm OK Purpose: Return the averaged RSSI for the specified channel and LNA offset index. **Parameters:** <channel> (Channel number for the band specified using !DASBAND) • Valid values depend on the selected band <LNA Index> (LNA offset index) • 0 — R0 (highest gain) • 1 — R1 • 2 — R2 • 3 — R3 (lowest gain) <rssi> (Averaged RSSI, in dBm) • Decimal ASCII value • e.g. "-86.3125"
!DAGSRXBURST	**Set GSM receiver to burst mode (GSM only)** Set the receiver to start or stop sending bursts. (The receiver must be in burst mode to read the RSSI. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a GSM band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes **Usage:** ▪ Execution: **AT!DAGSRXBURST=<function>** Response: <function> OK Purpose: Set the receiver to burst mode. **Parameters:** <function> • 0 — Get RSSI (Burst mode) • 2 — Stop continuous Rx

Table 6-2: Test Command Details (Continued)

Command	Description
!DAGSTXFRAME	**Set GSM Tx frame structure (GSM only)** This command configures the Tx slots for GSM operation. It must be issued eight times to set all eight slots. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a GSM band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes **Usage:** ▪ Execution: **AT!DAGSTXFRAME=<slotnum>, <onoff>, <pwr>, <mcs>** Response: <slotnum> <onoff> <pwr> <mcs> OK Purpose: Set the Tx frame structure. **Parameters:** <slotnum> (Slot number) • Valid range: 0–7 (eight available Tx slots) <onoff> (Enable/disable the specified slot) • 0 — Off (disable) • 1 — On (enable) <pwr> (Slot power level) • Measured in dB*100 • Maximum values: ▪ GMSK Mode 850/900 bands: 3200 (32 dBm) 1800/1900 bands: 2900 (29 dBm) ▪ 8PSK (EDGE) Mode 850/900 bands: 2700 (27 dBm) 1800/1900 bands: 2600 (26 dBm) <mcs> (Modulation code scheme) • Valid range: 0–8 (MCS1 to MCS9)

Table 6-2: Test Command Details (Continued)

Command	Description
!DALGAVGAGC	**Return averaged Rx AGC value (LTE only)** Return the averaged AGC (Automatic Gain Control) readings for a specific uplink channel on the main and diversity paths. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. • Use !DALSRXBW to set the LTE Rx bandwidth. **Password required:** Yes **Usage:** ▪ Execution: **AT!DALGAVGAGC=<channel>, <LNA Index>** Response: Paths: <paths> Rx<n>: AGC: <agc> dBm LNA: <lna> Chain: <chain> Rx<n>: AGC: <agc> dBm LNA: <lna> Chain: <chain> OK Purpose: Return the averaged AGC for <channel> on the main and diversity paths. **Parameters:** <channel> (Uplink channel number (UARFCN) for the band specified using !DASBAND) • Valid values depend on the selected band <LNA Index> (LNA offset index) • 0 — R0 (Highest gain) • 1 — R1 • 2 — R2 • 3 — R3 (Lowest gain) <paths> (Number of receive paths) • 2 <agc> (AGC value in dBm) • Valid values: Dynamic Rx range <chain> (Receive paths) • 0 — Rx Main • 1 — Rx Diversity

Table 6-2: Test Command Details (Continued)

Command	Description
!DALSNSVAL	**Configure LTE Net Sig value (LTE only)** Configure the LTE Net Sig (NS) value, which will be used to configure Tx power. The NS value is used to determine the additional max power backoff to reduce spectrum emissions. **Command Availability:** WP76, WP77. Valid in WP75xx/WP85xx Release 16 and later. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. • Use !DALSRXBW to set the LTE Rx bandwidth. • Use !DALSTXBW to set the LTE Tx bandwidth. • Use !DASCHAN to set the uplink channel for the selected band. • Use !DALSTXMOD to set the LTE Tx modulation type. • Use !DALSWAVEFORM to set the LTE Tx waveform characteristics. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DALSNSVAL=<ns_val>** Response: OK Purpose: Set the LTE Net Sig value. **Parameters:** <ns_val> (Net Sig value) • 1–32
!DALSPARANGE	**Set LTE PA range (LTE only)** Set the LTE PA (Power Amplifier) range. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. • Use !DALSRXBW to set the LTE Rx bandwidth. • Use !DALSTXBW to set the LTE Tx bandwidth. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DALSPARANGE=<pa_range>** Response: <pa_range> OK Purpose: Set the LTE PA range. **Parameters:** <pa_range> (PA range) • 0–3

Table 6-2: Test Command Details (Continued)

Command	Description
!DALSRXBW	**Set LTE Rx bandwidth (LTE only)** Set the LTE Rx bandwidth. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DALSRXBW=<bw>** Response: OK Purpose: Set the LTE Rx bandwidth. **Parameters:** <bw> (LTE bandwidth) • 0 — 1.4 MHz • 1 — 3 MHz • 2 — 5 MHz • 3 — 10 MHz • 4 — 15 MHz • 5 — 20 MHz
!DALSTXBW	**Set LTE Tx bandwidth (LTE only)** Set the LTE Tx bandwidth. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DALSTXBW=<bw>** Response: OK Purpose: Set the LTE Tx bandwidth. **Parameters:** <bw> (LTE bandwidth) • 0 — 1.4 MHz • 1 — 3 MHz • 2 — 5 MHz • 3 — 10 MHz • 4 — 15 MHz • 5 — 20 MHz

Table 6-2: Test Command Details (Continued)

Command	Description
!DALSTXMOD	**Set LTE Tx modulation type (LTE only)** Set the LTE Tx modulation type. **Command Availability:** WP76, WP77. Valid in WP75xx/WP85xx Release 16 and later. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE band. • Use !DALSRXBW to set the LTE Rx bandwidth. • Use !DALSTXBW to set the LTE Tx bandwidth. • Use !DASCHAN to set the uplink channel for the selected band. After this command is used: • For the modulation change to have an effect, use !DALSWAVEFORM to set the LTE Tx waveform. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DALSTXMOD=<mod_type>** Response: OK Purpose: Set the LTE Tx modulation type. **Parameters:** <mod_type> (LTE modulation type) • 0 — QPSK • 1 — 16 QAM • 2 — 64 QAM

Table 6-2: Test Command Details (Continued)

Command	Description
!DALSTXPWR	**Set LTE Tx power level (LTE only)** Set the desired LTE Tx power level. *Note: This command cannot support a PUCCH waveform. (Waveform type is set using !!DALSPARANGE.)* **Command Availability:** WP76, WP77. Valid in WP75xx/WP85xx Release 16 and later. **Password required:** Yes (see !ENTERCND for details) **Requirements:** Before using this command, perform the following steps: a. Use !DAFTMACT to enter FTM mode. b. Use !DASBAND to set the device to an LTE band. c. Use !DALSRXBW to set the LTE Rx bandwidth. d. Use !DALSTXBW to set the LTE Tx bandwidth. e. Use !DASCHAN to set the uplink channel for the selected band. f. Use !DALSTXMOD to set the LTE Tx modulation type. g. Use !DALSWAVEFORM to set the LTE Tx waveform characteristics. h. Use !DALSNSVAL to set the LTE Net Sig value. i. Use !DASTXON to turn the LTE transceiver PA on. **Usage:** ▪ Execution: **AT!DALSTXPWR=<enable>,<power_dBm>** Response: OK Purpose: Set the LTE Tx power level. **Parameters:** <enable> (Enable/disable Tx power output) • 0 — Disable • 1 — Enable <power_dBm> (Desired Tx power) • -57 to 23 — Tx power in dBm • Field is ignored if <enable>=0

Table 6-2: Test Command Details (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!DALSWAVEFORM</td><td>
Set LTE TX waveform (LTE only)
Set the LTE Tx waveform characteristics.

Requirements:
Before this command can be used:
• Use !DAFTMACT to enter FTM mode.
• Use !DASBAND to set the device to an LTE band.
• Use !DALSTXBW to set the LTE Tx bandwidth.
• Use !DASCHAN to set the uplink channel for the selected band.
Password required: Yes (see !ENTERCND for details)

Usage:
▪ Execution: AT!DALSWAVEFORM=<waveform>[,<PUSCH_RBs>,<PUCCH_RBs>,<PUSCH_start_RB_index>]
Response: OK
Purpose: Set the LTE Tx waveform characteristics.
Parameters:
<waveform> (Tx waveform)
• 1 — LTE PUSCH (Physical Uplink Shared Channel)
• 2 — LTE PUCCH (Physical Uplink Control Channel)
<PUSCH_RBs> (Number of PUSCH resource blocks)
• Valid range: 0–100
• Recommended number of PUSCH RBs:
<table>
<tr><th>Bandwidth (MHz)</th><th>PUSCH RBs</th></tr>
<tr><td>1.4</td><td>6</td></tr>
<tr><td>3</td><td>15</td></tr>
<tr><td>5</td><td>25</td></tr>
<tr><td>10</td><td>50</td></tr>
<tr><td>15</td><td>75</td></tr>
<tr><td>20</td><td>100</td></tr>
</table>
<PUCCH_RBs> (Number of PUCCH resource blocks)
• Valid range: 0–12
<PUSCH_start_RB_index> (PUSCH starting resource block index)
• Valid range: 0–255
</td></tr>
</table>

Table 6-2: Test Command Details (Continued)

Command	Description
!DASBAND	**Set frequency band** Set the modem to use a particular frequency band. You must use this command to select an appropriate band before running LTE, WCDMA, or GSM commands. See page 170. **Requirements:** Before this command can be used: • Use !DAFTMACT to enter FTM mode. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DASBAND=<rfband>** Response (GSM/WCDMA): <rfband> OK Response (LTE): 0 OK *(Note: For LTE frequency bands, even though the response shows 0 instead of <rfband>, the band has been set correctly if the response shows 'OK'.)* Purpose: Set frequency band. **Parameters:** <rfband> (Unique value corresponding to an RF band and technology.) • Unique value that maps to an RF band and technology. It is not an actual 3GPP band number. For example, '18' is GSM 850, which corresponds to 3GPP band 5 (on a GSM network). • Band support is product-dependent — see the device's Product Specification or Product Technical Specification document for details. • Examples (for a full listing, see Table 17-1 on page 301): ▪ GSM ▪ 10—GSM 900 ▪ 11—GSM 1800 ▪ 12—GSM 1900 ▪ 18—GSM 850 ▪ WCDMA ▪ 9—WCDMA 2100 (IMT) ▪ 16—WCDMA 1900B ▪ 22—WCDMA 850 ▪ 28—WCDMA 1700 (BC4) ▪ 29—WCDMA 900 (BC8) ▪ 75—WCDMA 800 (BC19) (Continued on next page)

Table 6-2: Test Command Details (Continued)

Command	Description
!DASBAND (continued)	**Set frequency band (continued)** ▪ LTE ▪ 34—LTE B1 ▪ 35—LTE B7 ▪ 36—LTE B13 ▪ 39—LTE B40 ▪ 41—LTE B11 ▪ 42—LTE B4 ▪ 43—LTE B2 ▪ 44—LTE B3 ▪ 45—LTE B5 ▪ 47—LTE B8 ▪ 50—LTE B12 ▪ 51—LTE B14 ▪ 54—LTE B18 ▪ 55—LTE B19 ▪ 56—LTE B20 ▪ 57—LTE B21 ▪ 61—LTE B25 ▪ 62—LTE B26 ▪ 64—LTE B28 ▪ 76—LTE B41 ▪ 83—LTE B66 ▪ 97—LTE B71

Table 6-2: Test Command Details (Continued)

Command	Description
!DASCHAN	**Set modem channel (frequency)** Set the modem to operate on a particular frequency channel. Before using this command, use the command !DASBAND (described on page 183) to set the band. Once a channel is set, the modem continues to use that channel until the modem is reset or powered off and on. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to an LTE, WCDMA, or GSM band. • If In LTE mode (an LTE band was selected): ▪ Use !DALSRXBW to set the LTE Rx bandwidth. ▪ Use !DALSTXBW to set the LTE Tx bandwidth. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!DASCHAN=<rfchannel>** Response: <rfchannel> OK Purpose: Set modem channel (frequency). **Parameters:** <rfchannel> (Uplink channel number (ARFCN)—depends on frequency band being used) • GSM ▪ 1–124—GSM 900 MHz ▪ 128–251—GSM 850 MHz ▪ 512–810—GSM 1900 MHz ▪ 512–885—GSM 1800 MHz ▪ 975–1023—GSM 900 MHz • WCDMA ▪ 312–363—WCDMA 850 (Band XIX) ▪ 1312–1513—WCDMA 1700 (Band IV) ▪ 2712–2863—WCDMA 900 (Band VIII) ▪ 4132–4233—WCDMA 850 (Band V) ▪ 4162–4188—WCDMA 800 (Band VI) ▪ 9262–9538—WCDMA 1900 (Band II) ▪ 9612–9888—WCDMA 2100 (Band I) (Continued on next page)

Table 6-2: Test Command Details (Continued)

Command	Description
!DASCHAN (continued)	**Set modem channel (frequency) (continued)** • LTE ▪ 18000–18599—LTE B1 ▪ 18600–19199—LTE B2 ▪ 19200–19949—LTE B3 ▪ 19950–20399—LTE B4 ▪ 20400–20649—LTE B5 ▪ 20750–21449—LTE B7 ▪ 21450–21799—LTE B8 ▪ 22750–22949—LTE B11 ▪ 23010–23179—LTE B12 ▪ 23180–23279—LTE B13 ▪ 23280–23379—LTE B14 ▪ 23850–23999—LTE B18 ▪ 24000–24149—LTE B19 ▪ 24150–24449—LTE B20 ▪ 24450–24599—LTE B21 ▪ 26040–26689—LTE B25 ▪ 26690–27039—LTE B26 ▪ 27210–27659—LTE B28 ▪ 38650–39649—LTE B40 ▪ 39650–41589—LTE B41 ▪ 131972–132671—LTE B66 ▪ 133122–133471—LTE B71

Table 6-2: Test Command Details (Continued)

Command	Description
!DASLNAGAIN	**Set LNA gain state** Set the LNA (Low Noise Amplifier) range for the main or diversity path (if applicable), in either WCDMA or GSM mode. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA or GSM band • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DASLNAGAIN=<gain index>[, <path>]** Response: <gain index> OK Purpose: Set the LNA gain state for either the main or diversity paths. **Parameters:** <gain index> • 0 — R0 (highest gain) Approximate switch from low to high gain: WCDMA (< -72 dBm); GSM (< -73 dBm) • 1 — R1 Approximate switch from low to high gain: WCDMA (< -72 up to -46 dBm); GSM (< -73 up to -58 dBm) • 2 — R2 Approximate switch from low to high gain: WCDMA (< -46 up to -36 dBm); GSM (< -58 up to -41 dBm) • 3 — R3 (lowest gain) Approximate switch from low to high gain: WCDMA (> -36 dBm); GSM (< -41 dBm) *Note: The LNA gain state is set based on the expected receive power level. The gain state values listed above are provided as a guideline. Values are approximations and subject to change over time.* <path> (For modules supporting diversity) • 0 — Main path (Default) • 1 — Secondary (diversity) path

Table 6-2: Test Command Details (Continued)

Command	Description
!DASPDM	**Set PDM value (WCDMA and GSM only)** Adjust the PDM (Pulse Duration Modulation), allowing you to apply frequency offset to the LO (Local Oscillator) or Tx AGC. When you adjust the Tx AGC (<PDM ID> = 2), the modem does not use a calibrated result but uses the raw AGC value. The resulting change in Tx power will vary from modem to modem, so it is usually necessary to tune this value by executing the command repeatedly with different settings for the <PDMvalue> until you obtain the desired Tx power. When adjusting the tracking LO, you also need to execute the command repeatedly with different settings for the <PDMvalue> until you obtain the desired frequency offset. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA or GSM band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DASPDM=<PDM ID>, <PDMvalue>** Response: <PDM ID> <PDMvalue> OK Purpose: Set the tracking LO and Tx AGC PDM. **Parameters:** <PDM ID> (LO (Local Oscillator) or Tx AGC (Automatic Gain Control) to adjust) • 0 — Tracking LO adjust (GSM only) • 2 — Tx AGC adjust (WCDMA only) • 4 — Tracking LO adjust (WCDMA only) <PDMvalue> (Frequency offset value) • If <PDM ID>=0: 0–511 • If <PDM ID>=2: 0–511 • If <PDM ID>=4: 0–65535
!DASTXOFF	**Turn Tx PA off** Turn the transceiver PA off, after it has been turned on with !DASTXON. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!DASTXOFF** Response: OK Purpose: Turn the Tx PA off. **Parameters:** None

Table 6-2: Test Command Details (Continued)

Command	Description
!DASTXON	**Turn Tx PA on** Turn the transceiver PA on. The PA remains on until you turn it off using !DASTXOFF, or until you reset or power the modem down and up. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!DASTXON** Response: OK Purpose: Turn the Tx PA on. **Parameters:** None
!DAWGAVGAGC	**Return averaged Rx AGC value (WCDMA only)** Return the averaged AGC (Automatic Gain Control) reading for a specific band for either the main path or diversity path (if applicable). **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DAWGAVGAGC=<channel>, <LNA Index>[, <path>]** Response: <agc> OK Purpose: Return the averaged AGC for <channel> on the main path or diversity path. **Parameters:** <channel> (Uplink channel number (UARFCN) for the band specified using !DASBAND) • Valid values depend on the selected band <LNA Index> (LNA offset index) • 0=R0 (Highest gain) • 1=R1 • 2=R2 • 3=R3 (Lowest gain) <path> (For modules supporting diversity) • 0=Main path • 1=Diversity path <agc> (Averaged Rx AGC in dBm) • Example: -78.9

Table 6-2: Test Command Details (Continued)

Command	Description
!DAWSPARANGE	**Set PA range state machine (WCDMA only)** Set the PA range state machine in WCDMA operation. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: AT!DAWSPARANGE=<PA range> Response: <PA range> OK Purpose: Set the PA range state machine. **Parameters:** <PA range> • 0 — Low gain state of the PA — Limited to about 16 dBm output power (R0=0, R1=0) • 1 — (R0=1, R1=0) • 2 — (R0=0, R1=1) • 3 — High gain state of the PA — Up to the maximum output power of the modem (R0=1, R1=1)
!DAWSSCHAIN	**Enable secondary receive chain (WCDMA only)** Enable or disable the secondary receive chain. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: AT!DAWSSCHAIN=<state> Response: OK Purpose: Enable or disable the secondary receive chain. **Parameters:** <state> (Requested state for secondary receive chain) • 0=Off (Disable) • 1=On (Enable)

Table 6-2: Test Command Details (Continued)

Command	Description
!DAWSTXCW	**Set waveform used by the transmitter (WCDMA only)** Set the waveform used by the transmitter — the modem can transmit either in carrier wave or WCDMA modulated. **Requirements:** • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA band. • Use !DASCHAN to set the uplink channel for the selected band. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!DAWSTXCW=<waveform>** Response: OK Purpose: Set the transmitter waveform. **Parameters:** <waveform> (Waveform used by the transmitter) • 0=WCDMA • 1=Carrier wave (no modulating signal applied)
!DAWSTXPWR	**Set desired Tx power level (WCDMA mode only)** Enable/disable Tx power output and set the desired Tx power level in dBm. **Requirements:** • The modem must be in WCDMA mode. • Use !DAFTMACT to enter FTM mode. • Use !DASBAND to set the device to a WCDMA band. • Use !DASCHAN to set the uplink channel for the selected band. • Use !DASTXON to turn the transceiver PA. **Password required:** Yes **Usage:** ▪ Execution: **AT!DAWSTXPWR=<enable>,<power_dBm>** Response: OK Purpose: Enable/disable Tx power output and set the Tx power level to the requested <dBm> level. **Parameters:** <enable> (Enable/disable Tx power output) • 0 — Disable • 1 — Enable <power_dBm> (Desired Tx power in dBm) • -57 to 23

Table 6-2: Test Command Details (Continued)

Command	Description
!LDTEST	**Test LED (WP8548/WP75xx)** Test an LED by turning it on (light) or off (dark). When finished testing the LED, either use !LDTESTOFF or reboot the device to return to normal LED operation. *Note: Only one LED can be tested at a time.* *Note: For WP76xx/WP77xx, use !LEDTEST.* **Supporting devices:** WP8548/WP75xx **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!LDTEST=<led_no>,<state>** Response: OK Purpose: Turn the specified LED on (light) or off (dark). ▪ Query: **AT!LDTEST?** Response: (last test record of tested leds) OK Purpose: Report the reusult of the last test. ▪ Query List: **AT!LDTEST=?** Purpose: Display the assignment command format and valid parameter options. **Parameters:** <led no> (LED to test) · 0–8 — LED index number <state> (LED state) · 0 — Off (Dark) · 1 — On (Light)

Table 6-2: Test Command Details (Continued)

Command	Description
!LDTESTOFF	**Reset LED to normal mode from test mode** Show current LED mode (testing/normal) or return LED to normal mode from test mode. **Supporting devices:** WP8548/WP75xx **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!ILDTESTOFF** Response: OK Purpose: Return an LED that is currently in test mode to normal mode. ▪ Query: **AT!LDTESTOFF?** Response: !LDTESTOFF: <mode> OK Purpose: Report the current mode of the LED. ▪ Query List: **AT!LDTESTOFF=?** Purpose: Display the assignment command format. **Parameters:** <mode> (LED mode) · 0 — Normal operating mode · 1 — Test mode
!LEDTEST	**Test LED (WP76xx/WP77xx)** Test an LED by turning it on (light) or off (dark). When finished testing the LED, reboot the device to return to normal LED operation. *Note: Only one LED can be tested at a time.* *Note: For WP8548/WP75xx, use !LDTEST.* **Supporting devices:** WP76xx/WP77xx **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!LEDTEST=<led_no>,<state>** Response: OK Purpose: Turn the specified LED on (light) or off (dark). ▪ Query List: **AT!LEDTEST=?** Purpose: Display the assignment command format and valid parameter options. **Parameters:** <led no> (LED to test) · 0 — WWAN_LED <state> (LED state) · 0 — Off (Dark) · 1 — On (Light)

7: Memory Management Commands

7.1 Introduction

The modem uses non-volatile memory to store:

- Factory calibration data
- Settings made in a host application such as Skylight.

