AT Command Reference

Proprietary and Confidential

Products supported:

MiniCard	MC5728V
ExpressCard/PC Card	AirCard 402
USB modem	USB 598 AirCard 102U AirCard 250U

SIERRA WIRELESS

2130620
Rev 2

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Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.

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For up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases, consult our website:

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Revision history

Version	Summary of changes	Internal doc
1.0 Sep05	Initial release	
1.1 Oct06	Added support for GPS, AirCard 595 PC Card, EM5725 module, MC5725/MC5725V Mini Card. Modified commands: !STATUS (page 49) New commands: !APPSUBTYPES (page 35), !GPSDLOAD (page 36), !GPSEND (page 38), !GPSFIX (page 38), !GPSLOC (page 39), !GPSLOCK (page 40), !GPSSTATUS (page 41), !GPSTRACK (page 42), !MUFWDRESET (page 43), !MUFWDSTATS (page 43), !PERSONALITY (page 44), !PROTSUBTYPES (page 45), !SCPCUSTCONFIG (page 46),	

Version	Summary of changes	Internal doc
	!SESSIONSTATUS (page 46), !SLEEPPARMS (page 48), !SUFWDCCSTATS (page 49), !SUFWDCRCS (page 51), !SUFWDRESET (page 51), !SUFWDTCSTATS (page 52)	
Apr07	Removed support for EM5725 module. Added support for AirCard 595U USB modem. Changes to these commands: !GPSTRACK (page 42), !SSMS (page 48)	
1.2 Apr08	~TONDUR (page 86) – added mapping between Parm value and duration used over the air. Added support for: • MC5757 module • Compass 597 USB modem • AirCard 597E ExpressCard.	
1.3 Sep08	Added I command (page 79). Changes to these commands: !STATUS (page 49)—Added ERI information; +GMR (page 70)—Added details about the version information (for Bugzilla item 10848).	
1.4 Feb09	Removed EM5625, MC5720. Added USB 598 and AirCard 402. Removed references to NAM 1. Only NAM 0 is supported. Added column “Internal doc” to the current table. Added !GPSSATINFO (page 40) and !PREV (page 45). Removed ~PREV.	Rev. 0.7
1.5 Mar09	Added MC5728V.	N/a
1.6 Feb10	Added support for AirCard 102U and AirCard 250U USB modems. New formatting.	N/a
2 Aug 12	Changes to the patents section. Removed products that have reached end-of-life (Compass 597, AirCard 595, 595U, 597E, MC 5725, 5725V, 5727, 5727V).	N/a

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1: About This Guide

Introduction

This reference describes the Attention (AT) command set supported by the AirCard™ 402 modem, AirCard 102U, AirCard 250U, and USB 598 modems, and the MC5728V CDMA 1xEV-DO embedded modem. Unless specified otherwise, the word “modem” applies to all of these Sierra Wireless products.

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 a section “Modem Basics” (page 16), 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.

References

This guide covers only the command set used by the modem and 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.

Requests for hard copies of standards should be directed to the Global Engineering Documents Division of Information Handling Services:

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Global Engineering operates offices around the world. For locations, consult the web site above.

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 and terms that are in common use in data communications and cellular technology. Many of these items are described in Appendix C: Acronyms and definitions (page 101).

Our Internet site provides a Glossary (document #2110032) that may be helpful in understanding some acronyms and terminology used in this guide.

Currency

Versions

Document

This document is under ongoing revision to expand explanations and enhance detail. This edition is:

Rev 2, 23 August 2012

This document is current with the modem firmware revisions shown in the following table.

Product	Firmware version
AirCard 102U USB modem	SWI6085_FP_01.16 or newer
AirCard 250U USB modem	SWI6085_FP_01.16 or newer
USB 598 modem	SWI6085_FP_01.00 or newer
AirCard 402 modem	SWI6085_FP_01.00 or newer
MC5728V	SWI6800V2_FP.01.04 or newer

To determine your firmware revision:

- Enter the AT command **AT**+GMR

The modem will respond with the software and firmware revision information. The details following the revision number include Sierra Wireless information on the specific build followed by the date and time of the build.

Upgrading

If your modem firmware is an earlier version, you can acquire updated firmware from our web site or by contacting your account manager.

Document structure

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 (page 26)
- Basic modem configuration—settings governing the modem's behavior when executing basic operations (page 27)

- Advanced modem configuration—settings governing the modem's behavior related to advanced operations (for example, Mobile IP) (page 29)
- Account activation and management commands (page 30)
- Device and service interrogation commands—commands to determine the services available, information about and the status of the modem (page 30)
- Voice operation—related to configuring, making, and controlling voice calls (page 32)
- SMS operations—commands to check, receive, and delete, incoming messages, and to originate outgoing messages (page 32)
- GPS—commands related to Location Based Services
- Fax configuration and operation commands—configuring and operating in fax mode (page 33)

In addition to the commands, the definitions and use of status registers is also described (page 87). The factory / reset defaults are listed in a table starting on page 91.

Result codes, both numeric and verbose, are provided in a table (page 89). Extended Cellular Result Codes are also listed (page 89).

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.

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.

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 “Framing” on page 25.

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

```
CONNECT 14400
```

Note: You can view this guide online or print it to keep on hand. If you're viewing it online, simply click a topic in the Table of Contents, or any page reference, table reference, or section reference. (Most text that is blue is a clickable link.) The PDF automatically displays the appropriate page.

2: Modem Basics

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.

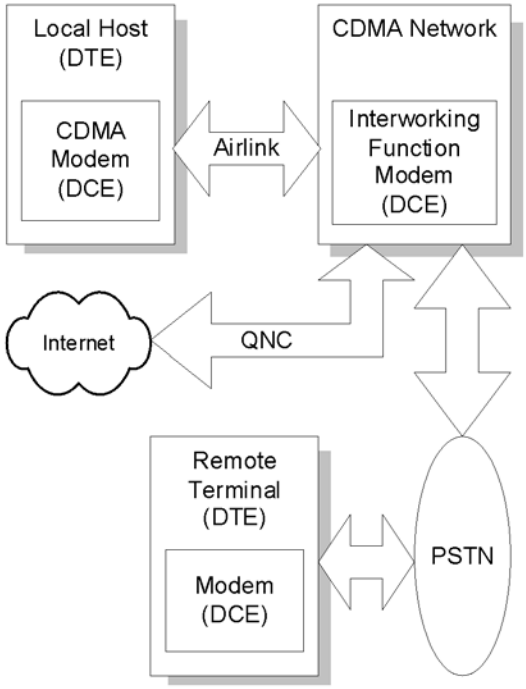
Traditional wireline

Before looking at the call setup process in CDMA, lets 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.

