AT Commands Interface Guide

AirPrime SL5011 and SL3010T

SIERRA WIRELESS

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6.0
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Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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Document History

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001	March 08, 2011	Creation
002	May 04, 2011	Updated +RCHVUNBLK in Table 21 +R Prefix Commands
003	Aug 25, 2011	Added +WHCNF in: • Table 3 Basic Modem Configuration • Table 22 +W Prefix Commands
		Updated +GMR in Table 18 +G Prefix Commands
		Added !ADC in: • Table 47 EMConnect Command Summary • Table 83 Enhanced GPIO Commands • Section 4.2 !ADC
		Updated !AIN in: • Table 47 EMConnect Command Summary • Table 83 Enhanced GPIO Commands
		Deleted !MAPUART from: • Table 47 EMConnect Command Summary • Table 48 Enhanced Serial (UART) Interface Commands
		Update !SERIALPORTMAP in: • Table 29 Hardware Configuration Command Details
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6.0	December 11, 2013	Added support for SL3010T
		Updated: • Table 18 +G Prefix Commands • Table 23 Alphabetic AT Commands • Table 29 Hardware Configuration Command Details
		Removed SL5010

Contents

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Introduction

This AT reference guide is divided into three sections – the basic Attention (AT) command set (AT Command Reference), the extensions to the operation set of AT commands (Extended AT Command Reference) supported by the AirPrime SL5011 and SL3010T embedded modules and the EM Connect command set (EMConnect).

Unless specified otherwise, the word “modem” applies to the AirPrime SL5011 and SL3010T.

Note that this document does not cover the command set offered when the AirPrime SL3010T is used with the Open AT Application Framework. For SL3010T commands used with the Open AT Application Framework, please refer to document AT Commands Interface Guide for Firmware 7.52 (document # 4111843).

To fully understand the workings of the AT commands, an understanding of the CDMA data network and the call setup process is needed. This document includes section 1 Modem Basics, which covers these issues and other important connection details. To use this document, you should be familiar with the use of AT commands with standard wireline modems. There are two methods of controlling the modem: AT commands and CnS (Control and Status) language. Some features or capabilities of the modem require the use of CnS. This document presumes that the AT interface is the only interface available to you; features requiring CnS are not discussed.

Note:	*The modem supports a user locking mechanism (similar to a PIN) via the CnS language. The AT command interface does not support access to this feature. If the modem was locked by the user through another application (such as Watcher®), the AT command interface is disabled.*

Note that some commands in the Extended AT Command Reference section are not generally accessible to end users. Access to the commands is unlocked by a setting of the !OEM command.

Commands related to testing the hardware may require the normal modem operations be halted to prevent unintended changes in state. To do this, use the !DIAG command to place the modem in diagnostic mode. While in diagnostic mode, the normal automatic operations are suspended.

Commands requiring !OEM access or !DIAG mode operation are noted with the symbols shown below.

Commands requiring the !OEM setting to unlock access are marked with the cog symbol.

Commands requiring the !DIAG setting for diagnostic mode are marked with the magnifying glass symbol.

References

This guide covers both the command set used by the modem (AT Command Reference) and the command set used by designers and testers of the Sierra Wireless modems (Extended AT Command Reference). It does not deal with operational use guides. Not all commands include detailed descriptions.

Commands are implemented to be compliant with industry standards, and reference is often made to the following standards:

- IS-131 (Data Transmission Systems and Equipment - Extensions to Serial Asynchronous Dialing and Control)
- EIA/TIA-592 (Asynchronous Facsimile DCE Control Standard, Service Class 2)
- EIA/TIA/IS-134 (Amendments to TIA-592 to Support T.30 - 1993 (Facsimile protocol standard))

Electronic copies of standards can be purchased at the ANSI Electronic Standards Store at: webstore.ansi.org. ANSI Customer Service will respond to inquiries about standards information at: sales@ansi.org.

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You may also want to consult the other documents available on our Internet site at www.sierrawireless.com.

Terminology and Acronyms

This document makes wide use of acronyms that are in common use in data communications and cellular technology. Our Internet site provides a Glossary (document #2110032) that may be helpful in understanding some acronyms and terminology used in this guide. Some of these items are also described in Appendix B: Acronyms and Definitions.

Firmware Revision

To determine the module's firmware version, enter the AT command **AT+GMR** and the modem will respond with the corresponding module and firmware revision. For more information, see **+GMR** in Table 18 +G Prefix Commands.

Updated firmware can be acquired from the Sierra Wireless Developer Zone or by contacting your account manager. Restrictions on each firmware release are detailed in the associated release notes (also available from the Sierra Wireless Developer Zone or from your account manager).

Conventions

The following format conventions are used in this reference:

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

Numeric values are decimal unless prefixed as noted below.

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

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

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

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

Commands are presented in table format. Each chapter covers the commands related to that subject and presents a summary table to help you locate a needed command.

The default settings are noted in the command tables. Note that these are the factory default settings and not the default parameter value assumed if no parameter is specified. The factory defaults are also noted in a section at the end of each operational mode reference.

Commands requiring !OEM access or !DIAG mode operation are noted with the symbols shown below.

Commands requiring the !OEM setting to unlock access are marked with the cog symbol.

Commands requiring the !DIAG setting for diagnostic mode are marked with the magnifying glass symbol.

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

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

For a discussion of how the modem frames these two elements, see section 1.6.3 Framing.

Responses and result codes from the modem, or host system software prompts, are shown in this font: `CONNECT 14400`.

AT Command Reference

Following this introduction is a section on basic elements important to understanding and communicating with the modem. This includes discussions of the QNC (Quick Net Connect) call setup process and interaction with the CDMA Interworking Function (IWF), as well as notes on the connection between the host (DTE) and the Sierra Wireless modem (DCE). The document then presents the commands, registers, result codes, and defaults provided in the command state of the modem. Commands are often termed AT commands since this character sequence (originated by Hayes™) is used to prefix each specific command.

In addition to the commands, the definitions and use of status registers are also described.

Commands are referenced in strict alphabetical order. This facilitates searches for the syntax, parameters, and operation of specific commands. To help locate whether or not a command exists to perform a desired function, tables organize the commands into these groups:

- Basic modem operation actions – commands that make the modem execute an immediate action, such as dialing, or restoring settings
- Basic modem configuration – settings governing the modem's behavior when executing basic operations
- Advanced modem configuration – settings governing the modem's behavior related to advanced operations (for example, Mobile IP)
- Account activation and management commands
- Device and service interrogation commands – commands to determine the services available, information about and the status of the modem
- Voice operation – related to configuring, making, and controlling voice calls
- SMS operations – commands to check, receive, and delete, incoming messages, and to originate outgoing messages
- GPS – commands related to Location Based Services
- Fax configuration and operation commands – configuring and operating in fax mode

In addition to the commands, the definitions and use of status registers are also described. The factory/reset defaults are also listed in a table.

Result codes are also provided in a table.

1. Modem Basics

1.1. CDMA Basics

To help understand the call connection process in CDMA modems, a basic knowledge of the CDMA network helps. Two primary services are available using a CDMA 1xEVDO modem:

- IS-95B, a circuit switched type of connection; and
- 1x/1xEVDO, a packet switched connection.

1.1.1. Traditional Wireline

Before looking at the call setup process in CDMA, let's take a moment to review the traditional wireline modem. A call is established by the local modem placing the call over the Public-Switched Telephone Network (PSTN). The local and remote modems are connected and handshake the data protocol to use. The local modem can monitor the call progress by picking up the dial tone, busy, ring, and answer from the PSTN wireline connection.

1.1.2. CDMA IS-95B

Not being connected to the PSTN, the modem must first connect to the CDMA network. The CDMA service provider connects the call to either the PSTN or (by using QNC) the Internet. This environment uses an Interworking Function (IWF) to bridge the two systems.

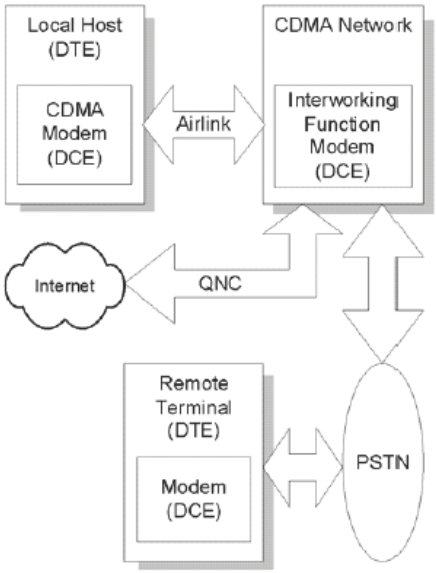

Figure 1. CDMA IS-95B Call Connection Block Diagram

Where traditional wireline has only the local host and modem on one side, the CDMA IS-95 model requires two modems on the local side: the IWF and the Sierra Wireless radio modem. These two modems must work as a team to make a data connection.

Note: When using IS 95, there is special handling of AT commands. For a detailed explanation, consult Appendix A: ASCII Table.

For Internet connections, the interworking function can use a special feature called QNC (Quick Net Connect). The IWF provides a link to the Internet without going through the PSTN.

Establishing a standard point-to-point call requires the Sierra Wireless modem to configure a modem at the IWF. It is the IWF modem that actually connects to the PSTN and dials the number. Call progress is not directly available to the local modem, although some information can be exchanged. When the IWF has completed the handshake with the remote modem, the local modem is advised and the connection is complete.

1.1.3. CDMA 1X

In areas where this service is provided, the modem can connect much like a local area network card. The connection can be “always on” and only actively used when there is packet data to send or receive.

CDMA 1X offers higher speed data operations than are available with IS-95 service. IS 95 is limited to 14.4 kbps. The packet services of CDMA 1X use a fundamental channel at 9600 bps and can add supplemental channels when needed to boost speed to as high as 153.6 kbps.

1.1.4. CDMA 1xEV-DO

In areas where this service is provided, the modem can provide packet data services at a much higher data rate, as shown in the following table.

Table 1. CDMA 1xEV-DO Packet Data Services

Data Service	Direction	Theoretical Maximum Data Rate	Typical Data Rate
1xEV-DO rev. 0	Upload	153 kbps	40-80 kbps
	Download	2.4 Mbps	400-700 kbps
1xEV-DO rev. A	Upload	1.8 Mbps	300-400 kbps
	Download	3.1 Mbps	600-1300 kbps

1.1.5. Voice Service

Also added with the AirPrime SL3010T embedded module is the ability to make and receive voice calls. This allows the modem to serve as a cellular telephone.

Note: The AirPrime SL5011 does not support voice.

1.2. Host Connection Basics

The embedded modem provides a USB interface and optional serial port interfaces. To support the high data rate of the 1xEVDO service the USB is highly recommended. The “Modem Port” presented is the interface available for performing AT commands.

1.2.1. Modes, States, and Conditions

Discussion of the operation of a Sierra Wireless modem requires understanding the settings of the modem and just how it is handling the data being sent to it. Describing the modem as being in a particular “mode” is not sufficient to capture the various characteristics of the modem in any given case.

To improve clarity, this document uses the words “mode”, “state”, and “condition” to reflect different elements of the modem’s configuration. This section describes the various modes, states, and conditions that are used in the reference.

The CDMA 1X modems operate very much like a landline modem. There are, however, some differences in that the modem supports multiple connection options.

One method of operation is to place a call just like a landline modem would (asynchronous serial); we call this a CSC (Circuit Switched Cellular) call. This type of connection supports both data and fax communication, and is available in IS-95 service areas.

An alternate (and more common) method is to place a QNC call by dialing a special number provided by your carrier. QNC provides a mechanism to connect to the Internet using PPP, without using an intermediate modem. This is functionally identical to using Dial-Up Networking for a PPP connection to an Internet Service Provider (TCP/IP) on a standard landline modem. QNC offers a faster call connection time than standard CSC calls. This is also available in IS-95 coverage.

The AirPrime SL5011 and SL3010T introduces a third data connection type, using 1X service. This is a packet data connection that does not tie up a circuit (or channel), but rather operates like a packet switched network, in which multiple users share the resources and only use them when there is data to send or receive.

These three calling options are simply different methods of placing what amounts to a data call. As such they are not included in the classification of modes, states, and conditions.

The commands and registers used depend on the modem’s operating mode. The state of the modem and its condition also determine how the modem will behave in any given situation.

1.2.2. Modes

For the purposes of this document, the following are the modes of operation: Data, Fax, and Voice.

1.2.2.1. Data (CSC, QNC, or Packet)

Connections to a PCS or cellular network for data transfers. This includes asynchronous (CSC) calls, PPP packet connections to the network (QNC), and 1X packet service connections.

1.2.2.2. Fax (CSC)

Using the PCS or cellular network to send and receive fax communication over a CSC connection.

1.2.2.3. Voice

The product is being used for voice communication instead of data/fax.

Note: The AirPrime SL5011 does not support voice.

In addition to the basic modes (data, fax, and voice), there are states and conditions to consider.

1.2.3. States

The modem’s state, in conjunction with its condition, governs how the modem handles traffic to and from the host (DTE), and to and from a remote modem. Data/fax modes can support up to three states: Command, Passthrough, and Data.

1.2.3.1. Command

The modem exchanges data with the host (DTE) as AT commands and replies. This state handles commands at the modem without the use of the airlink to the IWF modem. Voice modes are always in command state.

1.2.3.2. Passthrough

The modem has an active airlink with the IWF but is otherwise in the Command state. Data from the local host is passed through the modem to the IWF where it is executed as an AT command and then reflected back for execution by the local modem. This state only applies to IS-95 calls, not 1X packet connections.

1.2.3.3. Data

Communication is passed between the host and a remote terminal or network as computer or fax data.

Note:	*Voice modes do not support the data state. Even while off-hook with a voice call active, the modem still communicates over the serial connection in command state. Commands can be issued and executed while a voice call is in progress.*

1.2.4. Conditions

In addition to mode and state the modem can be in one of two conditions: online, and offline.

1.2.4.1. Online

Actively connected to a remote terminal or network (off-hook).

1.2.4.2. Offline

Disconnected from any remote terminal or network (on-hook).

While in offline condition the modem can only be:

- In command state (without an airlink), or
- In passthrough state with an airlink to the IWF modem but without an active call.

In the online condition, the modem can be:

- In data state, which passes data (including faxes) through the modem between the host (DTE) and the remote terminal or network.
- In passthrough state (IS-95B), which exchanges commands and replies between the host (DTE) and the IWF modem (DCE). The data is not sent all the way through the active connection to the remote terminal. The remote connection is still active (carrier is maintained) but data is not forwarded to the remote end.

1.3. State Transitions

On power up the modem is in command state.

1.3.1. Command to Data State

The modem changes to data state when a session is opened either by dialing a connection (or answering a data or fax call). When a session opens, the modem issues the **CONNECT** message and asserts the DCD control signal.

Note: *Due to multi-processing in the modem, the DCD signal may be asserted slightly before the modem has completed the transition to data state. The host device should allow a delay of 100 ms after receiving the complete **CONNECT** message and DCD signal before beginning transmission; otherwise some data may be lost.*

1.3.2. Data to Command State

When the modem changes to command state, an **OK** result is issued. This may be preceded by another result (such as **NO CARRIER**) to indicate that the session was closed by an event outside the modem. A closed session requires the modem to return to command state.

Several events can cause the modem to transition from data to command state based on mode.

SLIP mode transitions:

- DTR is deasserted, with a configuration to use DTR (**&D1** or **&D2**)
- The modem receives the escape sequence as a SLIP frame (**0xC0 +++ 0xC0**)
- The modem is reset or power-cycled

PPP mode transitions:

- DTR is deasserted, with a configuration to use DTR (**&D1** or **&D2**)
- PPP negotiates command state
- The modem is reset or power-cycled

Note: *A transition to command state from data state does not require that the session be closed. This means that DCD remains asserted while the modem is in command state, online condition.*

1.4. Modem Buffers

Communication with the modem is buffered to allow the modem to provide a variety of features and speed configurations. This section provides an introduction to the types of buffering performed by the modem.

1.4.1. Command Buffer

When in command state, the modem buffers the input from the host until a <CR> is entered. The buffered data can be edited using the backspace <BS>. The modem (with Echo enabled) may echo the sequence <BS><space><BS> for human readability.

There is a limit of 518 characters to one command line, excluding the **AT** prefix and the <CR> termination. If the command buffer length is exceeded, the modem continues to echo input (which is not buffered) until the <CR> is received. When the <CR> is entered, the modem returns the **ERROR** result code without executing any commands in the line. Once over the limit, the <BS> does not bring you back under the limit; the **ERROR** code is still returned.

The command buffer is distinct from the data receive and transmit buffers. The command buffer retains the contents of the last issued command until the **AT** command prefix is received for the next command. This allows repeating of the last issued command by entering **A/** instead of **AT**.

1.4.2. Data Buffers

Data being transmitted or received is buffered in several ways depending on the mode and nature of the connection. Some caution must be taken when disconnecting to ensure that any buffered data in the modem has been properly processed prior to breaking the connection.

Specific settings for buffer controls are described in the relevant commands and registers. Normal configuration of the modem does not require you to adjust these settings.

1.4.2.1. Speed Buffering

The simplest form of buffering allows for line speed differences and busy conditions between the host (DTE) and modem and between the modem and the remote terminal or network. The network side of the connection can have rates up 153.6 kbps, while the local host connection can be at one of many different speeds from 300 bps to 230.4 kbps.

Where large amounts of data are being exchanged, local hardware flow control must be used to prevent buffer overflows. To reduce packet loss, the CDMA protocol incorporates flow control on the network connection.

1.5. Command Handling

AT can be issued as a command without parameters. It acts like a “ping” to the modem and always gives a result code of **OK**. If there is no response from the modem, try issuing **ATQ0** (Quiet mode off). If this fails, try the **+++** escape sequence or resetting the modem.

Commands may be entered in upper or lower case.

1.5.1. Concatenation

More than one command can be included in a single line, although some commands or their parameters must be placed at the end of the line. When concatenating commands, a space between basic commands is optional. Where extended commands (those beginning with a non-alphabetic character) are concatenated, they must be separated by a semi-colon.

Commands are executed in the order entered. If a command results in the **ERROR** result code, the balance of the command line is ignored. Only one result code is returned for the entire command line.

1.5.2. Parameters

Most AT commands support one or more parameters, usually a number. Parameter ranges are specified in the reference.

Commands that normally accept a single numeric option switch (**[n]**) and are issued without that parameter assume a value of zero (**0**).

Defaults shown in the command tables are those for the factory settings of the modem and are not the defaults assumed for a command issued without parameters.

Note:	*Entering incorrect syntax or a parameter outside of the specified range may have unexpected results.*

1.5.3. Registers

Some registers are read only. If an attempt is made to write to a read only register, the **ERROR** result code is returned.

Some registers store the setting of commands. Changing the register is equivalent to changing the command setting.

Table 25 S Registers indicates the standard default values. The factory defaults are shown in Table 27 Profile Settings.

1.6. Responses and Result Codes

Most commands return only a result code however some commands request information, which is provided by the modem as a response prior to the result code.

1.6.1. Possible Result Codes

Result codes are not shown in the command tables unless special conditions apply. Generally the result code **OK** is returned when the command has been executed. **ERROR** may be returned if parameters are out of range, and is returned if the command is not recognized, or the command is not permitted in the current mode, state, or condition of the modem. Table 26 Result Codes lists all result codes, giving both the numeric and verbose results.

1.6.2. Human vs. Machine Interface

The AT command interface was designed for human interaction. When an intelligent host is managing a modem, the interface may need to be altered; result code words replaced with numbers, for example. Framing characters (line feeds and carriage returns) must be properly understood to ensure the host system properly parses the responses and result codes.

As shipped the modem is configured with these settings:

- Echo enabled (**E1**): which causes the modem to echo characters received from the host back to it while in command state. The backspace is echoed as <BS>.
- Quiet result codes disabled (**Q0**): which enables the modem to issue result codes following commands. Quiet on (**Q1**) suppresses result codes entirely; responses remain unaffected.
- Verbose result codes (**V1**): which provides results in English text appended with <CR><LF>. Verbose off (**V0**) returns the results as ASCII numeral codes. Numeric codes are much easier to process.

With Echo on (**E1** - the default), data received from the local host while in command state is echoed back to the host. This can present problems to machine control, which is not interested in an echo of its own commands to the modem. In some configurations the echo should be turned off (**E0**). The configuration for most machine-controlled hosts is more likely to be set to Echo off, and Verbose off or possibly Quiet on.

1.6.3. Framing

The framing of the response and result elements by <CR><LF> depends heavily on the settings of the modem. In particular the settings of Verbose (**V**) and Quiet (**Q**) modes alter the framing of both responses and result codes.

These elements are normally formatted for human reading with a terminal program; however users wishing to have software read and adjust to these responses and result codes must understand how they are framed.

1.6.3.1. Framing Characters

The modem will frame replies with carriage return and line feed characters as they are defined in registers **S3** and **S4** respectively. These are normally the ASCII values 13 <CR> and 10 <LF>. For the purposes of the discussion here, they are referred to as <CR> and <LF>.

If there are any problems determining the exact framing of the response and result codes, use a protocol analyzer to monitor the exchanges.

1.6.4. Response Framing

Regardless of command settings, responses are in ASCII text with a trailing <CR><LF>. Where a response has more than one line, each line is terminated with a <CR><LF>. The programmer must know the number of lines expected in the response.

The setting of Verbose (**V**) on (=1) triggers a leading <CR><LF> prior to the first line of the response. If Verbose is off (=0), there are no leading characters prior to the first line of response. The setting of Quiet (**Q**) has no impact on responses.

1.6.5. Result Code Framing

Every command returns a result code unless the Quiet command is enabled. If Quiet (**Q**) is on (=1), then there are no framing characters nor any result code returned; the modem is truly silent with respect to result codes.

A leading <CR><LF> is inserted ahead of the result code if Verbose (**V**) is on (=1), otherwise there are no leading characters prior to the ASCII numeral result. The result code is always followed by a <CR>. There is a trailing <LF> only if Verbose is on. Samples:

V=1 <CR><LF>OK<CR><LF>

V=0 0<CR>

2. Commands

The modem supports commands for:

- IS 95B data service
- Fax service
- 1X packet service
- SMS
- Voice (SL3010T only)
- GPS

The modem also has commands related to configuration of the hardware to suit particular integrations, and modem activation.

2.1. AT Command Set Summary

The reference tables are presented in strict ASCII alphabetical order (including prefixes). This format allows quick look-up of each command to verify syntax, parameters, and behaviors. It does not lend itself to finding whether or not the modem has a command to perform a particular service or setting.

The summary in this section organizes the commands into functional groups to allow you to more quickly locate a desired command when the operation is known but the command is not.

2.1.1. Basic Operation Actions

Table 2. Basic Modem Operation Actions

Command	Description
&F	Factory Settings Restore
&V	View Configuration
+++	Escape from data state to command state
A/	Repeat last command (re-execute the line in the command buffer)
A	Answer – Manual
D	Dial
H	Hook Control
O	Online (Remote)
Z	Profile Restore
~DTMFB	DTMF Burst
~DTMFK	DTMF Key
~RESET	Reset
~SHTDWN	Shutdown
~TONMUT	Tone Mute

2.1.2. Basic Modem Configuration

Table 3. Basic Modem Configuration

Command	Description
&C	Data Carrier Detect Control
&D	Data Terminal Ready Options
+ATINIT	AT Initialization
+ATINITSTATE	AT Initialization State
+CFG	Configuration String
+CMUX	Multiplex Option
+CQD	Command State Inactivity Timer
+CRC	Cellular Result Codes
+CRM	Local (R_m) Interface Protocol
+CTA	Packet Data Inactivity Timer
+CXT	Cellular Extension
+FCLASS	Modem Operating State
+ICF	Character Framing
+ILRR	Local Rate Reporting
+IPR	Fixed Port (R_m) Rate
+IFC	TX/RX flow control
+MA	Modulation Automode
+MR	Modulation Reporting
+MS	Modulation Selection
+MV18R	V.18 Reporting
+MV18S	V.18 Selection
+WHCNF	Activate, deactivate or interrogate a WHCNF feature
+WWKUP	Wake-up Events Mask
E	Echo (Command State)
L	Loudness (Speaker Volume)
M	Mute (Speaker Control)
P	Pulse Dialing
Q	Quiet – Result Code Display Option
S	S-Register Read and Write
T	Tone Dialing
V	Verbose – Result Code Form
X	Result Code/Call Progress Control
~HDSET	Headset Detection Option
~TONDUR	Tone Duration

2.1.3. Advanced Modem Configuration

Table 4. Advanced Modem Configuration

Command	Description
!APPSUBTYPES	Application subtypes negotiated for the four streams
!MUFWDRESET	Resets all data reported by **!MUFWDSTATS**
!MUFWDSTATS	Current Multi-User Forward Traffic Channel Statistics
!PERSONALITY	Current personality and its negotiated protocol subtypes
!PROTSUBTYPES	Negotiated subtypes for all protocols in all stored personalities
!SCPCUSTCONFIG	Current Session Configuration Protocol Customer configuration
!SESSIONSTATUS	Current HDR session status
!SIPID	Simple IP setup (user ID)
!SIPPWD	Simple IP setup (password)
!SLEEPPARMS	1xEV-DO Rev. A sleep parameters (slot cycle indexes and sleep periods)
!SUFWDCCSTATS	Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Control Channel)
!SUFWDCRCS	Current Single User Forward Channel Statistics (Single User packet CRCs and Packet Error Rate)
!SUFWDRESET	Resets the data reported by **!SUFWDCCSTATS**, **!SUFWDCRCS** and **!SUFWDCSTATS**.
!SUFWDCSTATS	Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Traffic Channel)
$QCMIP	Mobile IP behavior
$QCMIPEP	Enables/disables the currently active Mobile IP user profile
$QCMIPGETP	Query a user profile
$QCMIPNAI	Set the Network Access ID (NAI) for the currently active profile
$QCMIPP	Select one of the Mobile IP user profiles to be the current active profile

2.1.4. Account Activation

The modem supports modem account activation via the AT command interface.

Table 5. Account Activation and Management Commands

Command	Description
~NAMLCK	NAM Lock – enter the subsidy lock or SPC required to write account data
~NAMVAL	NAM Values – query or set the account data

2.1.5. Device and Service Interrogation

Table 6. Device and Service Interrogation Commands

Command	Description
I	Product identification information
!ECIO	Ec/Io
!GMODE	Mode of the modem
!MDMVER	Version of the modem firmware
!PREV	Protocol Revision
!PRLVER	PRL version
!RSSI	Received Signal Strength Indication
!STATUS	Modem status report
!SWICALLPROG	Output unsolicited call progress indication
!SYSTIME	CDMA time
+CAD?	Analog or Digital Service (Read-only) (local only)
+CBC?	Battery Charge (Read-only) (local only)
+CBIP?	Base Station IP Address (Read-only)
+CGCAP	Get IWF Capabilities
+CGMI	Get IWF Manufacturer
+CGMM	Get IWF Model
+CGMR	Get IWF Revision
+CGOI	Get IWF ISO ID
+CGSN	Get IWF ESN
+CMIP	Mobile Station IP Address (Read-only)
+CSQ	Signal Quality (Read-only)
+CSS?	Serving System (Read-only)
+GCAP	Get Capabilities
+GMI	Get Manufacturer
+GMM	Get Model Number
+GMR	Get Revision
+GOI	Get ISO ID
+GSN	Get ESN
+RCHVCHG	Change PIN code
+RCHVEN	Set CHV state
+RCHVVER	CHV Verification
+RCHVUNBLK	Use PUK to generate new PIN code
+RSTATUS	Get RUIM card status
+WGETWK	Request Wake-up Reason
S	S-Register Read

2.1.6. Voice Operation

Note: The AirPrime SL5011 does not support voice.