The commands in this chapter allow you to back up and restore the data in non-volatile memory.

7.2 Command Summary

The table below lists the commands described in this chapter:

Table 7-1: Memory Management Commands

Command	Description	Page
!PARTITION	Display/set partition sizes	195
!RMARESET	Restore device	197

7.3 Command Reference

Table 7-2: Memory Management Command Details

Command	Description
!PARTITION	**Display/set partition sizes** Display or modify the sizes of application processor partitions. **Important:** *By default, this command is not available. It is only available as a factory (SKU-level) configuration.* *If the module was factory-configured with this command available, it is strongly recommended to either:* ▪ *Disable the command when it is no longer needed (via AT!PARTITION=disable), or* ▪ *Set a unique password (!SETCND on page 28) to prevent unapproved access to protected commands (including !PARTITION).* **Supporting devices:** WP76xx **Password required:** Yes **Reset required to apply changes:** Yes **Usage:** ▪ Execution (Set): **AT!PARTITION=<name>,<size0>[,<size1>[,<size2>[...]]]** Response: Partitions to be updated: PART NAME / BLOCK OFFSET / SIZE (KB) / NEW SIZE [list of partitions] OK Purpose: For the specified partition (<name>), set the partition size (<size0>) and optionally set the sizes of one or more subsequent partitions. Recommendation—Before resizing the partitions, make sure to use AT!PARTITION? and record the current sizes in case you need to reset them. Example: AT!PARTITION=0:LEFWKRO,16000 Partitions to be updated: PART NAME / BLOCK OFFSET / SIZE (KB) / NEW SIZE 0:aboot 1024 1024 0:boot 15360 15360 0:system 30720 30720 0:LEFWKRO 8960 16128 * 0:SWIRW 25600 25600 * 0:USERAPP 134144 134144 * 0:RESERVED 55808 48640 * NOTE: partitions marked with '*' will be erased on partition change If these numbers look not OK, run the command again. Otherwise run AT!RESET to apply the changes OK (Continued on next page)

Table 7-2: Memory Management Command Details (Continued)

Command	Description
!PARTITION (continued)	**Display/set partition sizes (continued)** **Important:** *Any partition that is being resized or moved (has its starting position shifted because another partition is being resized) will be marked with a '*'. Marked partitions will be erased when the module is reset. To prevent them from being erased, re-enter the !PARTITION command with appropriate sizes.* *Erased contents cannot be recovered. Firmware components that were stored in the erased partitions must be re-downloaded (restoring default configurations) to ensure proper running of the firmware.* ▪ Execution (Disable): **AT!PARTITION=disable** Response: OK Purpose: Disable this command. This takes effect [immediately || after the module is reset]. (Note: 'disable' must be entered in lower-case.) ▪ Query: **AT!PARTITION?** Response: PART BLOCK SIZE NAME OFFSET (KB) <name> <offset> <size> ... OK Purpose: Report the current partition sizes. ▪ Query List: **ATPARTITION=?** Purpose: Return the execution command format and the supported parameter values. If !PARTITION is not enabled, the response will include "None/Not Allowed" instead of a list of partitions. **Parameters:** <name> (Partition name) • Character string. For the list of partition names, use AT!PARTITION=? • e.g. "0:aboot" <size> (Partition size, in KB) • Integer • Partitions are based on 256-byte blocks. If a partition is to be resized, the <size> rounds up to the nearest block. (e.g. If "AT!PARTITION=0:LEFWKRO,16000" is entered, the actual block size will be 16128 bytes (rounded up from 16000).) <offset> (Partition position) • Hexadecimal • e.g. 00000000 (first partition); 000000A; 0000024D, etc

Table 7-2: Memory Management Command Details (Continued)

Command	Description
!RMARESET	**Restore device** Command details for WP75xx/WP85xx: Restore the device to its original provisioned (OEM default) state, or to the original state plus activation and Sprint-related settings. *Note: The module reboots automatically with the restored settings.* **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!RMARESET=<category>** Response: !RMARESET: <category> RESET OK Purpose: Restore device to the requested state. **Parameters:** <category> (Restoration type) • OEM=Default OEM provisioned state • RTN=OEM provisioned state plus activation and Sprint-related settings Command details for WP76xx/WP77xx: Restore the device to its original provisioned (OEM default) state, or to the latest backed-up state. *Note: The module does not reboot automatically. It must be manually rebooted to use the restored settings.* **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!RMARESET=<level>** Response: !RMARESET: DEVICE REBOOT REQUIRED Items Restored: ##### Items Deleted: ##### Items Defaulted: ##### Items Skipped: ##### OK Purpose: Restore device to the requested state. **Parameters:** <level> (Restoration type) • 1=Default OEM provisioned state • 3=Latest backed-up state

8: GNSS Commands

8.1 Introduction

This chapter describes commands used to access GNSS functionality in supporting modules.

When using these commands, the following considerations apply:

- GNSS is typically enabled by default; however, it may be disabled by default for some SKUs. If so, enable GNSS using **AT!CUSTOM="GPSENABLE"**
- If supported by the modem, XTRA is enabled (over the NDIS interface) by default when GPS is enabled, and it generates data traffic.

8.2 Command Summary

The table below lists the commands described in this chapter.

Table 8-1: GPS Commands

Command	Description	Page
!GNSSCONFIG	Configure GNSS satellite constellation support	200
!GNSSDPOMODE	Enable/Disable Dynamic Power Optimization (DPO)	201
!GPSAUTOSTART	Configure GPS auto-start features	202
!GPSCLRASSIST	Clear specific GPS assistance data	203
!GPSCOLDSTART	Clear all GNSS assistance data	204
!GPSEND	End an active session	204
!GPSFIX	Initiate GPS position fix	205
!GPSIDREN	Enable/disable DR_SYNC	206
!GPSLOC	Return last known location of the modem	207
!GPSMOMETHOD	Return last known location of the modem	207
!GPSNMEASENTENCE	Set/report NMEA sentence type	209
!GPSSATINFO	Request satellite information	211
!GPSSTATUS	Request current status of a position fix session	212
!GPSSUPLURL	Set/report SUPL server URL	213
!GPSSUPLVER	Set/report SUPL server version	214
!GPSTRACK	Initiate local tracking (multiple fix) session	215
!GPSTRANSSEC	Control GPS transport security	216
!GPSXTRADATAENABLE	Set/report GPS XTRA settings	217
!GPSXTRADATAURL	Set/report GPS XTRA data server URLs	218

Table 8-1: GPS Commands (Continued)

Command	Description	Page
!GPSXTRAINITDNLD	Initiate GPS XTRA data download and inject operation	219
!GPSXTRASTATUS	Return current status of XTRA	220
!GPSXTRATIME	Inject GPS or UTC time into XTRA system	221
!GPSXTRATIMEENABLE	Set/report GPS XTRA time settings	222
!GPSXTRATIMEURL	Set/report GPS XTRA SNTP server URLs	223

8.3 Command Reference

Table 8-2: GPS Command Details

Command	Description
!GNSSCONFIG	**Configure GNSS satellite constellation support** Configure GNSS engine to support various GNSS satellite systems. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GNSSCONFIG=<GPS>,<GLO>,<BDS>,<GAL>,<QZS>** Response: OK Purpose: Enable or disable satellite systems. ▪ Query: **AT!GNSSCONFIG?** Response: GPS: <GPS> GLONASS: <GLO> BDS: <BDS> GAL: <GAL> QZSS: <QZS> OK Purpose: Display state of each satellite system (enabled/disabled). ▪ Query List: **AT!GNSSCONFIG=?** Purpose: Return the expected command format. **Parameters:** <GPS> (GPS satellite system state) • 1 — Enable • Note: GPS support cannot be disabled. <GLO> (GLONASS satellite system state) • 0 — Disable • 1 — Enable <BDS> (Beidou satellite system state) • 0 — Disable • 1 — Enable worldwide • 2 — Enable outside US <GAL> (Galileo satellite system state) • 0 — Disable • 1 — Enable worldwide • 2 — Enable outside U.S. <QZS> (Quasi-Zenith satellite system state) • 0 — Disable. QZSS satellites will not be used in GNSS position fix calculation. However, they are still tracked for the purpose of cross-correlation detection and mitigation. • 1 — Enable worldwide • 2 — Enable outside U.S.

Table 8-2: GPS Command Details (Continued)

Command	Description
!GNSSDPOMODE	**Enable/Disable Dynamic Power Optimization (DPO)** Enable or disable dynamic power optimization (DPO). **Supporting devices:** WP76xx/WP77xx **Requirements:** • Before DPO can be enabled, AT!GPSIDREN=0 must be used to disable DR_SYNC. **Password required:** Yes **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GNSSDPOMODE=<state>** Response: OK Purpose: Enable or disable DPO. ▪ Query: **AT!GNSSDPOMODE?** Response: !GNSSDPOMODE: <state> OK Purpose: Display state of each satellite system (enabled/disabled). ▪ Query List: **AT!GNSSDPOMODE=?** Purpose: Return the expected command format. **Parameters:** <state> (DPO mode state) • 0 — Disable • 1 — Enable

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSAUTOSTART	**Configure GPS auto-start features** Configure the GPS auto-start features. Any changes take effect the next time the modem is reset. *Note: If auto-start is enabled, another GPS session cannot be started.* **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSAUTOSTART=<function>[, <fixtype>, <maxtime>, <maxdist>, <fixrate>]** Response: OK *or* ERROR Purpose: Assign start values for various GPS settings ▪ Query: **AT!GPSAUTOSTART?** Response: !GPSAUTOSTART function: <function> fixtype: <fixtype> maxtime: <maxtime> seconds maxdist: <maxdist> meters fixrate: <fixrate> seconds OK Purpose: Display the current values for auto-start features ▪ Query List: **AT!GPSAUTOSTART=?** Purpose: Return the expected command format. **Parameters:** <function> (When GPS auto-start will occur) · 0=Disabled · 1=At bootup · 2=When NMEA port opened <fixtype> (Type of fix to establish) · 1=Standalone (not supported by a mobile station) · 2=MS-based only · 3=MS-assisted only <maxtime> (Maximum time to wait for a position fix) · Valid range: 1–255 — Number of seconds to wait <maxdist> (Requested accuracy of fix) · Entered in decimal format · Valid range: ▪ 1–4294967279 meters ▪ 4294967280=No preference <fixrate> (Time to wait between fixes) · Valid range: 1–65535 seconds

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSCLRASSIST	**Clear specific GPS assistance data** Clear one or more types of assistance data from the modem. This forces a cold start for GPS acquisition the next time a session starts. Note: • AT!GPSCLRASSIST=1,1,1,1,1 is equivalent to **!GPSCOLDSTART**. • (WP76xx/WP77xx only) AT!GPSCLRASSIST=0,0,0,0,0 is a special case that leaves GPS assistance data untouched, but clears the last fix data. **Requirements:** • Device must not have an active GPS session (the GPS receiver is off and no position fix is being calculated). **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!GPSCLRASSIST=<eph>, <alm>, <pos>, <time>, <iono>** Response: OK *or* Command ignored OK Purpose: Clear each assistance data type that is flagged as '1'. ▪ Query List: **AT!GPSCLRASSIST=?** Purpose: Return the expected command format and supported values. **Parameters:** <eph> (Ephemeris assistance data) • 0=Ignore (Do not clear the ephemeris assistance data) • 1=Clear this assistance data type — Clears GPS, GLONASS, and SBAS ephemeris assistance data. <alm> (Almanac assistance data) • 0=Ignore (Do not clear the almanac assistance data) • 1=Clear this assistance data type — Clears GPS, GLONASS, and SBAS almanac assistance data. <pos> (Position assistance data) • 0=Ignore (Do not clear the position assistance data) • 1=Clear this assistance data type <time> (Time reference) • 0=Ignore (Do not clear the time reference) • 1=Clear the time reference <iono> (Ionosphere assistance data) • 0=Ignore (Do not clear the ionosphere assistance data) • 1=Clear this assistance data type

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSCOLDSTART	**Clear all GNSS assistance data** Clear all GNSS assistance details from the modem and put the modem into a coldstart state. Data cleared includes Almanac, Ephemeris, Previous Position, Ionosphere, and GPS time. This forces a cold start for GPS acquisition the next time a session starts. **Requirements:** • Device must not have an active GPS session (the GPS receiver is off and no position fix is being calculated). **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!GPSCOLDSTART** Response: OK Purpose: Clear the modem's GPS details **Parameters:** None
!GPSEND	**End an active session** End an active position fix session. **Password required:** No **Usage:** ▪ Execution: **AT!GPSEND=<sessType>** Response: ERRCODE = <value> OK *or* OK Purpose: End the current session. **Parameters:** <sessType> (Type of session to end) • 0 — Position fix session <value> (Error code returned when command fails for any reason) • See Table 8-3 on page 223 for a list of possible error codes.

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSFIX	**Initiate GPS position fix** Initiate a GPS position fix. **Password required:** No **Usage:** ▪ Execution: **AT!GPSFIX=<fixType>, <maxTime>, <maxDist>** Response: OK *or* ERROR CODE = <value> OK Purpose: Initiate a time-limited position fix with a specified accuracy. ▪ Query List: **AT!GPSFIX=?** Purpose: Return supported <fixType>, <maxTime>, and <maxDist> values. **Parameters:** <fixType> (Type of fix to establish) · 1 — Standalone (not supported by a mobile station) · 2 — MS-based only · 3 — MS-assisted only <maxTime> (Maximum time to wait for a position fix) · Valid range: 1–255 seconds <maxDist> (Requested accuracy of fix) · Entered in decimal format · Valid range: ▪ 1–4294967279 meters ▪ 4294967280—No preference <value> (Error code returned when command fails for any reason) · See Table 8-3 on page 223 for a list of possible error codes. **Example(s):** AT!GPSFIX=1, 15, 10 requests a standalone position fix to 10 meters accuracy. The request will fail (timeout) if the modem cannot determine a position fix within 15 seconds. **Related commands:** ▪ **!GPSSTATUS** (page 212) — Use this command while the tracking session is in progress. ▪ **!GPSLOC** (page 207) — Use this command after the session completes to obtain the result.

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSIDREN	**Enable/disable DR_SYNC** Enable or disable DR_SYNC. (DR_SYNC must be disabled before dynamic power optimization (DPO) can be enabled using !GNSSDPOMODE.) **Password required:** No **Usage:** ▪ Execution: **AT!GPSIDREN=<switch>** Response: OK *or* ERROR OK Purpose: Enable or disable DR_SYNC. ▪ Query: **AT!GPSIDREN?** Response: !GPSIDREN: <switch> Purpose: Return current state of DR_SYNC. ▪ Query List: **AT!GPSIDREN=?** Purpose: Return supported <switch> values. **Parameters:** <switch> (DR_SYNC state) • 0 — Disabled • 1 — Enabled

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSLOC	**Return last known location of the modem** Return the details obtained during the most recent position location session, if available. **Password required:** No **Usage:** ▪ Query: **AT!GPSLOC?** Response: Unknown *(No information is available)* OK *or* Not Available *(No information is available)* OK *or* Lat: <latitude> Lon: <longitude> Time: <time> LocUncAngle: <luAngle> LocUncA: <luA> LocUncP: <luP> HEPE: <hepe> <fixType> Altitude: <altitude> LocUncVe: <luV> Heading: <heading> VelHoriz: <vH> VelVert: <vV> OK *(Altitude and heading only appear if data was collected as part of the most recent fix.)* Purpose: Return last position location details. **Parameters:** <latitude> (Latitude at last position fix) • Example: "49 Deg 10 Min 21.49 Sec N (0x008BDE6C)" <longitude> (Longitude at last position fix) • Example: "123 Deg 4 Min 14.76 Sec W (0xFEA1EE9A)" <time> (Time at which last position fix was taken) • Example: "2009 01 30 4 20:27:18 (GPS)" <luAngle> (Location uncertainty angle of returned position) • Example: "11.2 deg" <luA> (Standard deviation of axis along <luAngle>) • Example: "6.0 m" <luP> (Standard deviation of axis perpendicular to <luAngle>) • Example: "6.0 m" <hepe> (Horizontal Estimated Positional Error) • Example: "8.485 m" <fixType> (2D or 3D fix) • Example: "2D Fix" or "3D Fix" <altitude> (Altitude in meters at which last position fix was taken) • Only present if <fixType> is 3D • Example: "-1 m" <luV> (Vertical uncertainty in meters) • Only present if <fixType> is 3D • Example: "3.0 m" (Continued on next page)

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSLOC (continued)	**Return last known location of the modem (continued)** <heading> (Direction of MS) • Example: "0.0 deg" <vH> (Horizontal velocity) • Example: "0.0 m/s" <vV> (Vertical velocity) • Example: "0.0 m/s"
!GPSMTLRSETTINGS	**Set/report MT location request settings** Set or report the current MT (mobile-terminated) Location Request settings, which control how the UE responds to network-initiated notifications. **Password required:** Yes **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSMTLRSETTINGS=<response>** Response: OK *or* ERROR Purpose: Indicate how MT location request will be handled. ▪ Query: **AT!GPSMTLRSETTINGS?** Response: Notification Response Setting: <response> OK Purpose: Return the current <response> setting. ▪ Query List: **AT!GPSMTLRSETTINGS=?** Purpose: Return valid <response> values. **Parameters:** <response> (Notification response setting) • 0=Default setting as defined in *3GPP specification 29.002*, 'NotificationToMSUser' enumeration. • 1=Accept all MT location requests. • 2=Reject all MT location requests. • 3=Verify all—User will be asked to accept or reject every MT location request.