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



Note: *When using IS 95, there is special handling of AT commands. For a detailed explanation, consult* *Appendix A (page 95).*

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.

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.

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.

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.

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

Voice service

Also added with the MC5728V modem is the ability to make and receive voice calls. This allows the modem to serve as a cellular telephone.

Note: The AirCard102U/250U/402/ USB598 products do not support voice.

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.

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 AirCard102U/250U/402/ USB598/ MC5728V products introduce 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.

Modes

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

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.

Fax (CSC)

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

Voice

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

Note: The AirCard102U/250U/402/ USB598 products do not support voice.

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

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.

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.

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.

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.

Conditions

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

Online

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

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.

State transitions

On powerup the modem is in command state.

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.

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.

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.*

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

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.

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.

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.

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.

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.

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.

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).

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

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.

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 23 on page 87 indicates the standard default values. The factory defaults are shown in Table 27 on page 91.

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.

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 24 on page 89 lists all result codes, giving both the numeric and verbose results.

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.

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.

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.

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.

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>

3: Commands

Introduction

The modem supports commands for:

- IS 95B data service
- Fax service
- 1X packet service
- SMS
- Voice (MC5728V modem only)
- GPS

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

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.

Basic operation actions

Table 1: Basic modem operation actions

Command	Page	Description
&F	56	Factory Settings Restore
&V	56	View Configuration
+++	56	Escape from data state to command state
A/	77	Repeat last command (re-execute the line in the command buffer)
A	77	Answer—Manual
D	77	Dial

Command	Page	Description
H	79	Hook Control
O	80	Online (Remote)
Z	82	Profile Restore
~DTMFB	82	DTMF Burst
~DTMFK	82	DTMF Key
~RESET	84	Reset
~SHTDWN	85	Shutdown
~TONMUT	87	Tone Mute

Basic modem configuration

Table 2: Basic modem configuration

Command	Page	Description
&C	55	Data Carrier Detect Control
&D	56	Data Terminal Ready Options
+ATINIT	57	AT Initialization
+ATINITSTATE	58	AT Initialization State
+CFG	59	Configuration String
+CMUX	61	Multiplex Option
+CQD	62	Command State Inactivity Timer
+CRC	62	Cellular Result Codes
+CRM	62	Local (R_m) Interface Protocol
+CTA	64	Packet Data Inactivity Timer
+CXT	65	Cellular Extension
+FCLASS	66	Modem Operating State

Command	Page	Description
+ICF	72	Character Framing
+ILRR	72	Local Rate Reporting
+IPR	73	Fixed Port (R_m) Rate
+MA	73	Modulation Automode
+MR	73	Modulation Reporting
+MS	73	Modulation Selection
+MV18R	74	V.18 Reporting
+MV18S	75	V.18 Selection
+WWKUP	76	Wake-up Events Mask
E	79	Echo (Command State)
L	80	Loudness (Speaker Volume)
M	80	Mute (Speaker Control)
P	80	Pulse Dialing
Q	80	Quiet—Result Code Display Option
S	81	S-Register Read and Write
T	81	Tone Dialing
V	81	Verbose—Result Code Form
X	81	Result Code/Call Progress Control
~HDSET	83	Headset Detection Option
~TONDUR	86	Tone Duration

Advanced modem configuration

Table 3: Advanced modem configuration

Command	Page	Description
!APPSUBTYPES	35	Application subtypes negotiated for the four streams
!MUFWDRESET	43	Resets all the data reported by !MUFWDSTATS.
!MUFWDSTATS	43	Current Multi-User Forward Traffic Channel Statistics
!PERSONALITY	44	Current personality and its negotiated protocol subtypes
!PROTSUBTYPES	45	Negotiated subtypes for all protocols in all stored personalities
!SCPCUSTCONFIG	46	Current Session Configuration Protocol Customer configuration
!SESSIONSTATUS	46	Current HDR session status
!SIPID	47	Simple IP setup (user ID)
!SIPPWD	47	Simple IP setup (password)
!SLEEPPARMS	48	1xEV-DO Rev. A sleep parameters (slot cycle indexes and sleep periods)
!SUFWDCCSTATS	49	Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Control Channel)
!SUFWDCRCS	51	Current Single User Forward Channel Statistics (Single User packet CRCs and Packet Error Rate).
!SUFWDRESET	51	Resets the data reported by !SUFWDCCSTATS, !SUFWDCRCS, and !SUFWDTCSTATS.
!SUFWDTCSTATS	52	Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Traffic Channel)
$QCMIP	53	Mobile IP behavior
$QCMIPEP	53	Enables/disables the currently active Mobile IP user profile.
$QCMIPGETP	54	Query a user profile

Command	Page	Description
$QCMIPNAI	54	Set the Network Access ID (NAI) for the currently active profile
$QCMIPP	54	Select one of the Mobile IP user profiles to be the current active profile

Account activation

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

Table 4: Account activation and management commands

Command	Page	Description
~NAMLCK	83	NAM Lock—enter the subsidy lock or SPC required to write account data
~NAMVAL	84	NAM Values—query or set the account data

Device and service interrogation

Table 5: Device and service interrogation commands

Command	Page	Description
I	79	Product identification information.
!ECIO	36	Ec/Io
!GMODE	36	Mode of the modem
!MDMVER	36	Version of the modem firmware
!PREV	45	Protocol Revision
!PRLVER	45	PRL version
!RSSI	45	Received Signal Strength Indication
!STATUS	49	Modem status report
!SYSTIME	52	CDMA time
+CAD?	58	Analog or Digital Service (Read-only) (local only)
+CBC?	59	Battery Charge (Read-only) (local only)

Command	Page	Description
+CBIP?	59	Base Station IP Address (Read-only)
+CGCAP	60	Get IWF Capabilities
+CGMI	60	Get IWF Manufacturer
+CGMM	60	Get IWF Model
+CGMR	60	Get IWF Revision
+CGOI	60	Get IWF ISO ID
+CGSN	61	Get IWF ESN
+CMIP	61	Mobile Station IP Address (Read-only)
+CSQ	63	Signal Quality (Read-only)
+CSS?	64	Serving System (Read-only)
+GCAP	70	Get Capabilities
+GMI	72	Get Manufacturer
+GMM	72	Get Model Number
+GMR	70	Get Revision
+GOI	72	Get ISO ID
+GSN	72	Get ESN
+WGETWK	76	Request Wake-up Reason
S	81	S-Register Read

Voice operation

Note: The AirCard102U/250U/402/ USB598 products do not support voice.