Table 7. Voice Operation

Command	Description
$QCCAV	Answer Voice
+CDV	Dial Voice
+CHV	Hang-up Voice
~ECHO	Echo Cancellation
~MICMUT	Microphone Mute
~SPKMUT	Speaker Mute
~SPKVOL	Speaker Volume
~STGLVL	Side Tone Gain Level

2.1.7. SMS Messages

The modem supports sending and receiving SMS (Short Message Service) messages.

Table 8. SMS Operations

Command	Description
!CNTSMS	Count of SMS messages in the modem
!DASMS	Delete All SMS messages
!DSMS	Delete SMS message (selective)
!GSMS	Get SMS message from the modem
!SSMS	Send SMS message, or query the send status

2.1.8. GPS

Note: For information on GPS support, please see the product specification for your Sierra Wireless product.

Table 9. GPS Commands

Command	Description
!GPSDLOAD	Initiate a download of ephemeris and almanac data
!GPSEND	End an active position location session
!GPSFIX	Initiate a location fix
!GPSLOC	Get the last known location of the modem
!GPSLOCK	Query or set the GPS lock for location processing
!GPSSATINFO	Get information for all satellites in view and those used in the last known, successful location fix.
!GPSSTATUS	Get the status of position location sessions (Fixed, and Download)
!GPSTRACK	Initiate a location tracking session

2.1.9. Fax Operation

Table 10. Fax Configuration and Operation Commands

Command	Description
$QCVAD	Answer as Data or Fax
+CFC	Airlink Fax Compression (Remote)
+FAA	Fax Adaptive Answer (Remote)
+FAP	Fax Addressing and Polling Capabilities (Remote)
+FBO	Fax Data Bit Order (Remote)
+FBS	Fax Buffer Size (Read-only)
+FBU	Fax HDLC Frame Reporting (Remote)
+FCC	Fax DCE Capabilities (Remote)
+FCLASS	Modem Operating State
+FCQ	Fax Copy Quality (Remote)
+FCR	Fax Capability to Receive (Remote)
+FCT	Fax DCE Phase-C Timeout (Remote)
+FDR	Fax Data Reception (Remote)
+FDT	Fax Data Transmission (Remote)
+FEA	Fax EOL Alignment (Remote)
+FFC	Fax Format Conversion (Remote)
+FHS	Fax Call Termination Status (Remote) (Read-only)
+FIE	Fax Procedure Interrupt Enable (Remote)
+FIP	Fax Initialize Parameters (Remote)
+FIS	Fax Current Session Negotiation (Remote)
+FKS	Fax Kill Session (Remote)
+FLI	Fax Local ID String (Remote)
+FLO	Fax Flow Control Select
+FLP	Fax Indicate Document to Poll (Remote)
+FMI	Fax Manufacturer (Remote)
+FMM	Fax Model (Remote)
+FMR	Fax Revision (Remote)
+FMS	Fax Minimum Speed (Remote)
+FNR	Fax Negotiation Reporting (Remote)
+FNS	Fax Non-standard Frame FIF (Remote)
+FPA	Fax Selective Polling Address (Remote)
+FPI	Fax Local Polling ID String (Remote)
+FPR	Fax Serial Port Rate Control
+FPS	Fax Page Status (Remote)
+FPW	Fax Password (Remote)
+FRQ	Fax Receive Quality Threshold (Remote)
+FRY	Fax ECM Retry Value (Remote)
+FSA	Fax Sub-address (Remote)
+FSP	Fax Request to Poll (Remote)

2.2. Reference Tables

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

A full list of result codes (verbose and numeric) is provided in Table 26 Result Codes.

2.2.1. ! Prefix

Table 11. ! Prefix Commands

Command	Description

!APPSUBTYPES	Application subtypes negotiated for the four streams.
	
	Example:
	`AT!APPSUBTYPES`
	`Stream0: Default Signaling Application`
	`Stream1: Default Packet Application for SN`
	`Stream2: Default Packet Application for AN`
	`Stream3: Default Test Application`
	`OK`

!CNTSMS	Count SMS Reports the number of messages stored in the modem as follows: New Urgent Msg {Index = 1}: <n> New Regular Msg {Index = 2}: <r> Old Messages {Index = 3}: <o> Voice Messages {Index = 4}: <v> The Index number corresponds to the SMS list index used to retrieve and delete messages. The counters n, r, o, and v indicate the number of messages in each list. When retrieving (**!GSMS**) or deleting (**!DSMS**), the message number is base 1, so the highest message number in any list is the same as the reported count.
!DASMS	Delete All SMS Deletes all SMS messages from all four SMS lists. Use this command with care, as confirmation is not required.
!DSMS=<i>[,m]	Delete SMS (selective) Deletes one or all messages from one of the index lists (for the definitions of the SMS index lists, see **!CNTSMS**). **Parameter** / **Meaning** i — message list (index 1, 2, 3, or 4) m — message number Message number 1 is the oldest message, and the number reported by **!CNTSMS**, is the most recent message. If the message number parameter is omitted, then all messages in the specified index list are deleted. Normally messages are only deleted from list 3 (old).

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!ECIO?</td><td>Ec/Io
If there is an active pilot, returns the current Ec/Io in units of 1dB.
See also !RSSI.</td></tr>
<tr><td>!GMODE</td><td>Mode of the modem
Returns either “ONLINE” or “OFFLINE”</td></tr>
<tr><td>!GPSDLOAD=<freq>, <duration></td><td>Initiate a download of ephemeris and almanac data
If the application requesting this data will be requiring the use of the data over a period of time, the application should indicate that the download should be periodic.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>freq</td><td>1</td><td>Periodic</td></tr>
<tr><td></td><td>2</td><td>Single</td></tr>
<tr><td>duration</td><td>1- 65535</td><td>Number of minutes between downloads.
Valid when freq = 1.
This parameter is required, even if freq = 2.</td></tr>
</table>

If the modem is unable to initiate the download operation, an error code (ERRCODE) is returned.

<table>
<tr><th>ERRCODE</th><th>Meaning</th></tr>
<tr><td>1</td><td>Internal modem error</td></tr>
<tr><td>2</td><td>Bad service type</td></tr>
<tr><td>3</td><td>Bad session type</td></tr>
<tr><td>4</td><td>Invalid privacy</td></tr>
<tr><td>5</td><td>Invalid data download</td></tr>
<tr><td>6</td><td>Invalid network access</td></tr>
<tr><td>7</td><td>Invalid operation mode</td></tr>
<tr><td>8</td><td>Invalid number of fixes</td></tr>
<tr><td>9</td><td>Invalid server info</td></tr>
<tr><td>10</td><td>Invalid timeout</td></tr>
<tr><td>11</td><td>Invalid QOS parameter</td></tr>
<tr><td>12</td><td>No session active</td></tr>
<tr><td>13</td><td>Session already active</td></tr>
<tr><td>14</td><td>Session busy</td></tr>
<tr><td>15</td><td>Modem is offline</td></tr>
<tr><td>16</td><td>CDMA lock error</td></tr>
<tr><td>17</td><td>GPS lock error</td></tr>
<tr><td>18</td><td>Invalid state</td></tr>
<tr><td>19</td><td>Connection failure</td></tr>
<tr><td>20</td><td>No buffers available</td></tr>
<tr><td>21</td><td>Searcher error</td></tr>
<tr><td>22</td><td>Cannot report now</td></tr>
<tr><td>23</td><td>Mode not supported</td></tr>
<tr><td>24</td><td>Other error</td></tr>
<tr><td>25</td><td>Invalid fix rate</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td></td><td>Example 1:
AT!GPSDLOAD=2,1
OK

Example 2:
AT!GPSDLOAD=1,60
ERRCODE = 17</td></tr>
<tr><td>!GPSEND= <sesstype></td><td>End an active position location session.
Either the current position fix session or the current download data session may be aborted. (There may be one of each type of session open simultaneously.)

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>sesstype</td><td></td><td>Type of session to abort:</td></tr><tr><td></td><td>0</td><td>Position Fix</td></tr><tr><td></td><td>1</td><td>Data Download</td></tr></table>
If the modem is unable to abort the specified session, or the session is not active, an error code is returned. For a list of supported error codes, see !GPSDLOAD.

Example:
AT!GPSEND=0
OK</td></tr>
<tr><td>!GPSFIX= <fixtype>, <maxtime>, <maxdist></td><td>Initiate a location fix.
While the fix is in progress, the application may query the status of the session (!GPSSTATUS). Once the status shows that the fix is complete, the application should use !GPSLOC to obtain the result.
If the modem is unable to initiate the location fix, an error code is returned. For a list of supported error codes, see !GPSDLOAD.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>fixtype</td><td></td><td>Type of fix to perform</td></tr><tr><td></td><td>1</td><td>Standalone</td></tr><tr><td></td><td>2</td><td>MS-Based Only</td></tr><tr><td></td><td>3</td><td>MS-Assisted Only</td></tr><tr><td></td><td>4</td><td>Optimized for speed</td></tr><tr><td></td><td>5</td><td>Optimized for accuracy</td></tr><tr><td></td><td>6</td><td>Optimized for data</td></tr><tr><td>maxtime</td><td>0 – 255</td><td>Number of seconds allowed to capture satellite information</td></tr><tr><td>maxdist</td><td>0 – 4294967280</td><td>Accuracy (in meters) the application prefers</td></tr></table>
Example 1:
AT!GPSFIX=2,30,200
OK

Example 2:
AT!GPSFIX=3,60,100
ERRCODE = 18</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSLOC</td><td>
Get the last known location of the modem
This command does not initiate a position location session; rather, it attempts to access the information from the most recent position location session. If the data is not available, the response indicates that the location is unknown (see Example 1 below).
Note: The Altitude and/or Heading information are included only if this data was collected as part of the most recent location fix.
For a 2D fix, VelVert is set to 0.

Example 1:
<pre>AT!GPSLOC
Unknown
OK</pre>
Example 2:
<pre>AT!GPSLOC
Lat: 33 Deg 7 Min 21.00 Sec N (0x005E3712)
Lon: 117 Deg 16 Min 10.31 Sec W (0xFEB26EEF)
Time: 200603174135634
LocUncAngle: 0 LocUncA: 8   LocUncP: 9
3D Fix
Altitude: 43   LocUncVe: 11
Heading: 0   VelHoriz: 515   VelVert: 0
OK</pre>
Example 3 (“Altitude” not included):
<pre>AT!GPSLOC
Lat: 33 Deg 7 Min 21.00 Sec N (0x005E3712)
Lon: 117 Deg 16 Min 10.31 Sec W (0xFEB26EEF)
Time: 200603174135634
LocUncAngle: 0 LocUncA: 8   LocUncP: 9
2D Fix
Heading: 0   VelHoriz: 515   VelVert: 0
OK</pre>
</td></tr>
<tr><td>!GPSLOCK= <lock>

!GPSLOCK?</td><td>
Queries or sets the GPS lock for location processing

<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>No GPS lock active</td></tr>
<tr><td>1</td><td>Mobile initiated sessions locked</td></tr>
<tr><td>2</td><td>Mobile terminated sessions locked</td></tr>
<tr><td>3</td><td>All GPS sessions locked (except 911)</td></tr>
</table>
Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
<pre>AT!GPSLOCK=2
OK</pre>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSSATINFO</td><td>
Query the modem for information for all satellites in view and those used in the last known, successful location fix.
The information is valid regardless of fix mode or whether the PDE or the modem performs the fix calculations.
Information is displayed for up to 12 satellites. “*” indicates that this satellite was used in the fix calculation.
Meanings of abbreviations:

SV: Satellite vehicle number (1-32)
ELEV: Satellite elevation (0-90°)
AZI: Satellite azimuth (0-360°)
SNR: Signal to Noise Ratio, in dB (0-99)

Example:
<pre>AT!GPSSATINFO?
Satellites in view: 5
* SV:21 ELEV:56 AZI:323 SNR:40
* SV:24 ELEV:52 AZI: 43 SNR:37
* SV:18 ELEV:51 AZI:226 SNR:42
* SV:26 ELEV:35 AZI: 85 SNR:22
* SV:16 ELEV:23 AZI:298 SNR:32
OK</pre>
</td></tr>
<tr><td>!GPSSTATUS</td><td>
Get the status of position location sessions (Fixed, and Download).
<table>
<tr><th>Status</th><th>Meaning</th></tr>
<tr><td>NONE</td><td>No session of this type has occurred since power-up</td></tr>
<tr><td>ACTIVE</td><td>A session of this type is currently active</td></tr>
<tr><td>SUCCESS</td><td>The most recent session of this type had succeeded</td></tr>
<tr><td>FAIL</td><td>The most recent session of this type had failed</td></tr>
</table>
The session status includes a timestamp of when the last session’s status was determined. (If a session is active, the system time of when the session entered the ACTIVE state is displayed.) If a session has a FAIL status, an error code (“FAILCODE”) is also displayed.
Example 1:
<pre>AT!GPSSTATUS
200505166000104 Last Fix Status = SUCCESS
200505166000215 Last DLoad Status = SUCCESS
200505166000104 Fix Session Status = ACTIVE
200505166000215 DLoad Session Status = SUCCESS
OK</pre>
</td></tr>
</table>

Command	Description

	Example 2:
	`AT!GPSSTATUS`
	`200503094060302 Last Fix Status = FAIL`
	`FAILCODE = 12`
	`000000000000000 Last DLoad Status = NONE`
	`200503094060302 Fix Session Status = FAIL`
	`FAILCODE = 12`
	`000000000000000 DLoad Session Status = NONE`

Status	Meaning
0	Phone is offline
1	No service
2	No PDE connection
3	No data available
4	Session manager busy
5	CDMA locked
6	GPS locked
7	PDE connection failed
8	GPS ended session due to error
9	User ended session
10	End key pressed from UI
11	Network session was ended
12	Timeout occurred
13	Privacy level error
14	Net access error
15	Error in fix
16	PDE rejected
17	Traffic channel exit
18	E911 override
19	Server error
20	Stale BS info

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSTRACK= <fixtype>, <maxtime>, <maxdist>, <fixcount>, <fixrate></td><td>
Initiate a location tracking session.
This command should be used when an application requires multiple location fixes over a small period of time (for example, a fix between every 1 to 240 seconds).
Using the <fixcount> and <fixrate> parameters, the application can specify how many fixes should be done, and at what rate they should occur. (<fixrate> is measured as the number of seconds from the start of one fix to the time that the subsequent fix is triggered.)
Due to the potential need for first updating the ephemeris, almanac and/or location data, the “time to first fix” may require more time than the subsequent fixes. Tracking applications need to consider this possible initial delay and may want to behave proactively by initiating, as part of their startup sequence, a Data Download session and/or a single location fix. As a guideline: almanac data is valid for 3 to 4 days, ephemeris data is valid for 30 to 120 minutes, coarse location data is valid for 4 minutes.
While the session is in progress, the application may query the status of the session (!GPSSTATUS). Once the status shows that the session is complete, the application should use !GPSLOC to obtain the result.
If the modem is unable to initiate the tracking session, an error code is returned.
<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>fixtype</td><td></td><td>Type of fix to perform</td></tr>
<tr><td></td><td>1</td><td>Standalone</td></tr>
<tr><td></td><td>2</td><td>MS-Based Only</td></tr>
<tr><td></td><td>3</td><td>MS-Assisted Only</td></tr>
<tr><td></td><td>4</td><td>Optimized for speed</td></tr>
<tr><td></td><td>5</td><td>Optimized for accuracy</td></tr>
<tr><td></td><td>6</td><td>Optimized for data</td></tr>
<tr><td>maxtime</td><td>0 – 255</td><td>Number of seconds allowed to capture satellite information</td></tr>
<tr><td>maxdist</td><td>0 – 4294967280</td><td>Accuracy (in meters) the application prefers</td></tr>
<tr><td>fixcount</td><td>1 - 999, or 1000 = continuous</td><td>Number of fixes to perform</td></tr>
<tr><td>fixrate</td><td>0 – 1800</td><td>Number of seconds between each fix</td></tr>
</table>
</td></tr>
<tr><td>!GSMS?<i,m></td><td>
Get SMS
Read an SMS message from the modem. The message read is determined by the parameters:
<table>
<tr><th>Parameter</th><th>Meaning</th></tr>
<tr><td>i</td><td>message list (index 1, 2, or 3)</td></tr>
<tr><td>m</td><td>message number</td></tr>
</table>
Message number 1 is the oldest message, and the number reported by !CNTSMS, is the most recent message.
After a new message is read, it is placed in message list index 3 (old messages).
The following information may be displayed:

Message center timestamp (optional)
Originating address
Priority (optional)
User data

</td></tr>
</table>

Command	Description
!MDMVER?	Version of the modem firmware Returns the firmware version being run on the modem. See also **+GMR** (Get Revision).
!MUFWDRESET	Resets all the data reported by **!MUFWDSTATS**.
!MUFWDSTATS	Current Multi-User Forward Traffic Channel Statistics **!MUFWDRESET** resets the data reported by this command. Example: AT!MUFWDSTATS FORWARD TRAFFIC CHANNEL CRC Count Termination Slot Count Good CRCs Bad CRCs 1 2 3 4 DRC3_128 0 - 0 0 0 0 DRC3_256 0 - 0 0 0 0 DRC3_512 0 - 0 0 0 0 DRC3_1024 0 0 0 0 0 0 DRC5_2048 0 0 0 0 0 0 DRC8_3072 0 0 0 0 DRC10_4096 0 0 0 0 DRC13_5120 0 0 0 0 Packet Error Rate (%): 0.000 OK
!PERSONALITY?	Current personality and its negotiated protocol subtypes. Example: AT!PERSONALITY? Current Personality: 0 Physical Layer Protocol Subtype: 0 Control Channel MAC Protocol Subtype: 0 Access Channel MAC Protocol Subtype: 0 Fwd Traffic Channel MAC Protocol Subtype: 0 Rev Traffic Channel MAC Protocol Subtype: 0 Key Exchange Protocol Subtype: 0 Authentication Protocol Subtype: 0 Encryption Protocol Subtype: 0 Security Protocol Subtype: 0 Idle State Protocol Subtype: 0 Generic MM Cap Disc Protocol Subtype: 0 Generic Virtual Stream Protocol Subtype: 0 OK

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!PREV?</td><td>Protocol Revision
Queries the modem for the current protocol revision reported by the current base station the modem is communicating with. The response is a decimal digit as noted below.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>1</td><td>JSTD-008 (PCS)</td></tr><tr><td>2</td><td>IS-95</td></tr><tr><td>3</td><td>IS-95A (cellular)</td></tr><tr><td>4</td><td>Minimum requirements for IS-95B</td></tr><tr><td>5</td><td>Full requirements for IS-95B</td></tr><tr><td>6</td><td>CDMA 1X Rev. 0</td></tr><tr><td>7</td><td>CDMA 1X Rev. 1</td></tr></table></td></tr>
<tr><td>!PRLVER?</td><td>PRL Version
Returns the version of the PRL stored in the modem.</td></tr>
<tr><td>!PROTSUBTYPES?</td><td>Negotiated subtypes for all protocols in all stored personalities.

Example
<pre>AT!PROTSUBTYPES
Number of Stored Personalities: 1
Current Personality: 0 Personality: 0
Physical Layer Protocol Subtype: 0
Control Channel MAC Protocol Subtype: 0
Access Channel MAC Protocol Subtype: 0
Fwd Traffic Channel MAC Protocol Subtype: 0
Rev Traffic Channel MAC Protocol Subtype: 0
Key Exchange Protocol Subtype: 0
Authentication Protocol Subtype: 0
Encryption Protocol Subtype: 0
Security Protocol Subtype: 0
Idle State Protocol Subtype: 0
Generic MM Cap Disc Protocol Subtype: 0
Generic Virtual Stream Protocol Subtype: 0
OK</pre></td></tr>
<tr><td>!RSSI?</td><td>Received Signal Strength Indication
Reports the current RSSI (P(AGC)+Ec/Io) in dBm using a (N-1)/N IIR filter for smoother display. When no signal is present it reports -125. Reported values can be interpreted as follows:

< -90 = very poor
-90 to -86 = poor
-85 to -81 = fair
-80 to -76 = good
> -76 = excellent

This command is supported in the online command state and in the command state.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!SCPCUSTCONFIG?</td><td>Sets or reads the current Session Configuration Protocol Customer configuration.

Example:
AT!SCPCUSTCONFIG?
1 - Custom Config is Active
Protocol Subtypes:
1 - Subtype 2 Physical Layer
0 - Enhanced CCMAC
1 - Enhanced ACMAC
1 - Enhanced FTCMAC
0 - Enhanced 3 RTCMAC
0 - Enhanced 1 RTCMAC
0 - Enhanced Idle
Broadcast Subtypes:
0 - Generic Broadcast Enabled
Applications Subtypes:
1 - SN Multiflow Packet App
OK

To set this item, enter 13 hex bytes.
Example:
AT!SCPCUSTCONFIG=01,0D,00,00,00,00,00,00,00,01,00,00,00
OK</td></tr>
<tr><td>!SESSIONSTATUS=
<lower_byte>,
<upper_byte></td><td>Set or read the current Session status.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Inactive – there is no session</td></tr><tr><td>1</td><td>Default – there is a session, but no negotiation has been completed</td></tr><tr><td>2</td><td>Active – there is a session, and all parameters have had at least one chance to be negotiated</td></tr></table>
In testing and debugging procedures, it is useful to force the session status to Inactive, so that Session negotiation and configuration occur upon the next power up.
For the change to occur, the modem must be reset.
When the HDR session is negotiated, the session status is stored in NV RAM. Upon next power up, if the session status is Active, the session parameters are not renegotiated, unless a new network is acquired.

Example:
AT!SESSIONSTATUS
HDR Session Status: 2
OK
AT!SESSIONSTATUS =00,00
OK
AT!SESSIONSTATUS?
HDR Session Status: 0
OK</td></tr>
<tr><td>!SIPID=<user id></td><td>User ID information for Simple IP setup
See also !SIPPWD.</td></tr>
<tr><td>!SIPPWD=<passwrd></td><td>Password information for Simple IP setup
See also !SIPID.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!SLEEPPARMS</td><td>Returns 1xEV-DO Rev. A sleep parameters (slot cycle indexes and sleep periods). Slot cycle timeouts are listed in Julian time format (year month day day-of-week hour:minutes:seconds).

Example 1:
AT!SLEEPPARMS
Slot Cycle1:3
Slot Cycle2:0
Slot Cycle3:0
Slot Cycle1 Timeout:1980 01 06 6 00:00:00
Slot Cycle2 Timeout:1980 01 06 6 00:00:00
OK

Example 2:
AT!SLEEPPARMS
HDR Rev.A not currently available
OK</td></tr>
<tr><td>!SSMS=<p>, <dest>,[cb], ”<text>”

!SSMS?</td><td>Send SMS
Sends an SMS message using these parameters:

<table>
<tr><th>Parameter</th><th>Meaning</th><th>Range</th></tr>
<tr><td>p</td><td>Priority</td><td>0 = normal
1 = interactive
2 = urgent
3 = emergency
(Actual priority transmitted depends on the carrier.)</td></tr>
<tr><td>dest</td><td>destination #</td><td>Phone number of destination, maximum of 32 characters; only 0–9, #, and * permitted.</td></tr>
<tr><td>cb</td><td>callback #
(this is optional)</td><td>Phone number for reply, same 32 character limit</td></tr>
<tr><td>text</td><td>message body</td><td>Up to 227 bytes of data (not including the compulsory quote marks).</td></tr>
</table>

The text is enclosed in quotations. The quote character cannot appear in the body text. Body text over the carrier-defined limit is truncated and sent anyway. Messages of length 228 or greater result in an ERROR.
The query form reports the progress of the last message sent. Possible responses are:
• none: No SMS messages being sent.
• pending: Message has not left the modem (an attempt to use !SSMS= again yields an ERROR result code.)
• sent: Successfully sent to the network.
• failed: Sending failed and should be retried.

If you send a second message after receiving the "sent" response for the first message, subsequent queries will report the status of the second message.</td></tr>
</table>

Command	Description
!STATUS	Status of the modem Reports the modem's status as follows: Current band: <band> Current channel: <chan> SID: <sid> NID: <nid> 1xRoam: <n> HDRRoam: <n> Temp: <temp> State: <state> Sys Mode: <mode> Pilot [NOT] acquired Modem has [NOT] registered HDR revision: <HRD_rev> <band> is either OFFLINE, PCS CDMA, Cellular CDMA, PCS Sleep, Cellular Sleep, HDR PCS, HDR Cellular or GPS. <n> for the roaming indicator. Values larger than 2 indicate ERI usage; to obtain the ERI banner, icon state, and icon image, parse the carrier's ERI file. <temp> is the radio temperature in degrees C. <mode> is either NO SRV, CDMA, HDR or GPS NOT appears if the pilot has not been found or the modem has not registered. <HRD_rev> is displayed only if the modem has 1xEV-DO service. The value is either 0 or A. See also **+CSS?** (Serving System).

!SUFWDCCSTATS	Reports the current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Control Channel; (columns are tab separated).
	!SUFWDRESET resets the data reported by this command.
	
	Example:
	`AT!SUFWDCCSTATS`
	`FORWARD CONTROL CHANNEL - Early Termination Slot Count`
	`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16`
	`DRC0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0`
	`DRC1 0 0 0 0 0 0 0 0`
	`OK`

Command	Description
!SUFWDCRCS	Reports the current Single User Forward Channel Statistics (Single User packet CRCs and Packet Error Rate). **!SUFWDRESET** resets the data reported by this command. Example: AT!SUFWDCRCS FORWARD TRAFFIC CHANNEL Good CRCs Bad CRCs DRC0 0 0 DRC1 0 0 DRC2 0 0 DRC3 0 0 DRC4 0 0 DRC5 0 0 DRC6 0 0 DRC7 0 0 DRC8 0 0 DRC9 0 0 DRC10 0 0 DRC11 0 0 DRC12 0 0 DRC13 0 0 DRC14 0 0 FORWARD CONTROL CHANNEL Good CRCs Bad CRCs DRC0 0 0 DRC1 0 0 Packet Error Rate (%): 0.000 OK
!SUFWDRESET	Resets the data reported by **!SUFWDCCSTATS**, **!SUFWDCRCS**, and **!SUFWDTCSTATS**.

Command	Description
!SUFWDTCSTATS	Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Traffic Channel). **!SUFWDRESET** resets the data reported by this command. Example: AT!SUFWDTCSTATS FORWARD TRAFFIC CHANNEL - Early Termination Slot Count 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 DRC0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 DRC1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 DRC2 0 0 0 0 0 0 0 0 DRC3 0 0 0 0 DRC4 0 0 DRC5 0 0 0 0 DRC6 0 DRC7 0 0 DRC8 0 0 DRC9 0 DRC10 0 0 DRC11 0 DRC12 0 DRC13 0 0 DRC14 0 OK
!SYSTIME?	CDMA time If the modem has not acquired a system, then the system time may not be available; some time in 1980 is displayed. The format is: YYYYMMDDWHHMMSS (W is day of week, 0=Monday) For example: 200309183180142 = Thursday, Sep 18, 2003, 18:01:42

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!SWICALLPROG=
<cpnStatus></td><td>Output unsolicited call progress indications.