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSNMEASENTENCE (F/W Rev: 07.00.00.00 and newer)	**Set/report NMEA sentence type** Set or report the current GPS NMEA sentence types. **Requirements:** • NMEA streaming must be enabled using **!GPSNMEA** before using this command. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSNMEASENTENCE=<nmea type>** Response: OK *or* ERROR Purpose: Enable or disable NMEA sentence types. ▪ Query: **AT!GPSNMEASENTENCE?** Response: !GPSNMEASENTENCE: <nmea type> OK Purpose: Indicate the currently enabled GPS NMEA sentence types. ▪ Query List: **AT!GPSNMEASENTENCE=?** Purpose: Return valid parameter values. (Continued on next page)

Table 8-2: GPS Command Details (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSNMEASENTENCE (continued)</td><td>
Set/report NMEA sentence type (continued)

Parameters:
<nmea type> (NMEA sentence types)

2-byte hex format mask (Note: In the execution format, do not include '0x' before the mask value)
Each bit: 0 — Disabled; 1 — Enabled

<table>
<tr><th>Bit</th><th>Description</th></tr>
<tr><td>0</td><td>GPGGA (Fix information)</td></tr>
<tr><td>1</td><td>GPRMC (Recommended minimum data for GPS)</td></tr>
<tr><td>2</td><td>GPGSV (Detailed satellite data)</td></tr>
<tr><td>3</td><td>GPGSA (Overall satellite data)</td></tr>
<tr><td>4</td><td>GPVTG (Vector track and speed over the ground)</td></tr>
<tr><td>5</td><td>PQXFI (Proprietary Qualcomm eXtended Fix Information)</td></tr>
<tr><td>6</td><td>GLGSV (GLONASS GSV)</td></tr>
<tr><td>7</td><td>GNGSA (GLONASS GSA)</td></tr>
<tr><td>8</td><td>GNGNS (Time, position, fixed related data for GLONASS receiver)</td></tr>
<tr><td>9</td><td>GARMC (Galileo RMC)</td></tr>
<tr><td>10</td><td>GAGSV (Galileo Satellites in View)</td></tr>
<tr><td>11</td><td>GAGSA (Galileo GSA)</td></tr>
<tr><td>12</td><td>GAVTG (Galileo VTG)</td></tr>
<tr><td>13</td><td>Reserved</td></tr>
<tr><td>14</td><td>GSV_EXTENDED (Enable/disable Extended GGSV)</td></tr>
<tr><td>15</td><td>GAGGA (Galileo GGA)</td></tr>
<tr><td>16</td><td>PQGSA (Beidou GSA)</td></tr>
<tr><td>17</td><td>PQGSV (Beidou GSV)</td></tr>
<tr><td>18</td><td>Reserved</td></tr>
<tr><td>19</td><td>GAGNS (Galileo new GGA)</td></tr>
<tr><td>20</td><td>GPDTM (Datum Reference)</td></tr>
<tr><td>21</td><td>GNGGA (GNSS GGA)</td></tr>
<tr><td>22</td><td>GNRMC (GNSS RMC)</td></tr>
<tr><td>23</td><td>GNVTG (GNSS VTG)</td></tr>
<tr><td>24–29</td><td>Reserved</td></tr>
<tr><td>30</td><td>GPGLL (Geographic Position)</td></tr>
<tr><td>31</td><td>GPGRS (GPS Range Residuals)</td></tr>
</table>
</td></tr>
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Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSSATINFO	**Request satellite information** Return the following information for all satellites in view (including those used in the latest position fix): satellite vehicle number (SV), elevation (ELEV), azimuth (AZI), and signal to noise ratio (SNR). The information returned is valid regardless of the current fix mode or whether the PDE or the modem performs the fix calculations. **Password required:** No **Usage:** ▪ Query: **AT!GPSSATINFO?** Response: NO SAT INFO OK *or* Satellites in view: <numSats> * SV: <SV 1> ELEV:<ELEV 1> AZI:<AZI 1> SNR:<SNR 1> ... * SV: <SV n> ELEV:<ELEV n> AZI:<AZI n> SNR:<SNR n> OK Purpose: Return the number of satellites in view (including those used in the latest position fix) and details for each satellite (or return an error message). *Note: An asterisk (*) at the beginning of a line indicates the satellite was used in the fix location calculation.* **Parameters:** <numSats> (Number of satellites in view) • 1 or more <SV n> (Satellite vehicle number for the nth satellite in the list) • 1 or more • 1-32 — GPS • 65-96 — GLONASS • 201–237 — Beidou (Note: Not supported by WP75xx/WP85xx.) • 301-336 — Galileo <ELEV n> (Satellite elevation relative to modem location, in degrees) • Valid range: 0–90 <AZI n> (Satellite azimuth relative to modem location, in degrees) • Valid range: 0–360 <SNR n> (Signal to noise ratio, in dB) • Valid range: 0–99

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSSTATUS	**Request current status of a position fix session** Return the current status of a position fix session. **Password required:** No **Usage:** ▪ Query: **AT!GPSSTATUS?** Response: <year> <month> <day> <day of week> <time of day> Last Fix Status = <status> <year> <month> <day> <day of week> <time of day> Fix Session Status = <status> Purpose: Return timestamps and status of a position fix session. **Parameters (Timestamp):** <year> · Example: "2007" <month> · 01–12 (Jan–Dec) <day> · 01–31 <day of week> · 0–6 (0=Monday) <time of day> · 24-hour clock format · Example: "13:25:48" **Parameters (Status):** <status> (Session status) · "NONE": No session of this type has occurred since the modem powered up. ▪ The timestamp is the current time. · "ACTIVE": A session of this type is currently active. ▪ The timestamp is the time when the session entered this state. · "SUCCESS": The most recent session of this type succeeded. ▪ The timestamp is the time when the previous session completed successfully. · "FAIL": The most recent session of this type failed. ▪ The timestamp is the time when the previous session failed. ▪ An error code is displayed with the "FAIL" string. See Table 8-3 on page 223 for a list of error codes. **Example(s):** AT!GPSSTATUS? returns: 2007 01 06 6 00:25:01 Last Fix Status = SUCCESS 2007 01 06 6 00:25:02 Fix Session Status = ACTIVE

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSSUPLURL	**Set/report SUPL server URL** Set or return the URL and port of the SUPL server to be used when TCP/IP is used as the transport mechanism for location processing. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSSUPLURL="<suplURL>"[:<port ID>]** Response: OK or ERROR Purpose: Identify the SUPL server URL. ▪ Query: **AT!GPSSUPLURL?** Response: <suplURL> OK Purpose: Return the SUPL server's URL.. ▪ Query List: **AT!GPSSUPLURL=?** Purpose: Return the execution command format. **Parameters:** <suplURL> (SUPL server URL) • Must be a fully qualified domain name (FQDN) or address • Examples: "supl.url.net", "123.123.123.123" • The <suplURL> is not checked for correctness — if the string is invalid, the modem will not be able to perform MS-assisted GPS fixes. <port ID> (Port ID to use over TCP/IP) • Valid range: 0–65535 **Example(s):** AT!GPSSUPLURL="supl.url.net" AT!GPSSUPLURL="123.123.123.123" AT!GPSSUPLURL="123.123.123.123":17432

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSSUPLVER	**Set/report SUPL server version** Set or return the version of the SUPL server. **Password required:** No **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSSUPLVER=<supl ver>** Response: OK or ERROR Purpose: Identify the SUPL server version. ▪ Query: **AT!GPSSUPLVER?** Response: <supl ver> OK Purpose: Return the SUPL server's version. ▪ Query List: **AT!GPSSUPLVER=?** Purpose: Return the execution command format. **Parameters:** <supl ver> (SUPL server version) ▪ 1 — SUPL version 1 ▪ 2 — SUPL version 2

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSTRACK	**Initiate local tracking (multiple fix) session** Initiate a local tracking session comprising a specific number of position fixes taken at regular time intervals. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!GPSTRACK = <fixType>, <maxTime>, <maxDist>, <fixCount>, <fixRate>** Response: OK *or* ERROR CODE = <value> OK Purpose: Initiate a series of time-limited position fixes. ▪ Query List: **AT!GPSTRACK=?** Purpose: Return supported <fixType>, <maxTime>, <maxDist>, <fixCount>, and <fixRate> values. **Parameters:** <fixType> (Type of fix to establish) · 1=Standalone (not supported by a mobile station) · 2=MS-based only · 3=MS-assisted only <maxTime> (Maximum time to wait for satellite information) · Valid range: 1–255 seconds <maxDist> (Requested accuracy of fix) · Entered in decimal format · Valid range: ▪ 1–4294967279 meters ▪ 4294967280=No preference <fixCount> (Number of position fixes requested) · Valid range: 1–1000 (1000 — Take a continuous series of position fixes) <fixrate> (Amount of time to wait between fix attempts) · Valid range: 1–65535 seconds **Failure conditions:** The request fails if the tracking session fails to initiate. If the request fails, the message ERROR CODE = <value> is returned. See Table 8-3 on page 223 for a list of error codes. *Note: The 'time to first fix' may require more time than subsequent fixes, if almanac, ephemeris, or location data needs to be updated. (Almanac data is valid for 3–4 days, ephemeris for 30–120 minutes, and location data for 4 minutes). To avoid a timeout error (time spent > <maxtime>), your application could precede the **!GPSTRACK** call with a single position fix (**AGPSFIX**) with a greater <maxTime> value.* (Continued on next page)

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSTRACK (continued)	**Initiate local tracking (multiple fix) session (continued)** **Example(s):** AT!GPSTRACK=1, 15, 10, 20, 60 requests a series of 20 standalone position fixes to 10 meters accuracy—fixes are taken every 60 seconds. One of the following responses will be received: • "OK" if the request is successful, or • "ERROR CODE = <value>" if the request fails for any reason. See Table 8-3 on page 223 for a list of error codes. **Related commands:** ▪ **!GPSSTATUS**—Use this command while the tracking session is in progress. ▪ **!GPSLOC**—Use this command after the session completes to obtain the result.
!GPSTRANSSEC	**Control GPS transport security** Enable or disable GPS transport security for SUPL GPS fixes. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSTRANSSEC=<security>** Response: OK *or* ERROR Purpose: Indicate if transport security is used. ▪ Query: **AT!GPSTRANSSEC?** Response: Transport security: <security> OK Purpose: Return the current <security> setting. ▪ Query List: **AT!GPSTRANSSEC=?** Purpose: Display the command format and valid parameter options. **Parameters:** <security> (Transport security state) • Bit mask: ▪ Bit 0: 0=Disabled (No security); 1=Enabled (Security) ▪ Bit 1: 0=SSL Version TLS 1.1; 1=SSL Version TLS 1.0 ▪ Bit 2: 0=SHA256; 1=SHA1

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRADATAENABLE	**Set/report GPS XTRA settings** Enable or disable XTRA data and set or report XTRA data configuration settings. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSXTRADATAENABLE=<enable>[,<retries>,<retryInt>[,<dload>,<dloadInt>[,<validityTime>]]]** Response: OK *or* ERROR Purpose: Enable or disable XTRA data. You can set the retry parameters only if <enable> = 2, and you can set the download parameters only if the retry parameters are set. ▪ Query: **AT!GPSXTRADATAENABLE?** Response: XTRA Data Enabled: <enable> XTRA Data Retry Number: <retries> XTRA Data Retry Interval: <retryInt> XTRA Data Autodownload Enabled: <dload> XTRA Data Autodownload Interval: <dloadInt> XTRA Data Validity Time: <validityTime> Purpose: Return the current GPS XTRA data settings. ▪ Query List: **AT!GPSXTRADATAENABLE=?** Purpose: Display the command format and valid parameter options. **Parameters:** <enable> (Enable or disable XTRA data information) • 0=Disable. To fully disable XTRA, **!GPSXTRATIMEENABLE=0** must also be called to disable XTRA time functionality. • 1=Reserved • 2=Enable XTRA data information <retries> (Number of download retries) • Valid range: 0–10 <retryInt> (Interval between download retries, in minutes) • Valid range: 1–120 <dload> (Enable or disable automatic downloads) • 0=Disable • 1=Enable <dloadInt> (Interval between automatic downloads, in hours) • Valid range: 24–168 • Note: If <dload> is 0 (disable), a value must still be entered for the interval (although it will not be used) <validityTime> (Length of time that XTRA data is considered to be valid, in hours) • Valid range: 1–168

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRADATAURL	**Set/report GPS XTRA data server URLs** Set or report the URLs of up to three GPS XTRA data servers. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSXTRADATAURL=<urlIndex>,<url>** Response: OK *or* ERROR Purpose: Set the URL used for the primary, secondary, or tertiary data server. ▪ Query: **AT!GPSXTRADATAURL?** Response: XTRA Primary Server: <url1> XTRA Secondary Server: <url2> XTRA Tertiary Server: <url3> OK Purpose: Return the URLs of the primary, secondary, and tertiary data servers. **Parameters:** <urlIndex> (Server index) • 1=Primary server • 2=Secondary server • 3=Tertiary server <url> (Server URL) • URL string includes quotes • Example: “http://xtra1.gpsoneextra.net/xtra.bin" • URL must be complete, including the “http://" • Maximum string length: 128 characters

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRAINITDNLD	**Initiate GPS XTRA data download and inject operation** Initiate an XTRA data download and inject operation using the data server specified in the **!GPSXTRADATAURL** command. **Password required:** No **Usage:** ▪ Execution: **AT!GPSXTRAINITDNLD** Response: OK *or* Error code = <err> OK Purpose: Initiate the download and inject operation. If the command fails, it returns “Error code = <err>". **Parameters:** <err> (Error code returned if command fails) • 3=Bad CRC for XTRA data file • 4=Old XTRA data file • 7=GPS subsystem busy • 8=GPS time reference entered is invalid • 9=Unknown error

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRASTATUS	**Return current status of XTRA** Return the status of the most recent time and data injection operations. **Password required:** No **Usage:** ▪ Query: **AT!GPSXTRASTATUS?** Response: Xtra Time status = <timeStatus> Xtra Data status = <dataStatus> Validity Start = <timeStamp> Validity End = <timeStamp> OK Purpose: Return the status of the most recent time and data injection operations. **Parameters:** <timeStatus> · Returned string does not include quotes (they are used in this description for clarity). ▪ "Unknown": Default value if time injection operation has not been performed yet, or if operation was incomplete ▪ "Valid": GPS time injection succeeded ▪ "Invalid": GPS time injection failed <dataStatus> · Returned string does not include quotes (they are used in this description for clarity). ▪ "Unknown": Default value if data injection operation has not been performed yet, or if operation was incomplete ▪ "Valid": GPS data injection succeeded ▪ "Invalid": GPS data injection failed ▪ "xtra.bin file has bad crc" ▪ "GPS Busy, end current session first" ▪ "error reading xtra.bin file" ▪ "bad TOA in xtra.bin file": The XTRA data retrieved from the XTRA server is too old (exceeds the Time Of Applicability). ▪ "failure downloading" ▪ "GPS Subsys error" ▪ "PDP Context Failure" <timeStamp> (GPS time stamp) · Format: <year> <month> <day> <dayOfWeek> <time> ▪ <year>: 4 digits (Example: 2008) ▪ <month>: 2 digits (01–12) ▪ <day>: 2 digits (01–31) ▪ <dayOfWeek>: 1 digit (0–6) where 0=Monday ▪ <time>: time of day (Example: 13:15:45) · Example: 2008 02 28 5 13:15:45 represents Thursday 28 Feb 2008 at 1:15:45 PM

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRATIME	**Inject GPS or UTC time into XTRA system** Inject the GPS or UTC time into the XTRA system. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!GPSXTRATIME=<YYYY>, <MM>, <DD>, <hh>, <mm>, <ss>, <utc>, <force>, <uncrtn>** Response: OK *or* Error code = <err> OK Purpose: Inject the specfied date and time into the XTRA system. If the command fails, it returns “Error code = <err>". ▪ Query List: **AT!GPSXTRATIME=?** Purpose: Return supported parameter values. **Parameters:** <YYYY> (Year) • 4 digits required <MM> (Month) • Valid range: 1–12 <DD> (Day) • Valid range: 1–31 <hh> (Hour) • Valid range: 0-23 <mm> (Minute) • Valid range: 0–59 <ss> (Second) • Valid range: 0–59 <utc> (Flag indicating time type) • 0=GPS time • 1=UTC time <force> (Force or allow GPS subsystem to decide to accept the time entered) • 0=Do not force acceptance • 1=Force acceptance <err> (Error code returned if command fails) • 3=Bad CRC for XTRA data file • 4=Old XTRA data file • 7=GPS subsystem busy • 8=GPS time reference entered is invalid • 9=Unknown error

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRATIMEENABLE	**Set/report GPS XTRA time settings** Enable or disable XTRA time information, and set or report specific XTRA time settings. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSXTRATIMEENABLE=<enable> [,<thresh>, <delay>]** Response: OK *or* ERROR Purpose: Enable or disable time information. If enabled, sets the uncertainty threshold and delay time to retry with a backup server. ▪ Query: **AT!GPSXTRATIMEENABLE?** Response: XTRA Time Info Enabled: <enable> XTRA Time Uncertainty Threshold: <thresh> XTRA Time Delay Threshold: <delay> Purpose: Return the current values of GPS XTRA time parameters. ▪ Query List: **AT!GPSXTRATIMEENABLE=?** Purpose: Return supported execution parameter values. **Parameters:** <enable> (Enable or disable XTRA time information) • 0=Disable. To fully disable XTRA, you must also call **!GPSXTRADATAENABLE=0** to disable XTRA data information. • 1=Reserved • 2=Enable XTRA time information <thresh> (XTRA time uncertainty threshold, in ms) • Valid range: 100–30000 <delay> (Time to delay before retrying with backup server, in ms) • Valid range: 100–10000

Table 8-2: GPS Command Details (Continued)

Command	Description
!GPSXTRATIMEURL	**Set/report GPS XTRA SNTP server URLs** Set or report the URLs of up to three GPS XTRA SNTP (Simple Network Time Protocol) servers. **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSXTRATIMEURL=<urlIndex>,<url>** Response: OK *or* ERROR Purpose: Set the URL used for the primary, secondary, or tertiary data server. ▪ Query: **AT!GPSXTRATIMEURL?** Response: XTRA SNTP Primary Server: <url 1> XTRA SNTP Secondary Server: <url 2> XTRA SNTP Tertiary Server: <url 3> Purpose: Return the URLs of the primary, secondary, and tertiary SNTP servers. **Parameters:** <urlIndex> (Server index) • 1 = Primary server • 2 = Secondary server • 3 = Tertiary server <url> (Server URL) • URL string includes quotes • Example: "xtra1.gpsoneextra.net" • Maximum string length = 128 characters

Error codes

Table 8-3 describes error codes that can be returned by **!GPSEND** (page 204), **!GPSSTATUS** (page 212), and **!GPSTRACK** (page 215).

Table 8-4 on page 225 describes error codes that can be returned by **!GPSFIX** (page 205).

Table 8-3: AT Command Error Codes (!GPSEND, !GPSSTATUS, !GPSTRACK)

Error code	Description
0	Phone is offline
1	No service
2	No connection with PDE (Position Determining Entity)
3	No data available
4	Session Manager is busy
5	Reserved

Table 8-3: AT Command Error Codes (!GPSEND, !GPSSTATUS, !GPSTRACK) (Continued)

Error code	Description
6	Phone is GPS-locked
7	Connection failure with PDE
8	Session ended because of error condition
9	User ended the session
10	End key pressed from UI
11	Network session was ended
12	Timeout (for GPS search)
13	Conflicting request for session and level of privacy
14	Could not connect to the network
15	Error in fix
16	Reject from PDE
17	GPS is disabled
18	Ending session due to E911 call
19	Server error
20	Reserved
21	Reserved
22	Unknown system error
23	Unsupported service
24	Subscription violation
25	Desired fix method failed
26	Reserved
27	No fix reported because no Tx confirmation was received
28	Network indicated normal end of session
29	No error specified by the network
30	No resources left on the network
31	Position server not available
32	Network reported an unsupported version of protocol

Table 8-4: AT Command Error Codes (!GPSFIX)

Error code	Description
0	No error
1	Invalid client ID
2	Bad service parameter
3	Bad session type parameter
4	Incorrect privacy parameter
5	Incorrect download parameter
6	Incorrect network access parameter
7	Incorrect operation parameter
8	Incorrect number of fixes parameter
9	Incorrect server information parameter
10	Error in timeout parameter
11	Error in QOS accuracy threshold parameter
12	No active session to terminate
13	Session is active
14	Session is busy
15	Phone is offline
16	Phone is CDMA locked
17	GPS is locked
18	Command is invalid in current state
19	Connection failure with PDE
20	PDSM command buffer unavailable to queue command
21	Search communication problem
22	Temporary problem reporting position determination results
23	Error mode not supported
24	Periodic NI in progress
25	Unknown error
26	Unknown error

9: SIM Commands

9.1 Introduction

This chapter describes commands used to communicate with an installed SIM.

9.2 Command Summary

Table 9-1 lists the commands described in this chapter:

Table 9-1: SIM Commands

Command	Description	Page
+CCID	Return SIM/eUICC ICCID and EID	227
+CCID (notification)	eUICC profile switch — Unsolicited notification	227
+CPINR	Display remaining number of SIM unlock retries	228
+CSPN	Display SIM card service provider's name (SPN)	229
!ICCID	Return SIM card's ICCID	229
+KSIMSEL	Select External SIM interface	230
!UIMS	Select active UIM interface	231

9.3 Command Reference

Table 9-2: SIM Command Details

Command	Description
+CCID	**Return SIM/eUICC ICCID and EID** Return the active SIM's ICCID and (if it is an eUICC) its EID, and enable/disable unsolicited notifications of eUICC profile switches. **Password required:** No **Usage:** ▪ Execution: **AT+CCID=<notifications>** Response: +CCID: <iccid>[,<eid>] OK Purpose: Enable/disable unsolicited notifications for eUICC profile switches. ▪ Query: **AT+CCID?** or **AT+CCID** Response: +CCID: <iccid>[,<eid>] OK or +CME ERROR: <error> Purpose: Display the ICCID of the active SIM and, if the SIM is an eUICC, display its EID (eUICC-ID). **Parameters:** <notifications> (Unsolicited notifications): · 0 — Disable eUICC profile switch unsolicited notifications · 1 — Enable eUICC profile switch unsolicited notifications (default) · See +CCID (notification) on page 227 for details. <iccid> (ICCID of the SIM/eUICC currently being tested): · 20 digit decimal number — This number is often printed on the SIM card. <eid> (eUICC ID): · Appears in response only if SIM is an eUICC · 32 digit decimal number
+CCID (notification)	**eUICC profile switch—Unsolicited notification** Unsolicited notification indicating the eUICC profile has been switched. To enable/disable this notification, use AT+CCID. See +CCID on page 227 for details. **Notification format:** **+CCID: <new_iccid>** **Examples:** · Notifications received: +CCID: 89019990001234567026 ICCID of the new profile **Parameters:** <new_iccid> (ICCID of the new profile) · 20 digit decimal number — This number is often printed on the SIM card.