Table 6: Voice operation

Command	Page	Description
$QCCAV	53	Answer Voice
+CDV	59	Dial Voice
+CHV	61	Hang-up Voice
~ECHO	83	Echo Cancellation
~MICMUT	83	Microphone Mute
~SPKMUT	85	Speaker Mute
~SPKVOL	85	Speaker Volume
~STGLVL	86	Side Tone Gain Level

SMS messages

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

Table 7: SMS operations

Command	Page	Description
!CNTSMS	36	Count of SMS messages in the modem
!DASMS	36	Delete All SMS messages
!DSMS	36	Delete SMS message (selective)
!GSMS	43	Get SMS message from the modem
!SSMS	48	Send SMS message, or query the send status

GPS

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

Table 8: GPS commands

Command	Page	Description
!GPSDLOAD	36	Initiate a download of ephemeris and almanac data
!GPSEND	38	End an active position location session
!GPSFIX	38	Initiate a location fix
!GPSLOC	39	Get the last known location of the modem
!GPSLOCK	40	Query or set the GPS lock for location processing
!GPSSATINFO	40	Get information for all satellites in view and those used in the last known, successful location fix.
!GPSSTATUS	41	Get the status of position location sessions (Fixed, and Download)
!GPSTRACK	42	Initiate a location tracking session

Fax operation

Table 9: Fax configuration and operation commands

Command	Page	Description
$QCVAD	55	Answer as Data or Fax
+CFC	59	Airlink Fax Compression (Remote)
+FAA	65	Fax Adaptive Answer (Remote)
+FAP	65	Fax Addressing and Polling Capabilities (Remote)
+FBO	65	Fax Data Bit Order (Remote)
+FBS	65	Fax Buffer Size (Read-only)
+FBU	65	Fax HDLC Frame Reporting (Remote)
+FCC	66	Fax DCE Capabilities (Remote)
+FCLASS	66	Modem Operating State

Command	Page	Description
+FCQ	66	Fax Copy Quality (Remote)
+FCR	66	Fax Capability to Receive (Remote)
+FCT	66	Fax DCE Phase-C Timeout (Remote)
+FDR	67	Fax Data Reception (Remote)
+FDT	67	Fax Data Transmission (Remote)
+FEA	67	Fax EOL Alignment (Remote)
+FFC	67	Fax Format Conversion (Remote)
+FHS	67	Fax Call Termination Status (Remote) (Read-only)
+FIE	67	Fax Procedure Interrupt Enable (Remote)
+FIP	67	Fax Initialize Parameters (Remote)
+FIS	67	Fax Current Session Negotiation (Remote)
+FKS	67	Fax Kill Session (Remote)
+FLI	68	Fax Local ID String (Remote)
+FLO	68	Fax Flow Control Select
+FLP	68	Fax Indicate Document to Poll (Remote)
+FMI	68	Fax Manufacturer (Remote)
+FMM	68	Fax Model (Remote)
+FMR	68	Fax Revision (Remote)
+FMS	68	Fax Minimum Speed (Remote)
+FNR	68	Fax Negotiation Reporting (Remote)
+FNS	68	Fax Non-standard Frame FIF (Remote)
+FPA	68	Fax Selective Polling Address (Remote)
+FPI	69	Fax Local Polling ID String (Remote)
+FPR	69	Fax Serial Port Rate Control

Command	Page	Description
+FPS	69	Fax Page Status (Remote)
+FPW	69	Fax Password (Remote)
+FRQ	69	Fax Receive Quality Threshold (Remote)
+FRY	69	Fax ECM Retry Value (Remote)
+FSA	69	Fax Sub-address (Remote)
+FSP	69	Fax Request to Poll (Remote)

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 24 on page 89.

! Prefix

Table 10: ! 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

Command	Description
!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 on page 36). Parm 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).
!ECIO?	Ec/Io If there is an active pilot, returns the current Ec/Io in units of 1dB. See also !RSSI (page 45).
!GMODE	Mode of the modem Returns either “ONLINE” or “OFFLINE”
!GPSDLOAD= <freq>, <duration>	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.

Command	Description

Parm	Value	Meaning
freq	1	Periodic
	2	Single
duration	1- 65535	Number of minutes between downloads. Valid when freq = 1. This parameter is required, even if freq = 2.

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

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

Example 1

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td></td><td>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><td>Parm</td><td>Value</td><td>Meaning</td></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 (page 36).
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; page 41). Once the status shows that the fix is complete, the application should use !GPSLOC (page 39) 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 (page 36).
<table><tr><td>Parm</td><td>Value</td><td>Meaning</td></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></td></tr>
</table>

Command	Description

	Example 1
	`AT!GPSFIX=2,30,200`
	`OK`
	
	Example 2
	`AT!GPSFIX=3,60,100`
	`ERRCODE = 18`

!GPSLOC	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).
	
