Modules

SIERRA WIRELESS IS NOW SEMTECH®

EM9 Series

AT Command Reference

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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 5:00 pm PST
Corporate and product information	Web: sierrawireless.com

Revision History

Revision number	Release date	Changes
1.0	November 2019	Creation
1.1	January 2020	▪ Updated !PCTEMP, !PCTEMPLIMITS, !GSTATUS, !PCVOLT, !SARINTGPIOMODE, !SARSTATE, !USBCOMP, !CUSTOM ▪ Updated 3GPP AT commands to mark GSM and voice call related commands to "N/A"
1.2	May 2020	▪ Added !DAUPDATEPARAM, !DATXCONTROL, !DAMMWACT, !DAMMWDEACT, !VERINFO, !DISABLEDEBUG ▪ Updated !DARCONFIG, !DAGFTMRXAGC, !DACGPSCTON, !DARCONFIGDROP, !GSTATUS, !ERR, !USBCOMP, !GPSTRACK, !GPSLBSAPN, !TMSTATUS, !SETCND ▪ Removed !DALGRXAGC, !DALGTXAGC, !DAWTXCONTROL, !DALTXCONTROL, !DACGPS-MASKON, !GPSNMEACONFIG, !GPSNMEASENTENCE, +WANT, !SCACT, !LTERX-CONTROL, !RXDEN, !DAOFFLINE ▪ Updated 3GPP and carrier AT commands to only focus on certification requirements
1.3	June 2020	▪ Added !CMTI, !CMT, !ANTSEL, !LEDTEST, !DASUB6TECHACT, !RFCID ▪ Updated !IMPREF, !ERR, !GSTATUS, !DARCONFIG, !TMSTATUS
1.4	August 2020	▪ Added EM9191 and EM7690 information ▪ Added !RATCA, !LTEINFO, !NRINFO, !USBVID, !USBPID, !PCIESSVID, !PCIESSDID, !RFCMBNSCAN, !RXDEN, !LTERXCONTROL ▪ Updated !DATALOOPBACK, !CUSTOM, !SARSTATE, !DAUPDATEPARAM, !DARCONFIG, !DAGFTMRXAGC, !DATXCONTROL, !ENTERCND, !SETCND
1.5	September 2020	▪ Added !RFDEVSTATUS ▪ Added 5.4 Number of Resource Block ▪ Updated !CUSTOM, !DATXCONTROL, !USBCOMP, !GPSAUTOSTART
1.6	November 2020	▪ Added !STEFS, !DMSUPPORT ▪ Updated !RATCA

Revision number	Release date	Changes
1.7	January 2021	▪ Updated !GSTATUS (notes) ▪ Updated !RFCID ▪ Updated !TMSTATUS
2	July 2021	▪ Added !HOSTDEVINFO ▪ Updated !BAND, !DARCONFIG, !DATXCONTROL, !LEDTEST, !NVBACKUP, !RMARESET, !TMSTATUS, !USBCOMP
3	October 2021	▪ Updated !CUSTOM (GPSENABLE customization), !RFDEVSTATUS (<instance> parameter description) ▪ Added !IMAGE, !MMWBYPASSSCAN, !SELRAT
4	December 2021	▪ Added !IMSIM, !MMWCAL, !TMCONFIG ▪ Updated !CUSTOM customizations (added MBIMMODE; updated ICMPINTSRVDIS) ▪ Updated !DAGFTMRXAGC, !DARCONFIG, !DATXCONTROL, !STEFS ▪ Removed references to Customer Release Notes (BuildPackage 7.4B1)
5	March 2022	▪ Added !SKU ▪ Updated 1.2 Command Access description of !ENTERCND ▪ Updated !ANTSEL, !DAFTMACT, !GSTATUS, !LTEINFO, !NRINFO, !PCOFFEN, !TMSTATUS
6	September 2022	▪ General formatting edit ▪ Added !GNSSPERMITTEDSTATE, !LTECA, !POWERDOWN, !RATCONFIG, !RFCOMBOS, !SDPREF ▪ Updated !BAND, !CUSTOM (“SIMHOTSWAPDIS”, “UIM2ENABLE”), !ENTERCND, !IMSIM, !SETCND, !UIMS (description, params), !USBCOMP (corrected description) ▪ Deprecated !RATCA ▪ Removed !DISABLEDEBUG, !PCIESSDID, !PCIESSVID
7	January 2023	▪ General formatting edit ▪ Added EM92 content ▪ Updated 1. About This Guide (added EM92 content, updated firmware information, general cleanup) ▪ Added !SARSTATEDFLT, !STSTATUS ▪ Updated !ANTSEL (query response format; GPIO availability note), !CUSTOM (added “DGENABLE”, “DHCPRELAYENABLE”, “PCSCDISABLE”, “PCIEFORCEEN”), !DACGPS-STANDALONE (query response format), !DACGPSTESTMODE (query response format), !ERR (execution response format), !HOSTDEVINFO, !LTEINFO (added error response), !NRINFO (5G Sub6 query response format, added parameter details), !PCVOLT (Query response format) !RATCA (deprecation description), !RFCMBNSCAN (description, parameter details), !SELRAT (query response — clarified parameters), !TMCONFIG (query response — clarified parameters), !VERINFO (parameter details) ▪ Deprecated !GPSCOLDSTART, !GPSPORTID ▪ Removed &V, !ERR
8	May 2023	▪ Updated !BAND (PRI restrictions note); !NRINFO (Updated NR cell ID parameter description / examples); !SDPREF (Updated F/W version)

Revision number	Release date	Changes
9	November 2023	▪ Added Sample DA* Command Usage, DG Commands, Carrier IDs ▪ Added !CARRIERRESET, !GNSSCONFIG, !GPSMTLRSETTINGS, !GPSNIQOSTIME, !NVPERSISTRST, !SIMDETPOL, +WWANT, !WDISABLE ▪ Updated !CUSTOM: · Updated Password requirement statement · Added DIAGENABLE, GPSSEL, UIMAUTOSWITCH, USBSERIALENABLE) · Updated DGENABLE (values, notes), UIM2ENABLE (values, notes); ▪ Updated !BAND (description), !DATALOOPBACK (updated muliplier limit), !DARCONFIG (usage, <mimo_mode> usage, added EM92 format), !DASUB6TECHACT (usage), !DATXCONTROL (usage), !DAUPDATEPARAM (usage, deprecated EM92), !GPSSUPLURL (description), !LTERXCONTROL(description, usage, <selection>), !PCINFO (<vote> note), !PCOFFEN (description, <state>), !PCTEMP (response, <state>), !PCTEMPLIMITS (description, response), !PCVOLT (response), !PCVOLTLIMITS (description, response), !RATCONFIG (description, examples), !RXDEN (description, usage, response), !SDPREF (description), !SELRAT (parameters), !STSTATUS (description, <ST_MCC_Exposure_mode> details), !UIMS (usage, response, parameter values), !USBCOMP (parameters) ▪ Deprecated !DAFTMACT, !DAFTMDEACT; Updated references from !DAGFTMRXAGC, !DAMMWACT, !DAMMWDEACT, !DARCONFIG, !DARCONFIGDROP, !DASUB6TECHACT, !DATXCONTROL, !DAUPDATE-PARAM ▪ Updated Table 12-3 (+CFUN(states))

Revision number	Release date	Changes
10	September 2024	▪ Updated applicable Firmware list ▪ Added Reset/Persistent entries to all command descriptions where missing ▪ Added !DATXMEASURE; !NRPCI ▪ Updated !ANTSEL (removed EM92); !DAGFTMRXAGC (<path> EM92 details); !DARCONFIG (<subband_type> description; <mimo_mode> support note); !DATXCONTROL (<power_dBm10> values; <mimo_mode> behavior); !DMSUPPORT (Reset requirement); !GNSSCONFIG (QZSS usage note); !GNSSPERMITTEDSTATE (EM91 support); !GPSLBSAPN (<IPtype> format note); !GPSSATINFO (QZSS usage note); !GSTATUS (removed Thermal Mitigation); !IMPREF (AUTO-SIM); !NRINFO (<cell id> description); !NVPERSISTRST (Reset requirement); !RFDEVSTATUS (query response heading; <present> EM91 values); !PCOFFEN (usage note); !RXDEN (Reset requirement); !SARINTGPIOMODE (EM92 support, Reset requirement); !SARSTATE (EM92 support, <state> values); !SARSTATEDFLT (EM92 support); !SELRAT (<ratname> EM91 values); !STEFS (EM92 support, Query response formats)) ▪ Renamed !VERINFO to !VERINFO (EM91); added !VERINFO (EM92); Renamed !CARRIERRESET (EM92) to !CARRIERRESET ▪ Updated !CUSTOM (Updated UIM2ENABLE (description)) ▪ Updated Table 12-1, ITU-T Recommendation V.250 AT commands (Corrected V support); Table 12-3, 3GPP TS 27.007 AT commands (added +C5GNSSAI, +C5GNS-SAIRDP, +C5GREG) ▪ Removed !DAMMWACT, !DAMMWDEACT ▪ Renamed Chapter 12 to “Standard AT Commands”
11	January 2025	▪ Deprecated !GCFEN ▪ Updated !CUSTOM customizations: DIAGENABLE (added EM91 support; corrected typo — changed Default value to 0); QXDMLOGENABLE (deprecated) ▪ Updated !BCFWUPDATESTATUS (clarified response format); !DAUPDATEPARAM (persistence); !DATALOOPBACK (updated formats to include <sys_mode>, <nr5g_only> (already supported by EM92, and updated EM91 to support new format)); !GPSSUPLVER (password requirement); !IMSIM (<rank> usage note); !LTERXCONTROL (persistence); MMWCAL (format, parameters); !NRINFO (NR5G MCC-MNC (EM91 only); !NRPCI (added EM91 support); !RXDEN (persistence); !TMCONFIG (EM91) (password requirement); !VERINFO (migrated EM91 to EM92)

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1: About This Guide

Introduction

This document describes supported standard and proprietary (extended) AT commands available for Semtech modules, and provides details where commands vary from the standards. These commands are intended for use by OEMs, and are supplemental to the standard AT commands for WCDMA 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: In this document:
- *EM91 refers to the EM91 module series (EM9190, EM9191, EM7690)*
- *EM92 refers to the EM92 module series (EM9291, EM9293)*
- *EM9 refers to EM91 and EM92*

The commands in this document apply to EM9 modules as follows:
- EM9190 — All commands apply. (EM9190 supports 3G/4G/5G Sub-6 GHz/5G mmW)
- EM9191 — 5G mmW related commands/parameters do not apply. (EM9191 does not support 5G mmW.)
- EM7690 — 5G mmW and 5G Sub-6 GHz related commands/parameters do not apply. (EM7690 does not support 5G mmW or 5G Sub-6 GHz)
- EM9291 — 5G mmW related commands/parameters do not apply. (EM9291 does not support 5G mmW.)

When designing applications that use these AT commands, use Semtech applications as functionality templates to ensure proper use of command groups. For questions or concerns relating to command implementation, please contact your supplier.

Semtech also provides a forum for users of EM series modules, at forum.sierrawireless.com/c/modules/mc-em-series.

Command access

Some commands in this reference are password-protected. To enable access to password-protected commands, use !ENTERCND to enter the password. (Access remains enabled until the module is reset or powered off and on.)

Password Recommendation

Important — To prevent unauthorized access of password-protected AT commands, Semtech strongly recommends selecting a unique password (4–10 alphanumeric characters) to replace the module's default password for extended AT commands. (The default password is configured during manufacture.)

See Password Recommendation on page 17 for details.

Firmware

This document applies to:
- EM91 — SWIX55C_03.17.02.00 (Release 7)
- EM92 — SWIX65C_02.17.08.00 (Release 6)

Firmware for EM9 modules is available at source.sierrawireless.com on the following device-specific pages:
- EM91 — source.sierrawireless.com/resources/airprime/software/em919x/em9-approved-fw-packages/
- EM92 — source.sierrawireless.com/resources/airprime/software/em929x/em92-approved-fw-packages/

To determine your current firmware revision, use **AT+GMR** or **ATI**.

Command timing

Interval timing

Some commands require time to process before additional commands are entered. For example, the modem returns OK when it receives **AT+CFUN=5**. If **AT!DARCONFIG** 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.

Result codes

A result code is typically returned after each AT command (except the **!RESET** command) has been executed:
- `OK` — Indicates the command has executed successfully.
- `ERROR` — Indicates the command failed for some reason (e.g., parameters missing or out of range, command not permitted due to current state / condition of the modem, unrecognized command, etc.)

Conventions

The following format conventions are used in this reference:
- Unless described otherwise, numeric values are decimal unless prefixed as noted below.
  - Hexadecimal — Prefixed with "0x" (e.g., 0x3D)
  - Binary — Prefixed with "0b" (e.g., 0b00111101)
- In the "Usage" section for each command, the command and response syntaxes are shown using different fonts. For example:
  - Command: **AT!HWID?**
  - Response: `Revision: <MajorVer> <CR>`
    `OK`
- Commands referenced from other command descriptions are shown without the leading "AT" (but the AT is still required).
  For example, **!CUSTOM=<customization>,<value>**.
- Command and response parameters:
  - <n> — Required
  - [<n>] — Optional
  - Factory default values are indicated in parameter descriptions (if applicable).
- Response formats:
  - Responses with 2+ lines are shown with a <CR> to indicate line breaks.
  - Response lines that repeat the same format for more than one line are displayed as "..."
  - For example, the **!CUSTOM** command returns the values of multiple customizations:

```
!CUSTOM:
      <customization>  <value> <CR>
      ...
OK
```

- Firmware release indications for each command — Each command includes an entry indicating when the command was first officially available, and another entry indicating when the command behavior was last updated (if applicable):
  - **"Added F/W:"** — Firmware version where the command was first available.
  - **"Updated F/W:"** — Firmware version where the command was last updated.
  - **"Deprec. F/W:"** — Firmware version where support for the command was removed. (The command may still be available, but behavior is not guaranteed.)
  - **"Removed F/W:"** — Firmware version where the command was removed from the firmware.

  For details concerning changes to command support, refer to *[10] EM919x Customer Release Notes (Doc# 4134813)* or *[11] EM929x Customer Release Notes (Doc# 4134932)*.

Document structure

Semtech proprietary commands are grouped into general categories, with each category in a specific chapter. The tables below summarize the commands for each chapter. (Note that as this document is updated, new commands are added in alphabetical order.)

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	18
!SETCND	Set AT command password	19

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
!ANTSEL (EM91)	Set/query external antenna selection configuration	22
!BAND	Select/return frequency band set	25
!BOOTHOLD	Reset modem and wait in bootloader for firmware download	30
!CUSTOM	Set/return customization settings	31
!DATALOOPBACK	Enable/disable and configure loopback mode	36
!GCFEN	Enable/disable GCF test mode	38
!GSTATUS	Return operational status	39
!HWID	Display hardware version	41
!IMAGE	Manage firmware images	42
!IMPREF	Query/set Image Management preferences	44
!LTECA (EM91)	Enable/disable LTE Carrier Aggregation	46
!LTEINFO	Display LTE network information	47

Table 1-2: Modem status commands (Continued)

Command	Description	Page
!MMWBYPASSSCAN (EM91)	Bypass the check for mmWave antennas during power ON	50
!MMWCAL (EM91)	Report mmW calibration status	51
!NRINFO	Display NR information	52
!NRPCI	Display NR PCI value(s)	59
!NVENCRYPTIMEI	Write unencrypted IMEI to modem	60
!NVPLMN	Provision/display PLMN list for Network Personalization locking	62
!PCINFO	Return power control status information	63
!PCOFFEN	Enable/return Low Power Mode control via W_DISABLE_N feature	65
!PCTEMP	Return current temperature information	66
!PCTEMPLIMITS	Set/report temperature state limit values	67
!PCVOLT	Return current power supply voltage information	68
!PCVOLTLIMITS	Set/report power supply voltage state limit values	69
!POWERDOWN	Power down (reset) module	70
!PRIID	Set/Report module PRI part number and revision	71
!RATCA (EM91)	Enable/disable CA, ENDC, and SA capability	72
!RATCONFIG	Configure Radio Access Technology (RAT) Support	73
!RESET	Reset modem	74
!RFCID	Set/query RFC related hardware IDs and board IDs	74
!RFCMBNSCAN (EM91)	Display all RFC .mbn files	77
!RFCOMBOS	Display supported CA/EN-DC combinations	79
!RFDEVSTATUS	Display all RFFE status	82
!SDPREF	Display enabled RATs and bands	84
!SELRAT	Set/query preferred RAT	86
!SKU	Display module's SKU	88
!TMCONFIG (EM91)	Configure EM91 thermal mitigation thresholds	89
!TMCONFIG (EM92)	Configure EM92 thermal mitigation thresholds	92
!TMSTATUS (EM91)	Report EM91 Thermal Mitigation Status	95
!TMSTATUS (EM92)	Report EM92 Thermal Mitigation Status	97
!USBCOMP	Set/report USB interface configuration	99
!USBPID	Set/query USB product IDs	101
!USBVID	Set/query USB vendor ID	102

Table 1-2: Modem status commands (Continued)

Command	Description	Page
!VERINFO (EM91)	Display firmware image version and security state	103
!VERINFO	Display firmware image version	105
!WDISABLE	Display the W_DISABLE_N pin status	106

Diagnostic Commands — Commands used to select frequency bands and diagnose problems.

Table 1-3: Diagnostic commands

Command	Description	Page
!BCFWUPDATESTATUS	Report status of most recent firmware update attempt	108
!GCCLR	Clear crash dump data	110
!GCDUMP	Display crash dump data	111
!IMSTESTMODE	Enable/disable IMS test mode	112
!LEDTEST	Test to switch LED on/off	113

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 1-4: Test commands

Command	Description	Page
!DACGPSCTON	Return GPS CtoN and frequency measurement	115
!DACGPSSTANDALONE	Enter/exit StandAlone (SA) RF mode	116
!DACGPSTESTMODE	Start/stop CGPS diagnostic task	117
!DAFTMACT	Put modem into Factory Test Mode	118
!DAFTMDEACT	Put modem into online mode from Factory Test Mode	119
!DAGFTMRXAGC	Get FTM Rx AGC	120
!DARCONFIG	Configure radio	122
!DARCONFIGDROP	Drop Radio Configurations	126
!DASUB6TECHACT	Start/stop 5G Sub-6 GHz technology	127
!DATXCONTROL	Configure Tx Power	128
!DATXMEASURE (EM91)	Get Tx Power (FTM mode)	131
!DAUPDATEPARAM	Update parameters to prepare for !DARCONFIG	132
!LTERXCONTROL	Enable/disable LTE receive (Rx) diversity during Carrier Aggregation	133
!RXDEN	Enable/disable WCDMA/LTE/5G Sub-6 GHz receive (Rx) diversity	135

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

Table 1-5: Memory management commands

Command	Description	Page
!CARRIERRESET	Reset carrier configuration	138
!NVBACKUP	Back up device configuration	139
!NVPERSISTRST	Configure item persistency / Reset persistent item(s)	141
!RMARESET	Restore device to saved restore point	144

GNSS Commands — Supported on GNSS-enabled modems only.

Table 1-6: GNSS commands

Command	Description	Page
!GNSSCONFIG	Configure GNSS Satellite Constellation	146
!GNSSPERMITTEDSTATE	Query GNSS feature permitted state	148
!GPSAUTOSTART	Configure GPS auto-start features	149
!GPSCLRASSIST	Clear specific GPS assistance data	150
!GPSCOLDSTART	Clear all GNSS assistance data	151
!GPSEND	End an active session	152
!GPSFIX	Initiate GPS position fix	153
!GPSLBSAPN	Set GPS LBS APNs	154
!GPSLOC	Return last known location of the modem	156
!GPSMOMETHOD	Set / report GPS MO method	158
!GPSMTLRSETTINGS	Configure response behavior to network-initiated GPS notifications	159
!GPSNIQOSTIME	Configure GPS Quality of Service timeout	160
!GPSPORTID	Set / report port ID to use over TCP/IP	161
!GPSSATINFO	Request satellite information	162
!GPSSTATUS	Request current status of a position fix session	164
!GPSSUPLURL	Set / report SUPL server URL	166
!GPSSUPLVER	Set / report SUPL server version	167
!GPSTRACK	Initiate local tracking (multiple fix) session	168
+WANT (EM92)	Configure DC bias power for GNSS dedicated antenna	170

SIM Commands — Commands used to communicate with an installed (U)SIM.

Table 1-7: SIM commands

Command	Description	Page
!IMSIM	Update AUTO-SIM matching list	175
!SIMDETPOL	Configure SIM hot swap detection	177
!UIMS	Select active SIM interface	178

Smart Transmit Commands — Commands used to configure the modem's output power.

Table 1-8: Smart Transmit commands

Command	Description	Page
!SARINTGPIOMODE	Configure DPR GPIO pull mode for Smart Transmit DSI selection	181
!SARSTATE	Set/report Smart Transmit Device State Index (DSI)	182
!SARSTATEDFLT	Set/report default Smart Transmit Device State Index (DSI)	183
!STEFS	Query ST files	184
!STSTATUS	Display ST status details	186

DM Commands — Commands used to control different DM sessions and get information about LWM2M objects.

Table 1-9: DM commands

Command	Description	Page
!DMDEBUG	Enable/disable DM-related debug log on AT port	190
!DMREAD	Get content of specified LWM2M object	191
!DMREADALL	Get content of all LWM2M objects	193
!DMSESSION	Control DM session	195
!DMSUPPORT	Enable/disable carrier DM feature	196
!HOSTDEVINFO	Configure host device details	197

DG Commands — Commands used to manage Dying Gasp SMS messages.

Table 1-10: DG commands

Command	Description	Page
!DGSMSCONTENT	Set Dying Gasp SMS Message Content	200
!DGSMSDEST	Set Dying Gasp SMS Destination Phone Number	201
!DGSTAT	Set/Clear Dying Gasp SMS Timestamp	202

2: AT Password Commands

Introduction

Many AT commands described in this document are password-protected. This chapter describes how to enter or change the password used to gain access to the protected commands.

Password Recommendation

Important — To prevent unauthorized access of extended AT commands, Semtech strongly recommends selecting a unique password (8–64 alphanumeric characters) to replace the module's default password for extended AT commands.

To change the AT command password:

1. Connect to the module's AT COM port.
2. Enable extended AT command access using the current password, and set a unique password:

```
AT!ENTERCND="<current_password>"
AT!SETCND=”<new_password>”
```

Command summary

Table 2-1 summarizes the commands that are described in detail in Table 2-2 on page 18.

Table 2-1: AT password commands

Command	Description	Page
!ENTERCND	Enable access to password-protected commands	18
!SETCND	Set AT command password	19

Command reference

Table 2-2: AT command password details

Command	
!ENTERCND	**Enable access to password-protected commands**
Description	

Use this command to enable access to password-protected commands.

Once the password has been entered correctly, the password-protected AT commands remain available until the modem is reset or powered off and on.

Important — Semtech strongly recommends changing the default password — see Password Recommendation on page 17.

Warning: ***!ENTERCND*** *does not accept blank passwords. If the password has been cleared (using !SETCND), you will not be able to use password-protected commands, and will have to contact Semtech for help to reset the password.*

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: No

Persistent across power cycles: No

Usage:

- Execution: **AT!ENTERCND=<"key">**
  Response: OK
  Purpose: Unlock password-protected commands.

Parameters:

<"key"> (Password stored in NV memory)

- Password must be entered with quotation marks (for example, **AT!ENTERCND="ExamplePW"**).
- Password length: 8–64 characters (0–9, A–Z, upper or lower case)

Table 2-2: AT command password details (Continued)

Command	
!SETCND	**Set AT command password**
Description	

Change the password that is used for the !ENTERCND command.

Important — Semtech strongly recommends changing the default password — see Password Recommendation on page 17.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage:

- Execution: **AT!SETCND=<"key">**
  Response: `OK`
  Purpose: Set the <"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"**).
- Password length: 8–64 characters (0–9, A–Z, upper or lower case)

Warning: *Do NOT enter a null password (i.e., the <"key"> cannot be "") — you will NOT be able to use password-protected commands, and will have to contact Semtech for help to reset the password.*

3: Modem Status, Customization, and Reset Commands

Introduction

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

Command summary

Table 3-1 summarizes the commands that are described in detail in Table 3-2 on page 22.

Table 3-1: Modem status commands

Command	Description	Page
!ANTSEL (EM91)	Set/query external antenna selection configuration	22
!BAND	Select/return frequency band set	25
!BOOTHOLD	Reset modem and wait in bootloader for firmware download	30
!CUSTOM	Set/return customization settings	31
!DATALOOPBACK	Enable/disable and configure loopback mode	36
!GCFEN	Enable/disable GCF test mode	38
!GSTATUS	Return operational status	39
!HWID	Display hardware version	41
!IMAGE	Manage firmware images	42
!IMPREF	Query/set Image Management preferences	44
!LTECA (EM91)	Enable/disable LTE Carrier Aggregation	46
!LTEINFO	Display LTE network information	47
!MMWBYPASSSCAN (EM91)	Bypass the check for mmWave antennas during power ON	50
!MMWCAL (EM91)	Report mmW calibration status	51
!NRINFO	Display NR information	52
!NRPCI	Display NR PCI value(s)	59
!NVENCRYPTIMEI	Write unencrypted IMEI to modem	60
!NVPLMN	Provision/display PLMN list for Network Personalization locking	62
!PCINFO	Return power control status information	63
!PCOFFEN	Enable/return Low Power Mode control via W_DISABLE_N feature	65
!PCTEMP	Return current temperature information	66
!PCTEMPLIMITS	Set/report temperature state limit values	67

Table 3-1: Modem status commands (Continued)

Command	Description	Page
!PCVOLT	Return current power supply voltage information	68
!PCVOLTLIMITS	Set/report power supply voltage state limit values	69
!POWERDOWN	Power down (reset) module	70
!PRIID	Set/Report module PRI part number and revision	71
!RATCA (EM91)	Enable/disable CA, ENDC, and SA capability	72
!RATCONFIG	Configure Radio Access Technology (RAT) Support	73
!RESET	Reset modem	74
!RFCID	Set/query RFC related hardware IDs and board IDs	75
!RFCMBNSCAN (EM91)	Display all RFC .mbn files	77
!RFCOMBOS	Display supported CA/EN-DC combinations	79
!RFDEVSTATUS	Display all RFFE status	82
!SDPREF	Display enabled RATs and bands	84
!SELRAT	Set/query preferred RAT	86
!SKU	Display module's SKU	88
!TMCONFIG (EM91)	Configure EM91 thermal mitigation thresholds	89
!TMCONFIG (EM92)	Configure EM92 thermal mitigation thresholds	92
!TMSTATUS (EM91)	Report EM91 Thermal Mitigation Status	95
!TMSTATUS (EM92)	Report EM92 Thermal Mitigation Status	97
!USBCOMP	Set/report USB interface configuration	99
!USBPID	Set/query USB product IDs	101
!USBVID	Set/query USB vendor ID	102
!VERINFO (EM91)	Display firmware image version and security state	103
!VERINFO	Display firmware image version	105
!WDISABLE	Display the W_DISABLE_N pin status	106

Command reference

Table 3-2: Modem status, customization, and reset commands

Command	
!ANTSEL (EM91)	**Set/query external antenna selection configuration**

Description

Configure the modem to use available GPIOs (antenna control signals) to select external tunable antennas for low frequency bands (< 1000 MHz) that are grouped in predefined signal paths. Semtech recommends configuring any GPIOs that are not used to select external antennas as not required.

Note: EM91 modules have 4 GPIOs (corresponding to ANT_CTRL0–ANT_CTRL3).

When the modem switches to a frequency band in a signal path that has been configured using this command, the GPIOs are driven as specified and the host uses them to tune the external antenna appropriately. This applies whether this is a primary band or the secondary component carrier as part of LTE CA (Carrier Aggregation)/5G ENDC. If the modem switches to a band that has not been configured, the host uses the default antenna.

Signal paths are defined in the following table:

Signal Path	3G Bands	4G Bands	5G Bands
0	B5, B6, B19	B5, B18, B19, B26	n5
1	B8	B8	–
2	–	B12, B17	–
3	–	B13	–
4	–	B14	–
5	–	B20	–
6	–	B28A	n28A
7	–	B28B (B80)	n28B (n90)
8	–	B29	–
9	–	B71	n71

When this command is used to set the GPIO configuration (<gpio1>, <gpio2>, <gpio3>, and <gpio4>) for a supported 3G, 4G or 5G band, the configuration is used for all bands/RATs that share the same signal path. For example, if a configuration is set for B18, which is in signal path 0, the same configuration is automatically used for all signal path 0 3G bands (B5, B6, B19), 4G bands (B5, B18, B19, B26) and 5G bands (n5).

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).
- Make sure there are no conflicts between primary (PCell) and secondary (SCell) cells for all supported LTE CA/5G ENDC combinations, since a conflict can detune the PCell during CA/ENDC, resulting in reduced performance.

  Note that a conflict occurs when the primary band is configured to drive a GPIO one way (high or low), and the secondary is configured to drive the same GPIO the other way (low or high).

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!ANTSEL (EM91) (continued)	Set/query external antenna selection configuration (continued)

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!ANTSEL=<tech_num>, <band>, <gpio1>, <gpio2>, <gpio3>, <gpio4>**
  Response: `OK`
  Purpose: Configure the GPIOs for the specified technology and band.
- Query: **AT!ANTSEL?<tech_num>**
  Response:
  ```
  <tech_num>G BAND <band a>: <gpio1>, <gpio2>, <gpio3>, <gpio4> <CR>
  <tech_num>G BAND <band b>: <gpio1>, <gpio2>, <gpio3>, <gpio4> <CR>
  ...
  Conflicts: <CR>        ← The 'Conflicts' section appears only if there are 1 or more conflicts.
  <band q> + <band r>: <gpio1>, <gpio2>, <gpio3>[, <gpio4>] <CR>
                         ↑ (Note — GPIOs in conflict appear as 'C')
  ...
  OK
  ```
  Purpose: Display the current external antenna select configuration.
- Query List: **AT!ANTSEL=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<tech_num> (Radio access technology (RAT) number)
- 3 — WCDMA
- 4 — LTE
- 5 — NR5G

<band> (RF band)
- Supports only low-frequency bands (< 1000 MHz)
- Valid values:
  - 3G: 5, 6, 8, 19
  - 4G: 5, 8, 12, 13, 14, 17, 18, 19, 20, 26, 28 (for B28A), 29, 71, 80 (for B28B)
  - 5G: 5, 28 (for n28A), 71, 90 (for n28B)

<gpio1>, <gpio2>, <gpio3>, <gpio4> (GPIO configurations)
- Valid values:
  - 0 — Logic low (Default)
  - 1 — Logic high
  - 2 — Not used for antenna selection
- Note: <gpio1>–<gpio4> correspond to ANT_CTRL0–ANT_CTRL3 respectively

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!ANTSEL (EM91) (continued)	Set/query external antenna selection configuration (continued)

Example(s):

- Display current 3G external antenna selection configuration, including conflict between bands B2 and B5:

```
AT!ANTSEL?3
3G BAND 5:  1, 1, 1, 1 <CR>
3G BAND 6:  1, 0, 1, 1 <CR>
3G BAND 19:  1, 1, 2, 2 <CR>
<CR>
Conflicts: <CR>
B5 + B6 :1, C, 1, 1 <CR>
OK
```

- Display current 4G external antenna selection configuration, with no conflicts.

```
AT!ANTSEL?4
4G BAND 5:  0, 0, 0, 0 <CR>
4G BAND 18:  0, 0, 0, 0 <CR>
4G BAND 19:  0, 0, 0, 0 <CR>
4G BAND 26:  0, 0, 0, 0 <CR>
4G BAND 71:  0, 0, 0, 0 <CR>
<CR>
OK
```

- Display current 5G external antenna selection configuration, with no conflicts.

```
AT!ANTSEL?5
4G BAND 5:  1, 1, 1, 1 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!BAND	**Select / return frequency band set**
Description	

Use this command to:

- Configure the modem to operate on a defined 'band set' (i.e., a set of frequency bands).
- Create (define) new band sets.
- Return the current configuration (display the configured band set).
- Display all defined band sets (AT!BAND=?) that the module hardware is capable of supporting. (Note — These sets do not reflect restrictions due to carrier or customer configurations.) To display the module's currently enabled bands, use !SDPREF.)

Important: *If !BAND and !SELRAT are both used, issues can occur with incompatible RAT / band combinations. To avoid issues from occurring, either !BAND must be set to 'All Bands' or !SELRAT must be set to 'Automatic'.*

Note: Configuration changes via !BAND do not affect the output of !SDPREF.

Note: The 'Basic' command and response versions described below are used if you have not entered the required password. (See Command access on page 10.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes — Execution (Extended)
Yes — Query (Extended)

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage:

- Execution (Basic):

  AT!BAND=<Index>

  Response: OK

  Purpose: Select an existing set of bands.

- Execution (Extended):

  (Create or delete a GSM/WCDMA/LTE set)

  AT!BAND=<Index>,<Operation>[,<"Name">,<RAT>,<GWmask>, <Lmask1>, <Lmask2>, <Lmask3>, <Lmask4>]

  or

  (Create or delete an NRNSA set)

  AT!BAND=<Index>,<Operation>[,<"Name">,<RAT>,<NRNSAmask1>, <NRNSAmask2>, <NRNSAmask3>, <NRNSAmask4>, <NRNSAmask5>]

  or

  (Create or delete an NRSA set)

  AT!BAND=<Index>,<Operation>[,<"Name">,<RAT>,<NRSAmask1>, <NRSAmask2>, <NRSAmask3>, <NRSAmask4>, <NRSAmask5>]

  Response: OK

  Purpose: Create a new set of bands (all parameters are required), or delete an existing set of bands (parameters inside "[ ]" are not required).

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!BAND (continued)	Select / return frequency band set (continued)

- Query: **AT!BAND?[<index>]**

  Response (Basic)

```
<Index>, <Name> <CR>
OK
```

  Response (Extended)

```
Index, Name <CR>
<Index>, <Name> <CR>
0 - GW: <GWmask> <CR>
1 - LTE: <LTEmask1> <LTEmask2> <LTEmask3> <LTEmask4> <CR>
3 - NRNSA: <NRNSAmask1> <NRNSAmask2> <NRNSAmask3> <NRNSAmask4> <NRNSAmask5>
<CR>
4 - NRSA: <NRSAmask1> <NRSAmask2> <NRSAmask3> <NRSAmask4> <NRSAmask5> <CR>
OK
```

  or

  (If the current band mask does not match a band set)