Table 9-2: SIM Command Details (Continued)

Command	Description
+CPINR	**Display remaining number of SIM unlock retries** Display the number of remaining SIM unlock retries. **Password required:** No **Usage:** ▪ Execution: **AT+CPINR=<CPIN TYPE>** Response: +CPINR: <CPIN TYPE>,<remaining> OK Purpose: Display the number of remaining retries for the specified PIN/PUK type. ▪ Execution: **AT+CPINR** Response: +CPINR: SIM PIN,<remaining> +CPINR: SIM PUK,<remaining> +CPINR: SIM PIN2,<remaining> +CPINR: SIM PUK2,<remaining> +CPINR: PH-FSIM PIN,<remaining> +CPINR: PH-NET PIN,<remaining> +CPINR: PH-NETSUB PIN,<remaining> +CPINR: PH-SP PIN,<remaining> +CPINR: PH-CORP PIN,<remaining> +CPINR: PH-FSIM PUK,<remaining> +CPINR: PH-NET PUK,<remaining> +CPINR: PH-NETSUB PUK,<remaining> +CPINR: PH-SP PUK,<remaining> +CPINR: PH-CORP PUK,<remaining> OK Purpose: Display the number of remaining retries for all PIN/PUK types. **Parameters:** <CPIN TYPE> (PIN/PUK type): ▪ ASCII string enclosed within quotes. ▪ Example values: (Available types are device-dependent. Use AT+CPINR to display the list of types available for your device.) ▪ "SIM PIN" ▪ "SIM PUK" ▪ "SIM PIN2" ▪ "SIM PUK2" ▪ "PH-FSIM PIN" ▪ "PH-NET PIN" ▪ "PH-NETSUB PIN" ▪ "PH-SP PIN" ▪ "PH-CORP PIN" ▪ "PH-FSIM PUK" ▪ "PH-NET PUK" ▪ "PH-NETSUB PUK" ▪ "PH-SP PUK" ▪ "PH-CORP PUK" <remaining> (Number of retries remaining for specified PIN/PUK type) ▪ 0–255 (maximum value is type-dependent)

Table 9-2: SIM Command Details (Continued)

Command	Description
+CSPN	**Display SIM card service provider's name (SPN)** Display the service provider name for the SIM card. **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** (Note: Execution and Query formats return the same response.) ▪ Execution: **AT+CSPN** Response: +CSPN: <spn> OK or +ERROR Purpose: Display the SIM card's service provider name. ▪ Query: **AT+CSPN?** Response: +CSPN: <spn> OK or +ERROR Purpose: Display the SIM card's service provider name. ▪ Query List: **AT+CSPN=?** Response: OK Purpose: None. **Parameters:** <spn> (Service provider name): ▪ ASCII string enclosed within quotes.
!ICCID	**Return SIM card's ICCID** Return a SIM's ICCID (Integrated Circuit Card ID). **Password required:** No **Usage:** ▪ Query: **AT!ICCID?** Response: !ICCID: <iccid> OK Purpose: Display the ICCID. **Parameters:** <iccid> (ICCID of the SIM currently being tested): ▪ 20 digit decimal number — This number is often printed on the SIM card.

Table 9-2: SIM Command Details (Continued)

Command	Description
+KSIMSEL	**Select External SIM interface** Enable/disable selection of an external SIM via GPIO6. This command is for use with hardware designs with an external SIM multiplexer connected to the WP module's UIM1 interface. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Requirements:** • The fast SIM switch feature must be enabled using the !CUSTOM EXTUIMSWITCHEN customization before +KSIMSEL can be used. See !CUSTOM on page 51. **Notes:** • The !CUSTOM UIMDETPULL customization can be used to control the UIM detect lines for UIM1 (external SIM) and UIM2 (WPx5xx external SIM; WP76/WP77 eSIM). To use this customization, you must have enabled hot swap for the desired slot(s) using the HOTSWAPDIS customization. (By default, hot swap is not enabled, so default pull settings are used.) See !CUSTOM on page 51 for details on both customizations. **Usage:** ▪ Execution: **AT+KSIMSEL=<sim_slot>** Response: OK Purpose: Set the active external SIM interface. ▪ Query: **AT+KSIMSEL?** Response:! +KSIMSEL: <sim_slot> OK Purpose: Indicate the active external SIM interface. ▪ Query list: **AT+KSIMSEL=?** Purpose: Return a list of supported <sim_slot> values. **Parameters:** <sim_slot> (External SIM being used) • 0 — (Query only) External SIM select feature disabled. This value is returned when the !CUSTOM EXTUIMSWITCHEN customization is 0. • 1 — External SIM slot 1 (GPIO6 low) • 2 — External SIM slot 2 (GPIO6 high)

Table 9-2: SIM Command Details (Continued)

Command	Description
!UIMS	**Select active UIM interface** On a module that supports multiple UIM interfaces, select the active UIM interface. **Password required:** No **Persistent across power cycles:** Yes, unless overridden by !CUSTOM="UIMAUTOSWITCH", which, when enabled, sets the preferred UIM interface when the module boots. **Usage:** ▪ Execution: **AT!UIMS=<uim>** Response: OK Purpose: Configure the module to use the selected UIM interface. ▪ Query: **AT!UIMS?** Response: !UIMS: <uim>[,<used uim>] OK Purpose: Display the currently selected interface. ▪ Query List: **AT!UIMS=?** Purpose: Return the command format and the supported parameter values. **Parameters:** <uim> (SIM interface): ▪ 0 — UIM1. External UIM interface #1 ▪ 1 — UIM2: ▪ (WPx5xx) External UIM interface #2 ▪ (WP76xx/WP77xx) eSIM (embedded SIM) ▪ 2 — Reserved. Do not use. ▪ 3 — Auto-SIM-Switch activated. Refer to !CUSTOM="UIMAUTOSWITCH" for details. <used uim> (UIM slot used when Auto-SIM-Switch is activated): ▪ 0 — UIM1. External UIM interface #1 ▪ 1 — UIM2: ▪ (WPx5xx) External UIM interface #2 ▪ (WP76xx/WP77xx) eSIM (embedded SIM)

10: OMA-DM Commands

10.1 Introduction

Note: The commands in this chapter are provided to satisfy AT&T carrier requirements.

This chapter describes commands used to configure DM (Device Management) accounts, sessions, and host–device–server interactions.

10.2 Command Summary

The table below lists the commands described in this chapter.

Table 10-1: OMA-DM Host Device Configuration Commands

Command	Description	Page
!HOSTDEVINFO	Configure host device details	234
!OSINFO	Configure host device operating system information	236

Table 10-2: OMA-DM Commands

Command	Description	Page
!IDSDEBUGPRINT	Enable/disable debug (detailed message) printing	237
!IMSTESTMODE	Enable/disable IMS test mode	237

10.3 Command Reference

Table 10-3: OMA-DM Host Device Configuration Command Details

Command	Description

!HOSTDEVINFO	**Configure host device details**
	Configure the host device details that will be reported by OMA DM for Verizon devices, to comply with Verizon's requirement.
	To configure host device operating system information, see !OSINFO on page 236.
	
	Notes:
	• In the Execution format, if a parameter is not entered then the value on the device does not change.
	• In the Query format, the labels in the response are all 7 characters plus a colon (e.g. there is a space in "HostID :").
	Password required: Yes (Execution format only) (see !ENTERCND for details)
	
	Usage:
	▪ Execution: **AT!HOSTDEVINFO=[<instance>,]<["<Manufacturer>"][,["<Model>"][,["<SW Version>"][,["<Host ID>"][,["<FW Version>"][,[<"HW Version">][,<"Date Stamp">]]]]]]>**
	Response: OK
	or ERROR
	Purpose: Set some or all host device detail parameters for the specified instance (instance 0 by default if not specified).
	▪ Query: **AT!HOSTDEVINFO?**
	Response:
	`HostMan: HMAN0`
	`HostMod: HMOD0`
	`HostSwV: HSW0`
	`HostID : HUID0`
	`HostFwV: HFW0`
	`HostHwV: HHW0`
	`HostUpd: HDTS0`
	`OK`
	
	Purpose: Display current host device details for the specified instance (instance 0 by default if not specified).
	▪ Query List: **AT!HOSTDEVINFO=?**
	Purpose: Display the execution command format and parameter values.
	Parameters:
	<instance>
	• 0–1
	• Default: 0
	<Manufacturer> (Host device manufacturer's name)
	• 255 characters maximum
	<Model> (Host device model name)
	• 255 characters maximum
	<SW_Version> (Host software version)
	• 255 characters maximum
	<Host_ID> (Host ID)
	• 255 characters maximum
	
	(Continued on next page)

Table 10-3: OMA-DM Host Device Configuration Command Details (Continued)

Command	Description
	<FW Version> (Host Firmware Version) • 255 characters maximum <HW Version> (Host Hardware Version) • 255 characters maximum <Date Stamp> (Host Last Update time stamp) • 255 characters maximum
!HOSTDEVINFO (continued)	**Configure host device details (continued)** **Example(s):** ▪ AT!HOSTDEVINFO=0,"MAN0","MOD0","SW0","ID0","FW0","HW0","00:00:00 00:00:00" All fields set for instance 0 values. ▪ AT!HOSTDEVINFO=0,,,,,"FWX","HWX","01:01:01 01:01:01" This sets the <FW Version>, <HW Version> and <Date Stamp> for instance 0. All other parameters keep their current values.

Table 10-3: OMA-DM Host Device Configuration Command Details (Continued)

Command	Description
!OSINFO	**Configure host device operating system information** Configure the host device operating system name and version that will be reported by OMA DM for AT&T devices, to comply with AT&T <CDR-DVM-4533> requirement. To configure host device details, see !HOSTDEVINFO on page 234. *Note: In the Execution format, if a parameter is blank then the value on the device does not change.* **Password required:** Yes (Execution format only) (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!OSINFO="<osname>"[, "<osversion>"]** *or* **AT!OSINFO=["<osname>"], "<osversion>"** Response: OK *or* ERROR Purpose: Set host device operating system information parameters. ▪ Query: **AT!OSINFO?** Response: OSName: <osname> OSVersion: <osversion> OK Purpose: Display current host device operating system information. ▪ Query List: **AT!OSINFO=?** Purpose: Display the execution command format and parameter values. **Parameters:** <osname> (Host device operating system name) · 256 characters maximum · Quotation marks are required around the <osname> · Note: If <osname> is blank, the current value remains unchanged. <osversion> (Host device operating system version) · 256 characters maximum · Quotation marks are required around the <osversion> · Note: If <osversion> is blank, the current value remains unchanged. **Example(s):** ▪ AT!OSINFO="An OS Name"","1.0" This sets both parameters. ▪ AT!OSINFO="An OS Name" Only the <osname> is changed. ▪ AT!OSINFO=,"1.0" Only the <osversion> is changed.

Table 10-4: OMA-DM Command Details

Command	Description
!IDSDEBUGPRINT	**Enable/disable debug (detailed message) printing** Enable/disable the printing of all transmitted and received HTTP traffic to the AT command port during a session with a DM server (typically for debugging purposes). **Password required:** No **Usage:** ▪ Execution: **AT!IDSDEBUGPRINT=<enable>** Response: OK *or* ERROR Purpose: Enable or disable printing of HTTP traffic to AT the AT command port. ▪ Query List: **AT!IDSDEBUGPRINT=?** Purpose: Display the execution command format and parameter values. **Parameters:** <enable> (Enable/disable debug printing) · 0 — Disable debug printing to AT command port · 1 — Enable debug printing to AT command port
!IMSTESTMODE	**Enable/disable IMS test mode** Enable/disable IMS (IP Multimedia Subsystem) test mode. If IMS test mode is enabled: ▪ IMS registration attempts will not occur ▪ SMS over IMS is not supported **Password required:** Yes **Usage:** ▪ Execution: **AT!IMSTESTMODE=<mode>** Response: OK Purpose: Enable/disable IMS test mode. ▪ Query: **AT!IMSTESTMODE?** Response: IMS Test Mode Enabled *or* IMS Test Mode Disabled Purpose: Return the current state of IMS Test Mode. **Parameters:** <mode> (IMS Test Mode state) · 0=Disable · 1=Enable

11: SAR Backoff Commands

Introduction

This chapter describes:

- SAR-related commands (Specific Absorption Rate) — SAR commands are used to meet regulatory requirements for the OEM host device by managing the modem's SAR backoff state. OEMs should carefully evaluate their use of these commands and their impact on device operation.

Note: Operators may require OEMs to disclose SAR settings and theory of operation for applicable certifications.

11.1 Command Summary

The table below lists the commands described in this chapter.

Table 11-1: SAR Backoff and Thermal Control Commands

Command	Description	Page
+KRFMUTE	Enable/disable RAT-specific Tx muting	239
+KRFMUTE (notification)	RAT Tx mute mode status change (unsolicited notification)	240
!MAXPWR	Set/report maximum Tx power	241
!SARBACKOFF	Set/report offset from maximum Tx power	243
!SARGPIO	Set/report External GPIO controlling SAR	246
!SARINTGPIOMODE	Set/report default pull mode for SAR interrupt GPIOs	247
!SARSTATE	Set/report SAR backoff state	247
!SARSTATEDFLT	Set/report default SAR backoff state	248

11.2 Command Reference

Table 11-2: SAR Backoff and Thermal Control Command Details

Command	Description
+KRFMUTE	**Enable/disable RAT-specific Tx muting** Enable or disable RF Tx muting a combination of RATs for a specific duration, and enable/disable unsolicited notifications for this command. If enabled, unsolicited notifications (+KRFMUTE (notification)) will be received when: ▪ The mute duration is enabled or expired. ▪ This command is used to disable RF Tx muting while Tx muting is in progress (that is, sometime during the mute duration). **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Password required:** No **Usage:** ▪ Execution: **AT+KRFMUTE=<mode>[,<duration>[,<indication>]]** Response: OK Purpose: Enable or disable Tx muting for the RATs specified by the <mode>. ▪ Query: **AT+KRFMUTE?** Response: +KRFMUTE: <mode>,<duration>,<indication> OK Purpose: Display the current RF Tx mute state. ▪ Query list: **AT+KRFMUTE=?** Purpose: Display valid execution format and parameter values. **Parameters:** <mode> (RF mute mode) · 0 (Default) — Disable · 1 — Mute GSM only · 2 — Mute UMTS only · 3 — Mute GSM and UMTS · 4 — Mute LTE only · 5 — Mute GSM and LTE · 6 — Mute UMTS and LTE · 7 — Mute GSM, UMTS, and LTE <duration> (Mute duration in seconds) · 0.5 — 120 · Default: 30.0 <indication> (Enable/disable mute mode unsolicited notifications)) · 0 (Default) — Disable · 1 — Enable

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
+KRFMUTE (notification)	**RAT Tx mute mode status change (unsolicited notification)** Notification received when RAT Tx mute mode is enabled, expires, or is disabled while in progress. *Note: This notification is enabled/disabled using +KRFMUTE.* **Supporting devices:** WP76xx/WP77xx. Not supported by WP8548/WP75xx. **Usage:** ▪ Notification: **+KRFMUTE: <mode>[,<duration>]** Purpose: Indicates RAT Tx muting has begun (been enabled) or stopped (mute period expired, or muting disabled). **Parameters:** <mode> (RF mute mode) • 0 (Default) — Disable • 1 — Mute GSM only • 2 — Mute UMTS only • 3 — Mute GSM and UMTS • 4 — Mute LTE only • 5 — Mute GSM and LTE • 6 — Mute UMTS and LTE • 7 — Mute GSM, UMTS, and LTE <duration> (Mute duration in seconds) • 0.5 — 120 • This parameter is included when mute is enabled. If mute is disabled/expired, this parameter does not appear. **Examples:** • Notification received when RAT Tx mute is set to Enabled: +KRFMUTE: 1, 30.0 • Notification received when RAT Tx mute is expired, or is disabled while in progress: +KRFMUTE: 0

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!MAXPWR	**Set/report maximum Tx power** Set or report the maximum Tx power for a specific technology/band combination. **Caution:** *Any adjustments of Tx power may impact regulatory certification of the module in the host platform. The OEM is responsible for ensuring that the final module configuration in the host platform meets all regulatory requirements.* **Warning:** *(WP8548/WP75xx devices only) To prevent incorrect SAR backoff values from being used, any time !MAXPWR is used to change the max Tx power for a specific technology/band combination, !SARBACKOFF must then be used to update all previously defined SAR backoff values for the same technology/band combination.* *Failure to adhere to this warning can result in erroneous SAR backoff values for that particular technology/band combination.* *Note: Increasing Tx power affects the module's current consumption and thermal performance.* **Password required:** Yes **Usage:** ▪ Execution (WCDMA/LTE): **AT!MAXPWR=<band>,<tech>,<max_tx_pwr>** Response: OK Purpose: Set the maximum Tx power for the specified technology/band combination. ▪ Execution (CDMA): **AT!MAXPWR=<band>,<tech>,<temperature_bin>,<max_tx_pwr>** Response: OK Purpose: Set the maximum Tx power for the specified technology/band/temperature bin combination. ▪ Query (WCDMA/LTE): **AT!MAXPWR?<band>,<tech>** Response: <max_tx_pwr> dBm OK Purpose: Indicate the maximum Tx power for the specified technology/band combination. ▪ Query (CDMA): **AT!MAXPWR?<band>,<tech>** Response: Max Tx value for temperature bin 0 = <Max Tx power> dBm ... Max Tx value for temperature bin 7 = <Max Tx power> dBm OK Purpose: For the specified tech/band combination, display the offset from maximum Tx power for the tech/band combination and the SAR limits for each temperature bin. (For 'bin' definition, see <temperature_bin> description.) Continued on next page)

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!MAXPWR (continued)	**Set/report maximum Tx power (continued)** ▪ Query list: **AT!MAXPWR=?** Purpose: Display valid execution format and parameter values. **Parameters:** <band> (RF band) • 3GPP band number. For a full listing of 3GPP band numbers, see Table 17-2 on page 302. • Band support is product specific — see the device's Product Specification or Product Technical Specification document for details. • Valid range: 0–88 (<tech> (Network technology) • 0 = WCDMA • 1 = CDMA • 2 = LTE <temperature_bin> (Temperature bin identifier. CDMA only) • Valid range: 0–7 • The module has minimum and maximum operating temperature thresholds and throughout the temperature range, eight different temperatures are defined during calibration and stored as temperature bins. Temperature values stored correspond to bin boundaries, which map to seven temperature ranges. <max_tx_pwr> (Maximum Tx power in dB) • Valid range: 20.0–24.5

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARBACKOFF	**Set/report offset from maximum Tx power** Set or report the offset from maximum Tx power limit for a specific technology/band combination. Changes take place after the next modem reset. **Warning:** *(WP8548/WP75xx devices only) To prevent incorrect SAR backoff values from being used:* ▪ *If !MAXPWR is used to change the max Tx power for a specific technology/band combination, !SARBACKOFF must then be used to update all previously defined SAR backoff values for the same technology/band combination.* ▪ *Note: SAR backoff values are calculated as MaxTxPower - BackoffOffset.* *Failure to adhere to this warning can result in erroneous SAR backoff values for that particular technology/band combination.* **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution (WCDMA, CDMA, LTE): **AT!SARBACKOFF=<Technology>,<Band>,<State>,<Backoff offset>** Response: OK Purpose: Set the maximum Tx power for the tech/band/state combination. ▪ Execution (GSM): **AT!SARBACKOFF=<Technology>,<Band>,<Slot>,<State>,<Modulation>,<Backoff offset>** Response: OK Purpose: Set the maximum Tx power for the tech/band/state combination. ▪ Query (WCDMA, LTE): **AT!SARBACKOFF?<Technology>,<Band>,<State>** Response: SAR Backoff: <offset> dBm SAR Limit: <SAR limit> dBm *or* NV Not Set OK Purpose: For the specified tech/band/state combination, display the offset from maximum Tx power and the SAR limit. (Continued on next page)

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARBACKOFF (continued)	**Set/report offset from maximum Tx power (continued)** ▪ Query (CDMA): **AT!SARBACKOFF?<Technology>,<Band>,<State>** Response: SAR Backoff: <offset> dBm Max Tx value for temperature bin 0 = <SAR limit> dBm ... Max Tx value for temperature bin 7 = <SAR limit> dBm *or* NV Not Set OK Purpose: For the specified tech/band/state combination, display the offset from maximum Tx power for the tech/band/state combination and the SAR limits for each temperature bin. (For 'bin' definition, see <temperature_bin> in !MAXPWR.) ▪ Query (GSM): **AT!SARBACKOFF?<Technology>,<Band>,<Slot>,<State>,<Modulation>** Response: SAR Backoff: <offset> dBm SAR Limit: <SAR limit> dBm *or* NV Not Set OK Purpose: For the specified tech/band/slot/state/modulation combination, display the offset from maximum Tx power and the SAR limit. ▪ Query list: **AT!SARBACKOFF=?<Technology>** Purpose: Display valid execution format and parameter values for LTE/WCDMA/CDMA and GSM queries. **Parameters:** <Technology> (Network technology) · 0=WCDMA · 1=CDMA · 2=LTE · 3=GSM <Band> (RF band) · Valid values (Absolute ranges shown below for convenience. Use the Query list format to display full details.): ▪ LTE: 1–71 ▪ WCDMA: 1–19 ▪ GSM: 0–3 ▪ CDMA: 0–15 · Band support is device-dependent. See the device's Product Technical Specification for details. <Slot> (Tx slot. GSM only) · 1–5 (Continued on next page)

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARBACKOFF (continued)	**Set/report offset from maximum Tx power (continued)** <State> (SAR backoff state) • 0=No backoff • 1–8=Backoff state 1 to 8 <Modulation> (Modulation method. GSM only.) • 0=GMSK (GPRS) • 1=8PSK (EDGE) <Backoff offset> (Offset from max Tx power, in dBm) • Valid values: use the Query List command to display valid values. • Value may be integer or decimal. (For example, "4" or "6.8") <SAR limit> (SAR limit, in dBm) • Integer or decimal (e.g. "4" or "6.8") • Valid values: Use the Query List command to display valid values. Values will be in the range 0–MaxPower.