	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
	`AT!GPSLOC`
	`Unknown`
	`OK`
	
	Example 2
	`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`
	
	Example 3 (“Altitude” not included)
	`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`

Command	Description
	OK
!GPSLOCK= <lock> !GPSLOCK?	Queries or sets the GPS lock for location processing Value — Meaning 0 — No GPS lock active 1 — Mobile initiated sessions locked 2 — Mobile terminated sessions locked 3 — All GPS sessions locked (except 911) **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!GPSLOCK=2 OK
!GPSSATINFO	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: 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

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>!GPSSTATUS</td><td>
Get the status of position location sessions (Fixed, and Download).
<table>
<tr><td>Status</td><td>Meaning</td></tr>
<tr><td>NONE</td><td>No session of this type has occurred since powerup</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>
Example 2
<pre>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</pre>
<table>
<tr><td>FAILCODE</td><td>Meaning</td></tr>
<tr><td>0</td><td>Phone is offline</td></tr>
<tr><td>1</td><td>No service</td></tr>
<tr><td>2</td><td>No PDE connection</td></tr>
<tr><td>3</td><td>No data available</td></tr>
<tr><td>4</td><td>Session manager busy</td></tr>
<tr><td>5</td><td>CDMA locked</td></tr>
<tr><td>6</td><td>GPS locked</td></tr>
</table>
</td></tr>
</table>

Command	Description	
	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
!GPSTRACK= <fixtype>, <maxtime>, <maxdist>, <fixcount>, <fixrate>	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; page 41). Once the status shows that the session is complete, the application should use !GPSLOC (page 39) to obtain the result. If the modem is unable to initiate the tracking session, an error code is returned. Parm / Value / Meaning fixtype / / Type of fix to perform / 1 / Standalone / 2 / MS-Based Only	

Command	Description
	3 — MS-Assisted Only 4 — Optimized for speed 5 — Optimized for accuracy 6 — Optimized for data maxtime — 0 - 255 — Number of seconds allowed to capture satellite information maxdist — 0 – 4294967280 — Accuracy (in meters) the application prefers fixcount — 1 - 999, or 1000 = continuous — Number of fixes to perform fixrate — 0 – 1800 — Number of seconds between each fix
!GSMS?<i,m>	Get SMS Read an SMS message from the modem. The message read is determined by the parameters: Parm — Meaning i — message list (index 1, 2, or 3) m — message number 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
!MDMVER?	Version of the modem firmware Returns the firmware version being run on the modem. See also +GMR (Get Revision) (page 70).
!MUFWDRESET	Resets all the data reported by !MUFWDSTATS.
!MUFWDSTATS	Current Multi-User Forward Traffic Channel Statistics !MUFWDRESET resets the data reported by this command. Sample:

Command	Description
	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

Command	Description
!PREV?	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. Value Meaning 1 JSTD-008 (PCS) 2 IS-95 3 IS-95A (cellular) 4 Minimum requirements for IS-95B 5 Full requirements for IS-95B 6 CDMA 1X Rev. 0 7 CDMA 1X Rev. 1
!PRLVER?	PRL Version Returns the version of the PRL stored in the modem.

!PROTSUBTYPES?	Negotiated subtypes for all protocols in all stored personalities.
	Example:
	`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`

!RSSI?	Received Signal Strength Indication Reports the current RSSI (P(AGC)+Ec/Io) in dBm using a

Command	Description
	(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.

!SCPCUSTCONFIG?	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`

!SESSIONSTATUS=<lower_byte>,<upper_byte>	Set or read the current Session status. Value Meaning 0 Inactive—there is no session 1 Default—there is a session, but no

Command	Description

!SESSIONSTATUS?	negotiation has been completed
	2 Active—there is a session, and all parameters have had at least one chance to be negotitated
	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`

!SIPID=<user id>	User ID information for Simple IP setup. See also !SIPPWD (page 47).
!SIPPWD=<passwrd>	Password information for Simple IP setup See also !SIPID (page 47).

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

Command	Description
	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.
!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) (page 64).
!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 (page 51) resets the data reported by this command.

Command	Description
	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 (page 51) 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 (page 51) 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

$ Prefix

Table 11: $ Prefix command

Command	Description
$QCCAV	Answer Voice (MC5728V modem only) Answers an incoming call as a voice call. Use ~SPKMUT (Speaker Mute) (page 85) to manually unmute the audio path before answering the call. Contrast with A (Answer) (page 77). See also +CDV (Dial Voice) (page 59), and +CHV (Hang-up Voice) (page 61).
$QCMIP	Mobile IP (MIP) behavior Value — Meaning 0 — Mobile IP disabled. Simple IP only. 1 — Mobile IP preferred. In the initial MIP registration, if the network does not support Mobile IP, then the mobile automatically reverts to Simple IP. However, if a Mobile IP session is registered and then the mobile enters a network that does not support Mobile IP, the mobile will drop the session and inform the upper layers of the failure. 2 — Mobile IP only. The mobile will make data calls only when Mobile IP is supported in the network. During a MIP session, if the mobile hands off to a network that does not support MIP, then the mobile will drop the session and inform the upper layers of the failure. If a connected data device wants to use its own Mobile IP implementation, the mobile's IP implementation should be disabled by setting AT$QCMIP to 0.
$QCMIPEP	Enables/disables the currently active Mobile IP user profile. To enable the currently active profile, use AT$QCMIPEP = 1. To disable the currently active profile, use AT$QCMIPEP = 0. See also $QCMIPP (page 54).

Command	Description
$QCMIPGETP	Query a user profile. AT$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.
$QCMIPNAI	Set the Network Access ID (NAI) for the currently active profile. AT$QCMIPNAI= "user@domain", 0 or 1 Value Meaning 0 Do not store in NOVRAM 1 Store in NOVRAM The double quotes (“ ”) are required only if the string contains a comma.
$QCMIPP	Select one of the Mobile IP user profiles to be the current active profile. AT$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 (page 53).

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.

& Prefix

Table 12: & 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)

Command	Description
&D[n]	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 MC5728V modem, nor does it affect the use of DTR to control modem shutdown.* Value Setting 0 Ignore DTR 1 Enter command state for an on-to-off DTR transition. The modem condition (on or offline) is not affected. **(Currently not supported.)** 2 Hang up and enter command state for an on-to-off DTR transition. Auto-answer is disabled if DTR is off. (Default)
&F	Factory Settings Restore Reloads the factory-stored default configurations into active memory. For information on factory settings, see Table 27 on page 91. This command is functionally the same as Z (Reset). If there is an active call, the command executes and the call is dropped.
&V[n]	View Configuration Displays the active profile (commands and S-register contents). Any numeric parameter is ignored.

+++ Escape

Table 13: +++ Escape command

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 modem 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.