Example:
<pre>AT!SWICALLPROG=2
OK
RING
!SWICALLPROG: 1,4,0,"08071017000"
ATA
OK
!SWICALLPROG: 1,0,0,"08071017000"
!SWICALLPROG: 1,6,0,"08071017000"</pre>
<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>cpnStatus</td><td>0</td><td>Disabled</td></tr>
<tr><td></td><td>1</td><td>Output on AT channel if AT is not blocked</td></tr>
<tr><td></td><td>2</td><td>Output on AT channel even if AT is blocked</td></tr>
<tr><td></td><td colspan="2">Any other value will return an ERROR response</td></tr>
<tr><td>dir</td><td>0</td><td>Mobile-originated (MO)</td></tr>
<tr><td></td><td>1</td><td>Mobile- terminated (MT)</td></tr>
<tr><td>state</td><td>0</td><td>Active</td></tr>
<tr><td></td><td>2</td><td>Dialing (MO calls)</td></tr>
<tr><td></td><td>4</td><td>Incoming (MT calls)</td></tr>
<tr><td></td><td>5</td><td>Waiting (MT calls)</td></tr>
<tr><td></td><td>6</td><td>Disconnected (This event is not for waiting calls and applicable for all other calls)</td></tr>
<tr><td>mode</td><td>0</td><td>Voice</td></tr>
<tr><td>number</td><td colspan="2">Telephone number of other end of connection</td></tr>
</table></td></tr>
</table>

2.2.2. $ Prefix

Table 12. $ Prefix Command

Command	Description
$QCCAV	Answer Voice (SL3010T only) Answers an incoming call as a voice call. Use **~SPKMUT** (Speaker Mute) to manually unmute the audio path before answering the call. Contrast with **A** (Answer). See also **+CDV** (Dial Voice), and **+CHV** (Hang-up Voice).

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>$QCMIP</td><td>Mobile IP (MIP) behavior

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Mobile IP disabled. Simple IP only.</td></tr><tr><td>1</td><td>Mobile IP preferred.
In the initial MIP registration, if the network does not support Mobile IP, then the mobile automatically reverts to Simple IP.
However, if a Mobile IP session is registered and then the mobile enters a network that does not support Mobile IP, the mobile will drop the session and inform the upper layers of the failure.</td></tr><tr><td>2</td><td>Mobile IP only.
The mobile will make data calls only when Mobile IP is supported in the network. During a MIP session, if the mobile hands off to a network that does not support MIP, then the mobile will drop the session and inform the upper layers of the failure.</td></tr></table>
If a connected data device wants to use its own Mobile IP implementation, the mobile’s IP implementation should be disabled by setting AT$QCMIP to 0.</td></tr>
<tr><td>$QCMIPEP</td><td>Enables/disables the currently active Mobile IP user profile.
To enable the currently active profile, use AT$QCMIPEP = 1.
To disable the currently active profile, use AT$QCMIPEP = 0.
See also $QCMIPP.</td></tr>
<tr><td>$QCMIPGETP</td><td>Query a user profile.
AT$QCDMIPGETP = 1-5 (profile number)
The command returns the following parameters for the selected profile:
NAI
Home Addr
Primary HA
Secondary HA
MN-AAA SPI
MN-HA SPI
Rev Tun (Reverse Tunneling)
MN-AAA SS
MN-HA SS
If a profile number is not entered, then the AT command returns all the information corresponding to the currently active profile.</td></tr>
<tr><td>$QCMIPNAI</td><td>Set the Network Access ID (NAI) for the currently active profile.
AT$QCMIPNAI= "user@domain", 0 or 1

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Do not store in NOVRAM</td></tr><tr><td>1</td><td>Store in NOVRAM</td></tr></table>
The double quotes (“ ”) are required only if the string contains a comma.</td></tr>
<tr><td>$QCMIPP</td><td>Select one of the Mobile IP user profiles to be the current active profile.
AT$QCMIPP can be used to configure specific dial-up for various user profiles.
AT$QCMIPP = 1-5 (profile number)
To enable/disable a currently active profile, see $QCMIPEP.</td></tr>
</table>

Command	Description
$QCVAD=<n>** **$QCVAD?	Answer Data or Fax Sets or reads the mode for answering data/fax calls with **A** (Answer) or autoanswer via **S0**=1. **Value** / **Setting** 0 – Off (answer as voice) (Default) 1 – Fax for next call, then revert to Off (voice)* 2 – Fax for all calls 3 – Async data for next call, then revert to Off (voice)* 4 – Async data for all calls * Reverting to voice happens at the first of these events: • An incoming call arrives (answered or not) • Ten minutes elapse without receiving a call • The modem is reset (or power-cycled) • The setting is changed by command The CDMA network requires the call type to be negotiated before the call is answered. This command sets the call negotiation the modem makes prior to answering.

2.2.3. & Prefix

Table 13. & Prefix Commands

Command	Description
&C[n]	Data Carrier Detect Control This determines the behavior of the Data Carrier Detect (DCD) signal to the host (DTE) in response to the presence of a connection. **Value** / **Setting** 0 – DCD is always ON 1 – DCD reflects state of connection 2 – Unix-compatible DCD control. DCD is always ON except for a short time (~1 s) when the carrier is lost. (Default)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>&D[n]</td><td>Data Terminal Ready Options
Determines what actions the modem takes in response to the Data Terminal Ready (DTR) signal from the host (DTE). For action to be taken, DTR must be off for a period of 2–10 milliseconds.
Note: This command has no impact on the use of DTR to terminate a voice call on the SL3010T, nor does it affect the use of DTR to control module shutdown.
<table><tr><th>Value</th><th>Setting</th></tr><tr><td>0</td><td>Ignore DTR</td></tr><tr><td>1</td><td>Enter command state for an on-to-off DTR transition. The modem condition (on or offline) is not affected. (Currently not supported.)</td></tr><tr><td>2</td><td>Hang up and enter command state for an on-to-off DTR transition. Auto-answer is disabled if DTR is off. (Default)</td></tr></table></td></tr>
<tr><td>&F</td><td>Factory Settings Restore
Reloads the factory-stored default configurations into active memory. For information on factory settings, see Table 27 Profile Settings.
This command is functionally the same as Z (Reset). If there is an active call, the command executes and the call is dropped.</td></tr>
<tr><td>&V[n]</td><td>View Configuration
Displays the active profile (commands and S-register contents). Any numeric parameter is ignored.</td></tr>
</table>

2.2.4. +++ Escape

Table 14. +++ Escape Control

Command	Description
+++	Escape Sequence (not preceded by AT) Applies only to asynchronous calls. Used to exit data state and enter command state; this is not preceded by AT and does not require <CR>. The escape character is fixed as the plus sign “+” (0x2B). The guard time between normal transmission data and the escape sequence is specified as 1 second and cannot be changed. Therefore, the module requires a minimum of 1 second of inactivity on the serial input, three plus sign characters, followed by 1 second of inactivity. If a PPP session is active, then use PPP to escape data state. For details on using **AT&C** and **AT&D** settings to escape 1X data calls, see the Software Integration Guide for your product.

2.2.5. +A Prefix

Table 15. +A Prefix Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+ATINIT=<cmd>
[,C|T[,s[,c]]]

+ATINIT?</td><td>
AT Initialization
This command is used to store an AT command string into the module, or query the module for the current initialization string. If the initialization string is not empty, the AT commands in this string are executed when the module is powered on or reset. If the initialization string is empty, no AT commands are executed upon module startup.
The AT+ATINITSTATE command is used to enable or disable the execution of the command stored by +ATINIT upon module startup. This allows you to temporarily disable the execution of the initialization string without losing the setting of the stored string.
Based on the optional mode parameter (C or T), the command string (cmd) is either stored or executed as a test.

<table>
<tr><th>Parameter</th><th>Meaning</th></tr>
<tr><td>cmd</td><td>The character string that is executed upon module power-up or reset. This parameter has a maximum length of 40 characters.
To avoid parsing errors, semi-colons and commas in the initialization string must be replaced as noted by the s and c parameters below.</td></tr>
<tr><td>C|T</td><td>Mode: determines whether the command string parameter is to be stored (C) or executed immediately as a test (T). If this parameter is omitted, T is assumed. Test commands are not stored.</td></tr>
<tr><td>s</td><td>Semi-colon replacement character. The command string may require the use of semi-colon delimiters that would be trapped by the AT command handler when intended to be stored as part of the initialization string. To prevent parsing errors, semi- colons in the initialization command must be replaced. This parameter specifies the replacement character. This parameter can be omitted if there are no semi-colon characters in the command string. See the samples below.</td></tr>
<tr><td>c</td><td>Comma replacement character. Similar to the semi-colon, any commas in the initialization string must be replaced to prevent parsing errors. This parameter can be omitted if there are no comma characters in the initialization command string.</td></tr>
</table>

f the string is accepted without errors, it is echoed to the serial terminal with the semicolon and comma characters replaced. If only the string is given, then it is assumed that the T command is desired.

Example 1:
<code>AT+ATINIT=+GMR,c</code>
Stores the single command “+GMR” to report the revision of the firmware.

Example 2:
<code>AT+ATINIT=+GMR\+CMUX=2/2,c,\,/</code>
Stores the command string “+GMR;+CMUX=2,2”. Note the substitution characters for semi-colon (\) and comma (/).
To delete the stored string, set +ATINIT= ,c
</td></tr>
</table>

Command	Description
+ATINITSTATE= <n> **+ATINITSTATE?**	AT Initialization State This command is used to enable or disable the automatic execution of the startup initialization string set using **AT+ATINIT**. This allows you to temporarily disable the execution of the initialization string without losing the setting of the stored string. **Value** — **Meaning** 0 — Disables the execution of the initialization string on startup. (Default) 1 — Enables the automatic execution of the initialization string on module startup.

2.2.6. +C Prefix

Table 16. +C Prefix Commands

Command	Description
+CAD?	Analog or Digital Service (Read-only) (local only) Reports the current service mode of the module in the form +CAD: n. **Value** — **Meaning** 0 — No service available 1 — CDMA Digital service is available 2 — TDMA Digital service is available 3 — Analog service is available
+CBC?	Battery Charge (Read-only) (local only) Reports the power source and battery level in the form +CBC: status,level. The other products do not have an internal battery, so they always return a value of +CBC: 1,0, meaning it is connected to external power.

+CBIP?	Base Station IP Address (Read-only)
	Reports the IP address (in dotted-decimal format) of the Base Station if there is a currently active call. If there is no active call, the following response is returned:
	`0.0.0.0`
	`OK`
	See also **+CMIP** (Mobile IP Address).

+CDV [options]	Dial Voice (SL3010T only) Initiates a voice call. Because of the options available in this command, another AT command cannot follow it on the same line. All characters following the **+CDV** command are taken as parameter options. For a list of dialing option parameters and restrictions, see the **D** (Dial) command. The options available are the same as those described for async data/fax dialing. Voice dialing leaves the module in command state. This allows use of commands to control microphone and speaker options, and to generate DTMF tones if needed. See also **+CHV** (Hang-up Voice).
+CFC=<n>	Airlink Fax Compression (Remote) Sets the form of compression between the module and the Base Station for fax mode. **Value** — **Meaning** 0 — Disables airlink compression in fax mode. (Default) 1 — Enables airlink fax compression if available at the IWF. (**Currently not supported.**)

Command	Description
+CFG="<str>" **+CFG?**	Configuration String This command sets a configuration string of up to 248 characters. The string parameter must be enclosed within quotation marks (0x22). You cannot append any other commands after it in the same command line. This string is transmitted to the Base Station as the last step of establishing the transport layer of the airlink. The default setting is null. Any setting replaces the previous value.
+CGCAP	Get IWF Capabilities Requests the IWF to send one or more lines of text containing **AT+** commands which indicate the additional capabilities of the IWF. This is used to determine if services the user needs (such as +CIS707, **+MS**, +ES, +DS, and **+FCLASS**) can be performed by the IWF. For details on parameters and use, see IS-131. If the module is not registered for service, the **ERROR** result code is returned. See also **+GCAP** (Get Capabilities).
+CGMI	Get IWF Manufacturer Requests the IWF to send one or more lines of text identifying the manufacturer of the IWF equipment software. The response is determined by that manufacturer and may contain address or contact information. If the module is not registered for service, the **ERROR** result code is returned. See also **+GMI** (Get Manufacturer).
+CGMM	Get IWF Model Requests the IWF to send one or more lines of text determined by the manufacturer of the IWF to identify the model of the equipment. If the module is not registered for service, the **ERROR** result code is returned. See also **+GMM** (Get Model).
+CGMR	Get IWF Revision Requests the IWF to send one or more lines of text identifying the IWF equipment software version, revision level, and/or date. The response is determined by that manufacturer and may contain additional information. If the module is not registered for service, the **ERROR** result code is returned. See also **+GMR** (Get Revision).
+CGOI	Get IWF ISO ID Requests the IWF to send one or more lines of text determined by the manufacturer of the IWF to identify the device based on the ISO system of registering unique object identifiers. Typically this is a numeric string delimited with periods. If the module is not registered for service, the **ERROR** result code is returned. See also **+GOI** (Get ISO ID).
+CGSN	Get IWF ESN Requests the IWF to send one or more lines of text determined by the manufacturer of the IWF to identify the individual device by serial number. The string is typically one line of alphanumeric data but may contain any additional information the manufacturer chooses. If the module is not registered for service, the **ERROR** result code is returned. See also **+GSN** (Get ESN).
+CHV [0]	Hang-up Voice (SL3010T only) Terminates a voice connection previously established with **+CDV** (Dial Voice), or **$QCCAV** (Answer Voice). The only valid parameter is zero, which is optional. See also **H** (Hook Control).

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+CMIP?</td><td>Mobile Station IP Address (Read-only)
Returns the IP address assigned to the module for this connection. This address is temporary only. The network assigns an IP address on an as-needed basis.
If there is no current network connection, hence no local IP address, the module issues no response, only the OK result code.
See also +CBIP (Base Station IP Address).</td></tr>
<tr><td>+CMUX=<f[,r]>
+CMUX?</td><td>Multiplex Option
Selects the maximum number of multiplex options for the forward and reverse links valid within the context of the data service selected by the +CRM (Local Interface Protocol) command. The first parameter is for the forward link (from the Base Station to the module) and the second is for the reverse link (from the module to the Base Station).

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>f</td><td>1 – F</td><td>Hexadecimal value for Multiplex Option for the forward link.</td></tr><tr><td>r</td><td>1 – 2</td><td>Multiplex Option for the reverse link.</td></tr></table>
If parameter r is omitted, it is assumed to have the same value as f, provided f is 1 or 2; otherwise, the ERROR result is returned. Values for the two parameters must be either both odd or both even. If odd values are used, the module originates data calls using Rate Set 1. If both are even, originated calls use Rate Set 2.</td></tr>
<tr><td>+CQD=<n>
+CQD?</td><td>Command State Inactivity Timer
This timer determines when (or if) the module will release a call if there is no activity on the connection between the module and the IWF, for the specified period. The entry represents a multiple of five seconds. That is, each unit represents 5 seconds.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disables the timer</td></tr><tr><td>1 – 255</td><td>Indicates timer value in steps of five seconds</td></tr></table>
The default value is 10, meaning a timer setting of 50 seconds.
See also +CTA (Packet mode Inactivity Timer).</td></tr>
<tr><td>+CRC=<n>
+CRC?</td><td>Cellular Result Codes
Enables or disables cellular result codes for call progress.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disables the cellular result codes (Default)</td></tr><tr><td>1</td><td>Enables the cellular result codes</td></tr></table></td></tr>
<tr><td>+CRM=<n>
+CRM?</td><td>Local (R_m) Interface Protocol
Reports (or sets) the protocol for the local (DCE - DTE) interface. This value is set automatically by the module, based on the data received.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Asynchronous Data or Fax (Default)</td></tr><tr><td>1</td><td>Packet data service, Relay Layer interface</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+CSQ?</td><td>
Signal Quality (Read-only)
Reports the received Signal Quality Measure (SQM) and Frame Error Rate (FER). The response is in the form +CSQ: <SQM>, <FER>. If no cellular service is available, the values reported are both 99. If the module has acquired service but is not in an active call, the SQM value is valid but the FER is still undetectable.

<table>
<tr><th>SQM</th><th>Meaning</th></tr>
<tr><td>0 – 31</td><td>00 is lowest quality signal, 31 is the highest. This is based on received signal strength.</td></tr>
<tr><td>99</td><td>Value not known or is not detectable.</td></tr>
</table>

<table>
<tr><th>FER</th><th>Meaning</th></tr>
<tr><td>0</td><td><0.01%</td></tr>
<tr><td>1</td><td>0.01% >= FER < 0.1%</td></tr>
<tr><td>2</td><td>0.1% >= FER < 0.5%</td></tr>
<tr><td>3</td><td>0.5% >= FER < 1.0%</td></tr>
<tr><td>4</td><td>1.0% >= FER < 2.0%</td></tr>
<tr><td>5</td><td>2.0% >= FER < 4.0%</td></tr>
<tr><td>6</td><td>4.0% >= FER < 8.0%</td></tr>
<tr><td>7</td><td>FER >= 8.0%</td></tr>
<tr><td>99</td><td>Value is not known or is not detectable.</td></tr>
</table>

See also !RSSI for received signal strength in dBm.
</td></tr>
<tr><td>+CSS?</td><td>
Serving System (Read-only)
Reports the cellular band and system on which the module is registered. The response is in the form +CSS: <class>, <band>, <system>.

<table>
<tr><th>class</th><th>Meaning</th></tr>
<tr><td>0</td><td>Current band class is unsupported by this command.</td></tr>
<tr><td>1</td><td>800 MHz Cellular</td></tr>
<tr><td>2</td><td>1900 MHz PCS</td></tr>
</table>

<table>
<tr><th>band</th><th>Meaning</th></tr>
<tr><td>A – F</td><td>Registered on a band system indicated.</td></tr>
<tr><td>Z</td><td>Not registered</td></tr>
</table>

<table>
<tr><th>system</th><th>Meaning</th></tr>
<tr><td>0 – 32767</td><td>System ID of the network that the module is currently registered with.</td></tr>
<tr><td>99999</td><td>Module is not registered.</td></tr>
</table>

See also !STATUS (Status).
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+CTA=<n>

+CTA?</td><td>Packet Data Inactivity Timer
This timer determines when (or if) the module will use dormant mode on the network. If a timer value is set, the module releases the radio resource if there is no activity (RLP data frames) on the connection between the module and the network for the specified period.
The module maintains the PPP session with the local host, and the network retains the PPP session at its end, only the intervening “physical link” layer is dropped. The module restores the link when traffic resumes.
Each unit represents 1 second.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disables the timer (Default)</td></tr><tr><td>1 – 255</td><td>Indicates timer value in seconds.</td></tr></table>
Note: When set to 0, the network governs the dormant mode timing.
See also +CQD (Command State Inactivity Timer).</td></tr>
<tr><td>+CXT=<n>

+CXT?</td><td>Cellular Extension
Enables and disables the passing of unrecognized AT commands to the IWF. If disabled, the module replies with ERROR to unrecognized commands. If enabled, the module opens the transport layer airlink and enters passthrough state.
Use H0 (on-hook) to close the airlink.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Do not pass unrecognized commands. (Default)</td></tr><tr><td>1 – 255</td><td>Open a transport layer connection and pass the unrecognized command to the IWF.</td></tr></table></td></tr>
</table>

2.2.7. +F Prefix

Table 17. +F Prefix Commands

Command	Description
+FAA	Fax Adaptive Answer (Remote) This command is passed to the IWF. In order to be useful, the module would have to maintain the airlink to the IWF while waiting for an incoming fax call. In practice, this is not feasible. Use of this command is not recommended. For details on parameters and use, see EIA/TIA-592
+FAP	Fax Addressing and Polling Capabilities (Remote) The default value is **+FAP=0,0,0**. For details on parameters and use, see EIA/TIA/IS-134.
+FBO	Fax Data Bit Order (Remote) Sets the Phase-C data bit order. The default value is **+FBO=0**, direct bit order. For details on parameters and use, see EIA/TIA-592.
+FBS?	Fax Buffer Size (Read-only) By default the module reports 0x624 (1572) octets for the transmit buffer and 0x1C2 (450) octets for the receive buffer. This value is less meaningful than that reported by the IWF when connected. For details on parameters and interpretation, see EIA/TIA-592.

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+FBU</td><td>Fax HDLC Frame Reporting (Remote)
The default value is +FBU=0, HDLC frame reporting is disabled.
For details on parameters and use, see EIA/TIA-592.</td></tr>
<tr><td>+FCC</td><td>Fax DCE Capabilities (Remote)
Sets or reports the following sub-parameters in sequence:

<table>
<tr><th>Parameter</th><th>Meaning</th><th>Range</th><th>Default</th></tr>
<tr><td>VR</td><td>Vertical Resolution</td><td>0 – 1</td><td>0</td></tr>
<tr><td>BR</td><td>Bit Rate</td><td>0 – 5</td><td>1 = 4800 bps</td></tr>
<tr><td>WD</td><td>Page Width</td><td>0 – 4</td><td>0</td></tr>
<tr><td>LN</td><td>Page Length</td><td>0 – 2</td><td>0</td></tr>
<tr><td>DF</td><td>Data Compression Format</td><td>0 – 3</td><td>0</td></tr>
<tr><td>EC</td><td>Error Correction</td><td>0 – 1</td><td>0</td></tr>
<tr><td>BF</td><td>Binary File Transfer</td><td>0 – 1</td><td>0</td></tr>
<tr><td>ST</td><td>Scan Time/Line</td><td>0 – 7</td><td>0</td></tr>
</table>
For details on parameters and use, see EIA/TIA-592. All parameters of this command (including optional ones) are supported.</td></tr>
<tr><td>+FCLASS=[n]</td><td>Module Operating State
Sets the module's data state.

<table>
<tr><th>Value</th><th>Setting</th></tr>
<tr><td>0</td><td>Data (Default)</td></tr>
<tr><td>2.0</td><td>Fax Class 2.0 (EIA/TIA-592)</td></tr>
</table>
Neither fax Class 1 nor the early version of Class 2 is supported in the module. The parameter entry for fax Class 2.0 must include all three characters “2.0”. To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities).</td></tr>
<tr><td>+FCQ</td><td>Fax Copy Quality (Remote)
The default value is +FCQ=1,0, meaning receive quality checking is enabled and the Post-Page Message is stored in the +FPS parameter. Transmit quality checking is disabled; the host device sending the fax is responsible for T.4 or T.6 compliance.
For details on parameters and use, see EIA/TIA-592.</td></tr>
<tr><td>+FCR</td><td>Fax Capability to Receive (Remote)
The default is +FCR=0 indicating the module cannot receive message data or poll the remote device.
For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.</td></tr>
<tr><td>+FCT</td><td>Fax DCE Phase-C Timeout (Remote)
The default value is 0x1E, equivalent to 30 seconds.
For details on parameters and use, see EIA/TIA-592.</td></tr>
<tr><td>+FDR</td><td>Fax Data Reception (Remote)
Receive Phase-C Data
For details on use, see EIA/TIA-592.</td></tr>
<tr><td>+FDT</td><td>Fax Data Transmission (Remote)
Transmit Phase-C Data
For details on use, see EIA/TIA-592.</td></tr>
</table>

Command	Description
+FEA	Fax EOL Alignment (Remote) Phase-C received end-of-line alignment. The default is **+FEA=0**, meaning T.4 EOL patterns at bit aligned as received. For details on parameters and use, see EIA/TIA-592.
+FFC	Fax Format Conversion (Remote) The default settings are **+FFC=0,0,0,0**. This ignores all format codes. For details on parameters and use, see EIA/TIA-592.
+FHS?	Fax Call Termination Status (Remote) (Read-only) For details on parameters and interpretation, see EIA/TIA-592
+FIE	Fax Procedure Interrupt Enable (Remote) The default is **+FIE=0**, meaning procedure interrupt requests from the remote station are ignored. For details on parameters and use, see EIA/TIA-592.
+FIP[=0]	Fax Initialize Parameters (Remote) For details on use, see EIA/TIA-592. Only the parameter 0 (zero) is supported.
+FIS	Fax Current Session Negotiation (Remote) The default settings are **+FIS=0,1,0,0,0,0,0,0**. For details, see **+FCC**. For details on parameters and use, see EIA/TIA-592. This is set to **+FCC** settings when **+FCC** is changed and at the end of a fax call.
+FKS	Fax Kill Session (Remote) Terminates the current session. For details on use, see EIA/TIA-592. If the module is in command state, offline condition, the **OK** result code is returned without processing.
+FLI	Fax Local ID String (Remote) The default is the null string. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.
+FLO	Fax Flow Control Select The default value is **+FLO=1**. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.
+FLP	Fax Indicate Document to Poll (Remote) The default value is **+FLP=0**. If **+FLP=1** the IWF sets this back to 0 at the CDMA module after the successful fax transmission of the polled document. No result code is returned.
+FMI?	Fax Manufacturer (Remote) Reports IWF Fax Module Manufacturer.
+FMM	Fax Model (Remote) Reports IWF Fax Module Model.
+FMR	Fax Revision (Remote) Reports IWF Fax Module software revision.
+FMS	Fax Minimum Speed (Remote) Sets the minimum Phase-C speed. The default value is **+FMS=0**, meaning 2400 bps. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.
+FNR	Fax Negotiation Reporting (Remote) The default is **+FNR=0,0,0,0** indicating all negotiation message reporting is disabled. For details on parameters and use, see EIA/TIA-592.

Command	Description
+FNS	Fax Non-standard Frame FIF (Remote) The default value is the null string. For details on parameters and use, see EIA/TIA-592.
+FPA	Fax Selective Polling Address (Remote) The default value is the null string. For details on parameters and use, see EIA/TIA/IS-134.
+FPI	Fax Local Polling ID String (Remote) The default value is the null string. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.
+FPR=8	Fax Serial Port Rate Control For details on parameters, see EIA/TIA-592. The module only accepts a parameter of 8, which is equivalent to a setting of 19200 bps.
+FPS	Fax Page Status (Remote) For details on parameters and use, see EIA/TIA-592. Parameter values 4 and 5 (involving interrupt requests) may not be supported. The IWF sets this at the CDMA module whenever it changes at the IWF.
+FPW	Fax Password (Remote) The default value is the null string. For details on parameters and use, see EIA/TIA/IS-134.
+FRQ	Fax Receive Quality Threshold (Remote) The default settings are **+FRQ=0,0**, meaning receive quality checking is disabled. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported.
+FRY	Fax ECM Retry Value (Remote) The default setting is **+FRY=0**, meaning no additional retries are attempted after the first attempt block. For details on parameters and use, see EIA/TIA-592.
+FSA	Fax Sub-address (Remote) The default value is the null string. For details on parameters and use, see EIA/TIA/IS-134.
+FSP	Fax Request to Poll (Remote) The default value is **+FSP=0**, meaning the host does not want to poll. For details on parameters and use, see EIA/TIA-592. All parameters (including optional ones) are supported. If **+FSP=1** the IWF sets this to 0 at the CDMA module after the successful reception of a fax. No result code is sent.