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARGPIO	**Set/report External GPIO controlling SAR** Set or report the external GPIO used to control SAR. This command can be used to set any unallocated external GPIO to control SAR. To check the configuration of a GPIO (e.g. pull mode or function), use +WIOCFG. **Requirements:** Before this command can be used: • Use !CUSTOM="GPIOSARENABLE" to enable SAR customization. **Notes:** • If a GPIO is currently set to control SAR and !CUSTOM="GPIOSARENABLE]" is used to disable SAR customization, the GPIO will be deallocated when the device resets. • If the GPIO pull mode must be changed, use !SARINTGPIOMODE to set the mode, and then reset the device. • If a GPIO is currently set to control SAR and is to be replaced with a different GPIO, use this command to disable the current GPIO and then use it again to set the new GPIO. **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!SARGPIO=<GPIO>,<mode>** Response: OK *or* ERROR *(If any GPIO is currently set to control SAR)* Response: OK Purpose: Set the external GPIO to be used for controlling SAR. ▪ Query: **AT!SARGPIO?** Response: <GPIO>,<mode> OK Purpose: Indicate the external GPIO used to control SAR, and its state (disabled/enabled). ▪ Query list: **AT!SARGPIO=?** Purpose: Display valid execution format and parameter values. **Parameters:** <GPIO> (External GPIO used to control SAR) • Valid values: 2, 7, 8, 13, 21, 22, 23, 24, 25, 28, 29, 30, 31, 32, 42 <mode> (SAR GPIO mode) • 0 — Disabled • 1 — Enabled

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARINTGPIOMODE	**Set/report default pull mode for SAR interrupt GPIOs** Set or report the default pull mode (high/low) for SAR interrupt GPIOs. This setting applies to all SAR interrupt GPIOs. **Supporting devices:** WP76xx/WP77xx; WPx5xx (Release 16+) **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!SARINTGPIOMODE=<mode>** Response: OK Purpose: Set the default pull mode for all SAR interrupt GPIOs. ▪ Query: **AT!SARINTGPIOMODE?** Response: <mode> OK Purpose: Indicate the default pull mode. ▪ Query list: **AT!SARINTGPIOMODE=?** Purpose: Display valid execution format and parameter values. **Parameters:** <mode> (SAR GPIO interrupt pull mode default setting) · 0=Standard mode — Default pull is HIGH/DAL_GPIO_PULL_UP · 1=Inverse mode — Default pull is LOW/DAL_GPIO_PULL_DOWN
!SARSTATE	**Set/report SAR backoff state** Set or report the current SAR (Specific Absorption Rate) backoff state. *Note: This setting is not persistent. To change the default backoff state (persistent), use !SARSTATEDFLT.* **Password required:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!SARSTATE=<state>** Response: OK Purpose: Temporarily set the SAR backoff state. ▪ Query: **AT!SARSTATE?** Response: !SARSTATE: <state> OK Purpose: Indicate the current SAR backoff state. ▪ Query list: **AT!SARSTATE=?** Purpose: Display valid execution format and parameter values. **Parameters:** <state> (SAR backoff state) · 0=No backoff · 1–8=Backoff state 1 to 8

Table 11-2: SAR Backoff and Thermal Control Command Details (Continued)

Command	Description
!SARSTATEDFLT	**Set/report default SAR backoff state** Set or report the default (persistent) SAR (Specific Absorption Rate) backoff state. *Note: This setting is persistent. To temporarily change the backoff state, use !SARSTATE.* **Password required:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!SARSTATEDFLT=<state>** Response: OK Purpose: Set the default SAR backoff state. ▪ Query: **AT!SARSTATEDFLT?** Response: <state> OK Purpose: Indicate the default SAR backoff state. ▪ Query list: **AT!SARSTATEDFLT=?** Purpose: Display valid execution format and parameter values. **Parameters:** <state> (SAR backoff state) • 0=No backoff • 1–8=Backoff state 1 to 8

12: Audio Commands

12.1 Introduction

This chapter describes commands used to configure and manage audio-capable WPx5xx and WP76xx devices.

12.2 Command Summary

Table 12-1 lists the commands described in this chapter.

Table 12-1: Audio Commands

Command	Description	Page
!AVAUDIO	Play/record audio file (.wav format)	250
!AVAUDIOLPBK	Start/stop audio loopback	251
!AVAUDVOL	Set/return audio playback volume	251
!AVCFG	Bind audio profile to device/physical interface	252
!AVCODECMICTXG	Set/return codec Tx path gain	254
!AVDEF	Reset configurable audio parameters to default settings	255
!AVEC	Enable/disable Echo Cancellation mode for audio profile	256
!AVMUTE	Mute/unmute earpiece/microphone/call waiting tone	257
!AVNS	Enable/disable Noise Suppression and Far-end Noise Suppression modes for audio profile	258
!AVSETPROFILE	Select/configure audio profile for CS call	259
!AVSETVOL	Query/set audio profile's Rx volume level	260
!AVTONEPLAY	Play a tone	261
!AVTXVOL	Query/set audio profile's Tx volume gain	262
+CLVL	Set active audio profile's Rx volume	263
+VTD	Set DTMF tone duration	263
+VTS	Send DTMF tone	264

Command reference

Table 12-2: Audio Command Details

Command	Description
!AVAUDIO	**Play/record audio file (.wav format)** Play an audio file (locally or for both sides of a voice call), or record to an audio file (from the microphone only, or both sides of a voice call). Each <operation> type is started and stopped independently. For example, to simultaneously play a file for both ends of a voice call and record that call to another file: 1. Start recording to a file and start playing an existing audio file for both ends of the call: **AT!AVAUDIO=4,1,/usr/recording1.wav** **AT!AVAUDIO=3,1,/data/outgoing1.wav** 2. When ready to stop playing the outgoing file and recording the call: **AT!AVAUDIO=3,0** **AT!AVAUDIO=4,0** *Note: Only .wav format audio files are supported.* **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Usage:** ▪ Execution: **AT!AVAUDIO=<operation>, <switch>[, <file_path>]** Response: OK Purpose: Start or stop the playback or recording of an audio file. Note: <file_path> is required when <switch> = 1, and optional when <switch> = 0. ▪ Query List: **AT!AVAUDIO=?** Purpose: Display valid execution format and parameter values. **Parameters:** <operation> (Play or record) • 1=Audio play. Play the specified .wav file (<filepath>) locally. If a voice call is in progress, the file is not played for the far end of the call. • 2=Audio record. Record the local microphone input to the specified .wav file (<filepath>). If a voice call is in progress, the far end of the call is not recorded. • 3=WWAN play. Play the specified .wav file (<filepath>) for both ends of a voice call. • 4=WWAN record. Record both ends of a voice call to the specified .wav file (<filepath>). <switch> (Stop or start playing/recording) • 0=Stop • 1=Start <filepath> (Absolute pathname of file to play/record) • ASCII string. Note that the string must not use quotation marks. • Example: /usr/avfile.wav Note: Relative pathnames are not supported. • Required when <switch> = 1 (starting to play or record a file), and optional when <switch> = 0.

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVAUDIOLPBK	**Start/stop audio loopback** Set up (start/stop) an audio loopback at some point in the audio chain. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** Yes (see !ENTERCND for details) **Usage:** ▪ Execution: **AT!AVAUDIOLPBK=<enable>** Response: OK Purpose: Start or stop an audio loopback. ▪ Query List: **AT!AVAUDIOLPBK=?** Purpose: Display valid execution format and parameter values. **Parameters:** <enable> (Start/stop an audio loopback) · 0=Stop the loopback · 3=PCM loopback (WPx5xx only, not supported on WP76xx/WP77xx) · 4=codec loopback
!AVAUDVOL	**Set/return audio playback volume** Set (or return) the audio playback volume. The volume setting can be set before or during file playback and takes effect immediately. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVAUDVOL=<volume>** Response: OK Purpose: Set the audio playback volume. ▪ Query: **AT!AVAUDVOL?** Response: !AVAUDVOL: <volume> Purpose: Return the current volume. ▪ Query List: **AT!AVAUDVOL=?** Purpose: Display valid execution format and parameter values. **Parameters:** <volume> (Audio playback volume) · Format: Hexadecimal · Valid range: 0–FFFF **Example(s):** ▪ AT!AVAUDVOL=172A

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVCFG	**Bind audio profile to device/physical interface** Bind an audio profile to a specific ACDB (Audio Calibration Database) device/physical interface combination and, depending on the interface that is chosen, configure the physical interface. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVCFG=<profile>,<device>, <interface>[,<param1>[,...<paramN>]]** Response: OK Purpose: Bind the specified <profile> to a <device>/<interface> combination. If applicable, specify required parameters. ▪ Query: **AT!AVCFG?** Response: !AVCFG: <profile0>,<device>,<interface> [<param1> [,...<paramN>]] ... <profile5>,<device>,<interface>[<param1>[,...<paramN>]] Purpose: Show current bindings for all audio profiles. ▪ Query List: **AT!AVCFG=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) • (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) • (WP76xx) 0–9=Audio profile number (10 profiles are supported) <device> (ACDB device type) • 0=Vehicle hands-free device • 1=Handset • 2=TTY device • 3=USB device <interface> (Physical interface type) • 0=PCM (Use <param> options to configure the interface.) • 1=I2S (No <param> required.) • 2=Internal codec (No <param> required.) • 3=USB (No <param> required.) (Continued on next page)

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVCFG (continued)	**Bind audio profile to device/physical interface (continued)** <param> (Interface configuration parameters) • For <interface>=0 (PCM): ▪ <param1> (Mode) ▪ 0=Slave ▪ 1=Master ▪ 2=Auxiliary PCM ▪ <param2> (Rate) ▪ 0=8K ▪ 1=16K ▪ <param3> (Format) ▪ 0=Linear ▪ 1=μ-law ▪ 2=A-law ▪ <param4> (Padding) ▪ 0=Disable ▪ 1=Enable ▪ <param5> (Bits per frame (bpf)) ▪ 0=8 bpf ▪ 1=16 bpf ▪ 2=32 bpf ▪ 3=64 bpf ▪ 4=128 bpf ▪ 5=256 bpf **Example(s):** ▪ AT!AVCFG=1,1,0,1 (Bind profile 1 to the handset device via PCM, and set PCM as master mode.)

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVCODECMICTXG	**Set/return codec Tx path gain** Set (or return) the codec Tx path gain for s specific profile. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVCODECMICTXG=<profile>,<gain>** Response: OK Purpose: Set the overall gain. ▪ Query: **AT!AVCODECMICTXG?<profile>** Response: !AVCODECMICTXG: <gain> Purpose: Return the overall gain for the specified <profile>. ▪ Query List: **AT!AVCODECMICTXG=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) · (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) · (WP76xx) 0–9=Audio profile number (10 profiles are supported) <gain> (Codec Tx path overal gain value) · Valid <gain> values: 0000–FFFF Note: 4 hexadecimal digits must be entered. (e.g. 0x7F is not valid) · 0000 — Disable · 0001–FFFF — Gain in range -48 dB to +48 dB ▪ 0001: -48 dB 0002: -42 dB … 010F: 0 dB 217F: 30 dB … FFFF: 48 dB · Gain is calculated using the following formula: 20 * LOG(<value> / 0x0100) · Supported gain range: -48 dB to +48 dB **Example(s):** ▪ AT!AVCODECMICTXG=1,1AF4 ▪ AT!AVCODECMICTXG=5,217F

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVDEF	**Reset configurable audio parameters to default settings** Reset all of the configurable audio parameters that are stored in non-volatile (NV) memory to default values. *Note: Some values that affect ACDB (Audio Calibration Database) devices are stored in NV, and some are stored on the device. Values that are stored on the device are not affected by this command.* **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Usage:** ▪ Execution (WPx5xx): **AT!AVDEF** Response: OK Purpose: Reset all parameters to default values. ▪ Execution (WP76xx/WP77xx): **AT!AVDEF[=<profile>]** Response: OK Purpose: Reset all parameters for the specified <profile> (or all profiles if "=<profile> not used) to default values. **Parameters:** <profile> (Audio profile) ▪ Valid values: ▪ No value (e.g. "AT!AVDEF")—Reset parameters for all profiles to default values. ▪ 0–9—Audio profile number (10 profiles are supported). Resets parameters for the specified profile number.

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVEC	**Enable/disable Echo Cancellation mode for audio profile** Enable or disable Echo Cancellation (EC) mode for a specific audio profile. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVEC=<profile>,<value>** Response: OK Purpose: Enable or disable EC mode for the selected profile. ▪ Query: **AT!AVEC?<profile>** Response: !AVEC: <value> Purpose: Show the current EC mode state (enabled/disabled) for the selected profile. ▪ Query List: **AT!AVEC=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) ▪ (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) ▪ (WP76xx) 0–9=Audio profile number (10 profiles are supported) <value> (EC mode state) ▪ 0=Disable ▪ 1=Enable

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVMUTE	**Mute/unmute earpiece/microphone/call waiting tone** Mute or unmute the earpiece, microphone, and call waiting tone. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVMUTE=<profile>,<earmute>,<micmute>[,<cwtmute>]** Response: OK Purpose: Set the mute states for the selected profile. ▪ Query: **AT!AVMUTE?<profile>** Response: !AVMUTE: <earmute>,<micmute>,<cwtmute> Purpose: Show the current mute settings (enabled/disabled) for the selected profile. ▪ Query List: **AT!AVMUTE=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) · (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) · (WP76xx/WP77xx) 0–9=Audio profile number (10 profiles are supported) <earmute> (Earpiece mute state) · 0=Unmuted · 1=Muted <micmute> (Microphone mute state) · 0=Unmuted · 1=Muted <cwtmute> (Call waiting tone mute state) · 0=Unmuted · 1=Muted · This parameter is optional.

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVNS	**Enable/disable Noise Suppression and Far-end Noise Suppression modes for audio profile** Enable or disable Noise Suppression (NS) mode on the Tx path and/or Far-end Noise Suppression (FNS) mode on the Rx path for a specific audio profile. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVNS=<profile>,<ns>[,<fns>]** Response: OK Purpose: Enable or disable NS mode (and optionally, FNS mode) for the selected profile. ▪ Query: **AT!AVNS?<profile>** Response: !AVNS: <ns>,<fns> Purpose: Show the current NS and FNS mode states (enabled/disabled) for the selected profile. ▪ Query List: **AT!AVNS=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) · (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) · (WP76xx) 0–9=Audio profile number (10 profiles are supported) <ns> (NS mode state) · 0=Disable · 1=Enable <fns> (FNS mode state) · 0=Disable · 1=Enable

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVSETPROFILE	**Select/configure audio profile for CS call** Select and configure an audio profile to be used for a circuit-switched call. (To view the current audio profile configurations, use **AT!AVCFG?**). **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVSETPROFILE=<profile>[,<earmute>,<micmute>, <generator>,<volume>[,<cwtmute>]]** Response: OK Purpose: Select the profile to use for a circuit switched call and, if needed, configure the mute and volume settings for the profile. ▪ Query: **AT!AVSETPROFILE?[<generator>]** Response: !AVSETPROFILE: <profile>,<earmute>,<micmute>, [<generator>,]<volume>,<cwtmute> Purpose: Show the profile that has been selected for circuit switched calls, and its configuration parameters. (The <generator> field does not appear if <generator> is used in the query.) ▪ Query List: **AT!AVSETPROFILE=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile used for CS call) • (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) • (WP76xx) 0–9=Audio profile number (10 profiles are supported) <earmute> (Earpiece mute state) • 0=Unmuted • 1=Muted <micmute> (Microphone mute state) • 0=Unmuted • 1=Muted <generator> • 0=Voice synthesizer (Note: This is the only option at this time.) <volume> (Rx volume level) • (WP75xx/WP8548) Valid range: 0 (quietest) – 8 (loudest) • (WP76xx) Valid range: 0 (quietest) – 5 (loudest) NOTE: The Query List format incorrectly indicates valid range as 0–8. <cwtmute> (Call waiting tone mute state) • 0=Unmuted • 1=Muted

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVSETVOL	**Query/set audio profile's Rx volume level** Set the Rx volume level for a specific audio profile. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVSETVOL=<profile>,<generator>,<volume>** Response: OK Purpose: Set the Rx volume for the specified audio profile/generator combination. ▪ Query: **AT!AVSETVOL?<profile>,<generator>** Response: !AVSETVOL: <volume> Purpose: Show the current volume level for the specified audio profile/generator combination. ▪ Query List: **AT!AVSETVOL=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile used for CS call) • (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) • (WP76xx) 0–9=Audio profile number (10 profiles are supported) <generator> • 0=Voice synthesizer (Note: This is the only option at this time.) <volume> (Rx volume level) • (WP75xx/WP8548) Valid range: 0 (quietest) – 8 (loudest) • (WP76xx) Valid range: 0 (quietest) – 5 (loudest) NOTE: The Query List format incorrectly indicates valid range as 0–8.