```
Unknown band mask. Use AT!BAND to set band. <CR>
<bandmask> <CR>
OK
```

  Purpose: Report the current band selection. (Note — <GWmask>, <LTEmask#>, <NRNSAmask#> and <NRSAmask#> appear only in Extended responses.)

- Query List: **AT!BAND=?**

  Purpose: Display valid parameter values.

Parameters:

<Index> (Index of a band set. Use the Query List command format to display all supported sets.)

- Valid range: 0–13 (Hexadecimal; i.e., there are 20 possible values — 0–F, 10-13)

<Operation> (Add or delete a band set)

- 0 — Delete
- 1 — Add

<Name> (Name of the band set)

- Format: ASCII string
- Length: Up to 30 characters

<RAT> (Index indicating the band set's RAT)

- 0 — GSM / WCDMA
- 1 — LTE
- 2 — Reserved (for command compatibility with other Semtech modules)
- 3 — 5G NR NSA
- 4 — 5G NR SA

<GWmask> (GSM / WCDMA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.

  0000000000000001 — BC0-A
  0000000000000002 — BC0-B
  ...
  0002000000000000 — W900
  1000000000000000 — B19 (850)

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!BAND (continued)	Select / return frequency band set (continued)

<Lmask1> (LTE bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — Band 1
    0000000000000002 — Band 2
    ...
    0000010000000000 — Band 41
    0000200000000000 — Band 46
    0000800000000000 — Band 48
- Note — The full list of bands in the set is spread across <Lmask1>–<Lmask4>.

<Lmask2> (LTE bands included in the set)

- Format: 64-bit bitmask
- Example values — Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000002 — Band 66
  - 0000000000000040 — Band 71
- Note — The full list of bands in the set is spread across <Lmask1>–<Lmask4>.

<Lmask3> (Reserved for future use)

- Format: 64-bit bitmask
- Required value: 0000000000000000
- Note — The full list of bands in the set is spread across <Lmask1>–<Lmask4>.

<Lmask4> (Reserved for future use)

- Format: 64-bit bitmask
- Required value: 0000000000000000
- Note — The full list of bands in the set is spread across <Lmask1>–<Lmask4>.

<NRNSAmask1> (NRNSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n1
    ...
    8000000000000000 — n64
- Note — The full list of bands in the set is spread across <NRNSAmask1>–<NRNSAmask5>.

<NRNSAmask2> (NRNSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n65
    ...
    8000000000000000 — n128
- Note — The full list of bands in the set is spread across <NRNSAmask1>–<NRNSAmask5>.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!BAND (continued)	Select / return frequency band set (continued)

<NRNSAmask3> (NRNSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n129
    ...
    8000000000000000 — n192
- Note — The full list of bands in the set is spread across <NRNSAmask1>–<NRNSAmask5>.

<NRNSAmask4> (NRNSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n193
    ...
    8000000000000000 — n256
- Note — The full list of bands in the set is spread across <NRNSAmask1>–<NRNSAmask5>.

<NRNSAmask5> (NRNSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n257
    ...
    8000000000000000 — n320
- Note — The full list of bands in the set is spread across <NRNSAmask1>–<NRNSAmask5>.

<NRSAmask1> (NRSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n1
    ...
    8000000000000000 — n64
- Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>.

<NRSAmask2> (NRSA bands included in the set)

- Format: 64-bit bitmask
- Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format.
  - 0000000000000001 — n65
    ...
    8000000000000000 — n128
- Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!BAND (continued)	Select / return frequency band set (continued)
<NRSAmask3> (NRSA bands included in the set) • Format: 64-bit bitmask • Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format. ▪ 0000000000000001 — n129 ... 8000000000000000 — n192 • Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>. <NRSAmask4> (NRSA bands included in the set) • Format: 64-bit bitmask • Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format. ▪ 0000000000000001 — n193 ... 8000000000000000 — n256 • Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>. <NRSAmask5> (NRSA bands included in the set) • Format: 64-bit bitmask • Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format. ▪ 0000000000000001 — n257 ... 8000000000000000 — n320 • Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>. <NRSAmask5> (NRSA bands included in the set) • Format: 64-bit bitmask • Example values — This list is an example only and does not show all possible bands. Available bands are device-dependent. To display the list of bands available for your device, use !ENTERCND to enable access to password-protected commands, and then use the Query command format. ▪ 0000000000000001 — n257 ... 8000000000000000 — n320 • Note — The full list of bands in the set is spread across <NRSAmask1>–<NRSAmask5>.	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!BOOTHOLD	**Reset modem and wait in bootloader for firmware download**
Description	
Prepare for a firmware download by resetting the modem and waiting in "boot and hold" mode. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** Automatic **Persistent across power cycles:** n/a **Usage:** ▪ Execution: **AT!BOOTHOLD** Response: `OK` Purpose: Force the modem to reset and then wait in boot and hold mode for a firmware download.	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!CUSTOM	**Set / return customization settings**

Description

Set (configure) or return several customization values.

Note: Some customizations may not be available for certain chipsets, firmware revisions, or devices.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.17.02.00 (Release 7)
Password required: Yes (Execution)
No (Query)
Reset required to apply changes: Variable (refer to <customization> descriptions)
Persistent across power cycles: Yes

Usage:

- Execution: **AT!CUSTOM=<customization>, <value>**
  Response: OK
  Purpose: Assign <value> to a specific <customization> setting.
- Query: **AT!CUSTOM?**
  Response:
  ```
  !CUSTOM: <CR>
          <customization>     <value> <CR>
          ... <CR>
  OK
  ```
  Purpose: Display a list of all customizations that are currently enabled.
- 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 listed below.
- Numeric value. Valid range depends on the <customization> type.

<customization> (String identifying customization setting.)

- **Note —** For the Execution command format, quotation marks are required around the <customization> string. For example: **!CUSTOM="GPSENABLE",0**
- "BOOTQUIETDISABLE" — Enable / disable the boot quiet feature, which determines if the kernel log is printed.
  <value>:
  - 0 — Enable (i.e., do not print the kernel log) (Default)
  - 1 — Disable (i.e., print the kernel log)
  - Reset required to apply changes: Yes
- "CFUNPERSISTEN" — Enable / disable persistence (across power cycles) of the **+CFUN** setting.
  <value>:
  - 0 — Disable (**+CFUN** setting does not persist across power cycle) (Default)
  - 1 — Enable (**+CFUN** setting persists across power cycle)
  - Reset required to apply changes: Yes

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!CUSTOM (continued)	Set / return customization settings (continued)

- "DGENABLE" — Enable / disable 'Dying Gasp' feature
  <value>:
  - 0 — Disable the Dying Gasp feature (Default)
  - 1 — Enable. When Dying Gasp is triggered, send an SMS.
  - 2 — Enable. When Dying Gasp is triggered, request a device detach from the network.
  - 3 — Enable. When Dying Gasp is triggered, send an SMS and request a device detach from the thetwork.
  - Note: When Dying Gasp is enabled (i.e., <value>=1–3):
    - The W_DISABLE_N pin can be used to trigger the Dying Gasp.
    - The W_DISABLE_N pin cannot be used to control the radio power state, so the W_DISABLE LPM voter status is ignored in the !PCINFO? response.
    - The current state of the W_DISABLE_N pin can be displayed in the !WDISABLE response.
  - Reset required to apply changes: Yes
- "DHCPRELAYENABLE" — Enable / disable DHCP Relay feature
  <value>:
  - 0 — Disable (Default). Modem filters DHCP requests to the internal DHCP server.
  - 1 — Enable. DHCP requests go out over the network.
  - Reset required to apply changes: Yes
- "DIAGENABLE" — Enable / disable diagnostic (DIAG) interface
  <value>:
  - 0 — DIAG logging disabled (Default)
  - 1 — DIAG logging enabled
  - 128 — Dynamic DIAG enable based on debug policy
  - Reset required to apply changes: Yes
- "GPIOSARENABLE" — Configure Smart Transmit (ST) Device State Index (DSI — exposure scenario) selection method
  <value>:
  - 0 — Selection controlled by AT command — !SARSTATE (Default).
  - 1 — Selection controlled by GPIO — DPR (pin 25). DPR behaviour is configured using !SARINTGPIOMODE.
  - Note: If GPIOSARENABLE is switched from 0 to 1 (controlled by GPIO), the device must be reset for the change to take effect.
  - Reset required to apply changes: Yes
- "GPSENABLE" — Enable / disable the GNSS feature.
  <value>:
  - 0 — GNSS disabled
  - 1 — MO & MT enabled regardless of GPS_DISABLE pin status (Default)
  - 2 — MO enabled regardless of GPS_DISABLE pin status
  - 3 — MT enabled regardless of GPS_DISABLE pin status
  - 4 — MO & MT enabled when the GPS_DISABLE pin is not asserted
  - 5 — MO enabled when the GPS_DISABLE pin is not asserted
  - 6 — MT enabled when the GPS_DISABLE pin is not asserted
  - Reset required to apply changes: Yes
- "GPSLPM" — Enable / disable GPS in Low Power Mode.
  <value>:
  - 0 — Enable. GPS engine remains enabled when modem enters LPM (Default)
  - 1 — Disable. GPS engine is disabled when modem enters LPM
  - Reset required to apply changes: Yes

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!CUSTOM (continued)	Set / return customization settings (continued)
• "GPSSEL" — Select GPS antenna (useful only for devices with both a dedicated GPS antenna and a shared GPS antenna). <value>: ▪ 0 — Use the EM9293 dedicated GPS antenna "GNSS" (Default) Note: When this antenna is selected, DC bias power can optionally be applied to enhance the received RF signal — see +WANT (EM92). ▪ 1 — Use the EM9293 shared GPS / Rx diversity antenna "ANT1". ▪ Reset required to apply changes: Yes • "ICMPINTSRVDIS" — Enable / disable incoming ping reply. <value>: ▪ 0 — Enable incoming ping reply ▪ 1 — Disable incoming ping reply for IPv4 (Default) ▪ Note: When a test SIM is used with the module, this customization is ignored, and the module operates as if option 0 (Enable incoming ping reply) is set. (This occurs when the module transitions to online mode.) ▪ Note: This customization does not disable incoming ping replies for IPv6. ▪ Reset required to apply changes: Yes • "IMCONFIG" — Configure IM (Image Switch) feature. <value>: ▪ 0 — Image switch for boot and modem ▪ 1 — Disable device-based IM feature ▪ 2 — Image switch for all images (Default) ▪ Reset required to apply changes: Yes • "IPCHANNELRATEEN" — Enable/disable IP channel rate feature. <value>: ▪ 0 — Disable (Default) ▪ 1 — Enable ▪ Reset required to apply changes: Yes • "IPV6ENABLE" — Enable / disable IPV6 support. <value>: ▪ 0 — Disable IPV6 ▪ 1 — Enable IPV6 (Default) ▪ Reset required to apply changes: Yes (Continued on next page)	

Table 3-2: Modem status, customization, and reset commands (Continued)

!CUSTOM (continued)	Set / return customization settings (continued)

- "MBIMMODE" — Enable / disable MBIM mode for data path initialization.
  <value>:
  - 0 — Disable (Default)
  - 1 — Enable
  - Reset required to apply changes: Yes
- "PCSCDISABLE" — Configure PCSC / Authentication features (bitmap value)
  <value>:
  - Valid range: 0–7. Set bits to disable functions:
    - Bit 0 — Disable PCSC (Default: 0 — Enabled)
    - Bit 1 — Disable GSM Algorithm and Authenticate commands (Default: 0 — Enabled)
    - Bit 2 — Disable +CIMI from outputting IMSI (Default: 0 — Enabled)
  - Default: 0 (All functions enabled)
  - Reset required to apply changes: Yes
- "QXDMLOGENABLE" (EM91 only) — Enable/disable QXDM log. This setting takes effect immediately without power cycle.

  DEPRECATED: This customization is deprecated as of SWIX55C_03.17.02.00 (Release 7). Use the DIAGENABLE (page 32) customization instead.

  <value>:
  - 0 — Disable QXDM log (Default)
  - 1 — Enable QXDM log
  - Reset required to apply changes: Yes
- "SIMHOTSWAPDIS" — Configure the SIM hotswap feature for UIM1 and UIM2.
  Note: If the UIM2ENABLE customization disables UIM2 slot support or enables the eSIM on UIM2, this customization affects only the UIM1 SIM.
  <value>:
  - 0 — Enable hotswap for UIM1 and UIM2
  - 1 — Disable hotswap for UIM1, and enable hotswap for UIM2
  - 2 — Enable hotswap for UIM1, and disable hotswap for UIM2 (Default)
  - 3 — Disable hotswap for UIM1 and UIM2
  - Reset required to apply changes: Yes
- "SIMLPA" (Enable / disable LPA (Local Profile Assistant) eSIM feature on the host
  <value>:
  - 0 — Disable (Default)
  - 1 — Enable
  - Reset required to apply changes: Yes
- "SIMLPM" — Indicate default SIM power state during Low Power Mode.
  <value>:
  - 0 — QCT default behavior (same as <value>=2)
  - 1 — SIM remains powered in LPM (Default)
  - 2 — Power down SIM with **AT+CFUN=0**; Power up SIM with **AT+CFUN=1**
  - Reset required to apply changes: Yes

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!CUSTOM (continued)	Set / return customization settings (continued)
• "UIM2ENABLE" — Configure UIM2 slot operation. <value>: ▪ 0 — Disable UIM2 (Default) ▪ 1 — Device-dependent: ▪ EM91: Enable the module's internal eSIM on UIM2 slot. (i.e., An eSIM is enabled on UIM2.) ▪ EM92: Enable UIM2 on an external SIM slot. (i.e., A second external SIM is enabled on UIM2.) Note: When <value>=1, the SIM hotswap feature for UIM2 is set in the SIMHOTSWAPDIS customization. ▪ 2 — Enable eSIM on UIM2 slot (i.e., An eSIM is enabled on UIM2.) Note: When <value>=2: ▪ The SIM hotswap feature for UIM2 is disabled, regardless of how it is set in the SIMHOTSWAPDIS customization. ▪ The external SIM2 (if there is one present) must be removed. ▪ Reset required to apply changes: Yes • "UIMAUTOSWITCH" — (EM92 only) Enable / disable automatic SIM switching. <value>: ▪ 0 — Disable automatic SIM switching (Default) ▪ 1 — Enable, UIM1 preferred ▪ 2 — Enable, UIM2 preferred ▪ Reset required to apply changes: Yes • "USBSERIALENABLE" — Serial number to be used in the USB descriptor (USBD) <value>: ▪ 0 — Same as <value>=1 (Default) ▪ 1 — Use IMEI as the serial number in the USBD. ▪ 2 — Do not use any serial number in the USBD. ▪ Reset required to apply changes: Yes • "WAKEHOSTEN" — 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. ▪ Reset required to apply changes: Yes	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!DATALOOPBACK	**Enable / disable and configure loopback mode**

Description

Enable or disable loopback mode and the loopback multiplier, or display the current settings.

This feature is typically used to test the module↔host interface without requiring an OTA data connection.

When loopback is enabled, the EM9 receives input traffic from the host (i.e., uplink (UL)) and echoes it back to the host as output traffic (i.e., downlink (DL)). The <loopback_multiplier> option controls the number of copies the EM9 sends as output traffic.

For example, to simulate a possible real-world scenario with max UL throughput = 250 Mbps and max DL throughput = 1000 Mbps, data loopback mode can be enabled with the multiplier set to 4 (i.e., 4 x 250 Mbps UL = 1000 Mbps DL).

Note: The data loopback feature might affect 3G / 4G / 5G registration or other features — disable it when you don't need it.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.17.02.00 (Release 7)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage Notes:

- When setting the <loopback_multiplier>, limit the overall throughput rate to the maximum expected throughput.

Usage:

- Execution: **AT!DATALOOPBACK=<loopback_mode>[, <loopback_multiplier>[,<sys_mode>[,<nr5g_only]]]**
  Response: `OK`
  Purpose: Enable / disable loopback mode, and set the loopback multiplier.
- Query: **AT!DATALOOPBACK?**
  Response: `!DATALOOPBACK: <loopback_mode>,<loopback_multiplier>,<sys_mod>,<nr5g_only>`
  `<CR>`
  `OK`
  Purpose: Display the loopback mode settings.
- Query List: **AT!DATALOOPBACK=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<loopback_mode> (Loopback mode state)

- 0 — Disable data loopback mode (Default)
- 1 — Enable data loopback mode

<loopback_multiplier> (Number of downlink bytes sent to the host for each uplink byte received by the module — i.e., replication count)

- Decimal value
- Parameter is used only for <loopback_mode>=1
- Valid ranges: 1–4294967295
  Note: The functional loopback_multiplier limit is ~900. Larger values are not guaranteed to increase the resulting replication count.
  Recommendation: Limit the overall throughput rate to the maximum expected throughput.
- Default (if not specified): 1

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!DATALOOPBACK (continued)	Enable / disable and configure loopback mode (continued)
<sys_mode> (System mode being tested) • 3 — WCDMA • 4 — LTE • 5 — 5G • **Important:** To guarantee correct internal loopback setup, make sure to use the correct RAT from the options above. If <sys_mode> is not specified, default values are used — 0 (Unused) for non-5G NR platforms, or 4 (LTE) for 5G NR platforms. <nr5g_only> (Bearer setup direction being tested) • Note: This option applies only when <sys_mode> = 5 (5G). • 1 — MCG (Master Cell Group) • 2 — SCG (Secondary Cell Group) • 3 — UL_MCG_SPLIT_DL (Master Cell Group split bearer) • 4 — UL_SCG_SPLIT_DL (Secondary Cell Group split bearer) • **Note:** For non-5G NR platforms, or for 5G NR platforms when not in 5G, <nr5g_only> defaults to 0 (Unset). When in 5G, if <nr5g_only> is not specified, <nr5g_only> defaults to 2 (SCG).	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!GCFEN	Enable / disable GCF test mode
Description	
DEPRECATED: This command is deprecated for EM91 and EM92. GCF test mode is driven by the use of a test SIM.	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!GSTATUS	**Return operational status**

Description

Return specific details about the current operational status of the modem. The response details vary depending on the current RAT. Contact Semtech for further details if required.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6) EM92: SWIX65C_02.17.08.00 (Release 6)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Notes:

- (EM91) The Thermal Mitigation Level (<mitlvl>) row appears for EM91 only, and is the maximum mitigation level from all sources. For detailed mitigation information, use !TMSTATUS (EM91).

  (EM92) For detailed thermal mitigation information, use !TMSTATUS (EM92).
- Tx power values (PCC Tx Power, SCCx Tx Power, SCCx NR5G Tx Power) are indicated by the <txpwr> parameter, which represents the input power to antennas in dBm.
- When the response is for LTE/NR5G, the LTE Tx power is reported as PCC Tx Power, and the NR Tx power is reported as SCC1 NR5G Tx Power.

Usage:

- Query: **AT!GSTATUS?**

  Response: *// Example shown is for ENDC; fields will vary depending on RAT;*
  // SSCx will be displayed only when the SSC is activated.)

```
!GSTATUS: <CR>
Current Time:  <ctime>      Temperature: <temp> <CR>
Thermal Mitigation Level:    <mitlvl> <CR> ← Row appears for EM91 only. (Blank for EM92)
Reset Counter: <rcounter>   Mode:        <mode> <CR>
System mode:   <smode>      PS state:    <PSstate> <CR>
LTE band:      <lband>      LTE bw:      <lbw> <CR>
LTE Rx chan:   <lrchan>     LTE Tx chan: <ltchan> <CR>
LTE SSC1 state: <castate>   LTE SSC1 band: <lband> <CR>
LTE SSC1 bw: <lbw>          LTE SSC1 Rx chan: <lrchan> <CR>
LTE SSC1 UL Configured: <lucon>  LTE SSC1 Tx chan: <ltchan> <CR>
… <CR>
LTE SSCn state: <castate>   LTE SSCn band: <lband> <CR>
LTE SSCn bw: <lbw>          LTE SSCn Rx chan: <lrchan> <CR>
LTE SSCn UL Configured: <lucon>  LTE SSCn Tx chan: <ltchan> <CR>
EMM state:     <emmstate>  <emmsubstate> <CR>
RRC state:<rrcconn>  <CR>
IMS Reg State: <imsstate>   IMS mode:    <ims mode> <CR>
IMS Srv State: <imssrvstate> <CR>
<CR>
PCC Rx0 RSSI: <rssi>        PCC Rx0 RSRP: <rsrp> <CR>
PCC Rx1 RSSI: <rssi>        PCC Rx1 RSRP: <rsrp> <CR>
PCC Rx2 RSSI: <rssi>        PCC Rx2 RSRP: <rsrp> <CR>
PCC Rx3 RSSI: <rssi>        PCC Rx3 RSRP: <rsrp> <CR>
```

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!GSTATUS (continued)	Return operational status (continued)

```
SCC1 Rx0 RSSI: <rssi>              SCC1 Rx0 RSRP: <rsrp> <CR>
SCC1 Rx1 RSSI: <rssi>              SCC1 Rx1 RSRP: <rsrp> <CR>
SCC1 Rx2 RSSI: <rssi>              SCC1 Rx2 RSRP: <rsrp> <CR>
SCC1 Rx3 RSSI: <rssi>              SCC1 Rx3 RSRP: <rsrp> <CR>
… <CR>
SCCn Rx0 RSSI: <rssi>              SCCn Rx0 RSRP: <rsrp> <CR>
SCCn Rx1 RSSI: <rssi>              SCCn Rx1 RSRP: <rsrp> <CR>
SCCn Rx2 RSSI: <rssi>              SCCn Rx2 RSRP: <rsrp> <CR>
SCCn Rx3 RSSI: <rssi>              SCCn Rx3 RSRP: <rsrp> <CR>
PCC Tx Power: <txpwr>              TAC: <tac> <CR>
SCC1 Tx Power: <txpwr> <CR>
… <CR>
SCCx Tx Power: <txpwr> <CR>
RSRQ (dB): <rsrq>                  Cell ID: <Cell ID> <CR>
SINR (dB): <sinr> <CR>
 <CR>
SCC1 NR5G band: <nrband>     SCC1 NR5G bw: <nrbw> <CR>
SCC1 NR5G Tx Power: <txpwr>  SCC1 NR5G Tx chan: <nrtxchan> <CR>
SCC1 NR5G Rx chan: <nrrxchan> <CR>
… <CR>
SCCn NR5G band: <nrband>     SCCn NR5G bw: <nrbw> <CR>
SCCn NR5G Tx Power: <txpwr>  SCCn NR5G Tx chan: <nrtxchan> <CR>
SCCn NR5G Rx chan: <nrrxchan> <CR>
NR5G RSRP (dBm): <rsrp>      NR5G RSRQ (dB): <rsrq> <CR>
NR5G SINR (dB): <sinr> <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!HWID	**Display hardware version**
Description	
Display the device's hardware version number. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** Yes **Reset required to apply changes:** n/a **Persistent across power cycles:** n/a **Usage:** ▪ Query: **AT!HWID?** Response: `Revision: <MajorVer> <CR>` `OK` Purpose: Display hardware version number. ▪ Query List: **AT!HWID=?** Purpose: Display the Query command format. **Parameters:** <MajorVer> (Major versioning number) • 0–9	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!IMAGE	**Manage firmware images**

Description

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.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes

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 <CR>
<ty> <slot> <status> <lru> <f1> <f2> <unique_id> <build_id> <CR>
... <CR>
Max FW images: <max_fw> <CR>
Active FW image is at slot <slot> <CR>
<CR>
TYPE  SLOT   STATUS   LRU  FAILURES   UNIQUE_ID   BUILD_ID <CR>
<ty> <slot> <status> <lru> <f1> <f2> <unique_id> <build_id> <CR>
... <CR>
Max PRI images: <max_fpri> <CR>
<CR>
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 — CONFIG (PRI configuration)
- This is used in the Execution format. It corresponds to <ty> in the Query response.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!IMAGE (continued)	Manage firmware images (continued)

<slot> (Firmware image slot ID)
- Valid range: 0–FF
- Field is ignored for PRI images in the execution format

<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")

<ty> (Image type)
- "FW" — Firmware
- "PRI" — PRI configuration
- This is used in the Query response. It corresponds to <type> in the Execution format.

<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> (Maximum number of firmware images that can be stored)
- Device-dependent

<max_pri> (Maximum number of PRI images that can be stored)
- Device-dependent

Example(s):

- Delete all stored FW and PRI images:
  AT!IMAGE=0
- Delete all stored FW images:
  AT!IMAGE=0,0
- Delete FW at slot 2
  AT!IMAGE=0,0,2
- Delete a particular PRI by build/unique ID:
  AT!IMAGE=0,1,,"01.00.01.00_SWISSCOM","000.001_000"
- Display lists of FW and PRI images:

```
AT!IMAGE?
TYPE SLOT STATUS LRU FAILURES UNIQUE_ID   BUILD_ID <CR>
FW   1    GOOD   1   0 0      ?_?         01.01.00.00_? <CR>
FW   2    GOOD   2   0 0      ?_?         00.00.05.05_? <CR>
FW   3    EMPTY  0   0 0 <CR>
Max FW images: 3 <CR>
Active FW image is at slot 2 <CR>
<CR>
TYPE SLOT STATUS LRU FAILURES UNIQUE_ID   BUILD_ID <CR>
PRI  FF   GOOD   0   0 0      000.000_000 01.01.00.00_GENERIC <CR>
PRI  FF   GOOD   0   0 0      005.027_000 00.00.05.05_TMO <CR>
Max PRI images: 50 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!IMPREF	**Query / set Image Management preferences**

Description

Indicate which firmware image (firmware plus carrier configuration) should be selected from those available on the device. Use the Query command format to list the configuration pairs that are currently downloaded and preferred.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!IMPREF = "<preference>"**
  Response: OK
  Purpose: Indicate the preferred image (i.e., the image that should be used).
- Query: **AT!IMPREF?**
  Response:!

```
!IMPREF: <CR>
preferred fw version: <firmware-ver> <CR>
preferred carrier name: <carrier-name> <CR>
preferred config name: <carrier-config> <CR>
preferred subpri index: <carrier-sub-config> <CR>
current fw version: <firmware-ver> <CR>
current carrier name: <carrier-name> <CR>
current config name: <carrier-config> <CR>
current subpri index: <carrier-sub-config> <CR>
<CR>
[<mismatch information> <CR>]
OK
```

or

```
!IMPREF <CR>
<invalid image> <CR>
OK
```

  Purpose: Query (show) the preferred and current images (firmware plus carrier configuration pairs). If they are not set, display the <mismatch_information>.

Parameters:

<preference> (Preferred carrier)
- ASCII string (quotation marks required)
- Valid values:
  - <carrier-name> — Module will search for a matching carrier PRI and the firmware required for that PRI. If found, the new image preference is set.
  - "AUTO-SIM" — Enable SIM-based switching. (To disable SIM-based switching, select a <carrier-name> instead.
  - e.g., "GENERIC"

<carrier-name> (Unique code identifying the carrier that the firmware was designed for)
- ASCII string

<firmware-ver> (Unique firmware version number assigned by Semtech)
- ASCII string

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!IMPREF (continued)	Query / set Image Management preferences (continued)
<carrier-config> (Unique code identifying the carrier and configuration details) • ASCII string <carrier-sub-config> (Sub-configuration for carrier PRI for custom ICCID / IMSI ranges) • ASCII string <mismatch information> (Message indicating a field mismatch between the current and preferred image settings) • ASCII string (quotation marks do not appear): ▪ "fw version mismatch" ▪ "carrier name mismatch" ▪ "config name mismatch" <invalid image> (Message indicating an image does not exist) • ASCII string (quotation marks do not appear): ▪ "preferred image setting does not exist" ▪ "current image setting does not exist" **Example(s):** ▪ **`AT!IMPREF="ABC"`** ← *where "ABC" is a carrier name* ▪ **`AT!IMPREF="AUTO-SIM"`** ← *enable SIM-based switching*	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!LTECA (EM91)	**Enable / disable LTE Carrier Aggregation**
Description	
Enable or disable LTE Carrier Aggregation (CA) capability.	

Supporting EM9 devices: EM91
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: n/a
Password required: No
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!LTECA=<ca_state>**
  Response: OK
  Purpose: Enable or disable LTE CA capability.
- Query: **AT!LTECA?**
  Response:
  ```
  LTECA: <CR>
  CA:<ca_state> <CR>
  OK
  ```
  Purpose: Return the current state of LTE CA capability.
- Query List: **AT!LTECA=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<ca_state> (Enable / disable LTE CA)

- 0 — Disable CA
- 1 — Enable CA (Default)

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!LTEINFO	**Display LTE network information**
Description	

Display LTE network information.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_02.08.01.00 (Release 2)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!LTEINFO?**

Response:

```
!LTEINFO: <CR>
Serving: EARFCN   MCC   MNC   TAC   CID   Bd   D   U   SNR   PCI
    RSRQ   RSRP   RSSI   RXLV <CR>
        <earfcn> <mcc> <mnc> <tac> <cid> <bd> <d> <u> <snr> <pci>
   <rsrq> <rsrp> <rssi> <rxlv> <CR>
IntraFreq: PCI  RSRQ   RSRP   RSSI RXLV <CR>
<pci> <rsrq> <rsrp> <rssi> <rxlv>   <CR>
InterFreq: EARFCN   ThresholdLow   ThresholdHi   Priority   PCI
    RSRQ   RSRP   RSSI   RXLV <CR>
          <earfcn> <thresholdlow> <thresholdhi> <priority> <pci>
   <rsrq> <rsrp> <rssi> <rxlv> <CR>
CA SCell: EARFCN   SCID   Bd   ST   D   U   Mdl   Mul   PCI   RSRP
    RSSI   SINR <CR>
         <earfcn> <scid> <bd> <st> <d> <u> <mdl> <mul> <pci> <rsrp>
   <rssi> <sinr> <CR>
WCDMA: UARFCN   ThreshL   ThreshH   Prio   PSC   RSCP   ECN0
    RXLV <CR>
      <uarfcn> <threshl> <threshh> <prio> <psc> <rscp> <ecn0>
   <rxlv> <CR>
OK
```

or

```
!LTEINFO: Unavailable <CR>          ← Device is in non-LTE service
OK
```

or

```
!LTEINFO: <CR>
ERROR                   ← Device has no service
```

Purpose: Display LTE network information for the LTE Serving Cell (including Intra-band and Inter-band), CA Serving Cell, and WCDMA Serving Cell.

Parameters:

<earfcn> (LTE RF channel of the serving cell (E-UTRA absolute radio frequency channel number))

- 0–65535

<mcc> (Mobile country code)

- 3-digit code

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!LTEINFO (continued)	Display LTE network information (continued)
<mnc> (Mobile network code) • 2-digit or 3-digit code <tac> (Tracking area code) • 0–65535 <cid> (Serving cell global ID) • 8-character hex code (00000000—FFFFFFFF) <bd> (Serving cell operating band) • 1–64 <d> (DL bandwidth) • 0 — 1.4 MHz • 1 — 3 MHz • 2 — 5 MHz • 3 — 10 MHz • 4 — 15 MHz • 5 — 20 MHz <u> (UL bandwidth) • 0 — 1.4 MHz • 1 — 3 MHz • 2 — 5 MHz • 3 — 10 MHz • 4 — 15 MHz • 5 — 20 MHz <snr> (Average reference signal signal-to-noise ratio (RSSNR) of the serving cell over last measurement period, in decibels) • -10 to 30 <pci> (Physical cell ID) • 0–503 <rsrq> (Current Reference Signal Receive Quality in dB, as measured by L1) • -3 to -19.5 <rsrp> (Current Reference Signal Receive Power in dBm x10 as measured by L1) • -144 to -40 <rssi> (Current Received Signal Strength Indication in dBm, as measured by L1) • Total received wide-band power • 16-bit decimal <rxlv> (Suitable receive level) • 16-bit decimal <thresholdlow> (Lower receive level threshold for reselection) • 8-bit decimal <thresholdhi> (Higher receive level threshold for reselection) • 8-bit decimal <priority> (Cell reselection priority) • 8-bit decimal (Continued on next page)	

Table 3-2: Modem status, customization, and reset commands (Continued)

!LTEINFO (continued)	Display LTE network information (continued)
<scid> (Secondary Component Carrier ID) • 0–503 <st> (State of the secondary cell) • 0 — Init • 1 — Configured • 2 — Active <mdl> (Number of downlink MIMO layers) • 0–4 <mul> (Number of uplink MIMO layers) • 0–4 <sinr> (Signal to interference plus noise ratio, in 1/5 dB) • Logarithmic value of SINR • Range: 0–250 (corresponds to -20 dB to +30 dB) <uarfcn> (WCDMA RF channel number) • 3GPP channel number • 16-bit decimal <psc> (Scrambling code) • 16-bit decimal <rscp> (Absolute power level of the common pilot channel (CPICH) as received by the UE, in dBm x10) • 16-bit decimal <ecn0> (Energy per chip over the noise) • 16-bit decimal	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!MMWBYPASSSCAN (EM91)	**Bypass the check for mmWave antennas during power ON**

Description

By default, during the module power-on sequence, the module's mmWave antenna modules are scanned to ensure they are functioning properly. If any modules are scanned and found to be missing, damaged, etc., mmWave functionality is disabled.

However, mmWave functionality can be maintained by using this command to bypass known missing or damaged modules during the scan.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4)
Password required: Yes (Execution)
No (Query)
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!MMWBYPASSSCAN=<device>,<enable>**
  Response: `OK`
  Purpose: Explicitly exclude or include the mmWave <device> during the module's power-on sequence.
- Query: **AT!MMWBYPASSSCAN?**
  Response:
  ```
  DEVICE < device>: <enable> <CR>
  … <CR>
  DEVICE < device>: <enable> <CR>
  OK
  ```
  Purpose: Display the scan setting (enabled or disabled) of all devices that have been configured. (i.e., only devices that have been explicitly enabled or disabled will be listed)
- Query List: **AT!MMWBYPASSSCAN=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<device> (mmW device to configure)
- Valid values:
  - Low power design: 1–8
  - High power design: 1–16

<enable> (Include or exclude (bypass) the <device> in the power-on scan):
- 0 — Include device in scan (i.e., The device will not be bypassed in the power on scan.)
- 1 — Exclude device from scan (i.e., mmW will not be disabled even if the device is missing or damaged.)

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!MMWCAL (EM91)	**Report mmW calibration status**
Description	

Use this command to indicate if mmW calibration has been performed since the module was originally factory-calibrated at Semtech.

Note: mmW calibration is done by users using the processes described in [6] EM9190 High Power mmWave RF Customization File Preparation (Doc# 2174282) or [7] EM9190 Low Power mmWave RF Customization File Preparation (Doc# 2174286). After performing mmW calibration, users are advised to back up the calibration using !NVBACKUP with <restore_point>=2.

Supporting EM9 devices: EM9190
Added F/W: EM91: Release 1 (SWIX55C_01.07.08.00) EM92: n/a
Updated F/W: EM91: SWIX55C_03.17.02.00 (Release 7)
Password required: Yes
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage Requirements:

- This command requires that calibration be performed using version 3 (or higher) of the .xtt tool indicated in the documents mentioned above. Modules calibrated using earlier versions will always return 0.

Usage:

- Query: **AT!MMWCAL?**
  Response:
  ```
  !MMWCAL: <calibrated>,<rfcid>,<rfc_version>,<tool_version> <CR>
  OK
  ```
  Purpose: Indicate whether or not the module has been calibrated by the user using version 3 (or higher) of the .xtt tool indicated in the documents mentioned above.

Parameters:

<calibrated> (Module calibration status)
- 0 — SWIR factory-calibrated
- 1 — Customer-calibrated

<rfcid> (RFC ID)
- Decimal

<rfc_version> (RFC Version)
- Decimal

<tool_version> (Web char tool version used to generate the codebook)
- Decimal

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!NRINFO	**Display NR information**

Description

Display the NR (5G Sub-6 GHz or 5G mmW) information of the device.

Supporting EM9 devices: All (except EM7690)
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.17.02.00 (Release 7)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query (no 5G): **AT!NRINFO?**

Response:

```
!NRINFO:  <CR>
Connectivity Mode: --- <CR>        ← The Connectivity Mode row repeats as shown
                                     in this example, only for the "no 5G" case.
<CR>
Connectivity Mode: --- <CR>
<CR>
NR5G Cell ID:     --- <CR>
[NR5G MCC-MNC:     --- <CR>]       ← Appears only for EM91 devices
NR5G band:        ---             NR5G Carrier ID: --- <CR>
NR5G dl bw:       ---             NR5G ul bw:      --- <CR>
NR5G Tx Power:    ---             NR5G Tx chan:    --- <CR>
NR5G Rx chan:     --- <CR>
NR5G dl MIMO:     ---             NR5G ul MIMO:    --- <CR>
NR5G(sub6) RxM RSSI (dBm):   ---                      NR5G(sub6) RxD RSSI
(dBm):   --- <CR>
NR5G(sub6) RxM1 RSSI (dBm):  ---                NR5G(sub6) RxD1 RSSI (dBm):
--- <CR>
NR5G(mmw) Rx0 RSSI (dBm):    ---                      NR5G(mmw) Rx1 RSSI
(dBm):   --- <CR>
<CR>
NR5G RSRP (dBm): ---             NR5G RSRQ (dB):  --- <CR>
NR5G SINR (dB):  --- <CR>
OK
```

Purpose: Display all 5G Sub-6 GHz and 5G mmW field labels when there is no available 5G.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)

- Query (5G Sub-6 GHz): **AT!NRINFO?**

Response:
```
!NRINFO: <CR>
Connectivity Mode: <mode> <CR>
<CR>
NR5G Cell ID:    <cell id> <CR>
[NR5G MCC-MNC:    <mcc_mnc> <CR>]    ← Appears only for EM91 devices in 5G Sub-6 GHz SA mode.
NR5G band:       <band>         NR5G Carrier ID:   <cid> <CR>
NR5G dl bw:      <dl_bw>        NR5G ul bw:      <ul_bw> <CR>
NR5G Tx Power:   <TxPower>      NR5G Tx chan:    <TxChan> <CR>
NR5G Rx chan:    <RxChan> <CR>
NR5G dl MIMO:    <dlMaxMimo>    NR5G ul MIMO:    <ulMaxMimo> <CR>
NR5G(sub6) RxM RSSI (dBm):   <rssi>            NR5G(sub6) RxD RSSI (dBm):
<rssi> <CR>
NR5G(sub6) RxM1 RSSI (dBm):  <rssi>            NR5G(sub6) RxD1 RSSI (dBm):
<rssi> <CR>
<CR>
... <CR>  ← NR5G section (Cell ID to RxD1 RSSI) repeats for additional NR5G Cells
<CR>
NR5G RSRP (dBm): <rsrp>         NR5G RSRQ (dB):  <rsrq> <CR>
NR5G SINR (dB):  <sinr> <CR>
<CR>
OK
```

Purpose: Display 5G Sub-6 GHz information.

- Query (5G mmW): **AT!NRINFO?**

Response:
```
!NRINFO: <CR>
Connectivity Mode: <mode> <CR>
<CR>
NR5G Cell ID:    <cell id> <CR>
[NR5G MCC-MNC:    <mcc_mnc> <CR>]    ← Appears only for EM91 devices in 5G Sub-6 GHz SA mode.
NR5G band:       <band>          NR5G Carrier ID:   <cid> <CR>
NR5G dl bw:      <dl_bw>         NR5G ul bw:      <ul_bw>     <CR>
NR5G Tx Power:   <TxPower>       NR5G Tx chan:    <TxChan> <CR>
NR5G Rx chan:    <RxChan> <CR>
NR5G dl MIMO:    <dlMaxMimo>     NR5G ul MIMO:    <ulMaxMimo> <CR>
NR5G(mmw) Rx1 RSSI (dBm): <rssi>  NR5G(mmw) Rx2  RSSI (dBm):   <rssi> <CR>
 <CR>
... <CR>  ← NR5G section (Cell ID to Rx2 RSSI) repeats for additional NR5G Cells
<CR>
NR5G RSRP (dBm): <rsrp>          NR5G RSRQ (dB):  <rsrq> <CR>
NR5G SINR (dB):  <sinr> <CR>
<CR>
OK
```

Purpose: Display 5G mmW information.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)

Parameters:

<mode> (UE connectivity mode)
- "NSA" — Non-Standalone
- "SA" — Standalone

<cell id> (NR5G cell ID)
- Value appears only when the module is in 5G Sub-6 GHz SA mode. In NSA mode, "---" appears.
- (EM91) Physical cell ID:
  - Range: 0–1007
- (EM92) Global cell ID:
  - Type: uint64
  - Display format: <cell_id_hex> (<cell_id_decimal>)
  - e.g., "ef4c717d7 (64236230615)"

<mcc_mnc> (EM91 only. Mobile Country Code and Mobile Network Code)
- Parameter applies only to EM91 modules, and a value appears only when the module is in 5G Sub-6 GHz SA mode.
- Format: <mcc>-<mnc>
- Value ranges:
  - <mcc>: 0–999
  - <mnc>: 0-999

<band> (Serving cell operating band)
- Note — Valid values depending on the module's configured band support.
- Valid values:
  - n1, n2, n3, n5, n7, n8, n12, n20, n28, n38, n41, n50, n51, n66, n70, n71, n74, n75, n76, n77, n78, n79, n80, n81, n82, n83, n84, n85, n257, n258, n259, n260, n261

<cid> (Carrier Index or (RF) group index)
- 32-bit decimal

<dl_bw> (Downlink (DL) bandwidth)
- ASCII string
- Valid values:
  - "5 MHz"
  - "10 MHz"
  - "15 MHz"
  - "20 MHz"
  - "25 MHz"
  - "30 MHz"
  - "40 MHz"
  - "50 MHz"
  - "60 MHz"
  - "80 MHz"
  - "90 MHz"
  - "100 MHz"
  - "200 MHz"
  - "400 MHz"
  - "Unknown" (Note — This will appear only if the network provides an invalid value.)

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)
<ul_bw> (Uplink (UL) bandwidth) • ASCII string • Valid values: ▪ "5 MHz" ▪ "10 MHz" ▪ "15 MHz" ▪ "20 MHz" ▪ "25 MHz" ▪ "30 MHz" ▪ "40 MHz" ▪ "50 MHz" ▪ "60 MHz" ▪ "80 MHz" ▪ "90 MHz" ▪ "100 MHz" ▪ "200 MHz" ▪ "400 MHz" ▪ "Unknown" (Note — This will appear only if the network provides an invalid value.) <TxPower> (Transit power, in dBm) • Range: 0—26 <TxChan> (NR5G Tx channel) • 32-bit decimal • NR-ARFCN value (New Radio Absolute Radio Frequency Channel Number) <RxChan> (NR5G Rx channel) • 32-bit decimal • NR-ARFCN value (New Radio Absolute Radio Frequency Channel Number) <dlMaxMimo> (Maximum number of downlink MIMO layers) • 0–4 <ulMaxMimo> (Maximum number of uplink MIMO layers) • 0–4 <rssi> (Current Received Signal Strength Indication, in dBm) • -120 to 0 <rsrp> (Reference Signal Receive Power, in dBm x 10) • -140 to -44 <rsrq> (Reference Signal Receive Quality, in dB) • -20 to -3 <sinr> (Signal to Interference plus Noise) • -20 to 30 (Continued on next page)	

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)

Example(s):

- 5G Sub-6 GHz, SA connectivity mode; EM91 format NR5G Cell ID parameter:

```
AT!NRINFO?
!NRINFO: <CR>
Connectivity Mode: SA <CR>
<CR>
Connectivity Mode: SA <CR>
<CR>
NR5G Cell ID:  500 <CR>
NR5G band:     n77       NR5G Carrier ID: 0 <CR>
NR5G dl bw:    20 MHz    NR5G ul bw: 20 MHz <CR>
NR5G Tx Power: -22       NR5G Tx chan: 620644 <CR>
NR5G Rx chan:  620644 <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 1 <CR>
NR5G(sub6) RxM RSSI (dBm):  -31.8   NR5G(sub6) RxD RSSI (dBm): -5.6 <CR>
NR5G(sub6) RxM1 RSSI (dBm): -37.9   NR5G(sub6) RxD1 RSSI (dBm): -4.4 <CR>
<CR>
NR5G RSRP (dBm): -       NR5G RSRQ (dB): - <CR>
NR5G SINR (dB):  - <CR>
<CR>
OK
```

- 5G Sub-6 GHz, NSA connectivity mode; EM92 format NR5G Cell ID parameter:

```
AT!NRINFO?
!NRINFO: <CR>
<CR>
Connectivity Mode: NSA <CR>
NR5G Cell ID:  --- <CR>
NR5G band:     n78       NR5G Carrier ID: 0 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: 100 MHz <CR>
NR5G Tx Power: 19        NR5G Tx chan: 636666 <CR>
NR5G Rx chan:  636666 <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 1 <CR>
NR5G(sub6) RxM RSSI (dBm):  -66.9   NR5G(sub6) RxD RSSI (dBm): -66.3 <CR>
NR5G(sub6) RxM1 RSSI (dBm): ---     NR5G(sub6) RxD1 RSSI (dBm): --- <CR>
<CR>
NR5G RSRP (dBm): -102    NR5G RSRQ (dB): -11 <CR>
NR5G SINR (dB):  22.0 <CR>
OK
```

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)

- 5G mmW; EM91 format NR5G Cell ID parameter:

```
AT!NRINFO?
!NRINFO: <CR>
Connectivity Mode: NSA <CR>
<CR>
NR5G Cell ID:  0 <CR>
NR5G band:     n261      NR5G Carrier ID: 0 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: 100 MHz <CR>
NR5G Tx Power: -5        NR5G Tx chan: 2072459 <CR>
NR5G Rx chan:  2072459 <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 1 <CR>
NR5G(mmw) Rx1 RSSI (dBm): -39.3   NR5G(mmw) Rx2 RSSI (dBm): -36.0 <CR>
NR5G Cell ID:  1 <CR>
NR5G band:     n261      NR5G Carrier ID: 1 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2074125  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
NR5G Cell ID:  2 <CR>
NR5G band:     n261      NR5G Carrier ID: 2 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2075791  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
NR5G Cell ID:  3 <CR>
NR5G band:     n261      NR5G Carrier ID: 3 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2077457  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
NR5G Cell ID:  4 <CR>
NR5G band:     n261      NR5G Carrier ID: 4 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2079123  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
NR5G Cell ID:  5 <CR>
NR5G band:     n261      NR5G Carrier ID: 5 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2080789  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
NR5G Cell ID:  6 <CR>
NR5G band:     n261      NR5G Carrier ID: 6 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2082455  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
```

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NRINFO (continued)	Display NR information (continued)

```
NR5G Cell ID:  7 <CR>
NR5G band:     n261      NR5G Carrier ID: 7 <CR>
NR5G dl bw:    100 MHz   NR5G ul bw: Unknown <CR>
NR5G Tx Power: ---       NR5G Tx chan: 0 <CR>
NR5G Rx chan:  2084121  <CR>
NR5G dl MIMO:  0         NR5G ul MIMO: 0 <CR>
NR5G(mmw) Rx1 RSSI (dBm):  -40.1   NR5G(mmw) Rx2 RSSI (dBm): -37.0 <CR>
<CR>
NR5G RSRP (dBm): -72     NR5G RSRQ (dB): -11 <CR>
NR5G SINR (dB):  25.0 <CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!NRPCI	**Display NR PCI value(s)**
Description	
Display the 5G NR (5G Sub-6 GHz or 5G mmW) Physical Cell ID (PCI) for the PCC (primary cell) and any SCCs (secondary cells). This command applies to both NSA and SA networks.	

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_03.17.02.00 (Release 7) EM92: SWIX65C_02.17.08.00 (Release 6)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!NRPCI?**
  Response: *(For 5G NR service)*
  `!NRPCI: <PCI_1>[ <PCI_2> [ <PCI_3> [...]]]  <CR>`
  `OK`
  or
  (For non-5G service)
  `ERROR`

  Purpose: Display the 5G NR PCI for the primary cell (<PCI_1>) and any secondary cells (<PCI_2>, <PCI_3>, etc.).
- Query List: **AT!NRPCI=?**
  Response: `OK`
  Purpose: Indicates the execution command format is available.

Parameters:

<PCI_*> (5G NR Physical cell ID of a primary cell (PCI_1) or secondary cell (PCI_2, PCI_3, etc.))

- Value appears when the module is in 5G Sub-6 GHz SA or NSA mode.
- Range: 0–1007

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!NVENCRYPTIMEI	**Write unencrypted IMEI to modem**

Description

Write an unencrypted IMEI to the modem *if* the modem does not already have an IMEI — the command can only be used once per modem.

The IMEI is a fifteen digit string formed by concatenating the following elements:

TAC code (8 digits)
SN (Serial number) (6 digits)
CheckDigit (1 digit calculated from TAC code and SN)

The CheckDigit is calculated as follows:

1. Label the fourteen digits in the TAC and SN as:

   TAC: D14..D7
   SN: D6..D1

   For example:

   TAC = 12345678 ('1' is D14, '8' is D7)
   SN = 901234 ('9' is D6, '4' is D1)

2. Double the value of each odd-labeled digit (D13, D11, ..., D1).
3. Add the values of each individual digit from the result of Step 2.
4. Add the even-labeled digits (D14, D12, ..., D2) to the result of Step 3.
5. Check the last digit of the result of Step 4. If it is '0', the CheckDigit is 0; if it is not '0', subtract it from 10 to get the Check-Digit.

For example:

TAC (12345678) SN (901234)

Step 1: Label the digits of the TAC and SN.

D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1
1	2	3	4	5	6	7	8	9	0	1	2	3	4

Step 2: Double the odd-labeled values:

D14	**D13**	D12	**D11**	D10	**D9**	D8	**D7**	D6	**D5**	D4	**D3**	D2	**D1**
1	**4**	3	**8**	5	**12**	7	**16**	9	**0**	1	**4**	3	**8**

Step 3: Add *each* digit of the odd-labeled values:
4 + 8 + (1 + 2) + (1 + 6) + 0 + 4 + 8 = 34

Step 4: Add each digit of the even-labeled values to the Step 3 total:
1 + 3 + 5 + 7 + 9 + 1 + 3 +34 = 63

Step 5: Check last digit of Step 4 total.
CheckDigit = 10 - 3 = 7

Result: IMEI = TAC:SN:CheckDigit
= 123456789012347

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: Yes

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!NVENCRYPTIMEI (continued)	Write unencrypted IMEI to modem (continued)

Usage:

- Execution: **AT!NVENCRYPTIMEI=<P1>, <P2>, <P3>, <P4>, <P5>, <P6>, <P7>, <P8>**
  Response: OK
  Purpose: Write the unencrypted IMEI to the modem.

Parameters:

<P1> to <P8> (IMEI segments)

- <P1> = IMEI[0..1]; <P2> = IMEI[2..3]; ...; <P8> = IMEI[14..15]
- <P1> to <P4> represent the TAC
- <P5> to <P7> represent the SNR
- <P8> represents the CheckDigit plus a padding digit ('0')

Example(s):

Using the example IMEI shown above:

```
AT!NVENCRYPTIMEI=12,34,56,78,90,12,34,70
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!NVPLMN	**Provision / display PLMN list for Network Personalization locking**
Description	

Provision or display the list of PLMN (MCC / MNC pairs) used for Network Personalization locking.

Important: Use the execution format to provision the list ***one time only***. After the list is provisioned, it can only be displayed, not updated.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage:

- Execution: **AT!NVPLMN=<MCC1>, <MNC1>, ..., <MCCn>, <MNCn>**
  Response: `OK`
  Purpose: Add up to 50 MCC / MNC pairs to the PLMN list.
  Note — Execution can be performed one time only (all MCC / MNC pairs must be set at the same time).
- Query: **AT!NVPLMN?**
  Response:
  ```
  <MCC> <MNC> <CR>
  ... <CR>
  OK
  ```
  Purpose: Return a list of up to fifty NV items that can be read or written.

Parameters:

<MCC> (Mobile Country Code)
- 3 digits

<MNC> (Mobile Network Code)
- 2 digits

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCINFO	**Return power control status information**

Description

Return the modem's current power control status information — the current power mode, the status of all low power mode (LPM) 'voters' (conditions that can cause the module to be in LPM), and the current status of LPM persistence (i.e., whether LPM will persist across resets).

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: SWIX55C_02.08.01.00 (Release 2)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!PCINFO?**

  Response:
  ```
  State: <state> <CR>
  LPM voters - Temp:<vote>, Volt:<vote>, User:<vote>, W_DISABLE: <vote>,
  IMSWITCH:<vote>, BIOS:<vote>, LWM2M:<vote>, OMADM:<vote>, FOTA:<vote>,
  NVCRIT:<vote>, RFCAL:<vote>, MMWCAL:<vote>, RFC_INIT:<vote> <CR>
  LPM persistence - <lpm_persistence> <CR>
  <CR>
  OK
  ```

  Purpose: Return power control information.

Parameters:

<state> (The modem's current power mode)

- "Low Power Mode"
- "Online"
- "Offline"

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!PCINFO (continued)	Return power control status information (continued)

<vote> (LPM required flag, for each voter)

- Valid values:
  - 0 — LPM not required by the indicated voter
  - 1 — LPM required by the indicated voter
- The module has several 'voters' that when triggered or selected will cause the modem to enter LPM. The list below indicates the voters and the conditions that will cause them to require the modem to enter LPM:
  - Power state triggers:
    - "Temp" — Module temperature has reached the low or high "Normal to Low Power" power state transition trigger levels.
    - "Volt" — Module voltage has reached the low or high "Normal to Low Power" power state transition trigger levels.
    - For temperature and voltage trigger levels, refer to *[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174)* or *[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)*.
  - "User" — Low power (minimum functionality) has been requested. (e.g., via QMI, MBIM, or AT interfaces (such as **AT+CFUN=0**))
  - "W_DISABLE" — W_DISABLE_N pin is LOW. (Disables the main RF radio)
    Note — This vote does not apply (and is not updated) when the !CUSTOM "DGENABLE" customization is enabled (i.e., not 0), which uses the W_DISABLE_N pin for the Dying Gasp feature instead of radio power control.
  - "IMSWITCH" — The preferred image (see !IMPREF) is not available.
  - "BIOS" — Legacy voter, not supported. Included for backwards-compatibility.
  - "LWM2M" — LWM2M requests reset. (Note — This will not hold the module in LPM.)
  - "OMADM" — Legacy voter, not supported. Included for backwards-compatibility.
  - "FOTA" — Firmware-Over-The-Air update operation is in progress.
  - "NVCRIT" — Image switching issue.
  - "RFCAL" — Internal voter (Semtech use only)
  - "MMWCAL" — mmW is enabled but mmW calibration has not been performed.
  - "RFC_INIT" — RF initialization error (e.g., RF component failure)

<lpm_persistence> (Low Power Mode persistence)

- Valid values:
  - "None" — LPM does not persist across resets. This status occurs in either of the following cases:
    - No voters require LPM.
    - LPM was requested using **AT+CFUN=0** but LPM persistence has not been enabled using the !CUSTOM "CFUNPERSISTEN" customization.
    - **Note:** "CFUNPERSISTEN" is not required when LPM persistence is requested via the QMI or MBIM interfaces.
  - <voter>":1":
    - The indicated voter required the radio to go to LPM, and LPM persistence has been enabled via the QMI, MBIM, or AT interfaces.

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCOFFEN	**Enable / return Low Power Mode control via W_DISABLE_N feature**

Description

The modem can be configured to enter low power mode when W_DISABLE_N is asserted.
Use this command to indicate or set this feature's state.

Notes:

- This setting is ignored if dying gasp is enabled.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Manual
Persistent across power cycles: Yes

Usage:

- Execution: **AT!PCOFFEN=<state>**
  Response: `OK`
  Purpose: Set the current state.
- Query: **AT!PCOFFEN?**
  Response: `<state> <CR>`
  `OK`
  Purpose: Report the current <state>.

Parameters:

<state> (Current state of Low Power Mode control)

- 0 — Modem will enter LPM (low power mode) when W_DISABLE_N is asserted.
- 1 — Modem shuts down when W_DISABLE_N is asserted (Note — This is legacy behavior for older MiniCard products.)
- 2 — Ignore changes on W_DISABLE_N.

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCTEMP	**Return current temperature information**
Description	
Return the module's power control temperature state and actual temperature.	

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!PCTEMP?**
  Response:
  ```
  Temp state: <state> <CR>
  Temperature: <temperature> C <CR>
  OK
  ```
  Purpose: Return the module's temperature information.

Parameters:

<state> (Temperature state):

- Valid values:
  - "High Critical"
  - "High Warning"
  - "Normal"
  - "Low Warning"
  - "Low Critical"

<temperature> (Current temperature):

- Current temperature in °C
- Decimal ASCII — Value reported to two decimal places (e.g., "23.00")

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCTEMPLIMITS	**Set/report temperature state limit values**

Description

Certain modem functionality is affected by the module's power control temperature state. The possible states are high critical, high warning, normal, low warning, and low critical.

Use this command to report or set the limits that correspond to these temperature states.

To display the current temperature and power control temperature state, use !PCTEMP.

Note: All temperatures are in Celsius.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage:

- Execution: **AT!PCTEMPLIMITS=<high_critical>,<high_warning>,<normal>,<low_warning>,<low_critical>**
  Response: `OK`
  Purpose: Set the temperature limits for each power control temperature state (all five values must be specified).
- Query: **AT!PCTEMPLIMITS?**
  Response:
  ```
  !PCTEMPLIMITS: <high_critical>,<high_warning>,<normal>,<low_warning>,
  <low_critical> <CR>
  <CR>
  OK
  ```
  Purpose: Return the temperature limits for each state.

Parameters:

<high_critical> (High Critical temperature limit, in °C)
- Integer
- Default: 118

<high_warning> (High Warning temperature limit, in °C)
- Integer
- Default: 100

<normal> (Normal temperature, in °C)
- Integer
- Default: 70

<low_warning> (Low Warning temperature limit, in °C)
- Integer
- Default: -30

<low_critical> (Low Critical temperature limit, in °C)
- Integer
- Default: -45

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCVOLT	**Return current power supply voltage information**

Description

Return the module's power control supply state and actual voltage.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!PCVOLT?**
  Response:
  ```
  Volt state: <state> <CR>
  Power supply voltage: <voltage> mV (ADC: <raw>) <CR>
  OK
  ```
  Purpose: Return the module's voltage information.

Parameters:

<state> (Power supply state):
- Valid values:
  - "High Critical"
  - "High Warning"
  - "Normal"
  - "Low Warning"
  - "Low Critical"

<voltage> (Current voltage, in mV):
- Decimal ASCII

<raw> (ADC (Analog/digital convertor) reading):
- Decimal ASCII

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PCVOLTLIMITS	**Set/report power supply voltage state limit values**

Description

Certain modem functionality is affected by the modem's power supply voltage state. The possible voltage states are high critical, high warning, normal, low warning, and low critical.

Use this command to report or set the limits that correspond to these voltage states.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage:

- Execution: **AT!PCVOLTLIMITS=<high_critical>,<high_warning>,<normal>,<low_warning>,<low_critical>**
  Response: `OK`
  Purpose: Set the voltage limits for each state (all five values must be specified).
- Query: **AT!PCVOLTLIMITS?**
  Response:
  ```
  !PCVOLTLIMITS: <high_critical>,<high_warning>,<normal>,<low_warning>,
  <low_critical> <CR>
  <CR>
  OK
  ```
  Purpose: Return the voltage limits for each state.

Parameters:

<high_critical> (High Critical voltage limit, in mV)
- Integer
- Default: 4600

<high_warning> (High Warning voltage limit, in mV)
- Integer
- Default: 4400

<normal> (Normal voltage, in mV)
- Integer
- Default: 3300

<low_warning> (Low Warning voltage limit, in mV)
- Integer
- Default: 3135

<low_critical> (Low Critical voltage limit, in mV)
- Integer
- Default: 2900

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!POWERDOWN	**Power down (reset) module**
Description	
Power down and restart the module. (Note — The module does not stay powered off.) This command has the same effect as !RESET. Note — Although the module cannot be fully powered down without physically removing power, it is capable of entering low power consumption states. For details, refer to *[8] EM9190 Current Consumption Application Note (Doc# 2174287)*. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** Automatic **Persistent across power cycles:** n/a **Usage:** ▪ Execution: **AT!POWERDOWN** Response: `OK` Purpose: Power down and restart the module.	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!PRIID	**Set/Report module PRI part number and revision**

Description

Report or set the module's customer and carrier PRI part numbers and revisions.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes (Execution)
No (Query)
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!PRIID="<priPN>","<priRev>","<pri_cust>"**
  Response: OK
  Purpose: Set the module's PRI part number (<priPn>), revision (<priRev>), and customer name (<pri_cust>).
- Query: **AT!PRIID?**
  Response:
  ```
  PRI Part Number: <priPn> <CR>
  Revision: <priRev> <CR>
  Customer: <pri_cust> <CR>
   <CR>
  Carrier PRI: <bcVersion_0> <CR>
  ... <CR>
  Carrier PRI: <bcVersion_n> <CR>
  <CR>
  OK
  ```
  Purpose: Return the module's PRI information.

Parameters:

<priPn> (PRI part number)
- ASCII string, 7 digits
- Example: 9991234

<priRev> (PRI revision number)
- ASCII string, 7 digits
- Format: 999.999
- Example: 001.001

<pri_cust> (PRI customer name)
- ASCII string
- Example: "Generic Operator"

<bcVersion_n> (BC version in CWE header of the Carrier PRI NVUP file)
- ASCII string

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RATCA (EM91)	**Enable / disable CA, ENDC, and SA capability**
Description	

DEPRECATED: This command is deprecated for EM91 and is not available for EM92. Use !RATCONFIG for equivalent functionality.

Enable or disable CA (Carrier Aggregation), ENDC (EUTRA-NR Dual Connectivity) and SA (Stand-Alone) NR (5G Sub-6 GHz or 5G mmW) capability.

Supporting EM9 devices: EM91
Added F/W: EM91: Release 1 (SWIX55C_01.07.08.00) EM92: n/a
Deprec. F/W: EM91: Release 5 (SWIX55C_03.10.07.00)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes (Some parameters — see descriptions)

Usage:

- Execution: **AT!RATCA=<ca>,<endc>,<sa>**
  Response: `OK`
  Purpose: Enable or disable CA (Carrier Aggregation), ENDC (EUTRA-NR Dual Connectivity) and SA (Standalone) capability.
- Query: **AT!RATCA?**
  Response:
  ```
  CA: <ca> <CR>
  ENDC: <endc> <CR>
  SA: <sa> <CR>
  OK
  ```
  Purpose: Query the current CA, ENDC and SA capability settings.
- Query List: **AT!RATCA=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<ca> (Carrier Aggregation capability)
- 0 — CA disabled
- 1 — CA enabled (Default)
- The setting is persistent across power cycles.

<endc> (ENDC capability)
- 0 — ENDC disabled
- 1 — ENDC enabled (Default)
- The setting is NOT persistent across power cycles.

<sa> (Stand-Alone capability)
- 0 — SA disabled
- 1 — SA enabled (Default)
- The setting is NOT persistent across power cycles.

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RATCONFIG	**Configure Radio Access Technology (RAT) Support**
Description	

Query / set the supported configuration for specific RATs.

Note: Configuration changes via !RATCONFIG do not affect the output of !SDPREF.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!RATCONFIG="<RAT>",<option>**
  Response: `OK`
  Purpose: Set the supported configuration option for the indicated <RAT>.
- Query: **AT!RATCONFIG?**
  Response:
  ```
  !RATCONFIG: <CR>
  <RAT>     <option> <CR>
  OK
  ```
  Purpose: Display the current configuration option for configurable RATs.
- Query List: **AT!RATCONFIG=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<RAT> (Configurable RAT)
- ASCII string (quotation marks required in Execution format)
- Valid values:
  - "NR" — New Radio (i.e., 5G NR)

<option> (Configuration of the associated <RAT>)
- Integer value
  - Execution format: decimal or hexadecimal (e.g., "1" or "0x01")
  - Query response format: hexadecimal (e.g., "0x01")
- Valid values:
  - 0 — None disabled
  - 1 — SA (standalone) disabled
  - 2 — NSA (ENDC) disabled

Example(s):

- **AT!RATCONFIG?**
  ```
  !RATCONFIG: <CR>
                NR          0x00 <CR> ← Not disabled (i.e., SA and NSA are both enabled)
  <CR>
  OK
  ```
- **AT!RATCONFIG?**
  ```
  !RATCONFIG: <CR>
                NR          0x02 <CR> ← NSA (ENDC) is disabled (and SA is enabled)
  <CR>
  OK
  ```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RESET	**Reset modem**
Description	
Perform a modem reset. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** Automatic **Persistent across power cycles:** n/a **Usage:** ▪ Execution: **AT!RESET** Response: `OK` Purpose: Reset the modem.	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RFCID	**Set/query RFC related hardware IDs and board IDs**

Description

Set or query the RFC (Radio Frequency Card) related hardware IDs and board IDs that are used to identify the firmware to be loaded on the module.

To display a list of all supported RF firmware files stored on the module, use !RFCMBNSCAN (EM91).

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_02.08.01.00 (Release 2)

Password required: Yes (Execution)
No (Query)

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage Notes:

- The Execution format is supported for EM91 only.

Usage:

- Execution (EM91):

  AT!RFCID=<cmw_hardware_id>, <cmw_board_id>[,<mmw_hardware_id>,<mmw_board_id>]

  Response: `OK`

  Purpose: Set the RFC-related hardware IDs and board IDs.
  Note — All RFC IDs (set by this command) must be supported in modem RFC configuration files. Otherwise, the RF firmware cannot be identified and the radio will stay in offline mode (i.e., RFC cannot work).

- Query: **AT!RFCID?**

  Response:
  ```
  !RFCID: <CR>
  CMW_HWID: <cmw_hardware_id> <CR>
  CMW_BID: <cmw_board_id> <CR>
  MMW_HWID: <mmw_hardware_id> <CR>
  MMW_BID: <mmw_board_id> <CR>
  <CR>
  OK
  ```

  Purpose: Query the current RFC related hardware IDs and board IDs.

Parameters:

<cmw_hardware_id> (Centimeter wave hardware ID)
- Valid values: 0–4095
- Applies to WCDMA, LTE and 5G Sub-6 GHz

<cmw_board_id> (Centimeter wave board ID)
- Valid values: 0–15
- Applies to WCDMA, LTE and 5G Sub-6 GHz

<mmw_hardware_id> (5G-mmW hardware ID)
- Decimal ASCII number
- Valid values: 0–4095
- Applies to 5G mmW

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!RFCID (continued)	Set/query RFC related hardware IDs and board IDs (continued)
<mmw_board_id> (5G mmW board ID) • Decimal ASCII number • Valid values: 0–15 • Applies to 5G mmW	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RFCMBNSCAN (EM91)	**Display all RFC .mbn files**
Description	

Display all RF Card (RFC) configuration files (.mbn) stored on the EM9.
To select the configuration file to use or to display the current selection, use !RFCID.

Supporting EM9 devices: EM91
Added F/W: SWIX55C_01.07.08.00 (Release 1) EM92: n/a
Updated F/W: EM91: SWIX55C_02.08.01.00 (Release 2)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!RFCMBNSCAN?**
  Response:
  ```
  <RFC name:> <FW tag> <build server name> <build time> <RFC tag>
  <RFC version> <CR>
  OK
  ```
  Purpose: Display all RFC .mbn files.

Parameters:

<RFC name> (RF firmware filename)
- ASCII string (e.g., "1003_0_0.mbn")
- The first four characters (e.g., "1003") is the RFCID value. This value is used in !RFCID (i.e., the <cmw_hardware_id> or <mmw_hardware_id>) — RFCID < 1500 indicates centimeter wave (cmW), and RFCID ≥ 1500 indicates millimeteter wave (mmW).

<FW tag> (Firmware version and hash)
- ASCII string
- Format: <fw_version> <fw_hash>
  - <fw_version>: ASCII string (e.g. "SWIX55C_00.00.00.00"
  - <fw_hash>: ASCII string (hex digits only). Valid values: 000000–FFFFFF
- Note — This parameter also appears as the "Revision" file in the output for the standard **ATI** command.

<build_server name> (Name of server on which firmware was built)
- ASCII string

<build_time> (Date and time of the firmware build)
- Format: YYYY/MM/DD hh:mm:ss

<RFC tag> (RF firmware ID)
- ASCII string (digits only)
- Valid values:
  - blank (e.g., "") — depends on the RFCID (part of the <RFC name>):
    - If (RFCID < 1500) – cmW RF firmware
    - If (1500 ≤ RFCID < 2000) — Reserved (Semtech mmW RF firmware for internal use only)
  - "001" — mmW RF firmware for customers

<RFC version> (RF firmware version)
- Valid values: 0–999

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Table 3-2: Modem status, customization, and reset commands (Continued)

!RFCMBNSCAN (EM91) (continued)	Display all RFC .mbn files (continued)

Example(s):

- **AT!RFCMBNSCAN?**

```
1003_0_0.mbn:   SWIX55C_00.00.00.00 000000 CNSHZ-ED-SVR107 2020/08/04 09:57:32
rfctag:005 rfcver:66 <CR>
1004_0_0.mbn:   SWIX55C_00.00.00.00 000000 CNSHZ-ED-SVR107 2020/08/04 09:57:32
rfctag:005 rfcver:63 <CR>
... <CR>
1005_0_0.mbn:   SWIX55C_00.00.00.00 000000 CNSHZ-ED-SVR107 2020/08/04 09:57:32
rfctag:005 rfcver:61 <CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RFCOMBOS	**Display supported CA / EN-DC combinations**
Description	

Display the carrier aggregation (CA) and EN-DC combinations that the module could potentially support.

Important: The module may not support some of the listed CA and EN-DC combinations, depending on its default configuration or carrier PRI configuration.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4)

Password required: No

Reset required to apply changes: No, but recommended after using the Query command, to ensure any excess memory allocated by the module is released.

Persistent across power cycles: No

Usage:

- Execution: **AT!RFCOMBOS=<format>[,<filter>[,<filterbands>]]**
  Response: OK
  Purpose: Set the configuration options for the Query response, including the combinations format and optional filtering parameters.
- Query: **AT!RFCOMBOS?**
  Response (<format>=0 (RFC)):
  ```
  <band><dlbwcls><dlantnum>;<ulbwclass><ulantnum>[+<band><dlbwcls><dlantnum>;<
  ulbwclass><ulantnum>]... <CR>
  <band><dlbwcls><dlantnum>;<ulbwclass><ulantnum>[+<band><dlbwcls><dlantnum>;<
  ulbwclass><ulantnum>]... <CR>
  ... <CR>
  OK
  ```
  Response (<format>=1 (3GPP)):
  ```
  <aggtype>_<band><dlbwcls>[-<band><dlbwcls>]..._n<band> <CR>
  <dlbwcls>[-n<band><dlbwcls>]... <CR>
  <aggtype>_<band><dlbwcls>[-<band><dlbwcls>]..._n<band> <CR>
  <dlbwcls>[-n<band><dlbwcls>]... <CR>
  ... <CR>
  OK
  ```
  Response (<format>=0 (3GPP with uplink)):
  ```
  <aggtype>_<band><dlbwcls>[-<band><dlbwcls>]..._n<band> <CR>
  <dlbwcls>[-n<band><dlbwcls>]...;<band><ulbwcls>[-<band> <CR>
  <ulbwcls>]..._n<band><ulbwcls>[-n<band><ulbwcls>]... <CR>
  <aggtype>_<band><dlbwcls>[-<band><dlbwcls>]..._n<band> <CR>
  <dlbwcls>[-n<band><dlbwcls>]...;<band><ulbwcls>[-<band> <CR>
  <ulbwcls>]..._n<band><ulbwcls>[-n<band><ulbwcls>]... <CR>
  ... <CR>
  OK
  ```
  Purpose: Based on the current configuration options, list the CA and EN-DC combinations supported by the device — see the **Important** note in the command description above.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!RFCOMBOS (continued)	Display supported CA/EN-DC combinations (continued)

- Query List: **AT!RFCOMBOS=?**

  Response:

```
Format: <format> <CR>                          ← Current output format
Filter: <filter> <CR>                          ← Current filter option
Filter by: <filterband> <CR>                   ← Current filterband option
!RFCOMBOS: (<format_rng>),(<filter_rng>),(<filterbands_rng>) <CR>
<CR>
OK
```

  Purpose: Display the current configuration options, and the execution command format with valid parameter values.