2.2.8. +G Prefix

Table 18. +G Prefix Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+GCAP</td><td>Get Capabilities
Reports the module's additional capabilities in one or more lines of text containing AT+ commands that the module supports. This is used to determine if services the user needs can be performed by the module. The services and commands reported can be any or all of:

<table>
<tr><th>Response</th><th>Description</th></tr>
<tr><td>+FCLASS</td><td>Fax support (all fax related commands)</td></tr>
<tr><td>+MS</td><td>Modulation control (+MS, +MR)</td></tr>
<tr><td>+MV18S</td><td>V.18 modulation control (+MV18S, +MV18R)</td></tr>
<tr><td>+ES</td><td>Error control (+ES, +EB, +ER, +EFCS, +ETBM)</td></tr>
<tr><td>+CIS707-A</td><td>IS-707-A (High Speed Packet Data Services)</td></tr>
<tr><td>CIS-856</td><td>IS-856 (High Rate Packet Data Air Interface)</td></tr>
<tr><td>+DS</td><td>Data compression (+DS, +DR)</td></tr>
</table>

See also +CGCAP (Get IWF Capabilities).</td></tr>
<tr><td>+GMR</td><td>Get Revision
Reports the module firmware version: revision level (see the following paragraphs) and date, followed by the version for the Preferred Roaming List (PRL) in use. It also reports the hardware revision.
Example of interpreting the firmware revision level: p3111200:
P: Production release

The next two digits indicate the product ID:
<table>
<tr><th>Value</th><th>Product</th></tr>
<tr><td>31</td><td>SL5011</td></tr>
<tr><td>49</td><td>SL3010T</td></tr>
</table>

The next three digits indicate the firmware build version: for example, 112 correspond to firmware build version 1.12.
The next digits (two; in some cases, four) indicate the point release within the above build version.
In our example, 11200 means point release .00 in firmware build 1.12.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td></td><td>The command also returns version information on some or all of the following:
<table>
<tr><th></th><th>Description</th></tr>
<tr><td>QCOM</td><td>Boot images</td></tr>
<tr><td>BOOTS</td><td>SWI Boot Loader: Product/product family description (for example, SL501X or SL3010T), followed by:
“FP” (Full Production), “FD” (Full Development), or “PP” (Point Production)
Major revision number (2 digits)
Minor revision number (2 digits)
Point release number (optional)</td></tr>
<tr><td>APPL</td><td>Application code</td></tr>
<tr><td>USBD</td><td>USB descriptor table</td></tr>
<tr><td>USB VID</td><td>USB Vendor ID</td></tr>
</table>
Example, with interpretation of each line of the module’s response:
<pre>AT+GMR
p3111200,0 [Dec 18 2012 23:47:55]</pre>
Production release (p) for SL5011(31), firmware build version 1.12, point release 00.
<pre>QCOM: SWI6085_FP.01.38</pre>
Boot image: SWI6085 family, Full Production(FP), Major revision 01, minor revision 38.
<pre>BOOT: SL501X_FP.01.12 2012/12/19 01:32:04</pre>
SWI Boot Loader: SL501X family, Full Production (FP), Major revision 01, minor revision 12. Build date Dec 19, 2012.
<pre>APPL: SL501X_FP.01.12 2012/12/19 01:32:04</pre>
Application code: SL501X family, Full Production (FP), Major revision 01, minor revision 12. Build date Dec 19, 2012.
<pre>USBD: SWI6085_GENERIC.00.01</pre>
USB descriptor table: SWI6085 family, generic build, Major revision 00, minor revision 01.
<pre>USB VID: 0x1199 PID: 0x0300</pre>
USB Vendor ID 0x1199; product: SL5011 (31).
See also +CGMR (Get IWF Revision) and I.</td></tr>
<tr><td>+GMI</td><td>Get Manufacturer
Reports the module’s manufacturer.
See also +CGMI (Get IWF Manufacturer).</td></tr>
<tr><td>+GMM</td><td>Get Model Number
Reports the module model.
See also +CGMM (Get IWF Model).</td></tr>
<tr><td>+GOI</td><td>Get ISO ID
Reports the module’s ISO system registration code provides a method of uniquely defining an object. The module has no ID string (null).
See also +CGOI (Get IWF ISO ID).</td></tr>
</table>

Command	Description
+GSN	Get ESN Reports the module's electronic serial number. The module reports an eight character ASCII string of hex digits (no spaces). See also **+CGSN** (Get IWF ESN).

2.2.9. +I Prefix

Table 19. +I Prefix Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+ICF=<[f],[p]>

+ICF?</td><td>Character Framing
Settings with this command are ignored. Normally this sets the local serial port (DTE - DCE) connection character framing.
The module uses a true serial interface, but the module's support is limited to 8-bit data, 1 stop bit, no parity (the parity setting is ignored).

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>f (format)</td><td>3</td><td>8 data bits, 1 stop bit (no other values are permitted)</td></tr><tr><td>p (parity)</td><td>0 – 3</td><td>Value is ignored</td></tr></table>
Default value is 8 data bits, 1 stop, no parity.
See also +IPR (Fixed Port Rate).</td></tr>
<tr><td>+ILRR[=0]

+ILRR?</td><td>Local Rate Reporting
Enables and disables the reporting of the local rate to the host (DTE). The modules do not support local rate reporting. This command is provided for compatibility only and only accepts a setting of 0 (off).</td></tr>
<tr><td>+IPR=<n>

+IPR?</td><td>Fixed Port (R_m) Rate
Sets a data rate for the local serial port (DTE - DCE).
The module supports the following rates:
300 1200 4800 19200 57600 230400 600 2400 9600 38400 115200</td></tr>
<tr><td>+IFC=<tx>,<rx>

+IFC?</td><td>TX/RX flow control

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>tx/rx</td><td>0</td><td>Flow control disabled</td></tr><tr><td>tx/rx</td><td>1</td><td>Use XON/XOFF flow control, but strip XON/XOFF characters from stream</td></tr><tr><td>tx/rx</td><td>2</td><td>Hardware flow control</td></tr></table></td></tr>
</table>

2.2.10. +M Prefix

Table 20. +M Prefix Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+MA=<str>

+MA?</td><td>Modulation Automode
Sets the additional modulations that the Base Station may use to connect with the destination module in Automode operation. This is used for originating and answer operations on data calls and is additional to the modulation set using the +MS (Modulation Selection) command.
The default setting is null.
For details on parameters and use, see IS-131.</td></tr>
<tr><td>+MR=<n>

+MR?</td><td>Modulation Reporting
Enables or disables the extended intermediate result codes for +MCR:<carrier> and +MRR:<rate>[,rx_rate] from the IWF to the module. For details on the intermediate result codes possible, see IS-131.
To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MS result must be in that response.
If reporting is enabled, the intermediate result is sent when modulation has been determined and before error control or data compression are negotiated. This is before the final result code (e.g. CONNECT) is sent.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disables reporting of modulation connection. (Default)</td></tr><tr><td>1</td><td>Enables reporting.</td></tr></table></td></tr>
<tr><td>+MS=<parms>

+MS?</td><td>Modulation Selection
Controls the manner and operation of the modulation capabilities in the IWF. To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MS result must be in that response.
The default setting is null.
For details on parameters and use, see IS-131.</td></tr>
<tr><td>+MV18R=<n>

+MV18R?</td><td>V.18 Reporting
Enables or disables the extended result codes for +MV18R: from the IWF to the module.
To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MV18S result must be in that response.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disables reporting of V.18 result codes. (Default)</td></tr><tr><td>1</td><td>Enables reporting.</td></tr></table>
The possible intermediate result codes are:<table><tr><td>+MV18: 5BIT</td><td>Indicates connection with 5-bit (Baudot) mode</td></tr><tr><td>+MV18: EDT</td><td>Indicates connection with EDT</td></tr><tr><td>+MV18: DTMF</td><td>Indicates connection with DTMF</td></tr><tr><td>+MV18: V21</td><td>Indicates connection with V.21</td></tr><tr><td>+MV18: V23</td><td>Indicates connection with V.23</td></tr><tr><td>+MV18: B103</td><td>Indicates connection with Bell 103-type modulation</td></tr><tr><td>+MV18: V18</td><td>Indicates connection with V.18</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+MV18S=[m],[ans],[fb]

+MV18S?</td><td>V.18 Selection
Controls the manner and operation of the V.18 capabilities in the IWF (if present in the IWF). To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities).
The +MV18S result must be in that response.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>m</td><td>0</td><td>Disable V.18 operation (Default)</td></tr>
<tr><td></td><td>1</td><td>V.18 operation, auto detect mode</td></tr>
<tr><td></td><td>2</td><td>V.18, connect in 5-bit (Baudot) mode</td></tr>
<tr><td></td><td>3</td><td>V.18, connect in DTMF mode</td></tr>
<tr><td></td><td>4</td><td>V.18, connect in EDT mode</td></tr>
<tr><td></td><td>5</td><td>V.18, connect in V.21 mode</td></tr>
<tr><td></td><td>6</td><td>V.18, connect in V.23 mode</td></tr>
<tr><td></td><td>7</td><td>V.18, connect in Bell 103-type mode</td></tr>
<tr><td>s</td><td>0</td><td>Disable V.18 answer operation (Default)</td></tr>
<tr><td></td><td>1</td><td>No default specified (auto-detect)</td></tr>
<tr><td></td><td>2</td><td>V.18 operation, connect in 5-bit (Baudot) mode</td></tr>
<tr><td></td><td>3</td><td>V.18, connect in DTMF mode</td></tr>
<tr><td></td><td>4</td><td>V.18, connect in EDT mode</td></tr>
<tr><td>fb</td><td>0</td><td>Disable fallback (Default)</td></tr>
<tr><td></td><td>1</td><td>Enable fallback to re-acquisition after 2 seconds of no transmission.</td></tr>
</table>

The default setting is +MV18S=0,0,0, meaning V.18 operation is disabled.</td></tr>
</table>

2.2.11. +R Prefix

Table 21. +R Prefix Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+RCHVCHG=<state>,
<pin_old>,
<pin_new></td><td>Change the pin code
This command should be used only when CHV is enabled.

<table>
<tr><th>Parameter</th><th>Value</th></tr>
<tr><td>state</td><td>1</td></tr>
<tr><td>pin_old</td><td>Not more than 8 digital numbers</td></tr>
<tr><td>pin_new</td><td>Not more than 8 digital numbers</td></tr>
</table></td></tr>
<tr><td>+RCHVEN=
<dis_enable>,
<pin_code></td><td>Set the CHV state to enable or disable.
To change the card to enabled, it must be currently disabled. Likewise, to disable the card, it must be currently enabled.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>dis_enable</td><td>0</td><td>Disable the CHV</td></tr>
<tr><td></td><td>1</td><td>Enable the CHV</td></tr>
<tr><td>pin_code</td><td colspan="2">Not more than 8 digital numbers</td></tr>
</table></td></tr>
</table>

Command	Description
+RCHVVER=<state>, <pin_code>	Enter the PIN code to do the CHV verification with the CHV enabled After entering an invalid pin code for 3 times, the pin code will become invalid. **Parameter** / **Value** state / 1 pin_code / Not more than 8 digital numbers
+RCHVUNBLK= <state>, <pin_new>, <puk>	Use the PUK code to generate a new PIN code If the PUK count remains zero, the RUIM card will be disabled. **Parameter** / **Value** state / 3 pin_new / Not more than 8 digital numbers puk / 8 digital numbers
+RSTATUS	Get the status of the RUIM card. Return items: • CHV state • PIN count (remaining) • PUK count (remaining)

2.2.12. +W Prefix

Table 22. +W Prefix Commands

Command	Description
+WGETWK	Request Wake-up Reason Responds with the reason of the last wake-up event. The response is a decimal digit representing the bit-mask below. If no events have triggered, the response is a zero. **Value** / **Meaning** 0 / No event 1 / Ring received 2 / Radio coverage restored 3 / SMS message received

Command	Description
+WHCNF? **+WHCNF=** **<type>,** **<mode>,** **[uartgroup],** **[uartlinedcd],** **[uartlinedtr],** **[uartlinedsr]** 	This command is used to activate, deactivate or interrogate a WHCNF feature. The query command output is of the form: +WHCNF:<type>,<mode>,<resetflag>,[<uartgroup>],[<uartlinedcd>],[<uartlinedtr>],[<uartlinedsr>]

Parameter	Value	Meaning
type		Configuration type
	6	UART
mode		Command mode
	0	De-activate this feature
	1	Activate this feature
	2	Get feature status
uartgroup		Pins mapping group selection (this is optional and is only for type 6)
	0	No Group – no pins selected to map to enhanced UART pins
	1	Group A – mapping to GPIO pins
	2	Group B – mapping to PCM pins
uartlinedcd		DCD line configuration, this is optional and is only for type 6
	0	Disable DCD line
	1	Enable DCD line
uartlinedtr		DTR line configuration, this is optional and is only for type 6
	0	Disable DTR line
	1	Enable DTR line
uartlinedsr		DSR line configuration, this is optional and is only for type 6
	0	Disable DSR line
	1	Enable DSR line
resetflag		Query status bit, indicates whether the feature is set by the +WHCNF command
	0	This feature is not set. The modem is using the same settings as the +WHCNF? output.
	1	This feature is set by +WHCNF, the module has to be restarted to make the new settings available.
type		Configuration type
	10	I^2C (only supported in SL3010T)
mode		Command mode
	0	De-activate this feature
	1	Activate this feature
	2	Get feature status
resetflag		See definition for <type> = 6

Command	Description
+WWKUP=<n> **+WWKUP?**	Wake-up Events Mask Sets or reports the bit-mask used to identify events that generate a wake-up from the module to the host device. A setting of zero disables all wake-up signals. The default setting is 5; wake on ring and SMS received. When this command is issued, the last wake-up event reason (see **+WGETWK**) is reset to 0. **Bit** / **Meaning** 0 – Wake-up on ring received (Default is set) 1 – Wake-up on radio coverage restored (Default is clear) 2 – Wake on SMS received (Default is set) 3 – 7 – Reserved

2.2.13. No Prefix

Table 23. Alphabetic AT Commands

Command	Description
+++	Refer to Table 14 +++ Escape Control.
A/	Repeat Last command (not preceded by AT) Re-executes the last command string entered. The previously executed command remains in the command buffer until AT is entered or the module is reset or power-cycled. This command does not require the AT prefix or a <CR> at the end. It executes immediately on entry of the slash character.
A	Answer – Manual Instructs the modem to immediately go off-hook and attempt to establish a connection without waiting for a ring. This is used to answer an incoming call if autoanswer (**S0**) is disabled. The command presumes a **RING** has been received. If the command is issued without a RING, behavior depends on the state. If in command state, the modem replies with **OK** and remains in command state. Should the modem be in passthrough state without a call pending, the Answer command is sent to the IWF modem. This typically goes off- hook and looks for carrier. When none is detected, the **NO ANSWER** or **NO CARRIER** result is returned. This is, however, dependent on the IWF modem. If the incoming call is a fax call, the modem must be configured for answering fax via **$QCVAD** and set for fax mode using **+FCLASS**=2.0 prior to the RING being received by the modem. This is due to the method of call setup on the airlink between the IWF and the CDMA modem. The modem looks for carrier to negotiate the connection, and issues either: • **CONNECT** and enters data state; or, • **NO CARRIER** and remains in command state.

Command	Description
D [options]	Dial Initiates a data/fax call. (To dial a voice call, use **+CDV**.) Because of the options available in this command, another AT command cannot follow it on the same line. All characters following the D command are taken as parameter options. Several types of data and fax calls are possible, based on the option(s) entered. **Packet Data calls** Traditional CDMA data call dialing uses the parameter "**#777**". This triggers the modem to try a connection using the detected service type: 1X or QNC (IS-95). It is possible that 1X service may be detected in an area that offers 1x voice service, but only IS-95 data service. The use of passwords can differ between a QNC and 1X call on some networks as well. In these situations the call is likely to fail. You should force the modem to attempt one service type or the other by using dedicated dial strings dictated by the carrier. Typically (but not in all cases) the strings are: • #762 "QNC" – Connect to QNC using IS-95 service • #19788 "1XRTT" – Connect PPP using 1X service Your connection software must manage use of the correct password for the type of service used.

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td></td><td>
Async (CSC) Data/Fax
The type of call opened depends on the setting of +FCLASS. The modem does not actually dial the number in the string. For an IS-95 call, the dial string is passed to the IWF where a modem there issues the dial over the PSTN. Prior to passing the dial command, the modem sends the IWF modem the string defined in +CFG (Configuration String) to configure the IWF modem for the call.
For dialing an async data or fax call, the parameter string options are included on one command line with or without spaces. There is a limit of 35 characters in the dial options string. Upon successful answer and connection, the modem goes into data state. There is a time limit set in register S7 (Wait for Carrier) for the entire process.
The options listed below are commonly supported, but specific IWF modem capabilities govern the list of supported parameters.

<table>
<tr><th>Option</th><th>Meaning</th></tr>
<tr><td>0 – 9</td><td>Any digit (0-9) (*, #, A, B, C, or D are also permitted). The phone number may also include the formatting characters brackets (and), hyphen -, and <space>. These characters are ignored.</td></tr>
<tr><td>T</td><td>Tone (DTMF) dialing - ignored by the modem.</td></tr>
<tr><td>P</td><td>Pulse dialing - ignored by the modem.</td></tr>
<tr><td>W</td><td>Wait for dial tone before processing the remaining characters in the dial string. The duration of the wait is limited by register S7 (Wait for Carrier).</td></tr>
<tr><td>,</td><td>Pause before processing the remaining characters in the dial string. The pause time is set by register S8 (Comma Pause Time).</td></tr>
<tr><td>$</td><td>Wait for billing (bong) tone before processing balance of string.</td></tr>
<tr><td>@</td><td>Wait for quiet answer; limited by register S7 (Wait for Carrier).</td></tr>
<tr><td>!</td><td>Hook flash. Causes the modem to go on-hook briefly and then returns to off-hook. This is used to access certain calling features on the PSTN.</td></tr>
</table>

Result Codes:
The possible result codes are determined by the call monitoring set by X[n] (Result Code Select). A complete table of possible result codes is in Table 26 Result Codes.
</td></tr>
<tr><td>E[n]</td><td>
Echo
Controls echoing of characters received from the host (DTE) back to the host when in command state. This also affects framing of responses (for details, see section 1.6.3 Framing).

<table>
<tr><th>Value</th><th>Setting</th></tr>
<tr><td>0</td><td>Disable echo</td></tr>
<tr><td>1</td><td>Enable echo (default)</td></tr>
</table>
</td></tr>
<tr><td>H[0]</td><td>
Hook Control
Go ON-Hook to disconnect a data/fax call. (To end a voice call, use +CHV.)
If the modem was already on-hook, no change is made. The only parameter allowed is 0 (zero), which is optional. The modem goes from online condition to offline condition.
See also +CHV (Hang-up Voice).
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>I</td><td>Product identification information.
ATI
Manufacturer: Sierra Wireless, Inc.
Model: SL5011 Rev 1.0 (1)
Revision: p3111200,0 [Dec 18 2012 23:47:55]

For information and examples on interpreting the (firmware) Revision, QCOM and other return values, see +GMR.
QCOM: SWI6085_FP.01.38
BOOT: SL501X_FP.01.12 2012/12/19 01:32:04
APPL: SL501X_FP.01.12 2012/12/19 01:32:04
USBD: SWI6085_GENERIC.00.01
USB VID: 0x1199 PID: 0x0300 ESN: 0x60684203
+GCAP: +CIS707-A, CIS-856, CIS-856-A, +MS, +ES, +DS, +FCLASS

See +GCAP.
SKU: 0x192BB7</td></tr>
<tr><td>L[n]</td><td>Loudness - Speaker Volume
This command is provided for compatibility reasons; the module takes no action. Parameters are ignored.
For control of voice mode speaker levels, see ~SPKVOL.</td></tr>
<tr><td>M[n]</td><td>Mute - Speaker Control
This command is provided for compatibility reasons; the module takes no action. Parameters are ignored.
For control of voice mode microphone and speaker muting, see ~MICMUT and ~SPKMUT.</td></tr>
<tr><td>O</td><td>On-line (Remote)
Currently not supported.
Causes the module to go from command state (online condition) to data state. The module responds with the normal CONNECT response codes (if enabled) as if the connection were new.
This command is executed by the IWF modem. If the CDMA modem was in an offline condition and without an airlink, the NO CARRIER and OK result codes are returned. If the modem was offline and the airlink was established (passthrough state) but without a call in place, the IWF modem attempts to process the command. The typical result is either NO ANSWER or NO CARRIER. This is, however, dependent on the IWF modem.</td></tr>
<tr><td>P</td><td>Pulse Dialing
This command is provided for compatibility reasons; the module takes no action.</td></tr>
<tr><td>Q[n]</td><td>Quiet - Result Code Display Option
Controls the return or suppression of result codes to the host (DTE).

<table><tr><th>Value</th><th>Setting</th></tr><tr><td>0</td><td>Disables Quiet mode (enables return of result codes.) (Default)</td></tr><tr><td>1</td><td>Enables Quiet mode (disables return of result codes).</td></tr></table>
Result Codes:
<table><tr><td>OK</td><td>n = 0 Otherwise the result code is suppressed (n=1).</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>S<n>=<x>

S<n>?</td><td>S-Register Set/Query
Sets (or queries) the contents of the specified S-register (n) to the new value (x). Where parameter values are omitted, zeros are assumed.

<table><tr><th>Parameter</th><th>Range</th></tr><tr><td>n</td><td>Valid S-register number (for values, see Table 25 S Registers).</td></tr><tr><td>x</td><td>as determined by the S-register (n).</td></tr></table>
Result Codes:
<table><tr><td>OK</td><td>S-register n set to x.</td></tr><tr><td>ERROR</td><td>Invalid S-register value (n), or setting (x) is outside of permitted range.</td></tr></table></td></tr>
<tr><td>T</td><td>Tone - Set DTMF Dialing
This command is provided for compatibility reasons; the modem takes no action. For information on DTMF tone generation, see ~DTMFB, ~DTMFK, ~TONDUR, and ~TONMUT.</td></tr>
<tr><td>V[n]</td><td>Verbose - Result Code Form
Specifies whether the module displays the result codes in numeric format or as words (verbose). For a numerical list of the result codes, see Table 26 Result Codes.
Note that numeric codes are returned as ASCII character numerals.
This command also affects framing of responses (for details, see section 1.6.4 Response Framing).

<table><tr><th>Value</th><th>Setting</th></tr><tr><td>0</td><td>Numeric result code</td></tr><tr><td>1</td><td>Verbose result code (Default)</td></tr></table>
Result Codes:
<table><tr><td>OK (0)</td><td>n = 0, 1 (returned in the new setting)</td></tr><tr><td>ERROR (4)</td><td>Otherwise</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>X<n></td><td>Result Code Select/Call Progress Control
Enables tone detection options used in the dialing and handshaking process. As options are chosen, the result codes are also affected. The prime function is to control the modem call response capabilities when the D (Dial) command is issued.

Dial tone detection
When disabled, the modem waits for the period set in register S6 (Wait for Blind Dial) and blind dials. When enabled, the modem allows five seconds to receive at least 1 second of dial tone. If none is detected, then the result code is NO DIAL TONE.

Busy signal detection
When disabled, the modem waits for the period set in register S7 (Wait for Carrier). If no connection is made, then the result code is NO CARRIER. When enabled, the modem can return the result code BUSY if detected.
Values enable (✓) or disable (×) tone detection and result codes as indicated in the chart below:

<table>
<tr><th>Value</th><th>No Dial Tone</th><th>Busy Signal</th></tr>
<tr><td>1</td><td>×</td><td>×</td></tr>
<tr><td>2</td><td>✓</td><td>×</td></tr>
<tr><td>3</td><td>×</td><td>✓</td></tr>
<tr><td>4</td><td>✓</td><td>✓ (Default)</td></tr>
</table>
</td></tr>
<tr><td>Z</td><td>Profile Restore
The modem goes on-hook (drops any active call) and then resets the command and register parameters to the defaults. For information on factory settings, see Table 27 Profile Settings.</td></tr>
</table>

2.2.14. ~ Prefix

Table 24. ~ Prefix Commands

Command	Description
~DTMFB=<key1> [<key2>,<key3>, …]	DTMF Burst Generates a string of DTMF tones under the timings defined by ~TONDUR (Tone Duration). This command can be overridden by ~TONMUT (Tone Mute). The values of <key> can be any of 0–9, *, and #, up to a total of 32 keys. Spaces, quotes, brackets,
~DTMFK=<key>	DTMF Key Generates a single key DTMF tone for the duration set by **~TONDUR** (Tone Duration). This command can be overridden by **~TONMUT** (Tone Mute). The values of “key” can be any of 0–9, *, and #.

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>~ECHO=<n>

~ECHO?</td><td>Echo Cancellation Level
Sets and queries the environment for the echo cancellation profile. The modem has five environments available.
The setting is stored in non-volatile memory.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Factory default (headset) (same as 3) (Default)</td></tr><tr><td>1</td><td>No echo cancellation</td></tr><tr><td>2</td><td>Handset</td></tr><tr><td>3</td><td>Headset</td></tr><tr><td>4</td><td>Acoustic (AEC)</td></tr><tr><td>5</td><td>Speaker-phone</td></tr></table></td></tr>
<tr><td>~HDSET=<n>

~HDSET?</td><td>Headset Detection Option
Sets and queries the detection option for the voice headset. The setting is stored in non-volatile memory.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Do not use headset detection. Always report “not inserted” via CnS message.</td></tr><tr><td>1</td><td>Do not use headset detection. Always report “inserted” via CnS message. (Default)</td></tr><tr><td>2</td><td>Use headset detection. Report current headset detected state via CnS message.</td></tr></table>
There is no AT command to report whether a headset is detected when setting 2 is used. Headset detection is only reported via CnS messages.</td></tr>
<tr><td>~MICMUT=<n>

~MICMUT?</td><td>Microphone Mute
Sets and queries the state of the microphone mute. This value is not stored in non-volatile memory. The setting is considered temporary, and reverts to the default (OFF) at the beginning of a new call, and when the modem is power-cycled, reset, or when the profile is restored (&F and Z).

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Microphone mute is OFF (Default)</td></tr><tr><td>1</td><td>Mute is ON</td></tr></table></td></tr>
<tr><td>~NAMLCK=<n></td><td>NAM Lock
Stores a passcode number for comparison to the modem’s 6-digit OTSL (One Time Subsidy Lock), MSL (Master Subsidy Lock), or SPC (Service Provisioning Code). The service provider provides this number to you at the time of service activation.
If the number is an acceptable format, the OK result code is returned. If the parameter’s format is rejected (such as too many digits), the ERROR result is returned.
The actual comparison of the passcode entered with this command and the lock codes encoded in the modem does not take place until an attempt is made to write a NAM profile account using ~NAMVAL.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>~NAMVAL=<nam>
[,<MDN>,
<MIN>,<SID>,
<NID>]

~NAMVAL?<nam></td><td>NAM Values
This command has three functions related to the account or NAM (Number Assignment Module):

Set the active account index
The modem supports one account. Using only the <nam> parameter (0) sets that account as the active account used by the modem.

Read the current account information
The query form of the command will report the details of the specified account (0):
MDN: 9999999999 (10 digit phone number)
MIN: 9999999999 10-digit MIN (encoded and stored into MIN1 and MIN2)
SID: 99999 (System ID)
NID: 99999 (Network ID)

Write account activation data
This form requires the optional parameters. The modem will first compare the passcode stored using ~NAMLCK. If the passcode fails to match, the ERROR result is returned. If the OK result is received, the NAM profile account was successfully activated.
The parameter values are as noted for the query form of the command. The service provider will tell you what numbers to enter for NUM, MIN, SID, and NID. NAM must be 0.
Following writing the values, the modem must be reset to have the values take effect.</td></tr>
<tr><td>~RESET</td><td>Soft Reset
Resets the modem gracefully, shutting down any active connection. The modem issues the OK result before completing the reset cycle. The reset is complete after approximately 5–15 seconds, after CTS has been deasserted and then reasserted.</td></tr>
<tr><td>~SHTDWN</td><td>Shutdown
Forces the modem into a shutdown state, gracefully closing any open connection. This shutdown is deeper than the one achieved by using the control signals on the modem; it includes closing the serial connections.
Following this command, the modem can be restarted only by power cycling or a hardware reset.
The Shutdown Acknowledge control line is asserted when the shutdown is complete.</td></tr>
<tr><td>~SPKMUT=<n>

~SPKMUT?</td><td>Speaker (Headset) Mute
Sets and queries the state of the speaker mute. This value is not stored in non-volatile memory. The setting is considered temporary, and reverts to the default (OFF) when a new call is started, or the modem is power- cycled, reset, or when the profile is restored (&F and Z).