+A Prefix

Table 14: +A Prefix command

Command	Description
+ATINIT=<cmd>[,C|T[,s[,c]]] +ATINIT?	AT Initialization This command is used to store an AT command string into the modem, or query the modem for the current initialization string. If the initialization string is not empty, the AT commands in this string are executed when the modem is powered on or reset. If the initialization string is empty, no AT commands are executed upon modem startup. The **AT**+ATINITSTATE command is used to enable or disable the execution of the command stored by +ATINIT upon modem 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. Parm — Meaning cmd — The character string that is executed upon modem 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. C|T — 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. s — 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. c — 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. If the string is accepted without errors, it is echoed to the serial terminal with the semicolon and comma characters replaced. If

Command	Description
	only the string is given, then it is assumed that the T command is desired. Example 1: **AT+ATINIT=+GMR,c** Stores the single command "**+GMR**" to report the revision of the firmware. Example 2: **AT+ATINIT=+GMR\+CMUX=2/2,c,\,/** 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**
+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 modem startup.

+C Prefix

Table 15: +C Prefix commands

Command	Description
+CAD?	Analog or Digital Service (Read-only) (local only) Reports the current service mode of the modem 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

Command	Description
+CBC?	Battery Charge (Read-only) (local only) Reports the power source and battery level in the form +CBC: status,level. The 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) (page 61).
+CDV [options]	Dial Voice (MC5728V modem 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 (page 77). The options available are the same as those described for async data/fax dialing. Voice dialing leaves the modem 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) (page 61)**.**
+CFC=<n>	Airlink Fax Compression (Remote) Sets the form of compression between the modem 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.)**
+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.

Command	Description
+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 modem is not registered for service, the ERROR result code is returned. See also +GCAP (Get Capabilities) (page 70).
+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 modem is not registered for service, the ERROR result code is returned. See also +GMI (Get Manufacturer) (page 72).
+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 modem is not registered for service, the ERROR result code is returned. See also +GMM (Get Model) (page 72).
+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 modem is not registered for service, the ERROR result code is returned. See also +GMR (Get Revision) (page 70).
+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 modem is not registered for service, the ERROR result code is returned. See also +GOI (Get ISO ID) (page 72).

Command	Description
+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 modem is not registered for service, the ERROR result code is returned. See also +GSN (Get ESN) (page 72).
+CHV [0]	Hang-up Voice (MC5728V modem only) Terminates a voice connection previously established with +CDV (Dial Voice; page 59), or $QCCAV (Answer Voice; page 53). The only valid parameter is zero, which is optional. See also H (Hook Control) (page 79).
+CMIP?	Mobile Station IP Address (Read-only) Returns the IP address assigned to the modem 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 modem issues no response, only the OK result code. See also +CBIP (Base Station IP Address) (page 59).
+CMUX=<f[,r]> +CMUX?	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 (page 62). The first parameter is for the forward link (from the Base Station to the modem) and the second is for the reverse link (from the modem to the Base Station). Parm — Value — Meaning f — 1 - F — Hexadecimal value for Multiplex Option for the forward link. r — 1 - 2 — Multiplex Option for the reverse link. 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 modem originates data calls using Rate Set 1. If both are even, originated calls use Rate Set 2.

Command	Description
+CQD=<n> +CQD?	Command State Inactivity Timer This timer determines when (or if) the modem will release a call if there is no activity on the connection between the modem and the IWF, for the specified period. The entry represents a multiple of five seconds. That is, each unit represents 5 seconds. Value — Meaning 0 — Disables the timer 1–255 — Indicates timer value in steps of five seconds. The default value is 10, meaning a timer setting of 50 seconds. See also +CTA (Packet mode Inactivity Timer) (page 64).
+CRC=<n> +CRC?	Cellular Result Codes Enables or disables cellular result codes for call progress. Value — Meaning 0 — Disables cellular result codes (Default) 1 — Enables cellular result codes The extended cellular result codes are in Table 25 on page 89. Extended cellular call progress codes are in Table 26 on page 90.
+CRM=<n> +CRM?	Local (R_m) Interface Protocol Reports (or sets) the protocol for the local (DCE - DTE) interface. This value is set automatically by the modem, based on the data received. Value — Meaning 0 — Asynchronous Data or Fax (Default) 1 — Packet data service, Relay Layer interface

<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 modem has acquired service but is not in an active call, the SQM value is valid but the FER is still undetectable.

<table>
<tr><td>SQM</td><td>Meaning</td></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><td>FER</td><td>Meaning</td></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 (page 45).
</td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+CSS?</td><td>Serving System (Read-only)

Reports the cellular band and system on which the modem is registered. The response is in the form
+CSS: <class>, <band>, <system>.

class — Meaning
0 — Current band class is unsupported by this command.
1 — 800 MHz Cellular
2 — 1900 MHz PCS

band — Meaning
A - F — Registered on a band system indicated.
Z — Not registered

system — Meaning
0–32767 — System ID of the network that the modem is currently registered with.
99999 — Modem is not registered.

See also !STATUS (Status) (page 49).</td></tr>
<tr><td>+CTA=<n>

+CTA?</td><td>Packet Data Inactivity Timer

This timer determines when (or if) the modem will use dormant mode on the network. If a timer value is set, the modem releases the radio resource if there is no activity (RLP data frames) on the connection between the modem and the network for the specified period.

The modem 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 modem restores the link when traffic resumes.

Each unit represents 1 second.

Value — Meaning
0 — Disables the timer (default)
1–255 — Indicates timer value in seconds.

Note: When set to 0, the network governs the dormant mode timing.

See also +CQD (Command State Inactivity Timer) (page 62).</td></tr>
</table>

Command	Description
+CXT=<n> +CXT?	Cellular Extension Enables and disables the passing of unrecognized AT commands to the IWF. If disabled, the modem replies with ERROR to unrecognized commands. If enabled, the modem opens the transport layer airlink and enters passthrough state. Use H0 (on-hook) (page 79) to close the airlink. Value — Meaning 0 — Do not pass unrecognized commands. (Default) 1–255 — Open a transport layer connection and pass the unrecognized command to the IWF.

+F Prefix

Table 16: +F Prefix commands

Command	Description
+FAA	Fax Adaptive Answer (Remote) This command is passed to the IWF. In order to be useful, the modem 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 modem 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.
+FBU	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.