Parameters:

<format> (Output format)
- Valid values:
  - 0 — RFC (Qualcomm Technologies, Inc (QTI) format)
  - 1 — 3GPP
  - 2 — 3GPP with uplink

<filter> (Enable/disable filtering of combinations in the Query response)
- Valid values:
  - 0 — Disable (Display unfiltered combinations)
  - 1 — Enable (Display filtered combinations)

<filterbands> (Band set to display)
- Valid range:
  - 0–14 (Hexadecimal)
  - Note — Supported band sets are indicated by the 'Index' values displayed in the response for !BAND**=?** . (e.g., 0 (All bands), 7 (North America), C (NR5G ALL), etc.)
- Default: Filter by active bands if no <filterbands> parameter is passed (Note — 'active' bands are the bands in the set currently specified by !BAND.)

<aggtype> (Aggregation type)
- Valid values:
  - CA — Carrier Aggregation
  - DC — Dual Connectivity

<band> (3GPP band number)
- LTE bands are displayed as "B#" for <format>=0, or "#" for <format>=1 or 2
- NR bands are displayed as "n#"
- e.g., Band 66 is displayed as "n66" for NR, "B66" for LTE (<format>=0), or "66" for LTE (<format>=1 or 2)

<dlbwcls> (Downlink bandwidth class per 3GPP TS 36.101, TS 38.101-1, T 38.101-2)
- Valid range: A–Q

<dlantnum> (Number of downlink antennas)
- Value is displayed between square brackets
- Valid range: [1]–[4]
- Comma-separated list for bandwidth classes that support multiple intra-band component carriers (e.g., [4,4] for class C)

<ulbwcls> (Uplink bandwidth class per 3GPP TS 36.101, TS 38.101-1, T 38.101-2)
- Valid range: A–Q

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!RFCOMBOS (continued)	Display supported CA / EN-DC combinations (continued)
<ulantnum> (Number of uplink antennas) • Value is displayed between square brackets • Valid range: [1]–[4] • Comma-separated list for bandwidth classes that support multiple intra-band component carriers (e.g., [4,4] for class C)	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!RFDEVSTATUS	**Display all RFFE status**

Description

Display the status of all RFFE (Radio Frequency Front End) components.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!RFDEVSTATUS?**
  Response:
  ```
  RFC init failure <CR>
  OK
  ```
  or
  ```
  instance, manufacture id, product id, <HDG_STATUS> <CR>
  <instance>, <manufacture id>, <product id>, <device status> <CR>
  …… <CR>
  <instance>, <manufacture id>, <product id>, <device status> <CR>
  OK <CR>
  ```
  Purpose: Display all RFC .mbn files.

Parameters:

<HDG_STATUS> (Response heading name for the device status column)
- EM91: "device status"
- EM92: "present"

<instance>
- Each instance indicates one RFFE device.
- The first part of the response is for WCDMA, LTE and 5G Sub-6 GHz (i.e., 0–37).
  The second part of the response is for 5G mmW (i.e., 0–8 for low power QTM antenna modules, or 0–16 for high power QTM antenna modules).

<manufacture id>
- RFFE device manufacture ID

<product id>
- RFFE device product ID

<present>
- EM91:
  - PRESENT — RFFE device can work well
  - NON_FATAL — CMW device is not physically available
  - FATAL — CMW device is physically available but not in good condition
  - ERROR — mmWave device has NON_FATAL/FATAL error
- EM92:
  - TRUE — RFFE device can work well
  - FALSE — RFFE device cannot work

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!RFDEVSTATUS (continued)	Display all RFFE status (continued)

Example(s):

- EM91 (Sample output where mmW antennas are not connected):

```
AT!RFDEVSTATUS?
instance, manufacture id, product id, device status <CR>
0  ,0x217 ,0xfed ,PRESENT <CR>
1  ,0x217 ,0x35  ,PRESENT <CR>
2  ,0x217 ,0x1c3 ,PRESENT <CR>
…… <CR>
37 ,0x134 ,0x15  ,PRESENT <CR>
0  ,0xff  ,0x526 ,PRESENT <CR>
36 ,0x134 ,0x14  ,PRESENT
37 ,0x134 ,0x15  ,PRESENT
1  ,0x217 ,0x35  ,ERROR <CR>
2  ,0x217 ,0x35  ,ERROR <CR>
…… <CR>
OK
```

- EM92:

```
AT!RFDEVSTATUS?
instance, manufacture id, product id, present <CR>
0  ,0x217 ,0xfed ,TRUE <CR>
1  ,0x217 ,0x35  ,TRUE <CR>
2  ,0x217 ,0x1c3 ,TRUE <CR>
…… <CR>
37 ,0x134 ,0x15  ,TRUE <CR>
0  ,0xff  ,0x526 ,TRUE <CR>
1  ,0x0   ,0x0   ,FALSE <CR>
2  ,0x0   ,0x0   ,FALSE <CR>
…… <CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!SDPREF	**Display enabled RATs and bands**
Description	

Display the enabled RATs and bands (i.e., the RATs and bands that are available after customer and carrier policies have been applied.)

For example, OEM and carrier PRIs may not allow some bands that are supported by the module's hardware. (To display hardware-level band support use *!BAND*.)

*Note: The !SDPREF listing may include RATs and bands that are not currently **available** due to user configurations via host interfaces (e.g., AT commands such as !RATCONFIG and !SELRAT, etc.)*

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_03.09.03.00 (Release 4) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!SDPREF?**

  Response:
```
!SDPREF: <CR>
RATs : <rat_list> <CR>
GWC : <gwc_band_list> <CR>
LTE : <lte_band_list> <CR>
TDS : <tds_band_list> <CR>
NRSA : <nr_band_list> <CR>
NRNSA : <nr_band_list> <CR>
OK
```

  Purpose: Display the currently enabled RATs and bands (GWC, LTE, etc.).

Parameters:

<rat_list> (Currently enabled RATs)

- ASCII string, comma-separated list of enabled RATs
- Valid RATs:
  - GSM
  - LTE
  - NR5G
  - WCDMA
- e.g., "RATs : WCDMA,LTE,NR5G"

<gwc_band_list> (Currently enabled GSM/WCDMA/CDMA bands)

- ASCII string, comma-separated list of enabled bands
- e.g., "GWC : B1,B2,B3,B4,B5,B6,B8,B9,B19"

<lte_band_list> (Currently enabled LTE bands)

- ASCII string, comma-separated list of enabled bands
- e.g., "LTE : B1,B2,B3,B4,B5,B7,B8,B12,B13,B14,B17,B18,B19,B20,B25,B26,B28,B29,B30,B32,B34,B38,B39,B40,B41,B42,B46,B48,B66,B71"

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!SDPREF (continued)	Display currently enabled RATs and bands

<tds_band_list> (Unused)

- This parameter is unused for EM9 modules.
  The row heading ("TDS: ") is included for consistency with other Semtech modules.

<nrsa_band_list> (Currently enabled NR standalone bands)

- ASCII string, comma-separated list of enabled bands
- e.g., "NRSA : n1,n2,n3,n5,n28,n41,n66,n71,n77,n78,n79"

<nrnsa_band_list> (Currently enabled NR non-standalone bands)

- ASCII string, comma-separated list of enabled bands
- e.g., "NRNSA: n1,n2,n3,n5,n28,n41,n66,n71,n77,n78,n79"

Example(s):

- **AT!SDPREF?**

```
RATs : WCDMA,LTE,NR5G <CR>
GWC  : B1,B2,B3,B4,B5,B6,B8,B9,B19 <CR>
LTE  : <CR>
B1,B2,B3,B4,B5,B7,B8,B12,B13,B14,B17,B18,B19,B20,B25,B26,B28,B29,B30,B32,B34,B38,B39,
B40,B41,B42,B46,B48,B66,B71 <CR>
TDS  : <CR>
NRSA : n1,n2,n3,n5,n28,n41,n66,n71,n77,n78,n79 <CR>
NRNSA: n1,n2,n3,n5,n28,n41,n66,n71,n77,n78,n79 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!SELRAT	**Set/query preferred RAT**
Description	

Set the preferred RAT mode(s) for acquisition.

If the module's current band setting is not compatible with the selected RAT, either an appropriate band will be selected automatically and set on the modem, or an ERROR may be returned.

Note: Configuration changes via !SELRAT do not affect the output of !SDPREF.

Important: To avoid issues with incompatible RAT/band combinations, if !BAND and !SELRAT are both used, either !BAND must be set to 'All Bands' or !SELRAT must be set to 'Automatic'.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.04.03.00 (Release 3)

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!SELRAT?**
  Response:
  ```
  <ratInd>, <ratName> <CR>
  OK
  ```
  or
  ```
  Unknown RAT mode. Use AT!SELRAT to set mode. <CR>
  <ratInd> <CR>
  OK
  ```
  Purpose: Return the current RAT (<ratInd>) and description. If the <ratInd> is undefined, an error message is returned.
- Query List: **AT!SELRAT=?**
  Purpose: Display valid parameter values.

Parameters:

<ratInd> (RAT index)

- 00 — Automatic
- 01 — WCDMA only
- 06 — LTE only
- 11 — WCDMA and LTE only
- 20 — NR 5G only
- 21 — LTE and NR 5G only
- 22 — WCDMA and NR 5G only

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!SELRAT (continued)	Set/query preferred RAT (continued)
<ratName> (Description of RATs covered by <ratInd>) • <ratInd>=00: "Automatic" • <ratInd>=01: "WCDMA Only" • <ratInd>=06: "LTE Only" • <ratInd>=11: "WCDMA and LTE Only" • <ratInd>=20: "NR 5G Only" • <ratInd>=21: "LTE and NR 5G only" • <ratInd>=22: "WCDMA and NR 5G only"	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!SKU	**Display module's SKU**
Description	
Display the module's production SKU number. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** Yes **Reset required to apply changes:** n/a **Persistent across power cycles:** n/a **Usage:** ▪ Query: **AT!SKU?** Response: `!SKU: <SKU> <CR>` `OK` Purpose: Display the module's SKU number. ▪ Query List: **AT!SKU=?** Purpose: Display the query command format. **Parameters:** <SKU> (Module's SKU number) · 7-digit integer · Example: 1101234	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!TMCONFIG (EM91)	**Configure EM91 thermal mitigation thresholds**

Description

EM91 modules are pre-configured with thermal mitigation thresholds for several sensors that are monitored by specific thermal mitigation devices. This command can be used to display and modify the configured thresholds.

Supporting EM9 devices: EM91

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: See !TMCONFIG (EM92)

Password required: No

Reset required to apply changes: Yes. Changes will appear in the Query response as soon as they are made, but the module must be reset for the changes to take effect.

Persistent across power cycles: Yes

Usage Requirements:

- Before changing any threshold values, make sure to use **!TMCONFIG?** and record the default values. When finished testing, use the execution format to reset the threshold values appropriately.

Usage:

- Execution: **AT!TMCONFIG=<tm_device>,<t1>,<t2>,[<t3>],<t1_clr>,<t2_clr>,[<t3_clr>]**
  Response: OK
  Purpose: Set the thresholds for initiating thermal mitigation steps, and for ending the mitigations.
- Query: **AT!TMCONFIG?**
  Response:
  ```
  [<tm_device>] <CR>      ← i.e. '[pa]', '[pa_fr1]', 'qfe_mmw2', etc.
  thermal_zone      <tm_zone> <CR>
  sampling          <t0_sample>    <t1_sample>   <t2_sample>   <t3_sample> <CR>
  thresholds        <t1>           <t2>          <t3>           <t_rdonly> <CR>
  thresholds_clr    <t_clr_rdonly> <t1_clr>      <t2_clr>         <t3_clr> <CR>
  actions           <t0_action>     <t1_action>   <t2_action>   <t3_action>
  <CR>
  action_info       <t0_act_info>  <t1_act_info> <t2_act_info> <t3_act_info>
  <CR>
  [...] <CR>      ← repeats for each <tm_device>
  <CR>
  OK
  ```
  Purpose: Display configured thermal mitigation thresholds for all thermal mitigation devices.
- Query List: **AT!TMCONFIG=?**
  Purpose: Display the execution command format and parameter values.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMCONFIG (EM91) (continued)	Configure EM91 thermal mitigation thresholds (continued)

Parameters:

<tm_device> (Device sensor)

- 0 — pa (4G/3G/2G only)
- 1 — pa_1 (4G/3G/2G only)
- 2 — pa_fr1 (5G only)
- 3 — pa_1_fr1 (5G only)
- 4 — modem_tsens
- 5 — modem_tsens1
- 6 — mmw0
- 7 — mmw1
- 8 — mmw2
- 9 — mmw3

<tm_zone> (Thermal zone that monitors the <tm_device>s in a thermal region and triggers mitigation)

- ASCII string
- Valid values:
  - pa
  - pa_fr1
  - modem
  - mmw0
  - mmw1
  - mmw2
  - mmw3

<t0_sample>..<tN-1_sample> (Temperature polling rate, in ms):

- Frequency of thermal sensor polling while the module is operating in the mitigation step
- Valid range: 0–99999

<t1>,<t2>,<t3>,<t_rdonly> (Thermal threshold values in C):

- Mitigation begins when the detected temperature increases to ≥ this value.
- Valid values:
  - <t1>,<t2>,<t3> — 0–527
  - <t_rdonly> — 528. This value cannot be changed since there are no further mitigations possible.

<t_clr_rdonly>,<t1_clr>,<t2_clr>,<t3_clr> (Thermal threshold clear values in °C):

- Mitigation ends when the detected temperature is less than the corresponding <t#> threshold. (e.g. <t1_clr> < <t1>)
- Valid values:
  - <t_clr_rdonly> — -273. This value cannot be changed since there are no further mitigations to clear.
  - <t1>,<t2>,<t3> — 0–527

<t0_action>,<t1_action>,<t2_action>,<t3_action> (Actions associated with the thermal threshold and threshold clear values):

- "mitigate" — Thermal mitigation
- No other values are supported.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMCONFIG (EM91) (continued)	Configure EM91 thermal mitigation thresholds (continued)

<t0_act_info>,<t1_act_info>,<t2_act_info>,<t3_act_info> (Thermal mitigation levels):

- Valid values:
  - 0 — No mitigation
  - 1 — Level 1 mitigation.
  - 2 — Level 2 mitigation.
  - 3 — Level 3 mitigation.

Example(s):

- Change thresholds for device 4 (modem_tsens):

```
AT!TMCONFIG=4,35,40,45,33,38,42
OK
```

- Display current configuration:

```
AT!TMCONFIG?
[pa] <CR>
thermal_zone     pa <CR>
sampling         10000        5000         5000         5000 <CR>
thresholds       100          105          115          528 <CR>
thresholds_clr   -273         85           90           85 <CR>
actions          mitigate     mitigate     mitigate     mitigate <CR>
action_info      0            1            2            3 <CR>
 <CR>
... <CR>      ← Repeats for each <tm_device>
 <CR>
[qfe_mmw3] <CR>
thermal_zone     mmw3 <CR>
sampling         5000         5000         5000         5000 <CR>
thresholds       75           80           85           528 <CR>
thresholds_clr   -273         73           78           73 <CR>
actions          mitigate     mitigate     mitigate     mitigate <CR>
action_info      0            1            2            3 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!TMCONFIG (EM92)	**Configure EM92 thermal mitigation thresholds**

Description

EM92 modules are pre-configured with thermal mitigation thresholds for several sensors that are monitored by specific thermal mitigation devices. This command can be used to display the configured thresholds.

Supporting EM9 devices: EM92

Added F/W: EM91: See !TMCONFIG (EM91) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query (List devices):

  AT!TMCONFIG?

  Response:
  ```
  Mitigation Devices   Num. of Config <CR>
  <mitigation_device>  <Num. of Config> <CR>
  [...] <CR>      ← Repeats for each mitigation device
  <CR>
  OK
  ```

  Purpose: Display a list of all thermal mitigation devices and the number of sensors monitored by those devices.

- Query (Mitigation device detail):

  AT!TMCONFIG?<mitigation_device_index>

  or

  AT!TMCONFIG?<mitigation_device_name>

  Response:
  ```
  [<thermal_sensor>] <CR>   ← '[' and ']' are actual displayed characters (i.e., "[lte_only_2cc]")
  thermal_zone      <mitigation_device_name> <CR>
  sampling          <t0_sample>          [...      <tN-1_sample>]<CR>
  thresholds        <t1>                 [...      <tN>] <CR>
  thresholds_clr    <t0_clr>             [...      <tN-1_clr>] <CR>
  actions           <t0_action>          [...      <tN-1_action>] <CR>
  action_info       <t0_action_info>    [...       <tN-1_action_info>] <CR>
  <CR>
  [...] <CR>      ← Repeats for each <thermal_sensor>
  <CR>
  OK
  ```

  Purpose: Display configured thermal mitigation thresholds for a specific thermal mitigation device. Each listed thermal sensor may have 1 or more thresholds—for example, one sensor may have three mitigation 'steps' (t0, t1, t2), another sensor may have four steps (t0, t1, t2, t3), etc.
  t0 represents no mitigation, t1 is the first mitigation step, t2 is more mitigation, etc.

- Query List: **AT!TMCONFIG=?**

  Purpose: Display the query command formats and parameters.

Parameters:

<mitigation_device> (Index number and name of a specific thermal mitigation device)

- Format: <mitigation_device_index>.<mitigation_device_name>
- e.g., "18.modem_lte_dsc"

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMCONFIG (EM92) (continued)	Configure EM92 thermal mitigation thresholds (continued)

<mitigation_device_index> (Index number of a thermal mitigation device)

- 2-character decimal ASCII string
- Valid range: "00"–"99"
- e.g., "18"
- Note — The index must be 2 characters long. (e.g., for "01" is valid; "1" is not valid)

<mitigation_device_name> (Name of a thermal mitigation device)

- ASCII string
- e.g., "modem_lte_dsc"

<Num. of Config> (Number of sensors monitored by a thermal mitigation device)

- Integer
- Valid range: 1–32

<thermal_sensor> (Name of sensor monitored by thermal mitigation device)

- ASCII string
- Name is obtained from the chipset's stack and may vary across firmware releases.
- e.g., "lte_only_2cc"

<t0_sample>..<tN-1_sample> (Temperature polling rate, in ms):

- Frequency of thermal sensor polling while the module is operating in the mitigation step
- Valid range: 0–99999

<t1>..<tN> (Thermal threshold values in m°C (millidegree Celcius)):

- The module begins operating in the next mitigation step begins when the detected temperature increases to ≥ this value.
- e.g., While operating with no mitigations (step 0), if the detected temperature rises to ≥ <t1>, the module moves to mitigation step 1.
- Valid theoretical range: -273000 – 528000 (528000 indicates no further mitigations are possible.)

<t0_clr>..<tN-1_clr> (Thermal threshold clear values in m°C (millidegree Celcius)):

- The current mitigation step ends and the module begins operating in the previous (lower) mitigation step when the detected temperature decreases to less than the corresponding <t#> threshold.
- e.g., While operating with the first set of mitigations (step 1), if the detected temperature decreases to < <t1_clr>, the module moves back to mitigation step 0 (no mitigation).
- Valid theoretical range: -273000 – 528000 (-273000 indicates there are no further mitigations to clear.)

<t0_action>..<tN-1_action> (Action taken when the thermal threshold or threshold clear value is reached):

- "mitigate" — Thermal mitigation
- No other values are supported.

<t0_action_info>..<tN-1_action_info> (Mitigation state):

- Valid range: 0–255

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMCONFIG (EM92) (continued)	Configure EM92 thermal mitigation thresholds (continued)

Example(s):

- Display a list of all mitigation devices and the number of sensors they monitor:

```
AT!TMCONFIG?
Mitigation Devices      Num. of Config <CR>
00.pa_nr_sdr0_dsc       1 <CR>
01.pa_lte_sdr0_dsc      1 <CR>
... <CR>
17.modem_nr_sub1_dsc    3 <CR>
18.modem_lte_dsc        3 <CR>
19.modem_lte_sub1_dsc   1 <CR>
OK
```

- Display thermal mitigation details for device 18/modem_lte_dsc:

AT!TMCONFIG?18 *or* **AT!TMCONFIG?modem_lte_dsc**

```
[lte_only_2cc] <CR>
thermal_zone     modem_lte_dsc <CR>
sampling         5000          5000          5000          5000 <CR>
thresholds       95000         100000        105000        528000 <CR>
thresholds_clr   -273000       92000         97000         102000 <CR>
actions          mitigate      mitigate      mitigate      mitigate <CR>
action_info      0             9             10            255 <CR>
[lte_only_3cc] <CR>
thermal_zone     modem_lte_dsc <CR>
sampling         5000          5000          5000          5000          5000 <CR>
thresholds       95000         100000        102000        105000        528000 <CR>
thresholds_clr   -273000       92000         97000         99000         102000 <CR>
actions          mitigate      mitigate      mitigate      mitigate      mitigate <CR>
action_info      0             7             9             10            255 <CR>
[modem_tsens] <CR>
thermal_zone     modem_lte_dsc <CR>
sampling         500           500 <CR>
thresholds       105000        528000 <CR>
thresholds_clr   -273000       92000 <CR>
actions          mitigate      mitigate <CR>
action_info      0             255 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!TMSTATUS (EM91)	**Report EM91 Thermal Mitigation Status**

Description

Report the thermal mitigation status of all available Thermal Mitigation Devices (TMD) in the module. Also, during an active mmW ENDC call, report the current temperatures of the mmW antenna modules.

To display detailed thermal mitigation details for specific devices, use !TMCONFIG (EM91).

For additional information, refer to *[5] AirPrime EM919x/EM7690 Thermal Mitigation (Doc# 2174267)*.

Supporting EM9 devices: EM91

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: See !TMSTATUS (EM92)

Updated F/W: EM91: SWIX55C_02.08.01.00 (Release 2)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!TMSTATUS?**

  Response:
  ```
  Device     Level     Temperature(C) <CR>
  <device>   <status>  <temp>[, <temp>[, ...]] <CR>
  … <CR>
  OK
  ```

  Purpose: Display the thermal mitigation status of the module's TMDs.
- Query List: **AT!TMSTATUS=?**

  Purpose: Display the query command format and parameters.

Parameters:

<device> (Thermal mitigation (cooling) device)

- "cpuv_restriction_cold" — CPU voltage mitigation
- "mmw0" – "mmw3" — Cooling devices for mmWave antenna modules QFE_MMW0 to QFE_MMW3, respectively. Note:
  - Antenna module designations cannot be changed.
  - As of this document's publication date, only mmw0 is reported. A future firmware update will enable reporting of mmw1–mmw3.
- "modem" — Cooling device for MODEM_TSENS//MODEM_TSENS1 sensors.
- "pa" — Cooling device for PA/PA1 sensors; applies to WCDMA and LTE thermal mitigation actions.
- "pa_fr1" — Cooling device for PA/PA1 sensors; applies to 5G NR Sub6 thermal mitigation actions.

<status> (Device thermal mitigation level)

- Valid values are <device>-dependent:
- For device "cpuv_restriction_cold":
  - 0 — No mitigation
  - 1 — Restricts the voltage
- For device "mmw0" – "mmw3":
  - 0 — No mitigation
  - 1 — Reduce number of antenna elements (4 / 4-2 / 2-1 / 1)
  - 2 — Reduce number of antenna elements (1 / 1-0 / 0)
  - 3 — No data calls

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMSTATUS (EM91) (continued)	Report EM91 Thermal Mitigation Status (continued)

- For device "modem":
  - 0 — No mitigation
  - 1 — DL data rate throttling
  - 3 — No data calls
- For device "pa" or "pa_fr1":
  - 0 — No mitigation
  - 1 — UL data rate throttling
  - 2 — UL rate throttling and Tx power limiting
  - 3 — No data calls

<temp> (Device temperature, in °C)

- Always reported for mmWave antenna modules. (Temperature display for other antenna modules to be supported in a future firmware update.)
- "NA" (not available) appears if a value is not reported by a sensor.
- Each device reports one or more temperatures, depending on the number of sensors it monitors.
- mmW devices only:
  - Actual mmW antenna module temperature is reported only during an active mmW ENDC call. Otherwise, the temperature is reported as -273 °C.
  - Note — As of this document's publication date, only mmw0 is reported. A future firmware update will enable reporting of mmw1-mmw3.

Example(s):

- Display a list of all mitigation devices and the number of sensors they monitor:

```
at!tmstatus?
Device                  Level   Temperature(C) <CR>
pa                      0       25 25 <CR>
pa_fr1                  0       25 25 <CR>
modem                   0       27 26 <CR>
cpuv_restriction_cold   0       NA <CR>
mmw0                    0       -273 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!TMSTATUS (EM92)	**Report EM92 Thermal Mitigation Status**

Description

Report the thermal mitigation status of all available Thermal Mitigation Devices (TMD) in the module. Also, during an active mmW ENDC call, report the current temperatures of the mmW antenna modules.

To display detailed thermal mitigation details for specific devices, use !TMCONFIG (EM92).

For additional information, refer to *[5] AirPrime EM919x/EM7690 Thermal Mitigation (Doc# 2174267)*.

Supporting EM9 devices: EM92

Added F/W: EM91: See !TMSTATUS (EM91) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!TMSTATUS?**

  Response:
  ```
  Device      Level      Temperature(C) <CR>
  <device>    <status>   <temp>[, <temp>[, ...]] <CR>
  … <CR>
  OK
  ```

  Purpose: Display the thermal mitigation status (level) of the module's TMDs and the current temperatures reported by the sensors monitored by the TMDs.
- Query List: **AT!TMSTATUS=?**

  Purpose: Display the query command format and parameters.

Parameters:

<device> (Thermal mitigation (cooling) device)

- Device names may vary across firmware releases.
- Device names begin with descriptors that generally identify the device:
  - "modem" — Cooling device that monitors modem thermal sensors.
  - "pa_lte" — Cooling device that monitors power amplifier thermal sensors; applies to WCDMA and LTE thermal mitigation actions.
  - "pa_nr" — Cooling device that monitors power amplifier thermal sensors; applies to 5G NR Sub6 thermal mitigation actions.
  - "mmw" — Cooling device that monitors a mmWave antenna module.
- e.g., "modem_lte_dsc", "pa_nr_sdr0_sub1_dsc", "mmw2_dsc", etc.

<status> (Device thermal mitigation level)

- Valid range: 0–255. 0 indicates no mitigation, and higher values indicate stricter mitigations.

<temp> (Device temperature, in °C)

- Each device reports one or more temperatures, depending on the number of sensors it monitors.
- mmW devices only — Actual mmW antenna module temperature is reported only during an active mmW ENDC call. Otherwise, the temperature is reported as -273 °C.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!TMSTATUS (EM92) (continued)	Report EM92 Thermal Mitigation Status (continued)

Example(s):

- Display a list of all mitigation devices, their current mitigation level, and the temperatures reported by the sensors they monitor:

```
at!tmstatus?
Device                  Level   Temperature(C) <CR>
modem_lte_dsc           0       27 <CR>
modem_lte_sub1_dsc      0       27 <CR>
modem_nr_dsc            0       27 <CR>
[…] <CR>
pa_nr_sdr0_scg_dsc      0       26 -273 -273 -273 -273 <CR>
[...] <CR>
mmw0_dsc                0       -273 <CR>
mmw1_dsc                0       -273 <CR>
mmw2_dsc                0       -273 <CR>
mmw3_dsc                0       -273 <CR>
<CR>
OK
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!USBCOMP	**Set/report USB interface configuration**

Description

Set or display the device's USB interface configuration.

By default, devices are typically configured to use a USB composition that presents a minimal set of interfaces from a list of available interfaces. Use this command to add or remove interfaces from the configuration.

Note that the RmNet and MBIM interfaces are mutually exclusive — they cannot both be enabled at the same time.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!USBCOMP=<config_Index>,<config_type>,<interface_bitmask>**
  Response: `OK`
  Purpose: Set the device's USB interface configuration.
- Query: **AT!USBCOMP?**
  Response:
  ```
  Config Index: <config_index> <CR>
  Config Type: <config_type> (<config_type_desc>) <CR>
  Interface bitmask: <interface_bitmask> (<bitmask_desc>) <CR>
  OK
  ```
  Purpose: Report the device's current USB interface composition.
- Query List: **AT!USBCOMP=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<config_index> (Configuration index)
- Valid value: 1

<config_type> (Configuration type)
- 4 — (EM91) USBIF MBIM V2; (EM92) MBIM V2
- 6 — (EM91) USBIF MBIM_V2_CUSTOM; (EM92) MBIM V2 CUSTOM
  Note that this is a special-case configuration type that assigns the lowest-available endpoint numbers to each USB interface for a host platform that supports fewer endpoint numbers (e.g., 0–9 up and 0–9 down) than the default range (0–15 up, and 0–15 down).

<config_type_desc> (Configuration description)
- Description for <config_type> = 4:
  - EM91: "USBIF-MBIM-V2"
  - EM92: "MBIM V2"
- Description for <config_type> = 6:
  - EM91: "USBIF-MBIM-V2-CUSTOM"
  - EM92: "MBIM V2 CUSTOM"

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!USBCOMP (continued)	Set/report USB interface configuration (continued)
<Interface bitmask> (USB interface bitmask) • Bitmask representing all enabled interfaces • Format: 32-bit bitmask • Valid values (available interfaces are device-dependent): ▪ 0x00000001 — DIAG ▪ 0x00000008 — MODEM (mandatory) ▪ 0x00000100 — RMNET0 (Note — If RmNet is enabled, MBIM must be disabled.) ▪ 0x00001000 — MBIM (Note — If MBIM is enabled, RmNet must be disabled.) <bitmask_desc> (Interface bitmask description) • List of interface descriptions corresponding to <Interface bitmask> components • Example: "(diag, modem, mbim)"	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!USBPID	**Set/query USB product IDs**

Description

Use this command to set or query product IDs in the USB descriptor.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!USBPID=<app_product_id> [,<boot_product_id>]**
  Response: `OK`
  Purpose: Set the device's application and boot product IDs in the USB descriptor.
- Query: **AT!USBPID?**
  Response:
  ```
  !USBPID: <CR>
  APP: <app_product_id> <CR>
  boot: <boot_product_id> <CR>
  OK
  ```
  Purpose: Report the device's USB product IDs.
- Query List: **AT!USBPID=?**
  Response:
  ```
  !USBPID: <CR>
  APP                    BOOT <CR>
  <app_product_id>,      <boot_product_id> <CR>
  OK
  ```
  Purpose: Display available default app PIDs and their relevant boot PIDs.

Parameters:

<app_product_id> (APP product ID)
- Hexadecimal ASCII value.
- Valid range: 0000–FFFF

<boot_product_id> (BOOT product ID)
- Hexadecimal ASCII value.
- Valid range: 0000–FFFF

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!USBVID	**Set/query USB vendor ID**
Description	
Use this command to set or query the vendor ID in the USB descriptor.	

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!USBVID=<vendor_id>]**
  Response: `OK`
  Purpose: Set device's USB vendor ID.
- Query: **AT!USBVID?**
  Response:
  ```
  !USBVID: <CR>
  <vendor_id> <CR>
  OK
  ```
  Purpose: Report the device's USB vendor ID.

Parameters:

<vendor_id> (USB vendor ID)

- Hexadecimal ASCII value.
- Valid range: 0000–FFFF

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!VERINFO (EM91)	**Display firmware image version and security state**

Description

MIGRATED: This command is migrated to have the same functionality as EM92 — Use !VERINFO on page 105 beginning with SWIX55C_03.17.02.00 (Release 7).

Display SBL, TZ, AOP, UEFI, Mpss, OS, Yocto and RootFS versions, and security state information (which indicates whether the module is in secure or unsecure state).

Supporting EM9 devices: EM91
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1)
Migrated F/W: EM91: SWIX55C_03.17.02.00 (Release 7) — Use !VERINFO on page 105 beginning with this release.
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Execution: **AT!VERINFO**

  Response:

```
          SBL: <version> <CR>
           TZ: <version> <CR>
          AOP: <version> <CR>
         UEFI: <version> <CR>
         Mpss: <version> <CR>
           OS: <version> <CR>
       Yocto: <version> <CR>
      RootFS: <version> <CR>
    Security: <secure_info> [(debug policy: <debug_policy_bitmask>] <CR>
RF_CAL_TREE: <version> <CR>
<CR>
OK
```

  Purpose: Display image versions and security state.

Parameters:

<version> (Image version information)

- ASCII string
- Example: SWIX55C_00.04.06.00 488291 jenkins 2019/09/30 03:56:48

<secure_info> (Security state)

- ASCII string
- "secure" — Secure boot is enabled, secure debug is disabled, and all debug policy bits (bits 0–63) are 0.
- "unsecure":
  - Secure boot is disabled,
    or
  - Secure boot is enabled, secure debug is enabled, and all OEM debug policy bits (bits 48–63) are 0.
- "unsecure (debug policy: <debug_policy_bitmask>)"
  - Secure boot is enabled, secure debug is enabled, and at least one OEM debug policy bit (bits 48–63) is 1.
    or
  - Secure boot is enabled, secure debug is disabled, and at least one debug policy bit (bits 0–63) is 1.

(Continued on next page)

Table 3-2: Modem status, customization, and reset commands (Continued)

!VERINFO (EM91) (continued)	Display firmware image version and security state (continued)
<debug_policy_bitmask> (Debug policy functions) • Bitmask is displayed only as detailed in <secure+info> description. • Bitmask display format: 0xFFFFFFFFFFFFFFFF (e.g., 0x0000000000000002) • bit 0 = 1 — Enable crash dumps before boot • bit 1 = 1 — Enable crash dumps during boot • bit 2 = 1 — Enable JTAG • bit 3 = 1 — Enable QTEE/QSEE logging • bit 4 ~ bit 8 — MSS debug related • bit 9 ~ bit 23 — Reserved • bit 24 = 1 — Enable crash dumps of memory other than QTEE/QSEE secure regions • bit 25 ~ bit 31 — Encrypted mini dumps related • bit 32 ~ bit 47 — Reserved • bit 48 = 1 — Enable Semtech assistant debug tools • bit 49 ~ bit 63 — Reserved	

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!VERINFO	**Display firmware image version**
Description	

Display the module firmware version information.

Supporting EM9 devices: All
Added F/W: EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.17.02.00 (Release 7) — For pre-Release 7, use !VERINFO (EM91) on page 103.
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage Notes:

- Because the AT port takes a few seconds to enumerate when the module is reset, the "Apps" component version may not appear if !VERINFO is issued immediately after a reset. After the port has enumerated, the version number for the Apps component will be reported accurately.

Usage:

- Execution: **AT!VERINFO**

  Response:
```
Firmware ID: <version> <CR>
Boot Loader: <version> <CR>
       TAOP: <version> <CR>
      Modem: <version> <CR>
       Apps: <version> <CR>
OK
```
  Purpose: Display image versions.

Parameters:

<version> (Image version information)

- ASCII string
- Format:
  - For Boot Loader, Modem, Apps: Semtech-defined tag
  - For Firmware ID, TAOP: First 6 characters of a hash string calculated over the full component version information

Example(s):

- Example response for EM92:
```
at!verinfo
Firmware ID: 7A385C
Boot Loader: SWIX65C_02.15.01.00
       TAOP: CA9EF6
      Modem: SWIX65C_02.15.01.00
       Apps: SWIX65C_02.15.01.00
```

Table 3-2: Modem status, customization, and reset commands (Continued)

Command	
!WDISABLE	**Display the W_DISABLE_N pin status**
Description	
Display the status of the W_DISABLE_N pin. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** n/a **Persistent across power cycles:** n/a **Usage:** ▪ Query: **AT!WDISABLE?** Response: `<wdisable_status> <CR>` `OK` Purpose: Display the current status of the W_DISABLE_N pin. ▪ Query List: **AT!WDISABLE=?** Purpose: Display the query command format and parameters. **Parameters:** <wdisable_status> (Status of the W_DISABLE_N pin) • 0 — W_DISABLE_N is not asserted. The modem is ON. • 1 — W_DISABLE_N is asserted. The modem is OFF.	