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Speaker mute is OFF (Default)</td></tr><tr><td>1</td><td>Mute is ON</td></tr></table>
This setting does not affect the setting of ~SPKVOL (Speaker Volume)</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>~SPKVOL=<n>

~SPKVOL?</td><td>Speaker (Headset) Volume
Sets and queries the volume level of the voice circuit speaker. The value is stored in non-volatile memory, making it persistent across resets and power-cycles.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Muted</td></tr><tr><td>1</td><td>-20 dB</td></tr><tr><td>2</td><td>-16 dB</td></tr><tr><td>3</td><td>-12 dB (Default)</td></tr><tr><td>4</td><td>-18 dB</td></tr><tr><td>5</td><td>-4 dB</td></tr><tr><td>6</td><td>0</td></tr></table></td></tr>
<tr><td>~STGLVL=<n>

~STGLVL?</td><td>Side Tone Gain Level
Sets or queries the amount of side tone gain; that is the volume of the speaker’s own voice (microphone input) that is presented to the earpiece (speaker output).

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>-84 dB</td></tr><tr><td>1</td><td>-36 dB</td></tr><tr><td>2</td><td>-32 dB (Default)</td></tr><tr><td>3</td><td>-28 dB</td></tr><tr><td>4</td><td>-24 dB</td></tr><tr><td>5</td><td>-20 dB</td></tr><tr><td>6</td><td>-16 dB</td></tr></table></td></tr>
<tr><td>~TONDUR=<key, on,off>

~TONDUR?</td><td>Tone Duration
Sets and queries the timing, in milliseconds, for generating DTMF tones using single key tones (~DTMFK) and bursts (~DTMFB). Settings are stored in non-volatile memory.

<table><tr><th>Parameter</th><th>Range</th><th>Meaning</th></tr><tr><td>key</td><td>100 – 3000</td><td>Key duration for single key tones (~DTMFK) Default = 300 ms</td></tr><tr><td>on</td><td></td><td>On time for tones in bursts (~DTMFB)</td></tr><tr><td></td><td>95 – 144</td><td>95 ms</td></tr><tr><td></td><td>145 – 195</td><td>150 ms</td></tr><tr><td></td><td>195 – 244</td><td>200 ms (Default)</td></tr><tr><td></td><td>245 – 294</td><td>250 ms</td></tr><tr><td></td><td>295 – 344</td><td>300 ms</td></tr><tr><td></td><td>345 – 350</td><td>350 ms</td></tr><tr><td>off</td><td></td><td>Off time between tones in bursts.</td></tr><tr><td></td><td>60 – 109</td><td>60 ms</td></tr><tr><td></td><td>110 – 159</td><td>100 ms (Default)</td></tr><tr><td></td><td>160 – 200</td><td>150 ms</td></tr></table></td></tr>
</table>

Command	Description
~TONMUT=<n> **~TONMUT?**	Tone Mute Sets and queries the mute setting on the generation of DTMF tones via **~DTMFK** and **~DTMFB**. Settings are stored in non-volatile memory. **Parameter** / **Meaning** 0 – DTMF mute is OFF (tones can be generated) 1 – Mute is ON

2.3. Status Registers

Some of these registers relate to the call progress timing at the IWF with the PSTN connection. These are noted below using the (Remote) tag.

Table 25. S Registers

Register	Description	Range	Default	Units
0	Autoanswer The modem autoanswers after a delay specified by **S0**. If S0=0, then autoanswer is turned off. The delay is equivalent to [<value> - 1] x 6 seconds. Examples: 1 = no delay 3 = 12 seconds	0 – 255	000	(n-1)*6 s
3	Carriage Return Character The standard end of line character used to indicate the end of an AT command. This character is also used as the carriage return character for framing responses and result codes in command state.	0 – 127	013 (CR)	ASCII
4	Line Feed Character The standard line feed character sent by the modem to the host at the end of a response or return code in command state.	0 – 127	010 (LF)	ASCII
5	Backspace Character This register sets the character recognized as a backspace during command entry.	0 – 127	008 (BS)	ASCII
6	Wait for Blind Dial (Remote) This register denotes the wait time, in seconds, before a blind dial (no dial tone detection). The value of **S6** is used when the **X** (Result Code Select/Call Progress Control) command is set to 1, or 3. **X** settings of 2 and 4 enable dial tone detection and disable blind dialing. Therefore, when **X** is set to 2 or 4, the value of S6 is irrelevant.	2 – 10	002	seconds

Register	Description	Range	Default	Units
7	Wait For Carrier (Remote) If no carrier from the remote modem is detected within the specified time, the modem goes on-hook.	1 – 255	060	seconds
8	Comma Pause Time (Dial Modifier) (Remote) Whenever a dial command contains the comma character, the contents of this register specify the pause time for each comma.	0 – 255	002	seconds
9	Carrier Detect Response Time (Remote) Specifies the time that the received carrier must be present for the modem to recognize it and turn on Data Carrier Detect (DCD) if applicable. The implementation is entirely at the IWF modem.	0 – 255	006	0.1 s
10	Lost Carrier Hang-up Delay (Remote) Specifies the amount of time that the carrier from the remote modem can be lost before the modem goes on-hook. This allows temporary disruptions to carrier without disconnecting. A setting of 255 causes the modem to disable Carrier Detect and presume carrier is always present.	1 – 255	014	0.1 s
11	DTMF Dialing Speed (Remote) This specifies the duration of tones in DTMF dialing. This register is not used by the **~DTMFB** command. See **~TONDUR** (Tone Duration).	50 – 255	095	0.001 s

2.4. Result Codes

This table provides a numerical list of the standard result codes possible.

Table 26. Result Codes

Code	Verbose	Meaning
0	OK	Command executed without errors.
1	CONNECT	Connected at any of the supported speeds.
2	RING	Alerting Signal (Ring) signal received from the network.
3	NO CARRIER	Carrier signal lost or not detected. Unable to activate the service.
4	ERROR	Command not recognized or could not be executed. Illegal command. Error in command line. Command line exceeds buffer size. Parameters out of range.
6	NO DIAL TONE	Dial tone not detected within timeout and subsequent commands not processed.
7	BUSY	Reorder (Busy) signal detected and subsequent commands not processed.
8	NO ANSWER	Five seconds of silence not detected after ring back when “@” (quiet answer) dial modifier is used.
9	DSAT CONNECT PAD	PAD TCP server not in manual mode and remote client connects
10	DSAT CLIENT UP	PAD TCP server in manual mode and remote client connects

2.5. Stored Profile Settings

The Sierra Wireless CDMA 1X modems do not support a user- defined profile. Both **Z** (Reset) or **&F** (Factory Settings Restore) restore these settings.

Table 27. Profile Settings

Command	Description	Factory
$QCMIP	Mobile IP behavior	Carrier dependent
$QCMIPNAI	Network Access ID (NAI) for the Mobile IP general user profile	Carrier dependent
$QCMIPP	Active Mobile IP user profile	
E	Echo (Command State)	1 (enabled)
L	Loudness - Speaker Control	0 (ignored)
M	Mute - Speaker Control	0 (ignored)
Q	Quiet - Result Code Display Option	0 (Codes returned)
V	Verbose - Result Code Form	1 (Words)
X	Result Code Select/Call Progress Control	4 (all codes)
&C	Data Carrier Detect Control	2 (UNIX wink)
&D	Data Terminal Ready Options	2 (Hang up)
+CFG	Configuration String	(null)
+CMUX	Multiplex Option	C (Forward link) 2 (Reverse link)
+CQD	Command State Inactivity Timer	10 (50 seconds)
+CRC	Cellular Result Codes	0 (disabled)
+CRM	Local (R_m) Interface Protocol	0 (async data)
+CXT	Cellular Extension	0 (do not pass)
+ICF	Character Framing	3, 3 (ignored)
+ILRR	Local Rate Reporting	0 (off)
+IPR	Fixed Port (R_m) Rate	115200 (ignored)
+MA	Modulation Automode	(null)
+MR	Modulation Reporting	0
+MS	Modulation Selection	(null)
+MV18R	V.18 Reporting	0 (disabled)
+MV18S	V.18 Selection	0, 0, 0
FAX Commands		
+CFC	Airlink Fax Compression	0 (no compression)
+FAA	Fax Adaptive Answer	0
+FAP	Fax Addressing and Polling Capabilities	0, 0, 0
+FBO	Fax Data Bit Order	0
+FBU	Fax HDLC Frame Reporting	0

Command	Description	Factory
+FCC	Fax DCE Capabilities	0 (VR) 1 (BR 4800 bps) 0 (WD) 0 (LN) 0 (DF) 0 (EC) 0 (BF) 0 (ST)
+FCLASS	Modem Operating State	0 Data (async)
+FCQ	Fax Copy Quality	1, 0
+FCR	Fax Capability to Receive	0
+FCT	Fax DCE Phase-C Timeout	1E
+FEA	Fax EOL Alignment	0
+FFC	Fax Format Conversion	0, 0, 0, 0
+FHS	Fax Call Termination Status	0
+FIE	Fax Procedure Interrupt Enable	0
+FIS	Fax Current Session Negotiation	0 (VR) 1 (BR 4800 bps) 0 (WD) 0 (LN) 0 (DF) 0 (EC) 0 (BF) 0 (ST)
+FLI	Fax Local ID String	(Null)
+FLO	Fax Flow Control Select	1
+FLP	Fax Indicate Document to Poll	0
+FMS	Fax Minimum Speed	0
+FNR	Fax Negotiation Reporting	0, 0, 0, 0
+FNS	Fax Non-standard Frame FIF	(Null)
+FPA	Fax Selective Polling Address	(Null)
+FPI	Fax Local Polling ID String	(Null)
+FPR	Fax Serial Port Rate Control	8
+FPS	Fax Page Status	1
+FPW	Fax Password	(Null)
+FRQ	Fax Receive Quality Threshold	0, 0
+FRY	Fax ECM Retry Value	0
+FSA	Fax Sub-address	(Null)
+FSP	Fax Request to Poll	0
S Registers		
S0	Auto-answer mode	0 (disabled)
S3	Carriage Return Character	013 (CR)
S4	Line Feed Character	010 (LF)
S5	Backspace Character	008 (BS)
S6	Wait for Blind Dial (Remote)	002 (2 seconds)
S7	Wait for Carrier (Remote)	060 (60 seconds)

Command	Description	Factory
S8	Comma Pause Time (Remote)	002 (2 seconds)
S9	Carrier Detect Response Time (Remote)	006 (0.6 seconds)
S10	Lost Carrier Hang-up Delay (Remote)	014 (1.4 seconds)
S11	DTMF Dialing Speed (Remote)	095 (0.095 s)

3. Working with the IWF

When operating a CDMA modem in IS 95B (CSC) service, the local modem and the IWF modem must work as a team to perform the duties that a traditional wireline modem handles alone. To support this teamwork, the modem has an extensive set of commands to query the PCS network and IWF for information about the services and capabilities available. There are also commands to configure the IWF modem as well as commands to configure the local modem.

The modem is designed to keep this dependency as transparent as possible. Commands that configure the IWF modem are typically stored at the local modem until a connection request is made. At that time, the commands are sent as a block to the IWF to set up the modem team for the call. Settings stored at the local modem will report the user setting even though the command is intended for execution / implementation at the IWF.

The airlink radio connection between these two modems operates on two levels. There is the traditional link to exchange user data between the local and remote terminal applications, and a second link to exchange operational information between the local modem and the IWF modem. This second link is largely transparent to the user.

The modem control information is exchanged using a transport layer of the airlink that is independent of an active data call. The modem can open the airlink specifically to exchange command settings without having an incoming or outgoing call on the usual data link. Normal call setup will trigger the local modem to open the airlink for the transport of the dial command. The data aspect of the link is not opened until the IWF has established the call through to the remote terminal.

The two modems use the transport layer of the airlink to stay synchronized. In simple operation, the user would not be aware that there are actually two modems on the local side of the connection. The local Sierra Wireless modem and the IWF modem co-ordinate their functions without specific user actions.

3.1. Local and Remote Commands

Some commands in this reference are noted as “(Remote)”. This indicates that the command is related to query or configuration of the IWF modem.

There are essentially three classes of commands: Local Only, Shared, and Remote-only.

3.1.1. Local Only

These are commands that control or query the local modem only. There are only a very few commands like this that are not shared. Local only commands return an **ERROR** result when the airlink to the IWF is active, but return valid results when the modem is on-hook. **I5** is an example.

3.1.2. Shared

These commands appear to execute on the local modem. In fact these commands only store settings that are later used to configure the IWF, which must actively use the settings in establishing a call on the PSTN. The local modem does not need to create an airlink to the IWF for these commands. When an airlink is needed, the settings are sent to the IWF as part of the initialization of the link.

3.1.3. Remote-Only

Some commands require the IWF to provide the response. The local modem treats these as unrecognized commands. If configured (using **+CXT**), the local modem will open the airlink and pass the command to the IWF, then relay the response to the local host; otherwise the local modem returns **ERROR** for unrecognized commands. These commands work on the transport layer in the airlink between the two modems. A command such as **+CGCAP** is in this class.

Still other commands are only meaningful if there is an established call because the data involved is transient and only exists in the presence of a call. **+CMIP** is used to query for the current IP address of the modem. The modem is assigned an IP address by the network only when there is an active IS 95B call. This is an example of another type of remote-only command.

Remote-only commands are noted in the reference with the tag “(Remote)”. If the tag is not shown, the command may be shared. Shared commands are “stored” at the local modem and are sent to configure the IWF when the airlink is established.

3.2. Airlink Control

Most of the time, the Sierra Wireless modem is operating independently (idle) – without an airlink established to the IWF or beyond. When AT commands are issued to query, configure, and set up a call, the modem may automatically establish the airlink as needed. When the call is terminated, or the modem is not actively configuring the IWF, the airlink is dropped to free the radio band for other users.

Knowing when the transport layer is active and when it is not is critical to proper interpretation of the result codes. If the link is not in place, remote-only commands give the **ERROR** result code. The command is unknown to the local modem or is related to a data object only available from the IWF. The same command responds differently when the airlink is established.

3.2.1. Establishing the Airlink

For the local modem to communicate with the IWF, an airlink is opened between them. The local modem can open this link without initiating a call through the PSTN or Quick Net Connect to a remote system. There are two primary methods to establish the airlink:

- Initiate or answer a call. Using **ATD** to initiate a call or **ATA** to answer a call causes the local modem to open the link.
- Issue a remote-only command (or any command unrecognized by the local modem) with the modem set using **+CXT=1** (Cellular Extension enabled). If **+CXT=0** (disabled), then the local modem gives the **ERROR** result code for unrecognized commands. When the cellular extension is enabled, the modem will open the airlink and pass the command to the IWF for processing.

If the modem can find a channel but is not permitted to register, attempts to establish the airlink results in the **NO CARRIER** result.

3.2.2. Initializing the Airlink

Note: To control the configuration process, the local modem and the IWF have a standard default setting. Unlike standard wireline modems that allow a user configuration (profile) to be saved and restored on reset, CDMA modems support only the factory defaults on reset. A non- standard user configuration must be sent to the local modem after any reset, ***ATZ****, or power-cycle.*

The local modem automatically initializes the airlink each time it is opened. The initialization process involves first sending the IWF all needed AT commands to configure it to match the (non-default) settings of the local modem itself. This ensures that both modems are synchronized. The second step to initializing the link is to send the IWF the contents of the **+CFG** string. These are commands selected by the user to configure the IWF for a particular operation.

Once the airlink is established, the local modem will pass the command that initiated the link (**ATD**, **ATA**, or the unrecognized command line) to the IWF.

3.2.3. Passthrough and Reflection

In many respects, the local modem operates as a passthrough modem providing the local host device with a radio link to the IWF modem. In many cases commands are passed through the local modem for execution at the IWF. The IWF then reflects the command back to the local modem on the transport layer of the airlink. Both modems are kept synchronized with respect to their configuration.

When a command is entered into the local modem (with the airlink active) the command is passed through to the IWF without any processing locally. The IWF controls the command line echo (if enabled). There is a noticeable delay in the echo time when the airlink is active and when it is not.

The IWF processes the command line and reflects it back to the local modem. Only if the IWF is successful at executing the command is the command reflected back to the local modem for processing locally. If the command fails, the **ERROR** result is passed back and through to the local host. This ensures the two modems are kept synchronized.

For further details on how the command line is processed, see section 1.5 Command Handling.

3.2.4. Closing the Airlink

The airlink is closed whenever a call terminates through:

- Normal disconnection (**ATH**)
- Loss of carrier (disconnection at the remote end or break in the PSTN connection)
- Loss of cellular coverage

If the modem has an airlink established but is not in an active call, the link can be closed by the IWF if there is no traffic (commands or replies) for the duration set with **+CQD**. This timer defaults to 50 seconds. The link can be closed before this time by issuing the **H** command.

When the airlink is closed, the local modem reports to the host (DTE) with the **NO CARRIER** result code.

3.3. Modem Defaults and Configurations

To summarize the discussion above:

- Both the local modem and the IWF share common defaults.
- The user cannot save a non-standard default configuration.
- Upon initialization of the airlink, the IWF is reset to default, and then any non-default values stored at the local modem are sent to the IWF to configure both modems to the same settings.
- When the airlink is active, all commands are executed by the IWF first. Settings are reflected back to the local modem to keep them synchronized.

When the airlink connection is closed, the local modem retains the settings last used, while the IWF modem is reset to defaults. When the next airlink is opened, the local modem may connect to a different modem at the IWF, so the local modem must repeat the initialization process. The user does not need to reconfigure the local modem for each call, although reconfiguration will be needed if the local modem is reset or power-cycled.

Extended AT Command Reference

Note: This section covers commands that are needed to make hardware configuration at the factory and conduct required product testing.

This section covers the following classes of extended AT commands.

- Hardware Configuration Commands – commands that are usually used in a script to configure the modem in the integrated product, at the factory.
- Diagnostic Commands – commands used to perform diagnostics not normally performed by end users.
- Test Commands – commands required to place the modem in particular modes of operation, test host connectivity, and to exercise the transmitter and receiver for test measurements.
- Device Interrogation and Provisioning Commands – commands for querying the modem for device and provisioning information, and for configuring authentication and security items.
- Device Management Commands – commands related to OMA Device Management.
- Voice Commands – commands required to query or configure voice-related settings of the AirPrime SL3010T.
- GPS Commands – commands used for Position Determination Session Management (PDSM) – a GPS feature supported by some carriers/networks. The CDMA network is used to assist the modem to acquire a GPS location fix.

Note: For information on GPS support, please see the product specification for your Sierra Wireless product.

- EFS Commands – commands for file/directory operations.

1. Hardware Configuration Commands

The modems provide the following elements for hardware configuration to suit your particular integration project:

- Modem port mappings in non-MUX mode
- Audio level—headset or line level
- Microphone level calibration
- Speaker level calibration
- Antenna diversity control
- Shutdown mode—defines the conditions that trigger modem shutdown
- Status line behavior—human (LEDs) or machine interface
- Secondary port data rate

1.1. Hardware Configuration Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands to allow you to more quickly locate a desired command when the operation is known but the command is not.

Table 28. Hardware Configuration Commands

Command	Description
!BZBUZZ	Enable/disable BUZZER
!BZBUZZPLAY	Generate pre-defined melody on the BUZZER
!DIO	Writes to an IO (if it's set as an output)
!DIOCFG	Configures the digital IO
!DIVERSITY	Antenna diversity control
!DLED	Tests LED functions
!LED	Temporarily change LED behavior
!LEDCTRL	Query or set the LED flash pattern in the NV
!NDIS	Enable/disable NDIS driver
!SERIALPORTMAP	Modem port mappings in non-MUX mode
!WHQL	Enable/disable NDIS-based Autoconnect for WHQL testing
~IPR2	Port Rate - Secondary Port
~SCRPAD	Scratchpad

1.2. Hardware Configuration Reference

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

Table 29. Hardware Configuration Command Details

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!BZBUZZ=
<status>,
<freq></td><td>This command will generate frequency on the BUZZER pin of the module. As the SL5011 and SL3010T do not have a PWM module, this command can be only used to enable or disable BUZZER.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>Status</td><td>0</td><td>Disable buzzer</td></tr><tr><td></td><td>1</td><td>Enable buzzer</td></tr><tr><td>Freq</td><td colspan="2">Buzzer frequency. This parameter is ignored.</td></tr></table></td></tr>
<tr><td>!BZBUZZPLAY=
<melody></td><td>This command will generate a pre-defined melody on the BUZZER pin of the module. As there is no PWM module in the SL5011 and SL3010T, this function is not supported.

<table><tr><th>Parameter</th><th>Value</th></tr><tr><td>melody</td><td>Pre-defined melody number</td></tr></table></td></tr>
<tr><td>!DIO=<chan>,
<value>

!DIO?<chan></td><td>The query command returns the read value for a given digital IO channel. The set command writes to an IO if it is an output.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>chan</td><td>1</td><td>GPIO_1</td></tr><tr><td></td><td>2</td><td>GPIO_2</td></tr><tr><td></td><td>3</td><td>GPIO_3</td></tr><tr><td></td><td>4</td><td>GPIO_4</td></tr><tr><td></td><td>5</td><td>GPIO_5</td></tr><tr><td>value</td><td></td><td>For outputs. Defines the output level for the given digital IO.</td></tr><tr><td></td><td>1</td><td>IO is at low logic level</td></tr><tr><td></td><td>2</td><td>IO is at high logic level</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!DIOCFG=<chan>,
<enable>,
<type>,
<InitVal/Notify>

!DIOCFG?<chan></td><td>The query command returns the digital IO configuration settings. The set command configures the digital IO.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>chan</td><td>1</td><td>GPIO_1</td></tr>
<tr><td></td><td>2</td><td>GPIO_2</td></tr>
<tr><td></td><td>3</td><td>GPIO_3</td></tr>
<tr><td></td><td>4</td><td>GPIO_4</td></tr>
<tr><td></td><td>5</td><td>GPIO_5</td></tr>
<tr><td>enable</td><td></td><td>Enable/Disable IO function</td></tr>
<tr><td></td><td>0</td><td>Disable IO function</td></tr>
<tr><td></td><td>1</td><td>Enable IO function</td></tr>
<tr><td>type</td><td></td><td>Defines the GPIO type</td></tr>
<tr><td></td><td>0</td><td>Output</td></tr>
<tr><td></td><td>1</td><td>Input pull-up</td></tr>
<tr><td></td><td>2</td><td>Input pull-down</td></tr>
<tr><td>InitVal</td><td></td><td>For outputs. Defines the IO output value</td></tr>
<tr><td></td><td>0</td><td>Set output low at power-up</td></tr>
<tr><td></td><td>1</td><td>Set output high at power-up</td></tr>
<tr><td>Notify</td><td></td><td>For inputs. Enables/disables notifications when the input level changes.</td></tr>
<tr><td></td><td>0</td><td>Disable input level change notification message</td></tr>
<tr><td></td><td>1</td><td>Enable input level change notification message</td></tr>
</table>
</td></tr>
<tr><td>!DIVERSITY=
<1x,EVDO>

!DIVERSITY?</td><td>Antenna diversity control
Set or query the antenna diversity control for both 1X and 1xEV-DO.
The setting is stored in non-volatile memory. The modem does not need to be reset for the change to take effect.
Note that the parameter <EVDO> is only applicable when using the AirPrime SL5011.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>1x</td><td>0</td><td>Diversity control for 1X is off</td></tr>
<tr><td></td><td>1</td><td>Diversity control for 1X is on</td></tr>
<tr><td>EVDO</td><td>0</td><td>Diversity control for 1xEV-DO is off</td></tr>
<tr><td></td><td>1</td><td>Diversity control for 1xEV-DO is on</td></tr>
</table>

Example:
<pre>AT!DIVERSITY?
CDMA Diversity: 1
HDR Diversity: 1</pre>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!DLED=
<ate_ena>,
<ledbitmask></td><td>This command is used to test the LED functions of the system.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>ate_ena</td><td></td><td>LED mode set</td></tr><tr><td></td><td>0</td><td>Test mode disabled. LED is in normal operation.</td></tr><tr><td></td><td>1</td><td>LED test mode enabled.</td></tr><tr><td>ledbitmask</td><td></td><td>Bit mask of the LEDs. Only the lowest bit is used is used.
This filed is valid when ate_ena = 1.</td></tr><tr><td></td><td>0</td><td>Corresponding LED OFF</td></tr><tr><td></td><td>1</td><td>Corresponding LED ON</td></tr></table></td></tr>
<tr><td>!LED=<led>,
<rate>, <on_time></td><td>Temporarily change the LED behavior.
This command takes direct control of the LED in order to test different rates and on_time’s. This change is not persistent, and is lost once power is cycled.
Use this command to determine the LED timing desired, and then insert those settings into the PRI tables.

<table><tr><th>Parameter</th><th>Value</th></tr><tr><td>led</td><td>3 – Service LED</td></tr><tr><td>rate</td><td>Period or rate in milliseconds.</td></tr><tr><td>on_time</td><td>Defines the duty cycle in which the LED is on within “rate”
Range: 0-65535 (time in milliseconds)</td></tr></table></td></tr>
<tr><td>!LEDCTRL=
<index>,
<period>,
<ontime>,
<invert></td><td>This command is use to query or set the LED flash pattern stored in the NV. Note that the modem must be reset for the new settings to become effective.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>index</td><td></td><td>Flash pattern type</td></tr><tr><td></td><td>0</td><td>OFF</td></tr><tr><td></td><td>1</td><td>OUT OF SERVICE</td></tr><tr><td></td><td>2</td><td>CONNECTED</td></tr><tr><td></td><td>3</td><td>1X ONLY SERVICE</td></tr><tr><td></td><td>4</td><td>OFFLINE</td></tr><tr><td></td><td>5</td><td>HDR SERVICE</td></tr><tr><td>period</td><td colspan="2">LED period in 100ms units for the corresponding index</td></tr><tr><td>ontime</td><td colspan="2">LED ON DURATION in 100ms units for the corresponding index.</td></tr><tr><td>invert</td><td>0</td><td>LED ON duration is as specified</td></tr><tr><td></td><td>1</td><td>LED ON duration is <period> - <ontime></td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!NDIS= <supported>, <enabled>

!NDIS?
  </td><td>Enable/disable the NDIS driver
Sets or queries the NDIS driver support. This change is persistent, and is maintained across power cycles.
The “supported” parameter instructs the USB bus driver whether to load the NDIS driver; “enabled” is then used to instruct the NDIS driver to run or not.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>supported</td><td>0</td><td>NDIS not supported</td></tr><tr><td></td><td>1</td><td>NDIS supported</td></tr><tr><td>enabled</td><td>0</td><td>NDIS not enabled</td></tr><tr><td></td><td>1</td><td>NDIS enabled</td></tr></table>
Example:
<pre>AT!NDIS?
NDIS Support: 1
NDIS Pref: 0
OK</pre></td></tr>
<tr><td>!SERIALPORTMAP =<mode>

!SERIALPORTMAP?
  </td><td>Modem port mappings in non-MUX mode.
Note: This command has no effect on operations when using 27.010 MUX mode drivers from Sierra Wireless.