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVTONEPLAY	**Play a tone** Play a predefined tone. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Usage:** ▪ Execution: **AT!AVTONEPLAY=<generator>,<tone>[,<duration>]** Response: OK Purpose: Play the specified tone, and if required, indicate how long to play it. ▪ Query List: **AT!AVTONEPLAY=?** Purpose: Display valid execution format and parameter values. **Parameters:** <generator> • 0=Voice synthesizer (Note: This is the only option at this time.) <tone> (Predefined tone to play) • Enter tone # in decimal or hex format (with leading '0x') • Example: For TONE_RING_AS4, enter either 25 or 0x1A. <duration> (Length of time to play the <tone>) • 0–65535 (milliseconds) • Default duration=1000 ms

#	Description	#	Description	#	Description	#	Description	#	Description
0	DTMF (0 key)	13	TONE_ERR	26	TONE_RING_AS5	39	TONE_RING_F6	4C	TONE_LOW_PITCH_A
1	DTMF (1 key)	14	TONE_TIME	27	TONE_RING_B5	3A	TONE_RING_FS6	4D	TONE_LOW_PITCH_B
2	DTMF (2 key)	15	TONE_RING_A	28	TONE_RING_C5	3B	TONE_RING_G6	4E	TONE_TEST_ON
3	DTMF (3 key)	16	TONE_RING_B	29	TONE_RING_CS5	3C	TONE_RING_GS6	4F	TONE_MSG_WAITING
4	DTMF (4 key)	17	TONE_RING_C	2A	TONE_RING_D5	3D	TONE_RING_A7	50	TONE_PIP_TONE_TONE
5	DTMF (5 key)	18	TONE_RING_D	2B	TONE_RING_DS5	3E	TONE_RBACK	51	TONE_SPC_DT_INDIA
6	DTMF (6 key)	19	TONE_RING_A4	2C	TONE_RING_E5	3F	TONE_BUSY	52	TONE_SIGNAL_INDIA
7	DTMF (7 key)	1A	TONE_RING_AS4	2D	TONE_RING_F5	40	TONE_INTERCEPT_A	53	TONE_DT_TONE_INDIA
8	DTMF (8 key)	1B	TONE_RING_B4	2E	TONE_RING_FS5	41	TONE_INTERCEPT_B	54	TONE_DT_TONE_BRAZIL
9	DTMF (9 key)	1C	TONE_RING_C4	2F	TONE_RING_G5	42	TONE_REORDER_TONE	55	TONE_DT_DTACO_TONE
A	DTMF (A key)	1D	TONE_RING_CS4	30	TONE_RING_GS5	43	TONE_PWRUP	56	TONE_HFK_TONE1
B	DTMF (B key)	1E	TONE_RING_D4	31	TONE_RING_A6	44	TONE_OFF_HOOK_TONE	57	TONE_HFK_TONE2
C	DTMF (C key)	1F	TONE_RING_DS4	32	TONE_RING_AS6	45	TONE_CALL_WT_TONE		
D	DTMF (D key)	20	TONE_RING_E4	33	TONE_RING_B6	46	TONE_DIAL_TONE_TONE		
E	DTMF (# key)	21	TONE_RING_F4	34	TONE_RING_C6	47	TONE_ANSWER_TONE		
F	DTMF (* key)	22	TONE_RING_FS4	35	TONE_RING_CS6	48	TONE_HIGH_PITCH_A		
10	TONE CTRL	23	TONE_RING_G4	36	TONE_RING_D6	49	TONE_HIGH_PITCH_B		
11	TONE 2ND	24	TONE_RING_GS4	37	TONE_RING_DS6	4A	TONE_MED_PITCH_A		
12	TONE WARN	25	TONE_RING_A5	38	TONE_RING_E6	4B	TONE_MED_PITCH_B		

Table 12-2: Audio Command Details (Continued)

Command	Description
!AVTXVOL	**Query/set audio profile's Tx volume gain** Set the Tx volume gain for a specific audio profile. The value entered is mapped to a gain range of -78 dB to +18 dB. Gain is applied to PCM voice packets before they are fed into the vocoder, which encodes the PCM packets for more efficient over the air transmission. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!AVTXVOL=<profile>,<gain>** Response: OK Purpose: Set the Tx volume gain for the specified profile. ▪ Query: **AT!AVTXVOL?<profile>** Response: !AVTXVOL: <gain> Purpose: Show the Tx volume gain for the specified profile. ▪ Query List: **AT!AVTXVOL=?** Purpose: Display valid execution format and parameter values. **Parameters:** <profile> (Audio profile) · (WP75xx/WP8548) 0–5=Audio profile number (6 profiles are supported) · (WP76xx) 0–9=Audio profile number (10 profiles are supported) <gain> (Encoder gain value) · Format: Hexadecimal · Valid <gain> values: 0–FFFF ▪ Execution example: Hexadecimal: AT!AVTXVOL=1,32A0 ▪ Query response example: !AVTXVOL: 32A0 · Volume gain is calculated using the following formula: 20 * LOG(<gain> / 0x2000) · Supported volume gain range: -78 dB to +18 dB · Recommended volume gain range: 0 dB to +18 dB

Table 12-2: Audio Command Details (Continued)

Command	Description
+CLVL	**Set active audio profile's Rx volume** Set the Rx volume for the active audio profile. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+CLVL=<level>** Response: OK Purpose: Set the Rx volume gain for the active profile. ▪ Query: **AT+CLVL?** Response: +CLVL: <level> Purpose: Show the Rx volume for the active profile. ▪ Query List: **AT+CLVL=?** Purpose: Display valid execution format and parameter values. **Parameters:** <level> (Rx level for the active profile) · (WP75xx/WP8548) Valid range: 0–8 (Level 0–Level 8) · (WP76xx) Valid range: 0–5 (Level 0–Level 5) NOTE: The Query List format incorrectly indicates valid range as 0–8.
+VTD	**Set DTMF tone duration** Set the duration for DTMF tones (for UMTS and CDMA networks) **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** No (After a power cycle, default tone duration is used.) **Usage:** ▪ Execution: **AT+VTD=<duration>** Response: OK Purpose: Set the duration for DTMF tones. ▪ Query: **AT+VTD?** Response: +VTD: <duration> Purpose: Display the current DTMF tone duration. ▪ Query List: **AT+VTD=?** Purpose: Display valid execution format and parameter values. **Parameters:** <duration> (Length of DTMF tone) · Unit value: 100 msec · Valid values: ▪ 0=20 msec (default) ▪ 1–255=100–25500 msec (<duration> * 100)

Table 12-2: Audio Command Details (Continued)

Command	Description
+VTS	**Send DTMF tone** Send continuous in-band DTMF tones (for UMTS and CDMA networks) while on an active call. Use **AT+VTD** to set the tone duration. **Supporting devices:** Audio-capable WPx5xx/WP76xx devices **Password required:** No **Usage:** ▪ Execution: **AT+VTS=<tone>** Response: OK Purpose: Send the specified DTMF tone. ▪ Query List: **AT+VTS=?** Purpose: Display valid execution format and parameter values. **Parameters:** <tone> (DTMF tone) ▪ UMTS networks: 0–9, A–D, a–d, *, # ▪ CDMA networks: 0–9, *, # ▪ Examples: ▪ AT+VTS=1 (Send the DTMF tone for '1'.) ▪ AT+VTS=# (Send the DTMF tone for '#'.)

13: I/O Commands

13.1 Introduction

This chapter describes commands used to configure and manage GPIOs, ADCs and other IOs.

13.2 Command Summary

Table 13-1 lists the commands described in this chapter.

Table 13-1: I/O Commands

Command	Description	Page
!GPIOINT	GPIO interrupt detected — Unsolicited notification	266
!MADC	Display ADC values	267
!MCCELL	Enable/disable coin cell charging feature	268
!MVCOIN	Configure coin cell charging	269
!RIOWNER	Set/query Ring Indicator owner	270
+WEXTCLK	Enable/Disable user clock mode	271
+WIOCFG	GPIO Configuration	272
+WIOR	Read GPIO value	274
+WIOW	Write GPIO value	275
+WRID	Set/query Ring Indicator Duration	275
+WWAKE	Query Wakeup Event	276
+WWAKESET	Set/query Wake Up Event Mask	277

13.3 Command Reference

Table 13-2: I/O Command Details

Command	Description
!GPIOINT (notification)	**GPIO interrupt detected—Unsolicited notification** Unsolicited notification received when an I/O pin sends an interrupt. *Note: The I/O pin must be configured via +WIOCFG as an Input with a <trigger> value greater than 0. See +WIOCFG on page 272 for details.* To enable !GPIOINT (and other notifications), use AT+WUSLMSK. See +KSREP on page 78 for details. **Notification format:** **!GPOINT:<index>[,<level>]** **Examples:** • !GPOINT:7 *Edge-triggered interrupt detected on EXT_GPIO7.* • !GPOINT:5,0 *Level-triggered interrupt detected on EXT_GPIO5.* **Parameters:** <index> (Index of I/O port that generated the interrupt) • 1–42 Not all values are valid. Use AT+WIOCFG? (page 272) to view supported values. <level> (Logic level of the I/O port that generated the interrupt) • 0 — Logic LOW • 1 — Logic HIGH

Table 13-2: I/O Command Details (Continued)

Command	Description
!MADC	**Display ADC values** Read one of the available ADCs (Analog to Digital Converters). **Password required:** No **Usage:** ▪ Query: **AT!MADC?<adc>** Response: !MADC: <value> Purpose: Show the value being reported by the specified ADC. ▪ Query List: **AT!MADC=?** Purpose: Display valid execution format and parameter values. **Parameters:** <adc> (Analog to Digital Converters) · 0 — VBATT (Battery voltage) · (WP8548/WP75xx only) 1 — VCOIN (Charging voltage of RTC coin battery. Note: This voltage can be configured using AT!MVCOIN) · 2 — PA_THERM (Power Amplifier Thermistor) · 3 — PMIC_THERM (Power Management Integrated Circuit Thermistor) · 4 — XO_THERM (Crystal Oscillator Thermistor) · 5 — ADC1 · 6 — ADC2 · 10 — ADC0 · 11 — ADC3 <value> (Value returned from ADC) · ASCII string, contents depend on ADC being polled.

Table 13-2: I/O Command Details (Continued)

Command	Description
!MCCELL	**Enable/disable coin cell charging feature** Enable or disable the coin cell charging feature. (See !MVCOIN on page 269 to configure coin cell charging.) **Supporting devices:** WP75xx, WP8548 **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!MCCELL=<enable>** Response: OK, or ERROR *(if invalid parameter entered)* Purpose: Enable or disable coin cell charging. ▪ Query: **AT!MCCELL?** Response: !MCCELL: <enable> OK Purpose: Report the current setting for coin cell charging. ▪ Query List: **AT!MCCELL=?** Purpose: Return the command format and the supported parameter values. **Parameters:** <enable> (Coin cell charging state) · 0 — Disabled · 1 — Enabled (Default)

Table 13-2: I/O Command Details (Continued)

Command	Description
!MVCOIN	**Configure coin cell charging** Configure the coin cell charging configuration (voltage and resistance). (Default options described in parameter list below.) (See !MCCELL on page 268 to enable / disable coin cell charging.) **Supporting devices:** WP75xx, WP8548 **Password required:** Yes (see !ENTERCND for details) **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!MVCOIN=<voltage>,<resistance>** Response: OK, or ERROR *(if invalid parameter entered)* Purpose: Configure coin cell chargiing parameters. ▪ Query: **AT!MVCOIN?** Response: !MVCOIN: <voltage>,<resistance> OK Purpose: Report the current coin cell charging configuration. ▪ Query List: **AT!MVCOIN=?** Purpose: Return the command format and the supported parameter values. **Parameters:** <voltage> (Charging voltage) ▪ 0 — 3.0V ▪ 1 — 3.1V ▪ 2 — 3.2V ▪ 3 — 2.5V (Default) <resistance> (Charging resistor) ▪ 0 — 2100 Ω (Default) ▪ 1 — 1700 Ω ▪ 2 — 1200 Ω ▪ 3 — 800 Ω

Table 13-2: I/O Command Details (Continued)

Command	Description
!RIOWNER	**Set/query Ring Indicator owner** Set or return the core that controls the module's Ring Indicator (RI) pin. **Password required:** No **Reset required to apply changes:** Yes (Changes take effect immediately, but a controlled reset is required to make the change persistent. **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!RIOWNER=<owner>** Response: OK Purpose: Indicate which core controls the RI pin. ▪ Query: **AT!RIOWNER?** Response: !RIOWNER: <owner> Purpose: Display the core that controls the RI pin. ▪ Query List: **AT!RIOWNER=?** Purpose: Display valid execution format and parameter values. **Parameters:** <owner> (Core that controls the RI pin) • 0 — Modem core • 1 — Application core (Legato)

Table 13-2: I/O Command Details (Continued)

Command	Description
+WEXTCLK	**Enable/Disable user clock mode** Enable/disable generation of 19.2 MHz on the user output clock pins. **Supporting devices:** WP **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+WEXTCLK=<port>,<mode_select>[,<mode>]** Response: OK Purpose: Enable the user clock pin for automatic or manual mode, or disable the pin. ▪ Query: **AT+WEXTCLK?** Response: +WEXTCLK: <port>,<mode_select> Purpose: Display the current clock mode setting. ▪ Query List: **AT+WEXTCLK=?** Purpose: Display valid execution format and parameter values. **Parameters:** <port> (Output port) · 1 <mode_select> (Enable/disable output) · 0 — Off (disable) · 1 — On · 2 — Switch between automatic and manual mode Note: WPx5xx only. Not supported for WP76xx/WP77xx. <mode> () · Parameter is used only if <mode_select> = 2. · 0 — Automatic mode · 1 — Manual mode

Table 13-2: I/O Command Details (Continued)

Command	Description
+WIOCFG	**GPIO Configuration** Configure a specific GPIO (I/O port) for one of the following uses (indicated by the <func> parameter): ▪ GPIO, accessible via AT commands (<func> = 4) ▪ Usage by the embedded Linux host (<func> = 16) ▪ Deallocate port (<func> = 0) ▪ Antenna select using GPIOs 28–31 (<func> = 0, then !ANTSEL can be used) *Note: To enable 'Reset Out', set <gpio>=6 and <func>=0. Refer to the AirPrime WP76xx Product Technical Specification for details.* **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution (Mark GPIO as unallocated): **AT+WIOCFG=<gpio>,<func>** *(Note: <func> must be 0.)* Response: OK *(If the port configuration works as requested)* Purpose: Deallocate a GPIO. (Note: This must be done for GPIO28–GPIO31 if !ANTSEL is to be used for antenna select.) ▪ Execution (Allocate GPIO for General use or for Embedded Host use: **AT+WIOCFG=<gpio>,<func>,<dir>,<state>,<pull>,<trigger>,<intrvl>** *(Note 1: <func> must be 4 or 16. All other <func> values are assigned by other commands as noted in the parameter description below.* Response: OK *(If the port configuration works as requested)* *or* ERROR *(If the port is already allocated—the current <func> value is not 0)* Purpose: Allocate the requested port (<idx>) for use as a GPIO or for control by the embedded host. ▪ Query: **AT+WIOCFG?[<gpio>]** Response: *(if <gpio> is specified>)* +WIOCFG:<gpio>,<func>,<dir>,<state>,<pull>,<trigger>,<intrvl> OK *or (if <gpio> is not specified, shows all ports (<gpio> values))* +WIOCFG:<gpio>,<func>,<dir>,<state>,<pull>,<trigger>,<intrvl> ... +WIOCFG:<gpio>,<func>,<dir>,<state>,<pull>,<trigger>,<intrvl> OK Purpose: Report the configuration for the specified port (<gpio>), or for all ports (no <gpio> specified) ▪ Query List: **AT+WIOCFG=?** Purpose: Display valid execution format and parameter values. (Continued on next page)

Table 13-2: I/O Command Details (Continued)

Command	Description
+WIOCFG (continued)	**GPIO Configuration (continued)** **Parameters:** <gpio> (Index of I/O port to be configured) · Valid range: 1–46. Use AT+WIOCFG? to view supported <gpio> values. · Example: AT+WIOCFG? +WIOCFG: 2,16,0,0,1,0,0 +WIOCFG: 7,16,0,0,1,0,0 ... The first parameters of each line of output are the valid <gpio> values (e.g. 2, 7, ...). · Note: To enable 'Reset Out', set <gpio> = 6 and <func> = 0. <func> (I/O port usage) · Valid values for Execution format: ▪ 0—Unallocated ▪ 4—General GPIO ▪ 16—Embedded host · Valid values for Query format: ▪ 0—Unallocated ▪ 2—Antenna Select (applies only to GPIO28–31). GPIO28–GPIO31 can be allocated for external antenna selection using !ANTSEL. ▪ 3—External SIM2_DET Applies only to GPIO4, allocated for external SIM2 detection when: ▪ "EXTUIMSWITCHEN" customization is enabled and UIM1 is enabled by "SIMHOTSWAPDIS" customization or ▪ "UIM2ENABLE" customization is enabled) ▪ 4—General GPIO ▪ 8—External SIM Switch (applies only to GPIO6, when EXTUIMSWITCHEN customization is enabled) ▪ 16—Embedded host ▪ 26—Wi-Fi/LTE Coexistence control UART (applies only to GPIO35) · Note: To enable 'Reset Out', set <gpio> = 6 and <func> = 0. <dir> (GPIO direction) · 0—Input · 1—Output <state> (Power-up state for external GPIO configured as an output) · 0—Output low level · 1—Output high level <pull> (Internal pull type for the I/O port) · 0—No pull · 1—Pull down · 2—Keeper · 3—Pull up (Continued on next page)

Table 13-2: I/O Command Details (Continued)

Command	Description
+WIOCFG (continued)	**GPIO Configuration (continued)** <trigger> (Trigger type for I/O port configured as an input) • Note: <trigger> is not supported if <gpio>=6 (GPIO6) • 0 — No trigger • 1 — Trigger high • 2 — Trigger low • 3 — Trigger rising • 4 — Trigger falling <intrvl> (Interval at which the I/O port is checked for the specified trigger (<trig>) level) • Note: <intrvl> is not supported if <gpio>=6 (GPIO6) • 0 — 50 ms • 1 — 1000 ms *Note: For edge interrupt, the module can only respond one time per 10 ms per GPIO.*
+WIOR	**Read GPIO value** Read the pin value of a GPIO (General Purpose I/O port) that has been configured as an input. *Note: This command returns an ERROR if the GPIO has been configured as an output.* **Password required:** No **Usage:** ▪ Execution: **AT+WIOR=<gpio>** Response: <value> OK or (if <gpio> is configured as an output) ERROR Purpose: Read the specified GPIO's pin value. ▪ Query List: **AT+WIOR=?** Purpose: Display valid execution format and parameter values. **Parameters:** <gpio> (External GPIO number) • Integer value — Use AT+WIOCFG? (page 272) to view supported values. • Example: AT+WIOCFG? +WIOCFG: 2,16,0,0,1,0,0 +WIOCFG: 7,16,0,0,1,0,0 ... The first parameters of each line of output are the valid <gpio> values (e.g. 2, 7, ...). <value> (GPIO pin value) • 0–1

Table 13-2: I/O Command Details (Continued)

Command	Description
+WIOW	**Write GPIO value** Write a GPIO (General Purpose I/O port) pin value. **Password required:** No **Usage:** ▪ Execution: **AT+WIOW=<gpio>,<value>** Response: OK Purpose: Write the specified GPIO's pin value. ▪ Query List: **AT+WIOW=?** Purpose: Display valid execution format and parameter values. **Parameters:** <gpio> (External GPIO number) ▪ 1–42 Not all values are valid. Use AT+WIOCFG? (page 272) to view supported values. <value> (GPIO pin value) ▪ 0–1
+WRID	**Set/query Ring Indicator Duration** Set or return the duration of the pulse that is asserted on the Ring Indicator line (pin RI1). (The pulse may be asserted under several different event conditions, but the pulse duration is the same.) Make sure to set the duration appropriately. While long durations may make sense for some events, it is possible that shorter events may expire before the pulse finishes (for example, an incoming call could expire or be re-routed to voicemail). The design is such that if an event expires before the pulse finishes, the wakeup reason and ring indicator will not be reset. **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+WRID[=<n>]** Response: OK, or ERROR *(If invalid assignment)* Purpose: Set the ring indicator pulse duration. If "=<n>" is not entered, the default pulse duration value (50 ms) is used. ▪ Query: **AT+WRID?** Response: +WRID: <n> Purpose: Display the ring indicator pulse duration. ▪ Query List: **AT+WRID=?** Purpose: Display valid execution format and parameter values. **Parameters:** <n> (Ring indicator pulse duration, in ms units) ▪ 50–10000 (Default=50 ms). Range equates to 0.05–10.0 seconds. ▪ Integer values only (pulse is set in 1 ms steps)

Table 13-2: I/O Command Details (Continued)

Command	Description
+WWAKE	**Query Wakeup Event** Return a mask indicating the event(s) that have pulsed the Ring Indicator (RI) signal since the module was powered on or since the last time this command was successfully issued, whichever is most recent. When the command is successfully issued: ▪ the mask is cleared and, ▪ the RI signal is de-asserted (if it is still being asserted when the command is issued) Usage recommendations: ▪ The application should poll the module immediately upon starting up to determine the event that triggered the RI. Some events depend upon external resources (for example, the network) and may terminate if not handled immediately. For example, if an incoming voice call is not handled in a timely manner, the network will reroute the call to voicemail. ▪ The host application should issue this command immediately before powering down if the intention is to leave the device powered on. This resets the wakeup reason, and no "old" events are indicated when in fact they did not happen during the time the host application was powered down. This is necessary because the wakeup reason can be set, and the RI pin asserted during normal execution when the host application is powered on. Notes: ▪ Notification of losing or finding service implies that the module first had service, and then the service changed the triggering the event. ▪ If an established call is dropped after the notification of an incoming call, the module does not reflect the dropped call in the wakeup status. The dropped call should be handled like a dropped call in the case where the application was monitoring the device all along. **Supporting devices:** WP **Password required:** No **Usage:** ▪ Query: **AT+WWAKE?** Response: WWAKE: <bitmask> OK Purpose: Indicate the events that pulsed the RI pin. **Parameters:** <bitmask> (Events that pulsed the RI pin) ▪ See the <bitmask> parameter in +WWAKESET on page 277 for supported values.