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+FCC</td><td>Fax DCE Capabilities (Remote)
Sets or reports the following sub-parameters in sequence:
<table><tr><th>Parm</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>Modem Operating State
Sets the modem'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 modem. 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) (page 70).</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 modem 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>
</table>

Command	Description
+FDR	Fax Data Reception (Remote) Receive Phase-C Data For details on use, see EIA/TIA-592.
+FDT	Fax Data Transmission (Remote) Transmit Phase-C Data For details on use, see EIA/TIA-592.
+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 (page 66). 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 modem is in command state, offline condition, the OK result code is returned without processing.

Command	Description
+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 modem after the successful fax transmission of the polled document. No result code is returned.
+FMI?	Fax Manufacturer (Remote) Reports IWF Fax Modem Manufacturer.
+FMM	Fax Model (Remote) Reports IWF Fax Modem Model.
+FMR	Fax Revision (Remote) Reports IWF Fax Modem 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.
+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.

Command	Description
+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 modem 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 modem 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 modem after the successful reception of a fax. No result code is sent.

+G Prefix

Table 17: +G Prefix commands

Command	Description
+GCAP	Get Capabilities Reports the modem's additional capabilities in one or more lines of text containing **AT+** commands that the modem supports. This is used to determine if services the user needs can be performed by the modem. The services and commands reported can be any or all of: Response — Description (related commands) +FCLASS — Fax support (all fax related commands) +MS — Modulation control (+MS, +MR) +MV18S — V.18 modulation control (+MV18S, +MV18R) +ES — Error control (+ES, +EB, +ER, +EFCS, +ETBM) +CIS707-A — IS-707-A (High Speed Packet Data Services) CIS-856 — IS-856 (High Rate Packet Data Air Interface) +DS — Data compression (+DS, +DR) See also +CGCAP (Get IWF Capabilities) (page 60).
+GMR	Get Revision Reports the modem 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: p2006001: P: Production release The next two digits indicate the product ID: Value — Product 25 — USB 598 27 — AirCard 402 28 — MC5728V 29 — AirCard 102U 30 — AirCard 250U The next three digits indicate the firmware build version: for example, 060 corresponds to firmware build version 0.60. The next digits (two; in some cases, four) indicate the point release within the above build version. In our example, 06001 means point release .01 in firmware build 0.60. The command also returns version information on some or all of the following: Description QCOM — Boot images

Command	Description

	BOOT — SWI Boot Loader: Product/product family description (for example, SWI6800 or SWI6800V2), 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)
	Note: Depending on your modem model, the above information may not apply.
	APPL — Application code
	SWOC — Software on Card image: "CDPC", followed by the 5-digit decimal CDPC (CD Product Code), followed by the CD version:
	• Major revision number (2 digits)
	• Minor revision number (2 digits)
	• Point release number (2 digits)
	USBD — USB descriptor table
	USB VID — USB Vendor ID
	Example, with interpretation of each line of the modem's response:
	`AT+GMR`
	`p2710100,5077 [Aug 07 2007 14:29:37]`
	Production release (p) for AirCard 402 (27), firmware build version 1.01, point release 00.
	`QCOM: SWI6800V2_FD.00.32`
	Boot image: SWI6800V2 family, Full Development (FD), Major revision 00, minor revision 32.
	`BOOT: SWI6800V2_FP.01.01 2007/08/09 10:37:43`
	SWI Boot Loader: SWI6800V2 family, Full Production (FP), Major revision 01, minor revision 01. Build date Aug 9, 2007.
	`APPL: SWI6800V2_FP.01.01 2007/08/09 10:37:43`
	Application code: SWI6800V2 family, Full Production (FP), Major revision 01, minor revision 01. Build date Aug 9, 2007.
	`USBD: SWI6800V2_GENERIC.00.00`
	USB descriptor table: SWI6800V2 family, generic build, Major revision 00, minor revision 00.
	`SWOC: CDPC_00004_01.01.02`
	Software on Card image, CDPC (CD Product Code) = 00004; CD version: major revision 01, minor revision 01, point release 02.
	`USB VID: 0x1199 PID: 0x0021`
	USB Vendor ID 0x1199; product: AirCard 402 (27).
	See also +CGMR (Get IWF Revision) (page 60) and I (page 79).

Command	Description
+GMI	Get Manufacturer Reports the modem's manufacturer. See also +CGMI (Get IWF Manufacturer) (page 60).
+GMM	Get Model Number Reports the modem model. See also +CGMM (Get IWF Model) (page 60).
+GOI	Get ISO ID Reports the modem's ISO system registration code (if any). The code provides a method of uniquely defining an object. The Sierra Wireless modems have no ID string (null). See also +CGOI (Get IWF ISO ID) (page 60).
+GSN	Get ESN Reports the modem's electronic serial number. The Sierra Wireless modems report an eight character ASCII string of hex digits (no spaces). See also +CGSN (Get IWF ESN) (page 61).

+I Prefix

Table 18: +I Prefix commands

Command	Description
+ICF=<[f],[p]> +ICF?	Character Framing Settings with this command are ignored. Normally this sets the local serial port (DTE - DCE) connection character framing. The modem uses a true serial interface, but the modem's support is limited to 8-bit data, 1 stop bit, no parity (the parity setting is ignored). Parm / Value / Meaning f (format) / 3 / 8 data bits, 1 stop bit (no other values are permitted) p (parity) / 0–3 / value is ignored. Default value is 8 data bits, 1 stop, no parity. See also +IPR (Fixed Port Rate) (page 73).
+ILRR[=0] +ILRR?	Local Rate Reporting Enables and disables the reporting of the local rate to the host (DTE). The modems do not support local rate reporting. This command is provided for compatibility only and only accepts a setting of **0** (off).

Command	Description
+IPR=<n> +IPR?	Fixed Port (R_m) Rate Sets a data rate for the local serial port (DTE - DCE). The modem supports the following rates: 300 1200 4800 19200 57600 230400 600 2400 9600 38400 115200

+M Prefix

Table 19: +M Prefix Commands

Command	Description
+MA=<str> +MA?	Modulation Automode Sets the additional modulations that the Base Station may use to connect with the destination modem 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 (page 73). The default setting is null. For details on parameters and use, see IS-131.
+MR=<n> +MR?	Modulation Reporting Enables or disables the extended intermediate result codes for +MCR:<carrier> and +MRR:<rate>[,rx_rate] from the IWF to the modem. 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) (page 70). 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. Value Meaning 0 Disables reporting of modulation connection. (Default) 1 Enables reporting.
+MS=<parms> +MS?	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) (page 70). The +MS result must be in that response. The default setting is null. For details on parameters and use, see IS-131.