4: Diagnostic Commands

Introduction

This chapter describes commands used to diagnose modem problems.

Command summary

Table 4-1 summarizes the commands that are described in detail in Table 4-2 on page 108.

Table 4-1: Diagnostic commands

Command	Description	Page
!BCFWUPDATESTATUS	Report status of most recent firmware update attempt	108
!GCCLR	Clear crash dump data	110
!GCDUMP	Display crash dump data	111
!IMSTESTMODE	Enable/disable IMS test mode	112
!LEDTEST	Test to switch LED on/off	113

Command reference

Table 4-2: Diagnostic command details

Command	
!BCFWUPDATESTATUS	**Report status of most recent firmware update attempt**

Description

Return the status of the most recent firmware update attempt made since the last cold restart. (Note: The status is retained between warm resets unless manually cleared.)

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Execution: **AT!BCFWUPDATESTATUS**
  and
  Query: **AT!BCFWUPDATESTATUS?**
  Response: `!BCFWUPDATESTATUS: <result>[, error code: <errorno>] <CR>`
  `[<error_str>] <CR>`
  `OK`
  Purpose: Return the status of the most recent firmware update attempt. Note: The error code and error string details appear only for <result>="FAILED".

Parameters:

<result> (Status of last firmware update attempt)
- ASCII string:
  - "UNKNOWN" — Status of last attempt is unknown. No error information appears.
  - "SUCCESS" — Last update was successful. No error Information appears.
  - "FAILED" — Last update failed. Error information appears.

<errorno> (Error code)
- Error code that may be displayed when <result>="FAILED"
- Uint32 value

<error_str> (Information associated with the <errorno>)
- Displayed when <result>="FAILED"
- ASCII string
- Format: "`Failed IMG TYPE <type>, DATA <data>, PART <part>`"

<type> (Firmware image type that failed to update)
- ASCII string
- Note — Parameter appears only if <result> is FAILED.

<data> (Reference data for failed image)
- Location of the reference data as an offset in the CWE image
- Valid range: 0–(2^{32}-1)
- Note — Parameter appears only if <result> is FAILED.

(Continued on next page)

Table 4-2: Diagnostic command details (Continued)

!BCFWUPDATESTATUS (continued)	**Report status of most recent firmware update attempt (continued)**
<part> (Partition associated with the failed image) • ASCII string • Applies only to configuration updates • Note — Parameter appears only if <result> is FAILED.	

Table 4-2: Diagnostic command details (Continued)

Command	
!GCCLR	**Clear crash dump data**
Description	
Clear crash dump data. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GCCLR** Response: `Crash data cleared <CR>` `OK` Purpose: Clear crash dump data. **Parameters:** None	

Table 4-2: Diagnostic command details (Continued)

Command	
!GCDUMP	**Display crash dump data**
Description	

Display crash dump data.
 	
Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a
 	
Usage:
▪ Execution: **AT!GCDUMP**
Response: `<crash dump data> <CR>`
`OK`
or
`No crash data available <CR>`
`OK`
Purpose: Display crash dump data.	

Table 4-2: Diagnostic command details (Continued)

Command	
!IMSTESTMODE	**Enable / disable IMS test mode**
Description	

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

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!IMSTESTMODE=<mode>**
  Response: `OK`
  Purpose: Enable / disable IMS test mode.
- Query: **AT!IMSTESTMODE?**
  Response:
  ```
  IMS Test Mode Enabled <CR>
  OK
  ```
  or
  ```
  IMS Test Mode Disabled <CR>
  OK
  ```
  Purpose: Return the current state of IMS Test Mode.

Parameters:

<mode> (IMS Test Mode state)

- 0 — Disable
- 1 — Enable

Table 4-2: Diagnostic command details (Continued)

Command	
!LEDTEST	**Test to switch LED on/off**
Description	
Switch ON or OFF the LED that is connected to the WWAN_LED pin. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** No **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage:** ▪ Execution: **AT!LEDTEST=<led no>,<state>** Response: `OK` Purpose: Switch the LED on/off. ▪ Query List: **AT!LEDTEST=?** Purpose: Display the execution command format and parameter values. **Parameters:** <led no> (LED index number) • 0—LED connected WWAN_LED pin <state> (LED state) • 0—Off • 1—On	

5: Test Commands

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.

For command usage examples:

- Refer to the test procedures described in *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)*
- See Sample DA* Command Usage on page 136.

Command summary

Table 5-1 summarizes the commands that are described in detail in Table 5-2 on page 115.

Table 5-1: Test commands

Command	Description	Page
!DACGPSCTON	Return GPS CtoN and frequency measurement	115
!DACGPSSTANDALONE	Enter/exit StandAlone (SA) RF mode	116
!DACGPSTESTMODE	Start/stop CGPS diagnostic task	117
!DAFTMACT	Put modem into Factory Test Mode	118
!DAFTMDEACT	Put modem into online mode from Factory Test Mode	119
!DAGFTMRXAGC	Get FTM Rx AGC	120
!DARCONFIG	Configure radio	122
!DARCONFIGDROP	Drop Radio Configurations	126
!DASUB6TECHACT	Start/stop 5G Sub-6 GHz technology	127
!DATXCONTROL	Configure Tx Power	128
!DATXMEASURE (EM91)	Get Tx Power (FTM mode)	131
!DAUPDATEPARAM	Update parameters to prepare for !DARCONFIG	132
!LTERXCONTROL	Enable/disable LTE receive (Rx) diversity during Carrier Aggregation	133
!RXDEN	Enable/disable WCDMA/LTE/5G Sub-6 GHz receive (Rx) diversity	135

Command reference

Table 5-2: Test command details

Command	
!DACGPSCTON	**Return GPS CtoN and frequency measurement**

Description

Return the GPS CtoN and frequency measurement.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage Requirements:

Before using !DACGPSCTON, enter the following commands:

a. AT!DACGPSTESTMODE=1 *(to start CGPS diagnostic task)*
b. AT!DACGPSSTANDALONE=1 *(to enter SA RF mode)*

Usage:

- Execution: **AT!DACGPSCTON=<GNSS_path>**
  Response: `CtoN=<CtoN>, Freq=<freq> <CR>`
  `OK`
  Purpose: Return CtoN and frequency measurements.

Parameters:

<GNSS_path> (GNSS signal path)
- 1 — GNSS L1 signal path
- 5 — GNSS L5 signal path

<CtoN> (Carrier-to-noise density ratio, in dBHz)
- Uint32

<freq> (Frequency in Hz)
- Int32

Table 5-2: Test command details (Continued)

Command	
!DACGPSSTANDALONE	**Enter / exit StandAlone (SA) RF mode**
Description	
Enter / exit Standalone (SA) RF mode.	

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: No

Usage Requirements:

1. AT!DACGPSTESTMODE=1 *(to start CGPS diagnostic task)*

Usage:

- Query: **AT!DACGPSSTANDALONE=<state>**
  Response: `4B0D650014007F000000 <CR>`
  `OK`
  or
  `ERROR`
  Purpose: Enter / exit SA RF mode

Parameters:

<state> (SA RF mode state)
- 0 — Enter SA RF mode
- 1 — Exit SA RF mode

Table 5-2: Test command details (Continued)

Command	
!DACGPSTESTMODE	**Start / stop CGPS diagnostic task**
Description	

Start/stop the CGPS diagnostic task.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: No

Usage:

- Execution: **AT!DACGPSTESTMODE=<mode>**
  Response: *(for start):*
  ```
  4B0D650014007F000000 <CR>
  OK
  ```
  (for stop):
  ```
  4B0D650014007F000000 <CR>
  OK
  ```
  or
  ```
  Error
  ```
  Purpose: Start or stop the CGPS diagnostic test.

Parameters:

<mode> (CGPS diagnostic task mode)

- 0 — Stop
- 1 — Start

Table 5-2: Test command details (Continued)

Command	
!DAFTMACT	**Put modem into Factory Test Mode**
Description	

DEPRECATED: This command is deprecated, but not removed. Use +CFUN=5 for equivalent functionality.

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 command +CFUN=0 puts the modem into online mode.)

Note: When this command executes successfully, the modem responds with the value 290300. Any other response indicates an error.

Supporting EM9 devices: EM91

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: Pre-Release

Deprec. F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Removed F/W: EM91: n/a EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: No

Usage Requirements:

- The device must be in full functionality mode (**AT+CFUN=1**) to use this command.

Usage:

- Query: **AT!DAFTMACT**

  Response: `290300 <CR>` ← *Success. Any other response indicates an error.*

  `OK`

  Purpose: Place modem in FTM mode (from online mode).

Table 5-2: Test command details (Continued)

Command	
!DAFTMDEACT	**Put modem into online mode from Factory Test Mode**
Description	

DEPRECATED: This command is deprecated, but not removed. Use +CFUN=5 for equivalent functionality.

This command takes the modem out of FTM and puts the modem back into online mode. (The command +CFUN=5 puts the modem into FTM.)

Note: When this command executes successfully, the modem responds with the value 290400. Any other response indicates an error.

Supporting EM9 devices: EM91

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: Pre-Release

Deprec. F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Removed F/W: EM91: n/a EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: No

Usage Requirements:

Before using this command:

a. Issue !DARCONFIGDROP to clean up the radio configuration (i.e., remove the radio configuration set by !DARCONFIG).

b. If 5G Sub-6 GHz was activated using !DASUB6TECHACT=1, then issue !DASUB6TECHACT=0 to deactivate the technology.

c. Then use this command to put the modem into online mode.

Usage:

- Query: **AT!DAFTMDEACT**

  Response: `290400 <CR>` ← *Success. Any other response indicates an error.*

  `OK`

  Purpose: Place modem in online mode (from FTM mode).

Table 5-2: Test command details (Continued)

Command	
!DAGFTMRXAGC	**Get FTM Rx AGC**
Description	

Get the FTM Rx AGC on the primary, diversity, MIMO or mmW IF paths.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage Requirements:
Before using this command:

- +CFUN=5 must be issued to put the modem into FTM.
- (EM91 only) !DAUPDATEPARAM must be issued to update/get parameters except for 5G mmW.
- !DARCONFIG must be issued to set the technology, band, and channel.

Usage:

- Execution: **AT!DAGFTMRXAGC=<carrier>, <technology>, <expected_AGC>, <path>[, <beam_ID>]**
  Response:
  ```
  <rssi> <CR>
  OK
  ```
  Purpose: Return the FTM Rx AGC value.

Parameters:

<carrier> (Carrier ID)

- 0—PCC

<technology> (Radio access technology (RAT))

- RAT support is device-dependent.
- 1—WCDMA
- 3—LTE
- 6—5G Sub-6 GHz or 5G mmW

<expected_AGC> (Expected AGC value)

- Valid range: -550 to 230
- Value represents (expected AG * 10)
- e.g., '-505' indicates -50.5 dBm power

(Continued on next page)

Table 5-2: Test command details (Continued)

!DAGFTMRXAGC (continued)	Get FTM Rx AGC (continued)

<path> (Rx path)

- EM91:
  - 0 — Primary Rx
  - 1 — MIMO1
  - 2 — MIMO2
  - 3 — Diversity Rx
  - 4 — mmW IF Rx
- EM92:

!DAGFTMRXAGC <path> to Rx Antenna Connector Mapping (Single Band Operation)

		Band-specific[ab] Connector Use (ANT0-ANT3)		
		LB / MB bands		UHB bands
<path>	Antenna function	(All except n38 / n41)	(n38, n41)	(All)
0	PRx	ANT0	ANT2	ANT3
1	MIMO1	ANT1	ANT3	ANT2
2	MIMO2	ANT3	ANT1	ANT1
3	DRx	ANT2	ANT0	ANT0

a. Per [2] AirPrime EM92XX Product Technical Specification (Doc# 41114313) r3, Table 3-2: 5G NR Sub-6/LTE/WCDMA/GNSS Antenna Receptacles — RF Technology Support. (Table number subject to change by revision number)

b. LB=Low Band (<1 GHz), MB=Mid Band (1–2.2 GHz), HB=High Band (2.2–3. GHz), UHB (3–6 GHz)

<beam_ID> (5G mmW beam ID)

- Applies to 5G mmW only
- Indicates the mmW IF port used for testing
- Valid ranges:
  - IFV port: 0–127
  - IFH port: 128–255
  - For mappings between <beam_ID>s and mmW IF ports, refer to *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)*.

<rssi> (RSSI, in dBm)

- Dynamic Rx AGC

Table 5-2: Test command details (Continued)

Command	
!DARCONFIG	**Configure radio**

Description

Configure the module's radio to a specific RAT, band, channel, bandwidth, etc.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4) EM92: SWIX65C_02.17.08.00 (Release 6)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: No

Usage Requirements:
Before using this command (!DARCONFIG):

- +CFUN=5 must be issued to put the modem into FTM.
- (EM91 only) !DAUPDATEPARAM must be issued to update/get parameters for all RATs except for 5G mmW.
- If configuring the module for 5G Sub-6 GHz, !DASUB6TECHACT=1 must be issued to enable the technology.

Usage (EM91):

Execution (WCDMA):
AT!DARCONFIG=<carrier>,<technology>,<band>,<tx_channel>
Execution (LTE/5G Sub-6 GHz/5G mmW):
AT!DARCONFIG=<carrier>,<technology>,<band>,<tx_channel>[,<bw>,<rx_channel>[,<mimo_mode>[,<beam_ID>[, <continuous_mode>]]]]
Response: OK
Purpose: Set the selected RAT's band and channel, bandwidth, etc.

Usage (EM92):

Execution (WCDMA):
AT!DARCONFIG=<carrier>,<technology>,<band>,<tx_channel>
Execution (LTE/5G Sub-6 GHz/5G mmW):
AT!DARCONFIG=<carrier>,<technology>,<band>,<tx_channel>[,<bw>,<rx_channel>[,<mimo_mode>[,<beam_ID>[,<continuous_mode> [,<tx_ant>[,<subband_type>]]]]]]
Response: OK
Purpose: Set the selected RAT's band and channel, bandwidth, etc.

Parameters:

<carrier> (Carrier ID)

- 0 — PCC

<technology> (Radio access technology (RAT))

- RAT support is device-dependent
- 1 — WCDMA
- 3 — LTE
- 6 — 5G Sub-6 GHz or 5G mmW

(Continued on next page)

Table 5-2: Test command details (Continued)

!DARCONFIG (continued)	Configure radio (continued)

<band> (Band number)

- Valid range: Refer to section "Supported RF Bands" of *[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174)* or *[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)*.
- e.g., '1' corresponds to WCDMA B1, LTE B1, or 5G Sub-6 GHz n1

<tx_channel> (Uplink channel number for selected <band>)

- Integer value
- <band>-dependent, refer to Transmission Path test settings tables in *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)*.

<bw> (Bandwidth)

- <band>-dependent, refer to tables "LTE Bandwidth Support" and "NR Bandwidth Support" of document *[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174)* or *[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)*.
- Valid values:
  - Valid values are RAT-dependent:
    - LTE: 0–5
    - 5G Sub-6 GHz: 2–13
    - 5G mmW: 9, 13
  - 0 — 1.4 MHz
  - 1 — 3 MHz
  - 2 — 5 MHz
  - 3 — 10 MHz
  - 4 — 15 MHz
  - 5 — 20 MHz
  - 6 — 25 MHz
  - 7 — 30 MHz
  - 8 — 40 MHz
  - 9 — 50 MHz
  - 10 — 60 MHz
  - 11 — 80 MHz
  - 12 — 90 MHz
  - 13 — 100 MHz

<rx_channel> (Downlink channel number for selected <band>)

- Integer value
- Valid values:
  - <band>-dependent, refer to Transmission Path test settings tables in *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)*.
  - Note: In LTE mode, set the Rx channel number explicitly, or set '1' and the actual channel will be calculated from the Tx channel.

(Continued on next page)

Table 5-2: Test command details (Continued)

!DARCONFIG (continued)	Configure radio (continued)

<mimo_mode> (MIMO mode)

- Valid values are RAT-dependent:
  - LTE/5G Sub-6 GHz:
    - 0 — Not supported (Default);
      Configures the PRx and DRx paths and (if applicable) the Tx path.
    - 1 — Supported
      (EM91) Configures the MIMO1 and MIMO2 paths.
      (EM92) Configures the PRx, DRx, MIMO1 and MIMO2 paths, and (if applicable) the Tx path.
  - 5G mmW (EM91 only):
    - 0 — Not supported. To select the correct path, use the <beam_ID> parameter. For details, refer to *[3] EM91 Series Customer Production Test Guide (Doc# 41113679).*
- **Important:**
  - MIMO is not supported on DL-only bands
  - (EM91 only) If !DATXCONTROL will be used for Tx testing, set <mimo_mode>= 0, otherwise !DATXCONTROL will crash the module — as noted above, <mimo_mode>=1 does not configure the Tx path.
    (Note — !DA commands do not test for UL MIMO.)

<beam_ID> (5G mmW beam ID)

- Applies to 5G mmW only. If <continuous_mode> is used for LTE or 5G Sub-6 GHz, leave this parameter blank.
- Indicates the mmW IF port used for testing
- Valid ranges:
  - IFV port: 0–127
  - IFH port: 128–255
  - For mappings between <beam_ID>s and mmW IF ports, refer to *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569).*

<continuous_mode> (Burst or Continuous mode)

- Valid values:
  - 0 — Burst mode
  - 1 — Continuous mode (Default)

<tx_ant> ((EM92 only) Tx antenna number to use for 5G Sub-6 GHz bands that support SRS)

- This parameter applies only to 5G Sub-6 GHz bands that support SRS. (i.e., n38, n40, n41, n48, n77, n78, n79)
- If not specified, the default antenna is used. (See *[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)*for band-specific default Tx antenna assignments.)
- Valid values: 0–3

<subband_type> ((EM92 only) Sub-band to use for bands that require sub-band testing)

- This parameter applies to LTE and 5G Sub-6 GHz.
- This parameter is only allowed if <tx_ant> is not blank.
  If <tx_ant> is blank, the <subband_type> is automatically inferred from the <tx_channel>.
- Valid values:
  - 0 — Sub-band A (Default)
  - 1 — Sub-band B
  - e.g., For 5G Sub-6 GHz n41A, set this parameter to 0 or leave it blank. For 5G Sub-6 GHz n41B, set this parameter to 1.

(Continued on next page)

Table 5-2: Test command details (Continued)

!DARCONFIG (continued)	Configure radio (continued)
Example(s): ▪ Configure WCDMA band 8 Tx/PRx/DRx **AT!DARCONFIG=0,1,8,9750** ▪ Configure LTE B66 Tx/PRx/DRx **AT!DARCONFIG=0,3,66,132322,3,66786** ▪ Configure LTE B41 Tx/PRx/DRx (use burst mode for Tx) **AT!DARCONFIG=0,3,41,39700,3,39700,0,,0** ▪ Configure n77 MIMO1/MIMO2 and (for EM92 only) Tx/PRx/DRx **AT!DARCONFIG=0,6,77,650000,13,650000,1** ▪ (EM92 only) Configure n48 Tx/PRx/DRx (force Tx to use antenna 2) **AT!DARCONFIG=0,6,48,641667,5,641667,0,,1,2** ▪ (EM92 only) Configure n41B Tx/PRx/DRx (force Tx to use antenna 0) **AT!DARCONFIG=0,6,41,525000,5,525000,0,,1,0,1** ▪ Configure n261 for Tx **AT!DARCONFIG=0,6,261,2077949,13,2077949,0,0**	

Table 5-2: Test command details (Continued)

Command	
!DARCONFIGDROP	**Drop Radio Configurations**
Description	
Drop the radio configurations that were previously set using !DARCONFIG. This command must be used when switching between technologies (RATs). **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** Yes **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage Requirements:** Before using this command: • +CFUN=5 must be issued to put the modem into FTM. **Usage:** ▪ Execution: **AT!DARCONFIGDROP=<technology>** Response: OK Purpose: Drop the current configurations for the selected RAT (<technology>). **Parameters:** <technology> (Radio access technology (RAT)) • RAT support is device-dependent • 1 — WCDMA • 3 — LTE • 6 — 5G Sub-6 GHz or 5G mmW	

Table 5-2: Test command details (Continued)

Command	
!DASUB6TECHACT	**Start / stop 5G Sub-6 GHz technology**
Description	
Start (enter) 5G Sub-6 GHz technology mode before configuring the 5G Sub-6 GHz radio with !DARCONFIG / !DAUPDATEPARAM, or stop (exit) 5G Sub-6 GHz technology mode after dropping the 5G Sub-6 GHz radio configuration with !DARCONFIGDROP. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** Yes **Reset required to apply changes:** No **Persistent across power cycles:** No **Usage Requirements:** Before using this command: • +CFUN=5 must be issued to put the modem into FTM. After disabling 5G Sub-6 GHz with !DARCONFIGDROP: • Use AT!DASUBTECHACT=0 to deactivate the technology. **Usage:** ▪ Execution: **AT!DASUB6TECHACT=<enable>** Response: OK Purpose: Start/stop 5G Sub-6 GHz technology. **Parameters:** <enable> • 0 — Stop 5G Sub-6 GHz technology • 1 — Start 5G Sub-6 GHz technology	

Table 5-2: Test command details (Continued)

Command	
!DATXCONTROL	Configure Tx Power

Description

Configure the Tx power for WDCMA, LTE, 5G Sub-6 GHz and 5G mmW.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: No

Usage Requirements:
Before using this command:

- +CFUN=5 must be issued to put the modem into FTM.
- (EM91 only) !DAUPDATEPARAM must be issued to update/get parameters except for 5G mmW.
- !DARCONFIG must be issued to set the technology, band, channel, etc.**:**
  - **Important —** For EM91 Tx testing, the !DARCONFIG <mimo_mode> must be 0, otherwise !DATXCONTROL will crash the module.

    Note — !DA test commands do not test for UL MIMO.

Usage:

- Execution: **AT!DATXCONTROL=<carrier>,<technology>,<enable>, <power_dBm10>[,<waveform>,<mod>,<ns_value>,<start_RB>, <num_RB>[,<beam_ID>[,<duty_cycle>]]]**

  Response: OK

  Purpose: Set the Tx parameters for WCDMA, LTE, 5G Sub-6 GHz and 5G mmW.

Parameters:

<carrier> (Carrier ID)

- 0 — PCC

<technology> (Radio access technology (RAT))

- RAT support is device-dependent
- 1 — WCDMA
- 3 — LTE
- 6 — 5G Sub-6 GHz or 5G mmW

<enable> (Enable/disable Tx power output)

- 0 — Disable
- 1 — Enable

<power_dBm10> (Desired Tx power in dBm * 10)

- Valid range:
  - EM91: -900 to 230 (represents 10 times desired Tx power)
  - EM92: -900 to 260 (represents 10 times desired Tx power)
- Value is ignored if <enable>=0
- e.g., -505 represents -50.5 dBm Tx power

(Continued on next page)

Table 5-2: Test command details (Continued)

!DATXCONTROL (continued)	Configure Tx Power (continued)

<waveform> (Waveform for LTE, 5G Sub-6 GHz or 5G mmW)

- LTE waveform
  - 0 — 1 MHz offset CW
  - 1 — LTE PUSCH
  - 2 — LTE PUCCH
  - 3 — LTE PRACH
  - 4 — LTE SRS
  - 5 — UpPTS
- 5G Sub-6 GHz or 5G mmW waveform
  - 1 — CW
  - 2 — Offset CW
  - 9 — Reserved
  - 10 — PUSCH
  - 11 — PUSCH DFT-S

<mod> (Tx modulation)

- Applies to LTE, 5G Sub-6 GHz and 5G mmW
- 0 — QPSK
- 1 — 16 QAM
- 2 — 64 QAM
- 3 — 256 QAM
- 4 — BPSK (5G Sub-6 GHz and 5G mmW only)

<ns_value> (Network signal value)

- Applies to LTE, 5G Sub-6 GHz and 5G mmW
- Valid range: 1–32
- Affects max output power

<start_RB> (Start resource block index)

- Applies to LTE, 5G Sub-6 GHz and 5G mmW
- Valid range: 0–273
- **Note —** The actual maximum value depends on the band, bandwidth, and SCS configuration. Refer to Table 5-3 on page 136 for details.

<num_RB> (Number of resource blocks)

- Applies to LTE, 5G Sub-6 GHz and 5G mmW
- Valid range: 0–273
- Requirement: (<start_RB> + <num_RB> - 1) ≤ actual maximum value from Table 5-3 on page 136)

<beam_ID> (5G mmW beam ID)

- Applies to 5G mmW only. If <duty_cycle> is used for LTE or 5G Sub-6 GHz, leave this parameter blank.
- Valid ranges:
  - IFV port: 0–127
  - IFH port: 128–255
- Indicates the mmW IF port used for testing
- Refer to document *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* or *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)* for the mapping between beam ID and mmW IF port.

(Continued on next page)

Table 5-2: Test command details (Continued)

!DATXCONTROL (continued)	Configure Tx Power (continued)
<duty_cycle> (Transmission duty cycle) • Applies to LTE, 5G Sub-6 GHz and 5G mmW radio configurations in burst mode. If the radio is in continuous mode, <duty_cycle> will be ignored. • LTE: ▪ 1 — 10% duty cycle ▪ 2 — 20% duty cycle ▪ 3 — 30% duty cycle ▪ 4 — 40% duty cycle ▪ 5 — 50% duty cycle ▪ 6 — 60% duty cycle ▪ 7 — 70% duty cycle ▪ 8 — 80% duty cycle ▪ 9 — 90% duty cycle ▪ 10 — 100% duty cycle (Default) • 5G Sub-6 GHz, 5G mmW: ▪ 0 — 20% duty cycle ▪ 1 — 25% duty cycle ▪ 2 — 40% duty cycle ▪ 3 — 50% duty cycle (Default)	

Table 5-2: Test command details (Continued)

Command	
!DATXMEASURE (EM91)	**Get Tx Power (FTM mode)**
Description	

Get the current measured Tx power when the module is in FTM mode.
(To configure the Tx power in FTM mode, use !DATXCONTROL.)

Supporting EM9 devices: EM91
Added F/W: EM91: SWIX55C_03.14.10.00 (Release 6)
Password required: Yes
Persistent across power cycles: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage Requirements:
Before using this command:

- +CFUN=5 must be issued to put the modem into FTM.
- !DAUPDATEPARAM must be issued to update/get parameters except for 5G mmW.
- !DARCONFIG must be issued to set the technology, band, channel, etc.

Usage:

- Execution: **AT!DATXMEASURE**
  Response: `!DATXMEASURE: <status>,<txpower> <CR>`
  `OK`
  Purpose: Display the current measured Tx power.
- Query List: **AT!DATXMEASURE=?**
  Response: `OK`
  Purpose: Indicates the execution command format is available.

Parameters:

<status> (Result of request for current Tx power value)

- Format: 32-bit hexadecimal bitmask (leading zeroes are not displayed)
- 0—Success (the <txpower> was obtained)
- 1–FFFFFFFF—Error

<txpower> (Measured Tx power, in dBm)

- Format: Signed float
- Range:
  - If <status> = 0—Approximately -50 to +50
  - If <status> = 1–FFFFFFFF—-99.99 (indicates invalid / error)

Example(s):

```
AT!DATXMEASURE
!DATXMEASURE: 0,-24.92
```

Table 5-2: Test command details (Continued)

Command	
!DAUPDATEPARAM	**Update parameters to prepare for !DARCONFIG**

Description

Update/get signal path, RFM (Radio Frequency Module) device, etc., for a specific band.

Note: This command is for EM91 only.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: Pre-Release
Updated F/W: EM91: SWIX55C_01.07.23.00 (Release 1.1)
Removed F/W: EM92: REMOVED — Release 1
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage Requirements:
Before using this command:
- +CFUN=5 must be issued to put the modem into FTM.

Usage:
- Execution: **AT!DAUPDATEPARAM=<technology_family>,<band>[, <subband_type>]**
  Response: OK
  Purpose: Configure band parameters prior to using !DARCONFIG.

Parameters:

<technology_family> (Radio access technology (RAT))
- RAT support is device-dependent
- 1 — WCDMA
- 10 — LTE
- 18 — 5G Sub-6 GHz

<band> (Band number)
- Valid range: Refer to section "Supported RF Bands" in *[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174).*
- e.g. '1' corresponds to WCDMA Band 1, LTE B1, or 5G Sub-6 GHz n1

<subband_type> (Sub-band type)
- 1 — Sub-band B
- This parameter is used only to indicate sub-band B. For example, use **!DAUPDATEPARAM=10,28,1** to update parameters for LTE B28**B**.

Table 5-2: Test command details (Continued)

Command	
!LTERXCONTROL	**Enable / disable LTE receive (Rx) diversity during Carrier Aggregation**

Description

This command is used to evaluate LTE / ENDC RF functionality. Enable or disable LTE receive diversity for individual component carriers (PCC or SCC) during Carrier Aggregation (CA).

Important: A test SIM (MCC ID 001) ***must*** *be used when testing RF functionality with this command. If a commercial SIM is used on a live network, the module will crash and get stuck in QDLoader mode.*

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
SIM card requirement: Yes
Reset required to apply changes: No
Persistent across power cycles: EM91: Yes EM92: No

Usage Notes:

- Use a test SIM (MCC ID 001) when testing RF functionality with this command.
- **Important — Do not use a commercial SIM** on a live network. The module will crash and get stuck in QDLoader mode.
- (EM92 only) Before testing different Rx chains, do the following (otherwise the module will crash and reboot):
  1. The module must be put into RRC Idle (controlled by test equipment).
  2. Rx select must be initialized — Use AT!LTERXCONTROL=0,40.
- When using !LTERXCONTROL to disable any chain, make sure !RXDEN is set to enable all Rx chains.
- Due to firmware design, LTE open-loop Tx power should be set to 20 dBm when measuring SISO sensitivity with Rx diversity as the primary path.
- There is an overlap for LTE configuration between !LTERXCONTROL and !RXDEN. Each command will overwrite the other, therefore, the currently active setting is from the most-recently issued command.

Usage:

- Execution: **AT!LTERXCONTROL=<cc_id>,<selection>**
  Response: OK
  Purpose: Configure the component carrier as primary Rx, diversity Rx, or both.
- Query List: **AT!LTERXCONTROL=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<cc_id> (Component carrier ID)

- 0 — PCC (Primary cell) (Default)
- 1 — SCC (Secondary cell)
- 2 — SCC2 (Secondary cell)
- 3 — SCC3 (Secondary cell)

(Continued on next page)

Table 5-2: Test command details (Continued)

!LTERXCONTROL (continued)	Enable / disable LTE receive (Rx) diversity during Carrier Aggregation (continued)
<selection> (Rx path to be enabled) • Hex values • Valid values are module series-dependent: ▪ EM91xx: ▪ 1 — Enable Primary Rx only (i.e., primary Rx path only) ▪ 2 — Enable Diversity Rx1 only (i.e., MIMO1 Rx path only) ▪ 3 — Enable Diversity Rx2 only (i.e., MIMO2 Rx path only) ▪ 4 — Enable Diversity Rx3 only (i.e., aux Rx path only) ▪ 5 — Enable both Primary Rx and Diversity Rx (i.e., all four Rx paths) (Default) ▪ EM92xx: ▪ 1 — Enable Primary Rx0 ▪ 2 — Enable Diversity Rx1 ▪ 4 — Enable Diversity Rx2 ▪ 8 — Enable Diversity Rx3 ▪ F — Enable both Primary Rx and Diversity Rx (i.e., all four Rx paths) (Default) ▪ 40 — Initialize Rx select capability. The module must be in RRC idle before using this mask.	

Table 5-2: Test command details (Continued)

Command	
!RXDEN	**Enable / disable WCDMA / LTE / 5G Sub-6 GHz receive (Rx) diversity**

Description

This command is used to evaluate RF functionality. Enable or disable WCDMA / LTE / 5G Sub-6 GHz receive diversity.

Important: A test SIM (MCC ID 001) must be used when testing RF functionality with this command. If a commercial SIM is used on a live network, the module will crash and get stuck in QDLoader mode.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes (Execution)
No (Query)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage Notes:

- **Important — Do not use a commercial SIM** on a live network. The module will crash and get stuck in QDLoader mode. If this happens, recover using the following procedure:
  1. Remove the commercial SIM.
  2. Reboot the module.
  3. Unlock the module.
  4. Revert to a known working value (e.g., typically use AT!RXDEN=1)
  5. Reboot the module.
  6. Re-insert the SIM.
- There is an overlap for LTE configuration between !LTERXCONTROL and !RXDEN. !LTERXCONTROL will overwrite !RXDEN, and !RXDEN will overwrite !LTERXCONTROL. Therefore, the currently active setting is from the most-recently issued command.
- During LTE CA, this command works only on the Primary component carrier (PCC). To control SCC Rx chains, use !LTERXCONTROL.

Usage:

- Execution: **AT!RXDEN=<mode>[,<rx_chain_select>]**
  Response: OK
  Purpose: Enable or disable Rx diversity.
- Query: **AT!RXDEN?**
  Response:
  ```
  !RXDEN: <CR>
  <mode>[,<rx_chain_select>] <CR>
  OK
  ```
  Purpose: Query the current parameter settings.
- Query List: **AT!RXDEN=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<mode> (Component carrier ID)

- Applies to 3G/4G/5G Sub-6 GHz
- 0 — Disable Rx diversity (i.e., primary Rx path only)
- 1 — Enable Rx diversity (i.e., all 4 Rx paths)(Default)
- 2 — Rx diversity as primary path (depends on parameter <RX CHAIN SELECT>)

(Continued on next page)

Table 5-2: Test command details (Continued)

!RXDEN (continued)	Enable / disable WCDMA / LTE / 5G Sub-6 GHz receive (Rx) diversity (continued)
<rx_chain_select> (Select Rx path) • Optional. Used only when <WCDMA/LTE/NR5G flag>=2. • 0 — Rx1 diversity as primary path (i.e., MIMO1 Rx path only) • 1 — Rx2 diversity as primary path (i.e., MIMO2 Rx path only) • 2 — Rx3 diversity as primary path (i.e., aux Rx path only)	

Table 5-3: Maximum Transmission Bandwidth Configuration (Number of Resource Blocks)[a]

SCS[b] (kHz)	Number of Resource Blocks (N_{RB}) per Bandwidth											
	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
15	25	52	79	106	133	160	216	270	n/a	n/a	n/a	n/a
30	11	24	38	51	65	78	106	133	162	217	245	273
60	n/a	11	18	24	31	38	51	65	79	107	121	135

a. Table source — 3GPP TS 38.521-1 V15.3.0 Table 5.3.2-1.
b. Subcarrier spacing

Sample DA* Command Usage

For suggested Tx and Rx testing instructions for supported RATs, refer to *[3] EM91 Series Customer Production Test Guide (Doc# 41113679)* and *[4] EM92 Series Customer Production Test Guide (Doc# 41114569)*.

6: Memory Management Commands

Introduction

The modem uses non-volatile memory to store:

- Factory calibration data
- Settings made in a host application

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

Command summary

Table 6-1 summarizes the commands that are described in detail in Table 6-2 on page 138.

Table 6-1: Memory management commands

Command	Description	Page
!CARRIERRESET	Reset carrier configuration	138
!NVBACKUP	Back up device configuration	139
!NVPERSISTRST	Configure item persistency / Reset persistent item(s)	141
!RMARESET	Restore device to saved restore point	144

Command reference

Table 6-2: Memory management command details

Command	
!CARRIERRESET	**Reset carrier configuration**

Description

Reset any carrier configuration on the module to its default configuration, if the carrier was properly provisioned on the module and a default carrier reset file is present. (Note — The carrier reset file is typically loaded on the module during provisioning.)