Table 13-2: I/O Command Details (Continued)

Command	Description
+WWAKESET	**Set/query Wake Up Event Mask** Set or query the WAKE mask setting, which indicates the actions that will generate a pulse on the Ring Indicator (RI1) output signal to "wake up" an application. The WAKE mask indicates all events that can generate the wake pulse. When an event occurs, the RI is asserted for the duration defined via AT+WRID and then de-asserts. If additional events occur while the RI is asserted, the RI is not re-asserted and the duration is not extended; it is assumed that the external processor is awakened by the first assertion. *Note: Each time this command is used to set the mask, the previous setting is replaced. That is, the mask value must indicate all the events that will generate a pulse.* **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+WWAKESET[=<bitmask>]** Response: OK, or ERROR (if an invalid mask value is entered) Purpose: Indicate which events pulse the RI pin. If "=<bitmask>" is not entered, the default mask value (4—Incoming voice call) is used. ▪ Query: **AT+WWAKESET?** Response: +WWAKESET: <bitmask> Purpose: Display the current mask value. ▪ Query List: **AT+WWAKESET=?** Purpose: Display valid execution format and parameter values. **Parameters:** <bitmask> (Events that will assert (pulse) the RI signal) · If more than one event will assert the signal, add the values. For example, to get notifications for both lost service and incoming voice calls, the <bitmask> value is 5. · 0—No notifications · 1—Lost service (for example, going from digital service to no service)—If the module is in deep sleep (32 kHz), the RI will assert and the module will remain asleep · 2—Service regained (going from no service to service)—If the module is in deep sleep (32 kHz), the RI will assert and the module will remain asleep. NOTE: Changing the SID and remaining on the same service type will NOT trigger the RI signal. · 4—Incoming voice call (Default setting) · 8—Incoming data call · 16—Incoming SMS message · WPx5: ▪ 32—Incoming voice mail ▪ 64/128/256/512/1024/2048—Reserved ▪ 4095—All events as listed above · WP76xx: ▪ 32/64/128/256/512/1024/2048/4096—Reserved ▪ 8191—All events as listed above · (WP77xx): ▪ 32/64/128/256/512/1024/2048/4096—Reserved ▪ 8191—All events as listed above

14: AirVantage Commands

14.1 Introduction

This chapter describes AirVantage (AV) related commands.

14.2 Command Summary

Table 14-1 lists the commands described in this chapter.

Table 14-1: AirVantage Device Services Commands

Command	Description	Page
+WDSC	Configure AirVantage Management Services	279
+WDSE	Display most recent AirVantage Management Services error	281
+WDSG	Display AirVantage Management Services status information	282
+WDSI	Activate/deactivate AirVantage Management Services unsolicited notifications	283
+WDSR	Reply to AirVantage server request	286
+WDSS	Configure/connect AirVantage Management Services session	287

14.3 Restoring AVMS Default Configuration

To restore AVMS configuration settings to their default values:

1. Remove the current configuration file: /data/le_fs/avc/config/avcConfigParam.
2. Reboot the module.
   A new configuration file (with default values) is automatically created to replace the file that was removed.

14.4 Command Reference

Table 14-2: AirVantage Device Services Command Details

Command	Description
+WDSC	**Configure AirVantage Management Services** Configure the following AirVantage Management Services parameters: ▪ User agreement for connection, package download, package install, and package uninstall ▪ Polling mode to make a connection to the AirVantage server ▪ Retry mode to attempt a new connection to the AirVantage server when the WWAN DATA service is temporarily out of order or when an http/CoAP error occurs **SIM card requirement:** Not required **Password required:** No **Persistent across power cycles:** Yes (<State>, <Timer_1>, <Timer_n> **Usage:** ▪ Execution (<Mode> = 0, 1, 2, 3, 5, 6): **AT+WDSC=<Mode>,<State>** Response: OK Purpose: Enable or disable the selected <Mode>. ▪ Execution (<Mode> = 4): **AT+WDSC=<Mode>,<Timer_1>[[,<Timer_2>]...[,<Timer_n>]]** Response: OK Purpose: Set interval timers for successive connection attempts. ▪ Query: **AT+WDSC?** Response: +WDSC: 0,<State> +WDSC: 1,<State> +WDSC: 2,<State> +WDSC: 3,<State> +WDSC: 4,<Timer_1>[[,<Timer_2>]...[,<Timer_n>]] +WDSC: 5,<State> +WDSC: 6,<State> OK Purpose: Show the current <Mode> configurations. ▪ Query List: **AT+WDSC=?** Purpose: Display valid execution format and parameter values. (Continued on next page)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSC (continued)	**Configure AirVantage Management Services (continued)** **Parameters:** <Mode> (Mode being configured) • 0 — User agreement for AVMS connection. When enabled, the module returns an unsolicited notification to request an agreement before connecting to the server. See +WDSI on page 283 for details. Note: If a FOTA session begins and user agreement for package download (<mode> 1) is disabled, an AVMS connection is initiated, regardless of whether user agreement for AVMS connection (<mode> 0) is enabled or disabled. • 1 — User agreement for package download. When enabled, the module returns an unsolicited notification to request an agreement before downloading any package. See +WDSI on page 283 for details. • 2 — User agreement for package install. When enabled, the module returns an unsolicited notification to request an agreement before installing any package. See +WDSI on page 283 for details. • 3 — Polling mode. When enabled (<State> > 0), the module waits for the number of minutes specified in <State>, then will initiate a connection to the AirVantage server based if the device is registered on the network. • 4 — Retry mode. If an error occurs during a connection to the AirVantage server (e.g. WWAN DATA establishment failed, http error code received), the module will initiate a new connection according to the defined timers. (Note: This is a persistent setting.) • 5 — User agreement for device reboot. When enabled, the module returns an unsolicited notification to request an agreement before rebooting the device. See +WDSI on page 283 for details. • 6 — User agreement for application uninstall (software update). When enabled, the module returns an unsolicited notification to request an agreement before uninstalling an application. See +WDSI on page 283 for details. <State> (For <Mode> = 0, 1, 2, 5, 6: Activation state of <Mode>) • 0=Disabled • 1=Enabled <State> (For <Mode> = 3: Activation state/timer of <Mode>) • 0=Disabled • 1–525600=Polling timer (in minutes) <Timer_1> (Connection attempt interval timer, in minutes) • The number of minutes to wait after the first failed connection attempt before making the next attempt. • Valid values: ▪ 0—<Timer_1> is disabled. Start with <Timer_2>. ▪ 1–20160 ▪ Default value: 15 <Timer_2>..<Timer_n> (Connection attempt interval timers, in minutes) • The number of minutes to wait after connection attempt (n) before making connection attempt (n+1). (Note: There is a maximum of 8 connection attempts.) • Valid range: 1–20160 • Default values: ▪ <Timer_2>=60 (Time to wait after second failed connection attempt.) ▪ <Timer_3>=240 (Time to wait after third failed connection attempt.) ▪ <Timer_4>=960 (Time to wait after fourth failed connection attempt.) ▪ <Timer_5>=2880 (Time to wait after fifth failed connection attempt.) ▪ <Timer_6>=10080 (Time to wait after sixth failed connection attempt.) ▪ <Timer_7>=10080 (Time to wait after seventh failed connection attempt.)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSE	**Display most recent AirVantage Management Services error** Display the most recent HTTP(S) response received by the device for the package download. **Requirements:** • AirVantage Management Services must be activated (See +WDSG on page 282 for details). • Session must be initiated using AT+WDSS=1,1. (See +WDSS on page 287 for details). **SIM card requirement:** Not required **Password required:** No **Usage:** ▪ Execution: **AT+WDSE** Response: [+WDSE: <HTTP_Status>] OK *or* +CME ERROR: 3 *(If AirVantage Management services are not in the Activated state.)* Purpose: Display most recent response. (If HTTP/HTTPS is not yet used, return only OK.) **Parameters:** <HTTP_Status> (Standard HTTP status code) • none — No response shown if HTTP/HTTPS has not yet been used. • Supported statuses: ▪ 1xx Informational: 100 (Continue) 101 (Switching protocols) ▪ 2xx Success: 200 (OK) 201 (Created) 202 (Accepted) 203 (Non-authoritative information) 204 (No content) 205 (Reset content) 206 (Partial content) ▪ 3xx Redirection: 300 (Multiple choices) 301 (Moved permanently) 302 (Found) 303 (See other) 304 (Not modified) 305 (Use proxy) 307 (Temporary redirect) ▪ 4xx Client Error: 400 (Bad request) 401 (Unauthorized) 402 (Payment required) 403 (Forbidden) 404 (Not found) 405 (Method not allowed) 406 (Not acceptable) 407 (Proxy authentication required) 408 (Request time-out) 409 (Conflict) 410 (Gone) 411 (Length required) 412 (Precondition failed) 413 (Request entity too large) 414 (Request URI too large) 415 (Unsupported media type) 416 (Requested range not satisfiable) 417 (Expectation failed) ▪ 5xx Server Error: 500 (Internal server error) 501 (Not implemented) 502 (Bad gateway) 503 (Service unavailable) 504 (Gateway time-out) 505 (HTTP version not supported)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSG	**Display AirVantage Management Services status information** Display general AirVantage Management Services status details. **SIM card requirement:** Not required **Password required:** No **Usage:** ▪ Execution: **AT+WDSG** Response: +WDSG: <Status>, <Value> +WDSG: <Status>, <Value> OK Purpose: Returns the current <Value>s for <Status>=1 and <Status>=2. **Parameters:** <Status> (Information type to display) · 0 — AirVantage Management Services activation state ▪ For <Value>=2 and <Value>=3, connection parameters are automatically provisioned and no actions are required by the user. ▪ Device is activated (<Value>=3) when a dedicated APN (Access Point Name) is set manually or automatically in the first session. See +WDSS on page 287 for details. · 1 — Session and package indication <Value> (Detail for the <Status>) · For <Status>=0: ▪ 0 — AirVantage Management Services prohibited. Management Services will never be activated. ▪ 1 — AirVantage Management Services deactivated. Connection parameters to an AirVantage server must be provisioned. This is the default state when a device has never been activated (first use of device services on this device). ▪ 2 — AirVantage Management Services must be provisioned. A bootstrap session is required. ▪ 3 — AirVantage Management Services are activated. · For <Status>=1: ▪ 0 — No session or package. ▪ 1 — A session is under treatment. ▪ 2 — A package is available on the server. ▪ 3 — A package was downloaded and ready to install. ▪ Note: If a package is downloaded unsuccessfully, the <Value> is set to 0. If it downloads successfully, the <Value> is set to 3.

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSI	**Activate/deactivate AirVantage Management Services unsolicited notifications** Activate/deactivate specific AirVantage Management Services unsolicited notifications. **Requirements:** • To receive unsolicited notifications, AirVantage Management Services must be activated (see +WDSG on page 282 for details). **SIM card requirement:** Not required **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT+WDSI=<Level>** Response: OK Purpose: Activate/deactivate identifications as specified in the <Level> bitmask parameter. ▪ Query: **AT+WDSI?** Response: +WDSI: <Level>] OK Purpose: Indicates the current state (activated/deactivated) of indications using the <Level> bitmask parameter. ▪ Query List: **AT+WDSI=?** Purpose: Display valid execution format and parameter values. **Parameters:** <Level> (Unsolicited AirVantage Management Services notifications bit mask) • Bit mask indicating which notifications to enable/disable entered as integer value • Default: 0= No indications activated • Bit value: ▪ 0=Indication deactivated ▪ 1=Indication activated • Valid ranges: 0-127, 256-383, 4096-4223, 4352-4479. Add the values of each bit listed below. (See +WDSI (notification) on page 284 for <Event> details.) Note that bit combinations must add up to values in the valid ranges—combinations outside the ranges are not valid. ▪ 1 (Bit 0)—Initialization end indication (<Event> = 0) ▪ 2 (Bit 1)—Server request for user agreement indication (<Event> = 1, 2, 3, 24) ▪ 4 (Bit 2)—Authentication indications (<Event> = 4, 5) ▪ 8 (Bit 3)—Session indication (<Event> = 6, 7, 8) ▪ 16 (Bit 4)—Package download indications (<Event> = 9, 10, 11) ▪ 32 (Bit 5)—Certified downloaded package indication (<Event> = 12, 13) ▪ 64 (Bit 6)—Update indications (<Event> = 14, 15, 16) ▪ 128 (Bit 7)—Fallback indication (<Event> = 17) ▪ 256 (Bit 8)—Download progress indication (<Event> = 18) ▪ 512 (Bit 9)—Memory preemption indication (<Event> = 19) ▪ 1024 (Bit 10)—User PIN request indication for bootstrap (<Event> = 20) ▪ 2048 (Bit 11)—Reserved ▪ 4096 (Bit 12)—Bootstrap event indication (<Event> = 23)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSI (notification)	**AirVantage Management Services events—Unsolicited notification** Unsolicited notification received for various AirVantage Management Services events. **Requirements:** • To receive unsolicited notifications, AirVantage Management Services must be activated (see +WDSG on page 282 for details). **Notification format:** **+WDSI: <Event>[,<Data>]** *Note: <Event> parameter descriptions below indicate when a <Data> parameter is included in the response.* **Examples:** • +WDSI: 9,1000 *Package will be downloaded, size is 1000 bytes* • +WDSI: 18,1 *1% of package has been downloaded* • +WDSI: 18, 100 *Entire package (100%) has been downloaded* • +WDSI: 11,2 *Package download failue due to HTTP(S) error (see +WDSE on page 281 for error values)* **Parameters:** <Event> (AirVantage Management Services event) • 0 — AirVantage Management Services are initialized and can be used. (Note: Management Services are initialized when the SIM PIN code is entered and a dedicated NAP is configured. See +WDSS on page 287 for details.) • 1 — AirVantage server requests that the device make a connection. The device requests a user agreement to allow the module to make the connection. The response can be sent using +WDSR (see +WDSR on page 286) and this indication can be returned by the device if the user has activated the user agreement for connection (see +WDSC (continued) on page 280 for details). • 2 — AirVantage server requests that the device make a package download. The device requests a user agreement to allow the module to make the download. The response can be sent using +WDSR (see +WDSR on page 286) and this indication can be returned by the device if the user has activated the user agreement for download (see +WDSC (continued) on page 280 for details). • 3 — Device has downloaded a package. The device requests a user agreement to install the downloaded package. The response can be sent using +WDSR (see +WDSR on page 286) and this indication can be returned by the device if the user has activated the user agreement for install (see +WDSC (continued) on page 280 for details). • 4 — Module starts authentication with the server. • 5 — Authentication with the server failed. • 6 — Authentication has succeeded and session with the server has started. • 7 — Session with the server failed. • 8 — Session with the server is finished. • 9 — Package is available on the server and can be downloaded by the module. A <Data> parameter is returned indicating the package size in kBd. (Continued on next page)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSI (notification) (continued)	**AirVantage Management Services events—Unsolicited notification (continued)** · 10—Package was successfully downloaded and stored in flash. · 11—One of the following issues happened during the package download: ▪ If the download did not start (a +WDSI <Event>=9 indication has not been received), there is not enough space in the device to download the package. ▪ If the download started (a +WDSI <Event>=9 indication has been received), a flash problem implies that the package has not been saved in the device. · 12—Downloaded package is certified to be sent by the AirVantage server. · 13—Downloaded package is not certified to be sent by the AirVantage server. · 14—Update will be launched. · 15—OTA update client has finished unsuccessfully. · 16—OTA update client has finished successfully. · 17—Reserved · 18—Download progress: ▪ No <Data> parameter—Download start ▪ <Data> parameter—Percentage progress · 19–22—Reserved · 23—Session type (only in LWM2M protocol) · 24—AirVantage server requests that the device make a reboot. The device requests a user agreement to allow the module to reboot. The response can be sent using +WDSR (see +WDSR on page 286) and this indication can be returned by the device if the user has activated the user agreement for connection (see +WDSC (continued) on page 280 for details). · 25—AirVantage server requests that the device make an application uninstall (software update). The device requests a user agreement before uninstalling. The response can be sent using +WDSR (see +WDSR on page 286) and this indication can be returned by the device if the user has activated the user agreement for connection (see +WDSC (continued) on page 280 for details). <Data> (Additional data for specific <Event>s) · (<Event>=5) To be defined · (<Event>=9) Package size: ▪ Package size in bytes, which will be downloaded ▪ Preempted DOTA area size needed to download an update package ▪ If preemption is not made, this parameter is not returned for this event. ▪ If a reverse package is not downloaded and stored, the preempted area will be released after the installation. · (<Event>=11) Download failure reason: ▪ 0=Insufficient memory in device to save firmware update package. Package was not downloaded. ▪ 1=HTTP/HTTPS error occurred. See +WDSE on page 281 for possible error values. ▪ 2=Corrupted firmware update package, did not store correctly. Reasons include (or example), mismatched CRCs between actual and expected, or signature check error. · (<Event>=18) Download progress: ▪ Integer value (% complete) · (<Event>=23) Session event type: ▪ 0=Bootstrap session ▪ 1=Device management session

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSR	**Reply to AirVantage server request** Reply to a user agreement request (see +WDSI (notification) on page 284 for details) from the module. **SIM card requirement:** Required, and PIN 1/CHV 1 code must be entered. **Password required:** No **Usage:** ▪ Execution: **AT+WDSR=<Reply>[,<Timer>]** Response: OK Purpose: Send <Reply> to a user agreement request from the module. For specific <Reply> types, include a <Timer> to have the module send a new user agreement request after the specified delay. ▪ Query List: **AT+WDSR=?** Purpose: Display valid execution format and parameter values. **Parameters:** <Reply> (Reply type) · 0 — Delay the connection to server (Connect later) · 1 — Accept the connection to server (Connect now) · 2 — Delay or refuse to download. New user agreement request to be sent by module after <Timer> minutes: ▪ Delay — <Timer> must be > 0, or blank (Default 30). New user agreement request to be sent by module after <Timer> minutes. ▪ Refuse — <Timer>=0. Usage restrictions include: ▪ Option available only if OMA DM protocol is used. ▪ Not supported for install request (AT+WDSR=5,0). Returns +CME ERROR: 3 ▪ Not supported for device reboot request (AT+WDSR=7,0). Returns +CME_ERROR: 3 ▪ Not supported for uninstall request (AT+WDSR=9,0). Returns +CME_ERROR: 3 · 3 — Accept the download (download it now) · 4 — Accept the install (install it now) · 5 — Delay the install. New user agreement request to be sent by module after <Timer> minutes. · 6 — Accept the device reboot (reboot now) · 7 — Delay the device reboot. New user agreement request to be sent by module after <Timer> minutes. · 8 — Accept the application uninstall (uninstall it now) · 9 — Delay the application uninstall (uninstall it later after <Timer> minutes) · Note: If the module is powered down before a delay (install, download, or reboot) finishes, the new user agreement request will be returned during the next start up. <Timer> (Interval before new user agreement request to be sent by module) · Applies to <Reply> types 2, 5, 7, 9 · Valid values: ▪ Valid range: 0–1440 (minutes) ▪ 0 — If <Reply>=2 and OMA DM protocol is used, refuse the user agreement request. ▪ Default (if not specified): 30 (minutes)

Table 14-2: AirVantage Device Services Command Details (Continued)

Command	Description
+WDSS	**Configure/connect AirVantage Management Services session** Initiate or terminate a connection to the AirVantage server, and set the PDP context for the connection. After setting the PDP context ID for the connection, configure the PDP context using AT+CGDCONT. *Note: If AT+WDSS is used to change the current PDP context, the new ID is not guaranteed to have a valid configuration (AT+CGDCONT must be used to configure the context).* **SIM card requirement:** Required, and PIN 1/CHV 1 code must be entered. **Password required:** No **Persistent across power cycles:** Yes (<Apn> only) **Usage:** ▪ Execution (<Mode> = 1): **AT+WDSS=<Mode>,<Action>** Response: OK Purpose: Connect to/disconnect from the AirVantage server ▪ Execution (<Mode> = 2): **AT+WDSS=<Mode>[,<Cid>]** Response: OK Purpose: Set the PDP context ID for the AirVantage server connection. If no <Cid> is entered, the default PDP context ID is used. ▪ Query: **AT+WDSS?** Response: [+WDSS: 1,<Action>] [+WDSS: 2,<Cid>] OK Purpose: Display the current AirVantage server connection state, and the PDP context ID for the connection. ▪ Query List: **AT+WDSS=?** Purpose: Display valid execution format and parameter values. **Parameters:** <Mode> (Connection method) · 1 — User-initiated connection to the AirVantage server · 2 — PDP context configuration for AirVantage server · Note: Mode 0 is deprecated; use Mode 2 instead. <Cid> (PDP context identifier) · Integer value · Valid range: 1–16 <Action> (Connect to/disconnect from AirVantage server) · 0 — Release connection (Default) · 1 — Establish connection

15: SMS Wake Commands

Introduction

This chapter describes commands used for the SMS host wake-up feature.

Command summary

Table 15-1 lists the commands described in this chapter.