Command	Description
+MV18R=<n> +MV18R?	V.18 Reporting Enables or disables the extended result codes for +MV18R: from the IWF to the modem. To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities) (page 70). The +MV18S result must be in that response. Value — Meaning 0 — Disables reporting of V.18 result codes. (Default) 1 — Enables reporting. The possible intermediate result codes are: +MV18: 5BIT — Indicates connection with 5-bit (Baudot) mode +MV18: EDT — Indicates connection with EDT +MV18: DTMF — Indicates connection with DTMF +MV18: V21 — Indicates connection with V.21 +MV18: V23 — Indicates connection with V.23 +MV18: B103 — Indicates connection with Bell 103-type modulation +MV18: V18 — Indicates connection with V.18

<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) (page 70). The +MV18S result must be in that response.

<table>
<tr><th>Parm</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>

+W Prefix

Table 20: +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 if set to this value 0 — No event 1 — Ring received 2 — Radio coverage restored 3 — SMS message received
+WWKUP=<n> +WWKUP?	Wake-up Events Mask Sets or reports the bit-mask used to identify events that generate a wake-up from the modem 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 on page 76) is reset to **0**. Bit — Meaning when set 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

No Prefix

Table 21: Alphabetic AT commands

Command	Description
+++	See Table 13 on page 56.
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 modem 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 (page 55) 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.
D [options]	Dial Initiates a data/fax call. (To dial a voice call, use +CDV, page 59.) 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.

Command	Description
	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. **Async (CSC) Data/Fax** The type of call opened depends on the setting of +FCLASS (page 66). 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; page 59) 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. Option — Meaning 0 - 9 — 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. T — Tone (DTMF) dialing - ignored by the modem. P — Pulse dialing - ignored by the modem. W — 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). , — Pause before processing the remaining characters in the dial string. The pause time is set by register S8 (Comma Pause Time). $ — Wait for billing (bong) tone before processing balance of string. @ — Wait for quiet answer; limited by register S7 (Wait for Carrier). ! — 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.

Command	Description
	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 24 on page 89.
E[n]	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 "Framing" on page 25). Value Setting 0 Disable echo 1 Enable echo (Default)
H[0]	Hook Control Go ON-Hook to disconnect a data/fax call. (To end a voice call, use +CHV, page 61.) 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) (page 61).

I	Product identification information.
	Note: Depending on your modem model, the types of information may vary.
	`ATI`
	`Manufacturer: Sierra Wireless, Inc.`
	`Model: USB 598 Rev 1.0 (2)`
	`Revision: p2514500,4012 [Mar 06 2008 17:19:08]`
	For information and examples on interpreting the (firmware) Revision, QCOM and other return values, see +GMR (page 70).
	`QCOM: SWI6800V2_FD.00.32`
	`BOOT: SWI6800V2_FP.01.45 2008/03/07 16:36:13`
	`APPL: SWI6800V2_FP.01.45 2008/03/07 16:36:13`
	`USBD: SWI6800V2_GENERIC.00.01`
	`SWOC: CDPC_00005_01.01.01`
	`USB VID: 0x1199 PID: 0x0025`
	`ESN: 0x60684203`
	`+GCAP: +CIS707-A, CIS-856, CIS-856-A, +MS, +ES, +DS, +FCLASS`
	See +GCAP (page 70).
	`SKU: 0x2BAF`

Command	Description
L[n]	Loudness - Speaker Volume This command is provided for compatibility reasons; the modem takes no action. Parameters are ignored. For control of voice mode speaker levels in the MC5728V, see ~SPKVOL (page 85).
M[n]	Mute - Speaker Control This command is provided for compatibility reasons; the modem takes no action. Parameters are ignored. For control of voice mode microphone and speaker muting in the MC5728V, see ~MICMUT (page 83) and ~SPKMUT (page 85).
O	On-line (Remote) **Currently not supported.** Causes the modem to go from command state (online condition) to data state. The modem 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.
P	Pulse Dialing This command is provided for compatibility reasons; the modem takes no action.
Q[n]	Quiet - Result Code Display Option Controls the return or suppression of result codes to the host (DTE). Value Setting 0 Disables Quiet mode (enables return of result codes.) (Default) 1 Enables Quiet mode (disables return of result codes). Result Codes: OK n = 0 Otherwise the result code is suppressed (n=1).

Command	Description
S<n>=<x> S<n>?	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. Var. Range n Valid S-register number (for values, see Table 23 on page 87). x as determined by the S-register (n). Result Codes: OK S-register n set to x. ERROR Invalid S-register value (n), or setting (x) is outside of permitted range.
T	Tone - Set DTMF Dialing This command is provided for compatibility reasons; the modem takes no action. For information on DTMF tone generation on the MC5728V modem, see ~DTMFB (page 82), ~DTMFK (page 82), ~TONDUR (page 86), and ~TONMUT (page 87).
V[n]	Verbose - Result Code Form Specifies whether the modem displays the result codes in numeric format or as words (verbose). For a numerical list of the result codes, see Table 24 on page 89. Note that numeric codes are returned as ASCII character numerals. This command also affects framing of responses (for details, see "Response framing", page 25). Value Setting 0 Numeric result codes 1 Verbose result codes (Default) Result Codes: OK (0) n = 0, 1 (returned in the *new* setting) ERROR (4) otherwise
X<n>	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 (page 77) 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.

Command	Description
	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: Value / No Dial Tone / Busy Signal 1 / ✗ / ✗ 2 / ✓ / ✗ 3 / ✗ / ✓ 4 / ✓ / ✓(Default)
Z	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 on page 91.

~ Prefix

Table 22: ~ Prefix commands

Command	Description
~DTMFB=<key1>[<key2>,<key3>,...]	DTMF Burst Generates a string of DTMF tones under the timings defined by ~TONDUR (Tone Duration; page 86). This command can be overridden by ~TONMUT (Tone Mute; page 87). The values of <key> can be any of **0-9**, *****, and **#**, up to a total of 32 keys. Spaces, quotes, brackets, dashes, and commas are *not* permitted in the string.
~DTMFK=<key>	DTMF Key Generates a single key DTMF tone for the duration set by ~TONDUR (Tone Duration; page 86). This command can be overridden by ~TONMUT (Tone Mute; page 87). The values of “key” can be any of **0-9**, *****, and **#**.