Note:
- *If a carrier reset is performed on the active carrier, the module automatically reboots after completing the reset.*
- *The carrier does not have to be the active carrier.*
- *This command does not affect any customer or OEM settings.*

Supporting EM9 devices: EM92

Added F/W: EM91: SWIX55C_02.08.01.00 (Release 2) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Password required: Yes

Reset required to apply changes: No (Note: If resetting the active carrier, the module automatically resets)

Persistent across power cycles: n/a

Usage:

- Execution:

  AT!CARRIERRESET=<Carrier ID>

  or

  AT!CARRIERRESET=<Carrier Name>

  Response:
  ```
  !CARRIERRESET: <CR>
  OK
  ```

  Purpose: Reset the carrier

Parameters:

<Carrier ID> (Unique numeric code identifying the carrier)
- Valid range: 1–253

<Carrier Name> (Unique string identifying the carrier)
- ASCII string
- e.g., “GENERIC”, “Verizon”, etc.

Table 6-2: Memory management command details (Continued)

Command	
!NVBACKUP	**Back up device configuration**

Description

Save the device's current configuration as a 'restore point'. The restore point can then be restored at a later time if necessary, using !RMARESET on page 144 and !NVPERSISTRST on page 141.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!NVBACKUP[=<restore point>[,<name>]]**
  Response:
  ```
  !NVBACKUP: <CR>
  Items Saved: <saved> <CR>
  Items Skipped: <skipped> <CR>
  OK
  ```
  Purpose: Save the current device configuration to the indicated <restore point>.
  Note — The restore point replaces the existing same-numbered restore point (if present), and deletes higher-numbered restore points. (i.e., saving to <restore point>=2 replaces any existing configuration in that restore point, and deletes the configuration in <restore point>=3)
- Query: **AT!NVBACKUP?**
  Response:
  ```
  !NVBACKUP: <CR>
  <restore point> <name> <CR>
  ... <CR>
  OK
  ```
  Purpose: Display all saved restore points.

Usage Notes:

- When saving a restore point:
  - If no parameters are entered (i.e., "**AT!NVBACKUP**"), the next available restore point is used. (i.e., <restore point>=2 will be used if it is empty, otherwise <restore point>=3 will be used)
  - The existing <restore point> is replaced (if present).
  - Higher-numbered restore points are deleted.
- If a <name> is not specified, the file is saved as "unnamed" or "Latest", depending on the <restore point>.

Parameters:

<restore point> (Type of saved restore point)

- 0 — Semtech factory-calibrated configuration (Reserved for internal use)
- 1 — Semtech-provided SKU configuration (Reserved for internal use)
- 2 — Save the current configuration using a specified file <name>. If no <name> is specified, save as "unnamed".
- 3 — Save the current configuration as the 'Latest' restore point.
  Note: The category 3 restore point is also generated automatically after a successful reconfiguration (e.g. after an image switch or firmware update).

(Continued on next page)

Table 6-2: Memory management command details (Continued)

!NVBACKUP (continued)	Back up device configuration (continued)
<name> (Name used to store the restore point) • 0–32 ASCII characters ▪ <restore point> = 0 — "Factory" (Semtech factory-calibrated configuration, pre-SKU) ▪ <restore point> = 1 — "Provision" (Semtech-provisioned SKU configuration) ▪ <restore point> = 2 — User-defined name provided when restore point was saved, or "unnamed" if no name was provided ▪ <restore point> = 3 — Customer-defined name provided when restore point was saved, or "Latest" (Latest saved configuration) if no name was provided <saved> (Number of saved items) • 0–(2^{32} - 1) <skipped> (Number of skipped items) • 0–(2^{32} - 1) • Note — Does not display if 0	

Table 6-2: Memory management command details (Continued)

Command	
!NVPERSISTRST	**Configure item persistency / Reset persistent item(s)**

Description

Use this command to reset persistent carrier configuration items. (i.e., reverse changes that have been made to profiles or other persistent items).

Note — Each carrier configuration can be assigned a unique set of reset 'exceptions' to customize the reset behavior for specific carrier and customer requirements.

Supporting EM9 devices: EM92

Added F/W: EM91: n/a EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage Notes:

- The default reset <operation> can be used with or without exceptions. Without exceptions, configuration items are reset to their default values.

Usage:

- Execution: **AT!NVPERSISTRST=<operation>[,<carrier>[,<reset-type>[,<item>[,<source>]]]]**
  Note: The command format varies depending on the <operation> type — see the <operation> definitions in the 'Parameters' section below.
  Response: `OK`
  Purpose: Reset the carrier's persistent items, or add / remove / display a reset exception. Refer to the <operation> parameter for the additional parameters required for each operation type.
- Query: **AT!NVPERSISTRST?**
  Response:
  ```
  !NVPERSISTRST:
  [<source>,<item path> <CR>]
  ... <CR>
  OK
  ```
  Purpose: Display a complete list of the active carrier's reset exceptions.
  (Note — This is equivalent to !NVPERSISTRST=1 or !NVPERSISTRST=1,)

(Continued on next page)

Table 6-2: Memory management command details (Continued)

!NVPERSISTRST (continued)	Configure item persistency / Reset persistent item(s) (continued)

Parameters:

<operation> (Type of operation to perform)

- 0 (Default) — Perform a persistence reset:
  - Command format: **!NVPERSISTRST=0[,<carrier>[,<reset-type>]]**
    - To reset the active carrier to its default PRI configuration (with any configured exceptions), leave <carrier> blank and do not use any other parameters.
    - To reset a specific carrier (active or not) to its default PRI configuration (with any configured exceptions), specify the <carrier> and do not use any other parameters.
    - To reset the carrier to its default PRI configuration (with any configured exceptions), use <reset-type>=0. (See the <reset-type> parameter description below for details.)
    - To reset the carrier to a stored carrier-specified pre-configuration (with any configured exception), use <reset-type>=1. (See the <reset-type> parameter description below for details.)
- 1 — Get reset exceptions. Display all or only type of reset exceptions for a carrier.
  Command format: **!NVPERSISTRST=1[,<carrier>[,<reset-type>]]**
- 2 — Add reset exception. Add a reset exception for a specific carrier.
  Command format: **!NVPERSISTRST=2,<carrier>,<reset-type>,<item>,<source>**
- 3 — Remove reset exception. Remove a reset exception from a specific carrier.
  Command format: **!NVPERSISTRST=3,<carrier>,<reset-type>,<item>**

<carrier> (Unique carrier ID number or carrier name string identifying the carrier)

- If the <carrier> is blank or not entered, the active carrier is used.
- Carrier ID:
  - Valid range: 1–253
- Carrier name:
  - ASCII string. The string must match (case-insensitive) a defined carrier name in Table 14-1 on page 213.
  - e.g., "GENERIC", "generic", "GenERiC" are all valid strings for carrier 1.
- For a list of Carrier IDs and names, see Table 14-1 on page 213.

<reset-type> (Type of reset to perform)

- Valid values:
  - 0 (Default) — Reset to the carrier PRI configuration. Note — Reset exceptions can be added for this reset type (using <operation>=2) but are not required. For example, if Profile3 is customized with a specific APN, an exception can be added to not reset Profile3.
  - 1 — Reset carrier configuration according to an exception list. Note — At least one exception must exist otherwise the command will fail.

<item> (Absolute path of a reset exception item, including the item name)

- ASCII string
- Note — Directories are not supported.

<source> (Source of the reset exception to add)

- Valid values:
  - 2 — Factory-provisioned (i.e., Original Semtech provisioning)
  - 3 — OEM restore point.
  - 4 — Latest restore point
  - 9 — Keep the current configuration (i.e., the specified <item> does not get reset)
- Note: If a persistence reset is attempted (i.e, <operation>=0) on a <source> that does not exist (i.e., an OEM restore point or the latest restore point (backup)), the command will fail.

(Continued on next page)

Table 6-2: Memory management command details (Continued)

!NVPERSISTRST (continued)	Configure item persistency / Reset persistent item(s) (continued)

Example(s):

- List all reset exceptions for the active carrier, for the default reset type:

```
AT!NVPERSISTRST?
!NVPERSISTRST: <CR>
2,/Data_Profiles/Profile1 <CR>
<CR>
OK
```

- List all reset exceptions for carrier 4 (AT&T), for reset type 1 (carrier reset):

```
AT!NVPERSISTRST=1,4,1
!NVPERSISTRST: <CR>
2,/nvm/num/10 <CR>
2,/nv/item_files/data/3gpp/ds_3gpp_mtu <CR>
9,/Data_Profiles/Profile1 <CR>
9,/Data_Profiles/Profile2 <CR>
9,/Data_Profiles/Profile3 <CR>
2,/nv/item_files/modem/mmode/ciot_lte_preferences <CR>
2,/nv/item_files/modem/nas/nas_ciot_capability_config <CR>
<CR>
OK
```

- Reset all persistent items for the active carrier to the carrier PRI configuration plus any reset type 0 exceptions:

```
AT!NVPERSISTRST=0
OK
```

- Reset all persistent items for carrier 182 (Sierra Wireless) to the carrier PRI configuration plus any reset type 0 exceptions:

```
AT!NVPERSISTRST=0,182
OK
```

- Add two exceptions to the default reset behavior for carrier "Verizon", and then reset all persistent data to the carrier PRI configuration for Verizon plus the new exceptions:

  Add the first exception, which will reset profile 1 to the value it was when the device was provisioned in the factory (restore point 2).

```
AT!NVPERSISTRST=2,Verizon,,/Data_Profiles/Profile1,2
OK
```

  Add the second exception, which will preserve the current value of profile 3 during a persistence reset.

```
AT!NVPERSISTRST=2,Verizon,,/Data_Profiles/Profile3,9
OK
```

  Reset all persistent data for Verizon using the new exceptions.

```
AT!NVPERSISTRST=0,Verizon
OK
```

- Remove an existing exception carrier "AT&T" for reset type 1 (carrier reset):

```
AT!NVPERSISTRST=3,AT&T,1,/nv/item_files/data/3gpp/ds_3gpp_mtu
OK
```

Table 6-2: Memory management command details (Continued)

Command	
!RMARESET	**Restore device to saved restore point**

Description

Restore the device to a previously saved restore point.

Important — Using this command may erase any settings performed by the user. Semtech recommends creating a backup (using the !NVBACKUP command) in restore point 2 after making configuration changes (e.g. after downloading mmWave or Smart Transmit settings).

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage Notes:

- After using the execution format to specify a restore point, restart the module to perfrom the restore.

Usage:

- Execution: **AT!RMARESET=<restore point>**

  Response:
  ```
  !RMARESET: DEVICE REBOOT REQUIRED <CR>
  Items Restored:  <restored count> <CR>
  Items Deleted:   <deleted count> <CR>
  Items Defaulted: <defaulted count> <CR>
  Items Skipped:   <skipped count> <CR>
  OK
  ```

  Purpose: Restore device to the specified <restore point> (configuration). A reboot is required to take effect.
- Query: **AT!RMARESET?**

  Response:
  ```
  !RMARESET:
  <restore point> <name> <CR>
  ... <CR>
  OK
  ```

  Purpose: Display all available restore points.

Parameters:

<restore_point> (Saved restore point)

- 0 — Semtech factory-calibrated configuration (Note — For information only, cannot be restored.)
- 1 — Semtech-provided SKU configuration
- 2 — Restore to the restore point that was saved earlier using !NVBACKUP.
- 3 — Restore to the latest saved restore point (saved earlier using !NVBACKUP or automatically when the device was successfully reconfigured, e.g. after an image switch or firmware update)

<name> (Descriptive name of <restore_point>)

- ASCII string, varies by <restore point>:
  - <restore point> = 0 — "Factory" (Semtech factory-calibrated configuration, pre-SKU)
  - <restore point> = 1 — "Provision" (Semtech-provisioned SKU configuration)
  - <restore point> = 2 — Customer-defined name provided when using !NVBACKUP to save a configuration, or "unnamed" if no name was provided
  - <restore point> = 3 — Customer-defined name provided when using !NVBACKUP to save a configuration, or "Latest" (Latest saved configuration)

7: GNSS Commands

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 !CUSTOM="GPSENABLE"
- If supported by the modem, gpsOneXTRA is enabled (over the NDIS interface) by default when GNSS is enabled, and it generates data traffic.

Command summary

Table 7-1 summarizes the commands that are described in detail in Table 7-2 on page 146.

Table 7-1: GNSS commands

Command	Description	Page
!GNSSCONFIG	Configure GNSS Satellite Constellation	146
!GNSSPERMITTEDSTATE	Query GNSS feature permitted state	148
!GPSAUTOSTART	Configure GPS auto-start features	149
!GPSCLRASSIST	Clear specific GPS assistance data	150
!GPSCOLDSTART	Clear all GNSS assistance data	151
!GPSEND	End an active session	152
!GPSFIX	Initiate GPS position fix	153
!GPSLBSAPN	Set GPS LBS APNs	154
!GPSLOC	Return last known location of the modem	156
!GPSMOMETHOD	Set/report GPS MO method	158
!GPSMTLRSETTINGS	Configure response behavior to network-initiated GPS notifications	159
!GPSNIQOSTIME	Configure GPS Quality of Service timeout	160
!GPSPORTID	Set/report port ID to use over TCP/IP	161
!GPSSATINFO	Request satellite information	162
!GPSSTATUS	Request current status of a position fix session	164
!GPSSUPLURL	Set/report SUPL server URL	166
!GPSSUPLVER	Set/report SUPL server version	167
!GPSTRACK	Initiate local tracking (multiple fix) session	168
+WANT (EM92)	Configure DC bias power for GNSS dedicated antenna	170

Command reference

Table 7-2: GNSS command details

Command	
!GNSSCONFIG	**Configure GNSS Satellite Constellation**

Description

Configure the module's GNSS satellite constellation by enabling/disabling specific GNSS satellite systems.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWX55C_03.09.06.00 (Release 4.1)
Password required: No
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage Notes:

- Disabled systems (except QZSS) are not tracked, so are not used for position fixes, and do not appear in the !GPSSATINFO query response.
  When QZSS is disabled, it is not used for position fixes, but is tracked internally for cross-correlation with other enabled satellite systems. This causes QZSS to appear in the !GPSSATINFO query response, regardless of its !GNSSCONFIG setting.

Usage:

- Execution: **AT!GNSSCONFIG=<GPS>,<GLO>,<BDS>,<GAL>,<QZS>**
  Response: `OK`
  Purpose: Enable or disable tracking for specific GNSS satellite systems.
- Query: **AT!GNSSCONFIG?**
  Response:
  ```
  GPS:     <GPS> <CR>
  GLONASS: <GLO> <CR>
  BDS:     <BDS> <CR>
  GAL:     <GAL> <CR>
  QZSS:    <QZS> <CR>
  OK
  ```
  Purpose: Return the current GNSS satellite constellation configuration.
- Query List: **AT!GNSSCONFIG=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<GPS> (GPS satellite system tracking)
- 1 — Enable
- Note: GPS cannot be disabled

<GLONASS> (GLONASS satellite system tracking)
- 0 — Disable
- 1 — Enable

<BDS> (BeiDou satellite system tracking)
- 0 — Disable
- 1 — Enable worldwide
- 2 — Enable outside of US

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GNSSCONFIG (continued)	Configure GNSS Satellite Constellation (continued)
<GAL> (Galileo satellite system tracking) • 0 — Disable • 1 — Enable worldwide • 2 — Enable outside of US <QZS> (Quasi-Zenith satellite system (QZSS) tracking) • 0 — Disable • 1 — Enable worldwide • 2 — Enable outside of US	

Table 7-2: GNSS command details (Continued)

Command	
!GNSSPERMITTEDSTATE	**Query GNSS feature permitted state**
Description	

Display the current permitted state of the GNSS feature. The feature is not permitted to be used if any of the following conditions (votes) exist:

- The physical GPS_DISABLE switch is ON.
- The module is in low power mode (LPM) — the !CUSTOM "GPSLPM" customization is set to 1.
- The carrier restricts the use of the feature.
- The !CUSTOM "GPSENABLE" customization is set to 0 (GNSS disabled).

Supporting EM9 devices: All

Added F/W: EM91: n/a EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!GNSSPERMITTEDSTATE?**

  Response:
  ```
  Permitted: <permitted> <CR>
  Disable votes: WDIS_2:<vote>, LPM:<vote>, CARRIER:<vote>,
  GPSENABLECUST:<vote> <CR>
  OK
  ```

  Purpose: Display the current permitted state of the GNSS feature.

Parameters:

<permitted> (Permitted state)

- 0 — Disabled (GNSS is not permitted)
- 1 — Permitted (GNSS is permitted)

<vote> (Current state of each condition (voter) that controls GNSS permitted state)

- Valid values:
  - 0 — GNSS feature is permitted
  - 1 — GNSS feature is not permitted due to this condition
- Voters include:
  - WDIS_2 — Vote is '1' if the physical GPS_DISABLE switch is ON.
  - LPM — Vote is '1' if the module is in LPM (the !CUSTOM "GPSLPM" customization is set to 1).
  - CARRIER — Vote is '1' if GNSS is disabled due to carrier restrictions.
  - GPSENABLECUST — Vote is '1' if the !CUSTOM "GPSENABLE" customization is set to 0.

Table 7-2: GNSS command details (Continued)

Command	
!GPSAUTOSTART	**Configure GPS auto-start features**
Description	

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.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
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 <CR>
    function: <function> <CR>
    fixtype:  <fixtype> <CR>
    maxtime: <maxtime> seconds <CR>
    maxdist: <maxdist> meters <CR>
    fixrate: <fixrate> seconds <CR>
  OK
  ```
  Purpose: Display the current values for auto-start features
- Query List: **AT!GPSAUTOSTART=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<function> (Enable/disable the feature)
- 0 — Disabled
- 1 — Enabled at boot (GPS tracking session starts automatically when modem is reset)

<fixtype> (Type of fix to establish)
- 1 — Standalone
- 2 — MS-based only
- 3 — MS-assisted only

<maxtime> (Maximum time to wait for a position fix, in seconds)
- Valid range: 0–255

<maxdist> (Requested accuracy of fix, in meters)
- Entered in decimal format
- Valid range:
  - 0–4294967279
  - 4294967280 — No preference

<fixrate> (Time to wait between fixes, in seconds)
- Valid range: 1–65535

Table 7-2: GNSS command details (Continued)

Command	
!GPSCLRASSIST	**Clear specific GPS assistance data**
Description	

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.

The command is only available when there is no active GPS session — the GPS receiver is off and no position fix is being calculated.

(This command is equivalent to !GPSCOLDSTART when all parameters (except <alm>) are set to '1'.)

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_02.08.01.00 (Release 2)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: n/a

Usage:

- Execution: **AT!GPSCLRASSIST=<eph>, <alm>, <pos>, <time>, <iono>**
  Response:
  ```
  OK
  ```
  or
  ```
  Command ignored <CR>
  OK
  ```
  Purpose: Clear each assistance data type that is flagged as '1'.
- Query List: **AT!GPSCLRASSIST=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<eph> (Ephemeris assistance data)
- 0 — Ignore (Do not clear the ephemeris assistance data)
- 1 — Clear this assistance data

<alm> (Almanac assistance data)
- 0 — Ignore (Do not clear the almanac assistance data)
- 1 — Clear this assistance data

<pos> (Position assistance data)
- 0 — Ignore (Do not clear the position assistance data)
- 1 — Clear this assistance data

<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

Table 7-2: GNSS command details (Continued)

Command	
!GPSCOLDSTART	Clear all GNSS assistance data
Description	
DEPRECATED: This command is deprecated for EM91 and EM92. Use !GPSCLRASSIST for equivalent functionality.	
Supporting EM9 devices: None	

Table 7-2: GNSS command details (Continued)

Command	
!GPSEND	**End an active session**
Description	

End an active position fix session.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.09.11.00 (Release 4.2)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: n/a

Usage:

- Execution: **AT!GPSEND=<sessType>[, <sessionID>]**
  Response:
  ```
  [ErrCode = <value> <CR>]
  OK
  ```
  Purpose: End the current session and, if the command fails for any reason, return an error code (<value>).

Parameters:

<sessType> (Type of session to end)
- 0 — Position fix session

<sessionID> (ID of the session to end)
- 0–254 — Reserved
- 255 — End all sessions

<value> (Error code returned when command fails for any reason)
- See Table 7-3 on page 171 for a list of possible error codes.
- N/A — Not available

Table 7-2: GNSS command details (Continued)

Command	
!GPSFIX	Initiate GPS position fix

Description

Initiate a GPS position fix.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: No

Usage:

- Execution: **AT!GPSFIX=<fixType>, <maxTime>, <maxDist>**
  Response:
  ```
  Fix initiated <CR>
  OK
  ```
  or
  ```
  ERROR CODE = <value> <CR>
  OK
  ```
  Purpose: Initiate a time-limited position fix with a specified accuracy.
- Query List: **AT!GPSFIX=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<fixType> (Type of fix to establish)
- 1 — Standalone
- 2 — MS-based only
- 3 — MS-assisted only

<maxTime> (Maximum time to wait for a position fix, in seconds)
- Valid range: 0–255

<maxDist> (Requested accuracy of fix, in meters)
- Entered in decimal format
- Valid range:
  - 0–4294967279
  - 4294967280 — No preference

<value> (Error code returned when command fails for any reason)
- See Table 7-3 on page 171 for a list of possible error codes.
- N/A — Not available

Example(s):

- Request a standalone position fix to 10 meters accuracy. The request will fail (timeout) if the modem cannot determine a position fix within 15 seconds.
  ```
  AT!GPSFIX=1,15,10
  Fix initiated <CR>
  OK
  ```

Related commands:

- !GPSSTATUS on page 164 — Use this command while the tracking session is in progress.
- !GPSLOC on page 156 — Use this command after the session completes to obtain the result.

Table 7-2: GNSS command details (Continued)

Command	
!GPSLBSAPN	**Set GPS LBS APNs**
Description	

Set the GPS Location Based Service (LBS) APNs to be used for various RATs (Radio Access Technologies).

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution (Add):
  AT!GPSLBSAPN=<operation>,<ratmask>,<IPtype>,<APN>
  Execution (Delete one):
  AT!GPSLBSAPN=<operation>,<ratmask>
  Execution (Delete all):
  AT!GPSLBSAPN=<operation>
  Response: `OK`
  or
  `ERROR`
  Purpose: Set the APN to be used for the specified <ratmask>, or delete the APN for a single <ratmask> or all RATs.
- Query: **AT!GPSLBSAPN?**
  Response:
  ```
  <ratmask>, <IPType>, <APN> <CR>
  <ratmask>, <IPType>, <APN> <CR>
  ... <CR>
  OK
  ```
  or
  `OK` ← *if no ID has been set*
  Purpose: Display the APNs currently assigned for each RAT.
- Query List: **AT!GPSLBSAPN=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<operation> (Add or delete APNs)

- 1 — Add an APN for a specific <ratmask> and <IPtype>.
  Note — All parameters are required.
- 2 — Delete the APN for a specific <ratmask>
  Note — Only <ratmask> is required.
- 3 — Delete all APNs
  Note — No other parameters are required.

Note: To change an APN that has been set for a RAT, you must first delete the current APN, then add the new APN.

<ratmask> (Radio access technology)

- Valid values (values shown are in hexadecimal format):
  - 08 — WCDMA
  - 10 — LTE
  - Note — 5G is not supported.

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GPSLBSAPN (continued)	Set GPS LBS APNs (continued)
<IPtype> (Internet Protocol version) ▪ Character string ▪ Double quotation marks (") are required for the Execution format (e.g., "IPV4V6") · Valid values: ▪ IPV4 ▪ IPV6 ▪ IPV4V6 <APN> (Access Point Name) · Character string, entered with quotation marks · Examples: "mycompany.mnc987.mcc123.gprs", "ourinternet"	

Table 7-2: GNSS command details (Continued)

Command	
!GPSLOC	**Return last known location of the modem**
Description	

Return the details obtained during the most recent position location session, if available.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!GPSLOC?**

Response:

```
Unknown <CR>                    ← No information is available
OK
```

or

```
Not Available  <CR>             ← No information is available
OK
```

or

```
Lat: <latitude> <CR>
Lon: <longitude> <CR>
Time: <time> <CR>
LocUncAngle: <luAngle> LocUncA: <luA> LocUncP: <luP> HEPE: <hepe>
<fixType> <CR>
Altitude: <altitude> LocUncVe: <luV> <CR>
Heading: <heading> VelHoriz: <vH> VelVert: <vV> <CR>
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"

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GPSLOC (continued)	Return last known location of the modem (continued)
<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" <heading> (Direction of MS) • Example: "0.0 deg" <vH> (Horizontal velocity) • Example: "0.0 m/s" <vV> (Vertical velocity) • Example: "0.0 m/s"	

Table 7-2: GNSS command details (Continued)

Command	
!GPSMOMETHOD	**Set / report GPS MO method**
Description	
Set or report the GPS MO method (session type) that a mobile-originated GPS session should use (Control plane or User plane).	

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!GPSMOMETHOD=<MO_method>**
  Response: `OK`
  or
  `ERROR`
  Purpose: Indicate the MO method to use.
- Query: **AT!GPSMOMETHOD?**
  Response: `<MO_method> <CR>`
  `OK`
  Purpose: Return the current <MO_method> setting.

Parameters:

<MO_method> (MO method)

- 0 — CP (Control Plane)
- 1 — UP (User Plane)

Table 7-2: GNSS command details (Continued)

Command	
!GPSMTLRSETTINGS	**Configure response behavior to network-initiated GPS notifications**

Description

Configure the module's response behavior to network-initiated GPS notifications.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!GPSMTLRSETTINGS=<Notification** Response**>**
  Response: `OK`
  Purpose: Configure the module's response behavior.
- Query: **AT!GPSMTLRSETTINGS?**
  Response: `Notification Response Setting: <Notification Response> <CR>`
  `OK`
  Purpose: Display the currently configured response behavior.
- Query List: **AT!GPSMTLRSETTINGS=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<response> (Response behavior)

- 0 — Default setting specified by network
- 1 — Accept all
- 2 — Reject all
- 3 — Verify all

Table 7-2: GNSS command details (Continued)

Command	
!GPSNIQOSTIME	**Configure GPS Quality of Service timeout**
Description	
Configure the Quality of Service (QOS) timeout for network-initialized fixes. **Supporting EM9 devices:** All **Added F/W:** EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1) **Password required:** Yes **Reset required to apply changes:** Yes **Persistent across power cycles:** Yes **Usage:** ▪ Execution: **AT!GPSNIQOSTIME=<val>** Response: `OK` Purpose: Set the GPS QOS timeout (in seconds) for network-initialized fixes. ▪ Query: **AT!GPSNIQOSTIME?** Response: `QoS time: <val> <CR>` `OK` Purpose: Display the current QOS timeout value. **Parameters:** <val> (QOS timeout, in seconds) · Integer · Valid range: 0–2147483647	

Table 7-2: GNSS command details (Continued)

Command	
!GPSPORTID	Set / report port ID to use over TCP/IP
Description	
DEPRECATED: This command is deprecated for EM91 and EM92. Use !GPSSUPLURL to set or report the SUPL server's port ID. **Supporting EM9 devices:** None *Note: Command was available in earlier releases, but was non-functional.*	

Table 7-2: GNSS command details (Continued)

Command	
!GPSSATINFO	**Request satellite information**
Description	

Return the following information for up to twelve 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.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage Notes:

- Systems (except QZSS) that have been disabled in !GNSSCONFIG are not tracked, so are not used for position fixes, and do not appear in the !GPSSATINFO query response.

  When QZSS is disabled, it is not used for position fixes, but is tracked internally for cross-correlation with other enabled satellite systems. This causes QZSS to appear in the !GPSSATINFO query response, regardless of its !GNSSCONFIG setting.

Usage:

- Query: **AT!GPSSATINFO?**

  Response:
```
NO SAT INFO <CR>
OK
```
or
```
Satellites in view: <numSats>  (Timestamp of sat. info) <CR>
* SV: <SV 1> ELEV:<ELEV 1> AZI:<AZI 1> SNR:<SNR 1> <CR>
  SV: <SV 2> ELEV:<ELEV 2> AZI:<AZI 2> SNR:<SNR 2> <CR>
* SV: <SV 3> ELEV:<ELEV 3> AZI:<AZI 3> SNR:<SNR 3> <CR>
  SV: <SV 4> ELEV:<ELEV 4> AZI:<AZI 4> SNR:<SNR 4> <CR>
... <CR>
* SV: <SV n> ELEV:<ELEV n> AZI:<AZI n> SNR:<SNR n> <CR>
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)

- Valid range: 1–12

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GPSSATINFO (continued)	Request satellite information (continued)
<SV n> (Satellite vehicle number for the nth satellite in the list) • Valid ranges: ▪ 1–32 (GPS) ▪ 65–96 (GLONASS) ▪ 193–197 (QZSS) ▪ 201–237 (BeiDou) ▪ 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 7-2: GNSS command details (Continued)

Command	
!GPSSTATUS	**Request current status of a position fix session**

Description

Return the current status of a position fix session.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!GPSSTATUS?**

  Response:
```
Current time: <year> <month> <day> <day of week> <time of day> <CR>
<CR>
<year> <month> <day> <day of week> <time of day> Last Fix Status    =
<status>[, FAILCODE = <failCode>] <CR>
<year> <month> <day> <day of week> <time of day> Fix Session Status =
<status>[, FAILCODE = <failCode>] <CR>
<CR>
[TTFF (sec) = <ttff> <CR>]    ← Appears if TTFF is available
[No TTFF available <CR>]      ← Appears if TTFF is not available
OK
```

  Purpose: Return timestamps and status of a position fix session.

Parameters:

<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"

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GPSSTATUS (continued)	Request current status of a position fix session (continued)

<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.
  - A <failCode> is displayed with the "FAIL" string. See Table 7-3 for a list of error codes.

<failCode> (Error code displayed when <status> = "FAIL")

- See Table 7-3 on page 171 for a list of error codes.

<ttff> (Time To First Fix, in seconds)

- Format: uint32
- Minimum: 1
- The TTFF is calculated on the first fix after the modem powers up, or when !GPSCOLDSTART is called.

Example(s):

-
```
AT!GPSSTATUS?
2007 01 06 6 00:25:01 Last Fix Status = SUCCESS <CR>
2007 01 06 6 00:25:02 Fix Session Status = ACTIVE
```

Table 7-2: GNSS command details (Continued)

Command	
!GPSSUPLURL	**Set / report SUPL server URL**
Description	

Set or return the URL of the SUPL server to be used when TCP/IP is used as the transport mechanism for location processing.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: Yes
Persistent across power cycles: Yes

Usage:

- Execution: **AT!GPSSUPLURL="<suplURL>"**
  Response: `OK`
  or
  `ERROR`
  Purpose: Identify the SUPL server URL.
- Query: **AT!GPSSUPLURL?**
  Response: `<suplURL> <CR>`
  `OK`
  Purpose: Return the SUPL server's URL.
- Query List: **AT!GPSSUPLURL=?**
  Purpose: Display 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.

Example(s):

- `AT!GPSSUPLURL="supl.url.net"`
- `AT!GPSSUPLURL="123.123.123.123"`

Table 7-2: GNSS command details (Continued)

Command	
!GPSSUPLVER	**Set / report SUPL server version**

Description

Set or return the version of the SUPL server.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
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> <CR>`
  `OK`
  Purpose: Return the SUPL server's version.
- Query List: **AT!GPSSUPLVER=?**
  Purpose: Display the execution command format.

Parameters:

<supl ver> (SUPL server version)

- 1 — SUPL version 1
- 2 — SUPL version 2

Table 7-2: GNSS command details (Continued)

Command	
!GPSTRACK	**Initiate local tracking (multiple fix) session**

Description

Initiate a local tracking session comprising a specific number of position fixes taken at regular time intervals.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: No

Usage:

- Execution: **AT!GPSTRACK = <fixType>, <maxTime>, <maxDist>, <fixCount>, <fixRate>**
  Response:
  ```
  Fix initiated <CR>
  OK
  ```
  or
  ```
  ERROR CODE = <value> <CR>
  OK
  ```
  Purpose: Initiate a series of time-limited position fixes.
  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 7-3 on page 171 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 (!GPSFIX) with a greater <maxTime> value.
- Query List: **AT!GPSTRACK=?**
  Purpose: Display the execution command format and parameter 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, in seconds)
- Valid range: 1–255

<maxDist> (Requested accuracy of fix, in meters)
- Entered in decimal format
- Valid range:
  - 1–4294967279
  - 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, in seconds)
- Valid range: 1–65535

(Continued on next page)

Table 7-2: GNSS command details (Continued)

!GPSTRACK (continued)	Initiate local tracking (multiple fix) session (continued)

Example(s):

- Request a series of 20 standalone position fixes to 10 meters accuracy—fixes are taken every 60 seconds.