<table><tr><th>Mode</th><th>AT/PPP</th><th>CnS</th><th>DM</th><th>NMEA</th></tr><tr><td>75</td><td>USB EP 2</td><td>USB (HIP) EP 4</td><td>USB EP 8</td><td>USB EP 5</td></tr><tr><td>76</td><td></td><td>USB (HIP) EP 4</td><td>UART1</td><td></td></tr><tr><td>77</td><td></td><td>USB (HIP) EP 4</td><td></td><td></td></tr><tr><td>79</td><td>UART1</td><td>USB (HIP) EP 4</td><td></td><td></td></tr></table></td></tr>
<tr><td>!WHQL= <enabled>

!WHQL?</td><td>Enable/disable NDIS-based Autoconnect for WHQL testing
Sets or queries the WHQL autoconnect feature. This change is persistent, and is maintained across power cycles.
When enabled, the modem will autoconnect when the NDIS driver is detected.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>enabled</td><td>0</td><td>Autoconnect is disabled</td></tr><tr><td></td><td>1</td><td>Autoconnect is enabled</td></tr></table></td></tr>
<tr><td>~IPR2=<n>

~IPR2?</td><td>Port Rate - Secondary Port
Sets or queries the data rate used on the secondary serial port. The setting is persistent until explicitly changed by a new command.
This command affects only the serial port. USB usage is not affected.
Valid parameters for the data rate are: 2400, 4800, 9600, 19200, 38400, 57600, and 115200.
The factory default is 115200 bps.
For information on controlling the primary port, see +IPR (Fixed Port (R_m) Rate) in Table 19 +I Prefix Commands.</td></tr>
</table>

Command	Description

~SCRPAD=<str>
 	
~SCRPAD?
	Scratchpad
	Sets and reads a text string of up to 20 characters. The string is stored in non-volatile memory. Due to the nature of this command, no other AT command can follow on the same command line.
	The string is taken from immediately after the "=" sign; no delimiters are used. If quotes are entered, they will be treated as part of the string—not delimiters of it.
	A modem response of "unset" means that the memory location has not been written.
	
	Example:
	`AT~SCRPAD?`
	`Unset`
	`OK`

2. Diagnostic Commands

The modems support some low-level diagnostic commands that are not normally used by end-users. This chapter details these commands.

The set of diagnostic commands supports the following items:

- Unlock access to diagnostic and test services
- Reading device status
- Audio circuit testing

These commands are not available on the modem until access is unlocked using the **!OEM** command. These commands can be executed with the modem in its normal operating mode, although this can cause unintended changes in behavior when using the audio features. For audio tests, diagnostic mode (via **!DIAG**) is recommended.

2.1. Diagnostic Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands to allow you to more quickly locate a desired command when the operation is known but the command is not.

Table 30. Diagnostic Commands

Command	Description
!AUD	Activates the audio circuitry for testing
!AUDLP	Controls audio loopback
!DIAG	Change from normal to diagnostic operation
!OEM	Enable access to protected commands
!SCI	Reads the Slot Cycle Index

2.2. Diagnostic Reference

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

Table 31. Diagnostic Command Details

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AUD=<n>
 
 
(Recommended)</td><td>Audio enable
Enables or disables the audio path circuitry. Normally, the audio path is off unless a voice call is active.
Diagnostic mode (!DIAG) is strongly recommended when using this feature. The normal operation of the modem may turn the audio circuit on or off, disrupting tests. Diagnostic mode will prevent unintended changes in circuit state.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>Audio circuit disabled (Default)</td></tr><tr><td>1</td><td>Audio circuit enabled</td></tr></table></td></tr>
<tr><td>!AUDLP=<n>
 
 
(Recommended)</td><td>Audio enable
Enables or disables a loopback of the audio path. The audio circuitry must first be enabled using !AUD=1.
Diagnostic mode (!DIAG) is strongly recommended when using this feature. The normal operation of the modem may turn the audio circuit on or off, disrupting tests. Diagnostic mode will prevent unintended changes in circuit state.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>0</td><td>PCM loopback off (Default)</td></tr><tr><td>1</td><td>PCM loopback on</td></tr><tr><td>2</td><td>Audio loopback off</td></tr><tr><td>3</td><td>Audio loopback on</td></tr></table></td></tr>
<tr><td>!DIAG
  </td><td>Diagnostic Mode
Places the modem into diagnostic mode. Normal operations are suspended. This is required for several test functions and is recommended for audio diagnostics.
To leave diagnostics mode, the modem must be reset or power cycled.</td></tr>
<tr><td>!OEM=176</td><td>OEM Access Lock
Sets the status of the lock for access to OEM restricted commands. Once the restricted command access has been unlocked, it remains unlocked until the modem is reset.</td></tr>
<tr><td>!SCI=<n>

!SCI?</td><td>Slot Cycle Index
Sets or reads the slot cycle index used for slotted mode sleep. This setting is made in non-volatile memory. For the value to take effect, the modem must be reset.
Upon reset and registration with a network, the modem will use the lower of:
This setting
Maximum that the network will allow
This command overrides the default setting from the PRI, but cannot override the network. The network will ultimately determine the maximum permitted setting.
Note: Once !SCI is used, the original PRI setting for the slot cycle index can only be restored by manually entering it using this command.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>n</td><td>0-7</td></tr></table></td></tr>
</table>

3. Test Commands

The modems can test host connectivity by setting and reading the I/O pins, and can also permit direct control of the transmitter and receiver for test purposes.

Due to the danger of interference with public networks, these commands are not to be made available to general users.

To access the features, the modem must be set to the unlock value (**!OEM=176**). Additionally, the modem must be placed in diagnostic mode using **!DIAG**. On completion of testing, the modem must be reset to clear the diagnostic mode and lock the restricted command set.

The set of test commands supports the following actions:

- Transmitter or receiver on and off
- Channel selection
- Transmitter power level
- I/O line configuration, setting, and reading

3.1. Test Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands, allowing you to more quickly locate a desired command when the operation is known but the command is not.

Table 32. Test Commands

Command	Description
!ALLUP	Turn on transmitter in all up's condition.
!CHAN	Tune the synthesizer channel and band
!KEYOFF	Turn off the transmitter power amplifier
!KEYON	Key the transmitter
!RX2	Turn the second receiver on and off
!RXAGC	Read RX AGC of first receiver
!RX2AGC	Read RX AGC of second receiver
!TX	Turn the transmitter circuitry on and off
!TXAGC	Set TX AGC

3.2. Test Reference

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

Table 33. Test Command Details

Command	Description
!ALLUP=<value> 	Turn on transmitter in all up's condition. Turns on/off the Transmitter and simulates an "All Up's" TX condition. **Value** — **Meaning** 0 — All Up's Off 1 — All Up's On
!CHAN=<c>[,b] **!CHAN?** 	Channel Tunes the synthesizer to the specified channel and band, or reports the current tuning (including changes made via **!KEYON**). If the band is omitted, the modem uses the current band setting, changing only the channel. The channel setting on entry to diagnostic mode is determined by the prior activity of the modem. **Parameter** — **Meaning** — **Range** c — channel — 0–799, 991–1023 (Cellular); 0–1200 (PCS) b — band — 0 = cellular; 1 = PCS The query command will return the last channel that the synthesizer attempted to tune to.
!KEYOFF 	Key Off Turns off the transmitter's power amplifier. The transmitter circuitry remains powered until **!TX=0** is used.
!KEYON=<c,b,w> 	Key On Tunes the radio and keys the transmitter at maximum. The command can select either pseudo-random noise (PN) or a sine wave signal (SINE). **!TX** is not needed prior to use; this command will enable the transmitter circuitry. The power amplifier is set to maximum gain and the output power limit is disabled. **!KEYOFF** is used to turn off the power amplifier, or **!TX=0** will turn off the transmitter circuit. **Parameter** — **Meaning** — **Range** c — channel — 0–799, 991–1023 (Cellular); 0–1200 (PCS) b — band — 0 = cellular; 1 = PCS w — wave — 0 = PN; 1 = SINE
!RX2=<n> 	Second receiver Turns the circuitry of the second receiver on or off. The channel tuned is set by the **!CHAN** or **!KEYON** commands. **Value** — **Meaning** 0 — Turn the circuitry of the second receiver off 1 — Turn the circuitry of the second receiver on

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!RXAGC?
  </td><td>Reads RX AGC of first receiver.
0 represents the most positive RX_AGC value.
0x3FF represents the lowest RX_AGC value.
0x200 represents a 50% duty cycle.</td></tr>
<tr><td>!RX2AGC?
  </td><td>Reads RX AGC of second receiver.
0 represents the most positive RX_AGC value.
0x3FF represents the lowest RX_AGC value.
0x200 represents a 50% duty cycle.</td></tr>
<tr><td>!TX=<n>
  </td><td>Transmitter
Currently not supported.
Turns the transmitter circuitry on and off. When turned on, the transmitter is not keyed until the !KEYON command is used.
<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Transmitter circuit off</td></tr><tr><td>1</td><td>Transmitted circuit on</td></tr></table></td></tr>
<tr><td>!TXAGC=<value>
  </td><td>Set TX AGC
<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0x000 to 0x1FF</td><td>The desired TX_AGC_ADJ, entered in hexadecimal.</td></tr></table>0 represents the lowest TX_AGC_ADJ value.
0x100 represents a 50% duty cycle.
1FF represents the most positive TX_AGC_ADJ value.</td></tr>
</table>

4. Device Interrogation and Provisioning Commands

The modems support some device interrogation and provisioning commands that are not normally used by end-users. This chapter describes these commands.

The set of commands supports access to the following items:

- PRI revision
- Carrier ID
- IOTA-related items (not all carriers support IOTA)
- A-Key

These commands are not available on the modem until access is unlocked using the **!OEM** command.

4.1. Device Interrogation and Provisioning Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands to allow you to more quickly locate a desired command when the operation is known but the command is not.

Table 34. Device Interrogation and Provisioning Commands

Command	Description
!ACHK	Store the A-Key checksum in the modem
!ACTSTAT	Activation status.
!AKEY	Calculate the A-Key checksum; write the A-Key
!IOTABOOTURL	IOTA Boot URL
!IOTALOG	Display the IOTA EFS Log
!IOTAMSG	Control IOTA Message Level
!IOTASTART	Start a client initiated IOTA session
!IOTATDOMAIN	IOTA Trusted Domain
!SKU	Query Sierra Wireless SKU
+CARRIERID	Carrier ID
+PRIREV	PRI revision

4.2. Device Interrogation and Provisioning Reference

Result codes are not shown in the command tables unless special conditions apply. Generally the result code **OK** is returned when the command has been executed. **ERROR** may be returned if

parameters are out of range, and is returned if the command is not recognized or is not permitted in the current state or condition of the modem.

Table 35. Device Interrogation and Provisioning Command Details

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!ACHK=<value></td><td>Store the A-Key checksum in the modem.
See also !AKEY.</td></tr>
<tr><td>!ACTSTAT?</td><td>Query the activation status.
This command checks for a valid MIN.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>The modem has not been activated.</td></tr><tr><td>1</td><td>The modem has been activated.</td></tr></table></td></tr>
<tr><td>!AKEY=<value></td><td>Calculate the A-Key checksum; write the A-Key
If the value entered is a 20-digit number, the 6 digit checksum is returned.
If the value entered is a 26-digit number, the modem validates the last six digits (the checksum), before writing the validated A-Key to the modem.
If the checksum is invalid, or the A-Key has already been written, ERROR is returned.

Note: Run this command only AFTER the modem has been calibrated, default NV items have been loaded, and the modem has been reset. Otherwise, the produced checksum will be incorrect.

Example:
To write the A-Key for NAM 0:
<code>AT!AKEY=00,DF,D9,37,E5,9F,E0,86,2F
204516
OK</code>

See also !ACHK.</td></tr>
<tr><td>!IOTABOOTURL=<string>

!IOTABOOTURL?
  </td><td>IOTA Boot URL
This parameter represents IOTA parameter block phone:boot.url, which is the URL used for the client initiated IOTA session. This parameter is stored in one of the IOTA EFS files. Changes made to this parameter are persistent through power cycles.</td></tr>
<tr><td>!IOTALOG
  </td><td>Display the IOTA EFS Log
This command displays the IOTA EFS log created from the most recent IOTA session, either client initiated or network initiated.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!IOTAMSG= <0|1|2>

!IOTAMSG?

!IOTAMSG=?
  </td><td>Control IOTA Message Level
This parameter determines the IOTA message level for EFS logs, DIAG messages and AT command unsolicited messages. Setting this parameter will remain in effect until the next time the modem is power-cycled. The power-up default setting is 0.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Normal messages for EFS logs, DIAG messages and unsolicited messages (AT command initiated IOTA session only). No unsolicited messages are sent if an IOTA session was initiated from a CnS message or from an IOTA WAP trigger received from the network.</td></tr><tr><td>1</td><td>Normal messages for EFS logs, DIAG messages and unsolicited messages for all IOTA sessions (both client initiated and network initiated IOTA sessions).</td></tr><tr><td>2</td><td>Extended messages for EFS logs, DIAG messages and unsolicited messages for all IOTA sessions. Extended messages include normal messages plus additional debug messages.</td></tr></table></td></tr>
<tr><td>!IOTASTART
  </td><td>Start a client-initiated IOTA session
This command starts a client initiated IOTA session using the parameters stored in the IOTA EFS files. A mobile IP session is established using MIP profile 0, and an HTTPS connection is made to the URL stored in parameter block phone:boot.url.
MIP profile 1 data is provisioned during a client initiated IOTA session and, if the session is completed successfully, the active mobile IP profile is switched to 1. If an IOTA session fails, the previous active mobile IP profile is restored.
During a client initiated IOTA session, unsolicited messages show the progress of the IOTA session; when the session is concluded, OK or ERROR final result code is displayed.</td></tr>
<tr><td>!IOTATDOMAIN= <string>

!IOTATDOMAIN?
  </td><td>IOTA Trusted Domain
This parameter represents IOTA parameter block browser:domain.trusted, which is the trusted domain for IOTA sessions. This parameter is stored in one of the IOTA EFS files. Changes made to this parameter are persistent through power cycles.</td></tr>
<tr><td>!SKU?
  </td><td>Query the Sierra Wireless SKU</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+CARRIERID?
  </td><td>Carrier ID that the modem is configured for.
Queries the Carrier ID.

<table><tr><th>Value</th><th>Carrier</th></tr><tr><td>1</td><td>Generic</td></tr><tr><td>2</td><td>Sprint</td></tr><tr><td>3</td><td>Bell Mobility</td></tr><tr><td>4</td><td>Telus</td></tr><tr><td>5</td><td>Verizon</td></tr><tr><td>6</td><td>Western Wireless</td></tr><tr><td>7</td><td>Smartcom</td></tr><tr><td>8</td><td>Alltel</td></tr><tr><td>9</td><td>US Cellular</td></tr><tr><td>10 – 13</td><td>Obsolete</td></tr><tr><td>14</td><td>China Unicom</td></tr><tr><td>15</td><td>Hutchison Thailand</td></tr><tr><td>16</td><td>Movinet</td></tr><tr><td>17</td><td>Tarjetas-Lusacell Mexico</td></tr><tr><td>18</td><td>Telecom New Zealand</td></tr><tr><td>19</td><td>Reliance</td></tr><tr><td>20</td><td>Telstra</td></tr><tr><td>21</td><td>Mobility Canada</td></tr><tr><td>22</td><td>VZW Puerto Rico</td></tr><tr><td>23</td><td>Pelephone</td></tr><tr><td>24</td><td>Bell Canada</td></tr><tr><td>25</td><td>Indosol Indonesia</td></tr><tr><td>26</td><td>Midwest Wireless</td></tr><tr><td>27</td><td>Bell South Chile</td></tr><tr><td>28</td><td>Bell South Panama</td></tr><tr><td>29</td><td>Tata India</td></tr><tr><td>30</td><td>Alaska Communication Systems</td></tr><tr><td>31</td><td>Sprint Private Label Services</td></tr><tr><td>32</td><td>Starcomm Nigeria</td></tr><tr><td>33</td><td>Telecsa Ecuador</td></tr></table></td></tr>
<tr><td>+PRIREV?
  </td><td>PRI revision.
Reports the PRI revision (major and minor revision number).</td></tr>
</table>

5. Device Management Commands

OMA Device Management is a device management (DM) protocol specified by the Open Mobile Alliance (OMA) Device Management Working Group and the Data Synchronization (DS) Working Group.

5.1. Device Management Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands to allow you to more quickly locate a desired command when the operation is known but the command is not.

Table 36. Device Management Commands

Command	Description
!DMBOOT	Populate the bootstrap information in the DM tree file.
!DMCANCEL	Cancel an OMA-DM session.
!DMDC	Set or query the Device Configuration Session setting; initiate a CIDC session.
!DMDLRSP	Confirm or reject the installation of the FUMO update package.
!DMFUMO	Set or query the FUMO session setting; initiate a CIFUMO session.
!DMLOG	Display the contents of an OMA-DM EFS session log.
!DMMSG	Set or query the message logging level.
!DMPRL	Set or query the PRL Update session setting; initiate a CIPRL session.

5.2. Device Management Reference

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

Table 37. Device Management Command Details

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!DMBOOT</td><td>
Populate the bootstrap information in the DM tree file. To use the updated information, the modem must power-cycle after executing the command.
The bootstrap information contains the following four parameters:

Client Password
./DMAcc/AppAuth/clientAuth/AAuthSecret
Server Password
./DMAcc/AppAuth/clientAuth/AAuthSecret
Client Name
./DMAcc/AppAuth/clientAuth/AAuthName
Device Id
./DevInfo/DevId

The response includes the OMA-DM library provider and the session mask. The session mask value indicates the OMA-DM session types that the device supports.
<table>
<tr><th>Session Mask</th><th>Session Type</th></tr>
<tr><td>0x00000001</td><td>CIDC</td></tr>
<tr><td>0x00000002</td><td>NIDC</td></tr>
<tr><td>0x00000004</td><td>CIPRL</td></tr>
<tr><td>0x00000008</td><td>NIPRL</td></tr>
<tr><td>0x00000010</td><td>CIFUMO</td></tr>
<tr><td>0x00000020</td><td>NIFUMO</td></tr>
<tr><td>0x00000040</td><td>HFA</td></tr>
</table>
Example:
<pre>AT!DMBOOT
OK,OMA_DM_RED_BEND,4f
OK</pre>
Interpretation: “OMA_DM_RED_BEND” is the OMA-DM library provider; the device supports these session types: HFA, CIDC, NIDC, CIPRL, and NIPRL.
</td></tr>
<tr><td>!DMCANCEL</td><td>
Cancel an OMA-DM session.
Cancel any active or retry-pending (for example, an HFA retry pending) OMA-DM session.
If the session is Network Initiated (NI), then the modem may or may not queue a session reattempt; this is determined by the SKU configuration of the modem. If the NI session is not queued for a reattempt, then any NIA associated with this NI DM session is deleted from the modem; to reattempt the same NI session, the network must resend the NIA.
The modem never queues a cancelled Client Initiated (CI) session for a session reattempt; to reattempt the CI session, use !DMDC.
</td></tr>
<tr><td>!DMDC=<command>
!DMDC?</td><td>
Set or query the Device Configuration Session setting; initiate a CIDC session.
<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td>command</td><td>0</td><td>Disable the NIDC/CIDC Session setting</td></tr>
<tr><td></td><td>1</td><td>Enable the NIDC/CIDC Session setting</td></tr>
<tr><td></td><td>2</td><td>Initiate a CIDC session</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!DMDLRSP=<user_response></td><td>Confirm or reject the installation of the FUMO update package.
Once the update package is successfully downloaded from the OMA server, the user is prompted for the confirmation. If the user confirms the package (by entering AT!DMDLRSP=1), the modem proceeds with the firmware update. If user rejects the package (by entering AT!DMDLRSP=0), the modem discards the package.
This command has no effect if no update package is pending for user response.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>user_response</td><td>0</td><td>Reject the package.</td></tr><tr><td></td><td>1</td><td>Confirm installation of the package. The modem will then proceed with the firmware update.</td></tr></table></td></tr>
<tr><td>!DMFUMO=<command>

!DMFUMO?</td><td>Set or query the FUMO session setting; initiate a CIFUMO session.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>command</td><td>0</td><td>Disable the NIFUMO/CIFUMO Session setting.</td></tr><tr><td></td><td>1</td><td>Enable the NIFUMO/CIFUMO Session setting.</td></tr><tr><td></td><td>2</td><td>Initiate a CIFUMO session.</td></tr></table></td></tr>
<tr><td>!DMLOG [=<log_number>]</td><td>Display the contents of an OMA-DM EFS session log on the AT command port.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>log_number</td><td>0</td><td>Display the most recent session log (default).</td></tr><tr><td></td><td>1</td><td>Display the second most recent session log.</td></tr></table></td></tr>
<tr><td>!DMMSG=<level>

!DMMSG?</td><td>Set or query the message logging level.
The message logging level determines the type of messages generated for OMA-DM EFS logs, DIAG messages and AT command unsolicited messages.
A change to this parameter remains in effect until the modem is power cycled.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>level</td><td>0</td><td>No messages are logged.</td></tr><tr><td></td><td>1</td><td>Normal messages are logged (default).</td></tr><tr><td></td><td>2</td><td>Normal and debug messages are logged.</td></tr><tr><td></td><td>3</td><td>Normal, debug and extended debug messages are logged.</td></tr></table></td></tr>
<tr><td>!DMPRL=<command>

!DMPRL?</td><td>Set or query the PRL Update session setting; initiate a CIPRL session.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>command</td><td>0</td><td>Disable the NIPRL/CIPRL Session setting.</td></tr><tr><td></td><td>1</td><td>Enable the NIPRL/CIPRL Session setting.</td></tr><tr><td></td><td>2</td><td>Initiate a CIPRL session.</td></tr></table></td></tr>
</table>

6. Voice Commands

The AirPrime SL3010T embedded module has built-in audio support that allows the module to be used as a mobile phone.

The SL3010T supports a PCM digital audio interface and has a wide range of software-controlled, audio filtering and amplification stages that minimize the amount of external circuitry required on the host system.

At its most basic configuration, customers could add an external codec with the PCM interface.

The SL3010T also provides 13-tap FIR (Finite Impulse Response) filtering for both the receive and transmit paths to equalize the acoustic response of the speaker and microphone.

The embedded module can serve as an integral component of a more complex audio system, such as a PDA with a separate codec interfacing with the main processor. In this case, the interface between the modem and PDA codec can be as simple as line-level audio with no transducer considerations. Phone-oriented functions such as echo cancellation and FIR filtering are typically left to the module, while path-switching and transducer interfaces are the responsibility of the PDA codec. Functions such as adjustable gain and volume settings, DTMF and ringer tone generation, and mixing can be accomplished in either codec, depending on the architecture of the particular product. The interface between the module and host audio systems is usually the primary audio interface set to line-level amplitudes, routed as differential pairs for noise immunity.

6.1. Audio Profiles

The AT command set allows you to have different audio configurations for different purposes. As an example, assume you are embedding the module in a device that has a handset mode and a speakerphone mode. Assume also that you want to use different transmit gain, noise suppression, and echo cancellation settings in each mode. You can store the settings for each mode in separate audio profiles, and then activate the appropriate profile as your application switches to handset or speakerphone mode.

The SL3010T support various audio profiles:

- 0—Handset
- 1—Headset
- 2— Speaker phone
- 3— Car kit
- 4— HAC (Hearing Aid Compatibility)
- 5— TTY (TeleTYpe—a device that allows speech and hearing-impaired people to use a phone)

AT commands that are used to change the audio configuration has a profile parameter; any changes you make are applied to the specified profile. The default audio configuration for each profile is shown in one of the three following tables (depending on firmware version).

Table 38. Default Settings for Each Audio Profile (firmware versions 01.65 and newer)

Setting	Profile ID					
	0 Handset	1 Headset	2 Speaker Phone	3 Car Kit	4 HAC	5 TTY
Automatic Gain Control (TX) **!AVTXAGC**	Off					
Noise Suppression (TX) **!AVNS**	On	On	On	On	On	Off
AGC, AVC (RX) **!AVRXAGC**	Off					
Echo Cancellation **!AVEC**	Ear Seal	Headset	Speaker-phone	Acoustic	Ear Seal	Off
Sidetone gain **!AVCODECSTG**	-24 dB	-6 dB	-91 dB	-91 dB	-24 dB	-90 dB
Codec TX gain **!AVCODECTXG**	10 dB					
Codec RX gain **!AVCODECRXG**	2 dB	-1 dB	-1 dB	-1 dB	2 dB	-1 dB

Table 39. Default Settings for Each Audio Profile (firmware versions 01.09 and newer)

Setting	Profile ID					
	0 Handset	1 Headset	2 Speaker Phone	3 Car Kit	4 HAC	5 TTY
Automatic Gain Control (TX) **!AVTXAGC**	On					
Noise Suppression (TX) **!AVNS**	On	On	On	On	On	Off
AGC, AVC (RX) **!AVRXAGC**	On					
Echo Cancellation **!AVEC**	Ear Seal	Headset	Speaker-phone	Acoustic	Ear Seal	Off
Sidetone gain **!AVCODECSTG**	-36 dB	-18 dB	-96 dB	-96 dB	-36 dB	-96 dB
Codec TX gain **!AVCODECTXG**	-6.5 dB					Firmware versions 01.12 and newer: -14 dB Firmware versions 01.09 through 01.11: -6.5 dB
Codec RX gain **!AVCODECRXG**	-16.5 dB	-19.5 dB	-19.5 dB	-19.5 dB	-16.5 dB	Firmware versions 01.12 and newer: -1 dB Firmware versions 01.09 through 01.11: -19.5 dB

Table 40. Default Settings for Each Audio Profile (firmware versions 01.08 and earlier)

Setting	Profile ID					
	0 Handset	1 Headset	2 Speaker Phone	3 Car Kit	4 HAC	5 TTY
Automatic Gain Control (TX) **!AVTXAGC**	Off					
Noise Suppression (TX) **!AVNS**	On	On	Off	On	Off	On
AGC, AVC (RX) **!AVRXAGC**	Off					
Echo Cancellation **!AVEC**	Ear Seal	Headset	Acoustic	Speaker-phone	Ear Seal	Off
Sidetone gain **!AVCODECSTG**	-24 dB	-6 dB	Infinity	Infinity	-24 dB	Infinity
Codec TX gain **!AVCODECTXG**	10 dB					
Codec RX gain **!AVCODECRXG**	2 dB	-1 dB	-1 dB	-1 dB	2 dB	-1 dB

6.2. Profile Activation

Profile 0 (Handset) is the default profile. Unless you activate a different profile prior to establishing a circuit-switched call, the default profile is used in establishing the call. To use a profile other than Profile 0, use the command **!AVSETPROFILE** to activate the profile prior to establishing the call.