Command	Description
~ECHO=<n> ~ECHO?	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. Parm — Meaning 0 — Factory default (headset) (same as 3) (Default) 1 — No echo cancellation 2 — Handset 3 — Headset 4 — Acoustic (AEC) 5 — Speaker-phone
~HDSET=<n> ~HDSET?	Headset Detection Option Sets and queries the detection option for the voice headset. The setting is stored in non-volatile memory Parm — Meaning 0 — Do not use headset detection. Always report "not inserted" via CnS message. 1 — Do not use headset detection. Always report "inserted" via CnS message. (Default) 2 — Use headset detection. Report current headset detected state via CnS message. 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.
~MICMUT=<n> ~MICMUT?	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). Parm — Meaning 0 — Microphone mute is OFF (Default) 1 — Mute is ON
~NAMLCK=<n>	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

Command	Description
	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 (page 84).
~NAMVAL= <nam> [,<MDN>, <MIN>,<SID>, <NID>] ~NAMVAL?<nam>	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 (page 83). 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.
~RESET	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.

Command	Description
~SHTDWN	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.
~SPKMUT=<n> ~SPKMUT?	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). Parm Meaning 0 Speaker mute is OFF (Default) 1 Mute is ON This setting does not affect the setting of ~SPKVOL (Speaker Volume; page 85)
~SPKVOL=<n> ~SPKVOL?	Speaker (Headset) Volume Sets and queries the volume level of the voice circuit speaker (MC5728V modem only). The value is stored in non-volatile memory, making it persistent across resets and power-cycles. Parm Meaning 0 muted 1 -20 dB 2 -16 dB 3 -12 dB (Default) 4 -18 dB 5 -4 dB 6 0 dB

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

~STGLVL?</td><td>Side Tone Gain Level (MC5728V modem only)

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><td>Parm</td><td>Meaning</td></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><td>Parm</td><td>Range</td><td>Meaning</td></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>145–194</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. Parm — Meaning 0 — DTMF mute is OFF (tones can be generated) (Default) 1 — Mute is ON

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 23: S registers

Reg.	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

Reg.	Description	Range	Default	Units
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
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; page 86).	50–255	095	0.001 s

Result codes

Basic result codes

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

Table 24: 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.

Extended cellular result codes

This table provides a numerical list of extended result codes that may be supported by the IWF. Note that IWF systems may not support some or all of these codes.

Table 25: Extended cellular result codes

Code	Verbose	Meaning
11	RING ASYNC	Indicates an incoming CSC call.
12	RING FAX	Indicates an incoming CSC Fax call.
13	RING PACKET	Indicates an incoming packet data mode call.
21	NO SERVICE	Origination was attempted while the modem was not able to acquire a CDMA Paging Channel.
22	NO ASYNC SERVICE	The base station rejected the async service option request.

Code	Verbose	Meaning
23	NO FAX SERVICE	The base station rejected the fax service option request.
25	BAD REQUEST	An intercept was received after call origination.
26	PAGED	The modem attempted to originate a call after receiving a page.
27	RETRY	Reorder received after call origination.
28	PAGE FAIL	The modem received a page but not an alert.
29	LINK FAIL	The modem has lost the Traffic Channel.
30	RELEASE	The call has been released.

Extended cellular call progress codes

The following extended result codes may be enabled when the +CRC=1 setting is used. Support for these rests with the IWF. These are primarily call progress indications. Note that if Verbose is off (V0), these codes are suppressed; there are no numeric equivalents for call progress codes.

Table 26: Extended call progress codes

Code	Verbose	Meaning
	+CERROR: INIT FAILED <failed command>	Initialization String failed during transport layer initialization. If +CRC**=0** then result code 4 ERROR is returned.
	+CPROG: ANSWER	Indicated remote DCE has answered.
	+CPROG: BONGTONE	Billing tone was detected.
	+CPROG: DIALING <num>	Indicates PSTN dialing.
	+CPROG: DIALTONE	Dial tone was detected.
	+CPROG: QUIET ANSWER	Indicates Quiet Answer.
	+CPROG: RINGING	Indicates PSTN ringing.
	+CPROG: VOICE	Voice detected on PSTN connection.
	+CPROG: VOICE	Voice detected on PSTN connection.
*	+RING <service mode>	Indicates an incoming call to the modem in the service mode indicated: ASYNC, FAX, or STU-III (not supported).

Code	Verbose	Meaning
* 11–13 in Table 25 on page 89		

Stored profile settings

The Sierra Wireless CDMA 1X modems do not support a user- defined profile. Both Z (Reset; page 82) or &F (Factory Settings Restore; page 56) 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)

Command	Description	Factory
+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
+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

Command	Description	Factory
+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

Command	Description	Factory
	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)
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)

4: Appendix A: Working With the IWF

Introduction

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.

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.

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.

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.

Remote-only

Some commands require the IWF to provide the response. The local modem treats these as unrecognized commands. If configured (using +CXT; page 65), 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 (page 61) 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.

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.

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 result in the NO CARRIER result.

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 (page 59). 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.

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 “Command handling” on page 23.

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 (page 62). This timer defaults to 50 seconds. The link can be closed before this time by issuing the H command (page 79).

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

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.

5: Appendix B: 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

6: Appendix C: Acronyms and definitions

Table 28: Acronyms and definitions

Acronym or term	Definition
AGC	Automatic Gain Control
Cellular	800MHz radio spectrum air interface
dB	Decibel = 10 x $\log_{10}$ (P1/P2) (Power dB) Decibel = 20 x $\log_{10}$ (V1/V2) (Voltage dB)
dBm	Decibels, relative to 1 mW - Decibel(mW) = 10 x $\log_{10}$ (Pwr (mW)/1mW)
FER	Frame Error Rate – a measure of receive sensitivity
GPS	Global Positioning System—a system that uses a series of 24 geosynchronous satellites to provide navigational data.
IS-95	2G radio standards targeted for voice (cdmaONE)
MHz	MegaHertz = 1e6 Hertz (Hertz = 1/second)
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.
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

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