```
AT!GPSTRACK=1, 15, 10, 20, 60
OK
```

Note: The example above was successful (indicated by "OK"). If the request had failed for any reason, the response would be "ERROR CODE = <value>". See Table 7-3 on page 171 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.

Table 7-2: GNSS command details (Continued)

Command	
+WANT (EM92)	**Configure DC bias power for GNSS dedicated antenna**
Description	

Enable/disable DC bias power for the GNSS dedicated antenna.

Supporting EM9 devices: EM9293
Added F/W: EM91: n/a EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage Notes:

- When <enabled>=1, DC bias power will be applied if the dedicated GNSS path has been selected (using the "GPSSEL" !CUSTOM customization). If an over-current condition occurs, the DC bias power is automatically turned off. To re-apply DC bias power, re-run the command (+WANT=1).

Usage:

- Execution: **AT+WANT=<enabled>**
  Response: `OK`
  Purpose: Enable or disable DC bias for the GNSS dedicated antenna.
- Query: **AT+WANT?**
  Response: `+WANT: <enabled>[,<state>] <CR>`
  `OK`
  Purpose: Display the current DC bias state.
- Query List: **AT+WANT=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<enabled> (DC bias power enabled/disabled)

- 0 — Disabled (Default)
- 1 — Enabled

<state> (DC bias state)

- This parameter appears only if the dedicated GNSS path is selected (using the "GPSSEL" !CUSTOM customization) and DC bias power is enabled.
- 0 — Normal DC bias power state
- 1 — Over-current condition has been detected since the last time DC bias was enabled.

Error codes

Table 7-3 describes error codes that can be returned by !GPSEND on page 152, page 164, and !GPSTRACK on page 168.

Table 7-4 on page 172 describes error codes that can be returned by !GPSFIX on page 153

Table 7-3: 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
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

Table 7-3: AT command error codes (!GPSEND, !GPSSTATUS, !GPSTRACK) (Continued)

Error code	Description
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 7-4: 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

Table 7-4: AT command error codes (!GPSFIX) (Continued)

Error code	Description
22	Temporary problem reporting position determination results
23	Error mode not supported
24	Periodic NI in progress
25	Unknown error
26	Unknown error

8: SIM Commands

Introduction

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

Command summary

Table 8-1 summarizes the commands that are described in detail in Table 8-2 on page 175.

Table 8-1: SIM command passwords

Command	Description	Page
!IMSIM	Update AUTO-SIM matching list	175
!SIMDETPOL	Configure SIM hot swap detection	177
!UIMS	Select active SIM interface	178

Command reference

Table 8-2: SIM command details

Command	
!IMSIM	**Update AUTO-SIM matching list**

Description

Update the module's image switching AUTO-SIM matching list, which the module uses to select the correct carrier PRI and firmware to use with the detected SIM.

The module is pre-loaded with a SKU-specific matching list of carrier configurations.

This command can be used to:

- Add SIM entries for any of the carrier configurations in the pre-loaded matching list
- Reset carrier configurations (i.e., remove user-entered SIM entries) to their pre-loaded settings

---

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4)

Password required: Yes (Execution)
No (Query)

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage notes:

- Each pre-loaded carrier configuration includes one or more SIM entries. Users can add up to 50 additional SIM entries per carrier configuration.
- Negative <rank> values ≤ -2 are reserved for Semtech use.

Usage:

- Execution: **AT!IMSIM=<carrier_name>[,<type>,<key>,<rank>,<subpri>]**
  Response: `OK`
  Purpose: Either add a new SIM for the specified carrier (all parameters are required), or reset the specified carrier configuration to its pre-loaded version.
- Query: **AT!IMSIM?<carrier_name>**
  Response:
  ```
  !IMSIM: <CR>
  configuration: <configuration>, Firmware: <firmware>, count: <count> <CR>
  Type    Key   Rank   SubPri    Source <CR>
  <type> <key> <rank> <subpri>  <source> <CR>
  ... <CR>
  OK
  ```
  Purpose: Display the SIM entries for a single specified carrier (<carrier_name>), or for all carriers (do not include a <carrier_name>).
  Note — If the <carrier_name> is not specified and there are multiple images loaded, this command may return ERROR.
- Query List: **AT!IMSIM=?**
  Purpose: Display the execution command format and parameter values.

(Continued on next page)

Table 8-2: SIM command details (Continued)

!IMSIM (continued)	Update AUTO-SIM matching list (continued)

Parameters:

<carrier_name> (Carrier identifier):
- ASCII string
- e.g., ATT = AT&T, GENERIC = Generic, etc.
- The list of supported carriers is SKU-dependent.

<configuration> (Carrier PRI ID):
- e.g., GENERIC_002.023_000

<Firmware> (Firmware version to use for the carrier's SIMs that are included in the carrier's configuration)
- e.g., 01.11.00.00

<count> (Number of SIM entries in the carrier's configuration):
- 1–50 (See "Usage notes" above for details.)

<type> (Entry type):
- 0 — IIN (i.e., the first 7 digits of the SIM's ICCID)
- 1 — MCC/MNC (i.e., the SIM's PLMN)
- The numeric value (0–1) is used in the Execution format, and the string equivalent is displayed by the Query format.

<key> (Entry value):
- Valid formats:
  - 7-digit IIN value (the first 7 digits of the ICCID) (e.g., 8901410)
  - MCC/MNC value — The MCC and MNC must be separated by ':', the MCC must be 3 digits, and the MNC must be 2 or 3 digits. (e.g., 313:100, 432:65, etc.)

<rank> (Image switch ranking):
- Used to choose between applicable PRIs when switching images. e.g., if two PRIs are suitable, the PRI with the highest rank is used.
  - Valid values:
    - 0–127
    - 255 (-1) — Lowest rank (indicates the PRI should be used only if no better choice is available). Note — 255 is used in the Execution format and appears as -1 in the Query output format.
    - **Important:** Negative <rank> values ≤ -2 are reserved for Semtech use.

<subpri> (SubPri index):
- Index used to identify the carrier sub-PRI to use for custom ICCID/IMSI ranges. (A carrier PRI may contain multiple sub-PRIs.)
- Minimum value: 1

<Source> (Entry origin):
- Indicates the source of the SIM entry (i.e., how it was added to the list)
- Valid values:
  - PRI — Included in the pre-loaded list. The entry cannot be deleted.
  - CUST — Added by the customer using !IMSIM. The entry can be deleted.

Table 8-2: SIM command details (Continued)

Command	
!SIMDETPOL	**Configure SIM hot swap detection**
Description	

Configure the signal polarities that the SIM hot swap feature checks to determine if a SIM card is inserted.

Note: This command configures the polarity level (LOW or HIGH) only for SIM insertion. e.g., if HIGH polarity indicates a SIM is inserted for UIM1, then LOW polarity logically indicates that no SIM is inserted.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes (Execution)
No (Query)

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage:

- Execution: **AT!SIMDETPOL=<m>,<n>**
  Response: `OK`
  Purpose: Configure the SIM detection polarity levels for both SIM interfaces.
- Query: **AT!SIMDETPOL?**
  Response:
  ```
  !SIMDETPOL:<CR>
  UIM1: <m><CR>
  UIM2: <n><CR>
  OK
  ```
  Purpose: Display the current configuration.
- Query List: **AT!SIMDETPOL=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<m> (SIM detection polarity level for the UIM1 interface):

- 0 — LOW polarity indicates a SIM is inserted
- 1 — HIGH polarity indicates a SIM is inserted

<n> (SIM detection polarity level for the UIM2 interface):

- 0 — LOW polarity indicates a SIM is inserted
- 1 — HIGH polarity indicates a SIM is inserted

Table 8-2: SIM command details (Continued)

Command	
!UIMS	**Select active SIM interface**

Description

On a module that supports multiple SIM interfaces (e.g., multiple external UIMs, eSIM), select the active SIM interface.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage Requirements:

- To enable/disable UIM2 slot support, use the !CUSTOM "UIM2ENABLE" customization on page 35.
- (EM92 only)
  - Before using !UIMS=3 for the first time to activate automatic SIM switching (Auto-SIM Switch), use the !CUSTOM "UIMAUTOSWITCH" customization on page 35 to enable the Auto-SIM Switch feature.
  - If Auto-SIM Switch is activated and !UIMS=0 or !UIMS=1 is called, Auto-SIM Switch is immediately deactivated, but can be reactivated again using !UIMS=3.

Usage:

- Execution: **AT!UIMS=<uim>**
  Response: `OK`
  Purpose: Configure the module to use the selected SIM interface.
- Query: **AT!UIMS?**
  Response: `!UIMS: <uim>[,<used_sim>] <CR>`
  `OK`
  Purpose: Display the currently selected SIM interface (i.e., 0 (UIM1) or 1 (UIM2)) and (if Auto-SIM-Switch is activated) the interface that is being used.
- Query List: **AT!UIMS=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<uim> (Selected SIM interface):

- 0 — UIM1 — External UIM interface #1
- 1 — UIM2 — External UIM interface #2, or eSIM (embedded SIM)
- 3 — (EM92 only) Auto-SIM-Switch activated. (Note — This option is only available if the Auto-SIM Switch feature is enabled. See **Usage Requirements** above.)

<used_uim> (SIM interface being used when Auto-SIM-Switch is activated):

- 0 — UIM1 — External UIM interface #1
- 1 — UIM2 — External UIM interface #2, or eSIM (embedded SIM)

(Continued on next page)

Table 8-2: SIM command details (Continued)

!UIMS (continued)	Select active SIM interface (continued)

Example(s):

- Enable UIM2 support and select UIM2 as the active interface:

```
AT!CUSTOM="UIM2ENABLE",1    ← Enable UIM2 slot support
OK
AT!UIMS=1   ← Set UIM2 as the active slot
OK
AT!UIMS?
!UIMS: 1 <CR>    ← UIM2 is the active slot
OK
```

- (EM92 example only) Enable UIM2 slot support, enable the Auto-SIM-Switch feature, and activate Auto-SIM-Switch:

```
AT!CUSTOM="UIM2ENABLE",1    ← Enable UIM2 slot support
OK
AT!UIMS=1    ← Set UIM2 as the active slot
OK
AT!UIMS?
!UIMS: 1 <CR>   ← UIM2 is the active slot
OK
AT!CUSTOM="UIMAUTOSWITCH",1     ← Enable the Auto-SIM-Switch feature, with UIM2 as the preferred slot
OK
AT!RESET    ← Reset is required to make <uim>=3 available
OK
AT!UIMS?
!UIMS:1 <CR>    ← UIM2 is the active slot
OK
AT!UIMS=3      ← Activate Auto-SIM-Switch
OK
AT!UIMS?
!UIMS: 3,1 <CR>    ← Auto-SIM-Switch is active, and the active slot is UIM2
OK
AT!UIMS=0     ← Set UIM1 as the active slot. This automatically deactivates Auto-SIM-Switch.
OK
AT!UIMS?
!UIMS: 0 <CR>     ← Active slot is UIM1. <used_uim> does not appear beacuse Auto-SIM-Switch is deactivated.
OK
AT!UIMS=3      ← Activate Auto-SIM-Switch
OK
AT!UIMS?
!UIMS: 3,1 <CR>    ← Auto-SIM-Switch is active, and the active slot is UIM2
OK
```

9: Smart Transmit Commands

Introduction

This chapter describes:

- Smart Transmit (ST)-related commands — ST commands are used to meet regulatory requirements for the OEM host device by managing the modem's output power. OEMs should carefully evaluate their use of these commands and their impact on device operation.
- For usage details, refer to *[9] EM919x/EM7690 Smart Transmit (Doc# 2174291)* and *[12] EM92xx Smart Transmit (Doc# 2174327)*

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

Command summary

Table 9-1 summarizes the commands that are described in detail in Table 9-2 on page 181.

Table 9-1: Smart Transmit commands

Command	Description	Page
!SARINTGPIOMODE	Configure DPR GPIO pull mode for Smart Transmit DSI selection	181
!SARSTATE	Set/report Smart Transmit Device State Index (DSI)	182
!SARSTATEDFLT	Set/report default Smart Transmit Device State Index (DSI)	183
!STEFS	Query ST files	184
!STSTATUS	Display ST status details	186

Command reference

Table 9-2: Smart Transmit command details

Command	
!SARINTGPIOMODE	**Configure DPR GPIO pull mode for Smart Transmit DSI selection**

Description

Configure the internal DPR GPIO (pin 25) as a pull-up or pull-down.

When the !CUSTOM "GPIOSARENABLE" customization is set to '1', the DPR GPIO selects the Smart Transmit (ST) exposure scenario (the Device State Index (DSI)) — either DSI 0 or DSI 1.

!SARINTGPIOMODE	DPR Internal Pull	DPR Pin State
0 (default)	Pull-up	Low (Active) — Selects DSI 0 High — Selects DSI 1
1	Pull-down	Low — Selects DSI 1 High (Active) — Selects DSI 0

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: No

Reset required to apply changes: Yes

Persistent across power cycles: Yes

Usage:

- Execution: **AT!SARINTGPIOMODE=<mode>**
  Response: `OK`
  Purpose: Set the pull mode for the DPR GPIO (pin 25).
- Query: **AT!SARINTGPIOMODE?**
  Response: `<mode> <CR>`
  `OK`
  Purpose: Indicate the current pull mode for DPR GPIO (pin 25).
- Query List: **AT!SARINTGPIOMODE=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<mode> (DPR GPIO pull mode)

- 0 — Pull-up (Default)
- 1 — Pull-down

Table 9-2: Smart Transmit command details (Continued)

Command	
!SARSTATE	**Set / report Smart Transmit Device State Index (DSI)**
Description	

Set (or report) the current Device State Index (DSI), which indicates the desired Smart Transmit (ST) exposure scenario to use.

Note: This setting is not persistent. To change the default DSI (i.e., make it persistent), use !SARSTATEDFLT.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.15.01.00 (Release 2)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: No

Usage:

- Execution: **AT!SARSTATE=<state>**
  Response: `OK`
  Purpose: Set the DSI.
- Query: **AT!SARSTATE?**
  Response: `!SARSTATE: <state> <CR>`
  `OK`
  Purpose: Indicate the current DSI.
- Query List: **AT!SARSTATE=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<state> (DSI)

- Valid range:
  - EM91: 0–20 (Factory default: 0)
  - EM92: 0–40 (Factory default: 0)

Table 9-2: Smart Transmit command details (Continued)

Command	
!SARSTATEDFLT	**Set / report default Smart Transmit Device State Index (DSI)**

Description

Set (or report) the default (persistent) Device State Index (DSI), which indicates the desired Smart Transmit (ST) exposure scenario to use.

Note: This setting is persistent. To temporarily change the DSI, use !SARSTATE.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.15.01.00 (Release 2)

Updated F/W: EM91: SWIX55C_03.14.10.00 (Release 6)

Password required: No

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage:

- Execution: **AT!SARSTATEDFLT=<state>**
  Response: `OK`
  Purpose: Set the default DSI.
- Query: **AT!SARSTATEDFLT?**
  Response: `!SARSTATEDFLT: <state> <CR>`
  `OK`
  Purpose: Indicate the default DSI.
- Query List: **AT!SARSTATE DFLT=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<state> (Smart Transmit DSI)

- Valid range:
  - EM91: 0–20 (Factory default: 0)
  - EM92: 0–40 (Factory default: 0)

Table 9-2: Smart Transmit command details (Continued)

Command	
!STEFS	**Query ST files**

Description

Check if ST (Smart Transmit) files are present and print their SHA-256 hash values.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4) EM92: SWIX65C_02.15.08.00 (Release 3)
Password required: No
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Query: **AT!STEFS?**

  Response (EM91):

```
rtsar_config_fcc   <sha256_hash_ID> <CR>
rtsar_config_row   <sha256_hash_ID> <CR>
rtsar_swi          <sha256_hash_ID> <CR>
OK
```

or (if one or more files are missing)

```
[rtsar_config_fcc   <sha256_hash_ID> <CR>]← List of files that are present
[rtsar_config_row   <sha256_hash_ID> <CR>]
[rtsar_swi          <sha256_hash_ID> <CR>]

File(s) missing <CR>
[rtsar_config_fcc <CR>]← List of files that are missing
[rtsar_config_row <CR>]
[rtsar_swi <CR>]

OK
```

  Response (EM92):

```
rtsar_config    <sha256_hash_ID> <CR>    ← All files are present (no files are missing)
rtsar_swi_v2    <sha256_hash_ID> <CR>
OK
```

or

```
rtsar_config    <sha256_hash_ID> <CR>    ← File is present
File missing <CR>]                       ← The rtsar_swi_v2 file is missing
OK
```

or

```
rtsar_swi_v2    <sha256_hash_ID> <CR>    ← File is present
File missing <CR>]                       ← The rtsar_config file is missing
OK
```

or

```
File missing <CR>]                       ← Both rtsar_swi_v2 and rtsar_config files are
OK                                         missing
```

  Purpose: Show all ST EFS files or indicate if files are missing.

(Continued on next page)

Table 9-2: Smart Transmit command details (Continued)

!STEFS (continued)	Query ST files (continued)

Parameters:

<sha256_hash_ID> (SHA 256 hash values of ST EFS files)

- e.g., 709c4b46da06ef70057d25d16f09e3c6cc6f829a5ca0b66576839b6d49f7202f

Example(s):

- (EM91) All files present:

```
AT!STEFS?
rtsar_config_fcc        b412e35cd213c3eefb9a5a128b1ad6eaf59f333e33b071c0d93f02a0a69764d0<CR>
rtsar_config_row        dd237eb17c6fa7da3350ef9ce8f5b53e7116fe92585b44af51c1c962a25ee6e2<CR>
rtsar_swi       ad0e8800df65ce43b7075a5b878bcc3e34c3332402b16c81ff68f983067f8e48<CR>
OK
```

- (EM91) Files missing:

```
AT!STEFS?
File(s) missing:<CR>
rtsar_config_fcc<CR>
rtsar_config_row<CR>
rtsar_swi<CR>
OK
```

- (EM92) All files present:

```
AT!STEFS?
rtsar_config    18C4FF98EF5F8DA5223D9F8C81AF14CEC0EDBBA93702AC819F0D58536E7DF4BF<CR>
rtsar_swi_v2    A8E5B187D4218DB7478C7247A7CF70260E76C043D4262543557E1699F59469FA<CR>
OK
```

- (EM92) rtsar_swi_v2 file missing:

```
AT!STEFS?
rtsar_config    18C4FF98EF5F8DA5223D9F8C81AF14CEC0EDBBA93702AC819F0D58536E7DF4BF<CR>
File missing <CR>
OK
```

- (EM92) All files missing:

```
AT!STEFS?
File missing <CR>
OK
```

Table 9-2: Smart Transmit command details (Continued)

Command	
!STSTATUS	**Display ST status details**

Description

Check Smart Transmit (ST) status and, if ST is enabled, display basic ST details. Otherwise, display an appropriate error message and, depending on the error, display firmware ID details.

Important — The ST_MCC_Exposure_mode displayed in the response refers to the current MCC's preferred RF exposure mode as listed in the ST rtsar configuration template's "mcc" tab. It does *not* take into account whether the template's "tech_records" tab has an override. (The configuration template was used to prepare the OEM's ST package.)

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)

Updated F/W: EM91: SWIX55C_03.09.03.00 (Release 4)

Password required: Yes

Reset required to apply changes: n/a

Persistent across power cycles: n/a

Usage:

- Query: **AT!STSTATUS?**

  Response (No errors):

```
ST_FW_version: <ST_Firmware_Version> <CR>
ST_Config_version: <ST_Configuration_Version> <CR>
ST_OEM_ID: <ST_OEM_ID> (<ST_OEM_ID_decimal) <CR>
ST_Current_MCC: <ST_Current_MCC> <CR>
ST_MCC_Exposure_mode: <ST_MCC_Exposure_Mode> <CR>
ST_Sensing_mode: <ST_Sensing_Mode> <CR>
<CR>
OK
```

  Response (Error preventing ST from running):

```
<error message> <CR>
ST_FW_version: <ST_Firmware_Version> <CR>
ST_Config_version: <ST_Configuration_Version> <CR>
ST_OEM_ID: <ST_OEM_ID> (ST_OEM_ID_decimal) <CR>
<CR>
OK
```

  Response (Undefined ST status condition preventing ST from running):

```
<error message_invalid> <CR>
<CR>
OK
```

  Purpose: Show the current ST status and basic ST details.

Parameters:

<error message> (ST Error message indicating issue preventing ST from running)

- ASCII string
- Supported values:
  - "ST configuration not present"
  - "ST configuration version disabled"
  - "ST configuration version failsafe"
  - "ST invalid license"

(Continued on next page)

Table 9-2: Smart Transmit command details (Continued)

!STSTATUS (continued)	Display ST status details (continued)

<error message_invalid> (ST Error message indicating undefined issue with ST)
- ASCII string
- Value: "ST unknown status"

<ST_FW_version> (ST firmware version currently in use)
- Integer
- Minimum value: 1

<ST_Config_version> (ST configuration files version)
- Integer
- Minimum value: 0

<ST_OEM_ID> (ST OEM ID in hexadecimal format)
- OEM ID as specified in ST configuration files
- Hexadecimal (8-digits, leading '0x')
- e.g. 0x0000740a

<ST_OEM_ID_decimal> (ST OEM ID in decimal format)
- Decimal equivalent of <ST_OEM_ID>
- e.g. 29706

<ST_Current_MCC> (Current Mobile Country Code (MCC) used by the ST firmware)
- 3-digit code

<ST_MCC_Exposure_mode> (Preferred RF exposure mode of the current MCC, regardless of tech_records override)
- This is the preferred exposure mode that was specified for the MCC in the Smart Transmit configuration file's mcc_list.
  Note — If the current Device State Index (DSI) was configured (in the configuration file's tech_records) as:
  - force peak = 0 — The actual exposure mode is the same as <ST_MCC_Exposure_mode>.
  - force peak = 1 — The actual exposure mode is Force Peak, but <ST_MCC_Exposure_mode> still returns the preferred exposure mode (Time averaging or Force Peak) from the mcc_list.
- Valid values:
  - 0 — Time averaging
  - 1 — Force Peak

<ST_Sensing_mode> (mmW Smart Transmit sensing mode for current MCC)
- Valid values:
  - 0 — Disabled
  - 1 — Enabled

Example(s):

- ST running with no errors:

```
AT!STSTATUS?
ST_FW_version: 15 <CR>
ST_Config_version: 15 <CR>
ST_OEM_ID: 0x00000740a (29706) <CR>
ST_Current_MCC: 302 <CR>
ST_MCC_Exposure_mode: 0 <CR>
ST_Sensing_mode: 0 <CR>
<CR>
OK
```

(Continued on next page)

Table 9-2: Smart Transmit command details (Continued)

!STSTATUS (continued)	Display ST status details (continued)
▪ ST not running — missing ST configuration **AT!STSTATUS?** ST configuration not present <CR> ST_FW_version: 19 <CR> ST_Config_version: 0 <CR> ST_OEM_ID: 0x00000000 <CR> <CR> OK ▪ ST not running — undefined condition **AT!STSTATUS?** ST unknown status <CR> <CR> OK	

10: DM Commands

Introduction

This chapter describes Data Management (DM) related commands based on LWM2M (Light Weight Machine to Machine) protocol.

Command summary

Table 10-1 summarizes the commands that are described in detail in Table 10-2 on page 190.

Table 10-1: DM commands

Command	Description	Page
!DMDEBUG	Enable/disable DM-related debug log on AT port	190
!DMREAD	Get content of specified LWM2M object	191
!DMREADALL	Get content of all LWM2M objects	193
!DMSESSION	Control DM session	195
!DMSUPPORT	Enable/disable carrier DM feature	196
!HOSTDEVINFO	Configure host device details	197

Command reference

Table 10-2: DM command details

Command	
!DMDEBUG	**Enable / disable DM-related debug log on AT port**

Description

Enable/disable the DM-related debug log on the AT port.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: No
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!DMDEBUG=<dbg>**
  Response: `OK`
  or
  `ERROR`
  Purpose: Enable / disable the DM-related debug log on the AT port.
- Query List: **AT!DMDEBUG=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<dbg> (Enable / disable debug log)

- 0 — Disable debug log on AT port
- 1 — Enable debug log on AT port

Table 10-2: DM command details (Continued)

Command	
!DMREAD	**Get content of specified LWM2M object**

Description

Get the content of a specified LWM2M object.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Execution: **AT!DMREAD=<Object ID>**
  Response:
  ```
  <ObjID>/<InstID_n>/<ResID_n>[/<ResInstID_n>]: <stored_value> <CR>
  ... <CR>
  OK
  ```
  or
  ```
  <ObjID>:  (empty) <CR>
  OK
  ```
  ← *Appears if the client has never registered with the server.*
  or
  ```
  ERROR
  ```
  Purpose: Display the content of the specified LWM2M object.
- Query List: **AT!DMREAD=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<Object ID> (LWM2M object ID)

- Format:
  - Execution format: "<ObjID>[/<InstID_n>[/<ResID_n>[/<ResInstID_n>]]]"
    (Note — Double-quotes required around parameter in Execution format.)
  - Response format: <ObjID>/<InstID_n>/<ResID_n>[/<ResInstID_n>]
- Adding the optional parameter components narrows down the information that is displayed.
  e.g.,
  - <ObjID> displays all stored values that have the same <ObjID>
  - <ObjID>/<InstID> displays only the stored values that have the same <ObjID> AND the same <InstID>
  - etc.
- <ResInstID_n> appears only for multiple instance resources.
- If there are no values stored for an object, the Execution response returns "<ObjID>: (empty)".

<ObjID> (Object ID, assigned by OMA)

- 16-bit unsigned integer

<InstID> (Object instance ID, assigned by LWM2M client or server)

- 16-bit unsigned integer
- Minimum value: 0

<ResID> (Resource ID)

- 16-bit unsigned integer
- Minimum value: 0

(Continued on next page)

Table 10-2: DM command details (Continued)

!DMREAD (continued)	Get content of specified LWM2M object (continued)

<ResInstID> (Resource Instance ID, for multiple instance resources only, assigned by LWM2M client or server)

- Decimal value

<stored_value> (Value stored in the object)

- ASCII string
- Value types vary. String values are enclosed in double quotation marks. Other types (e.g., boolean, date/time, etc.) do not include marks.

Example(s):

- Display details of all instances of object "1"

```
at!dmread="1"
22:06:58.28 on 15-Feb-2022> /1/1/0: 102 <CR>
… <CR>
22:06:58.43 on 15-Feb-2022> /1/2/0: 101 <CR>
22:06:58.45 on 15-Feb-2022> /1/2/1: 86400 <CR>
22:06:58.47 on 15-Feb-2022> /1/2/2: 300 <CR>
22:06:58.49 on 15-Feb-2022> /1/2/3: 6000 <CR>
22:06:58.51 on 15-Feb-2022> /1/2/5: 86400 <CR>
22:06:58.52 on 15-Feb-2022> /1/2/6: true <CR>
22:06:58.54 on 15-Feb-2022> /1/2/7: "UQS" <CR>
22:06:58.55 on 15-Feb-2022> /1/2/30000/0: 1 <CR>
22:06:58.57 on 15-Feb-2022> /1/2/30000/1: 30 <CR>
22:06:58.59 on 15-Feb-2022> /1/3/0: 1000 <CR>
… <CR>
22:06:58.72 on 15-Feb-2022> /1/3/30000/1: 30 <CR>
OK
```

- Display details of instance "2" of object "1":

```
at!dmread="1/2"
22:06:58.43 on 15-Feb-2022> /1/2/0: 101 <CR>
22:06:58.45 on 15-Feb-2022> /1/2/1: 86400 <CR>
22:06:58.47 on 15-Feb-2022> /1/2/2: 300 <CR>
22:06:58.49 on 15-Feb-2022> /1/2/3: 6000 <CR>
22:06:58.51 on 15-Feb-2022> /1/2/5: 86400 <CR>
22:06:58.52 on 15-Feb-2022> /1/2/6: true <CR>
22:06:58.54 on 15-Feb-2022> /1/2/7: "UQS" <CR>
22:06:58.55 on 15-Feb-2022> /1/2/30000/0: 1 <CR>
22:06:58.57 on 15-Feb-2022> /1/2/30000/1: 30 <CR>
<CR>
OK
```

- Display details of only resource ID "7" from instance "2" of object "1":

```
at!dmread="1/2/7"
22:06:58.54 on 15-Feb-2022> /1/2/7: "UQS"
```

- Display result when client has never registered with the LWM2M server:

```
at!dmread="1"
1: (empty) <CR>
OK
```

Table 10-2: DM command details (Continued)

Command	
!DMREADALL	**Get content of all LWM2M objects**
Description	

Get the content of all currently configured LWM2M objects.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: n/a
Persistent across power cycles: n/a

Usage:

- Execution: **AT!DMREADALL**
  Response:
  ```
  <ObjID>/<InstID_n>/<ResID_n>[/ResInstID_n>: <stored_value> <CR>
  ... <CR>
  <ObjID>:  (empty) <CR>
  ... <CR>
  OK
  ```
  or
  ```
  ERROR
  ```
  Purpose: Display the content of all LWM2M objects.
- Query List: **AT!DMREADALL=?**
  Purpose: Display the execution command format.

Parameters:

<Object ID> (LWM2M object ID)

- Format:
  - Execution format: "<ObjID>[/<InstID_n>[/<ResID_n>[/<ResInstID_n>]]]"
    (Note — Double quotation marks (") are required.)
  - Response format: <ObjID>/<InstID_n>/<ResID_n>[/<ResInstID_n>]
- Adding the optional parameter components narrows down the information that is displayed.
  e.g.,
  - <ObjID> displays all stored values that have the same <ObjID>
  - <ObjID>/<InstID> displays only the stored values that have the same <ObjID> AND the same <InstID>
  - etc.
- <ResInstID_n> appears only for multiple instance resources.
- If there are no values stored for an object, the Execution response returns "<ObjID>: (empty)".

<ObjID> (Object ID, assigned by OMA)

- 16-bit unsigned integer

<InstID> (Object instance ID, assigned by LWM2M client or server)

- 16-bit unsigned integer
- Minimum value: 0

<ResID> (Resource ID)

- 16-bit unsigned integer
- Minimum value: 0

(Continued on next page)

Table 10-2: DM command details (Continued)

!DMREADALL (continued)	Get content of all LWM2M objects (continued)

<ResInstID> (Resource Instance ID, for multiple instance resources only, assigned by LWM2M client or server)

- Decimal value

<stored_value> (Value stored in the object)

- ASCII string
- Value types vary. String values are enclosed in double quotation marks. Other types (e.g., boolean, date/time, etc.) do not include marks.

Example(s):

- EM9190 response

```
at!dmreadall
... <CR>
/0/1/50003: "/rd/uNvQZHGLOm" <CR>
<CR>
<CR>
/1/2/0:  101 <CR>
/1/2/1:  86400 <CR>
/1/2/2:  300 <CR>
... <CR>
/3/0/1:  "EM9190" <CR>
/3/0/2:  "4H0524020601A1" <CR>
/3/0/3:  "SWIX55C_03.09.03.00" <CR>
/3/0/11:  0 <CR>
/3/0/13:  1980/01/06,00:00:00 <CR>
/3/0/14:  "UTC-05:00" <CR>
... <CR>
/3/0/30000/0: "" <CR>
/3/0/30000/1: "Home" <CR>
... <CR>
OK
```

- EM9291 response