6.3. Voice Command Summary

Table 41. Voice Commands

Command	Description
!AVAUDIOLPBK	Enable / disable an audio loopback
!AVCODECRXG	Set / query CODEC RX gain
!AVCODECSTG	Set / query CODEC sidetone gain
!AVCODECTXG	Set / query the CODEC TX gain
!AVDEF	Set audio settings to default values
!AVDTMFTXG	Set / query the DTMF TX gain
!AVDTMFVOLDB	Set the audio volume and DTMF volume for each audio type
!AVEC	Set / query the echo cancellation setting
!AVEXTPCMCFG	Configure the external PCM interface
!AVEXTPCMSEL	Query / set external PCM interface for profile
!AVEXTPCMSTOPCLKOFF	Enable / disable the ability to turn off the external PCM interface clock
!AVMICGAIN	Set / query the microphone gain
!AVNS	Enable / disable noise suppression
!AVRXAGC	Set / query RX AVC / AGC configuration
!AVRXPCMFLTR	Set / query the RX PCM filter tap
!AVSETPROFILE	Activate a profile
!AVSN	Set / query audio revision number

Command	Description
!AVTONEPLAY	Play a tone
!AVTXAGC	Set the TX AGC
!AVTXPCMFLTR	Set / query the TX PCM filter tap
!AVTXVOL	Set the TX volume

6.4. Voice Reference

Table 42. Voice Reference

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVAUDIOLPBK=<enable>
  </td><td>Enable / disable an audio loopback
The loopback occurs at the vocoder interface and tests the audio front end with the EFR (Enhanced Full Rate) vocoder.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>enable</td><td>0</td><td>Loopback off</td></tr><tr><td></td><td>1</td><td>Loopback on</td></tr></table></td></tr>
<tr><td>!AVCODECRXG=<profile>, <value>

!AVCODECRXG? <profile></td><td>Set / query CODEC RX gain
The CODEC RX gain is applied to the digital signal prior to its conversion to the analog domain to provide additional gain range from -84dB to +12dB in the receive direction.
This setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.
This command has no effect if the specified profile’s external PCM interface is enabled. Use !AVEXTPCMSEL to disable the interface.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td>0x0000</td><td>Mute (minimum value)</td></tr><tr><td></td><td>0x4000</td><td>Unity gain</td></tr><tr><td></td><td>0xFFFF</td><td>Maximum value</td></tr></table>
You can calculate the gain in dB using this formula:
Gain = 20 $\log_{10}$ (<value> / 16384)
In the command, <value> is in hexadecimal format. In the formula, convert <value> to decimal format.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVCODECSTG=<profile>, <value>

!AVCODECSTG? <profile></td><td>Set / query CODEC sidetone gain
The side tone is the sound of the mobile user's own voice as heard on the mobile's speaker, and the gain ranges from -84dB to +12dB. This setting is stored in non-volatile memory and persists across power cycles. The change to the audio system takes place immediately if the specified audio profile is active.
This command has no effect if the specified profile’s external PCM interface is enabled. Use !AVEXTPCMSEL to disable the interface.
<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td>0x0000</td><td>Mute (minimum value)</td></tr><tr><td></td><td>0x4000</td><td>Unity gain</td></tr><tr><td></td><td>0xFFFF</td><td>Maximum value</td></tr></table>
You can calculate the gain in dB using this formula:
Gain = 20 $\log_{10}$ (<value> / 16384)
In the command, <value> is in hexadecimal format. In the formula, convert <value> to decimal format.</td></tr>
<tr><td>!AVCODECTXG=<profile>, <value>

!AVCODECTXG?</td><td>Set / query the CODEC TX gain
The CODEC TX gain is applied to the digital signal after its conversion from the analog domain to provide additional gain range from -84dB to +12dB in the transmit direction.
This setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.
This command has no effect if the specified profile’s external PCM interface is enabled. Use !AVEXTPCMSEL to disable the interface.
<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td>0x0000</td><td>Mute (minimum value)</td></tr><tr><td></td><td>0x4000</td><td>Unity gain</td></tr><tr><td></td><td>0xFFFF</td><td>Maximum value</td></tr></table>
You can calculate the gain in dB using this formula:
Gain = 20 $\log_{10}$ (<value> / 16384)
In the command, <value> is in hexadecimal format. In the formula, convert <value> to decimal format.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVDEF</td><td>Set audio settings to default values
This command sets all the configurable audio parameters to default values. The default values are also loaded into non-volatile memory.</td></tr>
<tr><td>!AVDTMFTXG=<profile>, <value>

!AVDTMFTXG? <profile></td><td>Set / query the DTMF TX gain
The DTMF TX gain determines the gain, from -84dB to +12dB, for the DTMF tone that is transmitted over the air.
This setting is stored in non-volatile memory and persists across power cycles. The change to the audio system takes effect when a phone call is made or received.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><value></td><td>0x0000</td><td>Mute (minimum value)</td></tr>
<tr><td></td><td>0x4000</td><td>Unity gain</td></tr>
<tr><td></td><td>0xFFFF</td><td>Maximum value</td></tr>
</table>

You can calculate the gain in dB using this formula:
Gain = 20 $\log_{10}$ (<value> / 16384)
In the command, <value> is in hexadecimal format. In the formula, convert <value> to decimal format.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVDTMFVOLDB=<profile>, <method>, <level>, <value>

!AVDTMFVOLDB? <profile>, <method>, <level></td><td>Set the audio volume and DTMF volume for each audio type.
This command sets the audio volume and the DTMF volume level for voice and key beep tones. The setting is stored in non-volatile memory and persists across power cycles. The change to the audio system takes effect immediately if the specified path is active and all the volumes have been initialized. (You must run the AVSETPROFILE command to assign specific volume ranges to each of the predefined volume levels, 0 through 7. See section 6.2 Profile Activation.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><method></td><td>0</td><td>Voice</td></tr>
<tr><td></td><td>1</td><td>Key beep</td></tr>
<tr><td><level></td><td></td><td>Volume level</td></tr>
<tr><td></td><td>0</td><td>Level 0</td></tr>
<tr><td></td><td>1</td><td>Level 1</td></tr>
<tr><td></td><td>2</td><td>Level 2</td></tr>
<tr><td></td><td>3</td><td>Level 3</td></tr>
<tr><td></td><td>4</td><td>Level 4</td></tr>
<tr><td></td><td>5</td><td>Level 5</td></tr>
<tr><td></td><td>6</td><td>Level 6</td></tr>
<tr><td></td><td>7</td><td>Level 7</td></tr>
<tr><td><value></td><td></td><td>Volume for the specified <level></td></tr>
<tr><td></td><td>0x0000 to 0x04B0</td><td>Positive gains</td></tr>
<tr><td></td><td>0xFFFF to 0xEC78</td><td>Negative gains</td></tr>
</table>

The volume in dB is equal to the <value>/100.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVEC=<profile>, <value>

!AVEC?<profile></td><td>Set / query the echo cancellation setting
The echo canceller monitors the conversation and eliminates the echo that may return to its point of origin (far end). Several settings are available:
Handset mode for mild echo with short delay
Headset mode for moderate echo with short delay
Car kit for loud echo with long delay
Speakerphone mode for loud echo with extreme acoustic distortion
This setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.
<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td></td><td>Echo cancellation mode</td></tr><tr><td></td><td>0</td><td>Echo cancellation off</td></tr><tr><td></td><td>1</td><td>Handset echo cancellation mode (ESEC—Ear Seal Echo Cancellation)</td></tr><tr><td></td><td>2</td><td>Headset echo cancellation mode</td></tr><tr><td></td><td>3</td><td>Car kit echo cancellation mode (AEC—Acoustic Echo Cancellation)</td></tr><tr><td></td><td>4</td><td>Echo cancellation speaker</td></tr></table></td></tr>
<tr><td>!AVEXTPCMCFG=
<clock>,<format>,<padding></td><td>Configure the external PCM interface
The change takes place immediately if the current audio profile uses the external PCM interface.
These settings are stored in NV memory and persist across power cycles.
Padding is typically disabled (padding bits are used to control the volume level for some external codecs).
<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><clock></td><td></td><td>PCM clock speed</td></tr><tr><td></td><td>0</td><td>2.048 MHz (short sync)</td></tr><tr><td></td><td>1</td><td>128 kHz (long sync)</td></tr><tr><td><format></td><td></td><td>PCM format type</td></tr><tr><td></td><td>0</td><td>8-bit µ-law</td></tr><tr><td></td><td>1</td><td>8-bit a-law</td></tr><tr><td></td><td>2</td><td>16-bit linear</td></tr><tr><td><padding></td><td>0</td><td>Disable padding</td></tr><tr><td></td><td>1</td><td>Enable padding</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVEXTPCMSEL? <profile>

!AVEXTPCMSEL=<profile>, <value></td><td>Query / set external PCM interface for profile
The change takes effect after the modem is reset.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><value></td><td></td><td>State of external PCM interface</td></tr>
<tr><td></td><td>0</td><td>Disable</td></tr>
<tr><td></td><td>1</td><td>Enable</td></tr>
</table>

The following commands affect a specified profile’s internal codec—they have no effect if that profile’s external PCM interface is enabled: AVCODECRXG, AVCODECSTG, AVCODECTXG, and AVMICGAIN. To use these commands, you must disable the profile’s external PCM interface and then reset the modem.</td></tr>
<tr><td>!AVEXTPCMSTOPCLKOFF?

!AVEXTPCMSTOPCLKOFF= <value></td><td>Enable / disable the ability to turn off the external PCM interface clock.
If the current audio profile uses the external PCM interface, this command enables or disables the ability to turn off the external PCM interface clock—the change takes effect after the modem is reset.
The external PCM interface for the current audio profile must be enabled before using this command.

<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>Disable the ability to turn off the PCM clock</td></tr>
<tr><td>1</td><td>Enable the ability to turn off the PCM clock</td></tr>
</table>

At startup, if audio profile 0 (default) uses the external PCM interface, the modem enables the clock.
At startup, if audio profile 0 (default) does not use the external PCM interface; the user must switch to a different profile that does to enable the clock.
If the user switches from a profile that uses the external PCM interface to one that does not, the PCM clock is lost.
Depending on the external CODEC configuration, OEMs using this command might prevent the audio from being muted, so the device could be more prone to noise from the RF subsystem.</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVMICGAIN=<profile>, <value>

!AVMICGAIN? <profile></td><td>Set / query the microphone gain
This setting provides a set of twenty-six gain levels from -6 dB to +49.5 dB (steps of 1.5 dB). The gain is applied to the analog audio input prior to its conversion into the digital domain.
This setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.
This command has no effect if the specified profile’s external PCM interface is enabled. Use !AVEXTPCMSEL to disable the interface.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td></td><td>Gain value</td></tr><tr><td></td><td>0 – 25</td><td>0 = -6 dB, 25 = 49.5 dB</td></tr></table></td></tr>
<tr><td>!AVNS=<profile>, <value>

!AVNS?<profile></td><td>Enable / disable noise suppression
The noise suppressor reduces or eliminates continuous background noise, providing a clearer Rx audio signal.
The change to the audio system takes place immediately if the specified audio profile is active.
This setting is stored in NV memory and persists across power cycles.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td></td><td>Noise suppression mode</td></tr><tr><td></td><td>0</td><td>Off</td></tr><tr><td></td><td>1</td><td>On</td></tr></table></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVRXAGC=<profile>, <value>

!AVRXAGC? <profile></td><td>Set / query RX AVC / AGC configuration
The RX AGC (Automatic Gain Control) compensates for variations in audio gains from the landline side, while the RX AVC (Automatic Volume Control) tracks the ambient audio noise on the mobile side and compensates accordingly. Both controls allow for a constant audio level in the RX direction. The setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><value></td><td></td><td>AVC / AGC configuration</td></tr>
<tr><td></td><td>0</td><td>AGC off, AVC off</td></tr>
<tr><td></td><td>1</td><td>AGC on, AVC on</td></tr>
<tr><td></td><td>2</td><td>AGC on, AVC off</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVRXPCMFLTR=<profile>, <tap>, <value>

!AVRXPCMFLTR? <profile>, <tap></td><td>
Set / query the RX PCM filter tap
The AirPrime SL3010T has a 7-tap PCM (Pulse Code Modulation) filter.
This command sets the RX PCM filter tap for the specified profile. This command is useful only when embedding the modem in a handset.
Mobile phones, PDAs or other handheld transmitters and receivers that incorporate a CDMA module are required to comply with certain standards or with national standards or government regulations. To conform to the relevant standard you may need to tune certain audio characteristics. This command allows you to tune the receive PCM filter to alter audio characteristics.
Settings are stored in non-volatile memory and persist across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.
The process of tuning the receive audio characteristics generally involves these steps:
1. Turn off the PCM filter (set <value> parameter to 0x0000 on Tap 6).
2. Use test equipment to obtain a frequency response curve with the passing mask.
3. Identify the frequency bands that need correction in order to bring the overall response within the bounds specified in the test case.
4. Use a filter design tool to determine the filter coefficients, convert to signed Q14 format, and enter the appropriate tap settings using the !AVRXPCMFLTR command.
5. Repeat the process until the specifications are met.
<value> is calculated using the formula: <value>= hex number of ROUND (filter coefficient x 2^{14})

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><tap></td><td></td><td>Sets the taps in use</td></tr>
<tr><td></td><td>0</td><td>Tap 0</td></tr>
<tr><td></td><td>1</td><td>Tap 1</td></tr>
<tr><td></td><td>2</td><td>Tap 2</td></tr>
<tr><td></td><td>3</td><td>Tap 3</td></tr>
<tr><td></td><td>4</td><td>Tap 4</td></tr>
<tr><td></td><td>5</td><td>Tap 5</td></tr>
<tr><td></td><td>6</td><td>Tap 6</td></tr>
<tr><td><value></td><td></td><td>Sets the RX PCM filter tap</td></tr>
<tr><td></td><td>0x0000–0xFFFF</td><td>0x0000 on Tap6 causes the PCM filter to be bypassed</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVSETPROFILE=<profile>, <earmute>, <micmute>, <generator>, <volume>, <cwtmute>

AVSETPROFILE? <generator></td><td>Activate a profile
This command is used to select a profile with which to establish a circuit-switched call. (See section 6.2 Profile Activation.) This command also enables/disables muting on the earpiece and microphone and sets the volume level.
The profile you select remains active until the modem is reset or powered down and up again. Following a reset or power up, Profile 0 (the default profile) is active.
You must run the !AVSETPROFILE command to assign specific volume levels to each of the predefined volume levels, 1 through 7.

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><profile></td><td></td><td>Audio profile</td></tr>
<tr><td></td><td>0</td><td>Handset</td></tr>
<tr><td></td><td>1</td><td>Headset</td></tr>
<tr><td></td><td>2</td><td>Speaker phone</td></tr>
<tr><td></td><td>3</td><td>Car kit</td></tr>
<tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr>
<tr><td></td><td>5</td><td>TTY</td></tr>
<tr><td><earmute></td><td></td><td>Enable / disable earpiece muting</td></tr>
<tr><td></td><td>0</td><td>Unmuted</td></tr>
<tr><td></td><td>1</td><td>Muted</td></tr>
<tr><td><micmute></td><td></td><td>Enable / disable microphone muting</td></tr>
<tr><td></td><td>0</td><td>Unmuted</td></tr>
<tr><td></td><td>1</td><td>Muted</td></tr>
<tr><td><generator></td><td></td><td>Audio type</td></tr>
<tr><td></td><td>0</td><td>Voice</td></tr>
<tr><td></td><td>1</td><td>Key beep</td></tr>
<tr><td></td><td>2</td><td>MIDI</td></tr>
<tr><td><volume></td><td></td><td>Volume level</td></tr>
<tr><td></td><td>0</td><td>Level 0</td></tr>
<tr><td></td><td>1</td><td>Level 1</td></tr>
<tr><td></td><td>2</td><td>Level 2</td></tr>
<tr><td></td><td>3</td><td>Level 3</td></tr>
<tr><td></td><td>4</td><td>Level 4</td></tr>
<tr><td></td><td>5</td><td>Level 5</td></tr>
<tr><td></td><td>6</td><td>Level 6</td></tr>
<tr><td></td><td>7</td><td>Level 7</td></tr>
<tr><td><cwtmute></td><td></td><td>Enable / disable call waiting tone muting</td></tr>
<tr><td></td><td>0</td><td>Unmuted (Default)</td></tr>
<tr><td></td><td>1</td><td>Muted</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!AVSN=<value>

!AVSN?</td><td>Set / query audio revision number
This command allows you to store and retrieve a revision number for your audio configuration. The modem does NOT associate this number with any settings, and this command does not provide a means of restoring a particular configuration. The command only provides a means of storing and retrieving a number.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td>value</td><td></td><td>Revision number</td></tr><tr><td></td><td>0x00000000 – 0xFFFFFFFF</td><td></td></tr></table></td></tr>
<tr><td>!AVTONEPLAY= <method>, <value></td><td>Play a tone
This command is used to play a specified tone with the current active audio profile. This is for testing purposes – not for normal operation.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><method></td><td></td><td>Audio type</td></tr><tr><td></td><td>0</td><td>Voice</td></tr><tr><td></td><td>1</td><td>Key beep</td></tr><tr><td><value></td><td></td><td>Tone setting</td></tr><tr><td></td><td>0x00 – 0x57</td><td>For details, see Table 43 Tone Settings for AT!AVTONEPLAY Command.</td></tr></table></td></tr>
<tr><td>!AVTXAGC= <profile>, <value>

!AVTXAGC? <profile></td><td>Set the TX AGC
The TX AGC (Automatic Gain Control) compensates for variations in audio gains from the mobile side to allow for a constant audio level in the TX direction.
The setting is stored in non-volatile memory and persists across power cycles.
The change to the audio system takes place immediately if the specified audio profile is active.

<table><tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr><tr><td><profile></td><td></td><td>Audio profile</td></tr><tr><td></td><td>0</td><td>Handset</td></tr><tr><td></td><td>1</td><td>Headset</td></tr><tr><td></td><td>2</td><td>Speaker phone</td></tr><tr><td></td><td>3</td><td>Car kit</td></tr><tr><td></td><td>4</td><td>HAC (Hearing Aid Compatibility)</td></tr><tr><td></td><td>5</td><td>TTY</td></tr><tr><td><value></td><td></td><td>Enable / disable TX AGC</td></tr><tr><td></td><td>0</td><td>AGC Off</td></tr><tr><td></td><td>1</td><td>AGC On</td></tr></table></td></tr>
</table>

Command	Description
!AVTXPCMFLTR=<profile>, <tap>, <value> **!AVTXPCMFLTR? <profile>, <tap>**	Set / query the TX PCM filter tap The SL3010T has a 7-tap PCM (Pulse Code Modulation) filter. This command sets the TX PCM filter tap for the specified profile. See **!AVRXPCMFLTR** for a description of using the filters. <value> is calculated using the formula: <value>= hex number of ROUND (filter coefficient x 2^{14})

Parameter	Value	Meaning
<profile>		Audio profile
	0	Handset
	1	Headset
	2	Speaker phone
	3	Car kit
	4	HAC (Hearing Aid Compatibility)
	5	TTY
<tap>		Sets the tap in use
	0	Tap 0
	1	Tap 1
	2	Tap 2
	3	Tap 3
	4	Tap 4
	5	Tap 5
	6	Tap 6
<value>		Sets the TX PCM filter tap
	0x0000–0xFFFF	0x0000 on Tap6 causes the PCM filter to be bypassed

Command	Description
!AVTXVOL=<profile>, <value> **!AVTXVOL? <profile>**	Set the TX volume The TX volume gain determines the gain, from -84 dB to +12 dB, for the voice that is transmitted over the air. This gain is applied to the PCM voice packets prior to feeding them into the vocoder, which encodes the PCM packets into a more efficient format for over-the-air transmission. This setting is stored in non-volatile memory and persists across power cycles. The change to the audio system takes effect when a phone call is made or received. Calculate the gain in dB using the formula: Gain = 20 log10 (<value> / 16384). In the command, <value> is in hexadecimal format. In the formula, convert <value> to decimal format.

Parameter	Value	Meaning
<profile>		Audio profile
	0	Handset
	1	Headset
	2	Speaker phone
	3	Car kit
	4	HAC (Hearing Aid Compatibility)
	5	TTY
<value>		TX volume gain
	0x0000	Mute (minimum value)
	0x4000	Unity gain
	0xFFFF	Maximum value

Table 43. Tone Settings for AT!AVTONEPLAY Command

<value>	Tone	Description
0x00	SND_0	DTMF for 0 key
0x01	SND_1	DTMF for 1 key
0x02	SND_2	DTMF for 2 key
0x03	SND_3	DTMF for 3 key
0x04	SND_4	DTMF for 4 key
0x05	SND_5	DTMF for 5 key
0x06	SND_6	DTMF for 6 key
0x07	SND_7	DTMF for 7 key
0x08	SND_8	DTMF for 8 key
0x09	SND_9	DTMF for 9 key
0x0A	SND_A	DTMF for A key
0x0B	SND_B	DTMF for B key
0x0C	SND_C	DTMF for C key
0x0D	SND_D	DTMF for D key
0x0E	SND_POUND	DTMF for # key
0x0F	SND_STAR	DTMF for * key
0x10	SND_CTRL	Tone for a control key
0x11	SND_2ND	Tone for secondary function on a key

<value>	Tone	Description
0x12	SND_WARN	Warning tone (e.g. overwriting user phone# slot)
0x13	SND_ERR	Tone to indicate an error
0x14	SND_TIME	Time marker tone
0x15	SND_RING_A	1st Ringer tone
0x16	SND_RING_B	2nd Ringer tone
0x17	SND_RING_C	3rd Ringer tone
0x18	SND_RING_D	4th Ringer tone
0x19	SND_RING_A4	440.0 Hz (Piano Notes)
0x1A	SND_RING_AS4	466.1 Hz
0x1B	SND_RING_B4	493.8 Hz
0x1C	SND_RING_C4	523.2 Hz
0x1D	SND_RING_CS4	554.3 Hz
0x1E	SND_RING_D4	587.3 Hz
0x1F	SND_RING_DS4	622.2 Hz
0x20	SND_RING_E4	659.2 Hz
0x21	SND_RING_F4	698.5 Hz
0x22	SND_RING_FS4	739.9 Hz
0x23	SND_RING_G4	784.0 Hz
0x24	SND_RING_GS4	830.6 Hz
0x25	SND_RING_A5	880.0 Hz
0x26	SND_RING_AS5	932.2 Hz
0x27	SND_RING_B5	987.7 Hz
0x28	SND_RING_C5	1046.5 Hz
0x29	SND_RING_CS5	1108.7 Hz
0x2A	SND_RING_D5	1174.6 Hz
0x2B	SND_RING_DS5	1244.3 Hz
0x2C	SND_RING_E5	1318.5 Hz
0x2D	SND_RING_F5	1397.0 Hz
0x2E	SND_RING_FS5	1479.9 Hz
0x2F	SND_RING_G5	1568.0 Hz
0x30	SND_RING_GS5	1661.2 Hz
0x31	SND_RING_A6	1760.0 Hz
0x32	SND_RING_AS6	1864.7 Hz
0x33	SND_RING_B6	1975.5 Hz
0x34	SND_RING_C6	2093.1 Hz
0x35	SND_RING_CS6	2217.4 Hz
0x36	SND_RING_D6	2349.3 Hz
0x37	SND_RING_DS6	2489.1 Hz
0x38	SND_RING_E6	2637.0 Hz
0x39	SND_RING_F6	2793.7 Hz
0x3A	SND_RING_FS6	2959.9 Hz
0x3B	SND_RING_G6	3135.9 Hz
0x3C	SND_RING_GS6	3322.4 Hz

<value>	Tone	Description
0x3D	SND_RING_A7	3520.0 Hz
0x3E	SND_RBACK	Ring back (audible ring)
0x3F	SND_BUSY	Busy tone
0x40	SND_INTERCEPT_A	First tone of an intercept
0x41	SND_INTERCEPT_B	Second tone of an intercept
0x42	SND_REORDER_TONE	Reorder
0x43	SND_PWRUP	Power-up tone
0x44	SND_OFF_HOOK_TONE	Off-hook tone, IS-95 (CAI 7.7.5.5)
0x45	SND_CALL_WT_TONE	Call-waiting tone
0x46	SND_DIAL_TONE_TONE	Dial tone
0x47	SND_ANSWER_TONE	Answer tone
0x48	SND_HIGH_PITCH_A	1st High pitch for IS-54B alerting
0x49	SND_HIGH_PITCH_B	2nd High pitch for IS-54B alerting
0x4A	SND_MED_PITCH_A	1st Medium pitch for IS-54B alerting
0x4B	SND_MED_PITCH_B	2nd Medium pitch for IS-54B alerting
0x4C	SND_LOW_PITCH_A	1st Low pitch for IS-54B alerting
0x4D	SND_LOW_PITCH_B	2nd Low pitch for IS-54B alerting
0x4E	ND_TEST_ON	Test tone on
0x4F	SND_MSG_WAITING	Message Waiting Tone
0x50	SND_PIP_TONE_TONE	Used for Pip-Pip-Pip-Pip (Vocoder) Tone
0x51	SND_SPC_DT_INDIA	Used for India's Special Dial Tone
0x52	SND_SIGNAL_INDIA	Used in Various India Signaling Tones
0x53	SND_DT_TONE_INDIA	Used for India's Normal Dial Tone (and others)
0x54	SND_DT_TONE_BRAZIL	Used for Brazil's Dial Tone
0x55	SND_DT_DTACO_TONE	Used for DTACO's single tone (350 Hz, 350 Hz)
0x56	SND_HFK_TONE1	These two tones are used for Voice Activation and Incoming Call Answer in phone VR-HFK
0x57	SND_HFK_TONE2	

7. GPS Commands

Position Determination Session Management (PDSM) is a GPS feature supported by some carriers/networks. The CDMA network is used to assist the modem to acquire a GPS location fix.

The set of commands supports access to the following items used for Location Processing:

Base station (BS) information

- IP address
- Network access level
- NMEA output
- Port ID
- Privacy level
- Transportation mechanism

For information on GPS support, please see the product specification for your Sierra Wireless product.

7.1. GPS Summary

The reference tables are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors.

The summary in this section offers a quick description of commands to allow you to more quickly locate a desired command when the operation is known but the command is not.

Table 44. GPS Commands

Command	Description
!GPSBSINFO	Returns the base station (BS) information used for Location Processing
!GPSCLRASSIST	Force a cold start for GPS acquisition.
!GPSIPADDR	Queries or sets the IP address used when TCP/IP is the transport mechanism for Location Processing.
!GPSNETACC	Queries or sets the network access level for location processing
!GPSNMEAENABLE	Enables or disables NMEA output
!GPSPORTID	Queries or sets the port ID to be used when TCP/IP is the transport mechanism for Location Processing
!GPSPRIV	Queries or sets the privacy level for location processing
!GPSPTLM	Queries or sets the transportation mechanism to be used for Location Processing.
!NMEA	Starts or stops the NMEA stream

7.2. GPS Reference

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

Table 45. GPS Command Details

Command	Description

!GPSBSINFO?	Returns the base station (BS) information used for Location Processing:
	• Stale Indicator
	  ▪ 0 = information is not stale
	  ▪ 1 = information is stale
	• Timestamp (time that the system parameter message was received from the Base Station)
	• Base Station ID
	• System ID
	• Network ID
	• Base Station Latitude
	• Base Station Longitude
	Note: Depending on the version of the module's firmware, access to the BS information may or may not be supported.
	
	Example 1:
	`AT!GPSBSINFO?`
	`Stale: 0`
	`Time: 200603174135938`
	`BSID: 12 SID: 8 NID: 12`
	`Lat: 33 Deg 7 Min 21.34 Sec N`
	`Lon: 117 Deg 16 Min 32.10 Sec W`
	`OK`
	
	Example 2:
	`AT!GPDBSINFO`
	`Not supported`
	`OK`

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSCLRASSIST=
<eph>,<alm>,
<pos>,<learn>,
<serv>,<time>,
<throttle></td><td>
Force a cold start for GPS acquisition.
Clears various assistance data in the modem, which forces the cold start. Individual items of the assistance data can be specified.

Example:
<code>AT!GPSCLRASSIST=1,1,1,0,0,0,1
OK</code>

<table>
<tr><th>Parameter</th><th>Value</th><th>Meaning</th></tr>
<tr><td><eph></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear epemeris assistance data</td></tr>
<tr><td><alm></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear almanac assistance data</td></tr>
<tr><td><pos></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear position assistance data</td></tr>
<tr><td><learn></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear self learning database</td></tr>
<tr><td><serv></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear serving system databas</td></tr>
<tr><td><time></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Clear time reference</td></tr>
<tr><td><throttle></td><td>0</td><td>Ignore</td></tr>
<tr><td></td><td>1</td><td>Reset the MS-based throttle parameters</td></tr>
</table>

Example (typical settings for a cold start):
<code>AT!GPSCLRASSIST=1,1,1,0,0,0,1
OK</code>
</td></tr>
<tr><td>!GPSIPADDR=<address>

!GPSIPADDR?</td><td>
Queries or sets the IP address used when TCP/IP is the transport mechanism for Location Processing.

Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
<code>AT!GPSIPADDR=196.168.1.15
OK</code>
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSNETACC=<access>

!GPSNETACC?</td><td>Queries or sets the network access level for location processing.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Network access only</td></tr><tr><td>1</td><td>No network access</td></tr><tr><td>2</td><td>Network access with demodulation</td></tr><tr><td>3</td><td>Network access without demodulation</td></tr></table>Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
AT!GPSNETACC=2
OK</td></tr>
<tr><td>!GPSNMEAENABLE=<nmea></td><td>Enables or disables output of the NMEA messages (stream) to the NMEA port. To start or stop the stream, use !NMEA.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Disable the NMEA stream</td></tr><tr><td>1</td><td>Enable the NMEA stream</td></tr></table>Example:
AT!GPSNMEAENABLE=1
OK</td></tr>
<tr><td>!GPSPORTID=<port ID>

!GPSPORTID?</td><td>Queries or sets the port ID to be used when TCP/IP is the transport mechanism for Location Processing.

Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
AT!GPSPORTID=2301
OK</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSPRIV=<level>

!GPSPRIV?</td><td>Queries or sets the privacy level for location processing.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Low</td></tr><tr><td>1</td><td>Medium</td></tr><tr><td>2</td><td>High</td></tr></table>Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
AT!GPSPRIV=2
OK</td></tr>
<tr><td>!GPSPTLM=<transport mode>

!GPSPTLM?</td><td>Queries or sets the transportation mechanism to be used for Location Processing.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>TCP/IP</td></tr><tr><td>1</td><td>Data Burst</td></tr></table>Note: A successful SET operation does not guarantee that the value has been updated in NV. It indicates that the request to update the value is syntactically correct, and the request is being placed in the queue. The application that has requested the change in value should verify that the value has actually changed (in NV), by issuing a query operation of this command.

Example:
AT!GPSPTLM=0
OK</td></tr>
<tr><td>!NMEA=<arg>

!NMEA=?</td><td>Starts or ends the NMEA stream.

<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>Start the NMEA stream</td></tr><tr><td>1</td><td>End the NMEA stream</td></tr></table>Example:
AT!NMEA=0
OK</td></tr>
</table>

8. EFS Commands

The command supports the following file operations:

- List the available space, used space and erased space in EFS
- List the file contents (in /SWIR directory, top directory, or a specified directory)
- List the directories in the modem's top directory

8.1. EFS Command Summary

Command	Description
!EFS	Check EFS space
!FML	Lists file contents of the modem's /SWIR directory.
!FMGENL	Lists file contents of a specified directory.
!FMGENDIRL	Lists the directories in the modem's top directory.

8.2. EFS Reference

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

Table 46. EFS Command Details

Command	Description
!EFS?	Returns the available space, used space, and erased space in EFS.
!FML	Lists the filename and size of each file in the modem's /SWIR directory. If the /SWIR directory is empty, **OK** is returned. If the /SWIR directory doesn't exist, an **ERROR** is returned.

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!FMGENL?

!FMGENL=<dir></td><td>Lists the filename and size of each file in a specified directory. If the directory is not specified, then the modem's top directory is used.

<table><tr><th>Parameter</th><th>Meaning</th></tr><tr><td>dir</td><td>Name of directory</td></tr></table>
If the directory doesn't exist, an error is returned.

Note: All filenames and directory names are case sensitive. If the directory is empty, OK is returned.

Example 1:
<pre>AT!FMGENL?
/$SYS.FACTORY   000000CE
/.DIAGCFG   00000005
/.DIAGIN   0000018B
/CLK_DB   00000040
OK</pre>Example 2:
<pre>AT!FMGENL=mydir
/myfile1   00000020
/myfile2   000000A1
OK</pre></td></tr>
<tr><td>!FMGENDIRL?</td><td>Lists the directories in the modem's top directory.

Note: All filenames and directory names are case sensitive.</td></tr>
</table>

EMConnect

EMConnect is a robust set of firmware features that enables original equipment manufacturers (OEMs) to reduce their development time, platform costs and dependence on host processors. Refer to the EMConnect Guide (document number: 2131177) for more information about EMConnect.

This section covers the following EMConnect features.

- Enhanced Serial (UART) Interface
- PAD (Packet Assembler/Dis-assembler)
- Connection Watchdog to ensure connectivity
- Enhanced GPIO
- Modem configuration persistence

The reference tables in the following sections are presented in alphabetical order. This format allows quick look-up of each command to verify syntax, parameters, and behaviors. The command summary table in each sub-sequent section offers a quick description of commands, allowing you to more quickly locate a desired command when the operation is known but the command is not.

A summary of the EMConnect Commands supported by the SL5011 and SL3010T are listed in the table below.

Table 47. EMConnect Command Summary

Command	Description
!AIN	Reads the raw value of the A/D converter (ADC_1)
!ADC	Reads the voltage value of the A/D converters (ADC_1, ADC_2)
!CWSETUP	Sets up and displays Connection Watchdog configuration
!CWSTATS	Displays the EFS logs of OMA-DM session. Also used to reset the reset/disconnect count to zero
!DIO	Reads or writes to the specified Digital IO channel
!DIOCFG	Configures and displays a digital IO line
!GPIOCONFIG	Stores the current configuration to be used for a particular GPIO
!PADCONF	Configures and displays the trigger conditions for packetization on the transmit side
!PADCONN	Initiates a PAD connection. Also shows the connection status for a specified PAD profile ID
!PADCUSTOM	Enables customized processing of data in PAD mode. Displays the custom mode.
!PADDISCONN	Disconnects an active PAD session
!PADSETUP	Sets up and displays IP address of remote PAD agent, they type of IP connection(TCP/UDP), local/remote TCP/UDP port numbers and autostart options
!PADLISTEN	Initiates a PAD TCP server connection, enters listening status and waits for a connection request from client
!PADDNSLOOKUP	Query the IP for a desired domain
!SWAPDSRRI	Swaps DSR and RI output signals on the development kit. Also displays if these signals are swapped or not
&W	Sets the AT persistence status

1. Enhanced Serial (UART) Interface Commands

Table 48. Enhanced Serial (UART) Interface Commands

Command	Description
`!SWAPDSRRI`	Swaps DSR and RI output signals on the development kit. Also displays if these signals are swapped or not

Also refer to +WHCNF and !SERIALPORTMAP for other enhanced UART settings.

1.1. !SWAPDSRRI

Protection: None

AT Command Set: E

1.1.1. Description

The query command returns if DSR line is swapped with the RI line in the dev kit. The set command sets the status of the DSR/RI line swap. This command is used to overcome the different routing of the UART signals in certain dev kits.

1.1.2. Syntax

Table 49. !SWAPDSRRI Query

Command Input	Output	Example

`AT!SWAPDSRRI?`	`!SWAPDSRRI: <swap>`	`AT!SWAPDSRRI?`
		`!SWAPDSRRI : 0`
		`OK`

Table 50. !SWAPDSRRI Assignment

Command Input	Output
`AT!SWAPDSRRI=<swap>`	`OK`

Table 51. !SWAPDSRRI Argument Description

Input	Range	Description
Swap	0-1	0 – DSR is not swapped with RI 1 – DSR is swapped with RI

2. PAD (Packet Assembler/Dis-Assembler)

PAD buffer limitations:

1. PAD SIO buffer is 1072 bytes when modem's CTS is de-asserted, then asserted.
2. PAD will only buffer the last received package (<=1500 bytes) when modem is from AT command mode back to data mode.

Table 52. PAD (Packet Assembler/Dis-Assembler) Commands

Command	Description
!PADCONF	Configures and displays the trigger conditions for packetization on the transmit side
!PADCONN	Initiates a PAD connection. Also shows the connection status for a specified PAD profile ID
!PADCUSTOM	Enables customized processing of data in PAD mode. Displays the custom mode.
!PADDISCONN	Disconnects an active PAD session
!PADLISTEN	Initiates a PAD TCP server connection, enters listening status and waits for a connection request from client
!PADDNSLOOKUP	Query the IP for a desired domain
!PADSETUP	Sets up and displays IP address of remote PAD agent, they type of IP connection(TCP/UDP), local/remote TCP/UDP port numbers and autostart options

2.1. !PADCONF

Protection: None

AT Command Set: E

2.1.1. Description

The query command returns the configuration settings. The set command configures the trigger conditions for packetization on the transmit side.

2.1.2. !PADCUSTOM=0

Table 53. !PADCUSTOM=0 Query

Command Input	Output	Example
AT!PADCONF?<padprofile>	**<padprofile>,<idle>,<timeout>,<pktlen>,<fwdopt>,<fwdchar>**	**AT!PADCONF?1** **1,0,50,0,0,0** **OK**

Table 54. !PADCUSTOM=0 Assignment

Command Input	Output
`AT!PADCONF=<padprofile>,<idle>,<timeout>,<pktlen>,<fwdopt>,<fwdchar>`	`OK`

Table 55. !PADCUSTOM=0 Argument Description

Input	Range	Description
Padprofile	1-3	PAD profile ID
Idle	0-65535	0 - idle disconnect timeout disabled 1-65535 – idle disconnect timeout in seconds
Interchar	0-65535	0 – intercharacter timeout trigger disabled 1-65535 – intercharacter timeout in milliseconds
Pktlen	0-1460	0 – packet length trigger is disabled 1-1460 – number of bytes for packet length trigger
Fwdopt	0-2	0 – Forwarding Character trigger is disabled 1 – Forwarding Character trigger is enabled and character is included in message 2 – Forwarding Character trigger is enabled and character is excluded from message

2.1.3. !PADCUSTOM=1

Table 56. !PADCUSTOM=1 Query

Command Input	Output	Example

`AT!PADCONF?`	`<idle>,<escape>,<framing>`
	`for all three profiles`
		`AT!PADCONF?`
		`0,1,0,0`
		`1,0,0,0`
		`2,0,0,0`
		`OK`

Table 57. !PADCUSTOM=1 Assignment

Command Input	Output
`AT!PADCONF=<idle>,<escape>,<framing>`	`OK`

Table 58. !PADCUSTOM=1 Argument Description

Input	Range	Description
Idle	0-255	Inactivity timeout. If the timer expires, the PAD session is terminated. It's not implemented yet. 0 – Disabled 1-255 timer duration in minutes
Escape	0	0 - +++ ends the PAD session(not implemented)
Framing	0 – 1	Framing option for data 0 – No framing 1 – Framing character are added to data sent to T-box.

2.2. !PADCONN

Protection: None

AT Command Set: E

2.2.1. Description

The query command returns the state of the PAD session. The set command is used to initiate a PAD connection using the setup and configuration settings for a desired profile ID. At least one trigger condition must be defined for this command to execute.

2.2.2. Syntax

Table 59. !PADCONN Query

Command Input	Output	Example
AT!PADCONN?	<padprofile>,<connection state>	AT!PADCONN?1 0 OK

Table 60. !PADCONN Assignment

Command Input	Output
AT!PADCONN=<padprofile>	CONNECT, NO CARRIER or ERROR

Table 61. !PADCONN Argument Description

Input	Range	Description
Padprofile	1-3	PAD profile ID (0-2 for !PADCUSTOM = 1)
Connection state	0-1	0 – PAD session inactive 1 – PAD session escaped and active

2.3. !PADCUSTOM

Protection: None

AT Command Set: E

2.3.1. Description

The query command returns the customization mode. The set command enables customized processing of data in PAD mode. Setting the value to zero will disable the customization mode. For !PADCUSTOM = 1(Magneti), a different set of parameters are used for !PADSETUP, !PADCONF and !PADCONN.

2.3.2. Syntax

Table 62. !PADCUSTOM Query

Command Input	Output	Example

`AT!PADCUSTOM?`	`<mode>`	`AT!PADCUSTOM?`
		`0`
		`OK`

Table 63. !PADCUSTOM Assignment

Command Input	Output
`AT!PADCUSTOM=<mode>`	`OK`

Table 64. !PADCUSTOM Argument Description

Input	Range	Description
Mode	0-255	Customization mode enabled

2.4. !PADDISCONN

Protection: None

AT Command Set: E

2.4.1. Description

This command is provided as an alternative means of disconnecting an active PAD session and has the same effect as ATH.

2.4.2. Syntax

Table 65. !PADDISCONN Query

Command Input	Output	Example

`AT!PADDISCONN`	`OK`, followed by `NO CARRIER`	`AT!PADDISCONN`
		`OK`
		`NO CARRIER`

2.5. !PADLISTEN

Protection: None

AT Command Set: E

2.5.1. Description

The query command returns the state of the active PAD TCP server session. The set command is used to initiate a PAD TCP server listen using the setup and configuration settings for a desired profile ID. At least one trigger condition must be defined for this command to execute.

2.5.2. Syntax

Table 66. !PADLISTEN Query

Command Input	Output	Example
AT!PADLISTEN?	<padprofile>,<connection state>	AT!PADLISTEN?1 0 OK

Table 67. !PADLISTEN Assignment

Command Input	Output
AT!PADLISTEN=<padprofile>,[,<manual>]	OK, NO CARRIER or ERROR

Table 68. !PADCONN Argument Description

Input	Range	Description
Padprofile	1-3	PAD profile ID(0-2 for !PADCUSTOM = 1)
Manual	0-1	0 – When remote client connects, modem sends a “CONNECT PAD” response to host and switches the port to PAD mode (default) 1 – When remote client connects, modem sends a “CLIENT UP” response to host and waits for an ATO command to send a “CONNECT PAD” response before switching to PAD mode

2.6. !PADDNSLOOKUP

Protection: None

AT Command Set: E

2.6.1. Description

The query command returns the IP address for a desired domain. It is MUST that there is no any active PAD connection for this command to execute.

2.6.2. Syntax

Table 69. !PADDNSLOOKUP Query

Command Input	Output	Example

`AT!PADDNSLOOKUP?<domain>`	IP address of the desired domain and OK if it is successful
	
	+CME: 129 and ERROR if failed
		`AT!PADDNSLOOKUP?www.sierrawireless.com`
		`69.10.131.102`
		`OK`
		
		`AT!PADDNSLOOKUP?www.google.com`
		`+CME: 129`
		
		`ERROR`

2.7. !PADSETUP

Protection: None

AT Command Set: E

2.7.1. Description

The query command will return the PAD setup settings. The set command specifies the IP address of the remote PAD agent, the type of IP connection (TCP or UDP), the local and remote TCP/UDP port numbers and the auto-start option.

2.7.2. !PADCUSTOM=0

Table 70. !PADCUSTOM=0 Query

Command Input	Output	Example

`AT!PADSETUP?<padprofile>`	`<padprofile>,<conntype>,<ipaddr>,<localport>,<remoteport>,<autostart>,<conprofile>`	`AT!PADSETUP?1`
		`1,1,216.139.218.195,5000,8009,0,1`
		`OK`

Table 71. !PADCUSTOM=0 Assignment

Command Input	Output
`AT!PADSETUP=<padprofile>,<conntype>,<ipaddr>,<localport>,<remoteport>,<autostart>,<conprofile>`	`OK`

Table 72. !PADCUSTOM=0 Argument Description

Input	Range	Description
padprofile	1-3	PAD profile ID

Input	Range	Description
conntype	0-2	0 – PAD profile is disabled 1 – UDP client 2 – TCP client 3 – TCP server
ipaddr	nnn.nnn.nnn.nnn	Destination IP address
localport	0 – 65535	0 – port number is assigned by modem 1-65535 – port number used by modem
remoteport	1 – 65535	Port number of remote client
autostart	0 – 1	0 – Auto-start is disabled 1 – Auto-start is enabled
conprofile	1-16	Connection profile ID, default is 1 if not specified

2.7.3. !PADCUSTOM=1

Table 73. !PADCUSTOM=1 Query

Command Input	Output	Example

`AT!PADSETUP?`	`<profile #>,<IP address>,<port #> for all 3 profiles`	`AT!PADSETUP?`
		`0,216.139.218.195,8009`
		`1,0.0.0.0,0`
		`2,0.0.0.0,0`
		`OK`

Table 74. !PADCUSTOM=1 Assignment

Command Input	Output
`AT!PADSETUP=<profile #>,<IP address>,<port #>`	`OK`

Table 75. !PADCUSTOM=1 Argument Description

Input	Range	Description
Profile #	0-2	Profile number, 3 profiles available
IP address	nnn.nnn.nnn.nnn	Destination IP address
Port #	1 – 65535	Destination port number

3. Connection Watchdog

Table 76. Connection Watchdog Commands

Command	Description
!CWSETUP	Sets up and displays Connection Watchdog configuration
!CWSTATS	Displays the EFS logs of OMA-DM session. Also used to reset the reset/disconnect count to zero

3.1. !CWSETUP

Protection: None

AT Command Set: E

3.1.1. Description

The query command returns the Connection Watchdog configuration settings. The set command configures the Connection Watchdog settings.

3.1.2. Syntax

Table 77. !CWSETUP Query

Command Input	Output	Example
AT!CWSETUP?	<mode>,<PingIP>,<dnsname>, <rxint>,<valint>,<reset>	AT!CWSETUP? 1,216.139.218.195,"www.yahoo.com",1,1,1 OK

Table 78. !CWSETUP Assignment

Command Input	Output
AT!CWSETUP=<mode>,<PingIP>,<dnsname>, <rxint>,<valint>,<reset>	OK

Table 79. !CWSETUP Argument Description

Input	Range	Description
Mode	0-2	0 – CW is disabled 1 – CW uses Ping method 2 – CW uses DNS method
PingIP	nnn.nnn.nnn.nnn	IP address of ping server
Dnsname	128 chars max	Domain name for DNS lookup(e.g. “www.yahoo.com”)
Rxint	1-1440	Interval in minutes at which the modem checks if new data has been received since the last check

Input	Range	Description
Valint	1-10	Interval in minutes at which the modem reattempts to validate the CW method, if the previous attempt had failed
Reset	0-1	0 – Do not reset the modem if CW detects a bad connection – just reestablish data connection 1 – Reset the modem if CW detects a bad connection

3.2. !CWSTATS

Protection: None

AT Command Set: E

3.2.1. Description

The query command returns the status of the Connection Watchdog such as the state of the connection watchdog, check counter and reset/disconnect count. The set command resets the reset/disconnect counter to zero.

3.2.2. Syntax

Table 80. !CWSTATS Query

Command Input	Output	Example

`AT!CWSTATS?`	`State : <state>`
	`Check Counter : <check counter>`
	`Reset/Disconnect Count : <rd_cnt>`
		`AT!CWSTATS?`
		`Connection Watchdog State: Off`
		`Check Counter: 1`
		`Reset/Disconnect Count: 3`
		`OK`

Table 81. !CWSTATS Assignment

Command Input	Output
`AT!CWSTATS=0`	`OK`

Table 82. !CWSTATS Argument Description

Input	Range	Description
State	Off, Validating, Active	Connection Watchdog state
Check Counter	0 -	Number of times CW sent a Ping/DNS to check the connection since power-up
Rd_cnt	0 -	Number of times CW caused a reset or disconnect

4. Enhanced GPIO

Table 83. Enhanced GPIO Commands

Command	Description
!AIN	Reads the raw value of the A/D converter (ADC_1)
!ADC	Reads the voltage value of the A/D converters (ADC_1, ADC_2)
!GPIOCONFIG	Stores the current configuration to be used for a particular GPIO.
!DIO	Reads or writes to the specified Digital IO channel
!DIOCFG	Configures and displays a digital IO line

4.1. !AIN

Protection: None

AT Command Set: E

4.1.1. Description

The query command returns the ADC reading at the analog input (ADC_1).

4.1.2. Syntax

Table 84. !AIN Query

Command Input	Output	Example
AT!AIN?	AIN: <reading>	AT!AIN? AIN:254 OK

Table 85. !AIN Argument Description

Input	Range	Description
Reading	0-255	ADC reading at analog input of ADC_1

4.2. !ADC

Protection: None

AT Command Set: E

4.2.1. Description

The query command returns the ADC reading at the analog input (ADC_1 or ADC_2). The value is the voltage of the A/D converter in MV and showed in HEX mode.

4.2.2. Syntax

Table 86. !ADC Query

Command Input	Output	Example

`AT!ADC?<channel>`	`ADC Value= 0x<read value>`	`AT!ADC?37`
		`ADC Value=`
		`0x7D0 ;2000MV`
		`OK`
		`AT!ADC?38`
		`ADC Value=`
		`0xA4 ;164MV`
		`OK`

Table 87. !ADC Argument Description

Input	Range	Description
`channel`	`37-38`	37: channel ADC_1 38: channel ADC_2

4.3. !GPIOCONFIG

Protection: None

AT Command Set: S

4.3.1. Description

A GPIO can have different configurations which performs different functions. This command is used to store the current configuration to be used for a particular GPIO. It can store configurations of up to 16 GPIOs. These values are stored in NV and will persist across power cycles.

4.3.2. Syntax

Table 88. !GPIOCONFIG Query

Command Input	Output	Example
AT!GPIOCONFIG?	0 <GPIO> <GPIO Config> . . . 15 < GPIO > <GPIO Configu>	AT!GPIOCONFIG? 0 255 255 1 255 255 2 255 255 3 255 255 4 255 255 5 255 255 6 255 255 7 255 255 8 255 255 9 255 255 10 255 255 11 255 255 12 255 255 13 255 255 14 255 255 15 255 255 OK

Table 89. !GPIOCONFIG Assignment

Command Input	Output
AT!GPIOCONFIG =<location number> <GPIO> <GPIO Config>	OK

Table 90. !GPIOCONFIG Argument Description

Input	Range	Description
location number	0-15	16 locations to store the configurations of the GPIOs
GPIO	0x00-0xff	GPIO number in HEX
GPIO Config	-	At any time, each GPIO can perform different functions depending on the configurations. Configuration of the GPIO to be set usually varies between 0-3 but can have more depending on the functions it can perform.

4.4. !DIO

Protection: None

AT Command Set: E

4.4.1. Description

The query command returns the read value for a given digital IO channel. The set command writes to an IO if it is an output.

4.4.2. Syntax

Table 91. !DIO Query

Command Input	Output	Example

`AT!DIO?<chan>`	`!DIO:<chan>,<level>`	`AT!DIO?1`
		`!DIO:1,0`
		`OK`

Table 92. !DIO Assignment

Command Input	Output
`AT!DIO=<chan>,<level>`	`OK`

Table 93. !DIO Argument Description

Input	Range	Description
Chan	1-4	Channel number read(or to read)
Level	0-1	0 – IO is at low logic level 1 – IO is at high logic level

4.5. !DIOCFG

Protection: None

AT Command Set: E

4.5.1. Description

The query command returns the digital IO configuration settings. The set command configures the digital IO. For both targets, the digital IO channels are defined below.

Table 94. GPIO Pin Mapping

Digital IO Channel	Pin Name	Modem Connector Pin Number	Description
1	GPIO_1	3	Digital input/output
2	GPIO_2	2	Digital input/output
3	GPIO_3	1	Digital input/output
4	GPIO_4	4	Digital input/output

4.5.2. Syntax

Table 95. !DIOCFG Query

Command Input	Output	Example
AT!DIOCFG?<chan>	!DIOCFG: <chan>,<enable>,<type>, <initval/notify>	AT!DIOCFG?1 !DIOCFG: 1,1,1,1 OK

Table 96. !DIOCFG Assignment

Command Input	Output
AT!DIOCFG=<chan>,<enable>,<type>,<initval/notify>	OK

Table 97. !DIOCFG Argument Description

Input	Range	Description
Chan	1-4	Digital IO Channel Number
Enable	0-1	0 – IO function is disabled 1 – IO function is enabled on pin(disables alternate function on connector pin)
Type	0-2	0 – Output 1 – Input pull-up 2 – Input pull-down
Initval(for outputs)	0-1	0 – Set output low at power-up 1 – Set output high at power-up
Notify(for inputs)	0-1	0 – Disable input level change notification message 1 – Enable input level change notification message

5. Modem Configuration Persistence

Table 98. Modem Configuration Persistence Commands

Command	Description
&W	Sets the AT persistence status.

5.1. &W

Protection: None

AT Command Set: S

5.1.1. Description

Turns the AT persistence feature ON and OFF. When the persistence feature is on, it will save the settings for the following AT commands:

- ATE
- AT+IPR
- AT+ICF
- ATQ
- ATV
- ATX
- AT&C
- AT&D
- AT&S

5.1.2. Syntax

Table 99. &W Assignment

Command Input	Output
AT&W<arg>	**OK**

Table 100. &W Argument Description

Input	Range	Description
arg	0-1	0 – persistence feature OFF 1 – persistence feature ON

Appendix A: ASCII Table

Table 101. ASCII Table

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	64
ENQ	5	05	%	37	25	E	69	45	e	101	65
ACK	6	06	&	38	26	F	70	46	f	102	66
BEL	7	07	’	39	27	G	71	47	g	103	67
BS	8	08	(	40	28	H	72	48	h	104	68
HT	9	09	)	41	29	I	73	49	i	105	69
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

Appendix B: Acronyms and Definitions

Table 102. Acronyms and Definitions

Acronym or Term	Definition
AGC	Automatic Gain Control
AMSS	Advanced Mobile Subscriber Software
Cellular	800MHz radio spectrum air interface
CI	Client-Initiated
CIDC	Client-Initiated Device Configuration
CIFUMO	Client-Initiated Firmware Update Management Object
CIPRL	Client-Initiated PRL Update
CnS	Control and Status (language) – a proprietary protocol for managing the control and status of the modem.
dB	Decibel = 10 x log10 (P1/P2) (Power dB) Decibel = 20 x log10 (V1/V2) (Voltage dB)
dBm	Decibels, relative to 1 mW - Decibel(mW) = 10 x log10 (Pwr (mW)/1mW)
DM	Device Management. See also OMA-DM
EFS	Encrypted File System
endpoint, USB	A uniquely addressable portion of a USB device used to transfer information between the host and module.
EP	See endpoint (above).
FER	Frame Error Rate – a measure of receive sensitivity
FUMO	Firmware Update Management Object
GSM	Global Positioning System – a system that uses a series of 24 geosynchronous satellites to provide navigational data.
HFA	Hands Free Activation
IOTA	Internet Over The Air – an automated feature, supported by some service providers, to perform account setup for you by making a connection to the CDMA network and using a secure Internet connection to download account parameters to your modem.
IS-95	2G radio standards targeted for voice (cdmaONE)
MHz	MegaHertz = 1e6 Hertz (Hertz = 1/second)
MIN	Mobile Identification Number—a number that identifies a specific mobile unit within a wireless carrier's network.
MIP	Mobile IP
NAM	Number Assignment Module—a CDMA account definition that includes a phone number and other unique unit and network identifiers.
NDIS	Network Driver Interface Specification—a programming interface specification for connecting network interface cards in Windows.
NI	Network-Initiated
NIA	Network-Initiated Alert
NID	Network Identification – a number that uniquely identifies a network.
NIDC	Network-Initiated Device Configuration
NIFUMO	Network-Initiated Firmware Update Management Object
NIPRL	Network-Initiated PRL Update
NV	Non-Volatile (memory) – Random Access Memory that retains its contents even if the power is removed.

Acronym or Term	Definition
OEM	Original Equipment Manufacturer – a company that manufactures a product and sells it to a reseller.
OMA-DM	Open Mobile Alliance - Device Management. A device management (DM) protocol specified by the Open Mobile Alliance (OMA) Device Management Working Group and the Data Synchronization (DS) Working Group.
PCS	Personal Communication System - PCS spans the 1.9GHz radio spectrum.
PDE	Position Determination Entity – the device that the mobile communicates with for assistance in acquiring a GPS location fix.
PRI	Product Release Instructions—a file that contains the settings used to configure wireless products for a particular service provider, customer, or purpose.
PRL	Preferred Roaming List—an account configuration item set by the user's service provider. It controls the radio channels/network carrier used by the modem.
response	A response from the modem that is issued prior to a result code.
result code	A numeric or text code that is returned after all commands (except resets).
RF	Radio Frequency
Sensitivity (RF)	Measure of lowest power signal that the receiver can measure.
TTY	TeleTYpe – a device that allows people who are deaf, hard of hearing, or speech-impaired to use the telephone to communicate.

SIERRA
WIRELESS