Table 15-1: SMS Wake Commands

Command	Description	Page
!SMSWAKE	Enable/disable SMS host wake-up feature	289
!SMSWAKEWIDTH	Set/read SMS Wake signal width	290

Command reference

Table 15-2: SMS Wake Command Details

Command	Description
!SMSWAKE	**Enable/disable SMS host wake-up feature** Enable/disable the SMS host wake-up feature. Using this feature, an SMS message containing a defined 'wake mask' can be used to wake a tethered host processor (e.g. a laptop). **Supporting devices:** WP76xx **Password required:** Yes **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** • Execution: **AT!SMSWAKE=<bEnabled>[,<wakeMask>]** Response: OK or ERROR Purpose: Disable the SMS host wake up feature, or enable the SMS host wake up feature and define the <wakeMask> that can be used to wake the tethered host. • Query: **AT!SMSWAKE?** Response: !SMSWAKE: Enabled <wakeMask>> OK or !SMSWAKE: Disabled OK Purpose: Report the current state of the SMS host wake-up feature. • Query List: **AT!SMSWAKE=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <bEnabled> (SMS wake-up feature state) • 0—Disabled • 1—Enabled <wakeMask> (Bitmask) • 32-bit bitmask, in Hex format • Parameter is not used when command is used to disable the feature. • Example: F27A4BB6

Table 15-2: SMS Wake Command Details (Continued)

Command	Description
!SMSWAKEWIDTH	**Set/read SMS Wake signal width** Set/read the SMS Wake signal width. **Supporting devices:** WP76xx **Password required:** Yes **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** • Execution: **AT!SMSWAKEWIDTH=<width>** Response: OK or ERROR Purpose: Set the wake signal width. • Query: **AT!SMSWAKEWIDTH?** Response: !SMSWAKEWIDTH: <width> OK Purpose: Report the configured wake signal width. • Query List: **AT!SMSWAKEWIDTH=?** Purpose: Return the execution command format and the supported parameter values. **Parameters:** <width> (SMS Wake signal width, in milliseconds) • Integer • Valid range: 1–65535

16: Supported GSM/WCDMA AT Commands

This chapter identifies standard AT commands that are supported by most Sierra Wireless AirPrime devices. These commands:

- Control serial communications over an asynchronous interface (*ITU-T Serial Asynchronous Dialling and Control (Recommendation V.250*), available on the International Telecommunication Union web site, www.itu.int).
  See Table 16-1 below.
- Control SMS functions for devices on GSM/WCDMA networks (*3GPP TS 27.005*, available on the 3GPP web site, www.3gpp.org)
  See Table 16-2 on page 293.
- Control devices operating on GSM/WCDMA networks (*3GPP TS 27.007,* available on the 3GPP web site, www.3gpp.org)
  See Table 16-3 on page 295.

The tables below identify whether each command is supported on Sierra Wireless UMTS devices. An “N/A" in the Supported column of the table indicates that the command is related to a feature (such as voice) that is not available on the modems.

Commands that are partially supported include descriptions identifying any limitations on command usage. Also, some commands are described in more detail in other chapters—the descriptions for these commands link to those detailed entries (for example, **&V** in Table 16-1 on page 291).

Table 16-1: Supported ITU-T Recommendation V.250 AT Commands

Command	Description	Supported 4=Yes; 8=No
Commands		
&C	Set Data Carrier Detected (Received line signal detector) function mode	8
&D	Set Data Terminal Ready function mode	4
&F	Set all current parameters to manufacturer’s defaults	4
&S	Set DSR signal	4
&T	Auto tests	8
&V	Return operating mode AT configuration parameters	4
&W	Store current parameter to user-defined profile	4
+DR	V42bis data compression report	4
+DS	V42bis data compression	4
+GCAP	Request complete TA capabilities list	4
+GMI	Request manufacturer identification	4
+GMM	Request TA model identification	4
+GMR	Request TA revision identification	4
+GOI	Request global object identification	8

Table 16-1: Supported ITU-T Recommendation V.250 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+GSN	Request TA serial number identification	4
+ICF	Set TE-TA control character framing	4
+IFC	Set TE-TA local data flow control	4
+ILRR	Set TE-TA local rate reporting mode	8
+IPR	Set fixed local rate (default rate is 115200). *Note: WP76xx/WP77xx modules support AT!MUXMODE. For these modules, the baud rate is stored in NV memory on the modem side (when AT!MUXMODE is 0 or 2) or in a Linux regular file on the application side (when AT!MUXMODE is 1). Therefore, when switching between MUX modes, the baud rate may also change.* *Note: If AT&F is used to set the device to manufacturer defaults, the baud rate in NV resets to default (115200), but the baud rate in the Linux regular file does not change.* *Note: The baud rate change takes effect immediately when +IPR is used over the UART AT port, or takes effect after the module is reset (power cycled) when +IPR is used over the USB AT port.*	4
A	Answer incoming call	4
A/	Re-issues last AT command given	4
D	Dial	4
D><MEM><N>	Originate call to phone number in memory <MEM>	8
D><N>	Originate call to phone number in current memory	4
D><STR>	Originate call to phone number in memory which corresponds to alphanumeric field <STR>	8
DL	Redial last telephone number used	8
E	Set command echo mode	4
H	Disconnect existing connections	4
I	Display product identification information	4
L	Set monitor speaker loudness	8
M	Set monitor speaker mode	8
O	Switch from command mode to data mode	4
P	Select pulse dialing	8
Q	Set Result code presentation mode	4

Table 16-1: Supported ITU-T Recommendation V.250 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
S0	Set number of rings before automatically answering the call	4
S10	Set disconnect delay after indicating the absence of data carrier	4
S3	Set command line termination character	4
S4	Set response formatting character	4
S5	Set command line editing character	4
S6	Set pause before blind dialing	4
S7	Set number of seconds to wait for connection completion	4
S8	Set number of seconds to wait when comma dial modifier used	4
T	Select tone dialing	4
V	Set result code format mode	4
X	Set connect result code format and call monitoring	4
Z	Set all current parameters to user-defined profile	4
Result Codes		
OK	Acknowledges execution of a command	4
CONNECT	A connection has been established	4
RING	Unsolicited notification of an incoming call signal from the network	4
NO CARRIER	The connection has been terminated or the attempt to establish a connection failed	4
ERROR	Command not recognized, command line maximum length exceeded, parameter value invalid, or other problem with processing the command line	4
NO DIALTONE	No dial tone detected	4
BUSY	Engaged (busy) signal detected	4

Table 16-2: Supported 27.005 AT Commands

Command	Description	Supported 4=Yes; 8=No
+CBM	Cell broadcast message directly displayed	4
+CBMI	Cell broadcast message stored in memory at specified <index> location	8
+CDS	SMS status report after sending a SMS	4
+CDSI	Incoming SMS status report	4
+CMGC	Send command	4
+CMGD	Delete message	4

Table 16-2: Supported 27.005 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+CMGF	Message format	4
+CMGL	List messages	4
+CMGR	Read message	4
+CMGS	Send message	4
+CMGW	Write message to memory	4
+CMMS	More messages to send	4
+CMS ERROR: <err>	SMS error (mobile or network error)	4
+CMSS	Send message from storage	4
+CMT	Incoming message directly displayed	4
+CMTI	Incoming message stored in <mem> (“SM"—SIM message storage) at location <index>	4
+CNMA	New message acknowledgment to mobile equipment	4
+CNMI	New message indications to TE *Note: The following parameter settings are not supported:* • *<mode>=0 or 2, <mt>=2 or 3* • *<mode>=0 or 2, <ds>=1* • *<bm>=1*	Partial
+CPMS	Preferred message storage	4
+CRES	Restore settings	8
+CSAS	Save settings	8
+CSCA	Service center address	4
+CSCB	Select cell broadcast message types	4
+CSDH	Show text mode parameters	4
+CSMP	Set text mode parameters	4
+CSMS	Select message service	4

Table 16-3: Supported 27.007 AT Commands

Command	Description	Supported 4=Yes; 8=No
&C	ITU T V.24 circuit 109 carrier detect signal behavior command Format • &C<value> Limitations • Default <value> = 2 • <value> = 2 causes the AT/Data carrier detect pin to 'wink' (briefly switch off and on) when data calls end. • <value> = 0 or 1 performs as defined in the standard	Partial
+CACM	Accumulated call meter	8
+CACSP	Voice Group or Voice Broadcast Call State Attribute Presentation	N/A
+CAEMLPP	eMLPP Priority Registration and Interrogation	8
+CAHLD	Leave an ongoing Voice Group or Voice Broadcast Call	N/A
+CAJOIN	Accept an incoming Voice Group or Voice Broadcast Call	N/A
+CALA	Alarm	N/A
+CALCC	List current Voice Group and Voice Broadcast Calls	N/A
+CALD	Delete alarm	N/A
+CALM	Alert sound mode	8
+CAMM	Accumulated call meter maximum	8
+CANCHEV	NCH Support Indication	8
+CAOC	Advice of Charge	8
+CAPD	Postpone or dismiss an alarm	N/A
+CAPTT	Talker Access for Voice Group Call	N/A
+CAREJ	Reject an incoming Voice Group or Voice Broadcast Call	N/A
+CAULEV	Voice Group Call Uplink Status Presentation	N/A
+CBC	Battery charge	4
+CBST	Select bearer service type	4
+CCCM	Current call meter value	8
+CCFC	Call forwarding number and conditions	4
+CCLK	Clock	4
+CCUG	Closed user group	4
+CCWA	Call waiting	4
+CCWE	Call Meter maximum event	8
+CDIP	Called line identification presentation	8

Table 16-3: Supported 27.007 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+CDIS	Display control	8
+CEER	Extended error report	8
+CEREG	EPS network registration status Note: Command implement based on 3GPP 27.007 rel 8.11.0.	4
+CFUN	Set phone functionality Format • +CFUN = [<fun> [, <rst>]] Limitations • Valid <fun> values: ・ 0 (minimum functionality, low power draw) ・ 1 (full functionality, high power draw)	Partial
+CGACT	PDP context activate or deactivate	4
+CGANS	Manual response to a network request for PDP context activation	8
+CGATT	PS attach or detach	4
+CGAUTO	Automatic response to a network request for PDP context activation	8
+CGCLASS	GPRS mobile station class	(WP85/75) 4 (WP76) 4 (WP77) 8
+CGCLOSP	Configure local octet stream PAD parameters	8
+CGCMOD	PDP Context Modify	4
+CGCONTRDP	PDP Context Read Dynamic Parameters	4
+CGDATA	Enter data state	4
+CGDCONT	Define PDP Context	(WP85/75) 4 For WP76/77, see +CGDCONT.
+CGDSCONT	Define Secondary PDP Context	4
+CGEQMIN	3G Quality of Service Profile (Minimum acceptable)	4
+CGEQNEG	3G Quality of Service Profile (Negotiated)	(WP85/75) 4 (WP76/77) 8
+CGEQOS	Define EPS Quality of Service	4
+CGEQREQ	3G Quality of Service Profile (Requested)	4
+CGEREP	Packet Domain event reporting	4
+CGEV	GPRS network event indication	4
+CGMI	Request manufacturer identification	4
+CGMM	Request model identification	4

Table 16-3: Supported 27.007 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+CGMR	Request revision identification	4
+CGPADDR	Show PDP address	4
+CGQMIN	Quality of Service Profile (Minimum acceptable)	4
+CGQREQ	Quality of Service Profile (Requested)	4
+CGREG	GPRS network registration status	4
+CGSCONTRDP	Secondary PDP Context Read Dynamic Parameters	4
+CGSMS	Select service for MO SMS messages	4
+CGSN	Request product serial number identification	4
+CGTFT	Traffic Flow Template	4
+CGTFTRDP	Traffic Flow Template Read Dynamic Parameters	4
+CHLD	Call related supplementary services	4
+CHSA	HSCSD non-transparent asymmetry configuration	N/A
+CHSC	HSCSD current call parameters	N/A
+CHSD	HSCSD device parameters	N/A
+CHSR	HSCSD parameters report	N/A
+CHST	HSCSD transparent call configuration	N/A
+CHSU	HSCSD automatic user initiated upgrading	N/A
+CHUP	Hangup call	4
+CIEV	Indicator event	4
+CIMI	Request international mobile subscriber identity	4
+CIND	Indicator control Limitations • The battery charge level indication (<battchg>) is not supported on WP products. Value returned is always 0 (zero).	(WP85/75) 4 (WP76) 4 (WP77) 8
+CKEV	Key press or release event	8
+CKPD	Keypad control	8
+CLAC	List all available AT commands	8
+CLAE	Language Event	8
+CLAN	Set Language	8
+CLCC	List current calls	4
+CLCK	Facility lock	4

Table 16-3: Supported 27.007 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+CLIP	Calling line identification presentation *Note: Verizon supports +CLIP=[0|1], but does not support +CLIP?*	4 (Partial)
+CLIR	Calling line identification restriction	4
+CLVL	Set/return internal loudspeaker volume	4
+CMAR	Master Reset	8
+CME ERROR: <err>	Mobile Termination error result code	4
+CMEC	Mobile Termination control mode	8
+CMEE	Report Mobile Termination error	4
+CMER	Mobile Termination event reporting *Note: The following parameter values are not supported:* • *<mode> = 2* • *<bfr> = 1*	Partial
+CMOD	Call mode	4
+CMUT	Enable/disable uplink voice muting	4
+CMUX	Multiplexing mode	4 (When MUX mode configured on USB or UART interface.)
+CNUM	Subscriber number	4
+COLP	Connected line identification presentation	4
+COPN	Read operator names	4
+COPS	Operator selection	4
+CPAS	Phone activity status	4
+CPBF	Find phonebook entries	4
+CPBR	Read phonebook entries	4
+CPBS	Select phonebook memory storage	4
+CPBW	Write phonebook entry	4
+CPIN	Enter PIN	4
+CPLS	Preferred PLMN list selection	4
+CPOL	Preferred operator list	4
+CPROT	Enter protocol mode	8
+CPUC	Price per unit and currency table	4

Table 16-3: Supported 27.007 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
+CPWC	Power class	8
+CPWD	Change password	4
+CR	Service reporting control	4
+CRC	Cellular result codes	4
+CREG	Network registration	4
+CRING	Incoming call type	4
+CRLP	Radio link protocol	4
+CRMP	Ring Melody Playback	N/A
+CRSL	Ringer sound level	N/A
+CRSM	Restricted SIM access	4
+CSCC	Secure control command	8
+CSCS	Select TE character set	4
+CSDF	Settings date format	N/A
+CSGT	Set Greeting Text	N/A
+CSIL	Silence Command	N/A
+CSIM	Generic SIM access	4
+CSNS	Single numbering scheme	8
+CSQ	Signal quality	4
+CSSN	Supplementary service notifications	4
+CSTA	Select type of address	4
+CSTF	Settings time format	4
+CSVM	Set Voice Mail Number	8
+CTFR	Call deflection	4
+CTZR	Time Zone Reporting	N/A
+CTZU	Automatic Time Zone Update	4
+CUSD	Unstructured supplementary service data	4
+CV120	V.120 rate adaptation protocol	8
+CVHU	Voice Hangup Control	8
+CVIB	Vibrator mode	N/A
D	ITU T V.25ter [14] dial command	4

Table 16-3: Supported 27.007 AT Commands (Continued)

Command	Description	Supported 4=Yes; 8=No
D*99#	Sets up a packet data call (PDP context) based on profile ID #1	4
D*99*<n>#**	Sets up a packet data call (PDP context) based on profile ID #<n> (<n> is the <cid> in the +CGDCONT command)	4
+VTD	Tone duration	4
+VTS	DTMF and arbitrary tone generation	4
+WS46	PCCA STD 101 [17] select wireless network	8

17: Band Definitions

Some commands described in this document include input and/or output 'band' parameters, where the value is one of the following:

- An enumerated value representing a network technology and band (Table 17-1).
  Commands using this table:
  - !DASBAND on page 183
- A 3GPP band number (Table 17-2 on page 302).
  Commands using this table:
  - !ANTSEL on page 34
  - !MAXPWR on page 241

Note: Band support is product-specific — see the device's Product Specification Document or Product Technical Specification for details.

Table 17-1: Band / technology Enumerations[a,b]

Band enum	Tech	Band enum	Tech	Band enum	Tech	Band enum	Tech
0	CDMA	22	WCDMA 800	42	LTE B4	60	LTE B24
2	Sleep	25	WCDMA B3	43	LTE B2	61	LTE B25
5	CDMA 800	26	CDMA BC14	44	LTE B3	62	LTE B26
6	CDMA 1900	27	CDMA BC11	45	LTE B5	63	LTE B27
7	HDR	28	WCDMA B4	46	LTE B6	64	LTE B28
8	CDMA 1800	29	WCDMA B8	47	LTE B8	65	LTE B29
9	WCDMA IMT	30	MF 700	48	LTE B9	66	LTE B30
10	GSM 900	31	WCDMA B9	49	LTE B10	67	LTE B31
11	GSM 1800	32	CDMA BC15	50	LTE B12	68	LTE B32
12	GSM 1900	33	CDMA BC10	51	LTE B14	69	LTE B33
14	JCDMA	34	LTE B1	52	LTE B15	70	LTE B34
15	WCDMA 1900A	35	LTE B7	53	LTE B16	71	LTE B35
16	WCDMA 1900B	36	LTE B13	54	LTE B18	72	LTE B36
17	CDMA 450	37	LTE B17	55	LTE B19	73	LTE B37
18	GSM 850	38	LTE B38	56	LTE B20	74	LTE B39
19	IMT	39	LTE B40	57	LTE B21	75	WCDMA B19
20	HDR 800	40	WCDMA B11	58	LTE B22	76	LTE B41
21	HDR 1900	41	LTE B11	59	LTE B23		

a. Band values not listed (e.g. 1, 3, 4) are reserved.
b. Commands using this table are identified in the chapter introduction.

Table 17-2: 3GPP Bands[a,b]

3GPP Band	Frequency ranges (MHz)		3GPP Band	Frequency ranges (MHz)	
	Tx	Rx		Tx	Rx
1	1920–1980	2110–2170	**30**	2305–2315	2350–2360
2	1850–1910	1930–1990	**31**	452.5–457.5	462.5–467.5
3	1710–1785	1805–1880	**32**	n/a	1452–1496
4	1710–1755	2110–2155	**33**	1900–1920	
5	824–849	869–894	**34**	2010–2025	
6	830–840	875–885	**35**	1850–1910	
7	2500–2570	2620–2690	**36**	1930–1990	
8	880–915	925–960	**37**	1910–1930	
9	1749.9–1784.9	1844.9–1879.9	**38**	2570–2620	
10	1710–1770	2110–2170	**39**	1880–1920	
11	1427.9–1447.9	1475.9–1495.9	**40**	2300–2400	
12	699–716	729–746	**41**	2496–2690	
13	777–787	746–756	**42**	3400–3600	
14	788–798	758–768	**43**	3600–3800	
15	Reserved	Reserved	**44**	703–803	
16	Reserved	Reserved	**45**	1447–1467	
17	704–716	734–746	**46**	5150–5925	
18	815–830	860–875	**47**	5855–5925	
19	830–845	875–890	**48**	3550–3700	
20	832–862	791–821	**49**	3550–3700	
21	1447.9–1462.9	1495.9–1510.9	**50**	1432–1517	
22	Reserved	Reserved	**51**	1427–1432	
23	2000–2020	2180–2200	**52**	3300–3400	
24	1626.5–1660.5	1525–1559	**53-64**	Reserved	Reserved
25	1850–1915	1930–1995	**65**	1920–2010	2110–2200
26	814–849	859–894	**66**	1710–1780	2110–2200
27	807–824	852–869	**67-70**	Reserved	Reserved
28	703–748	758–803	**71**	663–698	617–652
29	n/a	717–728			

a. For CDMA bands, use these equivalents: BC0 (Band 5), BC1 (Band 2), BC10 (Band 6).
b. Commands using this table are identified in the chapter introduction.

18: ASCII Table

Table 18-1: ASCII Values

Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex
NUL	0	00	SP	32	20	@	64	40	‘	96	60
SOH	1	01	!	33	21	A	65	41	a	97	61
STX	2	02	“	34	22	B	66	42	b	98	62
ETX	3	03	#	35	23	C	67	43	c	99	63
EOT	4	04	$	36	24	D	68	44	d	100	94
ENQ	5	05	%	37	25	E	69	45	e	101	95
ACK	6	06	&	38	26	F	70	46	f	102	96
BEL	7	07	’	39	27	G	71	47	g	103	97
BS	8	08	(	40	28	H	72	48	h	104	98
HT	9	09	)	41	29	I	73	49	i	105	99
LF	10	0A	*	42	2A	J	74	4A	j	106	6A
VT	11	0B	+	43	2B	K	75	4B	k	107	6B
FF	12	0C	,	44	2C	L	76	4C	l	108	6C
CR	13	0D	-	45	2D	M	77	4D	m	109	6D
SO	14	0E	.	46	2E	N	78	4E	n	110	6E
SI	15	0F	/	47	2F	O	79	4F	o	111	6F
DLE	16	10	0	48	30	P	80	50	p	112	70
XON	17	11	1	49	31	Q	81	51	q	113	71
DC2	18	12	2	50	32	R	82	52	r	114	72
XOFF	19	13	3	51	33	S	83	53	s	115	73
DC4	20	14	4	52	34	T	84	54	t	116	74
NAK	21	15	5	53	35	U	85	55	u	117	75
SYN	22	16	6	54	36	V	86	56	v	118	76
ETB	23	17	7	55	37	W	87	57	w	119	77
CAN	24	18	8	56	38	X	88	58	x	120	78
EM	25	19	9	57	39	Y	89	59	y	121	79
SUB	26	1A	:	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	>	62	3E	^	94	5E	~	126	7E
US	31	1F	?	63	3F	_	95	5F	DEL	127	7F