```
at!dmreadall
/0/0/0:  "" <CR>
... <CR>
/3/0/0:  "Sierra Wireless" <CR>
/3/0/1:  "EM9291" <CR>
/3/0/2:  "358186650004117" <CR>
/3/0/3:  "SWIX65C_02.04.01.00" <CR>
/3/0/11:  0 <CR>
/3/0/13:  1980/01/10,16:40:42 <CR>
/3/0/14:  "UTC+00:00" <CR>
/3/0/16:  "UQ" <CR>
/3/0/17:  "IoT Module” <CR>
/3/0/18:  "B" <CR>
... <CR>
OK
```

Table 10-2: DM command details (Continued)

Command	
!DMSESSION	**Control DM session**
Description	

Control a DM or bootstrap session.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
SIM card requirement: Required
Password required: No
Reset required to apply changes: No
Persistent across power cycles: No

Usage:

- Execution: **AT!DMSESSION=<action>**
  Response: `OK`
  or
  `ERROR`
  Purpose: Perform the specified action on the DM session.
- Query List: **AT!DMSESSION=?**
  Purpose: Display the execution command format and parameter values.
  Note — The command format shown includes an optional <Server ID> parameter. This parameter is reserved for internal Semtech use. Use the Execution format shown above.

Parameters:

<action> (Action to take on the DM session)

- 0 — Stop
- 1 — Register (i.e., start session)
- 2 — Update registration
- 3 — Bootstrap (i.e., start bootstrap session only)
- 4 — Deregister
- 5 — Resume
- 6 — Rehandshake

<Server ID>

- This parameter is reserved for Semtech use.

Example(s):

- Start session:
  ```
  AT!DMSESSION=1
  OK
  ```
- Deregister session:
  ```
  AT!DMSESSION=4
  OK
  ```

Table 10-2: DM command details (Continued)

Command	
!DMSUPPORT	**Enable / disable carrier DM feature**
Description	

Enable/disable the DM feature for a specific carrier.

Note: This command is used for debug purposes only. This command should only be used if the user is fully aware of its consequences (e.g., if LWM2M is disabled, the carrier will not be able to perform tasks that require LWM2M such as updating profiles).

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!DMSUPPORT=<Carrier LWM2M>**
  Response: `OK`
  or
  `ERROR`
  Purpose: Enable / disable the DM feature for the specified carrier.
- Query: **AT!DMSUPPORT?**
  Response: `!DMSUPPORT: <Carrier LWM2M> <CR>`
  `OK`
  Purpose: Display state of the DM feature.
- Query List: **AT!DMSUPPORT=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<Carrier LWM2M> (DM feature state for carrier)

- 0 — Disable DM
- 1 — Enable DM

Table 10-2: DM command details (Continued)

Command	
!HOSTDEVINFO	**Configure host device details**

Description

Configure the host device details that OMA DM will report to the LWM2M server.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_01.07.08.00 (Release 1) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes (Execution)
No (Query)
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage notes:

- In the Execution format:
  - At least one of the following 'host' parameters must be specified: <Manufacturer>, <Model>, <SW Version>, <Host ID>.
  - Any 'host' parameters that are not entered will not be changed on the device. For example, if <Model> and <Host ID> are specified, and <Manufacturer> and <SW Version> are not specified, only the <Model> and <Host ID> values are changed.

Usage:

- Execution:
  AT!HOSTDEVINFO=[<instance>,]<["<Manufacturer>"][,["<Model>"][,["<SW Version>"][,["<Host ID>"][,["<FW Version>"][,[<"HW Version">][,<"Date Stamp">]]]]]>
  Response: `OK`
  or
  `ERROR`
  Purpose: Configure some or all of the host device details for the specified host device instance. If no <instance> is entered, configure interface 0.
- Query: **AT!HOSTDEVINFO?[<instance>]**
  Response:
  ```
  HostMan: <Manufacturer> <CR>
  HostMod: <Model> <CR>
  HostSwV: <SW Version> <CR>
  HostID:  <Host ID> <CR>
  HostFwV: <FW Version> <CR>
  HostHwV: <HW Version> <CR>
  HostUpd: <Date Stamp> <CR>
  OK
  ```
  Purpose: Display the device details for the specified host device instance. If no <instance> is entered, display the details for instance 0.
- Query List: **AT!HOSTDEVINFO=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<instance> (Host device instance)

- Valid values: 0–1
- Default: 0
- Example: Device instance 0 could be the main host (e.g., Octave), which is connected to another host (a 'bigger' host) which could be instance 1.

(Continued on next page)

Table 10-2: DM command details (Continued)

!HOSTDEVINFO (continued)	Configure host device details (continued)

<Manufacturer> (Host device manufacturer's name)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<Model> (Host device model name)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<SW Version> (Host software version)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<Host ID> (Host device ID. Identifies the host to the LWM2M server.)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<Host FW> (Host device firmware version)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<Host HW> (Host device hardware version)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

<Date Stamp> (Time and date of last firmware or software update, in UTC format)

- ASCII string, 255 characters maximum
- Double-quotes required around parameter in Execution format.

Example(s):

- Set the manufacturer name and software version for instance 0 (no other parameters change):
  ```
  AT!HOSTDEVINFO=,"Manufacturer",,"1.0",
  OK
  ```
- Set the manufacturer name for instance 1 (no other parameters change):
  ```
  AT!HOSTDEVINFO=1,"Manufacturer"
  OK
  ```
- Display the details for instance 0:
  ```
  AT!HOSTDEVINFO?
  HostMan:      Manufacturer <CR>
  HostMod:      HMOD0 <CR>
  HostSwV:      1.0 <CR>
  HostID :      HUID0 <CR>
  HostFwV:      HFW0 <CR>
  HostHwV:      HHW0 <CR>
  HostUpd:      HDTS0 <CR>
  <CR>
  OK
  ```

11: DG Commands

Introduction

This chapter describes Dying Gasp (DG) related commands.

Command summary

Table 11-1 summarizes the commands that are described in detail in Table 11-2 on page 200.

Table 11-1: DG commands

Command	Description	Page
!DGSMSCONTENT	Set Dying Gasp SMS Message Content	200
!DGSMSDEST	Set Dying Gasp SMS Destination Phone Number	201
!DGSTAT	Set/Clear Dying Gasp SMS Timestamp	202

Command reference

Table 11-2: DG command details

Command	
!DGSMSCONTENT	**Set Dying Gasp SMS Message Content**

Description

Use this command to display the Dying Gasp SMS message that will be sent when the host platform is about to lose power (if the Dying Gasp feature is enabled using the "DGENABLE" !CUSTOM customization).

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_03.04.03.00 (Release 3) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!DGSMSCONTENT="<sms_content>"**
  Response: `OK`
  Purpose: Set the Dying Gasp SMS message content.
- Query: **AT!DGSMSCONTENT?**
  Response: `SMS Content: <sms_content> <CR>`
  `OK`
  Purpose: Display the configured Dying Gasp SMS message content.
- Query List: **AT!DGSMSCONTENT=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<sms_content> (Dying Gasp message content)

- ASCII string, double-quotes required for the Execution format (e.g. "01.00.04.00_ATT")
- Valid characters: 0x20 to 0x7E (except 0x5C ('\')
- String length: 1–160 characters

Table 11-2: DG command details (Continued)

Command	
!DGSMSDEST	**Set Dying Gasp SMS Destination Phone Number**
Description	

Use this command to set the destination phone number to use for a 'Dying Gasp' SMS message that will sent when the host platform is about to lose power.

Supporting EM9 devices: All
Added F/W: EM91: SWIX55C_03.04.03.00 (Release 3) EM92: SWIX65C_02.13.08.00 (Release 1)
Password required: Yes
Reset required to apply changes: No
Persistent across power cycles: Yes

Usage:

- Execution: **AT!DGSMSDEST="<phone_num>"**
  Response: `OK`
  Purpose: Set the Dying Gasp SMS destination phone number.
- Query: **AT!DGSMSDEST?**
  Response: `SMS Destination: <phone_num> <CR>`
  `OK`
  Purpose: Display the configured Dying Gasp SMS destination phone number.
- Query List: **AT!DGSMSDEST=?**
  Response: `!DGSMSDEST: <phone_num> <CR>`
  `OK`
  Purpose: Display the execution command format and parameter values.

Parameters:

<phone_num> (SMS destination phone number)

- ASCII string, double-quotes required for the Execution format (e.g. "01.00.04.00_ATT")
- Valid dial characters:
  - '0'–'9', 'A'–'Z', 'a'–'z', ''#'
  - '+' (only as the first character)
- String length: 1–20 characters

Table 11-2: DG command details (Continued)

Command	
!DGSTATS	**Set / Clear Dying Gasp SMS Timestamp**

Description

Use this command to display Dying Gasp statistice including the timestamp of the last Dying Gasp trigger (i.e., the last time the host was losing power) and whether or not the module attempted to send the Dying Gasp SMS, or use the command to clear the Dying Gasp statistics.

Supporting EM9 devices: All

Added F/W: EM91: SWIX55C_03.04.03.00 (Release 3) EM92: SWIX65C_02.13.08.00 (Release 1)

Password required: Yes

Reset required to apply changes: No

Persistent across power cycles: Yes

Usage:

- Execution: **AT!DGSTATS=<op>**
  Response: `OK`
  Purpose: Clear the Dying Gasp statistics.
- Query: **AT!DGSTATS?**
  Response:
  ```
  Timestamp: <timestamp> <CR>
  SMS Attempted: <attempted> <CR>
  OK
  ```
  Purpose: Display the Dying Gasp statistics.
- Query List: **AT!DGSTATS=?**
  Purpose: Display the execution command format and parameter values.

Parameters:

<timestamp> (Time stamp of the last Dying Gasp trigger, UTC time zone)

- ASCII string
- Format:
  - "%Y:%m:%d %H:%M:%S %Z" — Timestamp of the last Dying Gasp Trigger (UTC time zone)
  - "None" — No Dying Gasp has been triggered

<attempted> (Status of the Dying Gasp SMS attempt)

- Valid values:
  - 0 — SMS not attempted
  - 1 — SMS attempted

<op> (Requested execution operation)

- 0 — Clear Dying Gasp statistics

12: Standard AT Commands

This chapter identifies standard AT commands that are supported by most Semtech modules. These commands control:

- Serial communications over an asynchronous interface — See Table 12-1. (For command details, refer to *ITU-T Serial Asynchronous Dialling and Control (Recommendation V.250*), available on the International Telecommunication Union web site, www.itu.int).)
- SMS functions for devices — See Table 12-2. (For command details, refer to *3GPP TS 27.005*, available on the 3GPP web site, www.3gpp.org).)
- Devices — See Table 12-3 on page 206. (For command details, refer to *3GPP TS 27.007*, available on the 3GPP web site, www.3gpp.org).)

The tables below identify whether each command is supported on EM9 Series modules. 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.

Table 12-1: ITU-T Recommendation V.250 AT commands

Command	Description	Supported ✔=Yes; ✘=No
&C	Set Data Carrier Detected (Received line signal detector) function mode	✘
&D	Set Data Terminal Ready function mode	✘
&F	Set all current parameters to manufacturer's defaults	✘
&S	Set DSR signal	✘
&T	Auto tests	✘
&V	Return operating mode AT configuration parameters	✘
&W	Store current parameter to user-defined profile	✘
+DR	V42bis data compression report	✘
+DS	V42bis data compression	✘
+GCAP	Request complete TA capabilities list	✘
+GMI	Request manufacturer identification	✔
+GMM	Request TA model identification	✔
+GMR	Request TA revision identification	✔
+GOI	Request global object identification	✘
+GSN	Request TA serial number identification	✘
+ICF	Set TE-TA control character framing	✘
+IFC	Set TE-TA local data flow control	✘
+ILRR	Set TE-TA local rate reporting mode	✘
+IPR	Set fixed local rate	✘

Table 12-1: ITU-T Recommendation V.250 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
A	Answer incoming call	n/a
A/	Re-issues last AT command given	✘
D	Dial	n/a
D><MEM><N>	Originate call to phone number in memory <MEM>	✘
D><N>	Originate call to phone number in current memory	✘
D><STR>	Originate call to phone number in memory which corresponds to alphanumeric field <STR>	✘
DL	Redial last telephone number used	✘
E	Set command echo mode	✔
H	Disconnect existing connections	n/a
I	Display product identification information	✔
L	Set monitor speaker loudness	✘
M	Set monitor speaker mode	✘
O	Switch from command mode to data mode	✘
P	Select pulse dialing	✘
Q	Set Result code presentation mode	✘
S0	Set number of rings before automatically answering the call	✘
S10	Set disconnect delay after indicating the absence of data carrier	✘
S3	Set command line termination character	✘
S4	Set response formatting character	✘
S5	Set command line editing character	✘
S6	Set pause before blind dialing	✘
S7	Set number of seconds to wait for connection completion	✘
S8	Set number of seconds to wait when comma dial modifier used	✘
T	Select tone dialing	✘
V	Set result code format mode	✔
V1	Provides more verbose error codes that aid debugging	✔
X	Set connect result code format and call monitoring	✘
X4	Not to wait for dial tone before dialing	n/a
Z	Set all current parameters to user-defined profile	✘

Table 12-2: 3GPP TS 27.005 AT commands

Command	Description	Supported ✔=Yes; ✘=No
+CBM	Cell broadcast message directly displayed	✘
+CBMI	Cell broadcast message stored in memory at specified <index> location	✘
+CDS	SMS status report after sending a SMS	✘
+CDSI	Incoming SMS status report	✘
+CESP	Enter SMS block mode protocol	✘
+CMGC	Send command	✔
+CMGD	Delete message	✔
+CMGF	Message format	✔
+CMGL	List messages	✔
+CMGR	Read message	✔
+CMGS	Send message	✔
+CMGW	Write message to memory	✔
+CMMS	More messages to send	✔
+CMNA	New message acknowledgement to ME/TA	✘
+CMS ERROR: <err>	SMS error (mobile or network error)	✘
+CMSS	Send message from storage	✔
+CMT	Incoming message directly displayed	✔
+CMTI	Incoming message stored in <mem> (“SM” - (U)SIM message storage) at location <index>	✔
+CNMA	New message acknowledgement to mobile equipment	✔
+CNMI	New message indications to TE	✔
+CPMS	Preferred message storage	✔
+CRES	Restore settings	✔
+CSAS	Save settings	✔
+CSCA	Service center address	✔
+CSCB	Select cell broadcast message types	✔
+CSDH	Show text mode parameters	✔
+CSMP	Set text mode parameters	✔
+CSMS	Select message service	✔

Table 12-3: 3GPP TS 27.007 AT commands

Command	Description	Supported ✔=Yes; ✘=No
C	ITU T V.24 circuit 109 carrier detect signal behavior command	✘
+CACM	Accumulated call meter	✘
+CACSP	Voice Group or Voice Broadcast Call State Attribute Presentation	✘
+CAEMLPP	eMLPP Priority Registration and Interrogation	✘
+CAHLD	Leave an ongoing Voice Group or Voice Broadcast Call	✘
+CAJOIN	Accept an incoming Voice Group or Voice Broadcast Call	✘
+CALA	Alarm	✘
+CALCC	List current Voice Group and Voice Broadcast Calls	✘
+CALD	Delete alarm	✘
+CALM	Alert sound mode	✘
+CAMM	Accumulated call meter maximum	✘
+CANCHEV	NCH Support Indication	✘
+CAOC	Advice of Charge	✘
+CAPD	Postpone or dismiss an alarm	✘
+CAPTT	Talker Access for Voice Group Call	✘
+CAREJ	Reject an incoming Voice Group or Voice Broadcast Call	✘
+CAULEV	Voice Group Call Uplink Status Presentation	✘
+CBC	Battery charge	n/a
+CBKLT	Backlight (handset only)	✘
+CBST	Select bearer service type	✔
+CCCM	Current call meter value	✘
+CCFC	Call forwarding number and conditions	✘
+CCHC	Close logical channel	✘
+CCHO	Open logical channel	✔
+CCLK	Clock	✔
+CCUG	Closed user group	✘
+CCWA	Call waiting	n/a
+CCWE	Call Meter maximum event	✘
+CDIP	Called line identification presentation	✘
+CDIS	Display control	✘

Table 12-3: 3GPP TS 27.007 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
+CEER	Extended error report	✔
+CEREG	Read network register status	✔
+CESQ	Extended signal quality	✘
+CFUN	Set phone functionality Format ▪ +CFUN = [<fun> [, <rst>]] Limitations ▪ Valid <fun> values: · 0 — Minimum functionality, low power draw · 1 — Full functionality, high power draw · 4 — Disable transmit and receive (i.e., Airplane mode) per ETSI TS 127 007 · 5 — Enter factory mode · 6 — Reset (may be used to exit factory mode) · 7 — Offline. May be set manually, or occur automatically due to a radio fault condition (e.g., radio initialization failure)	✔ (Partial)
+CGACT	PDP context activate or deactivate	✔
+CGANS	Manual response to a network request for PDP context activation	✘
+CGATT	PS attach or detach	✔
+CGAUTO	Automatic response to a network request for PDP context activation	✘
+CGCLASS	GPRS mobile station class	✘
+CGCLOSP	Configure local octet stream PAD parameters	✘
+CGCMOD	PDP Context Modify	✔
+CGCONTRDP	PDP Context Read Dynamic Parameters	✘
+CGDATA	Enter data state	✘
+CGDCONT	Define PDP Context	✔
+CGDSCONT	Define Secondary PDP Context	✔
+CGEQMIN	3G Quality of Service Profile (Minimum acceptable)	✘
+CGEQNEG	3G Quality of Service Profile (Negotiated)	✘
+CGEQOSRDP	EPS quality of service read dynamic parameters	✘
+CGEQREQ	3G Quality of Service Profile (Requested)	✔
+CGEREP	Packet Domain event reporting	✘
+CGEV	GPRS network event indication	✘
+CGLA	Generic UICC logical channel access	✘
+CGMI	Request manufacturer identification	✔

Table 12-3: 3GPP TS 27.007 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
+CGMM	Request model identification	✔
+CGMR	Request revision identification	✔
+CGPADDR	Show PDP address	✔
+CGPIAF	Printing IP address format	✔
+CGQMIN	Quality of Service Profile (Minimum acceptable)	✘
+CGQREQ	Quality of Service Profile (Requested)	✘
+CGREG	GPRS network registration status	✘
+CGSCONTRDP	Secondary PDP context read dynamic parameters	✘
+CGSMS	Select service for MO SMS messages	✔
+CGSN	Request product serial number identification	✔
+CGTFT	Traffic Flow Template	✔
+CGTFTRDP	Traffic flow template read dynamic parameters	✘
+CHLD	Call related supplementary services	n/a
+CHSA	HSCSD non-transparent asymmetry configuration	✘
+CHSC	HSCSD current call parameters	✘
+CHSD	HSCSD device parameters	✘
+CHSR	HSCSD parameters report	✘
+CHST	HSCSD transparent call configuration	✘
+CHSU	HSCSD automatic user initiated upgrading	✘
+CHUP	Hangup call	n/a
+CIEV	Indicator event	✘
+CIMI	Request international mobile subscriber identity	✔
+CIND	Indicator control	✔
+CKEV	Key press or release event	✘
+CKPD	Keypad control	✘
+CLAC	List all available AT commands	✔
+CLAE	Language Event	✘
+CLAN	Set Language	✘
+CLCC	List current calls	n/a
+CLCK	Facility lock	✔

Table 12-3: 3GPP TS 27.007 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
+CLIP	Calling line identification presentation	n/a
+CLIR	Calling line identification restriction	n/a
+CLVL	Set/return internal loudspeaker volume	✘
+CMAR	Master Reset	✘
+CME ERROR: <err>	Mobile Termination error result code	✘
+CMEC	Mobile Termination control mode	✘
+CMEE	Report Mobile Termination error	✔
+CMER	Mobile Termination event reporting	✔
+CMOD	Call mode	n/a
+CMUT	Enable/disable uplink voice muting	✘
+CMUX	Multiplexing mode	✘
+CNUM	Subscriber number	✔
+COLP	Connected line identification presentation	✘
+COPN	Read operator names	✔
+COPS	Operator selection	✔
+CPAS	Phone activity status	✔
+CPBF	Find phonebook entries	✘
+CPBR	Read phonebook entries	✘
+CPBS	Select phonebook memory storage	✘
+CPBW	Write phonebook entry	✘
+CPIN	Enter PIN	✔
+CPINR	Remaining PIN retries	✘
+CPLS	Preferred PLMN list selection	✘
+CPOL	Preferred operator list	✔
+CPROT	Enter protocol mode	✘
+CPUC	Price per unit and currency table	✘
+CPWC	Power class	✘
+CPWD	Change password	✔
+CR	Service reporting control	✘
+CRC	Cellular result codes	✘

Table 12-3: 3GPP TS 27.007 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
+CREG	Network registration	✔
+CRING	Incoming call type	✘
+CRLP	Radio link protocol	✘
+CRMP	Ring Melody Playback	✘
+CRSL	Ringer sound level	✘
+CRSM	Restricted SIM access	✔
+CSCC	Secure control command	✘
+CSCS	Select TE character set	✔
+CSDF	Settings date format	✘
+CSGT	Set Greeting Text	✘
+CSIL	Silence Command	✘
+CSIM	Generic SIM access	✔
+CSNS	Single numbering scheme	✘
+CSQ	Signal quality	✔
+CSSN	Supplementary service notifications	✘
+CSTA	Select type of address	✘
+CSTF	Settings time format	✘
+CSUS	Set card slot	✘
+CSVM	Set Voice Mail Number	✘
+CTFR	Call deflection	✘
+CTSA	Command touch screen action (handset with touch screen only)	✘
+CTZR	Time Zone Reporting	✘
+CTZU	Automatic Time Zone Update	✘
+CUSD	Unstructured supplementary service data	✔
+CV120	V.120 rate adaptation protocol	✘
+CVHU	Voice Hangup Control	n/a
+CVIB	Vibrator mode	✘
+C5GNSSAI	5GS NSSAI Setting	✔
+C5GNSSAIRDP	5GS NSSAI read dynamic parameters	✔
+C5GREG	5GS Network Registration Status	✔

Table 12-3: 3GPP TS 27.007 AT commands (Continued)

Command	Description	Supported ✔=Yes; ✘=No
D	ITU T V.25ter [14] dial command	n/a
D*99#	Sets up a packet data call (PDP context) based on profile ID #1	✘
D*99***<n>#	Sets up a packet data call (PDP context) based on profile ID #<n> (<n> is the <cid> in the +CGDCONT command)	✘
+VTD	Tone duration	✘
+VTS	DTMF and arbitrary tone generation	n/a
+WS46	PCCA STD 101 [17] select wireless network	✔

Table 12-4: Carrier AT commands

Command	Description	Supported ✔=Yes; ✘=No
Verizon		
+VZWAPNE	Verizon proprietary command	✔
+VZWRSRP	Verizon proprietary command	✔
+VZWRSRQ	Verizon proprietary command	✔
AT&T		
$CCLK	AT&T proprietary command	✘
$CREG	AT&T proprietary command	✘
$CSQ	AT&T proprietary command	✘
*CNTI	AT&T proprietary command	✘
+CEINFO	AT&T proprietary command	✘
+ECNO	AT&T proprietary command	✘
+NCELL	AT&T proprietary command	✘
+PACSP	AT&T proprietary command	✘
+SCELL	AT&T proprietary command	✘
+RSCP	AT&T proprietary command	✔
+RSRP	AT&T proprietary command	✘
+RSRQ	AT&T proprietary command	✘

13: Band Definitions

Some commands described in this document include input and/or output 'band' parameters, which are defined in section "Supported Frequencies" of *[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174)* or *[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)*.

14: Carrier IDs

Table 14-1 is the a list of SIM carrier ID / Name mappings used by some commands in this document.

Note: The carrier names displayed in this table are shown in mixed-case for readability. AT commands using these strings typically allow any case (i.e., case-insensitive) or require all upper-case.

Table 14-1: Carrier ID / Name Mappings

ID	Name	ID	Name	ID	Name
0	"None"	115	"KDDI"	208	"O2"
1	"Generic"	116	GRUPO Iusacell	209	"SFR"
2	"Telstra"	117	"China Mobile"	210	"Swisscom"
4	"AT&T"	118	"Open Mobile Handset"	211	"China Mobile (2)"
5	"Verizon"	176	"Rogers"	212	"Telstra (3)"
11	"Sprint"	177	"NetIndex"	213	"Singapore Telecom"
12	"Telefonica"	178	"DNA"	214	"Reliance Telecom"
101	"Verizon (2)"	179	"Big Pond"	215	"Bharti Airtel"
102	"Sprint (2)"	180	"Aeris"	216	"NTT Docomo"
103	"AllTel"	181	"LG Uplus"	217	"EMobile"
104	"Bell Mobility"	182	"Sierra Wireless"	218	"Softbank"
105	"Telus"	183	"Deutsche Telekom"	219	"Korea Telecom"
106	"U.S. Cellular"	184	"Dish"	220	"SK Telecom (2)"
107	"Telstra (2)"	200	"PTCRB"	221	"Telenor"
108	"China Unicom"	201	"ATT (2)"	222	"NetCom Norway"
109	"Telecom New Zealand"	202	"Vodafone"	223	"Telia Sonera"
110	"SK Telecom"	203	"T-Mobile"	224	"AMX Telcel"
111	"Reliance Communications"	204	"Orange"	225	"Brasil VIVO"
112	"Tata Communications"	205	"Telefonica (2)"	254	"Any Carrier"
113	"Metro PCS"	206	"Telecom Italia"	–	–
114	"Leap Wireless"	207	"3 (Three)"	–	–

15: ASCII Table

Table 15-1: 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

16: References

Semtech Documents

Semtech documents are available from source.sierrawireless.com.

Semtech Documents on the Source

[1] AirPrime EM919X-EM7690 Product Technical Specification (Doc# 41113174)

[2] AirPrime EM92XX Product Technical Specification (Doc# 41114313)

[3] EM91 Series Customer Production Test Guide (Doc# 41113679)

[4] EM92 Series Customer Production Test Guide (Doc# 41114569)

[5] AirPrime EM919x/EM7690 Thermal Mitigation (Doc# 2174267)

[6] EM9190 High Power mmWave RF Customization File Preparation (Doc# 2174282)

[7] EM9190 Low Power mmWave RF Customization File Preparation (Doc# 2174286)

[8] EM9190 Current Consumption Application Note (Doc# 2174287)

[9] EM919x/EM7690 Smart Transmit (Doc# 2174291)

[10] EM919x Customer Release Notes (Doc# 4134813)

[11] EM929x Customer Release Notes (Doc# 4134932)

[12] EM92xx Smart Transmit (Doc# 2174327)

17: Glossary

Table 17-1: Terms and Definitions

Term	Definition
BeiDou	BeiDou Navigation Satellite System A Chinese system that uses a series of satellites in geostationary and middle earth orbits to provide navigational data.
CGPS	Converged Global Positioning System
CMW	Centimeter Wave
CtoN	Carrier-to-Noise density ratio (a.k.a., C/N_0)
DM	Data Management
ENDC	E-UTRAN New Radio – Dual Connectivity
HLOS	High Level Operating System
MMW	Millimeter Wave
PCC	Primary Component Carrier
QZSS	Quasi-Zenith Satellite System — Japanese system for satellite-based augmentation of GPS.
RFC	Radio Frequency Card An RF hardware configuration file stored on the module, which includes antenna path information, supported band combinations, etc.
SCC	Secondary Component Carrier
SUPL	Secure User Plane Location
TTFF	Time To First Fix

Index (AT commands)

A

A, answer incoming call, 204
A/, re-issue last AT command, 204
!ANTSEL, set/query external antenna select configuration, 22

B

!BAND, set/query frequency bands, 25
!BCFWUPDATESTATUS, report status of last firmware update attempt, 108
!BOOTHOLD, reset modem and wait for f/w download, 30

C

&C, set data carrier detected, 203
C, ITU T v.24 circuit 109 carrier detect signal behavior command, 206
+CACM, accumulated call meter, 206
+CACSP, voice group or voice broadcast call state attribute presentation, 206
+CAEMLPP, eMLPP priority registration and interrogation, 206
+CAHLD, leave an ongoing voice group or voice broadcast call, 206
+CAJOIN, accept incoming voice group or voice broadcast call, 206
+CALA, alarm, 206
+CALCC, list current voice group and voice broadcast call, 206
+CALD, delete alarm, 206
+CALM, alert sound mode, 206
+CAMM, accumulated call meter maximum, 206
+CANCHEV, NCH support indication, 206
+CAOC, advice of charge, 206
+CAPD, postpone or dismiss an alarm, 206
+CAPTT, talker access for voice group call, 206
+CAREJ, reject incoming voice group or voice broadcast call, 206
!CARRIERRESET, reset carrier configuration, 138
+CAULEV, voice group call uplink status presentation, 206
+CBC, battery charge, 206
+CBKLT, backlight (handset only), 206
+CBM, cell broadcast message directly displayed, 205
+CBMI, cell broadcast message stored in memory at specified location, 205
+CBST, select bearer service type, 206
+CCCM, current call meter value, 206
+CCFC, call forwarding number and conditions, 206
+CCHC, close logical channel, 206
+CCHO, open logical channel, 206
+CCLK, AT&T proprietary command, 211
+CCLK, clock, 206
+CCUG, closed user group, 206
+CCWA, call waiting, 206
+CCWE, call meter maximum event, 206
+CDIP, called line identification presentation, 206
+CDIS, display control, 206
+CDS, SMS status report after sending a SMS, 205
+CDSI, incoming SMS status report, 205
+CEER, extended error report, 207
+CEINFO, AT&T proprietary command, 211
+CEREG, read network register status, 207
+CESP, enter SMS block mode protocol, 205
+CESQ, extended signal quality, 207
+CFUN, set phone functionality, 207
+CGACT, PDP context activate or deactivate, 207
+CGANS, manual response to network request for PDP context activation, 207
+CGATT, PS attach or detach, 207
+CGAUTO, automatic response to network request for PDP context activation, 207
+CGCLASS, GPRS mobile station class, 207
+CGCLOSP, configure local octet stream PAD parameters, 207
+CGCMOD, PDP context modify, 207
+CGCONTRDP, PDP context read dynamic parameters, 207
+CGDATA, enter data state, 207
+CGDCONT, define PDP context, 207
+CGDSCONT, define secondary PDP context, 207
+CGEQMIN, 3G QoS profile (minimum acceptable), 207
+CGEQNEG, 3G QoS profile (negotiated), 207
+CGEQOSRDP, EPS quality of service read dynamic parameters, 207
+CGEQREQ, 3G QoS profile (requested), 207
+CGEREP, packet domain event reporting, 207
+CGEV, GPRS network event indication, 207
+CGIEV, indicator event, 208
+CGLA, generic UICC logical channel access, 207
+CGMI, request manufacturer identification, 207
+CGMM, request model identification, 208
+CGMR, request revision identification, 208
+CGPADDR, show PDP address, 208
+CGPIAF, printing IP address format, 208
+CGQMIN, QoS profile (minimum acceptable), 208
+CGQREQ, QoS profile (requested), 208
+CGREG, GPRS network registration status, 208
+CGSCONTRDP, secondary PDP context read dynamic parameters, 208
+CGSMS, select service for MO SMS messages, 208
+CGSN, request product serial number identification, 208
+CGTFT, traffic flow template, 208
+CGTFTRDP, traffic flow template read dynamic parameters, 208
+CHLD, call-related supplementary services, 208
+CHSA, HSCSD non-transparent asymmetry configuration, 208
+CHSC, HSCSD current call parameters, 208
+CHSD, HSCSD device parameters, 208
+CHSR, HSCSD parameters report, 208
+CHST, HSCSD transparent call configuration, 208
+CHSU, HSCSD automatic user initiated upgrading, 208
+CHUP, hangup call, 208
+CIMI, request international mobile subscriber identity, 208
+CIND, indicator control, 208
+CKEV, key press or release event, 208
+CKPD, keypad control, 208
+CLAC, list all available AT commands, 208
+CLAE, language event, 208
+CLAN, set language, 208
+CLCC, list current calls, 208
+CLCK, facility lock, 208
+CLIP, calling line identification presentation, 209
+CLIR, calling line identification restriction, 209
+CLVL, sets/returns internal loudspeaker volume, 209
+CMAR, master reset, 209
+CME ERROR, mobile termination error result code, 209
+CMEC, mobile termination control mode, 209
+CMEE, report mobile termination error, 209
+CMER, mobile termination event reporting, 209
+CMGC, send command, 205
+CMGD, delete message, 205

+CMGF, message format, 205
+CMGL, list messages, 205
+CMGR, read message, 205
+CMGS, send message, 205
+CMGW, write message to memory, 205
+CMMS, more messages to send, 205
+CMNA, new message acknowledgement to ME/TA, 205
+CMOD, call mode, 209
+CMS ERROR, SMS error (mobile or network error), 205
+CMSS, send message from storage, 205
+CMT, incoming message directly displayed, 205
+CMTI, incoming message stored at specific memory location, 205
+CMUT, enables/disables uplink voice muting, 209
+CMUX, multiplexing mode, 209
+CNMA, new message acknowledgement to ME, 205
+CNMI, new message indications to TE, 205
+CNTI, AT&T proprietary command, 211
+CNUM, subscriber number, 209
+COLP, connected line identification presentation, 209
+COPN, read operator names, 209
+COPS, operator selection, 209
+CPAS, phone activity status, 209
+CPBR, read phonebook entries, 209
+CPBS, select phonebook memory storage, 209
+CPBW, write phonebook entry, 209
+CPFB, find phonebook entries, 209
+CPIN, enter PIN, 209
+CPINR, remaining PIN retries, 209
+CPLS, Preferred PLMN list selection, 209
+CPMS, preferred message storage, 205
+CPOL, preferred operator list, 209
+CPROT, enter protocol mode, 209
+CPUC, price per unit and currency table, 209
+CPWC, power class, 209
+CPWD, change password, 209
+CR, service reporting control, 209
+CRC, cellular result code, 209
+CREG, AT&T proprietary command, 211
+CREG, network registration, 210
+CRES, restore settings, 205
+CRING, incoming call type, 210
+CRLP, radio link protocol, 210
+CRMP, ring melody playback, 210
+CRSL, ringer sound level, 210
+CRSM, restricted SIM access, 210
+CSAS, save settings, 205
+CSCA, service center address, 205
+CSCB, select cell broadcast message type, 205
+CSCC, secure control command, 210
+CSCS, select TE character set, 210
+CSDF, settings date format, 210
+CSDH, show text mode parameters, 205
+CSGT, set greeting text, 210
+CSIL, silence command, 210
+CSIM, generic SIM access, 210
+CSMP, set text mode parameters, 205
+CSMS, select message service, 205
+CSNS, single numbering scheme, 210
+CSQ, AT&T proprietary command, 211
+CSQ, signal quality, 210
+CSSN, supplementary service notifications, 210
+CSTA, select type of address, 210
+CSTF, settings time format, 210
+CSUS, set card slot, 210
+CSVM, set voice mail number, 210
+CTFR, call deflection, 210
+CTSA, command touch screen action, 210
+CTZR, time zone reporting, 210
+CTZU, automatic time zone update, 210
+CUSD, unstructured supplementary service data, 210
!CUSTOM, customization settings, 31
    BOOTQUIETDISABLE, enable/disable quiet mode feature, 31
    CFUNPERSISTEN, AT+CFUN setting persistence across power cycles, 31
    DGENABLE, enable/disable Dying Gasp feature, 32
    DHCPRELAYENABLE, enable/disable DHCP Relay feature, 32
    DIAGENABLE, enable/disable DIAG interfaces, 32
    GPIOSARENABLE, configure ST DSI selection method, 32
    GPSENABLE, enable GPS, 32
    GPSLPM, enable GPS in low power mode, 32
    GPSSEL, select GPS antenna type, 33
    ICMPINTSRVDIS, enable/disable incoming ping reply, 33
    IMCONFIG, configure Image Switch feature, 33
    IPCHANNELRATEEN, enable/disable IP channel rate feature, 33
    IPV6ENABLE, enable/disable IPV6 support, 33
    MBIMMODE, enable/disable MBIM mode, 34
    PCSCDISABLE, configure PCSC/Authentication features, 34
    QXDMLOGENABLE, enable/disable QXDM log, 34
    SIMHOTSWAPDIS, Configure SIM hotswap feature, 34
    SIMLPA (Local Profile Assistant), enable/disable, 34
    SIMLPM, set default low power mode SIM power state, 34
    UIM2ENABLE, Enable/disable UIM2 slog support, 35
    UIMAUTOSWITCH, Enable/disable automatic SIM switching, 35
    USBSERIALENABLE, serial number type to use in USB descriptor, 35
    WAKEHOSTEN, enable/disable host wakeup via SMS or incoming data packet, 35
+CV120, v.120 rate adaption protocol, 210
+CVHU, voice hangup control, 210
+CVIB, vibrator mode, 210

D

&D, set DTR function mode, 203
D, dial, 204
D, ITU T V.25ter dial command, 211
D'99'''<n>#, set up packet data call based on profile ID #<n>, 211
D'99#, set up packet call based on profile ID #1, 211
D><MEM><N>, originate call to phone number in memory, 204
D><N>, originate call to phone number in current memory, 204
D><STR>, originate call to phone number corresponding to a/n field, 204
!DACGPSCTON, return CtoN and frequency measurement, 115
!DACGPSSTANDALONE, enter/exit StandAlone (SA) RF mode, 116
!DACGPSTESTMODE, start/stop CGPS diagnostic task, 117
!DAFTMACT, put modem into FTM mode, 118
!DAFTMDEACT, put modem into online mode, 119
!DAGFTMRXAGC, get FTM Rx AGC on Primary or Diversity path, 120
!DARCONFIG,configure radio, 122
!DARCONFIGDROP, drop radio configurations, 126
!DASUB6TECHACT, start/stop 5G Sub6 technology, 127
!DATALOOPBACK, enable/disable and configure loopback mode, 36
!DATXCONTROL, configure Tx power, 128

!DATXMEASURE, get Tx power (FTM mode), 131
!DAUPDATEPARAM, update parameters for !DARCONFIG, 132
!DGSMSCONTENT, set Dying Gasp SMS message content, 200
!DGSMSDEST, set dying gasp SMS destination phone number, 201
!DGSTATS, set/clear last Dying Gasp SMS trigger, 202
DL, redial last phone number used, 204
!DMDEBUG, enable/disable DM-related debug log on AT port, 190
!DMREAD, get LWM2M object content, 191
!DMREADALL, get all LWM2M objects content, 193
!DMSESSION, control DM session, 195
!DMSUPPORT, enable/disable carrier DM feature, 196
+DR, V42bis compression report, 203
+DS, V42bis data compress, 203

E

E, set command echo mode, 204
+ECNO, AT&T proprietary command, 211
!ENTERCND, enable protected command access, 18

F

&F, set current parameters to defaults, 203

G

+GCAP, Request complete TA capabilities list, 203
!GCCLR, clear crash dump data, 110
!GCDUMP, display crash dump data, 111
!GCFEN, enable/disable GCF test mode, 38
+GMI, request manufacturer identification, 203
+GMM, request TA model identification, 203
+GMR, request TA revision identification, 203
!GNSSCONFIG, configure GNSS satellite constellation, 146
!GNSSPERMITTEDSTATE, query GNSS feature permitted state, 148
+GOI, request global object identification, 203
!GPSAUTOSTART, configure GPS auto-start features, 149
!GPSCLRASSIST, clear selected GPS assistance data, 150
!GPSCOLDSTART, clear all GPS assistance data, 151
!GPSEND, end active position fix session, 152, 171
!GPSFIX, initiate GPS position fix, 153, 172
!GPSLBSAPN, set GPS LBS APNs, 154
!GPSLOC, return last known modem location, 156
!GPSMOMETHOD, query/set GPS MO method, 158
!GPSMTLRSETTINGS, configure GPS notification response behavior, 159
!GPSNIQOSTIME, configure GPS QOS timeout, 160
!GPSPORTID, query/set TCP/IP port ID, 161
!GPSSATINFO, request satellite information, 162
!GPSSTATUS, request position fix session status, 164, 171
!GPSSUPLURL, query/set SUPL server URL, 166
!GPSSUPLVER, query/set SUPL server version, 167
!GPSTRACK, initiate multiple-fix tracking session, 168, 171
+GSN, request TA serial number identification, 203
!GSTATUS, return operational status, 39

H

H, disconnect existing connections, 204
!HOSTDEVINFO, set/report host device details, 197
!HWID, display hardware version, 41

I

I, display product identification information, 204
+ICF, set TE-TA control character framing, 203
+IFC, set TE-TA local data flow control, 203
+ILRR, set TE-TA local rate reporting mode, 203
!IMAGE, list stored firmware images, 42
!IMPREF, query/set Image management preferences, 44
!IMSIM, update AUTO-SIM matching list, 175
!IMSTESTMODE, enable/disable IMS test mode, 112
+IPR, set fixed local rate, 203

L

L, set monitor speaker loudness, 204
!LEDTEST, switch LED on/off, 113
!LTECA, enable/disable LTE CA, 46
!LTEINFO, display LTE network information, 47
!LTERXCONTROL, enable/disable LTE Rx diversity during CA, 133, 134

M

M, set monitor speaker mode, 204
!MMWBYPASSSCAN, bypass check for mmW antennas during power ON, 50
!MMWCAL, report mmW calibration status, 51

N

+NCELL, AT&T proprietary command, 211
!NRINFO, display NR information, 52
!NRPCI, display NR PCI value(s), 59
!NVBACKUP, back up device configuration, 139
!NVENCRYPTIMEI, write IMEI to modem, 60, 61
!NVPERSISTRST, configure item persistency/reset persistent item(s), 141, 142, 143
!NVPLMN, provision/display PLMN list for Network Personalization, 62

O

O, switch from command mode to data mode, 204

P

P, select pulse dialing, 204
+PACSP, AT&T proprietary command, 211
!PCINFO, return power control status information, 63
!PCOFFEN, enable/return Power Off Enable state, 65
!PCTEMP, return current temperature information, 66
!PCTEMPLIMITS, query/set temperature state limits, 67
!PCVOLT, return current power supply voltage information, 68
!PCVOLTLIMITS, query/set power supply voltage state limits, 69
!POWERDOWN, power down (reset) modem, 70
!PRIID, set/query PRI part number and revision, 71

Q

Q, set result code presentation mode, 204

R

!RATCA, enable/disable CA/ENDC/SA capability, 72
!RATCONFIG, configure RAT support, 73
!RESET, reset the modem, 74
!RFCID, set/query RFC-related hardware ID and board ID, 75
!RFCMBNSCAN, display all RFC .mbn files, 77
!RFCOMBOS, display supported CA/EN-DC combinations, 79
!RFDEVSTATUS, display all RFFE status, 82
!RMARESET, restore device to saved restore point, 144
+RSCP, AT&T proprietary command, 211
+RSRP, AT&T proprietary command, 211
+RSRQ, AT&T proprietary command, 211
!RXDEN, enable/disable Rx diversity, 135

S

&S, set DSR signal, 203
S0, set number of rings before auto-answer, 204
S10, set disconnect delay after indicating absence of data carrier, 204
S3, set command line termination character, 204
S4, set response formatting character, 204
S5, set command line editing character, 204
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